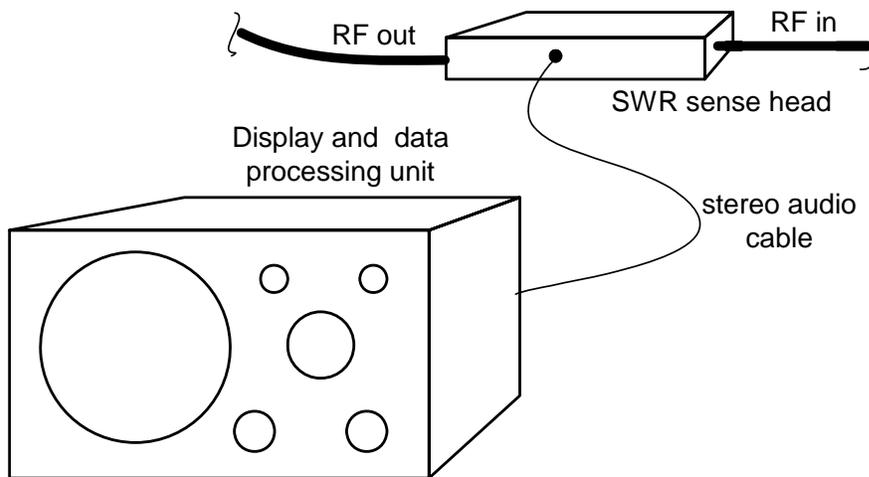


## Operating instructions for the SWR/Power/Return Loss monitor and a summary of features.

### Description

The VSWR/Return Loss monitor consists of a sense head and a separate display and data processing unit. The sense head is designed for use in a 50-ohm system and contains a Stockton Standing Wave Ratio (SWR) bridge with Schottky diode detectors. The diodes convert forward and reflected RF voltages to dc levels which are passed to the main data display and processing unit via a 3-conductor stereo audio cable.

The sense head is small and may be located any reasonable distance from the display.



There are two separate sense heads for use with the display unit. One can handle RF power levels up to 10 watts, the other up to 100 watts. Both cover the frequency range 1.8 to 54 MHz.

Based on the forward and reflected voltage readings, a microprocessor in the data display module calculates

- Relative forward power
- Percent reflected power
- Net power delivered to the load
- Standing Wave Ratio (SWR)
- Return loss (in db)

Accuracy of the SWR reading is better than 5% over a range from 1.0 to 10.0 when used in a 50-ohm system.

The return loss scale covers a range of 0 to 33 db.

Measurements are displayed on an analog panel meter and are also available as ASCII character strings for display on a computer terminal.

### **Auto-calibration**

When the instrument is first powered on, the instrument goes through an initial calibration and zero adjustment sequence and the front panel LED labeled *Calibrating* remains lit for about three seconds before starting its normal cycle. Occasionally, the initial calibration sequence may be repeated two or three times at power-up. This is normal.

After it is up and running, the system goes through a zero-adjustment cycle approximately every six seconds. The *Calibrating* LED flashes very briefly when this occurs. The normal flashing of this LED can be thought of as a “heart beat” indicating that the main portion of the software is running as it should.

### **Transmitter Lockout**

There is a *Transmitter Lockout* (XLO) feature which is enabled by a slide switch on the rear panel. When enabled, this feature opens a set of relay contacts when the SWR exceeds a pre-determined level. By this means, the transmitter can be automatically turned off in the event of high SWR, possibly protecting the output RF amplifier from a damaging condition. A LED on the front panel is also lit when the XLO is in effect.

### **Adjustments and Controls**

The meter display mode is controlled by a front panel rotary switch. The user can select among Forward power, Percent Reflected power, Net Power, VSWR or Return Loss modes.

Internal to the monitor, mounted on the circuit board, there is a multi-section dual-inline package (DIP) switch which enables and controls several setup and operating functions of the VSWR meter. (See the illustration below.)

Five sections of the DIP switch are used:

DIP switch section 1 overrides all operating modes and simply puts out a full-scale level to the meter. When this switch is on, the meter sensitivity trimmer resistor R15 is adjusted so that the meter reads full scale. This switch is turned on only during the initial setup of the meter and must be turned off for normal operation.

