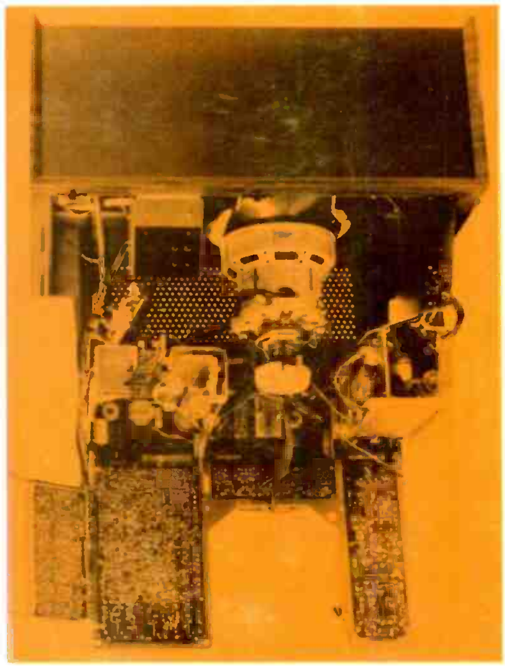
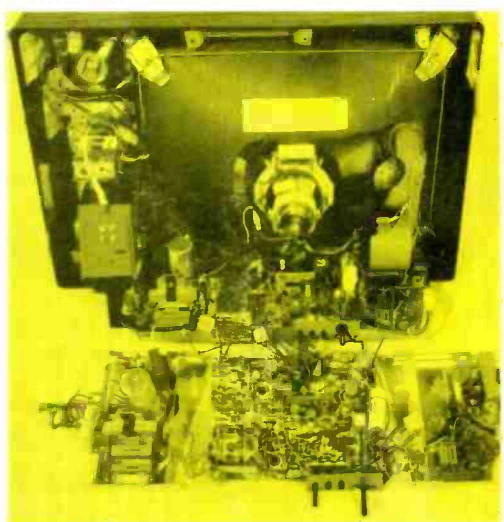
October, 1971 75 cents

A HOWARD W. SAMS PUBLICATION

Electronic Servicing





Improved Serviceability:
Easing the Technician's Burden,
page 10

CES Wrapup,
page 34

Practical Tuner Servicing,
page 64

FM Alignment —With and Without Sweep,
page 52

PF Annual Index Supplement page 75

THE ELECTRIC GIFTS

WITH GENERAL ELECTRIC TUBES

Save the gift point coupons you'll receive with each General Electric tube purchase from your participating distributor . . . and earn your great electric gifts.

1. GE Styling Comb, 282 Gift Points
2. GE Tape Recorder, 543 Gift Points
3. GE Marble Clock, 265 Gift Points
4. GE Youth Phono, 459 Gift Points
5. GE Portable Vacuum Cleaner, 564 Gift Points
6. GE Toast-R-Oven™, 608 Gift Points
7. GE Porta-Color® Television (reception simulated), 4331 Gift Points
8. Black & Decker® Drill Set, 412 Gift Points
9. Dremel Electric Shoe Polisher, 640 Gift Points
10. Brothers® Electric Pencil Sharpener, 260 Gift Points
11. Brothers® Calculator, 4728 Gift Points
12. Automatic Putting Set, 260 Gift Points

Tube Products Department, Owensboro, Ky.

GENERAL ELECTRIC

288-37

October, 1971 • Volume 21, No. 10

Electronic Servicing

in this issue...

DEPARTMENTS

Second class postage paid at Kansas City, Mo. and additional mailing offices. Published monthly by INTERTEC PUBLISHING CORP., 1014 Wyandotte St., Kansas City, Mo. 64105. Vol. 21, No. 10. Subscription rates $5 per year in U.S., its possessions and Canada; other countries $6 per year.

ELECTRONIC SERVICING (with which is combined PF Reporter) is published monthly by Intertec Publishing Corp., 1014 Wyandotte Street, Kansas City, Missouri 64105.

Subscription Prices: 1 year—$5.00, 2 years—$8.00, 3 years—$10.00, in the U.S.A., its possessions and Canada.

All other foreign countriesc: 1 year—$6.00, 2 years—$10.00, 3 years—$13.00. Single copy 75¢; back copies $1.
Adjustment necessitated by subscription termination at single copy rate.

Robert E. Hertel, Publisher
Intertec Publishing Corp.
Subsidiary of Howard W. Sams & Co., Inc.

Sprague gives you 2,442 exact replacement capacitors to choose from... so why fool around with makeshifts?

When you use "fits-all" capacitor replacements you leave yourself open for criticism of your work . . . and you could lose customers. _Exact_ replacements are easier to install, and are less expensive, in most cases.

Don't settle for "nearly-right" substitutes. The Sprague TWIST-LOK® line gives you the _exact_ capacitor you need, when you need it, most every time.

Get your copy of Sprague's comprehensive Electrolytic Capacitor Replacement Manual K-110 from your Sprague distributor or write: Sprague Products Company, 509 Marshall St., North Adams, Mass. 01247.

SPRAGUE®
THE MARK OF RELIABILITY

THE BROAD-LINE PRODUCER OF ELECTRONIC PARTS

Circle 3 on literature card

electronic scanner

news of the industry

Sylvania Opens Service Centers In Cleveland and Detroit

Sylvania Service Co., Inc., has announced the opening of home entertainment electronic service centers in Cleveland, Ohio and Detroit, Michigan.

Arthur E. Kruschka, general manager of Sylvania Service Co., said the Cleveland center, headquartered at 13701 Enterprise Ave., will be managed by Albert J. Winter, and the Detroit center, located at 13101 Capital St., in Oak Park, a suburb of Detroit, will be managed by Kenneth L. Bird.

Both centers reportedly will service color and black-and-white TV and stereo and will also specialize in MATV and closed-circuit TV installations, as well as administering service contracts on Sylvania home entertainment electronic products.

FINCO Again Contributes $1000 To NEA For Membership Campaign Prizes

The FINCO Antenna Company, for the second consecutive year, has contributed $1,000 to the National Electronic Associations (NEA), for award to NEA members who have made significant contributions of time and effort in NEA's membership campaign.

This year, the $1,000 new-membership achievement fund was divided by NEA into thirteen individual prizes for award by drawing to qualified NEA members who signed up at least one new member during the year. The cash prizes ranged from $25 up to the grand prize of $500.

The grand prize winners, Hal and Elizabeth Frutschy (middle), of Medina, Ohio, are shown here receiving their $500 check from M. L. Finneburgh (far left), chairman of the board of The Finney Company, of which FINCO is an operating division, and his wife Frieda, who drew the prizes.

Industry Self-Regulation and FCC Control of CATV Included In NEA Resolutions

Proposal of a permanent committee to establish a program for self-regulation of the electronic service industry, and the recommendation that the Federal Communications Commission exercise control of CATV were included in a list of resolutions adopted by the National Electronic Association (NEA) at its annual convention in Portland, Oregon, in July.

Other regulations adopted by the NEA include: the installation of interference rejection circuits in all TV receivers, by the manufacturer, to reduce FM interference; adoption, by the Federal Trade Commission (FTC), of rules similar to those in the California consumer protection law which specify that the manufacturers of TV picture tubes must disclose to consumers which parts of the picture tube are new and which are used; the selection of New Orleans as the site for the NEA's annual convention in 1972; and the encouraging of the National Alliance of Television and Electronic Service Associations (NATESA) to hold its 1972 annual convention jointly with the NEA in New Orleans.

TV "Freezes" Display

A prototype home TV information center with which a viewer can freeze an individual picture by depressing a button was demonstrated by RCA at the National Cable TV Association convention in Washington in July, according to a report in **Home Furnishings Daily.**

The new information system reportedly permits a viewer to select any picture appearing on the TV screen and freeze it for closer study.

A console equipped with two screens, one for the continuing program and the other for display of a "frozen" picture, reportedly was used for the demonstration. A silicon tube stores the picture frame and displays it on command, according to the report.

Servicers' Capacity Must Increase 65 Percent By 1975, Says Motorolas' Head of Video Products Planning

By 1975, consumer electronic servicers must be capable of handling 65 percent more business than handled in 1970.

Sales of color TV in 1975 will be 40 percent higher than that in 1970.

These and other favorable predictions were voiced by Charles Eissler, manager, video products planning. consumer products division, Motorola, Inc., at the 19th Annual Convention of the Texas Electronics Association (TEA), held in Austin, Texas in early August.

Noting that the Electronic Industries Association (EIA) estimates that U.S. consumer electronics sales grew some 250 percent during the past 10 years, from $2 billion annually to $5 billion annually, Eissler said that there were some 30 million color television sets in use in 1970 and he expects to see an additional 20 million units in use by the end of 1975.

Total color TV sales to the consumer, including both domestic and imported sets, could reach about 6.7 million units in 1971, for a penetration of about 54 percent of all households. By 1975, said the Motorola

(Continued on page 6)

(Continued from page 4)

manager, total color TV sales to the consumer should rise to 7.2 million sets, with a penetration of about 71 percent. By the end of 1975, the replacement market should account for three out of every seven color set sales, or some 40 percent of total sales, Eissler said.

Today's product mix of 60 percent portable and table color TV set sales, versus 40 percent console type, will change to 80 percent portable and table type retail sales by 1975, the Motorola manager predicted. "By 1975, the screen sizes the dealers will be selling will cover the diagonal measurements of 25V, 21V, 19V, 17V and 13V," Eissler stated.

Monochrome television sales, both domestic and imported sets, will increase from 6.9 million units, at dealer-to-consumer level, in 1970, to 8.6 million units by 1975, according to Eissler. "And I may be conservative in that 1975 estimate, as greater growth in personal-use sets could occur if lower prices can be achieved in this product. Another two million unit sales could be added if the industry reaches the $50 level on such a monochrome TV," Eissler told the TEA.

Eissler said that he expected sales of audio products, including console and component stereo as well as four-channel sound, to jump from 1.9 million units, distributor to dealer, to 2.8 million units by 1975, while radio sales could climb from 44.4 million to 56 million during the same period.

Eissler also predicted that four-channel sound will replace stereo instruments, except for leader-type models, within the next five years. Eissler did not estimate 1975 tape sales but said, "tape will sell at an increasingly higher rate." He pointed out that between 1950 and 1960, only 1.5 million to 2 million tape units were sold per year, mostly reel-to-reel. But with the advent of improved packaging (magazine type) and greater availability of softwear, tape sales jumped to 4 million in 1966, and to 15 million units per year, mostly eight-track and cassette player/recorders, by 1970.

Eissler suggested that electronic video recording (EVR) players and similar equipment are potentially important consumer electronics products. Availability of software will determine the extent of the home application of such products, he said, adding that, initially, the industrial and educational markets will most likely be the first to be tapped.

"The history of audio tape will be repeated in video cartridge players, with the plentiful availability of prerecorded, cassette or cartridge type software turning on the consumer," the Motorola manager of video products planning predicted.

Blonder-Tongue Subscription TV System Approved by FCC

FCC advance approval of the Blonder-Tongue BTVision subscription television system recently was announced by Isaac S. Blonder, Chairman of the Board of the New Jersey electronics research and manufacturing corporation.

BTVision is a system for over-the-air transmission, reception and decoding of scrambled television signals and is compatible with the standard television broadcasting facilities. A small decoder placed in the subscriber's home unscrambles the picture for use with any television receiver. There reportedly is no interference with or reduction of existing home television reception when this system is used.

According to Mr. Blonder, the BTVision system will provide the television set owner with entertainment not previously available because of cost. New movies, feature sports events, and current Broadway plays will be offered.

The first application to the FCC to use the BTVision system has been made by Universal Subscription TV, Inc., for the Boston area. This application is in accordance with the FCC fourth Report and Order, Docket 11279, December 21, 1968, which authorizes, under certain limitations, subscription television service for markets with five or more television station assignments.

FCC Proposes 70-Channel UHF Detent Tuner

The Federal Communications Commission (FCC) has proposed a rule which will permit the use of a 70-channel UHF detent-type tuner, which it says is nearly comparable to VHF tuners.

The deadline for industry replies to the proposed rule was July 19. No extension of time was allowed by the FCC because it said a prompt start on design work would be necessary for compliance with the rules effective date.

At least three UHF broadcasters have opposed the FCC's proposal because they feel the proposed tuner is not comparable to those used for VHF.

First CATV Receiver Introduced By Magnavox

The first home television receiver designed exclusively for cable television application was introduced by Magnavox at the National Cable Television Association Convention (NCTA) in Washington D.C., in July.

Called the Magnavox "TV 101" Cable TV Terminal, the console unit reportedly offers a total of 31 channels for cable reception, as well as the standard UHF channels prescribed for all TV receivers by FCC regulations.

The set, which reportedly will be available in early 1972, is also designed to operate with a standard antenna in non-CATV applications.

The 31-channel capacity of the CATV receiver is accomplished by inserting 8 channels in the frequency gap between standard channels 6 and 7, and by adding

(Continued on page 9)

Circle 5 on literature card

(Continued from page 7)

11 channels above channel 13. The "TV 101" had detented electronic tuning, as specified in the NCTA request to the FCC, and is double-shielded with coaxial integrity to prevent interferences from the off-the-air TV transmissions.

The price will be approximately the same as that of 25-inch color sets equipped with remote control.

Developed by Craftsman Electronics Products Division of Magnavox, the terminals will be distributed through Magnavox dealers, who will provide sales and service for this new consumer product in all areas served by CATV systems.

"The need for a special terminal for CATV subscribers has long been apparent", says Magnavox President R. H. Platt. He said that the introduction of the terminal also reinforces Magnavox's entry into the cable television systems market.

According to Mr. Platt, Magnavox regards the CATV field as one of its markets of maximum promise. He said the Company had instituted a substantial research and development program for total utilization of the Company's two-way CATV system capabilities. Short-range developments center on improving current products for cable TV distribution, while long-term projects involve the new services which he believes will develop as the wired-nation concept evolves.

The NCTA has petitioned the FCC to institute proceedings to define the specifications which a cable television receiver must meet.

Improved Serviceability: Easing the Technician's Burden

What two manufacturers have done to improve the serviceability of their 1972 products, and the role played by electronics service associations. *by J. W. Phipps*

NEA Serviceability Improvement Program

The National Electronics Association (NEA) in 1968 established a special program to help manufacturers of home entertainment electronic equipment improve the serviceability of their products.

The program, administered by the chairman of an eight-member serviceability committee, involves two distinct functions:

Gathering of serviceability information from field and dissemenation to manufacturer—*Special serviceability survey forms are provided member technicians on which they are encouraged to list specific details about service problems they encounter which increased the "down time" of the product because of:*

- *chassis and/or cabinet features which significantly increases the time required for disassembly and reassembly or which reduce the accessibility of the circuitry.*
- *unavailability of parts and/or service literature.*
- *incorrect and/or inadequate labeling or identification of parts and/or controls.*
- *inaccuracies or omissions in service literature.*

The information on the survey forms is compiled by the NEA and forwarded to the manufacturers of the sets involved. Although such information can be considered after-the-fact, it nevertheless alerts manufacturers to problem areas which can be eliminated by changes, omissions or additions to designs in the development stage.

Pre-production serviceability evaluations—*Members of the NEA and other association serviceability commitees perform first-hand evaluations of new chassis designs to determine how well they conform to the serviceability guidelines established by the NEA. Such evaluations are intended to help manufacturers avoid design features which detract from the serviceability of the set. To date, manufacturers which have actively participated in this part of the program include General Electric, Magnavox, Motorola and Sylvania.*

Additional information about the NEA serviceability program can be obtained by writing:

Lewis Edwards, CET
Chairman, Serviceability Committee
NEA
1309 W. Market St.
Indianapolis, Indiana 46222

Serviceability seemingly has been moved up a notch or two in the list of factors which influence the designs of new home entertainment electronic products. Preliminary analyses of 1972 chassis designs reveal that at least a few manufacturers now are placing increased importance on the ease with which their products can be serviced, if needed.

A review of the material about new chassis received by ES to date reveals only two TV designs which incorporate features that significantly improve serviceability and which have not been covered previously in ES. One is General Electric's U-1 b-w chassis, and the other is MGA's CS-195 19-inch color receiver. The significant serviceability features of both chassis are illustrated and described in this article, beginning on page 12.

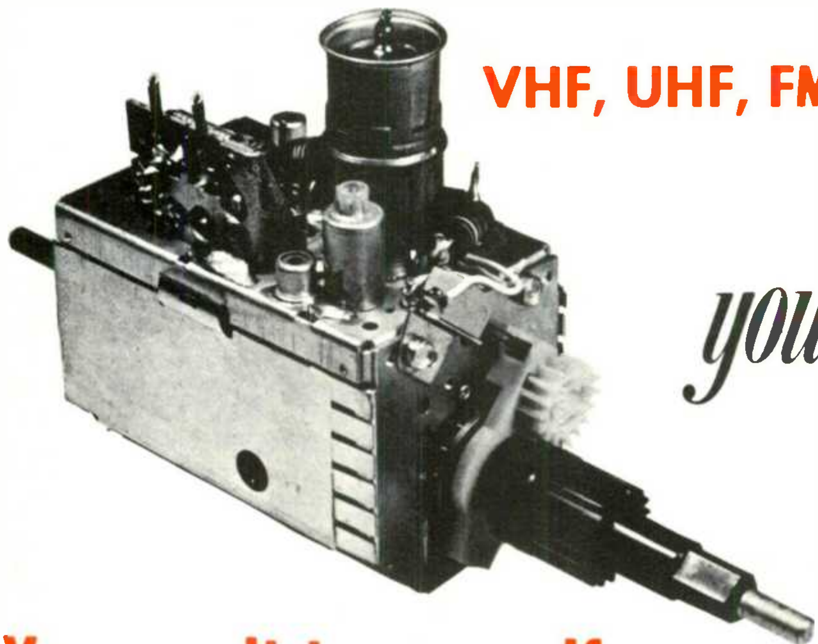
Carry-over design features which improve serviceability but which were introduced prior to 1972 chassis and have been covered in previous issues of ES include plug-in transistors, introduced in significant quantities in Sylvania chassis, and modular design, introduced first in color TV by Motorola and adopted later, in varying degrees, by most other major manufacturers.

Manufacturer Motivation

Consumer demand for more prompt and proficient service after the sale undoubtedly has been the most influential factor in getting manufacturers to upgrade the serviceability of their products. Those manufacturers who have responded undoubtedly have done so because they realize that, today, service is an essential part of marketing.

(Continued on page 16)

TV TUNER SERVICE



VHF, UHF, FM or IF-Subchassis. . .

. . . All Makes

you get...

Fast 8 hr. Service!

1 YEAR GUARANTEE

You owe it to yourself

to try P.T.S. We are the fastest growing, oldest and now the largest tuner service company in the world. Here is what you get:

1. **Fastest Service — 8 hr. — in and out the same day. Overnight transit to one of our six plants, for parts, tuners or IF-modules.**
2. **All tuners cleaned inside and out, repaired, realigned and air tested.**
3. **On IF-modules all stages checked, all traps set with high calibre test equipment.**
4. **Fine Quality! Your customers are satisfied and you are not bothered with returning your units for rework!**
5. **Lower Cost! Up to $5.50 less than other tuner companies!**
6. **Friendly, helpful personalized service!**

FIRST TO OFFER 365-DAY GUARANTEE!
COLOR—BLACK & WHITE—TRANSISTOR TUNERS—ALL MAKES
GUARANTEED COLOR ALIGNMENT—NO ADDITIONAL CHARGE

We offer you finer, faster...

. . Precision Tuner Service

VHF-UHF-FM	$ 9.95
UV-COMBO	$16.95
IF-MODULE	$12.50

Major Parts charged at Net Price

CUSTOMIZED REPLACEMENTS AVAILABLE FOR $12.95 UP (NEW OR REBUILT)

For fastest service, send faulty unit with tubes, shields and all broken parts to:

PTS ELECTRONICS, INC.

HOME OFFICE—	P. O. Box 272—Bloomington, Ind. 47401	Tel. 812/824-9331
EAST—	P. O. Box 3189—Springfield, Mass. 01103	Tel. 413/734-2737
WEST COAST—	P. O. Box 41354—Sacramento, Calif. 95841	Tel. 916/482-6220
MOUNTAIN—	P. O. Box 4145—Denver, Colo. 80204	Tel. 303/244-2819
SOUTHWEST—	P. O. Box 7332—Longview, Tex. 75601	Tel. 214/753-4334
SOUTHEAST—	P. O. Box 6771—Jacksonville, Fla. 32205	Tel. 904/389-9952

LIKE TO DO IT YOURSELF?
PTS makes all tuner parts available to you.
Send one dollar (redeemable) for our
TUNER REPLACEMENT GUIDE AND PARTS CATALOG

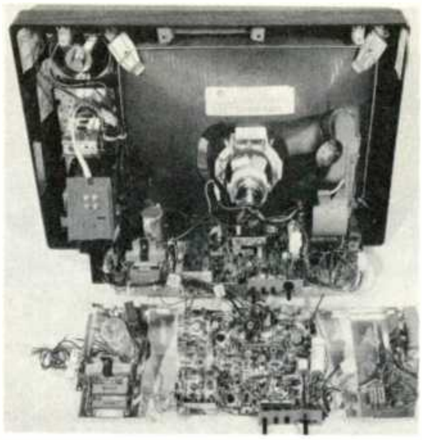
•60 pages of top information •Blow-up of all tuners •Largest exact tuner replacement guide •Antenna Coil Replacement Guide •Multi-fit Replacement Tuner Shaft Guide

Circle 7 on literature card

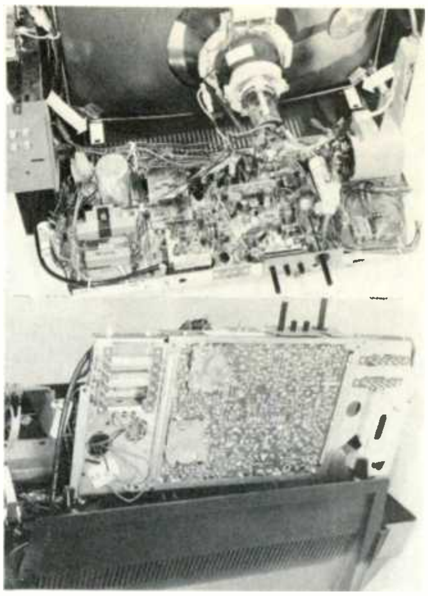
Serviceability features of General Electric's U-1 b-w TV chassis,

some of which were included in the U-1 design as a result of suggestions from technicians, are illustrated by this series of photos.

Completely solid-state, the U-1 chassis employs 21 transistors, 16 diodes and 1 integrated circuit. Seven of the transistors are mounted in sockets, for quick substitution. These are: the audio output, horizontal oscillator, horizontal output, sync clipper, and three transistors in the vertical sweep circuitry. Also, the high-voltage rectifier, a selenium stick-type unit, is mounted in a manner which permits "snap-out" removal.



Accessibility of all circuitry, logical grouping of circuitry according to function, and quick-disconnect-type connections and fastening devices, which make circuit board, component and module removal easy, are illustrated in this rear-view of a U-1-equipped receiver, with duplicate chassis sections shown removed in the foreground. Section on left is the low-voltage power supply; section in middle contains the signal-processing circuits; and section on right contains the vertical and horizontal sweep circuits. (Horizontal-output transformer and high-voltage rectifier are on a separate, easily removed assembly mounted above the sweep-circuits board.)

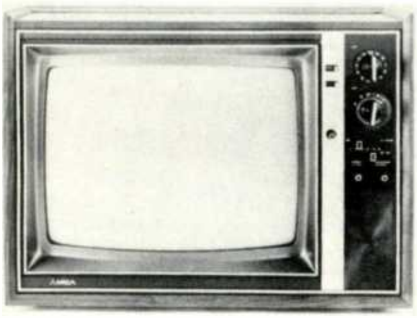


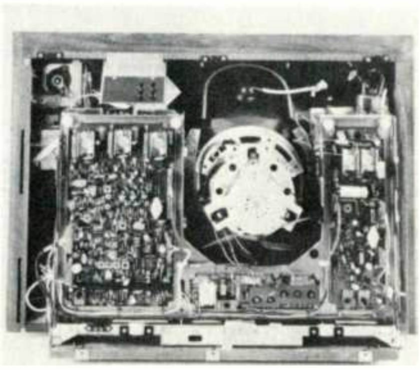
Main chassis of U-1-equipped receivers slides back on two tracks, to completely expose all circuitry, adjustments and test points on the top **and** the bottom of the chassis, as shown here. Chassis is freed from normal operating position by releasing two clip-type retainers, pointed out by large, white arrows in top photo. Note that components and test points are labeled both on the top **and** on the bottom of the signal-processing circuit board.

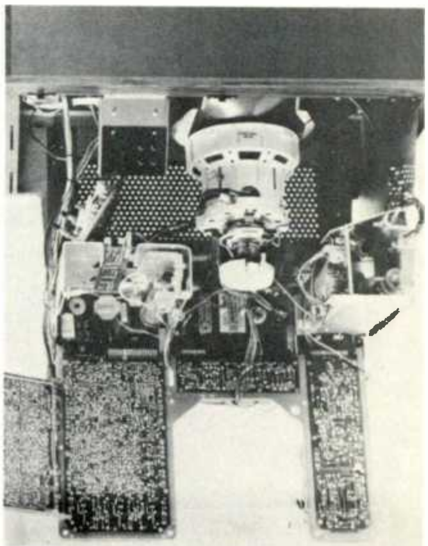
(Continued on page 14)

Serviceability of some color chassis also improved

Features which improve serviceability also have been designed into some of the new color TV chassis. An example of the significantly easier-to-service designs is MGA's CS-195 solid-state, 19-inch color receiver, the major serviceability features of which are illustrated here. MGA is a division of Mitsubishi International Corporation.







Rear views of the CS-195 receiver with back cover removed illustrates the normal operating (left) and service (right) positions of the chassis. The set is completely operable in either position. Disengaging 4 white plastic press-fit buttons permits the chassis to be swung down and folded out for servicing. Because the chassis is mounted on two rails, it also can be slid out, for improved accessibility of components on the front of the chassis. Removal of five screws releases the cabinet rear cover. The bottom of the cabinet also can be removed, to provide access to the bottom of the chassis without sliding out the chassis.

(Continued on page 14)

The last tube-tester you'll ever have to buy!

It's strange, but while tubes are on the way out—tube-testers are needed more than ever. That's because the home electronic sets today use sophisticated tubes in sophisticated circuits—and simple Shorts and Emission tests don't take into account the actual operation of the tube. Now B & K offers the Model 747 Dyna-Jet Solid State 100% *Dynamic Mutual Conductance* Tester—the last tube-tester you'll ever have to buy.

Triodes, nuvistors, tetrodes, pentodes and all other multi-element tubes can now be tested under AC operating conditions for 100% *dynamic mutual conductance.* Intermittents, low gain and other tube problems that would be obscured in an emission test, show up in this tester's dynamic mutual conductance tests.

A special Dynamic test has been designed into the B & K Model 747 to test high-voltage regulators. This test puts one signal on the regulator grid and another on the plate—actually operating the tube with the correct plate current. Too much or too little current can either destroy the tube or produce an unreliable reading.

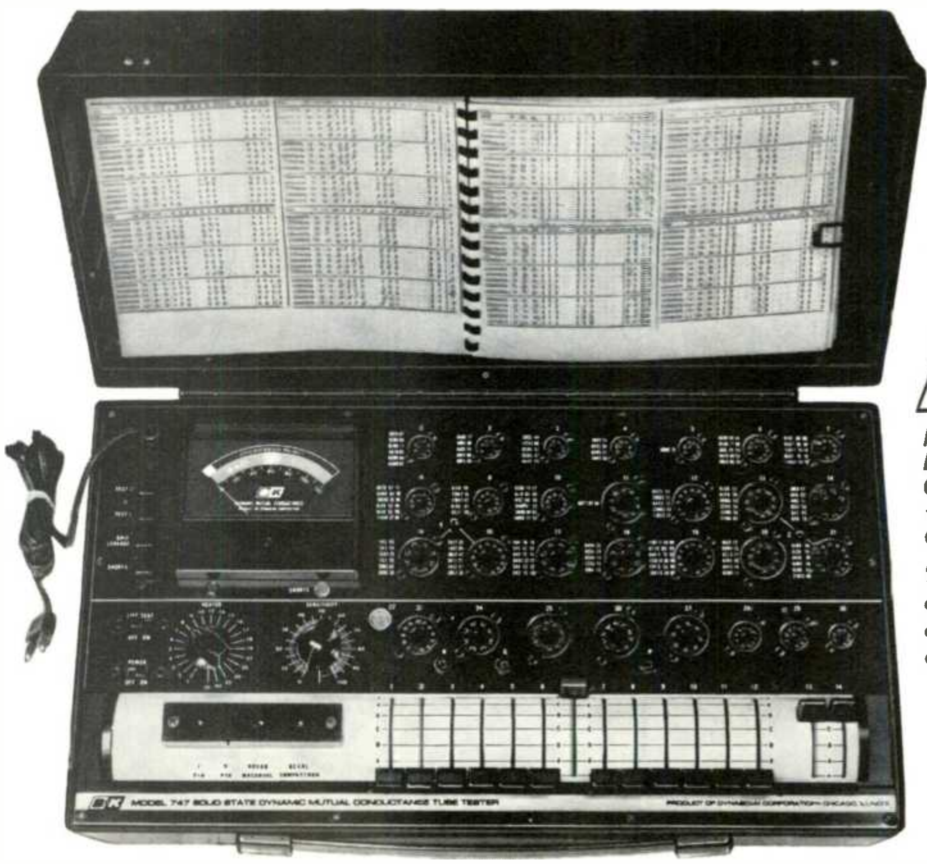
Diodes, low- and high-voltage rectifiers are tested with proper voltages and loads to determine their emission capability.

And, of course, you'll still want to test for shorts, leakage and gassy tubes. The B & K Model 747 makes this easy with a one-button "Shorts" test and a one-button grid-leakage and gas test. And it "quick tests" 82% of the tubes you'll test. And gives you functional pin-straighteners to fit any tubes you'll ever run into. And to help you predict a tube's reserve, the 747 has a built-in "Life" test. Filament voltage is reduced 10% when the "Life" test switch is set on.

All-in-all, the B & K Model 747 Dyna-Jet Tube-Tester has all the features you've wanted—all the features you'll ever need in a tube-tester. And it's small, lightweight and very good-looking.

See it at your B & K distributor, and you'll see why it's the last tube-tester you'll ever have to buy!

Model 747
100% Dynamic Mutual Conductance
Dyna-Jet Tube-Tester . . . . Price $249.95



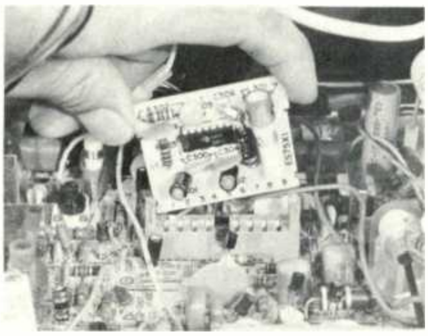
B&K

Product of
DYNASCAN
CORPORATION
1801 W. Belle Plaine
Chicago, Illinois 60613

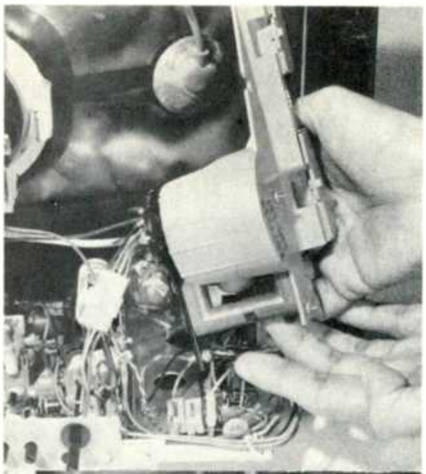
There is a difference in test equipment — ours works!

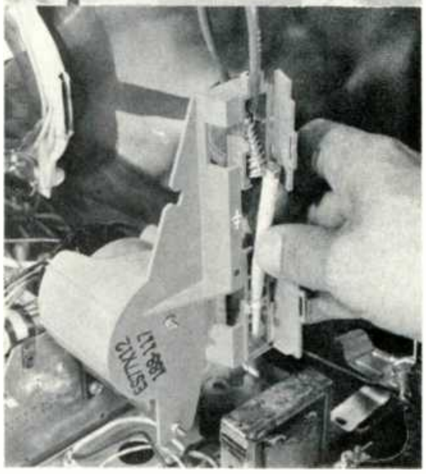
Circle 2 on literature card

Serviceability features of General Electric's U-1, b-w TV chassis



Audio module, shown here being removed, is plugged into strip-type socket on signal-processing board and contains all sound processing circuitry, with exception of input coil, volume control and output stage. A single integrated circuit on the audio module performs the functions of 4.5-MHz amplifier, quadrature-type FM detector and audio preamplifier. The only service adjustment in the sound section is the quadrature coil, which is adjusted for maximum sound.

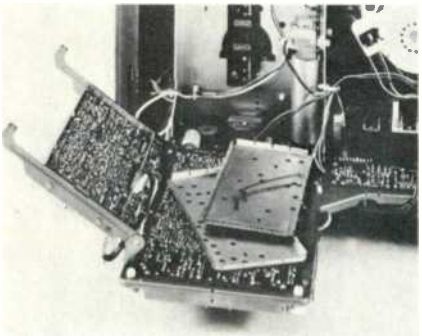




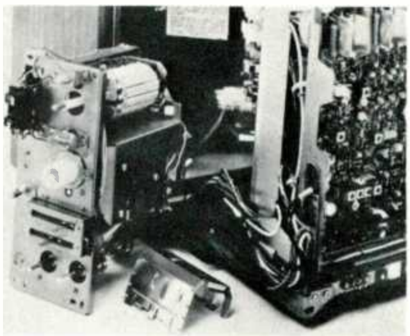
Horizontal-output transformer/high-voltage rectifier assembly, located above the sweep-circuit section, is easily removed for replacement by disconnecting one plug, removing one screw and unsoldering 4 connections. Top photo shows complete assembly being removed. Removal of high-voltage rectifier is accomplished by opening two small doors, one at each end of selenium rectifier stack, and snapping out rectifier, as shown. Note that a diode symbol is placed on the assembly near rectifier, to point out the correct position of the rectifier.

Tuners/controls assembly, shown here, contains the VHF and UHF tuners and the slide-type volume, brightness and contrast controls. Turret-type VHF tuner is readily accessible for cleaning or adjusting, even when installed in the cabinet, as shown in top photo, or it can be removed easily and placed in position shown in the bottom photo, for access to controls. Note that the external antenna connections are located on a plastic bracket which remains attached to the tuners/controls assembly after the cabinet back is removed. Plug-type connections between assembly and chassis speed up removal and reinstallation.

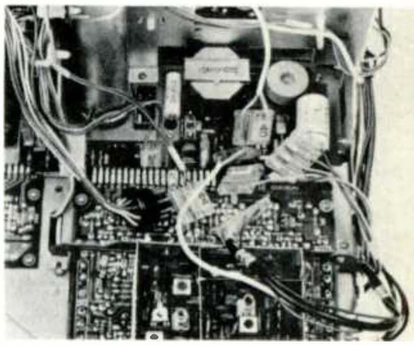
Serviceability of some color chassis also improved



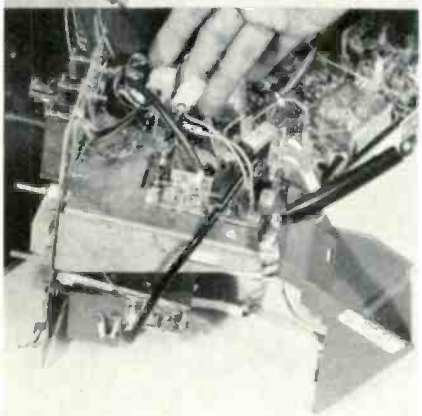
The IF circuit panel is shown here in the swing-out position. During normal operation, the panel is covered with metal shields, shown here removed. Normal adjustments can be made through the shields, if required. The circuitry on the IF panel, as on all panels, is "road-mapped" on both sides, for easy component and circuit identification. Note the plastic press-fit buttons, on corners of panel, which hold chassis in vertical position during normal operation.

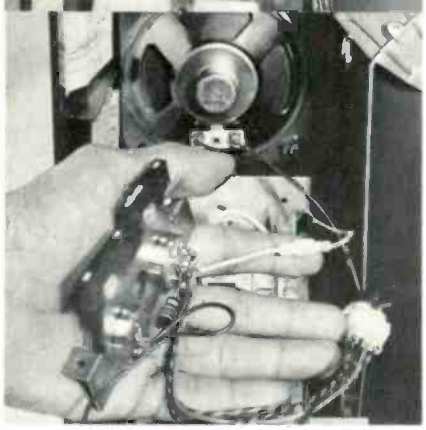


Slide-out feature of chassis makes possible easy removal of tuners/controls assembly, shown here in service position. Both VHF and UHF tuners are detent types.

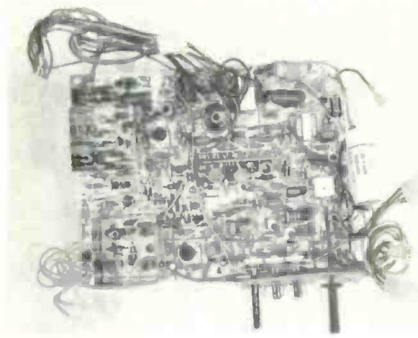


Quick-disconnect plugs, some of which are shown here, are used throughout the CS-195 receiver, to eliminate the need for soldering and resoldering of wiring for removal and installation of the circuit boards and panels which make up the chassis. Again, note the clear road mapping of circuitry and identification of components and test points.

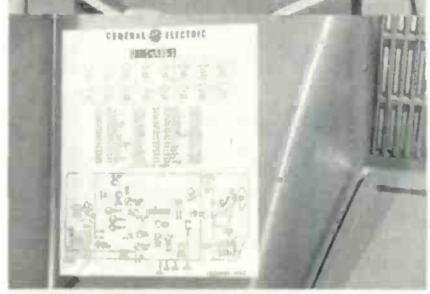


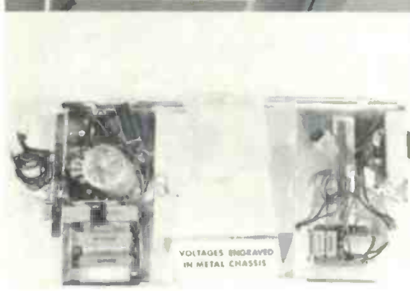


Speaker and AC switch unit fasteners and connections, shown in photos here, are representative of the easy access and quick-disconnect features of the U-1 chassis. Speaker is easily removed by releasing two retaining nuts and unplugging leads, as shown in top photo. Removal of push-to-operate on/off and instant-on switches, located together on assembly normally positioned above speaker (top photo), is accomplished by removing two screws and unplugging two connections (bottom). Note label, on side of receiver, which gives instructions for speaker removal.

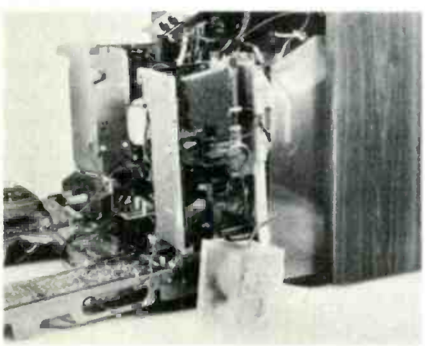


Signal-processing circuit board of U-1 chassis, shown here, contains video IF and amplifier stages, AGC circuitry, the horizontal oscillator and buffer, and the vertical oscillator and buffer. Component adjustment and test point callouts and circuit pattern are printed on both top and bottom of board. Note that all connections to board are plug or slip-on type; unsoldering and resoldering are not required to remove or re-install board.





Identification of receiver model and chassis and all components, test points, voltages and adjustments obviously was given special attention during the designing of the U-1 chassis, as indicated by these photos. Serial number, model and chassis labels on cabinet back are shown in top photo. Chassis layout diagram and transistor identification data are grouped on a single large label affixed to the inside of the cabinet back, shown in the middle photo. Voltages significant to testing and the labels of controls are stamped into the metal of the power supply and sweep sections (bottom photo).



The horizontal-output transformer unit is shown here removed. The high-voltage tripler assembly, which also can be replaced as a "package", is positioned above the flyback unit.

(Continued from page 10)

The Role of Service Associations

National, state and, in some cases, local electronic service associations also have played a significant role in improving the serviceability of consumer electronic products. Although it is doubtful that association efforts have had much effect in actually motivating manufacturers to improve serviceability, associations have shown interested manufacturers *how* to improve serviceability.

One example of the improved serviceability achieved by co-operation among service associations and a manufacturer is General Electric's new U-1 b-w TV chassis.

The serviceability committee of the Virginia Electronics Association of Tidewater (VEA), an affiliate of the National Alliance of Television and Electronic Service Associations (NATESA), at the request of General Electric, in October, 1970, performed an evaluation of the serviceability of a color TV chassis. The committee, using as a guide a serviceability rating system developed by the National Electronics Association (NEA), evaluated the ease with which the color chassis could be serviced, both in-home and in-shop. The chassis was awarded a serviceability rating of slightly over 80 percent, out of a possible 100 percent.

Although the serviceability of the chassis was considered by the committee to be good relative to that of other existing designs, it did recommend to the General Electric design engineers specific design changes and additions which it believed would further improve the serviceability.

An evaluation of the serviceability of the prototype U-1 b-w TV chassis was performed by the VEA committee and the chairman of the NEA serviceability committee on March 17, 1971, again at the request of General Electric, and at its TV production facility in Nansamond County, Virginia. The evaluation revealed that many of the design changes and additions suggested by the committee during the previous evaluation of the color chassis had been incorporated into the U-1 chassis design. The committee awarded the U-1 design a serviceability rating of 94.6 percent. ▲

Parts availability and service information: Two other essential facets of serviceability

Although chassis design—both physical and electrical—is the major element of serviceability, two other factors also directly affect the efficiency with which a consumer electronic product can be serviced. These are: 1) the availability of replacement parts, and 2) the availability and accuracy of service information. General Electric has established programs to improve both.

Parts availability

The formation of an expanded network of franchised independent parts distributors was announced earlier this year by General Electric. When completed, probably before the end of this year, over 250 distribution locations will have been established nationwide.

During the same period, General Electric has been testing, in select locations, new telephone ordering systems and a new credit policy, which, if adopted nationwide, will reduce telephone and shipping charges and will permit independent servicers to purchase parts without prepayment.

Also, General Electric has established a "Guaranteed Active Parts" program, which is designed to help distributors and servicers reduce and protect their investments in parts inventories. Under the terms of the program, if a distributor or servicer cannot move, within a specified time, parts recommended for inventory, General Electric will buy them back without penalty.

Service information

Direct-mail communications with every television service company who services TV receivers on a regular basis is another goal in General Electric's effort to improve the ease with which its sets can be serviced. To accomplish this, General Electric began publishing, on a quarterly basis, early this year, a publication titled "G. E. Television Service News", which provides information about parts outlets, credit policies, technical publications, training programs, new products and the location and the telephone number in his area the servicer can call for technical or other assistance. The publication is mailed on a district basis, and is available without charge to all regular servicers of TV.

More information about these programs can be obtained from your local General Electric Distributor. ▲

Pick a present with RCA...

When you purchase RCA entertainment receiving and picture tubes from your participating RCA Distributor

15 gifts for you and your family

1. Bulova Digital Electric Alarm Clock
2. Love-Me-Baby Doll
3. Mighty Tonka Crane
4. Paint by the Number Set
5. Tiny Tonka Cars
6. Baby's Busy Box
7. Mirro-Matic Buffet Server-Fryer
8. Drag Stripper Boys Bike

(Not Shown)

Tiny Town Doctor Set
Tiny Town Nurse Set
Dip-A-Flower Maker
Easel Peg Chest
Skittle Pins
Atlas Train Set
Mini Miss Girls Drag Stripper Bike

Play Santa Claus with your choice of 15 name-brand high quality gifts for yourself, your home, your children, just in time for the holiday gift-giving season!

See your participating RCA tube distributor for full details.

RCA/Electronic Components/Harrison, N. J. 07029

RCA

shoptalk

With Carl Babcoke
ES Technical Editor

Guidelines for Troubleshooting Vertical Sweep Defects, part 2

Advanced techniques for in-shop servicing.

Several techniques which are effective for finding the sources of vertical sweep defects include: DC voltage analysis, signal injection, frequency analysis, ohmmeter tests, and waveform analysis. Although these are all independent tests, you will analyze vertical problems faster if you use as many of them as necessary during each diagnosis.

DC Voltage Analysis

DC voltage analysis should be performed on two levels:

First, if there is little or no vertical deflection, the DC voltages at the plates of the output and oscillator tubes should be measured.

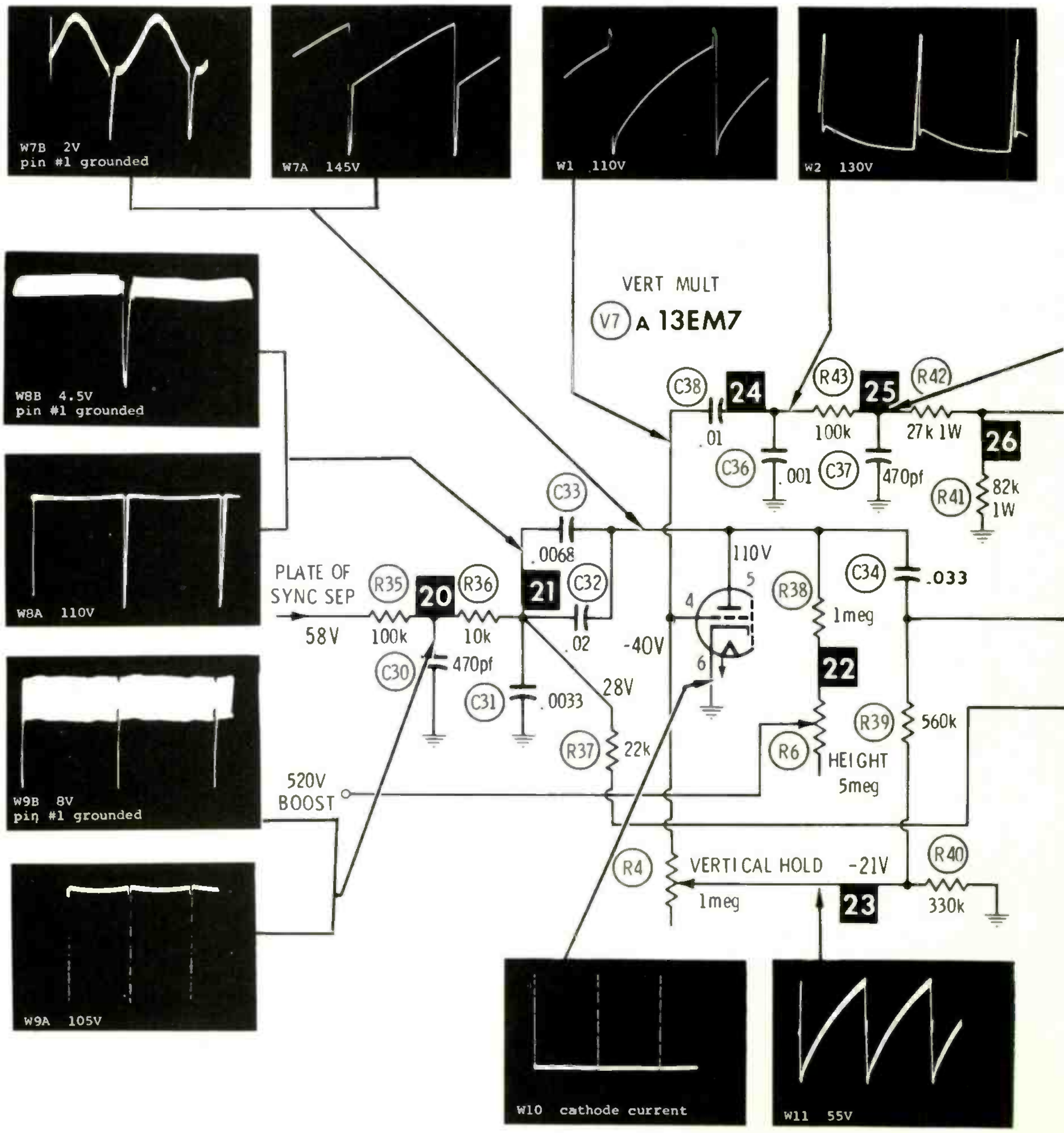


Fig. 1 Complete schematic diagram of the vertical sweep system in Sears' 528.-51780 b-w chassis.

The voltage at the plate of the output tube normally should change only about 20 or 30 volts regardless of height and linearity adjustments, and not much more than that after most defects.

The voltage on the plate of the oscillator tube normally will vary more than that on the plate of the output tube. This voltage is changed substantially by height adjustments and by any defect which affects either the AC or DC voltages at the grid. Of course, neither stage will operate if the plate voltage is near zero.

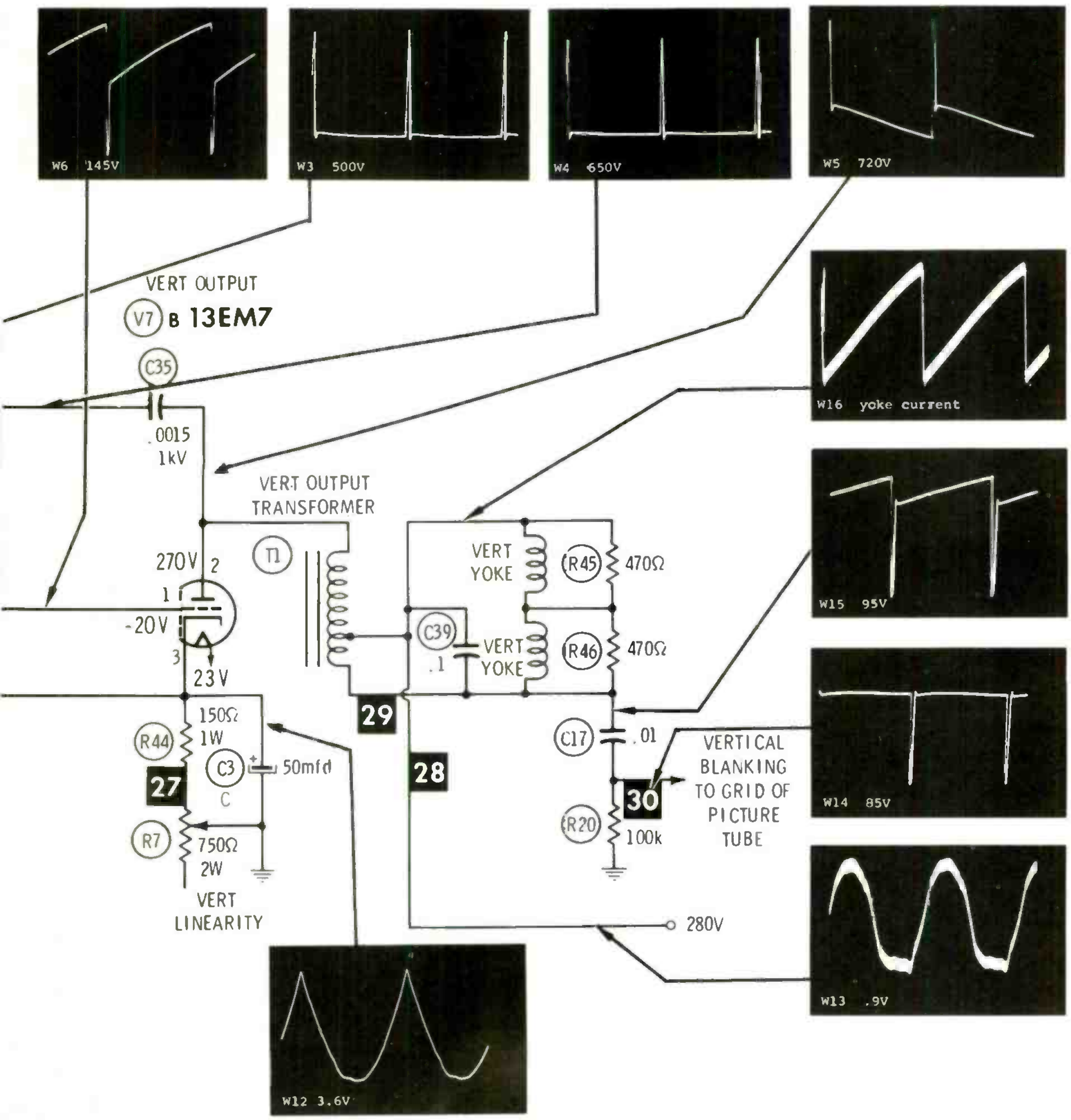
Assume that the first feedback capacitor, C35, in the schematic in Fig. 1, is open. Oscillation will cease, and there will be no vertical sweep. However, no shorts or other defects are present. The DC voltages resulting from this defect are shown in Table 1.

Because the circuit is not oscillating, very little negative voltage will appear at the oscillator grid. With neither DC nor AC voltages at the grid, a large amount of plate current flows constantly. Because the value of the plate-load resistor is several megohms and a large amount of current is flowing in the plate circuit, the plate voltage drops to a very low value.

The output stage normally does not draw grid current and would not be affected by the DC voltages

Table 1 - Voltages Produced With C35 Open

Testpoint	DC voltage should be	DC voltage measured
Grid pin 4	-40	-.7
Plate pin 5	+110	+61
Output grid pin 1	-20	-.4
Output cathode pin 3	+23	+31.5
Output plate pin 2	+270	+265



in the oscillator stage, except that a part of the bias for the output stage is obtained from the grid circuit of the oscillator. When there is no oscillation, the oscillator grid is no longer negative, and no negative voltage is supplied to the grid of the output stage. With no negative voltage applied to its grid, the output tube draws more current. This increased current slightly lowers the voltage on the plate of the output tube and increases the voltage drop across the cathode resistors. The grid-to-cathode bias is now 32 volts; normal bias is between 40 and 45 volts.

Cutoff bias for the output tube is about 60 volts. This is proved by a 60-volt reading between cathode and ground when either cathode resistor is open. In circuits in which the grid resistor returns to the cathode, the value of the cathode-to-ground voltage will almost equal the plate voltage when the cathode return is open. This is not true for the circuit in Fig. 1, in which the grid returns to ground through R39 and R40. Many technicians have been mislead by the voltage obtained from an open cathode circuit. An open R44 or R7 would produce the same voltages produced by an open C35, except that the cathode voltage of the output tube would be between +55 and +60 volts and the circuit might produce a slight amount of vertical deflection every few seconds, depending upon the setting of the associated controls.

Defects in the feedback components change the oscillator voltages (and the grid voltage of the output tube) because of changes in the amplitude and the shape of the signal at the oscillator grid.

If it is necessary to advance excessively the height control, and thus produce a much larger voltage than normal at the plate of the oscillator tube, the defect probably is a weak output stage.

A leaky coupling capacitor, C34, in the circuit in Fig. 1, would cause the grid-to-ground negative voltage of the output tube to decrease, and the cathode-to-ground voltage to increase slightly. Proof that C34 is leaking or that the tube is gassy is obtained if there is a voltage drop across R39 and the grid side is more positive. If the grid side is more negative, the grid of the output tube is drawing current because of too much oscillator output or insufficient bias applied to the output stage.

Excessive or reduced voltage at the plate of the oscillator might indicate a defect in that particular circuit; however, it also might indicate incorrect values of AC or DC voltage at the oscillator grid.

Oscillator Grid Voltage and Frequency Analysis

The DC voltage at the grid of the oscillator tube is very critical. However, the oscillator grid voltage might differ ±50 percent from the value on the schematic and yet be normal for that one individual receiver. Although these two statements appear to be contradictory, the following information will reconcile them:

Assume that the vertical sweep circuit (Fig. 1) produces good height, linearity and locking. Next, assume that we apply, through a 22-megohm resistor (so that the time constant will not be upset), the output from a variable negative voltage supply to the grid of the oscillator tube. The more negative voltage we apply to the grid, the lower the frequency becomes, and, eventually, the picture flips up and out of lock. Then we reverse the polarity of the bias supply and apply a variable positive voltage to the grid of the oscillator tube through the same 22-megohm resistor. The decreasing negative voltage at the grid of the oscillator produces a high oscillation frequency, and the picture rolls down.

These two experiments varied the frequency by changing the amount of negative voltage stored in C38, which is also the oscillator grid voltage. The more negative the voltage, the longer the time required for the voltage to reach the point where plate current can flow and the new cycle start, and vice versa.

