



TEN - TEC

OPERATOR'S MANUAL

JUPITER

**MODEL 538
HF Transceiver**

TABLE OF CONTENTS

Photos 1 and 2 JUPITER Front and Rear Views	i
Photos 3 and 4 JUPITER Top and Bottom Views	ii
Specifications	iii
Introduction	v
Unpacking	vi
Accessories	vi
1 INSTALLATION	
1.1 Power Supply	1-1
1.2 Antenna	1-1
1.3 External Speaker	1-1
1.4 Front Panel Connections & Indicators	1-2
1.4.1 Phones	1-2
1.4.2 Key Line Out	1-2
1.4.3 MIC	1-2
1.4.4 RX Led	1-2
1.4.5 TX Led	1-3
1.4.6 ALC Led	1-3
1.5 Rear Panel Connections	1-3
1.5.1 50 Ohm Antenna	1-3
1.5.2 GND	1-3
1.5.3 DC POWER	1-3
1.5.4 FUSE	1-3
1.5.5 ACCESSORY JACK	1-3
1.5.6 TX EN / TX OUT	1-3
1.5.7 EXT T/R	1-4
1.5.8 AUX +13.5V	1-4
1.5.9 REMOTE	1-4
1.5.10 SERIAL INTERFACE	
1.5.11 SPARE	1-4
1.5.12 ACC-2 JACK	1-4
2 GETTING STARTED	
2.1 Introduction	2-1
2.2 Powering Jupiter for the First Time	2-1
2.3 Initial Radio Settings	2-1
2.4 A Brief Tour of the Front Panel Controls	2-1
2.4.1 Left Edge	2-1
2.4.2 Second Column	2-1
2.4.3 Top Row	2-3
2.4.4 Middle Row	2-3
2.4.5 Bottom Row	2-4
2.4.6 Cluster Above Tuning Knob	2-5
2.4.7 LOCK Button	2-5
2.4.8 RIT & XIT Buttons	2-6
2.4.9 Mode Selection	2-6

2.4.10	VFO Operation	2-6
2.4.11	Split Operation Example	2-6
2.4.12	Reverse-Split Example	2-6
2.5	Receiver Operation	
2.5.1	RECEIVE FILTER SELECTION	2-7
2.5.2	PASSBAND TUNING (PBT)	2-7
2.5.3	AUDIO (AF) AND RF GAIN CONTROLS	2-7
2.5.4	AUTOMATIC GAIN CONTROL (AGC)	2-7
2.5.5	NR (DSP NOISE REDUCTION)	2-7
2.5.6	AN (AUTOMATIC NOTCH)	2-7
2.5.7	S METER	2-8
2.5.8	SQUELCH	2-8
2.5.9	RF ATTENUATOR	2-8
2.5.10	LOCK	2-8
2.6	Transmitter and Transceiver Operation	
2.6.1	CW OPERATION TUNE	2-8
2.6.2	PUSH to TALK USB/LSB OPERATION	2-8
2.6.3	MONITOR	2-8
2.6.4	DIGITAL MODE OPERATION	2-9
2.6.5	FM OPERATION	2-9
2.6.6	CONTROL SUMMARY	2-9

3. DETAILED OPERATING INSTRUCTIONS

3.1	Introduction	3-1
3.2	Jupiter's Menu Screen	3-1
3.3	Transmitter Settings	3-1
3.3.1	TRANSMITTER ON/OFF	3-1
3.3.2	TRANSMITTER METER	3-1
3.3.3	OUTPUT POWER	3-1
3.4	CW Settings	3-2
3.4.1	TX Enable Keying Loop	3-2
3.4.2	CW QSK Delay	3-2
3.4.3	CW Keyer	3-2
3.4.4	Keyer Speed	3-2
3.4.5	CW Weighting	3-2
3.4.6	Sidetone Volume	3-2
3.4.7	Sidetone Frequency	3-2
3.4.8	SPOT Volume	3-2
3.5	SSB and Digital Mode Settings	3-3
3.5.1	Transmitter Filter Bandwidth	3-3
3.5.2	Microphone Gain	3-3
3.5.3	VOX Controls	3-3
3.5.4	VOX Gain	3-3
3.5.5	VOX Delay	3-4
3.5.6	Anti-VOX	3-4
3.5.7	Monitor Volume	3-4
3.5.8	Microphone/Speaker vs. Accessory Input/Output	3-4
3.6	Sweep Function	3-4

3.7	Autosweep Function	3-4
3.8	Sweep Range	3-4
3.9	High Boost	3-4
3.10	Contrast	3-4
3.11	Using External Amplifiers	3-5
3.11.1	Operation With a Non-QSK Amplifier	3-5
3.11.2	Operation With a Ten-Tec QSK Amplifier	3-5
4	SCHEMATICS AND PARTS LISTS	4-1
Figure 4-1	DIAGRAM – JUPITER TRANSCEIVER 538.SCH	4-2
Figure 4-2	RF BOARD 81889 538RF.SCH	4-3
Figure 4-3	LOCAL OSC S p/o 81889 81889LO.SCH	4-4
Figure 4-4	RECEIVER1 p/o 81889 81889RX1.SCH	4-5
Figure 4-5	RECEIVER2 p/o 81889 81889RX2.SCH	4-6
Figure 4-6	TRANSMITTER1 p/o 81889 81889TX1.SCH	4-7
Figure 4-7	TRANSMITTER2 p/o 81889 81889TX2.SCH	4-8
Figure 4-8	81889 TOP VIEW COMPONENT MAP 81889TOP	4-9
Figure 4-8A	81889 BOTTOM VIEW COMPONENT MAP 81889BOT	4-10
Table 4-2	81889 BILL OF MATERIALS 81889.BOM	4-11
Figure 4-9	DSP BOARD 81886 538DSP.SCH	4-15
Figure 4-10	POWER/CONTROL p/o 81886 81886CTL.SCH	4-16
Figure 4-11	AUDIO I/O p/o 81886 81886ANG.SCH	4-17
Figure 4-12	CODEC p/o 81886 81886COD.SCH	4-18
Figure 4-13	LOGIC/DSP p/o 81886 81886CPU.SCH	4-19
Figure 4-14	PLD p/o 81886 81886PLD.SCH	4-20
Figure 4-15	81886 TOP VIEW COMPONENT MAP 81886TOP	4-21
Table 4-3	81886 BILL OF MATERIALS 81889.BOM	4-22
<i>No figure 4-16</i>		
Figure 4-17	81863: 538LOWPASS FILTER 538LPF.SCH	4-24
Table 4-4	81863 BILL OF MATERIALS 81863.BOM	4-25
Figure 4-18	81877: 538KEY PAD 538PANEL.SCH	4-27
Table 4-5	81877 BILL OF MATERIALS 81877.BOM	4-28
Table 4-5A	78213: PANEL JACKS BILL OF MATERIALS 78312.BOM	4-29
Figure 4-19	81888: REAR CONNECTORS 538REAR.SCH	4-30
Table 4-6	81888 BILL OF MATERIALS 81888.BOM	4-31
Figure 4-20	81895: JUPITER DCIN 81895.SCH	4-32
Table 4-7	81895 BILL OF MATERIALS 81895.BOM	4-33
Figure 4-21	81897: 100 WATT RF AMPLIFIER 81897.SCH	4-34
Table 4-8	81897 BILL OF MATERIALS 81897.BOM	4-35

5	THEORY OF OPERATION	5-1
6	GLOSSARY	6-1
7	TROUBLE SHOOTING GUIDE	7-1
8	PEGASUS EMULATION MODE	8-1

Photo 1 Jupiter Front View



Photo 2 Jupiter Rear View

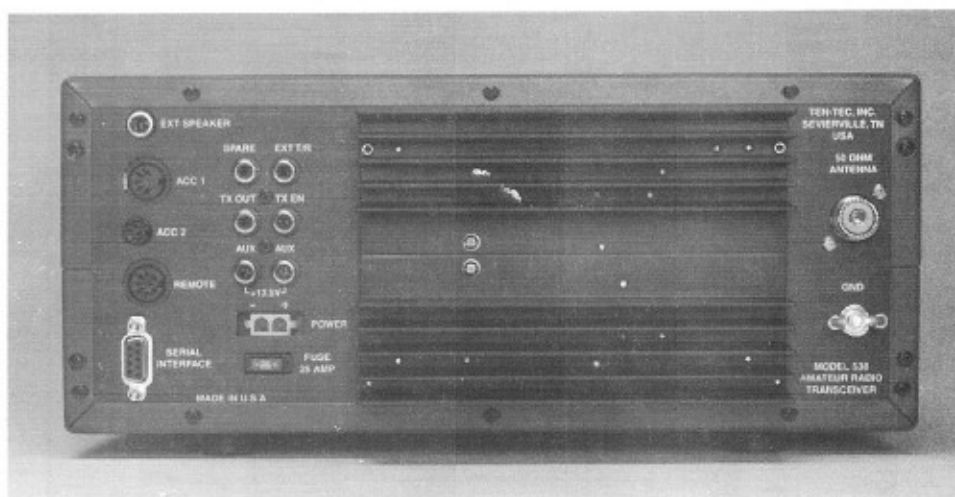


Photo 3 Jupiter Top View

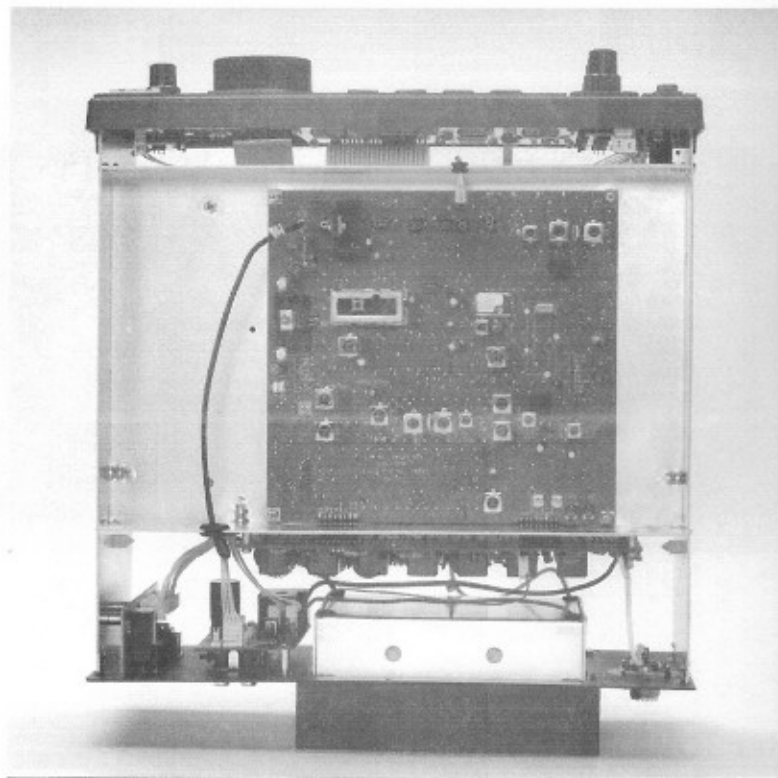
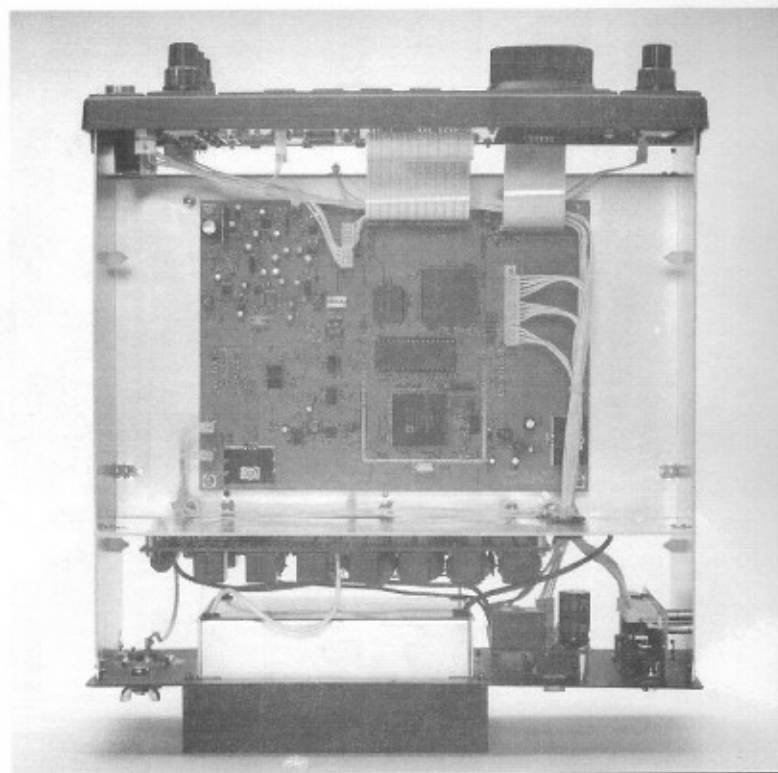


Photo 4 Jupiter Bottom View



SPECIFICATIONS

GENERAL

MODULATION	LSB, USB, CW, AFSK, FM, AM.
FREQUENCY RANGE	Receive: 100 kHz – 30 MHz. 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.) Depth includes heat sink on rear panel.
WEIGHT	12 lbs. (5.45 kg.)

TRANSMITTER

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.
<u>RECEIVER</u>	
SENSITIVITY	0.35 μ 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 μ V standard.
ATTENUATOR	20 dB, selectable by operator
PASSBAND TUNING	+/- 2 kHz.
I-F FREQUENCIES	1 st I-F 45 MHz, 2 nd I-F 455 kHz, 3 rd 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. 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.

SPECIFICATIONS

GENERAL

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DISPLAY	Multi-line text and graphic Liquid Crystal Display.
VFO	Dual VFOs with SPLIT transceive option.
OFFSET TUNING	+/- 10 kHz on receive and transmit.
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LINE INPUT	1 mV p-p into 47k Ohms.
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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.

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.

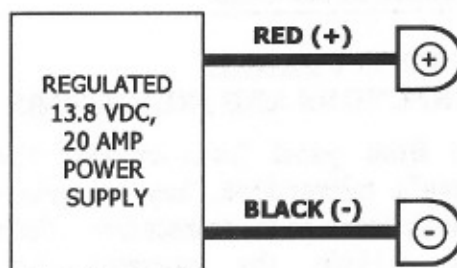


Figure 1-1 Power Supply Connections

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.

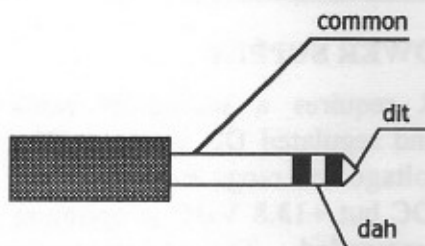
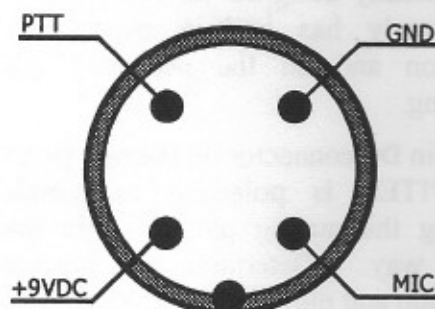


Figure 1-2 Paddle Wiring for Built-in Keyer

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.

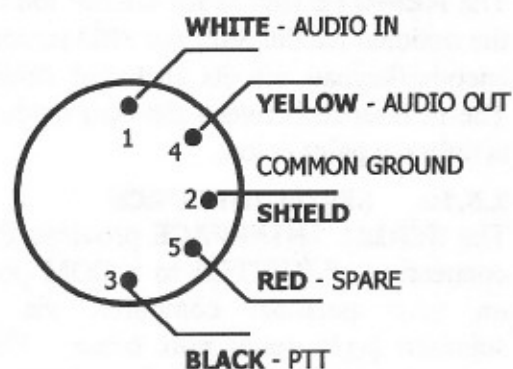
Please observe correct polarity when using this jack or damage will result.

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.

