

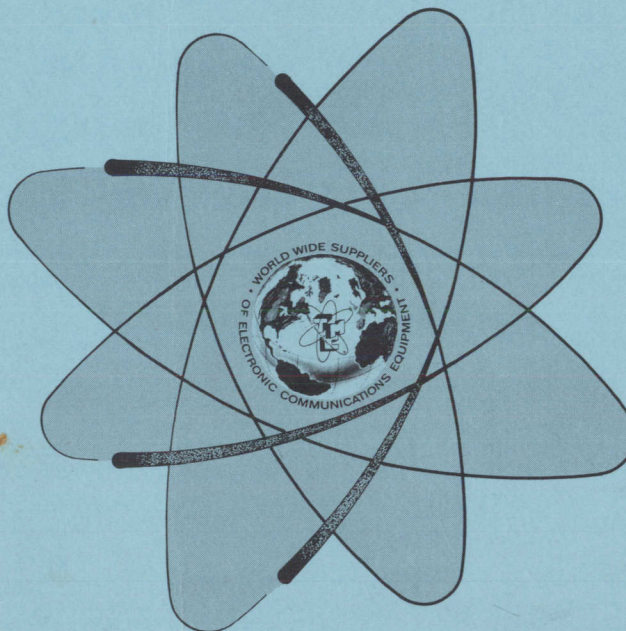
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ALIGNMENT PROCEDURE

for

TRANSMITTER POWER MONITOR

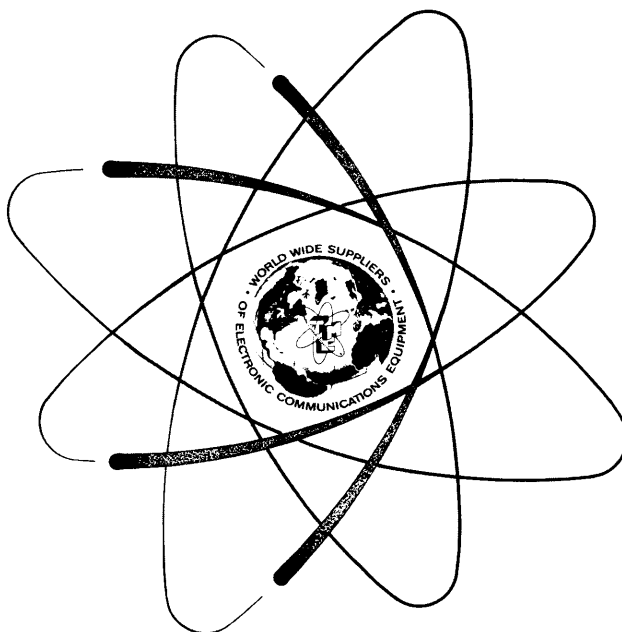
MODEL TPM-1K



THE TECHNICAL MATERIEL CORPORATION
MAMARONECK, N.Y.

OTTAWA, ONTARIO

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1-1. INTRODUCTION

The Transmitter Power Monitor, TPM-1K is a modular unit incorporated in the Coastal Radio Transmitting Systems of The Technical Materiel Corporation. The unit (TPM-1K) serves to provide continuous visual monitoring of the transmitters peak envelope power and reflected power in watts. Additionally, the TPM-1K provides separate contact closures for RF and VSWR indications. Terminals are also provided for remote RESET of the SWR overload.

The Power Monitor unit is normally connected in the transmitting system between a Low Pass Filter, LPF-750-3 and dummy load or antenna.

The following paragraphs, provide principles of operation and maintenance alignment procedures for the TPM-1K.

1-2. PRINCIPLES OF OPERATION (Refer to figure 1-3)

A. Forward Power

During ON THE AIR periods of transmissions RF forward power is routed through the Low Pass Filter to the RF IN connector J2 on the RF coupler assembly. The RF coupler assembly provides the TPM-1K with signals that are proportional to forward and reflected power. These signals are derived from the RF input applied to E1 and E2 within the RF coupler. Capacitors C1 and C2 are adjusted to balance the voltage across FORWARD POWER and REFLECTER POWER meters M1 and M2.

A proportional forward power voltage is routed from the RF coupler assembly at terminal E3 and applied to Peak Reading Amplifier assembly A2. The sampled forward power voltage is amplified in A2 and routed to the Forward Power meter calibrate potentiometer and RF Indicator assembly A1. Feedback adjust A2R4, adjust the gain of Peak Reading Amplifier A2.

