



HPT401BT

User Manual

Version 1.0

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PREFACE

Thank you for purchasing this product. The materials available in this Manual (the “Manual”) have been prepared by JAVAD GNSS, Inc (“JAVAD”) for owners of JAVAD products. It is designed to assist owners with the use of HPT401BT and its use is subject to these terms and conditions (the “Terms and Conditions”).

Note: Please read these Terms and Conditions carefully.

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Preface

Regulatory Information

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SAFETY – Improper use of HPT401BT can lead to injury to persons or property and/or malfunction of the product. The HPT401BT modem should only be repaired by authorized JAVAD GNSS warranty service centers. Users should review and heed the safety warnings in Appendix C.

MISCELLANEOUS – The above Terms and Conditions may be amended, modified, superseded, or canceled, at any time by JAVAD GNSS. The above Terms and Conditions will be governed by, and construed in accordance with, the laws of the State of California, without reference to conflict of laws.

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 Règlement 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
<i>File</i> ► <i>Exit</i>	Click the <i>File</i> menu and click <i>Exit</i>
<i>Link Space</i>	This format represents titles of dialog windows/boxes, names of menu options, identifies program interface objects, such as checkboxes, edit boxes, radio buttons, etc.

Preface

Screen Captures

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

HPT401BT is the up-to-date unsurpassed 1W UHF radio transceiver with USB and Bluetooth® capacity, and internal rechargeable Li-Ion batteries. The HPT401BT radio transceiver provides a high-speed point-to-point and point-to-multipoint wireless data transfer at up to 38.4 kbps. HPT401BT firmware supports user selectable modulation techniques (GMSK, 4FSK, DBPSK, DQPSK, D8PSK, or D16QAM), which allows the user to achieve the highest data speed for a given range. It also includes a selectable error correction, which improves the functioning of the radio modem under interference.

The built-in software tools provide the wireless link testing, unit's status and error statistics monitoring as well as unit's settings change over the air. The firmware of the HPT401BT radio modem resides in a flash memory. The updating of the radio modem programs is entirely software-based. The flash memory is re-programmable through an RS-232 interface, USB, or Bluetooth.



Figure 1. HPT401BT without battery and HPT401BT with battery

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 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.

Introduction

Getting Acquainted

1. Getting Acquainted

The HPT401BT 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); HPT401BT with battery dimensions are 3.11 x 5.94 x 2.87 inches (79 x 151 x 73 mm), and it weighs 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 HPT401BT data and power port is placed on the front of the unit (Figure 2).

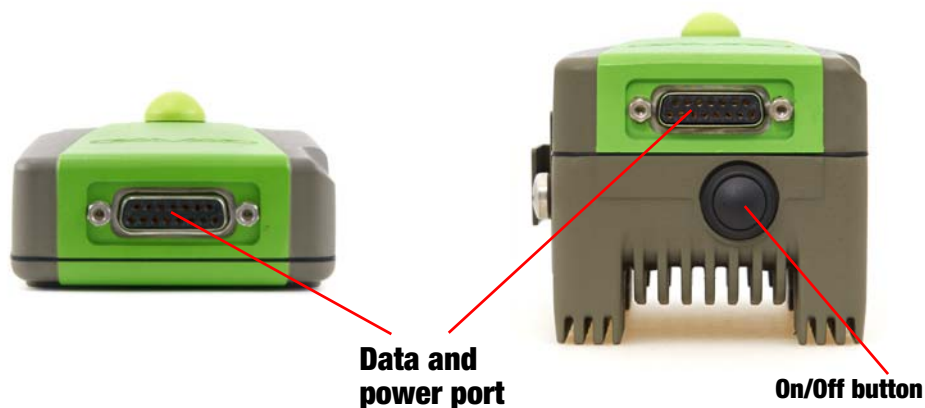


Figure 2. HPT401BT front side

Through the DB15 port the HPT401BT 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 HPT401BT.

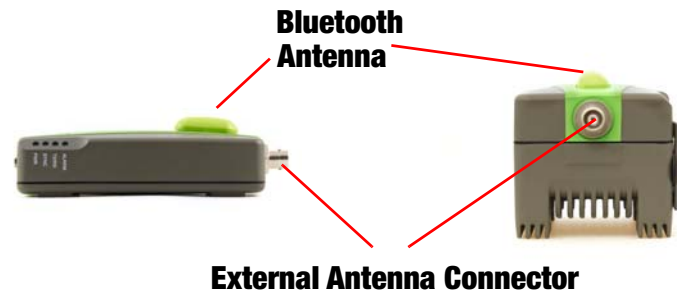


Figure 3. External antenna connector and Bluetooth Antenna

1.4. Mounting Bracket

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

1.5. Cables

The HPT401BT package includes standard communication and power cables for configuring the modem and providing a power source to the modem.

