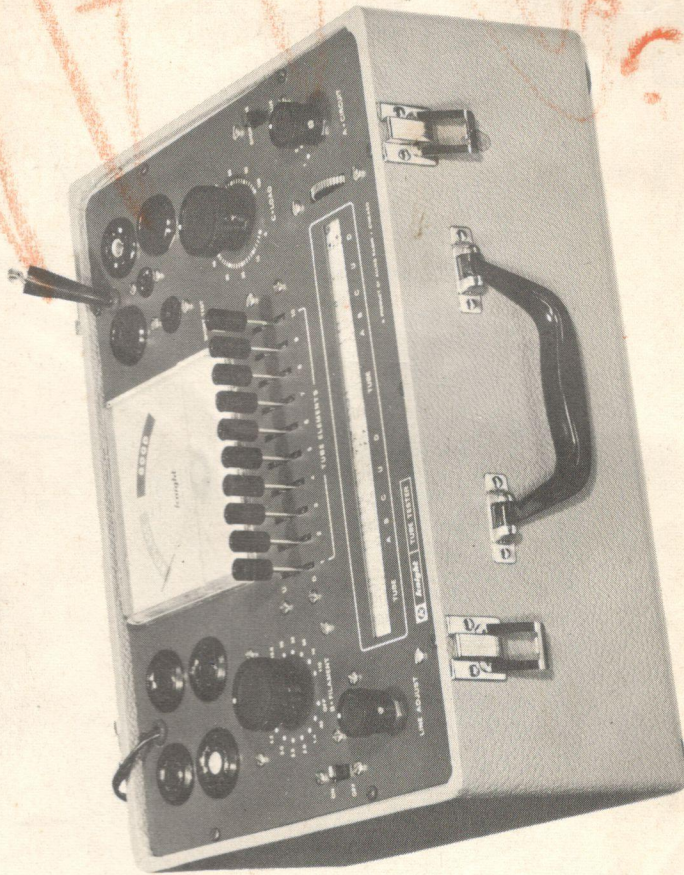


knight-kits



Allied knight-kit[®] TUBE TESTER 83YX142 83YX143



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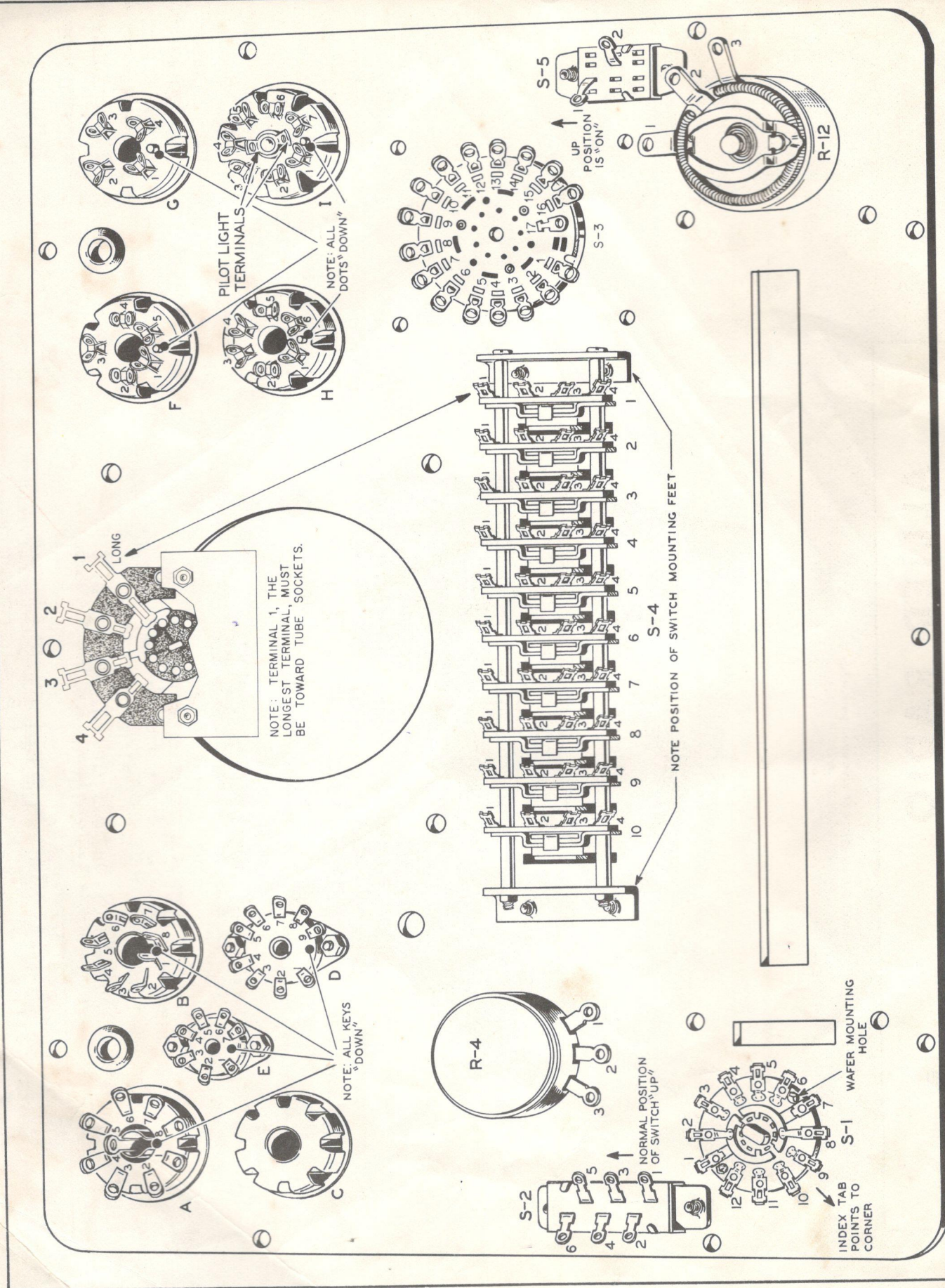


FIGURE 1. HOW TO MOUNT THE PARTS ON THE PANEL.

HOW TO BUILD THE TUBE TESTER

This fine Tube Tester is designed especially for the radio-TV serviceman and the laboratory technician. It is a reliable and accurate instrument which tests all 4, 5, 6 and 7-pin types, as well as octal, loktal, and 9-pin miniatures and pilot lamps. Tubes with new base wiring may be checked because the universal socket pin selectors eliminate any need for wiring changes. The blank socket permits the addition of wiring to accommodate new sockets as they are developed. Compensation for line voltage variation is provided and may be adjusted from the front panel. Front panel selection of filament voltages from .63 to 110 volts in 16 steps is clearly marked.

Each of these features saves valuable time in your service or laboratory work. You can check

Place a pad or a soft cloth on your work table to protect the finish on the front panel.

See Figure 1.

Begin building your kit by mounting the tube sockets. Notice the placement of the sockets for keyway location and socket locations. The sockets are located and identified as follows:

every tube in a radio or TV set quickly and accurately, just follow the settings of the controls given by the roll chart, and press the "Value" switch for the reading on the tube.

Cathode ray tubes may be checked with the TV Picture Tube Adapter, which is available as an accessory.

Building your Tube Tester kit will be easier if you study all of the diagrams and instructions before any assembly is started.

Check all of the parts against the Parts List as you unpack the Tube Tester Kit package. If you are unable to identify some of the parts by sight, locate them on the pictorial diagrams. Resistor values, if not printed on the part, may be found with the aid of the color code chart.

HOW TO MOUNT PARTS ON THE PANEL. See Figure 1.

A group of five holes in the upper left corner of the panel, with the panel face down on the table:

"A"	Loktal
"B"	Octal
"C"	Blank
"D"	9-pin miniature
"E"	7-pin miniature

Hardware is listed in the last part of the Parts List. To keep our kits at the lowest possible price, we frequently weigh hardware rather than to count it one by one. Therefore, do not be concerned if more nuts and machine screws, for example, are supplied than are specified in the Parts List.

The only tools you will need are: long-nose pliers, diagonal cutters, a screwdriver, a small set-screw driver, a hammer, and a soldering iron.

The pictorial diagrams show the actual location of all parts and wiring. The Tube Tester will work best when all parts are placed as shown in the diagrams. The schematic diagram shows how the parts are connected electrically, and is useful in understanding how the Tester works.

A group of four holes in the upper right corner of the panel:

"F"	5-pin
"G"	4-pin
"H"	6-pin
"I"	7-pin large.

May we suggest that you mark each socket location on the panel with the corresponding letter with a crayon or chalk.

The seven large tube sockets mount with split-type retainer rings. Six of these rings are of identical size, and the seventh is slightly larger and is used to mount the 7 pin large socket. See Figure 2 for the manner in which the retainer ring is installed.

In the upper left corner:

() Mount socket "A", the loktal socket, from the front of the panel through the hole in the upper left corner. The keyway must be as shown in Figure 1, facing straight down toward the bottom edge of the panel. Use one of the smaller split retainer rings to securely fasten this socket in position.

() Mount socket "B", the octal socket, from the front of the panel and install the split retainer ring over the rear of the socket as shown in Figure 2. The Keyway of socket "B" must also be toward the bottom edge of the panel.

() Mount socket "C", the blank socket, in the same way.

() Mount socket "D", the 9-pin miniature socket, from the rear of the panel. The keyway on this socket is slightly toward the lower left corner of the panel. Use two of the medium sized machine screws and hex nuts to securely fasten socket "D".

() Mount socket "E", the 7-pin miniature socket, from the rear of the panel. The keyway on this socket is also slightly toward the lower left corner of the panel. Use two of the medium sized machine screws and hex nuts to fasten socket "E".

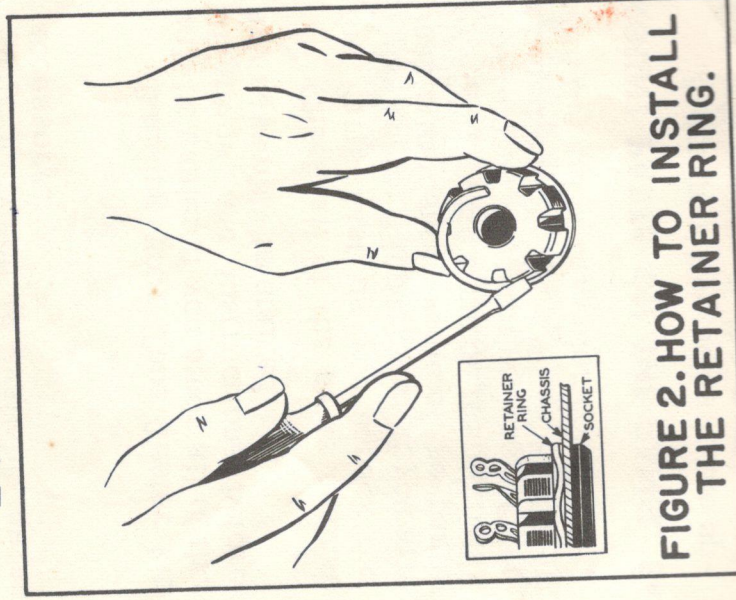


FIGURE 2. HOW TO INSTALL THE RETAINER RING.

In the upper right corner:

() Mount socket "F", the 5-pin socket, from the front of the panel. Install the split retainer ring over the rear of the socket as shown in Figure 2. The raised dot on the socket base is the keyway for this type socket. This dot must be toward the bottom edge of the panel.

() Mount socket "G", the 4-pin socket, from the front of the panel. Install the split retainer ring over the rear of the socket. The raised dot on this socket must also be toward the bottom edge of the panel.

() Mount socket "H", the 6-pin socket, from the front of the panel. Install the split retainer ring over the rear of the socket. The raised dot on socket "H" must also be toward the bottom edge of the panel.

() Mount socket "I", the 7-pin large socket, from the front of the panel. Install the large split retainer ring over the rear of the socket. Here, too, the raised dot must be toward the bottom edge of the panel.

The ten lever switches, designated as S-4 on the diagrams, are factory mounted on a common bracket for ease in mounting to the panel.

() Mount S-4 on the rear of the panel. This switch must be positioned as shown in Figure 1, with the mounting feet of the bracket pointing to the left. Slip the levers through the slots in the panel, and fasten securely with four of the larger machine screws.

() Mount S-1, the "A" circuit switch, which is the 12 terminal rotary wafer switch, in the lower left corner of the panel. The wafer mounting hole and the index tab must be positioned as shown in Figure 1. Use one of the large nuts and a shakeproof washer over the threaded bushing of the switch before inserting the bushing through the panel. Use another of the large nuts on the threaded bushing on the outside of the panel. Tighten this nut. The top of the threaded bushing and the top of the nut on the outside of the panel should be flush.

