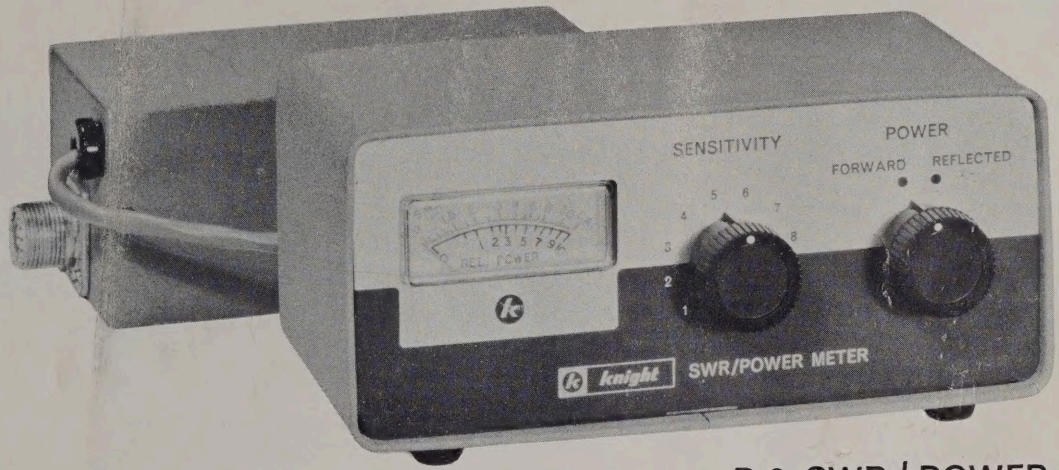

P-2 SWR / POWER METER

ASSEMBLY MANUAL

A PRODUCT OF ALLIED RADIO CHICAGO

knight-kit®

Thank You . . .

for your interest in Knight-Kits.

This Assembly Manual represents our many decades of experience in developing electronic kits which bring you outstanding performance at dollar-saving prices . . . and with maximum ease of construction.

> *As you go through the pages of this brochure, note how carefully each stage of construction is explained—how each diagram is magnified so that you almost have the feeling a good instructor is working at your side!*

Knight-Kit's "do and check" method of kit-building insures accurate and simple assembly. Although your final product may represent a very complicated piece of electronic equipment, you will proceed with ease and assurance, step-by-step . . . and enjoy enormous satisfaction in your completed working unit.

Every Knight-Kit of your choice is available to you on the Allied Credit Fund Plan—

- No Money Down
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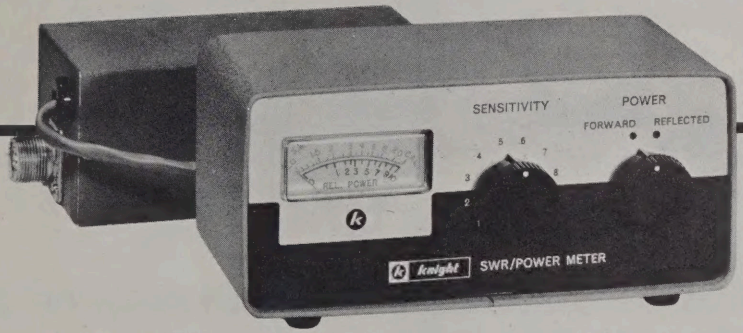
Your Knight-Kit purchase is backed with our exclusive and iron-clad guarantee—you must be *completely* satisfied or your purchase price is refunded!

It is always a pleasure to serve you.

A. D. Davis

A. D. Davis, President



knight-kits

P-2 SWR/POWER METER

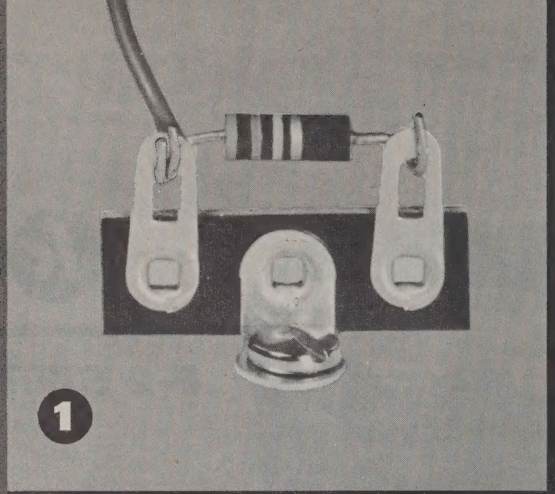
The P-2 SWR meter provides accurate readings of standing wave ratio and relative forward power . . . supplying a reliable and inexpensive indicator for adjusting antenna coupler, antenna or transmitter for maximum power transfer to the antenna.

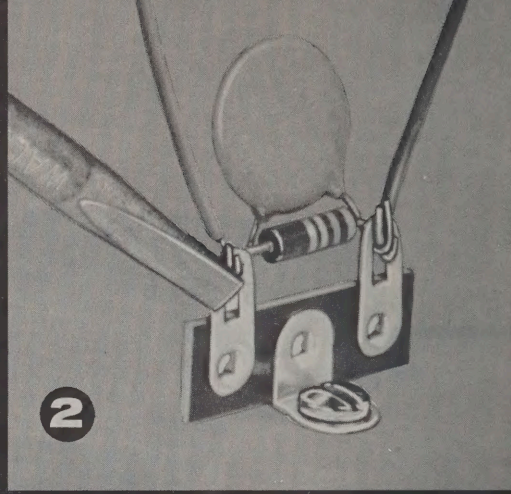
Easy to build and convenient to use, the P-2 SWR meter can be permanently installed in the transmission line for continuous monitoring . . . thanks to its high power capability (one kilowatt) and its negligible insertion loss.

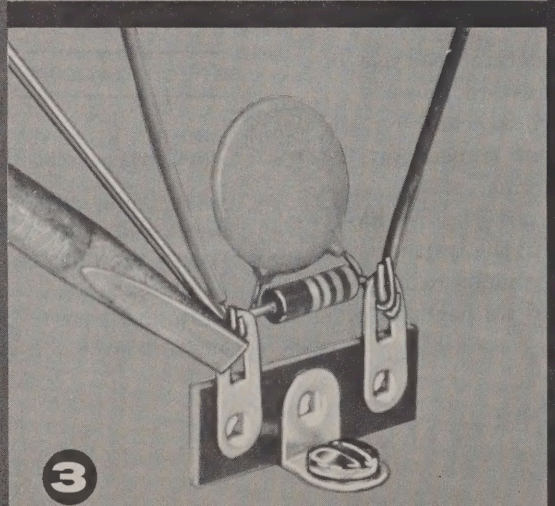
SPECIFICATIONS

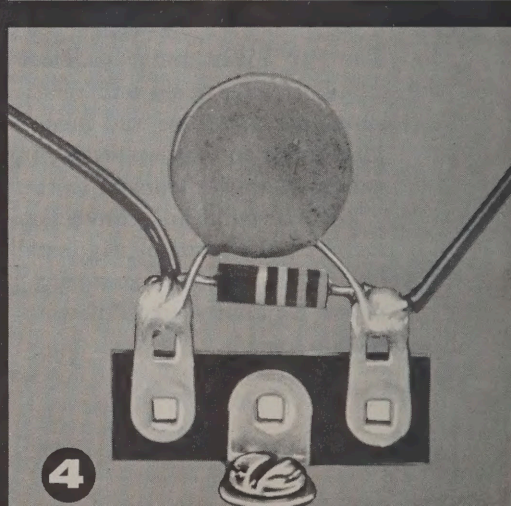
MINIMUM RF POWER (full scale deflection)	45 watts at 1.8 MC ½ watt at 432 MC
MAXIMUM RF POWER	1 kilowatt
INPUT AND OUTPUT IMPEDANCE	52 or 72 ohms
POWER REQUIREMENTS	None
BAND COVERAGE	1.8 to 432 MC
METER SENSITIVITY	100 microamperes, full scale
METER SCALES	Relative power SWR, from 1:1 to 20:1

THIS KIT MUST BE PROPERLY SOLDERED!









