AW400

User Manual

Version 1.1
Last Revised July 9, 2009

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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 the AW400 can lead to injury to persons or property and/or malfunction of the product. The AW400 should only be repaired by authorized ArWest warranty service centers. Users should review and heed the safety warnings in Appendix C on page 39.

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Regulatory Information

The following sections provide information on this product's compliance with government regulations.

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.

Note: 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.

Declaration of Conformity

Cesky [Czech]	ArWest tímto prohlašuje, že tento AW400 je ve shodì se základními požadavky a dalšími pøíslušnými ustanoveními smìrnice 1999/5/ES.
Dansk [Danish]	Undertegnede ArWest erklærer herved, at følgende udstyr AW400 overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF.
Deutsch German]	Hiermit erklärt ArWest, dass sich das Gerät AW400 in Übereinstimmung mit den grundlegenden Anforderungen und den übrigen einschlägigen Bestimmungen der Richtlinie 1999/5/EG befindet.
Eesti [Estonian]	Käesolevaga kinnitab ArWest seadme AW400 vastavust direktiivi 1999/5/EÜ põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele.
English	Hereby, ArWest, declares that this AW400 is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
Español [Spanish]	Por medio de la presente ArWest declara que el AW400 cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE.
Ελληνική [Greek]	ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ ArWest ΔΗΛΩΝΕΙ ΟΤΙ AW400 ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 1999/5/ΕΚ.
Francais [French]	Par la présente ArWest déclare que l'appareil AW400 est conforme auxexigences essentielles et aux autres dispositions pertinentes de la directive 1999/5/CE.
Italiano [Italian]	Con la presente ArWest dichiara che questo AW400 è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE.
Latviski [Latvian]	Ar šo ArWest deklare, ka AW400 atbilst Direktivas 1999/5/EK butiskajam prasibam un citiem ar to saistitajiem noteikumiem.
Lietuviu [Lithuanian]	ŠiuoArWest deklaruoja, kad šis AW400 atitinka esminius reikalavimus ir kitas 1999/5/EB Direktyvos nuostatas.
Nederlands [Dutch]	Hierbij verklaart ArWest dat het toestel AW400 in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 1999/5/EG.
Malti [Maltese]	Hawnhekk, ArWest, jiddikjara li dan AW400 jikkonforma mal-.ti.ijiet essenzjali u ma provvedimenti o.rajn relevanti li hemm fid-Dirrettiva 1999/5/EC.
Magyar [Hungarian]	Alulírott, ArWest nyilatkozom, hogy a AW400 megfelel a vonatkozó alapvetõ követelményeknek és az 1999/5/EC irányelv egyéb elõírásainak.
Polski [Polish]	Niniejszym ArWest oświadcza, że AW400 jest zgodny z zasadniczymi wymogami oraz pozostałymi stosownymi postanowieniami Dyrektywy 1999/5/EC.
Portugues [Portuguese]	ArWest declara que este AW400 está conforme com os requisitos essenciais e outras disposições da Directiva 1999/5/CE.
Slovensko [Slovenian]	ArWest izjavlja, da je ta AW400 v skladu z bistvenimi zahtevami in ostalimi relevantnimi doloèili direktive 1999/5/ES.
Slovensky [Slovak]	ArWest týmto vyhlasuje, že AW400 spåòa základné požiadavky a všetky príslušné ustanovenia Smernice 1999/5/ES.
Suomi [Finnish]	ArWest vakuuttaa täten että AW400 tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.
Svenska [Swedish]	Härmed intygar ArWest att denna AW400 står I överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 1999/5/EG.
Íslenska [Icelandic]	Hér með lýsir ArWest yfir því að AW400 er í samræmi við grunnkröfur og aðrar kröfur, sem gerðar eru í tilskipun 1999/5/EC.
Norsk [Norwegian]	ArWest erklærer herved at utstyret AW400 er i samsvar med de grunnleggende krav og øvrige relevante krav i direktiv 1999/5/EF.

