EICO

construction steps

Classic Series

EICO *Electronic Instrument Co., Inc./3300 Northern Blvd., Long Island City 1, N. Y.*

The Construction Manuals

The EICO kit you are about to assemble and wire has been designed to meet the highest standards of performance. It is a high quality tuner to be constructed from the finest components available anywhere.

The Construction Manuals have been written to carefully guide you through the construction of your kit. If you follow all the instructions implicitly, and work carefully without haste, you will be rewarded with many years of fine performance and a personal inner satisfaction from a job well done.

The 2200 CONSTRUCTION MANUALS consist of two books – a book of figures and a book of steps. The CONSTRUCTION FIGURES (which must be used in conjunction with the CONSTRUCTION STEPS) have been mounted onto an easel. These books are used for kit construction and should be retained for possible future reference.

The MAINTENANCE MANUAL and the MANUAL OF OPERATION have also been printed as separate books and should BE PERMANENTLY KEPT for information pertaining to the INSTALLATION and OPERATION, as well as any MAINTENANCE that may be necessary in the future.

Revisions.

From time to time due to modernization, it will be necessary to make changes in your Instruction and/or Construction Manuals. These will be loose ADDENDA sheets or loose completely REPRINTED pages slipped in the affected manual.

Should the changes be printed on Addenda Sheets, be certain to enter these changes in your manuals before checking the components or constructing the kit.

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When unpacking the kit, handle all the parts carefully so that you will not damage any delicate components. DO NOT throw any packing material away until you have completed checking the components. In some cases, there may be a loose component contained within the packing. In any case, whether you check the components against the parts list or not, it is advisable that you store the container and the packing material until you have completed the kit.

We would appreciate any comment, observation, or criticisms you care to make about this method of packaging -- either favorable or unfavorable. Please address your comments to:

EICO Electronic Instrument Co., Inc.
131-01 39th Avenue
Flushing 54, N. Y.

Choosing a Workbench and Tools.

To avoid accidental loss or misplacement of components, choose a convenient workbench before unpacking your new kit.

Choose a corner on a table that will not be used for any other purpose until after you have completed the construction of your kit.

Proper precautions should be taken to prevent damage to any table top from a soldering iron or heavy tools.

Several basic tools are required to construct this kit. They are:

1. SCREWDRIVER - (3/16" to 1/4" wide blade)
2. SCREWDRIVER - (1/8" wide blade)
3. LONGNOSE PLIERS - (5" or 6" long)
4. GAS PLIERS
5. DIAGONAL WIRE CUTTERS
6. SMALL SOLDERING OR PENCIL IRON (35 watts or less)

7. HIGH QUALITY 60-40 ROSIN CORE RADIO SOLDER

CAUTION

Under no circumstances use acid cord solder or acid flux in constructing this instrument. Use only the best grade of rosin core solder. When in doubt about the solder you have, do not use it; instead buy a new roll which is plainly identified as "ROSIN CORE RADIO SOLDER." All performance and service guarantees are voided by the use of acid flux. Furthermore, we will not service and return unrepaired any instrument in which acid core or acid flux is used.

The following tools are useful, but are not absolutely necessary to construct this kit.

1. Wire stripper
2. Solder gun

IMPORTANT! PLEASE READ

Construction Hints.

The various lengths of wire to be used in this kit are specified in the construction steps. After cutting the wire to the LENGTHS SPECIFIED, strip off 1/4" of insulation on each end. The exposed wire will be used to make the actual connection to the solder lug.

Components such as RESISTORS and CAPACITORS, may have longer leads than specified. Cut the leads to the length indicated in the particular construction step. This length is to be measured from the body of the component. In the case of insulated leads, strip 1/4" of insulation off from the ends

and twist the strands (if any) of the wire together.

AS AN EXAMPLE, one step may specify that each lead on a resistor be cut to 1/2". 1/4" of each lead is used to make a mechanical connection to the solder lug. The other 1/4" is between the solder lug and the component so that the component will not be overheated when soldering.

When a CONNECTION is indicated, a (C) or an (S) will appear next to the lug involved. The (C) indicates that the connection should be simply mechanical, WITHOUT SOLDERING, since other leads are to be connected to this same lug. The (S) indicates that the connection should be made and soldered immediately. However, the (S) is always followed by a number, such as (S1), (S2), (S3), etc. This number indicates the NUMBER OF CONNECTIONS made and soldered to the lug. It is a check on the accuracy of your work.

AS AN EXAMPLE, if it says (S3) you should count three leads going to the lug to be soldered. If there are less than three leads at this particular lug, you will know that you have forgotten one or more leads, or connected them to the wrong lugs. If there are more than three leads, you can be certain you have connected an extra wire to this lug, which should probably go elsewhere.

WHEN YOU ASSEMBLE the parts in your unit, mark the symbol of each component on the chassis near the part, with a crayon. This will facilitate your wiring operation.

WHEN WIRING, lay the component in close to the chassis and dress it as shown in the drawing. BE CAREFUL to avoid shorts at the lugs. The book is written so that the wiring closest to the chassis usually gets wired in first. The next layer of wires are to be soldered in next. In each case, dress the leads and components as close to the chassis as possible.

NOTE: Although the pictorials are correct insofar as the connections made, they DO NOT in any way reflect the ACTUAL LENGTHS or PLACEMENT OF LEADS.

We may in some cases distort the actual component or lead placement to provide the kit builder with a clearer illustration. Nevertheless, the wires and component leads must be cut according to the WRITTEN INSTRUCTIONS.

The Figures.

At the top of some pages in the construction figure book you will find a series of twenty rectangles. These rectangles contain important information which refers to a component (resistor, capacitor, etc.) that must be used for building your kit. This information is keyed directly to the steps and the figures.

The circled number at the top of the rectangle indicates the step in which the component is to be wired. Following the number is its reference designation, its value and (in resistors) the color code.

Using the information in the rectangle, locate the component and place it into the corrugated slot on the easel directly above its respective rectangle.

