JAVAD

HPT901BT

User Manual

Version 1.1

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PREFACE

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> **Note:** Please read these Terms and Conditions carefully.

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SAFETY – Improper use of HPT901BT can lead to injury to persons or property and/or malfunction of the product. The HPT901BT modem should only be repaired by authorized JAVAD GNSS warranty service centers. Users should review and heed the safety warnings in Appendix C.

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Regulatory Information

FCC Class A Compliance

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the

instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

CAUTION: *Any changes or modifications to the equipment not expressly approved by the party responsible for compliance could void your authority to operate such equipment.*

Canadian Emissions Labeling Requirements

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Réglement sur le matériel brouilleur du Canada.

Industry Canada

The term "IC:" before the equipment certification number only signifies that the Industry Canada technical specifications were met.

WEEE Directive

The following information is for EU-member states only: The use of the symbol indicates that this product may not be treated as household waste. By ensuring this product is disposed of correctly, you will help prevent potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling of this product. For more detailed information about the take-back and recycling of this product, please contact your supplier where you purchased the product or consult.

Manual Conventions

This manual uses the following conventions:

Example	Description
File ▶ *Exit*	Click the *File* menu and click *Exit*
Link Space	This format represents titles of dialog windows/boxes, names of menu options, identifies program interface objects, such as checkboxes, edit boxes, radio buttons, etc.

Example	Description
`Temp`	This format is used to enter various string information (e.g., file and directory names) as well as operator commands.

Screen Captures

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

Technical Assistance

If you have a problem and cannot find the information you need in the product documentation, contact your local dealer.

INTRODUCTION

External extra rugged digital high power UHF radio transceiver is designed as universal license-free modem. It uses 902-928 MHz ISM (industrial, scientific and medical) license free USA/Australia band frequency hopping transmission techniques for excellent reliability in noisy plant environments and European CEPT license free 868-870 MHz band, allocated for narrow band telemetry, alarms and data transfer applications.

Figure 1. HPT901BT without battery and HPT901BT with battery

The HPT901BT is a wireless system, based on FH915 – Spread Spectrum Radio Transceiver.

The Digital Data is delivered to/from the FH915 Radio Transceiver through the Serial (RS232) connection, through USB- to-Serial adapter or through the Bluetooth module. The modem status is indicated by LEDs.

The HPT901BT radio transceiver provides a high-speed Point-to-Point and Point-to-Multipoint wireless data transfer at up to 64.0 kbps. HPT901BT supports GMSK modulation technique, which allows the user to achieve the highest data speed. It also includes a forward error correction, data packets doubling technique and data scrambling, which improve the functioning of the radio modem with frequency hopping under interference. The output power is programmable up to 1 W.

The sophisticated features of HPT901BT include user selectable frequency hopping sequences and transmit output power level, low power consumption sleep modes and plug-and-play installation for remote terminals.

The firmware of the HPT901BT radio transceiver resides in a flash memory. The updating of the radio modem programs is entirely software-based. The flash memory is reprogrammable through an RS232 interface, USB, or Bluetooth.

The unit's user settings can be changed through the built-in Command Line interface (CLI) or through the supporting software ModemVU - Windows based Unit Configuration and Maintenance Software Application running on a IBM PC compatible computer and connecting to the device over RS-232 interface or USB.

The diagnostic feature of the FH915 system provides the information to monitor and maintain user's communications link. The output transmit power, received signal strength (RSSI) and data decode performance are transmitted online without application interruption.

The product is designed for maximum performance and reliability even in the harshest environments.

1. Getting Acquainted

The HPT901BT is a rugged and very powerful external radio transceiver 5.75 x 2.95 x 1.73 inches (146 x 75 x 44 mm), weighs 1.3 lbs (0.488 kg); HPT901BT with battery dimensions are 3.11 x 5.94 x 2.87 inches (79 x 151 x 73 mm), and it weights 2.2 lbs (1 kg) .

1.1. LEDs

External LED's are used for Link and Line status indication:

Position	LED Name	Color	Description
1	PWR	Green	Solid - external power is connected, battery charger is off. Blinking every 1 second - external power is connected, the battery is being charged Blinking every 4 seconds - external power is not connected, internal battery is being used as power source Blinking every 0.5 second - external power is not connected, the battery is near to full discharge OFF - external power is not connected
2	RX	Green	ON - radio receives data
3	TX	Green	ON - radio transmits data
4	BT	Blue	OFF - Bluetooth® is OFF; Solid blue - Bluetooth® is ON; Blinking if radio receives or transmits data over Bluetooth®

1.2. Data and Power Port

The HPT901BT data and power port is placed on the front of the unit (Figure 2).

