rf neulink
DIVISION OF RF INDUSTRIES

RF Neulink NL5000-T VHF/UHF

PROGRAMMABLE

FM TRANSCEIVER MODULES

MAINTENANCE & OPERATING

MANUAL

FOR USE ONLY BY AUTHORIZED SERVICE/MAINTENANCE PERSONNEL

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I NL5000-T MODULES

1 INTRODUCTION

1.1 GENERAL

The NL5000-T modules are programmable 2-way radios, which operate either in the VHF, 220 MHz or UHF professional FM communications bands. Each of eight channels can be programmed to contain a unique set of operating frequencies. The NL5000-T VHF/220/UHF module is made up of two PC boards, an RF board and a control/loader board. These two boards are enclosed in a metal case with two connectors on one end; a 50 ohm BNC connector for connection to an antenna and a DB-15 sub-miniature connector for power and control input/output.

In addition, the RF board is available as a stand-alone unit for system integrators. The RF board as sold as a stand-alone item has a few more hardware options than when installed and sold as part of a module. See section 11 for details on the hardware options.

1.2 MODEL IDENTIFICATION

The part number system for the NL5000-T VHF/220/UHF module is as follows:

The module has a part number in the form of "NL5000-VHF/HN"

Where:

A is the major frequency band designator:

VHF=VHF
220=220 MHz
UHF=UHF

/ designates the IF bandwidth:

N=narrow
W=wide

F designates whether the control/loader board has a regulator and if so, at what current level:

D=no regulator; the unit must operate at +7.5 VDC and is limited to either 3 or 6 watts max.
L=low current regulator; the power module is not regulated. Used for 10 watt version only.
I=high current regulator; the unit operates from 10-15 volts at either 3 or 6 watts max.

Example: NL5000-UHF/HN-T would be a UHF module for operation between 450 and 470 MHz with a BNC RF connector, narrow (12.5 kHz channel spacing).

Note that the RF board inside a module is not exactly the same as the corresponding stand-alone RF board. There are a number of components and jumper options on the stand-alone board that are not necessary when mated to the NL5000-T control/loader board.

1.3 FCC REGULATIONS

1.3.1 LICENSING

The FCC requires that the radio owner obtain a station license for his radio before using the equipment to transmit, but does not require an operating license or permit. The station licensee is responsible for proper operation and maintenance of his radio equipment, and for ensuring that transmitter power, frequency and deviation are within the limits specified by the station license. This includes checking the transmitter frequency and deviation periodically using appropriate methods.

1.3.2 EQUIPMENT AUTHORIZATION

The unit is certified for transmission of either voice or data signals when aligned according to the alignment procedure for the proper bandwidth and when operated as a complete unit in the metal case. Operation of the RF board as a stand-alone unit or in combination with any other equipment, in any mode outside the alignment procedure, or with the clipper filter electronically disabled will require the filing of a new type acceptance application with the FCC by the user.

1.3.3 SAFETY STANDARDS

The FCC, with its action in General Docket 79-144, March 13, 1985, adopted a safety standard for human exposure to radio frequency electromagnetic energy emitted by FCC regulated equipment.

The NL5000-T has been evaluated for compliance with the maximum exposure limits for RF energy at the maximum power rating of the unit and with the only antenna sold for use with this product by RF Neulink. To ensure compliance with the General Population/Uncontrolled maximum exposure limits, please observe the following:

When the RAM-1545 remote magnetic mount antenna is used, mount the antenna in a location that will ensure that all persons will be at least 19 inches (49 cm) away from the antenna.

Antennas other than the RAM-1545 must be tested with the NL5000-T for RF exposure compliance in the environment in which it is to be used per the FCC's OET Bulletin 65, Edition 97-01 or Industry Canada RSS-102.