- AC Power Adapter, 3c, C13 / NEMA 5-15P, USA
- AC Power Cable, 3c, C13/C14, SVT, 6 ft.
- Access Data-Ser-Pwr Cable, DB9/DB15/SAE (1,8m)
- External Power Supply/Charger 60W C14/SAE

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° ... $+85^{\circ}\text{C}$, 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 HPT401BT

To power HPT401BT 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 HPT401BT. 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 +12... +34V, 2.4A. 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.*

Configuration

Antenna Installation

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 HPT401BT 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 HPT401BT, you need to connect the modem and a computer using an Data-Ser-Pwr Cable, DB9/DB15/SAE (1,8m) p/n 14-578108-02. .



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 HPT401BT 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 HPT401BT.
6. Windows 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 HPT401BT 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 PCMCIA-to-Bluetooth® adapter installed, etc.

Configuration

Configuring HPT401BT

HPT401BT 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 HPT401BT

1. Connect the computer and HPT401BT, as described in "Connecting HPT401BT and Computer" on page 14.
2. Turn on the HPT401BT.
3. Start ModemVU. *Main* window appears (Figure 4). Choose *HPT401BT* modem and click *OK*. Then select the COM port the modem is connected to, and click *Connect*:

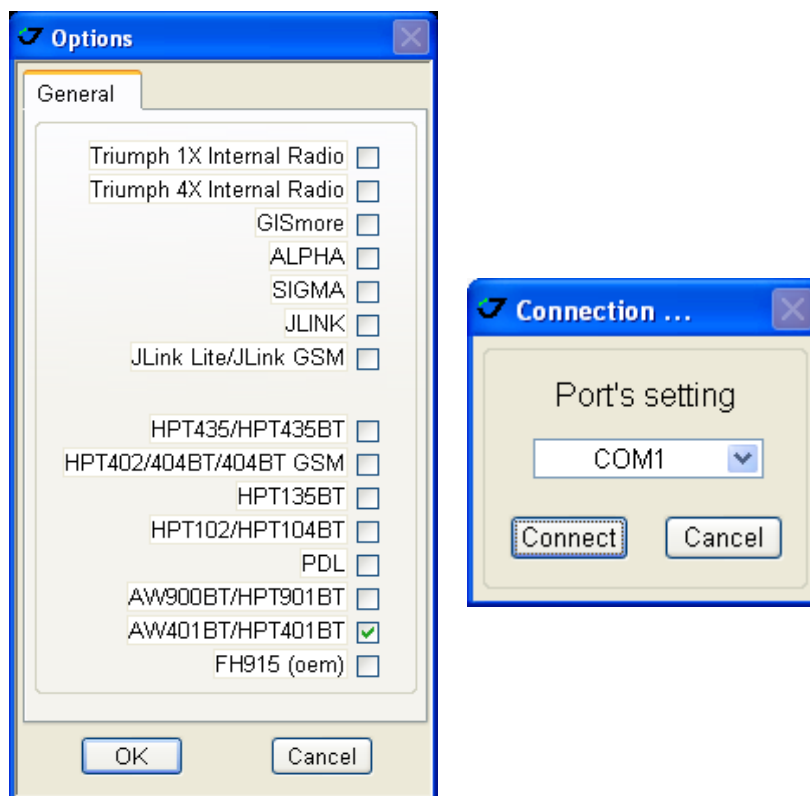


Figure 4. Main window

- Once the connection is established the window with *General*, *Interface*, *BT*, and *Identification* subtabs will appear:

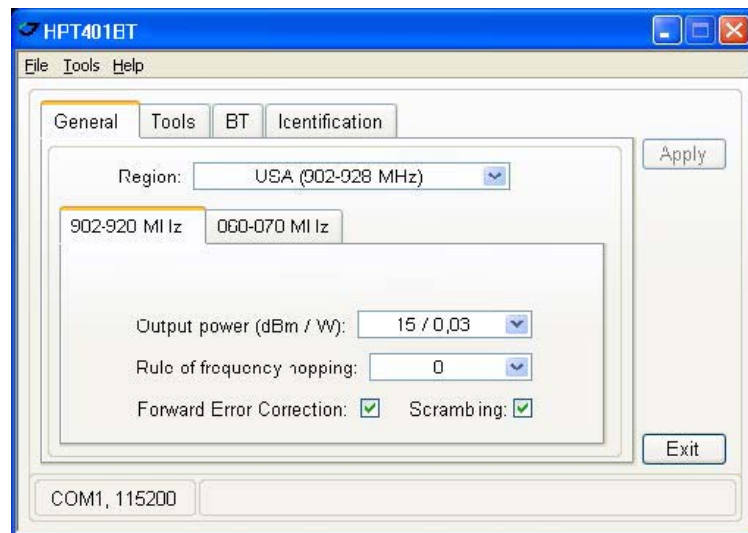


Figure 5. General tab

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

4.1. Checking firmware version

Identification tab shows versions of HPT401BT components:

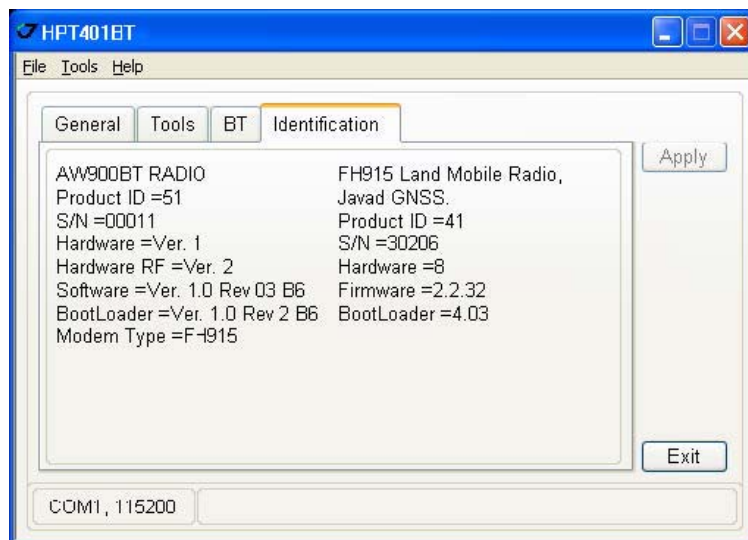


Figure 6. Identification tab

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

Configuration

Configuring HPT401BT

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

4.2. New Firmware Downloading

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

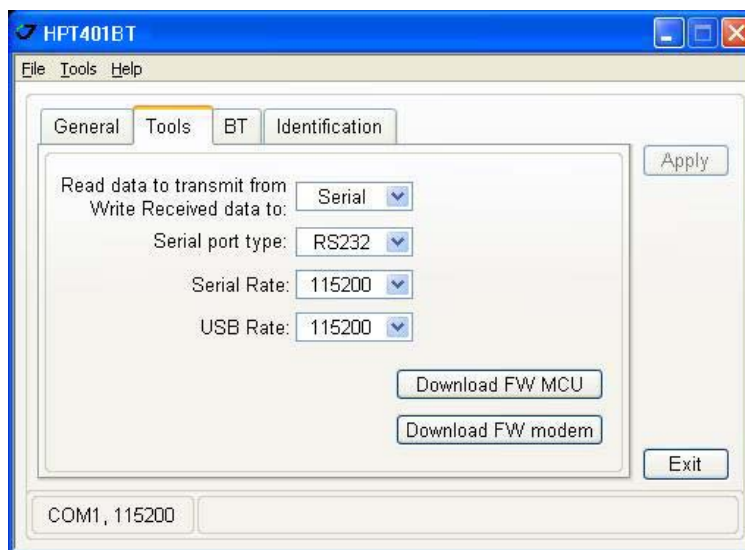


Figure 7. Tools tab

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.

Command Line Interface

Command Line Interface Convention

Table 1. Command Line Interface Error Codes

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. CONNECT

To connect the radio unit through the local maintenance serial port or to establish the link with the remote unit in the Point-to-Multipoint network, the CONNECT command must be used.

CONNECT [Unit_Numb] [/?]

