

# YAESU

## VL-1000

### OPERATING MANUAL

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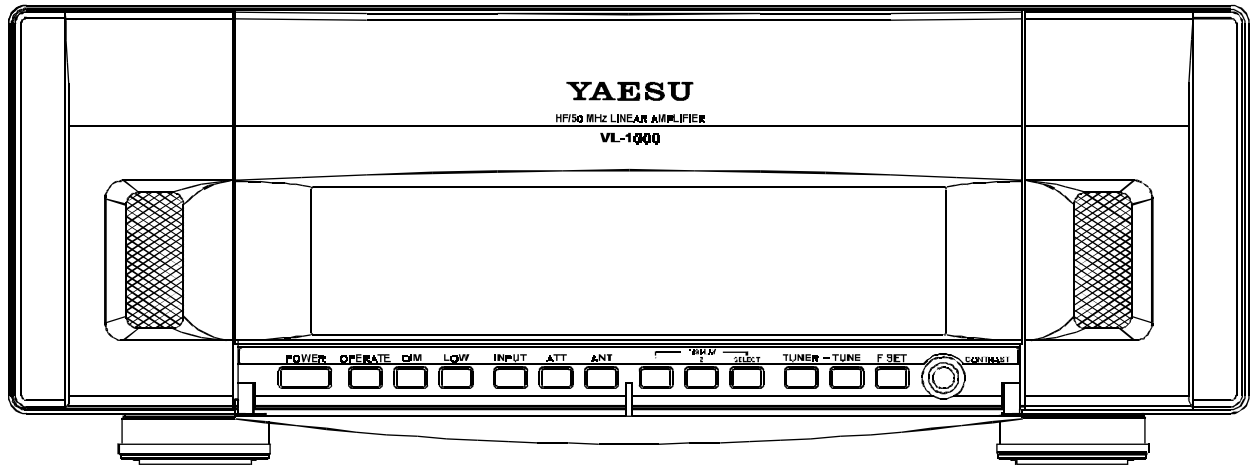
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# General Description



Congratulations! You are now the owner of the Yaesu VL-1000 Linear Amplifier, which brings you leading-edge technology for the ultimate in operating convenience and reliability. We appreciate your investment in Yaesu equipment, and wish you many years of satisfying operation using your new amplifier!

The VL-1000 is an all-solid-state linear amplifier operating on the 160 through 6 meter amateur bands (USA version: 160-15 meters) at a power output level of 1000 Watts on CW and SSB (500 Watts on continuous data modes such as RTTY). The VL-1000 includes a built-in antenna tuner with 240 memories for tuning data, and microprocessor control of the tuning circuitry. The VL-1000 features input jacks for two different exciters, as well as four antenna jacks for connection of antennas for different bands. Extensive self-test, system monitoring, and protection circuits are provided, with status and tuning information being displayed on a huge Liquid Crystal Display panel.

The separate VP-1000 Power Supply Unit provides the +48 Volts required by the PA transistors, as well as all required control voltages for the amplifier. The VL-1000 normally is powered via 220 Volt AC mains, although it can be operated, at the 500 Watt level, from 117 Volt AC power.

We encourage you to read this manual thoroughly before beginning installation and operation of your VL-1000 Linear Amplifier. The details regarding proper installation and operating advice contained in these pages will help you derive maximum satisfaction from your new Yaesu equipment. Be certain to observe all due safety precautions when using this high-power device!

## Supplied Accessories

<u>Item</u>	<u>Quantity</u>
ALC Cable (T9101489; 2 m)	1
Band Data Cable (T9101487A; 8-pin DIN ↔8-pin DIN, 2 m)	1
Control Cable (T9101491; D-sub 15-pin ↔RCA, 2 m)	1

# Installation

The proper, safe installation of the VL-1000 is not difficult to accomplish, using the guidelines to follow.

## Caution!

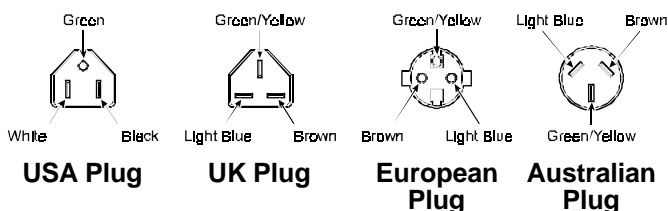
**Lethal AC and RF voltages are present within the cabinets of the VL-1000 Linear Amplifier and VP-1000 Power Supply. Use extreme caution when opening the cabinet(s) to perform any alignment or adjustment steps, and take particular care to inspect interconnection cables frequently to ensure that they are in good condition.**

**It is assumed that you possess technical knowledge and experience consistent with your possession of an amateur radio license; this knowledge and experience are important tools which will aid in the successful installation of this apparatus. Should you have any questions about the safe installation of this equipment, consult your Yaesu dealer or seek the assistance of a professional installer.**

## AC Power Connections (using VP-1000 Power Supply)

The VL-1000 is usually operated from 220 Volt (nominal) AC power. With 220 Volt input to the VP-1000 Power Supply, full (1000 W) power output will be obtained from the VL-1000, while 117 Volt input to the VP-1000 is possible at the 500 Watt power output level.

The advanced switching-regulator power supply used in the matching VP-1000 Power Supply does not require any transformer rewiring, nor any changing of a switch position; the power supply will operate from either 220 or 117 Volt line voltages without configuration changes.



(viewed from plug prong side)

However, the AC power cable/plug configuration *will* be somewhat different, depending on the country in which you purchased your amplifier. In some countries, the VP-1000 is shipped with the standard 220 Volt connector appropriate for your location. In those areas where there are multiple 220 Volt connectors in common use, the VP-1000 is shipped *without* the power connector; one may be obtained at a local hardware or electrical supply store.

Pictorial diagrams of the common 220 and 117 Volt AC connectors in use are shown below. When wiring your own connector, be absolutely certain to observe the proper polarity on the pin connections. Consult with an electrician if you have any doubts about your wiring!

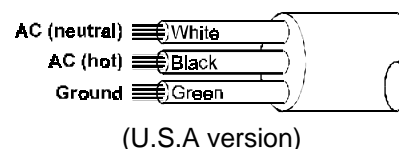
Be sure that your house wiring is capable of sufficient current capacity on the 220 Volt circuit to be used, especially if this circuit is shared with household appliances. It always is preferable to operate the VL-1000 from a dedicated 220 Volt circuit with its own circuit breaker.

