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**VECTRONICS**

**HFT-1500 Digital Bargraph Antenna Tuner**

**FEATURES**

The Vectronics HFT-1500 optimizes the performance of your antenna and transmitter or SWL receiver by providing adjustable impedance matching. The HFT-1500 also measures the Power and Standing Wave Ratio (SWR), which allows you to tune the indicted SWR to the lowest possible ratio for the selected transmit frequency. The HFT-1500 also features a precision frequency compensated lighted dual movement SWR meter. Included with the tuner is an unique Digital Bargraph Display that enables you to analyze peak SSB power measurements. Level and Delay controls are front panel adjustments.

**SPECIFICATIONS**

**FRONT PANEL INDICATORS AND CONTROLS**

- Meter ..... Dual movement D'Arsonval lighted cross needle Power and SWR meter. RF directional coupler sensing head for the internal wattmeter circuit. Meter is lighted.
- Bargraph Display..... 21 segment LED display to indicate 100% peak reading with adjustable level and delay.

**CONTROLS**

- Input Tuning ..... Continuous rotation 4.5 kV capacitor.
- Antenna Tuning..... Continuous rotation 4.5 kV capacitor
- Inductance ..... 28 uH roller inductor with #10 bright tin plated wire and Delrin/Teflon body.
- Antenna Switch Selector ..... Six position ceramic coax switch: COAX 1, Tuned and Tuner Bypass, COAX 2, Tuned and Tuner Bypass, Bypass and Balanced Antenna.
- Power Range Switch ..... Two position: 300W/3000W
- Inductor Control/Tune..... Dual nylon gear driven, Veerderoot precision 5 digit mechanical counter for accurate resetability.

**REAR PANEL CONNECTORS**

- Coax 1 ..... SO-239 connector
- Coax 2 ..... SO-239 connector

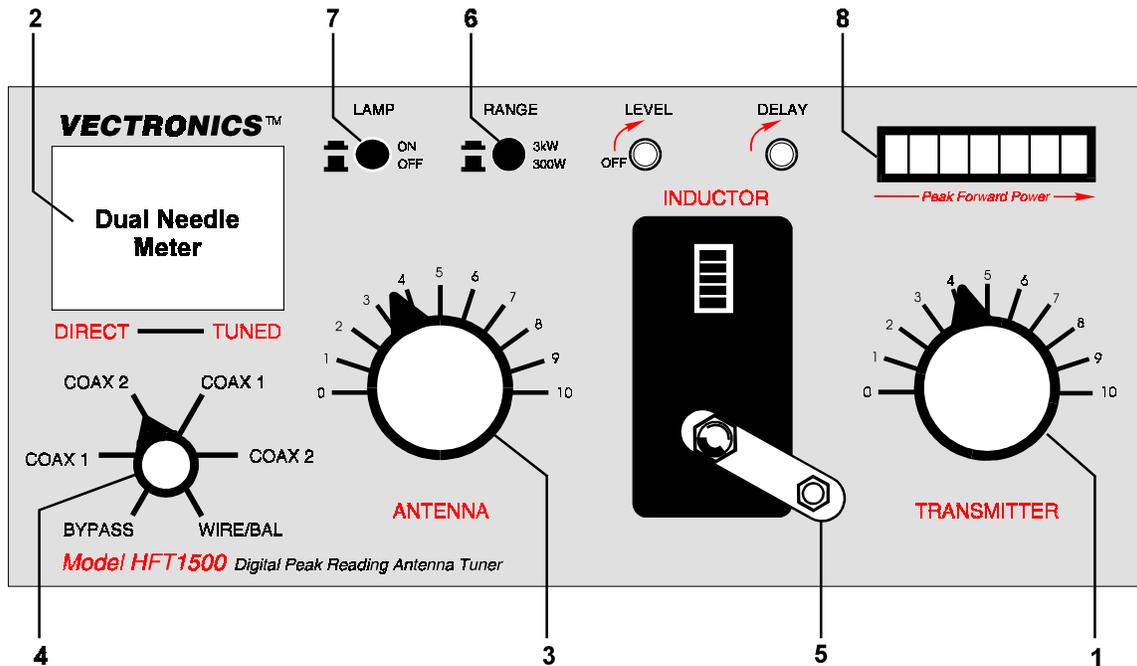
- Bypass ..... SO-239 connector
- RF Input..... SO-239 connector
- Balanced Line..... Dual high voltage Derlin terminal post; includes 4:1 2.5 kW voltage balun (Ruthroff type).
- End-Fed Wire ..... High voltage Derlin terminal post.

