JAVAD UHFSSRX OEM Receiver User Manual

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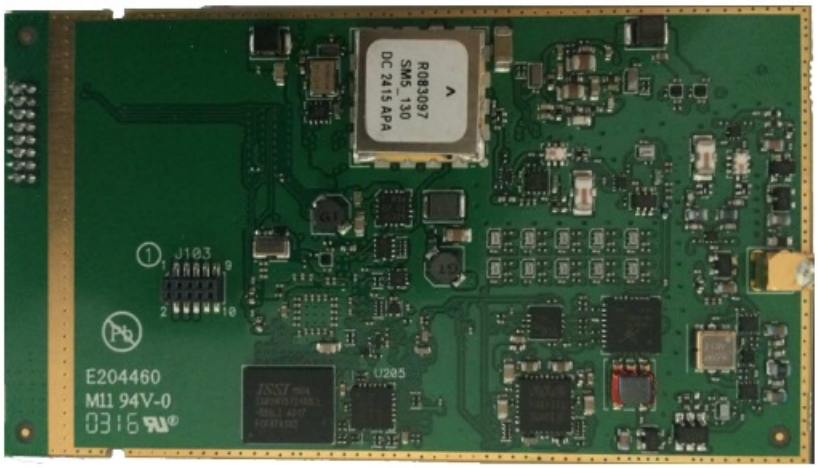

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Contents

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SCREEN CAPTURES

This manual includes sample screen captures. Your actual screen can look slightly different from the sample screen due to the receiver you have connected, operating system used and settings you have specified. This is normal and not a cause for concern.

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www.javad.com

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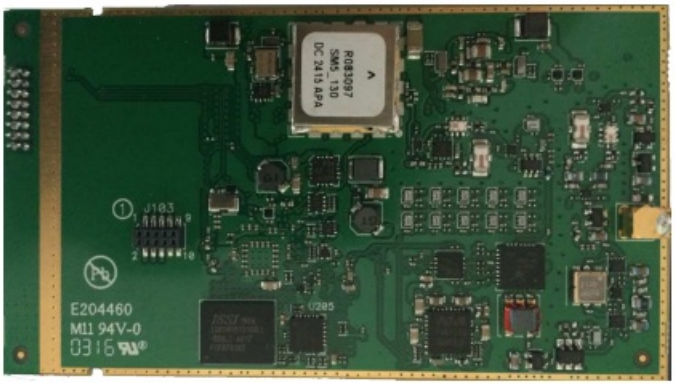
INTRODUCTION

UHFSSRx tri-band radio receiving only module is an universal radio operating in the UHF 406-470 MHz licensed and 868 – 870 MHz European CEPT license free bands, allocated for narrow band telemetry, alarms and data transfer applications like broadcasting of GNSS RTCM corrections; 902-928 MHz USA and 915-928 MHz Australian ISM (industrial, scientific and medical) license free bands.

In that way UHFSSRx communicates with any of broad range of JAVAD transmitters.

The UHFSSRx is developed for exacting customer needs for excellent reliability in noisy plant environments.



UHFSSRx OEM board

Operating at Ultra High Frequency Band

UHFSSRx operates in UHF frequency band covering both licensed and unlicensed frequencies. The following are its key benefits:
Operating in UHF frequency band will provide a non-line of sight connection.
Single radio system covers the whole UHF frequency band from 406 to 470 MHz;
User selectable channel spacing (25 kHz, 20 kHz, 12.5 kHz or 6.25 kHz);

MODULATION TECHNIQUE

The design is based on high-level modulation techniques which include:

Modulation/ Channel Spacing	6.25 kHz	12.5 kHz	20 kHz	25 kHz
DBPSK – Differential Binary Phase Shift Keying	2.4 kbps	4.8 kbps	7.5 kbps	9.6 kbps
DQPSK – Differential Quadrature Phase Shift Keying	4.8 kbps	9.6 kbps	15 kbps	19.2 kbps
D8PSK – Eight Phase Shift Keying	7.2 kbps	14.4 kbps	22.5 kbps	28.8 kbps
D16QAM – Sixteen Quadrature Amplitude Modulation	9.6 kbps	19.2 kbps	30 kbps	38.4 kbps
GMSK – Minimal Shift Keying with Gaussian Filtering	2.4 kbps	4.8 kbps	7.5 kbps	9.6 kbps
4FSK- Four Level Frequency Shift Keying	Not aplicable	9.6 kbps	15.0 kbps	19.2 kbps

MEDIA ACCESS CONTROL (MAC)

The following Media Access protocols are available for AW400Rx modem:
Simplex protocols (Simplex Base, Simplex Remote, and Repeater) are developed primarily for GNSS applications.

Sleep mode is an investment provided by MAC sub-layer that provides additional power saving. The wakeup from Sleep mode is user selectable either by an internal real-time clock, or by an external controller through the data interface control lines (RTS or DTR), or by SLEEP input line (CMOS/TTL compatible input lines).

OPERATING MODES

The operating modes for UHFSSRx can be set through the CLI, and/or through AWLaunch. The following operating mode are available for UHFSSRx :
The sleep mode has automatic transmitter activation by an internal real-time clock, or by an external controller through the data interface control lines (RTS and DTR), or by the triggering of the external Sense Inputs.

MANAGEMENT TOOLS

The built-in management tools along with AWLaunch (configuration and monitoring software application) will provide the following benefits:

1. Easy user’s interface for system configuration and monitoring using well developed CLI or intuitive GUI.

2. An ability to monitor status, alarms and radio performance through the intuitive GUI.
3. Software upgrades and improvements can be downloaded from AWLaunch to the units connected with PC/PDA.

