AT-AUTO$_{(tm)}$
Analog Meter Upgrade Kit
Installation Manual

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Introduction

1.1 General Description and Purpose

This meter upgrade kit replaces the AT-AUTO's$_{(tm)}$ original "dingy colored", incandescent backlit meter with an improved-movement LED backlit meter. The original meter suffers several impairments: The meter scales were congested and the poor choice of power ranges of either $0-300$W or $0-3000$W limited the meter's useful resolution. Additionally the single incandescent lamp was prone to burn-out and often produced a "hot-spot" effect in the meter.

The new meter provides ranges of $0-150$W and $0-1500$W and the scales have been sanitized, removing the clutter, improving resolution, and making the meter easier to read. The improved meter is also backlit with three white LEDs, providing a much more uniform and pleasing illumination effect.

The AT-AUTO$_{(tm)}$ meter upgrade kit comes with the items listed in Table 1.1 and shown in Figure 1.1.

Table 1.1: AT-AUTO$_{(tm)}$ Meter Upgrade Kit Contents

Quantity	Description
1	LED-Backlit Meter – Printed Circuit Board Assembly
1	Wiring Harness
2	1.25 inch, 4-40 Hex Standoffs
2	0.25 inch, 4-40 Pan–Head Machine Screws
1	2 inch Length of #26 Tinned Copper Wire
4	10Ω Surface Mount Resistors (Optional)

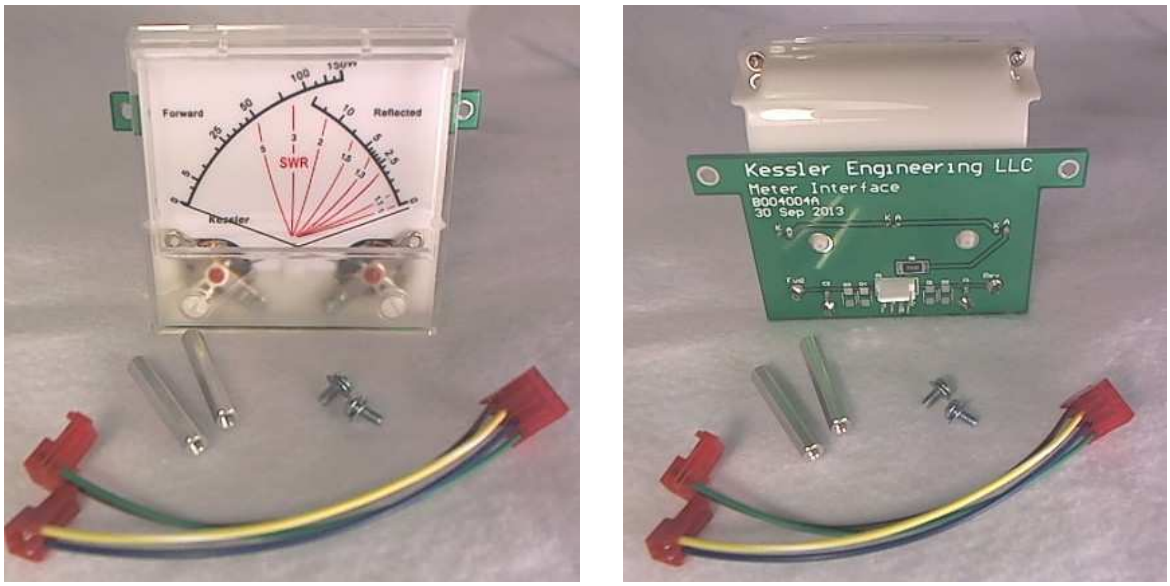

Figure 1.1: AT-AUTO$_{(tm)}$ Meter Upgrade Kit Contents (Front/Rear View)

1.2 Tools Required

- #2 Phillips Head Screwdriver
- #2 Right-Angle Drive Phillips Head Screwdriver
- $\frac{3}{16}''$ Wrench or Socket
- Wire Cutters
- Small Needle-Nose Pliers
- Soldering Iron and Solder

1.3 Meter Upgrade

Synopsis

The AT-AUTO's$_{(tm)}$ top cover will be removed and the AT-AUTO's$_{(tm)}$ stock meter, incandescent lamp, and holder will be removed and discarded. The Peak–Hold PCB will be removed, modified, and re-installed. The replacement meter and PCB assembly will then be installed and meter recalibrated.

Meter & Lamp Removal

The AT-AUTO's$_{(tm)}$ top cover is held in-place by ten Phillips-head screws: five along the left and right sides, respectively. Begin by removing these ten screws. Be careful not to loose the ten plastic washers.

