MODEL IP-5220 Variable Isolated AC Power Supply

HEATHKIT®

ASSEMBLY MANUAL

Model IP-5220 Variable Isolated AC Power Supply

HEATH COMPANY • BENTON HARBOR, MICHIGAN

HEATHKIT

PRICE $2.00

I-595-1773

HEATH COMPANY PHONE DIRECTORY

The following telephone numbers are direct lines to the departments listed:

Kit orders and delivery information	(616) 982-3411
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Technical Assistance:	
R/C, Audio, and Electronic Organs	(616) 982-3310
Amateur Radio	(616) 982-3296
Test Equipment, Strobe Lights, Calculators, Clocks, Weather Instruments	(616) 982-3315
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YOUR HEATHKIT 90-DAY FULL WARRANTY

During your first ninety (90) days of ownership, Heath Company will replace or repair free of charge — as soon as practical — any parts which are defective, either in materials or workmanship. You can obtain parts directly from Heath Company by writing us or telephoning us at (616) 982-3571. And we'll pay shipping charges to get those parts to you — anywhere in the world.

We warrant that, during the first ninety (90) days of ownership, our products, when correctly assembled, calibrated, adjusted, and used in accordance with our printed instructions, will meet published specifications.

If a defective part or error in design has caused your Heathkit product to malfunction during the warranty period, through no fault of yours, we will service it free upon delivery at your expense to the Heath factory, Benton Harbor, Michigan, or to any Heathkit Electronic Center (units of Schlumberger Products Corporation), or through any of our authorized overseas distributors.

You will receive free consultation on any problem you might encounter in the assembly or use of your Heathkit product. Just drop us a line or give us a call. Sorry, we cannot accept collect calls.

Our warranty, both express and implied, does not cover damage caused by use of corrosive solder, defective tools, incorrect assembly, misuse, fire, customer-made modifications, flood or acts of God, nor does it include re-imbursement for customer assembly or set-up time. The warranty covers only Heath products and is not extended to non-Heath allied equipment or components used in conjunction with our products or uses of our products for purposes other than as advertised.

And if you are dissatisfied with our service — warranty or otherwise — or our products, write directly to our Director of Customer Services, Heath Company, Benton Harbor, Michigan, 49022. Telephone (616) 982-3524. He'll make certain your problems receive immediate, personal attention.

HEATH COMPANY
BENTON HARBOR, MI. 49022

Prices and specifications subject to change without notice.

Assembly and Operation of the

HEATHKIT®

VARIABLE ISOLATED AC POWER SUPPLY

Model IP-5220

HEATH COMPANY
BENTON HARBOR, MICHIGAN 49022

Printed in U'S.A.

TABLE OF CONTENTS

PARTS LIST

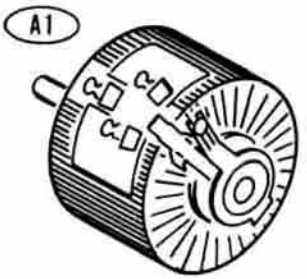
Check each part against the following list. Make a check (✓) in the space provided as you identify each part. Any part that is packed in an individual box (meter, etc.) should be placed back in the box for safe keeping until it is called for in a step. Any part packed in an envelope with its mounting hardware (fuseholder, etc.) should be placed back in the envelope with its hardware until it is called for in a step. This will keep the hardware from being lost.

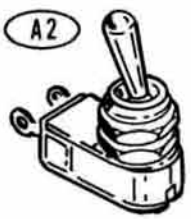
To order a replacement part, always include the PART NUMBER. Use the Parts Order Form furnished with the kit. If one is not available, see "Replacement Parts" inside the rear cover.

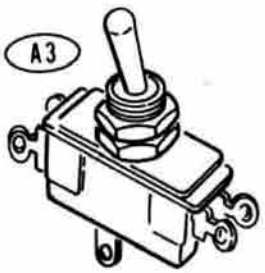
Each circuit component in this kit has a circuit component number (SW1, M1, etc.). This is a specific number for only that one part in the kit. The purpose of these numbers, which are especially useful if a part ever has to be replaced, is to help you easily identify the same part in each section of the Manual. These numbers will appear:

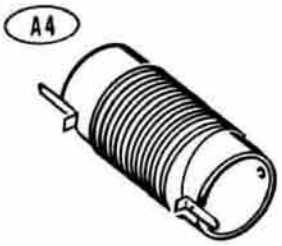
- In the Parts List,
- At the beginning of each step where a circuit component is installed,
- In some illustrations,
- On the Schematic Diagram,
- In the various other sections of the Manual.

KEY No.		QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.	PRICE Each
CIRCUIT COMPONENTS						
A1	( )	1	Variable transformer (Do not unpack until instructed to do so in a step.)	54-898	T1	33.70
	( )	1	Power transformer	54-897	T2	29.50
A2	( )	1	2-lug switch	61-1	SW1	1.85
A3	( )	1	6-lug switch	61-8	SW2	3.10
A4	( )	1	Meter shunt resistor	9-69	R1	1.50

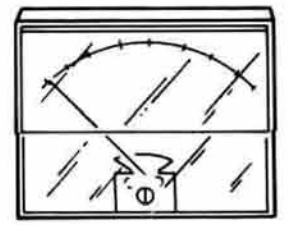


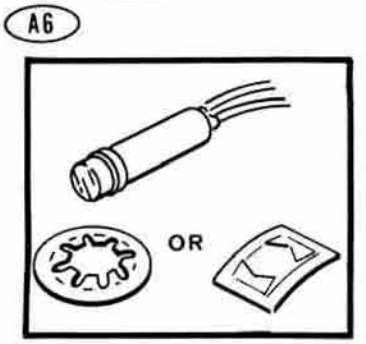


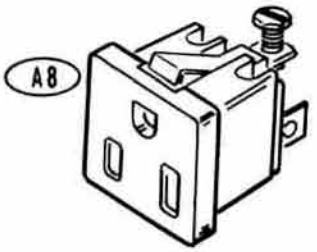


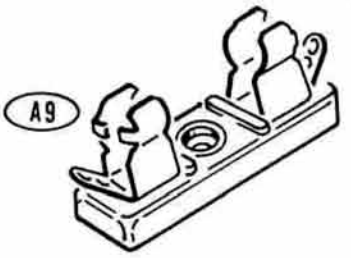


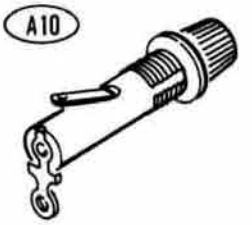
KEY No.		QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.	PRICE Each
CIRCUIT Components (cont'd.)						
A5	( )	1	AC ampere meter	407-707	M1	20.35
	( )	1	AC volt meter	407-708	M2	24.80
A6	( )	1	Pilot lamp with push-on nut	412-24	PL1	1.80
A7	( )	1	1-ampere, 3AG fuse	421-37	F2	.25
	( )	1	3-ampere, 3AG fuse	421-2	F3	.15
	( )	1	7-ampere, 3 AG, slow-blow fuse	421-9	F1	.55
A8	( )	2	AC socket	434-148	S1, S2	.40
A9	( )	1	Fuse block	422-1		.40
A10	( )	2	Fuseholder	423-4		1.25





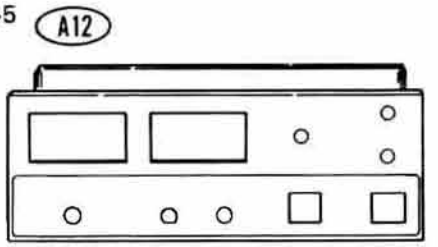


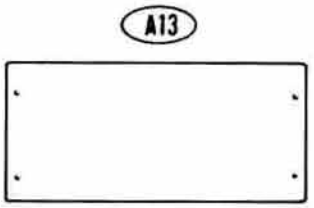


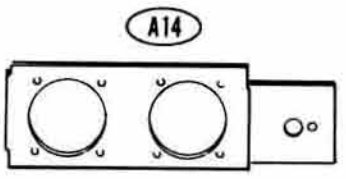


METAL PARTS

A11	( )	1	Top panel	203-1705-1		5.00
A12	( )	1	Chassis	200-1237-1		10.95
A13	( )	2	Side panel	203-1706-1		5.00
A14	( )	1	Meter bracket	204-2103		3.05
A15	( )	1	Trim bar	216-67		4.45



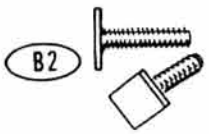




KEY No.		QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.	PRICE Each

HARDWARE

NOTE: The hardware may be in more than one packet. Open all the hardware packets before you check the hardware against the Parts List.

