

dynatuner

**STEREOMATIC
MULTIPLEX
INTEGRATOR
MODEL FMX-3**

SERIAL NUMBER

This number must be mentioned in all communications concerning this equipment.

INSTRUCTIONS FOR

**ASSEMBLY
ALIGNMENT
OPERATION**

dynatuner

FREQUENCY MODULATION



VOLUME



POWER

Price \$1.00

929011

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FMX-3 MULTIPLEX INTEGRATOR

DESCRIPTION

The Dynatuner FMX-3 is a multiplex integrator designed to convert the FM-1 Dynatuner into a compatible FM-Stereo-Mono tuner. When installed and aligned, the completed system exhibits specifications which are virtually unchanged from those of the basic tuner. Separation of the two stereo channels is 30 db or more over the useable audio range, closely approaching the limits of the system, and the Dynatuner FMX-3 is uniquely able to maintain this high degree of separation even with very low signal strengths. The FMX-3 has some novel features which contribute to ease of operation as well as a high level of performance.

The FMX-3 has three basic sections:

1. A 19KC and doubler channel using a 6BL8/ECF80 tube, in which the pilot signal of the stereo broadcast is amplified and doubled to reconstruct the 38KC carrier.
2. A symmetrical gated bridge detector utilizing 4 matched 1N541 germanium diodes which detect the signal.
3. A twin triode 12AX7/ECC83 tube which amplifies the signal. This stage is a feedback stage, providing a low output impedance with low distortion.

When there is a stereo broadcast, the doubler circuit produces from the transmitted 19KC stereo pilot signal, a 38KC signal which is locked in phase with the pilot signal. This 38KC signal is amplitude controlled by a limiter to reject AM noise and to maintain a constant carrier level. The doubler circuit also provides a signal for actuating the STEREOCATOR to indicate the existence of a stereo broadcast. The same STEREOCATOR is used as an alignment indicator when initially adjusting the integrator.

The reconstituted 38KC carrier is combined with the detected FM signal in a special balanced transformer. This signal has been modified by augmenting the portion which contains stereo information and by introducing a notch type filter at 67KC in order to eliminate problems from stations with subsidiary non-stereo multiplex operation. The combination of the 38KC carrier and detected FM signal has an envelope on which one side is left channel and the other side is right channel modulation. Each channel is detected by half the balanced bridge in which the arms alternately open and close, actuated synchronously by the 38KC signal. Balanced detection insures linearity.

The demodulated signals are de-emphasized. They pass through a dual volume control which handles both channels, and then are amplified in the output stage where the unwanted signal portions above the audio spectrum are filtered out. The resultant output contains very small percentages of 38KC and its harmonics so that there are no signals to cause spurious beats with tape recorder bias frequencies.

There are two very important benefits from this system. First, its very high degree of linearity provides minimum distortion. This results in stereo reception of a quality commensurate with the finest mono broadcasts, plus all the benefits of excellent stereo separation. Second, there is no switching required of the user in the transition from mono

to stereo or vice versa. The integrator takes care of this automatically since the 38KC carrier does not exist in the absence of the 19KC stereo pilot signal, and there is no free-running oscillator to cause beats and whistles which might be encountered under many conditions of use.

The integrator fits inside the Dynatuner FM-1 in the space provided. It requires slight modifications in the FM-1 because some extra features are included in the integrator which more than outweigh the short time required for their inclusion. These features are the STEREOCATOR and the dual volume control, which together greatly simplify stereo reception.

USING YOUR MULTIPLEX DYNATUNER

Operation of the FMX-3 equipped Dynatuner is remarkably simple. The socket marked "A" (indicated on the bottom plate beneath the output sockets) is the left channel output. The "B" socket is the right channel output. Shielded cables should connect these with the stereo pre-amplifier, or directly to power amplifiers if no preamplifier is to be used. Either the FM-AM inputs or the FM-MPX inputs on the preamplifier may be used. The outputs of the Dynatuner can go into any input of 100,000 ohms impedance or greater which can accept signal levels between one and two volts.

Stereo reception is just as simple as mono reception with the multiplex Dynatuner. Just tune the station. A monophonic broadcast will automatically be heard through both speakers. A stereo broadcast will be received with maximum separation (depending on the program material) without adjustment. Because the integrator performs the necessary switching automatically, the preamplifier may usually be left in the "stereo" mode. Under certain conditions of mono reception, however, switching the preamplifier to the A+B (L+R) mode may afford reduction of noise components on weaker signals.

Refer to your Dynatuner manual for further information on tuner usage. When using the FMX-3, the lower beam of the tuning eye is used for normal tuning, and the upper beam illuminates the word "STEREO" when a stereo station is transmitting. Between stations, the upper beam may light or flicker. There can be no confusion as to whether you are listening to a stereo station if you tune for closure of the lower beam first, and then observe whether "STEREO" is lighted. Noise on extremely weak signals (there is some 19KC in random noise) and 19KC harmonics in the program material may also cause flickering of the STEREOCATOR during mono reception.

For those who use the unit with a mono system, in anticipation of the time when they will have the remainder of the stereo system, it is suggested that they use a "Y" connection to feed both outputs into a single channel system. This will avoid limiting reception to one channel only when a stereo broadcast is received.

It is important to note that a proper antenna is more important for stereo reception than for mono reception. Many problems of noise and distortion can be eliminated by rotating the antenna for best results on individual stations. The ideal procedure is to use a directional FM antenna with a rotator and a variable attenuator in the

feed line. This is not practical for everybody, however, but orientation of the antenna for best reception is essential even when using an indoor folded dipole of the type shown in the Dynatuner FM-1 manual. If relocation of an indoor antenna is frequently required for best results, an indoor all-band TV antenna of the "rabbit ears" type may prove more convenient than the twin-lead folded dipole.

READ THESE INSTRUCTIONS FIRST

- A. If this FMX-3 kit is to be incorporated into an already completed FM-1 Dynatuner, you may proceed with the complete assembly instructions.
- B. If this FMX-3 has been purchased as a Semi-Kit, with the etched circuit board factory preassembled, you need not check that section of the parts list which includes the items on the PC-12 board. You may proceed with the assembly instructions, ignoring the section describing the assembly of the etched circuit board.
- C. If you have not yet assembled your FM-1 Dynatuner kit, you can save a few minutes assembly time by noting the following changes in your FM-1 manual:
- 1 () page 5, column 2, step 1: Do not install resistors R20, R30 or R35.
 - 2 () page 6, column 1, step 4 at top of page: Do not install capacitor C28.
 - 3 () page 6, column 2, step 13: Delete this step.
 - 4 () page 7, column 2, step 31: Delete the sentence, "Solder all three wires".
 - 5 () page 10: Front Panel Assembly: Delete steps #1 through #19 inclusive.
 - 6 () page 10, column 2, step 21: *Delete this step and replace it with the following instructions:* Twist together a 9" black wire and a 9" green wire. Thread these wires through the small slot in the front of the chassis, and through grommet #2. Connect the black wire to lug #2 of the three lug terminal strip. Connect the green wire to lug #1 of the three lug terminal strip. Also at eyelet #37 on the bottom of PC-8, solder should be flowed onto the board and over to the chassis to make a good ground contact to the chassis.

