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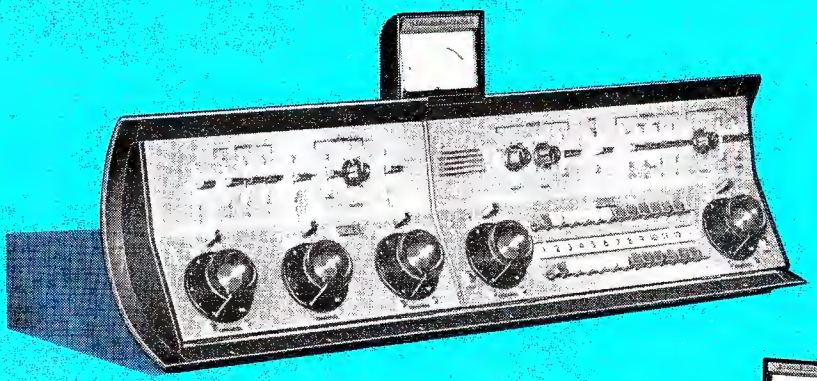
SEPTEMBER 1963 75c

SPECIAL TRANSISTOR AND AUTOMATION FEATURES

Broadcast Engineering

the technical journal of the broadcast-communications industry

Choose From 4 Transistorized Consoles



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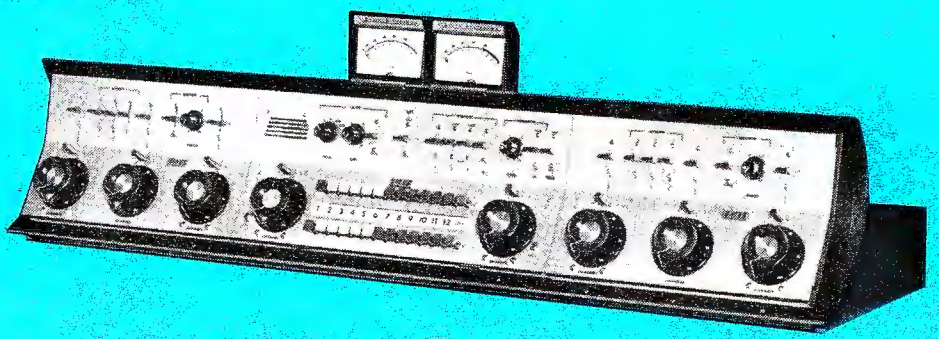
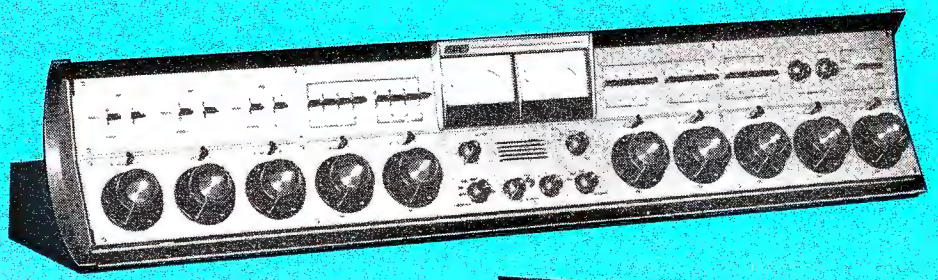
Gates **President** dual channel transistor console, featuring a 24 position pre-set master control for medium level inputs. Program selection is by individual illuminated touch-control keys for precise fingertip command. Eight ladder-type controls accommodate 28 inputs for exceptional versatility in AM, FM, TV or recording.





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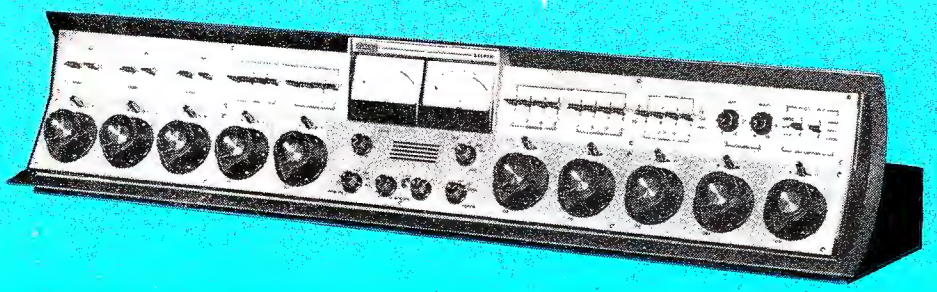

Summit Meeting

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Broadcast Engineering

Volume 5, No. 9 **September, 1963**

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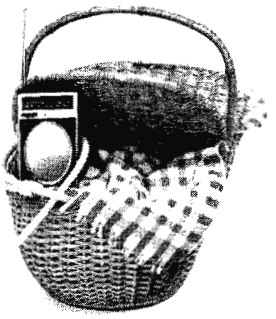
BPA



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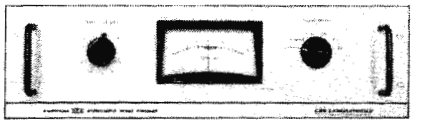


CBS LABORATORIES

Circle Item 4 on Tech Data Card

LETTERS to the editor

DEAR EDITOR:

Several days ago I was looking through some of my past copies of BROADCAST ENGINEERING, and came across the November, 1962 number. In this issue I found an article, "Radio Transmitter Maintenance," on page 16. This was part of a three-part series written by Thomas R. Haskett.

I was unable to locate the two issues preceding November, which carried the other two parts of the series. Would you please send me the September and October issues? I have enclosed a check to cover the cost.

I hope you will be able to assist, because the last part of the series is of great interest to me.

MICHAEL A. WALLMAN
KBHS Radio, Hot Springs, Arkansas

Your issues are on the way, Mike, glad we could help. For your information, and that of other interested readers, here is a breakdown of the back issues we can supply:

All 1961, except April
All 1962, except February
All 1963 to date, except June

The price is $1.00 each, current issues are $0.75.—Ed.

DEAR EDITOR:

I was glad when my July issue of BROADCAST ENGINEERING arrived recently, since I believe it is one of the best magazines covering the broadcasting industry. However, I believe I have discovered an error in the "Auto Speaker Muter" item on page 26.

If you wire the circuit as it is shown, I don't think it will operate as expected. Relay K3 will be energized at all times, whenever the time-delay relay points are closed.

HARRY KAEMMERER
Engineer, VOHF Radio

Relay K3 should be energized when the delay relay contacts are closed; but these contacts should be shown normally open. Thanks for pointing out the "points," Harry.—Ed.

NEXT MONTH . . .

Special Television Features, including:

A PROPOSED TELEVISION CENTER
Plans of a complete television/radio facility, including building, equipment, and system installations.

•

TRANSMITTERS FOR ETV
A discussion of transmitting devices especially intended for use in educational television systems.

•

TELEVISION TRANSLATORS
An introduction to the subject of translators as used by broadcasters; includes theory and application basics.

•

ANALYZING CASCADED AMPLIFIER SYSTEMS
Description and explanation of a method for determining — before turning on the power — whether a combination of amplifiers will operate properly.

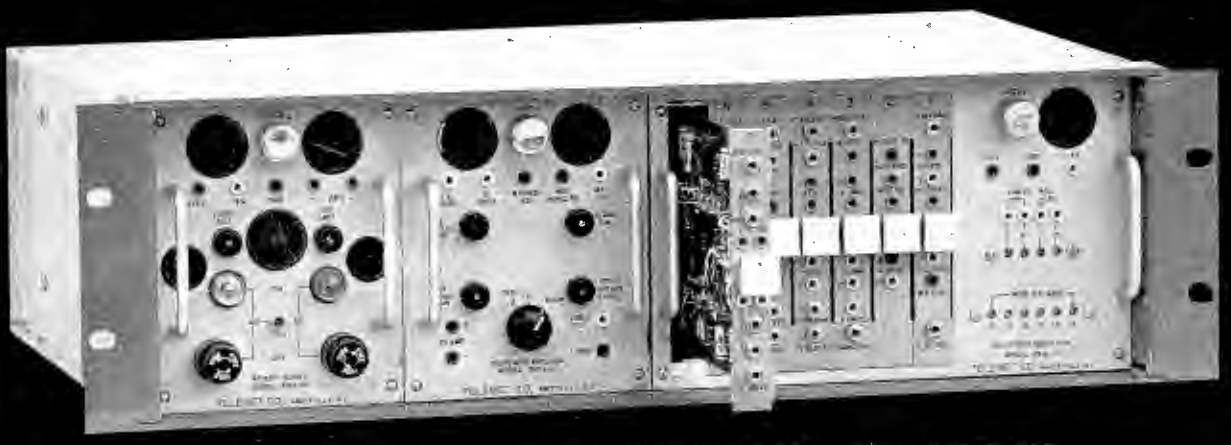
•

Plus — A host of other important features and departments of current interest, including, Technical Talks, Engineers' Exchange, and special extra television items.

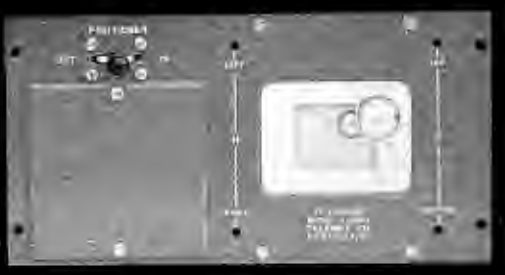
•

Don't wait! Reserve your issue now, and receive the Broadcast Engineers' Maintenance Guide absolutely free of charge, by filling out and sending in the convenient subscription card bound into this issue.

Telechrome*
SOLID STATE TV SPECIAL EFFECTS



MODEL 3801A1 TV SPECIAL EFFECTS PICTURED WITH MODEL 13802A1 POSITIONER



*Brand Name

Designed for studio or mobile applications, the new TELECHROME Solid State Special Effects Generator, Model 3801A1, produces a multitude of visual effects to enhance scene changes, insert keying for commercials and bulletins, etc. The system comprises a power supply, switching amplifier and waveform generator in a 5¼" high rack mounting frame and remote control units. The waveform generator contains 7 plug-in cards, 6 for the effects and one for the accessory joy stick positioner. A newly designed effects remote control unit provides an illuminated pictorial of the selected effects – plus Thumb-Wheel control for rapid and positive wipe selection.

FEATURES

- Occupies only 5¼" of rack space.
- Fully transistorized for reliable service free operation.
- Color or monochrome operation.
- Plug-in waveform generating cards.
- Inserts camera control and chroma keying.
- Up to 72 effects; including both horizontal and vertical wipes, diagonals, rectangle, diamond, circle, etc.
- Individual plug-in switching amplifier, waveform generator, and power supply.
- New compact remote control units occupy less console space.
- Thumb-wheel wipe selector eliminates parallax.
- Plug-in oscillators in positioner remote control unit for modulation of effects.

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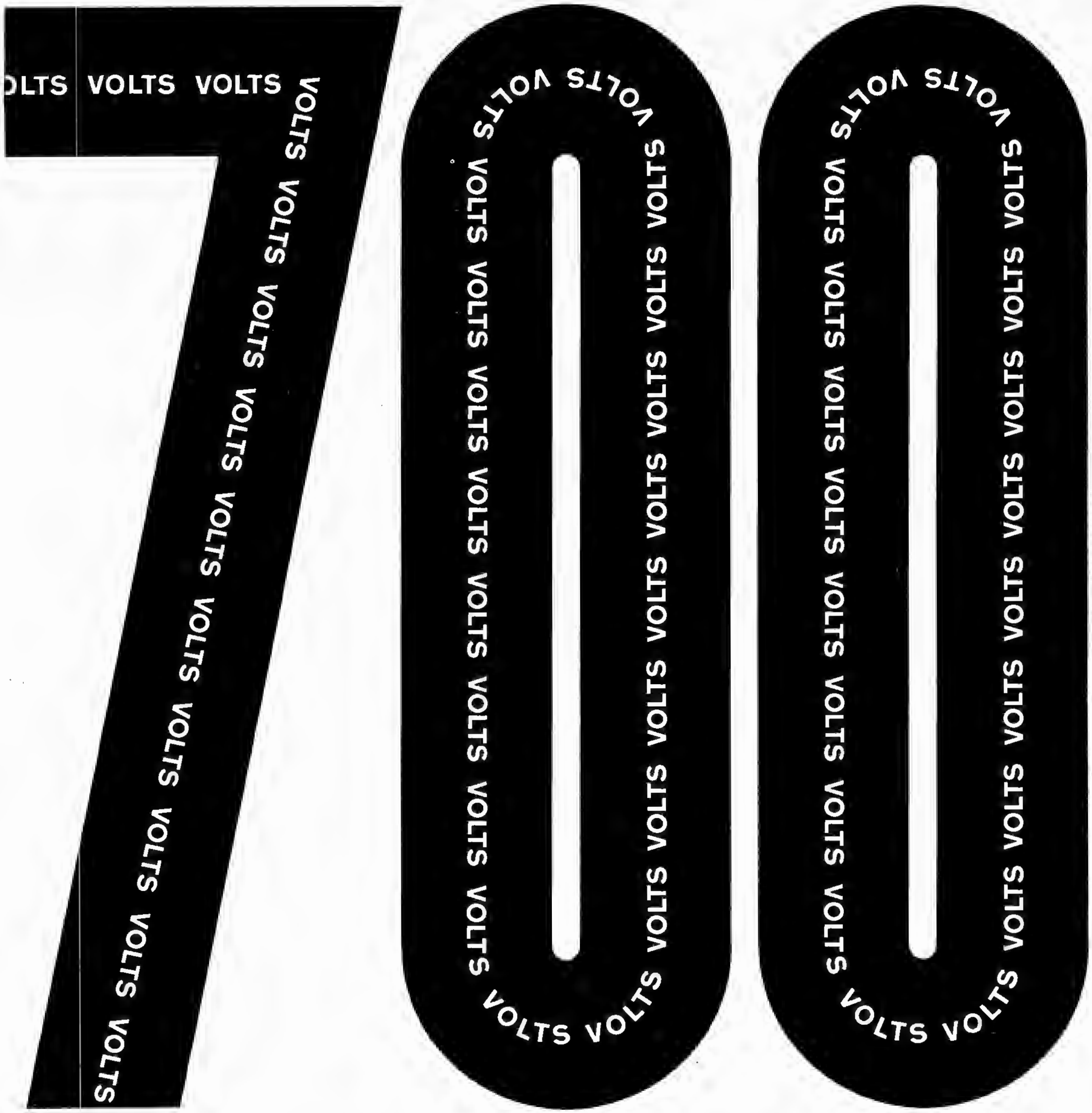

100% arc-shorts testing at 700 volts...that's your assurance of no arcs.

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RAYTHEON

Circle Item 7 on Tech Data Card

REMOTE CONTROL OF BROADCAST TRANSMITTERS

*by Frank B. Ridgeway** — A broad coverage of remote transmitter control, outlining regulations, techniques, and systems.

Remote control of broadcast transmitters is an acceptable modern technique proven in past years of operation at both standard AM and FM broadcast stations.

Facilities

By using remote control of a transmitter, building space normally allocated to operating personnel convenience is greatly reduced. Heating requirements are reduced during winter months. At some stations the need for drilling a well and installation of a septic tank is eliminated.

For unattended operation a simple one story concrete block structure on a concrete slab would be ample if local building codes permit. Windows are not necessary; in fact, it is recommended that windows be eliminated, since to the "young fry", they offer quite a temptation to use air guns, bean shooters, and even to test their throwing arms. If daylight is desired it can be obtained by using several glass block areas in the otherwise solidly constructed concrete block walls.

One very important fact to remember is ample ventilation. Since most unattended transmitters are located in smaller buildings, overheating becomes a problem. A large high-speed fan should be installed in the wall, as near the ceiling as possible, on one side of the building; an air intake should be installed near the floor on the opposite side. The fan should be equipped with automatic shutters to prevent rain or snow from blowing in when it is not running. The fan should be controlled by a thermostat located in the building. The size of the air intake is also important since a fan cannot blow air out of the building if the air cannot enter. The air intake should be protected by spun glass filters to eliminate bugs, dirt, and even snakes and small animals. It should be covered with a canopy to prevent water from blowing into the building.

The transmitter should be mounted on a four by four wood (or metal) frame and all conduits should extend three or four inches above the floor to prevent water damage, should water blow in the building during a driving rain storm. In addition, a metal fire-proof door should be used.

*Director of Engineering, WEBR, Inc., Buffalo, N. Y.

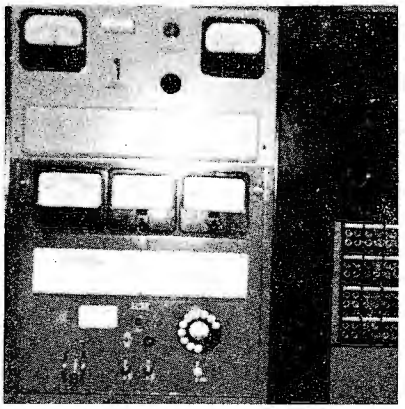

Fig. 1. Gates remote control unit in WEBR-FM control room; H-P monitor above.

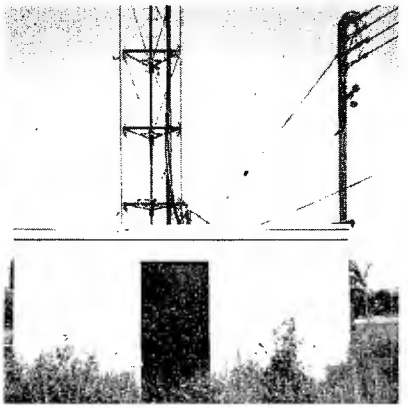

Fig. 2. WEBR-FM transmitter building, showing simple and compact construction.