The actual wiring can begin once all the components have been placed into their respective slots.

The Steps.

Next to each step you will find a number enclosed by a circle. This circled number corresponds directly to the dark circled number in the figure. These numbers refer to the particular step in which the component is mounted or wired.

After you have completed each step, make a check mark or cross out the number next to the step so that you will have a complete record of your work.

Follow the steps in the sequence given in the book. DO NOT skip steps or pages unless otherwise specified.

Method of Part Identification.

To enable rapid identification of electronic parts, each part has been assigned one or two letters of the alphabet called a "reference designation". These "reference designations" are nothing more than an initial letter or two representing the name of the part. For example, a tube socket has been assigned the "reference designation" letters "XV" and a resistor the letter "R". Thus, if you have ten sockets and 20 resistors in your kit, these parts would be identified by the designations XV1 through XV10 and R1 through R20, respectively.

Capacitors.

The reference designation assigned to capacitors is C.

The unit of capacitance is the "Farad". 1/1,000,000 of a Farad is the microfarad (abbreviated UF or UFD). 1/1,000,000 of a microfarad is a micro-microfarad (abbreviated UUF or UUFD). 1000 micro-microfarads is denoted by the letter "K". Thus 0.1uf = 100Kuuf = 100,000uuf.

At the ends of some capacitors, such as electrolytics, the outer case is marked plus (+) and/or a minus (-). These are the only capacitors that must be mounted in a specific direction. Follow the direction for mounting described in the appropriate steps below. When no direction is mentioned, mount the capacitor either way. Some molded and paper capacitors have a black line near one end. Although these can be mounted without any concern for direction, it is preferable that you follow the direction for the black line shown in the drawing. If there is no black line on the drawing or on the capacitor, mount the capacitor in either direction.

The peak or working voltages are important capacitor characteristics. A capacitor marked with a higher voltage may be substituted for a lower voltage unit. Thus a 50 volt capacitor may be used in place of a 10 volt unit. The REVERSE is not true. You cannot use a 10 volt unit as a substitute for

a 50 volt capacitor. Where more than one capacitor of identical value but different breakdown voltages are used, the unit you are to use is indicated in the appropriate construction step.

Ceramic capacitor tolerance may be noted by a letter rather than a number. "K" is 10%. "M" is 20%. "P" or "GMV" means guaranteed minimum value.

Ceramic capacitors have specific temperature characteristics -- percent and degree of variation of capacity with temperature. These variations are indicated by means of a code number stamped on most capacitors. Thus, a capacitor marked 68 Z5E indicates a 68uuf capacitor having a Z5E temperature characteristic. The actual meaning of Z5E, or any other characteristic, is important to the engineer. When building the kit, be sure to use the capacitor with the characteristics specified by the engineer, if it is indicated in the construction steps. If no value is indicated in the construction book, use any of the ceramic capacitors or proper value, tolerance and voltage characteristics, supplied with the kit.

Resistors.

Resistors are denoted by the symbol letter R.

The unit of resistance is the "Ohm". The letter "K" indicates multiplication by 1000 and the letter "M" indicates multiplication by 1,000,000. Thus 1000 ohms = 1K or 1 kilohm. 1,000,000 ohms = 1M or 1 megohm.

On some resistors, the resistance value is stamped on the surface of the resistor body. However, other fixed resistors are coded with color bands which indicate their value. The actual color code of these resistors is noted in the parts list. In some instances, even when the color code is noted in the book, the actual resistor value, rather than the color code, may be stamped on the body.

The tolerance of a resistor is the amount the resistance can vary around its marked value. Thus, if a 1KΩ (1000 ohms) resistor has a ±10% tolerance, its actual value can be between 900Ω and 1100Ω. If the same resistor has a ±5% tolerance, its actual value can be between 950Ω and 1050Ω. In all cases, the tolerance is always stated or given as part of the color code when the resistor is listed. If the resistor is marked with a number rather than a color code, the tolerance is stamped on the body. In your kit, 5% resistors may be substituted for 10% components and 10% resistors substituted for the 20% ones. However, be certain that you do not use a 10% resistor when a 5% resistor is required or a 20% resistor when a 10% resistor is specified.

Resistors are capable of dissipating power. Large resistors handle more power while smaller ones handle less. A 1/4 watt resistor is usually smaller than a 1/2 watt unit, while 1/2 watt resistor is usually smaller than a 1 watt unit. If like valued resistors are used in the kit, differing in power rating, the proper resistor to use is designated in the particular construction step.

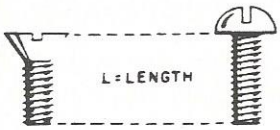
Hardware.

Hardware is a general term for mechanical parts used in the assembly of EICO kits. Such items are usually screws, nuts and washers. Machine screws are sized in accordance with the diameters of the threaded portion (No. 2, No. 4, No. 6), with the smaller number denoting the smaller diameter. The second number indicates the number of threads to an inch.

Thus, a No. 6-32 screw has a No. 6 diameter with 32 threads per inch. The final number indicates the length of the threaded portion. A No. 6-32 x 3/8 screw has a 3/8" long threaded portion.

The figure also shows the various head types in which these screws are supplied. Use the type specified in the particular step.

EXAMPLE:



No. 6-32 x 3/16 Round Head

- Length
- Threads Per Inch
- Diameter

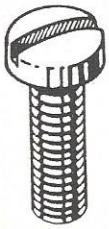
SCREW HEADS

Round Head

Set Screw (Headless)

SCREW THREADS

Machine



Self-Tapping

NUTS

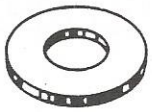
Hex

Tinnerman

WASHERS

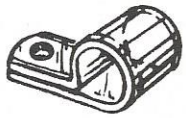
Lock

Flat



CLAMP

Plastic



Washers and nuts are sized in accordance with the diameter of the screws they are used with.

Various types of washers are supplied. A lockwasher may have internal or external teeth. A flatwasher is made out of flat metal or plastic.