The NL5000-T has been evaluated for compliance with the maximum exposure limits for RF energy at the maximum power rating of the unit with a common unity gain quarterwave magnetic mount mobile antenna. To ensure compliance with the General Population/Uncontrolled maximum exposure limits, please observe the following:

When the quarterwave remote magnetic mount antenna is used, mount the antenna in a location that will ensure that all persons will be at least 26 inches (67 cm) away from the antenna. Antennas other than a quarterwave magnetic mount antenna must be tested with the NL5000-T for RF exposure compliance in the environment in which it is to be used per the FCC's OET Bulletin 65, Edition 97-01 or Industry Canada RSS-102.

The NL5000-T UHF units has been evaluated for compliance with the maximum exposure limits for RF energy at the maximum power rating of the unit and with the only antenna sold for use with this product by RF NEULINK. To ensure compliance with the General Population/Uncontrolled maximum exposure limits, please observe the following:

When the RAM-45 remote magnetic mount antenna is used, mount the antenna in a location that will ensure that all persons will be at least 21 inches (53 cm) away from the antenna. Antennas other than the RAM-45 must be tested with the NL5000-T for RF exposure compliance in the environment in which it is to be used per the FCC's OET Bulletin 65, Edition 97-01 or Industry Canada RSS-102.

2 MODELS NL5000-T VHF/UHF SPECIFICATIONS

2.1 GENERAL

	VHF	220 MHz	UHF
Frequency Range	136-162 MHz 148-174 MHz	217-245MHz	400-420 MHz 420-440 MHz* 430-450 MHz* 450-470 MHz 470-490 MHz* 490-512 MHz*
Number of Channels	8	8	8
Transmit/Receive Spacing	26 MHz max.	28 MHz max.	20 MHz max.
Mode of Operation	Simplex/half Duplex		
Frequency Control	PLL Synthesizer		
Channel Increment (Synthesizer step size)	2.5 kHz	2.5/3.125 kHz	5/6.25 kHz
Emissions Bandwidth			
Narrow Mode	11 kHz	11 kHz	11 kHz
Wide Mode	16 kHz	16 kHz (FCC)	16 kHz
Frequency Stability (-30 to +55 °C)	1.5 ppm	1.0 ppm	1.5 ppm
Supply Voltage			
3 and 6 watt versions			
w/o internal regulator	7.5 VDC	7.5 VDC	7.5 VDC
w internal regulator	11-16 VDC	11-16 VDC	11-16 VDC
10 watt version	N/A	N/A	11-16 VDC
RF Input/Output Connector	BNC standard		
Power/Data Interface	15 pin subminiature D type		
Maximum Dimensions (L x W x H)	3.6” x 2.3” x 1.0” including connectors		
Weight	6 oz.		

2.2 TRANSMITTER

	VHF	220 MHz	UHF
Operating Bandwidth	26 MHz	28 MHz	20 MHz
RF Output Power (internally adjustable)			
3 watt version	N/A	N/A	1 to 3 watts
6 watt version	1 to 6 watts	1 to 6 watts	1 to 6 watts
10 watt version	N/A	N/A	1 to 10 watts
Duty Cycle	5 to 100 % depending upon voltage and power level		
RF Load Impedance	50 ohms		
Modulation Distortion (per TIA/EIA 603)	5 % max.		
Frequency Response (+1/-3 dB ref 1 kHz)			
At MIC IN (ref pre-emphasis curve)	50 Hz to 2500 Hz		
At AUX IN w/o pre-emphasis	50 Hz to 2700 Hz		
Transmitter Attack Time:	15 ms max		
Spurious and Harmonics	-20 dBm max.		
FM Hum and Noise (per TIA/EIA 603)			
12.5 kHz channel operation	40 dB min.		
25 kHz channel operation	45 dB min.		
Group Delay Variation (50-2500 Hz)	5 us max.		
Current Drain			
1 watt	1.0 A max.	1.0 A max.	1.0 A max.
3 watts	1.6 A max.	1.6 A max.	1.6 A max.
6 watts	2.4 A max.	2.4 A max.	2.4 A max.
10 watts @ 13.5 V	N/A	N/A	2.4 A max.
AUX IN adjustment range (60% rated dev.)			
w pre-emphasis (@ 1 kHz)	200 to 1000 mV rms		
flat	40 to 300 mV rms		