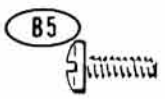


#2 Hardware

B1	( )	8	#2 x 3/16" screw	250-355	.05

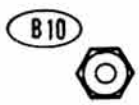
#4 Hardware

B2	( )	3	4-40 x 1/2" T bolt	250-1194	.10
B3	( )	3	4-40 nut	252-2	.05
B4	( )	3	#4 lockwasher	254-9	.05

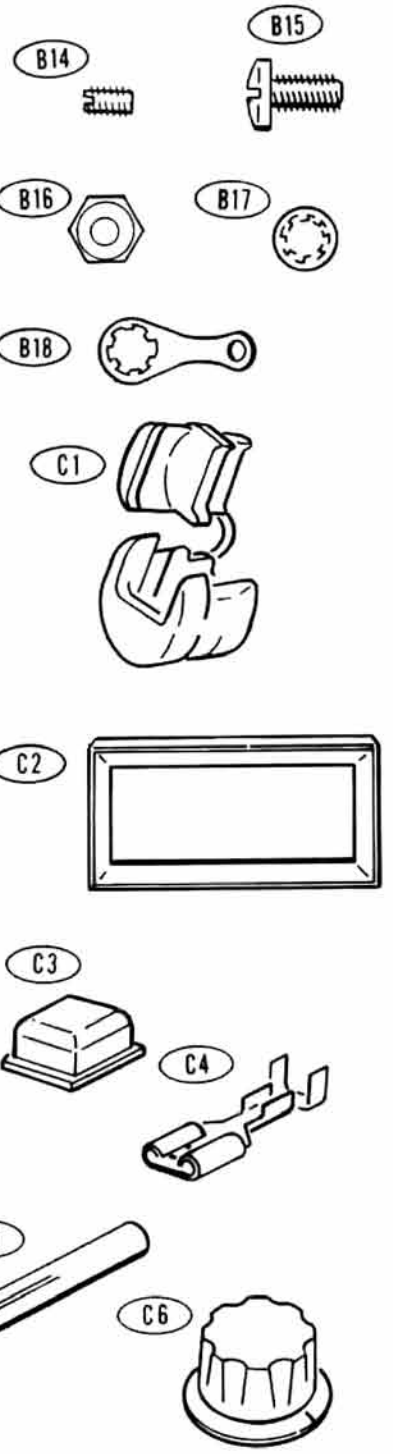


#6 Hardware

B5	( )	4	6-32 x 3/8" screw	250-89	.05
B6	( )	10	6-32 x 3/8" black screw	250-381	.05
B7	( )	2	6-32 x 3/8" flat head black screw	250-276	.05
B8	( )	1	6-32 x 1/2" thread tapping screw	250-46	.05
B9	( )	2	6-32 x 5/8" screw	250-36	.05
B10	( )	6	6-32 nut	252-3	.05
B11	( )	3	#6 lockwasher	254-1	.05
B12	( )	1	#6 external tooth lockwasher	254-6	.05
B13	( )	2	#6 x 1/4" long spacer	255-13	.05
B14	( )	3	#6 solder lug	259-1	.05



KEY No.		QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.	PRICE Each
#8 Hardware						
B14	( )	1	8-32 x 1/4" setscrew	250-43		.05
#10 Hardware						
B15	( )	6	10-32 x 3/8" screw	250-330		.10
B16	( )	6	10-32 nut	252-5		.05
B17	( )	6	#10 lockwasher	254-3		.05
B18	( )	4	#10 solder lug	259-5		.05
MISCELLANEOUS						
	( )	2	Insulator sheet	75-103		.20
C1	( )	1	Line cord strain relief	75-123		.25
C2	( )	2	Meter bezel	210-70		.80
C3	( )	4	Plastic foot	261-34		.10
C4	( )	4	Push-on connector	432-137		.15
C5	( )	1	Test probe	439-2		.70
C6	( )	1	Knob	462-219		.45
	( )	1	Sandpaper sheet	489-1		.25
	( )	1	Line cord	89-40		2.25
	( )	7'-6"	Black wire	344-2		.05/ft
	( )	1	Fuse label	390-362		.15
	( )	1	Model label	390-1187		.30
	( )	1	Blue and white label	391-34		.15
	( )	1	Parts Order Form	597-260		
	( )	1	Kit Builder's Guide	597-308		
	( )	1	Assembly Manual (See front cover for part number.)			
	( )		Solder (Additional 3' rolls of solder, 331-6, can be ordered for 25 cents each.)			



The above prices apply only on purchases from the Heath Company where shipment is to a U.S.A destination. Add 10% (minimum 25 cents) to the price when ordering (Michigan residents add 4% sales tax) to cover insurance, postage, and handling. Outside the U.S.A parts and service are available from your local Heathkit source and will reflect additional transportation, taxes, duties, and rates of exchange.

STEP-BY-STEP ASSEMBLY

Before you begin the assembly of this Kit, read the "Kit Builders Guide" for complete information on wiring, soldering, and step-by-step assembly procedure.

During the assembly, position all parts as shown in the Pictorials. Follow the instruction carefully, and read the entire step before you perform the operation.

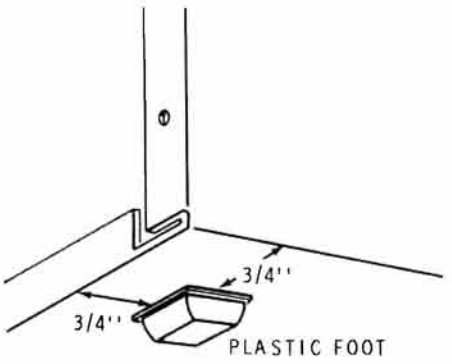
NOTE: A separate Illustration Booklet contains Pictorials that are too large for the Assembly Manual. The illustrations are arranged in Pictorial number sequence. Place the Booklet in a convenient location during assembly. Keep it with the Assembly Manual after the unit is completed.

PARTS MOUNTING

Refer to Pictorial 1 (in the Illustration Booklet) for the following steps.

( ) Locate the chassis.

( ) Refer to Detail 1A and remove the protective backing from one of the plastic feet. Press the foot in place in one of the corners on the bottom of the chassis.

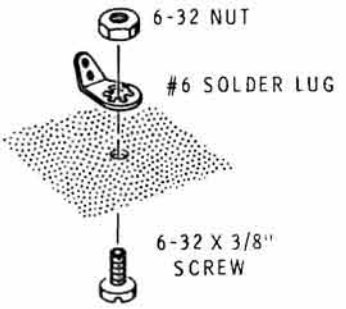


Detail 1A

( ) In the same manner, install the remaining three plastic feet.

Turn the chassis over and position it as shown in Pictorial 1.

( ) Refer to Detail 1B and install a #6 solder lug at location A. Use a 6-32 x 3/8" screw (not a black one) and a 6-32 nut.

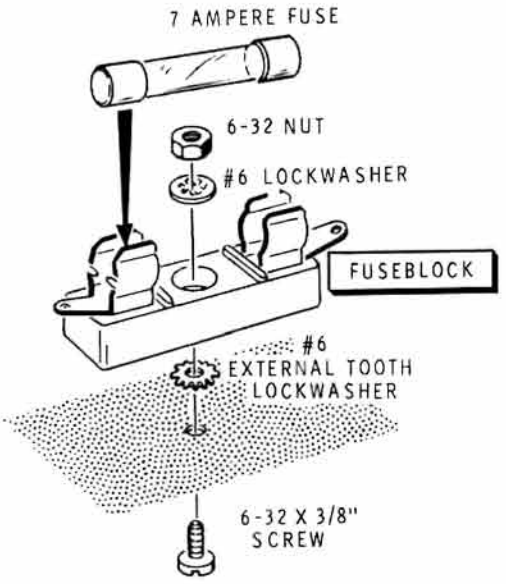


Detail 1B

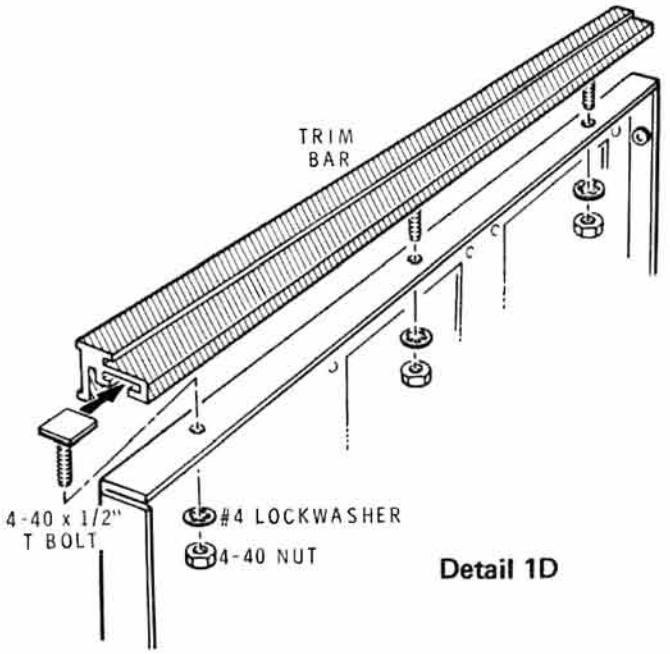
( ) In the same manner, install #6 solder lugs at locations B and C.

