

**OPERATOR'S  
MANUAL**

**JUPITER**

**MODEL 538  
HF Transceiver**

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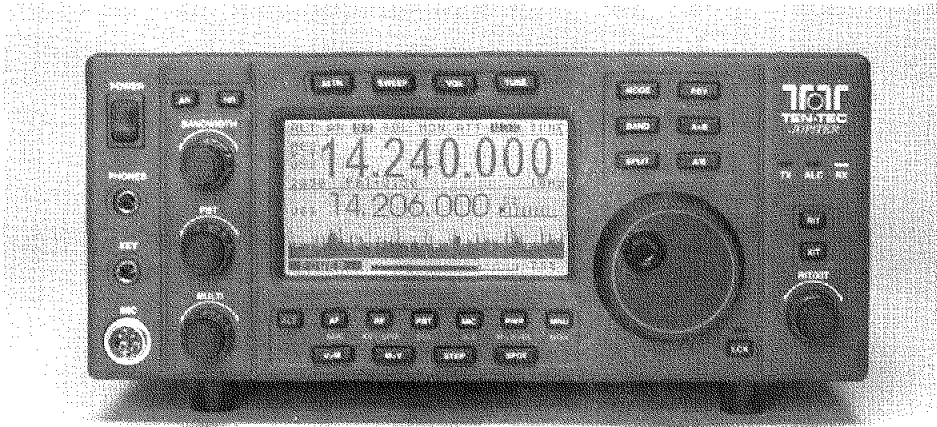
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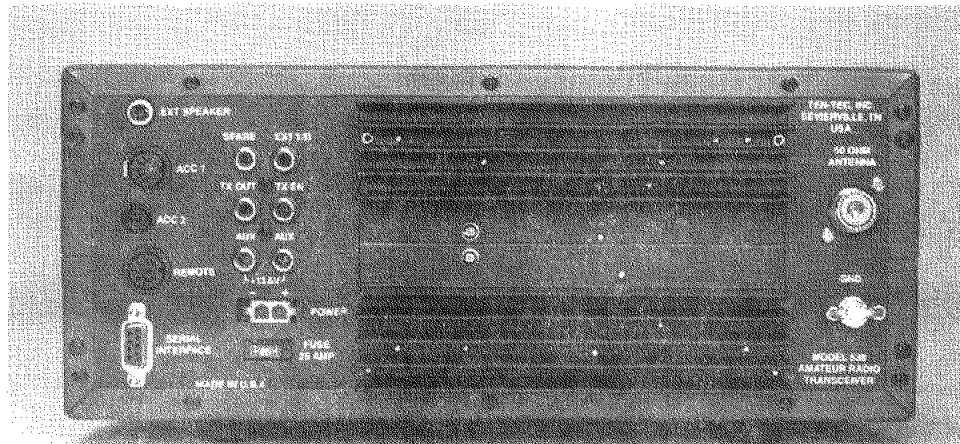
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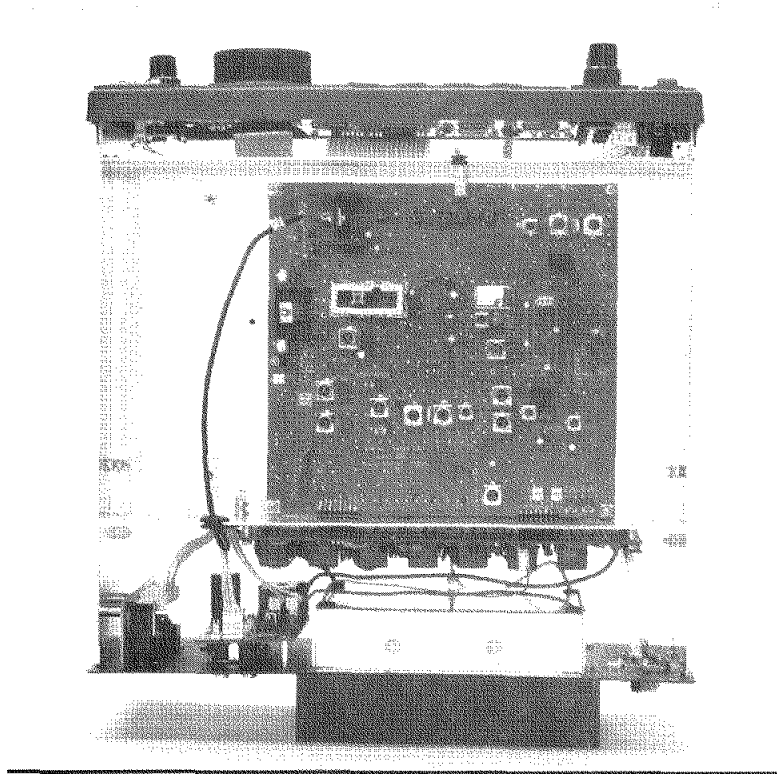
**Photo 1 Jupiter Front View**



