Eclipse2

UHF / VHF / 800MHz Base Station Technical Manual

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List of Associated Publications

Document Number	Description
TPR-0308920019	IP Commander User Manual

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NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
-Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
-Consult the dealer or an experienced radio/TV technician for help.

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Contents

Warnings

Although there are no dangerous mains voltages present within the equipment, the following general safety precautions as would normally apply, should be observed during all phases of operation, service and repair of this equipment.

AROUND THE EQUIPMENT

To minimise any possible shock hazard from an external power supply or lightning strike, the chassis or equipment cabinet must be connected to an electrical ground. Provide adequate ventilation around the rear of the equipment.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE

Do not operate the equipment in the presence of flammable gases or fumes. Operation of any electrical equipment in such an environment constitutes a definite safety hazard.

DO NOT ATTEMPT INTERNAL SERVICE WHILE TRANSMITTING

Thermal or RF burns may result from touching certain components within the power amplifier module while transmitting or operating the transmitter.

DO NOT SUBSTITUTE PARTS OR MODIFY THE EQUIPMENT

Because of the danger of introducing additional hazards, do not install substitute or lower voltage parts to the equipment. Return to your authorised distributor.

EXERCISE CAUTION AND CORRECT DISPOSAL OF RF POWER DEVICES

Most RF power transistors and some RF power hybrids contain Beryllium Oxide. Although they are normally safe, if physically damaged toxic dust may be released. Consult your local authority for correct disposal thereof.

Introduction

The Eclipse2 series is a Base Station designed for Conventional Analogue FM and Conventional APCO P25 modes of operation. Internally, it is driven by software, allowing future firmware releases to track the development of radio standards and add new modes.

Based on a DSP and RISC platform, the base station has a modular design, which provides extensive flexibility for users. For example, it may act as a standalone transmitter/receiver, cross-band repeater, and more. The built-in Ethernet port allows remote monitoring and control of all operating parameters. Under software control, the centre-frequency can be arbitrarily tuned across a band, within the limits of the installed receiver and transmitter submodules. A range of available submodules allows The Eclipse2 system to cover most of the band from 66MHz to 941MHz.

A typical base station or repeater system includes a Reciter (Receiver & Exciter); an RF power amplifier; and a switch mode or linear power supply. All the modules can be plugged into an RF Technology standard 19 inch wide, 4U high, rackframe.

The Reciter can deliver enough RF output power to be useful as a point-to-point link, meaning an external power amplifier may not be required in some configurations. This allows up to six Reciters to be mounted into a single 19 inch rack.

Features

Specifications

General

Channel Spacing	6.25kHz, 12.5kHz, 25kHz
Reference Frequency	internal, or 5MHz, 10MHz, 12.8MHz external
Monitor speaker output:	3 watts @ 8 ohm
Microphone input:	6 mV RMS @200 ohm
Duty cycle:	100%
Power Supply:	+13.8VDC +/-10% (Negative Ground)
Current Drain:	2A Max (with T150A installed with 5 Watt TX output power) 750mA Max with TX OFF
Operating temperature:	-30°C to +60°C

Receiver

Frequency Spread:	see Table 1.
Frequency Stability:	+/-1ppm (-30°C to +60°C)
Frequency Step:	1Hz
IF frequency:	45 MHz
Sensitivity:	12dB SINAD @ -119dBm (0.25uV) RF Input
Selectivity:	80dB for 25kHz Channel spacing 75dB for 12.5kHz Channel spacing
Spurious Rejection:	90dB
Intermodulation:	85dB
Modulation acceptance:	7.5kHz for 25kHz Channel spacing 3.75 kHz for 12.5kHz Channel spacing

Noise squelch:	Adjustable from 0 to 26 dB SINAD
Carrier squelch:	Adjustable from –120dbm to –60dBm
Audio Response:	300Hz to 3000Hz +1/-3dB, Flat or 6dB per Octave de-emphasis
Audio Distortion:	< 3%
Line output level:	-20dbm to +10dbm @600ohm
Auxiliary Audio Output	Frequency Response: 0Hz to 3000Hz DC offset: 4.6 V Peak-peak voltage: 7.8V

