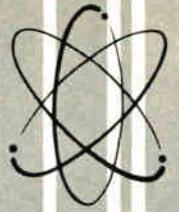




Techni-talk

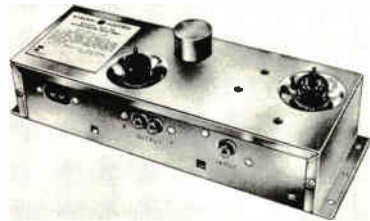
COMPLETE ELECTRONIC SERVICING INFORMATION
radio • tv • hi-fi



Vol. 14, No. 2

May, 1962

INCREASE PROFIT WITH NEW MA-2G STEREO ADAPTOR



CONVERT
YOUR
SYSTEM
TODAY!



FM STEREO ADAPTOR

\$39.95*

*For Model MA2G, Installation Charge Extra

Use this window streamer — Convert your system today to FM stereo. \$39.95 (suggested list price) plus installation charge. This promotion can prove to be a profitable addition to the service man's bag of tricks. With the General Electric model MA-2G FM stereo adaptor available at approximately 40% off list, the service dealer can add \$15.00 to his service charges.

Many stereo systems were supplied with provisions for

adapting to FM stereo. Many were not. Regardless of which you encounter, you will find the conversion simplified with the help of a recently published manual, by the Audio Products Department of the General Electric Company entitled: "Adapting to FM Stereo," A Guide to Installation and Service. This manual is available to you for \$1.00. Ask your G-E tube distributor for ETR-3050 or use order coupon on page 7.

TUNER MODIFICATIONS FOR FM STEREO-MULTIPLEX

With over 75 FM stations currently broadcasting stereophonically, many people will want to convert their component or console tuners to receive the new FM stereo broadcasts. The equipment required includes an FM tuner, a stereo amplifier, a stereo speaker system, and an FM stereo adaptor. Of these four units, the tuner is the most critical component.

This article is a reprint of Chapter III of the recently published manual by the Audio Products Department, "Adapting to FM Stereo." (See above to learn how the full manual can be obtained.)

Tuner Requirements

The distance, which acceptable reception may be obtained, can decrease up to 50% of the monaural reception distance during stereo transmission.

Therefore, Tuners employed in FM Stereo conversion should have a sensitivity rating of 10 MV. with 200db quieting or better. Even with the most sensitive tuner, reception will vary depending upon its location in relation to the transmitter. If, after the installation of the FM Stereo adaptor the performance is marginal, it may be necessary to consider the addition of an FM antenna. A TV

antenna can be used as a quick test of the need for an antenna. It is not recommended, however, that the TV antenna be used on a permanent basis because of the "Hole" in response TV antennas may have at FM frequencies. For proper performance an antenna designed for FM should be used.

Performance Requirements

I. F. Bandwidth

Experience at this writing indicates no extra I. F. bandwidth required over and above the average FM Tuner. It is important that the Technician take steps to be sure that the I.F. response is correct according to the manufacturer's alignment specifications. This is normally found in the service manual for the Tuner under consideration.

The Discriminator (FM detector) response is *very important*. The response should be (Linear vs. Frequency) from 50 CPs to 53KC. If not flat, the following effects may occur:

A. A loss of L-R signal which results in lower output level from the adaptor.

B. Phase shift between side bands which may cause quadrature modulation. This would result in a loss of separation and distortion particular-

ly at high frequencies where side bands are further removed from each other.

C. Phase shift between Pilot and L-R side bands that would result in incorrect insertion of subcarrier resulting in distortion and loss of separation.

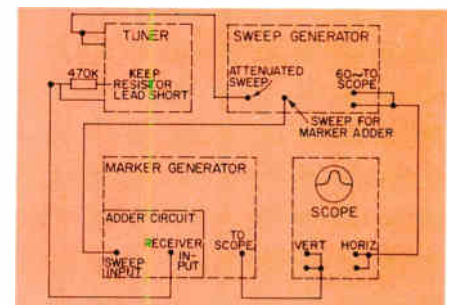
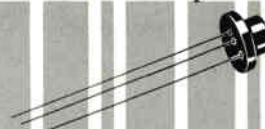


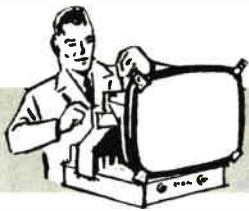
Fig. 1. Test equipment arrangement for I. F. alignment.