( ) Refer to Detail 1C and mount the fuse block at location F1. Use a 6-32 x 3/8" screw (not a black one), a #6 lockwasher, a #6 external tooth lockwasher, and a 6-32 nut.

( ) F1: Install the 7-ampere slow-blow fuse in the fuse block.



Detail 1C



Detail 1D

( ) Locate the fuse label and write 3AG 7A on the indicated lines.

( ) Remove the paper backing from the fuse label and press the label onto the chassis next to fuse block F1.

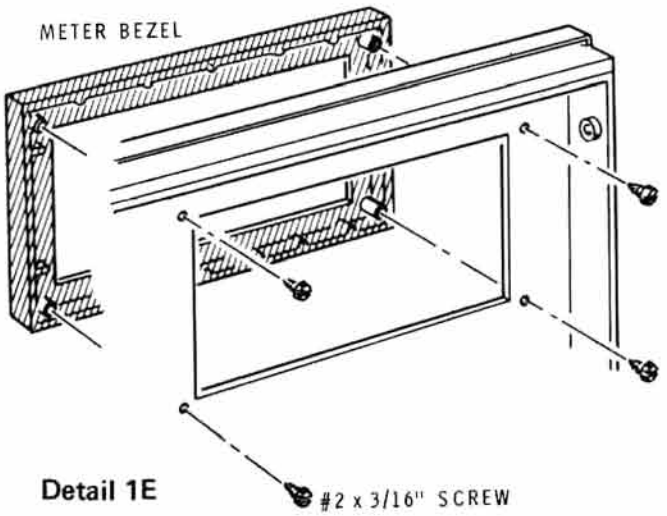
( ) Locate the trim bar and slide the three 4-40 x 1/2" T bolts into the indicated groove as shown in Detail 1D.

( ) Refer to Detail 1D and mount the trim bar to the chassis with a #4 lockwasher and 4-40 nut on each of the three T bolts. Be sure the ends of the trim bar are even with the edges of the chassis.

( ) Refer to Detail 1E and mount a meter bezel at location M2 with #2 x 3/16" screws. Be sure the four bezel studs fit into their holes in the chassis. Otherwise, the bezel will not be tight against the chassis. Do not overtighten the screws, as the threads can be stripped from the bezel holes.

( ) In the same manner, mount the other meter bezel at location M1.

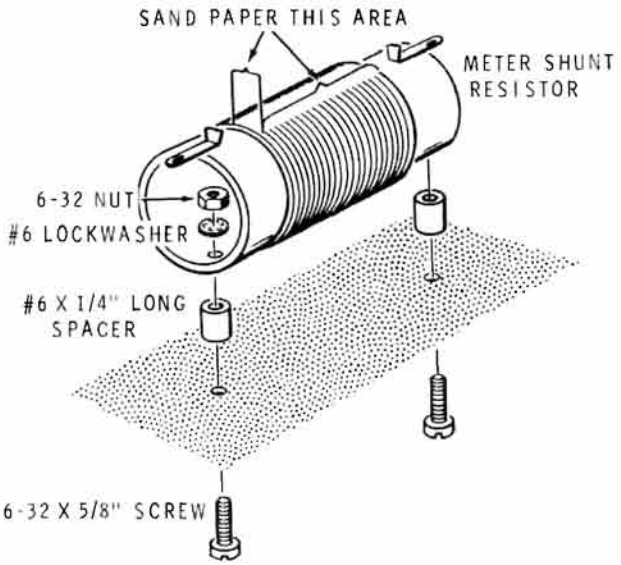
( ) Refer to Detail 1F, locate the meter shunt resistor, and sand a strip approximately 1/4" wide across the windings between the two resistor lugs. Wrap the sandpaper around a pencil and remove the varnish (red coating) from the windings as shown. Remove only enough varnish to make the copper wire appear. Do not sand away the copper wire itself. A wire will be soldered to this cleaned area of the resistor later.



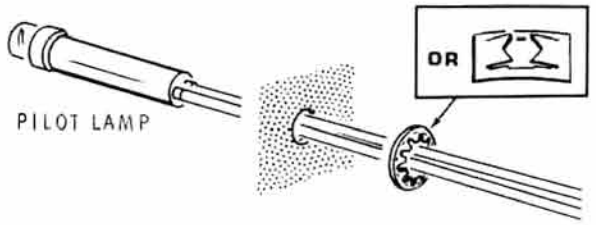
Detail 1E

( ) R1: Refer to Detail 1F and mount this shunt resistor with 6-32 x 5/8" screws, #6 x 1/4" long spacers, #6 lockwashers, and 6-32 nuts. The resistor can be mounted with either end to the left.

( ) Locate the pilot lamp and cut both leads to 9". Measure the leads from where they come out of the pilot lamp. Remove 1/4" of insulation from each lead end and twist the small wire strands together.



Detail 1F

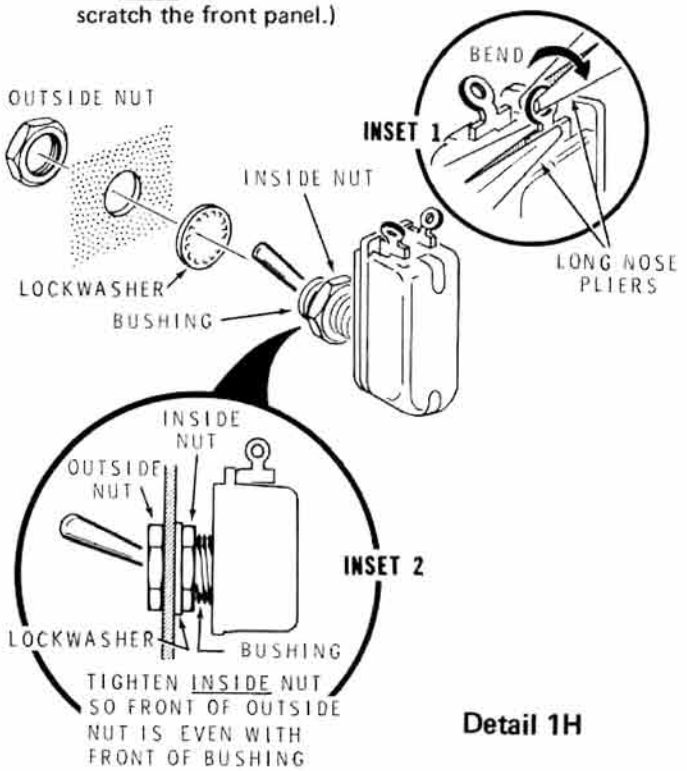


Detail 1G

( ) PL1: Refer to Detail 1G and install the pilot lamp with its push-on nut.

( ) Locate the 2-lug switch. Bend the lugs outward as shown in inset drawing #1 in Detail 1H. Be sure to support the lugs next to the switch body with long nose pliers, otherwise the switch can be broken.

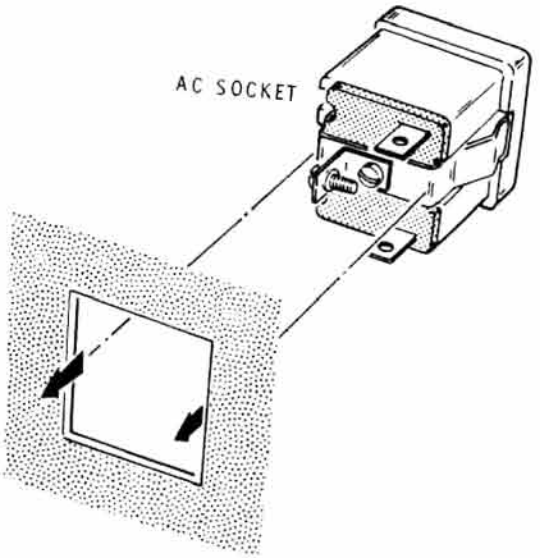
( ) SW1: Refer to Detail 1H and inset drawing #2 in Detail 1H and mount the 2-lug switch with its hardware. Position the switch as shown. Then tighten the inside nut. (If you tighten the outside nut, you can scratch the front panel.)



Detail 1H

( ) S2: Refer to Detail 1J and push an AC socket into its chassis cutout until it snaps into place. Position the socket as shown in Pictorial 1.

( ) S1: In the same manner, install an AC socket in its chassis cutout.



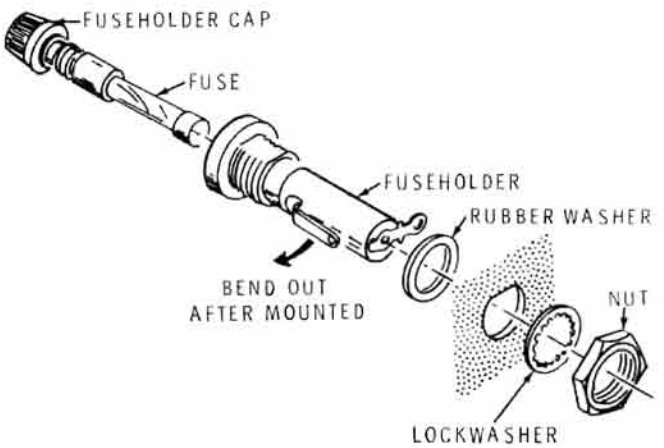
Detail 1J

( ) Refer to Detail 1K and install a fuseholder in chassis hole F3 with its hardware. Be sure to position the fuseholder so its lugs are positioned as shown. Do not overtighten the hardware, as the fuseholder can be broken.