Data and
power port

On/Off button
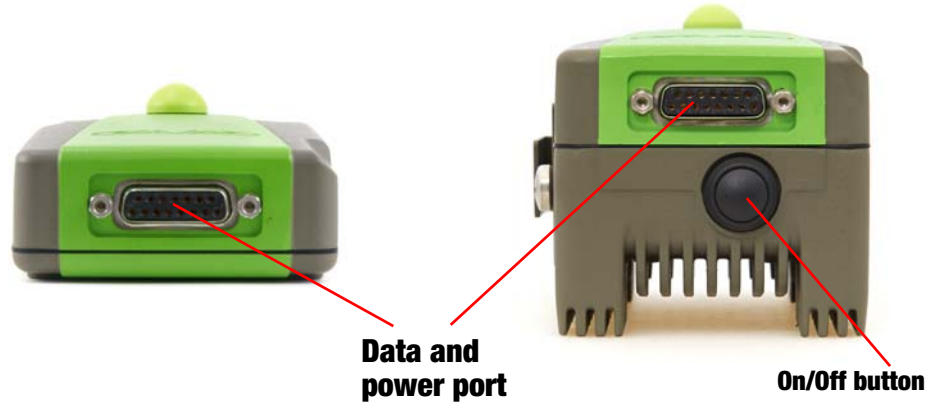
Figure 2. HPT901BT front side

Through the DB15 port the HPT901BT can be connected to PC with Accessory Data-Ser-Pwr Cable, DB9/DB15/SAE (6ft/1.8m) p/n 14-578108-02 and can be powered.

1.3. External Antenna Connector and Bluetooth Antenna

The external antenna connects to the TNC external antenna connector which is placed on the back panel of HPT901BT.

Bluetooth
Antenna

External Antenna Connector
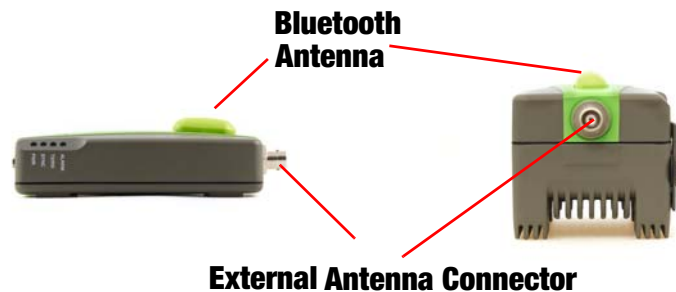
Figure 3. External antenna connector and Bluetooth Antenna

1.4. Mounting Bracket

The mounting bracket connects the modem to a standard pole/adapter.

1.5. Cables

The HPT901BT package includes standard communication and power cables for configuring the modem and providing a power source to the modem.

Accessory Data-Ser-Pwr Cable, ODU-7/DB15/SAE (1,8m) p/n 14-578110-02	

1.6. External Antenna (not included)

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

Warning: *To avoid serious damage of the equipment, do not use the radio without the antenna.*

1.7. Storage Precautions

1. Always clean the instrument after use. Wipe off dust with a cleaning brush, then wipe off dirt with a soft cloth.
2. Store in a location with a temperature of -40°... +85°C, and no exposure to direct sunlight.
3. Use a clean cloth, moistened with a neutral detergent or water, to clean the modem. Never use an abrasive cleaner, ether, thinner benzene, or other solvents.

Always make sure the instrument is completely dry before storing. Dry the modem with a soft, clean cloth.

CONFIGURATION

1. Powering HPT901BT

To power HPT901BT without battery, use the Battery kit 1 (p/n 99-587300-10).

Figure 1. Battery Kit 1

1.1. Power supply requirements

A single external power supply is necessary to operate HPT901BT. The external power supply needs to be Listed for US and Certified for EU countries, it needs also to be a Limited Power Source and rated for Outdoor Use and have an output rated for +9... +36V, 4A. This may not be the same range as other JAVAD GNSS products with which you are familiar.

CAUTION: *To avoid the introduction of hazards when operating and installing, before connecting of the equipment to the supply, make sure that the supply meets local and national safety ordinances and matches the equipment's voltage and current requirements.*

CAUTION: *Never attempt any maintenance or cleaning of the supply while plugged in. Always remove supply from AC power before attempting service or cleaning.*

Warning: *If the voltage supplied is below the minimum specification, the modem will suspend operation. If the voltage supplied is above the maximum specification, the modem may be permanently damaged, voiding your warranty.*

Make sure cords are located so that will not be stepped on, tripped over, or otherwise subjected to damage or stress. Do not operate equipment with a damaged cord or plug – replace immediately.

To reduce the risk of damage to the equipment, pull by the plug body rather than the output cord when disconnecting the equipment.