**OTHER**

- Frequency Coverage..... 1.8-30 MHz; continuously tunable.
- Power Maximum..... 1000 Watts single tone continuous; 2 kW PEP SSB.
- Dimensions..... 5.5" (140 mm) H x 12.5" (318 mm) W x 12" (305 mm) D
- Weight..... 10 lbs. (4.5 kg.)

**CONTROLS / CONNECTORS**

**FRONT PANEL FUNCTIONS**



1. TRANSMITTER  
Continuously adjustable input capacitor
2. POWER / SWR METER  
Dual needle meter displays FOWARD and REFLECTED Power in Watts.

The SWR is measured where the two needles intersect on the red scale.

### 3. ANTENNA

Continuously adjustable output capacitor.

### 4. DIRECT-TUNED MODE SWITCH

Six-position rotary switch and an output coaxial connector.

1. DIRECT BYPASS selects BYPASS COAX connector bypassing the impedance matching circuit but providing SWR, FORWARD, and REFLECTED power meter readings.
2. DIRECT COAX 1 selects the COAX 1 connector bypassing the impedance matching circuit but providing SWR, FORWARD, and REFLECTED meter readings.
3. DIRECT COAX 2 selects the COAX 2 connector bypassing the impedance matching circuit but providing SWR, FORWARD, and REFLECTED meter readings.
4. TUNED COAX 1 selects the COAX 1 connector through the impedance matching circuit.
5. TUNED COAX 2 selects the COAX 2 connector through the impedance matching circuit.
6. TUNED WIRE/BAL selects the END FED WIRE connector through the impedance matching circuit. For balanced antennas, the wire antenna post is externally connected to the balanced line.

### 5. INDUCTOR

28  $\mu$ H continuously variable Derlin roller inductor driven by a crank handle. A gear-driven precision mechanical counter is coupled to the crank handle.

### 6. RANGE SWITCH

Two-position push button switch selects the range (300w or 3kW) of FORWARD and REFLECTED Power displayed on the power meter.

When the METER button is out, the FORWARD meter scale reads 300 watts full scale and the REFLECTED meter scale reads 60 watts full scale. When the METER button is in, the FORWARD meter scale reads 3000 watts full scale and the REFLECTED meter scale reads 600 watts full scale.

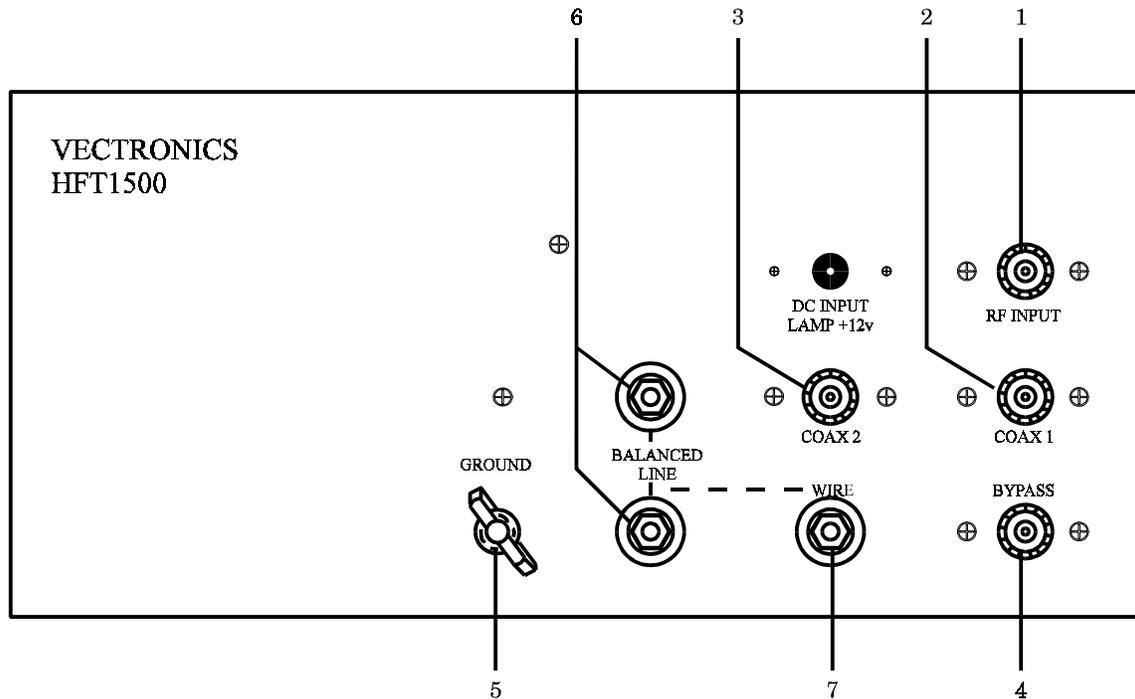
### 7. LAMP

A two position switch selects whether the meter is illuminated.

