

PRICE: \$10.00

DZ COMPANY · LOVELAND, COLORADO

DZKIT

ASSEMBLY MANUAL



SWR/REFLECTED POWER METER
MODEL HM-17

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YOUR DZKIT 90-DAY FULL WARRANTY

During your first ninety (90) days of ownership, DZ 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 DZ Company by writing us, emailing us or telephoning us. 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.

You will receive free consultation (except for the cost of your long distance phone call) on any problem you may encounter in the assembly or use of your DZKit product. Just drop us a line, email us, give us a call, or visit our website and click on "Support". That will give you access to free on-line support and a discussion group. Sorry, we cannot accept collect calls.

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

If you are ever dissatisfied with our service—warranty or otherwise— or our products, please write or email the president, Brian Wood, W0DZ, and he will make certain your problems receive prompt, personal attention.

THE DZ COMPANY, LLC
LOVELAND, CO 80537

Assembly

Of the



HM-17 SWR Meter



DZ COMPANY
LOVELAND, COLORADO

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9-15-08

HM-17

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INTRODUCTION

The DZKit HM-17 SWR Meter indicates reliably but inexpensively, how well the RF power out of your transmitter is being transferred to your antenna. It does not affect receiver operation.

The combination of low insertion loss and high power handling capability allows you to leave the SWR meter permanently inserted in a 50 ohm transmission line, for constant monitoring of your SWR or reflected power (as a percent-

age of forward power).

You can use the SWR Meter for testing the effectiveness of new antennas, and because of its rugged construction, small size and no external power supply requirements, you can move it about conveniently.

Thanks for trusting in DZKit to provide not only unique electronic products, but to give you hours of building fun too.

SPECIFICATIONS

RF Power Handling Capacity	1kW CW, 2kW PEP
Input and Output Impedance	50 ohms
Band Coverage	160 through 6 meters
Meter	100 microamperes, full scale
Dimensions	6 1/4" W x 3.5" H x 5.5" D
Net Weight	1.25 lb



General Assembly Notes

1. As you tighten a screw, it is very important that you do not strip the threads. All screws should fasten smoothly without resistance. If a screw appears to be hard to fasten, something else is probably wrong—a cable could be in the way, you are trying to use the wrong size screw or something else is wrong. **DO NOT FORCE SCREWS!** Instead, inspect the assembly carefully and try to see why you are having difficulty.
2. All references to left and right, front and back are with the chassis in an orientation such that the front of the device faces you.
3. Each circuit part has its own component number (R1, L4, Q3, etc.). Check off each part in the parts list to make sure all the parts are there. If you find any missing, give us a call or email us and we will rush a replacement to you.
4. Most electronic kits that are returned for service have poor soldering jobs. **Please** take a moment to familiarize yourself with proper soldering technique. And do not, under **ANY** circumstances, use corrosive (“acid-core”) solder! That will void your warranty and render your kit inoperative. Also be sure to avoid the use of products that may be called solder but are really glue. Soldering should only be done in an area with good ventilation and with a properly heated soldering iron.
5. Resistors are identified by their values in Ohms, Kiloohms (K) or Megohms (M) and by color codes. Your kit uses resistors of several types. Axial leaded resistors have color coded bands on them. For 5% resistors, the first two bands represent the numeric value and the third band represents a multiplier, which is a power of 10. Thus, a 56 Ohm resistor is Green-Blue-Black. A 10KOhm resistor is Brown-Black-Orange, and so on. The fourth band is the tolerance – no band represents 20%, a silver band 10%, and a gold band 5%. Your kit uses mostly one percent or better resistors, which have 4 bands for the value. A 4.75K resistor is Yellow-Violet-Green-Brown. A fluorescent light is useful to “bring out” the colors, and a magnifying glass is also handy.
6. Capacitors are identified by their type – disk, polystyrene, polypropylene, electrolytic, trimmer, etc.) and capacitance values are in microfarads (μF) or picoFarads (pF).
7. Diodes are marked with a band on the cathode end.



Most kit builders find it helpful to separate the parts into categories for quick identification. Muffin tins and egg cartons serve this purpose admirably.



KIT-BUILDING PROCEDURES

The steps involved in building a kit are listed below. Be sure to follow them and you will have a lot of fun building, aligning, testing and using your kit.

1. **Do a parts inventory.** If you are missing any parts, call or email us and we'll rush replacements to you immediately.
2. **Take your time!** We know you want to get it done and start using it, but doing it wrong will only delay that moment. Before you start, set up a ventilated, static-free work area with enough room to build the kit. Prepare parts bins and get the tools you will need (needle-nose pliers, wire-cutter, wire stripper, Phillips head screw drivers, wrenches, soldering iron, solder, insulated tool, awl or other sharp-ended tool, scissors, magnifying glass, etc.) If you're tired, take a break. Enjoy building your kit!
3. **Make sure that you are loading the part that's called for in the right place.** If you are not sure about any step, call us!
4. Once you've done a step, **put a checkmark inside the parentheses.**
5. **Pay attention to soldering techniques.** Keep your soldering iron clean by using a wet sponge, use appropriate heat and maintain heat long enough to make good solder joints. Solder problems are the number one cause of problems when building electronic products (not just kits!), so try extra hard to do it right. Use a temperature-controllable soldering iron such as the one shown below.
6. The number of wires that are to be soldered in a step is shown by the letter "S", followed by the number of wires, e.g., "(S-3)". If wires are to be attached but not soldered until a later step, the designation is "(NS)", for "no solder".



Use good quality solder and a temperature-controlled soldering iron (set to 750 degrees F) with a sponge. Keep the tip clean by wiping it on the sponge periodically.



Safety First!