SECURITY

The system provides wireless media access protection as well as data encryption. The following are its key features and benefits:

1. The Key Sequence generated by Pseudo-random generator scrambles the fully formatted frame (including Frame's CRC). This provides the wireless media access protection.
2. User selectable Frequency Hopping Pattern provides another level of the wireless media access protection.
3. At the same time it allows operators to increase the number of links deployed in the same location.

Operating at Spread Spectrum Band

The Spread Spectrum (SSR) technique in which a signal is transmitted on a bandwidth considerably larger than the frequency content of the original information.
Spread-spectrum telecommunications is a signal structuring technique that employs direct sequence, frequency hopping or a hybrid of these, which can be used for multiple access and/or multiple functions.
This technique decreases the potential interference to other receivers while achieving privacy. Spread spectrum generally makes use of a sequential noise-like signal structure to spread the normally narrowband information signal over a relatively wideband (radio) band of frequencies. The receiver correlates the received signals to retrieve the original information signal.

MODULATION TECHNIQUE

Spread Spectrum (SS) radio transceiver uses two bands: 902-928 MHz ISM license free USA band and European CEPT license free 868-870 MHz band. In 902-928 MHz band SS radio uses frequency hopping transmission techniques. The design is based on high-level modulation techniques which include:

Modulation/ Channel Spacing	**902.0-928.0**
GMSK – Minimal Shift Keying with Gaussian Filtering	64.0 kbps, 128 *200.0 kHz

The following are its key benefits:

- Ten optimized Frequency Hopping Patterns provides simultaneous operating of several units with minimum of mutual interference.
- FEC coding scheme used with GMSK modulation is based on Convolutional code and the Viterbi decoding algorithm which is the most resource-consuming, but it does Maximum likelihood decoding.

In 868-870 MHz band the design is based on high-level modulation techniques which include:

Modulation/ Channel Spacing	12.5 kHz	25 kHz
GMSK – Minimal Shift Keying with Gaussian Filtering	4.8 kbps	9.6 kbps

The following are its key benefits:

- FEC coding scheme used with GMSK modulation is based on Convolutional code and the Viterbi decoding algorithm.
- Powerful FEC scheme used with ArWest proprietary frame format improves the tolerance to interference and ensures the highest link quality at distances range higher than 8 miles (13 km) and roaming speeds of up to 60 mph (96 km/h).

MANAGEMENT TOOLS

The built-in management tools along with ModemVU (configuration and monitoring software application) will provide the following benefits:

1. Easy user's interface for system configuration and monitoring using well developed CLI .
2. An ability to monitor status, alarms and radio performance through the CLI.
3. Software upgrades and improvements can be downloaded from ModemVU to the units connected with PC/PDA.

SECURITY

The system provides wireless media access protection as well as data scrambling. The following are its key features and benefits:

1. The Key Sequence generated by Pseudo-random generator scrambles the fully formatted frame (including Frame's CRC). This provides the wireless media access protection.
2. User selectable Frequency Hopping Pattern provides another level of the wireless media access protection.

At the same time it allows operators to increase the number of links deployed in the same location.

Specifications

PHYSICAL INTERFACES

Serial Data Interface – The serial asynchronous interface allows connection to external serial devices. It is shared between user data and unit's command/status information. All commonly supported baud rates, parity and bit configurations are available up to 115.2 kbps.

Power Interface – The power interface allows connection to an unregulated DC power source. The DC power source (third-party or user supplied) must provide DC power of 4.0V±5% DC.

The standalone unit's RF interface is a 50-ohm impedance matched standard MMCX connector as required by regulation.

Antennas – Antenna type depends on the site requirements, and may be directional or omni-directional.

Note: To support 8 miles distance range between Base station and SS unit, an antenna mast should elevate the base antenna a minimum of 20 feet above the average level of the terrain.

5.84CONT COMM CON INC 3913-16G2

GENERAL SPECIFICATION

- Input Voltage: 3.6 V ± 5 %
- Power Consumption (average):
  1 W – receive mode
- Temperature range:
  Operation -40 o F … 140 o F (-40 o C … +60 o C) Storage -40 o F… 176 o F (-40 o C … +80 o C)
- Dimensions:
  3.18 x 1.80 x 0.29/0.37 in (80.8 x 45.7 x 7.4/9.4 mm)
- Weight: 43 g

FEATURES

- DSP-Modem
- Zero-IF Technologies
- 406-470 MHz
- 902-928 MHz (USA); 915-928 MHz (Australia);
- 868-870 MHz (EU) with 25/20/12.5 kHz CS
- Up to 115200 bps Serial Interface Data Rate
- Embedded Firmware Compensation for Operation at Extremely Low and High Temperatures
- Compact Design

EXTERNAL CONNECTORS

- RF Connector: J2 is Antenna Input / Output Connector:
  MMCX RIGHT ANGLE PCB JACK, AMPHENOL P/N 908- 24100.
- Main Connector – 285209LF CONN, 16LEAD, HEADER,

UHF RADIO SPECIFICATIONS

- Frequency Range: 406 – 470 MHz
- Channel Spacing: 25/20/12.5/6.25 kHz
- Carrier Frequency Stability: ±1 ppm
- Modulation GMSK/4FSK/DBPSK/DQPSK/ D8PSK/ D16QAM
- Communication Mode: Simplex
- Supported User Interfaces: Serial Asynchronous (TTL compatible)
- Supported Comms. Protocols: Transparent Receiver

