LP-500

Operation Manual v1.5

January 15, 2016

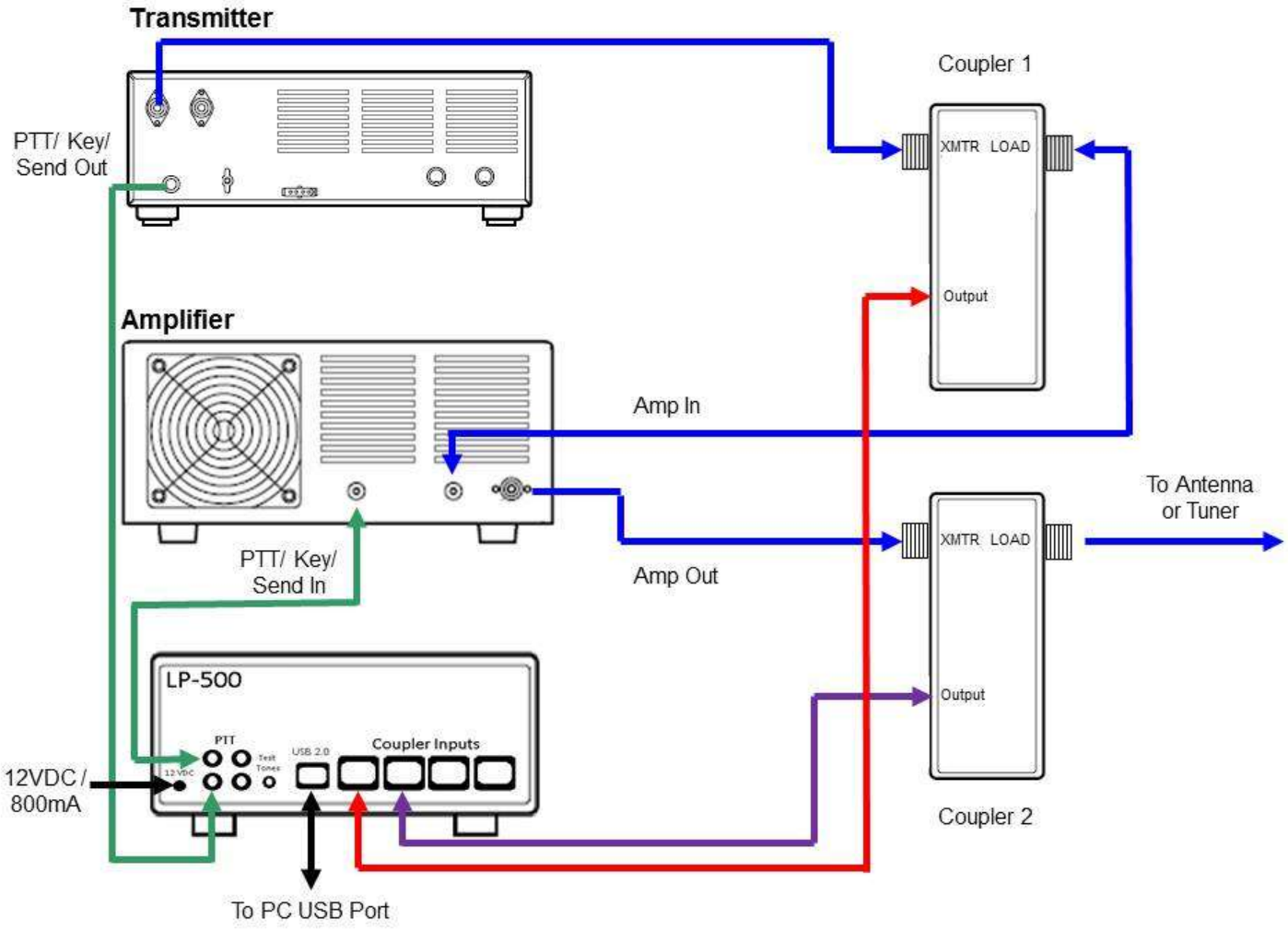


Fig.1. Shows installation with two couplers and PTT Alarm connections. The use of two couplers allows viewing of amplifier linearity with a trapezoidal display. PTT Alarm connections are optional and designed mainly for older amplifiers with no built in protection.

Connections…

Power: 12-16 VDC @ 800 mA max., center pin positive, 2.5mm. The lead with the white stripe on the supplied cable is positive. The meter has a built in mini 1A slo-blo fuse on the PCB for protection.

PTT: For older amplifiers, loop the PTT (amp keying) between your amplifier and rig through the LP-500 using RCA connectors. Two sets of connectors are provided for connecting two amplifiers. Use either pair for either amplifier.

Test Tones: Audio output for built in test tones. Connects to the MIC or LINE input of the rig. An attenuator will be needed in the case of mic input. We plan to offer an interface box for this type of connection in the future, which will allow hot-switching between the mic and LP-500, and level balancing between them.

USB 2.0: Connects to computer using standard USB cable (Type A to Type B connectors). Used for flashing firmware and interfacing to LP-500 VM and Utility programs. Can be connected to USB 2.0 or 3.0 jacks on PC. No special drivers are necessary.

Couplers: Connect to corresponding jacks on the coupler(s) using supplied CAT5/6 shielded Ethernet cables.

Overview

The LP-500 Digital Station Monitor combines a state-of-the-art wattmeter and SWR meter with a task specific oscilloscope and spectrum analyzer, all using a large, bright color TFT display. The LP-500 also employs a low distortion audio signal generator with a number of complex signals available, plus the ability to allow users to create their own test signals. The instrument can be used to monitor the outputs of four different transmitters, or the inputs and outputs of two amplifiers as well as other combinations. The intent is for the user to be able to monitor many aspects of his transmitted signal and ensure that his station is operating as cleanly as possible.

