PRICE $1.00

HEATHKIT®
ASSEMBLY MANUAL

HEATHKIT® by DAYSTROM

ISOLATION TRANSFORMER

MODEL IP-10

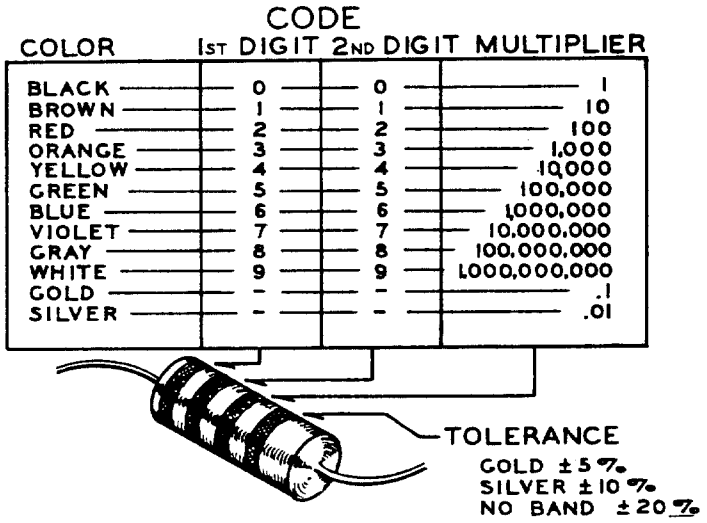
RESISTOR AND CAPACITOR COLOR CODES

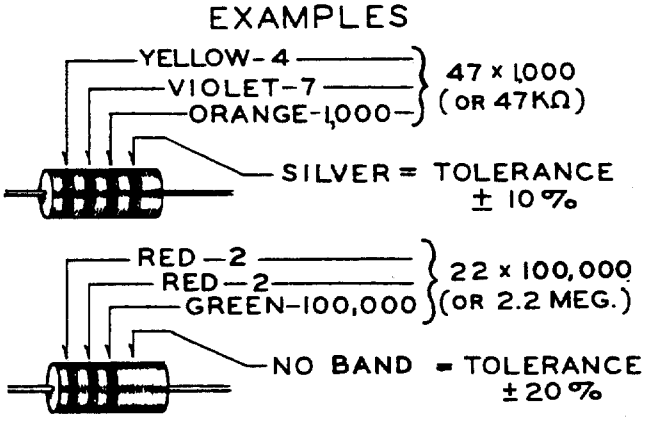
RESISTORS

The colored bands around the body of a color coded resistor represent its value in ohms. These colored bands are grouped toward one end of the resistor body. Starting with this end of the resistor, the first band represents the first digit of the resistance value; the second band represents the second digit; the third band represents the number by which the first two digits are multiplied. A fourth band of gold or silver represents a tolerance of ±5% or ±10% respectively. The absence of a fourth band indicates a tolerance of ±20%.

The physical size of a composition resistor is related to its wattage rating. Size increases progressively as the wattage rating is increased. The diameters of 1/2 watt, 1 watt and 2 watt resistors are approximately 1/8", 1/4" and 5/16", respectively.

The color code chart and examples which follow provide the information required to identify color coded resistors.

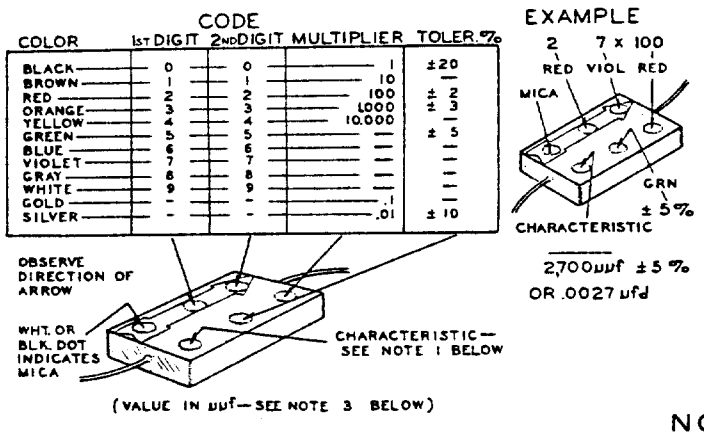




CAPACITORS

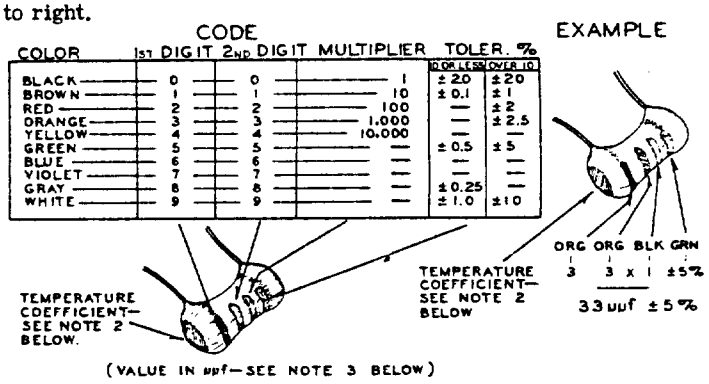
Generally, only mica and tubular ceramic capacitors, used in modern equipment, are color coded. The color codes differ somewhat among capacitor manufacturers, however the codes shown below apply to practically all of the mica and tubular ceramic capacitors that are in common use. These codes comply with EIA (Electronics Industries Association) Standards.

MICA



TUBULAR CERAMIC

Place the group of rings or dots to the left and read from left to right.



NOTES:

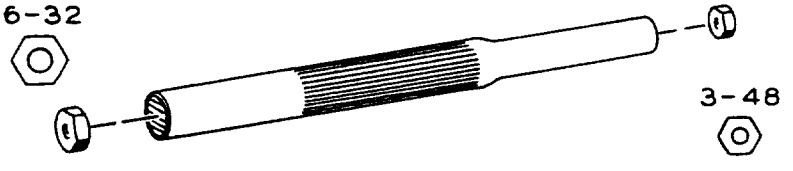
1. The characteristic of a mica capacitor is the temperature coefficient, drift capacitance and insulation resistance. This information is not usually needed to identify a capacitor but, if desired, it can be obtained by referring to EIA Standard, RS-153 (a Standard of Electronic Industries Association.)

2. The temperature coefficient of a capacitor is the predictable change in capacitance with temperature change and is expressed in parts per million per degree centigrade. Refer to EIA Standard, RS-198 (a Standard of Electronic Industries Association.)

3. The farad is the basic unit of capacitance, however capacitor values are generally expressed in terms of μfd (microfarad, .000001 farad) and μμf (micro-micro-farad, .000001 μfd); therefore, 1,000 μμf = .001 μfd, 1,000,000 μμf = 1μfd.

USING A PLASTIC NUT STARTER

A plastic nut starter offers a convenient method of starting the most used sizes: 3/16" and 1/4" (3-48 and 6-32). When the correct end is pushed down over a nut, the pliable tool conforms to the shape of the nut and the nut is gently held while it is being picked up and started on the screw. The tool should only be used to start the nut.

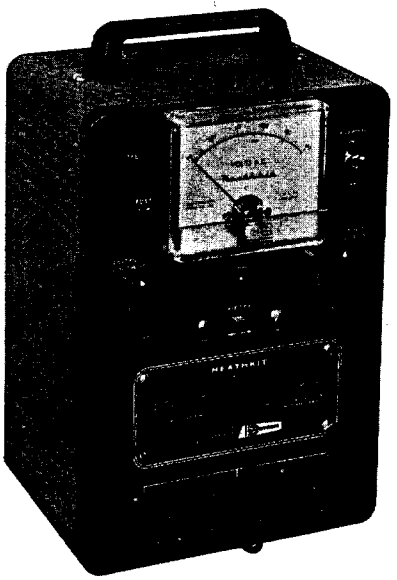


Assembly
and
Operation
of the

HEATHKIT by DAYSTROM

ISOLATION TRANSFORMER

MODEL IP-10



HEATH COMPANY,
BENTON HARBOR,
MICHIGAN

a subsidiary of
DAYSTROM, INCORPORATED

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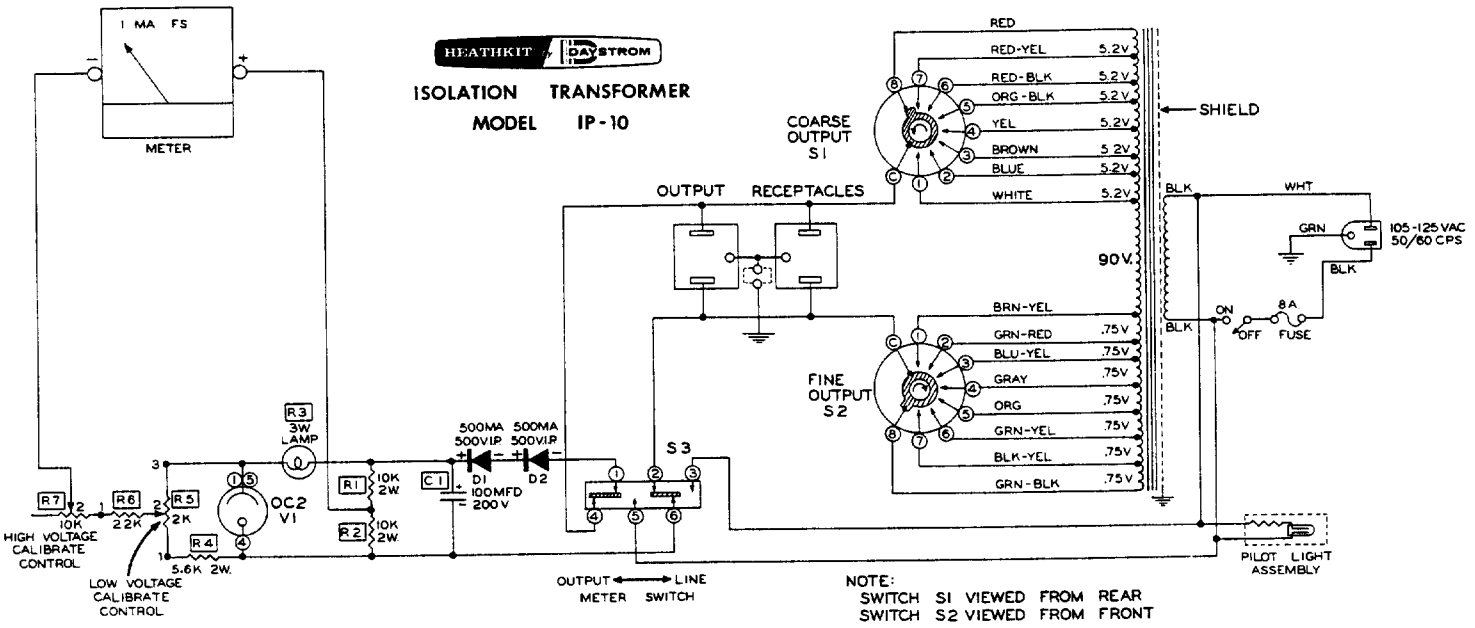
All prices are subject to change without notice. The Heath Company reserves the right to discontinue instruments and to change specifications at any time without incurring any obligation to incorporate new features in instruments previously sold.

11/3/61



SPECIFICATIONS

INPUT:	105-125 volts AC, 50/60 cycles.
OUTPUT:	Variable from 90-130 volts in steps of approximately .75 volt by means of transformer secondary tap switching.
METER:	90-140 volt scale, ±1 volt accuracy. Switch selection of input or output voltage indication.
POWER RATING:	300 watts continuous, 500 watts intermittent.
FUSE:	8 ampere.
DIMENSIONS:	6-1/2" wide x 9-1/2" high x 5" deep.
NET WEIGHT:	18 lbs.
SHIPPING WEIGHT:	22 lbs.

INTRODUCTION

The Model IP-10 Isolation Transformer provides isolation between the AC power line and any equipment that is plugged into one of its output receptacles. This practically eliminates AC shock hazards when testing AC-DC and transformerless equipment.

The output voltage of the IP-10 can be varied from 90 to 130 volts with the front panel controls. This function compensates for either high or low line voltage and will prove helpful in locating intermittent conditions in the equipment being tested. A large, expanded-scale meter accurately monitors the output voltage; also, the meter can be switched to indicate the value of input (line) voltage.

Loads that require up to 300 watts continuously,

or up to 500 watts intermittently, can be operated from the IP-10. This power rating is more than adequate to operate larger equipment such as color television sets.

A heavy-duty, 3-conductor line cord and plug are used with the IP-10; the ground wire of the line cord is connected to the case of the IP-10.

Fusing of the IP-10 protects the IP-10 components, the connected load, and the power line fuses in case of a short circuit in the equipment being tested.