Regulations

Remote operation of AM and FM transmitters will be permitted by the FCC subject to the following conditions:

1. The equipment at the operating transmitting positions shall be so installed and protected that it is not accessible to persons other than those duly authorized by the licensee.
2. The control circuit from the operating position to the transmitter shall provide positive on and off control and shall be such that open circuits, short circuits, grounds, or other line faults causing loss of such control will automatically place the transmitter in an inoperative position.
3. A malfunction of any part of the remote control equipment and associated line circuits resulting in improper control or inaccurate meter readings shall be cause for the immediate cessation of operation by remote control.
4. Control and monitoring equipment shall be installed so as to allow the licensed operator at the remote control point to perform all the functions in a manner required by the Commission's rules.

In addition to the above, for standard broadcast stations with a power rating in excess of 10 kw., satisfactory showing must be made that the transmitter is reliable and capable of being operated by remote control. This is to include the number of transmitter outages during the past year, the duration and

causes of such outages, and the future maintenance plans to prevent such outages. This does not preclude a new station from applying for remote control since it can be assumed that new transmitters are designed for remote operation and are reliable. A waiver of the 12-months rule can be requested.

If a directional antenna system is authorized, it must be shown that the array is in proper adjustment and is stable. For an array that has been in operation for some time a "skeleton" proof of performance is required.

Where there is remote control operation of AM stations using a directional antenna array, readings for each pattern must be taken **at the transmitter** (within two hours of commencement of operation with each pattern) of:

1. Common-point current without modulation, or with modulation if the meter reading is not affected by modulation.
2. Base currents without modulation, or with modulation if the meter reading is not affected by modulation.
3. Phase monitor sample loop currents without modulation, or with modulation if the meter reading is not affected by modulation.

All broadcast stations must keep a maintenance log in addition to a program log and operating log. This presents no problem at stations where the transmitter is manned, but it should be considered when remote control is planned.

Inspections

At all broadcast stations, except at some noncommercial educational FM stations, a complete inspection of all transmitting equipment in use shall be made by an operator holding a valid radiophone first-class operator license (whether employed full time or an a part-time contract basis) at least once each day, 5 days each week, with an interval of no less than 12 hours between successive inspections. This inspection shall include such tests, adjustments, and repairs as may be necessary to insure operation in conformance with the provisions of the Commission Rules and the current instrument of authorization for the station.

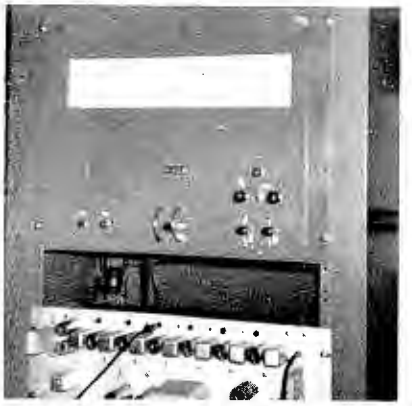

Fig. 3. Remote control unit at WEBR-FM transmitter site; STL receiver just below.

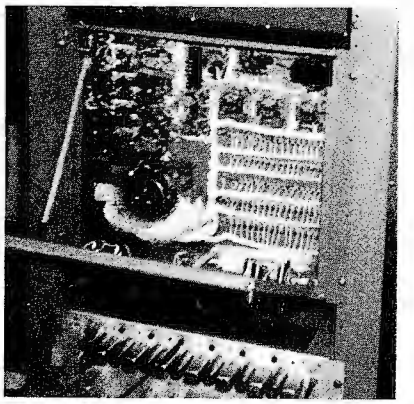

Fig. 4. Remote control unit at transmitter with front panel down for maintenance.

Upon completion of this inspection, the inspecting operator shall enter a signed statement that the required inspection has been made, noting in detail the tests, adjustments and repairs which were accomplished in order to insure operation in accordance with the Commission Rules and the current instrument of authorization of the station. The statement shall also specify the amount of time, exclusive of travel time to and from the transmitter, which was devoted to such inspection duties. If complete repairs could not be affected, the statement shall set forth in detail the items of equipment concerned, the manner and degree in which they are defective, and the reasons for failure to make satisfactory repairs. Any other entries required by the current license or Commission Rules should also be entered.

At noncommercial educational FM stations with a transmitter power output in excess of 10 watts but not greater than 1 kilowatt, an operator holding a radiotelephone second-class operator license may perform the inspection. At noncommercial educational FM stations with a transmitter power output of 10 watts or less no such daily inspection need be made. This does not, however, in any way, relieve such stations from the responsibility of operating in conformance with the Commission Rules and the terms of the station license.

Remote Control Operation of Television Transmitters

In May, 1963, the Federal Communications Commission adopted rules permitting television broadcast stations operating on Channels 14-83 to operate by remote control upon a satisfactory showing as to the manner of compliance with the following requirements:

1. Suitable control circuits shall be installed to:
   a. Turn the transmitter on and off at will.
   b. Determine the power output of the visual and aural final radio frequency amplifiers or the power delivered to the antenna.
   c. Adjust the power output of the final radio frequency

• Please turn to page 37

Fig. 5. ITA remote control unit installed at the WDCX (FM) main studio location.

Fig. 6. The remote control unit installed at the WDCX (FM) transmitter location.

A TRANSISTORIZED CROSS-BAR VIDEO SWITCHER

by John H. DeWitt, Jr., Raymond L. Weiland**, and Aaron C. Shelton**** — A complete solid-state video switcher having provisions for 22 inputs and 20 outputs.

In planning the new WSM-TV studio plant (in which two large studios are involved with a multiplicity of cameras, as well as several tape machines and other sources) it became apparent that if a large cross-bar switcher could be made it would give far more accessibility to the various program sources than would an elaborate video patch field. While video patch fields are workable, frequently much time is lost in finding the particular patch arrangement desired.

Each station has its own particular pattern of operations. It is felt that the flexibility of any station's operation is directly proportional to the number of outputs from all of its video sources. A source switcher with twenty outputs and twenty-two inputs, therefore, should achieve a high degree of flexibility for day to day operation. It should also give isolated control of all the video sources for use in production and spot taping which since the advent of video tape recording have become so important. As an example of the flexibility achieved with this type of switcher, we will outline the locations and use of some of these outputs in the WSM-TV operation.

First and of most importance in our day to day operation, is the master control position (MCR). This is an operational position charged with quality control, level riding, and switching of all sources needed at program changing periods such as station breaks. During these "panic periods" this operator has quite a few changes to make. A typical case might be to drop off of net, pick up ID on slide film Chain 1, a commercial spot on VTR 1, a promo on film chain 11, and then go back into net for the next show. To have all this come off smoothly, the operator should be able to preview all these sources ahead of time, check levels, and make smooth changes at the conclusion of each event outlined. By furnishing this MCR position five of the cross-bar outputs the operator, using one output as a reference preview bus, can have all the other sources adjusted and available on the other four output channels which we call A, B, C, D channels. Then using a simple binary relay system of four inputs and one output, a high speed transition from any one of these A, B, C, D channels to any other one is achieved. If high speed vertical interval switching should be desired at this location a simple vertical interval trigger pulse source and solid state diode switch could replace the binary relay arrangement. It has been our observation that this high speed is not necessary for source switching. "Audio Follows Video" is provided at this position, but on each of the A, B, C, D, channels an audio cross-bar provides the possibility of selecting any one of fifteen audio sources so that "crossed audio" can be used.

The possible use of "panic period" automation at the MCR position with this type of switcher would be the essence of simplicity.

Three of the video cross-bar outputs are available at the Studio A switcher to provide key, background

*President, WSM, Inc., Nashville, Tenn.
**President, International Nuclear Corp., Nashville, Tenn.
***Chief Engineer, WSM-TV, Nashville, Tenn.

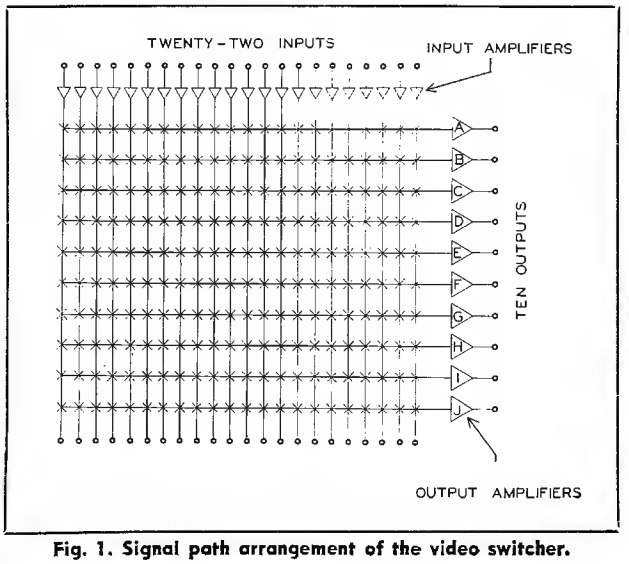

Fig. 1. Signal path arrangement of the video switcher.

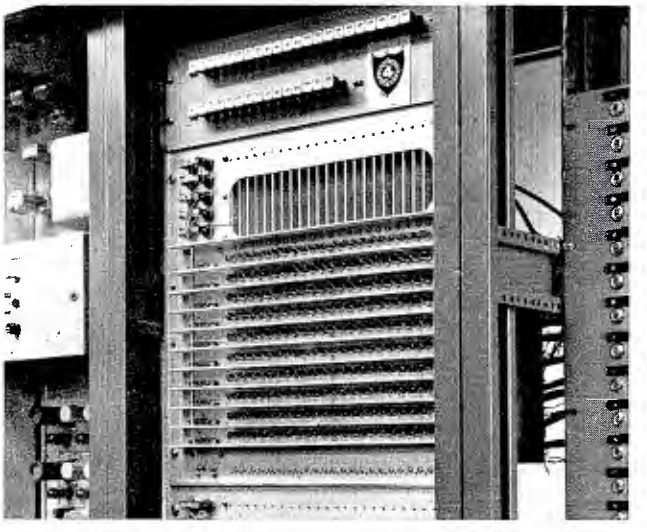

Fig. 2. Front view of rack-mounted switcher.

and insert sources for the special effects gear. One output is provided for the floor manager in both Studio A and Studio B. One output is provided in each announce booth associated with each studio. One output is provided to each audio control position in each studio control room. One output is available at the video control position in MCR and also at the projection control position in MCR. One output is available at each of two VTR machines. One output is furnished the director's position in Studio B and another is available at the rack housing a modulated RF House monitoring distribution center. It is admitted that all these positions do not rank in the same order of importance, but they are all useful nonetheless.

A bank of twenty-two video and fifteen audio selector buttons normally constitutes an output designation. The selection control circuitry is highly flexible. It is not necessary to make all of the selections available at all of the remote locations, but in our case this has been done at a very slight increase in cost.

Design Criteria

It was quickly determined that a diode type switcher of the size which we needed would be prohibitive in cost. It was decided for convenience to break the unit in two identical sections, each having twenty-two inputs and ten outputs. The switcher which we have designed to meet this need can be operated in tandem to provide twenty outputs. The design criteria which we set down to meet are as follows:

Inputs 22
Outputs 20 (two units of 10 each)
To be completely transistorized using plug-in amplifiers for input and output.
Associated power supply to be solid-state design.
Differential gain less than 1%. Differential phase less than 1°.
No observable distortion when transmitting a ⅛ microsecond sine squared pulse plus window.
Gain and phase stability such that when all 20 outputs are connected to one input gain shall not change more than .25 db and added phase shift at 3.58 mc shall be less than 3° (extreme condition).

Crosstalk between any two circuits shall be more than 60 db below desired program up to 100 kc, and 50 db below desired program up to 5 mc.
Noise level (hum and thermal) shall be 60 db or more below 1 volt peak to peak output.
Switching time less than 2 milliseconds, if possible.
Metallic contacts at cross points (relays) to insure reliable operation.
Use a minimum of relay-rack space, yet have ready accessibility to all components for ease of maintenance.

In addition to crosstalk considerations, one of the most important factors in the cross-bar switcher has to do with the capacitance of the cross-point connectors (relays) as well as distributed capacitance in the circuit. Tests of various relays indicated strongly that the dry-reed type offered many advantages, among which are:

1. Great speed of operation.
2. Low capacitance, about 1 picofarad in open condition.
3. Completely sealed in inert atmosphere.
4. Tests showed no failure up to 10 million operations.

Fig. 1 is a simple line drawing of the 22 input, 10 output unit which we have designed. Tests on various lab models in which the input bars and output lines were shielded with aluminum channels showed that the crosstalk requirement could be met easily and in a straightforward manner provided relay capacitance was low enough and provided the shields between lines extended far enough beyond the lines to prevent capacitive and inductive coupling. Reed relays are available which have a multiplicity of contacts which would make it possible to have audio switched at the same time as the video; but they would be larger than a single contact relay and would greatly complicate the wiring problem of the video switcher. We therefore decided to switch the audio in a separate cross-bar which could be made up using simple plug-in relays. The reed relay chosen for the video switcher is cylindrical with a length of only one inch and a diameter of 0.4 inch. This design lends itself to the use of a basic assembly in which an aluminum relay rack panel having a total height of only 17½ inches is used. Holes are punched through the panel and the relays are suspended halfway through the holes giving excellent shielding between the input and output sides. Vertical barriers are used between the input rows and horizontal barriers are used on the backside of the panel to separate the output rows. Fig. 2 is a photograph of the completed 22 by 10 switcher as viewed from the back.

• Please turn to page 41

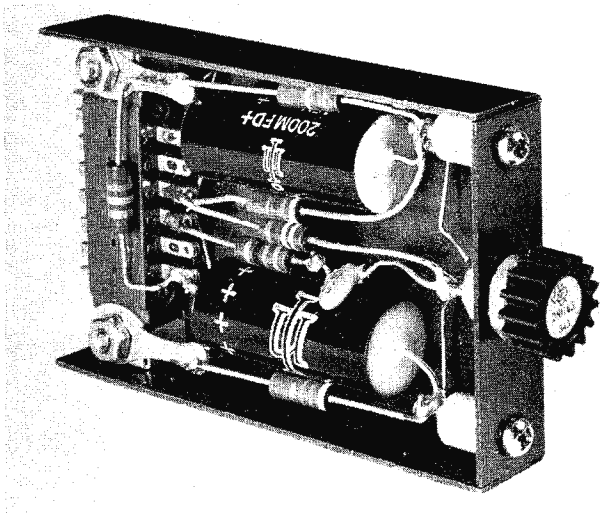

Fig. 3. Typical line driver input amplifier.

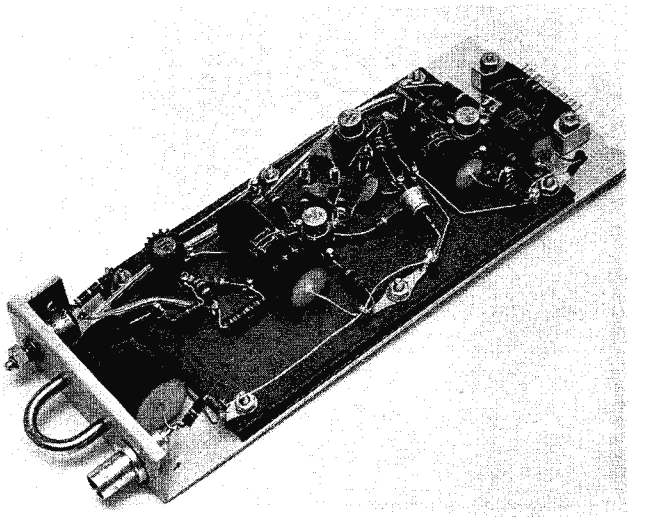

Fig. 4. Typical feedback-type output amplifier.

RF AMMETER CALIBRATION TESTS

*by Elton B. Chick** — The author outlines methods of checking RF ammeters and assuring proper calibration.

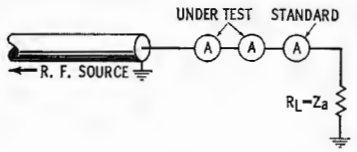

Fig. 1. Series meter current method.

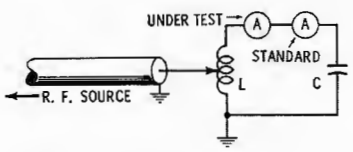

Fig. 2. Tuned L and C test method.

When the efficiency of a broadcast transmitter appears to change, or a directional antenna current ratio shifts for no apparent reason, an RF ammeter often comes under suspicion. Also, there is often the question of accuracy of spare ammeters, especially if they have been used. In any case it is usually difficult to eliminate an ammeter as a possible cause of the problem.

One of the most frequently used methods of checking an RF ammeter involves wiring two or more instruments in series and passing an RF current through them as is shown in Fig. 1. This is usually done at the frequency at which the meters are to be used; but the results are not always satisfactory.

*Assistant director, engineering, Rounsaville Radio Stations, Cincinnati, Ohio.

When ammeters of the same make, model, and full-scale range are used the chances of success are best. However, it is wise to make comparisons with several meters since accuracy of the reference instrument may be in doubt.

Another problem in using this method is in the difficulty in adjusting the RF source, usually a transmitter, to provide the range of currents needed. With the setup shown in Fig. 2 it is possible to achieve a relatively wide range of currents with a low-power RF source. Here the inductance and capacitance are of such values that they can be resonated at the frequency of the RF source, the amount of current through the ammeters being adjusted by tuning L or C. In this arrangement leads should be kept very short as stray capacities can upset the results, especially at the higher frequencies. Using an RF ammeter with an accuracy of 2% these methods are likely to give results which are accurate to only 3 or 4%, at best. This is of course questionable where rules require an accuracy of 2% or better.[1] Usually the alternative to these methods is shipping the meter back to the manufacturer or to an instrument repair service for checking. This naturally takes time and may cause undesirable delays and expense during an antenna proof or similar work.

Obviously where greater accuracy is required the use of RF currents for testing leaves much to be desired. Where a large number of ammeters are in use, as in a directional antenna system, it may be desirable to have on hand a device and means which will give tests results that are accurate to 1%, or so. Such a device can save much time and inconvenience, and make trouble shooting much easier.