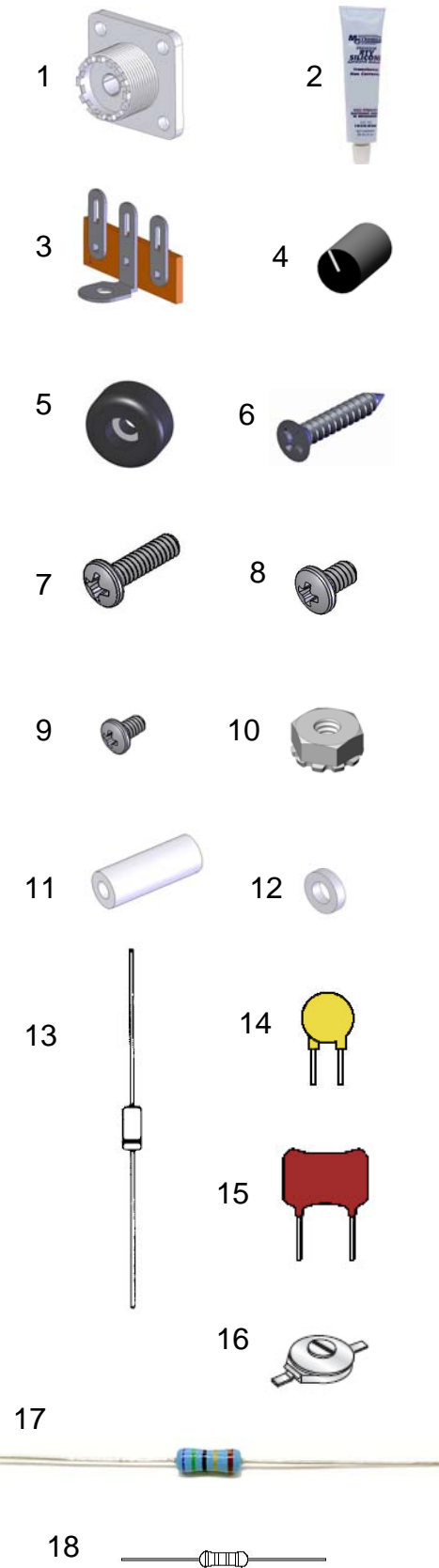
Your safety is of utmost importance to us. Please read this information before you get started, and remember these rules as you continue building and testing your DZKit product.

1. Always have a healthy respect for electricity. While the voltages present inside your kit are not lethal, RF power is present between the input and output connectors whenever the transmitter is transmitting.
2. When measuring voltages inside electronic equipment, it is generally a good idea to use only one hand, wear rubber-soled shoes and avoid areas with standing water. However, remember that slightly humid environments can prevent static electricity that could damage the electronic parts! Use a humidifier in dry climates.
3. Do not work on electronics by yourself if at all possible. Have a parent, spouse or friend nearby. If you must work alone, keep a telephone handy in the event you run into problems.
4. Soldering irons are hot. They can burn your skin and cause damage to workbenches and carpets. We recommend you use one with an automatic shutoff in case you forget to turn it off when you are done.
5. Do not work on electronic projects when you are tired. We know you want to finish it, but accidents are more likely when you are tired. Take breaks! Be careful!
6. Use proper ventilation in your work area. Solder contains tin and lead (or tin and silver), and solder fumes should not be allowed to “hover” near your work. Open a door or window, use a fan, and be cognizant of the potential dangers.
7. When clipping leads, use eye protection and/or be sure to direct the flying leads down into a nearby trash can. As you gain experience clipping component leads, you will learn how to clip them so that they fall harmlessly away from the board.
8. Be careful not to cut yourself when handling sharp objects such as connectors and sheet metal. Keep some tissues, bandages and antibiotic ointment nearby in the event of an injury.
9. This may sound obvious, but do not insert any parts in any portion of your body no matter how good they may smell.
10. Use common sense in dealing with unfamiliar things. If you don't understand something, call us or ask a friend for help.



Parts List

Item	Description	Qty
1	Connector — SO-239 RF chassis mount	2
2	RTV silicone adhesive	1
3	3-lug terminal strip	3
4	Knob-small	2
5	Rubber foot	4
6	Screw - 4-40 x 5/8" FH Self-tapping	8
7	Screw - 6-32 x 3/8" PH Phillips M/S	9
8	Screw - 6-32 x 1/4" PH Phillips M/S	2
9	Screw - 4-40 x 1/4" PH Phillips M/S	2
10	Nut - 6-32 KEPS	9
11	1/2" Nylon spacer	1
12	.05" Nylon spacer	2
13	1N5711 Schottky diode	2
14	.001uF disk ceramic capacitor	3
15	100pF silver mica capacitor	1
16	30pF trimmer capacitor	1
17	200 ohm 1W resistor	1
18	3.3K 1/4W resistor	1
19	Magnet wire — red 24 gauge	24"
20	Magnet wire — green 24 gauge	24"
21	12 gauge bare wire	8"
22	100uA meter	1
23	FT50-43 toroid core	1
24	2 pole 6-pos rotary switch	1
25	100K ohm potentiometer	1
26	Serial number sticker	1
27	Polycarbonate front panel overlay	1
28	Plastic bezel - outer	2
29	Plastic bezel - inner	2
30	Aluminum extrusion	1
31	Back panel plate	1
32	Front panel plate	1
33	Meter mounting bracket	1
34	Nylon hole plug—1/4"	1