Where the Unit_Numb is an assigned decimal number for the unit to be connected. To get the complete unit list, the CONNECT command must be used with no parameter. The list of units in the Point-to-Point link with the connection established with remote unit is shown in Figure 1:

Unit	Serial Number	Connect
BS	003578659922	
1	003574459923	C

Figure 1. Connection List

To disconnect from the remote unit and connect to the local unit, the parameter (Unit_Numb) must be equal to 0x00.

Command Line Interface

Modem Commands

2.2. LINK

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

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

Parameter Name	Parameter List
CHAN	Selects the Channel Number: CN = 1 to 32. Each Channel is defined by three parameters: Carrier Frequency, Channel Spacing and Allowed Output Power level. CN = 0 is reserved to set up the Frequency Automatic scanning mode. The LINK CHAN 0 command also forces the radio modem to continue scanning starting from the channel currently selected by automatic scanning algorithm. In Automatic scanning mode, to check the channel currently used or scanned, the STATE command must be used
FEC	0 – Disable Forward Error Correction, a default setting (see note below) 1 – Enable Forward Error Correction (see note below)
FHOP	(1 – 32) – Frequency Hoping Pattern number LINK FHOP command can be processed only if the Channel Map (up to 32 channels) is defined by AWLaunch or by MAP command.
MOD	1 – DBPSK 2 – DQPSK, a default settings 3 – D8PSK 4 – D16QAM 5 – GMSK 6 – 4FSK
PWRB / PWRW	0 – Automatic Transmit Power control, a default setting for Remote units (15 – 30) / (30 – 1000) – RF output Power in dBm / mW
PROT	1 – “Simplex Receiver” a default setting (see note below) 2 – “Simplex Transmitter” 3 – “Half Duplex” Base (reserved) 4 – “Half Duplex” Repeater (reserved) 5 – Not used 6 – Not used 7 – “TRMB Receiver” (used with GMSK modulation) 8 – “TRMB Transmitter” (used with GMSK modulation) 9 – “Transparent w/EOT” Repeater (used with GMSK and 4FSK) 10 – “Repeater” (ArWest Proprietary Simplex) 11 – “TRMB Repeater” (used with GMSK modulation) 12 – “Transparent w/EOT” Receiver (used with GMSK and 4FSK) 13 – “Transparent w/EOT” Transmitter (used with GMSK and 4FSK) 14 – “STL Receiver” (used with 4FSK modulation) 15 – “STL Transmitter” (used with 4FSK modulation) 16 - Not used 17 - “Fast Async” Receiver (used with GMSK and 4FSK) 18 - “Fast Async” Transmitter (used with GMSK and 4FSK) 19 - “Transparent w/EOT Character” Receiver (used with GMSK and 4FSK) 20 - “Transparent w/EOT Character” Transmitter (used with GMSK and 4FSK)
PWRB / PWRW	(15 – 30) / (30 – 1000) – RF output Power in dBm / mW
RTR	0 – No Retransmission in the wireless cluster 1 – There is Repeater in the wireless cluster, valid for Base only
SCRAM	0 – No Scrambling (a default setting) (1 – 255) – Seed for Pseudo-Random Sequence Generator

Parameter Name	Parameter List
FEC	0 – Disable Forward Error Correction (FEC), a default setting 1 – Enable Reed-Solomon encoding
CHAR	(0 – 255) – defines the ASCII code of the symbol indicating the end of a data chunk of “Transparent w/EOT Character” protocol.
ADDR	Indicates the number of address bytes of “STL” protocol’s data frame.
CLKCORR	0 – Disables Clock Correction algorithm of STL protocol 1- Enables Clock Correction algorithm of STL protocol.

Note: LINK FHOP and LINK CHAN commands can be processed only if Frequency Map is defined. Auto-scanning may not start automatically, only when scanning requested via CLI command (see LINK CHAN 0 and STATE commands).

The frequency defined by CHAN parameter is not valid if Frequency Hoping mode is selected.

The radio link with GMSK and 4FSK modulations are used by Non-ArWest protocols only.

Enabling FEC via LINK FEC command provides different options for different protocols:

- Enables Read-Solomon encoding for frame’s header used by ArWest proprietary protocols
- Enables Hamming encoding for Trimble and Pacific Crest compatible protocols
- Enables Trellis encoding for Satel compatible protocol

For ArWest proprietary protocols, the Read-Solomon FEC encoding is always applied to data payload.

“Half Duplex” Base and “Half Duplex” Remote protocols are not supported in current release.

LINK ADDR and LINK CLKCORR commands are not recommended for using on site of End Users.