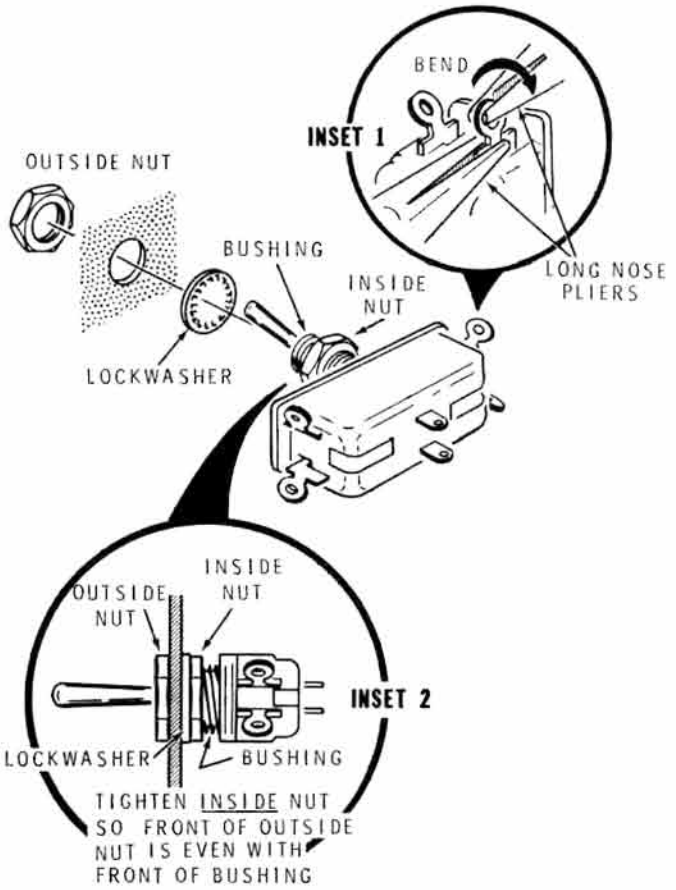
( ) F3: Install the 3-ampere fuse in the fuseholder.

( ) In the same manner, install a fuseholder in chassis hole F2.

( ) Refer to Detail 1K and bend outward the side lug of fuseholder F2. Similarly bend the side lug of fuseholder F3.



Detail 1K



Detail 1L

( ) Locate the 6-lug switch and bend the lugs outward as shown in inset drawing #1 of Detail 1L.

( ) SW2: Refer to Detail 1L and inset drawing #2 in Detail 1L and install the 6-lug switch with its hardware. Tighten the inside nut.

Refer to Detail 1M for the following steps.

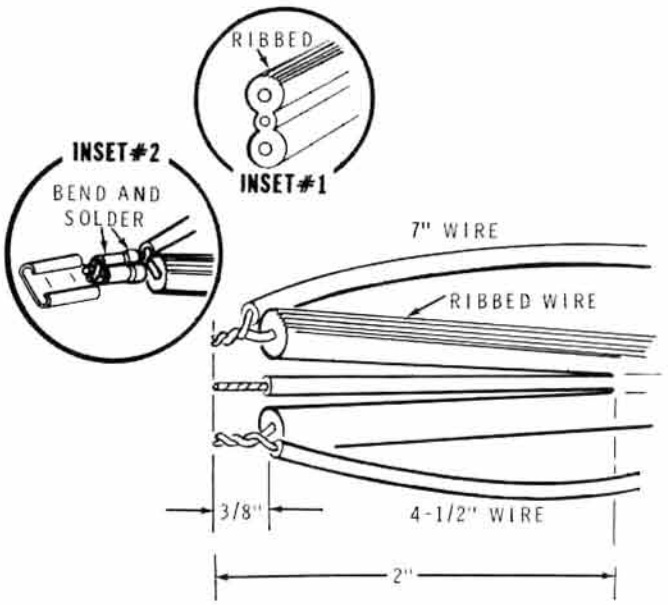
( ) Locate the line cord and separate the wires a distance of 2" from the end. Then remove 3/8" of insulation from the end of the three wires.

( ) Cut a 4-1/2" wire and 7" wire from the black wire supplied with the kit. Then remove 1/2" of insulation from only one end of each wire.

( ) Refer to inset drawing #1 in Detail 1M and identify the ribbed outer wire of the line cord. Then wrap the bare end of the 7" wire around this line cord wire.

( ) Refer to inset drawing #2 in Detail 1M and solder a push-on connector on these wires.

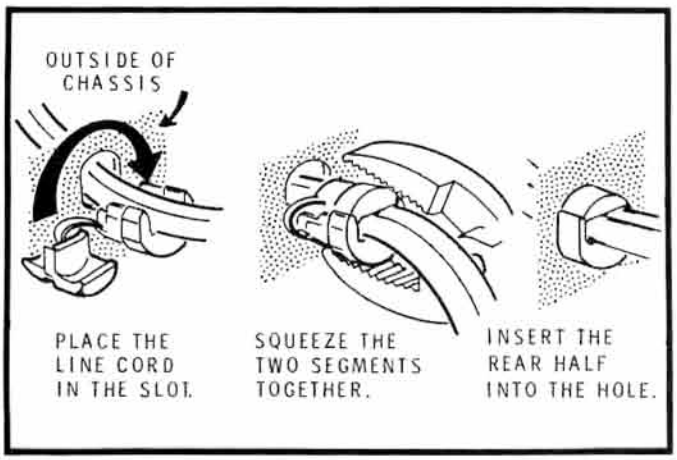
( ) In a like manner, twist the bare ends of the 4-1/2" wire around the end of the smooth line cord wire. Then solder a push-on connector on these wires. Do not allow solder to flow into the end of the connector.



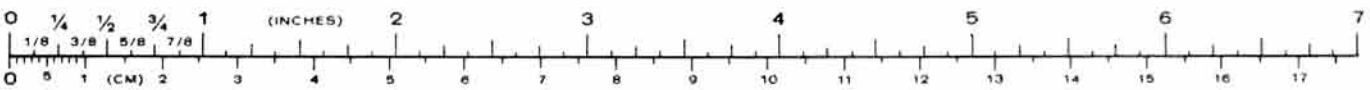
Detail 1M

( ) Remove 1/4" of insulation from the free end of both black wires. Twist the wire ends and melt a small amount of solder on them to hold the fine wires together.

( ) Refer to Detail 1N and install the line cord with the line cord strain relief in hole D. Position the line cord strain relief 9-1/2" from the prepared end of the line cord as shown in Pictorial 1.



Detail 1N



WIRING

NOTES:

1. To prepare a wire, remove 1/4" of insulation from the wire end(s). Twist the fine wire strands of the exposed wire end to hold the small wire strands together. When a wire is called for in a step, use the black wire furnished in the kit.

2. All connections must be mechancially secure. Do this by inserting the wire end through and wrapping it around the lug before soldering. See inset drawing #1 in Pictorial 2. Be sure all the fine wire strands of each wire are through the connection hole and do not touch any other connection.

3. Position all wires down against the chassis where possible. Some wires may seem too long; however, do not make them shorter.

4. In the steps, (NS) means not to solder the connection at this time as another wire will be connected here later. "S-" with a number, such as (S-2), means to solder the connection. The number following the "S-" tells how many wires are at the connection.

Refer to Pictorial 2 (in the Illustration Booklet) for the following steps.

NOTE: If you wish, you may prepare wires ahead of time as in the following step. The wires are listed in the order they will be used.

( ) Prepare the following five wires:

2-1/2"	9"
2-1/2"	6"
6"	

( ) Remove an extra 1/4" of insulation (total 1/2") from only one end of the two 2-1/2" wires. Then bend a loop in this end of each wire. See inset drawing #2 in Pictorial 2. Then melt a small amount of solder on the exposed wire end to hold the small wire strands together.

( ) Secure the looped end of one of these 2-1/2" wires under the screw of socket S2 lug 3. Connect the other end to solder lug A (S-1).

( ) Secure the looped end of the other 2-1/2" wire under the screw of socket S1 lug 3. Connect the other end to solder lug C (S-1).

( ) Push the connector on the ribbed wire of the line cord onto socket S2 lug 2. Then solder the connector to the socket lug.

( ) Push the connector on the other wire of the line cord onto socket S2 lug 1. Then solder the connector to the lug.

( ) Connect the green (center) wire of the line cord to solder lug B (S-1).