DECLARATION of CONFORMITY

According to ISO/IEC Guide 22 and EN45014

Manufacturer s Name:	JAVAD GNSS, Inc
Manufacturer s Address:	1731 Technology Drive San Jose, CA 95110 USA

declares, that the products

Product Name:	HPT402 (AW400) UHF RADIO TRANSCEIVER
Product Number:	01-587300-01, 01-00001-210
Product Options:	All

conforms to the following Product Specification:

Safety:	
Low Voltage Directive 2006/95/EC	EN 60950-1:2006
R&TTE Directive 1999/5/EC	EN 300 113 -1, EN 300 113 - 2 EN 301 489 -1, EN 301 489 - 5
EMC Directive 2004/108/EC	EN 61000-4-3, EN 61000-4-2 EN 61000-4-6

Supplementary Information:

The product herewith complies with the essential requirements of the directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment (R&TTE) and the mutual recognition of their conformity and carries the CE marking accordingly

1) These products were tested in a typical configuration with JAVAD GNSS, Inc products
2) AW400 is identical to HPT402, different names are used for marketing purpose

This Declaration of Conformity is based on the following documents:

Doc No	Type of Product	Test Specification	Laboratory / Date of issue
ARWT01-B1 RevA	HPT402/AW400	EN 300 113-2	MiCOM Labs / Pleasanton 29.08.2005
ARWT01-B1 RevA	HPT402/AW400	EN 300 113-1	MiCOM Labs / Pleasanton 29.08.2005
ARWT01-B2a RevA	HPT402/AW400	EN 301 489-1	MiCOM Labs / Pleasanton 02.09.2005
ARWT01-B2a RevA	HPT402/AW400	EN 301 489-5	MiCOM Labs / Pleasanton 02.09.2005
3176893MPK-002	HPT402/AW400	EN 60950-1:2006	Intertek / Menlo Park 24.03.2009

V. Zhukov

San Jose, April 24, 2009

Vladimir Zhukov, Product Regulations Manager

European contact for regulatory topics only: ALLSAT GmbH Am Hohen Ufer 3A, 30159 Hannover, Germany
USA contact: JAVAD GNSS, Inc 1731 Technology Drive, San Jose, CA 95110. Phone (408)573-8100

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.

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.

Technical Assistance

If you have a problem and cannot find the information you need in the product documentation, contact your local dealer. Alternatively, request technical support using the ArWest Communications World Wide Web site at: www.arwestcom.com

Return Material Authorization

Initially, the customer contacts support to report a problem. Please refer to support: support@arwestcom.com. If support determines the problem cannot be resolved over e-mail/internet, it will authorize the return of the unit for repair or replacement, depending on the nature of the problem.

INTRODUCTION

External extra rugged digital high power UHF radio transceiver programmable in frequency ranges from 406 to 470 MHz. It has GMSK, DBPSK, DQPSK, 4FSK, D8PSK, and D16QAM modulations with advanced forward error correction and data scrambling. The output power is programmable up to 2 W.

Figure 1-1. AW400

It takes incoming data, modulates it with GMSK, FSK, PSK or most spectrum efficient QAM modulation and transmits it at RF power output levels from 13 dBm up to 33 dBm operating in 406 to 470 MHz.

The UHF transceiver is also capable of receiving RF signals through a 50 Ohm impedance external antenna port. These signals are demodulated and output to the RS-232 serial port.

AW400 delivers a reliable radio link at up to 38.4 kbps over the air for the 25 kHz channel spacing, 30 kbps for 20 kHz, 19.2 kbps for 12.5 kHz, and 9.6 kbps for 6.25 kHz.

The unmatched features of AW400 include data scrambling, frequency hopping, user selectable transmit output power level, low power consumption sleep modes, autoscanning for base.

The unit's user settings can be changed through the built-in Command Line interface (CLI), or through AWLaunch.

1.1. Getting Acquainted

The AW400 is a rugged and very powerful external radio transceiver 146 mm wide 75 mm deep 44 mm high, weighs 488 g.

1.1.1. LEDs

External LED's (see Figure 1-2) are used for Link and Line status indication:

Position	LED Name	Color	Description
1	PWR	Green	Active if Power connected to modem
2	SYNC	Red	Active whenever a signal with a level exceeding the level required for reception exists on the radio channel (min. light on 200ms).
3	TX/RX	Green	Active if modem receives or transmits Data over serial interface (min. light on 200ms)
4	ALARM	Red	Reserved

1.1.2. Data and Power Port

The AW400 data and power port (DB15 connector) s placed on the front of the unit (Figure 1-2).