CIRCUIT DESCRIPTION

The IP-10 consists basically of three sections; the transformer, the switching and output circuit, and the meter circuit. Occasional reference to the Schematic Diagram while following this description will prove helpful in understanding how each section functions, both individually and with the other sections.

Transformer

The transformer is a heavy-duty unit, designed to convert the nominal 117 volt power into a wide choice of voltages at its secondary. The use of completely separate primary and secondary windings provides isolation of the secondary circuit from the power source.

The taps on the upper portion of the secondary winding (as shown on the Schematic Diagram) are electrically spaced at approximately 5.2 volt intervals, and the taps on the lower portion of the secondary winding are at approximately .75 volt intervals. An output of approximately 90 to 130 volts is available from this tapped winding.

Switching And Output Circuit

COARSE OUTPUT VOLTAGE switch S1 is used to select the desired 5.2 volt tap and FINE OUTPUT VOLTAGE switch S2 is used to select the desired .75 volt tap. The voltage, between the taps selected by switches S1 and S2 is applied to the output receptacles. By rotating S1 and S2, the output voltage can be varied from minimum to maximum (90 to 130 volts) in .75 volt steps.

If desired, the ground terminals of the 3-conductor, grounding-type, output receptacles can be connected to the base by connecting a jumper wire between the two binding posts on the front panel.

OFF-ON switching is accomplished by single-pole-single-throw toggle switch S4 in the fused primary circuit of the IP-10. The front panel-mounted pilot lamp is connected across the primary winding of the transformer.

Meter Circuit

METER switch S3 is a double-pole-double-throw, spring-return, slide switch. S3 is used to select either the IP-10 output voltage or the power line voltage to be measured by the meter circuit. The spring return action of this switch is such that it normally remains in the OUTPUT position.

The voltage source selected by the METER switch is applied to D1, D2, and C1, which form a half-wave rectifier circuit with a DC output voltage that is directly proportional to the peak value of the applied AC input voltage. The DC voltage output of the half-wave rectifier is applied across a voltage divider consisting of R1 and R2. One-half of the applied DC voltage appears between the junction of R1 and R2, and the negative (-) terminal of capacitor C1.

The DC voltage output of the half-wave rectifier is also used to form a meter reference voltage. R3, the 3 watt lamp, is used as a current limiting resistor for gas-voltage-regulator tube V1. With a low applied voltage, the relatively cool lamp filament has a low resistance, thus allowing sufficient current for proper operation of V1. As the applied voltage increases, the lamp filament heats due to increased current through it. This increases the resistance of the filament and thereby limits the current through V1. V1 maintains a constant voltage across R4 and Low Voltage Calibrate control R5. The meter reference voltage is set by adjusting Low Voltage Calibrate control R5 so that the meter indicates 90 volts (no meter current) when the actual voltage output of the IP-10 is 90 volts. R6 and High Voltage Calibrate control R7 are in series with the negative terminal of the meter movement and adjust the sensitivity of the meter circuit by limiting meter current. R7 is adjusted so that the meter indicates 130 volts when the actual voltage output of the IP-10 is 130 volts.

The linear voltage response of the meter circuit allows the use of a linear meter movement and a linear, proportional meter scale.

CONSTRUCTION NOTES

This manual is supplied to assist you in every way to complete your kit with the least possible chance for error. The arrangement shown is the result of extensive experimentation and trial. If followed carefully, the result will be a stable instrument, operating at a high degree of dependability. We suggest that you retain the manual in your files for future reference, both in the use of the instrument and for its maintenance.

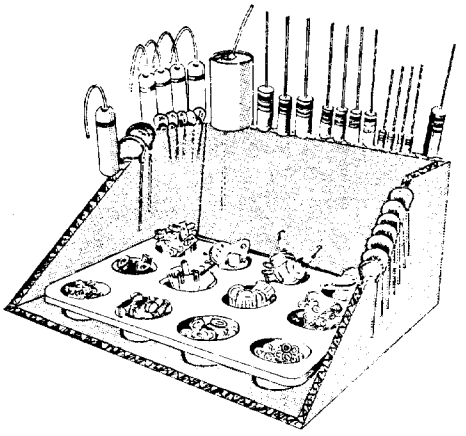
UNPACK THE KIT CAREFULLY AND CHECK EACH PART AGAINST THE PARTS LIST. In so doing, you will become acquainted with the parts. Refer to the charts and other information on the inside covers of the manual to help you identify the components. If some shortage or parts damage is found in checking the Parts List, please read the REPLACEMENT section and supply the information called for therein. Include all inspection slips in your letter to us.

Resistors generally have a tolerance rating of 10% unless otherwise stated in the Parts List. Tolerances on capacitors are generally even greater. Limits of +100% and -20% are common for electrolytic capacitors.

We suggest that you do the following before work is started:

1. Lay out all parts so that they are readily available.
2. Provide yourself with good quality tools. Basic tool requirements consist of a screwdriver with a 1/4" blade; a small screwdriver with a 1/8" blade; long-nose pliers; wire cutters, preferably separate diagonal cutters; a pen knife or a tool for stripping insulation from wires; a soldering iron (or gun) and rosin core solder. A set of nut drivers and a nut starter, while not necessary, will aid extensively in construction of the kit.

Most kit builders find it helpful to separate the various parts into convenient categories. Muffin tins or molded egg cartons make convenient trays for small parts. Resistors and capacitors may be placed with their lead ends inserted in the edge of a piece of corrugated cardboard until they are needed. Values can be written on the cardboard next to each component. The illustration shows one method that may be used.



PARTS LIST

PART No.	PARTS Per Kit	DESCRIPTION
Resistors-Capacitor		
1-22	1	22 KΩ 1/2 watt resistor (red-red-orange)
1B-23	1	5.6 KΩ 2 watt resistor (green-blue-red)
1B-3	2	10 KΩ 2 watt resistor (brown-black-orange)
25-57	1	100 μfd 200 V electrolytic capacitor
Controls-Switches		
10-52	1	2 KΩ linear control (tab mounting)
10-57	1	10 KΩ linear control (tab mounting)
60-3	1	Slide switch, spring return, DPDT
61-1	1	Toggle switch, SPST
63-234	2	Rotary switch, 8-position, 10 ampere contacts.
Transformer-Diode		
54-99	1	Transformer
57-27	2	Silicon diode
Hardware		
250-49	2	3-48 x 1/4" screw
250-83	2	#10 x 1/2" sheet metal screw
250-89	17	6-32 x 3/8" screw
250-128	6	#10 x 7/8" sheet metal screw
250-137	4	8-32 x 3/8" screw
252-1	2	3-48 nut
252-3	9	6-32 nut
252-4	4	8-32 nut
252-5	4	10-32 nut
252-7	2	3/8" control nut
252-22	8	#6 speednut
252-54	6	#10 speednut
253-10	2	3/8" control flat washer
254-1	11	#6 lockwasher
254-2	4	#8 lockwasher
254-3	4	#10 lockwasher
254-4	2	3/8" control lockwasher
254-7	2	#3 lockwasher
259-1	2	#6 solder lug
259-11	6	#6 spade lug

PART No.	PARTS Per Kit	DESCRIPTION
Terminal Strips-Sockets		
431-1	1	Dual-lug terminal strip
431-2	1	2-lug terminal strip
431-27	1	3-lug terminal strip
431-12	1	4-lug terminal strip
434-15	1	7-pin tube socket
434-23	1	Lamp socket
434-109	2	3-prong AC receptacle
Metal Parts		
90-149	1	Cabinet
200-M275	1	Transformer chassis
200-M276	1	Subchassis
203-212F390	1	Front panel
204-M345	2	Vertical support bracket
204-M346	2	Horizontal support bracket
205-M253	1	Reinforcing plate
Wire		
89-15	1	3-wire line cord with 3-prong plug
344-6	1	Length #18 hookup wire
346-1	1	Length sleeving
Miscellaneous		
75-17	4	Bushing, binding post
75-29	1	Strain relief, line cord
100-M16B	2	Binding post cap, black
211-4	1	Handle
261-6	4	Rubber feet
407-70	1	Meter, 0-1 ma
411-140	1	OC2 tube
412-2	1	Lamp, 3 watt, 120 volt
412-10	1	Pilot light assembly
421-4	1	8 ampere fuse
423-1	1	Fuse holder
427-2	2	Binding post base
432-27	1	Adapter, 3-prong to 2-prong
462-52	2	Knob
595-357	1	Manual

Refer to the Parts Pictorial which folds out from Page 9.

PROPER SOLDERING TECHNIQUES

Only a small percentage of HEATHKIT equipment purchasers find it necessary to return an instrument for factory service. Of these instruments, by far the largest portion malfunction due to poor or improper soldering.

If terminals are bright and clean and free of wax, frayed insulation and other foreign substances, no difficulty will be experienced in soldering. Correctly soldered connections are essential if the performance engineered into a kit is to be fully realized. If you are a beginner with no experience in soldering, a half hour's practice with some odd lengths of wire may be a worthwhile investment.

For most wiring, a 30 to 100 watt iron or its equivalent in a soldering gun is very satisfactory. A lower wattage iron than this may not heat the connection enough to flow the solder smoothly over the joint. Keep the iron tip clean and bright by wiping it from time to time with a cloth.

CHASSIS WIRING AND SOLDERING

1. All wire used is the type with colored insulation (hookup wire). In preparing a length of hookup wire, remove 1/4" of insulation from each end unless directed otherwise in the construction step.

2. Leads on resistors, capacitors and similar components are generally much longer than they need to be to make the required connections. In these cases, the leads should be cut to proper length before the part is added to the chassis. In general, the leads should be just long enough to reach their terminating points.

3. Wherever there is a possibility of bare leads shorting to other parts or to the chassis, the leads should be covered with insulating sleeving. Where the use of sleeving is specifically intended, the phrase "use sleeving" is included in the associated construction step. In any case where there is the possibility of an unintentional short circuit, sleeving should be used. Extra sleeving is provided for this purpose.

4. Crimp or bend the lead (or leads) around the terminal to form a good joint without relying on solder for physical strength. If the wire is too large to allow bending or if the step states that the wire is not to be crimped, position the wire so that a good solder connection can still be made.

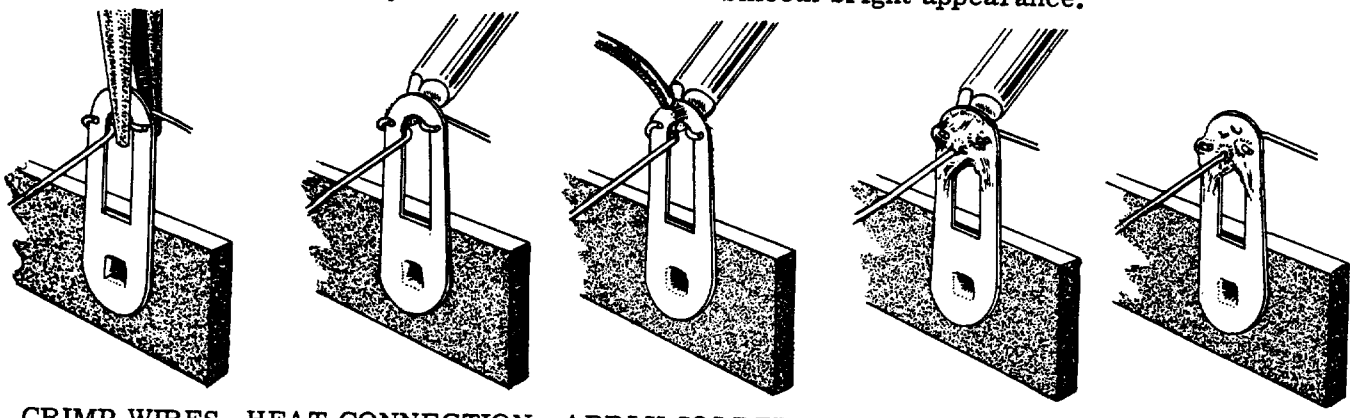
5. Position the work, if possible, so that gravity will help to keep the solder where you want it.

6. Place a flat side of the soldering iron tip against the joint to be soldered until it is heated sufficiently to melt the solder.

7. Then place the solder against the heated terminal and it will immediately flow over the joint; use only enough solder to thoroughly wet the junction. It is usually not necessary to fill the entire hole in the terminal with solder.

8. Remove the solder and then the iron from the completed junction. Use care not to move the leads until the solder is solidified.

A poor or cold solder joint will usually look crystalline and have a grainy texture, or the solder will stand up in a blob and will not have adhered to the joint. Such joints should be reheated until the solder flows smoothly over the entire junction. In some cases, it may be necessary to add a little more solder to achieve a smooth bright appearance.