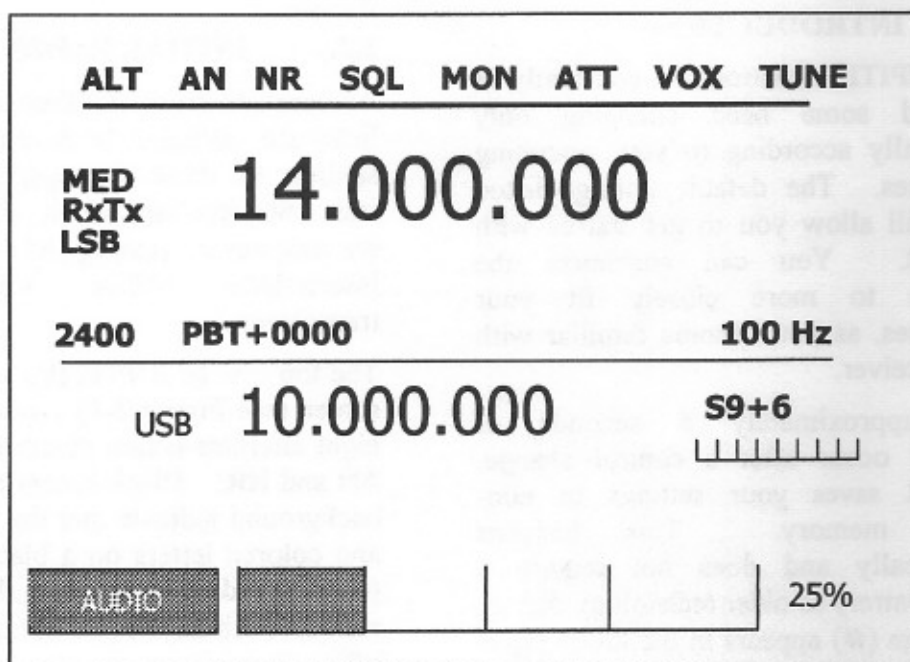


Figure 2-1 - JUPITER Screen in MULTI mode

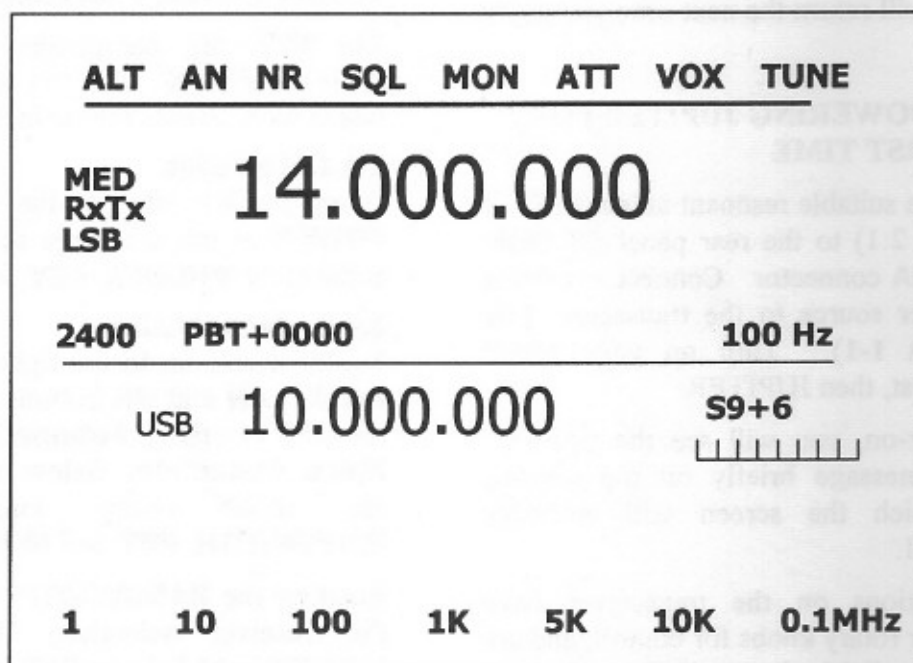


Figure 2-2 - JUPITER Screen in Tuning Step Mode

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** (squellch) controls the normally off squellch 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 squellch 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**, **PACTOR**, 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.

For example: a DX station is transmitting on 14.195 MHz and listening for calls around 14.200. Tune the main display frequency to the DX at 14.195. Tap the **A=B** key to set both VFOs at 14.195. Select **SPLIT** operation, then press and hold **REV**. **VFO A** tunes the receiver on the split (transmit) frequency while you hold the button. Tune and listen around 14.200 to determine where to transmit. (You might choose a relatively clear frequency or you might choose to use the same frequency as a successful caller). When you release **REV**, the receiver is back on the DX station's frequency and the transmitter is ready on the **SPLIT** frequency you chose by monitoring in **REV**.

The optional Model 302J remote encoder/keypad can also control **REV**. **RIT** and **XIT** provide yet another way to split frequencies in this versatile radio. See paragraph 2.4.8.

2.5. RECEIVER OPERATION

JUPITER's receiver provides general coverage reception from below 500 kHz to 30.0 MHz. The **BAND** key cycles through the amateur bands, but the receiver will tune over its entire range from any starting frequency, automatically switching band filters as necessary. All receiver features are functional throughout the range.

2.5.1. Receive Filter Selection

JUPITER comes with 34 built-in receive filters. To choose any filter, rotate the **BANDWIDTH** knob (which is always active). This updates the filter bandwidth legend to the left of the frequency display. Except for **FM**, where JUPITER's selectivity is fixed at

15 kHz, all filter choices are independent of mode.

2.5.2. Passband Tuning (PBT)

This is perhaps the most useful of all of the receiver controls, especially in a crowded band. Use the alternate action **PBT** button to enable or reset passband tuning. The **PBT** knob allows you to move the receiver passband back and forth across the desired signal. It can "drop QRM off one side or the other" of the passband. Adjusting it can often improve the quality and intelligibility of a signal. Note the **PBT** offset reading below the first two digits of **VFO A**.

2.5.3. Audio and RF Gain Controls

Use the **AF** button and the **MULTI** control to the left side of the graphic display to adjust audio level. Push the **RF** button to assign the **MULTI** control to the **RF** gain function.

JUPITER's receiver design provides good selectivity and dynamic range. Under most conditions, leave **RF** gain at 100%. Should you experience receiver overload, the **RF** gain control can limit receiver distortion and/or overload response in the presence of extremely strong signals. There is also a switchable 20 dB front-end attenuator (see paragraph 2.4.3).

2.5.4. Automatic Gain Control (AGC)

The AGC button selects the decay time constant of the AGC circuit. It steps through **FAST**, **MEDIUM**, or **SLOW** settings by pushing the **ALT+AGC** buttons. The current **AGC** setting appears just above and to the right of the **VFO A** readout.

2.5.5. DSP Noise Reduction

Pushing the **NR** (noise reduction) button activates or deactivates JUPITER's DSP noise reduction algorithm. This system identifies desired signals mathematically

and tracks them with a set of adaptive filters. **NR** suppresses broadband noise by as much as 15 dB depending upon the noise statistics.

2.5.6. **AN (Automatic Notch)**

Pushing the alternate action **AN** button enables this sophisticated DSP algorithm and puts its indicator in reverse video at the top of the screen. There is no frequency adjustment for the automatic notch. It seeks out and nulls all constant carriers in the receiver passband. This notch works well for SSB modes but is not useful in CW nor digital modes because it tends to notch out the desired signal as well as the QRM.

2.5.7. **S Meter**

While JUPITER is receiving, the "meter" at the right of the **VFO B** display shows received signal strength in S-units. Each S-unit represents a 6-dB change in signal level. S9 occurs at the standard 50 μ V level. The meter has a numeric readout and a bar graph.

In transmit, the same meter displays either forward power (**PWR**) or standing wave ratio (**SWR**) based on its **MNU** setting.

2.5.8. **Squelch**

This control is operational in all modes. To adjust, push the **SQL** button to bring up the **SQUELCH** bar graph and legend which shows that the **MULTI** control is connected to that function. **SQUELCH** mutes the receiver audio unless a signal greater in strength than the control setting is present. To set **SQL** properly, tune to a clear frequency and adjust the **SQUELCH** (via **MULTI**) control just into the threshold for receiver muting.

2.5.9. **RF Attenuator**

This function, useful when very strong signals overload the receiver, introduces 20-dB attenuation to all signals. To

enable or disable the attenuator, push the **ATTN** button.

2.5.10. **Lock**

The **LOCK** button on the front panel disables the **VFO A** tuning knob and the optional Model 302J tuning knob. With **LOCK** enabled all other JUPITER functions including direct frequency entry from the serial port or Model 302J keypad remain available. A red LED above the button indicates the locked condition.

2.6. TRANSMITTER AND TRANSCEIVER OPERATION

2.6.1. **CW Operation**

Attach an appropriate CW keying device to the front panel **KEY** jack (see paragraph 1.4.2). Select **CW** mode. The default value of JUPITER's firmware is to accept input from a straight key, bug, or external keyer through the key jack via a "mono" (2-circuit) plug. JUPITER's CW keying is full break-in by default. Adjustable timing via the **MNU** screen, detailed in paragraph 3.2, can provide much longer switching times between transmit and receive to suit operator taste. **MNU** can also enable JUPITER to accept input to the internal keyer from your paddles. The red **ALC** and **TX** LEDs on the front panel will light during CW transmission.

2.6.2. **Push-to-Talk USB/LSB Operation**

Select either **USB** or **LSB** and key the transceiver by pressing the microphone's **PTT** (push-to-talk) button. The red **TX** LED on JUPITER's front panel will light to indicate you are now transmitting. While speaking into the microphone, advance the **MIC** control until the red **ALC** LED on the front panel begins to flash. The **ALC** LED indicates that the transceiver is generating full

output power relative to the setting of the **POWER** control. See paragraph 3.6.3 for operation with VOX.

18 distinct DSP generated transmit bandwidths are available for use via the **MNU** screen. 3000 Hertz is the default setting. See paragraph 3.6.1 for more information.

2.6.3. Monitor

The **MON** button enables you to monitor your transmitter audio in any **MODE**. See paragraph 3.6.7 for information on adjusting the monitor.

2.6.4. Operation in Digital Modes

The rear panel **ACC 1** jack provides a direct connection for digital mode operation via SSB. JUPITER's 5-pin DIN connector has pins for **Audio In**, **Audio Out**, **PTT**, and **Ground**. The fifth pin on the **ACCESSORY** jack is available for future assignment. You can easily interface a TNC to JUPITER by using the supplied multi conductor ribbon cable, (#46176). See Figure 1-4 for the proper DIN plug connections.

The ends of the 46176 cable bear color codes as follows:

White = Audio In

Yellow = Audio Out

Black = PTT

Red = (Spare)

Connect an appropriate TNC or modem to the **ACC 1** jack using the #46176 cable provided, or an equivalent. To accept input from the accessory jack, you must turn on the **MNU** screen, select **AUDIO SOURCE** by highlighting it with the tuning knob, and select **LINE** with the **MULTI** knob.

2.6.5. FM Operation

NOTE: The FCC currently authorizes this mode for HF use only on the 10 meter 'phone band. National band plans call for FM only above 29.0 MHz.

Select the **FM** mode on the radio screen. Press the microphone PTT button to transmit. The receive filters have a fixed setting in **FM** mode and the **PBT** control is not active. The **MIC** gain control acts as a deviation control in **FM** mode.

2.6.6. AM Operation

Previous to firmware version 1.09 JUPITER's **AM** mode was receive-only, but this version added **AM** transmit operation with 100 watts peak envelope power (which corresponds to 25 watts of carrier power). See paragraph 3.2 for details.

2.6.7. Control Summary

Table 2-1 and Table 2-2 below summarize JUPITER's front panel controls. The **DESCRIPTION** field explains the abbreviated panel and key markings. The **ACTION** field deals with the several types of control action that JUPITER employs.

- Rotary controls have the familiar "analog" action.
- Alternate-action controls operate in a push-on – push-off fashion.
- The controls listed as **MULTIPLE** in the **ACTION** column are push-button keys that temporarily assign the designated function to the multi-purpose rotary control and display the control name and setting at the bottom of the screen.
- Alternate action one-shot is a special case for the **SWEEP** control. Alternate key pushes cause JUPITER to display a frequency-spectrum

snapshot and then to clear the display.

- Push & **MULTiple** action requires selecting the function with a key press and controlling it via the **MULTI** control, as is the case with the **M>V** and **V>M** keys.
- A momentary-action control is active only while its key is pushed. **SPOT** and **REV** are examples.

The **AVAILABILITY** field differentiates between "continuous" and "select-with-key" functions. Continuous controls are active full-time and status always appears on the screen. Select-with-key controls require a keystroke before they appear on the screen. Their setting remains effective until changed, but the display changes when the operator pushes another select-with-key button.

Table 2-1 Jupiter Front Panel Controls

MARKED	DESCRIPTION	ACTION	AVAILABILITY	COMMENT
AN	Automatic Notch	Alternate action	Continuous	NOT for CW nor data!
NR	Automatic Noise Reduction	Alternate action	Continuous	
BANDWIDTH	Receiver Bandwidth	Rotary	Continuous	Independent of mode.
PBT	Passband Tuning	Rotary	When PBT KEY is on	Setting Displayed On Screen
MULTIPLE	Adjusts any function selected by pushing a FCN key.	Rotary	Continuous	Function & Setting Displayed On Screen
ATTN	20 dB RF Attenuator	Alternate action	Continuous	
SWEEP	Spectral Display	Alternate action one-shot	Continuous. & Menu	Snapshot Function
VOX	Voice Operated Xmit	Alternate action	Continuous - See Menu Functions	See Menu
TUNE	Key-down CW	Alternate action	Continuous in Ham Bands	Always Key-down CW
ALT	Enable Alternate (Yellow) Function	Alternate action	Continuous	
AF	Audio Gain	MULTIPLE	Select-with-key	Setting Displayed On Screen
RF	RF Gain	MULTIPLE	Select-with-key	Usually 100%
PBT	PBT Enable	Alternate action	Select-with-key	Setting Displayed On Screen
MIC	Microphone Level	MULTIPLE	Select-with-key	Setting Displayed On Screen
PWR	RF Power Control	MULTIPLE	Select & See Menu	Setting Displayed On Screen
MNU	Menu Screen	Alternate action	Select-with-key	Scroll with Main Tuning Knob
ALT+AGC	AGC Speed	Alternate action	Select One Step with key	Fast/Medium /Slow
ALT+KEY SPD	Keyer Speed	MULTIPLE	Select-with-key	1 to 63 wpm
ALT+SQL	Squelch	MULTIPLE	Select-with-key	All Modes
ALT+S-T	CW Sidetone Volume	MULTIPLE	Select-with-key	Active only in CW See Menu
ALT+MON	Xmit Audio Monitor	MULTIPLE	Select. See M-LEVEL	Active only in Phone & Data

MARKED	DESCRIPTION	ACTION	PRESENCE	COMMENT
V > M	Store VFO to Memory	Push & MULTIPLE	Continuous	Select 128 Memory Channels with MULTI
M > V	Recall Memory to VFO	Push & MULTIPLE	Continuous	See above
STEP	Select Tuning Rate	Push to select tuning step on soft key menu	Continuous	302J option adds more tuning steps
SPOT	CW tuning-aid tone	Momentary	Select-with-key	Active only in CW
BAND	Select Band	Push to step through amateur bands	Continuous	10/12/15/17/20/30/40/80/160M ; Stores last frequency used
SPLIT	Tx on VFO B	Alternate action	Continuous	Receive on VFO A
REV	Monitor with VFO B	Momentary	Continuous	See Detailed Instructions
A = B	Copy VFO A contents to B	Momentary	Continuous	See Indicators on screen
A / B	Swap VFO Contents	Momentary	Continuous	See Indicators on screen
LCK	Lock Tuning Knob	Alternate action	Continuous	Red LED Indicator
RIT	RIT Enable/Disable	Alternate action	Continuous	Setting Displayed On Screen
XIT	XIT Enable/Disable	Alternate action	Continuous	Setting Displayed On Screen
RIT/XIT	Incremental Offset Tuning: Receiver OR Transmitter	Rotary	Enable with RIT or XIT Key	Setting Displayed On Screen

Table 2-2 Jupiter Front Panel Controls, (continued)

3. DETAILED OPERATING INSTRUCTIONS

3.1. INTRODUCTION

Chapter 2 of this manual describes many of JUPITER's basic transmit and receive functions in sufficient detail to get started quickly. This chapter provides more detailed operating instructions to permit taking full advantage of the transceiver's capabilities. Customize these settings to your operating preferences. JUPITER will retain them in non-volatile memory if you wait approximately five seconds without adjusting any controls before you remove power from the radio. When you next turn on the radio your custom settings will remain until you change them.

3.2. AM OPERATION

Double-sideband-AM-with-carrier was once the predominant mode of voice modulation in amateur radio. Because **AM** remains popular with some of our customers, Ten-Tec has added DSP firmware to JUPITER to enable that mode.

Two of JUPITER's controls operate differently when **AM** is the selected mode. The **TUNE** control activates the **AM-AUTO-SET** function. Pushing that key with the **MODE** in **AM** causes JUPITER to automatically adjust carrier power to 25 watts in order to keep the peak modulated RF output to 100 watts.

CAUTION: the RF output will pulse to 100 watts during this operation. Be certain that no amplifier is inline and active. We recommend using a dummy load rather than an antenna for setting up **AM**.

The **PWR** control becomes an **AM DRIVE** control to permit reducing the carrier level after the **AM-AUTO-SET** function has done its work. Adjust this control for 25 watts or less of carrier.

3.3. JUPITER's MENU SCREEN

JUPITER's menu screen, shown in Table 3-1 collects the "set-and-forget" controls in a convenient format.

MENU ITEM	CHOICES
TX METER	PWR/SWR
TRANSMITTER	ON/OFF
TX FILTER BW	See BW LIST below
KEYING LOOP	ON/OFF
AUDIO SOURCE	MIC/LINE
EXT T/R DELAY	0 - 100%
SIDETONE FREQUENCY	10 - 1270 Hz IN 10 Hz STEPS
SIDETONE VOL	0 - 100%
SPOT VOLUME	0 - 100%
CW QSK DELAY	0 - 100%
CW WEIGHTING	0 - 100%
CW KEYS	OFF - ON
AUTOSWEEP	OFF/ON
SWEEP RANGE	SELECT RANGE FROM LIST
VOX GAIN	0 - 100%
ANTI-VOX	0 - 100%
VOX HANG	0 - 100%
REMOTE F1	SELECT FUNCTION FROM LIST
REMOTE F2	SELECT FUNCTION FROM LIST
REMOTE F3	SELECT FUNCTION FROM LIST
HIGH BOOST	ENHANCES VOLUME OF HIGH AUDIO FREQUENCIES
CONTRAST	0 - 100%
NOISE BLANKER	OFF/ON
NB SELECTION	0/1/...../7
SPEECH PROC	0 - 100%

Table 3-1 JUPITER's Menu Screen

To access them, press **MNU** and use the main tuning knob to move the reverse-video highlight to any of the items on the menu. To the right of each listed

function its current setting appears. At each position of the highlight you may rotate the **MULTI** control to step the stored setting through its range of choices. You will find the **MULTI** control less sensitive in this mode than with other uses, so turn it until you have seen its range of choices.

3.4. TRANSMITTER SETTINGS

3.4.1. Transmitter On/Off

A responsible amateur radio operator takes steps, per FCC regulations, to prevent accidental or unauthorized transmission when he is not in the shack. To disable or enable JUPITER's transmitter, push **MNU** and select the **TRANSMITTER** item by turning the main tuning knob to highlight it. Rotate the **MULTI** control to select **ON** or **OFF** as required. Push **MNU** again to return to the previous screen.