( ) Connect a 6" wire from switch SW1 lug 1 (S-1) to fuse block F1 lug 1 (S-1).

( ) Connect one end of a 9" wire to switch SW1 lug 2 (S-1). The other end of this wire will be connected later.

( ) Connect the free end of the black wire coming from socket S2 lug 1 to fuse block F1 lug 2 (S-1).

( ) Connect one end of a 6" wire to socket S1 lug 2 (NS). The other end of this wire will be connected later.

( ) Prepare the following six wires:

3-1/2"	6"	4-1/2"
3-1/2"	6"	2"

( ) Connect a 3-1/2" wire from socket S1 lug 1 (NS) to fuseholder F3 lug 1 (NS).

( ) Connect a 3-1/2" wire from fuseholder F3 lug 1 (S-2) to fuseholder F2 lug 1 (S-1).

( ) Connect a 6" wire from fuseholder F3 lug 2 (S-1) to switch SW2 lug 4 (S-1).

( ) Connect a 6" wire from fuseholder F2 lug 2 (S-1) to switch SW2 lug 6 (S-1).

( ) Connect one end of a 4-1/2" wire to switch SW2 lug 1 (NS). The other end of this wire will be connected later.

( ) Connect a 2" wire to switch SW2 between lugs 1 (S-2) and 5 (S-1).

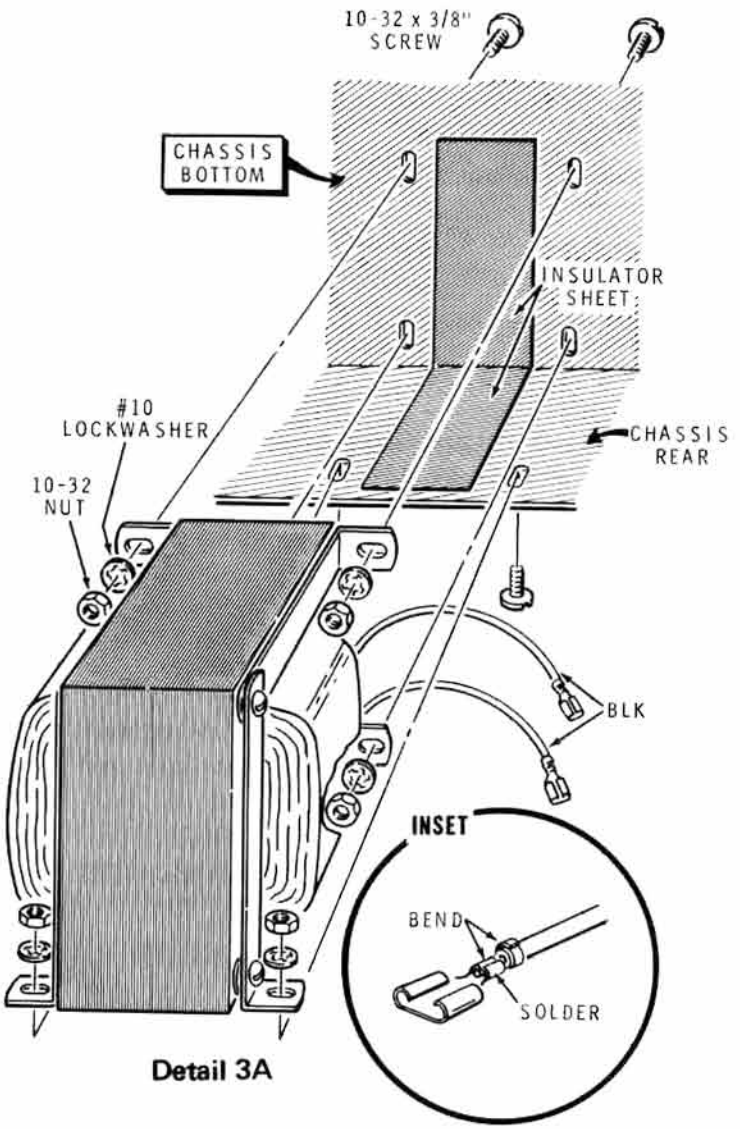
Refer to Pictorial 3 (in the Illustration Booklet) for the following steps.

( ) Locate power transformer #54-897 and trim the bare end of each black wire to 3/8" from the end of the insulation.

( ) Refer to the inset drawing on Detail 3A and install a push-on connector on each of the two black leads of the power transformer (#54-897) Do not allow solder to flow into the end of the connector.

( ) Locate and cut both insulator sheets to 4-1/2" in length.

( ) Remove the paper backing from one insulator sheet, and center the insulator sheet between the slotted holes in the chassis bottom as shown in Detail 3A. Then press the insulated sheet in place. Be sure the end of the sheet is tight against the bend in the chassis.



Detail 3A

( ) Remove the paper backing from the other insulator sheet, and center the insulator sheet between the slotted holes in the chassis rear as shown in Detail 3A. Then press the insulator sheet in place so its end is tight against the bend in the chassis.

( ) T2: Refer to Detail 3A and mount the power transformer in the chassis. Use a 10-32 x 3/8" screw, #10 lockwasher, and 10-32 nut in each of six mounting feet of the transformer.

( ) Connect power transformer T2 #1 red lead to socket S1 lug 2 (S-2).

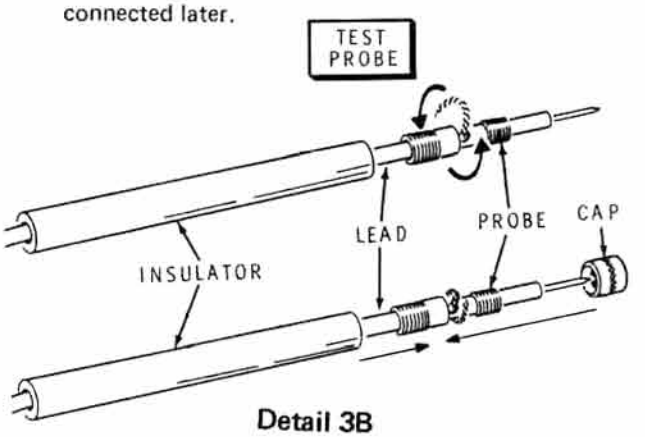
( ) Connect power transformer T2 #2 red lead to resistor R1 lug 1 (NS).

( ) Prepare the following three wires:

4-1/2"
4"
12"

( ) Connect one end of a 4-1/2" wire to socket S1 lug 1 (S-2). The other end of this wire will be connected later.

( ) Connect one end of a 4" wire to meter shunt resistor R1 lug 1 (S-2). The other end of this wire will be connected later.



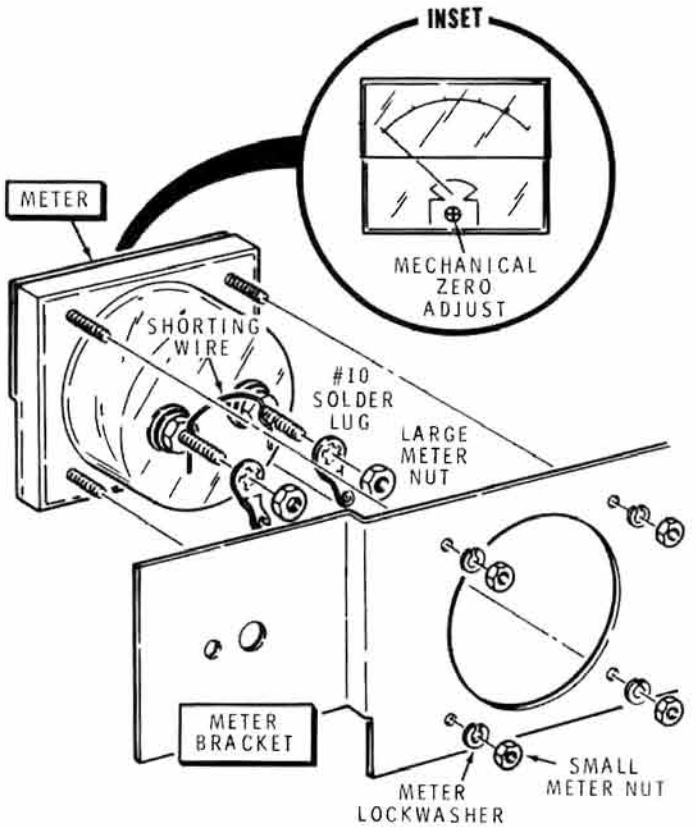
Detail 3B

( ) Refer to Detail 3B and install the test probe on one end of a 12" wire.

( ) Connect the free end of the test probe wire to switch SW2 lug 2 (S-1).

Set the chassis aside temporarily.

( ) Place a soft cloth on your work area so you do not scratch the plastic cases of the meters you will install in the following steps.



Detail 3C

( ) Carefully unpack both meters. Be careful not to lose any of the hardware packed with the meters.

