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- CATALOG PAGE SECTION
- TECHNICAL DATA/INFORMATION
- PRODUCT/SERVICE INDEX
- TELEPHONE DIRECTORIES

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BROADCAST

AVL

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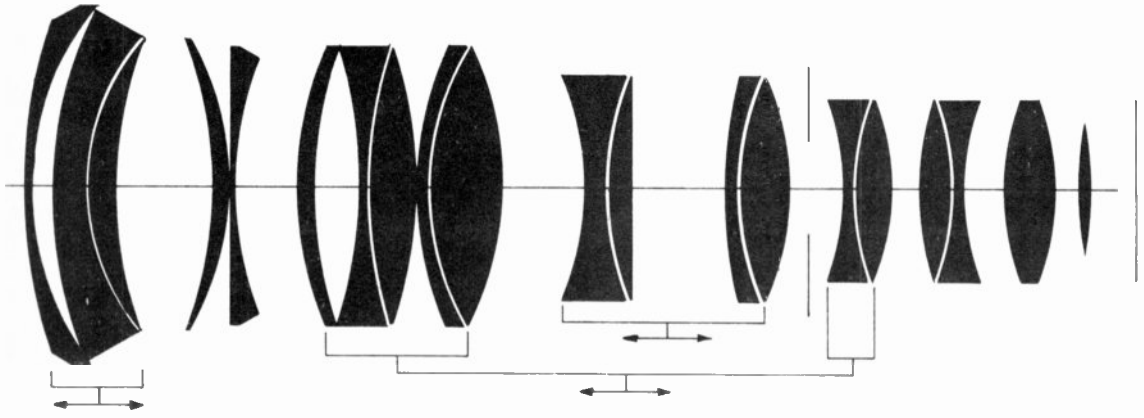

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Nick Glade
H. Nicholas Glade
President

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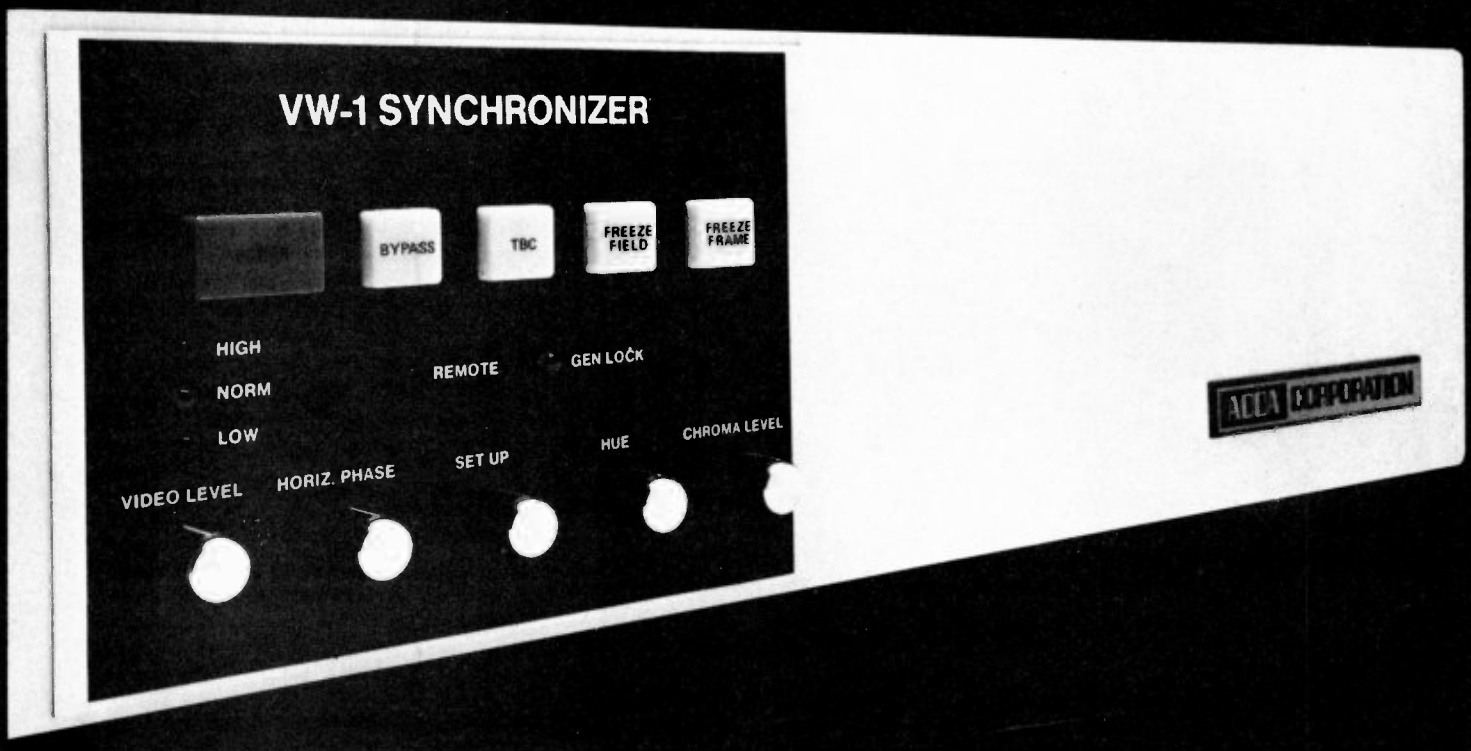

A frame synchronizer with TBC and freeze frame for under $20,000.

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ADDA CORPORATION

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AKG acoustics

PHILIPS AUDIO VIDEO SYSTEMS CORP.
A NORTH AMERICAN PHILIPS COMPANY
91 McKee Drive, Mahwah, NJ 07430 • (201) 529-3800

D-109 Lavalier Dynamic

$75.00

Lightweight microphone for public address, television and motion picture applications. Includes: 29½ ft. field-replaceable cable with stripped-and-tinned leads at free end; nylon cord; lavalier clip with tie clasp; and case. Net wgt. 5½ oz. w/cable. Matte nickel finish.

D-120E/ES Cardioid Dynamics

D120E...$70.00
D120ES...$75.00

Smooth-response, general purpose microphone with wire-mesh windscreen. Includes: SA-23/2 snap-out stand adapter; and case. (D-120ES same as D-120E but with integral on/off switch.)

D-140E Cardioid Dynamic

$170.00

Equally suited to studio or on-location uses. Optimally designed with a shock-suspended transducer and integral wire-mesh windscreen. Includes: integral bass roll-off switch to reduce proximity effect or low-frequency feedback; SA-25/1 stand adapter; and case.

D-160E1 Omnidirectional Dynamic

$80.00

Exceptional microphone for vocal recording and broadcast use. The "ideal" ambiance and round table mic. Includes: W-20 foam windscreen; SA-23/2 stand adapter; and case.

D-170E Supercardioid Dynamic

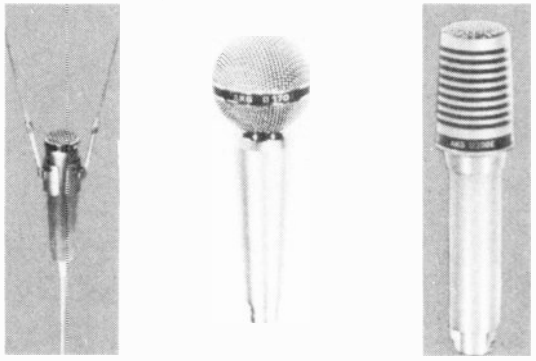
$115.00

Rugged microphone specially designed for rock vocalists. Internally shock-suspended transducer and wire-mesh windscreen for natural sounding close vocal pickups. Supercardioid pattern reduces feedback. Includes: SA-12/1 stand adapter; and case.

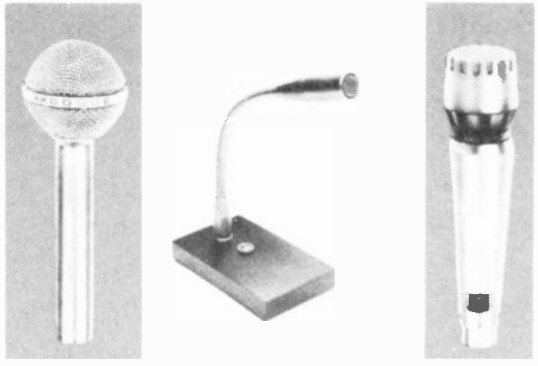
D-190E/ES Cardioid Dynamics

190E...$80.00
190ES...$85.00

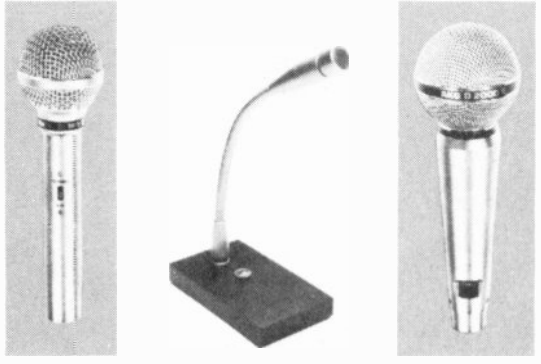
Excellent general-purpose, P.A., recording and live performance microphones. With sintered bronze wind/pop filter. Cardioid pattern reduces feedback. Includes: SA-11 stand adapter; and case. (D-190ES same as D-190E but with integral on/off switch.)



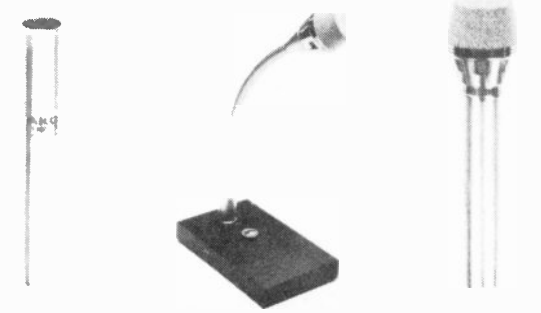
D-109 D-170E D-200E



D-120/ES D-510B D-1000E



D-140E D-558B D-2000E



D-160EI D-590 D-190E/ES

D-200E1 Two-Way Cardioid Dynamic

$115.00

Dual-transducer microphone for outstanding fidelity and uniform directivity. Has extended frequency response, no proximity effect and superbly linear response for superior recording and equalized sound system performance. Includes: SA-20 stand adapter; and case.

D-1000E Adjustable-Response Cardioid Dynamic

$90.00

Our most popular live-performance microphone. Designed with built-in 3-position mode switch for low- and mid-frequency equalization right at the microphone. Includes: SA-12 stand adapter; and case.

D-2000E Adjustable-Response Supercardioid Dynamic

$140.00

The ultimate professional entertainers' microphone. Combines feedback-rejecting supercardioid pattern, smooth response and 3-position bass rolloff and on-off switch. High reliability construction. Includes: SA-12/1 stand adapter; and case.

D-510B Omnidirectional Dynamic

$85.00

Designed for radio/TV/recording "announce booth" applications. Overall length is 12 3/16". Flexible gooseneck shaft permits convenient positioning. Includes: 3¾ ft. shielded cable; and mounting hardware.

D-558B Differential Noise-Cancelling Dynamic

$90.00

For working distances of about 2", such as in radio newsrooms, industrial paging, studio talk-back, and radio dispatchers. Convenient, flexible gooseneck shaft. Includes: 3¾ ft. shielded cable; and mounting hardware. Overall length 12 3/16".

D-590 Cardioid Dynamic

$100.00

Designed for sound reinforcement, paging and broadcast applications where ambient noise and feedback are considerations but where a greater working distance than 2" is required. Flexible shaft. Overall length 11¼". Includes: 3¾ ft. cable; and mounting hardware.

Prices and Specifications Subject to Change Without Notice.

Circle (7) on Reader Service Card

C-501E $150.00
Electret-Condenser Cardioid "Combo"

For most home recording, studio, broadcast and sound-reinforcement applications. Consists of SE-5E basic powering module; CE-1 electret-condenser capsule; W-20 foam windscreen; SA-11/1 stand adapter; battery; and case.

C-502E $150.00
Electret-Condenser Omnidirectional "Combo"

Designed for extra "hall" ambience, extended low-frequency response and for grouping around one mic. Consists of same components as the C-501E except with CE-2 electret-condenser capsule.

C-505E $155.00
Electret-Condenser Cardioid "Combo"

Ideal for pop and rock vocalists, stand-up comics, emcees and other "close-talking" applications. Consists of SE-5E basic powering module; CE-5 electret-condenser capsule with shock-suspended transducer and fixed wire mesh wind/pop filter; SA-11/1 stand adapter; battery; and case.

C-510E $180.00
Electret-Condenser Lavalier "Combo"

Miniature lavalier for film, TV, lecture-hall and other "hands-free" uses. Consists of 2¾ oz. CE-10/1 electret-condenser capsule; 4 ft. cable with adapter to SE-5E; SE-5E powering module; two W-6 foam windscreens; battery; H-16 belt clip; and case.

CE-1 Cardioid Electret-Condenser Capsule. Use with SE-5E. $60.00

CE-2 Omnidirectional Electret-Condenser Capsule. Use with SE-5E. $60.00

CE-5 Shock-Mounted Cardioid Electret-Condenser Capsule with wire-mesh wind/pop filter. Use with SE-5E. $70.00

CE-8 Short-Shotgun Electret-Condenser Capsule. Use with SE-5E. $105.00

CE-10/1 Miniature Lavalier Electret-Condenser Capsule. Capsule size: ⅞" x 9/16". Net wt. 2¾ oz. incl. cable. Cable length: 4'. Use with SE-5E. $105.00

SE-5E Powering Module for use with all CE-series capsules. Requires one PX-23 mercury battery (included). Battery life: Approx. 550 hours continuous use. On-off switch. May be phantom powered. $77.00

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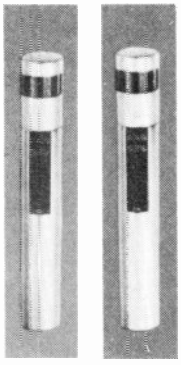

C-501E C-502E


C-510E


C-505E


CE-1

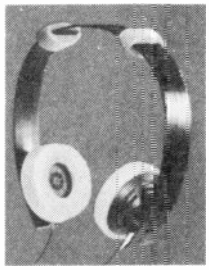

CE-2

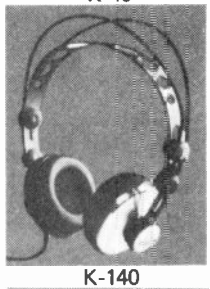

CE-5

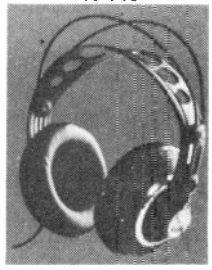

CE-8

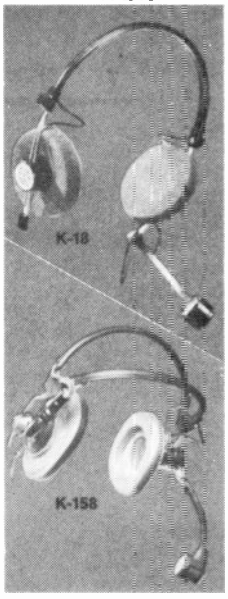

CE-10/1


SE-5E


K-40


K-140


K-240



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K-40 $24.00
Supra-Aural Stereo Headphone

Ultra-lightweight, high efficiency/wide bandwidth. Matches 4-200 ohm outputs. With 9¾ ft., 4-conductor cable and standard 3-conductor stereo phone plug. Wt.: 4½ oz.

K-140S $49.00
Supra-Aural Professional Monitoring Headphone

Lighweight. Capable of high sound pressure levels while maintaining low distortion and wide bandwidth. Matches 4-600 ohm outputs. With 9¾ ft., 4-conductor cable and standard 3-conductor stereo phone plug. Wt.: 6½ oz.

K-240 $79.00
Deluxe Circumaural Stereo Headphone

Provides better directional sound perspective and distance discrimination, faithfully simulating hearing in natural room conditions. Patented design combines main transducers and 12 passive diaphragms, providing crossover at 200 Hz. Matches 4-600 ohm outputs. With 9¾ ft., 4-conductor cable and standard 3-conductor stereo phone plug. Wt.: 9¼ oz.

K-18 Ultra-Lightweight Boom Set. Consists of two monophonically connected dynamic earphones and boom arm with noise-cancelling dynamic microphone. Headphone impedance matches 4-300 ohm outputs. Nominal microphone impedance: 200 ohms, matched by all low-impedance, unbalanced (25-1000 ohms) inputs. With 3¼ ft., non-detachable cable with stripped-and-tinned leads. Wt.: 3¾ oz. $45.00

K-158 Boom Set. Consists of two independently wired earphones and boom arm with noise-cancelling dynamic microphone. Designed for on-the-air and intercom use in TV/radio broadcasting, industrial and general applications. Headphone impedance matches 4-600 ohm outputs. Nominal microphone impedance: 200 ohms, suitably matched by all low-impedance, balanced (25-1000 ohms) inputs. With 6½ ft., detachable 6-conductor shielded cable with headset connector and stripped-and-tinned leads. Wt.: 12 oz. $110.00

K-158/T-301 Boom Set. Same as above with built-in transistor microphone preamplifier for use *only* with *carbon-microphone* inputs. $110.00

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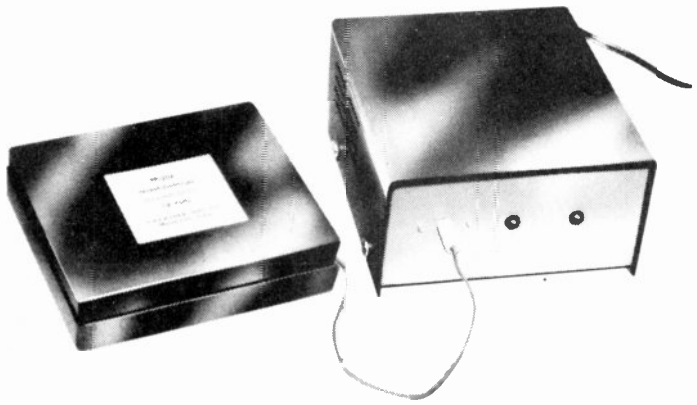

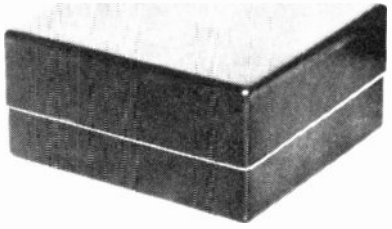

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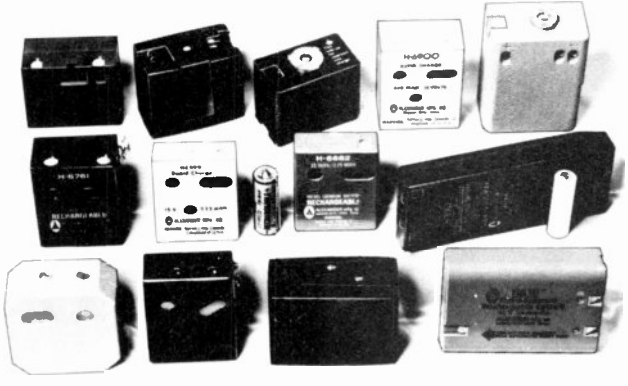

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Protect your A/V and Video investment with the strength of ANVIL Cases!

If your equipment is constantly on the road–or in the air–rugged, dependable ANVIL cases will make sure it arrives in performance-ready condition every time

ANVIL cases have been on tour with everyone from top rock bands to the Super Bowl Champs for years. They can't afford to miss a performance. If you can't afford to miss a performance you should protect your equipment with ANVIL quality too.

We can custom-build cases to fit any A/V or Video product on the market. And we can design your case to carry those all-important cords, cables and connectors right with your unit!

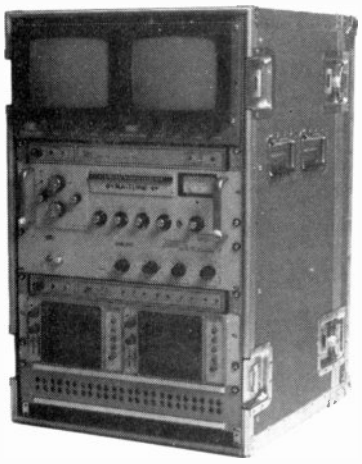
ANVIL ATA cases conform to rigid Airline Transport Association specs.

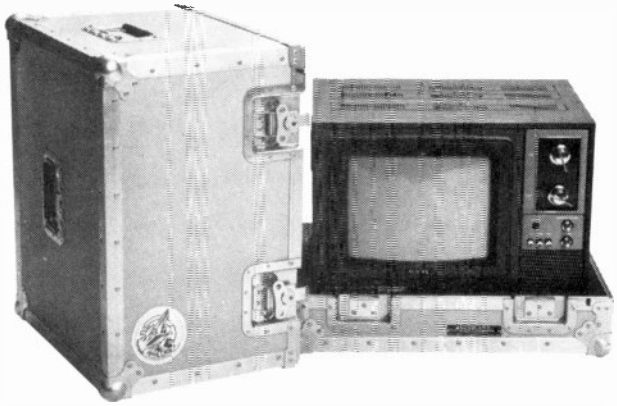
CAMERA CASES. Without a doubt, cameras are the most delicate and easily damaged of all video products. Keep your camera safe and vital interface components at hand in an ANVIL case.

RECORDER CASES. The ever-increasing demand for remote, field recording has increased the possibility of damage to delicate alignment and calibration adjustments during transit.

COMBINATION CAMERA/RECORDER CASES. Now any manufacturer's camera can be safely transported with any recording unit. Once on location, just open the case–hook up–and shoot!

ANVIL®





MONITOR CASES. Your delicate video monitor is gently but firmly suspended in high-density polyfoam sculptured to exact dimensions. The foam core is supported by top-grade wood and impact-resistant ABS plastic walls riveted to a rugged aluminum frame.

E.I.A. RACKMOUNT CASES. Standard 19 inch rackmount configurations can be safely and easily moved to your location - shoot - ready! Front and back covers remove to provide full access to controls and connections. Adequate ventilation for proper equipment operation is designed into the case.

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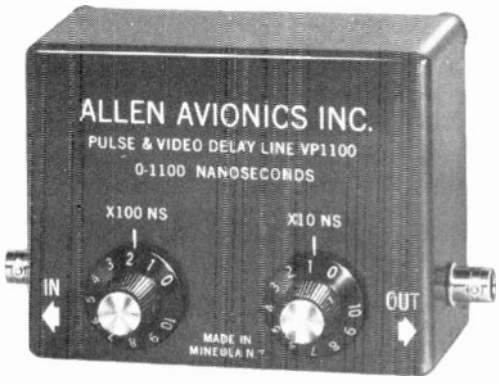
ALLEN AVIONICS, INC. VIDEO & PULSE DELAY LINES

224 EAST SECOND STREET, MINEOLA, NEW YORK 11501 Phones: (516) 248-8080 or (516) 747-5450

Allen Avionics, an established leader in the design and manufacture of Electromagnetic Delay Lines and L-C Filters has now developed a specialized group of products for the video market.

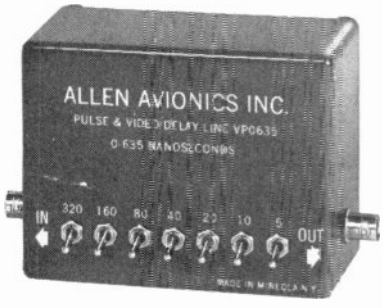
In color television broadcasting, accurate timing of signals is essential. This was initially achieved by the use of 75 ohm coaxial cable. The cost in time and materials to accomplish precise trimming and the lack of a rapid and convenient method of changing delays is currently responsible for the decline in cable usage. Television studios, studio equipment manufacturers and others engaged in the video industry are changing from 75 ohm cable to a more suitable method of achieving precise short delays. Allen Avionics now offers a line of Video Units for this purpose. Their use will result in a reduction of size, weight, installation cost and an overwhelming saving in time and effort to make delay changes.



Models VPO635 and VP1270 are padded to provide a flat loss of .5db and 3db, respectively. As a result of this padding, both units will exhibit a maximum variation of ±.2db at any delay setting.

Model VP0010 was designed specifically to be used as a delay trimmer in conjunction with our other delay units or any 75 ohm system. It offers .5 nanosecond switching resolution with excellent amplitude flatness up to 5.5 MHz.

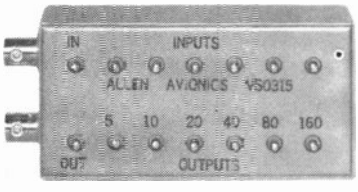
These new delay units feature extremely flat amplitude response to 5.5 MHz, small increments of delay variation, low signal distortion and tight delay tolerance. The delay networks are ideal for pulse applications because of their fast rise times and low distortion. Amplitude equalization is employed to achieve excellent flatness over the video frequency range. The delayed output of any model in this group is the summation of individual lines. It is not the result of a tapped line. This feature insures that output pulse distortions are minimized. Units will match to any 75 ohm system and can be directly connected into the video signal path by means of BNC connectors.



Part No.	Delay Range (Nano-Sec.)	Delay Steps (Nano-Sec.)	Method of Variation	Maximum Insertion Loss @ 100 KHz (db)	Amplitude Flatness At Any Delay Setting 100 KHz to 5.5 MHz (db)	Max. Rise Time (Nano-Sec.)	Package Size (Inches)
VP0010	0-10.5	.5	Toggle	.15	.2 Max.	3	4⅜ x 2⅜ x 1 1/16
VP0127	0-127	1.0	Toggle	.15	.3	14	4⅜ x 2⅜ x 1 1/16
VP0255	0-255	1.0	Toggle	.15	.3	16	4⅜ x 2⅜ x 1 1/16
VP0317	0-317.5	2.5	Toggle	.15	.3	20	4⅜ x 2⅜ x 1 1/16
VP0635	0-635	5.0	Toggle	.50	.4	25	4 11/16 x 3 11/16 x 2 1/16
VP1270	0-1270	10.0	Toggle	3.00	.4	30	4 11/16 x 3 11/16 x 2 1/16
VP1100	0-1100	10.0	Rotary	1.25	.4	30	4 11/16 x 3 11/16 x 2 1/16
VS0315	0-315	5.0	Strap	.25	.4	28	4 x 2 x 1¼
VS0635	0-635	5.0	Strap	.60	.5	33	5 x 2 x 1¼
VS1275	0-1275	5.0	Strap	1.25	.5	33	5 x 3 x 1¼

* .2db variation at any delay setting.

Impedance: 75 ohms.
Pulse Distortion: Less than 4% with an input pulse rise time of 20 nanoseconds.
Return Loss: 20db minimum.
Delay Tolerance: 5% or 1 nanosecond, whichever is greater.
Working Voltage: 100 volts Max.



All Models Stocked in our plant in Mineola, N.Y.

TYPE AV-397

MAXIMUM DELAY: 2.075 microseconds ±3% variable in .025 μs. steps from .025 to 2.075 microseconds.
TIME DELAY OF INDIVIDUAL LINES: 1, .5, .2, .2, .1, .05, .025 microseconds.
RISE TIME FOR ENTIRE LINE: .06 microseconds maximum.
FREQUENCY RESPONSE: 3db down at 5 megahertz for 2.075 microseconds delay.
DISTORTION: 2% maximum with .2 microsecond input pulse.
IMPEDANCE: 75 ohms ±5%.
WORKING VOLTAGE: 100.
TEMPERATURE COEFFICIENT: 50 parts/million/°C from −55°C to 105°C.
ATTENUATION: 7% maximum for 2.075 microsecond delay.
MECHANICAL: Hermetically sealed in a steel can 2" x 2½" x 5½".

Delay Equalized NTSC Lowpass, Bandpass & Reject Filters available with excellent delay linearity and low pulse distortions.

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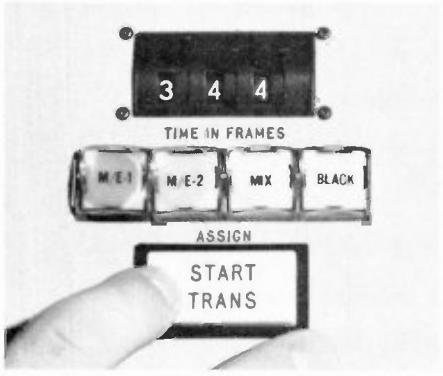

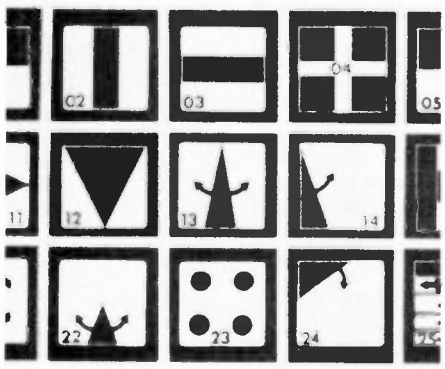

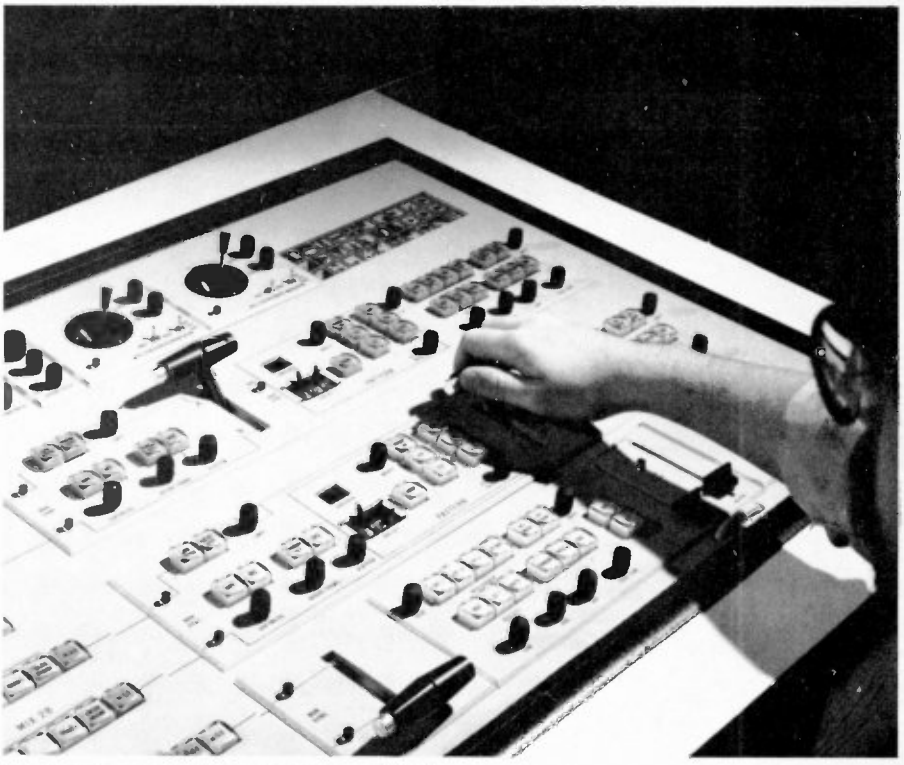

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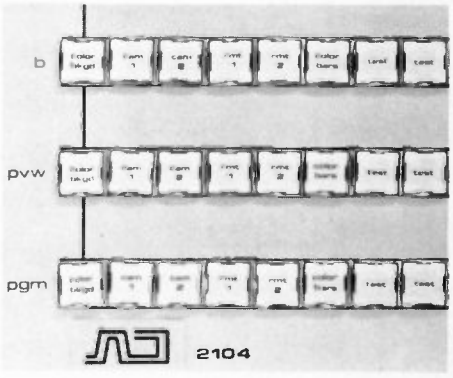
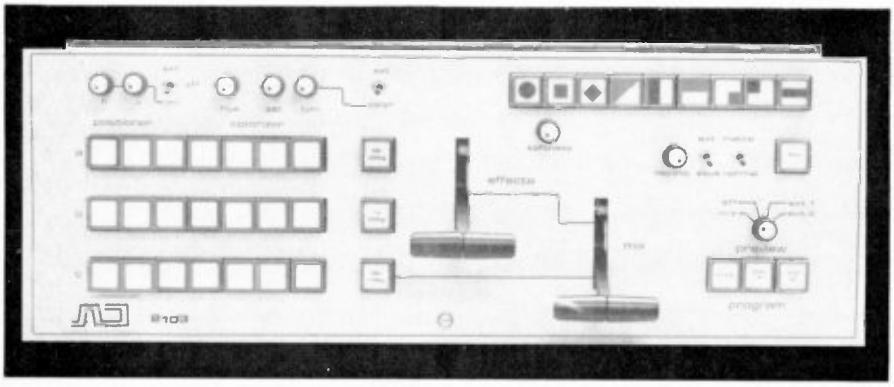
No matter what your company's production specialty, news, commercial programming, or instructional television, the American Data complete line of field proven production switchers have the features you'll need to do the job.





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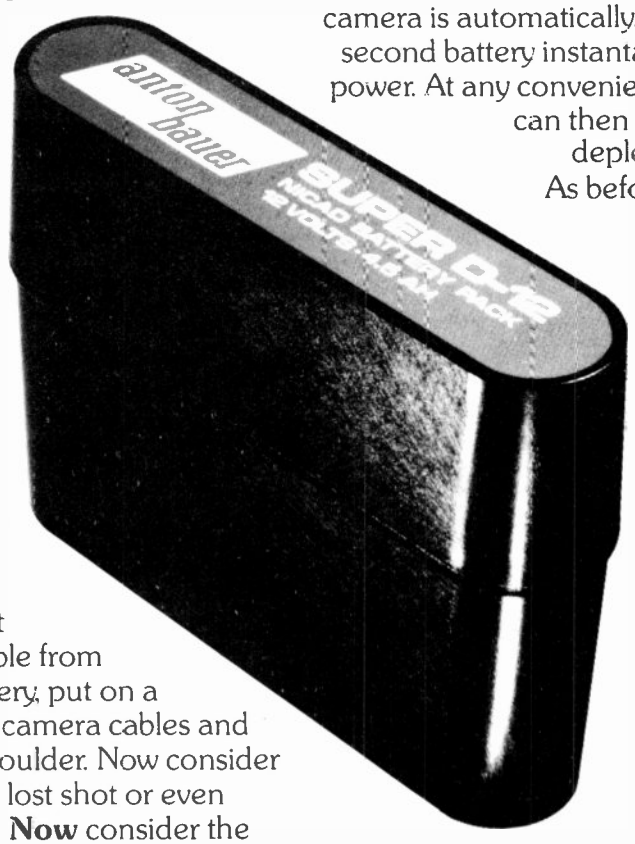
Perpetual Power

The First & Only Battery System That Never Runs Down

It is a fact that every battery must eventually run down, and usually does during your most important shot. We have changed all that. The new Anton/Bauer battery system will never run out of power, not during your most important shot, not during any shot.



The First System Approach

There are a lot of companies that make batteries, but only Anton/Bauer makes a battery system. Consider what happens when a conventional battery runs down, the cameraman must remove the camera from his shoulder, find a place to put it down, unplug the camera cable from the battery, unbuckle the battery, put on a fresh battery, fumble with the camera cables and lift the camera back on his shoulder. Now consider what this means in terms of a lost shot or even worse, an eternity of dead air. **Now** consider the Anton/Bauer System.

Quick-Change Modular System

Pull out the depleted battery module, push in a fresh one. The Anton/Bauer System is that simple and that direct. No plugs, no buckle, no fumbling. A fresh battery module in one second. But sometimes even one second is not good enough.

Perpetual Power

An important part of the Anton/Bauer System is our perpetual power belt which holds two battery modules. When the first is depleted, the camera is automatically, or manually switched to the second battery instantaneously without **any** loss of power. At any convenient moment, the cameraman can then take a second to replace the depleted battery with a fresh one. As before, when the second battery is depleted the camera will now draw once again from the fresh battery in position 1. And so it goes... no missed shot, no dead air, perpetual power. But there is even more to the Anton/Bauer System, like a variety of charges to fit any application, a selection of battery holders for any shooting style and battery modules tailored to the specific power requirements of virtually every portable Video camera.

Anton/Bauer... the first to design a **Professional Battery System** for the Video Industry—modular design—rugged LEXAN cases—silverplated contacts—welded cell construction—

It all adds up to a system that does not run down, or let you down either. Write or call for complete brochure.

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We're a little powerhouse.

Anton/Bauer is the first and only company to make **PROFESSIONAL** battery systems for the video industry. All Anton/Bauer systems feature cases of injection molded, fibre glass reinforced unbreakable LEXAN®, silver plated contacts, metal-to-metal screws, welded cell construction, and belts of heavy gauge genuine cowhide. This rugged construction is designed to withstand the heavy use and abuse that portable equipment must endure in the field. While there are other companies that make batteries, only Anton/Bauer offers complete battery **systems**. The Quick-Change, modular design provides unlimited flexibility. An Anton/Bauer battery can be worn inconspicuously on a pants belt, attached to a camera or VTR, or coupled with a PERPETUAL POWER BELT for unlimited and uninterrupted power. It can be charged fast, slow, one at a time or in groups of four or more. The slim compact design allows extra batteries to be carried in small cases, pockets, or almost any where.

There are four complete Anton/Bauer battery systems. Each is designed to cover a wide range of applications. Please see our individual information sheets for complete specifications and description of each system. The following is a brief guide to the general application of each system. The application chart and product/price list on the following pages may also prove helpful.

"COM-BATT"
Compact Battery System — Ni Cad 1.6 amp hour Modular, quick-change design. Full line of accessories including PERPETUAL POWER BELTS, mounting brackets for camera or VTR, quick-chargers and case chargers. Designed primarily for cameras drawing 15 watts or less but will still deliver ample power to cameras drawing up to 25 watts. Smallest and lightest of the Anton/Bauer Systems.

"SUPER D"
Heavy Duty System — Ni Cad 4 amp hour Modular, Quick-change design. Similar to Com-Batt system but with over 2½ times the power. Full line of accessories including PERPETUAL POWER BELTS, DUAL VOLTAGE BELTS, FAST CHARGERS and quick release mounting brackets for cameras and VTRs. For virtually all camera and VTR applications.

"SV SILVER SYSTEM"
Silver Zinc — 12 amp hours. Modular, Quick-change design. Most power for size and weight. About 2½ times the power density of Nickel Cadmium. Full line of accessories including PERPETUAL POWER BELTS, Automatic Quick chargers and quick release mounting brackets for cameras and VTRs. The sophisticated ANTON/BAUER silver chargers employ the latest state-of-the-art electronics and represent the first Silver Systems that really work.

"VIDEO BELTS"— Heavy Duty, Ni Cad 4 A.H. and 8 A.H.
All Anton/Bauer battery belts feature heavy duty genuine cowhide belts, aircraft style aluminum quick release buckles, and LEXAN® battery cases. All belts include charge sensors in **every module** monitoring the charge state of **every** cell in the belt, an ANTON/BAUER exclusive. This provides foolproof fast charging with the accessory fast charger. All belts include circuit breakers, zener diode expanded meters and built-in overnight chargers. All camera belts include protective relay that prevents the charging voltage from damaging the camera. Three models, each designed for a specific application:

LB 30 — 4 AH 30 VOLT LIGHTING BELT
VB 12 — 4 AH for cameras requiring + 12 volts
DB 13 — 8 AH double capacity belt for most 12 to 14 volt applications.

'D' System — Battery, Metered Unipack and DC 12 charger.

'D' System — Battery, Metered Unipack and DC 12 charger.

Basic **'Super D'** battery system. Pictured is SD12 battery module, UMD-2 Uni Pack with meter and DC 12 micro-charger. A wide range of accessories are available.

Silver Charger and Battery

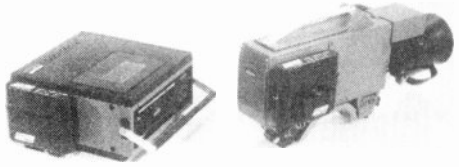
SV Silver Battery and Charger. Quick-change modular design allows battery to be snapped onto belt, camera or VTR. Most important, battery snaps onto charger during charging assuring mandatory upright position.

Camera and BVU W/Battery

The Anton/Bauer QRB Quick Release Bracket allows all models of Uni-Pack holders to be snapped onto virtually any camera, recorder or portable monitor.

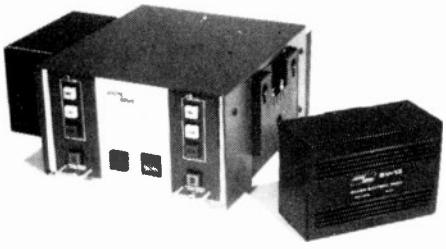
Video Belt

Anton/Bauer Battery Belts for portable lights and camera applications.



Camera and BVU W/Battery

Video Belt



Silver Charger and Battery

represented nationally by **VIDEO COMPONENTS INC.**
WE'RE KNOWN BY THE COMPANIES WE REP
601 south main street spring valley new york 10977
(914)356 3700
telex 996534

Prices and specifications subject to change without notice

Circle (14) on Reader Service Card

Professional Battery Systems

Anton/Bauer Inc.
66 Center St., Shelton, CT 06484, (203) 735-3305
We're a little powerhouse.

			SUPER D 4 Amp Hour Ni Cad Heavy Duty Modular Quick-Change		COM-BATT 1.5 Amp Hour Ni Cad Compact Modular Quick-Change		SV-SILVER 10 Amp Hour Silver Zinc Modular Quick-Change		VIDEO BELTS Heavy Duty 4 AH and 8 AH Ni Cad	
	Watts	Volts	Model	Running Time Hr.	Model	Running Time Hr.	Model	Running Time Hr.	Model	Running Time Hr.
Ampex BCC-14	27	14.4	SD-14	2	SV-13	5			DB-13	4
Asaca ACC2000	30	+/- 7.2	SD-14	1.6						
Cinema Products MNC-71CP	30	+/- 7.2	SD-14	1.6						
Fernseh KCA 90	30	+/- 7.2	SD-14	1.6						
Fernseh KCN	135	+/-14.4			SV-13*	2				
Hitachi FP-3030	12	12	SD-12	3.5	SV-13	10	QP-3	1.3	DB-13	8
Hitachi FP-1020	22	12	SD-12	2	SV-13+	6			DB-13+	4
Hitachi SK-80	48	+/-14.4	SD-14*	2	SV-13*	5				
Hitachi SK-90	35	12	SD-12	1.2	SV-13+	3.5			DB-13+	2
Ikegami HL-79A	23	13.2	SD-13	2	SV-13	6			DB-13	4
Ikegami HL-77	36	+/- 7.2	SD-14	1	SV6-2	3				
Ikegami HL-35	70	+/-14.4	SD-14*	1.5	SV-13*	3.5				
JVC CY-8800U	34	13.2	SD-13	1.2	SV-13	3.5			DB-13	2.5
JVC CR-4400U	14	12	SD-12	3	SV-13+	8			DB-13+	6
Panasonic AK750P/EN	23	13.2	SD-13	2	SV-13	6			DB-13	4
Panasonic WV-3800	14	13.2	SD-13	3	SV-13	9	QP-4	1.2	DB-13	6
Philips LDK-14	27	14.4	SD-14	2	SV-13	5			DB-13	4
Philips LDK-11	60	+/-12	SD-12*	1.5	SV-13*	4			VB-12	1.5
Philips Video 80	50	+/-12	SD-12*	1.8	SV-13* +	5			VB-12	1.8
RCA TK-76	42	14.4	SD-14	1	SV-13	3			DB-13	2
Sharp XC530	22	12	SD-12	2	SV-13+	6			DB-13+	4
Sharp XC320U	22	12	SD-12	2	SV-13+	6			DB-13+	4
Sony BVU-100	23	12	SD-12	2	SV-13+	6			DB-13+	4
Sony BVU-50	12	12	SD-12	3.5	SV-13+	10	QP-3	1.3	DB-13+	7
Sony DXC1610	11	12	SD-12	4	SV-13+	10	QP-3	1.5	DB-13+	8
Sony BVH-500	48	12			SV-13+	2.5			DB-13+	1.5
Sony BVP-300	21	14.4	SD-14	2	SV-13	6			DB-13	4
Thomson Microcam	21	14.4	SD-14	2	SV-13	6			DB-13	4
Portable Lights	100	12	SD-12	25 min.						
(Sun Guns)	150	30							LB-30	45 min.
	250	30							LB-30	30 min.
	350	30							LB-30	20 min.

*Requires special dual power belt which holds two batteries, one for (+) voltage, the other for (-) voltage. Running times are for the pair.

+ Requires special voltage reducing cable or bracket.

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Anton/Bauer Inc.

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PRICE LIST

"COM-BATT" COMPACT BATTERY SYSTEM
N. Cad 1.6 A.H.

Battery Modules		
QP-3	12 Volt Quick Pack	$ 180.00
QP-4	14.4 Volt Quick Pack	220.00
Holders		
UP-1	Uni-Pack Quick-Change Single Battery Holder	48.00
UPM-2	Uni-Pack w/Meter for QP-3	85.00
UPM-4	Uni-Pack w/Meter for QP-4	85.00
PPCA	Perpetual Power Belt — Automatic	275.00
QRB	Quick Release Bracket for Camera or VTR	50.00
Chargers		
MC-2	Micro Charger — Overnight for QP-3 Only	35.00
QC-3	Quick Charger — 4 hr. Charge for QP-3 Only	85.00
QC-4	Quick Charger — 4 hr. Charge for QP-4 Only	85.00
SC-4	Case Charger — Overnight for 4 QP-3 Batteries	195.00
SC-4L	Case Charger — Overnight for 4 QP-4 Batteries	210.00
SC-6	Case Charger — Overnight for 6 QP-3 Batteries	225.00
SC-6L	Case Charger — Overnight for 6 QP-4 Batteries	240.00

SUPER D SYSTEM
Heavy Duty, Modular, Quick-Change N. Cad 4. Amp Hr.

SD 12R	12 Volts Super D Regular Charge	$ 320.00
SD 12F	12 Volts Super D Fast Charge	360.00
SD 13F	13 Volts Super D Fast Charge	390.00
SD 14R	14.4 Volts Super D Regular Charge	360.00
SD 14F	14.4 Volts Super D Fast Charge	410.00
Holders		
UP-D	Uni-Pack Quick-Change Single Battery Holder	60.00
UMD-2	Uni-Pack with Meter — 12 Volts	90.00
UMD-3	Uni-Pack with Meter — 13 Volts	90.00
UMD-4	Uni-Pack with Meter — 14.4 Volts	90.00
PPA	Perpetual Power Belt — Automatic	285.00
PPM	Perpetual Power Belt — Manual	245.00
PPCT	Perpetual Power Belt — w/Center Tape (+ /- Voltage)	275.00
DPD	Dual Power Belt Holds 2 Batteries for + /-12 or + /-14 Volts	245.00
DPD/SK80	Dual Power Belt — Includes Bracket for SK80 Electronics Module and Cable to Module	315.00
QRB	Quick Release Bracket for Mounting Uni-Packs on Camera /VTR	50.00
Chargers		
DC-12	Micro Charger — Overnight — 12 Volts Only	60.00
DC-13	Micro Charger — Overnight — 13 Volts Only	60.00
DC-14	Micro Charger — Overnight — 14.4 Volts Only	60.00
FC-D	Fast Charger	285.00
DC4M	Case Charger — Overnight — for 4 Batteries (Chassis Only)	545.00
DC4M-T	Case Charger — As Above in Heavy Duty Case	675.00
Brackets		
QRB/HL-77	Quick Release Bracket Installed On Customers HL-77 Rear Side Plate	95.00
QRB/TK-76	Quick Release Bracket Installed On Special Plate for Mounting on Rear of TK-76 A or B. No Modification to Camera	95.00
QRB/BVU-50	Quick Release Bracket Installed on Special Wrap Around Protection Plate for Mounting on BVU-50. No Modification to Recorder	95.00
QRB/ BVU-100	Quick Release Bracket Installed on Special Plate for Mounting on Side of BVU-100 VTR. No Modification to Recorder	95.00
CD-50	Cassette Door Replaces Standard Battery Door on BVU-50 Allowing Storage of 20 Minute Cassette in Battery Compartment	55.00

SV SILVER SYSTEM
Modular, Quick-Change, Silver Zinc 12 Amp Hr.

Battery Modules		
SV-13	Silver Zinc 13.5 Volts — 12 AH	$ 895.00
SV 6.2	Silver Zinc + /-6 Volts — 12 AH	895.00
Holders		
UPSV/HL-77	Single Battery Holder With Belt Loops and Integral Power Cable for HL-77	130.00
UPSV/TK-76	(Same as above) for TK-76	165.00
UPSV/HL-79	(Same as above) for HL-79	130.00
UPSV/CY8800	(Same as above) for JVC CY-8800	130.00
UPSV/ MC-BVP	(Same as above) for Thompson Micro Cam and Sony BVP-300	130.00
DPSV/SK-80	Dual Power Belt — Includes Bracket and Cable for SK 80	320.00
PPSA	Perpetual Power Belt — Automatic (F/SV 13 Only)	295.00
PPCTS	Perpetual Power Belt — Manual (F/SV6.2 Only)	275.00
DPSV	Dual Power Belt (Holds Two SV-13 for + /-13.5 Volts)	250.00
QRSV	Quick Release Plate for Camera or VTR Mounting	55.00
Chargers		
SVDC 6.2	Fast/Slow for One SV 6.2 Battery	1595.00
SVDC 13	Fast/Slow Dual Charger for Two SV 13	1595.00
Brackets		
QRSV/ TK-76A and TK-76B	Quick Release Bracket for SV-13 — Installed on Special Plate for Mounting on Rear of TK-76A or B Includes Integral Shorty Power Cable. No Modification to Camera	165.00
QRSV/ BVU-100	Quick Release Bracket for SV-13 — Installed on Special Plate for Mounting on Side of BVU-100. No Modification to Recorder	125.00
QRSV/ BVU-50	Quick Release Bracket for SV-13 — Installed on Special Wrap Around Plate for BVU-50. No Modification to Recorder — Includes Integral Power Cable to Recorder	135.00

VIDEO BELTS
Heavy Duty N. Cad 4 A.H. and 8 A.H.

All Video belts have built-in overnight Chargers, Zener Diode expanded volt meters, circuit breakers and fast charge capability with FC-L fast charger.

Belts		
LB-30	Lighting Belt — 30 Volts — 4 AH	$ 645.00
LB-30D	Lighting Belt — 30 Volts — 4 AH — 115/230 Volt Charger	675.00
DB-13	Double Capacity Belt — 13.5 Volts — 8 AH	665.00
Chargers		
FC-L	Fast Charger — One Hour — For All LB, VB, DB Belts	250.00
TFC-L	Fast — Slow Charger. One Hour Transformer Type — 115 or 230 Volts for All LB and DB Belts	325.00

Prices and specifications subject to change without notice

ASACA

ASACA CORPORATION OF AMERICA
1289 Rand Road, Des Plaines, Illinois 60016
Tel: (312) 298-4380 Telex: 72-6351

Modular Type Portable Color TV Camera
ACC-2000

ASACA designed and developed its new ACC-2000 for a whole range of applications including electronic news gathering and field production work.

This camera can either be used as a one-piece (back packless) camera or as a two-piece camera whereby the rear section (process pack) is detached. This allows a greater degree of mobility. Furthermore, the whole system can be combined and used to maximum advantage.

By making use of a gen-lock circuit, 2-line contour circuit and an automatic adjustment circuit, the camera's mobility is enhanced and its picture quality is increased. In addition, these features give the user a feeling of quality and a feeling of being part of the action.

Another main feature of this camera is its excellent balance and ease of operation. The weight of the camera is distributed ideally and there is no feeling of fatigue even if the cameraman is at work for long periods of time.

Features

1. New modular camera configuration
The camera can be used as one-piece or as two-piece. The camera is constructed so as to allow the head pack and the process pack to be separated, the two individual units being linked by a camera cable.

2. Lens selection
The camera is provided with C, bayonet and Arriflex (using a replaceable adaptor) lens mounts, and this enables a wide variety of lenses to be used.

3. Effective battery operation
Thanks to the streamlined design of the circuitry, the power consumption of the camera is a mere 30W when a +7.2V Ni-Cd battery is used. This means that the camera can be powered for more than two hours at a stretch.

4. Automatic functions for improved operation
The camera is provided with an automatic white control, an automatic iris control and flare compensation which make the camera handle like a dream.

5. Gen-lock operation
It is possible to operate a multiple number of cameras in sync with black burst signals supplied from an external source. Furthermore, there is a built-in phase shifter for the subcarrier and sync signals.

6. Full 2-line contour enhancement
The adoption of a 2-line system enables pictures to be obtained which have been contour-compensated from the balance. Also featured is a circuit configuration which is equipped with a horizontal and vertical compensation adjustment function, a crispening function and a level dependent function.

7. Remote control function
If the remote control unit is employed, it is possible to control the cable compensation (maximum length: 1000 ft.), iris, gen lock, registration and master pedestal functions at the base station.

8. Perfectly balanced
The design of the camera has been made to conform to the principles of human engineering, and so the camera features perfect balance and just the right distance from your shoulder to the grip. This means that you're not aware of the color camera's actual weight.

UNIT COMPOSITION

[Basic configuration]
- Camera head with 3 pick-up tubes (2/3 inch plumbicon® or saticon®)
- 1.5" viewfinder
- AC pack
- Carrying cases
- Cords and accessories

[Options]
- DC pack with Ni-Cad batteries
- Belt battery
- DC-DC convertor for car battery use
- Battery charger
- 15 ft camera cable (When used as a 2 piece type camera)
- Conversion connector kit (When used as a 2 piece type camera)
- Remote control unit (Iris, black level, painting, gen-lock)
- Zoom lens; F 2.2 12 120mm
- C – ARRI conversion adaptor
- External zoom control box
- 5" viewfinder
- 9" picture monitor (B/W)
- Waveform monitor
- Head set
- Test charts
- Rain cover
- Cold-protective cover
- Microphone (600 ohm, balanced)
- Tripod
- Tripod mounting plate
- Tripod adaptor for 5" viewfinder

SPECIFICATIONS

- Input signals
1) Ext gen-lock signal/ VBS 1Vp-p or black burst signal
2) Aux video signal/VBS 1Vp-p
3) Mic input signal/ -60 dBm, 600 ohm, balanced
4) Tally/24V DC
- Output signals
1) Video signal/VBS 1Vp-p, 1 output
2) Monitor output/VBS 1Vp-p, 1 output
3) Mic output/-22dBm, 600ohm, balanced
4) VTR control/Switched voltage comparable with SONY VO-3800
5) Intercom/2 wire system
- Rated voltage
1) AC power/ AC 117V 50/60Hz 50VA (Approx.)
2) Battery/±7.2V 30W
- Optical system/Dichroic mirror system
- Filter/No.1 Clear 3200°K
  No.2 6000°K → 3200°K ND25%
  No.3 6000°K → 3200°K ND10%
  No.4 Cap
- Pick-up tube/ 2/3 inch Plumbicon® or Saticon®
- Viewfinder/1.5" electronic VF (B/W)
- Lens mount/ C mount, special bayonet mount
- Lens/Power zoom lens, F2.2 12–120mm
- Weight/
  1) Camera head: 19.1 lbs (8.7 kg)
  2) Viewfinder: 2.2 lbs (1.0 kg)
- Resolution/
  1) Over 500 TV lines at picture center
  2) Over 400 TV lines at picture corners
- S/N ratio/ More than 50 dB (Y channel) G channel signal current: 150 nA
- Sensitivity/ F 4+0.5 at 200 fc (2000 lux)
- Minimum illumination/ 30 fc (300 lux) F 2.2 +9dB
- Geometric distortion/ Less than 1.5% of picture height
- Resistration/
  *Circle 80% of picture height ..... within 0.1%
  *Circle 100% of picture height .... within 0.2%
  *Remaining area .....within 0.4%
- Usable ambient temperature range/ 0 – 40°C (With cold-protective cover, camera usable down to -20°C)
- Quick start/Within 10 sec.

Prices and Specifications Subject to Change Without Notice.

ASACA CORPORATION OF AMERICA
1289 Rand Road, Des Plaines, Illinois 60016
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925C

Video Noise Meter

The 925C video noise meter measures the units' video noise voltage generated in television transmission equipment, television cameras, video tape recorders, video disc units, digital image processors, and the like.

One conventional method of measuring such noise is to use a video noise meter that employs a power meter. In contrast, the Shibasoku noise meter supplements the conventional meter functions with a new function that allows operators to measure the chroma noise of color signals.

In particular, the Shibasoku model is especially designed to measure the several-kilo-hertz-order color shading noise that is generated inhelical video tape recorders.

Measurements of video noise and chroma noise using this model are conducted with the equipment under test subjected to exactly the same conditions as in actual operation.

Employed for the measurement of video band noise is a white signal of the desired level with a sync signal added to it. Chroma band noise is measured with a single-color signal of the desired level that contains both a sync signal and a color burst signal.

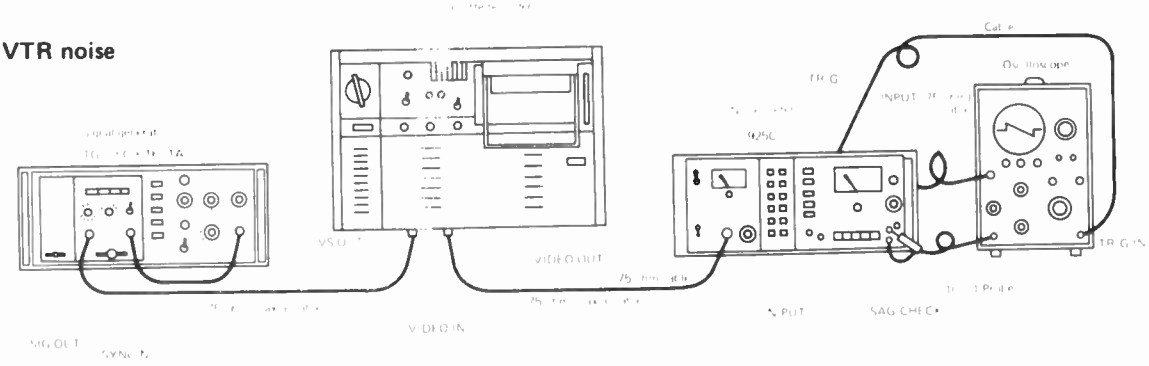
Chroma noise can be split into AM (amplitude modulation) and PM (phase modulation) components which can be measured separately.

At the point of measurement, all the blanking, sync signals and color burst signals that were added to the test signals are canceled out within the unit. Also, this miss pulse, created when head switchover takes place on a 2-head video tape recorder, is also eliminated.

The loss of the noise energy of the extracted component is compensated for at the power meter.

Operating Instructions

Example of measuring VTR noise



TELEVISION SYSTEMS
925C/1 System-M
925C/2 System-I

SPECIFICATIONS

Kinds of measured video noise	Video band noise, Visual weight noise, Chroma band AM noise and Chroma banc PM noise
Noise measurement range	
Video band noise	0.1 kHz to 10 MHz
Visual weight noise	τ = 0.245 μs filter at CCIR REPORT 410-1 (Doc. CMTT/273-E 1974) furnished to standard type, but change of it is acceptable by required
Chroma band noise	925C/1, 3.58 MHz ± 0.5 MHz 925C/2, 4.43 MHz ± 0.5 MHz
Selecting function for noise measuring band	
Low band cut-off frequency (HPF)	0.1/1/10/50/100 kHz switchable
High band cut-off frequency (LPF)	925C/1, 0.5/1/3/4 MHz/THROUGH switchable 925C/2, 0.5/1/4/5 MHz/THROUGH switchable
Measuring signal input	
Input waveforms	
Noise measurement of video band	0 to 1 Vp-p white signal which includes the composite sync pulse and blanking pulse is provided, and the color burst included in the signal is acceptable.
Noise measurement of chroma band	Single-color signal that the chroma signal of 0.2 Vp-p to 1 Vp-p is superimposed on white signal from 0 to 1 Vp-p
Sag adjusting range	≤ ± 5% of linearity sag (switch is selected to H or V)
Sync level range	≥ 0.1 Vp-p
Input impedance	75 Ω ± 3% or HIGH (1 MΩ 20 pF) selection
Input level correcting range	Adjustable within ± 3 dB
Indication of noise level	Vrms and S/N, dBp-p/rms
Definition of noise level (S/N)	Noise level defined by S (Vp-p)/N (Vrms) and indicated by dB
Video band noise	925C/1; S=0.714 Vp-p, 0 dBp-p/rms=0.714 Vrms 925C/2, S=0.7 Vp-p, 0 dBp-p/rms=0.7 Vrms
Chroma band noise	Effective voltage of PM side band is 0.714 Vrms=0 dBp-p/rms
Chroma PM noise	Effective voltage of PM side band is 0.714 Vrms=0 dBp-p/rms
Measurement of noise voltage	0.3 mVrms to 100 mVrms
Measuring accuracy	
Amplitude response	≥ ± 3 sigma at full scale
Frequency response	≤ ± 0.5 dB at measurement band
Errors	≤ ± 0.5 dB at −20 to −60 dB ≤ ± 1.0 dB at −60 to −70 dB
RMS voltmeter	
Detection methods	Detection of true RMS value
Scale indication	Vrms and dBp-p/rms
Meter scale	Voltage: 10~1/3~0.5 (Two scale at upward and down ward) dB, +3 to −12
Range switch	−20/−30/−40/−50/−60 dB
Reference value of dB scale	925C/1, 0 dB = 0.714 Vrms 925C/2, 0 dB = 0.7 Vrms
Input voltmeter	Meter scale, 0 to 1 Vp-p Indication (Vp-p) and calibration for the white signal and the chroma signal
Noise signal output	
Output level	Approx. 0.5 Vp-p at full scale
Output waveform	H/2 Sin^2 gate waveform
Output impedance	75 Ω ± 3%
Sub-carrier trap	
Attenuation	≥ −20 dB
Sync selection	(Internal or External)
Internal sync	Sync separating method
External sync	Composite sync pulse input: 1 Vp-p to 4 Vp-p
Input impedance	High impedance, bridge connection
Input and output connector	BNC type, unbalanced
Power supply	AC 100/115/200/230V ± 10%, 50/60 Hz, approx. 50 VA 430(W) x 149(H) x 335(D) mm, (inch) 16.9 x 5.9 x 13.1 approx. 15 kg
Accessories Supplied	Coaxial cables (BNC, 3C2V) . . . 2 Extension printed board for P.C.B . . . 1 M-BNC plug . 1
Optional L-150	Rack mounting adaptor

Prices and Specifications Subject to Change Without Notice.

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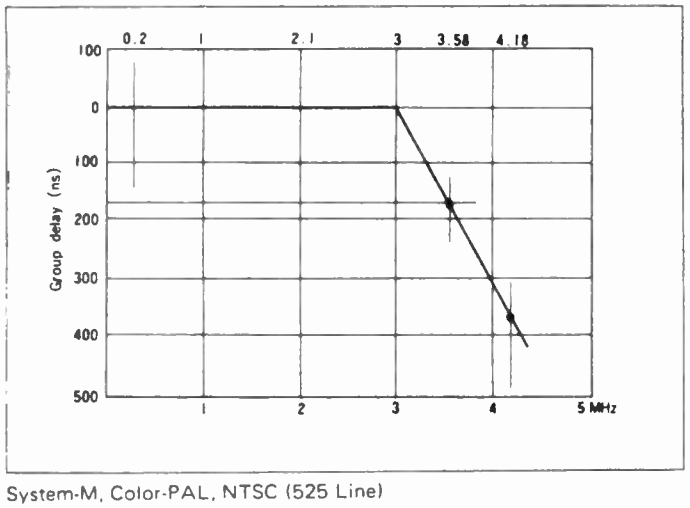
201-1

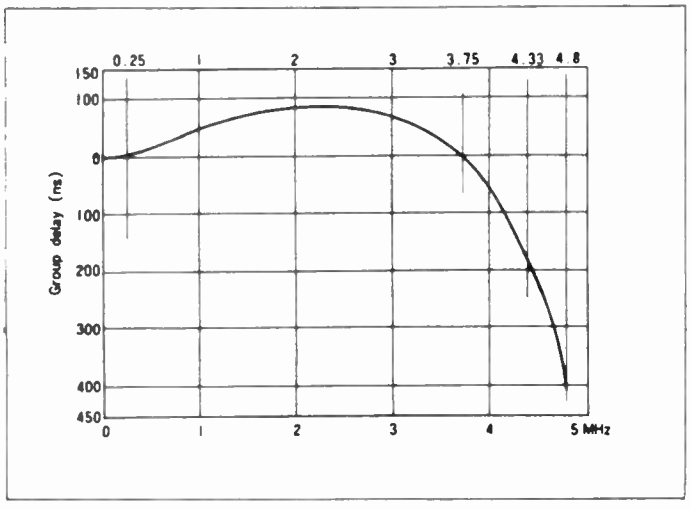
Envelope Delay Measuring Set

The 201-1 is expressly designed for measuring the envelope delay incurred in equipment used in the transmission and reception of color television signals.

It contains a built-in sweep signal generator which obviates the need for separate signal sources. Direct measurements are possible thanks to the graticule with the appropriate television system's standard gradations which is attached to the surface of the cathode-ray tube in the display section. The model features a choice of signal source between sweep signals and wave signals. Direct read-out is possible even with spot frequencies ranging from about 200 KHz to 10 MHz.



System-M, Color-PAL, NTSC (525 Line)



System-B.G, Color-PAL (625 Line)

FEATURES

- **Built In Sweep Generator** — It can determine sweep measurement and CW (point by point delay of descrete frequencies).
- **Sweep Speed Is Adjustable.**
- **Built In Sync and Blanking Circuit** — Since the unit has its own sync and blanking circuit, one is also able to measure GROUP DELAY.
- **Direct Read-Out by 7 Inch Square CRT** — It is possible to show simultaneously a dual trace for the envelope delay and frequency versus amplitude characteristics.
- **Internal and External Marker** — It has its own fixed internal marker as well as a connector for an external marker.

SPECIFICATIONS

• Measuring signal generator	
Frequency range	Sweep: 100 kHz to > 5 MHz CW : 100 kHz to > 5 MHz
Output frequency response	± 0.5 db at 100 kHz to 5 MHz
CW accuracy	< ± 3%
Marker frequency	0.2/1.0/2.1/3.0/3.58/4.18/5.0 MHz
Sweep rate	Approx. 1 Hz to 5 Hz continuous variable
Output impedance	75 Ω unbalanced < ± 10%
Output level	
without sync and blanking:	0 to 1.0 Vp-p, continuous variable
with sync and blanking:	Video 0.1 to > 0.7 Vp-p Set-up approx. 0.07V Sync 0.1 to > 0.4 Vp-p
Line frequency	15.734 kHz < 5×10^{-4}
Split frequency	20 kHz < 5×10^{-4}
CW output	1 Vp-p (< 1 kΩ)
• Envelope delay measuring section	
Measuring frequency range	Sweep: 200 kHz to > 5.0 MHz CW : 200 kHz to > 5.0 MHz
Measuring range	+ 100 ns to − 500 ns
Phase control	0 ~ 10 μs
Accuracy	< ± 10 ns (at input level variation of within 6 dB)
Measuring input level	0.1 Vp-p to 1.1 Vp-p
Noise	< ± 10 ns (at without sync signals)
Vertical display calibrated signal	100 ns ± 3%
• Display section	
Display methods	Dual trace display by chopper method
Vertical sensitivity	100 ns/div (1 div = 14 mm), with MAG × 2
Effective scale	118 x 84 mm
C.R.T.	7 inches square tube, persistence (B-7), magnetic deflection method
• Others	
Power supply	AC 100/117 V ± 10%, 50/60 Hz
Dimensions	430 (W) x 150 (H) x 335 (D) mm Approx. 16.9 x 5.9 x 13.1 inch

- 763 NA — Same unit less sync and blanking circuit available at reduced price.
- SHIBASOKU Equipment — sister company of ASACA.

Prices and Specifications Subject to Change Without Notice.

8 Haven Avenue
Port Washington, New York 11050
Tel: (516) 883-4414

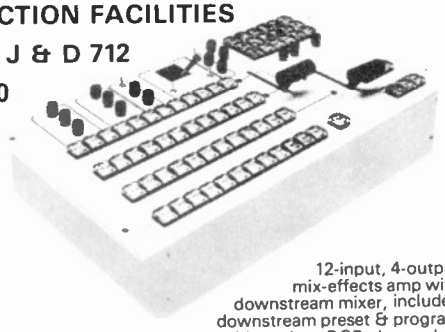
Beaveronics, Inc.

STUDIO PRODUCTION VIDEO SWITCHING SYSTEMS

FOR REMOTE & SMALL PRODUCTION FACILITIES

MODEL J & D 712

$7,400.00



12-input, 4-output mix-effects amp with downstream mixer, includes downstream preset & program busses with cut bar, RGB chroma key

Standard Features

- 12 inputs including Black-burst and Color Background
- Built-in Black Burst Generator
- Built-in Colorizer
- Built-in RGB Chroma keyer
- Four Switching busses
- Downstream Preset and Program Busses with cut bar
- Rack-mounted electronics
- Adjustable Soft Wipe
- Adjustable Border edges
- Color Matte
- Vertical Interval switching thru-out
- Illuminated Momentary Contact push buttons
- Internal, external, Chroma-key, and matte inputs to keyer
- Built-in pattern modulator with frequency and amplitude controls
- Full Tally
- Pattern symmetry control
- Illuminated Momentary contact push buttons for effects selection
- Normal/Reverse/Normal-reverse wipe transitions
- Pattern limit controls for presetting size of patterns or varying vertical and horizontal aspect ratio
- Loop-through inputs
- Input amplifiers with clamping
- Synchronous/Non-synchronous inhibit
- Modular construction with front access plug-in modules

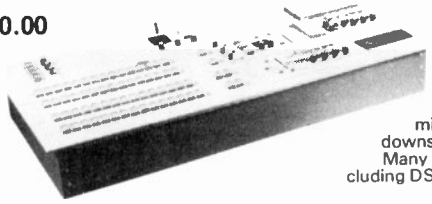
Options:

Downstream Keyer

FOR MODERATE SIZE FACILITIES

MODEL B1-154

$10,990.00

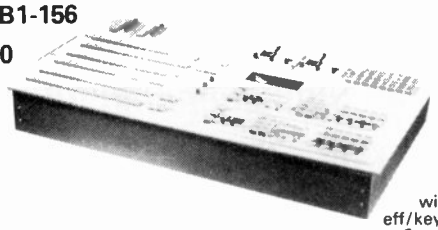


15-input, 4-bus mix/eff/key amp with downstream mix/key amp Many optional features including DSK & quad-split, etc.

FOR SOPHISTICATED FACILITIES

MODEL B1-156

$21,795.00



15-input, 6-bus with two full mix/eff/key systems & dir. pgm & pre busses: many options available, DSK, quad. etc.

MODELS 154 & 156

STANDARD FEATURES

1. **Switcher Models 154 and 156** are of the same basic design and utilize the same electronic sub assemblies. These switchers have the same standard basic features, differing only in the number of busses and in the number of mix/effects units. The basic standard features include 32-pattern mix/effects, color black and color matte background generator, and a mix/key unit in the case of the Model 154.

2. **Input Amplifiers**
   - loop through high impedance input • gain equalization for 1000' cable • 22° sub carrier phase control • clamped inputs (10% to 90% APL) • sync addition on non composite signals if desired.

3. **Tallies**
   - isolated dry contact relay closure on all inputs (2 amps at 50 v.)

4. **Mix-Effects Units (Includes Keying Function)**
   - **One** (1) used in Model B1-154
   - **Two** (2) used in Model B1-156.

   Fades (or Supers), Wipes, Keys may be produced.
   Positioner Joystick for each M/E positions patterns.
   - **Pattern Modulation** may be accomplished by an internal waveform generator. Modulating sources may be either (1) sine wave, (2) square wave, (3) saw tooth, or (4) an external customer generated source.
   - **Mix Key** and **Wipe Key** available.
   - **Soft Wipe** and **Soft Key** available with adjustable variations.
   - **Push to Preview** obtained by depressing knob on clip potentiometers (provides for M/E monitor output).
   - **Wipe Mode**—3 interlocked buttons select "NOR", "REV" or "N/R".
   - **Hard Wipe, Soft Wipe** or **Border** can be selected with degree of softness made by "Edge" control adjustment.
   - **Border may be Colorized by adjustment of "Hue" and "Luminance" control.**
   - **Symmetry of Pattern** may be adjusted by "SYM" knob.
   - **Preset Wipe Limits** are set by potentiometers. "H" and "V" vertical preset limits activated by Pattern Limit button.
   - **Spotlight** alternate action push button produces a 6 db. level difference between "A" and "B" input channels in the "Wipe" mode. (Operates on all patterns.)
   - **Pattern Assignment** is made by depressing **"ASSIGN"** button. Pattern select feature may be "locked" to pattern matrix by depressing the **"ASSIGN"** button a second time on the same pattern. Patterns assigned appear on LED display on M/E control panel.
   - **Non-Synchronous Inputs.** An "NS" indicator is provided. Tearing is prevented by not allowing a non-synchronous signal to be switched except at extreme position of fader handle where a "cut" transition occurs.
   - **Key Input Sources** may be either (1) "A" bus video for self keying, (2) preview Key bus, (3) chroma key, or (4) an external key source.
   - **Key Invert** selector provided to accommodate either positive or negative video as a keying source.
   - **Key Fill** may be either "A" video for self keying or a colorized matte.
   - **Mix/Key** provided a lieu of second Mix/Effects system for Model B1-154 switching system. Provides for all mix and keying functions of mix/effects system (as previously described) except for the pattern effects.

OPTIONAL FEATURES

May be added at any time (required control panel wiring already installed)

Chroma Keyer (C.K.) **$950.00**
• **Hue**—selects hue of keying color • **Gain**—adjusts the amplitude • **Clip**—adjusts the clip level for keying • **Camera (4 x 1) input switcher**—selects RGB output of any one of 4 cameras to feed C.K.

Down Stream Keyer (DSK) **$1,275.00**
• Keys in titles, inserts, or fades to black with or without insert • Color matte background • Key sources: (1) Mix/Effect, (2) Chroma Key, (3) External • Push to Preview (Monitor)

DSK Border **$1,200.00**
• **Border**—black edge around insert • **Shadow**—black edge on right side and bottom of insert

Quad Split **$1,190.00**
Provides four (4) variable size quadrants from ten possible sources with variable width border.

Aux Busses—(Model 156 only) **$2,100.00**
Two remote outputs are available—remote control panel and amps required.

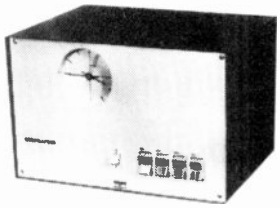
All Beaveronics Switching Equipment Carries a Two Year Warranty

OTHER ITEMS AVAILABLE FROM BEAVERONICS

- Master control switchers AFV with audio breakaway
- Routing switchers with AFV

CHECK BEAVERONICS FOR:
- Specialized custom switchers
- Selected terminal equipment

FAVAG MASTER CLOCK SYSTEMS



Available with accuracy better than 1 second/yr.

Table Top

Surface Mtg. Semi-flush

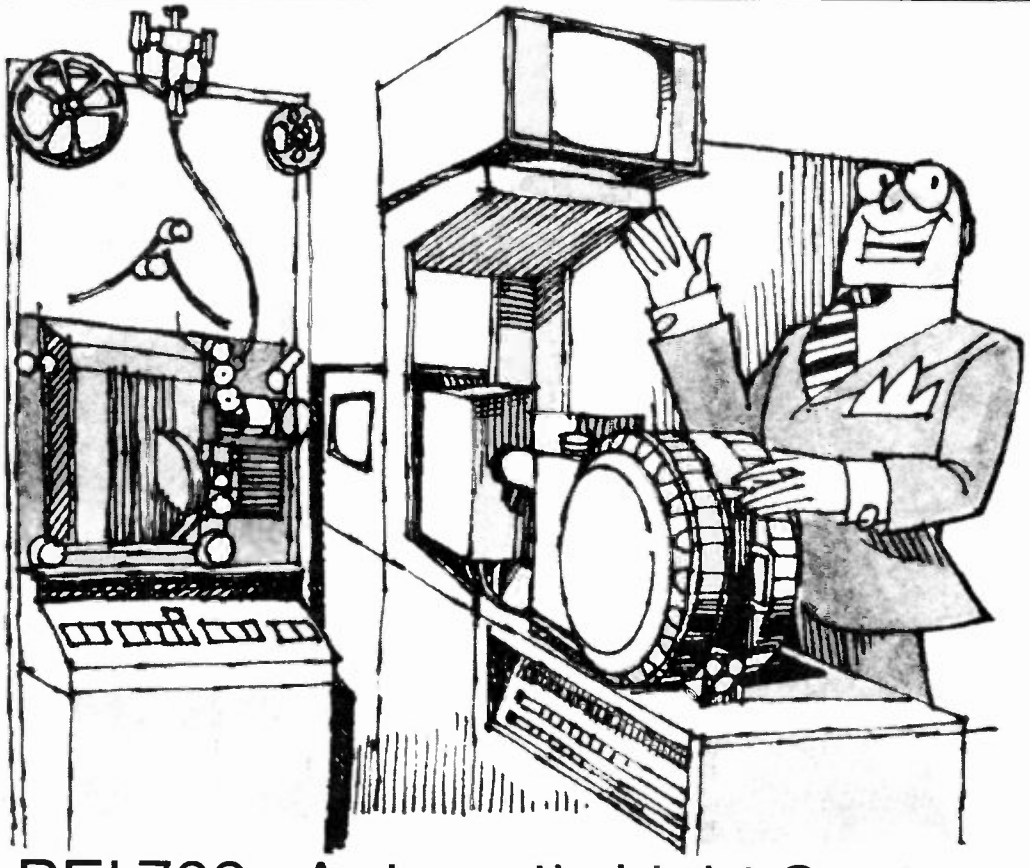
Write or phone for details.

Beaveronics, Inc. 8 Haven Avenue • Port Washington, New York, 11050 • Tel: (516) 883-4414

Prices and Specifications Subject to Change Without Notice.

Circle (20) on Reader Service Card

BEI 709



BEI 709 - Automatic Light Control: Designed to allow your film chain to perform to today's needs.

BEI, P.O. BOX 106-A, OLATHE, KANSAS 66061 • OR CALL: (913) 764-1900

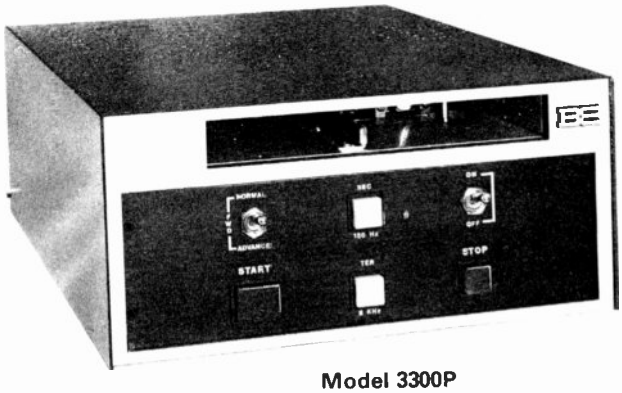
Circle (21) on Reader Service Card

BROADCAST ELECTRONICS INC.
4100 NORTH 24TH STREET • P.O. BOX 3606 • QUINCY, IL 62301 U.S.A.
TELEX: 25-0142 • CABLE: SPOTMASTER

a FILMWAYS company

Series 3000 Tape Cartridge Machines

Model 3100P



Model 3300P

Model 3200RP

SERIES 3000 TAPE CARTRIDGE MACHINES
(With Duracore® Heads)

3100P	906-3100	Mono, Playback Only. A Size Cartridges
3100PS	906-3101	Stereo, Playback Only, A Size Cartridges
3200P	906-3200	Mono, Playback Only, A & B Size Cartridges
3200RP	906-3201	Mono, Record/Playback, A & B Size Cartridges
3200PS	906-3202	Stereo, Playback Only, A & B Size Cartridges
3200RPS	906-3203	Stereo, Record/Playback, A & B Size Cartridges
3200RP/DL	906-3204	Mono, Delay Programmer, A & B Size Cartridges
3300P	906-3300	Mono, Playback Only, A, B, & C Size Cartridges
3300RP	906-3301	Mono, Record/Playback, A, B, & C Size Cartridges
3300PS	906-3302	Stereo, Playback Only, A, B, & C Size Cartridges
3300RPS	906-3303	Stereo, Record/Playback, A, B, & C Size Cartridges
3300RP/DL	906-3304	Mono, Delay Programmer, A, B, & C Size Cartridges

FACTORY INSTALLED OPTIONS

906-3000	Q Trip I & II (150 Hz and 8 kHz). Play-Back Only Models
906-3001	Q Trip I & II (150 Hz and 8 kHz), Record/Playback Models
906-3002	Adjustment of Equalization to IEC/CCIR Specifications
906-3003	Microphone Input Option, Mono Record/Playback Models
906-3004	Microphone Input Option, Stereo Record/Playback Models
906-3005	Manual Fast Forward, All Models, without Q Trip I & II
906-3006	Automatic and Manual Fast Forward, Playback Only Models with Q Trip I and II (150 Hz and 8 kHz)
906-3007	Automatic and Manual Fast Forward, Record/Playback Models with Q Trip I and II (150 Hz and 8 kHz)
906-3008	Additional cost for 117 VAC/50 Hz; or 220 VAC/240 VAC/50 Hz
906-3009	Additional cost for alternate 3.75 IPS tape speed

ACCESSORIES

906-3013	Rack Mount Shelf for EIA 19" Rack
471-0098	Top Cover for 906-3013 Shelf

Note: *If series 3000 machines are to be mounted in 906-3013 Rack-Shelf, order 471-0098 Top Cover.*

503-0022	Rack Shelf Filler Panel, ½ Rack
503-0023	Rack Shelf Filler Panel, ½ Rack
919-1504	Extender, P.C. Boards
970-0003	Transistor/IC kit for 3200P/RP

Note: *Accessory remote controls listed on next page.*

The Series 3000 cartridge machine incorporates an automatic release deck with a large air damped solenoid. Total power consumption is so low that the Series 3000 is the coolest running unit in the industry. Modern integrated circuits are used extensively, card edge connectors have gold plated contacts and all audio sections are internally shielded. Long head life is provided by Nortronics® Duracore® heads. Stereo units are equipped with the unique Phase-Lok III head bracket with independent azimuth adjustment for extremely tight control of stereo phasing. The Series 3000 is available in a full range of mono and stereo models to fit all cartridge sizes. Units can be desk top or rack mounted.

Model 3100 is available in mono or stereo playback units which accept A size cartridges. Three 3100 models can be placed in a 19" rack.

Model 3200 is available as playback only or record/playback in either mono or stereo. The 3200 accepts both A and B cartridges so that two units mount in a 19" rack. Model 3300 is available in the same configurations as the 3200 but accepts A, B, and C cartridges. A 3100 player may be mounted next to the 3300 in the same rack panel. Delay models are available in mono versions of the 3200 and 3300 Series.

Prices and specifications subject to change without notice

Circle (22) on Reader Service Card

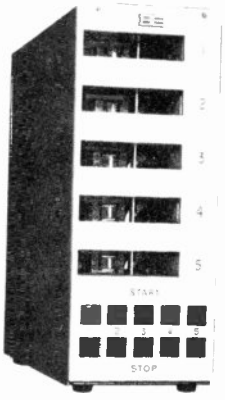
a FILMWAYS company

BROADCAST ELECTRONICS INC.
4100 NORTH 24TH STREET • P.O. BOX 3606 • QUINCY, IL 62301 U.S.A.
TELEX: 25-0142 • CABLE: SPOTMASTER

Series 5000 Multi-Deck Tape Cartridge Machines

Model 5300B

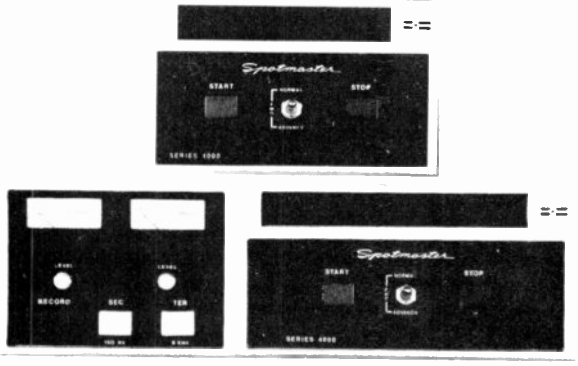
The most up-to-date monaural or stereo three deck cart machine available. Rugged machined deck, quiet air-damped solenoid, unique cartridge guidance system, drop down front panel, modular electronics, and long life Nortronics® Duracore® heads. Companion recording amplifier available.



Model 5500

A new 5-decker with rugged machined deck, dependable direct-drive hysteresis synchronous motor, air damped solenoid and the latest electronics. An optional sequencer is available.

Series 4000 Cartridge Machines



The Series 4000 is equipped with an automatic release deck with direct drive and air damped solenoid. Yet the machine operates cool and quietly. The unique Phase-Lok III head bracket is standard. It provides accurate phase response and simple adjustment. Long head life is provided by Nortronics® Duracore® heads. Available in mono and stereo playback or record/playback models for all size cartridges, and also available in space saving mono and stereo playback for A and B cartridges. Options include fast forward, auxiliary cue tones, mike input to record units, alternate tape speeds, rack mounting, and tape fault/splice detector in record models.

SERIES 5500 FIVE-DECK TAPE CARTRIDGE MACHINES
(With Duracore® Heads)

5501	906-5501	Mono Playback (A Size)
5502	906-5502	Mono Playback (A Size) with Cue Tones
5503	906-5503	Stereo Playback (A Size)
5504	906-5504	Stereo Playback (A Size) with Cue Tones

SERIES 5300B THREE-DECK TAPE CARTRIDGE MACHINES
(With Duracore® Heads)

5301B	906-5301B	Mono Playback (A & B Size)
5302B	906-5302B	Mono Playback (A & B Size) with Cue Tones
5303B	906-5303B	Stereo Playback (A & B Size)
5304B	906-5304B	Stereo Playback (A & B Size) with Cue Tones

ACCESSORIES (FOR 5500 & 5300 SERIES)

SW5F	904-5000	Audio Switcher for 3 Decker
SW5E	904-5001	Audio Switcher for 5 Decker
	906-5309	Recorder, Mono for 3 Decker, without Q Trip Option
	906-5309A	Recorder, Mono for 5 Decker, without Q Trip Option
	906-5310	Recorder, Stereo for 3 Decker, without Q Trip Option
	906-5310A	Recorder, Stereo for 5 Decker, without Q Trip Option
	906-5311A	Secondary (150 Hz) and Tertiary (8 kHz) Q Trips for Mono Recorder
	906-5311B	Secondary (150 Hz) and Tertiary (8 kHz) Q Trips for Stereo Recorder
	906-5506	Rack Shelf for (1) to (3) Units, 5 Decker
	906-5507	½ Rack Filler Panel, 5 Decker
	906-5306	Rack Mount (1) Unit, 3 Decker
	906-5307	Rack Mount (2) Units, 3 Decker
	906-5508	Additional Cost for 220V 50 Hz Power Source
	919-1806	Extender PC Board

SERIES 4000 TAPE CARTRIDGE MACHINES
(With Duracore® Heads)

4200P	906-4200	Mono, Playback Only, A & B Cartridges
4200PS	906-4202	Stereo, Playback Only, A & B Size Cartridges
4300P	906-4300	Mono, Playback Only, A, B, &C Size Cartridges
4300RP	906-4301	Mono, Record Playback, A, B, & C Size Cartridges
4300PS	906-4302	Stereo, Playback Only, A, B, & C Size Cartridges
4300RPS	906-4303	Stereo, Record/Playback, A, B, & C Size Cartridges

FACTORY INSTALLED OPTIONS

906-4000	Q Trip I & II (150 Hz and 8 kHz), Playback Only Models
906-4001	Q Trip I & II (150 Hz and 8 kHz), Record/Playback Models
906-4002	Adjustment of Equalization to IEC CCIR Specifications
906-4003	Microphone Input Option, Mono Record/Playback Models
906-4004	Microphone Input Option, Stereo Record/Playback Models
906-4005	Manual Fast Forward, All Models, without Q Trip I and II
904-4006	Automatic and Manual Fast Forward, Playback Only Models with Q Trip I & II (150 Hz and 8 kHz)
906-4007	Automatic and Manual Fast Forward, Record/Playback Models with Q Trip I & II (150 Hz and 8 kHz)
906-4008	Additional cost for 117 VAC/50 Hz; or 220 VAC/240 VAC/50 Hz
906-4009	Additional cost for alternate 3.75 IPS tape speed

ACCESSORIES

906-4013	Rack Mount for EIA 19" Rack, for mounting two 4200 Series
906-3015	Rack Shelf Filler Panel, ½ Rack
906-4014	Mounting Ears for Rack Mounting 4300 Series
919-1504	Extender Card, Recorder PCB Section
919-1703	Extender Card, Playback PCB Section

Note: *Accessory remote controls listed below.*

REMOTE CONTROL

BE-102	904-0102	400 Series, 500 Series, Remote Control, 3 start/stop functions w/15 ft. cable
BE-106	904-0106	605 Remote Control, 5 start/stop functions and sequencing indicator, illuminated buttons w/15 ft. cable
3000	906-3016	3000 Remote Control Panel, START for 5 Units
3000	906-3019	3000 Remote Control Panel, Single Record/Playback Model
3000	906-3020	Remote Control Panel, Single Playback (with cue tones)
3000	906-3021	Remote Control Panel, Single Playback (without cue tones)
3000	906 3028	Remote Control Panel with start/stop and fast forward switches for 5 Series 3000 or Series 4000 machines
4000	906-4015	4000 Remote Control Panel, START for 5 Units
4000	906-4016	4000 Remote Control Panel, Single Record Playback Model
5300	927 0047	Remote Control Panel for 5300 A B Series
5300	927-0048	Remote Control Panel for 5300 A/B Series with Companion Record Amplifier

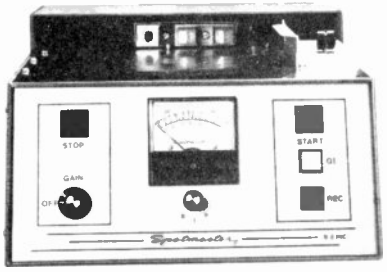
SEQUENCERS/SWITCHERS

SW5B	904-0005	605/610 Audio Switcher; switches any of five audio channels to program line; 600 ohm transformer equipped (use only with emitter follower output units 902-0605 or 902-0606; two required for 902-0610)
SW5C	904-0012	400 500 Audio Switcher for up to 5 units
SW5E	904-5000	5300 Audio Switcher for 3-Decks
SW5F	904-5001	5500 Audio Switcher for 5-Decks

Prices and specifications subject to change without notice

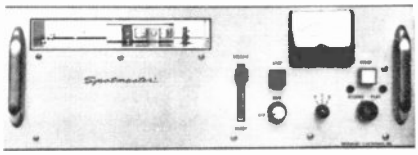
BROADCAST ELECTRONICS INC.
4100 NORTH 24TH STREET • P.O. BOX 3606 • QUINCY, IL 62301 U.S.A.
TELEX: 25-0142 • CABLE: SPOTMASTER
a FILMWAYS company

Series 400/500 Tape Cartridge Machines

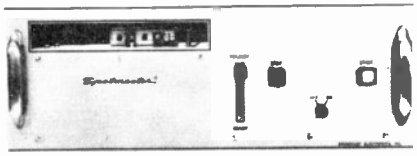


500D Mono Recorder/Playback

Spotmaster's 500D cart machines are traditional favorites that meet or exceed NAB specifications. These units have automatic cueing, automatic record cancel, built in mike pre-amp and full auxiliary cue tone options. A wide range of desk top and rack mount units are available including mono and stereo playback, mono and stereo record/playback and mono combined record/playback/delay. The record/playback/delay unit records, stores and plays back any program material for predetermined length on standard cartridges, as well as normal record/playback functions.

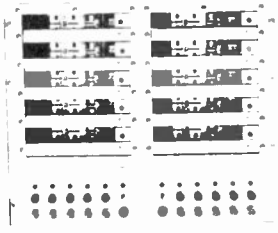


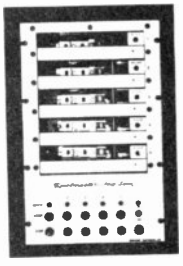
500DR. Rack Mount 500 D in 7" panel height. Chassis rolls out for access. Optional mike pre-amp.



505DR. Rack mount mono playback unit accepts A, B or C size cartridges.

Models 605 C and 610 CR





Spotmaster® Five-Spot and Ten-Spot multiple cartridge units are capable of manual operation, or they may be incorporated into programmed automation systems making use of one, two or three NAB standard cue tones.

Except for the common tape drive capstan, each tape deck is an independent unit — both electrically and mechanically. Each reproduce channel has its own separate electronics including cue amplifier(s) and a program amplifier. All channel output levels are separately adjustable to +4 dBm by means of locking type control. All amplifiers are plug-in modular units, and enclosed plug-in relays are used throughout. In the Ten-Spot, each module of five decks is separate from the other five-deck module.

Rear panel remote controls and inter-connections between channels are provided to permit automatic sequencing from channel to channel.

SERIES 400/500 TAPE CARTRIDGE MACHINES

500D	900-0500	Monaural Record/Playback Unit, Compact
500DR	901-0500	Monaural Record/Playback Unit, Rack Mounting with Slides
505D	900-0505	Monaural Playback Unit, Compact
505DR	901-0505	Monaural Playback, Rack Mounting with Slides
500D/DL	900-0502	Delay, Record/Playback Unit, Compact
400B	900-0400	Monaural Record Playback Unit, Compact
405B	900-0405	Monaural Playback Unit, Compact

Note: *Transformer output optional in 400B and 405B.*

FACTORY INSTALLED OPTIONS

900-0508	Additional cost for 117 VAC 50 Hz; or 220 VAC/240 VAC/50 Hz.
900-0509	Additional cost for alternate 3.75 IPS tape speed.
840-0004	Installed Cue Trip I Sensor (500D Series) (150 Hz)
840-0005	Installed Cue Trip I Generator (500DR) (150 Hz)
840-0006	Installed Cue Trip I Generator (500D) (150 Hz)
840-0007	Installed Cue Trip II Sensor all models (8 kHz)
840-0008	Installed Cue Trip II Generator all models (8 kHz)
841-0010	Installed Microphone Preamplifier Option (Models 400B, 500DR Series)
841-0002	Installed 600 ohm output transformer (400B, 405B)

Note: *Accessory Remote Controls, audio switcher, listed on previous page.*

FIELD INSTALLATION KITS FOR 500/505D SERIES

830-0100	Field Installation Kit, Cue Trip I Sensor (all units) (150 Hz)

Note: *Dual tone sensor replaces standard single sensor. Credit issued for single sensor under warranty.*

830-0101	Field Installation Kit, Cue Trip I Generator (500/505 D Series) (150 Hz)
830-0102	Field Installation Kit, Cue Trip I Generator (500D, 500D/DL) (150 Hz)
830-0200	Field Installation Kit, Cue Trip II Sensor (All Units) (8 kHz)
830-0201	Field Installation Kit, Cue Trip II Generator (All Units) (8 kHz)

FIELD INSTALLATION KITS FOR 400B SERIES

830-0100A	Field Installation Kit, Cue Trip I Sensor (150 Hz)
830-0101	Field Installation Kit, Cue Trip I Generator (150 Hz)

MODEL 605/610 MULTI-DECK TAPE CARTRIDGE MACHINES

605C	902-0605	5 Channel Playback Unit in Formica Cabinet w/Emitter Follower Output
605C	902-0605A	5 Channel Playback Unit in Formica Cabinet w/Transformer Output
605CR	902-0606	5 Channel Playback Unit, Rack Mounting, w/Cartridge Storage Cubicle, Emitter Follower Output
605CR	902-0606A	5 Channel Playback Unit, Rack Mounting, w/Cartridge Storage Cubicle and Transformer Output
610CR	902-0610	10 Channel Playback Unit, Rack Mounting, Emitter Follower Output
610CR	902-0610A	10 Channel Playback Unit, Rack Mounting w/Transformer Output

FACTORY INSTALLED OPTIONS

387-0041	Installed Power Conversion, 220V/50 Hz, 7.5 IPS, w/220V/117V step-down transformer (Models 605C, 605CR) (Requires two for 610CR)
387-0044	Installed Speed Conversion, 117V/60 Hz, 3.75 IPS (Models 605C, 605CR) (Requires two for 610CR)
840-0011	Installed Cue Trip I Sensor (per deck) (150 Hz)
840-0012	Installed Cue Trip II Sensor Option, less Sensors (Models 605C, 605CR) Includes separate enclosure
840-0013	Installed Cue Trip II Sensor Option, less Sensors (Model 610CR) includes separate enclosure
910-0032A	Cue Trip II Sensor (up to 5 required with 605C and 605CR; up to 10 with 610CR) (8 kHz)
949-0605	Installed Cue Trip Sequencing Cable for 605B

Note: *Cue Trip II Sensors mounted externally. 840-0012 may be used w/610CR model if only 5 sensors required.*

MRM-600A	904-0600	Installed Record Module, plug-in replacement for any 605/610 Playback Deck, w/record head
	840-0014	Installed Cue Trip I Generator for MRM-600A (150 Hz)
	840-0015	Installed Cue Trip II Generator for MRM-600A (8 kHz)
	840-0016	Installed Microphone Preamplifier for MRM-600A

ACCESSORIES

EB101	919-1010	Test Extender PCB Module

Note: *Accessory remote control and Audio Switcher are listed on previous page.*

Prices and Specifications Subject to Change Without Notice.

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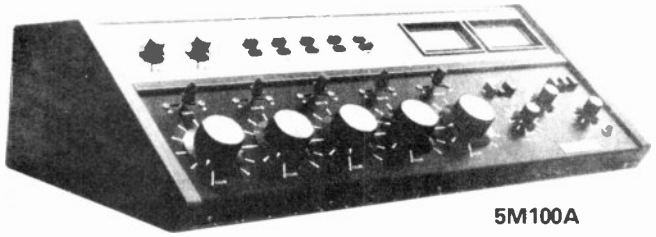
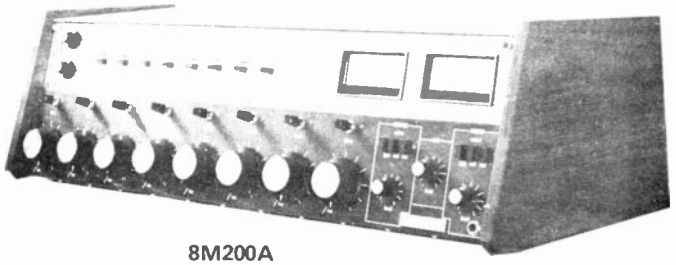
Audio Consoles

100A/200A Series Mono



5M100A



8M200A

The monaural 100A and 200A Series are high quality full dual channel audio consoles. Pushbutton selected inputs are available to high or low level (switchable) plug-in preamps. Mixers are precision ladder attenuators (200A Series) or sealed long-life potentiometers (100A Series). Selection of audition or program channels is by FET's for fast, quiet and distortion-free operation. Both output channels are continually monitored by individual 3½" illuminated VU meters. Both audition and program channels have transformers balanced outputs rated at over +18 dBm peak, and are on interchangeable plug-in PC cards.

These consoles have full built-in monitoring capabilities. The eight watt monitor amplifier delivers sharp, true sound to three individually muted outputs. Program, audition, and external (Off-Air) sources are front panel selectable. The separate headphone amplifier has both front panel and internal outputs. The cue amplifier (relay muted) drives a built-in or external speaker.

Three muting relays (two 100 Series) are provided for user convenience. Each can be wired to any mixer (channels 1, 2 and 3 are standard). Relay No. 1 mutes the cue speaker, and all relays control a monitor speaker output and a normally-open contact for warning lights, etc.

All internal connections are to screw-type barrier strips (except relay contacts and station ground) through two access openings in console bottom.

***100A SERIES MONO AUDIO CONSOLES**

5M100A	938-0510	5-Mixer Monophonic Console, sealed Pots, Dual Channel
8M100A	938-0810	8-Mixer Monophonic Console, sealed Pots, Dual Channel

OPTIONS AND ACCESSORIES

838-0200	Additional Cost for 230 VAC/50 Hz Power Source
938-0230	Step Type Attenuators Installed in 5M100A
938-0231	Step Type Attenuators Installed in 8M100A
270-0007	Second Muting Relay For 5M100A and 8M100A
	*Supplied with one muting relay

***100A SERIES STEREO AUDIO CONSOLES**

5S100A	938-0520	5-Mixer Stereophonic Console, sealed Pots
8S100A	938-0820	8-Mixer Stereophonic Console, sealed Pots

OPTIONS AND ACCESSORIES

838-0200	Additional Cost for 230 VAC/50 Hz Power Source
938-0232	Step Type Attenuators Installed in 5S100A
938-0233	Step Type Attenuators Installed in 8S100A
918-3602	Mono Matrix Card for 5S100A and 8S100A
918-3604	Line Amplifier for Stereo Audition Channel 5S100A and 8S100A (2 Required)
270-0007	Second Muting Relay for 5S100A and 8S100A
	*Supplied with one muting relay

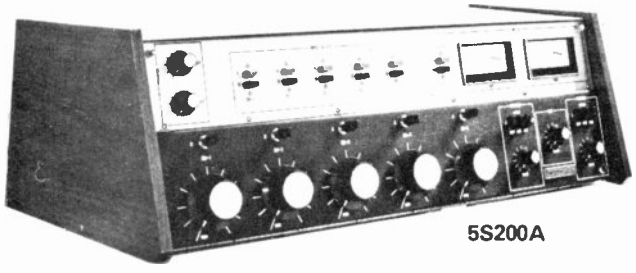
***200A SERIES MONO AUDIO CONSOLES**

5M200A	938-0511	5-Mixer Deluxe Monophonic Console, Step Type Attenuators, Dual Channel
8M200A	938-0811	8-Mixer Deluxe Monophonic Console, Step Type Attenuators, Dual Channel

OPTIONS AND ACCESSORIES

838-0200	Additional Cost for 230 VAC/50 Hz Power Source
	*Supplied with 3 muting relays

100A/200A Series Stereo



5S200A

These stereo consoles feature stereo mixers with pushbutton selection of high or low level inputs. Each preamp can also provide in-phase stereo from a mono source (switchable) to eliminate jumpers, impedance mismatch and phase errors. Mixers are long-life, low noise sealed pots (100A Series) or precision step attenuators (200A Series). Switching is accomplished with FET's for fast, quiet, low maintenance operation. Two 3½" illuminated VU meters continually monitor the program outputs (100A Series). On the 200A Series the meters are switchable to either the program or audition outputs. Program (and optional audition) plug-in mixer-line driver cards provide a transformer-balanced +18 dBm output.

Built-in amplifiers are provided for stereo monitoring capabilities by speaker or headphones of the program, optional audition, external ('Off-the-Air'), and cue circuits. The cue bus features a composite of both the left and right channels for positive preview of stereo sources.

***200A SERIES STEREO AUDIO CONSOLES**

5S200A	938-0521	5-Mixer Deluxe Stereophonic Console, Step Type Attenuators
8S200A	938-0821	8-Mixer Deluxe Stereophonic Console Step Type Attenuators

OPTIONS AND ACCESSORIES

838-0200	Additional Cost for 230 VAC/50 Hz Power Source
918-3602	Mono Matrix Module for 5S200A and 8S200A Stereo Consoles
	*Supplied with 3 muting relays

PLUG-IN MODULE BOARDS, REPLACEMENTS FOR 100 AND 200 SERIES CONSOLES, AND USED IN 100A AND 200A SERIES CONSOLES

918-3600	Mono Preamplifier Module
918-3601	Stereo Preamplifier Module
918-3602	Mono Matrix Card for 5S100A and 8S100A
918-3603	Stereo Monitor Amplifier Module
918-3604	Line Driver Amplifier Module
918-3605	Mono Cue/Headphone Amplifier Module
918-3606	Stereo Cue/Headphone Amplifier Module
918-3609	Mono Monitor Amplifier Module
919-3000	PC Board Test Extender

Prices and specifications subject to change without notice

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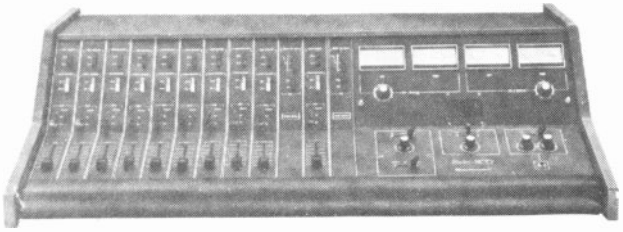
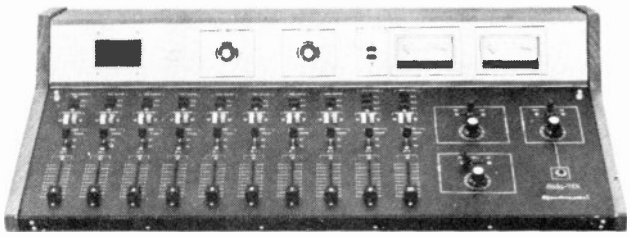
Audio Consoles

12-Mixer, Vertical Fader, Dual Channel Models ML-4000 Mono, SL-4100 Stereo

Features: • Vertical Faders • Completely shielded input modules • Low-noise reed relay bus selection • 12-input channel capability • Dual-channel output, mono or stereo • Modular plug-in electronics • Transformer balanced inputs





4000 SERIES SLIDE MIXER AUDIO CONSOLES

ML 4000	938-4000	Monaural dual-channel console chassis with provision for accepting up to 12 input modules (Select modules as required.)
SL 4100	938-4100	Stereo dual channel console chassis with provision for accepting up to 12 input modules. (Select modules as required.)
4021	980-4021	Mono Input Mixing Module, with muting logic.
4023	980-4023	Mono Input Mixing Module, less muting logic.
4025	980-4025	Mono Remote Input Module (feeds mono input Mixing Module).
4022	980-4022	Stereo Input Mixing Module, with muting logic.
4024	980-4024	Stereo Input Mixing Module, less muting logic.
4026	980-4026	Stereo Remote Input Module (feeds stereo Input Mixing Module.)
3602	918-3602	Mono mix-down module for stereo (4100) units.
	828-0200	Additional Cost for 230Vac Power Option (either model).
	980-4008	Module Filler Panel (for unused module space.)

Note: *Mono mix-down module — When used, two modules required (one for MIX-1, one for MIX-2). Mix-down module is necessary to use feed function of remote modules in SL-4100 Stereo Console only.*

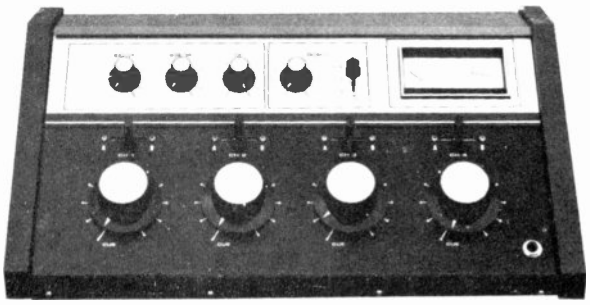
Note: *To determine selling price of complete 4000 Series consoles, add to basic console price any combination of input modules up to 12.*

EXAMPLE

(1) ML-4000 Monaural Audio Console, Dual Channel with slide controls with 12 input modules, to include:
(1) 938-4000 Basic Console Chassis
(2) 980-4025 Mono Remote Input Modules
(6) 980-4021 Mono Input Mixing Modules with muting logic
(4) 980-4023 Mono Input Mixing Modules less muting logic

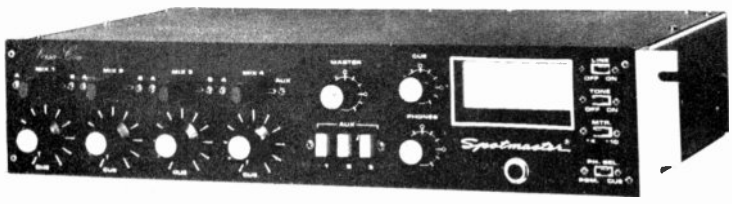
4M50

Selectable high/low input sensitivity, all channels. Individual monitor, headphone and cue amplifiers. High reliability sealed potentiometer-type mixer controls. Two Inputs per mixer.



4V50

10 inputs to 4 mixers. Cue switches, all mixers. For broadcast, A/V, CCTV, CATV applications. Switchable microphone/high level inputs. Integral tone generator. 1.0 watt rms headphone and cue amplifiers.



10-Mixer, Vertical Fader, Dual Channel Models SL-3110 Stereo, ML-3010 Mono

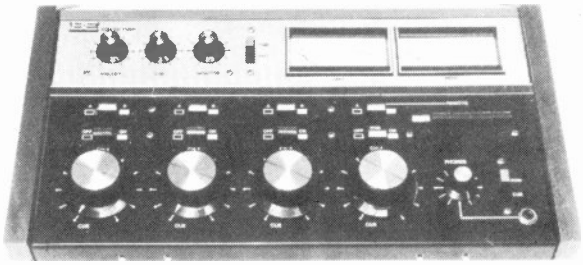
Features: • 22 inputs to 10 slide faders • Modular plug-in electronics • Dual channel output • Mono or stereo models • Contact-free, FET bus selection • Economical price

3000 SERIES SLIDE MIXER AUDIO CONSOLES

ML-3010	938-3010	10-Mixer, slide-fader, dual-channel monaural console 115V, 50/60 Hz
SL-3110	938-3110	10-Mixer, slide-fader, dual-channel stereo console 115V, 50/60 Hz
3602	918-3602	Mono matrix module for SL-3110
	838-0200	Additional Cost for 230Vac Power Source

4S50

Stereo version of the 4M-50. Fully metered outputs. Simple, straightforward installation. Efficient, professional performance. Cue Switches, all mixers.



50 SERIES MONO AND STEREO CONSOLES

4M50	938-0450	MONO FOUR 4-mixer Monophonic Console
4M50R	938-0451	MONO FOUR Rack Mount 4-Mixer Monophonic Console
4S50	938-0452	STEREO FOUR 4-Mixer Stereophonic Console
4S50R	938-0453	STEREO FOUR Rack Mount 4-Mixer Stereophonic Console
	838-0201	Additional Costs for 230Vac/50 Hz Power Source

VERSA CON AUDIO CONSOLE

4V50	938-2000	4 Mixer Mono Console with Rack Mount Adapters. Additional Cost for 220Vac/50 Hz Power Source

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Circle (26) on Reader Service Card

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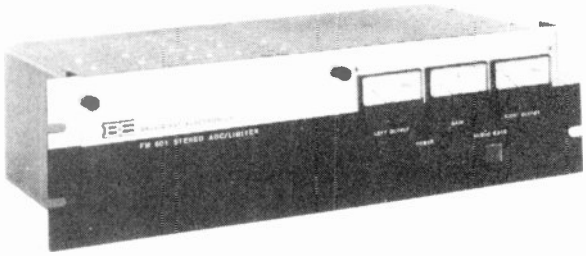
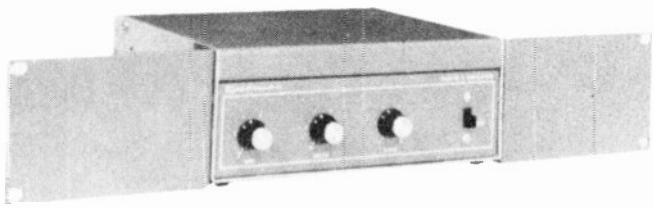
Models FM-600, FM-601
FM AGC/Limiters



This advanced design Stereo AGC/Limiter does everything an FM broadcaster needs to maximize and improve his FM signal. Unique signal processing including peak/average comparator, fast 5 usec attack time, audio gating to minimize unwanted noise and return to normal gain circuitry does it all. Everything is in one compact package.

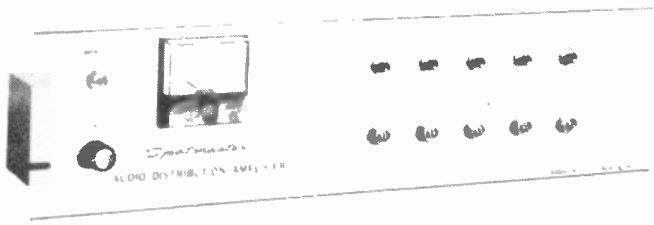
One stereo processor does the work of two conventional AGC's and two limiters. Monaural Model FM-600 replaces one AGC and one limiter.

Model BEM-10
Monitor Amplifier



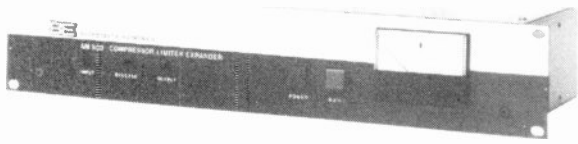
The BEM-10 is a conservatively rated wide band amplifier capable of delivering from 10 to 15 watts RMS. Electronic muting is incorporated to enable the microphone and mute the program channel for paging operation.

AD1B
Audio Distribution Amplifier



The AD1B distributes audio signals within a studio or to telephone lines. VU meter and aural monitoring of the input signal is provided, as well as separate monitoring and level controls for each output. The five highly isolated output channels are expandable up to 25 by the addition of AD1B-X Extenders, which also contain the same aural monitoring facilities as the AD1B. Both units are available with either optional output transformers or standard unbalanced emitter follower output. Input circuitry may be operated either bridging or matching and balanced or unbalanced.

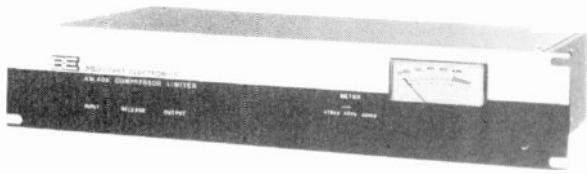
Model AM-500
AM Compressor/Limiter/Expander



The AM-500 combines compressor, limiter and expander functions with selectable asymmetrical or symmetrical limiting. This newly designed audio processor provides automatically controlled clean, crisp audio with over-modulation protection. Signal processing is smooth and quiet.

As a compressor/limiter/expander, the AM-500 has all characteristics of traditional gated automatic gain control amplifiers and fast acting peak limiters. Only three controls; input, output and return rate control.

Model AM-400
AM Compressor/Limiter



Economy priced, this new compressor/limiter for AM maintains high average modulation and protects against over modulation. Contains switchable control for symmetrical or asymmetrical peak limiting. May be operated in three modes: (a) compression and limiting, (b) compression only or (c) as a fixed gain conventional line amplifier. Features 1 microsecond attack time and +20 dBm output capability.

AUDIO PROCESSING AND DISTRIBUTION AMPLIFIERS

AM-500	937-0500	AM-500 Compressor-Limiter-Expander for AM Broadcasting
FM-600	937-0600	FM AGC/Limiter for Mono
FM-601	937-0601	FM AGC/Limiter for Stereo
FM-600E	937-0605	FM-600, for Mono-European STDS
FM-601E	937-0606	FM-601, for Stereo European STDS
	919-1908	Extender Board
AM-400	937-4001	Compressor-Limiter Amplifier, rack mounting, Mono
AD1B	903-0010	Audio D.A.; 1 in, 5 out, rack mounting, Emitter Follower Output
AD1B T	903-0011	Audio D.A ; 1 in, 5 out, rack mounting, Transformer Outputs
AD1BX	903-0012	5-Channel Extender for AD1B, rack mount, Emitter Follower Output
AD1BX T	903-0013	5-Channel Extender for AD1B, rack mount, Transformer Output
	903-0018	Additional Cost for 230Vac/50Hz AM-400, AM-500; AD-1B
BEM-10	837-0100	Monitor Amplifier, 10 watt, in cabinet 115V, 50 60 Hz, 30 watts.

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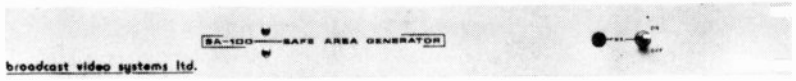
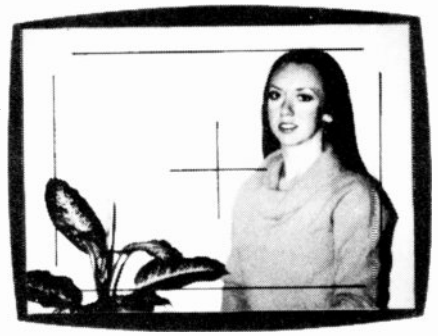
*THE SA-100 SAFE AREA GENERATOR**

Preview Video





The SA-100 eliminates the guesswork of where to position graphics and other important information in a television picture. Vertical and horizontal borders, 120 nanoseconds wide, are generated and non-additively mixed into the composite video connected to the SA-100 input. This "safe area" pattern, keyed into video, will appear at the SA-100 output for display on a picture monitor. The pattern can be remotely switched from Safe Title to Safe Action area substantially as specified in SMPTE Recommended Practice No. RP27.3.

Also included is a cross-hair pattern showing the exact picture center.

Both patterns can be switched on or off, black or white, from the remote panel included with the unit.

No external drives are required as all system timing is derived from program sync. This ensures that Safe Area is always correct, regardless of monitor scan adjustments.

A second output is provided which delivers a pattern signal only (not keyed into video) for in-house distribution.

* ***patent pending***

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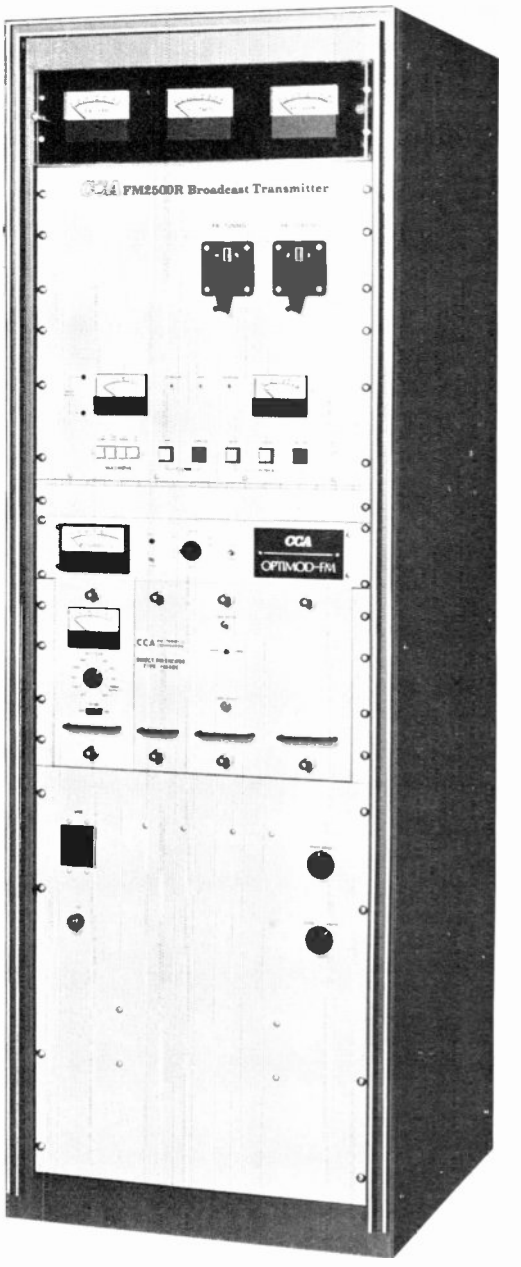
Circle (28) on Reader Service Card

THE "BEST-SELLING" FM TRANSMITTER EVER — "The Little Rascal" — from CCA Electronics!

FM2500R - 2.5 KW $10,995.00



- Compact size — only 5'7"h . . . 22"w . . . 24"d.
- One tube.
- 40-watt solid-state plug-in synthesized exciter.
- Type-accepted from 500 to 3000 watts.
- Wired for local or remote control.
- Power line transient protection.

Proof-positive good things come in small packages. No compromise has been made. Our 100% solid-state modular exciter, combined with the added enhancement of the optional CCA FM-Optimod assures the most competitive signal available today. Advanced control system includes built-in filament preheat, recycling overload protection, status lights and remote control interface as standard. Automatic high VSWR protection can be added easily with the CCA Watchdog II.

Phone CCA Electronics toll-free — 800-257-8171 — about the FM2500R or any of these CCA FM transmitters:

FM-10E, 10 Watts, Solid State, modular exciter, plug-in, synthesized	$3,495.00
FM-10ET, 10 Watt Transmitter, same as FM-10E but mounted in cabinet with meters	4,295.00
FM-40E, 40 Watts, Solid State modular exciter, plug-in, synthesized	3,895.00
FM-100E, 100 Watts, Solid State, modular exciter, plug-in, synthesized. Includes power supply	4,495.00
FM-250R, 250 Watts	8,995.00
FM-500R, 500 Watts	9,995.00
FM-1000R, 1000 Watts	10,495.00
FM-2500R, 2500 Watts	10,995.00
FM-4000E, 4KW Transmitter	18,795.00
FM-5000E, 5KW Transmitter	19,995.00
FM-8000E, 8KW Transmitter	22,995.00
FM-12,000E, 12KW Transmitter, convertible to 20KW	25,995.00
FM-12,000E to 20,000E Field Conversion Modification Kit	6,995.00
FM-20,000E, 20KW Transmitter	29,995.00
FM-25,000E, 25KW Transmitter	34,995.00
FM-27,500E, 27.5KW Transmitter in Single Cabinet	36,995.00
FM-40,000EP, 40KW combined FM transmitter configuration, includes two independent 20,000 Watt amplifiers, 100 watt solid state frequency synthesized exciter with 70KW hybrid combiner system	69,995.00
FM-55000EP, 55KW combined FM transmitter configuration, includes two independent 27,500 Watt amplifiers, 100 watt solid state frequency synthesized exciter with 70KW hybrid combiner system	79,995.00
70KW Combiner, FM Combiner rated 70KW maximum combined, power 35KW maximum to each input port with isolation between input ports to be 30db or better and less than 1.1 VSWR at either input port. All input ports are 3⅛" EIA Flanges 50 ohms and antenna output is 6⅛" EIA Flanges 50 ohms	6,595.00

Prices subject to change without notice.

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Circle (29) on Reader Service Card

880 Maude Avenue
Mountain View, California 94043
415/969-1910

CEI-310 Broadcast Color Television Camera System

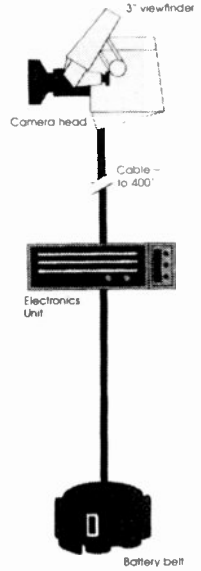
The CEI-310 was designed for electronic field production, with all the lightweight portability, all the conveniences, all the operating features, all the power sources, all the versatility, all the low light level sensitivity, all the video quality that belongs in field production. But until now has been unavailable.

- The CEI-310 camera head operates with just one cable—up to 400 feet from its electronics unit. Plenty of room for the cameraman to roam wherever he wants, to get just the shot he wants. And the absence of a myriad of cables not only makes setup easy, but gives him a new freedom of movement. If 400 feet isn't enough, your cameraman can go another 2500 feet with a Systems Integration Unit.
- The CEI-310 has a program quality microphone input built right into the camera head (and another at the Electronics Unit)—but no requirement for separate audio cables!
- The CEI-310 camera head has simple operational controls for automatic white balance and iris. The cameraman can quickly react to changing situations. He can even control a video tape recorder.
- The CEI-310 camera head, with its sealed prism optical assembly, is rugged and weathertight. It can take rough handling and withstand the rigors of the elements.
- The CEI-310, in its portable configurations, has one of the finest 3-inch viewfinders ever developed. It is fully adjustable in all directions. It can be changed in seconds from an ocular to a direct viewing setup, depending on the situation. Video level indicator is included, of course.
- The CEI-310 can be operated from a variety of power sources, from DC to 250VAC—a battery belt, a battery pack that attaches to the electronics unit, direct connection to any 12V DC source, or an AC power pack.
- The CEI-310 gives you a choice of 2/3-inch Saticon or Plumbicon rear-loading pickup tubes. Quick disconnect lens mount. A four position filter wheel with filters. Bias light. High gain, low noise preamplifiers. Self-gating low power sweep circuits. Precision yokes. Comprehensive radio frequency and magnetic shielding.
- But convenience and versatility are just one part of the story of this remarkable new camera. Equally important is that the CEI-310 gives you uncompromised full broadcast quality video performance, with outstanding S/N ratio, sensitivity, and resolution. And full production system control features.

The compact electronics unit has everything that sophisticated electronics can provide for signal processing, including an ultra stable I and Q encoder with color bar generator.

Configurations

Portable field production configuration

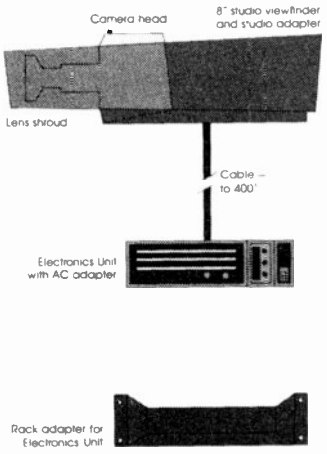


Fully adjustable 3 inch viewfinder may be used with ocular adapter or hood for direct viewing.

Electronics Unit may be used as a backpack (with harness) or as a remote unit with or without rack adapter.

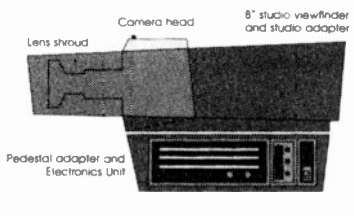
Battery belt comes with cord and internal charger. It may be replaced with a battery pack that snaps to the Electronics Unit.

Basic studio system configuration



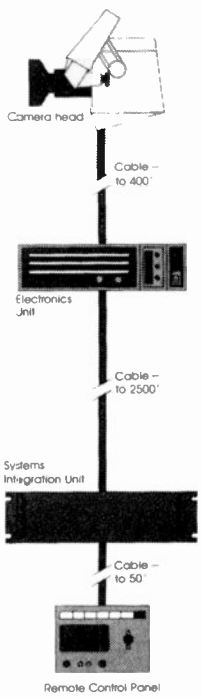
Camera head quickly mounts to studio adapter plate and connects to 8 inch studio viewfinder. Quick disconnect lens mount makes lens changes easy. Lens shroud slides in place. Electronics Unit may be rack mounted up to 400 feet away.

Basic studio self-contained configuration



Set up is almost the same as for studio system configuration except that a pedestal adapter is added to contain the Electronics Unit and AC adapter. Now the system is totally self contained.

Extended operation for any configuration



Any configuration – portable or studio – may be remoted up to 2500 feet beyond the Electronics Unit with a Systems Integration Unit and a Remote Control Panel.

Prices and specifications subject to change without notice

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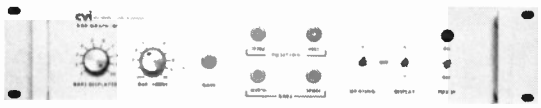
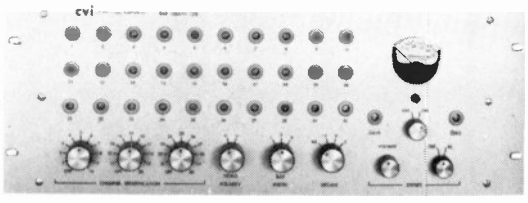


Bar Graph 101

Accepts 10 signal inputs and converts these into a vertical "Bar" pattern as seen on the screen of a standard TV monitor. Rack mount, 3½" h.

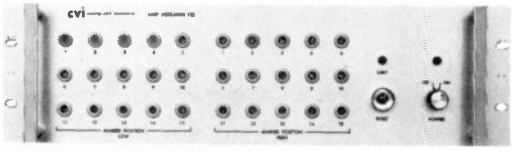
$1250.



Bar Graph 120

Accepts 30 negative going input signals and produces a horizontal bar display with better than 1% accuracy. Has individual channel markers, zero suppression, decade expansion, and other features. Requires external sync. Rack mount, 7" h.

$4200.



Limit Indicator 122

Produces 15 separate "high" and 15 separate "low" vertical markers with automatic alarm when video falls outside of predetermined limits. Requires external sync. Rack mount, 5¼" h.

$3500.

Video Compressor 260B

Accepts standard composite video signals and performs sampling, digitizing, buffering, and slow scan TV conversion operations. Provides output for direct connection of slow scan signals to voice grade communications circuits. Rack mount, 5½" h. Also includes remote control unit.

$3000.

Video Compressor 262

Similar to the 260B but uses sampling only (8kHz) or sampling plus buffering (1kHz) to perform slow scan conversion. Compact table-top configuration.

$1250.	**262A**	8kHz bandwidth
1500.	**262B**	1kHz bandwidth

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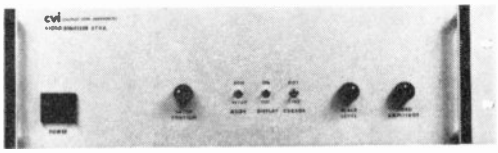
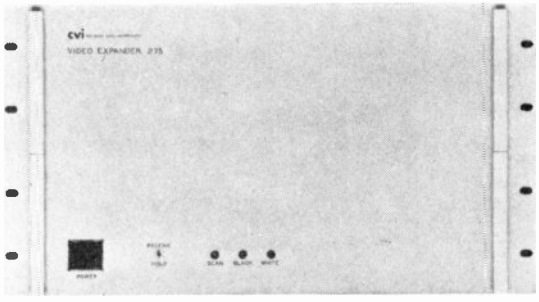
Video Digitizer **270A**



Converts standard television signals into digital data for computer processing and control. Can also redisplay data on a standard television monitor for photographic production of hard copy by time exposure. Easily interfaced with modern minicomputers. Rack mount, 5¼" h.

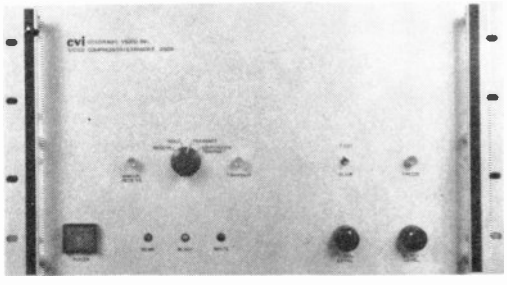
$4000.

Video Expander **275**



A solid state video memory capable of storing one frame of video information. Data may be fed into the 275 at a slow rate, stored, and displayed to present a continuously refreshed image on a standard television monitor screen. The image buildup process may be continuously observed, and there is no fadeout or image degradation with time in the resulting display. The 275 may be used as a computer display device or as a slow scan video communications receiver. For communications applications it is a companion unit for CVI Models 260B or 262 Video Compressors. Available in 256x256 or 256x512 element resolution, 6-bit grayscale. Rack mount, 10½" h.

$7000.	**275A**	1kHz	256x256
7000.	**275A-8**	8kHz	256x256
9000.	**275B**	1kHz	256x512
9000.	**275B-8**	8kHz	256x512
1000.	Computer I/O Option		
2000.	Frame Grab Option		



Video Transceiver **280**

Combines the functions of digital frame grabbing and slow scan transmission and reception in a single package. Contains 256x512x6 bit solid state video memory using 4K RAMs. Features remote control of functions and dual rate/resolution operation. Rack mount, 10½x10x15".

$12,500.

Video Analyzer **301**

Displays "vertically line-selected" TV waveforms directly on the screen of a normal TV monitor. 1/1 waveform/picture ratio simplifies identification of individual picture elements. Display also includes an electronic reference grating and H and V markers. Requires external sync. Rack mount, 3½" h.

$875.

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Sync Stripper **302-2**

A utility unit producing sync, horizontal drive, vertical drive, and blanking signals derived from a standard composite video source. Allows interconnection and synchronization of video devices to camera or tape recorded signals. Size 9½x6¾ x1¾".

$250.

Raster Generator **302-5**

Generates very low speed rasters, up to one half hour in duration. Intended for use in recording sampled video information or other low frequency signals in conjunction with a conventional X-Y plotter. Produces pseudo topographical type displays with information vertically deflecting raster lines. Rack mount, 3½" h.

$950.

Motion Detector **304**

Samples four independent points in a TV scene and produces an alarm when a change in brightness occurs at any of the sampling points. Operates with standard, composite, video signals. Rack mount, 3½" h.

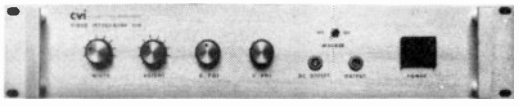
$1000.

Video Micrometer **305**

Designed for dimensional analysis of objects seen by TV camera. Incorporates image enhancement circuitry and a unique video waveform display superimposed on monitor screen for more objective determination of soft or fuzzy edges. Accepts standard video signals. Table top mounting; 5¼" h.

$3150.

Video Integrator **310**



Produces a D.C. voltage directly proportional to the integral of a video signal falling within a selectable "window" area. Requires external drives. Rack mount, 3½" h.

$1500.

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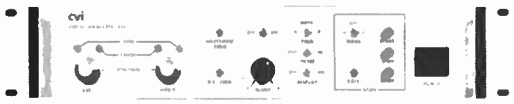
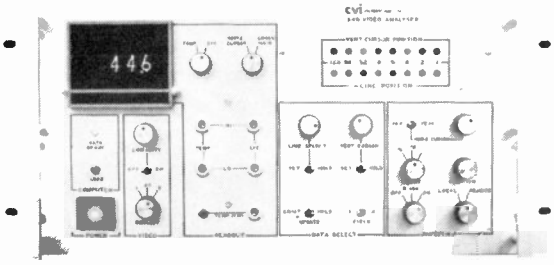
Video Analyzer 321



Laboratory version of the 301. Incorporates additional circuitry to allow chart recording of line selected video waveforms X-Y coordinate indication, noise analysis, computer data input, and other features. Rack mount, 3½" h.

$2500.



Video Analyzer 340

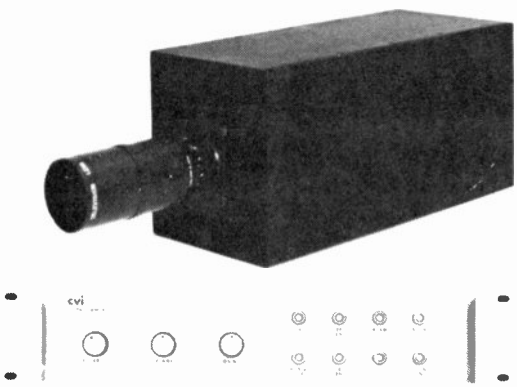
A sophisticated instrument intended to derive objective data from video signals. Functions include digitization of a selected TV line and processing of derived data. Several patterns are superimposed over input video for simplification of analysis. Rack mount, 8¾" h.

$14,500.

Video Analyzer 350

A low cost instrument for display of TV waveforms directly on a normal monitor screen, eliminating the need for a separate CRT display. Similar to the Model 301 but uses a fixed sampling position. Also features a peak video level detection mode. Rack mount, 1¾" h.

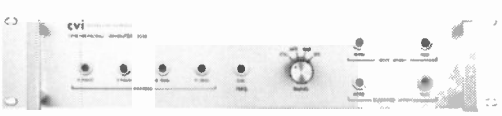
$400.



Data Camera 502

A TV camera intended particularly for research or industrial inspection uses. Accepts nearly any 1 inch tube and has various features such as externally controllable sweeps, beam blanking, dynamic gain control, plug-in low pass filters, and very wide range of operating rates. Options include video sampler and digital control of various functions. Camera is three chassis configuration: head, control unit, power supply. Requires external drives, blanking, or deflection voltages.

$4000.



Sync Generator 601-B

A unit intended for laboratory use when either standard or non-standard TV scan rates are required. Uses micrologic binary counters with adjustable feedback paths. Drive and blanking pulses are variable width, but sync is not EIA format. Incorporates dot/bar generator for test purposes. Rack mount, 3½" h.

$1025.

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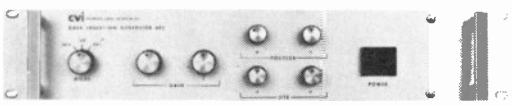
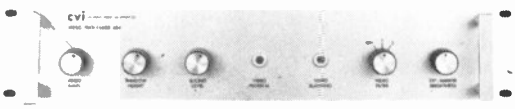
Data Insertion Generator **603**



Combines the functions of a 2 channel video mixer, special effects generator, and video pointer. A moveable oblong is positionable to any point in TV raster and is variable in size over a wide range. The oblong acts as the internal "key" in special effects mode, and also generates a white "box" outline or solid square for marking purposes. Requires external sync. Rack mount, 3½" h.

$1250.

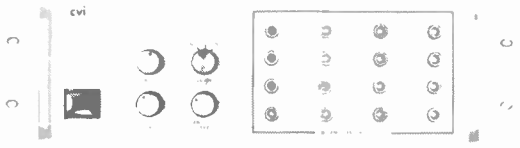
Video Processor **604**



Modifies the grayscale of a video input signal by selecting and amplifying a variable width "slice." Also incorporates variable brightness control, sync adding, and external marker adding functions. Requires external sync. Rack mount, 3½" h.

$950.

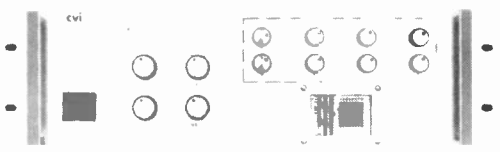
Video Quantizer **606**



Allows the processing of a video input signal into 16 separate amplitude levels. Operates with tape, camera, or disc inputs and allows radical grayscale alterations or the generation of complex synthetic color signals. Rack mount, 5¼" h.

$3500.

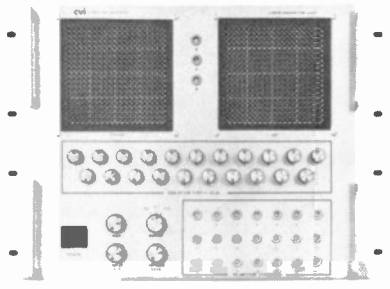
Video Quantizer **606A**



An eight-channel version of the 606, containing a built-in patch panel for the color coding and mixing functions. Produces R-G-B outputs and sync. Rack mount, 5¼" h.

$2500.

Video Quantizer **606C**



A 21-channel version of the 606, with integral patch panel for achieving a wide range of visual effects. Contains linear video amplifier for mixing input digital with quantized signals. Wide band operation. Rack mount, 14" h.

$5000.

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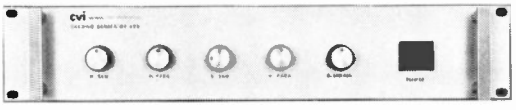
Shading Generator **608**



Generates H and V sawtooth and parabolic waveforms of variable amplitude and polarity to provide compensation of brightness errors in video input signals. May also be used to drive external dynamic correction circuitry. Requires external sync. Rack mount, 3½″ h.

$950.

Video Pointer **610E**

Generates five different oblong and/or cross patterns which are positionable to any location on the TV screen. Oblongs can be changed in size over a range of 10 to 1. Unit may be used for marking purposes or for positional measurements. Rack mount, 3½″ h.

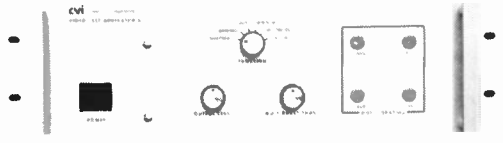
$1950.

Diameter Analyzer **611**

Contains gating, slicing, and counting circuits to provide automatic measurement of the maximum vertical dimension of a target with moderate to high contrast. Both digital and analog output signals are available. Rack mount, 3½″ h.

$1950.

Video Generator **615**



Generates grayscale, grating, dot, window, multiburst, and flat field signals. Multiburst is variable in position for monitor resolution checks, and multiburst frequencies to 20 MHz may be ordered. 615 requires external drives, blanking, and sync. 615A has internal sync generator and supplies video, sync, blanking, and drives. Rack mount, 5¼″ h.

$2000. 615
2250. 615A

X-Y Indicator **620**

Generates white cross hairs superimposed over a video input signal. Allows rapid alignment of subject material with a predetermined location when used in conjunction with a standard TV camera and monitor. Accepts composite video on a terminated input and provides composite video out to a standard TV monitor. Size 11x8x 1.65″. Mounting: Free standing or rack mount.

$400.

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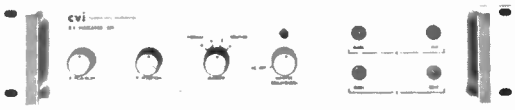
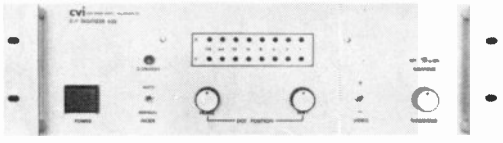
X-Y Indicator 621



Accepts either composite or non-composite video signals and superimposes either a small white dot or set of cross hairs on the video image. Marker may be manually positioned to any location on the raster and two directly proportional DC output signals are generated for analysis of spatial location of subjects. Also contains built-in grating generator for evaluation of input signal quality. Rack mount, 3½" h.

$1500.

X-Y Digitizer 622



Provides 8 bit digital X-Y coordinates of a small white dot that may be manually located anywhere on a standard TV image. Also incorporates automatic tracking of high contrast targets, and stable grating test signal. Operates from composite video. Rack mount, 5¼" h.

$4500.

Sync Delay 624

Accepts standard format vertical and horizontal drives and generates drives, blanking, and industrial sync signals which may be delayed by selectable amounts, both vertically and horizontally, from the original drive signals. Rack mount, 3½" h.

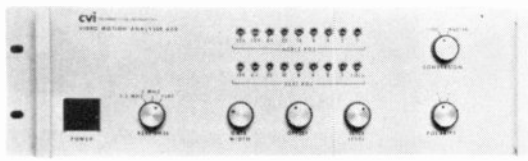
$1250.

Video Detector 630

Provides gating functions combined with high and low video detection circuitry to provide automatic warning when video levels exceed preset limits. May also be operated in a differential mode to provide high sensitivity to small changes in contrast, such as might be produced by spots or hairline cracks. Operates from composite video signals. Standard rack mount, 3½" h.

$1500.

Video Motion Analyzer 633



Accepts composite video signals and measures lateral motion of a high contrast video target in a selectable portion of the TV signal. Operates in two modes: one-line gate superimposed on target image, or variable gate to blank out all but target profile. Rack mount, 5¼" h.

$4000.

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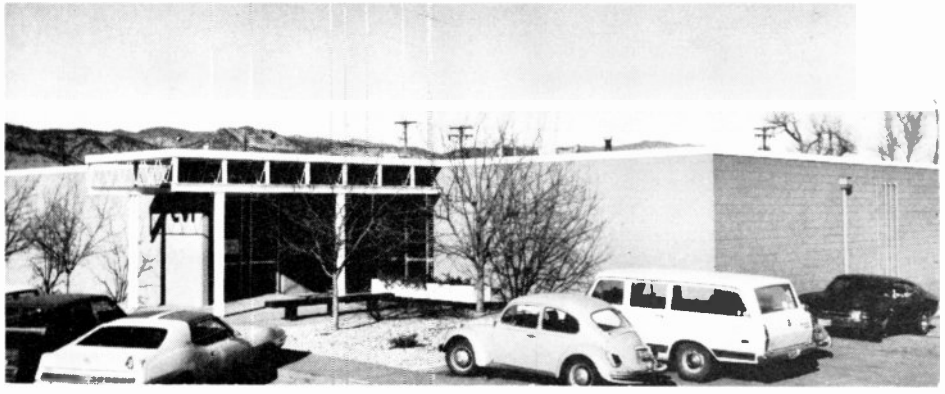
A few words about Colorado Video, Incorporated.

CVI specializes in the design and manufacture of instruments utilizing video technology. Particular areas of interest include research laboratory instrumentation, industrial inspection and control, computer input/output of television signals, video metrology, image alteration and synthesis, electronic art, scan conversion, and communications involving the transmission of TV pictures over audio grade circuits.



Colorado Video, Incorporated — 3245 Prairie Avenue, Boulder, Colorado USA

CVI instruments are used throughout the world and are available for operation from 50 to 400 Hertz power sources and at various scanning rates. For technical assistance, please contact any of the following:

CVI — Box 928 — Boulder, CO 80306 U.S.A.
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CVI New York Sales Office — New York, NY
(212) 246-2490

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San Diego, California 92111
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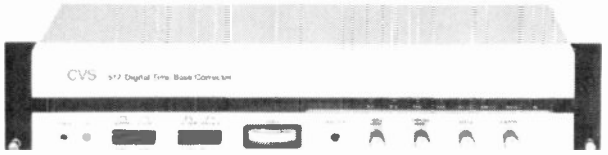
Better video–digitally–for any TV standard

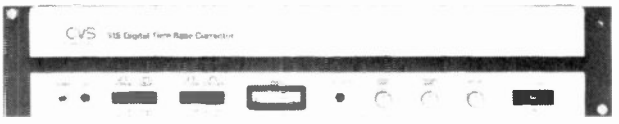
PAL/SECAM



CVS-517 Digital Time Base Corrector

Broadcast quality (SECAM optional), L. Lock and V. Lock. SECAM option also provides PAL/SECAM bi-directional standards conversion. Features: 2h + window, Gen Lock, DOC, Vel Comp, Proc Amp. Options include: SECAM, Image Enhancer/Noise Reducer, 16h window.

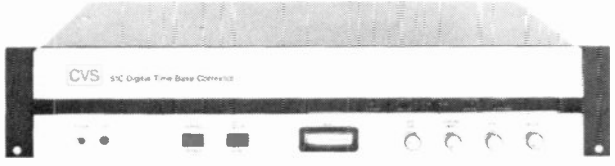
PAL-M



CVS-515 Digital Time Base Corrector

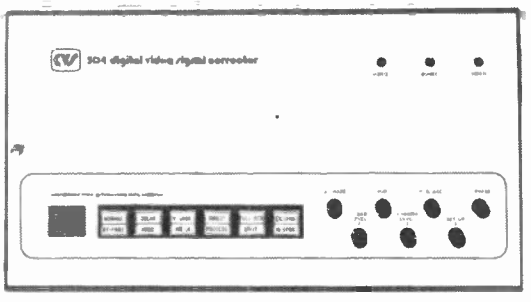
Broadcast quality, has NTSC to PAL-M standards conversion. Features: 2h+ window, Gen Lock, DOC, Vel Comp, and Proc Amp. Image Enhancer/Noise Reducer and 16h window optional.

NTSC



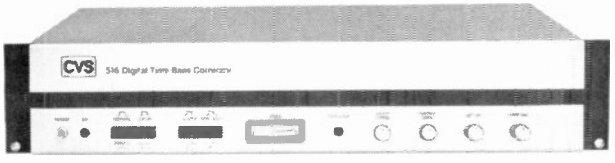
CVS-510 Digital Time Base Corrector

Ideal for CCTV and CATV; monochrome or heterodyne color. Features include: 1h + window, DOC, Proc Amp, Color Interlace.



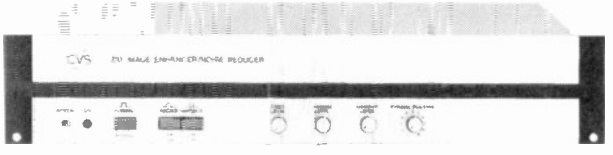
CVS-504B Digital Time Base Corrector

Broadcast quality, monochrome, direct and heterodyne color, (L. Lock and V. Lock). Includes: 3h window, Gen Lock, Proc Amp. Options: Vel Comp, Heterodyne Phase Corrector.



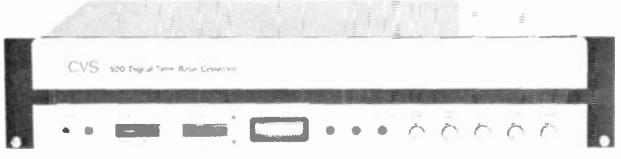
CVS-516 Digital Time Base Corrector

Broadcast quality, specifically designed for heterodyne VTRs. Features: 2h+ window, Gen Lock, DOC, Vel Comp, Proc Amp. Options: Image Enhancer/Noise Reducer, 16h window.



CVS 310 Image Enhancer/Noise Reducer

Reduces luminance & chroma noise 6 dB; enhances horiz. & vert.; minimizes fine grain noise, moiré & streaking; reduces chroma-to-luminance crosstalk by 20 dB; corrects chroma/luma delay errors.



CVS-520 Digital Time Base Corrector

Broadcast quality for every VTR; segmented or nonsegmented. Only TBC with 9 bit 4x subcarrier digital processing. Can update mono quad to color; has DOC, line-by-line Vel Comp and digital outputs.

EPIC™ Computer Aided Editor

A complete, software-based system for on or off-line use with multiple VTRs—from quad and 1" to ¾" cassette types. With EPIC, functions that, before, required separate, costly hardware—like time code generation—are now in software. As a result, total system cost is reduced while versatility and convenience are increased.

Want to know more about TBCs?
Ask for our free booklet, the "What, Why and When of Time Base Correction."

CVS

Consolidated Video Systems, inc.

CVS is making digital technology work for video users worldwide. To keep up to date on our new product developments call or write.

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Phone: (408) 737-2100
Telex: 35-2028

European Office
293 Regent Street
London, W1V2HR England
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Telex: 268316

Prices and Specifications Subject to Change Without Notice.

Circle (39) on Reader Service Card

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Organization For Your Rack Mount Equipment — Field Or Studio

- Attractive for studio use and rugged enough for field operations
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- All hardware is recessed on cases with four or more rack spaces
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Both Lids Attached Ready For Transport Or Storage

Heavy Duty Steel Corners

2½" Heavy Duty Casters For Field Or Studio

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Spring Loaded Recessed Handles With Thick Padded Rubber Grip For Comfortable Carrying

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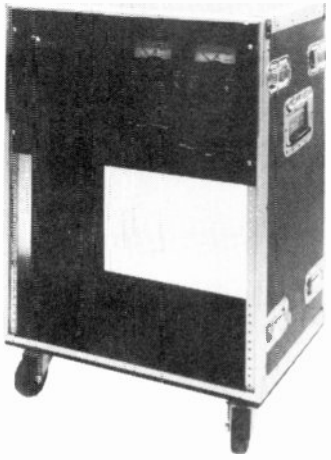

Vid-Pro Travel Cases

Carrying Cases For Video Recorders *Make Sure Your Equipment Arrives In Working Order*

Standard Duty Case

Attractive Carrying Case For Traveling Around Town Or To Your Friends.

Hand Holes For Easy Placement Of Your Equipment. Our Hand Holes Also Serve To Hold Two Tapes Each Side.

Dense Foam Padding For Added Protection

Chrome Corners For Extra Protection

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Reinforced Handle For Comfortable Carrying

Heavy Gauge Vinyl Covering Over Solid ¼" Plywood

Decorative Side Stitching Top & Bottom

Heavy Duty Case

Continuous Hinge

Hand Holes For Easy Placement And Extra Tapes

Extra Dense Foam Padding

Recessed Latches

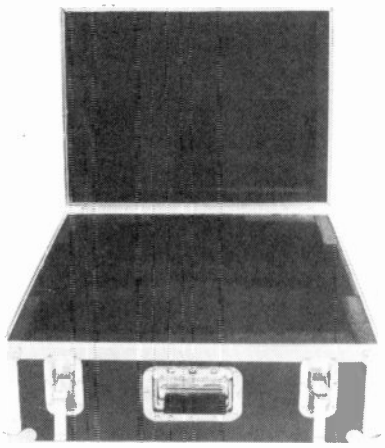
Recessed Spring Loaded Handle

Heavy ABS Plastic Laminated to ¼" Solid Plywood

Heavy Duty Steel Corners

Durable Aluminum Angle

Deep Tongue And Groove Valance



Total Protection For Your Valuable Equipment. Airline Proof Heavy Duty Travel Cases — Perfect For Traveling Around The Country Or Overseas

Travel Cases Available For:

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- Sony Betamax II
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- Magnavox
- RCA Selectavision
- Panasonic Omnivision
- JVC Vidstar
- Zenith
- Inquiries for equipment not listed welcome
- We manufacture cases for most audio visual and camera equipment

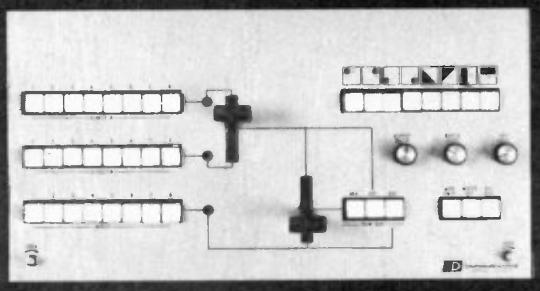
- Travel with confidence. . . use Vid-Pro

Tape carrying cases for Beta and VHS videocassette formats. Available in 12 or 24 tape. Constructed like standard duty case above.

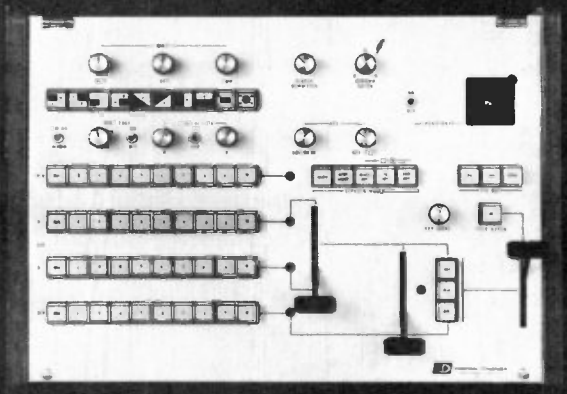
Specifications Subject to Change Without Notice.

Circle (40) on Reader Service Card

small... sophis-ticated & super



VS-10



VS-14

AFM-10

CDL's Video Switchers & Audio Mixer Switcher team up for flexibility, compact size & price!

small...

The VS-10 . . . an 8-input, 3-bus, compact, self contained, vertical interval, solid state switcher. Impressive special effects, Mix Amplifier, Wipe/Key Amplifier, output selector and broad operational capabilities provide exceptional production flexibility. Includes automatic Preview; can wipe and dissolve to keys; has true On-Air Tally system. Chroma Keying also available.

sophisticated

The VS-14 . . . a 10-input 4 bus switcher with a combined Mix Amp, Wipe/Key/Mask Key Amp and a Downstream Keyer that allows execution of a complex effects sequence . . . such as . . . dissolve from one source to a masked chroma key . . . then dissolve a color matted title over a chroma key, and finally dissolve out of the chroma key to a different source while retaining the title. Standard features also include Soft Wipes, Soft Keys, Color Titles, Split Screens and Spotlight. Downstream Keyer can insert or dissolve titles.

& super

AFM-10 . . . its "teammate" power and flexibility allows it to automatically operate as an Audio Follow or an Audio Mix/Follow Switcher with the VS-10 or VS-14 . . . *plus* it has a "hands-off" automatic gain riding Compressor/Limiter.

In the Follow Mode, the AFM-10 becomes an automatic remote controlled switcher.

In the Mix/Follow Mode, the AFM-10 beautifully performs a "voice over", manually or automatically.

As a Mixer, the AFM-10 handles many jobs with its 7 inputs with individual channel gain pots, independent Master and Auxiliary Line level outputs, and Comp/Lim that can be switched IN or OUT.

Actually, *Super* is what you'll say when you realize how much you can do for the price . . . and remember, that includes CDL Quality and Reliability

So send for brochures today or for immediate response, call or write.

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Circle (41) on Reader Service Card

CHYRON® CASSETTE CLEANER & EVALUATOR

The CHYRON Cassette Cleaner and Evaluator, Model U-1, provides rapid cleaning and evaluating of 3/4-inch Type A Format Video Magnetic Tape in both standard and small size videocassettes. The system operates with all standard tape, including the new thick oxide tape.

Outstanding operating features make the Model U-1 the leader in professional videocassette tape maintenance.

COMPLETELY SELF-CONTAINED.

All of the U-1's capabilities are built into a single stand-alone unit. *There is no need to tie up or tie into expensive auxiliary equipment.*

DOESN'T ALTER THE RECORDED SIGNAL.

The circuitry is designed to safeguard the pre-recorded signal — and, in fact, may *improve* the signal quality on playback.

SELECTABLE ERASE.

The erase function can be activated — at the operator's discretion — by two electrically interlocked front panel switches. When the ERASE button and START button are pressed simultaneously, the erase oscillator is energized and the full-track erase head moves into the tape path. In order to prevent accidental erasure of cassettes, the erase function is de-energized at the end of the cleaning cycle or when the STOP button is pressed.

SELECTABLE OPERATING MODES.

A front panel switch can select one of three operating modes: STOP ON MAJOR ERROR, DON'T STOP, or STOP ON ALL ERRORS. Thresholds of damage recognition are manually adjustable to meet specific user requirements. The *entire* playing surface of the tape can be cleaned and evaluated. However, when time is a prime consideration, selection of a STOP ON ERROR mode allows the operator to physically examine the tape and/or reject it without completing the cycle.

HIGH SPEED, HANDS-OFF OPERATION.

Inserting the cassette in the U-1 produces an automatic rewind to the beginning. Pressing the START button causes the tape to be withdrawn from the cassette and formed into a loop. The tape is automatically placed into contact with front and back surface cleaning stations and with a honing edge which removes embedded particles from the oxide surface.

The tape shuttles from supply spool to takeup spool, and rewinds with *constant* torque to assure proper tape tension for optimum performance during VTR recording and playback. The tape is cleaned — *doubly* cleaned — during the forward and reverse passes. Evaluation takes place during the forward pass only. Average tape speed is 60 inches per second. A 30-minute cassette is thoroughly cleaned, evaluated, and rewound in *less than 3 minutes*. The system is completely automatic — and so simple to use that little or no operator training is required.

DUAL OPTICAL EVALUATION.

The slit evaluator operates as a shadow-graph to detect edge damage, edge creases, changes in tape width, and uncoated tape. The reflective evaluator examines the oxide surface for head scoring, creases, and minor abrasions which could adversely affect signal quality during recording and playback.

FEED-BACK TO OPERATOR.

Eight indicator lights on the front panel provide easy monitoring of tape and system status. Two separate 3-digit LED counter displays provide the *actual* tape length in playing time, and tally *each* detection of major and minor tape damage.

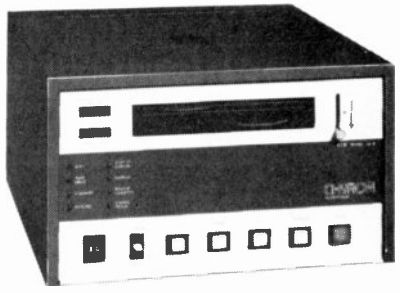
REPLACEABLE PARTS AND SUPPLIES.

Spools of specially treated polyester material — advancing at the rate of one inch per minute — are sufficient to clean 320 thirty-minute cassettes. Replacement is quick, easy — and inexpensive. The precision-ground honing edge can be rotated periodically to provide thousands of hours of use — and is easily replaced when necessary.

SPECIFICATIONS

- **INPUT POWER:** 105-125 VAC, 60 Hz, 100 watts nominal.
- **EXTERNAL ALARM OUTPUT:** Dry relay contacts, one Form C (SPDT) to operate remote "Stop On Error" indicator (lamp, bell, etc.). Contact ratings 48 VDC @ 1A.
- **FRONT PANEL CONTROLS:**
  POWER ON OFF (push push).
  START (momentary push).
  STOP (momentary push).
  ERASE (momentary push, electrically interlocked with START pushbutton).
  RETRACT (momentary push).
  STOP ON MAJOR ERROR ALL NONE (three-position selector switch).
  EJECT (lever).
  SET LENGTH (thumb-wheel switch).
- **FRONT PANEL 3-DIGIT LED INDICATORS:**
  TAPE LENGTH — displays the actual tape playing time in minutes and tenths to 99.9 minutes.
  DAMAGE COUNT — displays the accumulated count of major and minor tape damage as determined by Minor Error Sensitivity Setting.
- **MESSAGE READOUT LAMPS:** Wait, Tape Drive, Forward, Reverse, Damage, Remove Cassette, Change Tissue, Rewind.
- **SELECTABLE ERASE:** Frequency 800 kHz.
- **DEPTH OF ERASURE** (at tape speed of 60 ips): nominally 50 dB.
- **TISSUE SPOOL CAPACITY:** Each pair of spools contains 80 feet of specially treated polyester material.
- **TISSUE SPOOL ROTATION:** 1 4 rpm.
- **INTERNAL CONTROLS:**
  Major Error Sensitivity Setting — adjustable from 1 to 10.
  Minor Error Sensitivity Setting — adjustable from 1 to 10
  Erase Inhibit
  Jog Forward
  Jog Reverse.
- **DIMENSIONS:**
  Height — 10
  Width — 17
  Depth — 18-1 2
  Weight — 55 lbs.
- **FINISH:**
  Front and Rear Panels — Fed. Std. 595A #20400 (light tan lusterless vinyl).
  Cabinet — Fed. Std. 595A #30108 (dark brown textured vinyl).
  Chassis and Internal Assemblies — satin black anodize.
  Rugged, all-metal construction.
- **POWER CONNECTOR:** Hubbell, 3-wire twistlock #7484. Mating power cord supplied.
- **EXTERNAL ALARM CONNECTOR:** 5-pin Amphenol #126-218-1000 socket. Mating plug #126-217 supplied.

Maintenance and Operating Manuals provided.
Specifications subject to change without notice.



CHYRON CORPORATION
VIDEO PRODUCTS DIVISION
223 NEWTOWN ROAD PLAINVIEW NEW YORK 11803
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The CBS SOUND LIBRARY provides an outstanding selection of fresh, modern, never-before-released audio materials! Meticulously assembled from hours of raw sound footage, the CBS SOUND LIBRARY is designed to meet the universal demand for 1970's realism in audio production!

Over 8 full hours of today's most important sound effects...407 cuts in all...in one complete, easy-to-use library!

Here is a brief sampling of the many sounds included in this collection:

Actual moonshot launch, from mission control countdown and liftoff to the sounds of radio transmission from outer space . . . Satellite signals; missile base sounds . . . Sounds of the North Pole; glacial break-ups; explosions and avalanches, suitable for earthquakes and other natural disasters . . . Transportation atmospheres; wind effects; and various parade ground sounds . . . Modern airport and aircraft sounds, including helicopters . . . Various auto racing effects, including car starts . . . Stadium crowds including a comprehensive baseball stadium sequence . . . Outdoor crowds, such as street riots, street fighting, rallies, sirens, applauses; etc . . . Fire engines, traffic, construction, car wash and gas station sounds . . . Sports sequences including scuba diving; boxing; motorboating; and children at play . . . On-location nature and rainforest sequences; including weather and beach effects . . . Various bird sounds; sea lions; and horse and wagon effects . . . On-location sounds from prisons and courts of law; stock exchange interiors; department stores and supermarkets . . . Factory effects; school interiors and fireworks effects . . . Orchestra tuning up; party crowds; teargas grenades; street vendors . . . and more!

Every sound recorded live...on the spot!

Advanced recording techniques for superior fidelity!

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Complete Sound Library, designed exclusively for professionals!

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The new CBS SOUND LIBRARY - consisting of sixteen 12" pure vinyl LP records plus a complete catalog and exhaustive easy-to-use index -- can be yours right now for just $150. Quite a bargain when you consider the outstanding new dimension and quality you'll be adding to your production capabilities.

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Authorized signature

Circle (43) on Reader Service Card

CINE 60 POWERBELTS

Eighteen years proven performance...unmatched worldwide. Power you can rely on. With all you put on the line every time you pick up a camera, can you afford anything less?

Individual cell modules—custom-matched nickel-cadmium cells in high-impact protective containers.

Prime material—Most durable material known for imperviousness to extremes of temperature, humidity and abrasion.

Patented design—U.S. Pat. No. 3,274,476 and German Pat. No. D.B.P. 1,264,001 awarded to Cine 60 president, Paul Wildum.

Heavy-duty wiring—with AMP friction-lock connectors. For extra protection against loose connections due to shock and vibration, AMP connectors are additionally soldered to cell tabs for increased security and reduced internal resistance.

Heavy-duty zipper—Assures easy access to wiring and cell modules for on-the-spot internal inspection.

Powerpacks—all Powerbelt models also available in compact battery packs.

Automatic circuit breaker—helps protect camera, lights, etc., as well as batteries in case of external shorts. Resets automatically.

Form-fitting compartments—cells cannot shift or move regardless of Powerbelt position; minimizes undesirable flexing of belt wiring.

Vacuum-formed seamless compartments—deep-molded, with rounded corners and uniform wall thickness to reduce stress on material.

Built-in solid-state charger with indicator light and AC cable—provides overnight charging.

Special fast-charge in FC models—provides full charge in one hour with optional Model 9400 Fast Charger.

Optional coiled power cord shown.

Riveting and double-stitching—provides heavy-duty reinforcement.

160 types Powerbelts and Powerpaks, 4 to 14 Ampere-hour capacity for Sony, JVC, Panasonic, Thomson, Akai, Javelin, Magnavox, Ampex, NEC, Philips, Fernseh, CEI, Asaca, Micro-Wave, Hitachi, RCA, Ikegami, Sharp, Cinema Products, Sanyo, Toshiba, Mitchell, Bolex, Arri, Beaulieu, Eclair, Photosonics and other battery-operated equipment. See your local dealer or contact us for information and prices.

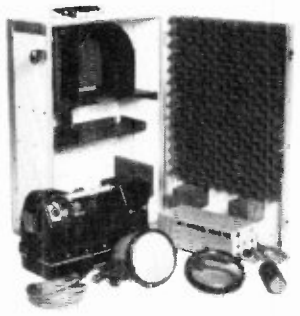
Cine 60 Inc. 630 9th Ave. N.Y. N.Y. 10036 212-586-8782 West Coast 6430 Sunset Blvd. Hollywood, Cal. 90028 213-461-3046

CINE 60 Sun-Gun Kits

The 12V. Sun-Gun Kit consists of: The Cine 60 Sun-Gun Head (with integral Swing-Away Filter Holder, removable handle, integral battery cable), Cat. No. 6201A; Tungsten-Halogen Lamp, 11.5V. 100 Watt, Cat. No. 6211; Swing-Away Dichroic Filter, Cat. No. 6202; Battery Cable Adapter, Cat. No. SG6512; 12V. SG Powerbelt or Powerpak, Standard or Fast Charge; Overnite Charger; Carrying Case Cat. No. 6207. Pictured: 12 V. 8AH Fast Charge Powerbelt Sun-Gun Kit with 1 Hour Fast Charger.

Cat. No. SGK-8327PS

SGK-6307PS	**12 VOLT 4AH STANDARD POWERBELT SUN-GUN KIT.** 25 minute life. Wt. 15 lbs	681.00
SGK-7007PS	**12 VOLT 7AH STANDARD POWERBELT SUN-GUN KIT.** 40 minute life. Wt. 17 lbs	811.00
SGK-6327PS	**12 VOLT 8AH STANDARD POWERBELT SUN-GUN KIT.** 50 minute life. Wt. 20 lbs	822.00
SGK-8307PS	**12 VOLT 4AH FAST CHARGE POWERBELT SUN-GUN KIT.** 25 minute life. With 9400 Fast Charger. Wt. 18 lbs	978.00
SGK-8327PS	**12 VOLT 8AH FAST CHARGE POWERBELT SUN-GUN KIT.** 50 minute life. With 9400 Fast Charger. Wt. 23 lbs	1135.00
SGK-9107PS	**12 VOLT 4AH STANDARD POWERPAK SUN-GUN KIT.** 25 minute life. Wt. 14 lbs	712.00
SGK-9107FC	**12 VOLT 4AH FAST CHARGE POWERPAK SUN-GUN KIT.** 25 minute life. With 9400 Fast Charger. Wt. 17 lbs	1008.00
SGK-9707PS	**12 VOLT 7AH STANDARD POWERPAK SUN-GUN KIT.** 40 minute life. Wt. 16 lbs	860.00
SGK-9127PS	**12 VOLT 8AH STANDARD POWERPAK SUN-GUN KIT.** 50 minute life. Wt. 19 lbs	871.00
SGK-9127FC	**12 VOLT 8AH FAST CHARGE POWERPAK SUN-GUN KIT.** 50 minute life. With 9400 Fast Charger. Wt. 22 lbs	1168.00
SGK-9727PS	**12 VOLT 14AH STANDARD POWERPAK SUN-GUN KIT.** 80 minute life. Wt. 23 lbs	1077.00



The 30V Sun-Gun Kit consists of: The Cine 60 Sun-Gun Head, Cat. No. 6201A; Tungsten-Halogen Lamp, 30V. 250 Watts, Cat. No. 6209; Swing-Away Dichroic Filter, Cat. No. 6202; 30V. SG Powerbelt or Powerpak, Standard or Fast Charge, Overnite Charger; Carrying Case, Cat. No. 6207. Pictured: 30V. 4AH Fast Charge Powerpak Sun-Gun Kit with 1 Hour Fast Charger.

Cat. No. SGK-9104FC

SGK-6304PS	**30V.-4AH STANDARD POWERBELT SUN-GUN KIT.** 25 minute life. Wt. 21 lbs	785.00
SGK-8304PS	**30V.-4AH FAST CHARGE POWERBELT SUN-GUN KIT.** 25 minute life. With 9400 Fast Charger. Wt. 24 lbs	1086.00
SGK-9104PS	**30V.-4AH STANDARD POWERPAK SUN-GUN KIT.** 25 minute life. Wt. 21 lbs	821.00
SGK-9104FC	**30V.-4AH FAST CHARGE POWERPAK SUN-GUN KIT.** 25 minute life. With 9400 Fast Charger. Wt. 24 lbs	1116.00
SGK-9704PS	**30V.-7AH STANDARD POWERPAK SUN-GUN KIT.** 40 minute life. Wt. 23 lbs	1024.00
SGK-9704FC	**30V.-7AH 2 HR. FAST CHARGE POWERPAK SUN-GUN KIT.** 40 minute life. With 9400 Fast Charger. Wt. 26 lbs	1322.00

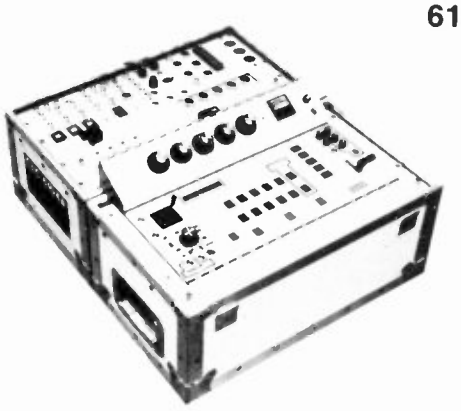
CINE 60 Sun-Gun Light

Cine 60's Sun-Gun is a unique battery powered light used by TV camera men and documentary film makers all over the world as a "fill" light outdoors, a "key" or "fill" light indoors. For 30 Volt 150, 250, 350 watt and 12 Volt 100 watt tungsten-halogen lamps. **Features: Soft, Wide Angle Focusing Light** ideal as a camera mounted light in head-on situations. At 10 ft. Flood Position throws a 14 ft. wide beam flat from edge to edge, free of hot spots, filament patterns, or halos. Lets camera man achieve better picture quality, balancing "fill" light to ambient light, and eliminating harsh facial shadows. A heat-insulated knob on back is used to focus, sliding in and out and locking at any point from maximum to minimum beam width. **Built-In Swing-Away Dichroic Filter,** 3400°K indoor color temperature or 5500°K color temperature with the turn of a knob

SWITCHER IN A "SUITCASE"

12V DC
117V AC

6104A



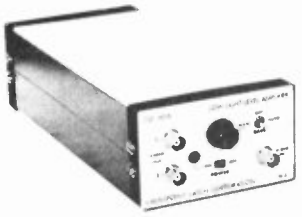
Fully Portable Switching System. Versatile switcher with mix into effects and effects into mix. Built in sync generator with full pulse distribution system, intercom, colorizer, color bar generator and audio mixer.

1 3/4" SYNC GENERATOR SYSTEM

6006

Complete Sync Generator System
Five subcarrier, vertical drive, sync or Horizontal drive outputs. (Four subcarrier and four horz. adjustable).

LOW LIGHT LEVEL AMPLIFIER



6016

6016A
Sony
Compatible

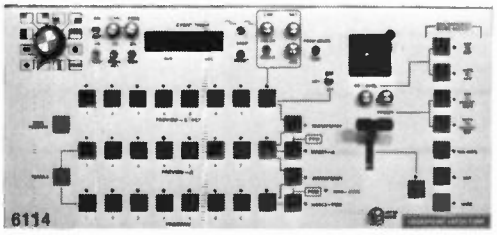
In-line amplifier. No modification to camera. Processor for sync and burst. Automatic gain control, max. 12db (Two lens stops)

INTERCOM & TALLY SUPPLY

Five Station Intercom System
For carbon microphone, 600 ohm head sets.
Tally supply: 24V, 500mA. DC.

8 INPUT SWITCHER

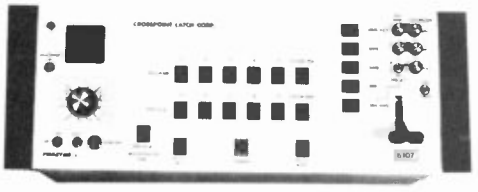
6114



8 input switcher with mix effects and effects into mix, wipe key, mix key, 24 hour event timer, blink effects, pattern modulator, soft wipe, spot-lite and colorizer.

6 INPUT SWITCHER

6107



Features double re-entry (Mix into effects and effects into mix). Full preview, with only two buses. Built in intercom, tally supply. Auto preview, toggle, 12 pattern effects, colorizer.

CALL OR WRITE FOR COMPLETE PRODUCT INFORMATION

CROSSPOINT LATCH CORPORATION 316 BROAD ST. SUMMIT, N. J. 07901 TEL. (201) 273-1090

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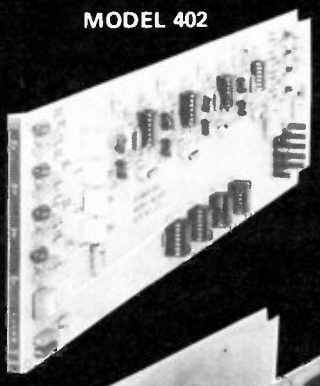
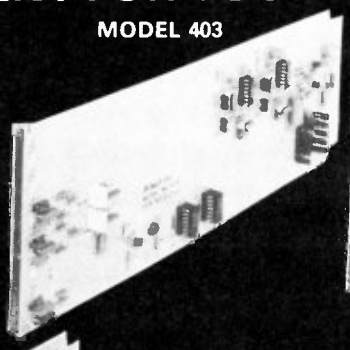
HAS EQUIPMENT FOR YOU

VIDEO PRESENCE DETECTORS

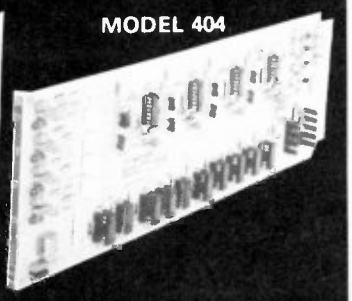
MODEL 402



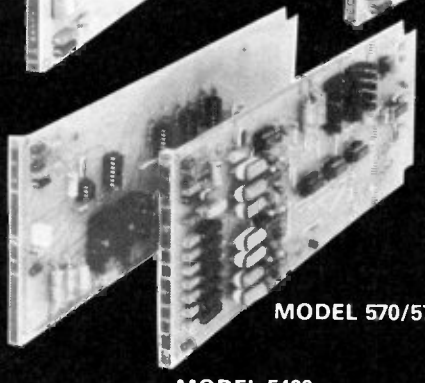
MODEL 403



MODEL 404



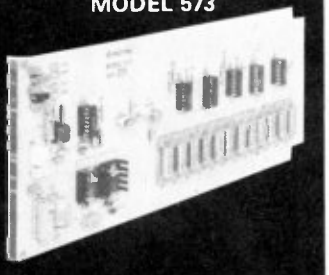
TOUCH TONE SYSTEMS



MODEL 570/572

FUNCTIONS 12 Per Card
MAX. 144
Auto Answer or
Dedicated
High Current or Relay
Outputs

MODEL 573

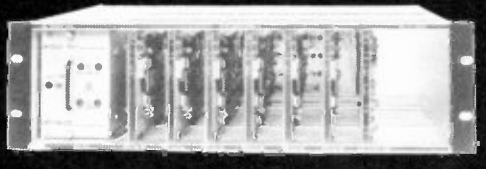


AUDIO/VIDEO ROUTING SWITCHERS, REMOTE CONTROLLED, LOOP THRU INPUTS

MODEL 5400

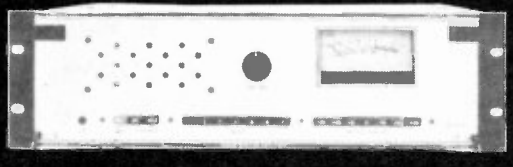
MATRIX: 4X1, 4X3, 8X2 or 12X2

MODELS 5500/5501/5502



MATRIX: UP TO 28X2

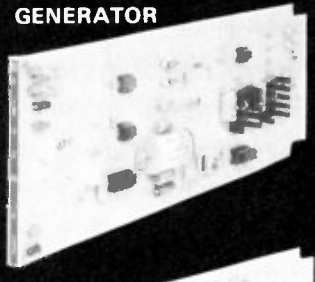
AUDIO MONITOR AMPLIFIER WITH SPEAKER AND VU METER



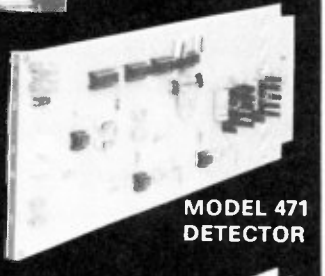
MODEL 7001

TRANSMISSION LINE SUPERVISION SYSTEM

MODEL 470
GENERATOR



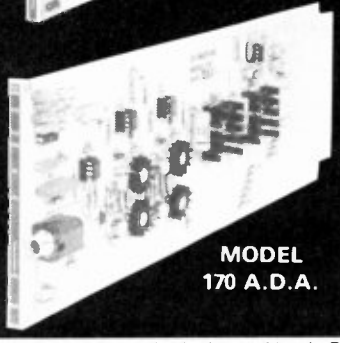
Freq. Range 20 to 100 CPS
(Factory Set)
Level -25 to -35 dBm
(Adjustable)
Alarm, LED & Relay



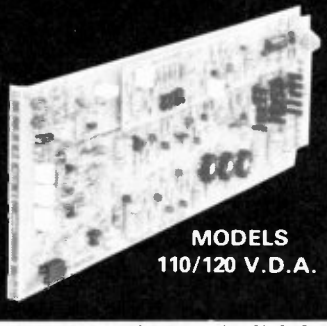
MODEL 471
DETECTOR

AUDIO/VIDEO/PULSE DISTRIBUTION AMPLIFIERS

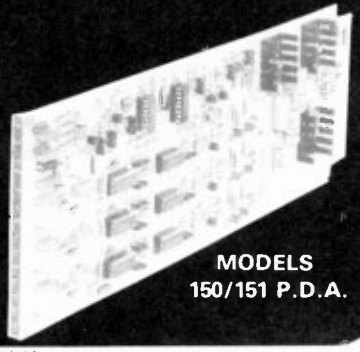
ALL D.A.'s
HAVE 6 OUTPUTS



MODEL
170 A.D.A.



MODELS
110/120 V.D.A.



MODELS
150/151 P.D.A.