Do not operate the supply if it has received a sharp blow, been dropped, or otherwise damaged. Do not disassemble the supply.

Warning: *Before connecting the external power source and the modem, make sure that the power source matches the modem's voltage and current requirements.*

2. Antenna Installation

Warning: *WARNING! To avoid serious damage of the equipment, do not use the radio without the antenna.*

Select the type of antenna that best fits your application and the one that offers the highest dB gain. In addition, setup your system in the highest possible location to minimize obstacles between the transmitting and receiving systems. Always place the antenna on the highest point available. At a minimum, set the antenna to at least ten feet above the terrain using an antenna mast.

3. Connecting HPT901BT and Computer

Once you have established a connection between the modem and the computer, you will be able to:

- Configure the modem and its components
- Send commands to the modem

Use ModemVU to load new firmware to the modem.

3.1. Connecting through serial port

To configure, or maintain HPT901BT, you need to connect the modem and a computer using an Accessory Data-Ser-Pwr Cable,ODU-7/DB15/SAE (1,8m) p/n 14-578110-02 .

Figure 2. Accessory Data-Ser-Pwr Cable

Default parameters for Serial port are:

- Baud Rate:115200
- Data Bits:8
- Stop Bits:1

- Parity:None
- Flow control:RTS/CTS

3.2. Connecting through USB port

Make sure the computer has special USB driver installed (available from www.javad.com) before continuing. To configure, or maintain HPT901BT using USB port, you need to connect the modem and a computer using special cable Access Data-Ser Cable, USB/DB15/SAE (1,8m) (p/n 14-578123-02).

Figure 3. Cable p/n 14-578123-01

1. Download the zip-archive with USB driver from www.javad.com;
2. Extract the archive to the new empty folder;
3. Connect the USB port of the computer to the data port of the modem at the switched off power supply by using of a cable.
4. Turn on your computer.
5. Power HPT901BT.
6. Widows will detect USB driver automatically. Otherwise it will ask to specify driver location. Select the folder with extracted file.

Default parameters for USB Bridge port are:

- Baud Rate:115200
- Data Bits:8
- Stop Bits:1
- Parity:None
- Flow control:RTS/CTS

3.3. Connecting through Bluetooth®

Note: Do not forget to attach the Bluetooth® antenna to Bluetooth antenna connector on the back panel of the modem.

The HPT901BT modem contains Bluetooth® wireless technology that allows synchronization between the modem and any other external device that supports Bluetooth® wireless technology; for example, an IPAQ, or a computer with USB-to-Bluetooth® adapter or PCMCA-to-Bluetooth® adapter installed, etc.

HPT901BT and external device connection procedure varies slightly depending on the type of external device used. In general, the connection procedure is as follows:

Note: Refer to your Bluetooth®-enabled external device documentation for more detailed connection information.

1. Turn on a Bluetooth®-enabled external device and your receiver. The default external device mode is Master; the modem's Bluetooth® module mode is Slave.

2. Instruct the external device (Master) to search for the modem (Slave).

3. Once the Master device detects the modem, use the procedure described in the external device's documentation to connect it with the modem.

4. Configuring HPT901BT

1. Connect the computer and HPT901BT, as described in"Connecting HPT901BT and Computer" on page 16.

2. Turn on the HPT901BT.

3. Start ModemVU. *Main* window appears (Figure 4). Choose *HPT901BT* modem and click *OK*. Then select the COM port the modem is connected to, and click *Connect*:
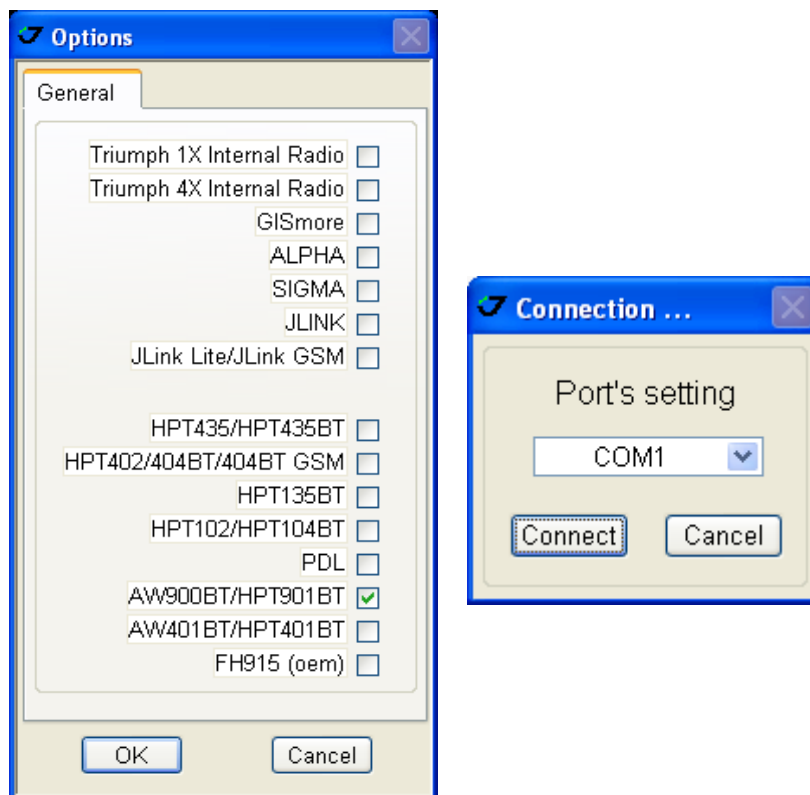
Figure 4. Main window