RADIO RECEIVER SPECIFICATIONS

- Receiver Sensitivity for DBPSK (BER 1x 10-4):
  - 113 dBm for 25 kHz Channel Spacing
  - 113 dBm for 20 kHz Channel Spacing
  - 114 dBm for 12.5 kHz Channel Spacing
  - 114 dBm for 6.25 kHz Channel Spacing
- Receiver Sensitivity for DQPSK (BER 1x 10-4)
  - 110 dBm for 25 kHz Channel Spacing
  - 110 dBm for 20 kHz Channel Spacing
  - 111 dBm for 12.5 kHz Channel Spacing
  - 111 dBm for 6.25 kHz Channel Spacing
- Receiver Dynamic Range: -119 to -10 dBm
- Data Rate of Radio Interface (25/20/12.5/6.25 kHz Channel Spacing):
  9600/7500/4800/2400 bps – DBPSK/GMSK
  19200/15000/9600/4800 bps – DQPSK
  28800/22500/14400/7200 bps – D8PSK
  38400/30000/19200/9600 bps – D16QAM
- Forward Error Correction (FEC): Reed-Solomon Error Correction
- Data scrambling

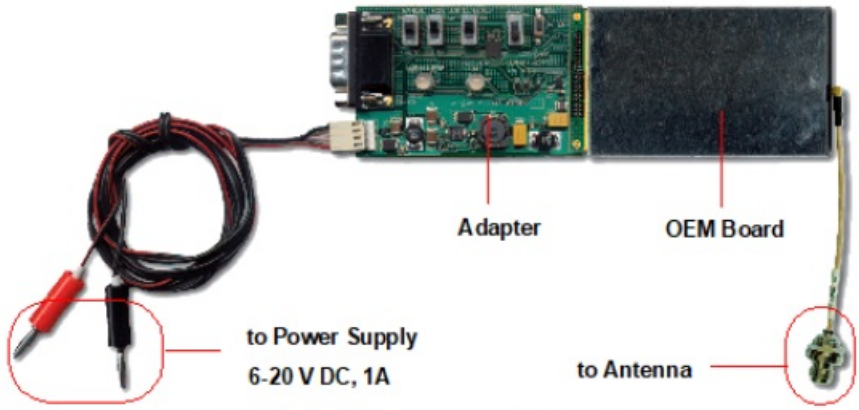
SPREAD SPECTRUM RADIO SPECIFICATIONS

- Frequency Range:
  902-928 MHz (USA); 915-928 MHz (Australia) 868-870 MHz (EU) with 25/20/12.5 kHz CS
- Link Rate, symbols/second: 4800, 9600 (EU) 9600, 19200, 38400, 64000 (USA/Australia)
- Carrier Frequency Stability:
  ±1 ppm
- Modulation: MSK/GMSK/4FSK
- Communication Mode: Half duplex, simplex, repeater
- Radio Receiver Specifications
- Receiver Sensitivity for GMSK (BER 1x 10-4):
  - 113 dBm for 25 kHz CS
  - 113 dBm for 20 kHz CS
  - 114 dBm for 12.5 kHz CS
- Receiver Sensitivity for 4FSK (BER 1x 10-4):
  - 110 dBm for 25 kHz CS
  - 110 dBm for 20 kHz CS
  - 111 dBm for 12.5 kHz CS
- Receiver Dynamic Range: -119 to -10 dBm
- Forward Error Correction: Convolutional code
- Data scrambling

CONNECTION

Connection to the Evaluation Kit

The UHFSSRx board can be connected directly to Evaluation Kit (p/n 99-571010-01) by its 16-Lead Header Connector, ECS Corp., as it shown on the figure below.



UHFSSRx board connected to Evaluation Kit

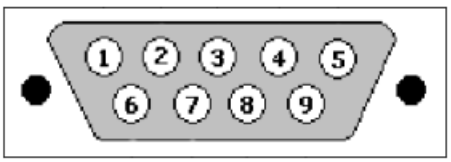
Power connection

The UHFSSRx powered through Evaluation Kit and Power Cable (included in Kit). The Banana plugs of power cable may be connected to any available laboratory power supply, battery or other power source with power parameters, suitable for particular UHFSSRx power specifications.

Note: Evaluation Kit does not provide any over-voltage protection. Connecting Evaluation Kit to voltage exceeding particular UHFSSRx power voltage range may cause damage of UHFSSRx and Evaluation Kit board.
Note: valuation Kit provides reverse polarity protection only in voltages range, specified for particular UHFSSRx.

Serial RS-232 connection

A standard Null-Modem cable (included in Kit) with DB-9 Female connectors on both ends may be used to connect PC COM_X port with Serial port on adapter.
Adapter's DB-9 male connector external view and pinout is shown on the figure below.