3. Serial Interfacing Commands

3.1. 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

Command Line Interface

Special Commands

Parameter Name	Parameter List
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)

3.2. 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: ArWest radio modem's does not support data flow and parity on the maintenance serial port.

MPORT operates using 8 bits in one byte fixed (not configurable).

The radio modem with none-dedicated maintenance serial port must keep CTS line always active in MPORT mode (DP/MP is low).

4. Special Commands

4.1. ALARM

The ALARM command is intended to set up the alarm indication mode and alarm control lines' behavior.

ALARM [*Parameter Name*] [*Parameters List*] [/?]

Parameter Name	Parameter List
TTL1	0 – TTL_OUT1 = logic "1" 1 – TTL_OUT1 = TTL_IN, received from remote unit (default settings)

Parameter Name	Parameter List
TTL2	0 – TTL_OUT2 = logic “1” 1 – TTL_OUT2 = TTL_IN2, received from remote unit (default settings) 2 – TTL_OUT2 = SYNC Loss 3 – TTL_OUT2 = BER > BERTH or SYNC Loss
BERTH	1 – BER Threshold $>10^{-3}$ (default threshold level for BER) 2 – BER Threshold BER $>10^{-2}$

The Alarm LED must indicate the SYNC Loss and BER exceeding the defined threshold.

Note: The BERTH 1 / 2 is optional for TTL2 = 3 condition, otherwise the BERT alarm is off

4.2. BOOT

The BOOT command is intended to reboot the unit using selected user settings. Two options are available, to use the default user settings defined by dealer or to use the settings defined by end-user

BOOT [*Parameter Name*] [*Parameters List*] [/?]

Parameter Name	Parameter List
CFG	0 – selects the default user settings 1 – selects user modified settings

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

4.3. HELP

The HELP command types the list of all available commands:

```

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

```

Command Line Interface

Diagnostics and Identification Commands

4.4. 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.

4.5. SLEEP

The SLEEP command determines the sleep mode parameters. The sleeping AW400Tx 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-time 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

5. Diagnostics and Identification Commands

5.1. 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	Product ID
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 revision in numeric format (range from 01 to 99) for engineering releases and alphabetic format (A to Z) for manufacturing releases
BL	Ver. 1.0 Rev. A – displays BootLoader's version in numeric “Major.Minor” format and revision in numeric format (range from 01 to 99) for engineering releases and alphabetic format (A to Z) for manufacturing releases

The INFO command without Parameter Name indicates all values:

```
AW400Tx UHF Radio Modem.
Product ID = 33
S/N = 000000 020303
Hardware = Ver. 1.0
Software = Ver. 1.8 Rev. 14
BootLoader = Ver. 2.0 Rev. 02
```

5.2. STATE

The STATE command is used to check the state of the wireless link, the unit in the link, and the alarm control lines. To specify a radio unit (local or remote), the CONNECT command must be used in prior of STATE command using.

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 channel
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 working on fixed channel from channel map.

The STATE command without Parameter Name indicates all values:

```
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
```

Note: The indicated receive signal strength (RSSI) is equal to -147 dBm if there is no signal received from transmitter.

Command Line Interface

Diagnostics and Identification Commands

SPECIFICATIONS

1. Technical Specifications

1.1. General Radio Specifications

Table 1. General Radio Specifications

Parameter	Details
Operating Frequency Range	406 - 470 MHz (EU) 406.1 - 470 MHz (USA) 406.1 - 430; 450 - 470 MHz (Canada)
Channel Spacing	25/12.5/6.25 kHz (USA for 406-420 MHz) 12.5/6.25 kHz (USA for 421-470 MHz) 25/12.5/6.25 kHz (Canada) 25/20/12.5 kHz (EU)
Data Rate (25/20/12.5/6.25 kHz Channel Spacing)	9600/7500/4800/2400 bps – DBPSK/GMSK 19200/15000/9600/4800 bps – DQPSK/4FSK 28800/22500/14400/7200 bps – D8PSK 38400/30000/19200/9600 bps – D16QAM
Roaming Speed for DBPSK modulation	75 mph / 120 km/h
Modulation	GMSK/4FSK/DBPSK/DQPSK/D8PSK/D16QAM
Nominal Impedance	50 Ohms
End to End delay	60 ms
Communication Mode	Time Division Duplex (TDD) Time Division Multiple Access (TDMA)
Maximum Distance Range	8 miles / 12.87 km
Serial port	Serial (RS-232) up to 115200 bps. Serial port configurable as RS-232 or RS-422, or RS-485
USB	USB 2.0 device port
Bluetooth	Bluetooth V2.0 Class 2 supporting SPP Slave and Master Profiles
Bluetooth Antenna	Embedded
Battery	One embedded, 7.2V, 5850 mAh
Operation Time (battery-powered)	6 hours (typ.)