( ) Refer to the inset drawing in Detail 3C and mechanically zero both meters. While you hold the meter vertical, turn (if necessary) the mechanical adjust button until the meter pointer is over the zero line on the meter face.

( ) Locate the meter bracket. Refer to Detail 3C and mount the AC volt meter at location M2 on the meter bracket. Use the small lockwashers and nuts furnished with the meter. Turn the nuts finger tight only at this time. Be sure you position the top of the meter and the meter bracket properly.

( ) In the same manner, mount the AC ampere meter at location M1 on the meter bracket.

( ) Refer to Detail 3C and remove the shorting wire from between the large bolts on each meter.

( ) Install a #10 solder lug on bolts of both meters. Use the large nuts furnished with the meters as shown in Detail 3C. (If flat washers were supplied with the meter, they can be discarded.)

( ) Refer to Detail 3D (in the Illustration Booklet) and prethread the two indicated holes in the meter bracket with the 6-32 x 1/2" thread tapping screw. This screw can then be discarded.

( ) Refer to Detail 3D and mount the meter bracket in the chassis with two 6-32 x 3/8" flat head black screws. Be sure the meters fit properly into their bezels.

CAUTION: When you unpack the variable transformer in the next step, be sure to handle it carefully. Do not bump or scrape it against any objects, as transformer windings can be easily damaged.

( ) Carefully unpack the variable transformer (#54-898) and remove only the outer nut and lockwasher from the transformer bushing. Leave the inner nut on the bushing. NOTE: The remaining parts packed with the transformer are not used and can be discarded.

( ) T1: Refer to Detail 3D and mount the variable transformer in the indicated hole in the meter bracket and the chassis. Use the nut and lockwasher previously removed from the transformer. Be sure you position the locating stud of the transformer in the small hole in the meter bracket.

( ) Turn the shaft of transformer T1 fully counterclockwise, as viewed from the front of the chassis.

( ) Install the knob on the shaft of transformer T1. Use 8-32 x 1/4" setscrew if one is not supplied in the knob. Position the pointer of the knob as shown in the inset drawing in Detail 3D.

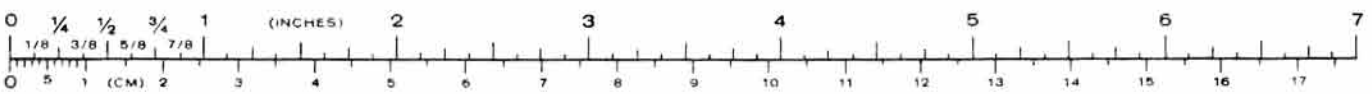
( ) Now tighten the four mounting nuts on each meter. Do not overtighten these nuts, as the meter cases can be damaged.

( ) Connect the free end of the wire coming from socket S1 lug 1 to meter M2 lug 1 (S-1).

( ) Connect the free end of the wire coming from socket S1 lug 2 to meter M2 lug 2 (S-1).

( ) Connect the free end of the wire coming from meter shunt resistor R1 lug 1 to meter M1 lug 1 (S-1).

( ) Connect the free end of the wire coming from switch SW2 lug 1 to meter M1 lug 2 (S-1).



NOTE: Terminals 1 and 4 on variable transformer T1 have two lugs; one with a hole and one without a hole. When you make a connection to T1 that has to be soldered, make the connection to the lug with the hole. Use the lugs without the hole for push-on connectors.

CAUTION: Do not get solder on the windings of transformer T1, as this can damage the transformer.

( ) Connect the free end of the wire coming from switch SW1 lug 2 to variable transformer T1 lug 4 (NS).

( ) Connect either lead coming from pilot lamp PL1 to variable transformer T1 lug 4 (S-2).

( ) Connect the free end of the wire coming from socket S2 lug 2 to variable transformer T1 lug 1 (NS).

( ) Connect the other lead coming from pilot lamp PL1 to variable transformer T1 lug 1 (S-2).

( ) Push the connector on power transformer T2 #4 black lead onto variable transformer T1 lug 1.

( ) Push the connector on power transformer T2 #3 black lead onto variable transformer T1 lug 3.

( ) Position all wires away from transformer T1, as T1 will get hot during operation and could melt the insulation from nearby wires and possibly cause a short circuit.

This completes the wiring of the Kit. Check to see that all connections are soldered, and shake out any cut-off wire ends or solder splashes from the chassis. Proceed to the "Test and Calibration" section of the Manual.

TEST AND CALIBRATION

RESISTANCE MEASUREMENTS

( ) If an ohmmeter is available, measure the resistance between each slotted hole and the round hole in the Isolated Variable Output socket. In both measurements you should obtain an infinite indication. Be sure the test probe is not touching the chassis or any connection.

If you do not obtain infinite indications, recheck all wiring and make sure no fine wire strands at any connection are touching another connection.

INITIAL TEST

NOTE: If you encounter any trouble in the following tests, unplug the unit and proceed to the "In Case of Difficulty" section of the Manual on Page 17.

( ) Set the front panel controls and switches as follows:

SW2: CURRENT RANGE – 1 AMP.

T1: VARIABLE OUTPUT VOLTAGE – Fully counterclockwise.

SW1: POWER – Off.

( ) Be sure the test probe is not touching the chassis or any connection.

CAUTION: AC line voltage is present in the kit. Refer to Figure 1 (in the Illustration Booklet), which shows the areas to avoid, when you perform the following tests.

( ) Plug the line cord into an AC receptacle.

( ) Turn the POWER switch to On. The POWER lamp should light and both meters should remain at zero.

( ) Slowly turn the VARIABLE OUTPUT VOLTAGE control clockwise. The AC VOLTS meter should increase to some point above 120 VAC when the control reaches its maximum clockwise position. The AC AMPERES meter should remain at zero. It is normal for transformer T2 to hum at higher voltage settings.

( ) Rotate the VARIABLE OUTPUT VOLTAGE control fully counterclockwise.

( ) Turn the POWER switch off.

NOTE: The LOAD you use in the next step, and to calibrate the unit, can be a lamp containing a 150 watt or larger light bulb (or bulbs).

( ) Plug a load into the ISOLATED VARIABLE OUTPUT socket.

( ) Turn the POWER switch to ON.

( ) Slowly rotate the VARIABLE OUTPUT VOLTAGE control clockwise until the AC AMPERES meter indicates 1 ampere (full scale) on the top (0-1) scale.

( ) Rotate the VARIABLE OUTPUT VOLTAGE control fully counterclockwise.

( ) Turn the POWER switch to OFF. Leave the load plugged into the unit.

Proceed to the "Calibration" section of the Manual.

CALIBRATION

Refer to Figure 1 (in the Illustration Booklet) for the following steps.

( ) Locate a 1" long piece of tape (not supplied) for use in the following procedure.

In the following step you will be instructed to calibrate the 3-ampere range of the Ampere meter. Read the entire "Calibration Procedure" before you perform the operation.

CALIBRATION PROCEDURE

1. Place CURRENT RANGE SWITCH SW2 in the 3 AMP position.

2. Turn the POWER switch to ON.

3. Rotate the VARIABLE OUTPUT VOLTAGE control until the AC AMPERES meter indicates 3 amperes on the bottom (0-3) scale. (This is actually a 1-ampere current drain without meter shunt R1 connected in the circuit.)

4. While you hold the plastic body of the test probe in your left hand, touch the tip of the test probe to the left end of the bared winding of meter shunt R1. Note the indication on the 3 AMPERES scale AC AMPERES meter.

5. Now slowly move the tip of the test probe to the right along the bared windings of the meter shunt resistor until the AC AMPERES meter indicates exactly 1 ampere on the bottom (0-3) scale. Hold the test probe in place at this point on the meter shunt resistor.

6. UNPLUG THE LINE CORD of the unit and do not move the VARIABLE OUTPUT VOLTAGE control.

7. Press a piece of masking tape on the shunt resistor windings just to the right of where the test probe is touching the resistor.

8. Remove the test probe from the meter shunt and press the tape firmly in place on the resistor.

9. Remove the test probe from the end of its wire. DO NOT shorten this wire.

10. Melt solder onto the windings of meter shunt resistor to the left of the tape on the coil. See the inset drawing. It does not matter how many windings to the left of the tape are covered with solder, as they are out of the circuit after the wire is soldered in the next operation.

11. Solder the free end of the test probe wire to the windings of meter shunt resistor just to the left of the tape.

12. Wait at least five minutes for the shunt resistor to cool.

13. Plug in the line cord and check to see that the AC AMPERES meter still indicates 1 ampere. (A slight variation is normal because of line voltage change.) If it does not, check to be sure the test probe wire is soldered to the meter shunt resistor winding just to the left of the tape on the resistor.

( ) Follow the above procedure and calibrate the 3-ampere range of the AC AMPERE meter.

( ) Unplug the line cord of the Unit. Unplug the load and then remove the tape from the meter shunt resistor. This completes the "Calibration Procedure." Proceed to the "Final Assembly" section of the Manual on Page 16.

FINAL ASSEMBLY

Refer to Pictorial 4 for the following steps.