If you connect a VTVM or FET meter to the grid of the oscillator tube in Fig. 1 and then lock the vertical, the meter should indicate about –40 volts. Next, if you rotate the vertical hold control so that the picture flips **up** out of lock (more resistance, lower frequency), the grid voltage should become more negative. If you adjust the hold control in the opposite direction until the picture rolls **down** (less resistance, higher frequency), the grid voltage should become less negative than when the picture was locked in. Frequency changes that occur when the hold control is varied are caused primarily by the change in time constant; the voltage stored in C38 discharges faster through a small resistor than through a larger one. A secondary factor which also affects the frequency in the same manner as a change of time constant, is the amount of DC voltage, which becomes less when the time constant is reduced.

If, at this point, you have concluded that a more negative oscillator grid voltage **always** causes a lower frequency, and that a less negative grid voltage **always** causes a higher frequency, you are slightly premature.

As an opposing example, suppose that C38 in Fig. 1 is .01 mfd, locking occurs with a grid resistance of 800K ohms, and the DC grid voltage is –40. If you change C38 to .0082 and relock the raster, you will find that locking occurs with a grid resistance of 1 megohm, but the DC grid voltage is now –45 volts, because of the higher resistance. The time constant and frequency are the same in each case, but the DC grid voltages are not the same.

Perform one more simple experiment. Lock the vertical, and again connect a VTVM to the oscillator grid. Now, increase the drive to the output tube by adjusting the height control (or whatever the

"The Yellow Pages lets me tell people that I'm an authorized TV Service Representative."

"Practically all of our service business for many national brands comes from the Yellow Pages. Frankly, throughout the years, the Yellow Pages has been the biggest thing that keeps me in business," explains Bill Howard, of Western States T.V. Company, Portland, Oregon. "We get practically all of our big jobs from the Yellow Pages. As an example, a builder came to me through the Yellow Pages and I ended up wiring all of his houses, and that was two to three thousand units. I like the Yellow Pages because it gets my message across. And it gives me a low-cost advertising program and high customer exposure. Over the years I'd say about 60 per cent of my customers came to me through the Yellow Pages."

Let the Yellow Pages do your talking. People will listen.

3 out of 4 prospects let their fingers do the walking.

Yellow Pages

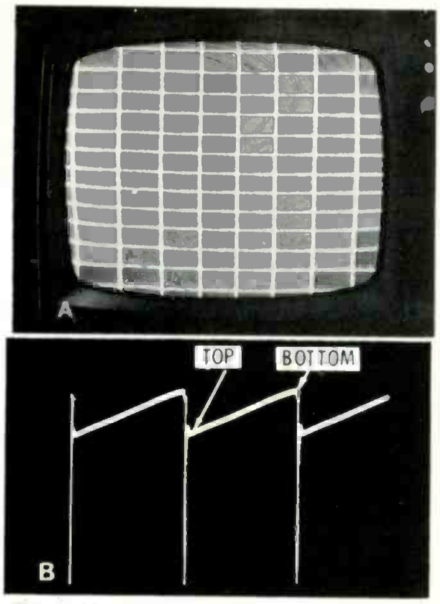


Fig. 2 Normal raster and normal waveform produced by yoke voltage, for purposes of comparison. (A) Normal raster with crosshatch pattern displayed. (B) Normal voltage waveform applied to the vertical windings of the yoke.

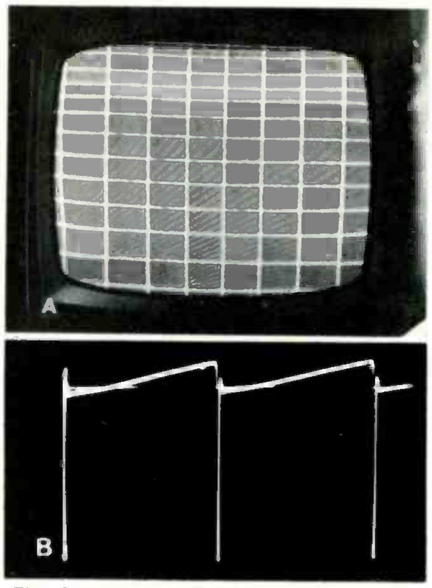


Fig. 3 Picture and yoke waveform when the height control is adjusted too high and the linearity is adjusted too low. (A) Raster with a crosshatch pattern which reveals compression at the top. (B) Yoke waveform, which produced compression, is flattened at the start of the sawtooth.

control is labeled which changes the oscillator plate voltage) until the picture rolls down (higher frequency). The VTVM will indicate a higher negative voltage, and will continue to do so even after the picture is locked, even though the frequency is higher—just the reverse of the action when the grid voltage was changed by either changing the time constant or voltage leakage.

Two effects are at work in this example: The higher negative grid voltage requires a longer time to discharge; this action tries to lower the frequency. The increased pulse voltage fed to the grid of the oscillator, through C38, causes the correct negative voltage needed for normal operation to be obtained sooner. That is, the **charging** time for the time constant is made shorter. This increases the frequency. Although one effect attempts to lower the frequency and the other one attempts to increase the frequency, the latter effect is dominant. and a higher pulse voltage at the grid of the oscillator tube causes the circuit to oscillate at a **slightly** higher frequency, even though the grid is more negative.

Because defects in the positive feedback circuit change both the time constant and the amplitude of the pulse, the change in frequency is less than we might suppose.

The preceeding paragraphs explain why a defect that primarily affects the height also slightly changes the frequency.

It is clear that using the negative voltage at the grid of the oscillator tube as an indicator of oscillator strength—as we correctly do with many types of oscillators—does not apply to this type of multivibrator circuit. Nor can the amount of negative voltage be used as an indicator of frequency.

Experience and logic are necessary to effectively use frequency analysis in practical servicing, but such analysis can be a useful diagnostic technique.

Waveform Analysis

Perhaps you wonder why I have not emphasized waveform analysis for servicing vertical sweep circuits. Although I do use a scope to help find the cause of vertical sweep defects, I have found that, in many instances, the waveforms only verify that a defect exists, and do not pinpoint the cause.

Most of the waveforms will be automatically wrong if the scanning frequency is wrong. Consequently, before attempting waveform analysis, always lock the vertical hold, if at all possible. If necessary, temporarily misadjust the height or linearity controls or

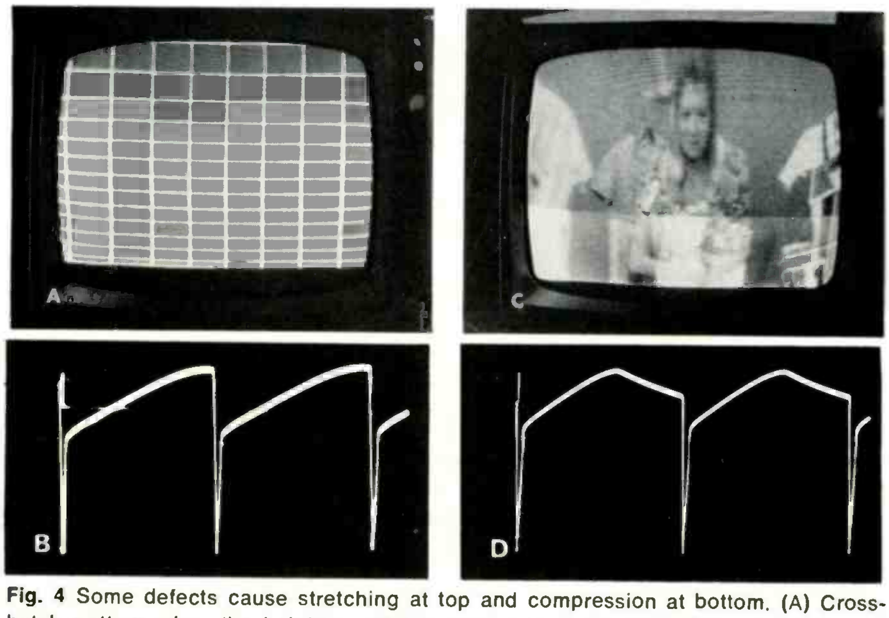


Fig. 4 Some defects cause stretching at top and compression at bottom. (A) Crosshatch pattern when the height control is too low and the linearity control adjusted too high. (B) Waveform when the height control is too low and the linearity control adjusted too high. (C) Leaky C34 caused extreme stretching at the top and foldover at the bottom. (D) Yoke waveform produced when C34 caused bottom foldover.

1,500,000 TEST HOURS A MONTH

MEANS THE KIND OF QUALITY, DEPENDABILITY AND FEWER CALL-BACKS THAT ZENITH "ROYAL CREST" REPLACEMENT TUBES GIVE YOU!

We spend a lot of time checking Zenith "Royal Crest" circuit tubes. To help you avoid embarrassing and costly call-backs. To give you replacement tubes tested for reliability and longevity.

1,500,000 hours of tube testing are logged each month in Zenith Quality Control Laboratories. And no tube is passed unless it meets the same rigid quality standards as the original equipment used in Zenith products.

Result: a complete line of more than 1,200 "Royal Crest" replacement tubes . . . each one built with Zenith quality for fewer call-backs and longer life.

ZENITH®

THE QUALITY GOES IN BEFORE THE NAME GOES ON®

Circle 9 on literature card

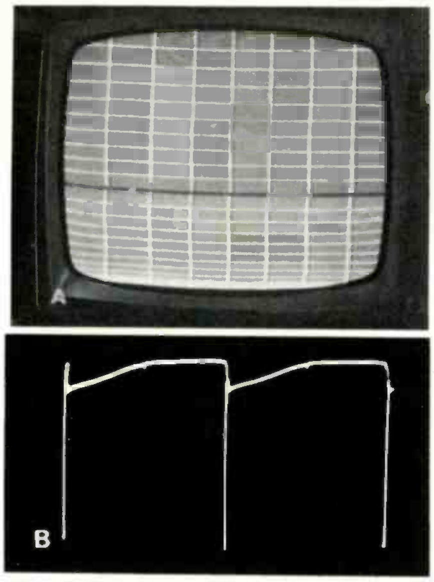


Fig. 5 Two complete pictures caused by vertical sweep at 30 Hz. (A) Crosshatch reveals two pictures, with the bottom one compressed. (B) Distorted yoke waveform and one sweep pulse for each two sync pulses are produced when sweep frequency is 30 Hz.

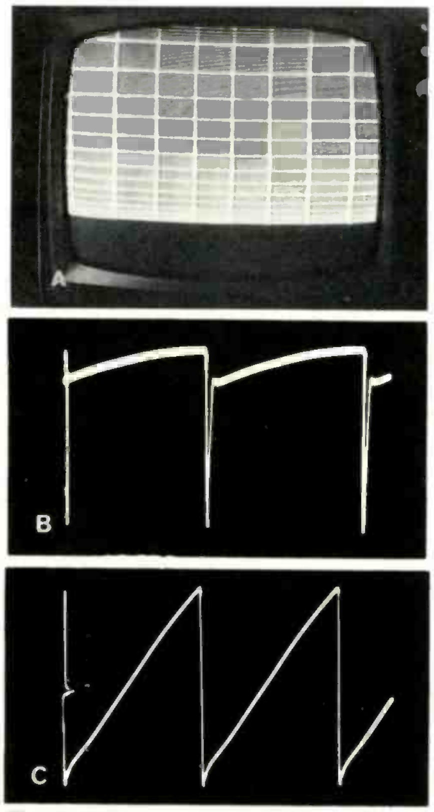


Fig. 6 Picture and waveforms produced when C3C cathode bypass is open. (A) Compression and loss of height at the bottom is produced by open C3C. (B) Yoke waveform reveals flattening at the top of the sawtooth. (C) Waveform with amplitude of 34 V PP is produced at the cathode when C3C is open.

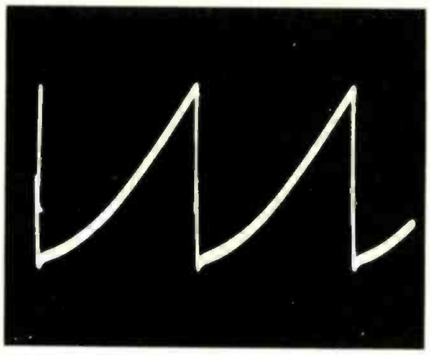


Fig. 7 Waveform produced by normal cathode current in the vertical output tube. Most of the large, negative-going pulse, which is at the grid, occurs after the tube is cut off, and the pulse does not appear at the plate or in the plate-cathode current.

change the value of the coupling capacitor connected to the grid of the oscillator, if these changes will produce vertical locking.

The waveshaping network in the plate circuit of the oscillator and the output transformer/yoke combination both are frequency sensitive, as revealed by the waveform variations in the next illustrations.

First, you must be able to distinguish between normal and abnormal waveforms. Fig. 2A shows the screen of the Sears receiver when a crosshatch pattern is tuned in and the controls are adjusted to produce the best visual height and linearity. The waveform of the voltage applied to the yoke is shown in Fig. 2B. The parts of the waveform corresponding to the top and bottom of the picture are indicated. Changes in linearity can be detected easiest by examining the two ends of the sawtooth portion of the waveform.

Compare the normal picture and yoke waveform in Fig. 2 with those in Fig. 3 (insufficient linearity and excessive height adjustments) and Fig. 4 (excessive linearity and insufficient height adjustments). A leaky coupling capacitor between the oscillator and output tubes also often causes the conditions exhibited in Fig. 4. Misadjustment of the vertical controls caused the picture and waveform shown in Fig. 4A and 4B, and substantial leakage in C34 caused the picture and waveform shown in Figs. 4C and 4D.

Operation of the vertical sweep circuit at 30 Hz caused reduced

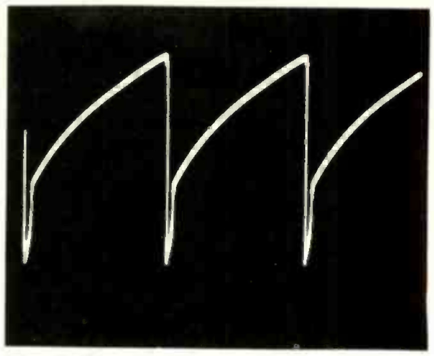


Fig. 8 Waveform produced at the vertical output transformer when the yoke is disconnected shows more non-linear sawtooth and significantly less pulse. This pulse is caused by the collapsing magnetic field of the vertical output transformer.

scan at the bottom of the raster, shown in Fig. 5A, and a flattened sawtooth waveform, shown in Fig. 5B. This illustrates the radical changes in waveforms produced by incorrect scanning frequency in a receiver that was normal in all other respects.

An open C3C cathode bypass electrolytic capacitor caused reduced scan at the bottom of the screen; shown in Fig. 6A, and produced the yoke voltage waveform shown in Fig. 6B. The normal 3.6-volt parabolic waveform at the cathode is changed to a 34-volt sawtooth (Fig. 6C) when capacitor C3C opens.

New Theory About Vertical Deflection

In the process of taking the preceding waveform pictures and analyzing the effects produced by various component defects, we in the ELECTRONIC SERVICING laboratory encountered some peculiar results which made us doubt the old explanation of how the sawtooth pulse, vertical yoke waveform is produced.

Traditional theory

Over the years, we have been told that a pulse of voltage is necessary to produce a sawtooth of current through the inductive reactance of the vertical yoke windings. We have been told also that a sawtooth of voltage is necessary to produce a sawtooth of current through the same vertical yoke windings. The required waveform was said to be a combination of pulse and sawtooth, and both elements of the waveform were said to be supplied by the vertical output stage.

Such theory is very plausible, as indicated by the waveforms in the schematic in Fig. 1. The waveform at the grid of the vertical output tube and the waveform at the yoke are very similar; both have a pulse and sawtooth. It seems that the tube is merely amplifying the waveform presented to it.

Tests raised doubts

Our first serious doubt about the old theory came when we attempted to correlate the amplitude of the pulse portion of the yoke voltage waveform with the amount of vertical sweep actually produced on the screen. There was **no** such relationship. Although increasing the setting of the height control produced more pulse in the waveform and more sweep height on the screen, more height could also be obtained by increasing the linearity control, which did **not** increase the pulse.

We also wondered how any tube can have a total grid bias of only 43 volts and yet amplify, with little

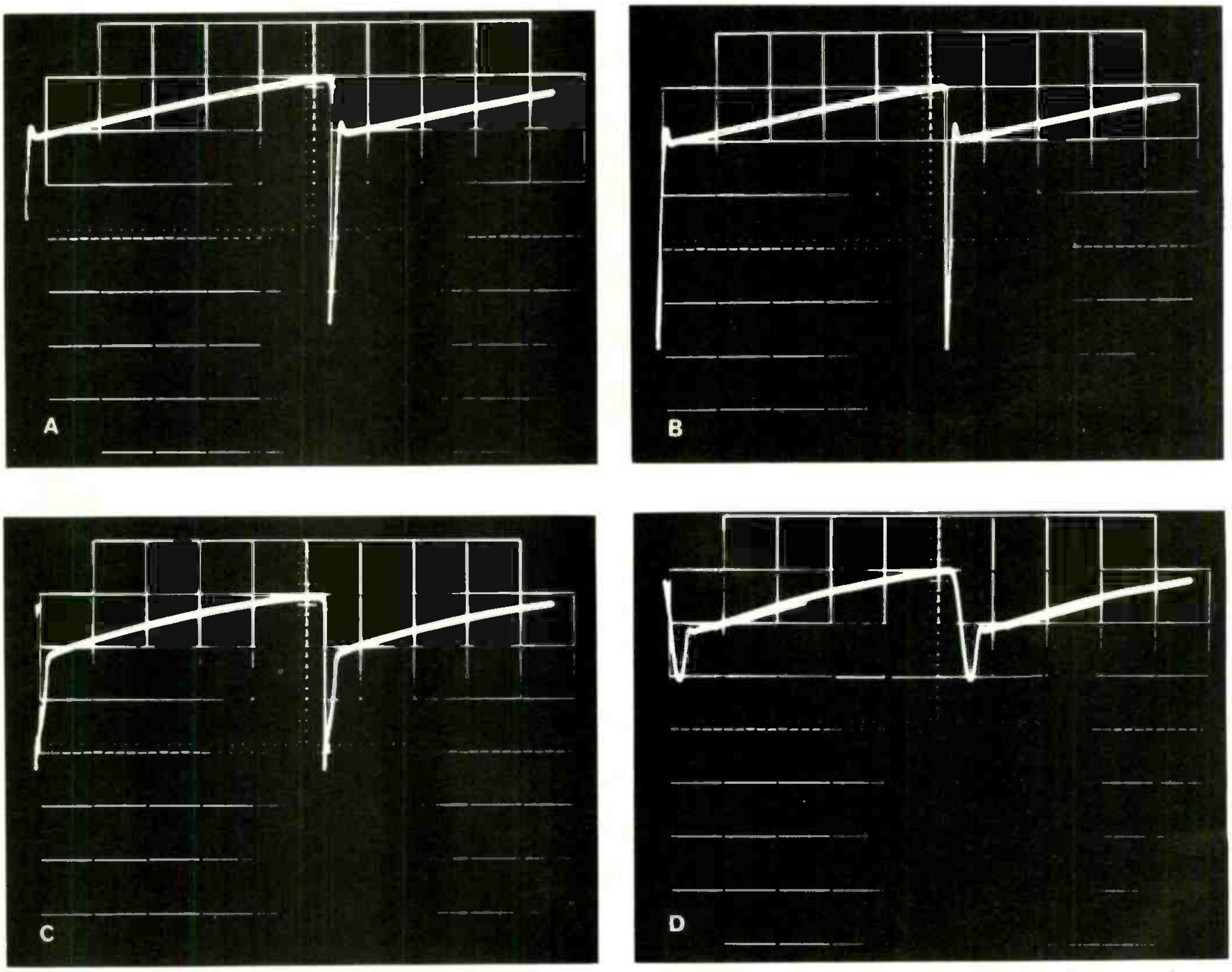


Fig. 9 Yoke voltage waveforms (taken without changing the scope gain) when the TV screen was filled to the same degree under the conditions listed. (A) Height and linearity controls adjusted for a normal picture. (B) Linearity adjusted for minimum, height control adjusted to fill the screen. (C) Linearity adjusted for maximum, height control adjusted to fill the screen. (D) 60-Hz sine wave applied to the grid of the oscillator produces almost normal picture when height and linearity controls are properly adjusted.

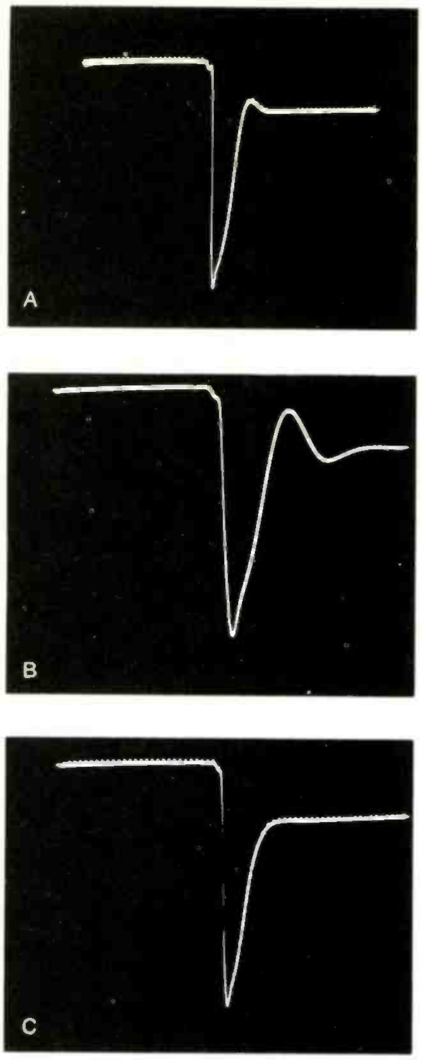


Fig. 10 The pulse portion of the yoke voltage waveform (widened 5X), with different types of loading across the yoke. (A) Normal voltage pulse at the yoke. Notice the horizontal pulses "riding" on the waveform. (B) Increased ringing caused by increasing C39 from the normal .1 to .6 mfd. Most of the horizontal pulses have been bypassed. (C) This loss of normal overshoot is caused by adding a 820-ohm resistor in parallel with the yoke.

distortion, an input voltage of 145 volts PP. Of course, this is impossible—there was extreme clipping.

Fig. 7 shows the waveform produced by the cathode current of the tube. This was obtained by adding a 2-ohm resistor in series between the cathode and the cathode resistors and bypass capacitor. The pulse at the bottom has been eliminated (except for a slight undershoot, which reveals where it should be) because the tube is cutoff at that point. Obviously, the pulse in the yoke is not obtained from the output tube.

With the yoke disconnected, the output waveform consists of more sawtooth than pulse, as shown in Fig. 8. Although, with the yoke disconnected, the tube was operating with an incorrect load, it did not seem likely that this change should distort the waveform as much as that indicated by Fig. 8.

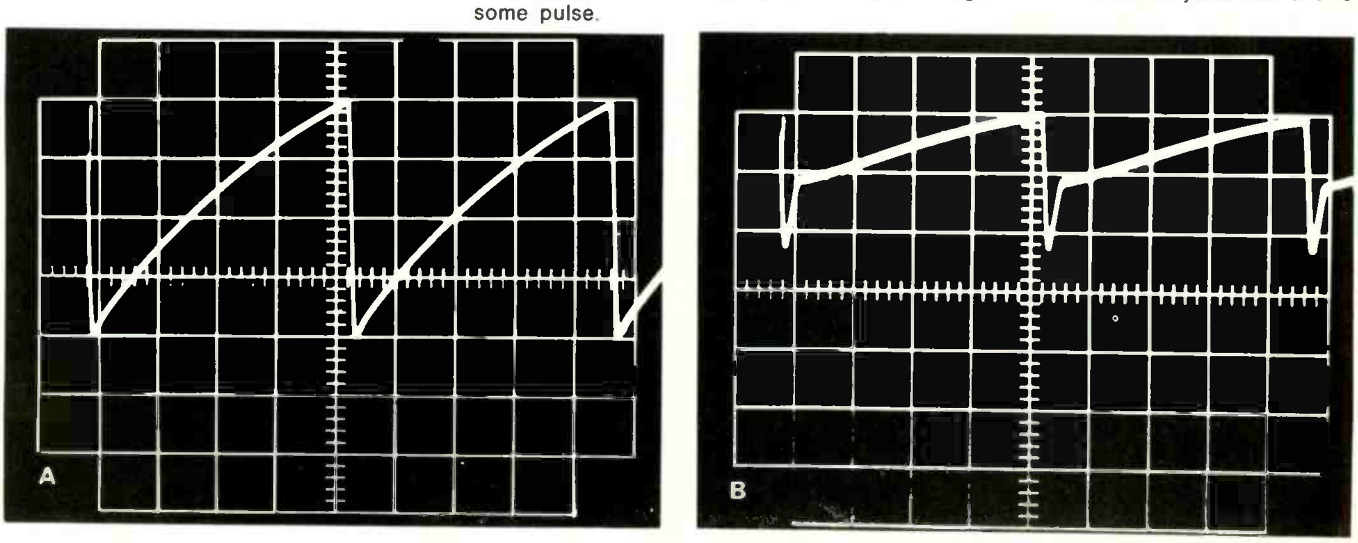
A controlled experiment seemed necessary. Four conditions—three abnormal and one normal—were set up, using the Sears b-w chassis, in which the control that varies the oscillator plate voltage is called "height" and the control that varies the cathode bias of the output tube is called "linearity". The resultant waveforms were photographed and the amplitude of the sawtooth and pulse portions were measured.

Fig. 9A shows the normal yoke voltage waveform produced when both the height and the linearity controls were adjusted correctly. The scope was calibrated for 20 volts PP per division, and the graticule markings show in the pictures so you can also read the voltages. Next, the linearity control was adjusted to produce maximum resistance (more bias and less deflection), and the height control was advanced until the raster was the same size as before, although the sweep was non-linear. Fig. 9B reveals that the sawtooth portion was little changed after these adjustments, but the pulse was larger.

The linearity control then was adjusted to produce minimum resistance (less bias and more deflection) and the height control was adjusted to produce a raster with the same height as produced in the two previous test conditions. Again, the sawtooth was virtually the same amplitude, but the pulse was much smaller (see Fig. 9C).

For the last test, a 9-volt (rms) AC signal was fed to the grid of the oscillator tube through a .5-mfd capacitor. This removed the positive feedback and substituted a 60-Hz sine wave. The picture rolled slowly down the screen, because of

Fig. 11 For a test, the pulse was removed from the waveform at the grid of the vertical output tube. (A) Only a sawtooth of 40 V PP, without pulse, is present at the grid of the vertical output tube. (B) Voltage waveform at the yoke still shows some pulse.



the difference between power line and color vertical sweep frequencies. The height and linearity controls were adjusted to produce the best possible deflection — the linearity was a little spread at the top, but the deflection was nearly normal. The resultant yoke voltage waveform with very little pulse is shown in Fig. 9D.

The amount of vertical deflection and the amplitude of the sawtooth portion of the waveforms were nearly the same in all four test situations. Only the pulse amplitude and width (which indicates the speed of retrace) were changed. According to the old theory, the pulse is the part of the waveform which contributes the height and, consequently, should have remained the same. However, the preceding tests clearly reveal that the pulse does not produce the height of the raster.

Another series of tests was performed in which the controls were adjusted to produce: 1) a reduced picture with good linearity, 2) a normal-sized picture which only slightly overscanned the screen, and 3) a picture much too large, but with good linearity. In all three cases, the pulse and sawtooth amplitudes increased and decreased proportionately.

In all of these tests, the height control had the most affect on the pulse, and the linearity (bias) control had the most affect on the sawtooth. It is apparent that the purpose of the pulse at the grid of the vertical output tube is to make certain the plate current is cut off completely during retrace. Also, the quicker the current through an inductor is interrupted, the larger the "kick back" pulse.

A preliminary conclusion

Our conclusion is that the amplitude of the **sawtooth** portion of the waveform determines the amount of vertical deflection, regardless of linearity. Only when the deflection is linear, regardless of the size of the raster, can the amplitude of the pulse be used as a measure of height.

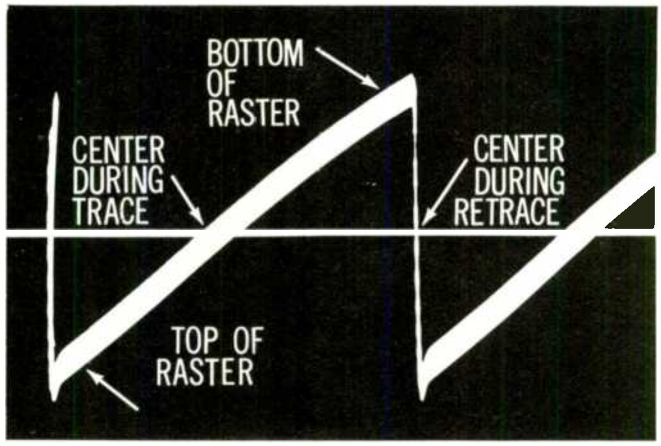


Fig. 12 Zero deflection action in the vertical yoke occurs twice, once during trace and once during retrace. This can be clearly seen only in the yoke current.

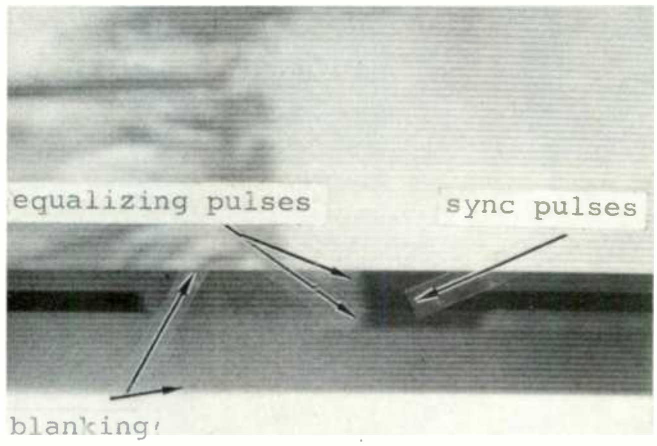


Fig. 13 Equalizing pulses, vertical sync pulses, more equalizing pulses, and the beginning and end of vertical retrace blanking can be seen here.

What causes the pulse?

If the pulse portion of the yoke voltage is not supplied by the vertical output tube, is it caused by the collapsing magnetic fields of the yoke and output transformer? In other words, is it caused by ringing? If it is caused by ringing, the circuit should respond to tuning and damping.

Fig. 10A shows a horizontally-enlarged normal vertical yoke voltage waveform, including the bump we thought might be overshoot from ringing. A .5-mfd capacitor added in parallel with C39 and the yoke windings in Fig. 1 increased amplitude of the ringing (shown in Fig. 10B) and caused it to occur at a lower frequency, as indicated by the increased width of the pulse and the added overshoot on the right.

Addition of a 820-ohm resistor in parallel with the yoke and capacitor C39 (extra .5-mfd capacitor removed) eliminated all ringing overshoot, as shown in Fig. 10C.

These tests indicate that the large pulse is caused by ringing.

Final proof

If the old theory of vertical sweep were true, loss of the large pulse at the grid of the vertical output tube would eliminate all vertical scan. We tested this assumption.

We grounded CIRCUITRACE point 21 in Fig. 1. The pulse at the grid of the output tube disappeared (see Fig. 11A), but some pulse still remained in the waveform at the yoke, as shown in Fig. 11B. The sweep was too large for the screen, but adjustment of the height and linearity controls made the picture nearly normal, except that the short used to eliminate the pulse at the oscillator also eliminated the locking.

The preceding test, in which no pulse was applied to the grid of the vertical output tube, proved that the pulse at the yoke is not produced by the output tube.

Final conclusion

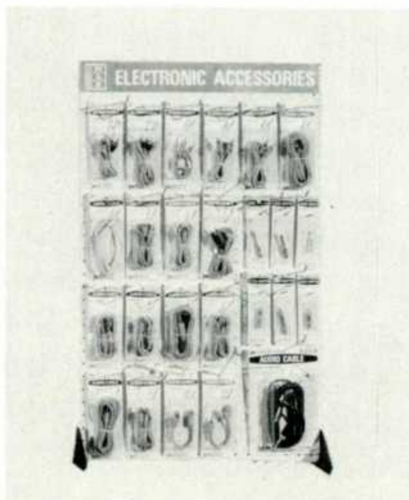
The pulse portion of the waveform at the vertical yoke windings is supplied by the collapsing fields of the inductances in the yoke and

audio systems report

Audio Cable and Adapter Display

A new sales program featuring an audio cable and adapter display has been introduced by North American Electronics.

This display consists of a pegboard rack which reportedly holds



a wide variety of adapters and connectors pre-packaged in clear plastic.

The Audio Cable and Adapter Program sells for $54.64.

Circle 50 on literature card

Cassette Universal Motor

The Weltron Company has introduced a new cassette replacement motor.

The 70-700 is a DC motor which reportedly operates on either 6 or 9 volts and rotates in a clockwise

direction. The cassette universal motor has capabilities of 2320 RPM at 6.5 volts or 2400 RPM at 9 volts, according to the manufacturer.

The 70-700 DC motor sells for $9.10.

Circle 51 on literature card

Audio Connectors

A new line of "Q-G" ("Quick-Ground") audio connectors reportedly designed for use with professional microphones has been introduced by Switchcraft, Inc.

The connectors, called T(*)F and T(*)FL audio connectors, are designed to give professional performers full control of their microphones. The built-in, slide-type on/off switch is located so that a performer can easily find and operate it with his or her thumb.

The audio connectors are available with 3-, 4-, and 5-pin female straight cord plugs that mate with all Switchcraft "Q-G" male plugs and with microphones having similar insert arrangements and an identical number of contacts, reports the manufacturer.

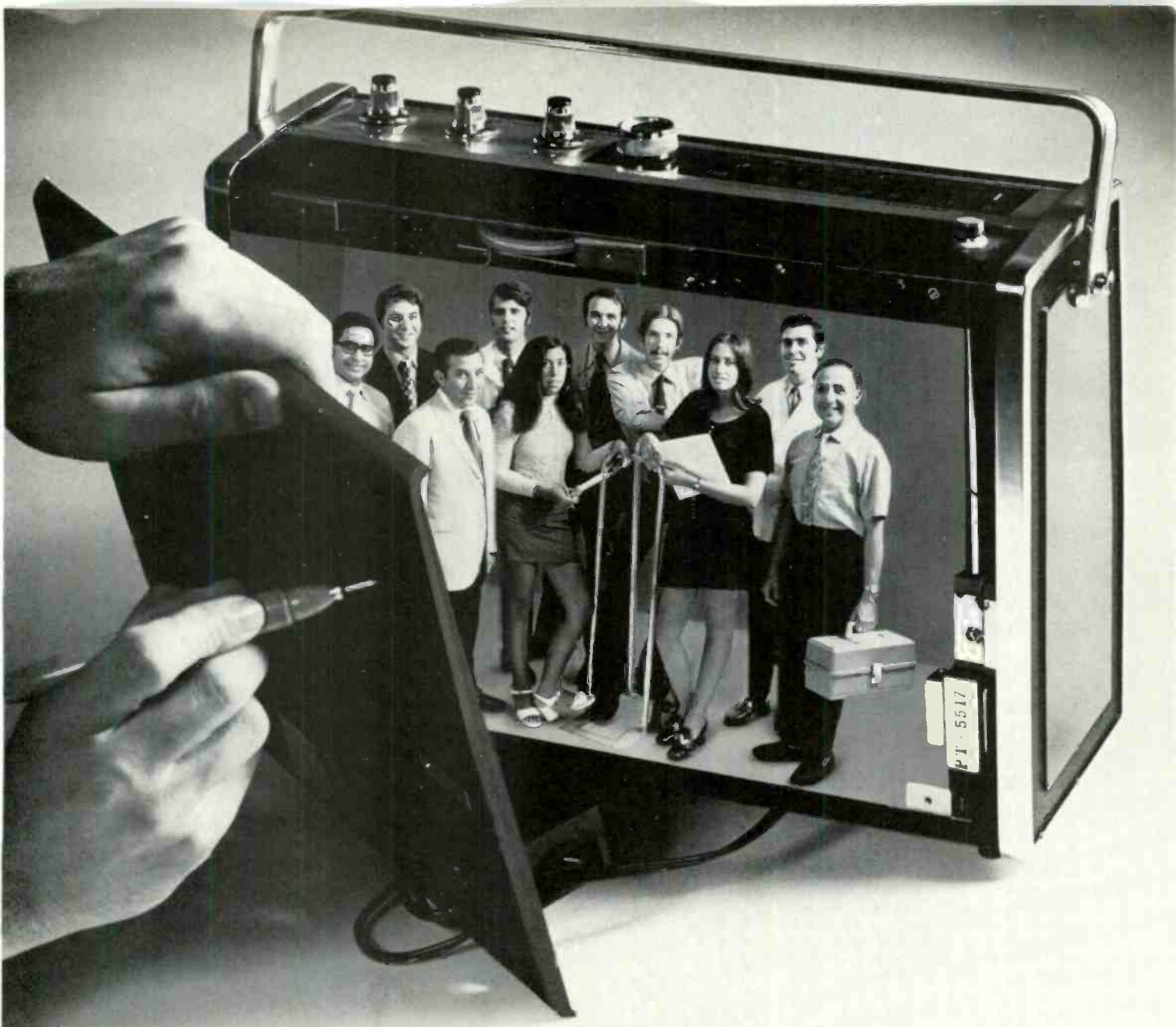
No. T(*)F has a black neoprene strain relief and accepts cables up to 0.25-inch in diameter; T(*)FL has the same type of strain relief, with a larger cable opening to accomodate cables from 0.25-inch to 0.328-inch in diameter.

Specific connectors are designated by inserting the number of contacts in place of the asterisk in the part number.

Price of the T3F audio receptacle is $7.00. Other units reportedly are comparably priced. ▲

Circle 52 on literature card

ELECTRONIC SERVICING . . . the country's only magazine devoted 100% to the ELECTRONIC SERVICING industry . . .



When we're in your hands, we're in good company.

We rely on you. For what you know. For your expert work on Panasonic products. And for the "service" you do for us. Providing the right kind of service for Panasonic products. Efficient. Professional. Yet personal. You take pride in your work. So do we.

That's why you're important to us. You're our local service facility. But you're not on your own. Because we've put together a service team to help you. To make you more important. A team of Panasonic people. Ready to work with you. And for you. Starting with technical specialists who check, and check, and check again. Every product we make. Before a product is made and after. And the field service specialists who work right along with you. Solving your particular problems. Even training personnel.

And five strategically located Regional Parts Depots. And a big Central Parts depot. Not only there for stocking parts. But to answer questions about parts. And to back you up with all the assistance they can give. We provide specially trained instructors to work along with you. To show you the Panasonic way of servicing. The kind that makes Panasonic customers happy they bought Panasonic.

And of course, we do it all with only Panasonic parts. Designed, engineered and manufactured by us. To insure a consistent, high level of quality. Panasonic parts for Panasonic products. It makes sense. As much sense as our being there. Whenever, wherever. With all the special hands you may ever need.

Panasonic®
just slightly ahead of our time

Panasonic Service Division
10-16 44th Drive
Long Island City, N.Y. 11101

Circle 11 on literature card

antenna systems report

CB Antenna Tuner/SWR Meter

A new combination antenna tuner and SWR meter, which contains everything needed to measure and correct antenna line mismatches, has been introduced by the E. F. Johnson Company.

Called the "Antenna Mate", the unit reportedly can correct antenna line SWR's of up to 5:1 to less than 1.1:1. A built-in meter reads the standing wave ratio from 1:1 to 10:1, and also indicates the relative power output.

By correcting antenna mismatches, the "Antenna Mate" not only produces maximum transmitted signal but also improves receiver performance, according to the manufacturer. All that is required to operate the unit is to insert the coaxial line between the transceiver and antenna, using standard coaxial connectors.

Price is $29.95.

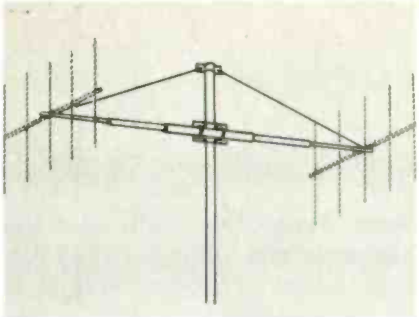
Circle 60 on literature card

Universal Stacking Kit

A new universal stacking kit which reportedly makes possible an added gain of 3 dB when used with a pair of 3-, 4-, or 5-element beams or quads has been made available by the Antenna Specialist Company.

The stacking arrangement reportedly also results in a narrowed beam path which is said to permit the operator to "zero in" on the received signal more precisely and also eliminate many interfering signals that are off the beam path.

Model M-205 has special seamless aluminum alloy support arms which take effective wind loads of up to a reported 100 m.p.h. Their



telescopic design permits them to be extended to optimum spacing, according to the manufacturer.

A phasing harness that allows matching and hookup of any pair of conventional beams or quads is supplied with the stacking kit.

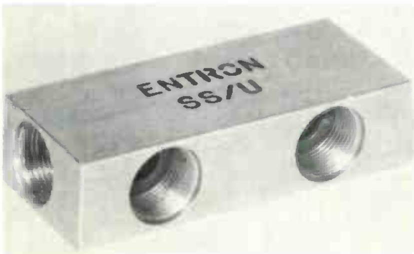
Model M-205 sells for $49.95.

Circle 61 on literature card

CATV Cable Splice

Entron, Inc., is introducing a new seized, center-conductor, coaxial cable splice offering input and output test points. The unit, which reportedly exhibits RF characteristics comparable to the cable itself, enables signal levels to be monitored throughout the cable system.

The cable splice also features a new universal seizing device. Designed for underground or aerial mounting, it is expected to help eliminate stocking and inventory problems because one unit will now fit all cable sizes.



The splice block, Model SS/U, is designed for RF coaxial transmission systems and CATV systems operating in the frequency range of 5 MHz to 230 MHz and 26 dB up to 300 MHz. The unit measures 1¼ inches x ¾ inches x 3 inches and has standard ⅝-24 entry ports. It is housed in corrosion-resistant aluminum.

This new cable splice sells for $6.95. ▲

Circle 62 on literature card

CES Wrapup

A review of the significant technological changes evident in the products displayed at the 1971 Consumer Electronics Show.

Two categories of equipment got heavy play at the 1971 Consumer Electronics Show. One was color television, the perennial cash crop of the electronics industry. The other was a newcomer: four-channel sound.

The Color TV Picture

Truly new developments in home electronics seem to be scarce this year. This also applies to developments in color TV.

Imports

The only new brand name at the show was Sanyo. Its color sets are standard sizes for imported models: 12-, 15-, and 18-inch sizes, plus the new 19-inch square-corner. A "Tint/Sensor" circuit used in Sanyo models reportedly is a true automatic tint control (ATC) system instead of pre-set controls, as in most imports.

Channel Master introduced a 25-inch set with a plug-in modular chassis which it called "Integrid". It's a hybrid, and elaborate. It sports AGC and the usual automatic stuff. The chassis appears to be similar

Microelectronics lead to more multi-function products.

Clock TV/radio from Symphonic has digital timer that turns whole unit on or off unattended; picks up UHF or VHF TV on 3-inch screen, and AM or FM radio.

Futuristic home entertainment complex from Panasonic contains AM, FM stereo, 8-track stereo tape, and color television, all controlled from special console in foreground. Digital timer turns system on or off. Tiny 2-inch b-w monitor in console can be switched to any channel for preview before changing the program on large center screen. This is prototype, but suggests future designs.

General Electric "floor component" stereo system plays AM, FM stereo, 8-track tape, or 4-speed phono.

Not pictured but worth mentioning: A Panasonic clock radio with world map for a face; touch a city with your finger and the time is spoken aloud in French, Spanish, Japanese, English, Italian, or German. A Panasonic "snapshot" TV that produces a photo of whatever is on the screen when you punch a button. An Akai color video recorder and camera that is portable and records on ¼-inch magnetic tape. A portable Ampex recorder and camera that puts video and audio on ½-inch videotape cartridges.

The Consumer Electronics Show

The Consumer Electronic Show (CES), produced and sponsored each year by the Consumer Electronics Group of the Electronics Industries Association (EIA), is the world's largest trade show devoted exclusively to consumer electronics.

This year, nearly 300 manufacturers, importers and distributors displayed their 1972 product lines at the Show, held June 27-30 at McCormick Place in Chicago. The more than 25,000 individual products exhibited included television and television systems, radios, phonographs, audio components, tape equipment, and accessories for these types of equipment.

A record 36,160 dealers, manufacturers, distributors, manufacturers' representatives, importers, and industry and government officials viewed the new products and attended conferences about retail marketing, servicing, legislation, broadcasting and a variety of other topics related to consumer electronics.

Next year, the CES again will be held at McCormick Place in Chicago, June 11-14. Attendance is free to qualified individuals—dealers, manufacturers, manufacturers' representatives, distributors and importers of consumer electronic products. For information, write: Consumer Electronics Show, 331 Madison Ave., New York, N.Y. 10017.

Fig. 1 Solid-state 19-inch MGA chassis features 25-position detented UHF tuner; slider-type Color and Tint controls; modular construction, although not plug-in; and easy access for servicing.

to a Wells-Gardner T50.

MGA (brand name of Mitsubishi) has a modular 25-inch too, using the Wells-Gardner plug-in, slide-out chassis. It makes servicing fairly nice. Outstanding at the MGA exhibit, though, was a solid-state 19-inch color chassis. Talk about serviceable. The boards open out so both sides are accessible for testing or parts replacement. Technicians who need information or parts for MGA sets and cannot obtain them locally should write John Doble, MGA Division, Mitsubishi International Corp., 7045 North Ridgeway Avenue, Lincolnwood, Ill. 60645.)

Unique to the MGA 19-inch chassis is a 25-channel, detented UHF tuner (Fig. 1). Other detented UHF tuners generally have only eight positions.

What is called automatic tint in the MGA, and most other imported sets, consists of spare controls which are pre-set for optimum color tint brightness and contrast. Some of these controls have been made more accessible so that you can adjust them without taking off the back.

JVC America has a solid-state square-19-inch chassis it calls "Quadrimatic." Some circuit boards plug in, and several IC's are used. A circuit labeled Automatic Brightness Control is merely a pre-set pot; so is the PSC (pre-set color control). Sharp Electronics, in high-end models, has ACT (automatic color tint), which is only another pre-set arrangement.

Panasonic brought a battery operated 4.5-inch color portable to the Show. The set operates on internal batteries, a car battery, or line voltage; it takes only 15 watts of power. Hitachi, Micotron (brand name of Midland International), and Toshiba displayed essentially the same line they had last year—plus some new 19-inch square-corner models.

Domestic color

Most innovations this year seemed to be in American sets. At least Motorola and RCA came through with advanced designs. Sylvania's color line is similar to what they produced last year, with the 11-inch touchbutton varactor UHF/VHF tuner in a solid-state chassis at the top of the line.

Motorola stirred curiosity with "Insta-Matic" color tuning in the new Quasar chassis. At first glance, you could mistake the one-button device for another pre-set-control gimmick. The button does switch in pre-set brightness, contrast, color, and hue controls. But there's more. Insta-Matic activates AFT plus two new automatic controls: a background circuit and a color-intensity circuit.

The background circuit does two things: 1) It turns up the red CRT gun slightly, warming the shade

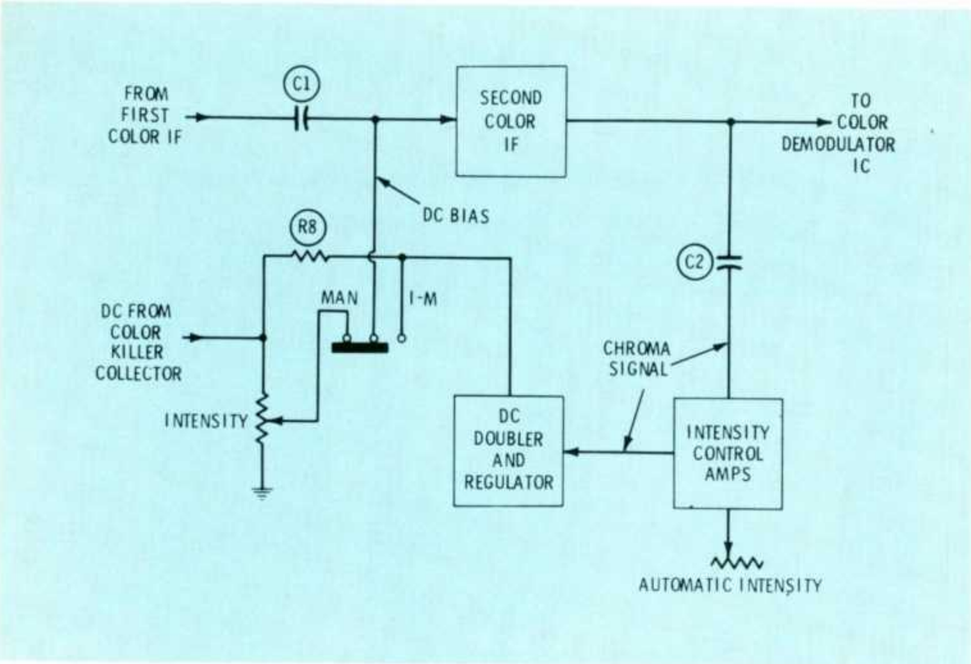


Fig. 2 Automatic color-intensity circuit is one of the functions brought into play by pushing Insta-Matic button. Pre-set contrast, brightness, hue, and color controls are also activated, plus a circuit that desensitizes the color demodulator to flesh color variations and adds a slight red shade to the raster.

(tint, Motorola calls it) of the raster; 2) it widens the angle of color demodulation, making the chassis less sensitive to errors in fleshtone.

The background circuit operates only if a color signal is received **and** the Insta-Matic switch is on. The color-killer stage sends a voltage to an AND gate when color sync, or burst, is part of the received signal. The second "input" for the AND gate is the closed Insta-Matic switch. If either input is missing, the background circuit is disabled.

The automatic color-intensity circuit affects chroma gain. It is in addition to regular ACC. Fig. 2 gives some idea of how it functions. With this section of the Insta-Matic switch in the Manual position, the manual color-intensity knob sets the bias on the second color-IF amplifier. Moved to the "I-M" position, the switch applies a different bias that is proportional to chroma amplitude.

C2 feeds the chroma signal to the intensity-control amplifiers, the gain of which is set by the Automatic Intensity pot. Doubler diodes develop the proportional DC bias. Voltage from the color killer, through R8, establishes the operating level for a Zener regulator, which determines nominal bias. This closed-loop system reportedly holds color intensity steadier than can regular ACC.

New from RCA is the CTC 46 chassis and its remote-controlled cousin, the CTC 54. Construction resembles last year's CTC 49. AccuCircuit plug-in modules (Fig. 3) are the outstanding feature; they plug in edgewise, like computer circuit cards.

Both chassis designs are called "AccuMatic Color Chassis". The AccuMatic feature is like AccuTint in older chassis, except that the ranges of the Color and Hue controls are narrowed. Angles in the color demodulator are broadened near flesh color, and the color temperature of the raster is "warmed" up.

Although Zenith didn't make it to the CES, their new all-transistor 25CC55 color casssis (Fig. 4) is worth mentioning. This chassis holds five plug-in Dura-Modules and drives a 25-inch picture tube. Five flatpack IC's are socket-mounted and perform the following functions: sync-AGC (new), chroma demodulator, subcarrier regenerator, chroma amplifier, and sound section. A special thick-film (not monolithic), integrated-circuit package contains all horizontal sweep circuitry except the power-output section. A varactor-equipped UHF/VHF tuner assembly rounds out the latest Zenith color chassis design.

Four-Channel Sound

What it is and how it is achieved

Under various tags—quadrasonic, quadriphonic, surround sound, wraparound stereo, and others—four-channel audio certainly grabbed a lot of attention at the CES.

Originally, four-channel hi-fi was a genuine attempt to recreate the exact sound of a concert hall. During recordings, two extra microphones picked up audio that included acoustic reverberation and phase lag just as it can be heard during a performance. The effect or feeling of "being there" is called **ambience.**

As hawked at the CES this year, four-channel audio seems mostly a sales-promotion gimmick. For one thing, there are multiple approaches. The goal of all is enhanced sound, but not necessarily through recorded acoustic effects. Each manufacturer seems to see

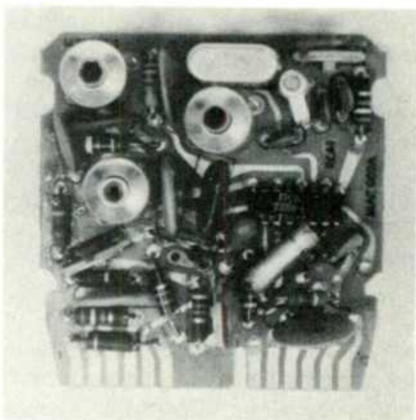


Fig. 3 AccuCircuit plug-in module cards are major design features of new RCA chassis CTC 46 and CTC 54. Five integrated circuits are used. Now-standard SCR horizontal deflection is retained in these new chassis.

four-channel sound as something different.

It always takes four speakers, and most use four amplifier channels. But program material is anybody's guess.

Few companies have significant amounts of four-channel material out. RCA has produced nearly 100 Quad-8 tape cartridges—a two-program version of the 8-track stereo cartridge. Vanguard has done some reel-to-reel, and Ovation and Project 3 have issued a few disc recordings. No more than a half-dozen FM stations around the country have given four-channel a serious try.

The buyer of four-channel equipment faces a wait. Tape, records, or FM—none are standard yet. Equipment bought now might be obsolete before standard methods are adopted by most manufacturers. Most four-channel still seems experimental.

One version uses only two stereo channels, but with four speakers. This special **Dynaco** hookup and speaker placement are shown in Fig. 5. Ambience is noticeable with ordinary stereo recordings. Special production mixing enhances the surround effect for this hookup, but no major record company does it that way.

A few systems merely add delay for some frequencies before feeding them to the back speakers. This creates an all-around-you effect and some ambience, but it's not what you hear at a live performance.

Electro-Voice devised a way to matrix (encode) four channels into two. Ordinary stereo-FM stations and stereo discs can handle this matrix signal. A decoder at the playback or receiving end converts the two-component signals back to four. Several companies at the Show offered decoders.

Many recording companies use multichannel consoles. Thus they have master tapes in multi-track format. Four-channel program material can be mixed down from 8- and 16-channel master tapes. This effectively puts the listener smack in the middle of the band or orchestra. Some listeners, especially youngsters, like that.

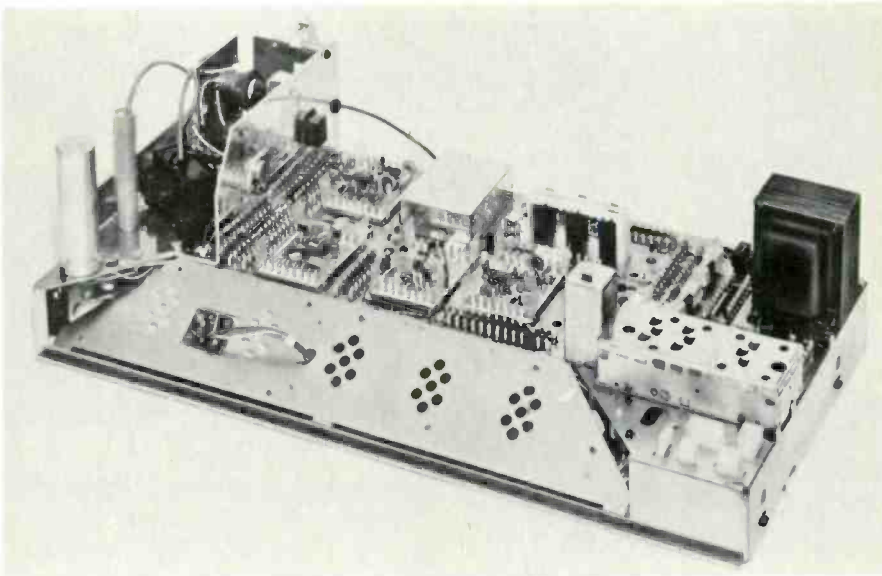


Fig. 4 New Zenith all-solid-state color chassis, the 25CC55, didn't make the CES but was shown nearby at the company's Chicago showroom. Newest addition is thick-film integrated circuit that develops horizontal sweep (but not output).

