

PRECISION AUTOMATIC SWR·POWER METER



Operation Instructions

SX9000



The SX9000 is an insertion type SWR/POWER meter being connected between a transmitter and an antenna. Transmitting power and SWR can be measured with very simple operations.

In addition with those conventional measurement, PEP (peak envelope power) on SSB mode can be measured with a PEP monitor function. External 13.8VDC power supply is required. Except some function, however, the unit can be used without the power supply. With our DIAMOND's wideband and low insertion loss directional coupler those measurements can be performed with minimum effect transmission line.

Before using the unit

1. Do not intend to open the housing or touch any place inside, since it may invite malfunction of the unit and causes measurement error. Especially directional coupler section is not servicable without specially prepared measurement tools. Note that warranty will not cover a unit which is modified in any part of the unit by a user.
2. Since the unit displays RF power at input end of the system, if RF power at output end is required, subtract the amount equivalent to the insertion loss from the displayed RF power.
3. When being operated on SSB mode, RF power displayed with PEP MONI function is approximately 70 to 90 percent of peak power at normal talking level. It is because of the time constant in CR circuit, the unit is not able to display 100 percent peak power.

Note on operations

1. The unit has the following band coverage;
S1: 1.8-160MHz
S2: 430-1300MHz
2. Measurable power range of the unit is up to 200W in intermittent mode. If transmitted on FM, CW, RADIO FAX or RTTY mode, do not exceed its continuous maximum power at the following power range. Otherwise pickup unit of the directional coupler section may burn out.

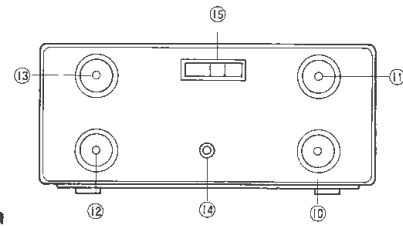
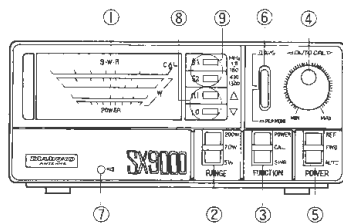
Sensor-1 (S1)			
1.8	-	100MHz	100W
100	-	160MHz	70W
Sensor-2 (S2)			
430	-	1300MHz	100W

3. Since the unit consists of delicate mechanism, do not drop it or subject it to hard blow.

Description of panel features

1. Meter
Displays forward RF power, reflected RF power and swr.
Uppermost scale is for high (H) and low (L) power swr reading. Low power swr scale is for RF power below 5W.
High power swr scale is for RF power over 5W.
Second and third scales are for RF power measurement which are 5W, 20W and 200W full scales respectively.
2. Range switch
Selects full scale RF power reading between 5W, 20W, and 200W.
3. Function switch
Selects measurement function between RF power and swr.
4. CAL (calibration) Knob
Do not necessary to touch this while automatic measuring function is in use. Use this for manual SWR measurement without external power supply.
Sets RF power to full scale reading depending on transmitting RF power to measure SWR. Readings increase as knob is being turned clockwise during transmission.
5. POWER display direction switch
Change RF power display between forward RF power (FWD), reflected RF power (REF) and automatic SWR measurement (AUTO).