Self tapping and self cutting screws are used where it is not desirable to hold the screw to the chassis by a nut. The screw actually taps the threads in the metal into which it is screwed. The sizes are designated by numbers similar to those used for machine screws, with the smaller number indicating a smaller diameter screw.

Most of the other component parts used with the kit are self evident and require little further explanation or description.

If after having checked all your components against the parts list, you find that you cannot identify or are missing a component, please write us at:

Customer Service
EICO Electronic Instrument Co., Inc.
131-01 39th Avenue
Flushing 54, N. Y.

Include the inspection slip, with your letter, should there be a shortage. If there is a slight hardware shortage, you can expedite matters by purchasing these pieces at your local jobber or hardware store.

Soldering Techniques.

To get a good, clean connection, use the Soldering Techniques described below.

USE THE BEST GRADE OF ROSIN CORE RADIO SOLDER ONLY. UNDER NO CIRCUMSTANCES SHOULD ACID CORE SOLDER OR ACID FLUX BE USED. The use of acid core solder or acid paste can cause serious corrosion and will VOID ALL THE REPAIR AND SERVICE GUARANTEES.

The soldering and wiring techniques described should be practiced several times before attempting to wire or solder components in the actual kit.

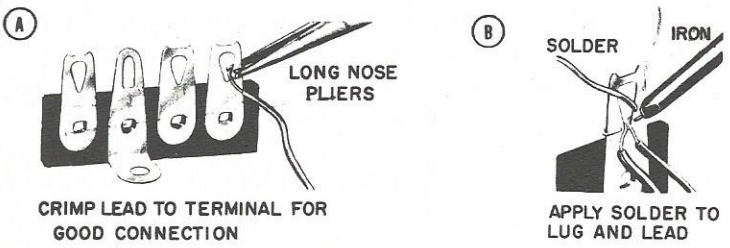
PRACTICE SEVERAL CONNECTIONS with a spare piece of wire and a socket or terminal strip that can be purchased at your local distributor.

The following refers to Figure "A".

( ) 1. Remove 1/4" of insulation from the end of the wire.

( ) 2. Feed the wire through the lug opening so that the insulation on the wire is approximately 1/64" away from the lug.

( ) 3. Bend the wire lead around the lug and crimp using a longnose pliers.



The following refers to Figure "B".

( ) 4. To solder the connection, place the tip of a hot soldering iron on the lug (terminal) at a point close to the wire being soldered.

( ) 5. Apply the solder to the connection of the lug and wire. DO NOT apply the solder to the soldering iron.

( ) 6. When the lug and wire have been heated sufficiently, the solder will flow into and over the joint.

( ) 7. Remove the solder after a reasonable amount flowed over the connection.

( ) 8. Keep the iron on the connection until all the solder flows thoroughly over the connection, then remove the iron.

Use only enough solder to cover the wire at the connecting points.

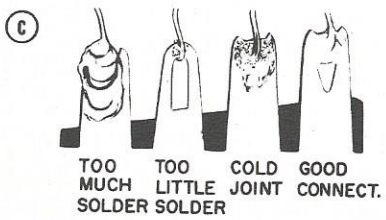
The following refers to Figure "C".

( ) 9. In some cases, where diodes, light components are soldered, it may be necessary to provide a heat conductor to carry away the excess heat that may damage the components.

In these instances it is best to place an alligator clip, pliers, etc., on the lead between the CONNECTION and the BODY of the component to be soldered.

The following refers to Figure "D".

A poor solder connection is obvious by its appearance. A grainy or pitted joint is a poor connection due to insufficient heat.



You are now ready to construct your fine unit.

Figure 1

Sub-Panel Component Mounting

1. ( ) Mount the POWER SWITCH, S3, as shown.
   Remove one of the hex nuts from the switch and use it to secure the switch to the panel.

   ( ) Feed the lead through hole "A" to the front of the SUB-PANEL. Run it along the bottom flange and through hole "B" to the sub-panel rear. Hold the lead taut and place a piece of tape to secure it.

2. ( ) Insert the BRASS SHAFT into the rear of the VERNIER DRIVE, as shown.
   SECURE it with the two No. 6-32 x 1/8 setscrews to the rear of the drive.

3. ( ) Mount the VERNIER DRIVE, as shown by passing the BRASS SHAFT through the bracket.
   SECURE the drive with two No. 4-40 x 1/4 screws, two No. 4 lockwashers and two No. 4-40 hex nuts.

4. ( ) Place the LARGE PULLEY over the brass shaft, as shown. Push the pulley up to the drive and secure it with one No. 8-32 x 1/8 setscrew.

5. ( ) Insert the BULB, I1 into the socket, XI1.

Figure 2

Sub-Panel Wiring

1. ( ) Connect an 8" piece of ORANGE WIRE to S1-1 (S1). The other end will be connected later.

2. ( ) Connect a 5-1/2" piece of WHITE WIRE to S1-2 (S1). The other end will be connected later.

3. ( ) Connect a 20" piece of GREY WIRE to S1-3 (S1). The other end will be connected later.

4. ( ) Connect a 4" piece of GREEN WIRE from S1-4 (C) to S2-10 (S1).

5. ( ) Connect a 15" piece of GREEN WIRE to S1-4 (S2). The other end will be connected later.

6. ( ) Connect an 18" piece of BLUE WIRE to S1-5 (S1). The other end will be connected later.

7. ( ) Connect a 1" piece of BARE WIRE from S1-6 (C) to lug "Z" (C).

8. ( ) Connect a 5" piece of BROWN WIRE from S1-7 (S1) to S2-12 (S1).

9. ( ) Connect an 8" piece of RED WIRE to TB7 (C). The other end will be connected later.

10. ( ) Connect a 5" piece of BLACK WIRE from S2-11 (S1) to lug "Z" (S2).

11. ( ) Connect a 1/2" piece of BARE WIRE from S2-1 (C) to S2-4 (S1).

12. ( ) Connect a 6-1/2" piece of VIOLET WIRE to S1-12 (S1). The other end will be connected later.