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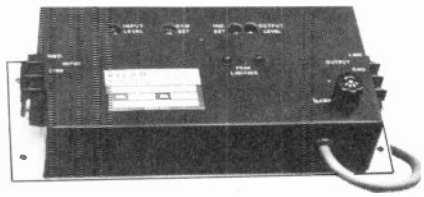
Insta-Peak II – AM-FM-TV **$495**

- ☐ Split Spectrum Optical Control
- ☐ Keyed Integrator – Low Distortion Limiting
- ☐ Peak Ceiling Control Circuit
- ☐ AM and FM Response Shaping



Wideband Composite Limiter Model WBL **$395**

- ☐ Stops **all** stereo filter and pre-emphasis wave-form over-shoot
- ☐ Increased FM modulation 40% and 15% over any other system
- ☐ Phase coherent wide band for composite stereo
- ☐ WBL-M for mono to stop pre-emphasis overshoot

Level Guard Mod. AGC **$395**

- ☐ AGC for AM-FM-TV-recording
- ☐ Optical gain servo for inaudible control
- ☐ Optional control by modulation flasher
- ☐ Meets FCC ATS rules

THE FREQUENCY MEASUREMENT PACKAGE

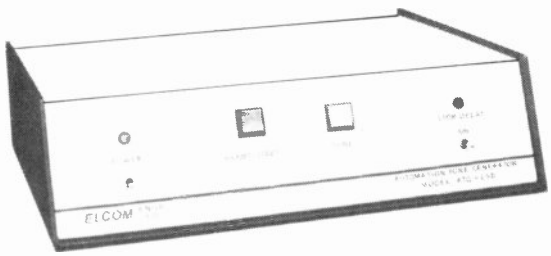
• IN-STATION FREQUENCY MEASUREMENTS •

Standard Frequency Monitor Model 300 **$495**

- ☐ FCC Approved method, station frequency measurements, 10Hz – 500 MHz
- ☐ Eliminates measurements by outside agency
- ☐ 8 digit readings referenced to WWV
- ☐ 5 and 10 MHz crystal control WWV receiver

AUTOMATION CONTROL TONES

• 25 Hz TONE GENERATOR AND TRANSPORT CONTROL •



Automation Tone Generator Model ATG-25D **$395**

- ☐ 0.25 Hz Digital Frequency Stability
- ☐ Internal Audio "Fade-in" for Noiseless Start
- ☐ Controlled and Extended Tone Duration
- ☐ Adjustable Stop Delay

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• SOLID STATE TOWER LIGHT FLASHERS • EBS RECEIVERS & GENERATORS

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Circle (49) on Reader Service Card

Electro-Voice® microphones

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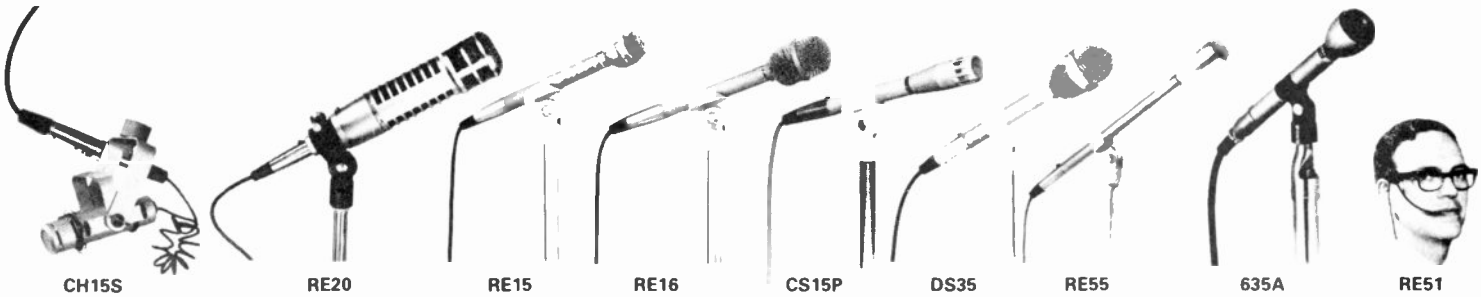
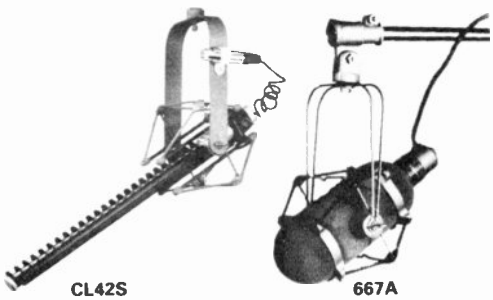


CH15S RE20 RE15 RE16 CS15P DS35 RE55 635A RE51



CL42S 667A

CO90 649B

professional models

model:	CL42S	667A	CH15S	RE20	RE15
type:	Cardiline condenser	Cont. Variable-D® cardioid dynamic	single-d hyper-cardioid condenser	Cont. Variable-D® cardioid dynamic	Cont. Variable-D® super-cardioid dynamic
response:	90-12k Hz	40-10k Hz	55-13.5k Hz	45-18k Hz	80-15k Hz
impedance:	lo-z	50/150/ 250 ohms	lo-z	50/150/ 250 ohms	lo-z
output:	—33 dB	—51 dB	—40 dB	—57 dB	—56 dB
finish:	fawn beige	gray	fawn beige	fawn beige	fawn beige
applications:	long range pick-up; TV & movie booms, ENG	boom/ fishpole	TV, movie boom/ fishpole	highest quality wide-range recording/p.a.	hand, stand, or boom/ broadcast/ recording/p.a.
comments:	phantom or A-B powerable	6 response variations selectable	phantom or A-B powerable	bass tiltdown switch	bass tiltdown switch
similar models:	**DL42**—dynamic				**RE10**—less exacting applications
	CL42S . $637.00 DL42 . . $400.00	667A . . $346.00	CH15S $491.00	RE20 . . $349.00	RE15 . . $202.00 RE10 . . $127.50

professional lavalier

RE16	CS15P	DS35	RE55	635A	RE51	CO90	649B
Cont. Variable-D® super-cardioid dynamic	single-d cardioid electret condenser	single-d cardioid dynamic	omni-directional dynamic	omni-directional dynamic	personal headset dynamic	omni-directional condenser	lavalier dynamic
80-15k Hz	40-18k Hz	60-17k Hz	40-20k Hz	80-13k Hz	80-10k Hz	40-15k Hz	70-10k Hz
lo-z	lo-z	lo-z	lo-z	lo-z	lo-Z	lo-z	lo-z
—56 dB	—45 dB	—60 dB	—57 dB	—55 dB	—56 dB	—57 dB	—61 dB
fawn beige	fawn beige	fawn beige	fawn beige	fawn beige	black	fawn beige	fawn beige
close-up handheld vocal	highest quality p.a./ recording	prof. entertainer broadcast/p.a./ recording	highest quality p.a./recording	hand or stand vocal/instrumental broadcast/record-ing	sports/news remotes/ lecturing	TV news, interview	concealed walkaround p.a./broadcast
bass tiltdown switch/super pop filter	remotely powerable/ removeable pop filter	emphases bass close-up super pop filter	smoothest widest range dynamic	built-in pop filter	hands-free use/clips on eyeglasses	tie clasp mounting	small and lightweight
RE11—less exacting applications	**BS9**—Opt. plug-in battery supply		**DO54**— 50-18k Hz —55 dB	**RE50**— noiseless construction	**967M**—communi-cations model **967ME**—with earphone	**CO85**— "tie-tac"	**RE85**— noiseless construction
RE16 . . $210.00 RE11 . . $141.00	CS15P . $237.00 BS9 . . . $ 50.75	DS35 . . $115.50	RE55 . . $232.00 DO54 . . $112.50	635A . . $ 69.75 RE50 . . $106.50	RE51 . . $153.00	CO90 . . $112.50 CO85 . . $164.00	649B . . $102.00 RE85 . . $106.50

Prices and Specifications Subject to Change Without Notice.

Electro-Voice Accessories

600 Cecil Street • Buchanan, MI 49107 • (616) 695-6831


AC24


BS9


CA10


380


381


502C


502CP


513A


314

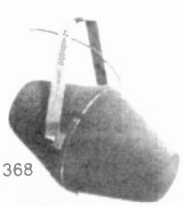

314E


315A


343


351


355A


368

Electrical Accessories

AC24 Phantom power supply AC24M provides remote power for two microphones from standard 117 VAC power Expandable in multiples of four to accept up to 10 microphones by using AC24S Expander Modules

BS9 Remote Battery power supply To power any E-V professional condenser microphone Inserts in mic line between mic and mixer For balanced or unbalanced lo-z (150 ohms) inputs Uses two standard 9v batteries $50.75

CA10 For any E-V professional condenser system head Reduces output level by approximately 10 dB For use where extremely high sound pressure levels may cause distortion in the microphone electronics $26.40

CO9R Repair kit for CO90 mike $19.10

380 Attenuator for use in mike line Reduces signal 10 dB. does not affect response Prevents overloading of electronics with extremely high-level sound input Mates with A3-type professional connectors (For other value attenuators, send for E-V Design your own attenuator plans) $20.60

381 Switch connector and cable SPST switch built into mike connector Converts mikes with no switch into switch type Fits mikes with A3-type professional connector 15 cable replaces cable supplied with mike $24.00

502C Transformer for matching low impedance microphones to high impedance amp inputs Input is A3F connector. MC1M output connects directly to amp Matching A3M cable connector furnished $20.60

502CP Same as 502C but with ¼ phone plug output $20.60

513A Low-frequency cutoff filter for use with Lo-Z mikes. Eliminates unwanted noise and reverberation components below 100 Hz Professional A3-type connectors $62.50

Windscreens

Specially formulated Acoustifoam™ cellular material is transparent to normal sounds but stops sudden air blasts as caused by wind, movement of the mike, and voice P and T pops Unaffected by temperature extremes water resistant, protects against mechanical shock and pickup of dust, magnetic particles

314 For RE10 and RE15 mikes Zippered for easy installation Rear portion can be used on RE11 and RE16 for wind protection For additional protection use 307 shock mount and 368 windscreen $12.00

314E For 635A Can be used for pop protection only on front of RE10, and RE15 $6.40

315A for CS15P mike $6.40

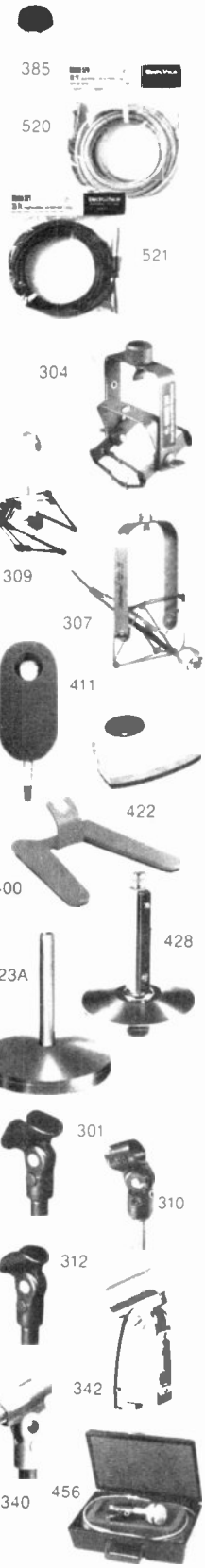
343 For CL42 and DL42 mikes $25.60

351 For pop filter on DS35 RE11 & RE16 $6.40

351 for pop filter on DS35, RE15 RE11, 671 & 672 $6.40

355A For DO54 RE55, mikes $6.40

368 For 667A Also fits over ¾ dia mikes in 307 shock mount and over RE20 in 309 shock mount for added wind protection $94.00


385

520

521

304

309

307

411

422

400

428

423A

301

310

312

342

340

456

385 For CO90 CO90E and CO85 mikes

Cables

520 4.6m (15) 2-cond shielded gray vinyl jacketed with Switchcraft A3F connector at one end and ¼ phone plug at the other end $17.00

521 76m (25) 2-cond shielded brown rubber jacketed with Switchcraft A3F connector at one end and A3M at the other end $23.40

Shock Mounts

304 Shock mount for SE15 Short electronics with CO15 CS15E or CH15E heads of the E-V condenser mic system Will also work with microphones with ¾ or 1 inch barrels Attaches directly to boom head fishpole or floor stand Includes ⅝-27 stand adapter $28.80

307 Shock mount adapts any microphone with ¾ diamater cylindrical shank for boom or stand use Accommodates 314 and or 368 windscreens $33.40

309 Shock mount for RE20 mike Accommodates 368 windscreen $44.00

Desk Stands

411 Floor-mount mike mouse for medium and long-distance pickup on stage, desk top, wall, ceiling, etc Recommended for use with RE10, RE15 mikes Uses reflected sound wave for increased gain before feedback $12.80

400 Desk stand in non-reflecting gray with foam rubber base pads, for most microphones whether clamp mounted or fitted with switch stud $14.40

422 Low profile desk stand with rubber shock mount, accepts E-V stand clamps into which mike is placed $15.90

423A Desk stand with 5⅛ diameter base and 5 riser ⅝-27 mounting thread Rests on rubber feet Gray $11.70

428 Desk stand 5⅛" diameter base with grip-to-talk switch in riser Lever type DPDT switch controls mike and relay Momentary contact or locks in talk position Gray 7 high $31.90

Stand Clamps and Mounts

301 Stand clamp for 1 to 1⅛ diameter microphones Allows snap-out use Black $5.60

301A Same as 301 except gray $5.60

310 Stand clamp for ¾ microphones Allows slip-out use Black $5.60

310A Same as 310 except gray $5.60

312 Stand clamp for ¾" microphones Allows snap-out use Black $5.60

312A Same as 312 except gray $5.60

340 Security Clamp For ¾" diameter cylindrical shank mikes. Allen set screws lock mike and connector in place Standard ⅝-27 thread mounting $11.90

342 Security stud-mount adapter Converts studless mikes with ¾ cylindrical barrel and A3-type connector to stud type with on off switch Allen set screw holds mike in position $22.30

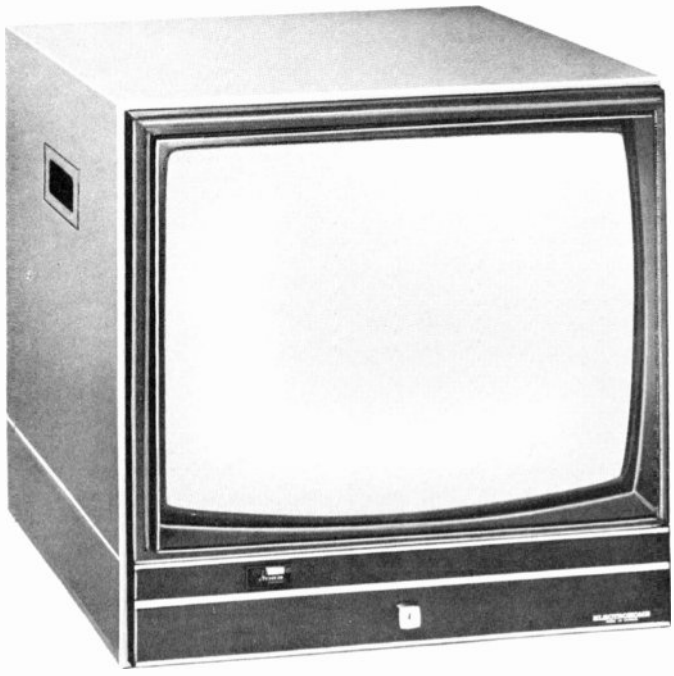
Carrying Case

456 Tough molded carrying case with foam plastic universal insert, holds virtually any E-V microphone and cable Keeps mike clean, free from damage $12.50

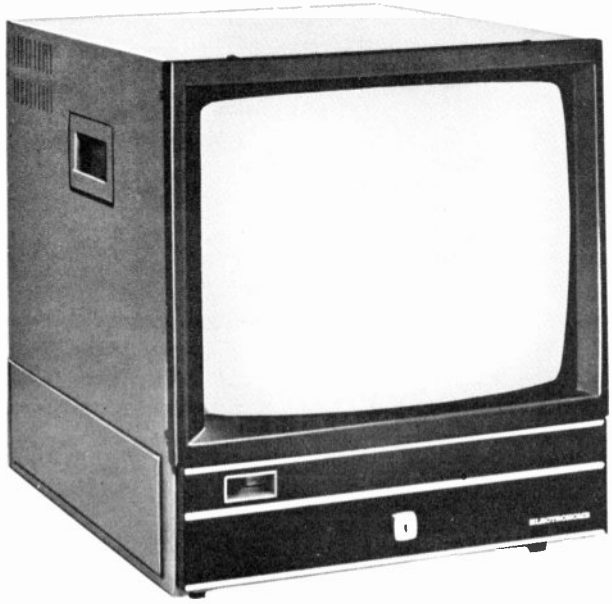
Prices and specifications subject to change without notice

ELECTROHOME
Color Monitor 2000 Series

Electrohome's new 2000 Series modular range of color monitors have been developed to meet a widely recognized need. They have been developed to satisfy the requirements of many specialized users, both in and outside the broadcast industry for a high grade utility color monitor at a price substantially less than that of existing broadcast-type units.



2250

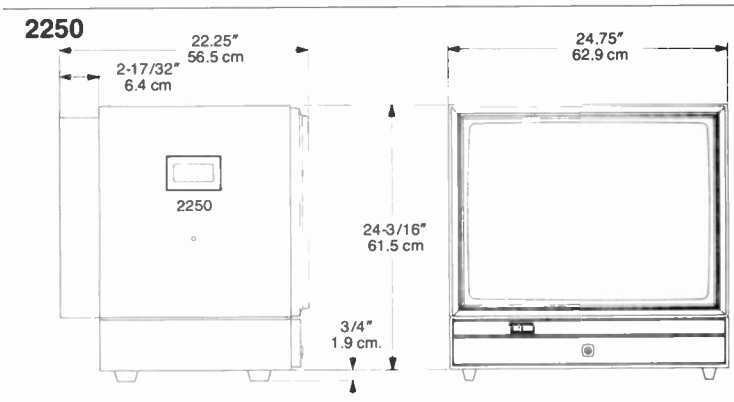


2190

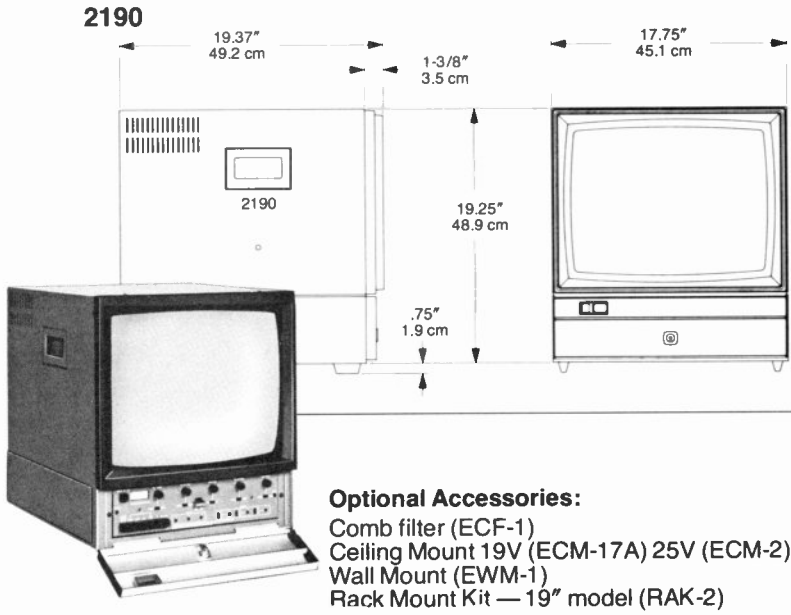
Product Features

- RGB/NTSC/PAL/SECAM convertibility through optional plug-in circuit boards.
- Signal processing circuitry located on front accessible plug-in circuit boards.
- DC coupled operating controls permitting final user to remote any or all primary functions.
- Excellent tracking of all three channels throughout the operating range.
- Active convergence circuitry provides full raster convergence.
- Excellent black level stability through high level back porch clamp.
- A multiple clamping arrangement provides hum rejection in series mode.
- The power supply design allows asynchronous operation.
- Maintenance of full resolution at brightness levels by the use of the Negative Guardband picture tube.
- Optional luminance comb filter provides full luminance response avoiding the bandwidth limitations associated with conventional passive subcarrier traps. As a second function, this comb filter reduces luminance cross color interference in the chroma display.
- Each model offers reduced scan.
- Options permit Ceiling/Wall/Pedestal mounting. Rack mount (19V) only.

2250



2190



Optional Accessories:
Comb filter (ECF-1)
Ceiling Mount 19V (ECM-17A) 25V (ECM-2)
Wall Mount (EWM-1)
Rack Mount Kit — 19" model (RAK-2)

ELECTROHOME

Commercial Marketing Electronics Division
Electrohome Limited, 809 Wellington Street North
Kitchener, Ontario N2G 4J6 Canada
Phone: 519/744-7111, Telex: 069-55449

Circle (52) on Reader Service Card

ELECTROHOME

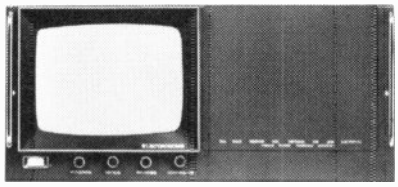
Electrohome's Solid State video monitors are designed and built to international standards as established by the communications and surveillance industries. These specially designed monitors are used in a variety of applications including digital and VTR display, studio, medical and industrial monitoring.

All cabinets are constructed of heavy gauge metal components. Case (table) models are finished in beige with a blue base or an optional Walnut paint finish with complementary black. Rack units are finished in beige with grey side painting. Add "X" to suffix of model code for 220/240 Volt versions.

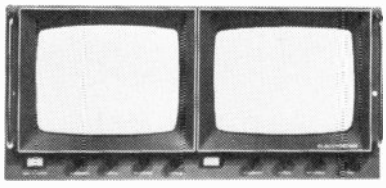
Featuring

- Internal/External Sync Capability
- A/B Video Input Selection
- VTR Time Constant Switching
- Pilot Lamp/Tally Light
- 75Ω Termination Switch (A & B)
- UL/CSA Approved
- Switchable Power Supply 110/220V Hi Lo|Line 90-132V
- 15 MHz Bandwidth to optimize resolution
- Wide Dynamic Range
- Excellent Black Level Clamping and Hum Suppression with Back Porch Clamp
- EHT Regulation
- Up Front Primary & Most Secondary Controls
- AC Cord Winder
- Universal AC Interlock
- Attractive Styling
- Optional Walnut Finish (N.A. Versions)

EVM-910R
9" 38 sq. in. (245.2 cm²)
Rack Mounted Video Monitor

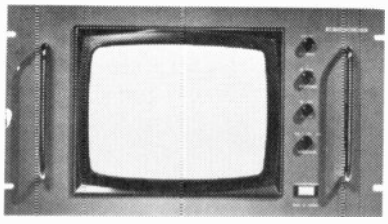


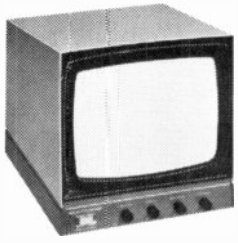
EVM-910R2
Twin 9" 38 sq. in (245.2 cm²)
Rack Mounted Video Monitor



EVM-910
9" 38 sq. in. (245.2 cm²)
Video Monitor

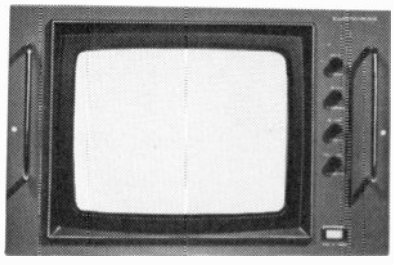
EVM-1110R
11" 61 sq. in. (393.5 cm²)
Rack Mounted Video Monitor

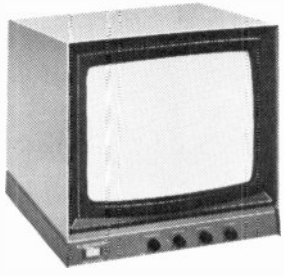




EVM-1110
11" 61 sq. in. (393.5 cm²)
Video Monitor

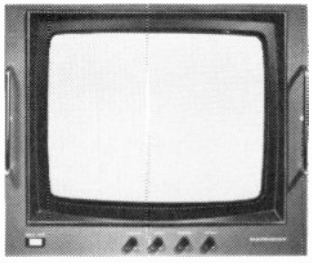
EVM-1410R
14" 82 sq. in. (529 cm²)
Rack Mounted Video Monitor

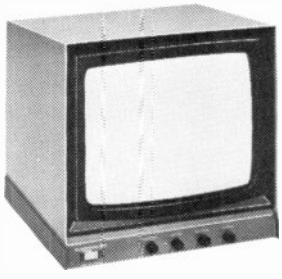




EVM-1410
14" 82 sq. in. (529 cm²)
Video Monitor

EVM-1710R
17" 149 sq. in. (961.3 cm²)
Rack Mounted Video Monitor





EVM-1710
17" 149 sq. in. (961.3 cm²)
Video Monitor

ELECTROHOME

Commercial Marketing Electronics Division
Electrohome Limited, 809 Wellington Street North
Kitchener, Ontario N2G 4J6 Canada
Phone: 519/744-7111, Telex: 069-5449

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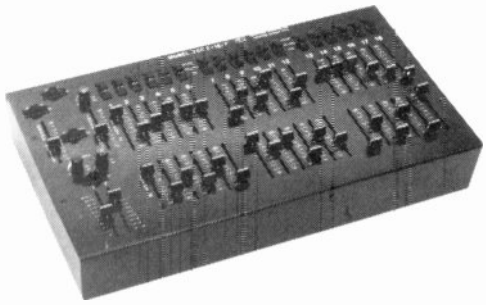
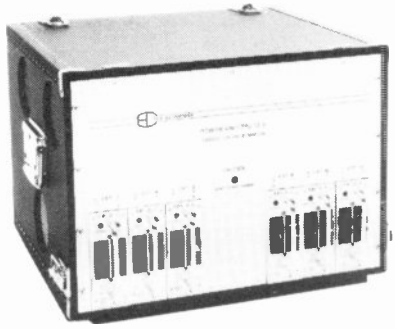
- Permanent Lighting Control Systems
- Memory Lighting Control Systems
- Architectural Lighting Control Systems
- Disco Lighting Control Systms
- Lighting Distribution Panels



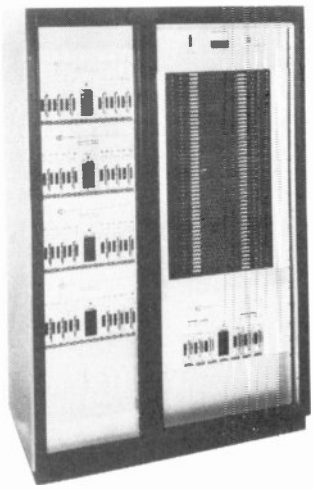
The Trouping Control Consoles (TCC) are completely portable control panels that permit an operator to vary the light output of a theatre lighting control system. TCCs can control two (2) scenes of six to thirty-six dimmers, in increments of six. Two-scene controllers have a split fader that smoothly transfers control from one scene to the other. Additional features include 2 time faders to be used in conjunction with the split fader and independent master with a time fader.

• X and Y Masters • Completely portable • Any controller can be used with any size power unit • U.L. Listed.

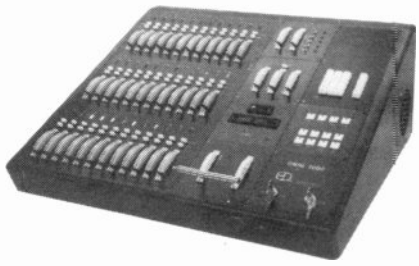


The Trouping Power Packs (TPP) are all-metal power units packaged in wooden, steel reinforced cases with front and rear covers. All units are forced-air cooled. Cool air passes through plug-in dimmer heat sinks, and exhausts high on each side expelling heat generated in the plug-in SCRs and chokes. The plug-in dimmers available may be used in any combination of 2.4Kw, 3.6Kw, 4.8Kw, 6.0Kw, 7.2Kw or 12Kw modules.

• 97% Efficiency • Various output panels available • Square Law dimming curve • No interaction • Modular plug-ins, for easy service.



The Dimmer Bank (DB) is constructed of code gauge cold roll steel and aluminum. With trouping cases removed, the power units are mounted in a standard 19" electronic equipment enclosure as a permanent installation. All units are air cooled. Each rack section is designed to house from one up to five power units. The plug-in units can be removed from the rack for maintenance without the use of any tools. The modules can be removed under power without damage to the units. These modules are available in any combination of 2.4Kw, 3.6Kw, 4.8Kw, 6 Kw, 7.2Kw and 12Kw plug-ins.



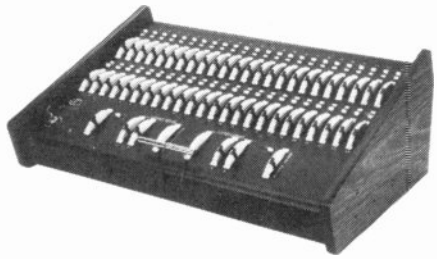
The OMNI/3000 was developed to provide all of the advantages of a memory system with the familiarity of a manual console. It's minicomputer design allows for more useful functions and operator interaction than most elaborate memory systems.

• Any and all channels may be overriden by the Channel Manual Selectors or the All On Manual button • Memory and Manual Masters allow the operator immediate access to all operations • Channel capacity is available up to 120 channels • Individual channels may be modified within a cue, alleviating the necessity of resetting and re-recording that cue.

This system is designed for technical simplicity and maximum versatility, the operator is always in complete control of the system.

The Desk Control Console (DCC) is of a permanent type control console with which an operator can vary the output of a theatre lighting system. DCCs are available in two scene or multi scene models consisting of any number of control channels, in increments of six. DCCs have split dipless crossfader controls that allow smooth transitions between scenes and pile-on capabilities.

• "A" and "B" Subscenes • U.L. Listed • Grand Master • Independent Master w/Grand Master assignment.



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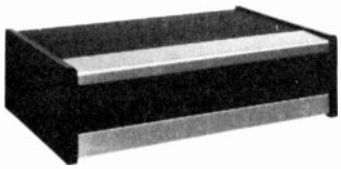
ESE DIGITALS

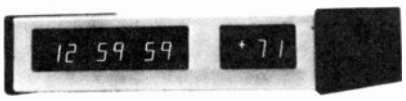


DIGITAL CLOCK
ES 112/124 ($145)

ES 112 (12 hr) and ES 124 (24 hr) are solid state, six digit clocks Three simple controls make setting to the precise second easy Fast Advance, Slow Advance, Hold Can drive Jumbo Slaves

Dimensions: 2½" High x 8" Wide x 5-5/8" Deep
Case: Etched Aluminum
Electrical: 117V AC 50/60 Hz 10W max
Options: B C D J K L P Q R S W

Do you need a contact closure one or more times during the hour? Many ESE clocks can be equipped to generate a time pulse Contact factory for pricing



DIGITAL CLOCK THERMOMETER
ES 142/144 ($250)

ES 142 (12 hr) and ES 144 (24 hr) are MOS, solid state digital clock/thermometers Displays 6 digits of time (hours, minutes, seconds) and 3 digits of temperature (-50°F to +150°F or -45°C to +66°C) in planar, gas discharge displays .55" high Temperature sensor on 25 ft cable included, attaches to rear-mounted connector

ES 240 Digital thermometer is available as separate unit, calibrated for °F or °C

Dimensions: 2½" High x 10" Wide x 6 Deep
Electrical: 12W max 117V AC 60 Hz
Options: B C D J K P R S W

SIX DIGIT-CLOCK TIMER
ES 500 ($166)

ES 500 is a 12 hour clock or timer with 5 front-mounted controls Start Stop, Reset, Fast Advance, Slow Advance Will run continuously to 12 59 59 Advances to 1 00 00 and continues as clock unless stopped or advanced After use as a timer time of day must be re-established Can drive Jumbo Slaves

Dimensions: 2", High x 8 Wide x 5-5/8 Deep
Case: Etched Aluminum
Electrical: 117V AC 60 Hz 12W max
Options: B C D J K P Q R S W

CONSOLE MOUNT CLOCKS AND TIMERS, 70 SERIES

All units have access to control inputs on rear mounted connector Displays are .3" red LEDs

ES 172 Six Digit, 12 Hour Clock ($139.00): Three setting controls—Fast Advance, Slow Advance, and Hold Four line multiplexed BCDs present on the rear connector Options are C, D, J, M and V

ES 174 Six Digit, 24 Hour Clock ($139.00) Otherwise identical to the ES 172.

ES 370 Four-Digit, One Hundred Minute Up/Down Timer ($178.00) Six controls—Count Up, Count Down, Stop, Minutes Advance Seconds Advance, Reset Options are B, C, D, J, M and V

ES 371 Up/Down Timer ($278.00) Similar to the ES 370 except with Leverwheel Preset capability for faster setting of the desired time Option D is an integral, separately mounted part of this unit Options are C, J, and V

ES 570 Four Digit, Sixty or 100 Minute Timer ($139.00) Select 60 or 100 minute mode on rear connector Start, Stop and Reset controls Runs continuously unless stopped Reset will return all displays to zero Unit will run if reset while running or will stay at zero if reset when stopped Options are B, C, D, J, M and V

ES 572 Six Digit, 12 Hour Clock or Timer ($166.00) Five controls—Start, Stop, Reset, Fast Advance, Slow Advance Will run continuously to 12 59 59 Advances to 1 00 00 and continues as clock unless stopped or advanced After use as a timer, time of day must be re-established using Fast Advance, Slow Advance and Stop Controls Options are C, D, J, M and V

ES 574 ($166.00) A 24 hour version of ES 572

Dimensions: 2.16" High x 4.5" Wide x 4.13" Deep
Electrical: 117V AC, 60 Hz

JUMBO CLOCKS AND TIMERS, 80 SERIES

Displays are 1" planar gas discharge

ES 182 Six Digit, 12 Hour Clock ($240.00) Three rear-mounted setting controls—Fast Advance, Slow Advance and Hold Options are B, C, D, J, P, Q, R, S, and W When option Q, panel mount, is specified digits will be separated by colons

ES 184 Six Digit, 24 Hour Clock ($240.00) Otherwise identical to the ES 182

ES 380 Four Digit, 100 Minute Up/Down Timer ($278.00) Displays minutes and seconds, with rear-mounted connector to allow remote wiring of six momentary SPST controls—Count Up, Count Down, Stop, Minutes Advance, Seconds Advance and Reset Other features similar to ES 300 Options are B, C, D, J, N, P, Q, S, T, W, Y, and Z

ES 381 Up/Down Timer ($367.00) Similar to ES 380, except that leverwheel preset is used instead of pushbutton preset Option D is supplied as part of this unit Options are B, C, J, N, P, Q, S, T, W Y, and Z

ES 580 Four Digit, 60 Minute Timer ($201.00) Displays minutes and seconds Rear connector allows remote wiring of three momentary SPST controls—Start, Stop and Reset Runs continuously unless stopped Reset returns all displays to zero, and timer will continue to run from zero if reset while running Options are B, C, D, J, P, Q, S, T, and W

ES 582 Six Digit, 12 Hour Clock or Timer ($278.00) Five control inputs (SPST momentary) brought to rear connector—Start, Stop, Reset, Fast Advance and Slow Advance After use as a timer, time of day must be re-established using Fast Advance, Slow Advance and Stop controls Options are B, C, D, J, P, Q, S, and W

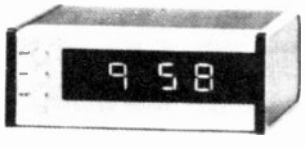
80 Series slaves are also compatible with other ESE clocks and timers ES 112/124, 300, 301, 302, 400, 510, and 500

Dimensions: 4.45" High x 10.38" Wide x 6.58" Deep
Electrical: 117V AC, 60 Hz

ES 512/524 FOUR DIGIT CLOCK TIMER WITH MEMORY ($208)

Combination four digit 12 or 24 hour clock and 60 minute timer with memory, allowing the user to set the clock to the correct time of day, switch to timer mode, then switch back to time of day by pushing one button time of day will be correctly displayed in hours and minutes

Electrical: 117V AC 60 Hz, 8 watts Max
Mechanical: 8" Wide x 2-3/4" High x 5-5/8" Deep
Case: Etched Aluminum
Display: Four digits of .55" Planar Gas Discharge Display
Options: B, C, D, J, P, Q, R & W



THREE DIGIT 10 MINUTE TIMER ES 400 ($109)

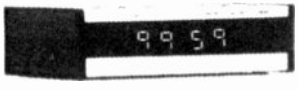
The ES 400 has three controls—Start, Stop, Reset Runs continuously unless stopped Reset returns display to all zeros Can be reset while running or stopped If reset while running timer will continue to run Can drive Jumbo Slaves

Dimensions: 2", High x 6 Wide x 5-5.8" Deep
Case: Etched Aluminum
Electrical: 117V AC 60 Hz 8W max
Options: B D J K P Q R S T W

FOUR DIGIT 60 MINUTE TIMER ES 510 ($139)

ES 510 is a four digit sixty minute timer (59 59) with Start, Stop and Reset controls (Single pole, momentary push-button) Runs continuously unless stopped Reset returns display to all zeros Can reset while running or stopped Can drive Jumbo Slaves

Dimensions: 2", High x 6 Wide x 5-5/8" Deep
Case: Etched Aluminum
Electrical: 117V AC 60 Hz 10W max
Options: B D J K P Q R S T W



ES 300 ($187)

ES 300 is a four digit, one hundred minute timer (99 59) with six controls Count Up, Count Down, Stop, Minutes Advance, Seconds Advance Reset Controls are single pole, momentary push-button switches When Stop control is pressed the four digit display is held Counting direction (up or down) can be changed or time can be reset for zero without stopping the count It will continue to register elapsed time beyond the zero setting unless stopped The ES 300 can drive Jumbo Slaves

ES 301 ($206)

Dimensions: 2", High x 8 Wide x 5-5.8 Deep
Electrical: 117V AC 60 Hz 10W max
Options: B D J K P Q R S W Y Z

The ES-302 is similar to the ES 300, except that planar gas discharge displays are used in the ES 301-302 Display height is .55"
All the ES 300 features are included in the ES 301 Additionally with the ES 302 the user can preset times much faster than with the ES 300 or ES 301 because lever-wheel type switches are used for the preset feature The ES 301-302 can drive Jumbo Slaves

ES 302 ($264)

Dimensions: ES 301 2", High x 8 Wide x 6 Deep
ES 302 2", High x 10 Wide x 6 Deep
Electrical: 117V AC 60 Hz 7 W max
Options: 301—B D J K N P Q R S T W Y Z
302—B D J K N P R S T W Y Z

100 MINUTE UP/DOWN TIMERS

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Circle (56) on Reader Service Card

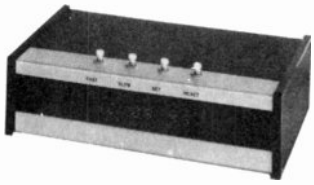
Perfect Timing

PROGRAMMER/ COMPARATORS 750 SERIES

For flexibility and economy with up to ten events ESE has designed the 750 Series of Programmer/Comparators. Rugged thumbwheel programmers coupled with an ESE clock or timer to provide single pole form A contact closure (1 Amp contact rating) for the length of time program matches display. All this on a 3½" high 19" relay rack mounting panel. Power required: 117V AC 60 Hz; 220V AC 50 Hz may be specified.

If required control function involves a count other than timing, these products can be adapted to your needs

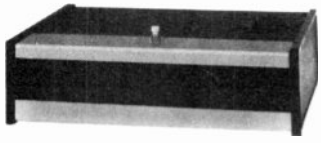
Thumbwheel Comparator Systems:
ES 750—ES 112 and one 6 Digit Program
ES 751—ES 124 and one 6 Digit Program
ES 752—ES 500 and one 6 Digit Program
ES 753—ES 112 and two 4 Digit Programs
ES 754—ES 124 and two 4 Digit Programs
ES 755—ES 500 and two 4 Digit Programs
ES 756—ES 510 and one 4 Digit Program
ES 757— ES 300 and one 4 Digit Program
ES 758—ES 510 and two 4 Digit Programs
ES 759—ES 300 and two 4 Digit Programs



ES 1296 ($156)

For Off-Air taping, or operating tape recorders when nobody is there, ESE has created **ES 1296.** Presets up to 96 hrs. ahead.
ES 1296 is a six digit, twelve hour clock with LED displays and a programmable, 300 watt, 117V AC outlet on the rear.
Once the rear outlet is activated, it will remain on for 66 minutes, unless manually terminated, or an optional Record Duration switch is set to a different time interval. This Record Duration option allows the user to select one of four time intervals for recording. These four time intervals are either 16, 33, 66 and 138 minutes, or 33, 66, 138 and 250 minutes. Price $25.00.

An additional option is Sequential Turn-on, for those machines that require Power, Play, Record in sequence, for proper operation. This option costs $25.00.

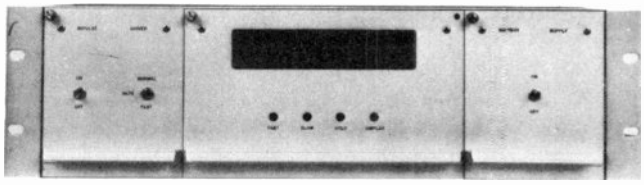


ES-251 ($260)

ES 251 SMPTE Time Code Reader ES 251 is a six digit SMPTE Time Code Reader displaying Hours, Minutes and Seconds. Receives the standard SMPTE Time Code through rear mounted BNC connector, converts it into six digits of clock time. Source of the code is normally a SMPTE time code generator but the unit will read the time code directly from a tape machine running at playback speed. This unit produces an extremely accurate time of day display when driven from a time code generator which is locked to a color sub-carrier frequency. The momentary hold switch allows holding of time on display. Releasing hold switch updates display to correct time.

The input code is AC coupled to two stages of amplification and level shifting to obtain a ground reference. The input circuit requires between 1 and 20 volts peak to peak of input signal and presents an input impedance of 50 Kohm. **ES 251** is a CMOS design which operates from a single power supply.
Dimensions: Aluminum Case 2¾" High x 8" Wide x 5-5/8" Deep.
Electrical: 117V AC 50/60 Hz 6W Max.
Options: BJPQW

ES 252 SMPTE Time Code Reader: Exactly like **ES 251**, but displays Minutes, Seconds and Frames.



MASTER CLOCKS

ES 160 ($775.00): Mounted in a 5¼" relay rack panel and chassis, displays six digits of time information on large, easy to read .3" LED displays, in 12 or 24 hour format, as specified. **ES 160** has its own internal timebase, with three second per month accuracy. Its standard output is serial BCD, CMOS compatible, and can drive 20 **ES 161, 166, 168** or **171** Remote Displays without buffering. All inputs and outputs are through rear-mounted connectors.
Dimensions: 5¼" High x 19" Wide x 15" Deep
Electrical: 117V AC 50/60 Hz.
Options: B (CMOS Compatible), J, One PPS Output, Relay Closure on hour and half hour, Battery/Charger (ES 163) Impulse Driver (ES 162), External Timebase-1, 5 or 10 MHz.
ES 160/1 ($935.00): One second per month version of **ES 160**
ES 190 ($935.00): The ultimate in accuracy! A digital clock, similar to **ES 160**, with special circuits for receiving and decoding a 1000 Hz tone at the start of each minute. The decoder output resets the seconds' counters in the clock each minute except the first minute of every hour, when a 1500 Hz tone occurs. These tones are transmitted by Radio Station WWV, with an oscillator accuracy of ± 1 part in 10^{11} **ES 190 has an antenna and internal** WWV receiver with audio-output. Its crystal timebase is accurate to ± 1.7 seconds per day, used when WWV is not received. A battery and charger (ES 163) is available to protect against power interruptions. Displays are .3" red LED's. Serial output drives **ES 161, 166, 168** or **171** Slaves.
Dimensions: 5¼" High x 19" Wide x 15" Deep
Electrical: 117V AC 50/60 Hz
Options: B (CMOS compatible), J, One PPS Output, Relay Closure on hour and ½ hour, Battery/Charger (ES 163)
ES192/194 (286.00): The most economical Masters, **ES 192** (12 Hr) and **ES 194** (24 Hr) are constructed using **ES 112** or **ES 124** digital clocks and adding the **ES 167** Serial Time Code Generator to provide the output needed to drive Remote Serial Displays **ES 161, ES 166, ES 168** and **ES 171.** 60 Hz timebase is derived from the power line. Displays are .6" incandescent type.
Dimensions: 2½" High x 8" Wide x 5-5/8" Deep.
Electrical: 117V AC 60 Hz
Options: BCDJLPQR, Time Pulse Outputs, Battery and Charger, Impulse Driver. Unit mounted on a 3½" High panel when certain options are specified.
ES 196 ($675.00) : Time and Temperature Master—Basically the same as **ES 192**, with gas discharge displays, panel mounting and separate serial BCD outputs for time and temperature. Displays either 12 or 24 hours and °F or °C, as specified.
Dimensions: 3½" High x 19" Wide x 8" Deep
Electrical: 117V AC 60 Hz
Options: BCDJR, Time Pulse Outputs, Battery/Charger.

ACCESSORIES

ES 161 Remote Digital Display ($145.00): Designed to function with any ESE Master Clock, decodes serial time data and displays six digits of clock time on large .55" Gas Discharge Displays, in either 12 or 24 hour format as specified.
Dimensions: 8" Wide x 2½" High x 6" Deep.
Electrical: 117V AC 50/60 Hz.
Options: JPQW.
ES 162 Impulse Driver ($177.00): Plugs into the **ES 160** chassis, can drive 20 Impulse Clocks. Designed so that, if power fails, impulse always comes on with the same polarity when power is restored. Drives minute or second clocks as specified.
ES 163 Battery and Charger ($145.00): Plugs into the **ES 160** or **ES 190** chassis. Fast charge, 12 hours continuous use. When operating on battery, displays are automatically blanked and may be viewed by actuating Display button on the front panel.
ES 164 Remote Digital Impulse Display ($177.00): **Similar to the ES 161 except that the ES 164** derives its count command from the **ES 162** Impulse Driver, or any impulse clock drive circuits already installed. Choice of 12 or 24 hour display and available either as desk top unit or panel mounted.
Dimensions: 8" Wide x 2½" High x 6" Deep.
Electrical: 117V AC 50/60 Hz.
Options: BJPQW.
ES 166 Jumbo 1" Clock Display ($224.00): Features six digits of one inch high planar gas discharge displays in 12 or 24 hour format as specified. Receives serial time code input from any ESE Master Clock or serial time code generator.
Dimensions: 10½" Wide x 4½" High x 6½" Deep.
Electrical: 117V AC 50/60 Hz.
Options: JPQW. If Q is ordered digits are separated by colons.
ES 167 Serial Time Code Generator ($130.00): Offers a low cost answer to a master timing system. An integral part of **ES 160, 190, 192/194** and **196** Master Clocks, this unit can be added to many other ESE products, including **ES 112, 124, 182, 184, 500, 582, 750, 751, 752, 753, 754, 755,** and all **780** Series Time Programmers. The **ES 167** fits inside the case so that no extra space is needed. Drives 20 **ES 161, 166, 168** or **171** Remote Displays. **ES 167** provides CMOS compatible serial BCD output and operates from the logic supply voltage.
ES 168 Remote Electromagnetic Display ($404.00): 4" HEIGHT! Used wherever large size at low cost is essential. Receives the serial time code from any ESE Master Clock, displays the time on four bright, yellow-green digits in 12 or 24 hour format as specified. Designed to mount on wall or ceiling. When time changes, audible "click" is heard
Dimensions: 6" High x 16½" Wide x 6" Deep.
Electrical: 117V AC 50/60 Hz.
Options: JW
ES 169 Temperature Slave ($130.00): Receives serial BCD temperature code from **ES 196**, displays it on .55" Gas Discharge Displays.
Dimensions: 8" Wide x 2½" High x 6" Deep.
Electrical: 117V AC 50/60 Hz.
Options: JPQW.
ES 171 Console Mount Display ($139.00): Newest of the 70 series console mount clocks and timers, **ES 171 receives the serial time code generated by any ESE Master Clock**, or any ESE product containing the **ES 167** serial time code generator, and displays it on bright red .3" LED's.
Dimensions: 2¼" High x 4½" Wide x 4" Deep.
Case: High Impact Black Plastic.
Electrical: 117V AC 50/60 Hz.
Options: JW.

RAM TIME PROGRAMMERS 780 SERIES

The ES 780 Series Programmers provide 32 events (expandable to 96) in 5¼ inches of rack space. Ten minutes is all that is required to install, set the clock and program 32 events. Bright .3" LED displays and all controls are on the front panel, outputs and battery test are on the rear. ES 167 Serial Time Code Outputs can be specified as an option. Line frequency time base with backup crystal time base, 72 hour battery/battery charger are standard. External time base can be used. 60 Hz is preferred, others may require additional internal circuitry.

Eight Digits of Programming Capability:
ES 780—10 Days, 10 Outputs, Hours, Minutes, Seconds
ES 781—100 Days, Hours, Minutes, Seconds
ES 782—16 Outputs, Hours, Minutes, Seconds
Six Digits of Programming Capability:
ES 783—Hours, Minutes, Seconds
ES 784—100 Days, Hours, Minutes
ES 785—100 Days, Minutes, Seconds
ES 786—16 Outputs, Hours, Minutes
ES 787—16 Outputs, Minutes, Seconds
Four Digits of Programming Capability:
ES 788—Hours, Minutes
ES 789—Minutes, Seconds

ES 782, 786, and 787 have 16 isolated outputs. Any of the 32 events can be programmed to activate any of the 16 outputs. ES 780 has 10 outputs. The other units have a single output.
ES 784, 786, and 788 have a one minute contact closure. The others have a one second contact closure.
Displays:
REAL TIME: An eight digit display when day selection is required as on the ES 781, 784, 785, seven digits for ES 780, and six digits for the others.
NEXT EVENT: A two digit display of next event number.
NEXT EVENT TIME: An eight digit display when ES 780, 781, or 782 is specified, a six digit display when ES 783, 784, 785, 786, or 787 is specified, and a four digit display when ES 788 or 789 is specified.
Dimensions: 5¼" high x 19" wide x 10" deep.
Weight: Approx. 20 lbs. varying with model number.
Front Panel: Brushed, etched, anodized aluminum.

OPTIONS

Please Note: Some combinations of options are not compatible. Consult factory if in doubt.

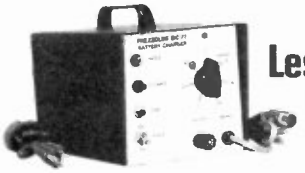
B BCD Output
C Crystal Timebase: A $\pm .002\%$ crystal is employed in an oscillator for those applications requiring independence from the power line frequency. Trimmer included for greater accuracy.
D Remote Connector, 6' Cable and Control Switch Set: This option consists of a rear-mounted connector wired for all control functions, a mating connector, wired to six feet of cable, the other end of which is connected to control switches which are mounted on a 1/8" anodized satin finish aluminum plate suitable for mounting on most surfaces.
L .55" Planar Gas Discharge Display
M Front-mounted pushbutton controls: available on 70 Series except for ES 371.
N Available on ES 301, 302, 380, 381. Provides a change in count direction from down to up at zero when the unit has been counting down from a preset time.
P 19" Front Panel, 3½" high.
Q 9" Front Panel, 3½" high.
R Remote Connector
S Slave/Remote Display: User must specify option B (BCD Output) on master when ordering a slave.
T Tenths of Seconds
V DC Operation (Includes crystal timebase)
W Three Wire Cord
Y Relay Closure at Zero: Available on ES 300, 301, 302, 380 and 381 only.
Z Relay Contact Closure and Stop at Zero: Available on ES 300, 301, 302, 380 and 381 only.

ESE
142 Sierra Street
El Segundo, CA 90245
(213) 322-2136

Compute your battery needs, and "go" with

Frezzi™ ENERGY High-Capacity Battery Packs

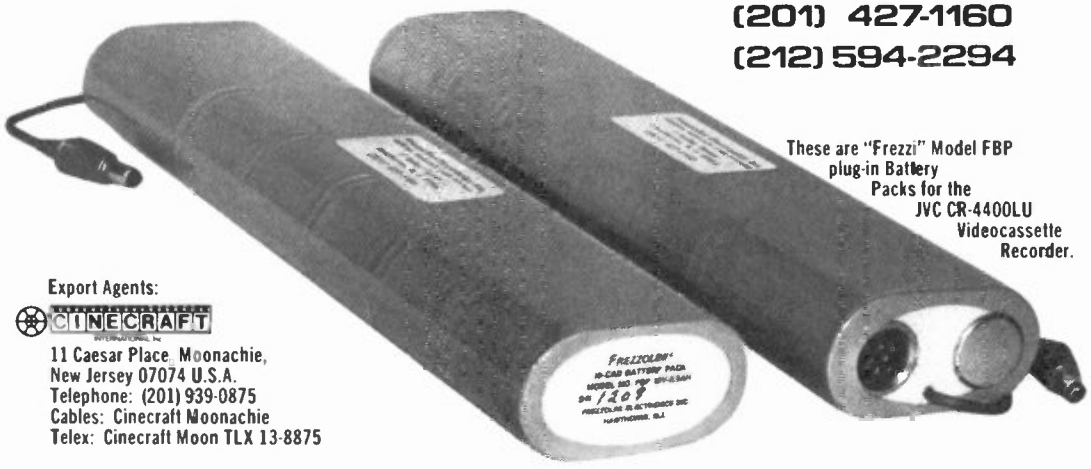
Portable power for all video cameras, video recorders, and hand-held "Frezzi™" Lights.



Less than 1 hour re-charge time with "Frezzi-Fast"™ Chargers. Universal AC-inputs available.

Frezzolini® E.N.G. support equipment.
Made in U.S.A.

Frezzolini Electronics Inc.
7 Valley St. Hawthorne, N.J. 07506 USA
(201) 427-1160
(212) 594-2294



These are "Frezzi" Model FBP plug-in Battery Packs for the JVC CR-4400LU Videocassette Recorder.

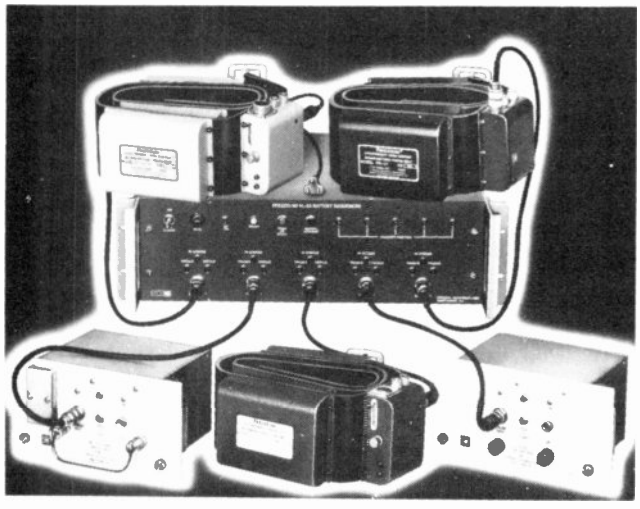
Export Agents:
CINECRAFT
11 Caesar Place, Moonachie,
New Jersey 07074 U.S.A.
Telephone: (201) 939-0875
Cables: Cinecraft Moonachie
Telex: Cinecraft Moon TLX 13-8875

Circle (58) on Reader Service Card

Frezzi Belts®

Video Power Selector Guide

YOUR VIDEO EQUIPMENT	FREZZI BELT MODEL NUMBER	BELT WEIGHT IN POUNDS	APPROXIMATE CAPACITY (IN MINUTES)	INTERNAL TRICKLE CHARGER	OPTIONAL EXTERNAL FAST CHARGER	SEQUENCER CHARGER CAPABILITY*	BELT LIST PRICE IN U.S. DOLLARS	EXTERNAL CHARGER LIST PRICE IN U.S. DOLLARS
RCA TK-76	F-12-P6	8.5	120	YES	BC-76	YES	$440.00	$395.00
IKEGAMI HL-77/37	F-12-77	8.5	120	YES	BC-77	YES	$440.00	$395.00
THOMSON MICRO-CAM	F-12-EXF (XLR-5-31)	8.5	120	YES	BC-77	YES	$440.00	$395.00
HITACHI FP-3030	F-12-EXF	8.5	180	YES	BC-77	YES	$440.00	$395.00
SONY VO-3800	F-12-EXF	8.5	180	YES	BC-77	YES	$440.00	$395.00
SONY BVU-100	F-12-EXF	8.5	180	YES	BC-77	YES	$440.00	$395.00
SONY DXC-1600	F-12-EXF	8.5	120	YES	BC-77	YES	$440.00	$395.00
AKAI VTS 150/150B	F-12-EXF	8.5	100	YES	BC-77	YES	$440.00	$395.00
AKAI CCS250P	F-12-EXF	8.5	180	YES	BC-77	YES	$440.00	$395.00
JVC CR4400U	F-12-EXF	8.5	180	YES	BC-77	YES	$440.00	$395.00
JVC GC4800U	F-12-EXF	8.5	180	YES	BC-77	YES	$440.00	$395.00
SUN GUN (250W)	F-30	10	30	YES	NONE	NO	$485.00	–
SUN GUN (250W)	F-30-EXF	10	30	YES	BC-30 BC-30C	YES	$535.00	$395.00 $495.00
ANY 30VDC CINÉ OR VIDEO SYSTEM	F-30-EXF	10		YES	BC-30 BC-30C	YES	$535.00	$395.00 $495.00
RCA TK-76 AND 100W SUN GUN, FREZZI FLH–100**	F-14-10P6 DUAL VOLTAGE	13	60 40	YES	NONE	NO	$625.00	–
IKEGAMI HL-77 AND 100W SUN GUN, FREZZI FLH–100**	F-12-1277 DUAL VOLTAGE	13	60 40	YES	NONE	NO	$625.00	–
RCA TK-76*** IKEGAMI HL-77/79***	D12-76-T D12-77/79-T	6 6	90 90	YES YES	NONE NONE	NO NO	$395.00 $395.00	–



FREZZI SEQUENCER CHARGER

*FREZZI SEQUENCER CHARGER re-charges any intermixed or same group of 5 (or less) Frezzi Belts or Frezzi Battery Packs, unattended (hands-off), in sequence, and maintains them in maximum readiness for use. List (USA) $1995.00

**FREZZI Model FLH — 100 (11.5VDC at 100W) Lighthead. List (USA) $98.00

NOTE: All optional external Frezzi Fast Chargers are line-isolated, power transformer models. All Frezzi Fast Chargers can fully recharge our Belts and Battery Packs in one hour or less.

***Built-in line isolated charger .
(C) designation after charger for use with overseas power line inputs.

For information call (N.J. 201) 427-1160 (N.Y.C. 212) 594-2294

Frezzolini Electronics Inc.
7 Valley St. Hawthorne, N.J. 07506 USA

Frezzolini® E.N.G. support equipment. Made in U.S.A.

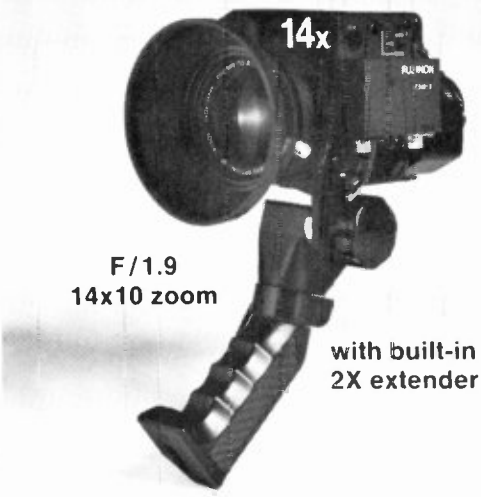
Prices and specifications subject to change without notice

BCTV

FUJINON

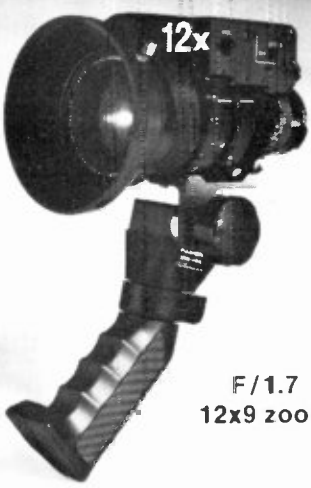
1979

F/1.7 17x9 zoom with
built-in 2X extender



F/1.9
14x10 zoom

with built-in
2X extender



F/1.7
12x9 zoom

10X close-focusing
wide angle zoom

F/1.4 6mm
ultra wide angle

14x16.5 high resolution
zoom F/2.1 at all focal lengths

16X lightweight
4-range wide angle zoom

Beam Splitting
Optical Systems

30X twin range
field zoom

In studio, field, ENG/EFP lenses and optical systems, FUJINON is light years ahead.

Handheld ENG/EFP For Prism Type Camera

Model No.	Format	Focal Length	f	Mod.	Diagonal	Field Angle Horizontal	Vertical	Back Focal Length	Iris	Zoom	Focus	Remarks
A10X10.5	⅔"	10.5-105	1.4	1.5	57° 38'-6° 18'	47° 30'-5° 04'	36° 32'-3° 47'	60.12	DC Servo	Flexible Cable	Flexible Cable	Adaptable For 2X Extender
A12X10	⅔"	10-120	1.9	0.8	57° 37'-5° 15'	47° 30'-4° 12'	36° 32'-3° 09'	58.08	DC Servo	Servo or Manual	Manual	
A12X9	⅔"	9-108	1.7	0.8	62° 52'-5° 50'	52° 06'-4° 40'	40° 16'-3° 30'	30.63	DC Servo	Servo or Manual	Manual	
A14X10	⅔"	10-140	1.9	0.8	57° 37'-4° 30'	47° 30'-3° 36'	36° 32'-2° 42'	38.99	DC Servo	Servo or Manual	Manual	Built-in 2X Extender
A14X11	⅔"	11-154	2.1	0.8	53° 08'-4° 05'	43° 36'-3° 16'	33° 24'-2° 27'	60.36	DC Servo	Servo or Manual	Manual	Built-in 2X Extender
A17X9	⅔"	9-153	1.7	0.9	62° 51'-4° 07'	52° 06'-3° 17'	40 16'-2 28'	55.99	DC Servo	Servo or Manual	Manual	Built-in 2X Extender
A22X12.5	⅔"	12.5-275	1.6	2.5	47° 9'-2° 19'	38° 30'-1° 52'	29° 21'-1° 24'		DC Servo	Manual	Manual	Built-in 2X Extender
AF6	⅔"	6	1.4	0.2	83° 54'	70° 36'	56° 00'		DC Servo		Manual	
K12X14	1"	14-164	1.9	0.95	59° 30'-5° 27'	49° 8'-4° 22'	37° 50'-3° 16'	59.47	DC Servo	Servo	Manual	

Handheld ENG/EFP For Relay Type Camera

N10X10	⅔"	10-100	1.9	1.0	57° 37'-6° 18'	47° 30'-5° 02'	36° 32'-3° 47'	29.02	DC Servo	Manual	Manual	
N12X9	⅔"	9-108	1.7	0.8	62° 52'-5° 50'	52° 06'-4° 40'	40° 16'-3° 36'	29.30	DC Servo	Servo or Manual	Manual	
N14X10	⅔"	10-140	1.9	0.8	57° 37'-4° 30'	47° 30'-3° 36'	36° 32'-2° 42'	32.49	DC Servo	Servo or Manual	Manual	

Manual and Servo Systems For ENG/EFP LENSES

MANUAL: Mounting Clamp (MCA)
Manual Zoom Module (ZMM)
Flexible Cable (CFC)
Zoom Handle (CZH)
Manual Focus Demand (FMM)
Focus Grip (CFH)

SERVO: Servo Zoom Module (ZSM)
Servo Focus Module (FSM)
Lens Grip (SRD)
Grip Attachment (CTHA)
Extension Cable or (ECC)
Servo Focus Demand (FMM)
DC Power Source (DPS)

Studio/Field Television Lenses

R10X11	1"	11-110	2.1	0.35	72° 00'-8° 18'	60° 12'-6° 36'	47° 06'-5° 00'	60.52	Servo	Flexible Cable	Flexible Cable	Adaptable For X1.5, 2, 2.5 Extender
R14X12.5	1"	12.5-175	1.6	0.75	65° 14'-5° 14'	54° 13'-4° 11'	42° 01'-3° 09'	60.61	Servo	Manual or Servo	Manual or Servo	
R16X13	1"	13-210	1.6	0.75	63° 13'-4° 22'	52° 25'-3° 29'	40° 32'-2° 37'	61.70	Servo	Manual or Servo	Manual or Servo	Built-in X1.5, 2, 2.5 Extenders
R30X16	1"	16-500	1.8	2.5	53° 08'-1° 50'	43° 36'-1° 28'	33° 24'-1° 06'	70.03	Servo	Manual or Servo	Manual or Servo	Built-in 2X Extender
P10X15	1¼"	15-150	2.8	0.35	71° 00'-8° 00'	59° 20'-6° 30'	46° 20'-4° 54'	63.74	Servo	Flexible Cable	Flexible Cable	Built-in 2X Extender
P14X16.5	1¼"	16.5-230	2.1	0.75	65° 56'-5° 20'	54° 50'-4° 16'	42° 31'-3° 12'	66.36	Servo	Manual or Servo	Manual or Servo	
P16X17	1¼"	17-270	2.1	0.75	64° 22'-4° 32'	53° 27'-3° 38'	41° 23'-21° 23'	81.72	Servo	Manual or Servo	Manual or Servo	Built-in X1.5, 2, 2.5 Extenders
P30X20	1¼"	20-620	2.2	2.5	56° 17'-1° 59'	46° 20'-1° 35'	35° 36'-1° 11'	91.39	Servo	Manual or Servo	Manual or Servo	Built-in 2X Extender

FUJINON

Fujinon Optical Inc. • 672 White Plains Road • Scarsdale, New York 10583 • (914) 472-9800 • Telex: 131642

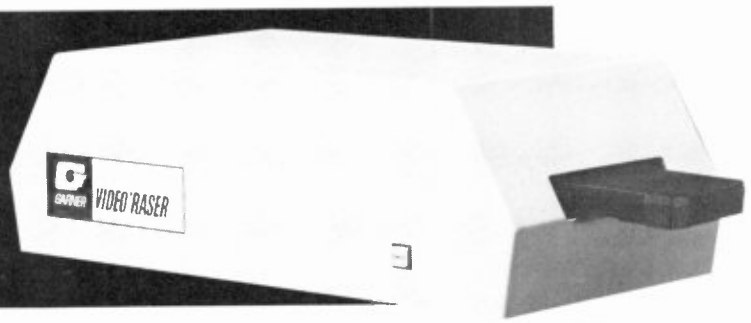
West Coast Distributor: F.P. Optical Inc. • 3333 Bowers Avenue • Suite 130 • Santa Clara, California 95051 • (408) 727-2757 • Telex: 171200

Circle (61) on Reader Service Card

Garner Industries High Speed Tape Erasers

Garner's New VIDEO'RASER

Erases video cassettes in less than 5 seconds



Imagine getting video tape erasure depth that exceeds professional standards in less than 5 seconds! Garner's compact Video'Raser Unit lets you completely automate your video tape erasing jobs. It's a simple one-step, in-and-out operation that gives you perfect tape erasures in one pass. Four high flux coils eliminate slow, time-consuming operations. Simply insert video cassette, cartridge or reel in the Video'Raser opening and erased tape is automatically ejected at end of machine.

Video'Raser Specifications Model 270

Operating Cycle: Less than 5 seconds.

Reel Sizes: Holds up to 8½" reels and cassettes.

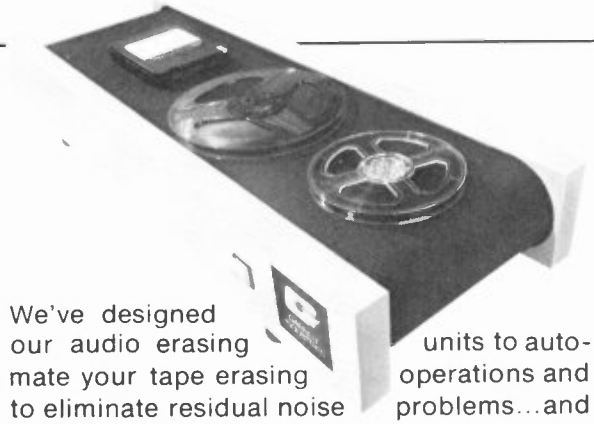
Overall Dimensions:
Length: 28½" Width: 16" Height: 9"

Weight: 95 lbs.

Method of Operation: Tapes are passed on continuous belt between four high flux coils and ejected at end of machine.

Power: 120 VAC, 60 Hz @ 15 Amps., or 240 VAC, 50 Hz @ 15 Amps. Specify when ordering.

Thermal Protection: Overheating is prevented by automatic cutoff switch, which reactivates eraser after cool-down period.



Garner's Audio Erasing Units

Turn a boring job into a breeze

We've designed our audio erasing units to automate your tape erasing operations and to eliminate residual noise problems...and our customers tell us we've got a winner! Just hit the power button and drop any reel or cassette up to 10½" on endless belt. In four seconds it delivers a clean, "no-whump" erasure that will meet the most stringent recording standards. You'll save valuable man-hours and do a better job.

Audio and Video Specifications

Overall Dimensions:	MODEL 70	MODEL 105
Length	27"	27½"
Width	10"	13¼"
Height	5"	5"
Belt Width*	7½"	11"
Power:	117 VAC, 4 amps	117 VAC, 6 amps

Method of Operation: Tapes are passed on continuous belt over high flux coils and deposited at end of machine.

Thermal Protection: Overheating is prevented by automatic cut-off switch, which reactivates eraser after cool-down period.

*Conveyor belt width can be ordered up to 16 inches. Specify width.

30-Day Trial Guarantee The Garner VIDEO'RASER and Audio Erasing Units may be returned at any time during the first 30 days after receipt for a complete refund. Advance notification is all that is required. Additional warranty information available from manufacturer on request.

For more information, write or call:

GARNER INDUSTRIES

4200 North 48th Street, Lincoln, Nebraska 68504, Phone 402-464-5911

GARNER

wheelit

Gruber Products Company

5254 JACKMAN RD.
TOLEDO, OHIO 43613
(419) 476-7200

MECHANICAL SPECIFICATIONS

Equipment platform
14" x 29"

Wheel base
16"

Camera platform
pre-drilled to accept
Quick-Set 7900
elevator column
5¾" x 14"

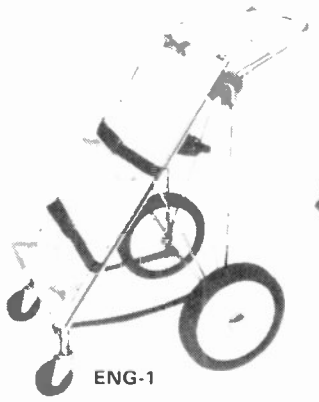
Shipping weight
50 lbs

ENG-1

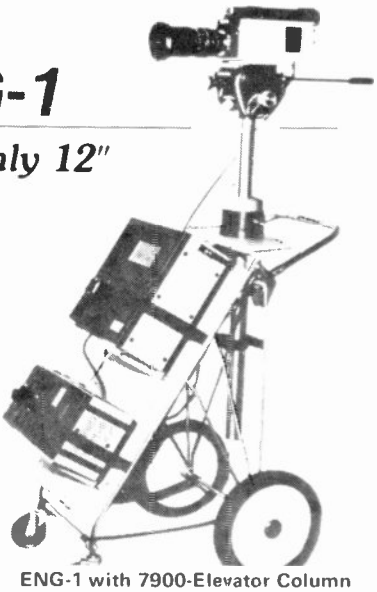
Folds to Only 12"

- *Smooth pivot collapsible fold*
- *Positive locking platforms*
- *Large 12" ball bearing wheels*
- *Solid 4" swivel caster wheels with lock*
- *Heavy duty construction*
- *Anti-corrosive zinc plating*
- *Formica covered platforms*
- *Sound-absorbing platforms*
- *Generous 16" wheel base*
- *Human engineered for perfect balance*
- *Camera platform pre-drilled for elevator column*
- *Equipment platform pre-drilled for easy adjustment*

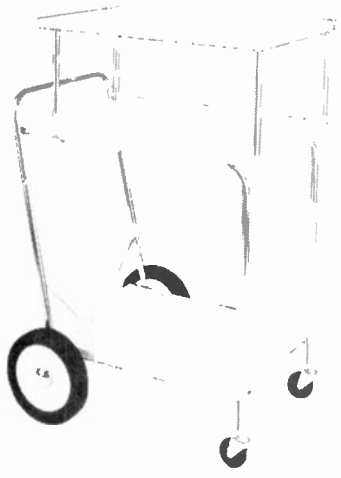
ENG-1	**$200.00**
PACKAGE 1	
ENG-1	**$200.00**
7900 Samson Elevator Column	**130.00**
7201-3 Samson Friction Head	**95.00**
	$425.00
PACKAGE 2	
ENG-1	**$200.00**
7900 Samson Elevator Column	**130.00**
7230 Samson Cam Link Head	**285.00**
	$615.00



ENG-1



ENG-1 with 7900-Elevator Column
7230-Cam Link Head



WHEELIT MODEL 432

WHEELIT INDOOR VIDEO CASSETTE ROLLING TABLE, MODELS 3727, 4327: Designed specially for indoor transportation and operation of video cassette equipment, these two Wheelit Rolling Tables accommodate all video cassette player recorders. The heavy duty tubular steel frame safely supports up to 140 pounds of equipment and the formica covered particle board platforms resist sound vibration. Large 10 inch wheels and 3 inch locking casters afford maneuverability around tight corners and narrow passageways. The tilt back handle design permits balanced transportation up and down stairways. Normally the video player/recorder is positioned on the second platform. For transportation the monitor is positioned on the lower platform and for viewing the monitor is stationed on the top platform. Selection between Model 3727 and 4327 should be made with regards to monitor transportation height and monitor viewing level. Both Wheelit Models accommodate the full line of accessories.

MODEL 3727	**$97.00**
Upper Platform	19½" x 27½" x 37½" high
Middle Platform	19½" x 27½" x 26" high
Lower Platform	18" x 24" x 8" high
Load Capacity	140 lbs.
Wheel Base	21"
Wheels	10"
Casters	3" w. swivel & lock
Shipping Weight	59 lbs.

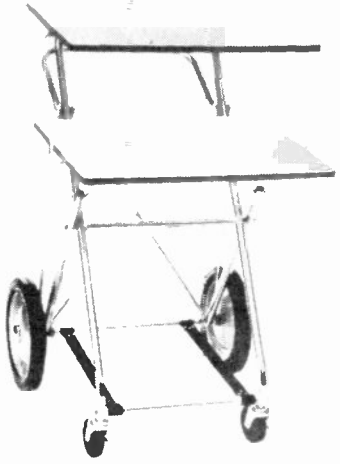
MODEL 4327	**$98.00**
Upper Platform	19½" x 27½" x 43½" high
Middle Platform	19½" x 27½" x 32" high
Lower Platform	18" x 24" x 8" high
Load Capacity	140 lbs.
Wheel Base	21"
Wheels	10"
Casters	3" w/swivel & lock
Shipping Weight	60 lbs.

Remember, *ENG* not only stands for *ELECTRONIC NEWS GATHERING* but also means *EVERYONE NEEDS GRUBER.*

WHEELIT INDOOR/OUTDOOR SLIM LINE FOLDING VIDEO CASSETTE TABLE, MODEL 4118: Designed for indoor outdoor transportation the new Wheelit Slim Line is unlike all other folding carts. All of the Slim Line folds not just the platforms but the entire unit pivots to collapse to an incredibly thin 12 inch profile. In the trunk of your automobile or stored in a closet there is room to spare. When transporting or displaying equipment you can trust the Wheelit Slim Line Platforms lock into the upright position with positive assurance. The generous 16 inch wheelbase assures perfect balance and stability. And when you operate equipment from the new Wheelit Slim Line there is hardly a hint of vibration noise because of the unique part ch board platform composition. Accessories available include the electric cord reel and equipment t e down straps. For additional Wheelit Slim Line Video Cassette Tables see back of page.

MODEL 4118

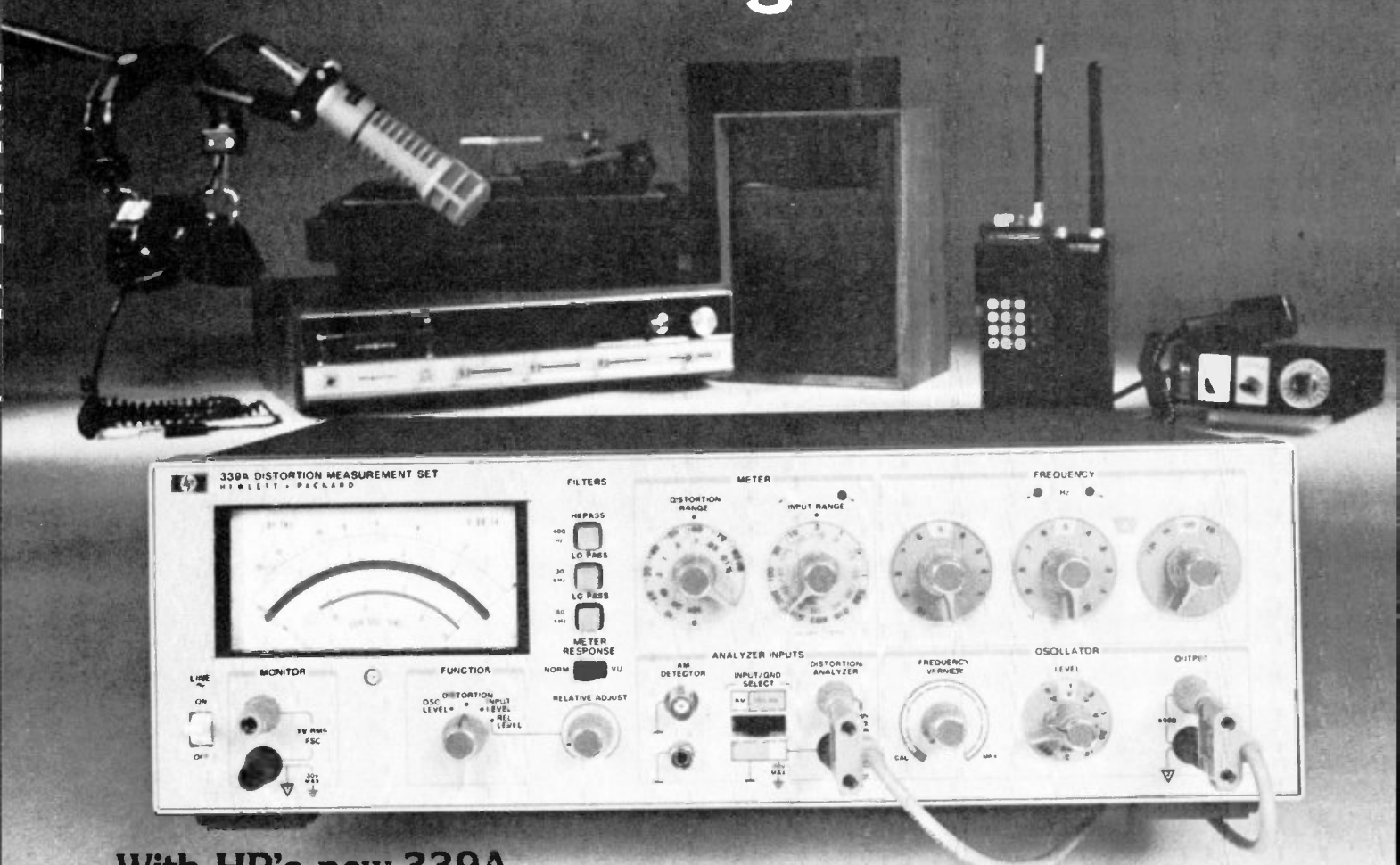
MODEL 4118	**$150.00**
Platforms	18" x 24"
Top Platform to floor	41¼"
Bottom Platform to floor	30¾"
Load Capacity	120 lbs.
Wheels	12"
Casters	4 in w. swivel & lock
Wheel base	16"
Folded Dim	12" x 25" x 41"
Shipping Weight	51 lbs.



WHEELIT MODEL 4118

Prices and Specifications Subject to Change Without Notice.

SPEED
transceiver, audio or broadcast testing...



With HP's new 339A Distortion Measurement Set.

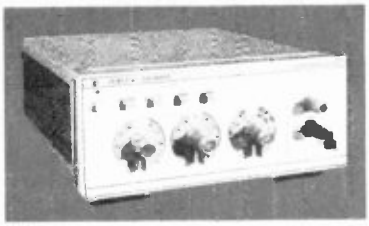
Automatic frequency nulling and auto set level features of the 339A speed your total harmonic distortion measurements (THD). And true-rms detection means accurate measurements as low as 0.0018% (−95 dB) from 10 Hz to 110 kHz. Just select the frequency of the built-in oscillator and the 339A's "turn signal" indicators show you how to make the proper range settings. Whether you're testing transceivers, sophisticated audio equipment or broadcast performance, here's how the 339A, priced at $1900*, can help you make quick and accurate measurements.

Transceiver testing. Automatic setting of the 100% reference level over a 10 dB input range means fewer critical adjustments. And true-rms detection lets you accurately determine thermal noise and harmonic components in making SINAD measurements.

Audio testing. In addition to the time-saving convenience of auto set level and auto null, you have the benefits of a built-in tracking oscillator for testing high-quality audio equipment.

Broadcast compliance testing. An AM detector, 30 kHz low-pass filter, switchable VU meter ballistics, and a +2 to −12 dBM (600Ω) meter scale reduce your set-up time when checking your equipment for compliance with operating regulations.

For a separate low-distortion oscillator, investigate HP's new 239A, priced at $575.* Like the built-in oscillator of the 339A, it provides less than −95 dB THD over the audio range. For details contact your local HP field engineer.



* Domestic U.S.A. price only

HEWLETT hp PACKARD

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Circle (64) on Reader Service Card

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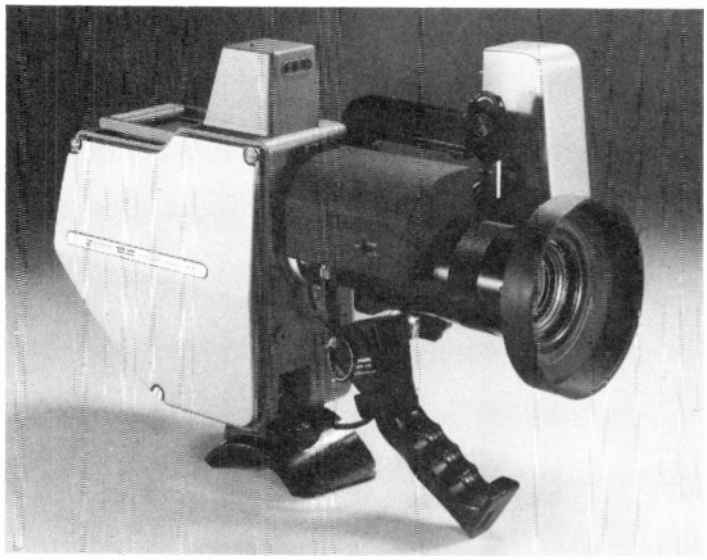
SK-96
Studio/Field Hand-Held Convertible Color TV Camera



Television production techniques are constantly diversifying. The SK-96 is designed to meet all requirements for TV camera versatility.

In addition to being a convertible studio/field and hand-held camera, the SK-96 also has a complete Camera Control Unit (CCU). With the SK-96, you can produce programs anytime, anywhere with assurance of superior picture quality.

FEATURES

Excellent Picture Quality

- Three ⅔-inch SATICON* tubes (H8397A) and an extra-small, highly efficient beam-splitting prism provide 500-line horizontal resolution and a signal-to-noise ratio of more than 51dB.
- Built-in 2H contour corrector with comb filter guarantees sharp, crisp pictures.
- Built-in linear matrix masking amplifier gives high-fidelity color rendition.
- Standard I & Q encoder with switchable color bar generator produces full bandwidth signals.

Convertible Camera

- The SK-96 is readily convertible from a studio camera to a hand-held camera and vice versa. To make the conversion, simply take the camera head out of the studio housing and set it in the hand-held housing. Then you have a perfectly functioning hand-held camera. The camera head and housing are designed for quick and easy conversion.
- Studio/Field Use — Equipped with everything necessary for standard studio use. x10 standard zoom lenses and x22 field zoom lenses are also available.
- Hand-held Use — Thanks to careful human engineering, the camera maintains proper balance on the operator's shoulder, assuring excellent operability. Built-in microphone amplifier accepts input levels of −50 to −10dB. A trigger button is provided on the camera grip for remote control (start/stop) of a portble VTR. An LED tally near the viewfinder screen lights up when the VTR is in the recording mode.

* Trademark

Built-in ABO [Automatic Beam Optimizer]

- An ABO circuit, newly developed by Hitachi, eliminates the comet-tail phenomenon which occurs due to lack of a beam current when shooting highly illuminated objects. Hitachi's exclusive ABO circuit controls the beam current automatically.

Remote Operation by DCU [Digital Command Unit]

- The SK-96 can be remotely controlled by a DCU at the base station. Signals can be transmitted through a coaxial or triaxial cable of up to 3,000 feet.

And Many More Features

- Automatic white balance, built-in color and N/D filters, and automatic iris control by video level detection simplify camera operation even under varying light conditions, both indoors and outdoors.
- The lens iris can be adjusted in the manual mode by observing the black and white stripes superimposed on the viewfinder screen which indicate over-level.
- High gain switch offers +6dB or +12dB operation for extremely low light conditions.
- Built-in sync generator with Genlock circuit can be locked to an external black burst or NTSC color composite signal.
- Low power consumption, great stability and great reliability are obtained by extensive use of ICs and LSIs. Bundled wiring is eliminated by the introduction of mother boards.
- The camera body is sturdily constructed.
- The 7-inch studio viewfinder has a tilting mechanism.
- The 1.5-inch hand-held viewfinder is equipped with a magnifying eyepiece and can be positioned for the individual cameraman's comfort by a fully adjustable mechanism for panning and tilting.

Prices and specifications subject to change without notice

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SK-90
Self-contained Portable Color TV Camera

The SK-90 is a lightweight color TV camera that produces unusually sharp and crisp pictures. It enhances the visual appeal of commercials and adds a new dimension of reality to dramas, news and sports. The SK-90 may look like an ordinary camera on the outside, but inside its sturdy case there are two pace-making developments in TV technology — SATICON* tubes and an Automatic Beam Optimizer (ABO). These innovations create a difference in picture quality which is dramatic enough to attract new viewers and sponsors to your station.

The SK-90 is designed to give TV cameramen all the freedom and mobility they need to go out on location and shoot action features, without worrying about complex equipment, tripping over bulky cords, or staggering under heavy loads.

Weighing only 18 pounds, the camera sits balanced on the operator's shoulder. It requires no backpack, delivers a usable picture in 5 seconds and runs for over an hour on a rechargeable battery belt. Built to withstand temperatures from below zero to above 100°F, the SK-90 will work wherever you have the imagination and the physical courage to take it. And it is packed with automatic features so you don't have to be a technical wizard to use it with professional results.

*Trade Mark

FEATURES

Excellent Picture Quality

- Three ⅔-inch SATICON tubes (H8397A) and an extra-small, highly-efficient beam-splitting prism (F1.4) provide 500-line horizontal resolution and a more than 51dB signal-to-noise ratio.
- The ABO (Automatic Beam Optimizer) circuit, newly developed by Hitachi, prevents occurrence of the comet-tail phenomenon due to lack of a beam current when shooting highly illuminated objects. Hitachi's exclusive ABO circuit solves the problem of lack of beam by controlling it automatically.
- Built-in 2H contour enhancer with comb filter guarantees sharp, crisp pictures.
- Built-in linear matrix masking amplifier for high-fidelity color rendition.
- Standard I & Q encoder with switchable color bar generator produces full bandwidth signals

Automatic and Easy Operation

- Automatic white balance, built-in color and N/D filters, and automatic iris control by video level detection simplify camera operation even under varying lighting conditions, both indoors and outdoors.
- In the manual iris mode the lens iris can be adjusted by observing picture waveforms superimposed on the viewfinder screen.
- Servo zoom lenses with automatic iris are provided. Conversion kit is available for studio use.
- Convenient quick-start circuit permits almost instantaneous operation (about 5 seconds) after switching-on.
- High gain switch offers both +6 dB and +12dB operation for extremely low light conditions.
- Built-in sync generator can be locked to external black burst signals or NTSC color composite signals with built-in Genlock circuit.
- The camera maintains proper balance on the operator's shoulder, assuring less operator fatigue, and allowing greater concentration on production.

Adjustable Viewfinder

- 1.5-inch viewfinder with magnifying eyepiece assures precise framing and focusing.
- 1.5-inch electronic viewfinder may be positioned for individual cameraman's comfort with fully adjustable mechanism for panning and tilting.
- LED (light-emitting diode) tally indicates "VTR Record" or "Battery Low Voltage." Switchable superimposed waveform shows picture level.

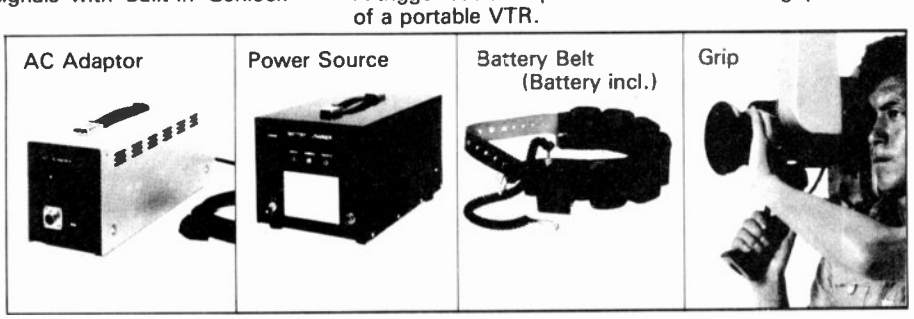
DCU (Digital Command Unit) and ROU (Remote Operation Unit)

- The camera with optional Multi-Adaptor can be remotely controlled from a DCU (option) at the base station. Signals can be transmitted via RG-11A/U coaxial cable or triaxial cable up to 3,300 feet.
- The ROU (with multi-conductor cable) is also available as an option. The cable can be extended up to 1,000 feet.

And More Features

- Low power consumption (only 35W) even when fully equipped.
- Continuous operation in excess of one hour may be achieved by using a battery belt. Flashing of LED Tally alerts the cameraman to low battery voltage.
- Built-in microphone amplifier accepts input level of -50 to -10dB.
- A trigger button is provided on the camera grip for remote control of a portable VTR.

OPTIONAL ACCESSORIES



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SK-80
PORTABLE COLOR CAMERA

SK-80 is a fully self-contained portable color TV camera which has broadcast quality. Although the camera utilizes a 3-tube system, compactness, lightweight and stable registration are attained by using Hitachi ⅔ inch SATICON tubes and a paralleled dichroic mirror system.

The SK-80 handles like a 16mm cine camera, yet offers on-air immediacy and versatility not only for ENG (electronic news gathering), but also for documentary production, sports coverage, and production of local programs and commercials.

FEATURES:

AUTOMATIC AND EASY OPERATION:

- Automatic white balance, built-in color and N/D filters, and automatic iris by video level detection simplify camera operation even under varying lighting conditions, both indoors and outdoors.
- The lens iris can be adjusted in the manual iris mode by observing picture waveforms superimposed on the viewfinder screen.
- Standard 16mm lenses ("C" mount or Arriflex mount, can be easily accommodated.
- Built-in microphone amplifier accepts input level of -50 to 0 dB. An earphone jack is also provided for monitoring.
- A trigger button is provided on the camera grip for remote control of a portable VTR. An LED (light-emitting diode) tally over the viewfinder screen illuminates when recording is in progress.
- Continuous two-hour operation may be achieved by using a battery belt. Flashing of LED Tally alerts the cameraman of low battery voltage.
- An attached adjustable shoulder mount assures better camera counter balance; by removing it the camera may be mounted on a standard tripod.

EXCELLENT PICTURE QUALITY:

- Three ⅔ inch SATICON Tubes (H8397) provide 500-line horizontal resolution and 50 dB signal-to-noise ratio.
- Built-in bias light and +6 dB high gain switch ensure excellent pictures under low light conditions.
- Built-in horizontal and vertical image enhancer guarantees sharp and crisp pictures.
- Built-in I & Q encoder with switchable color bar generator produces a full bandwidth signal.

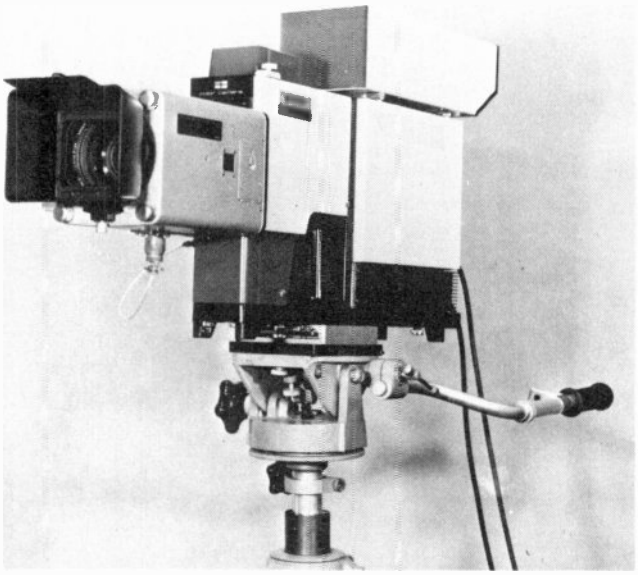
ADJUSTABLE VIEWFINDER:

- 1.5 inch electronic viewfinder may be positioned for individual cameraman's comfort. Full ± 90° tilting is possible for difficult camera angle shots.
- Diopter correction lenses are provided for nearsighted or farsighted cameramen.
- LED tally indicates "VTR Record" or "Battery Low Voltage." Switchable superimposed waveform shows "Picture Level."

USEFUL OPTIONAL ACCESSORIES:

- "AC Adaptor" or "Car Battery Adaptor" supplies DC power for longer operation.
- "Gen-lock unit" permits camera gen-lock with only external black-burst signal.
- "Studio Adaptor" houses 5-inch viewfinder, gen-lock unit, AC power adaptor and remote connector, rendering studio type camera operation possible.

SK-70
THE THIRD GENERATION COLOR TELEVISION CAMERA



Featuring Hitachi's newly developed ⅔ inch SATICON tube and new modular construction concept of this camera, the SK-70 offers highly satisfactory broadcast quality an unusual versatility for all-around application — at low cost.

If one considers the studio camera as the first generation and the portable camera as the second generation, then one must surely consider the SK-70 "The Third Generation Camera" for the television industry. Versatility should be the key word.

FEATURES:

- Three ⅔inch SATICON tubes with excellent picture quality.
- Versatile operation . . . Hand-held camera with back pack, self-contained camera for remote and small studio applications, and standard studio camera with full remote control . . . any of the above configurations can be achieved simply by changing the combination of modules, adaptors, and accessories, and time involved is just minutes.
- Small-size, light-weight, simplified operation, and improved performance.
- High sensitivity and excellent signal-to noise ratio
- Highly efficient beam-splitting prism with built-in bias light.
- Light-weight zoom lens for hand-held operation and high-quality zoom lens for studio use.
- Built-in linear matrix masking amplifier, and horizontal and vertical contour corrector.
- Digital command remote control.
- Low power consumption.

Prices and Specifications Subject to Change Without Notice.

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FP-1020 PORTABLE COLOR TELEVISION CAMERA

Hitachi FP-1020 is the three-tube, self-contained, portable color camera for everyone. Everyone, because the built-in auto color control circuit with digital memory makes the set-up of auto white and black blaance quite easy, with one touch in seconds. The memory can be kept on until power-off so as to be very stable, just to mention for example.

The development of the FP-1020 is an epoch-making outgrowth of the popular Hitachi FPC-1000 series cameras which have been widely used in every phase of industry because of their reliability and excellent performance.

The portable FP-1020 is proud of its compact light weight construction which provides easy handling and low power consumption of only 22 watts.

The Hitachi FP-1020 is a product of the combination of new technology and the vintage of well established experience for years.

FEATURES:

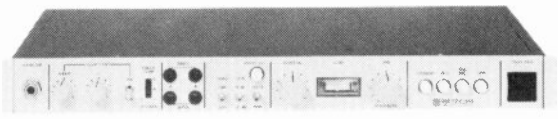
- **Built-in digital memory type color balance circuit**
  White balance and black balance are controlled by an 8-bit digital memory which guarantees one touch set-up and stable picture.
- **Saticon* with bias light**
  Hitachi Saticon*, featuring a uniform sensitivity in the entire visible light range, provides a sharp color picture. The built-in bias light reduces after-image.
- **Three-way power supply**
  An AC pack, batery pack and external DC (12V) can be used.
- Four (4)-position Filter disc for color temperature and ND.
- High gain switch (+6 dB).
- Low power consumption — only about 22 Watts.
- More than 2 hours of continuous operation by a power-belt (option).
- Built-in color bar generator.
- Built-in vertical enhancer is also available as an option.
- No mechanical mis-registration by a single-block mounting of lens, optical system and tubes.
- 1.5" detachable Viewfinder with built-in video level checker.
- Battery warning indicator and tally lamp in the Viewfinder.
- Plug-in type printed circuit boards for easy maintenance.

FP-1011B
COLOR TELEVISION CAMERA

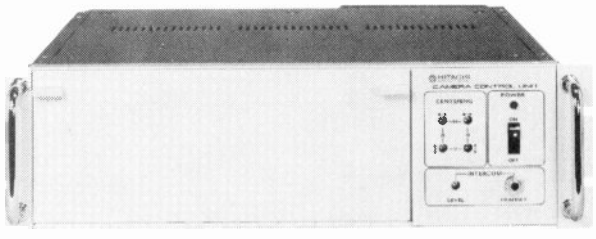
The FP-1011B is one of the FP-1010 series color television cameras whose excellent quality and performance have earned them a high reputation. The FP-1011B consists of a camera head and a camera control unit with a remote control panel which enables major camera operations from it. Since the remote control panel can be separated from the camera control unit up to 100m, the remote control panel can be located quite far from the camera control unit. Similar to the FP-1010, the FP-1011B can be used as a "self-contained camera" with the optional self-contained kit (only for NTSC color system). The FP-1011B is provided with three SATICON* tubes; however, the Plumbicon** or Vidicon tube version cameras are also available. The 7" viewfinder is tiltable and detachable. Performance of the new FP-1011B is enhanced by the listed features which provide ease of operation, stability, and minimal set-up time. These features make the FP-1011B ideal for use is educational broadcasting, CATV origination, software production and hospitals as well as in professional broadcasting.

FEATURES:

- **Pickup Tubes — SATICON***
- **The RP-1011B Remote Control Panel Controls Many Functions.**
- **3-way Synchronization System**
- **Self-contained Format Possible [Only for NTSC color system]**
- **Automatic Iris Control Circuit**
- **Built-in Digital-memory-type, White Balance Circuit**
- **Combined Color Temperature Compensation**
- **Built-in H-detail Circuit and Vertical Image Enhancer**
- **+6dB Switch [High Gain]**
- **Tiltable 7" Viewfinder**
- **Built-in Encoder**
- **Built-in Color Bar Generator**
- **Color Painting Function**
- **Built-in Cable Compensator**
- **Built-in Masking Amplifier [Option]**
- **Built-in Test Signals**
- **Built-in Auto-wobbling Circuit [Focus Lock]**



REMOTE CONTROL PANEL RP-1011B



CAMERA CONTROL UNIT CU-1011B

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** Trademark of N.V. Philips

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HR-100
Portable One Inch "C" Format Recorder

The HR-100 Portable One Inch Recorder Features:

- SMPTE type "C" format
- "Uniblock" construction makes sturdy yet small and lightweight unit.
- Built-in auto assemble edit
- Built-in SMPTE time code generator
- 90 minute operation on built-in 12V battery.

HR-200
Studio Model One Inch "C" Format Recorder

The HR-200 Studio Model One Inch Recorder Features:

- SMPTE type "C" format.
- Non-contact air drum for reduced tape and head wear.
- Movable exitguide to facilitate threading.
- Air entrance guide reduces tape wear and improves interchange.
- Fast acceleration DC motors reduce FF/REW time to 80 seconds.
- Advanced circuit design renders superior performance: 48+BSW, DFF Gain 3%, Diff. Phase 3 degrees.

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CM-182 (NTSC)
CM-1822 (R,G,B)
Color Video Monitor — 18 Inch

Hitachi 18-inch color video monitors CM-182 (for NTSC) and CM-1822 (for R,G,B), employing an in-line-type picture tube, provide sharp pictures with excellent color fidelity.

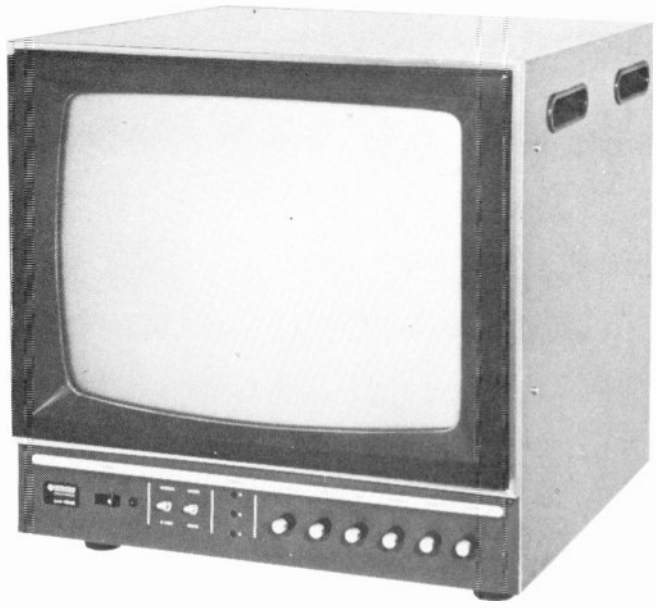
Model CM-182 (for NTSC) is ideally suited for broadcast and medical TV applications which demand accurate colorimetry.

Model CM-1822 (for R,G,B) is designed specifically for use in industrial or medical TV systems where individual color levels and better detail are desirable.

The CM-182 and the CM-1822 ensure a stable color presentation and excellent performance at a reasonable cost.

FEATURES:

- Hitachi's innovative in-line-type color picture tube ensures reproduction of an extremely bright picture with vivid color.
- By incorporating integrated circuits, color synchronizing and color decoding circuits can reproduce and maintain delicate color hues.
- Aperture correction circuit offers sharp pictures without ringing.



CM-182

SPECIFICATIONS

	CM-182	CM-1822
Color System	NTSC	RGB
Color decoding	3 axes decoding in narrow band	—
Video input	1.0 Vp-p (VBS) 75Ω or high, BNC connector	0.7 Vp-p (V) or 1.0 Vp-p (VS) G ch only 75Ω or high, BNC connector
Sync input	—	4.0 Vp-p negative polarity 75Ω or high, BNC connector
Resolution	Horizontal: more than 370 lines at center (at monochrome signal) Vertical: more than 350 lines at center	
Signal-to-noise ratio	More than 46dB	
Deflection linearity	Less than 2% (within the central zone of diameter equal to picture height)	
CRT	18-in. In-line-type 90° Deflection 470EFB22 or equivalent	
Ambient temperature	0°C to 40°C (32°F to 104°F)	
Power requirement	U & C type 117V AC ±10% 60Hz	
Power consumption	Approx. 80W	
Dimensions (W x H x D)	464 x 440 x 459mm (18-1/4 x 17-5/16 x 18-1/16 in)	
Weight	Approx. 30kg (66 lb)	

Prices and specifications subject to change without notice

HITACHI
Hitachi Denshi, Ltd.

• Hitachi Denshi America, Ltd.

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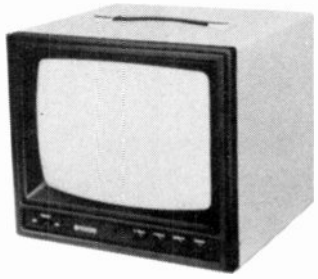
VM-129
12-Inch Video Monitor

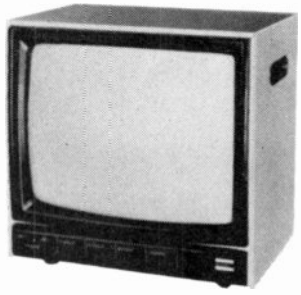


The Hitachi VM-129 Video Monitor is an IC-incorporated and transistorized, high resolution universaltype 12" monitor designed to receive video signals of such equipment as the Hitachi TV Camera and VTR without deteriorating their picture quality. The VM-129 is provided with such superb functions as high deflection linearity, wide synchronous holding range and DC restoration facility.

FEATURES

- **Preeminent reliability**
  All-IC and silicon transistorized circuit ensures high reliability.
- **High resolution**
  Enhanced frequency and focus characteristics offer horizontal resolution 700 lines at center.
- **Excellent deflection linearity**
  Linearity correcting coil of the horizontal deflection circuit and highly standardized deflection yoke provide remarkably low distortion factor of less than 1% at center.
- **Stable picture**
  Stabilized power circuit keeps picture stable.
- **Multiple monitoring**
  Bridge connection of the video monitors enables multiple monitoring through one video signal, which offers high image quality.
- **High-fidelity picture reproduction**
  Built-in DC restorer (switchable) ensures highly faithful image.
- **Wide holding range of synchronization**
  Wide holding range of synchronization stabilizes input signal against jittering video signal such as the VTR reproduction picture.
- **Capable of revising to an external sync mode video monitor.**

VM-173
17-Inch Video Monitor

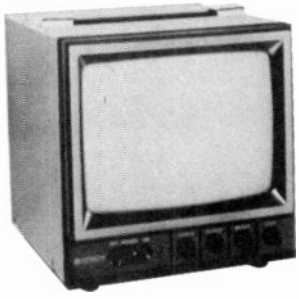


The Hitachi VM-173 is a solid state 17-inch black and white video monitor to display video signals from Hitachi CCTV cameras, VTRs and other signal sources.

FEATURES

- **Reliability**
  Solid state circuitry using an IC and silicon transistors ensures high reliability.
- **700 lines horizontal resolution**
  Horizontal resolution in excess of 700 lines is achieved at picture center.
- **Excellent linearity**
  Deflection linearity is less than 2%.
- **Stable picture**
  Even played back pictures of VTR can be displayed without jittering.
- **Looping video input**
  Video input can be looped through with built-in termination switch.
- **DC restoration switch**
- **External sync operation (available as option for U and C types)**

VM-906
9-Inch Video Monitor

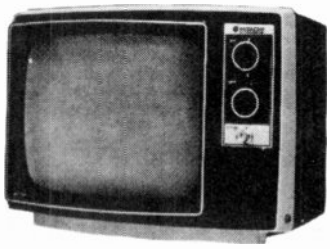


The Hitachi VM-906 is a solid state 9-inch black and white video monitor to display video signals from Hitachi CCTV cameras, VTRs and other signal sources.

FEATURES

- **Reliability**
  Solid state circuitry using an IC and silicon transistors ensures high reliability.
- **700 lines horizontal resolution**
  Horizontal resolution in excess of 700 lines is achieved at picture center.
- **Excellent linearity**
  Deflection linearity is less than 1%.
- **Stable picture**
  Even played back pictures of VTR can be displayed without jittering.
- **Looping video input**
  Video input can be looped through with built-in termination switch.
- **DC restoration switch**
- **External sync operation (available as option for U and C types)**
- **Compact construction**
  Two monitors are mountable side by side in a standard 19-inch rack.

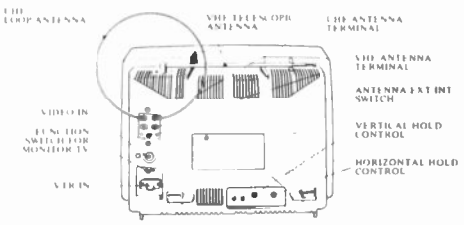
P/05M
12-Inch Receiver Monitor



12" Receiver Monitor with EIAJ VTR connector and video input (BNC).

FEATURES

- **Solid state chassis**
- **Low power consumption**
- **Instant picture and sound**
- **Memory fine tuning (VHF)**
- **Solid state 70 position UHF tuner**
- **UL approved**
- **FCC certified**



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Northwest Office: 1051 Andover Park West Tukwila, Wash. 98188 U.S.A. Phone (206) 298-1690 TWX 910-444-2155

V-059B MINI-PORTABLE OSCILLOSCOPE

Model V-059B combines a TV waveform monitor and a single trace 7 MHz portable oscilloscope in a small, lightweight body (6.4 lbs.). Features include keyed DC restorer; TV Sync-separator with automatic LINE/FIELD rate triggering selection by Time/div control; and AC, DC or rechargeable battery powering capability. It is ideal for video equipment servicing applications and for monitoring TV waveforms in electronic field production. The V-059B has a 10 mv/div deflection factor at 2 MHz bandwidth. A 3-½ inch 8 x 10 div rectangular internal graticule CRT assures accurate and easy measurements. The V-059B has a battery protection circuit.

FEATURES

- Small size and lightweight: 6.4 lbs.
- AC, DC or battery powered
- Sharp trace CRT with parallax-free internal graticule
- Keyed DC Restorer for TV waveform monitoring application
- TV Sync separator automatic LINE/FIELD rate triggering selection by time/div control switch
- Selectable input impedance, 1M ohm/75 ohm
- Low line/battery voltage warning indication and battery protection
- All-solid-state reliability and easy maintenance
- 15-position carrying handle optimizes viewing angle
- 2V/2H sweep rate selectable
- External Horizontal sweep mode provided
- External -40, 0, 100 IRE Unit graticule on light filter
- Charging indication by brightness of LED

COMPOSITION

1. V-059B oscilloscope . . . 1
2. AD-058B battery pack . 1
3. External graticule (attached to oscilloscope) 1
4. AT-10P1.5 probe 1
   Probe housing 1
   Pincher tip 1
   Needle tip attachment . 1
   Alligator attachment . . 1
   Ground lead 1
5. Protective cover 1
6. Viewing hood 1
7. Screw driver for adjustment 1
8. Operation manual 1

SPECIFICATIONS

VERTICAL DEFLECTION

Bandwidth and Risetime: 0°C to +40°C
DC to at least 7 MHz, 50 ns or less
DC to at least 2 MHz, 175 ns or less using x 5 gain

Input Coupling
AC, DC, or 75 ohm selectable. Using a high impedance 10x probe, the 75 ohm position will be an apparent ground. For AC coupling, the low frequency – 3 dB point is 10 Hz or less; 1 Hz or less with a 10x probe.

Deflection Factor
50 mV/div to 2 V/div in six calibrated steps (1-2-5 sequence), 10 mV/div and 20 mV/div using x5 gain, accurate within 3% from +20°C to +30°C and 5% from 0°C to +40°C. Continuously variable between steps and to at least 5 V/div

Input R and C
AC and DC: 1 M ohm ±2%, approx. 40pF
75 ohm: 75 ohm ±2%

DC Restorer
Slow-acting, sync-tip DC restoration. Sync-tip level shift due to changes in APL from 10 to 90% will not exceed 3 IRE units. May be rendered ineffective when desired by a front-panel switch.

Maximum Input Voltage
AC, DC and Ground: 100V (DC + peak AC), 100 Vp-p AC at 1 kHz or less
75 ohm: 5V rms max.
300V (DC + peack AC), 300 Vp-p AC at 1 kHz or less with a 10x probe.

HORIZONTAL DEFLECTION

Time Base
10 μs/div to 20 ms/div in 6 calibrated steps (1-5-20 sequence) x10 MAG extends fastest sweep rate to 1 μs/div
Continuously variable between steps and to at least 0.1 s/div
Time base may be selected: 2V/10 div or 2H/10 div when horizontal display switch is in the 2V-2H position.

Time Base Accuracy

	+20°C to +30°C	0°C to +40°C
x1	3%	5%
x10	5%	7%

External Horizontal Input
DC to at least 10 kHz. Approx. 2 V/div and 0.2 V/div with a x10 MAG.
Input R: approx. 20 K ohm
Maximum Input Voltage: 100V (DC + peak AC), 100 Vp-p AC at 1 kHz or less

TRIGGERING

Trigger Modes
Automatic: (sweep free-runs in the absence of a trigger and for signals below 100 Hz)
Normal: (sweep runs when triggered)

Coupling
AC

TV Sync Separator
An internal TV Sync Separator circuit permits stable internal Line or Field-rate triggering from displayed composite video or composite sync waveforms.

Trigger Source
Internal, External, and Line

Level and Slope
For Internal Trigger; permits triggering at any point on the positive or negative slope of the displayed waveform.
For External Trigger, permits triggering on any level between –2V to +2V.

Trigger Sensitivity

	Internal	External
50 Hz to 1 MHz	1 div deflection	400 mV
At 7 MHz	2 div deflection	800 mV

TV sync pulse amplitude requirements – 1 div deflection for internal and 400 mV for external in TV (–) slope selection.

External Trigger Input
Approx. 1 M ohm; Approx. 40 pF 100V (DC + peak AC), 100 Vp-p AC at 1 kHz or less

CRT
8 x 10 div display area, each div is 6.35 mm.
Rectangular tube, P31 Phosphor 1.5 kV accelerating potential

Graticule
Internal, nonparallax, nonilluminated
External – 40, 0, 100 IRE Unit graticule on light filter

ENVIRONMENTAL CAPABILITIES

Ambient Temperature
Operating: 0°C to +40°C
Storage: –20°C to +70°C

OTHER CHARACTERISTICS

Amplitude Calibrator
Sweep gate output, 1V ±2% (+15°C to +35°C)
Positive-going rectangular pulse

Power Requirements
117V ±10%, 50 Hz to 400 Hz. Approx. 18W at 117V, 60 Hz.
External DC source of 11.5V to 14V, requires approx. 0.8A.
Operates on an AD-058B Battery Pack.

Dimensions

Height	85mm	3.35"
Width	198mm	7.8"
Depth	292mm	11.5"
Depth (with handle extended)	360mm	18.17"
Net Weight	2.9 kg	6.4 lbs.

AD-058B BATTERY PACK

Model AD-058B provides up to three hours of operation for model V-059B. The pack may be attached to the bottom of the aforementioned oscilloscope.

SPECIFICATIONS

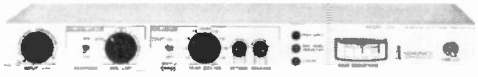
Output Power	12V, 2.7 Ah from full charge (sealed lead-acid gel)	
Charging Source	V-059B oscilloscope with power cord connected to AC line; scope operation is stopped in the charging mode.	
Charging Time	15 hours, charging current is automatically set to trickle level at full charge.	
Ambient Temperature	Operating 0°C to +40°C Charging 0°C to +40°C Storage 0°C to +40°C	
Dimensions	Height	42mm 1.65"
	Width	162mm 6.38"
	Depth	262mm 10.3"
Net Weight	1.7 kg	3.74 lbs.

Prices and specifications subject to change without notice

Innovative Electronics for Recording and Broadcasting

from Inovonics Inc.

Model 201—Average and Peak Responding Limiter
$480

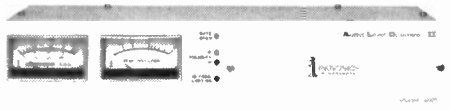


The ideal general-purpose radio production and recording studio compressor/limiter. Independent, yet simultaneous control over program average and peak values. Low distortion, very smooth sounding.

Model 215—AM Broadcast Peak Processor
$360

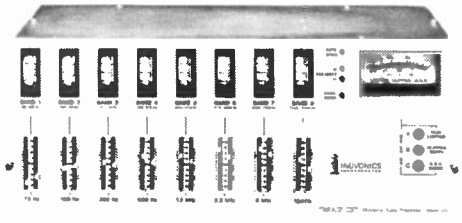
Phase-following integrated limiter/clipper for AM transmitter overmodulation protection. Follows other processors or STL/Telco facilities. Provides inaudible phase optimization, adjustable clipping depth and variable asymmetry.

Model 221—"Audio Level Optimizer II"
$760



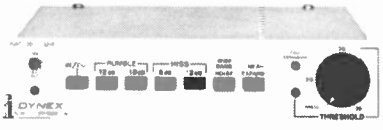
A broadband broadcast audio processor for either AM or FM. Gated A.G.C. is followed by a smooth r.m.s. compressor and a peak limiter switchable to phase-following, asymmetrical limiting for AM or independent 75 or 25μs FM limiting.

Model 231—"MAP II" Multiband Audio Processor
$1670



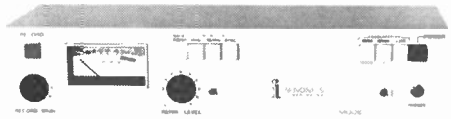
The last word in AM broadcast audio processing for a consistently loud, surprisingly clean sound. The MAP II features gated A.G.C., 8 bands of independently variable compression and a phase-following, asymmetrical Integrated Peak Controller for optimum AM carrier modulation. An integral Pink Noise source aids setup, and the Peak Controller can be remoted for split studio/transmitter operation.

Model 241—DYNEX Noise Suppression
$280



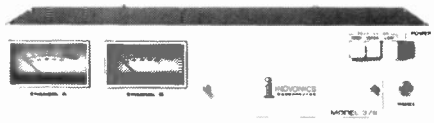
A novel and useful device for reduction of background noise in tape and disc playback systems, TV film chains, Telco program lines. Reduces hiss, rumble, hum, room noise, etc., with little effect on legitimate program material.

Model 375—Tape Recording Electronics
$690



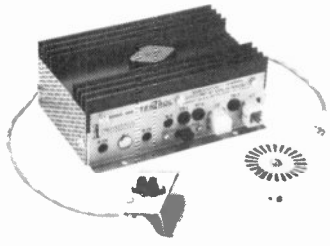
A self-contained record/reproduce electronics assembly for updating older professional recorders or for new installations. Pin-compatible with Ampex 300, 350/351/354 and all AG-series machines; adaptable to Scully and many other recorders. Interfaces with original or replacement heads. Three-speed equalization, "linearized" record amplifier, phase-correcting reproduce cicuitry.

Model 376—Dual Channel Reproduce Amplifier
$550



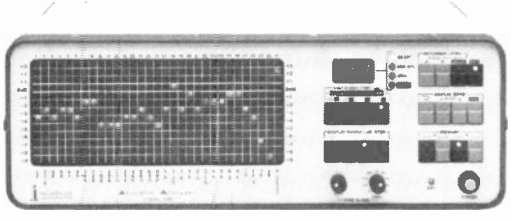
Two channel (stereo) playback-only version of Model 375. Suited to automation systems, editing machines, etc.

400 Series—TENTROL Tape Tensioning Kit
$300



For Ampex, Scully, Otari and several other studio recorders and tape duplicator transports. Provides constant holdback tension regardless of supply reel diameter. Improves high frequency response and 2-track phase performance, extends head life.

Model 500—Acoustic Analyzer
$2750



A fully portable unit for real time, one-third octave audio spectrum display and reverberation analysis. Peak and averaged measurements, two memories, RT_{60} and Decay Plot capabilities, built-in Pink Noise generator. I/O logic interfaces with digital peripherals.

Full details and specifications available in our full-line catalog; call or write for your copy and a listing of our dealers nationwide.

Inovonics Inc.

503-B Vandell Way
Campbell, CA 95008

Telephone
(408) 374-8300

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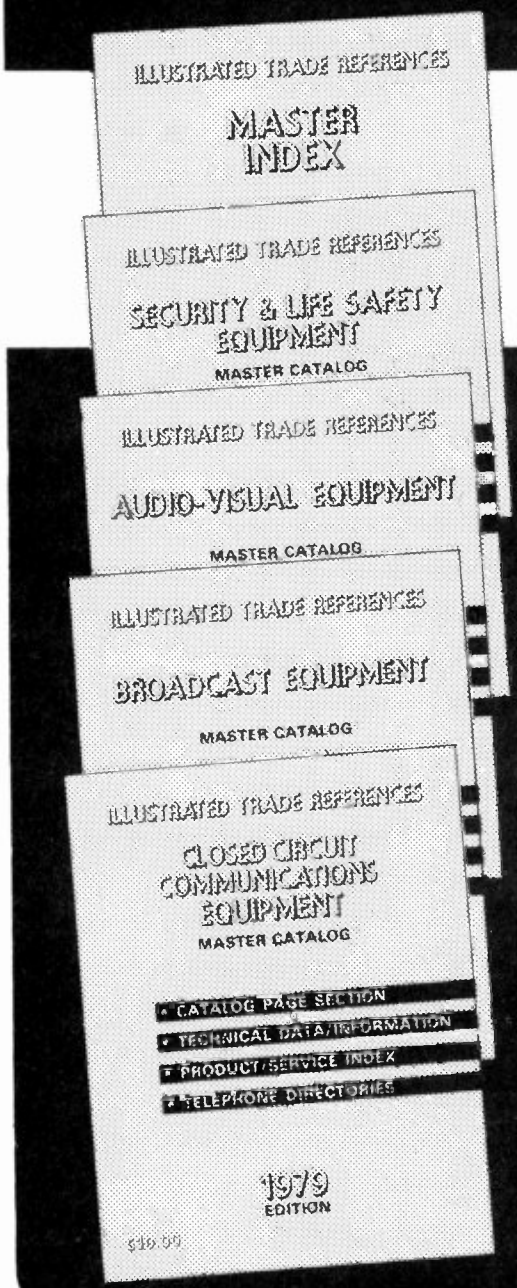

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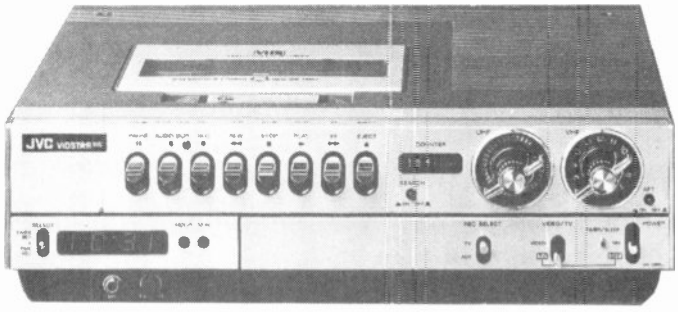
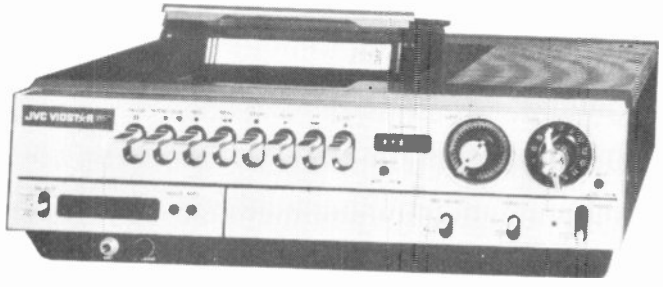
JVC VIDSTAR VHS™



VIDSTAR HR-3600



VIDSTAR HR-3300

New Vidstar ½-Inch VCR

The 2 Hour, ½" Videocassette Recorder/Player System

Featuring the popular VHS format developed by JVC. This system can record up to 2 hours of programming on reusable videocassettes. Record one program while watching another or use the built-in timer to record programs while you are not there.

Transfer your 8mm movies or slides to videocassettes with the optional Tele-cine Converter.

Make your own videocassettes using one of JVC's optional color cameras.

JVC's new Model HR-3600 Vidstar is the first ½-inch videocassette recorder to feature slow motion, stop-action and double-speed, in addition to normal viewing. The unit is equipped with two remote control attachments for operating stop-action, double-speed, normal speed and pause functions without touching the machine's front panel.

JVC's Model HR-3300 — a Video Cassette Recorder with styling, ease of operation and quality. Designed from the very start to give 2-hour playing time, and features such as Search and Pause controls, Switchable Channel 3-4 RF Modulator, Timer Select switch, Digital Clock, Audio Dub, Automatic Fine Tuning, and much more.

VIDSTAR VHS™ RECORDER/PLAYER SYSTEM

Model	Description
HR-3300	VIDSTAR VHS™ ½" Color Video Cassette Recorder/Player including built-in 24-hour LED Clock/Timer, built-in Switchable RF Modulator channel 3-4, VHF/UHF Tuner, and one T-30 (30 min.) tape
HR-3600	VIDSTAR VHS™ ½" Color Video Cassette Recorder/Player including built-in 24-hour LED Clock/Timer, built-in 24-hour LED Clock/Timer, built-in Switchable RF Modulator channel 3-4 and VHF/UHF Tuner, Remote Pause and Still Frame. Slow Motion, and Double Speed Play, 2 Remote Controls, and one T-30 (30 min.) tape.

VIDSTAR VHS™ VIDEOCASSETTE TAPES

T-30	½" Videocassette Tape (30 min.)
T-60	½" Videocassette Tape (60 min.)
T-120	½" Videocassette Tape (120 min.)

VIDSTAR VHS™ COLOR/BW CAMERA SYSTEMS AND ACCESSORIES

G-31US	Single Tube Striped Filter, 1" Vidicon Pick-up Tube, Optical View Finder, 25mm Fixed Lens, AC Adapter, Outdoor Filter and 20ft. Multipin Cable.

VIDSTAR VHS™ VIDEO CABLES

VC-102U	Coaxial cable (16 Ft.)
VC-103U	Coaxial cable (32 Ft.)
VC-104U	Coaxial cable (66 Ft.)
G-71US	Single Tube Striped Filter, 1" Vidicon Pick-up tube 1½" Electronic View Finder, 6 x 1 Auto iris Zoom Lens, AC Adapter, Outdoor Filter, and 20 ft. Multipin Cable.
BKT-112	Battery Kit for G-31US/G-71US Cameras, Consisting of Rechargeable Battery B-502, Charger BH-112, and Battery Case.
B-502	Rechargeable Battery for G-31US/G-71US
BH-112	Battery Charger for G-31US/G-71US
VC-405	33ft. Camera Extension Cable for G-31US/G-71US
VC-404	Camera Cable for Model HR-4100 and G-31US/G-71US
V-L617A	6 x 1 Auto Iris Zoom Lens (17-102mm) for G-31US
V-F503	1½" Electronic View Finder for G-31US
GS-1500	⅔" Vidicon B/W Camera with 16mm, F1.4 lens
VC-221	Camera extension cable (33 ft.)
GL-6X12U	Manual Zoom lens (12.5-75mm) for GS-1500
GA-120	Telecine Attachment
MD-220M	Omni-directional microphone
VC-226	Audio/Video cable (9 ft.)

Prices and specifications subject to change without notice

JVC

HP-4000AU
VHS Color Videocassette Player

The HP-4000AU color video player accepts standard VHS videocassettes for playback in classrooms, training centers and locker rooms. The HP-4000AU is suitable for home use as well.

Normal, stop-motion and slow-motion speed controls are offered on the HP-4000AU player via an optional Remote Controller (JVC RM-44). The player also has a Search mechanism to permit quick and easy location of desired selections on a pre-recorded VHS videocassette. The HP-4000AU accepts VHS videocassettes up to the T-120 for up to 120 minutes (2 hours) of audio/video playback in color with high quality sound.

VHS™

Easy Connection
Simply connect the cables (provided) to the Antenna terminals on any ordinary TV receiver, or to an optional 8-pin connector to monitor TV.

Simple Operation
Just push the PLAY lever after loading a pre-recorded VHS videocassette. Nothing could be simpler.

Up to Two Hours of Continuous Play
This player is designed to accept standard long-playing VHS videocassettes up to the T-120 for up to 120 minutes (2 hours) of video playback. Pre-recorded videocassettes in color or black and white always yield clean and clear pictures thanks to the drop-out compensator circuit in the JVC HP-4000AU.

Search Facility
Set the digital counter to "000" at any point during play. Then play or fast-forward the videocassette to its end. Next, set the mode to REWIND and the tape will return to the point previously marked, and stop. You may then replay the section of the tape you desire.

Normal, Stop-Motion and Slow-Motion Play
Speed control versatility is a highlight in the JVC HP-4000AU. It's easy to "freeze" the video motion at any time for a close inspection of the pictured subject. It's equally easy to set the mode for SLOW-MOTION to observe the action as you like it. Neither of these operations can cause damage to the tape or the player thanks to special JVC safeguards.

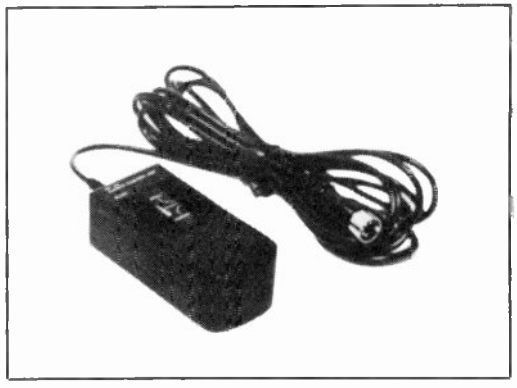
Remote Control Unit (optional)
The JVC RM-44 is available at option for use with the HP-4000AU to provide remote control of the Normal/Stop-Motion/Slow-Motion Playback functions.

AC/DC Power Supply
Indoors, use the AC power pack (provided) to power the HP-4000AU from ordinary household AC. User may also employ a DC power pack (JVC PBP-1, available at option) containing batteries for indoor or in-the-field use. A power adaptor (JVC AA-p41AU, also optional) is used to recharge the battery pack.

High-Quality Pictures/Sound
JVC is a leader in audio/video technology as is amply demonstrated in our wide high fidelity, home entertainment and video product lineups. The HP-4000AU, using the popular VHS videocassettes for crystal-clear video playback, likewise offers low-noise, low-distortion sound thanks to the total policy of JVC.

Dimensions: 33.8(W) x 13.7(H) x 36.1(D) cm
(13-3/8 x 5-7/16 x 14-3/16 inches)
Weight: 7.0kg (15.4 lbs.)
8.1kg (17.8 lbs.) including AC power pack
Accessories Provided:
AC power pack, Earphone, RF converter, Antenna cable

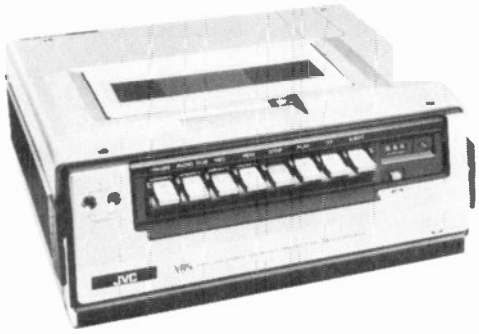
REMOTE CONTROL UNIT
JVC RM-44 (optional)



Prices and specifications subject to change without notice

JVC VIDSTAR VHS™

VHS recorder HR-4100AU



HR-4100AU Portable VHS Recorder
VHS quality and operability are met with full conformity in this unit; no additional equipment is necessary to obtain quality color video tapings in combination with the GC-3350U color video camera. Stable pictures are always the rule, even during on-the-go taping thanks to such special portability designing as high-precision capstan servo and quick-response drum servo systems. The built-in RF converter makes it connectable to most any TV receiver for playback.

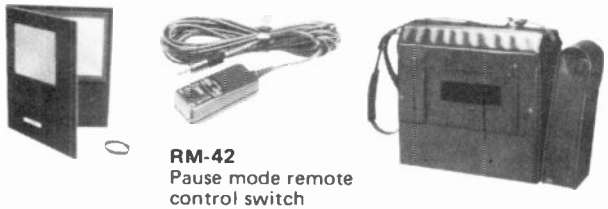
- One (1) hour of continuous recording on a single battery pack.
- Battery power/moisture condensation warning.
- Pause mode controlled directly or with an optional RM-42 remote control switch.
- Audio dubbing for later sound recording.
- Search mechanism for locating any tape section.
- Automatic switching between camera and line inputs.
- Video and audio source connection flexibility for direct recording from a TV monitor and/or audio equipment.
- Tape-end auto-stop mechanism.
- Drop-out compensator for clean pictures.

AA-P41AU AC Power Adapter
This is an essential member of this portable system, though you don't have to carry it with you. Employ it to power the system with household AC power or to recharge the battery pack for outdoor usage.

- Recharges two battery packs simultaneously; one in the recorder and a separate spare one.
- Informs you of the charging conditions with a switchable meter.

GA-120U
Telecine converter set

CB-35U
Carrying case for HR-4100AU

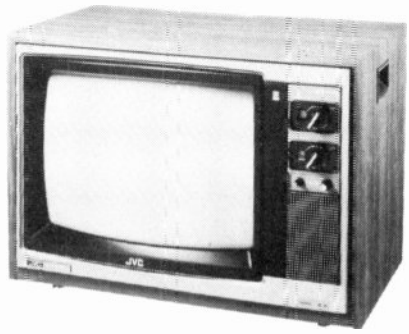


RM-42
Pause mode remote control switch

VC-3U
Car battery cord

VC-226
Monitor cable (3 m/9.5 ft)

VC-221
Camera extension cable (10 m/32 ft)



7860UM Color TV Monitor/Receiver
A 19" (measured diagonally) color monitor, with 100% solid-state chassis construction. Features 8-pin VTR connector that handles both video and audio input and output signals, letting you record off-the-air signals or play back video tapes (with optional equipment). Many connectors: video input for monitoring camera signals) bridged video output for multi-monitor system; audio output permitting hookups with separate audio systems; two earphone jacks. In-line black stripe picture tube. Scene control. Three-position aperture compensator control (APACON). One-touch Picture Tune Control simplifies color, tint, brightness and contrast adjustments. Manual adjustment is also possible. Automatic Fine Tune Control (AFC).

VC-202 Monitor Cable (9.75 ft.)

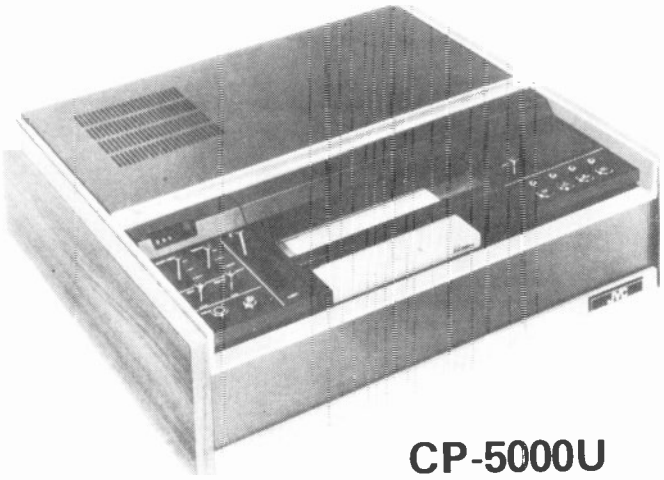
Optional Accessories for ¾-Inch VCR's

Model	Description	
KR-503BU	Channel 3 color RF converter	
KR-504BU	Channel 4 color RF converter	For
KR-505BU	Channel 5 color RF converter	CP-5000U
KR-506BU	Channel 6 color RF converter	
KR-234U	Switchable channel 3 and 4 color RF converter	For CP-5200U, CR-6300U, CR-6060U, CR-4400U
KR-256U	Switchable channel 5 and 6 color RF converter	
RM-50U	Remote control for CP-5000U/CP-5200U/CR-6300U	
RM-51U	Remote control with 18 Ft. cable	
RM-60U	Remote control for CR-6060U	
RM-41	Remote Actuating Switch for CR-4400U	
AAP-44U	AC power adapter for CR-4400U	
AAP-44LU	AC power adapter for CR-4400LU	
PBP-1	Battery pack for CR-4400U	
VC-208	Monitor cable for CP-5000U (9 Ft.)	
VC-216	Dubbing Cable (9.75 ft.) 10 pin (male)/8 pin (male)	
VC-220U	Monitor cable for CR-6100U/CR-6300U (9 Ft.)	
VC-224U	Connecting cable for CR-4400U to monitor	
SW-200UF	Switchbox and antenna cable for CR-6060U	
CN-309	Audio cable (6 Ft.)	
RC-101	Cable with RF connectors and matching transformer	
MCB-20	Special carrying case for any JVC VCR	
CB-56U	Metal case for CR-4400U	
CB-34U	Carrying case for CR-4400U	

Prices and specifications subject to change without notice

JVC VIDEOCASSETTE PLAYERS

Model CP-5000U Videocassette Player



CP-5000U

Dimensions: 20¾"(W) x 7-11/16"(H) x 17¾"(D)
(526mm x 195mm x 450mm)
Weight: 58 lbs. (26 kg)

This color videocassette player uses automatic phase control ar
automatic color control to insure crisp bright pictures.

All circuits are solid state providing reliable long-term operatio

The player is completely solenoid operated which prevents swit
jamming and makes operation a breeze.

The optional remote control unit permits PLAY, STOP, FAS
FORWARD and REWIND operation from as far away as 18 fe
Simplified, positive loading mechanism vertually eliminates t
possibility of tape jamming during loading or unloading. Aut
matic fail-safe circuit turns power off if tape should spill. Plug-
RF converter permits playback through almost any standa
monochrome or color receiver.

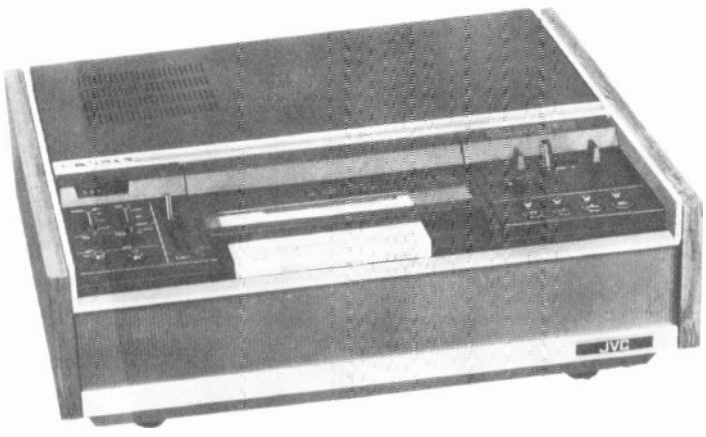
Auto-repeat provides the capability of viewing a progra
repeatedly with no operator present. Counter-repeat allows
selected program segment to be automatically played. (From t
beginning of tape to the selected point.)

Two audio tracks provide stereo sound or automatic cueing
system operation. Tracking, skew and color lock contr
guarantee interchange with any correctly set-up U-standa
VCR.

The videocassette may be removed and reinserted at any place
the program without rewinding tape. APC (Automatic Pha
Control) and ACC (Automatic Color Control) circuits insure cr
pictures and bright colors. A built-in drop out compensator he
clean up the picture, even if the videocassette is old and abus

Multiple distribution is available via RF or Video with the aid
accessory distribution amplifiers.

Model CP-5200U Videocassette Player



CP-5200U

MODEL CP-5200U VIDEOCASSETTE PLAYER

The CP-5200U is based on the CP-5000U with all its featu
additionally it provides *still-frame capability*. A simple lever gi
an excellent noise-free still-frame stop-action picture for deta
analysis of any event.

An RF plug-in converter, KR-256U, switchable to channel 5
channel 6, is a standard accessory for the CP-5200U only.

Dimensions: 20¾"(W) x 7-11/16"(H) x 17¾"(D)
(526mm x 195mm x 450mm)
Weight: 58 lbs. (26 kg)

Prices and Specifications Subject to Change Without Notice.

JVC VIDEOCASSETTE RECORDER/PLAYERS

Model CR-6060U Videocassette Recorder

The CR-6060U is the first fully remote controllable color videocassette recorder available at a reasonable price.

Features include:

- AGC (Automatic Gain Control) with ACC (Automatic Color Control) circuits for sharp pictures with stable images and well-balanced colors.
- Full solid state construction for consistent, reliable performance.
- Built-in control for Fast Forward, Play, Stop, Rewind, Full Record, Audio Dub Channel-1, Pause/Still and Frame Advance. (Remote Control accessory available.)
- Automatic or manual control of audio recording levels. Separate level meters for audio channels-1 and -2.
- Pause control to stop taping in the record mode. A tape and time-saving feature.
- Still Frame Playback with the frame advance (FRAME ADV) button — the operator can advance tape position to desired frame location.
- Stereophonic audio track — two audio channels for simultaneous recording or playback of two sound sources or audio cue tones.
- Auto search facility for automatically locating desired section of tape in rewind or fast forward mode.
- Auto re-play facility for repeating playback automatically.

CR-6060

- Patented dubbing mode (switch) for bypassing built-in APC circuit; permits processing of signal by receiving VCR, VTR, time base corrector, etc.
- Timer start capability — for automatic recording off-the-air material, with a monitor/receiver or an outboard tuner-timer.

Dimensions: 20¾"(W) x 7-11/16" (H) x 17¾"(D)
(526mm x 195mm x 450mm)
Weight: 58 lbs. (26 kg.)

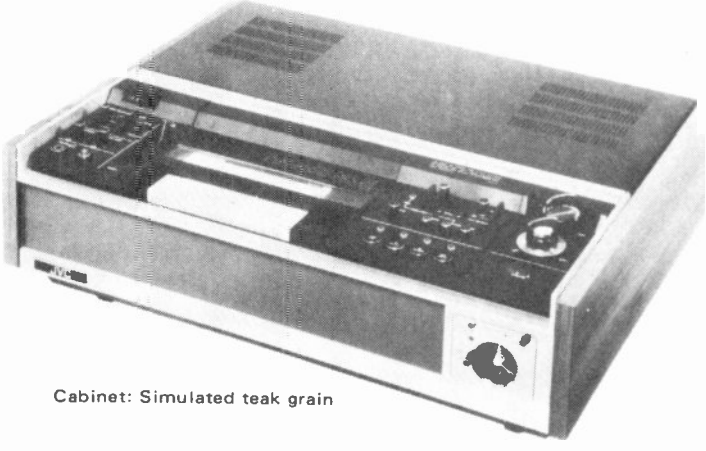
Model CR-6300U Videocassette Recorder

MODEL CR-6300U VIDEOCASSETTE RECORDER

The CR-6300U is based on the CR-6100U with all its features; additionally it provides still-frame capability in playback and pause capability in recording. A single Still/Pause lever gives you still pictures in playback and lets you stop the tape temporarily during recording.

An RF plug-in converter, KR-256U, switchable to channel 5 or channel 6, is a standard accessory for the CR-6300U only.

Dimensions: 24-1/16"(W) x 7-11/16"(H) x 17¾"(D)
(610mm x 195mm x 450mm)
Weight: 64 lbs. (29 kg)



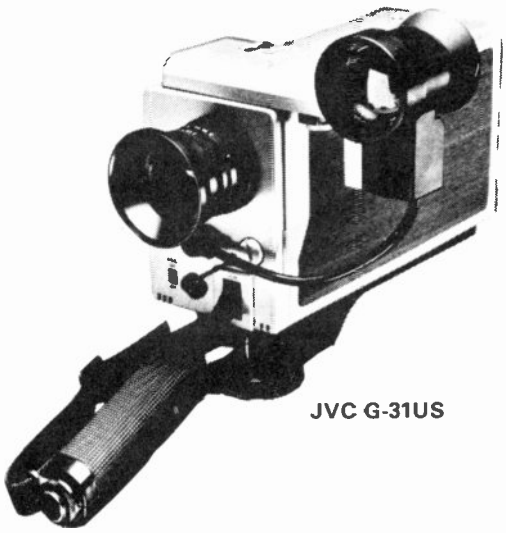
Cabinet: Simulated teak grain

CR-6300U

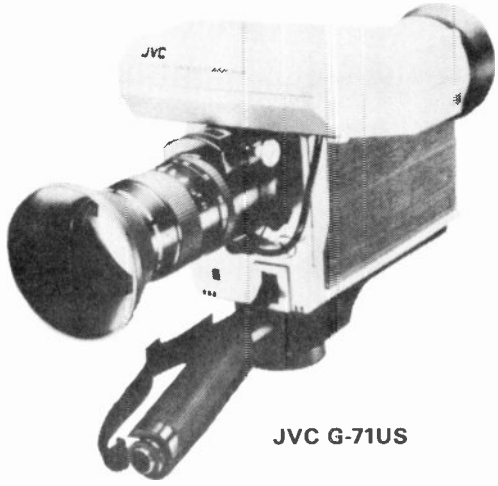
Prices and Specifications Subject to Change Without Notice.

Circle (79) on Reader Service Card

JVC G-31 Color Video Camera



JVC G-31US



JVC G-71US

JVC G-31US/G-71US Two versions of the same camera; the change is in viewfinder and lens. Uses one 1" uni-electrode striped filter vidicon with built-in color circuitry and phase frequency separation (PFS) that adjusts to changing light levels. Has condenser microphone built into hand grip and can use power from rechargeable batteries, "D" cell batteries, the VCR, or AC via an adaptor. The G-31US has a 25mm, f/1.8, "C" mount lens and an optical viewfinder; the G-71US has a 6:1, f/2.0 zoom lens with automatic iris and a 1.5" electronic viewfinder. Both types of viewfinder have LED indicators for overexposure, underexposure, and VCR on/off with flash to indicate the final 10 minutes of battery power. Camera also has automatic gain control and comes with a multi-pin cable, the AC adaptor, and an outdoor filter. *Outputs:* Video—1V p-p, 75 ohms; Audio— -20 dB low-Z. *S/N:* Better than 40 dB, luminance. *Hor. resolution:* More than 230 lines, center. *Added gain:* Automatic control to +/-6 dB. *Sensitivity:* 100 Lux (9 footcandles) minimum at f/1.8, 3,200°K indoors, 6,500°K outdoors with filter. *Cable/connector:* 12-pin, multi-conductor. *Power:* 12V DC; 9W (G-31US) or 12W (G-71US). *Dimensions:* 225mm(l) x 200mm(H) x 93mm(W). *Weight:* G-31US—4 lbs.; G-71US—6.1 lbs., 8.1 lbs. including battery.

Options: HR-4100 camera cable, extension cable (for operation up to 86' from VCR), battery kit with battery, charger, case.

The single-tube camera employs a conventional black-and-white TV vidicon with a special striped filter which reproduces a true color picture by using unique circuitry. Through this approach, JVC has achieved high productivity and low cost in a high performance color video camera.

Video playback capability is built into the electronic viewfinder on the G-71 camera. Used with any of JVC's Vidstar decks, this allows recorded material to be played back immediately through the viewfinder's 1.5-inch black and white TV screen.

Designed to be held while resting against the shoulder, for more stable shooting, the portable camera weighs 4 pounds with optical viewfinder and fixed lens (G-31), and 6.1 pounds with electronic viewfinder and zoom lens (G-71). Power usage is 9 watts in normal operation, 12 watts with electronic viewfinder.

Included in the system is a universal-type camera cable, for connection to any ½-inch videocassette recorder. By adding cable extensions, the camera can be operated on AC up to 86 feet away from the recorder.

When the Automatic Gain Control (AGC) is used the camera sensitivity adjusts to help correct underlit or overlit scenes by +/-6dB (6dB equals one F stop).

An outdoor filter accessory acts as a color temperature adjustment for natural daylight shooting. (A sun-gun clip is also provided.) The result is sharp, Vidstar-quality color.

A significant price breakthrough in video color cameras has been achieved by JVC, which recently introduced a low price portable color video camera.

The unit is the third Vidstar Color Camera in JVC's expanded line of ½-inch videocassette equipment.

The camera operates from either batteries or AC power and is available in two versions.

In its basic version, Model G-31 comes with fixed 25mm "C" mount lens (F1.8) and optical viewfinder with three LED indicators. The Model G-71 version is equipped with auto iris 6:1 zoom lens (F2.0) and 1.5-inch electronic viewfinder with three LED indicators.

All color control circuitry for the self-contained "G" cameras is built-in, eliminating the need for a separate Color Control Unit (CCU). Built into the hand grip is a condenser microphone.

Both models have as standard accessories an outdoor filter, AC adaptor, hand grip with built-in microphone and a multi-pin cable for use with any ½-inch VCR.

The unprecedented low price of the JVC "G" Series cameras is in part the result of a unique circuitry system developed by JVC engineers.

Called Phase Frequency Separation (PFS), this technological advance provides a high-quality color picture in varying light levels. If lighting conditions are either too bright or too dim, the PFS System automatically adjusts for the proper amount of illumination.

Prices and specifications subject to change without notice

Circle (80) on Reader Service Card

JVC

CY-8800U

Lightweight ENG Color Camera

This self-contained three-tube color camera is designed for professional quality, remote production. It is compact, rugged, and lightweight, ideally suited for ENG and EFP as well as studio applications.

The CY-8800U's sensitivity and signal-to-noise ratio are high; however, power consumption is very low, via an optional AC adaptor, or with an external +12V DC source.

The 1.5 inch (38 mm) viewfinder adjusts easily for maximum operator convenience. Also the handgrip contains both a VCR trigger switch and an open/close switch for the optional auto-iris 10 to 1 zoom lens. The controls and indicators are conveniently located on both sides of the camera.

Features

- Built-in color bar generator • Built-in auto white balance
- Built-in waveform sampler • Battery warning circuit
- Auto-iris circuit • Sensitivity doubling (+6 dB or +12 dB)
- Built-in horizontal and vertical contour correction
- Built-in filters: turret-type ND filter • Electronic and manual color temperature correction
- Fast warm-up time, full specification: 5 minutes

Model	Description
CY-8800US	with Saticon** tubes
CY-8800US10	with Saticon** tubes, F1.9 10mm - 100mm zoom lens, shipping case and KA880 hand grip
CY-8800US12	with Saticon** tubes, F1.7 9mm - 108mm auto iris zoom lens, and shipping case
CY-8800UP	with Plumbicon* tubes
CY-8800UP10	with Plumbicon* tubes, F1.9 10mm - 100mm zoom lens, shipping case and KA880 hand grip
CY-8800UP12	with Plumbicon* tubes, F1.7 9mm - 108mm auto iris zoom lens, and shipping case

OPTIONAL ACCESSORIES FOR CY-8800U

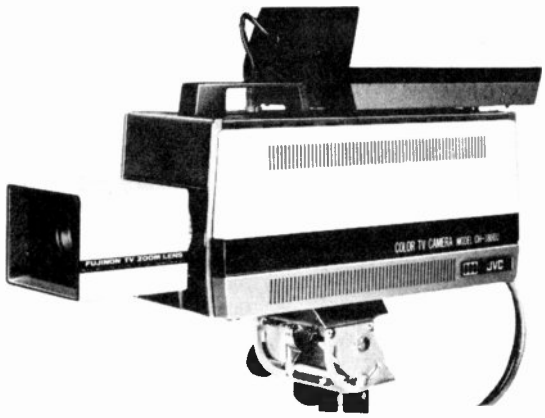
Model	Description
HZ-8100U	F1.9 10mm - 100mm auto iris zoom lens
N12 x 9R	F1.7 9mm - 108mm auto iris zoom lens
VF-8801U	3" electronic viewfinder
RS-8800U	Remote and synchronizing unit with (VC-550 cable and 66 ft.)
GN-8800U	Portable Gen lock unit with (VC-586 5 ft. cable)
VC-550	66 ft. remote cable
VC-551	163 ft. remote cable
VC-552	333 ft. remote cable
VC-553	495 ft. remote cable
VC-582	33 ft. 10 pin - 10 pin extension cable
VC-583	33 ft. 4 pin - 10 pin AC power supply cable
KA-880	Hand grip with VCR start/stop button, return video button, iris open/close button
CDK-1	Cable drives for 12 x 1 zoom (servo zoom & manual focus)
CDK-2	Cable drives for 12 x 1 zoom (servo zoom & servo focus)

Prices and specifications subject to change without notice

Circle (81) on Reader Service Card

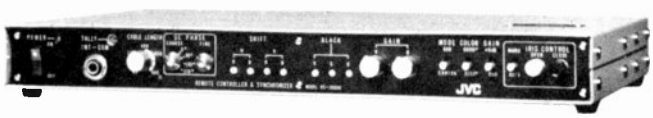
JVC

NU-1800U Color Video Camera



The NU-1800U, consisting of the CH-1800U camera head, VF-1800U viewfinder and HZ-1800U zoom lens, is a three-tube, professional quality "self-contained" TV camera, with built-in CCU. Compact and lightweight, it combines studio quality with operation simple enough for non-technical personnel. Dimensions: 7-3/16"(W) x 12-7/16"(H) x 24-7/16"(D) (182 mm x 315 mm x 620 mm). Weight: 28.7 lbs. (13kg).

DESCRIPTION: CH-1800U Camera Head — NTSC-type color signals directly from the camera head. Video adjustment indicator (VAI) in the viewfinder for adjusting color balance. Three-tube system with dichronic mirror color-separation. Internal color bar generator for checking encoder performance. Color temperature compensation for different lighting conditions by a switch located on the camera control panel. The iris functions in the automatic or manual mode. Controls on the rear panel for adjustment of camera registration. +/ dB gain switch for doubling sensitivity for low light conditions. Built-in ND filters — closed, 3%, 25% transmission, and open — can be selected by the rotary dial. All C-mount zoom lens, in both 1" and 2/3" formats, may be used. All circuits are constructed in plug-in module form for convenient servicing. VH-1800U Viewfinder — Video signal indicator (VSI) for at-a-glance checking of the light level and iris control. Video adjustment indicator (VAI) for black level and white balance. Video signal select switches for independently checking of R, G, B, -G and color encoded output. AUX video monitor switch for viewing the video signal fed back from a multi-camera system. HZ-1800U Zoom Lens — 6X (12.5 to 75 mm) f/1.8 zoom lens with C-mount. Automatic and manual iris control.



RS-1800U Remote & Synchronizing Unit

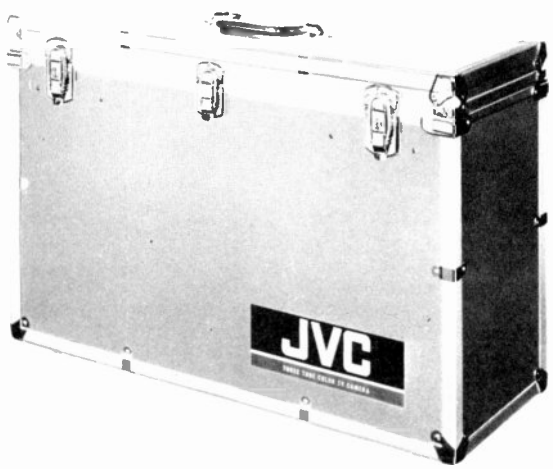
All electronic controls on the NU-1800U Color Camera head (with built-in CCU) are duplicated on this unit, permitting remote control operation of the camera. The RS-1800U also serves as a gen-lock coupler when two or more cameras are incorporated in a system. The unit accepts SYNC, BL, BFP and SC signals for external synchronization of the cameras, and is equipped with built-in cable length compensator, sub-carrier phase shifter, tally and intercom facilities. Only 1¾" (44 mm) high, the unit can be mounted on EIA standard 19" racks with adapters.

SG-1820U Color Sync Signal Generator (Gen-Lock type)

The SG-1820U incorporates a 14.3 MHz crystal oscillator, sub-carrier phase shifter and H-phase shifter. In the internal sysnc mode the SG-1820U produces all required pulses. In the external sysnc mode it locks the pulses to the NTSC-type composite video signal, SYNC + SC, or SYNC supplied from another optional unit. This permits mixing camera signals with VCR, VTR or off-the-air signals.

SG-1800U Color Sync Signal Generator

The SG-1800U sync signal generator produces SC, HD, VD, BL, SYNC and BFP pulses for use in the color video system. The sub-carrier of the unit is frequency-interleaved. Sync pulses provide EIA-type 2:1 interlacing. (RS-170)



CB-1800U Color Camera Shipping Case

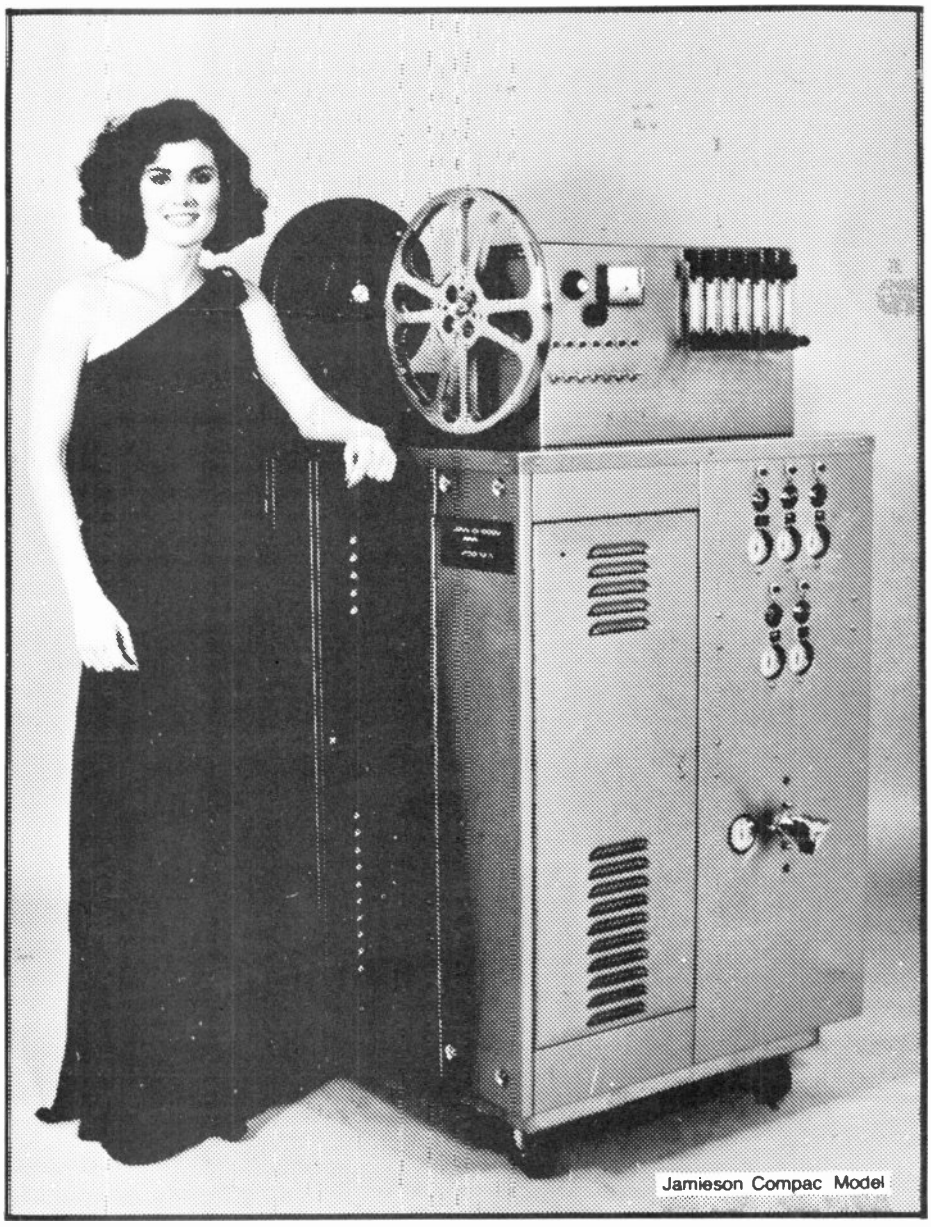
A specially-designed metal case, which protects the NU-1800U system during transport. Dimensions: 10-3/8"(W) x 18¾"(H) x 27¾"(D) (263 mm x 475 mm x 704 mm) Weight: 19.2 lbs. (8.7 kg)

VC-521U Camera Cable

34-pin (female) — 34-pin (male) for connecting the NU-1800U to the RS-1800U. Several cables can be interconnected with each other.

Prices and Specifications Subject to Change Without Notice.

JAMIESON COMPAC


Jamieson Compac Model

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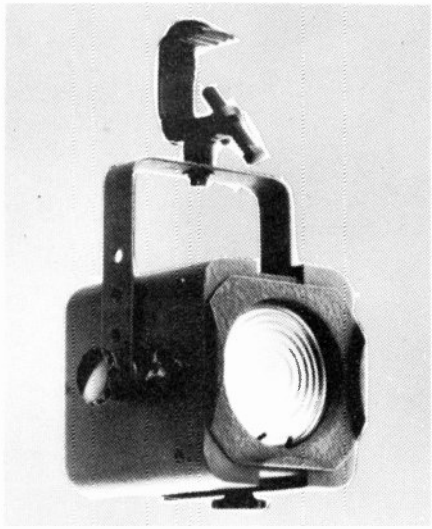
Circle (83) on Reader Service Card

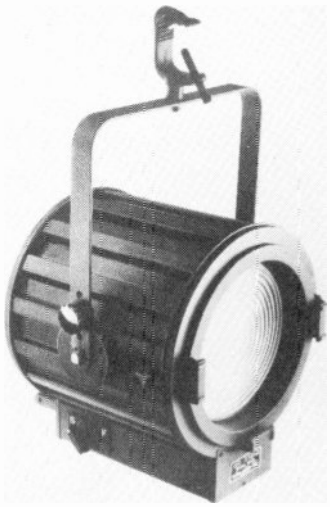
kliegl

Key and Back Lights



3604TV

3606TV



3610TV

ALL UNITS PROVIDED WITH 36 INCH LEADS, C-CLAMP, SAFETY CABLE AND CONNECTOR

CATALOG NUMBER	DESCRIPTION	PRICE
3604TV	4½" 750W quartz Fresnel, slide focus	$120.00
23604TV	4 way Barndoor	38.00
13604TV	Color Frame	5.00
	QUARTZ LAMPS FOR3604TV:	
	BSP 500W 3200°K 100 hrs.	33.75
	BWM 750W 3200°K 200 hrs.	49.50
3606TV	6-3/8" 750W Quartz Fresnel	130.00
23606TV	4 way Barndoor	40.00
13606TV	Color Frame	6.00
	QUARTZ LAMPS FOR 3606TV:	
	EHC 500W 3200°K 500 hrs.	34.00
	EHF 750W 3200°K 300 hrs.	38.00
3608TV	8" 1000W Quartz Fresnel	200.00
23608TV	4 way Barndoor	50.00
13608TV	Color Frame	7.00
	QUARTZ LAMPS FOR 3608TV:	
	CYV 1000W 3200°K 200 hrs.	58.00
	CXZ 1500W 3200°K 325 hrs.	83.25
	CYX 2000W 3200°K 250 hrs.	74.00
3610TV	10" 2000W Quartz Fresnel	300.00
23610TV	4 way Barndoor	86.00
13610TV	Color Frame	9.00
	QUARTZ LAMP FOR 3610TV:	
	CYX 2000W 3200°K 250 hrs.	74.00
3612TV	12" 5000W Quartz Fresnel	310.00
23612TV	4 way Barndoor	100.00
13612TV	Color Frame	15.00
	QUARTZ LAMP FOR 3612TV:	
	DPY 5000W 3200°K 500 hrs.	293.50
3616TV	16" 10000W Quartz Fresnel	P.O.A.
23616TV	4 way Barndoor	P.O.A.
13616TV	Color Frame	P.O.A.
	QUARTZ LAMP FOR 3616TV:	564.00
	DTY 10000W 3200°K 300 hrs.	

NOTES: Oval Beam® 8" Fresnels available on Special Order

Pole-operated Fresnels available on Special Order

P.O.A. — Price On Application

ADD SUFFIX TO CATALOG NUMBER TO SPECIFY PROPER CONNECTOR

—UG Parallel blade U-ground, U.L. listed
—955G 3 pole pin connector, U.L. listed
—TLG 3 pole twistlock, U.L. listed

Prices and specifications subject to change without notice

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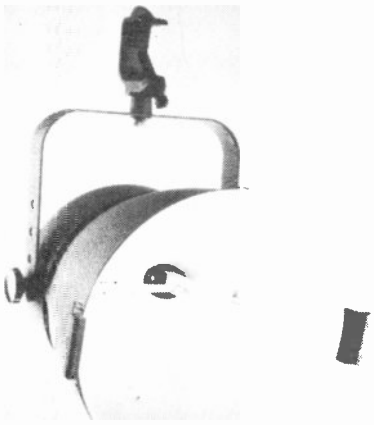
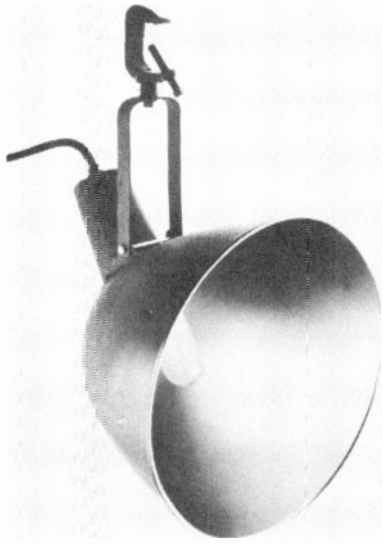
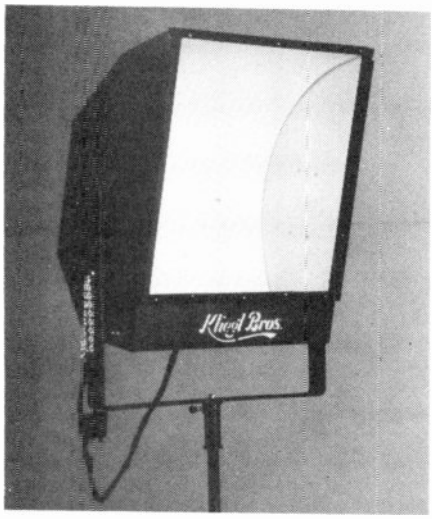
Base and Fill Lights



3451TV



1155TV



6914TV

ALL UNITS PROVIDED WITH 36 INCH LEADS, C-CLAMP, SAFETY CABLE AND CONNECTOR

CATALOG NUMBER	DESCRIPTION	PRICE
3450TV	12" 500/750W Quartz Scoop	$100.00
13450TV	Color Frame	25.00
	QUARTZ LAMPS FOR 3450TV:	
	FDN 500W 3200°K 400 hrs. frosted	20.00
	EMD 750W 3200°K 400 hrs. frosted	27.75
3451TV	16" 1000W Quartz Scoop	110.00
3452TV	16" 1000W Focusing Quartz Scoop	145.00
13451TV	Color Frame	20.00
	QUARTZ LAMPS FOR 3451TV/3452TV:	
	FDN 500W 3200°K 400 hrs. frosted	20.00
	EMD 750W 3200°K 400 hrs. frosted	27.75
	FHM 1000W 3200°K 300 hrs. frosted	25.50
1155TV	18" 2000W Quartz Scoop	120.00
11155TV	Color Frame	30.00
	QUARTZ LAMPS FOR 1155TV:	
	DSE 1000W 3200°K 500 hrs.	36.00
	DSF 1500W 3200°K 500 hrs.	36.00
	BWL 2000W 3200°K 750 hrs.	104.00
6912TV	2000W Soft Light	475.00
16912TV	Color Frame	35.00
	QUARTZ LAMPS FOR 6912TV:	
	FHM 1000W 3200°K 300 hrs. frosted	25.50
6914TV	4000W Soft Light	475.00
16912TV	Color Frame	35.00
	QUARTZ LAMPS FOR 6914TV:	
	FFW 2000W 3200°K 125 hrs.	52.50

DIFFUSION MATERIALS

CATALOG NUMBER	DESCRIPTION	PRICE
TSP-2TV	Tough Spun. Replaces spun glass. Roll 48" x 25 feet.	$ 60.00
TSK-2TV	Tough Silk. Same diffusion qualities as real silk. Roll 48" x 25 feet.	60.00
835TV	Spun glass. Roll 36" x 12 feet.	20.00

NOTE: Softlights require 2 lamps each.

ADD SUFFIX TO CATALOG NUMBER TO SPECIFY PROPER CONNECTOR

—UG Parallel blade U-ground, U.L. listed
—955G 3 pole pin connector, U.L. listed
—TLG 3 pole twistlock, U.L. listed

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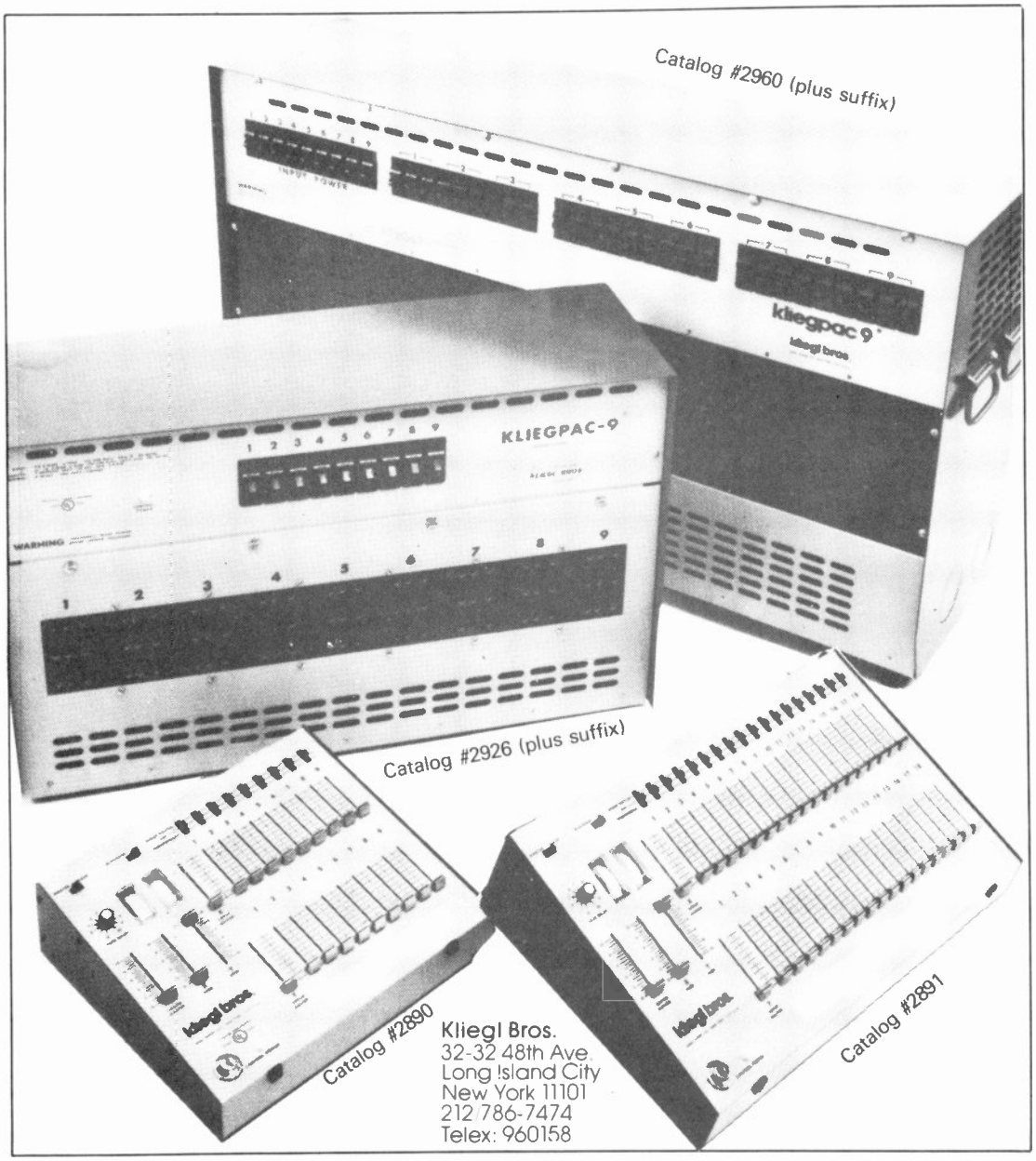
Kliegpac 9 specifications

Standard Systems (Include Dimmer Bank, Control Console and Control Cable)

System #	Description	Dimmer Bank #	Control Console #	Price $
4000/TLG	9 — 2.4 KW Dimmers. Twistlock Receptacles	2926/TLG	2890	3,600.00
4000/9555G	9 — 2.4 KW Dimmers. Pin Connector Receptacles	2926/955G	2890	3,600.00
4000/UG	9 — 2.4 KW Dimmers. U Ground Receptacles	2926/UG	2890	3,600.00
4000/S	9 — 2.4 KW Dimmers. Terminal Strip Output	2926/S	2890	3,400.00
5000/955G	9 — 6.0 KW Dimmers. Pin Connector Receptacles	2960/955G	2890	7,400.00
5000/S	9 — 6.0 KW Dimmers. Terminal Strip Output	2960/S	2890	6,400.00

NOTE: A #2892 Control Cable is furnished with each system.



Prices and Specifications Subject to Change Without Notice.

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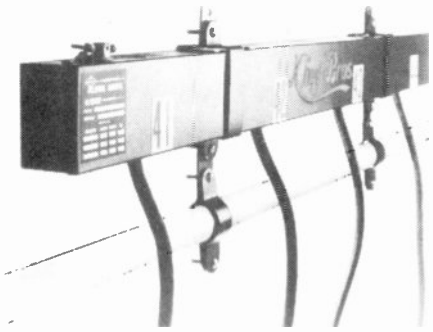
Studio Lighting Packages

SIX STUDIO LIGHTING PACKAGES

These packages have been designed and engineered by Kliegl to cover a broad spectrum of studio lighting applications as they apply to most commercial, educational, and industrial users. Each package has been carefully laid out to ensure that the compliment of lighting fixtures, distribution equipment and the lighting control system will prove adequate in the area for which it is designed.

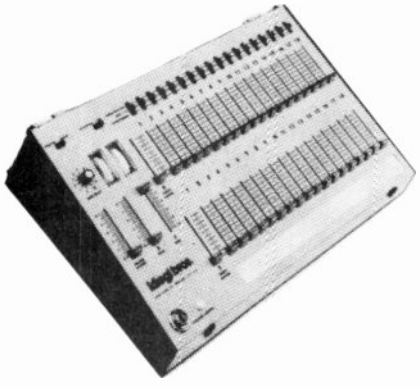
LIGHTING FIXTURES

LIGHTING FIXTURES — A varying compliment of Key, Back, Base, Fill and Set lights, including their accessories, are provided in every package. Pattern Projectors and special Cyc lighting instruments are included in certain packages. All fixtures are provided with 36" leads, C-clamp, safety cable and connector.



DISTRIBUTION EQUIPMENT

DISTRIBUTION EQUIPMENT — Wireway connector strips and wall outlet boxes are provided in various quantities for each package (except the STUDIO/FIELD Package, which uses a portable plugging box), in order to ensure proper power distribution throughout the specified studio. Cyc drop boxes are also used in the two larger packages for powering the cyc lighting units.



LIGHTING CONTROL SYSTEM

LIGHTING CONTROL SYSTEM — A solid state, low voltage control dimming system has been designed for each of the studio packages. Each system consists of an SCR Dimmer Bank, a Safpatch Panel, a portable 2 Scene Control Console and Plugging Box. The STUDIO/FIELD Package has the **option** of using a KLIEGPAC 9 portable dimming system in place of the portable Plugging Box normally provided.

In addition to the above, each of the studio packages contain a studio layout, the power requirements of the package, a system riser (flow) diagram and pricing information for budgeting purposes. The packages are listed as follows:

CATALOG NUMBER	PACKAGE DESCRIPTION	PRICE $
771015	STUDIO/FIELD	2,286.00
771520	15' x 20' (300 sq. ft.)	10,447.00
771825	18' x 25' (450 sq. ft.)	17,134.00
772030	20' x 30' (600 sq. ft.)	20,926.00
773040	30' x 40' (1200 sq. ft.)	45,638.00
774060	40' x 60' (2400 sq. ft.)	76,015.00

Kliegl is also available to work with you in the custom design of a lighting control and distribution system to meet your studio needs. Memory control is available using the affordable PERFORMANCE lighting control system. Please contact your Kliegl video dealer, sales representative or the factory direct, in order to arrange for a no-obligation review of your studio requirements.

Prices and Specifications Subject to Change Without Notice.

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32-32 48th Ave.
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212/786-7474
Telex: 960158

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Remote Lighting Kits

Kliegl kit 4Q-TV

Portable Kit for
150 Sq. Ft. Area

Kliegl kit 5Q-TV

Portable Kit for
225 Sq. Ft. Area

The KLIEGLKIT 4Q-TV and 5Q-TV provide the ideal solution to the lighting requirements encountered in the remote TV and film location applications of today. In addition to portability, these kits contain the types of lighting fixtures the lighting professional needs in equipping an O.B. van for Electronic News Gathering.

The two kits are identical except for the inclusion of an additional SPOT head, with accessories, in the 5Q-TV kit. The carrying cases for either kit are the same. This allows one to start with a 4Q-TV kit and later add an additional SPOT or FLOOD head, with accessories, as required.

Contents of 4Q-TV

2 — #1720-UG	1000W Focusing SPOTS with Switch, 20' Cord
2 — #11720	Diffuser Frames
2 — #21720	4-Way Barn Doors
2 — FBY	1000W Quartz Lamps
2 — #1750-UG	1000W FLOODS with Switch, 10' Cord
2 — #21750	4-Way Barn Doors
2 — FHM	1000W Quartz Lamps
4 — #14360	Folding Stands
2 — #25E16/3UG	Extension Cables, 25'
1 — #1700CC	Carrying Case

PRICE $1,115.00

Contents of 5Q-TV

3 — #1720-UG	1000W Focusing SPOTS with Switch, 20' Cord
3 — #11720	Diffuser Frames
3 — #21720	4-Way Barn Doors
3 — FBY	1000W Quartz Lamps
2 — #1750-UG	1000W FLOODS with Switch, 10' Cord
2 — #21750	4-Way Barn Doors
2 — FHM	1000W Quartz Lamps
5 — #14360	Folding Stands
2 — #25E16/3UG	Extension Cables, 25'
1 — #1700CC	Carrying Case

PRICE $1,390.00

4Q-TV Power Requirements: 120V AC/DC at 33.3 Amps. Weight: 64 lbs. 5Q-TV Power Requirements: 120V AC/DC at 41.66 Amps. Weight: 75 lbs.

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Long Island City
New York 11101
212/786-7474
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These kits may be purchased through your stocking video dealer.

Contact him today!

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VIDEO PRODUCTS

9700-B George Palmer Hwy.
Lanham, MD 20801

Telephone: (301) 459-2106
TLX: 89-8327

K128 Character Generator Specifications

General Description: Keyboard entry device for purpose of generating high resolution white alpha-numerics in video form. Unit self-contained requiring only AC power and sync pulse train. Used as video source or downstream keyer-inserter. Allows entry of information at any location on page. Audio I/O included.

Character Specifications: Display Format: 128 characters — 26 upper case, 26 lower case, 10 numerals, 26 typewriter symbols, 10 math symbols, 8 Greek letters, 11 foreign language letters, 9 special symbols, 1 flash, 1 space. Character resolution: 768 elements (32 horizontal x 24 vertical); Nominal character height: 32 scan lines, large, 16 scan lines, small: Page format: programmable 17 - 24 character/line, 8 lines/page.

Input: Full interlace composite video-sync per EIA RS170, RS330, EIAJ or similar standards.

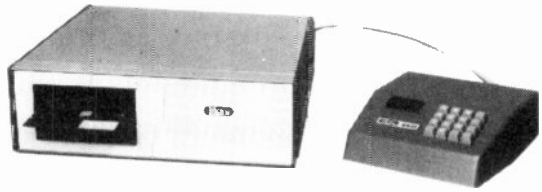
K128

KD-128 Expansion Memory Unit

Fast random access page storage on flexible magnetic "Diskettes," to expand K128 titling system.

General Description: The KD-128 is a general purpose memory device containing up to 109K bytes of permanent memory, organized as 280 pages of 8 bit words.

When used with K128 equipped with roll and/or crawl, the KD-128 pages can be linked together to form credit rolls or news bulletins of up to 280 full pages.



KD-128

K50 Titling Unit

General Description: Keyboard entry device for purpose of generating white alphanumerics information in video form. Unit self-contained requiring only AC power and sync pulse train. Used as a video source of downstream keyer-inserter. Allows entry of information at any location or page. Independent program/preview channels. 4 full pages of memory.

Character Specifications: Display format: 64 characters — 26 upper case, 10 numerals, 27 typewriter symbols, 1 space. Character resolution 7 x 9 dot matrix. Nominal character height 36 scan lines. Page format: 16 characters/line; 8 lines/page.

Input: Full interlace composite video-sync per EIA RS170, RS330, EIAJ, or similar standards.