Figure 1-2. AW400 front side

Through the AW programming cable (2 meter); interface cable DB15 - DB9 + 12VDC Power (CM-10001) the AW400 can be connected to PC and can be powered. See “Powering AW400” on page 15 for detailed information.

1.1.3. External Antenna Connector

The external antenna connects to the TNC external antenna connector placed on the back side of AW400.

Figure 1-3. AW400 back side

1.1.4. Cables

The AW400 package includes standard communication and power cable for configuring the modem and providing a power source to the modem.

Accessory Data-Ser-Pwr Cable, DB9/DB15/SAE (p/n CM-00215)

Figure 1-4. CM-00215 Cable

1.1.5. Mounting Bracket

The mounting bracket p/n PT-10001 (Figure 1-5) allows connecting the modem to a standard pole/ adapter.

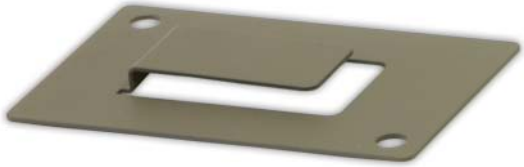

Figure 1-5. AlphaWave Mounting Bracket

1.1.6. Literature

AW400 literature, including manuals and other product information are available on the ArWest Communications website (http://www.arwestcom.com):

- AW400 Read This First Guide
- *AW400 Operator's Manual*
- AW400 Data Sheet

1.1.7. External Antenna (not included)

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

1.1.8. 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

2.1. Powering AW400

You can use the rechargeable battery or power supply with using cable Accessory Data-Ser-Pwr Cable, DB9/DB15/SAE (p/n CM-00215.)

Figure 2-1. Cable CM-00215

2.1.1. Power supply requirements

The socket-outlet shall be installed near the equipment and shall be easily accessible.

A single external power supply is necessary to operate AW400. 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 to +16 V, 5A. This may not be the same range as other ArWest Communications 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 receiver will suspend operation. If the voltage supplied is above the maximum specification, the receiver 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 receiver, make sure that the power source matches the receiver's voltage and current requirements.*

2.2. Configuring AW400

AWLaunch is ArWest Communications's configuration utility for external modems and modems embedded in ArWest Communications modems. AWLaunch provides the following functions:

- Connecting a computer to an UHF modem via a serial port.
- Displaying information about the radio modem installed in the modem.
- Programming the radio modem's settings.
- Loading the new modem firmware.

See the *AWLaunch Software Manual* available on the ArWest Communications website for details on configuring the UHF modem. To configure the AW400 modem, have the following ready:

- Computer running Windows®;
- AWLaunch Software installed on the computer;
- A serial cable.

2.3. Installing AWLaunch

AWLaunch™ is a Windows® application for the radio modem configuration. AWLaunch is available from the ArWest Communications website.

Note: Refer to the *AWLaunch Software Manual* for full details on installing and using AWLaunch Software.

1. If downloading the program from the website, extract the program files into a folder on your hard drive.
2. Navigate to the location of the AWLaunch program and double-click the *AWLaunch.msi* icon.
3. Follow the on-screen installation wizard instructions. Click *Next* to continue, *Back* to get back to previous step, or *Cancel* to quit the installation.
4. Keep the default installation location or select a new location
5. Click *Close* to complete the installation and quit wizard. If desired, create a shortcut on the computer's desktop for quick access to AWLaunch.

To uninstall AWLaunch use the *Add and Remove Programs* from the Control Panel.

1. Open the Control Panel, then *Add or Remove Programs* tool. Find *AWLaunch*, and click *Remove.* This will uninstall AWLaunch.

2.4. Connecting AW400 and Computer

In order to interface an AW400 to a third party system ArWest have developed an ‘open-ended’ transparent cable. The user can connect whatever connector is required to the ‘open-end’ of the cable following the correct pin protocol for this cable (CM-10001).

To configure, or maintain AW400, you need to connect the modem and a computer using cable Accessory Data-Ser-Pwr Cable, DB9/DB15/SAE (p/n CM-00215t.)