## Transceiver or Exciter Interconnections

The interface wiring to the transceiver or transmitter which drives the VL-1000 consists of:

- (A) A 50  $\Omega$  coaxial cable for carrying RF drive power from each exciter to the amplifier;
- (B) A 2-conductor transmit/receive control cable which provides a closure to ground signal from the transceiver to the amplifier during transmission;
- (C) A (supplied) 2-conductor ALC (Automatic Level Control) line, used to limit the drive level from the exciter to the amplifier; and
- (D) When using a compatible Yaesu trans-

### VP-1000 AC Cable wiring



(U.S.A version)



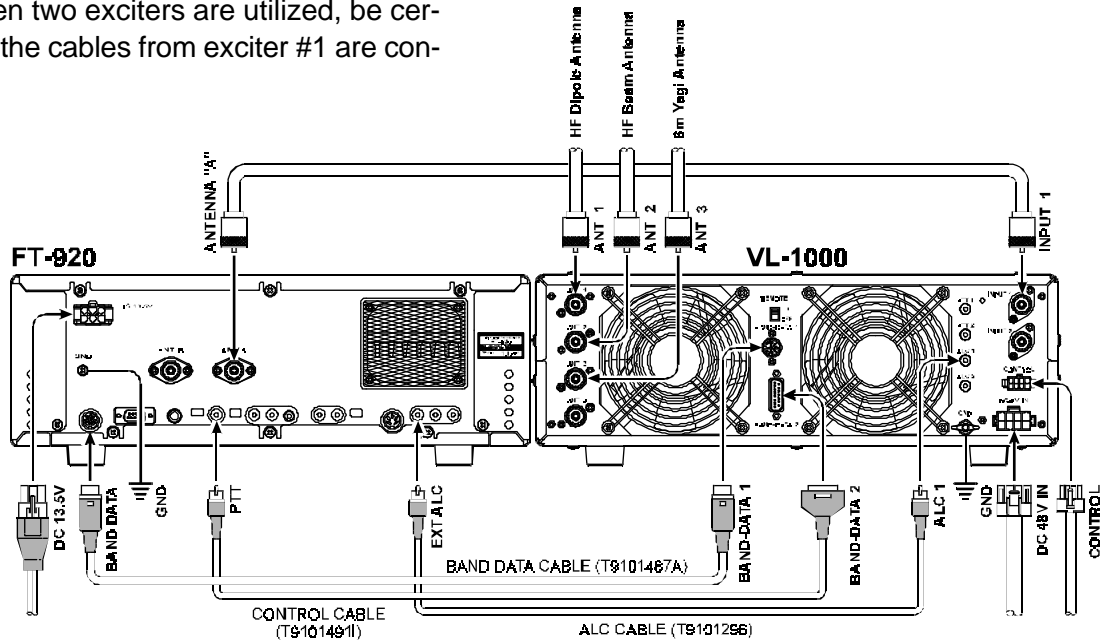
(European version)

# Installation

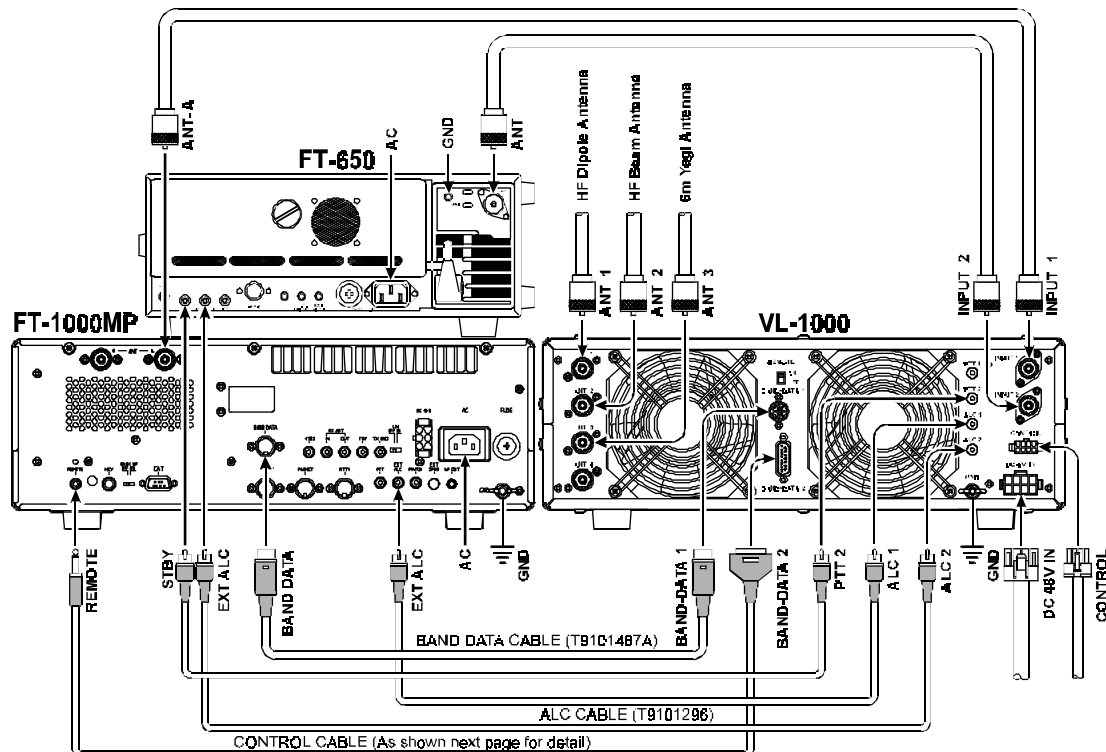
ceiver, a **BAND DATA** cable may be connected which provides automatic band change and T/R control (thus eliminating the need for cable (B) above), and +48 V DC supply voltage On/Off control (if the **REMOTE** switch on the rear panel of the VL-1000 is set to the **ON** position).

connected to the **INPUT 1/PTT 1/ALC 1** jacks, and that all cables from exciter #2 are connected to the **INPUT 2/PTT 2/ALC 2** jacks. When using a **BAND DATA** cable for interconnection, you do not need the **PTT** cable for the corresponding exciter, as the T/R control signal will be made via the **BAND DATA** cable.

Typical installation diagrams are shown below. When two exciters are utilized, be certain that all the cables from exciter #1 are con-



**FT-920/VL-1000**



**FT-1000MP/FT-650/VL-1000**


# Installation

## Antenna Connections

As many as four HF or 50 MHz antennas may be connected to the rear panel Antenna jacks, labeled **ANT 1** ~ **ANT 4**. The antenna to be used on a particular band will be memorized once you make the selection manually via the front panel **ANT** switch. See the “**Operation**” section of this manual for more details.

## ALC Connections

The VL-1000 provides negative-going ALC, which provides a negative voltage to the exciter which begins to appear when sufficient drive power from the exciter is being received; the voltage becomes of greater (negative) magnitude if the drive is increased, so as to prevent overdrive of the amplifier. The voltage range provided from the VL-1000 is 0 to  $-10$  Volts DC, and this is compatible with all Yaesu transceivers as well as many exciters of other manufacture. At 1000 Watts of output power, the typical voltage generated for use with Yaesu transceivers is about  $-4$  V DC.