Trimmer resistor R6 controls the scale factor of the meter. This adjustment allows setting the forward power as displayed on the meter to agree with some known level of input. When setting the sensitivity in this manner, it is convenient

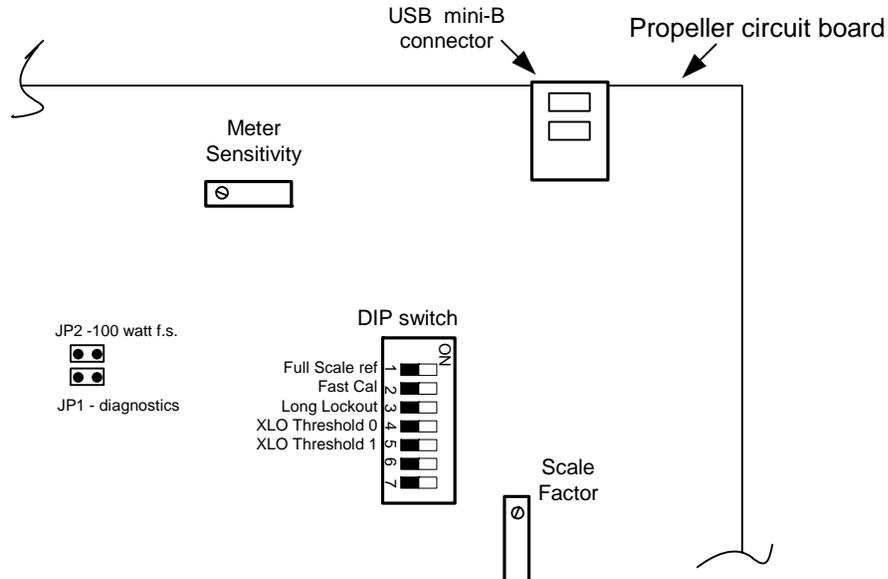
to have the meter respond more quickly than normal. Accordingly, section 2 of the DIP switch bypasses much of the averaging which is built into the signal processing firmware, thereby speeding up the response of the meter. This switch also should be off for normal operation

DIP switch sections 4 and 5 set the SWR threshold level at which the Xmtr Lockout relay is energized as shown in the following table.

DIP SWITCH SECTION 5 XLOTHRESH1	DIP SWITCH SECTION 4 XLOTHRESH0	VSWR THRESHOLD
OFF	OFF	1.5:1
OFF	ON	2:1
ON	OFF	3:1
ON	ON	4:1

Normally, the relay remains energized and the LED on the front panel remains lit for three seconds after the SWR drops back below the threshold. This can be extended to approximately 9 seconds by turning on DIP switch section 3.

The sketch below shows the location of the internal switches, jumpers and trimmers.



A convenience feature is a toggle switch on the front panel which increases the meter sensitivity by a factor of three for ease in reading low-power sources. This switch affects the sensitivity of the forward, % reflected, SWR and net power readings only. Return Loss meter readings are not affected by the position of this switch.

A second front-panel toggle switch enables a peak capture and hold function so that power and SWR can be monitored during CW or SSB operation.

### **Terminal display and keyboard commands**

The USB port located on the top panel of the data display unit can be connected to a computer running terminal emulation software, such as MS Windows HyperTerminal. The terminal should be set for 19200 baud, 8 data bits, no parity and one stop bit. All five data channels can then be displayed as a single data record for monitoring or logging purposes.

NOTE: The USB connection may show up on your computer as one of several different COM: ports, depending on the setup. You may have to try different COM: port numbers on your terminal program when first getting started. Once determined, however, the port location should not change.

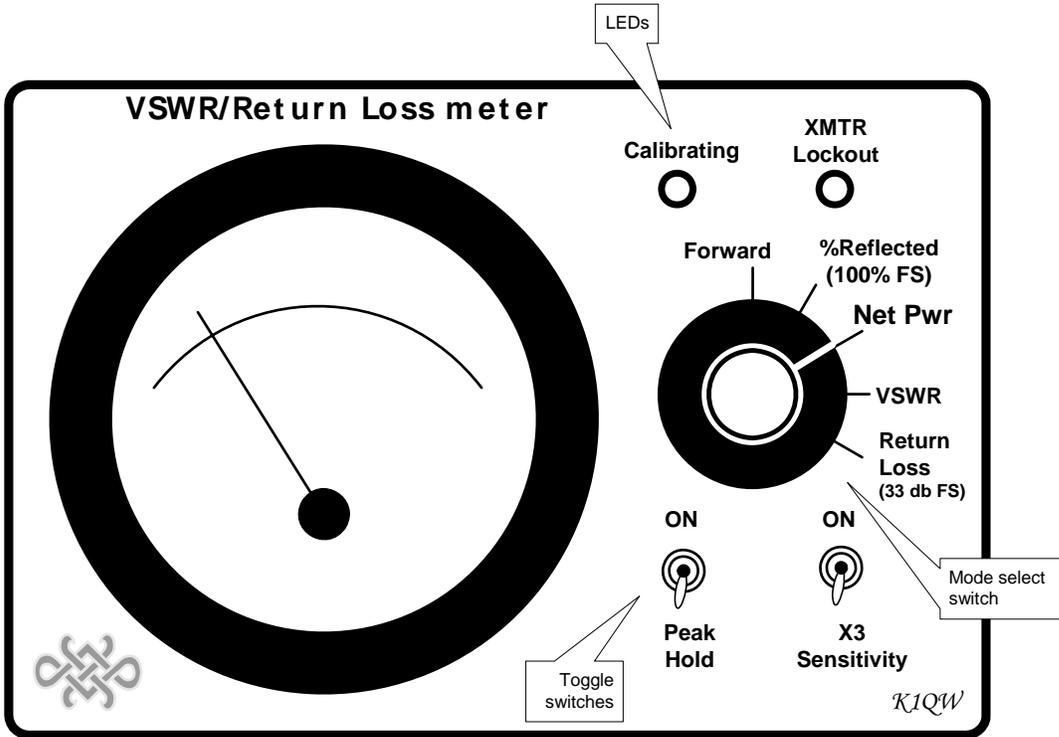
A rudimentary set of commands from the terminal control the collection of data.