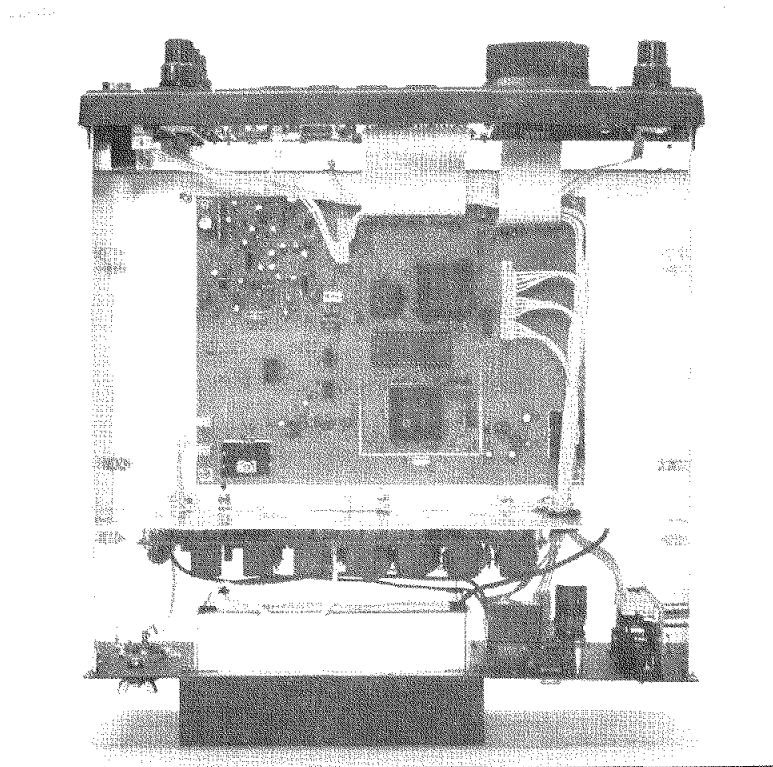
**Photo 2 Jupiter Rear View**



**Photo 3 Jupiter Top View**



**Photo 4 Jupiter Bottom View**



## SPECIFICATIONS

### GENERAL

|                    |  |
|--------------------|--|
| MODULATION         | LSB, USB, CW, AFSK, FM, AM.  |
| FREQUENCY RANGE    | Receive: 100 kHz – 30 MHz.<br>Transmit: All amateur radio frequencies: 160 through 10 m.   |
| DISPLAY            | Multi-line text and graphic Liquid Crystal Display.  |
| VFO                | Dual VFOs with SPLIT transceive option.  |
| OFFSET TUNING      | +/- 10 kHz on receive and transmit.  |
| MEMORIES           | 128 internal to Jupiter. - Virtually any PC will store thousands of memories in Pegasus Emulation Mode.  |
| FREQUENCY ACCURACY | +/- 90 Hz at 25°C at 30 MHz for 1 year.  |
| ANTENNA IMPEDANCE  | 50 ohms, SWR <2:1, unbalanced .  |
| POWER REQUIRED     | 12-14 VDC @1.5 A receive, 20A transmit.  |
| CONSTRUCTION       | 9 epoxy glass PC boards, molded front panel, aluminum chassis, textured painted steel cover.   |
| DIMENSIONS         | HWD = 5" x 12.125" x 13" (12.7 x 30.8 x 33 cm.)<br>Depth includes heat sink on rear panel.   |
| WEIGHT             | 12 lbs. (5.45 kg.)   |
| <u>TRANSMITTER</u> |  |
| RF OUTPUT          | 5 – 100 watts, ALC stabilized.   |
| DC INPUT           | Maximum 250 watts @ 14 VDC. 100% duty cycle for up to 10 minutes. Continuous duty with user-supplied air cooling of rear panel heat sink.                                  |
| MICROPHONE         | 4-pin front panel connector accepts 200 ohm to 50K ohm impedance microphones with 5 mV (-67 dB) output and provides DC polarizing voltage (+9 V) for electret microphones. |
| LINE INPUT         | 1 mV p-p into 47k Ohms.  |
| T/R SWITCHING      | PTT or VOX on SSB, Adjustable QSK on CW.   |
| CW OFFSET          | DSP generated: programmable 0 to 1270 Hz. Sidetone automatically matches offset.   |
| FM DEVIATION       | 5 kHz peak.  |
| METERING           | Selectable: Forward power or SWR.  |
| SSB GENERATION     | DSP implementation of Weaver method SSB.   |

|                               |   |
|-------------------------------|---|
| CARRIER SUPPRESSION           | > 50 dB.  |
| UNWANTED SIDEBAND SUPPRESSION | > 60 dB at 1.5 kHz.   |
| THIRD ORDER INTERMODULATION   | 25 dB below two tones @ 100 watts PEP.  |
| SPURIOUS OUTPUT               | Better than 40 dB below peak power output.  |
| <b><u>RECEIVER</u></b>        |   |
| SENSITIVITY                   | 0.35 $\mu$ V typical for 10 dB S+N/N @ 3 kHz bandwidth, SSB mode. Equivalent to 11.35 dB noise figure.  |
| SELECTIVITY                   | 34 filters built-in with 1.5:1 or better shape factors (-6 to -60 dB): 300 Hz, 330 Hz, 375 to 750 Hz in 75 Hz increments, 750 Hz to 3 kHz in 150 Hz increments, 3 kHz to 6 kHz in 300 Hz increments, and 8.0 kHz. |
| SPURIOUS FREE DYNAMIC RANGE   | 90 dB @ 3 kHz bandwidth at 50 kHz tone spacing.   |
| THIRD ORDER INTERCEPT         | +10 dBm.  |
| NOISE FLOOR                   | -126 dBm @ 3 kHz bandwidth.   |
| S-METER                       | S9 calibrated to 50 $\mu$ V standard.   |
| ATTENUATOR                    | 20 dB, selectable by operator   |
| PASSBAND TUNING               | +/- 2 kHz.  |
| I-F FREQUENCIES               | 1 <sup>st</sup> I-F 45 MHz, 2 <sup>nd</sup> I-F 455 kHz, 3 <sup>rd</sup> I-F 12 kHz.  |
| I-F REJECTION>                | 60 dB typical.  |
| IMAGE REJECTION               | > 60 dB typical.  |
| RECEIVE RECOVERY TIME         | less than 20 ms, including SPLIT mode.  |
| AUDIO                         | Speaker: 1 watts @ 4 ohms.<br>Line out: > 1 V p-p into 600 ohms.  |
| SPECTRUM SWEEP DISPLAY        | 8 widths from 240 Hz to 2.4 MHz, with tuning cursor and selectable Autosweep function.  |

## INTRODUCTION

The Model 538 JUPITER is a conventional front-panel version of Ten-Tec's notable PEGASUS HF transceiver, designed in response to our customers who want PEGASUS performance without requiring a computer to operate the radio. Apart from the changes necessary to include hardware controls, JUPITER uses the same IF DSP technology and RF circuitry, building on our years of engineering HF DSP receivers for government, commercial and amateur radio use.