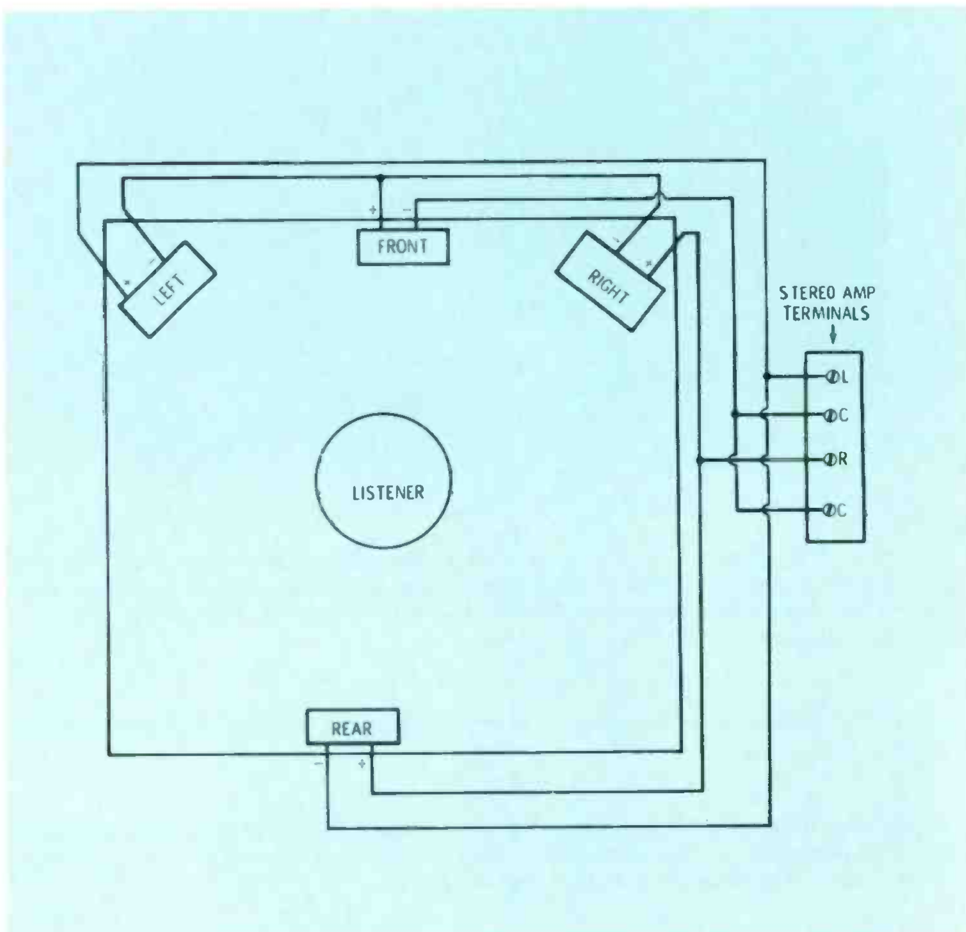


Fig. 5 Speaker hookup used by Dynaco to simulate four-channel sound. Separations among various speakers are enhanced by recordings made for this setup (Brothers Records, Los Angeles).

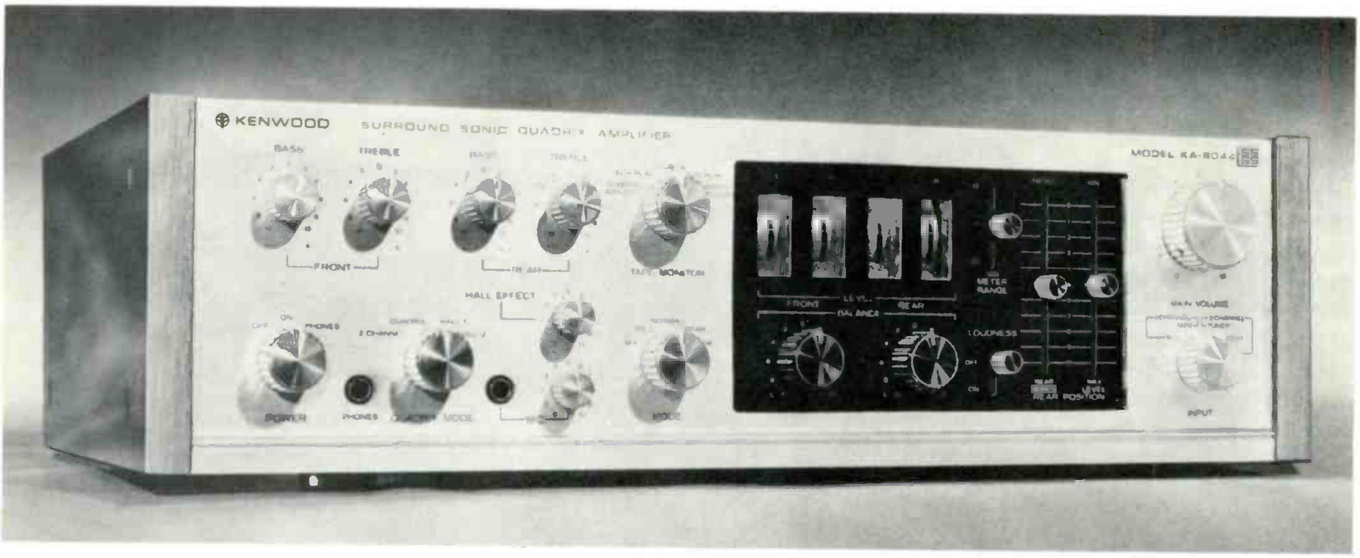


Fig. 6 Amplifier for four-channel audio has built-in reverb to emphasize big-hall sound. (Label "Hall Effect" does not refer to the well-known magnetic effect.) Slider controls set balance between front and rear speakers. VU meters are provided for all four channels.

Fig. 7 Ultramodern four-channel receiver by Quadracast Systems Inc., and sold by Mikado Electronics. Employs integrated circuits on plug-in modules. Can handle up to 100 watts (rms) power per channel, manufacturer claims, with special chip output amplifiers.

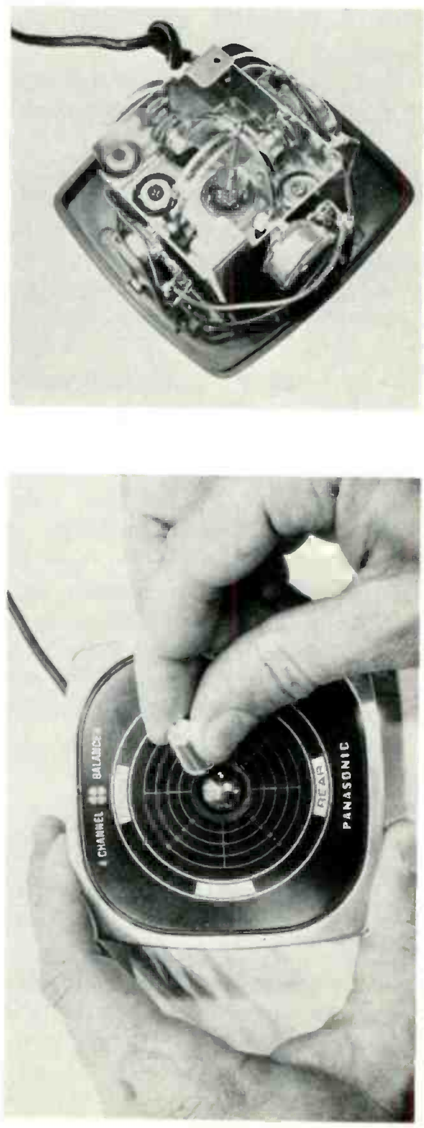


Fig. 8 One-control Panasonic balancing system for quad looks almost like a gyroscope. Can be added onto existing system, or is integral to some Panasonic quad-listening devices shown at CES.

Recording engineers and composers synthesize quad sound. Synthesizers such as the popular Moog (now **Moog-Microsonics**) supply unique bounce-around effects for four speakers. Similar qualities can be recorded from regular instruments. The sound is novel, even pleasing. Such techniques make four-channel a medium all its own —something you'll never hear in any concert hall.

Fig. 9 Little bright spot near front of grid (right) represents effective location of listener when balance controls are changed from center. Two controls balance the speakers and move the light. Motorola player accepts RCA-type four-channel or two-channel 8-track tapes.

The hardware

Some companies brought new quad equipment to the Show, some displayed last year's. I saw amplifiers and receivers, with and without decoders. Some new amplifiers include reverberation for the back channels, to stimulate big-hall ambience.

Shown in Fig. 6 is a four-channel Kenwood amplifier with decoding and reverb. The "Hall Effect" control label does not refer to true Hall effect, which is a magnetic phenomenon; this label is an offshore manufacturer's description of the sound effect you get by lengthening echo time.

A company new to the U.S., Rolecor of America, displayed two quad amplifiers. Sanyo, a name known here, brought in a four-channel amplifier with a matrix decoder. Benjamin, maker of Miracord record players, offered its first receiver/amplifier.

Fig. 10 Tape machines are the easiest program source for quad sound. This Panasonic reel-to-reel lets you make your own four-channel recordings—two programs per tape. Four mike inputs, four input controls, four VU meters, and noise reduction system are included.

Pictured in Fig. 7 is a Japanese-built unit which is loaded with integrated circuitry, (on plug-in modules), is equipped with digital tuning readout, and has a power capability up to 100 watts (rms) per channel. This unit, the QSI-4000, is the only receiver I know of that contains circuitry for Dorren Quadraplex, a system for multiplexing four discrete program channels on a single FM-station carrier. (Back-speaker signals go on a 76-kHz subcarrier, much like the front-speaker channels for ordinary FM stereo are put on the 38-kHz subcarrier. No station uses the system yet, but it has been tested at KIOI in San Francisco.)

The QSI-4000 also accommodates the JVC system of quad disc playback, too. The grooves of JVC-type, four-channel records contain, besides the 45-45 modulation for regular stereo, a multiplexed subcarrier that carries back-speaker modulation. Any cartridge that reaches up to 45-50 kHz can retrieve all of the modulating signal. A special demodulator recovers the two back channels.

Balancing controls for quads allow a listener to "place" himself almost anywhere in relation to the surrounding sound. The QSI receiver has a 360-degree stick-type control. It's similar to one that comes with several Panasonic quad systems, or is available for add-on.

You can see how it works in Fig. 8. It looks almost gyroscopic. The stick moves either or both of the two gimbals, which rotate the balance potentiometers.

Most quad units utilize two knobs for balancing right/left/front/rear. Motorola simplifies the task with a lighted grid in the "Quad-line" tape player (Fig. 9). The listener position, represented by a tiny lamp beneath the grid, can be moved forward or backward by one knob, from side to side with another.

Fig. 11 Desk-type Panasonic records four channels on ordinary stereo cassettes, and plays pre-recorded quad cassettes (when somebody makes some). This is the first of its kind.

Presently being the main producer of quad tape cartridges, RCA naturally has several machines to play them on. All of the RCA units play both stereo-8 and Quad-8 tapes. So do the Bell & Howell and General Electric quad units exhibited at the Show. Craig exhibited a new quad player for automobiles, and both Kenwood and Panasonic (Fig. 10) displayed elaborate four-channel reel players. Fig. 11 shows one of the first four-channel machines for recording and playing back on cassettes. It appears that some time will pass before disc records or FM radio provide much four-channel programming.

One unexpected device at the Show was a four-channel headset. The Koss "Quadrafone" (Fig. 12) reproduces "plain" stereo too. Don't expect ideal front-back separation, but the surround effect is there.

Synthetic quad

The ambience effect of quads can be faked. That is, your ear can be

Fig. 12 Another first—four-channel headphones by Koss. Can be used for regular stereo or to give surround-sound effect of listening in large concert hall.

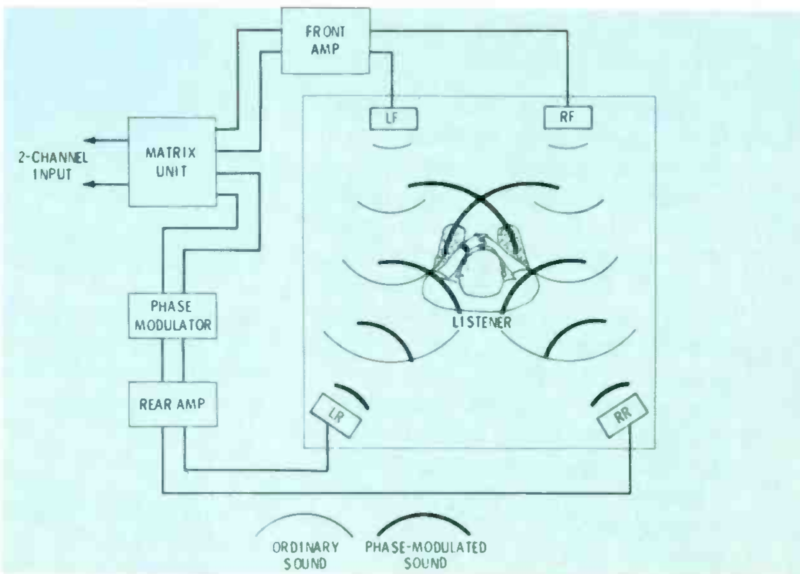


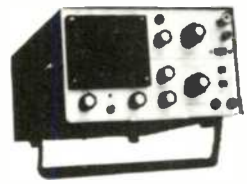
Fig. 13 Function diagram of method used by Sansui to synthesize what sounds like surround audio under some listening conditions. Synthesizer can be added to existing system.

LEADER

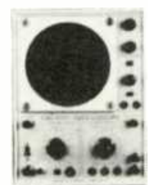
has lots of scope.

MODEL LBO-54B
5" WIDEBAND OSCILLOSCOPE/V'SCOPE
Calibrated vertical input, outstanding stability and 10MVp-p/cm sensitivity make this a Leader. Has DC to 10MHz bandwidth, high linearity sweep range with automatic sync. Push-pull amplifier assures distortion-free displays. Ideal for color testing.
$249.50

MODEL LBO-301
3" PORTABLE TRIGGERED SCOPE/V'SCOPE
The only 3" scope with solid state design, plus vertical and horizontal calibration. All you need for bench or field use. Offers horiz. front panel design, DC to 7MHz bandwidth, 5x magnification and 1μs to 50ms/div sweep time in 15 ranges. Compact, it's a great one.
$334.50



LBO-501
5" SOLID STATE TRIGGERED SCOPE/V'SCOPE
Professional results without peer. Features a calibrated vertical input and time base triggered sweep; 20MVp-p/cm vert. sensitivity and DC to 10MHz bandwidth. Also has sine and square wave calib. voltages, lighted graticule and tilt stand.
$339.50



MODEL LBO-32B
3" WIDEBAND OSCILLOSCOPE
Ideal for bench or on-call use with high performance and economy. DC coupled, 7MHz bandwidth. FET input stages with push-pull amplifiers to provide low distortion. Has special position sweep circuit for TV signal display. Lightweight.
$189.50

MODEL LBO-31M
3" FIELD SERVICE SCOPE
Everyone likes this 4" chassis scope for performance in a limited space. Use in side-by-side placement to observe several phenomena simultaneously. Priced so low you can buy a few in place of one unit for continuous monitoring of electronic gear.
$139.50

MODEL 53B
5" WIDEBAND OSCILLOSCOPE/V'SCOPE
Features automatic sync. with ultra-linear sweep range; 10MHz bandwith, 10MVp-p/cm vertical sensitivity. Add to this vert. and horiz. DC amplifiers plus solid state design. A best buy value for servicing color TV circuits.
$229.00

Instruments to believe in.

See Your Distributor   Send for catalog

Leader

INSTRUMENTS CORP.

37-27 Twenty-Seventh St. Long Island City, N.Y. 11101   (212) 729-7410

Circle 14 on literature card

fooled into thinking it's hearing sounds from a large concert hall.

How such a unit, the Sansui "Quadphonic Synthesizer", functions is illustrated in Fig. 13.

Music develops complicated interference patterns as its waves bounce around inside the hall. A listener's ears pick up these "beat" patterns along with direct waves, giving a music hall its characteristic "sound".

The Sansui synthesizer takes ordinary two-channel stereo, phase-modulates certain frequencies, and feeds them to the rear speakers. When the mixtures of waves reach the listener's ears, they "sound" like a concert hall. The unit in no way matches any particular hall, nor can it produce the ping-pong effects of true four-channel sounds.

The Power-Rating Battle

More than usual, manufacturers and importers at this year's CES specified the power ratings of amplifiers in rms values, measured into 8-ohm loads. The Federal Trade Commission made it clear, at one seminar during the Show, that it would soon stipulate how power and frequency response are to be measured and advertised. Arguments ensued, but rms seems to be the method that will be adopted.

Ratings can fool you. One unit at the Show was advertised as a 60-watt (IHF) amplifier. Another boasted 100 watts (IPMP). A third is rated at 22 watts (rms) per channel. Do you know which amplifier produces the most power?

If you guessed the 22-watter, you're right. The 60-watt (IHF) amplifier produces 7.5 watts (rms) per channel. The 100-watter (IPMP) is only a 50-watt-per-channel unit, which is less than 7 watts (rms). Consider this when you're trying to be fair with a customer who is buying an amplifier, or when you're checking power output after servicing one. Study the specs cautiously and be sure you duplicate input values and loading. ▲

Bookkeeping—a review

by Robert G. Amick

Let's wind up our discussions of bookkeeping and accounting with a quick review of what's been covered.

The Fundamental Equation of Business

Every business begins with ownership of something: the fixtures, tools, equipment required to do business. The location from which business is done (technically, you buy the right of occupancy for a stated period of time when you rent, so you own those rights while the rent is paid), and the merchandise and supplies sold or used, also are things owned. Cash in the business's bank account is owned by the business. Likewise, any money owed to your business is 'owned' by your business.

Most businesses also **owe** something from time to time. Short-term debts, like money owed for supplies purchased, to be paid at the end of the month, or long-term debts like mortgages on buildings and equipment.

What you own are called your ASSETS. What you owe are called your LIABILITIES. Taken together, these two factors determine the value of your business —its NET WORTH, your PROPRIETORSHIP. The simple equation based on Assets, Liabilities and Net

Fig. 1

Fundamental Equations of Accounting

NET WORTH*	=	ASSETS (value of what you own)	—	LIABILITIES (value of what you owe)
ASSETS	=	LIABILITIES	+	NET WORTH
LIABILITIES	=	ASSETS	—	NET WORTH

***Also called PROPRIETORSHIP or OWNER'S EQUITY or CAPITAL ACCOUNT**

Fig. 2 Mike's TV-Electronics Balance Sheet October 1, 1970

ASSETS		LIABILITIES	
Cash	$1,109.60	Accounts Payable	
Accounts Receivable		C E M Supply Company	112.00
Springville Hospital	134.00	Martin Supply Comapny	54.30
Truck	1,600.00	Sales Taxes Payable	48.20
Shop Equipment	1,900.00	Mortgages Payable	
Office Equipment	200.00	First National Bank	761.10
Parts and Supplies	857.00	Total Liabilities	975.60
		PROPRIETORSHIP	
		Mike Farad, Capital	4,825.00
Total Assets	$5,800.60	Total Liab. and Prop.	$5,800.60

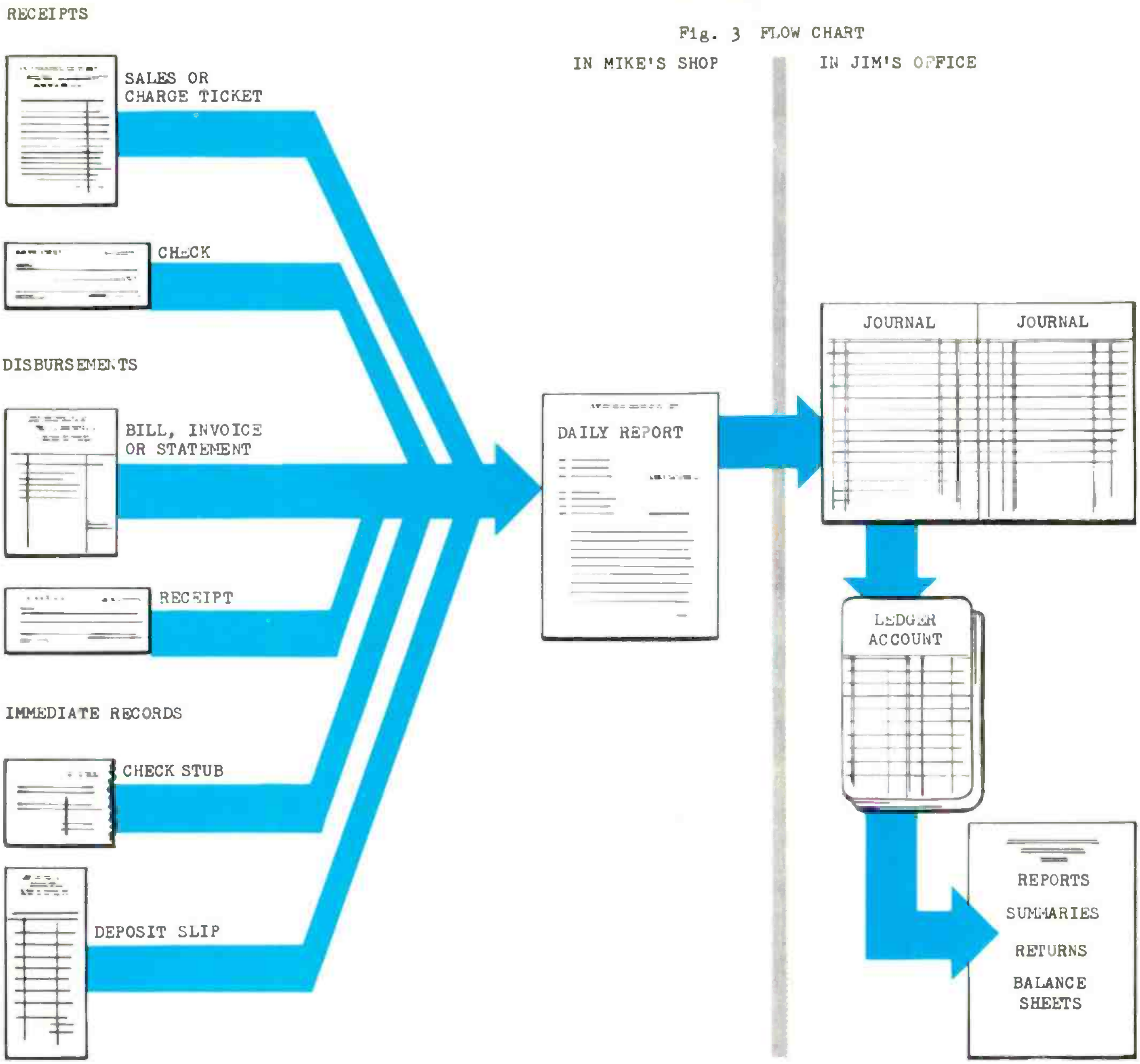


Fig. 3 FLOW CHART

Worth, or Proprietorship, is shown in Fig. 1.

The Balance Sheet: End Product of the Bookkeeping System

That equation is the major premise of bookkeeping and accounting. In practice it is expressed as a Balance Sheet, as shown in Fig. 2.

The Balance Sheet shows Assets to the left, Liabilities and Proprietorship to the right.

Assets

Assets begin with Cash (on hand, and in the bank account) and money owed (Accounts Receivable) to the business. Then the other items owned are listed, at their current book value. (Their beginning cost, less the amount of their value used up—called Depreciation.)

Liabilities

Liabilities begin with Accounts Payable—the money you owe that must be paid at the end of the month or soon thereafter. Then come the special items and long-term debts: Taxes Payable and Mortgages Payable.

Proprietorship

Finally, to satisfy the equation, comes proprietorship—the share of the business belonging to the owner, free and clear of all claims of his creditors. Determining Proprietorship follows upon establishing the other two items.

The Balance Sheet is the first, and basic document, of any business's books. Everything else follows upon it, because all the other records in a bookkeeping, or accounting, system feed information back to the Balance Sheet. That means that all the changes that result from doing business can be carried back to the Balance Sheet—and they are, each time the books are closed and summaries prepared.

When a new business is born, its birth-certificate is a Balance Sheet.

Change of Address

To receive Electronic Servicing at your new address, send an address label from a recent issue and your new address to:

Electronic Servicing, Circulation Dept.
1014 Wyandotte St., Kansas City, Mo. 64105

12FR8 Tube Availability

You can find a solid-state device to replace the hard to find 12FR8 tube from Frigart's Radio Supply Co., P.O. Box 48457, Los Angeles, California.

Cheatham Radio-TV Service
P.O. Box 1
Dover, Tenn. 37058

We have about 60 12FR8 receiving tubes. If you need this tube please contact: Hite Radio & Television Co., Inc., 1695 Washington St., Boston, Mass. 02118.

I have one brand new 12FR7 GE tube for sale for $8.00. First money order in the mail gets the tube.

C. H. Hooper
Hooper Radio & TV Service
Salamanca, N.Y. 14779 ▲

Bookkeeping—What and Why

All businesses exist to trade merchandise or service for money. That's giving and receiving value—and every such exchange of value is a business transaction.

From its birth, a business with a serious records system records each transaction faithfully and accurately. Its books become a complete history of its life as a business. One Balance Sheet follows another as the books are summarized periodically, to show the growth of the business or its shrinking; its success or its failure.

That's all Bookkeeping is—the recording of transactions in their proper form, to reflect the moment-to-moment changes taking place as one business transaction follows another. A bookkeeping system will be 'tailored' to a specific business, to record its particular types of transactions in the most useful form, but it will be very much like every other system, in outline.

Recording Business Transactions— The Place and Sequence

A major characteristic of bookkeeping systems is **orderliness.** From Immediate Record back to the Balance Sheet and other summaries and reports, the flow proceeds as in Fig. 3.

Immediate records

Each entry begins with a piece of business paper—a check, a receipt, an invoice or bill, a sales ticket, a check stub or a deposit slip. These are the immediate records of the transaction. They are made **at the time** of the transaction.

Journals

These papers trigger the entries in a Journal, which is a **book of original entry.** That is, the Journal is the first place a transaction is entered. There may be one Journal for each class of transaction—as in large businesses. There may be only one or two, in smaller business—or even one Journal combining many journals into one book (a Combination Journal) of several columns.

The original entries are classified in the Journals. There's a Cash Journal for cash transactions; a Sales Journal for sales on account; a Purchases Journal for purchases of parts on account for resale, and a General Journal to record miscellaneous transactions.

In a Combination Journal, the four Journals mentioned may be combined in one book, on an eight-column page, with two columns serving each of the four journals each get two columns—one for Debits and one for Credits.

Ledger Accounts

From the Journal, or Journals, the transactions are transferred to the Ledger Accounts concerned. This transferring is called **posting.** An Account is simply a record of a single class of transaction. There are Accounts for each category in the Balance Sheet—Assets, Liabilities and Proprietorship. There are also Accounts for Income and for Expenses. You'll have **Asset Accounts** consisting of Cash, Receivables, Equipment, Parts & Supplies—each class of item owned. You'll have Liability Accounts for each class of debt, and each creditor.

The advantages of such Account classifications are apparent—you have, in one Account record, information on who and how much you owe; who owes you, and how much; what you spend on a specific group of items. If you just wrote them down in a book, as they were transacted, you'd have to go through and sift them out when you needed information on one creditor or one bill owed you.

Debits and Credits—Give and Take

The two aspects of bookkeeping that cause more trouble than any other are the relationship and selection of Debits and Credits.

Naturally, transactions are two-way streets. You take in something and you give up something. If you're selling, you take in money and give up merchandise or service. If you're buying, you give up money and get merchandise or service in return.

Going back to the Balance Sheet, you can see immeditely that either of these transactions causes one of the Balance Sheet items to increase and another to decrease. **Every transaction has these two parts.** Double-Entry Bookkeeping is called that because it records both parts. Only by doing so is the continuing effect on the Balance Sheet accurately reflected.

There is no definition of Debit or Credit I can give you. There is just one fixed rule I can offer: **In any given transaction one will mean increase and the other will mean decrease.**

How you tell which means which is determined from the Balance Sheet, and the custom of putting Debits on the left and Credits on the right in the Ledger Account Form (T-Account), shown in Fig. 5

Assets are on the left-hand side of the Balance Sheet. Therefore, by accepted accounting custom, their increases are shown on the left-hand side of the account sheet (same-side-increase rule). Hence, an Asset Account increase is shown as a Debit. An Asset Account decrease must, therefore, be shown as a Credit.

On the Balance Sheet the right-hand side are Liabilities and Proprietorship. Under the same-side-increase rule Liabilities and Proprietorship Account increases are shown as Credits, and their decreases as Debits. Fig. 6 helps to clarify this.

That takes us through the Balance Sheet part of the problem. There is another basic business document—the Income and Expense Summary (or Operating Statement). Here, Debit and Credit mean decrease and increase, respectively. Not because they suddenly abandon the rule, however. The rule still holds true, for this reason:

Income is defined as the result of a transaction which increases an Asset and Increases Proprietorship. Expense is defined as the result of a transaction which reduces proprietorship, either by reducing an Asset or Increasing a Liability. As a result, these two items bear on Proprietorship—they're actually almost a part of it—so that the rule is satisfied.

The Bookkeeping Equation is subject to all the algebraic rules. Subtracting equal amounts from both sides, or adding equal amounts to both sides leaves Proprietorship unchanged. And, this operation also shows you why Debit and Credit can't mean the same thing on both sides of the Balance Sheet. Try it this way: you pay a bill that's due; you reduce Accounts Payable. Both reductions can't be Debits, or the Equation-Balance Sheet would go wild.

Circle 20 on literature card

Circle 21 on literature card

Balance Sheet and Operating Statement: Two Key Reports Which Summarize The Effects of Your Business Transactions

The Balance Sheet and Operating Statement are the two key reports you get from your bookkeeper after the closing of the books each month, quarter or year.

The Balance Sheet shows you the condition of your business at a given date.

The Operating Statement shows you what you've taken in and what you've spent.

Each can tell you something: Whether you're gaining or losing ground, whether sales or expenses explain the change, what your debt picture is and how you stand on operating capital. When compared with other reports they can show you patterns and trends. They can tell you **what's** happening, but not always **why.**

Part of any manager's job is to keep in touch with his business environment. To read his Balance Sheet with an eye to what's happening around him. To read his newspaper and other indicators of economic trends with an eye to his Balance Sheet. That's an important way to get the "**why**" of what your books alert you to look for. More than that, it's a good way to learn what upcoming changes might give you a chance to promote more business.

Bookkeeping—Not Necessarily Easy, But Necessary

Bookkeeping isn't a snap, it takes time and care. It will cost you to have someone else do it for you—although it probably will be money well-spent, freeing you to do what you get paid for doing. It'll cost you some late nights, if you do it yourself. Either way, it has to be done.

The U.S. Small Business administration says that next to lack of adequate capital and lack of knowledge of the business, the most common cause of small business failure is failure to keep sound, adequate records.

Why? First, sifting through a notebook to find records of a sale or a purchase of a certain class is time consuming. With bills to pay, bills to collect, an oc-

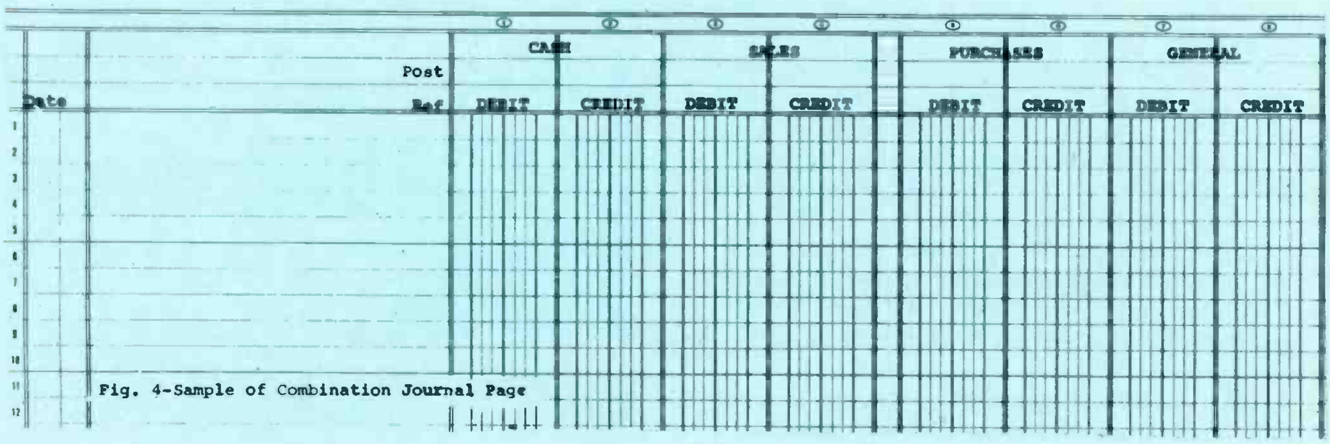
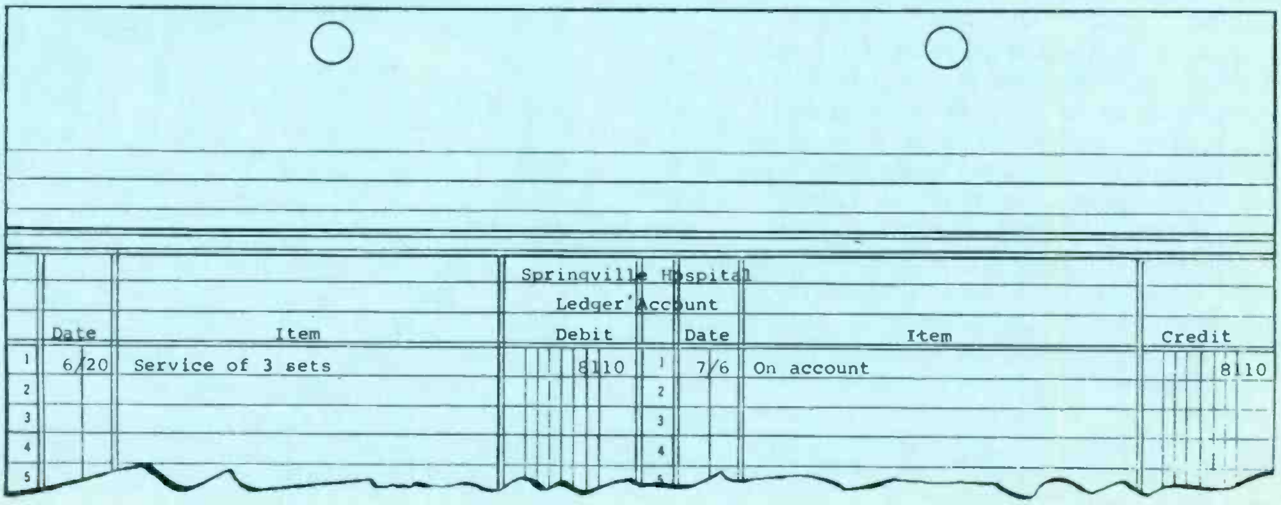


Fig. 4-Sample of Combination Journal Page

Fig. 5 Illustration of T-Account



READER SERVICE CARD

Electronic Servicing

Use the handy card below to obtain free catalogs and literature . . . and to subscribe or renew your subscription.

Read instructions carefully.

As a service to its readers, ELECTRONIC SERVICING makes the card below available for your convenience in obtaining current manufacturer's literature.

To use the card, simply:

a Circle the numbers corresponding to the numbers of the items about which you would like to receive additional information.

b Print your name and address and check your occupation.

c Include ZIP code—requests may not be filled without it.

d Tear out lower half of this insert and place in mailbox.

Note the deadline date—Requests received after this cannot be filled.

▼ Free catalogs & literature

Subscribe or renew your present subscription to the nation's favorite electronic servicing magazine . . . ELECTRONIC SERVICING (formerly PF REPORTER).

Now with expanded editorial coverage of the entire electronic servicing business, ELECTRONIC SERVICING is more valuable to you than ever! Monthly it brings you the latest solutions to service problems on home entertainment electronics, including concise, timely coverage of new testing methods, product reports and practical service procedures!

Start ELECTRONIC SERVICING coming by sending in this order form . . . TODAY!

▼ Subscription offer

OCTOBER, 1971

OFFER EXPIRES JANUARY 1, 1972

Please indicate number of items you have circled→ ☐

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	26	27	28	29	30	31	32	33	34	35	36
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72
73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108
109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126
127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144
145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162
163	164	165	166	167	168	169	170	171	172	173	174	175	176				

Print plainly or type below:

Name ....

Firm ....

Firm Address ....

City.................... State.................... Zip..........

Did you receive this issue through ☐ Distributor ☐ Subscription

Subscription Offer

Enter my subscription to ELECTRONIC SERVICING

☐ 3 Years $10.00 ☐ 2 Years $8.00 ☐ 1 Year $5.00

☐ Bill Me ☐ Remittance Enclosed ☐ Extend Present Subscription

IMPORTANT! Please check your business classification.

Type of Business

Check One

A. ☐ Independent Electronic Service Organization
B. ☐ Retailer with Electronic Service Department.
C. ☐ Independent or Self-Employed Service Technician
D. ☐ Electronics, Radio, TV Manufacturer
E. ☐ Industrial Electronic Service
F. ☐ Wholesale, Jobber, Distributor
G. ☐ Other (Specify) ....

Position

Check One

H. ☐ Owner, Manager
I. ☐ Ser. Manager
J. ☐ Technician
K ☐ Other

Be sure you have checked one box in each column above!

WRITING TO
Electronic Servicing?

Help us prevent delay

If your comment or question is about . . .

YOUR SUBSCRIPTION

Changes of address or any questions about your subscription should be sent to the address at right. Please advise us of a change of address at least 4-6 weeks in advance of your move, if possible.

Evelyn Rogers, Circulation Manager
ELECTRONIC SERVICING
1014 Wyandotte St.
Kansas City, Mo. 64105

ANY OTHER SUBJECT

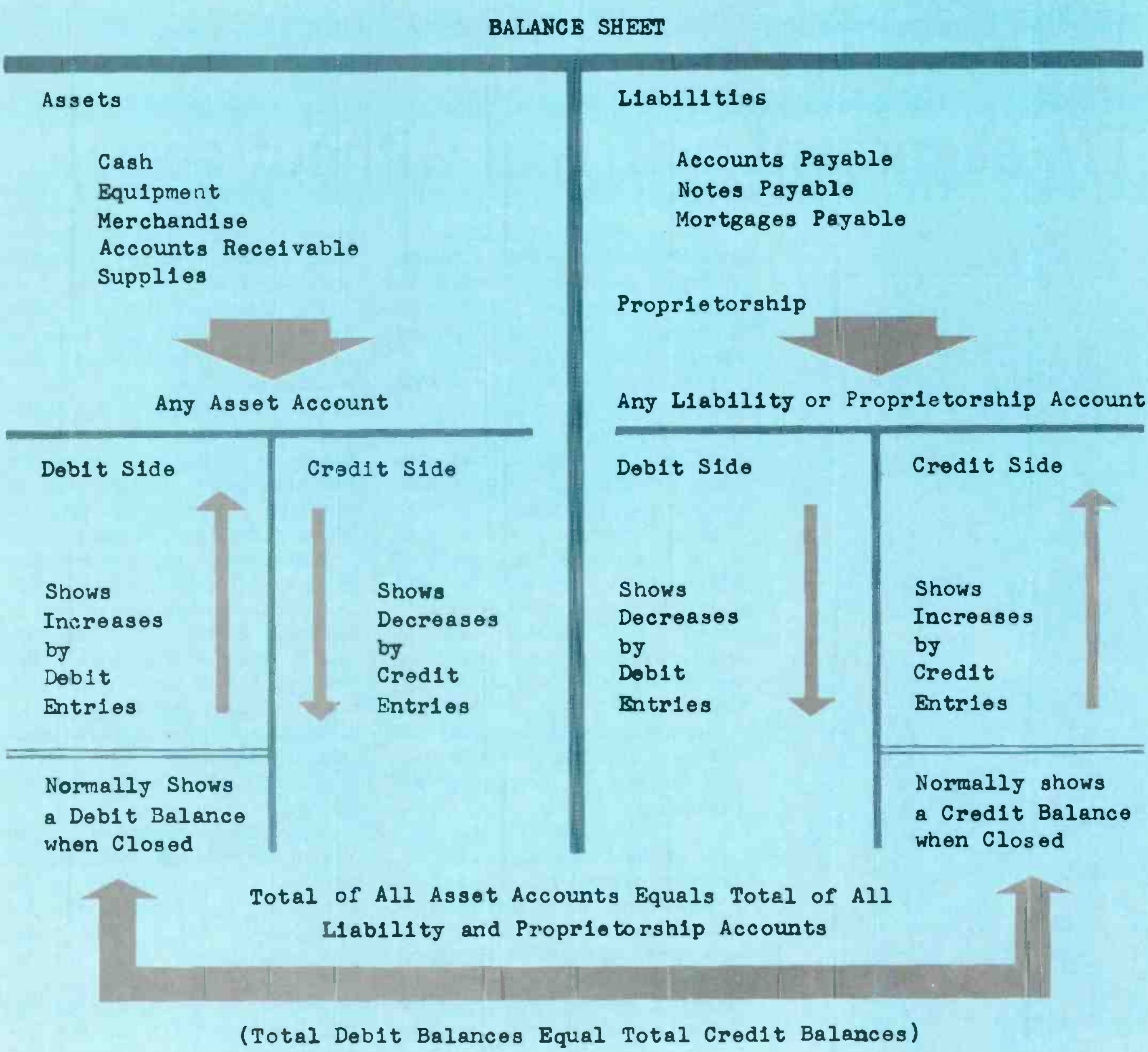
If you have a comment or question about an article, condition in the industry, a service tip or problem, need a part or schematic, or would like to pass along information about an industry oriented event, etc., write to:

J. W. Phipps, Managing Editor
ELECTRONIC SERVICING
1014 Wyandotte St.
Kansas City, Mo. 64105

6 CENTS
POSTAGE
REQUIRED

Electronic Servicing
P.O. Box 21501
El Paso, Texas 79998

Fig. 6 Showing how T-Account entries derive from the Balance Sheet.



casional question about each, plus quarterly and annual tax reports to two or three levels of the government, you can average sifting through such a notebook at least once or twice a week. This adds up to a lot of wasted time.

And, if your only record of work you've done and haven't been paid for is in that notebook, an attempt to be systematic about collections costs time too.

Finally, there have been small businesses which might have been helped when trouble first developed, except that lack of records kept anybody from knowing exactly what was wrong and, consequently, what help was needed.

Not too long ago, I heard of a promising small business that failed because of lack of working capital. The lack was brought about by an ambitious re-equipping and refixturing program—all paid for in cash.

The owner actually owned his new equipment and fixtures and could have borrowed money on them. But not a banker in town would risk much on him when it developed that he couldn't produce a Financial Statement (our old friend, the Balance Sheet). The man had $13,000 in new equipment and couldn't pay his rent. The new equipment might have brought him new business, but he couldn't afford to wait until it came in.

Records would have helped him, if he'd had them and had paid attention to them. He'd have known how much he had to hold back for operating expenses and how much might be needed to meet some big items due fairly soon. Most of all, he could have presented a reasonable case to the bankers.

One of the greatest effects a solid set of records gives you in the inclination to be systematic and businesslike in other things, as well. Systematic filing, recording, and other businesslike practices seem just naturally to follow. ▲

carr electronics

by Joseph J. Carr/ES Auto Electronics Editor

FM alignment with and without sweep

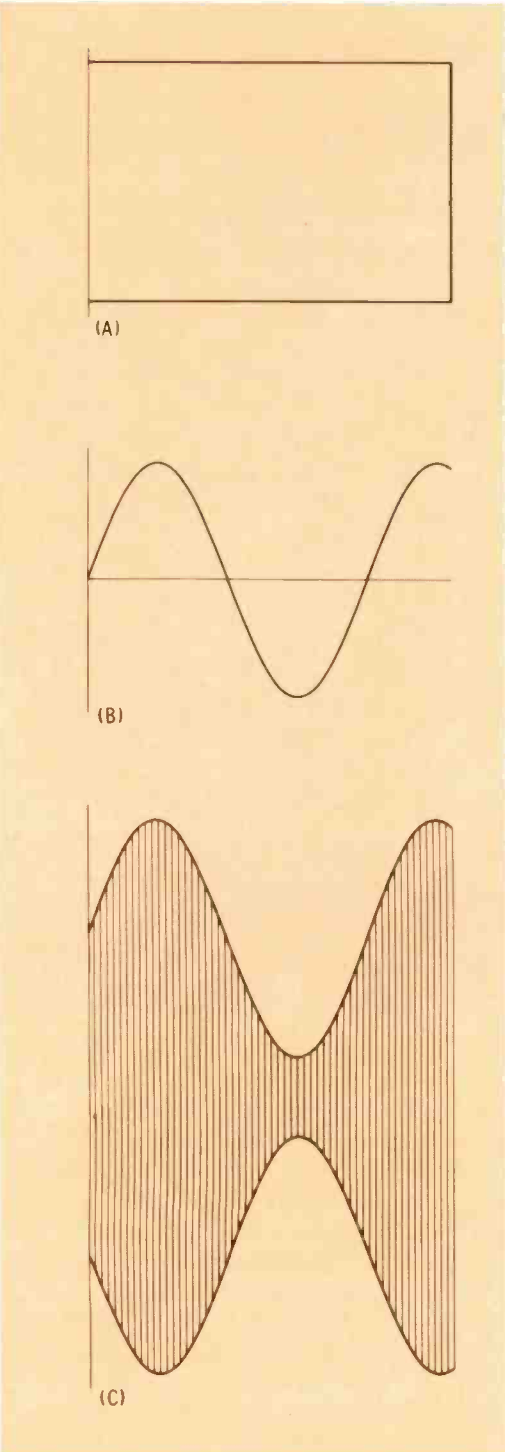


Fig. 1 Elements of amplitude modulation. **A)** Unmodulated carrier. **B)** Modulating signal. **C)** Amplitude modulated carrier. All of these can be viewed on a scope.

One of the persistent fears that prevents some technicians from realizing the most from FM radio servicing is alignophobia. This is characterized by a fear of touching tuned circuits above 2 MHz or so.

FM alignment admittedly is more complex than, say, aligning an AM table model radio. On the other hand, even the simplest black-and-white TV alignment is much more complex than FM radio.

Sweep alignment is considered to be the best method for aligning an FM receiver. Although we will shortly be getting into a more simplified method involving non-swept techniques, we'll begin examining the characteristics of FM modulation and sweep alignment methods.

Frequency modulation (FM) differs from amplitude modulation in, shall we say, the direction of the modulation.

AM

In amplitude modulation, the audio information is superimposed on a radio carrier wave. This relationship is shown in Fig. 1. (The waveform shown in C can be viewed on an oscilloscope by connecting the output of an AM signal generator through a diode demodulator probe to the vertical input of the scope.) All that is necessary for proper AM demodulation at the receiver end is a simple solid-state diode detector.

FM

In an FM transmitter, on the other hand, angular modulation is used. There are actually two types of modulation commonly called FM. One is "pure" FM while the other is actually **phase modulation.**

Terminology—deviation and swing

In any given FM modulator, an audio signal of one polarity will cause the carrier frequency to increase while the opposite polarity causes the frequency to decrease. Many technicians become bogged down at this point with unfamiliar terminology and false impressions. One point is confusion over the sweep width and deviation. The distinction between frequency deviation and swing is illustrated in Fig. 2.

The amount of frequency **shift,** usually measured in KHz from the center frequency to either extremity, is called **deviation.**

The entire width of the modulated signal, from it's lowest extremity to the highest, is called the frequency swing. The meaning of this term is synonomous with the sweep width of an FM generator.

Another term, **modulation index,** often is used in connection with frequency modulation. It is defined as the ratio between total deviation and the modulating frequency. Because an FM broadcast station can transmit audio signals up to 15 KHz, the maximum attainable modulation index value is 5 (75 KHz deviation/15 KHz modulating frequency).

Some technicians believe that deviation and frequency swing are determined by the frequency of the modulating signal. This is true for **AM.** In pure FM, however, deviation and frequency swing are determined by the **relative level,** or amplitude, of the modulating signal. The term "100 percent frequency modulation" is actually an arbitrary standard established by the FCC, who have determined that 75 KHz deviation will be 100 percent.

Phase modulation

To prevent confusion, it might be well to explain a thing or two about a related form of angular modulation, phase modulation (PM). It is the type of modulation used in the so-called VHF-FM two-way radio transmitters.

PM deviation is directly related to the modulating frequency. The process of phase modulation produces a rising curve which increases 6 dB per octave over the range of modulating frequencies. Because of this, it is necessary to **de**-emphasize the higher audio frequencies.

The deviation vs modulating frequency differences between FM and PM are shown in Fig. 2B.

FM fidelity

Frequency modulation is well known for it's high-fidelity sound. This is attributable to the wide range of audio frequencies allowed FM broadcasters by the FCC. An FM station is allowed to transmit audio frequencies up to 15 KHz while most AM stations are restricted to no more than 5 KHz. Some hi-fi buffs might be more than a little upset if they knew that FM is actually rather lo-fi. Those upper audio frequencies must be increased, or as mentioned earlier, pre-emphasized, before being applied to the modulator in the transmitter. To compensate for this preemphasis, the receiver must be equipped with a 75-microsecond (RC time constant) de-emphasis network.

The purpose of sweep alignment is to insure that the bandpass of the receiver is wide enough to provide sufficient amplification of all the transmitted intelligence. An FM receiver that has too narrow a bandpass will significantly distort the received signal. On the other hand, a bandpass that is too wide will produce an annoyingly high noise level.

What constitutes proper receiver bandwidth seems to be a matter of controversy. Many technicians, including the author, have traditionally aligned FM receivers to produce a 150-KHz bandpass. However, at least one authority claims that it should be wide enough to admit the eighth significant harmonic produced by an index 5 modulating frequency, which is 240 KHz on monoaural stations and 318 KHz on stereo stations. Because there is contradiction about this point, and because an electronic technician is a professional who is responsible for his own work, I leave it to you to determine which bandwidth to use.

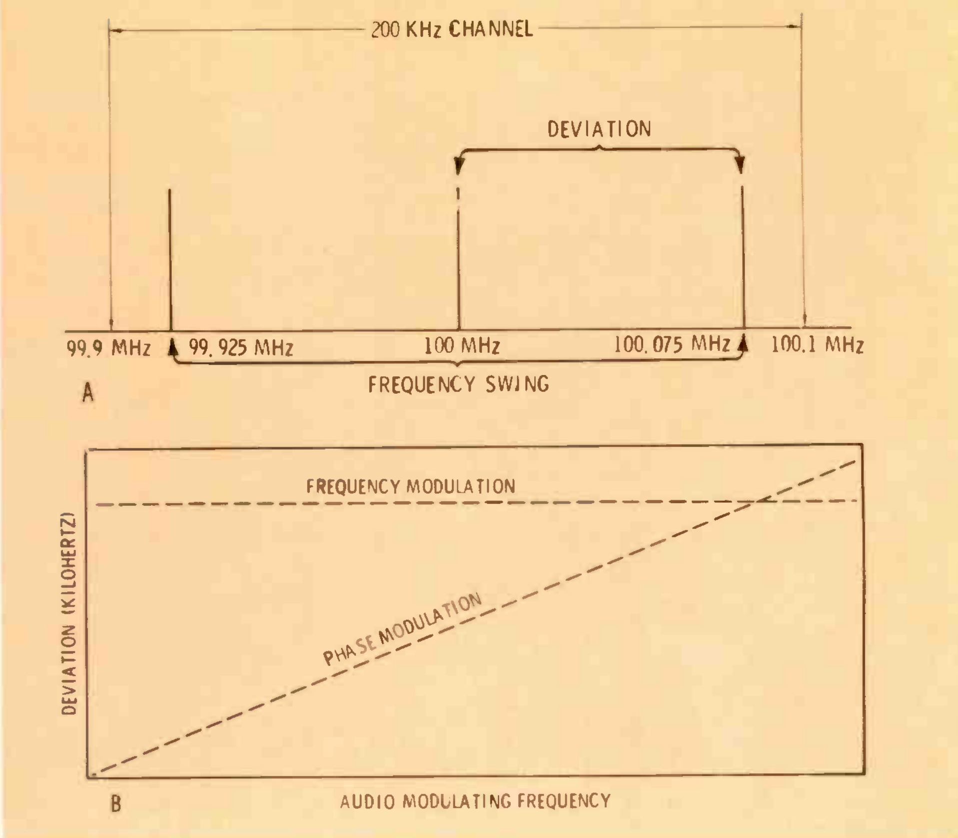


Fig. 2 A) The graph here illustrates the frequency components of a single FM channel. The total bandwidth is 200 KHz, 50 KHz of which is divided into two 25K-Hz guard bands, one situated at each extremity of the channel. The amplitude and polarity of the modulating signal causes the frequency to shift either above or below the center, or carrier, frequency; this is called deviation, and is limited to no more than 75 KHz above or below the center frequency. The total amount that the modulating signal can shift the frequency is 150 KHz. The frequency of the modulating signal determines the rate at which the frequency of the transmitted signal is shifted. Ideally, the amplitude of the transmitted signal remains relatively constant. The percentage of FM modulation, usually called the modulation index, is determined by the ratio of the maximum deviation and the modulating frequency which produced it. For example, if a deviation of 75 KHz is produced by a 15KHz modulating signal, the modulation index is 5, or 100 percent—the deviation and the modulating frequencies used in this example are the maximums allowed by the FCC. **B)** This graph illustrates the fact that in phase modulation, which is an indirect form of frequency modulation, the higher frequencies of the modulating signal are purposely de-emphasized prior to application to the modulator. This is because the amount of frequency modulation produced by the lower modulating frequencies is not proportional to that produced by the higher frequencies; the lower the frequency, the disproportionately lower the modulation. The main advantage of the various phase-modulation systems over conventional FM systems is that a crystal-controlled oscillator can be used in the master oscillator. This eliminates the need for the separate crystal-controlled frequency control system required to maintain acceptable frequency accuracy in conventional FM systems.

Sweep Alignment

A typical sweep alignment setup for FM is shown in Fig. 3. The sweep generator simulates the signal from an FM broadcast station. The marker generator provides small pips which help determine the frequency at a particular point on the response curve traced out by the oscilloscope. The marker and the sweep outputs are fed into an adder. This device combines all of the required signals into one composite that can be fed into the FM receiver. Direct connection, without the adder, can cause interaction between sweep and markers which can

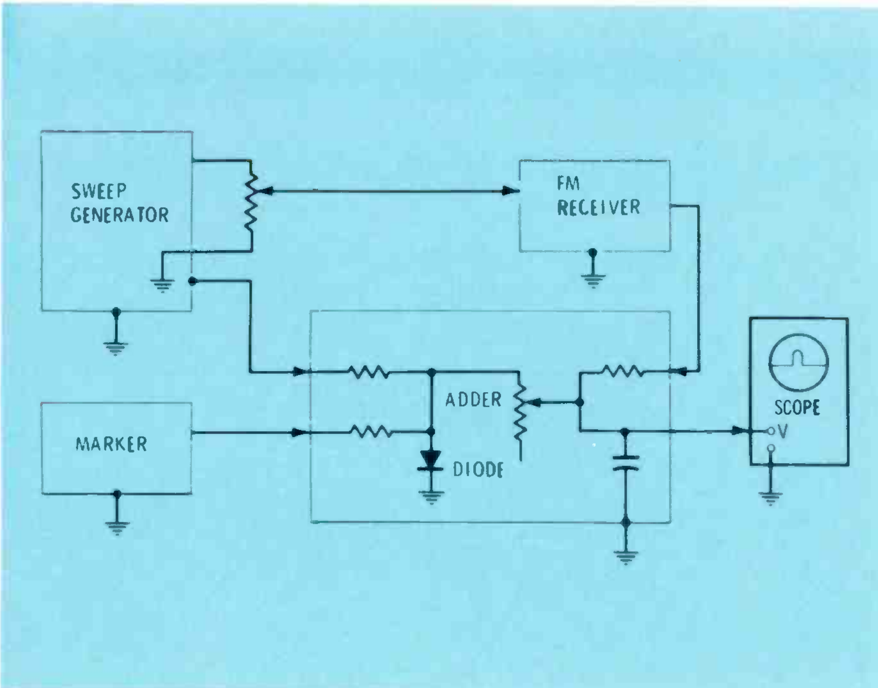


Fig. 3 Typical setups for performing sweep alignment of an FM receiver. See text for detailed procedure.

distort the response curve. Many test equipment manufacturers now offer sweep, marker and adder functions in one cabinet. Many of these instruments also include bias supplies and other functions that are needed by TV men. All this means a lot less effort, less bench clutter and more usable bench space.

IF

The alignment instructions for most FM receivers and/or tuners usually will tell you where the adder output is to be injected. Success will be more sure if these instructions are followed to the letter.