- Pressing the “Enter” key at the terminal will display a single line of data.
- Holding down the “Control” key while pressing “L” (Ctrl-L) will initiate periodic logging of data records. A message is shown prompting the user to enter a logging interval from 1 to 99 seconds. Then, pressing the “Enter” key will begin logging data records to the terminal.
- Logging is ended by sending Ctrl-Q from the terminal.

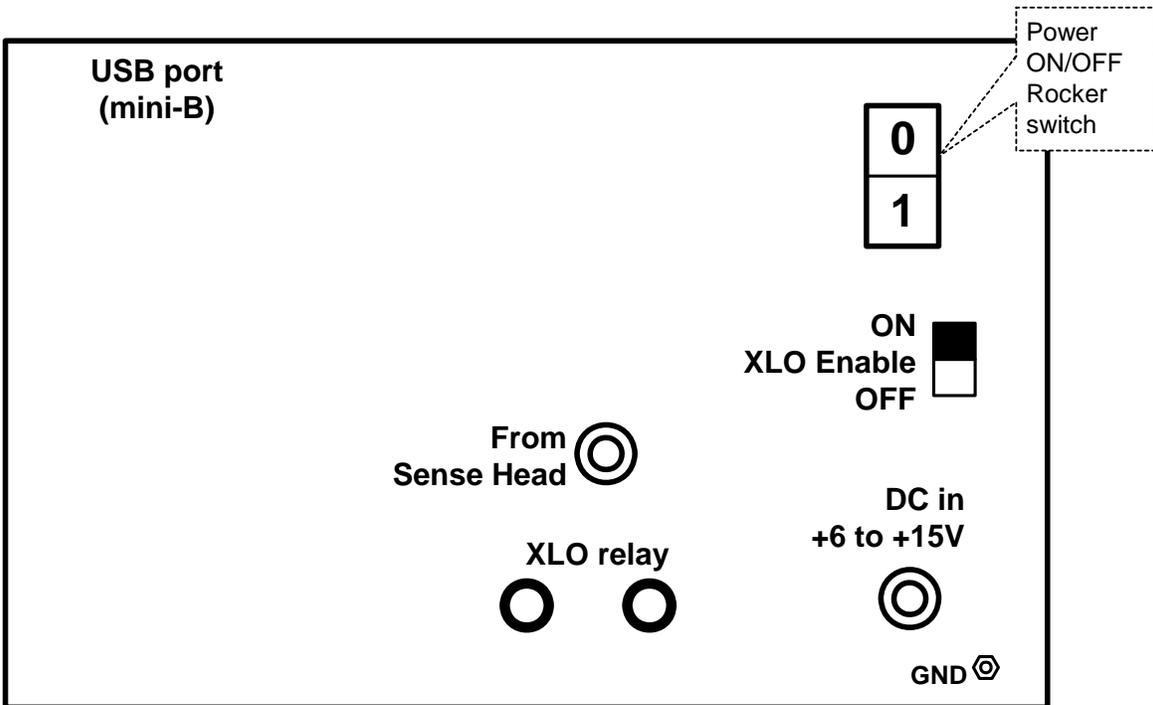
The logged data may be captured in a file and easily entered into a spread sheet for further processing and/or graphical display.

JP2 (“100 watts”) should be installed whenever the 100 watt sense head is in use. This jumper allows the terminal display to read forward and net power correctly in watts. It affects the terminal display only and has no affect on the meter reading. In other words, full scale on the meter power scales is either 10 watts or 100 watts, *depending on which sense head is in use*, regardless of the state of jumper Jp2.

If jumper JP1 (“diagnostics”) is in place, the display on the terminal changes to show “raw” data conversions of forward voltage, reflected voltage and dc zero offset voltage. These data are displayed in the range 0 – 4096 counts as converted by the ADC before any filtering or corrections are made. This jumper must be removed for a normal terminal display.



Front Panel Controls



Rear Panel Layout