The Forward Power calibrate potentiometer is used to calibrate the Forward Power meter that indicates transmitter peak power up to 500 watts.

RF Indicator assembly A1 serves to supply rf indication for an external monitoring device, SWR overload trip and indication, in addition to reflected power calibration.

The forward power voltage applied to assembly A1 is routed through RF level indication adjust and applied to amplifier A1Z1. The amplified output of A1Z1 is applied to the base of transistor Q1. The adjustment of RF LEVEL Indicator control determines the power level that will cause transistor Q1 to conduct. When transistor Q1 conducts, RF Indicator relay A1K1 energizes providing a contact closure between terminals (3) and (4) on TB1 when the transmitter power is at a pre-determined level. Feedback potentiometer A1R17 adjusts the gain of amplifier A1Z1 and should be set to mid position initially.

B. Reflector Power

A sample of reflected power voltage is routed from the coupler at terminal E4 and is routed through Reflected Cal potentiometer A1R19 to the REFLECTED POWER meter.

The REFLECTED POWER meter is equipped with an adjustable overload indicator which can be set to trip at a value determined by the operator. When the reflected power indicator hits the red overload pointer, a contact closure is provided within the reflected power metering circuit which trig-

gers SCR Q2, and routes 24 vdc to SWR INDICATOR relay AlK2 causing AlK2 to energize. The energized relay contacts provide the ground necessary to light the SWR OVERLOAD indicator, and opens the transmitter remote interlock circuit which causes high voltage to be removed.

A reset button is provided on the TPM-1K front panel to reset the overload circuit once it trips. In addition to the SWR overload reset button the SWR overload can be reset via remote mode selection.

Procedures for the adjustment and/or calibration of the TPM-1K is outlined in paragraph 1-3.

1-3. TRANSMITTER POWER MONITOR ALIGNMENT (Refer to figures 1-1 and 1-2)

The TPM-1K alignment is presented in four parts: Directional Coupler Alignment, Forward Power Calibration, Reflected Power Calibration and RF Indicator adjustment. To perform these aforementioned adjustments refer to the following paragraphs:

TABLE 1-1. TEST EQUIPMENT REQUIRED

<u>EQUIPMENT</u>	<u>TYPE</u>
Multimeter:	Simpson Model 260, or equivalent
Directional Wattmeter:	Bird Model 43, or equivalent

A. Directional Coupler Adjustment

NOTE

Loosen and remove TPM-1K cabinet mounting hardware and pull TPM-1K out from cabinet and remove top cover. (For ease of operation slide RFE-1 unit out of cabinet enough for TPM-1K to rest on while making the following adjustments.)

1. Set TPM-1K POWER switch to OFF.
2. Zero Forward, and Reflected power meter pointers by turning screwheads at pointer hubs.

3. Connect coupler RF input connector J2 to 50 ohm resistive load. (J2 located on rear of TPM-1K). Connect RF output connector J3 to transmitter.

4. Set TPM-1K power switch to ON.

5. Tune transmitter on channel frequency for an indication on the Directional watt meter and adjust Equalize capacitor C1 (left capacitor as viewed from top of TPM-1K) until Forward Power meter indicates minimum power on the meter scale.

6. Turn transmitter OFF. Interchange coaxial cables at the directional coupler by connecting the resistive load to RF OUT (J3) and the transmitter to RF IN (J2).

7. Turn transmitter ON and increase power until Reflected Power meter indicates $\frac{1}{4}$ scale and adjust NULL capacitor C2 until Reflected Power meter indicates minimum on the Reflected Power meter.

8. Turn transmitter OFF and restore coaxial cables to original position (Linear Amplifier Output connected to RF IN (J2) RF OUT (J3) connected to 50 ohm dummy load or antenna for desired transmitter.

B. Forward Power Calibration

1. Connect on external directional wattmeter (Bird Model 43, or equivalent) in series with the 50 ohm resistive load.

2. Turn transmitter ON. (AF GAIN control must be at max ccw.) Set STE-5A exciter MODE switch to AME position, obtain a single audio tone (-20 dbm to +5 dbm) from the selected channels audio line.