CRIMP WIRES | HEAT CONNECTION | APPLY SOLDER | ALLOW SOLDER TO FLOW | PROPER SOLDER CONNECTION

NOTE: ALL GUARANTEES ARE VOIDED AND WE WILL NOT REPAIR OR SERVICE INSTRUMENTS IN WHICH ACID CORE SOLDER OR PASTE FLUXES HAVE BEEN USED. WHEN IN DOUBT ABOUT SOLDER, IT IS RECOMMENDED THAT A NEW ROLL PLAINLY MARKED "ROSIN CORE RADIO SOLDER" BE PURCHASED.

STEP-BY-STEP PROCEDURE

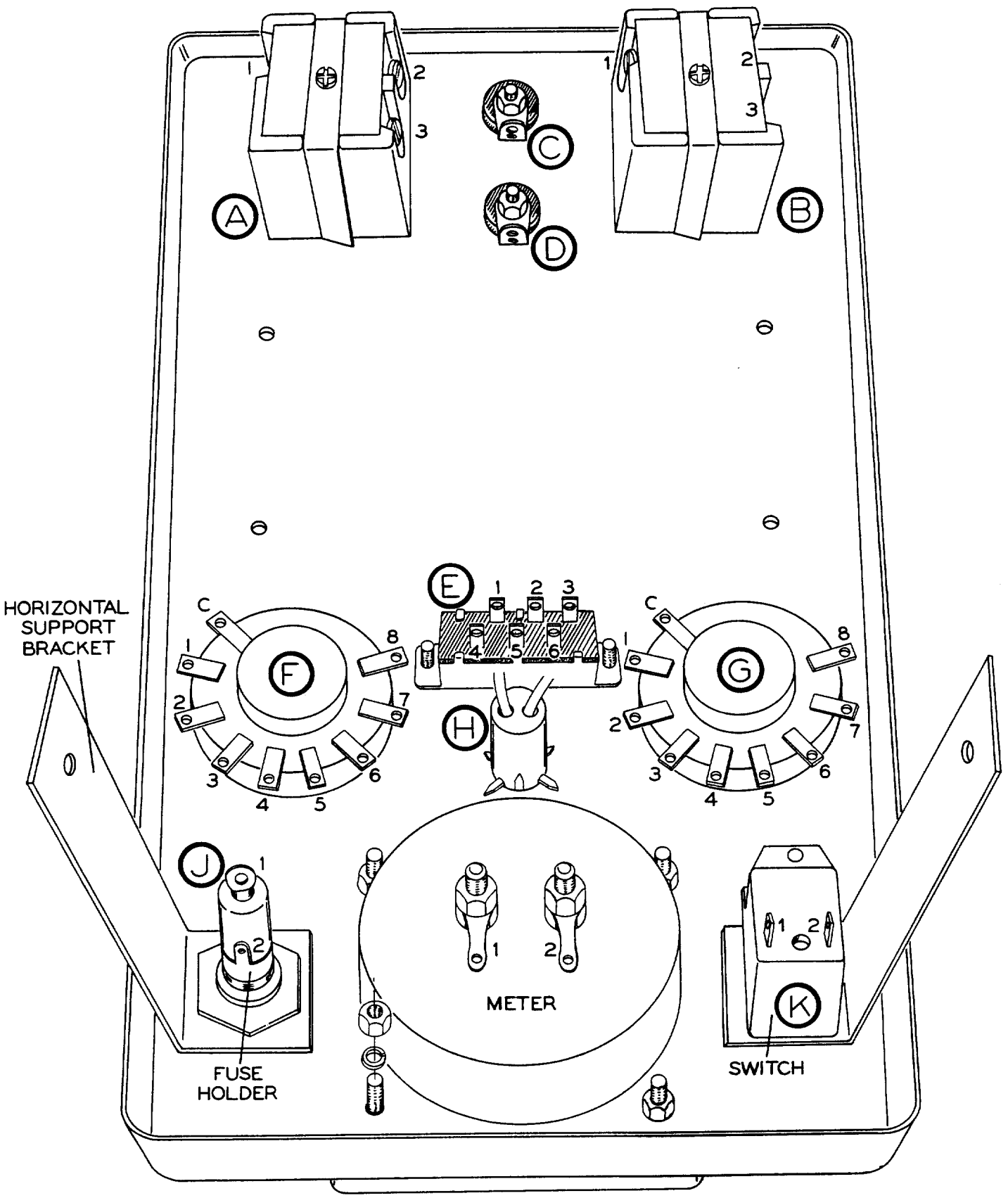
The following instructions are presented in a logical step-by-step sequence to enable you to complete your kit with the least possible confusion. Be sure to read each step all the way through before beginning the specified operation. Also read several steps ahead of the actual step being performed. This will familiarize you with the relationship of the subsequent operations. When the step is completed, check it off in the space provided. This is particularly important as it may prevent errors or omissions, especially if your work is interrupted. Some kit builders have also found it helpful to mark each lead in colored pencil on the Pictorial as it is added.

The fold-out diagrams in this manual may be removed and attached to the wall above your working area; but, because they are an integral part of the instructions, they should be returned to the manual after the kit is completed.

In general, the illustrations in this manual correspond to the actual configuration of the kit; however, in some instances the illustrations may be slightly distorted to facilitate clearly showing all of the parts.

The abbreviation "NS" indicates that a connection should not be soldered yet as other wires will be added. When the last wire is installed, the terminal should be soldered and the abbreviation "S" is used to indicate this. Note that a number will appear after each solder instruction. This number indicates the number of leads that are supposed to be connected to the terminal in point before it is soldered. For example, if the instruction reads, "Connect a lead to lug 1 (S-2)," it will be understood that there will be two leads connected to the terminal at the time it is soldered.

The steps directing the installation of resistors include color codes to help identify the parts. Also, if a part is identified by a letter-number designation on the Schematic, its designation will appear in the construction step which directs its installation.


A
B
C
D
E
F
G
H
J
K
HORIZONTAL SUPPORT BRACKET
METER
FUSE HOLDER
SWITCH

Pictorial 1

STEP-BY-STEP ASSEMBLY

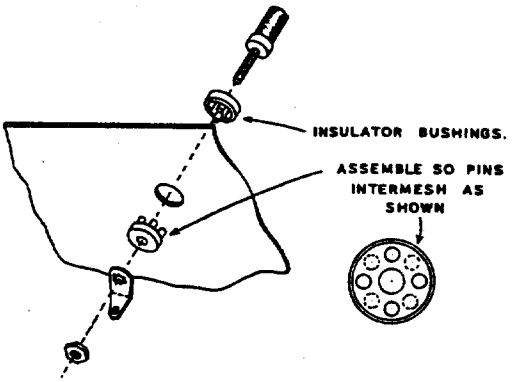
FRONT PANEL

Refer to Pictorial 1 for the following steps.

NOTE: It would be well to place a soft cloth on your work surface to prevent scratching the front panel when assembling the front panel in the following steps.

( ) Position the front panel as shown in Pictorial 1 and mount AC receptacle A. Note that the 2-screw side of the receptacle is toward locations C and D. The receptacle is mounted by pushing it into its hole from the front of the panel until the two tabs snap out to hold it in place.

( ) Similarly, mount AC receptacle B. The 2-screw side of receptacle B should be away from locations C and D.



Detail 1A

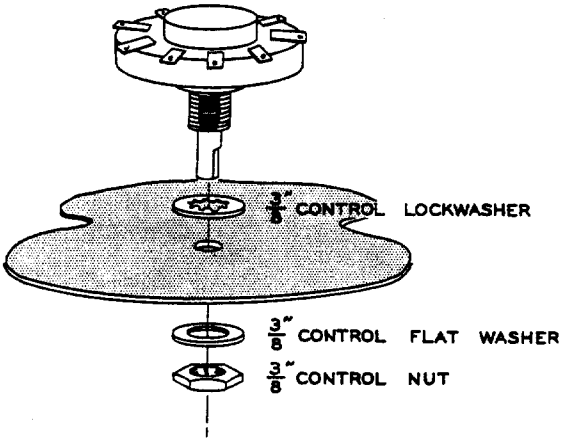
( ) Mount binding post base C as shown in Detail 1A. Use two binding post bushings, a #6 solder lug, and a 6-32 nut. Orient the solder lug as shown.

( ) Similarly, mount binding post base D.

( ) Mount slide switch E with two 6-32 x 3/8" screws. This switch should be oriented so that it is in its OUTPUT position as indicated by the front panel markings.

( ) Mount pilot light H. After inserting the pilot light through the front panel, bend four of its small tabs down against the panel to secure it in place.

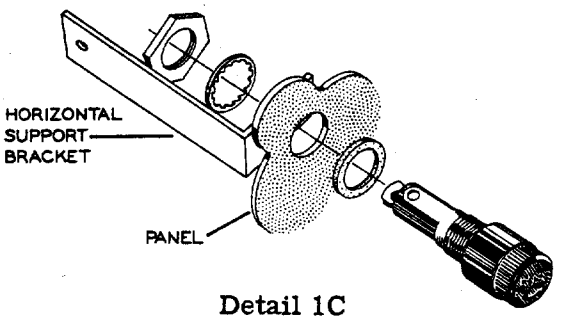
( ) Mount rotary switch F as shown in Detail 1B. Use a 3/8" control lockwasher, a 3/8" control flatwasher, and a 3/8" control nut. Before tightening the nut, position the space between lugs 7 and 8 toward pilot light H.



Detail 1B

( ) Similarly, mount rotary switch G. The space between lugs 1 and 2 should be toward the pilot light.

( ) Referring to Detail 1C, mount fuse holder J and one of the horizontal support brackets.



Detail 1C

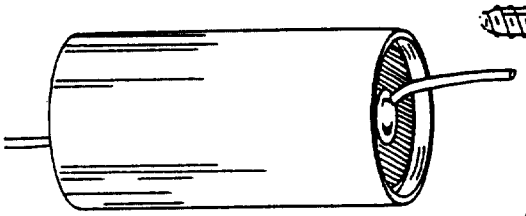
( ) Similarly, mount toggle switch K and the other horizontal support bracket. The two nuts used to mount this switch should be positioned on the switch bushing so that the end of the bushing is flush with the outside nut after the nut is tightened.

( ) Mount the meter movement to the front panel using the nuts and lockwashers furnished with the meter. Be careful not to overtighten the meter mounting nuts as this could crack the plastic meter base. Now remove the shorting wire (if present) from between the meter terminals, but do not loosen the nuts on the meter terminal studs.