Figure 3

Sub-Panel Wiring (Cont'd)

1. ( ) Strip off 3/4" of outer insulation from both ends of a 16" piece of BLACK RG174/U CABLE so that the braided shield is visible. DO NOT cut into the braid.

   ( ) With a sharp pointed tool, unravel the exposed braid covering the inner conductor.

   Twist the strands together, then remove 1/4" of insulation from the INNER CONDUCTOR.

   ( ) Connect the INNER CONDUCTOR from one end to S1-8 (S1) and the SHIELD from the same end to S1-6 (S2). The other end will be connected later. NOTE: WHEN SOLDERING SHIELDED CABLES, hold the end of the lead being soldered with a pliers. DO NOT overheat the insulation for it may melt and cause shorting and leakage to ground. This fault is deceptive and is difficult to trace. Therefore, caution should be exercised.

2. ( ) Prepare a 6" piece of GREY RG-174/U CABLE as described in step 1.

   Connect the INNER CONDUCTOR from one end to S2-1 (S2). Connect the SHIELD from the same end to TB8-3 (C). The other end will be connected later.

3. ( ) Prepare an 18" piece of RED RG-174/U CABLE as described in step 1.

   Connect the INNER CONDUCTOR from one end to S2-3 (S1) and the SHIELD from the same end to TB8-3 (C). The other end will be connected later.

4. ( ) Prepare a 20" piece of ~~GREEN~~ RG-174/U CABLE as described in step 1.

   Connect the INNER CONDUCTOR from one end to S2-6 (S1) and the SHIELD from the same end to TB8-3 (C).

5 ( ) Strip off 3/4" of outer insulation from both ends of a 13" piece of YELLOW SHIELDED CABLE and a 12" piece of BROWN SHIELDED CABLE. Twist and solder all the leads.

( ) Connect the INNER CONDUCTOR from one end of the YELLOW CABLE to TB8-1 (C) and the SHIELD from the same end to TB8-3 (C).

( ) Connect the INNER CONDUCTOR of the BROWN SHIELDED CABLE to TB8-2 (C) and the SHIELD from the same end to TB8-3 (S5). The remaining ends will be connected later.

6 ( ) Cut both leads on a 120KΩ, 1/2W, 10% RESISTOR, R8 to 1/2".
CONNECT from S1-11 (S1) to TB7 (S2).

7 ( ) Cut both leads on a .05ufd, 200V MYLAR CAPACITOR, C15 to 3/4". Cover the lead with a 1/2" piece of tubing.
CONNECT from S2-2 (S1) to TB8-2 (S2).

8 ( ) Cut both leads on a .05ufd, 200V MYLAR CAPACITOR, C14 to 3/4". Cover the leads with a 1/2" piece of tubing.
CONNECT from S2-5 (S1) to TB8-1 (S2).

Figure 4
PC2 Component Mounting

1 ( ) Position the MX BOARD, PC2, as shown.

2 ( ) Position the 7 PIN MINIATURE, TOP MOUNT SOCKET, XV9, in the holes marked with 6AU6 on the board. Rotate the socket until the lugs line up with these holes. Press the socket firmly into the board. Turn the board over and solder each of the eight pins and the

center post to the copper bottom following the techniques described in the introductory material.

3 ( ) Position the 9 PIN MINIATURE, TOP MOUNT SOCKET, XV8, in the holes marked 12DW7 on the board. Rotate the lugs in their appropriate holes and press firmly into the board. Turn the board over and solder the nine pins and the center post to the copper bottom following the techniques described in the introductory material.

4 ( ) Position the (34638) COIL, T6 over the appropriate holes in the board, as shown. Turn the board over and solder the five lugs.

5 ( ) Position the (34639) COIL, T7 over the appropriate holes in the board, as shown. Turn the board over and solder the five lugs.

6 ( ) Position the (34640) COIL, T8 over the appropriate holes in the board, as shown. Turn the board over and solder the seven lugs.

Figure 5
PC2 Wiring

NOTE: Follow the procedures outlined in the introductory material for the proper insertion and soldering of each component. After each step solder the component to the copper bottom and clip off the excess wire. PRESS EACH COMPONENT FIRMLY INTO THE BOARD so it rests on the board.

1 ( ) Insert the 6800Ω, 1/2W, 10% RESISTOR, R7 into the board.

2. ( ) Insert the 470KΩ, 1/2W, 10% RESISTOR, R5 into the board.

3. ( ) Insert the 1000Ω, 1/2W, 10% RESISTOR, R6 into the board.

4. ( ) Insert the 47KΩ, 1/2W, 10% RESISTOR, R16 into the board.

5. ( ) Insert the 47KΩ, 1/2W, 10% RESISTOR, R15 into the board.

6. ( ) Insert the 18KΩ, 1/2W, 10% RESISTOR, R14 into the board.

7. ( ) Insert the 15KΩ, 1/2W, 10% RESISTOR, R10 into the board.

8. ( ) Insert the 1MΩ, 1/2W, 10% RESISTOR, R11 into the board.

9. ( ) Insert the 33KΩ, 1/2W, 10% RESISTOR, R3 into the board.

10. ( ) Insert the 27KΩ, 1/2W, 10% RESISTOR, R4 into the board.

11. ( ) Insert the 220KΩ, 1/2W, 10% RESISTOR, R17 into the board.

12. ( ) Insert the 220Ω, 1/2W, 10% RESISTOR, R12 into the board.

Figure 6

PC2 Wiring (Cont'd)

NOTE: Follow the procedures outlined in the introductory material for the proper insertion and soldering

of each component. After each step solder the component to the copper bottom and clip off the excess wire. PRESS EACH COMPONENT firmly into the board so that it rests on the board.

1. ( ) Insert the .003ufd, DISC CAPACITOR, C5 into the board.

2. ( ) Insert the .01ufd, TUBULAR CAPACITOR, C10 into the board.