If such instructions are not given, however, you can connect the output wire from the generator or adder to a short piece of insulated hook-up wire. This "gimmick" is then dropped inside the slug of the 1st FM IF transformer. If this transformer has screw driver slots instead of hex-holes in the slugs, the added output can be connected to

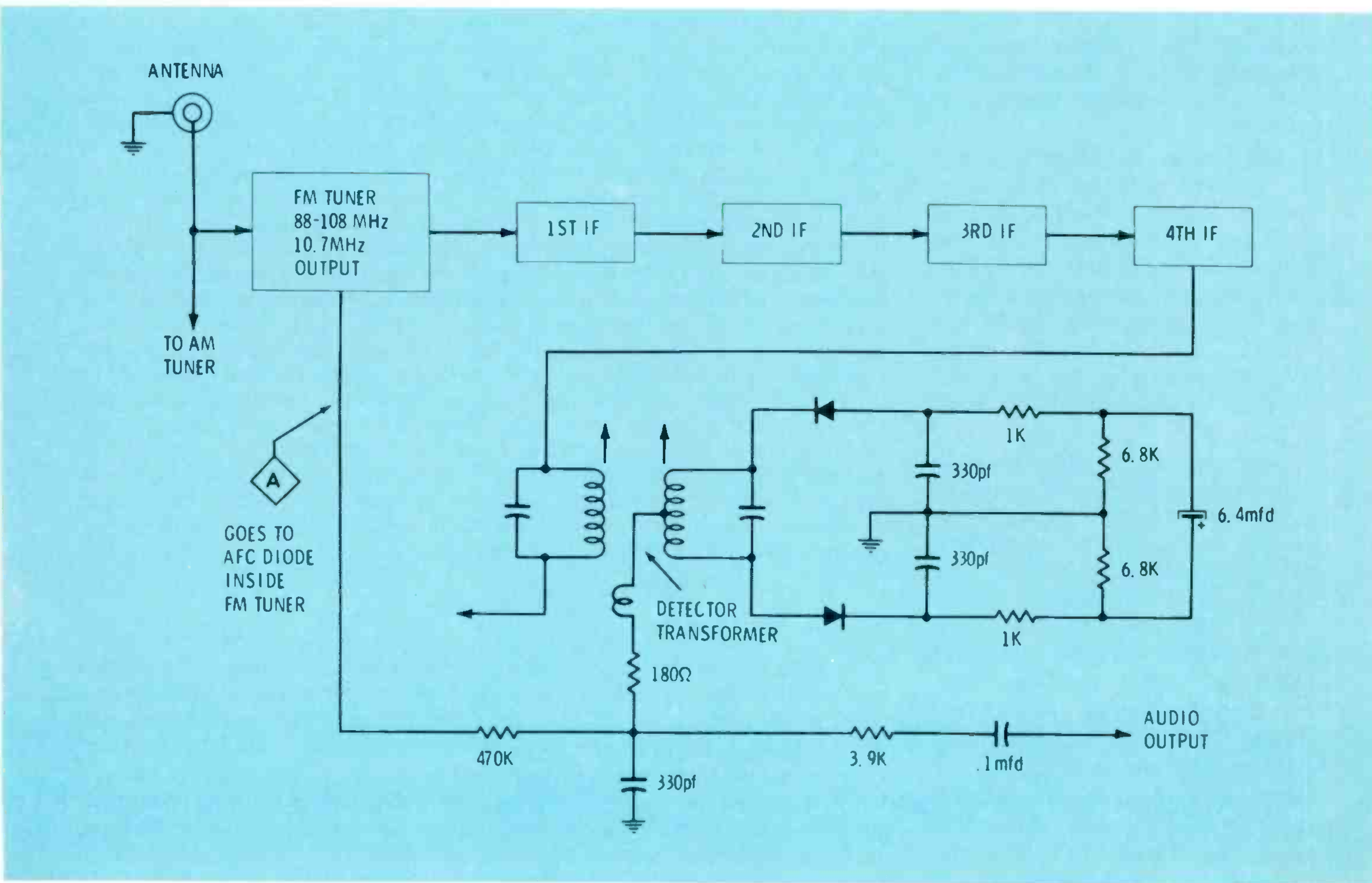


Fig. 4 Simplified block diagram of a typical FM receiver (Motorola Model FM991).

the base or grid of the FM mixer. The hot side of the adder's output cable should be connected to the injection point via a capacitor of .001-.005mfd.

Most instructions also specify the generator settings. These typically read: 10.7 MHz, 22.5 KHz sweep width, 400 Hz modulation.

A simplified block diagram of an FM receiver is shown in Fig. 4. Connect a zero-center, high-impedance voltmeter to point A. (Most ordinary shop VTVM's can be made zero center by readjusting the zero control.) With proper signal applied to the input point, as described previously, adjust the secondary of the detector transformer for zero volts. The meter will read a positive voltage on one side of the correct transformer setting and a negative voltage on the other side.

Next, connect the meter across the speaker of the receiver. Peak all other IF tuned circuits to produce a response curve similar to that in Fig. 5.

Tuner

To align the front end, it is necessary to apply a proper signal to the antenna terminals of the set. The signal, preferably, should have a frequency that corresponds to one of the calibration points on the tuning dial.

After injecting the proper signal, zero the receiver oscillator by carefully turning the associated trimmer capacitor (occasionally a slug-tuned coil is used) until the voltage at point A (Fig. 4) is again zero.

Next, peak the RF amplifier and antenna tuning adjustments for maximum output. Monitor the response curve on the scope during this process. The markers will help you determine whether or not the response is correct at the significant frequencies. It is best to sacrifice a little gain to produce a correctly shaped response curve.

Non-Swept Alignment

Although sweep alignment is considered the most accurate way to align an FM set, it isn't the only way. An unmodulated signal generator, if properly used, can provide a signal good enough for acceptable alignment under certain conditions.

Equipment for non-swept alignment is wide and varied. In general, however, all of it can be broken down into two catagories: First, you will need some sort of level indicator. A good shop VTVM generally will suffice. Also, you will need a stable signal source. This can be either a good grade of tunable service-type signal generator (AM modulation, if any, must be switched off) or a crystal-controlled marker oscillator.

There are only a few requirements which the signal source must meet: One is that it have decent short term stability. Another is that it be reasonably accurate. A third requirement is that it have low leakage and a good attenuator. (Many of the so-called service grade generators exhibit enough leakage, even under maximum attenuation, to cause overload problems during alignment.)

The author built a fairly decent alignment oscillator using commercially available oscillator and buffer kits. These are inexpensive and, when housed in a double-shielded aluminum enclosure produce low residual RF radiation.

I chose two crystals for my portable FM alignment oscillator: 10.7 MHz and 9 MHz. The 10.7-MHz crystal is, of course, used to align the FM IF amplifiers. The 9-MHz crystal was chosen because it has harmonics at 90 MHz, 99 MHz, and 108 MHz, which can be used for checking an FM receiver's calibration and tracking at both extremities and the middle of the band. No provision was made for modulation because this signal generator was intended exclusively for FM alignment and servicing.

Many sets require some sort of dummy antenna between the signal generator and the injection point. This is especially true of automotive FM and FM Stereo receivers. A dummy antenna which can be used with most types of car radio is shown in Fig. 6. It can be built inside of a standard Motorola-type car radio antenna plug. Other types might require a different type of dummy antenna. Be sure to consult either the appropriate PHOTOFACT or the manufacturer's service manual.

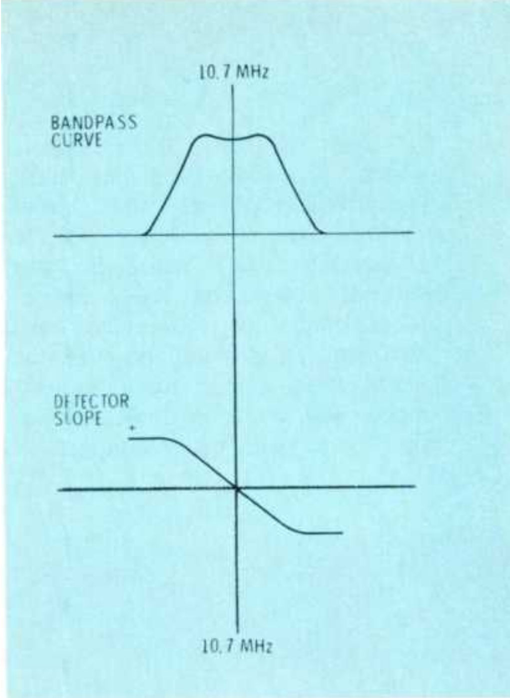


Fig. 5 Typical response curves produced by properly tuned FM receiver.

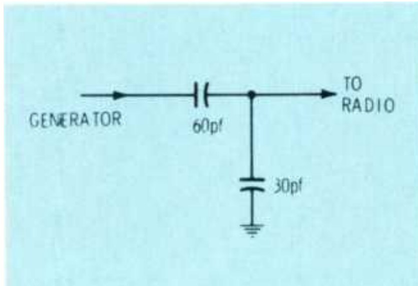


Fig. 6 Circuitry of a dummy antenna which can be used between the signal generator output and the signal injection point of most auto FM receivers.

The test setup shown in Fig. 7 will produce satisfactory alignment of most types of FM receivers. Connect the output of a 10.7-MHz generator (6.5-MHz for some European car radios) either to the input of the FM mixer or, via a gimmick, as described earlier, to the 1st IF transformer. (Do not connect the generator cable directly to the transformer because the cable capacitance will de-tune the set.) Connect a high-impedance DC voltmeter to a point that corresponds to point Z in Fig. 8. Adjust the secondary of the detector transformer to null (zero voltage). Here a zero-center VTVM will be convenient. As in sweep alignment, the voltage will swing positive and negative on either side of the correct adjustment.

There are two major factors which, if overlooked, can make identification of the "null" point difficult. One is overloading of the IF amplifier chain, which, in some sets, is caused by AGC action. Identification of the null points also can be difficult because the visual effect of the tuning adjustments will be very small in relation to the total meter reading.

The AGC system can be disabled in many FM sets. In fact, in many cases, the manufacturers instructions call for the FM AGC to be disabled.

The only way to eliminate simple overload problems associated with alignment is to select more attenuation in the signal generator. Most instructions state that the best signal level is the point slightly above the level that "quiets" the FM receiver. As the tuned circuits are peaked up, it might be necessary to periodically readjust the attenuator to that point.

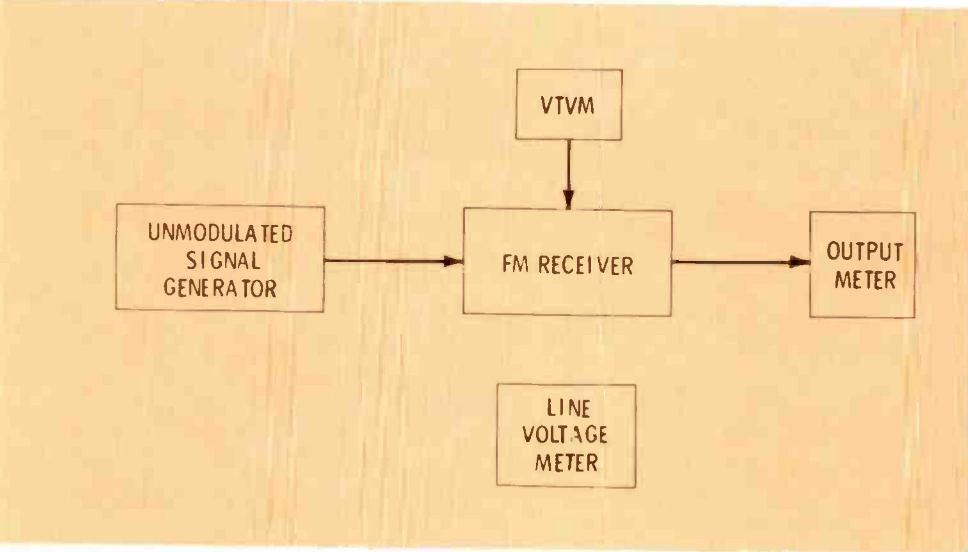


Fig. 7 Equipment setup for performing non-swept alignment of most types of FM receivers. See text for detailed procedure.

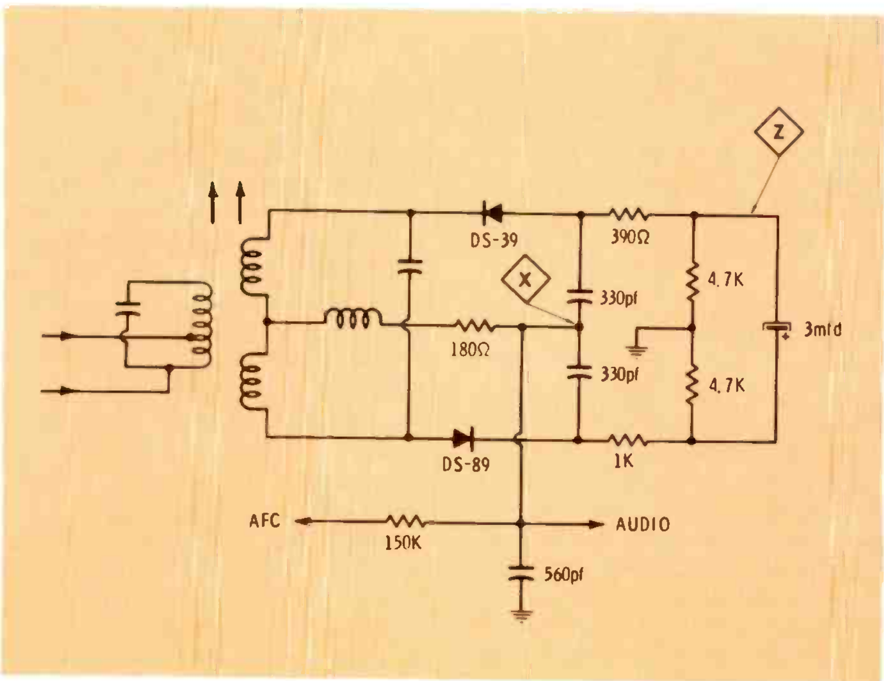


Fig. 8 A high-impedance DC voltmeter, connected to point Z in the demodulator circuitry shown here, serves as the indicator during non-swept alignment.

IF alignment

To peak the IF transformers, connect the meter to the point that corresponds to Z in Fig. 8. An alternate point might be the input of the limiter stage, which will require a low-capacitance detector probe. At either test point, the reading will be maximum when the IF transformers are properly adjusted.

When using the detector probe at the limiter input, however, you will find that adjusting the limiter output tuning will not produce an indication on the meter. Consequently, to peak the limiter output, connect the meter to either side of the detector transformer secondary. Be sure to use only a high-impedance voltmeter equipped with detector probe.

During IF transformer peaking, the signal source may be left connected in the same manner as it was in the previous step. Again, be sure that the generator output level is maintained just above the receiver's quieting point, to prevent overload.

Do not attempt to use a broadcast station signal as a source. It is very difficult to find a station that presents this optimum signal level with any degree of reliability. Also to be considered is that "capture effect" and the inherent rejection of weak signals by FM receivers will raise havoc with attempts at on-the-air alignment.

Also, do not attempt to use your ears as a level detector. Added to the objections listed previously is the annoying broadness of FM tuned circuits. This broadness is a result of the 75-KHz maximum deviation. Also, the receiver can break out of quieting at both extremes of the tuning slug adjustments while the quieted range can cover several complete turns. This explains the futility of aligning by ear.

Work from the detector end of the chain towards the tuner. Adjust first the secondaries then the primaries of each transformer. When you have completed the sequence, start again and repeak for optimum results. This repeaking is required on many sets because the transformers have substantial interaction.

Tuner alignment

The alignment of the tuner section of the FM set is similar to that used in sweep alignment. However, many of the signal sources that were usable at 10.7 MHz are useless at 100 MHz.

Some RF generators use harmonics to supply signals over 30 or 40 MHz. Unfortunately, this leads to problems. A frequency error, for example, at 10.7 MHz might be acceptable. At the tenth harmonic, however, that error will be ten times as bad. Instability also will be ten times as bad. Therefore, a signal generator that had reasonable short-term stability at 10.7 MHz will be unacceptable at 100 MHz.

As an alternative signal source, I use the 9-MHz crystal oscillator described earlier. Another alternative is to use the second harmonic of a crystal controlled TV alignment marker generator. The 2nd harmonic of the 44-MHz marker, for example, is 88 MHz. The harmonics of other markers provided other required frequencies further up the FM band. Again, as with the IF stages, continually adjust the attenuator in the generator to just above the receiver quieting level.

The tuner of an FM receiver is especially sensitive to changes of stray inductance and capacitance. To combat this problem, be sure to use a rather long non-metallic alignment tool. Also, be sure not to move any leads, resistors, capacitors, or coils inside the tuner. Although it might be a great temptation to move a disc ceramic capacitor to get to a tuning adjustment, it can very easily upset prior adjustments. Therefore, make sure all adjustments and test points are accessible before beginning alignment.

Proceed very slowly when adjusting the tuned circuits in an FM set; you might miss the peak setting of the adjustment.

It is worth noting, at this point, that most trimmers used in FM tuners pass through their entire capacitance range in just 180 degrees of rotation, although they will rotate a full 380 degrees. This will produce a double peak that can be very confusing.

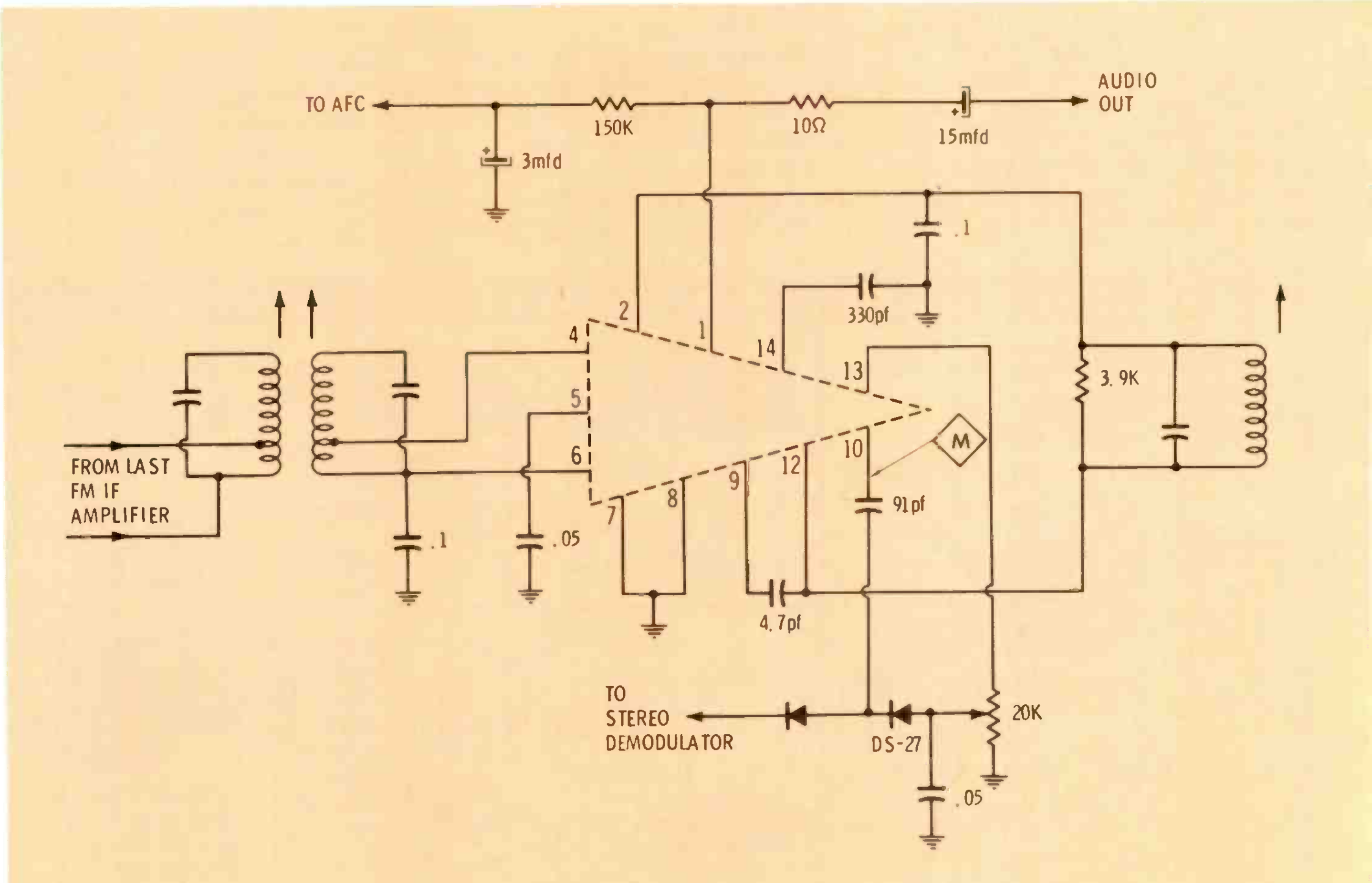


Fig. 9 Quadrature detector circuits, such as this one, used in Delco AM/FM stereo radio Model 02GFP1, require an alignment procedure which is different than that used with receivers equipped with conventional detectors. See text for detailed procedure.

Another standard FM alignment procedure is to leave all metal covers in place during alignment. It is quite possible for these covers, which admittedly are difficult to work through, to completely change the tuning of the front end.

Quadrature techniques

The methods detailed previously have been predicated on the assumption that the set uses either a discriminator or ratio detector. For most sets, these techniques will easily help a technician through an alignment job. Some recent sets, however, do not use either of these types of detector. They are using what is known as the quadrature detector.

In most sets employing quadrature detection, the demodulation, limiting and final IF amplifier functions are combined inside one integrated-circuit chip. This chip can be either a 14-lead dual in-line IC pack or a multi-lead version of the old TO-5 transistor case. In any event, quadrature detectors require an entirely different alignment problem.

The circuit in Fig. 9 is the quadrature detector circuit used in the 1970 Delco AM/FM Stereo radio model 02GFP1 (installed in Pontiac Grand Prixs). The alignment procedure for this radio is different than that for conventional detectors. One apparent difference is the necessity for using an RF demodulator probe as a peak indicator. Delco recommends the RCA WG-301 demodulator probe be connected to a high-impedance VTVM.

A 10.7-MHz unmodulated signal is injected into the set at the base of the mixer transistor. On the Delco set, it is necessary to use a dummy antenna consisting of a .0047-mfd. capacitor in series with a 270-ohm resistor.

The RF probe is connected to point M in Fig. 9. Adjust the transformers between the first two stages for maximum amplitude.

First, to adjust the phase transformer in the quadrature detector, remove the RF probe from the VTVM. Switch the meter to "AC Volts". then connect it directly across the speaker terminals. The 10.7-MHz signal is injected directly into the antenna circuit of the receiver. Reduce the output of the generator until background noise begins to overcome quieting. As the phase transformer is adjusted through its entire range, you will notice there are two peaks in the background noise. The proper adjustment point is the null between those two peaks. It will be very close to midway between the peaks.

Although the author prefers to use a genuine FM sweep generator for FM alignment, non-swept methods do have their proper use. After replacing a transistor or FM tuning component, for example, it is generally only necessary to peak the affected components using the above techniques. About the only place we use non-swept techniques for a complete alignment is when it is on a low-cost, low-quality set whose performance will not be compromised by such an alignment. ▲

test equipment report

FM Multiplex Signal Generator

The Model LSG-230, an FM multiplex generator, which reportedly provides RF and IF markers and multiplex signal output, has been introduced by Leader Instruments.

The LSG-230 has a 3-volt output at approximately 19 KHz, with an adjustable frequency range of 75 to 110 MHz; separation is over 30 dB, 50 to 15,000 Hz, according to the manufacturer.

The new unit not only checks separation and balance in FM receivers and tuners but also reportedly serves as a sweepmarker for 10.75 MHz FM and IF alignments.

The LSG-230 is 10½ inches x 7 inches x 11 inches, and weighs 13½ pounds. It features a 115- to 230-volt dual power supply and a 300-ohm or 75-ohm (open) cable.

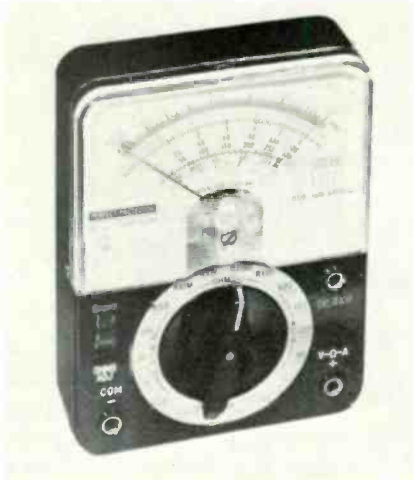
The price is $175.00.

Circle 70 on literature card

Multitester

A multitester, designated Model 51-100 which features 100,000-ohm-per-volt DC and 10,000-ohm-per-volt AC sensitivity has been introduced by Weltron Co.

The 51-100 has a low DC voltage range of 0.3 volt, which is used for testing semiconductor circuits. Test functions include resistance from 0 to 200 megohms, in 4



ranges; capacitance from 0 to 0.2 mfd, in two ranges; and decibels from −20 to +58 db, in 5 ranges.

The multitester reportedly has a band suspension meter movement, overload protection, and is pocket-size.

The 51-100 sells for $30.88.

Circle 71 on literature card

Portable Digital Frequency Counter

A new portable digital frequency counter, Model 1250, with a frequency range of 5 Hz to 32 MHz, has been introduced by Weston Instruments.

Specifications of the 1250 are:

Frequency Coverage—5 Hz to 32 MHz

Ranges—10 KHz (10 second gate); 100 KHz (1 second gate); 10 MHz (10 millisecond gate); 32 MHz (1 millisecond gate)

Accuracy—±1 count ± time base stability

Time Base Stability—±10 PPM/10 degrees (C) to 40 degrees (C), Ref. temperature of 25 degrees

(C) after 30 minutes 1 PPM/ month

Operating Temperature—10 to 40 degrees (C)

Input Impedance—1 megohm shunted by 30 pf

Input Sensitivity—250 mV rms (max. 50 volts rms or DC)

Power Required—115 volts or 230 volts, 50 or 60 Hz (approx. 10 watts)

Size—7 inches x 3 inches x 7.9 inches

Weight—4 pounds.

Model 1250 sells for $395.00.

Circle 72 on literature card

Solid-State Field-Strength Meter

A new portable solid-state field-strength meter, capable of measuring the signal levels of UHF, VHF and FM channels, plus mid-band and super-band CATV channels, has been introduced by Jerrold Electronics.

Channel separation reportedly is wide for ease of tuning, with picture and sound carriers marked, including mid-band and super-band carriers.

Accuracy of the Model 747 is ±1.75 dB, 50 to 260 MHz; and ±3 dB, 470 to 890 MHz, over a temperature range from 20 degrees (F) to 100 degrees (F). The unit provides simultaneous readings in microvolts and dBmV, with a range from 10 μV (–30 dBmV) to 1.0 volts (+60 dBmV), according to the manufacturer.

The 747 has a single input for the entire spectrum and single-knob tuning. The dial lights operate from separate C cell batteries; the meter itself operates from four miniature 9-volt batteries.

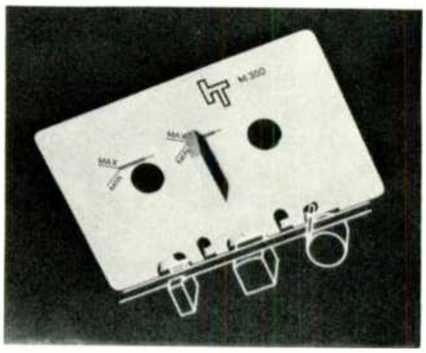
Model 747 sells for $450.00.

Circle 73 on literature card

Tape-Head and Guide Gauge

A new gauge which reportedly permits users of cassette drives to accurately position guides, heads and pinch rollers has been introduced by Information Terminals Corp.

The gauge locates the tape path in a cassette drive with reference to the mid-point dimensions of all



cassettes meeting ANSI, ECMA and audio standards, according to the manufacturer. It is placed in the drive in the same manner a cassette is inserted, and the machine then is set to the "play" mode. A separate reference block, machined to the width of a cassette tape, is placed on the gauge to provide an accurate reference for positioning drive components.

The tool-steel gage reportedly is machined to a tolerance of ±0.0001 inch for measurements, and has graduation marks which indicate head insertion distance.

The M-300 sells for $80.00. ▲

Circle 74 on literature card

Circle 24 on literature card

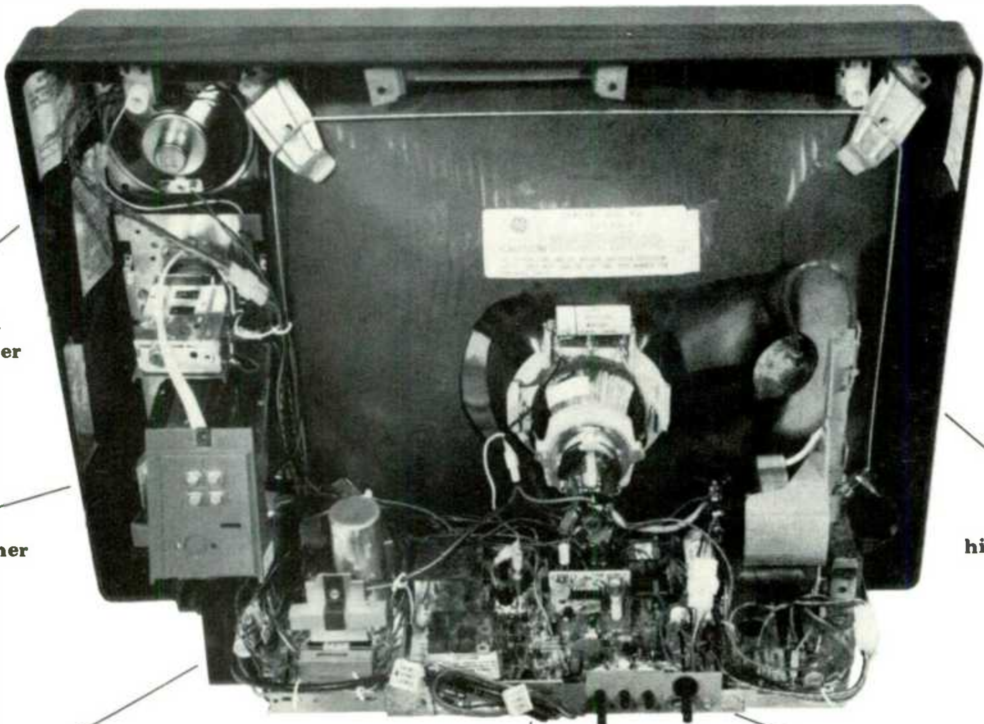
ELECTRONIC SERVICING

is your magazine!

If you would like to see an article about a particular subject directly related to servicing consumer or communications electronic products, send us your suggestion.

We value your comments and criticism.—Ed.

This General Electric solid state television received a 94.6% serviceability rating.



Nobody's perfect.

With the help of independent servicers, we designed General Electric's new 19" (diag meas) black and white solid state set to service like a tube set. It has a plug-in chassis that includes 21 transistors, 16 diodes and an integrated circuit module. And it was given a 94.6% serviceability rating by an independent service panel.

This is just one of the things we're doing to make General Electric television products as easy to service as possible. Our warranty policy now provides for prepaid transportation on in-warranty parts. We are also testing direct telephone lines to regional parts centers. To improve local parts availability, we are expanding parts distribution through independent parts distributors.

General Electric's television products aren't perfect yet. But we're getting closer. For additional information about GE service, call collect or write "Dutch" Meyer, Television Receiver Products Department, Portsmouth, Virginia. Telephone: (703) 484-3521.

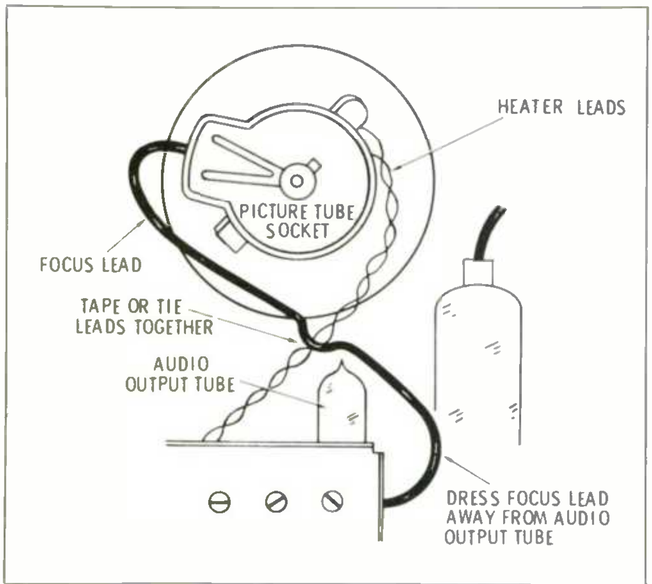
GENERAL ELECTRIC

service bulletin

a digest of information from manufacturers

Picture tube discontinued
General Electric b-w portable TV receivers

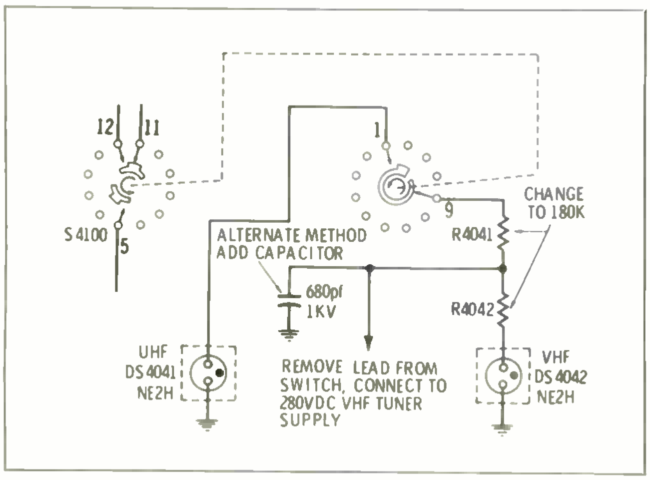
General Electric states that they will not produce any more 20AHP4 b-w picture tubes. Type 19VBNP4 replaces the discontinued tube and is reported to have a higher anode voltage rating than the older type tube.



Failure of the audio output tube, caused by arcs
RCA CTC38 and CTC39

The focus lead between picture tube and chassis should be tied or taped to the picture tube heater wires, to prevent the insulation on the wire from touching the audio output tube. Heat from the audio output tube might cause deterioration of the insulation on the focus wire, thus causing arcs which can crack the glass of the tube.

Examine the focus wire lead dress of each CTC38 and CTC39 chassis you service and correct it, if necessary.



Hum bars (silicon-diode type)
RCA CTC52

Hum bars of the type sometimes caused by radiation from the silicon diodes used in power supplies might originate in the CTC52 neon channel indicator bulbs and be noticeable during reception of weak signals.

In early production chassis, AC was applied to the bulbs (both anodes lighted in the bulb); later-production chassis operate the bulbs from the 280-volt DC supply (one anode lighted, one dark).

Test for bulb radiation by disconnecting the supply voltage at switch S4101, terminal 2 (RCA numbers). Absence of the bars when the supply voltage is disconnected indicates the bulb is the source. Reconnect the supply voltage and add a 680-pf ceramic (use short leads) from terminal 2 of the switch to ground.

If the radiated bars are still present, rewire the circuit so the bulbs operate from the 280-volt supply, as shown in the associated schematic.

Sound IC failures
RCA KCS176A

Repeated failures of the sound IC can occur in the KCS176A chassis because of a spark discharge from rug static attracted to the volume control knob and shaft when a customer turns off the machine.

Replace the volume control and switch with a unit which has an RCA stock number 128153. Be sure the shaft is nylon and not metal.

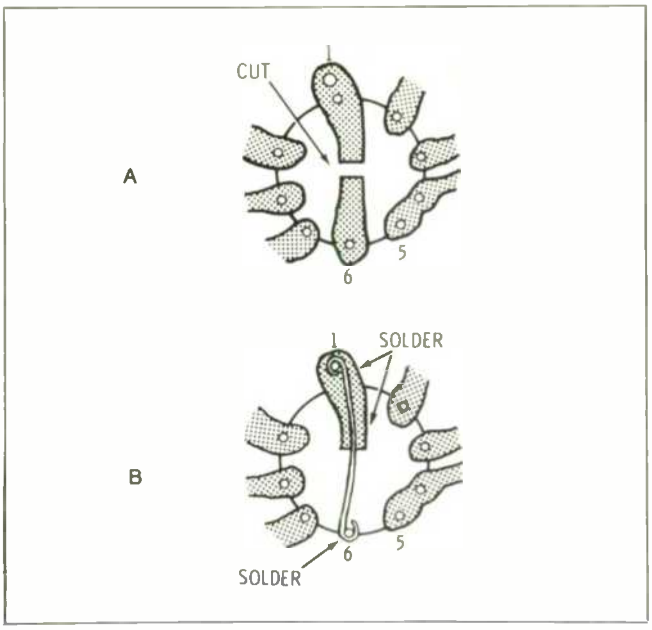
Disconnect and discard the resistor or capacitor which grounded the case of the original volume control, and add a wire from the case of the new control to ground. Also, scrape off any metallic coating from the rear side of the knob, and install a piece of insulating "fishpaper" around the shaft between the volume control and the escutcheon.

Nuisance fuse failures
Magnavox T940/T951

Because heavy heater supply current flows through F3 (20 ampere, 32-volt slow-blow type), any increase in contact resistance between the fuse and the fuse clips produces heat which can cause premature failure of the fuse when there actually is no overload.

Apply silicone grease (the kind used on power transistors) to the ferrules of the fuse before inserting it in the clips. Do *not* bend the clips to tighten the contact; this might destroy the resiliency of the clips.

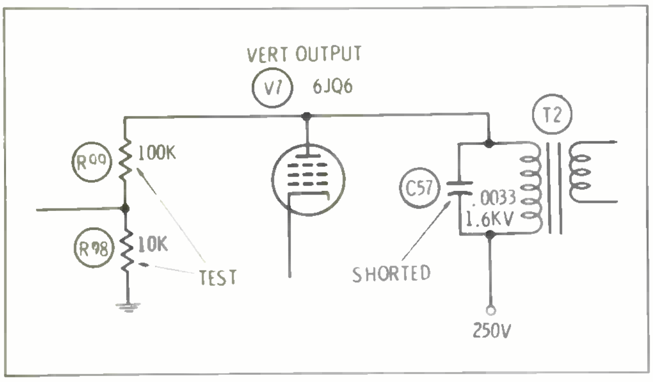
Fuses F3 and F1 (5 ampere, 125-volt slow-blow, used in series with the primary of the power transformer) are both mounted in a dual fuse holder on the side of the chassis near the power supply.



Arcing between pins of the pincushion tube socket
Magnavox T931/T933

Dust and moisture might cause arcing between socket pins 5 and 6 of the pincushion amplifier tube, V506 (V12, Photofact 984-1).

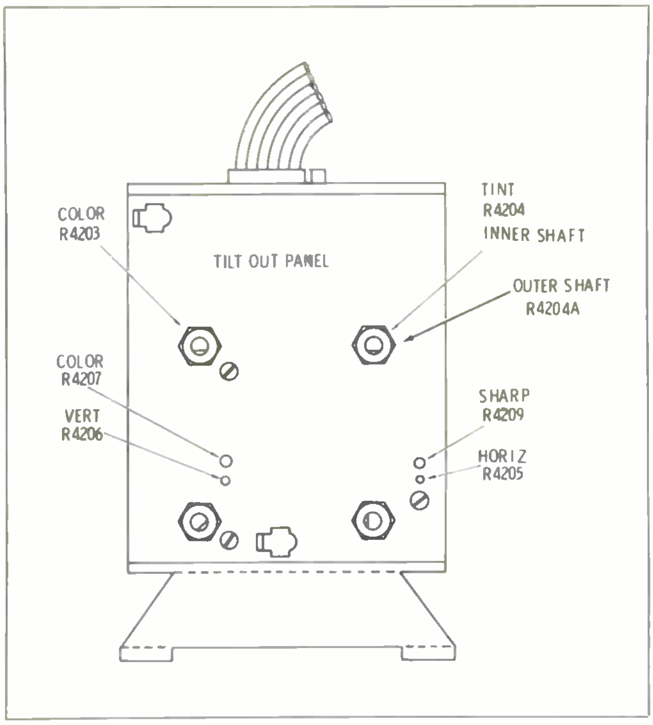
Scrape away carbonized particles or damaged parts of the board between the two pins. Move C571 out of the way and remove all the solder from pin 6. Cut the copper wiring near the center of the socket, as shown in drawing (A), heat the copper and peel it away between pin 6 and the cut point. Add a buss wire from pin 1 to pin 6, as shown in drawing (B), being careful to provide maximum spacing between the wire and pin 5. Return the capacitor to the original position.



Intermittent or no vertical sweep
Coronado TV2-6617 or TV2-6618

No vertical sweep when the receiver is first turned on or intermittent loss of vertical height at any time often can be corrected by replacement of V7 (6JQ6), the vertical output tube, and C57 (.0033, 1.6KV). Test C57 by disconnecting one end and checking for presence of DC. Restoration of vertical sweep when C57 is disconnected also indicates the capacitor is shorted.

Also, test R99 and R98, for changes of values. (Parts identification numbers used here are from Photofact 997-2.)



Color saturation produced in "on" position of AccuMatic control not the same as that in "off" position
RCA CTC46

Control R4204A, part of a dual control whose inner shaft is the customer tint control, provides a means of adjusting the color saturation so that the level produced in the "on" position of the AccuMatic control is the same as that produced in the "off" position.

R4204A should be re-adjusted if module MAC is replaced or if for any other reason the color saturation is not the same in both positions of the AccuMatic control.

The procedure: tune in a color program; turn the AccuMatic control to the "off" position; rotate the customer-operated color-level control to the minimum position (extreme counterclockwise); adjust R9 (on module MAC) to the point where color just disappears; adjust the customer-operated color-level control to produce a normal picture; turn the AccuMatic control to the "on" position; adjust R4204A to the point where no change of color saturation is evident when the Accumatic control is switched from "on" to "off".

(R4204A can be adjusted by removing the tint-control knob and using an Xcelite TW-140 or General Cement GC9308 control to rotate it.)

Discolored fuses
Delco electronics products

The engineering department at Delco Electronics states that reliability of the fuse resistors used in their products is not degraded because of any discoloration which might appear on the outer surfaces.

Do not replace a fuse resistor unless an ohmmeter check reveals that it is open or out of tolerance. The red covering of the .68-ohm fuse resistor often turns black, then later turns white after continuous usage. ▲

troubleshooter

Practical TV Tuner Servicing

by Carl Babcoke

Contact Cleaning

The switch contacts of VHF tuners should be cleaned periodically, as preventive maintenance.

Most switch contacts in tuners are silver plated, and silver does tarnish—as any housewife who owns a set of sterling silver knows very well. Lubrication slows the oxidation process, but the contacts eventually turn black, except for a narrow track where the wiping action of the rotor contact has swept a path. Clean contacts are shown in Fig. 1.

An easy test for corroded contacts is to rock gently the channel selector shaft up, down, sideways, and in a rotary direction while watching the picture for intermittent white flashes, loss of color, snow, or changes in contrast. Other loose connections can imitate these symptoms, but they do not occur as often as dirty tuner contacts.

Methods of cleaning corroded contacts can be classified into one of the following categories.

The soak-everthing-in-sight approach

A technician holds the nozzle of a spray can of tuner cleaner to each crevice of the tuner and sprays until liquid gushes from every crack in the shields. This same technician later mutters uncomplimentary remarks about TV and tuner manufacturers as he makes several callbacks for intermittent reception and drifting fine tuning. Finally, when he opens up the tuner, he finds most of the pastic parts have turned to jelly.

Think the preceding is far-fetched? Tuner repair stations report some tuners sent to them for repair are in just such a state.

If you must use this shortcut method, be selective. Don't spray neutralizing capacitors, variable capacitors, or other such components. Spray only the switch contacts.

Use a brand of spray cleaner which will not damage plastic or detune circuitry.

The combined selective spray and lubrication technique

For quick cleaning, remove the tuner shields and apply a safe brand of spray cleaner to the switch contacts.

But for more permanence, with a lintless rag remove most of the cleaner you have just sprayed. Then if the cleaner also contains a lubricant, again spray a small amount of cleaner on each contact. If the cleaner does not contain lubricant, apply a separate spray- or grease-type lubricant. Replace all shields.

The separate degreasing and lubrication technique

With a short-bristled brush, apply a liquid degreaser (chlorothene or other liquid specifically recommended for this method) to the contacts, tube sockets, neutralizing capacitor or any other component which is flooded with sprayed liquids or exhibits signs of corrosion. Clean vigorously until all the corrosion, old lubricant and cleaner have been wiped away. Don't turn the channel selector during this part of the operation, if it can be avoided, because damage by scratching is possible when there is no lubrication on the contacts.

Then, directly apply a good lubricant—either spray or bulk—to the stator and rotor contacts. Do not apply an excessive amount, or it will pile up on coils and capacitors.

Pads soaked in cleaner/lubricant, for mounting inside the bottom shield in turret (or "strip") type tuners, can be purchased at electronic parts distributors. The pad lubricates the strip contact during every revolution of the channel selector.

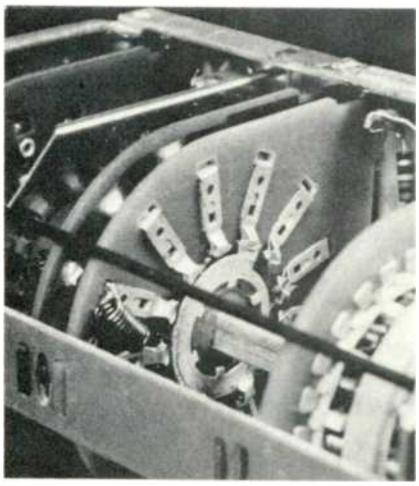


Fig. 1 One type of tuner switch contacts consist of double stationary wiping contacts made of spring material, and a knife contact that slides between. The contacts shown here are clean.

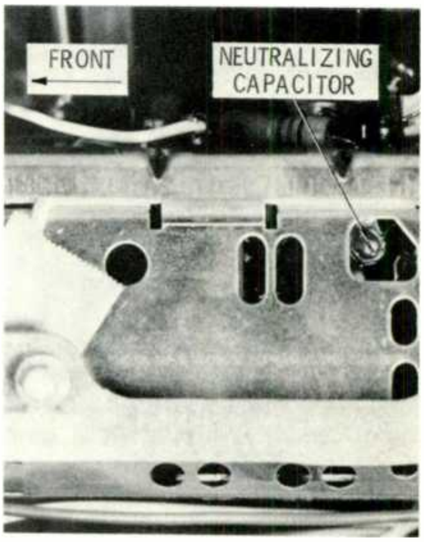


Fig. 2 Location of the neutralizing capacitor on the left side of most RCA tuners. It can be adjusted without removing the shields.

Neutralization of the RF Amplifier

During the past few years, many VHF tuners have used triode tubes in the RF amplifier stage. Although triodes have low noise (snow) they present oscillation problems because part of the RF signal is fed back from plate to grid via the internal inter-electrode capacitance. To counteract this tendency to oscillation, neutralizing circuits are used. Such circuits feed back to the grid a signal that is 180 degrees out of phase but equal in amplitude to the signal normally applied to the grid. When a sufficient degenerative signal is applied to the grid, the effect of the triode grid-plate capacitance is cancelled out and the tendency to oscillate is eliminated. However, because the amount of degenerative signal required is so critical, a variable capacitor, or a fixed capacitor and a "gimmick" in parallel for adjustment, is provided (see Fig. 2).

If the RF amplifier tube is replaced with a tube in which the internal capacitance is different, the tuner will require re-neutralizing.

Neutralizing capacitors which have become filled with tuner spray or other liquids must be thoroughly cleaned and degreased before neutralization is attempted.

To neutralize an RF tube, the gain of the tube first must be reduced to zero, and the tube must remain in the socket.

To satisfy both of these conditions, unsolder or disconnect only the resistor through which voltage is applied to the plate of the RF tube, or apply sufficient negative bias to the AGC line of the RF tube to completely cut off the tube. This voltage should be –15 volts or more.

With the RF tube cut off, the neutralizing capacitor is adjusted to produce minimum high-band station signal (preferably channel 8, 9 or 10) and maximum snow. Clamping the IF AGC bias produces a more stable reaction to the adjustment.

Most neutralizing capacitors should be adjusted with a nonmetallic tool; if not, the adjustment will change when the tool is withdrawn.

Symptoms which indicate that neutralization is needed

One common symptom indicating the need for neutralization is erratic, sharp-edged, black bars on one or more high-band channels (7 through 13). These bars might become either worse or better, if one side only of the antenna lead-in is connected.

Another more subtle symptom is automatic fine tuning action which is normal on the low-band channels, but incorrect on some of the high-band stations. Incorrect orientation of the antenna or misalignment of the RF stage can cause the same effect, but the need for neu-

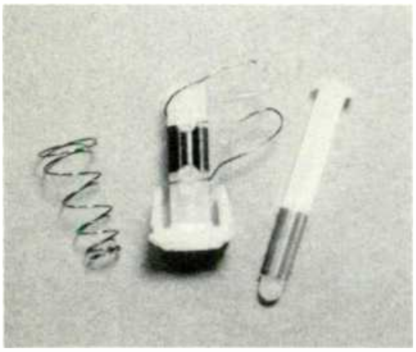


Fig. 3 A fine tuning coil used in older RCA tuners. The tip of the plunger contains inserts of powdered iron. Often the iron inserts fall out or break and either jam the movement or cause inadequate fine-tuning action. Buy a new coil and cross-switch the two cores. This eliminates the need for adjusting each channel screw or replacement of the coil.

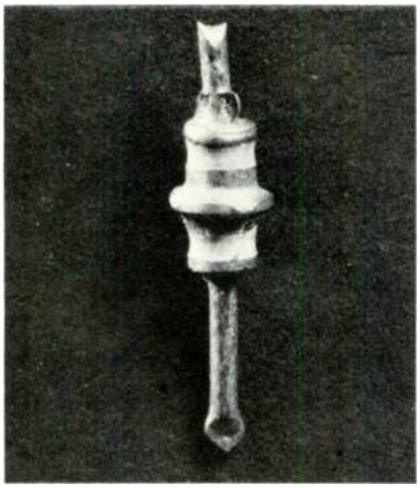


Fig. 4 One type of feedthrough capacitors used in tuners. The two white bands are ceramic insulation; the flange in the center is soldered to the chassis of the tuner. Avoid solder splatters.

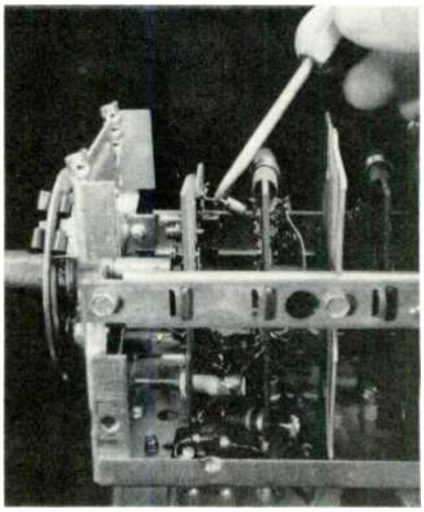
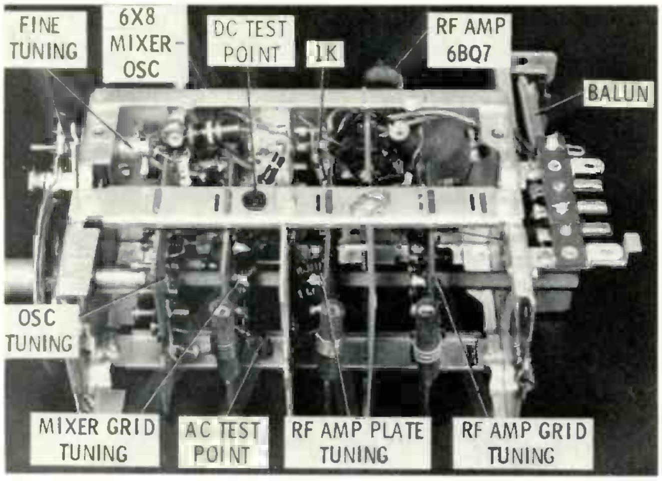
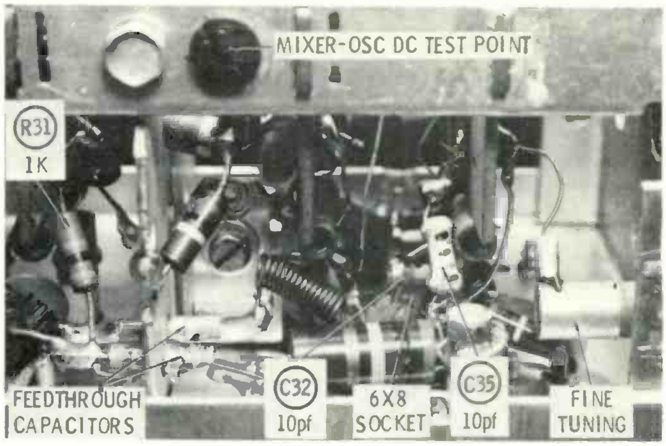


Fig. 5 When it is necessary to cut a wire, but the diagonal cutters won't reach, use a two-pronged soldering aid to break the wire by bending it back and forth.

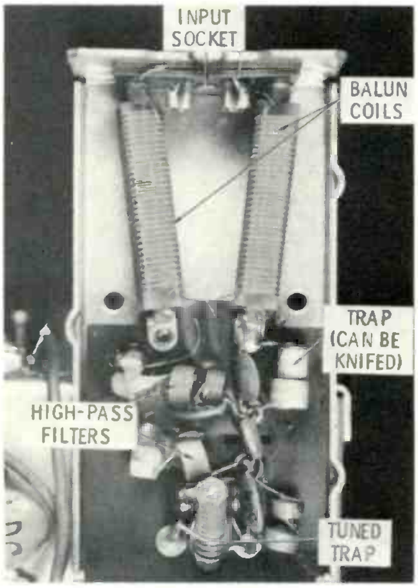
Switch-Type All-Tube Tuner



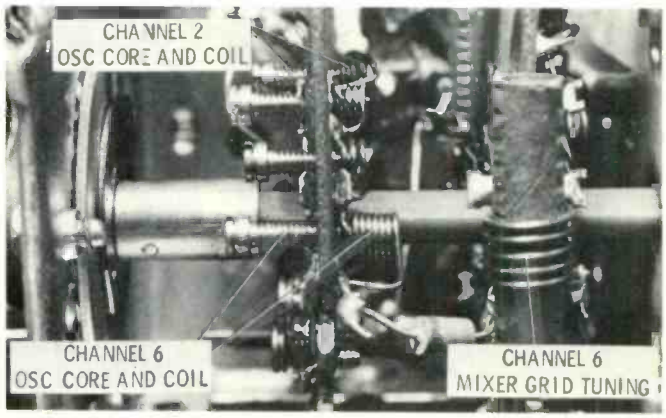
KRK22 tuner used in an RCA CTC5 chassis is a "switch" type and employs a 6BQ7 RF amplifier tube in a "cascode" circuit which requires no neutralization.



Capacitors C32 and C35 are likely suspects if all stations tune in one or more channels below normal. R31 (1000 ohms) will burn and its value will change when the 6BQ7 shorts; test it, because the value affects the proformance of the RF amplifier.



The balun coils can be damaged by lightning or static discharges. Be sure the relative phase of the windings of new coils are correct. The IF trap that has a core can be mistuned to an interfering signal in the 40-MHz range.



All the coils are electrically in series, starting with channel 13. If the oscillator will not adjust to the correct frequency on one channel, adjustment of the channel above it might be necessary. The low-band oscillator coils can be "knifed", if necessary to obtain the correct frequency.

tralization is the usual cause.

Oscillator Frequency Problems

The frequency of the oscillator in the tuner is critical even for b-w reception. For good color reception, the frequency is ultra-critical. If the frequency is slightly low, sound bars and beat patterns will be produced; if the frequency is too high, a smeared b-w picture and weak or no color will be produced.

A method of adjusting the oscillator frequency is included in all TV tuners. Usually oscillator frequency is adjusted by the fine tuning control, or the fine tuning plus AFT. One type of fine-tuning coil is shown in Fig. 3.