3.4.2. Transmitter Meter

JUPITER's meter display always indicates signal strength in the receive state, but you may choose to display either output power or standing wave ratio while transmitting. Turn on the **MNU** screen and set the highlight on **TX METER**. Turning the **MULTI** control will select either **PWR** or **SWR**.

3.4.3. Output Power

This controls JUPITER's transmitter output power. Push the **PWR** button and use the **MULTI** control to adjust forward output power from approximately 5 to 100 watts. The control is nearly linear in indicated percentage versus actual RF power.

3.5. CW SETTINGS

3.5.1. Tx Enable Keying Loop

The **TX EN** and **TX OUT** connectors on JUPITER's rear panel will form a keying loop to operate a QSK (full break-in

CW) linear amplifier with proper T/R sequencing. See 3.15 below for information on connecting an amplifier.

3.5.2. CW QSK Delay

Ten-Tec transceivers have always offered the full break-in operation that many (but not all) CW operators prefer. For reasons of particular preferences and possible limitations of external equipment, JUPITER's transmit-to-receive switching time is another **CW** set-and-forget item on the Menu screen. Select **CW QSK DELAY** from the Menu and adjust the timing with the **MULTI** control. The range of adjustment is from nearly instantaneous to 2.6 seconds.

3.5.3. CW Keyer

This function can accept direct connection of keyer paddles to JUPITER's built-in keyer via the front panel **KEY** jack. JUPITER's default setting is to accept a 1/4" mono key plug from a straight key, bug, or external keyer. To enable the internal keyer, for use with your paddle, select **CW KEYSER** on the **MNU** and use the **MULTI** knob to turn on the keyer.

The keyer will default to **OFF** when power is removed. This prevents inadvertent transmission if a 2-circuit plug is in the **KEY** jack as power is applied to the transceiver. Figure 3 in chapter 1 shows proper wiring of keyer paddles and a 1/4-inch stereo plug for use with the internal keyer.

3.5.4. Keyer Speed

The **KEYER SPD** button enables control of JUPITER's internal keyer speed. Activate the button by pressing **ALT + RF**, and set the speed with the **MULTI** control. The range is from 1 to 63 WPM.

3.5.5. CW Weighting

This control adjusts the ratio of dit-to-space timing to suit operator preference

and possible effects of an amplifier. The factory-default setting of 1:1 at 50% will suffice for most purposes. **CW** with extreme values of weighting may sound "distinctive", but it can be hard to copy!

3.5.6. Sidetone Volume

S.T. VOL controls **CW** sidetone volume as a separate adjustment from the main radio volume control. These two controls do interact and as main radio volume is increased, sidetone volume will increase. Some experimentation with sidetone volume vs. main volume will result in a comfortable setting.

3.5.7. Sidetone Frequency

The most usual pitch setting of beat-frequency oscillator (BFO) offset and monitoring sidetone is 700 Hertz, JUPITER's default value, but some operators prefer a different pitch. This Menu item assigns the **MULTI** control to adjust the BFO and sidetone together in 10 Hertz steps from 0 to 1270 Hertz.

3.5.8. Spot Volume

This **MNU** item adjusts the volume of the **CW** spotting tone aid (see paragraph 2.4.5). The **SPOT** tone occurs only while the front panel **SPOT** button is depressed while in **CW** mode.

3.6. SSB AND DIGITAL MODE SETTINGS

3.6.1. Transmitter Filter Bandwidth - IMPORTANT:

The JUPITER operator should be aware of the implications of using wide SSB filtering while transmitting.

Audio fidelity generally improves with the use of wider SSB transmit filtering. A 3.0 kHz transmit bandwidth has a more "well-rounded" audio response than a narrower bandwidth. Wider transmit bandwidth, however, increases the potential for interference with stations using adjacent frequencies.

The FCC regulations (Part 97) governing amateur radio operation do not specify a maximum transmit bandwidth for SSB communication.

However, FCC regulation 97.307(a) requires amateur stations to occupy no more bandwidth than is necessary for the emission type in accordance with good amateur practice. In amateur practice, SSB radio transceivers use **between 2.4 and 2.8 kHz**, and this range is the de facto standard for a communications-grade SSB transmit signal. Regulation 97.307(b) requires that emissions outside the "necessary bandwidth" must not cause splatter interference to operations on adjacent frequencies.

While these are broad regulations subject to interpretation, the responsibility for complying with the regulations rests with the operator. Using a SSB transmit bandwidth wider than necessary for communications and causing interference to adjacent stations while doing so is specifically what these regulations are addressing. In summary, what may be an acceptable bandwidth on a given band at a given time may not be acceptable on another band, or at another time.

SSB transmission on JUPITER is DSP generated. There are 18 available transmit bandwidth filters to suit your individual taste for transmit audio or data. The factory setting is 3000 Hertz.

The available transmit bandwidths are 900, 1050, 1200, 1350, 1500, 1650, 1800, 1950, 2100, 2250, 2400, 2550, 2700, 2850, 3000, 3300, 3600, and 3900 Hertz.

3.6.2. Microphone Gain:

The **MIC** button adjusts microphone gain with the ever-versatile **MULTI** control. While speaking into the microphone, advance the **MIC (MULTI)**

control until the **ALC** LED on JUPITER's front panel begins to flash. The LED indicates that the transceiver is generating full power relative to the output PWR setting.

This control provides approximately 22 dB of adjustment, which should accommodate most microphones. In the unlikely event your microphone requires more or less gain, there is a trim potentiometer (R72) on the logic board to provide further adjustment.

3.6.3. VOX Controls

To use the **VOX** (voice operated transmit) mode, access the **MNU** and move the highlight to the **VOX** items. To set the **VOX GAIN**, **ANTI-VOX**, and **VOX DELAY** controls, select the required control using the main tuning knob and adjust it using the **MULTI** knob. Once set, these controls should not require adjustment unless operator, microphone, or operating position changes.

3.6.4. VOX Gain

Adjust the **VOX GAIN** for desired transmitter action while speaking into the microphone. Avoid making the setting so sensitive that ambient noise will cause unintentional transmission.

3.6.5. VOX Delay

After setting **VOX GAIN**, adjust **VOX DELAY** for desired transmitter hang time.

3.6.6. ANTI VOX

Adjust **ANTI-VOX** to a level where the receiver audio does not trip the transmitter.

3.6.7. MONITOR VOLUME:

JUPITER includes a monitor function for listening to the sound of your microphone audio signal in speaker or headphones. To adjust the monitor volume, activate the **ALT+MON** keys on

the front panel. Proceed by pushing **ALT+M-LVL** and use the **MULTI** knob. The **M-LVL** setting interacts with the **AF** volume control, so work with both adjustments to set a comfortable volume. If you monitor with a speaker, place it carefully to avoid acoustic feedback.

3.6.8. MICROPHONE/ SPEAKER vs. ACCESSORY INPUT/OUTPUT:

By selecting either **MIC** or **LINE** at the **AUDIO SOURCE** Menu item, you can instruct JUPITER to route transmit audio from either the microphone jack or the **ACC 1** DIN connector located on the rear panel of the radio. This can facilitate switching the transceiver between voice and digital modes of SSB communication without moving cables.

3.7. SWEEP FUNCTION

The **SWEEP** control enables JUPITER's spectral display. It provides a way to view active frequencies in the visual format of a spectrum analyzer. It can help locate activity (or inactivity) on a given range of frequencies. Pressing the button mutes the audio for a few seconds while JUPITER quickly scans a range of frequencies below and above the frequency set by **VFO A**. A vertical dashed-line cursor follows the movement of the **MAIN TUNING** knob to show the tuned frequency in relation to the **SWEEP** display.

See the **SWEEP RANGE MNU** function, Table 3-2, to set the **SWEEP** range with the **MULTI** control.

3.8. AUTOSWEEP FUNCTION

Enabling this menu function will cause JUPITER to perform another spectrum sweep as soon as the operator tunes the receiver outside the existing sweep range.

3.9. SWEEP RANGE

This **MNU** item uses the **MULTI** control to select one of JUPITER's eight sweep ranges listed below. They range from quite narrow spans suitable for a look either side of a narrow CW or digital mode passband to wide survey sweeps past ham band edges.

Sweep Widths
240 Hz
2.4 kHz
12 kHz
24 kHz
120 kHz
240 kHz
1.2 MHz
2.4 MHz

Table 3-2 JUPITER Sweep Ranges

3.10. High Boost

HIGH BOOST increases the relative level of higher frequencies in the receiver audio as an aid to operators whose hearing has some loss at those frequencies.

3.11. Contrast

This **MNU** item adjusts the contrast of the front panel display to suit ambient lighting conditions and operator taste.

3.12. Noise Blanker

This position provides **OFF/ON** control of the DSP Noise Blanker via the **MULTI** control.

3.13. NB Selection

In this position of the **MNU** highlight, **MULTI** sets the Noise Blanker to one of seven threshold levels.

3.14. Speech Processor

When you select **SPEECH PROC** in the **MNU**, **MULTI** sets the relative level of transmit speech processing from 0 to

100%. A moderate amount of speech processing increases the "punch" of your signal, but too high a setting impairs intelligibility.

3.15. Using External Amplifiers

3.15.1. OPERATION WITH A NON - QSK AMPLIFIER

The **EXT T/R** phono connector provides an open collector output for keying a non-QSK linear amplifier. The **EXT T/R DELAY** menu function uses the **MULTI** knob to control the transmit-to-receive changeover (hang) time on the **EXT T/R** output. It is useful for keying a non- Ten-Tec external linear amplifier. The range of adjustment runs from *very short* to a maximum of 2.6 seconds. This guards against hot-switching your amplifier.

Refer to Figure 3-1 for required connections and use shielded cable for the keying line. The **EXT T/R** connection is *not* a relay similar to those found on many older transceivers. It is a transistor switch rated for a **maximum of 24 volts and 200 mA** on the keying line of your amplifier.

Many vacuum tube linear amplifiers such as those formerly manufactured by Collins, Drake, and Heathkit use keying voltages of 100 volts or higher. Further, some older amplifiers have a negative keying voltage instead of positive.

You cannot connect these *directly* to JUPITER. Please check your linear amplifier operator's manual before connecting the equipment to JUPITER.

If your amplifier does use negative keying polarity or a higher keying voltage or current value than JUPITER can tolerate, you must use an isolation relay or equivalent level-shifting circuit in the control line between your linear

amplifier and JUPITER. QST and other amateur radio publications have published articles on such devices. The Code Transmission, Digital Communications, or Station Setup chapters in recent ARRL Handbooks have some suitable circuits.

3.15.2. OPERATION WITH A TEN-TEC QSK AMPLIFIER

To use a Ten-Tec (or similar) QSK amplifier to greatest advantage on **CW**, cable these connectors to corresponding input and output jacks on the amplifier and enable this loop. See Figure 3-2 for a connection guide. To enable the keying loop, select the **KEYING LOOP** item on the Menu screen by first pushing **MNU** and then turning the main tuning knob to highlight **KEYING LOOP**. Next, rotate the **MULTI** knob until **ON** appears opposite **TRANSMITTER**. Pushing **MNU** again returns you to the previous screen.

The connectors should run in shielded cables to corresponding **KEY IN** and

KEY OUT jacks on the rear panel of a Ten-Tec linear amplifier, as shown in Figure 3-2. These connections ensure that proper timing is maintained between the transceiver and amplifier during QSK operation.

Note: The default setting (in the **MNU**) from the factory requires no connection between the **TX EN** and **TX OUT** jacks to operate JUPITER without an amplifier. This is unlike other Ten-Tec transceivers that use a jumper cable for "barefoot" operation with the Ten-Tec keying loop. The keying loop uses hardware "handshaking" between the amplifier and JUPITER to provide timing for full break-in that makes **CW** more efficient for experienced operators. This circuit takes advantage of the fast switching time of a well-designed QSK amplifier.

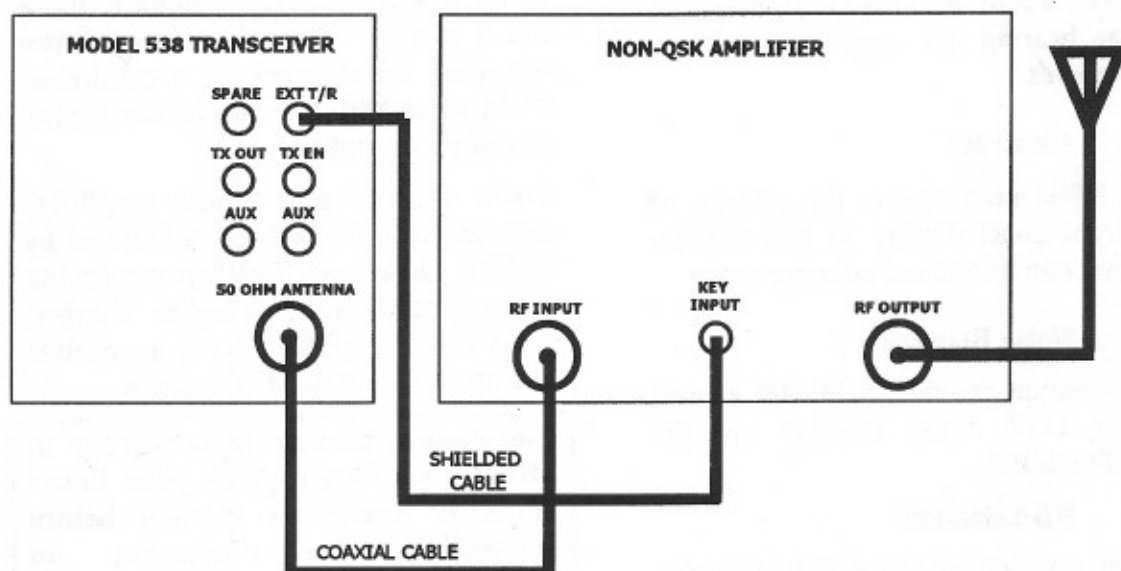


Figure 3-1-Connecting a Non-QSK Amplifier

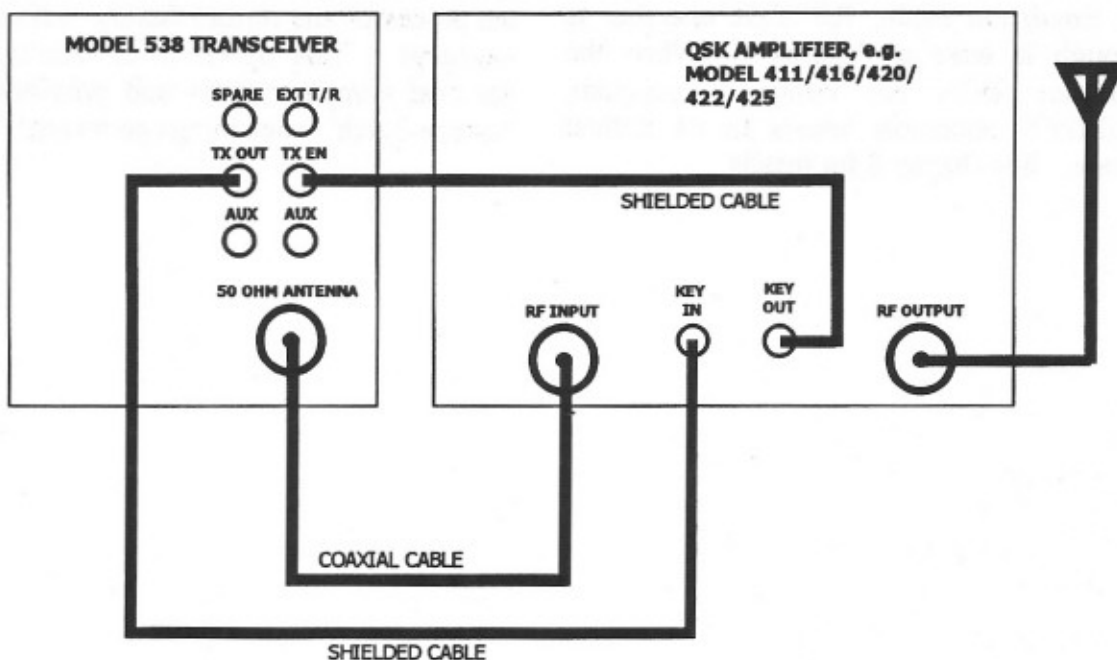


Figure 3-2 - Connecting a Ten-Tec Compatible QSK Amplifier

3.16. Control Via 302J Pod

The optional Model 302J remote tuning/keypad control features an "armchair" or "laptop" tuning knob and a numeric keypad for entering specific frequencies into the tuning register.

It also provides three function buttons (labeled **F1**, **F2**, and **F3**) that can bring specific radio functions, as assigned from the **MNU** screen, to a convenient location. A list of these choices appears as Table 3-3 below.

(F1, F2, F3)
STEP
MODE
REV
A/B
SWEEP

Table 3-3 302J Remote Function Keys

3.17. Firmware Updates

JUPITER will accept firmware updates via its **SERIAL INTERFACE** on the rear panel. This requires a Windows-based computer with the Ten-Tec update software installed. Use a standard serial port cable to connect the computer to JUPITER's 9-pin **SERIAL**

INTERFACE, and run the software to perform the update. The software is free via a connection to the Ten-Tec page on the Internet World Wide Web.

3.18. Pegasus Emulation Mode

In Emulation mode, JUPITER operates as though it were a Pegasus. When the operator exits the computer program, JUPITER operation reverts to its normal mode. See chapter 8 for details.

3.19. Resetting the JUPITER Processor

On rare occasions, it may be desirable to return to factory-default memory settings or to "rescue" JUPITER's processor from a "glitch". Holding down any control button while switching on the POWER will reset the processor and restore factory settings in memory. This operation is familiar to personal computer users and provides an "escape-hatch" when things go wrong!