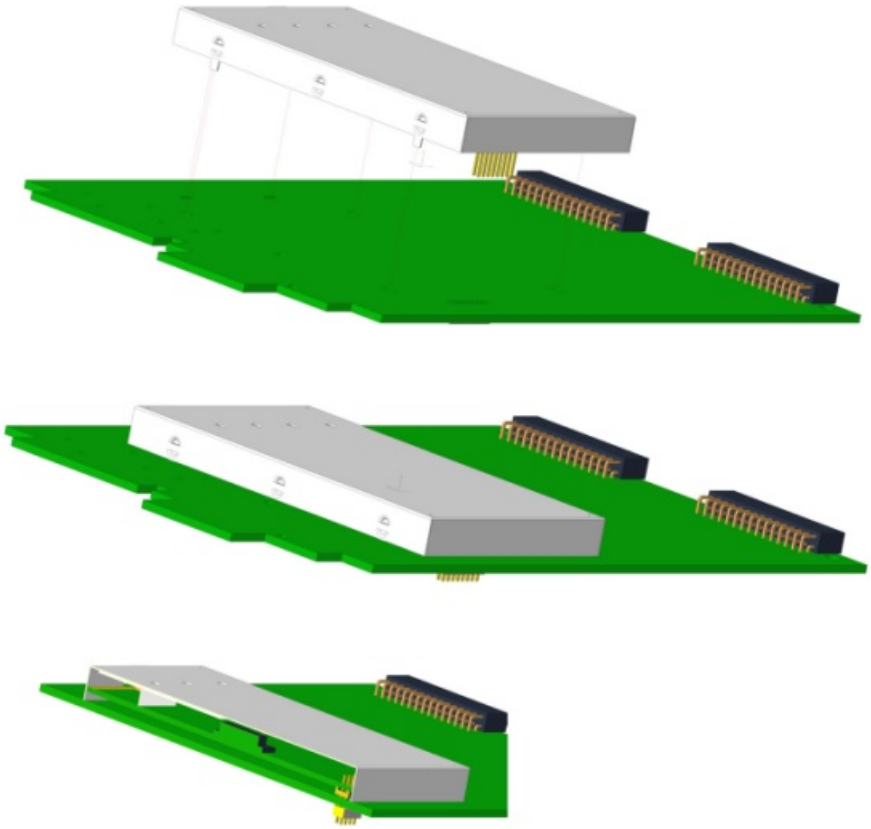
DB-9 Male connector

DB-9 Male Connector Specification

Pin	Signal Name	Dir	Description
1	–	–	Not used
2	RXD	I	Receive Data
3	TXD	O	Transmit Data
4	DTR	O	Data Terminal Ready
5	GND	–	Signal Ground
6	DSR	I	Data Set Ready
7	RTS	O	Request To Send
8	CTS	I	Clear To Send
9	–	–	Not used

Please, refer to particular external device Serial port specification to select and use right Serial cable for proper connection.

HOW TO INSTALL UHFSSRX



COMMAND LINE INTERFACE

The built-in user-friendly Command Line Interface (CLI) allows user to perform a full configuration of the unit and read the statistics and alarm status. It is the most powerful tool to configure the unit. It makes changes to all possible settings that system will not be able to determine automatically.

The CLI commands allow user to configure and reconfigure the unit's settings. The user configuration parameters that could be changed through the CLI are:

- Data Port Settings
  Baud Rate
  Data Bits (8, 7)
  Parity (Odd, Even, None)
  Flow control (None or RTS/CTS)
- Alarm Settings
- Radio Operation Modes
- Sleep modes
  On/Off
  Activate by internal real-time clock
  Activate through RTS/CTS lines
  Activate by external sense lines
  Activate by any combination of the parameters mentioned before

Note: The unit's configuration that is set or modified through the CLI will be lost after unit's reboot, unless the saving operation is used to store a new setting in the unit's configuration file.

The CLI commands also provide filing operations, which include:

- Downloading Unit's Configuration files
- Software Images
- Uploading Unit's Configuration files
- Saving into the configuration files the configuration parameters modified through the CLI.

Command Line Interface Convention

The following convention is implemented in HPT435BT Command Line Interface (CLI):

- The Carriage Return/Line Feed (CR/LF, 0x0D/0x0A) is a command delimiter.
- The Carriage Return/Line Feed (CR/LF, 0x0D/0x0A) is a reply delimiter followed by the "CLI>" prompt if Echo option is On.
- The Carriage Return/Line Feed (CR/LF, 0x0D/0x0A) is a reply delimiter if Echo option is Off (default option).
- The 2-digit number followed by "@" in the unit's reply indicates the error code (refer to Table 3 for description), if Echo Off is selected, otherwise the error message is displayed.
- A successfully performed command is replied by @00 code, if Echo Off is selected, otherwise the set value is replied.
- A command with the certain [Parameter Name] and blank [Parameter List] displays the current settings for a given parameter.
- To set the mode ordered by CLI commands as permanent User Setting (the setting automatically selected for the boot-up unit) the SAVE command must be asserted.
- A command followed by "/F" option displays the Parameters in the predefined frame format. The display frame format is unique for each command supporting "/F" option.

Table 1. Command Line Interface Error Codes

Error Code	Short Description
0x01	Command Syntax Error. A command followed by “/?” displays a command usage.
0x02	The parameter has a format error. A command with the certain [Parameter Name] f ollowed by “/?” displays the format and range of the variable.
0x03	The parameter is out of allowed range. A command with the certain [Parameter Na me] followed by “/?” displays the format and range of the variable.
0x04	The command is not valid for specific radio model. To display the list of available co mmands, the HELP command must be used.
0x05	Unspecified Error

Software Switching to Command Mode

On power-up the radio modem is in data-mode. To switch to command mode the special byte-sequences with special meanings are used:

- Escape-Sequence: “+++” with 20 ms guard time before and after the command characters
- Escape-Acknowledge: “@00”

20 ms toggling on CTS control line needed to acknowledge switching from Data to Command mode and vice versa.