K50

TITLERS

K50 4 Page Character Generator ..... $ 995.00
KS50 With Factory Installed Sync 1145.00
KX50 With Factory Installed:
Crystal Controlled Internal Sync
Character by Character Flash
Automatic Timed Page Advance
Crawl Function 1495.00
Factory Available Upgrades for K50 & KS50
KS Upgrade 200.00
KX Upgrade 600.00
K60 4 Page Character Generator
(32 Character/16 line) 1295.00

K128 SYSTEM

K128 High Resolution 2 Page Character Gen. $3250.00
With MF246 Five Font Option 4450.00

OPTIONS & ACCESSORIES:

RC128TS Factory Installed 3 Speed Roll/Crawl ..... $ 750.00
RC128VS Variable Speed Roll/Crawl 1000.00
PP128 Independent Program/Preview 950.00
AC128 Automatic Centering 550.00
IP008 Eight Internal Pages
(With PP128 Only) 500.00
DS128 Double Size Characters $1000.00
KM32 Companion 32 Page Memory for K128 ..... 1875.00
KD128 Minifloppy Disc System—280 Pages 4250.00

K128/MOD8

Includes K128, Roll/Crawl, Auto Center
Independent Program/Preview, and 8 Internal
Pages of Memory 5250.00
With MF246 Five Font Option 6350.00

K128/MOD16

Includes K128, Roll/Crawl, Auto Center, 16 Internal Pages,
Independent Program/Preview, 3 Position Title
Window, and MF246 Five Font Option 7250.00

KMS128

Includes K128, Roll/Crawl, Auto Center, Independent
Program/Preview, and KM32 Companion Memory
(32 Pages) 6875.00
With MF246 Five Font Option 7975.00

KDS128

Includes K128, Roll/Crawl, Auto Center, Independent
Prog/Prev, and KD128 Floppy Disc System $8950.00
With MF246 Five Font Option 9950.00
Spare Diskettes 10.00

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(412) 279-2264

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Prospect, KY 40059
(502) 228-4898

EMC Corporation
2979 Ualena Street
Honolulu, HI 96819
(808) 847-1138

EME
112 Buena Vista
High Point, NC 27260
(919) 869-3335

Mile High
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Bldg. 3, Suite G10
Denver, CO 80222
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Oscar Kraut
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New York, NY 10002
(212) 228-5511

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Light-weight Video Equipment and Instrument Carriers

Model 3000

Designed For SONY Video Equipment

Will carry most other equipment

Features of carrier:

- All-anodized aluminum — lightweight
- Completely-welded unit
- Locking casters on front and handle
- 21" wheelbase on 16" spoke wheels with ball bearings
- Easy up and down stairs or over rough ground
- Completely-padded shelves
- Room for tapes
- Convenient cable holders
- Drilled plate in handle to accept camera elevator — 2¼" hole
- Easy to put in truck or station wagon
- F.O.B. Mesa, Arizona
- We ship U.P.S.
- 1-year limited structural warranty

Options:

- Waterproof dust cover
- Heavy-duty AC strip-switch, light circuit breaker and mounting bracket
- Gimbeled battery box

Model 3000

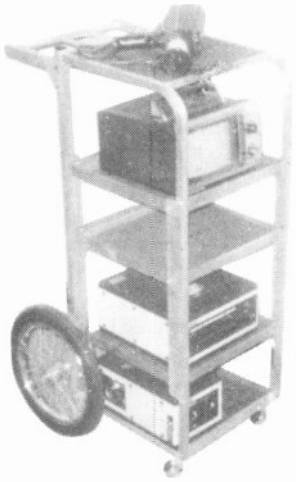
- Tripod and light-holding attachment
- Light tubes

Model 4000 ADD-A-SHELF

Ideal for: Schools, colleges, hospitals, factories, or studios

Features of Carrier:

- Main Feature — ***Light-weight***
- All anodized aluminum
- Welded unit
- Bolt-in padded shelves
- Space shelves to fit your equipment
- Safety straps each shelf
- Easy up and down stairs
- 16" spoke wheels — ball bearings air tires, on 21" wheelbase
- Locking castors on front
- Put in station wagon or truck
- Drilled plate in handle to accept camera elevator — 2¼" hole
- 1-year limited structural warranty
- F.O.B. Mesa, Arizona
- Total weight w/4 shelves — 26 lbs.
- Height 45". Length 26". Width 23".



Model 4000

Options:

- Additional shelves
- Waterproof dust cover

Deluxe ENG Carrier

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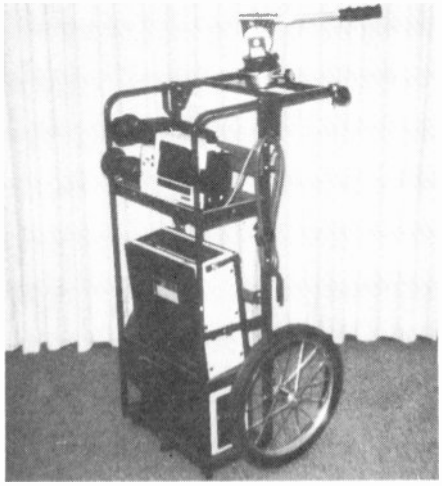
Carries The Complete Color Portable VTR System

Put All Your Equipment On Wheels

Model 3200 — 3 shelf carrier



Model 3200
Length: 18" — Width 23" — Height: 40"

Features:

- Rigid construction
- Completely welded unit
- One year limited structural warranty
- Designed and engineered to protect your video equipment
- 21" wheelbase — on 16" spoke wheels — ball bearings
- Easy to go up and down stairs
- Padded shelves for your equipment
- Room for tapes and batteries
- Convenient cable holders
- Camera plate drilled to accept 7900 Quick-set elevator
- Designed to ship U.P.S.
- F.O.B. Phoenix, Arizona
- Waterproof dust cover (optional)
- Semi-pneumatic tires
- Air-tires (optional)

Model 3300 — 4 shelf carrier

Model 3300
Length: 18" — Width: 23" — Height: 45"

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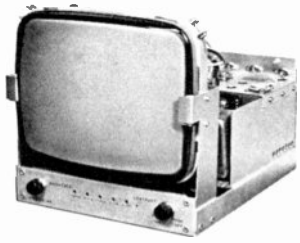
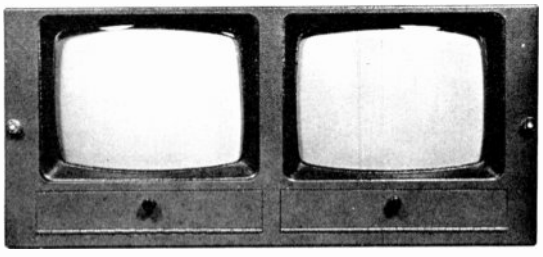
Professional Quality PMM-900 Series Monochrome Monitors

9" MONOCHROME VIDEO MONITOR



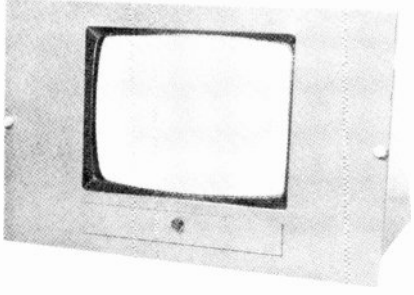
MODEL PMM-910

MODEL PMM-911

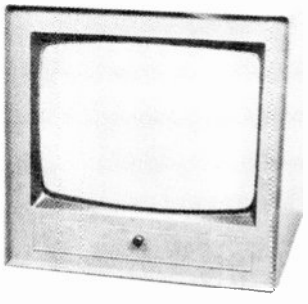


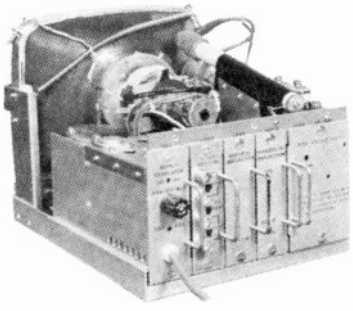
MODEL PMM-912

12" MONOCHROME VIDEO MONITOR



MODEL PMM-922





MODEL PMM-921

FEATURES:

- Professional Quality
- Modular Construction
- Cross Pulse Option
- 900 Line Resolution
- Underscan Option
- Regulated Low and High Voltage

The Lenco PMM-900 Series Monochrome Monitors is the most advanced design of professional monochrome video monitors in the industry. The 900 Series monitor is a high resolution display device for use in broadcasting, industrial, and educational facilities where quality and reliability are most required.

The 100% modular chassis consists of five individually shielded circuit modules that plug in directly from the rear of the chassis. This unique and exclusive feature simplifies any required servicing allowing for a minimum of down time. The five plug-in modules are common to all the 900 Series monitors regardless of CRT size.

The PMM-900 Series Video Monitors are designed for continuous operation and to give stable pictures without adjustment. The regulated low and high voltage power supplies maintains constant picture size and brightness with line voltages between 105 and 130 volts AC (or 210 to 260 volts AC).

The Lenco PMM-900 Series monitors 900 line center resolution provides outstanding picture clarity which is necessary in most studio and educational facilities. This sharp, bright picture provides excellent viewing even under high ambient lighting conditions. This is extremely important to ensure full details when used in surveillance or observation systems.

Video response is down 3 DB at 20 MHz providing for 900 line center and 750 line corner resolution. Differential gain of the video amplifier is less than 5% for 50 volt kinescope drive. Size of the raster can be switched from the front to show all four sides and corners. Optional cross pulse features can be provided to display the sync signals in the picture area for analysis. DC restoration is standard and is switchable on the rear panel.

The PMM-900 Series Video Monitors meet or exceed all EIA RS-170 specifications and are compatible with 525/60 U.S. and 625/50 CCIR scan rates.

9" VIDEO MONITORS		
PMM-910	Chassis Only	$699.00
PMM-911	Cabinet	755.00
PMM-912	Dual 9" units, Rack Mount	1450.00
PMM-913	Rack Mount, Right Side Blank	775.00
PMM-914	Rack Mount, Left Side Blank	775.00
PMM-915	Rack Mount for Tek 529 or 1480 Right Side	775.00
PMM-916	Rack Mount for Tek 529 or 1480 Left Side	775.00
PMM-917	Rack Mount for Tek 528 on Right Side	795.00
PMM-918	Rack Mount for Tek 528 on Left Side	795.00
12" VIDEO MONITORS		
PMM-920	Chassis Only	$725.00
PMM-921	Cabinet	799.00
PMM-922	Rack Mount	815.00
15" VIDEO MONITORS		
PMM-930	Chassis Only	$760.00
PMM-931	Cabinet	840.00
PMM-932	Rack Mount	850.00
19" VIDEO MONITORS		
PMM-940	Chassis Only	$840.00
PMM-941	Cabinet Only	935.00
PMM-942	Rack Mount	910.00
23" VIDEO MONITORS		
PMM-950	Cabinet	$950.00
MONITOR OPTIONS		
PMM-001	Module Extender Set (HV module and standard module)	$40.00
PMM-002	15" Monitor Ceiling Mounting Kit	75.00
PMM-003	19" Monitor Ceiling Mounting Kit	75.00
PMM-004	23" Monitor Ceiling Mounting Kit	75.00
PMM - 005	Pulse Cross	75.00
PMM - 006	Underscan	75.00

Prices and Specifications Subject to Change Without Notice.

LENCO, INC., ELECTRONICS DIVISION

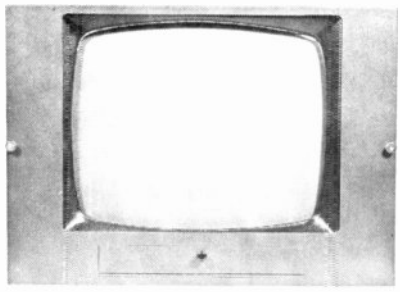
319 WEST MAIN ST.
JACKSON, MISSOURI 63755
(314) 243-3147

Professional Quality PMM-900 Series Monochrome Monitors

15" MONOCHROME VIDEO MONITOR

PMM-930

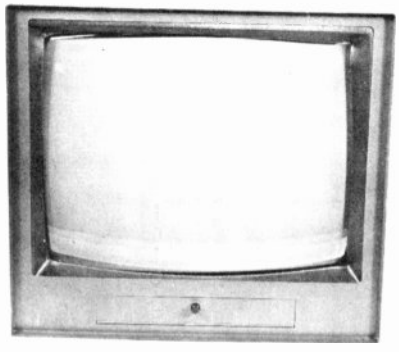
PMM-931



PMM-932

19" MONOCHROME VIDEO MONITOR

MODEL
PMM-941



23" MONOCHROME VIDEO MONITOR

SPECIFICATIONS

VIDEO INPUT:
- Level . . . . . 0.25 volts p-p to 2.5 volts p-p, negative sync
- Impedance . Bridging (loop-through) or 75 Ohm ± 5% terminated
- Connectors . . . . . 2 BNC female, UG1094/U

SYNC INPUT:
- Level . . . . . 1.0 to 8.0 volts p-p
- Impedance . . . . . bridging, loop-through
- Connectors . . . . . 2, BNC female, UG1094/U

PERFORMANCE:
- Frequency Response . . . . . -1.25 dB at 15 MHz & -3 dB at 20 MHz
- Differential Gain . . . . Less than 5% with 50 volts of kinescope drive
- Linearity . . . . . Less than 2% of raster height
- Resolution . . . . . 900 Lines Center, 750 Lines Corner
- Interlace . . . . . Better than 90%
- Raster Size Regulation . . . . . Less than 1% 0% to 100% APL
- Vertical Retrace . . . . . Less than 1000 uS
- Horizontal Retrace . . . . . Less than 10uS
- DC Restoration . . . . . Switchable, Zero or 100% Back Porch Clamp
- Discernable Grey Scale . . . . . 11 sections minimum
- System Standards . . . . . 525/60 EIA, 625/50 CCIR. Exceeds RS-170 Specifications.

POWER REQUIREMENTS:
- Power . . . . . 75 Watts
- Voltage . . . . . 120/240 volts AC at 50/60 Hz
- Regulation Input voltage, 105 to 130 volts, AC, 210 to 260 volts AC

CONTROLS
- Front Panel (under hinged cover) . . . . . On-Off, H-Hold, V-Hold, Height, Contrast, Brightness, Vertical Lin, Focus, Underscan, Pulse Cross
- Rear Panel . . . . . Horz Lin, Horz AFC, Vert Top Lin, Horz Freq, 120 VDC Adj, 24 VDC Adj

ENVIRONMENTAL:
- Temperature . . . . . 0° to 50° ambient
- Humidity . . . . . 5% to 90%

OPTIONS:
- Kinescopes . . . . . Etched anti-glare laminated safety shields
- Pulse Cross Delay . . . . . Displays sync signals in raster for analysis
- Pulse input . . . . . Separate horizontal and vertical pulse input replacing composite sync.

SAFETY:
- X-Radiation . . . . . Complies with the HEW safety rules (42CFR, Part 78, applicable at time of manufacture
- Underwriters Lab . . . . . This monitor has been designed to meet or exceed U/L and CSA (Canadian Standards Association) engineering standards and requirements.

Circle (93) on Reader Service Card

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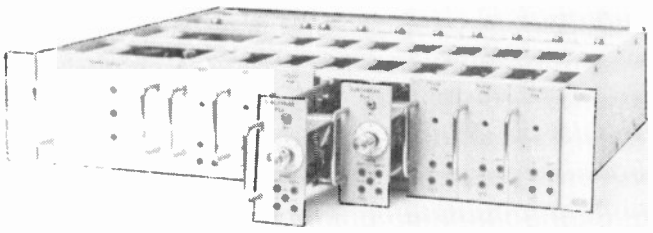
319 WEST MAIN ST.
JACKSON, MISSOURI 63755
(314) 243-3147

Modular Distribution Amplifier - Video, Pulse & Subcarrier



Lenco provides the most flexible family of distribution amplifiers available anywhere. The building block concept is used to provide for maximum flexibility and economy. You buy a basic video amplifier module and add "piggy back" boards to provide features such as: differential input, equalization, high gain and clamping. The pulse "D.A." is totally regenerative with its output fixed at 4 volts P.P. and width fixed equal to the incoming pulse at its 50% point. If delay is desired, add a "piggy back" delay board.
Each distribution amplifier has its own on board regulator which eliminates power supply crosstalk.

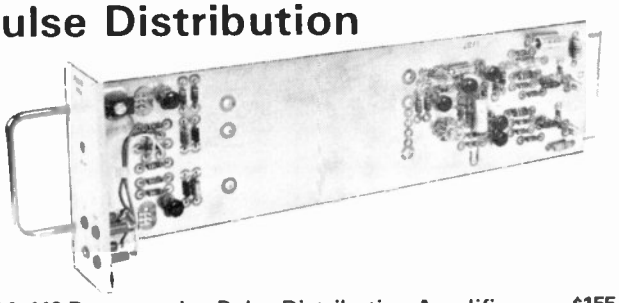
The PFM-100, eight module frame, houses a PPS-100 power supply and any combination of eight D.A.'s **$385.00**

PPS-100 Power supply for PFM-100 frame **$150.00**

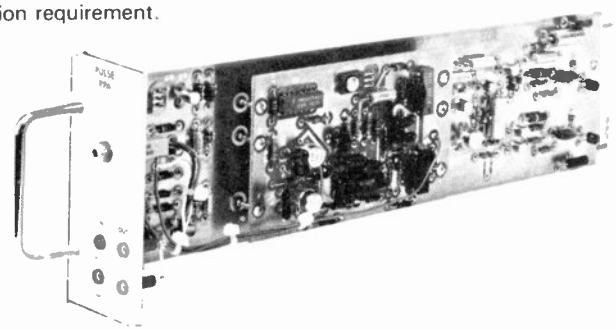
The PSF-200, four module frame, has a built in power supply, and will house any combination of four D.A.'s. **$400.00**

PFM-001 100 Series Blank Panel—Single Width **$33.00**
PFM-002 100 Series Blank Panel—Double Width **$38.50**
PFM-010 100 Series Extender Board **$42.50**

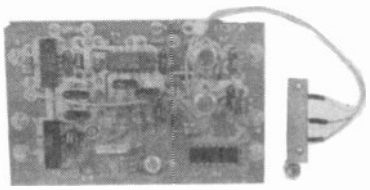
Pulse Distribution



PPA-110 Regenerative Pulse Distribution Amplifier **$155.00**
The PPA-110 is a basic regenerative pulse D.A. which can be adapted to a pulse delay D.A. with the addition of an accessory plug-in circuit board. The PPA-110 is useful for any type of pulse distribution requirement.



PPA-111 Regenerative Pulse Delay Distribution Amplifier **$240.00**
The PPA-111 is a PPA-110 Pulse Distribution Amplifier with the addition of a pulse delay circuit board. One control adjusts the total delay of both leading and training edges of the output pulse for maximum ease of adjustment. Minimum delay is 100 nanoseconds and maximum delay is 5.0 microseconds all with only one control. This amplifier can be strapped to provide two undelayed outputs and two delayed outputs. All other specifications are the same as the basic PPA-110 amplifier.

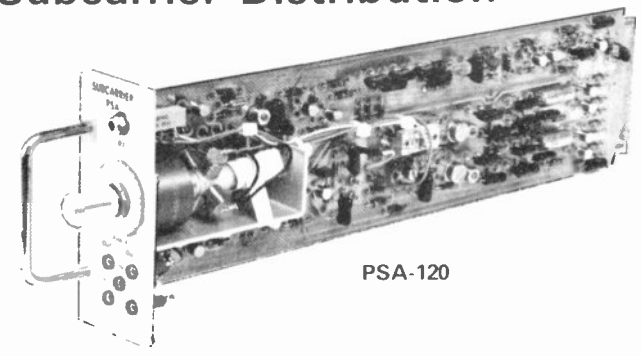


1137A Pulse Delay "piggy back" board **$85.00**
When plugged into a PPA-110, will delay two outputs, or all four outputs up to 5.0 microseconds.

SPECIFICATIONS

Input Impedance:	Greater than 60K ohms
Output:	Four, 75 ohm source terminated
Input Level:	1.0 V.P.P. minimum, 8.0 V.P.P. maximum
Output Level:	4.0 V.P.P. ± 5%
Output Pulse Width:	Equal to the width of the input pulse at the 50% amplitude point.
Isolation between Outputs:	Greater than 40 db
Tilt and Overshoots	Less than 1.0%
Rise and Fall Time:	100 N Sec. ± 20%
Delay:	100 N Sec
Hum and Noise:	Greater than —60 db
Temperature:	0° C to 50° C ambient
Test Points:	Input, Output, + 12 V, — 7.4 V
Front Panel Controls:	None
Internal Controls:	None

Subcarrier Distribution



PSA-120

PSA-120 Subcarrier Distribution Amplifier..... **$275.00**
The PSA-120 is, in effect, two cascaded subcarrier DAs with each having two 75 ohm outputs. Subcarrier is totally regenerated so that the purity of the output signal is not affected by the input waveshape. A goniometer is used to provide continuous phase control of all four outputs. The phase of the second set of outputs is adjustable, relative to the goniometer, by internal 90° steps and a veneer front panel control.

Prices and Specifications Subject to Change Without Notice.

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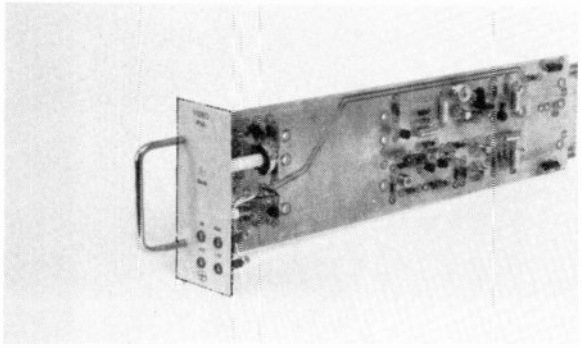
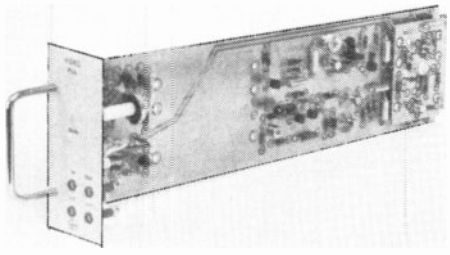
Video Distribution



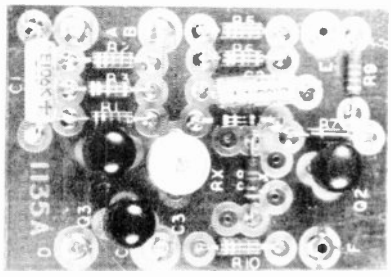
PVA-100 Basic Video Distribution Amplifier **$175.00**
The PVA-100 is a basic video distribution amplifier which can be adapted for expanded use. The PVA-100 specifications are common to all Lenco video distribution amplifiers.

SPECIFICATIONS

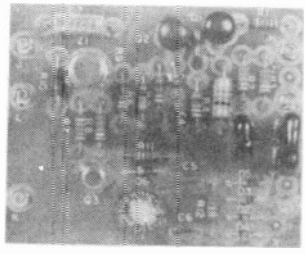
Input Impedance:	Greater than 50K ohms, Less than 15 pf
Output:	Four, 75 ohms source terminated
Input Level:	0.5 to 2.0 volts P.P. (Comp. or Non-Comp.)
Output Level:	0.5 to 2.0 volts P.P. (Comp. or Non-Comp.)
Isolation between Outputs:	Greater than 40 db at 3.58 MHz
Gain:	± 6 db
Frequency Response:	± 0.1 db to 8.0 MHz — 0.5 db at 15 MHz
Tilt and Overshoots	Less than 1.0%
Differential Gain:	0.1%, 10-90% APL 1.0 V.P.P. output
Differential Phase:	0.1 , 10-90% APL 1.0 V.P.P. output
Hum and Noise:	Greater than —60 db at 1.0 volt input and output
Temperature:	0 ° C to 50 ° C ambient
Test Points:	Input, Output, + 12V, — 12 V
Front Panel Controls:	Gain ± 6 dB
Internal Controls:	Frequency response, Output DC offset



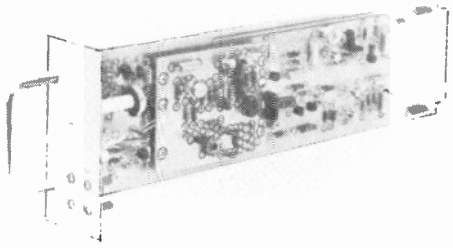
PVA-101 Video Distribution Amplifier with Differential Input Board in Place **$215.00**
The PVA-101 is a PVA-100 Video D.A. with the addition of a differential input circuit board.
Features: Differential input, greater than 60 dB hum rejection; High gain, up to 20 dB additional gain; Equalization, up to 200 foot of coax. Input Level: 0.05 V.P.P. to 2.0 V.P.P. Gain: Up to 26 dB (internally preset). Internal Controls: Frequency response, equalization, DC offset.



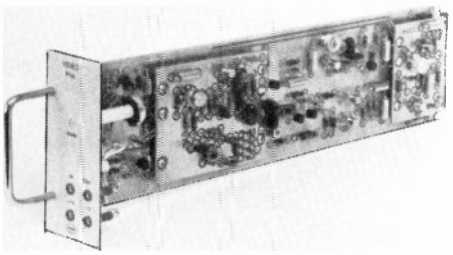
1135A Differential Input "piggy back" board **$40.00**
When plugged into a PVA-100 D.A., will provide greater than 60 dB hum rejection, up to 20 dB additional gain, or equalization for up to 2000 feet of RG-11.



1135B Breezeway Clamp "piggy back" board **$50.00**
When plugged into a PVA-100 D.A., provides restoration of the low frequency by clamping the breezeway to a fixed potential, thereby eliminating any vertical tilt.



PVA-102 Video Distribution Amplifier with Breezeway Clamp Board in Place **$225.00**
The PVA-102 is a PVA-100 Video Distribution Amplifier with a breezeway clamp circuit board installed. The clamp circuit is extremely noise immune and restores the low frequency component of the video signal by establishing the breezeway and back porch at a fixed potential.
Color burst is not affected in either amplitude or phase. All specifications for the PVA-102 are the same as the basic PVA-100.



PVA-103 Video Distribution Amplifier with Differential Input & Breezeway Clamp Board in Place **$265.00**
The PVA-103 is a PVA-100 Video Distribution Amplifier with a breezeway clamp circuit board and D.A. input circuit board installed.

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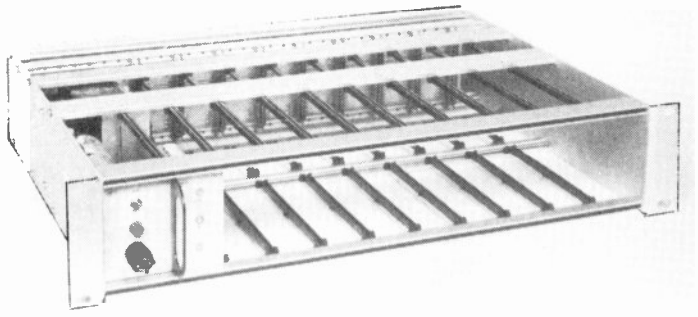
LENCO, INC., ELECTRONICS DIVISION

319 WEST MAIN ST. JACKSON, MISSOURI 63755 (314) 243-3147

The 300 System



PFM-300 Frame and Power Supply **$475.00**

Description: The Model PFM-300 Frame is unlike any other system frame developed. Its unique engineering concept allows the PFN-300 to house any nine 300 System modules, in almost any system configuration, and in any frame position, without modification. This unique universal concept means that the PFM-300 is not dedicated to the original application, but can be added to, or changed to any other system configuration whenever it is desired.

The PFM-300 Frame is the heart of the 300 System and consists of a constant voltage transformer, the PPS-302 Power Supply, nine cells with connectors mounted on a 30 buss "mother" board and 72 BNC connectors mounted on the rear panel.

The constant voltage transformer supplies the PPS-302 Power Supply with 30 VAC ± 1% from any line voltage between 70 VAC to 150 VAC. The PPs-302 then feeds the power busses in the frame DC voltages of ± 15 and + 8 VDC. The individual system modules protect and regulate these voltages to ± 12 and + 5 VCD. The wide range of input voltages, an exclusive feature of Lenco, alleviates any concern about line surges, low input levels, or line "hits". Ideal for remote applications where power line levels are uncertain. The power cord is wired into the frame to prevent loss of the cord or the possibility of broken connectors.

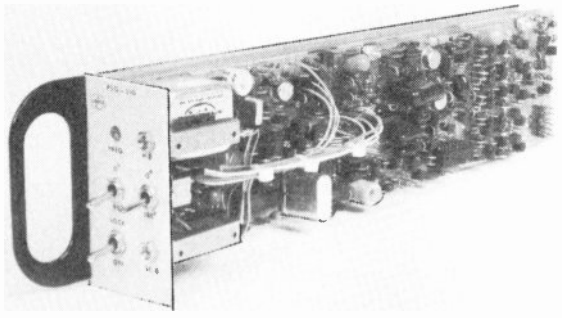
Another unique feature of the PFM-300 is that any module, placed in any position in the frame, is automatically fed the correct drives and/or signals. This is true for any additions or changes made at a later date. Frame rewiring or external looping of signals are almost never required.

The BNC connectors on the rear panel are mounted on an etched printed circuit board. This design concept allows for positive control of ground continuity and input isolation within each individual cell and also assures total isolation of grounds between cells. This prevents any chance of crosstalk or ground loops within the 300 System.

Height: 3½" (8.89 cm). Width: 19" (48.25 cm). Depth : 14" (35.56 cm). Weight: 11.25 lbs. (5.0625 kg).

ACCESSORIES:

PPS-302 Spare Power Supply for PFM-300 Frame $75.00
PBL-305 300 Series Blank Panel — Single Width 25.00
PBL-306 300 Series Blank Panel — Double Width 30.00
PEX-308 300 Series Extender Board 50.00
PEX-309 300 Series Extender for Double Width Units 75.00



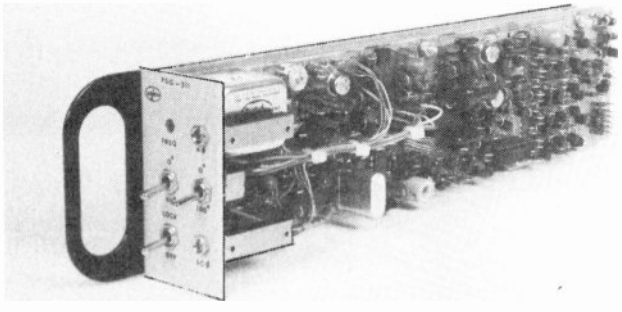
PSG-310 Digital Color Sync Generator **$995.00**

Description: The PSG-310 Digital Color Sync Generator exemplifies the latest in design techniques of digital engineering. The unique circuits allow us to offer an ultra-stable and trouble free generator, with exclusive features not normally found in broadcast quality equipment.

A temperature compensated crystal oscillator, operating at 14.318180 MHz provides the stable master frequency source from which all pulses and subcarrier are derived. Using digital dividing techniques, Subcarrier, as well as the Sync, Blanking, Horizontal and Vertical drive pulses, are produced virtually jitter free. All pulse widths and levels are fixed per EIA standards and cannot change. There are only three internal adjustments in the generator, subcarrier amplitude, lock range and vertical phase, which are set at the factory and seldom, if ever, require adjustment.

The Genlock circuit has a unique noise immunity circuit which makes the generator highly insensitive to noise or extreme changes in input levels. The incoming video is sensed by an extremely fast video presence detector, processed, and locks the generator automatically to the 50% point of the sync pulse. Genlock is accomplished within one second.

Other exclusive features include a clamped video feed, a field ident pulse is available if burst flag is not required, continuous adjustment of horizontal phase, instead of in 70 nS steps, vertical phase adjustable to two lines advance to compensate for enhancers, and three voltage regulators with current overload devices for power buss and module protection.



PSG-311 Digital Color Sync Generator **$945.00**

Description: The PSG-311 Digital Color Sync Generator incorporates the same unique design techniques that are found in the PSG-310 Sync Generator. The only exception is in the Genlock circuitry. The PSG-311 was engineered to operate with helical VTRs or other equipment that supplies unstable time base signals.

The genlock circuit has been designed so that it will lock to either a helical RS-330 signal or a standard RS-170 signal. Not only will the genlock circuit follow any unstable time base signal, it will ignore the fact that information is missing during the head dropout period of a helical VTR. Unlike other helical genlock Sync Generators, the PSG-311 does not require a coherent burst input to achieve lock.

The ultra-stable master frequence source from which all drives and subcarrier are derived is a temperature compensated crystal oscillator, operating at a frequency of 14.318180 MHz. Using digital dividing techniques, subcarrier and all drive pulses are generated virtually jitter free. There are only two internal adjustments, subcarrier amplitude and vertical phase. All pulse widths and levels are fixed within EIA standards and cannot be changed.

The PSG-311 offers exclusive features such as a strapping option to provide a frame ident pulse instead of burst flag, continuous adjustment of horizontal phase, instead of in 70 nS steps, and vertical phase that is adjustable from two and one-half lines delay to two and one-half lines advance, to compensate for in line enhancer delays.

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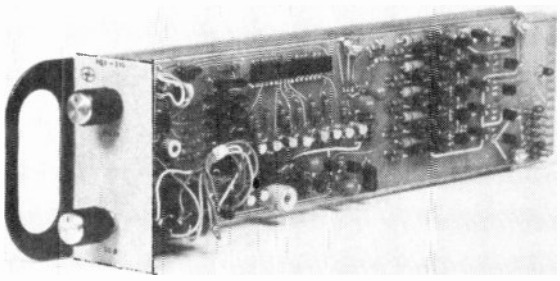
319 WEST MAIN ST. JACKSON, MISSOURI 63755 (314) 243-3147

The 300 System



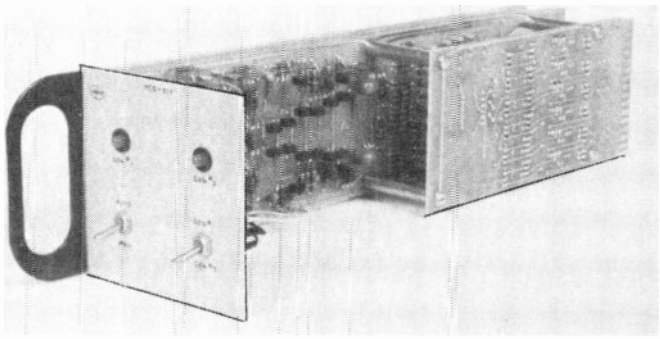
Features: Single Control System Timing / Provides System Flexibility / Jitter Free Pulse Distribution / Cost Saving Advantages.

PGS-315 Sync Generator Substitute **$465.00**

Description: The PGS-315 Sync Generator Substitute module is a valuable member of the overall 300 System concept. It has the primary function of replacing the PSG-310 or PSG-311 Sync Generators when external drive sources are available to the PFM-300 Frame. The PGS-315 accepts Sync, Blanking, H-Drive, V-Drive and Subcarrier from an external source, processes these signals and distributes them to the proper busses in the frame. The identical digital delay circuits, as described in the PSD-340 System Delay Module, are also in the PGS-315 module, providing the system timing capabilities for the frame. Because the PGS-315 is not a generator, although in this application it is performing the same function, the pulses supplied to the frame are absolutely jitter free an can be perfectly timed.

The PGS-315 is identical to the PSD-340 System Delay Module, with the exception of the external connections. It has the ability to simultaneously delay the Sync, Blanking, H-Drive, V-Drive and Burst Flag up 1.5 uS with only one control knob. Burst Flag is generated and timed with respect to output sync and will follow sync as the composite delay control is adjusted. The burst position and width are adjustable, should system applications require it.

Subcarrier phasing is controlled by using a "push-pull" type switch and potentiometer combination, allowing over 180 degrees of phase adjustment on each position of the switch.



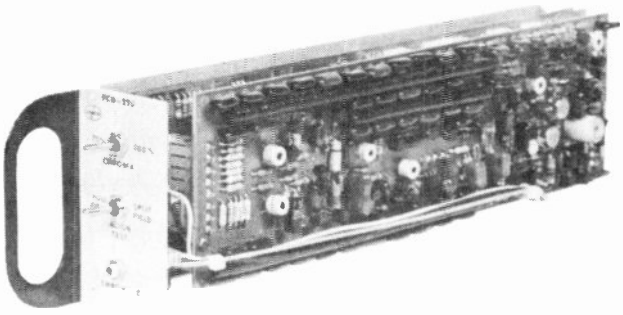
Features: Automatic or Manual Operation / Fail Safe Sensing Circuits / Complete Solid State Switching / Accepts External Generators / Senses All Inputs / LED Status Indicators.

PCO-317 Automatic Sync Changeover Switch **$495.00**

Description: The PCO-317 Automatic Sync Changeover Switch is a remarkable state of the art device designed to instantly recognize the failure of any synchronizing signals and immediately switch to an alternate source. Signal sensing circuits monitor each input for the level and timing of the sync, blanking, horizontal drive, vertical drive, burst flag, and subcarrier signals. Upon loss of the primary generator, the PCO-317 will supply the frame busses with the alternate source only if their signals are acceptable to the changeover module's parameters. It will not switch to a faulty generator.

The signals are switched by a diode gate, then fed to the frame and output connectors by an output amplifier to insure proper level and impedance. Solid state switching eliminates any possibility of relay "chatter", bounce, or dirty contacts as found in most relay type equipment. The digital sensing circuits are so accurate that the loss of any one pulse or the appearance of a non-coherent signal will either demand a switch or prevent one.

The PCO-317 has front panel switches to choose either automatic or manual control and to designate which generator is the primary source. The module is so designed that if both sources are lost, or if there is a loss of power, the module will revert to the designated primary source. Tri-state LED indicators indicate the condition of the two generators. The green light indicates that the generator is in service, while the red light indicates a failed source. When the secondary generator shows no light, it is indicating that the source is good and is in a standby condition, ready for service. A minor frame modification is required with the PCO-317, as well as external inputs from the second generator.



Features: RS-189-A, NTSC Standards / Alignment Test Signal / Composite Video Delay / Filtered I & Q Bandwidths / 75% or 100% Chroma Switch / Full Field Black Reference.

PCB-320 Encoded Color Bar Generator **$825.00**

Description: The PCB-320 Encoded Color Bar Generator is a precision Test signal generator engineered to conform to the EIA-RS-189-A and NTSC specifications. Reflecting the progressive concept of the 300 System, the PCB-320 includes the new SMPTE Alignment Color Bar Test Signal with chroma and black set signals. The encoder is a true NTSC standard as evidenced by the precise filtering of the I and Q channels shown by the waveform.

One of the exclusive features of the PCB-320 is the single control composite video delay circuit which, for the first time, allows system timing of test signals. Composite delay up to 1.5 uS is achieved, using the same techniques found in the PSD-340 System Delay module.

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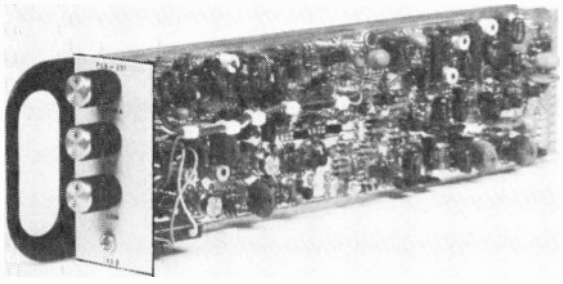
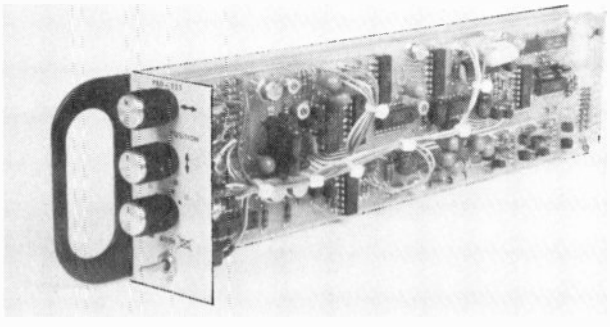
The 300 System



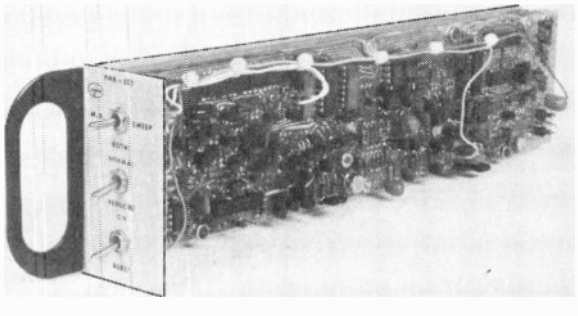
Features: Two Independent Generators / Composite System Delay / Optional Non-Composite Outputs / Two outputs Per Generator / Front Panel Color Control / Clamped Outputs.

PBB-321 Black Burst/Background Generator $575.00
Description: The PBB-321 Black Burst and Color Background Generator is essentially two independent signal generators combined into one inexpensive compact module. The combination of these two signals in one module is another 300 System exclusive and, since both signals are normally required in a switcher and/or special effects system, again illustrates the advanced engineering concepts found in Lenco's 300 System.
The Black Burst section of the PBB-321 provides a "Color Black" video signal composed of composite sync, set-up, and color burst. This signal is used as the black input to switching systems, or may be used as a signal source to genlock remote sync generators to "House" sync.
The Color Background section produces a solid field of color and, when connected to the input of a special effects generator or video insert keyer, provides color backgrounds for titles and other inserts.
A standard feature of all 300 System generators is a composite delay which provides for delaying the output signal up to 1.5 uS to assist in system timing.
Each generator has two clamped outputs with the option of either composite or non-composite signals. Burst phase is adjustable a full 360° by internal quadrant selector and front panel fine phase control. Front panel controls are also provided for luminance, hue, and chroma.
All required input signals to the PBB-321 are supplied by the PFM-300 Frame.



Features: Two Independent Generators / Composite System Delay Circuit / Optional Non-Composite Outputs / Exclusive Linearity Test Signal / Digital Safe Title Signal / Horizontal & Vertical Adjustments.

PBD-322 Bar Dot/Visual Reference Generator $650.00
Description: The PBD-322 Bar Dot/Visual Reference Generator is one of the 300 System's most technically advanced signal generators. It is two separate and independent generators providing the standard dot grading signals, and a new linearity test signal, including a "safe title" signal.
The Bar Dot Generator digitally produces EIA standard horizontal and vertical bars, cross hatch, and dot signals used in the testing for convergence of color monitors and camera sweep circuits. Horizontal and vertical position controls, plus pattern selection, are located on the front panel.
The Visual Reference Generator is a new exclusive production and technical aid, composed of digitally derived diagonal lines from corner to corner of picture blanking. It is the most severe test for linearity that can be performed on any monitor or CRT. The crossed diagonal lines identify the absolute electrical center of picture, no matter where it appears on the CRT. The other exclusive feature of the Visual Reference Generator is an adjustable rectangular shaped box that can be used to identify the "safe title" area or the usable area of the television screen. The output of the Visual Reference Generator section can be supplied as a non-composite signal and superimposed on the camera viewfinder to provide the camera safe viewing area and instant center of picture.
A single control "Composite Delay" feature provides for perfect system timing. The outputs of each generator section can be strapped for non-composite operation if desired. All required input signals and power are supplied by the PFM-300 Frame.



Features: EIA Multiburst Generator / Ultra-Stable Levels / Composite System Delay / 12 MHz Line Rate Sweep / Markers Every 2 MHz / Full or Reduced Amplitude.

PMB-323 Multiburst/Sweep Generator $875.00
Description: The PMB-323 Multiburst and Sweep Generator is a combination of two precision test signal generators which are required for overall system frequency response measurements. A front panel swtich provides for selection of either the Multiburst Signal, the Sweep Signal, or both (on alternate lines). Other switches allow for the selection of full or reduced amplitude and burst on-off. The Multiburst frequencies are preset to EIA standards but burst frequencies can be adjusted to 10 MHz if required. Stability of both amplitude and frequency is assured by a precision function generator operating within a feedback loop. The burst levels are fixed and cannot change as are the sync and setup levels. The Sweep Generator provides a linear sweep at a horizontal rate from 0.5 MHz to approximately 12 MHz with overall flatness of 0.2 dB. Fixed markers are provided at 2.0 MHz intervals.

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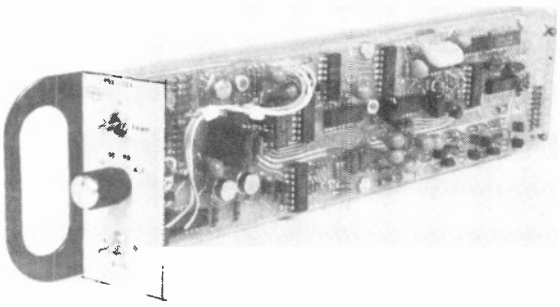
The 300 System



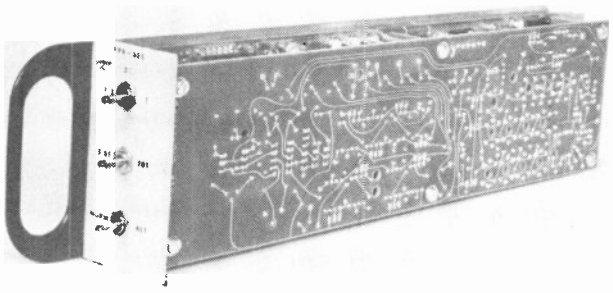
PSS-324 Stairstep/Ramp Generator **$485.00**

Description: The PSS-324 Stairstep/Ramp Generator provides a precision test signal for measuring differential phase and gain, luminance linearity, and burst phase error of a video system. An exclusive negative ramp signal is provided for the testing of differential phase and gain in the burst region. Strict conformity to the standards of IEEE 206 is adhered to, as well as a true video bounce test that conforms to standard APL definitions.

Front panel switches provide the choice between 5 or 10 step staircase, ramp signal, and APL levels of 10%, 50%, 90%, or bounce. A front panel switch is also provided for burst on-off and subcarrier on-off. Internal options include subcarrier in or out of phase with burst at either 20 or 40 IEEE units and standard or negative ramp signals.

A composite system delay circuit for system timing is included as well as two composite or non-composite outputs.

Features: Complies with IEEE 206 Standards/ Optional Non-Composite Outputs / Composite System Delay / Exclusive Negative Ramp / True APL Bounce Test / Phase-Locked Subcarrier.



PPB-325 SIN^2 Pulse Window Generator **$825.00**

Description: The Lenco Model PPB-325 Sin^2 Pulse Window Generator is another in the series of fine, precision, state of the art signal generators. Unique engineering and packaging techniques have provided the following nine precision test signals in a one module width plug-in unit: Modulated 12.5T & 20T, T, 2T, or T/2 pulses, window or bar signals and the exclusive "pluge" pulse. The PPB-325, with a combination of front panel switches and internal strapping options, can provide almost any combination of the nine signals. This feature was designed to allow the user to determine the proper test signals which are best suited for his particular system application.

The unique and exclusive Pluge pulse (picture line-up generator) is provided to adjust for monitor black level reference. The ± 2.5 IRE unit pulse at blanking should be used to assure proper monitor brightness and contrast adjustments.

The modulation of the 12.5T and the 20T pulses is phase locked to the input subcarrier and shifted in phase at the vertical rate. Pulse shaping of the T, 2T, and the T/2 pulses is derived by the use of 7 pole Thompson filters. This type of filter, commonly found in high quality precision test equipment, assures flat delay over a wide bandpass providing pulses with symmetrical and smooth responses with a minimum of overshoot, closely approximating a true Sin^2 pulse.

An exclusive feature of the PPB-325 is the "Line Alternate Switch". Lenco is providing this feature to allow the pulses to be placed under the window signal on alternate lines for instant system evaluation, using any existing waveform monitor.

Composite video delay, standard in all the 300 System test signal generators, is provided to allow up to 1.5 uS delay for system timing, along with the strapping option of composite or non-composite output signals.

Features: Nine Different Test Signals / Exclusive Pluge Pulse / 7 Pole Thompson Filters / Alternate Line Pulse Selector / Composite System Delay / Composite or Non-Composite Outputs

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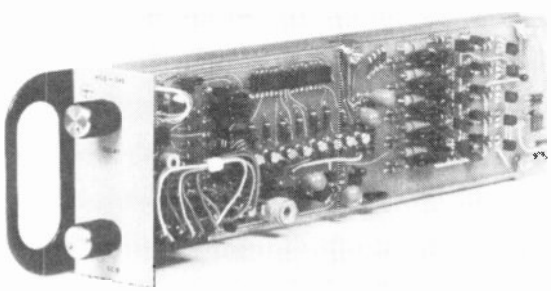

PSD-340 System Delay Module **$465.00**

Description: The PSD System Delay Module has completely changed the traditional system timing techniques as they are now used. This unique system concept obsoletes the use of pulse and subcarrier distribution amplifiers, as well as excessive cable or other external delay devices used in system timing. The PSD-340 will supply all drive signals to any video source, including subcarrier, with the unique capability of timing these signals to your system requirements. This jitter free device can be compared with having an individual genlock sync generator driving each camera, switcher, VTR, etc.

The PSD-340 receives sync, blanking, H and V drive plus subcarrier from the PFM Frame. The signals are then converted into digital information and sent to a unique digital delay circuit. This circuit has the ability to simultaneously delay the sync, burst flag, blanking, h and v drive pulses up to 1.5 uS, with only one control knob. The pulses are then converted back to analog signals, processed, and distributed to the proper output connectors on the frame. During the TTL logic sequence, the burst flag is generated and timed with respect to output sync. The burst position and width can be adjusted by internal controls to match system requirements.

The subcarrier is controlled by a unique phasing circuit, using a zero cross technique. Phasing is accomplished by using a "push-pull" switch and potentiometer combination. Over 180° of phase adjustment can be achieved on each position of the switch.

Features: Eliminates System Timing Problems / Replaces External Delay Devices / Provides System Flexibility / Single Control System Timing / Obsoletes Pulse D.A.s / Obsoletes Subcarrier D.A.s.

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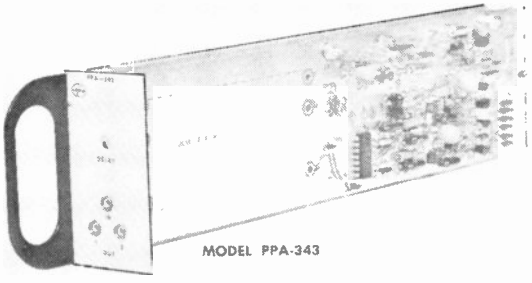
The 300 System



Features: Regenerates Pulses / Input Noise Immunity / Optional Delay Assembly / Six Source Terminated Outputs / Sin^2 Waveshaping / Internal or External Input.

PPA-343 Pulse Distribution Amplifier **$240.00**

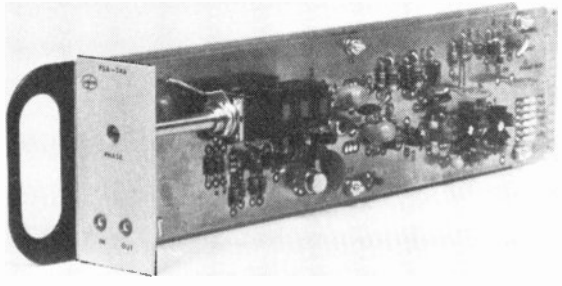
Description: The PPA-343 Pulse Distribution Amplifier is an important module in the overall concept of the 300 System. Although the PSD-340 System Delay Module is the modern method of pulse distribution and system timing, there are still many applications where the standard methods of individual pulse distribution are required.

The PPA-343 is a precision device and represents the latest in the art of regenerative pulse amplifiers. Using the incoming pulse for timing only, the logic circuitry samples the 50% point to determine its width. The PPA-343 then regenerates a matching pulse that is clean, distortion free, and conforms exactly to the input pulse parameters. This method allows the PPA-343 to be impervious to input level changes, noise, or degraded input pulses.

An optional pulse delay assembly may be added to the module to provide a pulse delay of up to 5 microseconds. A strapping option on the module allows the choice of delaying either three or all six of the outputs.

The PPA-343 has two identical and independent output amplifiers, each feeding three outputs. The output levels are fixed at 4 volts p-p. A unique input straping option allows the module the choice of any of the five pulses to be fed internally from the PFM-300 Frame. This eliminates the need for external cables to feed the input of the unit. Should the frame be used as a distribution frame only, looping high impedance external inputs are also provided.

Option 1 Pulse Delay Assembly for PPA-343 (1137A) **$85.00**



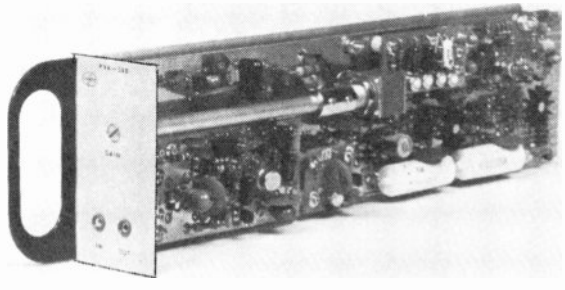
Features: Regenerated Subcarrier / Full 360° Phase Adjustment / Low Harmonic Distortion / Internal Input Option / Six Source Terminated Outputs / Excellent Stability.

PSA-346 Subcarrier Distribution Amplifier **$275.00**

Description: The PSA-346 Subcarrier Distribution Amplifier was designed to supplement the versatile 300 System's unique concept and incorporates the same state of the art design techniques found in all of the 300 System modules. The PSA-346 is a precision, ultra-stable, regenerative subcarrier amplifier whose advanced circuitry provides a pure, distortion free 3.58 MHz sine wave.

The PSA-346 uses a zero cross timing technique in its design which provides a superior output signal with virtually no harmonic distortion and excellent stability. The advantage of this technique is that the amplifier becomes impervious to input noise, distortion, or level change. The PSA-346 offers six source terminated outputs whose phase is controlled by one front panel adjustment. This one control proides a full 360° of phase adjustment with a smooth, high resolution vernier potentiometer. The output levels are fixed at two volts peak to peak, but the PSA-346 does provide an internal adjustment which will vary the output level as much as $\pm$ 3 dB if required.

The PSA-346 also provides an internal strapping option which will allow the module to receive an input signal directly from the PFM-300 Frame. This, of course, eliminates the necessity of external cabling to the amplifier. Should the subcarrier signal to be distributed come from another source other than the PFM-300 Frame, high impedance looping input connectors are available.



Features: Differential Input Provided / 15 MHz Band Width / Low Distortion / Six Outputs / Automatic DC Offset Control / Versatile Options.

Option 1 Feedback Clamp Assembly **$75.00**
Option 2 Cable Equalizer Assembly **65.00**
Option 3 Sync Adding Assembly **35.00**

PVA-350 Video Distribution Amplifier **$250.00**

Description: The PVA-350 Video Distribution Amplifier reflects a new concept in engineering techniques, bringing to the 300 System a versatile state of the art video amplifier with outstanding performance characteristics.

The PVA-350 is flat to 15 MHz, has a unique automatic DC offset control, and offers low noise, excellent stability, and virtually no distortion. A differential amplifier on the input is standard in the PVA-350, and provides 70 dB of common mode rejection.

The versatility of the PVA-350 is illustrated by its choice of optional assemblies. Any or all of the optional assemblies can be attached to the amplifier without adding or removing straps or wire connections.

The Option 1 Clamp Assembly is a feedback type clamp which is impervious to noise or extreme input level variations. It will maintain its clamp even when used with helical VTRs or other equipment which presents unstable time base signals. Up to 35 dB of clamping can be achieved.

The Option 2 Equalizer Assembly is a unity gain device providing up to 10.5 dB of equalization at 10 MHz. Exclusive variable adjustments for the low, mid and high frequency range will match any individual cable characteristic. No additional components are ever required.

The Option 3 Sync Add Assembly is designed to provide sync adding capabilities to the PVA-350 when required. Sync signals are automatically supplied to the PVA-350 from the PFM-300 Frame. Proper levels are maintained by a level control on the assembly.

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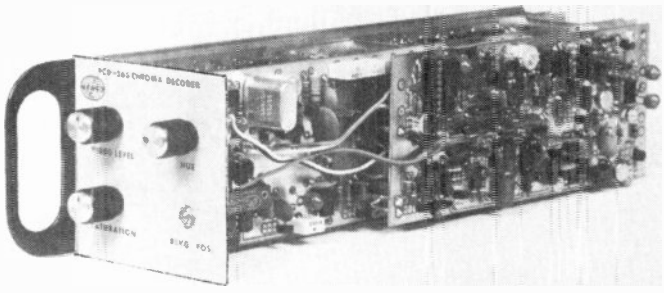


PCD-363 NTSC Chroma Decoder **$1795.00**

Features: 10 MHz Luminance Bandwidth / Comb Filter Separation / Optional Non-Composite Outputs / Superior Quality Decoding / Internal Genlock Sync Generator / Clamped, DC Coupled Outputs

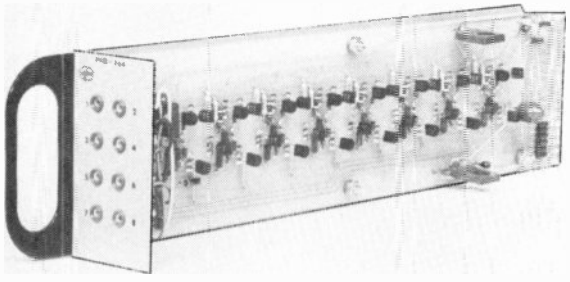
The PCD-363 Chroma Decoder exemplifies the unique engineering concept of the 300 System. A full combed filtered Chroma Decoder, with a full Genlock sync generator can now be supplied in a two module width plug-in device. Four PCD-363 Chroma Decoders can be mounted in one PFM-300 Frame, each operating independently from each other. The PCD-363 Chroma Decoder is especially valuable for color kine recording, large screen display, chroma keying, or other uses where RGB signals are required from a composite NTSC color source.

The Input to the PCD-363 can either be standard NTSC RS-170 video or from any helical tape machine or other source which may show an unstable time base error. The internal genlock sync generator has a subcarrier lock in range of ± 150 Hz and shows a pulse jitter of less than 5 nS. Regenerated blanking and sync widths are fixed and can not change or be misadjusted. The genlock circuit has a unique noise immunity circuit which makes the generator highly insensitive to noise or extreme changes of video input levels.

The PCD-363, utilizing a two line comb filter separation technique, removes the chrominance from the luminance effectively without detectable distortion of the luminance channel. Thus, the PCD-363 is able to offer a luminance bandpass of at least 10 MHz. The wide luminance bandwidth and the superior transit response results in an extremely clean and noise free video signal. Color crawl is all but eliminated by the comb filter. The unique independent preset phase and color difference gain controls are provided to permit compensation for the various phosphor characteristics of differenc CRTs. The quality and the resolution of the decoded output signals of the PCD-363 is far superior to any other decoding device yet offered.

A regenerated composite sync output is provided along with the composite or noncomposite RGB signals. An optional second set of RGB outputs are also available on request.

PVD-354 Video Delay Amplifier (not shown) ..... **$ 725.00**
PRC-360 Video Processing Amplifier (not shown) **$1350.00**
PRC361 Video Processing Amplifier w/Sync Generator (not shown) **$2250.00**



Features: Eight Individual Amplifiers / Unique Routing Amplifier / 8 MHz Bandwidth / Unlimited System Applications / Pulse, Video or Subcarrier Distribution / Unity Gain.

PFO-364 Universal Amplifier **$295.00**
Description: The PFO-364 Universal Amplifier is by far one of the most unique and versatile modules in the 300 System. The PFO-364 consists of eight separate and independent distribution amplifiers each having one input and one output with unity gain. Each amplifier can supply either subcarrier, drive pulses, or video signals as system applications require.

The design concept of the PFO-364 was that, no matter how carefully any system is designed, the need for "one more output" always arises. With the use of the PFO-364 there is no need to revert to the use of an extra standard type pulse or video D.A. with three to five outputs that are not needed. The PFO-364 can provide that one extra output...eight times.

Referring to the system concept of the PFM-300 Frame, there are sixteen possible signals in the frame available to the inputs of the PFO-364 unit. The number and type of signals, of course, depend on the number and types of units that are mounted in the frame. On the PFO-364 card there is a strapping option that allows the selection of any one of the sixteen signal sources to any, or all, of the inputs of the eight amplifiers.

Each amplifier cell is a unity gain, DC coupled device with a high impedance input and a source terminated 75 ohm output. The 8 MHz band width and unity gain features make the PFO-364 a truly universal pulse, video, or subcarrier routing amplifier. A high degree of isolation between the individual amplifier cells has been engineered in the unit to make crosstalk virtually non-existent.

MODEL VNM-428

Features: Fast, Easy to Use / Reliable / Built-in Calibration / Accuracy to ± 0.5 dB / CCIR-EIA Standards / Portable, Compact

VNM-428 Video Noise Meter **$1550.00**

The Lenco Model VNM-428 Video Noise Meter is a newly developed, patented device which utilizes a different principle of operation than any other instrument now in use. The VNM-428 was designed specifically for the video signal-to-noise measurement requirements of TV studios, CATV, and microwave system users where portability, simplicity of operation, and accurate measurements are desired.

A major feature of the VNM-428 is the in-service capability of making accurate, real time signal-to-noise measurements even on live off the air signals. The VNM-428 is small, rugged, stable, and has a built-in calibrator that insures accuracy of ± 0.5 dB throughout the range of 20 dB to 55 dB. The signal-to-noise ratio is shown directly on a large LED display and is calibrated to EIA standards.

The Model VNM-428 employs the tangential noise measurement technique and overcomes the problems traditionally associated with the oscilloscope measurement of Gaussian noise in video waveforms. A variable and calibrated square wave is added to the waveform under test which results in the display appearing as two identical waveforms, one on top of the other, at a distance equal to the amplitude of the square wave. The VNM-428 measurement technique allows the noise on a signal to be compared with itself; thus, as the square wave is reduced, displaying a single trace, the square wave becomes equal to twice the RMS noise voltage of the signal. The amplitude of the square wave is measured, converted to a logarithmic potential (referenced to the peak-to-peak signal) and displayed on the digital panel meter as the signal-to-noise in decibels.

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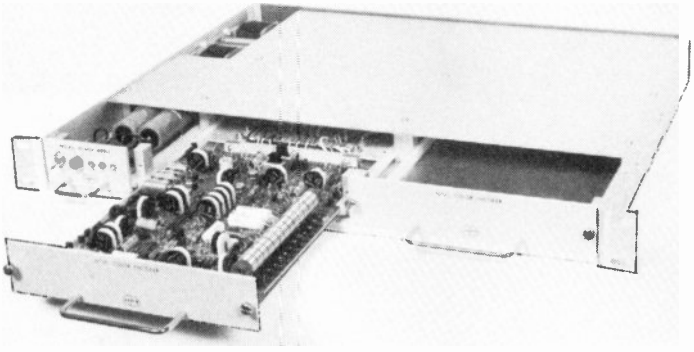


Features: Four Channal Operation / Exceptional Long Term Stability / In-Service Access / Horizontal Aperature Correction / Internal Color Bar Generator / Non-Interacting Controls

CEC-822 NTSC Color Encoder — Four Channel Combination PFM-802 and CEC-812 ..... $1465.00

The CEC-822 was designed to meet the growing requirements for a high quality, stable, and trouble free four channel color encoder as a replacement for the older type encoders used in cameras and film chains. The CEC-822 is designed so that two CEC-812 Encoders will mount in one 1¾" rack frame operating independently with a common power supply.

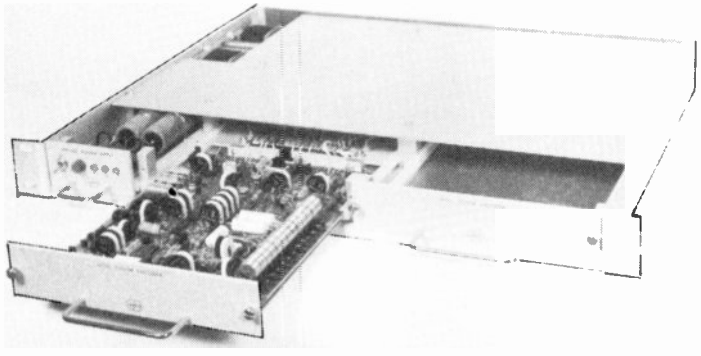
The CEC-822 produces an encoded video signal that meets all applicable EIA and NTSC standards. The CEC-822 has its own color bar generator for alignment of all parameters, including burst phase amplitude, I/Q quadrature and gain, chrominance to luminance ratio, and sync set-up. Horizontal aperature correction is also provided, using the "contours out of green" technique. The green tie switch, which is used for white and black balance, can also be used for monochrome operation in the event of a failure of either the red or blue tube of the camera.

The frequency response of the luminance channel is effectively flat to 7 MHz and down 3 dB at 10 MHz and provides aperature correction (boost) up to 10 dB at 2.9 MHz. Aperature correction is level dependent to provide enhancement proportional to the luminance level. An optional subcarrier (3.58 MHz) notch filter permits the user to reduce moire effects in the luminance channel by as much as 12 dB. System chrominance phasing can be adjusted through a full 360° and burst position, width, phase and amplitude are all independently adjustable.

Extensive care has been taken in the design of the CEC-822 Encoder to prevent any instability due to temperature variances or power supply crosstalk. Complementary symmetry, using transistor array integrated circuits, are used whenever temperature differentials could cause non-linearity between transistors. This technique is employed to insure minimum drift either with temperature or line voltage variations or component aging. Power supply crosstalk is minimized by isolating the negative and positive power supplies into five separate supplies each. The end result of these various stability techniques is an encoder that will maintain its specifications over an extended duration.

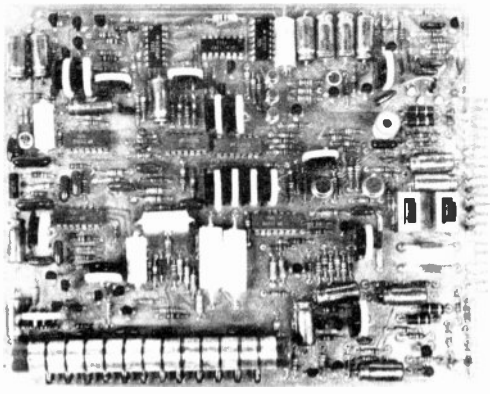
CEC-812 NTSC Color Encoder w/Color Bar Generator (RGBY) ..... $ 995.00

PFM-802 Dual Encoder Frame w/Power Supply for CEC-812 ..... 470.00



CEC-811 NTSC Color Encoder — Combination CEC-810 and PFM-801 ..... $1355.00

The CEC-811 consists of a CEC-810 encoder and a PFM-801 rack frame. The CEC-811 is a stand alone encoder for use with any three tube color camera or RGB device. There are provisions in the encoder frame for a second CEC-810 encoder which would be totally independent. Inputs to the encoder frame are: red, blue and green video, sync, blanking, and subcarrier.



CEC-810 NTSC Color Encoder (for camera mounting) ..... $ 895.00

Features: Replaces R-Y, B-Y Encoders / Horizontal Aperture Correction / Non-Interacting Controls / Internal NTSC Color Bars / 360° Chrominance Phasing / Temperature Stabilized.

Description: The CEC-810 is a complete NTSC color encoder with a built in bar generator. Stability is maintained by the generous use of multiple transistor "IC" which insure matched characteristics. A green tie switch is provided to simplify balancing or allow for monochrome operation. Horizontal aperature correction is also provided, using the "contours out of green" technique. A level dependance control is provided in the aperture correction circuit to improve the signal to noise in the black region.

System chrominance phasing can be adjusted through a full 360° and burst position, width, phase and amplitude are all independently adjustable. A 3.58 MHz notch filter is provided with an adjustable depth of from 1 to 12 dB.

Two CEC-810s can be housed in a PFM-801 mounting frame which provides the power supplies and necessary interconnections, or the encoder can be plugged into an IVC 90 or 150 camera. The CEC-810 is a direct replacement for the R-Y, B-Y encoder shipped as standard equipment by IVC. If the CEC-810 encoder is used with the CSG-720 sync generator, an IVC 90 or 150 camera can be made completely self contained for remote operation.

ACCESSORIES:

PFM-801 Frame mount and power supply, with provision for two CEC-810s $460.00

CSG-720 Color sync generator for IVC Model 90 or 150 cameras 350.00

CXO-815 3.58 Subcarrier Oscillator Assembly (for use where external subcarrier is not available) 175.00

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Circle (102) on Reader Service Card

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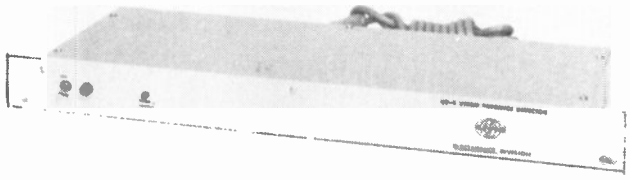
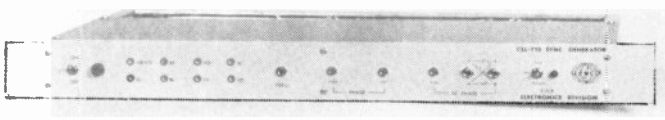


MODEL VP-1

Model VP-1 Video Presence Detector **$450.00**

The VP-1 is a device which will sample the signal on its "A" input and determine if true video is present. Loss of video or signal degradation beyond preset limits will cause the sensor circuit to activate a relay and connect the "B" input through to the output. When the "A" signal returns, the VP-1 will switch back to the "A" input. A set of form "C" contacts are provided for external equipment control or alarm. This device finds application where it is desired to control remote equipment with the presence of video. Transmission systems will also find use for this device to protect against the loss of a video signal.



MODEL CSL-710

Model CSL-710 Color Sync Generator with Gen-lock .. **$985.00**

The CSL-710 is a digital color sync generator with gen-lock. It will gen-lock to either a standard video signal or a helical VTR. Internal circuitry automatically compensates for video and chroma level variations. Automatic circuitry is also provided to select the proper operating mode to make the CSL-710 virtually fool proof. All pulse amplitudes and width are fixed at E.I.A. values. The CSL-710 provides two isolated outputs for each pulse, a looping video input and front panel adjustments for phasing, subcarrier, horizontal and vertical timing.

Two Year Warranty

Lenco, Inc., Electronics Division, guarantees this equipment to meet its specifications, be free from defects in workmanship, and to be free from manufacturing defects. Lenco, Inc., Electronics Division, will repair or replace at no charge any defective product for a period of two years from date of shipment. This warranty assumes that the equipment has been used under normal operating conditions and does not apply to any product or part thereof, which has been subject to misuse, neglect, improper installation, modification or accidental damage. Units that fail under conditions other than those covered above will be repaired on a cost of components, plus labor basis.

Freight charges on all equipment returned to Lenco, Inc., Electronics Division, for warranty service will be accepted by Lenco, Inc., Electronics Division, for surface freight only. Return freight charges will also be paid by Lenco, Inc., Electronics Division.

Prices and Specifications Subject to Change Without Notice.

LISTEC TELEVISION EQUIPMENT CORP.
39 Cain Drive, Plainview, N.Y. 11803 (516) 694-8963

PAN & TILT HEADS

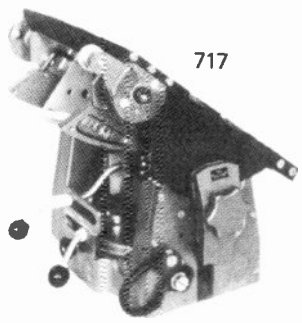

745

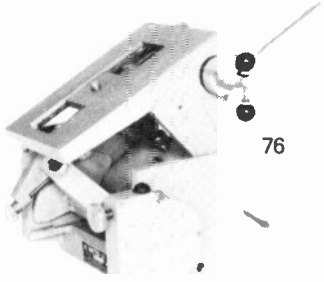
The Vinten Mark 3A Cam Head has long been established as the Broadcast Industry standard. Only the slighest touch is required to pan and tilt the Mark 3A fitted with the heaviest and most awkward loads. Improved friction controls provide finely adjustable pan and tilt drag with no backlash. Vinten's attention to close tolerances and highest quality workmanship yield silk smooth and long lasting performance. Cam sizes and adaptor plates are available to suit all camera load configurations.

717 ..... $1850.00

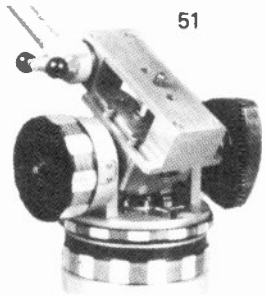
The Mark 5 Cam Head offers all the quality and dependability of the Mark 3A in a smaller package. Its 60 degree tilt angle provides the cameraman with great flexibility and its light weight makes it easily transportable for field use. A perfect match for the new lightweight studio cameras, the Mark 5 head has the same effortless feel and robust construction as its larger counterpart.

716 ..... $1475.00


717


76

ALL PAN & TILT HEADS FEATURE CONSTRUCTION OF STAINLESS STEEL AND ALUMINUM AND MAGNESIUM ALLOY CASTINGS


51

The Mark 2 Type 76 Petrel Pan & Tilt Head now incorporates the Vinten Lubricated Friction System in both pan and tilt operations, providing smooth control for the most difficult camera movements.

The use of L.F. (lubricated friction) gives an extremely smooth action to both pan and tilt movements at all settings from zero to full drag. The Mark 2 Petrel embodies this new feature with only a marginal increase in basic weight.

76 ..... $1095.00

For the new breed of lightweight, portable cameras Vinten offers the Model 51 Fluid Head. Features include exceptionally smoothe and variable torque, a quick release friction override and an externally adjustable vertical center of gravity compensator. Changing springs is not necessary when the camera load is changed. ENG and EFP cameramen favor the head's light weight and superior performance.

51 ..... $1895.00

SPECIFICATIONS		Capacity	Tilt Range	Weight	Adjustment for Vertical Center of Gravity	Adjustment for Horizontal Center of Gravity	3/8" Bolt Fixing
MARK 3A	717	500 lbs.	50°	44 lbs.	5"-11" Cams (1" increments)	2¼" continuous	std.
MARK 5	716	165 lbs.	60°	22 lbs.	3"-8" Cams (1" increments)	2¼" continuous	std.
MARK 2	76	100 lbs.	40°	15½ lbs.	2"-7½" continuous	4" continuous	std.
FLUID	51	50 lbs.	60°	9 lbs.	1"-9" continuous	4" continuous	std.

*At 4 inch center of gravity

TRIPODS


3063


737/739/719

TRIPOD SPECIFICATIONS	Ltwt. Combo. 3063	Std. Tripod 718	¾ Tripod 739	Tracking Dolly 719	¾ Elevation Unit 737
Load Capacity:	100 lbs.	200 lbs.	200 lbs.	250 lbs.	200 lbs.
Height Range:	24-72"	27-53½"	22-34"	9"	7-23"
Weight: 38lbs.	(Tripod, Dolly & Elevation Unit)	26 lbs.	26 lbs.	23 lbs.	20 lbs.
Wheel Diameter:	5"	- - - - - -	- - - - - -	5"	- - - - - -

LIGHTWEIGHT TRIPODS
(Complete with Pro Junior or Mitchell Adaptor)

3063 Combination Tripod/Elevation Unit/Dolly $1.125.00
3061 Tripod 475.00
3062 Elevation Unit 400.00
3060 Dolly 450.00

HEAVY DUTY TRIPODS
(Complete with Mitchell Adaptor)

718 Standard Tripod with Stabilizer $1,000.00
739 Three-Quarter Tripod with Stabilizer ... 970.00
719 Dolly with Wheel Tracking 885.00
699 Elevation Unit (30" rise) 925.00
737 Elevation Unit (22" rise) 825.00

Prices and specifications subject to change without notice

Circle (104) on Reader Service Card

LISTEC TELEVISION EQUIPMENT CORP.
39 Cain Drive, Plainview, N.Y. 11803 (516) 694-8963

STUDIO PEDESTALS

702

The top of the line Fulmar Pneumatic Pedestal's extremely smooth and quiet motions through the lowest and widest range have earned it the Guild of Television Cameramen's Award. Fingertip control, unsurpassed stability and heavy weight capacity make the Fulmar indispensible to the discriminating producer/broadcaster.

FULMAR 702

Capacity .....350 lbs.
Range .....21-59"
Minimum Width .....34"
Weight.....330 lbs.

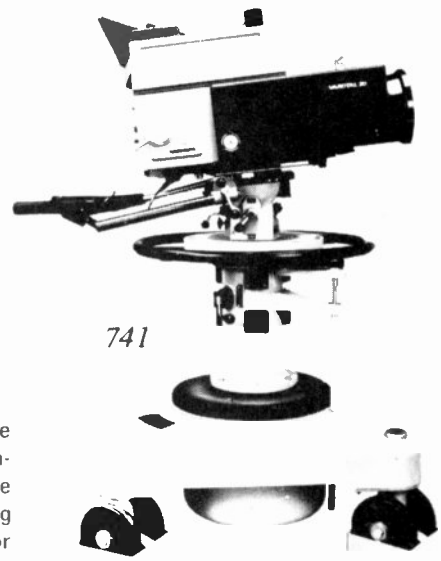
$10,500.00

FEATURES COMMON TO ALL VINTEN PEDESTALS

- Single Ring Steering/Elevation Control
- Crab and Tricycle Steering
- Adjustable Cable Guards
- 3 Pairs of Wheels each with 2 Ballraces
- Adjustable Friction and Brake Controls

FEATURES COMMON TO 702 AND 741 PEDESTALS

- Trim Weights and Tray
- Low Pressure/Large Tank Pneumatic System
- Aluminum and Magnesium Castings/Welded Stainless Steel Construction
- Adjustable Column Ballraces for Vertical Rigidity
- Pneumatic System Pressure Gauge (702 only)


741

The Tern Pneumatic Standard Studio Pedestal shares the same effortless and smooth performance as the award winning Fulmar pedestal. The Tern is the ideal choice for the studio requiring a top quality pedestal or for upgrading older and bulkier pedestals at modest cost. (See below for a complete list of features)

TERN 741

Capacity .....290 lbs.
Range .....33-54"
Minimum Width ....29½"
Weight.....250 lbs.

$4,575.00

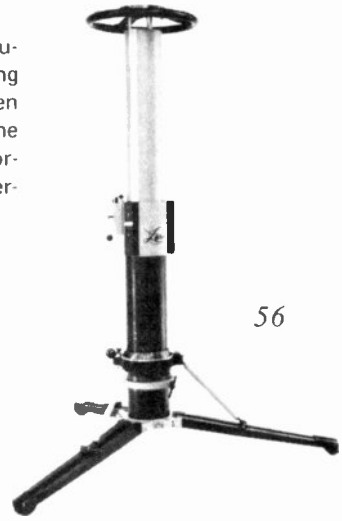
PORTABLE PEDESTALS

Easy to set up in the most awkward surroundings, the PortaPed will pneumatically counterbalance loads up to 100 lbs. The PortaPed's self-leveling action allows easy set-ups on escalators, bleachers or uneven terrain. Even with its built-in air pump (no external charging apparatus is required) the PortaPed is lightweight and quickly foldable. Put it on its optional castoring, folding dolly or folding/crabbing/tracking dolly and you have fingertip booming on location.

PORTAPED 56

Capacity .....100 lbs.
Range .....27-55"
Minimum Width .....28"
Weight.....30 lbs.

$3,250.00


56

Prices and specifications subject to change without notice

LISTEC TELEVISION EQUIPMENT CORP.
39 Cain Drive, Plainview, N.Y. 11803 (516) 694-8963

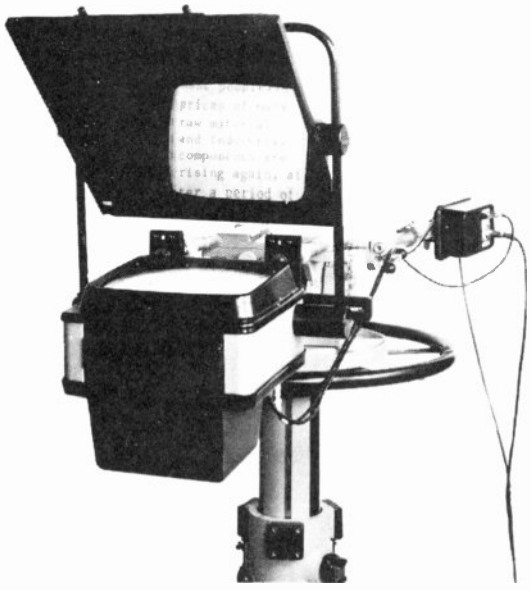
DIGIVISION

MONITOR PROMPTING SYSTEMS

The Digivision Prompting System consists of a lightweight, (14 lbs.) *12", professionally engineered, black and white monitor for below the lens positioning, complete with monitor, hood and semitransparent high quality mirror (equivalent to 85% transmission). Both units are encased in a virtually non-destructible lightweight plastic molding. Total weight of the monitor, hood and mirror assembly is only 22 lbs., the lightest in the industry.

The monitor, hood and mirror assembly is attached to the pan and tilt head by means of two adjustable length support rods. There are absolutely no connections necessary to the television camera and all centering and positioning is undertaken using sliding brackets. The attachment of the monitor and hood assembly to the support rods takes less than ten seconds, also by far the fastest assembly to date. In the case of all Vinten cam heads complete with wedge adaptors, there is no other hardware involved. With respect to other makes of cam heads, a sandwich plate is positioned initially between the television camera and cam head. This plate accepts the Digivision support rods and need not be removed if the system is not utilized.

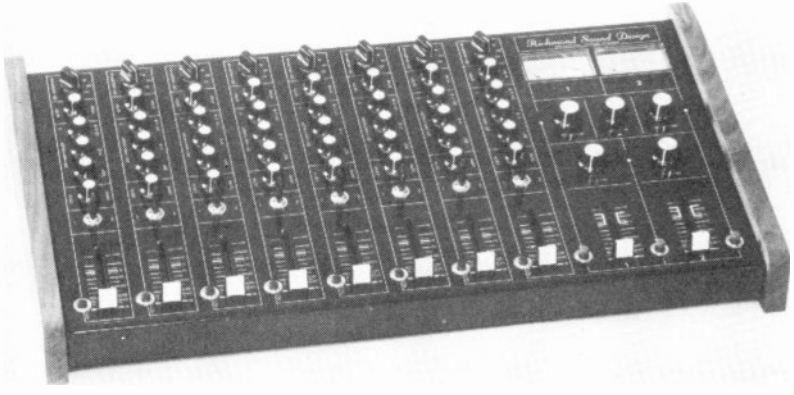
* 17" available upon request



12" Digivision Monitor Prompting System attached directly to Vinten Cam Head.

Richmond Sound Design

MODEL M82B
BROADCAST AUDIO CONTROL CONSOLE



FEATURES

- Production and On Air Capabilities
- State-Of-The-Art Transformless Inputs
- Full Equalization Facilities
- Complete Monitoring Facilities

APPLICATIONS

- Production and Recording
- On-Air Audio Control
- Re-Recording, mixing and processing
- Remote Audio Control

M82B Input Facilities

- Professional XLR type microphone input connector
- Professional telephone patch bay type line input connectors
- Tip-ring-sleeve line level send-receive channel access jack
- Calibrated Attenuation switch selecting mic input on 0, 10, & 20, line inputs on A & B positions, respectively
- Foldback level: foldback signal is derived from each input pre EQ to minimize accidental feedback or changes in foldback quality as EQ is adjusted for main mix.
- High, Mid, and Low Equalization has wide adjustment range, continuously variable boost/cut, active filter design
- Echo Send Level: echo send signal is derived post EQ & fader and may be used as an auxiliary monitor or foldback channel
- Toggle selector provides exclusive or combination output assignment capabilities
- Environmentally sealed straight-line fader
- Cue button provides both post EQ/pre fader listen and monitor/meter solo function, muting normal output monitoring and metering without affecting main mixes or creating pops

Output

- Illuminated professional specification VU meters switchable to any input or output channel
- Echo Returns are pre master faders with individual level controls
- Sealed straight-line master faders, normal position 15dB below maximum
- Master Foldback level control
- Dual concentric master Monitor level controls
- Master Echo Send level control
- Mechanical light-reflecting Cue bottoms for operator monitoring and metering of Foldback mix, Air (playback) signal, or Echo Send mix
- Separate phone jacks for Foldback and Echo Send outputs
- Tip-ring-sleeve two channel echo return jack
- Separate tip-ring-sleeve jacks for line out/air return (playback); channels 1 & 2
- Tip-ring-sleeve two channel Monitor jack will drive headphones directly or feed line levels to monitor amplifiers

specifications subject to change without notice

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- From the Manufacturer
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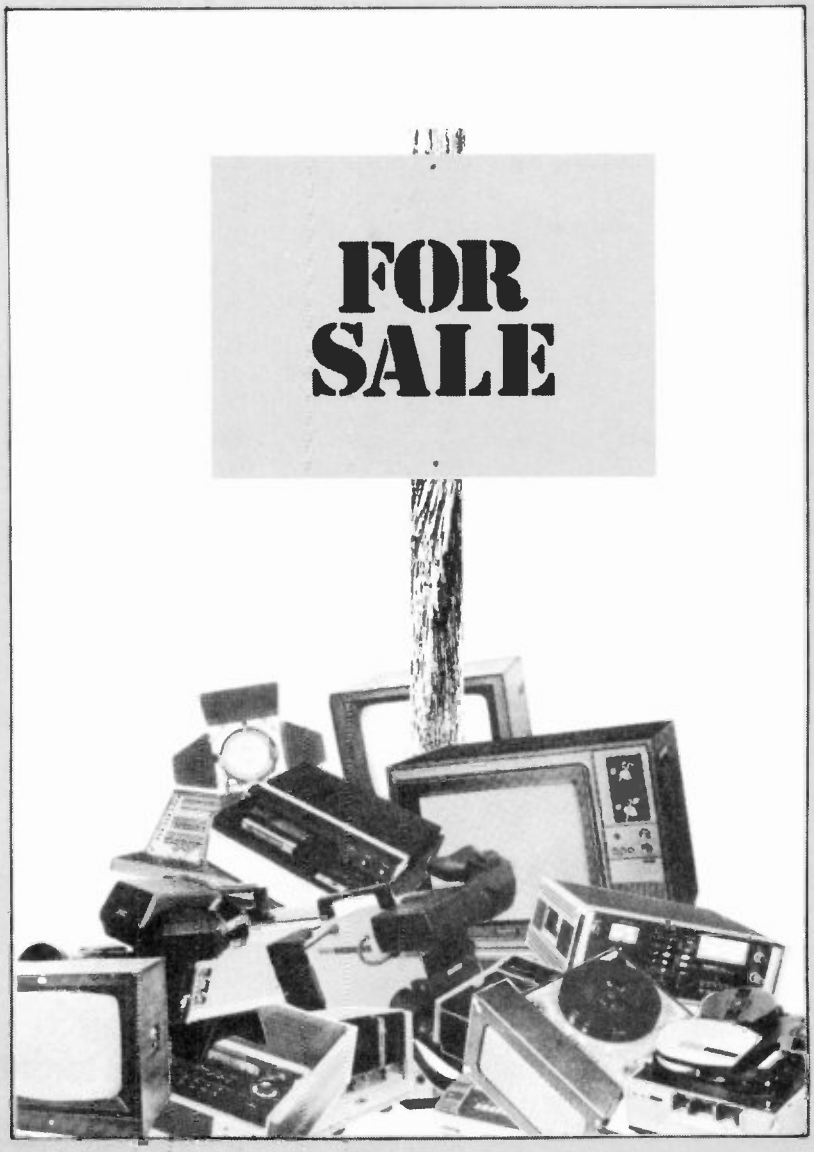
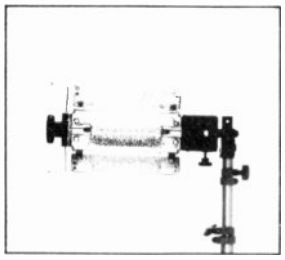


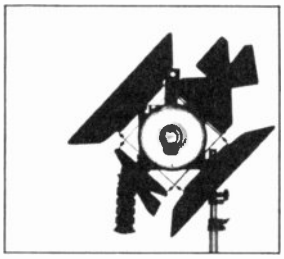
location lighting equipment



tota-light

The Lowel Tota-light uses 1000, 750 and 500 watt tungsten halogen lamps at 120 volts, and an 800 watt lamp at 220/240 volts. The Tota-light is exceptionally compact and delivers extraordinarily wide angle yet efficient illumination. One unit can provide very even coverage of four walls from the corner of a room. Tota-lights adjustable reflecting doors can concentrate light in a horizontal pattern, they can compensate for normal fall-off when lighting from an angle. Tota-light is a semi-hard source and with its efficient umbrella—a small softlight. The gel frame and umbrella lock into the light.

Tota-light mounts on standard 5/8" and smaller studs. By attaching it to the tota-mount, the unit fits securely atop open and closed doors, and gaffer-tapes on walls and windows. It weighs 22 ounces [0.6 kgs] without cable.

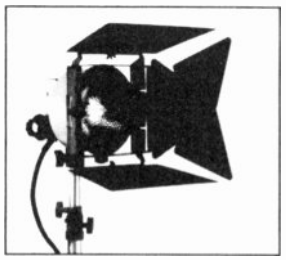


omni-light

The Lowel Omni-light uses 650, 600 and 420 watt tungsten halogen lamps at 120 volts, a 650 watt lamp at 220/240 volts, and a 250 watt lamp for 30 volt battery operation. Omni-light is a focussing unit with smooth beam patterns. Its spot/flood range is unprecedented—as much as 11:1.

Omni-light has its own accessory system, and also uses many of the Tota-light's components. Omni-light changes in seconds from a hard light into a semi-soft source; or into an umbrella-soft light. A responsive thumb operated focus control allows one hand operation.

Omni-light can be stand or camera mounted, and hand held for news work. With the tota-mount accessory it gaffer-tapes to walls and windows and hangs atop doors. Omni-light weighs 27 ounces [0.8 kgs] without cable.

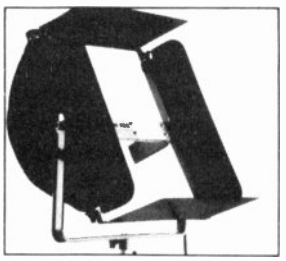


d light

The Lowel D light uses 1000, 750 and 500 watt tungsten halogen lamps at 120 volts; and 1000 watts at 220/240 volts. The light has a 7:1 focussing range with a smooth transition between its flood and spot positions. In seconds you can replace the standard reflector with a non-focussing super-spot reflector, to make the D light an exceptionally long throw instrument.

The D light's modular barndoor/accessory system includes various scrims, dichroic, diffusion and safety glass components.

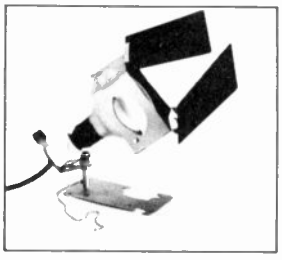
The D light has a constant-tension tilt system (like all other Lowel equipment). This allows fast, convenient, one-handed tilting. The light fits standard 5/8" (and smaller) studs. It weighs 3 pounds 8 ounces [1.6 kgs.] with built-in cable.



softlight

The Lowel Softlight 1500 uses either two 750 watt, or two 500 watt tungsten halogen lamps at 120 volts. At 220/240 volts, it accepts a pair of 800 watt lamps. The Lowel Softlight provides large-source, indirect illumination characterized by soft shadows and highlights. It is brighter than many 2000 watt conventional units. Yet it requires only 12½ amps at 120 volts, so it can be plugged directly into a wall outlet.

Accessory barndoors on the Lowel Softlight control lens flare and give subtle shading of light. The reflective shell will not scorch or discolor. The frame folds up for storage and travel. The Lowel Softlight 1500 weighs 6 pounds 14 ounces [3.2 kgs] with cable.

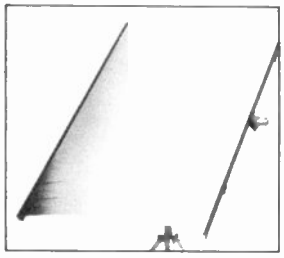


lowel-light

The Lowel-light uses standard reflector flood and spot lamps, to a maximum of 500 watts. Its lightweight, compact size and unique mounting methods make it ideal for concealment within a scene.

The Lowel-light clamps to pipes and stands with its notch-and chain fastening. The strong, resilient baseplate wedges into crevices, may be nailed or gaffer-taped to many surfaces. The Lowel-light weighs only 10 ounces [0.3 kgs] with its built in cable.

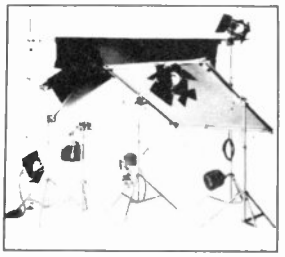
The Lowel-light barndoor slips on R-40 size lamps without the use of tools. It folds flat on removal. Made of aircraft alloy aluminum, it weighs only 7 ounces [0.2 kgs].



variflector

The Lowel Variflector II is a sun and artificial light reflector which stores (with stand) in a compact tube. It has adjustable brightness and spread control. A finger operated lever provides a 3:1 flood range. It can reduce power requirements indoors by reflecting an existing source back onto the subject. The reflecting element is tough, washable, aluminized mylar, embossed with a patterned surface that gives a bright, smooth light pattern. This flexible sheet is backed with stiff aircraft aluminum slats which roll neatly for storage.

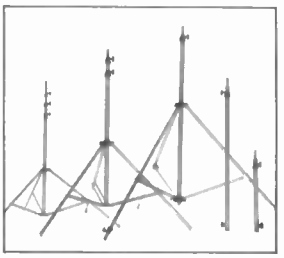
Variflector II has a sturdy, wide based, leveling stand for field use. The unit sets up quickly. Side channels open wide and clamp to the reflector panel. The channels lock to the crossbar, which mounts on a 5/8" stud. The unit can pan, tilt and rotate diagonally.



link

The Lowel-link system is our functional approach to the problems of oversized, over-specialized grip equipment. It consists of just a few basic components which link together in many extremely useful ways. They interlock without tools. They make rugged floor-to-ceiling poles, booms, sun diffusers, seemless paper supports, and many other devices.

These Lowel-link components are sturdy in use but disassemble for compact storage. While the system was designed with location work in mind, some of it has proven itself very useful in studios as well.



stands

Lowel stands and poles have a high strength-to-weight ratio. They open and close easily, yet lock securely. Each is made of thick wall, aluminum alloy tubing and has standard 5/8" studs. Reliable collar-clamping is used on all sections. Leg geometry has been designed to let you use stands close to one another.

The Omni-stand is intended for the Tota-light and Omni-light. The Link-stand is ideal for the D light, softlight and link components. The variflector stand is compatible with the Vari-flector, or with lights and rigs which need extra-wide-base stability. Its adjustable leg allows levelling for uneven surfaces. The Full pole and Half pole serve many functions in the Link system. They also extend the Link and Variflector stands to unusual heights.

lowel®

Lowel-Light Manufacturing Inc. 421 West 54th St., N.Y., N.Y. 10019 212 245-6744
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B-109

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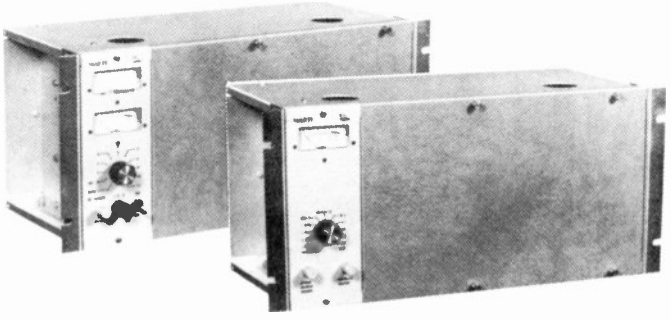
AURAL STUDIO-TRANSMITTER LINK

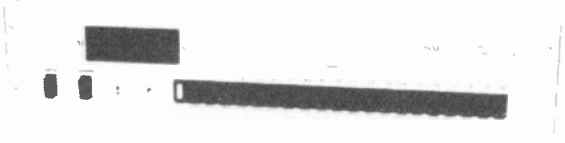
SOLID-STATE AM-FM, MONO-STEREO, INTER-CITY RELAY 950 MHZ.

- ★ **Direct FM Modulator**
- ★ **All Solid-State**
- ★ **Field Proven Varactor Final**
- ★ **Plug-in Modular Construction**
- ★ **Solid-State Ovens and Hi-Accuracy Crystals**
- ★ **RF Sensing for "Out of Status" Alarm Indication**
- ★ **Current Limiting in Regulated Power Supply**



Frequency Response: 0.5 db. from 30 Hz to 15,000 Hz.
Distortion: 0.5% or less, 40 Hz to 15,000 Hz.
Signal To Noise: —66 db. or better. Ref. 400 Hz. Mod. 100%
Carrier Frequency Stability: ± .0005%.
Temperature Range: —20 Degree C to +60 Degree C

RMC-20 Digital Remote Control



Features: Fully digital command telemetry (FSK) • Single push-button channel select • Telemetry accuracy 0.1% for directional antenna monitoring. RMC-20S does not require operator to calibrate each time data taken • Channel capacity 5, 10, 15 or 20 channels • 10 amp 120 VAC 5 amp 240 VAC UL recognized relays • Test meters built-in for setting levels and test • Quartz clock synchronized • Radio link or wire line operation • Large digital LED readout at *both* studio and remote unit • Decimal point location can be selected for each channel.

STEREO SYSTEM

STL-8 System, Stereo, complete with two (2) STL-8F Transmitters, two (2) R-200/950F Receivers, HRC-8 Transmitter Combiner and MTS-1 Receiver Combiner. Furnished complete with crystals and tested on final frequency. **$4160.00**

TRANSMITTERS & ACCESSORIES

STL-8F/H Transmitter, 8 watt, complete with crystal and tuned to frequency. 120/240 VAC. 8¾" x 19" Horizontal Rack construction. For AM & FM Broadcast application. **$1395.00**

ASO-8A Automatic Switchover Unit for "hot Standby" switching between two STL-8 Series transmitters. 120/240 VAC. Rack mount 3½" x 19" **325.00**

CLA-40A Compressor/Limiter Amplifier. 120/240 VAC. Rack Mount, 3½" x 19". **445.00**

HRC-8 Transmitter Combiner. For combining the outputs of two STL-8 Series transmitters into common antenna system. Furnished complete with inter-connect cables to transmitters. **175.00**

RECEIVERS & ACCESSORIES

R200/950F/H Receiver, complete with crystal and tuned to frequency. 120/240 VAC. 8¾" x 19" Horizontal Rack construction. For AM & FM Broadcast application. Includes Down Converter. **$895.00**

ASO-200A Automatic Switchover Unit for "hot standby" switching between two R-200/950 Series receivers. 120/240 VAC. Rack mount. 3½" x 19"..... **290.00**

MTS-1 Matching "T" Section. For combining the inputs of two R-200/950 Series receivers from a common antenna system. **25.00**

REMOTE CONTROL & ACCESSORIES

RMC-2AX(10) Remote Control System, 10-channel, solid-state. Complete with Studio & Transmitter units. Rack mount. 120 VAC. **$1495.00**

RMC-20 Digital Remote Control System, a Maximum of 20 Channels, solid-state. Complete with Studio & Transmitter units. Rack mount. 120 VAC. Basic 10 channel System. **2945.00**

SUB-CARRIER GENERATORS & RECEIVERS.

SCG-8H Sub-Carrier Generator, solid-state, tuned to 39 or 67 khz. 120/240 VAC. Complete with Mute Module. 3½" x 19" Horizontal Rack construction. **$395.00**

SCR-8H Sub-Carrier Receiver, solid-state, tuned to 39 khz. 120/240 VAC. 3½" x 19" Horizontal Rack construction. **345.00**

MONITOR, PROGRAM AND RF AMPLIFIERS

PGM-20 A Program Amplifier. 120/240 VAC. 3½" x 19" Rack mount. **$225.00**

MA-10 Monitor Amplifier. 120/240 VAC. 3½" x 19" Rack mount. Complete with Speaker Muting Relay. ... **186.00**

MRA-950 RF Preamplifier, 120 VAC. **205.00**

ANTENNA PACKAGE "AA"

(2) 4' Parabolic Antennas, c/w Mounting Brackets.
(2) Male Type N Connectors for LDF4-50 ½" Foam HELIAX.
(2) Female Type N Connectors for LDF4-50 ½" Foam HELIAX.
(2) PG-3B 3 foot Jumper Cables.
(2) Grounding and Weatherproofing Kits. LDF4-50 HELIAX not included **$1012.00**

Prices and Specifications Subject to Change Without Notice.

MARTI Electronics, Inc.

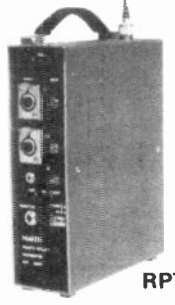
P.O. Box 661 • 1501 N. Main • Cleburne, Texas 76031 • 817/645-9163

Broadcast Quality Remote Pickup Equipment

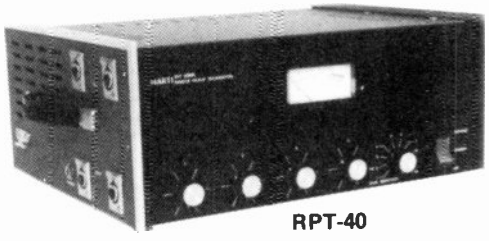
450-470 MHz • Solid State

150-172 MHz • Solid State

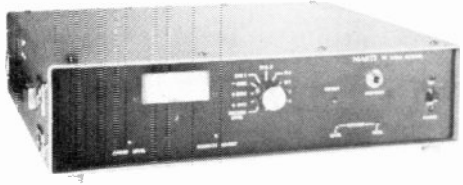
★ FCC TYPE ACCEPTED ★ Broadcast Quality Compressor Limiter ★ 115 V. AC or 13 V. DC Operation ★ Four Mixing Inputs ★ Continuous Duty Broadcast Service ★ Modular Construction ★ Quartz Crystal Filter in Receiver ★ Continuous Subaudible Tone Encoding (Optional)



RPT-1



RPT-40



RR-50 RECEIVER

TRANSMITTERS

RPT-40 40 watt, solid-state, complete with crystal & tuned to 150 MHz.	$1045.00
RPT-40-2 Dual Frequency, 40 watt, solid-state, complete with crystals & tuned to 150 MHz band, maximum frequency separation 0.5 MHz.	1150.00
RPT-25 25 watt, solid-state, complete with crystal & tuned to 450 MHz.	1195.00
RPT-25-2 Dual Frequency, 25 watt, solid-state, complete with crystals & tuned to 450 MHz band, maximum frequency separation 1.5 MHz.	130.00
RPT-1/150 1 watt, solid-state, complete with crystal & tuned to 150 MHz.	575.00
RPT-1/150-2 Dual Frequency, 1 watt, solid-state, complete with crystals & tuned to 150 MHz band, maximum frequency separation 0.5 MHz.	595.00
RPT-1/450 0.7 watt, solid-state, complete with crystal & tuned to 450 MHz.	575.00
RPT-1/450-2 Dual Frequency, 0.7 watt, solid-state, complete with crystals & tuned to 450 MHz band, maximum frequency separation 1.5 MHz.	595.00

TRANSMITTER ACCESSORIES

TPS-TC-1 Mobile Control Assemblage, required for 12 VDC operation for RPT-40 and RPT-25 transmitters.	$70.00
ENC-1 27 HZ encoder for transmitters listed above. Specify transmitter model number.	38.00
APS-28/14 Airborne Power Supply, 28-14 VDC, for RPT-40 & RPT-25.	98.00
MCD-70 Cardioid dynamic microphone with push to talk switch.	70.00
XT-1A Hi-Accuracy crystal for any Model Marti Transmitter.	17.95

BASE STATION

Mark 70W Telemote Remote Control with Broadcast Quality Line termination units.	$315.00
RPT-40 40 watt, solid-state Transmitter, complete with crystal & tuned to the 150 MHz. band, FCC Type Accepted to meet Base Station Specifications. Complete with RMH-2 Shelf, 585-005 Base Station RF Cable and 585-007 Base Station Mute Cable.	1072.00
RPT-25 25 watt, solid-state Transmitter, complete with crystal & tuned to the 450 MHz. band, FCC Type Accepted to meet Base Station Specifications. Complete with RMH-2 Rack Shelf, 585-006 Base Station RF Cable and 585-007 Base Station Mute Cable.	1224.00

RECEIVERS

R-30/150 Solid-state, complete with crystal & tuned to 150 MHz, for use with RPT-40 and RPT-1/150 Series transmitters.	$595.00
R-30/150-2 Dual Frequency, solid-state, complete with crystals & tuned to 150 MHz band, for use with RPT-40 & RPT-1/150 transmitters.	630.00
R-50/450 Solid-state, complete with crystal & tuned to 450 MHz, for use with RPT-25 and RPT-1/450 Series transmitters.	725.00
R-50/450-2 Dual Frequency, solid-state, complete with crystals & tuned to 450 MHz band, for use with RPT-25 & RPT-1/450 transmitters.	760.00
R-100/450 Solid-state, complete with crystal and tuned to 450.925 or 455.925 MHz. Group S (100 KHz) channels. For use with RPT-25S.	745.00

Group S Specifications:
Response: ± 1 DB from 30 to 15,000 KHz.
Distortion: Less than 1%
Noise: −58 DB or better

RR-30/150 Solid-state, Portable - Mobile Repeat Receiver complete with crystal & tuned to 150 MHz with de-code circuitry and high-pass filter to eliminate encoding tone. Operates of 12 VDC or 120 VAC.	$595.00
RR-50/450 Solid-state, Portable - Mobile Repeat Receiver complete with crystal & tuned to 450 MHz with de-code circuitry and high-pass filter to eliminate encoding tone. Operates of 12 VDC or 120 VAC.	725.00

RECEIVER ACCESSORIES

585-001 Interconnect cable between RR-30/150 and RR-50/450 Series Receivers and RPT-40 and RPT-25 Series Transmitters when used with TPS-TC-1 control assemblage as Unattended Automatic Mobile Relay.	$15.00
MRA-150 RF Preamplifier, solid-state, 10 db gain, 150-170 MHz complete with 120 VAC Power Supply.	135.00
MRA-450 RF Preamplifier, solid-state, 10 db gain, 450-460 MHz complete with 120 VAC Power Supply.	135.00
XR-1A Hi-accuracy crystal for any Marti Manufactured Receiver.	17.95
O-1A Oven for Hi-Accuracy crystal for XR-1A Crystals.	12.50
DFR-1A Dual frequency kit for any model Marti Receiver less crystal. Must be installed at Factory.	35.00

Circle (111) on Reader Service Card

Prices and Specifications Subject to Change Without Notice.

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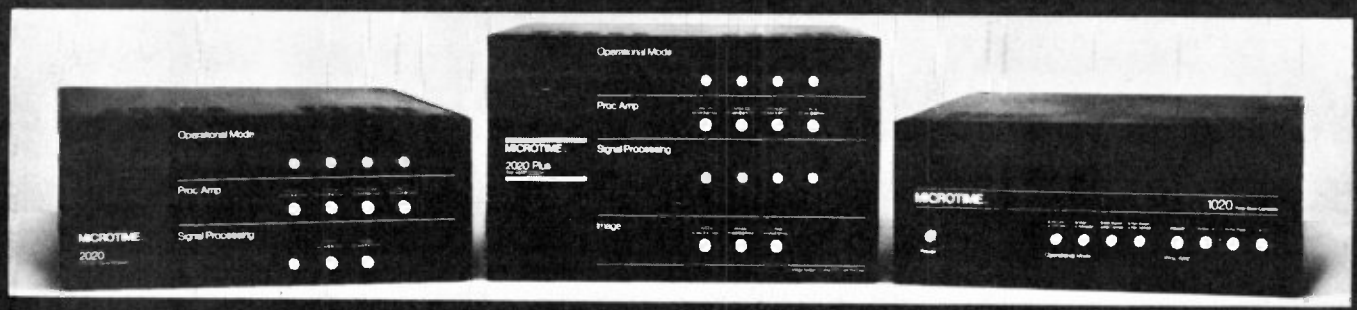
MICROTIME — Select Your Technology

If you are in the market for video signal processing equipment that will produce the best possible pictures — then look at MICROTIME. We can provide you with the complete range of video correction products for Time Base Correction, Image Processing, Noise Reduction, Color Correction, Velocity Correction, and Dropout Compensation using the technology that does it best.

Digital



2020 Electronic Signal Processor

Digital signal processor for any VTR. Provides 58 dB signal-to-noise ratio, Auto-Trac 2, Velocity Correction, and Image Processing which provides 3 dB visual noise reduction. DOC, Line Error Detection and 24 H line correction range options are available.

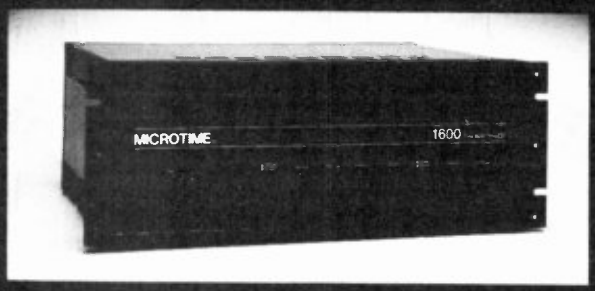
2020 Plus Total Signal Corrector

The most comprehensive signal corrector to process a signal from any video source. Provides Velocity Correction, Image Plus Processing, Auto-Trac 2, and 58 dB signal-to-noise ratio. Line Error Detection, 24 H line correction range, and DOC available.

1020 Time Base Corrector

Sensible time base correction for non-segmented helical scan VTRs. Low cost and high performance are featured with 4 H line or 24 H line correction range, internal sync generator, optional Image Processing, DOC and Velocity Correction.

CCD



1600 CCD Time Base Corrector

Lightweight, portable TBC designed for broadcast quality Electronic Field Production and other applications where ¾" VTRs are used. Incorporates charge-coupled device technology to provide low cost and excellent performance. Includes 55 dB signal-to-noise ratio, 4 H line correction range, Auto-Trac 2 and optional Image Processing.

Image Processing

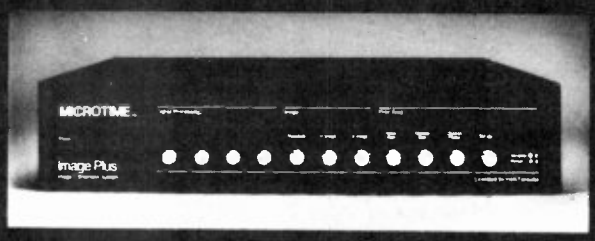


Image Plus Correction System

Provides horizontal and vertical detail improvement, reduces luminance and chrominance noise by 6 dB, corrects group delay errors and reduces chroma hue shift and cross color errors to improve any signal.

Microtime, Inc.
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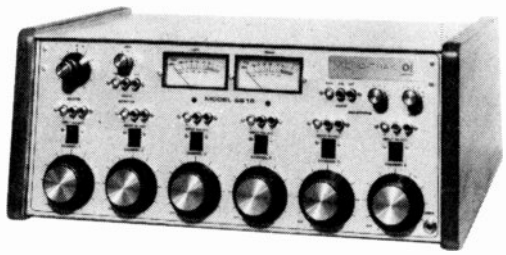
Bloomfield, Ct. 06002
(203) 242-0761 TWX 710-425-2390

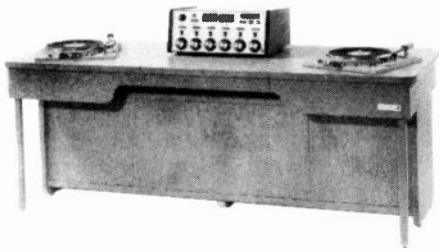
MICROTIME

MODEL 6618 BROADCAST SIX CHANNEL AUDIO CONSOLES
Mono and Stereo

Micro-Trak's Model 6618 is a high quality, conventional console for the budget minded station operator. The 6618 provides six mixing channels with three push button selected inputs to each channel for a total of 18 inputs. Line switches are push button latch logic controlled with individual LED indicators to show which channel is in use. The 6618 also includes an internal 10 watt per channel stereo monitor amplifier. Output line amplifiers supply +8 dBm levels of outputs of both mono and stereo program. The 6618 also includes an in-built cue speaker system. A separate headphone amplifier with push button selection of program cue or external input is also provided. A dual relay muting system allows for switch selected muting of the main studio monitor amplifier and also provides muting for additional line level monitor output by any or all channels. Spare form C contacts are provided on both muting relays for external function such as on-the-air lights. The 6618 is ideal for an upgrade for your mono facility now, which can later be applied to stereo uses.



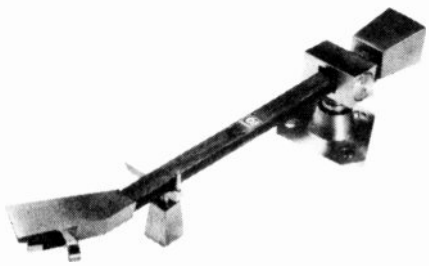
THE "S" SYSTEM



Micro-Trak's newest operating audio system is the "S" System. "S" stands for Studio and Micro-Trak's "S" System is a complete operating studio in one package. Provided with the Model 6618 Six Channel Stereo/Mono console, two Model 6401 Stereo Phono Preamplifiers and two Micro-Trak turntables equipped with Model 303 Tone Arms and Stanton 500AL cartridges, the "S" System comes with internal wiring ready for the normal broadcast studio. Beautifully designed to be used as a single stand-alone package. the 30" x 80" long operating desk provides plenty of space for adjacent cart machines. Reel-to-reel equipment, where required, can be mounted on an accessory roll-about Series "S" Tape Recorder Cabinet. In addition to providing table space for the console and turntable, the "S" System provides 17½ inches of vertical panel space for 19 inch rack mounted at either end of the pedestal. Rack panel equipment may be mounted at both the front and the rear of the cabinet. System "S" is the easy way to convert your studio from A.M. mono to A.M. stereo, to add that new studio you've been thinking about, or to upgrade an older F.M.

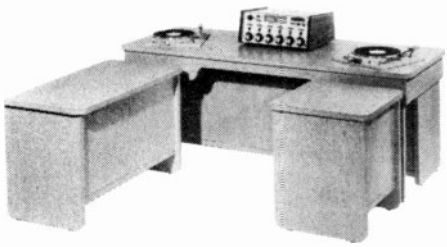
THE "D" SYSTEMS

Micro-Trak's "D" Systems offer more versatility than any other small broadcast production/disco system on the market today. With a choice of five audio consoles, four or five channel stereo or mono broadcast and disco teamed with Micro-Trak quality turntables, equipped with 303 Tone Arms and Stanton 500AL cartridges, the system meets all the requirements of the most discriminating broadcaster. Micro-Trak's "D" systems are shipped to you completely wired, tested, and ready to operate as they are taken from their shipping cartons. Just plug in external cables and you are ready to go. If you are thinking of remote production, or disco or a combination, order the Micro-Trak compacts.



MICRO-TRAK TONEARMS
Model 303 and 306

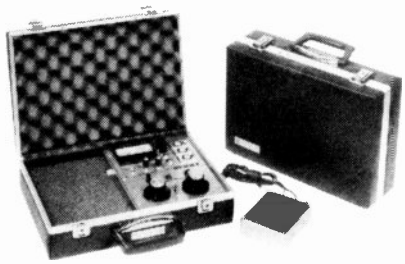
Micro-Trak — the name was created to define the most widely used Tone Arm in broadcast history. Tracking capabilities to a tenth of a gram, resonance below 10 Hz, high compliance, rugged, dependable strength offered by an impregnated wood body and super smooth performance with jewel bearings make the 303 and 306 Tone Arms the best buy for the broadcaster today. 30,000 broadcast and professional users demonstrate how their rugged simplicity of design can give you the best possible performance. Specify Micro-Trak 303 12" and 306 16" Professional Tone Arms for your studio.



MICRO-TRAK "S" LINE FURNITURE

Micro-Trak's "S" line furniture has been designed to be striking in visual appearance and to optimize operational performance of your broadcast studio. Currently five pieces are offered; the "S" operating desk, either with the Under Pedestal as in the "S" System or with four steel tubing legs. Additionally, the "S" line offers a double turntable cabinet, a single turntable cabinet, and a roll around reel-to-reel tape machine cabinet. These units are durably constructed of one and one eighth thick high density particle board offering high strength, high mass for noise free operation in your studio. Standard finish on the"S" line is formica finish oak providing a beautiful feeling in your studio atmosphere. Specify Micro-Trak "S" line furniture wherever you need high quality and beautiful appearing studios.

THE MICRO-TRAK SPORTS



Micro-Trak offers two battery powered portable sport/remote consoles designed with the sports broadcaster in mine. The Sport II is a two channel console which has two selectable inputs on channel two. The first channel being a primary microphone, the second channel being switch selectable between microphone and a high level input for the color man or a tape cartridge machine input. In addition, there is a third microphone input which is not mixable which feeds the headset output for the primary announcer to allow a spotter to feed him information on the play action. The Sport headset amplifier provides a separate output to each ear of the primary announcer, one side for monitor, the second side for the spotter input. Monitor input is switch selectable between cue program and an external monitor source such as an off-air portable radio. The Sport provides one monaural output channel which is metered and output levels are at the plus 8 dBm point. A self-contained battery pack provides fifty-five hours of operation from sixteen "C" size manganese alkaline flashlight batteries. Available as an option is one 110 volt power supply. Also available is an accessory case which provides space for headsets, microphone, etc. If you are sending your man to the ballpark, send him with a Micro-Trak Sport.

Specifications Subject to Change Without Notice.

MICRO-TRAK CORPORATION

620 RACE ST., HOLYOKE, MASSACHUSETTS 01040

USA

TELEPHONE 413 536-3551 **TELEX 95-5497** **NAB 391**

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BROADCAST MIXING CONSOLES
CONTROL & INSTRUMENT AMPLIFIERS**

Wide bandwidth — Broad frequency response — Hi efficiency. Extremely low distortion. Power level range up to +0 dBm. Negligible hum pick-up due to nested Mu-metal shields and unique gapless core construction. Ease of mounting and orientation for minimum hum pick-up. Polarizing voltage connection for condenser microphones. Subminiature size permits close spacing to adjacent circuitry. Low microphonics.

Fig. -SP
PRINTED CIRCUIT MOUNTED
Double Mu-metal Shielded. ¾" D x 1⅛" H. 7-.040 pins ⅛" H.

Fig. -S
SINGLE THREADED STUD MOUNTING
Double Mu-metal shielding. 3" color coded leads. ⅝" D x 1⅜" H. ⅜" D stud.

Part No.†	Nominal Turns Ratio Pri:Sec	Nominal Impedance Ratio Primary	Secondary	Typical Open Circuit Pri. Impedance @ 50 Hz	Frequency Response	Replaces Threaded Stud Mounting Beyer P/N‡	Net Each Lots of 1-9★ -S	-SP
S101-†	1:20	12.5	5,000	100	30-15,000Hz ±1db	TR-BV35704	$15.15	$18.15
S105-†	1:15	200	45,000	2,000	30-15,000Hz ±1db	351.015.006	17.40	22.65
S107-†	1:15	200/50 Split	45,000	2,000	30-15,000Hz ±1db	351.215.006	19.20	24.60
S108-†	1:10	200	20,000	2,000	30-15,000Hz ±1db	351.010.005	14.85	19.05
S111-†	1:7.1	200	10,000	2,000	30-15,000Hz ±1db	351.007.004	14.40	19.20
S116-†	1:5	200	5,000	2,000	30-15,000Hz ±1db	351.005.003	13.95	18.15
S118-†	1:5	200/50 Split	5,000	2,000	30-15,000Hz ±1db	351.205.003	16.20	20.40
S126-†	1:1	600 CT	600	3,750	30-20,000Hz ±.5db	TR-145/BV35508	14.70	19.20
S130-†	1:1	10,000	10,000	100,000	30-15,000Hz ±1db	TR-145/BV35590	13.80	18.00
S100-FB	Right angle mounting bracket for S100-S Series.						.81	—

‡ -SP Type is replacement for STR/BV37 & 370 PC pins. † ORDER BY COMPLETE PART NUMBER (S101-SP).

TELEPHONE COUPLING TRANSFORMERS

FIG. U

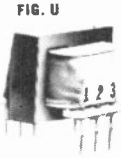
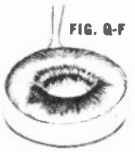


FIG. Q-F



DESIGNED TO MEET FCC PART 68

For interconnect of voice/data modem terminals to telephone lines. Permits optimum use of voice-grade telephone lines for broadband computer modems over a wide dynamic signal range with minimum distortion. PC construction.

- **Frequency Response:** 300-3500 Hz ±0.5 dB.
- **Level:** −45 dBm to +7 dBm.
- **Return Loss:** 26 dB min.
- **Impedance Matching:** ±10% over entire frequency range.
- **Distortion:** 0.5% max.
- **Long Balance:** Per FCC 68.310.

DIMENSIONS

Series	Width	Depth	Height	Weight
T1000	¾"	1 9/32"	7/16"	.4 oz.
T2000	49/64"	1 1/16"	23/32"	.5 oz.
T3000	1 1/64"	61/64"	27/32"	1.2 oz.
T4000	1 13/32"	1 5/32"	1¼"	3.5 oz.
T5000	1 41/64"	1 11/32"	1 5/32"	5.5 oz.
T6000†	1 61/64"	1 13/32"	1 41/64"	9.5 oz.

†Channel frame mounting 2⅜" M.C.

Part No.	Application	Primary Impedance	Secondary Impedance	Fig. No.	Price 1-9★
T1104	Coupling	600	600	U	$5.70
T2104	Coupling	600	600	U	4.65
T2106	Coupling	600 C.T.	600 C.T.	U	4.95
T2108	Coupling	600	900	U	4.65
T2110	Coupling§	900	900	U	4.95
T4113	Coupling☐	900/600 @ 60/75 mA D.C.	600 Split	U	7.65
T6112	Coupling§	600	900/600 @ 100/120 mA D.C.	U	15.75
T2220	Hybrid‡	600(4W)	600/600	U	6.15
T3220	Hybrid‡	600(4W)	600/600	U	6.60
T4220	Hybrid‡§	600(4W)	600/600 @ 60 mA D.C.(2W)	U	11.40
T5220	Hybrid‡§	600(4W)	600/600@ 100 mA D.C.(2W)	U	21.00
T2316	Bridging	4000	600	U	4.80
T4415	Holding Coil	2.0 hy @ 60 mA, 1.3 hy @ 100 mA D.C., 180Ω		U	5.10
T7410	Holding Coil	1.0 hy @ 0 mA, 0.8 hy @ 25 mA D.C., 225Ω		Q-F	7.95
T8410	Holding Coil	1.0 hy @ 0 mA, 0.8 hy @ 40 mA D.C., 113Ω		Q-F	8.40

‡2 required for Hybrid operation, trans-hybrid loss 45 db typical.
§Electrostatic Shield. ☐Level −15 to +7 dBm.
REQUEST ENGINEERING APPLICATION BULLETIN F232.

PRECISION HI-FI ACCESSORIES

STEREO CENTER CHANNEL

OUTPUT MATCHING TRANSFORMER FOR MONAURAL EXTENSION SPEAKERS

Designed for the Audiophile who wishes to convert a Stereo system to Monaural or wishes to modify or enlarge his Stereo system. Permits "hole-in-the-middle" fill in with 3rd channel speaker. Matches impedance, polarity and power level. 30 watts. Response 40 to 20,000 Hz.

HM-90 User net **$14.50**

HUM-BUCKING TELEPHONE PICK-UP COIL

Hum free transcription, no connection to phone. Perfect for high impedance tape recorders and dictating machines. Rugged construction of high impact plastic.

HP-70 User net **$13.50**

TELEPHONE PICK-UP COIL

For recorder or direct feed into amplifier — Use as probe for locating hum. Equalized pick-up level.

- Universal design - tinned leads.
- Black finish with 68" cable
- Size: ⅝" D. x 2½" L. Wgt: 1½ oz.

HP-61 User net **$6.15**

BULK TAPE ERASER FOOT SWITCH

For hands free operation of HD-25 and HD-20. Momentary switch prevents burn outs. Plug-in connection. Skid-proof base. Black wrinkle finish. UL approved 8' 3-conductor cord. Size: 5½" x 3¼" x 1¼" H. Wgt: 2 lbs.

HD-50 User net **$27.50**

AUDIO-VIDEO INDUSTRIAL GRADE DEMAGNETIZERS

MAGNETIC TAPE EDITING PEN

For erasing small areas of sound and video from magnetic tape or film. Syllables, program material, and errors may be removed. Press to operate switch. 115V 50/60 Hz at 10 watts. Active tip area ¼" D. Size: ⅝" D. x 8" L. Weight: 6 oz.

HD-35M

User net **$47.50**

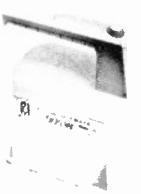
TAPE HEAD DEMAGNETIZER

Removes permanent magnetism. Protects tape from erasure. Minimizes noise and distortion. Extended pole piece for easy access. Polished end prevents scratches. 117V. 50/60 Hz, 1 Amp.
Size: 4" x 1¼" D. Weight: 7 ozs.

HD-40M

User net **$7.99**

HAND HELD BULK TAPE ERASER



A compact bulk tape eraser. For magnetic tape up to ½" wide. For cassettes, cartridges and reels. Erases recorded signals and noise instantly, when passed over tapes or sound film, without rewinding. Removes background noise below level of new tapes or film. 117V. 50/60 Hz, 4 Amps. Size: 4⅜"x2½"x4⅜" Wt.2½ lbs.

HD-15 User net **$14.50**

Adapter hub for NAB reels for ⅜" spindle. Wt. ½ lb. (not illustrated). **HD-11-AD** User net **$4.25**

HEAVY DUTY BULK TAPE ERASER

For bulk erasure of up to ½" tape. Ideal for cassettes, cartridges, film, and reel diameters from 3¼" - 10½". For Audio, Video and Computer Tapes. Restores tape to like new condition. Epoxy molded for ruggedness and longer duty cycle. 117V. 60 Hz, 5 Amps. Size: 7" x 3½" x 3¼" H. Weight: 9 lbs.

HD-11M User net **$49.50**

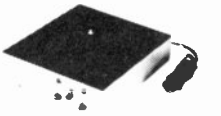
INDUSTRIAL AUDIO/VIDEO/COMPUTER BULK TAPE ERASER

For bulk erasure of up to 1" tape. Ideal for cassettes, cartridges, and reel diameters from 3¼" - 10½". Erasure 65-90 db below saturation level. Designed and constructed for heavy industrial use. Fuse and pilot light. 117V. 50/60 Hz, 10 Amps. Size: 4" x 6" x 8". Weight: 15 lbs.

HD-20 User net **$102.50**

PROFESSIONAL AUDIO/VIDEO/COMPUTER BULK TAPE ERASER

For tapes up to 2" wide by 17" diameter. For cassettes, cartridges, and reels. Erasure to 90 db below saturation. Designed and constructed for heavy duty professional use. Double fuse and pilot lights for safety. 115V. 50/60 Hz, 20 Amps. Size: 4" x 12" x 14". Weight: 33 lbs.



HD-25 User net **$262.50**

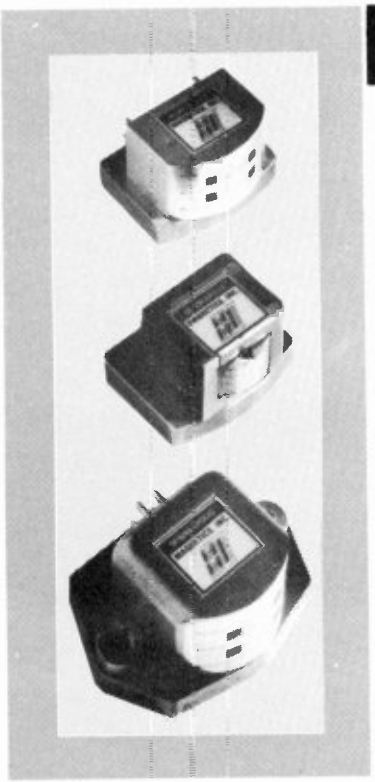
★ Quantity pricing schedule (Transformers only): 10-49 less 10%, 50-99 less 16⅔%, 100-249 less 33⅓%. Contact factory for pricing over 249 pieces.

MINNEAPOLIS MAGNETICS, INC.

(612) 927-8841

the preferred source for magnetic tape head replacements

ampex · scully · revox · magnecord



PROFESSIONAL TAPE HEADS

MMI HEADS EQUAL OR EXCEED ORIGINAL MANUFACTURERS' EQUIPMENT SPECS.

GAP: All of the heads produced by MMI have .024" depth of metal at the gap for longer life with minimal change in head characteristics as wear progresses. (Exception: Ferrite erase heads).

FACE: All of the heads produced by MMI have full metal face construction to minimize oxide loading and promote even wear, with no dishing, craters or other aberrations in the tape-to-head contact area.

LAMINATION: All of the heads produced by MMI have WIDE lamination stacks — the only way to obtain smooth, even frequency response. Wide contact area will also increase head life.

All heads produced by MMI are given INDIVIDUAL 100% testing.

All heads produced by MMI are DIRECT RETRO-FITS, complete with illustrated instructions for easy do-it-yourself installation.

RELAPPING — No charge head evaluation

REFURBISHING — Send us your assembly. We will ultrasonically clean everything, install new heads if yours cannot be relapped, replace any worn or missing minor hardware, adjust & test.

72 HOUR SERVICE — FREE LOANER SERVICE

HEADS FOR CART MACHINES

Ampro, ATC, Collins, Garron, Gates, ITC, Macarta, Moulic Spec., RCA, Schafer, SMC, Sparta, Spot Master, Tapecaster.

NOW . . . DIGITAL HEAD REFURBISHING

3104 West Lake Street
Minneapolis, Minn. 55416

HERE IS THE **MMI WARRANTY** THERE JUST ISN'T ANY BETTER.

Except for wear (which is inevitable) and abuse (which seldom occurs when handled by competent professionals), the very simplicity of the installation permits MMI to extend the most liberal warranty in the industry.

MINNEAPOLIS MAGNETICS, INC.
UNCONDITIONALLY GUARANTEES THESE PRODUCTS.

PROFESSIONAL AUDIO AND CUSTOM TAPE HEADS, EQUIPMENT DESIGN- PRECISION MACHINING / ASSEMBLY

Prices and Specifications Subject to Change Without Notice.

Circle (116) on Reader Service Card

MODULAR AUDIO PRODUCTS

■ A UNIT OF MODULAR DEVICES, INC.

50 Orville Drive ■ Airport International Plaza ■ Bohemia, New York 11716 ■ 516-567-9620

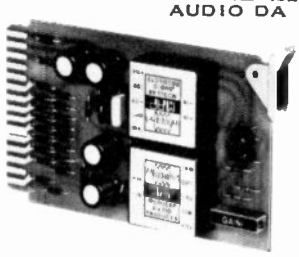
A COMPLETE LINE OF MODULAR EQUIPMENT FOR . . . . . ☐ AM – FM – TV BROADCASTING
☐ RECORDING STUDIOS
☐ SOUND & COMMUNICATIONS

FEATURING . . . MAP AUDIO OPERATIONAL AMPLIFIERS & VCA (VOLTAGE CONTROLLED AMPLIFIER) MODULES.

IMPAC ™ SERIES PC CARD SYSTEM

MAP IMPAC IS A COMPLETE & HIGHLY VERSATILE SYSTEM OF PLUG – IN PC CARD MODULES, IDEAL FOR USE IN MIXERS, CONSOLES, SOUND DISTRIBUTION & SWITCHING SYSTEMS. IMPAC OFFERS THE OPTION OF SELF – CONTAINED OR REMOTE – CONTROLLED OPERATION, UTILIZING STATE – OF – THE – ART VCA LEVEL CONTROLS & F.E.T. SWITCHING TECHNIQUES.

MODEL 4820
AUDIO DA



MODELS . . .

	1 – 9
4003 (AM – 27) MICROPHONE PREAMP. . .	$ 119.00
4004 (ABL – 27) BRIDGING LINE AMP. . .	119.00
4006 (AL – 27A) LINE – MIX – DIFF. AMP. .	96.00
4007 (PM – 40A) 15 WATT POWER AMP. . .	119.00
4008 (AT – 27) TAPE PREAMPLIFIER	117.00
4009 (AP – 27) PHONO PREAMPLIFIER . .	106.00
4010 (PPI – 27) PEAK INDICATOR	95.00
4011 FET AUDIO SWITCHER	75.00
4012 AUDIO OSCILLATOR	105.00
4100 VOLTAGE CONTROLLED AMPLIFIER .	151.00
4200 VCA WITH OUTPUT TRANSFORMER .	162.00
4820 1X8 AUDIO DISTRIBUTION AMP. . . .	139.00

ACCESSORIES . . .

4030 EXTENDER CARD	$ 27.00
4900 CARD RACK WITH FRONT COVER . .	125.00
1828 CARD RACK (OPEN FRONT)	90.00
1817 SINGLE CARD MTG. BRACKET	17.00

POWER SUPPLIES . . .

	1 – 9
4000 ±15VDC, 100MA CARD	$ 70.00
4005 ±15VDC, 200MA CARD	85.00
4050 ±15VDC, 500MA CARD	279.00
3151 ±14 TO 16VDC, 1AMP	260.00
RP3151 DUAL RACK MTG. PANEL . .	34.00
7000 ±14 TO 16VDC, 4AMPS	425.00
RP7000 DUAL RACK MTG. PANEL . .	34.00

MODEL
4050
500 MA

SYSTEM SPECIFICATIONS . . .

FREQUENCY RESPONSE . . . + 0.5DB, 30HZ TO 20KHZ
DISTORTION . . . 0.5% THD MAX. AT +27DBM
SIGNAL TO NOISE RATIO . . 74DB. REF. –55DB MIC INPUT
+8DBM PROGRAM OUTPUT
(E.I.N. –129DBM)

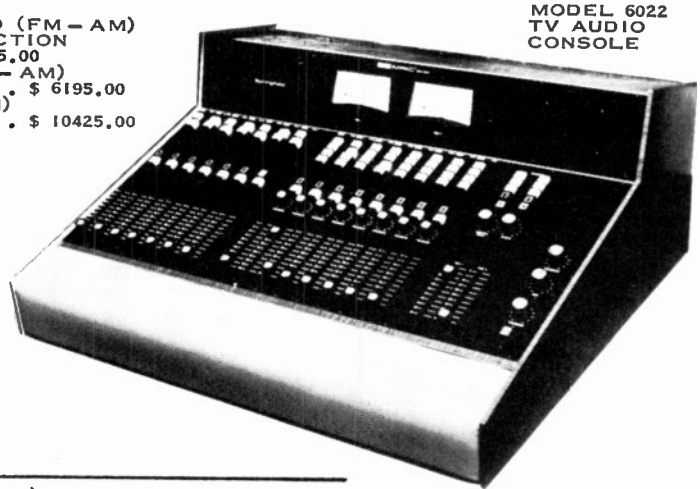
IMPAC ™ SERIES MODULAR BROADCAST CONSOLES

A NEW SERIES OF INTEGRATED MODULAR PROFESSIONAL AUDIO CONSOLES ENGINEERED FOR VERSATILE APPLICATIONS IN AM – FM RADIO & TELEVISION BROADCASTING AND PRODUCTION.

MAINFRAMES (FULLY WIRED LESS MODULES) . . .

6012 (DAYTON) 12 CHANNEL STEREO – MONO (FM – AM) RADIO BROADCAST – PRODUCTION CONTROL CENTER . . . $ 8295.00
6022 (SPRINGFIELD) 16 X 2 MONAURAL (TV – AM) AUDIO CONTROL CENTER . . . $ 6195.00
6032 (BURBANK) 16 X 4 MONAURAL (TV – AM) AUDIO CONTROL CENTER . . . $ 10425.00

MODEL 6022
TV AUDIO
CONSOLE



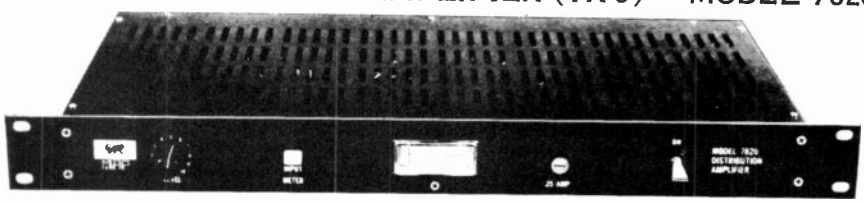
MODULES . . .

(FOR 6012)	1 – 9
6010 MIC INPUT WITH PAN	$ 475.00
6011 LINE – MED. LEVEL INPUT	456.00
6013 BLANK PANEL	25.00
(FOR 6022)	
6020 MIC INPUT MODULE	$ 445.00
6021 LINE – MED. LEVEL INPUT	465.00
6023 BLANK PANEL (6022 OR 6032)	25.00
(FOR 6032)	
6030 MIC INPUT MODULE	$ 479.00
6031 LINE MED. LEVEL INPUT	479.00

EQUALIZERS & OSCILLATOR . . .

3100 GRAPHIC – SHELF EQ.	$ 415.00
3270 RECIPROCAL PEAKING & SHELVING EQ.	415.00
3600 PRECISION OSCILLATOR	370.00
3000BP BLANK PANEL	10.00

AUDIO DISTRIBUTION AMPLIFIER (1X8) – MODEL 7820



- (8) 600 OHM OUTPUTS AT +20 DBM EACH
- TRANSFORMERLESS DIFFERENTIAL AMPLIFIER
- ONLY 3 – 3/4 IN. HIGH
- BUILT – IN POWER SUPPLY

$ 369.00

PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE – MAP 9/78

Circle (117) on Reader Service Card

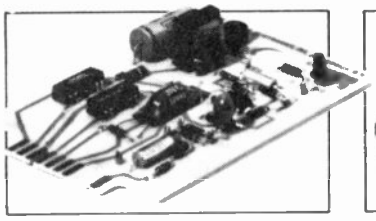
MONEY SAVING OPPORTUNITIES TO USE THE TELEPHONE FOR REMOTE CONTROL

Here are some of the HIGH-SPEED TONE SIGNALING DEVICES from Monroe Electronics, Inc.

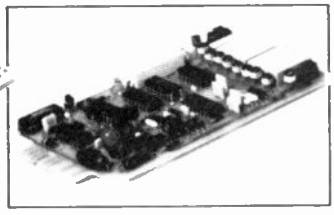
Use your regular touch button telephone to control:

- Closed circuit TV circuits
- Ambient temperature of building areas
- Microwave transmitters
- Energy conservation systems
- Security systems
- Antenna systems
- Telephone equipment
- Radio/telephone interconnection equipment
- Entrance ways, overhead doors

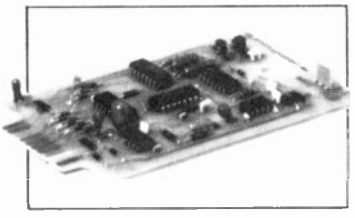
COMPONENTS – Ready for you to assemble – from $69



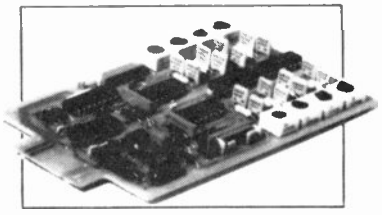
3137A-1
Unattended Automatic Telephone Answering Device and Coupler automatically activates upon receipt of telephone high level ring signal and provides both a bi-directional audio path between public network and customer owned equipment, and a relay contact closure to activate customer equipment. FCC Part 68: This unit is certified for direct connection to public telephone network.



3185
4 Digit Sequence Dual Tone Signal Detector. This unit will latch its relay output contacts upon receipt of a correct sequence of up to four digits (touch tone® or dual tone). It will unlatch its output upon receipt of the same initial digits but with a different last digit. On board switch permits programming to 1, 2, 3, or 4 digits, latching, momentary, or alternate action of output relay.

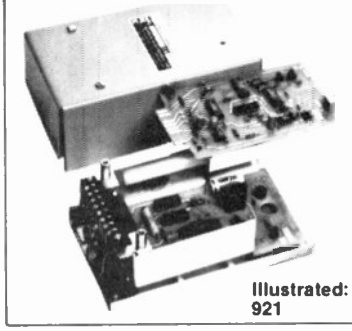


3178-1
Scanner verifier card, either of two audio tones for each of 10 alarm points.



3195
Touch Tone® Decoder decodes all 16 touch tone® frequency combinations, and provides bcd solid state output.

MINI SYSTEMS... Wired and Assembled

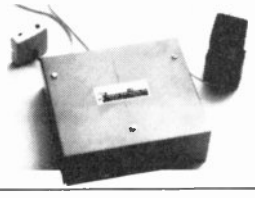


Illustrated: 921

921 Status verifier 10 point alarm status report unit. Unit sends telephone caller a series of tones indicating "The on/off" condition of 10 sets of status indicating relay contacts.

929A Automatically answers incoming phone calls, and upon reception of a four digit code, transfers a relay contact. Includes 3137A-1, 3185, and 424 power unit wired together in this mini system.

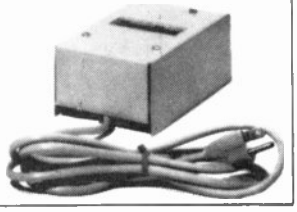
939A Wired mini system including 3185 4 digit tone detector, and 424 power unit. For hard line wire, radio, or microwave interface.



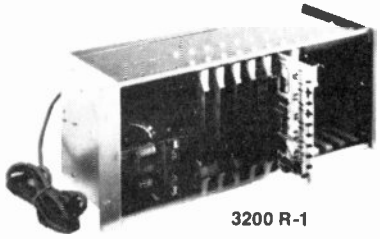
922 Unattended answering device which releases when calling party hangs up.

937 Wired 3137A-1, 424 power supply which serves as an unattended automatic telephone coupler to customer owned equipment. Unit has timed release-capacitor programmable to 2½ minutes.

951 Connects to telephone line, and converts touch tone signals to a one out of 10 output. For interface to external equipment, such as teletypewriter upon receipt of proper tone code.



COMPLETE REMOTE CONTROL AND STATUS MONITORING SYSTEMS

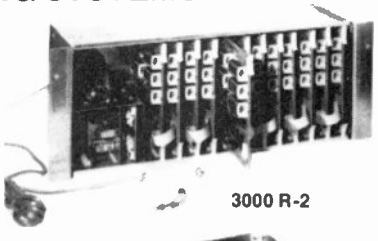


3200 R-1

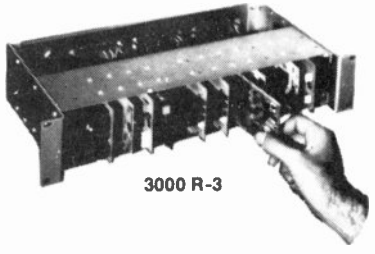
3200R-1 Broadcast transmitter status alarm and remote control unit. It monitors tolerance bands in the 0 to 10 dc reference output of transmitter and/or status relay contact closures, or opens. If status changes, unit siezes telephone line, dials preset number, and notifies called party of problems by a series of 10 tones each representing a monitored function. Called party acknowledges receipt of alarm by entering touch tone® code. He may then perform remote control operations by submitting proper tone codes.

3200R-2 10 to 60 Channel 2 Digit Tone Receiver System accepts 2 digit address plus the * to latch, and the # to unlatch. Available also with momentary contacts for "raise/lower" applications. Automatic telephone answering circuits built in.

3000R-3 Complete simplex radio autopatch. Provides call-in or call-out radio to landline telephone interconnection on an automatic basis. Built in timer and logic assure fail-safe operation.



3000 R-2



3000 R-3

Monroe electronics also manufactures a status reporting system which calls a central location (studio) and causes receiving unit to print date, time and fault. Provision is also made for building status reporting such as intrusion, temperature, air flow, etc. Write for technical literature covering your application.

®Touch Tone is a registered trademark of AT&T.

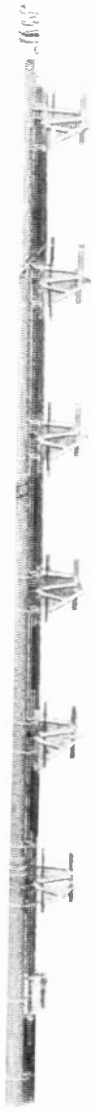
ME

MONROE ELECTRONICS, INC.
200 Housel Ave., Lyndonville, N.Y. 14098
Phone: 716-765-2254 Telex: 91-9188

FRED A. NUDD CORPORATION

1743 Route 104 • Ontario, NY 14519
315/524-2531

MONO-POLES



MODEL	HEIGHT (ht. over tower)	OUTSIDE DIA. of SECTIONS inches	MAX. OVERTURN MOMENT in lbs.	MAX. ANTENNA WIND LOAD psf	WIND LOAD CENTER (ft. over tower)
M-15	15	3.5	53,520	225	10′
M-20	20	4.5	102,480	306	13.33
M-25	25	4.5	162,960	526	14.06
M-30	30	5.5	230,330	560	16.88
M-40	40	6.625	480,000	941	22.5
M-50	50	8.625	759,500	1,003	28.13
S-40	40	6.625 8.625	588,000	1,350	26.67
S-50	50	6.625 8.625	759,500	1,303	33.33
S-60	60	6.625 8.625	1,165,600	1,735	40.0
S-70	70	6.625 8.625 10.75	1,708,000	2,244	46.67
S-80	80	6.625 8.625 10.75 12.75	2,132,800	2,359	53.33
S-100 (S-100H)	100 (100)	6.625 8.625 10.75 12.75	2,484,508 (3,120,256)	1,845 (2,640)	66.67 (66.67)
S-120	120	6.625 8.625 10.75 12.75 15.0	4.476,675	3,083	80.0

WIND LOADS BASED ON 50/33 PSF, INCLUDING 300 MM TOP BEACON AND MAXIMUM DEFLECTION OF 3/4" IN 10 FEET.

OTHER PRODUCTS AND SERVICES INCLUDE:

Custom design, fabrication and installation of towers, mono-poles and tower brackets and hardware.

Engineering services, modification and repairs to towers.

Tower inspections as well as service contracts and emergency service.

Our towers and mono-poles are designed to EIA specifications and are fabricated in our 14,000 sq./ft. shop located in Ontario, New York.

Prices and specifications subject to change without notice

Circle (119) on Reader Service Card

O'Connor
ENGINEERING LABS., INC.

THE WORLD'S FINEST CAMERA SUPPORT EQUIPMENT

Because your camera support system is only as good as its weakest component, O'Connor has designed the most complete professional support system.

In order to help you utilize many of the other fine products on the market, we continue to produce an increasing variety of interchangeable options and accessories. For each head there are numerous camera platforms to accommodate every camera. Various bases, including the innovative O'Connor "claw ball" bases with the ultra positive grip, enable one to use any O'Connor head with most 16MM and 35MM tripods and dollies. Other accessories include, adaptors, hi-hats, double video handles, handle extensions and casters for the Hydro-Ped. For more information on these O'Connor extras, contact your dealer or send for our brochure.

Prices and specifications subject to change without notice

Circle (120) on Reader Service Card

MODEL C

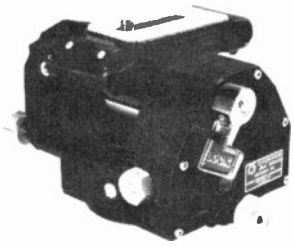
The O'Connor Model C is a professional quality head designed for lightweight 16mm cameras weighing up to 15 lbs. The smooth-flowing action of large motion picture cameras can be achieved with small 16mm cameras mounted on this lightweight, 6 lb. head.

The Model C is designed for the professional who's engaged in field production, news and documentary work. This head is terrific for wildlife photography and is very popular with the amateur who demands perfection.

Employing the same principles as larger O'Connor heads, the Model C provides super-smooth panning and tilting, with the camera under perfect control at all times. Infinitely variable fluid drag prevents sudden starts, stops and jerks.

Capacity	15 lbs (6.8 kg)
Weight	6 lbs (2.7 kg)
Size	6¾" high 5" wide 6½" long
Pan	360°
Pan drag	Fluid type continuously adjustable
Pan lock	Independent from fluid system
Tilt	70° up and 90° down
Tilt drag	Fluid type continuously adjustable
Tilt lock	Independent from fluid system
Counterbalance	60 in-lbs spring
Camera mounting screw	⅜ -16 (¼ -20 on special order)
Base	Pro-Jr type standard (options available)
Handle	Right or left hand operation and vertically adjustable
Temperature range	20° to 120° F −29° to 49° C
Material	Magnesium and aluminum alloy castings
Finish	Black wrinkle baked enamel anodized and or plated
Bearings	Precision ground deep groove ball
Shipping weight	8 lbs (3.6 kg)
Accessories	Arri 16 Ball and claw ball base ¼" platform with ¼" -20 camera tie-down screw metal shipping case assorted tripods and video double handles

MODEL 30

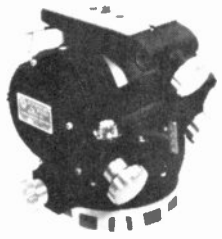


The 30 is small and weighs just 5 lbs., yet it will handle motion picture and video cameras weighing 10 to 30 lbs. One of the standard features is a unique new counterbalance which can be adjusted in the field. It comes with an entirely new drag mechanism which is continuously adjustable through 360° panning and ± 60° tilt.

The end result is a beautifully designed small head which has all the features and smooth-steady action which has made O'Connor the favorite of professionals throughout the world.

Capacity	30 lbs (13.6 kg)
Weight	5 lbs (2 kg)
Size	4¼" high 7" wide 5" long
Pan	360°
Pan drag	Fluid type continuously adjustable
Pan lock	Independent from fluid system
Tilt	60° up and 80° down
Tilt drag	Fluid type continuously adjustable
Tilt lock	Independent from fluid system
Counterbalance	Adjustable in field from 10 lb. to 30 lb. camera
Camera mounting screw	⅜ -16 (¼ -20 on special order)
Base	Flat/Pro Jr. combination (options available)
Handle	Vertically and horizontally adjustable
Temperature range	20° to 120° F 29° to 49° C
Material	Cast aluminum
Finish	Black wrinkle baked enamel, anodized or plated
Bearings	Tr. tion resistor and needle bearings
Shipping weight	7 lbs. (3.2 kg)
Accessories	Cine-ba base Arri 16 video double handles and metal shipping case and assorted tripods

MODEL 50-D



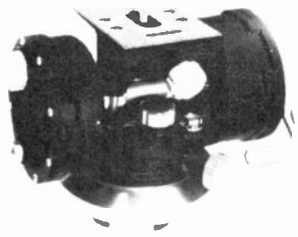
Here is an exceptionally lightweight head for cameras weighing up to 50 lbs. It is extremely maneuverable, yet it provides steady, smooth, jerk-free panning and tilting.

The O'Connor Model 50-D is considered a standard for making fine documentaries and has proved itself invaluable for critical assignments where perfection is desired. Its compact size and light weight make it ideal for location shooting, news work and field production.

Several improvements have recently been made on this head, eliminating breakaway friction, improved seals, a stronger body casting and other features which make it the ultimate head for 50 lb. cameras.

Capacity	50 lbs (23 kg)
Weight	7 lbs (3.2 kg)
Size	7" high 7" wide 7" long
Pan	360°
Pan drag	Fluid continuously adjustable
Pan lock	Independent from fluid system
Tilt	45° up and 45° down
Tilt drag	Fluid continuously adjustable
Tilt lock	Independent from fluid system
Counterbalance	150 in-lb springs standard 100 in-lb and 200 in-lb springs also available
Camera mounting plate and screw	5" long x 2¾" wide with ⅜ -16 recessed screw
Base	Pro Jr type standard (options available)
Handle	Right or left hand operation and vertically adjustable
Temperature range	−20° to 120° F 29° to 49° C
Material	Magnesium and aluminum alloy castings
Finish	Black wrinkle baked enamel anodized or plated
Bearings	O Connor s and pre loaded roller
Shipping weight	9 lbs (4 kg)
Accessories	Arri 16 Arri 35 claw ball and Mitchell bases fixed and adjustable camera platforms metal shipping case assorted tripods and video double handle

MODEL 100-C



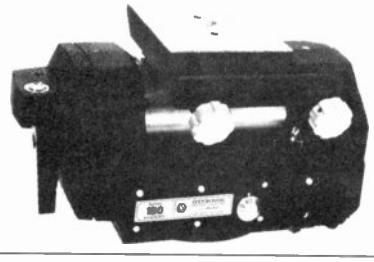
This low profile, lightweight head provides ultra-smooth panning and tilting for cameras weighing up to 100 lbs. Built of magnesium and aluminum alloy castings, the O'Connor 100-C weighs only 16 lbs.

Now the cinematographer is in complete, positive, flexible control of his camera, free to follow the action at any speed, in any direction, knowing the head will obey his every command. Panning and tilting can be done simultaneously, controlled by the same adjustable handle, which can be attached to either side.

The highest degree of professional cinematography is attainable with the O'Connor Model 100-C.

Capacity	100 lbs (45.5 kg)
Weight	16 lbs (7.3 kg)
Size	7" high 11" wide 7" long
Pan	360°
Pan drag	Fluid type continuously adjustable
Pan lock	Independent from fluid system
Tilt	60° up and 80° down
Tilt drag	Fluid type continuously adjustable
Tilt lock	Independent from fluid system
Counterbalance	500 in-lb springs standard 300, 700 and 900 in-lb springs also available
Camera mounting screw	⅜ -16 (with special lock lever)
Base	Mitchell type standard (options available)
Handle	Right or left hand operation and vertically adjustable
Temperature range	20° to 120° F 29° to 49° C
Material	Magnesium and aluminum alloy castings
Finish	Black wrinkle baked enamel anodized or plated
Bearings	Precision ground deep groove ball
Shipping weight	20 lbs (9.1 kg)
Accessories	Arri 35 super claw ball & Pro Jr. bases adjustable double handle platform video double handles metal shipping case and assorted tripods

MODEL 150-XR



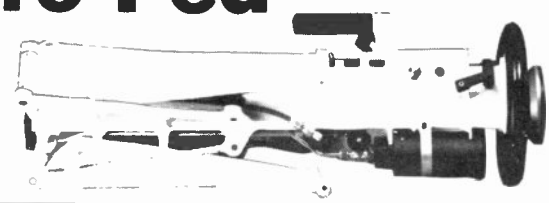
Studio-type motion picture and television cameras weighing up to 150 lbs. are handled with ease when mounted on this beautiful 25 lb. O'Connor 150-XR.

This head is completely counterbalanced at all times including extreme tilt positions, making operations much easier. It features pan and tilt drag adjustments with dial indicators and an independent pan and tilt lock. A removable and adjustable camera mounting plate can be mounted to the camera and an adjustable feature will accommodate different lenses and film magazines.

Built of magnesium and aluminum castings, the lightweight 150-XR provides exceptional maneuverability.

Capacity	150 lbs (68 kg)
Weight	25 lbs (11.4 kg)
Size	7" high 14" wide 8" long
Pan	360°
Pan drag	Fluid type continuously adjustable
Pan lock	Independent from fluid system
Tilt	45° up and 45° down
Tilt drag	Fluid type continuously adjustable
Tilt lock	Independent from fluid system
Counterbalance	1000 in-lb spring 1500 in lb spring also available
Camera mounting plate and screw	8" long x 5" wide with ⅜ -16 screw
Base	Mitchell type standard
Handle	Vertically and horizontally adjustable
Temperature range	−20° to 120° F 29° to 49° C
Material	Magnesium and aluminum alloy castings
Finish	Black wrinkle baked enamel anodized or plated
Bearings	Pre-loaded roller
Shipping weight	30 lbs (13.6 kg)
Accessories	Super claw ball to Mitchell adapter double handle platform w/video double handles metal shipping case and assorted tripods

Hydro-Ped



Here is an ingenious concept in camera support equipment which provides the professional cameraman with many advantages over traditional tripods. The Hydro-Ped levels and locks hydraulically on any terrain up to 40° and is four times as rigid as a conventional tripod in torsion and bending.

The center column is hydraulically adjustable from 30 to 60 inches at a selected speed which you control. The column is hydraulically balanced so that it can handle its own weight and the weight of the camera and head up to 100 lbs. on the column. Each unit is tested to 400 lbs. on the legs before you ever see it.

Built to travel, the O'Connor Hydro-Ped is made of a sturdy magnesium and aluminum construction, weighing only 29 lbs. and folds to 30 inches long and 9 inches in diameter. A single centered handle with comfortable grip makes it easy to tote even in the worst terrain.

Capacity	100 lbs (45.5 kg)
Weight	29 lbs (14 kg)
Size	Folded 10" diameter 31" long
Leg extension	40" for maximum stability
Operating Limits	Levels to a 40° slope
Leveling	Hydraulic
Elevation	Hydraulic
Base	Pro-Jr type standard (Mitchell available)
Temperature range	40° to 140° F 40° to 60° C
Material	Magnesium and aluminum alloy castings
Finish	White epoxy, black epoxy, anodized or plated
Bearings	Sleeved
Shipping weight	40 lbs (18.2 kg)
Accessories	Mitchell base wheels (for conversion to a dolly) and metal case

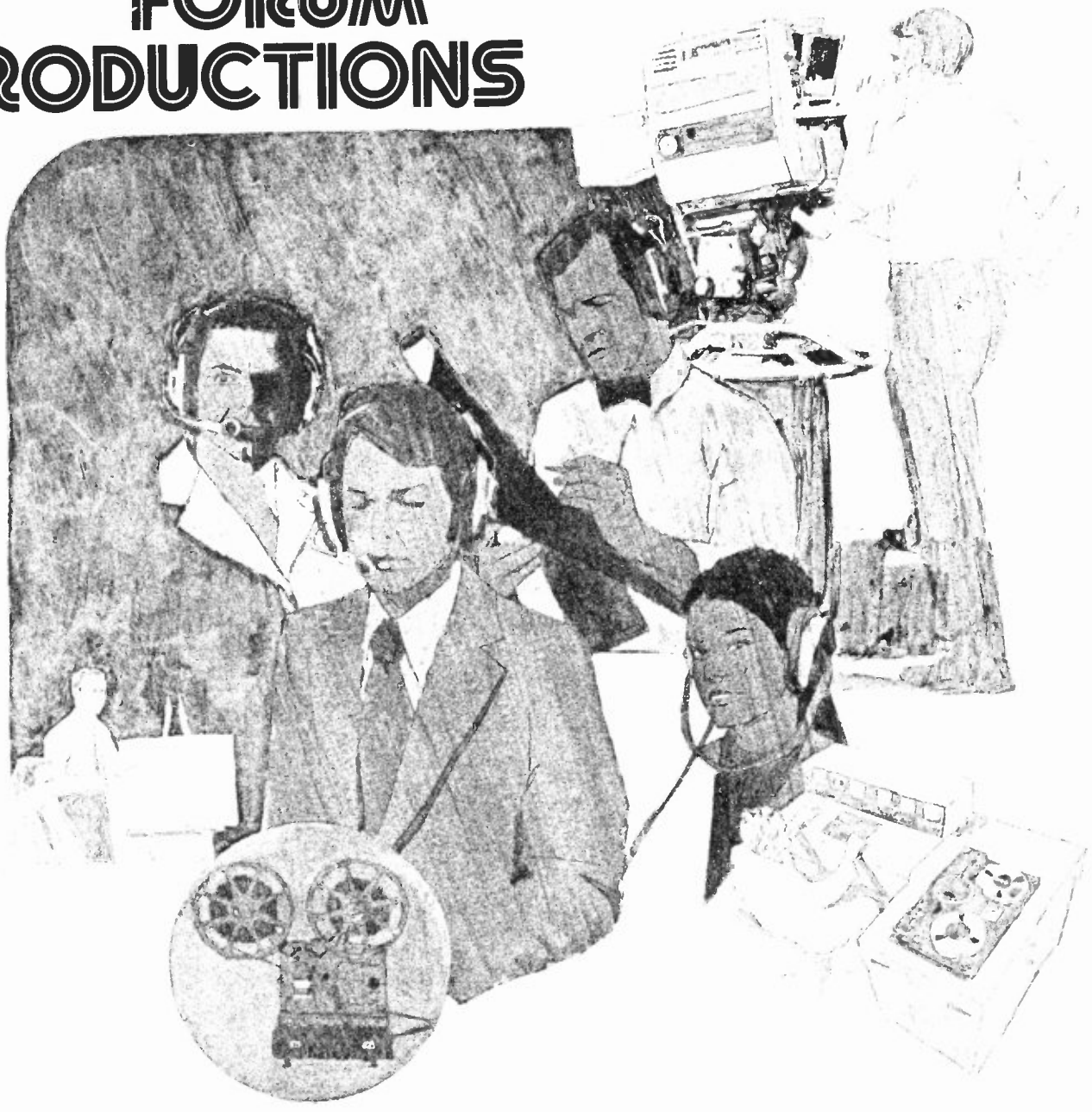
O'CONNOR ENGINEERING LABORATORIES, INC.
100 Kalmus Drive, Irvine Industrial Complex
Costa Mesa, California 92626
Telephone (714) 979-3993 - (213) 627-4057
Cable Address "OCELINC" - telex: 685 641

O'CONNOR ENGINEERING LIMITED
11 Rue des Moraines
1227 Carouge
Geneva, Switzerland
Tele: (022) 42 79 38 - Telex: 23 329

O'Connor ENGINEERING LAB INC

Prices and specifications subject to change without notice

MULTIMEDIA FORUM PRODUCTIONS



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Multimedia Forum Productions has some surprises in store for you. We're more than just a deluxe meeting and presentation facility. We can now offer you imaginative and innovative software to present in our facility—or anywhere else, for that matter.

Multimedia Forum Productions is now proud to present full-service program production. And we mean it.

Full-service means having the creative staff to develop your ideas, script your message and channel your thoughts.

Full-service means having the production team to produce in any medium—IN-HOUSE. We handle the writing, photography, cinematography, audio recording, artwork, printwork, meeting itineraries, videotaping, music composition, set design, lighting design, set construction, stage direction...well, full-service just means that if you've got the message, we've got the medium. Call Jim Gentry and ask him about it.

Multimedia Forum Productions
in Crown Center

A subsidiary of Hallmark Cards, Inc.
2450 Grand Avenue, Suite 400, Kansas City, MO 64108 (816) 274-8321

Where Productions Mean Impact

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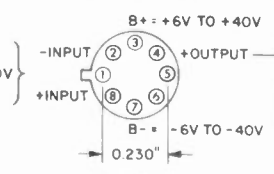
MODEL 4009 MEDIUM VOLTAGE D.C. OPERATIONAL AMPLIFIER

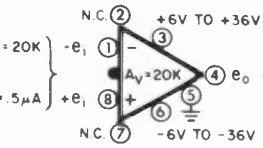


@ B± = ±36V
Z_O = 2.5K
e_o = ±30V/50K
$C_L \leq 0.1\mu F$
SLEW RATE = 10V/μS
A_V = 800
NOISE = 2μV

SIZE: TO-5 8-LEAD WT: 0.1 OZ PRICE: $12.00/EA

MODEL 423 D.C. OPERATIONAL AMPLIFIER (REPAIRABLE)

● D.C. TO 150KC ● ±20mV OFFSET ● ±10μV/°C DRIFT
● 2μV (-115dbm) NOISE ● 0.1% T.H.D.

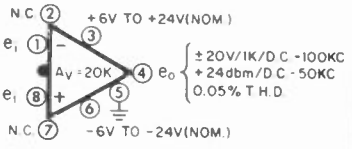


B± = ±24V (NOM.)
±18V/8Ω
12W RMS
40W PK (AUDIO)

OCTAL PLUG-IN
SIZE: 1-1/2" x 3-1/4" x 2-1/2" H. WT: 7 OZ PRICE: $40.00/EA

MODEL 425 D.C. OPERATIONAL AMPLIFIER

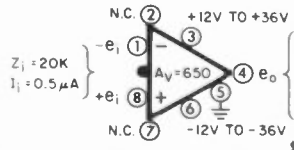
Z_I = 20K
±20mV OFFSET
I_I = 0.5μA
±20μV/°C
CM: ±20V
NOISE: 1μV (-120dbm)



±20V/1K/D.C. - 100KC
+24dbm/D.C. - 50KC
0.05% T.H.D.

OCTAL PLUG-IN
SIZE: 1" DIA x 1-5/8" H WT: 2 OZ PRICE: $30.00/EA

MODEL 440 50W. D.C. THRU AUDIO OPERATIONAL POWER AMPLIFIER



@ B± = 36V
±30V/8Ω
100W PK
50W RMS

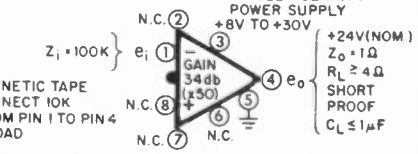
OCTAL PLUG-IN
SIZE: 4-3/4" x 5-1/2" x 2-5/8" H WT: 20 OZ PRICE: $45.00/KIT, $60.00/WIRED

MODEL SM-100 DUAL 50W. OR MONO 100W. D.C. THRU AUDIO OPERATIONAL POWER AMPLIFIER

DESCRIPTION: PANEL-CHASSIS WITH HARDWARE, TWO 440KR POWER AMPLIFIER KITS, ONE WIRED AND TESTED 536 POWER SUPPLY, PC-SM 100 CONVERTIBLE STEREO, 50W OR MONO 100W PRINTED CIRCUIT BOARD AND ALL NECESSARY COMPONENTS.
SIZE: 7" H x 19" W x 7" D
WT: 15 LBS PRICE: $200.00/KIT, $280.00/WIRED

MODEL 34 AMPLIFIER-BIAS OSCILLATOR

20CY TO 20KC (±1db) 0.25% T.H.D (+18dbm)
50CY TO 10KC (±3db) 1% T.H.D. (8W PK)
SINGLE POLARITY POWER SUPPLY



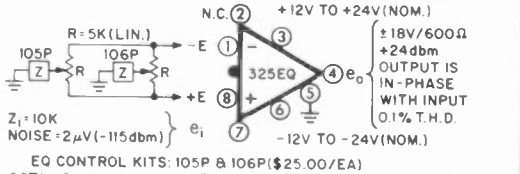
+24V (NOM.)
Z_O = 1Ω
$R_L \geq 4\Omega$
SHORT PROOF
$C_L \leq 1\mu F$

AS 100KC MAGNETIC TAPE BIAS OSC CONNECT 10K RESISTOR FROM PIN 1 TO PIN 4
e_o = 20V/1K LOAD

OCTAL PLUG-IN SIZE: 1" DIA x 2" H WT: 2 OZ PRICE: $25.00/EA

MODEL 325 EQ EQUALIZATION AMPLIFIER

● GAIN ADJ. FROM 0db TO +20db ● 20CY TO 20KC RESPONSE

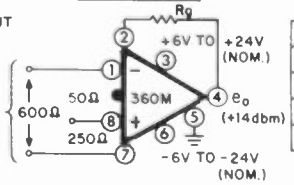


±18V/600Ω
+24dbm
OUTPUT IS IN-PHASE WITH INPUT
0.1% T.H.D.

EQ CONTROL KITS: 105P & 106P ($25.00/EA)
OCTAL PLUG-IN SIZE: 1" DIA x 2" H WT: 2 OZ PRICE: $35.00/EA

MODEL 360M MICROPHONE PREAMPLIFIER

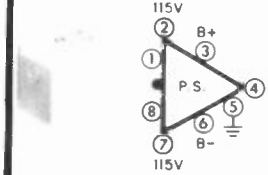
● INTERNAL INPUT TRANSFORMER
● 20CY TO 20KC
● 0.25% T.H.D.
● -125dbm NOISE



GAIN	Rg
60db	NONE
50db	15K
40db	3.3K
30db	1K

OCTAL PLUG-IN SIZE: 1" DIA x 2" H WT: 2 OZ PRICE: $35.00/EA

POWER SUPPLIES (REPAIRABLE)



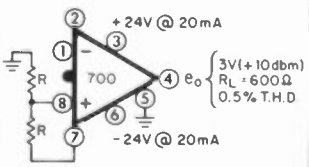
OCTAL PLUG-IN
WITH BOLT-DOWN PROVISIONS

MODEL	DESCRIPTION	SIZE (INCHES)	PR-EA
*515P	± 15V @ ± 50mA	2 x 3 x 2 H	$30
522	± 24V @ ± 150mA	2 x 3 x 2 H	30
523	± 24V @ ± 2A	3.25 x 5.25 x 4.25 H	45
*524P	± 24V @ ± 40mA	2 ½ 3 x 2 H	30
525	± 24V @ ± 1A	3 x 4 x 3.25 H	40
526	± 24V @ ± 4A	5 x 5.50 x 4.25 H	50
536	± 36V @ ± 3A	5 x 5.50 x 4.25 H	50
*523R	± 24V @ ± 1.5A	3.25 x 5.25 x 4.25 H	60
54	+ 24V @ +700mA	3 x 4 x 1.75 H	30

*REGULATED

MODEL 700 AUDIO OSCILLATOR (EXTERNALLY ADJUSTABLE)

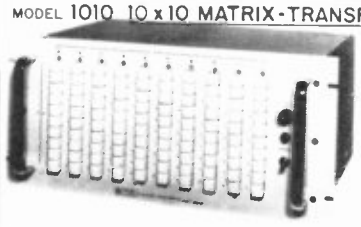
FREQ	R (±5%)	FREQ	R (±5%)
16CY	NONE	1KC	1.6K
50CY	43K	2KC	800Ω
100CY	20K	5KC	320Ω
200CY	9.1K	10KC	160Ω
440CY	3.6K	12KC	130Ω
500CY	3.2K	15KC	100Ω



3V (+10dbm)
R_L = 600Ω
0.5% T.H.D

OCTAL PLUG-IN SIZE: 1" DIA x 2" H WT: 2 OZ PRICE: $35.00/EA

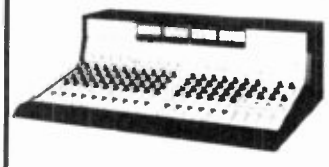
MODEL 1010 10 x 10 MATRIX-TRANSFORMER ISOLATED INPUTS AND OUTPUTS



- 10K INPUT IMPEDANCE
- UNITY GAIN
- 24 dbm OUTPUT
- 80db ISOLATION
- LIGHTED PUSH-ON/OFF SW
- BARRIER TERMINALS ON BACK PANEL
- INTERNALLY REGULATED P.S.

SIZE: 8-3/4" H x 19" W x 14" D
WT: 32 LBS PRICE: $2,200.00

AUDIO CONSOLES



1604-TV

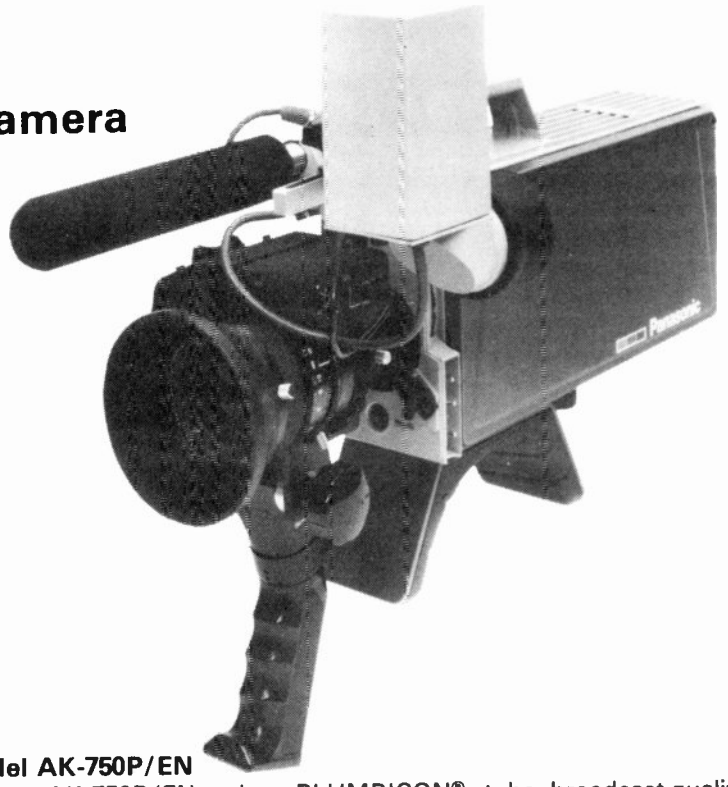
MODEL	DESC	PRICE KIT	PRICE WIRED
802-TV	8 IN-2 OUT	$4,100	$6,300
1204-RS	12 IN-4 OUT	6,000	9,500
1204-TV	12 IN-4 OUT	5,900	9,500
1604-RS	16 IN-4 OUT	7,400	11,800
1604-TV	16 IN-4 OUT	6,700	11,100
2008-RS	20 IN-8 OUT	10,900	17,000

TV = TELEVISION RS = RECORDING STUDIO
KITS: IN STOCK F.O.B. LOS ANGELES, CA.
DATE: AUGUST, 1977

PANASONIC'S New Portable ENG/EFP Camera

Panasonic®

ENG/EFP Portable Color Camera
Model AK-750P/EN



ENG/EFP PORTABLE COLOR CAMERA, Model AK-750P/EN
Panasonic introduces our first ENG/EFP color camera, AK-750P/EN: a three PLUMBICON® tube, broadcast quality, self-contained portable color camera for electronic news gathering and electronic field production. All the controls necessary for operation are built into the camera head. The operating controls are on the front of the camera for convenient use. And the camera head weighs less than 16 lbs. (excluding the lens). The AK-750P/EN is a versatile camera. It can be adapted for studio use with the optional studio viewfinder and optional Remote Control unit (RCU). Whether in the field or in the studio, the AK-750P/EN can handle the job.

SELF-CONTAINED PORTABLE OPERATION
For a completely portable ENG/EFP system, the AK-750P/EN goes anywhere with the Panasonic NV-9400 ¾" portable VCR. To control the start/stop function on the portable VCR, the AK-750P/EN has a trigger switch on the handgrip for recording; for VCR playback, a separate button is located on the rear of the handgrip. The AK-750P/EN can also be used with any other VTR. For convenient use, the 1.5" CRT viewfinder (1.4" actual visual size, measured diagonally) tilts and adjusts. And the detachable shoulder pad has an adjustable handgrip to facilitate hand-held use of the camera.

To make the AK-750P/EN a totally self-contained ENG/EFP camera, a directional microphone with a wind screen is mounted on the front with a standard Cannon connector, so different microphones can be used.

Field versatility is necessary in an ENG/EFP camera. The AK-750P/EN works in a multi-camera system because of the built-in genlock function for EFP system use. The AK-750P/EN also works from three different power supplies: the standard BP-100 battery pack, the optional AC adaptor for NV-9400/AK-750P/EN system use; or the optional studio Remote Control Unit (RCU). To carry the AK-750P/EN and accessories, the optional carrying case PC-400 provides protection with its hard shell while on the go as an active ENG/EFP camera.

STUDIO OPERATION
When a high quality TV camera is required in the TV studio, the AK-750P/EN fits the bill. What is required is the optional 4.5" CRT viewfinder (3¾" actual visual size, measured diagonally). Two other options are the zoom lens and its studio conversion kit. This provides flexible cable control of the zoom and focus. With the optional RCU you then have an ENG/EFP camera working in a studio multi-camera system. The AK-750P/EN connects to the RCU via a multi-pin cable. And the RCU provides automatic cable compensation, subcarrier phase, and horizontal phase controls. The RCU also has adjustments for R and B pedestal, R and B gain, total pedestal, manual iris, auto/manual iris switch, and an automatic white-set switch. The AK-750P/EN features rear panel controls for R, B, G, -G, NTSC, and white balance viewfinder selection switches. These controls allow R−G, R+B, B−G, and B+G viewing on the studio viewfinder for registration adjustments. It also features white balance, total pedestal, R and B pedestal, R and B gain, and R and B horizontal and vertical centering.

For versatile use with the RCU, an optional chroma key generator can be added. This produces a blue chroma key output for direct connection to a special effects generator.

Note: PLUMBICON is a registered trade mark of N.V. Philips' of Holland for TV camera tubes.

Specifications Subject to Change Without Notice.

PANASONIC'S New Portable ENG/EFP Camera

Model AK-750P/EN continued

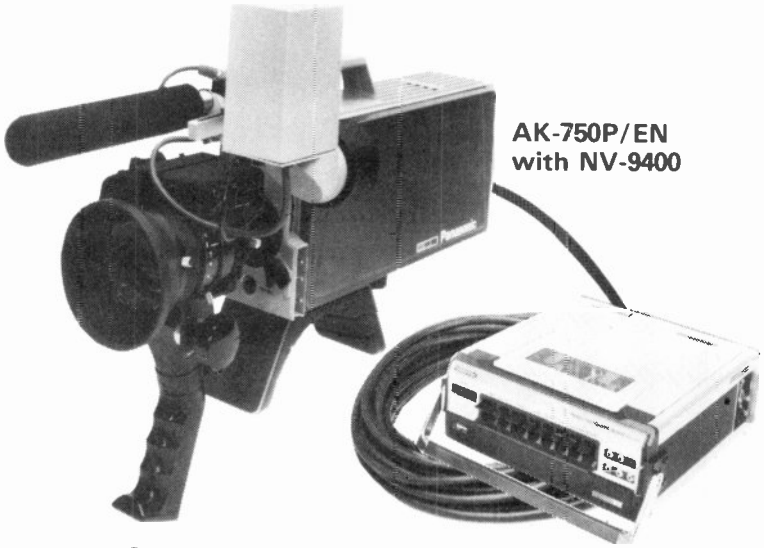
QUALITY ENGINEERING FEATURES

AK-750P/EN CAMERA

1) Self-contained portable ENG/EFP operation.
2) Dichroic mirror optical system with parallel arrangement of three ⅔" PLUMBICON tubes.
3) System use with the Panasonic NV-9400 ¾" portable VCR.
4) Studio system use with Remote Control Unit (RCU) and optional 4.5" viewfinder (3¾" actual visual size, measured diagonally) for studio operation.
5) NTSC output for use with any VTR.
6) 1.5" CRT viewfinder (1.4" actual visual size, measured diagonally) rotates for convenient use. Viewfinder detaches for studio operation.
7) Front mounted microphone.
8) Works from three different power supplies: Standard battery pack, BP-100, optional ac adaptor for NV-9400/AK-750P/EN system use; also the Remote Control Unit (RCU) provides power.
9) Internal RS-170A sync generator with genlock circuitry for EFP system use.
10) High signal/noise ratio of 49dB with the recommended illumination of 200 footcandles at f/4.
11) Minimum illumination is only 20 footcandles at f/1.8.
12) High horizontal resolution of 500 lines at center.
13) Gamma correction adjustable from 0.45 to 1.0.
14) Built-in horizontal aperture correction and 1-line type vertical aperture correction; optional 2-line type vertical aperture correction.
15) Die-cast chassis for rigid alignment of the optical system.
16) Color bar generator with front mounted camera/color bar switch.
17) Electronic color temperature conversion with three settings: 3200°K, 4700°K, and 7500°K.
18) Color temperature conversion filter for 6000°K, and a color temperature/neutral density filter for 6000°K and 25% light reduction.
19) Standby/0 db/+6 dB switch, mounted on front of camera.
20) Front mounted white set button.
21) 1.5" viewfinder has built-in video level indicator, battery warning indicator and tally light.
22) Operating controls: R, B, G, -G, NTSC, and white balance viewfinder selectors; horizontal and vertical R and B registration adjustments; auto/remote/manual iris switch; iris adjustment; R and B gain and pedestal controls; total pedestal control; automatic white set/manual switch.
23) Shoulder pad detaches for tripod mounting; also has adjustable handgrip.
24) Removable side panels.
25) M-type lens mount with standard C-mount adaptor; optional zoom lenses with servo iris control for automatic or manual iris control.

OPTIONAL REMOTE CONTROL UNIT (RCU)

1) Connects to AK-750P/EN via a multi-pin cable.
2) Provides automatic cable compensation and features a fine adjustment.
3) Operating controls for: total pedestal; R and B pedestal; R and B gain; horizontal and vertical R and B centering; white-set button; subcarrier phase shifter, coarse and fine adjustments; horizontal phase; servo iris control; intercom jack; tally light; power on/off.
4) Optional Blue Chroma Key plugs into RCU; features hue, delay and clip controls. Produces chroma key output direct to SEG external key input.
5) External sync, subcarrier and line view loop-through inputs.
6) Two NTSC composite outputs, one non-composite output, 1 chroma key output and tally/intercom connector.



AK-750P/EN with NV-9400

Specifications Subject to Change Without Notice.

Circle (125) on Reader Service Card

PANASONIC'S Broadcast Quality Color Studio Camera

COLOR STUDIO CAMERA

Model AK-920 is a fully self-contained, broadcast quality color studio camera complete with internal Y I/Q encoder, RS-170 sync generator, and multi-function viewfinder.

Recommended System Options:

AK-9220 remote control unit.

AK-9620 vertical aperture corrector.

AK-9720 RBG cable equalization module. PV10X15BIE zoom lens.

Camera Features:

RBG prism optical system and three 1" PLUMBICON* pick-up tubes for high quality pictures.

Internal, broadcast quality Y I/Q encoder.

Internal EIA RS-170 sync generator.

Horizontal resolution 500 lines at center.

High signal-to-noise ratio: luminance S/N 48dB, with recommended illumination.

High sensitivity: recommended illumination is just 150 footcandles at f/4.

Gain switchable for higher sensitivity: with +6 dB switch, minimum illumination is 15 footcandles at f/1.8.

Gamma correction is adjustable from 0.45 to 1.0 (unity).

To enhance edge detail and improve high frequency response, horizontal aperture correction is built into the camera head. The amount of correction is adjustable.

Vertical aperture correction can be added to the camera head, with the optional **AK-9620** vertical aperture corrector.

NTSC composite or non-composite output (switchable) from camera head.

Reliability and Serviceability:

Advanced solid state circuitry, including large scale integrated circuits (LSI).

Aluminum-alloy die-cast chassis assures high stability of the optical alignment.

Both side panels of the camera head can be removed for easy maintenance access.

Maintenance timer located inside the camera head.

Testing and Installation:

Color bar output for adjustment of encoder.

Focus wobble for beam alignment.

Beam on-off switch for protection of the PLUMBICON* tubes during stand-by.

Sawtooth signal generator for adjustment of processing amplifier.

White balance check circuit in viewfinder.

R, B, G, R-G, B-G display in viewfinder assists in adjustment of registration.

Viewfinder Features:

5½" (measured diagonally) monochrome CRT. Can be switched to display line view signal.

Also displays test signals.

Tilts 25° up or down for convenience of camera operator.

Long viewfinder hood included.

Optional Remote Control Unit (RCU) AK-9220:

For use with external sync in multi-camera systems. Critical controls are protected by a hinged front panel.

Operating controls include red and blue gain, pedestal, and horizontal and vertical centering; total pedestal; iris; cable equalization; and camera power.

RBG output for use with external encoder or chroma key generator.

Cable length equalization switch for camera cable lengths of up to 1,000 feet, or coax cable lengths of up to 2,000 feet.