Causes of incorrect oscillator frequency

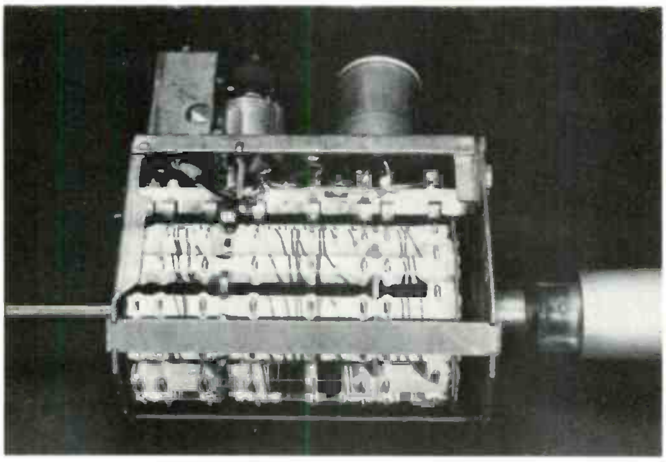
Incorrect oscillator adjustment can be caused by both mechanical and electronic defects. Slipping cams, belts or gears are the most frequent mechanical defects.

Electronic defects can produce either rapid or gradual misadjustment of the oscillator frequency. Rapid frequency changes are usually caused by corroded switch contacts, loose connections or capacitors which open intermittently. Slow frequency changes can be caused by tubes, resistors which change with heat, tuner spray on coils and capacitors or, capacitors which have incorrect temperature compensation or which leak when heated.

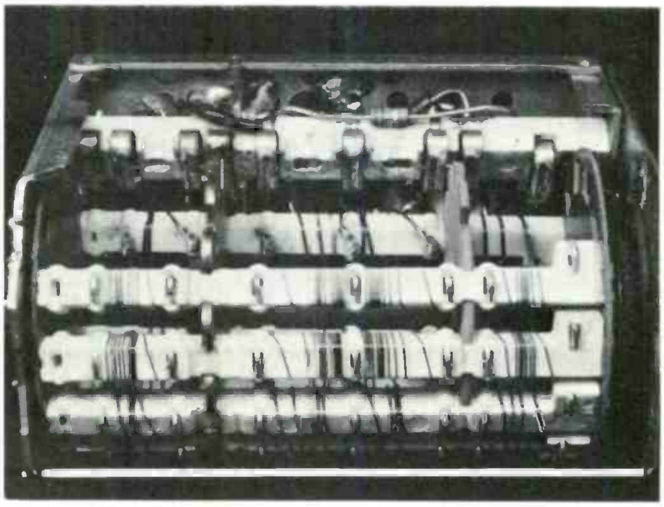
Whatever the cause, a rapid increase of oscillator frequency can cause complete loss of color, but it might not change the b-w sharpness enough to produce a conclusive symptom. Such an intermittent, can easily be diagnosed incorrectly as a defect in the chroma channel.

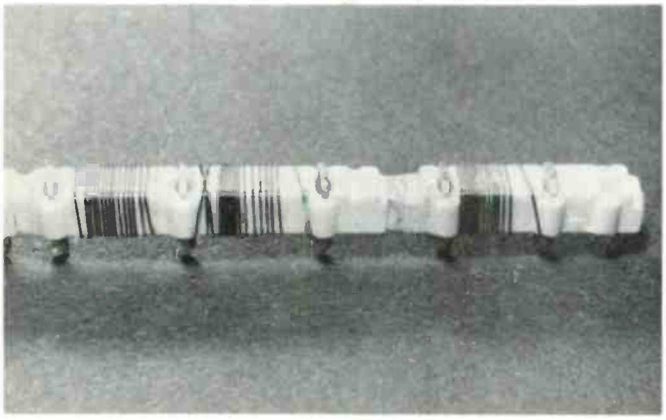
The oscillator frequency is considered correct, if the fine tuning control varies the picture quality

Turret-Type Tuner

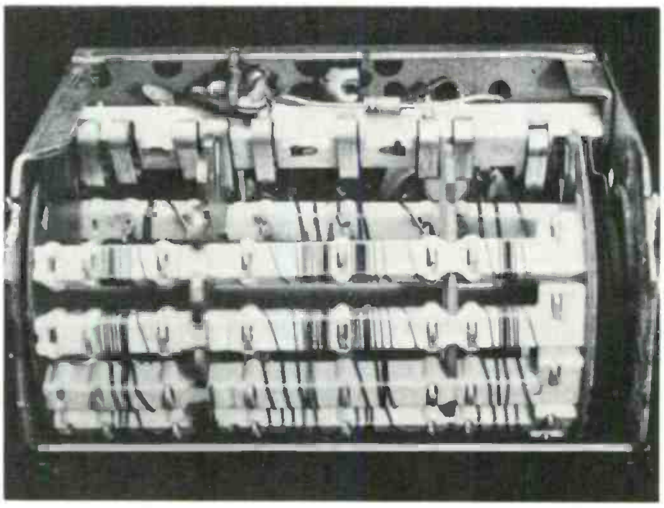


The tuner used in Silvertone chassis 456/528, 51780 is a turret type with plug-in strips.





The two strip contacts on the left have been cleaned; the three on the right are still corroded. Use a cloth and a degreasing liquid to clean such contacts.

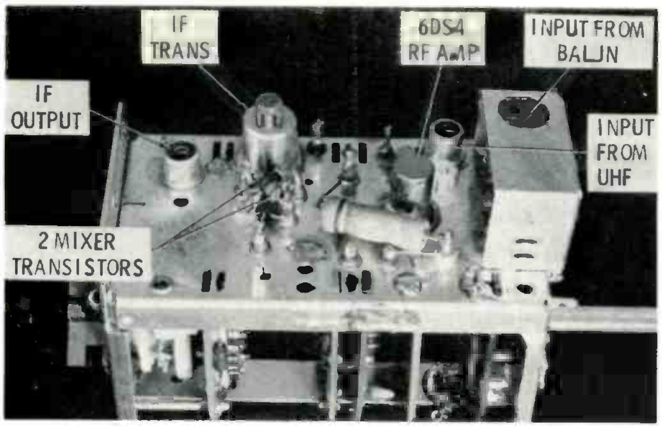


Stator contacts before and after cleaning. Several strips have been removed to provide access. Upper—dirty; lower—clean.

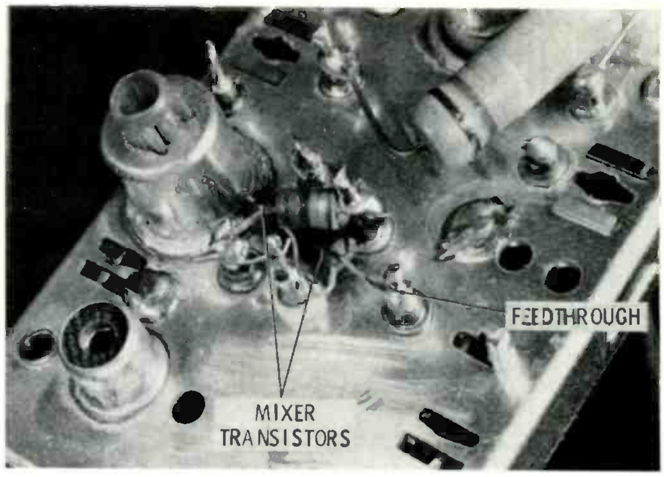
Remove several coil strips to make room for "live" testing. Strips are coded with numbers and colored dots. Capacitors C220 and C221 are the most critical components in the oscillator circuit.

Twin-lead connects the antenna terminals on the cabinet back to the two tuner input prongs, which are also feedthrough capacitors for isolation of the antenna circuit from the "hot" chassis. The balun coil is mounted next to the feedthroughs; the coils and capacitors below it are the high-pass filter assembly.

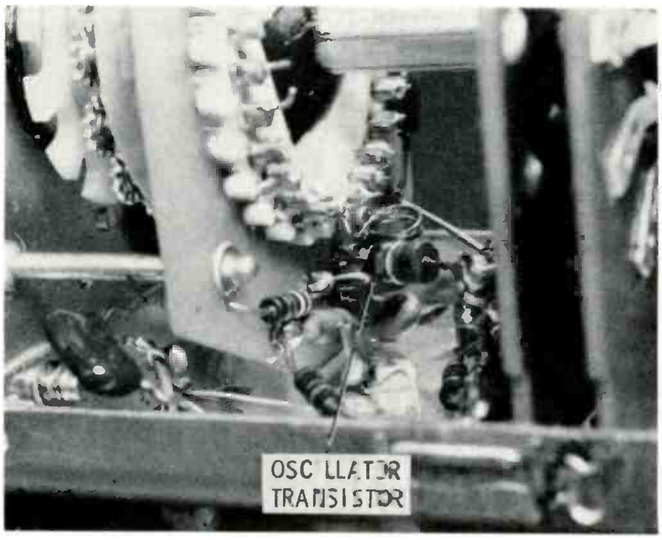
Hybrid Switch-Type Tuner



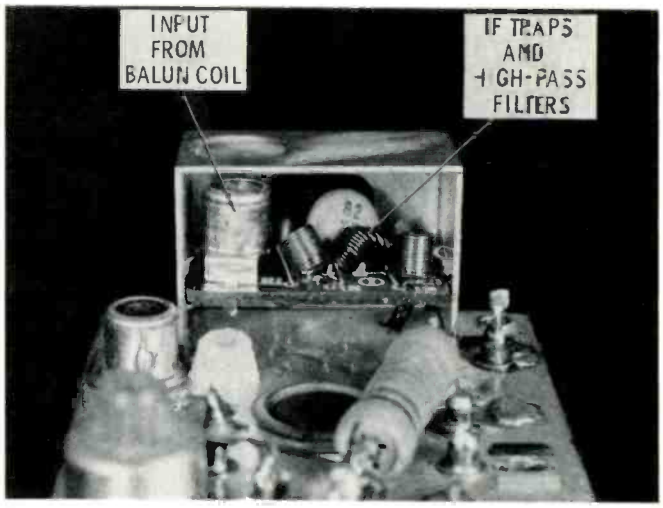
KRK144A hybrid tuner used in late-model RCA color receivers. The balun coil is mounted, with the antenna terminal strips, on the cabinet back. The tuner is very small, but accessibility is good.



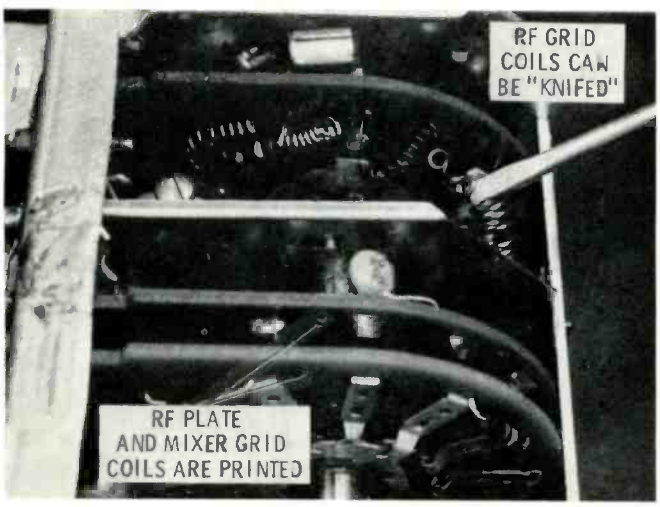
Two cascaded mixer transistors are mounted on feedthrough capacitors.



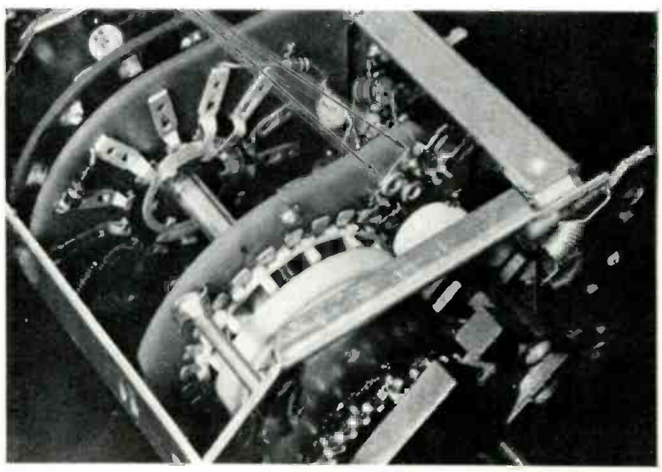
Oscillator transistor is mounted on the rear side of the oscillator switch-stator board.



Shielded box at rear of the tuner contains the input plug for the shielded cable from the balun coils, and the traps and high-pass filters.



The RF grid coils are conventional and can be "knifed" during sweep alignment. The RF plate and mixer-grid coils are "printed" on the board and cannot be adjusted.



Stator switch wiping contacts can cause loss of all stations, if they become bent. Older models were prone to intermittents caused by loose rivets. The cure is to solder them to the switch.

from "smear" to sound bars.

The tuner defect which is most likely to be the cause of total loss of color is incorrect oscillator frequency. Misalignment of the antenna or RF tuned circuits might weaken the color, but it cannot completely eliminate the color. Overload would cause clipping of the vertical and horizontal sync pulses before it would affect the burst or the chroma signal.

Snow and AGC

Snow is visual "white noise" which is normally caused by thermal agitation in the tubes in the tuner. The mixer stage contributes the most snow, the RF stage next, and the video IF's practically none. A mixer defect might increase the amount of snow, but this is rare; most cases of excessive snow originate in the RF stage.

It is impossible to separate RF stage snow from that caused by incorrect AGC action. Application of excessive AGC voltage to the RF stage reduces the input to the mixer. This degrades the signal-to-noise ratio, and snow is produced. At the other extreme, insufficient RF AGC voltage might permit overload of the mixer. Such overload causes problems such as reduced contrast, unstable sync, grainy picture with beat patterns, and a blurred picture with weak color.

In locations where the signal strength is not too high, a simple test for tube-equipped RF stages is to ground the AGC at the tuner. Any decrease in the amount of snow is proof the tuner AGC is too high. An AGC circuit defect which increases the negative AGC voltage to the tuner—such as an increase in the resistor from tuner AGC to B+—will cause extra snow. Any AGC defect which reduces the AGC voltage applied to the video IF's will increase the snow.

The test involving grounding of the AGC at the tuner also can be used for RF stages which use a MOSFET transistor. An AGC voltage of more than –2 volts is almost certain to cause snow. On the other hand, zero AGC voltage does not provide maximum RF gain, because an AGC voltage of around +5 is necessary for highest gain.

The forward bias of RF transistors is very critical. AGC voltage that is excessive will reduce the gain as much, or more, than a voltage which is too low. Grounding the AGC source at the tuner will **not** work as a test for snow in transistorized AGC stages.

Feedthrough Capacitors

More feedthrough capacitors are used in tuners than in any other TV circuit. Because the feedthrough capacitor effectively functions like many series RF chokes bypassed by many capacitors, bypassing at high frequencies is better than if separate components were used. Also, the assembly acts as a tie point for some of the wiring.

Feedthrough capacitors manufactured several years ago were relatively fragile and could be cracked easily by rough probing. Today's feedthroughs (see Fig. 4) are more durable, but are still occasionally victims of solder splatters.

One tuner-repair specialist advises that we should **not** unsolder all the wires from feedthrough capacitors when wire removal is necessary. Instead, cut the wire close to the rod and then restrip the wire and solder it near or over the old solder. This technique minimizes shorts and cracked ceramics by eliminating the stresses usually placed on the capacitor when attempts are made to remove wired connections.

Tools For Tuner Servicing

Tools for tuner repairs must be **small** because the working space is restricted and large tools cannot be inserted into many areas. Tiny diagonal-cutters, long-nose pliers and soldering irons are essential. However, for many jobs of holding or bending, a two-pronged soldering aid and picks are more useful. For example, whenever the small diagonal pliers can't be inserted to cut off a wire, use the soldering aid to bend rapidly the wire from side-to-side until it breaks, as shown in Fig. 5. Then the soldering aid can be used to hold the new wire or lead in place while it is soldered.

Magnifiers and small, high-intensity lamps help make those hidden corners accessible.

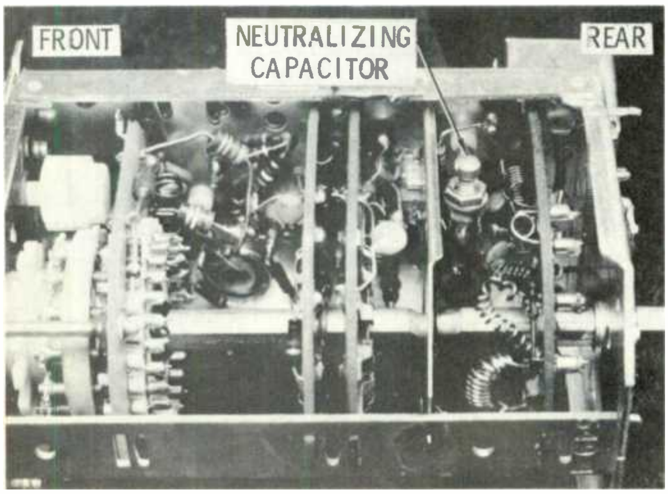
A large, high-heat iron should be available, for soldering shields and brackets.

Generally, very few special tools are necessary other than the ones that should be found in any shop which does acceptable repair of circuit boards.

Alignment

In most cases, re-alignment of the tuner will not be necessary following repairs—if the following precautions are observed:

- Don't move parts or wires, unless there is no alternative. That peculiarly-shaped, one-inch piece of wire just might be a trimming inductance.
- Keep the leads of replacement parts SHORT. This is particularly important in UHF tuners, in which long leads can detune



Location of the neutralizing capacitor. To perform neutralization: 1) bias the 6DS4 to cutoff by applying −15 volts or more to the tuner AGC point; 2) tune in a high-band station, preferably on channels 8, 9 or 10; 3) adjust neutralizing capacitor for minimum video. Use a non-metallic screwdriver.

Catalogs literature

ANTENNAS

100. *Antenna Specialists Company*—announces a transmitter accessories catalog. The catalog includes a series of circulators, isolators, hybrid couplers, circulation terminations and harmonic filters.

101. *RMS Electronics, Inc.*—has made available a 27-page catalog of their 1971 line of antennas, replacement antenna rods for TV sets and portable radios, color tube brighteners, replacement picture tube sockets, antenna hardware and kits, splitters, transformers, tap-offs, and many more.*

102. *Russell Industries* — announces the availability of a complete line of telescoping antenna rods with swivel bases and sliding adapters for rods to disappear. This line is used for walkie/talkie and all portable radio applications.

AUDIO

103. *Altec Lansing*—introduces a 12-page brochure for information on sound systems in the sports and entertainment field, stadiums, automobile speedways, hotels, restaurants and other public entertainment facilities.

104. *Bell P/A Products Corp.*—new 6-page catalog gives detailed specifications and descriptions of the company's broad line of commercial sound components and special purpose sound system products.

105. *Jensen Manufacturing Div.*—has issued an 8-page catalog, No. 1090-E, which describes applications of 167 individual speaker models. Special automotive, communications, intercom and weathermaster speakers, plus a complete line of electronic musical instrument loudspeakers are featured.

106. *Nortronics Co., Inc.* — has released a new Tape Head Replacement Guide which contains tape head replacements for over 2,800 domestic and foreign recorder models, a cross-reference to both model and head part numbers for reel-to-reel and cartridge recorders.

AUTO ELECTRONICS

107. *Littelfuse, Inc.* — has released a new 32-page, 1971 automotive replacement fuse guide for passenger autos, sports cars, trucks, and taxi cabs. Fuse descriptions and circuits they protect are included.*

CABLE HARDWARE

108. *Electrovert, Inc.*—has announced a 16-page brochure describing their line of wire/cable harnessing, wire/cable marking and wire/cable accessory products. The differences and application advantages of each of the products is explained.

109. *Sprague Products Co.*—announces a 40-page manual which lists original part numbers for each manufacturer, followed by ratings, recommended Sprague capacitor replacements, and list prices. More than 2,500 electrolytic capacitors are included.*

COMPONENTS

110. *Aerovox Corp.*—has made available a 20-page catalog of service replacement capacitors containing information and rating charts for electrolytic, paper/film, filters, ceramic, mica and AC capacitors.

111. *General Electric Tube Department* — has released a new 52-page Entertainment Semiconductor Almanac, No. ETRM-4311F. The almanac contains approximately 20,000 cross references from JEDEC, or OEM part numbers to GE parts numbers for universal replacement semiconductors, selenium rectifiers for color TV, dual diodes, and quartz crystals.*

112. *Motorola, Inc.* — has made available a 1971 HEP cross reference guide catalog, which lists replacements for over 31,000 different semiconductor device type numbers available through authorized HEP suppliers.

113. *Precision Tuner Service* — announces a new tuner parts catalog, including a cross reference list of antenna coils and shafts for all makes of tuners.*

114. *RCA Distributor Products*—introduces a 72-page "SK Series Top-Of-The-Line Replacement Guide" (SPG-202L) which cross-references over 20,000 semiconductor device numbers. In addition a Solid State Quick Selection Replacement Chart (1L1367) listing 79 entertainment SK-Series devices is included. Price of this catalog is $.35.*

115. *RCA Solid-State Division* has made available a new 28-page catalog describing the selection of RCA thyristors (triacs and SCR's), rectifiers, and diacs. Data for each type of device is arranged by series and in order of ascending current.*

116. *RCA / Solid-State Division* — announces a revised edition of the Power Transistor Directory, which reflects new product programs, as well as new product data. All product matrices have been updated to include the latest commercial types as well as preliminary data on developmental types, including RCA power transistors, both silicon and germanium. The Index of Types has been expanded to include DT types as well as JEDEC (2N-Series) types and RCA 40-K series types. Copies are $.40.*

117. *Sprague Products Co.*—has announced a 40-page man-

ual which lists original part numbers for each manufacturer, followed by ratings, recommended Sprague capacitor replacements, and list prices. More than 2,500 electrolytice capacitors are included.*

118. *Sylvania Electric Products, Inc.* — a 73-page guide which provides replacement considerations, specifications and drawings of Sylvania semiconductor devices plus a listing of over 35,000 JEDEC types and manufacturers' part numbers. Copies are $1.00.*

119. *Workman Electronic Products, Inc.*—has released a 32-page, pocket-size cross reference listing for color TV controls. 105 Workman part numbers are listed in numerical order with specifications and illustrations of the part.*

SERVICE AIDS

120. *Chemtronics, Inc.* — has published a 6-page, 4-color, folder describing TUN-O-Brite chemical spray. Application uses are included.*

TECHNICAL PUBLICATIONS

121. *Chemtronics, Inc.* — has published a pocket-sized booklet describing typical thermal intermittents and how Super Frost Aid aerosol coolant will locate them. A step-by-step service procedure is outlined.*

122. *Howard W. Sams & Co., Inc.* — literature describes popular and informative publications on radio and television servicing, communications, audio, hi-fi industrial electronics, including their 1971 catalog of technical books about every phase of electronics.*

TEST EQUIPMENT

123. *B & K Mfg. Div., Dynascan Corp.*—is making available an illustrated, 24-page 2-color Catalog BK-71, featuring B & K test equipment, with charts, patterns and full descriptive details and specifications included.*

124. *Eico* — has released a 32-page, 1971 catalog which features 12 new products in their test equipment line, plus a 7-page listing of authorized Eico dealers.*

125. *Hickok Electrical Instrument Co.* — the 1971 Product Selection Guide covers all current product lines including digital multimeters, oscilloscopes and digital measuring systems, as well as tube and transistor testers, data collection terminals, and card and industrial readers.

126. *Leader Instruments Corp.* —announces the 1971 Catalog of Leader Test Equipment. Test equipment included is the LBO-301 portable triggered-sweep oscilloscope, LSW-330 new solid-state post injection sweep/marker generator, and the LCG-384 mini-portable, solid-state battery operated color-bar generator.

127. *Lectrotech, Inc.* — announces the 1972 catalog, "Precision Test Instruments for the Professional Technician". It contains specifications and prices on sweep marker generators, oscilloscopes, vectorscopes, color bar generators and other test equipment.

128. *Pomona Electronics* — has published a 60-page, 1971 catalog of electronic test accessories which contains more than 450 individual products, including 47 new items.

TOOLS

129. *Xcelite, Inc.* — announces their New Bulletin/Price List 671L, describing a series of magnetic nutdrivers said to eliminate lost motion and fumbling when driving hex screws and bolts or starting nuts in close quarters and hard-to-reach places.*

*Check "Index to Advertisers" for additional information. ▲

Got A Troubleshooting Tip?

If you've recently run across an unusual trouble symptom, send a thorough description of it and the solution to:

Troubleshooting Tip,
Electronic Servicing
1014 Wyandotte St.
Kansas City, Mo. 64105

The MARKETPLACE

This classified section is available to electronic technicians and owners or managers of service shops who have for sale surplus supplies and equipment or who are seeking employment or recruiting employees.

Advertising Rates in the Classified Section are:

- 25 cents per word (minimum $3.00)
- "Blind" ads $2.00 additional
- All letters capitalized—35 cents per word

Each ad insertion must be accompanied by a check for the full cost of the ad.

Deadline for acceptance is 30 days prior to the date of the issue in which the ad is to be published.

This classified section is not open to the regular paid product advertising of manufacturers.

EQUIPMENT FOR SALE

CRT color champion and oven, near new, $1000.00 takes all. Rebuild your own picture tubes. Acme-TV, 1735 North Wells, Reno, Nevada 89502. 10-71-1t

19" Portable GE TV sets. VHF/UHF perfect and near new shape. Any amount. $55.00 each. Acme-TV, 1735 North Wells, Reno, Nevada 89502. 10-71-1t

Limited quantity 12FR8 tubes, $8.50. Cressman, 327 N. Prospect St., Washington, New Jersey, 07882. 10-71-1t

Flameless Heat Guns — Used Surplus. Great for electronic Techs & Hobbyist. 5 amp—200° F, 14 amp, 700° F, and 17 amp, 1000° F. New prices from $49.00 to $59.00. Your choice—$12.00 ea. We also offer Calibration & Repair Services on all types of electronic test equip. Large supply of new and used test equip. Imtronix Inc., 305 N. Broadway, Fresno, Calif. 93701. 10-71-1t

EQUIPMENT WANTED

WANTED: RCA model WV98A VTVM & Sam's AR Manuals. Williams Radio & TV, Lewisburg, W. Va. 10-71-1t

Wanted: Westinghouse grill style Q 25366 used with Westinghouse stove model KAA 40. Frank Szwanek, Mullen, Nebr. 69152. 10-71-1t

HELP WANTED

TV Tech—In a rut? Want a change of scenery and a new lease on life? Easy divorce, good hunting and fishing, ideal climate. We need a good all around man. Acme-TV, 1735 North Wells, Reno, Nevada 89502. 10-71-1t

SERVICE SHOP FOR SALE

I am retiring from the Electronic business, and I want to sell my shop, T. V. Stereo Palace (angel Soto) Centro Comercial Litheda, Rio Piedras, Puerto Rico 00926. The shop is very well equipped, and has been established for over four years in one of the best areas in San Juan. For information write to address above or call 761-5205 day or 761-2809 night. 10-71-1t

advertisers' index

SAMS PHOTOFACT®

Supplement to 1971 ANNUAL INDEX

Covers PHOTOFACT Set Numbers 1146 thru 1199 and Specialized Volumes AR-87 thru AR-105, CB-31 thru CB-35, MHF-8 thru MHF-17, TR-72 thru TR-85, TSM-119 thru TSM-127 Released.

JANUARY—SEPTEMBER 1971

This Supplement is your Index to new models covered by PHOTOFACT since December 1970. For model coverage prior to this date see the 1970 PHOTOFACT Annual Index. Use this Supplement with the Annual Index—together they are your complete Index to PHOTOFACT coverage of over 87,000 models.

NOTE: ● Denotes Television Receiver. ★ Denotes Color Television Receiver. **AOR** Denotes Available On Request. **AR** Denotes Auto Radio Series Volume. **CB** Denotes CB Radio Series Volume. **HTP** Denotes Home Tape Player Series Volume. **MHF** Denotes Modular Hi-Fi Series Volume. **PCB** Denotes Production Change Bulletin. **POM** Denotes Bonus Schematic in Photofact-of-the-Month Package—Unavailable After Month Of Issue. **SED** Denotes Special Equipment Data. **TR** Denotes Tape Recorder Series Volume. **TSM** Denotes Transistor Radio Series Volume.

Set No. | Folder No.

CORONADO
Gamble-Skogmo, Inc.
P.O. Box 458
Minneapolis, Minn. 55440

PH20-6023A 1140–5
RA1-6232A
For Radio Ch. (Similar to Chassis) 1113–4
For Tape Player (Similar to Page 39) HTP–5
RA1-6242A/6243A (Similar to Chassis) 1113–4
★TV2-2011A (Similar to Chassis) 1157–1
★TV2-6624A (Similar to Chassis) 1088–2
★TV2-6634A/35A 1157–1
★TV2-6636A/37A/38A/39A 1157–1
★TV2-6814A (TV Ch. Only) .1003–1
★TV2-6815A 1157–1
★TV21-6402B 1188–2
★TV21-6405A 1190–1
●TV24-7103A 1192–1
★Ch. T511/512/513/514 ..1157–1
★Ch. T541/542 1157–1
★Ch. T551/552 (Similar to Chassis) 1157–1

COURIER
Courier Communications Inc.
100 Hoffman Place
Hillside, New Jersey 07205

CCT-2w/CH8-3 ....CB–35
CHIEF 23 ....CB–35
Citation CB–34
Ranger 23 ....CB–33
Traveller II CB–31

CRAIG
(Also See Auto Radio and Recorder Listings)
Craig Corp.
921 West Artesia Blvd.
Compton, Calif. 90220

●6305 ....1152-POM

CROWN RADIO
Crown Radio Corp.
228 East Harris Avenue
South San Francisco, Calif. 94080

●7TV-15A 1166–1
●9TV-301 ....1152–POM

CURTIS MATHES
(Also See Recorder Listing)
Curtis Mathes Mfg. Co.
P.O. Box 5610
Dallas, Texas 75222

●10M057 (Ch. TV-17) ......733—1
★52M504 (Ch. C/CMC34) 1147–SED
★52M735 (Ch. C/CMC35) 1154–SED
★53M0233 (Ch. C/CMC-33) 1193–2
★53M0333 (Ch. C/CMC-33) 1193–2
★53M0433/0435 (Ch. C/CMC-33) 1193–2
★53M0533 (Ch. C/CMC-33) 1193–2
★53M0633 (Ch. C/CMC-33) 1193–2
★53M0733/0735 (Ch. C/CMC-33) 1193–2
★53M1233 (Ch. C/CMC-33) 1193–2
★53M1333 (Ch. C/CMC-33) 1193–2
★53M1433 (Ch. C/CMC-33) 1193–2
★53M1533 (Ch. C/CMC-33) 1193–2
★53M1633 (Ch. C/CMC-33) 1193–2
★53M1733 (Ch. C/CMC-33) 1193–2
★Ch. C/CMC-33 1193–2
★Ch. C/CMC-34 ......1147–SED
★Ch. C/CMC-35 ......1154–SED
★Ch. C/CMC-37 ......1194–POM

D

DECCA
MCA Distributing Corp.
445 Park Avenue
New York, New York 10022

DP-109 1141–4
DP-111 ....MHF–9

DELMONICO-NIVICO
Delmonico International Corp.
5035-56th Road
Maspeth, New York 11378

FPB400-Run 1 (Ch. TC-772) (Similar to Chassis) ..1079–1A
FPB400-Run 2 (Ch. TC-777) (Similar to Chassis) ..1079–1A
23S222EA (Ch. TS-773/779) (Similar to Chassis) ..1079–1A
23TS223/224 (Ch. TC-777) (Similar to Chassis) ..1079–1A
30S209/210 (Ch. TC-773/779) (Similar to Chassis) ..1079–1A
30S215 (Ch. TC-773/779) (Similar to Chassis) ..1079–1A
30SB210 (Ch. TC-773/779) (Similar to Chassis) ..1079–1A
30SB216 (Ch. TC-773/779) (Similar to Chassis) ..1079–1A
36S205 (Ch. TC-773/779) (Similar to Chassis) ..1079–1A
36S211/213 (Ch. TC-773/779) (Similar to Chassis) ..1079–1A
36S226 (Ch. TC-773/779) (Similar to Chassis) ..1079–1A
36SB206 (Ch. TC-773/779) (Similar to Chassis) ..1079–1A
36SB212/214 (Ch. TC-773/779) (Similar to Chassis) ..1079–1A
36SB227/228 (Ch. TC-773/779) (Similar to Chassis) ..1079–1A
40S406/408 (Ch. TC-777) (Similar to Chassis) ..1079–1A
40S411 (Ch. TC-777) (Similar to Chassis) ..1079–1A
40SB401-Run 2 (Ch. TC-777) (Similar to Chassis) ..1079–1A
40SB406/407/408/409 (Ch. TC-777) Similar to Chassis) 1079–1A
40SB412 (Ch. TC-777) (Similar to Chassis) ..1U79–1A
46SB401-Run 1 (Ch. TC-772) (Similar to Chassis) ..1079–1A
46SB4018 (Ch. TC-777) (Similar to Chassis) ..1079–1A
46SBR414 (Ch. TC-777) (Similar to Chassis) ..1079–1A
50SL413 (Ch. TC-777) (Similar to Chassis) ..1079–1A

DELMONICO-NIVICO—Cont.

60SB402 (Ch. TC-772) (Similar to Chassis) ..1079–1A
60SB403-Run 1 (Ch. TC-772) (Similar to Chassis) ..1079–1A
60SB403-Run 2 (Ch. TC-777) (Similar to Chassis) ..1079–1A
60SB405 (Ch. TC-773/779) (Similar to Chassis) ..1079–1A
60SB410-Run 1 (Ch. TC-772) (Similar to Chassis) ..1079–1A
60SB410-Run 2 (Ch. TC-777) (Similar to Chassis) ..1079–1A
60SB415 (Ch. TC-773/779) (Similar to Chassis) ..1079–1A
60SB422 (Ch. TC-773/779) (Similar to Chassis) ..1079–1A
60SB427B (Ch. TC-773/779) (Similar to Chassis) ..1079–1A
●60SC301 (Ch. C-26,TC-773) (Similar to Chassis) 1079–1
72SB416 (Ch. TC-777) (Similar to Chassis) ..1079–1A
931A, FX (See Contents) 869
945, FX (See Contents) 869
955, FX (See Contents) 869
965, FX (See Contents) 869
975, FX (See Contents) 869
Ch. TC-772/773 (Similar to Chassis) 1079–1A
Ch. TC-777/779 (Similar to Chassis) 1079–1A

DEMCO
Command Electronics, Inc.
11830 Shaver Road
Schoolcraft, Michigan 49087

CB-1A ....CB—7
M-10A ....CB—7
R-101A ....CB—7
R-102 ....CB—7
T-110A ....CB—7
VM-12-120 ....CB—7

DODGE
(See Auto Radio and Recorder Listings)

DUMONT
Dumont Radio & Television
14th & Coles Streets
Jersey City, N.J. 07302

★25DC01W/02S (Ch. 6K2000-1) 1176–POM
●43C01/02/03/04 (Ch. 120758A) (Similar to Chassis) ....774—1
●43K01 (Ch. 120758A, 120768)
For TV Ch. (Similar to Chassis) ....774—1
For Radio Ch. (Similar to Chassis) ....792—7
●43T01 (Ch. 120758A) (Similar to Chassis) ......774—1
●49P01/02 (Ch. 120759A/760A) (Similar to Chassis) ......774—1
★55C29 (Ch. 120926A—Codes A thru E) (PCB 1195-3) 1114–1
★55C32/34/35/36 (Ch. 120926A —Codes A thru E) ......(PCB 1195-3) 1114–1
★55C37W/39S (Ch. 120957A,B —Codes A thru E) ......(PCB 1195-3) 1114–1
★55C40M/42S/43W/44P (Ch. 120957A,B—Codes A thru E) ... (PCB 1195-3) 1114–1
★55K18/19 (Ch. 120928A—Codes A thru E) . (PCB 1195-3) 1114–1
★55K21W/22S (Ch. 120958A,B —Codes A thru E) ......(PCB 1195-3) 1114–1
★55T02W (Ch. 120957A,B—Codes A thru E) ......(PCB 1195-3) 1114–1
★59T01WN (Ch. 120976A) (Similar to Chassis) 1102–1
★59T02WN (Ch. 120984A) (Similar to Chassis) 1102–1
★Ch. 6K2000-1 ....1176–POM
●Ch. 120758A/759A/760A (Similar to Chassis) ....774—1
★Ch. 120926A (Codes A thru E) ......(PCB 1195-3) 1114–1
★Ch. 120928A (Codes A thru E) ......(PCB 1195-3) 1114–1
★Ch. 120957A,B (Codes A thru E) ......(PCB 1195-3) 1114–1
★Ch 120958A,B (Codes A thru E) ......(PCB 1195-3) 1114–1
★Ch. 120976A (Similar to Chassis) 1102–1
★Ch. 120984A (Similar to Chassis) 1102–1

DYNATRONICS
(See Auto Radio and Recorder Listings)

E

EIA
Production Source Code 1192

ELECTROHOME
Electrohome Limited
809 Wellington Street North
Kitchener, Ontario, Canada

★Amherst C06-016 (Ch. C6) 1198–1
★Amherst C07-115 (Ch. C7-B) 1198–1
★Andorra C06-017 (Ch. C6) 1198–1
★Andorra C07-102 (Ch. C7-B) 1198–1
●Apollo M04-018 (Ch. M4-XU) 1176–1
●Apollo M10-104 (Ch. M10-B) 1192–2
●Bedford M04-010 (Ch. M4-XU) 1176–1
●Bedford M10-101 (Ch. M10-B) 1192–2
★Berkley C06-026 (Ch. C6) 1198–1
★Berkley C07-120 (Ch. C7-D) 1198–1
★Berwick C06-002 (Ch. C6) 1198–1
★Berwick C07-104 (Ch. C7A-E) 1198–1
★Broadview C07-113 (Ch. C7-B) 1198–1
●Brunswick M04-011 (Ch. M4-XU) 1176–1
★Cabaret C06-022 (Ch. C6) 1198–1

ELECTROHOME—Cont.

★Cabaret C07-114 (Ch. C7-B) 1198–1
★Capilano C07-131 (Ch. C7A-E) 1198–1
★Caprice C07-141 (Ch. C7A-E) 1198–1
★Carlisle C06-032 (Ch. C6-A) 1198–1
★Carlton C06-014 (Ch. C6) . 1198–1
★Claridge C06-005 (Ch. C6) 1198–1
★Claridge C07-103 (Ch. C7A-E) 1198–1
●Comet M04-118 (Ch. M4-Y) 1176–1
★Conestoga C06-004 (Ch. C6) 1198–1
★Corsair C07-116 (Ch. C7-E) 1198–1
★Corsair MK11 C06-023 (Ch. C6) 1198–1
★Crusader C07-117 (Ch. C7-G) 1198–1
★Delmundo C06-028 (TV Ch. Only C6) 1198–1
●Falcon M10-006 (Ch. M10-A) 1192–2
●Falcon M10-111 (Ch. M10-B) 1192–2
●Fraser M04-115 (Ch. M4-Y) 1176–1
●Gemini M10-001 (Ch. M10) 1192–2
●Gemini M10-103 (Ch. M10-B) 1192–2
●Jupiter M04-015 (Ch. M4-XU) 1176–1
●Jupiter M04-114 (Ch. M4-Y) 1176–1
●Kenwood M04-012 (Ch. M4-XU) 1176–1
●Kenwood M04-101 (Ch. M4-Y) 1176–1
★Lonsdale C06-015 (Ch. C6) 1198–1
●Mercury M04-014 (Ch. M4-XU) 1176–1
●Meteor M04-016 (Ch. M4-XU) 1176–1
●Meteor M04-112 (Ch. M4-Y) 1176–1
●Polaris M04-113 (Ch. M4-Y) 1176–1
★Riviera C06-001 (Ch. C6) 1198–1
★Riviera C07-101 (Ch. C7-B) 1198–1
★Salerno C06-013 (Ch. C6) .1198–1
★Scando C07-132 (Ch. C7H-E) 1198–1
●Selkirk M10-002 (Ch. M10-AU) 1192–2
●Selkirk M10-102 (Ch. M10-B) 1192–2
★Sherbrooke C06-003 (Ch. C6) 1198–1
★Sherbrooke C06-031 (Ch. C6-A) 1198–1
★Sherbrooke C07-118 (Ch. C7A-E) 1198–1
●Venus M04-017 (Ch. M4-XU) 1176–1
●Verdun M04-013 (Ch. M4-XU) 1176–1
●Verdun M04-110 (Ch. M4-Y) 1176–1
★Ch. C6,-A 1198–1
★Ch. C7-B,-D,-E,-G 1198–1
★Ch. C7A-E 1198–1
★Ch. C7H-E 1198–1
●Ch. M4-XU, M4-Y 1176–1
●Ch. M10,-A,-AU,-B 1192–2

ELECTROPHONIC
(Also See Auto Radio and Recorder Listings)
Electrophonic Corp. of America
101-10 Foster Avenue
Brooklyn, New York 11236

CR-8 1183–4
T-10 ....TSM–121
T-600 ....MHF–17
TR-20 ....TSM–123
Ch. 11 1149–4
Ch. 13 1157–4
Ch. 14 1161–6
Ch. 16 1164–5
Ch. 18 1167–4
Ch. 21 1156–5
Ch. 21J 1186–5
Ch. 21K 1181–4
Ch. 22 ....MHF–16
Ch. 23 1148–6
Ch. 24 1163–5
Ch. 25 1143–4
Ch. 26 1182–5
Ch. 27M 1173–4
Ch. 64 1145–6
Ch. 71 1141–5
Ch. 74TN 1196–5
Ch. 75 1152–7
Ch. 76 1182–5
Ch. 81 1149–4
Ch. 83C 1153–5
Ch. 91 1156–5
Ch. 91J 1186–5
Ch. 91K 1181–4
Ch. 93M 1173–4

ELGIN
Elgin National Industries, Inc.
50-35 56th Road
Maspeth, New York 11378

R-1150 (Similar to Page 31) TSM–44
R-1650 ....TSM–122
R-5100 1159–3

EMERSON
(Also See Changer Listing)
Emerson Television Sales Corp.
14th & Coles Streets
Jersey City, N.J. 07302

P1936/1937 (Ch. 120637/638) ......682—5,—6
●9FP01W (Ch. T2L2-1A) 1140–POM
●9FP02/03/04W (Ch. T2R2-1A) 1176–POM
★12EP01W (Ch. T10K10-1D) 1173–1
●12HP02 (Similar to Chassis) 1096–1
●13C46 (Ch. 120933A) ....(PCB 1175-3) 1048–1

EMERSON—Cont.

●13C46 (Ch. 120933B) (Similar to Chassis) 1048–1
●13C46 (Ch. 120933E) ....(PCB 1175-3) 1048–1
●13C51 (Ch. 120933A) ....(PCB 1175-3) 1048–1
●13C51 (Ch. 120933B) (Similar to Chassis) 1048–1
●13C51 (Ch. 120933E) ....(PCB 1175-3) 1048–1
★16EP01W (Ch. T10K10-1C) 1173–1
●16FP01/02W (Ch. T7K3-1A) 1140–POM
★18EP01W (Ch. 920) 1181–1
★18EP02W (Ch. 930) 1181–1
★18EP03W (Ch. 4K16) .1164–POM
●19FP00 (Ch. T25H4-1A) 1140–POM
●19FP01 (Ch. T7K3-1A) 1140–POM
●19FP02W (Ch. T7K3-1B) 1140–POM
●19FP03W (Ch. T8K3-1B) 1140–POM
●19FP04/05W (Ch. 11H5) 1170–POM
●19P85W (Ch. 120969A) ..1112–2
●19P86 (Ch. 120948) ....(PCB 1175-3) 1048–1
★20C07W (Ch. 120919A) ....PCB 1165-4) 1063–1
★20EC01W (Ch. 4K16) .1164–POM
●22FT01W/FC01W/FC02M/FC03S (Ch. 12H5) ..1164–POM
★23EC02M, 23EC03S (Ch. 120980A or B) 1141–1
★23EC04W/05M/06S (Ch. 5K16) 1164–POM
★23ET01W (Ch. 5K16) .1164–POM
★25EC01W/02M/03S/04W/05S (Ch. 6K2000-1) ...1199–2
★26C52W/53M/54S (Ch. (120921A,B) (PCB 1165-4) 1063–1
★26C59W (Ch. 120974B) (Similar to Chassis) 1104–2
★26K16W (Ch. 120923A,B,121007)
For TV Chassis ....(PCB 1165-3) 1063–1
For Radio Chassis 1151–5
★26K17S (Ch. 120923A,B,121003)
For TV Chassis ....(PCB 1165-3) 1063–1
For Radio Chassis 1002–5
★26T08W (Ch. 120921A) ....(PCB 1165-3) 1063–1
★26T10W (Ch. 120924A) Similar to Chassis) 1104–2
★29P14W (Ch. 120916A,B) ....(PCB 1165-3) 1063–1
★29P15W (Ch. 120972A, 471965, 471918)
For TV Chassis ....(PCB 1165-3) 1063–1
For Remote Chassis . .1141–1A
31L57B 1103–4
31L67/68W 1179–3
31L72W 1179–3
31L75W 1184–4
31T62/63W 1179–3
31T68W 1179–3
32P27/28/29/30 (Ch. 120966) 1187–4
32P31 (Ch. 120967) 1191–4
32P32 (Ch. 120968) 1185–4
33C45W (Ch. 121008) .. 1153–4
33C46MH/47W/48S (Ch. 121007) 1151–5
33C51W (Ch. 121007) . 1151–5
●Ch. T2L2-1A 1140–POM
●Ch. T2R2-1A 1176–POM
●Ch. T8K3-1B 1140–POM
★Ch. T10K10-1C,-1D (Run 16) 1173–1
●Ch. T25H4-1A 1140–POM
★Ch. 4K16 ....1164–POM
★Ch. 5K16 ....1164–POM
★Ch. 6K2000-1 1199–2
●Ch. 11H5 ....1170–POM
●Ch. 12H5 ....1164–POM
★Ch. 920 1181–1
★Ch. 930 1181–1
●Ch. 120905A ....(PCB 1152-4) 1057–1
★Ch. 120916A,B ....(PCB 1165-3) 1063–1
★Ch. 120919A ....(PCB 1165-3) 1063–1
★Ch. 120921A,B ....(PCB 1165-3) 1063–1
★Ch. 120923A,B ....(PCB 1163-5) 1063–1
●Ch. 120933A,E ....(PCB 1175-3) 1048–1
●Ch. 120934A/935A,C ....(PCB 1152-4) 1057–1
●Ch. 120948 (PCB 1175-3) 1048–1
Ch. 120966 1187–4
Ch. 120967 1191–4
Ch. 120968 1185–4
★Ch. 120972A (PCB 1165-3) 1063–1
★Ch. 120974B (Similar to Chassis) 1104–2
★Ch. 120980A,B 1141–1
Ch. 121007 1151–5
Ch. 121008 1153–4

F

FANON-MASCO
Fanon Electronic Industries
100 Hoffman Place
Hillside, New Jersey 07205

SFT-400 ....CB–35
SFT-500 ....CB–35
SFT-600 ....CB–31
SFT-800A CB–34

FISHER
Fisher Radio Corp.
11-40 45th Road
Long Island City, N.Y. 11101

R-200-B (Beginning with Serial #20001) 1139–SED
440-T (Serial #20001 thru 29999) 1094–SED

FORD
(See Auto Radio and Recorder Listings)

G

GENERAL ELECTRIC
For TV Models
General Electric Company
College Blvd.
Portsmouth, Virginia 23705

For Radio and Phonograph Models
General Electric Company
1101 Broad Street
Utica, New York 13501

A308g (Ch. PK60) 1194–4
A435g,h (Ch. TU240-13,T20G) (Similar to Chassis) 1033–3
A501g,h (Ch. TU240-2,T20F) 1033–3
A534g (Similar to Chassis) 1072–5
A610A 1168–SED
A772g (Similar to Chassis) 1072–5
C122h,k (Ch. T2P) 1192–4
C251g,h/252g/253g (Ch. TU240-5,T20F) (Similar to Chassis) 1033–3
C309g (Ch. PK60) 1194–4
C345g,h (Ch. TU240-13,T20G) (Similar to Chassis) 1033–3
C374g (Ch. TU240-1,T7NK)
For Radio Ch. 1033–3
For Amp Ch. (Similar to).979—5
C378g (Ch. TU240-1, T20F) 1033–3
C414g,h (Ch. TU240-13,T20G) (Similar to Chassis) 1033–3
C522m (Similar to Chassis) 1078–4
C2544A 1149–3
C4505A,B 1149–3
C4510A,C4511A 1149–3
C4515A 1149–3
●CAM722BG-A1 (Ch. A1) ....(PCB 1154-4) 1015–1
★CAM909EWD (Ch. KE-II) .1177–2
★CBM250NWD-2 (Ch. N-2) 1158–POM
★CBM258CWD (Similar to ....PCB 953-3) 903—1
★CBM261CWD-1 (Ch. C-1) ....(PCB 1175-3) 1100–2
★CBM264CWD-1 (Ch. C-1) ....(PCB 1175-3) 1100–2
★CBM271CWD-1 (Ch. C-1) ....(PCB 1175-3) 1100–2
★CBM610EWD (Ch. KE) ....(PCB 1144-3) 1028–1
★CBM906EWD (Ch. KE) ....(PCB 1144-3) 1028–1
★CBM909EWD (Ch. KE) ....(PCB 1144-3) 1028–1
★CCM610EWD (Ch. KE) ....(PCB 1144-3) 1028–1
F535h,k (Ch. TU240-13,T20G) (Similar to Chassis) 1033–3
G478g (Ch. TU240-12, T20G) 1033–3
G502g,h/503g (Ch. TU240-2,T20F) 1033–3
G572g (Ch. TU240-1, T20F) 1033–3
G778g (Ch. TU540-1, T30G) 1078–4
●M151SBK-2/152SBN-2, SGL-2 (Ch. S-2) ....(PCB 1152-4) 965—1
●M157SBK-2/158SCG-2/159SBL-2,SBN-2 (Ch. S-2) ....(PCB 1152-4) 965—1
●M161SOL-2,SSG-2/162SWD-2 (Ch. S-2) ....(PCB 1152-4) 965—1
●M165SWD-2 (Ch. S-2) ....(PCB 1152-4) 965—1
●M168SWD-2 (Ch. S-2) ....(PCB 1152-4) 965—1
●M181SBN-2 (Ch. S-2) ....(PCB 1152-4) 965—1
●M186SCN-2 (Ch. S-2) ....(PCB 1152-4) 965—1
●M719WD-A2 (Ch. A2) 1196–1
●M731WD-A2/733MP-A2 (Ch. A2) 1196–1
●M761WD-A2 (Ch. A2) 1196–1
★M806EWD,M807EWD (Ch. KE) ....(PCB 1144-3) 1028–1
★M816EWD (Ch. KE) ....(PCB 1144-3) 1028–1
★M881EWD/882EMP/883EPN (Ch. KE-II) 1177–2
★M885EWD/886EMP/887EPN (Ch. KE-II) 1177–2
★M903EWD (Ch. KE-II) ...1177–2
★M908EWD,M909EWD (Ch. KE) ....(PCB 1144-3) 1028–1
★M910EWD (Ch. KE-II) ...1177–2
★M910LWD-1/911LMP-1/913LPN-1 (Ch. C-1, L-1) ....(PCB 1175-3) 1100–2
★M914EWD/915EMP (Ch. KE-II) 1177–2
★M917EWD (Ch. KE) ....(PCB 1144-3) 1028–1
★M918EPN (Ch. KE-II) 1177–2
★M921EWD (Ch. KE) ....(PCB 1144-3) 1028–1
★M929EAP (Ch. KE) ....(PCB 1144-3) 1028–1
★M971EWD/972EMP/973EPN (Ch. KE-II) 1177–2
★M974EWD/975EMP/977EPN (Ch. KE-II) 1177–2
★M981EWD (Ch. KE-II) ...1177–2
★M986EAP/987EPN/988EPN (Ch. KE-II) 1177–2
P350g/351g (Ch. T2P) 1192–4
P743k/744k (Ch. T7N-J) ..979—5
P771g,h (Similar to Chassis) 1033–3
P1820L/1821L (Similar to page 85) TSM–85
P2700 ....1181–SED
P2760A,B TSM–122
P2812A TSM–121
P2820A TSM–121
P2840B TSM–124
P2860A TSM–123
P2870A TSM–127
P2880A TSM–124
P2970A TSM–125
P4700A TSM–127
P4710A TSM–123
R475h, R476g (Ch. PK3) .TSM–123

GENERAL ELECTRIC—Cont.

R577g (Ch. PK5) TSM–125
RC1616B (Ch. TU20C) (Similar to Chassis) .....667—6
●SM150SSD-2,SVY-2/152SAV-2 (Ch. S-2) ....(PCB 1152-4) 965—1
T265g,h (Ch. T2P) 1192–4
T361h,j,k,m/362h,j,k (Ch. T2P) 1192–4
T440k,m (Ch. T2P) 1192–4
T541h (Ch. T7N-J) ......979—5
T1234B (Similar to Chassis) ....836—8
●TR120RVY (Ch. R-1) ..1158–POM
V422p/423p (Ch. T1N1) ..890—5
V636J (Ch. T1N1) ......890—5
V931k,m,p,r,s/933k,m,p,r,s/934h,i,p,r,s (Ch. T2P) ..1192–4
V941p,r,s (Ch. T2P) 1192–4
V944h,j,m,p,s/945h,j,m,r/946m,p,g,h (Ch. T2P) ..1192–4
●WM020WEB-1 (Ch. W-1) 1158–POM
●WM151SBK-2 (Ch. S-2, 1971 Prod.) 1163–1
●WM153SAV-2,SGY-2/154SEB-2/155SEB-2/157SBK-2/158SCG-2 (Ch. S-2, 1971 Prod.) ..1163–1
●WM160SEB-2, SMD-2,SWD-2 (Ch. S-2, 1971 Prod.) ..1163–1
●WM163SWD-2/164SEB-2 (Ch. S-2, 1971 Prod.) ..1163–1
●WM169SWD-2 (Ch. S-2, 1971 Prod.) 1163–1
●WM175SPN-2 (Ch. S-2, 1971 Prod.) 1163–1
●WM193SAV-2,SFR-2,SGY-2/194SWD-2/195SEB-2/197SWD-2 (Ch. S-2, 1971 Prod.) ..1163–1
★WM212HAV-3 (Ch. H-3) ..1094–1
★WM214HVY-3, HWD-3 (Ch. H-3) .....(PCB 1196-4) 1094–1
★WM216HEB-3, HWD-3 (Ch. H-3) .....(PCB 1196-4) 1094–1
★WM217HAV-3,HHG-3, (Ch. H-3) 1094–1
★WM217HWD-3 (Ch. H-3) .1094–1
★WM218HBW-3,HWD-3/219HWD-3 (Ch. H-3) (Similar to Chassis) 1094–1
★WM220HSG-3 (Ch. H-3) ....(PCB 1196-4) 1094–1
★WM226HWD-3 (Ch. H-3) ....(PCB 1196-4) 1094–1
★WM229HWD-3 (Ch. H-3) ....(PCB 1196-4) 1094–1
★WM238GWD-1 (Ch. G-1) (Similar to PCB 1057-3) 973—2
★WM257NWD-2 (Ch. N-2) 1158–POM
★WM264CWD-1 (Ch. C-1) ....(PCB 1175-3) 1100–2
★WM274CWD-1 (Ch. C-1) ....(PCB 1175-3) 1100–2
★WM277CWD-1/278CCT-1 (Ch. C-1) .(PCB 1175-3) 1100–2
★WM279CCT-1, CEA-1, CMD-1 (Ch. C-1) ....(PCB 1175-3) 1100–2
●WM410EB-D2 (Ch. D2) 1158–POM
●WM430HG-D2/431EB-D2 (Ch. D2) 1158–POM
●WM436WD-D2/437WD-D2 (Ch. D2) 1158–POM
●WM440WD-D2/441WD-D2 (Ch. D2) 1158–POM
●WM505SGY-2/506SVY-2/507SEB-2 (Ch. S-2, 1971 Prod.) 1163–1
●WM510SEB-2 (Ch. S-2, 1971 Prod.) 1163–1
●WM521SEB-2/522SEB-2/524SWD-2 (Ch. S-2, 1971 Prod.) 1163–1
●WM527SWD-2 (Ch. S-2, 1971 Prod.) 1163–1
★WM818CWD-1 (Ch. C-1) ....(PCB 1175-3) 1100–2
●XCM719WD-A1 (Ch. A1) ....(PCB 1154-4) 1015–1
●XSM506SVY-2 (Ch. S-2) ....(PCB 1152-4) 965—1
●Ch. A-1 ....(PCB 1154-4) 1015–1
●Ch. A2 1196–1
★Ch. C-1 ....(PCB 1175-3) 1100–2
●Ch. D2 ....1158–POM
★Ch. H-3 ....(PCB 1196-4) 1094–1
★Ch. K-11 ....1140–POM
★Ch. KE ....(PCB 1144-3) 1028–1
★Ch. KE-II 1177–2
★Ch. L-1 ....(PCB 1175-3) 1100–2
★Ch. N-2 ....1158–POM
Ch. PK3 ....TSM–123
Ch. PK5 ....TSM–125
Ch. PK60 1194–4
●Ch. R-1 ....1158–POM
●Ch. S-2 ....(PCB 1152-4) 965—1
●Ch. S-2 (1971 Prod.) 1163–1
●Ch. S-3 ....1188–POM
Ch. T2P 1192–4
●Ch. W-1 ....1158–POM

GENERAL MOTORS CORP.
(GMC) (See Auto Radio and Recorder Listings)

GIBBS
(See Auto Radio and Recorder Listings)

GROMMES
Precision Electronics, Inc.
9101 King Street
Franklin Park, Ill. 60131

LJ8 ....1168–SED

H

HAMMOND
(See Auto Radio and Recorder Listings)

HARMON-KARDON
Harmon-Kardon Inc.
55 Ames Court
Plainview, L.I., N.Y. 11803

F-50X 1153–SED

NOTE: ● Denotes Television Receiver. ★ Denotes Color Television Receiver. AOR Denotes Available On Request. AR Denotes Auto Radio Series Volume. CB Denotes CB Radio Series Volume. HTP Denotes Home Tape Player Series Volume. MHF Denotes Modular Hi-Fi Series Volume. PCB Denotes Production Change Bulletin. POM Denotes Bonus Schematic in Photofact-of-the-Month Package—Unavailable After Month Of Issue. SED Denotes Special Equipment Data. TR Denotes Tape Recorder Series Volume. TSM Denotes Transistor Radio Series Volume.