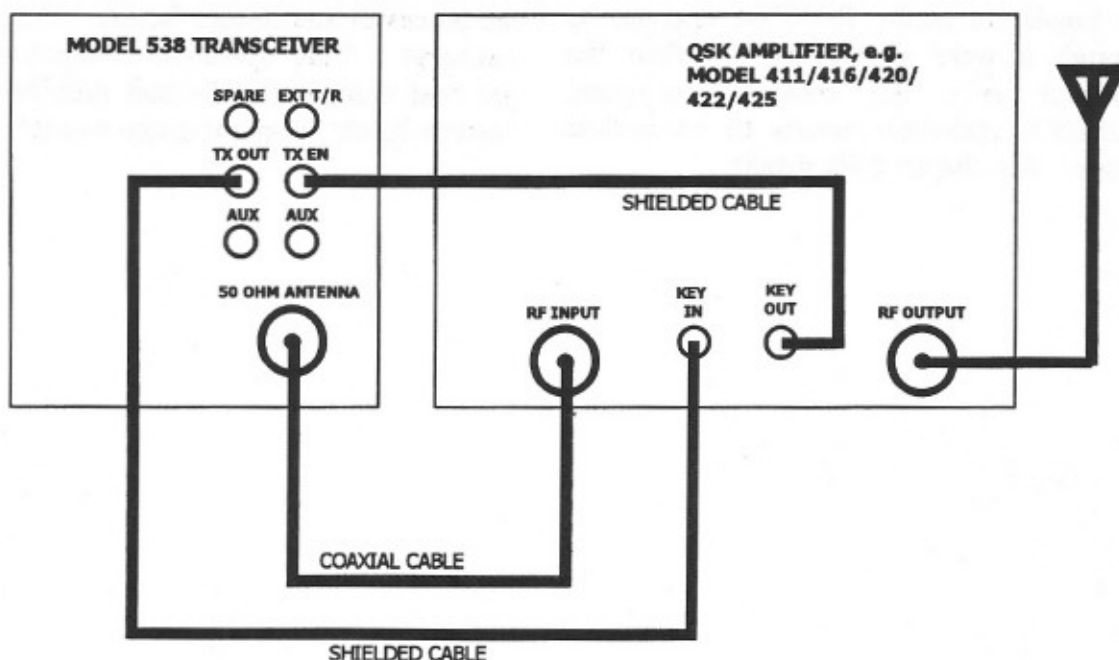


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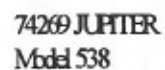
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4. Jupiter Schematic Diagrams

The following Ten-Tec drawings provide a guide to the JUPITER wiring and parts for maintenance purposes.

DRAWING TITLE	DWG No.	SH #	
INTERCONNECTION DIAGRAM – JUPITER TRANSCEIVER	538.SCH	SH 1/1	Figure 4-1
MODEL 538: RF BOARD 81889	538RF.SCH	SH 1/6	Figure 4-2
MODEL 538: LOCAL OSCILLATORS p/o 81889	81889LO.SCH	SH 2/6	Figure 4-3
MODEL 538: RECEIVER1 p/o 81889	81889RX1.SCH	SH 3/6	Figure 4-4
MODEL 538: RECEIVER2 p/o 81889	81889RX2.SCH	SH 4/6	Figure 4-5
MODEL 538: TRANSMITTER1 p/o 81889	81889TX1.SCH	SH 5/6	Figure 4-6
MODEL 538: TRANSMITTER2 p/o 81889	81889TX2.SCH	SH 6/6	Figure 4-7
ASSY 81889 TOP VIEW COMPONENT MAP	81889TOP	SH 1/1	Figure 4-8
ASSY 81889 BOTTOM VIEW COMPONENT MAP	81889BOT	SH 1/1	Figure 4-8A
ASSY 81889 BILL OF MATERIALS	81889.BOM	4	Table 4-2
MODEL 538: DSP BOARD 81886	538DSP.SCH	SH 1/6	Figure 4-9
MODEL 538: POWER/CONTROL p/o 81886	81886CTL.SCH	SH 2/6	Figure 4-10
MODEL 538: AUDIO I/O p/o 81886	81886ANG.SCH	SH 3/6	Figure 4-11
MODEL 538: CODEC p/o 81886	81886COD.SCH	SH 4/6	Figure 4-12
MODEL 538: LOGIC/DSP p/o 81886	81886CPU.SCH	SH 5/6	Figure 4-13
MODEL 538: PLD p/o 81886	81886PLD.SCH	SH 6/6	Figure 4-14
ASSY 81886 TOP VIEW COMPONENT MAP	81886TOP	SH 1/1	Figure 4-15
ASSY 81886 BILL OF MATERIALS	81886.BOM	3	Table 4-3
No figure 4-16			Figure 4-16
JUPITER ASSY 81863: 538LPF	538LPF.SCH	SH 1/1	Figure 4-17
ASSY 81863 BILL OF MATERIALS	81863.BOM	1	Table 4-4
JUPITER ASSY 81877: 538KEY PAD	538PANEL.SCH	SH 1/1	Figure 4-18
ASSY 81877 BILL OF MATERIALS	81877.BOM	1	Table 4-5
ASSY 78213 PANEL JACKS BILL OF MATERIALS	78312.BOM	1	Table 4-5A
JUPITER ASSY 81888: REAR CONNECTORS	538REAR.SCH	SH 1/1	Figure 4-19
ASSY 81888 BILL OF MATERIALS	81888.BOM	SH 1/1	Table 4-6
JUPITER DCIN: ASSY 81895	81895.SCH	SH 1/1	Figure 4-20
ASSY 81895 BILL OF MATERIALS	81895.BOM	SH 1/1	Table 4-7
100 WATT RF AMPLIFIER: ASSY 81897	81897.SCH	SH 1/1	Figure 4-21
ASSY 81897 BILL OF MATERIALS	81897.BOM	SH 1/1	Table 4-8

Table 4-1 SCHEMATICS & BILLS of MATERIAL



4-2

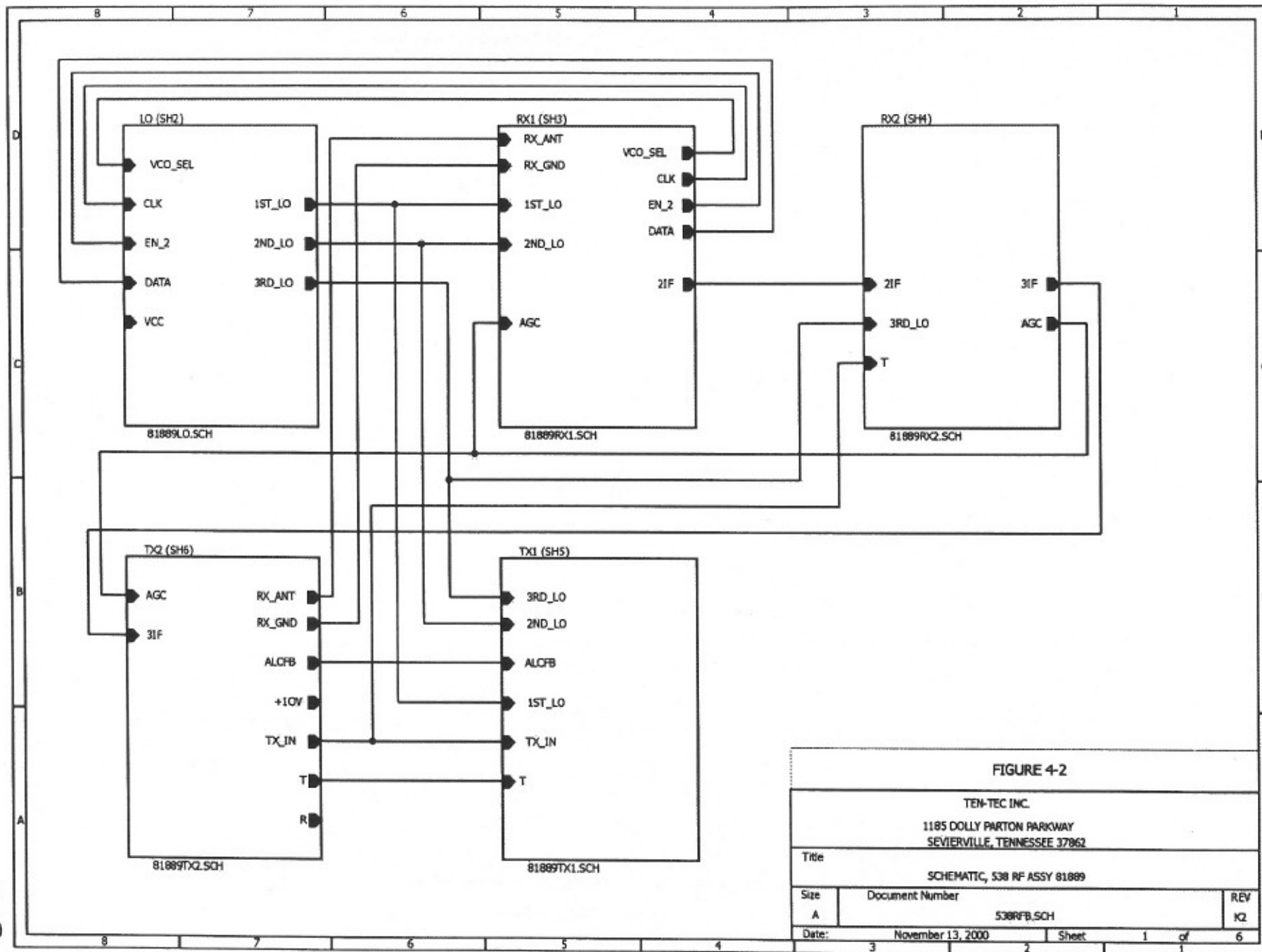


FIGURE 4-2

TEN-TEC INC.

1185 DOLLY PARTON PARKWAY
SEVIERVILLE, TENNESSEE 37862

Title

SCHEMATIC, 538 RF ASSY 81889

Size

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November 13, 2000

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6

5. THEORY OF OPERATION

This chapter introduces interested users to a brief explanation of what goes on behind JUPITER's front panel

5.1. Product Composition

JUPITER's basic design derives from the Ten-Tec Model 550, but a number of changes were necessary to replace PEGASUS' personal computer functions with front panel controls. Apart from the software, physical, and cosmetic changes, Ten-Tec engineers designed several new electronic circuit board subassemblies to transform PEGASUS to JUPITER. Model 538 comprises the following electronic subassemblies:

Ten-Tec Subassembly #	Subassembly Description
81886	Logic
81889	RF
81896	RF Power Amplifier
81863	Low-Pass Filter
81887	Keypad
28154	Graphic Display
81899	Front Connectors
81888	Rear Connectors
81895	DC & I/O

Table 5-1 Jupiter Subassemblies

Chapter 5 contains schematic diagrams and parts lists for these assemblies. Refer to them as necessary to follow the explanations in this chapter.

5.2. Functional Overview

The **81886 Logic** board connects directly or indirectly to all other JUPITER boards. Its principal functions are:

- All receiver and transmitter signal processing, including multi-mode modulation, demodulation and filtering, between audio/data baseband and the 3rd IF stages;
- Control of all tuning operations, including **SPLIT**, **PBT**, **RIT/XIT**;
- Non-volatile storage and recall of control settings and VFO memories;
- Constant monitoring of all operator controls to capture their status and any changes for conversion to transceiver control signals;
- Generation and control of all information on the front panel display;
- Monitoring of several significant analog signals from the transmitter and receiver circuitry.

The **81889 RF** board provides level control and three frequency conversions between HF and the 3rd IF for the receiver and 1-watt transmitter driver. It also hosts the three local oscillators shared by the receiver and transmitter.

The **81896 Power Amplifier** works exclusively in the transmit path where it raises the low power level of the exciter signal to as much as 100 watts output.

The primary function of the **81863 Low-pass Filter** board is to suppress harmonics and mixer image products from the transmitted signal, but it also includes the high-speed transmit/receive switches and detectors for monitoring forward and reflected power to feed control functions.

The **81887 Keypad** board hosts JUPITER's front panel controls and the 28154 Graphics Display. Five rotary shaft-to-digital encoders provide multiple control functions with a traditional analog feel. Twenty-six push-button keys selectively activate or disable one-at-a-

time functions. The display screen provides the operator with status and feedback for the principal and subsidiary controls, and a selectable menu screen displays the set-and-forget controls.

The **81895 DC & I/O** board primarily distributes DC power to the other boards and to rear panel receptacles.

5.3. Overall Schematic

Figure 4-1 shows the interconnection of JUPITER's 9 printed wiring board subassemblies. The five principal boards, **Power Amplifier**, **Lowpass Filter**, **RF**, **Logic**, and **DC&IO**, evolved from the Ten-Tec Pegasus design. The **Graphic Display**, **Keypad**, **Front Connectors**, and **Rear Connectors** are entirely new. There are 18 numbered cables and 2 soldered wires interconnecting the boards. Board-to-board header plugs in a manner similar to Pegasus couple the **Lowpass Filter**, **RF**, and **Logic** boards.

5.4. RF Board – P/N 81889

For the following, refer to Figures 4-2 through 4-8 in the Schematics chapter. The RF board schematic comprises an overall diagram, Figure 4-2, and five detail parts – Figures 4-3 through 4-7.

5.4.1.1. Local Oscillator Section

Jupiter's receiver and transmitter are triple-conversion superheterodyne designs sharing three local oscillators – Figure 4-3. The following description of the frequency plan takes the receiver point-of-view, but applies in reverse order to the transmitter.

The first local oscillator is a phase-locked loop that tunes 45.1 – 75 MHz to convert the signal frequency to the 45 MHz first IF. Tuning data comes from the Logic board via **CLK**, serial **DATA**, and **EN_2** lines. The **VCO_SEL** line switches from the Q4 VCO to the Q2 VCO at a

transceiver frequency of 13.03 MHz. U10 processes the control signals, the reference signal from TCXO U4, and the VCO samples from the loop buffer, Q1. The circuit surrounding Q54–Q48 is the charge-pump and loop filter, while Q7 buffers the **1st_LO** output to the receiver and transmitter first mixers.

The 14.8475 MHz TCXO reference also feeds the Q8 frequency tripler to develop the 44.5425 MHz **2nd_LO** for the second mixers.

Crystal, X1, at 4.76 MHz drives a divide-by-ten counter at U2 to develop the 476 kHz **3rd_LO**.

5.4.1.2. Receiver Section

Figures 4-4 and 4-5 show Jupiter's receiver schematic. The antenna signal from the Lowpass board encounters a common-mode choke at T13 followed by a PIN diode switched attenuator, R152, R201 and R202. Q43, Q52, and Q53 condition the attenuator control signal from the Logic board to levels suited to switches, D41 and D47. Common control signals, **DATA** and **CLK**, plus **EN_1** control driver, U17, which sources the band-select lines to PIN diode switched sub-octave filters between C181 and C148.

Q45, Q54, and Q55, form a parallel-connected high dynamic range RF amplifier with D21 as a gain control element. Q35 and Q40, with associated parts, comprise the balanced first mixer, fed by the first LO to develop a 45 MHz first IF. Monolithic crystal filter, FL4 feeds the dual-gate MOSFET (Q38) first IF amplifier. The **2nd_LO** signal drives the double-balanced mixer formed by T8, T10, and the diode pairs. The **2nd IF** centered at approximately 454 kilohertz results.

Common-gate buffer, Q35 and T11 feed this signal to FL3, a ceramic bandpass filter, followed in turn by the Q33 and Q34 cascode amplifier. The IF signal proceeds to the third mixer, D12 and D18 – D20, via T12, which also feeds the amplified AGC detector between Q37 and Q41. The **T** (transmit) control voltage at R162 mutes the receiver during transmit times. Following the third mixer, dual op-amp U11 and associated components apply a combination of active and passive filtering to condition the signal for circuitry on the Logic board.

5.4.1.3. Transmitter Section

See Figures 4-5 and 4-6 for the transmitter section schematic of JUPITER's RF board. From its source on the Logic board, the modulated **TX_IN** signal feeds the 3rd IF mixer at U18 where the **3rd_LO** converts the signal from its 13 kHz center frequency to 454 kHz. FL2 defines the 2nd IF passband and feeds U19, the 2nd mixer. The **2nd_LO** causes frequency translation to 45 MHz. The monolithic crystal filter, FL1, and Q32 filter and amplify the 2nd IF signal for the final mixer, which uses the first LO to shift the signal to the required amateur frequency.

Q25 and Q19 are broadband HF amplifiers that develop input for the Power Amplifier board. Q23, Q24, and Q26 use the **T** control signal to apply operating bias for transmitting and to mute the amplifiers during receive periods.

The two sections of U10 condition forward and reflected power signals from the Lowpass Filter board for use by the Logic metering functions. R86 and R83 set the meter calibration for those functions. The forward power signal and the PA current signal combine in R231 (via D62 and D63) to produce input for U8a. This op amp and the low-pass

filtered buffer, Q30 and Q31, generate the **ALCFB** (Automatic Level Control Feedback) to D10 to perform transmitter ALC. U8a also sums in a front panel power control signal from the Logic board to allow a range of RF power adjustments below the factory set point.

The U8a output also drives a peak detector (D46, R203, and C222) and U8b which supply a signal for the ALC indicator on the front panel. The **R** (receive) control voltage feeds Q44 to extinguish the ALC indicator as soon as JUPITER switches to receive. The **R** voltage feeds a buffer amplifier at Q21 and Q28 to distribute that control signal to the 81863 board. In similar manner, Q22 and Q28 buffer the **T** signal.

5.4.2. Logic Board - P/N 81889

Figure 4-9 is the overall schematic diagram for the Logic board. Five subordinate sheets (Figures 4-10 through 4-14) cover the detailed diagrams.