PARTS PICTORIAL

½ W RESISTOR

2 WATT RESISTOR



25-57 ELECTROLYTIC CAPACITOR

3-48 X ¼" SCREW

#10 x ½" SHEET METAL SCREW

6-32 x ⅜" BHMS

#10X ⅞" SHEET METAL SCREW

8-32 X ⅜" BHMS

3-48 NUT

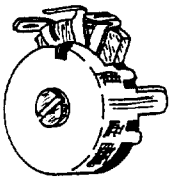
6-32 NUT

8-32 NUT

10-32 NUT

⅜" CONTROL NUT

#6 SPEEDNUT

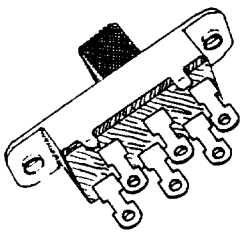


10-57 TAB MOUNT CONTROL

CONTROL FLAT WASHER

#6 LOCKWASHER

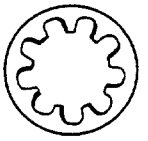
#10 LOCKWASHER



#60-3 DPDT SLIDE SWITCH

8 LOCKWASHER

#3 LOCKWASHER

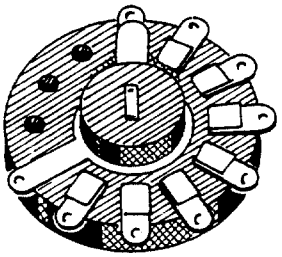


⅜" CONTROL LOCKWASHER

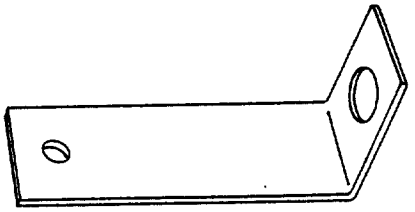
6 SOLDER LUG

#6 SPADE LUG

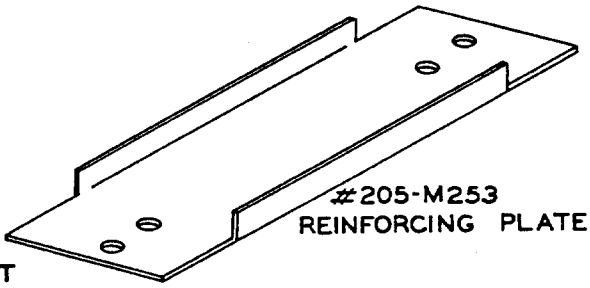
#75-29 LINE CORD STRAIN RELIEF



63-234 ROTARY SWITCH

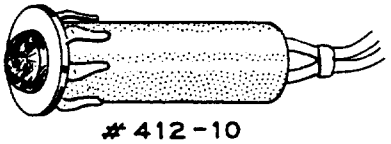


#204-M346 HORIZONTAL SUPPORT BRACKET

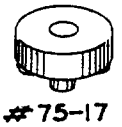


#205-M253 REINFORCING PLATE

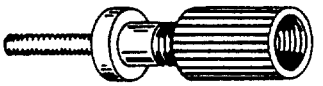
57-27 DIODE



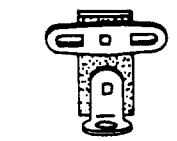
#412-10 PILOT LIGHT ASSEMBLY



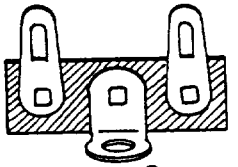
#75-17 BINDING POST BUSHING



427-2 BINDING POST BASE
#100-M16B BINDING POST CAP

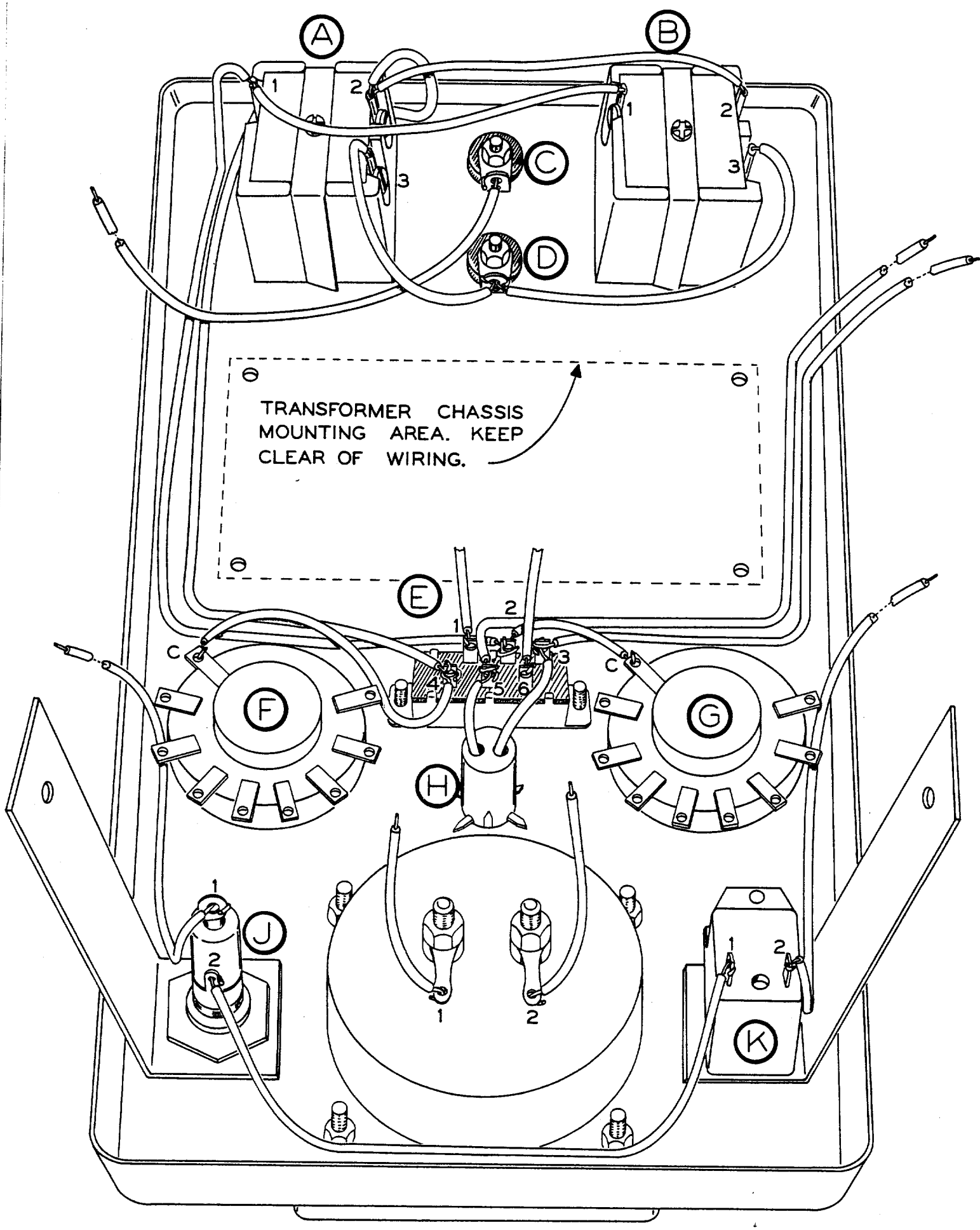


#431-1 I-LUG TERMINAL STRIP (DUAL)



#431-2 2-LUG TERMINAL STRIP

#434-15 7-PIN WAFER SOCKET


A
B
C
D
E
F
G
H
J
K
TRANSFORMER CHASSIS MOUNTING AREA. KEEP CLEAR OF WIRING.

Pictorial 2

Refer to Pictorial 2 for the following steps.

( ) Temporarily hold the transformer chassis against the front panel so that its four mounting holes line up with those in the front panel. (See Detail 4A on Page 13.) Now draw an outline of the transformer chassis mounting area on the front panel. This area should be kept clear of wiring in the following steps.

NOTE: Use the #18 hookup wire to make the following connections. When preparing a length of hookup wire, strip 1/4" of insulation from each end.

( ) Connect an 8" wire from lug 2 of fuse holder J (S-1) to lug 1 of toggle switch K (S-1).

( ) Connect one end of a 16" wire to lug 2 of toggle switch K (S-1). Dress this wire between switch G and the edge of the front panel as shown. Leave the end free.

( ) Connect one end of a 16" wire to lug 1 of fuse holder J (S-1). Dress as shown and leave the end free.

NOTE: When connecting wires to lugs 2, 3, 4, and 5 of slide switch E, wrap the first wire around the lug and connect the second wire to the hole in the lug.

( ) Connect a 4-1/4" wire from lug 4 of slide switch E (NS) to lug C of switch F (S-1).

( ) Connect a 3" wire from lug 2 of slide switch E (NS) to lug C of switch G (S-1).

( ) Connect one end of a 10-1/2" wire to lug 2 of slide switch E (S-2). Dress in the direction shown and leave the end free temporarily.

( ) Connect one end of an 11-1/2" wire to lug 4 of slide switch E (S-2). Dress in the direction shown and leave the end free temporarily.

( ) Connect one end of a 16" wire to lug 5 of slide switch E (NS). Dress as shown and leave the end free.

( ) Connect one end of a 16" wire to lug 3 of slide switch E (NS). Dress as shown and leave the end free.

( ) Connect one end of a 6" wire to lug 6 of slide switch E (S-1). Dress this wire perpendicular to the front panel and leave the other end free.

( ) Connect one end of a 7" wire to lug 1 of slide switch E (S-1). Dress this wire perpendicular to the front panel and leave the other end free.

( ) Cut both pilot light leads to 2" long, strip 1/4" of insulation from the end of each lead, and tin the ends. ("Tin" means to melt a small amount of solder over the exposed wire ends.)

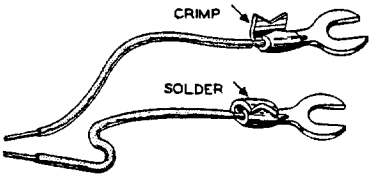
( ) Connect either pilot light lead to lug 5 of slide switch E (S-2).

( ) Connect the other pilot light lead to lug 3 of slide switch E (S-2).

( ) Connect one end of a 4-1/2" wire to lug 1 of the meter (S-1). Leave the other end free.

( ) Connect one end of a 5-1/4" wire to lug 2 of the meter (S-1). Leave the other end free.

( ) Connect one end of a 10-1/2" wire to the solder lug of binding post C (S-1). Leave the other end free.



Detail 2A

( ) Prepare a 3-3/4" hookup wire and solder a spade lug to one end as shown in Detail 2A.

( ) Place the spade lug under screw 3 of AC receptacle B and tighten. Connect the other end of this wire to the solder lug of binding post D (NS).

( ) Prepare a 2-1/2" hookup wire and solder a spade lug to one end.

( ) Place the spade lug under screw 3 of AC receptacle A and tighten. Connect the other end of this wire to the solder lug of binding post D (S-2).

( ) Prepare a 4" hookup wire and solder a spade lug to one end. Now solder a spade lug to both the other end of this wire and to the free end of the wire coming from lug 2 of slide switch E.

( ) Place the solder lug with two wires attached under screw 1 of AC receptacle A and tighten. Place the solder lug with one wire attached under screw 1 of AC receptacle B and tighten.

( ) Prepare a 4" hookup wire and solder a spade lug to one end. Now solder a spade lug to both the other end of this wire and to the free end of the wire coming from lug 4 of slide switch E.

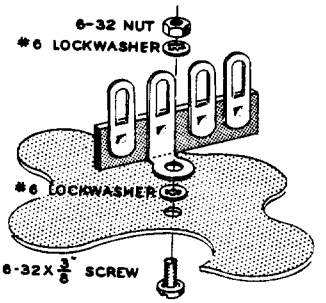
( ) Place the spade lug with two wires attached under screw 2 of AC receptacle A and tighten. Place the spade lug with one wire attached under screw 2 of AC receptacle B and tighten.

This completes preparation of the front panel. Compare the wiring to Pictorial 2 to see that all connections and lead dress are correct. All terminals should be soldered except lugs 1 through 8 of switches F and G, which will be wired later.

TRANSFORMER CHASSIS

Refer to Pictorial 3 for the following steps.

( ) Position the transformer on the transformer chassis as shown in Pictorial 3. The side of the transformer with the two short black leads should be away from the open side of the chassis. Secure the transformer to the chassis with four #10 lockwashers and four 10-32 nuts.



Detail 3A

( ) Mount 4-lug terminal strip L with a 6-32 x 3/8" screw, two #6 lockwashers, and a 6-32 nut as shown in Detail 3A.

( ) Place four #10 speednuts over the holes in the bottom flanges of the transformer chassis. The flat sides of the speednuts should face outward.

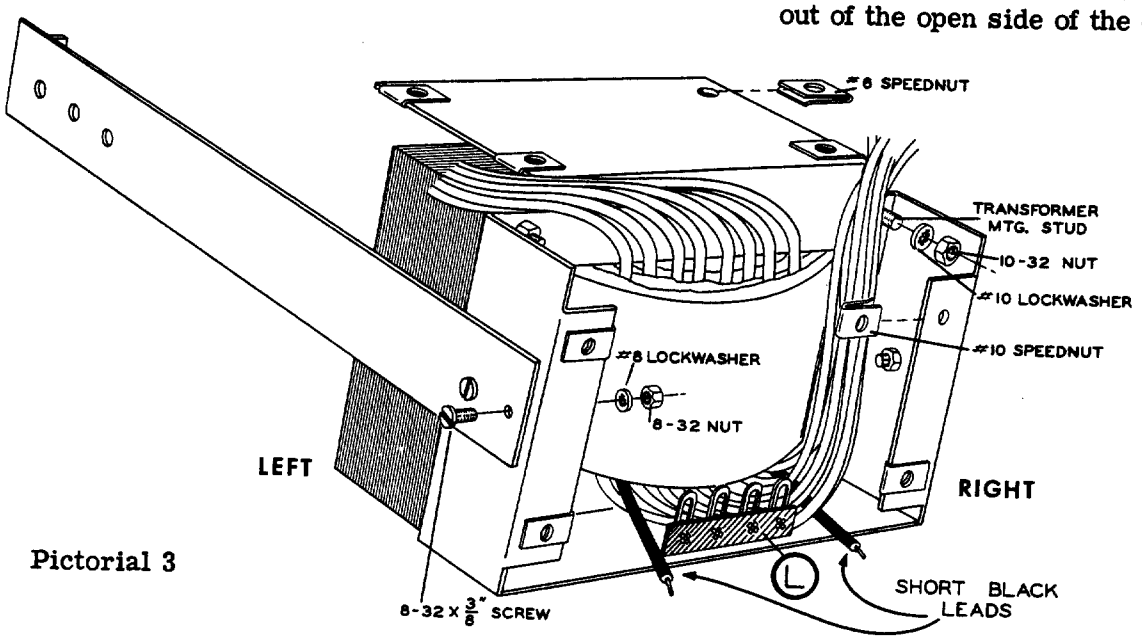
( ) Similarly, place four #6 speednuts over the holes in the front flange of the transformer chassis.

( ) Fasten a vertical support bracket to the left side of the transformer chassis as shown in Pictorial 3. Use 8-32 x 3/8" screws, #8 lockwashers, and 8-32 nuts.