A Test Unit

The unit described here is quite

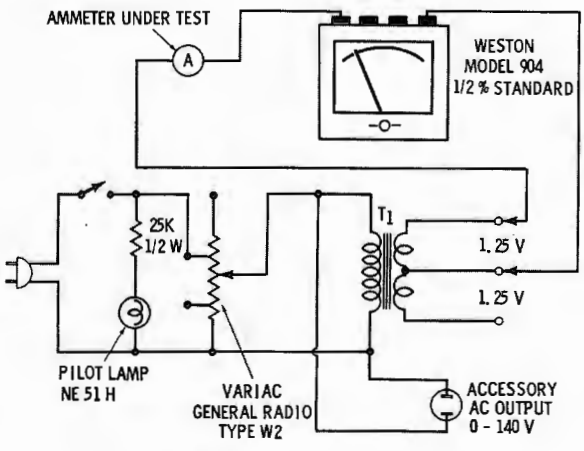

Fig. 3. RF ammeter testing current source.

Fig. 4. Test setup with completed device.

simple, easy to assemble, and offers several conveniences. It allows calibration tests to within 1%, better than that required by the FCC Rules, is portable, easy to operate, and may be used for currents in excess of 50 amperes. The device allows calibration in the same manner used by several manufacturers, that is, by the use of 60 cps sine-wave current. The use of 60 cps current is much more convenient than RF and eliminates several sources of error.

The test circuit is shown in Fig. 3. Current through the standard and meter under test is adjusted by an autotransformer which controls the transformer primary voltage. Although the test circuit is quite simple the transformer requires special attention. This is because of the low resistance of the ammeters, both the standard and the meter under test. (Typical ammeter resistances are shown in Table 1.) From this it is evident that only a very low voltage is needed to produce high currents. The transformer used in this unit is a modified filament transformer, with the secondary rewound for higher currents. The original secondary was replaced with 8 turns of No. 8 AWG wire; this winding is center tapped. Allowing 250 circular mils per ampere, the new winding can deliver in excess of 60 amperes for short periods, 4 or 5 minutes, without any damage to the transformer. The transformer should be capable of delivering about 50 watts to the secondary.

[1]F.C.C. Rule 3.39 covers indicating instruments and allows the use of meters having an accuracy of 2 per cent of the full scale reading.

TABLE 1

Ammeter Range	Resistance in Ohms (Nominal)
0-1A	.350
0-2A	.125
0-5A	.050
0-8A	.030
0-10A	.025

Where tests do not require more than 15 or 20 amperes a transformer having a 2.5-volt 10-ampere secondary will be satisfactory. One such transformer delivered 25 amperes, with reduced primary voltage, for about 5 minutes without showing signs of overheating. Another approach to the transformer problem is wiring a multiple secondary transformer so that its windings are in parallel. This can be done only with windings of equal voltage, and by phasing the windings properly.

The voltage control used here is rated at 2.4 amperes or about 275 watts. This is somewhat higher than needed for calibration testing but makes the unit more versatile by providing a source of variable voltage for other purposes. This voltage is accessible through a receptacle mounted on the rear of the unit.

The transformer, voltage control, etc., are housed in an aluminum utility box measures 6 × 9 × 5 inches. The transformer secondary is brought out to 3 binding posts mounted on top of the unit.

The standard used in this setup is a Weston model 904 meter having an accuracy of 0.5%. This instrument has several scales ranging from 0-3 to 0-200 A. The use of an 0.5% standard is generally accepted for tests which will be accurate to 1.0%. Where 2% accuracy is satisfactory a 1.0% meter may be used. In fact, almost any RF or AC ammeter known to be within 1.0% could be used, provided its scale ranges are suitable. As with any type of standard, the standard RF ammeter should be handled with great care, and caution must be used to **avoid overloads.**

Test leads are made of the copper braid removed from RG-8 coax. The braid is covered with plastic spaghetti and is fitted with lugs and battery clips (50-amp size). Having highly flexible test leads is a considerable convenience. The battery clips save time in making connections to the meter being tested.

Calibration Testing

The calibration test setup is shown in Figs. 3 and 4. Where the meter to be tested is mounted it may be desirable to test it in its normal position. In fact some meters are calibrated for use in panels of a specified thickness and may not indicate properly if not properly mounted. In checking a meter in its mounted position the RF leads to the meter should be disconnected. Test connections to the meter must be good, usually the 50-ampere battery clips will do the job. Before making any connections, however, the test unit should be turned off and the voltage control set to zero. Also the standard should be checked to be certain that it is set to the correct range.

There are two methods of reading comparisons between the standard and the meter under test. One is

• Please turn to page 47

R.F. AMMETER CALIBRATION CHART

MAKE _____ MODEL _____ SERIAL NO. _____

RANGE _____ USE _____

DATE OF INITIAL TEST _____ CHECKED BY _____

DATE OF SECOND TEST _____ CHECKED BY _____

STANDARD AMPERES	INITIAL TEST	PERCENT ACCURACY	SECOND TEST	PERCENT ACCURACY	REMARKS

ADDITIONAL TESTS & NOTES:

Fig. 5. Chart for recording ammeter calibration.

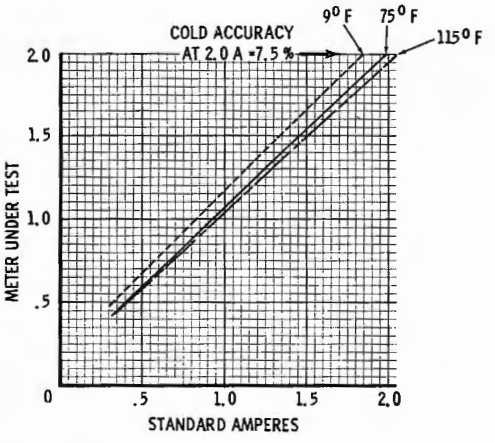

Fig. 6. Graph of temperature dependent accuracy.

PLANNING FOR AUTOMATION

by Wells Chapin* — A guide for broadcasters who may be considering an automation system.

There are about as many definitions of automation as there are people to define it. Many consider it as a mechanism or system that performs, automatically, a predetermined act at a predetermined time. Much more realistic is the way factory people define it: "continuous automatic production and data accumulation, interpretation and action." It is most important when you plan to automate to consider the end system and end job you want done; and this includes data accumulation. If you plan properly, it is possible to partially automate initially and still have each segment tie into the others at a future date.

Automation is not new. In our own industry we have gone a long way from throwing a simple switch for each operation, into a multiple switch, into relays, and then a fine automatic studio which we simply called a preset system. The author installed such a system in 1946. We were taking care of panic breaks before some of the TV automation experts drew their first plans, only it was called preset. Why not dust off some of these old ideas and get a start toward automation, solving some of your minor problems at the same time.

Guarantees that investment in automated facilities will pay off are hard to come by. However, the measures of sound investment and methods of gathering factual data vary from station to station and would take an entire article alone to properly present to you the guide posts. It is sufficient to say that the most important factors to be considered are cost, return on investment, and necessity. This is where a good finance man shines; they are always pretty realistic. The value of an automated system lies in its economic worth, with other contributing factors. If you only automate portions of your operation you must consider such factors as cost to modify the system at a future date, or the penalty for operating the system in less than its designed capacity. The operation to which your station will be subjected must be studied in its entirety, including the effect newly automated portions will have on all other aspects of the total operation—even including the decision making of the general manager.

The benefits of automation are roughly: Smoother operation and fewer air mistakes, better data handling, improved overall efficiency of all personnel and, possibly, operation with a smaller staff. However, all is not beer and skittles as automation has a tendency to destroy a station's personality, or to establish a new one. The people saving is another story—you are now faced with a greater demand on the staff, from the girls who prepare the program to the film man and engineer; all must have a high degree of competence and its inherent higher salary requirement. This is where one intangible lies.

At this point, I would like to point out that until the networks get a means of triggering your automatic devices, and until standards are set in this area, you are going to have some programs cutup at the ends, due to timing discrepancies. Operating errors still can be made by the girls typing the input data or by men loading or splicing the film. After a bit of operating experience, these mistakes should be to a minimum. Also, there are verification equipments available which provide quick checks on newly typed days programs. This last statement hits on the better efficiency or productivity, or what have you. You will not have the Alfonse Gaston act when you are trying to find out who goofed on

*General Electric Co., Light Military Electronics Dept., Utica, N. Y.

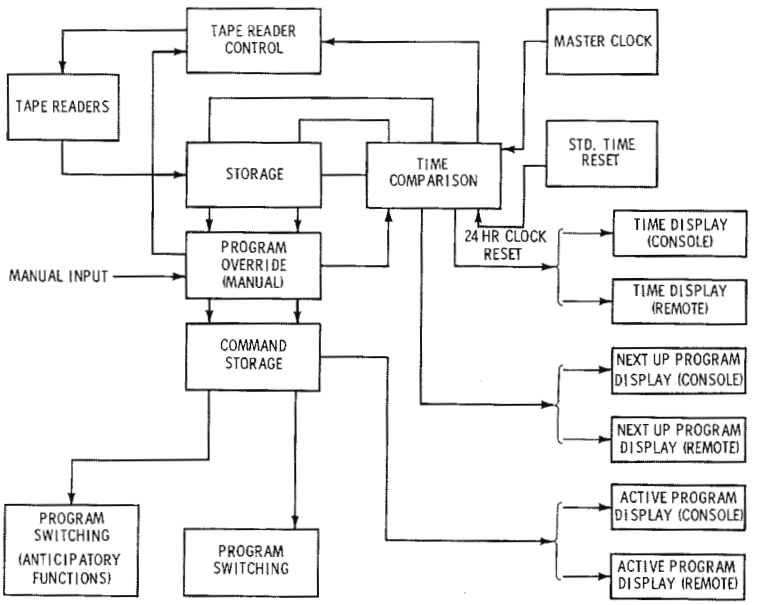

Fig. 1. Typical computer block diagram.

the spot announcement. Of course, now the excuse will be "Wilbur the automat" goofed. But it's not easy to blame Wilbur as he rarely ever goofs, and if desired, you can go back and have him type what he has done.

I'd suggest you start your automation in radio. There are many fine automatic devices to remote your transmitter. This is indeed a form of automation that is very successful. Advance from the transmitter to simple studio operation. In the radio automation field there are many fine tape, spot program, and programming systems available. Radio is relatively simple to automate, but raises certain questions: how extensively do you automate, how much money do you save, how much station personality is lost with each degree of automation, and how important is loss or alteration of station personality.

Automation was invented for Television. If you have ever watched a man make a panic break you know why. Let's consider the first step. If you have a complicated TV switching setup automation will only complicate things further. Therefore, you should first simplify your manual system, fitting it in the process to your automation ideas. Perhaps a simple preset system will be all you need. If you must go all the way, decide early; you will be in a real bear trap later when you want to expand and find it necessary to tear out your equipment and start over. Deciding how far to go involves not only engineering but the entire operation from sales to traffic, printing the program, changes, air, billing, accounting, payroll, and other procedures. Now this is where you really burn the midnight oil as you have to become familiar with the whole station operation (you suddenly find you haven't a corner on all the problems) to make more decisions. I'd suggest you call in one of the competent business data firms who specialize in this field. When you become informed enough to ask questions you will be amazed to see how his equipment which triggers off "Wilbur the automat," with either tape or cards, fits into, and can really help the entire business system.

One of the factors to consider when making up your mind on a system is that of cards versus tape. Cards work into the station system quite readily. The sequence can be changed easily by shuffling; and cards can be easily duplicated. In the case of a spot or program which is repeated each day all you do is re-use the same card. Cards and paper tape really present no problem.

Once you have decided on the end system you are again faced with decisions—do I put the whole system in now or a portion of it? You must remember it's pretty darned expensive to put in a big system and leave a large portion of it set idle. You must decide on how far you want to go and whether you have the people, know how, time, and money to do it.

Call in the equipment companies and work with them. Be sure everyone understands the problem by stating what you want accomplished in a tight set of specs. Determine who will do the integration work, wiring, etc., and have answered all the other questions a thorough engineer should ask, and include in the contract before work starts. Remember a well written thorough contract leads to friendship and understanding.

Today there are several methods of automation. You can do it simply or get as complex as a computer (Fig. 1). With a computer you can merely push buttons and feed typed instructions to the machine. The computer will give you easy and rapid change. You can search any segment of your program day practically instantaneously and make changes in whole blocks of time just as easy. Even with a computer you must go to tape or some sort of readout device to get your data into your system and vice-versa. A computer is complicated and is generally sold with a maintenance contract. It is expensive. The computer does an outstanding job, but you should weigh simplicity and the fact you have to use tape or cards somewhere any way you turn. Therefore, you ask yourself whether you can afford to dispense with the computer in the first place. Never complicate an automation system—simplify it.

There are other means of data storage, but each has its own problems, including information bit capacity, operating speed, etc.

The problem of program change deserves serious consideration. If you are using tape, you should have a spare reader, in order to go from one tape to the other and then back. Also, it is difficult to read a tape while it is on the machine, and off it is still quite a trick. A computer makes changes easy; you push buttons and up flashes the portion of the day you want to see. You push an erase button and off it goes; then you push the insert and you are done. This problem of change can be beat somewhat if you fill your data input unit with cards. Then all you have to do is find the cards you want and insert the new ones. Don't forget—changes don't always come

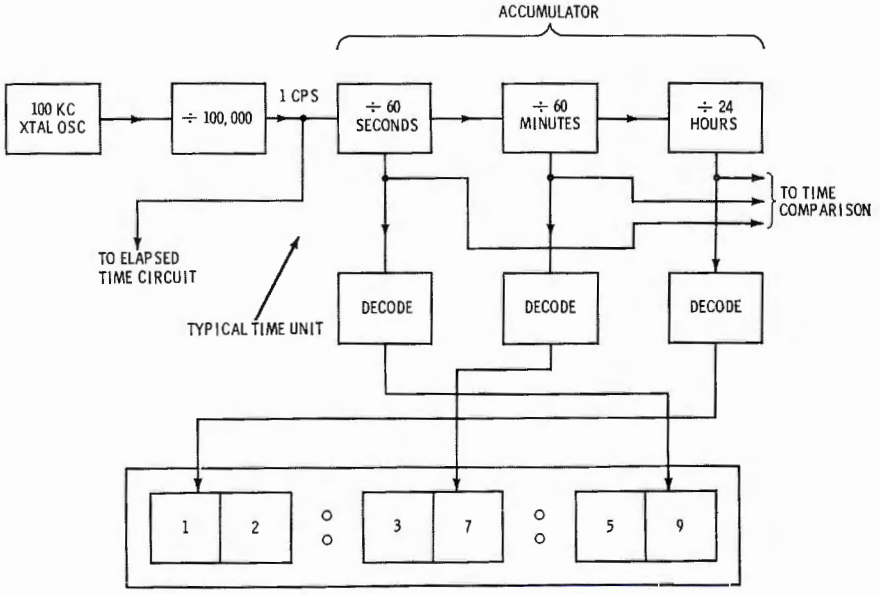

Fig. 2. Readout device block diagram.

up when it is most convenient. It could be late at night and the people on duty will have to make new cards or have substitute programming ready. In your quest for equipment it is a good idea to check on how close to program time you can make a change. Can the system you are planning take care of several rapid short spots. And correcting the automation input is not the end—you still have the loading of projectors, etc., to worry about.

You will have to make up your mind what timing the system will operate on—clock, relative, or both. Relative time is necessary when you insert a timed spot into a program on a cue basis, rather than on a scheduled clock time. Manual insert is also a necessary feature. It is also possible to have a system using a clock but with the added feature of being able to retard or advance the time at will, and then reset it instantly to the correct time. You may prefer an elapsed time system, where measured events are stored and the system counts until the event time has run out; it then switches to the next event and starts counting again.

How automation fits into all phases of your master timing system at the station is an important consideration. The desired number of video sources will be an important factor in determining the type of automation storage you must use. Each system has its limitations. One system is limited in storage capacity, another gets physically large when you need a large number of events and sources, and the last, which really gives flexibility, is expensive and complicated. Don't forget you have a sticky little problem with your projectors, since they require pre-roll time. This means your system must have a second time or pre-roll time of different duration for projectors, tape recorders, etc., preferably with a variable device to allow for the different characteristics of each machine.

Do you want remote indicators and how many? Some systems are limited as to the number of indicators because of bulb current versus wire size. Other systems permit you to use as many readout devices as you want, but cabling gets cumbersome and expensive. Readout devices are not cheap (see Fig. 2

• Please turn to page 39

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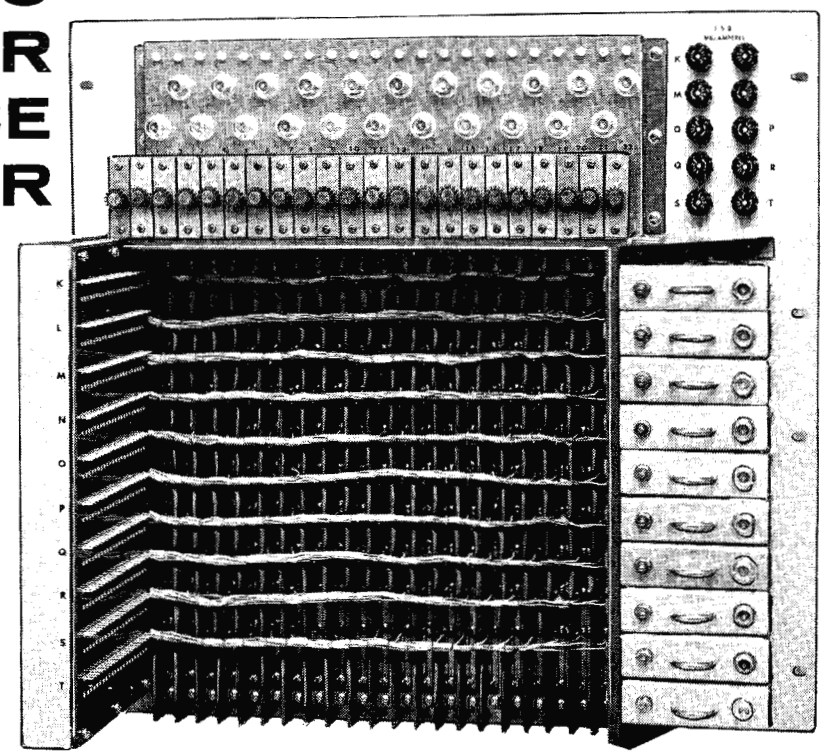

Model VS22-10 Video Crossbar Source Switcher provides instant accessibility to any of ten of 22 program sources.