JUPITER's "brain" is an Analog Devices™ AD2181 Digital Signal Processor (DSP). The DSP and control software implements many functions formerly performed by dedicated signal and control components. Digital Signal Processing provides JUPITER with features that would otherwise be too expensive or impractical for amateur equipment. The extensive repertoire of receive and transmit filter bandwidths is an example of a feature that would be too costly and space consuming without DSP. Automatic Notch (**AN**) and Noise Reduction (**NR**) are examples of functions which are not practical to include in amateur equipment without DSP.

Many new features and upgrades to DSP equipment require only new computer code rather than electronic components. Since introducing JUPITER, Ten-Tec has added firmware for AM transmit, a noise blanker, and speech processing. Internet downloads can quickly upgrade firmware in the Flash memory.

Because JUPITER is a traditional front panel transceiver, all features and functions are available without need of

computer skills and a computer. In keeping with modern trends and its PEGASUS heritage, however, the JUPITER design offers a built-in **PEGASUS Emulation Mode** that allows computer control for those who wish the best of both worlds. Using this mode, described later in this manual, makes all controls and functions visible on your computer screen and controllable by the computer keyboard, mouse, and optional Model 302J remote encoder/keypad.

JUPITER covers all amateur bands, 160 through 10 meters, using CW (full break-in – a Ten-Tec tradition!), SSB (with adjustable DSP generated transmit bandwidth filtering), digital modes (AFSK, PSK), FM and AM. JUPITER provides continuous receiver coverage from 100 kHz to 30 MHz.

## **OVERVIEW OF THIS MANUAL**

Chapter 1 of the manual is the JUPITER installation guide.

Chapter 2 contains the steps for getting JUPITER operational right out of the box.

Chapter 3 is a detailed operation guide that will help you take full advantage of the transceiver's capabilities.

Chapter 4 has the schematics and parts lists for JUPITER.

Chapter 5 covers JUPITER's theory of operation.

Chapter 6 contains the glossary of terms used in this manual. We recommend that you refer to it if you come across an unfamiliar descriptive term.

Chapter 7 is a troubleshooting guide, should you have difficulty with transceiver operation.

Chapter 8 describes PEGASUS EMULATION MODE of computer-controlled operation at the operator's option.

### UNPACKING

Examine your transceiver carefully for signs of shipping damage. Should any damage be apparent, notify the delivering carrier immediately, stating the full extent of the damage.

Retain all damaged cartons. Liability for shipping damage rests with the carrier. We recommended you keep the shipping carton and fillers in the event that storage, moving or re-shipment becomes necessary.

The following hardware and accessories come standard with your JUPITER. Make sure that you have not overlooked anything.

| Qty | Part # | Description                     |
|-----|--------|---------------------------------|
| 1   | #74269 | User's manual                   |
| 1   | #74020 | Warranty Card                   |
| 1   | #46176 | 5-pin DIN male to 4 phono plugs |
| 1   | #86095 | DC power cord                   |
| 2   | #41020 | Female terminal pins            |
| 1   | #35165 | 2 pin power connector shell     |
| 1   | #35017 | ¼ in. stereo plug               |
| 1   | #35003 | Male phono plug                 |
| 1   | #35057 | 4-pin mic. connector            |

If any of the previous items are missing, contact the repair department at Ten-Tec for replacements.

Repair Department (865) 428-0364  
 Switchboard (865) 453-7172  
 FAX (865) 428-4483

### ACCESSORIES

There are several Ten-Tec station accessory items that are suitable for use with JUPITER. Contact the Ten-Tec sales department for pricing and availability information.

| Part # | Description                               |
|--------|---|
| #963   | +13.8 VDC, 25 amp power supply            |
| #302J  | Remote tuning encoder/keypad              |
| #306   | 4 pin to 2 pin power supply cable adapter |
| #701   | hand microphone                           |
| #705   | desk microphone                           |
| #35057 | 4-pin microphone connector                |
| #80573 | 2-pin DC connector with pins              |

## 1. INSTALLATION

### 1.1. POWER SUPPLY

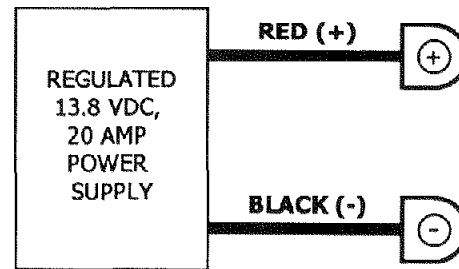
JUPITER requires a source of well-filtered and regulated DC voltage. The supply voltage can range from +12.0 to +15.0 VDC but +13.8 VDC is optimum and recommended. The power source must be capable of 20-ampere peaks. If you wish to run JUPITER to its full capability on digital modes, the current capacity must apply at 100% duty cycle, and you will need to direct a cooling air stream (from a fan) at the heat sink.