 The ALC cable must be connected between the transceiver and VL-1000 to prevent overdrive of the amplifier, and especially to facilitate the proper operation of the protection circuitry if sudden antenna system problems should cause the SWR to rise to dangerous levels.

## PTT Connections

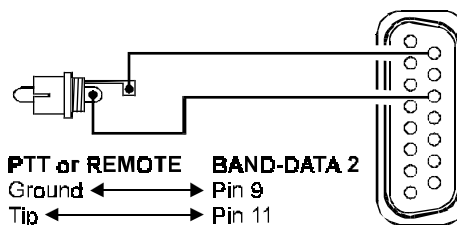
These jacks, labeled **PTT 1** and **PTT 2**, accept T/R control signals from your exciter. Grounding the center pin of one of these PTT jacks will cause the amplifier to be placed in the “Transmit” mode.

These jacks utilize a positive voltage (+5V DC) at very low current (10 mA maximum), so they are compatible with most open-collector NPN transistor amplifier control circuits in modern transceivers. Mechanical relays may also be used, so long as they are “floating” contacts that do not apply a voltage to the VL-1000’s **PTT** jacks. On Yaesu transceivers, use either the transistor or relay (Normally Open)

connections labeled **Tx GND** on the rear panel of the transceiver; do *not*, however, use the *transceiver’s* **PTT** jack, as it was designed for *PTT input* (via a footswitch, etc.), not for amplifier control.

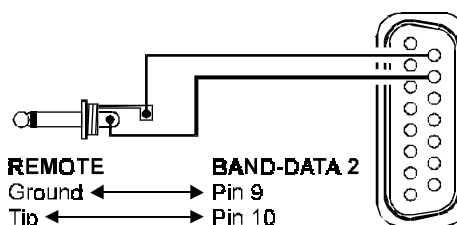
## Automatic Amplifier Tune-Up

If you connect the supplied control cable between the transceiver’s **PTT** or **REMOTE** jack and the VL-1000’s **BAND-DATA 2** jack, the transceiver will automatically transmit when you press the amplifier’s front panel **F SET** key (make sure that the **MODE** switch of the transceiver is set to CW, RTTY, or some other continuous mode, and set the **DRIVE** or **Rf PWR** control fully clockwise, if you want to perform antenna tuning). To accomplish this function, pin 11 of the **BAND-DATA 2** jack closes the transceiver’s **PTT** or **REMOTE** jack to ground, thus placing the transceiver in the transmit condition.

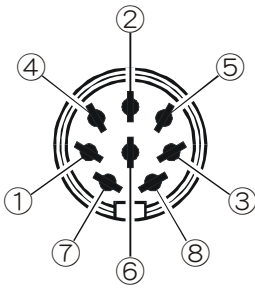
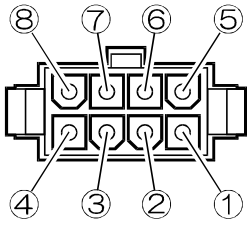
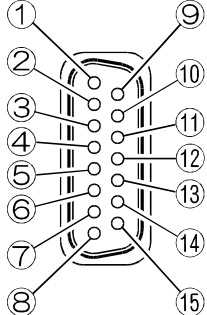
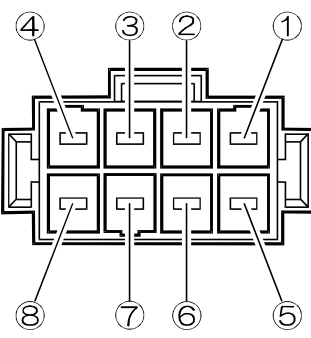
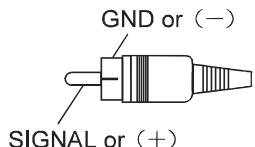


## Automatic Amplifier Tune-Up using FT-1000MP Transceiver

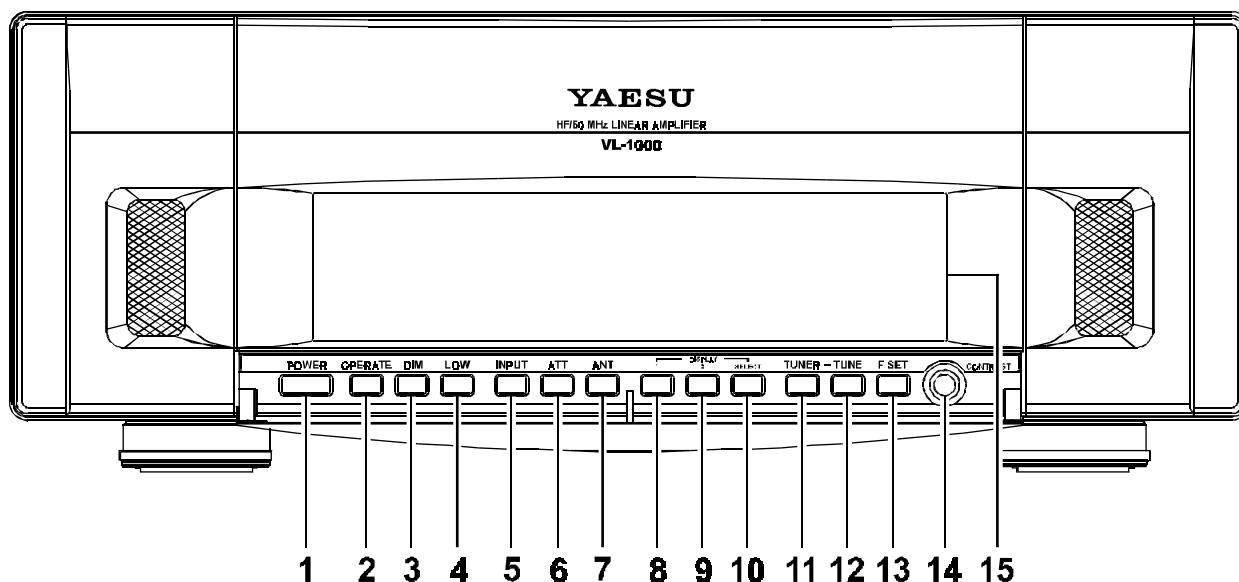
When using the VL-1000 in conjunction with the FT-1000MP transceiver, the front panel **F SET** key may be used to initiate an automatic tuning procedure for the amplifier. In order to accomplish this, Menu Item 7-9 on the FT-1000MP must be set to “**KEYER**” (which is its default value), and a control cable must be connected between the FT-1000MP’s **REMOTE** jack and the VL-1000’s **BAND-DATA 2** jack. The required wiring for this cable is shown below.