Table 1: Receiver Module specific specifications

Name of Band	Frequency Range
150A	136MHz - 174MHz (VHF)
350D	380MHz – 400MHz (UHF)
500A	400MHz – 430MHz (UHF)
500B	440MHz – 470MHz (UHF)
500D	465MHz – 490MHz (UHF)
500C	485MHz – 520MHz (UHF)
800A	800MHz – 870MHz (UHF)
800B	896MHz – 941MHz (UHF)

Note: Notwithstanding the capability of the receiver the software will be modified to ensure that the reciever will only function in the band approved by the authority responsible for licencing tne radio.

Exciter

Frequency Spread:	see Table 2.
Frequency Stability:	+/-1ppm (-30°C to +60°C)
Frequency Step:	1Hz
Maximum deviation:	5kHz for 25kHz Channel spacing 2.5kHz for 12.5kHz Channel spacing
Output power:	0.3 Watt to maximum defined in Table 2.
Spurious & harmonics:	-36dbm
Hum & Noise:	-55dB for 25kHz Channel spacing -49dB for 12.5 kHz Channel spacing
Audio Response:	300Hz to 3000Hz +1/-3dB, Flat or 6dB per Octave de-emphasis
Audio Distortion:	< 3%
Line input level:	-20dbm to +10dbm @600ohm
Auxiliary Audio Input	Frequency Response: 0Hz to 3000Hz Impedance: 100 kΩ Differential input: Common mode voltage: 0 V to 2.4 V Peak-peak voltage: 1.0 V Single-ended input (AUX IN- floating) DC offset: 1.2 V Peak-peak voltage: 2.0 V

Table 2: Exciter Module Specific Specifications

Name of Band	Frequency Range	Maximum Output Power (±15%)
150A	136MHz - 174MHz (VHF)	5W
350D	380MHz – 400MHz (UHF)	3W
500A	400MHz – 430MHz (UHF)	3W
500B	440MHz – 470MHz (UHF)	3W
500D	465MHz – 490MHz (UHF)	3W
500C	485MHz – 520MHz (UHF)	3W
800A	800MHz – 870MHz (UHF)	1W
800B	896MHz – 941MHz (UHF)	1W

Note: Notwithstanding the capability of the receiver the software will be modified to ensure that the exciter will only function in the band approved by the authority responsible for licencing tne radio.

Operation

The Reciter will need approximately 30 seconds to boot up after power up. When the transceiver is ready to operate, a voice report (if enabled) can be heard from the front panel speaker, and the Digital/Analog LED will indicate the current operational mode.

Front Panel Controls and Indicators

The front-panel includes LED indicators, tactile switch buttons, a microphone connector and an USB (type A) connector, refer figure.1 for details

Figure1: Eclipse2 Transceiver Front panel

Buttons:

Status – Press this button to listen to the voice report
Test – Press this button to key up the exciter (if front panel test key enabled)
Up – Press this button to increase the speaker volume
Down – Press this button to decrease the speaker volume
Left – Press this button to channel change down
Right – Press this button to channel change up
Reset – The reset switch mounted inside base station, used for reset the Reciter without power cycle, use a small pin (e.g. paper clipper) to access this switch

Indicators:

Power – This LED (on) indicates that DC power supply is applied to the Reciter
Ethernet – This LED (on) indicates that the transceiver is operating in Digital mode
Analog – This LED (on) indicates that the transceiver is operating in Analog mode, - if the transceiver is operating in dual mode, both Digital and Analog LED will be on
Tx – This LED (on) indicates the transceiver's transmitting path is active
Rx – This LED (on) indicates the transceiver's receiving path is active
Alarm – This LED (flash) indicates the transceiver is in alarm state, press the status button to listen the alarm information

Connectors:

Microphone – RJ45 connector for front-panel microphone input
USB – USB (type A) connector for connecting a PC via a standard USB cable to monitor or program the Reciter.

Rear Panel Connectors

System I/O:

The male D shell, 25-pin connector is the main interface to the Reciter Module. The pins of the connection are described in table 1.

