PRODUCT REVIEW

TELEPOST LP-100 HF DIGITAL VECTOR WATTMETER

The LP-100 wattmeter is an enhanced version of the design Larry Phipps, N8LP, described in the Jan/Feb 2006 issue of *QEX*.[6] This unit is an autoranging in-line wattmeter, available either as a kit or as a factory assembled and tested unit. (We opted for the factory assembled version.) The LP-100 is specified to operate from HF through 54 MHz at power levels from 50 mW to 3000 W (peak). While the unit can operate under PC control, and can provide plots and additional output formats using the PC, it can also perform its basic functions as a standalone unit.

A Plain Old Digital Wattmeter — Plus

The in-line directional coupler assembly that goes between your transmitter and antenna system is in a separate enclosure that can be mounted conveniently away from your operating position where you would likely want the meter display unit. This avoids the need to run extra antenna feed line cable to your operating position. The supplied cables are 6 feet long, but longer lengths can be accommodated if the calibration procedure is redone.

The interesting twist with this wattmeter is that in addition to providing power and SWR indication, it can also provide a measurement of impedance in both magnitude and phase and resistive and reactance units. I don't think I've previously encountered a wattmeter with this capability — hence its name *Vector Wattmeter*. As noted in the documentation, the meter does not know the sign of the reactance (or phase angle). For any situation I've encountered, the sign can readily be determined by noting the change in reactance upon a slight (make sure there's no zero crossing) upward shifting of frequency. If the reactance goes up, it's inductive — down it's capacitive.

Measuring complex impedance at transmit power levels has a subtle advantage over the typical flea power antenna analyzer. Those can sometimes give false readings caused by strong local signals being picked up by the antenna you are trying to measure. This is a chronic problem for those living near broadcast stations, especially if trying to take data on large lower frequency HF antennas.

[6]L. Phipps, "The LP-100 Wattmeter," *QEX*, Jan/Feb 2006, pp 3-13.

Table 2
TelePost Model LP-100, serial number 260

Manufacturer's Specifications	***Measured in the ARRL Lab***
Frequency range	1.8-54 MHz.
Power range	0.05-3000 W (peak).
Power requirement	11-15 V dc, 160 mA.
PEP measurement	Active.*

Size (height, width, depth): Controller, 2.75 × 6 × 6 inches; weight, 3 pounds.
Price: LP-100 kit version, $310; factory assembled, $410.
Add $25 for Type N connectors instead of the standard UHF type.

Actual Forward Power	**Measured Peak Power (W)**			
Frequency (MHz)	***2***	***14***	***28***	***50***
5 W CW	5.0	4.8	4.8	5.0
5 W 50%	5.0	4.7	4.9	5.1
100 W CW	100	98	97	100
100 W 50%	99	98	96	100
100 W Two-Tone	–	93	–	–
1 kW CW	980	990	1000	–**
1 kW 50%	1040	1050	1100	–
SWR Accuracy				
1:1 SWR	1.0:1	1.0:1	1.1:1	1.1:1
2:1 SWR	2:1	2:1	2:1	2:1
Insertion Loss (dB)	<0.1	<0.1	<0.1	<0.1

Notes
*For PEP monitoring, *Active* indicates that a circuit requiring external power is used.
**A 1000 W amplifier for 6 meters was not available at the time of testing.
– Not measured.

Figure 5 — The LP-100's front panel readout can display power in dBm and return loss in dB in addition to power in watts and SWR. In the vector mode, the display shows impedance. The top line is magnitude and phase, and the bottom line shows resistive and reactive components.

But Wait — There's More!

Many hams will be happy just displaying an accurate indication of the power and SWR. The FAST/SLOW button affects the way the numerical readout responds. Pressing this button toggles among FAST, PEAK-HOLD and TUNE modes. PEAK-HOLD shows the highest level reached during an interval — very handy, especially for SSB operators who sometimes get nervous if they aren't sure they are getting

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all the peak power that they paid for. TUNE is intended for adjusting a power amplifier with a pulser and locks the bargraph in the high power range to prevent range hunting.