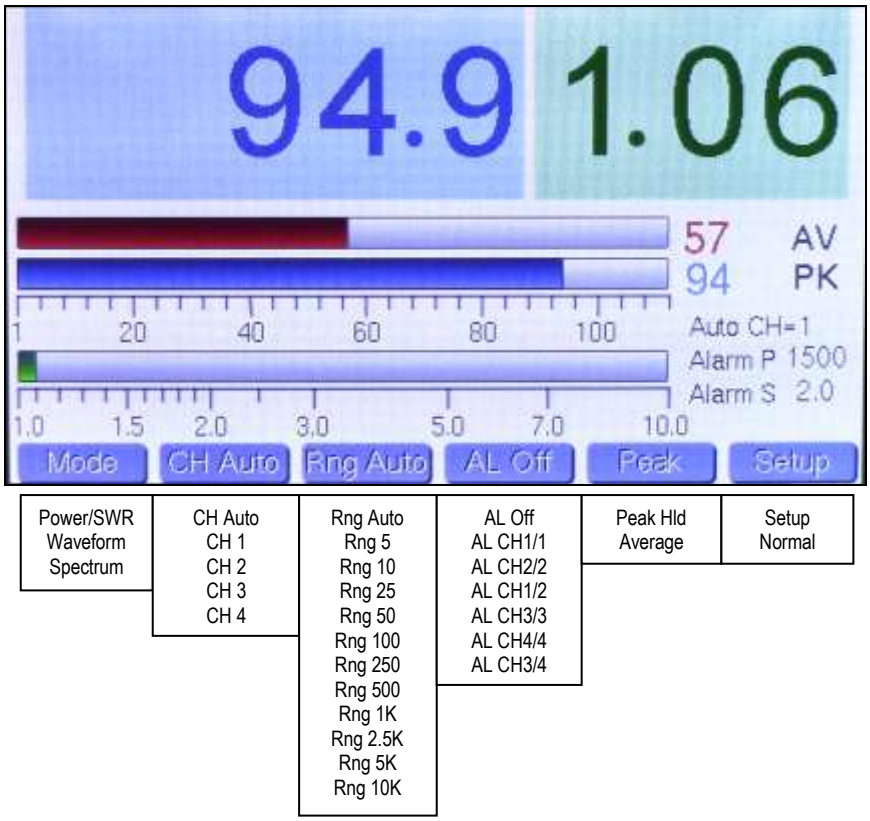
While it doesn't completely replace dedicated oscilloscopes and spectrum analyzers, it performs almost all the tasks one would employ these instruments to do, but does it much more conveniently, cost effectively and in many cases with better results.

While the LP-500 is a complex piece of test equipment, every effort has been made to make operation as simple as possible, with many automated or linked functions. Operation of the LP-500 is mostly controlled through the six pushbuttons, but in the scope and spectrum modes there are a number of touch screen controls, as well as a rotary digital encoder control. The six main buttons can also be controlled via the touch screen.

The main modes of operation… Power/SWR meter, Waveform Scope and Spectrum Display… are controlled by the Mode button. The Mode button remains in all modes, as does the Channel selection button. The 3rd button controls the range or gain of the meter in each mode. The other buttons are "soft keys" whose function changes with mode.

A detailed list of modes and controls follows on the next pages, which will help the user get the most out of this meter.

Power/SWR Mode…



The above picture shows the Power/SWR mode, with menu choices listed below each button. The last choice in each list wraps around to the top.

Mode Button: Changes mode.

CH Button: Selects among the 4 coupler channels, and also offers an Auto Channel selection, which displays the channel with the highest power reading. This mode is very useful for SO2R type contest operation. When in CH Auto, the current selected channel is displayed to the right of the SWR bargraph, along with the current power and SWR alarm settings for that channel.

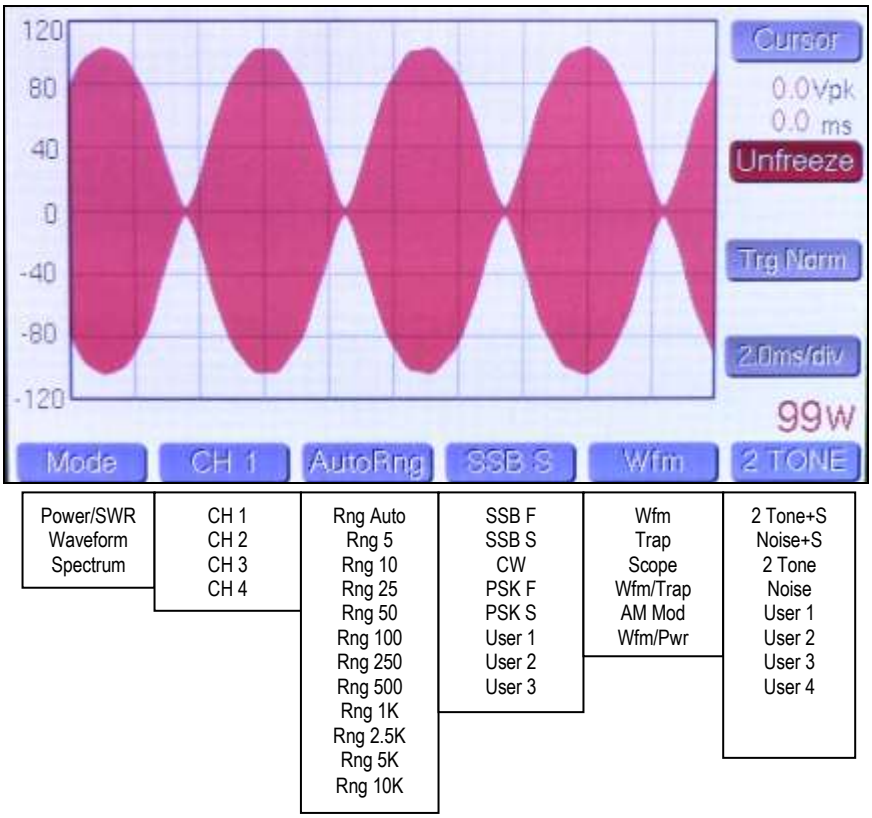
Range Button: Selects the desired power range between 5W and 10KW in 11 steps, and also offers an Auto-Range choice. The selection is indexed to the current channel selection and is saved in memory. As the range changes, the bargraph legends also change so that you always graphically see the correct range and bargraph length. When changing to a higher range, there is some hysteresis built in so that the meter will stay at the higher range unless power drops a certain percentage. This is done to prevent "hunting" on the edge of two ranges while operating, and especially while tuning. Note: This choice can't be changed when the CH button is in Auto.