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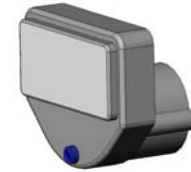
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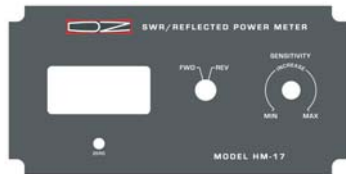
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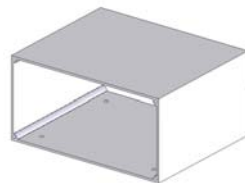
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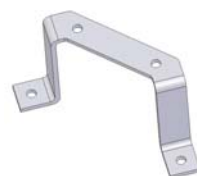
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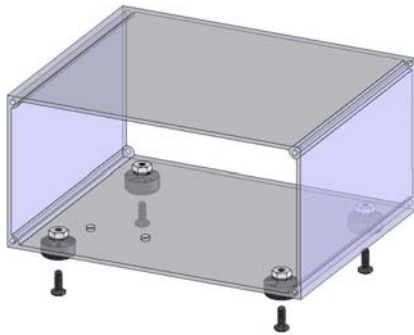
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STEP-BY-STEP ASSEMBLY

- () Attach four rubber feet to the bottom of the extrusion using four 6-32 x 3/8" machine screws and four 6-32 KEPS nuts. Tighten securely. See Detail 1.



Detail 1. Rubber foot mounting

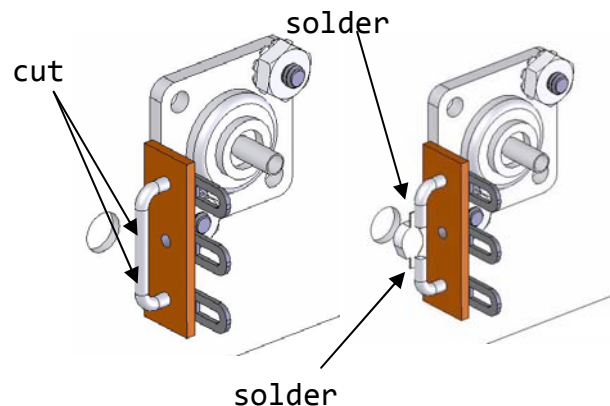
Refer to Figure 1 on page 12 for the following steps.

- () Insert both S0-239 connectors into the large holes on the back panel using four 6-32 x 3/8" machine screws and four 6-32 KEPS nuts. The counter-sunk corner holes must face out. On the S0-239 connector that is closest to the 1/4" hole, place the 3-lug terminal strip between the body of the connector and the nut. See Detail 2.

- () Cut a 2" length of 12-gauge bare wire. Bend each end to a length of 5/16" so that the distance from end to end is 3/4". (Use ruler on next page.) Insert the ends of the wire into the top and bottom lugs on the terminal strip,

using the portion of the terminal strip that is fastened to the phenolic body. Keep the wire level with the panel and centered over the 1/4" hole in the panel. Once it has cooled, tin the middle 1/2" of the wire and then clip 1/4" out. If a wire slips in the terminal strip, reposition it so that the wire stays level.

- () Position the 30pF trimmer capacitor so that the adjustment screw is visible from the 1/4" hole in the back panel. Solder each side to the two wire halves.



Detail 2. Trimmer capacitor

- () Build transformer T1 as shown in Detail 3: Twist the red and green magnet wire together about 2 turns per inch. Insert the double wire into the toroid with 3" extending out. Loop 12 turns

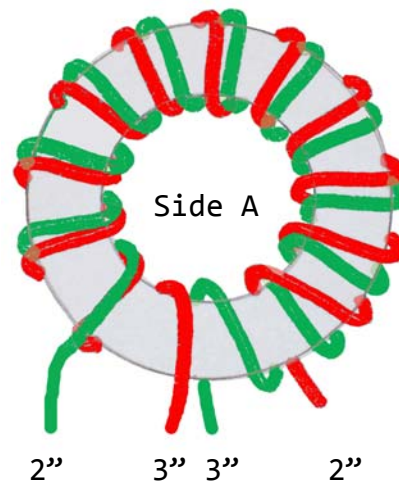


clockwise through the toroid and pull each turn snugly against the body of the toroid. Each time the wire passes through the body of the toroid counts as one turn. *See the note below on tinning magnet wire.*

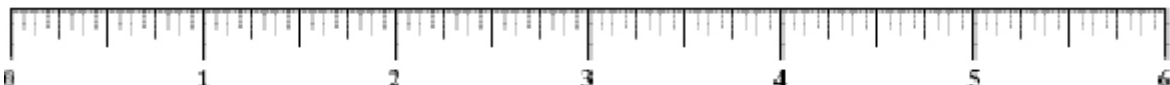
- () Cut the green wire on side A and the red wire on side B to a length of 2". Cut the green wire on side B to a length of 3". Save the remaining wire for use as hookup wire.
- () Place the 1/2" Nylon spacer inside the toroid. It should fit snugly.
- () Cut the 12-gauge bare wire to a length of 6". Insert the wire into the Nylon spacer with equal lengths on both sides. Bend the bare wire on each end so that the center-to-center distance is 2 7/8". The radius of the bend is not critical, but do not make it extremely sharp.
- () Solder the bare wire into the center terminal of each SO-239 connector. Use plenty of heat and add enough solder to ensure a good connection.
- () Remove 1/2" of enamel from the short red and green magnet wires coming from the

Preparation of magnet wire.

Your kit uses enamel-coated magnet wire. You must remove the coating on the ends and add solder to the exposed copper. This is called "tinning" the ends. You can use wire cutters to gently strip 1/2" of enamel off, being careful not to cut or weaken the wire, or you can apply heat from the soldering iron and a lot of solder for a minute or more to melt the enamel off (or both). Either way, be sure the end of the wire is tinned properly before permanently soldering it in place. The ends should be shiny with only solder and no enamel showing.