Occupying only 17½ inches of standard panel space, it offers increased efficiency and reliability to television operations with maximum flexibility.

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No detectable distortion of the ⅛ microsecond sine-squared pulse thru system, regardless of number of outputs connected to a single input.

Frequency Response: Flat within ± 0.5 db to 8 MC, regardless of number of outputs on a single input.

Noise: Minus 60 db.

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Switcher is designed to handle color with negligible distortion.

At 3.58 MC additional phase shift is less than 1.5° when nine additional output amplifiers are connected.

Less than 1% Tilt over 1 field.

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POWER SUPPLIES: Two regulated power supplies mounted on 5¼" panel, completely solid state, are furnished with the VS22-10. Each power supply will carry the entire load of the switcher. In case one power supply fails, an associated diode will automatically disconnect bad supply and transfer the entire load to the other supply. Each supply shares load equally during normal operation.

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A REVIEW OF AUTOMATIC TRANSMITTER LOGGING

Part 1* — Summary of regulations, application, and advantages.
Part 2 — Descriptions of some available equipment.

PART 1. APPLICATIONS

The FCC recently authorized broadcast stations the privilege of maintaining their operating logs by the use of automatic devices. This change in the Commission's Rules was made effective June 17, 1963.

To fully understand what can and can not be done, let's review in simple terms the text of these new Rules. Section 3.133(b) of the FCC Rules applies. First, any automatic devices must be accurately calibrated and must indicate time, date and circuit function measured. Second, they must not affect the operation of the circuits they are measuring. Third, the recording devices must have an accuracy equal to that of the indicating instruments they are replacing. Fourth, the calibration of these recording devices must be checked at least once a week against the original instruments, and the results logged in the maintenance log. Fifth, an alarm circuit, near the operator on duty, must warn when any of the automatic log readings are not within the tolerances specified by the Rules. Sixth, each recorder must read each parameter at least once during each 10 minute period. Seventh, the automatic equipment must be located at the remote control point, if the station so operates. Eighth, the operator must inspect the automatic logging equipment periodically during the broadcast day. And ninth, the indicating scales must conform to the requirements of Paragraph 3.39 of the Commission's Rules.

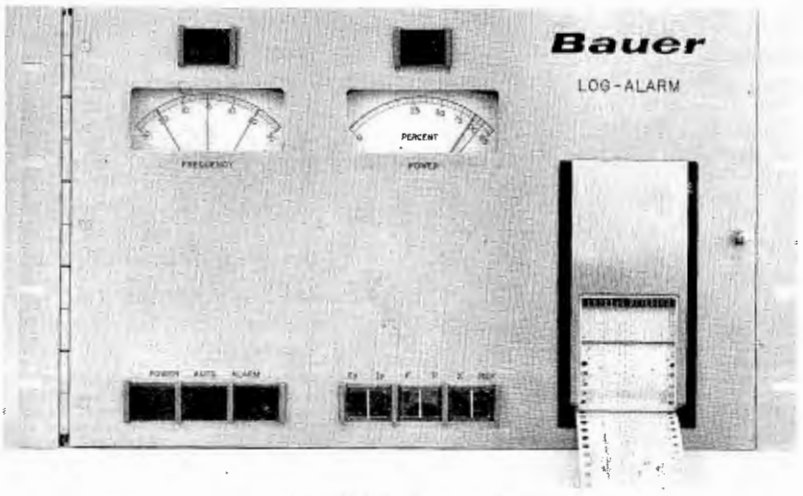
If you do not already have a copy of the complete FCC Rules governing automatic logging as well as all AM, FM, and TV you can easily obtain a loose-leaf copy from the Government Printing Office, Washington 25, D.C. for a cost of $4.50. This loose-leaf edition is then kept current, by periodic mailings of new pages and additions and corrections, at no additional expense. (ask for FCC, Volume III).

The primary use of automatic logging is not to replace the operators on duty, but rather it is a "tool" to be used by such persons, as an aid to more accurately performing their jobs. With automatic logging, no half-hour meter readings are skipped, or recorded late. Also no difference in reading accuracy between various operators is encountered, since the automatic logging always "sees things the same way."

By freeing the operator on duty from his periodic meter readings and technical observations, he is able to devote additional time to maintenance, recordings, and other engineering tasks formerly done after hours or pieced in between half-hour intervals.

One of the most helpful uses will be in pin-pointing the exact nature and beginning of technical troubles. Too often the operating logs reflect constant meter readings all day long, when in fact variations exist. The author has noted several times upon being called to a station to readjust a directional antenna or to repair a transmitter, that the operating logs could not be relied upon to show when the trouble first began, or even how serious it might have been. Automatic logging will tell when, where and why.

*by Robert A. Jones, Consulting Engineer, LaGrange, Ill.



Bauer 440 Log Alarm System.

PART 2. A REVIEW OF SOME AVAILABLE EQUIPMENT.

Following are brief descriptions of some automatic transmitter logging systems currently available to the broadcast engineer.

Bauer 440 Log Alarm System

The Bauer model 440 equipment is made up of three major components: a modified Amprobe DC-100 chart recorder, two contact-making meter relays, and a 26-position 5-deck precision stepping relay for sequential sampling of the parameters being recorded. All normal operating controls, as well as the

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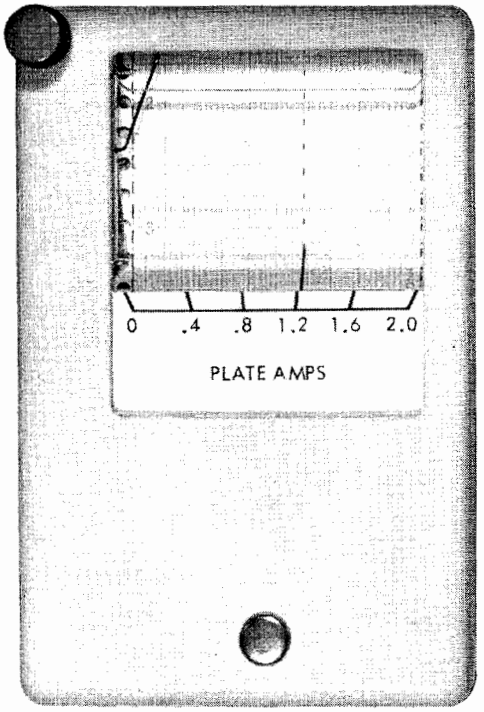

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- ☐ IRE Annual Broadcast Symposium, Washington, D.C., Sept., 1962
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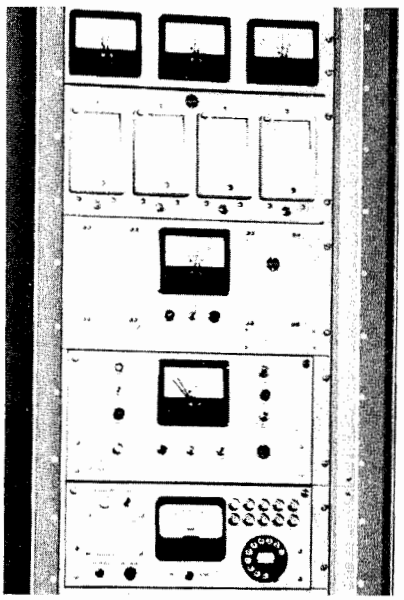
chart recorder, are mounted on the front panel; all other adjustments are accessible by opening the hinged front panel. The device is contained in a rack mounted assembly, 10½″ high by 19″ wide by 10″ deep.

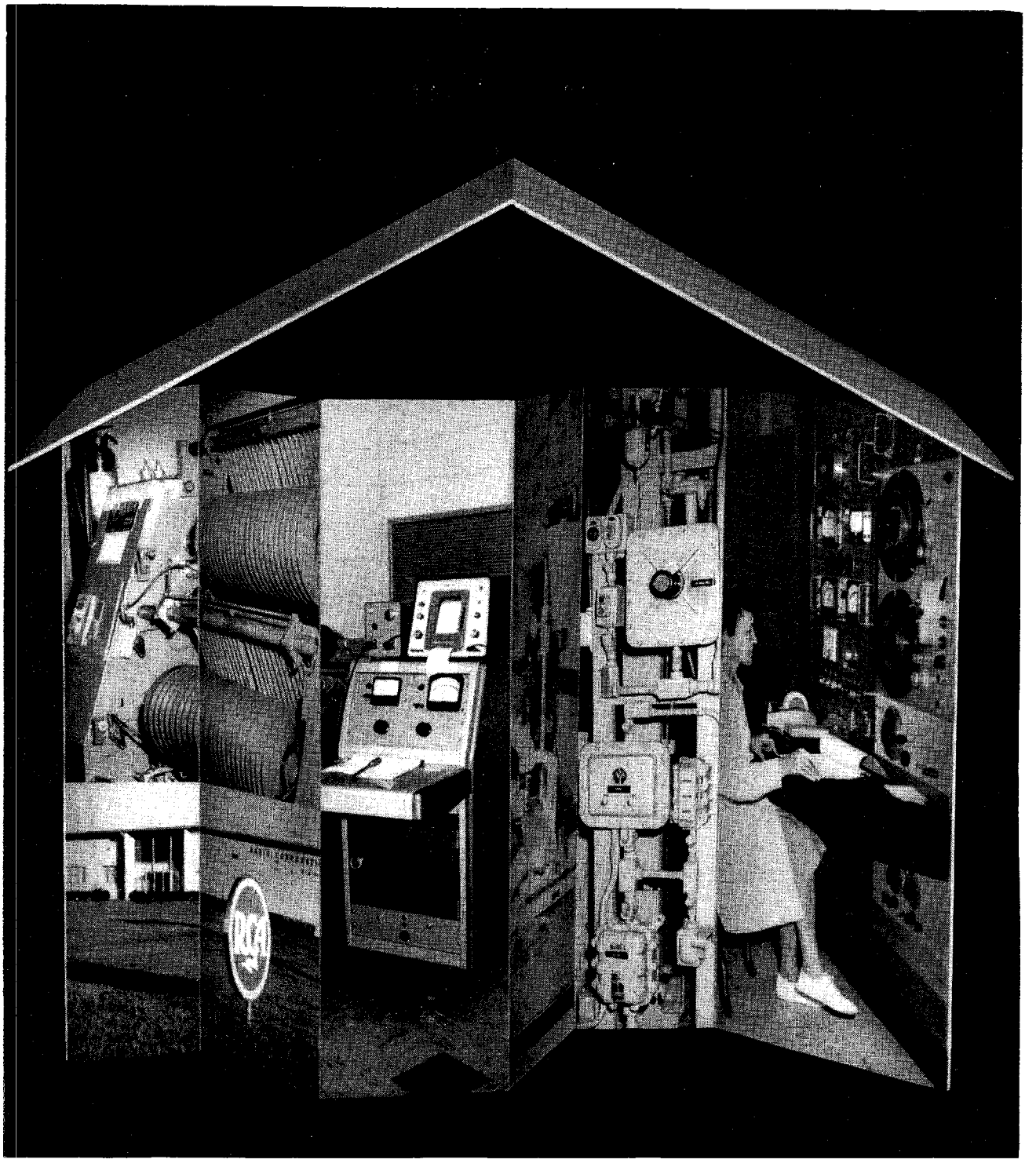
The single DC recorder is programmed to monitor all required operating parameters of a single broadcast transmitter. The readings are all made on a single chart, which moves at the rate of one inch per hour, the stepping relay providing the necessary coding to identify the various readings. The recorder prints once each minute, sampling each parameter at least once every seven minutes. The system also checks calibration automatically every 26 minutes by referring to a zener diode source. The metering relays monitor frequency and antenna current continuously and give visual and audible alarms should an out-of-tolerance condition occur. Provision for remote alarms is provided for installations where the operator might not be able to hear the alarm contained within the unit.

RCA Automatic Logging Equipment

The RCA AM automatic logging system provides six major functions: automatic power control of the transmitter, an alarm to indicate inability of the power control to maintain power output within required limits, an alarm to indicate transmitter overload, a negative



GEL Autolog System.



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At 6800 East 30th St., Indianapolis, Ind., one of the most modern tape plants in the country houses complete facilities for the manufacture of Red Seal tape. From the time raw materials reach the factory until they emerge as finished tape, every step is minutely checked. Quality control tests are rigid. Every inch of tape must live up to tough mechanical tests—have the same magnetic properties and the same recording-bias characteristic. Here's tape you can depend on completely — try RCA Red Seal Tape once—you'll never use any other tape!

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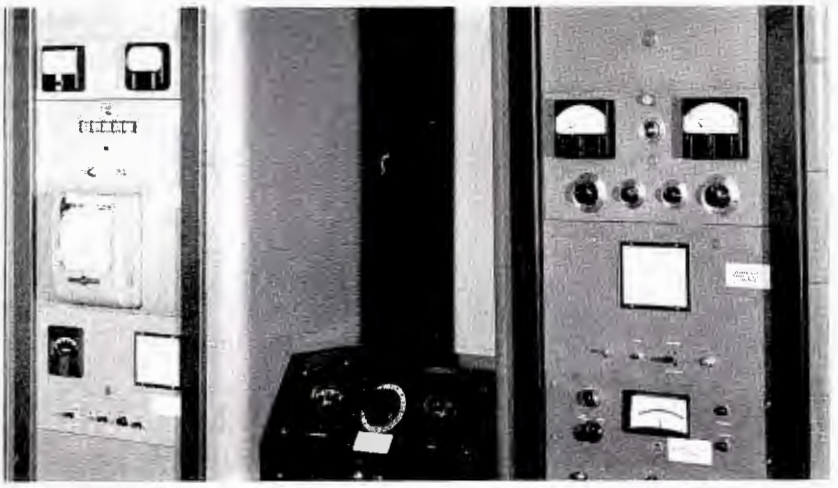

RCA Automatic Transmitter Logging System.

peak limiting unit, modulation peak count, and automatic logging of the operating parameters. The system is completely automatic and designed to record all parameters required by the FCC. All meter readings are scanned once each half hour and permanently recorded.

The parameters to be recorded are sequentially selected by a clock driven commutator. Each function is recorded for 2½ minutes and identified by a momentary blank spot on the chart.

One recorded segment is a zero voltage providing a check of the lower limit of the recorder; another records the standardizing voltage to develop a full scale calibration, as well as a starting point to identify the parameters. The calibration system provides a constant check on any changes which may affect the readings, and allows correction of the absolute values if necessary. The input impedance to the recorder is

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Magnecord's new half track and quarter track heads are the finest heads ever offered. Our revolutionary Micro-Optic honing process, together with other advances in design and production techniques, again demonstrates Magnecord's pre-eminence in the tape recorder field. Now, as always, you can depend upon Magnecord for the very best in professional sound.

NEW RECORD HEADS — By Magnecord's Micro-Optic honing process, both trailing and leading edges of recording head gap are polished to micro-inch flatness. The result: superior high frequency recording characteristics, because straightness or flatness of head's trailing edge is a critical measure of performance.

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NEW REPRODUCE HEADS—Hyperbolic wrap curve provides extended smoother low frequency response and better signal to noise ratio; prevents coupling of unwanted signals to pole faces. Sufficient tape wrap insures full coupling of high frequency signals with no loss, for superior performance at the extremes of the audio spectrum.

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Circle Item 17 on Tech Data Card

high to isolate the accuracy from telephone line variations. Controls and adjustments are provided to calibrate all parameters.

All metered circuits in the transmitter are connected to the system and recorded on a studio-located strip chart. This network is completely separate from the remote control system.

Tower lights and flasher are monitored for proper switching and operation.

General Electronic Laboratories Autolog

The Autolog transmitter logging system sequentially samples and records on dry pressure sensitive paper any nine of the FCC required or station desired parameters. Alarm meters can be added in any or all chart positions to indicate when readings deviate above or below adjustable limits.

This remote reading automatic system can be added to the remote control equipment of any manufacturer without modification. It is supplied with four basic sections: the transmitter unit, the chart recorder panel with three individual chart recorders, an interconnecting and First Alarm panel, and a panel containing the circuitry for accepting the readings and control functions. An integral part of the last unit is a No Signal alarm meter which is always in the system regardless of the parameter being sampled.

The device is wired so that none of the front panel switches will disable or disrupt the chart recording timing mechanism.

Each recorder passes through three modes. When recorder 1 enters the Reading condition it first records for 12 seconds a remote full-scale calibrate voltage received from the transmitter location. This verifies the accuracy of the reading which follows for more than 30 seconds thereafter. While the first recorder is in the Reade mode, the last in the chain is in the Local Calibrate condition and all other recorders are registering the accuracy of the no-voltage zero check. When the first recorder completes the Reading period it enters the Local Calibrate mode as the second passes through the Reading mode. This process continues in an endless loop 24 hours a day.

New, from Electro-Voice! Sentry Series Professional Monitor Loudspeakers... guaranteed flat ± 3 db from 40 to 20,000 cps!

No longer must you improvise with theatre or home-type hi-fi speakers designed for some other purpose. Gone is the guesswork when equalizing... you know you'll get *exactly* what you hear through an E-V Sentry Monitor. That's because each Sentry is simple, reliable and as flat in response as modern science can make it!

Gone are "balance" switches or knobs that vary response... each Sentry is adjusted flat at the E-V laboratories before you ever see or hear it! And because of this simplicity, the E-V Sentry Series speakers are modest in size and price.

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The natural-finish hardwood cabinets are available in a sloping-front style for wall or ceiling mounting... or in an upright floor model for fixed or portable applications. They are all identical in sound. Built-in transformer matches studio output impedance of 8, 16 and 600 ohms.

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Sentry II Floor Model, 32" H, 20" W, 13 D. List Price $248.33. Sentry I Wall or Ceiling Model, 17" H, 37" W, 21¾" D. List Price $265.00. (Normal trade discounts apply.)