Alarm Button: Selects the alarm source, and is indexed to the channel selection and saved in memory. There is a lot of flexibility built into this button, so that the user can determine how he wants the alarm to behave. Normally the user would select the alarm channel to match the selected channel, and both power and SWR alarms will trigger based on the selected channel. The user may prefer to trigger the alarm on CH1 even though CH 2 is selected. This is permissible. The options are shown in pairs, like CH 1/1 or CH 1/2. The first number is the power trigger channel and the second number is the SWR trigger channel. It is sometimes useful to monitor one channel for power and a different one for SWR, for instance when monitoring amplifier drive power and antenna SWR at the same time. The alarm settings for the current selected channel are displayed to the right of the SWR bargraph below the Auto CH display. This is true whether the channel is manually or automatically selected. If the alarm is tripped, the display indicates which channel tripped the alarm, and the chime sounds as well, with 1 chime for CH1, 2 chimes for CH2, etc. The sequence repeats continuously until you stop transmitting, the fault is cleared or the alarm is set to OFF. The Alarm P or Alarm S displays will change to red to indicate whether the trigger was due to a power fault or SWR fault. Note: This choice can't be changed when the CH button is in Auto.

Peak/Avg Button: Determines whether Average or Peak Hold is fed to the large power display. Note: Smaller values of average and peak power are always displayed at the end of the average and peak power bargraphs.

Setup Button: This is a special button and displays a screen with all the adjustable user preference items. This will be covered as a separate mode later in this guide. Tapping this button once changes to Setup mode, tapping again returns to Power/SWR mode. Tapping the Mode button will also return to Power/SWR mode.

Waveform / ‘Scope Mode…



Mode Button: Changes mode.

CH Button: Selects among the 4 coupler channels. CH Auto is not offered in the ‘scope mode to avoid confusion. The channel selection for the ‘scope mode is independent of the Power/SWR mode.

Range Button: Selects the desired power range between 5W and 10KW in 11 steps, and also offers an Auto-Range choice. The selection is indexed to the current channel selection and is saved in memory. As the range changes, the vertical voltage legend changes as well to indicate actual peak voltage at the output connector of the coupler. As with the Power/SWR mode, there is some hysteresis built into the auto-ranging.

Sweep Button: Selects the horizontal sweep rate / scaling. There are 5 presets… which select a combination of sweep rate and trigger mode optimized for the indicated mode, as follows:

SSB Fast...	1.0 msec/division, Normal trigger
SSB Slow…	2.0 msec/division, Normal trigger
CW…	1.0 msec/division, +/- trigger (more on this below).
PSK Fast…	5.0 msec/division, Normal trigger
PSK Slow…	10.0 msec/division, Normal trigger

Note: The +/- trigger mode displays a split screen of the CW waveform with positive edge triggering on the left side of the screen and negative edge triggering on the right edge. This provides more resolution for viewing the detail of the leading and trailing edges of the keying waveform.

In addition, there are three USER sweep settings which allow the user to select his own combinations of sweep rate and trigger style. Choices for sweep are 1, 2, 5 and 10 msec per division. In addition, the user can use the Adjust control to fine tune the sweep rate to something in-between the fixed choices. He can also choose from the various trigger modes… Off, Norm, +, - and +/-. Trigger and Sweep rate selections for the USER presets are made using the touch screen controls. More on this later.

Wfm Style Button: Selects the desired ‘scope display from these choices…

Wfm: Standard ‘scope display

Trap: Trapezoidal display plots exciter output vs. amplifier output and display a triangular image that easily shows when the output of the amplifier becomes nonlinear, ie. flat tops and no longer provides the same gain as at lower power. Also shows other distortions of the input signal.

Scope: Shows the modulation signal, ie. demodulated audio.

Waveform / ‘Scope Mode, Continued…

Wfm/Trap: Split screen of the transmitted waveform on the left of the screen and trapezoid on the right side.

AM Mod: AM Modulation screen showing the transmitted waveform on the left, and bargraphs for positive and negative modulation on the right. Also shown are numerical values of the modulation levels. This is especially useful for optimizing asymmetrical peak limiters for maximum “talk power” while observing the effects on the transmitted waveform. When first keying up, or during pauses in speech, the meter captures the carrier level. It then uses this value to calculate the positive and negative mod percentage by comparing the captured carrier level to the current positive and negative peak level values.

Wfm_Pwr: Displays the transmitted waveform on the left of the screen, and Power/SWR on the right side.

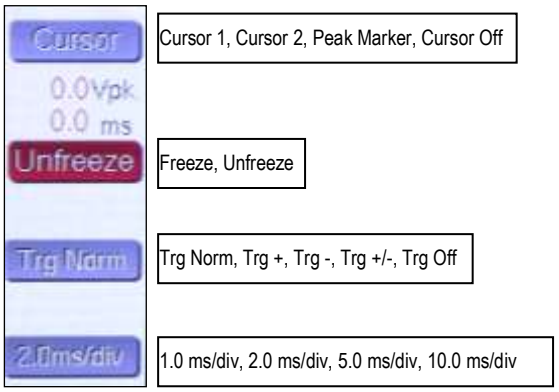
Test Tone Button: This button selects the desired test signal to be fed to the transmitter. Choices are:

2TON+S…	Two tones plus “subcarrier” (Spectrum Mode).
Noise+S…	White noise plus subcarrier (Spectrum Mode).
2 TONE…	Standard two tone test signal
Noise…	White noise
User 1…	Currently a 1 kHz Sine Wave
User 2,3,4…	These select custom tones that the user can record and save to memory in standard .wav format.