USE ENOUGH HEAT

This is the main idea of good soldering. Apply enough heat to the metal surfaces you are joining to make the solder spread freely, until the contour (shape) of the connection shows under the solder.

AN ELECTRONIC UNIT WILL NOT WORK . . . unless it is properly soldered. Read these instructions carefully to understand the basic ideas of good soldering.

Enough heat must be used so the solder can actually penetrate the metal surfaces, making an unbroken path over which electricity can travel. You are not using enough heat if the solder barely melts and forms a rounded ball of rough, flaky solder.

Use the Right Soldering Tool

A soldering iron in the 40-100 watt range is recommended. Any iron in this range with a clean, chisel-shaped tip will supply the correct amount of heat to make a good solder gun but make sure the tip reaches full heat before you solder.

Keep the iron or gun tip brightly coated with solder. When necessary, wipe the hot tip clean with a cloth. If you are using an old tip, clean it before you start soldering. Use a fine file or steel wool to expose the bright metal. Heat the iron and immediately coat the tip with solder.

Use Only Rosin Core Solder

We supply the right kind of solder *(rosin core solder).* Do not use any other kind of solder! **Use of Acid Core Solder, Paste, or Irons Cleaned on a Sal Ammoniac Block will ruin any Electronic Unit and will Void the Guarantee.**

HERE'S HOW TO DO IT...

1 Join bare metal to bare metal; insulation must be removed. Make good mechanical connections and keep resistor and capacitor leads as short as possible, unless otherwise specified.

2 Coat the tip of a hot iron with solder. Then **Firmly Press the Flat Side of the Tip** against the parts to be soldered together. Keep the iron there while you . . .

3 Apply the solder between the metal to be soldered and the iron tip. Use only enough solder to flow over all surfaces of the connection, and all wires in the connection. Remove the iron.

Do Not Move Parts Until the Solder Hardens. If you accidentally move the wires as the solder is hardening, apply your iron and reheat.

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

You Have Not Used Enough Heat: If your connection is rough and flaky-looking, or if the solder has formed a round ball instead of spreading.

The difference between good soldering (enough heat) and poor soldering (not enough heat) is just a few extra seconds with a hot iron **firmly** applied.

Remember, larger metal surfaces take a longer time to heat.

MOUNTING PARTS ON THE METER SUB-PANEL

UNPACKING

☐ If you are unfamiliar with electronic parts, we suggest that you check each part against the parts list in the rear of the manual. If you are unable to identify some of the parts, find their pictures on the wiring illustrations. As you check off the parts, sort them so they are readily available. You may find it advantageous to sort the hardware (screws, nuts, lockwashers, etc.) into suitable containers. This step will acquaint you with the various parts and thus simplify building.

HELPFUL CONSTRUCTION HINTS

This book uses some symbols to give the value of the parts. "Ω" means ohm, "K" means one thousand ohms, "meg" means one million ohms, μf means microfarad and μμf means micromicrofarad. Capacitor markings may be μf or MF for microfarad, μμf or MMF for micromicrofarad.

Several types of wire are supplied. It is important to use the wire called for in the building step. Insulated solid wire, identified by color, has been cut to length and pre-stripped for your convenience. Use only the color called for in the step.

SEE FIGURE 1.

☐ S-1 switch. Mount by inserting the locating tab in the locating hole in the panel. Fasten with a ⅜" nut.

☐ R-3, 25K control and a ground lug. Place the ground lug over the shaft of the control. Mount by inserting the locating tab in the locating hole in the panel. Fasten with a ⅜" nut.

NOTE: The meter must be zeroed before it is mounted. After the meter is mounted the adjusting screw will not be accessible. To adjust the meter, remove the piece of tape that covers the hole in the bottom of the meter.

☐ Meter. The two screws used to mount the meter are packed in the box with the meter. Mount the meter with these two screws and position the terminals as shown.

☐ Remove the jumper wire from the two meter terminals.

☐ Thread a ⅜" nut over the shafts of S-1 and R-3 so that there is approximately ¼" space between these nuts and the nuts used to mount S-1 and R-3.

☐ Dress panel. Position the panel over the shafts of S-1 and R-3. Mount with two ⅜" flatwashers and nuts. Adjust the two nuts used to space the panel for an even fit.

☐ Two Knobs - Place Knobs over shafts of S1 and R-3. Fasten each with a set screw

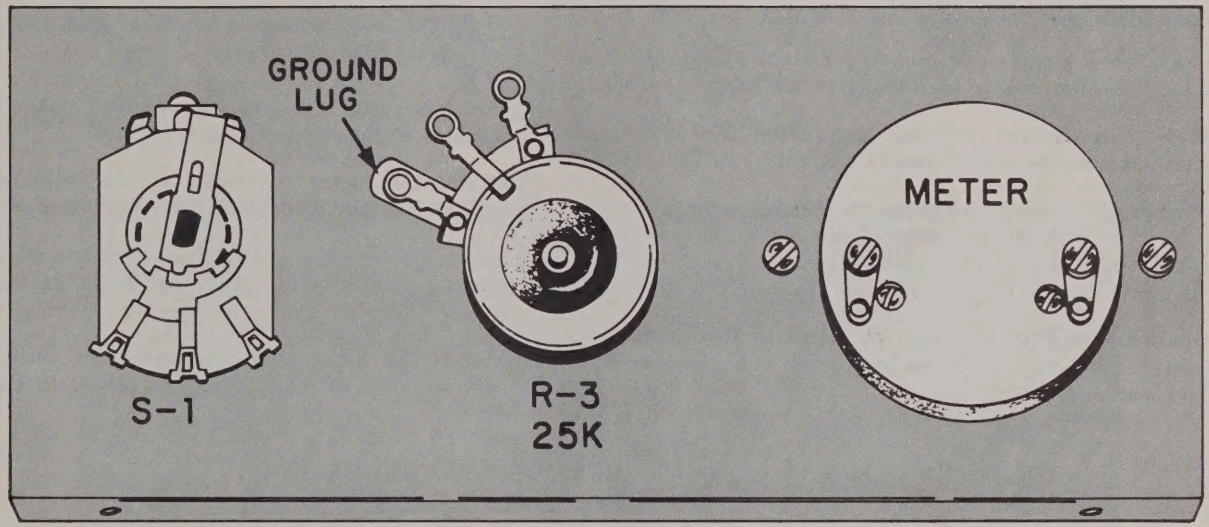


FIGURE 1. MOUNTING PARTS ON THE METER SUB-PANEL

WIRING THE METER SUB-PANEL

SEE FIGURE 4.

