



THE DISPLAY UNIT



What a meter

Array Solutions's PowerMaster meter system is far more than just a wattmeter, as Chris Lorek discovered.

Many years ago, when I had my first transceiver (an ex-PMR valve radio which I converted for 2m), the first accessory I bought for my station was a twin-meter power/VSWR meter. I found this device invaluable and over 30 years later I still have it, even though I also use other more modern power/VSWR meters.

Nowadays many transceivers have power and VSWR meters built in, but if you're using additions to a stand-alone 'black box' transceiver, for example an aerial tuning unit (ATU) or an external linear amplifier, then a decent external power/VSWR meter is a must. I can honestly say that such a meter is the most useful shack accessory I own.

For some amateurs, a simple meter will suffice. But if you use high power and need to keep a close check on what your linear is doing, or indeed your antenna and tuner system, then you'll want something better. A good meter is especially important in protecting your valuable equipment's 'finals' from a high VSWR due to, say, an antenna or coax fault.

Launched at last year's Dayton Hamvention in the US, the PowerMaster wattmeter from Array Solutions offers such protection – and a lot more.

Array Solutions, based in Sunnyvale, Texas, is headed by WXOB, a 'big gun' amateur who is happy with nothing but the best kit. You can see this from his antenna and equipment system, which is impressive to say the least.

Through Array Solutions, WXOB has developed a range of radio kit aimed at the amateur who wants the best, the PowerMaster wattmeter being no exception.

Covering a frequency range of 1.5-30MHz to 50-54MHz and boasting an accuracy of within +/-5%, the meter comes supplied as a smart desktop indicator unit which links to a remote sensor unit (which in turn connects in line with your coax) via a supplied plug-in cable.

This flexible cable is around 2m long and is fitted with standard stereo headphone style 6.3mm jack plugs at either end, which allows you to place the display at a convenient operating position without having to worry about thick coax leads to and from the meter position itself.

In addition, you can site the remote sensor unit at the base of your antenna or other location, and use a home-made screened lead to link the sensor box to the display unit. This also helps you keep high-power RF coax leads away from your desktop equipment.

The display head unit itself measures 210mm wide x 89mm high x 108mm deep, and can also be supplied in a 19in rack mount. The remote sensor unit, measuring 168mm x 66mm x 67mm, comes fitted with SO-239 sockets as standard, although other types such as N sockets, or even 7/16 DIN connectors for high power applications, can be supplied. The meter head unit needs a 12V DC supply at around half an amp, a suitable DC lead being supplied with the unit.

FEATURES. As well as indicating forward and reverse power levels, the meter system has a number of 'peak hold' modes which can be set to either fast, medium or slow for CW, SSB, data or whatever mode you're using. You don't even need to set the power range, as it has an 'auto ranging' facility to indicate the right power level. The wattmeter offers an effective 12 bit A/D (Analogue to Digital) resolution using multiple 10 bit A/D circuits, allowing the meter to achieve a power measurement resolution of 1W and 0.01 increments of VSWR.

There's a VSWR alarm with a programmable trip point, LED indicator and relay connection output. This facility could be used to automatically shut down your linear amplifier in case of an unexpected high VSWR. Those final amplifier valves are usually very, very expensive to replace! Besides red 'VSWR' and yellow 'Power' LEDs, the front panel also has a large vacuum fluorescent alphanumeric text display, which can also function as a bar graph along the lower section for power and/or VSWR indication.

VHF/UHF OPTIONAL COUPLERS. As well as couplers being available for either 3kW or 10kW power levels for HF and 6m, optional couplers are also available for 2m and 70cm band users. For 144MHz, there's a directional loop coupler for 500W and 1,500W power levels, and for 432MHz a directional loop for 300W and 1,500W power levels.

SOFTWARE. Along with a 25-page user manual, the wattmeter is also supplied with a CD containing PC software which adds a number of useful 'extras'. The meter comes with a 9-way RS-232 port which you can link with a serial lead to your shack PC. You can then customise any of the meter's functions, including displaying your callsign

or another alphanumeric message of up to 16 characters on the screen.

Other options include setting up the default VSWR alarm trigger, the Power alarm trigger, mode of operation, bar graph mode, VSWR or power displays, and so on. The supplied software is a 'Lite' version, which is perfectly adequate for most people.

However if you want the ultimate in power logging and control, a 'Pro' version is also available. This includes extra options such as histogram recording of power and VSWR (with rig control for automation), a talking interface for visually impaired operators, and a facility to allow access to the data from other applications such as contest logging programs.