2.3 RECEIVER

	VHF	220 MHz	UHF
Operating Bandwidth	26 MHz	28 MHz	20 MHz
Sensitivity (12 SINAD w de-emphasis)	0.30 uV (-117.5 dBm)		
RF Input Impedance	50 ohms		
Adjacent Channel Selectivity			
+/- 12.5 kHz w narrow IF		60 dB min.	
+/- 25 kHz w wide IF		70 dB min.	
Spurious and Image Rejection		70 dB min.	
Intermodulation Rejection		67 dB min.	
FM Hum and Noise (per TIA/EIA 603)			
12.5 kHz channel operation		35 dB min.	
25 kHz channel operation		40 dB min.	
Conducted Spurious		-57 dBm max.	
Receive Attack Time (transmit to receive)		15 ms max.	
Noise Squelch Attack Time		13 ms max.	
RSSI Squelch Attack Time		5 ms max.	
Audio Distortion (per TIA/EIA 603)		5 % max.	
Audio Response at AUX OUT (+1/-3 dB, ref 1 kHz)			
12.5 kHz channel operation		100 Hz to 3.5 kHz	
25 kHz channel operation		100 Hz to 5 kHz	
Group Delay Variation (100-3500 Hz)	20 us max.		
Receive Current Drain	80 mA max.	80 mA max.	75 mA max.
AUX OUT Adjustment Range			
w de-emphasis (@ 1 kHz)	50 to 500 mV rms open circuit		
flat	250 to 1800 mV rms open circuit		
AUDIO OUT Adjustment Range (@ 1 kHz)	400 to 1750 mV rms		

3 NL5000-T INPUT/OUTPUT CONNECTOR

Connector Pinout

Pin Number	Name	Description	Comments
1	CS0	Channel Select low bit	
2	CS1	Channel Select mid bit	
3	CS2	Channel Select high bit	
4	MIC IN	Microphone Input	Input for microphone type signals to be transmitted. Signals at this input are pre-emphasized, limited, and filtered.
5	CSN	High/Low Power or Channel 1/2	
6	RAW SUPPLY	Power Supply Input	Positive Supply voltage input.
7	AUX IN	Auxiliary Input	Wideband input for data.
8	AUX OUT	Auxiliary Output	Wideband output for data.
9	PGN IN/OUT	Programming I/O	External programmer connects here.
10.	CTS	Clear to Send	Active high when transmitter can accept modulation.
11.	RX MON	Monitor	Breaks squelch in receive.
12.	AUDIO OUT	Audio PA Output	Output of audio PA.
13.	DCD	Carrier Detect	Carrier detect output.
14.	PTT/RTS	Push to Talk	Activates transmitter.
15.	GND	Ground	Negative supply point and reference for all inputs.

Pinout Description

Pin Number	Description
1	CS0-Least significant bit of the channel select lines. Active high 5 volt TTL/CMOS level. Internal 10 kΩ pull-up to +5 volts.
2	CS1-Mid bit of the channel select lines. Active high 5 volt TTL/CMOS level. Internal 10 kΩ pull-up to +5 volts.

3 CS2-Most significant bit of the channel select lines. Active high 5 volt TTL/CMOS level. Internal 10 kΩ pull-up to +5 volts.

Channel	CS2	CS1	CS0
1	0	0	0
2	0	0	1
3	0	1	0
4	0	1	1
5	1	0	0
6	1	0	1
7	1	1	0
8	1	1	1

0 = Logic low
1 = Logic high

Note: Due to the internal pull-up resistors, the unit defaults to channel 8 if the channel pins are left open (unconnected).

4 MIC IN-Microphone input. This input accepts microphone type input signals for transmit. The signal is amplified, passed through the clipper and the clipper filter and then to the RF board. This input can be programmed to be disabled (muted) if desired.