( ) Carefully peel the backing from the blue and white identification label and press the label on the rear of the chassis above the line cord. NOTE: Always refer to the model number and production series number in any communications with the Heath Company; this assures you that you will receive the most complete and up-to-date information in return.

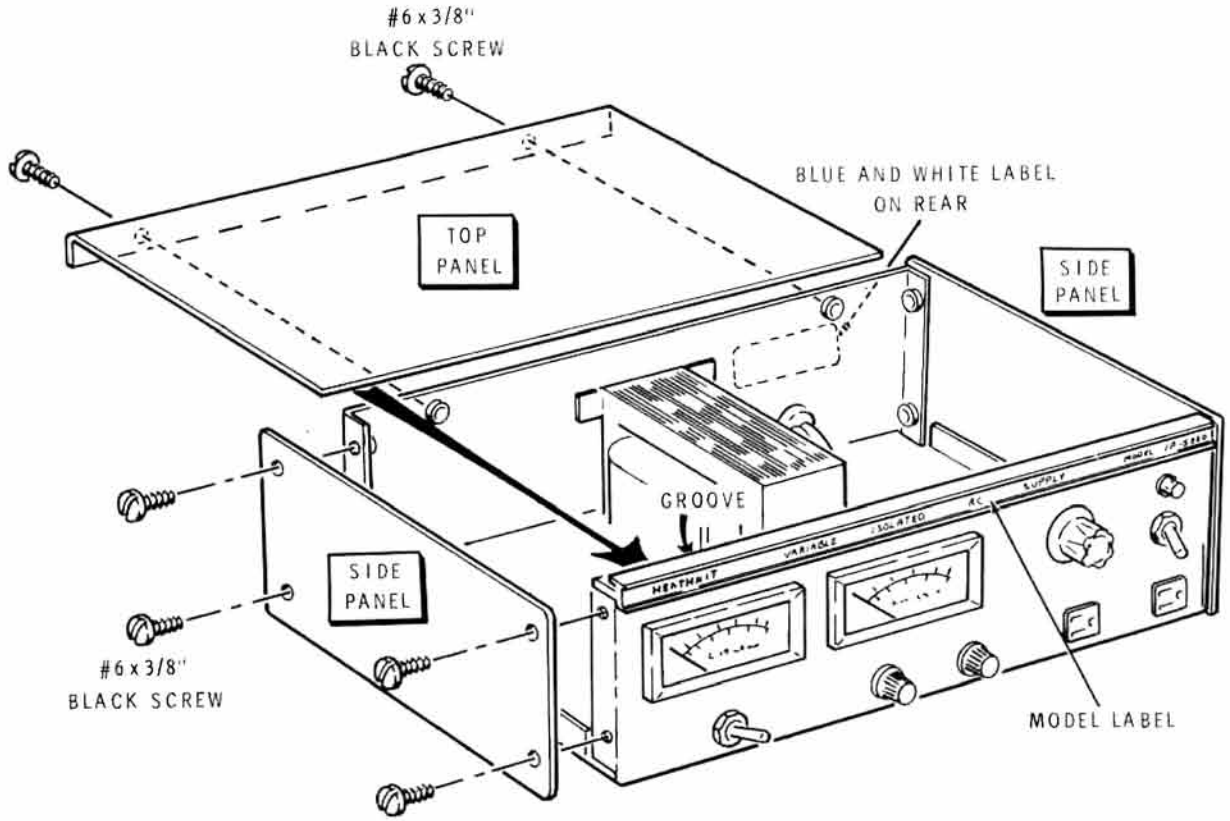
( ) Mount the top panel on the chassis with 6-32 x 3/8" black screws. Fit the front edge of the top panel into the groove of the trim bar.

( ) Mount either side panel with 6-32 x 3/8" black screws. The holes in the side panel are symmetrical. Therefore, the side panels can be mounted either way as long as the good painted side is out.

( ) In the same manner, mount the other side panel.

( ) Carefully peel the backing from the model label. Press the label in place in the recess in the trim bar.

This completes the assembly of the Kit. Proceed to the "Operation" section of the Manual.



PICTORIAL 4

OPERATION

There are only three operating controls on the Variable Isolated AC Supply. The functions of the controls, meters, and sockets are explained below.

POWER switch – Turns on the power to the internal circuit which, in turn, makes power available to the ISOLATED VARIABLE OUTPUT socket. NOTE: The NON-ISOLATED OUTPUT socket is not switched by the POWER switch. Line voltage is available at this socket whenever the line cord of the Supply is connected.

VARIABLE OUTPUT VOLTAGE control – Adjusts the voltage available at the ISOLATED VARIABLE OUTPUT socket from 0 to 140 volts. NOTE: To avoid blowing the output fuses (due to turn-on surges), it is recommended that you always set this control fully counterclockwise before turning on the POWER switch. Then gradually increase the control to the desired level.

CURRENT RANGE switch – Selects the full scale range (1 ampere or 3 amperes) of the Ampere meter. It also selects the proper output fuse to protect the meter and the Supply circuit.

NOTE: When you use an output that is higher than 120 volts, always limit the current so you do not exceed the power rating. For example, 360 volt-amperes at 140 volts is equal to a usable maximum of 2.57 amperes without overloading the circuit. At voltages below 120 volts, the current drawn must not exceed 3 amperes.

NON-ISOLATED OUTPUT socket – Provides a non-isolated line voltage not to exceed 10 amperes any time the line cord of the Supply is connected. This socket is not fused or switched.

IN CASE OF DIFFICULTY

VISUAL CHECKS

About 90% of the kits returned for repair do not function properly due to poor connections and soldering. Therefore, you can eliminate troubles by a careful inspection of connections to make sure they are soldered as described in the Soldering section of the "Kit Builders Guide." Reheat any doubtful connections and be sure all the wires are soldered at places where more than one wire is connected.

Recheck the wiring. Trace each wire in colored pencil on the Pictorial as you check it. It is frequently helpful to have a friend check your work. Someone not familiar with the unit may notice something you have consistently overlooked.

HOW TO TROUBLESHOOT

If you know which area your trouble is in, apply the "Visual Checks" listed to that area.

You may also go directly to the Troubleshooting Chart to see if the difficulty is described in the "Problem" column. If your difficulty is listed there, check the "Possible Cause" for that item and apply the "Visual Checks" to the area of difficulty.

NOTE: In an extreme case where you are unable to resolve a difficulty, refer to "Customer Service" on the inside rear cover of this Manual. Your Warranty is located inside the front cover.

Troubleshooting Chart

PROBLEM	POSSIBLE CAUSE
No output, Power lamp does not light.	1. Line cord not plugged in. 2. Fuse F1. 3. Power switch SW1.
No output, Power lamp lights.	1. Range Fuse, F2, F3. 2. Variable transformer T1. 3. Power transformer T2.
Unable to calibrate 3-ampere range or calibration unstable.	1. AC ampere meter M1. 2. Current Range switch SW2. 3. Shunt resistor (R1) not sanded clean enough for good solder connection.
3-ampere range indicates incorrectly.	1. Incorrect calibration. (See "Calibration" section of Manual.) 2. Meter shunt resistor R1. 3. AC ampere meter M1.
Output is constant at 120 volts regardless of variable transformer (T1) setting.	1. Variable transformer (T1) not wired correctly.

SPECIFICATIONS

Input Voltage	120 Volts 60 Hz for specified output.
Output Voltage	0 – 140 Volts 60 Hz.
Voltmeter Range	0 – 150 Volts AC.
Ammeter Ranges	0 – 1 and 0 – 3 Amperes AC.
Output Current	3 Amperes maximum. 10 Amperes (direct line connector).
Output Power	360 Volt-amperes maximum in 3 ampere range. 140 Volt-amperes maximum in 1 ampere range.
Net Weight	22 lbs.
Overall Dimensions	15" wide x 10.5" deep x 5.5" high (38 cm x 27 cm x 14 cm).

The Heath Company reserves the right to discontinue products and to change specifications at any time without incurring any obligation to incorporate new features in products previously sold.

CIRCUIT DESCRIPTION

Refer to the Schematic Diagram while you read the following Circuit Description.

One side of the AC line is connected directly to one end of variable transformer T1. The other side of the AC line is connected through circuit protection fuse F1 and Power switch SW1 to the tap on T1. This places T1 directly across the AC line. Pilot lamp PL1, also connected across the AC line, will light when SW1 is closed.