### 8. DIGITAL BARGRAPH DISPLAY

A 21 digit LED bargraph which display is capable of responding to SSB signals or CW. The sensitivity of the display is controlled by the LEVEL control on the front panel. The delay of the SSB signal is continuously variable by the DELAY control.

## REAR PANEL CONNECTORS



### 1. RF INPUT

Coaxial connector for input from SWL receiver or transmitter.

### 2. COAX 1

Coaxial connector for output to Antenna One.

### 3. COAX 2

Coaxial connector for output to Antenna Two.

### 4. BYPASS

Coaxial connector for output to dummy load or third coax output. Bypasses tuner, but meter circuits and digital bargraph remain active if AC adapter is connected to the jack located on the rear panel.

### 5. GROUND

Post/Wing-nut type ground connector.

### 6. BALANCED OUTPUT

Two Derlin High Voltage post for output to RF balanced twin-lead antennas. (Note that jumper must be used as shown by the dotted line.)

### 7. END FED WIRE

Derlin High Voltage post for output to a single-wire antenna. (Do not use jumper.)

## INSTALLATION

Carefully unpack your HFT-1500 from the packing carton and inspect it for signs of damage. If any damage is apparent, notify the transportation carrier or dealer immediately. We recommend keeping the packing carton for moving, storage, or reshipping the tuner.

Select a location for the HFT-1500 that allows the connectors to be free of any possible contact during operation.

**WARNING: SOME BALANCED OR END-FED ANTENNAS WILL PRODUCE HIGH RF VOLTAGES AT THE BANANA CONNECTORS. RF BURNS MAY RESULT IF TOUCHED DURING TRANSMISSION.**

### INSTALLATION PROCEDURES

1. Connect a coax cable from your transmitter or receiver to the RF INPUT connector on the rear panel. Keep the cable as short as possible. If you use a linear amplifier, connect your transmitter to the linear amplifier output to the HFT-1500. **Do not use more than 1000 watts average (single tone) through the tuner.**
2. Connect coax cable(s) from your antenna to COAX 1 or COAX 2 connectors on the rear panel. These connectors are either direct from the transmitter or through the tuned circuit depending on the setting of the OUTPUT SELECTOR switch on the front panel.
3. If you are using a balanced feed antenna, connect a balanced line to the BALANCED OUTPUT connectors and jumper banana jack (8) with lower jack (7) as shown by dotted line.
4. If using a single wire antenna, connect it to post (7) without installing jumper.
5. Connect a dummy load to the BYPASS (4) connector using a coax cable. This lets you select the dummy load from the OUTPUT SELECTOR switch. Any antenna that does not require the use of an antenna tuner may be connected to the BYPASS connector, if desired.

### BEFORE OPERATION

1. To avoid possible damage to the HFT-1500, set TRANSMITTER, ANTENNA, INDUCTOR, and POWER RANGE switches as outlined in the next section before applying transmitter power. (Tuning Section)
2. Begin tuning with your transmitter set at a low power setting (**50 to 100 W**)

**WARNING: DO NOT OPERATE THE HFT-1500 WITH THE COVER OFF!**

## TUNING

1. Select the band and frequency of desired operation.
2. Set TRANSMITTER, ANTENNA, and INDUCTOR controls to the suggested settings before applying transmitter power. Actual settings may vary from antenna to antenna.

BAND/ FREQUENCY	ANTENNA		INDUCTOR		TRANSMITTER	
	Sug.	Actual	Sug.	Actual	Sug.	Actual
160 M / 1.8 MHz	9.0		70		8.5	
75 M / 3.75 MHz	7.0		280		7.0	
40 M / 7.15 MHz	3.0		325		3.0	
30 M / 10.125 MHz	2.5		350		2.5	
20 M / 14.175 MHz	1.5		360		1.5	
17 M / 10.118 MHz	1.0		380		1.2	
15 M / 21.225 MHz	1.0		380		1.0	
12 M / 24.940 MHz	1.0		390		0.6	
10 M / 28.850 MHz	0.6		390		1.0	

3. Set up your transmitter to a low power output. If your transmitter has a TUNE position, select that position.
4. If you use a linear amplifier, set it to STANDBY. Do not use the linear amplifier until the HFT-1500 is tuned.

