

**INSTRUCTION
MANUAL**

ORDER NO. 421 B

POWER METER

PN 800978

**General
Description**

The 421B Power Meter is a measuring instrument that gives both power output readings and direct, standing wave ratio (SWR) readings. Its compact size, easy installation, and clean legible front panel make it a handsome addition to your station. Operating features that include power readings in three ranges up to 2000 watts and direct meter reading of the antenna/feedline system SWR make it a pleasure to use.

The power readings given by the 421B approach that of a peak reading metering system. With a 4-watt carrier, actual peak power output at 100% modulation is 16 watts. An averaging meter system would read about 4 watts, with or without modulation. But the 421B will indicate from 10 to 16 watts under modulation, depending on actual modulation at the moment. This reading is much closer to the actual modulation peaks. On single side band (SSB), which by its nature is all "peaks," the 421B will give readings with much greater accuracy than an averaging meter system would. From an SSB transmitter with a 12-watt, peak-envelope power (PEP) final output, you can expect about a 12-watt reading, instead of an averaging reading of 3 or 4 watts.

Major Features

Frequency range	3-30 MHz
Power ranges	0-20 watts 0-200 watts 0-2000 watts
SWR	1:1 - 3:1 and higher
Construction	high-impact Cycolac [®] case with aluminum front and rear panels
Size	3-1/2"H x 8"W x 5-1/4"D; (8.9 cm H x 20.3 cm W x 13.3 cm D)
Net weight	1 lb. 6 oz. (624 g)
Shipping weight	2 lbs. 8 oz. (1.13 kg)

Hook-Up

Carefully remove the unit from the box. Check it closely for any signs of shipping damage. If there are any, notify the carrier at once. Damage due to shipment is the responsibility of the carrier and a claim should be filed at once. The warranty does not cover shipping damage.

() Purchase or fabricate a short piece of RG-58/U or RG-8/U coax with PL-259 connectors on each end.

If your station uses a transceiver, install the unit as follows:

- () Connect the power meter between the transceiver and antenna with the hook-up cable just made, as shown in Figure 1.

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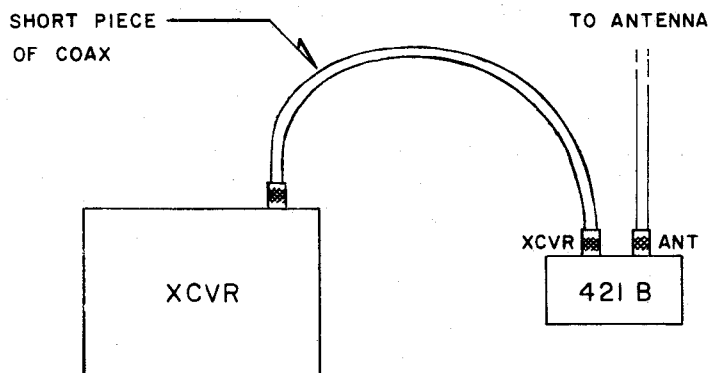


FIGURE 1.

TYPICAL INSTALLATION WITH TRANSCEIVER

If your station uses a separate transmitter and receiver, install the unit as follows:

- () Connect the power meter between the transmitter and the T/R switch or relay using the hook-up cable just made, as shown in Figure 2.

NOTE: In this installation, the 421B will be measuring the SWR of the entire system of the antenna, feedline, T/R switch or relay, and all connections -- not just the antenna alone.

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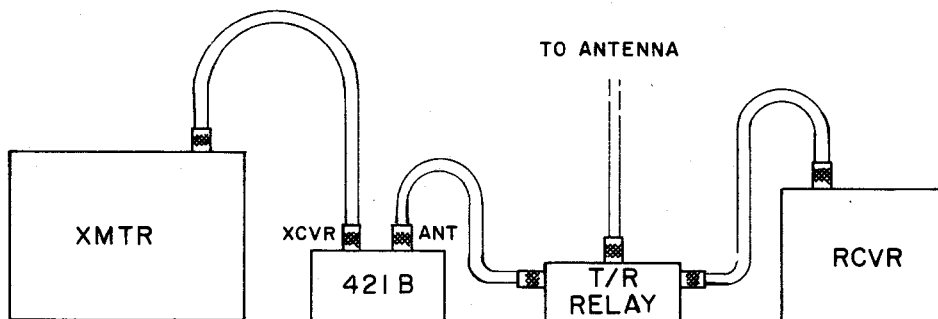


FIGURE 2.

TYPICAL INSTALLATION WITH SEPARATE XMTR & RCVR

Operation

To measure power output, your SWR should be less than 1.5:1 to insure full accuracy. Always start with the 2000-watt range and then go down until you get a reading. Do not allow the meter to be pinned as this may damage it. For maximum accuracy, power measurements should be made using a 50-ohm dummy load.

CAUTION

The internal power scale calibration has been factory set. Do not tamper with it.