Happy Flow

- In data-mode the unit starts looking for the Escape-sequence if there is no data from DTE (Data Terminal Equipment) for more than 20 ms (Start Guard Time).
- If the unit detects the Escape-Sequence:
- The transmitter continues sending over the air the data received from DTE before Escape- Sequence and buffers the data from DTE;
- The Receiver immediately stops forwarding to DTE the data received over the air and buffers it instead.
- The radio unit waits for 20 ms and then sends Escape-Acknowledge to DTE if there is no data from DTE during 20 ms of Stop Guard Time.
- The unit goes to command mode and discards Escape-Sequence from input buffer. The modem is immediately ready to receive commands. At the same time it continues buffering the data received over the air since step 2.

Escape-Sequence in Data

During its waiting in step 3, the unit receives data from DTE:

- The unit sends buffered Escape-Sequence from DTE to the air;
- The unit sends all buffered data received from the air since step 2 to DTE and stays in data-mode (i.e. transmits data received from DTE over the air – including the just received, unexpected, data and forwards data received over the air to DTE.)

Switching to Data Mode

- DTE sends the CLI command “DATAMODE” to the unit.
- Unit answers with Escape-Acknowledge („@00“) and immediately goes to datamode, so that the DTE can start sending data as soon as the Escape-Acknowledge has been received.
- If no valid CLI commands received from DTE within 1 minute, the unit will automatically switch back to data-mode.

UHF Modem Commands

LINK

The LINK command is responsible for configuring radio’s operation mode. It has parameters listed below.

Note: In parentheses is shown firmware version, which supports this parameter. If the firmware version is not specified, it means that this parameter is supported in both versions.

LINK [Parameter Name] [Parameters List] [/?]

Parameter Name	**Parameter List**
PROT	1 – Simplex Transceiver 2 – Simplex Transceiver 7 – Trimtalk 450S transceiver 8 – Trimtalk 450S transceiver 12 – Transparent w/EOT timeout Transceiver 13 – Transparent w/EOT timeout Tran sceiver 14 – STL Transceiver 15 – STL Transceiver 19 – Transparent w/EOT character Transceiver 20 – Transparent w/EOT character Transceiver 23 – TT450S(HW) Transceiver 24 – TT450S(HW) Transceiver 25 – Trimmark3 Transceiver 26 – Trimmark3 Transc eiver 27 – Trimmark ||/||e Transceiver 28 – Trimmark ||/||e Transceiver

RTR	0 – Auto Detect (Base or Repeater) 1 – Receive from Repeater 2 – Receive from Base
MOD	1- DBPSK 2 – DQPSK, a default settings 3 – D8PSK 4 – D16QAM 5 – GMSK 6 – 4FSK
SPACE	0 – 25 kHz (12.5 kHz for Trimmark3 protocol) = 9600 symbols/s 1 – 12.5 kHz = 4800 symbols/s 2 – 6.25 kHz = 2400 symbols/s 3 – 20 kHz = 7500 symbols/s 4 – 25 kHz = 19200 symbols/s (available for Trim- mark3 protocol only)
FHOP (only for firmware ver. 1.8)	(0 – 32) – Frequency Hoping Pattern number LINK FHOP command can be proces sed only if the Channel Map (up to 32 channels)
SCRAM	0 – No Scrambling (a default setting) (1 – 255) – Seed for Pseudo-Random Sequence Generator
FEC	0 – Disable Forward Error Correction (FEC), a default setting 1 – Enable Reed-Solomon encoding

Parameter Name	Parameter List
CLKCORR	1 – Enable 4FSK clock correction 0 – Disable 4FSK clock correction
SNST	0 – active AGC signal finding algorithm 1 – HIGH sensitivity level, -70…-117 dBm 2 – MIDDLE sensitivity level, -40…-90 d Bm 3 – LOW sensitivity level -10…-60 dBm 4 – Keep last successfully received packet state
SYNRT	0 – default value = 4 sec. 1 – do not reset the LNA and ADC gain N – Set Demodulator reset in sec
CMPT	sets/gets the compatibility with: 0 – Satel 3AS 1 – Satel Easy 2 – ADL

Note: The frequency defined by CHAN parameter is not valid if Frequency Hoping mode is selected. In the Frequency Hoping mode, the Frequency Pattern generator must generate the random numbers smaller than the number of frequencies listed in the unit's frequency list.

Serial Interfacing Commands

DPORT

The DPORT is an object that responsible for data port interface configurations like Bit Rate, Flow Control, etc.

DPORT [Parameter Name] [Parameters List] [/?]

Parameter Name	Parameter List
RATE	0 – Maintenance Port baud rate, a default setting 1 – 1200 baud 2 – 2400 baud 3 – 4800 baud 4 – 9600 baud 5 – 14400 baud 6 – 19200 baud 7 – 38400 baud 8 – 57600 baud 9 – 115200 baud, a default setting
BITS	Set number of bits in one byte (8 or 7) 8 is a default setting
PARITY	0 – None, a default setting 1 – Odd 2 – Even
FLOW	0 – None, a default setting 1 – Not used 2 – HW (RTS/CTS)

The response of command without Parameter Name indicates all values:

RATE =9
BITS =8
PARITY =NONE
FLOW =HARDWARE
STOPBIT =0
DTR =0
RS =RS232
DATATX =UART
DATARX =UART
BUF =0

MPORT

The MPORT is an object that responsible for maintenance serial port interface configurations such as data rate and number of bits in a byte.

MPORT [Parameter Name] [Parameters List] [/?]