3. Tune and load transmitter on operating frequency and observe external wattmeter. Adjust AF GAIN control clockwise until external wattmeter indicates *162 watts average power. Adjust FWD control until FORWARD Power meter on TPM-1K indicates approximately 400 watts.

4. Remove audio tone applied in Step 2 and FORWARD Power meter on

* Meter correction factor of $.405 \times \text{pep} = 162 \text{ watts}$

TPM-1K should indicate 100 watts. (Do not readjust AF GAIN control.)

5. With the transmitter set at 100 watts (AME carrier power) set exciter MODE switch to CARRIER -20 db position and apply two audio tones (DO NOT ADJUST AF GAIN CONTROL) and TPM-1K FORWARD POWER meter should indicate approximately 400 watts.

6. Set exciter MODE switch to SSB with two audio tones applied (DO NOT ADJUST AF GAIN CONTROL) and TPM-1K FORWARD POWER meter should indicate approximately 400 watts.

NOTE

Feedback adjust A2R4 is set to mid-position initially. This control is used to adjust the gain of Peak Reading Amplifier A2 and should only be adjusted if the correct reading cannot be obtained with the FWD adjustment control.

C. RF Indicator Adjustment

NOTE

FORWARD POWER calibration outlined in para B must be completed before making the RF indicator adjustment.

1. Connect multimeter across terminals (3) and (4) on TB1 (located on the rear of the TPM-1K).
2. Rotate AF GAIN control to increase forward power indication to 200 watts, (or power level desired) observe multimeter and adjust RF IND adjust until multimeter indicates a short circuit (zero ohms).
3. Reduce transmitter output to zero and place meter across terminals (2) and (3) on TB1 and meter should indicate zero ohms when the transmitter output is at zero or below 200 watts.
4. To check the RF INDICATOR adjustment increase and decrease the transmitter output above and below 200 watts and observe the following multimeter readings:

Transmitter Forward Power

200 watts

less than 200 watts

Multimeter Indication at TB1

terminals (3) and (4) zero ohms

terminals (2) and (3) zero ohms

NOTE

FDBK (Feedback) potentiometer AlR17 is initially set to its mid-position and should only be adjusted to increase the sensitivity of RF IND potentiometer AlR13.