The test tone output of LP-500 is unbalanced line level audio with a source impedance of 250 ohms. This can be directly fed to the line input of most radios. We are developing an interface box which will convert this audio to mic level balanced output, with a switch and attenuator to allow matching the LP-500 output to a microphone and switch between them.

Touch Screen Controls…

The touch screen serves a couple functions. It adds additional buttons that the user can access by pressing with his finger or a stylus, and it allows the user to control cursors which allow the user to make voltage and time measurements.



Cursor Button: Pressing this button cycles through four cursor modes. Selecting Cursor 1 displays a blue crosshair, which allows the user to set a position on the waveform in either voltage or time, or both. The corresponding voltage and the total time from the left edge of the display are displayed numerically. Selecting Cursor 2 adds a second cursor with green crosshairs. In this mode, the numerical readout shows the time difference between Cursor 1and Cursor 2. The voltage displays 0. Pressing the cursor button again turns on the Peak Pwr Markers. The fourth position is OFF.

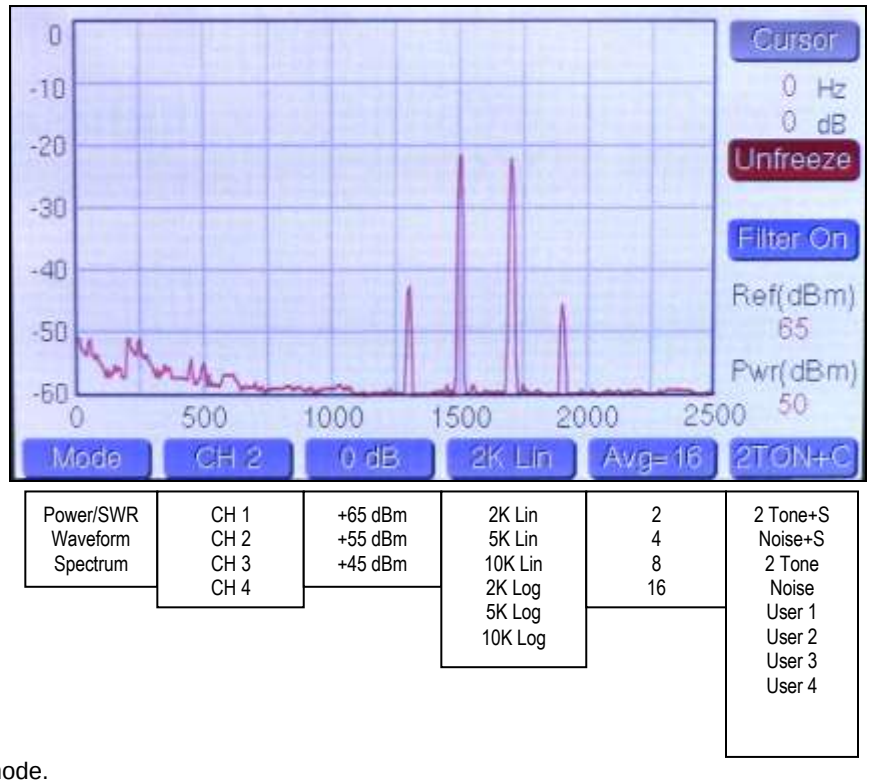
Freeze Button: To aid in setting the cursors and making measurements, pressing this button causes the waveform to freeze.

Trigger Button: This button selects the trigger mode when one of the USER sweep presets is selected. The selection is saved as a custom user preset. The button only works when a USER preset is selected, but always displays the current trigger setting, even in factory sweep preset positions.

Sweep Button: Selects the desired sweep rate when the Sweep preset is set to one of the USER choices. The setting is saved in memory along with trigger mode. The sweep rate can be modified by rotating the Adjust knob to any desired value.

Power Display: A numeric display below the Sweep button which shows the current transmitted power level. When moving Cursor 1, the power display shows calculated power based on the cursor position rather than transmitted power.

Spectrum Mode…



Mode Button: Changes mode.

CH Button: Selects among the 4 coupler channels. CH Auto is not offered in the Spectrum mode to avoid confusion. The channel selection for the Spectrum mode is independent of the Power/SWR mode.

Range Button: Selects the desired vertical gain from 0 dB to 20 dB. The button turns red and an error message appears if the signal is too strong. power range between 5W and 10KW in 11 steps, and also offers an Auto-Range choice. The selection is indexed to the current channel selection and is saved in memory. The “Ref(dBm)” readout below the Filter button updates to indicate the current 0 reference level at the top of the graph.

Span Button: Selects the desired span width in Hz. The choices are 2, 5 and 10 kHz with a linear scale, and 2, 5 and 10 kHz with a log scale. Linear is generally used for tests like two tone IMD. Log is best for frequency response measurements.

Averaging Button: Selects the amount of averaging applied to the display. A higher setting provides lower noise, but is slower to respond and update.

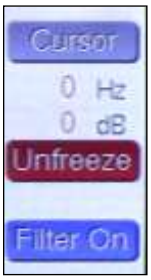
Test Tone Button: This button selects the desired test signal to be fed to the transmitter. Choices are:

2TON+S…	Two tones plus “subcarrier” (Spectrum Mode).
Noise+S…	White noise plus subcarrier (Spectrum Mode).
2 TONE…	Standard two tone test signal
Noise…	White noise
User 1…	Currently a 1 kHz Sine Wave
User 2,3,4…	These select custom tones that the user can record and save to memory in standard .wav format.

See the discussion at the top of page 5 which details the differences between the normal test signals and the Spectrum Mode test signals.

Spectrum Mode, Touch Screen controls…

Cursor Button: Pressing this button cycles through three cursor modes… Cursor 1, Cursor 2 and no cursor. Selecting Cursor 1 displays a blue crosshair, which allows the user to set a position on the waveform in either amplitude or frequency, or both. The corresponding amplitude and frequency are displayed numerically just below the Cursor button. Selecting Cursor 2 adds a second cursor with green crosshairs. In this mode, the numerical readout shows the amplitude and frequency difference between Cursor 1 and Cursor 2. Pressing the cursor button again turns on the Peak Pwr Markers. The fourth position is OFF.