5.4.2.1. Power/Control Section

Figure 4-10 shows the circuitry of the Power/Control section, comprised of a voltage regulator to condition the RF board 5 volt supply, networks to condition the **10vrf** distribution point, the RS232 integrated circuit level converter for the **Serial Interface** connector on the rear panel, and two distinct 13 volt paths. **13vpd** is a power-down signal to the CPU. **13vd** supplies voltage to Q1, an FET anti-pop switch on the Auxiliary Audio Output section of the Logic board.

5.4.2.2. Audio I/O Section

Refer to Figure 4-11. Signal **OUT_R** brings received audio from U19 on the Codec section to the audio output amplifier, U12 **VOLUME_V** is a DC volume control voltage from one channel

of U7 on the CPU section (Figure 4-13) of the Logic board. The **AUDIO-** and **AUDIO+** signals are the balanced output. They exit the board via JP7 to the 81887 Keypad board. Q2 and U11a are audio amplifiers that provide the **AUX_AUD_OUT** path to the **REAR CONNECTORS** board via J11 and Cable 10. **MIC_AUDIO** comes from the Keyboard Board via Cable 6 and J3. U13a and U13b provide amplification of the signal and R72 provides an internal control for setting the range of the operator's **MIC** control on the front panel. From U13a the amplified signal goes to an input of the codec IC, U19.

The codec section of the Logic schematic, Figure 4-12, is the bridge between JUPITER's analog and DSP circuitry, providing the two-way conversion between 3rd IF and audio signals for both receiver and transmitter. In the transmit path, the U19 IC converts analog audio input to digital data for the CPU and converts digital-signal-processed CPU data to analog 3rd IF. In the receive path it converts analog 3rd IF signals to digital data for the DSP and converts the processed data to audio for receiver output.

U4, an Analog Devices ADSP2181 processor clocked at 16.66 MHz by Y1, provides much of JUPITER's functionality. See Figure 4-13. Here the selectivity-critical filtering, multiple-mode modulation and demodulation, and interpretation of operator input to the radio controls takes place. Buffers, U8 and U9, are the drivers for discrete control signals to the RF board and U9 also conditions digital lines from such external control inputs as **MIC_PTT** (push-to-talk) and **CW_KEY_R** (Ring) and **CW_KEY_T** (Tip). U5 digitizes analog control signals from the transmitter and receiver. These include **FwdPwr** and **RefPwr** from the

transmitter and **AGC** from the receiver. U4 processes these inputs and returns analog control outputs via the D/A converter at U7 output. U22 is a serial Read-Only Memory that stores configuration data for the processor. U10 is the Flash Random-Access-Memory that holds the operating data and control settings. U18 performs parallel-to-serial and serial-to-parallel data conversion between the CPU and Jupiter's **SERIAL INTERFACE** connector.

Subsidiary to the Sheet5 CPU schematic diagram is the Sheet 6 PLD schematic. The Programmable Logic Device, U20, uses a single IC to replace many smaller-scale digital ICs. It communicates with the processor via 5 address lines and 8 data lines, and its internal logic handles six I/O connectors that serve the:

- 28154 GRAPHIC DISPLAY (JP6);
- 881887 KEYPAD (JP7);
- ACC2 Connector (JP3);
- Amplifier Control Connectors (J9); and
- Factory Test Connectors (JP12) & (JP11);

The PLD section of the Logic board schematic (Figure 4-14) shows the voltage regulator, U21, dedicated to the GRAPHIC DISPLAY and Q5, the driver for its contrast signal.

5.4.3. Lowpass Filter - P/N 81863

This circuit board (Figure 4-17) accepts band-selection signals from the CPU via driver, U1, in order to interpose the appropriate low-pass filter between the broadband 81896 Power Amplifier and the antenna. These filters suppress transmitter harmonics and undesired mixer products to levels that satisfy FCC requirements for signal purity and make JUPITER a good RF neighbor.

Reed relay, K6, switches the 100-watt RF amplifier output to the antenna at CW-keying speed. Transmitter RF feeds a voltage-doubler (D4 through D6, C12 and C46) to develop cut-off bias for the series diode switch (D7 and D8) to protect the receiver. On receive, the **R** control voltage (from the Logic board) turns on Q1, thereby biasing D7 and D8 on and restoring the RF path from the antenna to the receiver input. The directional coupler, T1, D1, and D2, supplies low-voltage DC signals proportional to forward and reflected power for metering and control by the processor. L31 establishes a static-electricity drain at the antenna jack, while GAP1 provides a protective-shunt path to transient energy pulses that might otherwise damage receiver components. J3 carries **T** control voltage to control the PA.

5.4.4. Keypad - P/N 81887

JUPITER's operator controls, rotary encoders and key-switches, connect via digital logic on the 81887 KEYPAD board (Figure 4-18). Located immediately behind the molded front panel, this board also carries the L.E.D. indicators for **ALC**, **TX**, **RX**, and **LOCK**. The KEYPAD board is a mechanical host for the 28154 GRAPHICS DISPLAY, the **MIC** connector, and for the 81899 board which mounts the **KEY** and **PHONES** jacks.

5.4.5. Rear connectors - P/N 81888

Figure 4-20 shows the REAR CONNECTOR board, a simple mounting means and junction site for rear panel connectors and several cables.

5.4.6. DCIN - P/N 81895

The external DC power supply connects to JUPITER via the 81895 circuit board which controls, and filters it for distribution throughout the transceiver. It hosts circuitry at Q1 and Q2 for the master power control, and PA protection circuitry.

Cable 4 carries keying control signals via J3 and the Q3, Q4 switch circuit. U1 and Q5 condition the PA current signal, developed across the R7 shunt and fed back to the RF board via J6 and Cable 18.

5.4.7. 100 watt Amplifier - P/N 81897

Refer to Figure 4-21, the schematic of JUPITER's 100-watt Power Amplifier. The amplifier comprises two transformer-coupled broadband push-pull bipolar transistor stages of amplification that are effective from 1.8 to 30 MHz. P5, a hard-wired terminal carries supply current to the PA from the current-sensing circuitry on the DCIN board. **T** control voltage, hardwired to P6 from E1 on the Lowpass Filter board, activates the bias circuits for driver and final stages during transmit periods and shuts down the stages during receive periods. R17 and D1 stabilize the control voltage, which provides a fixed reference to bias setting controls R19 (Driver Bias) and R15 (Final Bias). Diodes D2 and D3, coupled to the driver and final transistors reduce the set-point as device temperature rises. This is a precaution against thermal runaway. Collector-to-Base networks at each device provide increasing negative feedback with rising frequency to partially offset the inherent response of the transistors. Solder terminals, P3 and P4 at the output transformer, connect the coax output cable leading to the Lowpass Filter board.

6 GLOSSARY

Many of the definitions in this glossary are specific to JUPITER, and may not be strictly accurate in other contexts. For explanations in greater detail than is

practical here, we recommend consulting The ARRL Handbook for Radio Amateurs.

adaptive filter	An "intelligent" filter which changes its characteristics to optimize an output property.
AF	(Audio Frequency) JUPITER's volume control
AGC	(Automatic Gain Control) holds receiver output fairly constant with a wide range of input signals.
AGC hold time	During this period the automatic gain setting does not change.
ALC	(Automatic Level Control) holds transmitter output constant with changing loads.
algorithm	A method of problem solution, especially in computer programs.
alternate action	Example: push ON , then push OFF
AM	Amplitude Modulation of an RF signal.
AMTOR,	A digital mode that improves radioteletype performance.
AN	(Automatic Notch) A DSP function that removes steady tones from interfering with a voice signal.
attenuator	A device to reduce signal strength.
balanced feedline	A (low-loss) ungrounded two-wire feedline.
BANDWIDTH (BW)	The frequency space required (or allowed) to pass a signal.
BFO (beat-frequency oscillator)	Converts an IF signal to an audio tone.
break-in	Ability to receive CW between transmitted letters (or even dits).
bug	A semi-automatic telegraph key that forms dits automatically and dahs manually.
built-in preamplifiers	Included in some microphones to increase output, but makes problems if not used carefully.
codec	A combined analog-to-digital and digital to analog converter used with DSPs.
CW	"Continuous-wave", formerly used to distinguish electronic RF signals from older spark signals, became synonymous with Morse radiotelegraphy.
dB	(Decibel) a logarithmic unit of power <i>change</i> related to human hearing.
dead short	A usually unintentional electrical bypass of all current limiting elements in a circuit.
deviation control	Adjusts the level of modulation in an FM transmitter.

digital modes	Modulation methods, such as RTTY, AMTOR, PSK31, and others that use digital codes on RF.
direct frequency entry	Setting the operating frequency by using JUPITER's optional keypad.
DSP	Digital Signal Processor (processing).
duty cycle	Ratio of ON time to OFF time.
dynamic range	Ratio between strongest and weakest signals handled with acceptable performance.
dynamic, ceramic, crystal, or electret microphones	Commonly available methods of converting voice to electrical signals. Only the electret requires a power source.
external T/R	This control signal usually keys an external amplifier.
firmware	Computer instructions or data in a non-volatile medium.
flash RAM	A form of non-volatile Random-Access-Memory that accepts electronic updates without physical removal from its host circuit.
FM	(Frequency Modulation) impresses information on an RF carrier by varying its instantaneous frequency.
forward power	The component of RF power flowing in a transmission line from the generator towards the load. See reflected power and SWR.
front-end	The portion of receiver circuitry ahead of the main selectivity filtering.
heat sink	A metallic mass used to convey heat from JUPITER's power amplifier components to the air.
iambic	Alternating formation of dits and dahs in some automatic keyers.
IC	Integrated Circuit.
impedance mismatches	Discrepancies between inherent voltage-to-current ratios of connected components, especially transmitter and antenna.
KEY SPD	(Keyer Speed), the rate at which JUPITER's keyer forms Morse code dits and dahs. See WPM.
keyer	JUPITER's internal means of automatic dit and dah formation from the user's paddle input.
LCK (LOCK)	This key prevents accidental disturbance of JUPITER's tuning knob from moving the operating frequency of the transceiver.

LEDs	(Light Emitting Diodes) used as indicators on the control panel.
linear amplifier	External amplifier used to increase transmitted power with minimal distortion to SSB or AM signals.
low impedance	Usually below a thousand ohms for microphones or below 50 ohms for antennas.
61.1..1.1 LSB	(Lower sideband) AM without carrier or upper sideband. See USB.
M-LVL (MONITOR volume)	JUPITER's adjustment for listening to transmitted audio via speaker or headphones.
MODE	The method of impressing or recovering information on a radio signal, also called modulation. JUPITER uses five modes.
Model 302J	JUPITER's optional remote tuning/control device.
MOLEX™ connector	Brand name of JUPITER's power connector.
monaural (2-circuit – "mono")	A jack or plug (of telephone origin) carrying "tip" (signal) and "sleeve" (ground) circuits. See stereo, below.
MULTI	JUPITER's (multiple-purpose control) operates many functions that used to require individual knobs and occupy more panel space.
non-QSK	An RF device lacking Ten -Tec's traditional break-in capability. See QSK.
non-volatile memory	Computer memory that retains its contents without electrical power.
NR (Noise Reduction)	JUPITER's DSP function that diminishes random noise on received signals.
open circuit	Electrical circuit having a disconnected load. A common antenna fault.
open-collector	A transistor circuit requiring external connection of a power source and a load.
overcurrent protection	Prevents many commonly occurring conditions from overloading JUPITER's wiring or power amplifier components.
PACTOR	A popular amateur radio digital mode.
paddles	The form of telegraph hand key that controls an automatic keyer.
PBT	(Passband Tuning) tunes the receiver's selective filter across the signal without moving the apparent receiver tuning.

PEGASUS Emulation Mode	JUPITER's built-in remote control function uses existing PEGASUS software.
personal computer	As used here, this means IBM™-compatible and Windows™ operating system.
phono plug	A common connector for shielded cables. RCA introduced them in the 30's for phonograph connections to radio sets.
polarized	A connector whose design prevents mating with incorrect orientation.
polarizing voltage	The necessary power to operate an electret microphone.
PSK31	A very popular form of digital modulation compatible with SSB transceivers.
push-pull	An amplifier circuit in which pairs of devices handle signal excursions above and below the static bias current to increase the range of operation.
PWR	(Power) usually RF power; sometimes primary power.
QRM	Radio "Q-code" for interference.
receiver overload	An extremely strong signal can cause distortion in the receiver even when it is on a different frequency.
Reflected (reverse) power	The component of RF power returned towards the generator from a load whose impedance is not matched to that of the transmission line.
Regulated	Usually a power supply whose output voltage is constant with changing load current.
remote encoder/keypad	See 302J, above.
RESET	To restore factory settings, press a front panel button while applying power to JUPITER.
resonant	The condition of being tuned to the operating frequency maximizes power transfer.
reverse-video	(Light lettering on a dark background) shows that a particular JUPITER function is selected and active.
RTTY	Radio Teletypewriter operation, a digital mode of long standing, still popular in amateur contesting.
Rx	(Receiver)
Selectivity	Ability separate signals close in frequency.
serial port	Connector (on rear) and circuitry for connecting JUPITER to a personal computer.
shielded cable	One or more wires inside a metallic shield to prevent signal leakage.

single lever paddle	A non-iambic keyer paddle.
SO-239 connector	Old military name for JUPITER's 50 OHM ANTENNA coaxial connector. It mates with a PL-259 cable plug.
SQUELCH	This function will mute the receiver audio until a signal exceeds the threshold setting.
S-T (sidetone volume)	A tone which provides audio feedback to a CW operator while he is transmitting.
station ground	The common connection of equipment chassis to earth ground.
status	Information on the state of JUPITER's controls, settings, and operating conditions.
STEP	(Tuning step size) is the selectable smallest amount by which JUPITER will change frequency in response to the tuning knob.
Stereo	A jack or plug (of telephone origin) carrying "tip" (signal A), "ring" (signal B), and "sleeve" (ground) circuits. See Figure 1-2.
straight key	The traditional manual telegraph key.
SWR (standing wave ratio)	On RF transmission lines, the ratio between line and load impedance. An indicator of mismatch.
TNC or phone patch	A (Terminal Node Controller) for packet radio and a phone patch for interconnection of radio and telephone are two examples of equipment served by JUPITER's ACC-1 connector.
transmit power peaks	Usually, the maximum levels of SSB voice signals.
TX	(Transmitter)
unbalanced	Characteristic of coaxial cable, a transmission line having one side connected to ground.
USB	(Upper SideBand). AM without carrier or upper sideband. See LSB.
η V	(Microvolt) one-millionth of a volt. Unit of measure for RF at the receiver's antenna.
VFO A, VFO B	JUPITER's two Variable Frequency Oscillator functions that control and store the transceiver operating frequency.
Weighting	The ratio of dit to space timing in Morse code.
WPM	(Words per Minute) see KEY SPD .

7 – TROUBLESHOOTING

While we cannot cover every possible problem, here are hints for dealing with some potential difficulties.

7.1 Check the Obvious!

- Is DC **PWR** okay?
- Check power supply, cable and connector(s).
- Is 25 ampere fuse loose or missing.
- Antenna Problems?
 - Is the proper antenna connected?
 - Is the antenna switch connected and properly set?

Control Settings?

- Have you double-checked JUPITER's many control settings, including those on the **MNU** screen, for your intended mode of operation?

7.1 Reset the Processor.

See paragraph 3.19. We have learned that this can cure a multitude of "bugs" in a few seconds.

7.2 No audio from receiver.

- Frequency controls act normally;
- S-meter seems to be reacting to signals.
 - Receiver squelched. Push **SQL** key to check setting.
 - Check settings of **AF** and **RF** gain controls.
 - Try a set of headphones in case the speaker has failed.
 - Check inside the cabinet for cable connectors that may have loosened in shipment or rough handling.

7.3 Symptom: distorted SSB

- Be certain the ALC is set properly in accordance with paragraph 2.6.2.

The ALC LED should flash briefly on voice peaks.

- A frequent cause of a distorted SSB signal is inadequate RF grounding resulting in feedback. Common RF grounding problems are:
 - No ground connection: or
 - Too long a lead to a good ground.
- Another potential cause of distorted SSB arises when the station is in the near field of the antenna. This is a problem many apartment dwellers face.

7.4 Diagnosing RF feedback problems

- Every amateur station should have access to a well-shielded 50-ohm dummy load. Start troubleshooting by disconnecting all RF accessory equipment from the transceiver output. Likewise disconnect all accessories from other radio connectors, leaving only the microphone. Be certain your microphone cable is well shielded. Connect the dummy load to the Antenna receptacle with a short coaxial cable.
- A nearby HF receiver (or a local ham friend's station) will likely have little trouble hearing your very low power RF signal when you transmit 100 watts into the dummy load. If the distortion problem does *not* disappear under these conditions, your rig may well have a problem and you should call Ten-Tec's service department. If the problem goes away, as is likely, you can begin the process of re-connecting accessories one-at-a-time to isolate the problem.

7.5 RF Grounding

- Many problems relate to the lack of an RF station ground, as contrasted with a safety ground connection. We recommend bonding all equipment chassis together with short heavy metal braid or strap. Make these connections from chassis ground lug to chassis ground lug and connect the last piece in the chain feeding the antenna to a good earth ground. This lead needs to be as short as possible. Lengths near $\frac{1}{4}$ wavelength on any band used can be particularly troublesome when the far end is connected to earth.
- Ten-Tec recommends following the good advice in the ARRL Handbook for dealing with RF grounds and safety grounds.