The stock meter and incandescent lamp are held in-place by a tin-plate enclosure, which is held by two 4-40 hex nuts. Wires from the meter and incandescent lamp plug into the AT-AUTO$_{(tm)}$ peak – hold PCB (located directly below the meter).

- Locate the meter enclosure, follow the wires from the meter and the lamp and unplug them from the peak-hold PCB.
- Remove and discard the two hex nuts on either side of the tin-plate meter enclosure.
- Remove and discard the meter, tin-plate shield and the meter lamp.
- Replace any ground lugs removed in the prior steps.

When finished, the vacated meter area should appear as shown in Figure 1.2.

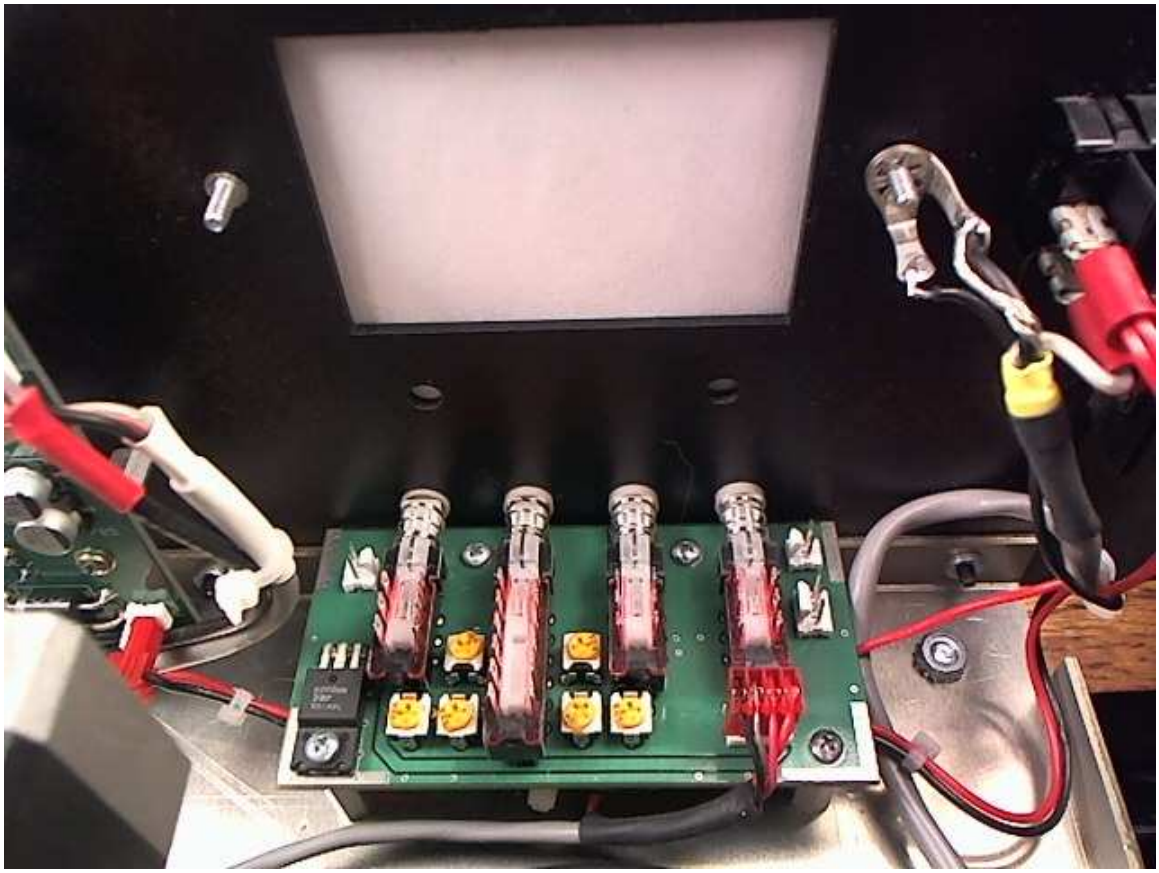

Figure 1.2: AT-AUTO$_{(tm)}$ after Meter Removal, Showing Peak–Hold PCB

Peak – Hold PCB Modification

The new meter is lower impedance than the stock meter and four resistors on the Peak – Hold PCB need to be shunted (or replaced).

- unplug the 4-pin connector from the Peak – Hold PCB.
- Remove the four 4-40 machine screws holding the Peak – Hold PCB.
- Turn the Peak – Hold PCB upside-down and locate the four resistors shown in Figure 1.3, and either jumper each of these resistors with the supplied #26 wire, or simply remove the four circled resistors and replace each one with one of the four, 10Ω surface mount resistors provided.