- ☐ Orange wire. Solder one end to terminal 2 of S-1. Solder the other end to terminal 3 of R-3.
- ☐ Orange wire. Solder one end to terminal 2 of R-3. Solder the other end to terminal 1 of the meter.
- ☐ Yellow wire. Solder one end to terminal 2 of the meter. Connect the other end to terminal 1 of R-3.
- ☐ 4′ length of 2-conductor cable. This cable connects the pick-up unit to the meter unit. Use all or any desired length of the cable, depending on the location of the two units.
- ☐ Prepare the ends of the cable as shown in Figure 2. Connect the end of the cable having the longest shield lead as follows:
  - ☐ Black lead. Solder to terminal 1 of S-1.
  - ☐ Red lead. Solder to terminal 3 of S-1.
  - ☐ Shield lead. Solder to terminal 1 of R-3 and the ground lug. (2 wires).
- ☐ Insert the other end of the shielded cable through the hole in the back of the meter case.
- ☐ Mount the meter sub-panel to the case with two rubber feet and two black self-tapping screws.
- ☐ Mount the remaining two feet with two black self-tapping screws in the other two holes on the meter case.
- ☐ Fasten the 2-conductor cable to the back of the case with one of the bushings as shown in Figure 3.

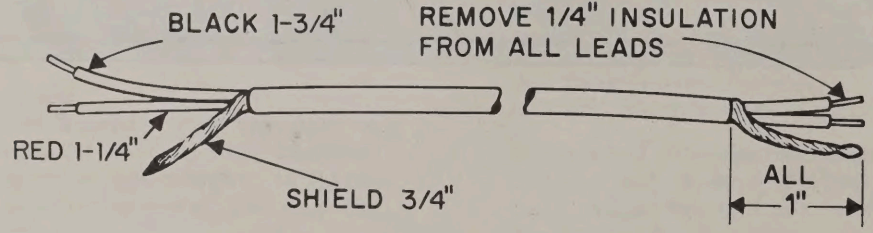


FIGURE 2. CABLE PREPARATION

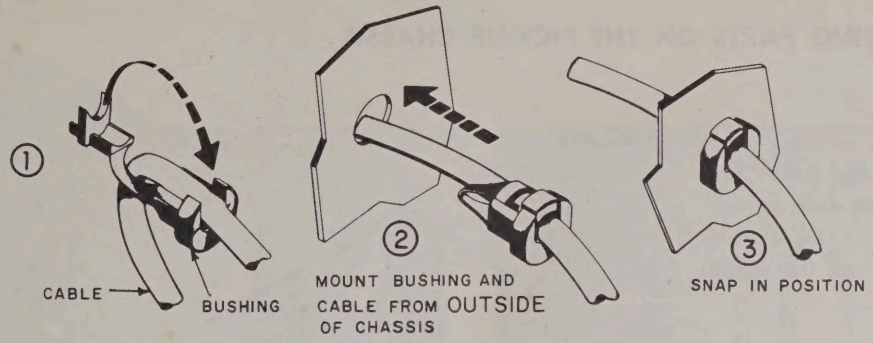


FIGURE 3. BUSHING MOUNTING

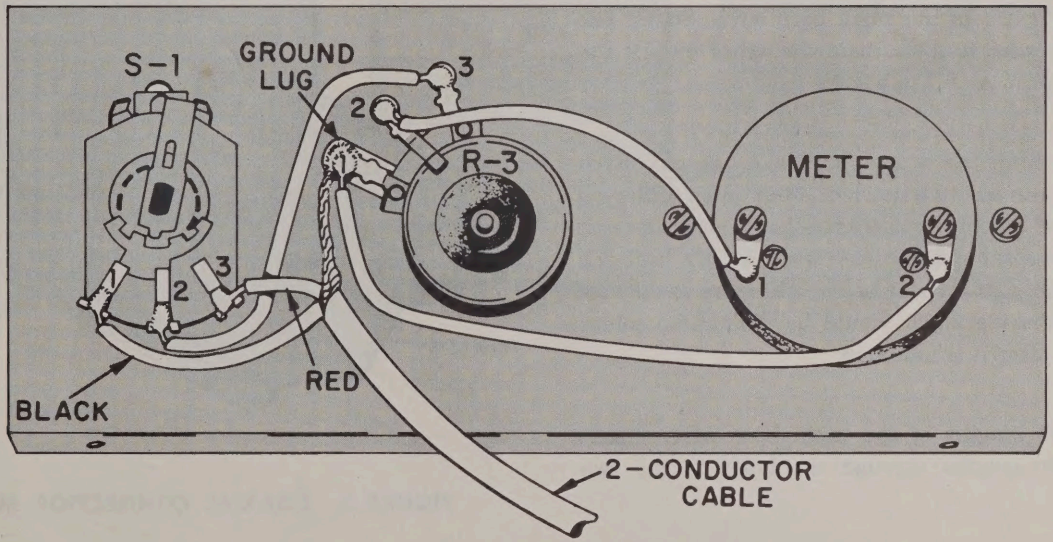


FIGURE 4. WIRING THE METER SUB-PANEL

MOUNTING PARTS ON THE PICK-UP CHASSIS

SEE FIGURE 6.

☐ J-2, one of the coaxial connectors and a solder lug. Mount J-2 and the solder lug with four 4-40 screws, three #4 lockwashers and four 4-40 nuts. Do not use a lockwasher on the screw which mounts the solder lug.

☐ Cut a 1½" piece of the small bare wire. Solder one end of the wire to J-2. Bend the other end of the wire as shown on J-1 in Figure 5.

☐ Metal rod. Slide the two supports over the rod. Each end of the rod has two notches. Melt some solder on the rod near one of the notches at one end of the rod. Turn the rod around and melt some solder near the notch on the opposite side of the other end of the rod. Without presoldering it would be difficult to solder to the rod after it is mounted.

☐ Cut two 4" lengths of the large bare wire. Insert each of the lengths through the holes in the two supports.