Figure 2-2. Cable CM-00215

1. Connect the serial port of the computer or USB-to-Serial adapter to the serial port of the modem at the switched off power supply by using of a cable.
2. Turn on your computer.
3. Power AW400.

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 AWLaunch to load new firmware to the modem

2.5. Configuring AW400

1. Connect the computer and AW400, as described in “Connecting AW400 and Computer” on page 17.
2. Turn on the AW400.
3. Start AWLaunch.

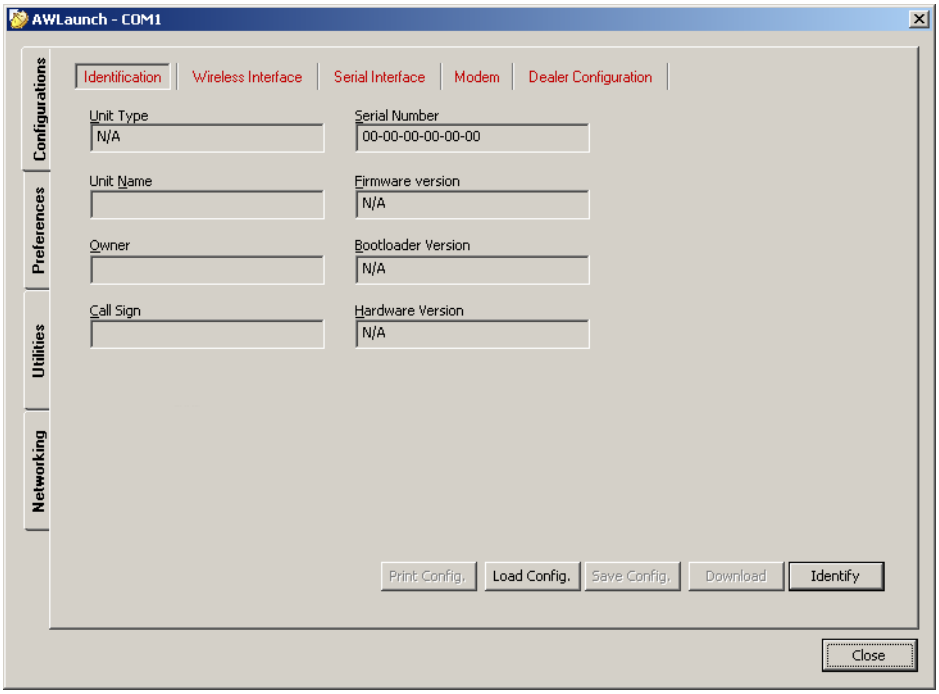

Figure 2-3. Main window

4. Open the *Preferences* tab and select the COM port the modem is connected to (Figure 2-4), and click *Identify.*

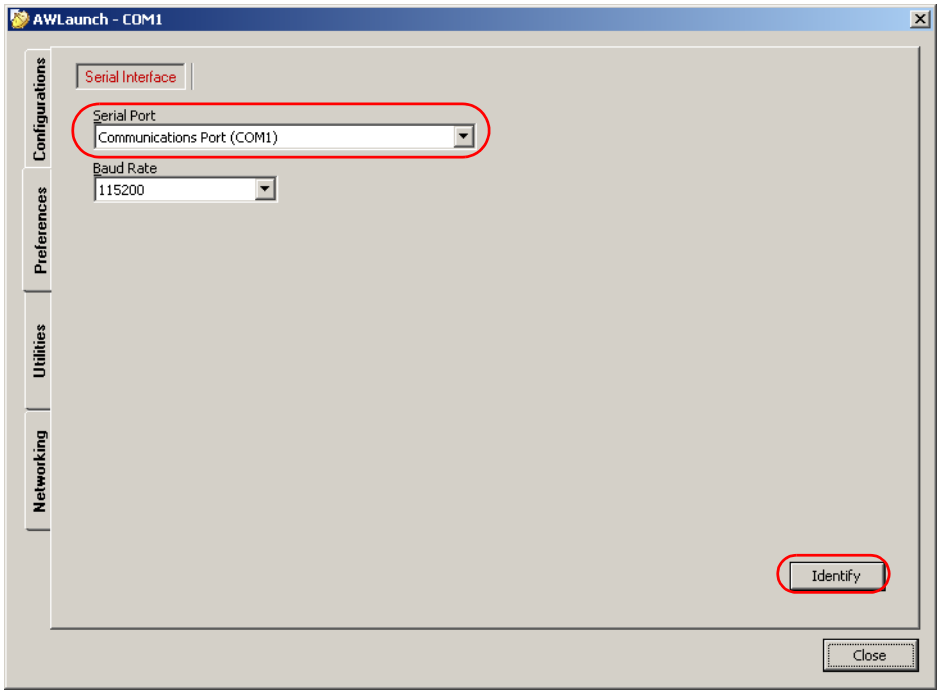

Figure 2-4. Connect to AWLaunch

5. Once the connection is established in the *Configurations* tab *Identification* subtab the unit's information will appear (Figure 2-5), i.e. unit serial number, firmware, hardware and boot loader versions:

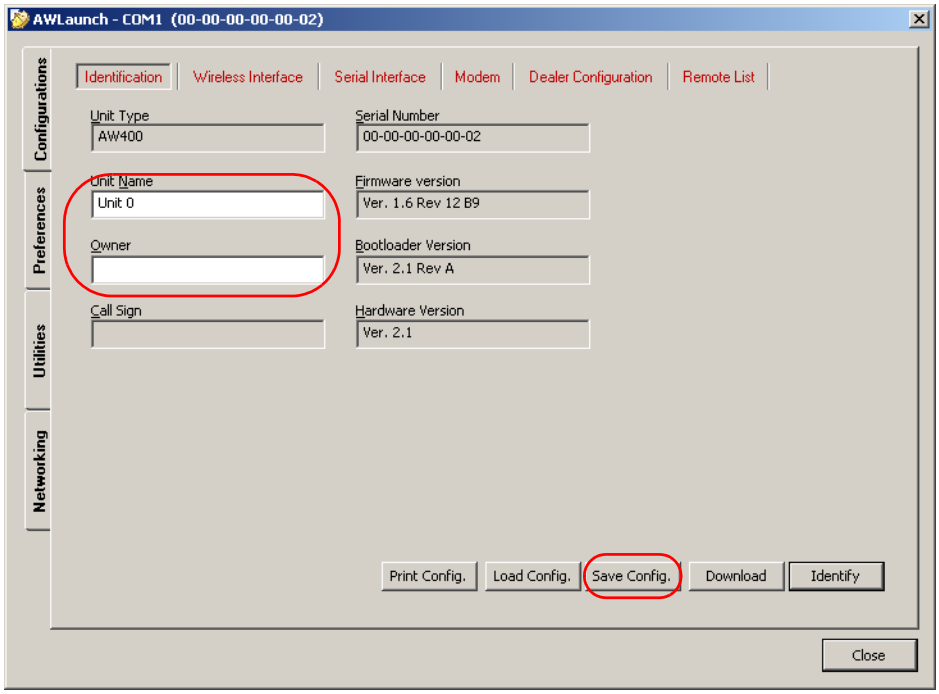

Figure 2-5. Identification tab

- In the *Unit Name* text field the unit's name can be inserted;
- In the *Owner* field the owner's name can be inserted.

  To save the changes click *Save Config.* button.

6. In the *Configurations* tab, *Wireless* subtab, set the following parameters (Table 2-1) and click *Identify* (Figure 2-6 on page 21). To save the changes click *Save Config.* button.

Table 2-1. Modem Parameters for the Wireless Subtab

Parameter	Base Modem	Remote Modem	Repeater
Protocol	Base Select from the *List* Simplex Transmitter, Half Duplex, or PCC transmitter if Pacific crest protocol is used.	Remote Select from the *List* Simplex Receiver, Half Duplex Remote, or PCC Receiver if Pacific crest protocol is used.	Remote Select from the *List* Repeater, if the modem will be used as Repeater, or PCC Repeater, if Pacific crest protocol is used.
Modulation type	Specifies a modulation scheme that will be used by your modem[1]. DQPSK is recommended.		
Forward Error Correction (FEC)	Enable		
Scrambling	Enable	Enable	
RF power	Select the transmission power for the radio modem in the RF modem slider, or type the value in the edit box		