To measure SWR:

1. Be sure the CALIBRATE control is turned fully counterclockwise.
2. Set the function switch on FWD (forward) and key your transceiver.
3. Advance the CALIBRATE control until the meter reads full scale (far right side of scale).
4. Switch the function switch to SWR. The SWR can now be read directly from the SWR scale.

Alignment

The 421B has been aligned in the factory prior to shipment. Tampering with the internal controls will only result in inaccurate meter readings. If you have reason to believe that your meter needs re-alignment, it must be done as follows:

Equipment needed:

- a. 50-ohm dummy load, w/load capability of 2000 watts rms.
- b. Hewlett Packard 410C VTVM or equivalent (properly calibrated)
- c. transmitter, w/variable output to 2000 watts rms at 30 MHz
- d. insulated, alignment tool

Null adjustment:

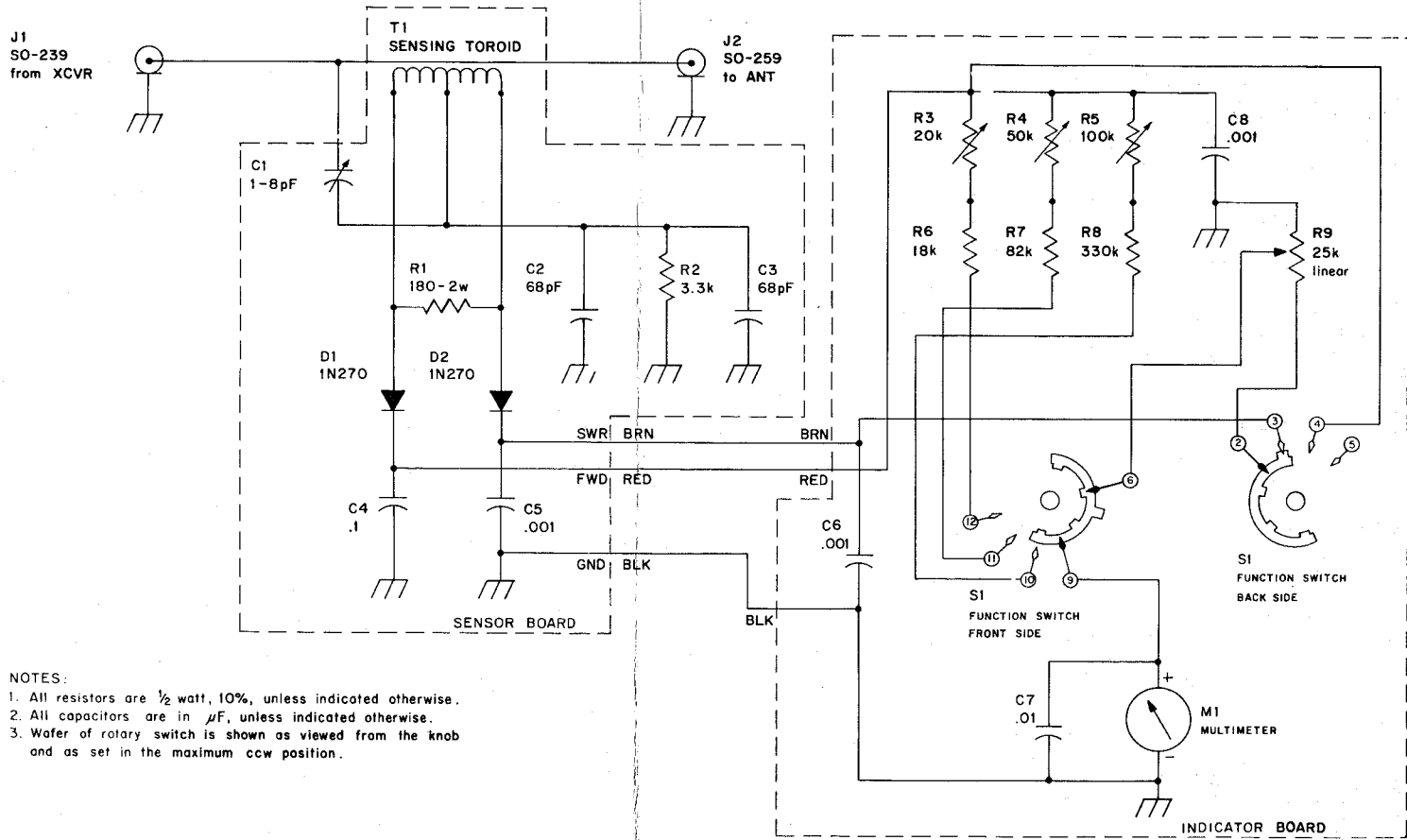
1. Turn the transmitter off.
2. Connect the dummy load to the antenna jack of the power meter. Connect the transmitter to the transmitter jack of the power meter.
3. Remove the cover from the power meter.
4. Turn the transmitter on.
5. Switch the function switch to FWD and key the transmitter.
6. Adjust the CALIBRATE control for a full-scale reading.
7. Switch the function control to SWR and adjust C1 for a minimum reading.
8. Unkey the transmitter.