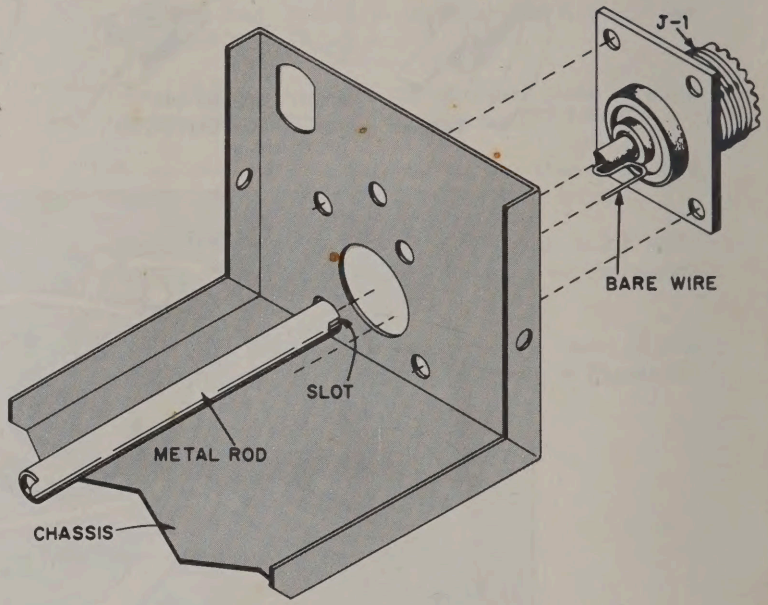


FIGURE 5. COAXIAL CONNECTIOR MOUNTING

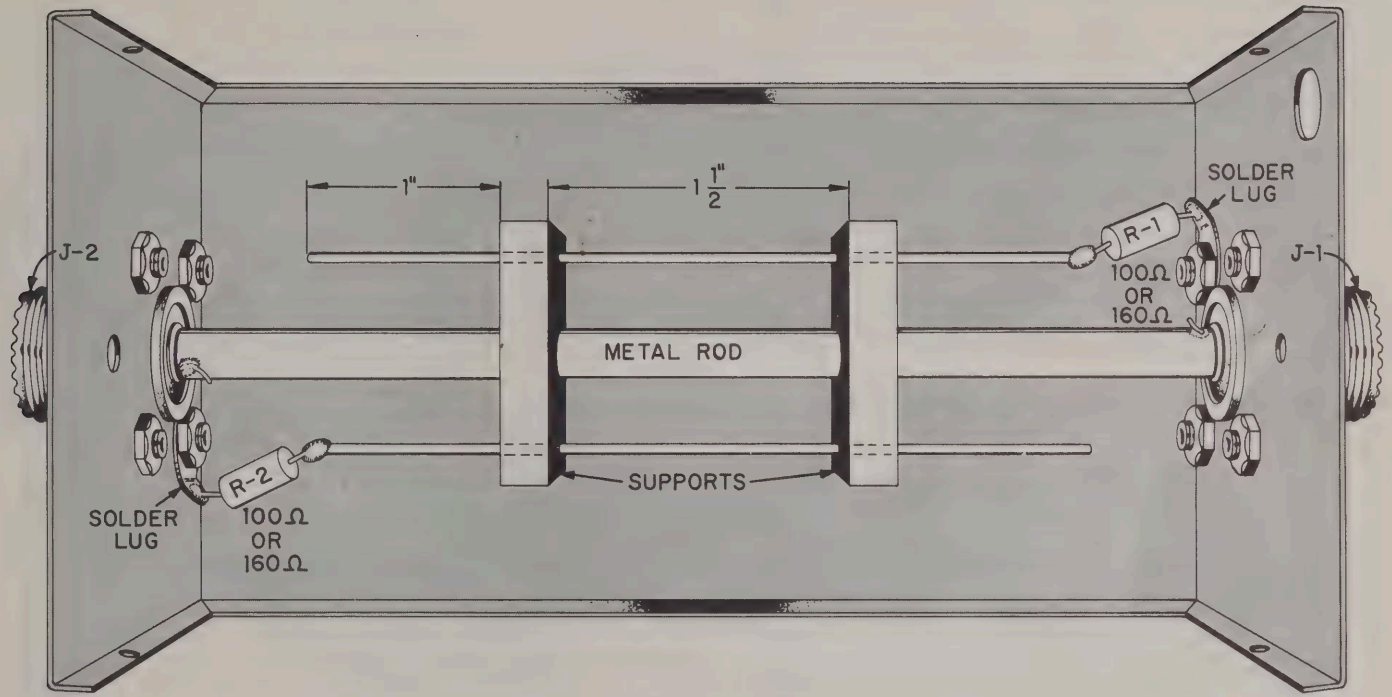


FIGURE 6. MOUNTING PARTS ON THE PICK-UP CHASSIS

SEE FIGURE 6.

☐ J-1, the other connector. Cut a 1½″ piece of the small bare wire. Solder one end of the wire to J-1. Bend the other end as shown in Figure 5.

☐ Slide one end of the metal rod over J-2 with the small bare wire on the outside of the rod as shown. Mount the other end of the rod, J-1 and a solder lug as shown in Figure 5. Use four 4-40 screws, three #4 lockwashers and four 4-40 nuts. Do not use a lockwasher on the screw which mounts the solder lug.

☐ Solder the bare wire connected to J-1 and J-2 to the metal rod as shown.

☐ Position the supports on the metal rod so that each one is 1½″ from the ends of the chassis.

☐ Position the two pieces of large bare wire so that each piece extends 1″ beyond the supports.

NOTE: There are two values of R-1 and R-2 supplied with this kit. The 100Ω resistors are for use with 72Ω coaxial cable and the 160Ω resistors are for use with a 52Ω line.

☐ R-1, either a 100Ω or 160Ω resistor. Cut each lead so it is ¾″ long. Solder one lead to the solder lug. Solder the other lead to the end of the bare wire.

☐ R-2, either a 100Ω or a 160Ω resistor. Cut each lead so it is ¾″ long. Solder one lead to the solder lug. Solder the other lead to the end of the bare wire.