() Mount S-2, the double pole - double throw, spring-return, Short-Value slide switch, from the rear of the panel in the slot at the left edge of the panel. Position this switch so that the button is in the SHORT-LINE or up position when not in use. Use two of the larger machine screws to fasten S-2.

() Mount R-4, the 200 ohm, "C" load potentiometer, from the rear of the panel. Use a large nut and a shakeproof washer over the threaded bushing before inserting the bushing through the panel. Use another nut over the threaded bushing on the front of the panel and tighten.

() Mount S-3, the 16 position rotary switch from the rear of

the panel in the large hole at the right end of S-4. The portion of this switch with no terminals must be toward the bottom edge of the panel. Use a large nut and a shakeproof washer over the threaded bushing before inserting the bushing through the hole in the panel. Use another large nut over the threaded bushing on the front of the panel and tighten.

() Mount S-5, the single pole - single throw, ON-OFF slide switch, from the rear in the slot at the right edge of the panel. The two terminals on S-5 must be toward the top of the panel. Use two of the larger machine screws to mount S-5.

() Mount R-12, 175 ohm, 25 watt, wire wound potentiometer, in the large hole at the lower right corner of the panel. Use a large nut and a shakeproof washer on the threaded bushing before inserting the bushing through the hole in the panel. Use another large nut on the threaded bushing and tighten.

() Insert the two smaller rubber grommets in the two holes near the top edge of the panel as shown in Figure 1.

You have completed the preliminary parts mounting. The roll chart, meter, and transformer will be mounted later.

WIRING AND SOLDERING

The quality of workmanship in test equipment is often the determining factor whether an instrument will be an accurate and reliable service and laboratory tool. While these wiring and soldering hints will be more helpful to a beginner in electronics, the more experienced builder may also benefit by reviewing them.

HOW TO CARE FOR YOUR SOLDERING IRON

Your soldering iron is the key to good soldering since it supplies the essential ingredient - HEAT. If the tip is covered by a dirt (oxide) film, the iron will not be able to transfer its full heat. A new tip can be protected from film by coating it with solder the first time it is heated. An old tip should first be cleaned with a file until bare copper is exposed. Then coat it with solder like a new tip.

Never use the iron like a brush -- soldering is not a paste-spreading operation. To get the most heat out of the iron, always press the iron firmly to the connection. Hold it so the greatest tip surface is directly in contact with the connection.

THIS KIT MUST BE PROPERLY SOLDERED!

WITHOUT GOOD SOLDERING, AN ELECTRONIC UNIT WILL NOT WORK . . . just as a suit of clothing will fall apart if the stitches are loose . . . no matter how excellent the material.

USE ENOUGH HEAT

This is the main idea of good soldering. The purpose of soldering is to join metal parts, making an **UNBROKEN** metal path over which electricity can travel. To do this you must apply enough heat to the metal surfaces to make the solder spread freely on them, until the contour (shape) of the connection shows under the solder. If the solder barely melts and forms a rounded ball, *you are not using enough heat*. If you do not use enough heat, there may be no electrical connection, although it appears soldered.

HERE'S HOW TO DO IT . . .

1. Join bare metal to bare metal.
2. Coat the tip of a hot iron with solder.
3. **FIRMLY PRESS THE FLAT SIDE OF THE TIP OF A HOT IRON FLAT** against the parts to be soldered together. Keep it there while you apply the solder **BETWEEN THE IRON TIP AND THE METAL TO BE SOLDERED**. Use only enough solder for it to flow over **ALL** the surfaces of the connection. Remove the iron.
4. **DO NOT MOVE PARTS UNTIL THE SOLDER HARDENS**. If you accidentally move the wires as the solder is hardening, apply your iron and reheat.

Compare your soldering with the pictures on this page. You have a good connection if your solder has flowed over all surfaces to be connected, following the shape of the surfaces. It should appear smooth and bright.

YOU HAVE NOT USED ENOUGH HEAT: If your connection is rough and flaky-looking, or if the solder has formed a round ball instead of spreading.

The difference between good soldering (enough heat) and poor soldering (not enough heat) is just a few extra seconds with a hot iron **FIRMLY** applied. Remember, larger metal surfaces take a longer time to heat.

USE A 100-WATT IRON

A 100-watt soldering iron with a clean, chisel-shaped tip will supply the right amount of heat when used correctly. Notice how the iron is held in the picture. Heat the iron for 10 minutes before you start soldering. Keep the tip brightly coated with solder. When necessary, wipe the hot tip clean with a cloth. (If you use a soldering gun, be sure the tip reaches full heat before you solder.)

USE ONLY ROSIN CORE SOLDER

We supply the right kind of solder (*rosin core solder*). Do not use any other kind of solder! **USE OF ACID CORE SOLDER, PASTE, OR IRONS CLEANED ON A SAL AMMONIAC BLOCK WILL RUIN ANY ELECTRONIC UNIT AND WILL VOID THE GUARANTEE.**

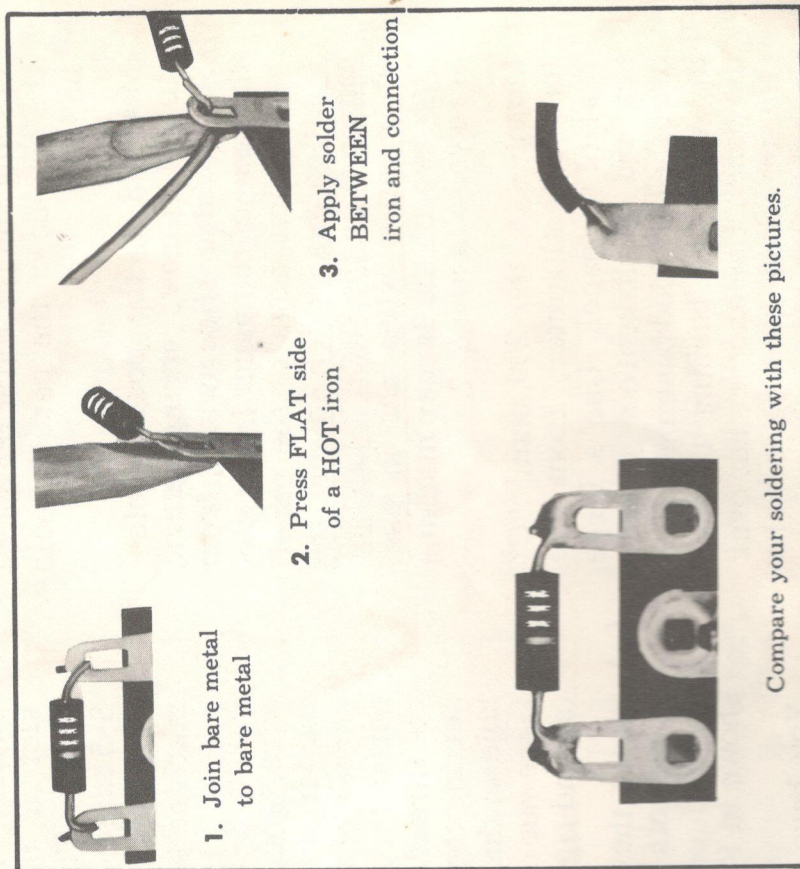


FIGURE 3. THE ONE-TWO-THREE OF GOOD SOLDERING



WIRING THE LEVER SWITCH

See Figure 4.

Begin wiring with the lever switch, S-4. The sections are numbered 1 through 10, reading from right to left. Each switch section has 4 terminals numbered 1 through 4, reading down from the terminal nearest the top of the panel.

() Straighten one of the 6" lengths of bare wire and thread it through the number 2 terminal of each section of S-4. Crimp one end of the wire around terminal 2 of section 10. Pull the wire tight and crimp the other end around terminal 2 of section 1. Solder all of the terminal 2 connections except sections 1 and 10.

() Straighten another 6" bare wire and thread it through the number 3 terminal of each section of S-4. Crimp one end of the wire around terminal 3 of section 10. Pull the wire tight and crimp the other end around terminal 3 of section 1. Solder all of the terminal 3 connections except section 1.

() Straighten the remaining 6" bare wire and thread it through the number 4 terminal of each section. Crimp one end of the wire around terminal 4 of section 10. Pull the wire tight and crimp the other end around terminal 4 of section 1. Solder all of the terminal 4 connections except section 10.

() Study figure 5. Prepare one piece of plastic tubing as follows: Cut a small slit in the tubing 1/2" from one end. Cut another slit 1 1/2" from the first. Repeat the process until you have 8 slits in the tubing.

() Solder one end of a 4" yellow wire to terminal 1 of section 1 of S-4. Connect, but do not solder, the other end to pin 1 of socket H.

() make a right angle bend in a 5" green wire 1" from one end. Insert the long end of the wire through the first slit made in the plastic tubing. Pull the wire through until the bend is just inside the tubing. Solder the

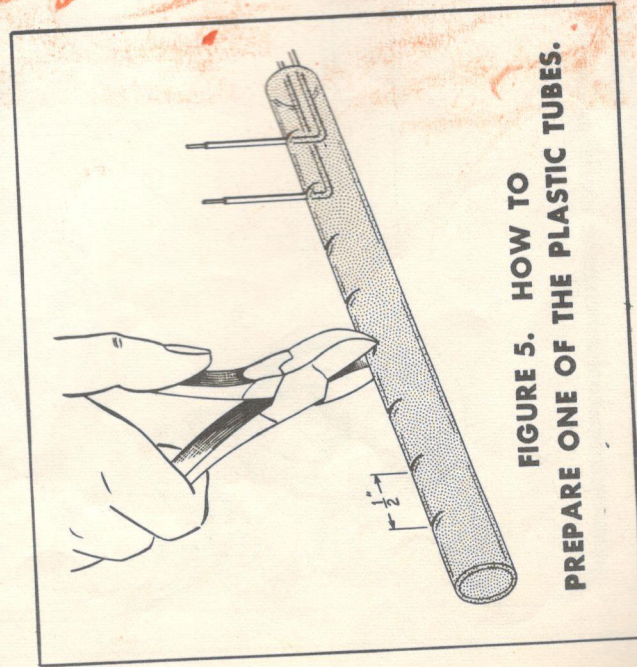


FIGURE 5. HOW TO PREPARE ONE OF THE PLASTIC TUBES.

short end of the wire to terminal 1 of section 2 of S-4. Connect, but do not solder, the other end to pin 2 of socket H.

() Make a right angle bend in a 6" blue wire 1" from one end. Insert the long end of the wire through the second slit made in the plastic tubing. Pull the wire through until the bend is just inside the tubing. Solder the short end of the wire to terminal 1 of section 3 of S-4. Connect, but do not solder, the other end of the wire to pin 3 of socket H.

() Make a right angle bend in an 8" grey wire 1" from one end. Insert the long end through the third slit. Solder the short end to terminal 1 of section 4 of S-4. Connect, but do not solder, the other end to pin 4 of socket F.

() Make a right angle bend in an 8" grey wire 1" from one end. Insert the long end through the fourth slit. Solder the short end to terminal 1 of section 5 of S-4. Connect, but do not solder, the other end to pin 5 of socket F.

() Make a right angle bend in a 7" violet wire 1" from one end. Insert the long end through the fifth slit and route it as shown. Solder the short end to terminal 1 of section 6 of S-4. Connect but do not solder, the other end to pin 6 of socket D.

() Make a right angle bend in a 6" blue wire 1" from one end. Insert the long end through the sixth slit. Solder the short end to terminal 1 of section 7 of S-4. Connect, but do not solder, the other end to pin 7 of socket D.

() Make a right angle bend in a 6" blue wire 1" from one end. Insert the long end through the seventh slit. Solder the short end to terminal 1 of section 8 of S-4. Connect, but do not solder the other end to pin 8 of socket D.

() Make a right angle bend in a 5" green wire 1" from one end. Insert the long end through the last slit in the plastic tubing. Solder the short end to terminal 1 of section 9 of S-4. Solder the other end to pin 9 of socket D.

() Insert one end of the 20 inch black rubber covered grid lead through the rubber grid cap insulator. Strip the insulation from 1/2 inch of one end of this lead. Tin the stripped end and fasten it tightly to the grid clip. There are two small prongs at the back of the grid cap clip. Bend each prong around the wire until the insulation is firmly held by these prongs. Now position the rubber insulator over the cap and lead.

() Insert the other end of the black grid lead through the grommet in the upper left corner of the panel. Knot this grid cap lead 6 inches from the end on the inside of the panel. Connect this end to terminal 1 of section 10 of S-4. Solder this connection.

() Insert the line cord through the grommet in the right corner of the panel. Knot the cord 10 inches from the stripped ends. Split the cord back two inches from the stripped ends. Connect one section of the line cord to terminal 2 of S-5, the ON-OFF switch. Solder this connection.