# Plug Pinout

BAND-DATA 1	CONTROL
 <ul style="list-style-type: none"> <li>① +13.5V</li> <li>② TX GND</li> <li>③ GND</li> <li>④ BAND DATA A</li> <li>⑤ BAND DATA B</li> <li>⑥ BAND DATA C</li> <li>⑦ BAND DATA D</li> <li>⑧ TX INH</li> </ul> <p style="text-align: right;"><i>as viewed from rear panel</i></p>	 <ul style="list-style-type: none"> <li>① NC</li> <li>② GND</li> <li>③ REMOTE</li> <li>④ PS ALARM</li> <li>⑤ LOW POWER</li> <li>⑥ GND</li> <li>⑦ -12V INPUT</li> <li>⑧ +12V INPUT</li> </ul> <p style="text-align: right;"><i>as viewed from rear panel</i></p>
BAND-DATA 2	DC48V IN
 <ul style="list-style-type: none"> <li>① +13.5V</li> <li>② TX GND</li> <li>③ GND</li> <li>④ BAND DATA A</li> <li>⑤ BAND DATA B</li> <li>⑥ BAND DATA C</li> <li>⑦ BAND DATA D</li> <li>⑧ TX INH</li> <li>⑨ F SET COMMON</li> <li>⑩ F SET 1</li> <li>⑪ F SET 2</li> <li>⑫ NC</li> <li>⑬ NC</li> <li>⑭ NC</li> <li>⑮ GND</li> </ul> <p style="text-align: right;"><i>as viewed from rear panel</i></p>	 <ul style="list-style-type: none"> <li>① +48V INPUT</li> <li>② +48V INPUT</li> <li>③ +48V INPUT</li> <li>④ +48V INPUT</li> <li>⑤ GND</li> <li>⑥ GND</li> <li>⑦ GND</li> <li>⑧ GND</li> </ul> <p style="text-align: right;"><i>as viewed from rear panel</i></p> <div style="text-align: center; border-top: 1px solid black; padding-top: 5px;"> <h3>RCA Plug</h3>  </div>

# Front Panel Controls and Switches



## 1. POWER Switch

This switch turns the VL-1000 on and off. When the amplifier is turned off, the **INPUT 1** jack is connected directly to the **ANT 1** jack. If using a Yaesu transceiver with a **BAND DATA** cable, the VL-1000 AC power will be remotely controlled by the *transceiver's* power switch when the **REMOTE** switch on the rear panel of the VL-1000 is set to **ON**.

## 2. OPERATE Switch

Pressing this switch activates the power amplifier section of the VL-1000. When the power amplifier is activated, "OPERATE" will appear on the display. Press this switch again to turn off the power amplifier section.

## 3. DIM Switch

This switch selects the brightness level of the LCD display. In low-light situations, activating the Dimmer may reduce excess brightness in the display. For normal room lighting, however, the Dimmer should be set to **OFF** for best visibility.

## 4. LOW Switch

This switch selects the RF output power. When in the LOW position, the RF output power will be reduced to (approximately) 500 watts PEP, and "LOW" will appear on the display.

**Note:** This switch should be set to the LOW position when operating from a 100 ~ 117 VAC power source.

## 5. INPUT Switch

Press this switch to toggle between the exciters connected to the **INPUT 1** and **INPUT 2** connectors on the rear panel. The indicator "INPUT 1" or "INPUT 2" will appear on the display to indicate which exciter is in use.

## 6. ATT Switch

This switch activates a 3 dB input RF power attenuator, to reduce excessive input power from the exciter. It should be on if exciter output exceeds 100 watts PEP, as is the case when using the FT-1000/D. The "ATT" indicator will appear on the display when this switch is on.

# Front Panel Controls and Switches

## 7. ANT Switch

This switch can be used for manual selection of up to four antennas. The antenna selection is stored in memory, so once selected and matched on a particular band, the same antenna will be reselected automatically when recalling that band. One of the indicators “ANT 1” to “ANT 4” will appear on the display to indicate which antenna is in use.

## 8. DISPLAY 1 Switch

Press and hold this switch for ½ second to copy the current display into Display Memory #1. Press this switch *momentarily* to recall the Display Memory 1 data to the display. This switch is also used for alignment of the ALC system, if needed.

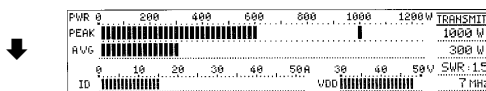
## 9. DISPLAY 2 Switch

Press and hold this switch for ½ second to copy the current display into Display Memory #2. Press this switch *momentarily* to recall the Display Memory 2 data to the display. This switch is also used for alignment of the ALC system, if needed.

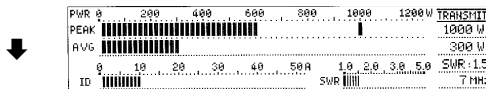
## 10. DISPLAY SELECT Switch

This switch is used to select the display function, with the selections being provided in the following sequence:

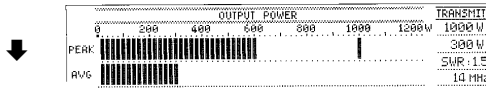
Multi Meter 1



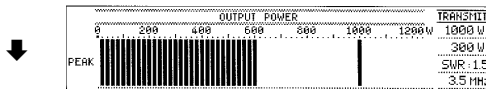
Multi Meter 2



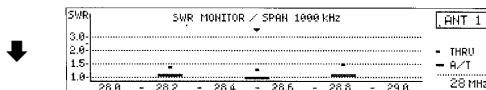
PO Meter 1



PO Meter 2



Graphical SWR Meter



Multi Meter 1



When using the Graphical SWR Meter display, *press and hold* this switch for ½ second to change the frequency span of the meter.

## 11. TUNER Switch

Pressing this switch places the antenna tuner in the transmit signal path. When the antenna tuner is activated, the “TUNER” indicator appears on the display. Press this switch again to turn off the antenna tuner.

## 12. TUNE Switch

This switch activates the auto-tune system manually. Normally, when the operating band is changed, the tuner will automatically adjust itself for the same antenna selection and matching impedance which was set the last time that band was used. Press this switch to retune if you are on a different part of the band, or if the SWR is still too high after automatic tuning. Manual-restart with this switch can be used to “force” rematching of the impedance presented by the antenna system at any time.

## 13. F SET Switch

Press this switch to activate the exciter and tune up the VL-1000 automatically when using the FT-1000MP (with the cable shown on page 4 connected between the **BAND DATA 2** jack on the VL-1000 and **REMOTE** jack on the FT-1000MP).