Parameter Name	Parameter List
RATE	0 – Auto 1 – 1200 baud 2 – 2400 baud 3 – 4800 baud 4 – 9600 baud 5 – 14400 baud 6 – 19200 baud 7 – 38400 baud 8 – 57600 baud 9 – 115200 baud, a default setting

Note: JAVAD GNSS radio modem's does not support data flow and parity on the maintenance serial port. The radio modem with none-dedicated maintenance serial port must keep CTS line always active in MPORT mode (DP/MP is low).

Special Commands

BOOT

The factory software image and default configuration is set for the new unit. The BOOT command is intended to reboot the unit using specified software image and selected configuration.

BOOT IMAGE BOOT CFG

The BOOT command with no parameters selects the user settings defined by the prior "parameterized" BOOT commands.

HELP

The HELP command types the list of all available commands:

HELP- Display this usage
BOOT- Reboot the unit
LINK- Set RF Link Operation Mode
DPORT- Set Data Port Configuration
MPORT- Set Maintenance Port Configuration
ALARM- Alarm Indication and Alarm Control Configuration SLEEP- Set Sleep Mode Configuration
STATE- Display Status and Statistics
SAVE- Save Current Configuration into Configuration File
INFO- Display Product ID along with Hardware/Software Versions
ATI- Display Product ID along with Hardware/Software Versions
MAP- Operates with Channel Map
DATAMODE- Exit Command Mode
[COMMAND] /?- Display Command Usage

SAVE

The SAVE command is intended to store the unit's currently used configuration into the User Configuration file. The configuration stored in the User Configuration file is activated by automatically after unit's reboot.

SLEEP

The SLEEP command determines the sleep mode parameters. The sleeping AW435BT can be activated by real-time CLK, DTR/RTS lines, and command received through TTL inputs. The user can select one, two, or all three conditions.

SLEEP [Parameter Name] [Parameters List] [/?]

Parameter Name	**Parameter List**
CLK	0 – Do not activate by internal real-time clock (1 – 255) – Activate by internal real-ti me clock after 100 to 25500 msec of sleeping
HW	0 – Do not activate through DTR/RTS lines 1 – Activate through DTR/RTS lines
TTL	0 – Do not activate by external sense lines 1 – Activate by external sense lines
GTS	0 – Disable Sleep mode (default) (1 – 255) – Go to sleep mode if there is no activity in 10 to 2550 msec

Diagnostics and Identification Commands

INFO

The INFO command is used to retrieve the Radio ID along with its Hardware version, the loaded real- time software version/revision and BootLoader's version/ revision.

INFO [Parameter Name] [Parameters List] [/?]

Parameter Name	Parameter List
ID	LMR400RX(UHFSSRX) UHF Radio Modem, Javad GNSS Product ID =111
SN	Six bytes Serial Number (SN)
HW	1.0 – hardware version in numeric “Major.Minor” format
SW	Ver. 1.0 Rev. A – displays software’s version in numeric “Major.Minor” format and re vision in numeric format (range from 01 to 99) for engi- neering releases and alpha betic format (A to Z) for manufacturing releases
BL	Ver. 1.0 Rev. A – displays BootLoader’s version in numeric “Major.Minor” format an d revision in numeric format (range from 01 to 99) for engi- neering releases and al phabetic format (A to Z) for manufacturing releases

The INFO command without Parameter Name indicates all values:

LMR400RX(UHFSSRX) UHF Radio Modem, Javad
GNSS Product ID =111
S/N =0000000123BB
Hardware =Ver. 3.3
Software =Ver. 1.8 Rev 04 B24
BootLoader =Ver. 3.0 Rev 03

STATE

The STATE command is used to check the state of the wireless link, the unit in the link, and the alarm control lines.

STATE [Parameter Name] [Parameters List] [/?]

Parameter Name	Parameter List
TTL1	0/1 – State of TTL_IN1 line
TTL2	0/1 – State of TTL_IN2 line
RSSI	-52 to -116 dBm – Indicates the Receive Signal Strength in dBm

BER	1.0E-6 to 9.9E-3 – Indicates the BER level
FREQ	406.000000 to 470.000000 MHz – Displays the central frequency of the operating c hannel
CHAN	1 to 9601 – Displays the selected or currently scanned frequency channel
TEMP	-30°C to 100°C – Displays the temperature inside of enclosure
SYNC	1 – Indicates the established link, 0 – if link is not established yet
MODE	AUTO – Indicates Automatic scanning mode FHOP – Indicates Frequency hopping mode FIXED – Indicates that the radio modem is work- ing on fixed channel from ch annel map.

The STATE command without Parameter Name indicates all values as shown below:

TTL_IN1 = 0
TTL_IN2 = 1
RSSI = -110 dBm
BER = < 2.3E-5
FREQ = 140.000000 MHz
CHAN = 10
TEMP = 70C
SYNC = 1
MODE = FIXED

Spread Spectrum Modem Commands

LINK

The LINK command is responsible for configuring radio's operation mode.

LINK [Parameter Name] [Parameters List] [/?]