When using the RBG output with more than 100 feet of camera cable, the optional **AK-9720** RBG cable equalization module is recommended.

Video outputs from the RCU include one NTSC non-composite and two NTSC composite video signals.

Model AK-920

AK-920 camera head, shown with optional zoom lens

Full System Compatibility:

Standard BNC connectors for interface with other video equipment.

External synchronization, with RCU:

- Only SYNC and SC are required.
- RCU has self-contained subcarrier phase shifter with coarse and fine phase adjustments.
- RCU supplies the camera head with a special mixed synchronizing signal consisting of both SYNC and SC in one line.
- When using coaxial cables between the camera head and RCU, just two are required: one for video output, the other for the special SYNC/SC signal from the RCU.
- The phase of the horizontal component of the external sync can be delayed up to 1H at the camera head, so that the video output at the RCU is exactly timed with respect to the external sync.

Tally lights:

- Large tally light on front of camera head, for high visibility by studio talent.
- Tally lights on rear of camera and viewfinder for convenience of camera operator.
- Tally light on RCU.
- The power supply for the tally lights is self-contained. Tally light switching must be controlled by an external source, such as a Panasonic special effects generator.

Intercom system:

- Party-line intercom system; also switchable to private-line, for communication between camera head and RCU only.
- Two intercom jacks on camera head: one for camera operator, the other for floor manager.
- Intercom jack on RCU.
- Power for the intercom system is self-contained.

Lens Options:

Recommended lens: **PV10X15BIE.**

- Flexible cable controlled 10:1 zoom, 15mm-150mm, f/1.8.
- Built-in 1.67X and 2.5X lens extenders.
- Built-in neutral density filters.
- Servo-iris for automatic light control.
- Iris can be adjusted manually at camera head or RCU.

Other zoom lenses (18:1 and 34:1) also available.

AK-9012 is 75mm, f/4.0 lens for film chain use.

CONTINUED NEXT PAGE

** Registered trademark of N. V. Philips' of Holland for TV camera tubes.*

Prices and Specifications Subject to Change Without Notice.

AK-920 Broadcast Quality Studio Camera

SPECIFICATIONS:

Composition of AK-920
AK-9120: Self-contained color camera head
AK-9320: Viewfinder
Accessories: Tally light number plates, 3 pcs.
Viewfinder hood for field use, 1 pc.

AK-9120 CAMERA HEAD
Power Source: 120V AC, 60 Hz, approx. 110 watts
Pick-up Tubes: AK-920 (supplied without tubes), AK-920IT with ITV grade, PLUMBICON tubes (XQ-1076R, XQ-1071G, XQ-1071B), AK-920ST with studio grade, PLUMBICON tubes (XQ-1075R, XQ-1070G, XQ-1070B).
Scanning Standard: 525 lines, 60 fields, 30 frames
Synchronization: Internal EIA RS-170; external sync with optional remote control unit AK-9220
Video Output: 1.0 Vp-p NTSC composite or 0.714 Vp-p NTSC non-composite (switchable), 75 ohms, BNC connector
Video Frequency Response: Less than 4 MHz: ±0.5 dB
At 6 MHz: +1 dB, −2 dB
Horizontal Resolution: Center: more than 500 lines
Corner: more than 400 lines
Registration Error: Within 80% of picture height: less than 0.2%
Elsewhere: less than 0.4%
Geometric Distortion: Within 80% of picture height: within 1%
Elsewhere: within 2%
Illumination Required: Recommended: 150 footcandles at f/4
Minimum, with + 6 dB gain: 15 footcandles at f/1.8
Signal-to-Noise Ratio: With recommended illumination, and without gamma and aperture correction: luminance signal 48 dB
Test Signal Generators: Self-contained color bar, focus wobble, and sawtooth signal generators
Automatic Light Control Circuitry: Self-contained for Canon servo-iris lens
Color Conversion Filters: Built into camera head, for 4000° K, 5600° K and 7500° K
Aperture Correction:
Horizontal: Self-contained, peaks at 2.9 MHz ±0.1 MHz, adjustable at camera head
Vertical: Optional, with AK-9620
Encoder: Y I/Q
Operating Controls: Remote/local switch
Manual iris
Total pedestal
Viewfinder selector
R and B gain
R and B pedestal
Camera/color bar switch
Beam on/off
+ 6 dB gain
R and B horizontal centering
R and B vertical centering
Two intercom jacks
Power on/off
Tally Lights: Top front and rear panel (requires external switching)
External Sync Input: From AK-9220 RCU only; signal consists of combination of SYNC and SC; switchable for camera cable, or one coax cable with BNC connector
Operating Ambient Temperature: 32° F to 104° F (0° C to 40° C)
Operating Ambient Humidity: Less than 90%
Dimensions (approx.): 10 3/8" (W) x 17½" (H) x 17¾" (D)
Weight (approx.): 55 lbs. without lens

AK-9320 VIEWFINDER
CRT: 5½" (measured diagonally) monochrome CRT
Resolution: 500 lines at center
Controls: Brightness, contrast
Tally Light: Rear panel LED (requires external switching)

* Registered trademark of N.V. Philips' of Holland for TV camera tubes.

Line View Function: Switchable with camera view; line view input from AK-9220 and camera cable
Display: Red, blue, green, R-G, B-G, NTSC signals or white balance check (selectable at camera head)
Tilt: 25° up and down in each direction
Scanning Size: Approx. 4 1/3" (W) x 3 1/4" (H)
Sweep Linearity: Horizontal: less than 7%
Vertical: less than 5%
Sweep Geometry: Less than 5%
Optional Accessories

AK-9220 REMOTE CONTROL UNIT (RCU)
Power Source: 120V AC, 60 Hz 30 watts
Video Input: 1.0 Vp-p NTSC composite or 0.714 Vp-p NTSC non-composite, 75 ohms, BNC connector
Video Output: 1.0 Vp-p NTSC composite, 75 ohms, x 2 BNC connectors
0.714 Vp-p NTSC non-composite, 75 ohms, BNC connector
RBG Output: 0.714 Vp-p, 75 ohms, BNC connectors: 1 line each Red, Blue and Green
External Sync Input: SYNC: − 4 Vp-p, 75 ohms or hi-Z, BNC connectors
SC: 2 Vp-p, 75 ohms or hi-Z, BNC connectors, phase adjustable at RCU
Line View Input: 1.0 Vp-p composite, 75 ohms or hi-Z, BNC connectors
Intercom, Tally Input: 5-pin connector
Operating Controls: Power on/off
Cable length equalization
H phase
SC phase
R and B gain
R and B horizontal centering
R and B vertical centering
R and B pedestal
Total pedestal
Manual iris
Intercom jack
Cable Equalization: Camera cable: switchable for 50, 100, 300, 500, 700 and 1,000 ft. cable lengths
Coax cable: switchable for 100, 200 600, 1,000, 1,400 and 2,000 ft. coax cable lengths
Tally Light: Front panel (requires external switching)
Rack Mounting: Requires 3½" of vertical rack space in standard 19" racks
Operating Ambient Termperature: 32 °F to 104° F (0° C to 40° C)
Operating Ambient Humidity: Less than 90%
Standard Accessory: Tally/intercom 5-pin plug, 1 pc.

AK-9620 VERTICAL APERTURE CORRECTOR
Type: Printed circuit board; plugs into AK-9120
Frequency Response of Video Signal: 6 MHz ±1 dB
Maximum Correct Level: 10 dB (adjustable)

AK-9720 RBG CABLE EQUALIZATION MODULE
Function: Adds cable equalization to RBG signals; recommended when camera cable length is more than 100 ft.
Control: Controlled by cable equalization switch on AK-9220 RCU front panel

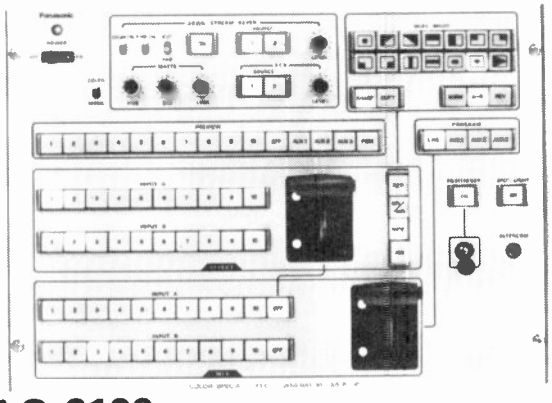
LENSES
PV10X15BIE: Flexible cable control zoom with servo-iris, lens extenders, neutral density filters and bayonet mount
Without Extender: 15mm-150mm, f/1.8
With 1.67X Extender: 25mm-250mm, f/3.0
With 2.5X Extender: 37.5 mm-375mm, f/4.5
Other Zoom Lenses: 18:1 and 25:1 also available
AK-9012: Film chain lens, 75mm, f/4.0

CAMERA CABLES
25A-50: 50 feet
25A-100: 100 feet

TRIPOD
VP-300: Deluxe, heavy duty tripod

PANASONIC'S Broadcast Quality Color Production Systems

Panasonic®



AS-6100 Special Effects Generator

AS-1000 Color Sync Generator

AS-2000 Chroma Key Generator

For broadcast quality color production, Panasonic has a whole system of production equipment: the AS-6100 self-contained special effects generator; the AS-2000 chroma key generator; and the AS-1000 color sync generator. These units provide a broadcast quality production system and add versatile special effects capabilities.

AS-6100 SPECIAL EFFECTS GENERATOR

For a self-contained broadcast quality special effects generator, Panasonic introduces model AS-6100, the latest generation of advanced color video signal equipment. AS-6100 features ten video inputs, 4 input buses, two sets of fade/wipe levers, fourteen wipe patterns, positioner, spotlight, colorizer, two downstream key inputs, two external inputs plus auxiliary inputs. All this provides a wide variety of special effects for creative television programming.

This special effects generator is ideal for use with the Panasonic AK-920 and AK-750 broadcast quality cameras, and can be used with any NTSC color television production system. And because it is a self-contained special effects generator, it is also ideal for a mobile production unit.

SWITCHING INPUTS AND WIPE MODES

For downstream mixing of up to three cameras with special effects, or just for simple set-ups, the AS-6100 has four input buses with two fade/wipe levers. AS-6100 accepts ten composite or non-composite video inputs, plus three auxiliary inputs for non-synchronous video sources, such as VTRs.

When any of the ten program inputs is not in use, it automatically produces a black burst when selected. All pushbuttons light up when pressed to show the inputs and functions selected. AS-6100 supplies intercom power and tally light switching for ten cameras.

The fourteen different wipe patterns can be adjusted with both the positioner and the wipe levers; they can also be used with sharp or soft edges. Wipes can be performed in the normal, normal-reverse, or reverse wipe modes.

There is also "spotlight" feature, adjustable in size and position with the wipe levers and positioner, for highlighting a particular area. This is done by reducing the A-bus signal by one half, thus "spotlighting" a particular subject in the B-bus signal.

COLORIZING AND KEYING

For versatile special effects, AS-6100 features two key inputs for external keying: chroma keying can be performed when the AS-2000 chroma key generator is used in conjunction with the AS-6100. The fully adjustable colorizer allows the addition of color to the background of the key signal. The two inputs for downstream keying can also be colorized and their edges highlighted, using hue, saturation and luminance controls. The downstream keyer can be keyed into the program by "CUT" or "FADE" modes.

The external key inputs can be "WIPED" into a program with any one of the fourteen different patterns.

AS-2000 CHROMA KEY GENERATOR

The AS-2000 chroma key generator adds an extra dimension of special effects to the AS-6100 SEG. It can also be used with other special effects generators that accept external key signals. Coarse and fine hue adjustments are provided by a rotary switch and variable resistor; the key signal delay is adjusted by a second variable resistor. Non-composite RGB inputs are required.

AS-1000 COLOR SYNC GENERATOR

The AS-1000 color sync generator produces broadcast-stable EIA RS-170 sync using a crystal oscillator. It also genlocks to incoming, non-synchronous composite video signals or composite sync. For studio adjustments it generates encoded EIA RS-189 and full field color bars with adjustable phase. AS-1000 also has a built-in subcarrier distribution amplifier to provide four subcarrier outputs: one with fixed phase and three with independently adjustable phase.

QUALITY ENGINEERING FEATURES

AS-6100 SPECIAL EFFECTS GENERATOR

1. Vertical interval switching of 10 program inputs, 2 external key inputs, 2 downstream key inputs, and 3 auxiliary inputs for film chains, VTRs, etc.
2. Downstream mixing of up to three cameras.
3. Fourteen wipe patterns with soft/sharp edges; normal, normal-reverse, and reverse wipe modes; wipe positioner; spotlight function.
4. Wipe key; external key; downstream keyer.
5. Black burst on any of the ten program inputs.
6. Can mix composite and non-composite video inputs.
7. Effect, color Matte, three preview and three program outputs.
8. Fully adjustable colorizer with hue saturation, and luminance controls: colorizes downstream keyer and background of key signal.
9. Two sets of mix and effect pushbuttons and levers permit mixing of three inputs using downstream keyer.
10. Edge highlighting of downstream keyer.
11. Downstream keyer can be keyed into the program by "CUT" or "FADE" modes.
12. Color Matte output can be connected to a program input for dissolves and wipes to an adjustable color background.
13. Self-contained unit allows use in mobile operation.

AS-2000 CHROMA KEY GENERATOR

1. For use with AS-6100 or any other special effects generator that accepts external key inputs.
2. Keying hue selection adjustable through 360°.
3. Coarse and fine hue adjustments.
4. Variable resistor adjusts key signal delay.

AS-1000 COLOR SYNC GENERATOR

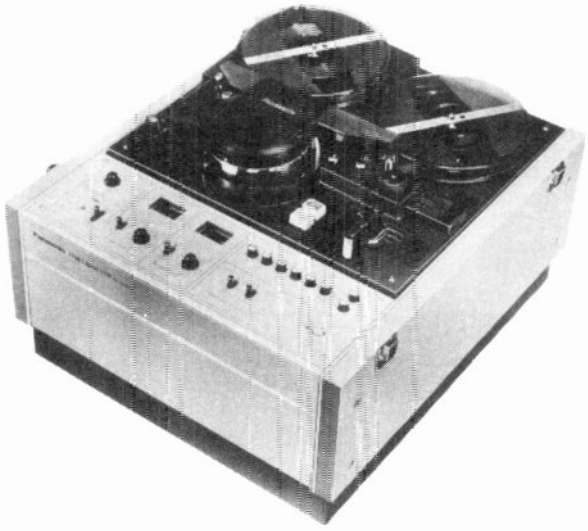
1. Generates EIA RS-170 sync.
2. Genlocks to incoming, non-synchronous composite video signals or composite sync.
3. Generates encoded EIA RS-189 and full field color bars with adjustable phase.
4. Internal subcarrier distribution amplifier provides four subcarrier outputs: one with fixed phase and three with independently adjustable phase.

Prices and Specifications Subject to Change Without Notice.

PANASONIC'S Time Lapse Recorder

Panasonic®

Model NV-8030



FEATURES:

1. Provides a continuous record of events lasting up to 108 hours.
2. Versatile system application: designed to mate with Panasonic sequential switchers WJ-506, WJ-507 and WJ-510. Deluxe model WJ-510 features alarm circuitry for sophisticated security applications.
3. Front panel time select pushbuttons for 1H (normal), 9H, 18H, 72H, 108H and 1 SHOT modes.
4. In 1H (normal) mode, tapes are recorded in accordance with the EIAJ #1 black-and-white standard and are fully compatible with other EIAJ standard VTR's.
5. True time lapse system records 9, 18, 72 or 108 hours on a single 7" reel (2400 ft.) of video tape.
6. 1 SHOT mode records single pictures, one at a time. When used with a timer to provide momentary contact closure at specified intervals, maximum recording time can be greatly extended:

Number of seconds between each contact	Maximum recording time (approx.)
12	30 days
60	5 months
144	1 year

7. Complete stop action playback capability in 1 SHOT mode: the VTR plays back a single picture (one field) when the 1 FIELD button is pressed. To obtain a perfect still frame picture, the ⅓ FIELD button may be used to eliminate any noise on the screen.
8. Alarm mode permits return to normal (1H) or 9 H record mode when the alarm input is activated.
9. Activation of alarm mode by alarm sensor (door switch, etc.) or by WJ-510 Auto Alarming Sequential Switcher.
10. Alarm output (6V DC, 120 ohms) can be used to activate external devices (warning lights, buzzers, etc).
11. Unique alarm memory system permits rapid search of tape to find portions that have been recorded in alarm mode.
12. No disturbance of horizontal picture lines when the tape is recorded at low speed and played back at any higher speed.
13. Audio record/playback capability in 1H, 9H and 18H modes.
14. Designed for high reliability, with three motor tape drive system, specially designed die cast chassis, ball bearings, and HPF™ video heads.
15. Maintenance timer shows elapsed operating time.
16. Trigger output for use with WJ-506, WJ-507 and WJ-510 sequential switchers.
17. Sequential operation of up to three NV-8030's by cascade connection: when the end of tape is reached on one VTR, the next VTR is started automatically.
18. Automatic gain controls for video and audio levels; manual control with illuminated level meters.
19. V-pulse (switchable) can be added to video output during playback when needed for better stability.
20. Horizontal resolution 300 lines at center in normal (1H) mode.
21. Digital tape counter.

SPECIFICATIONS:

Power Source: AC, 120V, 60 Hz

Power Consumption: Approx. 75 Watts

Video Recording System: 2 rotary heads, USA standards (525 lines, 60 fields)

Video Modulation System: Both sideband FM

Tape Speed:

Normal 1H:	7-1/2	i.p.s.
9H:	5/6	i.p.s.
18H:	5/12	i.p.s.
72H:	5/48	i.p.s.
108H:	5/72	i.p.s.

Repetition Rate of Fields:

Normal 1H:	1 field every 1/60 sec.
9H:	1 field every 0.15 sec.
18H:	1 field every 0.3 sec.
72H:	1 field every 1.2 sec.
108H:	1 field every 1.8 sec.

Reel Size: 7 inches

Tape Width: 1/2 inch

Heads:

Video:	2 rotary heads
Audio/Control:	1 stationary
Erase:	1 full track, 1 for audio dubbing

Recording/Playback Time: 60 min./9 hr./18 hr./72 hr./108 hr./1shot

Fast Forward/Rewind Time: Less than 9 min.

Horizontal Resolution (monoscope test pattern): More than 300 lines

Frequency Response: Video: greater than 2.5 MHz
Audio: 60 ~ 10,000 Hz

Signal-to-Noise Ratio: Video: better than 40 dB
Audio: better than 40 dB

Input: Video: min. 0.5 Vp-p
75 ohms unbalanced
Audio: MIC 0.25mV (−72 dB)
600 Ω ~ 20 K Ω unbalanced
AUX 0.056V (−25 dB)
220 K Ω unbalanced

Alarm Reset Input: +12V

Alarm Input: Short

1 Shot Input: Short

Output: Video: 1.0 Vp-p, 75 ohms, sync negative
Audio: 1.0 Vrms, 300 Ω or less unbalanced

Alarm Output: +6V DC, 120 ohms

Alarm Recover Output: +5V

Camera Switching Output: −10V (Negative pulse)

AC Power Outlet: AC 120V, max. 150 watts

Dimensions: 16⅜"(W) × 13¼" (H) × 19¼" (D)
430(W) × 336(H) × 500(D) (mm)

Weight: Approx. 66 lbs. (30 kg)

Standard Accessories: 7" empty reel (1 pc.)
VTR/TV connection cable, 5 ft. (1 pc.)
Video splicing tape (1 pc.)
Head cleaner set (1 pc.)

NOTE: The specifications of model NV-8030 are for the NORMAL (1H) mode, unless otherwise specified.

Circle (129) on Reader Service Card

Prices and Specifications Subject to Change Without Notice.

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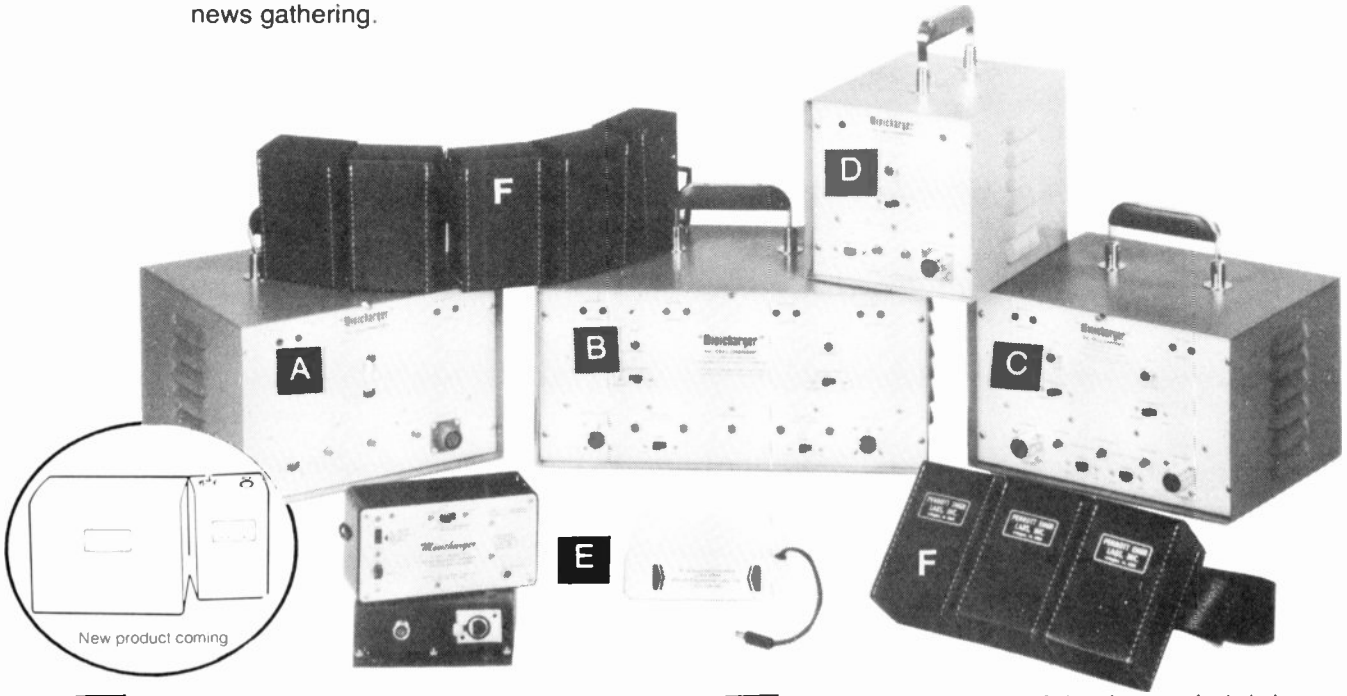

A The PE-74-1 MINICHARGER is designed to charge the battery for the Ikegama 35, or any double system.

B This is the PE-76 MINICHARGER, incorporating the largest charging capacity of the line. The PE-76 has been designed and engineered primarily for network, station and laboratory use. It will provide charge for two 30-volt units simultaneously, including double RCA's, double Thompsons, double Tashibas or a double-belt power system.

C The PE-74-2 MINICHARGER is engineered to charge any two single belt systems; two Tashibas, two RCA's or two Thompsons.

D The PE-74-4 is capable of charging any single belt system. The weight is only eight pounds!

E The PE-90 battery and charger is a team that has been going strong through the years. This compact battery is designed to power any Sony 3800, BVU 100 and BVU 50.

F The MINIPACK silver-zinc cell batteries will provide no less than three hours of camera power for the Sony, Hitachi, Ikegama, RCA, Thompson and others, as well as at least three hours for the JVC-4400, the VO-3800 and all other VTR's. Often, power life has run up to three to four times the power-life of any other battery on the market.

Speak directly to the company president. Call collect (703) 524-1668 for your needs

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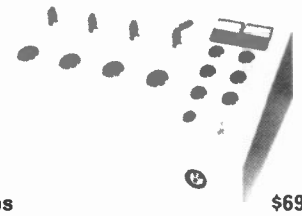
Alpha Mini Mixer

4-FADER STEREO AUDIO MIXER

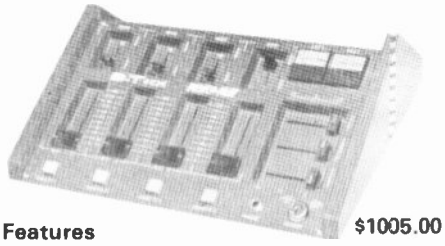


Features **$695.00**

- Substantial "Head Room"—Distortion Free Operation at 18 dbm Output
- 4 Inputs
- Response +/- 0.5 dbm 30 hz—20 KHz On Program Line
- Distortion—Less than 0.3% +8 dbm Output
- Plug-in Integrated Circuits Permit Replacement in Seconds
- Phone Amplifier with 10 Watts Output—Response +/- 0.5 db, 30-15,000 Hz—Distortion Less Than .5%
- Cue Position In All Channels
- 100% Solid State
- Crosstalk Between Channels Better Than —65 db
- Back Lighted VU Meters
- Separate Bass and Treble Controls

Disco-Tech

4-FADER STEREO AUDIO MIXER



Features **$1005.00**

- Modern Slide Attenuators for Ease of Multiple Mixing
- Substantial "Head Room"—Distortion Free Operation at 18 dbm Output
- 8 Inputs—Switchable to 4 Faders
- Response +/- 1.0 dbm 30 Hz—20 KHz On Both Cue and Program Lines
- Distortion—Less than 0.3% +8 dbm Output
- Plug-in Modules Permit Replacement and Interchange In Seconds
- Phone Amplifier with 10 Watts Output—Response +/- 1.0 db, 30-15,000 Hz—Distortion Less than .5%
- Cue Position In All Channels
- 100% Solid State
- Standard Unit Supplied with 8 Interchangeable Low Level and High Level Input Cards
- Crosstalk Between Channels Better Than —65
- Back Lighted VU Meters
- Separate Bass and Treble Controls
- Remote Start Switch For Each Fader

Custom 2 Turntable

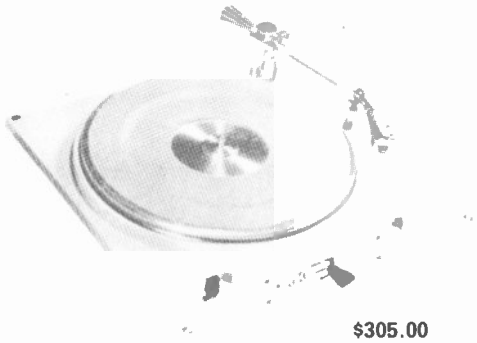
INSTANT START
PROFESSIONAL TURNTABLE

Features **$325.00**

- Turntable Powered By 60 Hz Synchronous Motor (Also Available In 50 Hz)
- Speed Change May Be Made While Platter Is Turning
- 45 RPM Adapter—Originated By QRK, Built Into Precision Platter
- Full 5.5 lb. Precision Platter Virtually Reduces Rumble
- Speed Indicator Lights
- Instant Start (Full Speed In Less Than 1/16th Revolution)
- Rugged Construction—With Only 3 Moving Parts
- Stereo Rumble Less Than -52 db (NAB Standard -35 db)
- Lifetime Guarantee Against Any Defects In Workmanship
- Full 1 Year Warranty On Parts
- Rim Drive Assures Minimum Rumble, Maximum Starting Torque
- Two Standard Speeds: 33, 45

12C Instant Start

BROADCAST PROFESSIONAL TURNTABLE
w/320 tone arm, F-3 Cartridge, shelf base



$305.00

Features

- Instant Start (Full Speed In Less Than 1/16th Revolution)
- Rugged Construction—With Only 3 Moving Parts
- Stereo Rumble Less Than—48 db (Exceeds NAB Standards)
- Lifetime Guarantee Against Any Defects In workmanship
- Full 1 Year Warranty On Parts
- Rim Drive Assures Minimum Rumble, Maximum Starting Torque
- Three Standard Speeds: 33, 45, 78
- Turntable Powered by 60 Hz Synchronous Motor (Also Available in 50 Hz)
- Speed Change May Be Made While Platter is Turning
- 45 RPM Adapter—Originated by QRK, Built Into Precision Platter
- Full 5.5 lb. Precision Platter Virtually Reduces Rumble

S-260/S-320 Tone Arms

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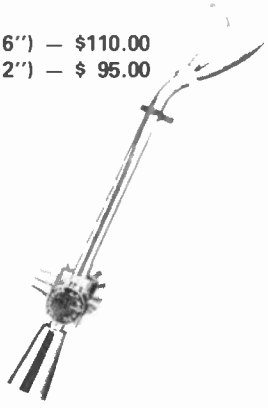
PROFESSIONAL TONE ARMS

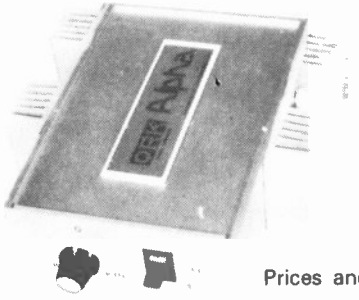
S260 (16") — $110.00
S320 (12") — $ 95.00



Features

- Tubular Construction
- Tracks At Less Than 1 Gram
- Tracking Error Under 1°—Horizontal Movement
- 100% Shielding
- Open Front For Visible Location Of Stylus In Grooves
- Cartridge Shell Accepts All Standard Stereophonic or Monophonic Cartridges
- Meets Or Exceeds The Critical Requirements of Ultra-High Compliance Cartridges
- Clean Modern Design, Chrome Finish
- Made In USA
- Manufactured By A Company That Has Produced Quality Tone Arms And Turntables Since 1944
- Vertical Height Adjustment Permits Setting Tone Arm Parallel To Record Surface
- Resonance Below 10 Cycles With Average Pick-Up Virtually Dampened Out
- Separate Balance And Stylus Pressure Adjustment Easily Obtained By Rotation Of The Counter Weight Or Micropoise Knob
- Removable Shell For Ease Of Replacement Of Stylus

Alpha AC Speed Control



Features

- +/- 10% Speed Variation
- Can Be Remote Controlled
- Solid State
- Compact—Low Profile
- No External Wiring Necessary

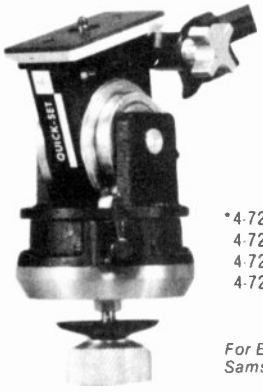
$195.00

Prices and Specifications Subject to Change Without Notice.

QuickSet

HEADS

3650 Woodhead Drive, Northbrook, Illinois 60062
Phone: (312) 498-0700, Telex: 72-4362

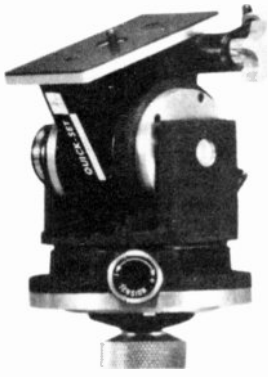


SAMSON MINI FLUID HEAD*

Load Capacity . . . . . 20 lbs. (9.1 kg)
Tilt Angle . . . . . ± 90°
Pan Rotation . . . . . 360°
Dimensions . . . . . 4" × 5" × 6"
(10.2 × 12.7 × 15.2 cm)
Weight . . . . . 4.5 lbs. (2.0 kg)

*4-72800-2 Mini Fluid Head with Pro Jr. Base	**$470.00**
4-72801-0 Mini Fluid Head with Ball Base	**470.00**
4-72802-8 Mini Fluid Head with Samson Column Base	**470.00**
4-72803-6 Mini Fluid Head w/Pro Jr. Base · No 3/8" Stud (For use with 4-70150-4 Tripod)	**470.00**

For ENG, E.F.P. and Cine applications. Use with any Samson tripod, pedestal or column.



SAMSON JUNIOR FLUID HEAD*

Load Capacity . . . . . 30 lbs. (13.6 kg)
Tilt Angle . . . . . ± 85°
Pan Rotation . . . . . 360°
Dimensions . . . . . 4" × 6" × 6"
(10.2 × 15.2 × 15.2 cm)
Weight . . . . . 7.0 lbs. (3.2 kg)

*4-72850-7 Jr. Fluid Head with Pro Jr. Base	**$595.00**
4-72851-5 Jr. Fluid Head with Ball Base	**595.00**
4-72852-3 Jr. Fluid Head w/Samson Column Base	**595.00**
4-72853-1 Jr. Fluid Head w/Pro Jr. Base · No 3/8" Stud (For use with 4-70150-4 Tripod)	**595.00**

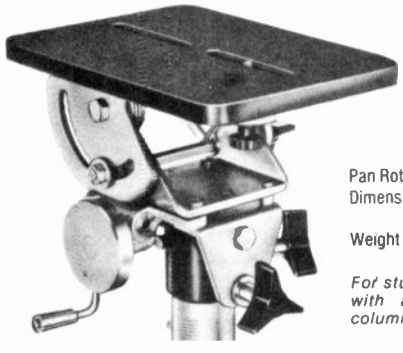
For ENG, E.F.P. and Cine applications. Use with any Samson tripod, pedestal or column.

HERCULES HYDRO FLUID HEAD*

Load Capacity . . . . 50 lbs. (22.7 kg)
Tilt Angle . . . . . ± 80°
Pan Rotation . . . . . 360°
Dimensions . . . . . 6" × 5" × 6"
(15.2 × 12.7 × 15.2 cm)
Weight . . . . . 8.5 lbs. (3.9 kg)

*4-52810-3 Hydro Fluid Head with Pro Jr. Base	**$850.00**
4-52811-1 Hydro Fluid Head with Ball Base	**850.00**
4-52812-9 Hydro Fluid Head with Samson Column Base	**850.00**
4-52813-7 Hydro Fluid Head w/Pro Jr. Base No 3/8" Stud (For use with 4-70150-4 Tripod)	**850.00**

For ENG, E.F.P. and Cine applications. Use with any Samson tripod, pedestal or column.



SAMSON GEARED STILL HEAD
#4-72512-3 **$155.00**

Load Capacity . . . . 15-25 lbs. (6.8-11.4 kg)
Tilt Angle . . . 45° up, 90° down 15° Side Tilt
Pan Rotation . . . . . 360°
Dimensions . . . . . 8½" × 6½" × 6"
(21.6 × 16 5 × 15.2 cm)
Weight . . . . . 2½ lbs. (1 kg)

For studio photographic applications. Use with any Samson tripod, pedestal or column.

SAMSON GEARED MOVIE HEAD
#4-72612-1 **$145.00**

Load Capacity . . . 15-25 lbs. (6.8-11.4 kg)
Tilt Angle . . . . . 45° up, 90° down
Pan Rotation . . . . 360°
Dimensions . . . . 6" × 6½" × 7½"
(15.2 × 16.5 × 19 cm)
Weight . . . . . 2 lbs. (1 kg)

For 8mm or 16mm motion picture applications. Use with any Samson tripod, pedestal or column.

SAMSON FRICTION HEAD*

Load Capacity . . . 25-35 lbs. (11.4-15.9 kg)
Tilt Angle . . . . . 45° up, 90° down
Pan Rotation . . . . 360°
Dimensions . . . . 5½" × 6½" × 6½"
(14.1 × 16.6 × 16.6 cm)
Weight . . . . . 2½ lbs. (1 kg)

*4-72011-6 Standard Counterbalance Spring (25 lb. cap.)	**$85.00**
4-72013-2 Heavy Duty Counterbalance Spring (35 lb. cap.)	**95.00**

3/8" × 16 mounting screw available on special order.

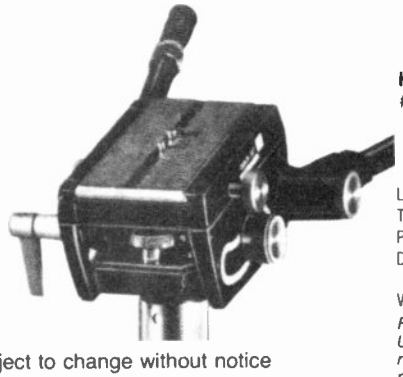
For Studio and remote applications. Use with any Samson tripod, pedestal or column.

For studio and remote applications. Use with any Samson tripod, pedestal or column.

SAMSON CAM HEAD
#4-72300-3 **$285.00**

Load Capacity . 40 lbs. (18.1 kg)
Tilt Angle . . . . 30° up, 40° down
Pan Rotation . . 360°
Dimensions . . . 8½" × 6½" × 4½"
(21.6 × 16.6 × 11.5 cm)
Weight . . . . . 5 lbs. (2.3 kg)
Mountings 1/4" × 20 Camera Screw. Adjustable Fore & Aft 3½" (8.9 cm) Mounting surface 3½" × 6" (8.9 × 15.2 cm)

3/8" × 16 mounting screw available on special order



HERCULES CAM HEAD
#4-52304-9 **$470.00**

Load Capacity . 80 lbs. (36.3 kg)
Tilt Angle . . . . 35° up, 45° down
Pan Rotation . . 360°
Dimensions . . . 5" × 9" × 10"
(12.7 × 22.9 × 25.4
Weight . . . . . 21 lbs. (9.5 kg)

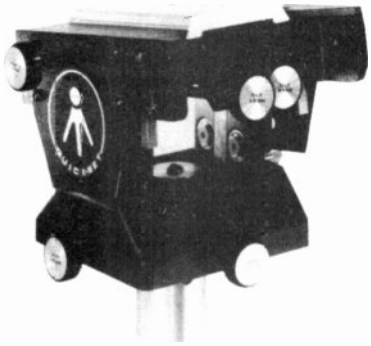
For studio and remote applications. Use with Hercules tripod and dolly for remote, Hercules and Gibraltar pedestals for studio work.

Prices and specifications subject to change without notice

QuickSet

HEADS

3650 Woodhead Drive, Northbrook, Illinois 60062
Phone: (312) 498-0700, Telex: 72-4362

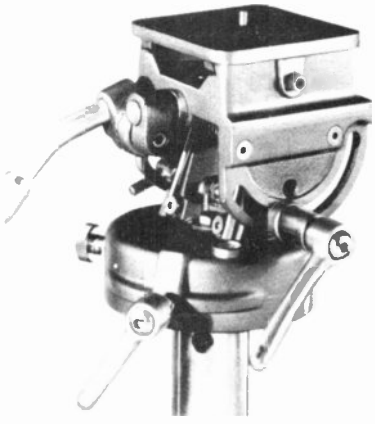


HERCULES CAM HEAD
#4-52330-4 **$685.00**

Load Capacity . 140 lbs. (63.6 kg)
Tilt Angle . . . . Up to 50° up & down
Pan Rotation . . 360°
Dimensions . . . 8½" × 9½" × 9½"
(21.6 × 24.1 × 24.1 cm)
Weight . . . . . 25½ lbs. (11.6 kg)

Specify type of camera, lens, and teleprompter for Cam designation.

For studio and remote applications. Use with Hercules tripod and dolly for remote, Hercules and Gibraltar pedestals for studio work.

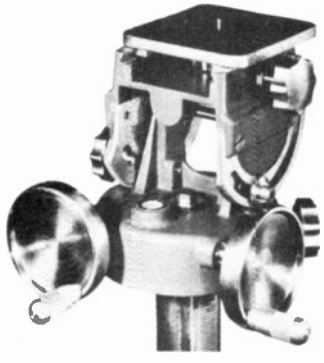


HERCULES DUALOK FRICTION HEAD
#4-52611-7 **$330.00**

Load Capacity . Up to 50 lbs. (22.7 kg)*
Tilt Angle . . . . 45° up, 90° down
Pan Rotation . . 360°
Dimensions . . . 6¾" × 6½" × 5"
(17.1 × 16.5 × 12.7 cm)
Weight . . . . . 7 lbs. (3.2 kg)
*Choice of counterbalance springs.

Hercules Movie Friction Head #4-52021-9 is the same as #4-52611-7 except for locking controls.

For studio and remote applications. Use with Hercules tripod and dolly or Hercules mobile pedestal.

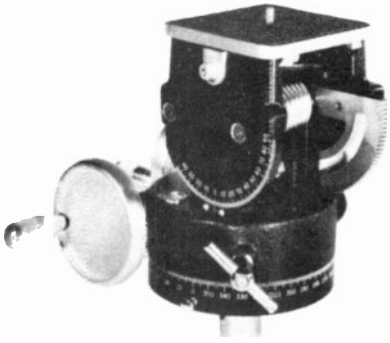


HERCULES GEARED HEAD
#4-52211-6 **$365.00**

Load Capacity . 15-50 lbs. (6.8-22.7 kg)*
Tilt Angle . . . . 45° up, 90° down
Pan Rotation . . 360°
Dimensions . . . 7" × 6" × 6¾"
(17.8 × 15.2 × 17.1 cm)
Weight . . . . . 7 lbs. (3.2 kg)

*Choice of counterbalance spring.

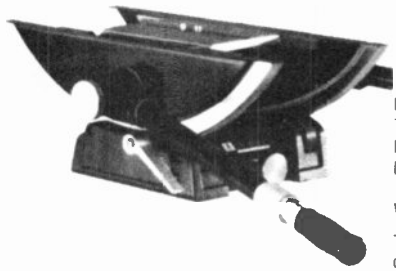
For use with instruments where smooth uniform movement is required. Use with Hercules tripods, pedestal or column.



HERCULES CALIBRATED HEAD
#4-52926-9 **$775.00**

Load Capacity . 15-30 lbs. (6.8-13.6 kg)
Tilt Angle . . . . 45° up, 90° down
Pan Rotation . . 360°
Dimensions . . . 7" × 6" × 6¾"
(17.8 × 15.2 × 17.1 cm)
Weight . . . . . 9 lbs. (4.1 kg)
Calibrations: Azimuth in 1° (0°-360°) w/Verniers; Elevation in 1° (+90° -45°) w/Verniers, Verniers at 15 minutes

For precise instrument movement where adjustment and no backlash is critical. Use with any Hercules tripod, pedestal or column.

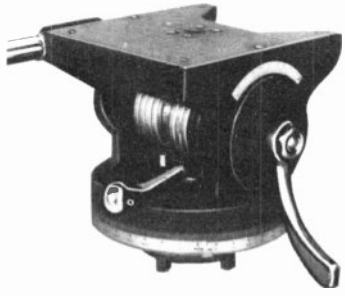


HERCULES AND GIBRALTAR CRADLE HEADS
#4-52451-8 and #4-62454-0 **$775.00**

Load Capacity . 150 lbs. (68.2 kg)
Tilt Angle . . . . 70° up, 40° down
Pan Rotation . . 360°
Dimensions . . . 18" × 11¼" × 6¼"
(45.7 × 28.6 × 15.9 cm)
Weight . . . . . 25 lbs. (11.4 kg)

The Hercules and Gibraltar Cradle Heads differ only in the size of the mounting studs.

For remote and studio applications. Use with Hercules or Gibraltar tripods for remote. Use with mobile or counterbalance pedestals for studio work.

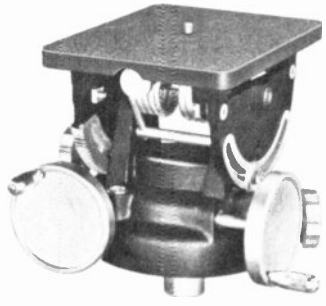


GIBRALTAR MICROWAVE RELAY TILT HEAD
#4-62050-6 **$430.00**

Load Capacity . 1,000 inch - pounds Fore on Tilt Axis
Tilt Angle . . . . 30° up, 38° down
Pan Rotation . . 360°
Dimensions . . . 6½" × 6½" × 7"
(16.5 × 16.5 × 17.8 cm)
Weight . . . . . 30 lbs. (13.6 kg)

Calibrations: Azimuth in 1° (0°-360°)
Elevation in 1° (± 45°)

For microwave relay application. Use with Gibraltar field tripod.

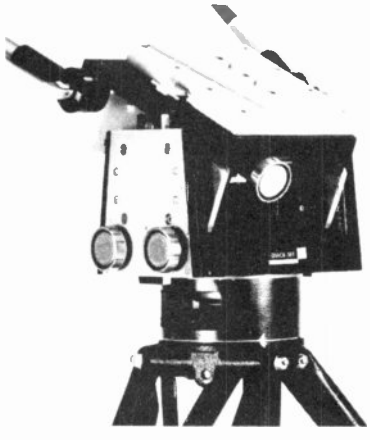


GIBRALTAR GEARED HEAD
#4-62225-4 **$775.00**

Load Capacity . 50-200 lbs. (22.7-90.9 kg)
Tilt Angle . . . . 53° up, 67° down
Pan Rotation . . 360°
Dimensions . . . 10" × 10" × 12"
(25.4 × 25.4 × 30.5 cm)
Weight . . . . . 18 lbs. (8.2 kg)

Model 4-62922-6 is the same as above with addition of calibrated pan and tilt. Model 4-62926-7 is the same as Model 4-62922-6 with addition of verniers.

For precise instrument movement where adjustment and no back-lash is critical. Use with Gibraltar tripods.



GIBRALTAR CAM HEAD
#4-62302-1 **$1325.00**

Load Capacity . 375 lbs. (170.5 kg)
Tilt Angle . . . . ± 50° up & down
Pan Rotation . . 360°
Dimensions . . . 13" × 11" × 10"
(33 × 28 × 25 cm)
Weight . . . . . 46 lbs. (20.9 kg)

Specify type of camera, lens, and teleprompter for Cam designation.

For remote and studio applications. Use with Gibraltar Field Tripod for remote work. Use with counterbalance pedestal for studio work.

Prices and specifications subject to change without notice

Circle (133) on Reader Service Card

QuickSet

TRIPODS

3650 Woodhead Drive, Northbrook, Illinois 60062
Phone: (312) 498-0700, Telex: 72-4362

HUSKY TRIPOD*

Load Capacity . . Up to 17 lbs. (7 7 kg)
Height
Extended . . . . 57"-72" (144.8 182.9 cm)
Height
Telescoped . . 23"-31" (58.4 78.7 cm)
(Dependent on model)
Column Rise . . 16" (40.6 cm)
Tilt Angle . . . 60° up, 90° down
Pan Rotation . 360°
Weight . . . 7 lbs. (3.2 kg)

*5 95534 9	2 section legs	**130.00**
5-95542 2	3-section legs	**145.00**
5 95549 7	4-section legs	**150.00**

All have anti drop columns and counter balanced heads included.

For remote or studio applications. Use with Husky dolly for mobility.

SAMSON TRIPOD
#4-73010-7 **$195.00**

Load Capacity . 40 lbs. (18.2 kg)
Maximum
Height . . . . . 76" (193 cm)
Minimum
Height . . . . . 34" (86.4 cm)
Column Rise . . 18" (45.7 cm)
Weight . . . . . 10 lbs. (4.5 kg)

A 3/4 size version is available under #4-73500-7. **$195.00**
Maximum
Height . . . . . 55" (139.7 cm)
Minimum
Height . . . . . 21" (53.3 cm)

For studio and remote applications. Use with any Samson panhead and dolly.

SAMSON TRIPOD FOR ENG AND CINE
#4 70150 4 **$175.00**

Load Capacity . 70 lbs. (31.8 kg)
Maximum
Height . . . . . 58" (cm: 147.3)
Minimum
Height . . . . 32" (cm: 81.3)
Weight . . . . 9 lbs. (4.1 kg)

For ENG, E.F.P. and Cine applications. Use with fluid heads for studio or remote. Add Samson dolly for mobility.

SAMSON TROLLY
#4-74810-9 **$235.00**

Load Capacity . 40 lbs. (18.2 kg)
Maximum
Height . . . . . 54" (137.2 cm)
Minimum
Height . . . . . 36" (91.4 cm)
Column Rise . . 18" (45.7 cm)
Weight . . . . . 13 lbs. (5.9 kg)
Wheel Circle . . 34" (86.4 cm)

For studio applications. Use with any Samson panhead.

Prices and specifications subject to change without notice

QuickSet

3650 Woodhead Drive, Northbrook, Illinois 60062
Phone: (312) 498-0700, Telex: 72-4362

DOLLIES

HERCULES TRIPOD WITH ELEVATOR $425.00
#4-53021-8

Load Capacity . 150 lbs. (68.2 kg)
Maximum Height . . . . . 73"(185.4 cm)
Minimum Height . . . . . 33"(83.8 cm)
Column Rise . . 18"(45.7 cm)
Weight . . . . . 19 lbs. (8.6 kg)

A 3/4 size version is available under #4-53220-6.
Maximum Height 55"(139.7cm)
Minimum Height . . . . 26"(66.0 cm)

For studio or remote application. Use with any Hercules panhead. Dolly provides mobility.

GIBRALTAR TRIPOD WITH ELEVATOR $775.00
#4-63020-8

Load Capacity . 200 lbs. (90.7 kg)
Maximum Height. . . . . 85"(215.9 cm)
Minimum Height . . . . . 42"(106.7 cm)
Weight . . . . . 42 lbs. (19.1 kg)

A 3/4 size version is available under #4-63120-6.
Maximum Height . . . . . 65"(165.1 cm)
Minimum Height . . . . 30"(76.2 cm)

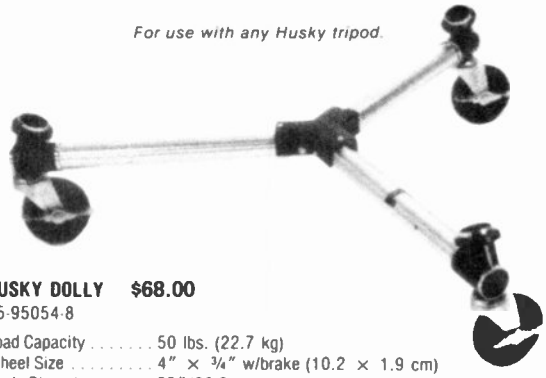
For studio and remote applications. Use with any Gibraltar panhead.

GIBRALTAR HEAVY DUTY FIELD/STUDIO TRIPOD $525.00
#4-60450-0

Load Capacity . 400 lbs. (181.8 kg)
Maximum Height. . . . . '?1½"(108 cm)
Minimum Height . . . . . 25¾"(64.8 cm)
Weight . . . . . 24 lbs. (10.9 kg)

For studio and remote applications. Use with any Gibraltar panhead.

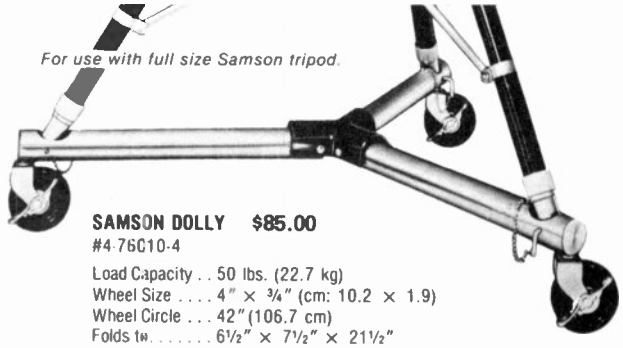
For use with any Husky tripod.



HUSKY DOLLY $68.00
#5-95054-8

Load Capacity . . . . . 50 lbs. (22.7 kg)
Wheel Size . . . . . 4" × ¾" w/brake (10.2 × 1.9 cm)
Circle Diameter . . . . . 35"(88.9 cm)
Folds to. . . . . 4" × 6" × 19"
(10.2 × 15.2 × 48.3 cm)
Weight . . . . . 8 lbs. (3.6 kg)

For use with full size Samson tripod.



SAMSON DOLLY $85.00
#4-76010-4

Load Capacity . . 50 lbs. (22.7 kg)
Wheel Size . . . . 4" × ¾" (cm: 10.2 × 1.9)
Wheel Circle . . . 42"(106.7 cm)
Folds to. . . . . 6½" × 7½" × 21½"
(16.5 × 19.0 × 54.6 cm)
Weight . . . . . 9 lbs. (4.1 kg)

HERCULES AND GIBRALTAR DOLLIES
#4-56020-7 **$235.00**
Load Capacity. . . . . 500 lbs. (226.8 kg)
Wheel Size Diameter . . . . . 4" × 1"(10.2 × 2.5 cm)
Wheel Circle Diameter . . . . . 45"(114.3 cm)
Folds to . . . . . 7" × 13" × 28"
(17.8 × 33.0 × 71.1 cm)
Weight . . . . . 17 lbs. (7.7 kg)

The same dolly w/4" wheels is available in a 3/4 size version under #4-56100-7. **$235.00**

#4-56450-6 w/Cable Guards **$510.00**
Load Capacity. . . . . 500 lbs. (226.8 kg)
Wheel Size Diameter . . . . . 8" × 1½"(20.3 × 3.8 cm)
Wheel Circle Diameter . . . . . 45"(114.3 cm)
Folds to . . . . . 11" × 13" × 28"
(27.9 × 33.0 × 71.1 cm)
Weight . . . . . 41 lbs. (18.6 kg)

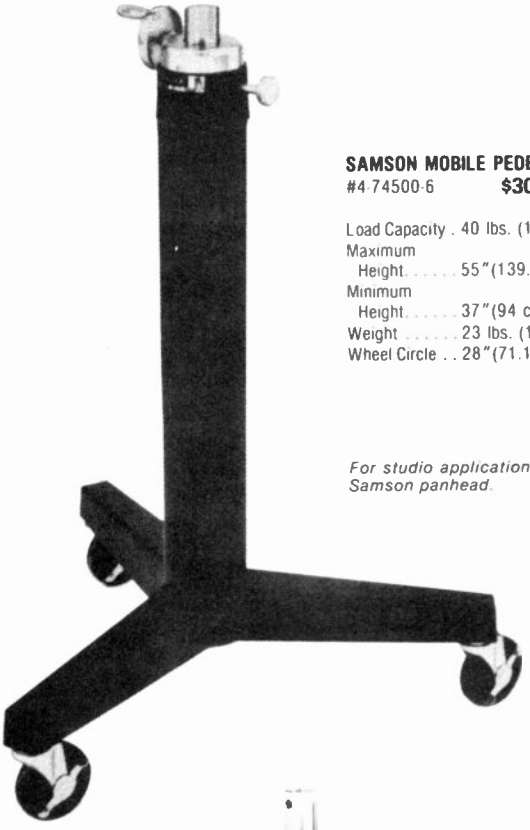
The same dolly w/8" wheels is available in a 3/4 size version under #4-56160-1. **$510.00**

Prices and specifications subject to change without notice

QuickSet

PEDESTALS

3650 Woodhead Drive, Northbrook, Illinois 60062
Phone: (312) 498-0700, Telex: 72-4362



SAMSON MOBILE PEDESTAL
#4-74500-6 **$305.00**

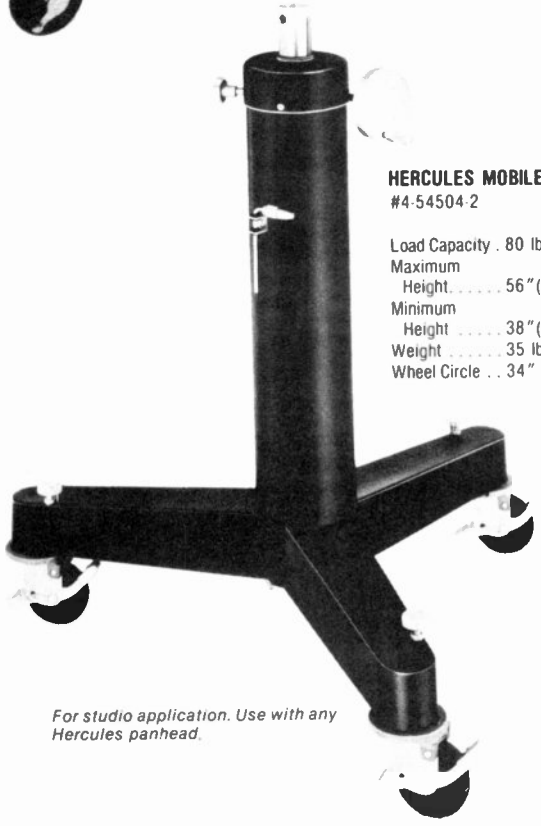
Load Capacity . 40 lbs. (18.2 kg)
Maximum
Height . . . . . 55"(139.7 cm)
Minimum
Height . . . . . 37"(94 cm)
Weight . . . . . 23 lbs. (10.5 kg)
Wheel Circle . . 28"(71.1 cm)

For studio application. Use with any Samson panhead.

GIBRALTAR MOBILE PEDESTAL
#4-64500-8 **$1450.00**

Load Capacity . 200 lbs. (90.7 kg)
Maximum
Height . . . . . 60"(152.4 cm)
Minimum
Height . . . . . 42"(106.7 cm)
Weight . . . . . 96 lbs. (43.5 kg)
Wheel Circle . . 38" (96.5 cm)

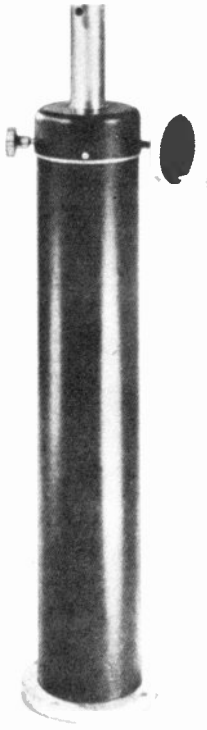
For studio application. Use with any Gibraltar panhead.



HERCULES MOBILE PEDESTAL
#4-54504-2 **$555.00**

Load Capacity . 80 lbs. (36.4 kg)
Maximum
Height . . . . . 56"(142.3 cm)
Minimum
Height . . . . . 38"(96.5 cm)
Weight . . . . . 35 lbs. (15.9 kg)
Wheel Circle . . 34" (86.4 cm)

For studio application. Use with any Hercules panhead.



SAMSON STATIONARY PEDESTAL
#4-78100-1 **$220.00**

Load Capacity . . . . . 25 lbs. (11.4 kg)
Maximum Height. . . . . 48" (121.9 cm)
Minimum Height . . . . . 30" (76.2 cm)
Weight . . . . . 10 lbs. (4.5 kg)

HERCULES STATIONARY PEDESTAL $360.00
#4-58001-5

Load Capacity . . . . . 80 lbs. (36.4 kg)
Maximum Height. . . . . 50" (127.0 cm)
Minimum Height . . . . . 32" (81.3 cm)
Weight . . . . . 12 lbs. (5.5 kg)

GIBRALTAR STATIONARY PEDESTAL $550.00
#4-68000-5

Load Capacity . . . . . 200 lbs. (90.7 kg)
Maximum Height. . . . . 52" (132.1 cm)
Minimum Height . . . . . 32" (81.3 cm)
Weight . . . . . 20 lbs. (9.1 kg)

For fixed locations. Use with any panhead from respective category

Prices and specifications subject to change without notice

QuickSet

3650 Woodhead Drive, Northbrook, Illinois 60062
Phone: (312) 498-0700, Telex: 72-4362

SPECIAL PURPOSE MOUNTS

GIBRALTAR COUNTERBALANCE PEDESTAL
#4-64850-7 **$2300.00**

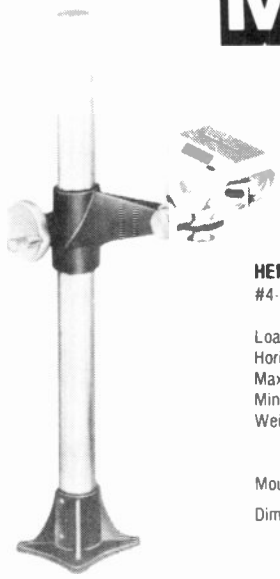
Load Capacity . . 150 lbs. (68.2 kg)
Maximum Height . . . . . 54"(137.2 cm)
Minimum Height. . . . . 36"(91.4 cm)
Doorway Width . 32"(81.3 cm)
Steering Wheel Dia. . . . . 24"(60.9 cm)
Weight . . . 250 lbs. (113.6 kg)

For studio application. Use with Hercules Cam Heads or Gibraltar Cradle Head.

GIBRALTAR COUNTERBALANCE PEDESTAL
#4-64860-6 **$3200.00**

Load Capacity . . 260 lbs. (118.2 kg)
Maximum Height. . . . . 57"(144.8 cm)
Minimum Height . . . . . 36"(91.4 cm)
Doorway Width . 38½"(97.8 cm)
Steering Wheel Dia. . . . 30"(76.2 cm)
Weight . . . . . 596 lbs. (270.9 kg)

For studio application. Use with Gibraltar Cam or Cradle Heads.



HERCULES MICROSCOPE STAND
#4-59750-6 **$265.00**

Load Capacity. . . . . 25 lbs. (11.4 kg)
Horizontal Reach. . . . 12"(30.5 cm)
Maximum Height . . . 31"(78.7 cm)
Minimum Height . . . . 13"(33 cm)
Weight. . . . . 10 lbs. (4.5 kg)

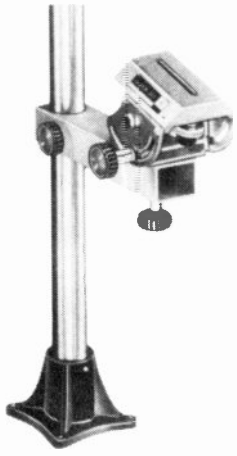
Mounted on Base (Optional) #4-59800-9
Dimensions . . . . . 20" × 28"(50.8 × 71.1 cm)

SAMSON ELEVATOR COLUMN UNIT
#4-79000-2 **$130.00**

Load Capacity . . . . . 25 lbs. (11.4 kg)
Maximum Height . . . . 24"(60.9 cm)
Minimum Height . . . . 6"(15.2 cm)
Weight . . . . . 6 lbs. (2.7 kg)

HERCULES ELEVATOR COLUMN UNIT
#4-59001-4 **$250.00**

Load Capacity . . . . . 80 lbs. (36.4 kg)
Maximum Height . . . . . 24"(60.9 cm)
Minimum Height . . . . . 6"(15.2 cm)
Weight . . . . . 15 lbs. (6.8 kg)



SAMSON STATIONARY COLUMN UNIT **$145.00**
#4-75810-8
(includes side arm & head)

Load Capacity. . 15 lbs. (6.8 kg)
Maximum Height. . . . . 30"(76.2 cm)
Minimum Height . . . . . 12"(30.4 cm)
Weight . . . . . 8 lbs. (3.6 kg)
Horizontal Reach. . . . . 10"(25.4 cm)

Prices and specifications subject to change without notice

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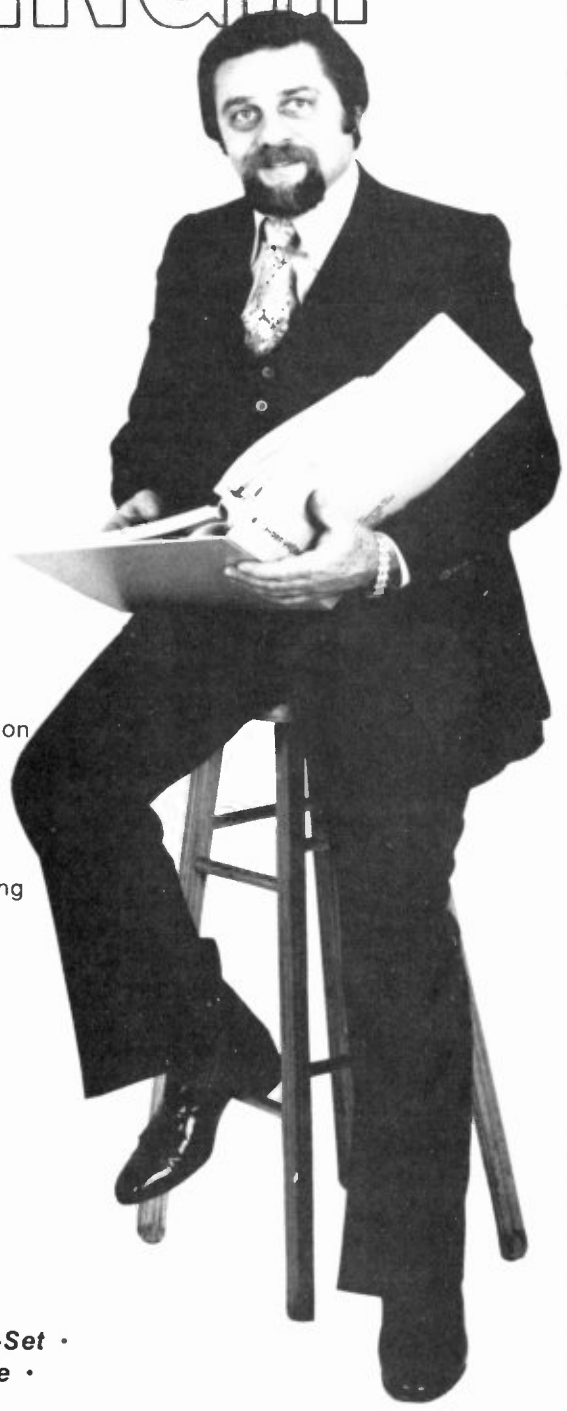

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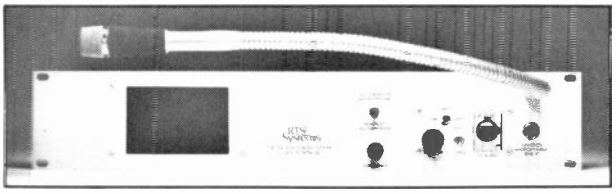
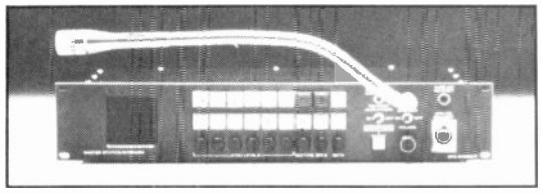
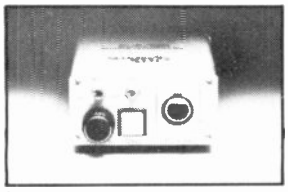
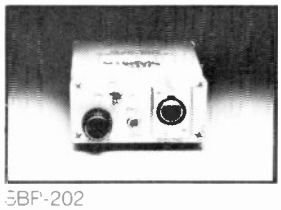
MASTER STATION—SERIES 800
IN-LINE MICROPHONE PREAMPLIFIER
HIGH PERFORMANCE MICROPHONE MIXER


SPK-20RM


801


BP-102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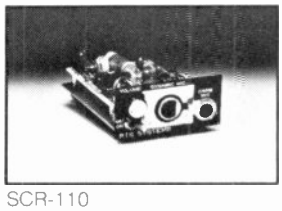
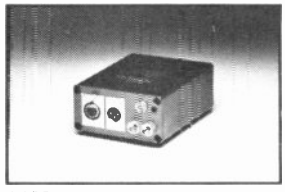
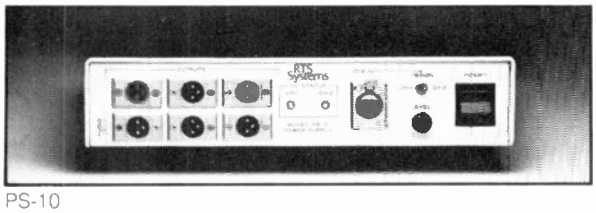
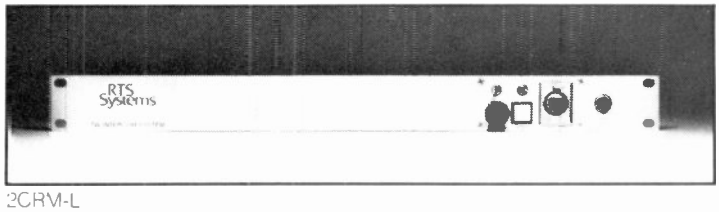

SCR-110

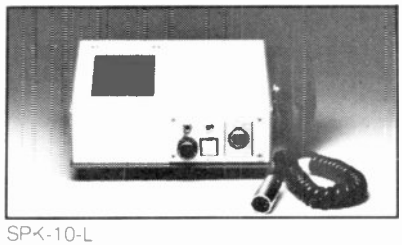

1400

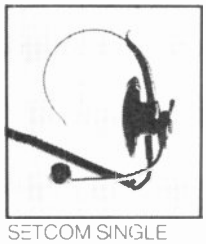

PS-10


2CRM-L

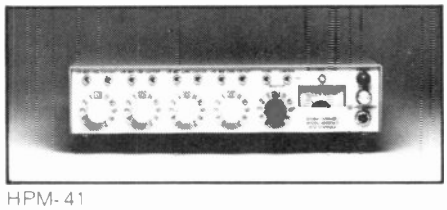

DT-108

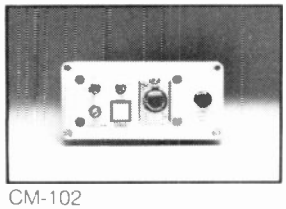

DT-109

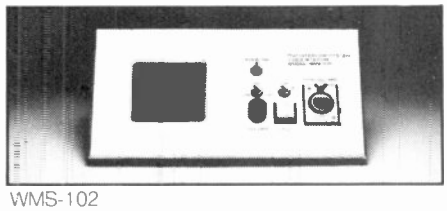

SPK-10-L


SETCOM SINGLE


SETCOM DUAL


HPM-41


CM-102


WMS-102

The *TW Intercom System* is a high performance closed-circuit intercommunications system designed for entertainment and industrial operations. The system arrangement can be customized from a variety of user stations (some are shown above). *TW* features include: up to 50 units on line without loading; flashing call light; adjustable sidetone; powerful headphone amplification; carbon dynamic mic headset capability; mic level limiting; and two (or more) channel operation. Our refined *Phase III* circuitry permits a 12 volt battery power source, low-cost multi-channel operation; dry line capability; two-, three-, or four-wire configurations; increased operation range; balanced line options, and a variety of custom adaptations. The system is completely field serviceable and handsomely packaged, providing super service under the toughest conditions. We also offer a series of interface units for coupling RTS systems with other brand intercoms, cameras, and telephone lines. In addition, RTS produces the *Model 801 Master Station*, a multi-functional communications control center with six intercom channels, two IFB circuits, two SA circuits, a built-in flexneck microphone and speaker, and a variety of outstanding capabilities.

The *Model 1400 In-Line Microphone Preamplifier* is a battery powered, high performance device featuring super specifications in a durable, compact housing. RTS professional equipment also includes our new *HPM-41 Microphone Mixer*. This high-performance device offers four inputs with switchable attenuation and lo-cut filters; overall limiter; peak indicating LED; powerful headphone amp; AC/battery power, line level and mic level outputs, transformer-balanced inputs and outputs; AB microphone power; phantom powering; and outstanding electrical specifications. For more information call or write

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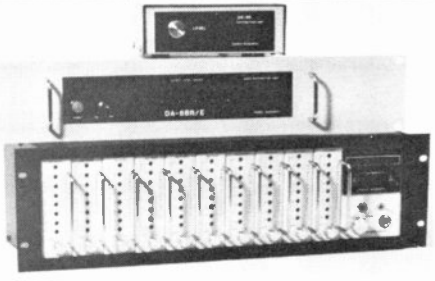
The products shown on these pages are but representative examples of over 150 items manufactured or sold thru RAMKO RESEARCH. From turntables, audio consoles, distribution amplifiers, and audio switchers to cart machines, tape winders and mic and line amplifiers.

We openly encourage your comparison with anything else on the market. Write, wire or call COLLECT for further information. Better yet, take advantage of our 2 week trial offer and prove us to yourself. We will both come out ahead.

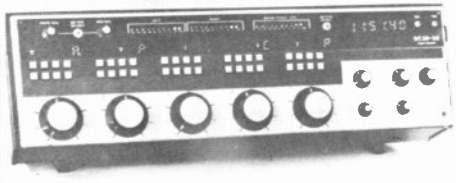
Sincerely,

RAY KOHFELD
President/Director of Engineering

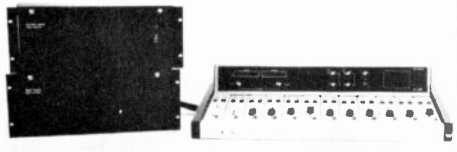
TURNTABLE PREAMPS. Leaders in their field. MP-8 & SP-8 — Bal. out; 0.05% dist.; 68dB gain; +8dBm out (+21dBm max); S/N —77dB down ref. to 12mv in @ 1kHz & +8dBm out. ±1dB RIAA, remote scratch & brilliance activation. Mono, stereo, table top, and rack mount versions. **$98 to $166.**
ESP-38 — Bal. out; 0.03% distortion; S/N, —85dB down referred to 12mv in @ 1kHz and +8dBm out; ±0.5dB RIAA; remote & local scratch, brilliance, rumble filter and mono activation; +8dBm out (+21dBm max.), +60dB gain. Left & right Hi/Lo equalization trimmers and recessed level controls. Built-in turntable remote start/stop relay. Stereo only. Price — $325.



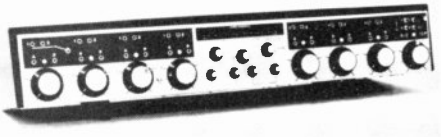
AUDIO DISTRIBUTION AMPLIFIERS. Available in 12 different rack and table top versions. All inputs and outputs may be used balanced or unbalanced and in any combination on the same amplifier. All outputs are individually amplifier isolated and will work into any load over 125 ohms without change in distortion or response. Response 10Hz to 30kHz, ±0.5 dB. Distortion 0.1% or less. Hum and Noise 98dB down referenced to +20dBm out. Channel separation —75dB. DA's start as low as $145 for our 1x30 mass feed model, thru our 1x6 line and mic level units, to our modular 20x80 rack mount design. No need to pay more or settle for less. Price — $145 to $2,276.



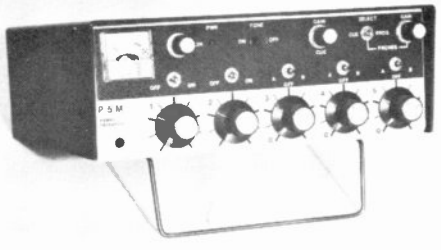
DC38 SERIES AUDIO CONSOLES. Outstanding versatility and advanced technology. Unparalled features such as 4 inputs per mixer, high Z balanced bridging inputs accept mic level thru high level, patch-panel input gain select, DC control of all audio, back lit alpha numeric readouts above each mixer, solid state LED VU meters, dual channel (plus mono mixdown channel on stereo), solid state switching and muting for noiseless operation, selectable muting, plug in electronics, and optional built in Clock/Timer. Available mono or stereo and 5, 8, or 10 mixer versions. 4 year warranty with 2 week trial period. Price — $2,400 to $4,980.



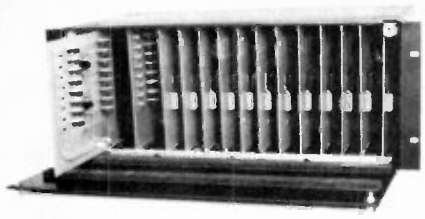
DC-12 SERIES AUDIO CONSOLES. A remote control console with low profile control head and rack mount electronics that may be located up to 90 feet away. Features 2 inputs per mixer, silent illuminated touch switches, dual channel (plus mono mix down channel on stereo), solid state LED VU meters, DC control of all audio, patch panel input gain select, selectable solid state muting and switching, slide faders with dual cue entry and plug in electronics. Since the DC-12's are totally modular you may order any number of mixers and add on later. Twelve channels may be accomodated and an additional 8 may be added via the DC-12 extender. 4 year warranty. Price — $4,700 to $5,900.



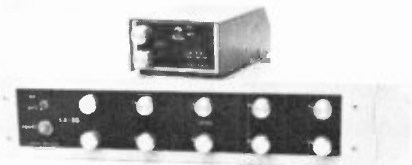
SC-5, DC-5, & DC-8 SERIES AUDIO CONSOLES. This series of consoles, whether single or dual channel; table models or rack mount; 5 or 8 mixers, mono or stereo, feature illuminated touch-pad audio select switching, solid state LED VU meters, Simul-Q monitoring capability, full-range gain selects on each input, selectable solid state cue and monitor muting on all channels, and plug-in electronics. DC control of all audio with built-in relays for on-air lights and aux. muting. Options include 4 and 8 channel extenders, Simul-Q latching and remote control of AC equipment. These popular consoles have recently been up-dated to incorporate many new features. Price — $864 to $2,298.



PORTABLE CONSOLE. P5M — A full 5 mixer audio console in miniature. Bal. in & out, 8 inputs, 3 of which are mic/line selectable & individual compressors on mic channels #1 & #2. Tone gen., cue and monitor feed with gain controls & phones select with gain control. Last 3 channels equiped with Q switch & the first 2 channels provide muting. A folding stand is part of the unit and may be removed for rack mounting. +8dBm out nominally (+18dBm max); ±2dB, 20Hz to 20kHz; S/N —75dB high level and —62dB mic level. Max gain of 90dB and distortion of 0.3%. Compression/limiting range of 35dB and a slope of 50:1. 9¾" W x 9½" D x 3½" H. Price — $545.



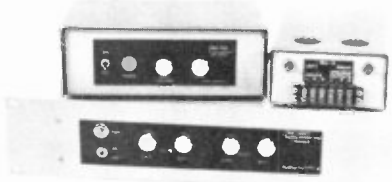
AUDIO ROUTER/ AMPLIFIER. The most versatile, feature loaded switcher on the market. Plug in cards for up to 16 inputs & 12 outputs. Each input has an amplifier and level adjust for attenuation and up to 17dB of gain. Output cards feature dual bal. 600 Ohm outputs, momentary BCD coded controls (may be slaved from other locations), LED output status lights show thru the front panel, and on-board mono/stereo select switch. A smoked plexiglass front panel allows the operator to tell the status of any output. Also on the front panel are 2 rows of silent momentary contact switches. One row for output selection & one row for input select. Contact RAMKO for further information and specs. Price — $716 - $2,108



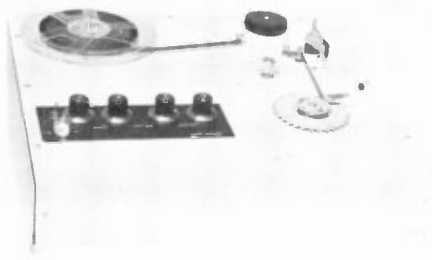
LINE AMPLIFIERS. The ideal solution for your line level problems can be found in one of the 4 different models offered. LA-2 (table top or rack) and LA-5S/10M: mono or stereo, balanced or unbalanced high impedance inputs, +21dBm maximum input level, +21dBm maximum output into 600 ohm balanced line, frequency response +0 —1dB 10 Hz to 50kHz, distortion 0.008% at +8dBm out. The LA-2 is a 2 channel amplifier. The LA-5S/10M is a modular rack mount unit with up to 5 stereo or 10 mono channels. The LE-3 is a 3 channel mono line amplifier with equalization for high and low frequencies and is also modular. Gain of all units, variable to +20dB. Price — $16 to $469.

DUAL MIC COMPRESSOR/AMPLIFIERS. Portable dual mono & stero mic limiters that amplify, mix, limit and control gain. The DML-dual mono is used where 2 separate mics must be independently amplified and compressed and mixed into a common 600 ohm output. Primary and backup batteries (or an optional AC supply). Includes tone generator & talkback ability. The DML-1S is an AC powered, stereo version. Input: —60dB nominal, —18dB max. Gain: 90dB max. Limiting Output Level: DML-2M, +10dBm. DML-1S, +18dBm or +8dBm. Balanced Inputs and Outputs. Dist.: 0.3%. Attack Time: 2 microseconds. Noise: 60dB below limiting output. Size 2½" H x 5¼" W x 8½" D. Price — $239 to $274.

MIC/LINE AMPLIFIERS. Dual function for microphone or line. The MLA series are ideal for remote broadcasts, churches, mixer expansion, and emergency situations. Front panel controls for mic or line selection and level. Mic input —60dB in for +4dBm out. Line input balanced bridging with gain variable +26dB. —18dBm in provides +8dBm out with an additional 13dBm of headroom. Distortion is 0.1% or less. Response: Mic channel ±2dB 20Hz to 20kHz. High level channel: ±1dB 5Hz to 30kHz. Inputs may be used bal. or unbal. XLR Mic connectors. Single or dual channel, table top or rack mount. Price — $128 to $195.



STUDIO MONITOR AMPLIFIERS. Exceptional reproduction with high performance and versatility. 7 different models to choose from. MA-7 (mono), MA-14 (stereo): 5W per channel into 8 ohms. Response: +0, —2dB 20 Hz to 19kHz at rated output. Distortion: 0.4% max. at 1kHz and rated output. Input: 5k unbalanced, 0.7V in for max. output. Table top or rack mount. SMA series: mono or stero, table top or rack mount. 25W RMS per channel into 8 ohms. Inputs: high Z balanced bridging. Response: ±1dB 15Hz to 90kHz at rated output. Distortion: 0.6% at rated output. Built in muting circuit with input and output level controls anc bass contour adjust. Price — $96 to $269.



AUTOMATIC CARTRIDGE & CASSETTE LOADER. Precision wind your own carts and cassettes and save up to 40% on reloading costs. The ACL-25/E is simple to use, just dial in the time desired and push the run switch. The ACL stops automatically, precisely to —O, +1 second of playback time. The exclusive playback speed selector ends mental gymnastics figuring tape length versus playback speed. Simply set the selector to 1⅞, 3¾, or 7½ i.p.s. and the ACL does the rest. An optional cassette adaptor enables you to wind both carts and cassettes on the same machine. An optional pancake adaptor is also available. The ACL-25/E has a nominal winding speed of 30 i.p.s. Price $325.

TECHNICS PROFESSIONAL SERIES BY PANASONIC. Ramko Research is proud to be one of the largest distributors of this extraordinary equipment. The SP-10MKII and the SL-1500-MK2 Turntables have set new standards by which turntables will be judged for many years. These direct drive units with Quartz-phase locked speed control maintain speed within 0.002%. Wow and flutter is 0.025% WRMS and Rumble —73dB. Also available are reel to reel tape recorders, portable and fixed cassette R/P units, power amps, parametric equalizers, tuners, and a series of studio monitor speakers that will astound you with their phase-linear reproduction.

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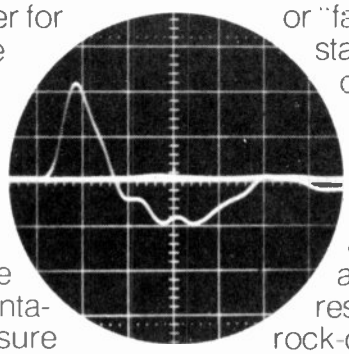
A lot of engineers are worried about overload these days. And no wonder: Rock groups. Country groups. Jetports. And other high program and ambient sources make it more necessary than ever for microphones to be overload-free as well as accurate.

Like our tough MD 421 cardioid dynamic.

In this test with a starter's pistol, we measured an instantaneous sound-pressure level of some 175 dB—well beyond what any musical instrument or voice can produce—while the oscillogram measured no clipping or ringing.



Whether you need a microphone to capture transient sound like this pistol shot, or "face the music" on stage at 130+ dB in a disco or recording session, consider our MD 421. You'll discover its precise cardioid directionality, rugged design and wide, smooth response are ideal for rock-concert, recording and broadcast applications.

The price won't overload you either.

*Outdoor test with Tektronix scope, set for 10V/division vertical, 01 μsec/div horizontal. 22 cal. starter's pistol mounted 15 cm from MD 421 measured pressure of 111,000 dynes/cm² (175 dB SPL). Smooth, rounded scope trace indicates total lack of distortion.

SENNHEISER
ELECTRONIC CORPORATION
10 West 37th Street, New York 10018 (212) 239-0190
Manufacturing Plant: Bissendorf/Hannover, West Germany

Suggested professional user's net price **$265.00**

Please ask for the nearest Sennheiser distributor by calling:

(212) 239-0190
(EAST COAST)

OR

(213) 877-4424
(WEST COAST)

The MD 421 is just one of the many products developed and manufactured by Sennheiser. Technical and price information for other Sennheiser microphones and headsets will be gladly furnished upon request.

Circle (143) on Reader Service Card

Prices and Specifications Subject to Change Without Notice. B-143

222 HARTREY AVE., EVANSTON, IL. 60204 U.S.A.
SHURE MICROPHONES AND ELECTRONIC COMPONENTS
® AREA CODE 312/866-2200 • CABLE: SHUREMICRO
TWX: 910-231-0048 TELEX: 72-4381

Model SM7: A dynamic microphone with a very smooth, flat, wide-range frequency response; cardioid polar pattern, uniform with frequency and symmetrical about the axis; internal "air suspension" shock isolation; highly effective pop filter; extremely good rejection of electro-magnetic hum due to a built-in hum rejection system; bass roll-off and mid-range emphasis. The Model SM7 was field-designed to be the finest dynamic microphone available for music recording and reproduction.
Model SM7 .....**$335.40**

Model SM11: The Shure Model SM11 is a miniature dynamic lavalier microphone designed for use in television broadcasting (on-camera), sound reinforcement, in certain radio and motion picture applications, and similar uses where a small, professional-quality, versatile microphone is required. Flat, natural response, tailored for lavalier use: 50 to 15,000 Hz.
Model SM11 .....**$66.60**

Model SM33: A compact and rugged unidirectional ribbon microphone combining wide range response and a supercardioid directional pattern. The performance characteristics are ideal for studio use in broadcasting and recording and for critical sound reinforcement applications. Built-in shock mount for quiet operation. Slotted Response Selector Switch. Frequency response: 40 to 15,000 Hz.
Model SM33 .....**$219.00**

Models SM53 and SM54 are designed for professional applications requiring the ultimate in sound quality and control. Broad, smooth frequency response: provides clean, natural reproduction of both voice and music. Cardioid directional pattern: Integral acoustic "pop" filter on the SM54. Mechanical noise isolation. Type: Dynamic. Frequency Response: 70 to 16,000 Hz
Model SM53 .....**$223.80**
Model SM54 .....**$237.00**

Studio Gradient Model 300 is a bidirectional microphone for recording, broadcast and sound reinforcement which provides sound pickup at the front and rear of the microphone, but greatly reduces pickup at the sides. Features: Voice-Music switch, vibration-isolation unit mounted in live rubber, multi-impedance switch. Frequency response: 40 to 15,000Hz.
Model 300 .....**$150.60**

Gradient Model 315S: Microphone feature frequency response of 50 to 12,000 Hz that reproduces voice and music in a clear, natural tonal quality. Bidirectional "Figure 8" pickup pattern.
Model 315S **$95.40**

Uni-Ron® Unidirectional Model 330: Highly recommended for motion-picture, TV, radio and professional recording studios; patented "Uniphase" system; the true super-cardioid pickup pattern; a ribbon transducer provides extended smooth response of 30 - 15,000 Hz; multi-impedance switch; lifetime swivel; vibration-isolation unit mounted in live rubber.
Model 330 .....**$123.00**

Model SM82 hand-held, self-contained, unidirectional, condenser microphone containing its own line level amplifier, peak limiter, and battery. It is designed to provide a line level output for use in a variety of broadcasting situations, and in sound reinforcement or recording applications where a line level microphone with a built-in limiter is required. Frequency Response: 40 to 15,000 Hz. Output Impedance: 250 ohms actual (designed for use with 600-ohm or greater loads)
Model SM82 .....**$215.40**

Model SM57 is a slender dynamic microphone built to provide wide range reproduction of music and voice. It features an exceptionally uniform and effective unidirectional pickup pattern. Bright, clean sound. Cartridge shock-mounted for quiet operation. Frequency response: 40 to 15,000 Hz
Model SM57 .....**$108.00**

Model SM58 is a rugged unidirectional dynamic microphone; self-contained spherical filter to control explosive breath sounds and wind noise; unusually effective cardioid pickup pattern to minimize background noise and undesirable effects of studio and location acoustics. Rear and side rejection uniform to very low frequencies and completely symmetrical about microphone axis; bright, clean sound; cartridge shock-mounted for protection and quiet operation; wind and "pop" filter readily removable for cleaning or replacement. Frequency response: 50 to 15,000 Hz
Model SM58 .....**$138.00**

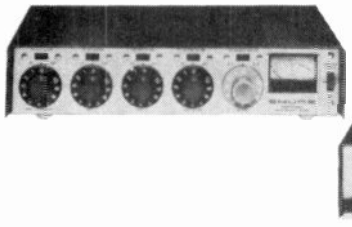
Model SM59 cardioid dynamic microphone. Essentially flat, wide response. 50 to 15,000 Hz. Patented Mechano-pneumatic shock mount system. Built in "pop" filter, and hum-bucking coil. Durable construction. Ideal for speech, vocal and instrument pick-up, for broadcast, recording and sound reinforcement uses.
Model SM59 .....**$144.00**

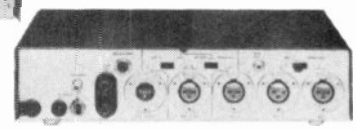
Model 50AC Telephone Acoustic Coupler, designed to acoustically couple recorded information into a telephone transmitter. May also be used in real-time broadcast applications. May also be used as a tape recorder microphone; its frequency response approximates that of a telephone. Is easily attached and removed from a telephone handset. The Model 50AC consists of a dynamic transducer cartridge in a small, lightweight molded rubber and plastic case. Frequency Response: 300 to 3,000 Hz.
Model 50AC **$31.20**

Prices and Specifications Subject to Change Without Notice.

222 HARTREY AVE., EVANSTON, IL 60204 U S A
SHURE MICROPHONES AND ELECTRONIC COMPONENTS
® AREA CODE 312/328 9000 • CABLE: SHUREMICRO

Microphone Mixers

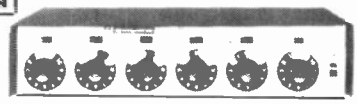




MODEL M67 PROFESSIONAL MICROPHONE MIXER

The M67 features balanced 600 ohm line and microphone level outputs; an illuminated VU meter calibrated for +4 and +10 dBm out; extremely low noise and RF susceptibility; wide, flat frequency response; two-level headphone monitor jack. AC or battery operation (see battery pack and other accessories on following page). Noiseless automatic switchover to battery if AC line fails. **$232.80**

A 68 R Rack Panel Kit **$12.45**

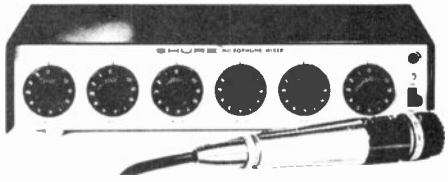


MODEL M677 ACCESSORY MIXER

A transistorized, six input accessory mixer designed for use with Shure M67, M68, M63 or SE30. When used with either M67 or M68, it provides a low-cost and convenient means of adding six additional input channels (10 total). When used with M63, provides a six channel mixer with extremely flexible equalization, a 600-ohm output, a VU meter and a headphone monitor. With SE30, it converts the three-input mixer system to a nine-input system. Obtains power from associated Shure Miser or Battery Power Supply (A67B).
Dimensions: 69.9mm H x 289mm W x 178mm D (2¾" x 11-3/8" x 7")
Weight: 17 kg. (3¾ lbs.)

MODEL M677 — Requires 30 V.D.C. from Units such as M67 or M68 Series Mixers. ..... User Net **$217.20**

MODEL M68 & M68FC MICROPHONE MIXERS



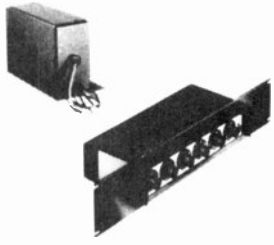
M68 & M68FC Microphone Inputs. The backs of the M68 and M68FC Mixers have four Cannon-type inputs. Model M68 has MALE Cannon XLR-3-14 input connectors (uses XLR-3-11C type mate). Model M68FC has FEMALE Cannon XLR-3-13 type (uses XLR-3-12C type mate). Each input accepts a dynamic or ribbon microphone (not recommended for crystal or ceramic microphones), either high or low impedance (balanced or unbalanced). Input impedance for each microphone is selected by a slide switch so that microphone types and impedances can be mixed. A fifth input, labeled "AUX," is high level and accepts a tape recorder or tuner signal. When used in conjunction with the A68P Phono Pre-Amp accessory, these mixers also accept a magnetic or ceramic phonograph signal.

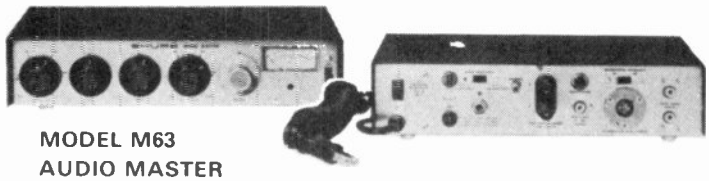
M68 ..... **$126.60**
M68FC **$136.20**

A67B Battery Power Supply for M63, M67, M68RM, M68RM 2E, or M688. May be used as sole power source. On the M67 it may also be used as standby during AC operations providing noiseless switchover in case of AC failure **$21.60**

A68R Rack Panel Kit—Standard 19" x 3½" audio equipment rack panel for use with all circuitry except M625 units. Gray Hammertone finish. **$12.45**

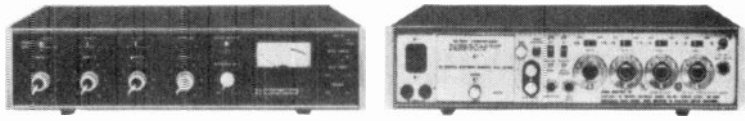
A68R-BL Rack Panel Kit—Same as Model A68R (above), except black finish **$12.45**





MODEL M63 AUDIO MASTER

A new concept in economical total control of audio response. Can be used in production and transfer studios to equalize sound systems, correct room acoustics, produce special sound effects, reduce stand or stage noise, and for tape recording and duplication. Has two high-level inputs and five output provisions for the greatest response control and flexibility available. Effective, continuously variable high-pass and low-pass 6 db-per-octave filters, plus separate bass and treble (boost and cut) controls, can be combined for virtually unlimited response characteristics. Output VU meter. Five outputs: high impedance, high level, high impedance mic level, 600-ohm balanced line, and headphone. Two high-level high impedance inputs controlled by single input attenuator accept signal from virtually any high level source. For 108-132 Volts A.C., 50-60 Hz. **$147.60**

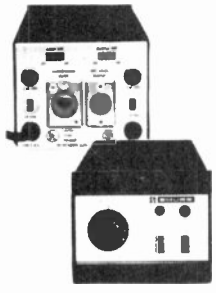


MODEL SE-30 GATED COMPRESSOR MIXER

High-quality, "hands-free" gain riding compressor in a single, portable unit. Makes output control in remote pickups, talk shows recording, program line compression and professional sound reinforcement smoother, surer and more trouble-free than it's ever been before. Features, such as: feedback-type gain controls that automatically increase the input clipping level as the individual gain controls are turned down; a built-in low-distortion 1 kHz tone oscillator; three-function VU meter; stereo parallel jack, self-contained battery and AC power supply, with automatic switch-over to battery in case of AC failure; auxiliary meter light source for battery operation; removable AC line cord; disable switches for compressor and Gated Memory that convert the SE30 to a high quality linear mixer.

SE-30 ..... **$454.80**
A100B Rack Panel 3½ x 19" **$16.20**

MODEL M625 VOICEGATE

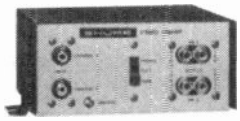


Voice-activated microphone gain controller with response-shaped voice-frequency sensor. Blocks unwanted background noise. Adjustable to keep microphone "On" up to 30 seconds during conversation pauses. Professional three-pin audio connectors: Female input and Male output.

Model M625. For 120 volts AC + 10%, 50/50 Hz, and can also be powered by a 9- and 30-volt external DC source. **$137.40**

Model M625AM is a "modular" unit which takes its power from the M625. (One M625 can power three M625 AM units for a total of four gain controls.) **$111.60**

M64 SERIES STEREO PREAMPLIFIERS



Low-cost, versatile, compact, low distortion, and low noise stereo preamplifiers that provide gain, qualization, and choice of output impedances and levels. Can be used in a broad variety of preamplification and equalization applications: as a high-quality, low-cost magnetic phono preamplifier in broadcast applications; to provide 7½ IPS NAB equalization for tape decks containing no electronics; to give nonequalized amplification wherever a boost in microphone output level is required. When used in conjunction with the A95 Series In-Line Transformers, an output of approximately −20 dbm is available.

For 108-132 volts AC, 50/60 Hz. **$70.00**

Prices and Specifications Subject to Change Without Notice.

SMPTE Time Code Generators & Readers

Time Code Generator TCG-80N

Features:

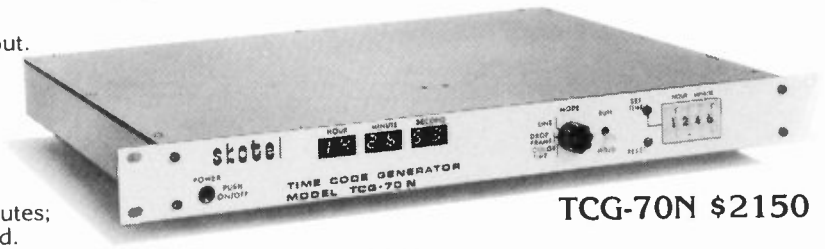
- Full User Data facilities.
- Thumbwheels set Time and User Data.
- Full Frame or Drop Frame modes.
- High level output is capable of feeding multiple machines.
- Self-contained Video Character Generator (Option 003).
- Low power consumption: 5 watts.
- Unaffected by momentary power dropout.
- LED display with contrast filter.

TCG-80N $2690

Time Code Generator TCG-70N

Features:

- Same as TCG-80N except:
- Thumbwheels set Time in Hours & Minutes; Hours, Minutes & Seconds are displayed.
- User Data information can be accepted from an external source (Option 001).



TCG-70N $2150

Specifications: TCG-80N & TCG-70N

Reference Input: Composite Video or Sync, loop thru.

Time Code Output: 1 ea. transformer isolated, balanced, +8dBm.

Power: 5 watts, 100-130VAC. 9 w. with Video Char Gen (TCG-80N only).

Size: Rack mount, 1¾" x 14½".

Time Code Reader TCR-80

Features:

- Displays Time and User Data, plus Drop Frame mode.
- Reads code from hand turn reel speed to 40 times play speed.
- Low level wide band head pre-amplifier, and wide dynamic range AGC.
- Digital decoding techniques.
- Retains and displays last code read when machine is stopped.
- Error detection and bypass.
- Self-contained Video Character Generator (Option 013).
- Low power consumption: 5 watts.
- LED display with contrast filter.

TCR-80 $2100

Specifications: TCR-80

High Level Code Input: −10 to +8dBm, 600 Ohms, balanced.

Low Level Code Input: Direct connection to head, current mode input.

Power: 5 watts, 100-130VAC. 9 w. with Video Char Gen.

Size: Rack mount, 1¾" x 14½".

Video Character Generator: Option 003 & 013

Features:

- Has integral keyer that can simultaneously insert User Data and Time code in selected positions into the video of a work print or on a monitor. Is installed into, and powered by TCG-80N & TCR-80.
- Remote control panel is supplied for User Data & Time On/Off and Hold.
- Rear panel controls for Insert background and Character luminance level. Display position selector can be remoted.

Specifications:

Video Input: 1 Vp-p, loop thru. Video Output: 2 ea. at 1 Vp-p, source terminated, 75 Ohms.

Options

TCG-80N	TCG-70N	TCR-80		
—	001	—	User Data Input Module to input Data from an external source. Data format: 32 bits parallel.	$270.
002	—	—	Data Input Module for External "Jam" Sync. Data format: Skotel byte serial.	$135.
—	—	012	Data Output Module for External "Jam" Sync. Data format same as Option 002: Skotel byte serial.	$135.
003	—	013	Video Character Generator	$750.
006	006	016	Input power line voltage: 200-260, 50/60 Hz.	No Charge

Notes: (1) All required mating connectors are supplied, except BNC's. (2) All options may be factory installed, or installed later on a plug in basis. (3) All prices are F.O.B. Destination, and in U.S. Funds.

skotel

SKOTEL CORPORATION
1445 Provencher
Brossard, Quebec,
Canada J4W 1Z3
(514) 676-1813

Distributed by:

North: Mike Dyer (313) 478-2157

East: Jim Landy (609) 424-4660

South: Gene Sudduth (214) 785-5764

West: Dave Hill (602) 948-1075

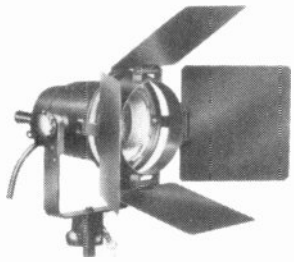
Prices and Specifications Subject to Change Without Notice.

Circle (146) on Reader Service Card

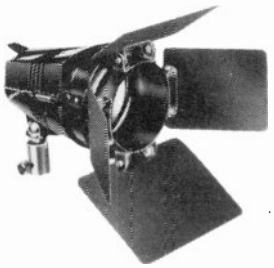
SMITH-VICTOR

Lake & Colfax Street
Griffith, Indiana 46319
312-768-1025 219-924-6136

Professional Quartz Studio Lights



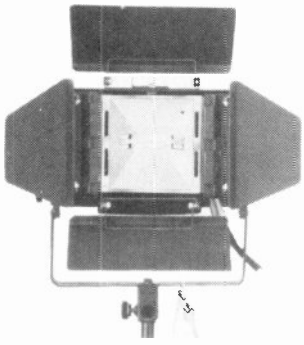
Model 710/600 Watt
PRO STUDIO LIGHT



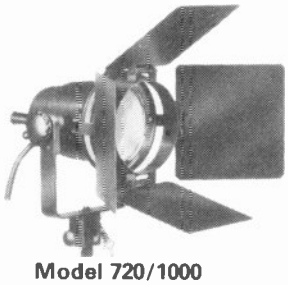
Model 700
QUARTZ LIGHT

New Smith-Victor PRO Studio Lights in the 700 Series are the result of manufacturing lighting equipment for the amateur and professional photographer. These new studio lights are made to meet the needs of the most discriminating and demanding professional photographer. They are cool, strong and lightweight. They provide high quality lighting for photography or T.V. and are ideal for Key, Fill or Back Lighting.

Stock No.	Model		
401101	**700**	**Quartz Light With DYH Lamp**	**$39.50**
620460	DYH	600 Watt Lamp, 3200°K, 120 Volt, Clear	19.45
401301	701	Barn Door for 700	27.50
401102	**710**	**Pro Studio Light, 600 Watt (foc)**	**$74.50**
620460	DYH	600 Watt Lamp, 3200°K, 120 Volt, Clear	19.45
401307	711	Barn Door for 710	24.50
401312	712	Sgl. Scrim for 710, 760 & 770	7.95
401103	**720**	**Pro Studio Light, 1000 Watt (foc)**	**$94.50**
620140	FBY	1000 Watt Lamp, 3200°K, 120 Volt, Frosted	26.75
401308	721	Barn Door for 720 Light	32.50
401316	722	Sgl. Scrim for 720 Light	10.95



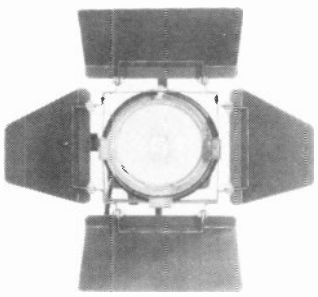
Model 740/650 Watt
PRO STUDIO LIGHT



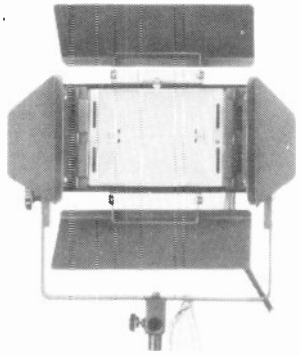
Model 720/1000
PRO STUDIO LIGHT

These new Smith-Victor PRO Studio Lights are specially designed with a new unique high efficiency reflector. They provide broad flat illumination to fill large areas, and are made to meet the needs of the most discriminating and demanding professional. Large handle placed away from housing provides for cool adjustment of light. These lights are strong, light-weight and provide high quality lighting for photography or T.V. Permanently attached Barn Doors give full light control.

Stock No.	Model		
401104	**740**	**Pro Studio Light, 650 Watt (n-foc) Fill**	**$104.95**
620050	FBX	650 Watt Lamp, 3200°K, 120 Volt, Frosted	19.00
401319	742	Sgl. Scrim for 740 Light	7.95
401105	**750**	**Pro Studio Light, 1000 Watt (n-foc) Fill**	**$109.95**
620380	FHM	1000 Watt Lamp, 3200°K, 120 Volt, Frosted	25.50
401322	752	Sgl. Scrim for 750 Light	8.50



Model 760 Quartz Fill
STUDIO LIGHT
600 WATT

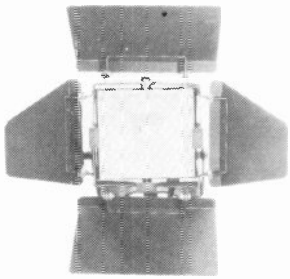


Model 750/1000
PRO STUDIO LIGHT

This new low cost quartz fill light for use with the 600 watt DYH lamp is ideal for photographic and T.V., key, fill and back lighting. It is of all aluminum construction for cool operation. Barn doors must be used to hold scrims. Safety wire included. Has 10 foot 3 wire cord with in-line switch.

Stock No.	Model		
401112	**760**	**Studio Light, 600 Watt Fill (n-foc)**	**$57.50**
620460	DYH	600 Watt Lamp, 3200°K, 120 Volt, Clear	19.45
401325	771	Barn Door for 760 & 770 Lights	27.50
401312	712	Sgl. Scrim for 760 & 770 Lights	7.95
401113	**770**	**Studio Light, 600 Watt Broad (n-foc)**	**$52.50**
620460	DYH	600 Watt Lamp, 3200°K, 120 Volt, Clear	19.45
401325	771	Barn Door for 760 & 770 Lights	27.50
401312	712	Sgl. Scrim for 760 & 770 Lights	7.95

Model SP1 1000 Watt
FRESNEL SPOTLIGHT



Model 770 QUARTZ BROAD
STUDIO LIGHT 600 WATT

SP/ A new professional lighting unit. A 6" focusing fresnel spotlight. Ideally suited for both key and fill applications, the SP1 spotlight accepts any medium bi-post lamp and features a rugged steel housing with oversized vents for maximum cooling. Swing-away rear door permits fast, easy relamping. The SP1 also features a ten foot 3 wire grounded cord for safety. Price $189.50

Stock No.	Model		
661101	**SP1**	**6" Fresnel Spotlight, 1000 Watt (foc)**	**$189.50**
621940	EGT	1000 Watt Lamp, 3200 K, 120 Volt, Clear	46.75
661103	BD6	4 Leaf Barn Door for SP1	29.95
661102	FH6	Gel Holder for SP1	7.95

Prices and specifications subject to change without notice

SMITH-VICTOR

Lake & Colfax Street
Griffith, Indiana 46319
312-768-1025 219-924-6136

ALUMINUM AND STEEL LIGHT STANDS

Sure-grip Lexan locking collars. This unique design allows for finger-tight locking and release.

STANDARD MODELS

401233 MODEL SA28
Extends to 8 feet **$39.95**

40123 MODEL SA210
Extends to 10 feet **$39.95**

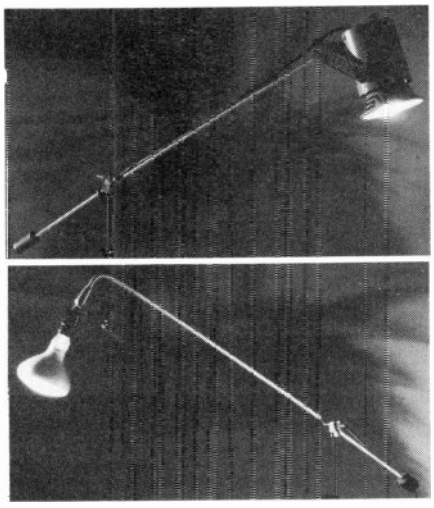
401231 MODEL SA24
Very lightweight, Flat legs **$24.95**

SUPER MODELS
Tubular legs, double braced for rigidity. Self locking nuts and leg braces are adjustable for wear. 3 popular models.

401232 MODEL SA8
Extends to 8 feet, folds to 24¾". Weighs 2 lbs., 2 oz. **$56.95**

401235 MODEL SA10
Extends to 10 feet, folds to 27½". Weighs 2 lbs., 7 oz. **$59.95**

401234 MODEL SA48
Extends to 8 feet, folds to 27½". Has 5/8" stud. Weighs 2 lbs., 5 oz. **$54.95**



STEEL STANDS
401250 MODEL BR10

A new heavy-duty roller base studio light stand is now available from Smith-Victor. Specifically designed for studio usage, the BR10 features a 10 foot 5/8" mount steel upright which mounts on a steel base. Four square steel tubing legs with casters, two of which lock, allow for unlimited mobility in the studio, yet may be locked into position to prevent unwanted movement. Suggested list price on the BR10 is **$125.00**

LIGHTBOOMS
401224 MODEL BP4 LIGHT BOOM

This chrome plated light boom is 51 inches long and has a 2-pound counterweight. Fits any stand with 3/8" stud **$39.95**

ALL PURPOSE STANDS

401228 MODEL S2
Extends to 6½ feet with leg spread of 26 inches. Folds to 42 inches and weighs only 3 lbs., 2 oz. 3/8 inch stud **$14.95**

401229 MODEL S3
Extends to 8 feet with leg spread of 33 inches. Folds to 36 inches and weighs only 5 lbs., 11 oz. 3/8 inch stud **$21.95**

401230 MODEL S4
(Similar to MODEL S3) Extends to 10½ feet with leg spread of 33½ inches and weighs only 7 lbs. **$26.95**

401237 MODEL S5
Similar to the S3, but with a 5/8" top upright section for use with professional type 5/8" mount equipment.
. . . . . **$24.50**

401238 MODEL S6
Compact section stand. Extends to 6½ feet. Disassembled, 15 inches **$19.95**

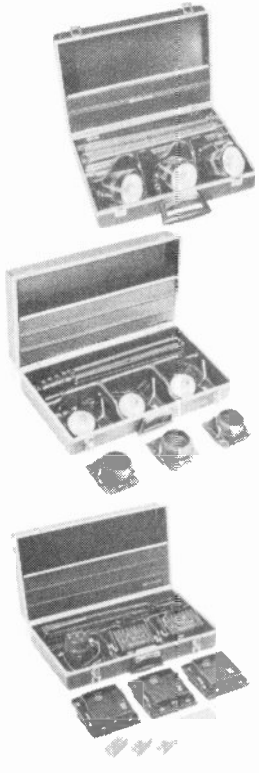
401239 MODEL S7
With portability in mind Smith-Victor presents this new ultra compact 3/8" moun steel stand. This full featured stand opens from a collapsed length of a mere 22" to over 6 feet. **$19.95**

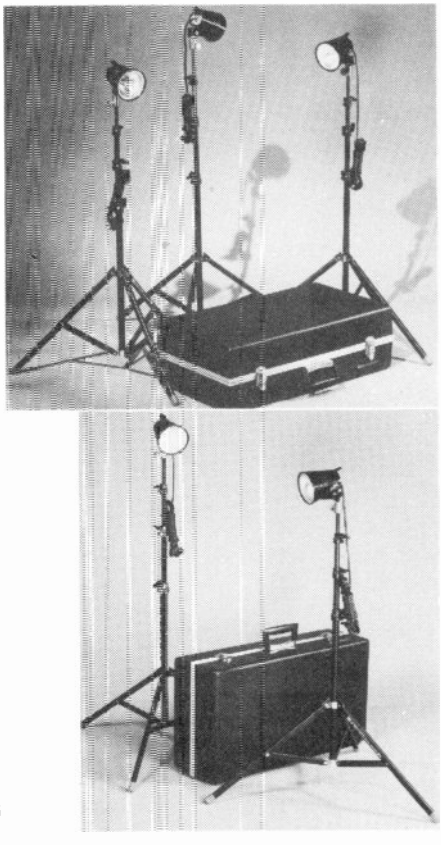
SMITH-VICTOR STUDIO KITS

401401 MODEL K2
(without barn doors)
This kit consists of 3 600 watt 700 DYH 3200° K Quartz Lights, 3 S6 6½ ft. multi-purpose steel stands, 1 512 adapter for background stand and 1 634L Case that holds extension cords, spare lamps and barn doors. Barn Doors are available as an accessory.
$199.50

401420 MODEL K33
(with barn doors)
This kit consists of 3 600 watt 700 DYH 3200°K Quartz Lights, 3 SA28 8 ft. black aluminum stands, 3 701 barn doors, and a 650 case that has room for lights, stands, extension cords, spare lamps and barn doors. **$375.00**

401417 MODEL K50
This kit has a total of 1,800 watts. Contains 1 760 fill light, 2 770 broad lights, 3 771 barn doors, 3 SA28 8 ft. black aluminum stands, 2 712 scrims, 3 DYH lamps and a 650 carrying case. . . . **$475.00**





K22 — Smith-Victor's new portable studio kit.

This kit features:
- 2 - 600 watt 700 Quartz lights, utilizing the
- 3200° K rated 75hr. DYH lamps.
- 2 - S7 6½' steel light stands, and 1 handy Smith-Victor 650 carrying case **$199.50**

K23 — The Smith-Victor K23 kit

Features:
- 3 - 600 watt 700 Quartz lights
- 3 - DYH lamps, 3200° K 75hr. life.
- 3 - S7 steel stands
- 1 - 650 carrying case . **$259.50**

Prices and Specifications Subject to Change Without Notice.

SMITH-VICTOR

Lake & Colfax Street
Griffith, Indiana 46319
312-768-1025 219-924-6136

K71 PRO FOCUSING QUARTZ STUDIO KIT

The K71 is a deluxe professional kit that consists of 3 lights with a total of 1800 watts, 3 10-foot black stands, 2 barn doors, 2 scrims and a convenient carrying case.

These lights provide high quality lighting for photography or T.V. and are ideal for Key, Fill or Punch Lighting.

The 3 710 HI-FI Quartz Lights, each with a 600 Watt DYH Lamp are rated at 3200° K, 75 hour life. Cable is 10 ft., 3 wire.

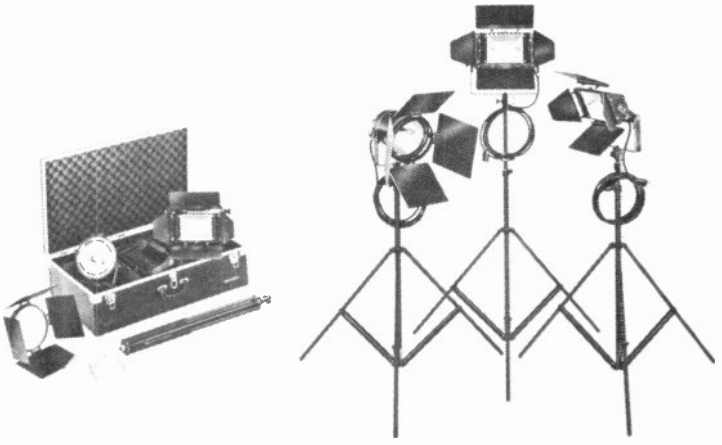
There are 3 SA10 aluminum stands that fold to 27½ inches and extend to 10 feet. Extensions are locked in, cannot be accidentally pulled apart. Extension thumb screws are locked in, cannot be dropped or lost. Entire stand is black to prevent reflections.

The entire unit is packed in a Model 671 case that has room for lights, stands and barn doors, plus extension cords, spare lamps.

KIT — 29" x 16" x 7" — Weight 34 lbs.

Stock # 401406 ..... **$625.00**

K74 PRO QUARTZ STUDIO KIT



The K74 deluxe kit is for the professional Cine and T.V. photographer and consists of 3 lights with a total of 3,000 watts, 3 8-foot black aluminum stands, 1 barn door, 2 scrims and a convenient carrying case.

There is a focusing 720 HI-FI Studio Light for Key Light with a FBY 1,000 watt lamp and 2 750 HI-FI Studio Lights, each with a FHM 1,000 watt lamp. The 750 lights provide broad flat illumination for Fill Light.

Permanently attached barn doors give full light control.

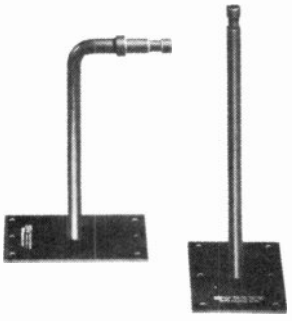
There are 3 SA48 black aluminum stands that fold to 27½ inches and extend to 8 ft. Extensions are locked in, cannot be accidentally pulled apart. Extension screws are locked in, cannot be dropped or lost.

The entire unit is packed in a Model 674 case that has room for lights, stands, barn door and scrims plus extension cords and spare lamps.

KIT — 29" x 18" x 8" — Weight 40 lbs.

Stock # 401409 ..... **$725.00**

Accessories



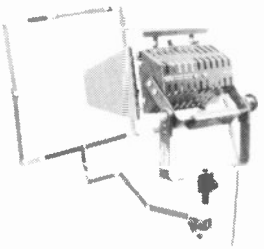
MOUNTS — These Smith-Victor light mounts are ideal for the professional photographer, movie studio or TV studio. Base plates are 4" x 6" steel with eight ¼" holes for easy mounting on wall or ceiling. Cold rolled steel studs are 5/8" in diameter and are available in 3", 6", 9" and 12" long. All mounts are painted matte black.

401217 MODEL MP1 ..... $10.95
Base Plate .. 4" x 6" eight ¼" holes
stud ..... 5/8" diameter, 3" long

401218 MODEL MP2 ..... $10.95
Base Plate .. 4" x 6" eight ¼" holes
Stud ..... 5/8" diameter, 6" long

401219 MODEL MP3 ..... $11.95
Base Plate .. 4" x 6" eight ¼" holes
Stud ..... 5/8" diameter, 12" long

401220 MODEL MP4 ..... $12.95
Base Plate .. 4" x 6" eight ¼" holes
Stud ..... 5/8" diameter, 9" long
Offset 3½"



401216 MODEL C7 CLAMP $18.95
Steel Clamp fits 1" to 2" O.D. pipe
Stud ..... 4" long
Adjusting Screw. 4" long with hex head

661201 MODEL C3 3/8" GAFFER GRIP $16.50

661202 MODEL C5 5/8" GAFFER GRIP $16.50

401346 MODEL FH1 FILTER & DIFFUSER HOLDER
Fits any light mounted on stand up to 12" diameter. **$27.50**

FILTER DIFFUSING AND EFFECT KITS FOR FILTER HOLDER
650009 12" For 10" & 12" Reflector Units Daylight correction $10.95
650010 12" Color Effect Pak . $10.95
650011 12" Diffusion Pak ... $10.95

Prices and Specifications Subject to Change Without Notice.

Circle (149) on Reader Service Card

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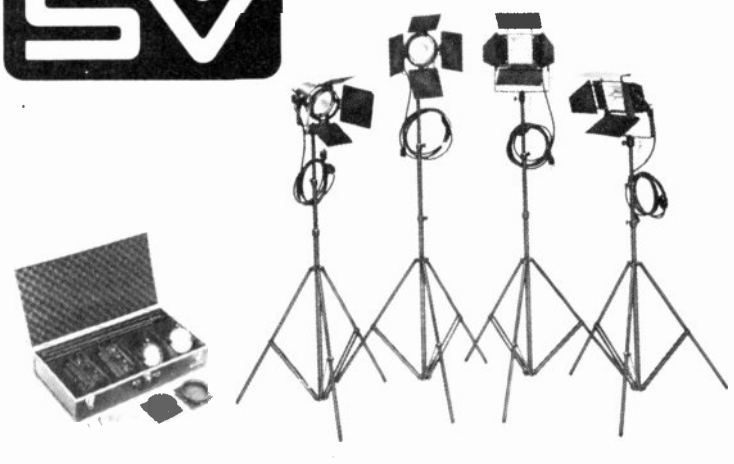


K75 PRO QUARTZ STUDIO KIT

The K75 is a deluxe kit that consists of 4 lights with a total of 2,500 watts, 48-foot black stands, 2 barn doors, 4 scrims and a convenient carrying case.

These lights provide excellent lighting for both studio or location use in photography or video, in color or black and white. Ideal for Key, Fill or Punch Lighting.

There are two 710 HI-FI Lights for accent lighting, each with a DYH 600 watt lamp, and two 740 HI-FI Lights for fill lighting, each with a FBX 650 watt lamp. A spare DYH and FBX lamp is included in kit. Cable is 10 ft., 3 wire.

There are 4 black aluminum stands that extend to 8 ft. and fold to 27½ inches. Extensions are locked in, cannot be accidentally pulled apart. Extension screws are locked in, cannot be dropped or lost.

The entire unit is packed in a Model 671 case that has room for lights, stands and barn doors plus extension cords and spare lamps.

For foreign location work, 240 volt lamps are available.

KIT — 29" x 16" x 7" — Weight 49 lbs.

Stock No. 401421 Complete Outfit No. K75 ..... **$850.00**

K76 PRO QUARTZ STUDIO KIT

The K76 is a deluxe kit that consists of 4 lights with a total of 4,000 watts, 48-foot black stands, 2 barn doors, 4 scrims and a convenient carrying case.

These lights provide high quality lighting for photography or T.V. in color or black and white and are ideal for Key, Fill or Punch Lighting.

There are two 720 HI-FI Lights for accent lighting, each with a FBY 1,000 watt lamp, and two 750 HI-FI Lights for fill lighting, each with a FHM 1,000 watt lamp. A spare FBY and FHM lamp is included in kit. Cable is 10 ft., 3 wire.

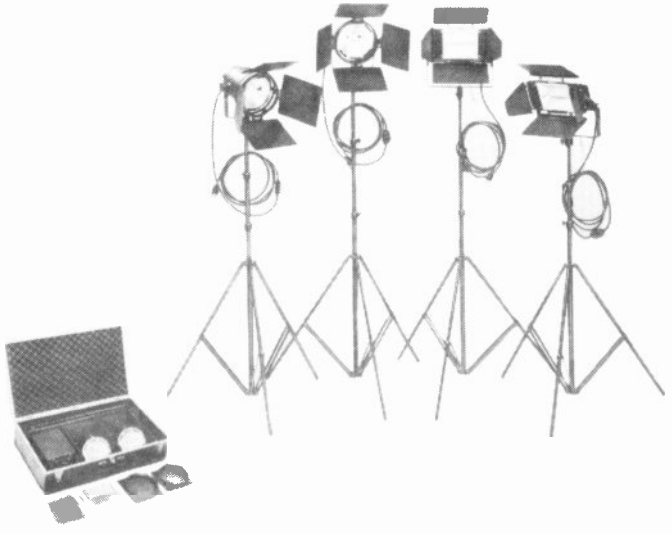
There are 4 black aluminum stands that extend to 8 ft. and fold to 27½ inches. Extensions are locked in, cannot be accidentally pulled apart. Extension screws are locked in, cannot be dropped or lost.

The entire unit is packed in a Model 674 case that has room for lights, stands and barn doors plus extension cords and spare lamps.

For foreign location work, 240 volt lamps are available.

KIT — 29" x 18" x 8" — Weight 50 lbs.

Stock No. 401422 Complete Outfit No..K76 ..... **$995.00**



K72 QUARTZ STUDIO KIT

The K72 is a deluxe professional kit that consists of 3 lights with a total of 1900 watts, 3 8-foot black stands, 1 barn door, 2 scrims and a convenient carrying case.

These lights provide high quality lighting for photography or T.V. and are ideal for Key, Fill or Back Lighting and provide a broader beam than the K71 Kit.

There is a 710 Pro Studio Light with a DYH 600 watt lamp and 2 740 Pro Studio Lights, each with a FBX 650 watt lamp. Cable is 10 ft., 3 wire.

Kit contains 3 SA48 aluminum stands that fold to 27½ inches and extend to 8 feet. Extensions are locked in, cannot be accidentally pulled apart. Extension thumb screws are locked in, cannot be dropped or lost. Entire stand is black to prevent reflections.

The entire unit is packed in a Model 671 case that has room for lights, stands and barn door plus extension cords and spare lamps.

KIT — 29" x 16" x 7" — Weight 32 lbs.

Stock No.
401407 Complete Outfit No. K72 ..... **$650.00**

Prices and Specifications Subject to Change Without Notice.

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RE-USE VIDEOCASSETTES WITH NO LOSS OF QUALITY!

Here's the electronic videocassette eraser for professional and home use. Erases 100 times better than the recorder's internal erase mechanism.

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Erases videocassettes clean . . . in seconds.
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Powerful-magnetic flux of 1400 gauss at ¼ inch.
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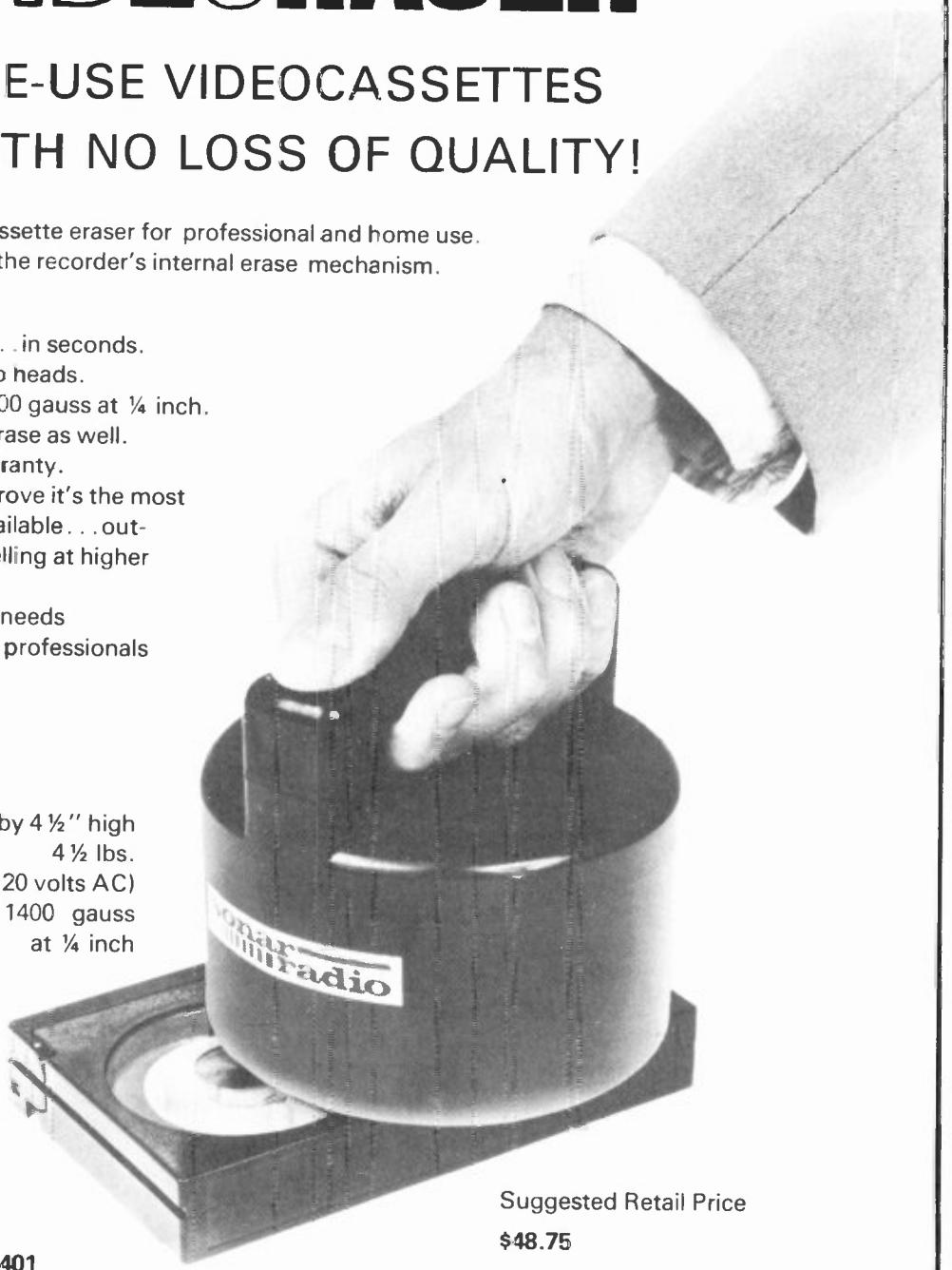
SPECIFICATIONS

Size	4¾" by 4½" high
Weight:	4½ lbs.
Power:	1200 watts (110-120 volts AC)
Magnetic Flux:	Open field 1400 gauss at ¼ inch



Suggested Retail Price
$48.75

Model VX – 1401

represented nationally by:

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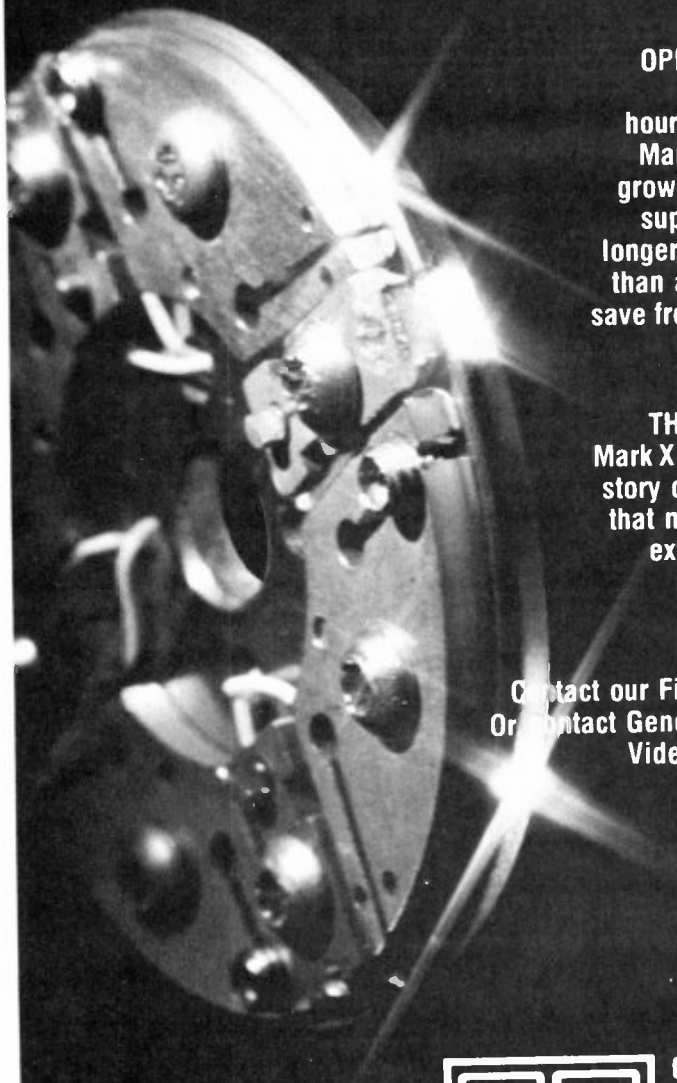
Prices and Specifications Subject to Change Without Notice.

Circle (151) on Reader Service Card

B-151

QUAD PANEL REFURBISHING SERVICE

Spin Physics will show you how and why our hot-pressed ferrite quad video heads with the 1000 hour warranty are your best buy.



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THE NON-PRORATED 1000 HOUR WARRANTY for each Mark X, Mark XV or RCA High Band quad panel spells out the story of savings. The compatible broadcast quality picture that maintains its crisp clarity throughout its dramatically extended life demonstrates superior performance. The combination illustrates Spin Physics' commitment to better service for the broadcast industry.

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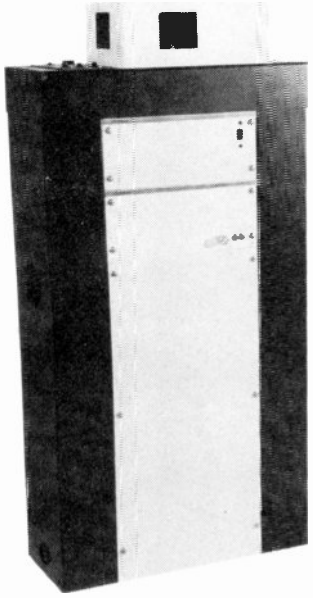
(801) 972-8000, Telex 388-352

Multiplexers

TMM-205



The TMM-205 can accommodate 8mm, 16mm, and 35mm film projectors and 35mm slide projectors for operation with a color or monochrome camera. Input selection is via motor-driven first-surface mirrors, providing a rapid optical wipe between sources.

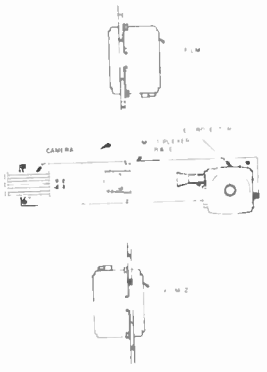
TMM-205 ..... **$995.00**
Remote Control **350.00**

Features

- Three Inputs — One Output
- Broadcast-Proven Quality
- Priced Below Competitive Units
- Transitions between Sources Exceed Broadcast Standards
- Accepts Wide Range of Cameras and Projectors

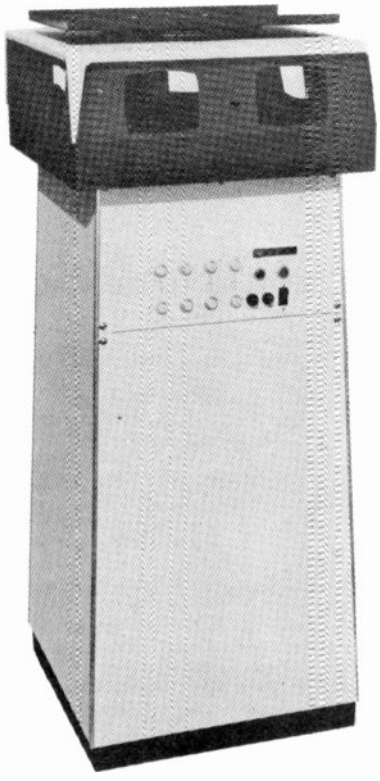
TMM-205
MULTIPLEXER

TYPICAL LAYOUT



TMM-211 ..... **$4195.00**

TMM-211



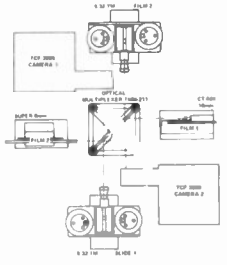
Features

- Four Projector Inputs — Two Camera Outputs
- All Optics Factory Aligned — No Field Adjustments Necessary
- 3" x 4" Image Format
- Flat Spectral Response Insures Optimum Color Operation
- All Optics Mounted on Single Rugged Casting
- Compatible with All Color Camera Chains
- Simultaneous use of Two Color Cameras Possible
- Time-Tested Mirror Mechanism — Smooth Operation without Use of Clutches
- Full Remote Control Operation
- Rotating Monitor Shelf

TMM-211
OPTICAL MULTIPLEXER

TYPICAL LAYOUT

Four projector inputs
Two camera outputs



The AK-211 Alignment Kit is available as an accesory to allow considerable time saving in multiplexer system setup and alignment. The Kit includes a "Projecticon," a projection light source that is placed in the camera in place of the green tube, and two precision targets that are placed on the transfer assembly.

Prices and Specifications Subject to Change Without Notice.

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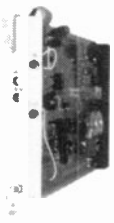
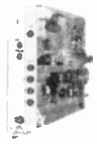
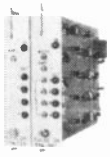
"525" Series Modular Video/Pulse/Audio Distribution Amplifiers, Sync Generators and Terminal Equipment



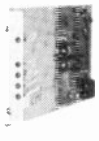
TVA-528



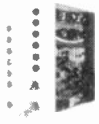
TVA-525



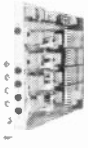
TPA-525/527



TPA-524



TBB-525

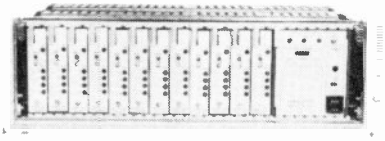


TSA-525

TVS/TAS-525

TMA-525

TAA-524/525



RF-525

"525" Series NTSC Sync Generator Systems

TSG-175 Sync Generator System installed in RF-175 Rack Frame, includes one TSG-525 Sync Generator. Space is provided for optional installation of GL-525 and BD-525 ..... **$820.00**

TSG-175GL Sync Generator/Genlock System, installed in RF-175 Rack Frame, includes one TSG-525 Sync Generator and one GL-525 Genlock Accessory. Space is provided for optional installation of BD-525 ..... **$1360.00**

TSG-176 Dual Sync Generator System, installed in RF-175 Rack Frame, includes two TSG-525 Sync Generators and one CO-525 Sync Changeover Module **$1675.00**

Connecting Panels for "525" Sync Generator Systems

IP-1 Connecting Panel and Card Connector for mounting TSG-525 in RF-175 or RF-525 Rack Frames. Required only where TSG-525 is to be used without GL, CO, or BD accessories. **$65.00**

IP-2 Connecting Panel and Motherboard for mounting TSG-525 and GL-525. Occupies two frame spaces. **$120.00**

IP-3 Connecting Panel and Motherboard for mounting TSG-525, GL-525, and BD-525 in RF-525 Rack Frame. Occupies three frame spaces **$150.00**

IP-6 Connecting Panel and Motherboard for mounting one CO-525, two TSG-525's, two GL-525's and one BD-525 in RF-525 Rack Frame. Occupies six frame spaces. . **$225.00**

"525" SERIES EQUIPMENT

TSG-525 Sync Generator, select appropriate connecting panel among IP-1, IP-2, IP-3, or IP-6 ..... **$565.00**

GL-525 Genlock Accessory, select IP-2, IP-3 or IP-6 ..... **$565.00**

CO-525 Sync Changeover Accessory, requires IP-6 ..... **$565.00**

BD-525 Bar Dot Accessory, to be used with IP-3 or IP-6 Connecting Panel configurations **$340.00**

TBB-525 Blackburst Generator **$640.00**

TVA-524 Broadcast Video Distribution Amplifier **$255.00**

TVA-528 Broadcast Precision Video Distribution Amplifier, 6 Outputs **$335.00**

TVA-525D Precision Video Distribution Amplifier with DL-525 Delay Plug-in Accessory **$630.00**

TVA-525E Precision Video Distribution Amplifier with EQ-525 Equalizer Plug-in Accessory **$430.00**

TVA-525DE Precision Video Distribution Amplifier with both DL-525 and EQ-525 Plug-in Accessories **$705.00**

TPA-524 Broadcast Pulse Distribution Amplifier **$225.00**

TPA-525 Precision Pulse Distribution Amplifier **$280.00**

TPA-527 Precision Pulse Distribution Amplifier, with individual delay **$330.00**

TSA-525 Subcarrier Distribution Amplifier, with individual 370-degree phase adjustments **$415.00**

ACCESSORIES

DL-525 Delay Plug-in for TVA-528 .. **$285.00**

EQ-525 Equalizer Plug-in for TVA-528 ..... **$55.00**

TAA-524 Audio Distribution Amplifier **$280.00**

TAA-525 Audio Distribution Amplifier, transformer outputs **$385.00**

TMA-525 Audio Monitor Amplifier, 15 watt **$330.00**

TVS-525 5 x 1 Video Switcher Module **$430.00**

TAS-525 5 x 1 Audio Switcher Module **$430.00**

ACCESSORIES FOR SWITCHER MODULES

RC-5 5-pushbutton Remote Control Panel, mounts in RP-203 ..... **$100.00**

CC-5/25 Connecting Cable, 5 ft. **$55.00**

CC-5/50 Connecting Cable, 50 ft. ... **$85.00**

RACK FRAMES AND POWER SUPPLIES

A PS-525 must be ordered w/each RF-525. The RF-175 comes with a power supply installed.

RF-525 5-¼-in. Rack Frame for PS-525 and up to twelve 1-in. modules **$185.00**

PS-525 Power Supply, uninstalled .. **$240.00**

PS-525RK Power Supply Redundancy Kit, uninstalled, to be used with PS-525 ..... **$80.00**

RF-175 1-¾-in. Rack Frame and Power Supply **$250.00**

EX-526 Module Extender **$100.00**

RP-203 Rack Panel for Remote Control Modules, accommodates up to three modules **$45.00**

BP-203 Blank Panel for RP-203 .... **$20.00**

Prices and Specifications Subject to Change Without Notice.

TeleMation
A Division of Bell & Howell

P.O. Box 15068, Salt Lake City, Utah 84115
(801) 972-8000, Telex: 388-352

TVS/TAS-1000 Video/Audio Distribution Switching Systems

TVS/TAS-1000 Matrix Configurations

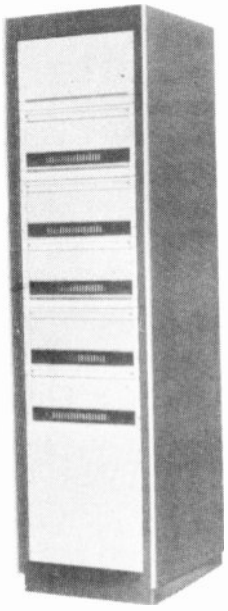
The TVS/TAS-1000 is offered in two standard configurations —type CAV and type MSO. It is also available under special order in numerous alternative configurations. The type CAV offers the most economical packaging while being limited to a maximum of 40 inputs, whereas the type MSO is more costly in a given configuration but permits expansion to matrix sizes of 100 x 100 and beyond.

Type MSO—Multiple Chassis with Single Output Card In Each Chassis

Type MSO switchers are supplied with one card frame for each video output decade and a separate card frame for each audio output decade. They are available on initial order or for field expansion with matrices of up to 100 x 100.

Type CAV Combined Audio and Video

In the CAV design, audio and video switchers are combined in a single 8¾-in. card frame. Type CAV, limited to 40 inputs can be ordered with or expanded to 100 outputs.



40 x 50
AFV Switcher

FEATURES

- Compact — Up to 1000 Crosspoints per 8¾-inch Chassis
- Solid-State Crosspoints with Vertical Interval Switching
- Single-Coax "Party-Line" Control
- Wide Selection of Bus Controls and Status Monitors
- Plug-In Conversion to Phone Line or Computer Control
- Excellent Long- and Near-Term Transfer Characteristics
- Automatic Restoration After Power Failure, with Refresh Memory Option
- Dual Video Outputs
- Standard, Multiple-Sourced Components — No Custom Hybrids
- Automatic System Testing of All Circuit Parameters Through All Possible Signal Paths — Hard Copy Results Supplied

MATRIX MSO SERIES OPTIONS

Audio Source Terminating Resistors, factory installed, specify value. Price shown is price per audio output decade **35.00**

Dual Audio Outputs, with source terminating or isolating resistors, factory installed. Specify value. Price shown is price per audio output decade **$130.00**

CP-1001

CP-1002

ACCESSORIES

EX-876 Module Extender, for servicing circuit cards or power supply **$145.00**

BX-1001 Output Bus Extender for CAV Series, permits in-service maintenance of crosspoint and output cards, requires EX-876 . . **110.00**

PS-1000A Spare Power Supply **$595.00**

PS-1000RK Power Supply Redundancy Kit **$80.00**

TVU-175 Ventilation Unit, 117V **$210.00**

TVU-176 Ventilation Unit for 234 V **$210.00**

DIGITAL CONTROL PANELS

CP-1001 Switcher Control and Status Monitor, deskmount, requires RM-1001 for status monitor function **$1050.00**

CP-1002 Switcher Control and Status Monitor, rackmount, requires RM-1001 for status monitor function **$1050.00**

CP-1006 Six-bus Switcher Control Panel **$1470.00**

RM-1001 Refresh Memory, required for status monitoring function of CP-1001/1002 . . . . . **$750.00**

BCD CONTROL PANELS

NOTE: BCD Control Panel interface to switching matrix is via CM-1020 Control Multiplexer. All require CC-1010 cable.

CP-1004/1 Lever Switch Remote Control Panel, rackmount, requires CC-1010 Cable **$120.00**

CP-1004/2 Dual Lever Switch Remote Control Panel, rackmount, requires two CC-1010 Cables . **$250.00**

CP-1011 Category number control panel with Take button **$485.00**

CP-1010 Category number control panel **$480.00**

CP-1020 20 push-button control panel **$480.00**

CP-1004/3 Triple Lever Switch Remote Control Panel, rackmount, requires three CC-1010 Cables **$340.00**

CP-1005 Deskmount Lever Switch Remote Control, requires CC-1010 . . . . . **$200.00**

CM-1020 Control Multiplexer, for up to 6 buses **$685.00**

CS-1004/1 Lever Switch Remote Control Panel with Bus Status Monitor, requires CC-1010 Cable **$385.00**

CS-1004/2 Dual Lever Switch Remote Control Panel with Dual Bus Status Monitor, requires two CC-1010 Cables **$680.00**

STATUS MONITORS

NOTE: All require RM-1001 in system

SM-1000 Full Matrix CRT Status Display Generator **1895.00**

SM-1004/1 Single-Bus Status Monitor **$370.00**

SM-1004/2 Dual-Bus Status Monitor **$630.00**

SM-1004/3 Triple-Bus Status Monitor **$895.00**

COMPUTER AND DATAPHONE CONTROL ACCESSORIES

CI-1030 DIA RS-232 Interface **$675.00**

CI-1060 EIA RS-232 Party Line/Status Interface subject to factory programming charge **$1495.00**

CONNECTING CABLE

CC-1010/25 Connecting Cable, 25 ft. **$65.00**

CC-1010/50 Connecting Cable, 50 ft. **$80.00**

CC-1010/100 Connecting Cable, 100 ft. **$115.00**

CC-1010/200 Connecting Cable, 200 ft. **$180.00**

CC-1010/XX Connecting cable . . . . . **$50.00 + .65/ft.**

CARD FRAME/RACK SPACE REQUIREMENTS

(A) **Type CAV** Single 8¾-in. card frame for both audio and video

(B) **TVU-175** Ventilation Unit — One 1¾-in. exhaust blower is provided for each two 8¾-in. card frames

12-Input Passive Switchers

TVS-12X1T 12 x 1 Terminating Switcher **$205.00**

MATRIX SIZE	VIDEO ONLY	AUDIO ONLY	COMBINED
INPUT OUTPUT	LIST	LIST	LIST
10 X 10	$ 4,360.	$ 3,940.	$ 6,250.
20 X 10	6,040.	5,410.	9,400.
30 X 10	7,720.	6,880.	12,550.
40 X 10	9,400.	8,350.	15,700.
10 X 20	$ 9,820.	$ 7,930.	$12,550.
20 X 20	13,180.	10,870.	18,850.
30 X 20	16,540.	13,810.	25,150.
40 X 20	19,900.	16,750.	31,450.
10 X 30	$15,280.	$11,920.	$18,850.
20 X 30	20,320.	16,330.	28,300.
30 X 30	25,360.	20,740.	37,750.
40 X 30	30,400.	25,150.	47,200.
10 X 40	$20,740.	$15,910.	$25,150.
20 X 40	27,460.	21,790.	37,750.
30 X 40	34,180.	27,670.	50,350.
40 X 40	40,900.	33,550.	62,950.
10 X 50	$26,200.	$19,900.	$31,450.
20 X 50	34,600.	27,250.	47,200.
30 X 50	43,000.	34,600.	62,950.
40 X 50	51,400.	41,950.	78,700.

TVS/TAS-1000
VIDEO/AUDIO DISTRIBUTION SWITCHING SYSTEMS
(CODE N)

MATRIX – CAV SERIES

NOTE: For switcher pricing with matrix larger than 40 x 50, the following per decade expansion pricing applies; maximum expansion is 40 x 100. Pricing for larger matrices adder for each additional 10 outputs beyond 50.

	VIDEO ONLY	AUDIO ONLY	COMBINED
	LIST	LIST	LIST
10 Inputs	$ 5,460.	$ 3,990.	$ 6,300.
20 Inputs	7,140.	5,460.	9,450.
30 Inputs	8,820.	6,930.	12,600.
40 Inputs	10,500.	8,400.	15,750.
Examples:			
10 X 80	(3x) 5,460.	(3x) 3,990.	(3x) 6,300.
20 X 80	(3x) 7,140.	(3x) 5,460.	(3x) 9,450.
30 X 80	(3x) 8,820.	(3x) 6,930.	(3x) 12,600.
40 X 80	(3x) 10,500.	(3x) 8,400.	(3x) 15,750.

Prices and Specifications Subject to Change Without Notice.

TENTELOMETER® —

THE USER PROVEN TAPE TENSION GAGE FOR DIAGNOSING PROBLEMS IN YOUR TAPE TRANSPORT

TENTEL'S HAND HELD TAPE TENSION GAGE (the TENTELOMETER) IS THE STANDARD OF THE INDUSTRY*

SOME OF THE BENEFITS ARE:

- Helps set proper tension on recorders and players for assured tape interchangeability.
- Diagnose tension problems affecting horizontal stability.
- Measure tension to maintain video within time base corrector window of correction.
- Non-technical operator can detect machine versus tape problems so that service by an authorized repair station can be scheduled.
- Detect Audio Signal Distortion, Wow, and flutter.

The T2-H20-ML TENTELOMETER shown diagnosing an Audio wow and flutter problem.

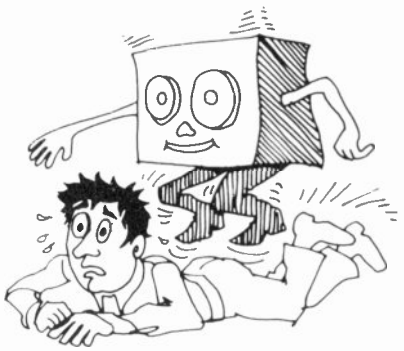
The T2-H15-UM TENTELOMETER shown measuring the critical supply tension on a SONY 2850. This tension determines the Horizontal stability of the video signal.

The entire 2850 can be set up using only the TENTELOMETER and a reel of tape. This alone will save many hundreds of dollars on special fixtures and allow preventive maintenance without disassembly of the machine.

APPLICATION	MODEL	PRICE
• ¼", ½", ¾"U, 1" Video	T2-H15-UM	$195.00
• 2" Quad	T2-H20-2	385.00
• ¼", ½", 1", 2" Audio	T2-H20-ML	195.00

* In use by and approved by virtually every foreign and domestic manufacturer of recording equipment.

Send for your FREE 8 page TENTELOMETER Instruction and application manual or call today.



TENTEL
50 Curtner Avenue
Campbell, California 95008
(408) 377-6588

CALL OR MAIL YOUR ORDER IN TODAY BEFORE THE TAPE "GREMLINS" SHUT YOU DOWN.

Circle (157) on Reader Service Card

Prices and Specifications Subject to Change Without Notice.

B-157

TROMPETER ELECTRONICS INC.

8936 Comanche Avenue
(213) 882-1020

Chatsworth, California 91311
TWX: 910 — 494-1210

INTRODUCTION

Trompeter Electronics designs and manufactures a wide variety of Video and Audio patch panels, patch cards, connectors, looping plugs, plugs and cable assemblies in Coax, Twinax and Triax. The coax series can be furnished in either 50 or 75 ohm. The entire line can be furnished in Western Electric miniature and miniature coax, twinax and triax.

PATCH JACK
(Normal thru)
J14W .090 pin (W.E.)

The J14 series is a dual coax jack the purpose of which is to automatically provide a "normal thru" signal path without the use of looping plugs or patch cords. The normalling switch contacts utilize a unique self-wiping action for positive contact.

Standard, terminated and monitor types. M is monitor, T is terminated. Jacks are normally furnished with BNC (UG1094 type) connectors.

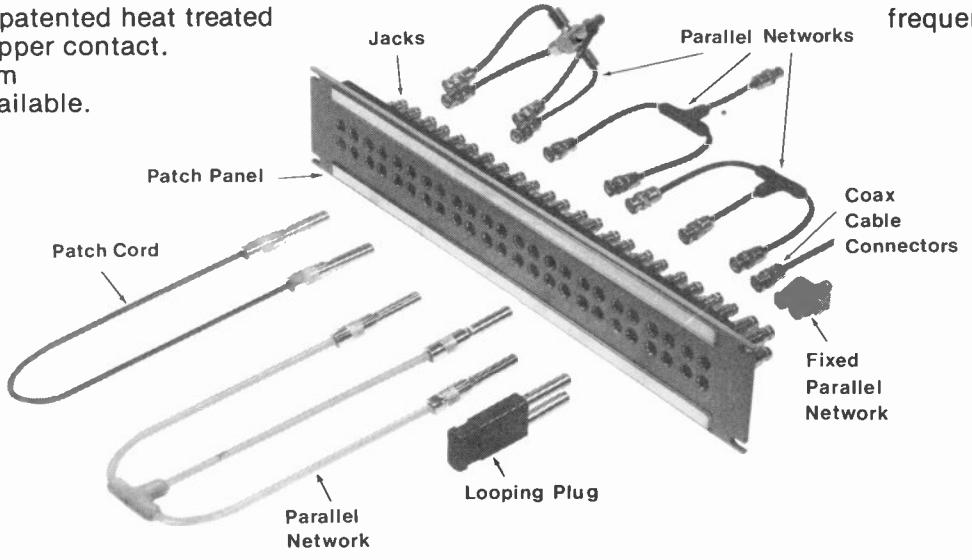
Signal degradation occurs when used at frequencies above 30 MHz.

BNC PLUG
PL20-N

This series is a fast 3-piece quick disconnect assembly accommodating 8218, 21-597, 8281 and other 75 ohm cables. The series is a propriatary Wrench Crimp design providing an all new coax cable attachment method. It can be assembled without the use of special tools.

It features a patented heat treated beryllium copper contact.

A true 75 ohm version is available.



PATCH JACK (Self-terminating)
J13W-R .90 pin (WE)

Rear mates with any BNC plug.

Circuit is terminated when patch plug is removed.

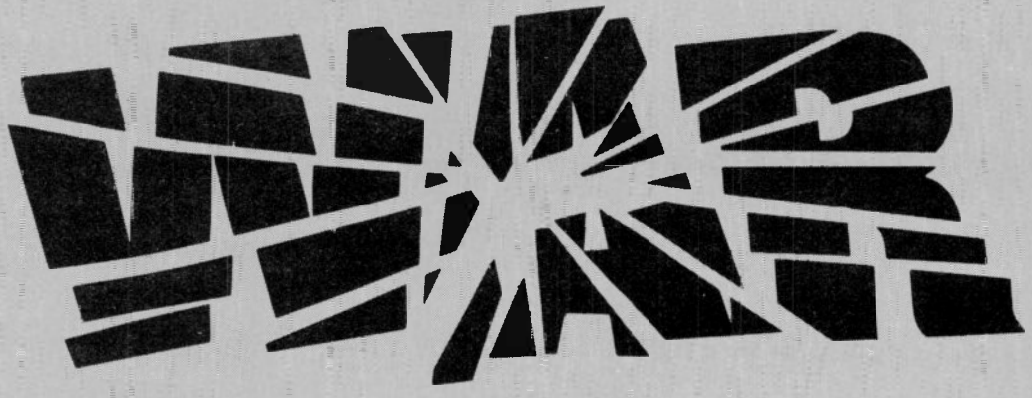
BNC-TNC TOOL RT1L (12") RT1S (6")

These tools greatly facilitate the installation of mating plugs to bulkhead or panel mounted jacks in high density areas.

SEND FOR YOUR FREE COMPLETE CATALOG

Circle (158) on Reader Service Card

From a cat's meow, to a lion's roarrrr. From a pistol shot, to a world



SOUND EFFECTS LIBRARY

The finest in Recorded Sound Effects, in one compact, versatile, easy-to-use collection of 21 Long Playing 33 1/3 RPM Discs. Major Records pioneered in the sound effects field and offers the greatest experience in selecting and recording sounds. In this series, Major Records now makes sound effects as easy to use as playing an LP record.

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- RECORDED THE WAY YOUR EAR HEARS IT
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THOMAS J. VALENTINO INC.
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Circle (159) on Reader Service Card

WRITE FOR FREE 48 PAGE CATALOG, TODAY.

VAMCO
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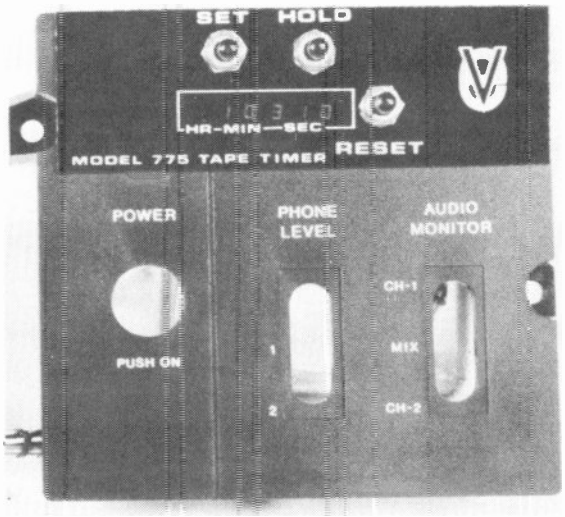
11104 E. 56TH ST. • TULSA, OKLAHOMA 74145
918/252-5448

VAMCO ENGINEERING
A DYTEK COMPANY

model 775



VIDEO CASSETTE TAPE TIMER is an electronic digital timer designed to mount into the helical-type tape machines as a replacement to the original mechanical counter. The Model 775 no only gives accurate time in all modes of operation, but can be preset with a "fast-advance" switch for editing sessions where several cartridges are involved, without the need to rewind each one. The Model 775 consists of two p.c. boards. One contains all electronics except display, and mounts into the machine. The display board consists of pushbutton controls and mounts directly behind the panel in place of the original counter.

Easy to install with 10 electrical connections to the tape machine internally (without modification) and powered by the machine itself. The kit comes complete with all parts and instructions.

SPECIFICATIONS

Installation: Installs in the field where old counter is removed on most video cassette machines. Installation time is 60 minutes, typical.

Note: Some machines may require optional control track adapter.

Controls: HOLD: "Freezes" display while timer continues operating. Display returns to real time when button is released.

Reset: Resets timer to zero count.

Set: "Fast advances" timer for finding tape locations without having to rewind cassettes everytime.

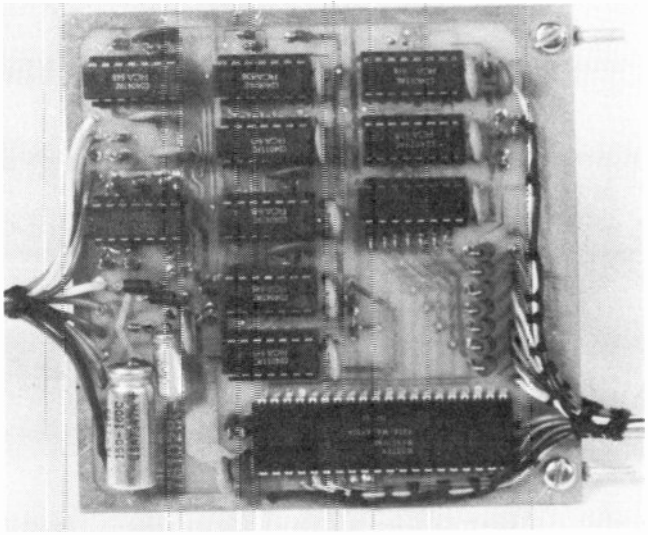
Display: Bright "calculator-type" display.

Maximum Time Displayed: 9 hours, 59 minutes, 59.9 seconds.

Accuracy: Utilizes control track for all timing except for 60Hz reference in record.

Power: 12 volts, D.C., 100 ma., typical. 5 or 6.5 volts, D.C., 28 ma., typical; derived from tape machine.

Note: Specify machine type when ordering.



model 749 & 749r

IVC TAPE TIMER is provided for quick installation on the IVC 800 and 900 series tape machines. This timer provides a resolution factor of 60:1 (to 1/10 second) over the original mechanical timer (6 seconds). This enhances program content timing and greater editing accuracy. The Model 749r is an optional rack-mounted display that will house up to two timers. For custom installations requiring additional timers specify number of timers per rack frame.

Prices and Specifications Subject to Change Without Notice.

Circle (160) on Reader Service Card

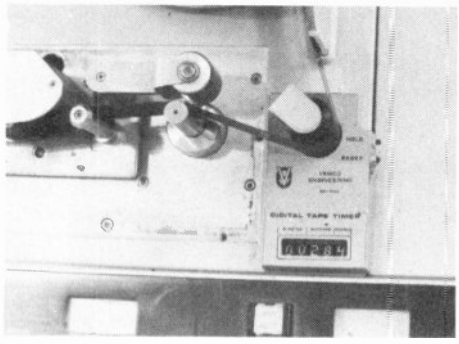
VAMCO
ENGINEERING
11104 E. 56TH ST. • TULSA, OKLAHOMA 74145
918/252-5448

VAMCO ENGINEERING
A DYTEK COMPANY

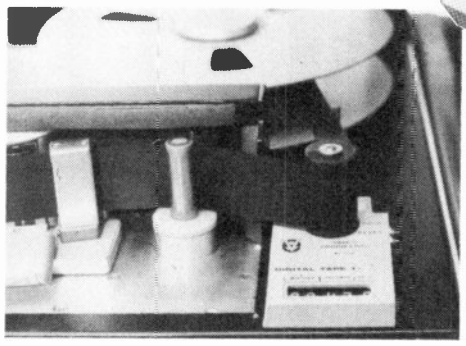
model 734

DIGITAL VIDEO TAPE TIMER, provides at a reasonable cost, the ultimate in tape timing accuracy.

The VAMCO 734 eliminated the mechanical problems of the traditional timer by omitting the mechanical gears and linkages that produce friction to impair timing accuracy. The timer can be installed in minutes with one mounting nut. All circuitry except power supply is housed in the timer assembly, the power supply is a separate unit that is provided with each timer. The timer mounts without tape machine modification on all 2" Quad videotape machines and all 2" audio machines, Ampex Cartridge winders, and most other videotape machines. A remote display option is also available.



AMPEX VR-1200



AMPEX AVR-2

RCA TR-22

SPECIFICATIONS

Installation: Mounts without tape machine modification on the following machine types:

Ampex VR-1000 series
VR-1100 series
VR-1200 series
VR-2000 series
AVR-2 series
Cart Winder

RCA TR-22 series
TR-50 series
TR-60 series
TR-61 series
TR-70 series
Allen RB-1000 series
RB-1200 series

Accuracy: ±0.14%

Display: 5 Hewlett Packard LED units

Maximum Time Display: 99 minutes, 59.9 seconds.

Controls: RESET: Resets all displays to zero.

Hold: "Freezes" display while tape is running. Counting circuitry continues to run and is automatically displayed after button is released.

Accessories: Remote display. Editec-R recueing.

Power: 115V 60MHz, A.C., 6 watts, with power supply included.

model 771-2

VIDEO CASSETTE TIMER is designed to provide production and engineering personnel with an accurate, reliable, high resolution, tape timer for the Sony VO-2850, VO-2850A, VO-2600*, VO-2800*, VO-2860, BVU-200, Panasonic NV9200, NV9500, JVC CR 8300U. The 771-2 offers accuracy to 1/10 second resolution for all cassettes. A "recue" button gives a programmable pre-roll cue for *editing* and ON AIR use.

An available option is the Model 773 Preset unit. Designed to enter the time of a previously used cassette that was not rewound. The 773 can be added to the basic timer at a later date.

Prices and Specifications Subject to Change Without Notice.

Circle (161) on Reader Service Card

VAMCO
ENGINEERING

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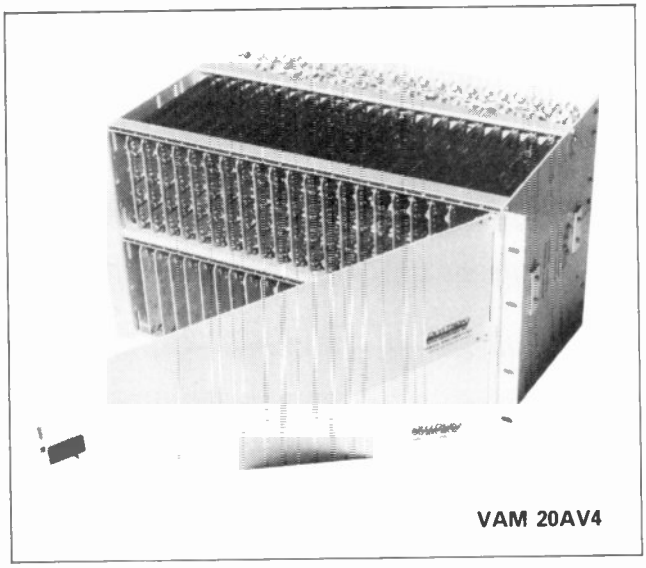
918/252-5448

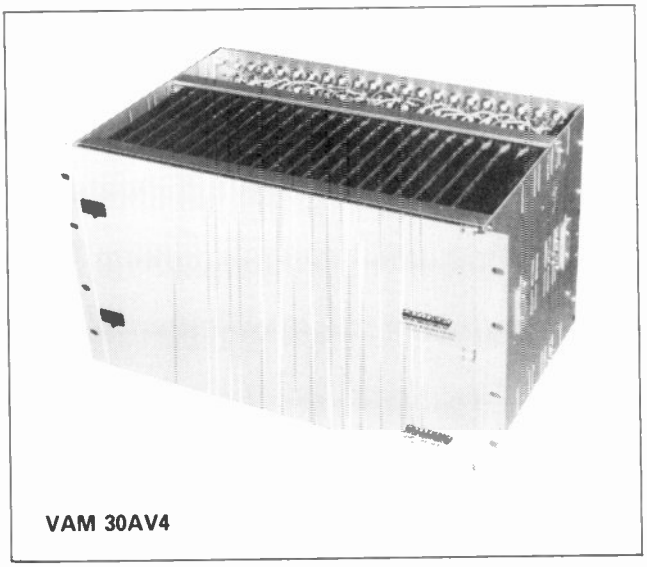
VAMCO ENGINEERING
A DYTEK COMPANY

Modulized in a 20 input by 4 output format the VAM20AV4 offers the latest in state-of-the-art routing switchers. Each system matrix is designed for interface compatibility (stacked) of up to 12 units without DA's. Units are supplied with dual auto changeover power supplies for minimum downtime. Switching is in the Vertical Interval and reverts to random nature upon loss of vertical interval drive signal. Each video crosspoint board is a 1x4 with on-card switchpoint status and on-card switching for ease of maintenance. High quality bi-polar video switching is used for theoretical 100 db off-mode attenuation. Complementary bi-polar transistors throughout video stage virtually eliminates differential phase and gain errors. Each audio crosspoint board provides a 20x1 audio switching capability. To prevent impairing signal swing or response, no transformers are used. This system can be operated directly from a -24 volt power supply which is a natural for remote microwave relay installations.



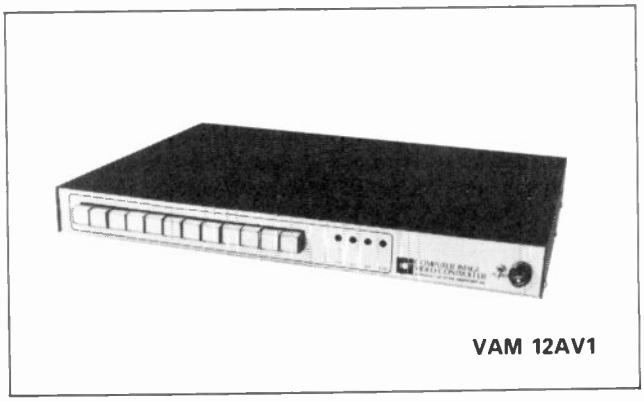
VAM 20AV4

The VAM 30AV4 system offers the same technical characteristics as the VAM 20AV4 except for expanded matrix, i.e. 30 inputs by 4 outputs. Both building block systems offer the following options: Dual Audio (Stereo), Remote control options are BCD parallel, Touch Tone, Two wire BCD serial, FSK tone, Two Wire "Party Line" and direct wire control. Remote panels can be fabricated to accommodate keyboard, individual pushbutton, thumbwheel or micro-computer control.



VAM 30AV4

The VAM 12AV1 is a self contained unit providing a 12 input by 1 output format and can be stacked up to 15 units high without DA's. Each unit has a built in power supply allowing maximum isolation and ease of maintenance. Other features include: Vertical interval switching, Bi-polar video switching, short term memory protection, AFV, and CMOS audio switching. Available options are remote control and dual (stereo) audio.



VAM 12AV1

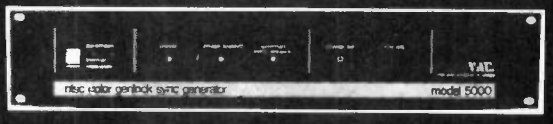
Prices and specifications subject to change without notice

VIDEO AIDS from VACC

VIDEO AIDS corporation of colorado

325 EAST SEVENTH STREET, LOVELAND, COLORADO 80537 Phone (303) 667-3301

VIDEO AIDS corporation of colorado

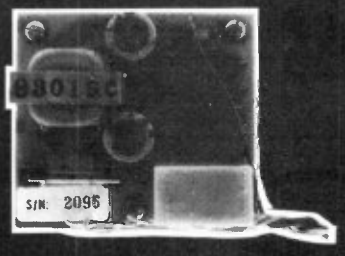


COLOR GENLOCK SYNC GENERATOR
MODEL 5000

SPECIFICATIONS MODEL 5000 OPTION:01 (Helical)
Model 5000 Helical tape recorder outputs have typically 1000 or more times the frequency variations of broadcast video. This new mode provides a very wide range genlock that is front panel selected to lock to helical recorder playbacks even with ± 1% speed variations, ± 10 microsecond skew and high amplitude head transition noise.
Price: Model 5000 — $1895.00

BLACK BURST GENERATOR KIT
MODEL BBG-1

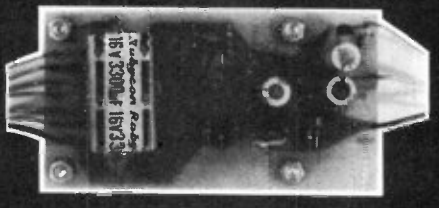
Low-cost black burst generator for driving new color cameras and for users of video switchers who desire to fade to color black.
Price: $89.00 F.O.B. Loveland, Colorado



VIDEO ACTIVATED POWER SWITCH
MODEL VPS-1

- Save electrical energy by using monitor only when video is present.
- Reduce color monitor maintenance when no drives are present.
- Eliminate distractions from free-running monitors.
- Eliminate special AC power lines or tall ladders to turn video monitors on and off in special locations.

Price: $65.00



VIDEO D/A
MODELS VDA-1, VDA-1P

The VACC Model VDA-1 is a video distribution amplifier which can be operated from any +12Vdc power supply capable of delivering 70 mA to the VDA-1.
The Model VDA-1P has its own self-contained 12V power supply. No cabinet is included with the VDA-1 or VDA-1P.
These video amplifiers have been designed in mind to install in TBC's and other equipment where additional video outputs or feeds are required.
Price: VDA-1 — $79.50; VDA-1P — $125.00

PARTY LINE SYSTEM
MODELS PLS-1, PL-1

BENEFITS

- Individual volume control
- Model PLS-1 handles up to 10 headset units
- Low cost
- Small cabinet enables user to mount party line next to camera or to any convenient location.

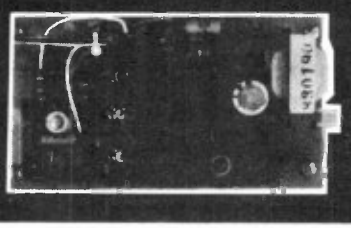
LIGHTED METER

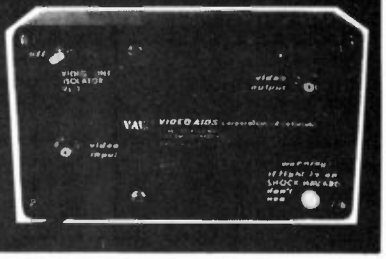
BURST-PHASE & H-PHASE METER
MODELS BPM-1 & BPM-1 OPTION: 02

VACC's BPM-1 Option: 02 Burst-Phase Meter and H-Phase Meter is both a low-cost substitute or replacement for most vectroscope applications where burst-phase errors need to be observed and measured. Likewise, the unit is a low-cost substitute for an oscilloscope where H-Phase errors need to be observed and measured.
Price: BPM-1 (cabinet) $599.00, Option: 02 H-Phase add $130.00

ELECTRO OPTICAL ISOLATORS
MODELS A-1, A-1A, D-1, D-1A, VL-1

Installing a VACC optical isolator circuit in your 12, 15, 17, 19, or 21 inch Sony Trinitron ™ color receiver converts it for use as a high quality color monitor and/or demodulator while still retaining the receiver function
Besides low cost, VACC's Video Line Isolator improves overall performance of your video system by providing better power-line isolation (80 dB) than traditional differential amplifiers.
Price: Specify Model # — $171.00; VL-1 — $250.00

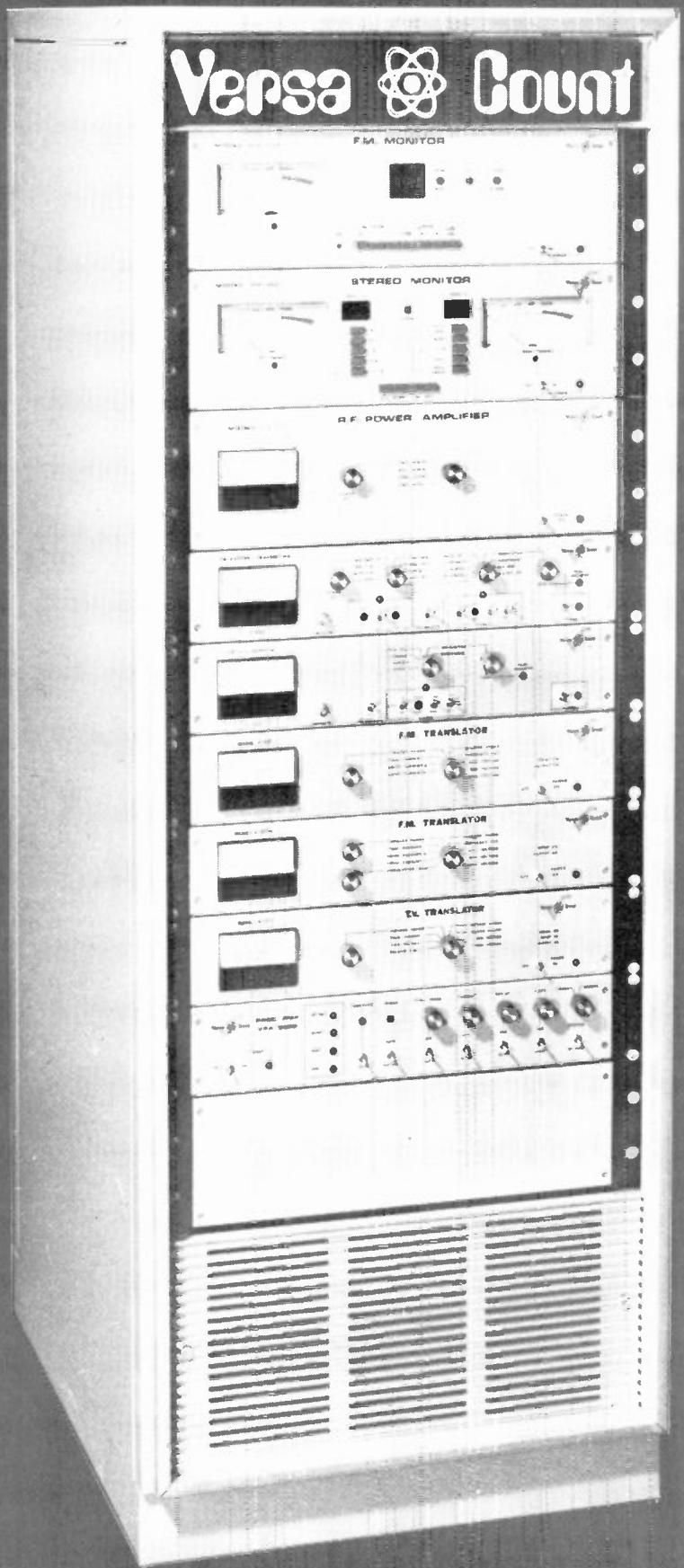




Circle (163) on Reader Service Card

Prices and Specifications Subject to Change Without Notice.

B-163



Versa ● Count

NEW FOR 1979

FM MODULATION MONITOR MM-440

A new super accurate design with crystal controlled calibration circuits. Extended range of noise measurements down to -80 db. Optional digital frequency meter available. Suitable for driving remote readout panels. LED peak level indicators set at 100 %, plus adjustable peak indicators showing peaks above or below 100%.

STEREO MONITOR SM-460

New and important quadrature error measurement. Accurately measures the phase relationship between the 38 KHz sub carrier and the 19 KHz pilot. This measurement gives you the information needed to properly adjust or check the pilot phase of any stereo generator without the use of external measuring equipment.

150 WATT R.F. POWER AMP LA-150

Unique built-in true power reflectometers sample and regulate the R.F. output power within 1% for 10% change in line voltage. Only 8 watts of R.F. drive power required for 150 watt output. Special circuits maintain constant output with variations in R.F. drive power of up to 25%.

TV TRANSLATOR VHF 1 & 10 WATT V-213 & 214

Designed for high reliability and stable operation. Versa-Count experience and reputation in the FM Translator field is all brought together in this new product. Highly selective cascode MOS-FET front end with dual gate mixing provides high overload capability, excellent cross modulation and image rejection.

NEW IN 1978

10 WATT FM EXCITER/TRANSMITTER V-322

The V-322 is now on the air in more than 75 stations in both the USA and South America. Several commercial stations have found that the V-322 is as good or better than exciters costing more than twice as much. The clean sound comes from very low S/N ratio, in fact lower than most monitors can measure.

FM TRANSLATORS 1 & 10 WATT V-316 & 317

These FM Translators were formerly made under the Robert Jones FCC type acceptance and are on the air in hundreds of locations throughout the world. Unquestionably the most reliable and stable of any FM Translator operating today. FCC type accepted 1978.

For further information, Write or Phone: **312-593-0208**

Versa ● Count

553 LIVELY BOULEVARD
ELK GROVE VILLAGE
ILLINOIS 60007

Circle (165) on Reader Service Card

B-165

from **Videomedia**
Professional Television Systems

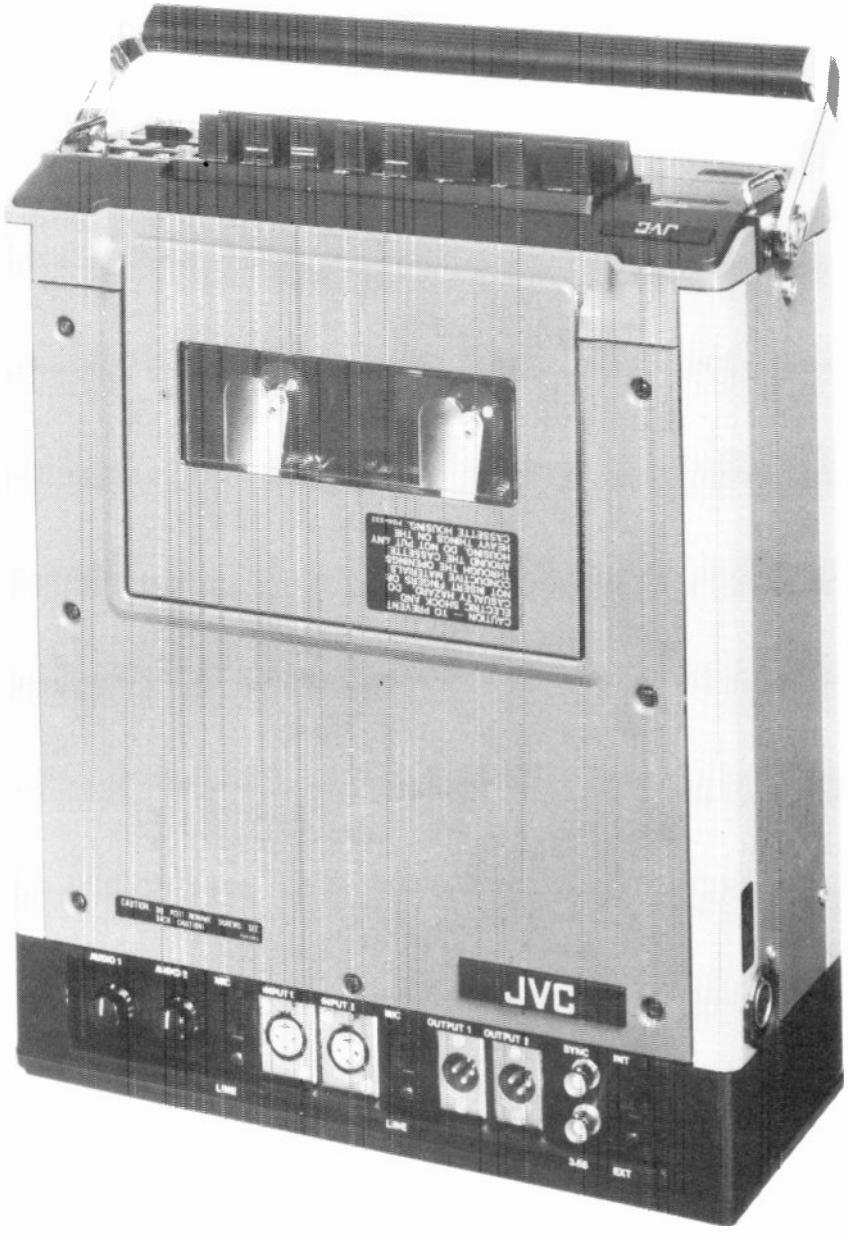
250 North Wolfe Road, Sunnyvale, CA 94086 408/733-6500

VMU-44

The VMU-44 is an add-on audio and video kit which expands a standard JVC 4400, Panasonic NV9400, and Hitachi SV340 to full broadcast features.