3. ( ) Insert the .05ufd, MYLAR CAPACITOR, 200V, C4 into the board.

4. ( ) Insert the .001ufd, DISC CAPACITOR, C13 into the board.

5. ( ) Insert the .001ufd, DISC CAPACITOR, C12 into the board.

6. ( ) Insert the 100uuf, DISC CAPACITOR, C9 into the board.

7. ( ) Insert the 220uuf, DISC CAPACITOR, C8 into the board.

8. ( ) Insert the .001ufd, DISC CAPACITOR, C11 into the board.

9. ( ) Insert the positive side (+) of the 10ufd, 10V ELECTROLYTIC CAPACITOR, C7 into the hole in the board marked (+) and the other end into the hole marked (-).

10. ( ) Cover each lead of the (29759) PRINTED CIRCUIT, PC4 with a 1/4" piece of tubing. Insert PC4 into the board so that leads 1, 2 and 3 are in their respective holes. After you solder PC4, bend it over so that it lies outside the board. Clip off excess wire.

11. ( ) Cover each lead of the (29759) PRINTED CIRCUIT, PC3 with a 1/4" piece of tubing. Insert PC3 into the

board so that leads 1, 2 and 3 are in their respective holes. After you solder PC3 bend it over so that it lies outside the board. Clip off excess wire.

12 (✓) Cut both leads on DIODE, CR1 to 1" and cover with a 7/8" piece of tubing. CONNECT the positive side (the side with the band) into the hole marked (+) on the drawing. CAUTION should be exercised so that you do not apply excessive heat to any of the leads. When soldering, use your pliers between the bare leads and the joint to carry off the heat.

13 (✓) Cut both leads on DIODE, CR2 to 1" and cover with a 7/8" piece of tubing. CONNECT the positive side (the side with the band) into the hole marked (+) on the drawing. CAUTION should be exercised to that you do not apply excessive heat to any of the leads. When soldering, use your pliers between the bare leads and the joint to carry off the heat.

GENERAL: Bend all components to the surface of the board. The maximum height of any component should not extend more than 1/2" from the surface of the board.

Figure 7

Sub-Panel & Chassis Mounting

1 (✓) Mount the WIDE "Z" shaped BRACKET to the FM TUNER, as shown.
SECURE it with two No. 6-32 x 3/16 Rd. Hd. screws, and two No. 6 lockwashers.

2 (✓) Mount the SMALL "Z" shaped BRACKET to the FM TUNER, as shown.

SECURE it with one No. 6-32 x 3/16 Rd. Hd. screw and one No. 6 lockwasher.

3 ( ) Mount the PRE-ASSEMBLED FM TUNER to the UNDERSIDE of the chassis, as shown by the flow lines.

SECURE it with four No. 4-40 x 1/4 screws, four No. 4 lockwashers and four No. 4-40 hex nuts. Place a small box underneath the unit so that the tube does not break.

4 ( ) Mount the three PLASTIC CABLE CLAMPS, as shown.

SECURE them with one No. 6-32 x 1/2" screw, one No. 6 flatwasher and one No. 6-32 hex nut for each clamp.

5 ( ) Mount the (24017) ELECTROLYTIC CAPACITOR, C2 to the chassis, as shown.

(Note that there is a TRIANGLE, SQUARE and SEMI-CIRCLE stamped on the bakelite end of the capacitor near each lug. One lug is blank. When mounting the capacitor, position so that each lug appears at its respective location as shown by the forms on the figure).

SECURE the capacitor by inserting the four tabs into the slots on the chassis. (CAUTION: DO NOT twist the tabs excessively or they will shear off.)

6 ( ) Mount the FUSEHOLDER, XF1, as shown.

SECURE it with one 1/2" rubber washer and one 1/2" hex nut.

(CAUTION: DO NOT tighten the nut excessively or the fuseholder may crack.)

7 ( ) Mount the (33001) COIL, L1, as shown.

Insert the metal top into the large hole, then rotate until the tab located in the smaller hole and snaps into place.

8 ( ) Mount the LINE CORD in the STRAIN RELIEF.

Hold the STRAIN RELIEF as shown in the Detail Drawing.

Place the LINE CORD onto the groove of the larger section and between both sections of the STRAIN RELIEF. Leave about 8" from the strain relief to the soldered

ends. (Make certain that the soldered ends are facing as shown).

Bend the smaller section over the LINE CORD and position it into the channels of the larger section.

Compress the two sections together with a pliers, grasping the large diameter of the end of the STRAIN RELIEF.

Pass the soldered ends of the LINE CORD through the Double "D" hole on the rear of the chassis and snap the STRAIN RELIEF into place.

9 ( ) Mount the SMALL PULLEY to the shaft of the FRONT END, as shown.

SECURE with one No. 8-32 x 1/8 setscrew.

10 ( ) Mount the PRE-WIRED SUB-PANEL to the chassis, as shown.

SECURE the SUB-PANEL to the chassis using eight No. 6 self-tapping screws.

11 ( ) Please retighten the nuts holding the TRANSFORMER as a precautionary measure.

12 ( ) Mount the FM PRINTED BOARD, PC1, as shown.

Position the board as shown in the drawing. Insert the IF CANS into the large cutout in the chassis and rest the board on the seven standoffs. Bend all of the lugs down so that they extend outside of the board.

SECURE it with seven No. 4-40 x 1/4 screws. Place one No. 4 lug on three screws and insert them into the standoffs located near lugs No. 5, No. 7 and No. 10 on PC1.

(CAUTION: DO NOT tighten the screws excessively or the board may crack).

13 ( ) Remove the backing from one FOAM RUBBER piece and place the adhesive surface to rear of the large cutout wrapping it AROUND the cutout to the front.

Figure 8

Interconnection & Wiring

GENERAL: Please make the following connections from the SUB-PANEL as described below.

1. ( ) From the panel: Feed the BROWN and YELLOW SHIELDED CABLES through CC1 and CC2.

( ) Connect the INNER CONDUCTOR of the YELLOW CABLE to XV10-7 (C) and the SHIELD to lug "Y" (S1) on XV10.