Cursor 1, Cursor 2, Peak Marker, Cursor Off

Freeze, Unfreeze

Filter On, Filter Off

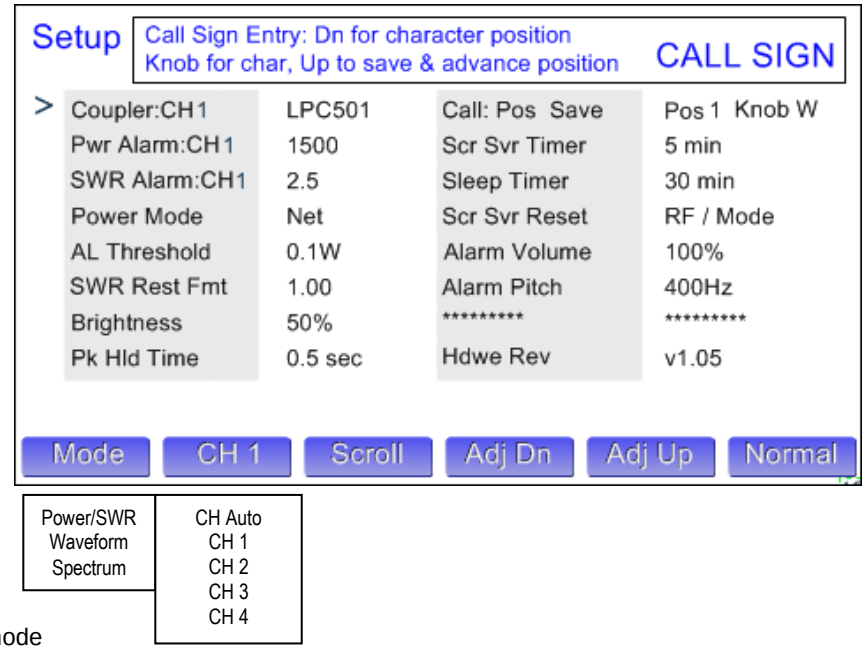
Freeze Button: To aid in setting the cursors and making measurements, pressing this button causes the waveform to freeze.

Filter Button: This button activates a 200 Hz filter, which eliminates the “carrier” generated by some of the test tones, and shifts the display by 200 Hz to restore proper values to the frequency scale. The filter button is automatically selected when any test tone that uses the 200 Hz carrier is selected, but the filter can be manually turned on or off with any test tone selection. A description of the use of the 200 Hz carrier are explained in the waveform / ‘scope section of the Quick Start Guide.

Ref Display: Indicates the maximum signal level at the top of the display (“0” reference). This changes as the gain control is adjusted. The choices are +65 dBm, +55 dBm and +45 dBm (approx. 3 KW, 300 W, 30W).

Pwr Display: This indicates the transmitted signal level in dBm. Note, this is a total peak power reading and will not always match the graphic display, because it represents the sum of the power in all the frequency bins, rather than the power in any given frequency bin.

Setup Mode…



Mode Button: Changes mode

CH Button: Selects among the 4 coupler channels. There are three parameters that are channel specific… Coupler, Pwr Alarm and SWR Alarm. The channel indicated next to each of these parameters is the one that is being adjusted.

Scroll Button: Allows the user to scroll down to the parameter he would like to change. This can be done by tapping repeatedly, or by holding the button down for rapid scrolling through the parameters. When you get to the end of the list, the cursor moves back to the first parameter.

Adj Dn / Adj Up Buttons: Once the cursor is pointing to the parameter you want to adjust, using these buttons will allow you to adjust the setting up or down. The exception is call sign entry. For this parameter, use the Dn button to select the horizontal position of the character you want to change, 1-9 from left to right. The use the knob to select the character (letter, numeral, punctuation) you want in that position. Pressing Up saves the character in the call sign. NOTE: The character position counter automatically advances when you save a character, so you only need to use the Dn button if you want to change one character.

Normal Button: Returns you to the Power/SWR screen

Here is a list of the various parameters and what they do, followed by a table of the default values.

Coupler…	Selects the coupler model that is plugged into the selected channel…. LPC501 , 502, 503, 504, 505
Power Alarm…	Sets the power alarm trigger point for the selected channel… 10 to 2500W in 10W steps This also sets the Peak Marker value.
SWR Alarm…	Sets the SWR alarm trigger point for the selected channel… 1.50 to 5.00 in 0.50 steps
Power Mode…	Selects power display type, either Net (F-R), ie. delivered power… or Fwd, ie. forward power.
AL Threshold…	Determines the minimum power required to activate the alarm system. Use higher values to prevent false triggering from other transmitters in multi-multi contest environments… 0.1, 1 ,10 50, 100W
SWR Rest Fmt…	Determines the graphic style for SWR display when not transmitting… 1.00, -.--, 0.00, Last
Brightness…	Sets the screen brightness… 10% to 100% in 10% steps
Pk Hold Time…	Sets the peak hold time in Peak power mode… 0.5, 1, 2, 3, 4, 5 seconds
Call: Pos Save…	Allows the user to set a character position and save the character to spell out his call sign.
Scr Svr Timer…	Sets the timeout values for the screen saver. Dims the screen to 10% after… 1, 2, 3, 4, 5 minutes
Sleep Timer…	Sets the timeout value for the screen to go to sleep… 10, 20, 30 minutes
Scr Svr Reset…	Determines whether the meter will wake when you transmit, or if you wish to manually wake it with the Mode button.
Alarm Volume…	Sets the volume of the alarm chimes… 10% to 100% in 10% steps. The chime sounds to help you set the right level.
Alarm Pitch…	Sets the approx. pitch of the alarm chimes (the chimes are actually specified as musical notes)… 300 to 900 Hz in 100 Hz steps
Hdwe Rev…	Displays the current firmware revision.