D. Reflected Power Calibration

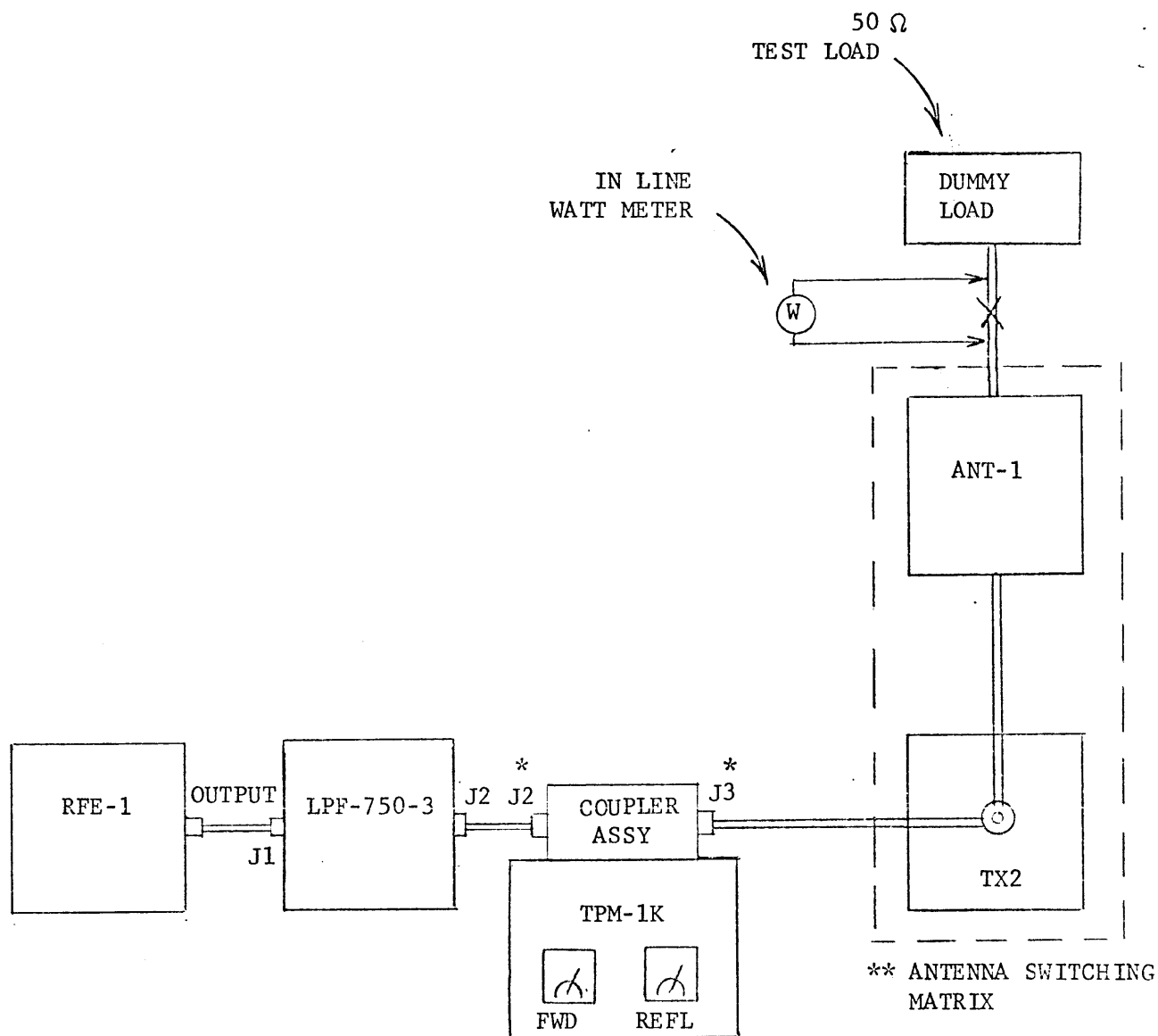
1. Turn transmitter OFF. Interchange coaxial cables at the coupler assembly by connecting the resistive load to J2 (RF IN) and the transmitter to J3 (RF OUT).
2. Connect external wattmeter in series with resistive load.
3. Turn transmitter ON. Adjust red overload pointer on Reflected Power meter for full scale indication.
4. Increase power until external wattmeter indicates 100 watts.
5. Adjust REFL potentiometer until REFLECTED POWER meter indicates 100 watts Reflected.
6. Reduce transmitter power to zero and set the red overload pointer to a value lower than 100 watts.
7. Increase the transmitter power until the Reflected Power indicator hits the red overload pointer and observe the following indications:
 - (a) SWR OVERLOAD indicator lights.
 - (b) Transmitter high voltage removed.
 - (c) Transmitter Output reduces to zero.
8. Turn transmitter OFF. Restore original coaxial connections at the coupler assembly by connecting the transmitter output to J2 (RF IN) and the resistive load to J3 (RF OUT).

E. TPM-1K Meter Check

Set POWER switch to ON position, POWER indicator must light. SWR overload indicator should be out, FORWARD and REFLECTED meters should indicate zero. Insure that transmitter is connected to J2 (RF IN) and resistive load to J3 (RF OUT).

Turn transmitter ON; set exciter MODE switch to AME. Remove audio input and set AF GAIN control counterclockwise (do not turn extreme clockwise). FORWARD POWER Meter should indicate 100 watts.

Turn transmitter OFF. Interchange coaxial cables by connecting the transmitter to J3 (RF OUT) and resistive load to J2 (RF IN). Turn transmitter ON with exciter set in AME and REFLECTED POWER meter should indicate 100 watts.