Since information in the stereo FM signal extends to 53KC, the I.F. bandwidth should be at least 150KC and preferably 200KC to allow for slight mistuning or drift. Check this, if possible, with a sweep and marker generator. (see Figure 1).

Connect the sweep output to the FM antenna terminals (per the manufacturer's instruction) and connect the scope (marker) input to the FM

Continued on page 3





BENCH NOTES

PAINT SAVER

Like other shops, we keep around a variety of paints for touch-up on appliances. Irsome fact is the formation of "skin" atop the unused paint.

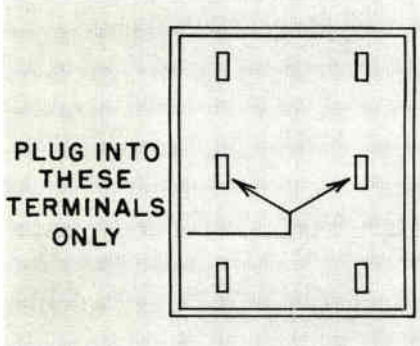
We eliminate the skin completely, by placing a piece of plastic across the top of the can, then pressing the lid on for a most efficient, air-tight seal.

Plastic is that used on vegetables sold in the supermarkets.

Harry J. Miller
Advance TV-Radio Ser.
991 42nd Street
Sarasota, Florida

A-C PLUG FOR REMOTE

On the new sonic remote receiver, a person can perform work without having the WT8X81 plug. All you have to do is plug a standard cheater cord across terminals 3 and 4 of the remote plug (the center pair of terminals), plug it in to 117 V.A.C. and go to work.



Gerald Chambers
3415 - 25th
Lubbock, Texas

Editor's Note: Make sure the plug is only used on the terminals shown, otherwise damage to the receiver will result. Also, it should be pointed out that although the receiver is in operating condition by this method, the transducer must be attached and the transmitter used to operate the unit functions. Operation of the receiver can be verified by observing action of the proper relays.

NON-TIPPING OIL CAN

Prevent your shop pressure-type oil can from forever toppling over and burying its nozzle in dirt, by soldering its bottom to a jar lid.

Stan Clark
Box 2162
East Bradenton, Fla.

TIME SAVER

I have had a lot of lost time hunting for the chassis end of my bench jumper cord.

I solved this by taping a magnet about 5 or 6 inches from the chassis end of jumper cord. When cord is disconnected magnet holds it to chassis a few inches away and always in easy reach.

Francis L. Schiel
Schiel Radio & TV
615 Glenwood St.
Waterloo, Iowa

RATIO DETECTOR ADJUSTMENT

An electric razor operating alongside a TV set is the only "test" instrument you need to adjust the ratio detector secondary to achieve excellent noise rejection. If the primary adjustment is also accessible from the top of the chassis it can also be set with the aid of the electric shaver.

H. Josephs
P.O. Box 22
Gardenville, Penna.

COLOR CODING TEST SOCKETS

When using test sockets for taking measurements on tube side of chassis, put a dab of paint next to each test point using a standard RETMA color code. This is very helpful in a poorly lighted or crowded chassis to quickly identify pin numbers. Most test sockets have the pin numbers between the two test points and make it difficult to know which way to go. I just paint the even numbers 2, 4, 6, and 8, having no trouble identifying the odd ones falling in between. This has greatly increased my speed and accuracy in taking above chassis measurements. The four colors can be obtained at most dime stores or hobby shops for a dime each.