LINK commands are as common so specific for two bands: 902-928 MHz band and 868-870 MHz band:

Parameter Name	Parameter List
FEC	0 – Disable Forward Error Correction (a default setting) 1 – Enable Forward Error Correction
FHOP	(0-9) – FH Pattern numbers for USA; (10-19) – FH Pattern numbers for Australia; For EU parameter FHOP not applied
MOD	5 – GMSK
PWRB	(15 – 30) – RF output Power in dBm
SCRAM	0 – No Scrambling 1 – Scrambling with Pseudo-Random Sequence Generator (a default setting) 2 – Scrambling with User defined SEED.
SCR	001,…,511 – User defined decimal SEED
SPACE	0 – 25.0 kHz Channel Spacing (a default setting) 1 – 12.5 kHz Channel Spacing 2 – 6.25 kHz Channel Spacing

PMP	0 – “Any transmits, any receives”. At the receiv- er side neither the source nor the r ecipient is validated. If parameter PMP =0, then its value is not displayed in a “link\n ” response. (a default setting) 1 – “Any transmits to me only”. The receiver compares the received code DST with its code SRC. If the received code DST coincides with the code SRC of the receiver , the received data are distributed to the port. If the received code DST is not coincide with the code SRC of the receiver, the rece ived data to the port are not provided. 2 – “Certified Base transmits to any”. The receiv- er compares the received code S RC and code KNW. If the received code SRC coincides with the code KNW, stored in the configuration file of the receiver, the received data are distributed to the port. If the received code SRC is not coincide with the code KNW, then the received data to the port are not provided. 3 – “Certified Base transmits to me only”. The receiver compares the received cod es: code DST with its code SRC and the code SRC with the code KNW. If these codes match the received data are dis- tributed to the port.

The LINK command without Parameter Name indicates all values.

MAP F

The MAP F command prints the initial frequency of the receiver: 915000000

MAP FTX

The MAP FTX command prints the initial frequency of the transmitter: 915000000

MAP FDDDDDDDDD

The MAP Fddddddddd command sets the initial frequency of the receiver.

For example: ddddddddd = 912000000 sets the initial frequency 912000000 Hz.

MAP FTX DDDDDDDDD

The MAP FTX ddddddddd command sets the initial frequency of the receiver.

For example: ddddddddd = 924000000 sets the initial frequency 924000000 Hz.

The RGN command is also responsible for configuring radio's operation mode.

RGN [Parameters List]

Parameter List	Short description
0	Sets EUR region
1	Sets USA region (a default setting)
2	Sets AUS region

The RGN command without parameter prints the Region number.

TRFC

The TRFC command is also responsible for configuring radio's operation mode.

TRFC [Parameters List]

Parameter List	Short description
0	0 – Disable Packet repeating
1	1 – Enable Packet repeating (a default setting)
2	2 – Transparent mode

If the TRFC=1 each Data Packet is transmitted twice:
first time on the current time and frequency, second time on the next time and frequency position.
If TRFC=2 ("Transparent mode" On) two modems implement a "full duplex" – duplex transmission mode in which data transfer maintained "simultaneously" with the reception of data.

LSRT

The LSRT command is specific for USA and AUS region. It changes Link Simbol Rate.

LSRT [Parameters List]

Parameter List	Short description
0	64000 kHz (a default setting)
1	32000 kHz
2	16000 kHz
3	8000 kHz

The LSRT command without Parameter prints Link Symbol Rate parameter.

DCRC

The DCRC (“Data CRC”) command is manage the output of the received data to the port.

DCRC [Parameters List]

Parameter List	Short description
0	0 – received data are distributed to the port, regardless of the received data CRC. (a default setting)
1	1 – data are distributed to the port only if the CRC is correct.

The DCRC command without Parameter prints DCRC parameter.

DLNG

The DLNG (“Data Subpackage Length”) command enables the validation of the receipted parameter – length of subpackage.

DLNG [Parameters List]

Parameter List	Short description
0	0 – validation of the receipted parameter length subpackage is not used (a default s etting).
1	1 – validation of the parameter is used

The DLNG command without parameter prints DLNG parameter.

DSRV

The DSRV (“Data Service”) command allows the transmitter to control the tuning of the receiver. When DSRV = 1 the receiver settings – FEC, SCRAM, TRFC – transmitted from the transmitter to the receiver through the air.

DSRV [Parameters List]

Parameter List	Short description
0	0 – the receiver's parameters are set from the configuration file. (a default setting)
1	1 – FEC, SCRAM, TRFC are set from service data passed to the receiver through t he air.

The DSRV command without parameter prints DSRV parameter.

LBT

The LBT ("Listen Before Talk") command allows to verify the channel occupancy before subpackage transmitting. If the channel was occupied at the previous slot, the current slot is not used for data transmission.

LBT [Parameters List]

Parameter List	Short description
0	0 – Listen Before Talk mode is turned off.
1	1 – Listen Before Talk mode is enabled. (a default setting)

The LBT command without parameter prints LBT parameter.

WHT

The WHT command defines type of data.
WHT [Parameters List]

Parameter List	Short description
43	43 – The receiver sees the received data as Com- mand.
44	44 – The receiver sees the received data as Data. (a default setting)

The WHT command without parameter prints WHT parameter.

SRC

The SRC command defines "address" of data (the data source code). By defaults SRC coincides with the last three symbols of the transmitter SN, but can be reprogrammed.

SRC [Parameters List]

Parameter List	Short description
XXX	XXX – the data source code (three hex symbols).

The SRC command without parameter prints SRC code.

DST

The DST command defines destination “address” of data. Destination address corresponding to the source code of the recipient.
DST [Parameters List]

Parameter List	Short description
XXX	XXX – the data destination code (three hex symbols).

The DST command without parameter prints DST code.

KNW

The KNW command defines the code of the certified data source.

KNW [Parameters List]

Parameter List	Short description
XXX	XXX – the certified data source (three hex sym- bols).

The KNW command without parameter prints KNW code.

Special Commands

BOOT

The BOOT command is intended to reboot the unit.