7.6 No Transmit, but Receiver works

- Check the following items on JUPITER's **MNU** screen to decide if the setting is right for the operating mode you plan to use:
- Is the **AUDIO SOURCE** set to **MIC** or **LINE** as appropriate?
- Is the **TRANSMITTER ENABLE ON**?
- Is the **KEYER ENABLE ON**?
- Is the **KEYING LOOP** set properly for your mode of operation? With no amplifier or with a non-QSK amplifier the **MNU** should indicate

KEYING LOOP off. See paragraph 3.15.

7.7 No Receiver, but JUPITER Transmits

- Check the **PBT** setting or turn it off. It may be set outside the passband.
- Disconnect any external equipment that might be pulling the **PTT** line to ground.
- Is the internal **KEYER** enabled with a mono plug is in the **KEY** jack? That would cause a constant stream of dits when you apply power.
- Check settings of the **SQL**, **AF**, and **RF** controls.

7.8 No operation in VOX

- Check the switch on the bottom of the Model 705 microphone.
- Check JUPITER's screen to see if the **MNU** items for **VOX** are active and set properly. If any of the three settings is at zero, **VOX** will not operate.

7.9 When All Else Fails...

- If the measures above do not fix the problem, please consult with our service department.

8 PEGASUS EMULATION MODE

JUPITER's **SERIAL INTERFACE** and built-in PEGASUS Emulation Mode provide the transceiver with remote control from a computer RS-232 port. JUPITER uses PEGASUS software in this mode. Upon detection of PEGASUS commands, JUPITER's display screen shows the legend **PEGASUS EMULATION MODE** and the normal front panel controls go inactive. JUPITER then responds much as a PEGASUS does. Using this mode makes all JUPITER's controls and functions visible on your computer screen and controllable by the computer keyboard, mouse, and optional Model 302J remote encoder/keypad. JUPITER reverts to front-panel operation when you quit the PEGASUS program.

JUPITER's Pegasus Emulation Mode allows a PEGASUS graphical user interface (GUI) computer program to operate the transceiver in a manner quite similar to the PEGASUS. This requires connecting a Windows computer to JUPITER's serial interface via a 9-pin serial port cable. The computer runs PEGASUS software (available by download from the www.tentec.com website). When JUPITER detects PEGASUS commands, the firmware responds by disabling the panel controls and displaying "Version x.xx PEGASUS EMULATION" in place of the JUPITER screen. "X.xx" will be the PEGASUS software version. The website provides a text help file for those unfamiliar with PEGASUS operation.

Über den Jupiter könnten die Meinungen auseinander gehen — die Gerätephilosophie von Ten-Tec ist eben von denen japanischer Hersteller ein wenig verschieden. Fest steht aber: Den Telegrafiefreund dürfte der amerikanische Charme dieses Transceivers bezaubern.

HF-Transceiver

Ten-Tec 538 Jupiter

Als Ten-Tec Anfang des Jahres 2000 die ersten Exemplare des Jupiter als Low-Range-Angebot für gut 1.000 Dollar auf den Markt brachte, gab es noch leichte Kinderkrankheiten, die in den heutigen Exemplaren weitgehend ausgemerzt sind. Dazu zählte ein zu hartes Ansprechen der Empfänger-AGC bei Sprachspitzen, von dem man nun nichts mehr findet. Geblieben ist der vergleichsweise geringe Regelumfang.

Auch zahlreiche Software-Aktualisierungen markierten den bisherigen Weg des Jupiter, nicht nur solche vom Hersteller, sondern auch solche für die anderen zahlreichen und oft sehr empfehlenswerten Programme zur Steuerung über einen Rechner.

Was der Funkamateurl heute mit dem Jupiter auf den Stationstisch bekommt, ist also ein aus-

gereiftes Gerät. Weil es recht komplex ist, kam es nicht nur zum weltweiten Erfahrungsaustausch von Jupiter-Besitzern im Internet, sondern auch zu Net-Runden speziell für Ten-Tec-Freunde jeden Sonntag auf 14.320 MHz um 21.30 Uhr und auf 7.251 MHz um 23 Uhr. Letzte ist aus Deutschland leider (noch) nicht zugänglich.

Nachfolger des Pegasus

Getreu der Methode der Benennung nach Sternbildern wurde der Nachfolger des Black-Box-Transceivers Pegasus Jupiter genannt. Seine Technologie jedoch ist stark an die des Orion angelehnt. Auch hat er quasi einen kleinen Bruder, nämlich den Empfänger RX-350, der sich in seinem Äußeren kaum vom Jupiter unterscheidet.

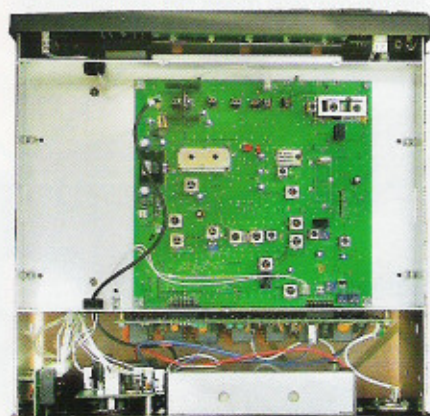
So sieht die komplette Station mit Jupiter, Desktop-Mikrofon Model 706 und Schaltnetzteil Model 963 aus.



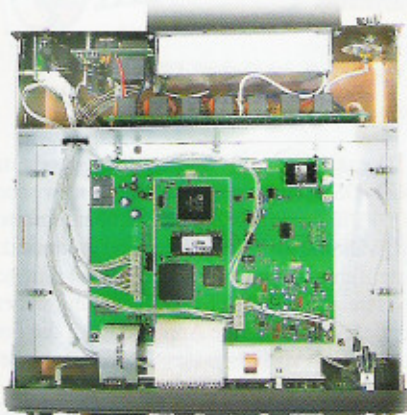
Das Schaltnetzteil sollte frei stehen, da es erhebliche Abwärme entwickelt. Der rückseitig montierte Lüfter sorgt für genügend Luftdurchsatz.



Die Ten-Tec-typische Rückseite wird vom Kühlkörper dominiert, an dem leicht ein Lüfter angebracht werden kann.



Auch der Blick von oben in das geöffnete Gerät zeigt viel ungenutzten Platz.



Blick von unten in den Jupiter. Viel freier Platz zeigt die Großzügigkeit der Entwickler bei der Raumaussnutzung.

der Jupiter problemlos per Software-Update um dieses Band auf zehn Amateurfunkbänder erweitert werden konnte.

Display fast wie beim Orion

Das Jupiter-Display ähnelt stark dem des Orion. Es wurde nur etwas anders aufgeteilt.



Der Automatiktuner ist senkrecht eingebaut.

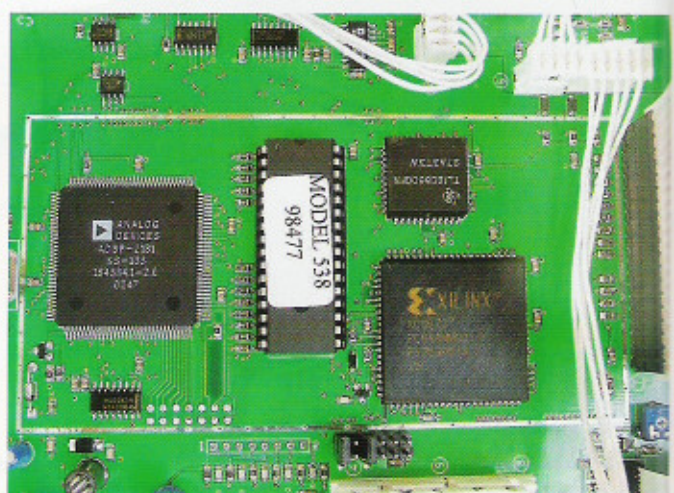
Technische Daten lt. Hersteller

Betriebsarten:	LSB, USB, CW, RTTY (AFSK), FM, AM
Empfangsfrequenzbereich:	100 kHz bis 30 MHz durchgehend
Sendefrequenzbereich:	alle KW-Amateurfunkbänder, per Software erweiterbar
Display:	LCD, Hintergrundbeleuchtung mit LEDs
VFO:	zwei VFOs mit Split-Modus
Feinverstimmung:	+/-10 kHz Offset für Empfänger und Sender
Speicher:	100 Frequenzen mit Einstellungen
Frequenzdrift:	+/-90 Hz bei 30 MHz für ein Jahr
Stromaufnahme:	1,5 A Empfang, 20 A Sendung
Spannungsbereich:	12-14 V DC
Aufbau:	acht Epoxyl-Glasfaser-Leiterplatten, Kunststoff-Spritzguss-Frontplatte, Aluminiumchassis, strukturlackierte Stahlblech-Halbschalen
Abmessungen:	12,7 x 30,8 x 33 cm inkl. Kühlkörper (H x B x T)
Masse:	5,23 kg
Senderausgangsleistung:	5-100 W einstellbar, ALC
Input:	max. 250 W bei 14 V DC
Einschaltzeit:	100 % Leistungsabgabe max. 20 min
dauerhaftig:	mit Zusatzlüfter an den Kühlrippen
Mikrofonimpedanz:	200 Ohm bis 50 kOhm
Mikrofonbuchse:	vierpolig, auch für Elektret-Mikrofon
Sende-Empfangs-Umschaltung:	PTT oder VOX bei SSB, QSK wahlweise FAST oder SLOW bei CW
CW-Offset:	programmierbar 400 Hz bis 900 Hz, DSP-gesteuert
Mithörton:	passt sich automatisch der Offset an, Lautstärke unabhängig wählbar
FM-Hub:	+/-5 kHz
SWR-Anzeige:	wählbar Vorlauf, Rücklauf, errechnetes SWR
SSB-Sprachaufbereitung:	DSP-gesteuert
Trägerunterdrückung:	min. 50 dB
Seitenband-Unterdrückung:	min. 60 dB bei 1,5 kHz
IM dritter Ordnung:	besser 25 dB bei Zweitonaussteuerung und Vollast 100 W PEP
Nebenwellen:	min. 40 dB Unterdrückung bei Vollast
Empfängerempfindlichkeit:	typ. 0,35 µV bei 10 dB S+N/N und 3 kHz Bandbreite in SSB
interne Filter:	34 Stück, 300 und 330 Hz, 375-750 Hz in Schritten von 75 Hz, 900-3.000 Hz in Schritten von 150 Hz, 3,3-6 kHz in Schritten von 300 Hz, 8 kHz
Shape-Faktor:	min. 1,5 bei allen Einstellungen
Dynamikbereich:	90 dB bei 3 kHz Bandbreite und 50 kHz Abstand
IP3:	10 dBm
Grundrauschen:	-126 dBm bei 3 kHz Bandbreite
S-Meter:	eingestellt auf S9 bei 50 µV
Abschwächer:	20 dB
Passband-Tuning:	+/-2 kHz
ZF-Frequenzen:	45 MHz, 455 kHz, 12 kHz
ZF- und Spiegelfrequenz-Unterdrückung:	typ. 60 dB
ZF-Durchschlagsfestigkeit:	typ. 60 dB
Empfänger-Erholzeit:	min. 20 ms auch im Split-Modus
Kleinsignalausgang:	1 V Spitze-Spitze an 600 Ohm

Dieses Schwarz-Weiß-Display, das mit LEDs beleuchtbar ist, wirkt recht übersichtlich, und das Menü lässt sich dank ausgeschriebener Funktionen für den Englischsprechenden nahezu unkompliziert handhaben. Während die Spektrumdarstellung recht groß und scharf erscheint und somit sehr gut ablesbar ist, wirkt das S-Meter etwas zu klein und setzt nicht auf ein analoges Instrument, wie man es vom Orion her kennt. Reichlich Platz dafür wäre vorhanden,

denn die Elektronik nimmt nur etwa den halben Raum im Gehäuse ein.

Dem Jupiter merkt man an, dass er von aktiven Hams konstruiert wurde, die das Handwerk der richtigen Programmierung von DSP-Bausteinen und der fachgerechten Auslegung von Mischern beherrschen. Aufgrund des recht hohen Grund-Stromverbrauchs empfehlen sich für den Portabelbetrieb „dicke“ Akkus. Die Einstellknöpfe täuschen eine nicht vor-



Herz und Hirn des Jupiter: Flash-ROM und DSP.

handene koaxial angeordnete Doppelfunktion vor, funktionieren aber dennoch anstandslos. Der Hauptabstimmknopf überzeugt durch wirklich gute Griffbarkeit, was den fehlenden Schwungradeneffekt deutlich kompensiert. Nur als Zubehör gibt es eine Tastatur, die den Frequenzwechsel bei einem großen Frequenzsprung erheblich erleichtert. Zu erwähnen wäre auch: Die Einsteller sind durch den rauen Gang etwas gewöhnungsbedürftig. Das ist kein Fehler, sondern so gewollt und nach etwas Gewöhnung gar nicht mal so unangenehm.

Wo ist der Lautstärkesteller?

Der Jupiter ist einer der wenigen Amateurfunk-Transceiver, die keinen Lautstärkesteller besitzen. Natürlich ist die Lautstärke von der Frontplatte aus einstellbar, aber nur über den Multifunktions-Einsteller durch Anwahl des entsprechenden Menüpunkts. Andere Funktionen tun es dem Lautstärkesteller gleich. Das bedeutet eine hohe Überschaubarkeit, zwingt aber zunächst zum Handbuchstudium. Damit der Benutzer nicht übersieht, dass der Bandwechsel nicht nur in eine Richtung möglich ist, sondern auch „rückwärts“ sollte die Bedienungsanleitung genau gelesen werden.

Wer die Bedienung umgestalten will, kann sich entsprechende Fernsteuerprogramme beschaffen. Diese sind wirklich empfehlenswert; sie ermöglichen eine ausgesprochen komfortable Bedienung und bieten hilfreiche Zusatzfunktionen.

Mikro, Monitor und Morsen

Hohe Schnelligkeit zeigte der eingebaute automatische Antennenkoppler im gesamten Anpassbereich. Bei Benutzung eines externen Antennenanpassgeräts kam es zur „Einstrahlung ins Mikrofon“. Dagegen halfen Verdrosselung und Erdung. Auch das originale Ten-Tec-Schaltenteil „beruhigte“ sich nach Erdung und Entkopplung: Je nach Empfangsfrequenz wirkten seine Impulse auch bei Einsatz einer Behelfsantenne nicht oder kaum störend. Das Schaltenteil sollte möglichst frei aufgestellt werden, da es eine beachtliche Abwärme produziert.

Der Jupiter hat eine recht empfindliche Leistungsregelung, die schon dann, wenn der hervorragend arbeitende automatische Antennenkoppler keine Anpassung mehr schafft, die Ausgangsleistung zurückschraubt. Besonders bei Ansteuerung einer Endstufe wäre dies eventuell zu berücksichtigen.

Das als Zubehör mitgelieferte Standmikrofon (zeitweise im Aktionspaket) wirkt trotz der genieteten Stahlplatte ein wenig schlicht. Der Windschutz ist fest angebracht. In seiner Hauptfunktion überzeugt das Mikrofon: Gegenstationen fanden den Sound weitgehend ausgewogen und natürlich. Mit DSP-Hilfe kann man zudem noch am Klangbild feilen.

Der Zweitlautsprecher-Ausgang hat Massepotential, was bei Zusatzgeräten für den digitalen

Der richtige Dreh! CREATE-Rotoren



Die soliden Horizontalrotoren von CREATE gibt es in drei verschiedenen Leistungsklassen. Sie sind für UKW-Antennen, UKW-Gruppen oder große KW-Beams geeignet. CREATE-Rotoren sind mit selbsthemmenden Schneckengetrieben aufgebaut und benötigen daher keine zusätzliche Bremse. Für komfortable Bedienung dieser Leistungs-Rotoren verfügt das Steuergerät über

eine PRESET-Funktion zur Richtungsvorwahl, regelbare Geschwindigkeit und eine große runde 360°-Kompasskala.