Pin No.	Description	Specification
1, 14	Power supply, positive	Input: +13.8VDC (minimum 10.8V, maximum 16V)
13,25	Power supply, negative	Input: Ground
2	System serial bus, Data out	Output: +3.3V TTL logic
15	System serial bus, Clock	Output: +3.3V TTL logic
3	Exciter PTT input	Input: Low active level ≤ +2.5V)
16	Receiver COS output	Output: open collector, Imax = 100mA
4	AUX+ audio input	Input: balanced or unbalanced, 100kohm, DC to 3000Hz
17	AUX- audio input	Input: balanced or reference voltage 100kohm, DC to 3000Hz
5	AUX+ audio output	Output: unbalanced low impedance, DC to 3000Hz
18	AUX- audio output	Audio signal ground
6	Line input +	Input: balanced 600ohm, 300 to 3000Hz, -20dbm to +10dbm
19	Line input -	Input: balanced 600ohm, 300 to 3000Hz, -20dbm to +10dbm
7	Line output +	Output: balanced 600ohm, 300 to 3000Hz, -20dbm to +10dbm
20	Line output -	Output: balanced 600ohm, 300 to 3000Hz, -20dbm to +10dbm
8	GPS 1 pulse/sec input	Input: +3.3V to +15V TTL logic
21	Monitor speaker output	Output: unbalanced 8 ohm 300 to 3000Hz, 3 Watt maximum
9	System serial bus, Data in	Input: +3.3V TTL logic
22	System serial bus, CS0	Output: +3.3V TTL logic
10	System serial bus, CS1	Output: +3.3V TTL logic
23	T/R relay output	Output: open collector, Imax = 100mA
11	External squelch input	Input: Low active (Vin ≤ +2.5V)
24	Spare GPIO input	Input: Low active level ≤ +2.5V)
12	Spare GPIO output	Output: open collector, Imax = 100mA

Table1: 25 Pin System I/O Connector signals

4 Wire E&M Port

This RJ45 connector provides easy connection to the equipment such as microwave links, the signal of the E/M line connector described in table2.

Pin No.	Description	Specification
1	E+	Input: 10V to 48V
2	E-	Input: 10V to 48V
3	Line out +	Output: balanced 600ohm, 300 to 3000Hz, -20dbm to +10dbm
4	Line out -	Output: balanced 600ohm, 300 to 3000Hz, -20dbm to +10dbm
5	Line in +	Input: balanced 600ohm, 300 to 3000Hz, -20dbm to +10dbm
6	Line in -	Input: balanced 600ohm, 300 to 3000Hz, -20dbm to +10dbm
7	M+	Output: sink current 150mA
8	M-	Output: sink current 150mA

Table2: RJ45 E/M Line Connector signals

Ethernet:

The RJ45 Ethernet connector is used for networking the base station via IP protocol, a PC can use this connector to monitor and control the base station locally or remotely.

The Reciter supports the 10/100Mbs specification (defined by IEEE802.3u) and the MDI/MDI-X auto crossover function which means either a straight though or crossover cable can be used to connect the base station.

There are two LEDs embedded in the RJ45 Ethernet connector, the green LED indicates that the Ethernet link is active; the yellow LED indicates TX/RX status between the base station and the network.

RF input:

The receiver RF input connector: 50ohm female, N type.

RF output:

The exciter RF output connector: 50ohm female SMA or Optional N type.

RS232 and external reference clock (optional)

The female D shell, 9-pin connector is an optional interface to the transceiver. RS232 and external reference clock (EXT_REF) signals share this connector. The pins of the connector are described in table 3.

Pin No.	Description	Specification
1	reserved for 1PPS	Input
2	reserved for TxD (RS232)	Output: +/-5V to +/-15V TTL logic
3	reserved for RxD(RS232)	Input: +/-5V to +/-15V TTL logic
4	GND	Ground
5	GND(EXT_REF)	Ground
6	GND(1PPS)	Ground
7	NC	No connection on pin 7
8	GND(RS232)	Ground
9	External reference clock	Input, sine wave or TTL logic, Minimum input: 1.5Vp-p

Table2: RJ45 E/M Line Connector signals

Programming and monitoring

Programming and monitoring is accomplished using the IP Commander Software. This software is based on the *Java* platform and can be run under various operation systems on the host computer, it provides a number of useful facilities for the configuration and monitoring of the base station.