() Connect the other section of the line cord to terminal 2, the center terminal, of R-12, the 175 ohm, 25 watt, line potentiometer. Solder this connection.

() Connect one end of a 6 inch blue lead to the top pilot light terminal of socket "I". Solder this connection. Connect the other end of this lead to terminal 3 of section 1 of S-4. Do not solder this connection.

() Connect one end of a 5 inch green lead to the bottom pilot light terminal of socket "I". Solder this connection. Connect the other end of this lead to terminal 2 of section 1 of S-4. Do not solder this connection.

WIRING OF THE TUBE SOCKETS.

See Figure 6.

() Connect a 3 inch orange lead to pin 1 of socket "H". Do not solder this connection. Connect the other end to pin 1 of socket "I". Solder this connection.

() Connect a 3 inch orange lead to pin 1 of socket "H". Solder this connection. Connect the other end to pin 1 of socket "F". Do not solder this connection.

() Connect a 3 inch orange lead to pin 1 of socket "F". Do not solder this connection. Connect the other end to pin 1 of socket "G". Solder this connection.

() Connect a 4 inch yellow lead to pin 2 of socket "H". Do not solder this connection. Connect the other end to pin 2 of socket "I". Solder this connection.

() Connect a 3 inch orange lead to pin 2 of socket "H". Solder this connection. Connect the other end to pin 2 of socket "F". Do not solder this connection.

() Connect a 4 inch yellow lead to pin 2 of socket "F". Do not solder this connection. Connect the other end to pin 2 of socket "G". Solder this connection.

() Connect a 3 inch orange lead to pin 3 of socket "H". Connect the other end to pin 3 of socket "I". Do not solder either connection.

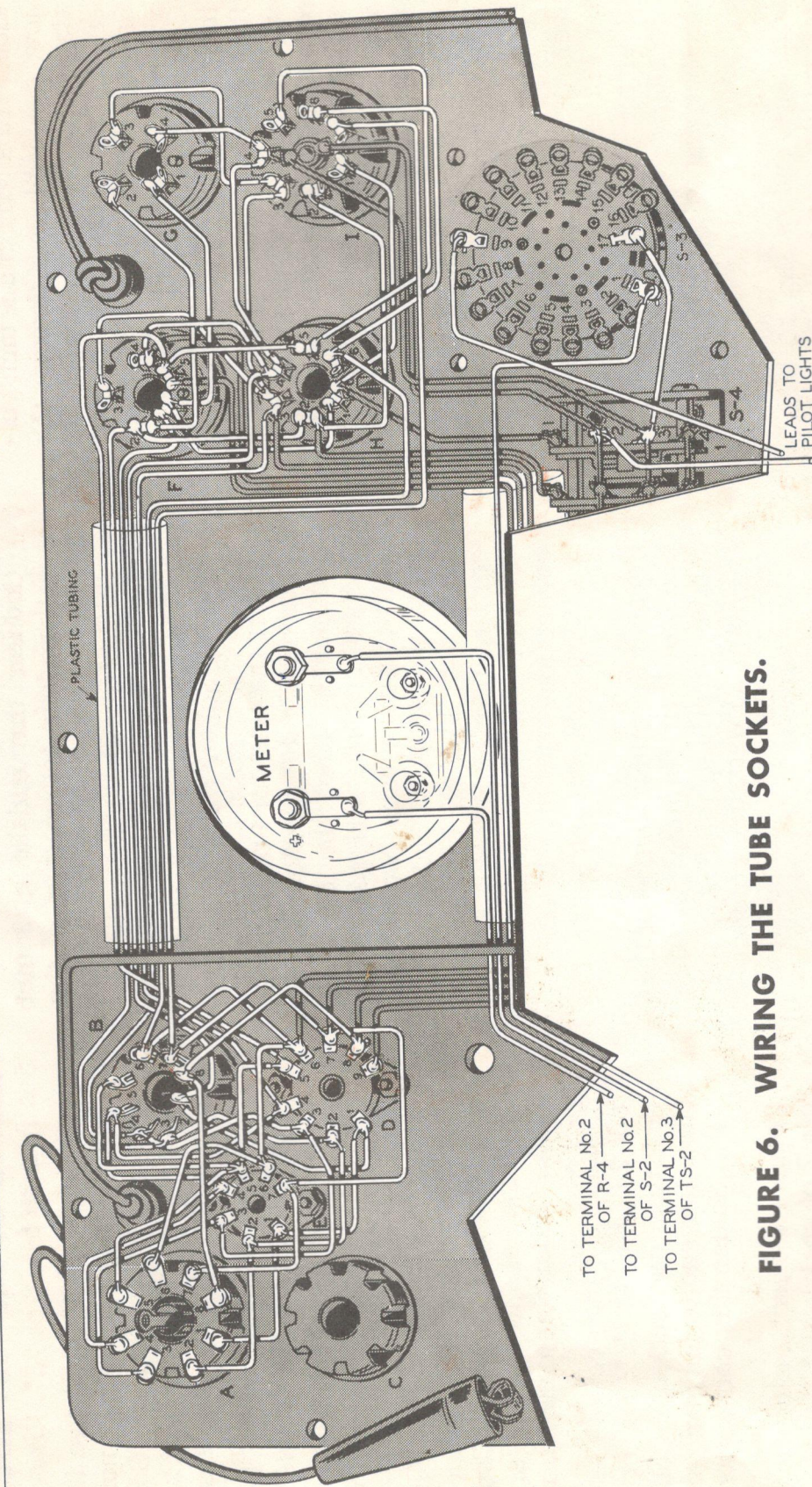


FIGURE 6. WIRING THE TUBE SOCKETS.

- () Connect a 3 inch orange lead to pin 3 of socket "I". Connect the other end to pin 3 of socket "G". Solder both connections.
- () Connect a 2 inch red lead to pin 4 of socket "H". Do not solder this connection. Connect the other end to pin 4 of socket "F". Solder this connection.
- () Connect one end of a 3 inch orange lead to pin 5 of socket "H". Connect the other end to pin 5 of socket "F". Do not solder either connection.
- () Connect a 4 inch yellow lead to pin 3 of socket "H". Do not solder this connection. Connect the other end to pin 3 of socket "F". Solder this connection.
- () Connect one end of a 3 inch orange lead to pin 5 of socket "H". Connect the other end to pin 5 of socket "F". Do not solder either connection.

() Connect one end of a 4 inch yellow lead to pin 5 of socket "H". Connect the other end to pin 5 of socket "I". Solder both connections.

() Connect one end of a 4 inch yellow lead to pin 6 of socket "H". Do not solder this connection. Connect the other end to pin 6 of socket "I". Solder this connection.

This is the main wiring between the four sockets in the upper right corner of the panel. The only connections still to be made are the cabling which goes across the top of the meter.

In the upper left corner of the panel:

() Connect one end of a 3 inch orange lead to pin 1 of socket "D". Connect the other end to pin 1 of socket "B". Do not solder either connection.

() Connect one end of a 2 inch red lead to pin 1 of socket "D". Solder this connection. Connect the other end to pin 1 of socket "E". Do not solder this connection.

() Connect one end of a 2 inch red lead to pin 1 of socket "E". Connect the other end to pin 1 of socket "A". Solder both connections.

() Connect one end of a 3 inch orange lead to pin 2 of socket "D". Connect the other end to pin 2 of socket "E". Do not solder either connection.

() Connect one end of a 2 inch red lead to pin 2 of socket "D". Solder this connection. Connect the other end to pin 2 of socket "B". Do not solder this connection.

() Connect one end of a 2 inch red lead to pin 2 of socket "E". Connect the other end to pin 2 of socket "A". Solder both connections.

() Connect one end of a 3 inch orange lead to pin 3 of socket "D". Connect the other end to pin 3 of socket "B". Do not solder either connection.

() Connect one end of a 3 inch orange lead to pin 3 of socket "D". Solder this connection. Connect the other end to pin 3 of socket "E". Do not solder this connection.

() Connect one end of a 4 inch yellow lead to pin 3 of socket "E". Connect the other end to pin 3 of socket "A". Solder both connections.

() Connect one end of a 3 inch orange lead to pin 4 of socket "D". Connect the other end to

pin 4 of socket "B". Do not solder either connection.

() Connect one end of a 2 inch red lead to pin 4 of socket "B". Solder this connection. Connect the other end to pin 4 of socket "E". Do not solder this connection.

() Connect one end of a 4 inch yellow lead to pin 4 of socket "E". Connect the other end to pin 4 of socket "A". Solder both connections.

() Connect one end of a 2 inch red lead to pin 5 of socket "D". Connect the other end to pin 5 of socket "E". Do not solder either connection.

() Connect one end of a 3 inch orange lead to pin 5 of socket "E". Do not solder this connection. Connect the other end to pin 5 of socket "B". Solder this connection.

() Connect one end of a 3 inch orange lead to pin 5 of socket "E". Connect the other end to pin 5 of socket "A". Solder both connections.

() Connect one end of a 2 inch red lead to pin 6 of socket "D". Connect the other end to pin 6 of socket "E". Do not solder either connection.

() Connect one end of a 3 inch orange lead to pin 6 of socket

"D". Solder this connection. Connect the other end to pin 6 of socket "B". Do not solder this connection.

() Connect one end of a 4 inch yellow lead to pin 6 of socket "E". Connect the other end to pin 6 of socket "A". Solder both connections.

() Connect one end of a 3 inch orange lead to pin 7 of socket "D". Connect the other end to pin 7 of socket "E". Do not solder either connection.

() Connect one end of a 3 inch orange lead to pin 7 of socket "D". Solder this connection. Connect the other end to pin 7 of socket "B". Do not solder this connection.

() Connect one end of a 3 inch orange lead to pin 7 of socket "E". Connect the other end to pin 7 of socket "A". Solder both connections.

() Connect one end of a 3 inch orange lead to pin 8 of socket "D". Solder this connection. Connect the other end to pin 8 of socket "B". Do not solder this connection.

() Connect one end of a 5 inch green lead to pin 8 of socket "B". Connect the other end to pin 8 of socket "A". Solder both connections.

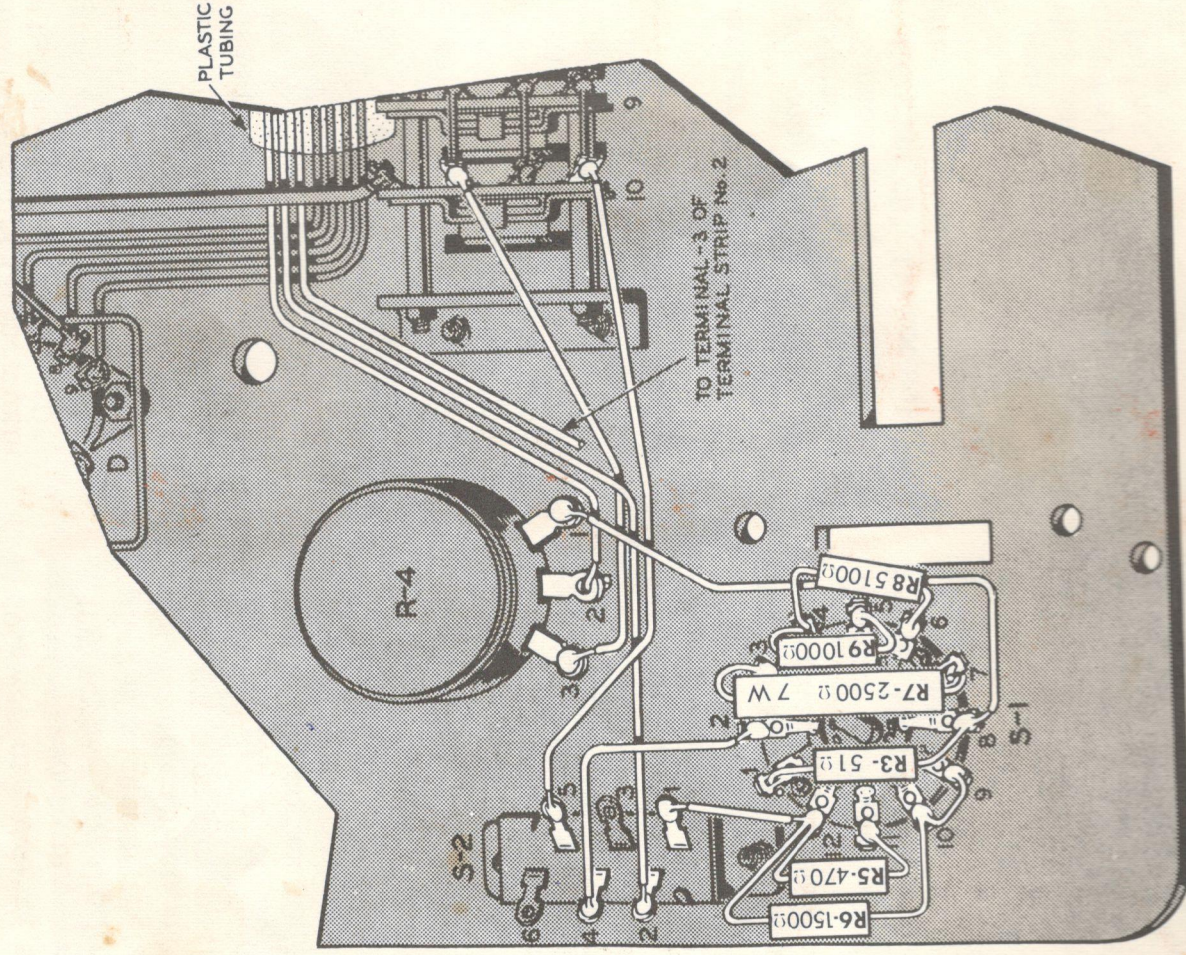


FIGURE 7.