H. L. Harshman
Ducor Radio & TV Service
P. O. Box 53
Ducor, California

SERVICING TRANSISTOR RADIOS

The following tools to aid in the servicing of transistor radios may be as helpful to others as they have been to me. 1. To facilitate collector current readings in a transistor circuit and yet leave one hand free to change meter range, handle probe or other tool I use two phono needles imbedded in a plastic rod about $\frac{3}{8}$ of an inch apart. Wires are attached from needles to two terminals such as a burned out resistor — type fuse. Meter leads can be clipped on these terminals when needed. 2. In transistor servicing, isolation of a component is achieved by cutting the printed foil with a piece of razor clamped into a small section of auto antenna which serves as a handle. 3. Inserting a transistor into a circuit, especially between i-f coils, is a lot easier if you cut the leads to different lengths. The base lead should be the longest as it's not in line with the other two holes. 4. To clean holes of solder after removing a component and before inserting the replacement, I use about 6 inches of the top rod of an auto antenna with the end ground down to a fine taper. This end is inserted into the circuit as soon as the solder is molten, and held there until the solder cools. This leaves a clean opening since the aluminum or steel rod will not stick to the solder. 5. To store transistors and some small components such as small filters, use an old cigar box, a piece of screen, or burlap stretched over a frame and positioned about one-half inch from top. Leads of parts are inserted through screen.

Frank T. Kurowski
20 Allman Place
New Hartford, N.Y.



"Can I go out and listen to Daddy install that 30-inch tube?"

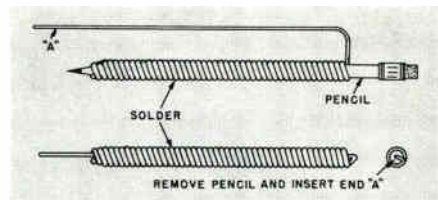
AUTO RADIO POWER SUPPLY

In many cases when shooting trouble on auto radios, we find our battery charger an excellent supply of low voltage d. c.

Harvey Muller
Box 6
Danboro, Penna.

SAVE-SOLDER-EASY

Most shops use one pound solder spools, which are heavy and hard to manipulate. I have found the following idea helpful. Take a regular wooden pencil, and wind around it from end to end single layer of solder. Leave an extra 10 to 15 inches surplus and cut loose from the spool. Then remove the pencil and insert the 10 to 15 inch piece inside. You will have a most handy form of solder which will reach tight spots and can be carried in the tube caddy without taking much room. It will also save a lot of otherwise wasted solder thereby saving time and money. When ever one needs more solder, all one has to do is to pull on the end.



A/2C Joaquin Araujo
P. O. Box 2011
James Connally A.F.B., Texas

Note:

Those desiring to have letters published in this column should write the Editor, Techni-Talk, Electronic Components Division, General Electric Company, Owensboro, Kentucky. For each such letter selected for publication you will receive \$10.00 worth of General Electric tubes. In the event of duplicate or similar items, selection will be made by the Editor and his decision will be final. The Company shall have the unlimited right without obligation to publish or otherwise use any idea or suggestion sent to this column. Caution: The ideas and suggestions expressed in this column are those of the individual writers. These ideas and suggestions have not been tried by the General Electric Company and therefore are not endorsed, sponsored or recommended.

TUNER MODIFICATIONS: FM STEREO-MULTIPLEX

Continued from page 1

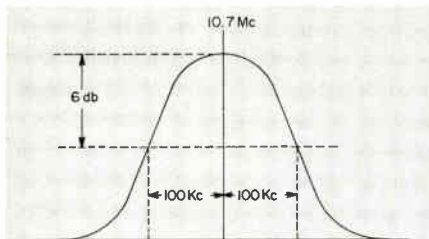


Fig. 2. Typical I. F. response curve

limiter grid circuit with a 470K resistor. The connections shown in the diagram are for a "post injection" marker system. (Post injection markers allow 10.7 reference on the presented "S" curve, although not present in the tuner's output. The DC balance of the discriminator is upset with conventional pre-injection markers and should not be used for discriminator alignment).

Since the bandwidth and linearity may vary with input, use 100 microvolts input as a "typical" signal for FM stereo. The response should not drop to less than one-half (-6 db) at + 100KC as shown in Figure 2.