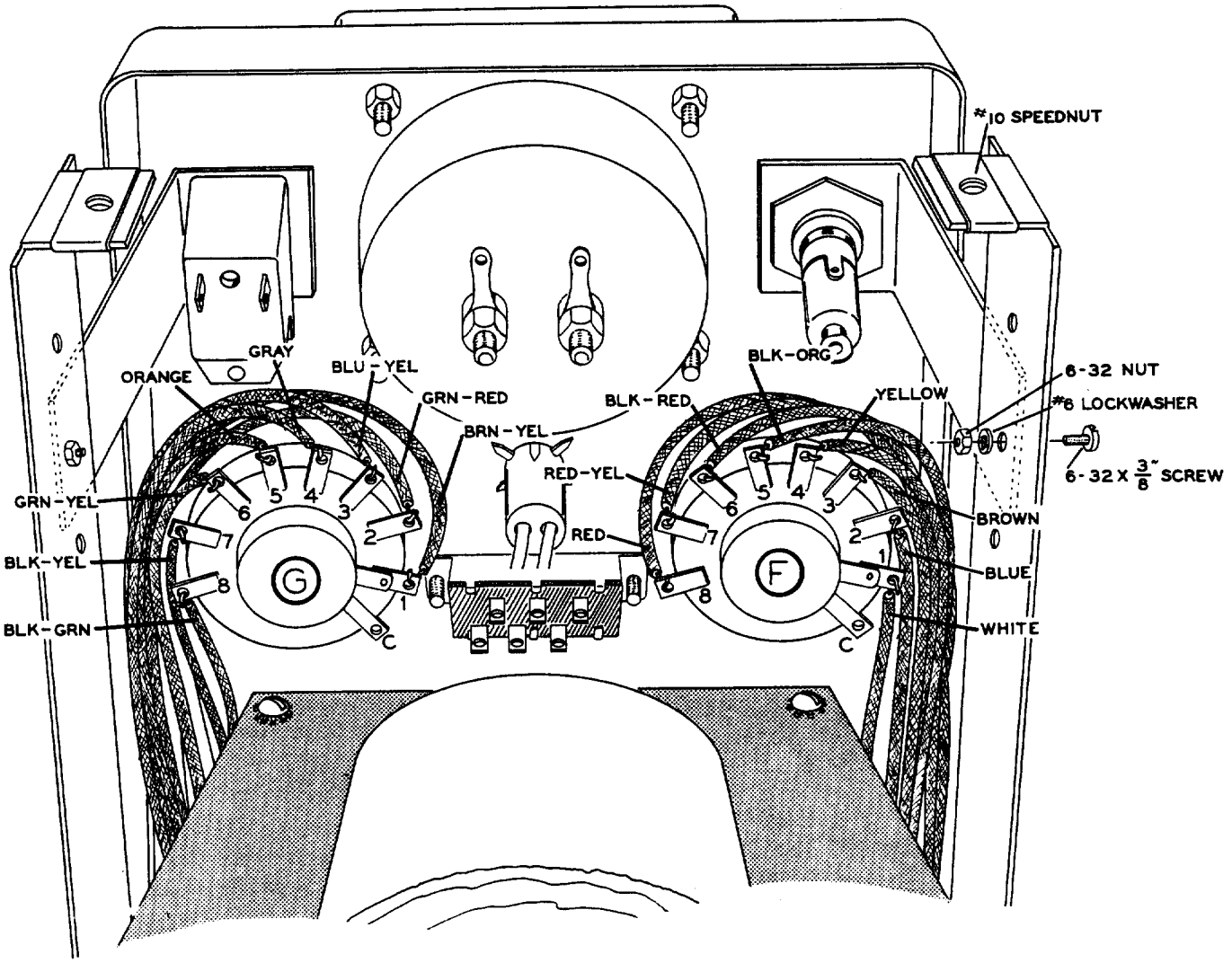
( ) Similarly, fasten the remaining vertical support bracket to the right side of the transformer chassis.

( ) Dress all of the leads (except the two black leads) coming from the transformer near terminal strip L, around to the right, and out of the open side of the chassis.

( ) Dress all of the leads coming from the other side of the transformer to the left, and out of the open side of the chassis.



Pictorial 3



Pictorial 4

Refer to Pictorial 4 for the following steps.

( ) Place the transformer chassis against the front panel as shown in Pictorial 4. The vertical support brackets should fit inside of the horizontal support brackets which are mounted on the front panel. Make sure that the transformer leads and hookup wires are not pinched between the chassis and front panel.

( ) Secure the transformer chassis to the front panel with four 6-32 x 3/8" screws as shown in Detail 4A.

( ) Fasten the horizontal support brackets to the vertical support brackets with 6-32 x 3/8" screws, #6 lockwashers, and 6-32 nuts.

( ) Place a #10 speednut over the hole in the end flange of each vertical support bracket. The flat sides of the speednuts should face outward.

NOTE: The transformer leads are precut and tinned. DO NOT cut these leads for the following steps.

Connect transformer leads to switch G as follows:

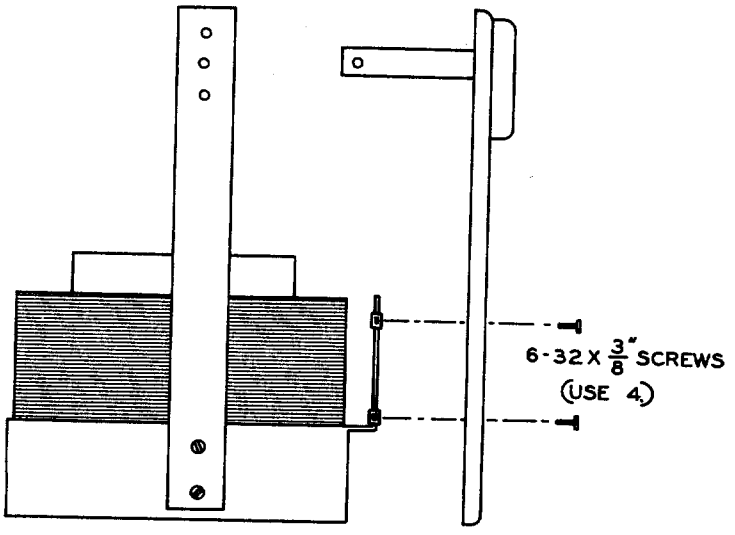
Lead Color	to lug
( ) Brown-yellow	1 (S-1)
( ) Green-red	2 (S-1)
( ) Blue-yellow	3 (S-1)
( ) Gray	4 (S-1)
( ) Orange	5 (S-1)
( ) Green-yellow	6 (S-1)
( ) Black-yellow	7 (S-1)
( ) Black-green	8 (S-1)

Connect transformer leads to switch F as follows:

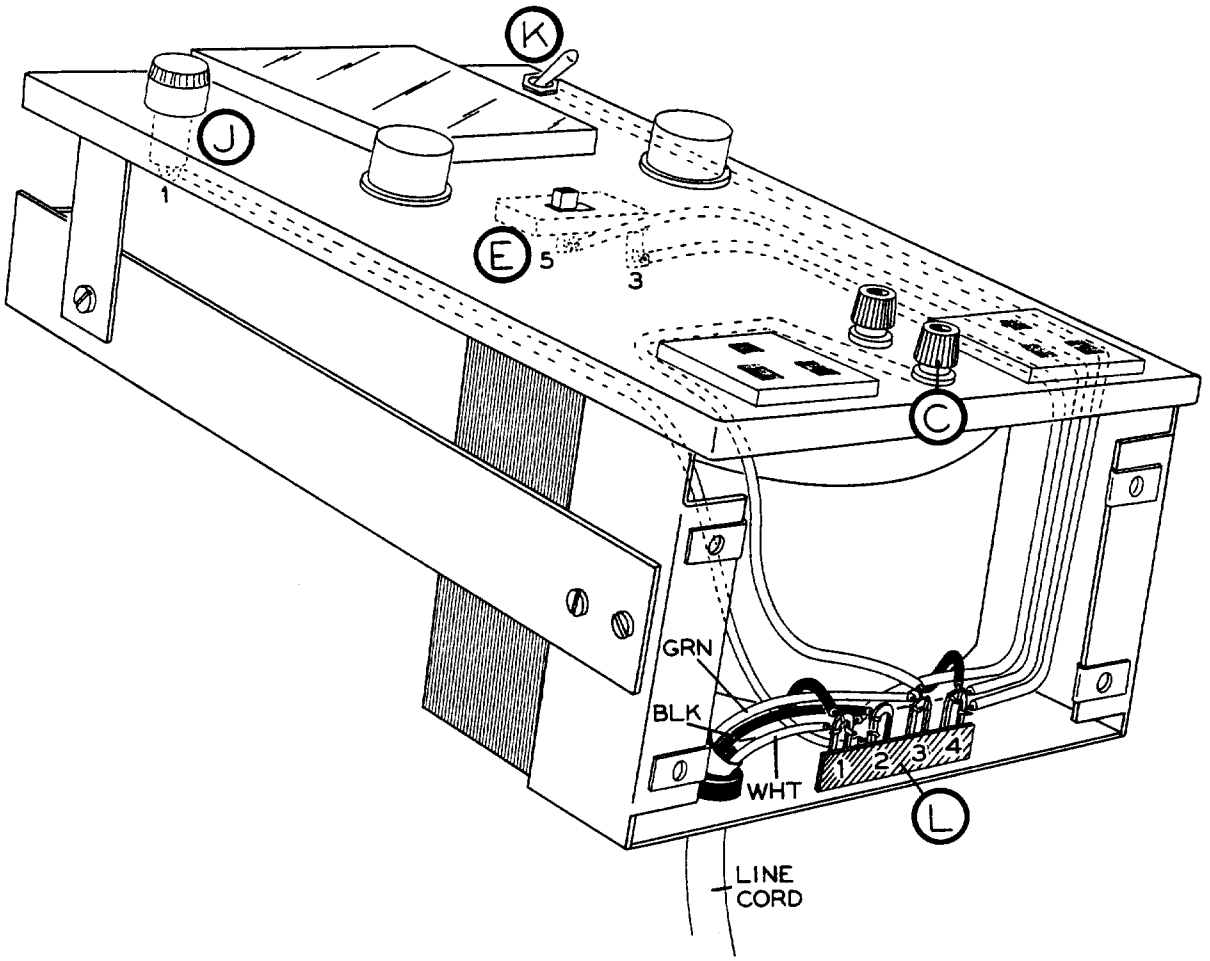
Lead Color	to lug
( ) Red	8 (S-1)
( ) Red-yellow	7 (S-1)
( ) Black-red	6 (S-1)
( ) Black-orange	5 (S-1)
( ) Yellow	4 (S-1)
( ) Brown	3 (S-1)
( ) Blue	2 (S-1)
( ) White	1 (S-1)

NOTE: The two black transformer leads will be connected later.

( ) For neater appearance, the transformer leads running along each edge of the front panel beside the transformer may be taped together with electrical or household adhesive tape. Any excess lead length should be pulled into the space under the transformer chassis.



Detail 4A



Pictorial 5

Refer to Pictorial 5 for the following steps.

NOTE: Each of the wires mentioned in the next five steps are already connected at one end to a component on the front panel. In each step, carefully trace the wire back to its front panel origin before connecting it to terminal strip L. Pictorial 2 (fold-out on Page 10) shows front panel component designations.

( ) Connect the wire coming from lug 1 of fuse holder J to lug 2 of terminal strip L (NS).

( ) Connect the wire coming from lug 2 of toggle switch K to lug 4 of terminal strip L (NS).

( ) Connect the wire coming from lug 5 of slide switch E to lug 4 of terminal strip L (NS).

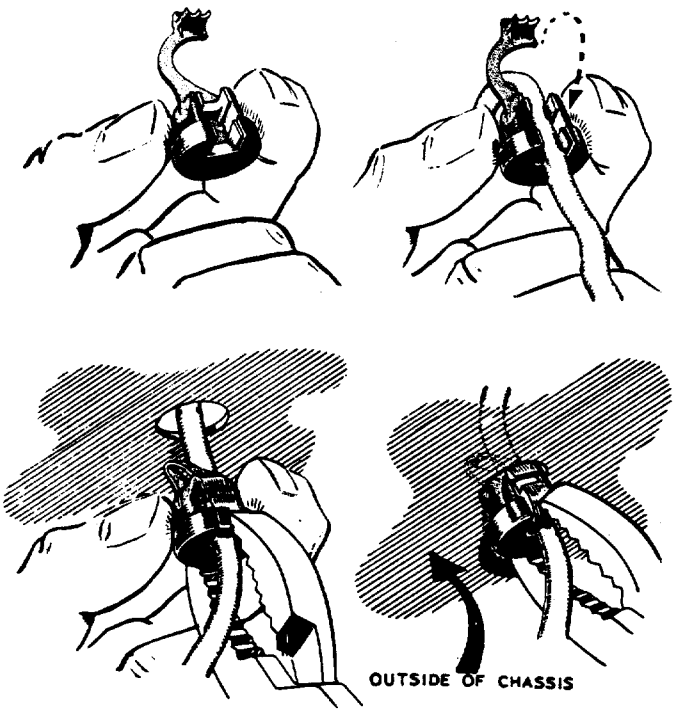
( ) Connect the wire coming from lug 3 of slide switch E to lug 1 of terminal strip L (NS).