## 14. CONTRAST Knob

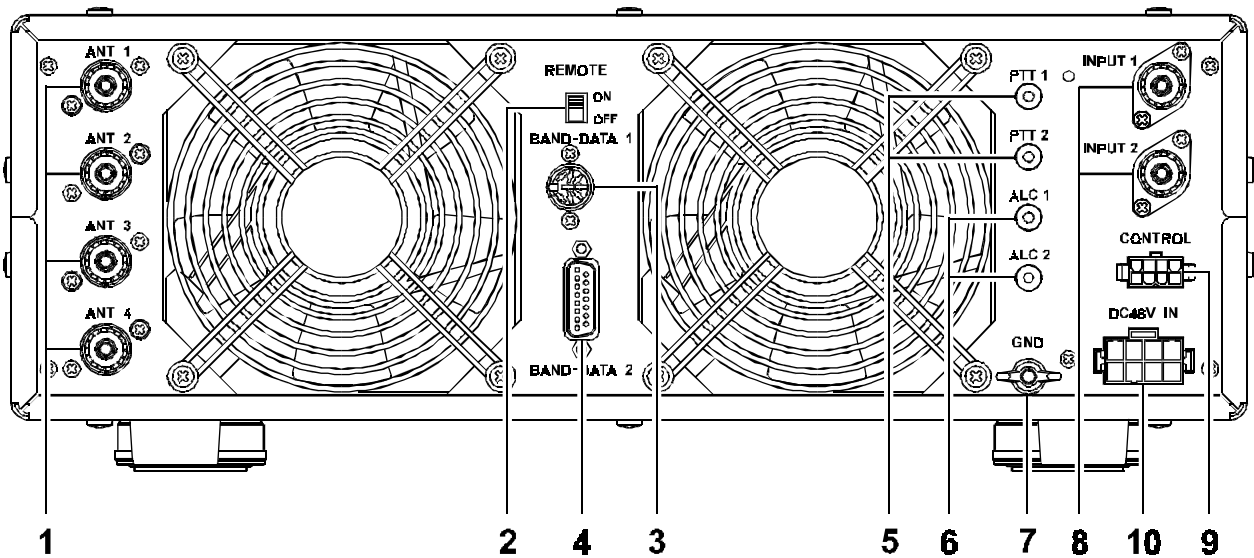
This knob used to adjust the LCD contrast.

## 15. LCD Display

The upper half of the display consists a 320 x 60 dot-matrix display showing operating status of the VL-1000, including the Graphical SWR meter. The lower half contains various icons representing enabled features.



# Rear Panel Connectors and Switch



## 1. ANTENNA Jacks

Connect these type M (SO-239) jacks to your antennas using large (RG-213 or larger) 50  $\Omega$  impedance coaxial cable with mating plugs (Type M/PL-259).

## 2. REMOTE Switch

When this switch is in the **ON** position, the VP-1000's +48V DC supply voltage will be controlled by the *transceiver's* power switch if you are using a Yaesu transceiver with a **BAND DATA** cable.

## 3. BAND-DATA 1 Jack

This 8-pin DIN jack provides for a supplied control cable for the Yaesu transceivers, to allow automatic band selection, T/R control, and power on/off control.

## 4. BAND-DATA 2 Jack

This D-sub 15-pin jack provides the same connections as does the **BAND-DATA 1** Jack, plus additional connections for special applications.

## 5. PTT Jacks

Shorting the center pins of these jacks to ground activates the amplifier for transmission. This function will normally be provided by amplifier control contacts in the T/R relay (or open-collector NPN transistor) in the exciter. Open circuit voltage at this **PTT** jack is +5V DC, and maximum closed circuit current required is 10 mA.

## 6. ALC Jacks

These RCA jacks provide the ALC (output) voltage for control of the exciter's RF drive level. The ALC control voltage range is 0 to -10 VDC.

## 7. GND Terminal Post

Connect this terminal to a good earth ground using the shortest practical length of heavy braided cable. All other station equipment should be grounded to the same ground system.

# Rear Panel Connectors and Switch

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## 8. INPUT Jacks

These type M (SO-239) jacks should be connected through a short 50  $\Omega$  coaxial jumper to the (transmitting) antenna jack of the transceivers.

## 9. CONTROL Socket

Connect this 8-pin Molex socket to the **CONTROL** socket on the Yaesu VP-1000 AC Power Supply. This socket provides  $\pm 12\text{V}$  DC and control signals for the VL-1000.

## 10. DC48V IN Jack

Connect this 8-pin Molex socket to the **OUTPUT** socket on the Yaesu VP-1000 AC Power Supply. This socket provides +48V DC supply voltage for the power amplifier of the VL-1000.

### Operating Advice

For most operating situations, the **REMOTE** switch on the rear panel of the VL-1000 should be set to the “**Off**” position (unless you have connected an appropriate **BAND DATA** cable for remote power control). Before commencing initial checkout, verify that the **REMOTE** switch is **OFF**.

If the **REMOTE** switch is on, and the VL-1000 is not connected to a Yaesu transceiver providing remote power actuation, Error Message #1005 (which warns of “Excessive PA DC Voltage”) will appear following the “Self Test” procedure. If you experience this situation, check to be sure that the **REMOTE** switch has not accidentally been turned on.

# Operation

## Preliminary Checks

Before switching on power, recheck all interconnections. Be certain that the ground, RF input, and ALC connection cables are all secure.

If using a Yaesu FT-980 transceiver for excitation, set the **LIN AMP** switch on the rear panel to the (upper) Position 1. If using an FT-757GX(II) or FT-767GX, ensure that the **LIN** or **LINEAR** switch is depressed (Position 1). Other Yaesu transceivers do not require special switch setting on the transceiver prior to commencing amplifier operation

## Band Changes

By now, you have noticed that there is no "BAND" switch on the VL-1000. Selection of the frequency band is accomplished in one of two ways:

- ① If using a Yaesu transceiver *with* a **BAND DATA** control cable, band selection and antenna rematching will occur automatically whenever you change bands on the transceiver. Similarly, the antenna last used by the VL-1000 on each band will be reselected when that band is recalled on the transceiver.
- ② If you are using a transceiver *without* a band control cable, injecting a carrier from the exciter for few seconds causes the VL-1000's microprocessor to count the input frequency and automatically set the amplifier up for operation on the appropriate band.

*Here are the appropriate procedures:*

1. Set the **MODE** switch of the exciter to CW, and the **DRIVE** or **RF PWR** control of the exciter so as to provide 50 Watts of less of drive power to the VL-1000.
2. Press the **F SET** key on the VL-1000 momentarily, then press the **PTT** switch of the exciter to activate the transmitter. If necessary, close your key to allow a carrier to be transmitted for a few seconds.
3. The microprocessor of the VL-1000 will now detect the frequency of the input signal, and the amplifier will then set itself to the matching band.

4. When the correct band appears on the VL-1000 display, release the exciter's **PTT** switch so as to return to the receive mode. Preliminary band setup is now complete.

If you attempt to *transmit* on an improper band (for example, at 6.2 MHz), the VL-1000 will automatically be placed in the "THRU" mode, and no amplification will take place.

## Antenna Selection

Pressing the **ANT** switch repeatedly causes the VL-1000 to "toggle" between the rear panel antenna jacks. Just remember to select the correct antenna when making band changes during initial operation, and the VL-1000 will thereafter remember which of **ANT 1** through **ANT 4** should be selected when you return to that band.