Power adjustment:

9. Switch the function switch to 2 kw.
10. Connect the VTVM RF probe across the dummy load.
11. Key the transmitter and apply power until a 316 volt rms reading is obtained.
12. Adjust blue knob pot R5 to get a reading of "20" (2000 watts) on the power scale.
13. Unkey the transmitter.

If your transmitter is not capable of 2000 watts rms, substitute the following procedure for the 2 kw scale :

- 11A. Key the transmitter and increase power until a 141 volt rms reading is obtained.
- 12A. Adjust blue knob pot R5 to get a reading of "4" (400 watts) on the power scale.
- 13A. Unkey the transmitter.
14. Switch the function switch to 200 w.
15. Key the transmitter and apply transmitter power until a 100 volt rms reading is obtained.
16. Adjust blue knob pot R4 to get a reading of "20" (200 watts) on the power scale.
17. Unkey the transmitter.
18. Switch the function switch to 20 w.
19. Key the transmitter and apply transmitter power until a 31.6 volt rms reading is obtained.
20. Adjust blue knob pot R3 to get a reading of "20" (20 watts) on the power scale.
21. Unkey the transmitter.
22. Turn the transmitter off.
23. Remove the dummy load and VTVM. Put the cover back on the power meter.



- NOTES:
1. All resistors are 1/2 watt, 10%, unless indicated otherwise.
 2. All capacitors are in μF, unless indicated otherwise.
 3. Wafer of rotary switch is shown as viewed from the knob and as set in the maximum ccw position.

421B POWER METER
SCHEMATIC DIAGRAM

Parts List

Item	Part No.	Description	Qty	Item	Part No.	Description	Qty
	460065	case clip	2	J1	657570	SO-239 connector	1
	460067	molded case	1	J2	657570	SO-239 connector	1
	170273	front panel	1	M1	790006	multifunction meter	1
	170275	rear panel	1	R1	722223	180, 2 watt, 10%	1
	705669	knob, function switch	1	R2	721321	3.3 k, 1/2 watt, 10%	1
	705670	knob, calibrate	1	R3	721483	20 k, p.c.m., linear potentiometer	1
C1	721861	1-8 pF, trimmer	1	R4	721487	50 k, p.c.m., linear potentiometer	1
C2	721601	68 pF, 5%, NPO, ceramic disc	1	R5	720042	100 k, p.c.m., linear potentiometer	1
C3	721601	68 pF, 5%, NPO, ceramic disc	1	R6	721339	18 k, 1/2 watt, 10%	1
C4	721574	.1 uF, flat film	1	R7	721317	82 k, 1/2 watt, 10%	1
C5	721158	.001 uF, 1 kV, ceramic disc	1	R8	721328	330 k, 1/2 watt, 10%	1
C6	721158	.001 uF, 1 kV, ceramic disc	1	R9	722263	25 k, linear potentiometer	1
C7	721550	.01 uF, 600 V, ceramic disc	1	S1	700310	function switch, rotary	1
C8	721158	.001 uF, 1 kV, ceramic disc	1	T1	722077	sensing toroid	1
D1	765722	1N270 germanium	1				
D2	765722	1N270 germanium	1				

90 DAY LIMITED

Warranty

Hy-Gain Electronics Corporation warrants each new product manufactured to be free from defects in material and workmanship and agrees to remedy any such defect, or to furnish a new part, in exchange for any part of any unit which under normal installation, use, and service discloses such defect within ninety days from the date of purchase by original owner.

This warranty does not extend to any of our products which have been subjected to mis-use, neglect, accident, incorrect wiring not our own, improper installation or to use in violation of instructions furnished by us. Nor does it extend to units which have been repaired or altered outside of our factory nor to accessories used therewith not of our own manufacture.

Hy-Gain Electronics Corporation reserves the right to make any changes deemed necessary or desirable without advance notice or incurring any obligation to make like changes in units previously manufactured or sold.

This warranty does not cover transportation or installation costs that may be incurred, Hy-Gain Electronics Corporation's sole liability is the remedy of any defect for ninety days. Hy-Gain Electronics Corporation is not responsible for personal injury or property damage resulting from improper or careless installation or usage not intended by the manufacturer.

No person is authorized to assume for us any other liability in connection with the sale of our products.

All warranties are void and terminated one year after the last unit of its type and design has been manufactured by us.

All claims of defects or shortages should be addressed to:

Hy-Gain Electronics Corporation
8601 Northeast Highway Six
Lincoln, Nebraska 68505
attn., Customer Service Department

You must furnish model number, date, place and proof of purchase, such as a copy of the sales receipt to establish warranty. Your letter should include all pertinent details along with part or item numbers involved. Do not return anything until requested to do so. No warranty card is furnished. You must supply the above information.

Any returned items must have prior authorization. Unexpected returns are greatly delayed in handling. These delays can be avoided by writing in advance furnishing the above information.