WIRING THE "A" SWITCH, "VALUE" SWITCH, AND R-4.

Use the other piece of 5" plastic tubing to form the cable which is shown across the top of the meter in Figure 6. Do not slit it.

() Pass an 8 inch grey lead through the tubing. Solder one end of this 8 inch grey lead to pin 1 of socket "F". Solder the other end to pin 1 of socket "B".

() Pass a 9 inch white lead through the tubing. Solder one end to pin 2 of socket "F". Solder the other end to pin 2 of socket "B".

() Pass a 10 inch brown lead through the tubing. Solder one end to pin 3 of socket "H". Solder the other end to pin 3 of socket "B".

() Pass an 11 inch white with brown tracer lead through the tubing. Solder one end to pin 4 of socket "H". Solder the other end to pin 4 of socket "D".

() Pass another 10 inch brown lead through the tubing. Solder one end to pin 5 of socket "F". Solder the other end to pin 5 of socket "D".

() Pass a 12 inch white with red tracer lead through the tubing. Solder one end to pin 6 of socket "H". Solder the other end to pin 6 of socket "B".

() Pass another 12 inch white with red tracer lead through the tubing. Solder one end to pin 7 of socket "I". Solder the other end to pin 7 of socket "B".

() Mount the meter from the front of the panel. Place a split lockwasher and a small nut over the two top meter mounting screws and the lower right screw. Tighten these. If the nuts, washers, and solder lugs are not mounted on the meter terminals, mount them as follows: A large nut, a flat washer, a solder lug, another flat washer, and another nut. Tighten each nut.

() Insert an 8 inch grey lead through the third slit from the left end in the first plastic tube. This is the slit for section 7 of S-4. Connect this end of the 8 inch grey lead to the positive terminal, marked with the plus (+) sign, of the meter. Solder this connection. The other end of this lead will be connected later to terminal 2 of R-4.

() Insert an 11 inch white with brown tracer lead through the fourth slit from the right end of the first plastic tube. This is the slit for section 5 of S-4. Connect this end to the negative, or unmarked, terminal of the meter. Solder this connection. The other end of this lead will be connected later to terminal 2 of S-2.

() Insert a 12 inch white with red tracer lead through the first plastic tube along the top of S-4. Connect one end of this lead to terminal 1 of S-3, the filament

switch. Do not solder this connection yet. The other end of this lead will be connected later to terminal 3 of terminal strip 2.

() Solder one end of a 4 inch yellow lead to terminal 17 of S-3, the filament switch. Solder the other end to terminal 3 of section 1 of S-4.

() Connect one end of an 8 inch grey lead to terminal 9 of S-3. Do not solder this connection. The other end of this lead will be connected later to one of the pilot light connections.

() Connect one end of a 5 inch green lead to terminal 2 of section 1 of S-4. Do not solder this connection. The other end of this 5 inch green lead will be connected later to one of the pilot light connections.

() Check all of the work against Figure 6 and Figure 7.

All of the wiring is now complete to the tube sockets and the meter.

See Figure 7.

S-1, the 2 pole - 4 position rotary wafer "A" switch, has 2 dummy terminals which are used as tie points. The switch terminals are numbered in a clockwise direction. The wafer mounting hole, toward the top of the panel is used as the key-way, as shown in Figure 1. Terminal 1 is immediately to the right of the wafer mounting hole, terminal 2 is next, through to terminal 12. Terminals 1 and 7 are the dummy terminals.

() Trim each end lead of R-3, 51 ohm, 1/2 watt, resistor marked with the color bands green, brown, and black. Connect one end lead to terminal 1 of S-1. Connect the other end lead to terminal 8 of S-1. Do not solder either connection.

() Connect one end of a 3 inch orange lead to terminal 2 of S-1. Connect the other end to terminal 4 of S-2. Terminal 4 is the middle terminal near the left edge of the panel of S-2, the short-value switch. Solder both connections.

() Trim each pigtail of R-7, the large resistor stamped with 2500 ohms, 7 watts. Connect one end lead to terminal 3 of S-1. Solder this connection. Connect the other end lead to terminal 7 of S-1. Do not solder this connection.

() Trim each end lead of R-8, 5100 ohm, 1/2 watt, resistor (green, brown, red). Connect one end lead to terminal 4 of S-1. Do not solder this connection. Connect the other end lead to terminal 6 of S-1. Solder this connection.

() Trim each end lead of R-9, 1000 ohm, 1/2 watt, resistor (brown, black, red). Connect one end lead of R-9 to terminal 4 of S-1. Do not solder this connection. Connect the other end lead of R-9 to terminal 5 of S-1. Solder this connection.

() Connect one end of a 5 inch green lead to terminal 8 of S-1. Connect the other end to terminal 1 of R-4, the 200 ohm "C" load potentiometer. Terminal 1 of R-4 is the terminal nearest section 10 of S-4. Solder both connections.

() Connect one end of a 1/2 inch bare wire to terminal 9 of S-1. Solder this connection. Connect the other end to terminal 10 of S-1. Do not solder this connection.

() Trim each end lead of R-6, 1500 ohm, 1/2 watt, resistor (brown, green, red). Connect one end lead of R-6 to terminal 10 of S-1. Solder this connection. Connect the other end lead to terminal 12 of S-1. Do not solder this connection.

() Trim each end lead of R-5, 470 ohm, 1/2 watt, resistor, (yellow, violet, brown). Connect one end lead of R-5 to terminal 11 of S-1. Solder this connection. Connect the other end lead to terminal 12 of S-1. Do not solder this connection.

() Connect one end of a 2 inch red lead to terminal 12 of S-1. Connect the other end to terminal 1 of S-2. Solder both connections.

The "A" circuit switch, S-1, is now wired except for three leads from the transformer. These connections will be made when the transformer is installed.

() Connect the loose end of the 11 inch white with brown tracer lead from the negative terminal of the meter to terminal 2 of S-2, the Short - Value switch. Solder this connection.

() Connect the loose end of the 8 inch grey lead from the positive terminal of the meter to terminal 2, the center terminal of R-4. Do not solder this connection.

() Connect one end of a 6 inch blue lead to terminal 5 of S-2. Connect the other end to terminal 4 of section 10 of S-4. Solder both connections.

() Connect one end of a 5 inch green lead to terminal 2 of section 10 of S-4. Connect the other end to terminal 3 of R-4. Solder both connections.

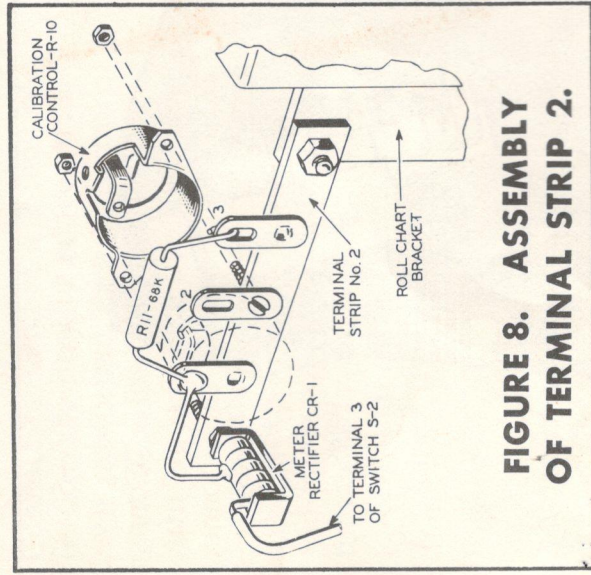


FIGURE 8. ASSEMBLY OF TERMINAL STRIP 2.

See Figure 8.

- () Mount R-10, the 1200 ohm variable calibration control on terminal strip 2, the three-lug terminal strip. This is the terminal strip which does not have any mounting lugs. Use one of the very small machine screws and hex nuts to mount R-10. Pass the small screw through the hole of the center terminal of terminal strip 2 and through the right mounting tab of R-10, as shown in Figure 8.

- () Mount CR-1, the meter rectifier, through the left end hole of terminal strip 2. Use the mounting screw of CR-1 to secure the other mounting tab of R-10. Fasten both items securely with the lockwasher and hex nut supplied with CR-1.

- () Trim each end lead of R-11, 68K ohm, 1/2 watt, resistor marked with the color bands blue, grey, and orange. Connect one end lead of R-11 to terminal 3 of terminal strip 2. Connect the other end lead of R-11 to terminal 1 of terminal strip 2. Do not solder either connection. Terminal strip 2 will be mounted when the roll chart assembly is mounted.

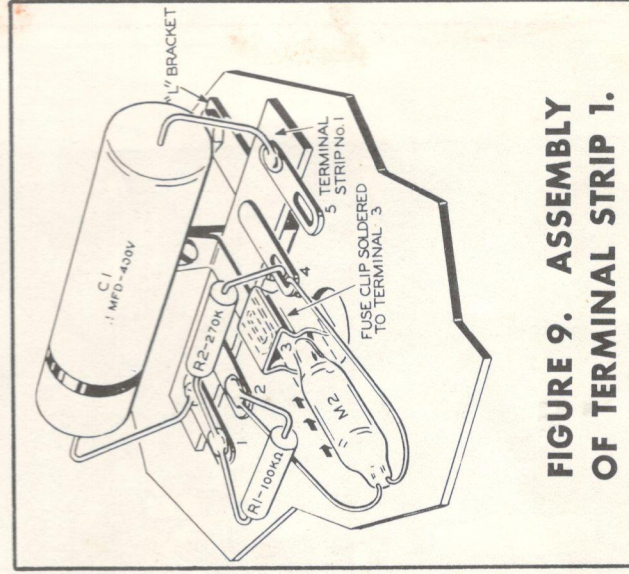


FIGURE 9. ASSEMBLY OF TERMINAL STRIP 1.

See Figure 9.

- The fuse mounting clip is the mounting for the neon short test bulb, M-2.
- () Solder this fuse mounting clip to the center terminal, or terminal 3 which is also the mounting lug, of terminal strip 1, the

5-lug terminal strip. Study Figure 9 to see how this clip is positioned.

- () Use one of the large machine screws and hex nuts to mount terminal strip 1 to the "L" bracket which is furnished.
- () Trim each end lead of C-1, .1 MFD-400 WV paper capacitor. Insert the end lead from the black banded end of C-1 through the hole where terminal 1 of terminal strip 1, the 5-lug terminal strip, is riveted to the bakelite strip. Solder this connection, but do not flow any solder on to the other portion of the lug. Insert the end lead from the unmarked end of C-1 through the hole where terminal 5 of terminal strip 1 is riveted to the bakelite strip. Solder this connection.

- () Trim each end lead of R-1, 100,000 ohm, 1/2 watt, resistor, (brown, black, yellow). Connect one end lead to terminal 1 of terminal strip 1. Connect the other end lead to terminal 2 of terminal strip 1. Do not solder either connection.

- () Trim each end lead of R-2, 270,000 ohm, 1/2 watt, resistor, (red, violet, yellow). Connect one end lead to terminal 1 of terminal strip 1. Solder this connection. Connect the other end lead of R-2 to terminal 4 of

terminal strip 1. Do not solder this connection.

() Insert the neon bulb, M-2, in the fuse clip. Connect one of the leads from this bulb to terminal 2 of terminal strip 1. Solder this connection. Connect the other lead from M-2 to terminal 4 of terminal strip 1. Do not solder this connection.

() Place the "L" bracket over the lower left mounting screw of the meter, M-1. Place the other lockwasher and hex nut supplied with the meter over this mounting screw and tighten.

() Tighten each meter nut evenly so that the meter is held in position in the panel.

See Figure 10.

() Solder one end of a 5 inch green lead to terminal 6 of S-2. Solder the other end to terminal 4 of terminal strip 1.

() Solder the long yellow lead of CR-1, the meter rectifier, to terminal 3 of S-2.