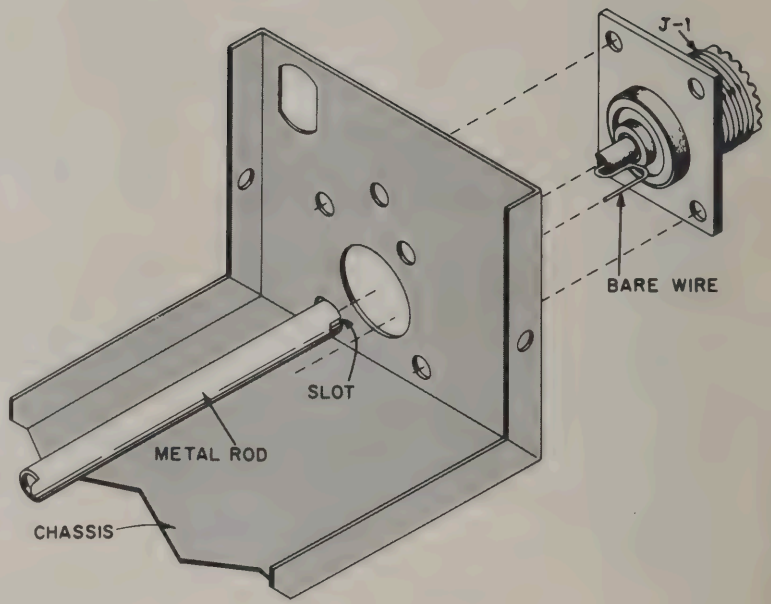


FIGURE 5. COAXIAL CONNECTOR MOUNTING

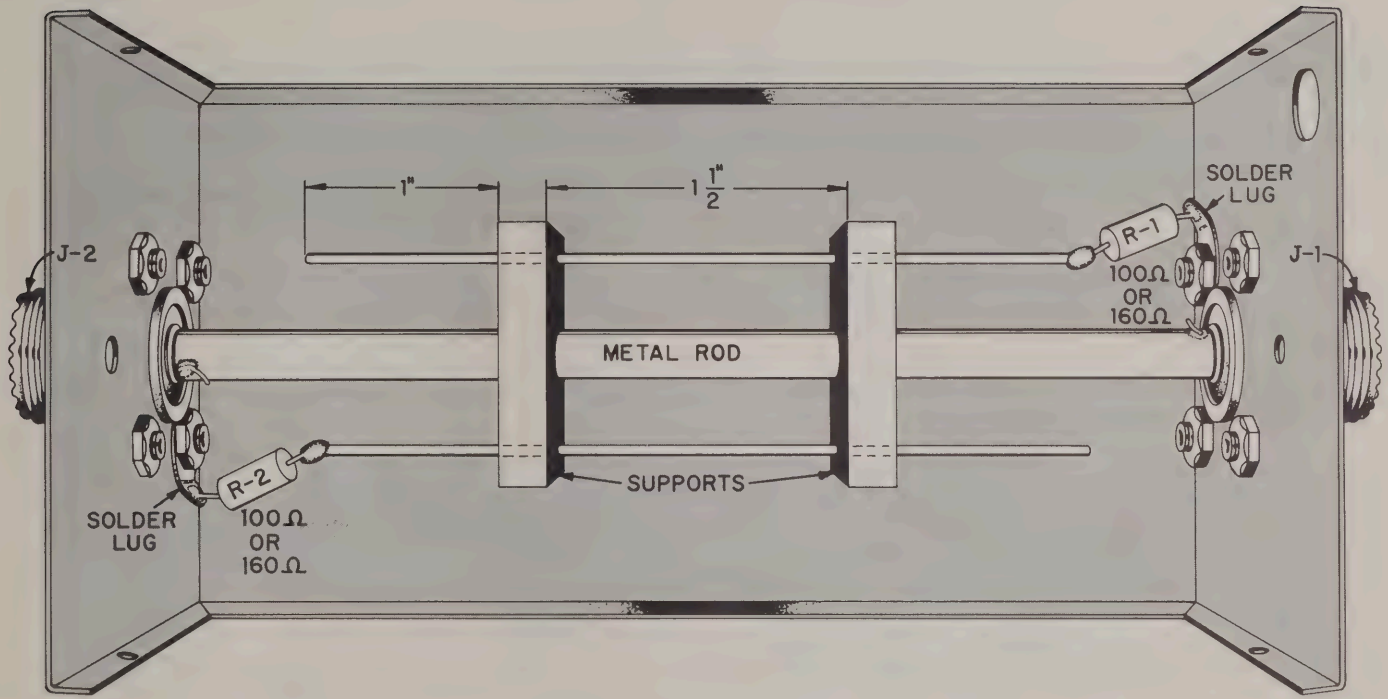


FIGURE 6. MOUNTING PARTS ON THE PICK-UP CHASSIS

WIRING THE PICK-UP CHASSIS

SEE FIGURE 7.

NOTE: A portion of the bracket is shown cut away to show the diode connections to the bare wire.

☐ Bracket. Mount the side with the notch (as shown in Figure 7) and TS-2, a 3-terminal strip. Use a 6-32 screw, lockwasher and nut. Mount the other side and TS-1, a 2-terminal strip, with a 6-32 screw, lockwasher and nut.

☐ Green wire. Connect one end to terminal 1 of TS-1. Connect the other end to terminal 1 of TS -2.

☐ C-2, .001 μf disc capacitor. Solder one lead to terminal 2 of TS-1. Connect the other lead to terminal 1 of TS-1.

NOTE: The two diodes are identical. The marked ends of the diodes may be marked with a band, a dot, several colored bands or have the end colored red. When wiring the diodes, be sure to connect the marked ends exactly as shown.

☐ CR-2, diode. Solder the unmarked end to the bare wire at a point 7/16″ from the end. Solder the marked end to terminal 1 of TS-1 (3 wires).

☐ CR-1, diode. Solder the unmarked end to the bare wire at a point 7/16″ from the end. Connect the marked end to terminal 3 of TS-2.

☐ C-1, .001 μf disc capacitor. Connect one lead to terminal 2 of TS-2. Connect the other end to terminal 3 of TS-2.

☐ The free end of the 2-conductor cable from the meter unit. Place a bushing on the cable 2″ from the end. Fasten the cable to the pick-up chassis as shown in Figure 4.

☐ Connect the ends of the cable as follows:

- ☐ Red lead. Solder to terminal 1 of TS-2 (2 wires).
- ☐ Shield wire. Solder to terminal 2 of TS-2 (2 wires).
- ☐ Black wire. Solder to terminal 3 of TS-2 (3 wires).

☐ Place the cover over the chassis. Fasten with four self-tapping screws.

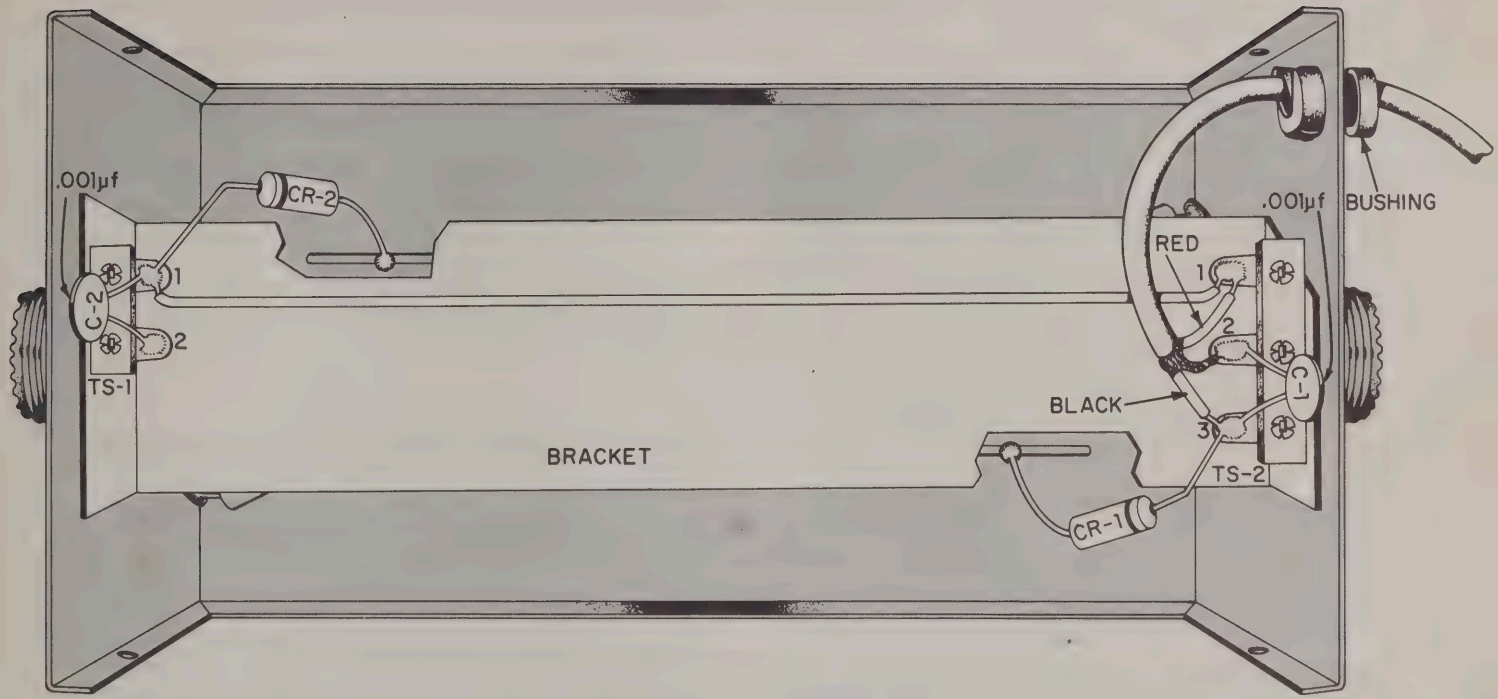


FIGURE 7. WIRING THE PICK-UP CHASSIS

If you use an antenna coupler or balun coils in your antenna system, the pick-up unit should be in the coaxial line between the transmitter and coupler or balun. If a low pass filter is used for TVI reduction, the unit should be placed between the transmitter and filter. Since the filter may introduce a mismatch in the line, it may be advisable to read SWR first with the filter in, and then with the filter out of the system. The indicator unit can be placed in any convenient location.

