Down East Microwave Inc. 954 Route 519, Frenchtown NJ 08825
Phone: 908-996-3584 (Voice) 908-996-3702 (Fax) http://www.downeastmicrowave.com

DEM RFPMK and CK
Positive or Negative Current Driven LED Power Meter

CIRCUIT DESCRIPTION:

The DEM RFPMK designed by WW2R and Down East Microwave Inc. is a spin off of Dave's original design that has appeared in many recent periodicals and on his web site. The idea we had at DEMI was that most RF diode detectors have a negative current output.. His original design only accommodates positive current inputs. With this design, the circuit will operate with either a positive or a negative current input. The RFPM can be operated from a standard 9 volt battery or and DC supply with the range of 8 to 17 VDC.

The heart of the circuit is a 10 segment multicolored bar graph display controlled by a LM3914 driver integrated circuit. The LM3914 accepts a positive voltage input and drives the 10 segment bar graph in ascending steps. There is an option of lighting a single LED instead of the complete bar graph if you wish to conserve battery power during portable use. To accommodate a negative voltage input, the circuit contains a isolated power supply to bias a Dual Op-Amp. With the proper configuration, you can tailor the meter for your specific use. It is also easily changed or could be configured with a switch to make it truly universal accepting all possibilities.

COMPONENTS LIST

BAR 1	Bar graph display	IC 3	ICL 7660
C1, C3, C4	.1μF disc Capacitor	R1	2.7K 1/4 watt resistor
C2	100 μF electrolytic Cap	R2, R3, R4,	47K 1/4 watt resistor
C6-C8	10 μF electrolytic Cap	VR1	10K potentiometer
IC 1	LM3914	VR2	1 MEG potentiometer
IC 2	TL072		

ASSEMBLY:

Although this is a basic circuit board assembly with a maximum of 14 components, be sure to read the complete document before assembly. The assembly of the complete circuit board will allow the use of any detector available. Follow the component placement document and install all of the components on the top side of the PCB except the BAR 1. The top side is the side with all of the labeling etched into the board. The BAR 1 is installed on the bottom side of the PCB. Follow the bottom side placement guide. Be sure about the "keyed" corner of the display. It is rounded very slightly but one corner is different than the other three.

If you decide you only want a power meter with a positive current detector, the circuit board may be altered to make it smaller and more compact.. This may be desirable if you are installing it in a power amplifier or in your own special enclosure. Examine the bottom side component placement document. You will see a dashed line. This is the cutting guide. The cut board will have both mounting holes still contained with in it. The board is thin enough to be cut with a simple scissors. Then install only the positive voltage detector components IC1, BAR 1, VR1, C1- C3, and R1.

If you are a purists and/or are concerned about battery drain or potential oscillation of the negative voltage generator or the dual Op-Amp, the RFPM may be assembled completely and then the negative voltage section can be disabled until it is required. Look for the "cut trace" label on the bottom side component placement document. Cut a small section out of the trace. The voltage can be restored to it later.

Testing and Operation:

Positive detector testing and operation is simple. All wiring can be done on either side of the board. The wire connection holes are indicated with an "X". All +V connections are on the same line and re connected together on the bottom side of the board. The mounting holes are on ground but IC2 and IC3 are isolated from ground.