Set No. | Folder No.

HITACHI
(Also See Auto Radio and Recorder Listings)
Hitachi Sales Corporation of America
48-50 34th Street
Long Island City, N.Y. 11101

★CFA-440 ....1176-POM
★CFA-460 1195-1
★CFA-461 ....1194-POM
★CNU-870 1196-2
★CNU-871 ....1176-POM
★CNU-880 1195-1
★CNU-881 ....1194-POM
★CNU-890 1195-1
★CNU-891 ....1194-POM
★CSU-690 1196-2
★CSU-691 ....1176-POM
★CSU-790 ....1194-POM
★CWU-210 1187-1
●IU-52/53 ....1158-POM
●IU-54 ....1152-POM
K-760H 1138-5
KH-1450P 1181-SED
KS-1220H 1147-3
KS-2400H MHF-13
●SU-85 ....1158-POM
TPQ-201 ....TSM-119
●TU-71 1166-2

HOWARD (TMA)
Television Manufacturers of America
Howard Division
1020 Noel Avenue
Wheeling, Illinois 60090

AS-8108 1182-4

I

IMPERIAL
(See Auto Radio Listing)

INTERNATIONAL
(See Auto Radio Listing)

J

JACOBSEN
(See Auto Radio Listing)

JEEP
(See Auto Radio Listing)

JERROLD
Jerrold Electronics Corp.
The Jerrold Building
15th & Lehigh
Philadelphia, Pa. 19132

DSB-1071 ....1187-SED
DSS-2 thru 13 ....1190-SED
DSS-FM 1190-SED
DSU-105 ....1181-SED
TAC-1 ....1187-SED
UA-420 ....1179-SED
UCF-14-83 ....1179-SED
UMF-14-83 ....1179-SED
3441 ....1183-SED
3661 ....1190-SED
3880 ....1180-SED
4330 ....1183-SED
4400 ....1181-SED

JOHN DEERE
(See Auto Radio Listing)

JOHNSON
E. F. Johnson Company
11-32nd Avenue S.W.
Waseca, Minnesota 56093

Messenger 102 ....CB-32
242-102 ....CB-32

JULIETTE
(Also See Recorder Listing)
Topp Electronics, Inc.
4201 N.W. 77th Ave.
Miami, Florida 33166

CTP-2010 ....TSM-120
CTP-2076 ....TSM-119
FCR-1235/1237 1158-5
FCR-1265 1150-6
FCR-1275 1160-5
FR-1245/1247 1158-5
R-2424X MHF-14
RPA-80 1142-5
RPF-85 1162-4
RPF-95S 1170-4
RT-2626X MHF-15

JVC
(See Nivico)

K

KARMANN GHIA
(See Auto Radio Listing)

KLH
KLH Research & Development Corp.
30 Cross Street
Cambridge, Mass. 02139

Sixteen-F 1169-SED

KNIGHT
Allied Radio Shack
2617 West Seventh Street
Fort Worth, Texas 76107

KN-150M (35DU819) 1169-SED
KN-3036 (35DU881) 1156-SED
35DU819 ....1169-SED
35DU881 ....1156-SED

L

LAFAYETTE
(Also See Auto Radio and Recorder Listings)
Lafayette Radio Electronics
111 Jericho Turnpike
Syosset, L.I., New York 11791

Comstat 25B (99-32146WX) CB-33
DYNA-COM 5a CB-35
HB-525D (99-31759WX) CB-31
LR-20 (99-3549) MHF-12
LR-808 ....MHF-16
LRK-1600 ....MHF-15
LSC-25 (24-03236WX) MHF-9

LAFAYETTE—Cont.

LSC-100 (24-02907WX) MHF-11
LSC-888 ....MHF-17
Micro-12 ....CB-34
XCL-55 (24-03210WX) 1166-4
17-01846WX MHF-16
17-01879 1167-3
24-02907WX MHF-11
24-03210WX 1166-4
24-03228WX MHF-17
24-03236WX MHF-9
99-3549 ....MHF-12
99-02172WX MHF-15
99-32146WX CB-33
99-3564 1139-4
99-31759WX CB-31
612 (See page 25) MHF-9

LINCOLN
(See Auto Radio and Recorder Listings)

LLOYD'S
(Also See Recorder Listing)
Lloyd's Electronics of California, Inc.
18601 South Susana Road
Compton, California 90221

1J44G-37A 1161-4
1J61G-07A 1186-4
1V56W-34A MHF-10
8R35-37A 1176-SED
9F13-08 ....MHF-13
9H32-16A 1176-5
9J45G-37B 1166-5
9M19 ....MHF-12
9M20-07A MHF-15
9M39-94A MHF-13
9M73 ....MHF-12

M

MACY
Macy Dept. Stores
Herald Square
New York, N.Y.

5007 (Similar to Chassis) .1046-8

MAGNAVOX
(Also See Recorder Listing)
The Magnavox Company
Bueter Road
Fort Wayne, Indiana 46803

●T915 Series (PCB 1003-3, 1059-3, 1189 3) 819—3
1P2505 ....TSM-126
1P2506 ....TSM-126
1P9281 ....MHF-16
1R1205 ....TSM-120
1R1226 ....TSM-124
1R1705, 1R1706 (Runs 2,3) 1187-5
1R1708 ....MHF-14
1V9032 ....TSM-126
2P9281 ....MHF-16
Chassis A507-01-AA, A507-01-BA 1171-4
Chassis A509-01-AA, A509-02-AA 1154-6
Chassis A511-01-AA (Runs 1,2) MHF-16
Chassis A576-03-BA 1144-1D
Chassis A576-73-CA 1192-6
Chassis R228-01-BA 1144-1C
Chassis R230-01-AA, R230-03-AA 1156-4
Chassis R230-71-AA, R230-73-AA 1156-4
Chassis R235-01-AA, R235-02-AA MHF-13
Chassis R235-02-AA,-AB (Similar to Page 81) MHF-13
Chassis R236-01-AA 1192-5
Chassis R238-01-AA 1192-5
Chassis R265-06-AA MHF-10
Chassis R270-01-AA, R270-02-AA,R270-03-AA, R270-04-AA 1148-5
Chassis R270-71-AA, R270-72-AA,R270-73-AA, R270-74-AA 1148-5
Chassis R271-01-AA, R271-02-AA MHF-14
Chassis R271-71-AA, R271-72-AA MHF-14
Chassis R273-01-AA, R273-02-AA 1155-4
Chassis R273-71-AA, R273-72-AA 1155-4
Chassis R274-01-AA, R274-02-AA,R274-03-AA, R274-04-AA 1155-4
Chassis R274-71-AA, R274-72-AA,R274-73-AA, R274-74-AA 1155-4
★Chassis T904-01-21 (PCB 1158 4) 796—3
★Chassis T904-04-HB,-IB (PCB 1158-4) 796—3
★Chassis T904-04-IB (PCB 1158 4) 796—3
★Chassis T904-04-31,-41,-51,-61 (PCB 1158-4) 796—3
★Chassis T904-07-HB,-IB (PCB 1158-4) 796—3
★Chassis T904-07-31,-41,-51,-61 (PCB 1158-4) 796—3
★Chassis T904-08-HB,-IB (PCB 1158 4) 796—3
★Chassis T904-08-31,-41,-51,-61 (PCB 1158-4) 796—3
★Chassis T904-09-HB,-IB (PCB 1158-4) 796—3
★Chassis T904-09-31,-41,-51,-61 (PCB 1158-4) 796—3
★Chassis T904-10-HB,-IB (PCB 1158-4) 796—3
★Chassis T904-10-31,-41,-51,-61 (PCB 1158-4) 796—3
★Chassis T904-12-HB,-IB (PCB 1158-4) 796—3
★Chassis T904-12-21,-41,-51,-61 (PCB 1158-4) 796—3
★Chassis T904-13-HB,-IB (PCB 1158-4) 796—3
★Chassis T904-13-41,-51,-61 (PCB 1158-4) 796—3
★Chassis T904-14-HB,-IB (PCB 1158-4) 796—3
★Chassis T904-14-41,-51,-61 (PCB 1158-4) 796—3
★Chassis T904-15-HB,-IB (PCB 1158-4) 796—3

MAGNAVOX—Cont.

★Chassis T904-15,-41,-51, 61 (PCB 1158-4) 796—3
★Chassis T904-16-HB (PCB 1158-4) 796—3
★Chassis T904-17-HB,-IB (PCB 1158-4) 796—3
★Chassis T904-17-51 (PCB 1158-4) 796—3
★Chassis T904-18-HB,-IB (PCB 1158-4) 796—3
★Chassis T904-19-HB,-IB,-JC (PCB 1158 4) 796—3
★Chassis T904-20-IB (PCB 1158 4) 796—3
★Chassis T904-21-IB (PCB 1158 4) 796—3
★Chassis T904-22-IB (PCB 1158 4) 796—3
★Chassis T904-23-IB (PCB 1158 4) 796—3
★Chassis T904-24-IB (PCB 1158 4) 796—3
●Chassis T908-01-AA,-BA, -CA,-DA,-EA,-FA,-HC (PCB979-3, 1181 3) 812—2
●Chassis T908 02-AA, -BA,-CA,-DA,-EA (PCB979-3, 1181 3) 812—2
●Chassis T908-03-AA,-BA,-CA (PCB979-3, 1181 3) 812—2
●Chassis T908-04-BA,-CA, -DA,-EA,-FA,-HC (PCB979-3, 1181-3) 812—2
●Chassis T908-05-AA,-BA, -CA,-DA,-EA,-FA,-HC (PCB979-3, 1181-3) 812—2
●Chassis T908-06-BA,-CA, -DA,-EA,-FA,-HC (PCB979-3, 1181-3) 812—2
●Chassis T908-07-BA,-CA, -DA,-EA,-FA,-HC (PCB979-3, 1181-3) 812—2
●Chassis T908-08-CA, -DA,-EA,-FA,-HC (PCB979-3, 1181-3) 812—2
●Chassis T908-09-DA, -EA,-FA,-HC (PCB979-3, 1181-3) 812—2
●Chassis T908-10-BA, -CA,-DA,-EA,-FA,-HC (PCB979-3, 1181-3) 812—2
●Chassis T908-11-CA,-DA,-EA,-FA (PCB979-3, 1181-3) 812—2
●Chassis T908-12-CA,-DA,-EA,-FA (PCB979-3, 1181-3) 812—2
●Chassis T908-13-CA,-DA,-EA,-FA (PCB 979-3,1181-3) 812—2
●Chassis T908-14-AA,-BA, -CA,-DA,-EA,-FA,-HC (PCB979-3, 1181-3) 812—2
●Chassis T908-15-AA,-BA, -CA,-DA,-EA,-FA,-HC (PCB979-3, 1181-3) 812—2
●Chassis T908-16-AA,-BA, -CA,-DA,-EA,-FA,-HC (PCB979-3, 1181-3) 812—2
●Chassis T915 01-AA (PCB 1003-3) 819—3
●Chassis T915-01-BA,-CA (PCB 974-4) 819—3
●Chassis T915-02-AA,-BA,-CA,-DA (PCB 1003-3) 819—3
●Chassis T915-02-CA,-DA (PCB 1003-3, 1059-3) 819—3
●Chassis T915-03-AA (PCB 1003-3) 819—3
●Chassis T915-04-AA,-BA,-CA,-DA (PCB 1003-3) 819—3
●Chassis T915-04-BA,-CA,-DA (PCB 1003-3, 1059-3) 819—3
●Chassis T915-05-CA,-DA (PCB 1003-3) 819—3
●Chassis T915-05-CA,-DA (PCB 1003-3, 1059-3) 819—3
●Chassis T915-06-CA,-DA (PCB 1003-3) 819—3
●Chassis T915-06-CA,-DA (PCB 1003-3, 1059 3) 819—3
●Chassis T915 07-DA (PCB 1003-3) 819—3
●Chassis T915-07-DA (PCB 1003-3, 1059-3) 819—3
●Chassis T925-01-BA,-CB, T925-02-AA,T925-03-AA, T925-04-AA,T925-05-AA (PCB 1169-3) 927—1
●Chassis T941-01-AA, T941-02-AA 1150-2
●Chassis T942-01-AA 1176-2
●Chassis T944-01-AB,-BB, T944-02-AB,-BB (Similar to Chassis) 1085-1
●Chassis T944 03-AB,-BE, T944-04-AB,-BB (Similar to Chassis) 1085-1
●Chassis T944-05-AA,-AB,-BA,-BB, T944-06-AA,-AB,-BA,-BB (Similar to Chassis) 1085-1
●Chassis T944-07-AA,-AB,-BA,-BB, T944-08-AA,-AB,-BA,-BB (Similar to Chassis) 1085-1
●Chassis T945-01-AB,-BA,-BB (Similar to Chassis) 1099-1
●Chassis T945-04-AA,-AB,-BA,-BB (Similar to Chassis) 1099-1
●Chassis T946-01-AA,-EA,-FA, T946-02-AA,-EA,-FA, T946-03-AA,-EA,-FA, T946-04-AA,-EA,-FA 1182-3
●Chassis T946 01-DB,-EB,-FB,-JB, T946-02-DB,-EB,-FB, JB, T946-03-DB,-EB,-FB, JB, T946-04-DB, EB, FB, JB (Similar to Chassis) 1182-3
●Chassis T946-05-AA,-EA,-FA, T946-06-AA,-EA,-FA, T946-07-AA,-EA,-FA 1182-3
●Chassis T946-05-DB,-EB,-FB, -JB, T946-06-DB,-EB,-FB,-JB, T946-07-DB,-EB,-FB, JB (Similar to Chassis) 1182-3
●Chassis T946-71-AA,-EA,-FA, T946-72-AA,-EA,-FA, T946-73-AA,-EA,-FA, T946-74-AA,-EA,-FA 1182-3
●Chassis T946-71-DB,-EB,-FB,-JB, T946-72-DB,-EB,-FB,-JB, T946-73-DB,-EB,-FB, JB (Similar to Chassis) 1182-3
●Chassis T946-75-AA,-EA,-FA, T946-76-AA,-EA,-FA, T946-77-AA,-EA,-FA 1182-3

MAGNAVOX—Cont.

●Chassis T946-76-DB,-EB,-FB, -JB (Similar to Chassis) .1182-3
★Chassis T947-01-AA 1179-1
★Chassis T950-01-AA thru AD,BA thru BD,CA thru CD, DA thru DD 1189-1
★Chassis T950-02-AA thru AD, BA, thru BD,CA thru CD, DA thru DD 1189-1
★Chassis T950-03-AA thru AC, BA thru BC,CA thru CC, DA thru DC 1189-1
★Chassis T950-04-AA thru AD, BA thru BD,CA thru CD, DA thru DD 1189-1
★Chassis T950-05-AA thru AD, BA thru BD,CA thru CD, DA thru DD 1189-1
★Chassis T950-06-AA thru AC, AZ,BA thru BC,CA thru CC, DA thru DC 1189-1
★Chassis T950-07-AA thru AC, AZ,BA thru BC,CA thru CC, DA thru DC 1189-1
★Chassis T950-08-AA thru AD, BA thru BD,CA thru CD, DA thru DD 1189-1
★Chassis T950-09-AA thru AD, BA thru BD,CA thru CD, DA thru DD 1189-1
★Chassis T950-10-AA thru AD, BA thru BD,CA thru CD, DA thru DD 1189-1
★Chassis T950-11-AA thru AD, BA thru BD,CA thru CD, DA thru DD 1189-1
★Chassis T950-12-AA thru AC, BA thru BC,CA thru CC, DA thru DC 1189-1
★Chassis T950-13-AA thru AC, BA thru BC,CA thru CC, DA thru DC 1189-1
★Chassis T950-14-AA thru AC, AZ,BA thru BC,CA thru CC, DA thru DC 1189-1
★Chassis T950-15-AA,AC, BA,BC 1189-1
★Chassis T950-16-AA thru AD, BA thru BD,CA thru CD, DA thru DD 1189-1
★Chassis T950-70-AA thru AD, BA thru BD,CA thru CD, DA thru DD 1189-1
★Chassis T950-71-AA thru AC, BA thru BC,CA thru CC, DA thru DC 1189-1
★Chassis T950-72-AA thru AD, BA thru BD,CA thru CD, DA thru DD 1189-1
★Chassis T950-73-AA thru AC, BA thru BC,CA thru CC, DA thru DC 1189-1
★Chassis T950-74-AA thru AC, BA thru BC,CA thru CC, DA thru DC 1189-1
★Chassis T950-75-AA thru AD, BA thru BD,CA thru CD, DA thru DD 1189-1
★Chassis T950-77-AA thru AD, BA thru BD,CA thru CD, DA thru DD 1189-1
★Chassis T950-79-AA thru AC, BA thru BC,CA thru CC, DA thru DC 1189-1
★Chassis T950-80-AA thru AD, BA thru BD,CA thru CD, DA thru DD 1189-1
★Chassis T950-81-AA thru AD, BA thru BD,CA thru CD, DA thru DD 1189-1
★Chassis T950-82-AA thru AD, BA thru BD,CA thru CD, DA thru DD 1189-1
★Chassis T950-83-AA,AC,BA, BC 1189-1
★Chassis T951-01-AA,-AB,-AX,-BA, -BB,-BX,-CA,-CB,-CX, -DA,-DB,-DX 1180-1
★Chassis T951-02-AA,-AB, -AC,-AZ,-BA 1180-1
★Chassis T951-03-AA,-AX,- BA,-BB,-BX,-CA,-CX, -DA,-DB 1180-1
★Chassis T951-C4-AA, -AB,-AC,-BA 1180-1
★Chassis T951-05-AA, -AB,-AC,-BA 1180-1
★Chassis T951-06-AA,-AC, -BA,-CA,-DA,-DC 1180-1
★Chassis T951-07-AA, -BA,-BB,-CA,-DA 1180-1
★Chassis T951-08-AA, -AB,-AC,-BA 1180-1
★Chassis T951-09-AA, -AB,-AC,-BA 1180-1
★Chassis T951-10-AC, -CC,-DC 1180-1
★Chassis T951-11-AC, -CC,-DC 1180-1
★Chassis T951-19-AC 1180-1
★Chassis T951-20-AA 1180-1
★Chassis T951-70-AB,-AC ..1180-1
★Chassis T951-71-AB,-AC ..1180-1
★Chassis T951-72-AB,-DC ..1180-1
★Chassis T951-73-AB,-CB ..1180-1
★Chassis T951-74-AB,-AC ..1180-1
★Chassis T951-75-AB 1180-1
★Chassis T951-76-AB 1180-1
★Chassis T951-77-AB 1180-1
★Chassis T951-78-AC 1180-1
★Chassis T952-01-AA ..1164-POM
★Chassis T952-02-AA ..1164-POM
●Chassis 704037-1 (TV Remote Control Unit) 1182-3A
★Chassis 704041-1 (TV Remote Control Unit) 1144-1B
●Chassis 704053-4 (TV Remote Control Unit) 1182-3A
★Chassis 704054-1 (TV Remote Control Unit) 1144-1B
★Chassis 704058-1 thru 704058-12 (TV Remote Control Unit) 1180-1A
★Chassis 704059-1 (TV Remote Control Unit) 1189-1A
★Chassis 704060-1 (TV Remote Control Unit) 1189-1A
★Chassis 704061-1 (TV Remote Control Unit) ..1180-1A

MALLORY
(See Recorder Listing)

MASTERWORK
(Also See Auto Radio and Recorder Listings)
Masterwork Audio Products
1080 Goffle Road
Hawthorne, New Jersey 07506

M51 1188-5
M300, M302 1177-4
M2404 1152-6
M2415 ....MHF-10
M3224 1173-3
M3226 ....TSM-119
M3306 ....TSM-121
M3308 ....TSM-121
M3316 ....TSM-123
M4596 ....1160-SED
M4710 ....MHF-10
M5134/35/36 1161-5
M7050 ....MHF-17

MAYFAIR ELECTRONICS
(See Recorder Listing)

McMARTIN
McMartin Industries, Inc.
605 N. 13th Street
Omaha, Nebraska 68102

LX-40 ....1160-SED

MEDALLION
(See Changer and Recorder Listings)

MERCURY
(See Auto Radio and Recorder Listings)

MERCURY RECORDS
(Also See Recorder Listing)
Pax, Ltd.
5125 Church Street
Skokie, Illinois 60076

10-1002 ....TSM-126

METEOR
Sears, Roebuck & Company
303 East Ohio Street
Chicago, Illinois 60611
Address Change

MGA
Mitsubishi International Corp.
7045 North Ridgeway Ave.
Lincolnwood, Illinois 60645

●BB-090 (Ch. 2N-U1) 1198-2
●BS-130 ....1146-POM
●BT-120 1194-1
●BT-150 ....1146-POM
★CH-120 (Ch. 3D81) 1176-3
★CH-140 (Ch. 3D81) 1176-3
★CH-180/-181 (Ch. 3B81) ..1197-1
★CM-250A/251A/252A 1171-1
★Ch. T511, T512, T513, T514 1171-1
●Ch. 2N-U1 1198-2
★Ch. 3B81 1197-1
★Ch. 3D81 1176-3

MIDLAND
(Also See Recorder Listing)
Micotron
P.O. Box 1903
Kansas City, Missouri 64141

3DX5451 ....1167-SED
11-335 1139-5
13-133E CB-34
13-700 ....CB-31
13-724 ....CB-32
13-872 ....CB-31
13-873 ....CB-32
●15-114 1164-1
●15-116 1194-2
●15-119 1170-1
●15-126 1186-3
★15-215B 1167-1
19-350 ....1167-SED
19-544 ....MHF-9
19-545 ....MHF-11
19-640 ....MHF-9

MILLER (J. W.)
J. W. Miller Company
19070 Reyes Ave.
Compton, California 90221
(Address Change)

MILOVAC
Milovac International Co., Inc.
4215 West 45th Street
Chicago, Illinois 60632

●BW-75,-1 1190-2
★CT-180 1158-1
★CT-711 1159-1

MONTCLAIR
Oklahoma Tire & Supply
P.O. Box 885
2619 E. Admiral Place
Tulsa, Oklahoma

●C5340W (Similar to Chassis) ....858—1
●C5341W (Similar to Chassis) ....952—2
●C5345 (Similar to Chassis) 1048—1
●C5370MA (Similar to Chassis) ....858—1 or 952—2
★CC574W/575M (Similar to Chassis) ....1063—1
●P5010 (Similar to Chassis) 950—3
●P5020 (Similar to Chassis) 1056—2
●P5035 (Similar to Chassis) 838—2
●P5060 (Similar to Chassis) 1057—1
●P5075 (Similar to Chassis) (PCB 972-4) 838—2
●P5140 (Similar to Chassis) 1048—1
●P5180 (Similar to Chassis) (PCB 972-4) 838—2
●P5200 (Similar to Chassis) 1048—1
●T231M/232M (Similar to Chassis) ....658—1
●T233,M (Similar to Chassis) ....682—1 or 743—2
●T237,M/239M (Similar to Chassis) ....702—1
●T241,M/243,M/245,M/247 (Similar to Chassis) .702—1
●T251 (Similar to Chassis) ..743—2
●T5300W (Similar to Chassis) ....952—2 or 1048—1
●T5325W (Similar to Chassis) 858—1
●U236/238 (Similar to Chassis) ....702—1
●U240/242/244/246/248 (Similar to Chassis) ....702—1
★19C-564 (Similar to Chassis) ....859—2

MONTCLAIR—Cont.

★23C-572W/573M,MA (Similar to Chassis) ....871—3
●85-503/504 (Similar to Chassis) ....838—2
●85-505 (Similar to Chassis) ....756—2
●85-508 (Similar to Chassis) ....801—1 or 838—2
●85-509 (Similar to Chassis) 801—1
●85-510/511 (Similar to Chassis) ....743—2
●85-512 (Similar to Chassis) ....776 or 801—1
●85-514 (Early Prod.) (Similar to Chassis) ....702—1
●85-514 (Late Prod.) (Similar to Chassis) ....801—1
●85-515/516 (Similar to Chassis) ....801—1
●85-524 (Similar to Chassis) 702—1
●85-532 (Similar to Chassis) 800—2
●85-533/535/536 (Similar to Chassis) ....858—1
●85-538 (Similar to Chassis) 800—2
●85-540 (Similar to Chassis) (PCB 953-3) 702—1
●85-545 (Similar to Chassis) 774—1
●85-550 (Similar to Chassis) 702—1
●85-560 (Similar to Chassis) 774—1
★85-580/581 (Similar to Chassis) ..(PCB 955—3) 871—3

MOPAR
(See Auto Radio Listing)

MORSE ELECTRO PRODUCTS
(Also See Recorder Listing)
Morse Electro Products Corp.
101-10 Foster Avenue
Brooklyn, New York 11236

CR-8 1183-4
Ch. 11 1149-4
Ch. 13 1157-4
Ch. 14 1161-6
Ch. 16 1164-5
Ch. 18 1167-4
Ch. 21 1156-5
Ch. 21J 1186-5
Ch. 21K 1181-4
Ch. 22 ....MHF-16
Ch. 23 1148-6
Ch. 24 1163-5
Ch. 25 1143-4
Ch. 26 1182-5
Ch. 27M 1173-4
Ch. 64 1145-6
Ch. 71 1141-5
Ch. 74TN 1196-5
Ch. 75 1152-7
Ch. 76 1182-5
Ch. 81 1149-4
Ch. 83C 1153-5
Ch. 91 1156-5
Ch. 91J 1186-5
Ch. 91K 1181-4
Ch. 93M 1173-4

MOTOROLA
(Also See Auto Radio and Recorder Listings)
Motorola, Inc.
9401 West Grand Ave.
Franklin Park, Ill. 60131

●BL765FW/766FW (Ch. C22TS-611) (PCB 1161-3) 1004-2
●BP309GH-1 (Ch. C12TS-465) (PCB 1185-3) 1091-2
●BP317GU/318GW (Ch. C12TS-465) (PCB 1185-3) 1091-2
●BP402GU/403GW (Ch. C12TS-465) (PCB 1185-3) 1091-2
●BP523FN-1 (Ch. Q19TS-597) 1087-2
●BT756FG (Ch. C22TS-611) (PCB 1161-3) 1004-2
●BU759FW (Ch. C22TS-611) (PCB 1161-3) 1004-2
★CL893DM (Ch. L23TS-921B,C) 1031-1
★HP558GW (Ch. D18TS-929A, B) 1175-1
★HT618CH,CN (Ch. E20TS-918, THS-67225) For TV Ch. (PCB 1031-3) 880—2 For Radio Ch. 960-1A
MP11FN 1158-6
NP12FG 1158-6
PP190FN,-1,-2,-1-2 (Ch. CHS-3292,-1) 1163-6
PP191FE,-1,-2,-1-2 (Ch. CHS-3292,-1) 1163-6
PP238GA (Ch. HS-63230) (Similar to Chassis) ....911—5
SK5FW/6FP (Ch. CHC-62380) 1167-5
SK25FW (Ch. CHC-62376) 1167-5
TC2FH (Ch. FHT14) 1162-5
TP15GU TSM-123
TP20GN TSM-119
TT7FH (Ch. FHT13) 1162-5
★WL829GS (Ch. G23TS-915G) (Similar to Chassis) 1121-1
★WP457GN (Ch. 16TS-929) 1164-POM
★WP464GW (Ch. 16TS-929) 1164-POM
★WP467GWA (Ch. E16TS-929) 1164-POM
★WP553GN/554GW (Ch. 18TS-929) 1164-POM
★WP556GW (Ch. 18TS-929A, B) 1175-1
★WP557GW (Ch. C18TS-929A, B) 1175-1
★WP563GWA (Ch. F18TS-929) 1164-POM
★WT561FW (Ch. TS-934) ..1159-2
★WT678FW (Ch. TS-934) ..1159-2
★WT815GW/817GW (Ch. TS-934) 1159-2
★WU820FW/821FS/822FP (Ch. TS-934) 1159-2
★WU828GW (Ch. G23TS-915G) (Similar to Chassis) 1121-1
●XU770GS (Ch. 22TS-599B) (Similar to Chassis) 1134-1
●YBP317GU/318GW (Ch. YC12TS-465) (PCB 1185-3) 1091-2
●YBP402GU/403GW (Ch. YC12TS-465) (PCB 1185-3) 1091-2

NOTE: ● Denotes Television Receiver. ★ Denotes Color Television Receiver. AOR Denotes Available On Request. AR Denotes Auto Radio Series Volume. CB Denotes CB Radio Series Volume. HTP Denotes Home Tape Player Series Volume. MHF Denotes Modular Hi-Fi Series Volume. PCB Denotes Production Change Bulletin. POM Denotes Bonus Schematic in Photofact-of-the-Month Package—Unavailable After Month Of Issue. SED Denotes Special Equipment Data. TR Denotes Tape Recorder Series Volume. TSM Denotes Transistor Radio Series Volume.

Set No. Folder No.

MOTOROLA—Cont.

● ZD402GU (Ch. ZDC12TS-465) ....(PCB 1185-3) 1091-2
● ZW402GU (Ch. ZWC12TS-465) ....(PCB 1185-3) 1091-2
● Ch. C12TS-465A-00 thru D-01 .... (PCB 1185-3) 1091-2
★Ch. C18TS-929A-00 thru B-00 1175-1
● Ch. C22TS-611 ....(PCB 1161-3) 1004-2
Ch. CHC-62376 1167-5
Ch. CHC-62380 1167-5
Ch. CHS-3292,-1 1163-6
Ch. CHS-67295 1173-5
★Ch. D18TS-929A-00 thru B-00 1175-1
★Ch. E16TS-929 ......1164-POM
★Ch. F18TS-929 ......1164-POM
Ch. FHT13/14 1162-5
● Ch. Q19TS-597E-01 1087-2
★Ch. TS-934 1159-2
● Ch. YC12TS-465A-00 thru D-01 .... (PCB 1185-3) 1091-2
● Ch. ZDC12TS-465A-00 thru D-01 ....(PCB 1185-3) 1091-2
● Ch. ZWC12TS-465A-00 thru D-01 .... (PCB 1185-3) 1091-2
★Ch. 16TS-929 ....1164-POM
★Ch. 18TS-929A-00 thru B-00 1175-1
● Ch. 22TS-599B-00 (Similar to Chassis) 1134-1

N

NIVICO
(Also See Recorder Listing)
JVC America, Inc.
50-35 56th Road
Maspeth, N.Y. 11378

9810 ....MHF-9

O

OLDSMOBILE
(See Auto Radio and Recorder Listings)

OLYMPIC
Olympic Int'l. Ltd.
Service Dept.
89-89 Union Turnpike
Glendale, N.Y. 11227

F250AB 1173-SED
MA338 1165-5
MA345 1165-5
S100 1158-7
SA790 1147-4

OPEL
(See Auto Radio Listing)

P

PACE
Pace Communications Corp.
P.O. Box "P"
24049 South Frampton Ave.
Harbor City, Calif. 90710

TA2300/B CB-32
2376 ....CB-32

PACKARD BELL
(Also See Recorder Listing)
Teledyne Packard Bell Electronics
12333 West Olympic Blvd.
Los Angeles, Calif. 90064

★C9-6248CHT,C9-6249RSW 1164-2
★C9-6346WAL 1164-2
★CQ-964 (Similar to Chassis) 1023-1
● M9-1231BGE 1172-1
● M9-1234KQT/35GRN 1172-1
● M9-1252BLK 1172-1
● M9-3231BGE 1172-1
● M9-3254RED 1172-1
● M9-3257GLD 1172-1
● M9-3276WAL 1172-1
● M9-5231BGE 1174-1
● M9-5252BLK 1174-1
● M9-5254TAN 1174-1
● M9-5276WAL 1174-1
● M9-6231BGE 1175-2
● M9-6258CHT 1175-2
● M9-6276WAL 1175-2
RPC-270CL,ED,WL (Similar to Chassis) 1076-4
RPC-270R (Ch. 15TU5, DPA-150-4)
For Radio, Amp Ch. 1076-4
For Tape Recorder (See Page 34) TR-73
RPC-370 (Ch. 15TU5, DPA-150-4) 1076-4
★2C934 (Similar to Chassis) 1124-2
★2C954 (Similar to Chassis) 1124-2
★3C958 (Similar to Chassis) 1124-2
★3C968 (Similar to Chassis) 1124-2

PANASONIC
(Also See Auto Radio, Changer and Recorder Listings)
Matsushita Elec. Corp. of America
Panasonic Service & Parts Div.
10-16 44th Drive
Long Island City, N.Y. 11101

● AN-76,C 1146-1
● AN-86D,DC 1146-1
● AN-132,C 1188-POM
● AN-142,C 1188-POM
● AN-152D,DC 1194-POM
● AN-199E, EC 1180-2
● AN-219,C 1154-2
● AN-229,C 1154-2
● AN-239D,DC 1154-2
● AN-709 ....1176-POM
★CT-97P,PC 1153-2
★CT-98D, DC 1179-2
★CT-391E,EC 1151-1
★CT-991P (Early Prod.) ...1169-1
RC-1280, C 1169-4
RC-6020 1188-6
RC-7240 1179-4
RC-7589 1157-5
RE-7080,C MHF-17

PANASONIC—Cont.

RE-7200 1171-5
RE-7500 1178-4
RE-7670, C MHF-12
SC-666 ....MHF-14
● TR-339RA 1168-2
● TR-339RN 1152-1
● TR-445T 1188-POM
● TR-469B 1168-2
● TR-519,C 1146-POM

PEARCE-SIMPSON
Pearce-Simpson Inc.
4701 N.W. 77th Ave.
Miami, Florida 33152

Bearcat 23 ....CB-32
Bobcat 23 ....CB-33
Tiger 23 ....CB-32

PENNEYS-PENNCREST
(Also See Recorder Listing)
J. C. Penney Co., Inc.
1301 Avenue of the Americas
New York, N.Y. 10019

850-0142 ....TSM-122
1100 ....MHF-10
● 1321 1196-3
1944 ....TSM-122
1971 ....1141-SED
1993 ....1147-SED
2310-44 ....1141-SED
2332/33 (Similar to Chassis) 1100-3
● 2338 1162-1
● 2363B (Similar to Chassis) 1089-3
★2853 ....1152-POM
★2871 ....1140-POM
★2887 ....1140-POM
★2890 1172-2
3015 1163-7
3545, A 1169-5
● 4351-48A ..(PCB 1157-3) 1006-3
● 4352-46A ..(PCB 1157-3) 1006-3
4370 ....TSM-125
● 4391-48A ..(PCB 1157-3) 1006-3
4445 1180-4
4600A 1156-6
4708A 1164-6
4710 1182-6
4720 1164-6
★4822B (Similar to Chassis) 1110-2
★4834A, 4835A (Similar to Chassis) 1165-1
★4848A 1165-1
★4854A, 4855A 1165-1
★4896A 4865-1
5110 1059-4
5115 1059-4
5157 1059-4
5311A 1185-5
6422,A MHF-9
6651 ....MHF-12
6815,A 1154-7
★6882E-49 (Similar to Chassis) ....906—3
★6883B 1165-1
★6891A 1165-1
8757,8758 1154-7
★Ch. T511, T512, T513, T514 1165-1
★Ch. T523, T524 1165-1

PHILCO-FORD
(Also See Recorder Listing)
Philco-Ford Corporation
Tioga & "C" Streets
Philadelphia, Pa. 19134

A1010BL TSM-120
● B310UWH (Ch. 21HT15) .1164-3
● B321UAV (Ch. 21HT16) ..1164-3
● B341UBK (Ch. 21HT16) ..1164-3
● B412UBE,UBK (Ch. 21L23) 1162-2
● B422UAV,UHG (Ch. 21L23A) 1162-2
● B432UWA (Ch. 21L23A) ..1162-2
● B521TBE,UAV (Ch. 20P24) 1148-1
● B531TWA (Ch. 20P24) ...1148-1
● B660UBE (Ch. 20ST30A) ..1172-3
● B660UBE-1 (Ch. 20ST30AV) 1172-3
● B711UBR (Ch. 20ST30) ...1172-3
● B711UBR-1 (Ch. 20ST30V) 1172-3
● B716UWA-1 (Ch. 20ST30V) 1172-3
● B731UWA (Ch. 21ST31) ..1172-3
● B731UWA-1 (Ch. 21ST31V) 1172-3
● B821UWA (Ch. 21ST31) ..1172-3
● B821UWA-1 (Ch. 21ST31V) 1172-3
● B831UWA (Ch. 21ST31) ..1172-3
● B831UWA-1 (Ch. 21ST31V) 1172-3
● B844UWA (Ch. 21ST31) ..1172-3
● B844UWA-1 (Ch. 21ST31V) 1172-3
● B854UWA (Ch. 21ST31) ..1172-3
● B854UWA-1 (Ch. 21ST31V) 1172-3
● B864UWA (Ch. 21ST31) ..1172-3
● B864UWA-1 (Ch. 21ST31V) 1172-3
● B874UWA (Ch. 21ST31) ..1172-3
● B874UWA-1 (Ch. 21ST31V) 1172-3
★C3750UBR (Ch. 20HT70) ..1155-2
★C3760UWA (Ch. 20HT71) .1155-2
★C4540UBR (Ch. 20KT40B) ....(PCB 1174-4) 1122-2
★C4550UWA (Ch. 21KT41B) ... .(PCB 1174-4) 1122-2
★C4551AWA (Ch. 21KT40) .1173-2
★C4560UWA (Ch. 21KT41B) ....(PCB 1174-4) 1122-2
★C4561AWA, AWAK (Ch. 21KT41, B) 1173-2
★C4561UWA (Ch. 21KT41, B) 1173-2
★C4565UWA (Ch. 20KT41BR) ....(PCB 1174-4) 1122-2
★C5550UWA (LP Ch. 20QT87 B - Run 8) (PCB 1181-3) 1126-2
★C7020UWA (Ch. 19QT85B) ....(PCB 1161-3) 1140-1
★C7030UWA (Ch. 20QT74) 1161-2
★C7030UWA-1 (Ch. 19QT85B) ....(PCB 1161-3) 1140-1
★C7040UWA (Ch. 20QT75) 1161-2
★C7040UWA-1 (LP Ch. 20QT87 B - Run 8) (PCB 1181-3) 1126-2
★C7050UWA (Ch. 20QT75) 1161-2
★C7050UWA-1 (LP Ch. 20QT87 B - Run 8) (PCB 1181-3) 1126-2

PHILCO-FORD—Cont.

★C7220UWA (Ch. 19QT85B) ....(PCB 1161-3) 1140-1
★C7224UWA (Ch. 20QT74) 1161-2
★C7224UWA-1 (Ch. 19QT85B) ....(PCB 1161-3) 1140-1
★C7228UWA (Ch. 20QT75) 1161-2
★C7228UWA-1 (LP Ch. 20QT87-Run 8) ....(PCB 1181-3) 1126-2
★C7230UWA/31UWA/32UPC (LP Ch. 20QT87B-Run 8) ....(PCB 1181-3) 1126-2
★C7240UWA/41UMA/42UPC (Ch. 20QT76) 1161-2
★C7360UWA/7361UWA/7362UPC (Ch. 21ST90T) 1174-2
★C7370UWA/7371UMA/7372UPC (Ch. 21ST90) .1174-2
★C7380UWA/7382UDK (Ch. 21ST90) 1174-2
★C8030UWA/31UMA/32USP (LP Ch. 20QT87B-Run 8) ....(PCB 1181-3) 1126-2
★C8032USP (LP Ch. 20QT87, B - Run 8) (Similar to Chassis) 1126-2
★C8180UWA/8182UDK (TV Ch. Only—21ST90) 1174-2
★C9260UWA (Ch. 21KT41B) ....(PCB 1174-4) 1122-2
★C9261AWA, AWAK (Ch. 21KT41, B) 1173-2
★C9261UWA (Ch. 21KT41, B) 1173-2
★C9450UWA/9452UDK (Ch. 21ST90T) 1174-2
H270TWA (Ch. T20STT) ..1140-6
H281TMA (Ch. T20STT) ..1140-6
H302TDK (Ch. T20STT) ..1140-6
H320UWA/321UMA/322UDK (Ch. 10PR205,U20STDK) 1182-7
H322TMC (Ch. T20STTZ) ..1140-6
H330TMA (Ch. T20STY) ..1140-6
H341TWA (Ch. T20STY) ..1140-6
H352TDK (Ch. T20STY) ..1140-6
H360TWA-1 (Ch. T70STZ) 1142-6
H371TMA-1 (Ch. T70STZ) .1142-6
H410TWA (Ch. T70STX) ..1142-6
H442TDK (Ch. T70STX) ..1142-6
H461TMA (Ch. T70ST) ...1142-6
H520TWA (Ch. T150ST) ..1149-5
H541TMA (Ch. T150ST) ..1149-5
H562TDK (Ch. T150ST) ..1149-5
H662TDK (Ch. T300ST) ...1146-5
H915TWA (Ch. T20STT) ..1140-6
H920UEB,UWA,UWH (Ch. U70STDKX-T70STX) (Similar to Chassis) 1142-6
H940TDK (Ch. T70STX) ..1142-6
H962UDK (Ch. T70STDK-T70STX) (Similar to Chassis) 1142-6
H965ALK (Ch. T70STX) (Similar to Chassis) 1142-6
M3700TWA (Ch. T20STX) ..1140-6
M3850TWA (Ch. T150STA) 1149-5
P670BE 1101-6
P730BE/731BE (Ch. 9PS4) .1177-5
P740BE/741BK (Ch. 9PS4) .1177-5
P745WA (Ch. 9PS4) 1177-5
P771WA (Ch. 8PS20) 1191-5
P830WA (Ch. 9PS4A) 1195-5
P840WA (Ch. 9PS4A) 1195-5
● P2710BE/2712WH (Ch. 16H22) 1156-SED
● Q2708TN (Ch. 16H22) .1156-SED
R165BK TSM-124
R185BR, BR-1 (Ch. 9FS2F) TSM-123
R190BR (Ch. 9FS2F) ...TSM-123
R191BR (Ch. 9F2SH) ...TSM-123
R340WH (Ch. 0AS3) 1179-5
R347WA (Ch. 0AS3) 1179-5
R350BL,PK (Ch. 0AS3A) ..1179-5
R353WA (Ch. 0AS3A) 1179-5
R440WA (Similar to Chassis) ....974—5
R445WA (Similar to Chassis) ....974—5
R580WA (Similar to Chassis) ....974—5
R969WH (Similar to Chassis) ....976—7
● R1228PGY (Ch. 17C21) ....897—1
● R1240TN,BR (Ch. 17C21V) 897—1
● R1242AV,BK,GY,SL,WH (Ch. 17C21AV) ......897—1
● R1243WA (Ch. 17C21AV) .897—1
● R2608BE (Ch. 17H22) .....895—3
● R2720BE,GY/2722WH (Ch. 17H22) ....895—3
● R2724WA (Ch. 17H22) ...895—3
● R3330WH/3331BE (Ch. 17J27) ....861—1
● R3344GY/3346WA (Ch. 17J27A) ....861—1
● R3396WA (Ch. 17J27) ....861—1
● R3563TN (Ch. 17J25) ....890—3
● R3566SD/3567WA/3569WA (Ch. 17J25) ....890—3
● R3578WA (Ch. 17J41) ....888—3
● R3622EA (Ch. 17J25) ....890—3
● R3626WA (Ch. 17J41) ....888—3
S746 (Similar to Chassis) ..974—5
S976/978 (Similar to Chassis) ....974—5
★S6604RWA/6606RMA (Ch. 19QT87R) (Similar to Chassis) 1026-3
★S6695DPC (Ch. 19QT87) (Similar to Chassis) 1026-3
★SD6690WA/6691MA/6692WA (Ch. 19QT87) (Similar to Chassis) 1026-3
★SD6890WA (Ch. 19QT87,S40ST)
For TV Ch. 1026-3
For Radio Ch. 1069-5
Ch. OAS3,A 1179-5
Ch. T20STT,STTZ,STX, STY 1140-6
Ch. T70ST,STDK,STX, STZ 1142-6
Ch. T150ST,STA 1149-5
Ch. T300ST 1146-5
Ch. U20STDK 1182-7
Ch. U70STDKX (Similar to Chassis) 1142-6
Ch. 8PS20 1191-5
Ch. 9F2SH TSM-123
Ch. 9FS2F TSM-123
Ch. 9PS4 1177-5
Ch. 9PS4A 1195-5
Ch. 10PR205 1182-7

PHILCO-FORD—Cont.

● Ch. 16H22 ....1156-SED
★Ch. 19QT85B ....(PCB 1161-3) 1040-1
★Ch. 19QT87R (Similar to Chassis) 1026-3
★Ch. 20HT70/71 1155-2
★Ch. 20KT40B,20KT41B,BR ....(PCB 1174-4) 1122-2
● Ch. 20P24 1148-1
★Ch. 20QT74/75/76 1161-2
★Ch. 20QT87,B (Late Prod.—Run 8) ....(PCB 1181-3) 1126 -2
● Ch. 20ST30,A (Runs 1,2) .1172-3
● Ch. 20ST30AV,V (Run 2) 1172-3
● Ch. 21HT15/16 1164-3
★Ch. 21KT40, 21KT41,B ..1173-2
● Ch. 21L23,A 1162-2
● Ch. 21ST31,V 1172-3
★Ch. 21ST90,T,21ST91 1174-2

PHILIPS
Philips Electronics Industries, Ltd.
156 Vanderhoff
Toronto 17, Ontario, Canada

AG9016/00 (Similar to Chassis) .... 599—9

PHONOLA
Telex-Waters Conley Co., Inc.
9600 Aldrich Avenue South
Minneapolis, Minn. 55420

86223 1178-5
B-6224/6225 (Radio Ch. Only) 1052-8
8CR-101D 1162-7

PILOT
Pilot Radio-Television Corp.
600 Monmouth Street
Jersey City, N.J. 07302

MC-30 (Ch. 123012) MHF-10
Ch. 123012 ....MHF-10

PLYMOUTH
(See Auto Radio and Recorder Listings)

PONTIAC
(See Auto Radio and Recorder Listings)

R

RCA
(Also See Changer Listing)
RCA Sales Corporation
600 North Sherman Drive
Indianapolis, Ind. 46201

● AM185W,WEN (Ch. KCS171F) ....(PCB 1151-3) 1061-1
● AM193YIP (Ch. KCS171E) ....(PCB 1151-3) 1061-1
● AM196WEN (Ch. KCS171E) ....(PCB 1151-3) 1061-1
● AM199WNS (Ch. KCS171H) ....(PCB 1151-3) 1061-1
● AM219WKEN (Ch. KCS171E) ....(PCB 1151-3) 1061-1
● AP103W (Ch. KCS185B) ..1170-2
● AP108Y (Ch. KCS176H, RC-3006) 1167-2
● AP122W (Ch. KCS169XA) 1140-2
● AP125WNS (Ch. KCS169XC) (Similar to Chassis) 1140-2
● AP133B,N,Y (Ch. KCS177C) 1149-2
● AP136Y (Ch. KCS177C) ...1149-2
● AP151W (Ch. KCS168D) (1971 Prod.) 1152-2
● AP159WK (Ch. KCS168D (1971 Prod.) 1152-2
● AP184W (Ch. KCS171F) ....(PCB 1151-3) 1061-1
● AP194W (Ch. KCS171E,ETJ) ....(PCB 1151-3) 1061-1
● AP195WEN (Ch. KCS171E) 1061-1
● AP199WNS (Ch. KCS171H) ....(PCB 1151-3) 1061-1
● AP222WEN (Ch. KCS171K,KTJ) ....(PCB 1151-3) 1061-1
● AP229WKEN (Ch. KCS171L) ....(PCB 1151-3) 1061-1
● AP237AEN (Ch. KCS184A) 1158-2
● AP262A (Ch. KCS179ZA) .1160-1
● AP301W (Ch. KCS174H) ....(PCB 1142-4) 1115-2
● AQ093E (Ch. KCS185B) ..1170-2
● AQ098Y (Ch. KCS176XB) ...1194-POM
● AQ122W (Ch. KCS188A) 1194-POM
● AQ126A,W (Ch. KCS177XD) ..1188-POM
● AQ127B (Ch. KCS188A) 1194-POM
● AQ158WR (Ch. KCS168XB) ...1194-POM
● AQ186WEN (Ch. KCS171F) (Similar to Chassis) 1061-1
● AQ191W (Ch. KCS171E) (Similar to Chassis) 1061-1
● AQ193WEN (Ch. KCS172A) 1198-3
● AQ194W (Ch. KCS171E) (Similar to Chassis) 1061-1
● AQ196WEN (Ch. KCS172A) 1198-3
● AQ197FEN (Ch. KCS186A) 1194-POM
● AQ201WEN (Ch. KCS174H) (Similar to PCB 1142-4) 1115-2
● AZ151W (Ch. KCS168XA) .... (PCB 1193-3) 1152-2
● BP337WEN (Ch. KCS179XA) 1160-1
● BQ221WEN (Ch. KCS179XA) 1160-1
● CP357W (Ch. KCS183A) ...1151-2
● CP363L (Ch. KCS183A) ...1151-2
● CP369S (Ch. KCS183A) ...1151-2
● CP371W (Ch. KCS183A) ...1151-2
● CQ222W/223L/224W/226L/228S (Ch. KCS183D) 1194-POM
★EP402H (Ch. CTC22AD) ..1107-1
★EP426T (Ch. CTC41XP) ....(PCB 1160-4) 1112-3
★EP480WEN (Ch. CTC43XP) ....(PCB 1193-3) 1137-1
★EP506W (Ch. CTC49XA) ..1187-2
★EQ327W (Ch. CTC51A) 1182-POM

RCA—Cont.

★EQ335W (Ch. CTC51XP) 1182-POM
★EQ363W (Ch. CTC52A) 1182-POM
★EQ371A,W (Ch. CTC52XP) 1182-POM
★EQ371WR (Ch. CTC52XR) 1182-POM
★EQ381WEN (Ch. CTC52B) 1182-POM
★EQ405W (Ch. CTC53A or A1) 1199-2
★EQ415W (Ch. CTC53XP) 1199-2
★EQ447W (Ch. CTC55XP) 1158-POM
★EW448W (Ch. CTC42A) ....(PCB 1160-4) 1112-3
★FJ573/575M,W (Ch. CTC31A) ....928—3
★FJ583WK (Ch. CTC31A) ..928—3
★FL508WX (Ch. CTC38A) ....(PCB 1146-4) 1000-3
★FL619W (Ch. CTC38XP) ....(PCB 1146-4) 1000-3
★FM507W (Ch. CTC38XA) ....(PCB 1160-4) 1092-3
★FP562W (Ch. CTC44A) ...1191-1
★FP562WR (Ch. CTC44B, CRK16A,CTP19A) 1191-1
★FP564W (Ch. CTC39XAP) ....(PCB 1183-3) 1126-3
★FQ505W,WR (Ch. CTC46A,B) 1170-POM
★FQ-517W (Ch. CTC39XAR) ..1194-POM
★FQ-517WR (Ch. CTC39XAT) ...1194-POM
★FQ-535W (Ch. CTC39XAK) ...1194-POM
★FQ547WR (Ch. CTC54A) 1188-POM
★FS515W (Ch. CTC39XT) ....(PCB 1183-3) 1126-3
★GJ725W (Ch. CTC31A) ...928—3
★GL616W (Ch. CTC38XP) ....(PCB 1146-4) 1000-3
★GL621L (Ch. CTC38XP) ....(PCB 1146-4) 1000-3
★GL624W (Ch. CTC38XP) ....(PCB 1146-4) 1000-3
★GL636WX (Ch. CTC38XP) ....(PCB 1146-4) 1000-3
★GL650M (Ch. CTC38XT) ....(PCB 1146-4) 1000-3
★GL678S (Ch. CTC38XP) ....(PCB 1146-4) 1000-3
★GL684W (Ch. CTC38X) ....(PCB 1146-4) 1000-3
★GL684WR (Ch. CTC38XR) ....(PCB 1146-4) 1000-3
★GL690W (Ch. CTC38XP) ....(PCB 1146-4) 1000-3
★GL692D (Ch. CTC38X) ....(PCB 1146-4) 1000-3
★GL692DR (Ch. CTC38XR) ....(PCB 1146-4) 1000-3
★GL692S (Ch. CTC38X) ....(PCB 1146-4) 1000-3
★GL698L (Ch. CTC38XP) ....(PCB 1146-4) 1000-3
★GL759WK (Ch. CTC38XP) ....(PCB 1146-4) 1000-3
★GM521W (Ch. CTC38AB) ....(PCB 1160-4) 1092-3
★GM531W (Ch. CTC38XA) ....(PCB 1160-4) 1092-3
★GM553W (Ch. CTC38XA) ....(PCB 1160-4) 1092-3
★GM577W (Ch. CTC38XA) ....(PCB 1160-4) 1092-3
★GM607W (Ch. CTC38XJ) ....(PCB 1160-4) 1092-3
★GM609W (Ch. CTC38XF) ....(PCB 1160-4) 1092-3
★GM645W (Ch. CTC38XA) ....(PCB 1160-4) 1092-3
★GM743W (Ch. CTC38XJ) ....(PCB 1160-4) 1092-3
★GM765DK,SK(Ch. CTC38XA) ....(PCB 1160-4) 1092-3
★GP568W (Ch. CTC38P) ....(PCB 1160-4) 1092-3
★GP586W (Ch. CTC38XA) ....(PCB 1160-4) 1092-3
★GP596D,S (Ch. CTC39XA) ....(PCB 1183-3) 1126-3
★GP629W (Ch. CTC39XAN) ....(PCB 1183-3) 1126-3
★GP631W (Ch. CTC39XAN) ....(PCB 1183-3) 1126-3
★GP634L/636D,S (Ch. CTC39XF ..(PCB 1183-3 1126-3
★GP638W (Ch. CTC44W) ..1191-1
★GP638WR (Ch. CTC44AA, CRK16A,CTP19A) 1191-1
★GP644F (Ch. CTC44W) ...1191-1
★GP644FR (CTC44AA,CRK16A, CTP19A) 1191-1
★GP648L (Ch. CTC44W) ...1191-1
★GP648LR (Ch. CTC44AA, CRK16A,CTP19A) 1191-1
★GP652F (Ch. CTC44W) ...1191-1
★GP652FR (Ch. CTC44AA, CRK16A,CTP19A) 1191-1
★GP658D,S (Ch. CTC44W) .1191-1
★GP658DR,SR (Ch. CTC44AA, CRK16A,CTP19A) 1191-1
★GP668W (Ch. CTC40P) ....(PCB 1174-4) 1111-3
★GP746W (Ch. CTC39XT) ....(PCB 1183-3) 1126-3
★GP750W (Ch. CTC39XT) ....(PCB 1169-3) 1126-3
★GP753L/754S (Ch. CTC39XT) ....(PCB 1169-3) 1126-3
★GP786W (Ch. CTC44A) ...1191-1
★GP786WR (Ch. CTC44B, CRK16A,CTP19A) 1191-1
★GP792L (Ch. CTC44A) ...1191-1
★GP792LR (Ch. CTC44B, CRK16A,CTP19A) 1191-1
★GP796F (Ch. CTC44A) ...1191-1
★GP796FR (Ch. CTC44B, CRK16A,CTP19A) 1191-1
★GP800D,S (Ch. CTC44A) ..1191-1
★GP800DR,SR (Ch. CTC44B, CRK16A,CTP19A) 1191-1
★GP838W (Ch. CTC44A) ...1191-1
★GP838WR (Ch. CTC44B, CRK16A,CTP19A) 1191-1
★GP844L (Ch. CTC44A) ...1191-1
★GP844LR (Ch. CTC44B, CRK16A,CTP19A) 1191-1

RCA—Cont.