( ) Connect the INNER CONDUCTOR of the BROWN CABLE to XV10-2 (C) and the SHIELD to lug "X" (S1) on XV10.

2. ( ) From the panel: Feed the ~~GREEN~~ WIRE through CC1 and CC2 and connect TB3-2 (C).

3. ( ) From the panel: Feed the BLACK, RED and ~~GREEN~~ RG-174/U CABLES and the GREY and the BLUE WIRES through CC1, CC2 and CC3.

( ) Connect the GREY WIRE to PC2-7 (S1).

( ) Connect the INNER CONDUCTOR of the BLACK CABLE to PC2-8 (S1) and the BRAIDED SHIELD lug to the copper foil surrounding the adjustment hole for T6 (S1), as shown.

( ) Connect the BLUE WIRE to PC2-6 (S1).

( ) Connect the INNER CONDUCTOR of the RED CABLE to PC2-11 (S1) and the BRAIDED SHIELD to PC2-13 (S1).

( ) Connect the INNER CONDUCTOR of the ~~GREEN~~ CABLE to PC2-10 (S1) and the BRAIDED SHIELD to PC2-12 (S1).

4 ( ) From S1-2: Connect the WHITE WIRE to XV7-1 (C).

( ) From TB7: Connect the RED WIRE to XV7-6 (C).

( ) From S1-12: Connect the VIOLET WIRE to XV7-9 (C).

( ) From S1-1: Connect the ORANGE WIRE to PC1-10 (C).

( ) From S2-1: Connect the INNER CONDUCTOR of the GREY CABLE to PC1-8 (S1) and the BRAIDED SHIELD to the edge of the copper foil near lug 8 on PC1.

5 ( ) From hole "B": Connect one side of the lead to TB2-1 (C) and the other side to TB2-3 (C).

6 ( ) Prepare a 14" piece of GREY RG-174/U CABLE as previously described.

Connect the INNER CONDUCTOR from one end to PC1-9 (S1) and the BRAIDED SHIELD on the same end to lug "W" (S1) on PC1.

( ) Feed the CABLE through CC1, CC2 and CC3.

( ) Connect the INNER CONDUCTOR to PC2-1 (S1) and the BRAIDED SHIELD to PC2-14 (S1).

7 ( ) Connect a 1-1/2" piece of BLACK WIRE from PC2-15 (S1) to PC2-9 (C).

8 ( ) Connect a 9" piece of RED WIRE to PC2-2 (S1). The other end will be connected later.

9 ( ) Connect a 7-1/2" piece of BROWN WIRE to PC2-3 (S1). The other end will be connected later.

10 ( ) Connect a 2-1/2" piece of VIOLET WIRE to PC2-4 (S1). The other end will be connected later.

11 ( ) Connect a 1-1/2" piece of ORANGE WIRE to PC2-5 (S1). The other end will be connected later.

12 ( ) Connect a 7-1/2" piece of YELLOW WIRE to PC2-9 (S2). The other end will be connected later.

NOTE: Before fastening PC2 permanently to the chassis, please turn it over (nomenclature side). Make a careful check of all of the components and wires for excessive solder and shorting together of wires. In particular, check for solder shorting lug 2 (red wire) to the case of T6; lug 15 (black wire) to case of T8; lug 8 (inner conductor of black cable) to the case of T7, and between lugs 1 and 14 (grey cable.)

Once more check and correct any component that might extend from the board more than 1/2". Go on with the next step ONLY if you have fully checked and are satisfied that you have carried out these instructions.

13 ( ) Mount the PREWIRED PRINTED BOARD, PC2, as shown in Figure 7.

SECURE the board using five No. 4-40 x 1/4 screws. (CAUTION: DO NOT tighten the screws excessively or the board may crack.)

Figure 9
Main Chassis Wiring (Cont'd)

1 ( ) From PC2-2: Connect the RED WIRE to TB3-1 (C).

( ) From PC2-3: Connect the BROWN WIRE to TB4 (C).

( ) From PC2-4: Connect the VIOLET WIRE to L1-1 (S1).

(✓) From PC2-5: Connect the ORANGE WIRE to L1-2 (S1).

(✓) From PC2-9: Connect the YELLOW WIRE to XV10-5 (C).

2 (✓) Connect the leads from the TRANSFORMER T9, as follows:

(✓) Twist both RED LEADS together. Connect one lead to XV11-1 (S1) and the other lead to XV11-7 (S1).

(✓) Twist the WHITE and the RED/YELLOW LEADS together. Connect them both to lug "V" (C) on XV11.

(✓) Twist the BLACK LEADS together. Connect the short lead to XF1-2 (S1) and the long lead to TB2-1 (C).

(✓) Twist the YELLOW LEADS together. Connect one lead to XV11-4 (C) and the other lead to XV11-5 (C).

(✓) Twist the GREEN LEADS together and run them along the chassis, as shown. Connect one lead to PC1-1 (C) and the other lead to lug "U" (C) on PC1.

3 (✓) Connect a 1/2" piece of BARE WIRE from XV7-3 (C) to lug "T" (S1) on XV7.

4 (✓) Cut a 5" piece of BROWN and a 4" piece of YELLOW WIRE.

Connect the YELLOW WIRE to XV7-4 (C) and the BROWN WIRE to XV7-5 (C).

Twist the leads together and run them along the chassis, as shown.

Connect the YELLOW WIRE to XI1-1 (S1) and the BROWN WIRE to XI1-2 (S1).

5 (✓) Cut a 5" piece of BROWN and YELLOW WIRE. Connect the YELLOW WIRE to XV7-4 (S2) and the BROWN WIRE to XV7-5 (S2). Push pin #5 down so that it doesn't touch pin #6.

Twist the leads together and run them along the

chassis, as shown.

Connect the YELLOW WIRE to PC1-1 (S2) and the BROWN LEAD to lug "U" (C) on PC1.