The IP Commander software allows configuring of the base station (e.g. the channel frequency, output power, signal path, etc.) without hardware alignment, it also provides a simple means of calibrating the RF power, RSSI level, audio line levels. For more details of IP Commander software, please refer the document: *RFT Doc No. 0305917801 (IP Commander User Manual).*

There are two interfaces which can be used for connecting a computer and the Reciter:

Connecting with Ethernet

Ethernet is the interface of the base station, especially for remote monitoring and controlling via an IP Network. Each base station has a unique IP address, to connect, the host PC must be in the same subnet with the base station.

Connecting with USB

The front-panel USB connector can be also used for connecting to a computer, IP Commander Software loads a USB driver to recognize the base station.

Technical Description

The transceiver consists of three sub assemblies: Control Board, Interface board, and RF modules.

Control Board

The Control Board is a multi-layer, double side component mounted PCB assembly. The most important parts of the base station, such as CPU, DSP and digital IF receiver, are embedded in this master board, two 40-pin connectors on this board allows user inserting/removing it from the interface (main) board.

The CPU (U1) is a single chip 32-bit RISC processor, it controls all the operating functions of the base station. The support chips include a 16Mbyte Flash (U9) and 64Mbyte SDRAM (U7, U8). The base station software and configuration databases are stored in the Flash memory. The system serial bus and GPIO of the RISC processor are connected to the system interface board via two 40-pin connectors.

The 10/100Mbps Ethernet Physical Layer single chip transceiver (U10) provides the interface between RISC processor and the Ethernet. A serial ATA cable is used for connecting between the Master board and System interface board.

The DSP (U2) is a 32-bit fixed-point digital signal processor, which provides the base band processing including modulation, demodulation, RSSI/SINAD calculation, CTCSS encoding/decoding and audio processing of the base station. The DSP software is modularized, the modulator, demodulator, pre-emphasis, de-emphasis, filters and gain are individual modules, user can connect or disconnect any module by the Service Kit software for different applications. The DSP also controls the frequencies of the PLL chips within the RF modules. The digitized audio signal interfaced to the CODEC of the system interface board is via the DSP serial port.

The digital IF receiver consists of an ADC (analogue to digital converter, U4) and a DDC (digital down converter, U3). The pre-filtered analogue IF signal from the receiver module is fed to ADC, converted to the digital IF and passed to the DDC via the parallel bus, the DDC mixes the incoming digital IF with the internal Numerically Controlled Oscillator (NCO) frequency signal to produce the 0Hz IF, the DDC also provides decimating and further filtering for the IF signal. The output from the DDC is in complex I/Q format, sent to the DSP for demodulating via the serial bus.

The clock of ADC, DDC and DSP is derived from the system interface board.

Interface (Main) board

The Interface (Main) board provides the interfaces among the Processor (main) board, RF modules and external equipment. The function of the Interface board can be described as following sub sections.

Audio signal processing

External audio signals from/to the base station are processed in this section.

The balanced audio input from RJ45 E/M Line connector or D25 system connector is passed, after line matching transformer (T1) coupling, to a Trans-conductance amplifier (U11), the gain of the amplifier is controlled by the RISC processor. The output of this amplification stage is then amplitude limited, attenuated and filtered before send to the channel 1 of the CODEC (U12). The CODEC encodes the analog audio to digital PCM signal send to the DSP via the serial bus.

The Microphone input from front panel RJ45 connector is amplified by op-amplifier (U16), amplitude limited and attenuated then fed to the cannel 2 of the CODEC (U12). The CODEC encodes the analog audio to digital PCM signal send to the DSP via the serial bus.