FEATURES INCLUDE:

- External Sync
- External Subcarrier
- Individual gain pots for each each audio channel
- Microphone/Line switch for each channel
- XLR Connectors
- Balanced Audio/Low Impedance
- Will accept RF Converter



The kit comes complete with wire harness, transformers and is pre-wired and ready to install on any JVC 4400 or equivalent ¾" portable VTR. The entire conversion takes a technician approximately two hours and adds 2½ lbs. in weight and 2" in overall machine height.

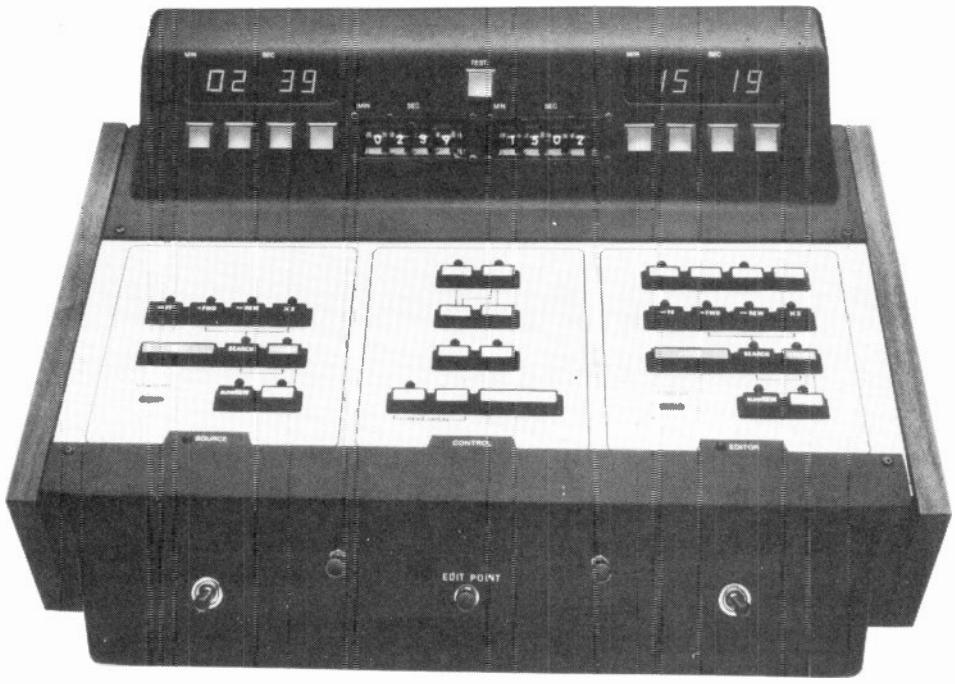
Prices and specifications subject to change without notice

Circle (166) on Reader Service Card

from **Videomedia**
Professional Television Systems

VM95U

250 North Wolfe Road, Sunnyvale, CA 94086 408/733-6500



The NV950U/VM95U represents the first practical approach to low cost editing while maintaining all the features presently available on any ¾" editing console. It also has one big advantage over the competition — it requires no mechanical modifications to the VTR's.

The NV950U/VM95U is available for interface to the Panasonic NV 9200, NV 9500, and Sony VO 2860. By eliminating mechanical modification to the VTR's, factory warranty is still valid (a big plus). Also, since we do not force the VTR into unnatural functions, they don't "eat" tape. If you have edited any length of time on a competitive editor, you know the heartbreak of having your master tape "eaten."

Check the comparison table below for features of the NV950U/VM95U as compared to a well known editing system and then check the price. There is no comparison.

NV950U/VM95U with T 95 Tape Timer
vs.
Competitor with Tape Timer and Keyboard Computer

	Joystick Control Bi-directional	Random Search	Preview of Insert Start & End	Mechanical Interface Required	Full Remote Control of Both VTR's	Dual Tape Timer	Return to Edit	Auto Assemble
COMP.	X	X	X	X	X	X	NO	NO
NV950U/ VM95U	X	X	X	NO	X	X	X	X

The T 95 tape timer search module and NV950U/VM95U are available as an add on and are field installable.

Prices and specifications subject to change without notice

Circle (167) on Reader Service Card

from **Videomedia**
Professional Television Systems

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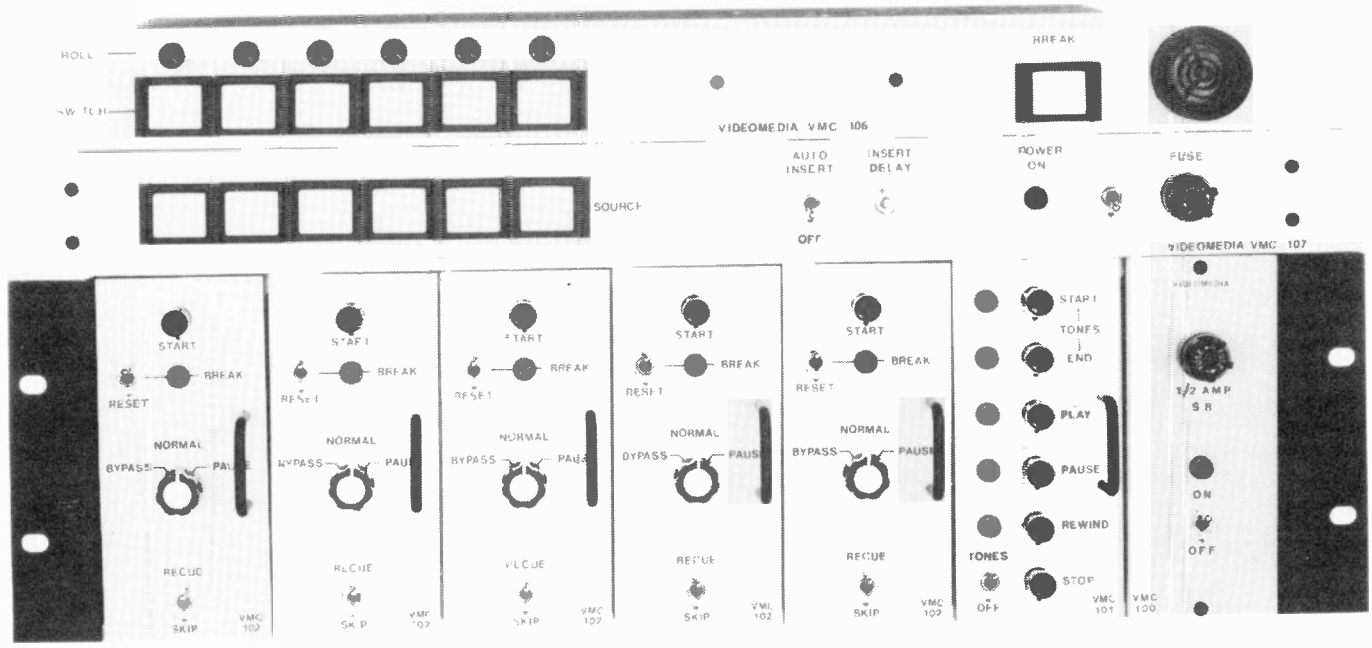
the VMC-100



VMC-100 with VMC-107 Vertical Interval Switcher and VMC-106 Remote Control for VMC-107 Switcher.

GENERAL DESCRIPTION

The Videomedia VMC-100 sequencing system was designed specifically as a professional approach to sequencing ¾" video tape machines in a broadcast situation.

The versatile VMC-100 sequencer is a rugged, dependable, low cost control system that interfaces to any capstan servoed helical-scan video cassette machine for precise cueing and vertical interval switching of program material.

The system derives its accuracy from counting control track pulses on standard, unmodified video tapes, obviating the need for expensive time codes.

The sequencer features individual control cards for each videotape machine for utmost dependability. In the event of a failure, either mechanical or electronic, the by-pass function allows the sequencing system to route control signals around the defective machine or control card.

The VMC-100 is the best system available for low cost sequencing of broadcast commercials. An analysis of broadcast users of video cart machines has indicated a typical loss of between $5,000.00 to $8,000.00 in revenues for the average down time of a cart machine.

Because of the individual control card-to-machine design of the VMC-100, with its by-pass capability, loss of commercial revenues is minimized.

Additionally, the cost of a turn key six machine system including switchers, time base corrector, waveform monitors, etc. is approximately 1/5th the cost of a quad video cart machine.

APPLICATIONS

The VMC-100 sequencing system design is flexible for adaptation to the following typical uses:

- Commercial spot play systems
- Standby or back-up for quad video cart machines
- Network delay with commercial inserts
- ENG news playback
- Automatic programming for cable television
- Hotel/motel movie sequencing (can handle three separate movie channels)
- Training tape repetition
- Can be used for continuous recording (infinite number of hours)

Prices and specifications subject to change without notice

Circle (168) on Reader Service Card

from Videomedia
Professional Television Systems
250 North Wolfe Road, Sunnyvale, CA 94086 408/733-6500

the VMC-100

FEATURES

- Automatic recue or program segment advance
- Automatic tape slack (machines may be left in cue position with tape loaded, without fear of head clog)
- Full remote control of vertical interval audio follow-video switcher
- Unit will automatically switch to and from external signals if required
- Pause/restart feature allows remote break to be made during any sequence of operation
- Remote status panel indicates which VTR is up
- Separate bridging switcher for monitoring, cueing and engineering checks
- Two-tone PLL system for positive precise tone cueing and indexing, up/down counters assure exact tone placement on tape
- Each control card has a by-pass, normal or pause mode function
- Warning beep tone at remote panel provides five (5) second count down to switcher operator indicating the machine is entering a pause condition. Operator has time to roll film, take network, etc.

The tone encoder back space control unit allows precise cueing of the program material. Upon selection of the switch point the control unit automatically, by counting control track pulses, applies the required tones exactly five (5) seconds prior to program start or end.

A single system consists of two to six machines and is expandable by cascading additional controllers and machines indefinitely.

Due to the card rack frame construction the user need buy only as many control cards as is immediately required, with complete assurance that the system can be expanded in the future. Trouble shooting is simplified since in the event of one card/machine failure, the entire sequencer control does not need to be replaced.

SPECIFICATIONS

General

Power ..... 25W (max)
117V 60 Hz or 230V 50 Hz

Size:
Width ..... 19" (48.26 cm)
Height ..... 5.25" (13.35 cm)
Depth ..... 11.5" (29.21 cm)

Weight ..... 9.2 lb. (4.17 kg) (approx.)

Ambient Temperature ..... 32°F to 104°F
(0° to 40°C)

VMC-101 Tone Encoder Backspace Control

Audio Output ..... 1.35V/600 ohms

Start Tone ..... 500 Hz 2 Hz

Enc Tone ..... 2.2 kHz 20 Hz

Cue Placement ..... 5 seconds prior to program switch (automatic placement)

VMC-102 VTR Control Card

Audio Input ..... 30 mV (min)

Input Impedance ..... 2k ohms

Input Activating Frequencies:
Pause ..... 500 Hz ±10 Hz
Program Switch ..... 2.2 kHz ±50 Hz

VMC 100 SYSTEM

Model	Modules	User Net
VMC-100	Power supply and frame	$ 670.00
VMC-101	Tone encoder and backspace control unit	690.00
VMC-102	VTR control card, one required per VTR used (price does not include VTR modification kit)	560.00
VMC-103	Card extender	35.00
VMC-105	Stand alone power supply/frame (houses two units)	500.00
VMC-106	Remote control for VMC-107 switcher (sequence "break" control, warn buss and audio alarm)	575.00
VMC-107	Vertical interval switcher 6X1 with auto-insert function, audio follow video (including VMC-100 interface mods)	1350.00
VMC-110	Complete spare parts kit for VMC-100 system (with VMC-103)	280.00

VTR MODIFICATION KITS FOR VMC-100 SYSTEM

(Restart, tape slack control, video unmute and ten foot control cable)

Panasonic NV 9200 Kit	190.00
Panasonic NV 9500 Kit	190.00
Sony VO 2860 Kit	225.00

CABLES FOR VMC-100 SYSTEM

RM-100	75' remote control cable for vertical interval switcher	180.00
RM-100J	Junction for utilizing two VMC-106 remote controls	140.00
RM-95J	Connects 105 with editing system	250.00

VTR CONTROL CABLES

(Included with VTR modification kits at no charge)

CC8P	10' control cable (Panasonic)	60.00
CC8S	Same as above (Sony)	60.00

Prices and specifications subject to change without notice

from Videomedia
Professional Television Systems

250 North Wolfe Road, Sunnyvale, CA 94086 408/733-6500

Z6 EDITING SYSTEM

The Z-6 microprocessor based control editing system represents the largest breakthrough in technology since the original inception of video tape editing itself. The system offers frame accurate editing and a 99 event memory with "micro-loc*".

"Micro-loc*" obviates the need for SMPTE time code. It is absolutely "dead lock" accurate and does not require expensive readers and generators. "Micro-loc" does not require an audio track to operate and if necessary can co-exist with SMPTE time code.

The Z-6 system has a Z-80 microprocessor "heart of gold". It won't break your pocket-book, resides on the industry standard S-100 buss; and its use, with total accuracy, is made possible for the first time by "micro-loc*". Here's why:

In order for an editing system to be frame accurate, each and every frame must have a way of being identified as unique. SMPTE time code fills this need, as does "micro-loc*". But SMPTE code requires complex data handling of an 80-bit word which becomes increasingly difficult in fast forward and rewind modes of the VTR. In that case, a 16-bit processor is an absolute necessity, hence a much more costly system (by a factor of 5X or more). The Z-6 however can cruise sweetly with "micro-loc*" and sample correctly at any speed forward or reverse with time to spare, hence the first 8-bit system in the world with frame accurate editing.

The operating program resides in a software package making this a system that will not obsolete itself. Any new features or options can be implemented by simply changing the software. A Z-6 purchased today will have the option of doing all the things a Z-6 of tomorrow can do, (whatever happened to "planned obsolescence"?).

*Patent Pending

OPERATING FEATURES

The Z-6 is the fastest, most flexible, most practical, most innovative, most reliable, most lovable editing system that has ever been touched by a video producer's hands. Editing the way it should be and never was. A tool to be loved, not feared. A unit easy to master, not to be conquered by. Most of all, a system with the power to be really creative without being a graduate engineer. Put your mind on your creation and forget all the technicalities. The Z-6 has a simple screen layout that doesn't take a genius to figure out. And you don't need numbers, only the computer does. You can edit an entire program and never mess with numbers, (people edit pictures, not numbers).

Prices and specifications subject to change without notice

from **Videomedia**
Professional Television Systems

250 North Wolfe Road, Sunnyvale, CA 94086 408/733-6500

A Microprocessor Based Editing Control System for

CREATIVE FREEDOM

Standard *Z6* features include:

- Play and record joystick shuttle arms for bi-directional search.
- Programmable pre-roll and post roll times.
- Programmable in, out and duration of each VTR.
- Auto search (with "sense enough" to know how far to go and what speed to get there).
- Single glide ballistics (3X play speed to stop with no overshoot, automatically controlled and varied).
- Select edits on the fly.
- Tag entries (for animation, multiple event execution etc.).
- Calculate mode.
- Convert (converts entire display from "micro-code" to minute; second; frame format and vice versa).
- Cruise control.
- Full function VTR remote control.
- Return to "in" edit point.
- Return to "out" edit point.
- Go to search function.
- Rehearse edit (ingoing and outgoing).
- Perform edit.
- Review edit.
- Auto select of "micro-loc* or not"
- "Micro-loc*" recalibrate features auto offset.
- Consecutive event non stop mode change execution.
- Foolproof error messages and keyboard lockout (won't let you make a mistake).
- Prompting for proper entries.
- AB monitor select with auto lockout functions.
- S-100 buss.
- Abort function.

*Patent Pending

SPECIFICATIONS

The Z-6 system is sold and serviced by authorized Videomedia Dealers throughout the United States and Canada with a strong commitment from Videomedia to provide ongoing software development to increase the personality of your powerful Z-6 system.

Dimensions

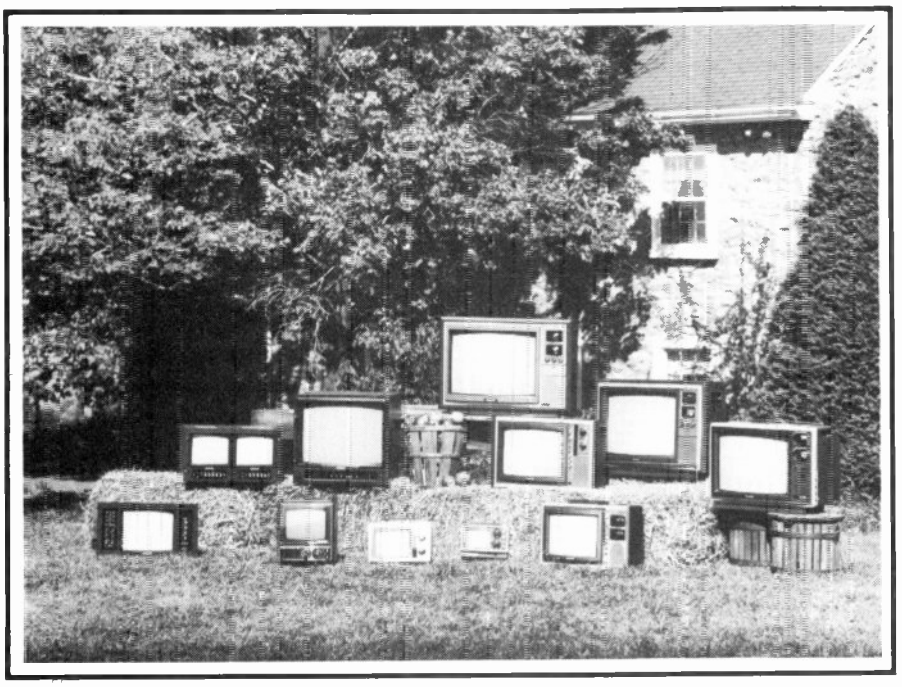
	Height	Width	Depth
Electronics Chassis	7"	19"	13"
Keyboard	4"	19"	10"

Power requirements 110/220 VAC 50/60 Hz 65 watts

Video output display IV pp at 75 ohms

Because of the high degree of technology involved in a Z-6 system, hardware interfaces must be performed by an authorized videomedia Z-6 dealer or a waiver for said installation must be submitted by the dealer to Videomedia to maintain Warranty Status.

Prices and specifications subject to change without notice



VIDEOTEK PRESENTS...

PROFESSIONAL COLOR MONITORS FOR BROADCAST ENG CCTV

Designed by the Professionals for the the Professionals

Pictured left to right
bottom row VM-12 PRO RM 9H RM 8 RM 5 RM-12
top row VM 8 PRO VM-19 PR RM-21 RM 12 RM-19 RM 17

PROFESSIONAL COLOR MONITORS

Videotek professional color monitors are designed and manufacturec with expert workmanship to assure the durability and performance needed in today's "On The Move" broadcasting. "State Of The Art" circuitry complemented by the Trinitron Plus® CRT brings high reliability, stability, and superior picture quality in all Videotek monitors. And the entire series (8, 12, and 19 inch) is designed for mounting in any standarc 19 inch equipment rack.
The latest additions to the line include 8 inch portable units, Studio 12 and VM-15PRO, ideal for all Broadcast applications.

VM-8PT — 8" Professional Portable AC/DC Color Monitor $1085.00
VM-8PR — 8" Professional Rackmount Color Monitor $1050.00
VM-8PRW — 8" Professional Rackmount Color Monitor with space for 528 Waveform Monitor 1095.00
VM-8PRD — Dual 8" Professional Rackmount Color Monitors 2045.00
VM-8PRA — 8" Professional Rackmount Color Monitor with speaker cabinet 1095.00
VM-12PR — 12" Professional Rackmount Color Monitors 1095.00
VM-12PRO — 12" Professional Rackmount Color Monitor with all Options 1395.00
STUDIO 12 — 12" Professional Rackmount Color Monitor 1995.00
VM-15PRO — 15" Professional Rackmount Color Monitor 1520.00
VM-19PR — 19" Professional Rackmount Color Monitor 1450.00
DM-4R — Rackmount Demodulator 550.00

CCTV COLOR MONITORS

All Videotek CCTV monitors and monitor/receivers are available with optional equipment making the entire series desirable for broadcast use. The complete line is totally compatible with all portable recording and eciting equipment. One hundred percent solid state circuitry, complemented by the Trinitron Plus® CRT, insures maximum stability and reliability.

VM-9 — 9" Portable Trinitron® Color Monitor $740.00
RM-9 — 9" Portable Trinitron® Color Receiver/Monitor, No Demodulated Output 775.00
VM-12 — 12" Portable Trinitron® Color Monitor 725.00
RM-12 — 12" Portable Trinitron® Color Receiver/Monitor 755.00
VM-12R — 12" Trinitron® Color Monitor (Rackmount) 760.00
RM-12R — 12" Trinitron® Color Receiver/Monitor (Rackmount) 790.00
VM-15 — 15" Trinitron® Color Monitor 825.00
RM-15 — 15" Trinitron® Color Receiver/Monitor 845.00
VM-17 — 17" Trinitron® Color Monitor 915.00
RM-17 — 17" Trinitron® Color Receiver/Monitor 935.00
VM-19 — 19" Trinitron® Color Monitor 970.00
RM-19 — 19" Trinitron® Color Receiver/Monitor 995.00
VM-21 — 21" Trinitron® Color Monitor 1105.00
RM-21 — 21" Trinitron® Color Receiver/Monitor 1130.00

AC/DC COLOR MONITORS

Complete your ENG Color System with the exciting new series of 5, 8, and 9 inch AC/DC Color Monitors by Videotek. The durable, lightweight Monitor and Monitor/Receivers take the guesswork out of setting up color cameras and taping color programming on remote locations. The entire series is also ideal for use with all editing systems.

VM-5 — 5" AC/DC Portable Trinitron® Color Monitor $718.00
RM-5 — 5" AC/DC Portable Trinitron® Color Receiver/Monitor, No Demodulated Output 758.00
VM-8 — 8" AC/DC Portable Trinitron® Color Monitor (Battery optional) 740.00
RM-8 — 8" AC/DC Portable Trinitron® Color Receiver/Monitor 795.00
VM-9H — 9" AC/DC Portable Color Monitor 745.00
RM-9H — 9" AC/DC Portable Color Receiver/Monitor (No Demod) 740.00

OPTIONS

Service Manual $4.50
Battery Pack for 9H 40.00
Battery Pack for 5" 110.00
Battery Pack for 8" 130.00
AB Selection (Not Available on RM-8, RM-5, VM-5) 45.00
Blue Gun 30.00
External Sync 30.00
Underscan (Not Available on 9H) 35.00
Pulse Cross 125.00
TV Line VTR Selection (Standard on RM-8) 60.00
Carrying Case for 8" (Holds monitor & Battery Pack) 180.00

QUALITY ENDURES AT

VIDEOTEK INC.

125 North York Street, Pottstown, Pennsylvania 19464
Telephone (215) 327-2292

9625 North 21st Drive, Phoenix, Arizona 85021
Telephone (602) 997-7523

See Us at NAB Booth 2602

Write for our brochure for more information on standard and optional features.

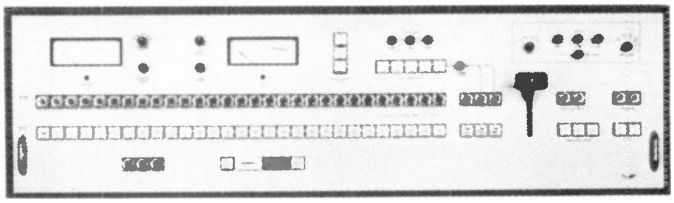
Prices and Specifications Subject to Change Without Notice.

VITEX co.

3700 N.E. 53rd Ave.
Gainesville, Florida, USA 32601
(904) 377-8900

Where Professional Standards are Required—Price range of $12,000.00 to $48,000.00

Model 730 Master Control System



The 730 Series Master Control System has been designed to permit a single master control operator to flawlessly air complex on-air programs and station breaks.

By combining Video, Audio, and Complete Machine Control functions into Preset and Take Operation, the ON AIR programming can be Smooth and continuous. Preset the next on air segment and relax until air time and just depress a SINGLE pushbutton — the 730 DIGITAL logic will do the Starting, Rolling, Flipping Mirrors, Switching Audio and Video, Key, Matte, Mix or Fade automatically and on time.

Modern technological advances in hardware and operational design permit hardware reliability with operational ease. Digital electronics are used throughout for superb linearity, stability and reliability, with an economical price.

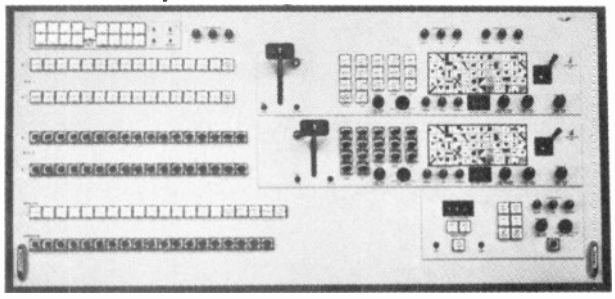
FEATURES

- 16, 20, or 24 Audio follow Video inputs (including color blk and color background)
- 5 Audio Only Sources
- 3 Switching Buses: Audio Breakaway, Program and Preset
- Automatic or optional Manual Video and Audio Mixer/Fader.
- Full over-under Audio Controller.
- Over-Under Ratio Control.
- 2 VU Meters and remotely operated Audio Level Controls.
- 5 input Audio Monitor Switch.
- Output Color Burst Defeat.
- Ready wired for computer interface.
- One-man operation of Audio, Video and Machine control.
- Full one-event preset and take system.
- Automatic Revert to Normal Selection (AFV Full, Cut and Key out)

OPTIONS

- Downstream Keyer with 4 key inputs and color matte, with auto preset controls for cut or dissolve in and out.
- Analog Key Border and Edge System with Drop Shadow and outline for the Downstream Keyer.
- Pre-roll system and automatic preset machine start and mirror flip system.
- Machine control for a complete film island (2 projectors and one slide) (4 island max:).
- Machine Control for a VTR or Video Cart.
- Audio Preset Level System.
- Additional 16 x 1, 20 x 1, or 24 x 1 AFV Switching Bus with 5 Audio Only Inputs, complete with 1.75 x 19 control panel. This system can be used as a second master control outlet.
- Micromax-32 Microprocessor Preset Control System.
- Micromax-200 Microprocessor Automatic System.
- Vimax-200 Computer Control System.
- 6 x 1 Audio Follow Video Bypass Switcher.

Model 702 Video Production Switching System



The Model 702 is a Digitally Controlled Video Switching System for use in Television Studios, Production Centers and other TV applications where professional standards are required. The 702 is available in NTSC, PAL, or PAL-M standards. The ease of operation and the outstanding features, combined with technical excellence, makes the 700 series a trend setter. Human engineered panel allows for full utilization of all features.

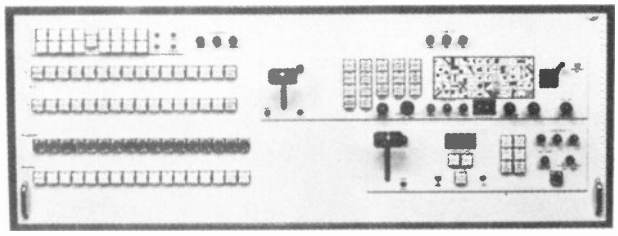
FEATURES

- 16 or 24 Inputs including Color Black and Color Background.
- 6 Output Buses: Mix/Effect 1 A and B, Mix/Effect 2 A and B, Program, and Preview.
- 2 Linear Shadow Keyer with 4 inputs and VARI-KEY.
- 2 Mix/Effect systems, each with color matte, modulated positioner, 60 pattern effect (Including Heart, Star, Binocular, Sequential, pointer and many other wipe patterns) Soft and Border wipe, spotlite, and preset patterns for Key into Wipe into Mix or Wipe.
- Synchronous or non-synchronous operation and inhibit.
- On Air tally system.
- Self contained Color Black and Color Background Generator.
- Vertical Interval Switching.

OPTIONS

- Shadow Chroma Key — Both RGB & Encoded.
- Downstream Keyer with automatic Key Cut or dissolve.
- Key Edge & Bordering with Edge, Shadow, and Outline.
- Digital, Quad Split and input selector.
- Frame Programmable Auto transition System.
- Rotary & Clock wipes.
- Computer Editor Access and Audio System.
- Auxiliary Switching Matrix.

Model 700 Video Production Switching System



The Model 700 is a Digitally Controlled Video Switching System for use in Television Studios, Production Centers and other TV applications where professional standards are required. The 700 is available in NTSC, PAL, or PAL-M standards. The ease of operation and the outstanding features, combined with technical excellence, makes the 700 series a trend setter.

FEATURES

- 16 inputs, including color black and color background.
- 4 output buses: mix/effects A & B, program and preview.
- Linear shadow keyer with 4 inputs and VARIKEY.
- Synchronous or non-synchronous operation and inhibit.
- On air tally system.
- Mixer/fader between program and preview buses.
- Mix/effects system with color matte, modulated patterns.
  60 pattern effect (including heart, star, binocular, sequential, pointer and many other wipe patterns) soft and border wipe, spotlite and preset patterns for key into wipe into mix or wipe.
- Self contained color black and color background generation.
- Vertical interval switching.

OPTIONS

- Shadow chroma Key — Both RGB & Encoded.
- Downstream keyer with automatic key cut or dissolve.
- Key edge & bordering with edge, shadow and outline.
- Digital Quadsplit and input selector.
- Frame programmable auto transition system.
- Rotary & clock wipes.
- Computer editor access and audio system.
- Auxiliary switching matrix.

Specifications Subject to Change Without Notice.

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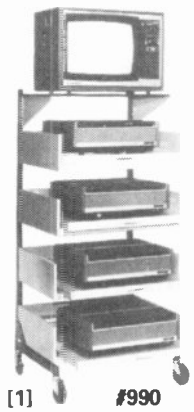

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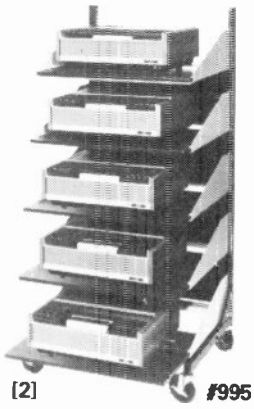

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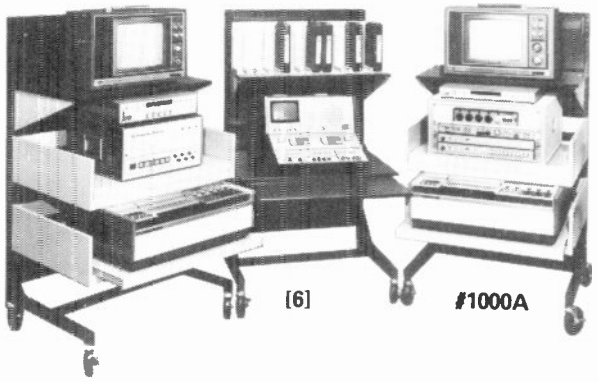
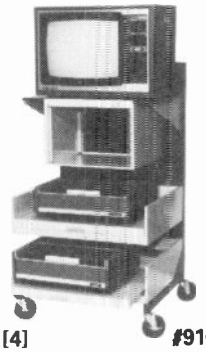


[6] #1000A

[3] #982



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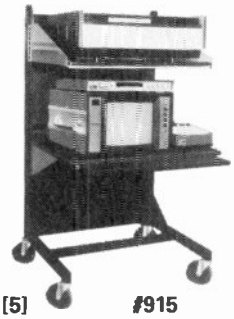

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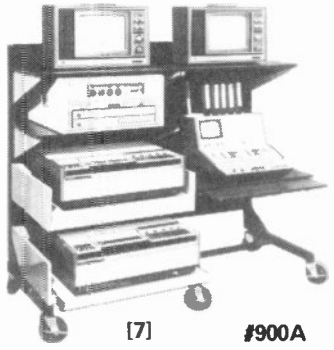

[7] #900A

EDITING, DUBBING AND POST-PRODUCTION CONSOLES

With strength, mobility and safety, here's new flexibility in working arrangements for ENG/EFP — without costly, clumsy fixed wooden installations. Caster-mounted steel construction lets you place these compact Winsted units virtually anywhere in your teleproduction facilities — or even roll a unit into a van to create a mobile setup. Modular components can easily be rearranged . . . whenever your needs change.

Separate "L" frame modules can be bolted together. All shelves and drawers have 1" adjustments. All VTR units have a pullout sliding shelf with 12" safety stop. A pullout work surface gives added space to the editor shelf. Removable rear panels reveal a handy 2" x 28" raceway for cords and cables.

Extended frames allow you to create the ideal setup for ¾" video-cassette duplicating. Consoles hold up to 5 VTR units.

[1] MODEL 990: Extended "L" frame with 5" casters (2 locking), four all steel #960 VTR drawers and one #930 monitor shelf. 72"H x 26"D x 30"W. (Wt. 232 lbs.) **$663.00**

[2] MODEL 995: Extended "L" frame with 5" casters (2 locking) and five #950 VTR shelves. 72"H x 26"D x 30"W. (Wt. 202 lbs.) . . **$649.00**

OPTIONAL ACCESSORY (for 990 and 995) MODEL 920 BP: Removable back panels (Wt. 18 lbs.) **$35.00**

[3] MODEL 982: One complete space saver "L" frame with 5" swivel casters (2 locking), one 19" rack mount cabinet (12¼" rack space), one monitor shelf and one editor shelf. 56"H x 28"D x 22"W. (Wt. 140 lbs.) **$364.00**

[4] MODEL 910: Complete "L" frame with 5" casters (2 locking), two all steel #960 VTR drawers, one #930 monitor shelf and one #986 rack mount cabinet. 56"H x 26"D x 30"W. (Wt. 183 lbs.) **$505.00**

[5] MODEL 915: Make editing decisions prior to actual edit, avoid costly tieups of your primary editing unit. Complete "L" frame — rolls easily on 5" casters (2 locking). All shelf units adjustable on 1" increments. One low profile VTR shelf and one editor shelf. 56"H x 28"D x 30"W. (Wt. 130 lbs.) **$350.00**

[6] MODEL 1000A: Three sets of complete "L" frames with 5" swivel casters (6 locking), three monitor shelves, editor shelf, four all steel #960 VTR drawers. Shown set up in individual modules — each 56"H x 28"D x 30"W. (Wt. 400 lbs.) **$1155.00**
MODEL 1000B: (not shown) Same as above except four #950 low profile VTR shelves in place of four #960 VTR drawers **$1095.00**

[7] MODEL 900A: Two sets of complete "L" frames with 5" swivel casters (4 locking), three monitor shelves, editor shelf and two all steel #960 VTR drawers. Shown assembled as "in-line" console — overall dimensions 56"H x 28"D x 60"W. (Wt. 280 lbs.) **$785.00**
MODEL 900B: (not shown) Same as above except two low profile #950 VTR shelves in place of two #960 VTR drawers. **$755.00**

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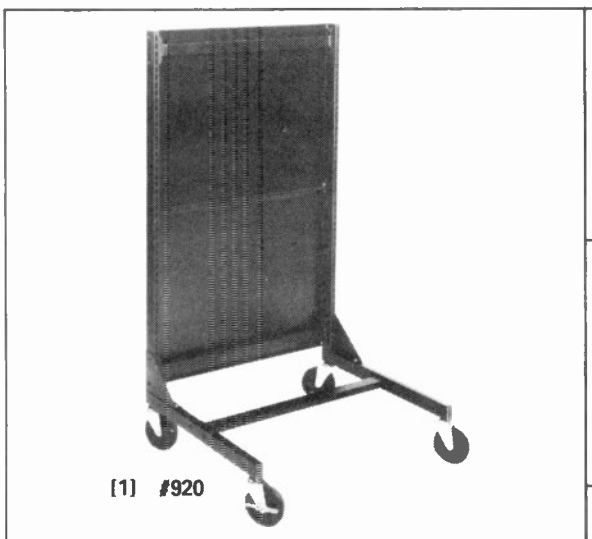

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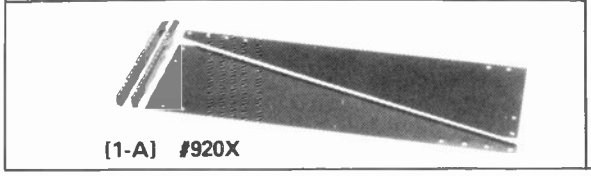

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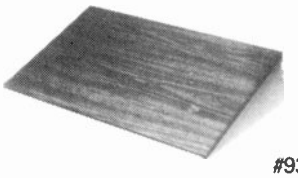

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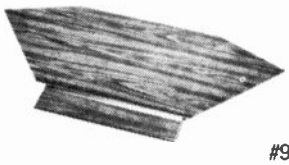

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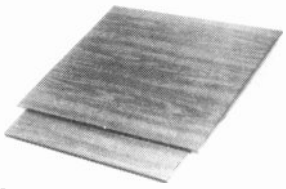

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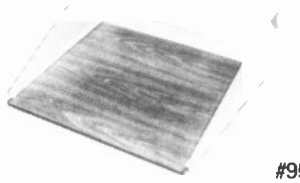

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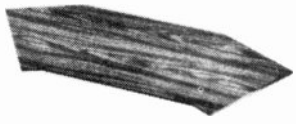

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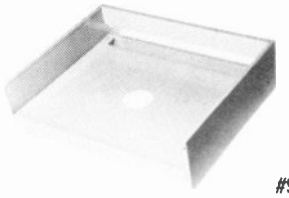

[7] #960

DESIGN A CONSOLE TO FIT *YOUR* VIDEO NEEDS

Now you can create the ideal setup for any ¾" cassette editing — ENG, EFP, industrial, educational or production house. Winsted gives you the exact combination of shelves and drawers you need; they all lock at 1" increments, at exactly the working height you like best.

[1] BASIC FRAME: Rugged black enamel 1" x 2" steel channel "L" frame is slotted to accept shelves and drawer units at 1" increments. Removable back panels for full rear access. Heavy duty 5" swivel casters (2 locking). Specifications: 56"H x 26"D x 30"W.
MODEL 920 (Wt. 60 lbs.) **$179.00**
MODEL 9200 (Wt. 42 lbs.) Same frame without removable back panels **$144.00**

[1-A] BASIC FRAME EXTENSION KIT: Two 16" extension and two side support gussets.
MODEL 920X (Wt. 25 lbs.) **$69.00**

[2] FLAT MONITOR SHELF: Made of 5/8" particle board with walnut woodgrain laminate top; will safely hold TV monitors. Specifications: 18"D x 29¾"W. Beige steel brackets.
MODEL 930 (Wt. 20 lbs.) **$49.00**

[3] FLAT EDITOR SHELF: Accommodates all sizes of editors; made of 5/8" particle board with walnut woodgrain finish. Pullout adds 12" of working surface. Specifications: 26"D x 29¾"W (38"D with pullout extended.) Beige steel brackets.
MODEL 940 (Wt. 40 lbs.) **$79.00**

[4] EXTENDED MONITOR SHELF: Adds shelf space when you're using single modules or angled frame layouts. Wings extend 15" beyond frame on each side. Same construction as Model 930. Specifications: 19½"D x 60"W.
MODEL 935 (Wt. 30 lbs.) **$112.00**

[5] EXTENDED EDITOR SHELF: Angled shelf extends 15" beyond frame on each side. Use with angled layout or individual module arrangement. Same construction as Model 940, including 12" pullout shelf. Specifications: 26"D x 60"W (38"D with pullout extended).
MODEL 945 (Wt. 50 lbs.) **$149.00**

[6] LOW PROFILE VTR SHELF: Holds all sizes of videotape recorder/players. Low profile design increases space for other equipment. Pullout sliding shelf with 12" safety stop. Steel tabs lock shelf to frame at any height in 1" increments. Specifications: Made of 5/8" particle board with walnut woodgrain laminate top. Brackets of beige steel. 7¾"H x 24"D x 29"W.
MODEL 950 (Wt. 30 lbs.) **$95.00**

[7] VTR DRAWER: Beige steel unit holds any size videotape recorder/player, has a pullout shelf with 12" safety stop. Drawer bottom is punched for installation of muffin fan where heat buildup is a problem. Specifications: 8"H x 24"D x 29¾"W.
MODEL 960 (Wt. 40 lbs.) **$110.00**

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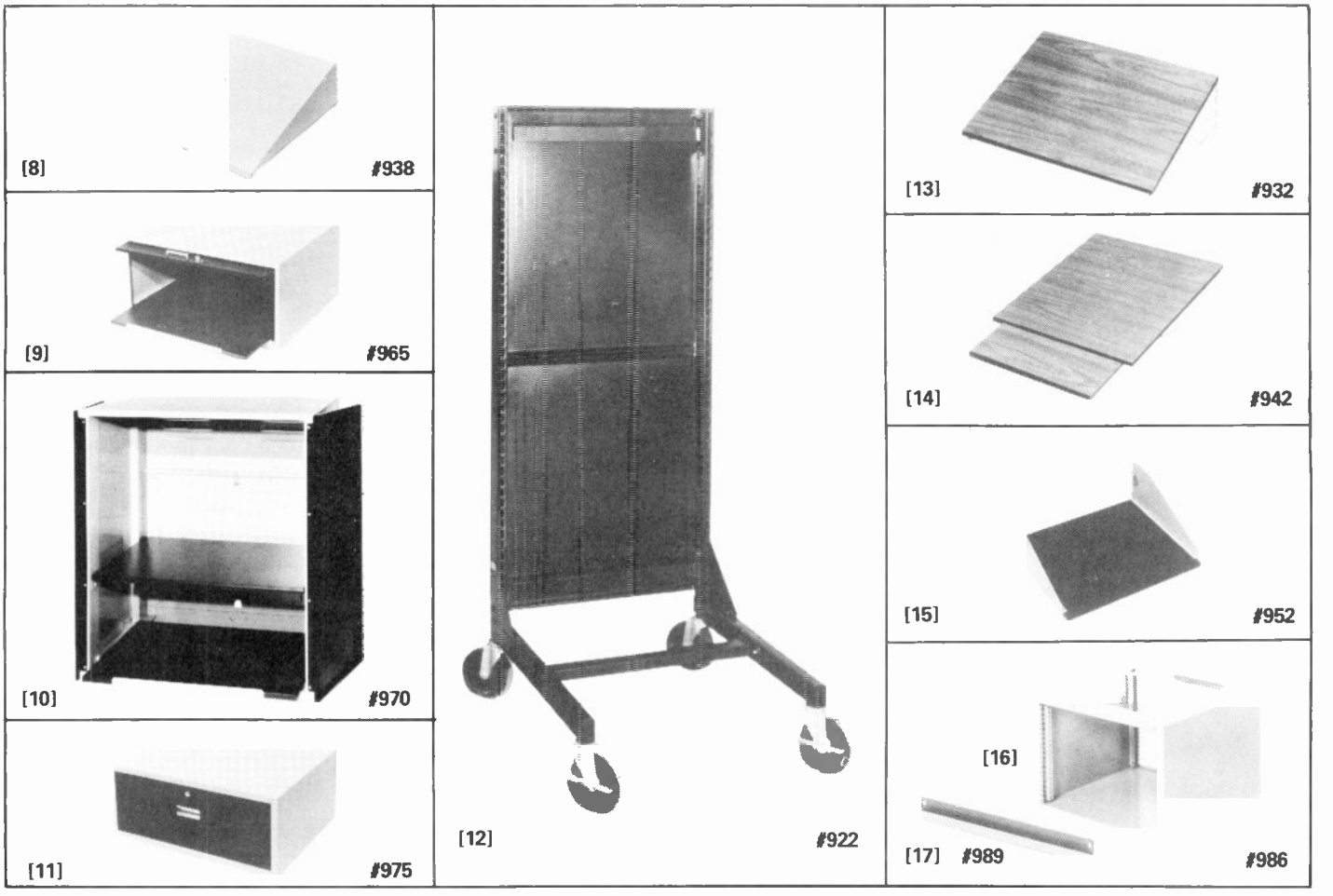

[8] ANGLED MONITOR SHELF: Holds up to a 25 monitor, is tilted for glare-free viewing, adjusts up or down in 1" increments. Specifications: 29"W x 22"D. Beige enameled steel.
MODEL 938 (Wt. 20 lbs.) **$59.00**

[9] VTR CABINET: Tip-up door locks for security. Pullout shelf with 12" safety stop for easy access to VTR. Locking ventilated rear panel is removable for full access. Specifications: 14½"H x 24"D x 29"W. Beige and black enameled steel.
MODEL 965 (Wt. 65 lbs.) **$155.00**

[10] TV/VTR CABINET: Holds most 19" monitors and VTR units. Adjustable monitor shelf can be angled 5° for glare-free viewing. Pullout VTR shelf, with 12" safety stop. Locking ventilated rear panel access to cords and cables. Locking swing-away doors. Specifications: 33½"H x 24"D x 29"W. Beige and black enameled steel.
MODEL 970 (Wt. 110 lbs.) **$315.00**

[11] STORAGE DRAWER: Locking cabinet stores plenty of supplies and equipment. Specifications: 12"H x 24"D x 29"W. Beige and black enameled steel.
MODEL 975 (Wt. 70 lbs.) **$158.00**

NEW SPACE SAVING MODULE: This compact unit is only 22" wide, yet has all of the features of the standard editing modules. Ideal for the new smaller editors, monitors, and rack mount equipment.

[12] BASIC FRAME: Compact 1" x 2" steel "L" frame has same rugged construction as Model 920 frame. Specifications: 56"H x 26"D x 22"W.
MODEL 922 (Wt. 55 lbs.) **$176.00**

[13] FLAT MONITOR SHELF: Sturdy shelf with same rugged construction as the Model 930 will safely hold TV monitor or other teleproduction equipment. Specifications: 18"D x 21¾"W.
MODEL 932 (Wt. 20 lbs.) **$47.00**

[14] FLAT EDITOR SHELF: Accommodates the new smaller editors. Pullout adds 12" of working surface. Same features as Model 940 shelf. Specifications: 26"D x 22"W.
MODEL 942 (Wt. 40 lbs.) **$77.00**

[15] COMPACT VTR SHELF: Accommodates any ½" Betamax or VHS machine. Same features as Model #950. Specifications: 7¾"H x 18"D x 21"W.
MODEL 952 (Wt. 20 lbs.) **$85.00**

[16] RACK MOUNT CABINET: Installs on or under Model 930 or Model 932 monitor shelf. Angle brackets lock unit in place. Ample 12¼" of rack space for variety of rack-mounted equipment. Shipped assembled with support brackets and mounting hardware. Specifications (13¼"H x 18"D x 19¾"W. Beige enameled steel.
MODEL 986 (Wt. 23 lbs.) **$74.00**

[17] EXTRA SUPPORT BRACKETS: For installations requiring more than the single pair of brackets included with [15]. Specifications: 1¼" x 1¼" x 15½".
MODEL 989 (Wt. 3 lbs.) per pair ..... **$ 6.00**

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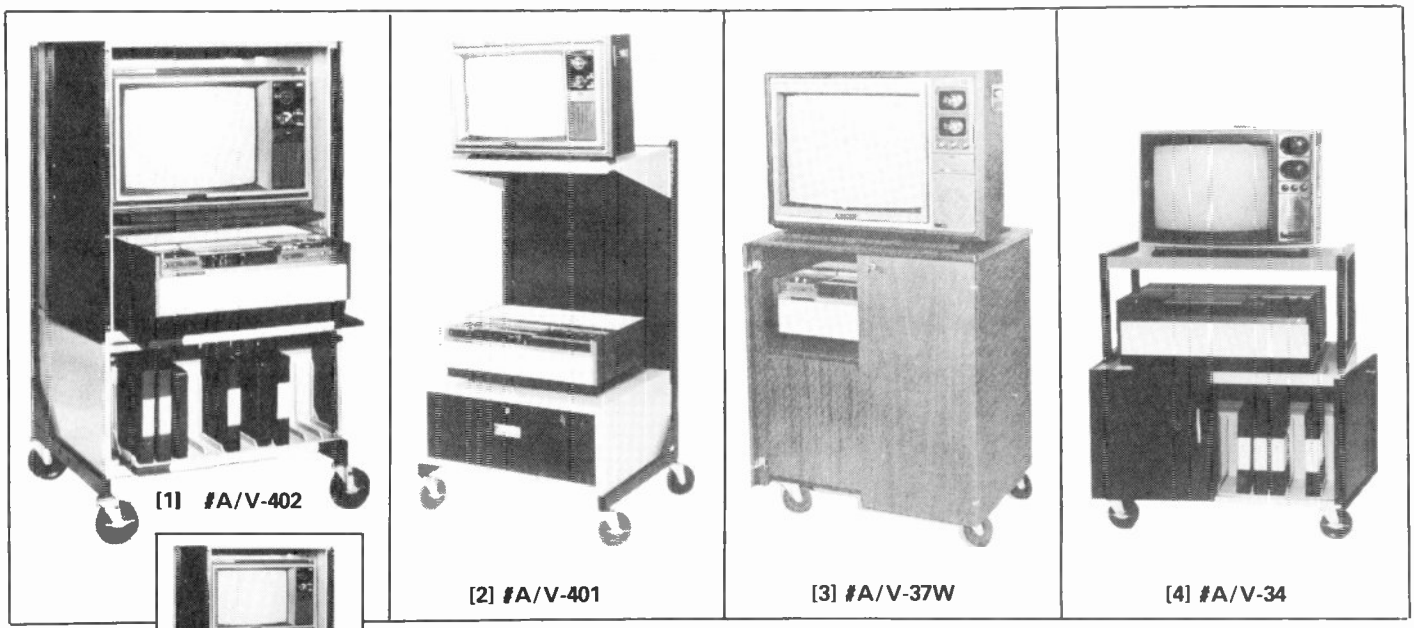

[1] #A/V-402

#A/V-405

[2] #A/V-401

[3] #A/V-37W

[4] #A/V-34

¾" VIDEO CENTERS/CONSOLES

DELUXE VIDEO CABINET: Upper section accepts most 19" monitors and VTR units. Adjustable monitor shelf can be angled 5° for glare-free viewing. Pullout VTR shelf with 12" safety stop. Ventilated locking rear panel access to cords, cables and adjustments. Locking swing-away doors.

Low section has locking tip-up door. Provides ample storage space; ideal for multiple VTR units. Ventilated locking rear panel for easy access to video equipment. Specifications: Overall size: 56"H x 26"D x 30"W.

[1] **MODEL A/V-402** complete with #920 Frame, #970 TV/VTR Cabinet, #965 VTR Cabinet.
(Wt. 220 lbs.) **$569.00**

MODEL A/V-405 Low Profile Unit #970 TV/VTR cabinet with 5" swivel casters.
(Wt. 115 lbs.) **$347.00**

TV AND VTR CONSOLES: Complete video center with ample capacity — up to 25" monitor plus the largest of videocassette recorder/players. Monitor shelf is angled for glare-free viewing, adjusts up or down on 1" increments. Locking drawer for supplies and equipment. Removable rear panel access to power cords and cables. Unit is extremely stable; rolls easily even with full load. Specifications: Overall size: 56"H x 26"D x 30"W. Monitor shelf 29"W x 22"D. VTR Cabinet 14½"H x 24"D x 29"W. Drawer 12"H x 24"D x 29"W. Heavy gauge steel in beige and black enamel.

[2] **MODEL A/V-401** complete with #920 Frame, #938 Monitor Shelf and #975 Storage Drawer.
(Wt. 148 lbs.) **$364.00**

MODEL A/V-401C (not shown) is designed for extra security. All features of A/V-401 plus locking VTR Cabinet. Complete with #920 Frame, #938 Monitor Shelf, #965 VTR Cabinet and #975 Storage Drawer.
(Wt. 213 lbs.) **$520.00**

[3] **EXECUTIVE VIDEO CONSOLE** of rich walnut wood grain laminate holds any ¾" VTR machine and monitor of up to 25" size. Ideal for executive conference rooms and offices. Storage shelf holds tapes and other video accessories. Pullout VTR shelf.

Locking cabinet doors provide extra security, swing back out of way a full 270°. Rear opening provides access to cords, cables and control adjustments. Large 4" industrial type casters. Shipped assembled. Specifications: 35"H x 22"D x 29"W.
MODEL A/V-37W (Wt. 110 lbs.) **$289.00**

[4] **MODEL A/V-34** is designed for smaller groups and individual use. Monitor shelf is set back slightly to permit easier access to VTR shelf. Specifications: 34"H x 20"D x 30"W. Top shelf 15"D x 28"W. Cabinet 13"H x 20"D x 29¾"W.
(Wt. 68 lbs.) **$159.00**

MODEL A/V-54 (not shown). Specifications: 54"H x 20"D x 30"W. Top shelf 20"D x 28"W. Cabinet 13"H x 20"D x 29¾"W.
(Wt. 75 lbs.) **$179.00**

Optional Accessories:
MODEL 130: Two-outlet Electrical Assembly with 20' three-wire cord and cord winder bracket.
(Wt. 2 lbs.) **$28.00**

MODEL UCS-12 Molded plastic divider holds 12 videocassettes.
(Wt. 3 lbs.) **$12.00**

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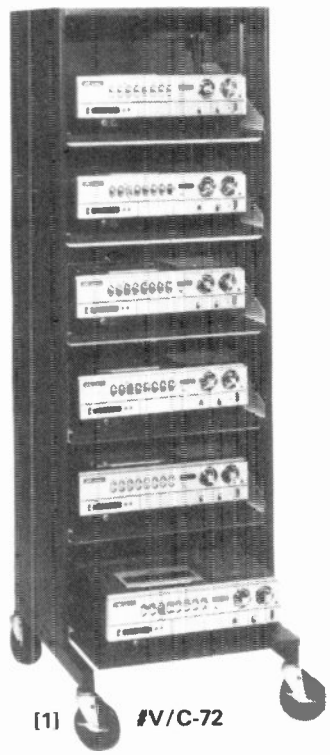

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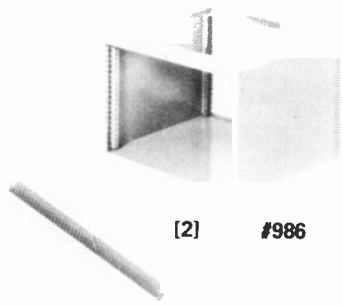

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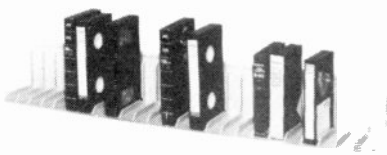

[4] #VCS-25

[5] #V/C-36W

½" VIDEO CENTERS and STORAGE SYSTEMS

A versatile ½" videocassette tape duplicating center. Console holds up to six VTR units — or one rack mount cabinet and five VTR shelves. Pullout sliding VTR shelf, with full 21" width, accommodates any size ½" videocassette machine. All shelves adjustable up or down on 1" increments. Caster mounted steel construction. Removable back panels for full rear access. Separate "L" frames can be bolted together.

[1] TAPE DUPLICATING CONSOLE: Complete extended "L" frame with 5" casters (2 locking), six #952 VTR shelves, top canopy and side panels. Specifications: 72"H x 20"D x 22"W. Black frame. Chocolate brown top and side panels. Walnut wood grain laminate VTR shelf with beige brackets.
MODEL V/C-72 (Wt. 245 lbs.) **$830.00**
MODEL V/C-72WO (not shown) Same as above except without top canopy, side and back panels. (Wt. 185 lbs.) **$669.00**

Individual Components:

922X Extended Frame (Wt. 61 lbs.)	**$142.00**
922BP Back Panels (set of 2) (Wt. 20 lbs.)	**35.00**
922C 5" Casters (set of 4) (Wt. 4 lbs.)	**24.00**
922TC Top Canopy (Wt. 10 lbs.)	**55.00**
922XS Side Panels (set of 2) (Wt. 30 lbs.)	**84.00**
952 VTR Shelf (Wt. 20 lbs.)	**85.00**
986 Rack Mount Cabinet (Wt. 23 lbs.)	**74.00**

[2] RACK MOUNT CABINET: Installs easily under top canopy of V/C-72 console. Ample 12¼" rack space. Shipped unassembled with support brackets (#989) and mounting hardware. Specifications: 13¼"H x 18"D x 19¾"W. Beige enameled steel.
MODEL 986 (Wt. 23 lbs.) **$74.00**

[3] EXTRA SUPPORT BRACKETS: For installations requiring more than the single pair of brackets included with above cabinet. Specifications: 1¼"H x 1¼"D x 15½"W.
MODEL 989 (Wt. 3 lbs.) per pair ..... **$ 6.00**

[4] CASSETTE HOLDER: Holds 25 tapes of any ½" videocassette format. Pressure-sensitive tape on bottom assures positive, easy installation. Specifications: 4-3/8"H x 5"D x 33"W. Molded high-impact polystyrene plastic, beige color.
MODEL VCS-25 Carton of 5 (Wt. 11 lbs.) **$35.00**
Individual Dividers (Wt. 2 lbs.) **$10.00**

[5] EXECUTIVE VIDEO CABINET: Holds any ½" Betamax or VHS machine. Spacious storage drawer and lower shelf holds tapes, camera or other valuable video equipment. Locking doors swing back a full 270°, provide cabinet security. Rear opening provides access to cords, cables and adjustments. Large 4" swivel casters make unit easy to move. Shipped assembled. Specifications: 35"H x 22"D x 24"W. Rich walnut wood grain laminate cabinet.
MODEL V/C-36W (Wt. 95 lbs.) **$259.00**

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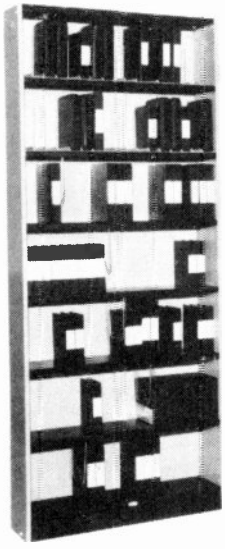

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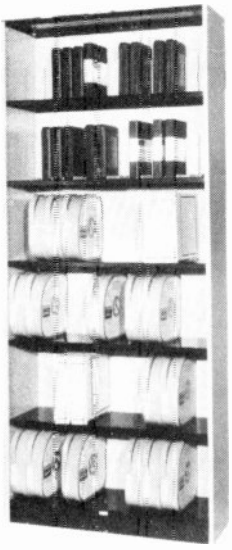
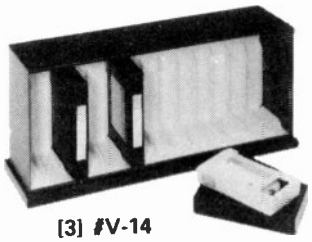
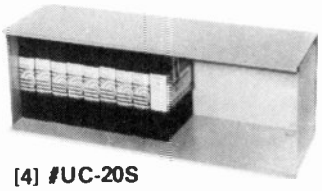


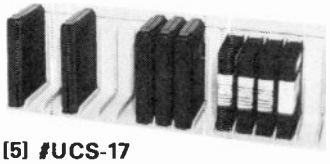
[2] #TC-12A



[3] #V-14



[4] #UC-20S



[5] #UCS-17

OPEN SHELF STORAGE SYSTEMS

Heavy gauge steel cabinets help you organize your tapes for quick access and proper filing. Shelves bolt in place, adjust up or down in 1" increments. Sliding wire supports hold tapes upright. "Add-on" cabinets bolt on side-to-side or back-to-back. Beige and black baked enamel finish.

SPACE SAVING, SLIDING LATERAL CABINETS AVAILABLE FOR SUPER DENSITY STORAGE ... CALL OR WRITE FOR DETAILS.

[1] VIDEO TAPE STORAGE SYSTEM: Has 8" cabinet depth, ideal for ¾" U-Matic videocassettes and 5" - 7" helical tape. Order molded plastic dividers for videocassettes separately. (Model UCS-17A, item 5). Seven shelves. Specifications: 88"H x 8"D x 36"W (inside width 34½", inside height 83").
MODEL TC-8 (Wt. 120 lbs.) **$295.00**
Add-On Unit TC-8X Specify side-to-side or back-to-back installation when ordering. (Wt. 105 lbs.) **$275.00**
MODEL TC-8S Extra Shelf. (Wt. 4 lbs.) **$14.00**

[2] QUAD TAPE STORAGE SYSTEM: Deeper 12" cabinet depth accommodates 7" - 10½" quad tapes and ¾" U-Matic videocassettes. Order molded plastic dividers for videocassettes (Model UCS-17A, item 5) separately. Six shelves. Specifications: 88"H x 12"D x 36"W. (Inside width 34½", inside height 83").
MODEL TC-12A (Wt. 125 lbs.) **$305.00**
Add-On Unit TC-12AX. Specify side-to-side or back-to-back installation when ordering (Wt. 110 lbs.) **$285.00**
MODEL TC-12AS Extra Shelf (Wt. 5 lbs.) **$14.00**

VIDEOCASSETTE STORAGE SYSTEMS

[3] OPEN-FRONT CASE. Holds 14 cased ¾" U-Matic videocassettes; any size of ¾" format. Units interlock, can be set on table, wall hung or stacked five high. Specifications: 13"H x 8"D x 30"W. Steel frame in black enamel with woodgrain end panels, molded vinyl dividers.
MODEL V-14 (Wt. 17 lbs.) **$43.00**

[4] TAPE STORETTE Welded steel cabinet holds 16 mini-size (20-minute) ¾" U-Matic videocassettes. Creates an orderly, efficient ENG/EFP station, library or storage area. Can be set on a table, wall hung or stacked four high. Sliding wire support holds tapes upright. Specifications: 9¼"H x 8"D x 25"W. Beige enamel finish.
MODEL UC-20S (Wt. 12 lbs.) **$32.00**

[5] HOLDER/DIVIDER: Holds 17 cased ¾" U-Matic videocassettes of all sizes, can be installed on standard 3' wide shelving. Pressure-sensitive tape on bottom assures positive, easy installation. Index label area on front. Specifications: 10-1/8"H x 7½"D x 35¼"W. Molded high-impact polystyrene plastic, beige color.
MODEL UCS-17 Carton of 5 (Wt. 12 lbs.) **$50.00**
Individual Dividers (Wt. 3 lbs.) **12.00**
MODEL UCS-17A. For use in TC-8 or TC-12A cabinets. Carton of 7 (Wt. 16 lbs.) **$70.00**
Individual Dividers (Wt. 3 lbs.) **12.00**

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The Winsted Corporation

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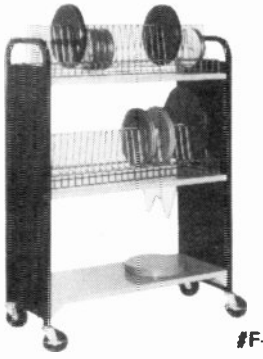
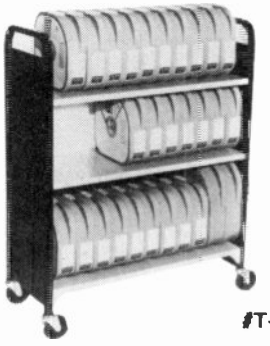
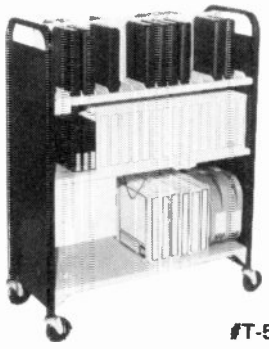


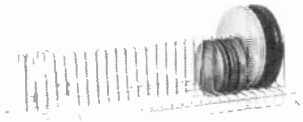
[1] #F-530



[2] #T-500

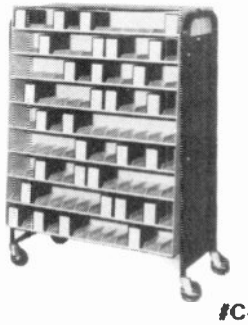


[3] #T-550

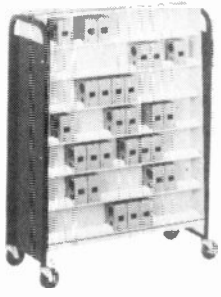


[6] #328

[7] #UCS-16A



[4] #C-701



[5] #C-601

TAPE AND FILM TRUCKS

These heavy trucks have metal end frames welded to heavy gauge square steel tubing. Shelves adjust to fit transport needs; each has a 3" steel backstop, removable for access to both sides of the shelf. Sliding supports hold tapes upright. Industrial 4" ball bearing casters allow safe effortless movement of heavy loads. Specifications: 50"H x 15"D x 36"W. Beige and black enamel finish. Inside shelf width 15"D x 34-1/8"W.

[1] FILM TRUCK: Holds 54 reels of 16mm film in 1-1/16" wide wire supports. Open bottom shelf holds additional films or equipment.
MODEL F-530 (Wt. 68 lbs.) **$239.00**

[2] VIDEO TAPE TRUCK: Includes shelf backstops and sliding supports to hold tapes securely upright.
MODEL T-500 (Wt. 64 lbs.) **$193.00**

[3] VIDEOCASSETTE/TAPE TRUCK: Includes two plastic molded dividers for ¾" U-Matic videocassettes.
MODEL T-550 (Wt. 70 lbs.) **$208.00**

PROGRAMMING TRUCKS

Helps you set up your daily spot programming schedule quickly, efficiently. Full access from both sides of truck. Cartridge shelves are tilted rearward for safe transport of tapes. Heavy duty truck rolls easily fully loaded on 4" industrual ball bearing casters. Specifications: 50"H x 15"D x 36"W. Black and Beige.

[4] BIG-CAPACITY AMPEX STYLE TRUCK. Holds 216 Ampex ACR-25 tape cartridges with "Pik-Quick" cartridge removal system.
MODEL C-701 (Wt. 98 lbs.) **$412.00**

[5] RCA-STYLE TRUCK: Holds 168 RCA TCR-100 type cartridges with "Pik-Quik" cartridge removal system.
MODEL C-601 (Wt. 95 lbs.) **$359.00**

[6] FILM RACK: Chrome-plated rack holds 27 reels of 16mm film. Fits film truck shelf or can be used separately. 1-1/16" spacing.
MODEL 328 (Wt. 9 lbs.) **$35.00**

[7] VIDEOCASSETTE DIVIDER: Molded plastic divider holds 16 cased ¾" videocassettes. Designed for use with T-550 Tape Truck. Specifications: 10-1/8"H x 7½"D x 32½"W. Color: Beige.
MODEL UCS;16A Carton of 5 (Wt. 12 lbs.) **$50.00**
Individual Dividers (Wt. 3 lbs.) **12.00**

ALL PRICES F.O.B. MINNEAPOLIS, MINN.

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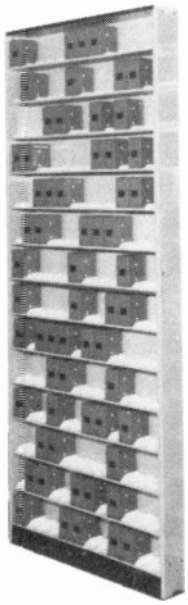
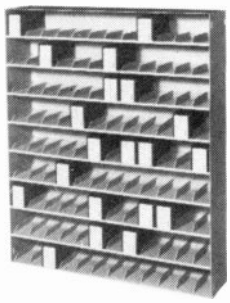
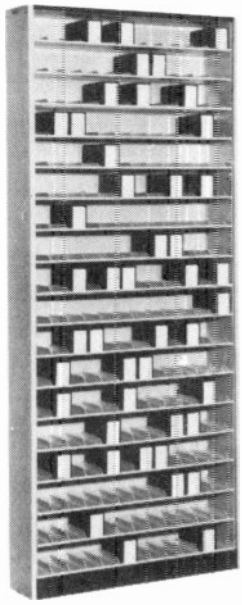


[1] #RC-168A

[2] #RC-84A



[3] #AC-108A



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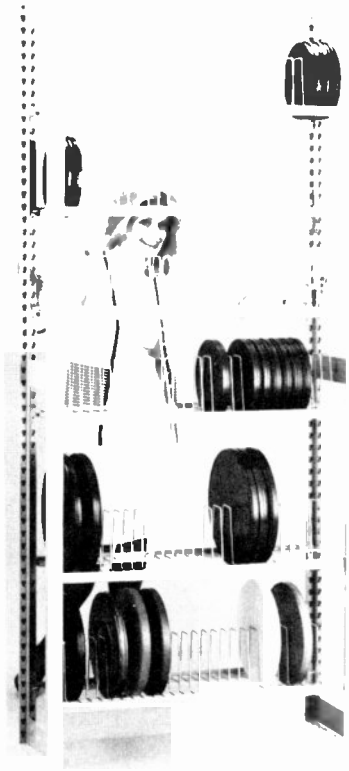

[5] #FOS-1612

TAPE AND FILM STORAGE SYSTEMS

Sturdy tape cabinets of beige and black enameled steel store your RCA TCR-100 or Ampex ACR-25 cartridges safely, conveniently. Double side walls give added strength. Extra units bolt on side-to-side or back-to-back.

Exclusive "Pik-Quik" feature — just tip back adjoining cartridges to grasp and remove any desired tape.

[1] TAPE STORAGE SYSTEM (RCA TCR-100 type) holds 168 tape cartridges. Specifications: 88"H x 4½"D x 36"W.
MODEL RC-168A (Wt. 120 lbs.) **$309.00**

[2] MINI TAPE STORAGE UNIT (RCA TCR-100 type) holds 84 tape cartridges in minimum space. Cabinet is easily wall hung. Specifications: 42"H x 4½"D x 34"W.
MODEL RC-84A (Wt. 40 lbs.) **$98.00**

[3] MINI TAPE STORAGE UNIT: (Ampex ACR-25 type) holds 108 tape cartridges in minimum space. Can easily be wall hung. Specifications: 42"H x 7¾"D x 34"W.
MODEL AC-108A (Wt. 50 lbs.) **$120.00**

[4] TAPE STORAGE SYSTEM: (Ampex ACR-25 type) holds 216 tape cartridges. Specifications: 88"H x 8"D x 36"W.
MODEL AC-216A (Wt. 165 lbs.) **$365.00**

SPACE SAVING, SLIDING LATERAL CABINETS AVAILABLE FOR SUPER DENSITY STORAGE — Call or Write for Details . . . . . .

[5] FILM STORAGE UNIT: Open-shelf for quick access, filing of 16mm film. Shelves adjust on 2" increments. Unit assembles without tools. Specifications: Beige enameled steel with chrome-plated reel racks. 88"H x 36"W.
MODEL FOS-1612 with six 12"deep shelves. Holds 162 reels of 12" diameter. (Wt. 87 lbs.) **$289.00**
MODEL FOS-1618 with five 18" deep shelves. Holds 100 reels of 15½" diameter. (Wt. 99 lbs.) **$339.00**

ADD-ON AND ENCLOSED CABINET UNITS AVAILABLE. CALL OR WRITE FOR FULL DETAILS.

FOR MORE INFORMATION . . . CALL TOLL FREE NUMBER (800) 328-2962

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AUDIO CONNECTORS

Broadcast Electronics Inc. ***B22-B27***
California Switch and Signal
Ercona Corp.
MPC Educational Systems Inc.
Neutrik Products
Switchcraft Inc.
Trompeter Electronics ***B158***

AUDIO CONSOLE KITS

Automated Processes Inc.
Broadcast Electronics Inc. ***B22-B27***
McMartin Industries Inc.
Modular Audio Products ***B117***
Opamp Labs ***B123***
Quad-Eight Electronics
Robins Broadcast and Sound Equipment Corp.

AUDIO CONSOLES

Altec Lansing
Amco Engineering Co.
Ampro Broadcasting Inc.
Audio Designs and Mfg. Inc.
Autogram Corp.
Automated Processes Inc.
Broadcast Electronics Inc. ***B22-B27***
Bud Industries Inc.
Cetec Audio
Custom Audio Electronics
Delta Electronics, Division of Long Engineering Co.
Harris Broadcast Products
Industrial Sciences Inc.
International Nuclear Corp.
KLM Associates
LPB Inc.
Listec Television Equipment Corp. ***B104-B107***
Logitek Electronic Systems
Roger Mayer Electronics Inc.
McCurdy Radio Industries Inc.
McMartin Industries Inc.
MCI Inc.
MPC Educational Systems Inc.
Micro-Trak Corp. ***B114***
Modular Audio Products ***B117***
Opamp Labs ***B123***
QRK Electronic Products Inc. ***B131***
Quad-Eight Electronics
Quantum Audio Labs Inc.
RCA Broadcast Systems
Ramko Research Inc. .. ***B140, B141***
Richmond Sound Design Ltd.
Robins Broadcast and Sound Equipment Corp.
Rockwell International-Collins Broadcast Products
Rupert Neve Inc.
Shure Brothers Inc. ... ***B144, B145***
Sphere Electronics Inc.
Sontec Electronics Corp.
Spectra Sonics
Superscope Inc.
2005 AD Inc.
Tangent Systems Inc.
Technical Audio Products Corp. (TAPCO)
Ultra Audio Pixtec
VIF International
Val-Tronics Inc.
Wilkinson Electronics Inc.

AUDIO CONTROLS

Automated Processes Inc.
Broadcast Electronics Inc. ***B22-B27***
Crown International
Delta Electronics Inc., Div. of Long Engineering Co.
ITI Electronics Inc.
McCurdy Radio Industries Inc.
Shallco Inc.
Spectra Sonics
Tech Laboratories Inc.
2005 AD Inc.
Val-Tronics Inc.
Waters Mfg. Inc.

AUDIO DELAY LINES

ESC Electronics Corp.
Eventide Clockworks Inc.
Gotham Audio Corp.
McCurdy Radio Industries Inc.
Neutrik Products
Quad-Eight Electronics
Ramko Research Inc. .. ***B140, B141***

AUDIO DISC CUTTING EQUIPMENT

Gotham Audio Corp.
Sontec Electronics Corp.
Sphere Electronics Inc.

AUDIO DISC PLAYING EQUIPMENT

Broadcast Electronics Inc. ***B22-B27***
Gotham Audio Corp.
MPC Educational Systems Inc.
Newcomb Audio Products Co.
QRK Electronic Products Inc. ***B131***
Sontec Electronics Corp.
Superscope Inc.

AUDIO DISCS — BLANK LAQUERS

Capitol Magnetic Products, Div. of Capitol Records

AUDIO ENHANCERS

EDCO Products Inc.
Kahn Communications Inc.
Roger Mayer Electronics Inc.
Richmond Sound Design Ltd.
Thomson-CSF Laboratories

AUDIO EQUALIZATION ANALYZER SYSTEMS

Amber Electro Design Ltd.
Comark Industries Inc.
Shure Brothers Inc. ... ***B144, B145***

AUDIO EQUALIZERS

Altec Lansing
Audio Design and Mfg. Inc.
Bogen Division/Lear Siegler Inc.
Crown International Inc.
Gotham Audio Corp.
Heath Co.
ITI Electronics Inc.
International Electro Magnetics
Kahn Communications Inc.
McCurdy Radio Industries Inc.
Micro-Trak Corp. ***B114***
Modular Audio Products ***B117***
Opamp Labs ***B123***
Orange County Electronics Corp. Ltd.
Precision Electronics Inc.
Pulse Techniques Inc.
Quad-Eight Electronics
Ramko Research Inc. .. ***B140, B141***
Richmond Sound Design Ltd.
Robins Broadcast and Sound Equipment Corp.
Roh Corp.
Sescom Inc.
Shure Brothers Inc. ... ***B144, B145***
Sontec Electronics Corp.
Spectra Sonics
Spectrum Instruments Inc.
Sphere Electronics Inc.
TT Electronics Inc.
Technical Audio Products Corp. (TAPCO)
2005 AD Inc.
VIF International

AUDIO FEEDBACK CONTROLLERS

Altec Lansing
Roger Mayer Electronics Inc.
Shure Brothers Inc. ... ***B144, B145***

AUDIO FILTERS

Altec Lansing
Crown International Inc.
ESC Electronics Corp.
Gotham Audio Corp.
Heath Co.
McCurdy Radio Industries Inc.
Marti Electronics Inc. .. ***B110, B111***
Roger Mayer Electronics Inc.
Pulse Techniques Inc.
Quad-Eight Electronics
Sescom Inc.
Shure Brothers Inc. ... ***B144, B145***
Spectra Sonics
Spectrum Instruments Inc.
TT Electronics Inc.
2005 AD Inc.

AUDIO GENERATORS

Amber Electro Design Ltd.
Automated Processes Inc.
Barker and Williamson Inc.
Gaw Co. Inc.
Heath Co.
Leader Instruments Corp.
McMartin Industries Inc.
Quad-Eight Electronics
Radiometer U.S. Corp.
Rohde and Schwarz
Sound Technology
Spectra Sonics
Sphere Electronics Inc.
United Research Laboratory Corp.

AUDIO HEADS, RECORDER REPLACEMENT

Broadcast Electronics Inc. ***B22-B27***
International Electro Magnetics
Minneapolis Magnetics Inc. ***B116***
Taber Mfg. and Eng. Co.
United Research Laboratory Corp.
VIF International

AUDIO LEADER TAPE

AGFA-Gevaert Inc.

AUDIO LINE AMPLIFIERS

Altec Lansing
American Data ***B12***
Audio Design and Mfg. Inc.
Audionics of Oregon
Automated Processes Inc.
BGW Systems Inc.
Bogen Division/Lear Siegler Inc.
Crown International Inc.
Delta Electronics Inc., Div. of Long Engineering Co.
Frezzolini Electronics Inc. ***B58, B59***
ITI Electronics Inc.
International Nuclear Corp.
Kahn Communications Inc.
McCurdy Radio Industries Inc.
McMartin Industries Inc.
Roger Mayer Electronics Inc.
Micro-Trak Corp. ***B114***
Modular Audio Products ***B117***
Rupert Neve Inc.
Opamp Labs ***B123***
Precision Electronics Inc.
Quad-Eight Electronics
Ramko Research Inc. .. ***B140, B141***
Richmond Sound Design Ltd.
Robins Broadcast and Sound Equipment Corp.
Roh Corp.
Sescom Inc.
Shure Brothers Inc. ... ***B144, B145***
Sontec Electronics Corp.
Spectra Sonics
Sphere Electronics Inc.
2005 AD Inc.
Vamco Engineering Inc. ***B160-B162***

AUDIOMETERS

Eckstein Brothers Inc.

AUDIO MODULATORS

Catel, Division of United Scientific Corp.
Roger Mayer Electronics Inc.
Spectra Sonics
Varian Electron Device Group

AUDIO MIXER/PREAMPLIFIERS

Altec Lansing
Ampro Broadcasting Inc.
Audio Designs and Mfg. Inc.
Audionics of Oregon
Autogram Corp.
Automated Processes Inc.
Bogen Division/Lear Siegler Inc.
Broadcast Electronics Inc. ***B22-B27***
Crosspoint Latch Corp. ***B46***
Crown International Inc.
Dage — MTI Inc.
Delta Electronics Inc., Div. of Long Engineering Co.
EDCOR
Heath Co.
ITI Electronics Inc.
Image Devices Inc.
International Microwave Corp.
International Nuclear Corp.
KEL Corp.
KLM Associates
LPB Inc.
McCurdy Radio Industries Inc.
McMartin Industries Inc.
Roger Mayer Electronics Inc.
Micro-Trak Corp. ***B114***
Modular Audio Products ***B117***
Opamp Labs ***B123***
Panasonic Co. ***B124-B129***
Paso Sound Products Inc.
Precision Electronics Inc.
QRK Electronic Products Inc. ***B131***
Quad-Eight Electronics
RTS Systems Inc. ***B139***
Ramko Research Inc. .. ***B140, B141***
Richmond Sound Design Ltd.
Robins Broadcast and Sound Equipment Corp.
Sansui Electronics Corp.
Scientific Systems Inc.
Shure Brothers Inc. ... ***B144, B145***
Sontec Electronics Corp.
Spectra Sonics
Sphere Electronics Inc.
Superscope Inc.
Switchcraft Inc.
Tangent Systems Inc.
Technical Audio Products Corp. (TAPCO)
Telex Communications Inc.
Transist-O-Sound Inc.
2005 AD Inc.
Ultra Audio Pixtec
VIF International

AUDIO MONITOR AMPLIFIERS

Altec Lansing
American Data ***B12***
Audio Designs and Mfg. Inc.
Audionics of Oregon
Autogram Corp.
Automated Processes Inc.
BGW Systems Inc.
Beaveronics Inc. ***B20***
Bogen Division/Lear Siegler Inc.
Broadcast Electronics Inc. ***B22-B27***
Crown International Inc.
Delta Electronics Inc., Div. of Long Engineering Co.
Di-Tech Inc. ***B48***
Frezzolini Electronics Inc. ***B58, B59***
ITI Electronics Inc.
International Nuclear Corp.
McCurdy Radio Industries Inc.
McMartin Industries Inc.
Marti Electronics Inc. .. ***B110, B111***
Micro-Trak Corp. ***B114***
Modular Audio Products ***B117***
Opamp Labs ***B123***
QRK Electronic Products Inc. ***B131***
Quad-Eight Electronics
Ramko Research Inc. .. ***B140, B141***
Roh Corp.
Sansui Electronics Corp.
Scientific Systems Inc.
Sescom Inc.
Spectra Sonics
Superscope Inc.
Telex Communications Inc.
Ultra Audio Pixtec

AUDIO NOISE REDUCTION SYSTEMS

Allison Research Inc.
Audio Designs and Mfg. Inc.
Dolby Laboratories
Gotham Audio Corp.
ITI Electronics Inc.
Inovonics Inc. ***B73***
Kahn Communications Inc.
Roger Mayer Electronics Inc.
Quad-Eight Electronics

AUDIO OPAMPS

Modular Audio Products ***B117***
Opamp Labs ***B123***

AUDIO PATCH PANELS AND CABLES

Audio Accessories Inc.
Audio Designs and Mfg. Inc.
Broadcast Electronics Inc. ***B22-B27***
California Switch and Signal
D'San Corp.
McCurdy Radio Industries Inc.
QRK Electronic Products Inc. ***B131***
Switchcraft Inc.
Trompeter Electronics ***B158***

AUDIO PEAK POWER INDICATOR

Lec Tro Tech Inc.

AUDIO PHASERS

Automated Processes Inc.
Eventide Clockworks Inc.
Gotham Audio Corp.

AUDIO POWER AMPLIFIERS

Altec Lansing
Audionics of Oregon
Automated Processes Inc.
BGW Systems Inc.
Bogen Division/Lear Siegler Inc.
Broadcast Electronics Inc. ***B22-B27***
Crown International Inc.
Delta Electronics Inc., Div. of Long Engineering Co.
Dynair Electronics Inc.
EDCOR
Heath Co.
ITI Electronics Inc.
International Microwave Corp.
International Nuclear Corp.
McCurdy Radio Industries Inc.
McMartin Industries Inc.
Micro-Trak Corp. ***B114***
Modular Audio Products ***B117***
Newcomb Audio Products Co.
Opamp Labs ***B123***
Orange County Electronics Corp. Ltd.
Osawa and Co. USA Inc.
Precision Electronics Inc.
Quad-Eight Electronics
Ramko Research Inc. .. ***B140, B141***
Robins Broadcast and Sound Equipment Corp.
Roh Corp.
Sansui Electronics Corp.
Scientific Systems Inc.
H.H. Scott Inc.
Sescom Inc.
Shure Brothers Inc. ... ***B144, B145***
Superscope Inc.
Technical Audio Products Corp. (TAPCO)
Ultra Audio Pixtec
Varian Electron Device Group

AUDIO PREAMPLIFIERS

Altec Lansing
Audionics of Oregon
Autogram Corp.
Automated Processes Inc.
BGW Systems Inc.
Bogen Division/Lear Siegler Inc.
Broadcast Electronics Inc. ***B22-B27***
Crown International Inc.
Delta Electronics Inc., Div. of Long Engineering Co.
Dynair Electronics Inc.
Frezzolini Electronics Inc. ***B58, B59***
Heath Co.

ITI Electronics Inc.
International Microwave Corp.
International Nuclear Corp.
LPB Inc.
Logitek Electronic Systems
McCurdy Radio Industries Inc.
McMartin Industries Inc.
Roger Mayer Electronics Inc.

Micro-Trak Corp. ***B114***

Modular Audio Products ***B117***

Opamp Labs ***B123***

Orange County Electronics Corp. Ltd.
Osawa and Co. USA Inc.
Paso Sound Products Inc.
Precision Electronics Inc.

QRK Electronic Products Inc. ***B131***

Quad-Eight Electronics

RTS Systems Inc. ***B139***

Ramko Research Inc. ... ***B140, B141***

Richmond Sound Design Ltd.
Roh Corp.
Sansui Electronics Corp.
H.H. Scott Inc.

Sescom Inc.

Shure Brothers Inc. ... ***B144, B145***

Sontec Electronics Corp.
Spectra Sonics
Sphere Electronics Inc.
Superscope Inc.
Telex Communications Inc.
2005 AD Inc.

AUDIO PROGRAMMING

Blue Hill Educational Systems Inc.

AUDIO PUBLIC ADDRESS AMPLIFIERS

Altec Lansing
Automated Processes Inc.
BGW Systems Inc.
Bogen Division/Lear Siegler Inc.
Crown International Inc.
EDCOR
Heath Co.
McCurdy Radio Industries Inc.
McMartin Industries Inc.
MPC Educational Systems Inc.
Newcomb Audio Products Co.
Paso Sound Products Inc.
Perma Power Electronics Inc.
Precision Electronics Inc.

Shure Brothers Inc. ... ***B144, B145***

Spectra Sonics
Telectro Systems Corp.

AUDIO PUBLIC ADDRESS SYSTEMS

Altec Lansing
Bogen Division/Lear Siegler Inc.

Hamilton Electronics Corp.

Precision Electronics Inc.
Richmond Sound Design Ltd.

AUDIO REVERB UNITS

AKG Acoustics ***B7, B8***

Eventide Clockworks Inc.
Gotham Audio Corp.
Logitek Electronic Systems
Quad-Eight Electronics
Robins Broadcast and Sound Equipment Corp.
Sansui Electronics Corp.
Technical Audio Products Corp. (TAPCO)
VIF International

AUDIO ROUTING SWITCHERS

Audio Designs and Mfg. Inc.
Automated Processes Inc.

Beaveronics Inc. ***B20***

Beta Technology Inc.

Broadcast Electronics Inc. ***B22-B27***

Central Dynamics Ltd. ***B41***

Di-Tech Inc. ***B48***

Dynair Electronics Inc.
Dytek Industries Inc.
International Nuclear Corp.

Lenco Inc., Electronics Div. ***B91-B103***

McCurdy Radio Industries Inc.
Roger Mayer Electronics Inc.

Modular Audio Products ***B117***

Opamp Labs ***B123***

Richmond Sound Design Ltd.
Roh Corp.
Utah Scientific Inc.

Vamco Engineering Inc. ***B160-B162***

Vitex Co. ***B173***

AUDIO SEARCH CONTROL

Electronic Engineering Co. of California (EECO)

Sony

AUDIO SLIDE/SYNC RECORDERS AND PLAYERS

MacKenzie Laboratories Inc.
Telex Communications Inc.

AUDIO SPLICING TAPE

AGFA-Gevaert Inc.

Broadcast Electronics Inc. ***B22-B27***

AUDIO SYNCHRONIZATION EQUIPMENT

Ampex Corp.
Automated Processes Inc.
Electronic Engineering Co. of California (EECO)
Martel Electronics
Mincom Division, 3M Co.
Telectro Systems Corp.

AUDIO TAPE ACCESSORIES

AGFA-Gevaert Inc.
A-V Tape Sales Corp.
Ampro Broadcasting Inc.

Broadcast Electronics Inc. ***B22-B27***

Fidelipac
Heath Co.
Ray Jacobs Audio Inc.
LPB Inc.
MPC Educational Systems Inc.
Magnesonics Mfg. and Sales Co.
Maxell Corp. of America

Micro-Trak Corp. ***B114***

Nagy Research Products
Nortronics Co. Inc.
Schuessler Case Co. Inc.
Superscope Inc.
TDK Electronics Corp.
United Research Laboratory Corp.

Vamco Engineering Co. ***B160-B162***

Vulcan Binder and Cover

AUDIO TAPE CARTRIDGE PLAYER/RECORDERS

Amilon Corp.
Ampro Broadcasting Inc.
Audi-Cord Corp.
Beacon-Camera Audio Visual Co. Inc.

Broadcast Electronics Inc. ***B22-B27***

EDCO Products Inc.
Harris Broadcast Products
Heath Co.
International Electro Magnetics
LPB Inc.
MPC Educational Systems Inc.
MacKenzie Laboratories Inc.
Martel Electronics
Superscope Inc.
Telectro Systems Corp.
Telex Communications Inc.
United Research Laboratory Corp.
VIF International

AUDIO TAPE CASSETTE PLAYER/RECORDERS

Amilon Corp.
Ampro Broadcasting Inc.
Avid Corp.

Broadcast Electronics Inc. ***B22-B27***

EDCO Products Inc.
EDCOR Products Inc.

Hamilton Electronics Corp.

Heath Co.
MPC Educational Systems Inc.
Mincom Division, 3M Co.
Newcomb Audio Products Co.
Radmar Inc.
Sansui Electronics Corp.
H.H. Scott Inc.

Sharp Electronics Corp. — Professional Products

Superscope Inc.
Telectro Systems Corp.
Telex Communications Inc.
Uher Corp.
United Research Laboratory Corp.

AUDIO TAPE DUPLICATION

Ray Jacobs Audio Inc.
MPC Educational Systems Inc.
Mincom Division, 3M Co.
Playback Conference Recording Ltd.
Radmar Inc.
Recortec Inc.
Superscope Inc.
TapeAthon Corp.
Telectro Systems Corp.
United Research Laboratory Corp.

AUDIO TAPE DUPLICATORS

Cetec Audio

International Audio Inc.

Ray Jacobs Audio Inc.
MPC Educational Systems Inc.
Mincom Division, 3M Co.
Radmar Inc.
Recordex Corp.
Recortec Inc.
Superscope Inc.
Telex Communications Inc.
United Research Laboratory Corp.

AUDIO TAPE EDITING EQUIPMENT

Automated Processes Inc.

Broadcast Electronics Inc. ***B22-B27***

Electronic Engineering Co. of California (EECO)
Fidelipac
Nagy Research Products
Nortronics Co. Inc.

AUDIO TAPE HEADS

Ampro Broadcasting Inc.

Broadcast Electronics Inc. ***B22-B27***

Ercona Corp.

Frezzolini Electronics Inc. ***B58, B59***

International Electro Magnetics

Minneapolis Magnetics Inc. ***B116***

Nortronics Co. Inc.
Taber Mfg. and Eng. Co.
United Research Laboratory Corp.
VIF International
Vikron

AUDIO TAPE HEAD AND TAPE ERASERS

R.B. Annis Co.
Broadcast Electronics Inc. ***B22-B27***
Chyron ***B42***
Ercona Corp.
Fidelipac
Garner Industries Inc. ***B62***
Magnesonics Mfg. and Sales Co.
Microtran ***B115***
Nortronics Co. Inc.
Taber Mfg. and Eng. Co.
VIF International

AUDIO TAPE MAGNETIC, BULK

AGFA-Gevaert Inc.
Audio Magnetics Corp.
Broadcast Cartridge Service
Broadcast Electronics Inc. ***B22-B27***
Capitol Magnetic Products, Div. of Capitol Records
DAK Industries Inc.
Fidelipac
International Audio Inc.
Irish Magnetic Recording Tape
Ray Jacobs Audio Inc.
MPC Educational Systems Inc.
Superscope Inc.
TDK Electronics Corp.
United Research Laboratory Corp.

AUDIO TAPE MAGNETIC, CASSETTE

A-V Tape Sales Corp.
Ampex Corp.
Audio Magnetics Corp.
Capitol Magnetic Products, Div. of Capitol Records
DAK Industries Inc.
Fuji Photo Film USA Inc.
Irish Magnetic Recording Tape
International Audio Inc.
Ray Jacobs Audio Inc.
MPC Educational Systems Inc.
Maxell Corp. of America
Superscope Inc.
TDK Electronics Corp.
United Research Laboratory Corp.

AUDIO TAPE MAGNETIC, CARTRIDGE

Ampex Corp.
Ampro Broadcasting Inc.
Audio Magnetics Corp.
Broadcast Cartridge Service
Broadcast Electronics Inc. ***B22-B27***
Capitol Magnetic Products, Div. of Capitol Records
Fidelipac
Fuji Photo Film USA Inc.
International Audio Inc.
Irish Magnetic Recording Tape
Ray Jacobs Audio Inc.
MPC Educational Systems Inc.
Maxell Corp. of America
Superscope Inc.
TDK Electronics Corp.

AUDIO TAPE MAGNETIC, REEL TO REEL

AGFA-Gevaert Inc.
A-V Tape Sales Corp.
Ampex Corp.
Audio Magnetics Corp.
Broadcast Electronics Inc. ***B22-B27***
DAK Industries Inc.
Fuji Photo Film USA Inc.
Irish Magnetic Recording Tape
Ray Jacobs Audio Inc.
MPC Educational Systems Inc.
Maxell Corp. of America
Superscope Inc.
TDK Electronics Corp.
United Research Laboratory Corp.

AUDIO TAPE REEL TO REEL PLAYER/RECORDERS

Ampex Corp.
Broadcast Electronics Inc. ***B22-B27***
Ray Jacobs Audio Inc.
MCI Inc.
MPC Educational Systems Inc.
Martel Electronics
Mincom Division, 3M Co.
Scully Recording Instruments
Superscope Inc.
TapeAthon Corp.
Telectro Systems Corp.
Telex Communications Inc.
Uher Corp.
United Research Laboratory Corp.
VIF International

AUDIO TAPE REELS AND BOXES

Plastic Reel Corp. of America

AUDIO TAPE SPLICERS

Broadcast Electronics Inc. ***B22-B27***
Nagy Research Products
Robins Broadcast and Sound Equipment Corp.

AUDIO TAPE STORAGE

Broadcast Cartridge Service
Broadcast Electronics Inc. ***B22-B27***
Display Media Inc.
Harwald Co.
Ray Jacobs Audio Inc.
MPC Educational Systems Inc.
Micro-Trak Corp. ***B114***
Neumade Products Corp.
Robins Broadcast and Sound Equipment Corp.
Reliance Plastics and Packaging Division
Storeel Corp.
TDK Electronics Corp.
Univex International
Vulcan Binder and Cover

AUDIO TEST SET

Delta Electronics Inc., Div. of Long Engineering Co.

AUDIO TAPE TIMERS

Ampex Corp.
Broadcast Electronics Inc. ***B22-B27***

AUDIO TRANSFORMERS

Altec Lansing
Automated Processes Inc.
Crown International Inc.
Delta Electronics Inc., Div. of Long Engineering Co.
Gotham Audio Corp.
Roger Mayer Electronics Inc.
Microtran ***B115***
Modular Audio Products ***B117***
Opamp Labs ***B123***
Sescom Inc.
Shure Brothers Inc. ... ***B144, B145***

AUDIO VISUAL PLANNING AIDS

Heindl Masks 'N' Mounts

AV TRAINING AND EDUCATION PROGRAMS

Motorola Teleprograms Inc.
Thompson-Mitchell and Associates

AUTOMATIC TRANSMISSION SYSTEMS

The Widget Works Inc.

AUTOMATION SYSTEMS, TV

Central Dynamics Ltd. ***B41***
Chrono-Log Corp.
Grass Valley Group Inc.
Programmable Systems Inc.
Vitex Co. ***B173***

AV PRODUCTION SERVICES

AIDS, A Damon Co.
KAPCO Communications
Multi Media Forum ***B122***
Webb Telemedia

AV TRAINING TAPES

Visual Learning Inc.

AUDIO/VIDEO EDITING DUPLICATION AND TRANSFER

KAPCO Communications
Multi Media Forum ***B122***
Webb Telemedia

B

BALUMS

The Finney Co.
North Hills Electronics Inc.

BANDPASS FILTERS

Bird Electronic Corp.
Cadco
Catel, Division of United Scientific Corp.
Coaxial Dynamics Inc.
Comark Industries Inc.
The Finney Co.
Wide Band Engineering Co. Inc.

BAR GRAPH

Colorado Video Inc. ***B31-B38***

BASE INSULATORS AM/FM

Utility Tower Co.

BATTERIES

Alexander Mfg. Co. ***B9***
Anton Bauer ***B13-B16***
Belden Communications Inc.
Cine 60 Inc. ***B44, B45***
Control Technology Inc.
Duracell Products Co.
Frezzolini Electronics Inc. ***B58, B59***
Alan Gordon Enterprises Inc.
Image Devices Inc.
MPC Educational Systems Inc.
Samigon Division/Argraph Corp.
Sanyo Electric Inc.
Sony
Video Components Inc.

BATTERY PACKS

Alexander Mfg. Co. ***B9***
Anton Bauer ***B13-B16***
Belden Communications Inc.
Christie Electric Corp.
Cinecraft International Inc.
Cine 60 Inc. ***B44, B45***

Control Technology Inc.
Data Precision Corp.
Frezzolini Electronics Inc. ***B58, B59***
Alan Gordon Enterprises Inc.
Harris Corp., Broadcast Products Div.
Ikegami Electronics (USA) Inc.
Image Devices Inc.
Panasonic Co. ***B124-D129***
Perrott Engineering Labs Inc. ***B130***
Sony
Superscope Inc.
Television Products Co. Inc.
Topaz Electronics
Video Components Inc.
Yardney Electric Corp.

BATTERY PACK CHARGERS

Alexander Mfg. Co. ***B9***
Anton Bauer ***B13-B16***
Belden Communications Inc.
Cine 60 Inc. ***B44, B45***
Control Technology Inc.
Frezzolini Electronics Inc. ***B58, B59***
Alan Gordon Enterprises Inc.
Image Devices Inc.
Perrott Engineering Labs Inc. ***B130***
Superscope Inc.
Video Components Inc.

BATTERY POWERED LIGHTS

Cine 60 Inc. ***B44, B45***

BATTERY TEST GAUGES/CONDITIONERS

Television Products Inc.

BENCHES, STEEL

Equipto Storage Systems

BLOWERS AND FANS

Amco Engineering Co.
Bud Industries Inc.
Javelin Electronics
Optima Enclosures
Stantron

BROADCASTING AUTOMATION

Bias/Data Communications Corp.
Broadcast Electronics Inc. ***B22-B27***

BRIDGES

CCA Electronics Inc. ***B29***
Delta Electronics Inc.
Harris Corp., Broadcast Products Division
Hamilton Electronics Corp.
Potomac Instruments Inc.
Sadelco Inc.
Val-Tronics Inc.

BROADCAST MODIFICATION AUDIO AND VIDEO KITS

Videomedia Inc. ***B166-B171***

C

CABINETS, RACKS, ENCLOSURES

AMCO Engineering
B and K Instruments Inc.
Bogen Division/Lear Siegler Inc.
Broadcast Electronics Inc. ***B22-B27***
Bud Industries Inc.
Communications Distribution Inc.
Crown International Inc.
Display Media Inc.
Emcor Products/GF Business Equipment Inc.
Enclosure Corp.
GBC Closed Circuit TV Corp.
Harwald Co.
Lyon Metal Products Inc.
McCurdy Radio Industries Inc.
M.M.S. Inc.
Micro-Trak Corp. ***B114***
Multiplex Display Fixture Co.
T.R. Pitts Co.
Plastic Reel Corp. of America
Quad-Eight Electronics
Quick-Set Inc. ***B132-B137***
Research Technology Inc.
Sansui Electronics Corp.
Shintron Co. Inc.
Smith System Mfg.
Storeel Corp.
Superscope Inc.
Toner Cable Equipment Inc.
Topaz Electronics
Vent-Rak, Div. of General Devices Co. Inc.
Winsted ***B175-B182***

CABLE AND EMERGING TECHNOLOGY INFORMATION SERVICE

Communication Commission, National Council of Churches

CABLE LOCATERS

Aqua-Tronics Inc.

CABLE, AUDIO

Boston Insulated Wire and Cable Co.
Brand-Rex Co.
Gotham Audio Corp.
Osawa and Co. USA Inc.
Sansui Electronics Corp.
Saxton Products Inc.
Sescom Inc.
Switchcraft Inc.
Trompeter Electronics ***B158***

CABLE, CAMERA

Anton Bauer ***B13-B16***
Belden Corp.
Boston Insulated Wire and Cable Corp.
Brand-Rex Co.
Diamond Electronics, Div. of Arvin Systems Corp.
Fernseh Group, Robert Bosch Corp.
GBC Closed Circuit TV Corp.
Harris Corp., Broadcast Products Division
Hitachi-Denshi America Ltd. ***B65-B72***
Ikegami Electronics (USA) Inc.
Image Devices Inc.
JVC Industries ***B75-B82***
Panasonic Co. ***B124-B129***
Sony

CABLE, COAXIAL

AEL Inc.
Andrew Corp.
Belden Corp.
Blonder-Tongue Labs
Boston Insulated Wire and Cable Co.
Brand-Rex Co.
Broadcast Electronics Inc. ***B22-B27***
CCA Electronics Corp. ***B29***
CCS Hatfield Wire and Cable
Cablewave Systems Inc.
California Switch and Signal
Cetec Broadcast Group
Comark Industries Inc.
Diamond Electronics, Div. of Arvin Systems
Dyma Engineering Inc.
Dynatech Data Systems
The Finney Co.
GBC Closed Circuit TV Corp.
G.C. Electronics
General Cable Corp.
Harris Corp., Broadcast Products Division
Image Devices Inc.
Javelin Electronics
Maury Microwave Corp.
Micro Control Associates Inc.
Nurad Inc.
Phelps Dodge Communications Co.
Prodelin Inc.
Saxton Products Inc.
Singer Products Co. Inc.
Sony
Steinberg ***B153***
Studer Revox America
Times Wire and Cable Co.
Toner Cable Equipment Co.
Trompeter Electronics ***B158***
Utility Tower Co.
Video Components Inc.
Wilkinson Electronics Inc.
Winegard Television Systems

CABLE, CONTROL

Boston Insulated Wire and Cable Co.
Brand-Rex Co.
Diamond Electronics, Div. of Arvin Systems Inc.
GBC Closed Circuit TV Corp.
Nurad Inc.

CABLE, DIRECT BURIAL

AEL Inc.
Belden Corp.
Brand-Rex Co.
CCA Electronics Corp. ***B29***
Cablewave Systems Inc.
J I Case Davis Div.
Comm/Scope Co.
General Cable Corp.
Times Wire and Cable

CABLE, MICROPHONE

AKG Acoustics ***B7, B8***
Belden Corp.
Boston Insulated Wire and Cable Co.
Broadcast Electronics Inc. ***B22-B27***
CCA Electronics Inc. ***B29***
California Switch and Signal Corp.
Dyma Engineering Inc.
Electro-Voice Inc. ***B50, B51***
G.C. Electronics
Gotham Audio Corp.
Harris Corp., Broadcast Products Division
Image Devices Inc.
Nagra Magnetic Recorders Inc.
Neutrik
Panasonic Co. ***B124-B129***
Saxton Products Inc.
Sescom Inc.
Singer Products Co. Inc.
Sony
Studer Revox America
Switchcraft Inc.
Times Wire and Cable Co.
Whirlwind Audio
Whirlwind Music
Wilkinson Electronics

CABLE PRESSURIZATION EQUIPMENT

Andrew Corp.
McIntire Co.

CABLE TESTER

Delta Electronics Inc., Div. of Long Engineering Co.
Image Devices Inc.

CALIBRATION SERVICES

Alford Mfg. Co.
B and K Instruments Inc.
Bird Electronic Corp.
Commercial Radio Monitoring Co. Inc.
Image Devices Inc.
Leasametric
National Electrolab Ltd.
Photo Research Div. of Kollmorgen Corp.
Potomac Instruments Inc.
Sadelco Inc.
Sencore Inc.
Tektronix Inc.

CALIBRATORS

Sadelco Inc.

CAMERA CRANES

Image Devices Inc.
Listec TV Equipment Corp. B104-B107

CAMERA HOUSINGS, ENVIRONMENTAL

ASACA Corp. of America B17-B19
Cohu Inc., Electronics Division
Dage — MTI Inc.
Electro and Optical Systems Ltd.
GBC Closed Circuit TV Corp.
Alan Gordon Enterprises Inc.
Ikegami Electronics (USA) Inc.
Image Devices Inc.
Javelin Electronics
Panasonic Co. B124-B129
Quick-Set Inc. B132-B137
RCA Electro Optics and Devices
Technovations
Video Components Inc.

CAMERA MOUNTING EQUIPMENT

Cleveland/Price Inc.
Davis and Sanford Co. Inc.
Fax Co.
GBC Closed Circuit TV Corp.
Image Devices Inc.
Innovative Television Equipment
Javelin Electronics
Lee-Ray Industries Inc. B90
Listec Telelvision Equipment Corp. B104, B107
Miller Professional Equipment
O'Connor Engineering Labs. B120, B121
Panasonic Co. B124-B129
Quick-Set Inc. B132-B137
RCA Electro Optics and Devices
Sony
Video Cinema Industries
Video Components Inc.
H. Wilson Corp.

CAMERA PICKUP TUBES

Amperex Electronic Corp.
Ceco Communications Inc.
Dage — MTI Inc.
Diamond Electronics, Div. of Arvin Systems Inc.
EEV Inc.
General Electrodynamics Corp.
GBC Closed Circuit TV Corp.
Levit Electronics
RCA Distributor and Special Products Division
RCA Electro Optics and Devices
Steinberg B153
Video Components Inc.

CAMERA TUBES

Amperex Electronic Corp.
Ceco Communications Inc.
Dage — MTI Inc.
Levit Electronics
Thomson-CSF Electron Tubes

CAMERAS, CCTV BLACK AND WHITE

ASACA Corp. of America B17-B19
Canadian General Electric Co. Ltd.
Cohu Inc., Electronics Division
Dage — MTI Inc.
Diamond Electronics, Div. of Arvin Systems Inc.
GBC Closed Circuit TV Corp.
General Electrodynamics Corp.
Hitachi-Denshi America Ltd. B65-B72
Ikegami
Javelin Electronics
Levit Electronics
NEC America Inc.
Panasonic Co. B124-B129
QSI Systems Inc.
RCA Electro Optics and Devices
R.F. Systems Co. — PA
Sanyo Electric Inc.
Sharp Electronics Corp. — Professional Products
Sony
Video Optics Inc.

CAMERAS, CCTV COLOR

ASACA Corp. of America B17-B19
Canadian General Electric Co. Ltd.
Cohu Inc., Electronics Division
Hitachi-Denshi America Ltd. B65-B72
Ikegami
JVC B75-B82
Levit Electronics
Panasonic Co. B124-B129
Philips
Sanyo Electric Inc.
Sharp Electronics Corp. — Professional Products
Sony

CAMERAS, DUMMY

Canadian General Electric Co. Ltd.
Dage — MTI Inc.
GBC Closed Circuit TV Corp.
Panasonic Co. B124-B129
RCA Electro Optics and Devices
R.F. Systems Co. — PA
Sanyo Electric Inc.

CAMERAS, FILM CHAIN

C.R.V. Systems
Cohu Inc., Electronics Division
Commercial Electronics Inc. . . B30
Comquip Inc.
Fernseh Group, Robert Bosch Corp.
GBC Closed Circuit TV Corp.
Harris Corp., Broadcast Products Division
Hitachi-Denshi America Ltd. B65-B72
Ikegami Electronics (USA) Inc.
Marconi Communication Systems Ltd.
Panasonic Co. B124-B129
Philips
RCA Broadcast Systems
Sharp Electronics Corp.
Sony
Telemation B154-B156
Thomson-CSF Laboratories
Videodetics Corp.

CAMERAS, FILM CINE

Arriflex Co. of America
Canon USA Inc.
Eastman Kodak Co.
Frezzolini Electronics Inc. B58, B59
Alan Gordon Enterprises Inc.
Harris Corp., Broadcast Products Division
Karl Heitz Inc.
Image Devices Inc.
L-W International
Minolta Corp.
RCA Broadcast Systems
Super 8 Sound Inc.
Teledyne Camera Systems
Video Components Inc.

CAMERAS, FILM STILL

Canon USA Inc., Optics Division
Comquip Inc.
Eastman Kodak Co.
Karl Heitz Inc.
Image Devices Inc.
Minolta Corp.
Radmar Inc.
Sickles Inc.

CAMERAS, SURVEILLANCE

ATV Research
ASACA Corp. of America B17-B19
Canadian General Electric Co. Ltd.
Cohu Inc., Electronics Division
Comquip Inc.
Dage — MTI Inc.
Diamond Electronics, Div. of Arvin Systems Inc.
Dyma Engineering Inc.
Eastman Kodak Co.
General Electric Co.
General Electrodynamics Corp.
Karl Heitz Inc.
Hitachi-Denshi America Ltd. B65-B72
Ikegami
Image Devices Inc.
Javelin Electronics
L-W International
Lenzar Optics Corp.
Marconi Communication Systems Ltd.
NEC America
Panasonic Co. B124-B129
Power-Optics Inc.
QSI Systems Inc.
RCA Electro Optics and Devices
R.F. Systems Co. — PA
Sanyo Electric Inc.
Sharp Electronics Corp. — Professional Products
Sony
Technovations
Teledyne Camera Systems
Telemation B154-B156
Telescript Inc.
Teltron Inc.

CAMERAS, TV BLACK AND WHITE PORTABLE

ASACA Corp. of America B17-B19
Dage — MTI Inc.
Diamond Electronics, Div. of Arvin Systems Inc.
GBC Closed Circuit TV Corp.
Hitachi-Denshi America Ltd. B65-B72
Ikegami
Image Devices Inc.
Javelin Electronics
Levit Electronics
Panasonic Co. B124-B129
Sanyo Electric Inc.
Sony

CAMERAS, BLACK AND WHITE STUDIO BROADCAST

ASACA Corp. of America B17-B19
Dage — MTI Inc.
Image Devices Inc.
Levit Electronics
Panasonic Co. B124-B129
Philips
Video Optics Inc.

CAMERAS, TV COLOR PORTABLE

Ampex Corp.
ASACA Corp. of America B17-B19
Frezzolini Electronics Inc. B58, B59
GBC Closed Circuit TV Corp.
Hitachi-Denshi America Ltd. B65-B72
Image Devices Inc.
JVC
Levit Electronics
Panasonic Co. B124-B129
Philips
Sharp Electronics Corp. — Professional Products
Sony

CAMERAS, TV COLOR PORTABLE BROADCAST

Ampex Corp.
ASACA Corp. of America B17-B19
Commercial Electronics Inc. . . B30
Custom Films Inc.
Frezzolini Electronics Inc. B58, B59
GBC Closed Circuit TV Corp.
Hitachi-Denshi America Ltd. B65-B72
Image Devices Inc.
JVC B75-B82
Levit Electronics
NEC America Inc.
Panasonic Co. B124-B129
Philips
RCA Broadcast Systems
Sharp Electronics Corp. — Professional Products
Sony
Thomson-CSF Laboratories

CAMERAS, TV COLOR STUDIO BROADCAST

All Mobile Video Inc.
Ampex Corp.
CCA Electronics Corp. B29
C.R.V. Systems Inc.
Commercial Electronics Inc. . . B30
Dyma Engineering Inc.
Fernseh Group, Robert Bosch Corp.
GBC Closed Circuit TV Corp.
Harris Corp., Broadcast Products Division
Hitachi-Denshi America Ltd. B65-B72
Ikegami
Image Devices Inc.
International Video Corp.
Levit Electronics
Marconi Communication Systems Ltd.
Marconi Electronics Inc.
Panasonic Co. B124-B129
Philips
RCA Broadcast Systems
Sharp Electronics Corp. — Professional Products
Sony
Thomson-CSF Laboratories

CAMERAS, TV HAND HELD

Ampex Corp.
ASACA Corp. of America B17-B19
Commercial Electronics Inc. . . B30
Custom Films Inc.
Frezzolini Electronics Inc. B58, B59
GBC Closed Circuit TV Corp.
Hitachi-Denshi America Ltd. B65-B72
Image Devices Inc.
Javelin Electronics
Levit Electronics
Panasonic Co. B124-B129
Philips
RCA Broadcast Systems
RCA Electro Optics and Devices
Sanyo Electric Inc.
Sharp Electronics Corp. — Professional Products
Sony
Thomson-CSF Laboratories

CARRELS, STUDY

MPC Educational Systems Inc.

CARTRIDGE LABELS

Broadcast Electronics Inc. B22-B27
Fidelipac
Image Devices Inc.

CARTRIDGE RECORDING SERVICES

AIDS, A Damon Corp.
Broadcast Component Dist.
Pentagon Industries Inc.
TapeAthon Corp.

CARTRIDGES, PHONO

AKG Acoustics B7, B8
Broadcast Electronics Inc. B22-B27
Ercona Corp.
Gotham Audio Corp.
LPB Inc.
Osawa and Co. USA Inc.

CASSETTE CLEANERS

Chyron Corp. B42

CATALOG DESIGN

The Bill Daniels Co. Inc. . B55, B74, B91, B109, B112, B174

CATALOGS, SPECIFICATION SHEETS, BROCHURES

Altec Lansing
Communication Commission, National Council of Churches
The Bill Daniels Co. Inc. . B55, B74, B91, B109, B112, B174
Heath Co.
MPC Educational Systems Inc.
Charles Mayer Studios Inc.
RCA Distributor and Special Products Division
Smith System Mfg.

CATV CONSTRUCTION ACCESSORIES

Burnup and Sims Inc.
EEG Enterprises Inc.
Hunt-Pierce Corp.
International Nuclear Corp.
Jackson Communications Corp.
Lightning Elimination Associates Inc.
Magnavox CATV System Inc.
Microdyne Corp.
Microwave Filter Co. Inc.
T.R. Pitts Co.
TOCOM Inc.
Toner Cable Equipment Inc.

CATV PAYMENT SYSTEMS

T.R. Pitts Co.

CATV REPLACEMENT COMPONENTS

Broadband Engineering Inc.

CHART RECORDERS

Fax Co.
Heath Co.
Toner Cable Equipment Inc.

CHECQUE VISION — CCTV SYSTEM

GBC Closed Circuit TV Corp.

CHROMA DECODER

Broadcast Video Systems Ltd. B28
Lenco Inc., Electronics Div. B91-B103
Vitex Co. B173

CHROMA KEY SYNCHRONIZED BACKGROUND EQUIPMENT

Power Optics

CHROMA KEYERS

American Data B12
Beaveronics Inc. B20
Broadcast Video Systems Ltd. B28
Central Dynamics Ltd. B41
Crosspoint Latch Corp. B46
Dyma Engineering Inc.
Dynasciences Div. Whitaker Corp.
Industrial Sciences Inc.
International Nuclear Corp.
J and D International
Panasonic Co. B124-B129
Shintron Co. Inc.
Thomson-CSF Laboratories
3M Co. — Mincom Division
Vital Industries Inc.
Vitex Co. B173

CHURCH FILM AND VIDEO INFORMATION

Communication Commission, National Council of Churches

CLOCKS DIGITAL AND DIGITAL DRIVER

Automated Broadcast Controls
Beaveronics Inc. B20
Broadcast Aids Inc.
Broadcast Electronics Inc. B22-B27
Caringella Electronics Inc.
Channelmatic Electronics Inc.
Chrono-Log Corp.
Digital Concepts Corp.
E.S.E. B56, B57

Harris Corp., Broadcast Products Division
Heath Co.
Industrial Sciences Inc.
McCurdy Radio Industries Inc.
Nationwide Electronic Systems Inc.
QRK Electronic Products Inc. ***B131***
QSI Systems Inc.
Ramko Research Inc. ... ***B140, B141***
Rohde and Schwarz
Singer Products Co. Inc.
Superscope Inc.
Vamco Engineering Inc. ***B160-B162***
Westlake Audio

CLOCKS, STATION MASTER CONTROL

Beta Technology Inc.
Channelmatic Electronics Inc.
Chrono-Log Corp.
Datametrics Inc.
Digital Concepts Corp.
E.S.E. ***B56, B57***
Kaitronics Corp.
Laird Telemedia Inc.
Leitch Video Ltd.
Nationwide Electronic Systems Inc.
QSI Systems Inc.
Singer Products Co. Inc.
Sono-Mag Corp.
Vamco Engineering Inc. ***B160-B162***
Video Devices Co.

CLOCKS AND TIME SYSTEMS

Beaveronics Inc. ***B20***
Broadcast Electronics Inc. ***B22-B27***
Caringella Electronics Inc.
Channelmatic Electronics Inc.
Chrono-Log Corp.
Digital Concepts Corp.
D'San Corp.
E.S.E. ***B56, B57***
Electronic Engineering Co. of California (EECO)
Harwood Mfg. Co.
Heath Co.
Leitch Video Ltd.
Logical Products Co.
McCurdy Radio Industries Inc.
Nationwide Electronic Systems Inc.
QSI Systems Inc.
Vamco Engineering Inc. ***B160-B162***
Video Components Inc.

CLOSED CIRCUIT INTERCOM SYSTEMS

Bogen Division/Lear Siegler Inc.
Catel, Division of United Scientific Corp.
Clear-Com
Image Devices Inc.
Video Aids of Colorado ***B163***

COLOR ANALYZER, ELECTRONIC

Power Optics

COLOR CORRECTORS

BJA Systems Inc.
Broadcast Video Systems Ltd. ***B28***

COLOR MEDIA FILTERS

Belden Communications Inc.
Image Devices Inc.

COLOR TEMPERATURE METERS

Photo Research Div. Kollmorgen Corp.

COMBINERS

Comark Industries Inc.
Continental Electronics Mfg. Co.
The Finney Co.
Micro Communications Inc.

COMMUNICATION SYSTEMS, LAND — MOBILE

Altec Lansing
Atlantic Research Corp.
David Clark Co. Inc.
Coastcom
Comark Industries Inc.
Dynair Electronics Inc.
GTE Lenkurt Inc.
Image Devices Inc.
International Microwave Corp.
KEL Corp.
Leasametric
McMartin Industries Inc.
Marti Electronics Inc. .. ***B110, B111***
Paso Sound Products Inc.
Raytheon Data Systems
TOCOM Inc.
Turner Division of Conrac Corp.

COMMUNICATIONS SERVICE MONITORS

GTE Lenkurt Inc.
Lampkin Laboratories

COMMUNICATIONS SYSTEMS RENTAL — LEASE

Leasametric

COMPARATOR, TIME CODE

E.S.E. ***B56, B57***
Skotel Corp. ***B146***

COMPUTER BUSINESS SERVICES

Bias/Data Communications Corp.
Columbine Systems Inc.
Paperwork Systems Inc.
Raytheon Data Systems
Toner Cable Equipment Inc.

COMPUTER/DATA PROCESSING

Kapco Communications

COMPUTER EQUIPMENT

Ampex Corp.
Bristol Division of Acco
Columbine Systems Inc.
Heath Co.
Moseley Associates Inc.
Nationwide Electronic Systems Inc.
Raytheon Data Systems
Eric Small and Associates Inc.
Toner Cable Equipment Inc.

CONDUIT, PLASTIC

Wipco

CONNECTORS, CAMERA CABLE

Boston Insulated Wire and Cable Co.
Image Devices Inc.

CONSOLES, AUDIO AM

Accurate Sound Co.
Amco Engineering Co.
Ampro Broadcasting Inc.
Audio Designs and Mfg. Inc.
Audio Interface Inc.
Auditronics Inc.
Autogram Corp.
Automated Processes Inc.
Bayly Engineering Ltd.
Broadcast Electronics Inc. ***B22-B27***
Bud Industries Inc.
CCA Electronics Corp. ***B29***
Cetec Audio
Cetec Broadcast Corp.
Contel Mfg.
Custom Audio Electronics
Dyma Engineering Inc.
Harris Corp., Broadcast Products Division
Industrial Sciences Inc.
International Communications and Control Corp.
J and D International
LPB Inc.
Listec Television Equipment Co. ***B104-B107***
Logitek Electronic Systems
McCurdy Radio Industries Inc.
McMartin Industries Inc.
Roger Mayer Electronics Inc.
Micro-Trak Corp. ***B114***
Modular Audio Products ***B117***
Rupert Neve Inc.
Opamp Labs Inc. ***B123***
Pacific Recorders and Engineering Corp.
QRK Electronic Products Inc. ***B131***
Quad-Eight Electronics
Quantum Audio Labs Inc.
RCA Broadcast Systems
Ramko Research Inc. .. ***B140, B141***
Richmond Sound Design Ltd.
Robins Broadcast and Sound Equipment Corp.
Rockwell International-Collins Broadcast Products
Russco Electronics Mfg. Inc.
Shure Brothers Inc. ... ***B144, B145***
Singer Products Co. Inc.
Sontec Electronics Corp.
Spectra Sonics
Studer Revox America
Superscope Inc.
Tangent Systems Inc.
Tri-Tronics Professional Electronics
UMC Electronics Co., Broadcast Products Division
Ultra Audio Pixtec
United Recording Electronics Industries
Val-Tronics
Ward-Beck Systems Ltd.
Wilkinson Electronics Inc.
Yamaha International Corp.

CONSOLES, AUDIO FM

Accurate Sound Co.
Amco Engineering Co.
Ampro Broadcast Inc.
Audio Designs and Mfg. Co.
Audio Interface Inc.
Auditronics Inc.
Autogram Corp.
Automated Processes Inc.
Bayly Engineering Ltd.
Broadcast Electronics Inc. ***B22-B27***
Bud Industries Inc.
CCA Electronics Corp. ***B29***
Cetec Audio
Cetec Broadcast Group
Contel Mfg.
Custom Audio Electronics
Dyma Engineering Inc.
Harris Corp., Broadcast Products Division
Holland Electronics
Industrial Sciences Inc.
International Communications and Control Corp.
J and D International
LPB Inc.
Listec Television Equipment Corp. ***B104-B107***
Logitek Electronic Systems
McCurdy Radio Industries Inc.
McMartin Industries Inc.
Roger Mayer Electronics Inc.
Micro-Trak Corp. ***B114***

Modular Audio Products B117
Rupert Neve Inc.
Opamp Labs Inc..... B123
Pacific Recorders and Engineering Corp.
Pulse Dynamics Mfg. Corp.
QRK Electronic Products Inc..... B131
Quad-Eight Electronics
Quantum Audio Labs Inc.
RCA Broadcast Systems
Ramko Research Inc... B140, B141
Richmond Sound Design Ltd.
Robins Broadcast and Sound Equipment Corp.
Rockwell International-Collins Broadcast Products
Roh Corp.
Russco Electronics Mfg. Inc.
Shure Brothers Inc. ... B144, B145
Singer Products Co. Inc.
Sontec Electronics Corp.
Spectra Sonics
Studer Revox Inc.
Superscope Inc.
Tangent Systems Inc.
Tri-Tronics Professional Electronics
UMC Electronics Co., Broadcast Products Division
Ultra Audio Pixtec
United Recording Electronics Industries
Val-Tronics Inc.
Ward-Beck Systems Ltd.
Yamaha International Corp.

CONSOLES, AUDIO PORTABLE

Altec Lansing
Amco Engineering Co.
Audio Design and Recording Inc.
Auditronics
Audio Designs and Mfg. Inc.
Automated Processes Inc.
BSC Inc.
Bayly Engineering Ltd.
Boston Sound and Power Corp.
Broadcast Electronics Inc..... B22-B27
Bud Industries Inc.
CCA Electronics Corp. B29
Central Dynamics Corp..... B41
Cetec Broadcast Group
Collins Television Services
Custom Audio Electronics
Delta Electronics Inc., Div. of Long Engineering Co.
Dyma Engineering Inc.
Harris Corp., Broadcast Products Division
Industrial Sciences Inc.
International Communications and Control Corp.
J and D International
LPB Inc.
Listec Television Equipment Corp. B104-B107
McCurdy Radio Industries Inc.
McMartin Industries Inc.
Roger Mayer Electronics Inc.
Micro-Trak Corp. B114
Modular Audio Products B117
Moseley Associates Inc.
Rupert Neve Inc.
Opamp Labs Inc..... B123
Pulse Dynamics Mfg. Corp.
QRK Electronic Products Inc..... B131
Quad-Eight Electronics
Quantum Audio Labs Inc.
RCA Broadcast Systems
Ramko Research Inc... B140, B141
Richmond Sound Design Ltd.
Robins Broadcast and Sound Equipment Corp.
Shure Brothers Inc. ... B144, B145
Sontec Electronics Corp.
Spectra Sonics
Sphere Electronics Inc.
Studer Revox America
Superscope Inc.
TEAC Corp. of America
Tangent Systems Inc.
Technical Audio Products Corp. (TAPCO)
Tri-Tronics Professional Electronics
2005 AD Inc.
UMC Electronics Co., Broadcast Products Division
Ultra Audio Pixtec
Val-Tronics Co.
Ward-Beck Systems Ltd.
Westlake Audio
Yamaha International Corp.

CONSOLES, AUDIO RECORDING

Accurate Sound Co.
Altec Lansing
Amco Engineering Co.
Ampro Broadcasting Inc.
Audio and Design Recording Co.
Audio Designs and Mfg. Inc.
Audio Interface Inc.
Auditronics Inc.
Automated Processes Inc.
BSC Inc.
Broadcast Electronics Inc..... B22-B27
Bud Industries Inc.
Cetec Audio
Cetec Broadcast Group
Custom Audio Electronics Inc.
Delta Electronics Inc., Div. of Long Engineering Corp.
Dyma Engineering Inc.
Harris Corp., Broadcast Products Division
Holland Electronics
Industrial Sciences Inc.
International Communications and Control Corp.
J and D International
LPB Inc.
Listec Television Equipment Corp. B104-B107
Logitek Electronic Systems
McCurdy Radio Industries Inc.
McMartin Industries Inc.
MCI Inc.
Magna-Tech Electronic Co. Inc.
Roger Mayer Electronics Inc.
Micro-Trak Corp. B114
Modular Audio Products B117
Rupert Neve Inc.
Opamp Labs Inc..... B123
Quad-Eight Electronics
Quantum Audio Labs Inc.
Ramko Research Inc... B140, B141
Richmond Sound Design Ltd.
Robins Broadcast and Sound Equipment Corp
Shure Brothers Inc. . . B144, B145
Singer Products Co. Inc.
Sontec Electronics Corp.
Spectra Sonics
Sphere Electronics Inc.
Superscope Inc.
Tangent Systems Inc.
Technical Audio Products Corp. (TAPCO)
2005 AD Inc.
VIF International

CONSOLES, AUDIO TV

Amco Engineering Co.
Ampro Broadcast Inc.
Audio Designs and Mfg. Inc.
Auditronics Inc.
Automated Processes Inc.
BSC Inc.
Broadcast Electronics Inc..... B22-B27
Bud Industries Inc.
Central Dynamics Corp..... B41
Cetec Audio
Collins Television Services
Communications Systems, Division of Powell Tool Supply Inc.
Delta Electronics Inc., Div. of Long Engineering Co.
Dyma Engineering Inc.
Dytek Industries Inc.
Harris Corp., Broadcast Products Division
Holland Electronics
Industrial Sciences Inc.
International Communications and Control Corp.
International Nuclear Corp.
J and D International
LPB Inc.
Listec Television Equipment Corp. B104-B107
Logitek Electronic Systems
McCurdy Radio Industries Inc.
McMartin Industries Inc.
Marconi Electronics Corp.
Roger Mayer Electronics Inc.
Micro-Trak Corp. B114
Modular Audio Products B117
Rupert Neve Inc.
Opamp Labs Inc..... B123
Panasonic Co..... B124-B129
Philips
QRK Electronic Products Inc..... B131
Quad-Eight Electronics
Quantum Audio Labs Inc.
RCA Broadcast Systems
Ramko Research Inc... B140, B141
Richmond Sound Design Ltd.
Robins Broadcast and Sound Equipment Corp.
Singer Products Co. Inc.
Sontec Electronics Corp.
Spectra Sonics
Summit Cinevideo Corp.
2005 AD Inc.
Ultra Audio Pixtec
Val-Tronics Inc.
Ward-Beck Systems Ltd.
Yamaha International Corp.

CONSOLES, STEREO

Amco Engineering Co.
Ampro Broadcasting Inc.
Audio Designs and Mfg. Inc.
Audio Interface Inc.
Auditronics Inc.
Autogram Corp.
Automated Processes Inc.
BSC Inc.
Broadcast Electronics Inc..... B22-B27
Bud Industries Inc.
CCA Electronics Corp. B29
Cetec Audio
Cetec Broadcast Group
Custom Audio Electronics
Delta Electronics Inc., Div. of Long Engineering Co.
Dyma Engineering Inc.
Electrohome Ltd..... B52, B53
Harris Corp., Broadcast Products Division
Industrial Sciences Inc.
International Communications and Control Corp.
J and D International
LPB Inc.
Listec Television Equipment Corp. B104-B107
Logitek Electronic Systems
McCurdy Radio Industries Inc.
McMartin Industries Inc.
Roger Mayer Electronics Inc.
Micro-Trak Inc..... B114
Modular Audio Products B117
Rupert Neve Inc.
Opamp Labs Inc..... B123
QRK Electronic Products Inc..... B131
Quad-Eight Electronics
Quantum Audio Labs Inc.
RCA Broadcast Systems
Ramko Research Inc... B140, B141
Richmond Sound Design Ltd.
Robins Broadcast and Sound Equipment Corp.
Russco Electronics Mfg. Inc.
Singer Products Co. Inc.
Sontec Electronics Corp.
Spectra Sonics
Sphere Electronics Inc.
Superscope Inc.
Tangent Systems Inc.
Technical Audio Products Corp. (TAPCO)
2005 AD Inc.
Val-Tronics Inc.
Ward-Beck Systems Ltd.
Westlake Audio
Wilkinson Electronics Inc.

CONSOLES, VIDEO PORTABLE

American Data B12
Amco Engineering Co.

Broadcast Video Systems Ltd. ***B28***
Bud Industries Inc.
C.R.V. Systems Inc.
Crosspoint Latch Corp. ***B46***
Dage – MTI Inc.
Dyma Engineering Inc.
Dytek Industries Inc.
Evenview Television Systems
GBC Closed Circuit TV Corp.
Industrial Sciences Inc.
International Nuclear Corp.
J and D International
Listec Television Equipment Corp. ***B104-B107***
RCA Broadcast Systems
Richmond Hill Laboratories Ltd.
Ross Video Ltd.
Sony Corp. of America
Victor Duncan Inc.
Video Components Inc.
Videodetics Inc.
Vital Industries Inc.
Weather Scan Inc.
Winsted Corp. ***B175-B182***

CONSOLES, VIDEO STUDIO

American Data ***B12***
Amco Engineering Co.
Broadcast Video Systems Ltd. ***B28***
Bud Industries Inc.
C.R.V. Systems Inc.
Central Dynamics Corp. ***B41***
Crosspoint Latch Corp. ***B46***
Dage – MTI Inc.
Dyma Engineering Inc.
Dytek Industries Inc.
GBC Closed Circuit TV Corp.
Grass Valley Group
Industrial Sciences Inc.
International Nuclear Corp.
J and D International
Laird Telemedia Inc.
Listec Television Equipment Corp. ***B104-B107***
Marconi Electronics Corp.
Panasonic Co. ***B124-B129***
Philips
RCA Broadcast Systems
Richmond Hill Laboratories Inc.
Ross Video Ltd.
Shintron Co. Inc.
Sony Corp. of America
Video Components Inc.
Videodetics Inc.
Vital Industries Inc.
Weather Scan Inc.
Winsted Corp. ***B175-B182***

CONSULTANTS, AV FACILITIES

Audio Visual Contractors

CONVERTERS, FREQUENCY

AEL Inc.
California Instruments
Catel, Division of United Scientific Corp.
Communication Modifications Inc.
The Finney Co.
Marconi Electronics Inc.
Motorola SPI
Mu-Del Electronics Inc.
North Hills Electronics Inc.
Oak Industries Inc.
Philips Test and Measuring Instruments Inc.
Telemet a Geotel Co.
Topaz Electronics

COPY STAND, TRANSPARENCY PREPARATION

Impact Communications Inc.
Leedal Inc.

CRYSTALS

Image Devices Inc.
Marti Electronics Inc. .. ***B110, B111***

CUSTOM CASES

Image Devices Inc.
Lowenthal Mfg.
Lumitrol Ltd. Theatre Lighting

CUSTOM CONTROL LIGHTING SYSTEMS

Electronics Diversified Inc. ***B54***
Kliegl Brothers ***B84-B88***
Skirpan Lighting Control Corp.
Strand Century Inc.

CUSTOM CONTROL SYSTEMS

Audio Visual Contractors
Erskine-Shapiro Theatre Technology Inc.
Industrial Sciences Inc.
McCurdy Radio Industries Inc.
Moseley Associates Inc.
Nationwide Electronic Systems Inc.
Quad-Eight Electronics
Richmond Sound Design Ltd.
Summit Cinevideo Corp.
TOCOM Inc.

CUTTING ROOMS

Color Stock Library Inc. and Lem Bailey Prod.
Image Devices Inc.

CYCLORAMA, STUDIO DRAPERY

Automatic Devices Co.
The Janson Industries
Lumitrol Ltd.

D

DARKROOM EQUIPMENT

Leedal Inc.

DATA CAMERA

Colorado Video Inc. ***B31-B38***

DATA INSERTION GENERATOR

Colorado Video Inc. ***B31-B38***

DATA LOGGING

Broadcast Electronics Inc. ***B22-B27***
Nationwide Electronic Systems Inc.

DATA RECEIVERS

American Modem Corp.
Catel, Division of United Scientific Corp.
Coastcom
GTE Lenkurt Inc.
Leasametric
Microdyne Corp.
Moseley Associates Inc.
Nationwide Electronics Systems Inc.
Raytheon Data Systems

DATA TRANSMITTER

American Modem Corp.
Catel, Division of United Scientific Corp.
Coastcom
GTE Lenkurt Inc.
Moseley Associates Inc.
Nationwide Electronics Systems Inc.
Raytheon Data Systems

DECODERS, TONE

American Microsignal Co.
Ampro Broadcasting Inc.
Bayly Engineering Ltd.
Channelmatic Electronics Inc.
Coastcom
Di-Tech Inc. ***B48***
Dyma Engineering Inc.
Elcom Engineering Co. ***B49***
Gorman Redlich Mfg. Co.
IGM Div. of Northwestern Tech.
International Nuclear Corp.
Marti Electronics Inc. .. ***B110, B111***
Monroe Electronics Inc. ***B118***
Rivers Associates Inc.
Time and Frequency Technology Inc.
Toner Cable Equipment Inc.
UMC Electronics Co., Broadcast Products Division
Val-Tronics Inc.
Vega Electronics

DEMAGNETIZERS, TAPE

R.B. Annis Co.
Broadcast Electronics Inc. ***B22-B27***
CCA Electronics Corp. ***B29***
Cetec Broadcast Group
Chyron ***B42***
Fidelipac
G.C. Electronics
Garner Industries Inc. ***B62***
Harris Corp., Broadcast Products Division
International Tapetronics Corp.
J and R Film Co. — Goldberg/Compco
MPC Educational Systems Inc.
Magnasync/Moviola Corp.
Magnesonics Mfg. and Sales Co.
Microtran Co. Inc. ***B115***
Nortronics Co. Inc.
Optek
Pentagon Industries Inc.
Robins Broadcast and Sound Equipment Corp.
TEAC Corp. of America
TDK Electronics Corp.
Taber Mfg. and Eng. Co.
UMC Electronics Co., Broadcast Products Div.
United Research Laboratory
Val-Tronics Inc.
Wide Range Electronics Corp.

DEMODULATORS

Catel, Division of United Scientific Corp.
Comark Industries Inc.
Rohde and Schwarz

DEMODULATORS, OPTICAL

Radiation Devices Co. Inc.
Telemet a Geotel Co.
Video Aids Corp. of Colorado ***B163***

DIAMETER ANALYZER

Colorado Video Inc. ***B31-B38***

DIGITAL AND ANALOG EQUIPMENT

Bristol Division of Acco
Lenco Inc., Electronics Div. ***B91-B103***
Micro Control Associates Inc.
Raytheon Data Systems

DIGITAL FRAME SYNCHRONIZER

ADDA Corp. ***B6***

DIGITAL HEAD REFURBISHING

Minneapolis Magnetics Inc. . ***B116***

DIGITAL METERS

Amber Electro Design Ltd.
Dranetz Engineering Laboratories Inc.
Nationwide Electronic Systems Inc.
Photo Research, Division Kollmorgen Corp.

DIGITAL MULTIMETERS

California Instruments
Data Precision Corp.
Dranetz Engineering Laboratories Inc.

DIGITAL PRODUCTION TIMERS

E.S.E. ***B56, B57***
Vamco Engineering Inc. ***B160-B162***

DIGITAL STOPWATCHES

E.S.E. ***B56, B57***
Image Devices Inc.
Nationwide Electronic Systems Inc.

DIGITAL TIMERS

Chrono-Log Corp.
Digital Concepts Corp.
E.S.E. ***B56, B57***
Image Devices Inc.
Nationwide Electronic Systems Inc.

DIPLEXERS, AM

Comark Industries Inc.
Continental Electronics Mfg. Co.

DIPLEXERS, FM

Cetec Jampro

DIPLEXERS, TV

Cetec Jampro
Comark Industries Inc.

DIRECTIONAL COUPLERS

Coaxial Dynamics Inc.
Comark Industries Inc.
Wide Band Engineering Co. Inc.

DISCO LIGHTING EFFECTS

Oregon Sound and Lights

DISCREET SECURITY ENCLOSURES

Video Components Inc.

DISCS, VIDEO

Ampex Corp.
Arvin/Echo Science Corp.
Chyron Telesystems
Computer Magnetics Corp.
Eigen Video
Panasonic Co. ***B124-B129***
Teknekron/TRAX

DISSOLVE CONTROLS

Logical Products Co.

DISTORTION MEASUREMENT SET

Amber Electro Design Ltd.
ASACA Corp. of America B17-B19
Hewlett Packard ***B64***

DISTRIBUTOR, EDUCATIONAL FILMS

Color Stock Library Inc. and Lem Bailey Prod.

DRAFTING SERVICES TV AND RADIO FACILITIES

Beaveronics Inc. ***B20***

DROPOUT COMPENSATORS

Ampex Corp.
Digital Video Systems

E

EARTH STATION FREQUENCY COORDINATION

Compucon Inc.

EASELS AND ACCESSORIES

Oravisual Co. Inc.

E.B.S. TWO TONE SYSTEM

Broadcast Electronics Inc. ***B22-B27***
Channelmatic Electronics Inc.
E.S.E. ***B56, B57***
Elcom Engineering Co. ***B49***
Gorman Redlich Mfg. Co.
International Nuclear Corp.
Logitek Electronic Systems
McMartin Industries Inc.
Time and Frequency Technology Inc.

EDITING CONSOLES

Consolidated Video Systems . ***B39***
Datatron Inc.
Image Devices Inc.
The Winsted Corp. ***B175-B182***

EDITING SERVICES

Color Stock Library Inc. and Lem Bailey Prod.

ELECTRICAL GAVEL

CA Compton Inc.

ELECTRO OPTICAL ISOLATORS

Video Aids of Colorado ***B163***

ELECTRONIC CONSULTING

Applied Video Electronics Inc.
Comark Industries Inc.
EEG Enterprises Inc.
Levit Electronics

ELECTRONIC DESIGN AND DEVELOPMENT

EEG Enterprises Inc.
Lenco Inc., Electronics Div. ***B91-B103***
MacKenzie Laboratories Inc.

ELECTRONIC EDUCATIONAL PROGRAMS

Electronic University

ELECTRONIC FIELD PRODUCTION

Webb Telemedia Corp.

ELECTRONIC MANUFACTURING

Bogen Division/Lear Siegler Inc.
Custom Audio Electronics
EEG Enterprises Inc.
Gorman-Redlich Mfg. Co.
Lenco Inc., Electronics Div. ***B91-B103***
MacKenzie Laboratories Inc.

EMERGENCY POWER

Communications Distribution Inc.
Control Technology Inc.
Onan Division — Onan Corp.
Sawyer Industries Inc.
Tech Laboratories Inc.
Toner Cable Equipment Inc.
Versa-Count Engineering ***B164-B165***

ENCLOSURES

Altec Lansing
Cases Inc. ***B40***
Optima Division, Scientific — Atlanta Inc.

ENCODERS, COLOR

Broadcast Video Systems Ltd. ***B28***
Cohu Inc., Electronics Division
Lenco Inc., Electronics Div. ***B91-B103***

ENCODERS, TONE

Bogen Division/Lear Siegler Inc.
Channelmatic Electronics Inc.
Coastcom
Di-Tech Inc. ***B48***
EEG Enterprises Inc.
Elcom Engineering Co. ***B49***
Gorman Redlich Mfg. Co.
McMartin Industries Inc.
Marti Electronics Inc. .. ***B110, B111***
Time and Frequency Technology Inc.
Vega Electronics

ENG BRACES

Cine 60 Inc. ***B44, B45***
Frezzolini Electronics Inc. ***B58, B59***
Innovative Television Equipment
Image Devices Inc.
K and H Products Ltd.
Video Cinema Industries Inc.
Video Components Inc.

ENG CARTS

Gruber Products Co. ***B63***
Image Devices Inc.
K and H Products Ltd.
Lee-Ray Industries Inc. ***B90***
Video Components Inc.

ENG REMOTE CONTROL

Micro Control Associates Inc.
Moseley Associates Inc.

ENVELOPE DELAY MEASURING SET

ASACA Corp. of America B17-B19
Rohde and Schwarz

EXCITERS, FM

AEL Inc.
CCA Electronics Corp. B29
CSI Electronics Inc.
Cetec Broadcast Group
Dyma Engineering Inc.
Harris Corp., Broadcast Products Division
LPB Inc.
McMartin Industries Inc.
Marconi Electronics Inc.
North American Radio Corp.
QEI Corp.
RCA Broadcast Systems
Rohde and Schwarz
Singer Products Co. Inc.
Sintronic Co.
Val-Tronics Corp.
Versa-Count Engineering B164-B165
Wilkinson Electronics Inc.

F

FIBER OPTICS

Catel, Division of United Scientific Corp.
GTE Lenkurt Inc.
Times Wire and Cable Co.

FIELD INTENSITY METERS, AM

Atlantic Research Corp.
B and K Instruments Inc.
McMartin Industries Inc.
Rohde and Schwarz

FIELD INTENSITY METERS, FM

Atlantic Research Corp.
B and K Instruments Inc.
Rohde and Schwarz
Toner Cable Equipment Inc.

FIELD INTENSITY METERS, TV

Atlantic Research Corp.
Avantek Inc.
B and K Instruments Inc.
Rohde and Schwarz
Toner Cable Equipment Inc.

FILM

AGFA-Gevaert Inc.
Colour Images Unlimited Inc.
Films Inc.
Fuji Photo Film USA Inc.
Image Devices Inc.
Studio Film and Tape Inc.
Transilwrap Co. Inc.

FILM ANALYST PROJECTORS

Image Devices Inc.
Technovations

FILM CAMERA CARRYING CASES

Frezzolini Electronics Inc. B58, B59
Alan Gordon Enterprises Inc.
Image Devices Inc.
Lowenthal Mfg.
Samigon Division/Argraph Corp.
Video Components Inc.

FILM CAMERA LENSES

Arriflex Co. of America
Century Precision Cine Optics
Fax Co.
Frezzolini Electronics Inc. B58, B59
Alan Gordon Enterprises Inc.
Karl Heitz Inc.
Image Devices Inc.
Laird Telemedia
Lenzar Optics Corp.
Samigon Division/Argraph Corp.
Video Components Inc.

FILM CAMERAS, CINE

Arriflex Co. of America
Frezzolini Electronics Inc. B58, B59
Alan Gordon Enterprises Inc.
Karl Heitz Inc.
Image Devices Inc.
Teledyne Camera Systems

FILM CAMERAS, HIGH SPEED

Image Devices Inc.
Teledyne Camera Systems

FILM CANS

Neumade Products Corp.
Plastic Reel Corp. of America

FILM CASES

Image Devices Inc.
Logan Electric Specialty Mfg. Co.
Lowenthal Mfg.
Charles Mayer Studios Inc.
Neumade Products Corp.
Plastic Reel Corp. of America
Samigon Division/Argraph Corp.
Schuessler Case Co. Inc.

FILM CHAIN LIGHT LEVEL CONTROLS

B.E.I. Beston Electronics Inc. . B21
Cohu Inc., Electronics Division
Comquip Inc.
Harris Corp., Broadcast Products Division
Industrial Sciences Inc.
Laird Telemedia
Specialized Industries Inc.
Video Components Inc.
The Zei-Mark Corp.

FILM CHAIN SYSTEMS

Cohu Inc., Electronics Division
GBC Closed Circuit TV Corp.
Laird Telemedia
Quad-Eight Electronics
Singer Education Systems
Video Components Inc.

FILM CLEANERS AND PRESERVATIVES

R.D. Hanish Co.
Image Devices Inc.
Lipsner-Smith Corp.
Neumade Products Corp.

FILM EDITING EQUIPMENT

Accessories Manufacturers Ltd.
Birns and Sawyer Inc.
Alan Gordon Enterprises Inc.
Harwald Co.
J and R Film Co. — Goldberg/Compco
KLM Associates
Kinetronics Corp.
Lipsner-Smith Corp.
Maier-Hancock Industries
Neumade Products Corp.
Plastic Reel Corp. of America
Research Technology Inc.
Samigon Division/Argraph Corp.

FILM GATE PHOTOMETERS

Photo Research Division Kollmorgen Corp.

FILM INSPECTION AND CLEANING EQUIPMENT

Chyron Corp. B42
Alan Gordon Enterprises Inc.
Harwald Co.
Image Devices Inc.
Kinetronics Corp.
Lipsner-Smith Corp.
Neumade Products Corp.
Plastic Reel Corp. of America
Research Technology Inc.
Starex Inc.

FILM LABORATORIES

Alan Gordon Enterprises Inc.
Houston Photo Products Inc.
Kreonite Inc.
W.A. Palmer Films Inc.
Radmar Inc.

FILM LEADERS

Image Devices Inc.
Neumade Products Corp.
Photographic Specialties
Starex Inc.

FILM MULTIPLEXERS

Laird Telemedia
Video Components Inc.

FILM PROCESSING CHEMICALS

AGFA-Gevaert Inc.
AIDS, A Damon Co.
Eastman Kodak Co.
Phillip A. Hunt Chemical Corp.
Samigon Division/Argraph Corp.

FILM PROCESSORS

AIDS, A Damon Co.
Alan Gordon Enterprises Inc.
Houston Photo Products Inc.
Image Devices Inc.
Jamieson Film Co. B83
Kreonite Inc.
Samigon Division/Argraph Corp.
Sickles Inc.

FILM PRODUCTION

Colour Images Unlimited Inc.
Communication Commission, National Council of Churches
Design-Form

FILM PROJECTORS, 8MM

Image Devices Inc.
Laird Telemedia
MPC Educational Systems Inc.
Minolta Corp.
Technovations

FILM PROJECTORS 8MM REPEATER

Image Devices Inc.
Permafilm International Corp.

FILM PROJECTORS, 16MM

Arriflex Co. of America
Alan Gordon Enterprises Inc.
Image Devices Inc.
L-W International
Laird Telemedia
MacKenize Laboratories Inc.
Magna-Tech Electronic Co. Inc.
Optical Radiation Corp.

W.A. Palmer Films Inc.
Singer Education Systems
Video Components Inc.

FILM PROJECTORS, CARTRIDGE

Fairchild Industrial Products
Image Devices Inc.
MPC Educational Systems Inc.

FILM PROJECTORS, SLIDE

Fairchild Industrial Products
Heindl Masks 'N' Mounts
Image Devices Inc.
Laird Telemedia
MPC Educational Systems Inc.
MacKenzie Laboratories Inc.
Radmar Inc.
Samigon Division/Argraph Corp.
Spindler and Sauppe' Inc.

FILM PROJECTORS, FILMSTRIP

Beacon-Camera Audio-Visual Co. Inc.
Dukane Corp. — Audio-Visual Division
Fairchild Industrial Products
MPC Educational Systems Inc.
Radmar Inc.

FILM PROTECTION

Lipsner-Smith Corp.
Permafilm International Corp.

FILM REJUVENATION

Permafilm International Corp.

FILM MAGNETIC RECORDING EQUIPMENT AND ACCESSORIES

Frezzolini Electronics Inc. ***B58, B59***
Alan Gordon Enterprises Inc.
Image Devices Inc.
International Electro Magnetics
KLM Associates
MPC Educational Systems Inc.
Quad-Eight Electronics
RCA Broadcast Systems
Transist-O-Sound Inc.
Wide Range Electronics Corp.

FILM SPLICERS

Image Devices Inc.
Maier-Hancock Industries
Neumade Products Corp.

FILM TREATMENT (PERFORATION REPAIR)

Harwald Co.
Image Devices Inc.
Permafilm International Corp.
Plastic Reel Corp. of America

FILM TO VIDEO TRANSFER

AIDS, A Damon Co.
American Cable Network
Communications Systems, Division of Powell Tool Supply Inc.
W.A. Palmer Films Inc.
VIDECOMM International

FILM TRUCKS

Image Devices Inc.
Lee-Ray Industries Inc.
Neumade Products Corp.
The Winsted Corp. ***B175-B182***

FILM VIEWERS

Image Devices Inc.
Lipsner-Smith Corp.
Maier-Hancock Industries

FILMS/FILMSTRIPS

Benchmark Films Inc.
Cablefilms
Colour Images Unlimited Inc.
Communication Commission, National Council of Churches
Design-Form

FILMSTRIP STORAGE ALBUMS/CONTAINERS

Neumade Products Corp.
Reliance Plastics and Packaging Division
Richard Mfg. Co.

FILTERS

Allen Avionics Inc. ***B11***
Bird Electronic Corp.
CADCO
Coaxial Dynamics Inc.
Comark Industries Inc.
The Finney Co.
Image Devices Inc.

FILTER SETS, AUDIO, THIRD-OCTAINE (For Electronic Music Processing)

Spectrum Instruments Inc.

FM EQUALIZER

Bogen Division/Lear Siegler Inc.
CADCO

FRAME/FIELD COUNTERS

QSI Systems Inc.

FRAME STORERS/ FLOPPY DISC

Arvin/Echo Science Corp.

FRAME SYNCHRONIZERS

Grass Valley Group Inc.
Thomson-CSF Laboratories

FREQUENCY DIVISION MULTIPLEX

Catel, Division of United Scientific Corp.
Coastcom
GTE Lenkurt Inc.

FREQUENCY METERS, RF

Lampkin Laboratories

FREQUENCY MONITORS AND COUNTERS

Ballantine Laboratories Inc.
Data Precision Corp.
Dranetz Engineering Labs Inc.
EIP Inc.
Elcom Engineering Co. ***B49***
Gaw Co. Inc.
Leader Instruments Corp.
Leasametric
Lec Tro Tech Inc.
McMartin Industries Inc.
Nationwide Electronics Systems Inc.
Wilkinson Electronics Inc.

G

GAFFERS TOOL AND ACCESSORY BOX

Walter S. Brewer Co.
Image Devices Inc.

GAFFERS BASKET

Walter S. Brewer Co.

GAME SHOW SCOREBOARDS, CLOCKS, ETC.

Logitek Electronic Systems

GENERATORS, AUDIO SINE

Altec Lansing Co.
Amber Electro Design Ltd.
Automated Processes Inc.
B and K Instruments Inc.
Bald Mountain Lab
Barker and Williamson Inc.
Beta Technology Inc.
Delta Electronics Inc., Div. of Long Engineering Corp.
Dyma Engineering Inc.
Frequency Devices Inc.
Heath Co.
Hickok Electric Instrument
Leader Instruments Corp.
Marconi Instruments, Div. of Marconi Electronics
Potomac Instruments Inc.
Quad-Eight Electronics
Rohde and Schwarz
SPI-ITT Metrix Instruments Corp.
Sencore Inc.
Sound Technology
Spectra Sonics
Sphere Electronics Inc.
TEAC Corp. of America
Val-Tronics Inc.
Wavetek Indiana Inc.
Westlake Audio

GENERATORS, AUDIO SWEEP

Allied Broadcast Equipment
Altec Lansing Sound Products
Amber Electro Design Ltd.
B and K Instruments Inc.
Bald Mountain Lab
Dyma Engineering Inc.
Heath Co.
Hickok Electric Instrument
Leader Instruments Corp.
Lec Tro Tech Inc.
Marconi Electronics Corp.
Radiometer US Corp.
Rohde and Schwarz Sales Co.
United Recording Electronics Industries
United Research Laboratory Corp.
Wavetek Indiana Inc.

GENERATORS, BACKGROUND COLOR

American Data ***B12***
Beaveronics Inc. ***B20***
Communications Technology Inc.
Digital Video Systems
Grass Valley Group
Harris Corp., Broadcast Products Division
Industrial Sciences Inc.
International Nuclear Corp.
J and D International
Lenco Inc., Electronics Div. ***B91-B103***
Richmond Hill Laboratories Ltd.
Shintron Co. Inc.
Sigma Electronics Inc.

GENERATORS, BURST

Amber Electro Design Ltd.
Beaveronics Inc. ***B20***
Broadcast Video Systems Ltd. ***B28***
Communications Technology Inc.
Digital Video Systems
Dranetz Engineering Labs Inc.
Dynair Electronics Inc.
Grass Valley Group
Harris Corp., Broadcast Products Division
International Nuclear Corp.
J and D International
Leader Instruments Corp.
Leitch Video Ltd.
Lenco Inc., Electronics Div. ***B91-B103***
Richmond Hill Laboratories Ltd.
Rohde and Schwarz Sales Co.
Sencore Inc.

Sigma Electronics Inc.
Tektronix Inc.
Telemation ***B154-B156***
Toner Cable Equipment Inc.
Ultra Audio Pixtec
Video Aids of Colorado ***B163***

GENERATORS, COLOR BAR

ASACA Corp. of America . . ***B17-B19***
B and K Precision Dynascan Corp.
Cohu Inc., Electronics Division
Digital Video Systems
Dyma Engineering Inc.
Dynasciences
Harris Corp., Broadcast Products Division
Heath Co.
Hickok Electric Instrument
Leader Instruments Corp.
Lec Tro Tech Inc.
Leitch Video Ltd.
Lenco Inc., Electronics Div. ***B91-B103***
Marconi Electronics
Panasonic Co. ***B124-B129***
Philips Test and Measuring Instruments Inc.
SPI-ITT Metrix Instruments Division
Sencore Inc.
Shintron Co. Inc.
Sigma Electronics Inc.
Tektronix
3M Co. — Mincom Division
Toner Cable Equipment Inc.
Ultra Audio Pixtec

GENERATORS, COLOR SYNC

Broadcast Video Systems Ltd. ***B28***
Cohu Inc., Electronics Division
Crosspoint Latch Corp. ***B46***
Digital Video Systems
Dyma Engineering Inc.
Dynair Electronics Inc.
Dynasciences
GBC Closed Circuit TV Corp.
Grass Valley Group
Harris Corp., Broadcast Products Division
Heath Co.
International Communications and Control Corp.
JVC Industries ***B75-B82***
Leitch Video Ltd.
Lenco Inc., Electronics Div. ***B91-B103***
Panasonic Co. ***B124-B129***
Philips Test and Measuring Instruments Inc.
RCA Broadcast Systems
Richmond Hill Laboratories Inc.
Rohde and Schwarz Sales Co.
Sencore Inc.
Sharp Electronics Corp. — Professional Products
Shintron Co. Inc.
Sigma Electronics Inc.
Tektronix
Telemation ***B154-B156***
3M Co. — Mincom Division
Ultra Audio Pixtec
Video Aids of Colorado ***B163***
Video Components Inc.
Viscount Industries Ltd.
Vital Industries

GENERATORS, CONVERGENCE

Broadcast Video Systems Ltd. ***B28***
Grass Valley Group
Harris Corp., Broadcast Products Division
Heath Co.
Kallman Associates Inc.
Leader Instruments Corp.
Lec Tro Tech Inc.
Leitch Video Ltd.
Lenco Inc., Electronics Div. ***B91-B103***
Philips Test and Measuring Instrument Inc.
Richmond Hill Laboratories Inc.
SPI-ITT Metrix Instruments Division
Sencore Inc.
Sigma Electronics Inc.
Tektronix Inc.
Ultra Audio Pixtec

GENERATORS, CROSS PULSE

Harris Corp., Broadcast Products Division
Leitch Video Ltd.
Siegel Electronics
Tektronix
3M Co. — Mincom Division
Ultra Audio Pixtec
Video Aids of Colorado ***B163***
Video Components Inc.

GENERATORS, DIGITAL SYNC

ADDA Corp. ***B6***
Broadcast Video Systems Ltd. ***B28***
Central Dynamics Corp. ***B41***
Crosspoint Latch Corp. ***B46***
Dyma Engineering Inc.
Digital Video Systems
Dynair Electronics Inc.
Grass Valley Group
Harris Corp., Broadcast Products Division
Industrial Sciences Inc.
International Communications and Control Corp.
Leitch Video Ltd.
Lenco Inc., Electronics Div. ***B91-B103***
Marconi Electronics Inc.
Panasonic Co. ***B124-B129***
RCA Broadcast Systems
Richmond Hill Laboratories Inc.
Rohde and Schwarz Sales Co.
Sigma Electronics Inc.
Telemation ***B154-B156***
Video Components Inc.
Video Data Systems
Vital Industries

GENERATORS, FM SUBCARRIER

AEL Inc.
CCA Electronics Inc. ***B29***
CSI Electronics Inc.
Catel, Division of United Scientific Corp.
Cetec Broadcast Group
Coastcom
Harris Corp., Broadcast Products Division
McMartin Industries Inc.
Marti Electronics Inc. ***B110, B111***
Micro Control Associates Inc.
Moseley Associates Inc.
QEI Corp.
RCA Broadcast Systems
Rockwell International-Collins Division
Singer Products Co. Inc.
Solid Electronics Laboratories
Tektronix
Versa-Count Engineering ***B164-B165***
The Widget Works Inc.
Wilkinson Electronics Inc.

GENERATORS, NTSC SIGNAL

ASACA Corp. of America . . ***B17-B19***
Broadcast Video Systems Ltd. ***B28***
Comquip Inc.
Digital Video Systems
Dyma Engineering Inc.
Harris Corp., Broadcast Products Division
International Communications and Control Corp.
Leader Instruments Inc.
Lec Tro Tech Inc.
Leitch Video Ltd.
Lenco Inc., Electronics Div. ***B91-B103***
Marconi Electronics Inc.
Philips Test and Measuring Instruments Inc.
Richmond Hill Laboratories Inc.
Rohde and Schwarz Sales Co.
Shintron Co. Inc.
Sigma Electronics Inc.
Tektronix
Toner Cable Equipment Inc.
Ultra Audio Pixtec

GENERATORS, POWER

Communications Distribution Corp.
J and D International
Rohde and Schwarz

GENERATORS, SCA

Leader Instruments Corp.
McMartin Industries Inc.
Marti Electronics Inc. ***B110, B111***
Micro Control Associates Inc.
Moseley Associates Inc.
Solid Electronics Laboratories
Versa-Count Engineering ***B164-B165***
Wilkinson Electronics Inc.

GENERATORS, SAFE AREA

Broadcast Video Systems Ltd. ***B28***

GENERATORS, SIGNAL AF

Altec Lansing
Amber Electro Design Ltd.
Automated Processes Inc.
B and K Precision Dynascan Corp.
Bald Mountain Lab
Delta Electronics Inc., Div. of Long Engineering Co.
Dranetz Engineering Labs
Dyma Engineering Inc.
Gaw Co. Inc.
Heath Co.
Lampkin Labs Inc.
Leader Instruments Corp.
Modular Audio Products ***B117***
Opamp Labs Inc. ***B123***
Philips Test and Measuring Instruments Inc.
Potomac Instruments Inc.
Rohde and Schwarz Sales Co.
Sencore Inc.
Sound Technology Inc.
Spectra Sonics
Tektronix
Telecommunications Technology
Val-Tronics Inc.

GENERATORS, SIGNAL BAR DOT

ASACA Corp. of America . . ***B17-B19***
Broadcast Video Systems Ltd. ***B28***
Colorado Video Inc. ***B31-B38***
Grass Valley Group
Heath Co.
Hickok Electric Instruments
Kallman Associates Inc.
Leader Instruments Corp.
Lec Tro Tech Inc.
Leitch Video Ltd.

Lenco Inc., Electronics Div. ***B91-B103***
Philips Test and Measuring Instrument Inc.
Richmond Hill Laboratories Inc.
Sencore Inc.
Tektronix
Telemation ***B154-B156***
Ultra Audio Pixtec

GENERATORS, SIGNAL MARKER

ASACA Corp. of America .. ***B17-B19***
B and K Precision Dynascan Corp.
Blonder-Tongue Labs
Leader Instruments Corp.
Lec Tro Tech Inc.
Sencore Inc.
Tektronix

GENERATORS, SIGNAL PULSE

ASACA Corp. of America .. ***B17-B19***
Dranetz Engineering Labs Inc.
Heath Co.
Leitch Video Ltd.
Lenco Inc., Electronics Div. ***B91-B103***
Marconi Electronics Inc.
Philips Test and Measuring Instrument Inc.
Richmond Hill Laboratories Corp.
Sigma Electronics
Systron-Donner
TM Systems Inc.
Tektronix
Wavetek Indiana Inc.

GENERATORS, SIGNAL AF

ASACA Corp. of America .. ***B17-B19***
B and K Instruments Corp.
Blonder-Tongue Labs
Boonton Electronics
Engineering Associates
Gaw Co. Inc.
Harris Corp., Broadcast Products Division
Heath Co.
International Microwave Corp.
Lampkin Laboratories Inc.
Leader Instruments Corp.
McMartin Industries Inc.
Microdyne Corp.
Philips Test and Measuring Instrument Inc.
Radiometer US Corp.
Rohde and Schwarz Sales Co.
Sadelco Inc.
Scientific — Atlanta Inc.
Sencore Inc.
Tektronix
Triple Crown Electronics Inc.
Val-Tronics Inc.
Wavetek Indiana Inc.

GENERATORS, SIGNAL SQUARE WAVE

Amber Electro Design Ltd.
ASACA Corp. of America .. ***B17-B19***
B and K Precision Dynascan
Heath Co.
Leader Instruments Corp.
Leitch Video Ltd.
Philips Test and Measuring Instrument Inc.
Sencore Inc.
Tektronix
Wavetek Indiana Inc.

GENERATORS, SIGNAL TV SYNCHRONIZING

ASACA Corp. of America .. ***B17-B19***
Broadcast Video Systems Ltd. ***B28***
Colorado Video Inc. ***B31-B38***
Cohu Inc., Electronics Division
Dage — MTI Inc.
Diamond Electronics, Div. of Arvin Systems Inc.
Dynair Electronics Inc.
Dynasciences
Grass Valley Group
Heath Co.
Industrial Sciences Inc.
Leitch Video Ltd.
Lenco Inc., Electronics Div. ***B91-B103***
Philips Broadcast Equipment Corp.
Portac Inc.
Sencore Inc.
Sigma Electronics Inc.
Tektronix
Telemation ***B154-B156***
Ultra Audio Pixtec
Video Aids Corp. of Colorado .. ***B163***

GENERATORS, SIGNAL VITS

ASACA Corp. of America ***B17-B19***
Beta Technology Inc.
Harris Corp., Broadcast Products Division
Industrial Sciences Inc.
J and D International
Lenco Inc., Electronics Div. ***B91-B103***
Philips Test and Measuring Instrument Inc.
Rohde and Schwarz Sales Co.
Tektronix

GENERATORS, STAIRCASE

ASACA Corp. of America ***B17-B19***
Broadcast Video Systems Ltd. ***B28***
Colorado Video Inc. ***B31-B38***
International Communications and Control Corp.
Leader Instruments Corp.
Leitch Video Ltd.
Lenco Inc., Electronics Div. ***B91-B103***
Philips Test and Measuring Instrument Inc.
Richmond Hill Laboratories Ltd.
Rohde and Schwarz Sales Co.
Tektronix

GENERATORS, STEREO

AEL Inc.
Boonton Electronics
CCA Electronics Corp. ***B29***
Catel, Division of United Scientific Corp.
Cetec Broadcast Group
Dyma Engineering Inc.
Harris Corp., Broadcast Products Division
Heath Co.
Kahn Communications Inc.
Leader Instruments Inc.
McMartin Industries Inc.
Moseley Associates Inc.
Philips Test and Measuring Instrument Inc.
QEI Corp.
Radiometer US Corp.
Rockwell International-Collins Broadcast Products
Rohde and Schwarz Sales Co.
Sencore Inc.
Solid Electronics Laboratories
Sound Technology
Val-Tronics Inc.
Versa-Count Engineering ***B164-B165***
Wilkinson Electronics

GENERATORS, SUBCARRIER

ATV Research
Broadcast Video Systems Ltd. ***B28***
CCA Electronics Corp. ***B29***
CSI Electronics Inc.
Cetec Broadcast Group
Cohu Inc., Electronics Division
Communications Technology Inc.
Crosspoint Latch Corp. ***B46***
Grass Valley Group
Harris Corp., Broadcast Products Division
Industrial Sciences Inc.
Leitch Video Ltd.
Lenco Inc., Electronics Div. ***B91-B103***
McMartin Industries Inc.
Marti Electronics Inc. .. ***B110, B111***
Merill Cable Equipment Corp.
Micro Control Associates Inc.
Moseley Associates Inc.
Philips Test and Measuring Instrument Inc.
Rockwell International-Collins Division
Rohde and Schwarz Sales Co.
Solid Electronics Laboratories
Telemation ***B154-B156***
Val-Tronics Inc.

GENERATORS, SYNC

ASACA Corp. of America ***B17-B19***
Broadcast Video Systems Ltd. ***B28***
Cohu Inc., Electronics Division
Colorado Video Inc. ***B31-B38***
Crosspoint Latch Corp. ***B46***
Dage — MTI Inc.
Digital Video Systems
Dynair Electronics Corp.
Dynasciences
GBC Closed Circuit TV Corp.
Grass Valley Group
Harris Corp., Broadcast Products Division
Hitachi-Denshi America Ltd. ***B65-B72***
Ikegami Electronics USA Inc.
Image Devices Inc.
Industrial Sciences Inc.
International Communications and Control Corp.
JVC Industries ***B75-B82***
Javelin Electronics
Leitch Video Ltd.
Lenco Inc., Electronics Div. ***B91-B103***
Panasonic Co. ***B124-B129***
Philips Test and Measuring Instrument Inc.
Rohde and Schwarz Sales Co.
Sharp Electronics Corp. — Professional Products
Shintron Co. Inc.
Sigma Electronics
Sony Corp. of America
Tektronix
Telemation ***B154-B156***
3M Co. — Mincom Division
Ultra Audio Pixtec
Video Aids Corp. of Colorado ***B163***
Video Components Inc.

GENERATORS, TIME CODE/READER

Beta Technology Inc.
Central Dynamics Corp. ***B41***
Chrono-Log Corp.

Datametrics Inc.
Datatron Inc.
E.S.E. ***B56, B57***
Electronics Engineering Co. of California (EECO)
Laird Telemedia
Listec Television Equipment Corp. ***B104-B107***
Media Concepts Inc.
MicroVision Systems
Nationwide Electronic Systems Inc.
Recortec
Shintron Co. Inc.
Skotel Corp. ***B146***
Tektronix

GENERATORS, TONE

Altec Lansing
Broadcast Electronics Inc. ***B22-B27***
Channelmatic Electronics Inc.
Di-Tech Inc. ***B48***
Elcom Engineering Co. ***B49***
Gaw Co. Inc.
Gorman-Redlich Mfg. Co.
Lampkin Laboratories
McMartin Industries Inc.
Opamp Labs Inc. ***B123***
Rohde and Schwarz Sales Co.
Shure Brothers Inc. ... ***B144, B145***

GENERATORS, TONE EBS

Broadcast Electronics Inc. ***B22-B27***
Channelmatic Electronics Inc.
E.S.E. ***B56, B57***
Elcom Engineering Co. ***B49***
Gorman-Redlich Mfg. Co.
International Nuclear Corp.
Logitek Electronic Systems
McMartin Industries Inc.

GENERATORS, VIDEO CARRIER

Sigma Electronics Inc.

GENERATORS, VIDEO SWEEP

ASACA Corp. of America B17-B19
Harris Corp., Broadcast Products Division
Leader Instruments Corp.
Lec Tro Tech Inc.
Lenco Inc., Electronics Div. ***B91-B103***
Philips Test and Measuring Instrument Inc.
Rohde and Schwarz Sales Co.
Tektronix
Wavetek Indiana Inc.

GRAPH PAPER

Charles Mayer Studios Inc.

GRAPH RECORDER

Neutrik Products

GRAPHICS GENERATORS

Chyron Corp. ***B42***
Telestrator Division, Interand Corp.
Thomson-CSF Laboratories

GROUP LISTENING CENTERS

Avid Corp.

H

HARMONIC DISTORTION METERS

Amber Electro Design Ltd.
B and K Instruments Inc.
Crown International Inc.
Gaw Co. Inc.
Heath Co.
Leader Instruments Corp.
Radiometer US Corp.
Sound Technology

HARMONIC FILTERS, FM

Bird Electronic Corp.
Cetec Jampro
Coaxial Dynamics Inc.
Comark Industries Inc.
Micro Communications Inc.

HARMONIC FILTERS, TV

Bird Electronic Corp.
Cetec Jampro
Comark Industries Inc.
Micro Communications Inc.

HEAD ALIGNMENT GAUGES

Broadcast Cartridge Service
Broadcast Electronics Inc. ***B22-B27***
Fidelipac
Mincom Division, 3M Co.

HEAD CLEANING PRODUCTS

Broadcast Electronics Inc. ***B22-B27***
Fidelipac
MPC Educational Systems Inc.
Nortronics Co. Inc.
Robins Broadcast and Sound Equipment Corp.
TDK Electronics Corp.
Uher Corp.
United Research Laboratory Corp.
VIF International

HEADPHONES, ANNOUNCERS

AKG Acoustics ***B7, B8***
Audiosears Corp.
Broadcast Electronics Inc. ***B22-B27***
Cetec Broadcast Group
Dyma Engineering Inc.
Electro-Voice Inc. ***B50, B51***
Ercona Corp.
Harris Corp., Broadcast Products Division
Image Devices Inc.
MPC Educational Systems Inc.
Neutrik
R-Columbia Products Co. Inc.
Sennheiser ***B143***
Studer Revox America
Television Equipment Associates
Telex Communications Inc.
Wilkinson Electronics Inc.

HEADPHONES, BROADCAST MONITORING

AKG Acoustics ***B7, B8***
Audiosears Corp.
Broadcast Electronics Inc. ***B22-B27***
Ercona Corp.
Harris Corp., Broadcast Products Division
Image Devices Inc.
LPB Inc.
MPC Educational Systems Inc.
Neutrik
Panasonic Co. ***B124-B129***
R-Columbia Products Co. Inc.
Sennheiser ***B143***
Superex Corp.
Telex Communications Inc.
Wilkinson Electronics Inc.

HEADPHONES, MONO

AKG Acoustics ***B7, B8***
Audiosears Corp.
Avid Corp.
Broadcast Electronics Inc. ***B22-B27***
CCA Electronics Corp. ***B29***
Cetec Broadcast Group
Ercona Corp.
Frezzolini Electronics Inc. ***B58, B59***
Hamilton Electronics Corp.
Harris Corp., Broadcast Products Division
Heath Co.
Image Devices Inc.
Koss Corp.
MPC Educational Systems Inc.
Newcomb Audio Products Co.
R-Columbia Products Co. Inc.
Sennheiser ***B143***
Singer Products Co. Inc.
Studer Revox America
Television Equipment Associates
Telex Communications Inc.
Uher Corp.
Westlake Audio
Wilkinson Electronics Inc.

HEADPHONES, STEREO

AKG Acoustics ***B7, B8***
Avid Corp.
Broadcast Electronics Inc. ***B22-B27***
CCA Electronics Corp. ***B29***
Dyma Engineering Inc.
Ercona Corp.
Frezzolini Electronics Inc. ***B58, B59***
Hamilton Electronics Inc.
Heath Co.
Image Devices Inc.
Koss Corp.
MPC Educational Systems Inc.
Neutrik
Newcomb Audio Products Co.
Panasonic Co. ***B124-B129***
R-Columbia Products Co. Inc.
Sansui Electronics Corp.
Sennheiser ***B143***
Singer Products Co. Inc.
Superscope Inc.
Telex Communications Inc.
Uher Corp.
Wilkinson Electronics

HEADS RECONDITIONED AND RECONDITIONING SERVICE FOR AUDIO HEADS

Image Devices Inc.
International Electro Magnetics
Minneapolis Magnetics Inc. . ***B116***
Saki Magnetics Inc. ***B142***
Taber Mfg. and Eng. Co.
United Research Laboratory Corp.
VIF International

HEADS RECONDITIONED AND RECONDITIONING SERVICE FOR VIDEO HEADS

Image Devices Inc.
Minneapolis Magnetics Inc. . ***B116***
Spin Physics Inc. ***B152***
Taber Mfg. and Eng. Co.
United Research Laboratory Corp.

HEADS, RECORDER REPLACEMENT AUDIO

Broadcast Electronics Inc. ***B22-B27***
Ercona Corp.
Grandy Inc.
Image Devices Inc.
International Electro Magnetics
Minneapolis Magnetics Inc. . ***B116***
Nortronics Co. Inc.
Saki Magnetics Inc. ***B142***
Spin Physics Inc. ***B152***
Taber Mfg. and Eng. Co.
United Research Laboratory Corp.
VIF International

HEADS RECORDER REPLACEMENT VIDEO

Broadcast Electronics Inc. ***B22-B27***
Image Devices Inc.
Minneapolis Magnetics Inc. . ***B116***
Saki Magnetics Inc. ***B142***
Spin Physics Inc. ***B152***
Taber Mfg. and Eng. Co.
United Research Laboratory Corp.

HEADSETS WITH MICROPHONE

Avid Corp.
EDCOR
Electro-Voice Inc. ***B50, B51***
Ercona Corp.
Image Devices Inc.
MPC Educational Systems Inc.
Shure Brothers Inc. ... ***B144, B145***
Telex Communications Inc.

HEADSETS, TV CAMERAMAN

GBC Closed Circuit TV Corp.
Image Devices Inc.
Sony
Telex Communications Inc.

HIGH FIDELITY CARTRIDGES

Shure Brothers Inc. ... ***B144, B145***

HIGH FIDELITY COMPONENTS

Altec Lansing
BGW Systems Inc.
H.H. Scott Inc.

HI-LIGHT ELIMINATOR

Video Components Inc.

HIP PACK

Image Devices Inc.
The Rotary Co. Inc.

HUM-STOP COILS

Audio-Video Engineering
Microtran ***B115***
Telemation ***B154-B156***
Video Aids Corp. of Colorado ***B165***

I

IDEA AND SCRIPT DEVELOPMENT

Kapco Communications
Multi Media Forum ***B122***
Webb Telemedia

IMAGE ENHANCERS

Consolidated Video Systems . ***B39***
Dynasciences
Mincom Division, 3M Co.
Thomson-CSF Laboratories

IMAGE PROCESSORS

Microtime Inc. ***B113***

IMPEDANCE BRIDGES

B and K Instruments Inc.
Delta Electronics Inc. — VA
Delta Electronics Inc., Div. of Long Engineering Co.
Leader Instruments Corp.
Leasametric
Wide Band Engineering Co. Inc.

IMPEDANCE MATCHING PADS

Rohde and Schwarz
Tech Laboratories Inc.
Wide Band Engineering Co. Inc.

INDUCTORS

Multronics Inc.

INFORMATION SYSTEMS, WEATHER-NEWS

CADCO
Gorman Redlich Mfg. Co.
Knox Ltd. ***B89***
TapeAthon Corp.

INTERCOM SYSTEMS

Altec Lansing
Atlas Sound
Audio Designs and Mfg. Inc.
Automated Processes Inc.
Bayly Engineering Ltd.
Bogen Division/Lear Siegler Inc.
David Clark Co. Inc.
Clear-Com
Coastcom
Collins Television Services
Crosspoint Latch Corp. ***B46***
Custom Audio Electronics
Delta Electronics Inc., Div. of Long Engineering Co.
Erskine-Shapiro Theatre Technology Inc.
Fisher Berkeley Corp.
Frezzolini Electronics Inc. ***B58, B59***
Harris Corp., Broadcast Products Division
Holland Corp.
Image Devices Inc.
Locator Electronics Co.
McCurdy Radio Industries Inc.
McMartin Industries Inc.
Paso Sound Products Inc.
RTS Systems Inc. ***B139***
Rivers Associates
Roh Corp.
Singer Products Co. Inc.
Vamco Engineering Inc. ***B160-B162***
Video Aids of Colorado ***B163***
Ward-Beck Systems Ltd.
World Video Inc.

INTERMODULATION METERS

Amber Electro Design Ltd.
B and K Instruments Inc.
Crown International Inc.
EEG Enterprises Inc.
Heath Co.

INVERTERS, SINE WAVE

Topaz Electronics
Versa-Count Engineering ***B164-B165***

ITFS SYSTEMS

Electronics, Missiles and Communications Inc.
Genesys Systems Inc.
Varian Electron Device Group

J

JACK PANELS

Audio Accessories Inc.
Broadcast Electronics Inc. ***B22-B27***

L

LAMINATING EQUIPMENT

Graphic Laminating Inc.
MPC Educational Systems Inc.

LAMINATING EQUIPMENT TRANSPARENCY

Graphic Laminating Inc.
Seal Inc.
Transilwrap Co. Inc.

LAMPS, STUDIO

Bardwell and McAlister Inc.
Berkey Colortran
Cine 60 Inc. ***B44, B45***
Fax Co.
GBC Closed Circuit TV Corp.
Alan Gordon Enterprises Inc.
Image Devices Inc.
Kliegl Brothers ***B84-B88***
Leedal Inc.
Packaged Lighting Systems Inc.
Smith-Victor Corp. ***B147-B150***
Strand Century Inc.
Video Components Inc.

LECTERNS AND ACCESSORIES

Argos Sound
Audio Visual Contractors
D'San Corp.
EDCOR
MPC Educational Systems Inc.
Charles Mayer Studios Inc.
Ora Visual Co. Inc.
Paso Sound Products Inc.
Perma Power Electronics Inc.
Sound-Craft Systems Inc.
Special Instruments Laboratory Inc.
Van San Corp.

LENS REPAIR SERVICE

Achro Video ***B5***
Angenieux Corp.
Century Precision Cine Optics
Ercona Corp.
Alan Gordon Enterprises Inc.
Image Devices Inc.
Lenzar Optics Corp.
Tele-Cine Inc.

LETTERING EQUIPMENT, MECHANICAL

Fax Co.
Harwald Co.
Image Devices Inc.
Kroy Industries Inc.
Charles Mayer Studios Inc.

LIGHT DIMMER CONTROLS

Berkey Colortran

Custom Audio Electronics
Delta Electronics Inc., Div. of Long Engineering Co.
EEG Enterprises Inc.
Electronics Diversified Inc. . . . B54
Fax Co.
Image Devices Inc.
Kliegl Brothers B84-B88
Lumitrol Ltd. Theatre Lighting
Packaged Lighting Systems Inc.
Skirpan Lighting Control Corp.
Spindler and Sauppe' Inc.
Strand Century Inc.
Technamics Co.
Ultra Audio Pixtec

LIGHT METERS

Frezzolini Electronics Inc. B58, B59
Alan Gordon Enterprises Inc.
Image Devices Inc.
Minolta Corp.
Photo Research, Division Kollmorgen Corp.
Samigon Division/Argraph Corp.
Strand Century Inc.

LIGHTING CONTROL CONSOLES

Custom Audio Electronics

LIGHTING FIXTURES

Bardwell and McAlister Inc.
Belden Communications Inc.
Berkey Colortran
Fax Co.
Alan Gordon Enterprises Inc.
Image Devices Inc.
Kliegl B84-B88
Lowel-Light Mfg. Inc. B108
Charles Mayer Studios Inc.
Oregon Sound and Lights
Packaged Lighting Systems Inc.
Smith-Victor Corp. B147-B150
Strand Century Inc.