4. Once the connection is established the window with *General, Interface, BT,* and *Identification* subtabs will appear:
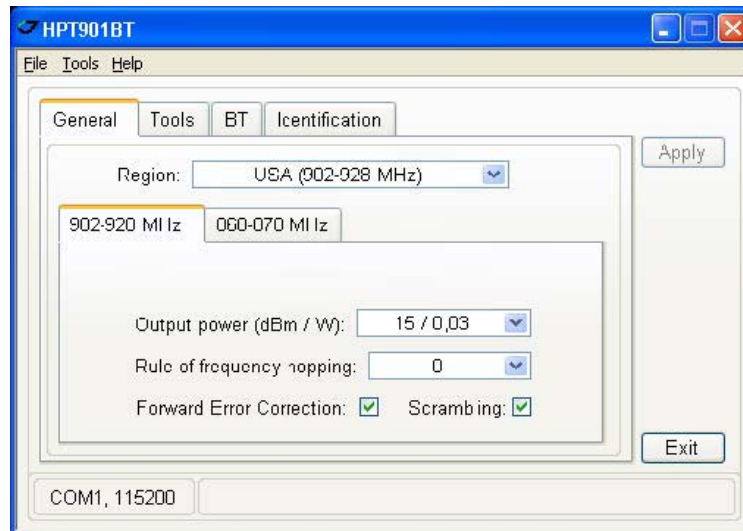
Figure 5. General tab

5. Set the needed parameters. To save the changes click *Apply* button.

4.1. Checking firmware version

Identification tab shows versions of HPT901BT components:
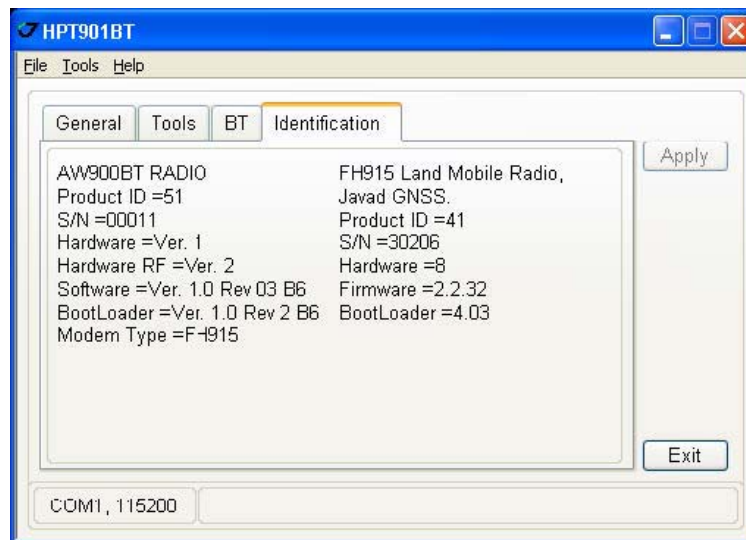
Figure 6. Identification tab

This tab lists important information about the hardware accessories and software properties. This list includes the following, which you will need if you contact JAVAD GNSS Communications or your dealer:

- Unit Type
- Unit Name
- Modem Serial Number
- Firmware Version
- Hardware Version
- BootLoader Version