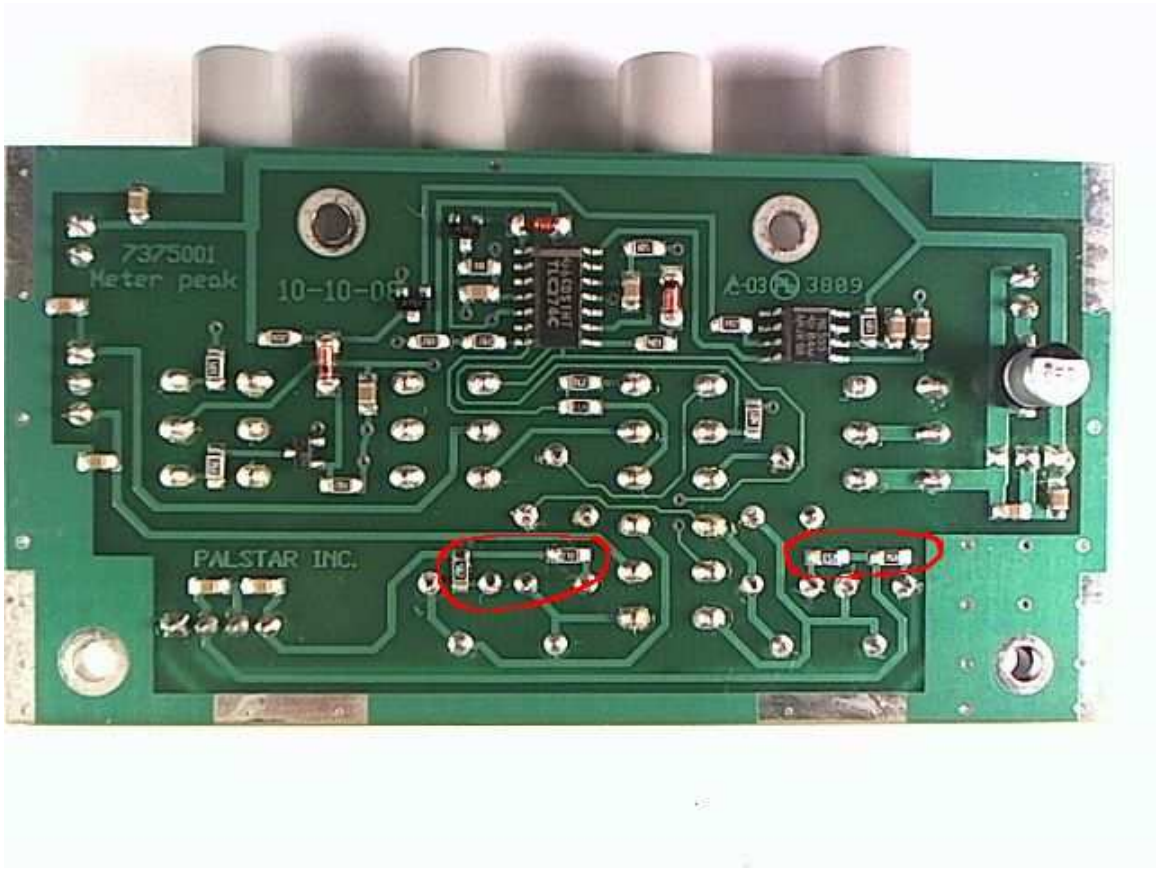

Figure 1.3: AT-AUTO$_{(tm)}$ Peak – Hold PCB, Showing Four Resistors to be Jumpered/Replaced

Peak – Hold PCB Re-installation

- Reinstall the Peak – Hold PCB into the AT-AUTO$_{(tm)}$.
- Install and tighten the four 4-40 machine screws holding the Peak – Hold PCB.
- Plug in the the 4-pin connector into the Peak – Hold PCB.
- Install and tighten the two 4-40 hex standoffs onto the two 4-40 Pem studs
- Locate the the meter wiring harness shown in Figure 1.4 and mate the 2-Pin and 3-Pin plugs with the respective 2-Pin and 3-Pin connectors on the Peak – Hold PCB.

When finished, the meter area should appear as shown in Figure 1.5.