1. For both Base and Remote modems the modulation type must be the same.

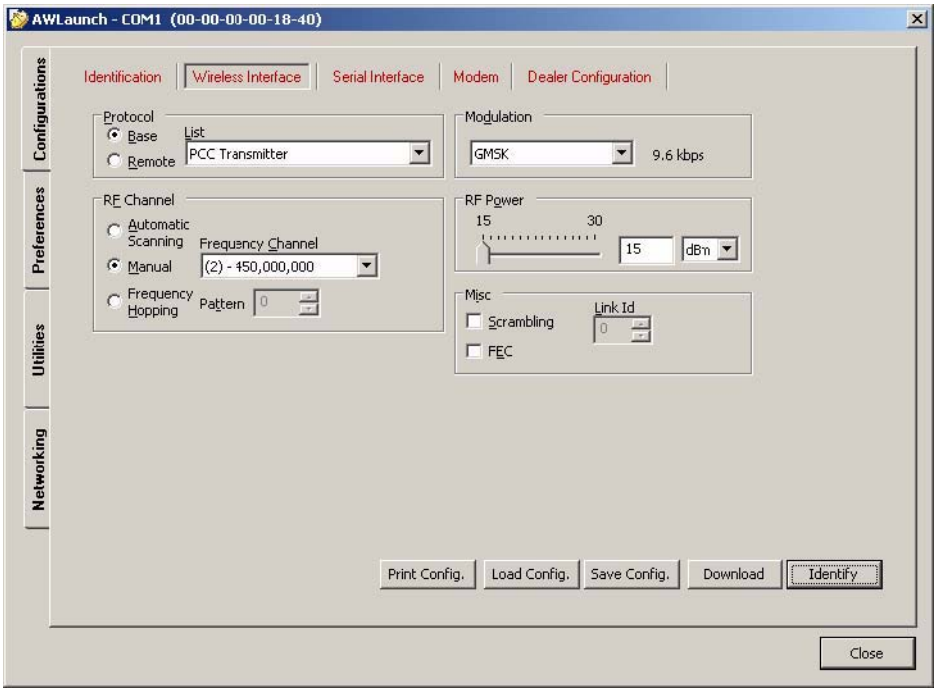

Figure 2-6. Configurations tab. Wireless subtab

7. In the *Dealer Configuration* subtab set the frequency and channel spacing (Figure 2-7 on page 22). To save the changes click *Save Config.* button.

- Set the frequency in band 406-470 MHz[1].

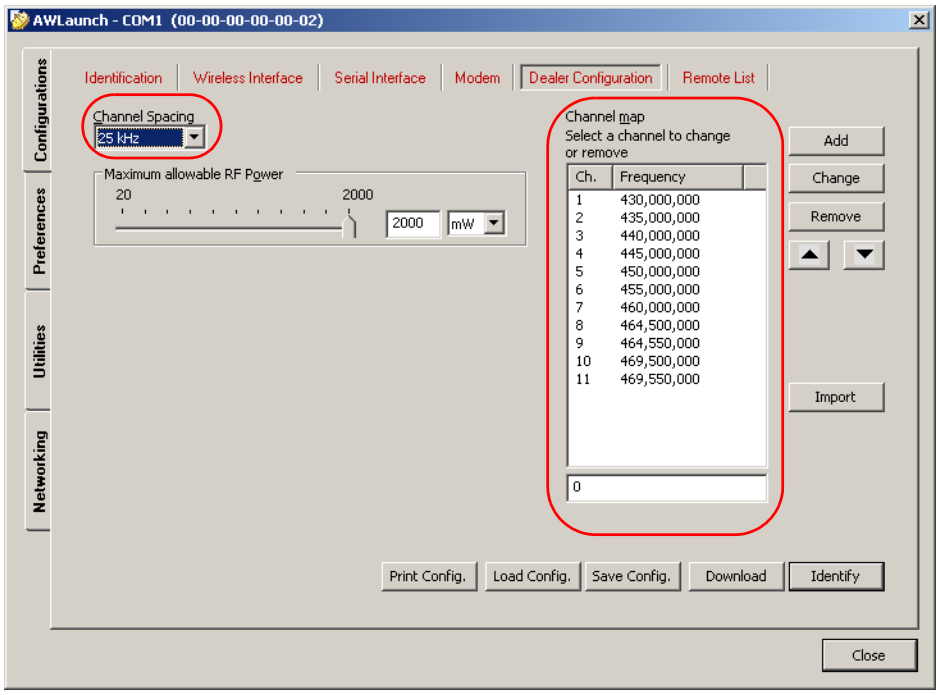

Figure 2-7. Dealer Configuration tab

8. When finished, click *Close*.

1. For both Base and Remote modems the frequency must be the same.

2.6. Checking Firmware Version

Use AWLaunch to check the firmware version of your AW400.