4.2. New Firmware Downloading

1. To download new firmware use *Tools* tab.
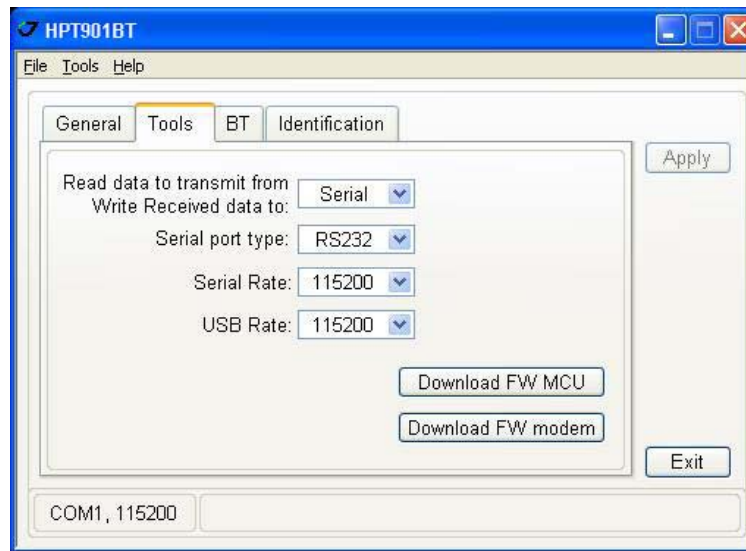
Figure 7. Tools tab

2. Click *Download FW modem*, select the file with the new modem firmware and click OK.
3. Click *Download FW MCU*, select the file with the new MCU firmware and click OK.
4. Use the latest firmware version, available for download from the JAVAD GNSS website www.javad.com, to ensure your modem has the most recent updates.

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.

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 Software Images
- Saving into the configuration files the configuration parameters modified through the CLI.

1. Command Line Interface Convention

The following convention is implemented in FH915 Command Line Interface (CLI):

- The Carriage Return/Line Feed (CR/LF, 0x0D/0x0A) is a command delimiter. Command delimiters CR or LF or CR+LF are valid. Preferable delimiter - LF.
- 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 1 for description), if Echo Off is selected.
- A successfully performed command is replied by @00 code, if Echo Off is selected.
- 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.
- [/?] orders to show the help information for the given command.
- Commands are not key sensitive; small, none capital characters can be used to enter CLI commands.

<p align="center">**Table 1. Command Line Interface Error Codes**</p>

Error Code	Short Description
0x01	Command Syntax Error.
0x02	The parameter has a format error.
0x03	The parameter is out of allowed range.
0x04	The command is not valid for specific radio model.
0x05	Unspecified Error

1.1. Software Switching to Maintenance Mode

To switch to Maintenance 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<CR><LF>".

Happy Flow

1. In data-mode the unit starts looking for the Escape-sequence if there is no data from DTE for more than 20 ms (Start Guard Time).
2. If the unit detects the Escape-Sequence:
- The transmitter continues sending over the air the data received from DTE before Escape-Sequence;
- The Receiver immediately stops forwarding to DTE the data received over the air and buffers it instead.
3. 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.
4. The unit goes to Maintenance 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.)

1.2. Switching to Data Mode

- DTE sends the CLI command "DATAMODE<CR>" or „DATAMODE<LF>" to the unit.

Note: Command "DATAMODE<CR><LF>" will be accepted as command "DATAMODE<CR>" and Data Byte=0x0A.

- Unit immediately goes to datamode, so that the DTE can start sending data.
- The data received over the air goes from buffer to DTE. If you need clear the buffer before going to datamode use the CLI command "DATAMOD<LF>".
- If no valid CLI commands received from DTE within 1 minute, the unit will automatically switch back to data-mode.

Note: The data received over the air could be lost due to Rx buffer overflow if the unit stays in Maintenance mode long time.

1.3. Software Switching to Data Route Mode

To switch to Data Route 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<CR><LF>".

1.4. Return from Data Route Mode

• Command "MCU CLI OFF<CR>" returns modem from Data Route Mode.

• Unit immediately goes to datamode, so that the DTE can start sending data.

2. Modem Commands

2.1. 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) - Frequency Hoping Pattern numbers for USA; (10-19) - Frequency Hoping Pattern numbers for Australia; For EU parameter FHOP not applied
MOD	5 - GMSK
PWRB	(15 – 30) – RF output Power in dBm

Parameter Name	Parameter List
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 receiver side neither the source nor the recipient 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 received data to the port are not provided. 2 – "Certified Base transmits to any". The receiver compares the received code SRC 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 codes: code DST with its code SRC and the code SRC with the code KNW. If these codes match the received data are distributed to the port.
REP	0 – Repeater mode is disabled. If parameter REP =0, then its value is not displayed in a "link\n" response. (a default setting) 1 - Repeater mode is enabled. Modem retransmits the received data.

The LINK command without Parameter Name indicates all values.

2.2. MAP F

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

2.3. MAP FTX

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

2.4. MAP Fddddddddd

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

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

2.5. 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.

2.6. RGN

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.

2.7. 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.

2.8. 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.

2.9. 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.

2.10. 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 setting)
1	1 - validation of the parameter is used

The DLNG command without parameter prints DLNG parameter.