**NOTE: ALWAYS ENABLE THE POWER SOURCE *FIRST* AND *THEN* THE TRANSCEIVER. IF THE DC SOURCE IS SUPPORTED BY A GENERATOR OR ALTERNATOR, ALWAYS TURN OFF THE TRANSCEIVER BEFORE THE EQUIPMENT IS STARTED OR SHUT OFF. THESE RECHARGING DEVICES OFTEN GENERATE LARGE VOLTAGE SPIKES THAT CAN DAMAGE THE TRANSCEIVER.**

The TEN-TEC Model 963 power supply is specifically designed for this service. This supply has built-in overcurrent protection and all the necessary RF bypassing.

The 2-pin DC connector on the rear panel of JUPITER is polarized to permit attaching the mating plug in only the correct way. Determine the correct orientation and plug the power cable into JUPITER. If you plan to use a power source other than Model 963, we recommend the pre-assembled DC power cord (#86095) that we supply with the 963. Older model Ten-Tec power supplies with 4-pin connectors

require the model 306 4-pin to 2 pin adapter.



**Figure 1-1 Power Supply Connections**

We have also included two spare connector pins (#41020) and a connector shell (#35165) for building your own cord. Be sure to use no less than 14 gauge stranded wire for these connections because of the high current demand on transmit.

### 1.2. ANTENNA

The transmitter is protected against damage from *brief* load impedance mismatches ranging from a dead short to an open circuit. Operation at or near full power is possible with an unbalanced (coax feed) load impedance between 25 and 100 ohms (approximately 2:1 SWR). Antennas with higher SWR require an external antenna tuner, as do single wire and balanced feedline types.

An SO-239 connector on the rear panel connects the antenna to the transceiver.

### 1.3. EXTERNAL SPEAKER

Note: JUPITER provides a connection for an *ungrounded* external speaker. JUPITER's audio power amplifier IC uses a full-bridge circuit. This connects the speaker terminals as a balanced load between two amplifiers driven in push-pull. While the circuit floats both sides of the speaker off ground, it maximizes the undistorted output power from a single-ended supply.

**Be sure to keep both speaker leads ungrounded if you connect them to any station accessories.**

#### 1.4. FRONT PANEL CONNECTORS AND INDICATORS

Three front panel jacks connect the operator's microphone, key or keyer, and headphones to the transceiver. Four LEDs provide the operator with transceiver status information.

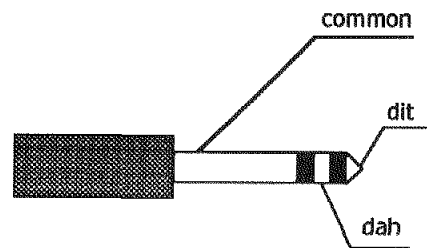
##### 1.4.1. PHONES

This is a standard jack used for connecting 8-ohm stereo or mono headphones. However, because dropping resistors reduce the output to headphone level at this jack, it cannot provide sufficient audio level to drive an external speaker. Use the rear panel **EXT SPEAKER** jack for that purpose.

##### 1.4.2. KEY

Two methods are available for keying the transceiver in CW mode. The front panel **KEY** jack provides CW with a straight key, bug, or external keyer. To use JUPITER's internal keyer with your iambic or single lever paddle, refer to Figure 3 and use the 1/4" stereo plug (#35017) supplied in the packing kit. A front panel **MENU** function allows the operator to configure the jack to accept either a monaural (2-circuit - "mono") input (like a straight key, bug, or external keyer), or a "stereo" paddle input. The factory value on power-up (or **RESET**) is to accept a "mono" input.

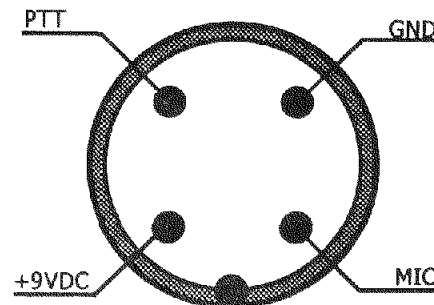
Older Ten-Tec keyers with a phono plug output will work with JUPITER via a RadioShack™ part #274-320 (or equivalent) male phono plug to 1/4" mono male adapter. Refer to paragraph 3.2 for more information on **MENU** functions.



**Figure 1-2 Paddle Wiring for Built-in Keyer**

##### 1.4.3. MICROPHONE

The Ten-Tec standard 4-pin **MIC** jack accommodates a low impedance microphone and provides a polarizing voltage of +9 VDC to power an electret microphone. Any Ten-Tec microphone, using our 4-pin connector, works without change. Most dynamic, ceramic, crystal, or electret microphones also work with this transceiver. When adapting another microphone for use with JUPITER, please refer to the wiring diagram in Figure 1-3. The JUPITER packing kit includes a spare 4-pin microphone plug (#35057). Be sure to use shielded cable to prevent any RF interference. Electret microphones and some with built-in preamplifiers will require the +9 VDC available at pin 4.



Front View of 538

**Figure 1-3 Microphone Connections**

#### 1.4.4. RX LED

The green **RX** LED is lit when JUPITER's receiver is operational.

#### 1.4.5. TX LED

The red **TX** LED is lit when JUPITER is transmitting.

#### 1.4.6. AUTOMATIC LEVEL CONTROL LED

The red **ALC** LED lights when transmit power peaks reach the proper level. Use it for adjustment of **MIC** gain. The LED will flash when JUPITER is transmitting at proper ALC level for CW or SSB.

### 1.5. REAR PANEL CONNECTIONS

There are several rear panel connections on JUPITER, to interface other station equipment with the transceiver.

#### 1.5.1. 50-OHM ANTENNA

This SO-239 jack connects to a suitable (SWR < 2:1) 50-ohm coax-fed antenna.