Detail 3. Toroid construction



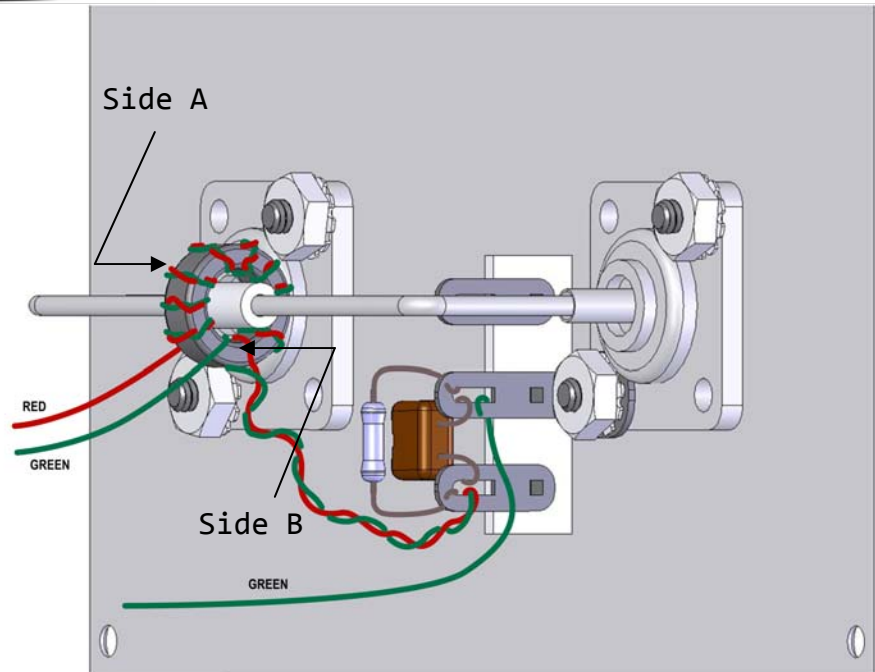


Figure 1. Back panel wiring

toroid as described in the note on page 11.

- () Twist the 2" red and green magnet wires together. Wrap the end of the twisted pair of magnet wires around the bottom lug on the 3-lug terminal strip (NS).
- () Attach one side of the 3.3K 1/4W resistor to the bottom lug (NS).
- () Attach one lead of the 100pF silver mica capacitor to the bottom lug (S-4).
- () Attach the other end of the 100pF silver mica capacitor and the 3.3K 1/4W resistor to the center lug (NS).
- () Cut a 3" length of green magnet wire. Tin the ends as de-

scribed earlier. Wrap one end around the center lug of the 3-lug terminal strip (S-3).

- () Apply RTV to both sides of the toroid and the 1/2" Nylon spacer so that the assembled part does not move on the wire.

Refer to Figure 2 for the following steps.

- () Attach two 3-lug terminal strips together, facing each other, with a 6-32 x 3/8" screw and 6-32 KEPS nut. *To make assembly easier, attach them to the OUTSIDE BOTTOM of the extrusion with the screw inside. Later, you will remove the assembly and place it inside.*
- () Attach the cathode (banded

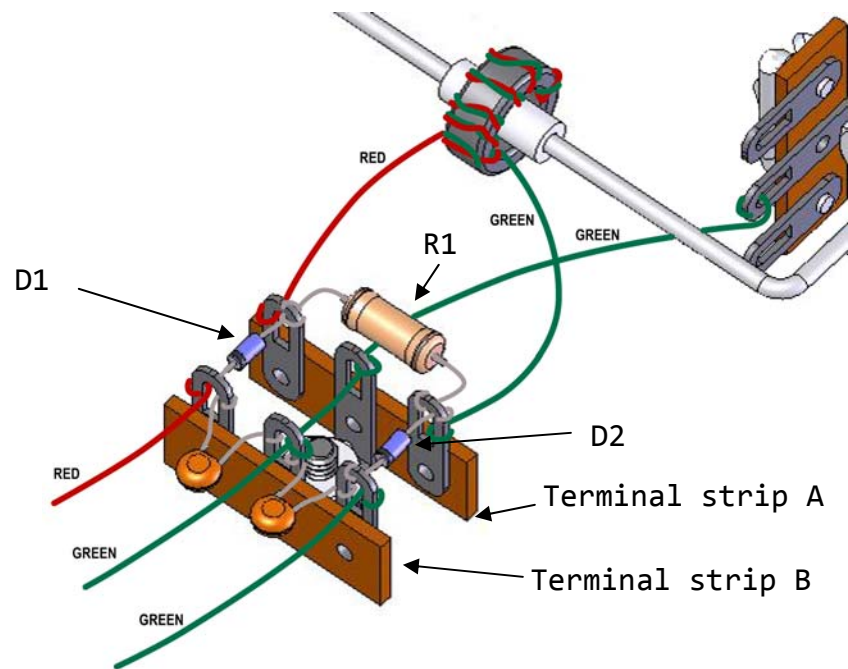


Figure 2. Terminal strip wiring

side) of a 1N5711 diode to an end lug on terminal strip A (NS). Attach the other end to the lug directly opposite on terminal strip B (NS). We'll refer to this as D1.

() Attach one lead of a .001uF disk ceramic capacitor to the cathode of D1 on terminal strip B (NS). Attach the other end of the .001uF capacitor to the center lug of the same terminal strip (NS).

() Attach the cathode (banded side) of another 1N5711 diode to the other end lug on terminal strip A (NS). Attach the other end to the lug directly opposite on terminal strip B (NS). We'll refer to this as D2.

() Attach one lead of an-

other .001uF disk ceramic capacitor to the cathode of D2 on terminal strip B (NS). Attach the other end of the .001uF capacitor to the center lug of the same terminal strip (NS).