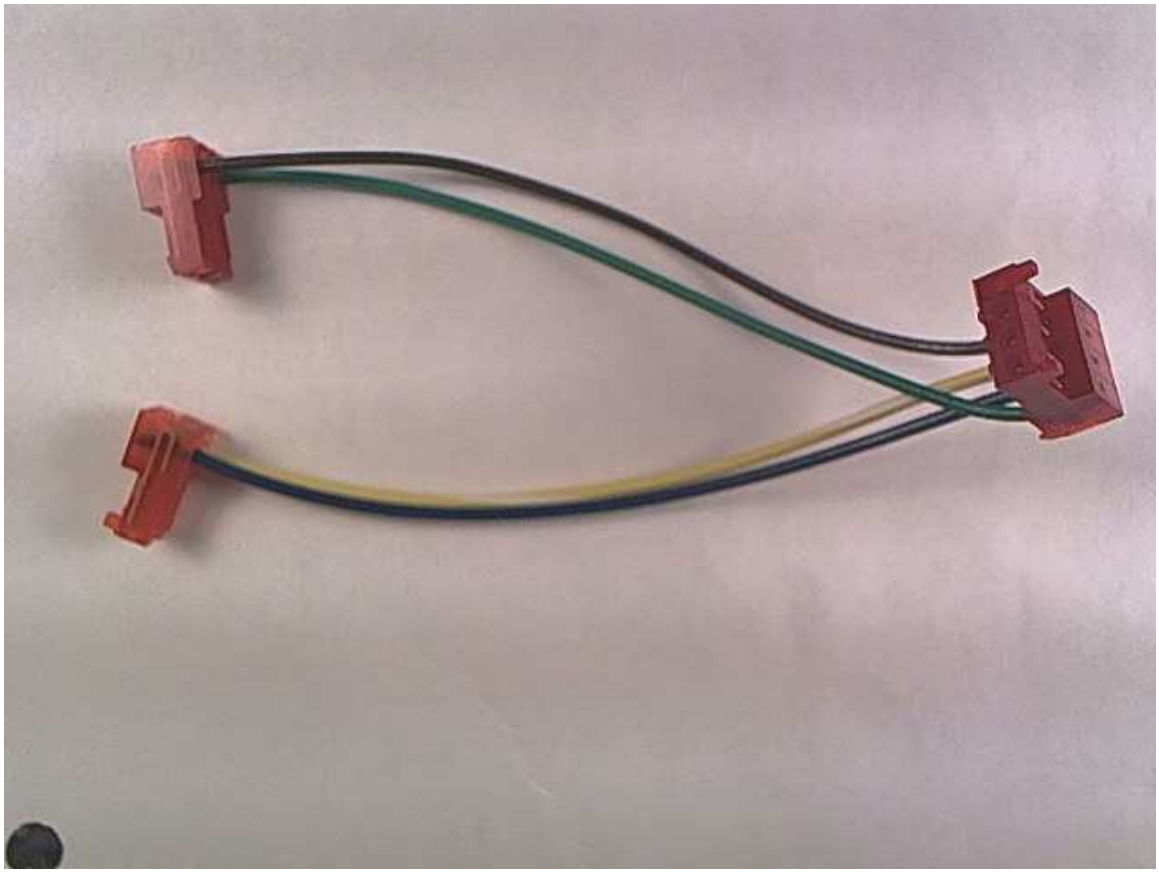

Figure 1.4: AT-AUTO$_{(tm)}$ Meter Wiring Harness

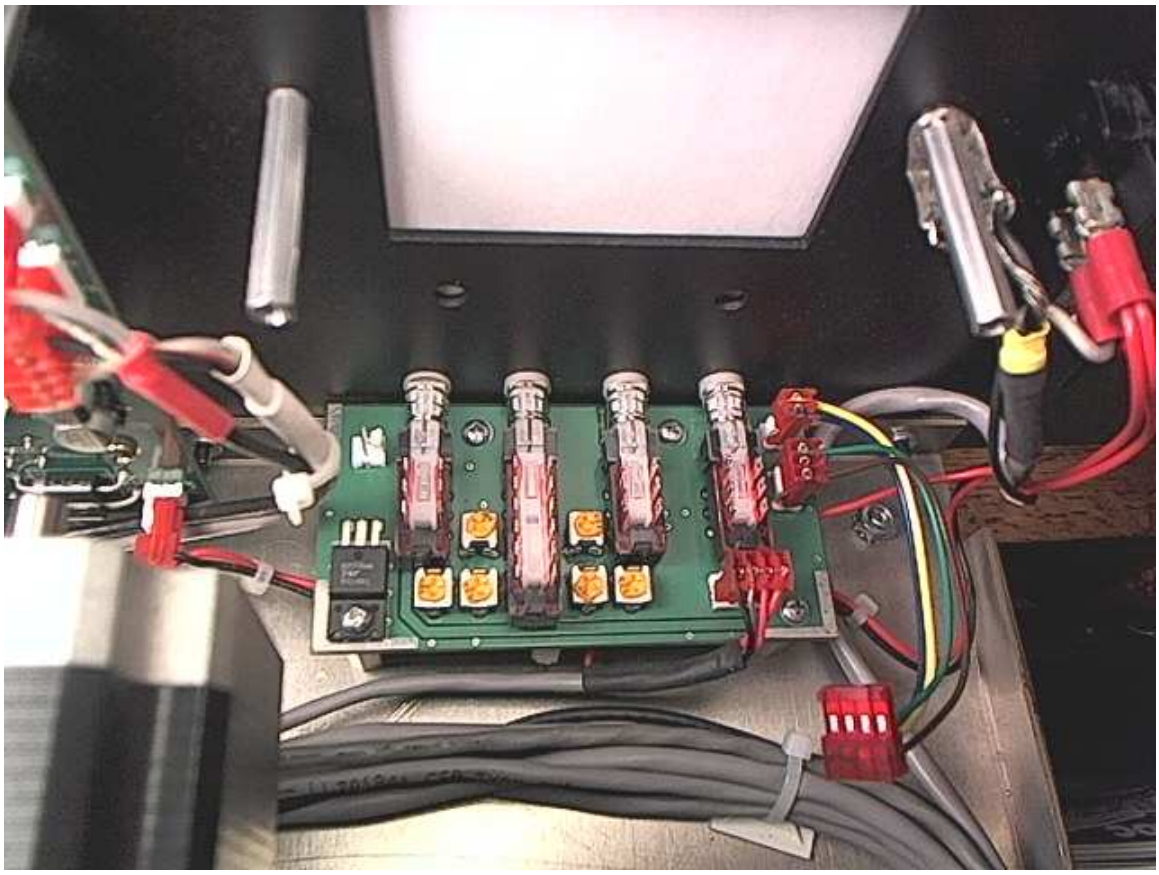

Figure 1.5: AT-AUTO$_{(tm)}$ Prepared for Meter Install

Meter Installation

- Locate the meter PCB and place into position in the AT-AUTO$_{(tm)}$.
- Install and moderately tighten the two 4-40 machine screws.
- Plug the free end of the meter wiring harness into the 4-Pin connector on the meter PCB.

When finished, the meter area should appear as shown in Figures 1.6 and 1.7.