When the amplifier is turned off, the default antenna selection is **ANT 1**. You may wish to consider putting a grounding-type coaxial switch in the coaxial line connected to the **ANT 1** jack, so as to shunt static electricity or nearby lightning pulses to ground.

## Fan Operation

The cooling fans for the amplifier and power supply are both thermostatically controlled. The thermostats are set to activate well before "dangerous" heat has built up inside the cabinets. It is quite normal for the fans to cycle on and off, occasionally, even during receive operation. The fans also may continue to operate after the front panel power switch is turned off, this feature allows the complete dissipation of heat so as to ensure long life of the components.

### Important Note

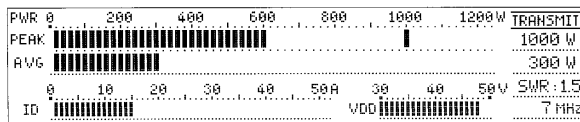
The **VL-1000** requires input drive power of 50~60 watts. Please ensure that the transmitter used with this amplifier is capable of producing at least 60 Watts of drive power so as to ensure full output from the **VL-1000**.

When driving the **VL-1000** with a transceiver which includes a built-in antenna tuner, please turn the transceiver's antenna tuner off when using the **VL-1000**.

## Metering

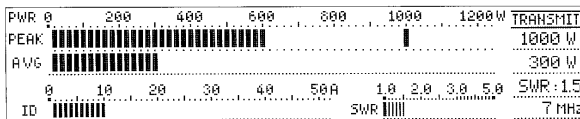
An extensive array of metering selections are available to the owner of the VL-1000. Pressing the **DISPLAY SELECT** switch allows you to choose from among these options. There are also two “Display Memory” switches on the front panel of the VL-1000, which you may use to store and recall your most-used metering choices. To store a meter selection, press *and hold in for 1/2 second* the **DISPLAY 1** (or **DISPLAY 2**) switch until you hear a double beep. To recall the saved setting, just *touch* (momentarily) the **DISPLAY 1** (or **DISPLAY 2**) switch.

### Multi Meter 1:



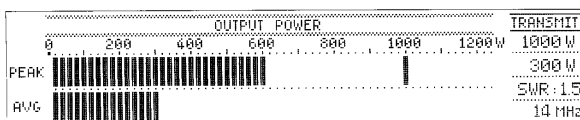
- Peak and Average Power Output Bar Graphs
- Peak and Average Power Output Numeric Displays
- PA Drain Current Bar Graph
- PA Drain Voltage Bar Graph
- Current Tx/Rx Status
- SWR Numeric Display
- Current Frequency Band (Numeric Display)

### Multi Meter 2:



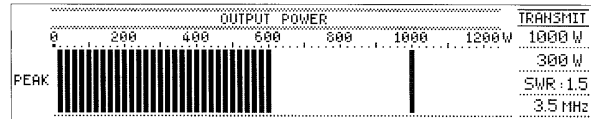
- Peak and Average Power Output Bar Graphs
- Peak and Average Power Output Numeric Displays
- PA Drain Current Bar Graph
- Current Tx/Rx Status
- SWR Bar Graph
- SWR Numeric Display
- Current Frequency Band (Numeric Display)

### PO Meter 1:



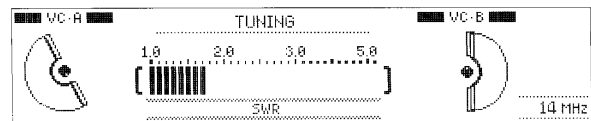
- Peak and Average Power Output Bar Graphs with Peak-hold Segment
- Peak and Average Power Output Numeric Displays
- SWR Numeric Display
- Current Tx/Rx Status
- Current Frequency Band (Numeric Display)

### PO Meter 2:



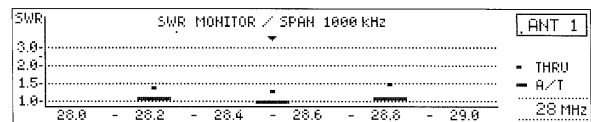
- Peak Power Output Bar Graph (large) with Peak-hold Segment
- Peak and Average Power Output Numeric Displays
- SWR Numeric Display
- Current Tx/Rx Status
- Current Frequency Band (Numeric Display)

### Antenna Tuning Meter:



- Current (changing) SWR Bar Graph
- Pictorial display of relative positions of Antenna Tuner Variable Capacitors
- Current Frequency Band (Numeric Display)

### Graphical SWR Meter:

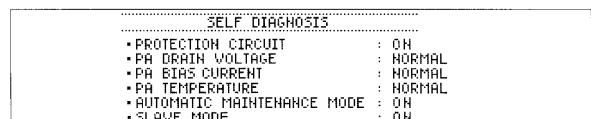


- Current Antenna Jack in Use (ANT 1 ~ ANT 4)
- Display of “TUNER OUT” SWR (Dots on Graph)
- Display of “TUNER IN” SWR (Dashes on Graph, this indicator does not indicate when SWR is above 1.5:1.)
- Current Frequency Band (Numeric Display)
- User-Defined Span on Band Display
  - ✦ 1.8 ~ 14 MHz: 100/500/1000 kHz (selectable)
  - ✦ 14 ~ 28 MHz: 500/1000 kHz (selectable)
  - ✦ 28 ~ 54 MHz: 1000 kHz (fixed)

## Initial Amplifier

### SELF-TEST Protocol

When the VL-1000 is initially turned on, it enters a “**SELF -TEST**” mode, in which the amplifier’s microprocessor checks various aspects of its control signals and supply voltages. If the amplifier’s self-test routine is successfully completed, the following display will be shown:



# Operation

## Drive Power Check

If this is first-time operation, or whenever using a different exciter (transceiver), perform this procedure to check peak exciter driving power.

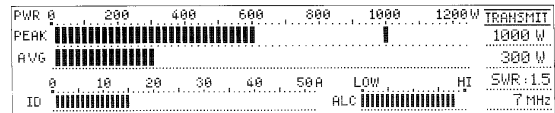
- ❑ Turn the VL-1000 **POWER** switch on by pressing the switch in.
- ❑ Make sure that the **OPERATE** and **TUNER** switches on the VL-1000 are both off.
- ❑ Connect a 100-watt dummy load to the **ANT 1** jack on the VL-1000, if available. If a dummy load is not available, connect an antenna which presents a 50  $\Omega$  resistive load to the **ANT 1** jack. Tune your exciter to a clear frequency.
- ❑ Set the transceiver to the CW mode, and preset the **DRIVE** or **Rf PWR** control on the transceiver fully clockwise (maximum).
- ❑ Briefly key the transmitter, while watching the display of the VL-1000. If the (indicated) exciter power is above 100 watts, turn the **ATT** switch **ON**. **Never press the ATT switch while transmitting.**

Drive power must be at least 50 watts for accurate SWR detection, and 70 to 80 watts for optimum tuner performance. Full power output will be obtained from the VL-1000 when the drive power is between 50 and 80 watts, depending on the band in use. When the VL-1000 power amplifier section is activated, ALC voltage is fed back from the amplifier to the transmitter, to reduce power output to this level. However, much higher drive power to the amplifier will cause the protective circuitry to disable the amplifier (to avoid damage to the input circuits). Therefore, when using an exciter delivering more than 100 Watts of drive power, the input attenuator should be used. With Yaesu transceivers, only the FT-1000/D series should require the use of the attenuator, as the FT-1000/D is capable of up to 200 Watts of output power.