The AUX input signal from D25 system connector is DC coupled, filtered and amplitude limited by the op-amplifier (U16), then fed into a 16-bit ADC (U17) to convert to the digital signal. The digitized signal is send to the DSP via the serial bus. This AUX input is useful for low frequency (down to 0Hz DC) signals, the DC offset of input signal is shifted by the bias circuit which is controlled by the RISC processor to give the maximum dynamic range for the ADC.

The CODEC has two identical channels, the output of channel 1 is used for line output. PCM signal from the DSP is decoded to analog audio, and amplified, buffered by op-amplifier U10, coupling through the line matching transformer (T2), and sent to the RJ45 E/M Line connector and the D25 system connector.

The channel 2 output of the CODEC is used for monitor speaker, PCM signal from the DSP is decoded to analog audio, amplified by a Trans-conductance amplifier (U11), this amplifier is used as the speaker volume control. The power amplifier (U13) provides additional power gain to drive the internal and external speaker.

A 16-bit DAC (U14) converts the digital output from the DSP to analog signal, the signal is filtered and buffered by op-amplifier (U10), then sent to the D25 system connector. The amplifier is DC coupled, the DC offset can be set by the bias circuit which is controlled by the RISC processor. This output is useful for low frequency application such as sub-tone, and NRZ digital signals.

I/O and Controls

The RISC processor uses serial buses and GPIO to control the base station.

A 10-bit 11-channel ADC (U7) senses the following signals and passes the data to the RISC processor via serial bus:

Channel 0: exciter PLL tuning voltage
Channel 1: exciter forward power of the power amplifier
Channel 2: exciter reverse power of the power amplifier
Channel 3: receiver PLL tuning voltage
Channel 4: Interface board temperature
Channel 5: Input power supply voltage
Channel 6: receiver power supply voltage
Other channels are reserved for future use.

A 10-bit 8-channel DAC (U6) converts data from the RISC processor serial bus to analog voltage for following functions:

Channel 0: monitor speaker volume control
Channel 1: 600 ohm audio Line input gain control
Channel 2: exciter reverse power of the power amplifier
Channel 3: AUX audio input bias setting
Channel 4: AUX audio output bias setting
Channel 5: receiver IF amplifier gain control (not used in release1 RX module)
Channel 6: exciter RF output power control
Channel 7: exciter VCO bias setting
Channel 8: receiver VCO bias setting

The op-amplifiers (U4, U28) are used for converting DAC output to proper voltage which is required by the system hardware.

The Interface board accepts both TTL PTT input and E/M signaling, the TTL PTT is buffered by Q4 and Q5, E/M signal is isolated by Opto-coupler U3 to system I/O level. The output of the RISC I/O logic is buffered by U1,Q1-Q3 for interfacing the external logic. The solid-state relay Opto-coupler is used to isolate the system I/O from E/M signal.

A dual retriggerable monostable multivibrator (U5) in the circuit is functioned as a IRQ generator, it senses the changes of the Input logic and sends a narrow pulse to the RISC processor for trigging the processing IRQ.

U31 is a USB to RS232 bridge which transfers the USB data between the front panel connector and the system serial bus. U9 is an transceiver which converts RS232 +/-15 logic from the rear panel to serial bus level. U30 is a bus switch to select one of above passing through to the RSIC processor.
Header (H4) is used only for emergency system booting purpose, do not assert jumper into this header.

Clock generator

the 12.8MHz TCXO (X1) output is buffered (by U26) and divided by 4 (U29) to provides PLL reference frequency for exciter and receiver. The frequency doubler double 12.8MHz frequency to 25.6MHz to provide system clock for digital IF receiver.

Voltage regulators

There are nine voltage sources generated by the voltage regulator

VTX – +12.5V DC for TX module
VRX – +12.0V DC for RX module
D3V3 – +3.3V DC for Processor (Master) board and 3V TTL logic
A3V – +3.15V DC for analog 3V rail
+12V – +12.0VDC for analog circuits
+5V – +5V DC for TCXO and 5V TTL logic
+1V8 – +1.8V DC for Flash core supply on the Processor (Master) board
-20V – -20.0V DC for TX and RX VCO bias setting
-12V – -12.0VDC for analog circuits

The input power supply voltage is 13.8VDC, LDO (U19, U22) provides 12.5V (Imax = 1.5A) and 12V DC (Imax = 800mA) for TX and RX module. Switch mode DC-DC converter (U20) generates digital 3.3V DC rail (Imax=2A) for the Processor board and Interface board, then regulated to 3.15V analog DC rail by LDO (U21) for 3V analog circuits in the transceiver.