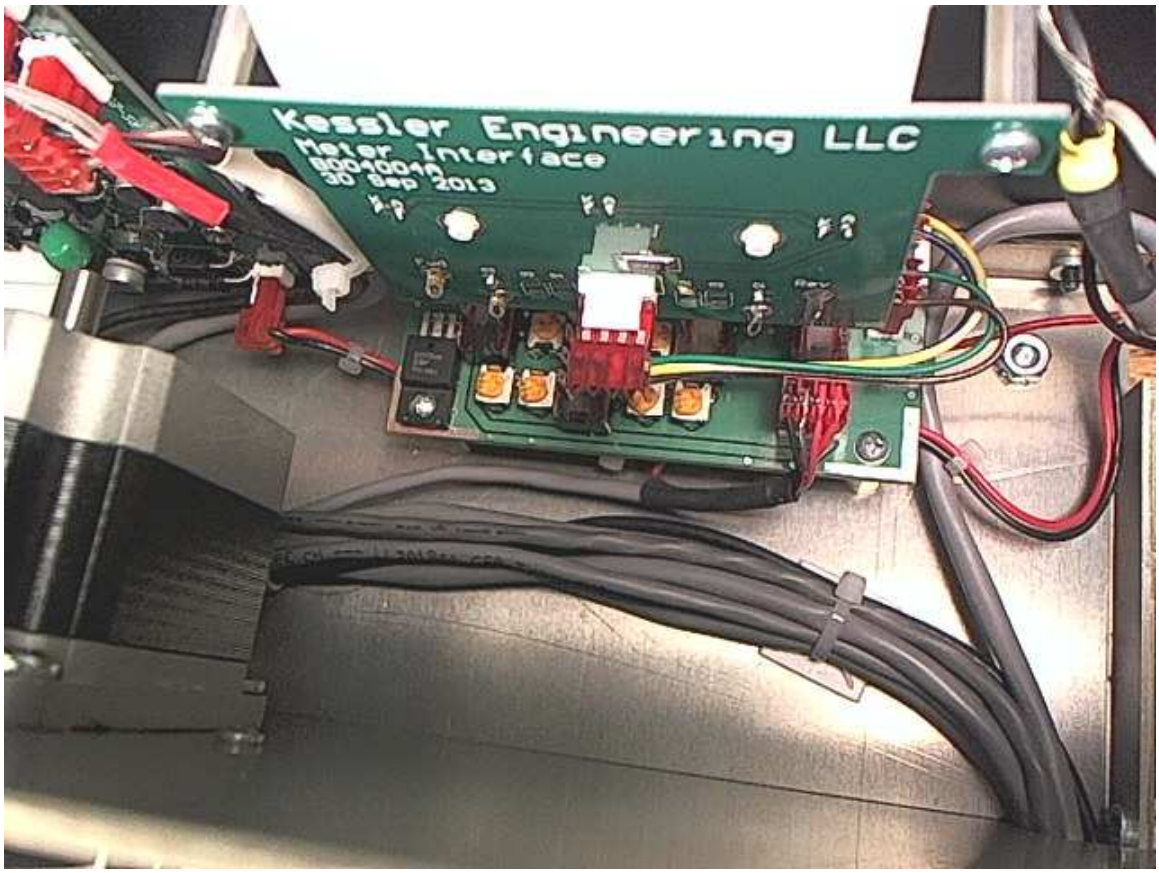

Figure 1.6: AT-AUTO$_{(tm)}$ Meter Install Complete

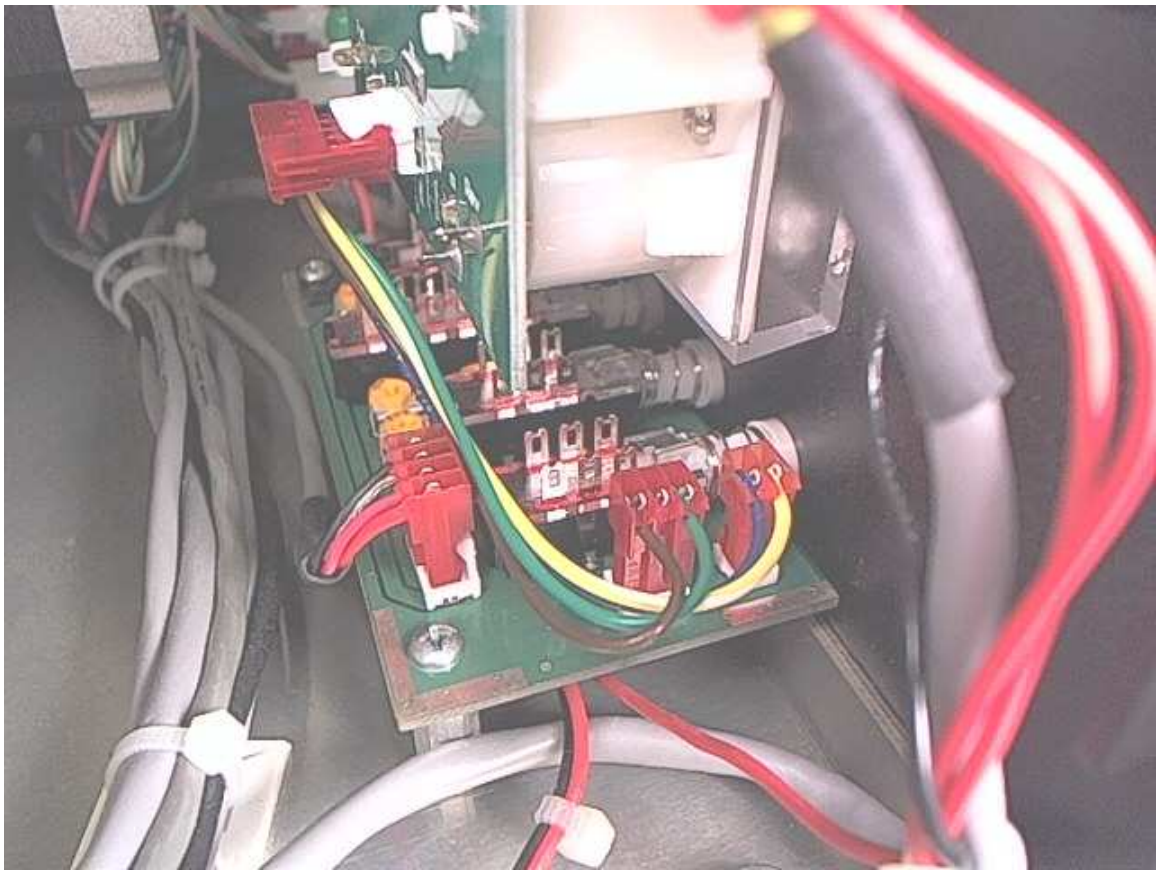

Figure 1.7: Side – view of installed meter and wiring harness

1.4 Meter Calibration

1.4.1 Reading Peak Power

Depressing the front panel **PEAK** button will activate the active peak power circuitry and the meter will display PEP and exhibit fast attack and approximately 1.5 second delay time. The displayed PEP will be approximately 95-100% of the SSB signal PEP, but may vary depending upon the tonal and inflection characteristics of the user's voice (displayed power may be greater). If the **PEAK/HOLD** button is depressed, the maximum PEP measured will be "held" on the meter display for approximately two seconds. This feature is provided to make it easier to observe the actual peak output power.