For those who like to think in terms of other units, choices include power measured in dBm (decibels referenced to a milliwatt) and *return loss* (ratio of reflected to outbound power in decibels) in place of the usual SWR. See Figure 5 for an example of this display.

The power range is automatically set to provide appropriate significant digits and to set the top of the bargraph range. Calibration is adjustable in 0.1% steps, if you have access to a more accurate calibration standard. The calibration is also temperature compensated and can be calibrated on a band by band basis to improve accuracy. There is also a mode that can be used as a field strength meter.

An SWR alarm can be set to disable the PTT or your amplifier key line and alert you if antenna system SWR exceeds a preset value. Standard choices are off, 1.5, 2, 2.5 and 3, but the user can program any value from 1:1 to 5:1. The alarm threshold is adjustable to prevent false alarms when energy from another transmitter is picked up by the antenna (at a multitransmitter contest station or Field Day site, for example).

A calibrated field strength mode is also provided. It has a range of –15 to +33 dBm.

The LP-100 has Software, Too!

Operating software, available from **www.telepostinc.com**, provides a screen indicating what's happening. The full display is shown in Figure 6. Once you have selected the outputs and settings you want, you can change the screen to show just the bargraphs. The graphs can then be moved to an unused corner of your PC display and you can keep an eye on operation at the same time that you operate your logging and control program.

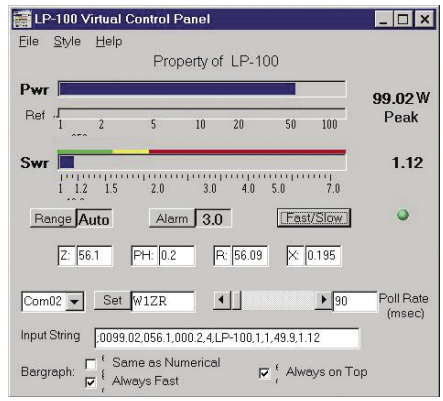

Figure 6 — LP-100 *Virtual Control Panel* software display. Once you set the parameters, a smaller version of the display can be selected.

There is also a separate plotting routine that can be used to generate SWR or impedance plots. The plots can be automatically generated through a second serial connection to the radio, so that the plot program can send frequency and PTT commands to the radio as it collects impedance data from the LP-100.

Impedance plots include an algorithm that determines the sign of the reactance at each measurement point providing a true measure of the impedance for each. The output format can be selected to show R ±*j*X, (R represents the resistive part of the impedance, *j*X the reactance, positive for inductive, negative for capacitive), or magnitude and phase angle. Other plots include Smith chart, return loss and reflection coefficient. Additional features are under development.

Bottom Line

The LP-100 is an accurate high-resolution in-line power meter with flexible output formats and the added output of vector impedance data, so you know what's happening out there.

Documentation

A 37 page manual is downloadable from the TelePost Web page. It serves as an assembly manual for the kit version as well as an operation manual for the completed unit. The instructions are clear and straightforward, describing hardware and software operation.

A look at the assembly instructions gives us a glimpse of the kit version, even though we didn't order that one. The few surface mount parts come preassembled. The remaining parts seem to be the through-hole mounting type that most of us prefer. Assembly seems straightforward. Don't expect a *Heathkit* type manual with a separate step for each connection, though. This appears to be a kit intended for the experienced home constructor. For example: "Install all of the .01 µF caps (marked 103), in groups of about 6."

The LP-100 firmware, software and documentation is updated regularly to improve operation or add features. Firmware updates are downloaded from the TelePost Web site (using a proprietary loading routine e-mailed to purchasers) and installed from your PC using supplied software. We updated our LP-100 firmware to the latest version, and the process was painless.

Manufacturer: TelePost, 49100 Pine Hill Dr, Plymouth, MI 48170; tel 734-455-3716; **www.telepostinc.com**.