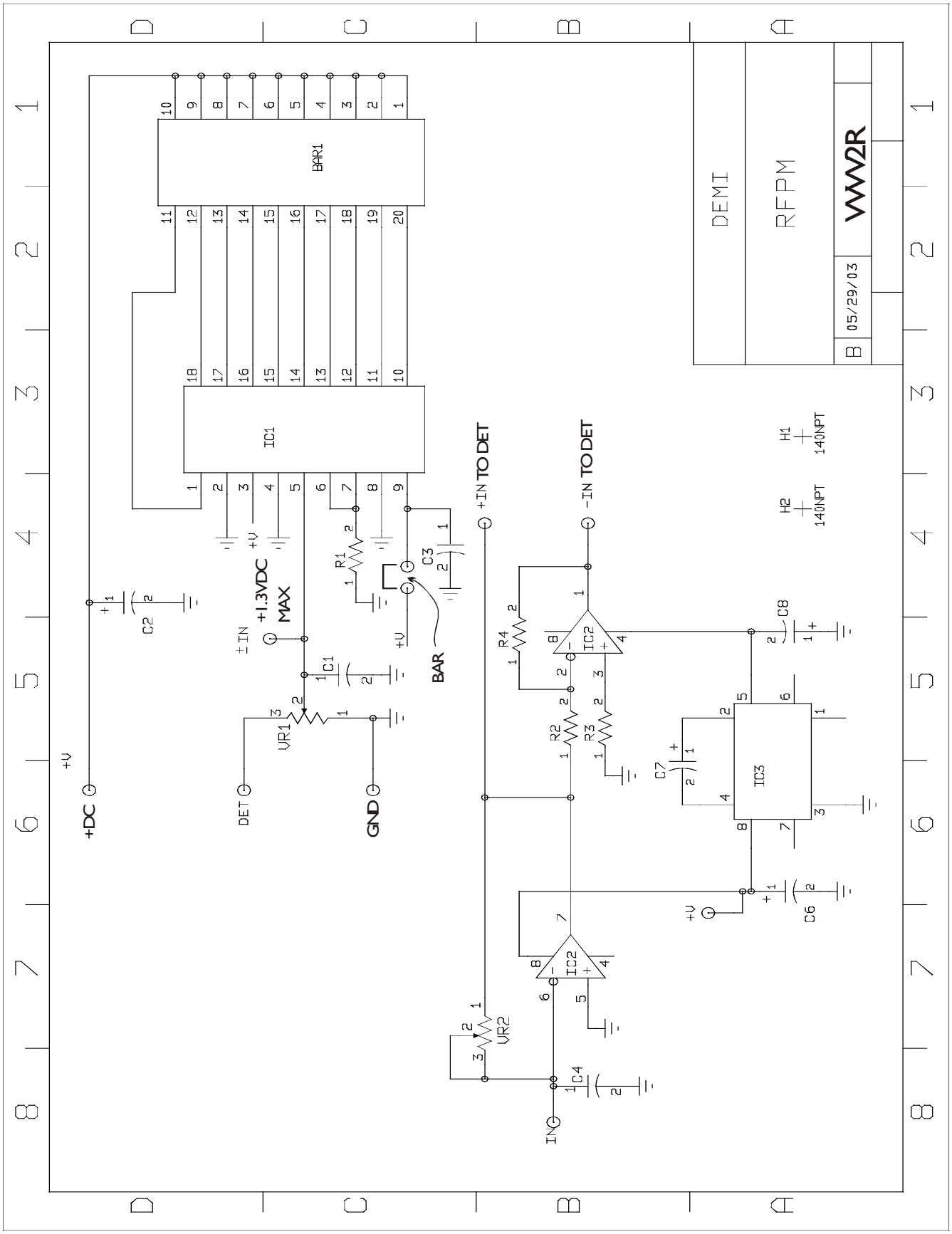
Start by connecting the DC power of choice (9 volt battery or any DC source between 5 and 17 VDC) to the +V and GND connection by the RFPM label. Then connect your positive current detector output to the DET connection on the board. Adjust VR1 counter clockwise for maximum attenuation. Apply RF power to the detector voltage and vary it to the maximum possible input. Verify the BAR 1 display is functioning. If the last bar on the display is not lit with the maximum detector voltage applied, adjust VR1 until is does. Now vary the detector current and the bar graph will light from the first to last position.

The bar graph will light one segment at a time. This is called the "Dotting" mode. This is the best way to operate the RFPM if using a battery since it will only have a current drain of one LED. If you are using a "unlimited" DC source, you may opt to have a continuos bar graph display. This means that once a segment is lit, it remains lit if the detector voltage does not decrease. A full power indication will be all 10 segments lit. At full power, the BAR 1 display will have a current drain 10 times higher than in the dotting mode. To enable this function install a jumper between the BAR and the +V connections shown on the top side component placement. .

For a negative current detector input, the simplest is to connect the detector's out put voltage to the point marked "IN" by IC3. Then connect a jumper from the "-IN" to the DET connections. Set VR2 for minimum resistance and apply the signal from the negative current detector to the circuit. As in the positive detector adjustment, vary the detector's output to maximum and if the bar is not lit at maximum, adjust VR1 to obtain it. If you have cut the negative voltage trace, the circuit can now be power by installing a +DC connection to the "+V" connection by R2.