2.11. 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 the air.

The DSRV command without parameter prints DSRV parameter.

2.12. 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.

2.13. WHT

The WHT command defines type of data.

WHT [*Parameters List*]

Parameter List	Short Description
43	43 - The receiver sees the received data as Command.
44	44 - The receiver sees the received data as Data. (a default setting)

The WHT command without parameter prints WHT parameter.

2.14. 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.

2.15. 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.

2.16. 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 symbols).

The KNW command without parameter prints KNW code.

3. Special Commands

3.1. BOOT

The BOOT command is intended to reboot the unit.

3.2. 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 <CR>) - 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
```

3.3. 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.

3.4. CFG2DFLT

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

3.5. 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<CR>" or Command "XMOD IMAGE<LF>".

Note: Command "XMOD IMAGE<CR><LF>" will be accepted as command "XMOD IMAGE<CR>" and byte of Firmware Image 0x0A.

4. Identification and Diagnostics Commands

4.1. INFO

The INFO command is used to retrieve the FH915 Radio ID along with its Hardware version, the loaded real- time software version/revision and BootLoader's version.

INFO [*Parameter Name*] [*/?*]

Parameter Name	Short Description
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
```

4.2. STATE

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

STATE [*Parameter Name*][/?]

Parameter Name	Short Description
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
```

4.3. IC

The IC command prints string:

```
IC: 3504A-FH915
@00
```

4.4. FCC ID

The FCC ID command prints string:

```
FCC ID: WJ4FH915
@00
```

4.5. 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 transmitted bytes (a default setting).

1	1 – Enable send to port the Number of the transmitted bytes.

4.6. 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.

4.7. RSSI

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

4.8. 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 can be read by command "rssm\n".

4.9. RSSC

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

4.10. RNSS

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

4.11. 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

4.12. 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

4.13. SCNS

The command SCNS stop scanning.

5. 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 frequencies they should be placed to list and saved in configuration file.

5.1. NLST

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

5.2. 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

Example: 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
```

5.3. 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.

5.4. 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.

6. Data Route Mode Commands

6.1. JLDEV

The JLDEV command is responsible for configuring of unit interface.

JLDEV [*/?*]

JLDEV [*Parameter Name*] [*Parameters List*]

Parameter Name	Short Description
MEM INIT	All parameters will be set to their default values
ECHO	OFF – Disabling of echo mode ON – Enabling of echo mode
BT	OFF – Turning off of Bluetooth module ON – Turning on of Bluetooth module
MDM	OFF – Turning off of Radio modem ON - Turning on of Radio modem
SER	RS232 – Setting of RS232 type for serial port RS422 – Setting of RS422 type for serial port RS485 – Setting of RS485 type for serial port
SRATE	9600 – Setting of 9600 baud rate for serial port 19200 – Setting of 19200 baud rate for serial port 38400 – Setting of 38400 baud rate for serial port 57600 – Setting of 57600 baud rate for serial port 115200 – Setting of 115200 baud rate for serial port

URATE	9600 – Setting of 9600 baud rate for USB port 19200 – Setting of 19200 baud rate for USB port 38400 – Setting of 38400 baud rate for USB port 57600 – Setting of 57600 baud rate for USB port 115200 – Setting of 115200 baud rate for USB port
CURPORT	Retrieves the current interface: SER - for serial interface USB – for USB interface BT – for Bluetooth interface

Note: The following of Serial and USB ports parameters to have on PC for communication with unit:

Data Bits:8

Parity:None

Stop Bits:1

Flow control: RTS/CTS

The JLDEV command without Parameter Name indicates all values:

```
ECHO =OFF
BT =OFF
MDM =ON
SER =RS232
SRATE =115200
URATE =115200
CURPORT =SER
```

6.2. JLBT

The JLBT command is responsible for configuring of Bluetooth interface.

JLBT [*/?*]

JLBT [*Parameter Name*] [*Parameters List*]

Parameter Name	Short Description
NAME	Setting of Bluetooth name (maximum 14 symbols) For example: `JLBT NAME HPT901BT`
OWNADDR	Retrieves the Bluetooth own address
SW	Retrieves the software version of Bluetooth module
PIN	Setting of PIN code (maximum 8 symbols) For example: `JLBT PIN 1234`
MASTER	OFF – Disabling of master mode ON – Enabling of master mode
DSTADDR	Setting of Bluetooth destination address (maximum 12 symbols) for master mode For example: `JLBT DSTADDR 001E58EBCC29`

Note: The JLBT parameters will be applied after resetting of device. Use the command MCU BOOT for resetting of device.