MEASURING SWR

☐ Connect the pick-up unit between the transmitter and antenna. Apply power to the transmitter.

☐ Place the switch in the FORWARD position and adjust the sensitivity control so the meter needle is at CAL.

☐ The SWR can now be read directly by switching to the REFLECTED position.

The SWR reading can be interpreted as percent of reflected power. The reflected power is that power which is not delivered to the antenna. If the SWR is 2.0 then 11% of the power leaving the transmitter is reflected. This means that only 89% (100%− 11%= 89%) of the total radio energy generated by the transmitter is radiated by the antenna.

If you find that the reflected power reads zero when the transmitter is running continuously but there is a momentary flick of the needle when the transmitter is keyed, you can be fairly certain there is a parasitic oscillation in the transmitter. Also if you find it impossible to obtain a zero reading in the reflected position, it may indicate that there is enough harmonic or subharmonic content in the transmitter output to cause a residual meter reading even with perfect matching at the fundamental frequency.

SWR IN TERMS OF REFLECTED AND USEFUL POWER

SWR	% Reflected power	% Useful power
1	0.0	100.0
2	11.0	89.0
3	25.0	75.0
4	36.0	64.0
5	~~67.0~~ 44.5	~~33.0~~ 55.5
6	~~71.4~~ 51	~~28.6~~ 49
8	~~77.7~~ 60.5	~~22.3~~ 39.5

MEASURING RELATIVE POWER

- ☐ Connect the pick-up unit between the transmitter and antenna.
- ☐ Apply power to the transmitter.
- ☐ Place the switch in the FORWARD position and adjust the sensitivity control for a meter reading of 1.
- ☐ Adjust the plate and loading capacitors of the transmitter for a maximum relative power reading.

The reading on the meter now is the relative power change. If the meter reads 3 that means that the transmitter is delivering three times as much power as before.

ANTENNA MATCHING

Insert the pick-up unit between the transmitter and the antenna. Set the switch in the forward position and adjust the sensitivity control so the needle is on CAL. Place the switch in the reverse position and note the meter reading. If there are standing waves present adjust the antenna for a meter reading of 1.

Detailed information on the adjustment of antennas is too broad to be covered in this manual. We recommend that you refer to the Radio Amateur's Handbook (ARRL) or similar publications for information on antennas.

DUMMY LOADS

If 100Ω resistors were used in the reflectometer, the unit will work on 72Ω coaxial cable and the dummy load should be 72Ω. If 160Ω resistors were used in the meter 52Ω coaxial cable and dummy load should be used.

A dummy load may be made of 2 watt carbon (not wirewound) resistors with short leads, soldered in parallel to a coaxial connector to give the proper wattage and impedance. A light bulb is *NOT* recommended for use as a dummy load.

It may be necessary to use the TUNE positon on your transmitter if the wattage of the dummy load is too low. If further reduction of power output is necessary, series parallel combinations of resistors and light-bulbs may be used to dissipate the power BETWEEN THE TRANSMITTER AND THE BRIDGE INPUT. Reduction of power is necessary only on initial adjustment when a dummy load is used. In operation the reflectometer can be left connected with no power reduction.

ALIGNMENT

NOTE: On frequencies below 10 meters the unit is pre-calibrated if built according to instructions. It is recommended therefore, that the highest frequency intended for use, be used for calibration.

☐ Connect J-1, the coax nearest to the bushing, to the transmitter.

☐ Select a non-reactive dummy load equal in resistance to the characteristic impedance of the line with which the bridge is to be used (see instructions under DUMMY LOADS). Connect this dummy load to J-2, the other coax connector.

☐ Set the sensitivity control of the reflectometer to the 0 position.

☐ Apply power to the transmitter and allow sufficient time for warm-up.

☐ Place the meter switch in the FORWARD position and adjust the sensitivity so the pointer is at CAL.

NOTE: Approximately 35 watts of RF will give full scale deflection at 3.5 mc and less than ½ watt is needed at 432 mc.

☐ Switch to the REFLECTED position and note the meter reading.

☐ The diode connected to the red lead of the 2-conductor cable is the reflected diode. While holding this diode with a pair of long nose pliers to dissipate the heat, unsolder the lead going to the pick up wire.

☐ Adjust the position of the diode on the pick-up wire for minimum reflected power. Solder the lead of the diode to the wire at this point.

☐ A slight bending of the other end of this pick-up wire in and out (± 3/16" maximum) will also aid in obtaining a minimum reading.

NOTE: If a proper dummy load is used it will be possible to obtain a zero reflected power reading.

☐ Reverse the transmitter and dummy load connections on the pick-up unit.

☐ Reset the sensitivity to the CAL position on the meter.

☐ Switch to the FORWARD position and adjust the other diode and pick-up wire for a minimum reading, as outlined in the previous instructions.

SERVICE HINTS

If the instructions and diagrams were followed carefully, the reflectometer should operate properly. One incorrect or poorly soldered connection can cause the reflectometer to be inoperative. A careful check of your wiring may reveal a wiring error or shorted connection.

The following Troubleshooting Chart will help you service your instrument.

TROUBLE SHOOTING CHART

TROUBLE	POSSIBLE CAUSE	SERVICE PROCEDURE
No reading in either switch position	Open circuit	Check continuity between J-1 and J-2. Check soldering of metal rod to J-1 and J-2.
	Sensitivity control set too low	Check setting of control.
	Defective meter	Unsolder the black lead from S-1. Check continuity from terminal 1 of the switch to ground. The reading should vary with the setting of the sensitivity control. If not the meter is defective.
Meter reads forward in the reverse position and reverse in the forward	Switch wired incorrectly	Check switch wiring. Check cable connections to pick-up unit.
	Pick-up unit connections reversed	Check to see that J-1 is connected to the transmitter and J-2 to the antenna.

TROUBLE SHOOTING CHART

TROUBLE	POSSIBLE CAUSE	SERVICE PROCEDURE
Meter reads backward (downscale) in the forward position	CR-1 polarity reversed	Check wiring of CR-1.
Meter reads backward (downscale) in the reverse position	CR-2 polarity reversed	Check wiring of CR-2.
Meter reads Backward (downscale) in both switch positions	CR-1 and CR-2 polarities reversed	Check wiring of CR-1 and CR-2.
	Meter polarity reversed	Check meter connections.
Meter pegs	Sensitivity control set too high	Check setting of control. Check for open control.

TROUBLE	POSSIBLE CAUSE	SERVICE PROCEDURE
No meter reading in forward position	Poor connection to switch	Check connection to terminal 1 of switch.
	Defective sensitivity control	Unsolder the black lead from S-1. Check continuity from terminal 1 of the switch to ground with the sensitivity control all the way to the left. The reading should be 25K and decrease as the sensitivity control is rotated to the right. Be careful not to peg the needle of the meter.
	Defective component in the pick-up unit	With the black lead disconnected from S-1 check the resistance of R-2. If defected replace. If R-2 checks okay replace C-1 with C-2 or another .001 μf, 600 volt capacitor. If this fails to remove the trouble then the defective component is CR-1.