**WARNING: DO NOT EXCEED 1000 WATTS AVERAGE (SINGLE TONE).**

5. Set POWER RANGE switch to 300W (with meter button out).
6. Set OUTPUT SELECTOR switch to BYPASS, or the position matching your antenna connection. To tune your antenna, the switch selection must be set to: COAX 1 TUNED, COAX 2 TUNED, or WIRE (BALANCED ANTENNA). Selecting COAX 1 DIRECT, COAX 2 DIRECT, or BYPASS, bypasses the tuning section.
7. Rotate the TRANSMITTER, ANTENNA, and INDUCTOR controls for maximum noise or signal as heard on your receiver.
8. Key your transmitter and adjust the power level for a reading of 50-100 watts on the FORWARD scale. Adjust the TRANSMITTER, ANTENNA, and INDUCTOR

controls for a minimum REFLECTED reading while maintaining a FORWARD reading of 50-100 watts using your transmitter power control.

9. Read the SWR on the red scale at the point where the two needles intersect. Repeat step 8 until the lowest SWR reading is obtained. The SWR should be 2:1 or lower.

**Note:** This procedure takes patience the first time. The TRANSMITTER and ANTENNA controls vary the capacitors and provide fine adjustments. The INDUCTOR control provides coarse adjustment.

10. When you have tuned your antenna to the best SWR, record the settings of the TRANSMITTER, ANTENNA, and INDUCTANCE controls on the previous chart for future reference. When you retune, use these settings as your starting point.

## USING THE BARGRAPH

1. Plug in the AC adapter provided with your tuner into jack located on the back panel.
2. In the Tuning Section after completing the tune-up sequence, key your transmitter through the tuner into the dummy load (e.g. DL-650; DL-500). Adjust for a meter reading of 100 Watts Forward (at this time the SWR will have been adjusted for minimum value as outlined in the Tuning Section).
3. Rotating the LEVEL control activates the bargraph and the segments will illuminate progressively as the LEVEL control is increased. If your cross-needle meter is reading 100 Watts as indicated in (2) rotate LEVEL control so that the last LED (red) illuminates. **This signifies that the 100 Watt average single tone reading on the cross-needle meter display is identical to the power reading of 100 Watts single tone on the digital display.** Without any further adjustment of the LEVEL control, switch your transmitter to SSB and speak normally into the microphone and you will notice that the cross-needle meter will read approximately 30-40 Watts and the digital display will show an output of 100 Watts PEP when red LED ignites while you are speaking. This will confirm that the cross-needle meter reads 30-40 Watts average assuming you started with the 100 Watts single-tone as described above and the digital display will read voice peaks of 100 Watts (**100 Watts PEP**).

**Note:** All cross-needle meters read average power when you are using the transmitter in the SSB mode. Some cross-needle meter displays are capable of peak-reading but will read 20% low because of directional coupler driver impedance problems.

4. Once satisfied you are getting the right results in (3), while you are speaking into the microphone with the DELAY control fully counter-clockwise, the forward peak indication on the meter will be as quick in response as the delay. If this is not a desirable condition, rotate the DELAY control counter-clockwise until the desired amount of DELAY is introduced in the display. The forward fast attack time is not affected by the DELAY control.

## **NOTES**

1. An SWR or 1:1 is best, but an SWR as high as 2:1 may be acceptable. Check your transmitter manual for details.
2. If you cannot get an acceptable SWR, lengthen or shorten your antenna and/or feedlines and retune.
3. If you get low SWR readings at more than one setting, use the setting that:
  - Gives the highest FORWARD power reading.
  - Gives the lowest REFLECTED power reading.
  - Uses the largest capacitance (highest number) on the TRANSMITTER and ANTENNA controls.
4. Any time a new or different antenna is connected, it is necessary to repeat the tuning procedure for each antenna.

## **TECHNICAL ASSISTANCE**

If you have any problem with this unit first check the appropriate section of this manual. If the manual does not reference your problem or your problem is not solved by reading the manual you may call VECTRONICS at 601-323-5800. You will be best helped if you have your unit, manual and all information on your station handy so you can answer any questions the technicians may ask.