The JLBT command without Parameter Name indicates all values:

```
NAME =HPT901BT_00001
OWNADDR =00:18:D7:00:3E:6E
SW =1.0.0 b2
PIN =1234
MASTER =OFF
DSTADDR =000000000000
```

6.3. JLROUTE

The JLROUTE command is responsible for configuring of routing between interfaces.

JLROUTE [/?]

JLROUTE [*Parameters List*]

Parameter List	Short Description
MDMSER	Setting of routing between Radio modem and Serial port
MDMUSB	Setting of routing between Radio modem and USB port
MDMBT	Setting of routing between Radio modem and Bluetooth

6.4. JLINFO

The JLINFO command is used to retrieve the information about unit.

JLINFO [/?]

JLINFO [*Parameter Name*]

Parameter Name	Short Description
ID	Product ID
SN	Serial Number
HW	Hardware revision
HWRF	Hardware version of RF board
SW	Software version
BL	Bootloader version
MT	Type of Radio modem

The JLINFO command without Parameter Name indicates all values:

```
HPT901BT RADIO
Product ID =80
S/N =00001
```

```
Hardware =Ver. 1
Hardware RF =Ver. 1
Software =Ver. 1.0 Rev 03 B8
BootLoader =Ver. 1.0 Rev 2 B7
Modem Type =FH915
@00
```

6.5. JLSTATE

The JLSTATE command is used to retrieve the status information.

JLSTATE [/?]

JLSTATE [*Parameter Name*]

Parameter Name	Short Description
TEMP	Retrieves the temperature (in degree).

The JLSTATE command without Parameter Name indicates all values:

```
TEMP =29.87
@00
```

6.6. XMOD IMAGE

The "XMOD IMAGE" command in Data Route Mode activates X-modem protocol to download the Data Route part of the Firmware Image.

6.7. MCU BOOT

The MCU BOOT command is intended to reboot the unit.

6.8. JLDEV SLEEP ON

The JLDEV SLEEP ON command is intended to minimize the modem power consumption.

SPECIFICATIONS

The Spread Spectrum module provides half-duplex communication with transmitter output power of 1 W (+30 dBm) in the frequency band 902-928 MHz z. In 868-870 MHz band module provides half-duplex communication with transmitter output power up to 0.5W (+27 dBm) with channel spacing 25.0/12.5 kHz. It supports GMSK modulation method.

Features

- DSP-Modem
- Zero-IF Technologies
- 902-928 MHz (USA), 915-928 MHz (Australia), 868-870 MHz (EU) Frequency Bands
- Up to 115200 bps Serial and USB Interface Data Rate
- Compact Design

1. Technical Specifications

1.1. Radio Receiver

Table 1. Radio Transceiver Specifications

Parameter	Details
Frequency Range	902-928 MHz (USA) 915-928 MHz (Australia) 868-870 MHz (EU) with 25/12.5 kHz CS
Link Rate, symbols/second	8000, 16000, 32000, 64000 (USA/Australia) 4800, 9600 (EU)
Carrier Frequency Stability	±1 ppm
Modulation	GMSK
Communication Mode	Half duplex, simplex
Receiver Sensitivity for GMSK (BER 1x 10-4)	-104 dBm for 64 kHz (USA, AUS) -110 dBm for 25 kHz CS (EUR) -112 dBm for 12.5 kHz CS (EUR)
Receiver Dynamic Range	-119 to -10 dBm

1.2. Radio Transmitter

Table 2. Transmitter Specifications

Parameter	Details
Output Power USA, AUS EUR	15 dBm to 30 dBm in 1 dB steps (32mW to 1W) 7 dBm up to 27 dBm in 1 dB steps (5mW to 0.5W)
Output Power Control Accuracy	±1.5 dB (at normal test conditions)
Carrier Frequency Stability	±1.5 ppm initial stability over temp with ±3.0 ppm aging/year
Max. Frequency Error	±1.0 kHz (at normal test conditions) ±1.5 kHz (under extreme test conditions)

1.3. Modem

Table 3. Modem Specifications

Parameter	Details
Interface	Serial (RS232, RS422, RS485) USB Bluetooth
Interface Connector	DB15 Connector
Data Speed of Serial Interface	9600 - 115200 bps
Data Rate of Radio Interface (USA/Australia)	8000 bps – GMSK 16000 bps –GMSK 32000 bps – GMSK
Data Rate Radio Interface (25 kHz CS)	9600 bps – GMSK
Data Rate Radio Interface (12.5 kHz Channel Spacing)	4800 bps – GMSK
Forward Error Correction (FEC)	Convolution code
Data scrambling	Yes

1.4. Environmental Specifications

Table 4. Environmental Specifications

Parameter	Details
Temperature	Operating –40ºC to +60ºC Storage –40ºC to +85ºC
Dimensions HPT901BT without battery HPT901Bt with battery	5.75 x 2.95 x 1.73 inches (146 x 75 x 44 mm) 3.11 x 5.94 x 2.87 inches (79 x 151 x 73 mm)