#### 1.5.2. GROUND

A wing nut connector provides the means to connect JUPITER to your station ground. A good ground system is essential for optimum operation of any transmitter. The best solution is to connect all the station equipment chassis together using a heavy flat ground braid. Use another length of braid to connect to a ground rod. Keep all connections as short as possible. If you are not using a linear amplifier a less ideal ground will suffice. A short ground connection to the copper cold water plumbing pipe is usually acceptable.

Antenna type and proximity to the station are also factors in choosing ground methods. With good resonant antennas located away from the station, the AC ground in your house wiring may be adequate.

#### 1.5.3. DC POWER

This is a 2-pin MOLEX™ connector for connection of a suitable 13.8 VDC power supply with 20-ampere capacity. See paragraph 1.1 for details.

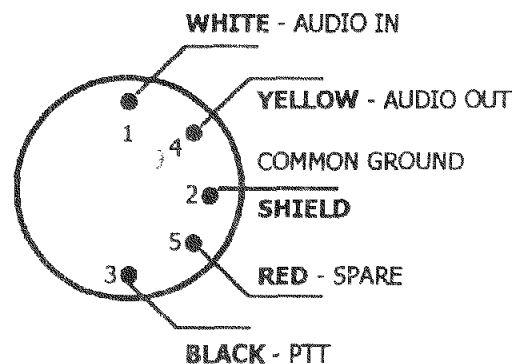
**Please observe correct polarity when using this jack or damage will result.**

#### 1.5.4. FUSE

A 25-ampere blade fuse protects JUPITER's transceiver wiring if an internal fault should occur. JUPITER's packing kit includes a spare fuse (#27074). These fuses are commonly available at automotive supply stores.

#### 1.5.5. ACCESSORY JACK

The **ACC1** jack is for interfacing equipment requiring audio in/out connections, like a TNC or phone patch. These connections also provide for digital mode operation. For information on using JUPITER in digital modes, see section 2.6.4. Figure 1-4 shows wiring information. Use the supplied cable (#46176) or an equivalent to connect accessories.



Looking at Rear Panel

Figure 1-4 Accessory Jack Connections

#### 1.5.6. TX ENABLE / TX OUT

These phono jacks are the input (**TX EN**) and output (**TX OUT**) for a QSK (full break-in) linear amplifier-keying loop. They are operational only when enabled via the **MENU** screen.

For operation without an amplifier, the default setting is **OFF**. See sections 3.5 and 3.15 for details.

#### **1.5.7. EXTERNAL T/R**

The **EXT T/R** connector provides for keying a non-QSK external linear amplifier. This connection does not use a relay. It is an open-collector transistor switch rated for a maximum of +24 volts and 200 mA at the amplifier key line.

**Do not connect EXT T/R to a circuit that will impose higher voltage, higher current or negative polarity.**

Please see section 3.15 of this manual for more information on connecting an amplifier.

#### **1.5.8. AUXILIARY +13.5V**

These two phono connectors provide 13.5 VDC power for connecting accessory equipment. They are in parallel. The maximum current available for both jacks combined is 2 amperes.

#### **1.5.9. REMOTE**

The **REMOTE** jack is for connection of the optional Model 302J (or 302) remote encoder/keypad via its included cable. The difference between the two models is only the paint color.

#### **1.5.10. SERIAL INTERFACE**

The **SERIAL INTERFACE** provides for connection of JUPITER to a COM port on your personal computer, via a standard 9-pin serial port cable. This connection allows electronic updates of

the firmware in JUPITER's flash ROM, and operation in the Pegasus Emulation Mode of remote control. Chapter 3, paragraph 3.18 describes optional operation by computer control.

#### **1.5.11. SPARE**

This phono connector has no connection as supplied from the factory, and is available for custom applications.

#### **1.5.12. ACC - 2 JACK**

This connector is for future use.

#### **1.5.13. AMPLIFIER DUTY CYCLE**

JUPITER has a thermostat sensor on the Power Amplifier module that disconnects DC power from the entire transceiver when the heat sink temperature exceeds 85°C (about 180°F). The transceiver will not power on until the heat sink cools to 80°C (about 170°F).

Our testing has established that the heat sink temperature will reach 85°C after approximately 15 minutes of continuous transmitting at 100 watts output without a cooling fan. The time to shutdown will vary with band and load impedance. We recommend that you always employ a cooling fan to blow air across the heat sink when operating key down digital modes such as RTTY, PSK31, and SSTV.

## 2. GETTING STARTED

### 2.1. INTRODUCTION

Some JUPITER controls are constantly in use, and some need changing only occasionally according to your operating preferences. The default settings listed below will allow you to get started with JUPITER. You can customize the operation to more closely fit your preferences, as you become familiar with the transceiver.

When approximately 5 seconds of inactivity occur after a control change, JUPITER saves your settings in non-volatile memory. This happens automatically and does not require a standby battery as older technology did. A pound sign (#) appears in the lower right-hand corner of the screen to verify the automatic store. If you power down the radio with the # in place, your current settings will return the next time you apply power.

### 2.2. POWERING JUPITER FOR THE FIRST TIME

Connect a suitable resonant antenna (SWR less than 2:1) to the rear panel **50 OHM ANTENNA** connector. Connect a suitable **DC** power source to the transceiver (see paragraph 1-1). Turn on your power supply first, then JUPITER.

At power-on, you will see the firmware version message briefly on the display, after which the screen will resemble Figure 2-1.

All functions on the transceiver have buttons or rotary knobs for control, and are also controllable by pointing, clicking, and/or "dragging" with your computer mouse in **Pegasus Emulation Mode** (See chapter 8). JUPITER constantly displays key functions and will show any other

setting in response to pressing the appropriate front panel key(s).

### 2.3. INITIAL RADIO SETTINGS

As supplied from the factory, JUPITER's firmware includes a number of default settings to allow the operator to quickly start using the transceiver. Please note that we recommend reading **ALL** the operating instructions before operating the transceiver.