RC 5-1	Rotor mit var. Geschwindigkeit, ohne Preset	# 01046	€ 486,75
RC 5-1 DC	Rotor für 12 VDC-Betrieb	# 01037	€ 580,00
RC 5-3	Rotor mit Preset und var. Geschwindigkeit	# 01011	€ 654,45
RC 5A-3	Leistungsmotor m. Preset / var. Geschw.	# 01012	€ 943,85
RC 5A-3-P	wie RC 5A-3 mit Interface-Buchse	# 01013	€ 965,00
RC 5B-3	Hochleistungsmotor m. Preset / var. Geschw.	# 01009	€ 1423,45
RC 5B-3-P	wie RC 5B-3 mit Interface-Buchse	# 01010	€ 1466,40
ERC 51	Bevelsrotor	# 01042	€ 715,00
ERC 5A-P	Hochleistungsbevelsrotor	# 01039	€ 1401,00

Das richtige Zubehör: Überlager von CREATE

CK 46	bis Ø = 63 mm, sehr solide	# 01051	€ 76,00
WinRot RC	PC-Interface speziell für CREATE-Rotoren, Windows-Software + Autotracking	# 01111	€ 81,30

KOAXKABEL-SERVICE



Wunschlänge –
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	ab je m	ab 50 m	ab 100 m	N- Stecker	N- Buchse	BNC- Stecker	UHF- Stecker
ECOFLEX 10	€ 2,10	2,05	2,00	6,40	6,90	6,40	5,90
ECOFLEX 15	€ 3,95	3,90	3,85	9,70	9,94		
AIRCORE +	€ 2,65	2,55	2,45	6,40	6,90	6,40	5,90
AIRCORE 7	€ 1,45	1,35	1,25	5,10	5,10	5,10	2,55
H-2000	€ 2,10	2,05	2,00	4,66	4,61	5,79	5,22
RG 213	€ 1,46	1,33	1,20	5,82	6,40	5,56	2,43
RG 58	€ 0,72	0,67	0,64	5,54	6,70	2,17	2,43

GPS-Kombi-Antenne

Kombi-Antenne für 2-m/70-cm-Funk und GPS, aktives Patch mit 30-dB-Verstärker, zwei Anschlüsse
P0816 € 95,80

Mini-Batterie-Rotor

Sehr kleiner Horizontal-Rotor für Portabelzwecke mit Kabelfernsteuerung und Batteriebetrieb 6 V DC. Ideal für Portabelbetrieb
01089 nur € 32,00

5,6"-Farbmonitor

universeller TFT-Monitor für Video und ATU, 960 x 234 Pixel, PAL-Norm, 12 V DC, integrierter Lautsprecher, inkl. Fernbedienung und Standfuß
03649 € 148,00

Abo UKW-Berichte 2005

4 Ausgaben pro Jahr
Probeheft kostenlos
€ 21,00

flexaYagi

mit geringer
Windlast

FX 205V	7,6 dBd/1,2 m	€ 76,00
FX 210	9,1 dBd/2,2 m	€ 93,00
FX 213	10,2 dBd/2,8 m	€ 116,00
FX 217	10,6 dBd/3,5 m	€ 134,00
FX 224	12,4 dBd/4,9 m	€ 153,00
FX 7015V	10,2 dBd/1,2 m	€ 88,00
FX 7033	13,2 dBd/2,4 m	€ 91,00
FX 7044	14,4 dBd/3,1 m	€ 116,00
FX 7056	15,2 dBd/3,9 m	€ 135,00
FX 7073	15,8 dBd/5,1 m	€ 150,00
FX 2304V	14,2 dBd/1,2 m	€ 110,00
FX 2309	16,0 dBd/4,0 m	€ 139,00
FX 2317	18,5 dBd/4,0 m	€ 166,00
FX 1308V	16,0 dBd/1,2 m	€ 137,00
FX 1316	18,3 dBd/2,0 m	€ 165,00
FX 1331	20,5 dBd/4,0 m	€ 211,00

Antennen-Drehsystem



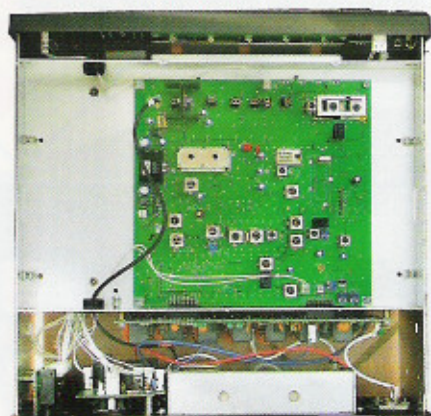
Ein komplettes Antennen-Drehsystem besteht aus:
2 x Plattform,
1 x Überlager
z.B. KS 065 oder
CK 46, 1 x
Horizontal-Rotor
Plattformen
aus Stahl pro Stück
PLS 50
bis Ø 50 mm
01022 € 50,00
PLS 60
bis Ø 60 mm
01023 € 60,00

F9FT-TONNA-Antennen

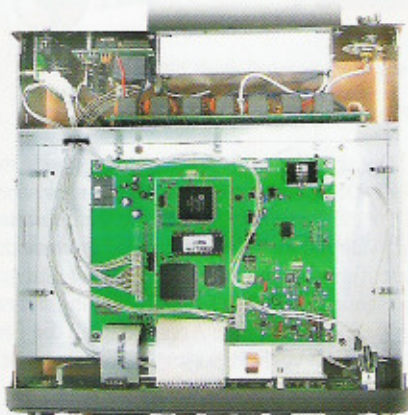
2 m, 4 El.	8,9 dBd/0,93 m	€ 53,70
2 m, 9 El.	13,1 dBd/3,47 m	€ 63,90
2 m, 9 El. port.	13,1 dBd/3,47 m	€ 67,00
2 m, 11 El.	14,2 dBd/4,56 m	€ 98,70
2 m, 17 El.	15,3 dBd/6,50 m	€ 114,60
2 m, 2x4	8,9 dBd/1,03 m	€ 80,80
2 m, 2x9	13,0 dBd/3,57 m	€ 103,80
2 m, 2x11	14,0 dBd/4,62 m	€ 140,10
70 cm, 9 El.	11,9 dBd/1,24 m	€ 52,70
70 cm, 19 El.	16,2 dBd/2,32 m	€ 62,90
70 cm, 23 El.	18,0 dBd/1,80 m	€ 80,80
70 cm, 21 El.-L	18,2 dBd/4,60 m	€ 80,80
70 cm, 2x19	16,0 dBd/3,25 m	€ 73,10
23 cm, 23 El.	18,0 dBd/1,80 m	€ 59,30
23 cm, 35 El.	20,0 dBd/3,07 m	€ 72,10
23 cm, 55 El.	21,5 dBd/6,64 m	€ 100,20
2,3 GHz, 25 El.	18,3 dBd/1,45 m	€ 74,15
2,4 GHz, 25 El.	18,3 dBd/1,45 m	€ 74,15
5/6 m, 3,45 m	10,0 dBd/3,45 m	€ 104,00

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Auch der Blick von oben in das geöffnete Gerät zeigt viel ungenutzten Platz.



Blick von unten in den Jupiter. Viel freier Platz zeigt die Großzügigkeit der Entwickler bei der Raumausnutzung.

der Jupiter problemlos per Software-Update um dieses Band auf zehn Amateurfunkbänder erweitert werden konnte.

Display fast wie beim Orion

Das Jupiter-Display ähnelt stark dem des Orion. Es wurde nur etwas anders aufgeteilt.



Der Automatiktuner ist senkrecht eingebaut.

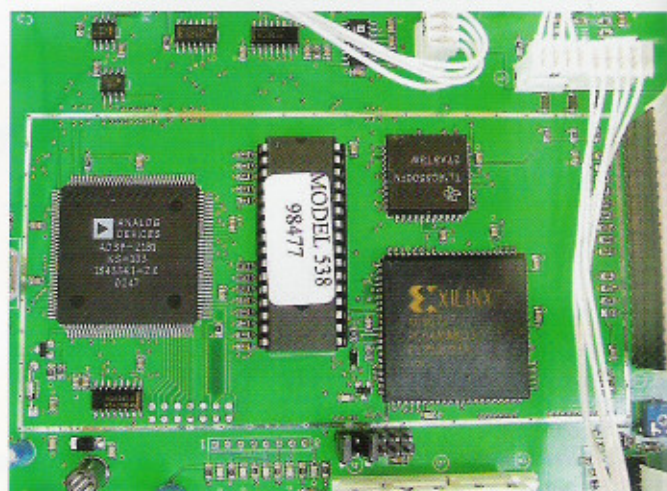
Technische Daten lt. Hersteller

Betriebsarten:	LSB, USB, CW, RTTY (AFSK), FM, AM
Empfangsfrequenzbereich:	100 kHz bis 30 MHz durchgehend
Sendefrequenzbereich:	alle KW-Amateurfunkbänder, per Software erweiterbar
Display:	LCD, Hintergrundbeleuchtung mit LEDs
VFO:	zwei VFOs mit Split-Modus
Feinverstimmung:	+/-10 kHz Offset für Empfänger und Sender
Speicher:	100 Frequenzen mit Einstellungen
Frequenzdrift:	+/-90 Hz bei 30 MHz für ein Jahr
Stromaufnahme:	1,5 A Empfang, 20 A Sendung
Spannungsbereich:	12-14 V DC
Aufbau:	acht Epoxid-Glasfaser-Leiterplatten, Kunststoff-Spritzguss-Frontplatte, Aluminiumchassis, strukturlackierte Stahlblech-Halbschalen
Abmessungen:	12,7 x 30,8 x 33 cm inkl. Kühlkörper (H x B x T)
Masse:	5,23 kg
Senderausgangsleistung:	5-100 W einstellbar, ALC
Input:	max. 250 W bei 14 V DC
Einschaltzeit:	100 % Leistungsabgabe max. 20 min
dauerlastfähig:	mit Zusatzlüfter an den Kühlrippen
Mikrofonimpedanz:	200 Ohm bis 50 kOhm
Mikrofonbuchse:	vierpolig, auch für Elektret-Mikrofon
Sende-Empfangs-Umschaltung:	PTT oder VOX bei SSB, QSK wahlweise FAST oder SLOW bei CW
CW-Offset:	programmierbar 400 Hz bis 900 Hz, DSP-gesteuert
Mithörton:	passt sich automatisch der Offset an, Lautstärke unabhängig wählbar
FM-Hub:	+/-5 kHz
SWR-Anzeige:	wählbar Vorlauf, Rücklauf, errechnetes SWR
SSB-Sprachaufbereitung:	DSP-gesteuert
Trägerunterdrückung:	min. 50 dB
Seitenband-Unterdrückung:	min. 60 dB bei 1,5 kHz
IM dritter Ordnung:	besser 25 dB bei Zweitonaussteuerung und Volllast 100 W PEP
Nebenwellen:	min. 40 dB Unterdrückung bei Volllast
Empfängerempfindlichkeit:	typ. 0,35 µV bei 10 dB S+N/N und 3 kHz Bandbreite in SSB
interne Filter:	34 Stück, 300 und 330 Hz, 375-750 Hz in Schritten von 75 Hz, 900-3.000 Hz in Schritten von 150 Hz, 3,3-6 kHz in Schritten von 300 Hz, 8 kHz
Shape-Faktor:	min. 1,5 bei allen Einstellungen
Dynamikbereich:	90 dB bei 3 kHz Bandbreite und 50 kHz Abstand
IP3:	10 dBm
Grundrauschen:	-126 dBm bei 3 kHz Bandbreite
S-Meter:	eingestellt auf S9 bei 50 µV
Abschwächer:	20 dB
Passband-Tuning:	+/-2 kHz
ZF-frequenzen:	45 MHz, 455 kHz, 12 kHz
ZF- und Spiegelfrequenz-Unterdrückung:	typ. 60 dB
ZF-Durchschlagsfestigkeit:	typ. 60 dB
Empfänger-Erholzeit:	min. 20 ms auch im Split-Modus
Kleinsignalausgang:	1 V Spitze-Spitze an 600 Ohm

Dieses Schwarz-Weiß-Display, das mit LEDs beleuchtet ist, wirkt recht übersichtlich, und das Menü lässt sich dank ausgeschriebener Funktionen für den Englischsprechenden nahezu unkompliziert handhaben. Während die Spektrumdarstellung recht groß und scharf erscheint und somit sehr gut ablesbar ist, wirkt das S-Meter etwas zu klein und setzt nicht auf ein analoges Instrument, wie man es vom Orion her kennt. Reichlich Platz dafür wäre vorhanden,

denn die Elektronik nimmt nur etwa den halben Raum im Gehäuse ein.

Dem Jupiter merkt man an, dass er von aktiven Hams konstruiert wurde, die das Handwerk der richtigen Programmierung von DSP-Bausteinen und der fachgerechten Auslegung von Mischern beherrschen. Aufgrund des recht hohen Grund-Stromverbrauchs empfehlen sich für den Portabelbetrieb „dicke“ Akkus. Die Einstellknöpfe täuschen eine nicht vor-



Herz und Hirn des Jupiter: Flash-ROM und DSP.

Messprotokoll Ten-Tec Jupiter

Seriennummer: HC10223

Empfangsteil

Sämtliche Messungen erfolgten bei 2,4 kHz ZF-Bandbreite.

Shape-Faktor: 2,4 (6/50 dB, 2.760/6.500 Hz)

Achtung: Wegen zu geringer Poldämpfung und verhältnismäßig hohem trägernahen Seitenbandrauschen der Frequenzaufbereitung basiert die Angabe auf -6 dB/50 dB, was bei der weiteren Beurteilung nicht berücksichtigt wurde!
Der Shape-Faktor kennzeichnet die Nahselektivität.

Rauschmaß

Es kennzeichnet die Empfindlichkeit und sollte deutlich unter dem Außenrauschen liegen.

Rauschmaß

Band	VV	F _{eff}
80 m	-	14 dB
40 m	-	13 dB
20 m	-	12 dB
15 m	-	13 dB
10 m	-	15 dB

Mittlerer Intercept-Punkt zweiter Ordnung: 54 dBm

Er beschreibt praktisch die Immunität gegenüber Rundfunktendern.

Einzelwerte

Empfangsfrequenz	Erregersignale bei	IP2
7 MHz	0,5 + 6,5 MHz	58 dBm
7 MHz	2 + 9 MHz	47 dBm
14 MHz	5 + 9 MHz	50 dBm
14 MHz	1 + 15 MHz	60 dBm
21 MHz	7 + 14 MHz	56 dBm
21 MHz	9,5 + 11,5 MHz	55 dBm

Intercept-Punkte dritter Ordnung

Der Intercept-Punkt dritter Ordnung IP3 – insbesondere vermindert um das Rauschmaß, d. h. als effektiver IP3 (IP3eff) – gilt als wichtiges Kennzeichen des Großsignalverhaltens. Diese(r) sollte(n) möglichst hoch liegen.

IP3-Einzelwerte

Band	f2 - f1 = 5 kHz	f2 - f1 = 20 kHz	f2 - f1 = 200 kHz
80 m	-26 dBm	-3 dBm	6 dBm
40 m	-30 dBm	-10 dBm	5 dBm
20 m	-17 dBm	-2 dBm	9 dBm
10 m	-29 dBm	-7 dBm	-3 dBm

IP3eff-Einzelwerte

Band	f2 - f1 = 5 kHz	f2 - f1 = 20 kHz	f2 - f1 = 200 kHz
80 m	-41 dBm	-18 dBm	-8 dBm
40 m	-43 dBm	-23 dBm	-8 dBm
20 m	-29 dBm	-14 dBm	-4 dBm
10 m	-44 dBm	-22 dBm	-18 dBm

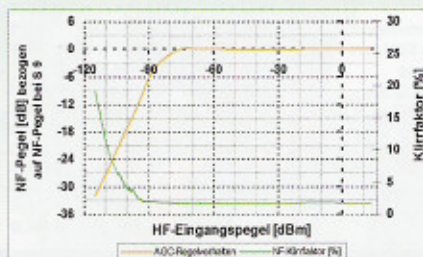
Dynamikbereich dritter Ordnung: 77 dB

(40 m, SSB, f2 - f1 = 20 kHz)

Dieser Bereich ist die Spanne zwischen einem intermodulierenden Störton und einem Intermodulationsprodukt dritter Ordnung mit 0 dB Rauschabstand.

Kennlinie und nomineller Regelbereich der AGC: 90 dB

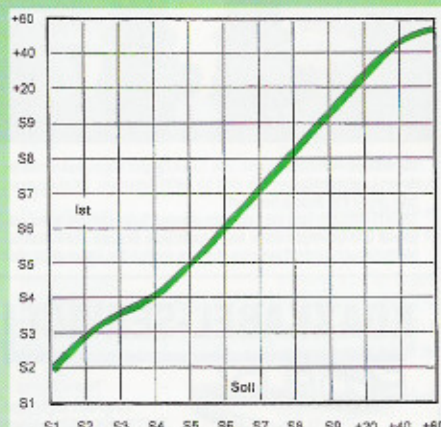
Infolge der im KW-Amateurfunk sehr hohen Pegelschwankungen ist eine automatische Regelung (AGC) mit hohem Dynamikbereich wünschenswert.



AGC-Regelverhalten und Demodulationsklirrfaktor: Die Lautstärkeinstellung kann am Display in Prozent digital abgelesen werden. Über 50 % steigt der Klirrfaktor stark an.

S-Meter-Anzeigegeometrie

Dem Wunsch nach der Konstruktion eines S-Meters mit wünschenswert hoher Genauigkeit wurde in hervorragender Weise entsprochen. Das obere Ende des Anzeigeumfangs liegt bei S9 + 99 dB und wird bei einem Pegel von 13,8 dBm am Eingang erreicht.



Oszillatorrauschen: -112 dBc/Hz (40 m, 10 kHz Abstand)

Infolge der neben schwächeren Signalen auftretenden stärkeren Eingangspegel kommt es im Amateurfunkdienst oft durch Oszillatorrauschen zu reziprokem Mischen und somit zur Desensibilisierung. Es sollte möglichst gering sein.

Blocking-Abstand: 65 dB (40 m, 20 kHz Abstand, bezogen auf ein -79 dBm/50-Nutzsignal)

Infolge der neben schwächeren Signalen auftretenden stärkeren Eingangspegel kommt es im KW-Amateurfunk durch Blocking oft zur Desensibilisierung. Der Blocking-Abstand sollte möglichst hoch sein.

Eigenempfangsstellen: 6 (davon 5 leise)

auf Amateurbändern über 10 MHz
Eigenempfangsstellen mindern oder verhindern den Empfang von Nutzsignalen auf der selben Frequenz.

Empfangsstromaufnahme: etwa 1,3 A

Sendeteil

Stromaufnahme und Wirkungsgrad bei verminderter Sendeleistung

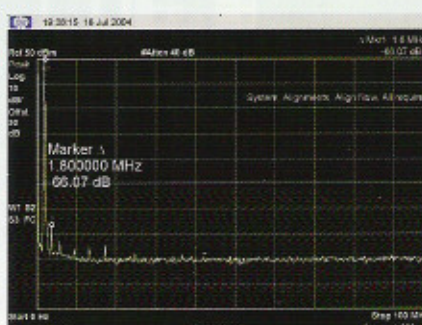
QRP-Betrieb wird auch gerne mit QRO-Geräten praktiziert, falls sich ihr Output bei akzeptabler Stromaufnahme (bzw. akzeptablem Input) vermindern lässt.

Einzelwerte

Band	Output in 50 Ohm	Betriebsspann.	Stromaufn.	Wirkungsgrad
160 m	99 W	14,2 V	-	-
160 m	5,1 W	14,2 V	5,2 A	7 %
10 m	101 W	14,2 V	-	-
10 m	5 W	14,2 V	5,2 A	7 %

Neben- bzw. Oberwellenabstand: -50 dBc

Um andere Funkamateure und -dienste möglichst wenig zu stören, sollten recht schwache Neben- und Oberwellen generiert werden. Hinweis: Auch bei hochwertigen Analyzern kann der Mischer durch Begrenzung eine zu geringe Anzeige des Abstands verursachen. Dieser Fehler ist jedoch bis etwa 65 dB gering.