() Connect the short red lead of CR-1 to terminal 1 of terminal strip 2. Do not solder this connection.

() Bend the connection lug of R-10 so that it fits against terminal 1 of terminal strip 2. Solder this connection. See Figure 8 for the correct positioning of this connection lug.

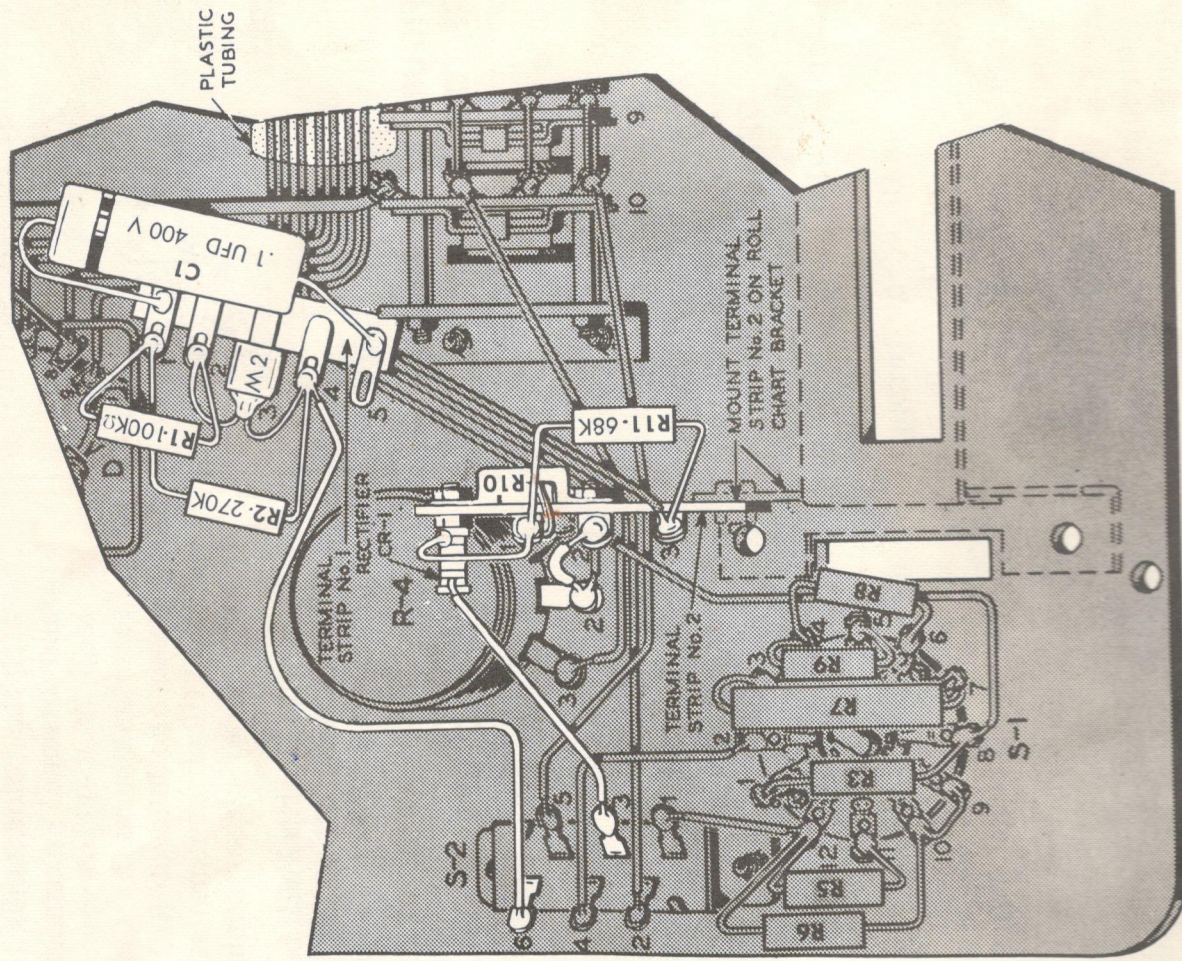


FIGURE 10. MOUNTING TERMINAL STRIPS 1 and 2.

- () Connect one end of a 2 inch red lead to terminal 2 of R-4. Connect the other end to terminal 2 of terminal strip 2. Solder both connections.
- () Connect the loose end of the 12 inch white with red tracer lead, which comes through the plastic tubing from terminal 1 of S-3, to terminal 3 of terminal strip 2. Solder this connection.

See Figure 11.

- () The terminals of S-3 are numbered in a clockwise direction starting at the open space toward the bottom of the panel. The chart below lists each terminal and its corresponding marking on the front of the panel:

1 - 110	9 - 6.3
2 - 70	10 - 5.0
3 - 50	11 - 4.2
4 - 32	12 - 3.0
5 - 25	13 - 2.5
6 - 19.6	14 - 2.0
7 - 12.6	15 - 1.4
8 - 7.5	16 - .63
	OFF

Examine T-1, the transformer. Notice that all of the green leads are the filament or heater leads, which are to be connected to the terminals of S-3. The green "heater common" lead is to be connected to S-4. All of these green leads except three, marked 110, 70, and 50 which come

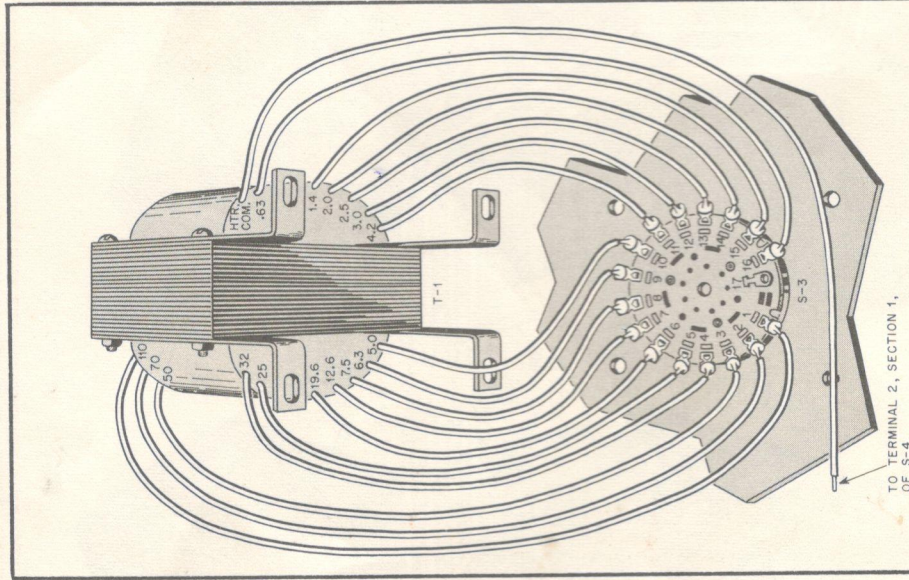


FIGURE 11.

WIRING THE FILAMENT SWITCH.

- out from the top of the transformer, come out in a clockwise direction from the bottom of the transformer.
- () Lean T-1 against sockets "H" and "I". This is done so that the connections between T-1 and S-3 can be made easily and all soldering can be done from the right.

- () Connect the lead marked "110", which is the first green lead out of the top of the transformer, to terminal 1 on S-3. Solder this connection.
- () Connect the next green lead marked "70" to contact 2 on S-3. Solder this connection.
- () Connect the last green lead from the top of the transformer, marked "50", to contact 3 on S-3. Solder this connection.
- () Connect the first green lead starting at the lower left from the bottom of T-1, marked "32", to contact 4 on S-3. Solder this connection.
- () Connect the next green lead marked "25" to contact 5 on S-3. Solder this connection.
- () Connect the next green lead marked "19.6" to contact 6 on S-3. Solder this connection.
- () Connect the next green lead marked "12.6" to contact 7 on S-3. Solder this connection.
- () Connect the next green lead marked "7.5" to contact 8 on S-3. Solder this connection.
- () Connect the next green lead marked "6.3" to contact 9 on S-3. Solder this connection.
- () Connect the next green lead marked "5.0" to contact 10 on S-3. Solder this connection.

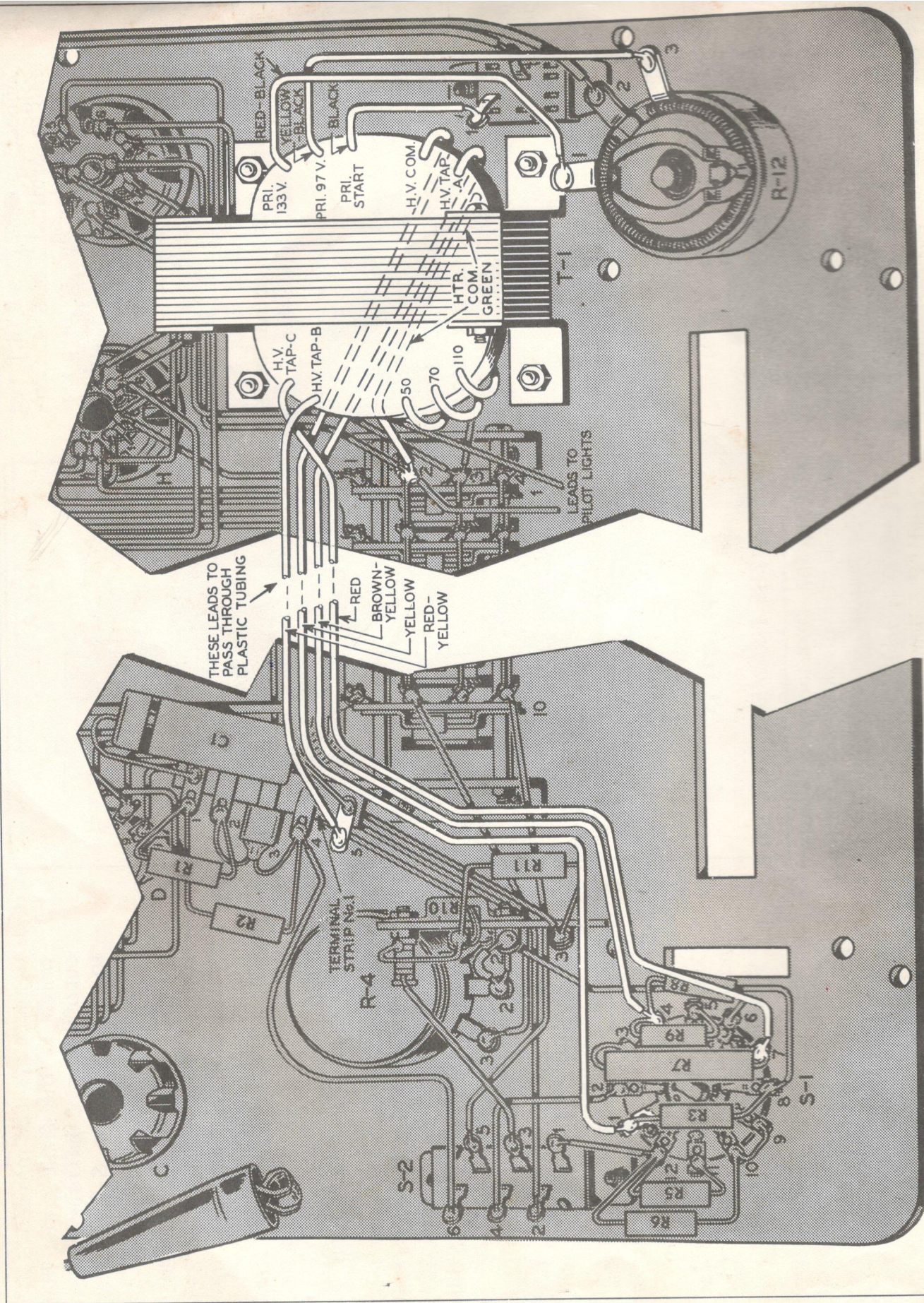


FIGURE 12. FINAL WIRING OF THE TRANSFORMER.

- () Solder the lead marked "4.2" to contact 11 on S-3.
- () Solder the lead marked "3.0" to contact 12 on S-3.
- () Solder the lead marked "2.5" to contact 13 on S-3.
- () Solder the lead marked "2.0" to contact 14 on S-3.
- () Solder the lead marked "1.4" to contact 15 on S-3.
- () Solder the lead marked ".63" to contact 16 on S-3.

See Figure 12.

- () Mount T-1 over S-3 to the panel. There are four holes in the panel around S-3. Set T-1 over these holes. Use four of the large machine screws, lock-washers, and hex nuts to fasten the transformer to the panel.
- () Pass the last green lead marked "HTR. COMM." under T-1. Solder this last green lead to terminal 2 of section 1 of S-4.
- () The primary of T-1 has three leads, black, black and red, and black and yellow. Connect the black lead, marked "PRI. START", which is the common lead of the primary winding, to terminal 1 of S-5, the ON-OFF switch. Solder this connection.
- () Solder the black and red lead, marked "PRI. 133 V", to terminal

nal 1 of R-12.