5 CSN-When enabled through programming, this input selects between channels 1 and 2. This input is TTL/CMOS level type input with a logic low required for channel 1 and a logic high required for channel 2. Internal 10 kΩ pull-up to +5 volts.

6 RAW SUPPLY- The positive supply voltage for the unit is supplied through this pin. The actual supply voltage required depends upon model type. Ensure that the correct supply voltage per the given model is used.

7 AUX IN-This is the broadband input for modulation. The gain through this input to the modulator is programmable, as is the use of pre-emphasis. This signal passes the clipper and clipper filter.

8 AUX OUT-This is the broadband output of the receiver. The gain from the receiver to the output is programmable, as is the use of de-emphasis. The choice of AC or DC coupling from the RF board discriminator is also programmable. The coupling at the output of this pin is AC coupled, however. It can be converted to DC coupling with internal hardware modifications.

9 PGN IN/OUT-Connect via RF Neulink NL5000T-PCPK PC Programming Kit to computer for programming the unit.

10 CTS-Clear-To-Send output from the unit which indicates that the unit is transmitting a carrier at the correct frequency and power level and is ready to accept an input signal to be transmitted. This output would normally become true in response to a PTT RTS (see pin 14 description below) activation. The polarity of this output can be programmed. The output is active low 5 volt logic with an internal 10 k ohm pull-up to 5 volts. It can source up to 10 mA when low.

11 RX MON-This input breaks the squelch on the receiver i.e. allows for monitoring the channel even when a signal not strong enough to break squelch is

present. Input levels are TTL/CMOS; polarity may be programmed. Internal 10 kΩ pull-up to +5 volts.

12 AUDIO OUT-This is the output of the audio power amplifier. This output can drive up to ½ watt in to an 8 ohm load. This output can be enabled and its gain controlled by programming.

13 DCD-Carrier detect output. This output becomes true when a signal strong enough to exceed the programmed squelch threshold is present. This output is not affected by the RX MON input. The polarity can be programmed. The output is active low 5 volt logic with an internal 10 kΩ pull-up to +5 volts. It can source up to 10 mA when low.

14 PTT/RTS-Push to Talk/Request to Send. This input commands the unit to transmit. Input levels are TTL/CMOS; polarity may be programmed. Internal 10 kΩ pull-up to +5 volts.

15 GND-System ground. All signals and voltages are referenced to this input. The negative side of the power supply should connect here.

4 ACCESSORIES

Note: Programming kits are for use by authorized service/maintenance personnel only.

The Programming Kit for NL5000-T radios (via compatible computer) is model NL5000-T-PCKT. It includes:

1) Programming software diskettes, 3.5" (qty 2).

2) 1 25 pin PC to 6 pin modular adapter cable with built-in interface circuitry.

3) 1 modular adapter to DB-15 connector cable with power cable.

Factory programming of channels and features is also optional. Contact the factory for details.

5 OPERATION

5.1 CHANNEL SELECTION

The NL5000-T module supports eight channels. The desired channel is chosen via pins 1,2, and 3 of the 15 pin connector as shown:

Channel	Pin 3	Pin 2	Pin 1
1	0	0	0
2	0	0	1
3	0	1	0
4	0	1	1
5	1	0	0
6	1	0	1
7	1	1	0
8	1	1	1

0 = Logic low
1 = Logic high

A logic low is a voltage level below 1 volt while a logic high is a voltage level above 3.5 volts. These three pins have an internal 10 kΩ pull-up resistor to + 5 volts. Therefore, any pin left unconnected will assume a logic high state. Do NOT apply voltages outside the range of 0 to +5 volts to these pins.

A change in the channel selection in receive will cause the receiver to operate on the new channel. In transmit, however, the channel selection is only checked upon a push-to-talk activation. Changes in channel during transmit will not change the transmit operating channel of the unit until the unit is cycled from transmit to receive and back to transmit.

5.2 POWER SUPPLY VOLTAGE

Pin 6 is the positive supply input to the unit. The type of module determines the actual voltage that should be applied to this pin. One should be absolutely sure of the proper voltage and current requirements before applying power.