Discriminator or Ratio Detector Bandwidth and Linearity

The bandwidth of the discriminator or ratio detector should be at least 400KC and as linear as possible between the two peaks of the "S" curve. Realign the tuner if necessary to achieve good linearity.

One check for linearity is as follows: Adjust an FM signal generator to 98 mc with small deviation at a low frequency (± 10 KC deviation (sweep) at 1KC or less). With a VTVM connected to the "multiplex" jack, tune from one side to the other of the channel passband (with AFC off). The output on the VTVM should remain constant across the channel with a smooth drop-off at each side.

Impedance of Detector

The usual reason for high frequency roll off in the Discriminator is the shunt capacity of the Discriminator in conjunction with the high impedance. In certain brand tuners it may be necessary to lower the im-

pedance and remove the 10.7mc shunting capacitors, but stability should be checked after doing this.

Because the stereo signal extends to 53KC and might be attenuated by the capacity of the cable attached to the multiplex output jack, the impedance of the diode loads in the detector circuit must be low. The connecting cables incorporated with the MA2G adaptor are designed for optimum performance.

Output Voltage at Multiplex Jack — Weak Signals

When the weakest FM stereo station that produces acceptable quality is being received there must be sufficient output at the multiplex jack to operate the demodulating circuits in the FM Stereo adaptor. Too little output voltage at the multiplex jack will not provide enough 19KC pilot to the stereo adaptor to synchronize the oscillator. This results in distortion or "motorboating" in the (L-R) stereo subcarrier channel.

(If the MA2G Stereo Adaptor is being used the output measured at the MPX jack of the Tuner must be at least 1 volt RMS or 2.8 volts peak to peak).

Strong Signals

When the strongest FM stereo station is being received the AGC circuits in the tuner must prevent the output at the MPX jack from rising to a value which would overload the FM stereo adaptor.

Too much output will overload the stereo adaptor causing distortion, loss of separation, and spurious responses. Note: Too much output may indicate too high an impedance at the detector, too much voltage at the limiter screen, poor regulation of the limiter screen voltage, or a narrow band discriminator.

(If the MA-2G FM Stereo Adaptor is being used the output measured at the MPX jack of the Tuner must be no more than 2 volts RMS or 5.6 volts peak to peak).

Tuner Modification Requirements

Figure 3 shows the connection of an FM stereo (multiplex) jack to a typical medium quality tuner using a Foster-Seeley discriminator circuit.

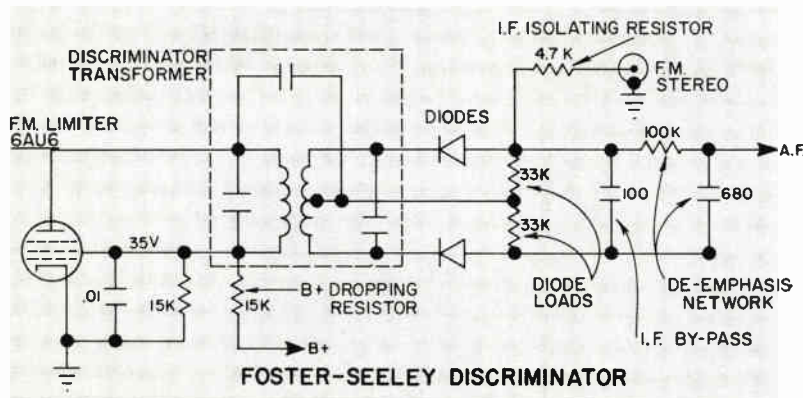


Fig. 3. Circuit illustrating possible changes for stereo.

Installation of Multiplex Jack

The FM stereo (multiplex) jack is connected with a 4.7K I.F. isolating resistor to the "hot" side of the I.F. by-pass capacitor and before the de-emphasis network. In all tuners, whether they be balanced or unbalanced, discriminators or ratio detectors, the take-off point is always just ahead of the de-emphasis network (to prevent attenuating the stereo information).