( ) Connect the wire coming from binding post C to lug 3 of terminal strip L (NS).

( ) Connect either black transformer lead to lug 1 of terminal strip L (NS).

( ) Connect the other black transformer lead to lug 4 of terminal strip L (S-3).

( ) Referring to Detail 5A, install the line cord and line cord strain relief in the hole in the rear of the transformer chassis. About 1" of the outer line cord insulation should extend beyond the strain relief, inside of the chassis.



Detail 5A

NOTE: When connecting the line cord leads in the following steps, cut each lead to the length required to reach the lug called out in the step; then strip 1/4" of insulation from the lead and tin ("tin" means melt a small amount of solder over the exposed wire end).

Connect the line cord leads to terminal strip L as follows:

Lead Color	to lug
( ) White	1 (S-3)
( ) Black	2 (S-2)
( ) Green	3 (S-2)

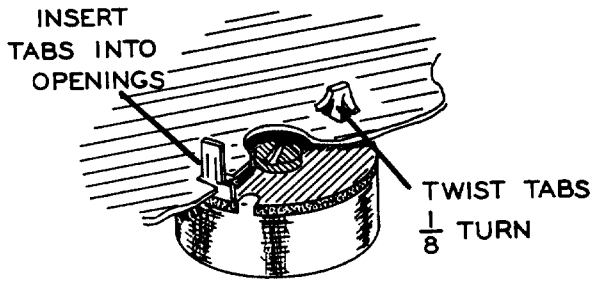
( ) Install the two pointer knobs on the shafts of rotary switches F and G. The setscrew in each knob should be tightened against the flat side of the switch shaft.

( ) Screw the two binding post caps on the binding posts at C and D.

Carefully check all connections made thus far against Pictorials 2, 4, and 5. When satisfied that all wiring is correct, set the front panel-transformer chassis assembly aside while assembling the subchassis.

SUBCHASSIS

Refer to Pictorial 6 for the following steps.

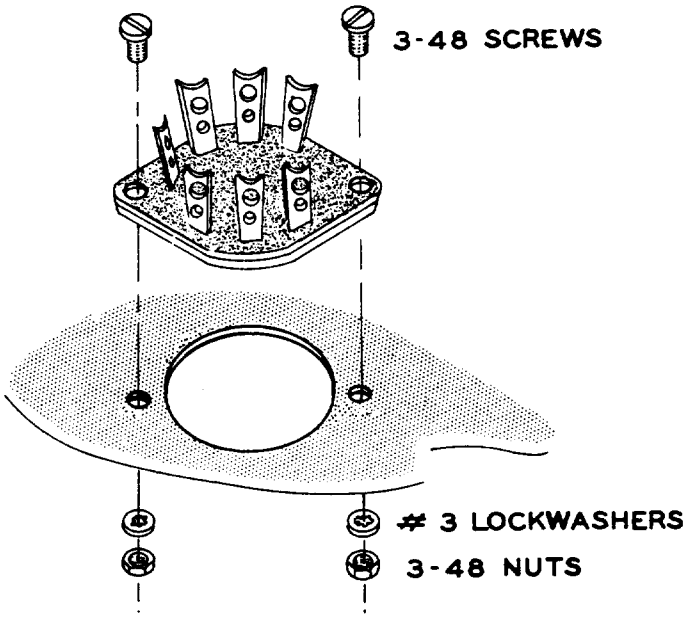


Detail 6A

( ) R5. Mount 2 KΩ control M (#10-52) on the subchassis. Refer to Detail 6A.

( ) R7. Similarly, mount 10 KΩ control N (#10-57).

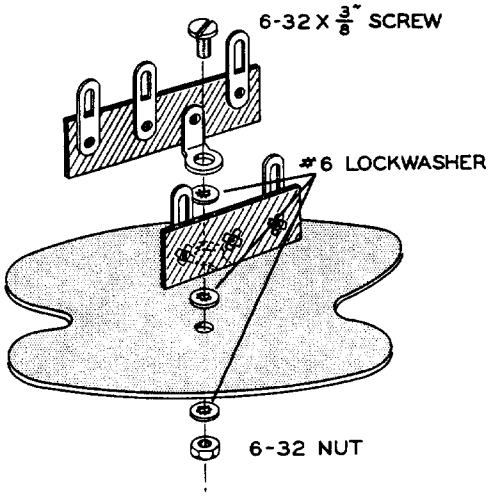
( ) Mount the 7-pin tube socket at V1. Use 3-48 screws, #3 lockwashers, and 3-48 nuts as shown in Detail 6B. Make sure that the tube socket blank space is placed as shown in Pictorial 6.



Detail 6B

( ) Mount dual-lug terminal strip P. Use a 6-32 x 3/8" screw, two #6 lockwashers, and a 6-32 nut. Refer back to Detail 3A on Page 11.

( ) Mount 3-lug terminal strip Q and 2-lug terminal strip R with a 6-32 x 3/8" screw, three #6 lockwashers, and a 6-32 nut. Place the lockwashers as shown in Detail 6C.



Detail 6C

( ) Mount lamp socket S with 6-32 x 3/8" screws, #6 lockwashers, and 6-32 nuts.

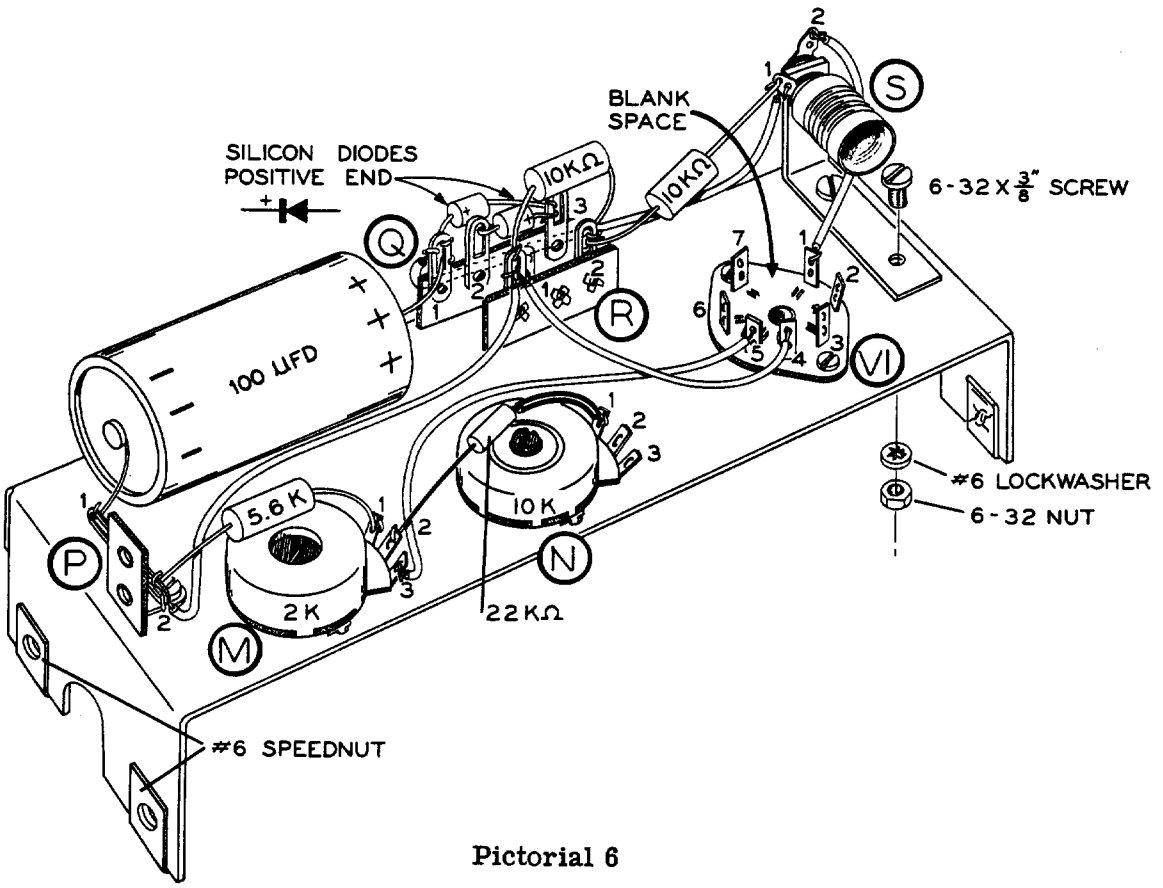
( ) Place two #6 speednuts over the holes in each end flange of the subchassis. The flat sides of the speednuts should face outward.

( ) Connect a 4-1/4" wire from lug 2 of terminal strip P (NS) to lug 1 of terminal strip R (NS).

( ) Connect a 3-3/4" wire from lug 3 of control M (S-1) to lug 5 of tube socket V1 (S-1).

( ) Connect a 2-1/2" wire from lug 1 of terminal strip R (NS) to lug 4 of tube socket V1 (S-1).

( ) Connect a 3-3/4" wire from lug 1 of terminal strip Q (NS) to lug 1 of lamp socket S (NS).



Pictorial 6

( ) Connect a 2-1/4" wire from lug 1 of tube socket V1 (S-1) to lug 2 of lamp socket S (S-1).

( ) C1. Connect the 100 μfd electrolytic capacitor from lug 1 of terminal strip P (S-1) to lug 1 of terminal strip Q (NS). The positive (+) lead goes to terminal strip Q.

( ) R4. Connect a 5.6 KΩ (green-blue-red) 2 watt resistor from lug 2 of terminal strip P (S-2) to lug 1 of control M (S-1).

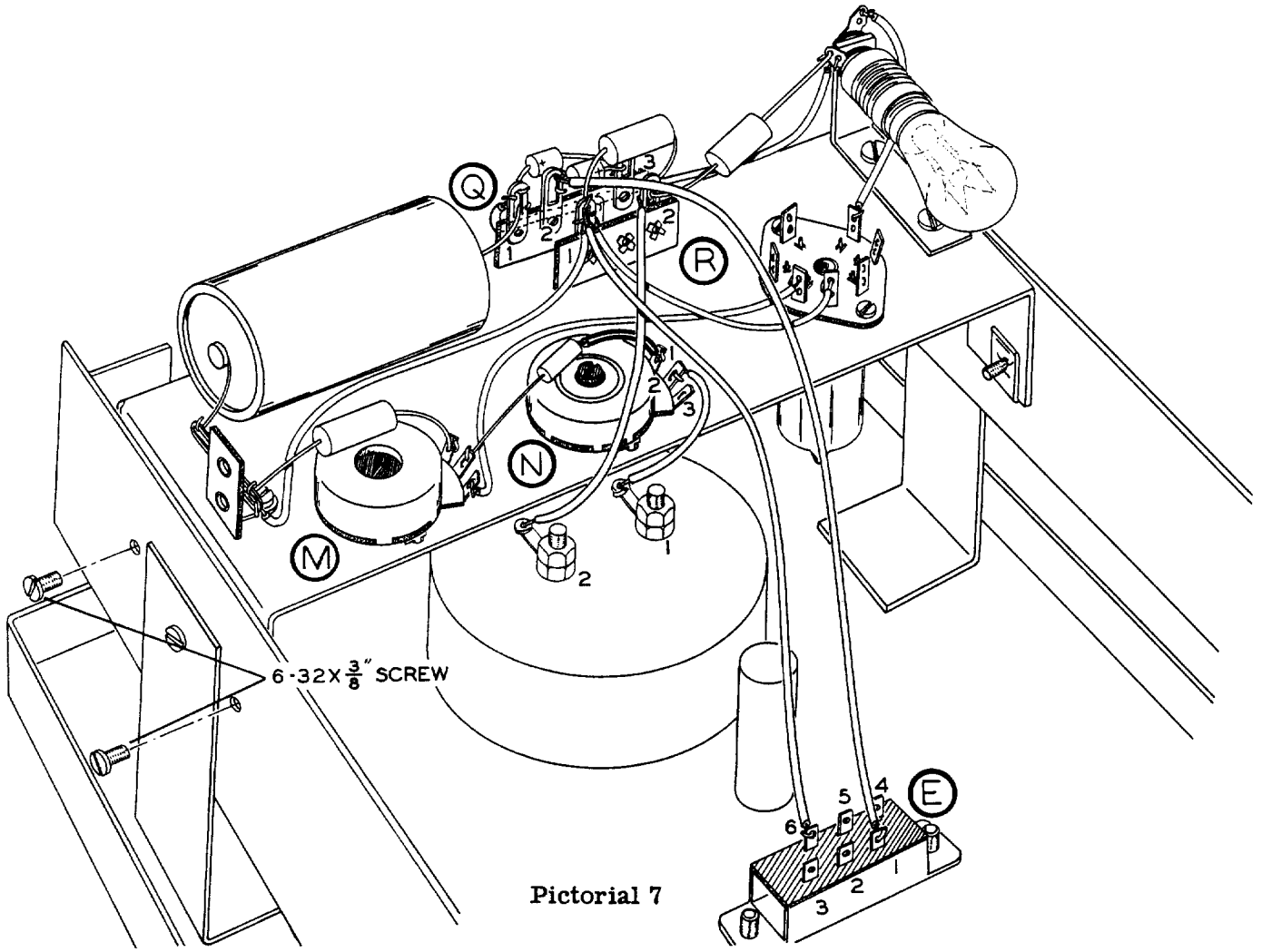
( ) R6. Connect a 22 KΩ (red-red-orange) 1/2 watt resistor from lug 2 of control M (S-1) to lug 1 of control N (S-1). Use sleeving on the lead to control N.