- () Solder the black and yellow lead, marked "PRI. 97 V", to terminal 3 of R-12.

The secondary of T-1 has four leads coming from it.

- () Pass the yellow lead, marked "H.V. COM", and the yellow and brown lead, marked "H.V. TAP A", under T-1. Pass these two leads and the red and yellow lead, marked "H.V. TAP B", and the red lead, marked "H.V. TAP C", through the first plastic tube along the top of S-4.

- () Connect the red and yellow lead to terminal 5 of terminal strip 1. Solder this connection.

- () Solder the yellow lead to terminal 1 of S-1.

- () Solder the yellow and brown lead to terminal 4 of S-1.

- () Solder the red lead to terminal 7 of S-1.

See Figure 13.

- () The roll chart is packed in the cardboard tube. Remove the chart from the tube and lay it, printed side down, on a table. The first work is on the end of the chart which starts the tube set-ups. This is the end which has the first tube listed.

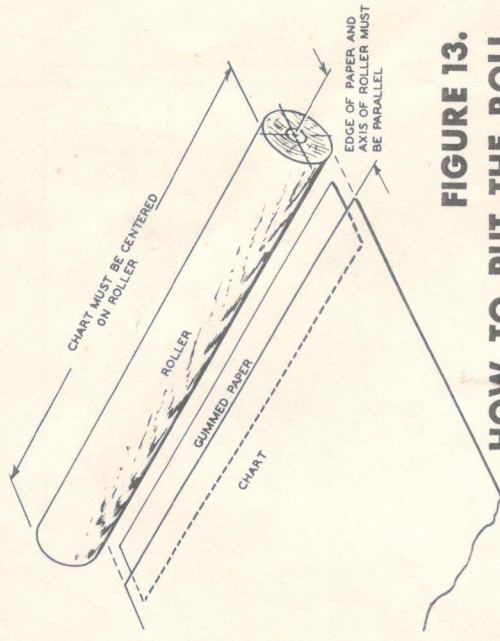


FIGURE 13.
HOW TO PUT THE ROLL
CHART ON THE WOOD ROLLERS.

- () Cut the 1 inch wide gummed paper tape supplied into two lengths of 8 inches. Dampen the gummed side of one of the lengths of tape and stick a quarter inch width of the tape to this end of the roll chart. Note; the sticky side of the tape is on the same side as the printing on the chart.

- () Wet the surface of one of the wood rollers. Place the end of the roller that is not painted on the edge of the roll chart which is closest to the first tube listed.

Line up the axis of the wood roller to be parallel with the edge of the chart. Line up the two edges of the roller so that they are centered across the chart. See Figure 13.

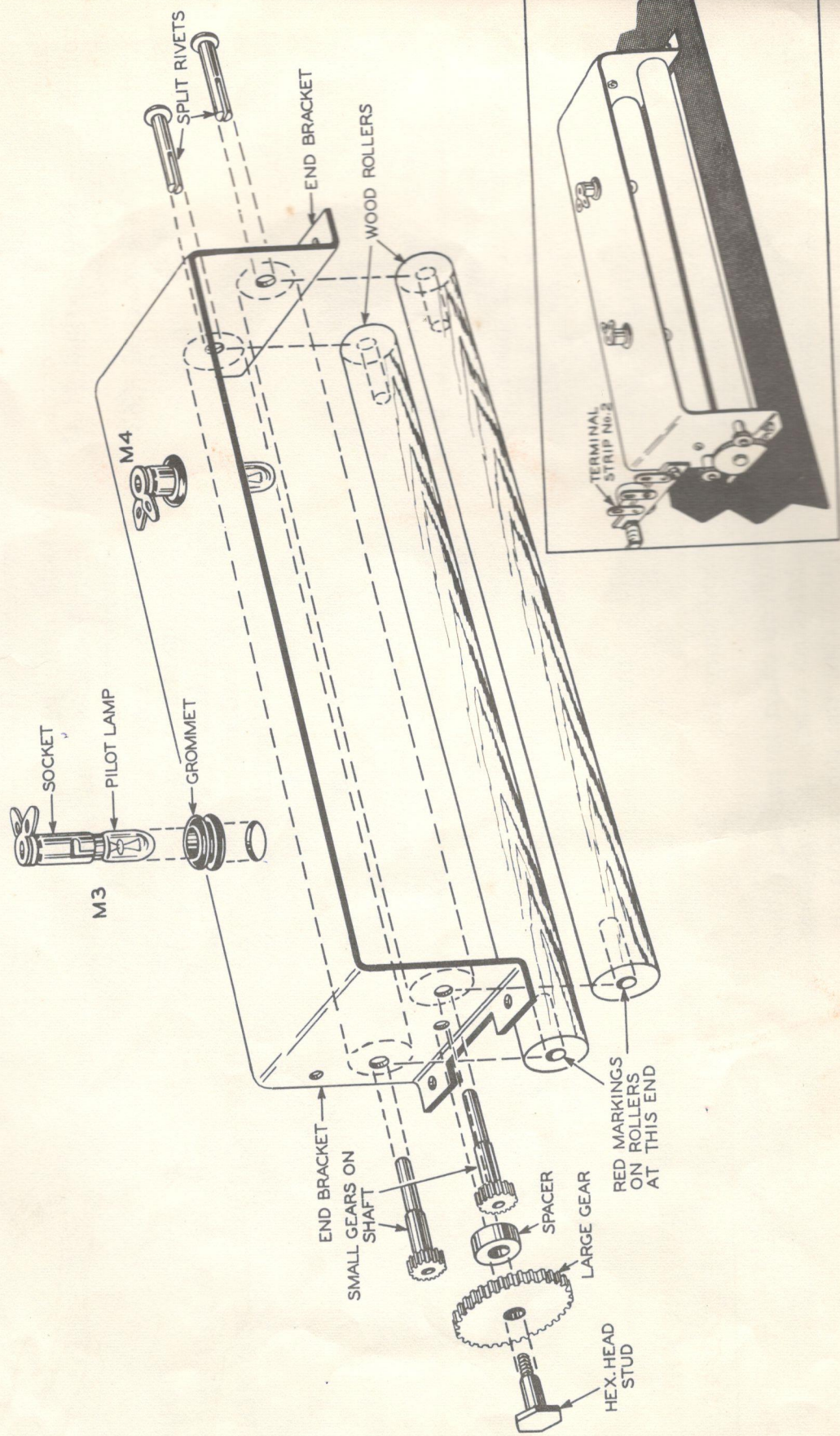


FIGURE 14. ASSEMBLY OF THE ROLL CHART PARTS.

Apply the sticky side of the tape to the roller. Smooth it out so that there are no wrinkles, and do any additional straightening of the edges or ends before the gummed tape sets.

- () Take the opposite end of the roll chart and place it facedown on the table. This is the end of the chart that has the last tube listed.

Dampen the gummed side of the other length of tape and stick a quarter inch of the tape width to this end of the roll chart. Note; the sticky side of the tape is on the same side as the printing on the chart.

- () Wet the surface of the other wood roller. Place the red end of this roller on the edge of the chart that is closest to the last tube listed.

Line up the axis of the wood roller to be parallel with the edge of the chart. Line up the two edges of the roller so that they are centered across the chart. See Figure 13, again. Apply the sticky side of the tape to the roller. Smooth it out so that there are no wrinkles, and do any additional straightening of the edges or end before the gummed tape sets.

See Figure 14.

- () Note that the roll chart bracket has a hole in one corner where terminal strip 2 is to be mounted. This end of the bracket must be toward S-1, the "A" switch.

- () Hold the rollers with the roll chart on them with one hand, and mount the roll chart. Use one of the split rivets through the right end of the bracket and into the larger countersunk holes of one of the rollers. This is the end without the red mark. The head of the split rivet should not be too tight against the bracket or the roller will bind.

- () Use the other split rivet through the other hole in the right end of the bracket and into the end with the larger, countersunk hole of the other wood roller. This is the end without the red mark. Leave this split rivet slightly loose also so that it does not bind.

- () The small gear is already mounted on its shaft. Drive this shaft through the left end of the bracket and into the end of the roller marked with red. See Figure 15. The shoulder on the shaft should be tight against the end of the wood roller.

- () Drive the other shaft with its small gear into the other wood

roller until the shoulder on the shaft is tight against the face of the wood roller. See Figure 15.

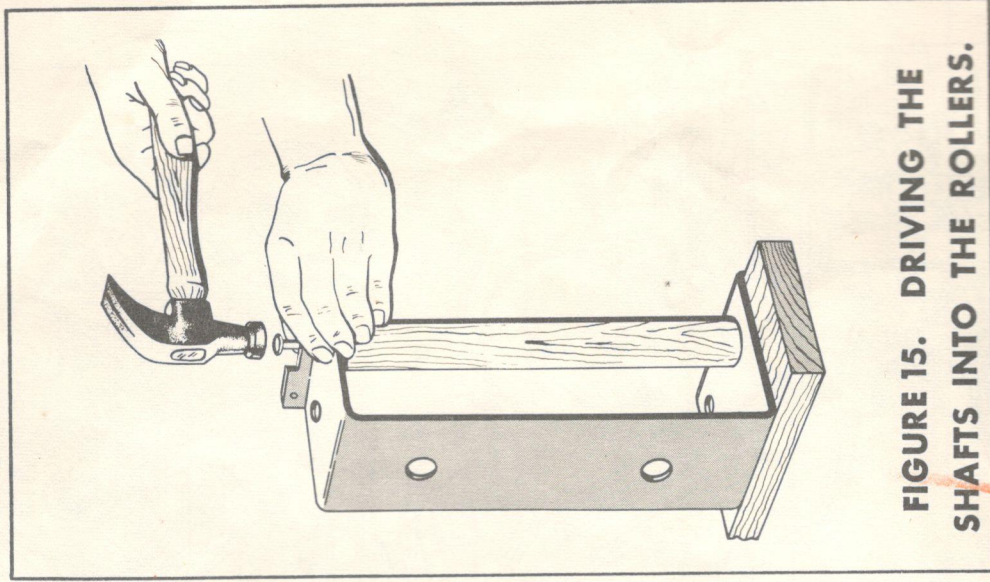


FIGURE 15. DRIVING THE SHAFTS INTO THE ROLLERS.

- () Tighten the roll chart on the rollers by rolling it up on one of the rollers if it has become loose.

- () Mount the large gear to the left end bracket. Place the large gear over the shaft of the hex head stud.



() Place the spacer over the shaft of the hex head stud so that it is tightly against the large gear. The large hole near the bottom of the end bracket is threaded. Tighten the hex head stud into this threaded hole. The teeth of the small gears must mesh with the teeth of the large gear.

() Insert the two larger rubber grommets in the holes in the long roll chart bracket.

() Push the two pilot lamp sockets through these rubber grommets until the top of the socket is through the grommet. Install the lamps.

() Mount the entire roll chart assembly to the panel from the rear. Use four of the larger machine screws and hex nuts. The end of the roll chart assembly with the gears must be next to S-1.

() Mount terminal strip 2 on the corner of the left end bracket of the roll chart assembly. Use a large machine screw, lockwasher, and hex nut.

See Figure 16.

() Connect one end of a 4 inch yellow lead to the outer terminal of M-3. Solder this connection. Connect the other end to the inner terminal of M-4, one of the pilot light sockets. Do

not solder this connection.

() Connect one end of a 4 inch yellow lead to the inner terminal of M-3, the other pilot light socket. Solder this connection. Connect the other end to the outer terminal of M-4. Do not solder this connection.

() Solder the 5 inch green lead from terminal 2 of section 1 of S-4 to the outer terminal of M-4.

() Solder the 8 inch grey lead from terminal 9 of S-3 to the inner terminal of M-4.

() Check all of the work. Every connection should be strong mechanically and all should now be well soldered.

You have finished wiring your Tube Tester kit. Check the wiring very carefully. A few extra minutes spent in checking can save hours of trouble shooting.

() Push the 10 lever switch knobs on the shafts of the switches. See Figure 17.

() Place one of the large grey knobs on the shaft of S-3, the filament switch. With the switch in the fully counter-clockwise position, tighten the set-screw of the knob with the line on the knob at the "OFF" position.

() Place the other large grey knob on the shaft of R-4, the "C" load. R-4 should be fully counter-clockwise. Tighten the set-screw of the knob with the line on the knob at the "O" position.

() Place one of the smaller grey knobs on the shaft of the "Line Adjust" control, R-12. Tighten the set-screw of the knob.

() Place the other small grey knob on the shaft of S-1, the "A" switch. With the switch in the fully counter-clockwise position, tighten the knob set-screw so that the line on the knob is in position 1.