## ALC Alignment

When this amplifier is used with Yaesu transceivers such as the FT-1000MP, FT-990, or FT-920, the ALC system normally will not require alignment. However, if it appears that full power is not being achieved due to excessive ALC action, you may align your VL-1000's ALC system to that of your transceiver via this simple procedure:

- ❑ Connect the transceiver to the **INPUT 1** jack, and select "INPUT 1" via the front panel **INPUT** switch.
- ❑ Set the RF output power to the HIGH power condition via the front panel **LOW** switch.
- ❑ Press and hold in the **INPUT** switch for ½ second; this initiates the "ALC Alignment" mode.



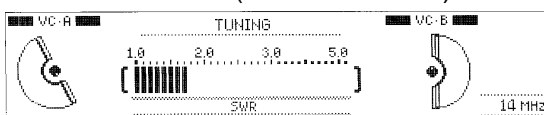
- ❑ Start with the transceiver's **DRIVE** or **Rf PWR** control fully counter-clockwise, then rotate the **DRIVE** or **Rf PWR** control to the fully clockwise position while transmitting.
- ❑ If the power output from the amplifier (as displayed on the AVG meter) does not reach 1000W because of the effect of the VL-1000's ALC voltage at full exciter drive, keep the transceiver's **DRIVE** or **Rf PWR** control fully clockwise, then press and hold in the **DISPLAY 2** key until the power output from the amplifier reaches 1000 Watts.
- ❑ If, on the other hand, the ALC voltage from the VL-1000 does not cause the exciter drive to be controlled such that the power output from the amplifier limits at 1000 Watts, do the reverse procedure from that just described. First, reduce the drive from the exciter until the VL-1000's power output is 1000 Watts. Next, press and hold in the **DISPLAY 1** key until the output power from the amplifier is just reduced from the 1000 Watt level. Now set the transceiver's **DRIVE** or **Rf PWR** control fully clockwise, and press the **DISPLAY 1** key (to increase ALC voltage/decrease power output) or **DISPLAY 2** key (to decrease ALC voltage/increase power output) until the power output from the amplifier reaches 1000 Watts (these tuning procedures should be as short as

possible).

- ❑ Return the input transceiver to the receive mode.
- ❑ Press the **LOW** switch to select LOW power operation.
- ❑ Again transmit a carrier at full drive power; press the **DISPLAY 1** or the **DISPLAY 2** key, as needed, until the power output from the amplifier reaches 500 Watts. Now return the exciter to the receive mode.
- ❑ Press and hold in the **INPUT** switch for ½ second to exit the ALC Alignment mode.
- ❑ You can align the ALC voltage of the transceiver that is connected to the **INPUT 2** jack in the same way. First select “INPUT 2” via the front panel **INPUT** switch, then follow the same procedure as described above.

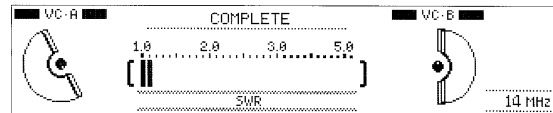
## Initial Antenna Matching Procedure

- ❑ Briefly key the transmitter, while watching the SWR indicator in the display of the VL-1000 (SWR calculation is automatic, so no full-scale presetting is necessary).
- ❑ If the SWR is above 1.5:1, activate the Antenna Tuning Unit to retune the impedance presented by the antenna system, as follows:
  - ① Press the **TUNER** switch;
  - ② Press the **TUNE** switch;
  - ③ Transmit a carrier from the exciter in the CW or other continuous mode. Do not attempt to perform antenna tuning by whistling into the microphone in an SSB mode, as the drive power delivered to the antenna tuner’s microprocessor will not be consistent.
- ❑ During antenna tuning, a special Antenna Tuning Meter display will be observed, showing the progress of the SWR reduction as well as showing a depiction of the relative positions of the two Variable Capacitors in the antenna tuner (VC-A and VC-B).

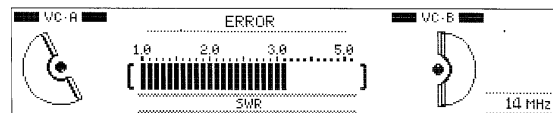


- ❑ At the completion of the tuning process, “COMPLETE” will appear on the display. Once tuning has been successfully completed, the display will shift to the Graphical SWR Meter automatically. In this mode, both the “before tuning” (THRU) and “after

tuning” (A/T) SWR conditions present at the VL-1000’s current antenna jack will be shown. As you move around the band, new antenna tuning settings will be recorded on the Graphical SWR Meter, giving you a clear picture of the tuning action of the VL-1000’s automatic antenna tuner.



- ❑ If “COMPLETE” does not appear, it means that an excessively-high SWR exists on the coaxial line; “ERROR” will appear on the display, and either “HI SWR” or “PROTECT” will come on to assist you in knowing the exact nature of the fault. If either of these warning messages should appear on the display, check the antenna, feedline, and antenna connection.



- ❑ If “COMPLETE” appears after tuning, press the **OPERATE** switch. The VL-1000 is now ready for operation.

**Note:** During antenna tuning, the tuning carrier is passed through the power amplifier then fed to a 20dB power attenuator circuit to minimize interference to other operators; this power reduction takes place even if the **OPERATE** switch is on.

# Operation

## Linear Amplifier Operation

Although continuous full exciter power is required for accurate SWR measurement and antenna matching, this will cause overheating if transmitting for an extended period when **OPERATE** switch is depressed (that is, when the power amplifier section is on). So once the antenna has been matched the first time, reduce the setting of the exciter's **DRIVE** or **Rf Pwr** control if you contemplate operation using a continuous-carrier operating mode (see the guidelines below).

**For SSB and CW operation**, make sure to adjust the **Mic GAIN** and/or **DRIVE** control on the transceiver for proper ALC indication on the transceiver ALC meter, as described in the transceiver manual. Generally, for SSB, the ALC meter indication should not deflect beyond a certain ALC limit (the "ALC" zone on the transceiver's meter) on voice peaks; on CW, the ALC indication should be just enough to cause slight meter deflection. Higher ALC levels may produce distortion or key clicks, without producing any additional power output.

**For FM, SSTV, RTTY, AMTOR or packet**, press the **LOW** switch to select the LOW power condition to prevent the overheating during continuous operation for extended periods.