( ) D2. Connect a silicon diode from lug 1 (S-3) to lug 3 (NS) of terminal strip Q. The positive (+) lead goes to lug 1. Avoid overheating the diode lead when soldering.

( ) D1. Connect a silicon diode from lug 2 (NS) to lug 3 (S-2) of terminal strip Q. The positive (+) lead goes to lug 3.

( ) R2. Connect a 10 KΩ (brown-black-orange) 2 watt resistor from lug 1 (NS) to lug 2 (NS) of terminal strip R.

( ) R1. Connect a 10 KΩ (brown-black-orange) 2 watt resistor from lug 2 of terminal strip R (NS) to lug 1 of lamp socket S (S-2).



Pictorial 7

Refer to Pictorial 7 for the following steps.

( ) Mount the subchassis between the vertical support brackets. Secure with 6-32 x 3/8" screws, inserted through the vertical support brackets into the speednuts on the end flanges of the subchassis.

( ) Connect the free end of the wire coming from lug 1 of the meter to lug 2 of control N (S-1).

( ) Connect the free end of the wire coming from lug 2 of the meter to lug 2 of terminal strip R (S-3).

( ) Connect the free end of the wire coming from lug 6 of slide switch E to lug 1 of terminal strip R (S-4).

( ) Connect the free end of the wire coming from lug 1 of slide switch E to lug 2 of terminal strip Q (S-2). Avoid overheating the diode lead that is connected to this lug.

NOTE: This completes all of the wiring operations in the assembly of the IP-10 and is a good time to recheck all connections against the Pictorials. See that the lugs of switch E are not shorted to each other, to the transformer, or to the front panel.

( ) Install the 3 watt lamp in lamp socket S on the subchassis.

( ) Install the OC2 tube in tube socket V1.

( ) Install an 8 ampere fuse in the fuse holder on the front panel.

CALIBRATION

Either of the two following calibration procedures will provide good accuracy; however, if an accurate AC voltmeter is available, the procedure using test equipment is preferable.

Calibration Without Test Equipment

( ) Adjust the small plastic screw at the bottom center of the meter so that the meter pointer indicates exactly 90 on the meter scale.

( ) Set both IP-10 meter calibrate controls (M and N) to the middle of their range.

NOTE: It will be necessary to use the adapter if you have a 2-prong AC outlet.

( ) Connect the IP-10 to your AC power source and place its POWER switch in the ON position. The pilot light should light and the meter pointer probably will move up-scale, depending on the positions of the OUTPUT VOLTAGE switches. If, the pilot light does not light or if any overheating is noticed, IMMEDIATELY UNPLUG THE IP-10 and refer to the IN CASE OF DIFFICULTY section of this manual.

( ) Hold the METER switch in the LINE position and adjust the Low Voltage Calibrate control (M) so that the meter indicates the value of AC line voltage for your location (usually 117 volts).

( ) Leave the High Voltage Calibrate control (N) set to the middle of its range.

Calibration With Test Equipment

( ) Adjust the small plastic screw at the bottom center of the meter so that the meter pointer indicates exactly 90 on the meter scale.

An accurate AC voltmeter, covering 90 to 140 volts, is required for this calibration procedure. It should be noted that the IP-10 meter accuracy can be no better than the accuracy of the voltmeter used for calibration.

( ) Set both IP-10 meter calibrate controls to the middle of their range.

NOTE: It will be necessary to use the adapter if you have a 2-prong AC outlet.

( ) Connect the IP-10 to your AC power source and place its POWER switch in the ON position. The pilot light should light and the meter pointer probably will move up-scale, depending on the positions of the OUTPUT VOLTAGE switches. If the pilot light does not light or if any overheating is noticed, IMMEDIATELY unplug the IP-10 and refer to the IN CASE OF DIFFICULTY section of this manual.

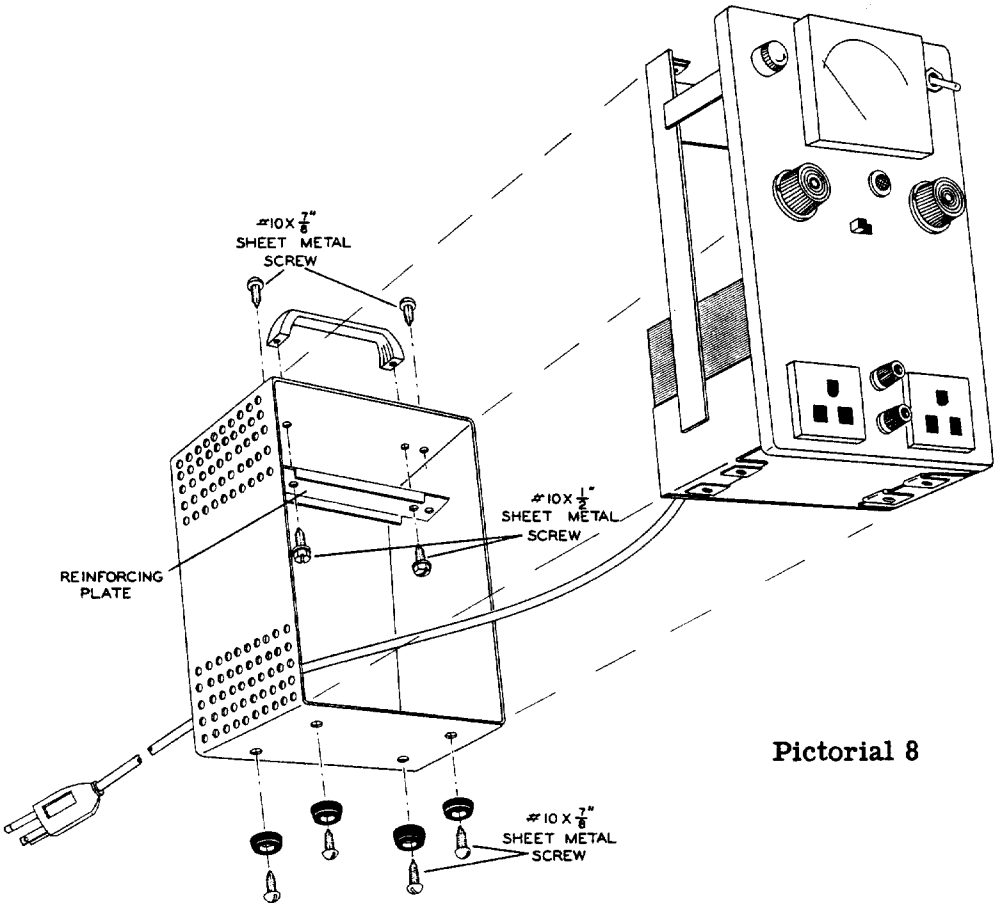
( ) Set both the FINE and COARSE OUTPUT VOLTAGE switches to their full counter-clockwise position.

( ) Connect the AC voltmeter across the bottom terminals of either IP-10 output receptacle. Now adjust the Low Voltage Calibrate control (M) so that the IP-10 meter indicates the same voltage as the AC voltmeter.

( ) Set both the FINE and COARSE OUTPUT VOLTAGE switches fully clockwise, then adjust the High Voltage Calibrate control so that the IP-10 meter indicates the same voltage as the AC voltmeter.

( ) Since the High Voltage and Low Voltage Calibrate adjustments interact, this calibration procedure should be repeated until no further improvement is obtained .

This completes calibration of the IP-10.



Pictorial 8

CABINET

Refer to Pictorial 8 for the following steps.

( ) Locate the cabinet, the reinforcing plate, the handle, and the two #10 x 1/2" sheet metal screws.

( ) Using the #10 x 1/2" sheet metal screws, fasten the reinforcing plate and handle to the top of the cabinet as indicated in Pictorial 8.

( ) Insert the plug of the line cord through the hole in the rear of the cabinet, then fit the cabinet over the chassis and inside of the front panel flanges. Make sure that none of the transformer leads or hookup wires are pinched between the cabinet and front panel.

( ) Secure the top of the cabinet with two #10 x 7/8" sheet metal screws, placed through the cabinet and into the speednuts on the end flanges of the vertical support brackets.

( ) Mount the four rubber feet to the bottom of the cabinet with #10 x 7/8" sheet metal screws. Each screw should be placed through a rubber foot, then through the cabinet and into a speednut on the flanges of the transformer chassis.

If difficulty is experienced in installing the cabinet, or if the cabinet does not fit properly after tightening its mounting screws, remove the cabinet and adjust the position of the vertical support brackets. This can be accomplished by slightly loosening the vertical support bracket mounting screws, repositioning the brackets, and retightening the screws.

This completes assembly of the IP-10 Isolation Transformer. Read the APPLICATION and OPERATION sections of the manual to gain a thorough understanding of how to use this instrument effectively.

OPERATION

There are only four operating controls on the IP-10. The function of each control is explained below.

COARSE OUTPUT VOLTAGE Switch: This switch is used to vary the output voltage in steps of approximately 5.2 volts. Clockwise rotation of this switch increases the output voltage, and counterclockwise rotation decreases the output voltage.

FINE OUTPUT VOLTAGE Switch: This switch is used to vary the output voltage in steps of approximately .75 volts. Clockwise rotation of this switch increases the output voltage, and counterclockwise rotation decreases the output voltage.

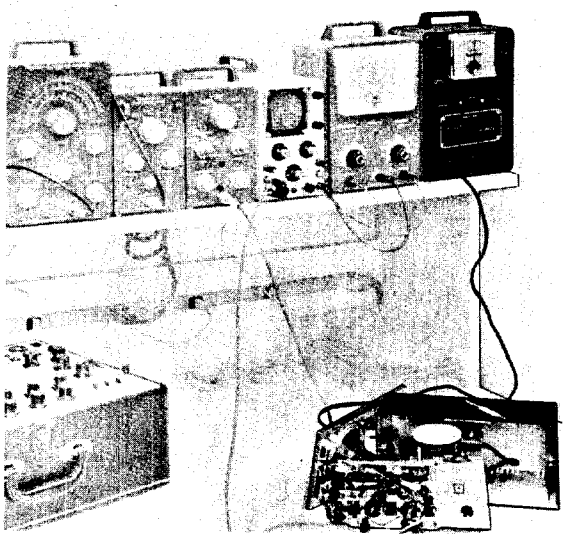
METER Switch: This switch is spring loaded in the OUTPUT position to monitor the value of IP-10 output voltage. When the METER switch is moved to the LINE position, the meter indicates the value of the source voltage to which the IP-10 line cord is connected.

POWER Switch: This switch is used simply to turn the IP-10, and any equipment which is connected to it, ON and OFF.

When equipment with a 3-wire line cord is connected to an IP-10 output receptacle, the ground terminal of the receptacle may be grounded to the IP-10 case, if desired, by connecting a jumper wire between the two binding posts on the IP-10 front panel. The ground wire of the IP-10 line cord is connected to the case at all times. Thus, the IP-10 case will be connected to the power system ground if the third (ground) wire of the IP-10 line cord plug is connected to the power system ground, either through use of an appropriate 3-prong receptacle or of the adapter with its jumper wire grounded.

APPLICATION

A typical test arrangement using the IP-10 is shown in the following illustration. In this case, a transformerless type radio is being tested.



First, the IP-10 provides isolation between the AC power line and the radio chassis, thereby reducing AC shock hazards due to voltage between the radio chassis and the case or ground circuit of any other transformerless equipment connected to the line voltage source.