LIGHTING KITS

Berkey Colortran
Cine 60 Inc. B44, B45
Crouse-Hinds Co.
Frezzolini Electronics Inc. B58, B59
GBC Closed Circuit TV Corp.
Alan Gordon Enterprises Inc.
Harwood Mfg. Co.
Image Devices Inc.
Kliegl Brothers B84-B88
Lowel-Light Mfg. Inc. B108
Packaged Lighting Systems Inc.
Smith-Victor Corp. B147-B150
Strand Century Inc.
Unarco-Rohn, Division of Unarco Industries Inc.
Utility Tower Co.
Video Components Inc.

LIGHTING PATCH PANELS

Berkey Colortran
Image Devices Inc.
Kliegl Brothers B84-B88
Lumitrol Ltd. Theatre Lighting
Packaged Lighting Systems Inc.
Rex Rheostat and Co. Inc.
Strand Century Inc.
Union Connector Co. Inc.

LIGHTING PLUGS AND CONNECTORS

Bardwell and McAlister Inc.
Berkey Colortran
Fax Co.
Image Devices Inc.
Kliegl Brothers B84-B88
Packaged Lighting Systems Inc.
Rex Rheostat and Co. Inc.
Strand Century Inc.
Union Connectors Co. Inc.
Video Components Inc.

LIGHTING STANDS AND HANGERS

Automatic Devices Co.
Bardwell and McAlister Inc.
Berkey Colortran
Cine 60 Inc. B44, B45
Alan Gordon Enterprises Inc.
Image Devices Inc.
Kliegl Brothers B84-B88
Lowel-Light Mfg. Inc. B108
Packaged Lighting Systems Inc.
Samigon Division/Argraph Corp.
Smith-Victor Corp. B147-B150
Strand Century Inc.
Video Components Inc.

LIGHTING SYSTEMS CONSULTANT

Walter S. Brewer
Custom Audio Electronics
Image Devices Inc.
Lumitrol Ltd. Theatre Lighting
Oregon Sound and Lights

LIGHTING TV STUDIO SYSTEMS

Bardwell and McAlister Inc.
Berkey Colortran
Comquip
Dyma Engineering Inc.
Electro Controls Inc.
Electronics Diversified B54
Harris Corp., Broadcast Products Division
Image Devices Inc.
Janson Industries
Kliegl Brothers B84-B88
Lumitrol Ltd. Theatre Lighting
Packaged Lighting Systems Inc.
Skirpan Lighting Control Corp.
Smith-Victor Corp. B147-B150
Stand Century Inc.
Video Components Inc.
Weather Scan Inc.

LIGHTNING ELIMINATION SYSTEMS

Lightning Elimination Associates Inc.

LIGHTNING WARNING SYSTEMS

Lightning Elimination Associates Inc.

LIMIT INDICATOR

Colorado Video Inc. B31-B38

LINE INSTALLATION EQUIPMENT

Burnup and Sims Inc.

LISTENING CENTERS/TABLES

Hamilton Electronics Corp.

LOGGERS AND LOGGER EQUIPMENT

Moseley Associates Inc.
Nationwide Electronic Systems Inc.
QSI Systems Inc.
Telex Communications Inc.

LOW VOLTAGE POWER SUPPLIES

California Instruments
Video Components Inc.

M

MAGNETIC FILM

Image Devices Inc.
J and R Film Co. — Goldberg/Compco

MAGNETIC TAPE EDITING PEN

Image Devices Inc.
Microtran B115

MAGNETIC TAPE ERASERS

R.B. Annis Co.
Broadcast Electronics Inc. B22-B27
Chyron Corp. B42
Ercona Corp.
Fidelipac
Garner Industries Inc. B62
Image Devices Inc.
Magnasonics Mfg. and Sales Co.
Microtran B115
Nortronics Co. Inc.
Robins Broadcast and Sound Equipment Corp.
Taber Mfg. and Eng. Co.
VIF International

MAGNETIC TAPE SYNCHRONIZERS

Electronic Engineering Co. of California (EECO)
Image Devices Inc.

MAILERS, AUDIO VISUAL

Cases Inc. B40
Image Devices Inc.
Reliance Plastics and Packaging Division

MAINTENANCE CATV AMPLIFIERS/EQUIPMENT

Applied Video Electronics Inc.
Com Sonics Inc.

MAINTENANCE PRODUCTS, AV

FilMagic Products Inc.
Tentel B157

MAINTENANCE SERVICES AM/FM

Applied Video Electronics Inc.
McMartin Industries Inc.
Solid Electronics Laboratories
Swager Tower Corp.

MAINTENANCE SERVICES CARTRIDGE/TAPE

Broadcast Cartridge Service
Broadcast Electronics Inc. B22-B27
Colorado Magnetics
Communications Ltd.
Comsonics Inc.
RCA Broadcast Systems

MAINTENANCE SERVICES, MICROWAVE

Atlantic Research Corp.
Comark Industries Inc.
Farinon Electric
Fort Worth Tower Co. Inc.
Microwave Associates
Fred A. Nudd Corp. B119
Prodelin Inc.
Raytheon Data Systems
Swager Tower Corp.

MAINTENANCE SERVICES, TV

Applied Video Electronics Inc.
Atlantic Research Corp.
Comark Industries Inc.
Comsonics Inc.
C.R.V. Systems Inc.
Evenview Television Systems
Fort Worth Tower Co. Inc.
Image Devices Inc.
Fred A. Nudd Corp. B119
RCA Broadcast Systems
Swager Tower Corp.
Townsend Associates Inc.

MAINTENANCE TEST EQUIPMENT

Comsonics Inc.
Dranetz Engineering Laboratories Inc.
Tentel..... B157

MANUFACTURERS REPRESENTATIVES

Broadcast Video Systems Ltd. B28
Video Components

MATCHING TRANSFORMERS

Altec Lansing
North Hills Electronics Inc.

MDS EQUIPMENT

Electronics, Missiles and Communications Inc.
Oak CATV Division/Oak Industries Inc.
Toner Cable Equipment Inc.
Varian Electron Device Group

MEDICAL FIBER SCOPE

Fujinon Optical Inc. B60, B61

MEGAPHONES

Paso Sound Products Inc.

MESSAGE CHANNEL

CADCO
Catel, Division of United Scientific Corp.

METAL FABRICATING

Harwood Mfg. Co.
Fred A. Nudd Corp. B119
Ramko Research Inc... B140, B141

METER MULTIPLIERS

Tech Laboratories Inc.

METERS DECIBEL

Amber Electro Design Ltd.
Lec Tro Tech Inc.
Weinschel Engineering Co. Inc.

METERS, PEAK PROGRAM

Eric Small and Associates Inc.

METERS, WOW AND FLUTTER

B and K Instruments Inc.
Dyma Engineering Inc.
Fidelipac
Gotham Audio Corp.
Leader Instruments Corp.
Leasametric
Video Research Corp.

MICROPHONE ACCESSORIES

AKG Acoustics B7, B8
Altec Lansing
Atlas Sound
Audiosears Corp.
Bogen Division/Lear Siegler Inc.
Broadcast Electronics Inc..... B22-B27
EDCOR
Electro-Voice Inc. B50, B51
Ercona Corp.
Frezzolini Electronics Inc. B58, B59
Alan Gordon Enterprises Inc.
HM Electronics Inc.
Heath Co.
Image Devices Inc.
MPC Educational Systems Inc.
Paso Sound Products Inc.
Perma Power Electronics Inc.
Sennheiser B143
Shure Brothers Inc. ... B144, B145
Special Instruments Laboratory Inc.
Switchcraft Inc.
Turner Division of Conrac Corp.
Uher Corp.

MICROPHONES, BOOM

AKG Acoustics B7, B8
Atlas Sound
Audiosears Corp.
B and K Instruments Inc.
Bayly Engineering
Bogen Division/Lear Siegler Inc.
Broadcast Electronics Inc..... B22-B27
CCA Electronics Corp. B29
Cetec Broadcast Group
Comquip Corp.
Electro-Voice Inc. B50, B51
Ercona Corp.
Alan Gordon Enterprises Inc.
Gotham Audio Corp.
Harris Corp., Broadcast Products Division
Image Devices Inc.
MPC Educational Systems Inc.
Panasonic Co..... B124-B129
Paso Sound Products Inc.
RCA Broadcast Systems
Sansui Electronics Corp.
Sennheiser B143
Shure Brothers Inc. ... B144, B145
Singer Products Co. Inc.
Studer Revox America
Wilkinson Electronics Inc.

MICROPHONES, DESK

AKG Acoustics B7, B8
Accurate Sound
Altec Lansing
Bayly Engineering Ltd.
Bogen Division/Lear Siegler Inc.
Broadcast Electronics Inc..... B22-B27
CCA Electronics Corp. B29
Cetec Broadcast Group
Dyma Engineering Corp.
EDCOR
Electro-Voice Inc. B50, B51
Ercona Corp.
GBC Closed Circuit TV Corp.
Alan Gordon Enterprises Inc.
Harris Corp., Broadcast Products Division
Image Devices Inc.
MPC Educational Systems Inc.
Newcomb Audio Products
Marti Electronics Inc... B110, B111
Panasonic Co..... B124-B129
Paso Sound Products Co.
RCA Broadcast Products Division
R-Columbia Products Co. Inc.
Rockwell International-Collins Broadcast Products
Sennheiser B143
Shure Brothers Inc. ... B144, B145
Singer Products Co. Inc.
Sony Corp. of America
Superscope Inc.
TEAC Corp. of America
Turner Division of Conrac
Uher Corp.
Wilkinson Electronics Inc.

MICROPHONES, FLOOR

AKG Acoustics B7, B8
Altec Lansing
Bayly Engineering Ltd.
Bogen Division/Lear Siegler Inc.
Broadcast Electronics Inc..... B22-B27
CCA Electronics Corp. B29
Cetec Broadcast Group
Dyma Engineering Inc.
Electro-Voice Inc. B50, B51
Ercona Corp.
Alan Gordon Enterprises Inc.
Harris Corp., Broadcast Products Division
Image Devices Inc.
Newcomb Audio Products Co.
Panasonic Co..... B124-B129
Paso Sound Products Inc.
RCA Broadcast Systems
Rockwell International-Collins Broadcast Products
Sennheiser B143
Shure Brothers Inc. ... B144, B145
Singer Products Co. Inc.
Studer Revox America
Superscope Inc.
TEAC Corp. of America
Uher Corp.
Wilkinson Electronics

MICROPHONES, HAND HELD

AKG Acoustics B7, B8
Altec Lansing
Audiosears Corp.
Avid Corp.
Bogen Division/Lear Siegler Corp.
Broadcast Electronics Corp. B22-B27
CCA Electronics Corp. B29
EDCOR
Electro-Voice Corp. B50, B51
Ercona Corp.
Frezzolini Electronics Corp..... B58, B59
Alan Gordon Enterprises Inc.
Gotham Audio Corp.
HM Electronics Inc.
Image Devices Inc.
MPC Educational Systems Inc.
Marti Electronics Inc... B110, B111
Newcomb Audio Products Co.
Panasonic Co..... B124-B129
Paso Sound Products Co.
RCA Broadcast Systems
R-Columbia Products Co. Inc.
Rockwell International-Collins Broadcast Products
Sansui Electronics Corp.
Sennheiser B143
Shure Brothers Inc. ... B144, B145
Singer Products Co. Inc.
Sony Corp. of America
Superscope
TEAC Corp. of America
Uher Corp.
VIF International
Wilkinson Electronics

MICROPHONES, LAVALIER

AKG Acoustics ***B7, B8***
Altec Lansing
Bogen Division/Lear Siegler Inc.
Broadcast Electronics Inc. ***B22-B27***
CCA Electronics Corp. ***B29***
Dyma Engineering Inc.
EDCOR
Electro-Voice Inc. ***B50, B51***
Ercona Corp.
Frezzolini Electronics Inc. ***B58, B59***
Alan Gordon Enterprises Inc.
Gotham Audio Corp.
Harris Corp., Broadcast Products Division
Image Devices Inc.
MPC Educational Systems Inc.
Paso Sound Products Inc.
RCA Broadcast Systems
Sennheiser ***B143***
Shure Brothers Corp. ... ***B144, B145***
Singer Products Co. Inc.
Sony Corp. of America
Studer Revox America
Uher Corp.
Wilkinson Electronics

MICROPHONES, PARABOLIC AND SHOTGUN

AKG Acoustics ***B7, B8***
Bayly Engineering Ltd.
Broadcast Electronics Inc. ***B22-B27***
Dyma Engineering Inc.
Electro-Voice Inc. ***B50, B51***
Ercona Corp.
Frezzolini Electronics Inc. ***B58, B59***
Gotham Audio Corp.
Image Devices Inc.
Sennheiser ***B143***
Westlake Audio

MICROPHONES STANDS AND BOOMS

AKG Acoustics ***B7, B8***
Altec Lansing
Atlas Sound
BSC Inc.
Bayly Engineering Ltd.
Bogen Division/Lear Siegler Corp.
Broadcast Electronics Inc. ***B22-B27***
CCA Electronics Corp. ***B29***
Comquip Inc.
EDCOR
Ercona Corp.
G.C. Electronics Corp.
Alan Gordon Enterprises Inc.
Gotham Audio Corp.
Karl Heitz Inc.
Image Devices Inc.
MPC Educational Systems Inc.
Panasonic Co. ***B124-B129***
Paso Sound Products Inc.
RCA Broadcast Systems
Sansui Electronics Corp.
Sennheiser ***B143***
Shure Brothers Inc. ... ***B144, B145***
Singer Products Co. Inc.
Strand Century Inc.
Studer Revox America
Television Products Co. Inc.
Uher Corp.
Westlake Audio
Wilkinson Electronics Inc.

MICROPHONES, WIRELESS

Bayly Engineering Ltd.
Cetec Broadcast Group
Comquip
Dyma Engineering Inc.
EDCOR
Electro-Voice Inc. ***B50, B51***
Ercona Corp.
Frezzolini Electronics Corp. ***B58, B59***
Alan Gordon Enterprises Inc.
HM Electronics Inc.
Ikegami Electronics Inc.
Image Devices Inc.
MPC Educational Systems Inc.
Perma Power Electronics Inc.
Singer Products Co. Inc.
Special Instruments Laboratory Inc.
Thomson-CSF Laboratories
VIF International
Val-Tronics Inc.
Vega Electronics
Wilkinson Electronics

MICROPHONE/TRANSDUCER INPUT TRANSFORMERS

Broadcast Electronics Inc. ***B22-B27***
Image Devices Inc.
Microtran ***B115***

MICROPROCESSOR CONTROLLED EARTH STATION RECEIVER AUTOMATION SYSTEMS

Channelmatic Electronics Inc.

MICROPROCESSOR CONTROLLED PROGRAMMABLE CLOCKS

Channelmatic Electronics Inc.

MICROPROCESSOR REAL-TIME CONTROLLERS

Bristol Division of Acco
Broadcast Electronics Inc. ***B22-B27***
Channelmatic Electronics Inc.

MICROSCOPE CCTV SYSTEMS

GBC Closed Circuit TV Corp.

MICROWAVE ACCESSORIES

Broadcast Electronics Inc. ***B22-B27***
Cablewave Systems Inc.
Catel, Division of United Scientific Corp.
Coastcom
EEV Inc.
GTE Lenkurt Inc.
Innovative Television Equipment
International Microwave Corp.
Leasametric
Marti Electronics Inc. .. ***B110, B111***
Maury Microwave Corp.
Moseley Associates Inc.
North Hills Electronics Inc.
Summit Cinevideo Corp.
UTE Microwave Inc.
Varian Electron Device Group
Weinschel Engineering Co. Inc.

MICROWAVE KLYSTRONS

Ceco Communications Inc.
Levit Electronics

MICROWAVE PATH SURVEY AND MONITOR

Compucon Inc.
GTE Lenkurt Inc.

MICROWAVE, PORTABLE/ENG

Coastcom
Farinon Electric
International Microwave Corp.
Leasametric
Marti Electronics Inc. .. ***B110, B111***
Nurad Inc.
Rockwell International-Collins Broadcast Products
Terra Com Division of Conic Corp.
Thomson-CSF Laboratories

MICROWAVE STL AND REMOTE PU

Coastcom
International Microwave Corp.
Marti Electronics Inc. .. ***B110, B111***
Micro Control Associates Inc.
Moseley Associates Inc.
Nurad Inc.
Rockwell International-Collins Broadcast Products
Tepco Corp.
Terra Com, Division of Conic Corp.
Time and Frequency Technology Inc.

MICROWAVE SUPPORTS/ACCESSORIES

Innovative Television Equipment
International Microwave Corp.
Microflect Co. Inc.

MIXERS CRYSTAL

Weinschel Engineering Co. Inc.

MOBILE VAN CONSTRUCTION

Applied Video Electronics Inc.
Atlantic Research Corp.
Soll Inc.

MOBILE VIDEO CARTS

Image Devices Inc.
Lee-Ray Industries Inc. ***B90***
Multiplex Display Fixture Co.
Peerless Sales Co.
Video Components Inc.
H. Wilson Corp.
The Winsted Corp. ***B175-B182***

MOBILE VTR CENTERS

Applied Video Electronics Inc.
Bretford
H. Wilson Corp.
The Winsted Corp. ***B175-B182***

MODULAR STAGES/ DANCE FLOORS — ILLUMINATED

Packaged Lighting Systems Inc.

MODULATION METERS, AM/FM

The Sequerra Co. Inc.

MODULATION MONITORS

Lampkin Labs Inc.
Leasametric
McMartin Industries Inc.
The Sequerra Co. Inc.
Time and Frequency Technology Inc.
Versa-Count Engineering ***B164-B165***
Wilkinson Electronics Inc.

MONITORS, FREQUENCY

Dranetz Engineering Laboratories Inc.
Time and Frequency Technology Inc.
Versa-Count Engineering ***B164-B165***

MONITOR/RECEIVERS, BLACK AND WHITE

Canadian General Electric Co. Inc.
Cohu Inc., Electronics Division
Conrac
Dage — MTI Inc.
Diamond Electronics, Division of Arvin Systems Inc.
Electrohome ***B52, B53***
NEC America Inc.
Panasonic Co. ***B124-B129***
RCA Electro-Optics and Devices
Rohde and Schwarz
Sanyo Electric Inc.
Sony
Video Components Inc.

MONITOR/RECEIVERS, COLOR

Canadian General Electric Co. Ltd.
Conrac
Electrohome ***B52, B53***
Frezzolini Electronics Inc. ***B58, B59***
Image Devices Inc.
JVC ***B75-B82***
Kallman Associates Inc.
Panasonic Co. ***B124-B129***
Rohde and Schwarz
Sanyo Electric Inc.
Sharp Electronics Corp. — Professional Products
Sony
Videotek Inc. ***B172***

MONITORS, BROADCAST FM

Conrac
The Sequerra Co. Inc.
Versa-Count Engineering ***B164-B165***

MONITORS, VIDEO PULSE CROSS

Amtron Corp.
ASACA Corp. of America B17-B19
CCA Electronics Corp. ***B29***
Conrac
Dyma Engineering Inc.
Electrohome Ltd. ***B52, B53***
Lenco Inc., Electronics Div. ***B91-B103***
Panasonic Co. ***B124-B129***
Rohde and Schwarz Sales Co.
Sony Corp. of America
Tektronix
Ultra Audio Pixtec
Unimedia Corp.
Video Aids Corp. of Colorado ***B163***
Videotek Inc. ***B172***

MONITORS, WAVEFORM

Broadcast Video Systems Ltd. ***B28***
CCA Electronics Corp. ***B29***
Harris Corp., Broadcast Products Division
Hitachi-Denshi Ltd. ***B65-B72***
Ikegami Electronics Inc.
Lec Tro Tech Inc.
Lenco Inc., Electronics Div. ***B91-B103***
Sharp Electronics Corp. — Professional Products
Tektronix Inc.
Ultra Audio Pixtec

MOTION DETECTOR

Colorado Video Inc. ***B31-B38***
GBC Closed Circuit TV Corp.

MOTION PICTURE DIST./PRODUCER

American Educational Films Inc.

MOTION PICTURE AND SLIDE FILM LIBRARIES

AIDS, A Damon Co.
American Educational Films Inc.
BNA Communications Inc.
Cable Films
Color Stock Library Inc. and Lem Bailey Prod.
Colour Images Unlimited Inc.
Harwald Co.
National Telefilm Associates
Sherman Films Inc.

MULTI-MEDIA PODIUMS

Communications Systems, Division of Powell Tool Supply Inc.

MULTI-MEDIA RENTAL

Communications Systems, Division of Powell Tool Supply Inc.

MULTIPOINT DISTRIBUTION AUDIO PROGRAMMING

RCA American Communications

MULTIPOINT DISTRIBUTION TV PROGRAMMING

RCA American Communications

MUSIC LIBRARY

De Wolfe Music Library ***B47***

MUSIC PRODUCTION

De Wolfe Music Library ***B47***
The Money Machine
TapeAthon Corp.
Ruth White Films/Rhythms Productions
T.J. Valentino ***B159***

MUSIC SYNTHESIZERS

ARP Instruments Inc.
Spectrum Instruments Inc.
Ruth White Films/Rhythms Productions

O

OBSTRUCTION LIGHTS (FAA APPROVED)

Crouse-Hinds Co.

ON AIR LIGHTS

Broadcast Cartridge Service
Broadcast Electronics Inc. ***B22-B27***
Fidelipac
QRK Electronic Products Inc. ***B131***
Ramko Research Inc. ... ***B140, B141***

ON LOCATION VIDEO PRODUCTION

Webb Telemedia Corp.

OPEN SHELF STORAGE SYSTEMS

The Winsted Corp. ***B175-B182***

OPTICAL COLOR COMPARATOR

Power Optics

OPTICAL EFFECTS

Technamics Co.
Video Components Inc.

OPTICAL SYSTEMS

Fujinon Optical Inc. ***B60, B61***
Lenzar Optics Corp.

OSCILLOSCOPES

B and K Instruments Inc.
Heath Co.
Leader Instruments Corp.
Leasametric
Lec Tro Tech Inc.
Wavetek Indiana Inc.

P

PAN AND TILT EQUIPMENT

Catel, Division of United Scientific Corp.
Diamond Electronics, Division of Arvin Systems Inc.
GBC Closed Circuit TV Corp.
Genesys Systems Inc.
Alan Gordon Enterprises Inc.
Image Devices Inc.
Innovative Television Equipment
Javelin Electronics
Karl Heitz Inc.
Listec Television Equipment Corp. ***B104-B107***
Nurad Inc.
Pelco
Quick-Set Inc. ***B132-B137***
RCA Electro Optics and Devices
Video Components Inc.

PASSIVE REPEATERS

Microflect Co. Inc.

PATCH CORDS

Audio Accessories Inc.

PEDESTALS, FIBERGLAS CATV

T.R. Pitts Co.

PHASE CONVERTERS, TRANSMITTER (SINGLE TO THREE)

California Instruments
Dyma Engineering Inc.
Harris Corp., Broadcast Products Division
Kay Industries Inc.
Val-Tronics Inc.

PHASE METERS

Amber Electro Design Ltd.
B and K Instruments Inc.
Dranetz Engineering Labs Inc.
Fidelipac
Gorman Redlich Mfg. Co.
Leasametric

Roger Mayer Electronics Inc.
Video Aids of Colorado B163
Video Components Inc.

PHOTOGRAPHY TIME LAPSE MOVIE CONTROLS
Sample Engineering Co.

PIPE LOCATERS
Aqua-Tronics Inc.

PLASTIC DUCT LOCATERS
Aqua-Tronics Inc.

POINTERS PROJECTION SCREEN
Audio Visual Contractors
Charles Mayer Studios Inc.
Ednalite Corp.
Samigon Division/Argraph Corp.

POLE LINE HARDWARE
Kortick Mfg. Co.

PORTABLE SLIDE SHOWCASE
General Audio Visual Inc. (GAVI)

PORTABLE TV PRODUCTION CENTER
GBC Closed Circuit TV Corp.

POWER/DIMMER RIGGING SYSTEMS — REMOTE CONTROL
Lumitrol Ltd. Theatre Lighting
Packaged Lighting Systems Inc.

POWER LINE MONITORS
Dranetz Engineering Laboratories Inc.

POWER PACKS
Anton Bauer B13-B16
Cine 60 Inc. B44-B45
Frezzolini Electronics Inc. B58, B59
Alan Gordon Enterprises Inc.
Heath Co.
Image Devices Inc.
Perrott Engineering Labs Inc. B130
Video Components Inc.

POWER SUPPLIES
Anton Bauer B13-B16
California Instruments
Communication Distribution Corp.
Control Technology Inc.
The Finney Co.
Frezzolini Electronics Inc. B58, B59
GBC Closed Circuit TV Corp.
Alan Gordon Enterprises Inc.
Heath Co.
Image Devices Inc.
International Nuclear Corp.
Kay Industries Inc.
Leasametric
McCurdy Radio Industries Inc.
McMartin Industries Inc.
Magnavox CATV System Inc.
Modular Audio Products B117
Optical Radiation Corp.
Robins Broadcast and Sound Equipment Corp.
Roh Corp.
Sample Engineering Co.
Sawyer Industries Inc.
Sitco Antennas
Spectra Sonics
Topaz Electronics
Varian Electron Device Group
Weinschel Engineering Co. Inc.

POWER SYSTEMS, UNINTERRUPTIBLE
Topaz Electronics

POWER TUBES
EEV Inc.
Levit Electronics
RCA Electro Optics and Devices
RCA Distributor and Special Products Division
Thomson-CSF Electron Tubes
Varian Electron Device Group

PRE-RECORDED TAPES/FILMS
Advanced Systems Inc.
Benchmark Films Inc.
Cable Films
Color Stock Library Inc. and Lem Bailey Prod.
Design-Form
EvenView Television Systems
Florida State University, Student Government Video Center
Microcampus — University of Arizona
Nightingale — Conant Corp.
VIF International

PRINTING AND TYPESETTING
The Bill Daniels Co. Inc. . B55, B74, B91, B109, B112, B174
Kroy Industries Inc.
Charles Mayer Studios Inc.
T.R. Pitts Co.

PRODUCERS AND DISTRIBUTORS OF VIDEOCASSETTE TRAINING PROGRAMS
BNA Communications Inc.

PRODUCT DEMONSTRATION CARTS
Ferno-Washington Inc.
Lee-Ray Industries Inc. B90

PRODUCTION, MOTION PICTURE
Color Stock Library Inc. and Lem Bailey Prod.

PROGRAMMED MUSIC
The CNB Studios
CaVox Stereo Productions
Cetec Broadcast Group
Concept Productions
TapeAthon Corp.
VIF International
T.J. Valentino Inc. B159
Ruth White Films/Rhythms Productions

PROGRAMMERS
E.S.E. B56, B57
Portac Inc.

PROGRAMMERS, MULTI-SCREEN
Audio-Sine Inc.
Audio Visual Laboratories Inc.
Communications Systems, Division of Powell Tool Supply Inc.
Delta Electronics Inc., Div. of Long Engineering Co.
EEG Enterprises Inc.
Impact Communications Inc.
Mincom Division, 3M Co.
Spindler and Sauppe' Inc.
Technamics Co.

PROJECTION SCREENS, CABINET AND TABLE TOP
Audio Visual Products Division/BCI
Daystar Audio Visual Inc.
General Audio Visual Inc. (GAVI)
Image Devices Inc.
MPC Educational Systems Inc.
Charles Mayer Studios Inc.
Raven Screen Corp.

PROJECTION SCREENS, FRONT
Da-Lite Screen Co. Inc.
Delta Electronics Inc., Div. of Long Engineering Co.
Alan Gordon Enterprises Inc.
Image Devices Inc.
MPC Educational Systems Inc.
Charles Mayer Studios Inc.
Projection Systems Inc.
Raven Screen Corp.

PROJECTION SCREENS, REAR
Audio Visual Contractors
Audio Visual Products Division/BCI
Da-Lite Screen Co. Inc.
Daystar Audio Visual Inc.
Delta Electronics Inc., Div. of Long Engineering Co.
Image Devices Inc.
Impact Communications Inc.
MPC Educational Systems Inc.
Charles Mayer Studios Inc.
Projection Systems Inc.
Raven Screen Corp.
Spectro-Vue Inc.
H. Wilson Corp.

PROJECTION SYSTEMS, 16MM XENON
Image Devices Inc.
Strong Electric Corp.

PROJECTOR, 8MM REPEATER
General Audio Visual Inc. (GAVI)

PROJECTOR LAMPS
Barbizon Electric
GTE Sylvania Inc.
General Audio Visual Inc. (GAVI)
Image Devices Inc.
Charles Mayer Studios Inc.
Riluma Co. of America
Schuessler Case Co. Inc.
Strand Century Inc.
Strong Electric Corp.
Varian Electron Device Group
H. Wilson Corp.

PROJECTOR TABLES AND STANDS
Accessories Mfg. Ltd.
Audio Visual Contractors
Bretford
Gruber Products Co. B63
Heindl Masks 'N' Mounts
Image Devices Inc.
J and R Film Co. — Goldberg/Compco
Karl Heitz Inc.
KLM Associates
Logan Electric Specialty Mfg. Co.
MPC Educational Systems Inc.
Charles Mayer Studios Inc.
Neumade Products Corp.
Optical Radiation Corp.
Samigon Division/Argraph Corp.
Smith System Mfg.
H. Wilson Co.
The Winsted Corp. B175-B182

PROJECTORS, SLIDE/SOUND
Technicolor Audio-Visual Systems

PROJECTORS, SUPER 8
Technicolor Audio-Visual Systems

PROMPTERS
D'San Corp.
Image Devices Inc.
Listec Television Equipment Corp. B104-B107
Q-TV/Telesync
Telescript Inc.

PULSE ASSIGNMENT SYSTEMS
Central Dynamics Ltd. B41
Lenco Inc., Electronics Div. B91-B103

PULSE DELAY LINES
Allen Avionics Inc. B11
Broadcast Video Systems Ltd. B28
Lenco Inc., Electronics Div. B91-B103

PULSE DISTRIBUTION AMPLIFIER
American Data B12
Applied Video Electronics Inc.
Beaveronics Inc. B20
Central Dynamics Ltd. B41
Cohu Inc., Electronics Division
Diamond Electronics, Division of Arvin Systems
Di-Tech Inc. B48
Dynair Electronics Inc.
Dynasciences
GBC Closed Circuit TV Corp.
Grass Valley Group Inc.
International Nuclear Corp.
J and D International
Leitch Video Ltd.
Lenco Inc., Electronics Div. B91-B103
North Hills Electronics Inc.
Shintron Co. Inc.
Sigma Electronics Inc.

Q

QUADRAPHONIC DECODERS
Sansui Electronics Corp.

QUADRAPHONIC ENCODERS
Sansui Electronics Corp.

R

RACK MOUNT ENCLOSURES
Cases Inc. B40

RACKS, STEEL
Equipto Storage Systems
Neumade Products Corp.
The Winsted Corp. B175-B182

RADAR/FLIR VIDEO FILM RECORDERS
Teledyne Camera Systems

RADAR, WEATHER
Levit Electronics
TSC Development Laboratories

RADIO AUTOMATION EQUIPMENT
VIF International

RADIO-TV PROGRAM CONTROLS
D'San Corp.

RADIO PROGRAMS
Nightingale-Conant Corp.

RADIO SPOT CARRIERS
Nightingale-Conant Corp.

RADIO/CASSETTE PLAYERS/RECORDERS
Hamilton Electronics Corp.

RASTER GENERATOR
Colorado Video Inc. B31-B38

REAL TIME ANALYZERS
Crown International Inc.

RECEIVERS, AM/FM
Altec Lansing
Bayly Engineering Ltd.
Bell Audio Systems Inc.
Bogen Division/Lear Siegler Inc.
CCA Electronics Corp. B29
Catel, Division of United Scientific Corp.
Comrex Corp.
Elcom Engineering B49
Electrohome Ltd. B52, B53
Fixtune Electronics Inc.
GTE Lenkurt Inc.
Heath Co.
International Microwave Corp.
Johnson Electronics
McMartin Industries Inc.
Marti Electronics Inc. . . B110, B111
Panasonic Co. B124-B129
Rohde and Schwarz Sales Co.
Sansui Electronics Corp.
H.H. Scott Inc.
Singer Products Co. Inc.
Studer Revox America
Superscope Inc.
Tandberg of America Inc.
Wilkinson Electronics Inc.

RECEIVERS, EBS
American Microsignal Co.
Broadcast Electronics Inc. B22-B27
CCA Electronics Corp. B29
Elcom Engineering Co. B49
Fixtune Electronics Inc.
Gorman Redlich Mfg. Co.
Harris Corp., Broadcast Products Division
International Nuclear Corp.
Logitek Electronic Systems
McMartin Industries Inc.
Rivers and Associates Inc.
Val-Tronics Inc.
Wilkinson Electronics Inc.

RECEIVERS, MULTIPLEX
Altec Lansing
Beta Technology Inc.
CCA Electronics Corp. B29
Coastcom
GTE Lenkurt Inc.
Heath Co.
International Microwave Corp.
McMartin Industries Inc.
Moseley Associates Inc.
Raytheon Data Systems
Singer Products Co. Inc.
Summit Cinevideo Corp.
Superscope Inc.

RECEIVERS, TIME SIGNAL
Caringella Electronics Inc.
Catel, Division of United Scientific Corp.
E.S.E. B56, B57
Elcom Engineering Co. B49
Electrohome Ltd. B52, B53

RECEIVERS, TV BLACK AND WHITE
Heath Co.
Panasonic Co. B124-B129
QSI Systems Inc.
Rohde and Schwarz
Sanyo Electric Inc.
Sharp Electronics Corp. — Professional Products
Sony

RECEIVERS, TV COLOR
Comquip
Electrohome Ltd. B52, B53
Evenview Television Systems
Heath Co.
Image Devices Inc.
Image Magnification Inc.
Panasonic Co. B124-B129
Pleasantville Labs
QSI Systems
Sanyo Electric Inc.
Sharp Electronics Corp. — Professional Products
Sony Corp. of America
Telescript Inc.
Videodetics Corp.

RECEIVERS, TV SATELLITE
Microdyne Corp.

RECEIVERS, WEATHER
Catel, Division of United Scientific Corp.
Gorman Redlich Mfg. Co.

RECORD PLAYERS
Broadcast Electronics Inc. B22-B27
Hamilton Electronics Corp.

RECORDER CARE KITS AUDIO
Broadcast Electronics Inc. B22-B27
Fidelipac
Nortronics Co. Inc.

RECORDER CARE KITS, VIDEO
Nortronics Co. Inc.
United Research Labs Corp.

RECORDERS, AUDIO REEL TO REEL

Ampex Corp.
Applied Video Electronics Inc.
B and K Instruments Inc.
Broadcast Electronics Inc. ***B22-B27***
Gotham Audio Corp.
Image Devices Inc.
Inovonics Inc. ***B73***
International Electro Magnetics (IEM)
Karl Heitz Inc.
MCI Inc.
Magna-Tech Electronic Co. Inc.
Martel Electronics
Scully Recording Instruments
Superscope Inc.
Telex Communications Inc.
Uher Corp.
United Research Labs Corp.
VIF International

RECORDERS, AUDIO TAPE CAMERA/TAPE TO FILM

Image Devices Inc.
Martel Electronics
W.A. Palmer Films Inc.
Teledyne Camera Systems

RECORDERS, CASSETTE AUDIO

Amilon Corp.
Avid Corp.
EDCO Products Inc.
Alan Gordon Enterprises Inc.
Heath Co.
Image Devices Inc.
MPC Educational Systems Inc.
MacKenzie Laboratories Inc.
Mincom Division, 3M Co.
Newcomb Audio Products Co.
Sansui Electronics Corp.
Sanyo Electric Inc.
Sharp Electronics Corp. — Professional Products
Superscope Inc.
Telectro Systems Corp.
Telex Communications Inc.
Uher Corp.
United Research Lab Corp.

RECORDERS, CASSETTE VIDEO

Heath Co.
Image Devices Inc.
NEC America Inc.
Panasonic Co. ***B124-B129***
Sanyo Electric Inc.
Sony
Telectro Systems Corp.

RECORDERS, DISC MAGNETIC

Ampex Corp.
Arvin/Echo Science Corp.

RECORDERS, FILM LIGHT

Wide Range Electronics Corp.

RECORDERS, FILM MAGNETIC

Image Devices Inc.
Magna-Tech Electronic Co. Inc.
Quad-Eight Electronics
Wide Range Electronics Corp.

RECORDERS, LOGGING

Broadcast Electronics Inc. ***B22-B27***
GYYR
QSI Systems Inc.
Scully Recording Instruments
The Stancil-Hoffman Corp.
Telectro Systems Corp.
Telex Communications Inc.
VIF International

RECORDERS, AUDIO TAPE

Ampex Corp.
Broadcast Electronics Inc. ***B22-B27***
Gotham Audio Corp.
Image Devices Inc.
International Electro Magnetics (IEM)
MCI Inc.
MPC Educational Systems Inc.
Magna-Tech Electronic Co. Inc.
Scully Recording Instruments
Superscope Inc.
Telectro Systems Corp.
Telex Communications Inc.
Uher Corp.
United Research Labs Corp.
VIF International

RECORDERS, SLOW MOTION

Ampex Corp.
Arvin/Echo Science Corp.
Image Devices Inc.

RECORDERS, TAPE AUDIO CARTRIDGE

Amilon Corp.
Audio-Sine Inc.
Broadcast Electronics Inc. ***B22-B27***
EDCO Products Inc.
International Electro Magnetics (IEM)
MPC Educational Systems Inc.
QRK Electronic Products Inc. ***B131***
Telectro Systems Corp.
Telex Communications Inc.
United Research Labs Corp.

RECORDERS, TIME BASE CORRECTION

Ampex Corp.
Digital Video Systems

RECORDERS, VIDEO KINESCOPE

W.A. Palmer Films Inc.
Teledyne Camera Systems

RECORDERS, VIDEO TIME LAPSE

Arvin/Echo Science Corp.
Eigen Corp.
GYYR
NEC America Inc.
Panasonic Co. ***B124-B129***
QSI Systems Inc.
RCA Electro Optics and Devices
Sanyo Electric Inc.

RECORDERS, VIDEO CARTRIDGE

EvenView Television Systems
Panasonic Co. ***B124-B129***
RCA Broadcast Systems

RECORDERS, VIDEO TAPE HELICAL

Ampex Corp.
NEC America Inc.
Panasonic Co. ***B124-B129***
RCA Broadcast Systems
Recortec Inc.
Sanyo Electric Inc.
Sony

RECORDERS, VIDEO TAPE QUAD

Ampex Corp.
RCA Broadcast Systems

RECTIFIERS

EEV Inc.
Levit Electronics
Thor Electronics Corp.
Varian Electron Device Group
Wilkinson Electronics Inc.

REELS, CABLE AND WIRE

Burnup and Sims Inc.
D'San Corp.

REELS, FILM

Alan Gordon Enterprises Inc.
Harwald Co.
Image Devices Inc.
J and R Film Co. — Goldberg/Compco
Neumade Products Corp.
Plastic Reel Corp. of America [PRC]
Schuessler Case Co. Inc.

REELS, TAPE

Image Devices Inc.
J and R Film Co. — Goldberg/Compco
MPC Educational Systems Inc.
Neumade Products Corp.
Plastic Reel Corp. of America [PRC]
Schuessler Case Co. Inc.
Superscope Inc.
Uher Corp.

REGULATORS, AC LINE

Topaz Electronics

RELAYS

Electronic Instrument and Specialty Corp.
ITT Jennings
Multronics Inc.

REMOTE CONTROL SYSTEMS

American Microsignal Inc.
Bayly Engineering Ltd.
CCA Electronics Corp. ***B29***
Cetec Broadcast Group
Comark Industries Inc.
Continental Electronics Mfg. Co.
Datalogic Rust Co.
Delta Electronics Inc.
Image Magnification Inc.
Logitek Electronic Systems
Marti Electronics ***B110, B111***
Micro Control Associates Inc.
Monroe Electronics Inc. ***B118***
Panasonic Co. ***B124-B129***
Portac Inc.
Power Optics Inc.
Robins Broadcast and Sound Equipment Corp.
Eric Small and Associates Inc.
Sono-Mag Corp.
Tayburn Electronics Inc.
Tele-Cine Inc.
Time and Frequency Technology Inc.
Val-Tronics Inc.
Vamco Engineering Inc. ***B160-B162***
Vega Electronics
The Widget Works Inc.
Wilkinson Electronics

REMOTE DATA ACQUISITION

Micro Control Associates Inc.
Nationwide Electronic Systems Inc.

REPEATING CASSETTES

Heindl Masks 'N' Mounts
MacKenzie Laboratories Inc.

REVERBERATION SYSTEMS

Eventide Clockworks Inc.
Gotham Audio Corp.
Quantum Audio Labs Inc.
Sansui Electronics Corp.
Technical Audio Products Corp. (TAPCO)
VIF International

REWINDERS, FILM

Alan Gordon Enterprises Inc.
Harwald Co.
J and R Film Co. — Goldberg/Compco
Kinetronics Corp.
Neumade Products Corp.
Recortec Inc.

REWINDERS, TAPE

Broadcast Electronics Inc. ***B22-B27***
Neumade Products Corp.
Telex Communications Inc.

R.F. AMMETERS

Delta Electronics Inc. — VA

R.F. AMPLIFIERS

AVA Electronics
Avantek Inc.
CADCO
C-Cor Electronics Inc.
EEV Inc.
Electronics, Missiles and Communications Inc.
The Finney Co.
International Microwave Corp.
LPB Inc.
McMartin Industries Inc.
Magnavox CATV Systems Inc.
Microwave Power Devices Inc.
Moseley Associates Inc.
T.R. Pitts Co.
R.F. Systems Co. — PA
Raytheon Data Systems
Sitco Antennas
Sony
Summit Cinevideo Corp.
TOCOM Inc.
Triple Crown Electronics Inc.
Varian Electron Device Group
Versa-Count Engineering ***B164-B165***
Wide Band Engineering Co. Inc.
Wilkinson Electronics Inc.

R.F. CABLES

AVA Electronics
Cablewave Systems Inc.
The Finney Co.
Micro Communications Inc.
T.R. Pitts Co.
Toner Cable Equipment Inc.
Trompeter Electronics ***B158***

R.F. COAXIAL RELAYS

Comsonics Inc.
ITT Jennings
Kilovac Corp.

R.F. CONNECTORS

AVA Electronics
Bird Electronic Corp.
Cablewave Systems Inc.
Comark Industries Inc.
The Finney Co.
Magnavox CATV System Inc.
Maury Microwave Corp.
T.R. Pitts Co.
Toner Cable Equipment Co.
Trompeter Electronics ***B158***
Weinschel Engineering Co. Inc.

R.F. CONSULTING

Comark Industries Inc.

R.F. CONTROL SYSTEMS

Fung Engineering Inc.
Soll Inc.

R.F. CONVERTERS, PAY TV

EEG Enterprises Inc.
GTE Sylvania Inc.,
CATV Equipment and Installation Operation
Magnavox CATV System Inc.
Oak CATV Division/Oak Industries Inc.
T.R. Pitts Co.
Summit Cinevideo Corp.
TOCOM Inc.
Toner Cable Equipment Inc.

R.F. CONVERTERS, STANDARD

CADCO
The Finney Co.
Fung Engineering Inc.
GTE Sylvania Inc.,
CATV Equipment and Installation Operation
Oak CATV Division/Oak Industries Inc.
T.R. Pitts Co.
R.F. Systems Co. — PA
Summit Cinevideo Corp.
TOCOM Inc.
Television Technology Corp.
Triple Crown Electronics Inc.
Varian Electron Device Group

R.F. DATA MODEMS FOR CATV

American Modem Corp.
Catel, Division of United Scientific Corp.
Fung Engineering Inc.
GTE Lenkurt Inc.

R.F. DEMODULATORS

American Modem Corp.
Catel, Division of United Scientific Corp.
Coastcom
Comark Industries Inc.
Dynair Electronics Inc.
Fung Engineering Inc.
Phasecom Corp.
TOCOM Inc.
Toner Cable Equipment Inc.

R.F. DIPLEXERS

Coastcom
Comark Industries Inc.
Continental Electronics Mfg. Co.
Dielectric Communications
Micro Communications Inc.
Microwave Filter Co. Inc.
Multronics Inc.
UTE Microwave Inc.
Varian Electron Device Group

R.F. DISTRIBUTION ACCESSORIES

CADCO
C-Cor Electronics Inc.
The Finney Co.
GTE Sylvania Inc.,
CATV Equipment and Installation Operation
Magnavox CATV System Inc.
Microwave Filter Co. Inc.
Multronics Inc.
North Hills Electronics Inc.
T.R. Pitts Co.
TOCOM Inc.
Toner Cable Equipment Inc.
Wide Band Engineering Co. Inc.

R.F. DISTRIBUTION AMPLIFIERS

CADCO
C-Cor Electronics Inc.
The Finney Co.
GTE Sylvania Inc.,
CATV Equipment and Installation Operation
Magnavox CATV System Inc.
T.R. Pitts Co.
R.F. Systems Co. — PA
Toner Cable Equipment Inc.
Triple Crown Electronics Inc.

R.F. GENERATORS

Delta Electronics Inc. — VA
GTE Sylvania Inc.,
CATV Equipment and Installation Operation
Gaw Co.
International Microwave Corp.
Lampkin Labs Inc.
Leader Instrument Corp.
McMartin Industries Inc.
Radiometer US Corp.
Rockwell International-Collins Broadcast Products
Sound Technology
Triple Crown Electronics Inc.
U.H.F. Associates
Wavetek Indiana Inc.

R.F. HEADEND PROCESSORS

American Modem Corp.
CADCO
Phasecom Corp.
T.R. Pitts Co.
TOCOM Inc.
Toner Cable Equipment Inc.
Triple Crown Electronics Inc.

R.F. INDUCTORS

Multronics Inc.

R.F. LINE EXTENDERS

CADCO
The Finney Co.
GTE Sylvania Inc.,
CATV Equipment and Installation Operation
Magnavox CATV System Inc.
T.R. Pitts Co.
TOCOM Inc.
Toner Cable Equipment Inc.
Triple Crown Electronics Inc.

R.F. LOADS

Bird Electronic Corp.
Coaxial Dynamics Inc.
Comark Industries Inc.
Continental Electronics Mfg. Co.
Dielectric Communications
Electro Impulse Laboratory Inc.
Lec Tro Tech Inc.
Trompeter Electronics ***B158***
Varian Electron Device Group
Wide Band Engineering Co. Inc.
Wilkinson Electronics Inc.

R.F. MODULATORS

American Modem Corp.
Catel, Division of United Scientific Corp.
Coastcom
Dynair Electronics Inc.
Fung Engineering Inc.
Phasecom Corp.
Rohde and Schwarz
Sony
Toner Cable Equipment Inc.
Triple Crown Electronics Inc.
U.H.F. Associates
Varian Electron Device Group

R.F. NON-DUPLICATION SWITCHERS

Multronics Inc.
T.R. Pitts Co.
Toner Cable Equipment Inc.
Triple Crown Electronics Inc.

R.F. PHASING SYSTEMS

Continental Electronics Mfg. Co.
Multronics Inc.

R.F. POWER MONITORS/ ALARMS REMOTE

Bird Electronic Corp.
Coaxial Dynamics Inc.

R.F. POWER SUPPLIES

Communications Distribution Corp.

Continental Electronics Mfg. Co.
GTE Sylvania Inc.,
CATV Equipment and Installat on Operation
Magnavox CATV System Inc.
T.R. Pitts Co.
Sawyer Industries Inc.
Toner Cable Equipment Inc.
Varian Electron Device Group

R.F. RECEIVERS

Catel, Division of United Scientific Corp.
International Microwave Corp.
KEL Corp.
Moseley Associates Inc.
Raytheon Data Systems
Scientific Radio Systems Inc.
Weinschel Engineering Co. Inc.

R.F. SWITCHERS

Barker and Williamson Inc.
Delta Electronics Inc. — VA
Dielectric Communications
Kilovac Corp.
Micro Communications Inc.
Multronics Inc.
T.R. Pitts Co.
Rockwell International-Collins Broadcast Products
Soll Inc.
Triple Crown Electronics Inc.
Wide Band Engineering Co. Inc.

R.F. TRUNK AMPLIFIERS

CADCO
C-Cor Electronics Inc.
The Finney Co.
GTE Sylvania Inc.,
CATV Equipment and Installation Operation
Magnavox CATV System Inc.
T.R. Pitts Co.
Toner Cable Equipment Inc.
Triple Crown Electronics Inc.

R.F. WATTMETERS

Barker and Williamson Inc.
Bird Electronic Corp.
Coaxial Dynamics Inc.
Dielectric Communications
Electro Impulse Laboratory Inc.
Leader Instruments Corp.
Lec Tro Tech Inc.
Rohde and Schwarz

S

SATELLITE AUDIO TRANSMISSION

RCA American Communications

SATELLITE EARTH STATIONS

Coastcom
Farinon Electric
Microdyne Corp.
Osawa and Co. USA Inc.
Prodelin Inc.
R.F. Systems Inc. — FL
Raytheon Data Systems
Rockwell International-Collins Broadcast Products
Soll Inc.
Terra Com, Division of Conic Corp.
Varian Electron Device Group

SATELLITE EARTH STATION ACCESSORIES

Catel, Division of United Scientific Corp.
Lenco Inc., Electronics Div. ***B91-B103***
Moseley Associates Inc.
Thomson-CSF Electron Tubes

SATELLITE EARTH STATION CONTROL SYSTEMS

Moseley Associates Inc.

SATELLITE TV ANTENNAS

Microdyne Corp.

SATELLITE TV RECEIVERS

Microdyne Corp.

SATELLITE VIDEO TRANSMISSION

Fung Engineering Inc.
RCA American Communications

SCA EQUIPMENT

Fixtune Electronics Inc.
McMartin Industries Inc.
Marti Electronics Inc. .. ***B110, B111***
Rockwell International-Collins Broadcast Products
Solid Electronics Laboratories
Versa-Count Engineering ***B164-B165***
Wilkinson Electronics Inc.

SCRAMBLERS, SPEECH

Telectro Systems Corp.

SCREENS, PROJECTION

Audio Visual Products Division/BCI
Daystar Audio Visual Inc.
Alan Gordon Enterprises Inc.
Heindl Masks 'N' Mounts
MPC Educational Systems Inc.
Charles Mayer Studios Inc.
Raven Screen Corp.
Wilcox Lange Inc.

SHADING GENERATOR

Colorado Video Inc. ***B31-B38***

SECURITY MOUNTING SYSTEMS

Lucasey Mfg. Co.

SHELVING, STEEL

Equipto Storage Systems
Image Devices Inc.
Neumade Products Corp.
The Winsted Corp. ***B175-B182***

SHIPPING CASES

Anvil Cases ***B10***
Cases Inc. ***B40***
Fiberbilt Photo Products/Ikelheimer-Ernst
Harwald Co.
Image Devices Inc.
J and R Film Co. — Goldberg/Compco
JVC ***B75-B82***
Charles Mayer Studios Inc.
Neumade Products Corp.
Plastic Reel Corp. of America [PRC]
Samigon Division/Argraph Corp.
Schuessler Case Co. Inc.
Sony
Thermodyne International Ltd.
Video Components Inc.

SIGNAL S AMPLIFIERS

Coaxial Dynamics Inc.

SIGNAL LEVEL METERS CATV/MATV

Fung Engineering Inc.
Sadelco Inc.

SINGLE CHANNEL PER CARRIER (SCPC)

Coastcom

SLIDE COLLATING EQUIPMENT

Sickles Inc.

SLIDE DUPLICATING EQUIPMENT

Sickles Inc.

SLIDE DUPLICATORS

Leedal Inc.

SLIDE AND FILMSTRIP SERVICES

AIDS, A Damon Co.
Charles Mayer Studios Inc.
Radmar Inc.
Richard Mfg. Co.
Starex Inc.

SLIDE MAKING KITS

The Film Makers

SLIDE MOUNTING EQUIPMENT

Ercona Corp.
Heindl Masks 'N' Mounts
Karl Heitz Inc.
Kaiser Corp.
The Kimac Co.
Samigon Division/Argraph Corp.
Sickles Inc.
Wess Plastics Inc.

SLIDE PROJECTION EQUIPMENT

Heindl Masks 'N' Mounts
MacKenzie Laboratories Inc.

SLIDE PROJECTORS, XENON 35MM

MacKenzie Laboratories Inc.
Strong Electric Corp.

SLIDE REQUEST DEVICE

CA Compton Inc.

SLIDE SORTING EQUIPMENT

Edna-Lite Corp.
Franklin Distributors Corp.
Harwood Mfg. Co.
Heindl Masks 'N' Mounts
J and R Film Co. — Goldberg/Compco
Leedal Inc.
Logan Electric Specialty Mfg. Co.
MPC Educational Systems Inc.
Multiplex Display Fixture Co.
Reliance Plastics and Packaging Division
Research Technology Inc.
Richards Mfg. Co.

SLIDE STORAGE EQUIPMENT

Bretford
Franklin Distributors Corp.
Heindl Masks 'N' Mounts
The Kimac Co.
Leedal Inc.
Logan Electric Specialty Mfg. Co.
MPC Educational Systems Inc.
Multiplex Display Fixture Co.
Neumade Products Corp.
Plastic Reel Corp. of America [PRC]
Radmar Inc.
Research Technology Inc.
Samigon Division/Argraph Corp.
H. Wilson Corp.

SLIDE TITLING EQUIPMENT
Heindl Masks 'N' Mounts

SLIDE TRAY LEADER
Sickles Inc.

SLIDE VIEWERS
Franklin Distributors Corp.

SMPTE CODE EDITING EQUIPMENT
Ampex Corp.
Consolidated Video Systems . B39
Datametrics Inc.
Datatron Inc.
Electronic Engineering Co. of California (EECO)

SOUND CONSULTANTS
Erskine-Shapiro Theatre Technology Inc.
Richmond Sound Design Ltd.

SOUND EFFECTS
AIDS, A Damon Co.
Color Stock Library Inc. and Lem Bailey Prod.
Columbia Special Products . . . B43
De Wolfe Music Library B47
MacKenzie Laboratories Inc.
T.J. Valentino Inc. B159

SOUND LIBRARY
Columbia Special Products . . . B43
De Wolfe Music Library B47

SOUND/SLIDE PROGRAMS
AIDS, A Damon Co.

SOUND SYSTEMS
AIDS, A Damon Co.
Altec Lansing
Argos Sound
Delta Electronics Inc., Div. of Long Engineering Co.
EDCOR
Erskine-Shapiro Theatre Technology Inc.
Image Devices Inc.
MPC Educational Systems Inc.
Micro-Trak Corp. B114
Newcomb Audio Products Co.
Paso Sound Products Inc.
Perma Power Electronics Inc.
Shure Brothers Inc. . . . B144, B145
Sound Craft Systems Inc.
Special Instruments Laboratory Inc.
Spectra Sonics
Telectro Systems Corp.

SPEAKER ENCLOSURES
Altec Lansing
Argos Sound
Atlas Sound
Bogen Division/Lear Siegler Inc.
Broadcast Electronics Inc. B22-B27
Electro-Voice Inc. B50, B51
Ercona Corp.
Oregon Sound and Lights
Paso Sound Products Inc.
QRK Electronic Products Inc. B131
Superscope Inc.
Telectro Systems Corp.

SPEAKERS, MONITOR
Altec Lansing
Shure Brothers Inc. . . . B144, B145

SPEAKER — TIME CONTROLS (LIGHT SIGNALS)
D'San Corp.
Ercona Corp.

SPEAKERS
Atlas Sound
Audionics of Oregon
Avid Corp.
Bogen Division/Lear Siegler Inc.
Broadcast Electronics Inc. B22-B27
Cetec Audio
Electro-Voice Inc. B50, B51
Gotham Audio Corp.
Heath Co.
Newcomb Audio Products Co.
Paso Sound Products Inc.
Quam-Nichols Co.
Sansui Electronics Corp.
H.H. Scott Inc.
Rank Hi Fi (USA)
Shure Brothers Inc. . . . B144, B145
Special Instruments Laboratory Inc.
Spectra Sonics
Superscope Inc.
Telectro Systems Corp.
VIF International

SPECTRUM ANALYSERS
Amber Electro Design Ltd.
B and K Instruments Inc.
Inovonics Inc. B73
Leasametric
Special Instruments Laboratory Inc.

SPEECH THERAPY AMPLIFIERS
Eckstein Brothers Inc.

SPOTLIGHTS, FOLLOW
Lumitrol Ltd. Theatre Lighting
Strong Electric Corp.

SPOTMETERS
Photo Research, Division Kollmorgen Corp.

SQ QUAD DECODER
Audionics of Oregon

STANDBY POWER SYSTEMS
Communications Distribution Corp.
Sawyer Industries Inc.
Versa-Count Engineering. B164-B165

STATUS AND ALARM INDICATORS
Atlas Sound
Delta Electronics Inc., Div. of Long Engineering Co.
GTE Lenkurt Inc.
Locator Electronics Co.
Marti Electronics Inc. . . B110, B111
Moseley Associates Inc.

STEREO MULTIPLEX
Catel, Division of United Scientific Corp.
Coastcom

STORAGE EQUIPMENT, ELECTRONIC STILL
ADDA Corp. B6

STORAGE RACKS FILM AND TAPE
Accessories Mfg. Ltd.
Avid Corp.
Equipto Storage Systems
Fidelipac
Harwald Co.
Harwood Mfg. Co.
J and R Film Co. — Goldberg/Compco
Lyon Metal Products Inc.
Neumade Products Corp.
Plastic Reel Corp. of America [PRC]
Storeel Corp.
H. Wilson Corp.
The Winsted Corp. B175-B182

STORY BOARD CARDS
Medro Educational Products

STORY PLANNING BOARDS
Fax Co.
Heindl Masks 'N' Mounts
Leedal Inc.
Charles Mayer Studios Inc.
Medro Educational Products

STUDIO CARTRIDGES
Shure Brothers Inc. . . . B144, B145

STUDIO CONSTRUCTION
Aderhold Construction Co.
Applied Video Electronics Inc.
Kliegl B84-B88
Soll Inc.
Val-Tronics Inc.

STUDIO DESIGN, RADIO
Aderhold Construction Co.
Applied Video Electronics Inc.
Delta Electronics Inc., Div. of Long Engineering Co.
Kallman Associates Inc.
Soll Inc.
Ultra Audio Pixtec
Val-Tronics Inc.

STUDIO DESIGN, TV
Aderhold Construction Co.
Applied Video Electronics Inc.
CRV Systems Inc.
Delta Electronics Inc., Div. of Long Engineering Co.
Kallman Associates Inc.
The Media Works Inc. (Industrial)
Soll Inc.
Strand Century Inc.
Ultra Audio Pixtec
Vamco Engineering Inc. B160-B162

STUDIO DESIGN, TV LIGHTING
Kliegl Brothers B84-B88
Strand Century

STUDIO FURNITURE
Amco Engineering Co.
Broadcast Electronics Inc. B22-B27
Design-Form
LPB Inc.
McCurdy Radio Industries Inc.
Micro-Trak Corp. B114
QRK Electronic Products Inc. B131

STUDIO LIGHTING LADDER
Walter S. Brewer Co.

STUDIO SET DESIGN
Design-Form
Hexcel Corp.
The Media Works Inc.

SUBCARRIER DISTRIBUTION AMPLIFIER

American Data ***B12***
Central Dynamics ***B41***
Dynair Electronics Inc.
Dynasciences Inc.
Industrial Sciences Inc.
International Microwave Corp.
International Nuclear Corp.
Leitch Video Ltd.
Lenco Inc., Electronics Div. ***B91-B103***

SURGE PROTECTORS

EEV Inc.
Lightning Elimination Associates Inc.
Toner Cable Equipment Inc.
Wilkinson Electronics Inc.

SWEEP GENERATORS

Weinschel Engineering Co. Inc.

SWITCHES, COAXIAL

Bird Electronic Corp.
Comark Industries Inc.
The Finney Co.
Weinschel Engineering Co. Inc.
Wide Band Engineering Co. Inc.

SWITCHERS, MANUAL AND SEQUENTIAL

Broadcast Video Systems Ltd. ***B28***
Dage — MTI Inc.
Diamond Electronics, Division of Arvin Systems Inc.
Fung Engineering Inc.
GBC Closed Circuit TV Corp.
International Nuclear Corp.
J and D International
Javelin Electronics
Lenco Inc., Electronics Div. ***B91-B103***
Portac Inc.
Quick-Set Inc. ***B132-B137***
Sigma Electronics Inc.
Sony
U.H.F. Associates
Vamco Engineering Inc. ***B160-B162***
Video Components Inc.

SWITCHERS, MASTER CONTROL

Central Dynamics Ltd. ***B41***
Dytek Industries Inc.
Industrial Sciences Inc.
Vitex Co. ***B173***

SYNC CHANGEOVER SWITCH, AUTOMATIC

Lenco Inc., Electronics Div. ***B91-B103***

SYNC DELAY

Colorado Video Inc. ***B31-B38***
Lenco Inc., Electronics Div. ***B91-B103***

SYNC GENERATOR SUBSTITUTE

California Instruments
Lenco Inc., Electronics Div. ***B91-B103***

SYNC STRIPPER

Colorado Video Inc. ***B31-B38***

T

TAPE AND FILM STORAGE SYSTEMS

Neumade Products Corp.
The Winsted Corp. ***B175-B182***

TAPE AND FILM TRUCKS

Lee-Ray Industries Inc. ***B90***
Neumade Products Corp.
The Winsted Corp. ***B175-B182***

TAPE TENSION GAUGES

Tentel ***B157***
VIF International

TAPE TRANSPORT MECHANISM FOR CASSETTES

Amilon Corp.

TAPE TRANSPORT MECHANISMS FOR NAB CARTRIDGES

Amilon Corp.

TELECOMMUNICATIONS EQUIPMENT

Catel, Division of United Scientific Corp.
Levit Electronics
Micro Control Associates Inc.
Raytheon Data Systems

TELEPHONE COUPLING EQUIPMENT

Broadcast Electronics Inc. ***B22-B27***
Channelmatic Electronics Inc.
D'San Corp.
Delta Electronics Inc., Div. of Long Engineering Co.
Image Devices Inc.
Leasametric
Locator Electronics Co.
McCurdy Radio Industries Inc.
Magnesonics Mfg. and Sales Co.
Microtran Co. ***B115***
Shure Brothers Inc. ... ***B144, B145***

TELEPHONE COUPLING TRANSFORMERS

Microtran ***B115***

TELEPHONE JACKS AND PLUGS

Audio Accessories Inc.

TELEPHONE LINE VIDEO TRANSMISSION

Colorado Video Inc. ***B31-B38***
Dynair Electronics Inc.
Leasametric

TELESCOPIC POWER BRIDGES — PORTABLE

Packaged Lighting Systems Inc.

TELETYPE MOTOR CONTROL ON/OFF

B and I Electronics Inc.

TEMPERATURE PROBES

Data Precision Corp.

TEST EQUIPMENT, CATV

ASACA Corp. of America ***B17-B19***
Avantek Inc.
B and K Instruments Inc.
Comsonics Inc.
EEG Enterprises Inc.
Leader Instruments Corp.
Leasametric
Lenco Inc., Electronics Div. ***B91-B103***
Mid State Communications Inc.
Rohde and Schwarz
Sadelco Inc.
Sigma Electronics Inc.
Toner Cable Equipment Inc.
Triple Crown Electronics Inc.
Wavetek Indiana Inc.
Wide Band Engineering Co. Inc.

TEST EQUIPMENT AND INSTRUMENT CART

Lee-Ray Industries Inc. ***B90***

TEST EQUIPMENT, RENTAL/LEASE

Leasametric
Neutrik Products

TEST SETS, RETURN LOSS

Weinschel Engineering Co. Inc.

TEST MONITORING SWITCHERS

Lenco Inc., Electronics Div. ***B91-B103***
QSI Systems Inc.

TEST RECORDS

B and K Instruments Inc.
Crown International Inc.

TEST SLIDES/TAPES

Diamond Electronics, Division of Arvin Systems Inc.
Heindl Masks 'N' Mounts
Porta-Pattern Telecommunications Industries Ltd.
Spindler and Sauppe' Inc.
TDK Electronics Corp.

TEST CHARTS, CAMERA

ATV Research
Diamond Electronics, Division of Arvin Systems Inc.
EEV Canada Ltd.
Harris Corp., Broadcast Products Division
Porta-Pattern Telecommunications Industries Inc.
RCA Broadcast Systems
Telecommunications Industries Ltd.
Ultra Audio Pixtec

TEXT BOOKS

Didactic Systems Inc.
Heindl Masks 'N' Mounts
Image Devices Inc.
The Media Works Inc.

TIME BASE CORRECTORS

ADDA Corp. ***B6***
Ampex Corp.
Automation Techniques Inc.
C.R.V. Systems Inc.
Consolidated Video Systems . ***B39***
Digital Video Systems

Dyma Engineering Inc.
Edutron Inc.
Merlin Engineering Works Inc.
Micro Consultants
Microtime Inc. ***B113***
NEC America Inc.
Panasonic Co. ***B124-B129***
RCA Broadcast Systems
Seigel Electronics
Sony Corp. of America

TIME — COMPRESSION PHOTO SYSTEMS
Technovations

TIME/DATE GENERATORS
Chrono-Log Corp.
Electronic Engineering Co. of California (EECO)
GBC Closed Circuit TV Corp.
GYYR
Laird Telemedia
Portac Inc.
QSI Systems Inc.
Quick-Set Inc. ***B132-B137***
RCA Electro Optics and Devices
Sigma Electronics Inc.
Video Components
Video Devices Co.

TIME DELAYS
Sawyer Industries Inc.

TIME/TEMPERATURE GENERATORS
Nationwide Electronic Systems Inc.
Vamco Engineering Inc. ***B160-B162***

TIMERS, VIDEO TAPE
Artists Engineering
Sony

TITLING EQUIPMENT, MECHANICAL
Kroy Industries Inc.

TITLING GENERATORS
B.E.I.
[Beston Electronics Inc.] ***B21***
Knox Ltd. ***B89***
Laird Telemedia
Portac Inc.
Sigma Electronics Inc.
Thomson-CSF Laboratories
Telestrator Division, Interand Corp.
Video Data Systems

TONE ARMS
Broadcast Electronics Inc. ***B22-B27***
LPB Inc.
Micro-Trak Corp. ***B114***
Osawa and Co. USA Inc.
QRK Electronic Products Inc. ***B131***
Shure Brothers Inc. ... ***B144, B145***
Eric Small and Associates Inc.

TOOLS
Heath Co.
Heindl Masks 'N' Mounts
Image Devices Inc.
QE Mfg. Co. Inc.

TOUCH-TONE CONTROLLED EARTH STATION RECEIVER AUTOMATION SYSTEMS
Channelmatic Electronics Inc.
Fung Engineering Inc.

TOUCH TONE SYSTEMS
Di-Tech Inc. ***B48***

TOWER HARDWARE
D.H.V. Inc.
Lightning Elimination Associates Inc.
Fred A. Nudd Corp. ***B119***
Swager Tower Corp.
Tiner Communications SVC Inc.
Unarco-Rohn
Utility Tower Co.

TOWER INSTALLATION SERVICES
Locator Electronics Co.
Microflect Co. Inc.
Fred A. Nudd Corp. ***B119***
Prodelin Inc.
Soll Inc.
Swager Tower Corp.
Tiner Communications SVC Inc.
Unarco-Rohn
Utility Tower Co.

TOWER LIGHTING
Elcom Engineering Co. ***B49***
Flash Technology Corp. of America
Hughey and Phillips Inc.
Hunt-Pierce Corp.
Fred A. Nudd Corp. ***B119***
Swager Tower Corp.
Tiner Communications SVC Inc.
Unarco-Rohn
Utility Tower Co.

TOWER PAINTING
Fred A. Nudd Corp. ***B119***
Utility Tower Co.

TOWERS
Kline Iron and Steel Co.
Microflect Co. Inc.
Fred A. Nudd Corp. ***B119***
Swager Tower Corp.
Tiner Communications SVC Inc.
Unarco-Rohn
Utility Tower Co.

TOWERS, FM
Allied Tower Co. Inc.
CCA Electronics Corp. ***B29***
Cetec Broadcast Group
Dyma Engineering Inc.
E-Z Way Products Inc.
Fort Worth Tower Co.
Harris Corp., Broadcast Products Division
Kline Iron and Steel Co.
RCA Broadcast Systems
Singer Products Co. Inc.
Stainless Inc.
Swager Tower Co.
Up-Right Scaffolds
Wilkinson Electronics

TOWERS, MICROWAVE
Kline Iron and Steel Co.

TOWERS, RADIO
Kline Iron and Steel Co.

TOWERS, TV
Allied Tower Co. Inc.
CCA Electronics Corp. ***B29***
Cetec Broadcast Group
Dyma Engineering Inc.
E-Z Way Products Inc.
Fort Worth Tower Co. Inc.
Harris Corp., Broadcast Products Division
Kline Iron and Steel Co.
RCA Broadcast Systems
Singer Products Co. Inc.
Stainless Inc.
Swager Tower Co.
Up-Right Scaffolds
Val-Tronics Inc.

TRAINING CASSETTES, SALES AND MANAGEMENT AND MOTIVATION
Nightingale-Conant Corp.

TRAINING — SIMULATIONS, BOOKS, FILMS
Didactic Systems Inc.

TRANSFORMERS, ISOLATION
Topaz Electronics

TRANSFORMERS, TOROIDAL, CURRENT
Delta Electronics Inc. — VA

TRANSIENT ELIMINATORS
Lightning Elimination Associates Inc.

TRANSLATORS, FM
D.N. Latus and Co. Inc.
RCA Electro Optics and Devices
Rodelco Electronics Corp.
Television Technology Corp.
Tepco Corp.
Versa-Count Engineering ***B164-B165***

TRANSLATORS, TV
Acrodyne Industries Inc.
Canadian General Electric Co. Ltd.
Electronics, Missiles and Communications Inc.
D.N. Latus and Co. Inc.
RCA Electro Optics and Devices
Rodelco Electronics Corp.
Television Technology Corp.
Tepco Corp.
Triple Crown Electronics Inc.
Versa-Count Engineering ***B164-B165***

TRANSMISSION LINE SUPERVISION SYSTEMS
Di-Tech ***B48***

TRANSMISSION LINES AND CONNECTORS
Comark Industries Inc.
Maury Microwave Corp.
Multronics Inc.
Phelps Dodge Communications Co.

TRANSMITTERS, AM
Audio-Sine Inc.
Continental Electronics Mfg. Co.
Harris Broadcast Products
Heath Co.
International Microwave Corp.
LPB Inc.
McMartin Industries Inc.
NEC America Inc.
RCA Broadcast Systems
Raytheon Data Systems
Rockwell International-Collins Broadcast Products

Sintronic Corp.
Wilkinson Electronics Inc.

TRANSMITTERS, FM

Harris Broadcast Products
Heath Co.
International Microwave Corp.
KEL Corp.
LPB Inc.
McMartin Industries Inc.
Microwave Power Devices Inc.
NEC America Inc.
RCA Broadcast Systems
Raytheon Data Systems
Rockwell International-Collins Broadcast Products
Sintronic Corp.
Solid Electronics Laboratories
Versa-Count Engineering ***B164-B165***
Wilkinson Electronics Inc.

TRANSMITTERS, TV

AEL Inc.
Acrodyne Industries Inc.
CCA Electronics Corp. ***B29***
CSI Electronics Inc.
Canadian General Electric Co. Ltd.
Comark Industries Inc.
Electronics, Missiles and Communications Inc.
Harris Corp., Broadcast Products Division
McMartin Industries Inc.
Microwave Power Devices Inc.
NEC America Inc.
North American Radio Corp.
RCA Broadcast Systems
Singer Products Co. Inc.
Sintronic Corp.
Val-Tronics Inc.
Varian Electron Device Group
Wilkinson Electronics Inc.

TRANSMITTER INSTALLATION

Soll Inc.

TRANSMITTER REMOTE CONTROL SYSTEMS — AM, FM TV

Moseley Associates Inc.
The Widget Works Inc.

TRANSMITTING ELECTRON TUBES

Ceco Communications Inc.
Levit Electronics
Thomson-CSF Electron Tubes

TRANSPARENCIES AND PREPARATION MATERIALS

Impact Communications Inc.
Starex Inc.
Transilwrap Co. Inc.

TRENCHERS/CABLE PLOWS

Jacobsen Mfg. Co., Minneapolis Division
F.B. Ryan Mfg. Co. Inc.

TRIPODS, HEADS, DOLLIES

Commercial Electronics Inc. .. ***B30***
Davis and Sanford Co. Inc.
Frezzolini Electronics Inc. ***B58, B59***
GBC Closed Circuit TV Corp.
Alan Gordon Enterprises Inc.
Innovative Television Equipment
Karl Heitz Inc.
Lee-Ray Industries Inc. ***B90***
Listec Television Equipment Corp. ***B104-B107***
Miller Professional Equipment
O'Connor Engineering Labs ***B120, B121***
Panasonic Co. ***B124-B129***
Quick-Set Inc. ***B132-B137***
Samigon Division/Argraph Corp.
Sharp Electronics Corp. — Professional Products
Smith-Victor Corp. ***B147-B150***
Sony
Video Cinema Industries Inc.
Video Components Inc.

TUNERS, FM

Accurate Sound Co.
Catel, Division of United Scientific Corp.
Collins, Division Rockwell International Inc.
Crown International Inc.
Heath Co.
McMartin Industries Inc.
Micro-Trak Corp. ***B114***
Panasonic Co. ***B124-B129***
Ram Audio Systems Inc.
Ramko Research Inc. .. ***B140, B141***
SWR Inc.
Sansui Electronics Corp.
The Sequerra Co. Inc.
TEAC Corp. of America

TV — AUDIO DIPLEXER

Coastcom

TV CARTS

Bretford
KLM Associates
Lee-Ray Industries Inc. ***B90***
Peerless Sales Co.
H. Wilson

TV CEILING/ WALL MOUNTS/STANDS

EvenView Television Systems
GBC Closed Circuit TV Corp.
Innovative Television Equipment
KLM Associates
Lucasey Mfg. Co.
Peerless Sales Co.
Quick-Set Inc. ***B132-B137***
Video Components Inc.
H. Wilson Corp.

TV CLOCK

Chrono-Log Corp.
Portac Inc.

TV/FILM PRODUCTION CONSULTANTS

Kapco Communications
Multi Media Forum ***B122***
Sherman Films Inc.
Webb Telemedia Corp.

TV FILM PROJECTORS

L and W International
RCA Broadcast Systems
Singer Education Systems

TV GRAPHICS PANELS

Charles Mayer Studios Inc.

TV LARGE SCREEN PROJECTORS

Canadian General Electric Co. Ltd.
Fryan Porta Vision
General Electric Corp.
Image Devices Inc.
Image Magnification Inc.
Kallman Associates Inc.
Keyser Video Inc.
Projection Systems Inc.

TV LIGHT METER

Image Devices Inc.
Power Optics

TURNTABLES, PHONO

Audio Interface Inc.
Broadcast Electronics Inc. ***B22-B27***
CCA Electronics Corp. ***B29***
Cetec Broadcast Group
Collins, Division of Rockwell International
Dyma Engineering Inc.
Gotham Audio Corp.
Hamilton Electronics Corp.
Harris Corp., Broadcast Products Division
Heath Co.
LPB Inc.
McCurdy Radio Industries Inc.
Micro-Trak Corp. ***B114***
Panasonic Co. ***B124-B129***
QRK Electronic Products Inc. ***B131***
RCA Broadcast Systems
Ramko Research Inc. .. ***B140, B141***
Russco Electronic Mfg. Co.
Sansui Electronics Corp.
Singer Products Co. Inc.
Stanton Magnetics Inc.
TEAC Corp. of America
Val-Tronics Inc.
Wilkinson Electronics Inc.

TV SYSTEMS, CLOSED CIRCUIT

A.F. Associates Inc.
ATV Research
AIDS, A Damon Co.
American Data Corp. ***B12***
Berkey-Colortran
Broadcast Video Systems Ltd. ***B28***
Canadian General Electric Co. Ltd.
Catel, Division of United Scientific Corp.
Central Dynamics Corp. ***B41***
Colorado Video Inc. ***B31-B38***
Communications Systems, Division of Powell Tool Supply Inc.
Dage — MTI Inc.
Davis and Sanford Co. Inc.
Diamond Electronics, Division of Arvin Systems
Dynair Electronics
Evenview Television Systems
GBC Closed Circuit TV Corp.
GYYR
Grass Valley Group
Ikegami Electronics Inc.
Image Devices Inc.
International Microwave Corp.
Javelin Electronics
Laird Telemedia Inc.
Leitch Video Ltd.
Lenzar Optics
Panasonic Co. ***B124-B129***
Philips Broadcast Equipment Corp.
Power Optics Inc.
RCA Broadcast Systems
Sanyo Electric Inc.
Sharp Electronics Corp. — Professional Products
Teltron
Temtron Inc.
Varian Electron Device Group
Videodetics
The Zei-Mark Corp.

U

UNDERGROUND TAPE
T.R. Pitts Co.

UNIVERSAL AMPLIFIER
Lenco Inc., Electronics Div. B91-B103

UTILITY REMOTE CONTROL
Moseley Associates Inc.

V

VACUUM TUBES, CAMERA
Amperex Electronic Corp.
Ceco Communications Corp.
Comquip
EEV Inc.
General Electric Co.
General Electrodynamics Corp.
Levit Electronics
RCA Broadcast Systems
Teltron
Temtron Electronics
Thomson-CSF Laboratories
Thor Electronics Corp.

VECTORSCOPES
Broadcast Video Systems Ltd. B28
Leader Instruments Corp.
Leasametric
Lec Tro Tech Inc.
Lenco Inc., Electronics Div. B91-B103
Ultra Audio Pixtec

VIDEO ACTIVATED POWER SWITCH
Video Aids of Colorado. B163

VIDEO ADAPTA-LENS/ POSITIONER
Warren R. Smith Co.

VIDEO ANALYZER
ASACA Corp. of America B17-B19
Colorado Video Inc. B31-B38
Rohde and Schwarz

VIDEO CABLE EQUALIZERS
Di-Tech Inc. B48
Lenco Inc., Electronics Div. B91-B103

VIDEO CAMERA LENS ACCESSORIES
Century Precision Cine Optics
Commercial Electronics Inc. . . B30
Dage — MTI Inc.
Diamond Electronics, Division of Arvin Systems Inc.
Frezzolini Electronics Inc. B58, B59
Fujinon Optical Inc. B60, B61
GBC Closed Circuit TV Corp.
Hitachi-Denshi America Ltd. B65-B72
Image Devices Inc.
Lenzar Optics Corp.
Panasonic. B124-B129
Quick-Set Inc. B132-B137
Sony
Video Components Inc.

VIDEO CAMERA LENS SERVICE
Achro-Video International Ltd. B5
Angenieux Corp.
Century Precision Cine Optics
Ercona Corp.
Alan Gordon Enterprises Inc.
Image Devices Inc.
Lenzar Optics Corp.

VIDEO CAMERA LENS, FIXED
Achro-Video International Ltd. B5
Century Precision Cine Optics
Cohu Inc.
Commercial Electronics Inc. . . B30
Diamond Electronics, Division of Arvin Systems Inc.
Frezzolini Electronics Inc. B58, B59
Fujinon Optical Inc. B60, B61
GBC Closed Circuit TV Corp.
Image Devices Inc.
Lenzar Optics Corp.
NEC
Panasonic Co. B124-B129
RCA Electro Optics and Devices
Sharp Electronics Corp. — Professional Products
Sony
Toyo Optics of America Inc.
Video Components Inc.

VIDEO CAMERA LENSES, ZOOM
Achro-Video International Ltd. B5
Angenieux of America
Century Precision Cine Optics
Cohu Inc.
Commercial Electronics Inc. . . B30
Dage — MTI Inc.
Diamond Electronics, Division of Arvin Systems Inc.
Frezzolini Electronics Inc. B58, B59
Fujinon Optical Inc. B60, B61
GBC Closed Circuit TV Corp.
Hitachi-Denshi America Ltd. B65-B72
Image Devices Inc.
Lenzar Optics Corp.
Panasonic. B124-B129
RCA Electro Optics and Devices
Sharp Electronics Corp. — Professional Products
Sony
Toyo Optics of America Ltd.
Video Components Inc.

VIDEO CAMERA REBUILDING
Applied Video Electronics Inc.

VIDEO CAMERAS, BLACK AND WHITE FILM CHAIN
Cohn Inc.
Dage — MTI Inc.
Image Devices Inc.

VIDEO CAMERAS, BLACK AND WHITE LOW LIGHT LEVEL
Canadian General Electric Co. Ltd.
Cohu Inc.
Dage — MTI Inc.
Diamond Electronics, Division of Arvin Systems Inc.
GBC Closed Circuit TV
General Electrodynamics Corp.
Hitachi-Denshi America Ltd. B65-B72
Ikegami
Image Devices Inc.
Panasonic. B124-B129
QSI Systems Inc.
RCA Electro Optics and Devices
Sanyo Electric Inc.
Video Optics Inc.

VIDEO CAMERAS, BLACK AND WHITE PORTABLE BATTERY OPERATED
Image Devices Inc.
Sanyo Electric Inc.
Sony

VIDEO CAMERAS, BLACK AND WHITE STUDIO
Dage — MTI Inc.
Image Devices Inc.
Panasonic Co. B124-B129
Sanyo Electric Inc.
Sony
Video Optics Inc.

VIDEO CAMERAS, BLACK AND WHITE SURVEILLANCE
Canadian General Electric Co. Ltd.
Cohu Inc.
Dage — MTI Inc.
Diamond Electronics, Division of Arvin Systems Inc.
GBC Closed Circuit TV Corp.
GYYR
General Electrodynamics Corp.
Hitachi-Denshi America Ltd. B65-B72
Ikegami
Image Devices Inc.
NEC
Panasonic Co. B124-B129
QSI Systems Inc.
RCA Electro Optics and Devices
R.F. Systems Co. — PA
Sanyo Electric Inc.
Sharp Electronics Corp. — Professional Products
Sony

VIDEO CAMERAS, COLOR FILM CHAIN
Cohu Inc.
Commercial Electronics Inc. . . B30
Panasonic Co. B124-B129
Philips
RCA Broadcast Systems
Sharp Electronics Corp. — Professional Products
Sony
Thomson-CSF Laboratories

VIDEO CAMERAS, COLOR PORTABLE
Ampex Corp.
ASACA Corp. of America B17-B19
Cohu Inc.
Commercial Electronics Inc. . . B30

Frezzolini Electronics Inc. ***B58, B59***
GBC Closed Circuit TV Corp.
Hitachi-Denshi America Ltd. ***B65-B72***
Image Devices Inc.
JVC ***B75-B82***
Panasonic Co. ***B124-B129***
Philips
RCA Broadcast Systems
Sharp Electronics Corp. — Professional Products
Sony
Thomson-CSF Laboratories

VIDEO CAMERAS, COLOR PORTABLE, BATTERY OPERATED

Ampex Corp.
ASACA Corp. of America B17-B19
Commercial Electronics Inc. ... ***B30***
Frezzolini Electronics Inc. ***B58, B59***
GBC Closed Circuit TV Corp.
Hitachi-Denshi America Ltd. ***B65-B72***
Image Devices Inc.
JVC ***B75-B82***
Panasonic Co. ***B124-B129***
Philips
RCA Broadcast Systems
Sharp Electronics Corp. — Professional Products
Sony
Thomson-CSF Laboratories

VIDEO CAMERAS, COLOR STUDIO

Cohu Inc.
Commercial Electronics Inc. ... ***B30***
GBC Closed Circuit TV Corp.
Harris Broadcast Products
Hitachi-Denshi America Ltd. ***B65-B72***
Image Devices Inc.
JVC ***B75-B82***
Panasonic Co. ***B124-B129***
Philips
RCA Broadcast Systems
Sanyo Electric Inc.
Sharp Electronics Corp. — Professional Products
Sony
Thomson-CSF Laboratories

VIDEO CARTS AND TABLES

Bretford
Design-Form
Gruber Products Co. ***B63***
Harwald Co.
Image Devices Inc.
KLM Associates
Lee-Ray Industries Inc. ***B90***
Peerless Sales Co.
Sony
H. Wilson Corp.
The Winsted Corp. ***B175-B182***

VIDEO CASSETTE BASED AUTOMATION SYSTEMS

Channelmatic Electronics Inc.

VIDEO CASSETTE RELOADING

Video Cassette SVCs Inc.

VIDEO CASSETTE SHIPPING CARTONS AND CASES

Amaray International Corp.
Fiberbilt Photo Products/Ikelheimer-Ernst Inc.
Harwald Co.
Ray Jacobs Audio Inc.
Reliance Plastics and Packaging Division
Sony
Univex International
Video Components Inc.

VIDEO CHARACTERS GENERATORS

Ampex Corp.
B.E.I. [Beston Electronics Inc.] ***B21***
Chyron Corp. ***B42***
Dynasciences
Knox Ltd. ***B89***
Laird Telemedia
Mincom Division, 3M Co.
Moxon Inc.
Portac Inc.
QSI Systems Inc.
Telestrator Division, Interand Corp.
Thomson-CSF Laboratories
Video Components
Video Data Systems
Video Devices Co.

VIDEO COLOR SIGNAL SYSTEM

Lenco Inc., Electronics Div. ***B91-B103***

VIDEO COLORIZERS

BJA Systems Inc.
Beaveronics Inc. ***B20***
Colorado Video Inc. ***B31-B38***
Crosspoint Latch Corp. ***B46***
Industrial Sciences Inc.
International Nuclear Corp.
J and D International
Thomson-CSF Laboratories

VIDEO COMPRESSOR

Colorado Video Inc. ***B31-B38***

VIDEO CONNECTORS

AVA Electronics
GBC Closed Circuit TV Corp.
Hitachi-Denshi America Ltd. ***B65-B72***
Trompeter Electronics ***B158***
Video Components Inc.

VIDEO CONSOLES

Bretford
Broadcast Video Systems Ltd. ***B28***
Vitex Co. ***B173***
H. Wilson Corp.
The Winsted Co. ***B175-B182***

VIDEO CONTROLS

Tech Laboratories Inc.

VIDEO DELAY

Allen Avionics Inc. ***B11***
Broadcast Video Systems Ltd. ***B28***
ESC Electronics Corp.
Listec Television Equipment Corp. ***B104-B107***
Leitch Video Ltd.
Lenco Inc., Electronics Div. ***B91-B103***

VIDEO DETECTOR

Colorado Video Inc. ***B31-B38***
Di-Tech Inc. ***B48***
Lenco Inc., Electronics Div. ***B91-B103***

VIDEO DIGITAL NOISE REDUCER

Thomson-CSF Laboratories

VIDEO DIGITIZERS

BJA Systems Inc.
Colorado Video Inc. ***B31-B38***
Digital Video Systems

VIDEO DISCS

Eigen Corp.
Oktel Corp.

VIDEO EDITING EQUIPMENT

Videomedia Inc. ***B166-B171***

VIDEO EFFECTS GENERATORS

American Data ***B12***
BJA Systems Inc.
Beaveronics Inc. ***B20***
Broadcast Video Systems Ltd. ***B28***
Central Dynamics Inc. ***B41***
Chyron Corp. ***B42***
Colorado Video Inc. ***B31-B38***
Crosspoint Latch Corp. ***B46***
Dage — MTI Inc.
Digital Video Systems
Dynair Electronics Inc.
GBC Closed Circuit TV Corp.
Industrial Sciences Inc.
International Nuclear Corp.
J and D International
Panasonic Co. ***B124-B129***
Portac Inc.
Sharp Electronics Corp. — Professional Products
Shintron Co. Inc.
Sony
Telestrator Division, Interand Corp.
Viscount Industries Ltd.
Vital Industries Inc.
Vitex Co. ***B173***

VIDEO ENCODERS, COLOR

Broadcast Video Systems Ltd. ***B28***
Central Dynamics Ltd. ***B41***
Cohu Inc.
Lenco Inc., Electronics Div. ***B91-B103***
Thomson-CSF Laboratories

VIDEO EQUIPMENT, RENTAL

AIDS, A Damon Co.

Communications Systems,
Division of Powell Tool Supply Inc.
Innovative Television Equipment
Portable Channel Inc.
Video Devices Co.
Videomax, Division of Orrox Corp.

VIDEO EXPANDER

Colorado Video Inc. ***B31-B38***

VIDEO GENERATORS

ASACA Corp. of America ***B17-B19***
BJA Systems Inc.
Colorado Video Inc. ***B31-B38***
Crosspoint Latch Corp. ***B46***
Leitch Video Ltd.
Lenco Inc., Electronics Div. ***B91-B103***
Ultra Audio Pixtec
Video Devices Co.
Wavetek Indiana Inc.

VIDEO GUIDE BOOK

Video Info Publications

VIDEO HEADS

Spin Physics Inc. ***B152***
Videomax, Division of Orrox Corp.

VIDEO — HUM BUCKERS

Audio-Video Engineering

VIDEO HUM STOP COILS

North Hills Electronics Inc.
Video Components Inc.

VIDEO IDENTIFICATION SYSTEMS

Di-Tech Inc. ***B48***
GBC Closed Circuit TV Corp.
GYYR
Leitch Video Ltd.
Portac Inc.
QSI Systems Inc.
Sigma Electronics Inc.

VIDEO ISOLATION TRANSFORMERS

North Hills Electronics Inc.

VIDEO INTEGRATOR

Colorado Video Inc. ***B31-B38***

VIDEO LARGE SCREEN PROJECTORS

Fryan Porta-Vision
General Electric Corp.
Image Magnification Inc.
Keyer Video Inc.
Projection Systems Inc.

VIDEO LINE ISOLATOR

Video Aids of Colorado ***B163***
Video Components Inc.

VIDEO MASTER CONTROL SWITCHER

Duca-Richardson Corp.

VIDEO MASTER CONTROL SWITCHERS

Grass Valley Group Inc.
Vitex Co. ***B173***

VIDEO MICROMETER

Colorado Video Inc. ***B31-B38***

VIDEO MONITORS, BLACK AND WHITE

AIDS, A Damon Co.
ASACA Corp. of America ***B17-B19***
Cohu Inc.
Conrac
Dage — MTI Inc.
Diamond Electronics, Division of Arvin Systems Inc.
Electrohome ***B52, B53***
GBC Closed Circuit TV Corp.
GYYR
Ikegami
Javelin Electronics
JVC ***B75-B82***
Lenco Inc., Electronics Div. ***B91-B103***
NEC
Panasonic ***B124-B129***
QSI Systems Inc.
RCA Electro Optics and Devices
Sanyo Electric Inc.
Sharp Electronics Corp. — Professional Products
Sony

VIDEO MONITORS, COLOR

AIDS, A Damon Co.
ASACA Corp. of America ***B17-B19***
Broadcast Video Systems Ltd. ***B28***
Conrac
Electrohome ***B52, B53***
Ikegami
Image Devices Inc.
Lenco Inc., Electronics Div. ***B91-B103***
QSI Systems Inc.
Rohde and Schwarz
Sanyo Electric Inc.
Sharp Electronics Corp. — Professional Products
Sony
Unimedia
Vamco Engineering Inc. ***B160-B162***
Videotek ***B172***

VIDEO MONITOR, COLOR, ENG

Rohde and Schwarz

VIDEO MOTION ANALYZER

Colorado Video Inc. ***B31-B38***

VIDEO NOISE METER

ASACA Corp. of America ***B17-B19***
Lenco Inc., Electronics Div. ***B91-B103***
Rohde and Schwarz

VIDEO PARTS DISTRIBUTOR

Steinberg ***B153***

VIDEO PATCH PANELS AND ACCESSORIES

Dynatech Data Systems
Trompeter Electronics ***B158***

VIDEO POINTER

Colorado Video Inc. ***B31-B38***

VIDEO POST PRODUCTION EQUIPMENT RENTAL

Kapco Communications
Portable Channel Inc.

VIDEO PRESENCE DETECTORS

Di-Tech Inc. ***B48***
GYYR
Lenco Inc., Electronics Div. ***B91-B103***
RCA Electro Optics and Devices
Sigma Electronics Inc.

VIDEO PROCESSING AMPLIFIERS

Central Dynamics Ltd. ***B41***
Cohu Inc.
Colorado Video Inc. ***B31-B38***
Dynasciences
Grass Valley Group Inc.
Industrial Sciences Inc.
International Nuclear Corp.
J and D International
Leitch Video Ltd.
Lenco Inc., Electronics Div. ***B91-B103***
Sigma Electronics Inc.
Versa-Count Engineering ***B164-B165***
Vitex Co. ***B173***

VIDEO PROCESSOR

Colorado Video Inc. ***B31-B38***
Crosspoint Latch Corp. ***B46***
Lenco Inc., Electronics Div. ***B91-B103***

VIDEO PRODUCTION EQUIPMENT RENTAL

J and D International
Portable Channel Inc.
Videocomm International

VIDEO PRODUCTION SWITCHERS

American Data ***B12***
Ampex Corp.
Beaveronics Inc. ***B20***
Central Dynamics Ltd. ***B41***
Crosspoint Latch Corp. ***B46***
Dage — MTI Inc.
Dytek Industries Inc.
Duca-Richardson Corp.
GBC Closed Circuit TV Corp.
Grass Valley Group Inc.
Industrial Sciences Inc.
International Nuclear Corp.
J and D International
Shintron Co. Inc.
Sony
Vamco Engineering Inc. ***B160-B162***
Viscount Industries Inc.
Vital Industries Inc.
Vitex Co. ***B173***

VIDEO PRODUCTIONS, STUDIO/LOCATION

Colour Images Unlimited Inc.
Design-Form
Electronic Arts Intermix
Florida State University, Student Government Video Center
Kapco Communications
Multi Media Forum ***B122***
Portable Channel Inc.
Videocomm International
Webb Telemedia Corp.

VIDEO PROGRAMMING

Blue Hill Educational Systems
Kapco Communications
Portable Channel Inc.
Webb Telemedia Corp.

VIDEO QUANTIZER

Colorado Video Inc. ***B31-B38***

VIDEO RECORDING FILM CAMERAS

Teledyne Camera Systems

VIDEO ROUTING SWITCHERS

American Data ***B12***
Beaveronics Inc. ***B20***
Beta Technology Inc.
Central Dynamics Ltd. ***B41***
Di-Tech Inc. ***B48***
Duca-Richardson Corp.
Dynair Electronics Inc.
Dytek Industries Inc.
Grass Valley Group Inc.
International Nuclear Corp.
J and D International
Lenco Inc., Electronics Div. ***B91-B103***
Mincom Division, 3M Co.
Sigma Electronics Inc.
Utah Scientific Inc.
Vamco Engineering Inc. ***B160-B162***
Viscount Industries Ltd.
Vitex Co. ***B173***

VIDEO SCRAMBLERS

Oak CATV Division/Oak Industries Inc.

VIDEO SEQUENCERS

Videomedia Inc. ***B166-B171***

VIDEO SIGNAL ENHANCER

Thomson-CSF Laboratories

VIDEO SOURCE IDENTIFIERS

QSI Systems Inc.

VIDEO STUDIO SYSTEM

Crosspoint Latch Corp. ***B46***
Philips

VIDEO SYNCHRONIZATION GENERATORS

ADDA Corp. ***B6***
Cohu Inc.
Colorado Video Inc. ***B31-B38***
Crosspoint Latch Corp. ***B46***
Dage — MTI Inc.
Digital Video Systems
Electronic Engineering Co. of California (EECO)
GBC Closed Circuit TV Corp.
JVC ***B75-B82***
Leitch Video Ltd.
Lenco Inc., Electronics Div. ***B91-B103***
Sigma Electronics Inc.
Sony
Thomson-CSF Laboratories
Vamco Engineering Inc. ***B160-B162***
Video Aids of Colorado ***B163***
Viscount Industries Ltd.

VIDEO TAPE ACCESSORIES

Ampex Corp.
Display Media Inc.
Ray Jacobs Audio Inc.
Nortronics Co. Inc.
Panasonic Co. ***B124-B129***
Sony
Vamco Engineering ***B160-B162***

VIDEO TAPE AUTOMATED SYSTEMS

Channelmatic Electronics Inc.
Programmable Systems Inc.
Summit Cinevideo Corp.

VIDEO TAPE CLEANING AND EVALUATING EQUIPMENT

Chyron Corp. ***B42***
Harwald Co.
Recortec Inc.
Research Technology Inc.

VIDEO TAPE DUPLICATION

Kapco Communications
Webb Telemedia Corp.

VIDEO TAPE DUPLICATORS

AIDS, A Damon Co.
Panasonic Co. ***B124-B129***
Videocomm International

VIDEO TAPE EDITING ACCESSORIES

Beta Technology Inc.
Convergence Corp.
Datatron Inc.
Down Stream-Keyer Inc.
Electronic Engineering Co. of California (EECO)
Media Concepts Inc.
Spectra-Vision Corp.
Sony
Vamco Engineering Inc. ***B160-B162***

VIDEO TAPE EDITORS

AIDS, A Damon Co.
Ampex Corp.
Artists Engineering
Beta Technology Inc.
Central Dynamics Ltd. ***B41***
Consolidated Video Systems . ***B39***
Convergence Corp.
Datatron Inc.
Down Stream-Keyer Inc.
Electronic Engineering Co. of California (EECO)
Micro Vision Systems
Panasonic ***B124-B129***
RCA Broadcast Systems
Recortec Inc.
Spectra-Vision Corp.
Sony

VIDEO TAPE ERASERS

Chyron Corp. ***B42***
Garner Industries Inc. ***B62***
Opamp Labs ***B123***
Taber Mfg. Co.

VIDEO TAPE/FILM RECORDING TRANSFER

AIDS, A Damon Co.
Kapco Communications
W.A. Palmer Films Inc.
Teledyne Camera Systems

VIDEO TAPE MAGNETIC, CARTRIDGE

Ampex Corp.
Fuji Photo Film USA Inc.
Ray Jacobs Audio Inc.
TDK Electronics Corp.
Sony

VIDEO TAPE MAGNETIC, CASSETTE

AGFA-Gevaert Inc.
Ampex Corp.
Down Stream-Keyer Inc.
Films Inc.
Fuji Photo Film USA Inc.
International Audio Inc.
Irish Magnetic Recording Tape
Ray Jacobs Audio Inc.
Maxell Corp. of America
NEC
Panasonic ***B124-B129***
QSI Systems Inc.
Sanyo Electric Inc.
Sony
TDK Electronics Corp.
Video Cassette SVCs Inc.

VIDEO TAPE MAGNETIC, QUAD

AGFA-Gevaert Inc.
Ampex Corp.
Fuji Photo Film USA Inc.
Ray Jacobs Audio Inc.

VIDEO TAPE MAGNETIC, REEL TO REEL

AGFA-Gevaert Inc.
Ampex Corp.
DAK Industries Inc.
Fuji Photo Film USA Inc.
Films Inc.
Irish Magnetic Recording Tape
Ray Jacobs Audio Inc.
Maxwell Corp. of America
QSI Systems Inc.
Sony

VIDEO TAPE, PLAYBACK SERVICES

Media Concepts Inc.
RCA American Communications

VIDEO TAPE PROGRAMS

Colour Images Unlimited Inc.
Evenview Television Systems
Genesys Systems Inc.
Intercollegiate Video Clearing House
Microcampus — University of Arizona
The Network for Continuing Medical Education
Nightingale-Conant Corp.
Studio Film and Tape Inc.

VIDEO TAPE RECORDERS/ PLAYERS CASSETTE

American Cable Network
Evenview Television Systems

Genesys Systems Inc.
JVC ***B75-B82***
Merlin Engineering Works Inc.
NEC America Inc.
Panasonic Co. ***B124-B129***
QSI Systems Inc.
Sanyo Electric Inc.
Sony
Telectro Systems Corp.
Telstar Productions Inc.

VIDEO TAPE RECORDERS/ PLAYERS, HELICAL

Ampex Corp.
Custom Films Inc.
Javelin Electronics
JVC ***B75-B82***
Merlin Engineering Works Inc.
NEC America Inc.
Panasonic Co. ***B124-B129***
QSI Systems Inc.
RCA Broadcast Systems
Recortec Inc.
Sanyo Electric Inc.
Sony
Telectro Systems Corp.
Telstar Productions Inc.

VIDEO TAPE RECORDERS/ PLAYERS, QUAD

Ampex Corp.
Merlin Engineering Works Inc.
RCA Broadcast Systems
Telectro Systems Corp.

VIDEO TAPE RECORDERS/ PLAYERS, TIME LAPSE

GBC Closed Circuit TV Corp.
GYYR
Javelin Electronics
Merlin Engineering Works Inc.
NEC America Inc.
Panasonic Co. ***B124-B129***
QSI Systems Inc.
RCA Electro Optics and Devices
Sanyo Electric Inc.
Telectro Systems Corp.

VIDEO TAPE REELS AND BOXES

AGFA-Gevaert Inc.
Ampex Corp.
Plastic Reel Corp. of America
Sony

VIDEO TAPE SEARCH AND LOCATE DEVICES

Artists Engineering

VIDEO TAPE SPLICERS

Nagy Research Products
Sony

VIDEO TAPE TENSION GAUGES

Tentel ***B157***

VIDEO TEST GENERATORS

ASACA Corp. of America B17-B19
Cohu Inc.
Colorado Video Inc. ***B31-B38***
Crosspoint Latch Corp. ***B46***
Digital Video Systems
Leasametric
Leitch Video Ltd.
Rohde and Schwarz
Ultra Audio Pixtec

VIDEO TEST SIGNAL EQUIPMENT

ASACA Corp. of America B17-B19
Crosspoint Latch Corp. ***B46***
Leasametric
Leitch Video Ltd.
Porta-Pattern Telecommunications Industries Ltd.
Rohde and Schwarz
Ultra Audio Pixtec

VIDEO TAPE TIMERS

Sony
Vamco Engineering Inc. ***B160-B162***

VIDEO TO FILM TRANSFER

W.A. Palmer Films Inc.
Teledyne Camera Systems

VIDEO TRANSCEIVER

Catel, Division of United Scientific Corp.
Colorado Video Inc. ***B31-B38***

VISUAL COMMUNICATIONS CABINETS

Oravisual Co. Inc.

VOLTAGE CONTROLLED AMPLIFIERS

Modular Audio Products ***B117***
Richmond Sound Design Ltd.

VOLTMETERS/MULTIMETERS

B and K Instruments Inc.
Ballantine Laboratories Inc.
Bayly Engineering Ltd.
Boonton Electronics
California Instruments
Data Precision Corp. Inc.
Dranetz Engineering Labs Inc.
Gralex Industries
Hamilton Electronics Corp.
Harris Corp., Broadcast Products Division
Heath Co.
ITT Jennings
Leader Instruments Corp.
Leasametric
Lec Tro Tech Inc.
Nationwide Electronic Systems Inc.
Philips Test and Measuring Instruments Inc.
Rohde and Schwarz Sales Co.
Sencore Inc.
Systron-Donner
Tektronix Inc.

VTR HEAD REBUILDING

RCA Broadcast Systems
Spin Physics Inc. ***B152***
Taber Mfg. and Eng. Co.
Videomax, Division of Orrox Corp.

VTR MODIFICATION KITS, QUAD

Recortec Inc.

VTR REBUILDING

Applied Video Electronics Inc.

VU METER AMPLIFIERS

Automated Processes Inc.

VU AND PEAK METERS

Audio Designs and Mfg. Inc.
Gotham Audio Corp.
Heath Co.
Lec Tro Tech Inc.
Roger Mayer Electronics Inc.
Quad-Eight Electronics
Sontec Electronics Corp.
Sphere Electronics Inc.

W

WANTED TO BUY

Image Devices Inc.
Ronald Phillips

WAVEFORM MONITORS AND ANALYZERS

Amber Electro-Design Ltd.
B and K Instruments Inc.
Broadcast Video Systems Ltd. ***B28***
Colorado Video Inc. ***B31-B38***
Crown International Inc.
Leasametrics
Lec Tro Tech Inc.
Sharp Electronics Corp. — Professional Products

WAVE GUIDE SUPPORT

Microflect Co. Inc.

WAVEGUIDES

Andrew Corp.
Comark Industries Inc.
Gabriel Electronics Inc.
Harris Corp., Broadcast Products Division
Leasametric
Maury Microwave Corp.
Micro Communications
Microwave Associates
Nurad Inc.
Prodelin Inc.
RCA Broadcast Systems
RF Systems
Singer Products Co. Inc.

WEATHER CHANNEL

CADCO

WINCHES AND HOISTS

T.R. Pitts Co.

WIRE AND CABLE

Brand-Rex Inc.
California Switch and Signal
Prodelin Inc.
Times Wire and Cable Co.

WIRELESS SOUND SYSTEMS

Avid Corp.
Edcor
Erskine-Shapiro Theatre Technology Inc.
Alan Gordon Enterprises
HM Electronics Inc.
Image Devices Inc.
KEL Corp.
Paso Sound Products Inc.
Special Instruments Laboratory Inc.
Telectro Systems Corp.
Vega Electronics

WIRING AND CABLING SERVICES

Erskine-Shapiro Theatre Technology Inc.
Locator Electronics Co.

Soil Inc.
Summit Cinevideo Corp.
TOCOM Inc.
Telectro Systems Corp.

WOW AND FLUTTER METER

B and K Instruments Inc.
Fidelipac
Gotham Audio Corp.
Leader Instruments Corp.
Leasametric
Saxton Products Inc.

X

X-Y DIGITIZER

Colorado Video Inc...... ***B31-B38***

X-Y INDICATOR

Colorado Video Inc...... ***B31-B38***

TECHNICAL DATA AND INFORMATION

The Following Data/Information Section is provided as a ready reference source for the

BROADCAST

Practitioner.

WIRE/CABLE TERMINOLOGY

THIS INFORMATION REPRINTED COURTESY OF: BELDEN

A—Ampere.

abrasion resistance—Ability to resist surface wear.

AC—Alternating current.

accelerated aging—A test that duplicates long time environmental conditions in a relatively short time.

AF—Audio frequency.

AGC—Automatic gain control.

AM—Amplitude modulation.

ambient—Conditions existing at a test or operating location prior to energizing of equipment (example: ambient temperature).

ampere—A standard unit of current. Designated as the amount of current that occurs when one volt of emf is applied across one ohm of resistance. An ampere of current is produced by one coulomb of charge passing a point in one second.

amplitude—The maximum value of a varying wave form.

anneal—To soften and relieve strains in any solid material, such as metal or glass, by heating to just below its melting point and then slowly cooling it. This also generally lowers the tensile strength of the material, while improving its flex life.

attenuation—The decrease in magnitude of a wave as it travels through any transmitting medium, such as a cable or circuitry. Attenuation is measured as a ratio or as the logarithm of a ratio (decibel).

attenuation constant—A rating for a cable or other transmitting medium, which is the relative rate of amplitude decrease of voltage or current in the direction of travel. It is measured in decibels per unit length of cable.

audio—A term used to describe sounds within the range of human hearing. Also used to describe devices which are designed to operate within this range.

audio frequency—That range of frequencies lying within the range of human hearing: approximately 20 to 20,000 Hz.

AWG—American Wire Gauge. A wire diameter specification. The lower the AWG number, the larger the wire diameter.

balanced line—A cable having two identical conductors with the same electromagnetic characteristics in relation to other conductors and to ground.

balun—A device for matching an unbalanced coaxial transmission line to a balanced two-wire system. Normally also gives impedance transformation, as 300 ohm balanced to 75 ohm unbalanced.

bandwidth—The difference between the upper and lower limits of a given band of frequencies. Expressed in Hertz.

bel—A unit that represents the logarithm of the ratio of two levels. The number of bels is equal to the logarithm_{10} of (P_1/P_2) 2 logarithm_{10} (E_1/E_2) and 2 logarithm_{10} (I_1/I_2). See db.

Beldfoil®—Belden trademark for highly effective electrostatic shield using reinforced metallic foil.

Beldsol®—Solderable Belden magnet wire combining films of polyurethane for excellent dielectric characteristics and Nylon for mechanical protection.

BEV—One billion electron volts.

binder—A tape or thread used for holding assembled cable components in place.

bonding—The method used to produce good electrical contact between metallic parts of any device. Used extensively in automobiles and aircraft to prevent static buildup. Also refers to the connectors and straps used to bond equipment.

booster—A device inserted into a line (or cable) to increase the voltage. Boosting generators are also used to raise the level of a dc line. Transformers are usually employed to boost ac voltages. The term booster is also applied to antenna preamplifiers.

braid—A group of textile or metallic filaments interwoven to form a tubular structure which may be applied over one or more wires, or flattened to form a strap.

bunch strand—Conductors twisted together with the same lay and direction without regard to geometric pattern.

Bus-bar Wire—Uninsulated tinned copper wire used as a common lead.

butyl rubber—A synthetic rubber with good electrical insulating properties.

C—Symbol designation for: capacitance, bias supply and centigrade.

cabling—The method by which a group of insulated conductors is mechanically assembled (or twisted together).

capacitance—The ability of a dielectric material between conductors to store electricity, when a difference of potential exists between the conductors. The unit of measurement is the farad, which is the capacitance value which will store a charge of one coulomb when a one-volt potential difference exists between the conductors. In ac, one farad is the capacitance value which will permit one ampere of current, when the voltage across the capacitor changes at a rate of one volt per second.

capacitive reactance—The opposition to alternating current due to the capacitance of a capacitor, cable, or circuit. It is measured in ohms and is equal to $1/6.28fC$ where f is the frequency in Hz and C is the capacitance in farads.

capacitor—Two conducting surfaces separated by a dielectric material. The capacitance is determined by the area of the surfaces, type of dielectric, and spacing between the conducting surfaces.

CATV—Community antenna television.

CB—Citizens band.

CCTV—Closed-circuit television.

cellular polyethylene—Expanded or "foam" polyethylene, consisting of individual closed cells of inert gas suspended in a polyethylene medium, resulting in a desirable reduction of dielectric constant.

circuit—A system of conducting mediums designed to pass an electric current.

circular mil—A term used to define cross sectional areas using an arithmetic short-cut in which the area of a round wire is taken as "diameter in mils (.001") squared," hence one circular mil is equal to $\pi/4$ square mils.

coaxial cable—A cylindrical transmission line comprised of a conductor centered inside a metallic tube or shield, separated by a dielectric material, and usually covered by an insulating jacket.

coil effect—The inductive effect exhibited by a spiral-wrapped shield, especially above audio frequencies.

concentric stranding—A group of uninsulated wires twisted together and containing a center core with subsequent layers spirally wrapped around the core to form a single conductor.

conductivity—The ability of a material to allow electrons to flow, measured by the current per unit of voltage applied. Also, it is the reciprocal of resistivity.

conductor—A material suitable for carrying an electric current.

Copperweld®—Trademark of Copperweld Steel Co. for copper clad steel conductor.

cord—A very flexible insulated cable.

corona—The ionization of gasses about a conductor that results when the potential gradient reaches a certain value. Also called brush discharge.

coupling—The transfer of energy between two or more cables or components of a circuit.

CPS—Cycles per second. This is an obsolete designation and is now called Hertz (Hz).

crosstalk—A type of interference caused by audio frequencies from one line being coupled into adjacent lines. The term is loosely used also to include coupling at higher frequencies.

current, alternating (ac)—An electric current that periodically reverses direction of electron flow. The rate at which a full cycle occurs in a given unit of time (generally a second) is called the frequency of the current.

current, direct (dc)—Electrical current whose electrons flow in one direction only. It may be constant or pulsating as long as their movement is in the same direction.

cut-through resistance—The ability of a material to withstand mechanical pressure without damage.

db—Decibel.

DC—Direct current. (See current, direct.)

dc resistance—See resistance

decibel (db)—One-tenth of a bel. It is equal to 10 times the logarithm of the power ratio, 20 times the log of the voltage ratio, or 20 times the log of the current ratio. One decibel is the amount by which the pressure of a pure sine wave of sound must be varied in order for the change to be detected by the average human ear. The decibel can express an actual level only when comparing with some definite reference level that is assumed to be zero db.

delay line—An artificial or real transmission line or equivalent device designed to delay a wave or signal for a specific length of time.

dielectric—An insulating (nonconducting) medium.

dielectric breakdown—Any change in the properties of a dielectric that causes it to become conductive. Normally a catastrophic failure of an insulation because of excessive voltage.

dielectric constant—Also called permittivity. That property of a dielectric which determines the amount of electrostatic energy that can be stored by the material when a given voltage is applied to it. Actually, the ratio of the capacitance of a capacitor using the dielectric to the capacitance of an identical capacitor using a vacuum as a dielectric.

dielectric heating—The heating of an insulating material when placed in a radio-frequency field, caused by internal losses during the rapid polarization reversal of molecules in the material.

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dielectric loss—The power dissipated in a dielectric as the result of the friction produced by molecular motion when an alternating electric field is applied.

distortion—An undesired change in wave form as the signal passes through a device.

distribution cable—In a catv system, the transmission cable from the distribution amplifier to the drop cable.

drain wire—An uninsulated wire in contact with a shield throughout its length, and used for terminating the shield.

drop cable—In a CATV system, the transmission cable from the distribution cable to a dwelling.

Duofoil®—Belden trademark for a shield in which metallic foil is applied to both sides of a supporting plastic film.

E—Voltage (electromotive force).

EIA—Electronic Industries Association (Formerly RMA or RETMA).

earth—British terminology for zero-reference ground.

elastomer—Any material that will return to its original dimensions after being stretched or distorted.

electromagnetic—Referring to the combined electric and magnetic fields caused by electron motion through conductors.

electromagnetic coupling—The transfer of energy by means of a varying magnetic field. Inductive coupling.

electron volt—A measure of the energy gained by an electron falling through an electric field produced by one volt.

electrostatic—Pertaining to static electricity, or electricity at rest. An electric charge, for example.

electrostatic coupling—The transfer of energy by means of a varying electrostatic field. Capacitive coupling.

EMF—Electromotive force (voltage).

energy—The capability of doing work.

energy dissipation—Loss of energy from a system due to the conversion of work into undesirable forms. An example of this is heat loss that is due to friction in a mechanical system.

EPDM—Ethylene-propylene-diene nonomer rubber. A material with good electrical insulating properties.

EPR—Ethylene-propylene copolymer rubber. A material with good electrical insulating properties.

EPT—Ethylene-propylene-terpolymer rubber. A material with good electrical insulating properties.

equilay—More than one layer of helically laid wires with the direction of lay reversed for successive layers, but with the length of lay the same for each layer.

ev—Electron volt.

expanded polyethylene—See cellular polyethylene.

f—Frequency.

farad—A unit of capacity that will store one coulomb of electrical charge when one volt of electrical pressure is applied.

feedback—Energy that is extracted from a high-level point in a circuit and applied to a lower level. Positive feedback reduces the stability of a device and is used to increase the sensitivity or produce oscillation in a system. Negative feedback, also called inverse feedback, increases the stability of a system as the feedback in an amplifier improves stability and fidelity.

feeder cable—In a catv system, the transmission cable from the head end (signal pickup) to the trunk amplifier. Also called a trunk cable.

ferrous—Composed of an/or containing iron. A ferrous metal exhibits magnetic characteristics as opposed to a non-ferrous metal, such as aluminum, which does not.

FEP—Fluorinated ethylene-propylene. A thermoplastic material with good electrical insulating properties and chemical and heat resistance.

field—An area through which pass electric and/or magnetic lines of force.

fillers—Nonconducting components cabled with the insulated conductors, to impart roundness, flexibility, tensile strength, or a combination of all three, to the cable.

flex life—The ability of a cable to bend many times before breaking.

flexibility—The ability of a cable to bend in a short radius (also see limpness).

floating—Referring to a circuit which has no connection to ground.

FM—Frequency modulation.

frequency—The number of times a periodic action occurs in a unit of time. The number of cycles that an electric current completes in 1 second.

frequency, power—Normally, the 50 or 60 cycle power available in residential areas.

frequency response—The characteristic of a device denoting the range of frequencies over which it may be used effectively.

foam polyethylene—See cellular polyethylene.

gain—The increase of voltage, current, or power over a standard or previous reading. Usually expressed in decibels.

geophysical cable—Cable used in exploring for underground oil deposits.

Geosol™—A solderable, extra tough film insulation developed by Belden for use in geophysical cables and miniature cables.

gimmick—A short length of wire which is soldered onto a circuit component and used as a small adjustable capacitor. A gimmick is often two short insulated wires that are twisted together to form a capacitor.

gnd—Ground.

ground—An electrical connection to the earth, generally through a ground rod. Also a common return to a point of zero potential, such as the metal chassis in radio equipment.

ground loop—A completed circuit between shielded pairs of a multiple pair cable created by random contact between the shields. An undesirable circuit condition in which interference is created by ground currents when grounds are connected at more than one point.

ground potential—The potential of the earth. A circuit, terminal, or chassis is said to be at ground potential when it is used as a reference point for other potentials in the system.

H—Symbol designation for: Magnetic intensity and henry.

hash—A type of interference produced by man-made devices, particularly those which experience arcing as contacts open and close. Automotive voltage regulators and power-supply vibrators are two common examples.

henry—A practical unit of inductance that will produce a voltage drop of one volt when the current changes at the rate of one ampere per second. (abbreviated H.)

Hertz—The unit of frequency, one cycle per second.

HF—High frequency.

high frequency—The band from 3 to 30 Hz in the radio spectrum, as designated by the Federal Communications Commission.

hum—A term used to describe the 60- or 120-cps sound present in the sound of some communications equipment. Usually hum is the result of undesired coupling to a 60-cps source or to the defective filtering of 120-cps ripple output of a rectifier.

Hypalon—A Du Pont trade name for a synthetic rubber (chlorosulfonated polyethylene) used as insulating and jacketing materials for wire and cable.

I—Symbol used to designate current.

IF—Intermediate-frequency.

impedance—The total opposition a circuit, cable, or component offers to alternating current. It includes both resistance and reactance and is generally expressed in ohms.

impedance, characteristic—In a transmission cable of infinite length, the ratio of the applied voltage to the resultant current at the point the voltage is applied. Or, the impedance which makes a transmission cable seem infinitely long, when connected across the cable's output terminals. For a waveguide, it is the ratio of rms voltage to total rms longitudinal current at certain points on a diameter, when the waveguide is match-terminated.

impedance, high—Generally, the area of 25,000 ohms or higher.

impedance, low—Generally, the area of 1 through 600 ohms.

impedance match—A condition whereby the impedance of a particular circuit cable or component is the same as the impedance of the circuit, cable, or device to which it is connected.

impedance matching stub—A section of transmission line or a pair of conductors cut to match the impedance of a load. Also called matching stub.

impedance matching transformer—A transformer designed to match the impedance of one circuit to that of another.

impulse—See pulse.

inductance—A property of a conductor or circuit which resists a change in current. It causes current changes to lag behind voltage changes and is measured in henrys.

induction—The phenomenon of a voltage, magnetic field, or electrostatic charge being produced in an object by lines of force from the source of such fields.

induction heating—Heating a conducting material by placing it in a rapidly changing magnetic field. The changing field induces electric currents in the material and I^2R losses account for the resultant heat.

input—A signal (or power) which is applied to a piece of electric apparatus, or the terminals on the apparatus to which a signal or power is applied.

insertion loss—A measure of the attenuation of a device by determining the output of a system before and after the device is inserted into the system.

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insulation—A material having good dielectric properties which is used to separate close electrical components, such as cable conductors and circuit components.

insulation stress—The molecule separation pressure caused by a potential difference across an insulator. The practical stress on insulation is expressed in volts per mil.

interference—Disturbances of an electrical or electromagnetic nature that introduce undesirable responses into other electronic equipment.

intermediate frequency—A frequency to which a signal is converted for ease of handling. Receives its name from the fact that it is an intermediate step between the initial and final conversion or detection stages.

ionization—The formation of ions. Ions are produced when polar compounds are dissolved in a solvent and when a liquid, gas, or solid is caused to lose or gain electrons due to the passage of an electric current.

ionization voltage—The potential at which a material ionizes. The potential at which an atom gives up an electron.

IPCEA—Insulated Power Cable Engineers Association.

I^2R—Formula for power in watts, where I = current in amperes, R = resistance in ohms. Also see watt.

IR drop—A method of designating a voltage drop in terms of both current and resistance.

IRS—Ignition radiation suppression.

Isolation—The ability of a circuit or component to reject interference, usually expressed in db.

jacket—Pertaining to wire and cable, the outer sheath which protects against environment and may also provide additional insulation.

kev—1000 electron volts.

kilo—Prefix meaning thousand.

KV—Kilovolt (1000 volts).

KVA—Kilovolt ampere.

KW—Kilowatt.

L—Symbol for inductance.

lay—Pertaining to wire and cable, the axial distance required for one cabled conductor or conductor strand to complete one revolution about the axis around which it is cabled.

lay direction—The twist in the cable as indicated by the top strands while looking along the axis of the cable away from the observer. Described as "right hand" or "left hand".

lead dress—The placement or routing of wiring and component leads in an electrical circuit.

lead-in—The conductor that provides the path for r-f energy between the antenna and the radio/television receiver or transmitter.

leakage—The undesirable passage of current over the surface of or through an insulator.

level—A measure of the difference between a quantity or value and an established reference.

LF—Low frequency.

limpness—The ability of a cable to lay flat or conform to a surface as with microphone cables. (also see flexibility.)

line drop—A voltage loss occurring between any two points in a power or transmission line. Such loss, or drop, is due to the resistance, reactance, or leakage of the line.

line equalizer—A reactance (inductance and/or capacitance) connected in series with a transmission line to alter the frequency-response characteristics of the line.

line level—The level of a signal at a certain point on a transmission line. Usually expressed in decibels.

line voltage—The value of the potential existing on a supply or power line.

load—A device that consumes or converts the power delivered by another device.

loaded line—A transmission line that has lumped elements (inductance or capacitance) added at uniformly spaced intervals. Loading is used to provide a given set of characteristics to a transmission line.

loading—See loaded line.

long-wire antenna—Any conductor length in excess of one-half of a wavelength. In a residential television installation, a horizontal run of unshielded lead-in will act as a long-wire antenna and introduce additional signal on top of the regular antenna signal, causing ghosts.

loss—The portion of energy applied to a system that is dissipated and performs no useful work.

lossy—Having poor efficiency.

low frequency—A band of frequencies extending from 30 to 300 kc in the radio spectrum, designated by the Federal Communications Commission.

M—Mutual inductance.

MA—Milliampere (one-thousandth of an ampere).

mega—Prefix meaning million.

MEV—One million electron volts.

MFD—Microfarad (one-millionth of a farad).

MHO—The unit of conductance, equal to the reciprocal of the unit of resistance (ohm).

MHz—Megahertz (one million cycles per second). Formerly mc.

micro—Prefix meaning one-millionth.

microfarad—One-millionth of a farad (uf, ufd, mf, and mfd are common abbreviations).

micromicrofarad—One-millionth of a microfarad (uuf, uufd, mmf, mmfd are common abbreviations). Also, a picofarad (pf or pfd).

microphonics—Noise caused by mechanical excitation of a system component. In a single-conductor microphone cable, for example, microphonics can be caused by the shield rubbing against the dielectric, as the cable is flexed.

mil—A unit of length equal to one thousandth of an inch.

milli—Prefix meaning one-thousandth.

MMF or MMFD—Abbreviation for micromicrofarad (one-millionth of one-millionth of a farad). A picofarad (pf or pfd).

mono filament—A single strand filament as opposed to a braided or twisted filament.

mutual capacitance—Capacitance between two conductors when all other conductors are connected together.

MV—Millivolt (one-thousandth of a volt).

MW—Milliwatt (one-thousandth of a watt).

Mylar®—Du Pont trademark for polyethylene terephtalate (polyester) film.

NBR—Butadiene-acrylonitrile copolymer rubber, a material with good oil and chemical resistance.

NEC—National Electric Code.

NEMA—National Electrical Manufacturers Association.

neoprene—A synthetic rubber with good resistance to oil, chemical, and flame. Also called polychloroprene.

noise—In a cable or circuit any extraneous sounds or signal which tends to interfere with the sound or signal normally present in or passing through the system.

Nomex®—Du Pont trademark for a temperature resistant, flame retardant nylon.

nylon—An abrasion-resistant thermoplastic with good chemical resistance.

ohm—The electrical unit of resistance. The value of resistance through which a potential difference of one volt will maintain a current of one ampere.

Ohm's law—Stated E = IR, I = E/R, or R = E/I, the current I in a circuit is directly proportional to the voltage E, and inversely proportional to the resistance R.

output—The useful power or signal delivered by a circuit or device.

ozone—Extremely reactive form of oxygen, normally occurring around electrical discharges and present in the atmosphere in small but active quantities. In sufficient concentrations it can break down certain rubber insulations under tension (such as a bent cable).

parallel circuit—A circuit in which the identical voltage is presented to all components, and the current divides among the components according to the resistances or the impedances of the components.

patchcord—A flexible piece of electrical cord terminated at both ends with plugs, used for interconnecting circuits on a patchboard.

peak—The maximum instantaneous value of a varying current or voltage. Also called crest.

periodicity—The uniformly spaced variations in the insulation diameter of a transmission cable that result in reflections of a signal, when its wavelength or a multiple thereof is equal to the distance between two diameter variations.

phase—The location of a position on a waveform of an alternating quality, in relation to the start of a cycle. Measured in degrees, with 360° corresponding to one complete cycle.

phase shift—A change in the phase relationship between two alternating quantities.

pickup—Any device which is capable of transforming a measurable quantity of intelligence (such as sound) into relative electrical signals, e.g., a microphone.

pico—Prefix meaning one-millionth of one-millionth. (10^{-12}).

picofarad—One-millionth of one-millionth of a farad. A micromicrofarad, or picofarad (abbreviation pf).

plastic—High polymeric substances, including both natural and synthetic products, but excluding the rubbers that are capable of flowing under heat and pressure.

plasticizer—A chemical added to plastics to make them softer and more flexible.

polybutadiene—A type of synthetic rubber often blended with other synthetic rubbers to improve their properties.

polyethylene—A thermoplastic material having excellent electrical properties.

polymer—A substance made of many repeating chemical units or molecules. The term polymer is often used in place of plastic, rubber, or elastomer.

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polypropylene—A thermoplastic similar to polyethylene but stiffer and having higher softening point (temperature).

polyurethane—Broad class of polymers noted for good abrasion and solvent resistance. Can be in solid or cellular form.

polyvinyl chloride—A general purpose thermoplastic used for wire and cable insulations and jackets.

potting—Sealing by filling with a substance to exclude moisture.

power—The amount of work per unit of time. Usually expressed in watts, and equal to I^2R.

power loss—The difference between the total power delivered to a circuit, cable, or device, and the power delivered by that device to a load.

power ratio—The ratio of the power appearing at the load, to the input power. Expressed in db, it is equal to 10 $\log_{10}$ (P_2/P_1), where P_1 is input power and P_2 is the power at the load.

pulse—A current or voltage which changes abruptly from one value to another and back to the original value in a finite length of time. Used to describe one particular variation in a series of wave motions.

PVC—Polyvinyl chloride.

R—Symbol for resistance or resistor.

radio frequency—The frequencies in the electromagnetic spectrum that are used for radio communications.

reactance—The opposition offered an alternating electron flow by a capacitance or inductance. The amount of such opposition varies with the frequency of the current. The reactance of a capacitor decreases with an increase in frequency; the opposite occurs with an inductance.

reflection—The change in direction (or return) of waves striking a surface. For example, electromagnetic energy reflections can occur at an impedance mismatch in a transmission line, causing standing waves.

resistance—In dc circuits, the opposition a material offers to current, measured in ohms. In ac circuits, resistance is the real component of impedance, and may be higher than the value measured at dc.

resonance—An ac circuit condition in which inductive and capacitive reactances interact to cause a minimum or maximum circuit impedance.

retractile cord—A cord having specially treated insulation or jacket so that it will retract like a spring. Retractability may be added to all or part of a cord's length.

R-F—Radio-frequency.

RG/U—"RG" is the military designation for coaxial cable, and "U" stands for "general utility."

RMS—Root-mean-square.

Romex®—General Cable Company's trademark for nonmetallic sheathed cable.

rope strand—A conductor composed of a center group of twisted strands surrounded by layers of twisted strands.

rubber (wire insulation)—A general term used to describe wire insulations made of thermosetting elastomers such as natural or synthetic rubbers, neoprene, Hypalon, butyl rubber and others.

SAE—Society of Automotive Engineers.

SBR—A copolymer of styrene and butadiene. Also GR-S or Buna-S. Most commonly used type of synthetic rubber.

semiconductor—In wire industry terminology, a material possessing electrical conduction properties that fall somewhere between conductors and insulators. Usually made by adding carbon particles to an insulator. Not the same as semiconductor materials such as silicon, germanium, etc., used for making transistors and diodes.

separator—Pertaining to wire and cable, a layer of insulating material such as textile, paper, Mylar®, etc., which is placed between a conductor and its dielectric, between a cable jacket and the components it covers, or between various components of a multiple-conductor cable. It can be utilized to improve stripping qualities and/or flexibility, or can offer additional mechanical or electrical protection to the components it separates.

series circuit—A circuit in which the components are arranged end to end to form a single path for current.

shield—A sheet, screen, or braid of metal, usually copper, aluminum, or other conducting material placed around or between electric circuits or cables or their components, to contain any unwanted radiation, or to keep out any unwanted interference.

shield coverage—See shield percentage.

shield effectiveness—The relative ability of a shield to screen out undesirable radiation. Frequently confused with the term shield percentage, which it is not.

shield percentage—The physical area of a circuit or cable actually covered by shielding material, expressed in percent.

signal—Any visible or audible indication which can convey information. Also, the information conveyed through a communication system.

silicone—A material made from silicon and oxygen. Can be in thermosetting elastomer or liquid form. The thermosetting elastomer form is noted for high heat resistance.

single-ended—Unbalanced, such as grounding one side of a circuit or transmission line.

skin effect—The tendency of alternating current, as its frequency increases, to travel only on the surface of a conductor.

spectrum—Frequencies or radiations that exist in a continuous range and have a common characteristic. A spectrum may be inclusive of many spectrums, e.g., the electromagnetic radiation spectrum includes the light spectrum, radio spectrum, infrared spectrum, etc.

standing wave—The stationary pattern of waves produced by two waves of the same frequency traveling in opposite directions on the same transmission line. The existence of voltage and current maxima and minima along a transmission line is a result of reflected energy from an impedance mismatch.

standing wave ratio (swr)—A ratio of the maximum amplitude to the minimum amplitude of a standing wave stated in current or voltage amplitudes.

static charge—An electrical charge that is bound to an object. An unmoving electrical charge.

stay cord—A component of a cable, usually a high tensile textile, used to anchor the cable ends at their points of termination and to keep any pull on the cable from being transferred to the electrical connections.

strain gauge—A device for determining the amount of strain (change in dimensions) when a stress is applied.

suppressor—A device used to reduce or eliminate unwanted actions in electric or electronic circuits. For example, a resistance conductor in, or a resistor in series with, a sparkplug cable, to suppress interference which would otherwise affect radio reception in and near the vehicle.

surge—A temporary and relatively large increase in the voltage or current in an electric circuit or cable. Also called transient.

swamp—The condition that prevails when too large a signal is applied to an electronic device, resulting in distortion of the output from the device.

sweep-test—Pertaining to cable, checking frequency response by generating an rf voltage whose frequency is varied back and forth through a given frequency range at a rapid constant rate and observing the results on an oscilloscope.

In CATV applications, the structural return loss sweep-test determines internal reflections in the cable. A high structural return loss is desirable.

Teflon®—Du Pont Company tradename for fluorocarbon resins. (See FEP and TFE.)

TFE—Tetrafluoroethylene. A thermoplastic material with good electrical insulating properties and chemical and heat resistance.

thermoplastic—A material which will soften, flow, or distort appreciably when subjected to sufficient heat and pressure. Examples are polyvinyl chloride and polyethylene.

thermosetting—A material which will not soften, flow, or distort appreciably when subjected to heat and pressure. Vulcanizable. Examples are rubber and neoprene.

tinsel—A type of electrical conductor comprised of a number of tiny threads, each thread having a fine, flat ribbon of copper or other metal closely spiralled about it. Used for small size cables requiring limpness and extra-long flex life.

transmission line—An arrangement of two or more conductors or a waveguide used to transfer signal energy from one location to another.

thermal rating—The temperature range in which a material will perform its function without undue degradation.

transducer—A device for transforming mechanical energy to electrical energy, or for transforming electrical energy to mechanical energy, such as in microphones and loudspeakers, but not motors or generators.

triboelectric noise—Noise generated in a shielded cable due to variations in capacitance between shielding and conductor as the cable is flexed.

trunk cable—See feeder cable.

turn-key—In catv, a contractural arrangement in which one party designs and installs the system and "turns over the keys" to another party who will operate the system.

twin-lead—A transmission line having two parallel conductors separated by insulating material. Line impedance is determined by the diameter and spacing of the conductors and the insulating material and is usually 300 ohms for television receiving antennas. Also called balanced transmission line and twin-line.

UHF—Ultrahigh frequency, the band extending from 300 to 3,000 mc as designated by the Federal Communications Commission.

UL—Underwriters' Laboratories, Inc.

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unbalanced line—A transmission line in which voltages on the two conductors are unequal with respect to ground, e.g., a coaxial cable.

unilay—More than one layer of helically laid wires with the direction of lay and length of lay the same for all layers.

V—Volt.

VA—Volt-ampere. A designation of power in terms of volts and amperes.

velocity of propagation—The transmission speed of an electrical signal down a length of cable compared to speed in free space. Usually expressed as a percentage.

VHF—Very high frequency, the band extending from 30 to 300 mHz as designated by the Federal Communications Commission.

video—Pertaining to picture signals in a television system.

vlf—Very low frequency, the band extending from 10 to 30 kc, as designated by the Federal Communications Commission.

volt—A unit of electrical pressure. One volt is the amount of pressure that will cause one ampere of current in one ohm of resistance.

voltage—Electrical potential or electromotive force expressed in volts.

voltage drop—The voltage developed across a component or conductor by the current in the resistance or impedance of the component or conductor.

W—Symbol for watt or wattage.

watt—A unit of electrical power. One watt is equivalent to the power represented by one ampere of current under a pressure of one volt in a dc circuit.

waveform—A graphical representation of a varying quantity. Usually, time is represented on the horizontal axis, and the current or voltage value is represented on the vertical axis.

wavelength—The distance between the nodes of a wave. The ratio of the velocity of the wave to the frequency of the wave.

X—Symbol for reactance.

Z—Symbol for impedance.

METRIC—DECIMAL—INCH CONVERSIONS

Fractions of an inch					Mm	Decim. of an inch
1/8	1/16	1/32	1/64	1/128		
				1	.198	.0078125
			1	2	.397	.0156250
				3	.595	.0234375
		1	2	4	.794	.031250
				5	.992	.0390625
			3	6	1.191	.0468750
				7	1.389	.0546875
	1	2	4	8	1.588	.062500
				9	1.786	.0703125
			5	10	1.984	.078125
				11	2.183	.0859375
		3	6	12	2.381	.093750
				13	2.580	.1015625
			7	14	2.778	.109375
				15	2.977	.1171875
1	2	4	8	16	3.175	.125000
				17	3.373	.1328125
			9	18	3.572	.140625
				19	3.770	.1484375
		5	10	20	3.969	.156250
				21	4.167	.1640625
			11	22	4.366	.171875
				23	4.564	.1796875
	3	6	12	24	4.763	.187500
				25	4.961	.1953125
			13	26	5.159	.2031250
				27	5.358	.2109375
		7	14	28	5.556	.218750
				29	5.755	.2265625
			15	30	5.953	.234375
				31	6.152	.2421875
2	4	8	16	32	6.350	.250000
				33	6.548	.2578125
			17	34	6.747	.265625
				35	6.945	.2734375
		9	18	36	7.144	.281250
				37	7.342	.2890625
			19	38	7.541	296875
				39	7.739	.3046875
	5	10	20	40	7.938	.312500
				41	8.136	.3203125
			21	42	8.334	.328125
				43	8.533	.3359375

Fractions of an inch					Mm	Decim. of an inch
1/8	1/16	1/32	1/64	1/128		
		11	22	44	8.731	.343750
				45	8.930	.3515625
			23	46	9.128	.359375
				47	9.327	.3671875
3	6	12	24	48	9.525	.375000
				49	9.723	.3828125
			25	50	9.922	.390625
				51	10.120	.3984375
		13	26	52	10.319	.406250
				53	10.517	.4140625
			27	54	10.716	.421875
				55	10.914	.4296875
	7	14	28	56	11.113	.437500
				57	11.311	.4453125
			29	58	11.509	.453125
				59	11.708	.4609375
		15	30	60	11.906	.46875
				61	12.105	.4765625
			31	62	12.303	.484375
				63	12.502	.4921875
4	8	16	32	64	12.700	.500000
				65	12.898	.5078125
			33	66	13.097	.515625
				67	13.295	.5234375
		17	34	68	13.494	.531250
				69	13.692	.5390625
			35	70	13.891	.546875
				71	14.089	.5546875
	9	18	36	72	14.288	.562500
				73	14.486	.5703125
			37	74	14.684	.578125
				75	14.883	5859375
		19	38	76	15.081	.593750
				77	15.280	.6015625
			39	78	15.478	.609375
				79	15.677	.6171875
5	10	20	40	80	15.875	.625000
				81	16.073	.6328125
			41	82	16.272	.640625
				83	16.470	.6484375
		21	42	84	16.669	.656250
				85	16.867	.6640625
			43	86	17.066	.671875

Fractions of an inch					Mm	Decim. of an inch
1/8	1/16	1/32	1/64	1/128		
				87	17.264	.6796875
	11	22	44	88	17.463	.687500
				89	17.661	.6953125
			45	90	17.859	.703125
				91	18.058	.7109375
		23	46	92	18.256	.718750
				93	18.455	7265625
			47	94	18.653	.734375
				95	18.852	.7421875
6	12	24	48	96	19.050	.750000
				97	19.248	.7578125
			49	98	19.447	.765625
				99	19.645	.7734375
		25	50	100	19.844	.78125
				101	20.042	.7890625
			51	102	20.241	.796875
				103	20.439	.8046875
	13	26	52	104	20.638	.81250
				105	20.836	.8203125
			53	106	21.034	.828125
				107	21.233	.8359375
		27	54	108	21.431	.843750
				109	21.630	.8515625
			55	110	21.828	.859375
				111	22.027	.8671875
7	14	28	56	112	22.225	.875000
				113	22.423	.8828125
			57	114	22.622	.890625
				115	22.820	.8984375
		29	58	116	23.019	.906250
				117	23.217	.9140625
			59	118	23.416	.921875
				119	23.614	.9296875
	15	30	60	120	23.813	.937500
				121	24.011	.9453125
			61	122	24.209	.953125
				123	24.408	.9609375
		31	62	124	24.606	.968750
				125	24.805	.9765625
			63	126	25.003	.9843750
				127	25.202	.9921875
8	16	32	64	128	25.400	1.000

TECHNICAL DATA and INFORMATION

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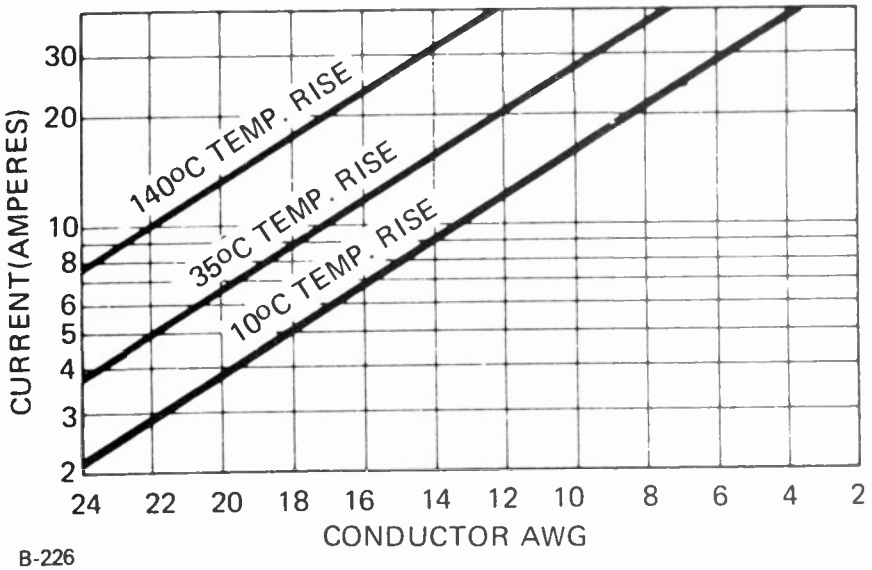
BARE COPPER WIRE PARAMETERS

AWG	Dia. Mils	Cross-Sect. Area Cir. Mils	Lbs. per 1000 Ft.	Breaking Strength (Lbs.)		Resistance Ohms per 1000 Ft. 20° C	
				Soft (ANL)	Med. Hard	Soft (ANL)	Med. Hard
10	101.9	10,380	31.43	314.0	467.5	0.999	1.033
11	90.7	8,230	24.92	249.0	372.9	1.260	1.303
12	80.8	6,530	19.77	197.5	297.5	1.588	1.643
13	72.0	5,180	15.68	156.6	237.2	2.003	2.072
14	64.1	4,110	12.43	124.2	189.2	2.525	2.613
15	57.1	3,260	9.86	98.5	150.9	3.184	3.295
16	50.8	2,580	7.82	78.1	120.3	4.016	4.154
17	45.3	2,050	6.20	61.9	96.0	5.064	5.239
18	40.3	1,620	4.92	49.2	76.5	6.385	6.606
19	35.9	1,290	3.09	39.0	61.0	8.051	8.330
20	32.0	1,020	3.09	30.9	48.7	10.15	10.50
21	28.5	812	2.452	24.5	38.8	12.80	13.24
22	25.3	640	1.945	19.4	30.9	16.14	16.70
23	22.6	511	1.542	15.4	24.7	20.36	21.06
24	20.1	404	1.223	12.7	19.7	25.67	26.56
25	17.9	320	0.970	10.1	15.7	32.37	33.49
26	15.9	253	0.770	7.98	12.5	40.81	42.22
27	14.2	202	0.610	6.33	9.97	51.47	53.24
28	12.6	159	0.484	5.02	7.95	64.9	67.1
29	11.3	128	0.384	3.98	6.34	81.8	84.7
30	10.0	100.0	0.304	3.16	5.05	103.2	106.8
31	8.9	79.2	0.241	2.50	4.03	130.1	134.6
32	8.0	64.0	0.191	1.99	3.21	164.1	169.8
33	7.1	50.4	0.152	1.58	2.56	206.9	214.1
34	6.3	39.7	0.120	1.25	2.04	260.9	269.9
35	5.6	31.4	0.095	0.990	1.63	329.0	340.4
36	5.0	25.0	0.076	0.785	1.30	414.8	429.2
37	4.5	20.2	0.060	0.623	1.03	523.1	541.2
38	4.0	16.0	0.0476	0.494	0.823	659.6	682.4
39	3.5	12.2	0.0377	0.392	0.656	831.8	860.5
40	3.1	9.61	0.0299	0.311	0.523	1,049	1,085
41	2.8	7.84	0.0237	0.246	0.415	1,323	1,368
42	2.5	6.25	0.0188	0.195	0.329	1,668	1,725
43	2.2	4.84	0.0149	0.155	0.261	2,103	2,176
44	2.0	4.00	0.0118	0.123	0.207	2,652	2,743
45	1.76	3.10	0.00981	0.09		3,200	
46	1.57	2.46	0.00775	0.07		4,050	
47	1.40	1.96	0.00593	0.054		5,290	
48	1.24	1.54	0.00436	0.04		7,200	
49	1.11	1.23	0.00366	0.033		8,570	
50	0.99	0.980	0.00303	0.027		10,400	
51	0.88	0.774	0.00234	0.023		13,400	
52	0.78	0.603	0.00184	0.017		17,000	
53	0.70	0.490	0.00148	0.013		21,200	
54	0.62	0.384	0.00116	0.011		26,900	
55	0.55	0.302	0.000916	0.006		34,300	
56	0.49	0.240	0.000727	0.0052		43,200	

TWO AND THREE CONDUCTOR WIRE CURRENT CARRYING CAPACITY



Temperature Rise of Conductors Surrounded by Still Air at 25°C.

Correction Factors Chart for Current Carrying Capacity of Other Multiconductor Cables

No. of Conductors	Multiplying Factor
1	1.6
2-3	1.0
4-5	0.8
6-15	0.7
16-30	0.5

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LEAD WIRE CURRENT CARRYING CAPACITY—AMPERES*

AWG	Rubber	Neoprene	Vinyl	Hypalon † XL-DUR T.M.	Silicone Nomex
24	2	3	4	4	6
22	3	4	5	5	8
20	5	6	7	7	12
18	8	9	10	10	18
16	13	14	15	15	29
14	20	21	22	22	45
12	25	27	29	29	55
10	40	43	47	47	75
8	65	70	75	75	100
6	95	100	105	105	135
4	125	135	150	150	180
3	145	155	175	175	210
2	170	180	205	205	240
1	195	210	235	235	280
0	230	245	275	275	325
00	265	285	315	315	370
000	310	330	375	375	430
0000	360	385	435	435	510

*Amperes shown are maximum for a single conductor in free air and an assumed ambient or room temperature of 30C (86F).

†Trademark of DuPont

LEAD WIRE CURRENT CARRYING CAPACITY CHART

How to Use

The choice of an appropriate Lead Wire with respect to current carrying capacity usually depends on one or more factors which vary according to the application. These factors include ambient or room temperature in which equipment operates, temperature rise of equipment, limitations of insulation, voltage drop and location of wires as in free air or enclosures such as formed by a compartment, tubing or a bundle of wires.

For these reasons it is not practical to provide a general chart showing the current carrying capacity of Lead Wire for all conditions. Accordingly the values shown in the chart below have been arbitrarily developed for stated conditions. *If necessary, choose a larger or smaller size by trial for final determination to satisfy the requirements in the application for proper operation and safety of the equipment.*

The insulations shown are those described for Belden Lead Wire constructions.

COMMON CONDUCTOR MATERIALS

Material	DC Resistance Compared to Annealed Cop.	R-F Resistance Compared to Annealed Cop.	Tensile Strength (PSI)	
			Annealed	Hard
Copper	100%	100%	35,000	66,000
Copperweld ® 40% LC	250%	100%	50,000	96,000
Copperweld ® 30% HM	333%	100%	70,000	130,000
Cadmium Bronze 99% Cu, 1% Cd	115%	115%	38,000	90,000
Aluminum[3]	164%	164%	17,000[4]	23,000

(1) Flex life will, in general, be improved by use of higher strength material.
(2) Theoretically, annealed material will have longer fatigue life than hard. However, in practice the stiffness of hard material frequently tends to restrict the sharpness of bend, resulting in improved life.
(3) Aluminum used in aircraft and power distribution for weight reduction. Not normally used for electronic applications.
(4) 3/4 hard.

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CONDUCTOR CONFIGURATIONS

For a given AWG wire size (based on equal cross-sectional area of conductor), limpness and flex life are increased by use of a large number of fine strands. It follows, costs are also increased with fine stranding.

Typical Application:	AMERICAN WIRE GAGE							
	12	14	16	18	20	22	24	26
Fixed Service Hook-up Wire Cable in Raceway	19x25	Solid or 19 x27	Solid or 19x29	Solid or 7x26 or 16x30	Solid or 7x28 or 10x30	Solid or 7x30	Solid or 7x32	Solid or 7x34
Moderate Flexing Frequently Disturbed for Maintenance	65x30	19x27 or 41x30	19x29 or 26x30	16x30 or 41x34	7x28 or 10x30 or 19x32 or 26x34	7x30 or 19x34	7x32 or 10x34	7x34
Severe Flexing Microphones Test Prods	165x34	104x34	65x34 or 104x36	41x34 or 65x36	26x34 or 42x36	19x34 or 26x36	19x36 or 45x40 *	7x34 or 10x36 *
Most Severe Duty—Mercury Switches	259x36 (7x37** Rope Lay)	168x36 (7x24 Rope Lay)	105x36 (7x15 Rope Lay)	63x36 (7x9 Rope Lay)	105x40 (3x35 Rope Lay)	(Consider braid or tinsel)		

*Composite constructions consisting of 4 strands Copperweld and 3 strands copper are frequently used for severe flexing in small size cables. # 25 AWG (4 x 33 Copperweld + 3 x 33 Copper) is popular in microphone cables.

**Rope Lay is several stranded groups cabled together. For example: # 12 AWG, 259 x 36 is 7 cords each consisting of 37 strands of #36 AWG.

METRIC PREFIXES AND SYMBOLS

Multiples and Submultiples			Prefixes	Symbols
1,000,000,000,000	—	10^{12}	Tera	T
1,000,000,000	—	10^{9}	Giga	G
1,000,000	—	10^{6}	Mega	M
1,000	—	10^{3}	Kilo	K
100	—	10^{2}	Hecto	h
10	—	10	Deca	dk
0.1	—	10^{-1}	Deci	d
0.01	—	10^{-2}	Centi	c
0.001	—	10^{-3}	Milli	m
0.000,001	—	10^{-6}	Micro	μ
0.000,000,001	—	10^{-9}	Nano	n
0.000,000,000,001	—	10^{-12}	Pico	p

UL FLEXIBLE CORDAGE CURRENT CARRYING CAPACITY IN AMPERES

AWG	Tinsel Cords	Rubber and Plastic Cords	Heater Cords
27	0.5	—	—
18	—	10	10
17	—	—	12
16	—	13	15
14	—	18	20
12	—	25	30
10	—	30	—
8	—	40	—
6	—	55	—
4	—	70	—

*Underwriters' Laboratories, Inc., & National Electrical Code Standard for 2 and 3 conductor cords. For cords with 4 to 6 conductors, the current rating is 80% of the values shown.

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FLEXIBLE COAXIAL CABLE PARAMETERS

Major Impedance Group	Imp. Ohms	RG No.	pf/ft.	O.D. In.	Mil Jkt. Type	Center Cond.	Max. Oper. Volts (Rms)	Lbs./100'	Applicable Specification
	50	5A/U	28.5	0.328	II	16S	3000	8.7	JAN-C-17A
	50	5B/U	28.5	0.328	IIa	16S	3000	8.7	MIL-C-17D
	52	8/U	29.5	0.405	I	7/21C	5000	10.6	JAN-C-17A
	52	8A/U	29.5	0.405	IIa	7/21C	5000	10.6	MIL-C-17D
	51	9/U	30	0.420	II	7/21S	5000	15.	JAN-C-17A
	51	9A/U	30	0.420	II	7/21S	5000	15.	JAN-C-17A
	50	9B/U	30	0.420	IIa	7/21S	5000	15.	MIL-C-17D
50	52	14A/U	29.5	0.545	IIa	10C	7000	21.6	MIL-C-17D
	52	17/U	29.5	0.870	II	.188C	11000	47.	JAN-C-17A
	52	17A/U	29.5	0.870	IIa	.188C	11000	47.	MIL-C-17D
	52	19A/U	29.5	1.120	IIa	.250C	14000	74.	MIL-C-17D
	53	21A/U	29	0.332	IIa	16N	2700	8.7	MIL-C-17D
	58	54A/U	26.5	0.250(max.)	III	7/.0152C	3000	4.1	JAN-C-17A
	53.5	55/U	28.5	0.206(max.)	III	20C	1900	3.6	JAN-C-17A
	53.5	55B/U	28.5	0.206	IIIa	20S	1900	3.6	MIL-C-17D
	53.5	58/U	28.5	0.195	I	20C	1900	2.9	JAN-C-17A
	50	58A/U	28.5	0.195	I	19/.0071TC	1900	2.9	JAN-C-17A
	50	58C/U	28.5	0.195	IIa	19/.0071TC	1900	2.9	MIL-C-17D
	50	122/U	29.3	0.160	IIa	27/36TC	1900	2.	MIL-C-17D
	50	174/U	30.4	0.100	I	7/34CW	1500	0.8	BuShips
	*50	178B/U	29.0	0.075(max.)	IX	7/38SCW	1000	0.6	MIL-C-17D
	*50	188A/U	29.0	0.110(max.)	VII	7/.0067SCW	1200	1.3	MIL-C-17D
	*50	196A/U	29.0	0.080(max.)	VII	7/38SCW	1000	0.7	MIL-C-17D
	50	213/U	29.5	0.405	IIa	7/.0296C	5000	10.6	MIL-C-17D
	50	214/U	30	0.425	IIa	7/.0296S	5000	15.	MIL-C-17D
	50	217/U	29.5	0.545	IIa	.106C	7000	21.6	MIL-C-17D
	50	218/U	29.5	0.870	IIa	.195C	11000	49.1	MIL-C-17D
	50	223/U	29.5	0.216	IIa	.035S	1900	3.6	MIL-C-17D
	75	6A/U	20	0.332	IIa	21CW	2700	8.2	MIL-C-17D
	75	11/U	20.5	0.405	I	7/26TC	5000	9.6	JAN-C-17A
	75	11A/U	20.5	0.405	IIa	7/26TC	5000	9.6	MIL-C-17D
	74	13/U	20.5	0.420	I	7/26TC	5000	12.6	JAN-C-17A
75	75	34B/U	21.5	0.630	IIa	7/.0249C	6500	22.4	MIL-C-17D
	73	59/U	21	0.242	I	22CW	2300	3.2	JAN-C-17A
	75	59B/U	21	0.242	IIa	.023CW	2300	3.2	MIL-C-17D
	78	108A/U	24.5 (max.)	0.235	IIa	2–7/28TC (twin)	1000	2.9	MIL-C-17D
	*75	140/U	21	0.233	V	.025SCW	2300	4.5	MIL-C-17D
	95	22/U	16	0.405	I	2–7/.0152C (twin)	1000	15.1	JAN-C-17A
	95	22B/U	16	0.420	IIa	2–7/.0152C (twin)	1000	15.1	MIL-C-17D
93	93	62/U	13.5	0.242	I	22CW	750	3.8	JAN-C-17A
	93	62B/U	13.5	0.242	IIa	7/32CW	750	3.8	MIL-C-17D
	93	71/U	14.5(max)	0.250(max.)	III	22CW	750	4.6	JAN-C-17A
	93	71B/U	14.5(max)	0.250(max.)	IIIa	22CW	750	4.6	MIL-C-17D
	*95	180B/U	15.5	0.145(max.)	IX	7/38SCW	1500	2.2	MIL-C-17D
	*95	195A/U	15.5	0.155(max.)	VII	7/38SCW	1500	2.5	MIL-C-17D
125	125	63/U	10	0.405	I	22CW	1000	8.3	JAN-C-17A
	125	63B/U	10	0.405	IIa	22CW	1000	8.3	MIL-C-17D
185	185	114/U	6.5	0.405	I	33CW	1000	8.7	JAN-C-17A
	185	114A/U	6.8(max.)	0.405	IIa	.007CW	1000	8.7	MIL-C-17D

*For high temperature operation.

Abbreviations: C = Bare Copper, CW = Copperweld, N = Nichrome, pf = picofarad, RMS = Root Mean Square, S = Silver coated copper, SCW = Silver coated copperweld, TC = Tinned Copper.

JACKETS

Jacket Type	Description	Temp. Range
I	Black Vinyl	−40°C to 80°C
II	Gray Vinyl (non-contaminating)	−55°C to 80°C
IIa	Black Vinyl (non-contaminating)	−55°C to 80°C
III	Clear Polyethylene)	−55°C to 80°C
IIIa	Black Polyethylene)	−55°C to 80°C
V	Fiberglass, silicone impregnated varnish	−55°C to 250°C
VII	White TFE Teflon*	−70°C to 200°C
IX	Brown FEP Teflon*	−70°C to 200°C

*Registered trademark of DuPont.

SUGGESTED AWG SIZE FOR LONG POWER SUPPLY CORDS*

Cord Length (ft)	Current (amp) 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
25	18	18	18	18	18	18	18	18	18	18	16	16	16	14	14	14	14	14	12	12	12	12	12	12	12
50	18	18	18	18	18	18	18	18	18	18	16	16	16	14	14	14	14	14	12	12	12	12	12	12	12
75	18	18	18	18	18	18	18	18	18	18	16	16	16	14	14	14	14	14	12	12	12	12	12	12	12
100	18	18	18	18	18	18	18	16	16	16	16	16	14	14	14	14	14	14	12	12	12	12	12	12	12
125	18	18	18	18	18	18	16	16	16	14	14	14	14	14	14	12	12	12	12	12	12	12	12	12	12
150	18	18	18	18	18	16	16	16	14	14	14	14	14	12	12	12	12	12	12	12	10	10	10	10	10

*Rubber and plastic cords, but not including heater cords. Based on a 115-v supply and a maximum voltage drop (loss) of 10v when cord carries rated current. To determine correct AWG, refer to the cord length in the table and the current nearest the current rating on the nameplate of the appliance.

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35mm PROJECTION CHARTS

DOUBLE FRAME SLIDES (1.34" Aperture Width)

Because focal length tolerances and lens construction vary from model to model, a general projection chart assumes that the projection distance can be varied by at least (plus or minus) six inches. (Refer to Buhl pertaining to special charts for internal mirrors.)

FOCAL LENGTHS from 1.4" to 5.0"

SCREEN WIDTHS from 12" to 12.0'

FOCAL LENGTH (inches)	SCREEN WIDTHS in INCHES and (DECIMALS) FEET																						
	12"	18"	24"	30"	36"	42"	48"	54"	60"	66"	72"	78"	84"	90"	96"	102"	108"	114"	10.0'	10.5'	11.0'	11.5'	12.0'
	Approximate Distances from Film Plane to Screen in Inches and (decimals) Feet																						
1.4"	19"	26"	32"	39"	45"	52"	58"	65"	71"	78"	84"	91"	97"	104"	110"	116"	10.2'	10.8'	11.3'	11.9'	12.4'	13.0'	13.5'
1.7"	23"	30"	38"	46"	53"	61"	68"	76"	84"	91"	99"	106"	114"	10.1'	10.8'	11.4'	12.0'	12.7'	13.3'	13.9'	14.6'	15.2'	15.8'
1.8"	24"	32'	40"	48"	56"	64"	72"	80"	88"	96"	104"	112"	10.0'	10.7'	11.4'	12.1'	12.7'	13.4'	14.1'	14.7'	15.4'	16.1'	16.8'
2.0"	24"	33"	41"	50"	58"	67"	75"	84"	92"	101"	109"	118"	10.5'	11.2'	11.9'	12.6'	13.3'	14.1'	14.8'	15.5'	16.2'	16.9'	17.6'
2.5"	32"	43"	54"	65"	76"	87"	99"	110"	10.1'	11.0'	11.9'	12.9'	13.8'	14.7'	15.7'	16.6'	17.5'	18.5'	19.4'	20.3'	21.3'	22.2'	23.1'
3.0"	34"	47"	60"	74"	87"	101"	114"	10.6'	11.7'	12.9'	14.0'	15.1'	16.2'	17.3'	18.5'	19.6'	20.7'	21.8'	22.9'	24.1'	25.2'	26.3'	27.4'
3.6"	40"	56"	72"	88"	105"	10.1'	11.4'	12.7'	14.1'	15.4'	16.8'	18.1'	19.5'	20.8'	22.1'	23.5'	24.8'	26.2'	27.5'	28.9'	30.2'	31.5'	32.9'
4.0"	45"	63"	81"	99"	117"	11.2'	12.7'	14.2'	15.7'	17.2'	18.7'	20.2'	21.7'	23.1'	24.6'	26.1'	27.6'	29.1'	30.6'	32.1'	33.6'	35.1'	36.6'
5.0"	4.7'	6.5'	8.4'	10.2'	12.1'	13.9'	15.8'	17.7'	19.5'	21.4'	23.3'	25.1'	27.0'	28.9'	30.7'	32.6'	34.5'	36.3'	38.2'	40.1'	41.9'	43.8'	45.7'

ZOOM LENSES — FOCAL LENGTHS from 2.4" to 6.0"

SCREEN WIDTHS from 36" to 16.0'

FOCAL LENGTH (inches)	SCREEN WIDTHS in INCHES and (DECIMALS) FEET																								
	36"	42"	4.0'	4.5'	5.0'	5.5'	6.0'	6.5'	7.0'	7.5'	8.0'	8.5'	9.0'	9.5'	10.0'	10.5'	11.0'	11.5'	12.0'	12.5'	13.0'	13.5'	14.0'	14.5'	15.0'	15.5'	16.0'
	Approximate Distances from Film Plane to Screen in (decimals) Feet																										
2.4" to 3.6"	5.8'	6.7'	7.6'	8.5'	9.4'	10.3'	11.2'	12.1'	13.0'	13.9'	14.8'	15.7'	16.6'	17.5'	18.4'	19.2'	20.1'	21.0'	21.9'	22.8'	23.7'	24.6'	25.5'	26.4'	27.3'	28.2'	29.1'
	8.7'	10.1'	11.4'	12.7'	14.1'	15.4'	16.8'	18.1'	19.5'	20.8'	22.1'	23.5'	24.8'	26.2'	27.5'	28.9'	30.2'	31.5'	32.9'	34.2'	35.6'	36.9'	38.3'	39.6'	40.9'	42.3'	43.6'
3.2" to 4.8"	7.7'	8.9'	10.1'	11.3'	12.5'	13.7'	14.9'	16.1'	17.3'	18.5'	19.7'	20.9'	22.1'	23.3'	24.5'	25.7'	26.8'	28.0'	29.2'	30.4'	31.6'	32.8'	34.0'	35.2'	36.4'	37.6'	38.8'
	11.6'	13.4'	15.2'	17.0'	18.8'	20.6'	22.3'	24.1'	25.9'	27.7'	29.5'	31.3'	33.1'	34.9'	36.7'	38.5'	40.2'	42.0'	43.8'	45.6'	47.4'	49.2'	51.0'	52.8'	54.6'	56.4'	58.2'
4.0" to 6.0"	9.7'	11.2'	12.7'	14.1'	15.6'	17.1'	18.6'	20.1'	21.6'	23.1'	24.6'	26.1'	27.6'	29.1'	30.6'	32.1'	33.5'	35.0'	36.5'	38.0'	39.5'	41.0'	42.5'	44.0'	45.5'	47.0'	48.5'
	14.5'	16.7'	19.0'	21.2'	23.4'	25.7'	27.9'	30.2'	32.4'	34.6'	36.9'	39.1'	41.3'	43.6'	45.8'	48.1'	50.3'	52.5'	54.8'	57.0'	59.3'	61.5'	63.7'	66.0'	68.2'	70.4'	72.7'

FOCAL LENGTHS from 4.0" to 15.5"

SCREEN WIDTHS from 36" to 16.0'

FOCAL LENGTH (inches)	SCREEN WIDTHS in INCHES and (decimals) FEET																								
	36"	42"	48"	54"	60"	66"	72"	78"	84"	90"	96"	102"	108"	114"	10.0'	10.5'	11.0'	11.5'	12.0'	12.5'	13.0'	13.5'	14.0'	14.5'	15.0'	15.5'	16.0'
	Approximate Distances from Film Plane to Screen in (decimals) Feet																										
4.0"	9.7'	11.2'	12.7'	14.1'	15.6'	17.1'	18.6'	20.1'	21.6'	23.1'	24.6'	26.1'	27.6'	29.1'	30.6'	32.1'	33.5'	35.0'	36.5'	38.0'	39.5'	41.0'	42.5'	44.0'	45.5'	47.0'	48.5'
5.0"	12.1'	13.9'	15.8'	17.7'	19.5'	21.4'	23.3'	25.1'	27.0'	28.9'	30.7'	32.6'	34.5'	36.3'	38.2'	40.1'	41.9'	43.8'	45.7'	47.5'	49.4'	51.3'	53.1'	55.0'	56.8'	58.7'	60.6'
*6.0"	14.5'	16.7'	19.0'	21.2'	23.4'	25.7'	27.9'	30.2'	32.4'	34.6'	36.9'	39.1'	41.3'	43.6'	45.8'	48.1'	50.3'	52.5'	54.8'	57.0'	59.3'	61.5'	63.7'	66.0'	68.2'	70.4'	72.7'
7.0"	17.0'	19.6'	22.2'	24.8'	27.4'	30.0'	32.6'	35.2'	37.9'	40.5'	43.1'	45.7'	48.3'	50.9'	53.5'	56.1'	58.8'	61.4'	64.0'	66.6'	69.2'	71.8'	74.4'	77.0'	79.6'	82.3'	84.9'
7.5"	18.2'	21.0'	23.8'	26.6'	29.4'	32.2'	35.0'	37.8'	40.6'	43.4'	46.2'	48.9'	51.7'	54.5'	57.3'	60.1'	62.9'	65.7'	68.5'	71.3'	74.1'	76.9'	79.7'	82.5'	85.3'	88.1'	90.9'
8.0"	19.4'	22.4'	25.4'	28.3'	31.3'	34.3'	37.3'	40.3'	43.3'	46.2'	49.2'	52.2'	55.2'	58.2'	61.2'	64.2'	67.1'	70.1'	73.1'	76.1'	79.1'	82.1'	85.0'	88.0'	91.0'	94.0'	97.0'
8.5"	20.6'	23.8'	26.9'	30.1'	33.3'	36.4'	39.6'	42.8'	46.0'	49.1'	52.3'	55.5'	58.6'	61.8'	65.0'	68.2'	71.3'	74.5'	77.7'	80.8'	84.0'	87.2'	90.4'	93.5'	96.7'	99.9'	103.0'
9.0"	21.8'	25.2'	28.5'	31.9'	35.2'	38.6'	41.9'	45.3'	48.7'	52.0'	55.4'	58.7'	62.1'	65.4'	68.8'	72.2'	75.5'	78.9'	82.2'	85.6'	88.9'	92.3'	95.7'	99.0'	102.4'	105.7'	109.1'
9.5"	23.0'	26.5'	30.1'	33.6'	37.2'	40.7'	44.3'	47.8'	51.3'	54.9'	58.4'	62.0'	65.5'	69.1'	72.6'	76.2'	79.7'	83.2'	86.8'	90.3'	93.9'	97.4'	101.0'	104.5'	108.1'	111.6'	115.1'
10"	24.3'	28.0'	31.7'	35.4'	39.2'	42.9'	46.6'	50.4'	54.1'	57.8'	61.5'	65.3'	69.0'	72.7'	76.5'	80.2'	83.9'	87.7'	91.4'	95.1'	98.9'	102.6'	106.3'	110.0'	113.8'	117.5'	121.2'
11"	26.7'	30.8'	34.9'	39.0'	43.1'	47.2'	51.3'	55.4'	59.5'	63.6'	67.7'	71.8'	75.9'	80.0'	84.1'	88.2'	92.3'	96.4'	100.5'	104.6'	108.7'	112.8'	116.9'	121.0'	125.1'	129.2'	133.3'
12"	29.1'	33.5'	38.0'	42.5'	47.0'	51.4'	55.9'	60.4'	64.9'	69.3'	73.8'	78.3'	82.8'	87.3'	91.7'	96.2'	100.7'	105.2'	109.6'	114.1'	118.6'	123.1'	127.5'	132.0'	136.5'	141.0'	145.5'
12.5"	30.3'	34.9'	39.6'	44.3'	48.9'	53.6'	58.2'	62.9'	67.6'	72.2'	76.9'	81.6'	86.2'	90.9'	95.5'	100.2'	104.9'	109.5'	114.2'	118.9'	123.5'	128.2'	132.9'	137.5'	142.2'	146.8'	151.5'
13"	31.5'	36.3'	41.2'	46.0'	50.9'	55.7'	60.6'	65.4'	70.3'	75.1'	80.0'	84.8'	89.7'	94.5'	99.4'	104.2'	109.1'	113.9'	118.8'	123.6'	128.5'	133.3'	138.2'	143.0'	147.9'	152.7'	157.6'
14"	33.9'	39.1'	44.3'	49.5'	54.8'	60.0'	65.2'	70.4'	75.7'	80.9'	86.1'	91.3'	96.5'	101.8'	107.0'	112.2'	117.4'	122.7'	127.9'	133.1'	138.3'	143.6'	148.8'	154.0'	159.2'	164.4'	169.7'
15.5"	37.5'	43.3'	49.1'	54.9'	60.7'	66.4'	72.2'	78.0'	83.8'	89.6'	95.3'	101.1'	106.9'	112.7'	118.5'	124.3'	130.0'	135.8'	141.6'	147.4'	153.2'	159.0'	164.7'	170.5'	176.3'	182.1'	187.9'

*Use Available as 4.0" to 6.0" Zoom Lens

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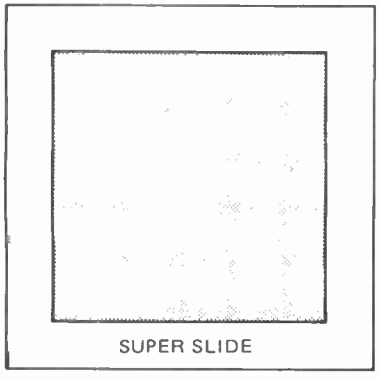
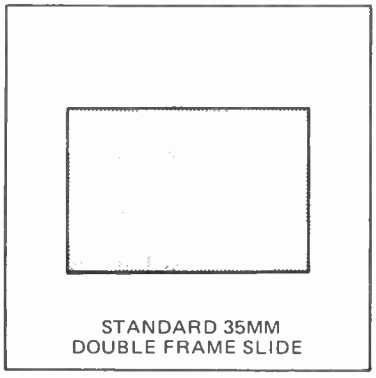
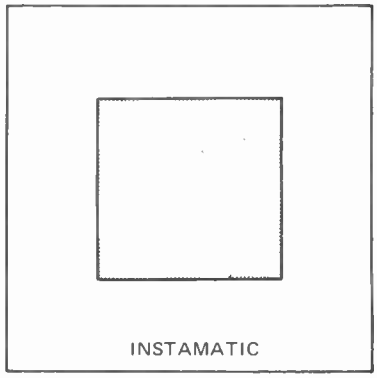
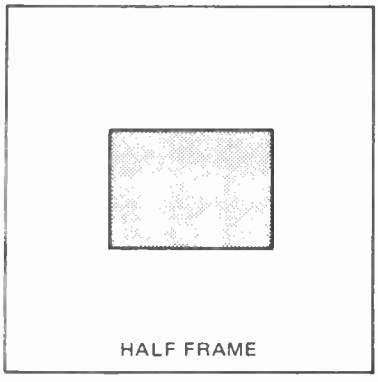
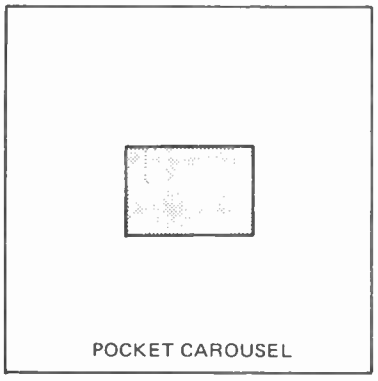
DESIGNER'S PROJECTION CHARTS
2"x 2" and Lantern Slide Sizes

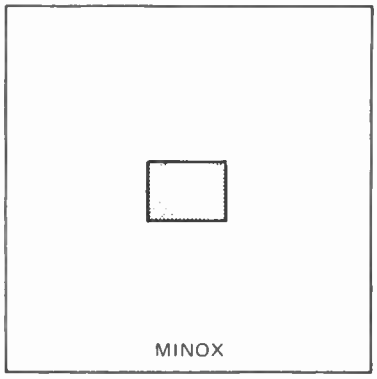

SUPER SLIDE


STANDARD 35MM
DOUBLE FRAME SLIDE


INSTAMATIC


HALF FRAME

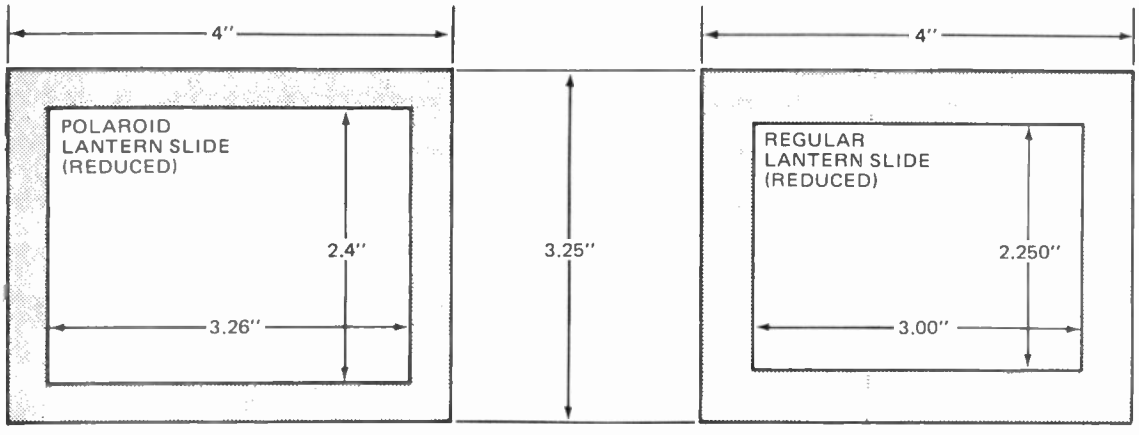

POCKET CAROUSEL


MINOX

CONSIDERATIONS WHEN FIGURING IMAGE AND SCREEN SIZES

If the slide is rectangular, will it be projected in both vertical and horizontal formats?

A rectangular slide projected to the same image size in both vertical and horizontal position will require a square screen but will not have a square image.



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TECHNICAL INFORMATION SHEET
Projection Format Focal Length Formulas

PROJECTION FORMATS:

DESCRIPTION	APERTURE WIDTH (INCHES)		APERTURE HEIGHT (INCHES)		ASPECT RATIO WIDTH/HEIGHT (INCHES)
8mm Motion Picture	.172		.129		1.33
Super 8 Motion Picture	.211		.158		1.33
16mm Motiom Picture*	.380		.284		1.33
16mm Cinemascope	.380 x 2	(A)	.284		2.66
126 Insta-Load Slides	.669		.500		1.34
35mm Motion Picture	.825		.600		1.375
35mm Cinemascope		(B)		(B)	2.34
35mm Filmstrip	.885		.668		1.32
2x2 Half Frame	.902		.626		1.44
2x2 Standard 35mm Double Frame Slide*	1.34	(C)	.902		1.49
2x2 Instamatic	1.043		1.043		1.00
2x2 Superslides	1.500		1.500		1.00
2¼ x 2¼ Slides	2.030		2.030		1.00
3¼ x 4 Lantern Slides	3.000	(C)	2.250	(C)	1.33
3¼ x 4 Polaroid	3.260		2.400		1.36
4x5	4.500		3.500		1.28
Overhead Projector	10.000		10.000		1.00
Overhead Projector	9.500	(D)	7.500	(D)	1.26
Television Projectors	---		---		1.33

*These are the most frequently used formats

(A) ANAMORPHIC

When calculating prime lens focal length for 16MM Cinemascope, use the value .760 as the aperature width. The actual width is .380, but the anamorphic attachment doubles the picture width without affecting the height.

(B) 35MM MOTION PICTURES

35MM Motion Picture wide screen formats vary. The aspect ratio of 2.34 is most common. Check with Buhl for detailed data when 35mm motion pictures are involved.

(C) 2x2 AND LANTERN SLIDES

Lantern slides and 2x2 slides are commonly described by the outside dimensions of the slide mount. But the actual projected opening can be one of several sizes. Be sure to work with the correct slide opening. With 2x2 slides consider whether both horizontal and vertical formats will be used.

(D) OVERHEAD PROJECTORS

Overhead projectors are commonly a 10"x10" opening, but frequently use transparencies with a 7.5"x9.5" opening, usually only in the horizontal position.

ASPECT RATIO

Aspect ratio is a convenient way to relate image width to image height.

Example: If you want to know the height of a 16mm image that is 5 feet wide, divide 5 by 1.33 (the aspect ratio) to get an image height of 3.76 feet. Or, if you had a 4 foot high screen to fill with a 16mm image and wanted to know how wide the screen must be, multiply 4 by 1.33 (the aspect ratio) to get an image width of 5.32 feet.

DETERMINING FOCAL LENGTH

To determine the focal length of the lens required, given the projection distance and desired image width, use existing projection charts or use the simplified formula shown at the right. However, keep in mind that most projection charts and this formula are approximations; also that the distance is measured from some vague point called the "front of the lens". In very short throw situations, or with projectors using long focal length lenses, such as overhead projectors, slightly more sophisticated formulas are needed.

If there is any problem in keeping inches and feet straight , simply convert both the image width and the distance into inches. Determined focal length will then be in inches too.

After calculating the required focal length you will probably find that it is a non standard lens. Choose the nearest lens and use the formulas at the right for recalculating the distance.

$$\text{Image Width} = \text{Image Height} \times \text{Aspect Ratio}$$

$$\text{Image Height} = \frac{\text{Image Width}}{\text{Aspect Ratio}}$$

F = Focal Length Of Lens In Inches

D = Projection Distance In Feet

A = Aperature Width In Inches

W = Image Width In Feet

$$F = \frac{DXA}{W}$$

$$D = \frac{FXW}{A}$$

$$W = \frac{DXA}{F}$$

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16mm PROJECTION CHART

FOCAL LENGTHS from .375" to 2.5"
SCREEN WIDTHS from 24" to 14.5'

FOCAL LENGTH (INCHES)	SCREEN WIDTH in INCHES and (DECIMALS) FEET																								
	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14.0	14.5
	Approximate Distances to Screen in Inches and (decimals) Feet																								
0.375	24	30	36	41	47	53	59	65	71	77	83	89	95	101	107	112	118	10.4	10.9	11.4	11.9	12.4	12.9	13.4	13.9	14.4
0.500	32	39	47	55	63	71	79	87	95	103	111	118	10.6	11.2	11.9	12.5	13.2	13.9	14.5	15.2	15.8	16.5	17.1	17.8	18.5	19.1
0.586	37	46	56	65	74	83	93	102	111	10.1	10.8	11.6	12.4	13.1	13.9	14.7	15.5	16.2	17.0	17.8	18.5	19.3	20.1	20.9	21.6	22.4
0.625	39	49	59	69	79	89	99	109	118	10.7	11.6	12.4	13.2	14.0	14.8	15.7	16.5	17.3	18.1	19.0	19.8	20.6	21.4	22.2	23.1	23.9
0.720	45	57	68	80	91	102	114	10.5	11.4	12.4	13.3	14.3	15.2	16.1	17.1	18.0	19.0	19.9	20.9	21.8	22.8	23.7	24.7	25.6	26.6	27.5
0.750	47	59	71	83	95	107	118	10.9	11.9	12.9	13.9	14.8	15.8	16.8	17.8	18.8	19.8	20.8	21.8	22.7	23.7	24.7	25.7	26.7	27.7	28.7
0.875	55	69	83	97	111	10.4	11.6	12.7	13.9	15.0	16.2	17.3	18.5	19.6	20.8	21.9	23.1	24.2	25.4	26.5	27.7	28.8	30.0	31.1	32.3	33.4
0.900	57	71	85	99	114	10.7	11.9	13.1	14.3	15.4	16.6	17.8	19.0	20.2	21.4	22.5	23.7	24.9	26.1	27.3	28.5	29.6	30.8	32.0	33.2	34.4
1.000	63	79	95	111	10.6	11.9	13.2	14.5	15.8	17.1	18.5	19.8	21.1	22.4	23.7	25.0	26.4	27.7	29.0	30.3	31.6	32.9	34.3	35.6	36.9	38.2
1.100	69	87	104	10.2	11.6	13.1	14.5	16.0	17.4	18.9	20.3	21.8	23.2	24.6	26.1	27.5	29.0	30.4	31.9	33.3	34.8	36.2	37.7	39.1	40.6	42.0
1.250	79	99	118	11.6	13.2	14.8	16.5	18.1	19.8	21.4	23.1	24.7	26.4	28.0	29.6	31.3	32.9	34.6	36.2	37.9	39.5	41.2	42.8	44.4	46.1	47.7
1.500	95	118	11.9	13.9	15.8	17.8	19.8	21.8	23.7	25.7	27.7	29.6	31.6	33.6	35.6	37.5	39.5	41.5	43.5	45.4	47.4	49.4	51.4	53.3	55.3	57.3
1.750	111	11.6	13.9	16.2	18.5	20.8	23.1	25.4	27.7	30.0	32.3	34.6	36.9	39.2	41.5	43.8	46.1	48.4	50.7	53.0	55.3	57.6	59.9	62.2	64.5	66.8
2.000	10.6	13.2	15.8	18.5	21.1	23.7	26.4	29.0	31.6	34.3	36.9	39.5	42.1	44.8	47.4	50.0	52.7	55.3	57.9	60.6	63.2	65.8	68.5	71.1	73.7	76.4
2.250	11.9	14.8	17.8	20.8	23.7	26.7	29.6	32.6	35.6	38.5	41.5	44.4	47.4	50.4	53.3	56.3	59.3	62.2	65.2	68.1	71.1	74.1	77.0	80.0	82.9	85.9
2.500	13.2	16.5	19.8	23.1	26.4	29.6	32.9	36.2	39.5	42.8	46.1	49.4	52.7	56.0	59.3	62.5	65.8	69.1	72.4	75.7	79.0	82.3	85.6	88.9	92.1	95.4

Because focal length tolerances and lens construction vary from model to model, a general projection chart assumes that the projection distance can be varied by at least (plus or minus) six inches.