* INTERCHANGE J2 AND J3 FOR REFLECTED POWER CALIBRATION

** ALL MATRIX KNOBS IN VERTICAL POSITION. LOCAL MATRIX LAMP OUT

Figure 1-1

TPM-1K

TEST SETUP

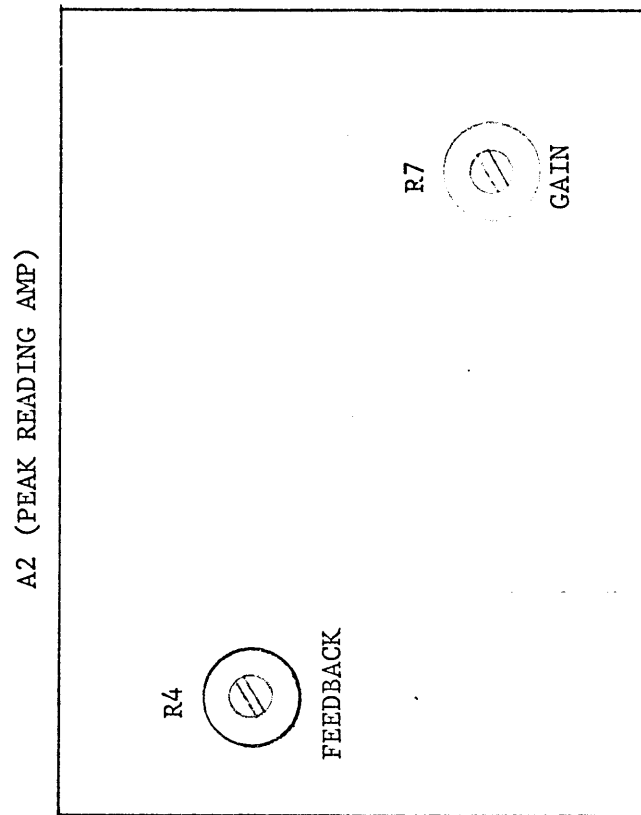
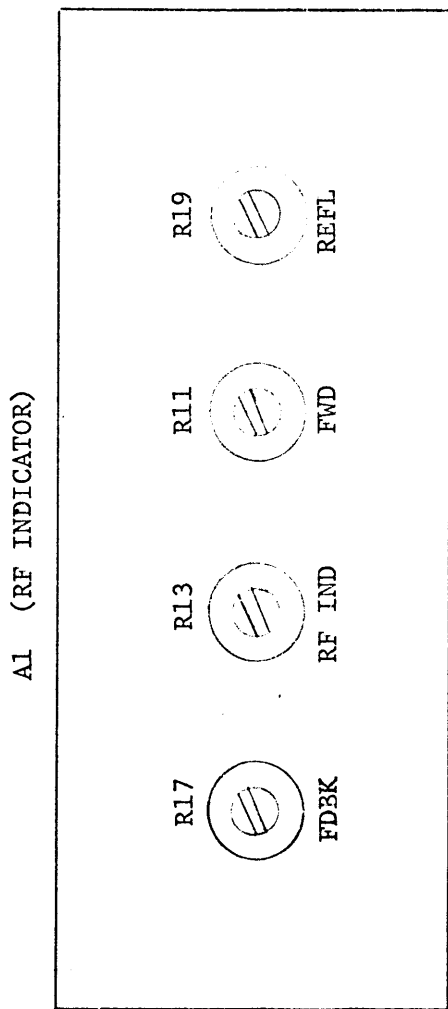
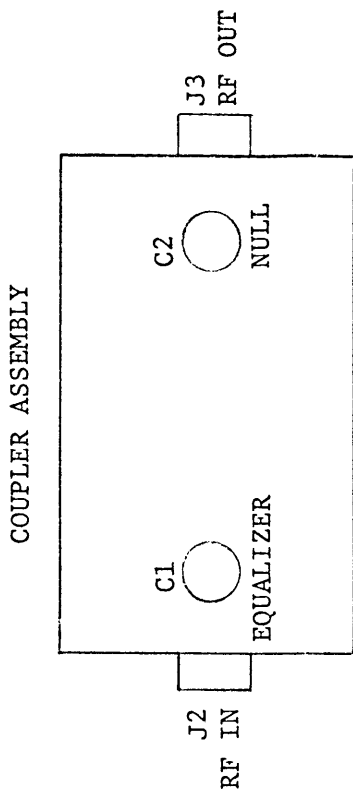
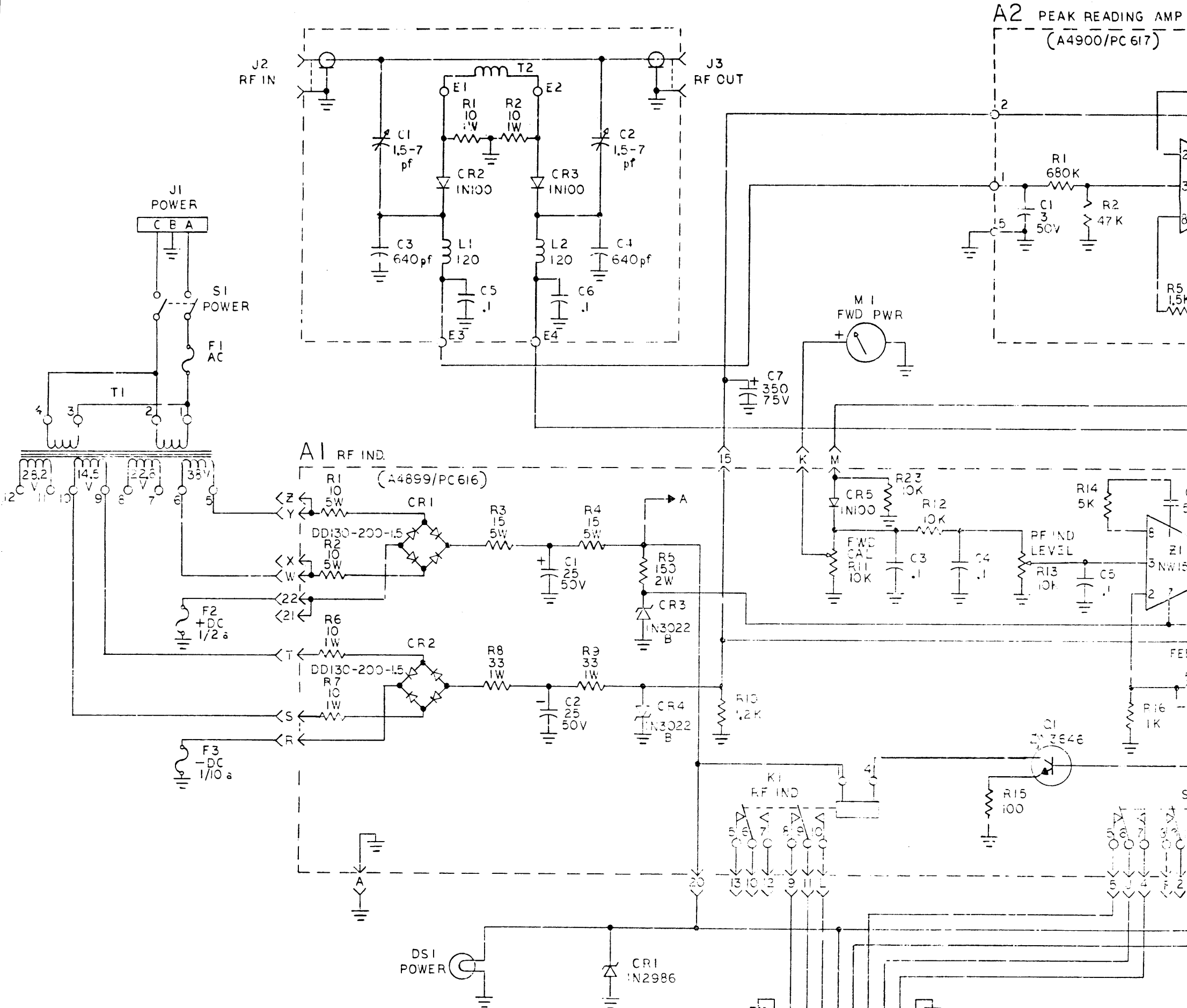


Figure 1-2. Component Location for TPM-1K Adjustment

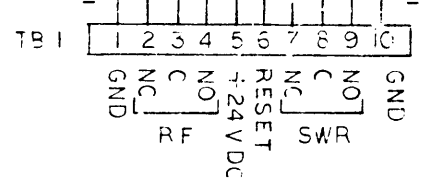
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UNLESS OTHERWISE SPECIFIED:
 1. ALL RESISTANCES IN OHMS, 1/2W.
 2. ALL CAPACITANCES IN MICRO-FARADS.
 3. ALL INDUCTANCES IN MICRO-HENRIES.
 4. PARTIAL REFERENCE DESIGNATIONS ARE SHOWN.
 FOR COMPLETE DESIGNATION PREFIX THE PART
 DESIGNATION WITH THE SUB-ASSEMBLY
 DESIGNATION.

PART SYMBOLS			
UNIT	A1	A2	
A2	M2	C7	C4
C7	R2	CR5	E5
CR3	S2	K2	R8
DS2	T2	Q2	Z1
E4	TB1	R23	
F3	XDS2	XK2	
J4	XF3	Z1	
L2	XAI		



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