The default settings for a standard LP-500 are shown below.

Coupler CH x…	LPC501	Call: Pos Char…	Dn 1 Up L
Power Alarm CH1, CH3…	100W	Scr Svr Timer…	5 min
(Power Alarm CH2, CH4…	1500W	Sleep Timer…	30 min
SWR Alarm CH x…	2.0	Scr Svr Reset…	RF / Mode
Power Mode…	Net	Alarm Volume…	100%
AL Threshold…	10W	Alarm Pitch…	700 Hz
SWR Rest Fmt…	1.00	******	******
Brightness…	70%	Hdwe Rev…	v1.xx.xx
Peak Hold Time…	1 sec		

Recommended Usage of the LP-500…

For the most part, you will find the LP-500 intuitive and easy to use. Below are some recommended settings for the various modes of the LP-500, and how to maximize your experience using it.

Power/SWR Mode…

The key thing to remember in this mode is that the Range and Alarm buttons are indexed to the selected channel. This is true whether using manual or auto channel selection. The first thing you should do is to enter Setup and set the coupler type for each channel (currently all choices result in LPC501 parameters), and the desired power and SWR alarm trigger points for that channel. Then, in the Power/SWR screen, step through each channel manually, and select the range that you would like, and which channel should be the trigger for the selected channel. Normally this would be the same channel as the selected channel, but there are a number of circumstances where you might want different channels selected for power alarm and SWR alarm, as outlined in the Power/SWR section of this guide. The programmed values for the trigger points are displayed to the right of the SWR bargraph. If the alarm is triggered, the Alarm P or Alarm S displays will turn red to indicate whether the alarm was triggered by high power or high SWR.

Once you have the channels configured, you can select auto channel if you like. When in auto channel, the currently selected channel is displayed to the right of the SWR bargraph.

For most operating modes, Peak power should be selected, which displays and holds the peak value in the blue area of the display. The hold time is programmable in Setup, from ½ second to 5 seconds.

Waveform/'Scope Mode…

Again, the key thing to remember here is that the Range is indexed to channel. For instance, if you typically use 100W on channel 1, you can manually set the range to 40V/div. If you typically use 1500W on channel 2, you can manually set the range to 150V/div. You could also set both to AutoRng if you like, and let the meter select the correct scaling.

Here are the recommended Sweep settings for the indicated modes…

SSB…	SSB F or SSB S. The slower sweep shows more cycles of speech waveforms, but is a tad slower.
Two Tone Tests…	SSB F or SSB S. The fast sweep displays 2 cycles of the test pattern, while the slow sweep displays 4.
CW…	CW. Displays both the leading and trailing edges of the keying waveform, independent of keying speed.
PSK 31…	PSK F or PSK S. The slower sweep rate shows 4 cycles of the PSK signal, the faster rate shows a bit more than 1 cycle.

You can experiment with different combinations to get the display you prefer, and you can create your own sweep presets for custom displays where you can choose your own trigger mode and sweep rate, from 1 msec to 20 msec in 0.1 msec steps. Just as with a normal oscilloscope, the slower the sweep rate the slower the response.

The Wfm Style button selects the type of waveform display that's shown. Choices are as follows…

Wfm…	Traditional envelope display of modulation.
Trap…	Trapezoidal display of exciter output vs. amplifier output
Scope…	Traditional scope display of modulation waveform.
Wfm/Trap…	Split screen of Wfm on the left and Trapezoid on the right.
AM Mod…	Split screen of Wfm on the left, and bargraphs for positive and negative modulation on the right.
Wfm/Pwr…	Split screen of Wfm on the left, and bargraphs for power and SWR on the right.

There are some warnings that you should be aware of regarding this mode…

In either Trap display, you must connect a coupler at the input and output of your amplifier, as shown in the diagram on page 1 of this guide. The couplers must be plugged into either CH1 / CH2 or CH3 / CH4, with the amplifier output on the higher number channel. When in either trap mode, you must select the higher number channel. If you select the lower number channel, you will see an error message and the button will briefly turn red. If the amplifier is off, or on the wrong band, you will receive another error indicating that the amplifier gain is low. The LP-500 assumes that the amp should have a gain of at least 6 dB.

In AM Mod display, the LP-500 looks for pauses in speech to determine the carrier level. Typically, this happens when you first key up, before speaking, but also happens anytime there is no modulation. The meter needs this info to calculate modulation percentages.

The test tones to use in the Wfm displays are 2 Tone for SSB testing and 1 kHz for AM testing. The other choices are specially designed for the Spectrum mode, as explained on the next page in the Spectrum Mode section.

We will be posting some video tutorials on our LP-500 web page, www.telepostinc.com/lp500.html which will walk the user through various tests like amplifier linearity using the trapezoid display, frequency response tests using the white noise signal, two-tone IMD tests, etc.

Recommended Usage of the LP-500, Continued…

Spectrum Mode…

Before going through the settings, we need to address some factors affecting spectrum measurements. Notice that two of the test tones have a "subcarrier" added. These signals are used only in the Spectrum Mode. The purpose of this is to restore the missing carrier when testing in SSB modes. Without this, the envelope detectors in the coupler would produce a highly distorted signal in the audio realm, which is what we are really measuring in the Spectrum Mode. So, these test tones are really designed to produce a pseudo-AM signal when fed to a SSB balanced modulator so that the detectors in the couplers can cleanly demodulate this into two tones and their distortion products. This is not exactly the same as a traditional two-tone test, even though it looks similar. But it allows the use of standard type couplers over very wide frequency ranges (up to microwaves if desired) without the complicated circuitry of an RF spectrum analyzer or expensive ADC circuits which can cover UHF frequencies… or both.

Because the subcarrier tone must be stronger than the two test tones, this limits the peak power in the two tones, but still results in meaningful measurements on a relative basis, so that the user can see the degradation of the IMD products depending on amplifier settings, or when comparing one amplifier to another. Note: The rig must be capable of passing 200 Hz for this mode to work. Most rigs will do this, or have SSB passband options which allow adjustment of the low frequency cutoff.