For CW signals, the peak power is synonymous with average power. Therefore, a transmitter's single tone (CW) signal should yield the same displayed power level regardless of whether the meter is set to display the average or peak power (switch selection set to **AVG** or **PEAK**, respectively).

Note: The style/size/shape of the trim potentiometers have changed considerably over the various production runs of Peak-Hold PCB. However, their respective locations remained unchanged. These procedures are consistent for all generations of Peak-Hold PCB.

Note: The **LAMP** button controls the meter illumination and must be *On* in order to read peak power.

Note: The **PEAK/AVG** switch must be depressed in order for the **PEAK/HOLD** feature to function properly.

1.4.2 Forward Power Calibration

The following steps must be carried out in order to ensure correct display of Forward and Reflected RF power.

1. Connect the AT-AUTO$_{(tm)}$ coaxial output to a 50 Ω dummy load.
2. Connect a calibrated Wattmeter of known accuracy between the input of the AT-AUTO$_{(tm)}$ and the output of the HF Radio/Linear Amplifier.
3. De-select the **PEAK/HOLD** feature.
4. Turn *On* the meter **LAMP** (to supply DC power to the meter circuitry) and ensure the meter lamp is illuminated.
5. Set the AT-AUTO$_{(tm)}$ to *Manual* mode.
6. Set the HF radio frequency to 14.250 MHz, and generate a 100 W CW carrier.

7. Manually tune the AT-AUTO$_{(tm)}$ for Flat SWR on the calibrated Wattmeter. **Leave the AT-AUTO$_{(tm)}$ in Manual Mode and do NOT make any further adjustments to the match setting**.

8. Remove the cover on the RF coupler and (if necessary), adjust the reflected power Null trim capacitor (trim capacitor on the RF coupler furthest from the rear panel) for Zero reflected power indication.

9. Terminate the 100 W CW carrier.

10. Swap the RF input and output connections on the AT-AUTO$_{(tm)}$ and adjust the RF coupler Forward Power Null (trim capacitor on the RF coupler nearest the rear panel) for Zero forward power indication.

11. Restore the RF input and output connections on the AT-AUTO$_{(tm)}$ so that the dummy load is connected to the AT-AUTO$_{(tm)}$ coaxial output, and the calibrated Wattmeter is connected to the AT-AUTO$_{(tm)}$ input.

12. Calibrate the low-range **AVG** and **PEAK** forward power display

    Set the AT-AUTO$_{(tm)}$ Wattmeter to the 300 W power range.

    Set the AT-AUTO$_{(tm)}$ Wattmeter to read **AVG** power.

    Ensure the output of an HF transmitter/amplifier is connected to the AT-AUTO$_{(tm)}$ RF input.

    Apply a 100 W CW carrier to the AT-AUTO$_{(tm)}$ and adjust the **FOR LO** potentiometer (Figure 1.8, page 14) so that the AT-AUTO$_{(tm)}$'s forward power indication matches that shown on the calibrated Wattmeter.

    Remove the 100 W CW carrier.

    Set the AT-AUTO$_{(tm)}$ Wattmeter to read **PEAK** power.

    Reapply the 100 W CW carrier to the AT-AUTO$_{(tm)}$ and adjust the **PEAK LO** potentiometer (Figure 1.8) so that the AT-AUTO$_{(tm)}$'s forward power indication matches that shown on the calibrated Wattmeter.

1. Calibrate the high-range **AVG** and **PEAK** forward power display

    Set the AT-AUTO$_{(tm)}$ Wattmeter to the 3000 W power range.

    Apply a 1000 W CW carrier to the AT-AUTO$_{(tm)}$ and adjust the **PEAK HI** potentiometer (Figure 1.8) so that the AT-AUTO$_{(tm)}$'s forward power indication matches that shown on the calibrated Wattmeter.

    Remove the 1000 W CW carrier.

    Set the AT-AUTO$_{(tm)}$ Wattmeter to read **AVG** power.

Reapply the 1000 W CW carrier to the AT-AUTO$_{(tm)}$ and adjust the **FOR HI** potentiometer (Figure 1.8) so that the AT-AUTO$_{(tm)}$'s forward power indication matches that shown on the calibrated Wattmeter.

Remove the 1000 W CW carrier.

1.4.3 Reflected Power Calibration

1. Reverse the AT-AUTO$_{(tm)}$ coaxial input and output (connect transmitter output to AT-AUTO$_{(tm)}$ coaxial output, connect AT-AUTO$_{(tm)}$ coaxial input to calibrated Wattmeter, which terminates into a 50 Ω dummy load.

2. Calibrate the high-range and low-range reflected power display

   Apply a 200 W CW carrier to the AT-AUTO$_{(tm)}$ and adjust the **REV HI** potentiometer (Figure 1.8) so that the AT-AUTO$_{(tm)}$'s reflected power indication matches the forward power displayed on the calibrated Wattmeter.