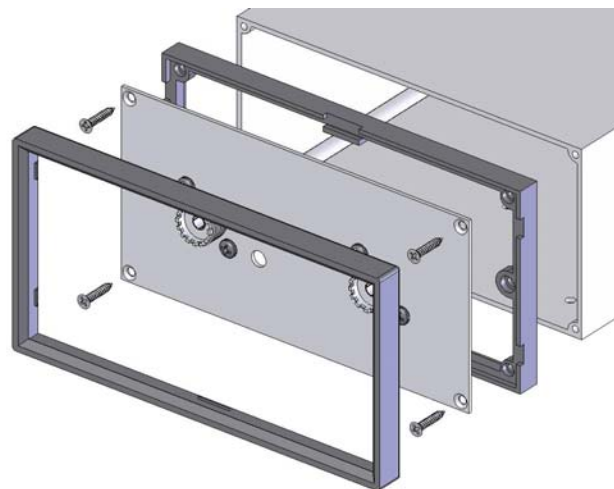
() Attach a 200 ohm 1W resistor between the anodes (non-banded sides) of the two diodes on terminal strip A (NS). We'll refer to this resistor as R1.

() Attach the red wire coming from the toroid to the anode of D1 and one lead of R1 on terminal strip A (S-3).

() Attach the green wire coming from the toroid to the anode of D2 and the other lead of R1 on terminal strip A (S-3).



- () Cut a 3" length of green magnet wire and tin the ends. Attach one end to the center lug on terminal strip B (NS).
- () Attach the green wire coming from the center (ground) lug on the terminal strip on the back panel to the center lug of terminal strips A (S-1) and B (S-4).
- () Cut a 3" length of red and green magnet wire and tin both ends of both wires.
- () Attach the red wire to the cathode of D1 on terminal strip B (S-3).
- () Attach the green wire to the cathode of D2 on terminal strip B (S-3).
- () Remove the screw and nut from the joined terminal strips.
- () Place the back panel on an inner plastic bezel and attach the panel with bezel attached to the back side of the extrusion using four self-tapping screws. Tighten them securely, but do not over tighten to avoid compressing the plastic. As you do so, insert the dual terminal strip into the extrusion. Snap the outer plastic bezel over the inner bezel. These fit together very snugly and it can take a fair amount of force to get the snaps to lock. There should be no bowing of the plastic when it is assembled correctly. See detail 4.
- () Insert the 6-32 x 3/8" screw into the center hole in the bottom of the extrusion from the outside. Hold the screw in place with one finger and reach inside to position the dual terminal strips over the screw. Place a 6-32 KEPS nut over the screw and tighten as much as possible by hand. Finally, using a screwdriver, tighten the screw while keeping the terminal strips parallel to each other and parallel to the back panel.
- () Clean the front panel with soap and water and dry thoroughly to remove all finger oils. Remove the backing from the polycarbonate overlay and



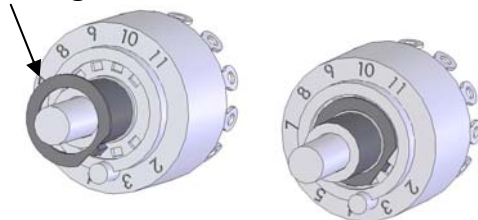
Detail 4. Back panel mounting



affix it to the front panel. Be sure to align it carefully with the holes in the sheet metal.

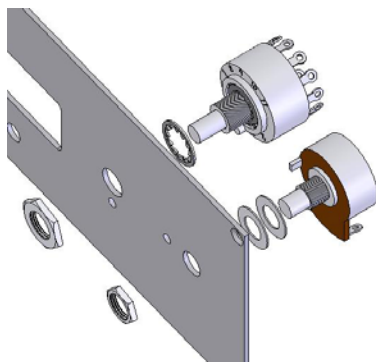
- () Remove the nut and lockwasher from the switch and then carefully remove the detent ring. Rotate the ring so that the tab lines up with the hole labeled "2" and reinsert it as shown in Detail 5. Replace the lockwasher over the shaft.

detent ring



Detail 5. Remove detent ring and re-insert with tab in hole 2

- () Insert the switch into the center hole in the front panel so that the alignment tab fits into the small hole. Tighten the nut, being careful not to mar the front panel. See Detail 6.

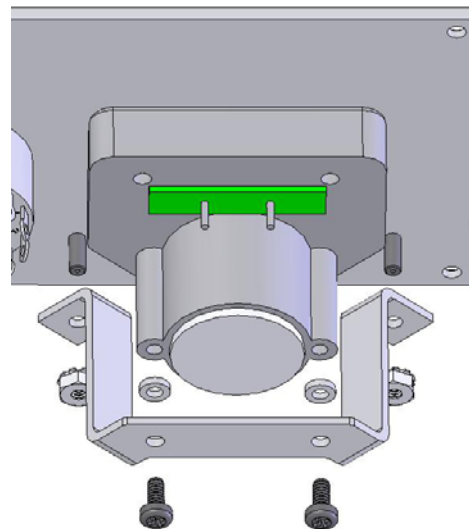


Detail 6. Pot and switch mounting in front panel

- () Insert the 100K potentiometer in the rightmost hole in the front panel as shown in Detail 6. Tighten the nut, being careful not to mar the front panel.

- () Place the front panel upside down on a protective surface such as a towel.

- () Attach the meter to the front panel plate using two 4-40 x 1/4" machine screws, two #4 Nylon washers, two 6-32 KEPS nuts and the meter mounting bracket as shown in Detail 7.