★GP852D,S (Ch. CTC44A) ..1191-1
★GP852DR,SR (Ch. CTC44B, CRK16A,CTP19A) 1191-1
★GP876WK (Ch. CTC44A) ..1191-1
★GP890SK (Ch. CTC44A) ..1191-1
★GQ561W/563L (Ch. CTC50XR) 1182-POM
★GQ575A,W (Ch. CTC46A) 1170-POM
★GQ579L (Ch. CTC46A) 1170-POM
★GQ583S (Ch. CTC46A) 1170-POM
★GQ-599W (Ch. CTC39XAJ) 1194-POM
★GQ-619W (Ch. CTC39XAJ) 1194-POM
★GQ-627L (Ch. CTC39XAJ) 1194-POM
★GQ-637D,S (Ch. CTC39XAJ) 1194-POM
★GQ-653W (Ch. CTC39XAJ) 1194-POM
★GQ-657L (Ch. CTC39XAJ) 1194-POM
★GQ-661D,S (Ch. CTC39XAJ) 1194-POM
★GQ681WR (Ch. CTC54A) 1188-POM
★GQ711LR (Ch. CTC54A) 1188-POM
★GQ721DR,SR (Ch. CTC54A) 1188-POM
★GQ725W (Ch. CTC46H) 1170-POM
★GQ841LR (Ch. CTC54A) 1188-POM
★GQ861DR,SR (Ch. CTC54A) 1188-POM
★GQ867WR (Ch. CTC54A) 1188-POM
★GQ877MR (Ch. CTC54A) 1188-POM
★HL812M,W (Ch. CTC38K, RC-1227H)
For TV Ch. ....(PCB 1146-4) 1000-3
For Radio Ch. 1001-3
★HL818W (Ch. CTC38XAD, RC-1227H)
For TV Ch. ....(PCB 1146-4) 1000-3
For Radio Ch. 1001-3
★HL818WR (Ch. CTC38XAE, RC-1227H)
For TV Ch. .(Similar to PCB 1146-4) 1000-3
For Radio Ch. 1000-3
★HL824L (Ch. CTC38XAD, RC-1227H)
For TV Ch. ....(PCB 1146-4) 1000-3
For Radio Ch. 1001-3
★HL824LR (Ch. CTC38XAE, RC-1227H)
For TV Ch. .(Similar to PCB 1146-4) 1000-3
For Radio Ch. 1001-3
★HL830W (Ch. CTC38XAD, RC-1223D,RK-314H, RS-215M)
For TV Ch. ....(PCB 1146-4) 1000-3
For Radio/Amp Ch. 1001-3
★HL884WK (Ch. CTC38XAD, RC-1227H)
For TV Ch. ....(PCB 1146-4) 1000-3
For Radio Ch. 1001-3
★HL890LK (Ch. CTC38XAD, RC-1227H)
For TV Ch. ....(PCB 1146-4) 1000-3
For Radio Ch. 1001-3
★HM801W (Ch. CTC38XC, RC-1239A,RS-252D)
For TV Ch. 1092-3
For Radio/Amp Ch. 1087-5
★HM807W (Ch. CTC38XC, RC-1239A,RS-252D)
For TV Ch. 1092-3
For Radio/Amp Ch. 1087-5
★HM813L (Ch. CTC38XC, RC-1239A,RS-252D)
For TV Ch. 1092-3
For Radio/Amp Ch. 1087-5
★HM819W (Ch. CTC40AD, RC1238B,RS-253B)
For TV Ch. 1111-3
For Similar Radio/Amp. Ch. 1123-4
★HM819WR (Ch. CTC40AE, RC-1238C,RS-253B)
For TV Ch. 1111-3
For Similar Radio/ Amp Ch. 1123-4
★HM831H,L (Ch. CTC40AD, RC-1238B,RS-253B)
For TV Ch. 1111-3
For Similar Radio/ Amp Ch. 1123-4
★HM831HR,LR (Ch. CTC40AE, RC-1238C,RS-253B)
For TV Ch. 1111-3
For Similar Radio/ Amp Ch. 1123-4
★HM837F (Ch. CTC40AD, RC-1238B,RS-253B)
For TV Ch. 1111-3
For Similar Radio/ Amp Ch. 1123-4
★HM843D,S (Ch. CTC40AD, RC-1238B,RS-253B)
For TV Ch. 1111-3
For Similar Radio/ Amp Ch. 1123-4
★HM843DR,SR (Ch. CTC40AE, RC-1238C,RS-253B)
For TV Ch. 1111-3
For Similar Radio/ Amp. Ch. 1123-4
★HM849W (Ch. CTC40AB, RC-1238B,RS-246B)
For TV Ch. 1111-3
For Radio/Amp Ch. 1123-4
★HM849WR (Ch. CTC40AC, RC-1238C,RS-246B)
For TV Ch. 1111-3
For Radio/Amp Ch. 1123-4
★HM855D,S (Ch. CTC40AB, RC-1238B,RS-246B)
For TV Ch. 1111-3
For Radio/Amp Ch. 1123-4
★HM855SR (Ch. CTC40AC, RC-1238C,RS-246B)
For TV Ch. 1111-3
For Radio/Amp Ch. 1123-4

NOTE: ● Denotes Television Receiver. ★ Denotes Color Television Receiver. AOR Denotes Available On Request. AR Denotes Auto Radio Series Volume. CB Denotes CB Radio Series Volume. HTP Denotes Home Tape Player Series Volume. MHF Denotes Modular Hi-Fi Series Volume. PCB Denotes Production Change Bulletin. POM Denotes Bonus Schematic in Photofact-of-the-Month Package—Unavailable After Month Of Issue. SED Denotes Special Equipment Data. TR Denotes Tape Recorder Series Volume. TSM Denotes Transistor Radio Series Volume.

Set No. — Folder No.

RCA—Cont.

★HM861WK (Ch. CTC40AF, RC-1239A,RS-253D)
For TV Ch. .... 1111—3
For Radio/Amp Ch. .... 1087—5
★HM867LK (Ch CTC40AF, RC-1239A,RS-253D)
For TV Ch. .... 1111—3
For Radio/Amp Ch. .... 1087—5
★HM873SK (Ch. CTC40AF, RC-1239A,RS-253D)
For TV Ch. .... 1111—3
For Radio/Amp Ch. .... 1087—5
★HP918DK,SK :TV Ch. only CTC44K) .... 1191—1
★HP9405R/942DR,SR (TV and Remote Ch. Only CTC44L, CRK16A,CTP19A) .... 1191—1
●JP192W (Ch. KCS171J) ....(PCB 1151-3) 1061—1
●JM195W (Ch. KCS 171D) ....(PCB 1151-3) 1061—1
RZA210E,T .... 1175—SED
RZC240W .... 1159—6
RZD311Y .... 1184—5
RZD434W .... 1180—5
RZD438R .... 1180—5
RZG121T .... 1150—SED
RZG354E .... TSM—123
RZM146A,B .... TSM—120
RZM151E,T .... TSM—120
RZM175J .... TSM—122
RZM188B,E .... TSM—119
RZM193E .... TSM—122
RZM990EK .... TSM—122
RZM995EK .... TSM—119
RZS331Y .... 1159—4
RZS472N,R,T .... 1159—4
RZS478W .... 1159—4
SS5000W (Ch. RK-327, RC-1240A) .... MHF—16
VPP21Y .... TSM—126
VPP46E (Ch. RS-256A) ... 1088—4
VPP54R/56W (Ch. RS-265A) .... 1181—5
VPP59W (Ch RS-264A) .. 1177—6
VPP60B,W (Ch. RS-264A) .... 1177—6
VPP64W (Ch. RS-255B) ... MHF—8
VPT30W/31L/32S/33F (Ch. RC-1239D, RS-252E) .... 1169—6
VPT40W/41L/42D,S/43F (Ch. RC-1239E, RS-253E) .... 1169—6
VPT50W/51H/52S/54F (Ch. RC-1239E, RS-253E) .... 1169—6
VPT60W/61L/62S/63F (Ch. RC-1239E,L RS-266A) . 1169—6
VPT70E (Ch. RC-1239J, RS-266C, RK-331) ...... 1169—6
VPT825,VPT84F (Ch. RC-1233B,RS-238E, RS-247C) .... 1146—6
VQP21YV (See Page 71) . TSM—126
VQP55B (Ch. RS-248B) .. 1019—8
VS1000W (Ch. RS-265A) . 1181—5
VS5000W (Ch. RK-327B, RC-1240B) .... MHF—16
YZD589E .... TSM—127
★14H935MV,MU/936,MU (Ch. CTC15AC,AD, RC1215C, RS-203B)
For Similar TV Ch. .... 673—2
For Radio/Amp Ch. 704—2C,-2E
★14H946MV,MU,RV (Ch. CTC15J,K,N, RC-1215C, RS-203B)
For Similar TV Ch. .... 673—2
For Radio/Amp Ch. 704—2C,-2E
★14H954MV,MU,RV (Ch. CTC15J,K,N, RC-1215C, RS-203B)
For Similar TV Ch. .... 673—2
For Radio/Amp Ch. 704—2C,-2E
★14H960MV,MU,RV (Ch. CTC15J,K,N, RS-1215C, RS-203B)
For Similar TV Ch. .... 673—2
For Radio/Amp Ch. 704—2C,-2E
★14H968MV,MU, RV/969MV, MU,RV (Ch. CTC15J,K,N, RC-1215C, RS-203B)
For Similar TV Ch. .... 673—2
For Radio/Amp Ch. 704—2C,-2E
★14H976MV,MU,RV (Ch. CTC15J,K,N, RC-1215C, RS-203B)
For Similar TV Ch. .... 673—2
For Radio/Amp Ch. 704—2C,-2E
★14H980MV,MU,RV (Ch. CTC15L,M,P, RC-1211B, RS-177J)
For Similar TV Ch. .... 673—2
For Radio/Amp Ch. ... 683—13
★14H986MV,MU,RV (Ch. CTC15L,M,P,RC-1211B, RS-177J)
For Similar TV Ch. .... 673—2
For Radio/Amp Ch. ... 683—13
★14H989MV,MU,RV (Ch. CTC15L,M,P, RC-1211B, RS-177J)
For Similar TV Ch. .... 673—2
For Radio/Amp Ch. ... 683—13
★14H995MV,MU,RV (Ch. CTC15L,M,P, RC-1211B, RS-204A)
For Similar TV Ch. .... 673—2
For Radio/Amp. Ch. .. 692—11
★Ch. CRK16A (TV Remote Control Unit) .... 1191—1A
★Ch. CTC15AC,AD (Similar to Chassis) ... 673—2
★Ch. CTC15J,K,L,M,N,P (Similar to Chassis) ... 673—2
★Ch. CTC22AD ....(PCB 1152-4) 1107—1
★Ch. CTC38A ....(PCB 1146-4) 1000—3
★Ch. CTC38AB ....(PCB 1160-4) 1092—3
★Ch. CTC38K (PCB 1146-4) 1000—3
★Ch. CTC38P (PCB 1160-4) 1092—3
★Ch. CTC38X (PCB 1146-4) 1000—3
★Ch. CTC38XA ....(PCB 1160-4) 1092—3
★Ch. CTC38XAD ....(PCB 1146-4) 1000—3
★Ch. CTC38XF,XJ ....(PCB 1160-4) 1092—3
★Ch. CTC38XP,XB,XT ....(PCB 1146-4) 1000—3
★Ch. CTC39XA ....(PCB 1183-3) 1126—3

RCA—Cont.

★Ch. CTC39XAJ .... 1194—POM
★Ch. CTC39XAK .... 1194—POM
★Ch. CTC39XAN ....(PCB 1183-3) 1126—3
★Ch. CTC39XAP ....(PCB 1183-3) 1126—3
★Ch. CTC39XAR .... 1194—POM
★Ch. CTC39XAT .... 1194—POM
★Ch. CTC39XF ....(PCB 1183-3) 1126—3
★Ch. CTC39XT ...(PCB 1169-3, 1183-3) 1126—3
★Ch. CTC40P (1971 Prod.). ....(PCB 1174-4) 1111—3
★Ch. CTC41XP ....(PCB 1160-4) 1112—3
★Ch. CTC42A ....(PCB 1160-4) 1112—3
★Ch. CTC43XP (PCB 1193-3) 1137—1
★Ch. CTC44A,AA,B,K,L,W, . 1191—1
★Ch. CTC46A,B,H .... 1170—POM
★Ch. CTC49XA .... 1187—2
★Ch. CTC51A,XP ...... 1182—POM
★Ch. CTC52A,B,XP,XR . 1182—POM
★Ch. CTC54A .... 1188—POM
★Ch. CTC55XP .... 1158—POM
★Ch. CTP19A (TV Remote Control Unit) .... 1191—1A
●Ch. KCS168D (1971 Prod.) .... 1152—2
●Ch. KCS168XA ....(PCB 1193-3) 1152—2
●Ch. KCS168XB .... 1194—POM
●Ch. KCS169XC (Similar to Chassis) .... 1140—2
●Ch. KCS171D,E,F,H,J,K,L ....(PCB 1151-3) 1061—1
●Ch. KCS172A .... 1198—3
●Ch. KCS174H ....(PCB 1142-4) 1115—2
●Ch. KCS176H .... 1167—2
●Ch. KCS176XB .... 1194—POM
●Ch. KCS177C (PCB 1169-3) 1149—2
●Ch. KCS177XD .... 1188—POM
●Ch. KCS179XA,ZA .... 1160—1
●Ch. KCS183A .... 1151—2
●Ch. KCS183D .... 1194—POM
●Ch. KCS-184A .... 1158—2
●Ch. KCS185B .... 1170—2
●Ch. KCS186A .... 1194—POM
●Ch. KCS188A .... 1194—POM
Ch. RC-1218D (Similar to Chassis) .... 786—10
Ch. RC-1218J,K .... 829—2B
Ch. RC-1233B .... 1146—6
Ch. RC-1239D,E,J .... 1169—6
Ch. RC-1240A,B .... MHF—16
Ch. RC-3006 .... 1167—2A
Ch. RK-327,B .... MHF—16
Ch. RK-331 .... 1169—6
Ch. RS-238E .... 1146—6
Ch. RS-247C .... 1146—6
Ch. RS-252E/253E .... 1169—6
Ch. RS-255B .... MHF—8
Ch. RS-264A .... 1177—6
Ch. RS-265A .... 1181—5
Ch. RS-266A,C .... 1169—6

RANGER
(See Auto Radio and Recorder Listings)

REALISTIC
(Also See Auto Radio and Recorder Listings)
Radio Shack Corporation
2727 West 7th Street
Fort Worth, Texas 76107

SC-70 (13-1045) .... MHF—11
TRC-28 (21-116) .... CB—31
12-1470 .... MHF—17
12-1481 .... 1184—6
13-1045 .... MHF—11
13-1138 .... MHF—12
13-1174 .... 1175—5
13-1175 .... 1168—4
13-1179 .... 1177—7
21-116 .... CB—31
22W (13-1138) .... MHF—12

REALTONE
Realtone Electronics Corp.
34 Exchange Place
Jersey City, N.J. 07302

4332 .... 1141—6

REGENCY
Regency Electronics, Inc.
7900 Pendleton Pike
Indianapolis, Indiana 46226

CB-254 .... CB—33
Imperial II (CB-254) ..... CB—33

ROBERTS
(See Recorder Listing)

ROBYN
Robyn Company
P.O. Box 478
Rockford, Michigan 49341

J-123 .... CB—34
K-123 .... CB—35
T-123 .... CB—35

ROSS
(Also See Recorder Listing)
Ross Electronics Corporation
2834 South Lock Street
Chicago, Illinois 60608

RE-025 .... CB—31
RE-050 .... CB—31
RE-1080 .... 1160—6
RE-1085 .... 1172—4
RE-1096 .... 1162—6
RE-2095 .... TSM—119
RE-2260 .... 1178—6
RE-3430 .... MHF—15
RE-3800 .... TSM—120
RE-5100 .... 1167—6
RE-5200 .... 1170—5
RE-8801 .... TSM—121
RE-8994 .... TSM—122

S

SAAB
(See Auto Radio Listing)

SANYO
Sanyo Electric, Inc.
1200 West Walnut Street
Compton, California 90220

●21T41 .... 1176—POM
●21V71 .... 1176—POM

SANYO—Cont.

●21V72 .... 1182—POM
★81C13/14 .... 1176—POM
★91C12 .... 1188—POM

SBE
Linear Systems Inc.
220 Airport Boulevard
Watsonville, California 95076

Cascade .... CB—31
SBE-3CB (Cascade) .... CB—31
SBE-6CB .... CB—33

SCOTT (H.H.)
H.H. Scott Inc.
111 Powder Mill Road
Maynard, Massachusetts 01754

344-B .... 1148—SED

SEARS-SILVERTONE
(Also See Auto Radio and Recorder Listings)
Sears Roebuck & Company
303 East Ohio Street
Chicago, Illinois 60611

●PC-1104/05 (Ch. 456.50378/79/80/81/82/83/85/86/87/.50466/67/70/71) (Similar to Chassis) .... 510—2
●PC-1112,-7/1113,-7 (Ch. 456.50378/79/80/81/82/83/84/85/86/87/.50466/67/70/71/(Similar to Chassis) .... 510—2
●PC-1122/23 (Ch. 456 50378/79/80/81/82/83/84/85/86/87/.50466/67/70/71) (Similar to Chassis) .... 510—2
●PC-1122A/23A (Ch. 456.50466/67/70/71) (Similar to Chassis) .... 510—2
132.20330000, 132.20330001 .... 1176—6
132.20340000, 132.20340001 .... 1176—6
132.20470000 .... 1184—7
132.20830000 .... 1176—6
132.22650000 .... TSM—125
132.22770000 .... TSM—122
132.96120000 .... 1151—SED
174.22960000 .... TSM—124
257.14312000 .... 1173—SED
528.31103000 .... 1172—5
528.31104000 .... 1172—5
528.31104001 (Similar to Chassis) .... 1172—5
528.31106000 .... 1172—5
528.31153000 .... 1172—5
528.31154000 .... 1172—5
528.31155000 .... 1172—5
528.31203000 thru .31203005 .... 1175—6
528.31203104 .... 1175—6
528.31204000 thru .31204005 .... 1175—6
528.31204104 .... 1175—6
528.31206000 thru .31206005 .... 1175—6
528.31206104 .... 1175—6
528.31253000 thru .31253005 .... 1175—6
528.31254000 thru .31254005 .... 1175—6
528.31256000 thru .31256005 .... 1175—6
528.31303000 thru .31303005 .... 1175—6
528.31304000 thru .31304005 .... 1175—6
528.31305000 thru .31305005 .... 1175—6
528.31504000 thru .31504005 .... 1175—6
528.31506000 thru .31506005 .... 1175—6
528.32522000 .... 1151—6
528.32522002 (Similar to Chassis) .... 1151—6
528.32622000/001/002/003 (Similar to Chassis) .... 1104—5
528.32623100/3101 (Similar to Chassis) .... 1104—5
528.32642100/2101 (Similar to Chassis) .... 1104—5
528.32662000/001/002/003 (Similar to Chassis) .... 1104—5
528.32663100/3101 (Similar to Chassis) .... 1104—5
528.32711000/001 (Similar to Chassis) .... 1104—5
528.32712100/2101/2102 (Similar to Chassis) .... 1104—5
528.32722000/001 (Similar to Chassis) .... 1104—5
528.32820000/0001 (Similar to Chassis) .... 1104—5
528.32840000/0001/0002 (Similar to Chassis) .... 1104—5
528.32841000/1100 (Similar to Chassis) .... 1104—5
★528.40950000 thru .40950006 .... 1194—3
★528.41681016 .... 1183—2
★528.41681125 .... 1183—2
★528.41681900 thru .41681913 .... 1183—2
★528.41880000 thru .41880013 .... 1192—3
★528.42711000 thru .42711015 .... 1183—2
528.42790000 (Similar to PCB 1126-4) . 965—2
★528.43000000 thru .43000013 .... 1192—3
★528.43040000 thru .43040011 .... 1192—3
★528.43050000 .... 1127—3
★528.43060000 thru .43060010 .... 1183—2
★528.43070000 thru .43070010 .... 1183—2
★528.43080000 thru .43080010 .... 1183—2
★528.43100000 thru 43100012 .... 1192—3
★528.43101000 thru .43101010 .... 1192—3
★528.43110000 thru .43110012 .... 1192—3

SEARS-SILVERTONE—Cont.

★528.43111000 thru .43111010 .... 1192—3
★528.43120000 thru .43120012 .... 1192—3
★528.43121000 thru .43121010 .... 1192—3
★528.43140000/150000/160000/170000 ... 1152—POM
★528.43340000 thru .43340007 .... 1192—3
★528.43350000 thru .43350007 .... 1192—3
●528.50070000 thru .50070005 .... 1190—3
●528.50070103 .... 1190—3
●528.50380001 (Similar to Chassis) .... 1138—1
●528.50400000 thru .50400003 .... 1190—3
●528.50400103 .... 1190—3
●528.50800001 (Similar to Chassis) .... 1138—1
●528.51030000 ...... 1152—POM
●528.51140001 thru .51140006 ....(PCB 1181-3) 1134—3
●528.51150001 thru .51150006 ....(PCB 1181-3) 1134—3
●528.51200000/210000/220000 .... 1152—POM
●528.51260000 ...... 1152—POM
●528.51710900 (Similar to Chassis) .... 1130—3
●528.51710901 thru .51710905 ....(PCB 1191-3) 1130—3
●528.51720901 thru .51720905 ....(PCB 1191-3) 1130—3
●528.71720900 (Similar to Chassis) .... 1130—3
548.31185000 .... 1196—6
548.74210900 .... 1196—6
★562.40280000 .... 1171—2
●562.40280001/0002 (Similar to Chassis) .... 1171—2
★562.40800000 .... 1154—3
★562.40900000 ...... 1170—POM
★562.41550000 ...... 1151—SED
●562.50260001 (Similar to Chassis) .... 1142—2
★564.41220000, 564.41220001 .... 1169—2
●564.50010000 .... 1184—1
●564.50080100 ...... 1170—POM
569.32420000 .... TSM—126
833.63250 .... TSM—119
●1104/05 (Ch. 528.50378/79/80/81/82/83/84/85/86/87/.50466/67/70/71) (Similar to Chassis) .... 510—2
●1112, -7, 1113, -7 (Ch. 528.50378/79/80,'81/82/83/84/85/86/87/50466/67/70/71) (Similar to Chassis) ..... 510—2
●1122/23 (Ch. 528.50378/79/80/81/82/83/84/85/86/87/.50466/67/70/71) (Similar to Chassis) .... 510—2
●1122A/23A (Ch. 528.50466/67/70/71) (Similar to Chassis) .... 510—2
2045 (Ch. 132.53601, 2006338) .... 1188—7
2056 (Ch. 132.51701) ... MHF—9
●2104/05 (Ch. 528.50384/85) (Similar to Chassis) ...... 510—2
●2104/05 (Ch. 528.50466/67/70/71) (Similar to Chassis) .... 510—2
3017/18/19 (Ch. 528.64410/411) .... 1171—6
3035/36/37 (Ch. 528.64410/411) .... 1171—6
3045/46/47 (Ch. 528.64420) .... 1153—6
3050/51/52 (Ch. 528.64420) .... 1153—6
3060/61/62 (Ch. 528.64430) .... 1153—6
3075/76/77/78 (Ch. 528.64440/441/442 ... 1153—6
3080/81/82 (Ch. 528.64440/441/442,528.58341)
For Radio Ch .... 1153—6
For Recorder Ch. (See Page 77) .... TR—49
3083/84 (Ch. 528.64450/451,528.58341)
For Radio Ch .... 1153—6
For Recorder Ch. (See Page 77) .... TR—49
3295 (Ch. 528.64290) .. 1149—6
★4008 (Ch. 562.10424/425/426/427)..(PCB 1189-3) 1079—2
★4022 (Ch. 562.10501/502) ....(PCB 1142-4) 1108—2
★4061 (Ch. 564.80151/152) 1195—2
★4159 (Ch. 564.80135/136/141) .... 1181—2
★4406 (Ch. 528/529.81360 thru .81365,528.64312)
For TV Ch. .... 1127—3
For Radio Ch. .... 1106—4
●5005 (Ch. 528.70581/582) ....(PCB 1163-3) 1064—3
●5022 (Ch. 564.80113) (Similar to Chassis) ... 1139—2
6458 (Ch. 787.10020) . 1158—SED
7423 (Ch. 540.10070) .. MHF—11
7433 (Ch. 540.10090) .. MHF—14
★8159 (Ch. 562.10424/425/426/427)..(PCB 1189-3) 1079—2
8991 .... 877—3,1142—2
32922 (Ch. 528.64290) .. 1149—6
32931 (Ch. 528.64290) .. 1149—6
★41101 (Ch. 564.80160) ... 1147—1
★41101 (Ch. 564.80161) ....(PCB 1181-3) 1147—1
★81641 (Ch. 564.80070) ....(PCB 1061-3) 962—2
Ch. 132.51701 .... MHF—9
Ch. 132.53601 .... 1188—7
●Ch. 456.50378/79 (Similar to Chassis) .... 510—2
●Ch. 456.50466/67 (Similar to Chassis) .... 510—2
●Ch. 456.50470/71 (Similar to Chassis) .... 510—2
●Ch. 528.50378/79 (Similar to Chassis) .... 510—2
●Ch. 528.50380/81/82/83/84 (Similar to Chassis) .... 510—2
●Ch. 528.50466/67 (Similar to Chassis) .... 510—2

SEARS-SILVERTONE—Cont.

●Ch. 528.50470/71 (Similar to Chassis) .... 510—2
Ch. 528.63560 .... 794—9
Ch. 528.64290 .... 1149—6
Ch. 528.64410/411 ...... 1171—6
Ch. 528.64420 .... 1153—6
Ch. 528.64430 .... 1153—6
Ch. 528.64440/441/442 .. 1153—6
Ch. 528.64450/451 ...... 1153—6
●Ch. 528.70581/582 ....(PCB 1163-3) 1064—3
★Ch. 528.72370 thru .72380 .... 965—2
★Ch. 528.72381/82/83/84/85 (Similar to Chassis) .. 965—2
★Ch. 528.72386 thru .72392 .... 965—2
★Ch. 528.81110 (Similar to Chassis) .... 1127—3
★Ch. 528.81116 (Similar to Chassis) .... 1127—3
Ch. 540.10070 .... MHF—11
Ch. 540.10090 .... MHF—14
★Ch. 562.10424/425/426/427 ....(PCB 1189-3) 1079—2
★Ch. 562.10501/502 ....(PCB 1142-4) 1108—2
★Ch. 562.10525 ....(PCB 1151-3) 1107—2
★Ch. 562.10531/532 ....(PCB 1143-3) 1120—2
●Ch. 562.10700/701/702/703 .... 1124—3
●Ch. 564.80051/52 (Similar to Chassis) .... 968—2
●Ch. 564.80113 (Similar to Chassis) .... 1139—2
★Ch. 564.80135/136 ..... 1181—2
Ch. 564.80141 .... 1181—2A
★Ch. 564.80151/152 ...... 1195—2
★Ch. 564.80160 .... 1147—1
★Ch. 564.80161 ....(PCB 1181-3) 1147—1
●Ch. 564.80162 (Similar to Chassis) .... 1147—1
Ch. 787.10020 ...... 1158—SED
Ch. 2006338 .... 1188—7

SETCHELL-CARLSON
Setchell-Carlson Inc.
New Brighton
St. Paul, Minnesota 55112

★2800 (Ch. U809) ..... 1194—SED
★2900 (Ch. U810) ..... 1194—SED
★Ch. U809 .... 1194—SED
★Ch. U810 .... 1194—SED

SHARP
(Also See Recorder Listing)
Sharp Electronics Corp.
10 Keystone Place
Paramus, N. J. 07652

★C-2010 .... 1191—2
★C-2030 .... 1191—2
★C-6010 .... 1189—2
★C-8010 .... 1158—POM
★CN-62T,TA .... 1148—2
★CY-61PC .... 1163—2
FXC-39 .... 1170—6
RP-661A .... 1143—5
●SQ-65P .... 1188—3
●TF-90P .... 1164—POM
●TM-68P .... 1184—2
●TM-85P .... 1184—2
●TN-39P .... 1154—SED
●TU-95P .... 1158—POM
●TU-96P (Similar to Chassis) 1136—2
●TW-93P/94P .... 1158—POM

SIMCA
(See Auto Radio Listing)

SINGER
Singer Consumer Prod. Div.
30 Rockefeller Plaza
Room 6228
New York, New York

HE-3020 (Similar to Chassis) .... 1139—6

SONY
(Also See Recorder Listing)
Sony Corp. of America
47-47 Van Dam St.
Long Island City, N.Y. 11101

HP-480,A .... MHF—8
HP-580 .... MHF—11
★KV-1212 .... 1188—POM
★KV-1710 .... 1194—POM
●TV-112 .... 1194—POM
●TV-130U .... 1140—POM
●TV-510U .... 1178—2
●TV-730 .... 1188—POM
●TV-740 .... 1194—POM
●TV-900UA .... 1188—POM
●TV-930U .... 1180—3
●TV-940 .... 1188—POM
8F-51W .... 1011—5
8FC-75W .... 1189—4
8FC-99W .... 1193—4
8FS-50W .... MHF—13
8RC-62 .... 1168—5
8RC-74 .... 1166—6

SOUNDESIGN
Realtone Electronics Corp.
34 Exchange Place
Jersey City, N.J. 07302

4370 .... MHF—10
4488 .... MHF—9

SUNBEAM
(See Auto Radio Listing)

SYLVANIA
(Also See Recorder Listing)
GTE Sylvania Inc.
700 Ellicott Street
Batavia, N.Y. 14021

●A10-1 .... 1188—POM
★CB35 (Ch. D11-3-Codes 06, 07) (PCB 1057 3, 1158-4) 1011—2
★CD70 (Ch. D14 1) ...... 1168—3
★CD70-1 (Ch. D14-8) .. 1188—POM
★CD71 (Ch. D14-2) ...... 1168—3
★CD72/74 (Ch. D14-3) .... 1168—3
★CD72-1/74-1 (Ch. D14-10) .... 1188—POM
★CD82WR (Ch. D14-4) .... 1168—3
★CD82WR-1 (Ch. D14-5) ... 1168—3
★CD82WR-2 (Ch. D14-11) .... 1188—POM
★CE80 (Ch. D15 1) ...... 1184—3

SYLVANIA—Cont.

★CE81/83 (Ch. D15-2) .... 1184—3
★CE85-2 (Ch. D15-2) ...... 1184—3
★CE88-2 (Ch. D15-2) ...... 1184—3
★CF521W-1 (Ch. D12-15) .. 1143—1
★CF564A (TV Ch. Only D-12-9) .... 1143—1
★CF702/704/706 (Ch. D16-2) .... 1178—3
★CF711,-2/713,-2 (Ch. D16-2) .... 1178—3
★CF725DP-1,P-1 (Ch. D12-9) (Similar to Chassis) .... 1143—1
★CL810W-2/811W-1/813P-1 (Ch. D16-2) .... 1178—3
★CL818W-1,-2 (Ch. D16-2) . 1178—3
★CL828W-2/829P-1,-2 (Ch. D-12-20) .... 1185—2
★CL831W-1,-2/832K-1,-2/833C-1,-2/834P-1,-2/835BT-1,-2 (Ch. D12-20) 1185—2
★CL850W (Ch. D12-20) .... 1185—2
★CL854K,N (Ch. D12-20) .. 1185—2
★CL858P (Ch. D12-20) ..... 1185—2
★CL928WR-2/929PR-1,-2 (Ch. D12-21) .... 1185—2
★CL931WR-1,-2/932KR-1,-2/933CR-1,-2/934PR-1,-2/935BTR-1,-2 (Ch. D12-21) .... 1185—2
★CX78/79 (Ch. D14-6) . 1188—POM
★CX87WR (Ch. D14-7) . 1188—POM
Exponent 5/05W (Ch. 432-1) .... 1175—7
●MY80 (Ch. B10-4) ....(PCB 1163-3) 1047—2
●MY81/82 (Ch. B10-3) ....(PCB 1163-3) 1047—2
●MZ200 (Ch. B12-2) Code 01) ....(PCB 1144-3) 1094—2
SC33-1 (Ch. 800-2, 400-3,881-1)
For Radio/Amp Ch. ... 645—13
For MPX Ch. .... 770—11
SC35 (Ch. 800-Z,400-5) .. 645—13
SC35-1,-2 (Ch. 800-2,-3, 400-5,881-1)
For Radio/Amp Ch. ... 645—13
For MPX Ch. .... 770—11
SC36 (Ch. 800-2,400-5) .. 645—13
SC36-1,-2 (Ch. 800-2,-3, 400-5,881-1)
For Radio/Amp Ch. ... 645—13
For MPX Ch. .... 770—11
SC37-1 (Ch. 800-2,401-1, 881-1)
For Radio/Amp Ch. ... 645—13
For MPX Ch. .... 770—11
SC38 (Ch. 800-2,400-5) .. 645—13
SC38-1,-2 (Ch. 800-2,-3, 400-5,881-1)
For Radio/Amp Ch. ... 645—13
For MPX Ch. .... 770—11
SC41-1 (Ch. 800-2,402-1, 881-1)
For Radio/Amp Ch. ... 645—13
For MPX Ch. .... 770—11
SC131W, SC133P (Ch. R41-1) .... 1193—5
SC374-1 (Ch. Q27-4, 538-1) .... 1136—5
SC388-1 (Ch. Q28-1, 532-6) .... 1114—1
TR1188K (Ch. 378-1) ... TSM—126
TR1278K (Ch. 379-1) ... TSM—124
TR1318K (Ch. 368-1) .. TSM—125
●Ch. A09-1 .... 1140—POM
●Ch. B10-1,-2,-3,-4 (Codes 01 thru 06) ...(PCB1163-3) 1047—2
●Ch. B10-6 .... 1194—POM
●Ch. B12-1,-2 (Code 01) ....(PCB 1144-3) 1094—2
●Ch. B13-1 .... 1140—POM
★Ch. D05-14,-15 (Code C12) ....(PCB 1151-3) 1051—2
★Ch. D06-3,-4 (Code 09,10) ....(PCB 1143-3) 1072—2
●Ch. D11-1,-2 (Codes 02,03,04) ....(PCB 1057-3) 1011—2
●Ch. D11-1,-2,-3 (Codes 06,07) ...(PCB 1158-4,1057-3) 1011—2
●Ch. D11-3 (Codes 03,05) ....(PCB 1057-3) 1011—2
★Ch. D12-1 thru D12-8 (Codes 00 thru 05) .... 1045—2
★Ch. D12-1 thru D12-8 (Codes 06 thru 11) (PCB 1163-3) 1045—2
★Ch. D12-20 (Code 00 thru 05) .... 1185—2
★Ch. D12-21 (Code 00 thru 05) .... 1185—2
★Ch. D14-1,-2,-3,-4,-5 .... 1168—3
★Ch. D14-6,-7,-10,-11 . 1188—POM
★Ch. D15-1,-2 (Codes 00 thru 03) .... 1184—3
★Ch. D15-3,-5 .... 1194—POM
★Ch. D16-2 .... 1178—3
★Ch. D16-3 thru -9 .... 1194—POM
★Ch. D17-1,-2 .... 1188—POM
★Ch. D19-1,-2,-3 ...... 1194—POM
★Ch. E01-9,-10,-19,-20 1194—POM
Ch. Q28-2 (Similar to Chassis) .... 1114—6
Ch. R41-1 .... 1193—5
★Ch. RC5MOD (TV Remote Control Unit) .... 1185—2A
Ch. 368-1 .... TSM—125
Ch. 378-1 .... TSM—126
Ch. 379-1 .... TSM—124
Ch. 432-1 .... 1175—4
Ch. 881-1 .... 770—11

SYMPHONIC
Symphonic Radio & Elec. Corp.
Foot of John Street
Lowell, Massachusetts 01852

P1411/1413 (Ch. A-886) (Similar to Chassis) .... 1139—6
1013 (Ch. A-886) (Similar to Chassis) .... 1139—6
3204SA (Ch. A-885-3) .... 1139—6
3206BK (Ch. A-885-3) .... 1139—6
4200BK,SN (Ch. A-885-2) . 1139—6
4201WA (Ch. A-885-1) ... 1139—6
4202TK (Ch. A-881-1) .... MHF—8
4301TK (Ch. R-821) ...... 1147—6
5000WA (Ch. A-885-1) .... 1139—6
5001WA (Ch. A-881-9) ... MHF—8
5201AWA,WA (Ch. R-821) 1147—6
5202WA .... MHF—16
6201WA/02MA/03PC/04WA (Ch. R-821) .... 1147—6
6300WA (Ch. R-821) ..... 1147—6
6500WA (Ch. R-824) ..... 1172—6

NOTE: ● Denotes Television Receiver. ★ Denotes Color Television Receiver. AOR Denotes Available On Request. AR Denotes Auto Radio Series Volume. CB Denotes CB Radio Series Volume. HTP Denotes Home Tape Player Series Volume. MHF Denotes Modular Hi-Fi Series Volume. PCB Denotes Production Change Bulletin. POM Denotes Bonus Schematic In Photofact-of-the-Month Package—Unavailable After Month Of Issue. SED Denotes Special Equipment Data. TR Denotes Tape Recorder Series Volume. TSM Denotes Transistor Radio Series Volume.

Set No. Folder No.

SYMPHONIC—Cont.

7200WA/02PC (Ch. R-821) 1147-6
Ch. A-881-1,-9 .... MHF-8
Ch. A-885-1,-2,-3 1139-6
Ch. A-886 (Similar to Chassis) 1139-6
Ch. R-821 1147-6
Ch. R-822 1159-5
Ch. R-824 1172-6

T

TEABERRY
Teaberry Electronics Corp.
3401 Shadeland Ave.
Indianapolis, Indiana 46226
FIVE BY FIVE CB-35

TEAC
(See Recorder Listing)

TELEX-PHONOLA
(Also See Phonola and Recorder Listing)

TENNA
(Also See Recorder Listing)
Tenna Corporation
19201 Cranwood Parkway
Warrensville Heights, Ohio 44128
PT-89 .... TSM-127
PT-90 .... TSM-126

TONECREST
Metro Wholesale Corporation
53 West 43rd Street
New York, New York 10036
T-7005 (Similar to Chassis) 1139-6

TOSHIBA
Toshiba America, Inc.
41-06 Delong Street
Flushing, N.Y. 11355
★C7A, C8A (Ch. TAC-3350/51) 1152-3
★C31B (Ch. TAC-4320/21) .. 1150-3
★C41A (Ch. TAC-4360) .... (PCB 1171-3) 1138-2
●V41 (Ch. TAM-3007) ... 1152-SED
16TL-625FD 1180-SED
★Ch. TAC-3350/51 1152-3
★Ch. TAC-4320/21 1150-3
★Ch. TAC-4360 .... (PCB 1171-3) 1138-2
●Ch. TAM-3007 .... 1152-SED

TRAM
Tram Electronics, Inc.
P.O. Box 187, Lower Bay Rd.
Winnisquam, N.H. 03246
Titan III CB-34

TRAVLER
Admiral Corp.—National Service Div.
P.O. Box 845
Bloomington, Illinois 61702

TRIUMPH
(See Auto Radio Listing)

TRUETONE
(Also See Auto Radio and Recorder Listings)
Western Auto Supply Co.
2107 Grand Avenue
Kansas City, Mo. 64108
DC2012B 1070-8
DC2034B 1084-7
DC3177 .... TSM-126
DC4303 .... 1175-SED
DC4812B CB-34
MAE6105A-17 .... MHF-12
MIC2012B-17 1070-8
MIC2034B-17 1084-7
MIC3177A-17 .... TSM-126
●MIC3912B-17 .... 1158-POM
●MIC3919B 1152-POM
★MIC4015A-17 .... 1158-POM
MIC4812B-17 .... CB-34
SYM6075B-07 1148-7
SYR6070A-07 1151-7
SYR6075A-07 1148-7
SYR6095A-07 1164-7
SYR6096A-07, B-07 .... MHF-15
SYR6098A-07 1164-7
★WEG2063B-17 (Similar to Chassis) 1160-2
★WEG2887A-17 1160-2
★WEG2889A-17 1160-2
★2DC2063B (Similar to Chassis) 1160-2
★2DC2887/2889 1160-2
●2DC3912B 1158-POM
●2DC3919B 1152-POM
★2DC4015 .... 1158-POM
4DC6069, B MHF-15
4DC6070 1151-7
4DC6075 1148-7
4DC6095 1164-7
4DC6098 1164-7
4DC6105 .... MHF-12

U

ULTRATONE
Audio Industries Inc.
532 West 4th St.
Michigan City, Ind. 46360
401, 402, 403 1151-8

V

V-M
(Also See Changer and Recorder Listings)
V-M Corporation
375 West Main Street
Benton Harbor, Mich. 49023
761-1 .... TSM-119

VISCOUNT
Webcor Electronics
50-50 Queens Midtown Expressway
Maspeth, New York 11378

Set No. Folder No.

VOLKSWAGEN
(See Auto Radio Listing)

VOLKSWAGEN TRANSPORTER
(See Auto Radio Listing)

VOLVO
(See Auto Radio Listing)

W

WARDS AIRLINE
(Also See Auto Radio and Recorder Listings)
Montgomery Ward & Co.
619 Chicago Avenue
Chicago, Illinois 60607
GAA-2031A 1190-4
GCI-2140A 1174-6
GCI-2330A 1174-6
GCI-2340A 1174-6
GCI-2360A 1174-6
GCI-2421A 1163-8
GCI-2431A 1163-8
GCI-2451A 1163-8
GCI-2545A (Similar to Chassis) 1133-5
GCI-2630A 1155-6
GCI-2640A 1155-6
GCI-2650A 1155-6
★GCI-12420A,B,C,D 1147-2
★GCI-12420E, G (Similar to Chassis) 1147-2
★GCI-12460A, B 1170-3
●GCI-14821A 1194-POM
●GCI-14829B .(PCB 1171-3) 1040-3
●GCI-14841A 1194-POM
●GCI-14849C .(PCB 1171-3) 1040-3
●GCI-14851A 1194-POM
●GCI-14859C .(PCB 1171-3) 1040-3
★GCI-17241A,B 1170-3
★GCI-17321A, B 1182-POM
★GCI-17341A, B 1182-POM
★GCI-17351A, B 1182-POM
★GCI-17421A 1182-POM
★GCI-17441A 1182-POM
★GCI-17451A 1182-POM
★GCI-17821A 1182-POM
★GCI-17841A 1182-POM
★GCI-17851A 1182-POM
GEN-930A 1161-7
GEN-1451A TSM-125
GEN-1471A TSM-127
GEN-1931A (Similar to Chassis) 1118-6
GEN-1941A,B,C (Similar to Chassis) 1118-6
GEN-2930A MHF-8
GEN-3970A TSM-120
GEN-3975A TSM-120
GEN-6121A (Similar to page 105) MHF-8
●GEN-11431A 1148-3
●GEN-11461A 1148-3
●GEN-11481A 1148-3
●GEN-11741A 1160-3
●GEN-11961A 1146-2
★GEN-12340B 1175-SED
★GEN-12440C 1162-3
★GEN-12441A,B 1162-3
●GEN-13460A (PCB 1152-4) 1025-2
●GEN-13461A 1158-3
★GHJ-17098A (Similar to Chassis) .... 891—1
GVC-9002A/9003A ... 1162-SED
GVC-9061A 1143-SED
GVC-9064A 1143-SED
JWR-2070A,B (Similar to Chassis) 1095-5
JWR-2812A,B MHF-10
62-1451 .... TSM-125
62-1471 .... TSM-127
63-13461 1158-3

WARDS-RIVERSIDE
(See Auto Radio Listing)

WEBCOR ELECTRONICS
Webcor Electronics
59-50 Queens Midtown Expressway
Maspeth, New York 11378
●TV3012 1174-3
★TV5018 1146-3

WESTINGHOUSE
(Also See Changer and Recorder Listings)
Westinghouse Electric Corp.
Consumer Electronics Div.
Route 27 Vineard Road
Edison, N.J. 08817
●BP82A19B (Ch. V-2490-16) (Similar to Chassis) .... 934—2
●BP82A49A (Ch. V-2490-15) (Similar to Chassis) .... 934—2
●BP82A49B (Ch. V-2490-17) 934—2
●BP82A69B (Ch. V-2490-18) (Similar to Chassis) .... 934—2
●BP82B49A (Ch. V-2490-15) (Similar to Chassis) .... 934—2
●BP82B49B (Ch. V-2490-17) (Similar to Chassis) .... 934—2
★H-C5220,U/5221,U/5223,U (Ch. V-2435-12/-13,V-2515-6) For TV Ch. .... 669—3 For Radio Ch. .... (PCB 665-4) 620-15
★H-CK7000A/7001A/7003A, LA (Ch. V-2489-1) ... 1194-SED
★H-CK7020/7022/7024 (Ch. V-2489-1) 1194-SED
●H-P8030C/8031C (Ch. V-2490-11) .... 934—2
PAS7020A (Ch. V-4002-C01) 1179-6
PAS7030A/7031A (Ch. V-4002-C01) 1179-6
PAS7060A (Ch. V-4002-C01) 1179-6
PAS7080C (Ch. V-9003-C02) 1181-6
PAS7115A (Ch. V-4002-C01) 1179-6
PAS7118A (Ch. V-4007C01) MHF-12
PAS7120A (Ch. V-4002-C01) 1179-6

Set No. Folder No.

WESTINGHOUSE—Cont.

PAS7130A (Ch. V-4002-C01) 1179-6
PAS7140A (Ch. V-4002-C01) 1179-6
PMM7100A (Ch. V-4006C02) 1155-SED
PMM7110A (Ch. V-4006C01) TSM-124
RC42R67B (Ch. V-3004-C03) 1186-6
RC42R87B (Ch. V-3004-C03) 1186-6
RC52R07B (Ch. V-3004-C04) 1186-6
RF44W07A (Ch. V-2587-1) (See page 131) TSM-88
RG23S18A (Ch. V-2594-1) TSM-125
RG23S18B (Ch. V-2594-2) TSM-125
RLA1010A/1011A (Ch. V-2576-1,-2) ... 1158-SED
RLA1010B/1011B (Ch. V-2576-3,-4) ... 1158-SED
RLA1020A/1021A (Ch. V-2576-1,-2) ... 1158-SED
RLA1020B/1021B (Ch. V-2576-3,-4) ... 1158-SED
RLA1070A (Ch. V-2599) .. 1174-7
RLA1100A (Ch. V-2576-1,-2) 1158-SED
RLA1100B (Ch. V-2576-3,-4) 1158-SED
RLA1110A/1111A (Ch. V-2576-1,-2) ... 1158-SED
RLA1110B (Ch. V-2576-3,-4) ... 1158-SED
RLA3190A (Ch. V-3016C01) 1174-7
RPF5035A (Ch. V-3019-C01) TSM-125
RPF5040A (Ch. V-3019-C01) TSM-125
RPF5060A (Ch. V-3018C01) TSM-124
RPF5080A (Ch. V-3015C01) TSM-121
RT42R37B (Ch. V-3004-C01) 1186-6
RT42R87B (Ch. V-3004-C01) 1186-6
RT52R07B (Ch. V-3004-C02) 1186-6
RTA3010A (Ch. V-2576-1,-2) ... 1158-SED
RTA3010B (Ch. V-2576-3,-4) ... 1158-SED
RTA3110A/3111A (Ch. V-2576-1,-2) ... 1158-SED
★Ch. V-2489-1 .... 1194-SED
●Ch. V-2490-15,-16,-17,-18 (Similar to Chassis) .... 934—2
Ch. V-2507-5 (PCB 526-3) 493-18
Ch. V-2576-1,-2,-3,-4 . 1158-SED
Ch. V-2594-1,-2 .... TSM-125
Ch. V-2599 1174-7
Ch. V-3004-C01/-C02/C03/-C04 1186-6
Ch. V-3015C01 .... TSM-121
Ch. V-3016C01 1174-7
Ch. V-3018C01 .... TSM-124
Ch. V-3019-C01 .... TSM-125
Ch. V-4002-C01 1179-6
Ch. V-4003-C02 1181-6
Ch. V-4006C01 .... TSM-124
Ch. V-4006C02 .... 1155-SED
Ch. V-4007C01 .... MHF-12

WIZARD
(See Auto Radio and Recorder Listings)

Y

YORK
(Also See Recorder Listing)
York Radio Corp.
15 Empire Bldg.
So. Hackensack, N.J. 07606
DC-100 .... 1176-SED
DC-103 1194-5
DCR-93 1190-5
TC-106 1165-6

Z

ZENITH
(Also See Recorder Listing)
Zenith Sales Corporation
1900 N. Austin Ave.
Chicago, Illinois 60639
A602B,F TSM-120
★A4519P5,W5 (LP Ch. 12A13C52) 1157-2
★A4520M5 (LP Ch. 12A13C52) 1157-2
★A4524H5/25P5,W5/26H5/28DE5,P5 (LP Ch. 12A13C52) 1157-2
★A4530M5 (LP Ch. 12A13C52) 1157-2
★A4533W5 (LP Ch. 12A13C52) 1157-2
★A4538DE5,P5/39M5 (LP Ch. 12A13C52) 1157-2
★A4542P5 (LP Ch. 12A13C52) 1157-2
★A6519P5 (LP Ch. 12A13C52) 1157-2
★A6546P5/48DE5 (LP Ch. 12A13C52) 1157-2
B535J, Y (Ch. 8BT20) 1168-6
B535J-1, Y-1 (Ch. 8BT20) . 1168-6
B595W (Ch. 10ZT30, 11ZT27) (See page 112) MHF-1
B907M-1/908DE-1, P-1 (Ch. 21BT34) 1190-6
B910W-1 (Ch. 21BT34) ... 1190-6
B914M, M-1 (Ch. 21BT34) 1190-6
B916DE, P (Ch. 21BT34) .. 1190-6
B920W (Ch. 21BT34) 1190-6
B923W/925M (Ch. 21BT34) 1190-6
B292DE, P (Ch. 21BT34) .. 1190-6
B960W (Ch. 6AT24, 29AT24) 1132-6

Set No. Folder No.

ZENITH—Cont.

B966DE,P (Ch. 6AT24, 29AT24) 1132-6
●B1331C5 (Ch. 13A12TZ) .... (PCB 1196-4) 1084-3
●B2002J2,J3 (Ch. 14B38Z) . 1156-3
●B2003L2 (Ch. 14B38Z) (Similar to Chassis) 1156-3
●B2005W2,W3 (Ch. 14B38Z) 1156-3
●B2009W3 (Ch. 14B38Z) ... 1156-3
●B2044W2 (Ch. 14B38) 1156-3
●B2044W3 (Ch. 14B38Z) ... 1156-3
●B2417W4, W6 (Ch. 14N22) (Similar to Chassis) 1095-3
●B2421W4, W5 (Ch. 14N22) (Similar to Chassis) 1095-3
●B2424M4, M5 (Ch. 14N22) (Similar to Chassis) 1095-3
●B2428W4 (Ch. 14N22) (Similar to Chassis) 1095-3
★B2955W (Ch. 12B9C16) ... 1165-2
★B2981W, W2 (Ch. 14B9C50) 1197-2
★B2995W (Ch. 14B9C50) ... 1197-2
★B2995W1 (Ch. 14A9C50) (Similar to Chassis) 1097-3
★B2999W (Ch. 12B14C50) .. 1157-2
★B3510C, C2 (Ch. 12B8C15) 1165-2
★B3510C1, C3 (Ch. 12B9C15) (Similar to Chassis) 1165-2
★B3510C5 (Ch. 12B8C15) (Similar to Chassis) 1165-2
★B3520W, W2 (Ch. 12B8C15) 1165-2
★B3520W1, W3 (Ch. 12B8C15) (Similar to Chassis) 1165-2
★B3710J, J2 (Ch. 12B8C15) 1165-2
★B3710J1, J3 (Ch. 12B8C15) (Similar to Chassis) 1165-2
★B3710L1, L3 (Ch. 12B8C15) (Similar to Chassis) 1165-2
★B3710J5 (Ch. 12B8C15) (Similar to Chassis) 1165-2
★B3710L, L2 (Ch. 12B8C15) 1165-2
★B3710L5 (Ch. 12B8C15) (Similar to Chassis) 1165-2
★B3721DE, DE2, W, W2, W3 (Ch. 12B9C16) 1165-2
★B3910W,W2 (Ch. 14A9C29Z) .... (PCB 1177-3) 1116-3
★B3914W,W2 (Ch. 14A10C29Z) .... (PCB 1177-3) 1116-3
★B4025W,W2 (Ch. 4B25C19) 1166-3
★B4030W,W2 (Ch. 4B25C19) 1166-3
★B4206W5/4208W4 (Ch. 14B9C50) 1197-2
★B4216W5 (Ch. 14B9C50) . 1197-2
★B4509W3 (Ch. 14A9C50) (Similar to Chassis) 1097-3
★B4509W4 (Ch. 14B9C50) . 1197-2
★B4512W5 (Ch. 14B9C50) . 1197-2
★B4512W8,W9 (Ch. 14A9C50) (Similar to Chassis) ... 1097-3
★B4513W5 (Ch. 14B9C50) . 1197-2
★B4513W11, W13 (Ch. 20BC50) 1197-2
★B4514M5 (Ch. 14B9C50) . 1197-2
★B4514M11, M13/4515DE11, DE13 (Ch. 20BC50) ... 1197-2
★B4515DE5 (Ch. 14B9C50) 1197-2
★B4519W (Ch. 12B14C52) .. 1157-2
★B4519W1 (Ch. 12B13C52) . 1157-2
★B4521M (Ch. 12B14C52) .. 1157-2
★B4521M1,P1 (Ch. 12B13C52) 1157-2
★B4522H,P/23DE,P (Ch. 12B14C52) 1157-2
★B4522H1,P1/23DE1,P1 (Ch. 12B13C52) 1157-2
★B4529W (Ch. 12B14C52) . 1157-2
★B4529W1 (Ch. 12B13C52) . 1157-2
★B4707W (Ch. 12B14C50) .. 1157-2
★B4725W (Ch. 12B14C50) . 1157-2
★B4727M/4728DE,P (Ch. 12B14C50) 1157-2
★B4732W (Ch. 12B14C50) . 1157-2
★B4736M/38DE,P (Ch. 12B14C50) 1157-2
★B4736M1 (Ch. 12B14C50) . 1157-2
★B4744W (Ch. 12B14C50) . 1157-2
★B4746DE (Ch. 12B14C50) 1157-2
★B4849P (Ch. 12B14C50) .. 1157-2
★B6030W, W2 (Ch. 4B25C19) 1166-3
★B6208W4 (Ch. 14B9C50, S-77536) 1197-2
★B6509W3 (Ch. 14A9C50, S-77536) (Similar to Chassis) 1097-3
★B6509W4, W6 (Ch. 14B9C50, S-77536 or S-86436) .. 1197-2
★B6513W4 (Ch. 14B9C50, S-77536) 1197-2
★B6513W11 (Ch. 20BC50, S-86436) 1197-2
★B6514M4 (Ch. 14B9C50, S-77536) 1197-2
★B6514M11 (Ch. 20BC50, S-86436) 1197-2
★B6519W (Ch. 12B14C52) . 1157-2
★B6519W6 (Ch. 12B14C52) . 1157-2
★B6523DE,P (Ch. 12B14C52) 1157-2
★B6523DE6, P6 (Ch. 12B14C52) 1157-2
★B6707W (Ch. 12B14C50) .. 1157-2
★B6707W6 (Ch. 12B14C50) . 1157-2
★B6744W (Ch. 12B14C50) .. 1157-2
★B6744W6 (Ch. 12B14C50) 1157-2
★B8720W (TV Ch. Only 12B14C50) 1157-2
★B8732M/M1/34DE (TV Ch. Only 12B14C50) 1157-2
★B8770P (TV Ch. Only 12B14C50) 1157-2
★B8770P6 (TV Ch. Only 12B14C50) 1157-2
●C1331C, F, J, L (Ch. 13A125) .... (PCB 1196-4) 1084-3
●C1331C3, F3, J3, L3 (Ch. 13A12T) (PCB 1196-4) 1084-3
●C1333W (Ch. 13A125) .... (PCB 1196-4) 1084-3
●C1333W3 (Ch. 13A12T) .... (PCB 1196-4) 1084-3
●C1810C, X (Ch. 13A16SZ) .... (PCB 1195-3) 1076-3

Set No. Folder No.