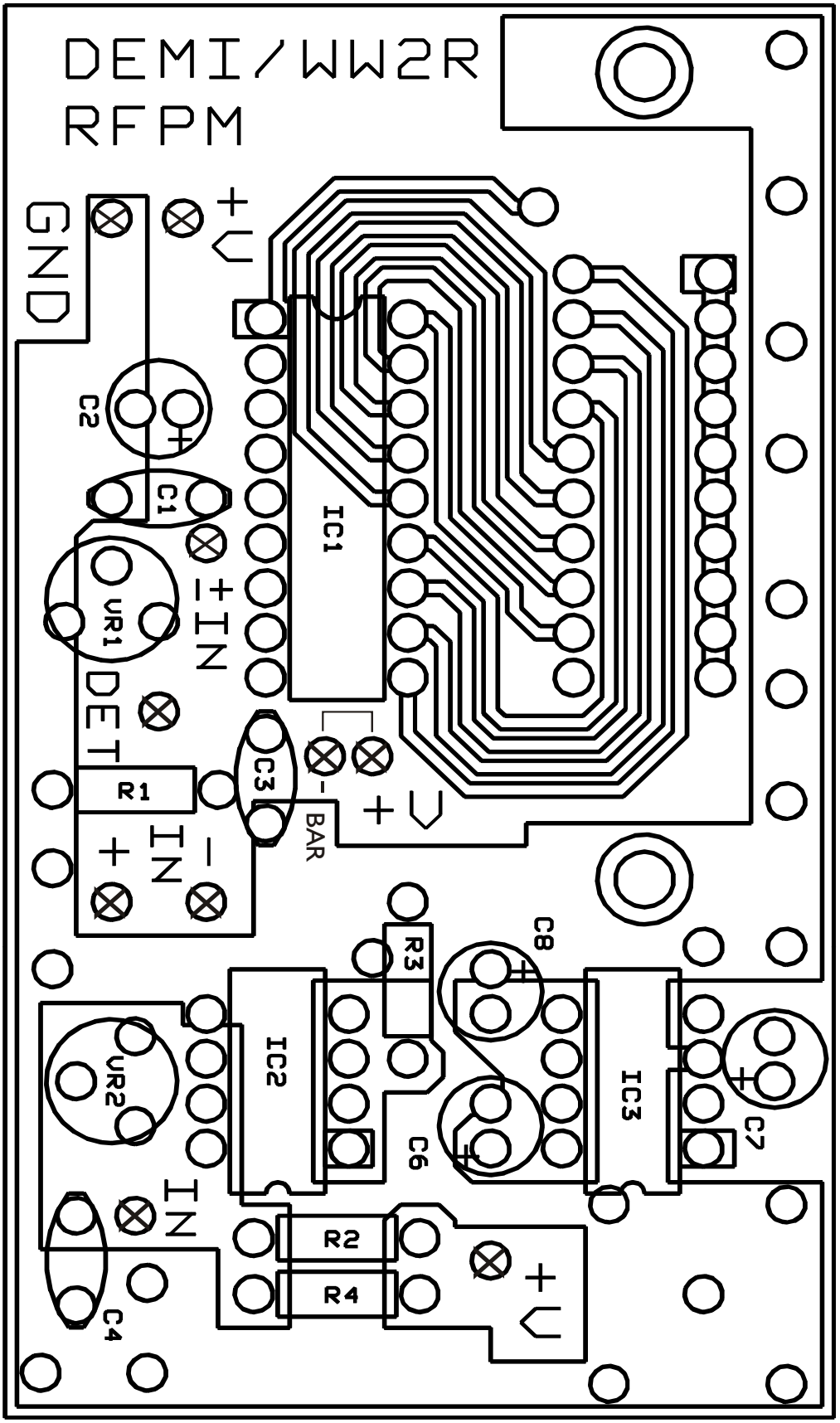
Other Detector Options:

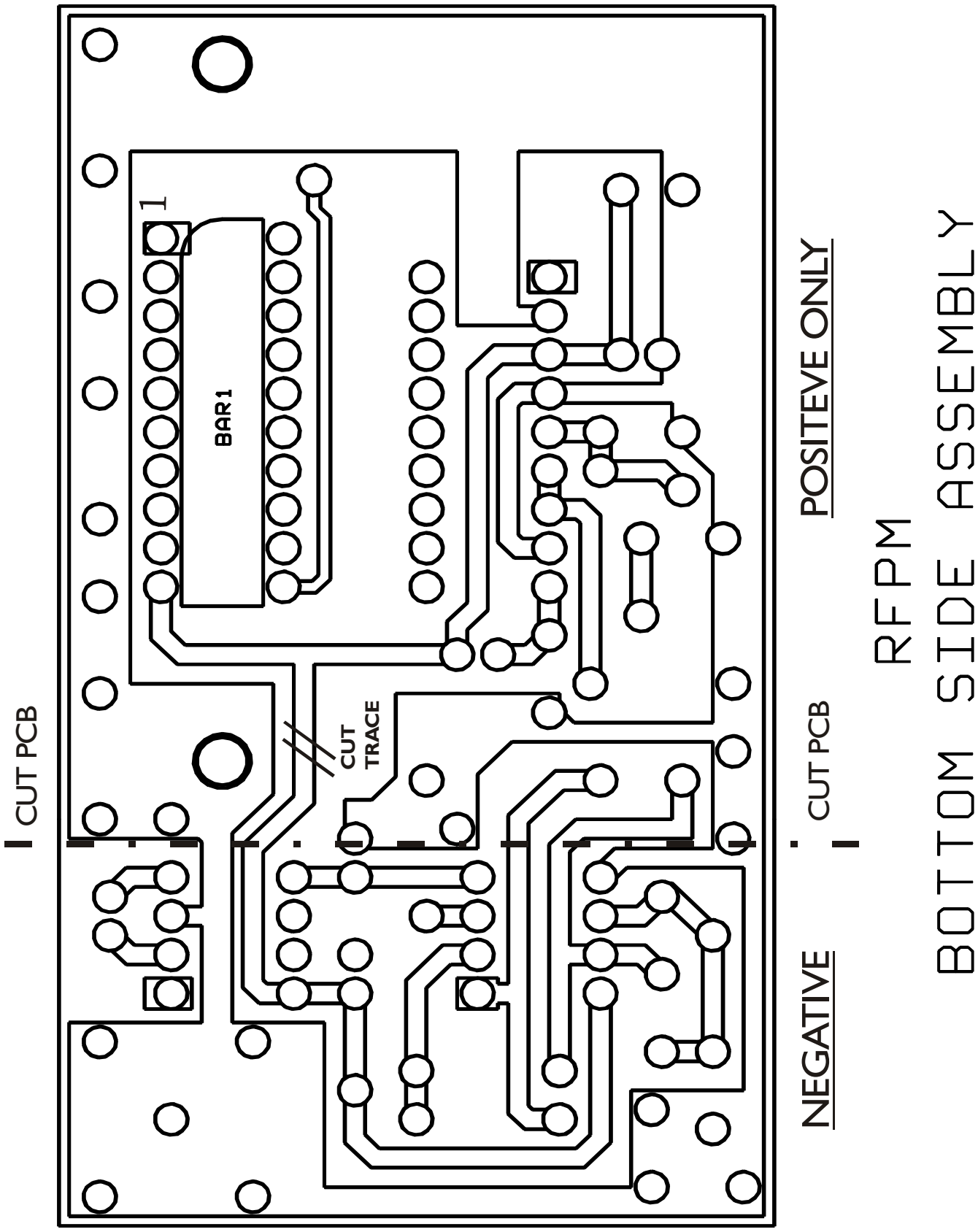
There are other connections that could be made to this circuit that will be covered in the complete kit version. For this kit if desired, a maximum of +1.3 VDC may be applied directly to the input of t he LM3914 at the "+/- IN" point on the circuit board. If a lower voltage maximum is all that can be achieved, the other stage of the op-amp may be used with VR2 as the gain control. Positive voltage is connected to the "IN" and a jumper is connected between the "+IN" and the "+/- IN" connection. Best way is to experiment for the best combination possible.


DEMI
RFPM
WW2R
B 05/29/03
BAR1
IC1
IC2
IC3
+DC
+V
+1.3VDC MAX
±IN
DET
GND
BAR
+IN TO DET
-IN TO DET
IN
H1 140NPT
H2 140NPT
R1
R2
R3
R4
VR1
VR2
C1
C2
C3
C4
C6
C7
C8

TOP SIDE ASSEMBLY

RFPM




BOTTOM SIDE ASSEMBLY
RFPM
POSITEVE ONLY
NEGATIVE
CUT PCB
CUT PCB
CUT TRACE
BAR1
1