Detail 7. Meter mounting

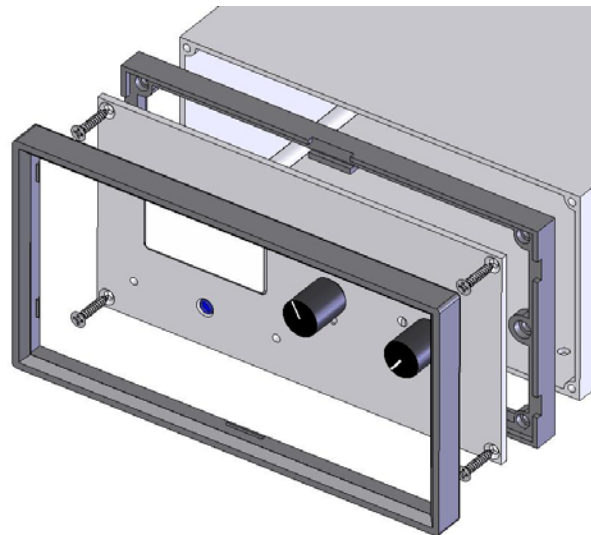


Refer to Figure 3 for the following steps.

- () Cut a 4" length of red magnet wire and tin the ends. Attach one end to the center lug on the potentiometer (S-1). Attach the other end to the left ("+") terminal on the meter (NS).
- () Cut a 3" length of green magnet wire and tin the ends. Attach one end to the right lug of the potentiometer (S-1). Attach the other end to the "-" terminal on the meter (NS).
- () Attach a .001uF disk capacitor from the left terminal (S-2) to the right terminal (NS) of the meter.
- () Attach the green wire coming from the center lug of terminal strip B to the "-" terminal on the meter (S-2).
- () Cut a 3" length of red magnet wire and tin the ends. Attach one end to the left lug on the potentiometer (S-1). Attach the other end to pin A of the switch (S-1).
- () Tin the red wire coming from terminal strip B and attach it to pin 1 on the switch (S-1).
- () Attach the green wire coming

from terminal strip B to pin 2 on the switch (S-1).

- () Insert the front panel into an inner plastic bezel until it lays flat, with the wires extending out the back. Attach the panel with bezel attached to the extrusion using four self-tapping screws. Tighten them securely, but do not over tighten to avoid compressing the plastic. Then snap the outer plastic bezel over the inner bezel. These fit together very snugly and it can take a fair amount of force to get the snaps to lock. There should be no bowing of the plastic when it is assembled correctly. See detail 8.



Detail 8. Attachment of front panel and bezels to extrusion

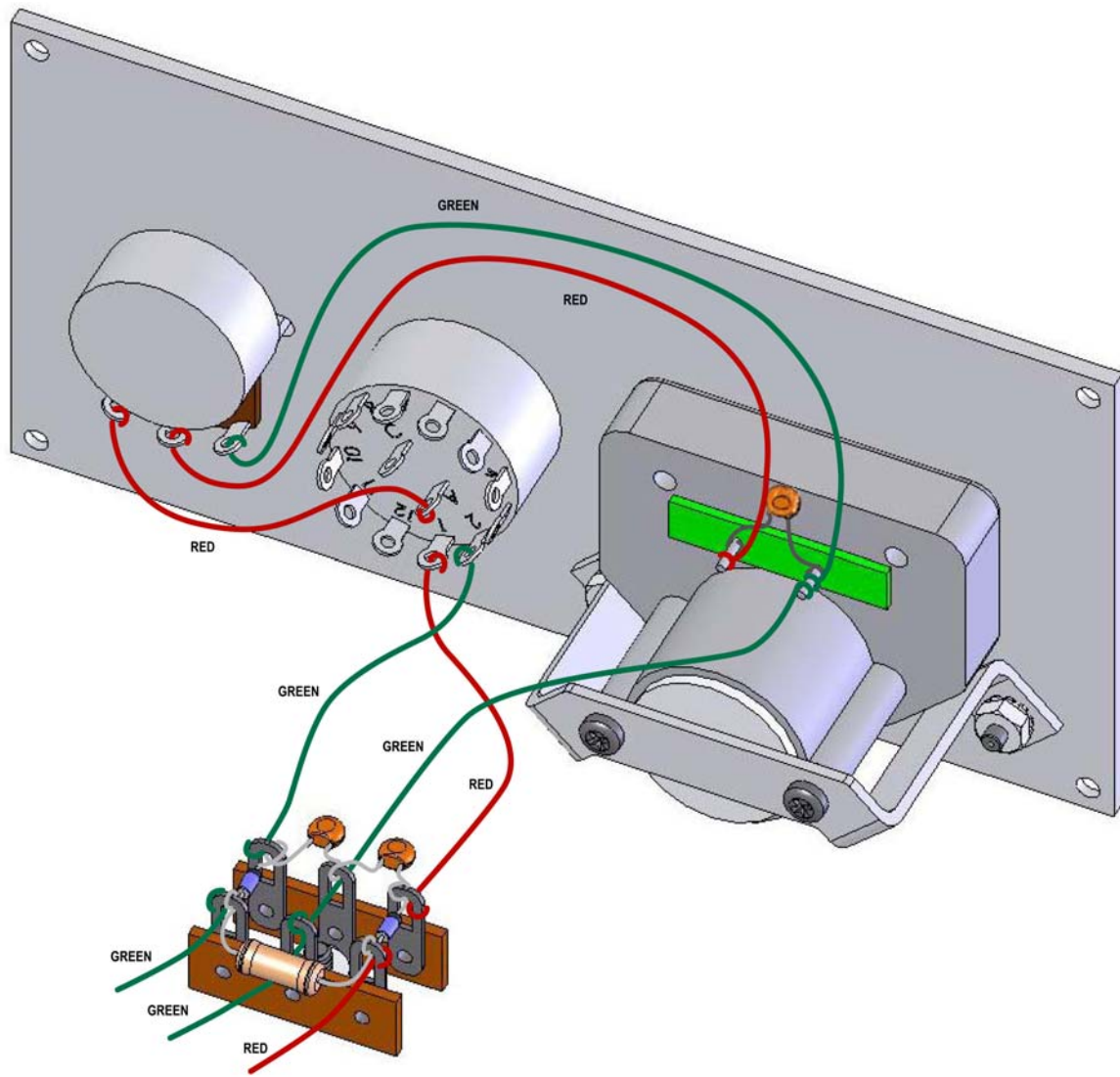


Figure 3. Front panel wiring

- () Attach the knobs to the switch and potentiometer using a .050" (1/20") allen wrench.
- () Affix the serial number sticker to the back panel, horizontally between the con-

nectors, so that the "Null" text is centered above the adjustment hole.