6. ( ) Connect an 8" piece of RED WIRE from XV7-6 (C) to C2-B (C). Make certain that pin #6 doesn't touch the chassis or pin #5.

7. ( ) Cut a 7" piece of YELLOW WIRE and a 6" piece of BROWN WIRE.

Connect the YELLOW WIRE to XV11-4 (S2) and the BROWN WIRE to XV11-5 (C). Twist the leads together and run them along the chassis, as shown.

Connect the YELLOW WIRE to XV10-4 (C) and the BROWN WIRE to XV10-9 (S1).

8. ( ) Connect a 1/2" piece of BARE WIRE from XV10-4 (S2) to XV10-5 (S2).

9. ( ) Connect a 2-1/2" piece of RED WIRE from XV11-3 (S1) to C2-A (C).

10. ( ) Connect a 1/2" piece of BARE WIRE from XV11-5 (S3) to lug "V" (S3) on XV11.

11. ( ) Connect a 5-1/2" piece of RED WIRE from TB1 (C) to PC1-6 (S1).

12. ( ) Connect an 8-1/2" piece of RED WIRE from TB1 (C) to TB3-1 (C).

13. ( ) Connect a 2-1/2" piece of RED WIRE from TB1 (S3) to C2-C (C).

14. ( ) Connect a 3" piece of BLACK WIRE from TB5-2 (C) to JA-1 (C).

15. ( ) Connect a 1-1/2" piece of BLACK WIRE from JA-1 (C) to JA-4 (C).

16. ( ) Connect a 9" piece of BLACK/WHITE COTTON COVERED WIRE from XF1-1 (S1) to TB2-2 (C).

17 ( ) Connect one lead from a 7-1/2" piece of TWIN LEAD, 300Ω CABLE to FM-1 (S1) and the other lead on the same end to FM-3 (S1). Connect one side on the remaining end to TB6-1 (S1) and the other side to TB6-2 (S1).

18 ( ) Prepare a length of BLACK RG-174/U CABLE EXACTLY to 5", as previously described.

19 ( ) Connect the INNER CONDUCTOR from one end to PC1-3 (S1) and the BRAIDED SHIELD to PC1-4 (S1).
Connect the INNER CONDUCTOR from the remaining end to FM-12 (S1) and the BRAIDED SHIELD to FM-11 (S1).

20 ( ) Connect a 5" piece of GREEN WIRE from PC1-5 (S1) to FM-10 (S1).

21 ( ) Connect an 8" piece of RED WIRE from PC1-11 (S1) to FM-6 (S1).

22 ( ) Connect a 1/2" piece of BARE WIRE from XV7-9 (C) to XV7-7 (S1).

23 ( ) Connect a 6" piece of BLACK WIRE from lug "S" (S1) on PC1 to FM-5 (S1).

24 ( ) Connect a 6-1/2" piece of YELLOW WIRE from PC1-2 (S1) to FM-4 (S1).

Figure 10
Final Wiring

1 ( ) Cut both leads on a 10MΩ, 1/2W, 10% RESISTOR, R13 to 3/4".
CONNECT from XV7-1 (S2) to XV7-3 (S2).

2 ( ) Cut both leads on a 470KΩ, 1/2W, 10% RESISTOR,

R9 to 3/4".
CONNECT from XV7-6 (S3) to XV7-9 (S3).

3 ( ) Cut both leads on a 10KΩ, 1/2W, 10% RESISTOR, R25 to 3/4".
CONNECT from XV10-1 (C) to TB3-1 (C).

4 ( ) Cut both leads on a .47ufd, 200V, MYLAR CAPACITOR, C17 to 1-1/4". Cover both leads with a 1" piece of TUBING.
CONNECT from XV10-1 (S2) to JA-3 (C).

5 ( ) Cut both leads on a 470KΩ, 1/2W, 10% RESISTOR, R22 to 3/4".
CONNECT from XV10-2 (S2) to TB5-1 (C).

6 ( ) Cut both leads on an 820Ω, 1/2W, 10% RESISTOR, R23 to 3/4".
CONNECT from XV10-3 (S1) to TB5-1 (C).

7 ( ) Cut both leads on a 10KΩ, 1/2W, 10% RESISTOR, R18 to 1". Cover both leads with a 3/4" piece of TUBING.
CONNECT from XV10-6 (C) to TB3-1 (S4).

8 ( ) Cut both leads on a .47ufd, 200V, MYLAR CAPACITOR, C16 to 1-1/4". Cover both leads with a 1" piece of TUBING.
CONNECT from XV10-6 (S2) to JA-2 (C).

9 ( ) Cut both leads on a 470KΩ, 1/2W, 10% RESISTOR, R19 to 3/4".
CONNECT from XV10-7 (S2) to TB5-3 (C).

10 ( ) Cut both leads on an 820Ω, 1/2W, 10% RESISTOR, R20 to 3/4".
CONNECT from XV10-8 (S1) to TB5-3 (C).

11 ( ) Cut both leads on a 220KΩ, 1/2W, 10% RESISTOR, R26 to 1/2".
CONNECT from JA-1 (S3) to JA-2 (S2).

12 ( ) Cut both leads on a 220KΩ, 1/2W, 10% RESISTOR,

R27 to 1/2".
CONNECT from JA-3 (S2) to JA-4 (S2).

13 (✓) Cut both leads on a .22ufd, 400V TUBULAR CAPACITOR, C6 to 3/4".
CONNECT from TB3-2 (S2) to TB4 (S2).

14 (✓) Cut both leads on a .015ufd, 600V, TUBULAR CAPACITOR, C1 to 1".
CONNECT from TB2-1 (S3) to lug "R" (S1) on XV11.

15 (✓) Cut both leads on a 500Ω, 5W, 10% RESISTOR, R1 to 1". Cover both leads with a 3/4" piece of TUBING.
CONNECT from C2-A (S2) to C2-B (C).

16 (✓) Cut both leads on a 500Ω, 5W, 10% RESISTOR, R2 to 1". Cover both leads with a 3/4" piece of TUBING.
CONNECT from C2-B (S3) to C2-C (C).