The DC-DC converter (U23) provides –20V negative supply voltage for VCO bias amplifier (U4). Voltage regulator (U24) generates –12V DC supply analog circuits of the interface board.

RF modules

TX module

The TX module can be divided into the VCO, PLL, PA and the Data storage section.

The Voltage Controlled Oscillator (VCO)

The Voltage Controlled Oscillator uses a junction FET (Q2) which oscillates at the required transmitter output frequency. Varactor diodes (D2, D9, D10, and D11) are used by the PLL and bias control circuits to keep the oscillator on the desired frequency. Transistor Q1 is used as an active filter to reduce the noise on the oscillator supply voltage.

The VCO is keyed ON by the RISC processor through Q3, It is keyed ON when any of the PTT inputs are active or self-calibrations, but OFF at all other times. The VCO output is amplified by monolythic amplifier U4 before being fed to the PLL chip (U10).

The Phase Locked Loop (PLL)

The frequency reference for the PLL is from the Interface board via a 20pin connector. A fractional-N PLL synthesiser (U10) is used in the TX module, this fractional-N synthesiser provides very fine frequency resolution which enables the PLL used as a FM modulator by modulating the PLL data. The modulation data is provided by DSP via the serial bus. The phase detector output (charge pump) signal of U10 is smoothed and filtered by the loop filter to form the tuning voltage for the VCO circuit.

The Power Amplifier (PA)

Amplifiers (U1, U2) increase the VCO output to a sufficient level to drive the power amplifier (U3). The output power level of the PA is controlled by RISC processor via bias pin of U3. The directional coupler (D3, D4) detects the forward and reverse power components, the detected voltages are then amplified by U7 and U8 to provide proportional dc levels to the RISC processor. The output from U3 is further filtered by the low pass filter to reduce higher order harmonics. U1, U2 and U3 are not switched on until the PLL has locked and had time to settle. This prevents any momentary off channel transmission when the transmitter is keyed.

The Data Storage

Each TX module has an EEPROM for storing the individual module information such as, TX module serial number, model name, frequency range, calibration data etc. This is allows user to simply replace the TX module in the transceiver without redo the alignment and calibration. The data is transferred between EEPROM and RISC processor via the serial bus.

RX module

The RX module can be divided into the Font-end Amplifier, LO, PLL, IF amplifier and the Data storage section.

The Front-end Amplifier

A two-pole voltage tuned filter (D6, D7, L18-20, L23 and L24) is used to limit the RF bandwidth prior to the RF amplifier transistor Q1. The tuning voltage is supplied by the RISC processor through the bias control. The circuit values are chosen so that the centre frequency tracks the VCO bias voltage. RF amplifier transistor Q5 is followed by a second two-pole voltage tuned filter (D4, D5, L7, L11, L14, L21 and L22) which provides additional image and spurious frequency rejection. The filter output is connected to the RF input port of the mixer MX1 via a 1.8dB pad.

The Mixer

MX1 is a level 13 double balanced diode ring mixer with excellent Intermodulation performance. It has a conversion loss of approximately 6 dB. The gain between the receiver input and the mixer input is approximately 10 dB so that the total gain between the antenna input and the IF input 3-

4dB. The network (C28, C74, L29, L15, L16 and R20) passes the IF frequency of 45 MHz and terminates the RF and LO components.

The Local Oscillator (LO)

The LO is a Voltage Controlled Oscillator (Q2) which oscillates at the required transmitter output frequency. Varactor diodes (D2, D9 - D11) are used by the PLL and bias control circuits to keep the oscillator on the desired frequency. Transistor Q1 is used as an active filter to reduce the noise on the oscillator supply voltage. Monolithic amplifiers U1, U2 and transistor Q6 amplify the VCO output to approximately +16dBm then feed to the mixer via a 3dB pad.