Set the panel into the case. Fasten it securely with the 10 small screws supplied.

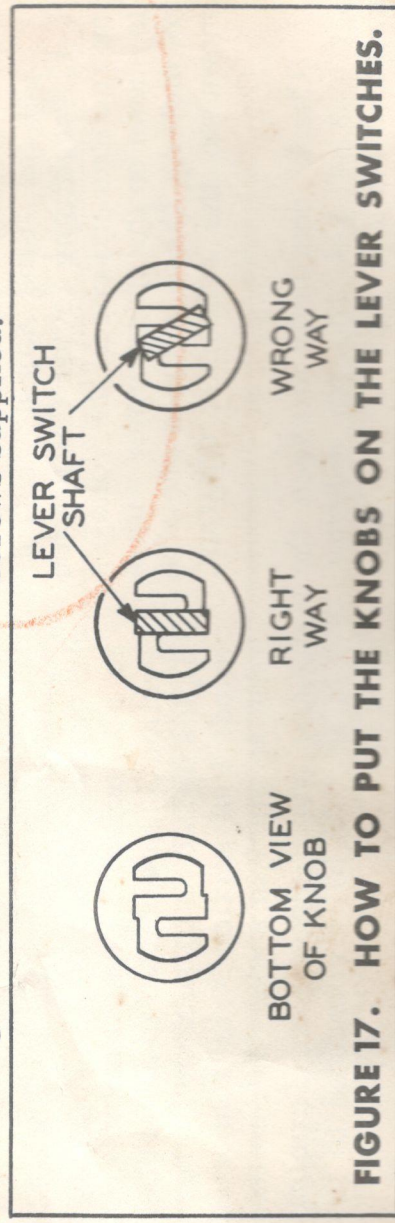


FIGURE 17. HOW TO PUT THE KNOBS ON THE LEVER SWITCHES.

HOW TO CALIBRATE YOUR TUBE TESTER

CAUTION: Do not touch any of the wiring while this instrument is plugged into power outlet.

The calibration of this fine Tube Tester is very simple. In any calibration a good standard is needed. The standard is used to check the calibrated equipment. The accuracy of the calibration will be limited only by the accuracy of the standard used.

To calibrate the Tube Tester, a good AC voltmeter or vacuum

tube voltmeter may be used as the calibration standard.

() Set the standard AC voltmeter or vacuum tube voltmeter to a scale which has 6.3 volts near full scale.

() Insert the test prods or connections of the AC voltmeter into pins 2 and 7 of the 8-pin octal socket. These pins may be identified from the pictorial diagrams.

() Set the Tube Tester for the 6V6 tube and turn the Tester on.

Adjust the Line Adjust control, R-12, on the Tube Tester until the AC voltmeter standard reads 6.3 volts. Do not pay any attention to the reading of the Tube Tester meter.

() Adjust the Calibration control, R-10, which is mounted on terminal strip 2, so that the Tube Tester meter now reads exactly on the "Line Test" mark.

The Tube Tester will now give correct voltages for all tubes whenever the Line Adjust setting is made.

TUBE TESTER SERVICE HINTS

Your Tube Tester is engineered to give years of accurate and reliable service. However, in the unusual case where a completed kit does not operate properly, we suggest the following:

Set the "Line Adjust" control, R-12, according to the Calibration instructions and check the voltages as shown on the transformer with a voltmeter. These voltages are also shown on the schematic diagram.

Check continuity between the sections of S-4, the pin selector switch, and the pins of the tube

sockets. All levers of this switch should be set in the straight-up position for these tests. Each terminal 1 of each section of S-4 is connected to all tube socket pins of a given number. For example, terminal 1 of section 1 is connected to all number 1 pins on all sockets, terminal 1 of section 2 is connected to all number 2 pins, terminal 1 of section 3 is connected to all number 3 pins and so on to section 8. Terminal 1 of section 9 is connected only to pin 9 of socket "D", as this is the only 9-pin socket. Terminal 1 of section 10 is connected to the grid cap.

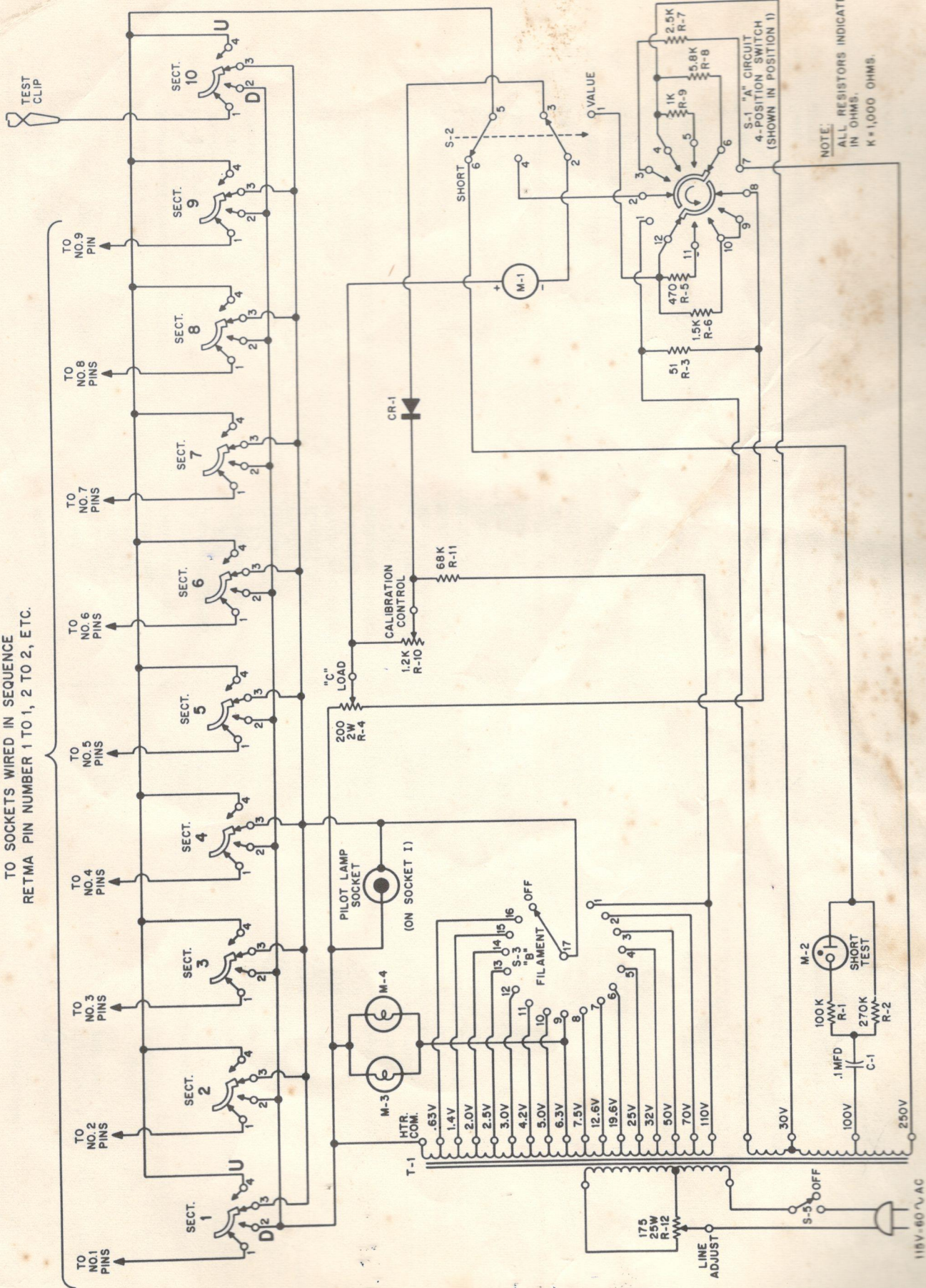
Should there be an open circuit, or a lead omitted, the meter will not read.

If there is a wiring short in the circuit the meter will often read full scale.

If all of the tubes which you check read low, recalibrate the instrument in accordance with the calibration instructions.

If the instrument still does not operate satisfactorily, have someone else check the wiring, preferably someone with radio experience.

S-4
(10-SECT. LEVER SWITCH)
TO SOCKETS WIRED IN SEQUENCE
RETMA PIN NUMBER 1 TO 1, 2 TO 2, ETC.



NOTE:
ALL RESISTORS INDICATED
IN OHMS.
K = 1,000 OHMS.

FIGURE 18. SCHEMATIC DIAGRAM.

PARTS LIST

Symbol Number	Description	Part No.	Description	Part No.	Description	Part No.
C-1	Capacitor, paper, .1 MFD, 400V	245014	Bracket, "L"	470036	Strip, 5-lug terminal	440501
R-1	Resistor, 100K ohms, 1/2 watt	301104	Bracket, roll chart	470069	Stud, 3/8" hex head	470023
R-2	Resistor, 270K ohms, 1/2 watt	301274	Chart, roll	750047	Tape, 1" gummed paper	
R-3	Resistor, 51 ohms, 1/2 watt, $\pm 5\%$	302510	Clip, fuse	492300	Tubing, 5"; plastic	812004
R-4	Potentiometer, 200 ohms, wirewound, 2 watt	402103	Cord, AC with plug	532012	Washer, shakeproof; 3/8"	582700
R-5	Resistor, 470 ohms, 1/2 watt, $\pm 5\%$	302471	Gear, large	802001	Washer, shakeproof; #6	583300
R-6	Resistor, 1500 ohms, 1/2 watt, $\pm 5\%$	302152	Gear, small; on shaft	470026&	Wire, 2" red	801002
R-7	Resistor, wirewound, 2500 ohms, 7 watt	373006	Grommet, rubber; 3/8"	470027	Wire, 3" orange	801003
R-8	Resistor, 5100 ohms, 1/2 watt, $\pm 5\%$	302512	Grommet, rubber; 1/2"	830200	Wire, 4" yellow	801004
R-9	Resistor, 1000 ohms, 1/2 watt, $\pm 5\%$	302102	Insulator	830002	Wire, 5" green	801005
R-10	Control, calibration; 1200 ohms	400100	Knob, 7/8"	880004	Wire, 6" blue	801006
R-11	Resistor, 68K ohms, 1/2 watt	301683	Knob, 1-3/8"	761004	Wire, 7" violet	801007
R-12	Control, line adjust; 175 ohms, 25 watt	407101	Knob, lever switch	761304	Wire, 8" grey	801008
T-1	Transformer, power	101307	Locking, split	764533	Wire, 9" white	801009
S-1	Switch, "A", rotary; 2 pole 4 position lugs for 5th position	432117	Locking, split for 7-pin socket	532002	Wire, 10" brown	801010
S-2	Switch, Value; spring return, slide	431302	List, obsolete tubes	532003	Wire, 11" white-brown tracer	801011
S-3	Switch, filament; off-position full counterclockwise	432125	Manual, instruction	750068	Wire, 12" white-red tracer	801012
S-4	Switch, lever, 10-section; each section 1 pole 3 position	434002	Nuts, 3/8"	750132	Wire, 6" bare	806006
S-5	Switch, on-off, slide, SPST	431002	Nut, 2-36	570840	Wire, 20" stranded black #20	804022
CR-1	Rectifier, meter copper oxide	621004	Nuts, 4-36	570000	Case, bench model	700044
M-1	Meter, 1 ma movement, 4"	654207	Nuts, 6-32	570230	Screws, #4 self tapping	569292
M-2	Bulb, neon, NE-2	640001	Panel, screened with window	570340	Case, portable	702001
M-3,4	Bulb, pilot #44	640003	Rivet, split	462232	Screws, #6 x 1/2"	562396

ACCESSORIES YOU MAY WANT

Stock Number	Description	Price*
83Y141	TV Picture Tube Adapter	\$4.25
83Y271	TV Picture Tube Adapter for 110° Tubes	4.25

TOOLS YOU MAY NEED

Stock Number	Description	Price*
46N852	Soldering iron	\$5.16
50N132	6" Long-nose pliers	1.54
50N133	5" Diagonal cutters	1.34
45N796	6" Screwdriver	.72
43N831	Setscrew driver	.24

* All Prices Subject to Change Without Notice.

How to Use the Tube Tester

SPECIFICATIONS

Tubes Tested: 4, 5, 6 and 7-pin large, regular and miniature, octal, local, 9-pin miniature tubes and pilot lamps. (Cathode Ray Tube Adapter available.)

Type of Tests: Check for emission.

Check for shorted and open tube elements.

Cathode-to-filament leakage checks.

(Note: All the above tests are made while the cathodes of the tubes are hot.)

Circuit Switch: Provides different ranges of sensitivity to permit tests of all tube types, including the new types with very low cathode currents. (1-ma meter movement used.)