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Circle Item 21 on Tech Data Card

A TRANSISTORIZED AUDIO DISTRIBUTION SYSTEM

*by Edward Tong** — Description of a cleverly packaged isolation amplifier system suitable for many applications in radio, TV, and recording.

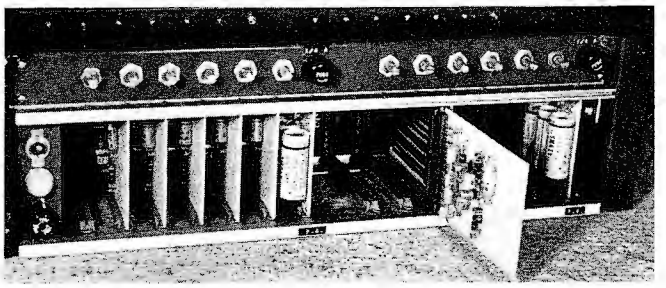

Fig. 1. Completed distribution amplifier.

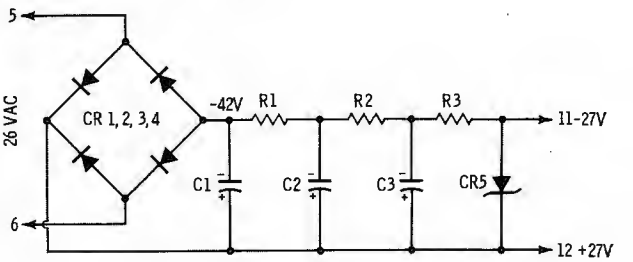

Fig. 4. Power supply module circuit.

The distribution of audio sources is a requirement present in the design of most complex audio systems such as found in radio, television, recording and other related fields. A typical example is the distribution of network audio information to various areas and activities in a typical television station as listed below:

1. Master control room (preset switcher and automatic program switcher).
2. Control room "A" audio console.
3. Control room "B" audio console.
4. Video recording equipment.
5. Audition room.
6. Audio recording room (disc and tape).

Sound engineers have found that resistive dividing networks, while simple and reliable, do not provide sufficient isolation to guarantee the elimination of crosstalk, and also may not tolerate the decibel loss in their design. To overcome these objections to the dividing pad, amplifiers are used. Equipment designed especially for this purpose is rare and seldom available commercially. The need is presently fulfilled by equipment principally designed for other uses, i.e., microphone preamplifiers, line amplifiers, etc. More than likely the equipment is "homebrew," and it is to the "brewmasters" that this paper on the transistorization of the audio isolation amplifier (Fig. 1) is addressed.

Nothing radical or new in nature is being claimed for this piece of equipment. The amplifier circuit (Fig. 2) has appeared in several publications. Our goal was to package this circuit in such a manner as to gain the advantages which transistors have to offer, i.e., compactness, lower power consumption, low heat output, low maintenance, reliability and ease of construction (Fig. 3).

The performance of the system, as listed below, fulfills our requirements very well.

Frequency Response	± 7 db, 50 to 15k cycles.
Distortion	Less than 1¼ %, 50 to 15kc.
Noise	— 63 dbm or better.
Output	0 dbm balanced.
Input	15,000 ohms balanced (bridging).
Gain	+12 db bridging 600 ohm (maximum).

The amplifier module has been checked out with a 34-volt supply and puts out + 20 dbm (100 mw, 600 ohms) with less than 1% distortion. It has a gain of 35 db and the frequency performance on both ends of the range is limited by the transformers used. Since 25- to 30-volt zener diodes were more generally available and our use requires outputs between —10 and 0 dbm the listed performance specifications were taken with a supply voltage of 28 volts. A "heat-run" was made on the amplifier to 130 degrees Fahrenheit, at which temperature the chassis was uncomfortable to the touch but the amplifiers showed no sign of "runaway," and the distortion decreased a few tenths of a per cent due to the

*Assistant Chief Engineer, WDSU-TV, New Orleans, La.

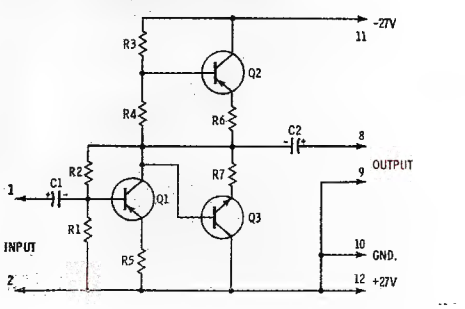

Fig. 2. Circuit of amplifier module.

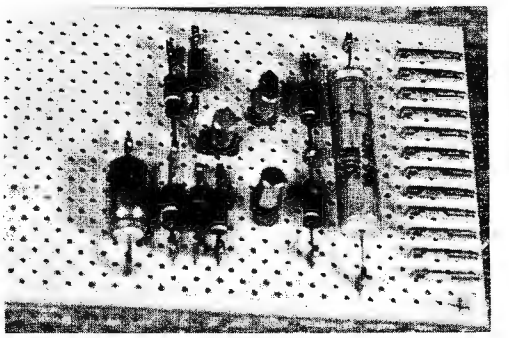

Fig. 3. Board-constructed amplifier unit.

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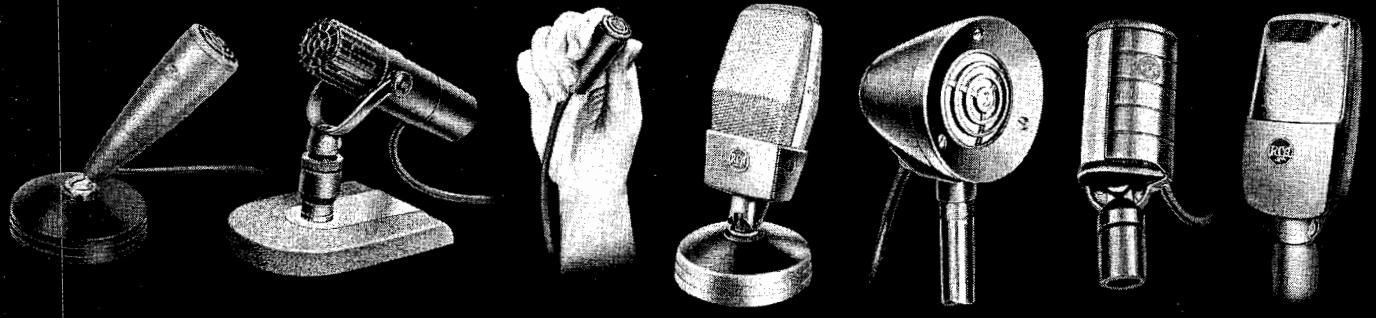

RCA MA 2313 Non-directional dynamic mike

RCA MA 2314 Uniaxial ribbon mike

RCA MA 2315 Semi-directional dynamic lavalier

RCA MA 2316 Bi-directional ribbon mike

RCA MA 2317 Non-directional dynamic mike

RCA MA 2318 Non-directional dynamic mike

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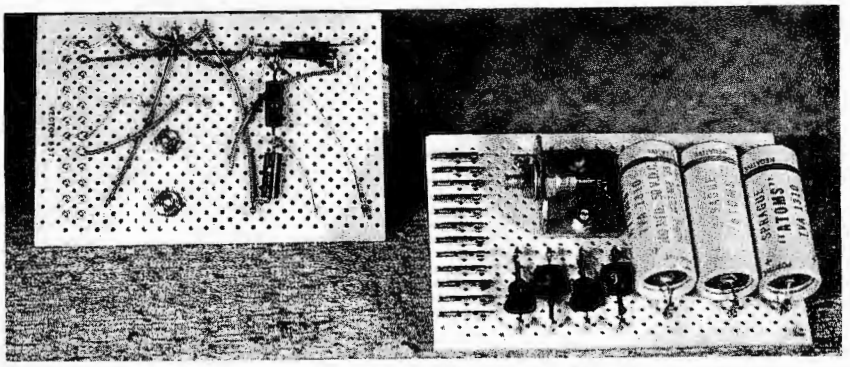


Fig. 5. Construction of power supply.

slight increase in current drawn. This feature will be much appreciated if the equipment is to share rack space with vacuum tube equipment.

The power supply module (Fig. 4) is simple and straightforward. The use of a 3½ watt zener diode regulator is conservative. It will soak up the entire load when all or any number of amplifiers are removed without getting overly warm. This permits the use of a very simple "heat sink" consisting of an L shaped piece of 16 gauge aluminum (Fig. 5). In order to dispense with induction coupling problems from the power transformer, it was located elsewhere in the rack. The total power used by the dual unit is less than 5 watts, contributing a negligible amount of heat to the rack temperature.

By using Elco Varipack chassis components and Vector plugboards, we were able to package two groups of up to a maximum of six amplifiers each and include the two power supply modules as well in a 5¼" standard rack chassis. In constructing the chassis assembly, it was found necessary to modify the guide plates to fit them into the rack chassis. This operation involved cutting off part of the rear lip of the guide plate and shortening it by drilling out the rivets holding the angle mounting bracket on one end, elongating the holes and refastening with small screws.

Each amplifier has its own gain control (Fig. 6) and provides balanced input and outputs by use of transformers mounted on the chassis (Fig. 1). Some thought was given to putting the transformers on the amplifier boards, but it was felt a better gradc of transformer could be used and a more flexible arrangement could be had if the same amplifier card could be used in other equipments, such as in remote amplifiers (as a line amplifier), intercom systems (as booster and talkback amplifiers), etc. Each system could then have the proper

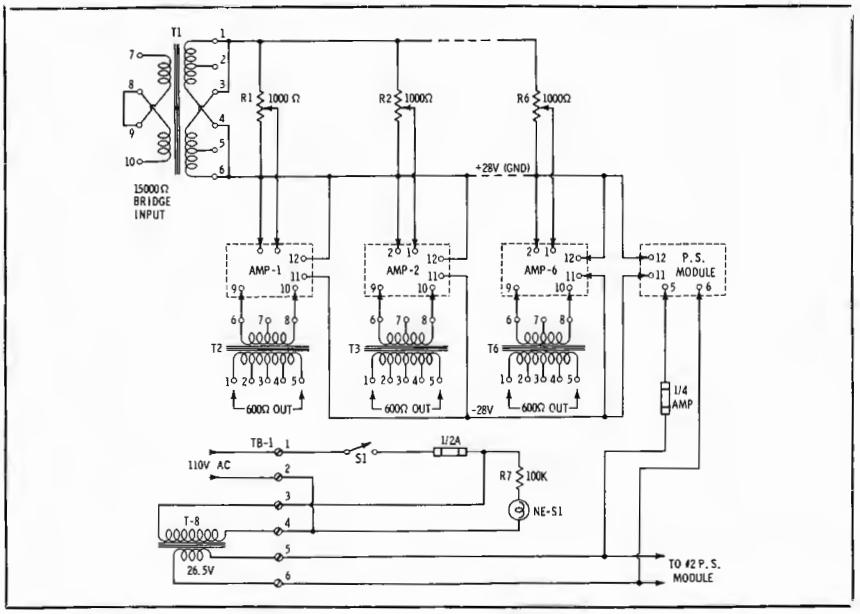
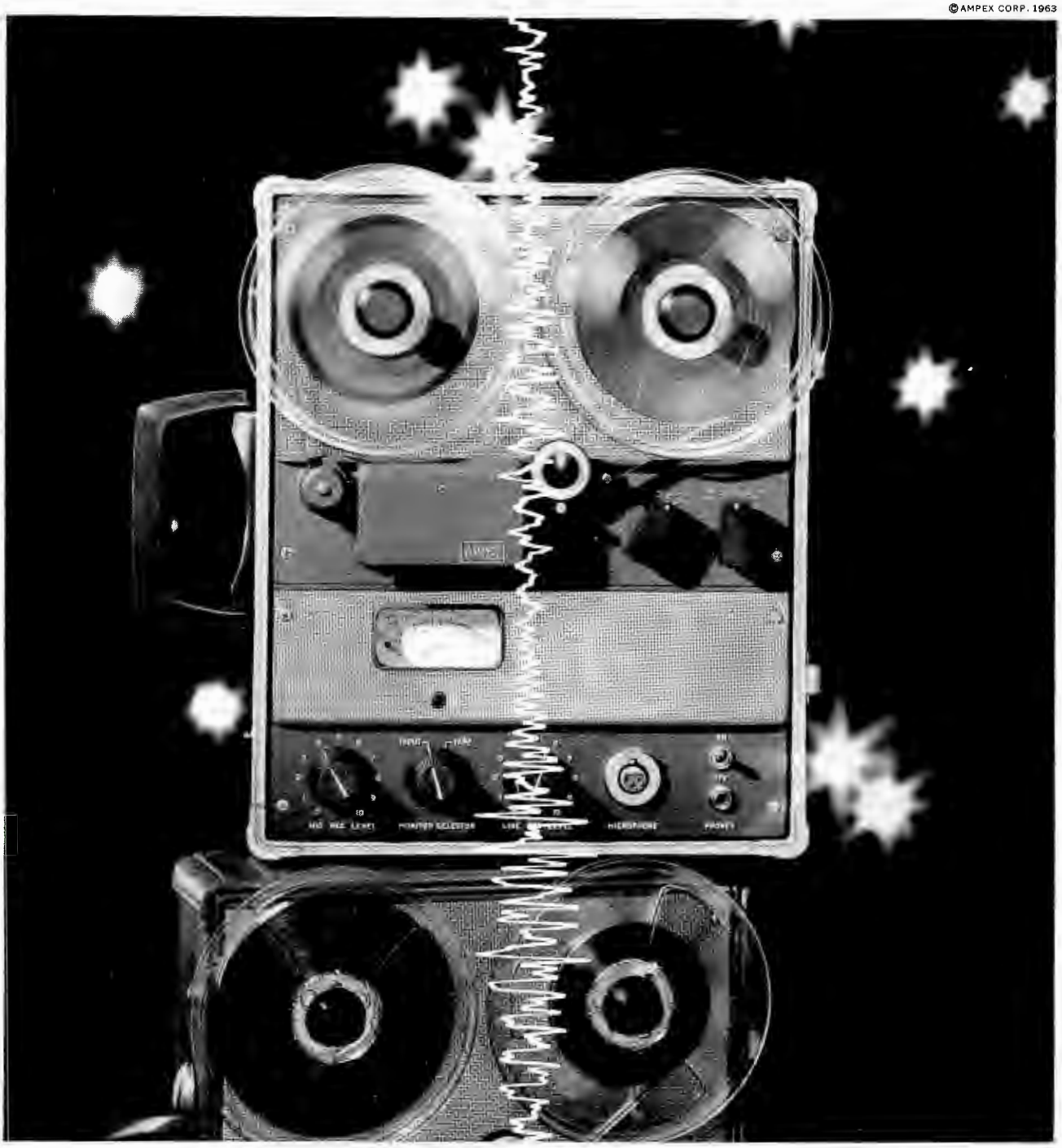
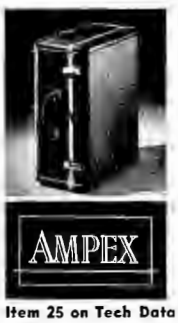


Fig. 6. Diagram of chassis wiring arrangement.



What can possibly follow the 601? **AMPEX 602**

It's quite a number, the 602. A lightweight, low-cost, true professional field recorder made, of course, by Ampex. It's built on the foundation of the Ampex 601 (the recorder that was the workhorse of the entire broadcast industry), and the new Ampex 602 promises even to outdo the 601. Here's why. The 602 features completely new electronics circuitry. It has new solid-state rectifiers to keep the chassis cool, helping to prolong the life of the other components. It has XL type connectors for all line inputs. A built-in low impedance mike transformer. A higher power balanced or unbalanced 600 ohm output. And improved signal-to-noise ratio. These are just some of the advancements. The 602 is portable—ideal for field applications. Or it can be rack mounted. And it comes in a one-channel or two-channel model. Both backed by the Ampex "Four Star" One-Year Warranty. Both built to be extremely reliable—to follow and outdo the 601. For more information write Ampex Corp., Redwood City, Calif. Worldwide sales and service.



Circle Item 25 on Tech Data Card

Parts List

Item	Description
AMPLIFIER	
C1	50-mfd, 6 VDC electrolytic capacitor
C2	100-mfd, 25 VDC electrolytic capacitor
R1	100K resistor
R2	3.9K resistor
R3	4.7K resistor
R4	82-ohm resistor
R5	68-ohm resistor
R6, R7	47-ohm resistor
Q1, Q2	2N109 transistor
Q3	2N214 transistor
POWER SUPPLY	
C1, C2, C3	100-mfd, 50 VDC electrolytic capacitor
R1, R2, R3	100-ohm, 1-watt resistor
CR1 thru 4	1N91 diodes
CR5	27-volt, 3½-watt zener diode
CHASSIS ASSEMBLY	
R1 thru 6	1K potentiometers
R7	100K resistor
T1	15K to 600 ohms plate to line transformer (UTC AZ4, or equivalent)
T2 thru 7	50, 200-250 to 50, 200-250, 500-600 audio transformer (UTC D-12, or equivalent)
T8	115-volt to 25.2-volt @ lamp filament transformer (Stancor P6469, or equivalent)
F1	½-amp, 3AG fuse
F2, F3	¼-amp, 3AG fuse
PL	NE51 neon lamp
S1	SPST toggle switch
Elco 9016-1302 guide plates (or equivalent)	
Elco 9016-1201 polycarbonate guides (or equivalent)	
Vector 837 plugboard (or equivalent)	
Vector T28 push-in terminals (or equivalent)	

note: all resistors are ½ watt unless specified.

grade and type of transformer, if needed, to retain the performance required; each transformer is then mounted in its own assembly.