Three voltages are used within the unit; +5 volts for the processor and logic circuits along with most of the receiver, +7.5 volts for the transmitter driver stages, and the supply voltage for the RF power module which depends upon which module is used.

The VHF and 220 MHz units and the 3 and 6-watt UHF units use 7.5 volt RF power modules. Two supply voltage options are available for these units depending upon whether the control/loader board has a regulator installed. If a regulator is not installed, the voltage should be 7.5 volts +/-10 %. This voltage should be “clean” and preferably regulated since the RF power module is powered directly from this source. Variations in voltage will cause variations in transmitted output power. Conversely, if the control/loader board has a regulator installed, the supply voltage can be at any voltage between 10 and about 15 volts. Although the use of the regulator allows flexibility in terms of supply voltage, because of the amount of heat generated by the regulator, significant duty cycle/key down limitations may apply (see below).

The RF power module in the 10 watt UHF unit requires at least 12 volts to achieve 10 watts, although voltages as high as 15 may be used. Since the module is powered directly from this voltage, the supply should be "clean" and, preferably, regulated. The output power will vary with supply voltage. The 7.5 volts required for the transmitter driver stages is developed by a regulator, but since the current requirements are limited, the regulator is not a factor in determining the duty cycle/key down limits.

5.3 DUTY CYCLE/KEY-DOWN LIMITATIONS

The major heat generating components within the module such as the RF power amplifier and voltage regulator (if used) have maximum temperature limits that should not be exceeded. In addition, the temperature within the module itself must be kept below the maximum temperature of the reference oscillator. As a result, depending upon power, supply voltage, and temperature, limits upon the average transmit duty cycle and the maximum continuous transmitter on time exist. These limits are summarized below for operation in still air:

	Temperature (°C)	Duty Cycle (%)	Key-Down Time (s)
w/o internal regulator:			
3 watt RF output	25	100	30
	60	15	5
6 watt RF output	25	80	30
	60	10	5
10 watt RF output @ 13.5 V	25	30	15
	60	5	5
w internal regulator			
3 watt RF output	25	50	20
	60	5	5
6 watt RF output	25	30	15
	60	5	5

Blowing air across the unit and/or adding heat sinks can significantly improve the duty cycle/key-down times, especially in units without the internal regulator.

5.4 OPERATING MODES

5.4.1 RECEIVE

Carrier Detect and Squelch Operation

The NL5000-T is a transceiver; i.e. it can receive and transmit, although not at the same time. A carrier detect system exists within the unit to detect the presence of a carrier which controls the logic state of the DCD (data carrier detect) output. The RF levels at which this output changes state are programmable. In addition, the unit may be programmed such that the audio outputs, AUDIO OUT and AUX OUT, are muted (squelched) in conjunction with DCD operation. In units where squelch operation has been enabled, the RX MON input can be used to override a squelched condition. The DCD output is not affected by the RX MON operation.

Receiver Audio Outputs

Two receiver audio outputs are present on the NL5000-T module. The AUX OUT is general purpose output which can have pre-emphasis enabled or bypassed. Its gain can be controlled and its output is designed to drive 600 Ω loads. The coupling from the discriminator on the RF board may be set to AC or DC by the programmer. The output stage is AC coupled, but can be modified for DC coupling. See the maintenance section of the manual for details on this modification. The AUDIO OUT is always de-emphasized, but its gain can be programmed. In addition, transmit sidetone can be programmed as an option, if desired. This output can drive 8 Ω speaker-type loads.

5.4.2 TRANSMIT

PTT Operation

The transmitter is activated by placing the PTT/RTS (Push-To-Talk/Request-To-Send) input in its true state. This state is programmable. If the unit is to operate in simplex (transmitter and receiver on the same frequency), one should check for activity on the channel before transmitting. This can be done by checking the state of the DCD output. In addition, the unit can be programmed so that transmit operation is inhibited if the DCD threshold has been exceeded.