TROUBLE SHOOTING CHART

TROUBLE	POSSIBLE CAUSE	SERVICE PROCEDURE
No meter reading in the reverse position	Poor switch connection	Check connection to terminal 3 of the switch.
	Defective sensitivity control	Unsolder the red lead from S-1. Check continuity from terminal 3 of the switch to ground with the sensitivity control all the way to the left. The reading should be 25K and decrease as the sensitivity control is rotated to the right. Be careful not to peg the meter.
	Defective component in the pick-up unit	With the red lead disconnected from S-1. Check the resistance of R-1. If defective replace. If R-1 checks okay, replace C-2 with C-1 or another .001 μf, 600 volt capacitor. If this fails to remove the trouble then CR-2 is defective.

TROUBLE	POSSIBLE CAUSE	SERVICE PROCEDURE
Can not read zero, when aligning in the forward position when using a dummy load	Improper dummy load	Check value of dummy load (52Ω with 160Ω resistors and 72Ω with 100Ω resistors). Be sure carbon resistors with short leads are used for the dummy load.
	R-2 incorrect	Be sure that R-2 is the correct value, depending on the coaxial line used, and is within 5% tolerance.
	Incorrect coax line	Check that correct impedance coax line is used.

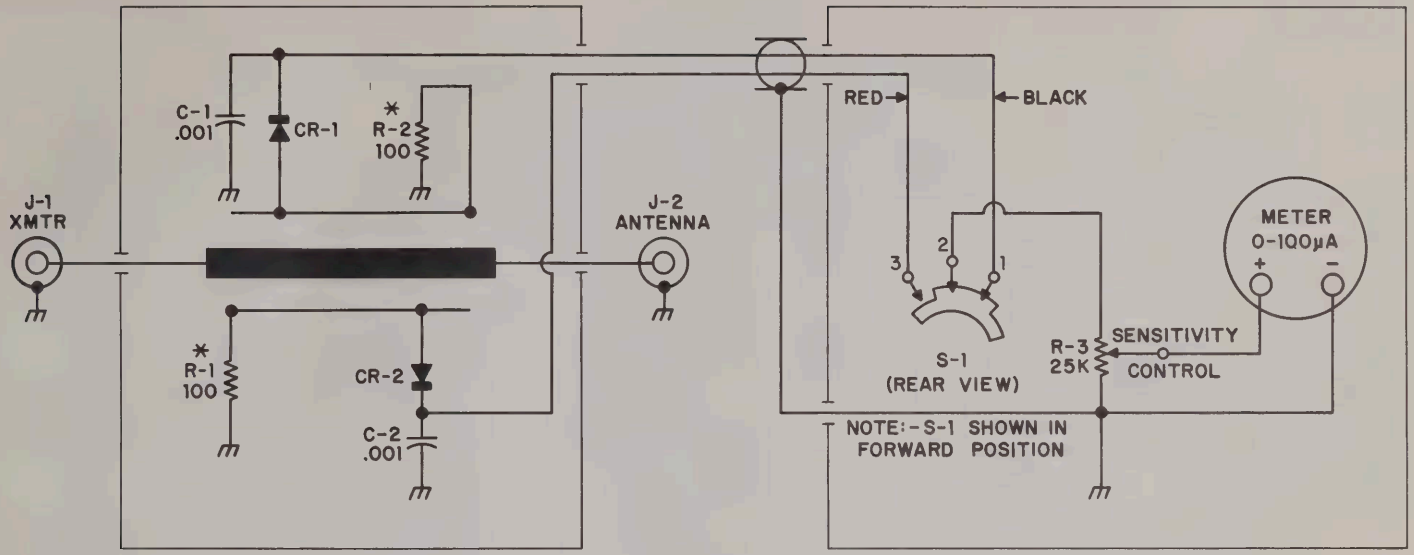
TROUBLE SHOOTING CHART

TROUBLE	POSSIBLE CAUSE	SERVICE PROCEDURE
Can not read zero when aligning in the reverse position when using a dummy load	Improper dummy load	Check value of dummy load (52Ω with 160Ω resistors 72Ω with 100Ω resistors. Be sure carbon resistors with short leads are used for the dummy load.
	Incorrect coax line	Check that correct impedance coax line is used.
	R-1 Incorrect	Be sure that R-1 is the correct value, depending on the coax line used, and is within 5% tolerance.
Can not read zero with an antenna	Unmatched antenna	Check for antenna mismatch as outlined under "Antenna Matching" in this book.
	Mismatch from a filter used for TVI reduction (if used)	Remove the filter from the line and check the meter reading. Check that the filter impedance is the same as that of the line.

CIRCUIT DESCRIPTION

The P-2 Reflectometer is simply a piece of transmission line to which a linear conductor is closely coupled. In this case the section of transmission line is the hollow metal rod and the linear conductor is the piece of pick-up wire on either side of the rod. The combination of the inductive and capacitive voltage is such that the incident RF voltage on the line is balanced out, leaving only the reflected portion to be read on the meter. The circuit uses two bridge circuits (each pick-up wire comprises a separate inductor) so that either the reflected or incident component may be read.

The current flow through the meter will vary with the operating frequency of the transmitter, because of the variation in coupling impedance. A control (R-3) is used to keep the readings in the desired section of the meter scale. This avoids the necessity of adjusting the transmitter level to an "on scale" reading.



NOTES

1-CAPACITORS INDICATED IN MICROFARADS.
2-RESISTORS INDICATED IN OHMS.
K=1,000 OHMS
*-VALUES SHOWN ARE FOR 72 Ω LINE.
*-WHEN USING A 52 Ω LINE, VALUES OF R-1 AND R-2 ARE 160 Ω.

SWR/POWER METER SCHEMATIC

PARTS LIST

CAPACITORS

Symbol Number	Description	Part Number
C-1	.001 μf, 600 volts	276016
C-2	.001 μf, 600 volts	276016

DIODES

CR-1	Diode	630007
CR-2	Diode	630007

RESISTORS

For 72Ω lines:		
R-1	100Ω, 5%	302101
R-2	100Ω, 5%	302101
R-3	25K control	392163
For 52Ω lines:		
R-1	160Ω, 5%	302161
R-2	160Ω, 5%	302161
R-3	25K control	392163

SWITCH

S-1	Selector	437065

TERMINAL STRIPS

TS-1	2-terminal	440203
TS-2	3-terminal	440301

MISCELLANEOUS

Description	Quantity	Part No.
Bushing	2	880013
Bracket	1	470468
Connector, coax	2	502222
Case, meter	1	463479
Chassis, pick-up	1	463477
Cover, pick-up	1	463480
Feet	4	831002

MISCELLANEOUS (Cont'd)

Description	Quantity	Part No.
Ground lug	1	553001
Knob	2	761004
Manual	1	750392
Meter	1	659253
Panel, dress	1	463481
Panel, meter sub	1	463478
Rod, metal	1	470469
Solder lug	2	553005
Supports	2	870152

HARDWARE

Flatwasher, 3/8"	2	580702
Lockwasher, #4	6	582200
Lockwasher, #6	2	582300
Nut, 4-40	8	570220
Nut, 6-32	2	570340
Nut, 3/8"	6	570840
Screw, 4-40 x 1/4"	8	560222
Screw, 6-32 x 5/16"	2	560343
Screw, self-tapping, 1/4" long	4	562292
Screw, self-tapping, 3/8" long, black	4	569345

WIRE, SOLDER AND TUBING

Bare wire, small, 4" length	1	806004
Bare wire, large, 10" length	1	806610
Cable, 2-conductor, 4' length	1	809055
Wire, 3" orange	2	801003
Wire, 4" yellow	1	801004
Wire, 5" green	1	801005
Solder, 2' length	1	930004

ALLIED SERVICE FACILITIES

FREE INFORMATION SERVICE

First write a letter to us if your wired kit does not operate properly. Address KNIGHT-KIT Dept. at Allied Radio. Give the stock number of the kit, date of purchase, and describe the problem. In a great many cases our technicians can outline corrective steps from the information in your letter. This free information service may save you the expense and inconvenience of returning the kit for repairs. Should it appear that work in our shop is necessary, we will send you a pre-addressed label and specific packing instructions for your kit.