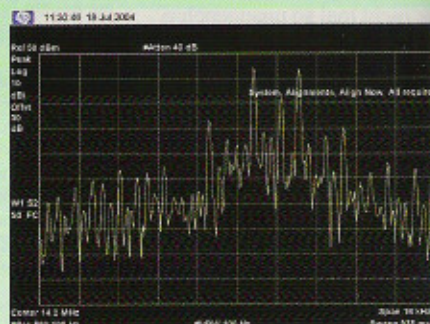
Senderausgangsspektrum auf 160 m.



Senderausgangsspektrum auf 10 m.

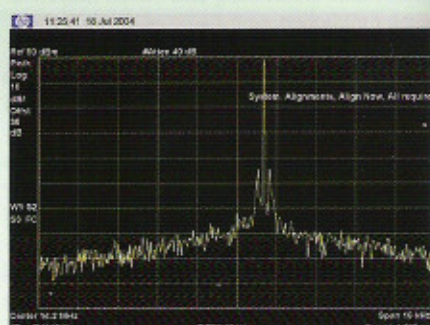
Intermodulationsdämpfung: -20 dBc (20 m)

Sie sollte hoch sein, so dass der Empfang von Stationen in der Umgebung der Sendefrequenz nicht durch eigene Intermodulationsprodukte beeinträchtigt wird.



Senderintermodulation auf 20 m mit Tönen von 700 Hz und 2,5 kHz. Die obere Linie entspricht der nominellen Ausgangsleistung bei Eintonaussteuerung.

Hinweis: Manche Quellen geben die Intermodulationsdämpfung bezogen auf die nominelle Einton-Aussteuerleistung an, hierfür wären zu den hier angegebenen Abständen 6 dB zu addieren.



Senderseitenband- und Trägerunterdrückung auf 20 m: Weder ein Restträger noch ein unerwünschtes Seitenband lassen sich nachweisen, die Unterdrückung dieser Signalkomponenten ist sehr gut.

Trägerunterdrückung: min. -60 dBc (20 m)

Seitenbandunterdrückung: min. -60 dBc (20 m)
Träger- und Seitenbandunterdrückung sollten insbesondere bei hohem Output hoch sein, sodass der Empfang von über- oder unterhalb der eigenen Station benachbarter Stationen nicht durch diese unerwünschten Signalkomponenten beeinträchtigt wird.

Ausfertigung:

Ralf Rudersdorfer, OE3RAA

Labor: J. K. Universität Linz –

Institut für Nachrichten-/

Informationstechnik



Funk zu der bekannten „Brummschleife“ führt. Eine einfache Entkopplung gelingt mit zwei NF-Transformatoren, die man mit ihren hochohmigen Seiten zusammenschaltet.

Wenig hilfreich war bei der Auswertung der Einstrahlprobleme die Monitorfunktion zur Kontrolle der eigenen Aussendung. Sie greift vermutlich schon sehr weit vorn in den Senderzug ein. Die Wirkung des passabel arbeitenden Kompressors konnte somit selbst im Kopfhörer nicht überprüft werden. Oder gibt es in den Tiefen irgend eines Menüs vielleicht eine Einstellung hierfür? Der Kompressor besitzt übrigens keine Ein/Aus-Funktion, sondern kann per Menü problemlos zwischen 0 und 100 % eingestellt werden.

Der Jupiter wurde von Funkamateuren entwickelt, die große Liebhaber des Morsens sind. Denn in der Betriebsart Telegrafie entfaltet dieser Transceiver erst wirklich alle seine Qualitäten. Nicht nur variables CW-Offset mit der komfortablen frequenzmäßigen Anbindung an den Mithörten (Auto-Tracking) und die gute Flankensteilheit der Filter, sondern auch das „seidenweiche“ QSK dürften so manchen Besitzer dazu bringen, öfter die Taste zu schwingen.

Wer den Jupiter einmal im Betrieb sehen will, kann eine DVD von WA4HWN erwerben. Hier wird in 20 Minuten recht nett demonstriert, was dieser Transceiver alles kann, ohne dass der Eindruck aufdringlicher Werbung entsteht. Hinzu kommt ein Firmenporträt, das die vielseitigen Tätigkeiten von Ten-Tec zeigt. Gut gemacht!

Fazit

Der Jupiter ist ohne jeden Zweifel mit Liebe zum Amateurfunk gebaut, wenn er auch manchmal etwas eigenwillig wirkt. Kennt man diesen Transceiver, kann man ihn sachgerecht bedienen, und er arbeitet zuverlässig und gut. Bei längeren Durchgängen wird der Kühlkörper allerdings



An Übersichtlichkeit lässt die Darstellung auf dem LCD nichts zu wünschen übrig, nur das S-Meter ist ein wenig klein geraten.



Das aussagekräftige Menü lässt keine Fragen offen.



Eine Demo-CD erklärt die Funktionen des Jupiter.

etwas heiß, weshalb die Nachrüstung eines Lüfters empfehlenswert ist. Der SSB-Freund mag hier und da noch ein wenig Optimierungs-

bedarf sehen, während der CW-Enthusiast in dem Jupiter sein optimales Funkgerät bezüglich Preis und Leistung finden könnte. Das in den USA als Ikone der Bewegung „Buy American“ hochstilisierte Gerät mit typisch amerikanischem Touch könnte sicherlich auch hier zu Lande viele Freunde finden, schon deshalb, weil es ein echtes Amateurfunkgerät ist.

Wolf P. Tangermann, DK1WC

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NEU!

SPS-4128-A

- hochwertiges Schaltnetzteil 25 Ampere
- klein, kompakt, leicht, nur 17 x 19 x 7 cm; 1,9 kg
- Eingangsspannung 115/230 VAC schaltbar
- Ausgangsspannung 13,5 VDC

NEU!

SPS-8400 40 Ampere
SPS-8250 25 Ampere

SPS-9600 60 A, 3-15 V
SPS-9400 40 A, 3-15 V

Antennen

MAAS MA-2000 • MA-3000 • MA-6000
Duo-Band Amateur VHF/ UHF Feststationsantenne.

- Hochwertige Qualität
- 144 MHz. (140 - 149 MHz. SWR besser als 1,5) / 430 MHz.
- (426 - 441) MHz. SWR besser als 1,5)
- max. Leistung 200 Watt
- weisser Fiberglasstrahler mit vergoldeter N Anschlussbuchse
- 3 Radiale jeweils 52 cm lang
- Montage mit U Bügel von 248 mm

MA-2000
144 MHz. 6 dBi / 430 MHz. 8 dBi

MA-3000
144 MHz. 6,7 dBi / 430 MHz. 9,2 dBi

MA-6000
144 MHz. 8,3 dBi / 430 MHz. 11,7 dBi

Produktvorankündigung TOP - Neuheit!!!
Ranger RCI Amateurtransceiver by Maas

RCI-2970-DX
Dual Band Amateur 10 und 12 Meter Mobile Transceiver

150 WATT OUTPUT

RCI-2905-DX
Dual Band Amateur 10 und 12 Meter Base Station Radio

150 WATT OUTPUT

RCI-2950
Dual Band Amateur 10 und 12 Meter Mobile Transceiver

HF-Verstärker

HLA-300-V 1,5-30 MHz 300/580 Watt

HLA-150

- Echte Qualitäts HF-Endstufe, 1,5 - 30 MHz.
- Input: 1-15 W AM-FM bzw. 1-20 W SSB
- Output: max. 130 W bei AM-FM bzw. max. 250 W PEP bei SSB
- AM-FM-SSB-CW Mode
- PTT oder HF-Vox Betrieb

UKW-Verstärker

VLA-200-V 140-150 MHz 250 Watt

- VHF Endstufe 140-150 MHz.
- 24 Ampere, 12-14 Volt
- Input 1-50 Watt
- Output 250 Watt max.
- SWR Betrieb max. 1:1,5
- FM-SSB-CW Mode
- Vorverstärker 18-26 dB
- mit eingebauten Lüftern

Grosse Auswahl an PMR-446 Funksprechgeräte

SL-01
PMR-446LP Duo-Bandfunkgerät

TTI PMR-200
PMR-446 Armbanduhr

TTI PMR-500-TX
PMR-446 Slim Line Walkie-Talkie

KENWOOD TK-5200
PMR-446 Handfunkgerät

Wir wünschen Allen unseren Kunden ein schönes Weihnachtsfest und bedanken uns für die Zusammenarbeit.
IMPORT/EXPORT • GÜNSTIG EINKAUFEN, DIREKT VOM IMPORTEUR

JUPITER

Model 538



JUDGE FOR YOURSELF!

JUPITER: A revolution in price versus performance for HF transceivers. Never has such a powerful HF transceiver been so easy to operate - simple, logical layout of front panel controls allows operation of the rig without the instruction manual tied to your wrist. A large, multi-function LCD graphics panel displays all radio functions and metering with a clean, uncluttered appearance. Take a look at what JUPITER brings to your shack. 34 built-in IF-DSP receive filters. No extra filters to purchase or install! Tailor the sound of your SSB transmit audio with 18 DSP-generated transmit bandwidths.

Software is the heart of JUPITER, and it's all stored in Flash ROM. This may be the last HF rig you ever need to buy. To add new features, simply visit our website, download the latest, and it's as if your rig rolled off the production line a few minutes earlier. Fully PC-controllable using provided graphical user interface software. That's right, run the entire radio from your personal computer, not just a few functions. Connect it to a serial port, and you're on the air. (Front panel operation is disabled and independent from PC GUI operation.) 100 watts output on all 9 HF ham bands, general coverage receiver, dual VFO's, RIT/XIT, passband tuning, adjustable AGC. Full QSK for CW and fast switching digital modes!

	JUPITER	FT920	TSS70SG	IC746
IF-DSP	YES	NO	NO	YES
# of stock RX filters	34	2	11	4
Variable SSB transmit B/W	YES	NO	YES	NO
Band sweep scope	YES	NO	NO	YES
Entire radio PC-controllable	YES	NO	NO	NO
Logic updates via Internet	YES	NO	NO	NO
Remote knob available	YES	NO	NO	NO
1 Hz frequency display	YES	NO	NO	YES
QSK amp keying loop	YES	YES	NO	NO
30-day, risk-free trial	YES	NO	NO	NO



302J Remote Encoder/Keypad:

Allows armchair tuning for your Jupiter. Direct frequency entry from keypad. Three function buttons above the tuning knob can control main tuning rate, mode switching, SPLIT reverse, VFO switching, and sweep function.



Model 705
Desk Microphone



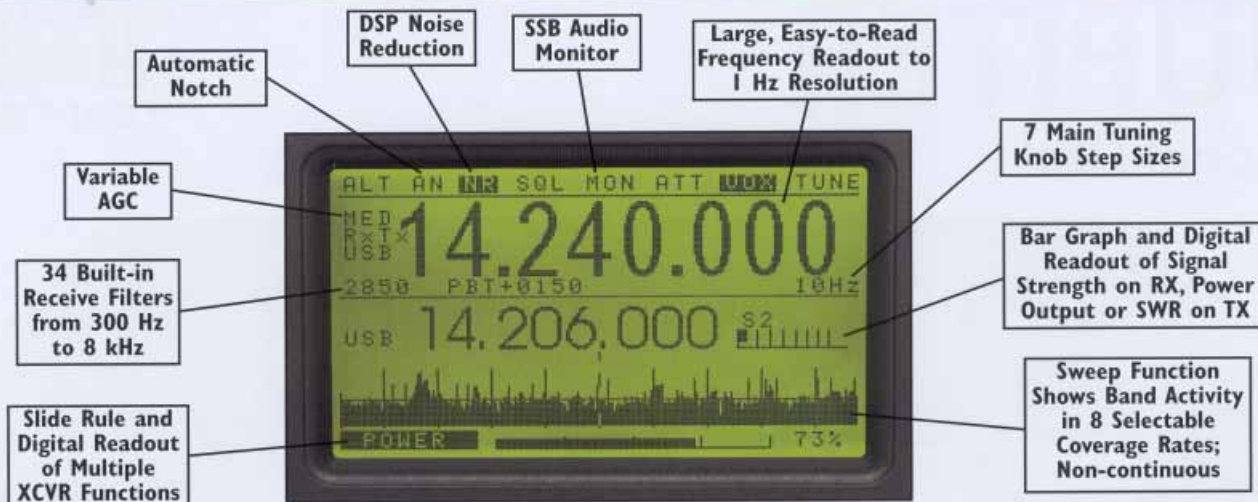
Model 963 Switching
Power Supply:
115/230 VAC input, 13.8 VDC
@ 25A output.



307C External
Speaker

Also Available: Model 701 Hand Microphone(not shown)
Model 538AT Optional Internal Automatic Antenna Tuner (not shown)

SCREEN DISPLAY



MENU DISPLAY



ADDITIONAL MENU ITEMS (not shown): High End RX Audio Boost, Screen Contrast, Noise Blanker, Speech Proc, Low End TX Audio Roll-Off

TX METER: Metering switchable between SWR and forward power.
TRANSMITTER: Transmitter can be disabled for RX-only use.
TX FILTER B/W: 18 selectable DSP transmit bandwidths ranging from 900 to 3900 Hz.
KEYING LOOP: Full QSK keying loop for keying true QSK linear amplifiers.
AUDIO SOURCE: Selectable to accept audio input from mic jack or rear panel ACC jack.
EXT T/R DELAY: Adjustable delay for keying of non-QSK linear amplifiers.
SIDETONE FREQ: CW sidetone frequency adjustable 0-1270 Hz in 10 Hz steps. CW xmit offset automatically tracks sidetone setting for easy zero beating using SPOT button.
SPOT VOLUME: For zero-beating; adjustable independent of main or sidetone volume controls.
CW QSK DELAY: Adjustable for just the "right" amount of QSK action.
CW WEIGHTING: Adjustable dit:dah weighting ratio for internal keyer.
CW KEYER: turns internal keyer on or off and allows acceptance of mono or stereo CW key connection through KEY jack.
AUTO SWEEP: Automatically re-activates the sweep feature for a new "look" at the band when the main tuning knob is moved out of range of the original sweep.
SWEEP RANGE: 8 selectable ranges from 240 Hz - 2.4 MHz allow small or large portions of band to be "seen" using the sweep feature.

GENERAL SPECIFICATIONS

MODES: LSB, USB, CW RTTY (AFSK), FM, AM.
FREQUENCY RANGE: Receive - 100 kHz to 30 MHz.
 Transmit - all ham bands 160-10 meters.
DISPLAY: LCD.
DUAL VFO's with SPLIT mode.
OFFSET TUNING: +/- 10 kHz receive and transmit.
MEMORIES: 100.
FREQUENCY ACCURACY: +/-90 Hz at 25 degrees C at 30 MHz for 1 year.
ANTENNA: 50 ohms unbalanced.
POWER REQUIRED: 1.5A receive, 20A transmit @ 12-14 VDC.
CONSTRUCTION: 8 epoxy glass PC boards, molded front panel, aluminum chassis, texture painted steel cover.
DIMENSIONS: HxWxD - 5" x 12.125" x 13" (12.7 x 30.8 x 33 cm). Depth measurement includes rear panel heat sink.
WEIGHT: 11.5 lbs. (5.23 kg).

TRANSMITTER

RF OUTPUT: 5 - 100 watts, ALC stabilized.
DC INPUT: maximum 250 watts @ 14 VDC, 100% duty cycle for up to 20 minutes. Indefinite continuous duty with user-supplied air cooling of rear panel heat sink.
MICROPHONE INPUT: 200 to 50K ohms. 4-pin, front panel connector accepts microphones with 5 mV (-67 dB) output. Polarizing voltage provided for electrets.
T/R SWITCHING: PTT or VOX on SSB, FAST or SLOW QSK on CW.
CW OFFSET: Programmable 400 to 900 Hz, DSP-generated. Sidetone automatically matches offset, volume adjustable independent of AF GAIN control.
FM DEVIATION: +/- 5 kHz.
METERING: Switchable to forward power, reflected power or SWR.
SSB GENERATION: DSP-generated.
CARRIER SUPPRESSION: >50 dB.
UNWANTED SIDEBAND SUPPRESSION: >60 dB at 1.5 kHz tone.
THIRD ORDER INTERMOD: 25 dB below two-tone @ 100 watts PEP.
SPURIOUS OUTPUT: Better than 40 dB below peak power output.

RECEIVER

SENSITIVITY: 35 μ V typical for 10 dB S+N/N @ 3 kHz bandwidth, SSB mode.
SELECTIVITY: 34 filters built in; 300 Hz, 330 Hz, 375 - 750 Hz in 75 Hz increments, 900 - 3000 Hz in 150 Hz increments, 3.3 - 6.0 kHz in 300 Hz increments, 8.0 kHz. All 1.5:1 shape factor or better.
DYNAMIC RANGE: 90 dB @ 3 kHz bandwidth at 50 kHz spacing.
THIRD ORDER INTERCEPT: +10 dBm.
NOISE FLOOR: -126 dBm @ 3 kHz bandwidth.
S-METER: Calibrated to 50 μ V at 59.
ATTENUATOR: -20 dB.
PASSBAND TUNING: +/- 2 kHz.
I-F FREQUENCIES: 1st I-F 45 MHz, 2nd I-F 455 kHz, 3rd I-F 12 kHz.
I-F REJECTION: > 60 dB typical.
IMAGE REJECTION: > 60 dB typical.
RECEIVE RECOVERY TIME: less than 20ms, including SPLIT mode.
AUDIO: speaker = 1 watt @ 4 ohms, line out = 1 V p-p into 600 ohms.

All specifications subject to change without notice.

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