1. Select *Identification* subtab of *Configurations* tab;
2. Press *Identify* button (note that you may not press *Identify* button if identification process has been complete successfully once);

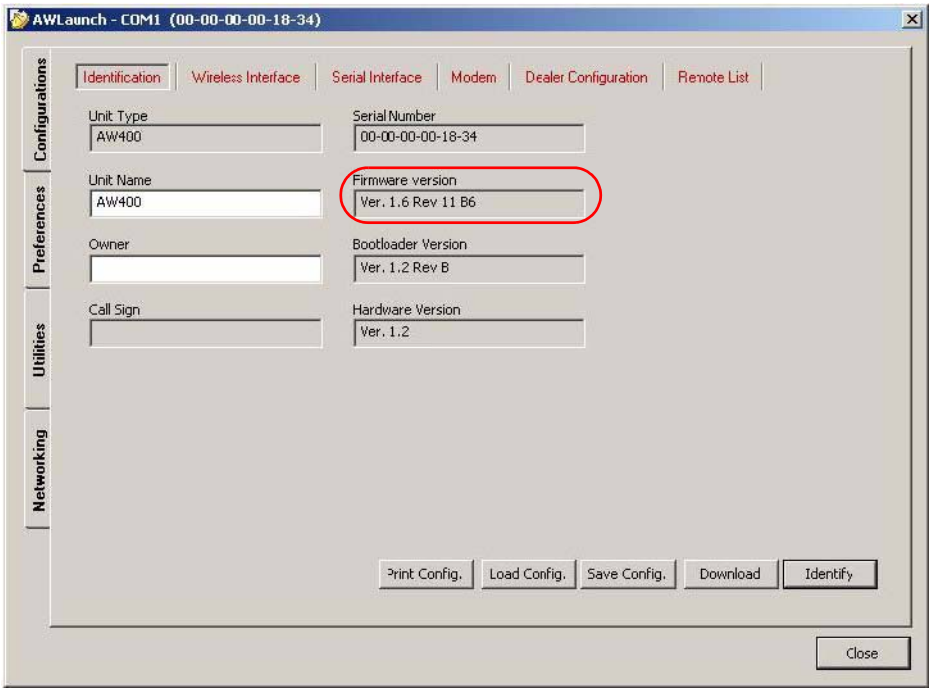

Figure 2-8. Identification subtab

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

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

3. Click *Close* to quit AWLaunch.

2.7. Loading New Firmware

Use the latest firmware version, available for download from the ArWest website www.arwestcom.com, to ensure your modem has the most recent updates.

The modem uses AWLaunch to load firmware onto the modem. For more information, refer to the *AWLaunch Software Manual*, available on the ArWest website. To upgrade the firmware of radio modem the following steps must be performed:

1. Download the new firmware package to your computer.
2. Connect your modem and computer. See “Connecting AW400 and Computer” on page 17 for this procedure.
3. Select *Download Firmware* subtab of *Utilities* tab;
4. Press *Identify* button (note that you may not press *Identify* button if identification process has been complete successfully once);
5. Press *Browse* button and select the firmware file which you want to download;
6. Press *Download* button (the downloading process may take a few minutes).