In the Preliminary Assembly and Wiring instructions for the FMX-3, you can delete steps #1 through #8 inclusive. Now proceed with the assembly of your FM-1 Dynatuner through to the bottom of Page 10 in its instruction book. The EM-84 tube, the volume control, and the plastic front plate insert supplied with the FM-1 are not used with the FMX-3. Next assemble the FMX-3. Install the 12AX7 in the FMX-3 but leave out the 6BL8/ECF80 while aligning the FM-1 according to its instruction manual. Then align the FMX-3 as shown later in this manual, after installing the 6BL8.

- D. If you have purchased your FM-1 Dynatuner as a Semi-Kit, and it is not yet assembled, you can save a few minutes assembly time by noting the following changes in your FM-1 SK manual and supplementary instructions:
- 1 () page 6, column 2, step 13: Delete this step.
 - 2 () page 7, column 2, step 31: Delete the sentence "Solder all three wires."
 - 3 () page 10 of Supplementary Instruction sheet for the Semi-Kit: Front Panel Assembly: Delete

steps #1 through #11 inclusive. *Add the following instructions after step #11:* Twist together a 9" black wire and a 9" green wire. Thread these wires through the small slot in the front of the chassis, and through grommet #2. Connect the black wire to lug #2 of the three lug terminal strip. Connect the green wire to lug #1 of the three lug terminal strip.

In the Preliminary Assembly and Wiring instructions for the FMX-3, you can delete steps #1 through #6 inclusive. Now proceed with the assembly of your FM-1 SK Dynatuner through to the bottom of the supplementary instruction sheet. The EM-84 tube and the plastic front plate insert supplied with the FM-1 SK are not used with the FMX-3. Next assemble the FMX-3. Install the 12AX7 in the FMX-3 but leave out the 6BL8/ECF80 while aligning the FM-1 according to its instruction manual. Then align the FMX-3 as shown later in this manual, after installing the 6BL8.

ASSEMBLY INSTRUCTIONS

There are five basic steps in the incorporation of your Dynakit FMX-3 Multiplex Integrator into the Dynatuner:

- A. The installation of the unique STEREOCATOR tuning system requires replacement of the present tuning eye and socket, and a few component changes on the PC-8 board in the tuner.
- B. The present volume control is replaced with a dual volume control which operates on both stereo channels.
- C. Assembly of the PC-12 integrator circuit board.
- D. Interconnection of the FMX-3 and the FM-1 tuner.
- E. Alignment of the FMX-3.

Refer to the FM-1 instruction manual for detailed instructions on proper wiring and soldering technique. A GOOD SOLDERING JOB IS ESSENTIAL TO THE PERFORMANCE OF YOUR TUNER. ALL SOLDERING MUST BE DONE WITH ROSIN CORE SOLDER. Whenever soldering is required, the instructions indicate it by "(S)". If this symbol is not shown after a connection is specified, it indicates that further connections will be made at that point before soldering.

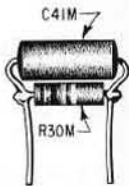
All resistors in the FMX-3 are 1/2 watt. The color coding which specifies their value is indicated as they are used. The first color is nearest the end of the resistor, and any fourth color band should be ignored. All capacitors are marked with their value. Whenever a length of hookup wire is specified, strip 1/4" from each end unless otherwise specified.

BEFORE STARTING WORK ON THE DYNATUNER, MAKE SURE THE LINE CORD IS DISCONNECTED FROM ANY SOCKET.

Preliminary Assembly and Wiring

- 1 () Remove the cover and bottom plate of the tuner. Save all the hardware.
- 2 () Remove the knobs. Remove the two brass screws and the nut on the volume control which secure the brass front plate. Remove the front plate and plastic insert.
- 3 () Remove the three sets of #4 hardware which secure the front panel to the chassis. Save the hardware.