17 (✓) Cut both leads on a 3300Ω, 1/2W, 10% RESISTOR, R24 to 1/2".
CONNECT from TB5-1 (S3) to TB5-2 (C).

18 (✓) Cut both leads on a 3300Ω, 1/2W, 10% RESISTOR, R21 to 1/2".
CONNECT from TB5-2 (S3) to TB5-3 (S3).

19 (✓) Cut both leads on a .01ufd, DISC CAPACITOR, C18 to 3/4".
CONNECT from lug "U" (S3) to PC1-10 (S2).

20 (✓) Cut both leads on a .01ufd, DISC CAPACITOR, C3 to 3/4". Cover both leads with a 1/2" piece of TUBING.
CONNECT from C2-C (S3) to lug "Q" (S1) on C2.

21 (✓) Connect one side of the line cord to TB2-2 (S2) and the other side to TB2-3 (S2).

Figure 11

Dial Cord Stringing

GENERAL INFORMATION: Position the chassis as shown in the drawing looking in at the rear of the sub-panel. Dip one end of the DIAL CORD in some nail lacquer or shellac to prevent fraying.

1. (✓) Make a loop knot on one end of the DIAL CORD.
2. (✓) Place the point of a pencil into the loop. Stretch the dial cord taut. Mark off exactly 35".
3. (✓) Tie the dial cord at the 35" MARK, to ONE end of the SPRING. Make a double knot.
4. (✓) Loosen the setscrew of the LARGE PULLEY and rotate it until the opening on the rim is facing up, as shown. Then retighten the screw.
5. (✓) Turn the SMALL PULLEY on the FM FRONT END to the extreme clockwise position. (Turn all the way to the right) as indicated by the arrow in the figure.

NOTE: At this point check both pulleys for freedom of movement. Make certain that they are not touching any part of the bracket or the chassis flange. Also adjust the pulleys so that their GROOVED CHANNELS are IN LINE with each other.

6. (✓) Remember to tighten the setscrews once the line up of both wheels are made.
7. (✓) Catch the looped end of the dial cord to point "A" on the large pulley.
8. (✓) Feed the end of the cord with the spring through the opening on the rim. Loop the dial cord around the CHANNEL of the LARGE PULLEY 1-1/2 times coming out at the bottom of the wheel, as shown in the detail.

9 ( ) Feed the spring around the SMALL PULLEY 2-1/2 times starting FROM THE BOTTOM.

10 ( ) Feed the spring through the opening of the LARGE PULLEY once more. Hold the SMALL PULLEY so that it doesn't rotate and hook the open end of the spring to point "B".

11 ( ) If the dial cord is of the proper length and all the instructions have been followed correctly, then the spring should have to be stretched partially open to hook onto point "B" and thus make the dial cord taut. If the spring can hook on to point "B" without stretching enough to obtain moderate tension, or would have to be stretched beyond its elastic limit to hook on, then the dial cord length must be corrected. Do this by untieing the double knot in the dial cord on the end of the spring, and either lengthening or shortening the dial cord as required before re-making the double knot. Place some nail lacquer or shellac on the knot for permanence.

Figure 12
Final Assembly

1 ( ) Insert the GROOVED portion of a PLASTIC FOOT into one of the four holes on the BOTTOM PLATE. Hold the bottom as shown in the drawing.

SECURE it by pressing the small protruding PLASTIC CYLINDER into the foot so that the grooved portion expands and holds it in the bottom plate.

( ) Mount the remaining three feet in a similar manner.

2. ( ) Snap into the rectangular cutouts on the BOTTOM PLATE the two No. 6-32 TINNERMAN NUTS. (Make certain that the flat surface of the nuts are facing toward you, as shown).

3. ( ) Mount the BOTTOM PLATE to the chassis, as shown. SECURE it with nine No. 6 self-tapping screws.

4. ( ) Remove the tape on the two FELT CUSHIONS and place the adhesive side on the channels of the sub-panel, as shown.

5. ( ) Apply a drop of GLUE from the capsule supplied, to the NOTCHED surface of the PLASTIC BAR. Press it onto the rectangular cutout on the front panel. Wipe off any excess glue from the front of the panel.

6. ( ) Mount the FRONT PANEL to the sub-panel. SECURE it with two No. 6-32 x 5/16 BROWN screws.

Figure 13

Dial Setting Procedure

1. ( ) Place the PLASTIC DIAL over the SHAFT of the VERNIER DRIVE, as shown.
   SECURE it with two No. 2-56 x 1/4" screws. DO NOT tighten excessively or the dial may crack.

2. ( ) Loosen the setscrew on the LARGE PULLEY. Rotate and hold the SMALL PULLEY in the extreme clockwise position (turn all the way to the right), as indicated by the arrow.

   ( ) While holding the SMALL PULLEY, turn the shaft of the drive so that the first line above "88" on the plastic dial is directly over the apex (tip) of the triangle on the WHITE WINDOW. See the detail drawing of the plastic dial.

(✓) RE-TIGHTEN the SET SCREW on the LARGE PULLEY making certain that none of the parts previously adjusted move. As a precautionary measure re-tighten all of the set screws on the entire drive assemble to prevent slippage.

3 (✓) Press the LARGE KNOB over the drive shaft.

4 (✓) Insert all of the tubes, V1 through V11 into their respective sockets as indicated by the tube layout label.

5 (✓) Snap a TUBE SHIELD over V8 and V9 on the MX BOARD.

6 (✓) Insert the 2 AMP FUSE, F1 into the fuseholder.

7 (✓) Mount the FRONT SHIELD, as shown in the detail.
Place the shield over the SUB-PANEL and insert the locking tab onto the flange on the chassis.
SECURE it with two No. 6 self-tapping screws in side flanges of the sub-panel and shield.

8 (✓) Place the TUBE LAYOUT LABEL on the vertical surface of the FRONT SHIELD so it can easily be viewed.