6. Average/PEP monitor switch
In ordinary RF power measurement, set the switch to the (⏏) position to display average RF power.
In SSB RF power measurement, set the switch to the (⏏) position to display PEP RF power.
7. Meter zero adjustment screw
Adjusts the meter indicator to zero position with regular screwdriver if the indicator is far from zero position when the unit is not in use.
8. Automatic calibration indicator
Lit when automatic SWR measurement function is in use.
9. SENSOR selection indicator
When external power supply is being connected to the unit, LED sensor selection indicator corresponding to each sensor selected by the band selection switch at the rear panel.
10. Transceiver (for S1)
RF power input from a radio equipment which is to be connected by 50 ohm coaxial cable with UHF connector.
11. Antenna (for S1)
RF power output to an antenna or a dummy load which is to be connected by 50 ohm coaxial cable with UHF connector.
12. Transceiver (for S2)
Use N connector.
13. Antenna (for S2)
Use N connector.
14. 13.8VDC jack
Power source for meter illumination, automatic SWR measurement function and LED indicators. Supply DC power source between 11 to 15V. Connect DC power cable included, red for positive and black for negative polarities respectively. All measuring function except automatic SWR measurement can be used without the power source.
15. Band selection switch
Select frequency band between band 1 and 2 by the switch at the rear panel. On selecting the band, sensor selection indicator LED corresponding to the band selected, S1 or S2, is being lit if external DC power supply is connected.

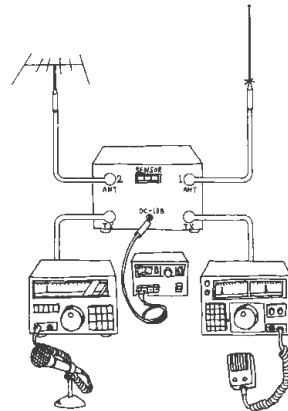


Installation

Connection

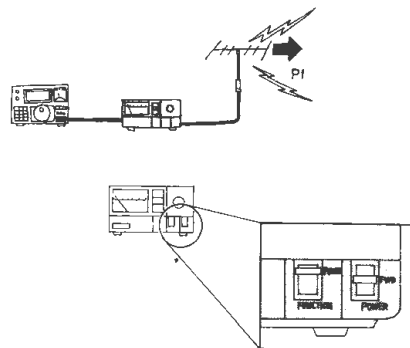
Connect the unit between a radio equipment and an antenna with coaxial cable.

For sensor 1 frequency band, connect a coaxial cable with UHF connector. And for sensor 2 frequency band, connect a coaxial cable with N connector. Note that forcing UHF connector to N connector section may destroy connector itself.



Measure forward RF power

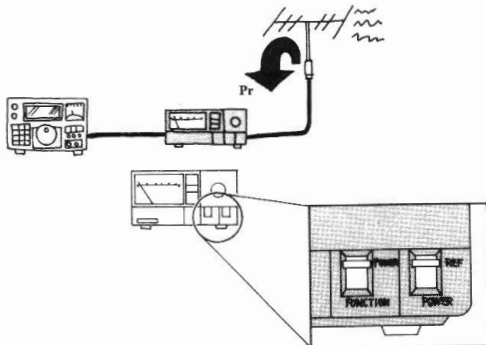
Measure how much RF output power is being applied from a radio equipment to an antenna. In case of forward RF power, the more indicator indicates RF power, the more RF power is applied to the antenna, provided that reflected RF power is minimum.



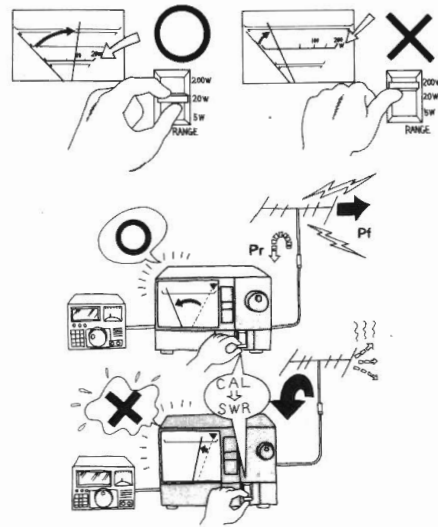
1. Set the FUNCTION switch to the POWER position.
2. Set the POWER switch to the FWD position.
3. Set the RANGE switch to appropriate RF power range. If a radio equipment is 10W RF output power, set the switch to the 20W position. If the equipment is 100W RF output power, then set the switch to 200W position.
4. Confirm to see if dummy load or coaxial cable from an antenna is being connected to the ANT receptacle.
5. Set the radio equipment on transmission, except SSB mode. On pressing press-talk switch, the meter indicates forward RF power.
6. In SSB mode, peak envelope power can be monitored by setting the AVG PEP MONI switch to the PEP MONI position and talking to a microphone.