CTS Output

The CTS (Clear To Send) output goes to its true state when the unit has powered up the transmitter, is locked on the correct transmit frequency, and is ready to accept modulation. This output may be used to signal a modem to start transmitting data. If this output is not used, to avoid loosing data, a delay of at least 15 ms is required between PTT/RTS activation and the application of data.

Transmitter Audio Inputs

Two audio inputs are available on the NL5000-T module. The AUX IN is a general-purpose input that can have pre-emphasis enabled or bypassed and its gain can be controlled through programming. The input impedance is greater than 50 kΩ and is capacitive coupled with a lower roll-off frequency of about 25 Hz. The MIC IN input is fixed gain input designed for connection to a standard electret or dynamic microphone. About 25 mV rms of input signal at 1 kHz will produce 60 % of maximum deviation. The signal at this input is pre-emphasized. The signals at both inputs pass through the modulation limiter and post-limiter filter.

High/Low Power

If RNet compatibility mode is not programmed into the unit, high and low power levels can be programmed into the unit on a channel by channel basis. High power is selected by placing the CSN input at a logic high state. Placing the CSN input at a logic low state chooses low power. The CSN input has an internal pull-up resistor; it will assume the high state i.e. high power when left unconnected.

Specialized Modem Operation

Modems designed to achieve the highest data rates possible in a radio channel may require a direct DC connection to the modulation path and the removal of the limiter-filter. In order to receive FCC Type Acceptance, the NL5000-T module must either be tested and approved with a specific modem connected to the transmitter, or a modulation limiter and limiter-filter must always be present in the transmit modulator audio path with the modulation inputs AC coupled. To allow for the most flexibility for the end user, the unit was type accepted as a stand-alone unit. It is possible, with hardware modifications and special programming software (not supplied with the unit), to DC couple the AUX IN input and/or defeat the limiter-filter. The modulation limiter would still be in place, but the deviation of the NL5000-T module could be set such that the modulation limit within the NL5000-T module is never reached. The deviation would be set by the modem level and the AUX IN gain setting. The end user/system integrator would then bear the responsibility of obtaining type acceptance or operating in a frequency band where type acceptance is not required. Contact RF Neulink for details. **Note: Most modems will connect directly to the NL5000-T without requiring any special modifications or programming.**

Antenna Placement

The NL5000-T module is enclosed in a metal housing for RF shielding. However, RF emitting sources located very close (less than 12 inches) to the unit can at times affect its operation. It is not recommended that an antenna be connected directly to the module's BNC connector unless the RF output power is set for less than 1 watt or the module is placed within another RF tight enclosure.

5.5 RNET COMPATIBILITY MODE

The NL5000-T module can be programmed to mimic some of the behavior of the RNet 450 radio. In the RNet compatibility mode, the CSN input is used as a channel selector line. A logic low selects channel 1 while a logic high selects channel 2. The channel select lines, CS0, CS1, and CS2 have no effect. Also, the DCD output is held in its true state during transmit. It would normally be false in transmit.

6 PROGRAMMING

To program the NL5000-T Module, the RF Neulink PC Programming Kit, NL5000-PCKT, must be used.

6.1 PC PROGRAMMING KIT

The user should install the programming software on the host computer. The NL5000-T adapter cables connect the radio to a computer's serial communications port. Once the cables are hooked up, the user runs the programmer software. This program transfers data between radio and computer memory.

6.1.1 PROGRAMMING KIT CONTENTS AND REQUIREMENTS

The NL5000-T Programming Kit includes the following:

1. Programming software that is contained on two diskettes.

2. PC to radio adapter cable, which is terminated at one end with a DB-25F connector and at the other end with a modular plug. The DB-25 connector plugs into the computer's serial port, the modular plug into an adapter.

3. The adapter for use with the NL5000-T Plus series of radios. This adapter mates the modular plug to a DB-15M plug for connection to the radio. The adapter also includes wires for powering the unit. The red wire is for positive voltage, the black for negative. Insure that the correct voltage is applied to the unit.