The top row of JUPITER's graphic display screen (see Figure 2-1) shows the status of eight alternate-action controls starting with **AN** and **NR**. Black letters on the colored background indicate that the function is off and colored letters on a black background (reverse video) mean that the function is active. Initially, these controls should be **off**.

### 2.4. A BRIEF TOUR OF THE FRONT PANEL CONTROLS

The following paragraphs will provide some familiarity with the controls, after which more details follow in chapter 3.

#### 2.4.1. Left Edge

Along the left edge of the panel are the **POWER** switch and three self-explanatory connectors: **PHONES**, **KEY**, and **MIC**.

#### 2.4.2. Second Column

The next column to the right on the panel has the **AN** and **NR** buttons which enable the DSP functions, **Automatic Notch** and **Noise Reduction**. Below those buttons are three rotary knobs labeled **BANDWIDTH**, **PBT**, and **MULTI**.

Rotating the **BANDWIDTH** knob chooses the receiver selectivity from among JUPITER's 34 built-in DSP filters. After a reset operation, **BANDWIDTH** defaults to **2400** hertz, the normal SSB setting, and a good place to start. That indication appears just above the horizontal line near the

middle of the display. The **BANDWIDTH** control is always available.

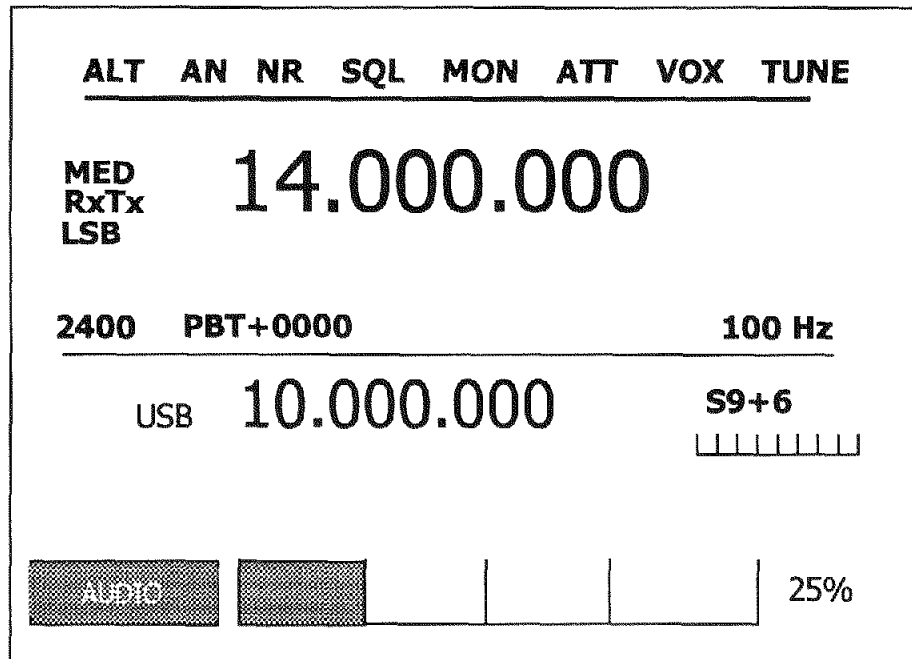


Figure 2-1 - JUPITER Screen in MULTI mode

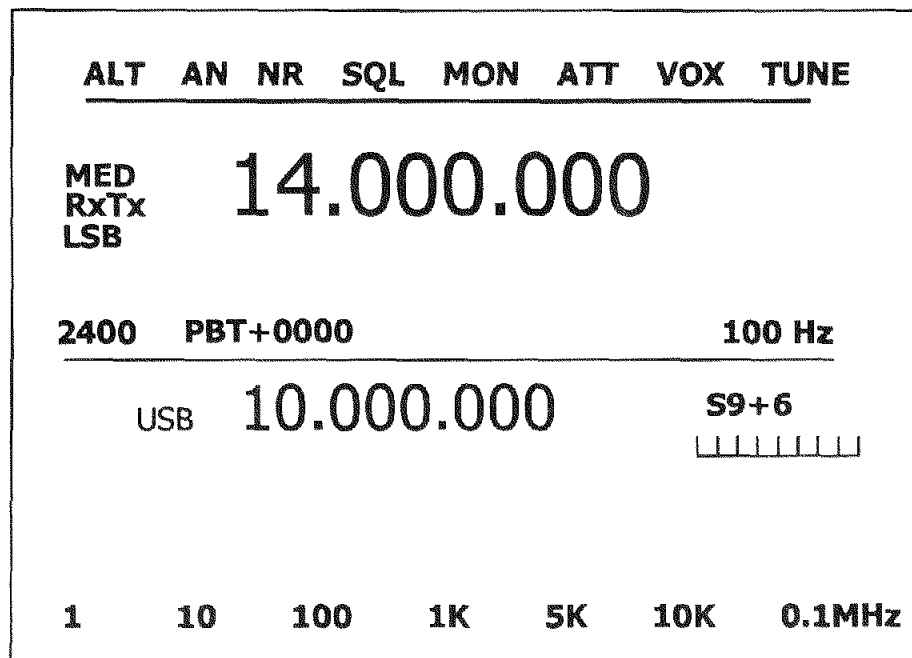


Figure 2-2 - JUPITER Screen in Tuning Step Mode

**PBT** (Passband Tuning) shifts the receiver's passband up or down with respect to the tuned frequency when the **PBT** button is **on**. **JUPITER** displays the **PBT** setting just below the first two digits of **VFO A**. Start with **PBT** **off**.