An I.F. isolating resistor is used between the take-off point and the FM stereo (multiplex) jack. The 4.7K value shown on this diagram is the largest value that should be used in this location. If a larger value were used, there would be too much high frequency roll off due to the cable capacity and the input capacity of the multiplex adaptor. Smaller values of resistor may lead to some troubles with I.F. instability due to the I.F. frequencies feeding through into the output. This resistor should be located as near as possible to the diodes for best isolation.

Diode Loads

The diode loads shown in this diagram are 33K. The average receiver you will run across will have 100K diode loads. These should be replaced with the smaller 33K resistors. This gives two benefits: lower impedance, which means better high frequency response, and a lower gain in the discriminator transformer which broadens the response of the transformer.

I.F. By-Pass Capacitors

The I.F. by-pass capacitors should be no larger than 100 micro-microfarads. Larger values than this will cause high frequency drop-off which again is detrimental to the high frequency response required for FM stereo. (Also, if the I.F. filter capacitor is large, over 200 mmf and they are reduced to 100 mmf, the discriminator diodes and associated circuitry may have to be shielded to prevent I.F. instability or I.F. oscillation).

De-emphasis Network

The resistor in the de-emphasis network should be no smaller than 100K value shown here. Smaller values will cause amplitude and phase shifts at higher audio frequencies which will make it impossible to get good stereo separation at higher frequencies. Note, that when the value of the resistor is changed, it is also necessary to change the value of the capacitor so that the product of $R \times C$ should be approximately 75 micro-seconds which is the standard de-emphasis time constant.

The values shown in the diagram do not exactly equal 75 micro-seconds due to the stray wiring capacities of the circuit and input tube capacities which are now shown on

Continued on page 7



SG-10FP4A replaces:
10BP4 • 10BP4A • 10BP4C
10BP4D • 10FP4 • 10FP4A



SG-12KP4A replaces:
12KP4 • 12KP4A • 12LP4
12LP4A • 12LP4C • 12TP4
12ZP4 • 12ZP4A



SG-14AJP4 replaces:
14AJP4 • 14ASP4 • 14AVP4



SG-14CP4A replaces:
14BP4 • 14BP4A • 14CP4
14CP4A • 14DP4 • 14EP4



SG-14QP4A replaces:
14BAP4 • 14HP4 • 14QP4
14QP4A



SG-17CKP4 replaces:
17BRP4 • 17BZP4 • 17CAP4
17CKP4



SG-17HP4B replaces:
17HP4 • 17HP4A • 17HP4B
17RP4 • 17RP4C



SG-17LP4A replaces:
17LP4 • 17LP4A • 17VP4
17VP4B



SG-17QP4A replaces:
17QP4 • 17QP4A • 17UP4
17YP4



SG-20CP4D replaces:
20CP4 • 20CP4A • 20CP4B
20CP4C • 20CP4D • 20DP4
20DP4A • 20DP4B • 20DP4C



SG-21EP4B replaces:
21EP4 • 21EP4A • 21EP4B



SG-21FP4C replaces:
21FP4 • 21FP4A • 21FP4C



SG-21FLP4 replaces:
21ALP4 • 21ALP4A • 21ALP4B
21ANP4 • 21ANP4A • 21ATP4
21ATP4A • 21ATP4B • 21BAP4
21BNP4 • 21BTP4 • 21CBP4
21CBP4A • 21CBP4B • 21CMP4
21CVP4 • 21CWP4 • 21DNP4
21FLP4



SG-21WP4A replaces:
21WP4 • 21WP4A



SG-21XP4A replaces:
21ASP4 • 21AYP4 • 21XP4
21XP4A

G.E. reporter, Roland Kempton, shows 30 "universal" picture tubes

30 SERVICE-DESIGNED "SG"

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Each of these Service-Designed "SG" tubes features General Electric's new straight line high-resolution gun. This means you don't have to install an ion trap. Save time. Less chance of call-back. Replace either bent gun or straight gun tubes and give your customers the best picture their sets can deliver.