Specifications

Technical Specifications

1.2. Environmental Specifications

Table 2. Environmental Specifications

Parameter	Detail
Temperature	Operating -40°C to $+70^{\circ}\text{C}$ ¹ Storage -40°C to $+85^{\circ}\text{C}$ ²
Environmental	IP 66
Dimensions (H x W x D) without battery 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 without battery with battery	1.3 lbs (0.488 kg) 2.2 lbs (1.0 kg)
Power Supply Voltage	+5.5...36V without battery charging, 1.4A max @ 5.5V +12...34V when the battery is charged, 2.4A max @ 12 V
Power Consumption (Average)	8W / 2W / 0.01W – Transmit / Receive / Sleep (without charging)
Housing/Color	Aluminum / Two-tone Green / Gray
Antenna Connector	TNC, 50Ohm

1. The operating temperature of Li-Ion batteries is -20°C to $+45^{\circ}\text{C}$

2. The storage temperature range of Li-Ion batteries is -20°C to $+60^{\circ}\text{C}$

1.3. Radio Transmitter

Table 3. Transmitter Specifications

Parameter	Detail
Output Power	+15... +30 dBm in 1 dB step / 50 ?
Output Power Control Accuracy	$\pm 1.5\text{dB}$ (at normal test conditions) $+2.0\text{dB}$ and -3.0dB (under extreme 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)
Adjacent Channel Power 25/12.5/6.25 kHz CB 25/20/12.5 kHz CB	Part §90.210 (C, D, E) (USA, Canada) 60 dBc (EU)
Spurious Emission (Conducted)	-36 dBm (9 kHz – 1GHz) -30 dBm (1GHz – 4 GHz)
Spurious Emission (Radiated)	-36 dBm (9 kHz to 1 GHz) -30 dBm (1 GHz to 4 GHz)

1.4. Radio Receiver

Table 4. Receiver Specification

Parameter	Detail
Noise Figure	4 dB
Receiver Sensitivity (BER 1×10^{-4} , 25 kHz CS) DBPSK DQPSK D8PSK D16QAM GMSK	-116 dBm 25kHz / -117 dBm 12.5kHz -115 dBm 25kHz / -116 dBm 12.5kHz -110 dBm 25kHz / -111 dBm 12.5kHz -106 dBm 25kHz / -107 dBm 12.5kHz -113 dBm 25kHz / -114 dBm 12.5kHz
Dynamic Range	-115 to -15 dBm
Max. Input Signal Level	-10 dBm
Co-channel Rejection	-8 dB for 25 kHz Channel Spacing -8 dB for 20 kHz Channel Spacing -12 dB for 12.5 kHz Channel Spacing -16 dB for 6.25 kHz Channel Spacing
Adjacent Channel Selectivity	70 dB for 25 kHz Channel Spacing 70 dB for 20 kHz Channel Spacing 60 dB for 12.5 kHz Channel Spacing 50 dB for 6.25 kHz Channel Spacing

1.5. Compliance

Table 5. Compliance

Parameter	Detail
FCC	Part 90
Industry Canada	RSS-119
R&TTE	ETSI EN 300 113-2; ETSI EN 301 489-5 EN 60950-1:2006

2. Connector Specifications

2.1. DB15 Connector

This connector provides DB15 connectivity for the HPT401BT with a DB9 for connection to a PC/CE Device for configuration.

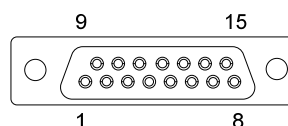


Figure 1. DB15 Fem Connector

Specifications

Connector Specifications

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

Table 6. 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	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

HPT401BT 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 HPT401BT SHOULD NEVER BE USED IN DANGEROUS ENVIRONMENTS.

Safety Warnings

General Warnings

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 Dealers¹.

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.

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



900 Rock Avenue, San Jose, CA 95131 USA

Phone: +1(408)770-1770

Fax: +1(408)770-1799

www.javad.com

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