The **MULTI** knob provides a means to adjust any of a number of settings selected by pressing a particular button. For example, pressing **AF** allows the **MULTI** knob to adjust the audio (speaker or headphones) volume, while pressing **PWR** causes **MULTI** to adjust the transmit power level. The selected function appears in the lower left-hand corner of the screen as reverse-video (light lettering on a dark background) and a bar graph illustrates the setting as a percentage of full-scale. Settings made using the **MULTI** control persist after switching to another function, and after you switch off the transceiver. Start with **MULTI** controlling **AF**.

#### 2.4.3. Top Row

Along the top of the panel, above the radio display, are four push-on push-off buttons.

**ATTN** (attenuator) reduces the RF gain of the receiver by 20 dB in case of overload by very strong signals. The attenuator is normally **off**.

Pushing **SWEEP** paints a snapshot of the activity either side of the tuned frequency. **JUPITER** mutes the audio for a few seconds while painting the screen. The horizontal dimension signifies relative frequency and the vertical dimension signifies relative strength of the signals. The width of the frequency scan is selectable as an item on the **MNU** screen. A vertical cursor on the display follows the main tuning frequency as a

aid for tuning to signals or clear spots as desired. **SWEEP** is an alternate-action key. See chapter 3 for more details on this function.

The **VOX** key switches the control of receive and transmit states between push-to-talk and Voice-Operated-Xmit. Three adjustments to this function are available on the **MENU** screen, discussed in chapter 3. Its operation is conventional.

The **TUNE** button keys the transmitter steadily in **CW** mode, regardless of the selected operating mode. This produces a steady RF carrier, useful for observing the output power setting or adjusting an external antenna coupler. Because **JUPITER** will automatically shut down if a badly mismatched load causes excessive power supply current, it is prudent to reduce power before activating **TUNE**.

**Be certain that a proper antenna or dummy load is connected before pressing TUNE, and avoid causing interference to others.**

Push the **TUNE** button to activate or deactivate. When activated, the **TUNE** legend will change to reverse video, the S-meter reading will change to **PWR**, or **SWR**, and the red **TX** LED on **JUPITER**'s front panel will light.

#### 2.4.4. Middle Row

Immediately below the display is a row of 7 buttons, starting with the yellow lettered **ALT** (alternate) button. Each of the next six buttons has a primary function, marked in white letters on the button, and an alternate function marked in yellow on the panel below. Tapping the **ALT** button (no need to hold it) temporarily re-assigns a selected button

in that row to its alternate (yellow) function.

**ALT+AGC** (automatic gain control) steps the **AGC** hold time among its **SLOW**, **MEDIUM**, and **FAST** settings. Tap **ALT+AGC** each time you wish to change the **AGC** speed. **MEDIUM** is a good starting point. The **AGC** setting appears to the left of the **VFO A** display.

Pushing **RF** (RF gain) assigns the **MULTI** rotary control to the RF gain control function. **RF** appears at the bottom of the display in reverse video. A bar graph and a numeric readout show the setting as a function of full-scale. The initial (and usual) setting is **100%**.

**ALT+ KEY SPD** (keyer speed) connects the **MULTI** control to set the speed of JUPITER's internal electronic keyer. **KEYER** appears at the bottom of the display in reverse video with a bar graph and readout to show the setting as a function of full-scale. A function on the **MNU** screen enables either the internal keyer or an external device. JUPITER's keyer speed ranges from 1 to 63 words per minute. See paragraph 3.3 for **MENU** functions.

Pushing **PBT** alternately enables or disables the passband tuning function, described in paragraph 2.5.2. **PBT** is initially off.

Pushing **ALT+SQL** (squelch) controls the normally off squelch function (via the **MULTI** knob). See paragraph 2.5.8. The **SQUELCH** legend appears at the bottom of the display in reverse video. A bar graph and numeric value show its setting as a fraction of full-scale. The **SQL** indicator in the top row of the screen shows reverse video when the signal level is below the threshold setting and squelch mutes the receiver.

**SQL** works in all modes. Start out with **SQL** at **0%**.

The **MIC** (microphone) button assigns the **MULTI** rotary control to the microphone gain function. **MIC** appears at the bottom of the display in reverse video, and a bar graph with a numeric readout shows the setting as a fraction of full-scale. Try an initial setting of **30%**.

**ALT+S-T** (sidetone volume) controls the CW sidetone volume with the **MULTI** knob. Sidetone volume defaults to **23%**. A sidetone pitch adjustment is another function of the **MENU** screen. Both are effective only in **CW** mode.

**PWR** (power) assigns the **MULTI** rotary control to set the RF power level at which **ALC** regulates. **PWR** appears at the bottom of the display in reverse video, and a bar graph shows the setting as a function of full-scale.

**ALT+M-LVL** adjusts the audio **MONITOR** volume in the operator's speaker or headphones. The control interacts with the **AF** control, and some adjustment of both will be required. **MONITOR** appears at the bottom of the display in reverse video and a bar graph shows the setting as a function of full-scale. See **ALT+MON** below.

**MNU** (menu) switches the display to show text for 21 "set-and-forget" settings for JUPITER functions. Rotating the main tuning knob moves the reverse video highlight to select a function. Turning the **MULTI** control changes the displayed state of the selected function, e.g. **ON** or **OFF**. See paragraph 3.3 for a description of the **MNU** functions. To return to the operating display, push **MNU** again.

**ALT+MON** enables or disables the **MONITOR** function by which the operator can hear his microphone audio for purposes of equipment adjustment. The default setting is **off**.

#### 2.4.5. Bottom Row

**V>M** (VFO-to-Memory) prompts the operator to select one of the 128 memory channels (with the **MULTI** control). A second push of the button stores the frequency and mode data from **VFO A** in the selected memory channel.