It is necessary to protect personnel from contact with 110 volt power by using an insulated plate over the terminal strip as shown. Servicing is greatly simplified by using the extender card shown in Fig. 1. Construction is simplified and space conserved by eliminating input and output terminal strips and making direct soldered connections to the transformer terminals; the transformers were mounted so this could be accomplished. ▲

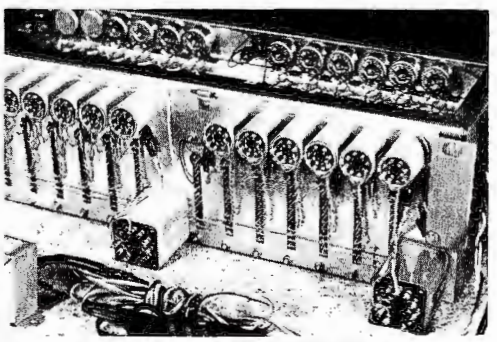


Fig. 7. Rear view of amplifier system.

For distinguished service

If distinguished service in the field of video tape—for inventing it in the first place, for producing it in commercial quantities in 1957 to meet the scheduling demands of Daylight Savings Time, or for carrying the first taped pictures transmitted via Telstar—would deserve a medal, it might look something like the above.

But much more meaningful than any medal is the overwhelming preference engineers every day vote "SCOTCH" Brand Live-Action Video Tape. This tape began its career nearly 7 years ago; and not a day has gone by since that 3M research in video recording and tape making hasn't been at work improving on this "seven-league-boots" head start. And in the audible range recording field as well, 3M is constantly developing refinements and improvements that set the standards in tape technology. "SCOTCH" Video Tape as well as "SCOTCH" Sound Recording Tapes put this experience and lead time at your service.

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Magnetic Products Division 3M COMPANY

Circle Item 27 on Tech Data Card

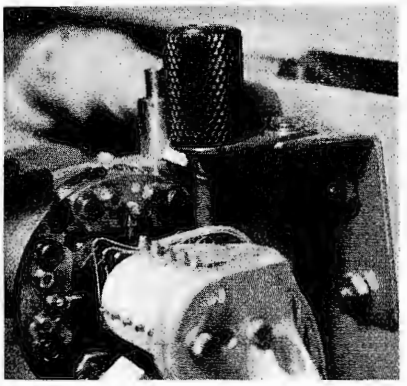
ENGINEERS' EXCHANGE

VTR Guide Height Adjuster

by James French, Jr., KRMA-TV, Denver, Colo.

When playing back video tapes from different sources, the adjustment of the vacuum tape guide height was found to vary greatly. This variance results in scalloping distortion of the reproduced picture.

The aid to alignment of this guide, described here, is very handy since the hex adjustment screw is below and dangerously close to the video head drum (which is rotating at 240 rps). The unit illustrated mounts permanently, and besides being in a convenient location also prevents damage to the head should the usual hex wrench slip.



The unit is installed as follows:

1. Assemble device per drawing.

2. Set assembly in place with allen wrench inserted into head of adjustment screw.

3. With 1/32" clearance between left side of unit and blower housing, and a slight downward tension on assembly, mark rear housing through holes A and B on unit 1.

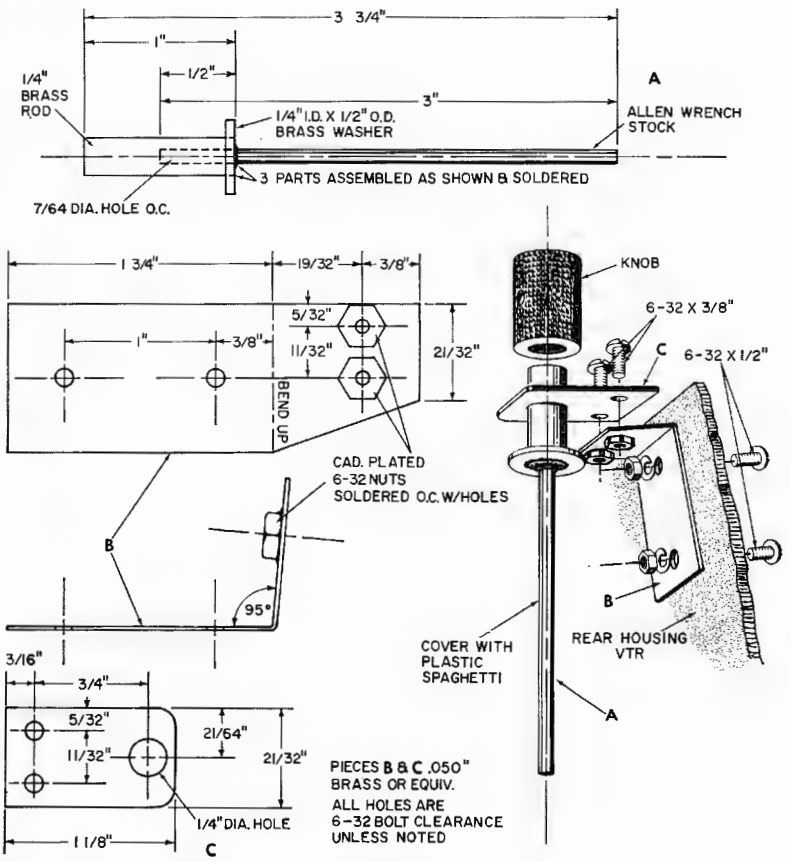
4. Remove video head assembly and drill marked holes for 6-32 machine screws.

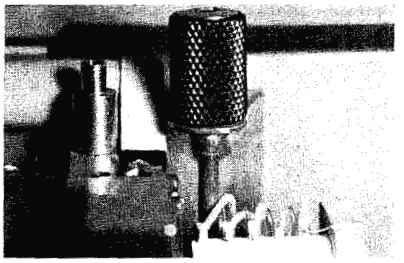
5. Remove chips, clean and replace head assembly.

6. Remove knob assembly (two top screws) and mount unit 1 to rear housing with ½" 6-32 machine screws.

7. Replace knob assembly; bracket assembly 1 may have to be bent slightly to obtain correct tension.

8. Cover allen shaft with plastic spaghetti tubing. This completes installation.





To replace the video head assembly, the adjustment unit may be removed by the two screws in the top bracket. To replace the unit, insert the hex stock into the adjustment screw, and tighten down the two screws.

Weekend Case Makes Remote Kit

by Phil Whitney, Chief Engineer, WINC, Winchester, Va.

Any engineer who has set up for a remote broadcast or taping session knows that every installation is a little different, and like the plumber with his traditional lack of tools, he frequently needs one extra cable which he doesn't have with him.

To overcome this recurrent event, WINC purchased a small weekend case in which are kept all the heterogeneous mike cables, AC extension cords, three-way plugs and small tools needed on any remote setup. In the case also are two microphones, a small mike stand (disassembled), plus tapes and empty tape reels. By placing all these items in a "remote box" and returning them to it after use, engineers' time is saved. The public's impression is also better, because the case with call letters and frequency painted on the side looks more professional than two hands full of mikes and coils of cables—which always seem to get dropped at the most inopportune time!

A TRANSISTOR POWER SUPPLY

*by James French, Jr.** — Design and construction notes for a solid-state regulated and adjustable supply.

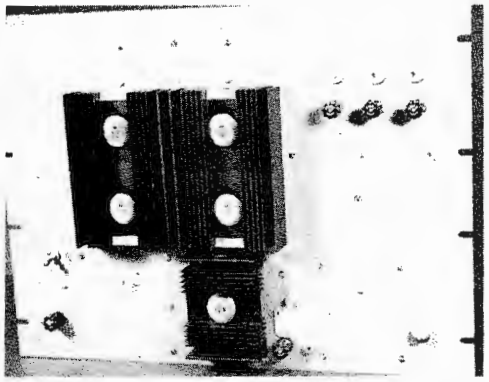


Fig. 1. Front view of completed supply.

A stable well filtered power source is very necessary for building and designing transistor circuits. The direct current used to supply most transistor circuits, especially high gain stages, must be virtually free from ripple. Supplies should be designed with these factors in mind.

The power supply described here is built for approximately 4 amps total load. The voltage can be varied from 0 to about 38 volts DC. This covers practically all of the range requirements of transistor circuits. It can be very useful for testing, designing, or operation of audio, video and other transistor equipment.

*KRMA-TV, Denver, Colo.

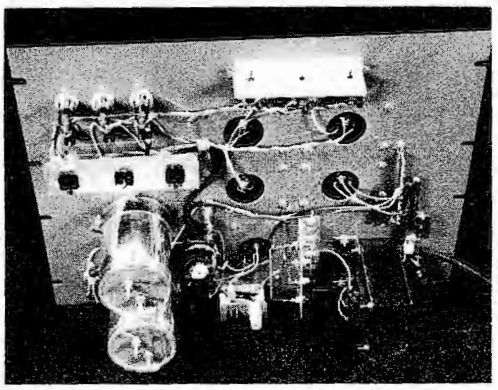


Fig. 2. Rear view showing neat layout.

The supply is a full-wave bridge rectifier with 5-amp rectifiers. The AC is fused in the primary. A transistor ripple filter follows the rectifier circuit. This drops the ripple to approximately .0002 V p-p in the output voltage. The output transistors are used in two circuits: one as a regulated fixed voltage output and the other as an adjustable voltage output. The output sections may be built to suit the needs of the user.

The unit pictured uses 4 outputs from a common supply (3 fixed regulated and 1 adjustable). The 3 regulated voltages are used for monitor audio amplifiers and the adjustable output is used for an audio console. The outputs are approximately 1 amp each although any one may be loaded heavier as long as the main supply is not overloaded.

Constructed on a 14 × 19 inch rack panel and using a single phase 115-volt input, the device may be rack mounted or built into a cabinet.

Any arrangement of regulator sections or adjustable outputs can be had by adding the appropriate circuit to the DC bus from the filter section. The adjustable section regulates to approximately 1 volt from 0 to 1 amp so very little adjustment is required under different or varying loads. The regulator fixed voltage output section regulates to better than 5% and is very stable under any normal load. Each output section is fused at the input to the output transistor.

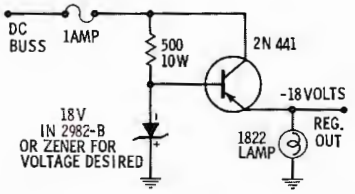


Fig. 3. Fixed regulated voltage circuit.

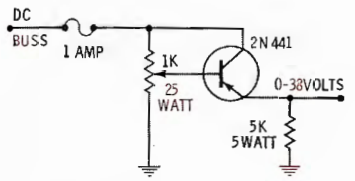


Fig. 4. Circuit for adjustable output.

Parts List

Item	Description
C1, C2	4000 mfd @ 50 volts electrolytic capacitor
R1	25-ohm, 10-watt resistor
R2	1000-ohm, 10-watt resistor
R3	250-ohm, 10-watt resistor
T1	115 to 32 volt power transformer @ 8 amps
Q1	2N441 power transistor
L1	1822, 36-volt lamp
F1	2-amp slow acting fuse
X1 thru 4	1N1342 islicon rectifiers

The transistors are mounted on heat sinks to dissipate the heat generated at high currents; this allows the transistors to operate well below their ratings. The heat sinks must be insulated from the panel or the transistors themselves mounted on mica or other insulators. Either approach is satisfactory.

We have at present 4 supplies practically identical to this one and find them quite versatile for any test or operational use. ▲

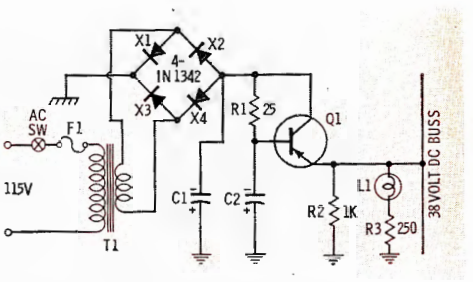


Fig. 5. Power rectifier/filter section.

(Continued from page 11)

amplifiers to compensate for variations in line voltage.

d. Make such adjustments as may be necessary to insure that the characteristics of the transmitted signal comply in all respects with the technical requirements of the Rules.

2. The control point shall be equipped with apparatus suitable for observing the waveform and other pertinent characteristics of the transmitter visual signal and the percent of modulation of the transmitted aural signal.
3. The control circuits from the control point to the transmitter shall be so designed and installed that open circuits, short circuits, accidental grounding, or other line faults will not activate the transmitting apparatus and any fault which results in loss of control of the transmitting apparatus will automatically remove power from the transmitting antenna.
4. The transmitting equipment and control equipment shall be adequately protected against tampering or activation by unauthorized persons.

b. Where a transmitter is operated by remote control the transmitting apparatus and associated controls shall be checked as often as is necessary to insure proper operation and confirm the accuracy of the transmitter data sent to the control point over the control circuits, and in all cases at least once each week until it can be demonstrated to the Commission that checks at less frequent intervals are satisfactory.

Systems

Remote control of a broadcast transmitter is usually done by means of two pairs of land lines, or telephone lines. However, it can be done by means of radio frequency circuits. (See STL Remote Control Systems for FM Stereo and SCA by John A. Moseley, BROADCAST ENGINEERING, February, 1963.)

Telephone lines used for remote control of radio equipment are usually termed "signal circuits" or telemetering circuits and are cheaper than program circuits. They should be complete circuits and able to carry direct current. Ground returns, phantoms, etc., will not be suitable except in smaller short distance installations.

Since telephone lines are not usually run directly between the control point and the transmitter site, the DC resistance of the lines should be determined to be certain the remote control equipment is capable of operating over the required distance. This is especially true where the lines take a circuitous route between the control point and the transmitter.

There are a number of makes and models of remote control systems on the market today. Some simpler models will function quite well for shorter distances while more elaborate models will be required for long distances. An elaborate model may be used to control more than one transmitter where the transmitters are located at the same place.

In one such system, by means of zener diodes to "bias" relays, voltage differentials, and polarized

relays, the control pair can perform a number of functions. This unit has stepper relays with 39 positions in addition to the "CAL" or off position. By means of a "Local-Remote" switch at the transmitter, the transmitter operator can take over control for testing, maintenance, etc.

Any number of control functions can be performed by remote control units. Any circuit that can be controlled with a switch can be controlled by the installation of a relay, either common, "momentary contact," or latching. Any circuit that is controlled by a dial or knob can be controlled by a motor driven unit.

By dialing a predetermined position on the stepper relays, the transmitter output can be varied by a motor driven rheostat in the plate supply in low powered transmitters, or by changing the excitation in higher powered transmitters.

By dialing another predetermined number the tower lights may be turned on in case of failure of the photo cell equipment. By means of a current transformer and a diode rectifier a small amount of DC current can be picked up from the tower lighting circuit and fed back over the metering circuit. If the meter is calibrated, it can be determined from the remote position if all tower lights are burning and the number of flashes per minute.

Fig. 7. WDCX (FM) transmitter building, another compactly constructed facility.

At some stations there is a remote antenna current meter in the transmitter building. If this is a diode meter the voltage feeding this meter can be used to feed the remote meter circuit, or a pickup coil and diode rectifier can be used with a calibrated meter. At stations employing a directional array the common point current can be obtained by taping a pickup loop just ahead of the common point meter.

In directional arrays where no remote base current meters are located at the transmitter, the base currents can be obtained from the pickup loops that feed the phase monitor. The rules will not permit a diode to be permanently connected directly across the coaxial cable from the phase loops but a switch can be inserted to throw the coax from the phase monitor to the diode and back to the monitor.

Monitoring

Almost all late model modulation and frequency monitors have provisions for remote meters. The advantage of having monitors located at the transmitter during maintenance and tests is obvious. However, an RF tuner may be used at the control point to feed the modulation and frequency meter and the audio monitor may be taken from the modulation meter. Such a system has worked quite well at WEBR-FM for the past three years. ▲

Automation

(Continued from page 18)

for typical block diagram). Decide where, how many, and what you want displayed. The number and type of events will seriously effect the price of each unit. Naturally you want the event on the air to show, then generally the next event, and that's about all that is practical unless you want to spend real money. Finally, in the selection of your equipment make reliability the most important factor, accuracy and flexibility next.

It is fairly easy to conclude there is no pat answer or a little black box that will fit every station. In general most installations must be tailored to fit the station, its engineering, business procedures, and personality. I would heartily recommend that one man be made the automation expert and have him lead the team. Remember you are in the communication business and see to it that this man communicates in the organization. One man could get well versed by prodigious reading and then have sessions with key executives for instruction with questions and answers. Unless you involve every department you may not get the full benefit of the capabilities of the system you design; or worse yet, you might forget a segment. Do these things in order:

1. While you are planning for automation begin preparing for it by cleaning up your present system to simplify it thereby easing the human operation problem. This step is important as the time may come when your automation systems fail and you have to go back to manual for a time. Begin to take steps towards automation by automating certain machines or segments of your system always making sure that they will fit your whole concept of the system.
2. Have the team leader become automation minded—know the economic, psychological, and engineering problems of the field in general. Always remember when you replace human judgment and action you have supplanted the ability to think, observe and act.
3. Have a few bull sessions on the subject in general so that

De Forest and his wireless phone, 1908 *(Culver Pictures, Inc.)*

all involved become basically knowledgeable.

4. When everyone is informed, then have each department come up with what they need and what they would like to have.
5. Block diagram the whole operation of each department and show how they fit into the flow of the system.
6. Begin to set up your engineering specs, then tie in your business specs. Perhaps you will have to modify each operation to some extent to accept automation.
7. A most important decision concerns how far you want and should go with automation. At this point you have made the decisions necessary before you call in the equipment men who must have these answers before they can bid on a system. Perhaps a few rough proposals will be helpful to give you your first realistic feel for the cost of the system.
8. After you have decided to go, approach the psychological problems that will confront you. Get set for possible union problems, understand them, and be sure they are solvent. Give yourself time for instruction and acclimation of people to the project.
9. Set up the timetable for all departments and the part they play. Get equipment delivery date.
10. Get a vacation—as for the next few months your brain and you will be literally automated.