Weight	1.3 lbs (0.488 kg) 2.2 lbs (1 kg)
Environmental	IP 66
Power Supply Voltage	+9 to +36 VDC nominal
Power Consumption (Average, 50% Duty Cycle)	3W/1.8W/0.2W - Transmit/Receive/Sleep
Battery	One embedded, 7.2V, 5850 mAh
Operation Time (battery-powered)	6 hours (typ.)
UHF Antenna Connector	TNC, 50 Ohm

1.5. Compliance

Parameter	Details
FCC	FCC Part 15.247
ETSI	EN 300 220-1, EN 301 489-1

2. Connector Specifications

2.1. DB15 Connector

This connector provides DB15 connectivity for the HPT901BT with a DB9 for connection to a PC/CE Device for configuration.
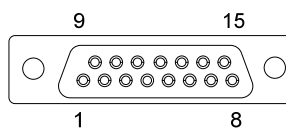

Figure 1. DB15 Fem Connector

Note: About using and configuration RS-485 please contact JAVAD GNSS support.

Table 5. DB15 Connector Specifications

Number	Signal Name	Dir	Details
1	DCD_OUT	O	Data Carrier Detect (RS-232)
2	DTR_OUT	O	Data Terminal Ready (RS-232)
3	RX+/CTS_IN	I	Receive Data positive line (RS-422)/ Clear to Send (RS-232)
4	RX-/RX_IN	I	Receive Data negative line (RS-422)/ Receive Data (RS-232)
5	PWR_IN	I	+9 to +36 VDC Power Input

6	USB_PWR	I	Power Input line (USB)
7	Ground	-	Power Ground
8	PWR_IN	I	+9 to +36 VDC Power Input
9	DSR_IN	I	Data Set Ready (RS-232)
10	TX+/RTS_OUT	O	Transmit Data positive line (RS-422) / Request to Send (RS-232)
11	TX-/TX_OUT	O	Transmit Data negative line (RS-422) / Transmit Data (RS-232)
12	Ground	-	Power Ground
13	USB_D+	I/O	Positive line (USB)
14	USB_D-	I/O	Negative line (USB)
15	Ground	-	Power Ground

2.2. External Antenna RF Connector

The external antenna connector type is a TNC RF connector AEP Connectors 6001-7051-003.

SAFETY WARNINGS

Read these instructions.

- Keep these instructions.
- Heed all warnings.
- Follow all instructions.
- Clean only with a damp cloth.
- Do not block any of the ventilation openings. Install in accordance with the manufacturer's instructions.
- Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
- Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
- Only use attachments/accessories specified by the manufacturer.
- Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, or has been dropped.
- Apparatus shall not be exposed to dripping or splashing and no objects filled with liquids, shall be placed on the apparatus.

1. General Warnings

HPT901BT is a wireless device used in a mobile application, at least 100 cm from any body part of the user or nearby persons.

Note: Minimum separation distance of 100 cm between the antenna and persons must be maintained.

This product should never be used:

- Without the user thoroughly understanding operator's manual.
- After disabling safety systems or altering the product.
- With unauthorized accessories.
- Contrary to applicable laws, rules, and regulations.

DANGER: THE HPT901BT SHOULD NEVER BE USED IN DANGEROUS ENVIRONMENTS.

WARRANTY TERMS

JAVAD GNSS electronic equipment are guaranteed against defective material and workmanship under normal use and application consistent with this Manual. The equipment is guaranteed for the period indicated, on the warranty card accompanying the product, starting from the date that the product is sold to the original purchaser by JAVAD GNSS' Authorized Dealers[1].

During the warranty period, JAVAD GNSS will, at its option, repair or replace this product at no additional charge. Repair parts and replacement products will be furnished on an exchange basis and will be either reconditioned or new. This limited warranty does not include service to repair damage to the product resulting from an accident, disaster, misuses, abuse or modification of the product.

Warranty service may be obtained from an authorized JAVAD GNSS warranty service dealer. If this product is delivered by mail, purchaser agrees to insure the product or assume the risk of loss or damage in transit, to prepay shipping charges to the warranty service location and to use the original shipping container or equivalent. A letter should accompany the package furnishing a description of the problem and/or defect.

The purchaser's sole remedy shall be replacement as provided above. In no event shall JAVAD GNSS be liable for any damages or other claim including any claim for lost profits, lost savings or other incidental or consequential damages arising out of the use of, or inability to use, the product.

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1. The warranty against defects in JAVAD GNSS battery, charger, or cable is 90 days.

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