The Noise+S signal is especially useful in adjusting parametric equalizers in SSB modes. For AM mode, a Noise signal is provided without the subcarrier tone. Keep in mind that the amplifier is being taxed to the full power limit because of the power in the subcarrier signal, which is stronger than the modulation signals.

In terms of settings, similar to what we saw in the other modes, the preamp gain settings are indexed to the selected channel. Normally, the gain can be left at +65 dBm or +55 dBm depending on whether you are using an amplifier, but occasionally when running very low power you may want to increase gain to +45 dBm full scale. If you use too much gain, the gain button will turn red and you will see an error message.

There are three span settings… 2.5, 5 and 10 kHz, with the option of either linear or logarithmic frequency scaling. Here are some recommended choices for some common tests…

Two Tone SSB…	2.5 kHz linear
Freq. Response…	5 or 10 kHz log
CW Bandwidth…	2.5 kHz linear
SSB or AM Bandwidth…	5 kHz log

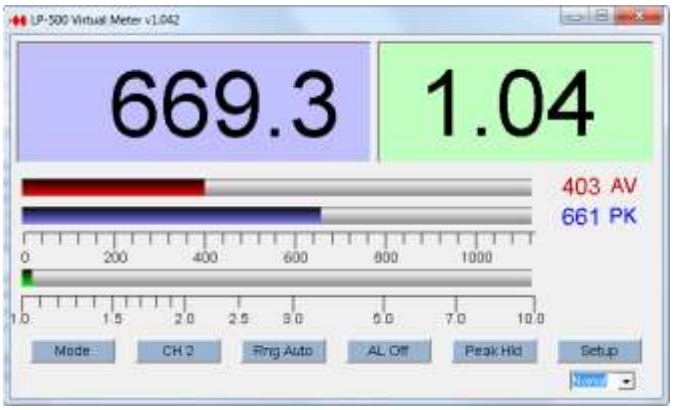
There is also a Span Multiplier button which decreases the span by a factor of 5:1 in the two narrowest ranges. Therefore, 2.5 kHz becomes 500 Hz and 5 kHz becomes 1 kHz. The span multiplier works in Linear modes and is useful for measuring the spectral width of CW or PSK signals. It should be noted than when the multiplier is on, it slows the meter own considerably. We recommend setting the averaging to 2. It is self-cancelling in that the Spectrum mode always starts with the multiplier off. This is done to eliminate starting in a slow mode.

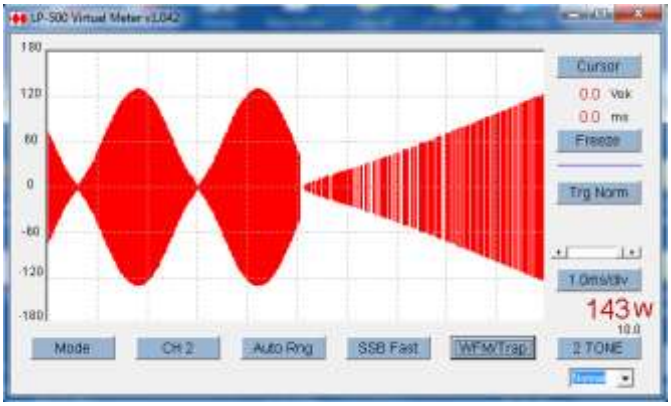
When making IMD tests, it is advisable to use +55 dBm reference gain setting when doing tests at 100W, or +45 dBm reference gain setting when doing tests at QRP levels. This not only lowers the noise floor, but places the signal and distortion products in a more linear range of the coupler detector. You should try to set the reference setting so that the two tones are at an indicated level of -10 to -20 dBm relative to the reference at the top of the display.

The Filter button should be On whenever using a test signal with subcarrier to filter out the carrier artifacts and to restore the proper frequency scaling to shift the display by the carrier frequency. This is automatic when selecting these test signals, but can be manually selected or deselected.

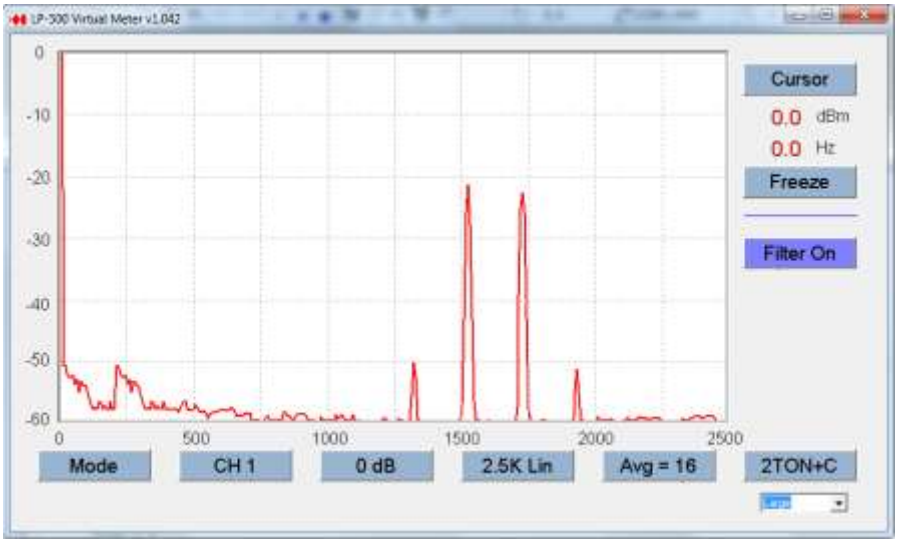
The averaging button can be set to taste. The higher the setting, the lower the noise floor, but also the slower the response. For frequency response measurements with white noise, it should be set to 8 or 16 to make it easier to see the curve.

LP-500 VM (Virtual Meter) Software for Windows





Above images are screen captures from the VM software. These images are scaled to half size for display in this manual. The images are taken using the “Normal” size setting of the VM, which is 600 x 360 pixels.