When more precise measurements are required, Buhl will prepare a special detailed film plane-to-screen chart for a specific Buhl lens or lenses. Buhl is also prepared to specially select lenses to meet very exact screen width/distance relationships . . . query us for details.

NOTES:

DA-LITE

Lens - Screen Size Charts

Tables prepared according to ANSI PH7.6.

1. Overhead and Opaque projection distances are measured from lens to screen.
2. All other projection distances are measured from film to screen.
3. Because of lens manufacturing tolerances, projection distances shown may vary 6 inches either way.

HOW TO FIND EXACT SCREEN SIZE:

Aperture Width x Projection Throw in inches ÷ Lens Focal Length = width of screen needed. For example: Aperture .380" (16mm movie projector) x 320" (projection throw...desired distance from screen) ÷ 2" (lens focal length) = a 60" screen.

WHR % width to height ratio
1 mm = .03937 inches
1 inch = 25.4 mm

16 mm MOTION PICTURES — APERTURE: .380" W x .286" H — WHR: 1.33

LENS FOCAL LENGTH		SCREEN WIDTH 40"	50"	60"	70"	84"	96"	9'	10'	12'	14'	16'	18'	20'	22'	24'	26'	28'	30'
12.7 mm — ½"	Projection Distance in Feet	4.5	5.7	6.7	7.8	9.3	10.6	11.9	13.2	15.9	18.5	21.1	23.8	26.4	29.0	31.7	34.3	36.9	39.6
15.875 mm — ⅝"		5.6	7.0	8.3	9.7	11.6	13.3	14.9	16.6	19.8	23.1	26.4	29.7	33.0	36.3	39.6	42.9	46.2	49.4
19 mm — ¾"		6.7	8.3	10.0	11.6	13.9	15.9	17.9	19.9	23.8	27.8	31.7	35.7	39.6	43.5	47.5	51.4	55.4	59.3
25.4 mm — 1"		8.9	11.1	13.3	15.5	18.6	21.2	23.9	26.5	31.7	37.0	42.3	47.5	52.8	58.1	63.3	68.6	73.9	79.1
38.1 mm — 1½"		13.4	16.7	20.0	23.3	27.9	31.8	35.8	39.7	47.6	55.5	63.4	71.3	79.2	87.1	95.0	102.9	110.8	118.7
50.8 mm — 2"		17.9	22.3	26.7	31.0	37.2	42.4	47.7	53.0	63.5	74.0	84.5	95.1	105.6	116.1	126.6	137.2	147.7	158.2
63.5 mm — 2½"		22.3	27.8	33.3	38.8	46.5	53.0	59.6	66.2	79.4	92.5	105.7	118.8	132.0	145.2	158.3	171.5	184.6	197.8
69.85 mm — 2¾"		24.6	30.6	36.6	42.7	51.1	58.4	65.6	72.8	87.3	101.8	116.2	130.7	145.2	159.7	174.1	188.6	203.1	217.6
76.2 mm — 3"		26.8	33.4	40.0	46.6	55.8	63.7	71.6	79.4	95.2	111.0	126.8	142.6	158.4	174.2	190.0	205.8	221.6	237.3
88.9 mm — 3½"		31.3	39.0	46.6	54.3	65.1	74.3	83.5	92.7	111.1	129.5	148.0	166.4	184.8	203.2	221.6	240.1	258.5	276.9
101.6 mm — 4"		35.8	44.5	53.3	62.1	74.4	84.9	95.4	105.9	127.0	148.0	169.1	190.1	211.2	232.2	253.3	274.4	295.4	316.5

SUPER 8mm MOTION PICTURES — APERTURE: .209" W x .158" H — WHR: 1.33

LENS FOCAL LENGTH		SCREEN WIDTH 40"	50"	60"	70"	84"	96"	9'	10'	12'
12.7 mm — ½"	Projection Distance in Feet	8.1	10.1	12.0	14.0	16.8	19.2	21.6	24.0	28.7
14.88 mm — 9/16"		9.0	11.3	13.5	15.7	18.9	21.5	24.2	26.9	32.3
17 mm — 43/64"		10.8	13.5	16.1	18.8	22.6	25.8	29.0	32.2	38.6
18.5 mm — 45/64"		11.8	14.7	17.6	20.5	24.6	28.1	31.6	35.1	42.0
19 mm — ¾"		12.1	15.1	18.1	21.1	25.2	28.8	32.4	36.0	43.2
22 mm — 55/64"		14.0	17.5	21.0	24.4	29.3	33.5	37.6	41.8	50.1
25.4 mm — 1"		16.1	20.1	24.1	28.1	33.7	38.4	43.2	48.0	57.6
27 mm — 1 1/16"		17.1	21.3	25.5	29.8	35.7	40.8	45.8	50.9	61.0
28 mm — 1 11/32"		17.7	22.1	26.5	30.9	37.0	42.3	47.6	52.8	63.3
32 mm — 1¼"		20.3	25.3	30.4	35.4	42.4	48.4	54.5	60.5	72.6

2"x2" 126 SLIDES — APERTURE: 1.04" W x 1.04" H — WHR: 1.0

LENS FOCAL LENGTH		SQUARE SCREEN SIZE 40"	50"	60"	70"	84"	96"	9'	10'	12'
1.4"	Projection Distance in Feet	4.7	5.8	7.0	8.1	9.7	11.0	12.4	13.7	16.4
2"		6.7	8.4	10.0	11.6	13.8	15.7	17.6	19.6	23.4
3"		10.1	12.5	14.9	17.3	20.7	23.6	26.5	29.3	35.1
4"		13.5	16.7	19.9	23.1	27.6	31.4	35.3	39.1	46.8
5"		16.9	20.9	24.9	28.9	34.5	39.3	44.1	48.9	58.5
6.5"		21.9	27.1	32.3	37.5	44.8	51.1	57.3	63.6	76.1
7"		23.6	29.2	35.0	40.4	48.3	55.0	61.7	68.5	81.9
8.5"		28.7	35.5	42.3	49.1	58.6	66.8	75.0	83.2	99.5
9"		30.4	37.6	44.8	52.0	62.1	70.7	79.4	88.0	105.4
10"		33.7	41.8	49.8	57.8	69.0	78.6	88.2	97.8	117.1
11"		37.1	45.9	54.7	63.5	75.9	86.5	97.0	107.6	128.8
12.5"		42.2	52.2	62.2	72.2	86.2	98.3	110.3	122.3	146.3
15.5"		52.3	64.7	77.1	89.5	106.9	121.8	136.7	151.6	181.4
20"		67.5	83.5	99.5	115.5	138.0	157.2	176.4	195.7	234.1

2"x2" DOUBLE FRAME — 35mm SLIDES — APERTURE: 1.35" W x .902" H — WHR: 1.49

LENS FOCAL LENGTH		SCREEN WIDTH 40"	50"	60"	70"	84"	96"	9'	10'	12'	14'	16'	18'	20'
1"	Projection Distance in Feet	2.6	3.3	3.9	4.5	5.4	6.1	6.8	7.6	9.1	10.5	12.0	13.5	15.0
1.4"		3.7	4.6	5.4	6.3	7.5	8.5	9.6	10.6	12.7	14.8	16.8	18.9	21.0
2"		5.3	6.5	7.7	9.0	10.7	12.2	13.7	15.2	18.1	21.1	24.0	27.0	30.0
3"		7.9	9.8	11.6	13.5	16.1	18.3	20.5	22.7	27.2	31.6	36.1	40.5	44.9
4"		10.6	13.0	15.5	18.0	21.4	24.4	27.3	30.3	36.2	42.2	48.1	54.0	59.9
5"		13.2	16.3	19.4	22.4	26.8	30.5	34.2	37.9	45.3	52.7	60.1	67.5	74.9
5.5"		14.5	17.9	21.3	24.7	29.4	33.5	37.6	41.7	49.8	58.0	66.1	74.3	82.4
6"		15.8	19.5	23.2	26.9	32.1	36.6	41.0	45.5	54.3	63.2	72.1	81.0	89.9
6.5"		17.1	21.2	25.2	29.2	34.8	39.6	44.4	49.2	58.9	68.5	78.1	87.8	97.4
7"		18.5	22.8	27.1	31.4	37.5	42.7	47.8	53.0	63.4	73.8	84.1	94.5	104.9
7.5"		19.8	24.4	29.0	33.7	40.2	45.7	51.3	56.8	67.9	79.0	90.1	101.3	112.4
8"		21.1	26.0	31.0	35.9	42.8	48.7	54.7	60.6	72.5	84.3	96.2	108.0	120.0
8.5"		22.4	27.7	32.9	38.2	45.5	51.8	58.1	64.4	77.0	89.6	102.2	114.8	127.4
9"		23.7	29.3	34.8	40.4	48.2	54.8	61.5	68.2	81.5	94.8	108.2	121.5	134.8
9.5"		25.1	30.9	36.8	42.6	50.9	57.9	64.9	72.0	86.0	100.1	114.2	128.3	142.3
10"		26.4	32.6	38.7	44.9	53.5	60.9	68.3	75.8	90.6	105.4	120.2	135.0	149.8
12.5"		33.0	40.7	48.4	56.1	66.9	76.2	85.4	94.7	113.2	131.7	150.2	168.8	187.3
15.5"		40.9	50.5	60.0	69.6	83.0	94.4	105.9	117.4	140.4	163.3	186.3	209.3	232.2
20"		52.8	65.1	77.4	89.8	107.1	121.9	136.7	151.5	181.1	210.8	240.4	270.0	299.7

35mm SINGLE FRAME FILM STRIPS — APERTURE: .885" W x .668" H — WHR: 1.32

LENS FOCAL LENGTH		SCREEN WIDTH 40"	50"	60"	70"	84"	96"	9'	10'	12'	14'	16'	18'	20'
3"	Projection Distance in Feet	11.8	14.6	17.5	20.3	24.2	27.6	31.0	34.4	41.2	48.0	54.7	61.5	68.3
4"		15.7	19.5	23.3	27.0	32.3	36.8	41.3	45.9	54.9	63.9	73.0	82.0	91.1
5"		19.7	24.4	29.1	33.8	40.4	46.0	51.7	57.3	68.6	79.9	91.2	102.5	113.8
6"		23.6	29.3	34.9	40.6	48.5	55.2	62.0	68.8	82.4	95.9	109.5	123.0	136.6
7"		27.5	34.1	40.7	47.3	56.5	64.4	72.4	80.3	96.1	111.9	127.7	143.5	159.4
8"		31.5	39.0	46.5	54.1	64.6	73.7	82.7	91.7	109.8	127.9	146.0	164.0	182.1

2"x2" SUPER SLIDES — APERTURE: 1.5" W x 1.5" H — WHR: 1.0

LENS FOCAL LENGTH		SQUARE SCREEN SIZE 40"	50"	60"	70"	84"	96"	9'	10'	12'	14'	16'	18'	20'
1"	Projection Distance in Feet	2.4	2.9	3.5	4.1	4.8	5.5	6.2	6.8	8.2	9.5	10.8	12.2	13.5
1.4"		3.3	4.1	4.9	5.7	6.8	7.7	8.6	9.6	11.4	13.3	15.2	17.0	18.9
2"		4.8	5.9	7.0	8.1	9.7	11.0	12.3	13.7	16.3	19.0	21.8	24.3	27.0
3"		7.2	8.8	10.5	12.2	14.5	16.5	18.5	20.5	24.5	28.5	32.5	36.5	40.5
4"		9.6	11.8	14.0	16.2	19.3	22.0	24.7	27.3	32.7	38.0	43.3	48.7	54.0
5"		12.0	14.7	17.5	20.3	24.2	27.5	30.8	34.2	40.8	47.5	54.2	60.8	67.5
5.5"		13.2	16.2	19.3	22.3	26.6	30.3	33.9	37.6	44.9	52.3	59.6	66.9	74.3
6"		14.4	17.7	21.0	24.3	29.0	33.0	37.0	41.0	49.0	57.0	65.0	73.0	81.0
6.5"		15.6	19.2	22.8	26.4	31.4	35.8	40.1	44.4	53.1	61.8	70.4	79.1	87.8
7"		16.7	20.6	24.5	28.4	33.8	38.5	43.2	47.8	57.2	66.5	75.8	85.2	94.5
7.5"		17.9	22.1	26.3	30.4	36.3	41.3	46.3	51.3	61.3	71.3	81.3	91.3	101.3
8"		19.1	23.6	28.0	32.5	38.7	44.0	49.3	54.7	65.3	76.0	86.7	97.3	108.0
8.5"		20.3	25.0	29.8	34.5	41.1	46.8	52.4	58.1	69.4	80.8	92.1	103.4	114.8
9"		21.5	26.5	31.5	36.5	43.5	49.5	55.5	61.5	73.5	85.5	97.5	109.5	121.5
9.5"		22.7	28.0	33.3	38.5	45.9	52.3	58.6	64.9	77.6	90.3	102.9	115.6	128.3
10"		23.9	29.5	35.0	40.6	48.4	55.0	61.7	68.3	81.7	95.0	108.3	121.7	135.0
12.5"		29.9	36.8	43.8	50.7	60.4	68.8	77.1	85.4	102.1	118.8	135.4	152.1	168.8
15.5"		37.1	45.7	54.3	62.9	74.9	85.3	95.6	105.9	126.6	147.3	167.9	188.6	209.3
20"		47.9	58.9	70.1	81.2	96.7	110.0	123.4	136.7	163.4	190.0	216.7	243.4	270.0

3¼"x4" SLIDES (LANTERN) — APERTURE: 3.0" W x 2.75" H — WHR: 1.09

LENS FOCAL LENGTH		SCREEN WIDTH 50"	60"	70"	84"	96"	9'	10'	12'	14'	16'	18'	20'
6"	Projection Distance in Feet	9.4	11.0	12.7	15.0	17.0	19.0	21.0	25.0	29.0	33.0	37.0	41.0
6.5"		10.1	11.9	13.7	16.3	18.4	20.6	22.8	27.1	31.4	35.8	40.1	44.4
8"		12.5	14.7	16.9	20.0	22.7	25.4	28.0	33.3	38.7	44.0	49.3	54.7
8.5"		13.3	15.6	18.0	21.3	24.1	26.9	29.8	35.4	41.1	46.8	52.4	58.1
10"		15.6	18.4	21.1	25.0	28.4	31.7	35.0	41.7	48.4	55.0	61.7	68.3
12"		18.7	22.1	25.4	30.0	34.0	38.0	42.0	50.0	58.0	66.0	74.0	82.0
12.5"		19.5	23.0	26.4	31.3	35.4	39.6	43.8	52.1	60.4	68.8	77.1	85.4
14"		21.9	25.7	29.6	35.0	39.7	44.4	49.0	58.4	67.7	77.0	86.3	95.7
15"		23.4	27.6	31.7	37.6	42.5	47.5	52.5	62.5	72.5	82.5	92.5	102.5
15.5"		24.2	28.5	32.8	38.8	44.0	49.1	54.3	64.6	74.9	85.3	95.6	105.9
16"		25.0	29.4	33.8	40.1	45.4	50.7	56.0	66.7	77.4	88.0	98.7	109.3
18"		28.1	33.1	38.1	45.1	51.0	57.0	63.0	75.0	87.0	99.0	111.0	123.0
20"		31.2	36.8	42.3	50.1	56.7	63.4	70.1	83.4	96.7	110.0	123.4	136.7
22"		34.3	40.4	46.5	55.1	62.4	69.7	77.1	91.7	106.4	121.0	135.7	150.4
24"		37.5	44.1	50.7	60.1	68.1	76.1	84.1	100.0	116.0	132.0	148.0	164.0
26"		40.6	47.8	55.0	65.1	73.7	82.4	91.1	108.4	125.7	143.0	160.4	177.7

OVERHEAD PROJECTION — TYPICAL APERTURE: 9.5" W x 7.5" H — WHR: 1.19

LENS FOCAL LENGTH		SCREEN WIDTH 50"	60"	70"	84"	96"	9'	10'	12'	14'	16'	18'	20'
10.5"	Projection Distance in Feet	5.5	6.4	7.3	8.6	9.7	10.8	11.9	14.1	16.3	18.6	20.8	23.0
12.0"		6.3	7.3	8.4	9.8	11.1	12.4	13.6	16.2	18.7	21.2	23.7	26.3
12.5"		6.5	7.6	8.7	10.3	11.6	12.9	14.2	16.8	19.5	22.1	24.7	27.4
12.75"		6.7	7.8	8.9	10.5	11.8	13.1	14.5	17.2	19.8	22.5	25.2	27.9
13.5"		7.0	8.2	9.4	11.1	12.5	13.9	15.3	18.2	21.0	23.9	26.7	29.5
14.0"		7.3	8.5	9.8	11.5	13.0	14.4	15.9	18.9	21.8	24.7	27.7	30.6
15.5"		8.1	9.5	10.8	12.7	14.4	16.0	17.6	20.9	24.1	27.4	30.7	33.9
16.0"		8.3	9.8	11.2	13.1	14.8	16.5	18.2	21.5	24.9	28.3	31.7	35.0
22.0"		11.5	13.4	15.3	18.0	20.4	22.7	25.0	29.6	34.2	38.9	43.5	48.1
40.0"		20.9	24.4	27.9	32.8	37.0	41.2	45.4	53.9	62.3	70.7	79.1	87.5
50.0"		26.1	30.5	34.9	41.0	46.3	51.5	56.8	67.3	77.8	88.4	98.9	109.4

2¼"x2¼" SLIDES — APERTURE: 2.1875" W x 2.1875" H — WHR: 1.0

LENS FOCAL LENGTH		SQUARE SCREEN SIZE 40"	50"	60"	70"	84"	96"	9'	10'	12'	14'	16'	18'	20'
5"	Projection Distance in Feet	8.5	10.4	12.3	14.2	16.8	19.1	21.4	23.7	28.3	32.8	37.4	42.0	46.6
6.5"		11.0	13.5	16.0	18.4	21.9	24.9	27.8	30.8	36.8	42.7	48.6	54.6	60.5
7"		11.9	14.5	17.2	19.9	23.6	26.8	30.0	33.2	39.6	46.0	52.4	58.8	65.2
8.5"		14.4	17.6	20.9	24.1	28.6	32.5	36.4	40.3	48.1	55.8	63.6	71.4	79.1
10"		17.0	20.8	24.6	28.4	33.7	38.3	42.8	47.4	56.5	65.7	74.8	84.0	93.1
12.5"		21.2	25.9	30.7	35.4	42.1	47.8	53.5	59.3	70.7	82.1	93.5	100.8	116.4
15.5"		26.3	32.2	38.1	44.0	52.2	59.3	66.4	73.5	87.6	101.8	116.0	130.1	144.3
20"		33.9	41.5	49.1	56.7	67.4	76.5	85.7	94.8	113.1	131.4	149.6	167.9	186.2
24"		40.7	49.8	58.9	68.1	80.9	91.8	102.8	113.8	135.7	157.6	179.6	201.5	223.4

OPAQUE PROJECTION — APERTURE: 10" W x 10" H — WHR: 1.0

LENS FOCAL LENGTH		SQUARE SCREEN SIZE 50"	60"	70"	84"	96"	9'	10'	12'
18"	Projection Distance in Feet	9.0	10.5	12.0	14.1	15.9	17.7	19.5	23.1
22"		11.0	12.8	14.7	17.2	19.4	21.6	23.8	28.2
26"		13.0	15.2	17.3	20.4	23.0	25.6	28.2	33.4

LEGIBILITY—ARTWORK TO SCREEN

One of the best ways to lose audience attention during an audiovisual presentation is to project material that is not legible to the entire audience. If a speaker has to say, "You probably can't read this from where you're sitting, so I'll read it to you," the presentation suffers from too little advance planning.

Planning Legibility of Projected Artwork

Once the objectives and the strategy of a talk have been planned, consideration can be given to the size of the anticipated audience, as well as to any unusual features of the projection facilities. Only *then,* should the artwork be designed. If a presentation is to be successful, original art must be prepared *with the people in the rear seats in mind!*

Experience has shown that:

1. Artwork can be planned and executed to permit the visuals to be legible when projected.

2. There are worthwhile advantages in establishing uniform sizes for artwork and making these sizes standard.

3. Although the letter height can ordinarily be a *minimum* of 1/50 the height of the information area, the use of a larger letter height (1/25 or larger) is strongly encouraged.

4. The use of a Legibility Calculator provides an easy way to determine the minimum artwork letter height needed for legibility at various viewing distances.

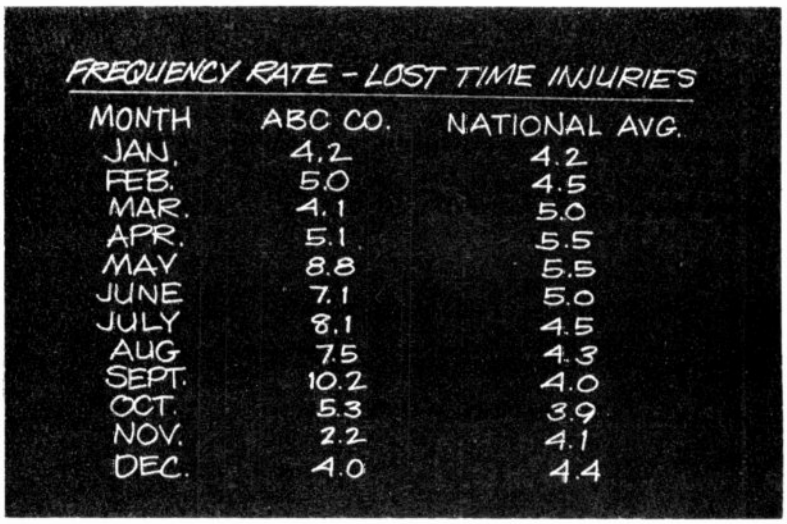

FIGURE 1

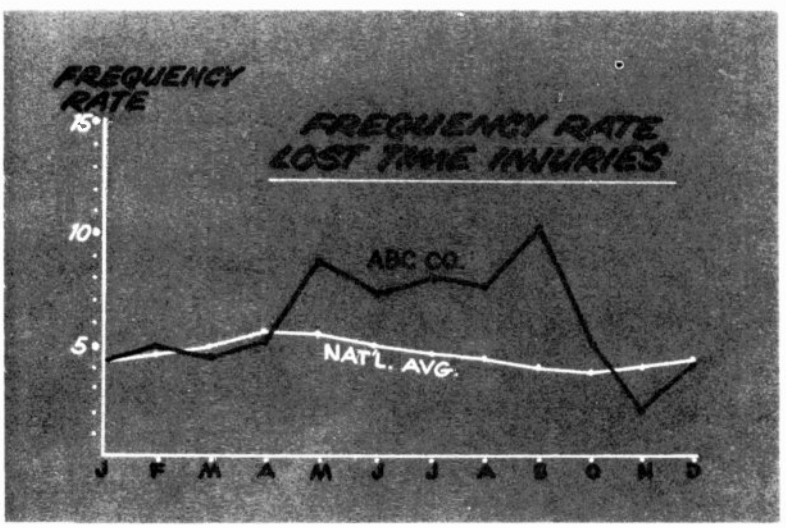

FIGURE 2

LEGIBILITY REQUIREMENTS

To be legible, lines, letters, and symbols should contrast adequately with the background, there must be distinct separation of tones, and the colors selected should be strong and attractive. Tonal contrast is particularly important when preparing artwork for television where the television receiver may display the colored artwork in a black-and-white mode. Additional comments on this format are in the television section.

Letters and symbols should be bold and simple, with no small openings that will tend to fill in when projected. All elements such as lines, letters, symbols, and figures require a size big enough to be seen easily by everyone in the audience. Therefore, these elements have to be at least a certain minimum size on the screen, the size depending on the height of the artwork area in relation to its distance from the farthest viewer.

In typical viewing situations—screen-to-viewer distances ranging from short (in small conference rooms or in homes), through medium (in class and meeting rooms), to long

(in large auditoriums and theaters)—*the maximum viewing distance should be about 8 times the height of the projected image.* To put it another way, if the projected material is legible for the farthest viewer, who is seated 8 times the projected image height from the screen, it will be legible for all other members of the audience. This maximum viewing distance (expressed as 8H) can be used in determining the minimum size of significant detail in the material to be projected.

Testing Existing Material for Legibility

When material that was not designed for projection (printed graphs, charts, etc) is to be converted to a projected visual, remember that contrast, colors, and viewing distance may change, but the requirements for legibility will remain the same.

Note that 8H viewing is a generally accepted standard. If the letter size suggested for 8H viewing is doubled, the projected image will be legible from twice the distance or 16H. The 8H concept also assumes average or slightly lower than average eyesight of the viewer. For 8H viewing, legibility can be judged by an average viewer by looking at the material to be copied from a distance 8 times its height. For example, consider a printed table that is to be photographed for projection. If the table is 3½ inches (88 mm) high, it should be viewed from 8 times that height (28 inches or 0.7 m) to see if it is readable. If it is, the type size will be suitable for copying and projection.

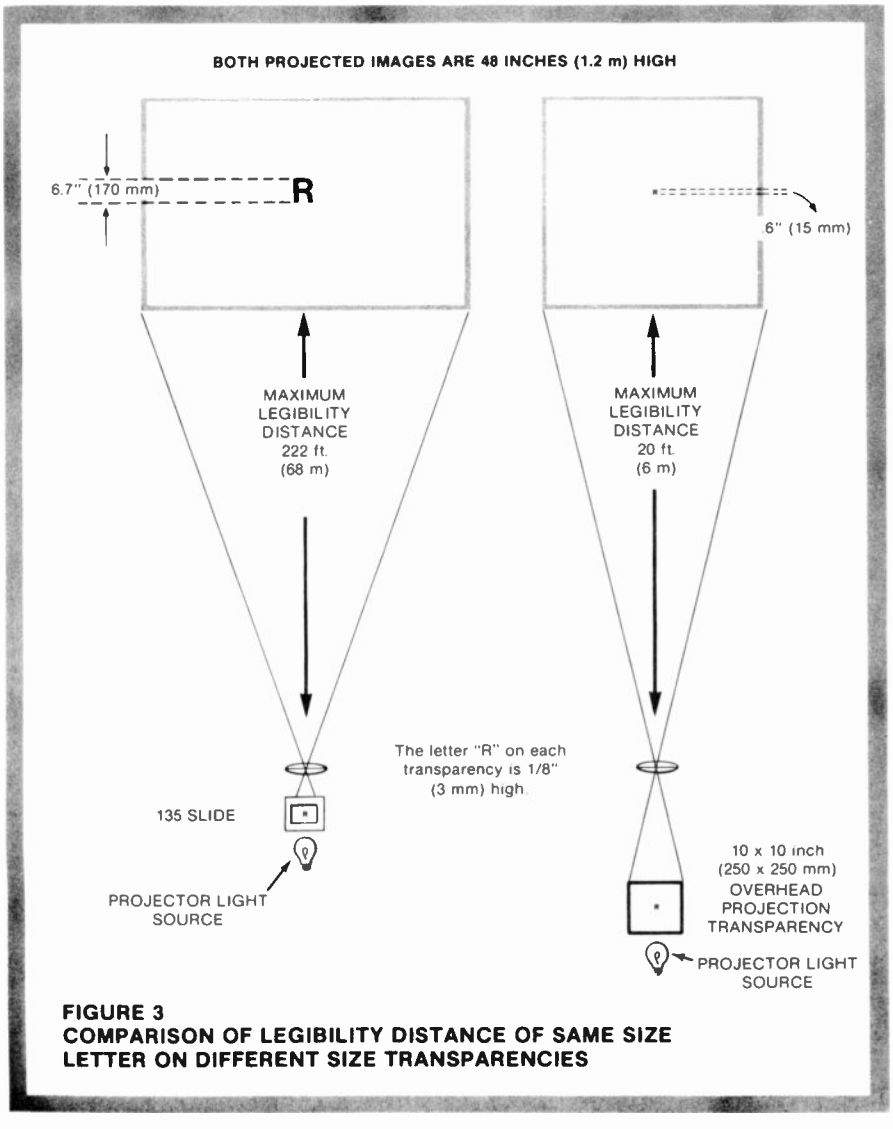

FIGURE 3
COMPARISON OF LEGIBILITY DISTANCE OF SAME SIZE LETTER ON DIFFERENT SIZE TRANSPARENCIES

The same principle applies to larger work. A wall chart or a map 4 feet (1.2 m) high requires legibility at a distance of 32 feet (9.6 m) if it is to be acceptable as a projected image for 8H viewing (4 feet x 8H = 32 feet). If the material is not legible at the test distance, it should either be redrawn or discarded.

Subject *content* as well as image size affects legibility. If the work you are photographing is complex, reduce the information to the essential elements, limit the text, and enlarge the letter size. Rearranging the information can help define the point you are making for the audience. Notice the greater visual clarity of Figure 2, compared to Figure 1.

It is a mistake to believe that enlarging the physical dimensions of a transparency improves legibility at practical viewing distances. *Transparency size* is not a determining factor; it is the size of the detail on the *screen* that is significant. This is shown in Figure 3.

If letters are to be legible at an 8H viewing distance of 32 feet, a projected image 1 inch (25 mm) high on the screen is required whether projection is from a 2 x 2-inch (50 x 50 mm) slide or a 10-inch (250 mm) wide transparency on an overhead projector, regardless of the overall projected image size.

ADVANTAGES OF STANDARDIZATION

Layout and Preparation

We have indicated that a minimum size for lettering has been established to meet legibility requirements. But legibility is not the only requirement for effective communication; flexibility to allow emphasis and pleasing design are also important. Therefore, it will be wise to standardize on at least three letter sizes to provide proper treatment and a variety of titles—primary, secondary, and tertiary. The use of more than three sizes, all larger than the recommended minimum, allows even greater variety in artistic freedom. Of course, standardization of letter sizes is practical only when the format and overall size of the artwork are also standardized.

Cost Reduction

The cost per hour of skilled professionals, such as artists and photographers, far outweighs the cost of materials. Therefore, the largest savings to be realized in the preparation of a visual presentation lies in reducing the time required to complete it. The standardization of format and size of artwork will pay the greatest dividends toward reducing costs. There are other benefits to standardization. One advantage is that the artist can work with a few standard, readily available pens, brushes, guides, and sizes of type. A feel for the size of lettering and artwork elements that will produce legibility can quickly be developed. Therefore, standard-size artwork becomes easier and faster to prepare than the alternative—an assortment of various sizes and shapes. Standard sizes simplify the stocking of mounting boards and paper stock. Making the artist's and photographer's jobs less time-consuming can increase productivity without increasing cost.

A standard field size for artwork and a specified location for the working area on the artwork can speed the photography and consequently increase the photographer's output. When working with artwork of random sizes and formats, the photographer must repeatedly adjust the camera-to-artwork distance, the focus, and the exposure settings. Conversely, it will be possible for the photographer to set lights, camera distance, focus, and exposure, only *once* for each complete *assignment* rather than once for each individual piece of artwork if the following conditions are met:

1. The artwork is all the same size.
2. The working area of the artwork is of the same dimensions on every piece of art.
3. The working area is in an identical location on each piece of art.
4. Provision is made for placing each piece of artwork in the same position on the copy stand.

Storage and Retrieval

Adopting a uniform 10 x 12-inch (250 x 300 mm) artwork size—see below—offers savings in cost and time. Storage of this size requires no expensive equipment of odd dimensions; letter-size office filing cabinets or desk drawers will serve. Artwork can be stored on edge, and segregated into categories with standard separators. The material is readily accessible; the possibility of damage or loss is reduced.

ARTWORK SIZES AND FORMATS

It is possible to specify a single standard size for most artwork. If it is necessary to produce a larger or smaller piece of artwork, a different working area or "field size" will be needed. For example, if an existing drawing is to be used in a piece of art and it is too large to fit into the standard 6 x 9-inch (150 x 225 mm) working area, it is suggested that a larger working area be selected having the same height-to-width ratio as indicated in the format chart. The lettering will also have to be enlarged to meet the 1/50 rule. For example, if the working area is enlarged to 8 x 12 inches (200 x 300 mm), the letter size should be a minimum of 5/32 (4 mm) of an inch. For more unusual enlargements, consult the legibility calculator.

Mount Size

The recommended primary standard for the artwork is 10 x 12 inches (250 x 300 mm). The working area sizes suggested in this pamphlet and the formats we suggest for typewritten copy (page 6) will fit this size mount. It accepts the common 8 x 10-inch (200 x 250 mm) photographic print. The mount allows a margin outside of the suggested working area to provide for safe handling, pin registration holes or field marks for camera alignment, production notations, and attachment of acetate cels or other types of overlays.

The usable area of the artwork, including the background, must fill a space somewhat larger than the information areas, if background edges are not to show when the visual is photographed. It is good practice to extend the usable area *at least* 1/2 inch (13 mm) beyond the information area on all sides. A better practice is to extend the usable area 1 inch (25 mm) beyond the information area.

Construction and Use of the Artwork Template

To prepare the template, which will be used for each format, start with a 10 x 12-inch (250 x 300 mm) piece of lightweight card stock or heavy paper. Keeping the area centered within this card stock, mark off the dimensions of the section to be removed for the particular format that will be used, i.e., 6 x 9 inches (150 x 225 mm) for 35 mm slides. If artwork for more than one format is to be created, this is a good time to make a template for each one. To consistently align the artwork in the proper position for photography, construct an L-shaped guide against which the artwork can be placed. See Figures 4, 5, and 6. If these format/size recommendations are adopted, it is necessary to observe only one minimum size requirement: for legibility of letters and of any significant artwork detail at 8H viewing distance, the letter or detail within the format area should have a minimum size of 1/50 of the information area.

IMPORTANT: When using certain types of equipment such as the KODAK EKTAGRAPHIC Visualmaker or the copying stand mentioned in Kodak Pamphlet No. T-43, *A Simple Wooden Copying Stand for Making Title Slides and Filmstrips*, use the artwork area dimensions suggested for the apparatus at hand. The principles of legibility mentioned in this pamphlet, *Legibility—Artwork to Screen*, will still be valid.

Typical materials for the three formats:

Figure 4 (height/width ratio 1:1)—2 x 2 slides with a square mask opening (26.5 mm, 30 mm, 38 mm, etc); 2¾-inch square slides for 2¼-inch square transparencies; and 3¼ x 4-inch slides with a 2¼ or 3-inch square mask opening.

Figure 5 (height/width ratio 2:3)—2 x 2 slides in a horizontal format made with a conventional camera, using 135 film (22.9 x 34.2 mm slide mask opening).

Figure 6 (height/width ratio 3:4)—motion pictures (super 8, 8 mm, 16 mm); size 110 slides (30 x 30 mm outside dimension and a 12 x 15.8 mm mask opening).

Sizes of Letters, Symbols, and Lines

Letter size of lowercase characters is specified as the height of the letter *excluding ascenders or descenders* (the "tails" on p's, q's, b's, etc). When determining letter size or specifying it for artwork, measure the smallest letter to be used. Since the artwork height in Figures 4, 5, and 6 is 6 inches, letter height for 4H viewing is 1/16 inch (1.5 mm), for 8H viewing 1/8 inch (3 mm), and for 16H viewing 1/4 inch (6 mm).

In no case should the specified minimum size be construed as a restriction on the use of larger sizes. Bolder or bigger treatment is often advantageous, e.g., to increase emphasis and strengthen impact.

When printer's type is being considered or specified, characters on a printed proof should be measured. Point sizes can be misleading; 18-point type may be suitable for capital-letter copy, but the same copy in lowercase can require the use of 24-point type. Typefaces also vary; 9-point might be suitable in one style, but not in another. Different point sizes of one type style are shown in Figure 7.

Dry-transfer lettering systems (Deca-Dry, Letraset, Prestype, etc) are sheets of letters that can be transferred to the artwork by burnishing. A wide selection of type styles is available in different point sizes, and most art supply stores have catalogs showing the letters in actual size.

Legibility of Typewritten Copy

A typewriter offers one of the simplest and quickest means for producing legible copy. All that is required is the use of a smaller information area and close-up photography to include only this area. If the artwork information area to be used is 3 inches (75 mm) high and the legibility requirement is for 8H viewing, elite type in all capital letters is the smallest acceptable size. It is recommended that typewritten copy be restricted to the

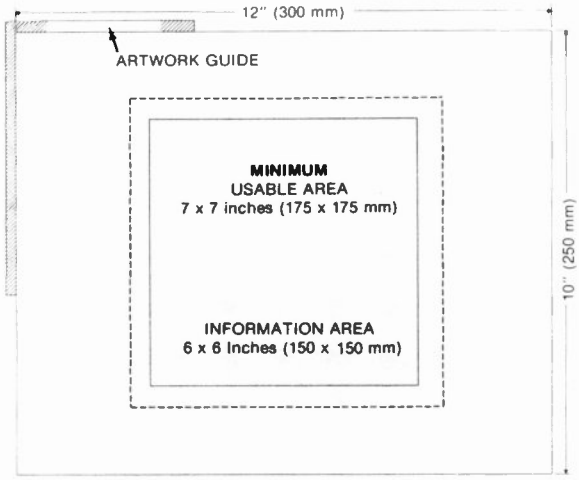

FIGURE 4
ARTWORK TEMPLATE FOR A FORMAT WITH A HEIGHT/WIDTH RATIO OF 1:1

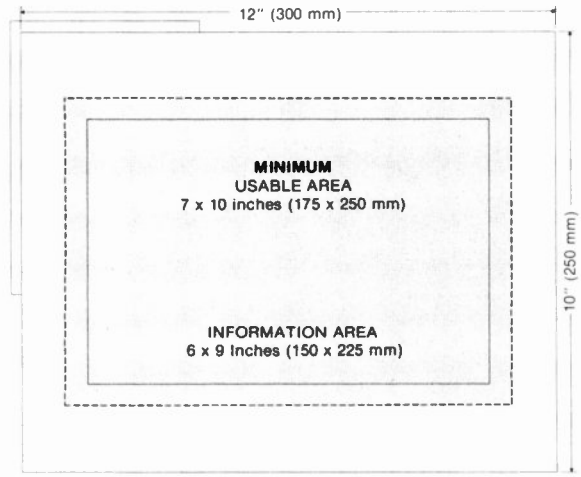

FIGURE 5
ARTWORK TEMPLATE FOR A FORMAT WITH A HEIGHT/WIDTH RATIO OF 2:3

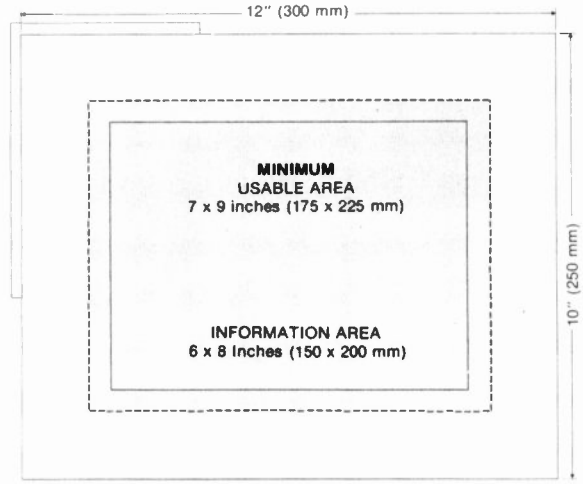

FIGURE 6
ARTWORK TEMPLATE FOR A FORMAT WITH A HEIGHT/WIDTH RATIO OF 3:4

Kodak

information areas shown in Figure 8. As with other types of artwork the minimum usable area should extend somewhat beyond the information area. In the case of typewritten material a minimum usable area of at least an additional 1/4 inch (shown with dotted lines in Figure 8) on all four sides can be obtained by simply including more of the paper on which the message is typed. The 3-inch height provides 8H legibility for all copy from standard typewriters, including elite and pica type; yet it offers a large enough area for direct artwork for simple charts, graphs, and diagrams.

For the 3-inch-high (75 mm) format, copy should be limited to 9 double-spaced lines.

SPECIAL APPLICATIONS

Long-Distance Viewing (Large H Factors)

Material for small rear-projection cabinets, used in exhibits or point-of-sale situations, often is viewed from greater than normal distances. For applications of this type, a projected image as small as 8 inches (200 mm) in height may need to be readable at distances up to 20 or 25 feet (6 or 7.5 m), approximately 30H. It may be necessary to enlarge the size of lettering proportionally. In such a case, lettering should be at least four times larger than the mini-

8 POINT

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16 POINT

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24 POINT

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FIGURE 7

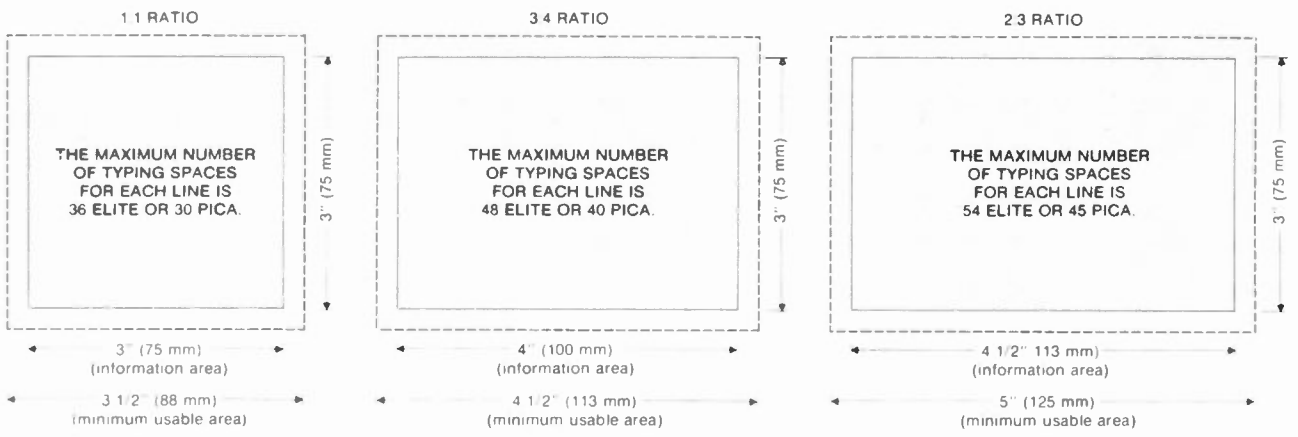


FIGURE 8
MAXIMUM SIZE OF INFORMATION AREA FOR TYPEWRITTEN COPY

mum for 8H viewing. For an artwork information area 6 inches (150 mm) high, the minimum letter height should be 1/2 inch (13 mm). Remember, however, that rear-projection cabinets used in study carrels may be viewed at only two or three times the screen height and that artwork for these situations can be sized to 2H or 3H requirements.

Television

Television images are frequently viewed at distances greater than 8H. For example, an image only 12½ inches high (315 mm) on a 21-inch (533 mm) picture tube may often be viewed from 20—30 feet (7—9 m) in the home or in a classroom. Therefore, when material is being prepared for such use, legibility requirements for comparatively great viewing distances must be considered as shown in Figure 9.*

In addition, some area of the original transparency will be lost in the television chain and in the receiver. Figure 10 illustrates the 6 x 9-inch (150 x 225 mm) artwork area of a 35 mm slide with a safe title area mask for television placed over it. From this illustration it is clear how much visual area (shaded portion) may be lost in the television system. The amount lost is not always the same; it will vary with such things as receiver adjustment and line voltage. To help provide minimum loss, any essential information must be confined to a central area, as indicated in Figure 10. Even so, the usable portion of the art should extend to a minimum area of 7 x 10 inches (175 x 250 mm). Minimum letter height (lowercase character less ascender or descender) can be 1/4—3/8-inch (6—9 mm) shown in Figure 9. These letter heights allow 16H—24H viewing and provide legibility at distances of 18—24 feet (5.5—7.3 m), 21—27 feet (6.4—8.2 m), and 23—30 feet (7—9.1 m) respectively from a 17-, 21-, or 25-inch (432, 533, or 635 mm) picture tube.

Where possible, it is recommended that the finished artwork be reviewed both in color and black-and-white on the telecine chain before being broadcast. This procedure will indicate any changes in the artwork (contrast, separation of tones, letter height, and color) needed to make it acceptable for broadcasting. If it is not practical, the artwork must be created to take these elements (of the artwork) into account. One color that reflects or transmits the same amount of light as another color will cause the two colors to appear as the same neutral tone on a black-and-white television receiver.

If the artwork is to be used for both TV transmission and regular projection, the lettering and title area

*SMPTE Recommended Practice RP 27.3-1972, "Specifications for Safe Action and Safe Title Areas Test Pattern for Television Systems."

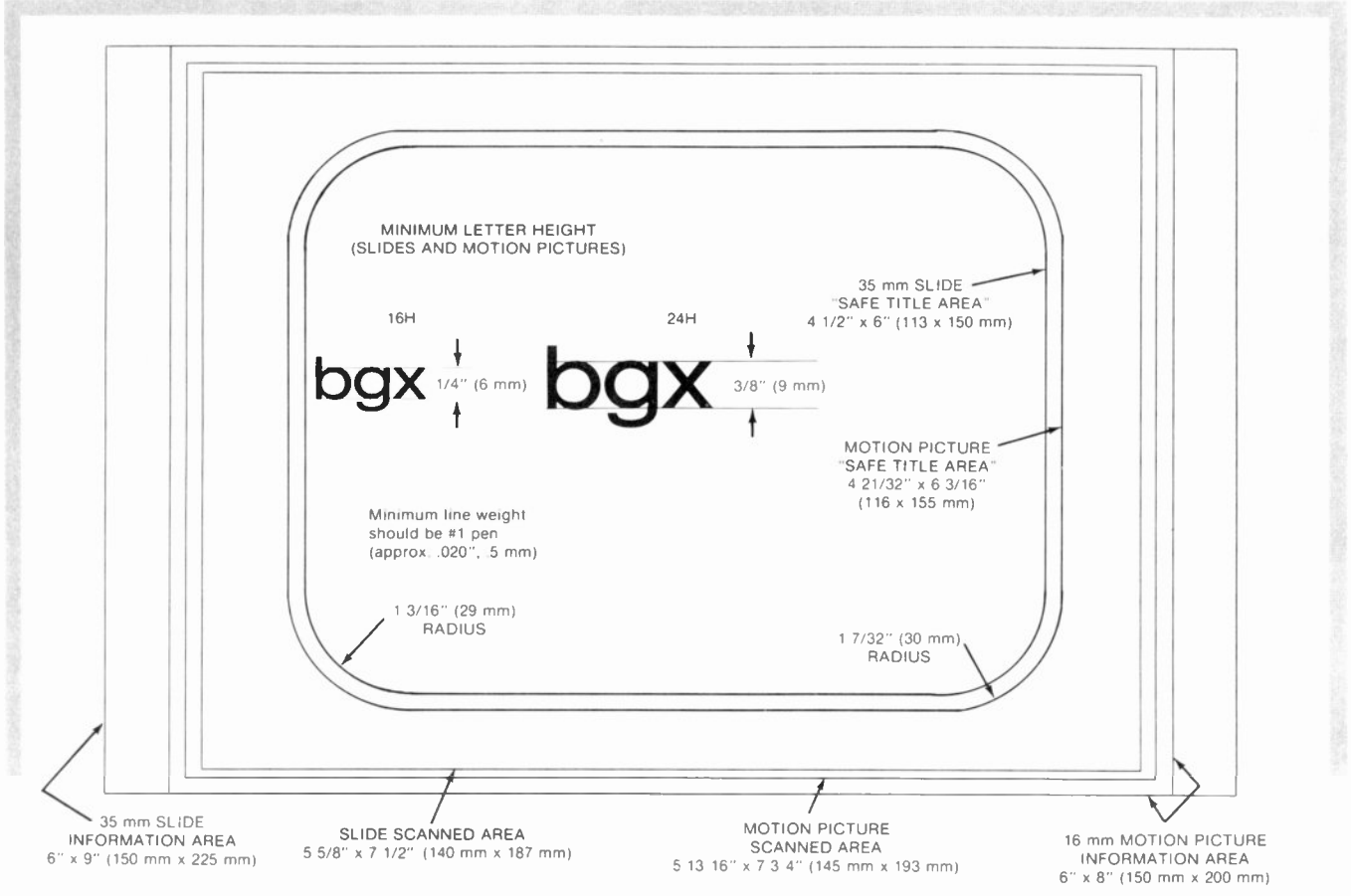


FIGURE 9
DIMENSIONS OF ARTWORK TEMPLATES FOR MATERIALS USED IN THE TELEVISION SYSTEM

This illustration, which was drawn to scale, can be photographically enlarged and used for artwork templates

should be designed to meet the TV requirements. When the material is being photographed for a projection slide, an extreme close-up can be made so that unnecessary background will be eliminated.

Legibility Calculator

The calculator is designed to help provide legibility of slides for the oft-forgotten person in the last row. It is based on the average legibility requirements and the standardization of artwork sizes as explained in the preceding pages.

Assembly of the calculator is a simple task. It is suggested that the entire page be dry-mounted or cemented to card stock before trimming. (A manila file folder is an example of suitable card stock.) Use care to trim the dial accurately and be sure the centers are aligned perfectly before you secure the dial to the base. If an eyelet grommet machine is not available to provide the center pivot, a tie tack or lapel pin would make a good substitute.

You will find the calculator a useful tool in determining the minimum artwork letter size that will be legible for the entire audience. Or the calculator can help to determine the proper screen size or farthest acceptable viewing distance when slides must be produced from existing artwork. For example, if you are utilizing a 6 x 9-inch working area and wish to fill a 4-foot-high screen that will be viewed from 64 feet—the distance from the screen to the last row in the auditorium—set a "Total Projected Image Height" of 4 feet at the 64-foot mark on the "Distance of Farthest Viewer" scale. You will notice that the "Minimum Artwork Letter Height" that lines up with 6 inches on the "Artwork Working Area Height" is 1/4 inch. If both upper- and lowercase letters are being used, the minimum height of the *main body* of the lowercase letters will therefore have to be at least 1/4 inch to be legible from the last row, as shown in Figure 11.

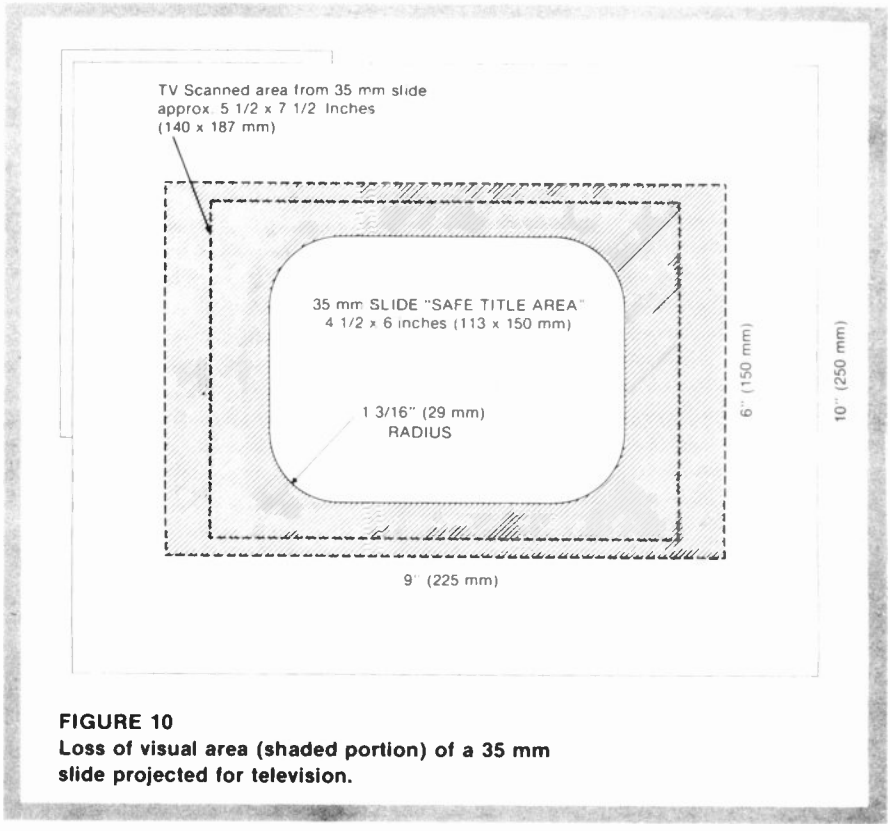


FIGURE 10
Loss of visual area (shaded portion) of a 35 mm slide projected for television.

Another use of the calculator is to determine acceptable screen height when you are required to use existing art.

Assume you have a 6 x 9-inch (150 x 225 mm) piece of artwork on which the height of the lettering is only 1/8 inch (3 mm). Set the 1/8-inch mark at the 6-inch mark on the lower scale. Note that a screen image 8 feet high would be required for proper legibility from the last row of this same auditorium. Or, using a 4-foot-high screen, the farthest viewing distance would have to be limited to 32 feet (10 m), as shown on the "Distance of Farthest Viewer" scale.

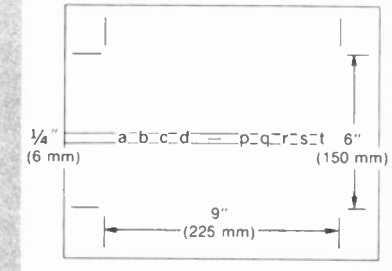
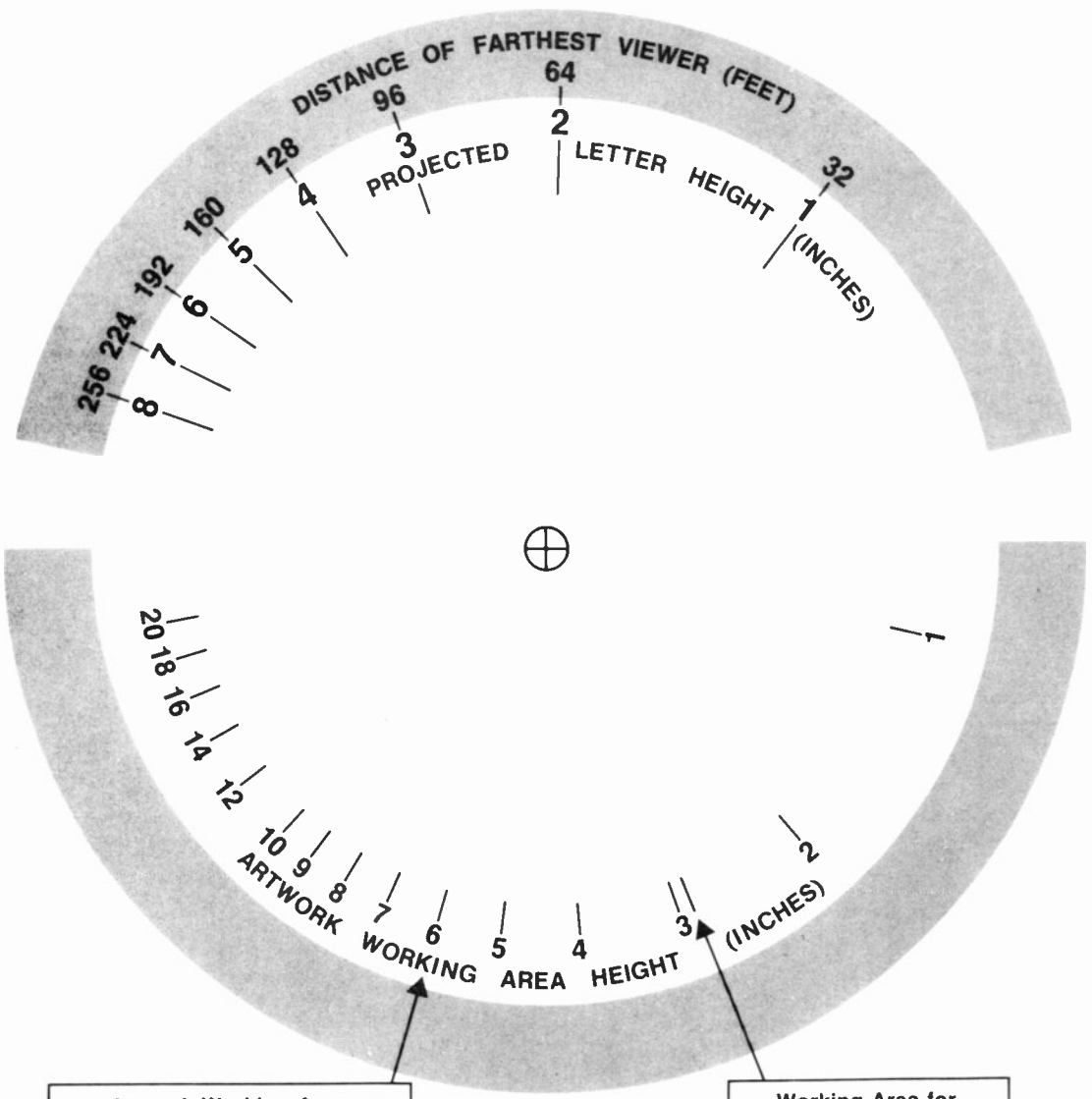


FIGURE 11

More Information

Eastman Kodak Company supplies a variety of publications including several that contain helpful information on the subject of the preparation of effective audiovisual presentations. One device that may be particularly helpful is the *Television Graphics Production Template*, H-42. This template is based on SMPTE Recommended Practice RP27.3-1972 and is designed specifically for making slides and motion pictures or animation sequences from original artwork.



Artwork Working Area for 35mm Slides (6 x 9)

Working Area for Typewritten Copy (Height 3 inches)

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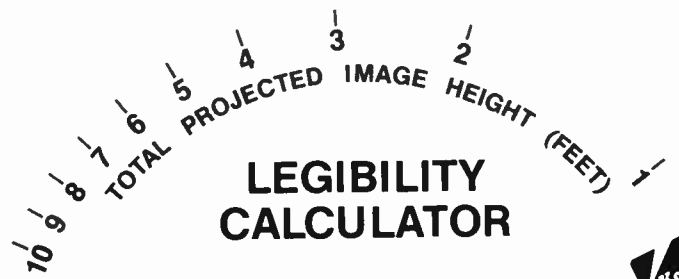
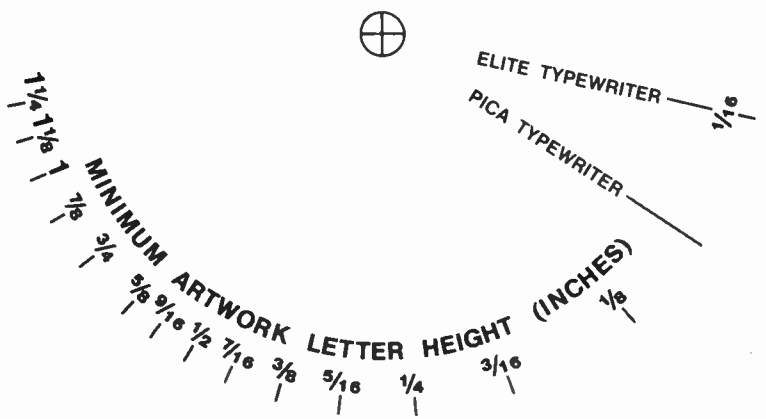


LEGIBILITY CALCULATOR

Kodak



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Microphone and Headphone Data

Acoustical Coupling
There are two basically different methods of coupling sound from a headphone to the ear. The circumaural system requires a sound-tight seal around the whole outer ear, while the supraaural headphone rests loosely against the ear (Open-Aire Principle).

Audio Frequency Condenser Microphone
Electret microphones from Sennheiser operate according to the audio frequency condenser microphone principle. A bias voltage of more than 100 V is "frozen" into the diaphragm permanently. This constant charge results into an alternating current, when the diaphragm is moved by impinging sound. An FET in the microphone amplifies the generated electrical signal and changes the impedance to a lower value. The audio output may now be processed in the same way as with a dynamic microphone.

Audio Frequency Range
The human ear can register sound between approximately 16 Hz and 16,000 Hz. Ultrasound is the range above, infrasound below this spectrum. The conversion of sound vibrations into electrical signals is performed by transducers. Their characteristics should be even throughout the frequency range of interest.

Balanced Microphone Circuit
Most professional sound equipment takes advantage of the balanced microphone connection technique. Both conductors from the microphone are symmetrical versus ground allowing long cable runs with only moderate shielding. Interference signals induced in the cable , such as hum and switching clicks will cancel in the input transformer of the following amplifier.

Cardioid Pattern
A unidirectional microphone with a directional pattern resembling a heartshape, is called a cardioid microphone.

dB Scale
To interpret a frequency response curve it is necessary to be able to assess quickly the various ratios of measured values at different frequencies. In electroacoustics a logarithmic scale is used for this purpose. The unit is the Decibel (dB). For instance, two voltages having a ratio of 1 : 2 are said to be different by 6 dB. In our data sheets, all frequency response curves are registered on graph paper with a total hight of 50 dB, thus each step between lines represents 2 dB.

Directional Characteristic
The directional characteristic of a microphone is the variation in response for different angles of sound incidence. The illustration on page 7 shows several typical Sennheiser microphones and their specific patterns. These are various types of directional microphones, those with a cardioid characteristic, those with supercardioid characteristic, the bi-directional microphone with its figure-8 pattern. In another design an interference tube is fitted in front of the microphone diaphragm. This results in a very directional microphone with an almost cone-shaped directional pattern (shotgun microphone). And then, there is of course the most basic type, the non-directional microphone, mostly called omni-directional.

Directivity Coefficient
To facilitate the comparison between various microphones, the directivity coefficient was introduced. It states the relation between the power output of a non-directional microphone and a directional microphone of equal sensitivity in a diffuse sound field. For instance, an ideal cardioid microphone has a directivity coefficient of 3. Since the intensity of sound decreases as the square of the distance it follows that the cardioid microphone may be used at a distance of $\sqrt{3} = 1{,}7$ times further than the non-directional microphone for the same amount of disturbing ambient noise.

Directivity
To help in evaluating a microphone without the help of a polar pattern, the directional characteristic is often stated in form of a rejection figure. This figure in dB units indicates the attenuation of sound inciding from an angle relative to the zero position. For supercardioid microphones the angel of best sound rejection is at 235°, for a cardioid microphone at 180°.

Dynamic Microphone
Dynamic Headphone
A dynamic microphone employs a diaphragm with an attached voice coil, moving in a strong permanent magnetic field. Sound waves striking the surface of the microphone cause the coil to be moved in the magnetic field, which generates a voltage corresponding to the sound pressure at the surface of the diaphragm.

All dynamic Sennheiser microphones have model numbers starting with MD.

In a dynamic headphone, the electrodynamic principle is reversed. An audio signal applied to the coil builds up a magnetic field which reacts with the permanent magnetic field, causing the diaphragm to move in and out correspondingly.

Dynamic headphones from Sennheiser have the letters HD in front of their model number.

Effective Output Level
The microphone sensitivity rating is defined as the ratio in dB of the power available from the microphone relative to 0,001 Watt at a sound pressure level of 10 dynes per square centimeter.

Electret Condenser Microphone
Electret microphones utilize the audio frequency condenser microphone principle. The basic difference to the conventional microphone of this type is that the electret microphone does not need an outside source for its bias. The flexible diaphragm consists of a metalized plastic foil with a permanent electrostatic charge, similar to a magnet having a permanent magnetic charge. Hence the name electret.

Electroacoustical Transducers
Several different principles are used in microphones to convert acoustical into electrical energy:
1. Resistance Control
   (carbon microphone)

Microphone and Headphone Data

2. Piezoelectric
   (ceramic and crystal microphone)
3. Electromagnetic
   (magnetic microphone)
4. Electrodynamic
   (dynamic microphone)
5. Electrostatic
   (condenser microphone)

Each one of these microphone types has its own merits and application. For example, the carbon microphone is still used in almost every telephone. On the other end of the spectrum is the condenser microphone, mainly employed in professional sound recording. Sennheiser manufactures magnetic, dynamic and condenser microphones.

Equivalent Noise
A microphone in a completely quiet room will still generate some residual noise. With dynamic microphones this noise will be caused by thermal movements of electrons in the voice coil material. Condenser microphones have several different noise sources. The microphone's generated noise can be measured. Usually, a peak measuring instrument and a weighting filter are employed (DIN 45 405) to put the right emphasis on the most disturbing components of the composite noise. The so-called "equivalent noise" is now figured by taking the microphone's sensitivity into consideration and relating the value to the hearing threshhold of 2×10^{-4} μbar. The equivalent noise figure allows to compare different microphones directly without regard to the sensitivity. A more common way of evaluating the noise characteristics of a microphone is by stating the signal-to-noise ratio. Please refer to the paragraph Noise Voltage and S/N-Ratio.

Free-Field Response (Microphone)
The free-field response of a microphone is defined as the open circuit voltage in mV generated by the microphone at its accessible terminals per undisturbed sound pressure in dyne/cm² at the specified frequency. The measurement is taken in a progressive plane sound wave at the microphone position prior to the introduction of the microphone, the microphone being placed at a specified angle with respect to the wave front. Recently it has become customary to relate the output voltage to 1 Newton/meter² = 1 Pa instead of to 1 dyne/cm². The conversion is simple since 1 mV/dynes/cm² equals 10mV/Pa.

The free-field response value has little practical significance unless accompanied by a statement of the electrical impedance of the microphone.

Frequency Range
Headphones and microphones have upper and lower frequency limits for their transducing capabilities. The useful frequency range is indicated in the technical data for each item.

Harmonic Distortion
Sound reproducing devices such as loudspeakers and headphones may display certain inaccuracies with which the diaphragm follows the electrical audio signal. This causes new and undesirable overtones which are measured in percent distortion. For headphones, the distortion shall not exceed 1% at a sound pressure level of 94 dB SPL (DIN 45 500).

Headband Tension
The wearing comfort of a headphone is mainly influenced by the weight of the headphone and even more by the mechanical pressure of the ear pads against the ears. This pressure is a function of the headband tension, expressed in ounces.

Interference Transducer
Maximizing the directional coefficient of cardioid and supercardioid microphones is limited for physical reasons. For a further improvement of directional characteristics, it is however possible to attach an interference tube in front of the microphone's diaphragm. This tube has a large number of sound inlets distributed over the length of the tube. Each inlet is dampened in a specific way and this arrangement causes partial cancellation of the sound within the tube, depending on the angle of sound incidence. The microphones MKH 815 an MKE 801 employ such an interference tube and a directivity coefficient of 4 to 11 is achieved troughout the frequency range.

Magnetic Interference Rejection
Strong magnetic fields may induce undesirable voltages in the voice coil of dynamic microphones. The disturbing fields can mostly be found in the vicinity of power lines and power transformers. All Sennheiser dynamic studio microphones contain compensation coils for an effective cancellation of the induced noise voltages. The technical data contain a statement of the remaining incuced noise voltage when the microphone is placed in a strong magnetic field of 5μ Tesla at 50 Hz.

Magnetic Microphone
Small an light microphones for the frequency range of the human voice can be built by attaching an armature of magnetically conductive material to a diaphragm. The armature is part of a magnetic circuit and changes the resistance of this circuit with the deflections of the diaphragm. The changing magnetic flux induces a signal voltage in a coil, surrounding the magnetic circuit. Magnetic microphones are mostly used in hearing aids.

Microphone Connection Primer
This booklet is available on request and shows all cables and adaptors necessary to connect our microphones to European-made tape recorders.

Microphone Impedance
The microphone impedance must be known for proper matching to amplifier or tape recorder inputs. The impedance is usually stated in Ohms for a frequency of 1,000 Hz. Dynamic microphones have mostly an impedance of 200 Ohms.

Minimal Load Impedance
Microphones with built-in amplifiers can work into any load higher or equal to the minimal load impedance. In contrast to power amplifiers, the microphone will not be damaged by a short across its output terminals, but the frequency response will be impaired if the microphone has to work in a load lower than the minimum load impedance. Also dynamic microphones have a lower limit with regard to the load impedance.

Noise Voltage and S/N Ratio
If you bring a microphone into a completely noisefree room and connect it to a very good amplifier, you will

Microphone and Headphone Data

notice a hiss or rustling sound which originates from the microphone. In dynamic microphones this noise is caused by the thermal agitation of electrons in the resistance of the moving coil of the microphone. In condenser microphones this noise derives from several sources.

The noise output of a microphone can be measured with a voltmeter and a weighting network to the DIN standard 45 405. The weighting network is an equalizer which has a frequency response which simulates the response of the human ear to attenuate sounds and enables the measuring instrument to give an indication of the subjective effect of the noise. The DIN standard requires the use of a peak reading measuring instrument to follow the weighting network.

Another method is given in IEC 179. Here the noise is measured with filter A and given as rms-voltage. This value is related to 94 dB SPL.

Nominal Frequency Response
The nominal frequency response for each microphone is shown as a graph in the following technical descriptions. An individual microphone may have small deviations from the nominal frequency response, as indicated by the dashed lines for the maximum and the minimum of the output voltage versus the frequency.

Nominal Impedance
For headphones, the nominal impedance is given for a frequency of 1,000 Hz. According to a standard classification (DIN 45 000), a headphone should have either 8Ω, 16Ω, 200Ω, 400Ω, 600Ω, 1,000Ω, 2,000Ω or 4,000Ω. The actual impedance shall not differ more than ± 30 % of the nominal values.

Nominal Load Impedance
The nominal load impedance for a microphone indicates the optimum matching load which will utilize the microphone's characteristics to the fullest extent. In Europe most manufacturers develop their microphones for no-load-operation. In USA also power-matching is usual.

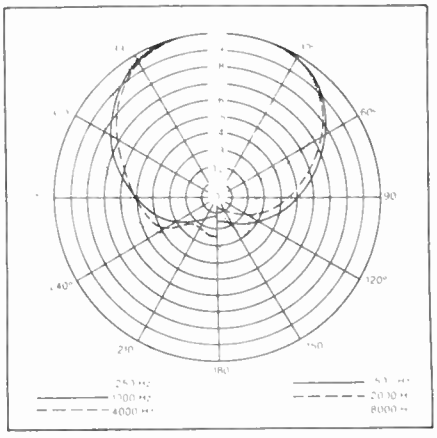
Output Level
The reproduction volume of a headphone is measured with a Type 4153 Bruel an Kjaer coupler with a power of 1 mW at 1,000 Hz into the headphone. According to DIN 45 500, the output level must exceed 94 dB SPL.

Overload Level
Condenser microphones operate in a linear fashion up to a certain sound pressure (overload level) above which they will cause harmonic distortion. Dynamic microphones cannot be overload in practical applications.

Phasing
Correct phasing is important to the operation of any system employing, simultaneously, more than one microphone. Of the two terminals of a microphone transducer, the inphase terminal is the one which acquires a positive potential with respect to the other when the front of the microphone is subjected to a positive sound pressure wave. The inphase terminal is pin 2 on microphones equipped with XLR connector and pin 1 on microphones equipped with Tuchel connectors.

Polar Diagram
The directional properties of microphones can be demonstrated by means of a polar diagram. The polar diagram shows the shape of the directional characteristic of the microphone (omni, cardioid, etc.). A microphone is placed in a sound field in an anechoic chamber at a fixed frequency and is rotated slowly. The relative sensitivity of the microphone for sound approaching it at varying angles is recorded. The sensitivity to sound on the axis of the microphone (0°) is taken as a reference of 1.0. The sensitivity of the microphone at any given angle is shown on the polar diagram by the distance of the response curve from the centre of the diagram.

For example, let us show you the polar diagram of the studio cardioid microphone MD 421. For the sake of clarity, the diagram is shown in two halves. Instead of plotting the six response curves all together, the response for 250 Hz, 1 kHz and 4 kHz are shown on the left half of the diagram and the response for 500 Hz, 2 kHz and 8 kHz are shown on the right-hand half on the diagram. Of course, each response curve would continue as a mirror image of the opposite half of the circle.



Polar Diagram MD 421

Pressure Buildup
Sound impinging on the diaphragm directly from the front leads to reflections, noticeable at high frequencies, where the wave length is in the same order as the diaphragm diameter. These reflections cause a pressure buildup with a resulting broad peak in the frequency response. For sound arriving at the microphone from the side, reflections cannot build up. The picture below shows a typical frequency response for 0° and 90° incidence.

Pressure Gradient Transducer
The diaphragm of a pressure gradient tranducer is moved by the resulting force of the pressure difference at the front and at the back of the diaphragm. It is therefore required to provide a path for the sound to the backside of the diaphragm. Special design procedures for the inside and outside sound passages make it possible to let the microphone react differently to sound from various directions. All unidirectional Sennheiser microphones make use of the pressure gradient principle.

Pressure Transducer
The diaphragm of a pressure transducer microphone is activated directly by the sound pressure independent of the direction of sound incidence. Therefore, these microphones are sensitive to sound from all directions and display an omnidirectional characteristic.

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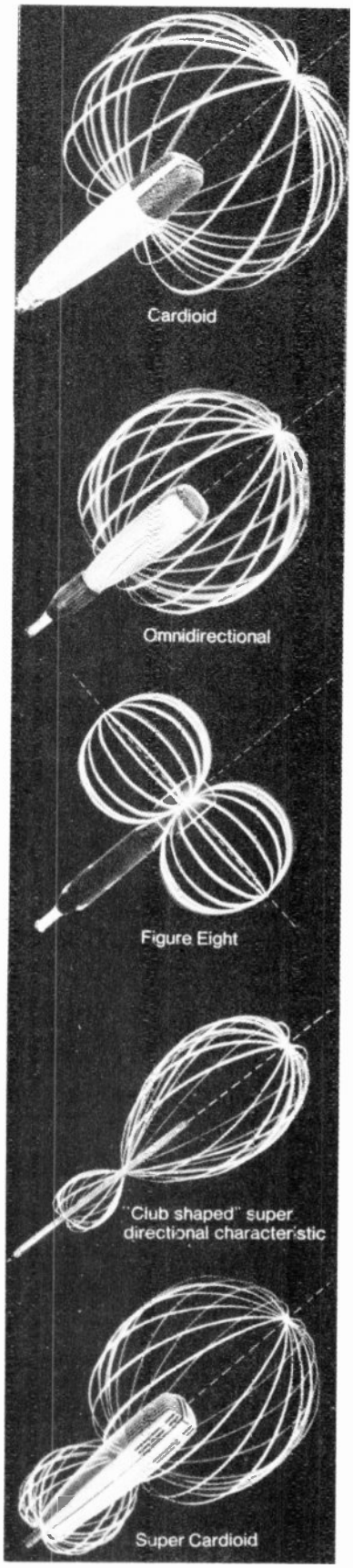
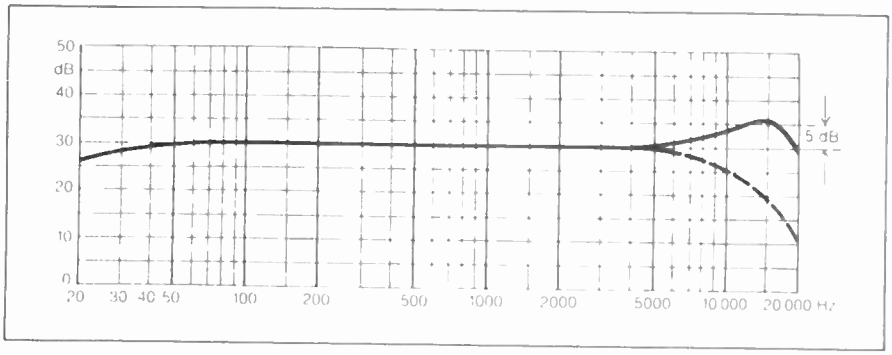


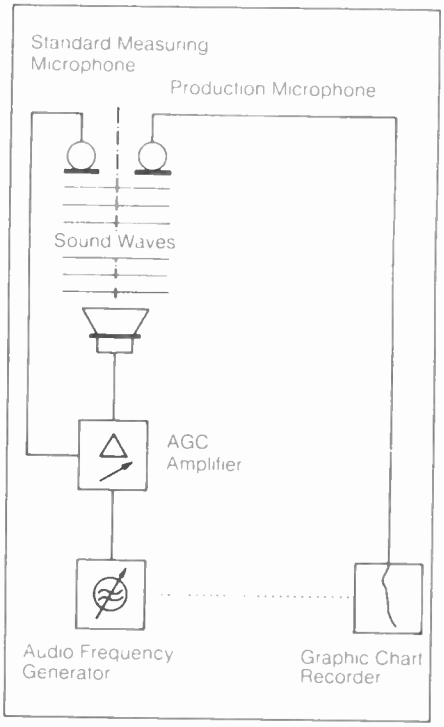


Proximity Effect

This effect is not encountered in omnidirectional microphones. With pressure gradient microphones, however, an increase of low frequencies can be noted at distances of less than two feet. The pressure difference is related to the velocity which decreases with the square of the distance in the near field and directly proportional with the distance in the free field Since the distance at which the near field becomes a free field depends on the frequency, the near field is larger for low frequencies. This means practically that a pressure gradient microphone close to the mouth of a performer will be in the free field for high frequencies and in the near field for low frequencies. Thus, the low frequencies will be emphasized. Microphone models MD 421 and MD 441 contain bass controls to compensate for the proximity effect.

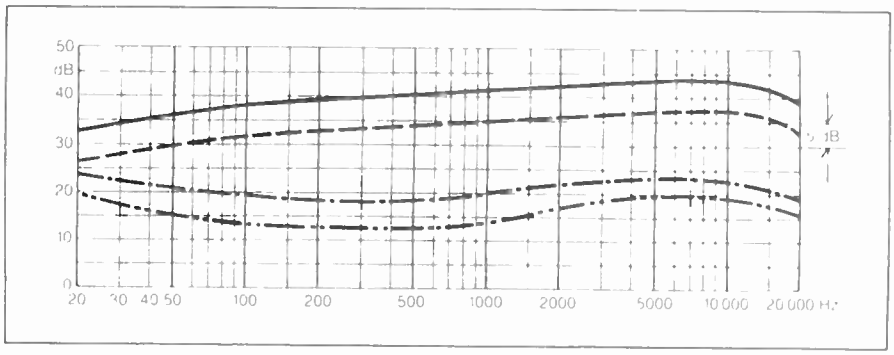
Response Curve

In order to record objectively a microphone's capacity to translate sound into electrical signals, a frequency response curve is drawn. It illustrates the variation of output voltage over the frequency range. The usual way of making the necessary measurements is shown in the illustration The microphone under test is compared with a calibrated standard microphone in an anechoic chamber. The frequency is varied and a mechanically coupled graph recorder writes the frequency response automatically.



RF-Condenser Microphone

Sennheiser studio condenser microphones do not use a dc-bias voltage. Instead, the condenser element is



part of a tuned RF-circuit, operating a 8 MHz. This frequency is generated inside the microphone by a crystal-controlled oscillator. The low element impedance at the high frequency and the crystal oscillator are the secret behind the unique high signal-to-noise ratio of our RF-condenser microphones.

Response, Free-Field (Headphone)
The frequency response of a headphone is not as easily determined as compared to a microphone or loudspeaker. Although there are socalled artificial ears or couplers, measurements taken with help of these devices show little correlation to the subjective hearing sensation when wearing the headphones. For this reason, a comparison method was developed in which a group of at least eight test persons compare the volume of the headphone with known free-field sound source at different frequencies in 1/3 octave steps. This method offers reliable results between 50 and 12,000 Hz. In addition, the response as measured with a coupler, can be related to the test results obtained with the subjective method described.

Sound Field
Near a source of sound, the sound waves travel in the shape of a sphere (near field). At a certain distance, the radius of the sphere has become so large that the sound propagation occurs in a practical parallel manner (free field). The sound pressure decreases proportional with the increasing distance from the sound source, while the velocity decreases with the square of the distance in the near field, and directly proportional in the free field.

Sound Pressure
Any moving solid body generates air pressure waves, which are called sound pressure, if the movement happens at a rate within the audible frequency range. The sound pressure is measured in microbars which is approximately one millionth of the normal atmospheric pressure. Recent engineering standards suggest to measure the sound pressure in "Pascal" where 1 Pa equals 1 Newton per squaremeter respectively 10 microbars.

Super-Cardioid Characteristic
The pressure gradient microphone with the best directivity coefficient of 4 is dubbed the hypercardioid. Its disadvantage, however, is the lack of rejection for sound coming directly from the back (180°). The rejection here is only 6 dB. Trying to optimize the directional characteristic, Sennheiser created the super-cardioid microphone with equal rejection at 90° an 180°. Still, a rather high directional coefficient of 3.86 could be obtained.

Unbalanced Microphone Circuit
With this wiring arrangement, there is only one conductor, the "hot" audio lead. while the return path utilizes the cable shield, which is also grounded at the amplifier end. Sometimes there is a second conductor for the return path. This gives the advantage of making it possible to use the microphone either balanced or unbalanced. Also, the cable shield does not become part of the microphone circuit and eventual hum pickup of the shield will not lead to interference with the microphone signal.

Velocity
This is the oscillating velocity of a given partical of the medium, with reference to the medium as the whole, due to the sound wave. The unit of measurement is centimeter per second. The velocity is not to be mistaken with the speed of sound.

NOTES:

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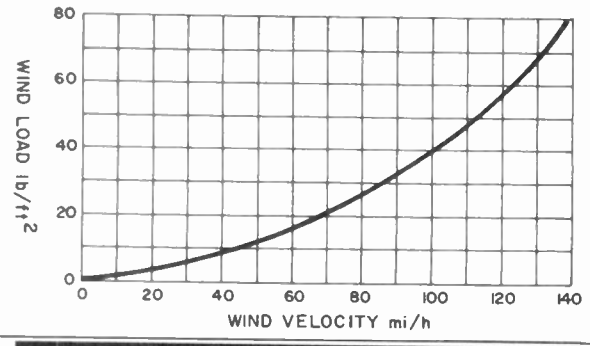
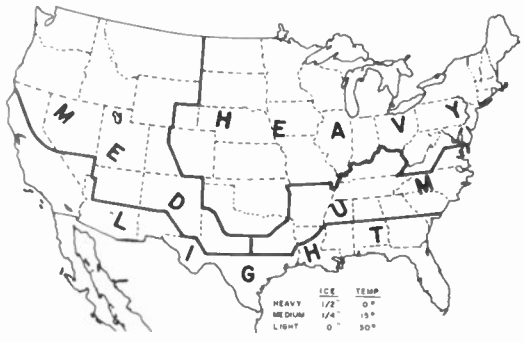
REFERENCE DATA

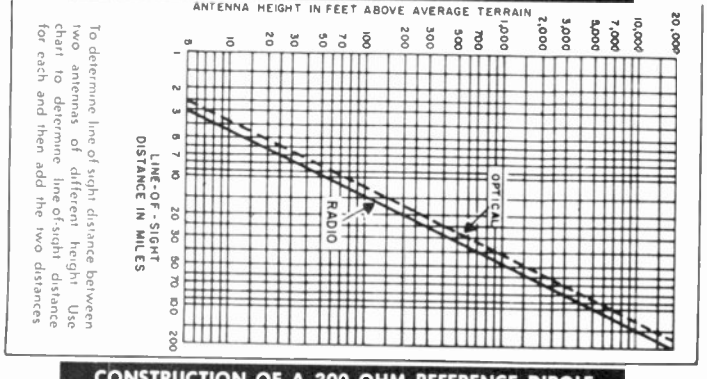
WIND VELOCITY VS. LOAD



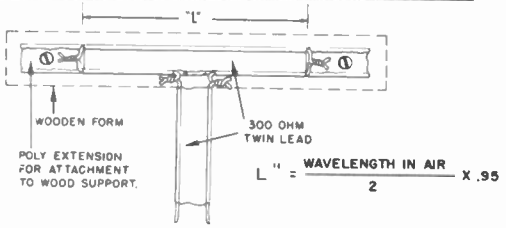
ICE-LOADING MAP



DISTANCE TO HORIZON FROM ANTENNA



CONSTRUCTION OF A 300 OHM REFERENCE DIPOLE



CHANNEL	2	3	4	5	6	FM	7	8	9	10	11	12	13
"L" LENGTH IN INCHES	98.31	89	81.18	71	66		31.62	30.62	29.62	28.68	28	27	26.31

dBm VOLTAGE CHART

dBm LEVEL	VOLTS 50 OHM	VOLTS 75 OHM	dBm LEVEL	VOLTS 50 OHM	VOLTS 75 OHM
20	2.236	2.739	0	0.2236	0.2739
19	1.993	2.441	− 1	0.1993	0.2441
18	1.776	2.175	− 2	0.1776	0.2175
17	1.583	1.939	− 3	0.1583	0.1939
16	1.411	1.728	− 4	0.1411	0.1728
15	1.257	1.540	− 5	0.1257	0.1540
14	1.121	1.373	− 6	0.2110	0.1373
13	0.9988	1.223	− 7	0.0999	0.1223
12	0.8902	1.090	− 8	0.0892	0.1090
11	0.7934	0.9718	− 9	0.0793	0.0972
10	0.7071	0.8660	−10	0.0707	0.0866
9	0.6302	0.7719	−11	0.0630	0.0772
8	0.5617	0.6879	−12	0.0562	0.0688
7	0.5060	0.6132	−13	0.0506	0.0613
6	0.4461	0.5465	−14	0.0446	0.0547
5	0.3976	0.4870	−15	0.0398	0.0487
4	0.3594	0.4340	−16	0.0359	0.0434
3	0.3158	0.3869	−17	0.0316	0.0387
2	0.2815	0.3448	−18	0.0282	0.0345
1	0.2508	0.3073	−19	0.0251	0.0307
0	0.2236	0.2739	−20	0.0224	0.0274

dB TO VOLTAGE CONVERSION CHART

dB	MULTIPLY VOLTAGE BY	dB	MULTIPLY VOLTAGE BY	dB	MULTIPLY VOLTAGE BY
1	1.12	16	6.3	31	35
2	1.25	17	7	32	40
3	1.4	18	8	33	45
4	1.6	19	9	34	50
5	1.8	20	10	35	56
6	2	21	11	36	63
7	2.25	22	12.5	37	71
8	2.5	23	14	38	80
9	2.75	24	16	39	90
10	3.16	25	18	40	100
11	3.55	26	20	43	140
12	4	27	22.5	46	200
13	4.5	28	25	50	300
14	5	29	28	56	600
15	5.6	30	32	60	1000

dBmV TO VOLTAGE CONVERSION CHART

REF: 0 dBmV = 1 mV measured across 75 ohms

dBmV +VALUES*	VOLTAGE IN mV	dBmV +VALUES*	VOLTAGE IN mV	dBmV +VALUES*	VOLTAGE IN mV
1	1.12	16	6.3	31	35
2	1.25	17	7	32	40
3	1.4	18	8	33	45
4	1.6	19	9	34	50
5	1.8	20	10	35	56
6	2	21	11	36	63
7	2.25	22	12.5	37	71
8	2.5	23	14	38	80
9	2.75	24	16	39	90
10	3.16	25	18	40	100
11	3.55	26	20	43	140
12	4	27	22.5	46	200
13	4.5	28	25	50	300
14	5	29	28	56	600
15	5.6	30	32	60	1,000

*To find negative values of dBmV, divide 1 mV by the voltage in mV.

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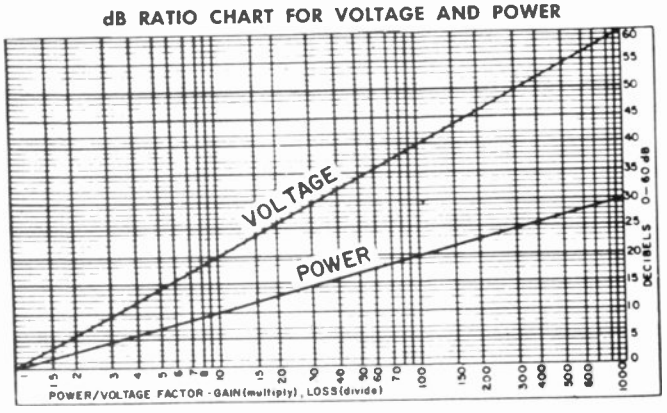
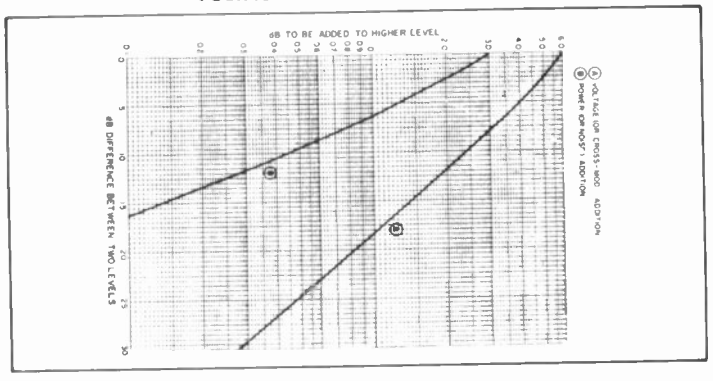
dB RATIO CHART FOR VOLTAGE AND POWER



VOLTAGE OR POWER ADDITION



TV CHANNEL DATA

CH	FREQ. RANGE IN MHz	CARRIERS IN MHz			WAVE LENGTHS IN INCHES*		
		VIDEO	COLOR	SOUND	AIR	** JD COAX	*** JA COAX
SUB-VHF	5.75-47.75	—	—	—	—	—	—
T-7	5.75-11.75	7	10.58	11.5	—	1551	1366
T-8	11.75-17.75	13	16.58	17.5	—	835	735
T-9	17.75-23.75	19	22.58	23.5	—	571	503
T-10	23.75-29.75	25	28.58	29.5	—	434	382
T-11	29.75-35.75	31	34.58	35.5	—	350	308
T-12	35.75-41.75	37	40.58	41.5	—	299	258
T-13	41.75-47.75	43	46.58	47.5	—	252	222
LO-VHF	54-88	—	—	—	—	—	—
2	54-60	55.25	58.83	59.75	214	197	173
3	60-66	61.25	64.83	65.75	193	178	156
4	66-72	67.25	70.83	71.75	176	162	142
5	76-82	77.25	80.83	81.75	153	141	124
6	82-88	83.25	86.83	87.75	142	130	115
FM	88-108	—	—	—	—	—	—
MID-BAND	120-174	—	—	—	—	—	—
A	120-126	121.25	124.83	125.75	—	89	79
B	126-132	127.25	130.83	131.75	—	85	75
C	132-138	133.25	136.83	137.75	—	81	71
D	138-144	139.25	142.83	143.75	—	78	68
E	144-150	145.25	148.83	149.75	—	74	65
F	150-156	151.25	154.83	155.75	—	71	63
G	156-162	157.25	160.83	161.75	—	69	60
H	162-168	163.25	166.83	167.75	—	66	58
I	168-174	169.25	172.83	173.75	—	64	56

CH	FREQ. RANGE IN MHz	CARRIERS IN MHz			WAVE LENGTHS IN INCHES*		
		VIDEO	COLOR	SOUND	AIR	** Polystyrene	*** Polyethylene
SUP-BAND	216-300	—	—	—	—	—	—
J	216-222	217.25	220.83	221.75	—	50	44
K	222-228	223.25	226.83	227.75	—	48	42
L	228-234	229.25	232.83	233.75	—	47	41
M	234-240	235.25	238.83	239.75	—	46	40
N	240-246	241.25	244.83	245.75	—	45	39
O	246-252	247.25	250.83	251.75	—	43	38
P	252-258	253.25	256.83	257.75	—	42	37
Q	258-264	259.25	262.83	263.75	—	41	36
R	264-270	265.25	268.83	269.75	—	40	35
S	270-276	271.25	274.83	275.75	—	39	34
T	276-282	277.25	280.83	281.75	—	38	33.5
U	282-288	283.25	286.83	287.75	—	38	33
V	288-294	289.25	292.83	293.75	—	37	33
W	294-300	295.25	298.83	299.75	—	36	32
UHF	470-890	—	—	—	—	—	—
14	470-476	471.25	474.83	475.75	25	23	20.2
20	506-512	507.25	410.83	511.75	23	21	18.6
27	548-554	549.25	552.83	553.75	21.5	19.5	17.5
35	596-602	597.25	600.83	601.75	20	18.2	16.2
42	638-644	639.25	642.83	643.75	18.5	17	15
50	686-692	687.25	690.83	691.75	17	15.5	13.7
60	746-752	747.25	750.83	751.75	15.5	14	12.5
70	806-812	807.25	810.83	811.75	14.5	13	11.7

*All measurements at video carrier.
**Polystyrene, velocity of propagation .92.
***Polyethylene, velocity of propagation .81.

TV FREQUENCY CHART

Channel No.	Picture Carrier Freq. MHz	Color Carrier Freq. MHz	Sound Carrier Freq. MHz	Receiver R-F Osc. Freq. MHz
VHF TELEVISION FREQUENCIES				
2	55.25	58.83	59.75	101
3	61.25	64.83	65.75	107
4	67.25	70.83	71.75	113
5	77.25	80.83	81.75	123
6	83.25	86.83	87.75	129
7	175.25	178.83	179.75	221
8	181.25	184.83	185.75	227
9	187.25	190.83	191.75	233
10	193.25	196.83	197.75	239
11	199.25	202.83	203.75	245
12	205.25	208.83	209.75	251
13	211.25	214.83	215.75	257
UHF TELEVISION FREQUENCIES				
14	471.25	474.83	475.75	517
15	477.25	480.83	481.75	523
16	483.25	486.83	487.75	529
17	489.25	492.83	493.75	535
18	495.25	498.83	499.75	541
19	501.25	504.83	505.75	547
20	507.25	510.83	511.75	553
21	513.25	516.83	517.75	559
22	519.25	522.83	523.75	565
23	525.25	528.83	529.75	571
24	531.25	534.83	535.75	577
25	537.25	540.83	541.75	583
26	543.25	546.83	547.75	589
27	549.25	552.83	553.75	595
28	555.25	558.83	559.75	601
29	561.25	564.83	565.75	607
30	567.25	570.83	571.75	613
31	573.25	576.83	577.75	619
32	579.25	582.83	583.75	625
33	585.25	588.83	589.75	631
34	591.25	594.83	595.75	637
35	597.25	600.83	601.75	643
36	603.25	606.83	607.75	649
37	609.25	612.83	613.75	655
38	615.25	618.83	619.75	661
39	621.25	624.83	625.75	667
40	627.25	630.83	631.75	673

Channel No.	Picture Carrier Freq. MHz	Color Carrier Freq. MHz	Sound Carrier Freq. MHz	Receiver R-F Osc. Freq. MHz
41	633.25	636.83	637.75	679
42	639.25	642.83	643.75	685
43	645.25	648.83	649.75	691
44	651.25	654.83	655.75	697
45	657.25	660.83	661.85	703
46	663.25	666.83	667.75	709
47	669.25	672.83	673.75	715
48	675.25	678.83	679.75	721
49	681.25	684.83	685.75	727
50	687.25	690.83	691.75	733
51	693.25	696.83	697.75	739
52	699.25	702.83	703.75	745
53	705.25	708.83	709.75	751
54	711.25	714.83	715.75	757
55	717.25	720.83	721.75	763
56	723.25	726.83	727.75	769
57	729.25	732.83	733.75	775
58	735.25	738.83	739.75	781
59	741.25	744.83	745.75	787
60	747.25	750.83	751.75	793
61	753.25	756.83	757.75	799
62	759.25	762.83	763.75	805
63	765.25	768.83	769.75	811
64	771.25	774.83	775.75	817
65	777.25	780.83	781.75	823
66	783.25	786.83	787.75	829
67	789.25	792.83	793.75	835
68	795.25	798.83	799.75	841
69	801.25	804.83	805.75	847
70	807.25	810.83	811.75	853
71	813.25	816.83	817.75	859
72	819.25	822.83	823.75	865
73	825.25	828.83	829.75	871
74	831.25	834.83	835.75	877
75	837.25	840.83	841.75	883
76	843.25	846.83	847.75	889
77	849.25	852.83	853.75	895
78	855.25	858.83	859.75	901
79	861.25	864.83	865.75	907
80	867.25	870.83	871.75	913
81	873.25	876.83	877.75	919
82	879.25	882.83	883.75	925
83	885.25	888.83	889.75	931

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REFERENCE DATA

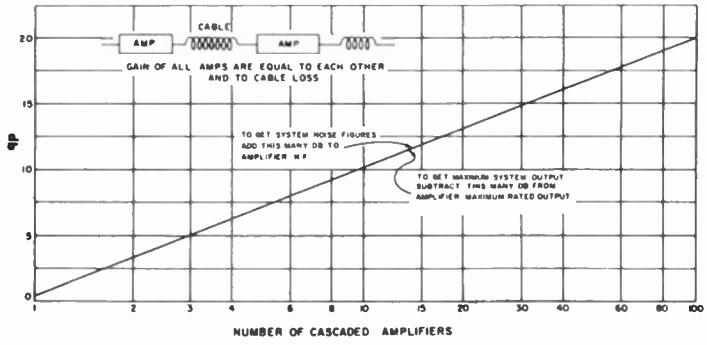
FCC RADIATION STANDARDS

Maximum cable-system radiation level allowed by FCC standards. Values are in dBmV, as read on a peak-reading level meter using a cut, folded-dipole antenna.

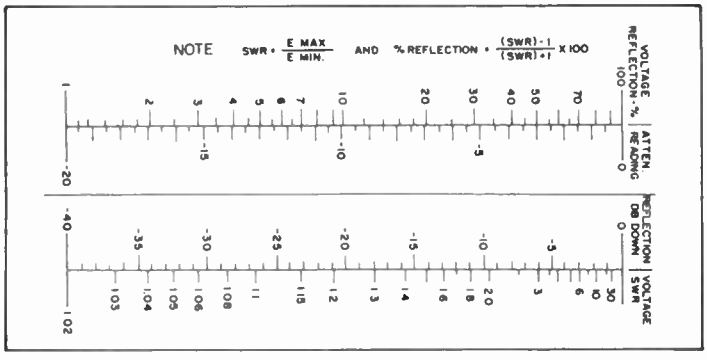
CH	LEVEL	CH	LEVEL	CH	LEVEL	CH	LEVEL
T7	−20	6	−40	8	−46	O	−51
T8	−26	A	−43	9	−46	P	−52
T9	−29	B	−43	10	−46	Q	−52
T10	−32	C	−43	11	−47	R	−52
T11	−33	D	−44	12	−47	S	−52
T12	−35	E	−44	13	−47	T	−52
T13	−36	F	−44	J	−50	U	−52
2	−36	G	−45	K	−50	V	−53
3	−37	H	−45	L	−51	W	−53
4	−38	I	−45	M	−51		
5	−39	7	−46	N	−51		

Values listed in table are to the nearest lower dB, based on formula Cable attenuation or any other gain or loss device must be considered when measurements are made. From ch. 2 to ch. 13 and from ch. A to ch. I, measurements are made at 10 ft. All others are made at 100 ft. To permit all measurements to be made at 10 ft., subtract 20 dB from indicated reading for ch. T7 through T13 and ch. J through W.

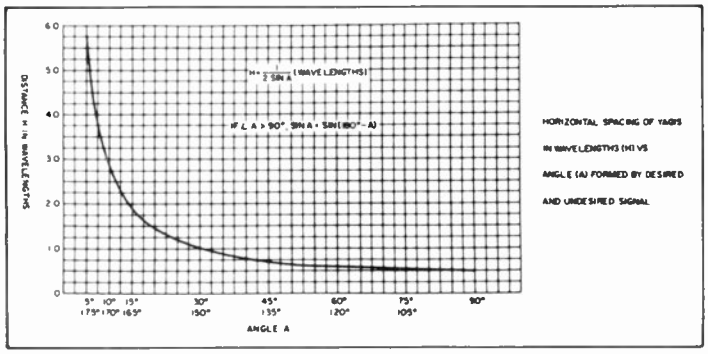
CASCADED SYSTEM NOISE CHART



VSWR CHART



YAGI SPACING TO PHASE OUT UNWANTED SIGNALS



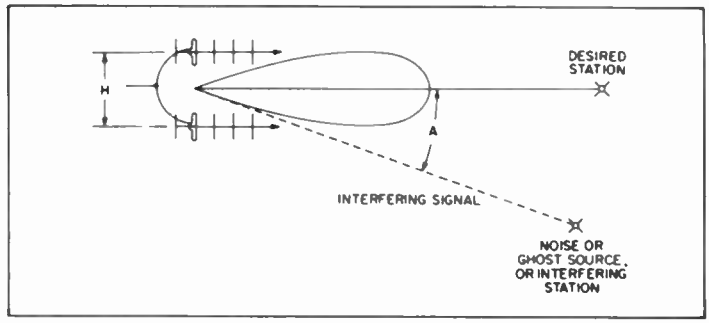
PREFERRED UHF-TO-VHF CONVERSIONS

UHF	VHF	UHF	VHF
14	3, 8, 10, 12, 13	43	2, 3, 6, 9, 11, 12
15	3, 6, 7, 8, 10, 11, 12	44	2, 3, 4, 6, 8, 9, 10, 11, 12
16	2, 3, 6, 9, 11, 13	45	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13
17	2, 6, 7, 9, 11, 12, 13	46	2, 3, 4, 5, 7, 8, 10, 11, 12, 13
18	5, 7, 8, 9, 10, 11, 12	47	2, 3, 4, 5, 7, 10, 12, 13
19	5, 7, 10, 12, 13	48	2, 5, 7, 8, 9, 11, 12, 13
20	4, 5, 7, 8, 10, 12, 13	49	2, 3, 4, 5, 7, 8, 9, 11, 12, 13
21	4, 5, 8, 9, 10, 11, 13	50	2, 3, 5, 7, 8, 11, 13
22	4, 5, 8, 11, 13	51	2, 7, 8, 10, 11, 13
22	4, 5, 8, 11, 13	52	2, 8, 9, 10, 12, 13
23	4, 5, 8, 9, 10, 11, 12, 13	53	2, 3, 4, 6, 8, 9, 10, 12
24	3, 4, 5, 6, 9, 12	54	2, 3, 4, 6, 8, 9, 12
25	3, 6, 8, 9, 12	55	2, 3, 4, 6, 8, 9, 11, 13
26	2, 3, 6, 9, 10, 11, 12, 13	56	2, 3, 4, 6, 7, 9, 10, 11, 13
27	2, 6, 7, 10, 13	57	2, 3, 4, 6, 7, 9, 10, 11, 13
28	6, 7, 10, 11, 13	58	2, 3, 4, 6, 7, 9, 10, 12, 13
29	6, 7, 10, 11, 12, 13	59	2, 3, 5, 6, 7, 9, 10, 11, 12
30	6, 7, 8, 11	60	2, 3, 4, 5, 7, 8, 10, 11, 12
31	6, 7, 8, 11, 12, 13	61	2, 3, 4, 5, 7, 8, 10, 11
32	4, 5, 7, 8, 11, 12, 13	62	2, 3, 5, 7, 8, 10, 11, 13
33	2, 4, 5, 8, 9, 12	63	2, 3, 5, 7, 8, 10, 11, 12, 13
34	2, 4, 5, 8, 9, 12, 13	64	2, 3, 4, 7, 8, 9, 11, 12, 13
35	2, 3, 4, 5, 7, 8, 9, 12, 13	65	2, 3, 4, 7, 8, 9, 11, 12
36	2, 3, 5, 7, 8, 9, 10	66	2, 3, 4, 5, 7, 8, 9, 11, 12
37	3, 5, 7, 9, 10, 13	67	2, 3, 4, 8, 9, 11, 12, 13
38	2, 8, 9, 10, 13	68	2, 3, 4, 6, 8, 9, 10, 12, 13
39	2, 3, 6, 8, 9, 10, 11	69	2, 3, 4, 5, 6, 8, 9, 10, 12, 13
40	6, 8, 10, 11	70	2, 3, 4, 5, 6, 8, 9, 10, 12, 13
41	6, 7, 10, 11	71	2, 3, 4, 5, 6, 7, 9, 10, 12, 13
42	2, 6, 7, 9, 10, 12		

89.3 MHz 89.5 MHz	color beat on channel 7
92.3 MHz 92.5 MHz	color beat on channel 8
95.3 MHz 95.5 MHz	color beat on channel 9
98.3 MHz 98.5 MHz	color beat on channel 10
101.3 MHz 101.5 MHz	color beat on channel 11
104.3 MHz 104.5 MHz	color beat on channel 12
107.3 MHz 107.5 MHz	color beat on channel 13

*Possible color beat from 2XFM.

HORIZONTAL SPACING OF YAGIS IN WAVELENGTHS (H) VS. ANGLE (A) FORMED BY DESIRED AND UNDESIRED SIGNALS



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GENERAL INSTRUMENT CORPORATION

REFERENCE DATA

CABLE ATTENUATION DATA

Nominal attenuation dB/100 feet at video carrier at 70°F.

CHANNEL	POLYSTYRENE				FOAM POLYETHYLENE		
	1.000"	.750"	.500"	.412"	.750"	.500"	.412"
SUB-CHANNELS							
T7	.092	.120	.181	.224	.139	.206	.264
T8	.126	.165	.249	.307	.193	.284	.363
T9	.154	.201	.303	.373	.236	.347	.441
T10	.178	.232	.349	.430	.274	.401	.509
T11	.200	.260	.390	.481	.308	.449	.570
T12	.219	.285	.428	.527	.339	.493	.625
T13	.238	.309	.463	.570	.369	.535	.677
LO-BAND VHF CHANNELS and FM							
2	.271	.352	.527	.649	.423	.610	.771
3	.287	.372	.556	.685	.448	.646	.815
4	.302	.391	.585	.770	.472	.679	.857
5	.326	.421	.629	.775	.511	.733	.924
6	.340	.438	.655	.806	.533	.764	.962
FM							
93 MHz	.351	.457	.684	.842	.549	.791	1.000
98 MHz	.361	.469	.702	.864	.563	.812	1.027
103 MHz	.370	.481	.720	.886	.578	.833	1.053
108 MHz	.379	.492	.737	.907	.591	.853	1.078
MID-BAND CHANNELS							
A	.419	.537	.801	.986	.663	.941	1.18
B	.430	.552	.823	1.01	.682	.967	1.21
C	.441	.566	.843	1.03	.700	.992	1.24
D	.452	.580	.864	1.06	.719	1.01	1.27
E	.463	.593	.884	1.08	.737	1.04	1.30
F	.474	.607	.903	1.11	.755	1.06	1.33
G	.485	.620	.923	1.13	.772	1.08	1.36
H	.495	.633	.942	1.15	.790	1.11	1.39
I	.505	.646	.960	1.18	.807	1.13	1.41
HI-BAND VHF CHANNELS							
7	.515	.658	.979	1.20	.824	1.15	1.44
8	.525	.671	.997	1.22	.841	1.18	1.47
9	.535	.693	1.01	1.24	.857	1.20	1.50
10	.545	.695	1.03	1.27	.873	1.22	1.52
11	.555	.707	1.05	1.29	.890	1.24	1.55
12	.564	.719	1.06	1.31	.906	1.26	1.57
13	.573	.730	1.08	1.33	.922	1.28	1.60
SUPER-BAND CHANNELS							
J	.583	.742	1.10	1.35	.937	1.31	1.63
K	.592	.753	1.11	1.37	.953	1.33	1.65
L	.601	.765	1.13	1.39	.968	1.35	1.68
M	.610	.776	1.15	1.41	.984	1.37	1.70
N	.619	.787	1.16	1.43	.999	1.39	1.72
O	.628	.798	1.18	1.45	1.01	1.41	1.75
P	.637	.809	1.19	1.47	1.02	1.43	1.77
Q	.646	.819	1.21	1.49	1.04	1.45	1.80
R	.654	.830	1.22	1.51	1.05	1.47	1.82
S	.663	.841	1.24	1.53	1.07	1.49	1.84
T	.671	.851	1.26	1.54	1.08	1.50	1.87
U	.680	.861	1.27	1.56	1.10	1.52	1.89
V	.688	.872	1.29	1.58	1.11	1.54	1.91
W	.696	.882	1.30	1.60	1.13	1.56	1.93

Nominal attenuation dB/100 foot at video carrier at 70°F

CHANNEL	2nd GENERATION GAS INJECTED				AIR DIELECTRIC			
	1.000"	.750"	.500"	.412"	1.000"	.750"	.500"	.412"
SUB-CHANNELS								
T7	.115	.139	.202	.250	.100	.129	.196	.236
T8	.156	.190	.275	.341	.136	.176	.266	.321
T9	.189	.230	.332	.412	.165	.213	.322	.388
T10	.216	.263	.381	.473	.189	.244	.370	.445
T11	.241	.293	.424	.527	.211	.272	.412	.496
T12	.263	.320	.464	.575	.230	.297	.450	.542
T13	.284	.345	.500	.620	.248	.321	.485	.584
LO-BAND VHF CHANNELS AND FM								
2	.322	.391	.567	.703	.281	.363	.549	.662
3	.339	.412	.597	.740	.296	.383	.578	.697
4	.355	.432	.625	.776	.310	.401	.606	.730
5	.381	.463	.670	.831	.332	.430	.650	.781
6	.395	.481	.696	.863	.345	.446	.674	.812
93 MHz	.417	.508	.736	.912	.365	.471	.712	.858
98 MHz	.429	.522	.755	.936	.374	.484	.731	.881
103 MHz	.450	.535	.774	.960	.383	.496	.749	.903
108 MHz	.462	.548	.792	.983	.392	.508	.767	.925
MID-BAND VHF CHANNELS								
A	.477	.580	.839	1.041	.417	.538	.814	.980
B	.488	.594	.860	1.067	.427	.551	.844	1.004
C	.500	.608	.880	1.092	.437	.564	.853	1.028
D	.511	.622	.900	1.116	.446	.577	.872	1.051
E	.522	.635	.919	1.140	.456	.589	.891	1.073
F	.533	.648	.938	1.163	.465	.601	.909	1.095
G	.543	.660	.956	1.186	.474	.613	.927	1.117
H	.553	.671	.974	1.208	.483	.625	.944	1.138
I	.563	.685	.992	1.230	.492	.634	.962	1.158
HIGH-BAND VHF CHANNELS								
7	.573	.697	1.009	1.252	.501	.647	.978	1.179
8	.583	.709	1.026	1.273	.509	.658	.995	1.199
9	.592	.721	1.043	1.294	.518	.669	1.011	1.218
10	.602	.732	1.060	1.315	.526	.680	1.027	1.238
11	.611	.743	1.076	1.335	.534	.690	1.043	1.257
12	.620	.755	1.092	1.355	.542	.700	1.059	1.276
13	.629	.766	1.108	1.375	.550	.711	1.074	1.294
SUPER-BAND VHF CHANNELS								
J	.638	.776	1.124	1.394	.558	.721	1.089	1.312
K	.647	.787	1.139	1.413	.565	.730	1.104	1.330
L	.656	.797	1.154	1.432	.573	.740	1.119	1.348
M	.664	.808	1.169	1.451	.580	.750	1.134	1.366
N	.673	.818	1.184	1.469	.588	.759	1.148	1.383
O	.681	.828	1.199	1.487	.595	.769	1.162	1.400
P	.689	.838	1.213	1.505	.602	.778	1.176	1.417
Q	.697	.848	1.228	1.523	.609	.787	1.190	1.434
R	.705	.858	1.242	1.540	.616	.796	1.203	1.450
S	.713	.867	1.256	1.558	.623	.805	1.217	1.467
T	.721	.877	1.269	1.575	.630	.814	1.231	1.483
U	.729	.886	1.283	1.592	.637	.823	1.244	1.499
V	.736	.896	1.297	1.608	.643	.831	1.257	1.514
W	.744	.905	1.310	1.625	.650	.840	1.270	1.530

USEFUL FORMULAS

Wavelength in Meters (Air) $= \frac{300}{\text{Freq. in MHz}}$

Wavelength in Feet (Air) $= \frac{984}{\text{Freq. in MHz}}$

E (Volts) = I (Amps) x R (Ohms)

Power W (Watts) $= \frac{E^2 \text{ (Volts)}}{R \text{ (Ohms)}}$

Temperature Conversion

$F° = C° \times \frac{9}{5} + 32$

Ef (Field Intensity in Microvolts per Meter) = 0.021 E (Field Strength Meter Reading in Microvolts Using Reference Dipole) x f (frequency in MHz)

UHF Channels 14 to 83

Frequencies 470-890 MHz

To Find Center Frequency of Any UHF Channel

C.F. = 473 + 6 (Channel Number—14)

USEFUL INFORMATION

The ratio of the difference in attenuation in coaxial cable for any two frequencies carried by the cable is approximately the square root of the ratio of the two frequencies. Example: Lo-Channel 54 MHz, Hi-Channel 216 MHz. $216 \div 54 = 4$; $\sqrt{4} = 2$ or the high channel has twice as much attenuation as the low channel.

CONVERSION TABLES

To convert from	To	Multiply by
Abamperes	Amperes	10.0000
Abamperes	Statampere	2.998×10^{10}
Abcoulombs	Ampere-hours	2.778×10^{-3}
Abcoulombs	Coulombs	10.0000
Abcoulombs	Faradays	1.036×10^{-4}
Abcoulombs	Statcoulombs	2.998×10^{10}
Abfarads	Farads	10^{9}
Abfarads	Microfarads	10^{15}
Abfarads	Statfarads	8.988×10^{20}
Abhenrys	Henrys	10^{-9}
Abhenrys	Microhenrys	0.001
Abhenrys	Millihenrys	10^{-6}
Abhenrys	Stathenrys	1.113×10^{-21}
Abohms	Megohms	10^{-15}
Abohms	Microhms	0.001
Abohms	Ohms	10^{-9}
Abohms	Statohms	1.113×10^{-21}
Abvolts	Microvolts	0.01
Abvolts	Millivolts	10^{-5}
Abvolts	Statvolts	3.336×10^{-1}
Abvolts	Volts	10^{-8}
Acres	Ares (square dekameters)	40.46873
Acres	Hectares (square hectometers)	0.4046873
Acres	Square feet	4.356×10^{4}
Acres	Square inches	6,272,640
Acres	Square kilometers	4.047×10^{-3}
Acres	Square meters	4047
Acres	Square miles	1.563×10^{-3}
Acres	Square rods	160
Acres	Square yards	4840
Amperes	Abamperes	0.1
Amperes	Milliamperes	1000
Amperes	Statamperes	2.998×10^{9}
Ampere-hours	Abcoulombs	360
Ampere-hours	Coulombs	3600
Ampere-hours	Faradays	3.731×10^{-2}
Ampere-hours	Statcoulombs	1.080×10^{13}
Ares	Acres (US)	0.02471044
Ares	Hectares	0.01
Ares	Square feet	1076.4
Ares	Square meters	100
Ares	Square miles	3.861×10^{-5}
Ares	Square yards	119.60
Bushels (dry)	Cubic centimeters	3524×10^{4}
Bushels (dry)	Cubic feet	1.2444
Bushels (dry)	Cubic inches	2150.4
Bushels (dry)	Cubic meters	3.524×10^{-2}
Bushels (dry)	Liters	35.24
Centimeters	Feet	3.281×10^{-2}
Centimeters	Inches	0.3937
Centimeters	Kilometers	10^{-5}
Centimeters	Meters	0.01
Centimeters	Mils	393.7
Centimeters	Miles	6.214×10^{-6}
Centimeters	Millimeters	10
Centimeters	Yards	1.094×10^{-2}
Centimeters/second	Feet/minute	1.969
Centimeters/second	Feet/second	3.282×10^{-2}
Centimeters/second	Kilometers/hour	0.036
Centimeters/second	Kilometers/minute	0.0006
Centimeters/second	Knots	1.943×10^{-2}
Centimeters/second	Meters/minute	0.6
Centimeters/second	Meters/second	0.01
Centimeters/second	Miles/hour	2.237×10^{-2}
Centimeters/second	Miles/minute	3.728×10^{-4}
Circular mils	Square centimeters	5.067×10^{-6}
Circular mils	Square inches	7.854×10^{-7}
Circular mils	Square millimeters	5.067×10^{-4}
Circular mils	Square mils	0.7854
Coulombs	Abcoulombs	0.1
Coulombs	Ampere-hours	2.778×10^{-4}
Coulombs	Faradays	1.036×10^{-5}
Coulombs	Statcoulombs	2.998×10^{9}
Cubic centimeters	Cubic feet	3.531×10^{-5}
Cubic centimeters	Cubic inches	6.102×10^{-2}
Cubic centimeters	Cubic meters	10^{-6}
Cubic centimeters	Cubic yards	1.308×10^{-6}
Cubic centimeters	Gallons (liquid)	2.642×10^{-4}
Cubic centimeters	Liters	0.001
Cubic centimeters	Pints (liquid)	2.113×10^{-3}
Cubic centimeters	Quarts (liquid)	1.057×10^{-3}
Cubic feet	Bushels (dry)	0.8036
Cubic feet	Cubic centimeters	2.832×10^{4}
Cubic feet	Cubic inches	1728
Cubic feet	Cubic meters	2.832×10^{-2}
Cubic feet (US)	Cubic yards	3.704×10^{-2}
Cubic feet	Gallons (liquid)	7.481
Cubic feet	Liters	28.316
Cubic feet	Pints (liquid)	59.84
Cubic feet	Quarts (liquid)	29.922
Cubic hectometers	Cubic meters	10^{6}
Cubic inches	Bushels (dry)	4.6503×10^{-4}
Cubic inches	Cubic centimeters	16.39
Cubic inches	Cubic feet	5.787×10^{-4}
Cubic inches	Cubic meters	1.639×10^{-5}
Cubic inches (US)	Cubic yards	2.143×10^{-5}
Cubic inches	Gallons	4.329×10^{-3}
Cubic inches	Liters	1.639×10^{-2}
Cubic inches	Pints (liquid)	3.463×10^{-2}
Cubic inches	Quarts (liquid)	1.732×10^{-2}
Cubic meters	Bushels (dry)	28.38
Cubic meters	Cubic centimeters	10^{6}
Cubic meters	Cubic feet	35.31
Cubic meters	Cubic inches	6.102×10^{4}
Cubic meters	Cubic yards	1.308
Cubic meters	Gallons (liquid)	264.2
Cubic meters	Liters	1000
Cubic meters	Pints (liquid)	2113
Cubic meters	Quarts (liquid)	1057
Cubic meters	Steres	1
Cubic yards	Cubic centimeters	7.646×10^{5}
Cubic yards	Cubic feet	27
Cubic yards	Cubic inches	46656
Cubic yards	Cubic meters	0.7646
Cubic yards	Gallons	202.0
Cubic yards	Liters	764.6
Cubic yards	Pints (liquid)	1616
Cubic yards	Quarts (liquid)	807.9
Decimeters	Meters	0.1
Decigrams	Grams	0.1
Decisteres	Cubic meters	0.1
Degrees	Circumferences (revolutions)	2.778×10^{-3}
Degrees	Minutes	60
Degrees	Quadrants	1.111×10^{-2}
Degrees	Radians	1.745×10^{-2}
Degrees	Seconds	3600
Degrees/second	Radians/second	1.745×10^{-2}
Degrees/second	Revolutions/minute	0.1667
Degrees/second	Revolutions/second	2.778×10^{-3}
Dekagrams	Grams	10
Dekameters	Meters	10
Faradays	Abcoulombs	9649
Faradays	Ampere-hours	26.81
Faradays	Coulombs	9.649×10^{4}
Faradays	Statcoulombs	2.893×10^{14}
Farads	Abfarads	10^{-9}
Farads	Microfarads	10^{6}
Farads	Statfarads	8.988×10^{11}
Feet	Centimeters	30.48
Feet	Inches	12
Feet	Kilometers	3.048×10^{-4}
Feet	Meters	0.3048
Feet	Miles (nautical)	1.645×10^{-4}
Feet	Miles (statute)	1.894×10^{-4}
Feet	Mils	1.2×10^{4}
Feet	Millimeters	304.8
Feet	Yards	0.3333
Feet/minute	Centimeter/second	0.5080
Feet/minute	Feet/second	1.667×10^{-2}
Feet/minute	Kilometers/hour	1.829×10^{-2}
Feet/minute	Kilometers/second	3.048×10^{-4}
Feet/minute	Knots	9.868×10^{-3}
Feet/minute	Meters/minute	0.3048
Feet/minute	Meters/second	5.080×10^{-3}
Feet/minute	Miles/hour	1.136×10^{-2}
Feet/minute	Miles/minute	1.894×10^{-4}

CONVERSION TABLES

To convert from	To	Multiply by
Feet/second	Centimeters/second	30.48
Feet/second	Feet/minute	60
Feet/second	Kilometers/hour	1.097
Feet/second	Kilometers/minute	1.829×10^{-2}
Feet/second	Knots	0.5921
Feet/second	Meters/minute	18.29
Feet/second	Meters/second	0.3048
Feet/second	Miles/hour	0.6818
Feet/second	Miles/minute	1.136×10^{-2}
Gallons (liquid)	Cubic centimeters	3785.
Gallons (liquid)	Cubic feet	0.1337
Gallons (liquid)	Cubic inches	231
Gallons (liquid)	Cubic meters	3.785×10^{-3}
Gallons (liquid)	Cubic yards	4.951×10^{-3}
Gallons (liquid)	Liters	3.785
Gallons (liquid)	Pints (liquid)	8
Gallons (liquid)	Quarts (liquid)	4
Grains	Grams	6.480×10^{-2}
Grains	Kilograms	6.481×10^{-5}
Grains	Milligrams	64.81
Grains	Ounces (avoirdupois)	2.286×10^{-3}
Grains	Pounds (avoirdupois)	1.429×10^{-4}
Grams	Grains	15.43
Grams	Kilograms	6.480×10^{-5}
Grams	Milligrams	64.80
Grams	Ounces (avoirdupois)	3.527×10^{-2}
Grams	Pounds (avoirdupois)	2.205×10^{-3}
Grams	Tons (long)	9.842×10^{-7}
Grams	Tons (metric)	10^{-6}
Grams	Tons (short)	1.102×10^{-6}
Hectares	Acres	2.471
Hectares	Acres	100
Hectares	Square feet	1.076×10^{5}
Hectares	Square meters	10000
Hectares	Square rods	3.954×10^{2}
Hectares	Square yards	11959.85
Hectograms	Grams	100
Hectograms	Ounces (avoirdupois)	3.527
Hectoliters	Liters	100
Hectometers	Meters	100
Hectometers	Rods	19.88
Hectometers	Yards	109.4
Hectowatts	Watts	100
Hemispheres	Spheres	0.5
Hemispheres	Spherical right angles	4
Hemispheres	Steradians	6.283
Henrys	Abhenrys	10^{9}
Henrys	Microhenrys	10^{6}
Henrys	Millihenrys	1000
Henrys	Stathenrys	1.113×10^{-12}
Inches	Centimeters	2.540
Inches	Feet	8.333×10^{-2}
Inches	Kilometers	2.540×10^{-5}
Inches	Meters	2.540×10^{-2}
Inches	Miles	1.578×10^{-5}
Inches	Millimeters	25.40
Inches	Mils	1000
Inches	Yards	2.778×10^{-2}
Kilograms	**Grains**	1.543×10^{4}
Kilograms	**Grams**	1000
Kilograms	**Milligrams**	10^{6}
Kilograms	**Ounces (avoirdupois)**	35.27
Kilograms	**Pounds (avoirdupois)**	2.205
Kilograms	**Tons (long)**	9.842×10^{-4}
Kilograms	**Tons (metric)**	0.001
Kilograms	**Tons (short)**	1.102×10^{-3}
Kiloliters	**Gallons (liquid)**	264.18
Kiloliters	**Liters**	1000
Kilometers	**Centimeters**	10^{5}
Kilometers	**Feet**	3281
Kilometers	**Inches**	3.937×10^{4}
Kilometers	**Meters**	1000
Kilometers	**Miles (nautical)**	0.5396
Kilometers	**Miles (statute)**	0.6214
Kilometers	**Millimeters**	10^{6}
Kilometers	**Mils**	3.937×10^{7}
Kilometers	**Yards**	1094
Kilometers/hour	**Centimeters/second**	27.78
Kilometers/hour	**Feet/minute**	54.68

To convert from	To	Multiply by
Kilometers/hour	Feet/second	0.9113
Kilometers/hour	Kilometers/minute	1.667×10^{-2}
Kilometers/hour	Knots	0.5396
Kilometers/hour	Meters/minute	16.67
Kilometers/hour	Meters/second	0.2778
Kilometers/hour	Miles/hour	0.6214
Kilometers/hour	Miles/minute	1.036×10^{-2}
Kilometers/minute	Centimeters/second	1667
Kilometers/minute	Feet/minute	3281
Kilometers/minute	Feet/second	54.68
Kilometers/minute	Kilometers/hour	60
Kilometers/minute	Knots	32.38
Kilometers/minute	Meters/minute	1000
Kilometers/minute	Meters/second	16.67
Kilometers/minute	Miles/hour	37.28
Kilometers/minute	Miles/minute	0.6214
Kilowatt hours	Watt-hours	1000
Kilowatts	Watts	1000
Knots	Centimeters/second	51.48
Knots	Feet/hour	6080.20
Knots	Feet/minute	101.3
Knots	Feet/second	1.689
Knots	Kilometers/hour	1.853
Knots	Kilometers/minute	3.088×10^{-2}
Knots	Meters/minute	30.88
Knots	Meters/second	0.5148
Knots	Miles/hour	1.152
Knots	Miles/minute	1.919×10^{-2}
Knots	Bushels (dry)	2.838×10^{-2}
Liters	Cubic centimeters	1000
Liters	Cubic feet	3.531×10^{-2}
Liters	Cubic inches	61.02
Liters	Cubic meters	0.001
Liters	Cubic yards	1.308×10^{-3}
Liters	Gallons (liquid)	0.2642
Mils	Millimeters	2.540×10^{-2}
Mils	Yards	2.778×10^{-5}
Minutes (angle)	Degrees	1.667×10^{-2}
Minutes (angle)	Quadrants	1.852×10^{-4}
Minutes (angle)	Radians	2.909×10^{-4}
Minutes (angle)	Revolutions (circumferences)	4.630×10^{-5}
Minutes (angle)	Seconds	60
Myriagrams	Grams	10,000
Myriagrams	Kilograms	10
Myriameters	Kilometers	10
Myriameters	Meters	10,000
Myriameters	Miles	6.21370
Ohms	Abohms	10^{9}
Ohms	Megohms	10^{-6}
Ohms	Microhms	10^{6}
Ohms	Statohms	1.112×10^{-12}
Ounces (avoirdupois)	Grains	437.5
Ounces (avoirdupois)	Grams	28.35
Ounces (avoirdupois)	Kilograms	2.835×10^{-2}
Ounces (avoirdupois)	Milligrams	2.835×10^{4}
Ounces (avoirdupois)	Pounds (avoirdupois)	6.250×10^{-2}
Ounces (avoirdupois)	Tons (long)	2.790×10^{-5}
Ounces (avoirdupois)	Tons (metric)	2.835×10^{-5}
Ounces (avoirdupois)	Tons (short)	3.125×10^{-5}
Pints (liquid)	Cubic centimeters	473.2
Pints (liquid)	Cubic feet	1.671×10^{-2}
Pints (liquid)	Cubic inches	28.87
Pints (liquid)	Cubic meters	4.732×10^{-4}
Pints (liquid)	Cubic yards	6.189×10^{-4}
Pints (liquid)	Gallons (liquid)	0.125
Pounds (avoirdupois)	Grains	7000
Pounds (avoirdupois)	Grams	453.6
Pounds (avoirdupois)	Kilograms	0.4536
Pounds (avoirdupois)	Milligrams	4.536×10^{5}
Pounds (avoirdupois)	Ounces (avoirdupois)	16
Pounds (avoirdupois)	Tons (long)	4.464×10^{-4}
Pounds (avoirdupois)	Tons (short)	0.0005
Quadrants	Degrees	90
Quadrants	Minutes	5400
Quadrants	Radians	1.571
Quadrants	Revolutions (circumferences)	0.25
Quadrants	Seconds	3.24×10^{5}

CONVERSION TABLES

To convert from	To	Multiply by
Quarts (liquid)	Cubic centimeters	946.4
Quarts (liquid)	Cubic feet	3.342×10^{-2}
Quarts (liquid)	Cubic inches	57.75
Quarts (liquid)	Cubic meters	9.464×10^{-4}
Quarts (liquid)	Cubic yards	1.238×10^{-3}
Quarts (liquid)	Gallons (liquid)	0.25
Radians	Circumferences	0.1591
Radians	Degrees	57.30
Radians	Degrees, minutes, seconds	57°, 17', 44.8"
Radians	Minutes	3438
Radians	Quadrants	0.6366
Radians	Revolutions	0.1591
Radians	Seconds	2.063×10^{5}
Radians/second	Degrees/second	57.30
Radians/second	Revolutions/minute	9.549
Radians/second	Revolutions/second	0.1592
Revolutions (circumferences)	Degrees	360
Revolutions (circumferences)	Minutes	2.16×10^{4}
Revolutions (circumferences)	Quadrants	4
Revolutions (circumferences)	Radians	6.283
Revolutions (circumferences)	Seconds	1.296×10^{6}
Revolutions/minute	Degrees/second	6
Revolutions/minute	Radians/second	0.1047
Revolutions/minute	Revolutions/second	1.667×10^{-2}
Revolutions/second	Degrees/second	360
Revolutions/second	Radians/second	6.283
Revolutions/second	Revolutions/minute	60
Seconds (angle)	Degrees	2.778×10^{-4}
Seconds (angle)	Minutes	1.667×10^{-2}
Seconds (angle)	Quadrants	3.087×10^{-6}
Seconds (angle)	Radians	4.848×10^{-6}
Seconds (angle)	Revolutions (circumferences)	7.716×10^{-7}
Hemispheres	Spheres	2
Spherical right angles	Spheres	8
Steradians	Spheres	12.57
Hemispheres	Spherical right angles	0.25
Spheres	Spherical right angles	0.125
Steradians	Spherical right angles	1.571
Circular mils	Square centimeters	1.973×10^{5}
Square decimeters	Square centimeters	0.01
Square feet	Square centimeters	1.076×10^{-3}
Square inches	Square centimeters	0.1550
Square kilometers	Square centimeters	10^{-10}
Square meters	Square centimeters	0.0001
Square miles	Square centimeters	3.861×10^{-11}
Square millimeters	Square centimeters	100
Square yards	Square centimeters	1.196×10^{-4}
Acres	Square feet	2.296×10^{-5}
Acres	Square feet	9.290×10^{-4}
Circular mils	Square feet	1.833×10^{8}
Square centimeters	Square feet	929.0
Square inches	Square feet	144
Square kilometers	Square feet	9.290×10^{-8}
Square meters	Square feet	9.290×10^{-2}
Square miles	Square feet	3.587×10^{-8}
Square millimeters	Square feet	9.290×10^{4}
Circular mils	Square inches	1.273×10^{6}
Square centimeters	Square inches	6.452
Square feet	Square inches	6.944×10^{-3}
Square kilometers	Square inches	6.452×10^{-10}
Square meters	Square inches	6.452×10^{-4}
Square millimeters	Square inches	645.2
Square yards	Square inches	7.716×10^{-4}
Acres	Square kilometers	247.1
Square centimeters	Square kilometers	10^{10}
Square feet	Square kilometers	1.076×10^{7}
Square inches	Square kilometers	1.550×10^{9}
Square meters	Square kilometers	10^{6}
Square miles	Square kilometers	0.3861
Square millimeters	Square kilometers	10^{12}
Square kilometers	Square yards	1.196×10^{6}
Square meters	Acres	2.471×10^{-4}
Square meters	Acres	0.01
Square meters	Circular mils	1.973×10^{9}
Square meters	Square centimeters	10^{4}
Square meters	Square feet	10.76
Square meters	Square inches	1550

To convert from	To	Multiply by
Square meters	Square kilometers	10^{-6}
Square meters	Square miles	3.861×10^{-7}
Square meters	Square millimeters	10^{6}
Square meters	Square yards	1.196
Square miles	Acres	640
Square miles	Square centimeters	2.590×10^{10}
Square miles	Square feet	2.788×10^{7}
Square miles	Square inches	4.015×10^{9}
Square miles	Square kilometers	2.590
Square miles	Square meters	2.590×10^{6}
Square miles	Square yards	3.098×10^{6}
Square millimeters	Circular mils	1973
Square millimeters	Square centimeters	0.01
Square millimeters	Square feet	1.076×10^{-5}
Square millimeters	Square inches	1.550×10^{-3}
Square millimeters	Square kilometers	10^{-12}
Square millimeters	Square meters	10^{-6}
Square millimeters	Square miles	3.861×10^{-13}
Square millimeters	Square yards	1.196×10^{-6}
Square rods	Acres	0.00625
Square rods	Square feet	272.25
Square rods	Square inches	39204
Square rods	Square meters	25.293
Square rods	Square miles	9.766×10^{-6}
Square rods	Square yards	30.25
Square yards	Acres	2.066×10^{-4}
Square yards	Square centimeters	8361
Square yards	Square feet	9
Square yards	Square inches	1296
Square yards	Square kilometers	8.361×10^{-7}
Square yards	Square meters	0.8361
Square yards	Square miles	3.228×10^{-7}
Square yards	Square millimeters	8.361×10^{-5}
Statamperes	Abamperes	3.335×10^{-11}
Statamperes	Amperes	3.335×10^{-10}
Statcoulombs	Abcoulombs	3.335×10^{-11}
Statcoulombs	Ampere-hours	9.259×10^{-14}
Statcoulombs	Coulombs	3.335×10^{-10}
Statcoulombs	Faradays	3.457×10^{-15}
Statfarads (or centimeters)	Abfarads	1.112×10^{-21}
Statfarads	Farads	1.112×10^{-12}
Statfarads	Microfarads	1.112×10^{-6}
Stathenrys	Abhenrys	8.988×10^{20}
Stathenrys	Henrys	8.988×10^{11}
Stathenrys	Microhenrys	8.988×10^{17}
Stathenrys	Millihenrys	8.988×10^{14}
Statohms	Abohms	8.988×10^{20}
Statohms	Megohms	8.988×10^{5}
Statohms	Microhms	8.988×10^{17}
Statohms	Ohms	8.988×10^{11}
Statvolts	Abvolts	2.998×10^{10}
Statvolts	Microvolts	2.998×10^{8}
Statvolts	Millivolts	2.998×10^{5}
Statvolts	Volts	299.8
Steradians	Hemispheres	0.1592
Steradians	Spheres	7.958×10^{-2}
Steradians	Spherical right angles	0.6366
Steres	Cubic meters	1
Steres	Liters	999.973
Tons (long)	Grams	1.016×10^{6}
Tons (long)	Kilograms	1016
Tons (long)	Milligrams	1.016×10^{9}
Tons (long)	Ounces (avoirdupois)	3.584×10^{4}
Tons (long)	Pounds (avoirdupois)	2240
Tons (long)	Tons (metric)	1.016
Tons (long)	Tons (short)	1.120
Tons (metric)	Grams	10^{6}
Tons (metric)	Kilograms	1000
Tons (metric)	Milligrams	10^{9}
Tons (metric)	Ounces (avoirdupois)	3.527×10^{4}
Tons (metric)	Pounds (avoirdupois)	2205
Tons (metric)	Tons (long)	0.9842
Tons (metric)	Tons (short)	1.102
Tons (short)	Grams	9.072×10^{5}
Tons (short)	Kilograms	907.2
Tons (short)	Milligrams	9.072×10^{8}
Tons (short)	Ounces (avoirdupois)	3.2×10^{4}
Tons (short)	Pounds (avoirdupois)	2000

TECHNICAL DATA & INFORMATION

CONVERSION TABLES

To convert from	To	Multiply by
Tons (short)	Tons (long)	0.8929
Tons (short)	Tons (metric)	0.9072
Volts	Abvolts	10^8
Volts	Microvolts	10^6
Volts	Millivolts	1000
Volts	Statvolts	3.335×10^{-3}
Watts	Horsepower	0.0013410
Watts	Kilowatts	0.001
Yards	Centimeters	91.44

To convert from	To	Multiply by
Yards	Feet	3
Yards	Inches	36
Yards	Kilometers	9.144×10^{-4}
Yards	Meters	0.9144
Yards	Miles	5.682×10^{-4}
Yards	Miles (nautical)	4.934×10^{-4}
Yards	Millimeters	914.4
Yards	Mils	3.6×10^4

TECHNICAL DATA & INFORMATION

TUBE LETTER SYMBOLS

A_{hf} . . . . . High frequency gain
A_{lf} . . . . . Low frequency gain
A_v . . . . . Voltage gain
C_c . . . . . Coupling capacitor
C_d . . . . . Distributed capacitance
C_{gk} . . . . Grid-to-cathode capacitance
C_{gp} . . . . Grid-to-plate capacitance
C_i . . . . . Input capacitance
C_k . . . . . Cathode bypass capacitor
C_o . . . . . Output capacitance
C_{pk} . . . . Plate-to-cathode capacitance
C_s . . . . . Shunt capacitance ($C_d + C_i + C_o$)
E_b . . . . . Plate volts (dc)
E_{bb} . . . . Supply volts (dc)
E_{bo} . . . . Quiescent plate voltage
E_{c1} . . . . Control grid voltage
E_{c2} . . . . Screen grid voltage
E_{cc} . . . . Control grid supply voltage
E_f . . . . . Filament terminal voltage
e_b . . . . . Instantaneous total plate volts (ac and dc)
e_{c1} . . . . . Instantaneous total control grid volts (ac and dc)
e_{c2} . . . . . Instantaneous total screen grid volts (ac and dc)
e_{g1} . . . . . Instantaneous value of ac control grid volts
e_{g2} . . . . . Instantaneous value of ac screen grid volts
e_{po} . . . . . Instantaneous value of plate voltage above and below the quiescent value
E_g . . . . . RMS value of grid volts
E_p . . . . . RMS value of plate volts
gm . . . . . Grid-plate transconductance (mutual conductance)
I_b . . . . . DC value of plate volts
I_{bo} . . . . Quiescent value of plate current
I_{c1} . . . . DC value of control grid current
I_{c2} . . . . DC value of screen grid current
I_f . . . . . Filament or heater current
I_{g1} . . . . RMS value of control grid current
I_{g2} . . . . RMS value of screen grid current
I_{gm1} . . Crest values of ac current control grid
I_{gm2} . . Crest values of ac current screen grid
I_p . . . . . RMS values of plate current
I_{pm} . . . Crest value of plate current
I_s . . . . . Total electron emission
i_b . . . . . Instantaneous total value of plate current
i_{c1} . . . . Instantaneous total value of control grid current
i_{c2} . . . . Instantaneous total value of screen grid current
i_{g1} . . . . Instantaneous ac value of control grid current
i_{g2} . . . . Instantaneous ac value of screen grid current
i_p . . . . . Instantaneous ac value of plate current
i_{po} . . . . Instantaneous values of plate current above and below the quiescent value
R_b . . . . DC plate resistance
R_g . . . . DC grid resistance
R_k . . . . DC cathode resistance
RL . . . . Plate load resistance
r_p . . . . AC plate resistance
μ . . . . . Amplification factor

TECHNICAL DATA & INFORMATION

SEMICONDUCTOR LETTER SYMBOLS

SIGNAL AND RECTIFIER DIODES

PRV — Peak Reverse Voltage
I_o — Average Rectifier Forward Current
I_r — Average Reverse Current
I_{surge} — Peak Surge Current
V_F — Average Forward Voltage Drop
V_R — D.c. Blocking Voltage

ZENER DIODES

I_F — Forward current
I_Z — Zener current
I_{ZK} — Zener current near breakdown knee
I_{ZM} — Maximum D.c. zener current (limited by power dissipation)
I_{ZT} — Zener test current
V_f — Forward voltage
V_Z — Nominal zener voltage
Z_Z — Zener impedance
Z_{ZK} — Zener impedance near breakdown knee
Z_{ZT} — Zener impedance at zener test current

I_R — Reverse current
V_R — Reverse test voltage

THYRISTORS AND SCRs

I_f — Forward current, r.m.s. value of forward anode current during the "on" state.
$I_{FM(pulse)}$ — Repetitive pulse current. Repetitive peak forward anode current after application of gate signal for specified pulse conditions.
$I_{FM(surge)}$ — Peak forward surge current. The maximum forward current having a single forward cycle in a 60 Hz single-phase resistive load system.
I_{FOM} — Peak forward blocking current, gate open. The maximum current through the thyristor when the device is in the "off" state for a stated anode-to-cathode voltage (anode positive) and junction temperature with the gate open.
I_{FXM} — Peak forward blocking current. Same as I_{FOM} except that the gate terminal is returned to the cathode through a stated impedance and/or bias voltage.
I_{GFM} — Peak forward gate current. The maximum instantaneous value of current which may flow between gate and cathode.
I_{GT} — Gate trigger current (continuous d.c.). The minimum d.c. gate current required to cause switching from the "off" state at a stated condition.
I_{HO} — Holding current. That value of forward anode current below which the controlled rectifier switches from the conducting state to the forward blocking condition with the gate open, at stated conditions.
I_{HX} — Holding current (gate connected). The value of forward anode current below which the controlled rectifier switches from the conducting state to the forward blocking condition with the gate terminal returned to the cathode terminal through specified impedance and/or bias voltage.
$P_{F(AV)}$ — Average forward power. Average value of power dissipation between anode and cathode.
P_{GFM} — Peak gate power. The maximum instantaneous value of gate power dissipation permitted.
I_{ROM} — Peak reverse blocking current. The maximum current through the thyristor when the device is in the reverse blocking state (anode negative) for a stated anode-to-cathode voltage and junction temperature with the gate open.

SEMICONDUCTOR LETTER SYMBOLS

I_{RXM}	Peak reverse blocking current. Same as I_{ROM} except that the gate terminal is returned to the cathode through a stated impedance and/or bias voltage.
$P_{GF(AV)}$	Average forward gate power. The value of maximum allowable gate power dissipation averaged over a full cycle.
V_F	Forward "on" voltage. The voltage measured between anode and cathode during the "on" condition for specified conditions of anode and temperature.
$V_{F(on)}$	Dynamic forward "on" voltage. The voltage measured between anode and cathode at a specified time after turn-on function has been initiated at stated conditions.
V_{FOM}	Peak forward blocking voltage, gate open. The peak repetitive forward voltage which may be applied to the thyristor between anode and cathode (anode positive) with the gate open at stated conditions.
V_{FXM}	Peak forward blocking voltage. Same as V_{FOM} except that the gate terminal is returned to the cathode through a stated impedance and/or voltage.
V_{GFM}	Peak forward gate voltage. The maximum instantaneous voltage between the gate terminal and the cathode terminal resulting from the flow of forward gate current.
V_{GRM}	Peak reverse gate voltage. The maximum instantaneous voltage which may be applied between the gate terminal and the cathode terminal when the junction between the gate region and the adjacent cathode region is reverse biased.
V_{GT}	Gate trigger voltage (continuous d.c.). The d.c. voltage between the gate and the cathode required to produce the d.c. gate trigger current.
$V_{ROM(rep)}$	Peak reverse blocking voltage, gate open. The maximum allowable value of reverse voltage (repetitive or continuous d.c.) which can be applied between anode and cathode (anode negative) with the gate open for stated conditions.
V_{RXM}	Peak reverse blocking voltage. Same as V_{ROM} except that the gate terminal is returned to the cathode through a stated impedance and/or bias voltage.

TRANSISTORS

A_G	Available gain
A_P	Power gain
A_I	Current gain
B or b	Base electrode
BV_{BCO}	D.c. base-to-collector breakdown voltage, base reverse-biased with respect to collector, emitter open.
BV_{BEO}	D.c. base-to-emitter breakdown voltage, base reverse-biased with respect to emitter, collector open.
BV_{CBO}	D.c. collector-to-base breakdown voltage, collector reverse-biased with respect to base, emitter open.
BV_{CEO}	D.c. collector-to-emitter breakdown voltage, collector reverse-biased with respect to emitter, base open.
BV_{EBO}	D.c. emitter-to-base breakdown voltage, emitter reverse-biased with respect to base, collector open.
BV_{ECO}	D.c. emitter-to-collector breakdown voltage, emitter reverse-biased with respect to collector, base open.
C or c	Collector electrode
C_c	Collector junction capacitance
C_e	Emitter junction capacitance
C_{ib}, C_{ic} C_{ie}	Input capacitance for common base, collector, and emitter, respectively.
C_{ob}, C_{oc} C_{oe}	Output terminal capacitance, a.c. input open, for common base, collector and emitter, respectively.
D	Distortion
E or e	Emitter electrode
$f_{\alpha b}$, $f_{\alpha c}$, $f_{\alpha e}$	Alpha cutoff frequency for common base, collector, and emitter, respectively.
f_{co}	Cutoff frequency
f_{max}	Maximum frequency of oscillation
GC (CB), GC (CC), GE (CE)	Grounded (or common) base, collector, and emitter, respectively.
G_b, G_c, G_e	Power gain for common base, collector, and emitter, respectively.
h	Hybrid parameter
h_{fe}, h_{fb}, h_{fc}	Small signal forward current transfer ratio, a.c. output shorted, common emitter, common base, common collector, respectively.
h_{ib}	Small-signal input impedance, a.c. output shorted, common base.
h_{ob}	Small-signal output admittance, a.c. input open, common base.
I	Direct current (d.c.).
I_B, I_C I_E	D.c. current for base, collector, and emitter, respectively.
I_{CBO}	D.c. collector current, collector reverse-biased with respect to base, emitter-to-base open.
I_{CES}	D.c. collector current, collector reverse-biased with respect to emitter, base shorted to emitter.
I_{EBO}	D.c. emitter current, emitter reverse-biased with respect to base, collector-to-base open.
NF	Noise Figure
P_D	Total average power dissipation of all electrodes of a semiconductor device.
P_G	Power gain
P_{Go}	Over-all power gain
P_{in}	Input power
P_{out}	Output power
r'b	Equivalent base resistance, high frequencies
T_j	Junction temperature
T_{stg}	Storage temperature
t_f	Fall time, from 90 percent to 10 percent of pulse (switching applications).
t_r	Rise time, from 10 percent to 90 percent pulse (switching applications).
t_s	Storage time (switching applications).
V_{BE}	Base-to-emitter d.c. voltage
V_{CE}	Collector-to-base d.c. voltage
V_{CE}	Collector-to-emitter d.c. voltage
V_{CEO}	D.c. collector-to-emitter voltage with collector junction reverse-biased, zero base current.
V_{CER}	Similar to V_{CEO}, except with a resistor (of value R) between base and emitter.
V_{CES}	Similar to V_{CEO}, except with base shorted to emitter.
V_{CEV}	D.c. collector-to-emitter voltage, used when only voltage bias is used.
V_{CEX}	D.c. collector-to-emitter voltage, base-emitter back biased.
V_{EB}	Emitter-to-base d.c. voltage
V_{pt}	Punch-through voltage

UNIJUNCTION TRANSISTORS

I_E	Emitter current
I_{EO}	Emitter reverse current. Measured between emitter and base-two at a specified voltage, and base-one open-circuited.
I_p	Peak point emitter current. The maximum emitter current that can flow without allowing the UJT to go into the negative resistance region.
I_V	Valley point emitter. The current flowing in the emitter when the device is biased to the valley point.
r_{BB}	Interbase resistance. Resistance between base-two and base-one measured at a specified interbase voltage.
V_{B2B1}	Voltage between base-two and base-one. Positive at base-two.
V_p	Peak point emitter voltage. The maximum voltage seen at the emitter before the UJT goes into the negative resistance region.
V_D	Forward voltage drop of the emitter junction.
V_{EB1}	Emitter to base-one voltage
$V_{EB1(SAT)}$	Emitter saturation voltage. Forward voltage drop from emitter to base-one at a specified emitter current (larger than I_V) and specified interbase voltage.

SEMICONDUCTOR LETTER SYMBOLS

V_v	Valley point emitter voltage. The voltage at which the valley point occurs with a specified V_{B2B1}.
V_{OB1}	Base-one peak pulse voltage. The peak voltage measured across a resistor in series with base-one when the UJT is operated as a relaxation oscillator in a specified circuit.
α_{rBB}	Interbase resistance temperature coefficient. Variation of resistance between B2 and B1 over the specified temperature range and measured at the specific interbase voltage and temperature with emitter open circuited.
$I_{B2(mod)}$	Interbase modulation current. B2 current modulation due to firing. Measured at a specified interbase voltage, emitter and temperature.

FIELD EFFECT TRANSISTORS

I_D	Drain current
I_{DGO}	Maximum leakage from drain to gate with source open
I_{DSS}	Drain current with gate connected to source
I_G	Gate current
I_{GSS}	Maximum gate current (leakage) with drain connected to source
$V_{(BR)DGO}$	Drain to gate, source open
V_D	D.c. drain voltage
$V_{(BR)DGS}$	Drain to gate, source connected to drain
$V_{(BR)DS}$	Drain to source, gate connection not specified
$V_{(BR)DSX}$	Drain to source, gate biased to cutoff or beyond
$V_{(BR)GS}$	Gate to source, drain connection not specified
$V_{(BR)GSS}$	Gate to source, drain connected to source
$V_{(BR)GD}$	Gate to drain, source connection not specified
$V_{(BR)GDS}$	Gate to drain, source connected to drain
V_G	D.c. gate voltage
$V_{G1S(OFF)}$	Gate 1-source cutoff voltage (with gate 2 connected to source)
$V_{G2S(OFF)}$	Gate 2-source cutoff voltage (with gate 1 connected to source)
$V_{GS(OFF)}$	Cutoff

ELECTRONICS SYMBOLS

AMPLIFIER

general

with two inputs

with two outputs

with adjustable gain

with associated power supply

with associated attenuator

with external feedback path

Amplifier Letter Combinations (amplifier-use identification in symbol if required)

BDG	Bridging
BST	Booster
CMP	Compression
DC	Direct Current
EXP	Expansion
LIM	Limiting
MON	Monitoring
PGM	Program
PRE	Preliminary
PWR	Power
TRQ	Torque

ANTENNA

general

dipole

loop

counterpoise

ARRESTER, LIGHTNING

general

carbon block

electrolytic or aluminum cell

horn gap

protective gap

sphere gap

valve or film element

multigap

ATTENUATOR, FIXED (see PAD)
(same symbol as variable attenuator, without variability)

ATTENUATOR, VARIABLE

balanced

unbalanced

AUDIBLE SIGNALING DEVICE

bell, electrical; ringer, telephone

buzzer

horn, electrical; loudspeaker; siren; underwater sound hydrophone, projector or transducer

Horn, Letter Combinations (if required)

*HN	Horn, electrical
*HW	Howler
*LS	Loudspeaker
*SN	Siren
‡EM	Electromagnetic with moving coil
‡EMN	Electromagnetic with moving coil and neutralizing winding
‡MG	Magnetic armature
‡PM	Permanent magnet with moving coil

identification replaces (*) asterisk and (‡) dagger)

sounder, telegraph

BATTERY

generalized direct current source; one cell

multicell

CAPACITOR

general

polarized

adjustable or variable

continuously adjustable or variable differential

phase-shifter

split-stator

feed-through

CELL, PHOTOSENSITIVE (Semiconductor)

asymmetrical photoconductive transducer

symmetrical photoconductive transducer

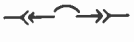
photovoltaic transducer; solar cell

CIRCUIT BREAKER

general

with magnetic overload

drawout type



CIRCUIT ELEMENT

general

Circuit Element Letter Combinations (replaces (*) asterisk)

EG	Equalizer
FAX	Facsimile set
FL	Filter
FL-BE	Filter, band elimination
FL-BP	Filter, band pass
FL-HP	Filter, high pass
FL-LP	Filter, low pass
PS	Power supply

ELECTRONICS SYMBOLS

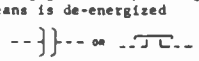
RG	Recording unit
RU	Reproducing unit
DIAL	Telephone dial
TEL	Telephone station
TPR	Teleprinter
TTY	Teletypewriter

Additional Letter Combinations (symbols preferred)

AR	Amplifier
AT	Attenuator
C	Capacitor
CB	Circuit breaker
HS	Handset
I	Indicating or switch board lamp
L	Inductor
J	Jack
LS	Loudspeaker
MIC	Microphone
OSC	Oscillator
PAD	Pad
P	Plug
HT	Receiver, headset
K	Relay
R	Resistor
S	Switch or key switch
T	Transformer
WR	Wall receptacle

CLUTCH; BRAKE

disengaged when operating means is de-energized



engaged when operating means is de-energized

COIL, RELAY and OPERATING (16)

semicircular dot indicates inner end of wiring

CONNECTOR

assembly, movable or stationary portion; jack, plug, or receptacle

jack or receptacle

plug

separable connectors

two-conductor switchboard jack

two-conductor switchboard plug

jacks normalled through one way

jacks normalled through both ways

2-conductor nonpolarized, female contacts

2-conductor polarized, male contacts

waveguide flange

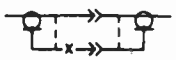
plain, rectangular

choke, rectangular

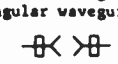
engaged 4-conductor; the plug has 1 male and 3 female contacts, individual contact designations shown

coaxial, outside conductor shown carried through

coaxial, center conductor shown carried through; outside conductor not carried through



mated choke flanges in rectangular waveguide



COUNTER, ELECTROMAGNETIC; MESSAGE REGISTER

general

with a make contact

COUPLER, DIRECTIONAL (common coaxial/waveguide usage)

(common coaxial/waveguide usage)

E-plane aperture-coupling, 30-decibel transmission loss

COUPLING

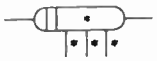
by loop from coaxial to circular waveguide, direct-current grounds connected

CRYSTAL, PIEZOELECTRIC

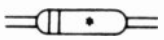
DELAY LINE

general

tapped delay



bifilar slow-wave structure (commonly used in traveling-wave tubes)



(length of delay indication replaces (*) asterisk)

DETECTOR, PRIMARY; MEASURING TRANSDUCER (see HALL GENERATOR and THERMAL CONVERTER)

DISCONTINUITY (common coaxial/waveguide usage)

equivalent series element, general

capacitive reactance

inductive reactance

inductance-capacitance circuit, infinite reactance at resonance

inductance-capacitance circuit, zero reactance at resonance

resistance

equivalent shunt element, general

capacitive susceptance

conductance

inductive susceptance

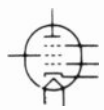
inductance-capacitance circuit, infinite susceptance at resonance

inductance-capacitance circuit, zero susceptance at resonance

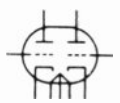
ELECTRON TUBE

triode

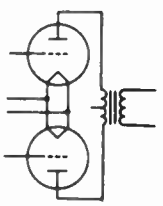
pentode, envelope connected to base terminal



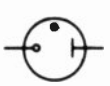
twin triode, equipotential cathode



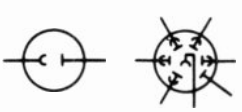
typical wiring figure to show tube symbols placed in any convenient positior



rectifier; voltage regulator (see LAMP, GLOW)



phototube, single and multiplier

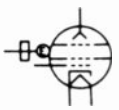


cathode-ray tube, electrostatic and magnetic deflection

mercury-pool tube, ignitor and control grid (see RECTIFIER)

resonant magnetron, coaxial output and permanent magnet

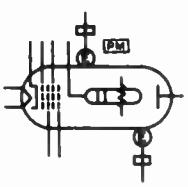
reflex klystron, integral cavity, aperture coupled



transmit-receive (TR) tube gas filled, tunable integral cavity, aperture coupled, with starter

traveling-wave tube (typical)

forward-wave traveling-wave-tube amplifier shown with four grids, having slow-wave structure with attenuation, magnetic focusing by external permanent magnet, rf input and rf output coupling each E-plane aperture to external rectangular waveguide



FERRITE DEVICES

field polarization rotator

field polarization amplitude modulator

FUSE

high-voltage primary cutout, dry

ELECTRONICS SYMBOLS

high-voltage primary cut-out, oil

GOVERNOR (Contact-making)

contacts shown here as closed

HALL GENERATOR

HANDSET

general

operator's set with push-to talk switch

HYBRID

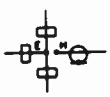
general

junction (common coaxial/waveguide usage)

circular

(E, H or HE transverse field indicators replace (*) asterisk)

rectangular waveguide and coaxial coupling



INDUCTOR

general

magnetic core

tapped

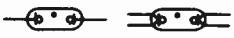
adjustable, continuously adjustable

KEY, TELEGRAPH

LAMP

ballast lamp; ballast tube

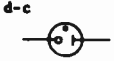
lamp, fluorescent, 2 and 4 terminal



lamp, glow; neon lamp

a-c

d-c



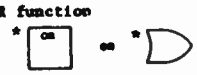
lamp, incandescent

indicating lamp; switch-board lamp (see VISUAL SIGNALING DEVICE)

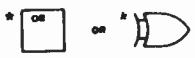
LOGIC (see 806B and Y32-14) (including some duplicate symbols; left and right-hand symbols are not mixed)

AND function

OR function



EXCLUSIVE-OR function



((*) input side of logic symbols in general)

condition indicators

state (logic negation)

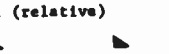
a Logic Negation output becomes 1-state if and only if the input is not 1-state

an AND func. where output is low if and only if all inputs are high

electric inverter

(elec. invtr. output becomes 1-state if and only if the input is 1-state) (elec. invtr. output is more pos. if and only if input is less pos.)

level (relative)



1-state is less +

1-state is more +

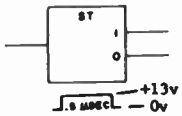
(symbol is a rt. triangle pointing in direction of flow)

an AND func. with input 1-states at more pos. level and output 1-state at less pos. level

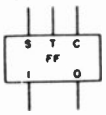
single shot (one output)

(waveform data replaces inside/outside (*))

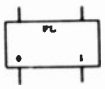
schmitt trigger, waveform and two outputs



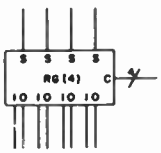
flip-flop, complementary



flip-flop, latch



register



(binary register denoting four flip-flops and bits)

amplifier (see AMPLIFIER)

channel path(s) (see PATH, TRANSMISSION)

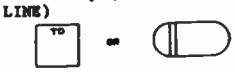
magnetic heads (see PICK-UP HEAD)

oscillator (see OSCIL-LATOR)

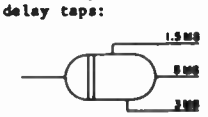
relay, contacts (see CONTACT, ELECTRICAL) relay, electromagnetic (see RELAY COIL RECOG-NITION)

signal flow (see DIREC-TION OF FLOW)

time delay (see DELAY LINE)



time delay with typical delay taps:



functions not otherwise symbolized

(identification replaces (*))

Logic Letter Combinations

S	set
C	clear (reset)
T	toggle (trigger)
(N)	number of bits
BO	blocking oscillator
CF	cathode follower
EF	emitter follower
FF	flip-flop
SS	single shot
ST	schmitt trigger
RG(N)	register (N stages)
SR	shift register

MACHINE, ROTATING

generator

motor

METER, INSTRUMENT

identification replaces (*) asterisk)

Meter Letter Combinations

A	Ammeter
AH	Ampere-hour
CMA	Contact-making (or breaking) ammeter
CMC	Contact-making (or breaking) clock
CMV	Contact-making (or breaking) voltmeter
CRO	Oscilloscope or cathode-ray oscil-lograph
DB	DB (decibel) meter
DBM	DBM (decibels re-ferred to 1 milli-watt) meter
DM	Demand meter
DTR	Demand-totalizing relay
F	Frequency meter
G	Galvanometer
GD	Ground detector
I	Indicating
INT	Integrating
μA or UA	Microammeter
MA	Milliammeter
NM	Noise meter
OHM	Ohmmeter
OP	Oil pressure

MODE TRANSDUCER

(common coaxial/waveguide usage)

transducer from rectangu-ler waveguide to coaxial with mode suppression, direct-current grounds connected

MOTION, MECHANICAL

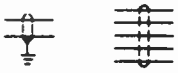
rotation applied to a resistor

(identification replaces (*) asterisk)

NUCLEAR-RADIATION DE-TECTOR, gas filled; IONIZATION CHAMBER; PROPORTIONAL COUNTER TUBE; GEIGER-MULLER COUNTER TUBE (50) (see RADIATION-SENSITIVITY INDICATOR)

PATH, TRANSMISSION

cable; 2-conductor, shield grounded and 5-conductor shielded



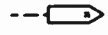
PICKUP HEAD

general

writing; recording

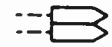
reading; playback

erasing



writing, reading, and erasing

stereo



RECTIFIER

semiconductor diode; metallic rectifier; electrolytic rectifier; asymmetrical varistor

mercury-pool tube power rectifier

fullwave bridge-type

RESISTOR

general

ELECTRONICS SYMBOLS

tapped

heating

symmetrical varistor resistor, voltage sensitive (silicon carbide, etc.)

(identification marks replace (*) asterisk)

with adjustable contact

adjustable or continuously adjustable (variable)

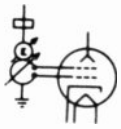
(identification replaces (*) asterisk)

RESONATOR, TUNED CAVITY

(common coaxial/waveguide usage)

resonator with mode suppression coupled by an E-plane aperture to a guided transmission path and by a loop to a coaxial path

tunable resonator with direct-current ground connected to an electron device and adjustably coupled by an E-plane aperture to a rectangular waveguide



ROTARY JOINT, RF (COUPLER) (72)

general; with rectangular waveguide

(transmission path recognition symbol replaces (*) asterisk)

coaxial type in rectangular waveguide

circular waveguide type in rectangular waveguide

SEMICONDUCTOR DEVICE (Two Terminal, diode)

semiconductor diode; rectifier

capacitive diode (also Varicap, Varactor, reactance diode, parametric diode)

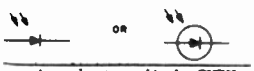
breakdown diode, unidirectional (also backward diode, avalanche diode, voltage regulator diode, Zener diode, voltage reference diode)

breakdown diode, bidirectional and backward diode (also bipolar voltage limiter)

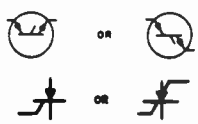
tunnel diode (also Esaki diode)

temperature-dependent diode

photodiode (also solar cell)



semiconductor diode, PNPN switch (also Shockley diode, four-layer diode and **SCR**).



(Multi-Terminal, transistor, etc.)

PNP transistor

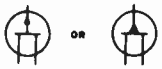
NPN transistor

unijunction transistor, N-type base

unijunction transistor, P-type base

field-effect transistor, N-type base

field-effect transistor, P-type base



semiconductor triode, PNPN-type switch

semiconductor triode, NPNP-type switch

NPN transistor, transverse-biased base

PNIP transistor, ohmic connection to the intrinsic region

NPIN transistor, ohmic connection to the intrinsic region

PNIN transistor, ohmic connection to the intrinsic region

NPIP transistor, ohmic connection to the intrinsic region

SQUIB

explosive

igniter

sensing link; fusible link operated

SWITCH

push button, circuit closing (make)

push button, circuit opening (break)

nonlocking; momentary circuit closing (make)

nonlocking; momentary circuit opening (break)

transfer

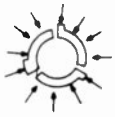
locking, circuit closing (make)

locking, circuit opening (break)

transfer, 3-position

wafer

(example shown: 3-pole 3-circuit with 2 non-shorting and 1 shorting moving contacts)



safety interlock, circuit opening and closing

2-pole field-discharge knife, with terminals and discharge resistor

(identification replaces (*) asterisk)

SYNCHRO

Synchro Letter Combinations

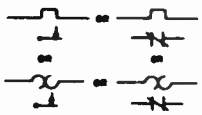
CDX	Control-differential transmitter
CT	Control transformer
CX	Control transmitter
TDR	Torque-differential receiver
TDX	Torque-differential transmitter
TR	Torque receiver
TX	Torque transmitter
RS	Resolver
B	Outer winding rotatable in bearings

THERMAL ELEMENT

actuating device

thermal cutout; flasher

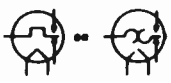
thermal relay



thermostat (operates on rising temperature), contact)

thermostat, make contact

thermostat, integral heater and transfer contacts



THERMISTOR; THERMAL RESISTOR

with integral heater

THERMOCOUPLE

temperature-measuring

current-measuring, integral heater connected

current-measuring, integral heater insulated

temperature-measuring, semiconductor

current-measuring, semiconductor

TRANSFORMER

general

magnetic-core

ELECTRONICS SYMBOLS

one winding with adjustable inductance

separately adjustable inductance

adjustable mutual inductor, constant-current

autotransformer, 1-phase adjustable

current, with polarity marking

potential, with polarity mark

with direct-current connections and mode suppression between two rectangular waveguides

(common coaxial/waveguide usage)

shielded, with magnetic core

with a shield between windings, connected to the frame

VIBRATOR; INTERRUPTER

typical shunt drive (terminals shown)

typical separate drive (terminals shown)

VISUAL SIGNALING DEVICE

communication switchboard-type lamp

indicating, pilot, signaling, or switchboard light (see LAMP)

(identification replaces (*) asterisk)

indicating light letter combinations

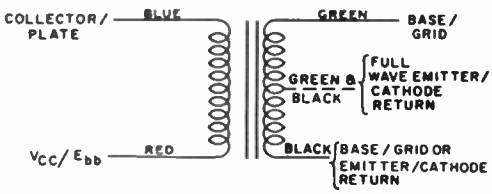
A	Amber
B	Blue
C	Clear
G	Green
NE	Neon
O	Orange
OP	Opalescent
P	Purple
R	Red
W	White
Y	Yellow

jeweled signal light

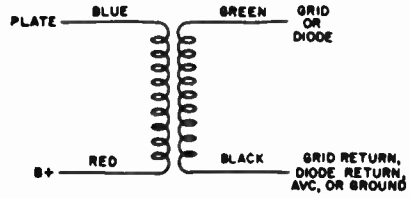
NOTES:

COLOR CODE FOR TRANSFORMERS

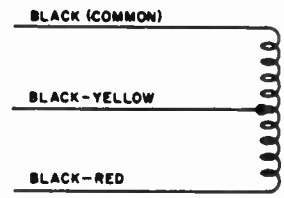
AF Transformers



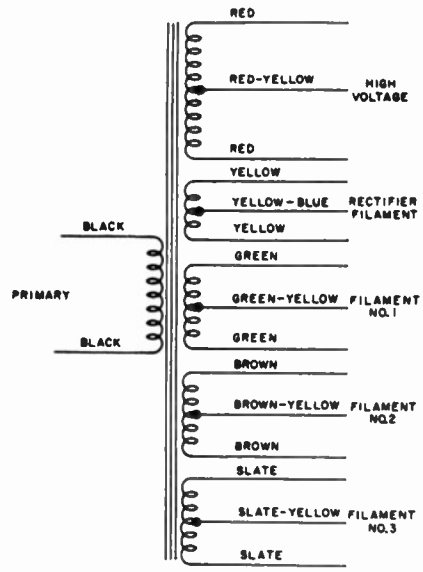
IF Transformers



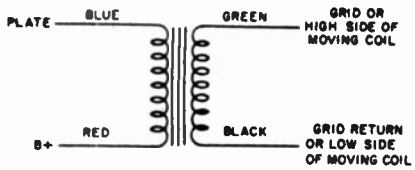
Power Transformers



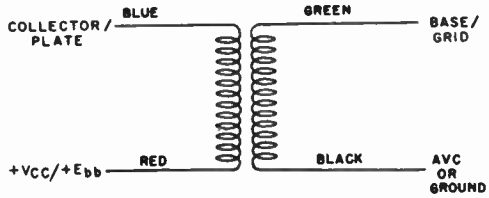
TAPPED PRIMARY



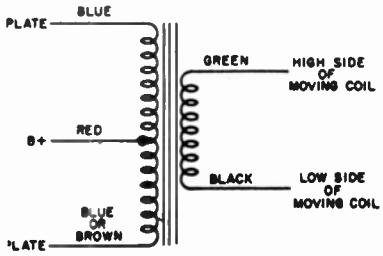
INTERSTAGE AUDIO TRANSFORMERS



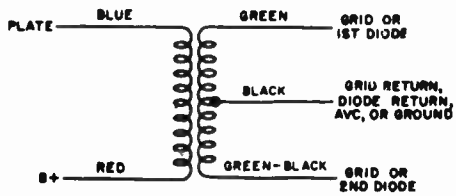
SINGLE PLATE TO SINGLE GRID OR SPEAKER MOVING COIL

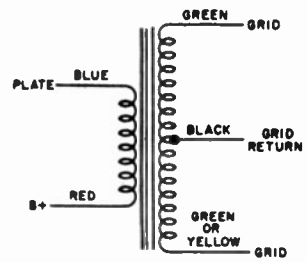


IF TRANSFORMERS.

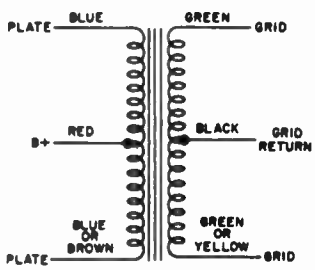


PUSH-PULL PLATES TO SPEAKER MOVING COIL





SINGLE PLATE TO PUSH-PULL GRIDS

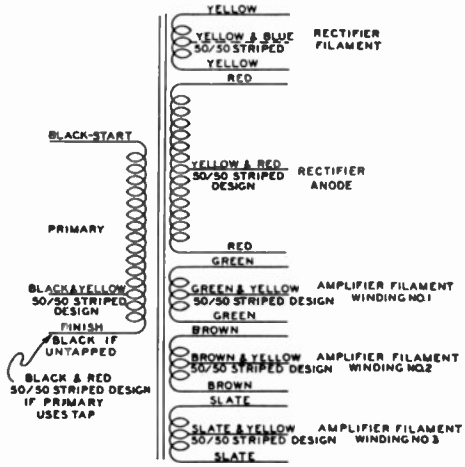


PUSH-PULL PLATES TO PUSH-PULL GRIDS

STANDARD COLORS USED IN CHASSIS WIRING FOR THE PURPOSE OF CIRCUIT IDENTIFICATION OF THE EQUIPMENT ARE AS FOLLOWS:

CIRCUIT	COLOR
GROUNDS, GROUNDED ELEMENTS, AND RETURNS	BLACK.
HEATERS OR FILAMENTS, OFF GROUND	BROWN.
POWER SUPPLY +Vcc/+Ebb	RED.
SCREEN GRIDS	ORANGE.
EMITTERS/CATHODES	YELLOW.
BASES/CONTROL GRIDS	GREEN.
COLLECTORS/ PLATES	BLUE.
POWER SUPPLY, MINUS	VIOLET (PURPLE).
A.C. POWER LINES	GRAY.
MISCELLANEOUS, ABOVE OR BELOW GROUND RETURNS, AVC, ETC.	WHITE.

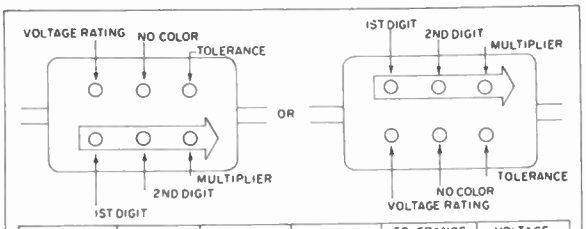
FOR OTHER ELECTRICAL AND ELECTRONIC SYMBOLS REFER TO MILITARY STANDARD, MIL-STD-15-1A



POWER TRANSFORMERS.

ELECTRONICS COLOR CODING

5-Dot Color Code For Capacitors (dielectric not specified)

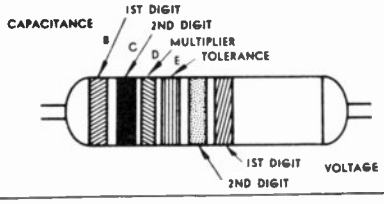


COLOR	1 ST DIGIT	2ND DIGIT	MULTIPLIER	TOLERANCE (PERCENT)	VOLTAGE RATING
BLACK	0	0	1.0		
BROWN	1	1	10	± 1	100
RED	2	2	100	± 2	200
ORANGE	3	3	1,000	± 3	300
YELLOW	4	4	10,000	± 4	400
GREEN	5	5	100,000	± 5	500
BLUE	6	6	1,000,000	± 6	600
VIOLET	7	7	10,000,000	± 7	700
GRAY	8	8	100,000,000	± 8	800
WHITE	9	9	1,000,000,000	± 9	900
GOLD			1		1000
SILVER			01	±10	2000
BODY				±20	*

* WHERE NO COLOR IS INDICATED, THE VOLTAGE RATING MAY BE AS LOW AS 300 VOLTS.

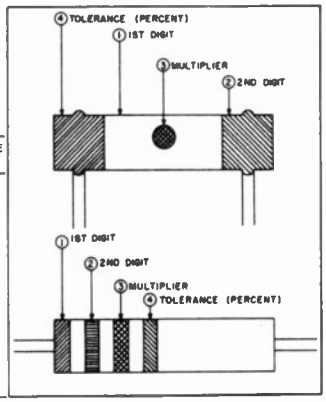
6-Band Color Code For Tubular Paper Dielectric Capacitors

COLOR	CAPACITANCE 1ST DIGIT	CAPACITANCE 2ND DIGIT	CAPACITANCE MULTIPLIER	TOLERANCE (PERCENT)	VOLTAGE RATING 1ST DIGIT	VOLTAGE RATING 2ND DIGIT
BLACK	0	0	1	±20	0	0
BROWN	1	1	10		1	1
RED	2	2	100		2	2
ORANGE	3	3	1,000	±30	3	3
YELLOW	4	4	10,000	±40	4	4
GREEN	5	5	100,000	± 5	5	5
BLUE	6	6	1,000,000		6	6
VIOLET	7	7			7	7
GRAY	8	8			8	8
WHITE	9	9		±10	9	9

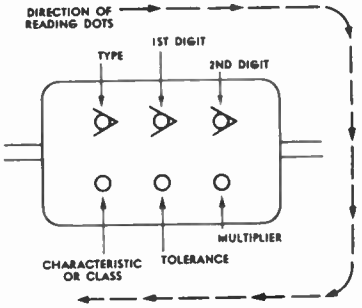


EIA Standard Resistor Color Code (marking system)

COLOR	1ST DIGIT	2ND DIGIT	MULTIPLIER	TOLERANCE (percent)
Black	0	0	1	
Brown	1	1	10	
Red	2	2	100	
Orange	3	3	1,000	
Yellow	4	4	10,000	
Green	5	5	100,000	
Blue	6	6	1,000,000	
Violet	7	7	10,000,000	
Gray	8	8	100,000,000	
White	9	9	1,000,000,000	
Gold			.1	5
Silver			.01	10
No color				20

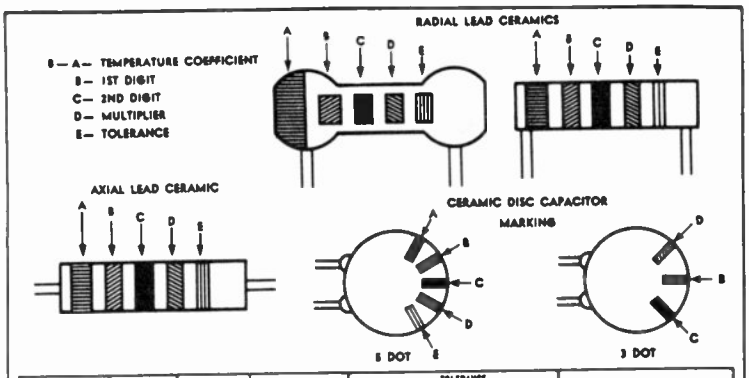


6-Dot Color Code For Mica and Molded Paper Capacitors



TYPE	COLOR	1ST DIGIT	2ND DIGIT	MULTIPLIER	TOLERANCE (PERCENT)	CHARACTERISTIC OR CLASS
JAN. MICA	BLACK	0	0	1.0		APPLIES TO
	BROWN	1	1	10	± 1	TEMPERATURE
	RED	2	2	100	± 2	COEFFICIENT
	ORANGE	3	3	1,000	± 3	OR METHODS
	YELLOW	4	4	10,000	± 4	OF TESTING
	GREEN	5	5	100,000	± 5	
	BLUE	6	6	1,000,000	± 6	
	VIOLET	7	7	10,000,000	± 7	
	GRAY	8	8	100,000,000	± 8	
EIA. MICA	WHITE	9	9	1,000,000,000	± 9	
	GOLD			.1		
MOLDED PAPER	SILVER			.01	±10	
	BODY				±20	

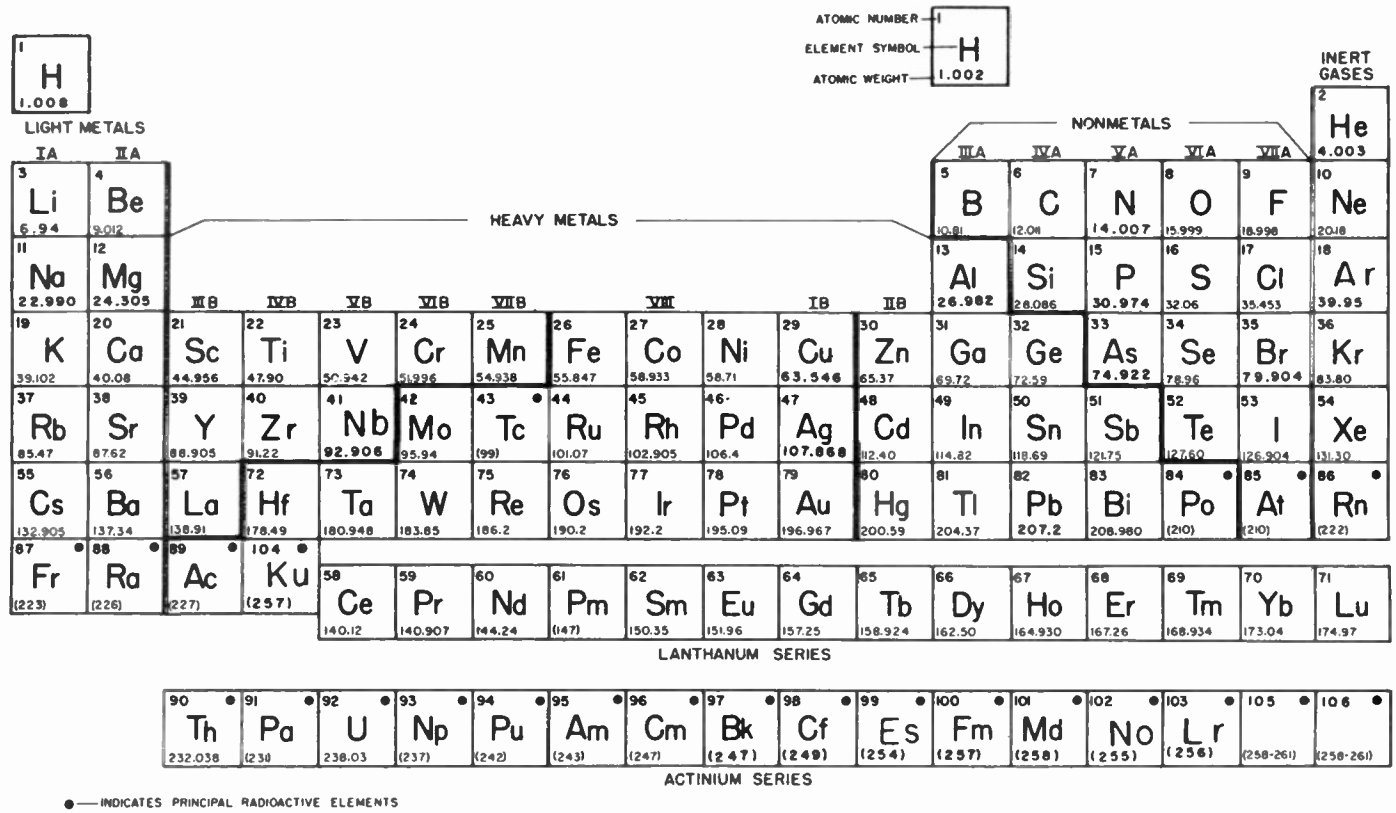
Color Code For Ceramic Capacitors Having Different Configurations



COLOR	1ST DIGIT	2ND DIGIT	MULTIPLIER	TOLERANCE MORE THAN 10 pF (IN PERCENT)	TOLERANCE LESS THAN 10 pF (IN pF)	TEMPERATURE COEFFICIENT *
BLACK	0	0	1.0	±20	±2.0	0
BROWN	1	1	10	± 1		— 30
RED	2	2	100	± 2		— 80
ORANGE	3	3	1,000			— 150
YELLOW	4	4	10,000			— 220
GREEN	5	5		± 5	±0.5	— 330
BLUE	6	6				— 470
VIOLET	7	7				— 750
GRAY	8	8	.01		±0.25	+ 30
WHITE	9	9	.1	±10	±1.0	+ 120 TO — 750 (EIA)
						+ 200 TO — 330 (JAN)
SILVER						+ 100 (JAN)
GOLD						BYPASS OR COUPLING (EIA)

* PARTS PER MILLION PER DEGREE CENTIGRADE.