IN USE. The meter has a power measurement accuracy of 5%, which is extremely good. To achieve this, each meter sensor is independently calibrated by the manufacturer, with 'trim' settings for HF and 6m indicated on the sensor label. These settings can easily be altered to meet your needs using the supplied PC software.

After plugging in the DC power, the meter instantly came to life, going through a short start-up procedure and displaying the firmware version number. There's no on/off switch. Instead after a couple of minutes with no RF power the meter display dims, and after ten minutes the display powers down, instantly powering up again as soon as RF is detected.

The meter was simple to use, with the display – showing digital information on the top row and a transmit power level bar graph along the bottom – being easy to decipher. It is also simple to change how the information is displayed. For example, by pressing the mode select button on the front panel, you can change the VSWR from being displayed digitally to being shown as a bar graph. I found the latter useful for antenna tune-ups.

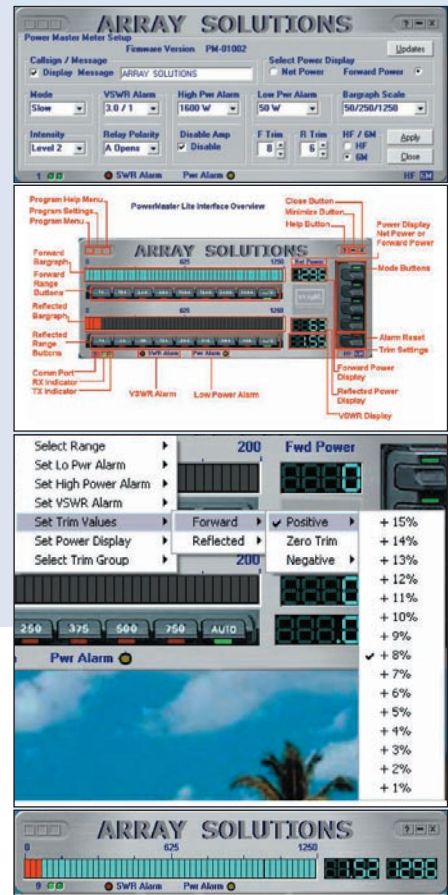
Although I sometimes use a remotely-sited microprocessor-controlled automatic ATU, adjusting antenna tuning manually sometimes can achieve a better match, and here the PowerMaster's VSWR bar graph proved the most useful.

Connecting my PC to the head unit, using a standard 9-way RS-232 lead, gave me a further display on my computer, this time with twin bar graphs for forward and reverse power together with digital forward

TOP: THE DISPLAY UNIT AND THE REMOTE SENSOR. BOTTOM: THE REMOTE SENSOR UNIT



INFORMATION FROM THE POWERMASTER CAN BE DISPLAYED ON A COMPUTER



and reverse power readings.

A 'double click' on this display condensed the size to a smaller single bar graph, this being quite handy for when I was using other applications on the PC such as a logging program. As a final test I checked the accuracy of the meter system against a further laboratory-calibrated power meter, finding the PowerMaster to be 'spot on'.

FIRMWARE UPDATES. One of the advantages of having a firmware and software controlled meter is that it can be updated with new features as and when these become available. The manufacturer currently makes these available for download from its web site, and at the time of writing, the latest firmware update was Version 2.0. One new feature of the V2.0 firmware is a 'High Power Alarm' menu. This allows you to choose a setting for peak power that if exceeded will cause the power alarm LED to flash and the power monitor relay to cycle on and off.

Another new feature of V2.0 is an 'Alarm Trips Amp' option, which when selected will cause the VSWR alarm LED to flash and the PTT/ALC relay to actuate. Finally, there's a 'Power Display' menu, which allows selection of two power measurement modes, these being net power (which is the forward power minus the reverse power) and forward power only (where the reverse power is not

subtracted).

Although the latest firmware was already supplied on the CD which came with the meter, I also tried downloading and installing it from Array Solutions's web site. The installation took just a few minutes, with the meter firmware successfully updating itself.

CONCLUSION. The Array Solutions PowerMaster system isn't simply a wattmeter; it's an integrated station system. In my opinion, it reaches professional levels rather than being just an amateur accessory. The RS-232 PC link and the availability of free firmware upgrades are also very useful facilities. I found the meter system extremely versatile and an invaluable addition to my station equipment, and I believe that many other amateurs who care about their station and operational performance would appreciate it as much as I did.

Our thanks go to Array Solutions in Sunnyvale for the loan of the review power meter system.