Tube Element Switch: Permits rapid selection of individual tube element for shorts, leakage and open checks.

Filament Adjustment: Switch provides full range from 0.63 to 110 volts in 14 steps.

Tube Condition Indicator: A big, easy-to-read, 4½-inch meter scale provides direct reading of the tube condition in terms of BAD, ? and GOOD.

Line Voltage Indicator: Monitors line voltage, showing any fluctuation, permitting necessary adjustments to insure greater test accuracy.

Illuminated Speed-Roll Chart: Lists over 600 different tube types providing a simplified setup procedure.

Blank Panel Socket: Provides obsolescence protection.

Dimensions: 14" wide x 10" deep x 5" high.

Power Requirements: 105-125 volts 50-60 cycles AC.

GENERAL

The most important component in today's electronic equipment is the vacuum tube. The technician servicing such equipment has to provide the means for testing the tubes, to supply him with reasonable assurance that a tube under question will operate satisfactorily.

The emission-type tube tester, such as this wired Tube Tester, can check the one thing common to all these tubes, namely, the ability of the cathode to emit electrons necessary for proper operation. The three colored sections of the indicator meter scale provide a fast indication of the tube condition in terms of GOOD (green), DOUBTFUL ? (yellow), or BAD (red). In addition to the emission test, other things may be easily tested, such as open filaments, shorted elements, and leakage between elements. Another feature of this tester is the continuity check, by which other components than tubes may also be tested.

HOW TO OPERATE THE TUBE TESTER

- (1) Set all ten lever switches to the normal (center) position.
- (2) Rotate the switch marked *A-Circuit* to its "1" position.
- (3) Rotate the switch marked *B-Filament* to its "off" position.
- (4) Rotate the control marked *C-Load* to its "zero" position.

How to Adjust the Controls (follow in order listed)

- (1) Insert line cord into a 110-volt, 60-cycle supply outlet.
- (2) Adjust the roll chart until the type of the tube to be tested appears in the plastic window.
- (3) Set the *A-Circuit* switch as shown on the roll chart in column *A-Cir.*
- (4) Set the *B-Filament* switch as shown on the roll chart in column *B-Fil.*
- (5) Set the *C-Load* control as shown on the roll chart in column *C-Load.*
- (6) Set lever switches as shown on the roll chart in column *U-Up* and *D-Down.*

(7) Insert tube in proper tube socket.

(8) Turn *On-Off Switch* to the "on" position and, adjust *Line control* until the meter pointer reads at the *Line-Test* mark.

Short Test

(9) Check the roll chart in the *U-Up* and *D-Down* columns for numbers in *light-face* type. Move each lever marked in this way two positions and then return it to the original position. (For example, if the lever is in the *U-Up* position, it should be moved to the center position and then to the *D-Down* position for the test. After this test, the lever is returned to its original position.) A shorted tube is indicated by a steady red glow of the *Short Test* indicator lamp. A faint glow indicates leakage. The lamp may show a flash as switch is moved. This does not indicate a short.

Emission Test (Value Test)

(10) Push and hold *Value* switch to the *Value* position and read meter. Meter will then directly indicate tube condition.

(11) Release *Value* switch.

(12) Reset all lever switches to their normal (center) positions.

Gas Test

The following procedure is recommended for the Gas Test:

- (1) Set all of the controls according to the roll chart.
- (2) Press the *VALUE* switch and make sure that the tube checks good on the emission test.

(3) In order to check for gaseous contents in the tube, move the lever switch connected to the control grid of the tube to the center position. If you are not sure which pin is the control grid on any given tube, consult the tube manual. The pin numbers correspond to the numbers of the lever switches shown on the front panel. Press the VALUE switch again and watch the pointer movement. If the tube is good, the pointer will move to the left. If the tube is gassy, the pointer will move to the right.

CAUTION: Do not press the VALUE switch for more than 3 or 4 seconds during the gas test. The meter movement may be damaged by excessive deflection.

Special Tests

Open Element Test

(1-S) Follow Steps (1) through (11) above.

(2-S) Check the roll chart in the *U-Up* columns for numbers in *light* type face.

(3-S) Push and hold the *Value* switch in its *Value* position and press the lever switches found in Step (2-S) to the *D* position. (Move only one at a time.) Return switch lever to the *U* position. A change in pointer deflection indicates continuity between the tube pin and the corresponding element being tested. A small change denotes proper plate or screen grid connections, while a large change of deflection indicates a satisfactory control grid connection. For tubes which require only one switch lever in the *U* position, it will not be necessary to make an open element test.

(4-S) Release *Value* switch.

Filament and Tap Continuity Test [Use only if tube type is followed by asterisk (*)]

(1-T) Follow Steps (1) through (9) under *How to Adjust the Controls*.

(2-T) Set *B-Filament* switch to the "0.63" position.

(3-T) Check the roll chart in the *U-Up* and *D-Down* columns for number in *dark-type* face.

(4-T) Move each switch lever indicated in Step (3-T) two positions and then return it. A good filament or other internal pin connection is indicated by a glow of the *Short Test* indicator.

Continuity Test for Miniature-base Bulbs

(1-M) Adjust the *B-Filament* switch to the voltage of the bulb under test.

(2-M) Place the base of the bulb in the center of the 7-prong socket (lower row, extreme left).

(3-M) The normal lighting of the bulb is an indication that it is good.

Continuity Test for Ballast Tubes and Electrical Appliances

(1-B) Follow Steps (1) through (8) under *How to Adjust the Controls*.

(2-B) Push the bare end of a jumper lead in prong No. 1 position (marked by line) of the octal socket (upper row, second from the right).

(3-B) Turn the *B-Filament* switch to the *Off* position.

(4-B) Set the switch lever "1" in the *U* position.

(5-B) Set the switch lever "0" in the *D* position.

(6-B) Momentarily connect the grid cap lead and the jumper lead together and note that the *Short Test* indicator lights up.

(7-B) Connect the grid cap and the jumper lead to the points between which continuity is to be checked. The lighting of the *Short Test* indicator shows continuity between these two points.

(Caution: Do not touch any exposed metal parts of the test leads during the test. When in doubt over the internal connections of the unit which is to be checked, consult the manufacturer's data for them.)

Tube Check Example — 6AG5 Tube

(1) Insert line cord into a 110-volt, 60-cycle supply outlet.

(2) Adjust the roll chart until the 6AG5 tube information appears in the plastic window.

(3) Set *A-Circuit* switch to 3.

(4) Set *B-Filament* switch to 6.3.

(5) Set *C-Load* control to 20.

(6) Set lever switch "1" to *U*.

Set lever switch "5" to *U*.

Set lever switch "6" to *U*.

Set lever switch "2" to *D*.

Set lever switch "3" to *D*.

Set lever switch "7" to *D*.

(7) Insert 6AG5 tube in 7-pin miniature socket.

(8) Adjust *Line* control until the meter pointer reads at the *Line Test* mark.

Short Test of 6AG5 Tube

(9) On the roll chart the following numbers appeared in light-face type: 1, 5 and 6. Moving these three levers (one at a time) two positions down and returning them produced no red glow of the *Short Test* indicator. Therefore, there were no interelement shorts.

Emission Test of 6AG5 Tube

(10) The *Value* switch was pushed and held to the *Value* position. The meter read "68" in the green sector of the meter scale. Therefore, the emission was good.

(11) Release *Value* switch.

(12) Reset all lever switches to their normal positions.

Testing Multipurpose Tubes

Certain tubes incorporate more than one set of electrodes. These are multipurpose tubes. If such a tube is tested it is necessary to check all sections. Therefore the tube roll chart incorporates certain additions for tubes of this type. Actually, two lines of information are given in one. These are designated "Test 1" and "Test 2".

Dashes are used between the numbers in the columns to separate the information for "Test 1" and "Test 2". The information for "Test 1" is

given at the left of the dashes, while the numbers at the right of the dashes concern "Test 2". Note that the *B-Fil* setting is the same though a tube may have two or more separate tests. If the number of tube sections and tests for one tube exceeds two, a second line is used to give the necessary information.

Special Notes Appearing on the Roll Chart

For testing certain tube types special notes are given directly below the setup information for the tube. For example, turn the roll chart to the 35B5. Directly under the window appears the note "shows short 1 and 7". This note indicates that a short should be indicated between two elements and between levers "1" and "7". Another note appearing on the roll chart occurs in the case of the 14X7 tube. This note is "Good = 30". This indicates that a meter reading of 30 or higher is satisfactory for this tube.

Sometimes certain tubes have more than one designation. In such cases the preferred type number is given first. This is then followed by the less common type number in parenthesis.

Some tuning indicator tubes are followed by the letters "CL" or "OP". These notations are used in the same manner as "Test 1" and "Test 2" information discussed above. In these cases, no meter indication occurs. The only indication is that the tuning indicator eye is completely closed for the "CL" test and completely open for the "OP" test.

Certain tubes have more than one top cap. A special note will then give the instructions on what should be done for the test. Usually the note will read "short top caps together". This means that a wire jumper should be used to connect the top caps together, and then the grid cap lead is clipped to one of the top caps.

An asterisk (*) following a tube type indicates that the filament has a tap and the Filament and Continuity Test should be made for this tube.

General Notes

If the pointer should run off the scale, the condition of the tube may be extremely good. To make a continuity check on such tubes, the *C-Load* control should be turned slowly counterclockwise, until the pointer falls below the maximum deflection mark. Then the usual procedure should be followed.

Cathode-to-filament leakage is indicated by a faint glow of the *Short Test* indicator when the tube checker is set up for a Short Test.

When a 5, 6 or 7-pin subminiature tube is checked, the red dot on the tube must always be placed at the extreme right of the socket.

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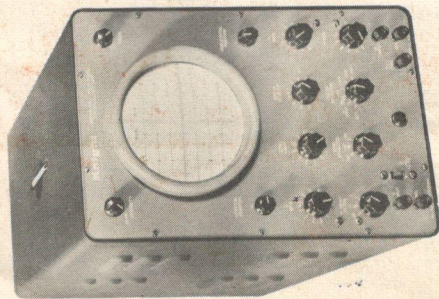
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- CHECK THESE DELUXE FEATURES**
- Sensitive 200 μ A Meter Movement
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SPECIFICATIONS

VERTICAL AMPLIFIER

Sensitivity:
Frequency response:
Input impedance:
Calibration:

.025 V rms per inch
3 db down at 700 kc (1000 cps reference)
3.3 megohms shunted by 45 μ fd
1 V P-P $\pm$ 7% square wave, regulated calibrating voltage internally injected by front panel push switch

HORIZONTAL AMPLIFIER

Sensitivity:
Frequency response:
Input impedance:

.07 V rms per inch
3 db down at 200 kc (1000 cps reference)
2.2 megohms shunted by 30 μ fd

SWEEP GENERATOR

Range:
Blanking:
Synchronization:

15 cps to 150 kc in four ranges
Retrace blanking on all ranges
Internal negative, internal positive, and external

TUBE COMPLEMENT:

6U8 vertical amp., 12BH7 push-pull vertical output, 6AU6 horizontal sweep ocs., 6C4 horizontal amp., 12AU7 push-pull horizontal output, 5CP1 CRT, 1V2 hi-voltage rect., and 6X4 low-voltage rect.

POWER SOURCE:

DIMENSIONS:

110-120 volts, 50-60 cycle AC
9 $\frac{1}{4}$ x 13 $\frac{3}{4}$ x 17 $\frac{3}{4}$ " deep
26 lbs.

SPECIFICATIONS

DC VOLTMETER

Ranges:
Input resistance:
Circuit:
Accuracy:

0-1.5, 5, 15, 50, 150, 500 and 1500 volts, full scale.
11 megohms (1 megohm in probe) on all ranges
Push-pull balanced bridge with 12AU7 twin triode
 $\pm$ 3% full scale

AC VOLTMETER

RMS ranges:
Accuracy:
Peak-to-peak ranges:

0-1.5, 5, 15, 50, 150, 500 and 1500 volts, full scale
 $\pm$ 5% full scale
0-4, 14, 40, 140, 400, 1400 and 4000 volts

OHMMETER

Ranges:

Center scale at 10 with multipliers X1, X10, X100, X1000, X10K, X100K, and X1Meg
1.5 volt "C"

Battery:

METER:

4 $\frac{1}{2}$ " 200 μ A movement

MULTIPLIERS:

1% precision type

TUBE COMPLEMENT:

12AU7 twin-triode meter bridge, 6AU5 twin-diode full wave rectifier

POWER SOURCE:

105-125 volts, 50-60 cycle AC

DIMENSIONS:

7 $\frac{3}{4}$ x 5 $\frac{1}{4}$ x 4 $\frac{1}{2}$ "

SHIPPING WEIGHT:

6 lbs.

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