Automation has proved in many instances in industry to be the difference between profit and loss. It could be the same in Radio and Television. Anything you can do to reduce operating costs may make the difference whether you are here to answer the roll call in the near future. Decision making in this age of automation must be simplified. A general manager can really use a tool like instant data information on the status of his broadcasting venture. Automation tied into a good station data system will give the manager a tool to better compete in this highly competitive world of broadcasting today. ▲

Cross-Bar Switcher

(Continued from page 13)

Input Amplifiers

Referring again to Fig. 1, it will be seen that if all ten outputs are connected to one input, the capacitance of the ten output lines is loaded directly on the one input. With this design the capacitance amounts to a total of 330 picofarads. This capacitance has a reactance of only about 50 ohms at 10 mc. The impedance of the input bus must therefore be quite low if we are to be able to load on all ten outputs simultaneously without affecting the level in the bus. Fortunately an emitter follower transistor amplifier has a very low output impedance. The input amplifiers which we have designed use 2N1143 transistors. When the base of the transistor is driven from a 75-ohm source its output impedance between emitter and ground is only about 2 ohms. Such an impedance level would be virtually impossible to achieve with vacuum tubes.

The strip line which the input amplifier drives is composed of two copper strips which are printed onto an epoxy board approximately ½ inch wide. This board, as may be seen from Fig. 2, runs from the bottom of the input amplifier down through the channel to the bottom of the unit, and is supported at the upper end and lower end. The reed-type relays are soldered to the copper connectors which are printed on the board. One connector is a ground strip which goes from top to bottom; the other is a transmission line on the front side of the board which also goes from top to bottom. This line has a very low surge impedance but since it is not terminated at the lower end it would ring at a frequency of about 35 mc if it were not properly damped. On the rear of the panel the output wire of the relay is soldered to a resistor. The resistors are all soldered to a crosswire which is the output circuit. This wire runs along the center of the channel which is formed by the barriers between the relay rows. The resistors provide sufficient damping for the input line even when all ten outputs are connected. Each output line goes to a goldplated connector at one side of the panel into which the feedback-type transistorized output

amplifier is plugged. Connections to these amplifiers may be seen on the right side of Fig. 2.

Output Amplifiers

Each output amplifier utilizes four 2N1143 transistors and two zener diodes. The input impedance of the amplifier is of the order of 20,000 ohms so that when it is bridged on the input bus the resistive load is completely negligible. The input capacitance of the amplifier is very low, the main capacitance in the circuit being that of the relays themselves and that of the horizontal output bus. The amplifiers utilize approximately 15 db of feedback which renders their frequency characteristic flat within a small fraction of a decibel up to 15 mc. The differential gain and phase error in these amplifiers at one volt output peak-to-peak is almost too small to measure.

Power Supplies

At the bottom of the strip input line of each switcher unit there is a terminal which gives access to the input circuit. The second switcher is exactly like the first except for the input termination. It is mounted directly below the first unit and the inputs are connected to the terminals at the lower end of the input lines on the upper unit. In this way the two units are placed in tandem to provide a total of 20 outputs. In the WSM-TV studios, we use interlocking pushbutton switches in two rows, one for video and one for studio for each output position.

The power supplied to the output amplifiers, and input amplifiers, is —26 volts DC. The switcher unit, exclusive of relay current, consumes approximately 1.1 amperes at 26 volts. The relays are designed to operate from a 24-volt supply. Each relay consumes approximately 5 milliamperes, so with all 10 outputs connected the total relay current would only be .05 amperes.

The power supplies for the two switchers are of the plug-in type. A relay rack panel mounted below the two switchers is equipped with two ammeters, as well as isolating power diodes in order that several supplies may be paralleled if desired. In case of failure of one supply the associated diode will automatically

disconnect the bad supply and transfer the entire load to the other plug-in units. Each unit is approximately five inches high and three inches wide. On the front in a heat sink is mounted the series power transistor which is the passing unit in the regulator. Inside the unit are a power transformer, silicon rectifier diodes, a zener reference diode, and a differential transistor amplifier for control purposes. The hum level at the output of the power supply at its rated current of 1.5 amperes is exceedingly small, about 1 millivolt.

Mechanical Design

The main consideration in the mechanical design of the switcher was to provide a straightforward layout as near to the "schematic" arrangement as possible. The panel width of 19 inches limited each input amplifier to a thickness of only ½ inch (Fig. 3). The input coaxial cable connectors were staggered in two rows directly above the input amplifiers, providing plenty of space between connectors so that the cables would not be crowded. The output cable connectors are mounted directly on the front of the plug-in amplifier (rear of rack), and a signal level control is provided near this output connector (Fig. 4). A terminal board containing 220 solder terminals is mounted on the side of the switcher. These terminals are laid out in ten rows of 22 lugs to correspond to the layout of the relays, and are connected to the respective relay coils and to the remote interlocking pushbutton switches. Each relay, crosspoint, and solder terminal is identified by a vertical number (input) and a horizontal letter (output), making it easy to identify a particular point in the circuit.

Conclusion

Our experience with the operation of this switcher unit to date has shown it to be exceedingly reliable in performance and fortunately we have been able to meet all the design criteria; in most cases we have bettered the desired specs. The switcher apparently meets all the most exacting requirements for color as well as monochrome operation. ▲

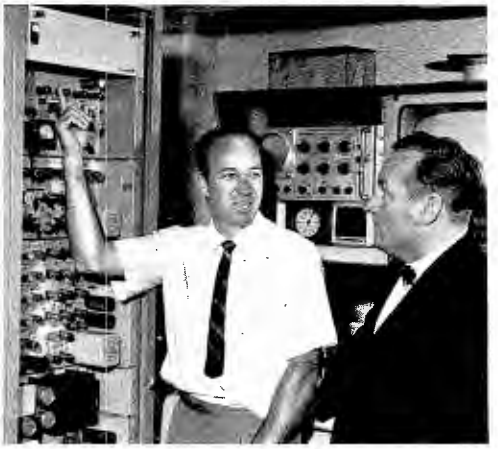
NEWS OF THE INDUSTRY

On-The-Spot Coverage is Taped

In recent weeks, a portable television tape recorder one-tenth the size of conventional machines, has been carried in the field by ABC to cover such events as President Kennedy's tour of Europe and the July 4 Daytona Stock Car Championship race. In July all 60 pounds of the MVR recorder were in action at Hayword, Wisc., for the World's Lumberjack Championship Contest. Frank Marx, President of ABC Engineers, says "in the few weeks we have been utilizing and experimenting with the device, it has opened even broader vistas of television reporting than we first imagined." Held secure by standard safety belts, the recorder was carried aloft on the seat of a small 3-man helicopter to cover the Daytona race. Its equipment companion was a new Sylvania 800 portable hand camera, the use of which is also being pioneered by ABC Engineers.

National Electronics Conference

Dr. Hansford W. Farris, 1963 **National Electronics Conference** program chairman, announced that the 1963 technical program will be the largest in NEC history. Dr. Farris stated that, beginning this year, NEC will conduct intensive introductory courses aimed at up-dating the tools of the practicing engineer. This procedure is recognized as being a major responsibility of NEC. The program on October 28, 29 and 30 will feature a six-hour integrated discussion of Quantum Devices in the Optical Region and a five-hour program on the State Variable Approach to Automatic Control Systems. In addition, there will be an intensive seminar on special applications of solid-state devices. More than 500 electronic firms will be exhibiting their latest products at the mammoth Chicago McCormick Place exhibition center on October 28, 29 and 30 at the 19th annual National Electronics Conference.



Mincom Dropout Compensator

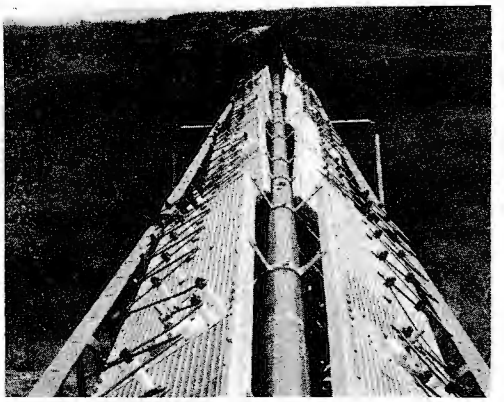
Tele View Recording Services, Inc., Los Angeles, Calif., has recently accepted a **Mincom Dropout Compensator** from the **3M Co.,** Los Angeles, Calif. The compensator will be installed at KTTV studio, whose tape equipment is used by the firm. Specializing in kinescope recordings, Tele View uses the unit to make film copies of video-taped programs for educational television use. Dropouts, which may be caused by dirt or improper handling of video tape, are seen on the television screen as random white or black flashes, can detract seriously from the program material. The unit replaces the dropout with information which is similar to that lost by substituting the same portion of the previous line, which has been stored in a 63.5-microsecond delay channel. As each successive line does not vary much from the preceding line, the inlayed information is not discernible from the original.

Short-Wave Station Joins NAB

The **National Association of Broadcasters** announced today that it taken its first commercial short-wave radio station, Station WRUL, New York, into membership. **Ralf Brent,** president of the station, which transmits to over 100 countries, asked other NAB member radio stations to submit programs for broadcast overseas. There is no better way to mirror life in America and to show the advantages of free, commercial broadcasting than through the special programs which individual stations prepare for the communities they serve, said Brent. WRUL is a subscriber to the NAB Radio Code and is supported by advertisers of international products. It operates as Radio New York Worldwide with five 50,000-watt transmitters which beam 40 hours of programming each day in Spanish and English. Brent reports that more than 3,000 letters from listeners are received by the station each month. Listeners receive the station in Europe, Africa, and Latin America.

Station Sold

Radio Station KRRV, Sherman, Texas, has been sold by **A. Boyd Kelley** to **Wayne Phelps,** Mayor of Alamogordo, New Mexico. Phelps also owns Radio Station KALG in Alamogordo.



GE Zig-Zag Panel Antenna

The Transcontinent Television Corp., Bakersfield, Calif., is installing a **General Electric** zig-zag panel antenna at their new UHF Channel 23 (station KERO-TV) transmitter. The new antenna provides the station with a planned 1.76-megawatt ERP and modified cardioid pattern covering the southern San Joaquin Valley. Antenna gain is 74.4 in the maximum lobe. The KERO-TV transmitter-antenna site is 22 miles east of Bakersfield on Mt. Breckenridge almost 3,700 feet above the average terrain. The planned 1.76-megawatt ERP at this altitude is equivalent to a 5-megawatt ERP at 2,000 feet above average terrain.

AES Fall Convention

The 15th annual fall convention and exhibit of the **Audio Engineering Society** will be held from Oct. 14 through 18 at the Barbizon-Plaza Hotel in New York City. The number and variety of technical papers submitted by scientists and engineers from all over the world cover a wide variety of subjects of interest to all segments of the industry. Besides industrial presentations, papers also will be presented by broadcasters, consultants in audio acoustics and other fields, scientists at leading universities and research laboratories, as well as by representatives of the Association for Audio Analgesia, and the FCC.

WSBC-FM Now WXRT

Radio station **WSBC-FM** of Chicago, Ill., has adopted new identifying calll letters, **WXRT.** The frequency, power rating, and programming policies of the station will remain the same as before, according to Louis B. Lee, president and general manager. WXRT serves all Chicagoland and sections of Illinois, Iowa, Wisconsin, Michigan, and Indiana.

Amphenol-Borg Expands

Amphenol-Borg Electronics, Inc., Broadview, Ill., has purchased the coaxial switch business (exclusive of liabilities) of **General Communications Co.,** Boston, Mass., a subsidiary of **Atlantic Research Corp.,** Alexandria, Va. The acquisition was announced by **Matthew L. Devine,** president of Amphenol-Borg, who added that the business will become a part of FXR, a division of Amphenol-Borg.

Ammeter

(Continued from page 15)

to set up a current of such value that the meter under test indicates current at an exact scale division (such as 1.0 ampere) the actual current is then read on the standard ammeter. Another method is to set up a standard current and read the meter under test. Of the two methods the first is likely to produce the best results since interpolation on the standard scale is usually easier and more accurate.

To tabulate the results of tests, a form such as shown in Fig. 5 is convenient since it also serves as a permanent record of tests.

After calibration tests are complete the percent accuracy can be determined as follows:

$$\% \text{ Accuracy} = \frac{Id}{Im} \times 100$$

where,

Id is deviation from standard in amperes,

Im is full scale value in amperes.

For example: A 0-5 ampere meter indicates 1.1 ampere when 1.0 ampere is passed through the meter.

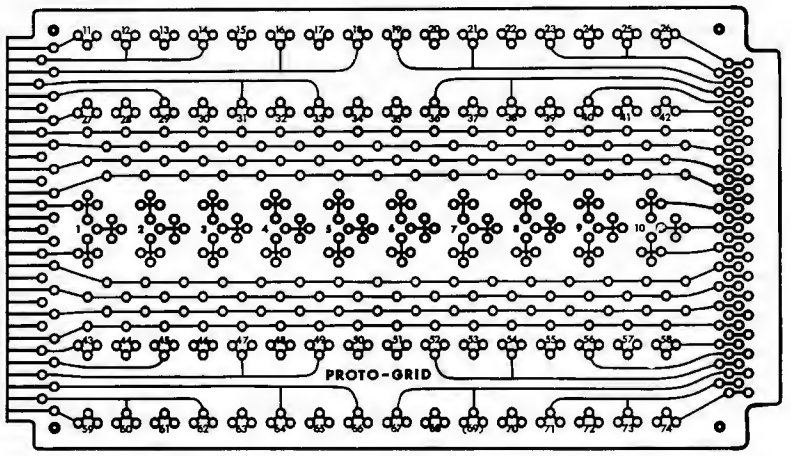
$$\% \text{ Accuracy} = \frac{.1}{5} \times 100 = 2\%$$

Quite often an ammeter will be of acceptable accuracy over the major portion of its range but be off at either end of the scale. On the other hand some meters may be found to be most accurate near the scale ends. In either case special care should be taken in measuring the accuracy within the range that the meter will be used.

Thermo ammeters are sensitive to large temperature changes and the possibility of this effect should be considered when temperatures are low, say below freezing. Some ammeters may be within 2% at 60° to 80° F. but be out of tolerance at 30°. Fig. 6 illustrates this condition.

One final word of caution, the FCC Rules require that any meter found to be defective or suspected of being defective must be returned to the manufacturer or an instrument repair service for repair. ▲

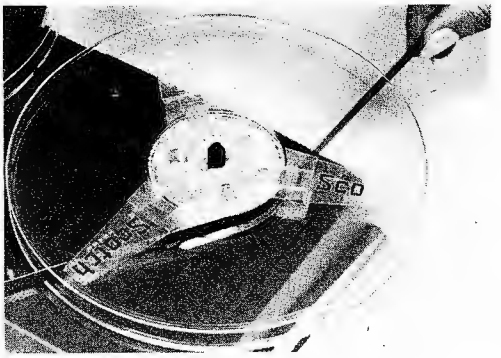
NEW PRODUCTS



Proto-Grid — A Printed Breadboard

AST Co., Inc., New York, New York, announces the availability of **Proto-Grid,** a universal protype printed circuit board. The product has wide application for breadboard, external test circuits, and limited production runs. A departure from standard breadboard assembly, **Proto-Grid** features a four-contact pad for completely flexible circuit junctions and a permanent ink, numerically indexed grid for precise component location. There are over 400 drilled holes to speed component assembly and a gold-plated easy-solder surface. Both edge-board and right-angle connectors can be used. With reasonable care the board can be reused many times. **Proto-Grid** printed circuits come in standard card cage size (8″ x 4½″) and are available in both 1/16″ mil spec epoxy glass and XXXP.

Check Item 54 on Tech Data Card



Self-Threading Tape Reel

A new sound tape reel, which literally threads itself, has been introduced by the **3M Company,** St. Paul, Minn. The new reel eliminates the traditional method of reel threading by using solid flanges. It comes equipped with a footed, snap-closure collar which makes the combination a self-storing unit. The solid flanges and collar protect the tape from dust and damage. Each set also includes pressure-sensitive adhesive write-on labels for both reel and collar. The new reel, valued at $1.50, will be offered initially for 39 cents with each purchase of three 7-inch reels of Scotch brand recording tape.

Check Item 55 on Tech Data Card

Transistor and Diode Tester

A portable instrument that balances effects of circuit impedances to accurately

measure parameters of transistors or diodes installed in circuits is available from **Test Equipment Corp.,** Houston, Texas. This unit measures the true small-signal AC current gain at a frequency of 1 kc. The DC operating current is continuously variable to 1,000 ma. The unit performs in-circuit measurements of the saturation and voltages of transistors and the forward voltage drop of diodes and rectifiers. Another feature is that it supplies the gate signal for testing silicon-controlled rectifiers in-circuit. Accuracy is 3% out-of-circuit and 5% in any circuit of 20 ohms or more.

Check Item 56 on Tech Data Card

FM Stereo Rebroadcast Receiver

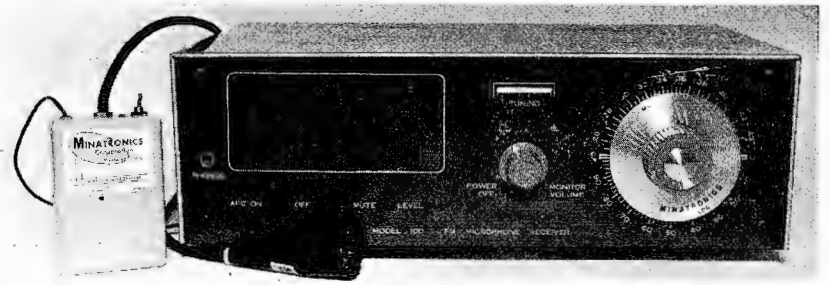
McMartin Industries, Inc., Omaha, Neb., has announced production of their TBM 1500 FM stereo rebroadcast receiver. The frequency response of the receiver enables an FM station to directly retransmit an FM stereo multiplex program without first demodulating and regenerating the composite waveform. For relay networks this method will minimize signal degradation with improved distortion and lower signal noise ratio. The necessity of an FM stereo multiplex generator, stereo receiver, and associated audio equipment is eliminated. The same approach can be used to rebroadcast SCA multiplex with similar improvements and reduced equipment costs. The RF sensitivity is 1 mv for 30 db to 100,000 cps. The TBM-1500 is listed at $450.00.