**For AM operation**, adjust the **DRIVE** or **Rf Pwr** control on the transceiver so that the AVG power meter on the VL-1000 does not exceed 250 watts when transmitting a carrier. On voice peaks, adjust the **Mic GAIN** control on the transceiver so that the PEAK power meter on the VL-1000 does not exceed 1000 watts.

## Beeper on/off

When you press a switch, the beeper provides useful audible feedback to confirm that the switch was successfully activated.

If you want to turn the beeper off, first turn the VL-1000 off, then *press and hold in* the **DISPLAY 1** and **DISPLAY 2** switches while you turn the VL-1000 on. To turn the beeper back on again, repeat this switch-on procedure.

## Resetting the CPU

The VL-1000 can be reset so as to clear all settings, display memories, and antenna tuner data; these will be reset to their factory defaults.

To reset the microprocessor, *press and hold in* the **OPERATE** and **DIM** switches while you turn the VL-1000 on.



## Operating Precautions

Summarized below are some precautions to adhere to in order to ensure long life and trouble-free operation with the VL-1000.

- Do not transmit, after changing bands, until "COMPLETE" appears on the display.
- Do not transmit when turning the **POWER** switch or the **ATT** switch on or off.
- When changing bands, always make certain that the VL-1000 is set for the same band as the transceiver before transmitting, and that the proper antenna is connected. Remember that **ANT 1** is automatically selected when the VL-1000 is switched off.
- Reduce the drive power or shorten transmissions if Warning Message #1001 appears on the display (see next page).

# WARNING Messages

If one of these messages should appear, a potentially serious situation is being experienced. Turn the amplifier off, correct the problem, then turn the amplifier back on. If the problem has, indeed, been corrected, full operation at the 1000 Watt power level should be restored.

#1001: PROTECTION CIRCUIT DETECTS EXCESSIVE PA

The Power amplifier heatsink is overheated. Reduce the drive power or shorten transmissions to cooling the heatsink.

```
-----  
WARNING!  
-----  
PROTECTION CIRCUIT DETECTS EXCESSIVE PA  
# 1001  
-----
```

#1002: PROTECTION CIRCUIT DETECTS SWR > 3:1

The SWR is too high (above 3:1). Check the antenna, feedline, and coaxial cable connector(s).

```
-----  
WARNING!  
-----  
PROTECTION CIRCUIT DETECTS SWR > 3:1  
# 1002  
-----
```

#1003: PROTECTION CIRCUIT DETECTS PA UNIT IMBALANCE

More than 50 watts of imbalance has occurred among the four sections of the power amplifier. A transistor or LPF Unit power combiner failure may be responsible.

```
-----  
WARNING!  
-----  
PROTECTION CIRCUIT DETECTS PA UNIT IMBALANCE  
# 1003  
-----
```

#1004: PROTECTION CIRCUIT DETECTS EXCESSIVE DRIVE POWER

The recommended drive level from the exciter (transceiver) has been exceeded. Reduce the drive level or set the **ATT** switch to the **ON** position.

```
-----  
WARNING!  
-----  
PROTECTION CIRCUIT DETECTS EXCESSIVE DRIVE POWER  
# 1004  
-----
```

#1005: PROTECTION CIRCUIT DETECTS EXCESSIVE PA DC VOLTAGE

The recommended Drain Voltage of the final amplifier has been exceeded. Check the power supply voltage regulator and associated circuitry.

```
-----  
WARNING!  
-----  
PROTECTION CIRCUIT DETECTS EXCESSIVE PA DC VOLTAGE  
# 1005  
-----
```

#1006: PROTECTION CIRCUIT DETECTS EXCESSIVE PA CURRENT

The recommended Drain Current of the final amplifier has been exceeded. Check the power FETs and associated circuitry.

```
-----  
WARNING!  
-----  
PROTECTION CIRCUIT DETECTS EXCESSIVE PA CURRENT  
# 1006  
-----
```

#1007: PROTECTION CIRCUIT DETECTS POWER SUPPLY FAILURE

The VP-1000 or its interconnection to the VL-1000 has failed. Check the cable connection from the VL-1000 and/or the VP-1000. This Warning only appears when using the Yaesu VP-1000 power supply unit.

```
-----  
WARNING!  
-----  
PROTECTION CIRCUIT DETECTS POWER SUPPLY FAILURE  
# 1007  
-----
```

#1008: PROTECTION CIRCUIT DETECTS BAND SELECTION ERROR

The VL-1000 and the transceiver are set up with conflicting band selection, due to a logic error in the Band Data matrix, a failure in the **BAND DATA** cable, or similar problem. The VL-1000 is placed in the "Thru" mode automatically when this occurs.

```
-----  
WARNING!  
-----  
PROTECTION CIRCUIT DETECTS BAND SELECTION ERROR  
# 1008  
-----
```



# Specifications

---

## **General**

<b>Frequency Coverage:</b>	160 ~ 6 Meter Amateur Bands (USA Version: 160 ~ 15, 6 Meter Amateur Bands)
<b>Power Output:</b>	1000 Watts @ 220V AC Input to VP-1000 Power Supply
<b>Continuous Transmission Period:</b>	100% @ 500 W for 1 hour
<b>Case Size (WHD):</b>	410 x 135 x 439 mm
<b>Weight (Approx.):</b>	21 kg
<b>Supply Voltage:</b>	+48 VDC, +12 VDC, -12 VDC
<b>Power Consumption (Max.):</b>	48 A @ +48 VDC, 2.8 A @ +12 VDC, 0.1 A @ -12 VDC

## **Linear Amplifier Section**

<b>Excitation Power:</b>	50 ~ 80 Watts
<b>ALC Voltage (output) Range:</b>	0 to -10 V (Nominal -4V @ 1000 W output)
<b>Spurious Radiation:</b>	less than -50 dB @ 160 ~ 10 Meter Amateur Bands less than -60 dB @ 6 Meter Amateur Band
<b>Third-order IMD:</b>	less than -30 dB @ 1000 W PEP (Typical)
<b>Input/Output Impedance:</b>	50 $\Omega$ , unbalanced

## **Automatic Antenna Tuner Section**

<b>Impedance Matching Range:</b>	16 to 100 $\Omega$ , unbalanced @ 160 Meter Amateur Band 16 to 150 $\Omega$ , unbalanced @ 80 ~ 10 Meter Amateur Bands 25 to 100 $\Omega$ , unbalanced @ 6 Meter Amateur Band
<b>Frequency Range:</b>	160 ~ 6 Meter Amateur Bands
<b>Matching Time:</b>	less than 10 seconds
<b>Matched SWR:</b>	1.5:1 or better
<b>Tuning Memory Register:</b>	240 channels

*Specifications are subject to change, in the interest of technical improvement, without notice or obligation.*

### **CAUTION!**

Changes or modifications to this device not expressly approved by Yaesu Musen could void the user's authorization to operate this device.

# YAESU

*....leading the way.<sup>SM</sup>*

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