- 4() Snip off at the socket, all of the wires connected to the tuning eye socket V8. Snip off all wires connected to the volume control. Set the front panel aside. Remove the tuning dial disc to prevent breakage. Remove V6 and V7 for convenience in making future connections.
- 5() Remove the tuning eye socket V8 from the front panel. Save the hardware.
- 6() Remove the volume control from the front panel. Save the $\frac{3}{8}$ " lockwasher, and the $\frac{3}{8}$ " nut which was removed in step #2.
- 7() Remove the seven wires which are connected to eyelets #25, #26, #28, #30, #36, #37 and #38. Heat the eyelets from below and withdraw the wires from the top.
- 8() Remove the following four parts from the PC-8 board, checking with the pictorial diagram for location: R20 (blue-gray-yellow); R30 (brown-black-orange); R35 (blue-gray-orange); C28 (.0075 disc capacitor). These should be removed by pulling gently on the component with a pair of pliers as each lead is heated from the other side of the board with a soldering iron. Clear the hole of solder by sweeping away the solder with the tip of the iron, after wiping the tip of the iron clean. Do this quickly with very light pressure to avoid excessively heating the board. Propping the tuner up with books will make the removal of these components simpler.
- 9() Mount the tuning eye socket V8M (with mounting flange), on the front panel with two sets of #4 hardware. Note that it is now installed with the blank space between pins #1 and #9 at the top of the panel.
- 10() Place the $\frac{3}{8}$ " lockwasher on the shaft of the dual volume control and insert the control into its hole in the front panel. Locate the lugs as shown in the pictorial diagram. Fasten loosely with the $\frac{3}{8}$ " nut.
- 11() In the location marked R20 on PC-8, insert a 100,000 ohm (brown-black-yellow) resistor R20M. Solder both leads and snip off the excess close to the bottom of the board.
- 12() In the location marked R35, insert an 18,000 ohm (brown-gray-orange) resistor R35M. Solder both leads and snip off the excess.
- 13() In the location marked C28, install resistor R39M. This resistor is 22,000 ohms (red-red-orange). Squeeze the leads together to fit the present hole spacing. Solder both leads and snip off the excess.
- 14() Refer to Detail A, and make the "piggy-back" combination of the 470 mmfd capacitor C41M and the 22,000 ohm (red-red-orange) resistor R30M. Solder. This combination is installed in the location marked R30. Solder both leads and cut off the excess.
- 15() Strip $\frac{1}{4}$ " from the ends of the black and green twisted pair of wires which protrude from the small slot in the front of the chassis. Connect the black wire to pin #4 of the socket V8M (S). Connect the green wire to pin #5 of socket V8M (S).
- 16() Cut a 3" black wire. Strip one end $\frac{1}{2}$ ", and feed it through pin #3 and connect it to pin #1 of socket V8M. Solder both pins. Position this wire under the right-angled mounting bracket for V8M and close to the front panel.
- 17() Connect one end of an $8\frac{1}{2}$ " red wire to pin #6 of socket V8M (S). Feed the other end through the small slot in the front of the chassis.
- 18() Connect one end of an 8" green wire to pin #7 of socket V8M (S). Feed the other end through the slot in the chassis.
- 19() Connect one end of a 3" red wire to pin #8 of socket V8M (S).
- 20() Connect one end of a $3\frac{1}{2}$ " green wire to pin #9 of socket V8M (S). Position this wire under the bracket and close to the front panel.
- 21() Connect one end of a 3" red wire to eyelet #30 on PC-8 (S). When soldering to an eyelet on the board, tin the wire with solder first, and then insert the wire from above as the eyelet is heated from below. Make certain that the eyelet is soldered to the board as well as to the wire lead. Do not allow any bare wire to show above the board, as it could short to the volume control.
- 22() Cut a $3\frac{1}{2}$ " black wire. Strip one end $\frac{3}{4}$ " and feed it through lug #1 of the volume control and connect it to lug #4 of the control.
- 23() Connect one end of an 8" black wire to lug #1 of the volume control (S).
- 24() Connect one end of an 8" red wire to lug #2 of the volume control (S).
- 25() Connect one end of a 6" red wire to lug #3 of the volume control (S).
- 26() Connect one end of an 8" black wire and one end of a 5" black wire to lug #4 of the volume control (S).
- 27() Connect one end of an 8" green wire to lug #5 of the volume control (S).
- 28() Connect one end of a 5" green wire to lug #6 of the volume control (S).
- 29() Position the red wire from eyelet #30 down between the resistors near it and towards socket V6.
- 30() Slide the tuning dial indicator disc fully onto the tuning capacitor shaft. The hub goes on the shaft first, and its flat side engages the flat section of the brass shaft.
- 31() Mount the front panel to the chassis using three sets of #4 hardware.
- 32() Connect the red wire from pin #8 of socket V8M to eyelet #28 (S). On this, and all future connections to eyelets on the board, make sure that the eyelets are soldered to the board as well as to the wires.
- 33() Connect the black wire from pin #3 of socket V8M to eyelet #25 (S).
- 34() Connect the green wire from pin #9 of socket V8M to eyelet #26 (S).
- 35() Connect the red wire from eyelet #30 (below the volume control) to pin #2 of socket V8M (S). Access to pin #2 can be gained through the front panel cutout.
- 36() Connect the short black wire from lug #1 of the volume control to eyelet #37 (S).



DETAIL "A"

Assembly of the PC-12 Circuit Board

Note that the top of the etched circuit board indicates the location of each component. The identification symbol for each part is marked between the holes into which its leads will be inserted.

It is important that all components be mounted close to the board. Flow solder from the lead onto the board so that no ball of solder is evident, but rather a smooth transition from solder to component lead, and to the board. The solder must completely surround the lead. Do not apply excessive solder, but do not hesitate to apply sufficient heat to assure a smooth flow of solder all around the lead and onto the board. Be sure that all the eyelets are soldered to the copper on the board, as well as to the lead. Cut off all leads close to the bottom of the board after soldering.

- 1 () Insert all of the resistors R71 through R93 in their places on the board. Solder all leads and cut off the excess.
- 2 () Insert all of the capacitors C71 through C84 in their places on the board. The direction in which these capacitors face is not important. Solder all leads.
- 3 () Mount the two 9-pin sockets V71 and V72. Note the orientation of the flat side of each socket. Ground straps have been installed in the sockets. *Be sure each pin penetrates the board and does not bend over on top of the board.* Seat each socket firmly to the board and then solder each pin, the ground straps, and the center ground pin.
- 4 () Mount the choke L71. Solder each lead and cut off the excess.
- 5 () Mount the transformers T71 and T72 (432003). Be careful to orient these correctly. *Make certain that the pin with the green dot is inserted in the hole nearest to the heavy dash on the board.* These transformers must be seated firmly against the board, and the two mounting tabs should snap into place. Solder all 6 lugs (4 connecting lugs and 2 mounting tabs) on each transformer.
- 6 () Mount transformer T73 (432004). Note that this transformer can only be mounted one way. Seat it firmly, so that it snaps into position, and make certain that all 5 connecting lugs, as well as the two mounting tabs, penetrate the board. Solder all seven lugs.
- 7 () Mount PEC-1 and PEC-2 (555001). Note that these identical units face in opposite directions. Solder all 6 leads and cut off the excess.
- 8 () Observing detail B, mount each of the four diodes D71 through D74. Those supplied may look like either of those in the illustration, and will have one end painted red, or marked with three stripes. (Disregard single green dots or stripes.) **DIODE POLARITY IS IMPORTANT.** The arrowhead on PC-12 board points to the *marked* end of the diode. Diodes should be soldered carefully without excessive heat, using the following technique: The leads should be bent up, and then down in the manner shown to pro-



vide a "heat sink" when these are soldered in place. When soldering them, grasp the loop with a pair of pliers from the top of the board, and solder from the bottom of the board. This technique prevents damaging the relatively delicate diodes with excessive heat.

Final Assembly

- 1 () Install the completed PC-12 board on *top* of the tuner chassis in place of the multiplex adaptor cover plate, using the four sets of #4 hardware. Follow the orientation in the pictorial diagram.
- 2 () Twist together the 8" black wire (the longer of the two black wires) from lug #4 of the volume control, and the green wire from lug #5 of the control. Connect the black wire to eyelet #82 (S). Connect the green wire to eyelet #80 (S).
- 3 () Twist together the following three wires: the remaining black wire from lug #4 of the volume control, the red wire from lug #3 of the control, and the green wire from lug #6 of the control. Connect the black wire to eyelet #77 (S). Connect the red wire to eyelet #76 (S). Connect the green wire to eyelet #78 (S).
- 4 () Twist together the remaining black wire from lug #1 of the volume control and the red wire from lug #2 of the volume control. Connect the black wire to eyelet #84 (S). Connect the red wire to eyelet #86 (S).
- 5 () Connect one end of a 1 1/4" red wire to eyelet #36 on the bottom of PC-8 (S). Connect the other end to eyelet #38 (S).
- 6 () Observe the red and the green wires protruding through the slot in the front of the chassis. Feed the red wire through grommet #2 (in line with the slot) and connect it to eyelet #79 on PC-12 (S).
- 7 () Feed the green wire through grommet #2 and connect it to eyelet #75 (S). This wire may appear long, but the extra length is used in the alignment procedure.
- 8 () Unsolder the two wires from output socket A on the back panel. Connect the free end of the short wire (the wire connected to output socket B) to eyelet #85 (S).
- 9 () Cut off 5 1/2" from the green wire just unsoldered from output socket A (the wire connected to eyelet #39 on PC-8). Strip the insulation back 1/4" on the free end, and connect it to eyelet #71 (S).
- 10 () Connect one end of a 6 1/2" black wire to eyelet #40 of PC-8 (S). Be sure that the solder flows from the lead, to the eyelet, and onto the copper on the board. Connect the other end of this wire to eyelet #73 (S).
- 11 () Connect one end of a 6" green wire to eyelet #33 of PC-8 (S). Connect the other end to eyelet #72 (S).
- 12 () Connect one end of a 2" green wire to the long (center) lug of output socket A (S). Connect the other end to eyelet #81 (S).