Check Item 57 on Tech Data Card

Plug-in Analyzer Unit

Spectropulse Division, PENTRIX Corp., Brooklyn, N. Y., has recently released a series of plug-in units, covering 0.5 to 12,000 mc, to convert standard oscilloscopes to spectrum analyzers without any modification to the scope. The combined instrument can be used as both an oscilloscope and spectrum analyzer at much less than the cost of a conventional spectrum analyzer. The plug-in units offer low incidental FM of less than 800 cps, sensitivities down to −130 dbm, and dispersions to 60 mc.

Check Item 58 on Tech Data Card



Wireless Microphone

A vest-pocket, solid-state, 8-oz., FM Wireless Microphone has been developed by **Miniatronics Corp.** of Pittsburgh, Pa. With FM modulation providing high-quality signal transmission, the range exceeds 200 feet for noise-free operation to cover 600 feet when conditions are favorable. Evidence of faultless operation is provided by its immediate success in Pittsburgh's new, retractable-dome arena where it has been used by Pittsburgh's Civic Light Opera Company. By varying the amplitude of microphones on several performers, a director can provide sound accentuation to individual performers or set location (some mikes can be hidden in the props). Frequency range is 27.23 to 43 MC with ±20 kc of deviation; power input to final stage is 100 mw: transmitter size is ⅞" x 2½" x 3½" (same as a pack of cigarettes). Price, with Altec 686-A microphone, is $475.

Check Item 59 on Tech Data Card

Motor-Speed Control

The **Vari-Volt** electronic motor speed controls manufactured in 7- and 15-ampere ranges for standard 110-volt operation by **Seco Electronics, Inc.,** Minneapolis, Minn., use silicon-controlled rectifiers for increasing or decreasing speed in two ranges. In the lower range an optical power-regulating system operates on motor feedback current to maintain a preset speed when the motor drives a variable load. Any universal AC/DC motor up to 1 hp may be controlled with a **Vari-Volt.** The instrument can also be used to vary the brightness of lights or the temperature of heating elements within its current range. **Vari-Volt** prices start at $19.95.

Check Item 60 on Tech Data Card

Vidicon Tube for Transistorized TV Cameras

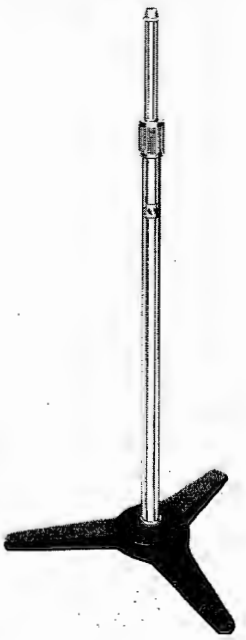
Amperex Electronic Corp., Long Island, New York, announces its first TV camera tube—the type 8483, a 1-inch vidicon capable of 900-line resolution. Incorporating a low power heater (only 0.6 watt at 90 ma), the new tube is suitable for transistorized cameras where heat dissipation and power requirements must be kept to a minimum. Designed for use in black and white or color TV cameras in closed circuit, industrial, medical, and broadcast applications, the tube is intended to replace many currently used types which draw significantly higher filament currents.

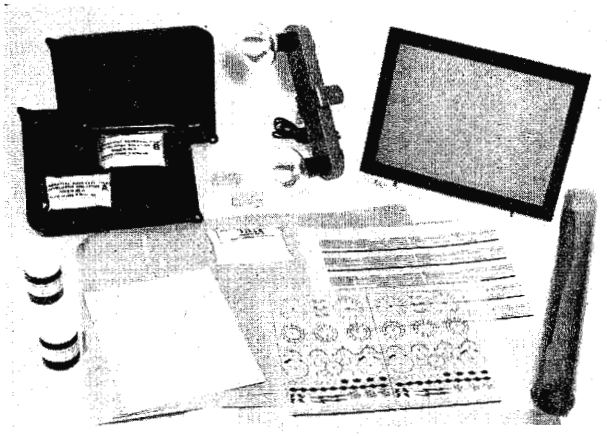
Circle Item 61 on Tech Data Card

Three-Legged Stand

A three-legged microphone floor stand designed for easy disassembly and compact handling has been announced by **Atlas Sound, Division of American Trading and Production Corp.,** Brooklyn, N. Y. The new model features a full-grip, velvet-action clutch which permits simple adjustment of the chrome-plated upright stand from 34" to 62". The base is finished in scuff-resistant dark gun-metal with shock-absorbing base pads on each leg. The stand is priced at $11.75.

Circle Item 62 on Tech Data Card





Instrument Panel Kit

Available from **Halmar Electronics, Inc.**, Columbus, Ohio, is a series of completely self-contained panel production kits which produce up to four color-permanent aluminum panels in twenty minutes. Graphic skills are not required of the operator to use the kits. No dangerous chemicals are involved in the process, nor is special equipment necessary. The complete operation can be performed on a table in subdued room light, thus eliminating the need for a darkroom. The kits, including all essential equipment and materials, are priced from $19.95.

Circle Item 63 on Tech Data Card

About the Cover

In keeping with this month's theme, "Transistors and Automation," the cover shows transistorized equipment in use at one of the nation's most modern television facilities. Transistorized vidicon studio cameras are seen in action at American Broadcasting Company's Washington News Bureau, which opened earlier this year. On camera with the ABC Six O'Clock News is William H. Lawrence, ABC's White House correspondent.

Designed specifically for news, panel, and quiz shows, which make up as much as four-fifths of today's studio productions, such cameras can greatly reduce TV studio operating costs. The camera shown, General Electric PE-23, can be operated by one man since sweep generator, video processor, power supplier, and viewfinder are located within the camera head. In addition, power consumption is low. Also employed at this ABC studio are transistorized monitors, scopes, audio and video tape recorders, amplifiers, switchers, and mixers, as well as silicon-controlled-rectifier lighting controls.

ENGINEERS' TECH DATA SECTION

AUDIO & RECORDING EQUIPMENT

80. AMERICAN CONCERTONE—Brochure has specs and photos of full line of tape recorders for professional applications.
81. AMPEX—Six-part file contains information on television recording equipment for broadcast and cctv users.
82. AUTOMATIC TAPE CONTROL—Brochure describes portable cartridge player and recorder/reproducer.
83. BROADCAST ELECTRONICS—Full line of cartridge equipment listed in set of spec sheets, includes recorders, players, racks, etc.
84. CROWN—Brochure covers seven distinct series of professional tape recorder/reproducers.
85. GOTHAM AUDIO—Paper entitled "M-S Stereophony and Compatibility" describes intensity method of stereo microphone pickup.
86. HARMON-KARDON—20-page booklet tells how to evaluate and select PA systems for specific applications.
87. 3M Co.—Periodical, "Playback," carries features of interest to broadcast engineers and others who work with video tape.
88. VIKING—Set of bulletins describe line of professional cartridge decks and heavy-duty reel-to-reel tape transport.

COMPONENTS & MATERIALS

89. AMPEREX—Condensed tube catalog lists line of special purpose tubes and tubes for receiving equipment.
90. ATLAS—Catalog lists 563 specs of weatherproof outdoor hi-fi and public-address speakers, microphone stands, and accessories.
91. AEROVOX—24-page catalog covers computer grade electrolytic capacitors for applications requiring reliability and long life.
92. CINCH—24-page catalog contains information on a variety of connecting devices for use with printed boards.
93. CLARE—Bulletin describes coaxial relays for a variety of switching operations at frequencies up to 700 mc.
94. DELTIME—Data sheet describes sine wave carrier circuit modules for magnetostrictive delay lines.
95. DuPONT—Wire and cable spec guide cites proper polyethelyne and nylon resins for insulating all kinds of wire and cable.
96. ENGLISH ELECTRIC — Spec sheet shows travelling-wave tube and discusses characteristics and applications.
97. FOURJAY INDUSTRIES—Catalog sheets cover line of speaker grills and baffles for indoor and outdoor use.
98. HART—Folder gives specs and characteristics of line of switches and relays, as well as other controls.
99. HARVEY RADIO—Catalog lists complete line of broadcast and recording equipment.
100. ITT—Eight-page catalog lists 160 different types of coaxial cables and their characteristics.
101. NILSEN—Data sheet describes phase-shift capacitor with screwdriver adjustment and lock.
102. OAKTRON INDUSTRIES—1963 catalog shows complete line of loudspeakers, plus ceiling, corner, and wall baffles.
103. OHIO SEMICONDUCTOR — A low-cost, high-performance thermoelectric module, with applications in cooling, is covered in bulletin.
104. ORGANIC PRODUCTS—Information on marker fountain pens which write on metals, plastics, and many other materials, is available in brochures.
105. RAYTHEON—Two-color brochure describes six new millimeter reflex klystrons.
106. ROBINS—Catalog describes Cannon XL connectors for audio applications.
107. RCA—Application note gives noise and gain characteristics of the 8056 nuvistor triode.
108. ROTRON—Four-page catalog contains information on compact fans for cooling, heat directing, and ventilating.

109. STANCOR—Chart lists the proper transformer to use for audio amplifier construction or replacement purposes with 260 different output tubes.
110. TUNG SOL—Six-page brochure covers a broad range of applications for hydrogen-filled tubes.
111. U. S. CAPACITOR—4-page catalog lists specs of resin encapsulated microminiaturized ceramic capacitors.
112. UTC—Two catalogs cover stock line of iron core components including transformers, inductors, and magnetic amplifiers.

POWER DEVICES

113. SECO—4-page catalog describes Vari-Volt units for control of lighting, heating elements, and AC/DC motors up to 15 amps.

RADIO & CONTROL ROOM EQUIPMENT

114. ALTEC—Folder contains information on line of speech input equipment for recording and broadcast studios.
115. AUTOMATIC TAPE CONTROL—Brochure describes a simple automatic system for programming.
116. CAMBRIDGE ELECTRONICS—Bulletin describes transistorized intercommunications amplifier.
117. McMARTIN—Brochure describes RF amplifier for use with remote operated FM frequency and modulation monitors.
118. SPARTA—Product sheet describes solid-state, plug-in module audio consolette.

STUDIO & CAMERA EQUIPMENT

119. BOSTON INSULATED WIRE—Catalog on connectors and accessories for British cameras, and catalog lists camera cables for U. S. and British built equipment.
120. BLONDER TONGUE — Brochure covers broadcast quality viewfinder vidicon camera.
121. G.E.L.—Catalog sheet presents description of remote control lighting panel which provides 5 preset combinations of 40 lighting circuits.
122. TELEVISION ZOOMAR—Illustrated catalog sheets cover line of lenses for image orthicon and vidicon broadcast television cameras.

TELEVISION EQUIPMENT

123. CONRAC—Catalog sheet covers television monitor and scope housing for RCA 13" console.
124. GENERAL ELECTRIC—Technical data sheet contains specs on vidicons for broadcast and cctv applications.

TEST EQUIPMENT & INSTRUMENTS

125. AMPROBE—Chart recorders, snap around current transducers, and high-intensity lights are covered in catalog.
126. ANALAB—Bulletin lists line of oscilloscope camera systems and accessories for Polaroid, and the new continuous motion 35mm fast developing film.
127. CROSSLEY ASSOCIATES—"New Ideas," a publication covering sales and service information for the Hewlett-Packard companies lines of products, is available.
128. DELTA ELECTRONICS—Short form catalog and spec sheets list impedance bridges, monitor amplifier, high frequency antenna system, and voltage regulating inverter.
129. PRD—Brochure lists microwave instruments available in sale.
130. SINGER—More than 100 spectrum analyzers are covered in 16-page catalog.
131. VITRO—Illustrated brochure describes systems engineering and other technical services and products offered by company.
132. WATERS—In set of brochures, RF dip oscillator, dummy load/wattmeter, coax switches, filters, and hybrid couplers, are discussed.
133. WEINSCHEL ENGINEERING — Brochure covers instruments for microwave systems.

TRANSMITTER & ANTENNA DEVICES

134. BAUER—Spec sheet describes Log Alarm automatic transmitter logging system with built-in alarm.
135. CO EL—Catalogs describe broadband dipole antennas, UHF slot antennas, filters, and diplexers.
136. JAMPRO—Reprints of article, "Effects of FM Antenna System VSWR on Stereo Separation," include degradation chart.

Professional Services

Classified

Advertising rates in the Classified Section are ten cents per word. Minimum charge is $2.00. Blind box number is 50 cents extra. Check or money order must be enclosed with ad.

The classified columns are not open to the advertising of any broadcast equipment or supplies regularly produced by manufacturers unless the equipment is used and no longer owned by the manufacturer. Display advertising must be purchased in such cases.

EQUIPMENT FOR SALE

Commercial Crystals and new or replacement crystals for RCA, Gates, W. E., Bliley and J-K holders; regrinding, repair, etc. BC-604 crystals. Also A. M. monitor service. Nationwide unsolicited testimonials praise our products and fast service. Eidson Electronic Company, Box 96, Temple, Texas. 9-61 tf

Ampex Head Assemblies for 300 and 400 series recorders reconditioned. Service includes lapping and polishing all three head stacks, cleaning entire assembly, readjusting and replacement of guides, and realignment of stacks as to azimuth and zenith. Full track assemblies—$60.00. Taber Manufacturing & Engineering Co., 2619 Lincoln Ave., Alameda, California. 8-63 2t

Transmission line, styroflex, heliax, rigid with hardware and fittings. New at surplus prices. Write for stock list. Sierra Western Electric Cable Co., 1401 Middle Harbor Road, Oakland 20, California. 6-61 tf

TRANSMITTING TUBES FOR SALE — Immediate Delivery on 6076 Power Tetrodes, at $245 each. 3X2500F3 — $175, 4W20000A — $1815, 450TL — $25, 4-125A — $22.50, 872A — $5.25, 575A — $15.50. Many Others. Brand New. 1,000 hour warranty. Write or call Calvert Electronics, Inc., Dept. BE-9, 220 E. 23rd St., New York 10, N. Y., (212) OR 9-1340. 7-63 3t

BROADCAST ENGINEER WANTED. Must have First Phone License and some experience. Send complete resume. WCHV Rosehill Drive, Charlottesville, Virginia. 8-63 2t

1 KW FM Transmitter General Electric 4 BT-1B includes GE Model 4 BT1B1 250 Watt Driver-Exciter. Excellent condition. $2,825. P. O. Box 2283, Newport Beach, California. 8-63 2t

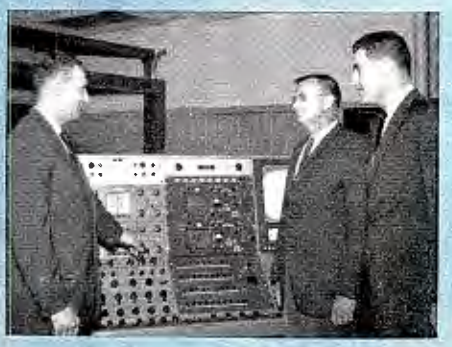
First phone, excellent electronics background. Need experience at TV level, hence your station can afford me. Age 35, will relocate. Dave Davis, 26 Central Ave., Shelby, Ohio. 8-63 2t

One surplus Rek-O-Kut B-16-H turntable. Unopened carton. Make offer. Bill Watson, 98-01 133 Ave., Ozone Park, N. Y. 11417. 9-63 1t

GOVERNMENT SURPLUS, NEW 10 CM. WEATHER RADAR SYSTEM—Raytheon, 275 KW peak output S band. Rotating yoke P.P.I. Weather Band 4, 20 and 80 mi. range. Price $975 complete. Has picked up clouds at 50 mi. Wt. 488 lbs. Radio Research Inst. Co., 550 5th Ave., New York, New York. 8-63 6t

Need AM Frequency Monitor, limiter, remote control equipment, console, turntables. 200-foot tower. KDEX, Dexter, Missouri. 8-63 1t

Advertisers' Index



This is KTRK-TV's new broadcasting station in Houston, Texas. The exclusive use of Belden camera, audio, and control cables by this ABC affiliate helps assure KTRK of continuous, highly efficient programing.

Looking over part of this 155,000-foot Belden wire and cable installation are Byron Turner, Salesman, Sterling Electronics (left), Jess Mitchell, KTRK Engineer (center), and Bill Donahoe, Belden Territory Salesman. They are standing in front of a Belden wired control panel in one of the many KTRK studios.

All of the wire and cable for this installation was placed through Sterling Electronics—one of Belden's Houston distributors.

155,000 ft of Belden Audio, Camera, and Control Cable helps keep KTRK-TV on the air

For all TV and radio broadcasting, recording studios, remote control circuits, and similar applications, Belden manufactures the most complete line of application engineered wire and cable. Call your Belden electronics distributor for complete specifications.

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RCA BC-7

Closest to Custom in a Production Consolette!

RCA Transistorized Consolette

for Dual-Channel AM/TV and FM Stereo

Take a good look at this smart new model. Here's that "custom" appearance to satisfy the proudest management; "custom" quality and flexibility to please the most discriminating engineers...all in a production-model!

CUSTOM STYLING—Striking new lines in blue and silver bring a color accent to control rooms. Color-coded operating controls are engineered to avoid errors. Only 39" long, it is compact and self-contained...to satisfy new or existing arrangements.

CUSTOM QUALITY—The BC-7A is fully transistorized for long-term reliability. All amplifiers have input and output transformers...precise impedance matching for both program and monitoring circuits. You get quality stereo monitoring (10 watts output), quality gain controls, quality leaf-type key switches on all program circuits.

CUSTOM FLEXIBILITY—You have interchangeable plug-in modules...preamplifiers, isolation/balancing units, program amplifiers, monitoring amplifiers, cue amplifier and power supply—all in one self-contained unit. You get three-mode operation...selector switch to instantaneously convert from dual channel, parallel or stereo operation.

We can't name them all here, but we believe you will agree that this is the kind of customized styling, quality, and flexibility you want. Let your Broadcast Representative show you all the features that make this consolette your best buy. Or write RCA, Broadcast and Television Equipment, Bldg. 15-5, Camden, N.J.

Plug-in flexibility . . . preamplifiers for low-level sources . . . isolation/balancing units for high level sources.

High quality mixers...ganged step-type attenuators when in stereo... individual step-type when in dual channel use.

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