Pick a number from 10BP4 to 27RP4 . . . or any of 167 tube types in between (see above). From just 30 G-E Service-Designed "SG" picture tubes choose a replacement. Chances are, you'll have it right in your shop, because now it makes sense to carry a minimum inventory for commonly replaced picture tubes. These picture tubes move! . . . give you a big advantage in prompt availability, faster customer service, fewer emergency pick-ups, simpler ordering.



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14RP4A • 14SP4 • 14WP4
14ZP4



SG-16KP4A replaces:
16KP4 • 16KP4A • 16QP4
16RP4 • 16RP4A • 16TP4
16UP4 • 16XP4



SG-17BP4B replaces:
17AP4 • 17BP4 • 17BP4A
17BP4B • 17BP4C • 17JP4



SG-17BJP4 replaces:
17ATP4 • 17ATP4A • 17AVP4
17AVP4A • 17BJP4, 17BUP4
17CBP4 • 17CLP4



SG-17BWP4 replaces:
17BVP4 • 17BWP4 • 17CSP4



SG-20HP4D replaces:
20HP4 • 20HP4A • 20HP4B
20HP4C • 20HP4D • 20LP4
20MP4



SG-21ACP4A replaces:
21ACP4 • 21ACP4A • 21AMP4
21AMP4A • 21AMP23A • 21AQP4
21AQP4A • 21BSP4 • 21CUP4



SG-21AUP4B replaces:
21AUP4 • 21AUP4A • 21AUP4B
21AVP4 • 21AVP4A • 21AVP4B
21BDP4



SG-21AWP4 replaces:
21AWP4



SG-21DEP4A replaces:
21CZP4 • 21DAP4 • 21DEP4
21DEP4A



SG-21YP4A replaces:
21AFP4 • 21BCP4 • 21YP4
21YP4A



SG-21ZP4B replaces:
21ZP4 • 21ZP4A • 21ZP4B



SG-24AEP4 replaces:
24AEP4 • 24ANP4 • 24DP4
24DP4A • 24YP4 • 24ZP4



SG-24CP4A replaces:
24ADP4 • 24CP4 • 24CP4A
24QP4 • 24TP4 • 24VP4
24VP4A • 24XP4



SG-27RP4 replaces:
27EP4 • 27GP4 • 27NP4
27RP4

picture tubes replace 169 types

In addition to the unique straight gun design, each of these Service-Designed picture tubes is aluminized and employs General Electric's high temperature phosphor screen. They provide the bright, clear pictures your customers want—up to 40 percent brighter. Get your new interchangeability chart, plus full details on General Electric Service-Designed "SG" picture tubes from your General Electric tube distributor.

General Electric Company, Distributor Sales, Electronic Components Division, Room 1709A, Owensboro, Kentucky.

Tubes listed contain all new material and parts in reused envelope.

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G-E reporter, Roland Kempton,
shows how General Electric puts the ...



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STEAM AND DRY IRON

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- Complete with control, cordset, and cover
- Handy cooking chart on handle

Check your stock now—then check your G-E tube distributor for full details on how you can get these valuable General Electric appliances at no additional cost. General Electric Company, Distributor Sales, Electronic Components Division, Room 1750, Owensboro, Kentucky.

Progress Is Our Most Important Product

GENERAL  ELECTRIC

TELEVISION

Television Wireless Remote Receiver- Adjustment of the Reed Relay Contact Points

There have been isolated cases where adjacent reeds have been found to vibrate in "Sympathy" with one representing a selected function. This causes erratic operation of an undesired function. When this condition exists, the "offending" reed contact point may be adjusted.

Reed contact adjustment procedure:

1. Connect a VTVM or scope to Test Point II of the remote receiver. (See p. 1 Vol. 13, No. 6 issue).
2. Insert a dummy antenna in the antenna input jack. (See Fig. 2, p. 6 Vol. 12, No. 6 issue).
3. Connect the power plug to an indicating device (See Fig. 1, p. 1 Vol. 12, No. 3), since reed adjustments should be made only with the television receiver inoperative.
4. Connect a .002 uuf capacitor across C656 of the transmitter when adjusting L651-L652 and a .001 uuf for L653-L654.
5. Depress the transmitter function button corresponding to the offending reed. To hold the transmitter "on" during reed adjustment, insert a coin (penny) between the function button and the case.
6. Bring the transmitter close to the dummy antenna so as to produce 10 volts P.P. (3.5 volts RMS) on the VTVM or scope. Position the transmitter to maintain this voltage.
7. Turn the reed contact point adjusting screw slightly (counter-clockwise)

until the reed just de-activates its respective control circuit. (Usually this is less than a quarter turn). De-activation of volume functions is indicated by movement of the associated sensitive relay armature.