HELP

The HELP command types the list of popular commands:

Popular Commands

BOOT – Reboot the unit
INFO – Product ID along with Hardware/Software Versions
STATE – Transceiver Status
SAVE – Save Current Configuration into Configuration File

+++ – (without) – Exit Data Mode DATAMODE – Exit Command Mode

LINK – Print RF Link Operation Mode
XMOD IMAGE – Activate X-Modem Protocol to load Firmware

TSTSGL /? – Displays Test Signals particularity

See Manual for details @00

SAVE

The SAVE command is intended to store the unit's currently used configuration into the Configuration file. The configuration stored in the Configuration file is activated automatically after unit's reboot.

CFG2DFLT

The CFG2DFLT command cleans current Configuration. After BOOT command all configuration parameThe CFG2DFLT command cleans current Configuration. After BOOT command all configuration parameters will be default.

XMOD IMAGE

The XMOD IMAGE command in Maintains Mode activates X-modem protocol to download the Modem part of the Firmware Image.

Use this command with one delimiter: "XMOD IMAGE" or Command "XMOD IMAGE".

Note: Command "XMOD IMAGE" will be accepted as command "XMOD IMAGE" and byte of Firmware Image 0x0A

Identification and Diagnostics Commands

INFO

The INFO command is used to retrieve the SS Radio ID along with its Hardware version, the loaded real- time software version/revision and BootLoader's version.

INFO [Parameter Name] [/?]

Parameter Name	Parameter List
ID	Product ID
SN	Serial Number (SN)
HW	3 – hardware revision
FW	2.2.30 – firmware version
BL	4.03 – BootLoader Version

The INFO command without Parameter Name indicates all values:

FH915 Land Mobile Radio, Javad GNSS.
Product ID =41
S/N =30196
Hardware =3
Firmware =2.2.32
BootLoader =4.03

STATE

The STATE command is used to check the state of the wireless link.

STATE [Parameter Name][/?]

Parameter Name	Parameter List
Region	0-EU; 1-USA; 2-Australia
Tx	Displays the initial frequency of the transmitter

Rx	Displays the initial frequency of the receiver
T	-30°C to 100°C – Displays the temperature inside of enclosure

The STATE command without Parameter Name indicates all values:
Region =1
Tx =915000000
Rx =915000000
T=46.00

IC

The IC command prints string:
IC: 3504A-FH915
@00

FCC ID

The FCC ID command prints string:
FCC ID: WJ4FH915
@00

GTX

The GTX command allows get from port the Number of transmitted bytes.
GTX [Parameters List]

Parameter List	**Short Description**
0	0 – Disable send to port the Number of the trans- mitted bytes (a default setting).
1	1 – Enable send to port the Number of the trans- mitted bytes.

RSS

The RSS command send to port the string: 00 0031 -85.7
Where: 0031 – the received Packets Number;

00 – the received Packets Number with bad Checksum;
-85.7 – RSSI (dBm) calculated along the last Packet;

After reading both the received Packets Number and the received Packets Number with bad Checksum are

cleaned.

RSSI

The RSSI command send to port RSSI (dBm) calculated along the last Packet.

RSSM

Modem stores the last RSSI values for each particular frequency on which a subpackage was received. An array of the last RSSI for 128 possible frequencies canbe read by command “rssm\n”.

RSSC

The command RSSC clears particular RSSI values obtained by using the command RSSM to default value -140.7 dBm.

RNSS

The command RNSS prints last Noise Strength measured between Data Sabpackages.

NSCN

The command NSCN allows to get the power of noise and interference for 128 frequencies from 902200000 to 927600000.
NSCN [Parameters List]

Parameter List	**Short Description**
d	d – threshold, dB

SCAN

The command SCAN allows to get the power of noise and interference for defined range of frequency with defined step.
SCAN [Parameters List]

Parameter List	**Short Description**
ddddddddd DDDDDDDDD sssss	ddddddddd – Begin frequency, Hz DDDDDDDDD – End frequency, Hz sssss – step, Hz

SCNS

The command SCNS stop scanning.

Modem protection from interference

If interference contains a big power at some frequency such frequency (“unwanted frequency”) can be excluded from the use. To eliminate unwanted fre-quencies they should be placed to list and saved in configuration file.

NLST

The NLST command prints the list of “unwanted frequencies”. By default the list is empty.

NADD

The NADD command adds some frequency to the list of “unwanted frequencies”. The added value of the frequency is rounded to the nearest used for frequency hopping.
NADD [Parameters List]

Parameter List	**Short Description**
ddddddddd	ddddddddd – frequency value, Hz

The command “nadd 915666777\n” add to list frequency 915600000 Hz. Its number equal 0x43. The command “nadd 918111222\n” add to list frequency 918200000 Hz. Its number equal 0x50.
The NLST command prints the list:
43 915600000
50 918200000
@00

NAPL

The NAPL command applies the list of “unwanted frequencies” and forms the frequency hopping sequence without “unwanted frequencies”. The list of “unwanted frequencies” from configuration file will be applied automatically by Reset or Power On of the modem.

To save the list in the configuration file, you must issue the command save\n.

NDEL

The NDEL command deletes frequency from the list of “unwanted frequencies”.
NDEL [Parameters List]

Parameter List	**Short Description**
HH	HH – hex frequency number

Example: The command “ndel 43\n” deletes frequency 915600000 Hz from the list.

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Documents / Resources

	JAVAD UHFSSRX OEM Receiver [pdf] User Manual UHFSSRX, OEM Receiver

References

- JAVAD GNSS
- JAVAD GNSS