ZENITH—Cont.

●C1825W (Ch. 13A16SZ) .... (PCB 1195-3) 1076-3
●C2003J, J1/2005W, W1 (Ch. 14B38Z) (Similar to Chassis) 1156-3
●C2213W (Ch. 19CB36) 1188-POM
●C2224W (Ch. 19CB36) 1188-POM
●C2410C, C1/2412W, W1/2414W, W1 (Ch. 14N22) (Similar to Chassis) 1095-3
●C2417W, W1 (Ch. 14N22) (Similar to Chassis) 1095-3
●C2420W, W1 (Ch. 14N22) (Similar to Chassis) 1095-3
●C2424M, M1 (Ch. 14N22) (Similar to Chassis) 1095-3
●C2428W (Ch. 14N22) (Similar to Chassis) 1095-3
●C2740W (Ch. 14B38Z) (Similar to Chassis) 1156-3
★C2983W, W2 (Ch. 20BC50) 1197-2
★C2994W, W2 (Ch. 20BC50) 1197-2
★C4025W, W2 (Ch. 19CC19) 1182-POM
★C4030W, W2 (Ch. 19CC19) 1182-POM
★C4208W (Ch. 20BC50) ... 1197-2
★C4509W (Ch. 20BC50) ... 1197-2
★C6030W2 (Ch. 19CC19) 1182-POM
★C6509W (Ch. 20BC50, S-86436) 1197-2
R16J, L, Y 1172-SED
R32C, P 1172-SED
R46C,J TSM-122
R86J (Ch. 32-1) TSM-127
R877T TSM-127
Royal 13F, W, Y 1189-SED
Royal 16J, L, Y 1172-SED
Royal 32C, P 1172-SED
Royal 46C, J TSM-122
Royal 86J (Ch. 32-1) TSM-127
Royal 877T TSM-127
●S2697L2,L3,L4,L5 (Ch. 14B39,Z) 1156-3
●S2697W4 (Ch. 14B39Z) (Similar to Chassis) 1156-3
★S2929W3 (Ch. 12B9C16) .. 1165-2
★S2960W, W2 (Ch. 14A9C29Z) .... (PCB 1177-3) 1116-3
★S-83596 (TV Remote Control Unit) 1157-2A
●S-85833 (TV Remote Control Unit) 1156-3A
★S-86335 (TV Remote Control Unit) 1166-3A
★S-86500 (TV Remote Control Unit) 1166-3A
★S-87286 (TV Remote Control Unit) 1157-2A
●T2654L2,L3 (Ch. 14B38) .. 1156-3
●T2655W2,W3 (Ch. 14B38Z) 1156-3
●72657W, W1 (Ch. 14B38Z) (Similar to Chassis) 1156-3
●T2673W4 (Ch. 14B38) 1156-3
●T2673W5 (Ch. 14B38Z) ... 1156-3
●T2688W (Ch. 19CB36) 1188-POM
●T2698W, W1 (Ch. 14N22) (Similar to Chassis) 1095-3
●T2720W8, W9 (Ch. 14N22) (Similar to Chassis) 1095-3
★T2836W, W2 (Ch. 19CC19) 1182-POM
★T2923W, W2, W3 (Ch. i2B8C15) 1165-2
★T2927W, W2, W3 (Ch. 12B9C16) 1165-2
★T2932W5 (Ch. 14A10C29, Z) .... (PCB 1177-3) 1116-3
★T2932W56 (Ch. 14A10C29Z) (Similar to Chassis) 1116-3
★T2935W, W2 (Ch. 4B25C19) 1166-3
★T2951W5 (Ch. 14B9C50) .. 1197-2
★T2951W11, W13 (Ch. 20BC50) 1197-2
★T2977W (TV Ch. Only 12B14C52) 1157-2
★T2985M1 (Ch. 20Y1C50) (Similar to Chassis) .... 981—2
★T2986W (Ch. 12B14C52) .. 1157-2
★T2989M (Ch. 12B14C52) .. 1157-2
★T2990DE,P (Ch. 12B14C52) 1157-2
★T2993DE5 (Ch. 14B9C50) . 1197-2
★T2993DE11, DE13 (Ch. 20BC50) 1197-2
★T2994W5/95M5 (LP Ch. 12A13C52) 1157-2
★T2996W (Ch. 12B14C50) .. 1157-2
★T2997DE5,P5 (LP Ch. 12A13C52 1157-2
★T2998DE,P (Ch. 12B14C50) 1157-2
Z538C, P (Ch. 8ZT20, Z) .. 1183-5
Z541P, W (Ch. 8ZT20, Z) . 1183-5
★Z4532DE1,P1 (Ch. 20Y1C50) (Similar to Chassis) .... 981—2
★Z8530W1 (Ch. 20Y1C50, 20YT20) For Similar TV Ch. ..... 981—2 For Radio Ch. .... 959—9
★Ch. S-77536 (TV Remote Control Unit) 1197-2A
★Ch. S-86436 (TV Remote Control Unit) 1197-2B
★Ch. 4B25C19 (PCB 1191-3) 1166-3
Ch. 8BT20 1168-6
Ch. 8ZT20, Z 1183-5
★Ch. 12A13C52 (Late Prod.) 1157-2
★Ch. 12B8C15 1165-2
★Ch. 12B9C16 1165-2
★Ch. 12B13C52 1157-2
★Ch. 12B14C50/52 1157-2
●Ch. 131A125, T, Z .... (PCB 1196-4) 1084-3
●Ch. 13A16, M, S, SZ .... (PCB 1195-3) 1076-3
★Ch. 14A9C29Z .... (PCB 1177-3) 1116-3
★Ch. 14A10C29,Z .... (PCB 1177-3) 1116-3
★Ch. 14B9C50 1197-2
●Ch. 14B38, Z 1156-3
●Ch. 14B39, Z 1156-3
●Ch. 19CB36 .... 1188-POM
★Ch. 19CC19 .... 1182-POM
★Ch. 20BC50 1197-2
Ch. 21BT34 1190-6
Ch. 32-1 .... TSM-127

Set No. Folder No.

AUTO RADIOS AND TAPE PLAYERS

A

AIWA
Milovac International Co., Inc.
4215 West 45th Street
Chicago, Illinois 60632
TP-1023 .... AR-91

ALLIS-CHALMERS
8BT (Similar to Page 5) ... AR-50

AMERICAN MOTORS
American Motors Corp.
14250 Plymouth Road
Detroit, Michigan
IJA4009 (3601578) AR-87
1RA5002 (3591052) AR-87
3591052 .... AR-87
3601578 .... AR-87

ARVIN
Arvin Industries, Inc.
1531 Thirteenth St.
Columbus, Indiana 47201
50Y74-19 (Ch. 1.51001) ... AR-92
Ch. 1.51001 .... AR-92

AUDIOVOX CORPORATION
Audiovox Corporation
300 Denton Avenue
New Hyde Park, Long Island, N.Y. 11040
C-80 .... AR-90
C-410 .... AR-92
C-420 .... AR-93
C-440 .... AR-96
C-510 .... AR-92
C-520 .... AR-94
C-560 .... AR-94
C-565 .... AR-94
C575, C-576 .... AR-93
C-930 .... AR-91
C-935 .... AR-95
C-940 .... AR-99
C-950 .... AR-99

AUTOMATIC
Automatic Radio Mfg. Co., Inc.
2 Main Street
Melrose, Massachusetts 02176
CFE-8001 .... AR-91
CRS-9440 .... AR-103
CSA-9934 .... AR-103
EMX-6810 .... AR-89
ESS-8528 .... AR-95
SED-9060 .... AR-99
UAF-6270 .... AR-94
VP-6235 .... AR-89

AUTO-SONIC
Martel Electronic Sales, Inc.
2339 South Cotner St.
Los Angeles, Calif. 90064
Mark 88 .... AR-95
ST-48 .... AR-91
ST-88 .... AR-95
ST-120G (Late Prod.) AR-99

B

BUICK
United Delco Distributors
04AFP2 .... AR-88
04APB1 .... AR-100
04EFM2 .... AR-88
04EFP2 .... AR-88
14AFP1 .... AR-101
14AT411 .... AR-97
14BFM1 .... AR-102
14BFM2 (Similar to Page 5) AR-98
14BFMT1 .... AR-98
14BFP1 .... AR-96
14BFP2 (Similar to Page 11) AR-96
14BPB2 .... AR-104
14BPBT1 .... AR-100
14BT411 .... AR-97
7307554 .... AR-97
7313514 .... AR-101
7930134 .... AR-100
7930144 .... AR-98
7930234 .... AR-96
7930244 .... AR-102
7935347 .... AR-97

C

CADILLAC
United Delco Distributors
05CFPK2 .... AR-93
05CT412 .... AR-94
15CFMT1, 15CFMT2 ...... AR-96
15CFP1 .... AR-100
15CFP2 (Similar to Page 29) AR-100
15CMW1 .... AR-102
15CMW2 (Similar to Page 19) AR-102
15CT411 .... AR-97
7930015 .... AR-100
7930025 .... AR-102
7930035 .... AR-96
7930495 .... AR-97

CHANNEL MASTER
Channel Master Corp.
Ellenville, N.Y. 12428
6317 .... AR-103

CHEVROLET
United Delco Distributors
01APB1,01APB2 .... AR-101
01BFP3 .... AR-92
01FFP1 .... AR-92
01FPB1 .... AR-101
01TFP3 .... AR-92
01TPB1,01TPB2 .... AR-101
01VFM3 .... AR-90
01VFP3 .... AR-92
11AFM1 .... AR-100
11AFMT1 (See page 19) ... AR-75

NOTE: ● Denotes Television Receiver. ★ Denotes Color Television Receiver. AOR Denotes Available On Request. AR Deno'es Auto Radio Series Volume. CB Denotes CB Radio Series Volume. HTP Denotes Home Tape Player Series Volume. MHF Denotes Modular Hi-Fi Series Volume. PCB Denotes Production Change Bulletin. POM Denotes Bonus Schematic in Photofact-of-the-Month Package—Unavailable After Month Of Issue. SED Denotes Special Equipment Data. TR Denotes Tape Recorder Series Volume. TSM Denotes Transistor Radio Series Volume.

Set No. / Folder No.

CHEVROLET—Cont.

11AFP1 .... AR-104
11APB1 .... AR-96
11APBT1 (See page 57) AR-74
11BFM1/BFM2 .... AR-101
11BFM3 (Similar to Page 25) AR-101
11BFMT1 .... AR-105
11BFP1 (7314221) AR-93
11BFP2 .... AR-93
11BFP3, 11BFPK3 (Similar to Page 47) AR-93
11BFPK1 (7933301) AR-93
11BFPK2 .... AR-93
11BPB2, 11BPBK2 .... AR-97
11BPBT1 .... AR-102
11BT411 .... AR-97
11HFP2 (7936011) AR-93
11HPB2 .... AR-97
11TFP1 .... AR-104
11TPB1 .... AR-96
11TT411 .... AR-97
11VFM1 (See page 25) AR-78
11VFP1 .... AR-104
7305841 .... AR-96
7313971 .... AR-97
7314201 .... AR-97
7314211 .... AR-101
7314221 .... AR-93
7930121 .... AR-105
7930631 .... AR-102
7933241 .... AR-96
7933261 .... AR-100
7933291 .... AR-97
7933301 .... AR-93
7933641 .... AR-97
7936011 .... AR-93

CHRYSLER
Chrysler Corp.
P.O. Box 1118
Detroit, Michigan 48231

CF09503 .... AR-87
CF15703 .... AR-96
CF84403 .... AR-87
0BBCC AR-94
0BDS AR-92
0BVD AR-94
1BBC AR-89
1CH4007 .... AR-90
1BBFW1 .... AR-98
1BBFW2 (Similar to Page 27) AR-98
376 (7BC) AR-42
2884095 (CF09503) AR-87
2884633 (1CH4007) AR-90
2884649 (0BDS) AR-92
2884750 (0BVD) AR-94
2884752 (0BBCC) AR-94
2884844 (CF84403) AR-87
3489157 (CF15703) AR-96
3501013 (1BBC) AR-89
3501045 .... AR-105
3501164 .... AR-98
3501166 .... AR-104

CRAIG
Craig Corp.
2302 East 15th Street
Los Angeles, California 90021

3108 .... AR-91
3116 .... AR-95
3117 .... AR-89
3119 .... AR-90
3123 .... AR-99

D

DODGE
(Also See Mopar)
Chrysler Corp.
P.O. Box 1118
Detroit, Mich. 48231

CF10503 .... AR-93
CF15703 .... AR-96
CF61003 .... AR-88
CF74903 .... AR-89
CF75203 .... AR-88
CF75603 .... AR-88
CF75703 .... AR-93
CG01303 .... AR-104
CG01403 .... AR-105
CG05903 .... AR-105
CG64803 .... AR-93
CG82704 .... AR-89
0BBCC AR-94
0BBJ AR-89
0BDS AR-92
0BDT AR-97
0BVD AR-94
1BBC AR-89
1BBJ AR-89
1BVD (Similar to page 45) AR-94
1CH4007 .... AR-90
1DT1919 .... AR-87
377 (7BBD) AR-42
2824744 (0BDT) AR-97
2824858/859 (0BDT) AR-97
2824858/859/860 (8BDT) (See page 79) AR-60
2864513 (8BDA, 9BDA (See page 24) AR-57
2884059 (8FBDA) (See page 41) AR-58
2884063 (8FBCO) (See page 41) AR-58
2884105 (CF10503) AR-93
2884151 (8BDC) (See page 24) AR-57
2884610 (CF61003) AR-88
2884633 (1CH4007) AR-90
2884649 (0BDS) AR-92
2884749 (CF74903) AR-89
2884750 (0BVD) AR-94
2884752 (CF75203) AR-88
2884752 (0BBCC) AR-94
2884756 (CF75603) AR-88
2884757 (CF75703) AR-93
2884759 (0BB., 1BBJ) AR-89
2884768 (8BCO, 9BBCC) (See page 24) AR-57
2932706 (8FBDD) (See page 41) AR-58
2958648 (CG64803) AR-93
2958827 (CG82704) AR-89
3420826 (1DT1919) AR-87
3489157 (CF15703) AR-96
3501013 (CG01303) AR-104
3501013 (1BBC) AR-89
3501014 (CG01403) AR-105

DODGE—Cont.

3501045 .... AR-105
3501059 (CG05903) AR-105
3501156 .... AR-104

DYNATRONICS
Inland Dynatronics, Inc.
111 Hackensack Ave.
Hackensack, N.J. 07601

S-401 .... AR-95
S-848 .... AR-91

F

FORD
Ford Motor Co.
Dearborn, Mich.

C80A-19A049 .... AR-87
D0BA-10010 (See page 51) AR-59
D0HA-18810 (See page 51) AR-59
D0KA-18810 (See page 51) AR-59
D0SA-19A242 .... AR-96
D1AA-19A241 .... AR-94
D1AA-18806 .... AR-94
D1DA-18806 .... AR-94
D1HA-18806 .... AR-94
D1OA-19A241 .... AR-94
D1OA-18806 .... AR-94
D1SA-19A242AB AR-102
D1SA-18806AB AR-101
D1TA-19A241 .... AR-94
D1TA-18806 .... AR-94
D1TJ-18806AA AR-97
D1UA-18806 .... AR-94
D1ZA-19A241 .... AR-94
D1ZA-18806 .... AR-94
D12A-18806 .... AR-94
ED-D1OA-19A241 .... AR-98
ED-D1SA-19A241 .... AR-100
ED-D1TA-19A241 .... AR-98
ED-D1ZA-19A241 .... AR-98
ED1-D1OA-19A241 .... AR-98
ED1-D1SA-19A241 .... AR-100
ED1-D1TA-19A241 .... AR-98
ED1-D1ZA-19A241 .... AR-98
0FBSW AR-96
1BTB/BTT/BTW (See page 51) AR-59
1FBF AR-94
1FBO AR-94
1FBOO AR-98
1FBOX AR-98
1FBSS (ED1-D1SA-19A241) AR-100
1FBSX (ED-D1SA-19A241) AR-100
1FBTP AR-94
1FBTPP AR-98
1FBTPX AR-98
1FBZ AR-94
1FBZX AR-98
1FBZZ AR-98
1FD4103 .... AR-104
1FD5003 (C80A-19A049) AR-87
2FD4103 .... AR-104
2MZ4101 .... AR-104
2TB4109 (D1SA-19A242AB) AR-102
9TBTL/TBTLM/TBTU (See page 26) AR-56

G

GENERAL MOTORS CORP. (GMC)
United Delco Distributors

01TPB1,01TPB2 .... AR-101
06TCFP2 .... AR-92
06TT412 .... AR-93
16TFP1 .... AR-104
16TRMP1 .... AR-96
16TTCP1 .... AR-96
16TT411 .... AR-97
16UT411 .... AR-97
7305516 .... AR-96
7307456 .... AR-97
7308166 .... AR-97
7931766 .... AR-96

GIBBS
Gibbs Special Products Corp.
P.O. Box 471
Janesville, Wisc. 53546

636 .... AR-103
657 .... AR-101
805, 807 .... AR-87
912 .... AR-103
920 .... AR-101
950, 952 .... AR-87

GM & GMC
(See General Motors)

H

HAMMOND
(See Gibbs)

HITACHI
Hitachi Sales Corporation of America
48-50 34th Street
Long Island City, N.Y. 11101

CS-133 .... AR-103
CS-1101C AR-103

I

IMPERIAL
(See Chrysler)

INTERNATIONAL
International Harvester Co.
180 North Michigan Avenue
Chicago, Illinois

8BT (Similar to page 85) AR-51

J

JACOBSEN

8BT (Similar to page 57) AR-52

JEEP
Kaiser-Jeep Corp.
200 Industrial Drive
Plymouth, Mich.

9BKJ, 9BKJC, 9BKJW (Similar to page 37) AR-69
978322 (8BKJ) (See page 37) AR-69
978339 (8BKJ) (See page 37) AR-69

JOHN DEERE

8BT (Similar to page 47) AR-49

K

KARMANN GHIA
Volkswagen of America
Englewood Cliffs, New Jersey

R2BG, 2BG AR-102

L

LAFAYETTE
Lafayette Radio Electronics Corp.
111 Jericho Turnpike
Syosset, L.I., New York 11791

Stereo 88 (99-15521W) AR-91
99-15521W AR-91

LINCOLN
Ford Motor Co.
Dearborn, Mich.

D0LA-19A241 .... AR-94
D0LA-19A242 .... AR-92
D1LA-18806 .... AR-98
D1VA-19A241 .... AR-97
D1VA-19A242AA AR-102
D1VA-19A244 (See page 37) AR-82
0FBX AR-94
1BLSS (D1VA-19A244) (See page 37) AR-82
1FBL AR-97
1MT4002 (D0LA-19A242) AR-92
2LN4110 (D1VA-19A242AA) AR-102
2MT4108 .... AR-104

M

MEDALLION
Medallion Automotive Products Company
P.O. Box 1903
Kansas City, Missouri 64141

65-206 .... AR-101
65-212 .... AR-96
65-231 .... AR-104
65-241 .... AR-102
65-482, 65-484 .... AR-103

MERCURY
Ford Motor Co.
Dearborn, Michigan

C9MA-19A242C AR-88
C80A-19A049 .... AR-87
D0RJ-18806A AR-102
D1AA-18806 .... AR-94
D1DA-18806 .... AR-94
D1GA-19A241 .... AR-98
D1HA-18806 .... AR-94
D1MA-19A241 .... AR-98
D1MA-19A242AD AR-105
D1OA-18806 .... AR-94
D1TA-18806 .... AR-94
D1UA-18806 .... AR-94
D1WA-19A241 .... AR-98
D1WA-19A242AD AR-105
D1YA-19A241 .... AR-98
D1YA-19A242AD AR-105
D1ZA-18806 .... AR-94
D12A-18806 .... AR-94
ED-D1GA-19A241 .... AR-97
ED-D1WA-19A241 .... AR-97
ED1-D1GA-19A241 .... AR-97
ED1-D1WA-19A241 .... AR-97
T9MM (C9MA-19A242C) AR-88
1CP1047 (D0RJ-18806A) AR-102
1FBA AR-98
1FBG AR-98
1FBGG AR-97
1FBGX AR-97
1FBM AR-98
1FBW AR-98
1FBWW AR-97
1FBWX AR-97
1FD5003 (C80A-19A049) AR-87
1MY4106 (2MY6) AR-105
2CR7 .... AR-105
2CR4107 (2CR7) AR-105
2MR1 .... AR-105
2MR4111 (2MR1) AR-105
2MY6 .... AR-105
2MY4106 (2MY6) AR-105

MOPAR
Chrysler Corporation
P.O. Box 1118
Detroit, Mich. 48231

376 (2820635) AR-51

MOTOROLA
Motorola, Inc.
9401 West Grand Ave.
Franklin Park, Ill. 60131

FM360A AR-87
PT70AD (See Page 43) AR-69
TF800S AR-90
TM203S (Similar to Page 57) AR-95
TM703S AR-95

O

OLDSMOBILE
United Delco Distributors

03AFM2 .... AR-88
03APB1 .... AR-98
03BFM2 .... AR-88
03BT412 .... AR-87
03EFM2 .... AR-88
03ET412 .... AR-87
13AFM1 .... AR-105
13APB1 .... AR-101
13AT411 .... AR-97
13BFM1, 13BFM2 .... AR-98
13BFMT1 .... AR-97
13BPB2 .... AR-101

OLDSMOBILE—Cont.

13BPBT1 .... AR-96
7930013 .... AR-101
7930033 .... AR-98
7930053 .... AR-96
7930063 .... AR-97
7932743 .... AR-101
7932753 .... AR-105
7932763 .... AR-97

OPEL
United Delco Distributors

04LPB1 .... AR-100
04PPB1 .... AR-100
14BPB1 .... AR-97
14LPB2 .... AR-96
7312234 .... AR-97
7930254 .... AR-96

P

PANASONIC
Matsushita Elec. Corp. of America
Panasonic Service & Parts Div.
10-16 44th Drive
Long Island City, N.Y. 11101

CX-777SU AR-99
CX-888SU AR-95

PLYMOUTH
(Also See Mopar)
Chrysler Corp.
P.O. Box 1118
Detroit, Mich. 48231

CF10103 .... AR-88
CF61003 .... AR-88
CF74803 .... AR-90
CF75503 .... AR-87
CF79503 .... AR-92
CGO1303 .... AR-104
CGO1403 .... AR-105
CGO5903 .... AR-105
0BBCC AR-94
0BBJ AR-89
0BDS AR-92
0BVD AR-94
1BBC AR-89
1BBJ AR-89
1BVD (Similar to page 45) AR-94
1CH4007 .... AR-90
2864515 (8BBA, 9BBA) (See page 93) AR-61
2864527 (8BVA, 9BVA) (See page 93) AR-61
2864756 (8FBPD) (See page 41) AR-58
2864767 (8BBE, 9BBCC) (See page 93) AR-61
2884056/057 (8FBBA/BVA, 9FBVA) (See page 41) AR-58
2884063 (8FBCO) (See page 41) AR-58
2884101 (CF10103) AR-88
2884610 (CF61003) AR-88
2884633 (1CH4007) AR-90
2884649 (0BDS) AR-92
2884748 (CF74803) AR-90
2884750 (0BVD) AR-94
2884752 (0BBCC) AR-94
2884755 (CF75503) AR-87
2884759 (0BBJ, 1BBJ) AR-89
2884795 (CF79503) AR-92
3501013 (CGO1303) AR-104
3501013 (1BBC) AR-89
3501014 (CGO1403) AR-105
3501045 .... AR-105
3501059 (CGO5903) AR-105
3501156 .... AR-104

PONTIAC
United Delco Distributors

02AFM2 .... AR-89
02AFP1/AFPK1 .... AR-94
02APB1/APBK1 .... AR-101
02BFM2 .... AR-89
02BFP1/BFPK1 .... AR-94
02BT412 .... AR-90
02FFP1/FFP2/FFPK2 .... AR-94
02FPB1/FPB2/FPBK2 .... AR-101
02FT412 .... AR-90
02GFP1/GFPK1 .... AR-94
12AFP1, 12AFPK1 .... AR-97
12APB1 .... AR-98
12APBK1 .... AR-98
12AT411 .... AR-97
12BFM1 .... AR-100
12BFM2 (Similar to Page 87) AR-100
12BFMT1 .... AR-104
12BFP1 .... AR-102
12BFP2 (Similar to Page 101) AR-102
12BFPK1 .... AR-102
12BFPK2 (Similar to Page 101) AR-102
12BPB2 .... AR-105
12BPBK2 .... AR-105
12BPBT1 .... AR-101
12BT411 .... AR-97
12FFP1, 12FFPK1 .... AR-97
12FPB1 .... AR-98
12FPBK1 .... AR-98
12FT451 .... AR-97
12GFP1, 12GFPK1 .... AR-97
12GPB1 .... AR-98
12GPBK1 .... AR-98
92AFP6 (Similar to page 63) AR-69
92APB6 (Similar to page 97) AR-66
92BFP6 (Similar to page 105) AR-73
92BPB6 (Similar to page 89) AR-72
92GFP6 (Similar to page 63) AR-69
92GPB6 (Similar to page 89) AR-72
7307302 .... AR-98
7307332 .... AR-98
7307402 .... AR-97
7307432 .... AR-97
7307702 .... AR-97
7312892 .... AR-98
7312912 .... AR-98
7312922 .... AR-97
7312941 .... AR-97
7313522 .... AR-98
7313532 .... AR-97
7313552 .... AR-98
7313562 .... AR-97
7930012 .... AR-105
7930022 .... AR-102
7930032 .... AR-100

PONTIAC—Cont.

7930202 .... AR-105
7930212 .... AR-102
7930242 .... AR-101
7930492 .... AR-97
7934782 .... AR-97

R

RANGER
Ranger Auto Radio
19201 Cranwood Parkway
Cleveland, Ohio 44128

RR-MPX-1 (See page 95) AR-63
RR-24 PB AR-105
RR-42-FT AR-95
RR-42-T (See Page 77) AR-95
RR-46-FMTX
For Radio Chassis (See page 83) AR-62
For MPX Chassis (See page 95) AR-63

REALISTIC
Radio Shack Corporation
2727 West 7th Street
Fort Worth, Texas 76107

12-1827 .... AR-95
12-1828 .... AR-99

S

SAAB
Saab, Inc.
100 Waterfront
New Haven, Conn.

9BSA, 9BSAA, 9BSA99 (Similar to Page 115) AR-70
500127 (8BSA) (See page 115) AR-70

SEARS-SILVERTONE
Sears, Roebuck & Co.
925 South Homan Ave.
Chicago, Illinois 60607

564.5071 .... AR-99
564.50700/701 .... AR-99
564.626410 .... AR-88
564.626420 .... AR-93
564.626430 .... AR-92
833.R6286 .... AR-92
833.6236 .... 1150-SED
833.50290 .... AR-89
833.62040 .... AR-91
833.62340 .... AR-103
833.62460 .... AR-92
833.62840 .... AR-101
833.62860 .... AR-92
833.62901 .... AR-92
833.63120/121 .... AR-103
833 63170 .... AR-99
833.63280 (See Page 107) AR-103

SIMCA
Chrysler Corporation
P.O. Box 1118
Detroit, Michigan 48231

S-48136 (8BSI) (See page 115) AR-66
9BSI, 9BSIA, 9BSIB (Similar to Page 115) AR-66

SUNBEAM

R-80001 (8BSU) (See page 115) AR-65
9BSU, 9BSUB (Similar to Page 115) AR-65

T

TRIUMPH
Standard Triumph
575 Madison Avenue
New York, New York 10022

9BTR, 9BTRA, 9BTRB (Similar to Page 107) AR-64

TRUETONE
Western Auto Supply Co.
2107 Grand Avenue
Kansas City, Missouri 64108

DC4060 .... AR-93
DC4060B AR-100
ID14DC7908A-86 .... AR-99
ID17908A-86 .... AR-99
ITC7006A-07 .... AR-91
ITC7010A-07 .... AR-99
ITC7908A-96 .... AR-99
ITC7910A-86 .... AR-95
MIC4060A-07 .... AR-93
MIC4060B-17 .... AR-100
4DC7006 .... AR-91
4DC7010 .... AR-99
4DC7908 .... AR-99
4DC7910 .... AR-95

V

VOLKSWAGEN
Volkswagen of America
Englewood Cliffs, New Jersey

R2BG, 2BG AR-102
R2BT, 2BT AR-102
R2BV, 2BV AR-102

VOLKSWAGEN TRANSPORTER
Volkswagen of America
Englewood Cliffs, New Jersey

R2BT, 2BT AR-102

VOLVO
Volvo Distributors, Inc.
Volvo Drive
Rockleigh, New Jersey

9BVO, 9BVOC, 9BVOD (Similar to Page 109) AR-67
279956/958/959/961 (8BVO) (See page 109) AR-67

W

WARDS-RIVERSIDE
Montgomery Ward & Co.
619 Chicago Avenue
Chicago, Illinois 60607

ZCX-16730A AR-91
ZCX-16732A,B AR-95
61-16730 .... AR-91

WIZARD
Western Auto Supply Co.
2107 Grand Avenue
Kansas City, Mo. 64108

ITC7910A-96 .... AR-95
4DC7910 .... AR-95

RECORD CHANGERS

A

ADMIRAL
Admiral Corporation
National Service Div.
P.O. Box 845
Bloomington, Ill. 61702

MC641 1141-3
750E1210-1 1141-3

E

EMERSON
Emerson Television Sales Corp.
14th & Coles Streets
Jersey City, N.J. 07302

ERC-10/-12 (Similar to Changer) 1135-3

L

Lloyd's Electronics, Inc.
LLOYD'S
5 Paul Kohner Place
East Paterson, New Jersey 07407

9F15-08 (Similar to Changer) 1135-3

P

PANASONIC
Matsushita Elec. Corp. of America
Panasonic Service & Parts Div.
10-16 44th Drive
Long Island City, N.Y. 11101

FA-707A, AD 1147-5
RD-7673 (Similar to Changer) 1135-3

R

RCA
RCA Sales Corp.
600 N. Sherman Drive
Indianapolis, Ind. 46201

RP-230-1,-2,-6,-8,-9 1155-5
RP-230-10,-11,-12,-14, -15,-16,-17,-18,-19 1155-5
RP-230-20,-21,-22 1155-5
RP-231-1,-3,-4,-5,-6,-7,-9 1155-5
RP-231-10,-11,-13 1155-5
RP-232-1,-2,-4,-5,-6,-7,-9 1155-5
RP-232-10,-11 1155-5
RP-233-1,-2,-3,-4,-5,-6,-7 1155-5
RP-234-1,-3,-5,-6 1173-6
RP-234-7 (Similar to Changer) 1173-6
RP-234-11,-12,-13 1173-6
RP-234-15,-16,17 1173-6
RP-234-19,-20 1173-6

V

V-M
V-M Corporation
375 West Main Street
Benton Harbor, Mich. 49023

A1286 1108-5
A1296 1108-5
1550-1 1108-5

W

WESTINGHOUSE
Westinghouse Electric Corp.
Consumer Electronics Div.
Route 27 Vineard Road
Edison, N.J. 08817

PCX9000A (Similar to Changer) 1127-5
670V056D01 (Similar to Changer) 1127-5

RECORDERS AND TAPE PLAYERS

A

ADMIRAL
Admiral Corp.
National Service Div.
P.O. Box 845
Bloomington, Illinois 61702

Chassis 5J4 .... TSM-122
TP360 .... TSM-122

NOTE: ● Denotes Television Receiver. ★ Denotes Color Television Receiver. AOR Denotes Available On Request. AR Denotes Auto Radio Series Volume. CB Denotes CB Radio Series Volume. HTP Denotes Home Tape Player Series Volume. MHF Denotes Modular Hi-Fi Series Volume. PCB Denotes Production Change Bulletin. POM Denotes Bonus Schematic in Photofact-of-the-Month Package—Unavailable After Month Of Issue. SED Denotes Special Equipment Data. TR Denotes Tape Recorder Series Volume. TSM Denotes Transistor Radio Series Volume.

Set No. / Folder No.

AIRCASTLE
Spiegel, Inc.
1061 West 35th Street
Chicago, Illinois 60609
TCT-601C TR-78
TR-1040 .... TR-76

AIWA
Milovac International Co., Inc.
4215 West 45th Street
Chicago, Illinois 60632
TP-1023 .... AR-91

AMC—AMCREST
Amcrest Corporation
1440 Broadway
New York, New York 10018
C-50 .... TR-82
C-75 .... TR-79
C150 .... TR-83

AMERICAN MOTORS
American Motors Corp.
14250 Plymouth Road
Detroit, Michigan
1JA4009 (3601578) AR-87
1RA5002 (3591052) AR-87
3591052 .... AR-87
3601578 .... AR-87

AMPEX
Ampex Consumer Equipment Division
2201 Lunt Avenue
Elk Grove Village, Ill. 60007
Micro 9 .... TR-81
Micro 14 .... TR-79
Micro 24 .... TR-82
Micro 95 .... TR-80
750 .... TR-73
755,A TR-73
1450 .... TR-73
1455,A TR-73

AUDIOVOX CORPORATION
Audiovox Corporation
300 Denton Ave.
New Hyde Park, L.I., N.Y. 11040
C-930 .... AR-91
C-935 .... AR-95
C-940 .... AR-99
C-950 .... AR-99

AUTOMATIC
Automatic Radio Mfg. Co., Inc.
2 Main Street
Melrose, Mass. 02176
CFE-8001 .... AR-91
CRS-9440 .... AR-103
CSA-9934 .... AR-103
EMX-6810 .... AR-89
EPE-9821 .... TSM-121
ESS-8528 .... AR-95
SED-9060 .... AR-99
SEP-9800 .... TSM-119

AUTO-SONIC
Martel Electronics Sales Inc.
2339 S. Cotner Street
Los Angeles, California 90064
Mark 88 .... AR-95
ST-48 .... AR-91
ST-88 .... AR-95
ST-120G (Late Prod.) AR-99

B

BELL & HOWELL
Bell & Howell General Service Dept.
7235 North Linder Avenue
Skokie, Illinois 60076
2423 .... TR-73
2433 .... TR-75

BUICK
United Delco Distributors
14AT411 .... AR-97
14BFM1 .... AR-98
14BPBT1 .... AR-100
14BT411 .... AR-97
7307554 .... AR-97
7930134 .... AR-100
7930144 .... AR-98
7935347 .... AR-97

C

CADILLAC
United Delco Distributors
05CT412 .... AR-94
15CFMT1,15CFMT2 .... AR-96
15CT411 .... AR-97
7930035 .... AR-96
7930495 .... AR-97

CENTURY
Mark IV (See Page 47) TR-83

CHANNEL MASTER
Channel Master Corp.
Ellenville, N.Y. 12428
6317 .... AR-103
6320 .... TR-76

CHEVROLET
United Delco Distributors
11BFMT1 .... AR-105
11BPBT1 .... AR-102
11BT411 .... AR-97
11TT411 .... AR-97

CHEVROLET—Cont.
7313971 .... AR-97
7930121 .... AR-105
7930631 .... AR-102

CHRYSLER
Chrysler Corp.
P.O. Box 1118
Detroit, Mich. 48231
CF09503 .... AR-87
CF61003 .... AR-88
CF84403 .... AR-87
1CH4007 .... AR-90
2884095 (CF09503) AR-87
2884610 (CF61003) AR-88
2884633 (1CH4007) AR-90
2884844 (CF84403) AR-87
3501045 .... AR-105

CONCERTONE
Concertone, Inc.
7035 Laurel Canyon Blvd.
North Hollywood, Calif. 91605
4001 .... TR-72

CONCORD
Concord Electronics Corp.
1935 Armacost Avenue
Los Angeles, California 90025
F-50 .... TR-74
F-95 .... TR-73
F-101 .... TR-72
MK-III TR-79
509D TR-80

CRAIG
Craig Corp.
2302 East 15th Street
Los Angeles, California 90021
2402 .... TR-75
2405 .... TR-75
2408 .... TR-76
2703 .... TR-77
2704 .... TR-80
3108 .... AR-91
3116 .... AR-95
3117 .... AR-89
3119 .... AR-90
3123 .... AR-99

CURTIS MATHES
Curtis Mathes Mfg. Co.
P. O. Box 5610
Dallas, Texas 75222
70M240 (Ch. R-10) TR-83
Ch. R-10 .... TR-83

D

DODGE
Chrysler Corp.
P.O. Box 1118
Detroit, Mich. 48231
CF10503 .... AR-93
CF61003 .... AR-88
1CH4007 .... AR-90
2884105 (CF10503) AR-93
2884610 (CF61003) AR-88
2884633 (1CH4007) AR-90
3501045 .... AR-105

DYNATRONICS
Inland Dynatronics, Inc.
111 Hackensack Ave.
Hackensack, N.J. 07601
S-401 .... AR-95
S-848 .... AR-91

E

ELECTROPHONIC
Electrophonic Corp. of America
101-10 Foster Avenue
Brooklyn, New York 11236
C5 .... TR-74
T-10 .... TSM-121
TR-20 .... TSM-123
102R MHF-15
105 .... MHF-15

F

FORD
Ford Motor Company
Dearborn, Mich.
C80A-19A049 .... AR-87
D1SA-19A242AB AR-102
1FD4103 .... AR-104
1FD5003 (C80A-19A049) AR-87
2FD4103 .... AR-104
2MZ4101 .... AR-104
2TB4109 (D1SA-19A242AB) AR-102

G

GENERAL ELECTRIC
General Electric Company
1001 Broad Street
Utica, New York 13501
M8308A TR-83
M8321A TR-84
M8400C (Similar to page 53) TR-53

GENERAL MOTORS CORP. (GMC)
United Delco Distributors
06TT412 .... AR-93
16TT411 .... AR-97

GMC—Cont.
16UT411 .... AR-97
7307456 .... AR-97
7308166 .... AR-97

GIBBS
Gibbs Special Products Corp.
P.O. Box 471
Janesville, Wisc. 53546
636 .... AR-103
657 .... AR-101
805, 807 .... AR-87
912 .... AR-103
920 .... AR-101
950, 952 .... AR-87

H

HAMMOND
(See Gibbs)

HITACHI
Hitachi Sales Corporation of America
48-50 34th Street
Long Island City, N.Y. 11101
CS-133 .... AR-103
CS-11001C AR-103
TPQ-201 .... TSM-119
TRQ-290(A), (W) TR-84

J

JULIETTE
Topp Electronics, Inc.
4201 N.W. 77th Ave.
Miami, Florida 33166
CTP-2010 .... TSM-120
CTP-2076 .... TSM-119

L

LAFAYETTE
Lafayette Radio Electronics
111 Jericho Turnpike
Syosset, L.I., New York 11791
RK-90 (27-0110L) TR-79
RK-100 (99-15679) TR-75
RK-835 (99-1569WX) TR-73
RK-870 (99-1566WX) TR-74
RK-920 (99-15547WX) TR-77
RK-960 (99-15489WX) TR-77
Stereo 88 (99-15521W) AR-91
27-0110L TR-79
99-1566WX TR-74
99-1569WX TR-73
99-15489WX TR-77
99-15521W AR-91
99-15547WX TR-77
99-15679 .... TR-75

LINCOLN
Ford Motor Co.
Dearborn, Mich.
DOLA-19A242 .... AR-92
D1VA-19A242AA AR-102
1MT4002 (DOLA-19A242) AR-92
2LN4110 (D1VA-19A242AA) AR-102
2MT4108 .... AR-104

LLOYD'S
Lloyd's Electronics of Calif., Inc.
6651 East 26th St.
City of Commerce, Cal. 90022
1V33B-07A TR-80
9V89-92A TR-74
9V91-114A TR-77
9V95-114A TR-78
9V95A-114 .... TR-78

M

MAGNAVOX
The Magnavox Company
Bueter Road
Fort Wayne, Indiana 46803
1K8868 .... TR-75
1K8879 .... TR-78
1V9024 .... TR-80
1V9030/31 .... TR-72
1V9032 .... TSM-126
701317-1 .... TR-78

MALLORY
P. R. Mallory & Co., Inc.
3029 E. Washington St.
Indianapolis, Ind. 46206
MCR1204 (Similar to page 31) TR-56
MCR1209 (Similar to page 45) TR-56
MCR1232 (Similar to page 5) TR-55

MASTERWORK
Masterwork Audio Products
1080 Goffle Road
Hawthorne, New Jersey
M404 .... TR-81
M656 .... TR-78

MAYFAIR
Mayfair Electronics Co.
666 West Kenzie
Chicago, Illinois 60610
2070 .... TR-85

MEDALLION
Medallion Automotive Products Co.
P. O. Box 1903
Kansas City, Missouri 64141
65-482, 65-484 .... AR-103

MERCURY
Ford Motor Company
Dearborn, Michigan
C9MA-19A242C AR-88
C80A-19A049 .... AR-87
D1MA-19A242AD. AR-105
D1WA-19A242AD. AR-105
D1YA-19A242AD. AR-105
T9MM (C9MA-19A242C) AR-88
1FD5003 (C80A-19A049) AR-87
1MY4106 (2MT6) AR-105
2CR7 .... AR-105
2CR4107 (2CR7) AR-105
2MR1 .... AR-105
2MR24111 (2MR1) AR-105
2MY6 .... AR-105
2MY4106 (2MY6) AR-105

MERCURY RECORDS
Pax, Ltd.
5125 Church Street
Skokie, Illinois 60076
10-1002 .... TSM-126

MIDLAND
Micotron
P. O. Box 1903
Kansas City, Missouri 64141
12-114 .... TR-85

MORSE ELECTRO PRODUCTS
Morse Electro Products Corp.
101-10 Foster Avenue
Brooklyn, New York 11236
C1 .... TR-74
102R MHF-15
105 .... MHF-15

MOTOROLA
Motorola Inc.
9401 West Grand Ave.
Franklin Park, Ill. 60131
GP31GU TR-85
TF800S AR-90
TM203S (Similar to Page 57) AR-95
TM703S AR-95

O

OLDSMOBILE
United Delco Distributors
03BT412 .... AR-87
03ET412 .... AR-87
13AT411 .... AR-97
13BFMT1 .... AR-97
13BPBT1 .... AR-96
7930053 .... AR-96
7930063 .... AR-97
7932763 .... AR-97

P

PACKARD BELL
Teledyne Packard Bell Electronics
12333 West Olympic Blvd.
Los Angeles, California 90064
TPA27 (See page 93) HTP-6
TPAK25 (Similar to page 80) HTP-1
TRA-17 .... TR-84
TRAK-15 .... TR-84

PANASONIC
Matsushita Electric Corp of America
Panasonic Service & Parts Div.
10-16 44th Drive
Long Island City, N.Y. 11101
CX-777SU AR-99
CX-888SU AR-95
RS-254S TR-78
RS-256US TR-76

PENNEY'S-PENNCREST
J. C. Penney Co., Inc.
1301 Avenue of the Americas
New York, N.Y. 10019
6525 .... TR-79
6552 .... TR-83
6570 (Similar to Page 73) TR-78
6891 (Tape Deck Only) TR-72
7525 .... TR-82

PHILCO-FORD
Philco-Ford Corporation
Tioga & "C" Streets
Philadelphia, Pa. 19134
A1010BL TSM-120

PHONOLA-MAGNECORD
Telex-Waters Conley Co., Inc.
9600 Aldrich Avenue South
Minneapolis, Minn. 55420
Address Change

PLYMOUTH
Chrysler Corp.
P.O. Box 1118
Detroit, Michigan 48231
CF10103 .... AR-88
CF61003 .... AR-88
1CH4007 .... AR-90
2884101 (CF10103) AR-88
2884610 (CF61003) AR-88
2884633 (1CH4007) AR-90

PONTIAC
United Delco Distributors
02BT412 .... AR-90
02FT412 .... AR-90
12AT411 .... AR-97
12BFMT1 .... AR-104
12BPBT1 .... AR-101
12BT411 .... AR-97
12FT451 .... AR-97
7307702 .... AR-97
7930242 .... AR-101
7930492 .... AR-97
7934782 .... AR-97

R

RCA
RCA Sales Corporation
600 North Sherman Drive
Indianapolis, Indiana 46201
YLB18E 1189-SED
YZB387T TR-81
TZDS89E TSM-127

RANGER
Ranger Radio
19201 Cranwood Parkway
Cleveland, Ohio 44128
RR-42-FT AR-95
RR-42-T (See Page 77) AR-95

REALISTIC
Radio Shack Corporation
2727 West 7th Street
Fort Worth, Texas 76107
SCT-2 .... TR-82
12-1827 .... AR-95
12-1828 .... AR-99
14-860 .... TR-82
14-909A TR-85
909A TR-85

ROBERTS
Rheem Manufacturing Co.
Califone-Roberts Div.
6050 West Jefferson Blvd.
Los Angeles, California 90016
95 .... TR-75
100 .... TR-76

ROSS
Ross Electronics Corporation
2834 South Lock Street
Chicago, Illinois 60608
Mark 2150 .... TR-72
Mark 8200 .... TR-75
Mark 8500 .... TR-77
Mark 8600 .... TR-78
Mark 8700 .... TR-85
Mark 9000 .... TR-84
RE-2095 .... TSM-119
RE-3800 .... TSM-120
RE-8801 .... TSM-121
RE-8994 .... TSM-122
2200 .... TR-74
8300 .... TR-76
8350 .... TR-83

S

SEARS-SILVERTONE
Sears Roebuck & Company
303 East Ohio Street
Chicago, Illinois 60611
564.5071 .... AR-99
564.50700/701 .... AR-99
833.6236 .... 1150-SED
833.62040 .... AR-91
833.62340 .... AR-103
833.63120/121 .... AR-103
833.63170 .... AR-99
833.63250 .... TSM-119
833.63280 (See Page 107) AR-103
2044 (Ch. 564.40070/71) TR-72
Ch. 528.58341 (See page 77) TR-49
Ch. 564.40070/71 .... TR-72

SHARP
Sharp Electronics Corp.
10 Keystone Place
Paramus, N.J. 07652
RD-403 .... TR-73
RD-404 .... TR-81
RD-407 .... TR-76
RD-408 .... TR-79
RD-418 .... TR-85
RD-708 .... TR-72
RD-709 .... TR-77
RD-711 .... TR-72
RD-712 .... TR-83

SONY
Superscope, Inc.
8150 Vineland Ave.
Sun Valley, Calif. 91353
TC-18 .... TR-77
TC-40 .... TR-83
TC-100F (See page 86) TR-71
TC-106 (Similar to page 81) TR-47
TC-122 .... TR-84
TC-127 .... TR-85
TC-230,W TR-80
TC-252 .... TR-78
TC-357-A (Similar to page 97) TR-46
TC-365 (Similar to page 97) TR-46
TC-560 .... TR-81
TC-630 .... TR-82
TC-1160 ("PEN") (See page 87) TR-60
TC-1165 ("L") (Similar to page 87) TR-60
TC-1170 ("MATE") (See page 110) TR-70

SONY—Cont.
TC-1177 ("GO") (Similar to page 110) TR-70
TC-1300 (See page 103) TR-34
TC-3125 ("STEREO E") (See page 97) TR-51
TC-5100 ("G-1") (Similar to page 81) TR-47
TC-6250 (See page 95) TR-56
TC-6251 (Similar to page 65) TR-56

SYLVANIA
GTE Sylvania Inc.
700 Ellicott Street
Batavia, New York 14021
CT100 (Ch. TC3) TR-79
Ch. TC3 .... TR-79

T

TEAC
Teac Corporation of America
2000 Colorado Avenue
Santa Monica, California 90404
A-2010 .... TR-83
A-2050 .... TR-83
A-2060 .... TR-83

TELEX-PHONOLA
Waters Conley Company
501 N.W. First Avenue
Rochester, Minnesota 55901
B9122 .... TR-73

TENNA
Tenna Corporation
19201 Cranwood Parkway
Warrensville Heights, Ohio 44128
PT-89 .... TSM-127
PT-90 .... TSM-126

TRUETONE
Western Auto Supply Co.
2107 Grand Avenue
Kansas City, Missouri 64108
1DI4DC7908A-86 .... AR-99
1DI7908A-86 .... AR-99
1TC7006A-07 .... AR-91
1TC7010A-07 .... AR-99
1TC7908A-96 .... AR-99
1TC7910A-86 .... AR-95
MIC7052A-07 .... TR-82
MID7052A-07 .... TR-82
4DC7006 .... AR-91
4DC7010 .... AR-99
4DC7052 .... TR-82
4DC7908 .... AR-99
4DC7910 .... AR-95

V

V-M
V-M Corporation
375 West Main Street
Benton Harbor, Mich. 49023
746-1 .... TR-74
761-1 .... TSM-119

W

WARDS (AIRLINE-RIVERSIDE)
Montgomery Ward & Co.
619 Chicago Avenue
Chicago, Illinois 60607
GEN-3620A 1147-SED
GEN-3940A TR-79
GEN-3970A TSM-120
GEN-3975A TSM-120
ZCX-16730A AR-91
ZCX-16732A,B AR-95
61-16730 .... AR-91

WESTINGHOUSE
Westinghouse Electric Corp.
Consumer Electronics Div.
Route 27 Vineard Road
Edison, N.J. 08817
TMC2030B (Ch. V-5007C01) TR-81
TMC8030A (Ch. V-5007C01) TR-81
TMC8032A (Ch. V-5007C01) (See Page 113) TR-81
TSR4020A (Ch. V-5001-C01) TR-84
Ch. V-5001-C01 .... TR-84
Ch. V-5007C01 .... TR-81

WIZARD
Western Auto Supply Co.
2107 Grand Avenue
Kansas City, Mo. 64108
ITC7910A-96 .... AR-95
4DC7910 .... AR-95

Y

YORK
York Radio Corp.
15 Empire Blvd.
So. Hackensack, N.J. 07606
CTR-10 .... TR-85

Z

ZENITH
Zenith Sales Corp.
1900 North Austin Ave.
Chicago, Illinois 60639
A602B, F TSM-120

NOTE: ● Denotes Television Receiver. ★ Denotes Color Television Receiver. AOR Denotes Available On Request. AR Denotes Auto Radio Series Volume. CB Denotes CB Radio Series Volume. HTP Denotes Home Tape Player Series Volume. MHF Denotes Modular Hi-Fi Series Volume. PCB Denotes Production Change Bulletin. POM Denotes Bonus Schematic in Photofact-of-the-Month Package—Unavailable After Month Of Issue. SED Denotes Special Equipment Data. TR Denotes Tape Recorder Series Volume. TSM Denotes Transistor Radio Series Volume.

Printed in U.S.A.

Now–Just 3 RCA Hi-Lite "V" Type Color Picture Tubes Replace 185 Types

Replaces 92 types

18VABP22
18VACP22
18VADP22
18VAHP22
18VAJP22
18VAQP22
18VARP22
18VASP22
18VATP22
18VBAP22
18VBCP22
19EXP22
19EXP22/
19GVP22
19EYP22
19EYP22/
19GWP22
19FMP22
19FXP22
19GLP22
19GSP22
19GVP22
19GVP22/
19EXP22
19GWP22
19GWP22/
19EYP22
19GXP22
19GYP22
19GZP22
19HBP22
19HCP22

19HCP22/
19HKP22
19HFP22
19HJP22
19HKP22
19HQP22
19HRP22
19HXP22
19JBP22
19JDP22
19JHP22
19JKP22
19JNP22
19JQP22
19JYP22
19JZP22
19KEP22
19KFP22
490AB22
490ACB22
490ADB22
490AEB22
490AFB22
490AGB22
490AHB22
490AHB22A
490AJB22
490AJB22A
490AKB22
490ALB22
490AMB22
490ANB22
490ARB22

490ASB22
490BAB22
490BCB22
490BDB22
490BGB22
490BHB22
490BRB22
490CB22
490CHB22
490CUB22
490DB22
490EB22
490EB22A
490FB22
490GB22
490HB22
490JB22
490JB22A
490KB22
490KB22A
490LB22
490MB22
490NB22
490RB22
490SB22
490TB22
490UB22
490VB22
490WB22
490XB22
490YB22
490ZB22

Replaces 22 types

19VABP22
19VACP22
21AXP22
21AXP22A
21AXP22A/
21AXP22
21CYP22
21CYP22A
21FBP22
21FBP22A
21FBP22A/
21GUP22
21FJP22
21FJP22A

21FJP22A/
21GVP22
21FKP22
21GUP22
21GUP22/
21FBP22A
21GVP22
21GVP22/
21FJP22A
21GXP22
21GYP22
21GZP22
21HAP22

Replaces 71 types

23VACP22
23VADP22
23VAHP22
23VALP22
23VAMP22
23VANP22
23VAQP22
23VARP22
23VASP22
23VATP22
23VAUP22
23VAWP22
23VAXP22
23VAYP22
23VAZP22
23VBAP22
23VBCP22
23VBDP22
23VBEP22
23VBGP22
23VBHP22
23VBJP22
23VBRP22
25ABP22
25ADP22

25AEP22
25AFP22
26AGP22
25AJP22
25ANP22
25AP22
25AP22A
25AP22A/
25XP22
25AQP22
25ASP22
25AWP22
25AXP22
25AZP22
25BAP22
25BCP22
25BDP22
25BFP22
25BGP22
25BHP22
25BJP22
25BMP22
25BP22
25BP22A
25BP22A/
25YP22

25BRP22
25BSP22
25BVP22
25BWP22
25BXP22
25BZP22
25CBP22
25CP22
25CP22A
25FP22
25FP22A
25GP22
25GP22A
25RP22
25SP22
25VP22
25WP22
25XP22
25XP22/
25AP22A
25YP22
25YP22/
25BP22A
25ZP22

Here's the way to save yourself time, give your customers faster service and improve your profit. Stock these three RCA Hi-Lite color picture tubes and have immediate replacements for the fastest moving industry types — 185 of them.

RCA Hi-Lite types are all new, made to OEM specifications and contain the newest RCA manufacturing technology, including Perma-Chrome and the latest X-ray attenuating glass.

It adds up to a big plus for you. Order these three RCA Hi-Lite tubes, and other types you may need, from your RCA Distributor. He also has the complete RCA Interchangeability Guide, available free of charge.

RCA | Electronic Components | Harrison, N.J. 07029

RCA Electronic Components

THE SAFEST SETS YOU'LL EVER SERVICE HAVE LITTELFUSE CIRCUIT BREAKERS.

Standard Catalog Part No	Hold Rating (Amps.)	Standard Catalog Part No.	Hold Rating (Amps.)
815.650	.490	8152.75	1.92
815.800	.600	815003	2.1
815001	.650	8153.25	2.2
8151.25	.930	815004	2.5
81501.5	1	81504.5	3
8151.75	1.2	815005	3.25
815002	1.4	815006	3.9
8152.25	1.5	815007	4.14
81502.5	1.65		

Littelfuse TV set circuit breakers are the safe, reliable, money saving short-circuit-problem-solvers . . . 17 available models—exact replacements—cover the entire range of domestic television sets.

Littelfuse circuit breakers are available from your distributor—singly or in bulk.

Super-simple in operation—the sensitive breaker flips open under current overloads protecting the circuitry. Reset by merely pressing the red reset plunger. A built-in "trip free" feature of Littelfuse breakers prevents forced closing when dangerous overload currents are present.

Nothing's more reliable than a Littelfuse circuit breaker. Thermal-responsive Littelfuse breakers are dual operated bi-metallic devices providing temperature compensation over a wide range of ambient temperature variation. Molded phenolic construction eliminates warping and distortion of the base, maintaining exact factory set calibrations. The unit is completely enclosed to protect critical moving parts from dirt and other foreign matter.

Any TV set you're likely to service will take Littelfuse circuit breakers.

They'll flip for safety.

You'll flip for satisfaction.

LITTELFUSE

DES PLAINES, ILLINOIS 60016

SUBSIDIARY OF TRACOR, INC.

Circle 1 on literature card