The remaining steps will require connections to lugs previously soldered in the construction of the FM-1 (unless you are building the FM-1 and FMX-3 at the same time, in which case solder will not have been applied). It may

be necessary to clear away some of the solder previously applied. To make these connections, heat the lug and push the wire through the terminal. Be certain that when soldering is called for, all of the wires are firmly soldered to the terminal.

- 13() Connect one end each of two 6" green wires to lug #1 of the three lug terminal strip. For convenience of wire location, insert one wire from each side of the lug. See the pictorial diagram. Solder all wires. A total of 8 wires are connected to this lug.
- 14() Connect one end each of two 6" black wires to lug #2 of the three lug terminal strip. For convenience of wire location, insert one wire from each side of the lug. Solder all wires. A total of 6 wires are connected to this lug.
- 15() Twist together the black and the green wire from the front side of the lug terminal strip. Connect the black wire to the center ground pin of socket V71 (S). Connect the green wire to eyelet #74 (S). Position the wires as shown in the pictorial.
- 16() Twist together the remaining black and green wires from the lug terminal strip. Connect the black wire to the center ground pin of socket V72 (S). Connect the green wire to eyelet #83 (S). Position the wires as shown in the pictorial.
- 17() Connect one end of a 9" red wire to lug #4 of the quadruple section filter capacitor. Solder all wires. A total of 3 wires and one resistor lead are connected to this lug. Connect the other end to eyelet #87 (S).

The wiring of your Multiplex Integrator is now completed. It is wise at this point to go back and check all solder connections in the unit. One poor solder connection can upset the performance of your unit. Check to be sure that the position of the wires in your unit agrees closely with the pictorial diagram and the photographs. The pictorial diagram must necessarily be exaggerated for clarity, but any discrepancies between it and the photographs are of no consequence. Make sure you remove all loose pieces of solder or wire.

Position the red-black and green-black pairs of leads from the volume control to eyelets #80, #82, #84 and #86 exactly as shown in the pictorial diagram, around the V-71 socket and away from T73. Keep them clear of the board. Insert the tubes in their respective sockets on the PC-8 and PC-12 boards, and install the tube shields. Make sure the ground straps on the sockets slip between the shield and the tube. Insert the EMM-801 tube in the V8M socket.

Now turn the tuner on and allow it to operate for one half hour or more to allow the tubes to age and for operating conditions to stabilize. Assuming that your FM-1 has been aligned according to its instructions, you should be able to enjoy the use of your tuner at this time, and normal monophonic reception should be available at both output jacks, using the lower beam of the dual-beam tuning eye for tuning in the stations. The upper beam will be used as a stereo indicator. A stereo program may have insufficient separation pending complete alignment, but in other respects should be satisfactorily received.

If the above conditions are not apparent, refer to the section "In Case of Difficulty" before proceeding with alignment of the FMX-3.

ALIGNMENT

The Dynatuner should have been aligned according to the instructions in the manual for the FM-1 before you proceed with the alignment of the FMX-3. Correct alignment

of the tuner is especially important for proper stereo operation, and in particular, *the discriminator must be accurately aligned according to the instructions in the FM-1 manual* if maximum noise rejection is to be realized. It is necessary to remove the 6BL8 tube from the completed FMX-3, although the 12AX7 (V72) must be in place when alignment of the tuner only is carried out. The lower beam of the new dual beam tuning eye is used in the same way as the EM84 in the alignment procedures described in the FM-1 Dynatuner manual.

The alignment procedure for your multiplex integrator is as simple and precise as the alignment procedure for your Dynatuner. It involves only the peaking of the tuned circuits for the proper reinsertion of the stereo sub-carrier. The transformers of the FMX-3 integrator have been preset close to the proper alignment point. The accuracy with which the alignment procedure is performed will determine the stereo separation capability of the tuner, but due to variations in the broadcast material, the same degree of separation will not always be apparent.

The only tool required for alignment is the plastic tool supplied with your Dynatuner. Only this type of tool should be used for adjusting the transformers. When using this tool, all adjustments should be made using the end which has a shoulder to prevent inserting the tool too far.

BE CAREFUL IN HANDLING THE CHASSIS DURING ALIGNMENT. THERE IS SOME SHOCK HAZARD DUE TO THE EXPOSED WIRING. *If you are careful*, it is possible to unsolder and resolder the required wires in the following steps without turning off the tuner. However, if you wish to avoid all risk of shock, you can turn the tuner off, make the connections, and turn it on again. It is *essential* that you give the set a few minutes to warm up thoroughly after any time that you turn it off, even if the ~~off~~ time is only a minute or less.

It is suggested that you read these instructions over completely before proceeding to completely familiarize yourself with the alignment procedure. If the 6BL8 has been removed, it and its shield must be reinstalled. The tuner is to be connected to an antenna, turned on, and *precisely* tuned to a *known* stereo broadcast. The connection of an amplifier and speaker is not required.

The lower beam of the EMM-801 eye indicates proper tuning of either mono or stereo. It is designed so that it does not overlap, but maximum closure indicates the point of correct tuning.

The upper beam of the eye is the STEREOCATOR. It will close completely (after alignment) in the presence of the 19KC pilot signal which is an integral part of a stereo broadcast. It will be fully open when a monophonic broadcast is correctly tuned, and, depending on ambient noise conditions, it may flicker between stations.

- 1() Temporarily solder one end of the 1.2 megohm (brown-red-green) resistor R94 to the center ground pin of V71 (S). Temporarily solder the other end to eyelet #75 (S). This is one test point, TP. Using the shoulder end of the plastic alignment tool, adjust transformers T71 and T72 for maximum closure of the upper beam of the eye. Adjust first one transformer, and then the other, and repeat. The purpose of the resistor is to reduce the closure of the eye for easiest adjustment. Usually only a very small adjustment is necessary to reach the right point.
- 2() Remove the 1.2 megohm resistor from eyelet #75, and temporarily solder it to eyelet #88 (S). This is the other test point, TP.