   Remove the 200 W CW carrier.

3. Calibrate the low-range reflected power display

   Set the AT-AUTO$_{(tm)}$ Wattmeter to the 300 W power range.

   Apply a 20 W CW carrier to the AT-AUTO$_{(tm)}$ and adjust the **REV LO** potentiometer (Figure 1.8) so that the AT-AUTO$_{(tm)}$'s reflected power indication matches the forward power displayed on the calibrated Wattmeter.

   Remove the 20 W CW carrier.

4. Reconnect the AT-AUTO$_{(tm)}$ for normal operation.

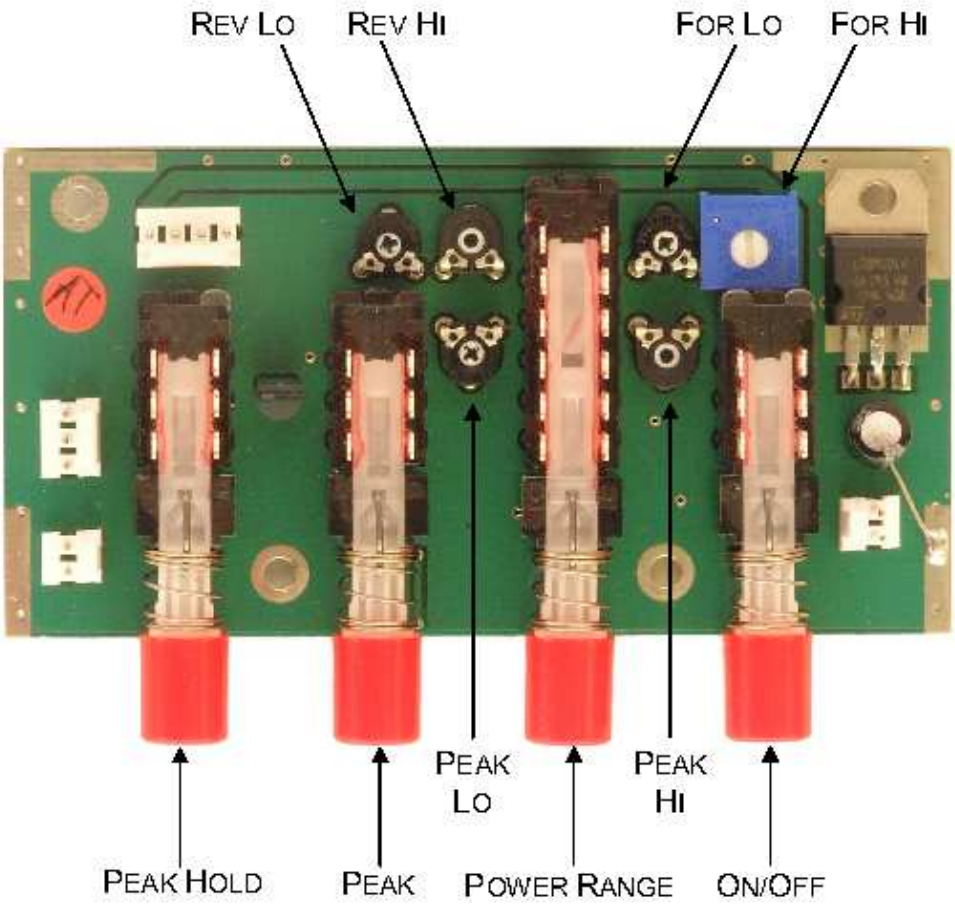

Figure 1.8: Meter Board Adjustment Locations

Service and Warranty

Warranty

Kessler Engineering, LLC. warrants all of our products to be free from defects in material and workmanship under normal use for a period of one year from the date of purchase. During this one-year warranty period, Kessler Engineering will opt to either repair or replace the product.

This warranty will be void if the product has been repaired or altered by anyone other than the staff at Kessler Engineering. This warranty does not apply to products damaged due to improper installation or abuse/misuse.

Repair Policy

Please contact our service department for return authorization and shipping instructions prior to sending any product for service or repair. All items shipped to Kessler Engineering, must be packed appropriately and insured against damage. Kessler Engineering is not responsible for merchandise damaged in shipment. Be sure to include a note describing the problem in detail and include your contact information (phone number and e-mail).

Return Policy

All returns must receive prior authorization. Returned items must also include a copy of the original sales receipt and be returned with the original box, manuals, and accessories. Returns must be received within 7 days of purchase and are subject to a restocking fee. Shipping expenses are not refundable.

User Notes

3.1 User Notes - Continued