Above image is a screen capture from the VM software set to the “Large” size of 800 x 480 pixels.
Again, the image is scaled to half size for display in this manual.

In general, the VM works just like the meter itself, with all of the controls and displays mirroring the ones on the meter. The VM can run simultaneously with the meter and is fully bidirectional, meaning that any change at the meter will be reflected in the VM and vice versa. This includes the displays and controls. For those with limited space for the LP-500, this provides a much larger display, and higher resolution. The VM is a free download, like all TelePost software, and very easy to set up. If the meter is plugged into a USB jack on the PC, starting the VM will automatically connect to it.

Preliminary Specifications… (Using standard LPC501 Coupler)

General

Power Range…	0.1W to 3000W (slightly reduced accuracy below 5W).
Absolute Power Accuracy…	Better than 3% at 7 MHz, NIST traceable (<2% typical)
Relative Power Accuracy…	< +/-0.5% variation from 3.5 to 28 MHz, < +/- 1% from 1.8 to 54 MHz.
SWR Range…	1.00 to 9.99
SWR Accuracy…	Within 5%, 1.8 to 54 MHz.
Bar Graph Resolution...	600 steps for Each Range, Manual or Auto-Ranging
Directivity…	>30 dB, 1.8 to 54 MHz.
Return Loss …	>40 dB, 1.8 to 54 MHz.
Number of Channels…	8 simultaneous (FWD & REF power for 4 couplers)
A/D Converter	16-bit / 200ksps, with 2X to 16X oversampling.
DAC Resolution…	18-bit, 96 dB SNR
Screen Refresh…	5 Hz to 70 Hz, depending on mode, sweep/span setting.
Sampling Rate…	2.5k to 80 ksps, depending on mode, sweep/span setting.
Display Resolution	800 x 480 pixels (WVGA)
Display Type	TFT with White LED Backlight
Display Size	LP-500: 5" Diagonal, LP700: 7" Diagonal
Test Tone Output…	250 ohms, 500mV RMS, unbalanced, 0.01% THD
Power Requirements…	12-16VDC @ 800 mA maximum
Size…	LP-500: 8.0" x 6.0" x 4.5" (20.3cm x 15.2cm x 11.4cm) LP-700: ~9.0" x 7.5" x 4.5" (22.9cm x 19.0cm x 11.4cm)

Scope

Sweep Rate …	1.0 to 20.0 ms/division in 0.1 ms steps 5 Factory Presets and 3 User Adjustable Presets
Display Modes …	6, including 3 split screens
Trigger Modes …	5
AM Modulation % …	0 to 150 positive, 0 to 100 negative.
Cursors …	2, measuring peak voltage and time (ms)
Markers...	2, adjustable to show preset power limits

Spectrum

Frequency Spans...	2.5, 5.0 & 10.0 kHz, w/linear or log scaling
Span Multiplier...	5x (500 & 1000 Hz, linear)
RBW…	1 to 20 Hz, depending on span
Averaging…	2X to 16X
Reference Level…	+45, +55, +65 dBm Full Scale
ADC Dynamic Range…	> 90 dB
Coupler Dynamic Range...	Up to 80 dB, depending on modulation type
Cursors …	2, measuring peak power (dBm) and frequency (Hz)
Marker...	1, adjustable to show preset power limit

Warranty

LP-500 is warranted against failure due to defects in materials and workmanship for two years from the date of purchase from TelePost Inc. Warranty does not cover damage caused by abuse, accident, improper or abnormal usage, improper installation, alteration, lightning or other incidence of excessive voltage or current.

If failure occurs within the warranty period, return the LP-500 to TelePost Inc. at your shipping expense. The device will be repaired or replaced, at our option, without charge, and returned to you at our shipping expense. Repaired or replaced items are warranted for the remainder of the original warranty period. You may be charged for repair or replacement of the LP-500 made after the expiration of the warranty period at our discretion or where, in our reasonable opinion, the damage is due to abuse, accident, improper or abnormal usage, improper installation, alteration, lightning or other incidence of excessive voltage or current.

TelePost Inc. shall have no liability or responsibility to customer or any other person or entity with respect to any liability, loss or damage caused directly or indirectly by use or performance of the product or arising out of any breach of this warranty, including, but not limited to, any damages resulting from inconvenience, loss of time, data, property, revenue or profit, or any indirect, special incidental, or consequential damages, even if TelePost Inc. has been advised of such damages.

Under no circumstances is TelePost Inc. liable for damage to your amateur radio equipment resulting from use of the LP-500, whether in accordance with the instructions in this Manual or otherwise.

Copyright and Trademark Disclosures

Compliance Statements…

LP-500 has been tested and fully documented in according to the following standards…

ANSI C63.4 – Radio Noise Emissions 2003.12
CFR47 FCC Part 15, SubPart B, Class B limits
AHD/SEI test procedures TP0101LC, TP0102RA
EN55022 ITE Disturbance 2005.11
EN61000-6-3 Generic 2007.2
EN61326-1:2006 (E)
EN61000-4-2
EN61000-4-3

Tests were conducted at the following accredited test facilities…

University of Michigan Radiation Laboratory, Ann Arbor, MI
AHD LC EMC Lab, Sister Lakes, MI – NVLAP LAB CODE 2001290

Federal Communications Commission Statement (USA)

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
I. Reorient or relocate the receiving antenna.
ii. Increase the separation between the equipment and receiver.
iii. Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
iv. Consult the dealer or an experienced radio/TV technician for help.

European Union Declaration of Conformity

TelePost Inc. declares that the product:
Product Name: Digital Station Monitor
Model Number:LP-500
Conforms to the following Product Specifications:
EN 55022: 1998 Class B
following the provisions of the Electromagnetic Compatibility Directive 89/336/EEC

Industry Canada Compliance Statement

Canada Digital Apparatus EMI Standard

This Class B digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment Regulations.
Cet appareil numerique de la classe B respecte toutes les exigences du Reglement sur le material brouilleur du Canada.