- 3 () Unsolder the green wire connected to eyelet #75 and temporarily solder it to eyelet #88 (S).
- 4 () Adjust the top slug of T73 for maximum closure of the upper beam of the eye.
- 5 () Adjust the bottom slug of T73 for maximum closure of the upper beam of the eye.
- 6 () Repeat step #4.
- 7 () Repeat step #5.
- 8 () Remove the 1.2 megohm resistor. This can be saved for future use when realignment is desired.
- 9 () Unsolder the green wire from eyelet #88 and resolder it to eyelet #75 (S).

This completes alignment of your Dynatuner Multiplex Integrator. If the brass front plate is being installed for the first time, its protective plastic film must be peeled off and it is wise to cut threads in the holes above and below the tuning capacitor shaft with the two small brass plated self tapping screws by inserting and removing them. This will avoid scratching the brass by enabling much easier insertion when the front plate is installed. Remove the $\frac{3}{8}$ " nut holding the volume control to the front panel. Insert the rectangular plastic insert which is included in the FMX-3 kit, into the front plate cutout from the rear (the top edge is narrower than the bottom). Place the front plate against the steel front panel so that the plastic insert is held between the two plates, and the volume control shaft and the tuning capacitor shaft protrude through both panels. Install the $\frac{3}{8}$ " nut on the volume control shaft and tighten it. Secure the front plate to the panel with the two brass self-tapping screws above and below the tuning shaft. Rotate the volume control shaft fully counter-clockwise and install the small knob with the pointer at the 7 o'clock position. The knob is pushed onto the knurled shaft. Fasten the large knob onto the tuning capacitor shaft by tightening the set screw. Install the rubber feet in the corner holes of the bottom plate, and secure the bottom plate and the cover with the four sheet metal screws. The flange on the front of the cover goes between the steel front panel and the brass front plate.

Your Multiplex Dynatuner is now ready for long pleasurable use.

IN CASE OF DIFFICULTY

Your FM-1 Dynatuner manual has some trouble shooting suggestions (page 13) which are applicable to the complete stereo tuner. In addition, it is frequently possible to locate difficulties by using the voltage table in this manual. A vacuum tube voltmeter is required. Departures of more than 20% from the indicated values (except for voltages marked *) indicate a possible error or component failure.

Some understanding of the FMX-3 circuitry will assist in troubleshooting. Review the circuit description at the beginning of this manual. In addition, the STEREOCATOR (upper beam of the EMM-801) will aid in locating the difficulty. The STEREOCATOR is operated by the 19KC amplifier and doubler circuit (T71, T72, V71). Remember that in most cases, if the EMM-801 socket has been correctly wired, improper indication by the STEREOCATOR is an effect, rather than a cause.

If the STEREOCATOR remains closed on both mono and stereo stations, the 19KC amplifier is oscillating. A rough check of the STEREOCATOR is to disconnect the green wire from eyelet #75 and touch the free end with the finger, which should illuminate the word STEREO.

If the STEREOCATOR passes this test, but does not deflect on a known stereo broadcast, check the 6BL8, and also check the continuity of T71 and T72 with an ohmmeter. The resistance of each transformer pin to ground is approximately as follows: #1 pin-0 Ω , #2 pin-40 Ω , #3 pin-10 Ω , #4 pin-100 Ω . The #1 pin is identified on the board by a white mark (green dot on the can) and the pins are numbered *clockwise* when looking at the *bottom* of the board.

If the STEREOCATOR is operating correctly, but there is little or no separation on a known stereo broadcast, make certain that the fault does not lie in the broadcast. Program material or transmission deficiencies are common causes of such complaints where stereo programming is relatively new. Separation may also be adversely affected by "multipath distortion"—reflections of the signal by buildings, hilly terrain, etc., which cause effects similar to television "ghosts," often accompanied by distortion of the audio signal. Multipath effects can be reduced only by improving the antenna system—relocation, reorientation, or replacement with a more directional antenna.

If it has been determined that poor separation is caused by the FMX-3, and the STEREOCATOR operates normally, the T73 transformer may be incorrectly aligned, although T71 and T72 should also be checked. Incorrect alignment can also cause channel reversal. Normally, the A output jack is the left channel.

A diode which is faulty, or one which is installed incorrectly may also reduce the separation, but this will usually be accompanied by a significant reduction in output on the affected channel.

If the 6BL8 tube is removed, there will be no separation, and the STEREOCATOR will not light, but monophonic transmissions will still be normally received with equal output from the A and B output jacks. If these signals are unbalanced, or if one channel is distorted, the difficulty is in the diode bridge or in the V72 circuit.

If the stereo alignment procedure can be carried out with eye deflection at both alignment points, it is probable that the 19KC and doubler sections are functioning properly. If there is no audio signal when there is deflection of the upper beam of the EMM-801 when tuned to a stereo broadcast, then the signal path should be checked from eyelets #33 and #39 through choke L71, to T73, through the diode bridge to the dual volume control and to pins #2 and #7 of V72. Touching the circuit at any of these points should produce a pop or hum through the system. If not, something in this path is malfunctioning.

FACTORY SERVICE AND GUARANTEE

It is recommended that the entire Dynatuner with FMX-3 installed be returned to the factory for service should service be required. Removal of the FMX-3 for servicing is generally not practical since its performance is interrelated with that of the Dynatuner, and both should be examined as an entity.

Please refer to the FM-1 manual for factory warranty and service on the FM-1. This section is applicable to the FMX-3 without additional charge for service of the multiplex portions of the circuitry.

Dyna Company assumes no responsibility or liability for damages or injuries sustained in assembly or operation of the FM-1 and/or FMX-3.

VOLTAGE CHECK POINTS

All voltages are measured between the point indicated and the chassis, using a vacuum tube voltmeter. All voltages are measured with volume control at maximum. STEREO voltages are measured when tuned to a station *known* to be transmitting a stereo signal. QUIESCENT voltages are measured with V6 removed from its socket to obtain quiescent condition of the FMX-3 and the tuning eye. Voltages indicated by (*) vary with signal strength but should always be negative.