You can also send questions by mail to VECTRONICS, 300 Industrial Park Road, Starkville, MS 39759 or by Fax to 601-323-6551. Send a complete description of your problem, an explanation of exactly how you are using your unit, and a complete description of your station.

## METER CALIBRATION

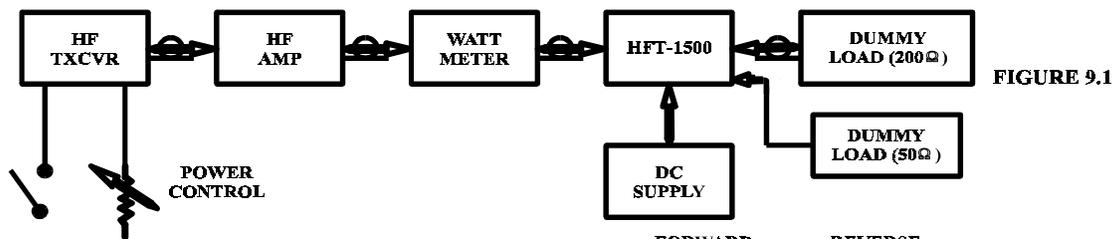


FIGURE 9.1

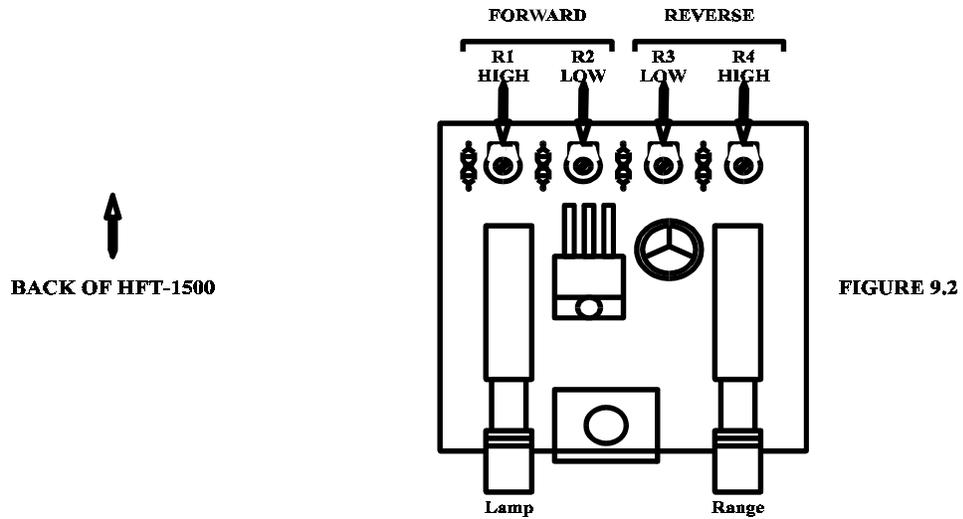


FIGURE 9.2

### METER CALIBRATION PEOCEDURE

- Connect the HFT-1500 as depicted in Figure 9.1.
- Connect external 50Ω load to COAX 1 connector and the HF amplifier to the RF INPUT connector.
- Set the COAX 1 DIRECT position on the selector switch.
- Set the mid range the two capacitors on the RF sampler board and the four potentiometers on the switch board.
- Select the 300 W range button and zero the two meters using a small slot screwdriver.
- Apply 100W of RF at 7.0 MHz from the receiver. By adjusting the trimmer capacitor closest to the rear panel, null the reflected power needle.
- Reverse the connections on RF INPUT and COAX.
- Apply 100 watts of RF power at 7.0 MHz. Adjust the trimmer capacitor closest to the front panel to null the forward power needle.
- Depress the RANGE button to select the 3000 Watt range and adjust R4 (in figure 9.2) until the reflected power reads 100 W.
- Reduce the power to 10 W, release the RANGE button and adjust R3 until the reflected power reads 10W.

- Reverse the connections on RF INPUT and COAX 1.
- Select the 300 watt range on the RANGE button, apply 100 Watts of RF power at 7.0 MHz and adjust R2 for a forward reading on 100 Watts.
- Select the 3000 Watt range, apply 800 Watts of RF power at 7.0 MHz and adjust R1 for a reading of 800 Watts.

## **YOUR NOTES**

# SCHEMATIC DIAGRAM