The Programmer Kit requires a PC compatible computer with Windows 95 or later operating system installed. The computer must have an RS-232 serial port available. A hard disk drive is also required.

6.2 LOADING THE PROGRAMMER SOFTWARE

Insert disk one of the two disk set in the floppy disk drive. View the contents of the floppy disk and double click on the install.exe file. Follow the instructions as they appear on the screen including the prompt to insert the second disk. At the conclusion of the installation procedure, the programming software will be resident on the user's host computer.

6.3 COMPUTER SOFTWARE COPYRIGHTS

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6.4 USING THE PROGRAMMING SOFTWARE

Upon starting the programming software, a screen will appear with three buttons at the top, Program Radio, Programmer Configuration, and Exit. Program radio moves the user to the program radio menus which are described below. Programmer configuration is used to select the appropriate serial port and password (if desired). A few notes about using the programming software:

- Moving from menu item to menu item and from screen to screen may take from 1 to 7 or 8 seconds. Some commands require that the entire contents of the radio's memory be accessed. An hourglass symbol may or may not be present for some or all of that time.

- If the programmer acts as if it is accepting commands, but the radio does not appear to be responding, exit the programmer and start over. A power glitch on the radio during the middle of a programming session can cause a serial communications conflict.

- The adjustments on the alignment menu are somewhat slower than changes in settings on the settings menu. More computations and radio memory communications are required on the alignment items.

6.5 PROGRAMMER MENUS

The NL5000-T Programmer has four menus or pages, selectable via tabs at the top of each page, which are always visible. These pages are:

1. Frequency Selection-Used to program the channel frequencies of the radio.

2. Settings-Used to set programmable features/functions of the radio.

3. Alignment-Used to align and set the internal digital potentiometers in the radio. Information on the use of this page is found in the Maintenance section of the manual.

4. Restore EEPROM-Used to program the unit with a set of previously saved frequency and setting values.

5. Summary-Used to summarize on one page the model, settings, and alignment information.

6.5.1 FREQUENCY SELECTION

The Frequency page has fields for the transmit and receive frequencies for each channel. Channel information can be entered by clicking on the appropriate box and entering the desired frequency. The frequency chosen must be within the operating range of the radio and on a frequency for which the synthesizer is capable of channeling i.e. for VHF, divisible by 2.5 kHz and for UHF, divisible by 5 or 6.25 kHz. When the RNET compatibility mode is chosen via the settings menu, only channel one and two are available for programming.

6.5.2 SETTINGS

The Settings page allows for programming various parameters of the radio. These are detailed below:

Microphone Mute-Allows the signal path from the MIC IN (microphone input) to be muted. If the microphone input is not to be used, the "mute" function should be selected. Factory default is for the microphone to be muted.

TX Pre-emphasis-Allows for the signal path from AUX IN to be either pre-emphasized or flat. Most applications where the AUX IN input is used work best with a flat response. Factory default is flat response.

RX De-emphasis-Allows for the signal path from the discriminator to the AUX OUT to be either de-emphasized or flat. Most applications where the AUX OUT output is used work best with a flat response. Factory default is for flat response.

Busy Channel Lockout-Prevents the transmitter from activating when the carrier detect output is true. Used to prevent interference on a channel where activity already exists. Not normally enabled in half duplex operation since the transmit and receive channels are not on the same frequency. Factory default is for this function to be off.

Squelch Enable-Allows the receive audio paths to be muted when the carrier detect output is false. Used to prevent the output of noise from the audio outputs when no signal is present. Due to the finite squelch attack time, some high-speed modems work best with unsquelched audio. The factory default is for this function to be set for never mute.

DCD Output Logic Level-Allows the setting of the polarity of the DCD (Data Carrier Detect) output. Active high means that the true state is a logic high while active low means that the true state is logic low. Normal setting is active high. The factory default is active high.