TUBE	CONDITION	PIN #								
		1	2	3	4	5	6	7	8	9
V 8M EMM801	QUIESCENT	0	205	0	0	6.3 AC	29	-.64	53	-.6
	STEREO	0	200	0	0	6.3 AC	180	-14*	150	-7*
V 71 6BL8/ECF80	QUIESCENT	29	0	78	6.3 AC	0	72	1	1.5	-.15
	STEREO	45	0	71	6.3 AC	0	64	1.1	1.1	-14*
V 72 12AX7/ECC83	QUIESCENT	135	0	.85	0	0	135	0	.85	6.3 AC
	STEREO	135	0	.85	0	0	135	0	.85	6.3 AC

PARTS LIST

The parts listed here are in addition to the parts list included with the pictorial diagram of PC-12. A complete inventory will include both sections. Parts of similar type which do not change performance may sometimes be included as a matter of expediency. This will account for slight variations in value and appearance.

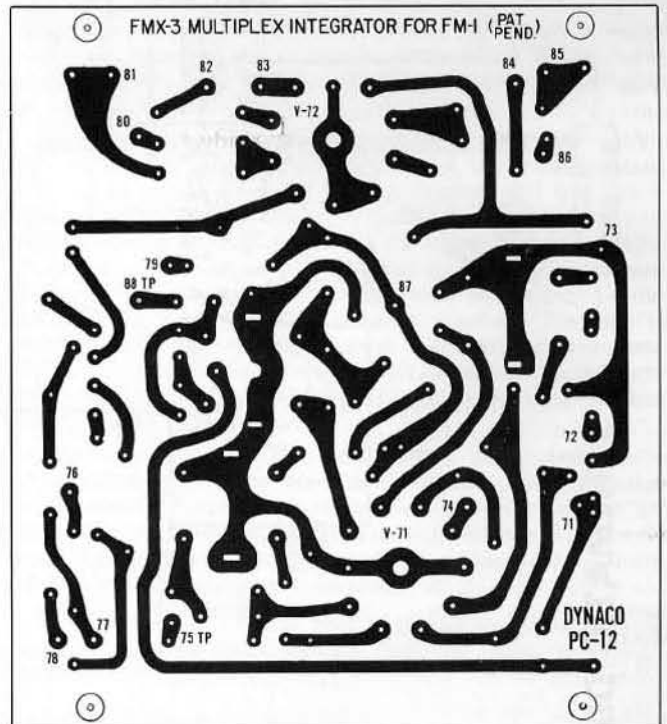
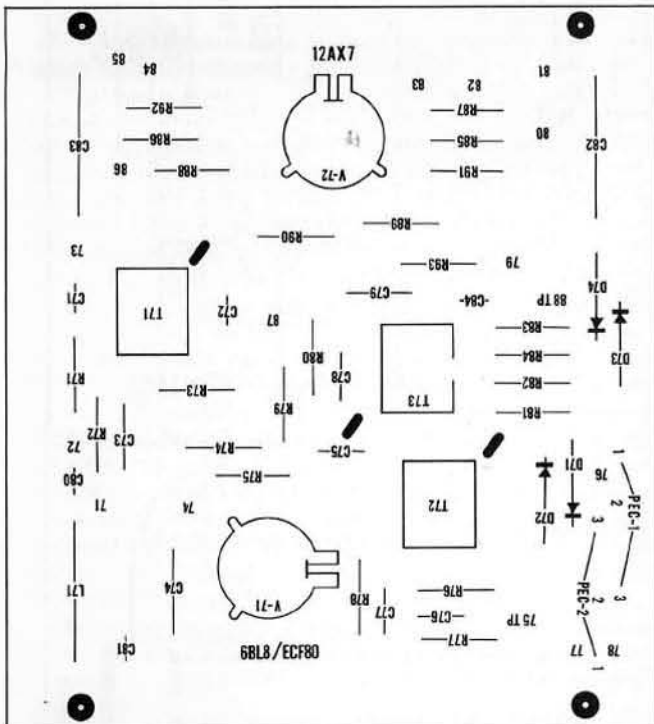
- 1 Etched circuit board PC-12
- 1 Dual volume control, 250,000 ohms per section
- 1 Plastic insert for front plate
- 1 Audio cable shielded
- 3 Pieces hook-up wire (red-black-green)
- 1 9 pin tube socket with flange — V8M
- 1 EMM801 tube — V8M
- 1 Instruction manual
- 1 Warranty card