In a like manner, each of the reeds may be checked for minimum operating voltage by repeating Steps 1 through 7, alternately depressing each of the transmitter function buttons.

To check maximum operating voltage of the reeds, move the transmitter closer to the dummy antenna so as to produce 25 volts P.P. (8.8 volts RMS). As each of the buttons is depressed, the corresponding function must indicate positive operation. Failure of any reed to initiate positive function operation, indicates improper adjustment in Steps 6 and 7.

Audio Buzz in 17 Inch M5 Chassis

Residual audio buzz in the 17 inch M5 chassis models may be caused by the leads from the vertical hold control running too close to the volume control terminals. This vertical pick-up on the volume control terminals appears as a buzz in the speaker which may be changed in pitch by the vertical hold control.

The simple cure is to dress the gray and yellow vertical hold control leads away from the volume control terminals to eliminate the buzz condition.

RADIO

Changer Repair Support for Record Changers

When troubleshooting or repairing record changer mechanism, it is helpful to have means of properly supporting the changer.

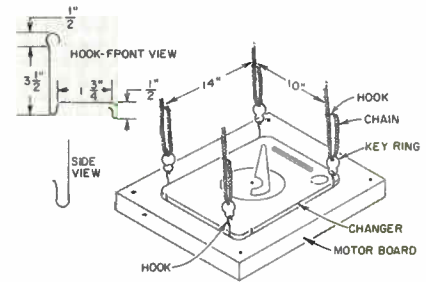
Wooden or metal racks are usually not flexible enough in height or width to fit all phonograph models.

The following is a recommended method.

Take four (4) equal lengths of window sash chain or equivalent, and fasten each chain to ceiling directly above phonograph repair bench. Next take four (4) standard key rings and slide one ring over each of the lengths of chain.

The loose end of the chain can now be secured further up the chain by the use of a hook made out of stiff wire (coat hanger material works well). A hook should then be made to fasten in the key ring that is in the loop section at the bottom of the chain (see diagram). The bottom hooks will fit around the corners of the changer. (See diagram showing how hook can be made.) The special shape of these hooks is required particularly for the record changer used in the RT1230; for the other present models, an ordinary "J" shaped hook would have sufficed.

This arrangement is now ready to adapt to different cabinet heights (approximately 10 inches above work bench) and will provide support for the changer.



TUNER MODIFICATIONS: FM STEREO-MULTIPLEX

Continued from page 3

the diagram. These make-up the difference between 680 and 750 micro-micro-farads.

Limiter Screen Voltage

The screen voltage on the limiter may be used as a means of adjusting the output of the receiver to match the FM stereo adaptor used. 35 volts shown in the diagram is the value that will normally give the right amount of output (between 1 and 2 volts RMS) to operate the MA-2G stereo adaptor. However, if the voltage is low it may be raised by raising the screen voltage and may be lowered by lowering the screen voltage. Increasing the value of the B+ dropping resistor lowers the voltage. It also should be stated that lowering the limiter screen voltage improves the limiting action of the receiver.

Use Order Coupon Below

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..... ETR-2579 Complete set of Techni-talk back issues Vol. 1, No. 1 — Vol. 13, No. 5 (Includes all Tele-Clues and Tele-Clue Schematics)	\$3.50 each.....
..... ETR-3200 Multi-Tube Pin Straightener	\$.60 each.....
..... ETR-2582 Soldering Gun and Drill Holder	\$.75 each.....
..... ETR-3050 Adapting to FM Stereo	\$1.00 each.....
TOTAL AMOUNT OF CHECK OR MONEY ORDER	\$.

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