The technician can check for intermittent conditions due to low voltage in a radio by reducing the AC voltage with the IP-10 OUTPUT VOLTAGE controls. These controls can also be used to increase the AC voltage applied to the radio so that the technician can check for component breakdown due to high voltage in the radio.

Similar checks can be made with other equipment, such as television sets, amplifiers, tape decks, etc., operated from the IP-10.

Also, the IP-10 will meet the requirements of many industrial and laboratory applications due to its power line isolation, variable-voltage output, and relatively high power handling capability.

It is possible that many other applications of the IP-10 will suggest themselves to the user; i.e., it can be used to isolate interference radiating devices from the AC line, thereby reducing interference level. It can also be used in checking fluorescent lamp starters by determining the voltage level required for operation. Small motors or appliances may have their operating characteristics altered through the use of a variable voltage isolation transformer. It is important that the power rating of the unit not be exceeded. The IP-10 is rated at 300 watts continuously, or up to 500 watts intermittently.

IN CASE OF DIFFICULTY

1. Recheck the wiring. Trace each lead in colored pencil on the Pictorial as it is checked. It is frequently helpful to have a friend check your work. Someone who is not familiar with the unit may notice something consistently overlooked by the constructor.
2. It is interesting to note that about 90% of the kits that are returned for repair, malfunction due to poor connections and soldering. Therefore, many troubles can be eliminated by reheating all connections to make sure that they are soldered as illustrated in the Figures found in the SOLDERING TECHNIQUES section of this manual.
3. Check the tube with a tube tester or by substitution of a tube of the same type and known to be good.
4. Check the values of the component parts. Be sure that the proper part has been wired into the circuit, as shown in the pictorial diagrams and as called out in the wiring instructions.
5. Check for bits of solder, wire ends or other foreign matter which may be lodged in the wiring.
6. A review of the Circuit Description and Schematic Diagram will prove helpful in indicating where to look for the trouble.
7. With a load connected to the IP-10, arcing in the OUTPUT VOLTAGE switches, as they are rotated, is normal.

SERVICE INFORMATION

SERVICE

If, after applying the information contained in this manual and your best efforts, you are still unable to obtain proper performance, it is suggested that you take advantage of the technical facilities which the Heath Company makes available to its customers.

The Technical Consultation Department is maintained for your benefit. This service is available to you at no charge. Its primary purpose is to provide assistance for those who encounter difficulty in the construction, operation or maintenance of HEATHKIT equipment. It is not intended, and is not equipped to function as a general source of technical information involving kit modifications nor anything other than the normal and specified performance of HEATHKIT equipment.

Although the Technical Consultants are familiar with all details of this kit, the effectiveness of their advice will depend entirely upon the amount and the accuracy of the information furnished by you. In a sense, YOU MUST QUALIFY for GOOD technical advice by helping the consultants to help you. Please use this outline:

1. Before writing, fully investigate each of the hints and suggestions listed in this manual under "IN CASE OF DIFFICULTY." Possibly it will not be necessary to write.
2. When writing, clearly describe the nature of the trouble and mention all associated equipment. Specifically report operating procedures, switch positions, connections to other units and anything else that might help to isolate the cause of trouble.
3. Report fully on the results obtained when testing the unit initially and when following the suggestions under "IN CASE OF DIFFICULTY." Be as specific as possible and include voltage readings if test equipment is available.
4. Identify the kit model number and date of purchase, if available.
5. Print or type your name and address, preferably in two places on the letter.

With the preceding information, the consultant will know exactly what kit you have, what you would like it to do for you and the difficulty you wish to correct. The date of purchase tells him whether or not engineering changes have been made since it was shipped to you. He will know what you have done in an effort to locate the cause of trouble and, thereby, avoid repetitious suggestions. In short, he will devote full time to the problem at hand, and through his familiarity with the kit, plus your accurate report, he will be able to give you a complete and helpful answer. If replacement parts are

required, they will be shipped to you, subject to the terms of the Warranty.

The Factory Service facilities are also available to you, in case you are not familiar enough with electronics to provide our consultants with sufficient information on which to base a diagnosis of your difficulty, or in the event that you prefer to have the difficulty corrected in this manner. You may return the completed equipment to the Heath Company for inspection and necessary repairs and adjustments. You will be charged a minimal service fee, plus the price of any additional parts or material required. However, if the completed kit is returned within the Warranty period, parts charges will be governed by the terms of the Warranty. State the date of purchase, if possible.

Local Service by Authorized HEATHKIT Service Centers is also available in some areas and often will be your fastest, most efficient method of obtaining service for your HEATHKIT equipment. Although charges for local service are generally somewhat higher than for factory service, the amount of increase is usually offset by the transportation charge you would pay if you elected to return your kit to the Heath Company.

HEATHKIT Service Centers will honor the regular 90 day HEATHKIT Parts Warranty on all kits, whether purchased through a dealer or directly from Heath Company; however, it will be necessary that you verify the purchase date of your kit.

Under the conditions specified in the Warranty, replacement parts are supplied without charge; however, if the Service Center assists you in locating a defective part (or parts) in your kit, or installs a replacement part for you, you may be charged for this service.

HEATHKIT equipment purchased locally and returned to Heath Company for service must be accompanied by your copy of the dated sales receipt from your authorized HEATHKIT dealer in order to be eligible for parts replacement under the terms of the Warranty.

THIS SERVICE POLICY APPLIES ONLY TO COMPLETED EQUIPMENT CONSTRUCTED IN ACCORDANCE WITH THE INSTRUCTIONS AS STATED IN THE MANUAL. Equipment that has been modified in design will not be accepted for repair. If there is evidence of acid core solder or paste fluxes, the equipment will be returned NOT repaired.

For information regarding modification of HEATHKIT equipment for special applications, it is suggested that you refer to any one or more of the many publications that are available on all phases of electronics. They can be obtained at or through your local library, as well as at most electronic equipment stores. Although the Heath Company sincerely welcomes all comments and suggestions, it would be impossible to design, test, evaluate and assume responsibility for proposed circuit changes for special purposes. Therefore, such modifications must be made at the discretion of the kit builder, using information available from sources other than the Heath Company.

REPLACEMENTS

Material supplied with HEATHKIT products has been carefully selected to meet design requirements and ordinarily will fulfill its function without difficulty. Occasionally, improper operation can be traced to a faulty component. Should inspection reveal the necessity for replacement, write to the Heath Company and supply all of the following information.

A. Thoroughly identify the part in question by using the part number and description found in the manual Parts List.

B. Identify the type and model number of kit in which it is used.

C. Mention date of purchase.

D. Describe the nature of defect or reason for requesting replacement.

The Heath Company will promptly supply the necessary replacement. PLEASE DO NOT RETURN THE ORIGINAL COMPONENT UNTIL SPECIFICALLY REQUESTED TO DO SO. Do not dismantle the component in question as this will void the guarantee. This replacement policy does not cover the free replacement of parts that may have been broken or damaged through carelessness on the part of the kit builder.

SHIPPING INSTRUCTIONS

In the event that your instrument must be returned for service, these instructions should be carefully followed.

Be sure to leave the tube and lamp in their sockets. The cabinet should be installed, with all mounting screws in place.

ATTACH A TAG TO THE EQUIPMENT BEARING YOUR NAME, COMPLETE ADDRESS, DATE OF PURCHASE, AND A BRIEF DESCRIPTION OF THE DIFFICULTY ENCOUNTERED. Wrap the equipment in heavy paper, exercising care to prevent damage. Place the wrapped equipment in a stout carton of such size that at least three inches of shredded paper, excelsior, or other resilient packing material can be placed between all sides of the wrapped equipment and the carton. Close and seal the carton with gummed paper tape, or alternately, tie securely with stout cord. Clearly print the address on the carton as follows:

To: HEATH COMPANY
Benton Harbor, Michigan

Include your name and return address on the outside of the carton. Preferably affix one or more "Fragile" or "Handle With Care" labels to the carton, or otherwise so mark with a crayon of bright color. Ship by parcel post or prepaid express; note that a carrier cannot be held responsible for damage in transit if, in HIS OPINION, the article is inadequately packed for shipment.

WARRANTY

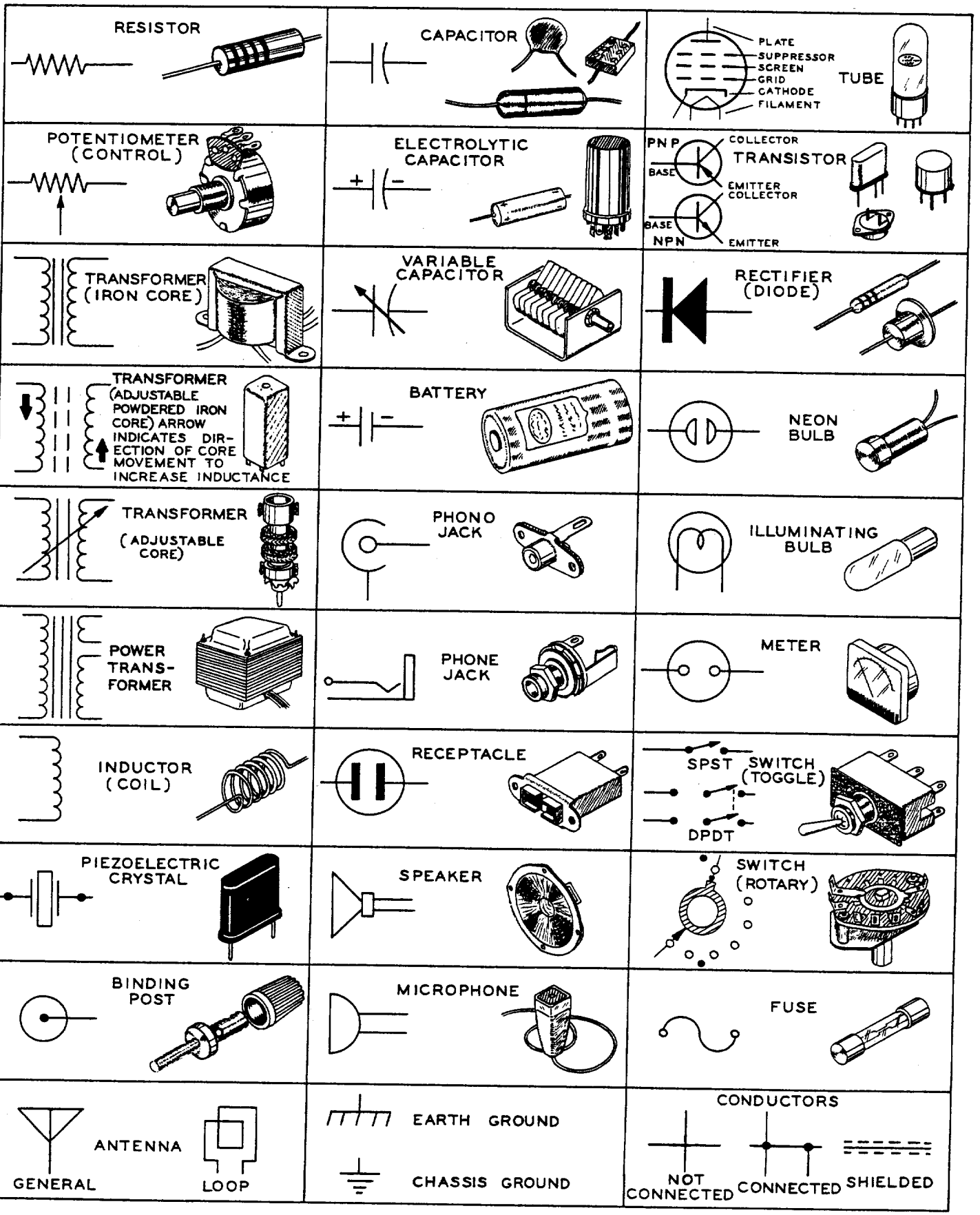
Heath Company warrants that for a period of three months from the date of shipment, all Heathkit parts shall be free of defects in materials and workmanship under normal use and service and that in fulfillment of any breach of such warranty, Heath Company shall replace such defective parts upon the return of the same to its factory. The foregoing warranty shall apply only to the original buyer, and is and shall be in lieu of all other warranties, whether express or implied and of all other obligations or liabilities on the part of Heath Company and in no event shall Heath Company be liable for any anticipated profits, consequential damages, loss of time or other losses incurred by the buyer in connection with the purchase, assembly or operation of Heathkits or components thereof. No replacement shall be made of parts damaged by the buyer in the course of handling or assembling Heathkit equipment.

NOTE: The foregoing warranty is completely void and we will not replace, repair or service instruments or parts thereof in which acid core solder or paste fluxes have been used.

HEATH COMPANY

TYPICAL COMPONENT TYPES

This chart is a guide to commonly used types of electronic components. The symbols and related illustrations should prove helpful in identifying most parts and reading the schematic diagrams.



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