Measure reflected RF power

In case of reflected RF power, the less indicator indicates reflected RF power, the better an antenna connected propagate transmitting power efficiently. Reflected RF power in this case amount of transmitting power which can not be propagated by the antenna due to its problem in propagation efficiency.



1. Set the FUNCTION switch to the POWER position.
2. Set the POWER switch to the REF position.
3. Set the RANGE switch to appropriate RF power range. If a radio equipment is 10W RF output power, set the switch to the 20W position.
4. Confirm to see if dummy load or coaxial cable from an antenna is being connected to the ANT receptacle.
5. Set the radio equipment on transmission. Then the meter indicates reflected RF power.
6. If the meter does not indicate any power, set the RANGE switch to the lower power range.



Measure swr

Since the SX9000 is an automatic SWR/Power meter, it can measure SWR without calibration. (External power supply is required.)

Set and confirm band selection switch at the rear panel depending on the frequency band of the antenna being measured.

1. Set the FUNCTION switch to SWR position.
2. Set the POWER switch to AUTO position.
3. Set the radio equipment on transmission. Then one of two automatic calibration indicators is being lit and CAL knob is being turned automatically. HI or LO indicator is being lit depending on the direction the knob being turned.
4. When the knob is stopped, the meter indicates SWR value.

If there is no DC power source at hand, SWR can be measured manually by the following procedure.

1. Set the FUNCTION switch to the CAL position.
2. Turn CAL knob counterclockwise fully to the MIN position.
3. Set the radio equipment on transmission and turn CAL knob clockwise to set the meter indicate "▼" position.
4. While the equipment is kept on transmission, set the FUNCTION switch to the SWR position. Then, the meter indicates swr of the antenna. Note that there are two scales H and L for swr reading. If transmitting RF power is less than 5W then read L position, and the power is more than 5W then read H position.

※ Relationship between reflected RF power and swr is as follows.

SWR	1.0	1.1	1.2	1.5	2.0	2.5	3.0
Reflected RF power (%)	0	0.22	0.8	4.0	11.1	18.4	25.0

5. Calculation of swr value is as follows.

$$SWR = \frac{\sqrt{P_f} + \sqrt{P_r}}{\sqrt{P_f} - \sqrt{P_r}}$$

Where P_f = forward RF power
 P_r = reflected RF power

Note

If swr reading and calculated swr value differs considerably, calculated swr value is more accurate due to frequency response of pickup diode used in the directional coupler section.

If swr is too high

If swr of the antenna is too high, see if antenna is correctly assembled and soldered, or coaxial cable and connector are correctly assembled and soldered. Installation location of the antenna, surrounding buildings and so on, can also be a cause of high swr value.

Confirm to see correct antenna which covers corresponding sensor frequency band, is connected to each sensor input. Sensor 1 covers HF bands to 160MHz. and sensor 2 covers 430 to 1300 MHz.

Specifications

	Sensor-1 (S1)	Sensor-2 (S2)
Frequency range	1.8~160MHz	430~1300MHz
Power measurement range	0~200W (intermittent measurement)	
Power display range	5W/20W/200W	
Accuracy of full scale	±10%	
Minimum power at swr measurement	1W	2W
Measurement range at swr measurement	1.0~∞	
Insertion loss	Less than 0.2dB	Less than 0.15dB
Impedance	50 ohms	
Connectors	UHF	N
Dimensions (W/H/D)	155×63(69)×103(135) mm 6.1"×2.5"(2.7")×4.1"(5.3") Values within () are dimensions including projection parts.	
Weight	890g (2.0lbs.)	
Accessories	Operation instructions DC power cable	