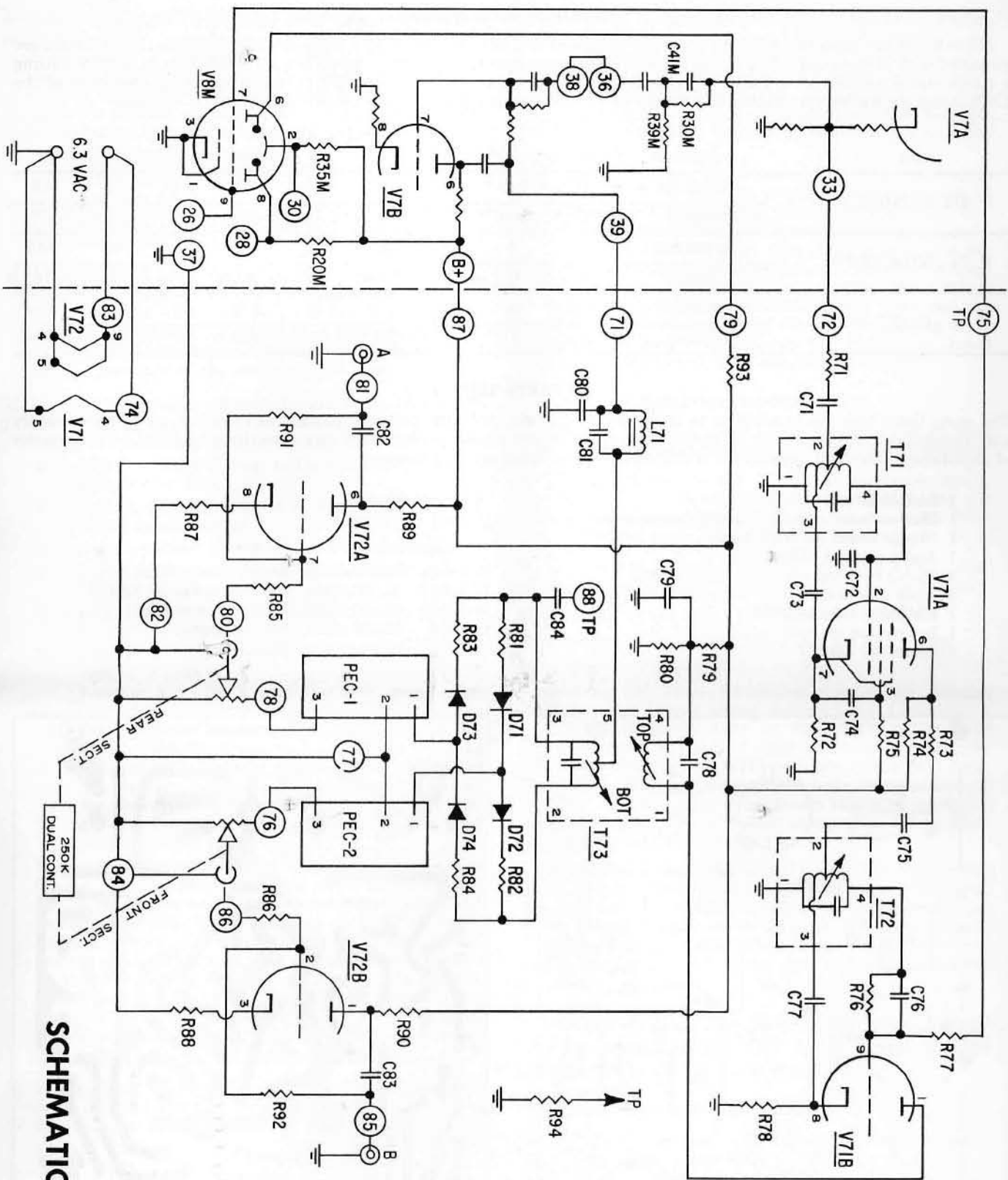
CAPACITOR

C 41M 470 mmfd

RESISTORS

R 20M	100,000 ohms	brown-black-yellow
R 30M	22,000 ohms	red-red-orange
R 35M	18,000 ohms	brown-gray-orange
R 39M	22,000 ohms	red-red-orange
R 94	1.2 megohms	brown-red-green