The Phase Locked Loop (PLL)

The frequency reference for the PLL is from the Interface board via a 20pin connector. A fractional-N PLL synthesiser (U10) is used in the RX module, PLL frequency PLL is set by DSP via the serial bus. The phase detector output (charge pump) signal of U10 is smoothed and filtered by the loop filter to form the tuning voltage for the VCO circuit.

The IF Amplifier

The first IF amplifier uses two parallel connected JFET transistors Q3 and Q4 to obtain 8-10 dB gain. The two transistors provide improved dynamic range and input matching over a single transistor. A 4-pole 45 MHz crystal filter (FIL1, FIL2) is used between the first and second IF amplifiers. The second IF amplifier (U3, U5) provides additional 35dB gain to drive the digital IF. A two pole crystal filter (FIL3) is used as an anti-alias filter of the digital IF.

The Data Storage

Each RX module has an EEPROM for storing the individual module information such as, TX module serial number, model name, frequency range, calibration data etc. This is allows user to simply replace the RX module in the transceiver without redo the alignment and calibration. The data is transferred between EEPROM and RISC processor via the serial bus.

Field alignments

As the TX and RX module is pre-tuned for the whole operational frequency range and level adjustment of signal path is done by software (local or remotely), there is no field alignment required for optimizing the performance.

Specifications

Description

The transceiver is a digitized, software upgradable radio, The exciter and the receiver can be configured as base station, repeater or the stand-alone unit. For base station use, the exciter normally drives a high power external RF amplifier. It can also be used alone in lower power applications. The output power can be preset between 0.3 and its maximum. All necessary control and 600 ohm line interface circuitry is included.

Channel Capacity

Although most applications are single channel, it can be programmed for up to 256 channels (from CH0 to CH255). Each channel can have it’s own name, TX/RX frequencies and profiles.

Sub Audio Signaling

Full EIA CTCSS capability as well as nonstandard sub tones are built into the modules. The CTCSS tone can be programmed for each channel in their profiles. This means each channel can represent a unique TX/RX and tone frequency combination.

Channel Programming

The channel information is stored in Flash memory and can be programmed via the Ethernet, USB or RS232 interface using a Host PC and RF Technology's Service Kit software.

Channel Selection

Channel can be select by Service Kit or front panel buttons (if enabled).

Physical Configuration

The transceiver is designed to fit in a 19-inch rack mounted frame. The installed height is 4 RU (178 mm) and the depth 350 mm. The transceiver is 63.5 mm. The weight of the transceiver is approximately 1.6kg

Connectors

Antenna Connector

Receiver: Type N 50ohm Female Mounted on the module rear panel
Exciter: SMA or Optional N Type 50ohm Female Mounted on the module rear panel.

Power & I/O Connector

25-pin "D" Male Mounted on the rear panel

Ethernet Connector

LED Embedded RJ45 Mounted on the rear panel

E/M Line Connector

RJ45 Mounted on the rear panel

RS232 & External Reference Connector

9-pin "D" Female mounted on the front panel

Microphone connector

RJ45 Mounted on the front panel

USB

Type A female Mounted on the front panel.

RF Exposure.

This transmitter exciter constitutes a RF transmitting system that both the FCC and Industry Canada has established RF exposure requirements for. In order to comply with the RF exposure requirements of both countries the transmitting antenna must maintain a specific physical separation from all persons. The antennas for this device usually are mounted on outdoor permanent structures and the installer must see that the separation distance be maintained. The RF exposure report was written for one typical power output and antenna gain.

If your situation is different than the one described your minimum separation distance will be different. RF exposure takes into account many different contributing factors some of which are: power output, system losses, coax cable losses, and antenna gain.

For a typical installation of a 3 dBi antenna and 3 W UHF band (470-495 MHz) transmitter. Operated in a radio system were the average ratio of transmit to receive time is near 100% transmitting the separation distance would be 0.33 meters or approximately 1.5 feet. This separation distance also does not take into account any other transmitters that might be considered co-located at the same site. An RF exposure report was prepared for this transmitter and in it are the typical calculations on which the above is based.