Carrier Mode-Allows the programmer to set the radio to match the type of carrier detection used by the RF board. The carrier detect mode may be either RSSI (Receive Signal Strength Indicator), based upon carrier level or Noise, which is based upon the receive signal to noise level. RSSI based is significantly faster than noise based systems and is usually preferred for data applications where fast turn-around times are important. **This selection must match that of the radio hardware. It is preset at the factory to match the RF board and must not be changed unless the RF board is modified.** See the Hardware Options section under Maintenance in this manual for details. The factory default is RSSI mode.

Audio PA TX Sidetone-When enabled, the Audio PA is turned on during transmit and has at its output the signal to be transmitted as a sidetone. The factory default is for this function to be off.

RX Discriminator Coupling-Selects whether the coupling from the discriminator output on the RF board is AC or DC coupled to the control/loader board. Since the audio outputs of the control/loader board are AC coupled, this function is normally set for AC as well. For response to DC, a hardware jumper options can be made for DC coupling at the AUX OUT. (See the Hardware Options section under Maintenance for details on this option.) If this is done, this function should be set for DC. The factory default is AC.

CSN Input-Selects whether RNET Compatibility mode is to be used. See section 5.5 for an explanation of this function. Normal operation is to set this for high/low Power. The factory default is high/low power mode.

PTT/RTS Input Logic Level-Sets the polarity of the PTT/RTS input. Normally set for active low i.e. transmitter is activated when this input is at the logic low state. **Due to the internal pull-up resistor, setting this to active high will cause activation of the transmitter when the PTT/RTS input is left unconnected.** The factory default is active low.

CTS Output Logic Level-Sets the polarity of the CTS (Clear-To-Send) output. Setting for active high caused the true logic state to be high. Active high is the normal setting. The factory default is active high.

TX Timeout Timer-Allows for limits on the maximum time the transmitter may be continuously keyed. When set, the maximum limit is set in the box. To prevent overheating and possible

damage to the unit, this is normally set on with a time of 60 seconds of less. See section 5.3 for limits on maximum key-down times. The factory default is 60 seconds.

6.5.3 ALIGNMENT

The alignment page is used for setting the values of the digital potentiometers which are used for aligning the unit and setting the gains of the audio paths. The unit leaves the factory already aligned, but the user may wish to change the values of some of the input and output gain settings. Different systems or modems may require different input and output levels. The factory default settings for the various menu items are listed below.

Aux In (TX) Gain-Set so that without pre-emphasis (flat), 100 mv rms will produce 60 % rated deviation. If pre-emphasis has been set, 500 mv rms at 1 kHz will produce 60 % rated deviation.

Aux Out (RX) Gain-Set so that without de-emphasis (flat), a signal with 60 % rated deviation will product 400 mv rms into an open circuit (half this value into 600 ohms). If de-emphasis has been set, the output level will be about 100 mv rms at 1 kHz into an open circuit.

Carrier Detect On and Carrier Detect Off-For RSSI based systems, factory set for carrier on at about –110 dBm and carrier detect off at about –115 dBm.

TX Frequency Trim and RX Frequency Trim-factory set to be on frequency.

Audio PA Gain-Set such that a signal at 60 % rated deviation at 1 kHz will product 400 mV rms of output level.

Deviation and Balance-Set such that the maximum deviation will fall within the regulatory requirements and that the transmit audio response has the correct characteristics. Deviation and Balance do not need to be adjusted after a change in programmed frequency. New values are calculated and loaded by the programmer when a frequency is entered in the frequency menu.

Instructions for using the alignment page can be found in section 13 of this manual.

6.5.4 RESTORE EEPROM

This selection is used to load a previously saved radio configuration file to the radio connected to the programmer. This is of benefit when a number of radios are to set to the same frequencies and with the same switch settings.

6.5.5 SUMMARY

The summary page summarizes the information shown on the other three pages and, in addition, includes the model and serial number of the unit.

6.5.6 SAVING A CONFIGURATION

Upon exiting the programmer via the exit button, the user will be presented with a box which allows the saving of the current configuration. This is useful if a number of other radios are to be programmed with the same frequencies and settings. If one does not wish to save the current configuration, the cancel icon should be selected.

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