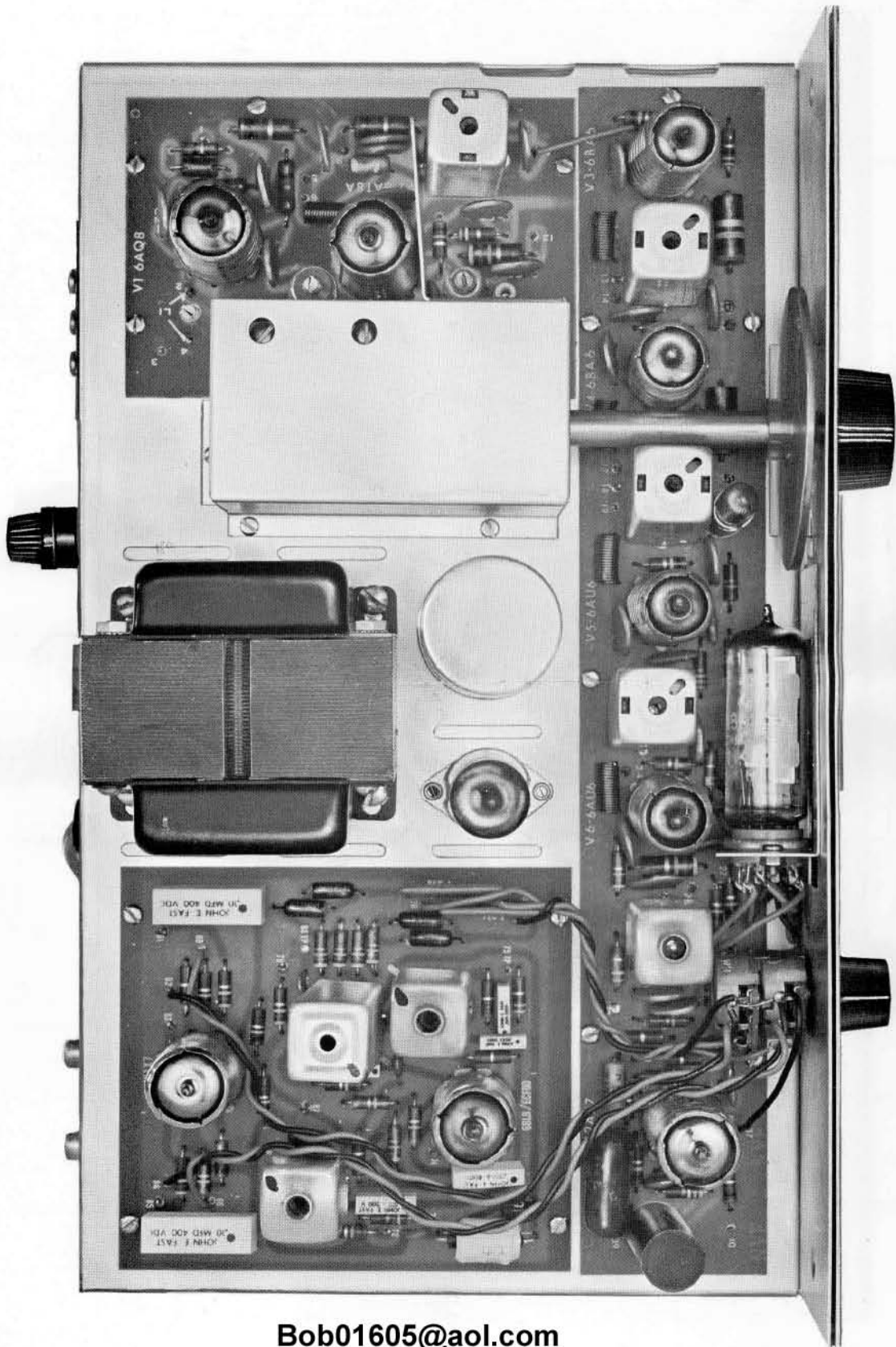


PARTS LIST FOR SCHEMATIC DIAGRAM

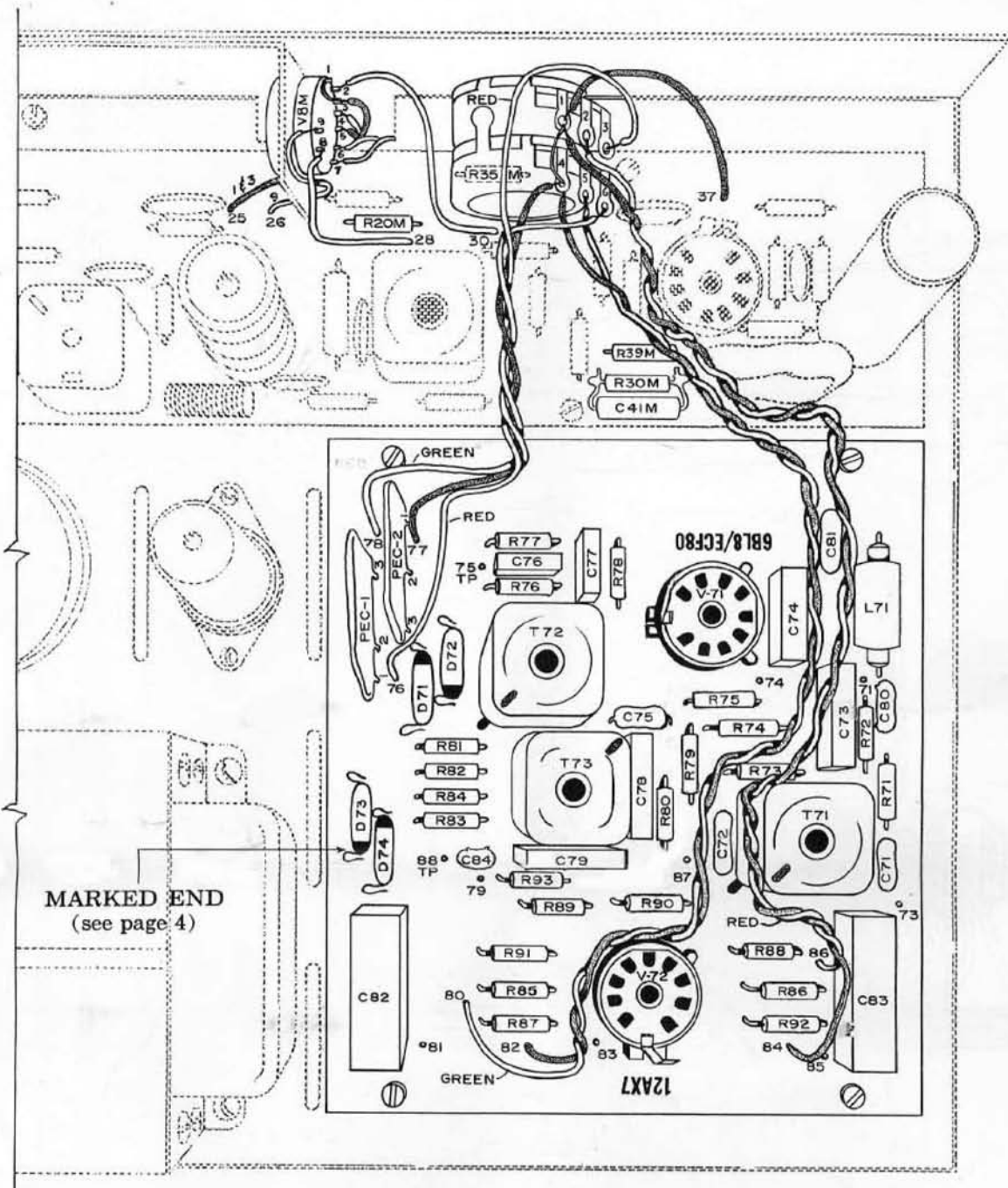
R 20M	100,000 ohms
R 30M	22,000 ohms
R 35M	18,000 ohms
R 39M	22,000 ohms
R 71	22,000 ohms
R 72	240 ohms
R 73	22,000 ohms
R 74	150,000 ohms
R 75	47,000 ohms
R 76	1.2 megohms
R 77	3.3 megohms
R 78	22,000 ohms
R 79	22,000 ohms
R 80	150,000 ohms
R 81	47,000 ohms
R 82	47,000 ohms
R 83	47,000 ohms
R 84	100,000 ohms
R 85	100,000 ohms
R 86	100,000 ohms
R 87	1,000 ohms
R 88	1,000 ohms
R 89	100,000 ohms
R 90	100,000 ohms
R 91	470,000 ohms
R 92	470,000 ohms
R 93	470,000 ohms
R 94	1.2 megohms
C 41M	470 mntfd
C 71	500 mntfd
C 72	220 mntfd
C 73	.012 mntfd
C 74	.0068 mntfd
C 75	500 mntfd
C 76	.001 mntfd
C 77	.0033 mntfd
C 78	.01 mntfd
C 79	500 mntfd
C 80	100 mntfd
C 81	100 mntfd
C 82	.1 mntfd
C 83	.1 mntfd
C 84	18 mntfd
D 71	1N541
D 72	1N541
D 73	1N541
D 74	1N541
L 71	53 mH choke
T 71	Transformer #432003
T 72	Transformer #432003
T 73	Transformer #432004
V 71	6BM
V 72	6BM
V 77	6BM
V 78	6BM
V 79	6BM
V 80	6BM
V 81	6BM
V 82	6BM
V 83	6BM
V 84	6BM
V 85	6BM
V 86	6BM
V 87	6BM
V 88	6BM
V 89	6BM
V 90	6BM
V 91	6BM
V 92	6BM
V 93	6BM
V 94	6BM
V 95	6BM
V 96	6BM
V 97	6BM
V 98	6BM
V 99	6BM

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SCHEMATIC DIAGRAM



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PARTS LIST FOR PC-12

CAPACITORS

- C 71 500 mmfd
- C 72 220 mmfd
- C 73 .012 mfd
- C 74 .0068 mfd
- C 75 500 mmfd
- C 76 .001 mfd
- C 77 .0033 mfd
- C 78 .0015 mfd
- C 79 .01 mfd
- C 80 500 mmfd
- C 81 100 mmfd
- C 82 .1 mfd
- C 83 .1 mfd
- C 84 18 mmfd
- D 71 diode 1N541
- D 72 diode 1N541
- D 73 diode 1N541
- D 74 diode 1N541

RESISTORS

- R 71 18,000 ohms brown-gray-orange
- R 72 240 ohms red-yellow-brown
- R 73 22,000 ohms red-red-orange
- R 74 47,000 ohms yellow-violet-orange
- R 75 150,000 ohms brown-green-yellow
- R 76 1.2 megohms brown-red-green
- R 77 3.3 megohms orange-orange-green
- R 78 2,200 ohms red-red-red
- R 79 220,000 ohms red-red-yellow
- R 80 150,000 ohms brown-green-yellow
- R 81 47,000 ohms yellow-violet-orange
- R 82 47,000 ohms yellow-violet-orange
- R 83 47,000 ohms yellow-violet-orange
- R 84 47,000 ohms yellow-violet-orange
- R 85 100,000 ohms brown-black-yellow
- R 86 100,000 ohms brown-black-yellow
- R 87 1,000 ohms brown-black-red
- R 88 1,000 ohms brown-black-red
- R 89 100,000 ohms brown-black-yellow

- R 90 100,000 ohms brown-black-yellow
- R 91 470,000 ohms yellow-violet-yellow
- R 92 470,000 ohms yellow-violet-yellow
- R 93 470,000 ohms yellow-violet-yellow

- L 71 53 mh choke
- T 71 transformer #432003
- T 72 transformer #432003
- T 73 transformer #432004

PEC-1 circuit module #555001
 PEC-2 circuit module #555001

- V 71 6BL8/ECF80
- V 72 12AX7/ECC83

- 2 9 pin socket for etched circuit board
- 2 tube shields
- 2 ground straps for socket shields