**M>V** (Memory-to-VFO) recalls the frequency and mode data from a memory channel selected by the **MULTI** control and *copies* it to VFO A, switching JUPITER to that setting. Rotating the **MULTI** control after pushing **M>V** steps JUPITER to the frequency and mode of each stored channel in sequence. Using any control except **M>V** or **MULTI** at this point returns JUPITER to the screen before the **M>V** operation. A second push of the **M>V** button writes the stored channel data into VFO A allowing full use of all controls on the recalled setting.

Tapping **STEP** (tuning step size) briefly replaces any bar graph currently showing on the bottom of the display with a horizontal "soft menu". The screen temporarily redefines the 7 buttons below it as tuning step sizes ranging from very fine (**1 Hz**) to coarse (**0.1 MHz**). Pushing any of the buttons sets the resolution of the Tuning knob and returns the display to its state before **STEP** was pushed, but with the new step size in effect. **STEP** returns JUPITER to the **MULTI** screen in about 3 seconds if no step size key is pressed.

Pushing and holding the **SPOT** button switches in an audio tone at the selected **SIDETONE** frequency to aid in tuning

the receiver exactly to the frequency of an incoming CW signal. **SPOT** and **SIDETONE** adjustments appear on the **MNU** function, covered in paragraph 3.3.

#### 2.4.6. Cluster Above Tuning Knob

The six buttons in this group control JUPITER's **BAND**, **MODE**, **VFO A** and **VFO B** functions.

**MODE** steps sequentially through JUPITER's five demodulation modes: **USB**, **LSB**, **CW**, **FM**, & **AM**. Initially, JUPITER sets the **MODE** to **USB** on 10 through 20 meters, to **CW** on 30 meters, and to **LSB** on 40 through 160 meters. These settings are conventional and popular on those bands, but stored operator settings can override them. JUPITER returns to the last mode used on a given band.

**BAND** steps sequentially through JUPITER's 9 amateur radio band allocations: **28**, **24**, **21**, **18**, **14**, **10.1**, **7.0**, **3.5**, & **1.8** Megahertz. The receiver coverage is continuous from 0.1 to 30 Megahertz with automatic band changing.

The **SPLIT** key switches between transceiving on the **VFO A** frequency (normal state) and receiving on the **VFO A** frequency but transmitting on the **VFO B** frequency (**SPLIT** state). **SPLIT** is normally **off**. See paragraph 2.4.11.

The **REV** (reverse) key works while **SPLIT** operation is active. While you push and hold the **REV** key, JUPITER tunes and receives on the frequency and mode from **VFO B** (the *transmit* VFO). Though **REV** defaults to **off**, it is convenient in particular operating situations. See paragraph 2.4.12 below for an example of **REV** use.

To switch the active VFO, tap the **A/B** button above the tuning knob. The **VFO**

**A** and **VFO B** displays will now exchange contents, each transferring its frequency and mode to the other one.

**A=B** copies the **VFO A** frequency and mode to the **VFO B** register.

#### 2.4.7. Lock Button

Pushing the **LCK** button locks the main tuning to prevent disturbing JUPITER's frequency by inadvertent movement of the knob. A nearby red LED lights when the frequency is locked. Push **LOCK** again to re-activate the tuning knob.

#### 2.4.8. RIT & XIT Buttons

Alternate presses of the **RIT** button activate or disable the **RIT/XIT** (Receiver / Transmitter Incremental Tuning) control. In the active **RIT** state, the control offsets the receiver frequency from that in the **VFO A** display without changing the transmit frequency. The control has a +/- 10 kHz range. The setting appears at the right of the display under the **VFO A** frequency range. **RIT** is normally off.

**XIT** offsets the transmit frequency from that in the **VFO A** display without changing the receive frequency. Otherwise it works the same as **RIT** and is normally off.

JUPITER will activate only one of the Incremental Tuning modes at a time.

#### 2.4.9. Mode Selection

JUPITER transceives in **USB**, **LSB**, **CW**, **AM** and **FM** modes within the 160 through 10-meter amateur bands. Use either **USB** or **LSB** as appropriate for the digital modulation modes (**RTTY**, **AMTOR**, **PSK31**, **FACTOR**, et cetera). Select the modulation mode by repeated presses of the **MODE** button until the desired mode shows on the display to the left of the **VFO A** readout.

#### 2.4.10. VFO Operation

JUPITER has two tuning registers or "VFOs", each of which displays and holds an operating frequency and mode. The larger (main) display is **VFO A**. **VFO B** is the smaller (alternate) display. To the left of each VFO readout is one of the following legends: **RxTx**, **Rx**, **Tx**, or a blank. They keep the operator aware of which VFO is active in receive and transmit states.

Before transmitting, it is wise to note which frequency the active transmit VFO holds.

#### 2.4.11. Split Operation Example

When the **SPLIT** mode is active, the receiving frequency and mode are in the **A** display (marked **Rx**) and the transmitting frequency and mode are in the **B** display (marked **Tx**). Pressing **SPLIT** again restores the **RxTx** designator to **VFO A** and leaves **VFO B** with inactive status.

For example: a DX station is transmitting on 14.195 and listening for calls around 14.200. Tune the **VFO A** display frequency to the calling frequency near 14.200. Tap the **A=B** button to equalize both VFOs at 14.200. Tap the **SPLIT** key. Now retune **VFO A** to the DX at 14.195. **VFO A** now controls the receive frequency. **VFO B** controls your transmit frequency and you are ready to join the action.

#### 2.4.12. Reverse-Split Example

With JUPITER in **SPLIT**-frequency operation, the momentary-action **REV** key exchanges the frequency and mode between **VFOs A** and **B** while you press it. **REV** is a convenient operating aid in situations such as the one below.