This completes assembly of your DZKit HM-17 SWR/Reflected Power Meter.



INSTALLATION

- () Place the HM-17 in a convenient location so that you have easy access to the controls.
- () Connect a short length of 50-ohm coaxial cable such as a 3-foot length of RG-8X with PL-259 connectors on each end between your transmitter and the coaxial connector labeled "TX" on the HM-17 back panel.
- () Connect an antenna to the connector labeled "ANT" on the HM-17 back panel.

NOTE: If an external antenna tuner is in use (i.e., one not built-in to your transmitter), connect the HM-17 between the transmitter and the tuner. When enabled, the tuner will minimize the SWR. You will be able to see the effect on your transmitter of having the tuner inline and out of line. When the tuner is inline, the SWR read on your meter should be nearly 1. When out of line, you will read the SWR that the tuner sees.

OPERATION

- () Before applying power, set the SENSITIVITY control all the way counterclockwise (MIN) and the function switch to FWD.
- () Apply power to the transmitter and tune it if necessary. Then set the SENSITIVITY control for a full scale (SET) meter reading.
- () Turn the function switch to the REV position. This may be done with power on with no negative effects, since the HM-17 detection and switching circuitry operates at very low voltages.
- () Insert a small, flat-blade

insulated screwdriver into the hole labeled "SWR Null" on the back panel and adjust the trimmer for a minimum reading on the meter. This adjustment only needs to be done once.

- () Insert a Nylon hole plug into the 1/4" hole.
- () Turn the function switch back to FWD and re-adjust the SENSITIVITY control for a full scale (SET) reading.
- () Switch the function switch to REV and read the SWR and/or reflected power percentage directly on the meter.



NORMAL CHARACTERISTICS

You can leave the HM-17 inline at all times. You will find that you need to reset the SET point at different frequencies. It will take higher power at lower frequencies to achieve a full scale FWD power reading.

The HM-17 is designed to provide accurate power readings only with a CW, AM or FM signal. However, if you see any forward power indication on the meter when your microphone is off but you are transmitting in SSB modes, this is an indication that your carrier suppression is inadequate and you should take steps to correct your transmitter's performance.

LOSSES

If you have a very long feed line to your antenna, losses in the cable can fool you into thinking that you have a better SWR than you do. In such cases, try the SWR meter outside, as close to the antenna as possible. If you are using the HM-17 to adjust an antenna for best SWR before placing the antenna on a tower, be sure to get the antenna as high off the ground as possible.

Typical coaxial cable used by amateurs (RG-8, RG-58 and variations) have less than 2dB of loss per 100 feet. Remember that with 3dB of loss, your SWR meter will read 3 if the end of the cable is shorted to ground. No signal would be radiated, but the meter

would tell you your SWR was "tolerable".

As the SWR rises, additional losses in the cable are incurred. For example, if you have 1dB of loss in a 100 foot cable at 10MHz, an SWR of 3 will result in an additional .5dB of loss. It may not sound like much, but remember that 3dB is a factor of 2, so if your transmitter is putting out 100W, only 50W would be reaching the antenna! Minimizing loss in transmission lines and maximizing the match to the antenna can be a real art. For much more information on this, we recommend further reading in the **ARRL Handbook** and the **ARRL Antenna Book**, available from DZKit and most amateur supply houses.