SPECIAL INSPECTION SERVICE

You may return this wired KNIGHT-KIT for inspection and repair within one year after purchase for a special service charge of $3.50. An additional charge will be made for parts damaged in construction or for parts beyond the one year warranty period. Service charges for kits returned after the one year period will be based on the length of time needed to repair the unit plus the cost of any parts required. Kits not completely wired and kits which require extensive re-work will be returned collect with a letter of explanation.

PLEASE NOTE: Kits soldered with acid core solder, paste flux, or with irons cleaned on a sal ammoniac block are not eligible for repair or service because they have been permanently damaged by the acid flux.

PACKING INSTRUCTIONS

If you return this kit, pack it well. Do NOT use the original carton, it is too small for the assembled kit. To prevent damage in shipment, use a carton large enough so that cushioning material can be placed around the instrument. Cushion it well and tightly. Mark it: FRAGILE—DELICATE ELECTRONIC EQUIPMENT.

We recommend that this equipment be shipped ONLY by Railway Express, if at all possible, to forestall damage in shipment. Send the kit prepaid and insured. We will return the repaired kit to you C.O.D. as soon as repairs are completed. If you wish to save C.O.D. fees, your advance remittance may be enclosed for standard repair charges plus transportation costs. Any excess remittance will be refunded.

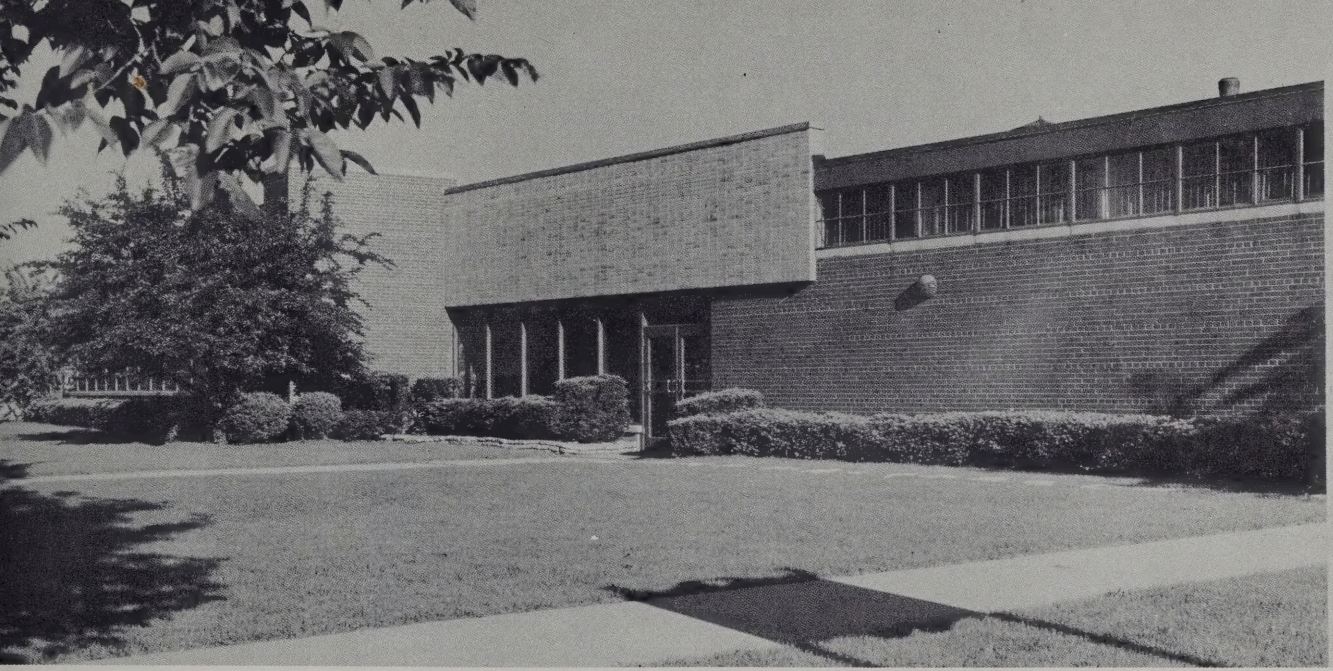
IF YOUR KIT ARRIVED DAMAGED

If your kit was damaged in a parcel post shipment, please write us at once, describing the condition in which the shipment was received. If your kit was part of a Railway Express shipment that was damaged in transit, please notify the local Railway Express agent at once and then write us.

KNIGHT-KIT GUARANTEE

Allied fully protects your Knight-Kit purchase with this exclusive money-back guarantee. Your Knight-Kit must meet with your complete satisfaction or your purchase price is refunded.

In addition, we guarantee that only premium-quality components are selected for use in Knight-Kits. **Every Knight-Kit component is fully warranted for a period of one year against defects in material and workmanship.** Should replacement parts be required under this warranty, notify us promptly, including sufficient details to identify the required parts. Parts will be shipped without charge. We reserve the right to request the return of defective parts.



This is the new Knight Electronics Corporation Plant in Maywood, Illinois – A facility completely devoted to research, engineering, and manufacturing of electronic equipment in kit form. Here Knight pioneers in better electronic units at lower cost for electronic hobbyists, experimenters, laboratories, schools, and for industry.

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KNIGHT-KITS ARE YOUR BEST BUY. THEY REPRESENT THE FINEST ELECTRONIC EQUIPMENT IN KIT FORM. TRULY CREATIVE ENGINEERING AND THE USE OF PREMIUM QUALITY PARTS ASSURE SUPERIOR PERFORMANCE.

KNIGHT-KITS ARE "CONVENIENCE ENGINEERED". EVERY DETAIL IS PLANNED FOR EASY CONSTRUCTION. RESISTORS ARE CARD-MOUNTED AND IDENTIFIED: WIRE IS PRECUT: SMALL PARTS ARE PACKAGED IN TRANSPARENT PLASTIC BAGS. SUPERB STEP-BY-STEP "SHOW HOW" MANUALS MAKE KNIGHT-KITS EASIEST TO BUILD.

KNIGHT-KITS ARE THE FIRST CHOICE OF EXACTING BUILDERS OF ELECTRONIC EQUIPMENT . . . THIS HAS BEEN TRUE SINCE THE EARLY 20'S. THERE IS AN OUTSTANDING KNIGHT-KIT FOR EVERY REQUIREMENT. EACH IS A REWARDING EXPERIENCE IN KIT CONSTRUCTION. YOU WILL BE PROUD TO BUILD AND OWN A KNIGHT-KIT.

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***ALLIED** fully protects your Knight-Kit purchase with this exclusive*

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Your Knight-Kit must meet with your complete satisfaction or your purchase price is refunded

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