PERIODIC TABLE OF THE ELEMENTS



Symbol	Name	Atomic Number	Atomic Weight
Ac	Actinium	89	1(227)
Ag	Silver	47	107.868
Al	Aluminum	13	26.982
Am	Americium	95	(243)
Ar	Argon	18	39.95
As	Arsenic	33	74.922
At	Astatine	85	(210)
Au	Gold	79	196.967
B	Boron	5	10.81
Ba	Barium	56	137.34
Be	Beryllium	4	9.012
Bi	Bismuth	83	208.980
Bk	Berkelium	97	(247)
Br	Bromine	35	79.904
C	Carbon	6	12.011
Ca	Calcium	20	40.08
Cd	Cadmium	48	112.40
Ce	Cerium	58	140.12
Cf	Californium	98	(249)
Cl	Chlorine	17	35.453
Cm	Curium	96	(247)
Co	Cobalt	27	58.933
Cr	Chromium	24	51.996
Cs	Cesium	55	132.905
Cu	Copper	29	63.546
Dy	Dysprosium	66	162.50
Es	Einsteinium	99	(254)
Er	Erbium	68	167.26
Eu	Europium	63	151.96
F	Fluorine	9	18.998
Fe	Iron	26	55.847
Fm	Fermium	100	(257)
Fr	Francium	87	(223)
Ga	Gallium	31	69.72
Gd	Gadolinium	64	157.25
Ge	Germanium	32	72.59
H	Hydrogen	1	1.008
He	Helium	2	4.003
Hf	Hafnium	72	178.49
Hg	Mercury	80	200.59
Ho	Holmium	67	164.930
I	Iodine	53	126.904
In	Indium	49	114.82
Ir	Iridium	77	192.2
K	Potassium	19	39.102
Kr	Krypton	36	83.80
*Ku	Kurchatovium	104	(257)
La	Lanthanum	57	138.91
Li	Lithium	3	6.94
Lr	Lawrencium	103	(256)
Lu	Lutetium	71	174.97
Md	Mendelevium	101	(258)
Mg	Magnesium	12	24.305
Mn	Manganese	25	54.938
Mo	Molybdenum	42	95.94
N	Nitrogen	7	14.007
Na	Sodium	11	22.990
Nb	Niobium	41	92.906
Nd	Neodymium	60	144.24
Ne	Neon	10	20.18
Ni	Nickel	28	58.71
No	Nobelium	102	(255)
Np	Neptunium	93	(237)
O	Oxygen	8	15.999
Os	Osmium	76	190.2
P	Phosphorus	15	30.974
Pa	Protactinium	91	(231)
Pb	Lead	82	207.2
Pd	Palladium	46	106.4
Pm	Promethium	61	(147)
Po	Polonium	84	(210)
Pr	Praseodymium	59	140.907
Pt	Platinum	78	195.09
Pu	Plutonium	94	(242)
Ra	Radium	88	(226)
Rb	Rubidium	37	85.47
Re	Rhenium	75	186.2
Rh	Rhodium	45	102.905
Rn	Radon	86	(222)
Ru	Ruthenium	44	101.07
S	Sulfur	16	32.06
Sb	Antimony	51	121.75
Sc	Scandium	21	44.956
Se	Selenium	34	78.96
Si	Silicon	14	28.086
Sm	Samarium	62	150.35
Sn	Tin	50	118.69
Sr	Strontium	38	87.62
Ta	Tantalum	73	180.948
Tb	Terbium	65	158.924
Tc	Technetium	43	(99)
Te	Tellurium	52	127.60
Th	Thorium	90	232.038
Ti	Titanium	22	47.90
Tl	Thallium	81	204.37
Tm	Thulium	69	158.934
U	Uranium	92	238.03
V	Vanadium	23	50.942
W	Tungsten	74	183.85
Xe	Xenon	54	131.30
Y	Yttrium	39	88.905
Yb	Ytterbium	70	173.04
Zn	Zinc	30	65.37
Zr	Zirconium	40	91.22

* Note: Element proposed but not confirmed.

TABLE OF LOGARITHMS

N	0	1	2	3	4	5	6	7	8	9
0	....	0000	3010	4771	6021	6990	7782	8451	9031	9542
1	0000	0414	0792	1139	1461	1761	2041	2304	2553	2788
2	3010	3222	3424	3617	3802	3979	4150	4314	4472	4624
3	4771	4914	5051	5185	5315	5441	5563	5682	5798	5911
4	6021	6128	6232	6335	6435	6532	6628	6721	6812	6902
5	6990	7076	7160	7243	7324	7404	7482	7559	7634	7709
6	7782	7853	7924	7993	8062	8129	8195	8261	8325	8388
7	8451	8513	8573	8633	8692	8751	8808	8865	8921	8976
8	9031	9085	9138	9191	9243	9294	9345	9395	9445	9494
9	9542	9590	9638	9685	9731	9777	9823	9868	9912	9956
10	0000	0043	0086	0128	0170	0212	0253	0294	0334	0374
11	0414	0453	0492	0531	0569	0607	0645	0682	0719	0755
12	0792	0828	0864	0899	0934	0969	1004	1038	1072	1106
13	1139	1173	1206	1239	1271	1303	1335	1367	1399	1430
14	1461	1492	1523	1553	1584	1614	1644	1673	1703	1732
15	1761	1790	1818	1847	1875	1903	1931	1959	1987	2014
16	2041	2068	2095	2122	2148	2175	2201	2227	2253	2279
17	2304	2330	2355	2380	2405	2430	2455	2480	2504	2529
18	2553	2577	2601	2625	2648	2672	2695	2718	2742	2765
19	2788	2810	2833	2856	2878	2900	2923	2945	2967	2989
20	3010	3032	3054	3075	3096	3118	3139	3160	3181	3201
21	3222	3243	3263	3284	3304	3324	3345	3365	3385	3404
22	3424	3444	3464	3483	3502	3522	3541	3560	3579	3598
23	3617	3636	3655	3674	3692	3711	3729	3747	3766	3784
24	3802	3820	3838	3856	3874	3892	3909	3927	3945	3962
25	3979	3997	4014	4031	4048	4065	4082	4099	4116	4133
26	4150	4166	4183	4200	4216	4232	4249	4265	4281	4298
27	4314	4330	4346	4362	4378	4393	4409	4425	4440	4456
28	4472	4487	4502	4518	4533	4548	4564	4579	4594	4609
29	4624	4639	4654	4669	4683	4698	4713	4728	4742	4757
30	4771	4786	4800	4814	4829	4843	4857	4871	4886	4900
31	4914	4928	4942	4955	4969	4983	4997	5011	5024	5038
32	5051	5065	5079	5092	5105	5119	5132	5145	5159	5172
33	5185	5198	5211	5224	5237	5250	5263	5276	5289	5302
34	5315	5328	5340	5353	5366	5378	5391	5403	5416	5428
35	5441	5453	5465	5478	5490	5502	5514	5527	5539	5551
36	5563	5575	5587	5599	5611	5623	5635	5647	5658	5670
37	5682	5694	5705	5717	5729	5740	5752	5763	5775	5786
38	5798	5809	5821	5832	5843	5855	5866	5877	5888	5899
39	5911	5922	5933	5944	5955	5966	5977	5988	5999	6010
40	6021	6031	6042	6053	6064	6075	6085	6096	6107	6117
41	6128	6138	6149	6160	6170	6180	6191	6201	6212	6222
42	6232	6243	6253	6263	6274	6284	6294	6304	6314	6325
43	6335	6345	6355	6365	6375	6385	6395	6405	6415	6425
44	6435	6444	6454	6464	6474	6484	6493	6503	6513	6522
45	6532	6542	6551	6561	6571	6580	6590	6599	6609	6618
46	6628	6637	6646	6656	6665	6675	6684	6693	6702	6712
47	6721	6730	6739	6749	6758	6767	6776	6785	6794	6803
48	6812	6821	6830	6839	6848	6857	6866	6875	6884	6893
49	6902	6911	6920	6928	6937	6946	6955	6964	6972	6981
50	6990	6998	7007	7016	7024	7033	7042	7050	7059	7067
N	0	1	2	3	4	5	6	7	8	9

N	0	1	2	3	4	5	6	7	8	9
50	6990	6998	7007	7016	7024	7033	7042	7050	7059	7067
51	7076	7084	7093	7101	7110	7118	7126	7135	7143	7152
52	7160	7168	7177	7185	7193	7202	7210	7218	7226	7235
53	7243	7251	7259	7267	7275	7284	7292	7300	7308	7316
54	7324	7332	7340	7348	7356	7364	7372	7380	7388	7396
55	7404	7412	7419	7427	7435	7443	7451	7459	7466	7474
56	7482	7490	7497	7505	7513	7520	7528	7536	7543	7551
57	7559	7566	7574	7582	7589	7597	7604	7612	7619	7627
58	7634	7642	7649	7657	7664	7672	7679	7686	7694	7701
59	7709	7716	7723	7731	7738	7745	7752	7760	7767	7774
60	7782	7789	7796	7803	7810	7818	7825	7832	7839	7846
61	7853	7860	7868	7875	7882	7889	7896	7903	7910	7917
62	7924	7931	7938	7945	7952	7959	7966	7973	7980	7987
63	7993	8000	8007	8014	8021	8028	8035	8041	8048	8055
64	8062	8069	8075	8082	8089	8096	8102	8109	8116	8122
65	8129	8136	8142	8149	8156	8162	8169	8176	8182	8189
66	8195	8202	8209	8215	8222	8228	8235	8241	8248	8254
67	8261	8267	8274	8280	8287	8293	8299	8306	8312	8319
68	8325	8331	8338	8344	8351	8357	8363	8370	8376	8382
69	8388	8395	8401	8407	8414	8420	8426	8432	8439	8445
70	8451	8457	8463	8470	8476	8482	8488	8494	8500	8506
71	8513	8519	8525	8531	8537	8543	8549	8555	8561	8567
72	8573	8579	8585	8591	8597	8603	8609	8615	8621	8627
73	8633	8639	8645	8651	8657	8663	8669	8675	8681	8686
74	8692	8698	8704	8710	8716	8722	8727	8733	8739	8745
75	8751	8756	8762	8768	8774	8779	8785	8791	8797	8802
76	8808	8814	8820	8825	8831	8837	8842	8848	8854	8859
77	8865	8871	8876	8882	8887	8893	8899	8904	8910	8915
78	8921	8927	8932	8938	8943	8949	8954	8960	8965	8971
79	8976	8982	8987	8993	8998	9004	9009	9015	9020	9025
80	9031	9036	9042	9047	9053	9058	9063	9069	9074	9079
81	9085	9090	9096	9101	9106	9112	9117	9122	9128	9133
82	9138	9143	9149	9154	9159	9165	9170	9175	9180	9186
83	9191	9196	9201	9206	9212	9217	9222	9227	9232	9238
84	9243	9248	9253	9258	9263	9269	9274	9279	9284	9289
85	9294	9299	9304	9309	9315	9320	9325	9330	9335	9340
86	9345	9350	9355	9360	9365	9370	9375	9380	9385	9390
87	9395	9400	9405	9410	9415	9420	9425	9430	9435	9440
88	9445	9450	9455	9460	9465	9469	9474	9479	9484	9489
89	9494	9499	9504	9509	9513	9518	9523	9528	9533	9538
90	9542	9547	9552	9557	9562	9566	9571	9576	9581	9586
91	9590	9595	9600	9605	9609	9614	9619	9624	9628	9633
92	9638	9643	9647	9652	9657	9661	9666	9671	9675	9680
93	9685	9689	9694	9699	9703	9708	9713	9717	9722	9727
94	9731	9736	9741	9745	9750	9754	9759	9763	9768	9773
95	9777	9782	9786	9791	9795	9800	9805	9809	9814	9818
96	9823	9827	9832	9836	9841	9845	9850	9854	9859	9863
97	9868	9872	9877	9881	9886	9890	9894	9899	9903	9908
98	9912	9917	9921	9926	9930	9934	9939	9943	9948	9952
99	9956	9961	9965	9969	9974	9978	9983	9987	9991	9996
100	0000	0004	0009	0013	0017	0022	0026	0030	0035	0039
N	0	1	2	3	4	5	6	7	8	9

TABLE OF TRIGOMETRIC FUNCTIONS

deg	function	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°
0	sin	0.0000	0.0017	0.0035	0.0052	0.0070	0.0087	0.0105	0.0122	0.0140	0.0157
	cos	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9999	0.9999	0.9999
	tan	0.0000	0.0017	0.0035	0.0052	0.0070	0.0087	0.0105	0.0122	0.0140	0.0157
1	sin	0.0175	0.0192	0.0209	0.0227	0.0244	0.0262	0.0279	0.0297	0.0314	0.0332
	cos	0.9998	0.9998	0.9998	0.9997	0.9997	0.9997	0.9996	0.9996	0.9995	0.9995
	tan	0.0175	0.0192	0.0209	0.0227	0.0244	0.0262	0.0279	0.0297	0.0314	0.0332
2	sin	0.0349	0.0366	0.0384	0.0401	0.0419	0.0436	0.0454	0.0471	0.0488	0.0506
	cos	0.9994	0.9993	0.9993	0.9992	0.9991	0.9990	0.9990	0.9989	0.9988	0.9987
	tan	0.0349	0.0367	0.0384	0.0402	0.0419	0.0437	0.0454	0.0472	0.0489	0.0507
3	sin	0.0523	0.0541	0.0558	0.0576	0.0593	0.0610	0.0628	0.0645	0.0663	0.0680
	cos	0.9986	0.9985	0.9984	0.9983	0.9982	0.9981	0.9980	0.9979	0.9978	0.9977
	tan	0.0524	0.0542	0.0559	0.0577	0.0594	0.0612	0.0629	0.0647	0.0664	0.0682
4	sin	0.0698	0.0715	0.0732	0.0750	0.0767	0.0785	0.0802	0.0819	0.0837	0.0854
	cos	0.9976	0.9974	0.9973	0.9972	0.9971	0.9969	0.9968	0.9966	0.9965	0.9963
	tan	0.0699	0.0717	0.0734	0.0752	0.0769	0.0787	0.0805	0.0822	0.0840	0.0857
5	sin	0.0872	0.0889	0.0906	0.0924	0.0941	0.0958	0.0976	0.0993	0.1011	0.1028
	cos	0.9962	0.9960	0.9959	0.9957	0.9956	0.9954	0.9952	0.9951	0.9949	0.9947
	tan	0.0875	0.0892	0.0910	0.0928	0.0945	0.0963	0.0981	0.0998	0.1016	0.1033
6	sin	0.1045	0.1063	0.1080	0.1097	0.1115	0.1132	0.1149	0.1167	0.1184	0.1201
	cos	0.9945	0.9943	0.9942	0.9940	0.9938	0.9936	0.9934	0.9932	0.9930	0.9928
	tan	0.1051	0.1069	0.1086	0.1104	0.1122	0.1139	0.1157	0.1175	0.1192	0.1210
7	sin	0.1219	0.1236	0.1253	0.1271	0.1288	0.1305	0.1323	0.1340	0.1357	0.1374
	cos	0.9925	0.9923	0.9921	0.9919	0.9917	0.9914	0.9912	0.9910	0.9907	0.9905
	tan	0.1228	0.1246	0.1263	0.1281	0.1299	0.1317	0.1334	0.1352	0.1370	0.1388
8	sin	0.1392	0.1409	0.1426	0.1444	0.1461	0.1478	0.1495	0.1513	0.1530	0.1547
	cos	0.9903	0.9900	0.9898	0.9895	0.9893	0.9890	0.9888	0.9885	0.9882	0.9880
	tan	0.1405	0.1423	0.1441	0.1459	0.1477	0.1495	0.1512	0.1530	0.1548	0.1566
9	sin	0.1564	0.1582	0.1599	0.1616	0.1633	0.1650	0.1668	0.1685	0.1702	0.1719
	cos	0.9877	0.9874	0.9871	0.9869	0.9866	0.9863	0.9860	0.9857	0.9854	0.9851
	tan	0.1584	0.1602	0.1620	0.1638	0.1655	0.1673	0.1691	0.1709	0.1727	0.1745
10	sin	0.1736	0.1754	0.1771	0.1788	0.1805	0.1822	0.1840	0.1857	0.1874	0.1891
	cos	0.9848	0.9845	0.9842	0.9839	0.9836	0.9833	0.9829	0.9826	0.9823	0.9820
	tan	0.1763	0.1781	0.1799	0.1817	0.1835	0.1853	0.1871	0.1890	0.1908	0.1926
11	sin	0.1908	0.1925	0.1942	0.1959	0.1977	0.1994	0.2011	0.2028	0.2045	0.2062
	cos	0.9816	0.9813	0.9810	0.9806	0.9803	0.9799	0.9796	0.9792	0.9789	0.9785
	tan	0.1944	0.1962	0.1980	0.1998	0.2016	0.2035	0.2053	0.2071	0.2089	0.2107
12	sin	0.2079	0.2096	0.2113	0.2130	0.2147	0.2164	0.2181	0.2198	0.2215	0.2232
	cos	0.9781	0.9778	0.9774	0.9770	0.9767	0.9763	0.9759	0.9755	0.9751	0.9748
	tan	0.2126	0.2144	0.2162	0.2180	0.2199	0.2217	0.2235	0.2254	0.2272	0.2290
13	sin	0.2250	0.2267	0.2284	0.2300	0.2318	0.2334	0.2351	0.2368	0.2385	0.2402
	cos	0.9744	0.9740	0.9736	0.9732	0.9728	0.9724	0.9720	0.9715	0.9711	0.9707
	tan	0.2309	0.2327	0.2345	0.2364	0.2382	0.2401	0.2419	0.2438	0.2456	0.2475
deg	function	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°

deg	function	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°
14	sin	0.2419	0.2436	0.2453	0.2470	0.2487	0.2504	0.2521	0.2538	0.2554	0.2571
	cos	0.9703	0.9699	0.9694	0.9690	0.9686	0.9681	0.9677	0.9673	0.9668	0.9664
	tan	0.2493	0.2512	0.2530	0.2549	0.2568	0.2586	0.2605	0.2623	0.2642	0.2661
15	sin	0.2588	0.2605	0.2622	0.2639	0.2656	0.2672	0.2689	0.2706	0.2723	0.2740
	cos	0.9659	0.9655	0.9650	0.9646	0.9641	0.9636	0.9632	0.9627	0.9622	0.9617
	tan	0.2679	0.2698	0.2717	0.2736	0.2754	0.2773	0.2792	0.2811	0.2830	0.2849
16	sin	0.2756	0.2773	0.2790	0.2807	0.2823	0.2840	0.2857	0.2874	0.2890	0.2907
	cos	0.9613	0.9608	0.9603	0.9598	0.9593	0.9588	0.9583	0.9578	0.9573	0.9568
	tan	0.2867	0.2886	0.2905	0.2924	0.2943	0.2962	0.2981	0.3000	0.3019	0.3038
17	sin	0.2924	0.2940	0.2957	0.2974	0.2990	0.3007	0.3024	0.3040	0.3057	0.3074
	cos	0.9563	0.9558	0.9553	0.9548	0.9542	0.9537	0.9532	0.9527	0.9521	0.9516
	tan	0.3057	0.3076	0.3096	0.3115	0.3134	0.3153	0.3172	0.3191	0.3211	0.3230
18	sin	0.3090	0.3107	0.3123	0.3140	0.3156	0.3173	0.3190	0.3206	0.3223	0.3239
	cos	0.9511	0.9505	0.9500	0.9494	0.9489	0.9483	0.9478	0.9472	0.9466	0.9461
	tan	0.3249	0.3269	0.3288	0.3307	0.3327	0.3346	0.3365	0.3385	0.3404	0.3424
19	sin	0.3256	0.3272	0.3289	0.3305	0.3322	0.3338	0.3355	0.3371	0.3387	0.3404
	cos	0.9455	0.9449	0.9444	0.9438	0.9432	0.9426	0.9421	0.9415	0.9409	0.9403
	tan	0.3443	0.3463	0.3482	0.3502	0.3522	0.3541	0.3561	0.3581	0.3600	0.3620
20	sin	0.3420	0.3437	0.3453	0.3469	0.3486	0.3502	0.3518	0.3535	0.3551	0.3567
	cos	0.9397	0.9391	0.9385	0.9379	0.9373	0.9367	0.9361	0.9354	0.9348	0.9342
	tan	0.3640	0.3659	0.3679	0.3699	0.3719	0.3739	0.3759	0.3779	0.3799	0.3819
21	sin	0.3584	0.3600	0.3616	0.3633	0.3649	0.3665	0.3681	0.3697	0.3714	0.3730
	cos	0.9336	0.9330	0.9323	0.9317	0.9311	0.9304	0.9298	0.9291	0.9285	0.9278
	tan	0.3839	0.3859	0.3879	0.3899	0.3919	0.3939	0.3959	0.3979	0.4000	0.4020
22	sin	0.3746	0.3762	0.3778	0.3795	0.3811	0.3827	0.3843	0.3859	0.3875	0.3891
	cos	0.9272	0.9265	0.9259	0.9252	0.9245	0.9239	0.9232	0.9225	0.9219	0.9212
	tan	0.4040	0.4061	0.4081	0.4101	0.4122	0.4142	0.4163	0.4183	0.4204	0.4224
23	sin	0.3907	0.3923	0.3939	0.3955	0.3971	0.3987	0.4003	0.4019	0.4035	0.4051
	cos	0.9205	0.9198	0.9191	0.9184	0.9178	0.9171	0.9164	0.9157	0.9150	0.9143
	tan	0.4245	0.4265	0.4286	0.4307	0.4327	0.4348	0.4369	0.4390	0.4411	0.4431
24	sin	0.4067	0.4083	0.4099	0.4115	0.4131	0.4147	0.4163	0.4179	0.4195	0.4210
	cos	0.9135	0.9128	0.9121	0.9114	0.9107	0.9100	0.9092	0.9085	0.9078	0.9070
	tan	0.4452	0.4473	0.4494	0.4515	0.4536	0.4557	0.4578	0.4599	0.4621	0.4642
25	sin	0.4226	0.4242	0.4258	0.4274	0.4289	0.4305	0.4321	0.4337	0.4352	0.4368
	cos	0.9063	0.9056	0.9048	0.9041	0.9033	0.9026	0.9018	0.9011	0.9003	0.8996
	tan	0.4663	0.4684	0.4706	0.4727	0.4748	0.4770	0.4791	0.4813	0.4834	0.4856
26	sin	0.4384	0.4399	0.4415	0.4431	0.4446	0.4462	0.4478	0.4493	0.4509	0.4524
	cos	0.8988	0.8980	0.8973	0.8965	0.8957	0.8949	0.8942	0.8934	0.8926	0.8918
	tan	0.4877	0.4899	0.4921	0.4942	0.4964	0.4986	0.5008	0.5029	0.5051	0.5073
27	sin	0.4540	0.4555	0.4571	0.4586	0.4602	0.4617	0.4633	0.4648	0.4664	0.4679
	cos	0.8910	0.8902	0.8894	0.8886	0.8878	0.8870	0.8862	0.8854	0.8846	0.8838
	tan	0.5095	0.5117	0.5139	0.5161	0.5184	0.5206	0.5228	0.5250	0.5272	0.5295
deg	function	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°

TABLE OF TRIGOMETRIC FUNCTIONS

deg	func-tion	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°
	sin	0.4695	0.4710	0.4726	0.4741	0.4756	0.4772	0.4787	0.4802	0.4818	0.4833
28	cos	0.8829	0.8821	0.8813	0.8805	0.8796	0.8788	0.8780	0.8771	0.8763	0.8755
	tan	0.5317	0.5340	0.5362	0.5384	0.5407	0.5430	0.5452	0.5475	0.5498	0.5520
	sin	0.4848	0.4863	0.4879	0.4894	0.4909	0.4924	0.4939	0.4955	0.4970	0.4985
29	cos	0.8746	0.8738	0.8729	0.8721	0.8712	0.8704	0.8695	0.8686	0.8678	0.8669
	tan	0.5543	0.5566	0.5589	0.5612	0.5635	0.5658	0.5681	0.5704	0.5727	0.5750
	sin	0.5000	0.5015	0.5030	0.5045	0.5060	0.5075	0.5090	0.5105	0.5120	0.5135
30	cos	0.8660	0.8652	0.8643	0.8634	0.8625	0.8616	0.8607	0.8599	0.8590	0.8581
	tan	0.5774	0.5797	0.5820	0.5844	0.5867	0.5890	0.5914	0.5938	0.5961	0.5985
	sin	0.5150	0.5165	0.5180	0.5195	0.5210	0.5225	0.5240	0.5255	0.5270	0.5284
31	cos	0.8572	0.8563	0.8554	0.8545	0.8536	0.8526	0.8517	0.8508	0.8499	0.8490
	tan	0.6009	0.6032	0.6056	0.6080	0.6104	0.6128	0.6152	0.6176	0.6200	0.6224
	sin	0.5299	0.5314	0.5329	0.5344	0.5358	0.5373	0.5388	0.5402	0.5417	0.5432
32	cos	0.8480	0.8471	0.8462	0.8453	0.8443	0.8434	0.8425	0.8415	0.8406	0.8396
	tan	0.6249	0.6273	0.6297	0.6322	0.6346	0.6371	0.6395	0.6420	0.6445	0.6469
	sin	0.5446	0.5461	0.5476	0.5490	0.5505	0.5519	0.5534	0.5548	0.5563	0.5577
33	cos	0.8387	0.8377	0.8368	0.8358	0.8348	0.8339	0.8329	0.8320	0.8310	0.8300
	tan	0.6494	0.6519	0.6544	0.6569	0.6594	0.6619	0.6644	0.6669	0.6694	0.6720
	sin	0.5592	0.5606	0.5621	0.5635	0.5650	0.5664	0.5678	0.5693	0.5707	0.5721
34	cos	0.8290	0.8281	0.8271	0.8261	0.8251	0.8241	0.8231	0.8221	0.8211	0.8202
	tan	0.6745	0.6771	0.6796	0.6822	0.6847	0.6873	0.6899	0.6924	0.6950	0.6976
	sin	0.5736	0.5750	0.5764	0.5779	0.5793	0.5807	0.5821	0.5835	0.5850	0.5864
35	cos	0.8192	0.8181	0.8171	0.8161	0.8151	0.8141	0.8131	0.8121	0.8111	0.8100
	tan	0.7002	0.7028	0.7054	0.7080	0.7107	0.7133	0.7159	0.7186	0.7212	0.7239
	sin	0.5878	0.5892	0.5906	0.5920	0.5934	0.5948	0.5962	0.5976	0.5990	0.6004
36	cos	0.8090	0.8080	0.8070	0.8059	0.8049	0.8039	0.8028	0.8018	0.8007	0.7997
	tan	0.7265	0.7292	0.7319	0.7346	0.7373	0.7400	0.7427	0.7454	0.7481	0.7508
	sin	0.6018	0.6032	0.6046	0.6060	0.6074	0.6088	0.6101	0.6115	0.6129	0.6143
37	cos	0.7986	0.7976	0.7965	0.7955	0.7944	0.7934	0.7923	0.7912	0.7902	0.7891
	tan	0.7536	0.7563	0.7590	0.7618	0.7646	0.7673	0.7701	0.7729	0.7757	0.7785
	sin	0.6157	0.6170	0.6184	0.6198	0.6211	0.6225	0.6239	0.6252	0.6266	0.6280
38	cos	0.7880	0.7869	0.7859	0.7848	0.7837	0.7826	0.7815	0.7804	0.7793	0.7782
	tan	0.7813	0.7841	0.7869	0.7898	0.7926	0.7954	0.7983	0.8012	0.8040	0.8069
	sin	0.6293	0.6307	0.6320	0.6334	0.6347	0.6361	0.6374	0.6388	0.6401	0.6414
39	cos	0.7771	0.7760	0.7749	0.7738	0.7727	0.7716	0.7705	0.7694	0.7683	0.7672
	tan	0.8098	0.8127	0.8156	0.8185	0.8214	0.8243	0.8273	0.8302	0.8332	0.8361
	sin	0.6428	0.6441	0.6455	0.6468	0.6481	0.6494	0.6508	0.6521	0.6534	0.6547
40	cos	0.7660	0.7649	0.7638	0.7627	0.7615	0.7604	0.7593	0.7581	0.7570	0.7559
	tan	0.8391	0.8421	0.8451	0.8481	0.8511	0.8541	0.8571	0.8601	0.8632	0.8662
	sin	0.6561	0.6574	0.6587	0.6600	0.6613	0.6626	0.6639	0.6652	0.6665	0.6678
41	cos	0.7547	0.7536	0.7524	0.7513	0.7501	0.7490	0.7478	0.7466	0.7455	0.7443
	tan	0.8693	0.8724	0.8754	0.8785	0.8816	0.8847	0.8878	0.8910	0.8941	0.8972
deg	func-tion	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°

deg	func-tion	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°
	sin	0.6691	0.6704	0.6717	0.6730	0.6743	0.6756	0.6769	0.6782	0.6794	0.6807
42	cos	0.7431	0.7420	0.7408	0.7396	0.7385	0.7373	0.7361	0.7349	0.7337	0.7325
	tan	0.9004	0.9036	0.9067	0.9099	0.9131	0.9163	0.9195	0.9228	0.9260	0.9293
	sin	0.6820	0.6833	0.6845	0.6858	0.6871	0.6884	0.6896	0.6909	0.6921	0.6934
43	cos	0.7314	0.7302	0.7290	0.7278	0.7266	0.7254	0.7242	0.7230	0.7218	0.7206
	tan	0.9325	0.9358	0.9391	0.9424	0.9457	0.9490	0.9523	0.9556	0.9590	0.9623
	sin	0.6947	0.6959	0.6972	0.6984	0.6997	0.7009	0.7022	0.7034	0.7046	0.7059
44	cos	0.7193	0.7181	0.7169	0.7157	0.7145	0.7133	0.7120	0.7108	0.7096	0.7083
	tan	0.9657	0.9691	0.9725	0.9759	0.9793	0.9827	0.9861	0.9896	0.9930	0.9965
	sin	0.7071	0.7083	0.7096	0.7108	0.7120	0.7133	0.7145	0.7157	0.7169	0.7181
45	cos	0.7071	0.7059	0.7046	0.7034	0.7022	0.7009	0.6997	0.6984	0.6972	0.6959
	tan	1.0000	1.0035	1.0070	1.0105	1.0141	1.0176	1.0212	1.0247	1.0283	1.0319
	sin	0.7193	0.7206	0.7218	0.7230	0.7242	0.7254	0.7266	0.7278	0.7290	0.7302
46	cos	0.6947	0.6934	0.6921	0.6909	0.6896	0.6884	0.6871	0.6858	0.6845	0.6833
	tan	1.0355	1.0392	1.0428	1.0464	1.0501	1.0538	1.0575	1.0612	1.0649	1.0686
	sin	0.7314	0.7325	0.7337	0.7349	0.7361	0.7373	0.7385	0.7396	0.7408	0.7420
47	cos	0.6820	0.6807	0.6794	0.6782	0.6769	0.6756	0.6743	0.6730	0.6717	0.6704
	tan	1.0724	1.0761	1.0799	1.0837	1.0875	1.0913	1.0951	1.0990	1.1028	1.1067
	sin	0.7431	0.7443	0.7455	0.7466	0.7478	0.7490	0.7501	0.7513	0.7524	0.7536
48	cos	0.6691	0.6678	0.6665	0.6652	0.6639	0.6626	0.6613	0.6600	0.6587	0.6574
	tan	1.1106	1.1145	1.1184	1.1224	1.1263	1.1303	1.1343	1.1383	1.1423	1.1463
	sin	0.7547	0.7559	0.7570	0.7581	0.7593	0.7604	0.7615	0.7627	0.7638	0.7649
49	cos	0.6561	0.6547	0.6534	0.6521	0.6508	0.6494	0.6481	0.6468	0.6455	0.6441
	tan	1.1504	1.1544	1.1585	1.1626	1.1667	1.1708	1.1750	1.1792	1.1833	1.1875
	sin	0.7660	0.7672	0.7683	0.7694	0.7705	0.7716	0.7727	0.7738	0.7749	0.7760
50	cos	0.6428	0.6414	0.6401	0.6388	0.6374	0.6361	0.6347	0.6334	0.6320	0.6307
	tan	1.1918	1.1960	1.2002	1.2045	1.2088	1.2131	1.2174	1.2218	1.2261	1.2305
	sin	0.7771	0.7782	0.7793	0.7804	0.7815	0.7826	0.7837	0.7848	0.7859	0.7869
51	cos	0.6293	0.6280	0.6266	0.6252	0.6239	0.6225	0.6211	0.6198	0.6184	0.6170
	tan	1.2349	1.2393	1.2437	1.2482	1.2527	1.2572	1.2617	1.2662	1.2708	1.2753
	sin	0.7880	0.7891	0.7902	0.7912	0.7923	0.7934	0.7944	0.7955	0.7965	0.7976
52	cos	0.6157	0.6143	0.6129	0.6115	0.6101	0.6088	0.6074	0.6060	0.6046	0.6032
	tan	1.2799	1.2846	1.2892	1.2938	1.2985	1.3032	1.3079	1.3127	1.3175	1.3222
	sin	0.7986	0.7997	0.8007	0.8018	0.8028	0.8039	0.8049	0.8059	0.8070	0.8080
53	cos	0.6018	0.6004	0.5990	0.5976	0.5962	0.5948	0.5934	0.5920	0.5906	0.5892
	tan	1.3270	1.3319	1.3367	1.3416	1.3465	1.3514	1.3564	1.3613	1.3663	1.3713
	sin	0.8090	0.8100	0.8111	0.8121	0.8131	0.8141	0.8151	0.8161	0.8171	0.8181
54	cos	0.5878	0.5864	0.5850	0.5835	0.5821	0.5807	0.5793	0.5779	0.5764	0.5750
	tan	1.3764	1.3814	1.3865	1.3916	1.3968	1.4019	1.4071	1.4124	1.4176	1.4229
	sin	0.8192	0.8202	0.8211	0.8221	0.8231	0.8241	0.8251	0.8261	0.8271	0.8281
55	cos	0.5736	0.5721	0.5707	0.5693	0.5678	0.5664	0.5650	0.5635	0.5621	0.5606
	tan	1.4281	1.4335	1.4388	1.4442	1.4496	1.4550	1.4605	1.4659	1.4715	1.4770
deg	func-tion	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°

TABLE OF TRIGOMETRIC FUNCTIONS

deg	function	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°
	sin	0.8290	0.8300	0.8310	0.8320	0.8329	0.8339	0.8348	0.8358	0.8368	0.8377
56	cos	0.5592	0.5577	0.5563	0.5548	0.5534	0.5519	0.5505	0.5490	0.5476	0.5461
	tan	1.4826	1.4882	1.4938	1.4994	1.5051	1.5108	1.5166	1.5224	1.5282	1.5340
	sin	0.8387	0.8396	0.8406	0.8415	0.8425	0.8434	0.8443	0.8453	0.8462	0.8471
57	cos	0.5446	0.5432	0.5417	0.5402	0.5388	0.5373	0.5358	0.5344	0.5329	0.5314
	tan	1.5399	1.5458	1.5517	1.5577	1.5637	1.5697	1.5757	1.5818	1.5880	1.5941
	sin	0.8480	0.8490	0.8499	0.8508	0.8517	0.8526	0.8536	0.8545	0.8554	0.8563
58	cos	0.5299	0.5284	0.5270	0.5255	0.5240	0.5225	0.5210	0.5195	0.5180	0.5165
	tan	1.6003	1.6066	1.6128	1.6191	1.6255	1.6319	1.6383	1.6447	1.6512	1.6577
	sin	0.8572	0.8581	0.8590	0.8599	0.8607	0.8616	0.8625	0.8634	0.8643	0.8652
59	cos	0.5150	0.5135	0.5120	0.5105	0.5090	0.5075	0.5060	0.5045	0.5030	0.5015
	tan	1.6643	1.6709	1.6775	1.6842	1.6909	1.6977	1.7045	1.7113	1.7182	1.7251
	sin	0.8660	0.8669	0.8678	0.8686	0.8695	0.8704	0.8712	0.8721	0.8729	0.8738
60	cos	0.5000	0.4985	0.4970	0.4955	0.4939	0.4924	0.4909	0.4894	0.4879	0.4863
	tan	1.7321	1.7391	1.7461	1.7532	1.7603	1.7675	1.7747	1.7820	1.7893	1.7966
	sin	0.8746	0.8755	0.8763	0.8771	0.8780	0.8788	0.8796	0.8805	0.8813	0.8821
61	cos	0.4848	0.4833	0.4818	0.4802	0.4787	0.4772	0.4756	0.4741	0.4726	0.4710
	tan	1.8040	1.8115	1.8190	1.8265	1.8341	1.8418	1.8495	1.8572	1.8650	1.8728
	sin	0.8829	0.8838	0.8846	0.8854	0.8862	0.8870	0.8878	0.8886	0.8894	0.8902
62	cos	0.4695	0.4679	0.4664	0.4648	0.4633	0.4617	0.4602	0.4586	0.4571	0.4555
	tan	1.8807	1.8887	1.8967	1.9047	1.9128	1.9210	1.9292	1.9375	1.9458	1.9542
	sin	0.8910	0.8918	0.8926	0.8934	0.8942	0.8949	0.8957	0.8965	0.8973	0.8980
63	cos	0.4540	0.4524	0.4509	0.4493	0.4478	0.4462	0.4446	0.4431	0.4415	0.4399
	tan	1.9626	1.9711	1.9797	1.9883	1.9970	2.0057	2.0145	2.0233	2.0323	2.0413
	sin	0.8988	0.8996	0.9003	0.9011	0.9018	0.9026	0.9033	0.9041	0.9048	0.9056
64	cos	0.4384	0.4368	0.4352	0.4337	0.4321	0.4305	0.4289	0.4274	0.4258	0.4242
	tan	2.0503	2.0594	2.0686	2.0778	2.0872	2.0965	2.1060	2.1155	2.1251	2.1348
	sin	0.9063	0.9070	0.9078	0.9085	0.9092	0.9100	0.9107	0.9114	0.9121	0.9128
65	cos	0.4226	0.4210	0.4195	0.4179	0.4163	0.4147	0.4131	0.4115	0.4099	0.4083
	tan	2.1445	2.1543	2.1642	2.1742	2.1842	2.1943	2.2045	2.2148	2.2251	2.2355
	sin	0.9135	0.9143	0.9150	0.9157	0.9164	0.9171	0.9178	0.9184	0.9191	0.9198
66	cos	0.4067	0.4051	0.4035	0.4019	0.4003	0.3987	0.3971	0.3955	0.3939	0.3923
	tan	2.2460	2.2566	2.2673	2.2781	2.2889	2.2998	2.3109	2.3220	2.3332	2.3445
	sin	0.9205	0.9212	0.9219	0.9225	0.9232	0.9239	0.9245	0.9252	0.9259	0.9265
67	cos	0.3907	0.3891	0.3875	0.3859	0.3843	0.3827	0.3811	0.3795	0.3778	0.3762
	tan	2.3559	2.3673	2.3789	2.3906	2.4023	2.4142	2.4262	2.4383	2.4504	2.4627
	sin	0.9272	0.9278	0.9285	0.9291	0.9298	0.9304	0.9311	0.9317	0.9323	0.9330
68	cos	0.3746	0.3730	0.3714	0.3697	0.3681	0.3665	0.3649	0.3633	0.3616	0.3600
	tan	2.4751	2.4876	2.5002	2.5129	2.5257	2.5386	2.5517	2.5649	2.5782	2.5916
	sin	0.9336	0.9342	0.9348	0.9354	0.9361	0.9367	0.9373	0.9379	0.9385	0.9391
69	cos	0.3584	0.3567	0.3551	0.3535	0.3518	0.3502	0.3486	0.3469	0.3453	0.3437
	tan	2.6051	2.6187	2.6325	2.6464	2.6605	2.6746	2.6889	2.7034	2.7179	2.7326
	sin	0.9397	0.9403	0.9409	0.9415	0.9421	0.9426	0.9432	0.9438	0.9444	0.9449
70	cos	0.3420	0.3404	0.3387	0.3371	0.3355	0.3338	0.3322	0.3305	0.3289	0.3272
	tan	2.7475	2.7625	2.7776	2.7929	2.8083	2.8239	2.8397	2.8556	2.8716	2.8878
	sin	0.9455	0.9461	0.9466	0.9472	0.9478	0.9483	0.9489	0.9494	0.9500	0.9505
71	cos	0.3256	0.3239	0.3223	0.3206	0.3190	0.3173	0.3156	0.3140	0.3123	0.3107
	tan	2.9042	2.9208	2.9375	2.9544	0.9714	2.9887	3.0061	3.0237	3.0415	3.0595
	sin	0.9511	0.9516	0.9521	0.9527	0.9532	0.9537	0.9542	0.9548	0.9553	0.9558
72	cos	0.3090	0.3074	0.3057	0.3040	0.3024	0.3007	0.2990	0.2974	0.2957	0.2940
	tan	3.0777	3.0961	3.1146	3.1334	3.1524	3.1716	3.1910	3.2106	3.2305	3.2506

deg	function	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°
	sin	0.9563	0.9568	0.9573	0.9578	0.9583	0.9588	0.9593	0.9598	0.9603	0.9608
73	cos	0.2924	0.2907	2.2890	0.2874	0.2857	0.2840	0.2823	0.2807	0.2790	0.2773
	tan	3.2709	3.2914	3.3122	3.3332	3.3544	3.3759	3.3977	3.4197	3.4420	3.4646
	sin	0.9613	0.9617	0.9622	0.9627	0.9632	0.9636	0.9641	0.9646	0.9650	0.9655
74	cos	0.2756	0.2740	0.2723	0.2706	0.2689	0.2672	0.2656	0.2639	0.2622	0.2605
	tan	3.4874	3.5105	3.5339	3.5576	3.5816	3.6059	3.6305	3.6554	3.6806	3.7062
	sin	0.9659	0.9664	0.9668	0.9673	0.9677	0.9681	0.9686	0.9690	0.9694	0.9699
75	cos	0.2588	0.2571	0.2554	0.2538	0.2521	0.2504	0.2487	0.2470	0.2453	0.2436
	tan	3.7321	3.7583	3.7848	3.8118	3.8391	3.8667	3.8947	3.9232	3.9520	3.9812
	sin	0.9703	0.9707	0.9711	0.9715	0.9720	0.9724	0.9728	0.9732	0.9736	0.9740
76	cos	0.2419	0.2402	0.2385	0.2368	0.2351	0.2334	0.2317	0.2300	0.2284	0.2267
	tan	4.0108	4.0408	4.0713	4.1022	4.1335	4.1653	4.1976	4.2303	4.2635	4.2972
	sin	0.9744	0.9748	0.9751	0.9755	0.9759	0.9763	0.9767	0.9770	0.9774	0.9778
77	cos	0.2250	0.2232	0.2215	0.2198	0.2181	0.2164	0.2147	0.2130	0.2113	0.2096
	tan	4.3315	4.3662	4.4015	4.4374	4.4737	4.5107	4.5483	4.5864	4.6252	4.6646
	sin	0.9781	0.9785	0.9789	0.9792	0.9796	0.9799	0.9803	0.9806	0.9810	0.9813
78	cos	0.2079	0.2062	0.2045	0.2028	0.2011	0.1994	0.1977	0.1959	0.1942	0.1925
	tan	4.7046	4.7453	4.7867	4.8288	4.8716	4.9152	4.9594	5.0045	5.0504	5.0970
	sin	0.9816	0.9820	0.9823	0.9826	0.9829	0.9833	0.9836	0.9839	0.9842	0.9845
79	cos	0.1908	0.1891	0.1874	0.1857	0.1840	0.1822	0.1805	0.1788	0.1771	0.1754
	tan	5.1446	5.1929	5.2422	5.2924	5.3435	5.3955	5.4486	5.5026	5.5578	5.6140
	sin	0.9848	0.9851	0.9854	0.9857	0.9860	0.9863	0.9866	0.9869	0.9871	0.9874
80	cos	0.1736	0.1719	0.1702	0.1685	0.1668	0.1650	0.1633	0.1616	0.1599	0.1582
	tan	5.6713	5.7297	5.7894	5.8502	5.9124	5.9758	6.0405	6.1066	6.1742	6.2432
	sin	0.9877	0.9880	0.9882	0.9885	0.9888	0.9890	0.9893	0.9895	0.9898	0.9900
81	cos	0.1564	1.1547	0.1530	0.1513	0.1495	0.1478	0.1461	0.1444	0.1426	0.1409
	tan	6.3138	6.3859	6.4596	6.5350	6.6122	6.6912	6.7720	6.8548	6.9395	7.0264
	sin	0.9903	0.9905	0.9907	0.9910	0.9912	0.9914	0.9917	0.9919	0.9921	0.9923
82	cos	0.1392	0.1374	0.1357	0.1340	0.1323	0.1305	0.1288	0.1271	0.1253	0.1236
	tan	7.1154	7.2066	7.3002	7.3962	7.4947	7.5958	7.6996	7.8062	7.9158	8.0285
	sin	0.9925	0.9928	0.9930	0.9932	0.9934	0.9936	0.9938	0.9940	0.9942	0.9943
83	cos	0.1219	0.1201	0.1184	0.1167	0.1149	0.1132	0.1115	0.1097	0.1080	0.1063
	tan	8.1443	8.2636	8.3863	8.5126	8.6427	8.7769	8.9152	9.0579	9.2052	9.3572

deg	function	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°
	sin	0.9945	0.9947	0.9949	0.9951	0.9952	0.9954	0.9956	0.9957	0.9959	0.9960
84	cos	0.1045	0.1028	0.1011	0.0993	0.0976	0.0958	0.0941	0.0924	0.0906	0.0889
	tan	9.5144	9.6768	9.8448	10.02	10.20	10.39	10.58	10.78	10.99	11.20
	sin	0.9962	0.9963	0.9965	0.9966	0.9968	0.9969	0.9971	0.9972	0.9973	0.9974
85	cos	0.0872	0.0854	0.0837	0.0819	0.0802	0.0785	0.0767	0.0750	0.0732	0.0715
	tan	11.43	11.66	11.91	12.16	12.43	12.71	13.00	13.30	13.62	13.95
	sin	0.9976	0.9977	0.9978	0.9979	0.9980	0.9981	0.9982	0.9983	0.9984	0.9985
86	cos	0.0698	0.0680	0.0663	0.0645	0.0628	0.0610	0.0593	0.0576	0.0558	0.0541
	tan	14.30	14.67	15.06	15.46	15.89	16.35	16.83	17.34	17.89	18.46
	sin	0.9986	0.9987	0.9988	0.9989	0.9990	0.9990	0.9991	0.9992	0.9993	0.9993
87	cos	0.0523	0.0506	0.0488	0.0471	0.0454	0.0436	0.0419	0.0401	0.0384	0.0366
	tan	19.08	19.74	20.45	21.20	22.02	22.90	23.86	24.90	26.03	27.27
	sin	0.9994	0.9995	0.9995	0.9996	0.9996	0.9997	0.9997	0.9997	0.9998	0.9998
88	cos	0.0349	0.0332	0.0314	0.0297	0.0279	0.0262	0.0244	0.0227	0.0209	0.0192
	tan	28.64	30.14	31.82	33.69	35.80	38.19	40.92	44.07	47.74	52.08
	sin	0.9998	0.9999	0.9999	0.9999	0.9999	1.000	1.000	1.000	1.000	1.000
89	cos	0.0175	0.0157	0.0140	0.0122	0.0105	0.0087	0.0070	0.0052	0.0035	0.0017
	tan	57.29	63.66	71.62	81.85	95.49	114.6	143.2	191.0	286.5	573.0

deg	function	0.0°	0.1°	0.2°	0.3°	0.4°	0.5°	0.6°	0.7°	0.8°	0.9°

Squares/Cubes/Square Roots/Cube Roots

No.	Square	Cube	Square Root	Cube Root
1	1	1	1.0000	1.0000
2	4	8	1.4142	1.2599
3	9	27	1.7321	1.4423
4	16	64	2.0000	1.5874
5	25	125	2.2361	1.7100
6	36	216	2.4495	1.8171
7	49	343	2.6458	1.9129
8	64	512	2.8284	2.0000
9	81	729	3.0000	2.0801
10	100	1000	3.1623	2.1544
11	121	1331	3.3166	2.2240
12	144	1728	3.4641	2.2894
13	169	2197	3.6056	2.3513
14	196	2744	3.7417	2.4101
15	225	3375	3.8730	2.4662
16	256	4096	4.0000	2.5198
17	289	4913	4.1231	2.5713
18	324	5832	4.2426	2.6207
19	361	6859	4.3589	2.6684
20	400	8000	4.4721	2.7144
21	441	9261	4.5826	2.7589
22	484	10648	4.6904	2.8020
23	529	12167	4.7958	2.8439
24	576	13824	4.8990	2.8845
25	625	15625	5.0000	2.9240
26	676	17576	5.0990	2.9625
27	729	19683	5.1962	3.0000
28	784	21952	5.2915	3.0366
29	841	24389	5.3852	3.0723
30	900	27000	5.4772	3.1072
31	961	29791	5.5678	3.1414
32	1024	32768	5.6569	3.1748
33	1089	35937	5.7446	3.2075
34	1156	39304	5.8310	3.2396
35	1225	42875	5.9161	3.2711
36	1296	46656	6.0000	3.3019
37	1369	50653	6.0828	3.3322
38	1444	54872	6.1644	3.3620
39	1521	59319	6.2450	3.3912
40	1600	64000	6.3246	3.4200
41	1681	68921	6.4031	3.4482
42	1764	74088	6.4807	3.4760
43	1849	79507	6.5574	3.5034
44	1936	85184	6.6332	3.5303
45	2025	91125	6.7082	3.5569
46	2116	97336	6.7823	3.5830
47	2209	103823	6.8557	3.6088
48	2304	110592	6.9282	3.6342
49	2401	117649	7.0000	3.6593
50	2500	125000	7.0711	3.6840
51	2601	132651	7.1414	3.7084
52	2704	140608	7.2111	3.8325
53	2809	148877	7.2801	3.7563
54	2916	157464	7.3485	3.7798
55	3025	166375	7.4162	3.8030
56	3136	175616	7.4333	3.8259
57	3249	185193	7.5498	3.8485
58	3364	195112	7.6158	3.8709
59	3481	205379	7.6811	3.8930
60	3600	216000	7.7460	3.9149
61	3721	226981	7.8102	3.9365
62	3844	238328	7.8740	3.9579
63	3969	250047	7.9373	3.9791
64	4096	262114	8.0000	4.0000
65	4225	274625	8.0623	4.0207
66	4356	287496	8.1240	4.0412
67	4489	300763	8.1854	4.0615
68	4624	314432	8.2462	4.0817
69	4761	328509	8.3066	4.1016
70	4900	343000	8.3666	4.1213
71	5041	357911	8.4261	4.1408
72	5184	373248	8.4853	4.1602
73	5329	389017	8.5440	4.1793
74	5476	405224	8.6023	4.1983
75	5625	421875	8.6603	4.2172
76	5776	438976	8.7178	4.2358
77	5929	456533	8.7750	4.2543
78	6084	474552	8.8318	4.2727
79	6241	493039	8.8882	4.2908
80	6400	512000	8.9443	4.3089
81	6561	531441	9.0000	4.3267
82	6724	551368	9.0554	4.3445
83	6889	571787	9.1104	4.3621
84	7056	592704	9.1652	4.3795
85	7225	614125	9.2195	4.3968
86	7396	636056	9.2736	4.4140
87	7569	658503	9.3274	4.4310
88	7744	681472	9.3808	4.4480
89	7921	704969	9.4340	4.4647
90	8100	729000	9.4868	4.4814
91	8281	753571	9.5394	4.4979
92	8464	778688	9.5917	4.5144
93	8649	804357	9.6437	4.5307
94	8836	830584	9.6954	4.5468
95	9025	857375	9.7468	4.5629
96	9216	884736	9.7980	4.5789
97	9409	912673	9.8489	4.5947
98	9604	941192	9.8995	4.6104
99	9801	970299	9.9499	4.6261
100	10000	1000000	10.0000	4.6416
101	10201	1030301	10.0499	4.6570
102	10404	1061208	10.0995	4.6723
103	10609	1092727	10.1489	4.6875
104	10816	1124864	10.1980	4.7027
105	11025	1157625	10.2470	4.7177
106	11236	1191016	10.2956	4.7326
107	11449	1225043	10.3441	4.7475
108	11664	1259712	10.3923	4.7622
109	11881	1295029	10.4403	4.7769
110	12100	1331000	10.4881	4.7914
111	12321	1367631	10.5357	4.8059
112	12544	1404928	10.5830	4.8203
113	12769	1442897	10.6301	4.8346
114	12996	1481544	10.6771	4.8488
115	13225	1520875	10.7238	4.8629
116	13456	1560896	10.7703	4.8770
117	13689	1601613	10.8167	4.8910
118	13924	1643032	10.8628	4.9049
119	14161	1685159	10.9087	4.9187
120	14400	1728000	10.9545	4.9324
121	14641	1771561	11.0000	4.9461
122	14884	1815848	11.0454	4.9597
123	15129	1860867	11.0905	4.9732
124	15376	1906624	11.1355	4.9866
125	15625	1953125	11.1803	5.0000
126	15876	2000376	11.2250	5.0133
127	16129	2048383	11.2694	5.0265
128	16384	2097152	11.3137	5.0397
129	16641	2146689	11.3578	5.0528
130	16900	2197000	11.4018	5.0658
131	17161	2248091	11.4455	5.0788
132	17424	2299968	11.4891	5.0916
133	17689	2352637	11.5326	5.1045
134	17956	2406104	11.5758	5.1172
135	18225	2460375	11.6190	5.1299
136	18496	2515456	11.6619	5.1426
137	18769	2571353	11.7047	5.1551
138	19044	2628072	11.7473	5.1676
139	19321	2685619	11.7898	5.1801
140	19600	2744000	11.8322	5.1925
141	19881	2803221	11.8743	5.2048
142	20164	2863288	11.9164	5.2171
143	20449	2924207	11.9583	5.2293
144	20736	2985984	12.0000	5.2415
145	21025	3048625	12.0416	5.2536
146	21316	3112136	12.0830	5.2656
147	21609	3176523	12.1244	5.2776
148	21904	3241792	12.1655	5.2896
149	22201	3307949	12.2066	5.3015
150	22500	3375000	12.2474	5.3133
151	22801	3442951	12.2882	5.3251
152	23104	3511808	12.3288	5.3368
153	23409	3581577	12.3693	5.3485
154	23716	3652264	12.4097	5.3601
155	24025	3723875	12.4499	5.3717
156	24336	3796416	12.4900	5.3832
157	24649	3869893	12.5300	5.3947
158	24964	3944312	12.5698	5.4061
159	25281	4019679	12.6095	5.4175
160	25600	4096000	12.6491	5.4288
161	25921	4173281	12.6886	5.4401
162	26244	4251528	12.7279	5.4514
163	26569	4330747	12.7671	5.4626
164	26896	4410944	12.8062	5.4737
165	27225	4492125	12.8452	5.4848
166	27556	4574296	12.8841	5.4959
167	27889	4657463	12.9228	5.5069
168	28224	4741632	12.9615	5.5178
169	28561	4826809	13.0000	5.5288
170	28900	4913000	13.0384	5.5397
171	29241	5000211	13.0767	5.5505
172	29584	5088448	13.1149	5.5613
173	29929	5177717	13.1529	5.5721
174	30276	5268024	13.1909	5.5828
175	30625	5359375	13.2288	5.5934
176	30976	5451776	13.2665	5.6041
177	31329	5545233	13.3041	5.6147
178	31684	5639752	13.3417	5.6252
179	32041	5735339	13.3791	5.6357
180	32400	5832000	13.4164	5.6462
181	32761	5929741	13.4536	5.6567
182	33124	6028568	13.4907	5.6671
183	33489	6128487	13.5277	5.6774
184	33856	6229504	13.5647	5.6877
185	34225	6331625	13.6015	5.6980
186	34596	6434856	13.6382	5.7083
187	34969	6539203	13.6748	5.7185
188	35344	6644672	13.7113	5.7287
189	35721	6751269	13.7477	5.7388
190	36100	6859000	13.7840	5.7489
191	36481	6967871	13.8203	5.7590
192	36864	7077888	13.8564	5.7690
193	37249	7189057	13.8924	5.7790
194	37636	7301384	13.9284	5.7890
195	38025	7414875	13.9642	5.7989
196	38416	7529536	14.0000	5.8088
197	38809	7645373	14.0357	5.8186
198	39204	7762392	14.0712	5.8285
199	39601	7880599	14.1067	5.8383
200	40000	8000000	14.1421	5.8480
201	40401	8120601	14.1774	5.8578
202	40804	8242408	14.2127	5.8675
203	41209	8365427	14.2478	5.8771
204	41616	8489664	14.2829	5.8868
205	42025	8615125	14.3178	5.8964
206	42436	8741816	14.3527	5.9059
207	42849	8869743	14.3875	5.9155
208	43264	8998912	14.4222	5.9250
209	43681	9129329	14.4568	5.9345
210	44100	9261000	14.4914	5.9439
211	44521	9393931	14.5258	5.9533
212	44944	9528128	14.5602	5.9627
213	45369	9663597	14.5945	5.9721
214	45796	9800344	14.6287	5.9814
215	46225	9938375	14.6629	5.9907
216	46656	10077696	14.6969	6.0000
217	47089	10218313	14.7309	6.0092
218	47524	10360232	14.7648	6.0185
219	47961	10503459	14.7986	6.0277
220	48400	10648000	14.8324	6.0368
221	48841	10793861	14.8661	6.0459
222	49284	10941048	14.8997	6.0550
223	49729	11089567	14.9332	6.0641
224	50176	11239424	14.9666	6.0732
225	50625	11390625	15.0000	6.0822
226	51076	11543176	15.0333	6.0912
227	51529	11697083	15.0665	6.1002
228	51984	11852352	15.0997	6.1091
229	52441	12008989	15.1327	6.1180
230	52900	12167000	15.1658	6.1269
231	53361	12326391	15.1987	6.1358
232	53824	12487168	15.2315	6.1446
233	54289	12649337	15.2643	6.1534
234	54756	12812904	15.2971	6.1622
235	55225	12977875	15.3297	6.1710
236	55696	13144256	15.3623	6.1797
237	56169	13312053	15.3948	6.1885
238	56644	13481272	15.4272	6.1972
239	57121	13651919	15.4596	6.2058
240	57600	13824000	15.4919	6.2145
241	58081	13997521	15.5242	6.2231
242	58564	14172488	15.5563	6.2317
243	59049	14348907	15.5885	6.2403
244	59536	14526784	15.6205	6.2488
245	60025	14706125	15.6525	6.2573
246	60516	14886936	15.6844	6.2658
247	61009	15069223	15.7162	6.2743
248	61504	15252992	15.7480	6.2828
249	62001	15438249	15.7797	6.2912
250	62500	15625000	15.8114	6.2996
251	63001	15813251	15.8430	6.3080
252	63504	16003008	15.8745	6.3164
253	64009	16194277	15.9060	6.3247
254	64516	16387064	15.9374	6.3330
255	65025	16581375	15.9687	6.3413
256	65536	16777216	16.0000	6.3496
257	66049	16974593	16.0312	6.3579
258	66564	17173512	16.0624	6.3661
259	67081	17373979	16.0935	6.3743
260	67600	17576000	16.1245	6.3825
261	68121	17779581	16.1555	6.3907
262	68644	17984728	16.1864	6.3988
263	69169	18191447	16.2173	6.4070
264	69696	18399744	16.2481	6.4151
265	70225	18609625	16.2788	6.4232
266	70756	18821096	16.3095	6.4312
267	71289	19034163	16.3401	6.4393
268	71824	19248832	16.3707	6.4473
269	72361	19465109	16.4012	6.4553
270	72900	19683000	16.4317	6.4633
271	73441	19902511	16.4621	6.4713
272	73984	20123648	16.4924	6.4792
273	74529	20346417	16.5227	6.4872
274	75076	20570824	16.5529	6.4951
275	75625	20796875	16.5831	6.5030
276	76176	21024576	16.6132	6.5108
277	76729	21253933	16.6433	6.5187
278	77284	21484952	16.6733	6.5265
279	77841	21717639	16.7033	6.5343
280	78400	21952000	16.7332	6.5421
281	78961	22188041	16.7631	6.5499
282	79524	22425768	16.7929	6.5577
283	80089	22665187	16.8226	6.5654
284	80656	22906304	16.8523	6.5731
285	81225	23149125	16.8819	6.5808
286	81796	23393656	16.9115	6.5885
287	82369	23639903	16.9411	6.5962
288	82944	23887872	16.9706	6.6039
289	83521	24137569	17.0000	6.6115
290	84100	24389000	17.0294	6.6191
291	84681	24642171	17.0587	6.6267
292	85264	24897088	17.0880	6.6343
293	85849	25153757	17.1172	6.6419
294	86436	25412184	17.1464	6.6494
295	87025	25672375	17.1756	6.6569
296	87616	25934336	17.2047	6.6644
297	88209	26198073	17.2337	6.6719
298	88804	26463592	17.2627	6.6794
299	89401	26730899	17.2916	6.6869
300	90000	27000000	17.3205	6.6943
301	90601	27270901	17.3494	6.7018
302	91204	27543608	17.3781	6.7092
303	91809	27818127	17.4069	6.7166
304	92416	28094464	17.4356	6.7240
305	93025	28372625	17.4642	6.7313
306	93636	28652616	17.4929	6.7387
307	94249	28934443	17.5214	6.7460
308	94864	29218112	17.5499	6.7533
309	95481	29503629	17.5784	6.7606
310	96100	29791000	17.6068	6.7679
311	96721	30080231	17.6352	6.7752
312	97344	30371328	17.6635	6.7824
313	97969	30664297	17.6918	6.7897
314	98596	30959144	17.7200	6.7969
315	99225	31255875	17.7482	6.8041
316	99856	31554496	17.7764	6.8113
317	100489	31855013	17.8045	6.8185
318	101124	32157432	17.8326	6.8256
319	101761	32461759	17.8606	6.8328
320	102400	32768000	17.8885	6.8399
321	103041	33076161	17.9165	6.8470
322	103684	33386248	17.9444	6.8541
323	104329	33698267	17.9722	6.8612
324	104976	34012224	18.0000	6.8683
325	105625	34328125	18.0278	6.8753
326	106276	34645976	18.0555	6.8824
327	106929	34965783	18.0831	6.8894
328	107584	35287552	18.1108	6.8964
329	108241	35611289	18.1384	6.9034
330	108900	35937000	18.1659	6.9104
331	109561	36264691	18.1934	6.9174
332	110224	36594368	18.2209	6.9244
333	110889	36926037	18.2483	6.9313
334	111556	37259704	18.2757	6.9382
335	112225	37595375	18.3030	6.9451
336	112896	37933056	18.3303	6.9521
337	113569	38272753	18.3576	6.9589
338	114244	38614472	18.3848	6.9658
339	114921	38958219	18.4120	6.9727
340	115600	39304000	18.4391	6.9795
341	116281	39651821	18.4662	6.9864
342	116964	40001688	18.4932	6.9932
343	117649	40353607	18.5203	7.0000
344	118336	40707584	18.5472	7.0068
345	119025	41063625	18.5742	7.0136
346	119716	41421736	18.6011	7.0203
347	120409	41781923	18.6279	7.0271
348	121104	42144192	18.6548	7.0338
349	121801	42508549	18.6815	7.0406
350	122500	42875000	18.7083	7.0473
351	123201	43243551	18.7350	7.0540
352	123904	43614208	18.7617	7.0607
353	124609	43986977	18.7883	7.0674
354	125316	44361864	18.8149	7.0740
355	126025	44738875	18.8414	7.0807
356	126736	45118016	18.8680	7.0873
357	127449	45499293	18.8944	7.0940
358	128164	45882712	18.9209	7.1006
359	128881	46268279	18.9473	7.1072
360	129600	46656000	18.9737	7.1138
361	130321	47045881	19.0000	7.1204
362	131044	47437928	19.0263	7.1269
363	131769	47832147	19.0526	7.1335
364	132496	48228544	19.0788	7.1400
365	133225	48627125	19.1050	7.1466
366	133956	49027896	19.1311	7.1531
367	134689	49430863	19.1572	7.1596
368	135424	49836032	19.1833	7.1661
369	136161	50243409	19.2094	7.1726
370	136900	50653000	19.2354	7.1791
371	137641	51064811	19.2614	7.1855
372	138384	51478848	19.2873	7.1920
373	139129	51895117	19.3132	7.1984
374	139876	52313624	19.3391	7.2048
375	140625	52734375	19.3649	7.2112
376	141376	53157376	19.3907	7.2177
377	142129	53582633	19.4165	7.2240
378	142884	54010152	19.4422	7.2304
379	143641	54439939	19.4679	7.2368
380	144400	54872000	19.4936	7.2432
381	145161	55306341	19.5192	7.2495
382	145924	55742968	19.5448	7.2558
383	146689	56181887	19.5704	7.2622
384	147456	56623104	19.5959	7.2685
385	148225	57066625	19.6214	7.2748
386	148996	57512456	19.6469	7.2811
387	149769	57960603	19.6723	7.2874

Squares/Cubes/Square Roots/Cube Roots

No.	Square	Cube	Square Root	Cube Root
388	150544	58411072	19.6977	7.2936
389	151321	58863869	19.7231	7.2999
390	152100	59319000	19.7484	7.3061
391	152881	59776471	19.7737	7.3124
392	153664	60236288	19.7990	7.3186
393	154449	60698457	19.8242	7.3248
394	155236	61162984	19.8494	7.3310
395	156025	61629875	19.8746	7.3372
396	156816	62099136	19.8997	7.3434
397	157609	62570773	19.9249	7.3496
398	158404	63044792	19.9499	7.3558
399	159201	63521199	19.9750	7.3619
400	160000	64000000	20.0000	7.3681
401	160801	64481201	20.0250	7.3742
402	161604	64964808	20.0499	7.3803
403	162409	65450827	20.0749	7.3864
404	163216	65939264	20.0998	7.3925
405	164025	66430125	20.1246	7.3986
406	164836	66923416	20.1494	7.4047
407	165649	67419143	20.1742	7.4108
408	166464	67917312	20.1990	7.4169
409	167281	68417929	20.2237	7.4229
410	168100	68921000	20.2485	7.4290
411	168921	69426531	20.2731	7.4350
412	169744	69934528	20.2978	7.4410
413	170569	70444997	20.3224	7.4470
414	171396	70957944	20.3470	7.4530
415	172225	71473375	20.3715	7.4590
416	173056	71991296	20.3961	7.4650
417	173889	72511713	20.4206	7.4710
418	174724	73034632	20.4450	7.4770
419	175561	73560059	20.4695	7.4829
420	176400	74088000	20.4939	7.4889
421	177241	74618461	20.5183	7.4948
422	178084	75151448	20.5426	7.5007
423	178929	75686967	20.5670	7.5067
424	179776	76225024	20.5913	7.5126
425	180625	76765625	20.6155	7.5185
426	181476	77308776	20.6398	7.5244
427	182329	77854483	20.6640	7.5302
428	183184	78402752	20.6882	7.5361
429	184041	78953589	20.7123	7.5420
430	184900	79507000	20.7364	7.5478
431	185761	80062991	20.7605	7.5537
432	186624	80621568	20.7846	7.5595
433	187489	81182737	20.8087	7.5654
434	188356	81746504	20.8327	7.5712
435	189225	82312875	20.8567	7.5770
436	190096	82881856	20.8806	7.5828
437	190969	83453453	20.9045	7.5886
438	191844	84027672	20.9284	7.5944
439	192721	84604519	20.9523	7.6001
440	193600	85184000	20.9762	7.6059
441	194481	85766121	21.0000	7.6117
442	195364	86350888	21.0238	7.6174
443	196249	86938307	21.0476	7.6232
444	197136	87528384	21.0713	7.6289
445	198025	88121125	21.0950	7.6346
446	198916	88716536	21.1187	7.6403
447	199809	89314623	21.1424	7.6460
448	200704	89915392	21.1660	7.6517
449	201601	90518849	21.1896	7.6574
450	202500	91125000	21.2132	7.6631
451	203401	91733851	21.2368	7.6688
452	204304	92345408	21.2603	7.6744
453	205209	92959677	21.2838	7.6801
454	206116	93576664	21.3073	7.6857
455	207025	94196375	21.3307	7.6914
456	207936	94818816	21.3542	7.6970
457	208849	95443993	21.3776	7.7026
458	209764	96071912	21.4009	7.7082
459	210681	96702579	21.4243	7.7138
460	211600	97336000	21.4476	7.7194
461	212521	97972181	21.4709	7.7250
462	213444	98611128	21.4942	7.7306
463	214369	99252847	21.5174	7.7362
464	215296	99897344	21.5407	7.7418
465	216225	100544625	21.5639	7.7473
466	217156	101194696	21.5870	7.7529
467	218089	101847563	21.6102	7.7584
468	219024	102503232	21.6333	7.7639
469	219961	103161709	21.6564	7.7695
470	220900	103823000	21.6795	7.7750
471	221841	104487111	21.7025	7.7805
472	222784	105154048	21.7256	7.7860
473	223729	105823817	21.7486	7.7915
474	224676	106496424	21.7715	7.7970
475	225625	107171875	21.7945	7.8025
476	226576	107850176	21.8174	7.8079
477	227529	108531333	21.8403	7.8134
478	228484	109215352	21.8632	7.8188
479	229441	109902239	21.8861	7.8243
480	230400	110592000	21.9089	7.8297
481	231361	111284641	21.9317	7.8352
482	232324	111980168	21.9545	7.8406
483	233289	112678587	21.9773	7.8460
484	234256	113379904	22.0000	7.8514
485	235225	114084125	22.0227	7.8568
486	236196	114791256	22.0454	7.8622
487	237169	115501303	22.0681	7.8676
488	238144	116214272	22.0907	7.8730
489	239121	116930169	22.1133	7.8784
490	240100	117649000	22.1359	7.8837
491	241081	118370771	22.1585	7.8891
492	242064	119095488	22.1811	7.8944
493	243049	119823157	22.2036	7.8998
494	244036	120553784	22.2261	7.9051
495	245025	121287375	22.2486	7.9105
496	246016	122023936	22.2711	7.9158
497	247009	122763473	22.2935	7.9211
498	248004	123505992	22.3159	7.9264
499	249001	124251499	22.3383	7.9317
500	250000	125000000	22.3607	7.9370
501	251001	125751501	22.3830	7.9423
502	252004	126506008	22.4054	7.9476
503	253009	127263527	22.4277	7.9528
504	254016	128024064	22.4499	7.9581
505	255025	128787625	22.4722	7.9634
506	256036	129554216	22.4944	7.9686
507	257049	130323843	22.5167	7.9739
508	258064	131096512	22.5389	7.9791
509	259081	131872229	22.5610	7.9843
510	260100	132651000	22.5832	7.9896
511	261121	133432831	22.6053	7.9948
512	262144	134217728	22.6274	8.0000
513	263169	135005697	22.6495	8.0052
514	264196	135796744	22.6716	8.0104
515	265225	136590875	22.6936	8.0156
516	266256	137388096	22.7156	8.0208
517	267289	138188413	22.7376	8.0260
518	268324	138991832	22.7596	8.0311
519	269361	139798359	22.7816	8.0363
520	270400	140608000	22.8035	8.0415
521	271441	141420761	22.8254	8.0466
522	272484	142236648	22.8473	8.0517
523	273529	143055667	22.8692	8.0569
524	274576	143877824	22.8910	8.0620
525	275625	144703125	22.9129	8.0671
526	276676	145531576	22.9347	8.0723
527	277729	146363183	22.9565	8.0774
528	278784	147197952	22.9783	8.0825
529	279841	148035889	23.0000	8.0876
530	280900	148877000	23.0217	8.0927
531	281961	149721291	23.0434	8.0978
532	283024	150568768	23.0651	8.1028
533	284089	151419437	23.0868	8.1079
534	285156	152273304	23.1084	8.1130
535	286225	153130375	23.1301	8.1180
536	287296	153990656	23.1517	8.1231
537	288369	154854153	23.1733	8.1281
538	289444	155720872	23.1948	8.1332
539	290521	156590819	23.2164	8.1382
540	291600	157464000	23.2379	8.1433
541	292681	158340421	23.2594	8.1483
542	293764	159220088	23.2809	8.1533
543	294849	160103007	23.3024	8.1583
544	295936	160989184	23.3238	8.1633
545	297025	161878625	23.3452	8.1683
546	298116	162771336	23.3666	8.1733
547	299209	163667323	23.3880	8.1783
548	300304	164566592	23.4094	8.1833
549	301401	165469149	23.4307	8.1882
550	302500	166375000	23.4521	8.1932
551	303601	167284151	23.4734	8.1982
552	304704	168196608	23.4947	8.2031
553	305809	169112377	23.5160	8.2081
554	306916	170031464	23.5372	8.2130
555	308025	170953875	23.5584	8.2180
556	309136	171879616	23.5797	8.2229
557	310249	172808693	23.6008	8.2278
558	311364	173741112	23.6220	8.2327
559	312481	174676879	23.6432	8.2377
560	313600	175616000	23.6643	8.2426
561	314721	176558481	23.6854	8.2475
562	315844	177504328	23.7065	8.2524
563	316969	178453547	23.7276	8.2573
564	318096	179406144	23.7487	8.2621
565	319225	180362125	23.7697	8.2670
566	320356	181321496	23.7908	8.2719
567	321489	182284263	23.8118	8.2768
568	322624	183250432	23.8328	8.2816
569	323761	184220009	23.8537	8.2865
570	324900	185193000	23.8747	8.2913
571	326041	186169411	23.8956	8.2962
572	327184	187149248	23.9165	8.3010
573	328329	188132517	23.9374	8.3059
574	329476	189119224	23.9583	8.3107
575	330625	190109375	23.9792	8.3155
576	331776	191102976	24.0000	8.3203
577	332929	192100033	24.0208	8.3251
578	334084	193100552	24.0416	8.3300
579	335241	194104539	24.0624	8.3348
580	336400	195112000	24.0832	8.3396
581	337561	196122941	24.1039	8.3443
582	338724	197137368	24.1247	8.3491
583	339889	198155287	24.1454	8.3539
584	341056	199176704	24.1661	8.3587
585	342225	200201625	24.1868	8.3634
586	343396	201230056	24.2074	8.3682
587	344569	202262003	24.2281	8.3730
588	345744	203297472	24.2487	8.3777
589	346921	204336469	24.2693	8.3825
590	348100	205379000	24.2899	8.3872
591	349281	206425071	24.3105	8.3919
592	350464	207474688	24.3311	8.3967
593	351649	208527857	24.3516	8.4014
594	352836	209584584	24.3721	8.4061
595	354025	210644875	24.3926	8.4108
596	355216	211708736	24.4131	8.4155
597	356409	212776173	24.4336	8.4202
598	357604	213847192	24.4540	8.4249
599	358801	214921799	24.4745	8.4296
600	360000	216000000	24.4949	8.4343
601	361201	217081801	24.5153	8.4390
602	362404	218167208	24.5357	8.4437
603	363609	219256227	24.5561	8.4484
604	364816	220348864	24.5764	8.4530
605	366025	221445125	24.5967	8.4577
606	367236	222545016	24.6171	8.4623
607	368449	223648543	24.6374	8.4670
608	369664	224755712	24.6577	8.4716
609	370881	225866529	24.6779	8.4763
610	372100	226981000	24.6982	8.4809
611	373321	228099131	24.7184	8.4856
612	374544	229220928	24.7386	8.4902
613	375769	230346397	24.7588	8.4948
614	376996	231475544	24.7790	8.4994
615	378225	232608375	24.7992	8.5040
616	379456	233744896	24.8193	8.5086
617	380689	234885113	24.8395	8.5132
618	381924	236029032	24.8596	8.5178
619	383161	237176659	24.8797	8.5224
620	384400	238328000	24.8998	8.5270
621	385641	239483061	24.9199	8.5316
622	386884	240641848	24.9399	8.5362
623	388129	241804367	24.9600	8.5408
624	389376	242970624	24.9800	8.5453
625	390625	244140625	25.0000	8.5499
626	391876	245314376	25.0200	8.5544
627	393129	246491883	25.0400	8.5590
628	394384	247673152	25.0599	8.5635
629	395641	248858189	25.0799	8.5681
630	396900	250047000	25.0998	8.5726
631	398161	251239591	25.1197	8.5772
632	399424	252435968	25.1396	8.5817
633	400689	253636137	25 1595	8.5862
634	401956	254840104	25.1794	8.5907
635	403225	256047875	25.1992	8.5952
636	404496	257259456	25.2190	8.5997
637	405769	258474853	25.2389	8.6043
638	407044	259694072	24 2587	8.6088
639	408321	260917119	25.2784	8.6132
640	409600	262144000	25.2982	8.6177
641	410881	263374721	25.3180	8.6222
642	412164	264609288	25.3377	8.6267
643	413449	265847707	25.3574	8.6312
644	414736	267089984	25.3772	8.6357
645	416025	268336125	25.3969	8.6401
646	417316	269586136	25.4165	8.6446
647	418609	270840023	25.4362	8.6490
648	419904	272097792	25.4558	8.6535
649	421201	273359449	25.4755	8.6579
650	422500	274625000	25.4951	8.6624
651	423801	275894451	25.5147	8.6668
652	425104	277167808	25.5343	8.6713
653	426409	278445077	25.5539	8.6757
654	427716	279726264	25.5734	8.6801
655	429025	281011375	25.5930	8.6845
656	430336	282300416	25.6125	8.6890
657	431649	283593393	25.6320	8.6934
658	432964	284890312	25.6515	8.6978
659	434281	286191179	25.6710	8.7022
660	435600	287496000	25.6905	8.7066
661	436921	288804781	25.7099	8.7110
662	438244	290117528	25.7294	8.7154
663	439569	291434247	25.7488	8.7198
664	440896	292754944	25.7682	8.7241
665	442225	294079625	25.7876	8.7285
666	443556	295408296	25.8070	8.7329
667	444889	296740963	25.8263	8.7373
668	446224	298077632	25.8457	8.7416
669	447561	299418309	25.8650	8.7460
670	448900	300763000	25.8844	8.7503
671	450241	302111711	25.9037	8.7547
672	451584	303464448	25.9230	8.7590
673	452929	304821217	25.9422	8.7634
674	454276	306182024	25.9615	8.7677
675	455625	307546875	25.9808	8.7721
676	456976	308915776	26.0000	8.7764
677	458329	310288733	26.0192	8.7807
678	459684	311665752	26.0384	8.7850
679	461041	313046839	26.0576	8.7893
680	462400	314432000	26.0768	8.7937
681	463761	315821241	26.0960	8.7980
682	465124	317214568	26.1151	8.8023
683	466489	318611987	26.1343	8.8066
684	467856	320013504	26.1534	8.8109
685	469225	321419125	26.1725	8.8152
686	470596	322828856	26.1916	8.8194
687	471969	324242703	26.2107	8.8237
688	473344	325660672	26.2298	8.8280
689	474721	327082769	26.2488	8.8323
690	476100	328509000	26.2679	8.8366
691	477481	329939371	26.2869	8.8408
692	478864	331373888	26.3059	8.8451
693	480249	332812557	26.3249	8.8493
694	481636	334255384	26.3439	8.8536
695	483025	335702375	26.3629	8.8578
696	484416	337153536	26.3818	8.8621
697	485809	338608873	26.4008	8.8663
698	487204	340068392	26.4197	8.8706
699	488601	341532099	26.4386	8.8748
700	490000	343000000	26.4575	8.8790
701	491401	344472101	26.4764	8.8833
702	492804	345948408	26.4953	8.8875
703	494209	347428927	26.5141	8.8917
704	495616	348913664	26.5330	8.8959
705	497025	350402625	26.5518	8.9001
706	498436	351895816	26.5707	8.9043
707	499849	353393243	26.5895	8.9085
708	501264	354894912	26.6083	8.9127
709	502681	356400829	26.6271	8.9169
710	504100	357911000	26.6458	8.9211
711	505521	359425431	26.6646	8.9253
712	506944	360944128	26.6833	8.9295
713	508369	362467097	26.7021	8.9337
714	509796	363994344	26.7208	8.9378
715	511225	365525875	26.7395	8.9420
716	512656	367061696	26.7582	8.9462
717	514089	368601813	26.7769	8.9503
718	515524	370146232	26.7955	8.9545
719	516961	371694959	26.8142	8.9587
720	518400	373248000	26.8328	8.9628
721	519841	374805361	26.8514	8.9670
722	521284	376367048	26.8701	8.9711
723	522729	377933067	26.8887	8.9752
724	524176	379503424	26.9072	8.9794
725	525625	381078125	26.9258	8.9835
726	527076	382657176	26.9444	8.9876
727	528529	384240583	26.9629	8.9918
728	529984	385828352	26.9815	8.9959
729	531441	387420489	27.0000	9.0000
730	532900	389017000	27.0185	9.0041
731	534361	390617891	27.0370	9.0082
732	535824	392223168	27.0555	9.0123
733	537289	393832837	27.0740	9.0164
734	538756	395446904	27.0924	9.0205
735	540225	397065375	27.1109	9.0246
736	541696	398688256	27.1293	9.0287
737	543169	400315553	27.1477	9.0328
738	544644	401947272	27.1662	9.0369
739	546121	403583419	27.1846	9.0410
740	547600	405224000	27.2029	9.0450
741	549081	406869021	27.2213	9.0491
742	550564	408518488	27.2397	9.0532
743	552049	410172407	27.2580	9.0572
744	553536	411830784	27.2764	9.0613
745	555025	413493625	27.2947	9.0654
746	556516	415160936	27.3130	9.0694
747	558009	416832723	27.3313	9.0735
748	559504	418508992	27.3496	9.0775
749	561001	420189749	27.3679	9.0816
750	562500	421875000	27.3861	9.0856
751	564001	423564751	27.4044	9.0896
752	565504	425259008	27.4226	9.0937
753	567009	426957777	27.4408	9.0977
754	568516	428661064	27.4591	9.1017
755	570025	430368875	27.4773	9.1057
756	571536	432081216	27.4955	9.1098
757	573049	433798093	27.5136	9.1138
758	574564	435519512	27.5318	9.1178
759	576081	437245479	27.5500	9.1218
760	577600	438976000	27.5681	9.1258
761	579121	440711081	27.5862	9.1298
762	580644	442450728	27.6043	9.1338
763	582169	444194947	27.6225	9.1378
764	583696	445943744	27.6405	9.1418
765	585225	447697125	27.6586	9.1458
766	586756	449455096	27.6767	9.1498
767	588289	451217663	27.6948	9.1537
768	589824	452984832	27.7128	9.1577
769	591361	454756609	27.7308	9.1617
770	592900	456533000	27.7489	9.1657
771	594441	458314011	27.7669	9.1696
772	595984	460099648	27.7849	9.1736
773	597529	461889917	27.8029	9.1775

Squares/Cubes/Square Roots/Cube Roots

No.	Square	Cube	Square Root	Cube Root
774	599076	463684824	27.8209	9.1815
775	600625	465484375	27.8388	9.1855
776	602176	467288576	27.8568	9.1894
777	603729	469097433	27.8747	9.1933
778	605284	470910952	27.8927	9.1973
779	606841	472729139	27.9106	9.2012
780	608400	474552000	27.9285	9.2052
781	609961	476379541	27.9464	9.2091
782	611524	478211768	27.9643	9.2130
783	613089	480048687	27.9821	9.2170
784	614656	481890304	28.0000	9.2209
785	616225	483736625	28.0179	9.2248
786	617796	485587656	28.0357	9.2287
787	619369	487443403	28.0535	9.2326
788	620944	489303872	28.0713	9.2365
789	622521	491169069	28.0891	9.2404
790	624100	493039000	28.1069	9.2443
791	625681	494913671	28.1247	9.2482
792	627264	496793088	28.1425	9.2521
793	628849	498677257	28.1603	9.2560
794	630436	500566184	28.1780	9.2599
795	632025	502459875	28.1957	9.2638
796	633616	504358336	28.2135	9.2677
797	635209	506261573	28.2312	9.2716
798	636804	508169592	28.2489	9.2754
799	638401	510082399	28.2666	9.2793
800	640000	512000000	28.2843	9.2832
801	641601	513922401	28.3019	9.2870
802	643204	515849608	28.3196	9.2909
803	644809	517781627	28.3373	9.2948
804	646416	519718464	28.3549	9.2986
805	648025	521660125	28.3725	9.3025
806	649636	523606616	28.3901	9.3063
807	651249	525557943	28.4077	9.3102
808	652864	527514112	28.4253	9.3140
809	654481	529475129	28.4429	9.3179
810	656100	531441000	28.4605	9.3217
811	657721	533411731	28.4781	9.3255
812	659344	535387328	28.4956	9.3294
813	660969	537367797	28.5132	9.3332
814	662596	539353144	28.5307	9.3370
815	664225	541343375	28.5482	9.3408
816	665856	543338496	28.5657	9.3447
817	667489	545338513	28.5832	9.3485
818	669124	547343432	28.6007	9.3523
819	670761	549353259	28.6182	9.3561
820	672400	551368000	28.6356	9.3599
821	674041	553387661	28.6531	9.3637
822	675684	555412248	28.6705	9.3675
823	677329	557441767	28.6880	9.3713
824	678976	559476224	28.7054	9.3751
825	680625	561515625	28.7228	9.3789
826	682276	563559976	28.7402	9.3827
827	683929	565609283	28.7576	9.3865
828	685584	567663552	28.7750	9.3902
829	687241	569722789	28.7924	9.3940
830	688900	571787000	28.8097	9.3978

No.	Square	Cube	Square Root	Cube Root
831	690561	573856191	28.8271	9.4016
832	692224	575930368	28.8444	9.4053
833	693889	578009537	28.8617	9.4091
834	695556	580093704	28.8791	9.4129
835	697225	582182875	28.8964	9.4166
836	698896	584277056	28.9137	9.4204
837	700569	586376253	28.9310	9.4241
838	702244	588480472	28.9482	9.4279
839	703921	590589719	28.9655	9.4316
840	705600	592704000	28.9828	9.4354
841	707281	594823321	29.0000	9.4391
842	708964	596947688	29.0172	9.4429
843	710649	599077107	29.0345	9.4466
844	712336	601211584	29.0517	9.4503
845	714025	603351125	29.0689	9.4541
846	715716	605495736	29.0861	9.4578
847	717409	607645423	29.1033	9.4615
848	719104	609800192	29.1204	9.4652
849	720801	611960049	29.1376	9.4690
850	722500	614125000	29.1548	9.4727
851	724201	616295051	29.1719	9.4764
852	725904	618470208	29.1890	9.4801
853	727609	620650477	29.2062	9.4838
854	729316	622835864	29.2233	9.4875
855	731025	625026375	29.2404	9.4912
856	732736	627222016	29.2575	9.4949
857	734449	629422793	29.2746	9.4986
858	736164	631628712	29.2916	9.5023
859	737881	633839779	29.3087	9.5060
860	739600	636056000	29.3258	9.5097
861	741321	638277381	29.3428	9.5134
862	743044	640503928	29.3598	9.5171
863	744769	642735647	29.3769	9.5207
864	746496	644972544	29.3939	9.5244
865	748225	647214625	29.4109	9.5281
866	749956	649461896	29.4279	9.5317
867	751689	651714363	29.4449	9.5354
868	753424	653972032	29.4618	9.5391
869	755161	656234909	29.4788	9.5427
870	756900	658503000	29.4958	9.5464
871	758641	660776311	29.5127	9.5501
872	760384	663054848	29.5296	9.5537
873	762129	665338617	29.5466	9.5574
874	763876	667627624	29.5635	9.5610
875	765625	669921875	29.5804	9.5647
876	767376	672221376	29.5973	9.5683
877	769129	674526133	29.6142	9.5719
878	770884	676836152	29.6311	9.5756
879	772641	679151439	29.6479	9.5792
880	774400	681472000	29.6648	9.5828
881	776161	683797841	29.6816	9.5865
882	777924	686128968	29.6985	9.5901
883	779689	688465387	29.7153	9.5937
884	781456	690807104	29.7321	9.5973
885	783225	693154125	29.7489	9.6010
886	784996	695506456	29.7658	9.6046
887	786769	697864103	29.7825	9.6082

No.	Square	Cube	Square Root	Cube Root
888	788544	700227072	29.7993	9.6118
889	790321	702595369	29.8161	9.6154
890	792100	704969000	29.8329	9.6190
891	793881	707347971	29.8496	9.6226
892	795664	709732288	29.8664	9.6262
893	797449	712121957	29.8831	9.6298
894	799236	714516984	29.8998	9.6334
895	801025	716917375	29.9166	9.6370
896	802816	719323136	29.9333	9.6406
897	804609	721734273	29.9500	9.6442
898	806404	724150792	29.9666	9.6477
899	808201	726572699	29.9833	9.6513
900	810000	729000000	30.0000	9.6549
901	811801	731432701	30.0167	9.6585
902	813604	733870808	30.0333	9.6620
903	815409	736314327	30.0500	9.6656
904	817216	738763264	30.0666	9.6692
905	819025	741217625	30.0832	9.6727
906	820836	743677416	30.0998	9.6763
907	822649	746142643	30.1164	9.6799
908	824464	748613312	30.1330	9.6834
909	826281	751089429	30.1496	9.6870
910	828100	753571000	30.1662	9.6905
911	829921	756058031	30.1828	9.6941
912	831744	758550528	30.1993	9.6976
913	833569	761048497	30.2159	9.7012
914	835396	763551944	30.2324	9.7017
915	837225	766060875	30.2490	9.7082
916	839056	768575296	30.2655	9.7118
917	840889	771095213	30.2820	9.7153
918	842724	773620632	30.2985	9.7188
919	844561	776151559	30.3150	9.7224
920	846400	778688000	30.3315	9.7259
921	848241	781229961	30.3480	9.7294
922	850084	783777448	30.3645	9.7329
923	851929	786330467	30.3809	9.7364
924	853776	788889024	30.3974	9.7400
925	855625	791453125	30.4138	9.7435
926	857476	794022776	30.4302	9.7470
927	859329	796597983	30.4467	9.7505
928	861184	799178752	30.4631	9.7540
929	863041	801765089	30.4795	9.7575
930	864900	804357000	30.4959	9.7610
931	866761	806954491	30.5123	9.7645
932	868624	809557568	30.5287	9.7680
933	870489	812166237	30.5450	9.7715
934	872356	814780504	30.5614	9.7750
935	874225	817400375	30.5778	9.7785
936	876096	820025856	30.5941	9.7819
937	877969	822656953	30.6105	9.7854
938	879844	825293672	30.6268	9.7889
939	881721	827936019	30.6431	9.7924
940	883600	830584000	30.6594	9.7959
941	885481	833237621	30.6757	9.7993
942	887364	835896888	30.6920	9.8028
943	889249	838561807	30.7083	9.8063

No.	Square	Cube	Square Root	Cube Root
944	891136	841232384	30.7246	9.8097
945	893025	843908625	30.7409	9.8132
946	894916	846590536	30.7571	9.8167
947	896809	849278123	30.7734	9.8201
948	898704	851971392	30.7896	9.8236
949	900601	854670349	30.8058	9.8270
950	902500	857375000	30.8221	9.8305
951	904401	860085351	30.8383	9.8339
952	906304	862801408	30.8545	9.8374
953	908209	865523177	30.8707	9.8408
954	910116	868250664	30.8869	9.8443
955	912025	870983875	30.9031	9.8477
956	913936	873722816	30.9192	9.8511
957	915849	876467493	30.9354	9.8546
958	917764	879217912	30.9516	9.8580
959	919681	881974079	30.9677	9.8614
960	921600	884736000	30.9839	9.8648
961	923521	887503681	31.0000	9.8683
962	925444	890277128	31.0161	9.8717
963	927369	893056347	31.0322	9.8751
964	929296	895841344	31.0483	9.8785
965	931225	898632125	31.0644	9.8819
966	933156	901428696	31.0805	9.8854
967	935089	904231063	31.0966	9.8888
968	937024	907039232	31.1127	9.8922
969	938961	909853209	31.1288	9.8956
970	940900	912673000	31.1448	9.8990
971	942841	915498611	31.1609	9.9024
972	944784	918330048	31.1769	9.9058
973	946729	921167317	31.1929	9.9092
974	948676	924010424	31.2090	9.9126
975	950625	926859375	31.2250	9.9160
976	952576	929714176	31.2410	9.9194
977	954529	932574833	31.2570	9.9227
978	956484	935441352	31.2730	9.9261
979	958441	938313739	31.2890	9.9295
980	960400	941192000	31.3050	9.9329
981	962361	944076141	31.3209	9.9363
982	964324	946966168	31.3369	9.9396
983	966289	949862087	31.3528	9.9430
984	968256	952763904	31.3688	9.9464
985	970225	955671625	31.3847	9.9497
986	972196	958585256	31.4006	9.9531
987	974169	961504803	31.4166	9.9565
988	976144	964430272	31.4325	9.9598
989	978121	967361669	31.4484	9.9632
990	980100	970299000	31.4643	9.9666
991	982081	973242271	31.4802	9.9699
992	984064	976191488	31.4960	9.9733
993	986049	979146657	31.5119	9.9766
994	988036	982107784	31.5278	9.9800
995	990025	985074875	31.5436	9.9833
996	992016	988047936	31.5595	9.9866
997	994009	991026973	31.5753	9.9900
998	996004	994011992	31.5911	9.9933
999	998001	997002999	31.6070	9.9967

Prefixes & Symbols For Powers of TEN

Multiples and Submultiples (Powers of Ten)	Prefixes	Symbols			
			10^{-1}	deci	d
10^{12}	tera	T	10^{-2}	centi	c
10^{9}	giga	G	10^{-3}	milli	m
10^{6}	mega	M	10^{-6}	micro	μ
10^{4}	myria	Ma	10^{-9}	nano	n
10^{3}	kilo	k	10^{-12}	pico	p (formerly micromicro – $\mu\mu$)
10^{2}	hecto	h	10^{-15}	femto	f
10	deka	da	10^{-18}	atto	a

CLASSIFICATIONS OF EMISSIONS

Symbol	Type of Transmission
a. Amplitude Modulated	
A0	Continuous wave, no modulation.
A1	Continuous-wave telegraphy. On-off keying.
A2	Telegraphy by keying of a modulating audio frequency. Also by keying of modulated emission.
A3	Telephony. Double sideband, full carrier.
A3a	Telephony. Single sideband, reduced carrier.
A3b	Telephony. Two independent sidebands reduced carrier.
A4	Facsimile.
A5	Television.
A9	Composite transmissions and cases not covered by above.
A9a	Composite transmissions, reduced carrier.
b. Frequency (or Phase) Modulated	
F0	Absence of modulation.
F1	Telegraphy by frequency shift keying. No modulation.
F2	Telegraphy by keying of a modulating audio frequency. Also by keying of modulated emission.
F3	Telephony.
F4	Facsimile.
F5	Television.
F9	Composite transmissions and cases not covered by above.
c. Pulse Modulated	
P0	Absence of modulation intended to carry information (such as radar).
P1	Telegraphy. No modulating audio frequency.
P2d	Telegraphy by keying an audio frequency modulating the pulse in amplitude.
P2e	Telegraphy by keying an audio frequency modulating the width of the pulse.
P2f	Telegraphy by keying an audio frequency modulating the phase (or position) of the pulse.
P3d	Telephony. Amplitude modulated.
P3e	Telephony. Width modulated.
P3f	Telephony. Phase (or position) modulated.
P9	Telephony. Phase (or position) modulated. Composite transmissions and cases not covered by above.

d. Classification of Time-Division Multiplex Systems

Class	Name	Code	Action of Modulating Signal
A	Pulse-time modulation	PTM	Varies some characteristic of pulse with respect to time.
	Pulse-position modulation	PPM	Varies position (phase) of pulse on time base.
	Pulse-duration modulation	PDM	Varies width of pulse (also called PWM, or Pulse-Width Modulation).
	Pulse-shape modulation		Varies shape of pulse.
	Pulse-frequency modulation	PFM	Varies pulse recurrence frequency.
B	Pulse-amplitude modulation	PAM	Varies amplitude of pulse—consists of two types: one using unipolar pulses, the other using bipolar pulses.
C	Pulse-code modulation	PCM	Varies the makeup of a series of pulses and spaces. Individual systems are classified as follows: Binary-pulse and spaces, or positive and negative pulses. Ternary-positive pulses, negative pulses, and spaces. N-ary-more complex combinations of pulses and spaces.

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UNIVERSITY® SOUND
ALTEC SOUND PRODUCTS DIVISION

Sound Column Technical Aids

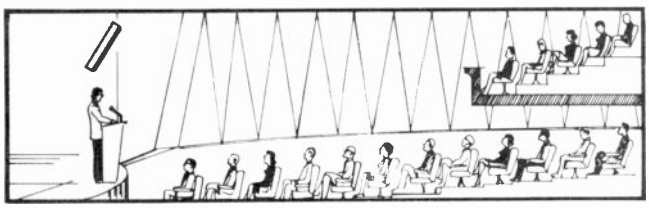
Sound Column

The sound column is a unitized high-fidelity speaker system for commercial sound and public address applications. The speaker system components (direct-radiator cone speakers) are positioned one above the other, and in phase, to provide a broad horizontal and a narrow vertical dispersion pattern. It has the effect of a theoretical single, tall and elongated cone speaker positioned in a vertical plane. The advantage of this design is a resultant unusual sound pattern which reduces acoustic feedback and reverberation because floor and ceiling reflections are essentially eliminated. With such a restricted vertical dispersion pattern, the sound column is positioned and beamed to areas ONLY where the sound is needed. A second, and most important advantage, is the almost unlimited freedom in locating and placing microphones without resulting feedback. However, all sound columns are not alike, and therefore a so-called sound column with a vertical tier of cone speakers will not necessarily provide these advantages. University's designers and engineers, recognizing this, developed the exclusive Uniline* to fully realize the benefits of this principle of speaker configuration. This was done with two highly significant proprietary Uniline characteristics:

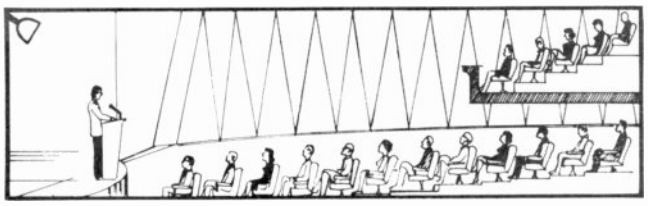
1. **High Power-Handling Capacity**
   To compensate for the lower efficiency of cone speakers used in sound columns (the price you pay for extended frequency high-fidelity reproduction), University developed heavy-duty, high-power-handling, direct-radiator speakers especially for Uniline.

2. **Acoustic Tapering**
   A University exclusive — the most perfect method yet devised to prevent excessive high-frequency beam effects and assure a balanced dispersion for uniform sound throughout the entire listening area. Acoustic tapering is accomplished by use of a crossover network which allows only the two center speakers, which have tweeters, to reproduce the high frequencies. This effectively shortens the column at the higher frequencies, thereby spreading these frequencies into a dispersion pattern more closely approximating the pattern of the low and mid frequencies.

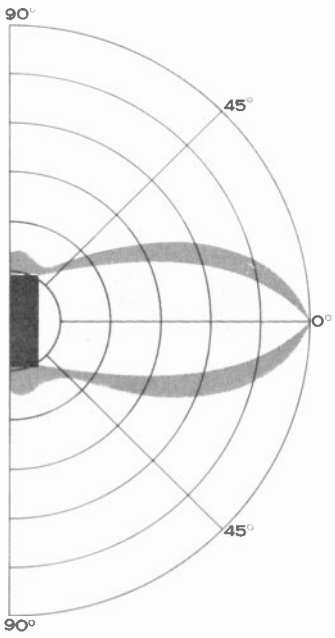
*Uniline is a registered trademark of University Sound



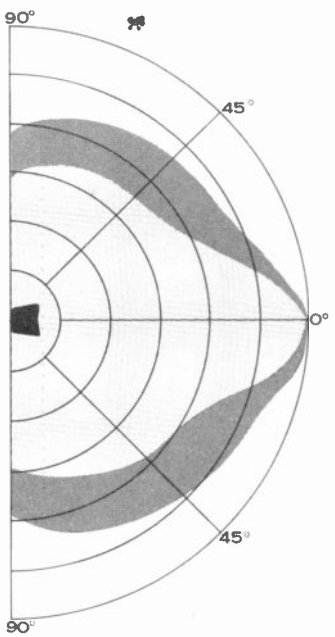
UNILINE SPEAKER CONTOUR
The above diagram shows the constant loudness contour for a Uniline sound column. With the Uniline column, exclusive "Acoustic Tapering" and the inherent distribution properties of the sound column combine to produce a uniform sound level for all portions of the auditorium, from front to back. No sound is lost, no portion of the audience is "blasted", no one strains to hear.



CONVENTIONAL SPEAKER CONTOUR
The above diagram shows the constant loudness contour for a conventional speaker at representative mid-range frequencies, where the high-audibility P.A. "punch" is concentrated. With conventional speakers, the sound level falls off rapidly, "blasting" the audience nearest the speakers and leaving the rest of the audience straining to hear.



Sound Column Vertical Distribution Pattern. The diagram on left shows the typical sound distribution pattern of a University Uniline sound column. The darkest color area in the diagram indicates the maximum sound pressure levels. The lightest color area indicates the lowest sound pressure levels. This diagram also indicates areas of high-frequency response. Due to University's exclusive "Acoustic Tapering", the high-frequency response falls off in direct ratio to the shade of the diagram; i.e., darker areas indicate areas of maximum high-frequency response, lighter areas indicate progressively attenuated high-frequency response. Acoustic tapering causes the effective length of the sound column to be reduced at high frequencies, so that the proper amount of vertical dispersion is maintained at all frequencies.



Sound Column Horizontal Distribution Pattern. The diagram on left shows the typical horizontal sound distribution pattern of a University Uniline sound column. The darkest color area in the diagram indicates the maximum sound pressure levels. The lightest color area indicates the lowest sound pressure levels. This diagram also indicates areas of high-frequency response. The high-frequency response falls off in direct ratio to the shade of the diagram; i.e., darker areas indicate areas of maximum high-frequency response, lighter areas indicate progressively attenuated high-frequency response.

Technical Aids

SELECTING THE PROPER LOUDSPEAKER SYSTEM

This is not too difficult if a problem is approached in logical, step-by-step order. The Speaker System Design Chart will enable you to estimate the approximate power required for a given location, considering noise level, reverberation, speaker efficiency, and program material. Treat individual rooms, alcoves, partitioned areas, and any other areas cut off acoustically from sound sources as separate problems. Based upon initial cost, convenience of installation and servicing, disturbance considerations, if any, and architectural dictates (reverberation, sound absorption, etc.), it is then decided whether a "high level" or "low level" speaker system shall be laid out for the specific location in question. If high level, the larger trumpets and radial

Selecting the Proper Loudspeaker System Continued

projectors with heavy duty driver units should be used, either singly at key points, or in a cluster at a central location. If a low level system is decided upon, the smaller paging and intercom type speakers will serve admirably. In either case, consideration should be given to the use of Uniline sound columns to take advantage of their unique properties. Knowing the power required to cover a given location, and the sound dispersion characteristics of the speakers being considered, the most suitable speaker and the number to be used is easily determined. Bear in mind that sound pressure is reduced approximately 6 dB below the previous level, each time the distance from the speaker is doubled. By laying out the speaker placement on a floor plan and tracing dispersion angles, the power at which each speaker must be operated, in order to cover the extremes, at a desired minimum level, can be estimated. Where music is involved, speakers capable of lower cutoff frequencies should be used to retain fidelity, irrespective of power considerations. On the other hand, where reverberation is particularly severe, fidelity may have to be compromised at the expense of the low-frequency response.

SELECTING THE DRIVER

With the variety of University driver units available, many with valuable exclusive features, full consideration can be given to overall response, required sound pressure, versatility and cost. Page 3 describes the individual features of each model driver. Once the differences between drivers are understood, it is easy to see how various combinations provide tremendous flexibility.

Sound system installations — whether involving only a single amplifier delivering its entire power output to a single loudspeaker, or a group of amplifiers feeding varying amounts of power to numerous speakers — depend primarily for satisfactory operation on an **efficient** transfer of power from the amplifier to the speaker. The wires connecting an amplifier to its respective speakers are known as speaker transmission lines. In planning interconnection of loudspeakers, it must be determined if these lines are to be of low impedance or constant voltage for proper match to the amplifier output transformer.

LOW IMPEDANCE

When the transmission lines are connected **directly** to one or more speaker voice coils, they are referred to as low-impedance lines. In general, where the distance between the amplifier and speakers is less than 200 feet, lines run at voice coil impedances are satisfactory. Figure 1 below indicates maximum practical distances.

Figure 1
Maximum Length of Line for 15% Power Loss
(Low Impedance Lines)

Wire Size (B & S)	Load Impedance		
	4 Ohms	8 Ohms	16 Ohms
14	125′	250′	450′
16	75′	150′	300′
18	50′	100′	200′
20	25′	50′	100′

CONSTANT VOLTAGE

This method is based on the "Constant Voltage" amplifier, and simplifies to a great degree the computation of the proper transformer taps when varying sound levels are required. It permits the addition of speakers to an existing system, without recalculation of the load and source impedances. As long as the total power consumed by the loudspeakers is less than or equal to the amplifier power rating, a favorable load condition will always exist. It also permits a loudspeaker to be connected across a transmission line up to the capacity of that circuit with the same ease that electric lights are loaded on a power line. To use this method requires that a power amplifier incorporate an output transformer tap which will deliver 70.7V or 25V at the rated output of the amplifier.

The choice of 70.7V (referred to hereafter as 70V) took into consideration Underwriters' requirements which in many locations limit loudspeaker circuit voltage to a specified maximum unless wiring is run in conduit or BX.

Reference to a "70V loudspeaker distribution line" does not mean that the voltage on this circuit will always be 70V. It may be less when the system is operated at levels well below the rating of the amplifier. The 70V is the **maximum** voltage on a sine wave test signal for a given amount of distortion. This expresses the standard for rating amplifier power. Standardizing this voltage means that the voltage is the same for a low power amplifier as for a high power amplifier if rated under 100 watts.

When transformer taps are marked directly in "watts," no mathematics is required. Simply choose a transformer with the correct power tap and connect to the desired terminals. For transformers marked in impedance, follow the procedure below. Actual calculations are simple. One basic formula is used:

$$Z = \frac{E^2}{P} \text{ of required impedance } = \frac{(\text{Output voltage})^2}{\text{desired power}}$$

so that for an amplifier employing a 70V output tap, the formula is reduced to:

$$\text{required impedance } = \frac{5000}{\text{desired power}}$$

For a system that may already be using a 25V constant wattage line, the formula would be:

$$\text{required impedance } = \frac{625}{\text{desired power}}$$

Figure 2
Quick Reference Chart for 70V Systems

Watts	Load Impedance (Ω)	Wire Size A.W.G. for 1 dB (20%) Power Loss Length of Wire Run			
		125 ft.	250 ft.	500 ft.	1,000 ft.
10	500	33	30	27	24
20	250	30	27	24	21
30	167	28	25	22	19
40	125	27	24	21	18
50	100	26	23	20	17
60	83.5	25	22	19	16
70	71.4	24	21	18	15
80	62.5	24	21	18	15
90	55.5	23	20	17	14
100	50	23	20	17	14
125	40	22	19	16	13
150	33.3	21	18	15	12
175	28.6	21	18	15	12
200	25	20	17	14	11

DRIVERS WITH BUILT-IN TRANSFORMERS

It is obvious from the foregoing, therefore, that where very long speaker lines are necessary, or the installation involves too many speakers to handle at voice coil impedances, drivers with built-in line-matching transformers such as Models ID40T and ID60T are the logical solution. In cases where a constant voltage 70V amplifying system is used, these same drivers will provide the proper power taps. If low-impedance operation is satisfactory, the ID30, ID40 or ID60 units can be used. If at a later date, it is decided to convert to high-impedance operation, transformers can be procured to make the change.

JUDGING EFFICIENCY AND POWER REQUIREMENTS

There are many ways to approach this question in connection with selection of a companion driver unit. We suggest you first establish the horn on the basis of function. For example,

Judging Efficiency and Power Requirements Continued

supposing the GH is selected for greatest **distance** coverage. If program is to consist mostly of speech, the ID30 would be adequate, providing 128 dB with 30 watts. By using a series capacitor, sound pressure would be 130 dB at 60 watts. Supposing, however, the area to be penetrated is quite noisy. The ID40 could provide 131 dB at 40 watts, and 134 dB at 80 watts. Need more? The ID75 will produce 138 dB at 75 watts, 140 dB at 150 watts with series capacitor. The influencing factors determining the selection of driver, **other** than sound pressure requirements, are amplifier power available and the cost of more amplifier power.

It's easy to see that on a watts-per-dollar basis, you can get more **sound** by using a more efficient driver than by pouring on more amplifier watts. For example, supposing you selected the PH trumpet because it offers the desired dispersion characteristics and meets frequency response requirements. The ID30 will yield 126 dB on the PH with 30 watts input. You need more? You can get a 60-watt amplifier instead, and obtain 129 dB by using a capacitor in series with the ID30. Or, the ID40 at only a few dollars more than the ID30, can be used with a PH to provide 131 dB at only 40 watts! If speech were still the only consideration and high sound pressure desired at a minimum cost, you might even consider the SMH with ID60 driver. That combination will produce 131 dB at 60 watts as against 130 dB using the ID30/GH combination at the same 60 watts (with series capacitor).

Obviously, University horn/driver combinations can be adapted to yield desired sound pressures. Once the **horn** has been selected on the basis of dispersion and frequency response characteristics, the driver should be selected to provide the sound pressure required. Bear in mind that as the smaller horns are used, dispersion increases and the available sound energy is more spread out. When exceptionally high powers are required, the University Super-Power speakers should be used.

ADJUSTING POWER CAPACITY AND CUTOFF

When the low-frequency response of the input program to a loudspeaker is limited to essentially the operating range of the speaker, as established by the horn cutoff, the "adjusted" power capacity becomes twice its rated "full range" response. Figure 5 provides the value of the nonpolarized capacitor to be placed **in series** with the speaker in order to cause a rate of loss of about 3 dB at the point of horn cutoff. Capacitors for operation up to 25-watts input should have a "working voltage" rating of no less than 50; up to 50 watts input, 75 to 100; and up to 100 watts input or better, 150V to 175V.

1. To determine the capacitor for a 70V (or 25V) "constant voltage" system, first determine the value of impedance which corresponds to the power tap **being used.**

$$\text{Impedance} = \frac{(\text{Voltage of system})^2}{\text{wattage to speaker}}$$

2. If the impedance is known (or calculated according to the formula), find the correct level line on the chart by referring to the table which identifies the impedance being used.
3. Find the horn cutoff on the horizontal scale of the chart, and intersect the selected level line at that point.
4. Follow that point horizontally to the vertical scale and note the number thus indicated.
5. Finally, multiply that number by the factor alongside the impedance level line in the table. The resulting answer is the value of capacitor in **microfarads**. Because of commercial availability, values within 10% will suffice.

Note: Add capacitor values can be achieved by paralleling capacitors to **add** value; or by placing capacitors in series to **reduce** values.

When they are in series, the resulting value $= \frac{1}{\frac{1}{C_a} + \frac{1}{C_b}}$

SOUND PRESSURE LEVEL (SPL) CHARTS

Figures 3 and 4 illustrate the position of the calibrated microphone used to take the measurements shown in the tables. All measurements were taken at 4 feet on the acoustical axis. Figure 3 pertains to Tables 1 and 3. Figure 4 pertains to the radial horns in Table 2. All figures are in dB.*

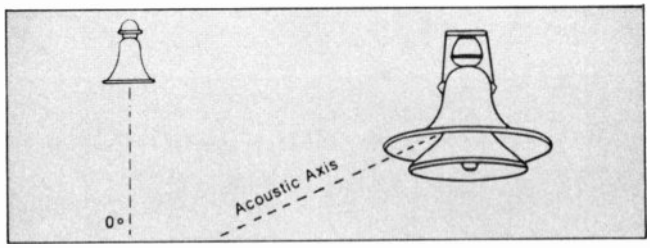


Figure 3
Diagram of On-Axis Readings for Tables 1 and 3.

Figure 4
Diagram of On-Axis Readings for Table 2.

Table 1. Directional Trumpets

Drivers	GH	LH	PH	SMH
ID20	125	123	122	121
ID30	128	126	126	125
ID30T	128	126	126	125
ID40A	131	129	127	126
ID40T	131	129	127	126
ID60	136	134	133	131
ID60T	136	134	133	131
ID75	138	136	135	133

Table 2. Radial Trumpets

Drivers	RLH	RSH
ID20	113	110
ID30	117	113
ID30T	117	113
ID40A	120	117
ID40T	120	117
ID60	122	119
ID60T	122	119
ID75	124	122

Table 3. Wide-Angle and Special Purpose Horns

Drivers	Cobreflex	CLH	SH	2WP
ID20	120	121	121	117
ID30	123	124	123	121
ID30T	123	124	123	121
ID40A	126	128	125	122
ID40T	126	128	125	122
ID60	128	133	126	123
ID60T	128	133	126	123
ID75	130	134	132	129

***A Note About SPL's.** This is a significant and revealing measurement of the output level of a commercial P.A. loudspeaker. It is precisely evaluated on a specific basis to indicate the actual performance of a driver/horn combination with respect to its output for a given input. This SPL figure, given in dB, is vital to the designer of commercial sound installations. All readings shown were taken at rated power input.

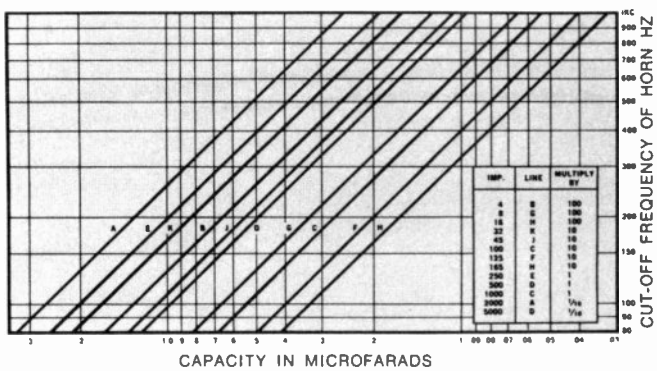


Figure 5
Values of Series Capacitor Required for Various Cutoff Frequencies

UNIVERSITY SOUND SYSTEM DESIGN CHART

The Speaker System Design Chart is based on the use of University high efficiency loudspeakers. To determine audio power, select required application and draw pencil line horizontally to proper room volume diagonal and continue pencil line down vertically to first adjustment line. Make adjustments as follows:

ADJUSTMENT FOR SOUND ABSORPTION

For acoustically treated locations, INCREASE adjustment reading 1-2 db by drawing line towards RIGHT 1-2 spaces. In location containing more than average reflecting surfaces, DECREASE adjustment reading 1-3 db by drawing line towards LEFT 1-3 spaces. Where acoustic conditions are normal (no acoustic treatment or highly reflective surfaces), no adjustments are required. Continue line vertically to voice-music adjustment.

ADJUSTMENT FOR VOICE OR MUSIC

For speech reproduction only, DECREASE adjustment reading 1-4 db by drawing line towards LEFT 1-4 spaces. For wider dynamic range in music, INCREASE adjustment reading 1-4 db by drawing line towards RIGHT 1-4 spaces. For speech reproduction and some incidental music, no adjustments are required.

After these two adjustments have been made, continue pencil line vertically down to the center of the horizontal bar in line with the speaker type selected for use. After this point has been reached, continue in a diagonal line to bottom scale which indicates the total operating power required for the system. The amount of power to each speaker is determined by the number of speakers used to provide adequate coverage.

AVERAGE SOUND LEVEL IN DB DELIVERED BY SOUND SYSTEM

100 95 90 85 80 75 70 65 60

1000 CU. FT. 3000 CU. FT. 10,000 CU. FT. 30,000 CU. FT. 100,000 CU. FT. 300,000 CU. FT. 1,000,000 CU. FT. 3,000,000 CU. FT. 10,000,000 CU. FT.

Average Typical Application	Background Noise Level in db	Background Noise Characteristic
FACTORY (Very Noisy)	95	
AIRPORT LOADING RAMP		HIGH NOISE LEVEL
MACHINE SHOP (Average)	90	CONVERSATION DIFFICULT
TRAIN LOADING RAMP		
TRAFFIC (HEAVY)		
PRINTING PRESS	85	
FOOTBALL STADIUM		
BALLROOMS		
RESTAURANT (Noisy)	80	
NOISY ASSEMBLY DEPT		MEDIUM NOISE LEVEL
FACTORY (Average)		
TRUCK LOADING DOCK		VOICE MUST BE RAISED TO BE UNDERSTOOD
R.R. WAITING ROOM	75	
AUDITORIUM (Average)		
ASSEMBLY PLANT (Quiet)	70	
SHIPPING-REC. (Average)		
TRAFFIC (AVERAGE)		
OFFICE (Busy)		
DEPT STORE (Average)	65	
AUDITORIUM (Quiet)		QUIET BACKGROUND
RESIDENTIAL AREA		
RESTAURANT (Average)	60	NORMAL CONVERSATION POSSIBLE
STORE (Quiet)		
OFFICE (Quiet)		
GARAGE		
HOTEL LOBBY – HOSPITALS		
CHURCH – FUNERAL PARLOR	55	

10 DBM* 20 30 40 50

EACH SPACE EQUALS 1db

REFLECTION-ABSORPTION ADJUSTMENT

VOICE-MUSIC ADJUSTMENT

.01 .02 .03 .06 .1 .2 .3 .6 1. 2 3 4 6 8 10 12 16 20 24 30 40 48 60 80 100 120 160 200 240 300

RATED AMPLIFIER POWER REQUIRED FOR UNIVERSITY SPEAKERS SHOWN AT RIGHT

READ WATTS OPPOSITE DESIRED SPEAKER

MIS, IBR, MSR, MUSTANGS, UNILINE COLUMNS, 2WP 20
MIL, CMIL, RLH ID 30, MM 2F, MM 2TC
COBREFLEX ID 30, CLH ID 30, RPH ID 60
GH ID 20, SH ID 30, LH ID 20
SMH ID 30, COBREFLEX ID 60, PH ID 30
LH ID 40, CLH ID 60, PH ID 40
CLH ID 75, SMH ID 60, PH ID 60
GH ID 60, LH ID 60, PH ID 60
GH ID 75, LH ID 75, PH ID 75

*DBM ZERO LEVEL .001 watt .

RULES AND REGULATIONS

SUBPART B—CRITERIA FOR DETERMINING WHETHER APPLICATIONS FOR RADIO TOWERS REQUIRE NOTIFICATION OF PROPOSED CONSTRUCTION TO FEDERAL AVIATION ADMINISTRATION

§ 17.7 Antenna structures requiring notification to the FAA.

A notification to the Federal Aviation Administration is required, except as set forth in § 17.14, for any of the following construction or alteration:

(a) Any construction or alteration of more than 60.96 meters (200 feet) in height above ground level at its site.

(b) Any construction or alteration of greater height than an imaginary surface extending outward and upward at one of the following slopes:

(1) 100 to 1 for a horizontal distance of 6.10 kilometers (20,000 feet) from the nearest point of the nearest runway of each airport specified in paragraph (d) of this section with at least one runway more than 0.98 kilometers (3,200 feet) in actual length, excluding heliports.

(2) 50 to 1 for a horizontal distance of 3.05 kilometers (10,000 feet) from the nearest point of the nearest runway of each airport specified in paragraph (d) of this section with its longest runway no more than 0.98 kilometers (3,200 feet) in actual length excluding heliports.

(3) 25 to 1 for a horizontal distance of 1.52 kilometers (5,000 feet) from the nearest point of the nearest landing and takeoff area of each heliport specified in paragraph (d) of this section.

(c) When requested by the FAA, any construction or alteration that would be in an instrument approach area (defined in the FAA standards governing instrument approach procedures) and available information indicates it might exceed an obstruction standard of the FAA.

(d) Any construction or alteration on any of the following airports (including heliports):

(1) An airport that is available for public use and is listed in the Airport Directory of the current Airman's Information Manual or in either the Alaska or Pacific Airman's Guide and Chart Supplement.

(2) An airport under construction, that is the subject of a notice or proposal on file with the Federal Aviation Administration, and except for military airports, it is clearly indicated that the airport will be available for public use.

(3) An airport that is operated by an armed force of the United States.

NOTE: Consideration to aeronautical facilities not in existence at the time of the filing of the application for radio facilities will be given only when proposed airport construction or improvement plans are on file with the Federal Aviation Administration as of the filing date of the application for such radio facilities.

§ 17.8 Establishment of antenna farm areas.

(a) Each antenna farm area will be established by an appropriate rule making proceeding, which may be commenced by the Commission on its own motion after consultation with the FAA, upon request of the FAA, or as a result of a petition filed by any interested person. After receipt of a petition from an interested person disclosing sufficient reasons to justify institution of a rule making proceeding, the Commission will request the advice of the FAA with respect to the considerations of menace to air navigation in terms of air safety which may be presented by the proposal. The written communication received from the FAA in response to the Commission's request shall be placed in the Commission's public rule making file containing the petition, and interested persons shall be allowed a period of 30 days within which to file statements with respect thereto. Such statements shall also be filed with the Administrator of the FAA with proof of such filing to be established in accordance with § 1.47 of this chapter. The Administrator of the FAA shall have a period of 15 days within which to file responses to such statements. If the Commission, upon consideration of the matters presented to it in accordance with the above procedure, is satisfied that establishment of the proposed antenna farm would constitute a menace to air navigation for reasons of air safety, rule making proceedings will not be instituted. If rule making proceedings are instituted, any person filing comments therein which concern the question of whether the proposed antenna farm will constitute a menace to air navigation shall file a copy of the comments with the Administrator of the FAA. Proof of such filing shall be established in accordance with § 1.47 of this chapter.

(b) Nothing in this subpart shall be construed to mean that only one antenna farm area will be designated for a community. The Commission will consider on a case-by-case basis whether or not more than one antenna farm area shall be designated for a particular community.

§ 17.9 Designated antenna farm areas.

The areas described in the following paragraphs of this section are established as antenna farm areas: [appropriate paragraphs will be added as necessary].

§ 17.10 Antenna structures over 304.80 meters (1,000 feet).

Where one or more antenna farm areas have been designated for a community or communities (see § 17.9), the Commission will not accept for filing an application for a construction permit to construct a new station or to increase height or change antenna location of an existing station proposing the erection of an antenna structure over 1,000 feet above ground unless:

(a) It is proposed to locate the antenna structure in a designated antenna farm area, or

(b) It is accompanied by a statement from the Federal Aviation Administration that the proposed structure will not constitute a menace to air navigation, or

(c) It is accompanied by a request for waiver setting forth reasons sufficient, if true, to justify such a waiver.

§ 17.14 Certain antenna structures exempt from notification to the FAA.

A notification to the Federal Aviation Administration is not required for any of the following construction or alteration:

(a) Any object that would be shielded by existing structures of a permanent and substantial character or by natural terrain or topographic features of equal or greater height, and would be located in the congested area of a city, town, or settlement where it is evident beyond all reasonable doubt that the structure so shielded will not adversely affect safety in air navigation. Applicants claiming such exemption under § 17.14(a) shall submit a statement with their application to the FCC explaining basis in detail for their finding.

(b) Any antenna structure of 6.10 meters (20 feet) or less in height except one that would increase the height of another antenna structure.

(c) Any air navigation facility, airport visual approach or landing aid, aircraft arresting device, or meteorological device, of a type approved by the Administrator of the Federal Aviation Administration, the location and height of which is fixed by its functional purpose.

§ 17.17 Existing structures.

(a) Nothing in the criteria in this subpart concerning antenna structures or locations shall apply to those structures authorized prior to September 5, 1967.

(b) No change in any of these criteria or relocation of airports shall at any time impose a new restriction upon any then existing or authorized antenna structure or structures.

SUBPART C—SPECIFICATIONS FOR OBSTRUCTION MARKING AND LIGHTING OF ANTENNA STRUCTURES

§ 17.21 Painting and lighting, when required.

Antenna structures shall be painted and lighted when:

(a) They exceed 60.96 meters (200 feet) in height above the ground or they require special aeronautical study.

(b) The Commission may modify the above requirement for painting and/or lighting of antenna structures, when it is shown by the applicant that the absence of such marking would not impair the safety of air navigation, or that a lesser marking requirement would insure the safety thereof.

§ 17.22 Particular specifications to be used.

Whenever painting and lighting are required, the Commission will assign painting and lighting specifications pursuant to the provisions of this subpart. If an antenna installation is of such a nature that its painting and lighting in accordance with these specifications are confusing, or endanger rather than assist airmen, or are otherwise inadequate, the Commission will specify the type of painting and lighting or other marking to be used in the individual situation.

§ 17.23 Specifications for the painting of antenna structures in accordance with § 17.21.

Except for antenna structures lighted in conformance with §§ 17.39, 17.40, 17.41 and 17.42. (High Intensity Obstruction Lighting), antenna structures shall be painted throughout their height with alternate bands of aviation surface orange and white, terminating with aviation surface orange bands at both top and bottom. The width of the bands shall be equal and approximately one-seventh the height of the structure, provided however, that the bands shall not be more than 30.48 meters (100 feet) nor less than 0.46 meters (1.5 feet) in width.

AVIATION RED OBSTRUCTION LIGHTING

§ 17.24 Specifications for the lighting of antenna structures up to and including 45.72 meters (150 feet) in height.

Antenna structures up to and including 150 feet in height above ground, which are required to be lighted as a result of notification to the FAA under § 17.7, shall be lighted as follows:

(a) There shall be installed at the top of the tower at least two 116- or 125-watt lamps (A21/TS) enclosed in aviation red obstruction light globes. The intensity of each lamp shall not be less than 32.5 candelas. The two lights shall burn simultaneously from sunset to sunrise and shall be positioned so as to insure unobstructed visibility of at least one of the lights from aircraft at any normal angle of approach. A light sensitive control device or an astronomic dial clock and time switch may be used to control the obstruction lighting in lieu of manual control. When a light sensitive device is used, it shall be adjusted so that the lights will be turned on when the north sky illuminance on a vertical surface falls to a level of not less than 376.74 lux (35 fc) and turned off when the north sky illuminance on a vertical surface rises to a level of not less than 624.31 lux (58 fc).

§ 17.25 Specifications for the lighting of antenna structures over 45.72 meters (150 feet) up to and including 91.44 meters (300 feet) in height.

(a) Antenna structures over 45.72 meters (150 feet) up to and including 60.96 meters (200 feet) in height above ground, which are required to be lighted as a result of notification to the FAA under § 17.7 and antenna structures over 60.96 meters (200 feet) up to and including 91.44 meters (300 feet) in height above ground, shall be lighted as follows:

(1) There shall be installed at the top of the structure one 300 m/m electric code beacon equipped with two 620- or 700-watt lamps (PS–40 Code Beacon type) both lamps to burn simultaneously, and equipped with aviation red color filters. The steady burning intensity shall not be less than 2,000 candelas (in red.) Where a rod or other construction of not more than 6.10 meters (20 feet) in height and incapable of supporting this beacon is mounted on top of the structure and it is determined that this additional construction does not permit unobstructed visi-

bility of the code beacon from aircraft at any normal angle of approach, there shall be installed two such beacons positioned so as to insure unobstructed visibility of at least one of the beacons from aircraft at any normal angle of approach. The beacons shall be equipped with a flashing mechanism producing not more than 40 flashes per minute nor less than 12 flashes per minute, with a period of darkness equal to approximately one-half of the luminous period.

(2) At the approximate mid point of the overall height of the tower there shall be installed at least two 116- or 125-watt lamps (A21/TS) enclosed in aviation red obstruction light globes. The intensity of each lamp shall not be less than 32.5 candelas. Each light shall be mounted so as to insure unobstructed visibility of at least one light at each level from aircraft at any normal angle of approach.

(3) All lights shall burn continuously or shall be controlled by a light sensitive device adjusted so that the lights will be turned on when the north sky illuminance on a vertical surface falls to a level of not less than 376.74 lux (35 fc) and turned off when the north sky illuminance on a vertical surface rises to a level of not less than 624.31 lux (58 fc).

§ 17.26 Specifications for the lighting of antenna structures over 91.44 meters (300 feet) up to and including 137.16 meters (450 feet).

(a) Antenna structures over 300 feet up to and including 450 feet in height above the ground shall be lighted as follows:

(1) There shall be installed at the top of the structure one 300 m/m electric code beacon equipped with two 620- or 700-watt lamps (PS–40 Code Beacon type) both lamps to burn simultaneously, and equipped with aviation red color filters. The steady burning intensity shall not be less than 2,000 candelas (in red.) Where a rod or other construction of not more than 6.10 meters (20 feet) in height and incapable of supporting this beacon is mounted on top of the structure and it is determined that this additional construction does not permit unobstructed visibility of the code beacon from aircraft at any normal angle of approach, there shall be installed two such beacons positioned so as to insure unobstructed visibility of at least one of the beacons from aircraft at any normal angle of approach. The beacons shall be equipped with a flashing mechanism producing not more than 40 flashes per minute, nor less than 12 flashes per minute, with a period of darkness equal to approximately one-half of the luminous period.

(2) On levels at approximately two-thirds and one-third of the overall height of the tower, there shall be installed at least two 116- or 125-watt lamps (A21/TS) enclosed in aviation red obstruction light globes. The intensity of each lamp shall not be less than 32.5 candelas. Each light shall be mounted so as to insure unobstructed visibility of at least one light at each level from aircraft at any normal angle of approach.

(3) All lights shall burn continuously or shall be controlled by a light sensitive device adjusted so that the lights will be turned on when the north sky illuminance on a vertical surface falls to a level of not less than 376.74 lux (35 fc) and turned off when the north sky illuminance on a vertical surface rises to a level of not less than 624.31 lux (58 fc).

§ 17.27 Specifications for the lighting of antenna structures over 137.16 meters (450 feet) up to and including 182.88 meters (600 feet) in height.

(a) Antenna structures over 450 feet up to and including 600 feet in height above the ground shall be lighted as follows:

(1) There shall be installed at the top of the structure one 300 m/m electric code beacon equipped with two 620- or 700-watt lamps (PS–40 Code Beacon type) both lamps to burn simultaneously, and equipped with aviation red color filters. The steady burning intensity shall not be less than 2,000 candelas (in red). Where a rod or other construction of not more than 6.10 meters (20 feet) in height and incapable of supporting this beacon is mounted on top of the structure and it is determined that this additional construction does not permit unobstructed visibility of the code beacon from aircraft at any normal angle of approach, there shall be installed two such beacons positioned so as to insure unobstructed visibility of at least one of the beacons from aircraft at any normal angle of approach. The beacons shall be equipped with a flashing mechanism producing not more than 40 flashes per minute nor less than 12 flashes per minute, with a period of darkness equal to approximately one-half of the luminous period.

(2) At approximately one-half of the overall height of the tower one similar flashing 300 m/m electric code beacon shall be installed in such position within the tower proper that the structural members will not impair the visibility of this beacon from aircraft at any normal angle of approach. In the event this beacon cannot be installed in a manner to insure unobstructed visibility of it from aircraft at any normal angle of approach, there shall be installed two such beacons at each level. Each beacon shall be mounted on the outside of diagonally opposite corners or opposite sides of the tower at the prescribed height.

(3) On levels at approximately three-fourths and one-fourth of the over-all height of the tower, at least one 116- or 125-watt lamp (A21/TS) enclosed in an aviation red obstruction light globe shall be installed on each outside corner of the tower at each level. The intensity of each lamp shall not be less than 32.5 candelas.

(4) All lights shall burn continuously or shall be controlled by a light sensitive device adjusted so that the lights will be turned on when the north sky illuminance on a vertical surface falls to a level of not less than 376.74 lux (35 fc) and turned off when the north sky illuminance on a vertical surface rises to a level of not less than 624.31 lux (58 fc).

§ 17.28 Specifications for the lighting of antenna structures over 182.88 meters (600 feet) up to and including 228.60 meters (750 feet) in height.

(a) Antenna structures over 182.88 meters (600 feet) up to and including 228.60 meters (750 feet) in height above the ground shall be lighted as follows:

(1) There shall be installed at the top of the structure one 300 m/m electric code beacon equipped with two 620- or 700-watt lamps (PS–40 Code Beacon type) both lamps to burn simultaneously, and equipped with aviation red color filters. The steady burning intensity shall not be less than 2,000 candelas (in red.) Where a rod or other construction of not more than 6.10 meters (20 feet) in height and incapable of supporting this beacon is mounted on top of the structure and it is determined that this additional construction does not permit unobstructed visibility of the code beacon from aircraft at any normal angle of approach, there shall be installed two such beacons positioned so as to insure unobstructed visibility of at least one of the beacons from aircraft at any normal angle of approach. The beacons shall be equipped with a flashing mechanism producing not more than 40 flashes per minute nor less than 12 flashes per minute, with a period of darkness equal to approximately one-half of the luminous period.

(2) At approximately two-fifths of the overall height of the tower one similar flashing 300 m/m electric code beacon shall be installed in such position within the tower proper that the structural members will not impair the visibility of this beacon from aircraft at any normal angle of approach. In the event this beacon cannot be installed in a manner to insure unobstructed visibility of it from aircraft at any normal angle of approach, there shall be installed two such beacons at each level. Each beacon shall be mounted on the outside of diagonally opposite corners or opposite sides of the tower at the prescribed height.

(3) On levels at approximately four-fifths, three-fifths and one-fifth of the overall height of the tower, at least one 116- or 125-watt lamp (A21/TS) enclosed in an aviation red obstruction light globe shall be installed on each outside corner of the tower at each level. The intensity of each lamp shall not be less than 32.5 candelas.

(4) All lights shall burn continuously or shall be controlled by a light sensitive device adjusted so that the lights will be turned on when the north sky illuminance on a vertical surface falls to a level of not less than 367.74 lux (35 fc) and turned off when the north sky illuminance on a vertical surface rises to a level of not less than 624.31 lux (58 fc.).

§ 17.29 Specifications for the lighting of antenna structures over 228.60 meters (750 feet) up to and including 274.32 meters (900 feet) in height.

(a) Antenna structures over 750 feet up to and including 900 feet in height above the ground shall be lighted as follows:

(1) There shall be installed at the top of the structure one 300 m/m electric code beacon equipped with two 620- or 700-watt lamps (PS–40 Code Beacon type) both lamps to burn simultaneously, and equipped with aviation red color filters. The steady burning intensity shall not be less than 2,000 candelas (in red). Where a rod or other construction of not more than 6.10 meters (20 feet) in height and incapable of supporting this beacon is mounted on top of the structure and it is determined that this additional construction does not permit unobstructed visibility of the code beacon from aircraft at any normal angle of approach, there shall be installed two such beacons positioned so as to insure unobstructed visibility of at least one of the beacons from aircraft at any normal angle of approach. The beacons shall be equipped with a flashing mechanism producing not more than 40 flashes per minute nor less than 12 flashes per minute, with a period of darkness equal to approximately one-half of the luminous period.

(2) On levels at approximately two-thirds and one-third of the overall height of the tower one similar flashing 300 m/m electric code beacon shall be installed in such position within the tower proper that the structural members will not impair the visibility of this beacon from aircraft at any normal angle of approach. In the event these beacons cannot be installed in a manner to insure unobstructed visibility of the beacons from aircraft at any normal angle of approach, there shall be installed two such beacons at each level. Each beacon shall be mounted on the outside of diagonally opposite corners or opposite sides of the tower at the prescribed height.

(3) On levels at approximately five-sixths, one-half, and one-sixth of the over-all height of the tower, at least one 116- or 125-watt lamp (A21/TS) enclosed in an aviation red obstruction light globe shall be installed on each outside corner of the tower at each level. The intensity of each lamp shall not be less than 32.5 candelas.

(4) All lights shall burn continuously or shall be controlled by a light sensitive device adjusted so that the lights will be turned on when the north sky illuminance on a vertical surface falls to a level of not less than 376.74 lux (35 fc) and turned off when the north sky illuminance on a vertical surface rises to a level of not less than 624.31 lux (58 fc).

§ 17.30 Specifications for the lighting of antenna structures over 274.32 meters (900 feet) up to and including 320.04 meters (1,050 feet) in height.

(a) Antenna structures over 274.32 meters (900 feet) up to and including 320.04 meters (1,050 feet) in height above the ground shall be lighted as follows:

(1) There shall be installed at the top of the structure one 300 m/m electric code beacon equipped with two 620- or 700-watt lamps (PS–40 Code Beacon type) both lamps to burn simultaneously, and equipped with aviation red color filters. The steady burning intensity shall not be less than 2,000 candelas (in red). Where a rod or other construction of not more than 6.10 meters (20 feet) in height and incapable of supporting this beacon is mounted on top of the structure and it is determined that this additional construction does not permit unobstructed visibility of the code beacon from aircraft at any normal angle of approach, there shall be installed two such beacons positioned so as to insure unobstructed visibility of at least one of the beacons from aircraft at any normal angle of approach. The beacons shall be equipped with a flashing mechanism producing not more than 40 flashes per minute nor less than 12 flashes per minute, with a period of darkness equal to approximately one-half of

the luminous period.

(2) On levels at approximately four-sevenths and two-sevenths of the overall height of the tower one similar flashing 300 m/m electric code beacon shall be installed in such position within the tower proper that the structural members will not impair the visibility of this beacon from aircraft at any normal angle of approach. In the event these beacons cannot be installed in a manner to insure unobstructed visibility of the beacons from aircraft at any normal angle of approach, there shall be installed two such beacons at each level. Each beacon shall be mounted on the outside of diagonally opposite corners or opposite sides of the tower at the prescribed height.

(3) On levels at approximately six-sevenths, five-sevenths, three-sevenths and one-seventh of the over-all height of the tower at least one 116- or 125-watt lamp (A21/TS) enclosed in an aviation red obstruction light globe shall be installed on each outside corner of the tower at each level. The intensity of each lamp shall not be less than 32.5 candelas.

(4) All lights shall burn continuously or shall be controlled by a light sensitive device adjusted so that the lights will be turned on when the north sky illuminance on a vertical surface falls to a level of not less than 376.74 lux (35 fc) and turned off when the north sky illuminance on a vertical surface rises to a level of not less than 624.31 lux (58 fc).

§ 17.31 Specifications for the lighting of antenna structures over 320.04 meters (1,050 feet) up to and including 365.76 meters (1,200 feet) in height.

(a) Antenna structures over 320.04 meters (1,050 feet) up to and including 365.76 meters (1,200 feet) in height above the ground shall be lighted as follows:

(1) There shall be installed at the top of the structure one 300 m/m electric code beacon equipped with two 620- or 700-watt lamps (PS–40 Code Beacon type) both lamps to burn simultaneously, and equipped with aviation red color filters. The steady burning intensity shall not be less than 2,000 candelas (in red). Where a rod or other construction of not more than 6.10 meters (20 feet) in height and incapable of supporting this beacon is mounted on top of the structure and it is determined that this additional construction does not permit unobstructed visibility of the code beacon from aircraft at any normal angle of approach, there shall be installed two such beacons positioned so as to insure unobstructed visibility of at least one of the beacons from aircraft at any normal angle of approach. The beacons shall be equipped with a flashing mechanism producing not more than 40 flashes per minute nor less than 12 flashes per minute, with a period of darkness equal to approximately one-half of the luminous period.

(2) On levels at approximately three-fourths, one-half and one-fourth of the overall height of the tower one similar flashing 300 m/m electric code beacon shall be installed in such position within the tower proper that the structural members will not impair the visibility of this beacon from aircraft at any normal angle of approach. In the event these beacons cannot be installed in a manner to insure unobstructed visibility of the beacons from aircraft at any normal angle of approach, there shall be installed two such beacons at each level. Each beacon shall be mounted on the outside of diagnoally opposite corners or opposite sides of the tower at the prescribed height.

(3) On levels at approximately seven-eighths, five-eighths, three-eighths, and one-eighth of the over-all height of the tower, at least one 116- or 125-watt lamp (A21/TS) enclosed in an aviation red obstruction light globe shall be installed on each outside corner of the tower at each level. The intensity of each lamp shall not be less than 32.5 candelas.

(4) All lights shall burn continuously or shall be controlled by a light sensitive device adjusted so that the lights will be turned on when the north sky illuminance on a vertical surface falls to a level of not less than 376.74 lux (35 fc) and turned off when the north sky illuminance on a vertical surface rises to a level of not less than 624.31 lux (58 fc).

§ 17.32 Specifications for the lighting of antenna structures over 356.76 meters (1,200 feet) up to and including 411.48 meters (1,350 feet) in height.

(a) Antenna structures over 356.76 meters (1,200 feet) up to and including 411.48 meters (1,350 feet) in height above the ground shall be lighted as follows:

(1) There shall be installed at the top of the structure one 300 m/m electric code beacon equipped with two 620- or 700-watt lamps (PS–40 Code Beacon type) both lamps to burn simultaneously, and equipped with aviation red color filters. The steady burning intensity shall not be less than 2,000 candelas (in red). Where a rod or other construction of not more than 6.10 meters (20 feet) in height and incapable of supporting this beacon is mounted on top of the structure and it is determined that this additional construction does not permit unobstructed visibility of the code beacon from aircraft at any normal angle of approach, there shall be installed two such beacons positioned so as to insure unobstructed visibility of at least one of the beacons from aircraft at any normal angle of approach. The beacons shall be equipped with a flashing mechanism producing not more than 40 flashes per minute nor less than 12 flashes per minute, with a period of darkness equal to approximately one-half of the luminous period.

(2) On levels at approximately two-thirds, four-ninths, and two-ninths of the overall height of the tower one similar flashing 300 m/m electric code beacon shall be installed in such position within the tower proper that the structural members will not impair the visibility of this beacon from aircraft at any normal angle of approach. In the event these beacons cannot be installed in a manner to insure unobstructed visibility of the beacons from aircraft at any normal angle of approach, there shall be installed two such beacons at each level. Each beacon shall be mounted on the outside of diagonally opposite corners or opposite sides of the tower at the prescribed height.

(3) On levels at approximately eight-ninths, seven-ninths, five-ninths, one-third and one-ninth of the overall height of the tower, at least one 116- or 125-watt lamp (A21/TS) enclosed in an aviation red obstruction light globe shall be installed on each outside corner of the tower at each level. The intensity of each lamp shall not be less than 32.5 candelas.

(4) All lights shall burn continuously or shall be controlled by a light sensitive device adjusted so that the lights will be turned on when the north sky illuminance on a vertical surface falls to a level of not less than 376.74 lux (35 fc) and turned off when the north sky illuminance on a vertical surface rises to a level of not less than 624.31 lux (58 fc).

§ 17.33 Specifications for the lighting of antenna structures over 411.48 meters (1,350 feet) up to and including 457.20 meters (1,500 feet) in height.

(a) Antenna structures over 411.48 meters (1,350 feet) up to and including 457.20 meters (1,520 feet) in height above the ground shall be lighted as follows:

(1) There shall be installed at the top of the structure one 300 m/m electric code beacon equipped with two 620- or 700-watt lamps (PS–40 Code Beacon type) both lamps to burn simultaneously, and equipped with aviation red color filters. The steady burning intensity shall not be less than 2,000 candelas (in red). Where a rod or other construction of not more than 6.10 meters (20 feet) in height and incapable of supporting this beacon is mounted on top of the structure and it is determined that this additional construction does not permit unobstructed visibility of the code beacon from aircraft at any normal angle of approach, there shall be installed two such beacons positioned so as to insure unobstructed visibility of at least one of the beacons from aircraft at any normal angle of approach. The beacons shall be equipped with a flashing mechanism producing not more than 40 flashes per minute nor less than 12 flashes per minute, with a period of darkness equal to approximately one-half of the luminous period.

(2) On levels at approximately four-fifths, three-fifths, two-fifths, and one-fifth of the overall height of the tower one similar flashing 300 m/m electric code beacon shall be installed in such position within the tower proper that the structural members will not impair the visibility of this beacon from aircraft at any normal angle of approach. In the event these beacons cannot be installed in a manner to insure unobstructed visibility of the beacons from aircraft at any normal angles of approach, there shall be installed two such beacons at each level. Each beacon shall be mounted on the outside of diagonally opposite corners or opposite sides of the tower at the prescribed height.

(3) On levels at approximately nine-tenths, seven-tenths, one-half, three-tenths, and one-tenth of the over-all height of the tower, at least one 116- or 125-watt lamp (A21/TS) enclosed in an aviation red obstruction light globe shall be installed on each outside corner of the tower at each level. The intensity of each lamp shall not be less than 32.5 candelas.

(4) All lights shall burn continuously or shall be controlled by a light sensitive device adjusted so that the lights will be turned on when the north sky illuminance on a vertical surface falls to a level of 376.74 lux (35 fc) and turned off when the north sky illuminance level on a vertical surface rises to a level of not less than 624.31 lux (58 fc).

§ 17.34 Specifications for the lighting of antenna structures over 457.20 meters (1,500 feet) up to and including 502.92 meters (1,650 feet) in height above the ground.

(a) Antenna structures over 457.20 meters (1,500 feet) up to and including 502.92 meters (1,650 feet) in height above the ground shall be lighted as follows:

(1) There shall be installed at the top of the structure one 300 m/m electric code beacon equipped with two 620- or 700-watt lamps (PS–40 Code Beacon type) both lamps to burn simultaneously, and equipped with aviation red color filters. The steady burning intensity shall not be less than 2,000 candelas (in red). Where a rod or other construction of not more than 6.10 meters (20 feet) in height and incapable of supporting this beacon is mounted on top of the structure and it is determined that this additional construction does not permit unobstructed visibility of the code beacon from aircraft at any normal angle of approach, there shall be installed two such beacons positioned so as to insure unobstructed visibility of at least one of the beacons from aircraft at any normal angle of approach. The beacons shall be equipped with a flashing mechanism producing not more than 40 flashes per minute nor less than 12 flashes per minute, with a period of darkness equal to approximately one-half of the luminous period.

(2) On levels at approximately eight-elevenths, six-elevenths, four-elevenths, and two-elevenths of the over-all height of the tower, one similar flashing 300 m/m electric code beacon shall be installed in such position within the tower proper that the structural members will not impair the visibility of this beacon from the aircraft at any normal angle of approach. In the event these beacons cannot be installed in a manner to insure unobstructed visibility of the beacons from aircraft at any normal angle of approach there shall be installed two such beacons at each level. Each beacon shall be mounted on the outside of diagonally opposite corners or opposite sides of the tower at the prescribed height.

(3) On levels at approximately ten-elevenths, nine-elevenths, seven-elevenths, five-elevenths, three-elevenths, and one-eleventh of the overall height of the tower at least one 116- or 125-watt lamps (A21/TS) enclosed in an aviation red obstruction light globe shall be installed on each outside corner of the tower at each level. The intensity of each lamp shall not be less than 32.5 candelas.

(4) All lights shall burn continuously or shall be controlled by a light sensitive device adjusted so that the lights will be turned on when the north sky illuminance on a vertical surface falls to a level of not less than 376.74 lux (35 fc) and turned off when the north sky illuminance on a vertical surface rises to a level of not less than 624.31 lux (58 fc).

RULES AND REGULATIONS

§ 17.35 Specifications for the lighting of antenna structures over 502.92 meters (1,650 feet) up to and including 548.64 meters (1,800 feet) in height.

(a) Antenna structures over 502.92 meters (1,650 feet) up to and including 548.64 meters (1,800 feet) in height above the ground shall be lighted as follows:

(1) There shall be installed at the top of the structure one 300 m/m electric code beacon equipped with two 620- or 700-watt lamps (PS–40 Code Beacon type) both lamps to burn simultaneously, and equipped with aviation red color filters. The steady burning intensity shall not be less than 2,000 candelas (in red). Where a rod or other construction of not more than 6.10 meters (20 feet) in height and incapable of supporting this beacon is mounted on top of the structure and it is determined that this additional construction does not permit unobstructed visibility of the code beacon from aircraft at any normal angle of approach, there shall be installed two such beacons positioned so as to insure unobstructed visibility of at least one of the beacons from aircraft at any normal angle of approach. The beacons shall be equipped with a flashing mechanism producing not more than 40 flashes per minute nor less than 12 flashes per minute, with a period of darkness equal to approximately one-half of the luminous period.

(2) On levels at approximately five-sixths, two-thirds, one-half, one-third, and one-sixth of the overall height of the tower one similar flashing 300 m/m electric code beacon shall be installed in such position within the tower proper that the structural members will not impair the visibility of this beacon from aircraft at any normal angle of approach. In the event these beacons cannot be installed in a manner to insure unobstructed visibility of the beacons from aircraft at any normal angle of approach, there shall be installed two such beacons at each level. Each beacon shall be mounted on the outside of diagonally opposite corners or opposite sides of the tower at the prescribed height.

(3) On levels at approximately eleven-twelfths, three-fourths, seven-twelfths, five-twelfths, one-fourth and one-twelfth of the overall height of the tower at least one 116- or 125-watt lamp (A21/TS) enclosed in an aviation red obstruction light globe shall be installed on each outside corner of the tower at each level. The intensity of each lamp shall not be less than 32.5 candelas.

(4) All lights shall burn continuously or shall be controlled by a light sensitive device adjusted so that the lights will be turned on when the north sky illuminance on a vertical surface falls to a level not less than 376.74 lux (35 fc) and turned off when the north sky illuminance on a vertical surface rises to a level of not less than 624.31 lux (58 fc).

§ 17.36 Specifications for the lighting of antenna structures over 548.64 meters (1,800 feet) up to and including 594.36 meters (1,950 feet) in height.

(a) Antenna structures over 548.64 meters (1,800 feet) up to and including 594.36 meters (1,950 feet) in height above the ground shall be lighted as follows:

(1) There shall be installed at the top of the structure one 300 m/m electric code beacon equipped with two 620- or 700-watt lamps (PS–40 Code Beacon type) both lamps to burn simultaneously, and equipped with aviation red color filters. The steady burning intensity shall not be less than 2,000 candelas (in red). Where a rod or other construction of not more than 6.10 meters (20 feet) in height and incapable of supporting this beacon is mounted on top of the structure and it is determined that this additional construction does not permit unobstructed visibility of the code beacon from aircraft at any normal angle of approach, there shall be installed two such beacons positioned so as to insure unobstructed visibility of at least one of the beacons from aircraft at any normal angle of approach. The beacons shall be equipped with a flashing mechanism producing not more than 40 flashes per minute nor less than 12 flashes per minute, with a period of darkness equal to approximately one-half of the luminous period.

(2) On levels at approximately ten-thirteenths, eight-thirteenths, six-thirteenths, four-thirteenths, and two-thirteenths of the overall height of the tower one similar flashing 300 m/m electric code beacon shall be installed in such position within the tower proper that the structural members will not impair the visibility of this beacon from aircraft at any normal angle of approach. In the event these beacons cannot be installed in a manner to insure unobstructed visibility of the beacons from aircraft at any normal angle of approach, there shall be installed two such beacons at each level. Each beacon shall be mounted on the outside of diagonally opposite corners or opposite sides of the tower at the prescribed height.

(3) On levels at approximately twelve-thirteenths, eleven-thirteenths, nine-thirteenths, seven-thirteenths, five-thirteenths, three-thirteenths, and one-thirteenth of the overall height of the tower at least one 116- or 125-watt lamp (A21/TS) enclosed in an aviation red obstruction light globe shall be installed on each outside corner of the tower at each level. The intensity of each lamp shall not be less than 32.5 candelas.

(4) All lights shall burn continuously or shall be controlled by a light sensitive device adjusted so that the lights will be turned on when the north sky illuminance on a vertical surface falls to a level not less than 376.74 lux (35 fc) and turned off when the north sky illuminance on a vertical surface rises to a level of not less than 624.31 lux (58 fc).

§ 17.37 Specifications for the lighting of antenna structures over 594.36 meters (1,950 feet) up to and including 460.08 meters (2,100 feet) in height.

(a) Antenna structures over 594.36 meters (1,950 feet) up to and including 460.08 meters (2,100 feet) in height above the ground shall be lighted as follows:

(1) There shall be installed at the top of the structure one 300 m/m electric code beacon equipped with two 620- or 700-watt lamps (PS–40, Code Beacon type) both lamps to burn simultaneously, and equipped with aviation red color filters. The steady burning intensity shall not be less than 2,000 candelas (in red). Where a rod or other construction of not more than 6.10 meters (20 feet) in height and incapable of supporting this beacon is mounted on top of the structure and it is determined that this additional construction does not permit unobstructed visibility of the code beacon from aircraft at any normal angle of approach, there shall be installed two such beacons positioned so as to insure unobstructed visibility of at least one of the beacons from aircraft at any normal angle of approach. The beacons shall be equipped with a flashing mechanism producing not more than 40 flashes per minute nor less than 12 flashes per minute, with a period of darkness equal to approximately one-half of the luminous period.

(2) On levels at approximately six-sevenths, five-sevenths, four-sevenths, three-sevenths, two-sevenths, and one-seventh of the overall height of the tower one similar flashing 300 m/m electric code beacon shall be installed in such position within the tower proper that the structural members will not impair the visibility of this beacon from aircraft at any normal angle of approach. In the event these beacons cannot be installed in a manner to insure unobstructed visibility of the beacons from aircraft at any normal angle of approach, there shall be installed two such beacons at each level. Each beacon shall be mounted on the outside of diagonally opposite corners or opposite sides of the tower at the prescribed height.

(3) On levels at approximately thirteen-fourteenths, eleven-fourteenths, nine-fourteenths, one half, five-fourteenths, three-fourteenths, and one-fourteenth of the overall height of the tower at least one 116- or 125-watt lamp (A21/TS) enclosed in an aviation red obstruction light globe shall be installed on each outside corner of the tower at each level. The intensity of each lamp shall not be less than 32.5 candelas.

(4) All lights shall burn continuously or shall be controlled by a light sensitive device adjusted so that the lights will be turned on when the north sky illuminance on a vertical surface falls to a level of not less than 367.74 lux (35 fc) and turned off when the north sky illuminance on a vertical surface rises to a level of not less than 624.31 lux (58 fc).

§ 17.38 Specifications for the lighting of antenna structures over 640.08 meters (2,100 feet) in height.

Antenna structures over 640.08 meters (2,100 feet) in height above the ground shall be lighted in accordance with specifications to be determined by the Commission after aeronautical study which will include lighting recommendations.

HIGH INTENSITY WHITE OBSTRUCTION LIGHTING

NOTE: When authorized by the Commission, high intensity white obstruction lighting will be used in lieu of obstruction marking and lighting specified in §§ 17.23 through 17.37.

In general, the number of levels of high intensity lighting specified is dependent upon the overall height of the skeletal frame or comparable main support structure, excluding antennas or similar appurtenances. A white capacitor discharge omnidirectional light is mounted on or adjacent to the appurtenance, if more than 6.10 meters (20 feet), to complement the lighting system.

Where a dual lighting system is employed, i.e., high intensity white obstruction lighting during daylight and red obstruction lighting at night, the omnidirectional high intensity light, if equipped with an aviation red color filter for nighttime illumination, may be used in lieu of the 300 mm top beacon specified in § 17.24(a) and subparagraph (a)(1) in §§ 17.25 through 17.37.

§ 17.39 Specifications for the high intensity lighting of antenna structures having a skeletal tower up to and including 91.44 meters (300 feet) in height.

Antenna structures having a skeletal tower or other main support structure up to and including 91.44 meters (300 feet) in height shall be obstruction lighted as follows:

(a) There shall be installed at the top of the skeletal tower or other main support structure three or more high intensity light units which conform to FAA/DOD Specification L–856, High Intensity Obstruction Lighting Systems. The complement of units shall emit a white high intensity light and produce an effective intensity of not less than 200,000 candelas (daytime) uniformly about the antenna structure in the horizontal plane. The effective intensity shall be reduced to approximately 20,000 candelas at twilight, and to approximately 4,000 candelas at night. The light units shall be mounted in a manner to insure unobstructed viewing from aircraft at any normal angle of approach and so that the effective intensity of the full beam is not impaired by any structural members of the skeletal framework. The units will normally be adjusted so that the center of the beam is in the horizontal plane.

(b) Where an antenna or similar appurtenance extends more than 6.10 meters (20 feet) above the skeletal tower or other main support structure, a white capacitor discharge omnidirectional light which conforms to FAA/DOD Specification L–856, High Intensity Obstruction Lighting Systems, shall be mounted on the highest point. If the antenna or similar appurtenance is incapable of supporting the omnidirectional light, one or more lights shall be installed on a suitable adjacent support with the light(s) mounted no more than 6.10 meters (20 feet) below the tip of the appurtenance. The light(s) shall be positioned so as to permit unobstructed viewing of at least one light from aircraft at any normal angle of approach. The light unit(s) shall emit a beam peak intensity around its periphery of approximately 20,000 candelas during daytime and twilight operation, and approximately 4,000 candelas at night.

(c) All lights shall be synchronized to flash simultaneously at 40 pulses per minute. The light system shall be equipped with a light sensitive control device which shall face the north sky and cause the intensity steps to change automatically when the north sky illumination on a vertical surface is as follows:

(1) Day to Twilight: This shall not occur before the illumination drops to 645.84 lux (60 fc), but shall occur before it drops below 322.92 lux (30 fc).

(2) Twilight to Night: This shall not occur before the illumination drops to 53.82 lux (5 fc), but shall occur before it drops below 21.53 lux (2 fc).

(3) Night to Day: The intensity changes listed in subparagraphs (1) and (2) of this paragraph shall be reversed in transitioning from the night to day modes. Failure of the intensity step changing circuits shall cause all lights to operate in the high intensity mode or, the next brighter intensity step above that required for the period of operation.

§ 17.40 Specifications for the high intensity lighting of antenna structures having a skeletal tower over 91.44 meters (300 feet) up to and including 182.88 meters (600 feet) in height.

Antenna structures having a skeletal tower or other main support structure over 91.44 meters (300 feet) up to and including 182.88 meters (600 feet) in height shall be obstruction lighted as follows:

(a) There shall be installed at the top of the skeletal tower or other main support structure three or more high intensity light units which conform to FAA/DOD Specification L–856, High Intensity Obstruction Lighting Systems. The complement of units shall emit a white high intensity light and produce an effective intensity of not less than 200,000 candelas (daytime) uniformally about the antenna structure in the horizontal plane. The effective intensity shall be reduced to approximately 20,000 candelas at twilight, and to approximately 4,000 candelas at night. The light units shall be mounted in a manner to insure unobstructed viewing from aircraft at any normal angle of approach and so that the effective intensity of the full beam is not impaired by any structural members of the skeletal framework. The units will normally be adjusted so that the center of the beam is in the horizontal plane.

(b) At the approximate ½ (midpoint) level of the skeletal tower there shall be installed an additional set of high intensity obstruction lights as in paragraph (a) of this section. The normal angular adjustment of the beam centers above the horizontal shall be 2 degrees. See Table under § 17.42.

(c) Where an antenna or similar appurtenance extends more than 6.10 meters (20 feet) above the skeletal tower or other main support structure, a white capacitor discharge omnidirectional light which conforms to FAA/DOD Specification L–856, High Intensity Obstruction Lighting Systems, shall be mounted on the highest point. If the antenna or similar appurtenance is incapable of supporting the omnidirectional light, one or more lights shall be installed on a suitable adjacent support with the light(s) mounted no more than 6.10 meters (20 feet) below the tip of the appurtenance. The light(s) shall be positioned so as to permit unobstructed viewing of at least one light from aircraft at any normal angle of approach. The light unit(s) shall emit a beam peak intensity around its periphery of approximately 20,000 candelas during daytime and twilight operation, and approximately 4,000 candelas at night.

(d) All lights shall be synchronized to flash simultaneously at 40 pulses per minute. The light system shall be equipped with a light sensitive control device which shall face the north sky and cause the intensity steps to change automatically when the north sky illumination on a vertical surface is as follows:

(1) Day to Twilight: This shall not occur before the illumination drops to 645.84 lux (60 fc), but shall occur before it drops below 322.92 lux (30 fc).

(2) Twilight to Night: This shall not occur before the illumination drops to 53.82 lux (5 fc), but shall occur before it drops below 21.53 lux (2 fc).

(3) Night to Day: The intensity changes listed in subparagraph (1) and (2) of this paragraph shall be reversed in transitioning from the night to day modes. Failure of the intensity step changing circuits shall cause all lights to operate in the high intensity mode or the next brighter intensity step above that required for the period of operation.

§ 17.41 Specifications for the high intensity lighting of antenna structures having a skeletal tower over 182.88 meters (600 feet) up to and including 304.80 meters (1,000 feet) in height.

Antenna structures having a skeletal tower or other main support structures over 182.88 meters (600 feet) up to and including 304.80 meters (1,000 feet) in height shall be obstruction lighted as follows:

(a) There shall be installed at the top of the skeletal tower or other main support structure three or more high intensity light units which conform to FAA/DOD Specification L–856, High Intensity Obstruction Lighting Systems. The complement of units shall emit a white high intensity light and produce an effective intensity of not less than 200,000 candelas (daytime) uniformly about the antenna structure in the horizontal plane. The effective intensity shall be reduced to approximately 20,000 candelas at twilight, and to approximately 4,000 candelas at night. The light units shall be mounted in a manner to insure unobstructed viewing from aircraft at any normal angle of approach and so that the effective intensity of the full beam is not impaired by any structural members of the skeletal framework. The units will normally be adjusted so that the center of the beam is in the horizontal plane.

(b) At the approximate ⅓ and ⅔ levels of the skeletal tower there shall be installed additional sets of high intensity obstruction lights as in paragraph (a) of this section. The normal angular adjustment of the beam centers above the horizontal shall be 2 degrees at the ⅓ level and one degree at the ⅔ level. See Table under § 17.42.

(c) Where a rod or similar appurtenance extends more than 6.10 meters (20 feet) above the skeletal tower or other main support structure, a white capacitor discharge omnidirectional light which conforms to FAA/DOD Specification L–856, High Intensity Obstruction Lighting Systems, shall be mounted on the highest point. If the antenna or similar appurtenance is incapable of suporting the omnidirectional light, one or more lights shall be installed on a suitable adjacent support with the light(s) mounted no more than 6.10 meters (20 feet) below the tip of the appurtenance. The light(s) shall be positioned so as to permit unobstructed viewing of at least one light from aircraft at any normal angle of approach. The light unit(s) shall emit a beam peak intensity around its periphery of approximately 20,000 candelas during daytime and twilight operation, and approximately 4,000 candelas at night.

(d) All lights shall be synchronized to flash simultaneously at 40 pulses per minute. The light system shall be equipped with a light sensitive control device which shall face the north sky and cause the intensity steps to change automatically when the north sky illumination on a vertical surface is as follows:

(1) Day to Twilight: This shall not occur before the illumination drops to 645.84 lux (60 fc), but shall occur before it drops below 322.92 lux (30 fc).

(2) Twilight to Night: This shall not occur before the illumination drops to 53.82 lux (5 fc), but shall occur before it drops below 21.53 lux (2 fc).

(3) Night to Day: The intensity changes listed in (1) and (2) of this paragraph shall be reversed in transitioning from the night to day modes.

Failure of the intensity step changing circuits shall cause all lights to operate in the high intensity mode or the next brighter intensity step above that required for the period of operation.

§ 17.42 Specifications for the high intensity lighting of antenna structures having a skeletal tower over 304.80 meters (1,000 feet) in height.

Antenna structures having a skeletal tower or other main support structure over 304.80 meters (1,000 feet) in height shall be obstruction lighted as follows:

(a) There shall be installed at the top of the skeletal tower or other main support structure three or more high intensity light units which conform to FAA/DOD Specification L–856, High Intensity Obstruction Lighting Systems. The complement of units shall emit a white high intensity light and produce an effective intensity of not less than 200,000 candelas (daytime) uniformally about the antenna structure in the horizontal plane. The effective intensity shall be reduced to approximately 20,000 candelas at twilight, and to approximately 4,000 candelas at night. The light units shall be mounted in a manner to insure unobstructed viewing from aircraft at any normal angle of approach and so that the effective intensity of the full beam is not impaired by any structural members of the skeletal framework. The units will normally be adjusted so that the center of the beam is in the horizontal plane.

(b) In addition, there shall be installed at approximate equi-distant levels along the vertical axis of the skeletal tower three or more sets of high intensity obstruction lights as in paragraph (a) of this section. Three intermediate levels are required for skeletal towers over 304.80 meters (1,000 feet) up to and including 426.72 meters (1,400 feet). For each additional 121.92 meters (400 feet) or fraction one additional level of lighting shall be installed. The normal angular adjustment of the beam centers at the bottom level shall be 3 degrees above the horizontal and for the second progressive level shall be 2 degrees above the horizontal. For other progressive levels, see Table below.

(c) Where a rod or similar appurtenance extends more than 6.10 meters (20 feet) above the skeletal tower or other main support structure, a white capacitor discharge omnidirectional light which conforms to FAA/DOD Specification L–856, High Intensity Obstruction Lighting Systems, shall be mounted on the highest point. If the antenna or similar appurtenance is incapable of supporting the omnidirectional light, one or more lights shall be installed on a suitable adjacent support with the light(s) mounted no more than 6.10 meters (20 feet) below the tip of the appurtenance. The light(s) shall be positioned so as to permit unobstructed viewing of at least one light from aircraft at any normal angle of approach. The light unit(s) shall emit a beam peak intensity around its periphery of approximately 20,000 candelas during daytime and twilight operation, and approximately 4,000 candelas at night.

(d) All lights shall be synchronized to flash simultaneously at 40 pulses per minute. The light system shall be equipped with a light sensitive control device which shall face the north sky and cause the intensity steps to change automatically when the north sky illumination on a vertical surface is as follows:

(1.) Day to Twilight: This shall not occur before the illumination drops to 645.84 lux (60 fc), but shall occur before it drops below 322.92 lux (30 fc).

(2.) Twilight to Night: This shall not occur before the illumination drops to 53.82 lux (5 fc), but shall occur before it drops below 21.53 lux (2 fc).

(3.) Night to Day: The intensity changes listed in subparagraph (1) and (2) of this paragraph shall be reversed in transitioning from the night to day modes.

Failure of the intensity step changing circuits shall cause all lights to operate in high intensity mode or the next brighter intensity step above that required for the period of operation.

Degrees elevation above horizontal

Light level	Number of light levels on structure					
	1	2	3	4	5	6
Top	0	0	0	0	0	0
5						0
4					0	1
3				1	1	2
2			1	2	2	2
Bottom		2	2	3	3	3

[In metric conversion §§ 17.10, 17.25—17.42 were amended eff. 10–17–77; I(77)–1]

§ 17.43 Painting and lighting of new and existing structures.

(a) The provisions of this part of the rules with respect to antenna structures required to be painted and/or lighted, shall be effective November 1, 1970, for any new antenna structure and for any change in the height or location of an existing antenna structure.

(b) All existing antenna structures required to be painted shall be painted in the manner set forth in § 17.23 at the time when the antenna structure is repainted (see § 17.50) or in no event later than November 1, 1977.

(c) All existing antenna structures required to be illuminated shall be brought into conformity herewith

within 6 months after September 5, 1970, at any station for which the authorization is renewable on or prior to that date, and within 3 months following the renewal of an authorization renewable after September 5, 1970.

(d) Nothing in the notification criteria concerning antenna structures or locations, as set forth in Subpart B of this part, shall apply to painting and lighting those structures authorized prior to September 5, 1967, except where lighting and painting requirements are reduced, in which case the lesser requirements may apply upon approval of an application to the Commission for such reduction.

[*§ 17.45 amended eff. 10–17–77; 1(77)–1*]

§ 17.45 Temporary warning lights.

During construction of an antenna structure, for which red obstruction lighting is required, at least two 116- or 125-watt lamps (A21/TS) enclosed in aviation red obstruction light globes, shall be installed at the uppermost point of the structure. The intensity of each lamp shall not be less than 32.5 candelas. In addition, as the height of the structure exceeds each level at which permanent obstruction lights will be required, two similar lights shall be installed at each such level. These temporary warning lights shall be displayed nightly from sunset to sunrise until the permanent obstruction lights have been installed and placed in operation, and shall be positioned so as to insure unobstructed visibility of at least one of the lights at any normal angle of approach. If practical, the permanent obstruction lights may be installed and operated at each required level as construction progresses.

§ 17.47 Inspection of tower lights and associated control equipment.

The licensee of any radio station which has an antenna structure requiring illumination pursuant to the provisions of section 303(q) of the Communications Act of 1934, as amended, as outlined elsewhere in this part:

(a) (1) Shall make an observation of the tower lights at least once each 24 hours either visually or by observing an automatic properly maintained indicator designed to register any failure of such lights, to insure that all such lights are functioning properly as required; or alternatively,

(2) Shall provide and properly maintain an automatic alarm system designed to detect any failure of such lights and to provide indication of such failure to the licensee.

(b) Shall inspect at intervals not to exceed 3 months all automatic or mechanical control devices, indicators, and alarm systems associated with the tower lighting to insure that such apparatus is functioning properly.

§ 17.48 Notification of extinguishment or improper functioning of lights.

The licensee of any radio station which has an antenna structure requiring illumination pursuant to the provisions of section 303(q) of the Communications Act of 1934, as amended, as outlined elsewhere in this part:

(a) Shall report immediately by telephone or telegraph to the nearest Flight Service Station or office of the Federal Aviation Administration any observed or otherwise known extinguishment or improper functioning of any top steady burning light or any flashing obstruction light, regardless of its position on the antenna structure, not corrected within 30 minutes, Such reports shall set forth the condition of the light or lights, the circumstances which caused the failure, and the probable date for restoration of service. Further notification by telephone or telegraph shall be given immediately upon resumption of normal operation of the light or lights.

(b) An extinguishment or improper functioning of a steady burning side intermediate light or lights, shall be corrected as soon as possible, but notification to the FAA of such extinguishment or improper functioning is not required.

§ 17.49 Recording of tower light inspections in the station record.

The licensee of any radio station which has an antenna structure requiring illumination shall make the following entries in the station record of the inspections required by § 17.47.

(a) The time the tower lights are turned on and off each day if manually controlled.

(b) The time the daily check of proper operation of the tower lights was made, if automatic alarm system is not provided.

(c) In the event of any observed or otherwise known extinguishment or improper functioning of a tower light:

(1) Nature of such extinguishment or improper functioning.

(2) Date and time the extinguishment or improper functioning was observed, or otherwise noted.

(3) Date, time, and nature of the adjustments, repairs, or replacements made.

(4) Identification of Flight Service Station (Federal Aviation Administration) notified of the extinguishment of improper functioning of any code or rotating beacon light or top light not corrected within 30 minutes, and the date and time such notice was given.

(5) Date and time notice was given to the Flight Service Station (Federal Aviation Administration) that the required illumination was resumed.

(d) Upon completion of the periodic inspection required at least once each 3 months:

(1) The date of the inspection and the condition of all tower lights and associated tower lighting control devices, indicators and alarm systems.

(2) Any adjustments, replacements, or repairs made to insure compliance with the lighting requirements and the date such adjustments, replacements or repairs were made.

§ 17.50 Cleaning and repainting.

All towers shall be cleaned or repainted as often as necessary to maintain good visibility.

§ 17.51 Time when lights should be exhibited.

(a) All red obstruction lighting shall be exhibited from sunset to sunrise unless otherwise specified.

(b) All high intensity obstruction lighting shall be exhibited continuously unless otherwise specified.

§ 17.53 Lighting equipment and paint.

The lighting equipment, color of filters, and shade of paint referred to in the specifications are further defined in the following government and/or Army-Navy Aeronautical Specifications, Bulletins, and Drawings: (Lamps are referred to by standard numbers).

Outside white	TT–P–102 [1] (Color No. 17875, FS–595).
Aviation surface orange	TT–P–59 [1] (Color No. 12197, FS–595).
Aviation surface orange, enamel	TT–E–489 [1] (Color No 12197, FS–595).
Aviation red obstruction light—color	MIL–C–25050 [2]
Flashing beacons	CAA–446 [3] Code Beacons, 300 mm.
Do	MIL–6273 [2].
Double and single obstruction light	L–810 [3] (FAA AC No. 150/5345–2 [4]).
Do	MIL–L–7830 [2].
High intensity white obstruction light	FAA/DOD L–856 (FAA AC No. 150/5345–43B [4]).
116-Watt lamp	No. 116 A21/TS (6,000 h).
125-Watt lamp	No. 125 A21/TS (6,000 h).
620-Watt lamp	No. 620 PS–40 (3,000 h).
700-Watt lamp	No. 700 PS–40 (6,000 h).

[1] Copies of this specification can be obtained from the Specification Activity, Building 197, Room 301, Naval Weapons Plant, 1st and N Streets, SE., Washington, D.C. 20407.

[2] Copies of Military specifications can be obtained by contacting the Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Ave., Attention: NPPC–105, Philadelphia, Pa. 19120.

[3] Copies of Federal Aviation Administration specifications may be obtained from the Chief, Configuration Control Branch, AAF–110, Department of Transportation, Federal Aviation Administration, 800 Independence Avenue SW., Washington, D.C. 20591.

[4] Copies of Federal Aviation Administration advisory circulars may be obtained from the Department of Transportation, Publications Section, TAD–443.1, 400 7th St. SW., Washington, D.C. 20590.

§ 17.54 Rated lamp voltage.

To insure the necessary lumen output by obstruction lights, the rated voltage of incandescent lamps used shall correspond to be within 3 percent higher than the voltage across the lamp socket during the normal hours of operation.

[*§ 17.54 amended eff. 10–17–77; 1(77)–1*]

§ 17.56 Maintenance of lighting equipment.

(a) Replacing or repairing of lights, automatic indicators or automatic control or alarm systems shall be accomplished as soon as practicable.

(b) The flash tubes in a high intensity obstruction lighting system shall be replaced whenever the peak effective daytime intensity falls below 200,000 candelas.

§ 17.57 Report of radio transmitting antenna construction, alteration and/or removal.

Any permitee or licensee who, pursuant to any instrument of authorization from the Commission to erect or make changes affecting antenna height or location of an antenna tower for which obstruction marking or lighting is required shall, prior to start of tower construction and upon completion of such construction or changes, fill out and file with the Aeronautical Chart Division of the National Ocean Survey, NOAA Form 76–10 (Report of Radio Transmitting Antenna Construction, Alteration and/or Removal) in order that antenna tower information may be provided promptly for use on aeronautical charts and related publications in the interest of safety in air navigation.

§ 17.58 Facilities to be located on land under the jurisdiction of the U.S. Forest Service or the Bureau of Land Management.

Any application proposing new or modified transmitting facilities to be located on land under the jurisdiction of the U.S. Forest Service or the Bureau of Land Management shall include a statement that the facilities will be so located, and the applicant shall comply with the requirements of § 1.70 of this chapter.

TELEPHONE DIRECTORY

NOTE: This directory has been compiled to make it easier to locate the name, address and telephone number of those who manufacture, consult, distribute, install and service the equipment used in the broadcast communications industry along with the companies who produce the programs and materials used in same. If your company has not been included, please send your particulars on your letterhead to the publisher: Bill Daniels Co. Inc., P.O. Box 2056, Shawnee Mission, KS 66201, (913) 831-0098.

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AD TECH, INC., 701 S. Lincoln Ave., Park Ridge, IL 60068 ..... (312) 692-7320

ADVANCE INDUSTRIES, 2301 Bridgeport Dr.,
Sioux City, IA 51102 ..... (712) 252-4101

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Wichita, KS 67201 ..... (316) 263-4231

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ADVANCED VIDEO COMMUNICATIONS
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ADVANCED VIDEO PRODUCTS, 5835 Herma St.,
San Jose, CA 95123 ..... (408) 224-0606

ADVENT CORP.
195 Albany St.
Cambridge, MA 02139 ..... (617) 661-9500

ADVERTISING RESEARCH FOUNDATION,
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ADWAR VIDEO CORP.
100 Fifth Ave.
New York, NY 10011 ..... (212) 691-0976

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Hollywood, CA 90046 ..... (213) 876-2320

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BOB AHRENS PRODUCTIONS, INC.
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AILTECH, 5340 Alla Rd., Los Angeles, CA 90066 ..... (213) 870-5461

AIMS INSTRUCTIONAL MEDIA, INC., 626 Justin Ave.,
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Mineola, NY 11501 ..... (516) 248-8080

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Northfield, IL 60093 ..... (312) 441-5220

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5504 Waterway, Rockville, MD 20853 ..... (301) 460-1454
ADC Southeast
2219 Oakawana Rd. Northeast, Atlanta, GA 30345 ..... (404) 633-2100
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P.O. Box 27324, Indianapolis, IN 46277 ..... (317) 784-3000
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Rosemead, CA 91770 ..... (213) 686-1353

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COMEX SYSTEMS, INC., Executive Dr., Hudson, NH 03051 ..... (603) 889-8564

COMMAND PRODUCTS CO., P.O. Box 1577, Evanston, IL 60204 ... (312) 944-6600

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Griffith, IN 46319 ..... (312) 768-1025

SMITHALL ELECTRONICS, INC.
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SOCIETY OF MANUFACTURING ENGINEERS
P.O. Box 930, 1 SME Dr., Dearborn, MI 48128 ..... (313) 271-1500

SOCIETY OF MOTION PICTURE & TELEVISION ENGINEERS (SMPTE)
862 Scarsdale Ave., Scarsdale, NY 10583 ..... (914) 472-6606

SOCIETY OF PETROLEUM ENG. OF AIME (Public Relations Dept.)
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SOLID STATE TECHNOLOGY
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Hollywood, FL 33021 ..... (305) 981-8800

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New York, NY 10019 ..... (212) 371-5800

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Western Region
700 West Artesia Blvd., Compton, CA 90220 ..... (213) 537-4300

Midwestern Region
6801 West Jarvis Street, Niles, IL 60648 ..... (312) 792-3600

Northwestern Region
230 W. Hill Place, Brisbane, CA 94005 ..... (415) 467-4700

Southwestern Region
9004 Ambassador Row, Dallas, TX 75247 ..... (214) 631-3431

Southeastern Region
20 Perimeter Park, Suite 109, Atlanta, GA 30341 ..... (404) 451-7501

North Central Region
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SOUND DYNAMICS, INC., Box 32055, San Jose, CA 95152 ..... (408) 926-3588

SOUND GENESIS, 2001 Bryant St., San Francisco, CA 94110 ..... (415) 285-8900

SOUND PLUS, 111 Yara Rd., Jenkintown, PA 19046 ..... (215) 885-5616

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THE SOUND ROOM, INC.
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SOUND TECHNOLOGY, 1400 Dell Avenue, Campbell, CA 95008 ..... (408) 378-6540

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Logan Campus, Logan, WV 25601 ..... ext 32 (304) 752-5900

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SPECIALIZED INDUSTRIES INC.
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North Hollywood, CA 91605 ..... (213) 764-1800

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4605 Lankershim Blvd., Suite 833, No. Hollywood, CA 91602 ..... (213) 985-0633

STAINLESS INC., Third Street, North Wales, PA 19454 ..... (215) 699-4871

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15525 S. 70th Court
Orland Park, IL 60462 ..... (312) 429-6200

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6334 Viscount Road
Mississauga, Ontario, Canada L4V 1H3 ..... (416) 677-7130

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STUDIO FILM AND TAPE, INC.
630 9th Avenue, New York, NY 10036 ..... (212) 977-9330

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BILLY SUNSHINE, 144 E. 22nd St., New York, NY 10010 ..... (212) 677-4347

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TV PRO-LOG, 150 Fifth Ave., New York, NY 10011 ..... (212) 924-0320
TV-R, INC., 556 W. 54th St., New York, NY 10019 ..... (212) 541-4030

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TAPEATHON CORPORATION
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One Taco St., Sherburne, NY 13460 ..... (607) 674-2211
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245 Executive Park Blvd.
Winston-Salem, NC 27103 ..... (919) 768-9536/924-2629
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TELEVISION EQUIPMENT ASSOCIATES
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TELEVISION FACTBOOK
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TELEVISION INFORMATION OFFICE (TIO)
745 Fifth Ave., New York, NY 10022 ..... (212) 759-6800
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P.O. Box 2430, Hollywood, CA 90028 ..... (213) 876-2219
TELEVISION PRODUCTION SERVICES CORPORATION
30 W. Maple Ave., Bound Brook, NJ 08805 ..... (201) 469-5743/356-1359

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Inglewood, CA 90301 ..... (213) 776-3276

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TELSTAR PRODUCTIONS, INC.
366 North Prior Avenue, St. Paul, MN 55104 ..... (612) 644-4726

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North 12316 Fairwood Dr. 53
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9020 Balboa Avenue, San Diego, CA 92123 ..... (910) 335-1202

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TEXAS INSTRUMENTS, LEARNING CENTER
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TEXSCAN CORPORATION
2446 N. Shadeland Ave., Indianapolis, IN 46219 ..... (317) 357-8781

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THEATRE TECHNIQUES INC.
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THOMSON-CSF LABS
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