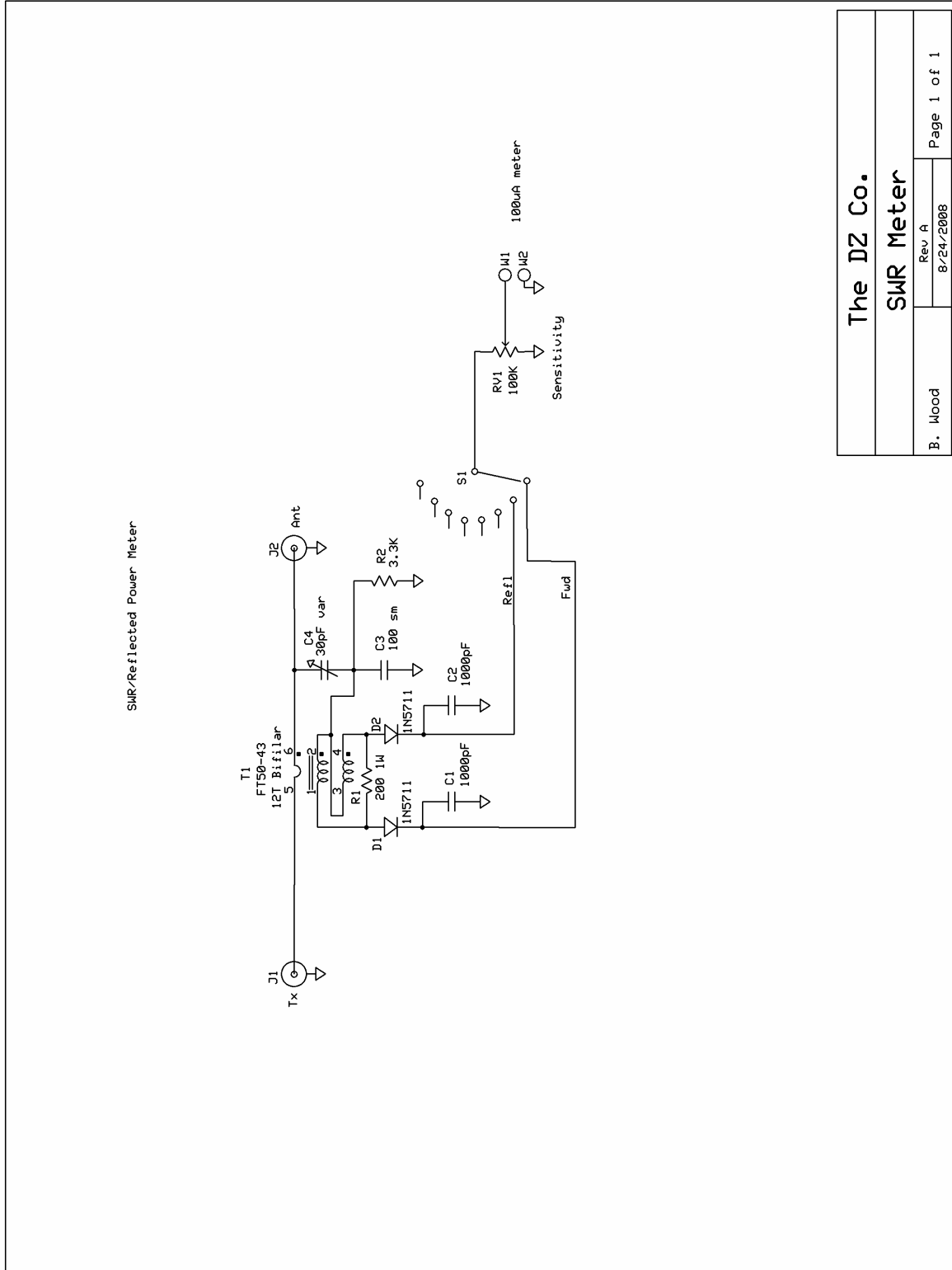
Although lower numbers are better, most transmitters can handle up to a 3:1 SWR without difficulty, although they may reduce their power output to limit the amount of reflected power that's trying to come back into the output stage. With many wire antennas, an SWR of less than 2:1 is perfectly adequate.

HOW TO PRONOUNCE "VSWR"

SWR is expressed as a ratio, so one generally says the value was, say, 1.5-to-1, expressed textually as "1.5:1". The meter shows only the numerator; the ":1" is implied. Since SWR is measured as a voltage, it is technically most accurate to call it VSWR, which is often pronounced "viz'-warr".



SCHEMATIC DIAGRAM



The DZ Co.	
SWR Meter	
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THEORY OF OPERATION

A 12-gauge wire routes the input connector to the output connector, providing low loss. Toroid transformer T1 takes current that's passing through its primary (the "one-turn" consisting of the thick wire) and impresses a small portion of it on the secondary. In the forward direction, the resulting current is rectified by Schottky diode D1 and filtered by capacitor C1 to produce a DC output that can drive the meter. The current is limited by potentiometer RV1 so that exactly 100 microamps flows into the meter when it is set for full scale.

Any reflected current from the antenna is coupled through a similar, but oppositely wound, winding on T1 and is rectified and filtered by D2 and C2. Since the windings are an equal number of turns, and the potentiometer value is the same for both forward and reflected power, any metering inaccuracies cancel out.

Resistor R1 provides a load for the secondary of the transformer, which reduces the Q and minimizes the effects of frequency on the readings.

Resistor R2 is a ground return path for diodes D1 and D2. Capacitors C3 and C4 form an AC voltage divider circuit to bal-

ance the capacitive effects of the bifilar windings in T1 which would otherwise affect the accuracy of the SWR readings.

Electrical power follows a square law: $P = E^2/R$, where P = Power, E = voltage and R = resistance. Thus, for power to be read directly on the meter, the meter dial must be calibrated in a manner that is the square of the voltage being fed to it. That's why the meter dial is not linear.

Reflected power is measured on this meter in percent. Thus, if full scale represents 200W, you can read reflected power by simply multiplying that known value by the percentage read off the meter.

The formula for SWR is:

$$\text{SWR} = \frac{1 + \sqrt{(\text{RP}/\text{FP})}}{1 - \sqrt{(\text{RP}/\text{FP})}}$$

RP = Reflected Power in W

FP = Forward Power in W

√ is the symbol for square root

This equation can be solved for RP/FP easily at various values of SWR. For example, if SWR = 3, RP/FP = .25, or 25%. Several values are marked on the meter below the SWR.



IN CASE OF DIFFICULTY

1. Recheck all wiring steps. Have a friend check your work. A different set of eyes might turn up something obvious that you have overlooked.
2. Most kits that are returned for repair do not work correctly due to improper soldering techniques. Reheat all connections and make sure they are soldered correctly.
3. Make sure the right parts have been placed in the right places and in the correct orientation.
4. Check for shorted wires.
5. If the meter pegs off scale to the left, one or both diodes are installed backwards. The cathode, marked with a black band, faces the front of the meter.
6. Check to make sure all magnet wire has been properly soldered.
7. If forward and reflected measurements are reversed, the red and green wires from the toroid are reversed, or pins 1 and 2 on the switch are reversed, or you have the antenna and transmitter connections reversed.
8. If you find it necessary to return the kit for repair, package it well and send it to:

DZKit Warranty Repair
710 Grove Ct.
Loveland, CO 80537



DZ COMPANY

LOVELAND, COLORADO

UNIQUE ELECTRONIC EQUIPMENT IN KIT FORM