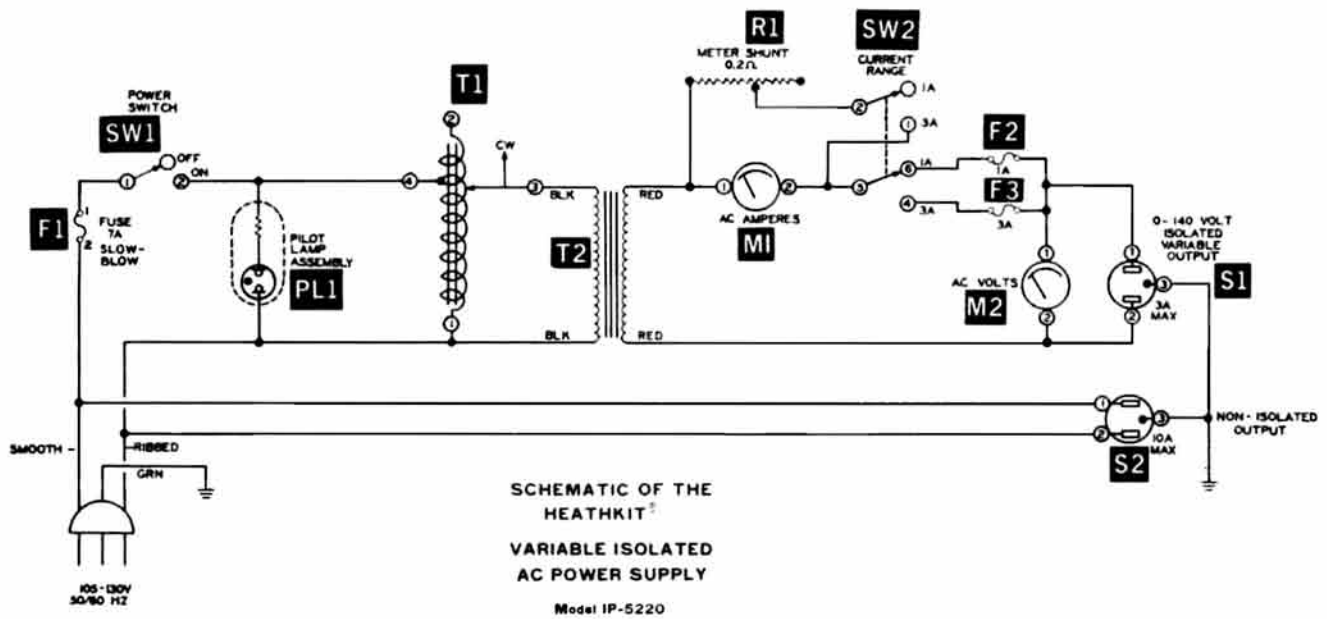
When you rotate the control (wiper) of T1 in a clockwise direction, 0 to 132 volts AC is applied to the primary winding of isolation transformer T2. This transformer provides slight step-up from the primary winding to the secondary winding (with 120 volts on the primary, the secondary produces 128 volts).

The voltage present at the Isolated Variable Output socket S1 is connected from the secondary winding of T2 through Ampere meter M1, Current Range switch SW2, and one of the two output fuses (F2 or F3). AC voltmeter (M2) monitors the voltage present at socket S1 at all times.

The AC Amperes meter continually monitors the current drawn by the equipment connected to socket S1. The Ampere meter has a 1-ampere movement and is connected directly to socket S1 through fuse F2 (1 ampere) when switch SW2 is in the 1-ampere position. The 3-ampere range for the ampere meter is obtained by connecting meter shunt resistor R1 across the meter when switch SW2 is in the 3-ampere position. Fuse F3 (3 ampere) protects the meter and the equipment under test when the 3-ampere current range is in use.

Fuses F2 and F3 are the standard (quick blow) type so they will blow quickly if the equipment under test presents an overload.

The AC line is also connected directly across Non-Isolated Output socket S2. Line voltage is available at this socket whenever the line cord is plugged in. Any equipment not requiring more than 10 amperes can be connected to this socket.



SCHEMATIC OF THE HEATHKIT®

VARIABLE ISOLATED AC POWER SUPPLY

Model IP-5220

EXPEDITED PARTS ORDER FORM

(FOR REPAIR PARTS ONLY)

PLEASE DO NOT WRITE IN THIS SPACE

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

KIT MODEL	PURCHASE DATE	INVOICE NUMBER	LOCATION PURCHASED

SEND TO: **HEATH COMPANY**
BENTON HARBOR,
MICHIGAN 49022
ATTN PARTS REPLACEMENT

QTY.	HEATH PART NUMBER	DESCRIPTION OF PART	PRICE	TOTAL PRICE	DESIRED METHOD OF SHIPMENT
					EDITORS INITIALS

INSTRUCTIONS:

- INCLUDE CHECK OR MONEY ORDER FOR TOTAL PARTS ORDERED ADD 10% (MINIMUM $0.25) FOR INSURANCE, POSTAGE AND HANDLING.
- AUTHORIZE PERMISSION FOR C.O.D. SHIPMENT (MINIMUM ORDER SHIPPED C.O.D. IS $10.00).
- MICHIGAN RESIDENTS ADD 4% SALES TAX

C.O.D. AUTHORIZATION

_____
SIGNED

THIS FORM IS FOR U.S. CUSTOMERS ONLY. OVERSEAS CUSTOMERS SEE YOUR DISTRIBUTOR.

CUT ALONG DOTTED LINE

EXPEDITED PARTS ORDER FORM

(FOR REPAIR PARTS ONLY)

PLEASE DO NOT WRITE IN THIS SPACE

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

KIT MODEL	PURCHASE DATE	INVOICE NUMBER	LOCATION PURCHASED

SEND TO: **HEATH COMPANY**
BENTON HARBOR,
MICHIGAN 49022
ATTN PARTS REPLACEMENT

QTY.	HEATH PART NUMBER	DESCRIPTION OF PART	PRICE	TOTAL PRICE	DESIRED METHOD OF SHIPMENT
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- MICHIGAN RESIDENTS ADD 4% SALES TAX

C.O.D. AUTHORIZATION

_____
SIGNED

THIS FORM IS FOR U.S. CUSTOMERS ONLY. OVERSEAS CUSTOMERS SEE YOUR DISTRIBUTOR.

CUSTOMER SERVICE

REPLACEMENT PARTS

If you need a replacement part, please fill in the Parts Order Form that is furnished and mail it to the Heath Company. Or, if you write a letter, include the:

- **Part number** and **description** as shown in the **Parts List.**
- Model number and Series number from the blue and white label.
- Date of purchase.
- Nature of the defect.

Please do not return parts to the factory unless they are requested. Parts that are damaged through carelessness or misuse by the kit builder will not be replaced without cost, and will not be considered in warranty.

Parts are also available at the Heathkit Electronic Centers listed in your catalog. Be sure to provide the Heath part number. Bring in the original part when you request a warranty replacement from a Heathkit Electronic Center.

NOTE: Replacement parts are maintained specifically to repair Heathkit products. Parts sales for other reasons will be declined.

TECHNICAL CONSULTATION

Need help with your Heathkit? . . . . Self-Service? . . . . Construction? . . . . Operation? . . . . Call or write for assistance. You'll find our Technical Consultants eager to help with just about any technical problem except "customizing" for unique applications.

The effectiveness of our consultation service depends on the information you furnish. Be sure to tell us:

- The Model number and Series number from the blue and white label.
- The date of purchase.
- An exact description of the difficulty.
- Everything you have done in attempting to correct the problem.

Also include switch positions, connections to other units, operating procedures, voltage readings, and any other information you think might be helpful.

Please do not send parts for testing, unless this is specifically requested by our Consultants.

Hints: Telephone traffic is lightest at midweek. . .please be sure your Manual and notes are on hand when you call.

Heathkit Electronic Center facilities are also available for telephone or "walk-in" personal assistance.

REPAIR SERVICE

Service facilities are available, if they are needed, to repair your completed kit. (Kits that have been modified, soldered with paste flux or acid core solder, cannot be accepted for repair.)

If it is convenient, personally deliver your kit to a Heathkit Electronic Center. For warranty parts replacement, supply a copy of the invoice or sales slip.

If you prefer to ship your kit to the factory, attach a letter containing the following information directly to the unit:

- Your name and address.
- Date of purchase.
- Copies of all correspondence relevant to the service of the kit.
- A brief description of the difficulty.
- Authorization to return your kit C.O.D. for the service and shipping charges. (This will reduce the possibility of delay.)

Check the equipment to see that all screws and parts are secured. (Do not include any wooden cabinets or color television picture tubes, as these are easily damaged in shipment.) Place the equipment in a strong carton with at least THREE INCHES of *resilient* packing material (shredded paper, excelsior, etc.) on all sides. Use additional packing material where there are protrusions (control sticks, large knobs, etc.). If the unit weighs over 15 lbs., place this carton in another one with 3/4" of packing material between the two.

Seal the carton with reinforced gummed tape, tie it with a strong cord, and mark it "Fragile" on at least two sides. Remember, the carrier will not accept liability for shipping damage if the unit is insufficiently packed. Ship by prepaid express, United Parcel Service, or insured Parcel Post to:

Heath Company
Service Department
Benton Harbor, Michigan 49022

HEATH

Schlumberger

HEATH COMPANY • BENTON HARBOR, MICHIGAN

THE WORLD'S FINEST ELECTRONIC EQUIPMENT IN KIT FORM

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