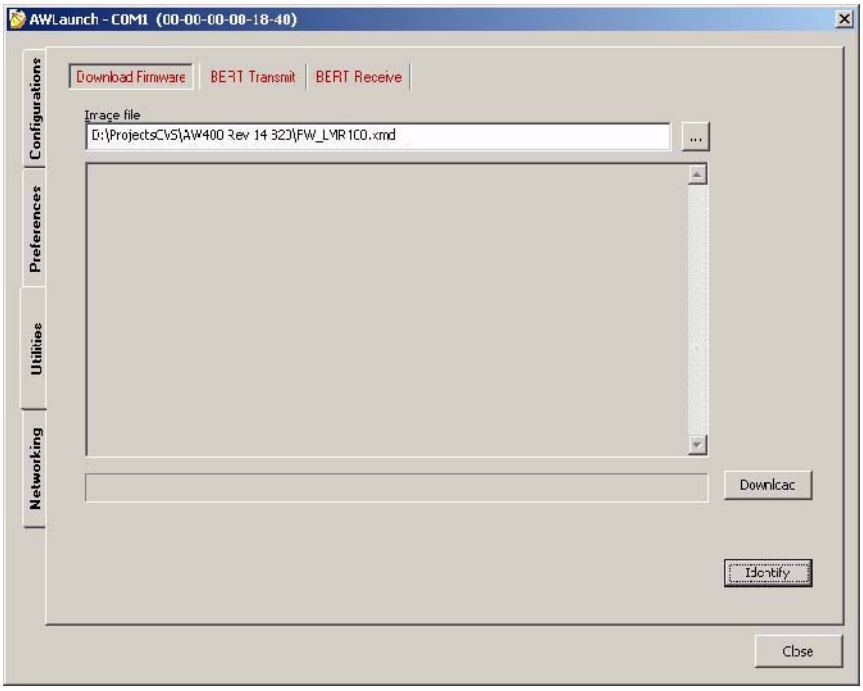

Figure 2-9. Download Firmware

7. Wait until the new firmware version loading will be complete.
8. Click *Close* to quit AWLaunch.

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.

3.1. Command Line Interface Convention

The following convention is implemented in AW400 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 3-1. 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] followed by “/?” displays the format and range of the variable.
0x03	The parameter is out of allowed range. A command with the certain [Parameter Name] 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 commands, the HELP command must be used.
0x05	Unspecified Error

3.1.1. 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<CR><LF>”

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

Happy Flow

1. 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).
2. 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.
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 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.)

3.1.2. Hardware Switching to Command Mode

As alternative to Software Switching, the switching through the MP/DP (Data Terminal Ready, DTR) control line can be used. To set Command Mode, the DTE must assert DTR signal active and then passive. By falling edge of DTR signal the unit goes to command mode and then sends Escape-Acknowledge to DTE (“@00<CR><LF>”).

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

Note: The powered up radio modem by default goes to Data Mode regardless of DTR control line polarity.

3.1.3. Switching to Data Mode

- DTE sends the CLI command “DATAMODE<CR><LF>” to the unit.
- Unit answers with Escape-Acknowledge („@00<CR><LF>“) 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.

3.2. Networking Commands

3.2.1. LINK

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

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

Parameter Name	Parameter List
PROT	1 - "Simplex Receiver", a default setting for Remote units 2 - "Simplex Transmitter" 3 - "Half Duplex" specific for remote units (Reserved for future use) 4 - "Half Duplex" specific for base unit (Reserved for future use) 5 - "Full Duplex" specific for remote units (Reserved for future use) 6 - "Full Duplex" specific for base unit (Reserved for future use) 7 - "TRMB Receiver" (used with GMSK modulation, Reserved for future use) 8 - "TRMB Transmitter" (used with GMSK modulation, Reserved for future use) 9 - "Transparent w/EOT" Repeater (used with GMSK and 4FSK) 10 - "Repeater" (ArWest Proprietary Simplex) 11 - "TRMB Repeater" (used with GMSK modulation, Reserved for future use) 12 - "Transparent w/EOT" Receiver (used with GMSK and 4FSK modulation) 13 - "Transparent w/EOT" Transmitter (used with GMSK and 4FSK modulation) 14 - "STL Receiver" (used with 4FSK modulation) 15 - "STL Transmitter" (used with 4FSK modulation)
MOD	1 – DBPSK 2 – DQPSK, a default settings 3 – D8PSK 4 – D16QAM 5 – GMSK 6 – 4FSK
SPACE	Sets channel spacing: 0 - 25kHz, a default setting 1 - 12.5kHz 2 - 6.25kHz 3 - 20kHz
PWRB / PWRW	(13 - 33) / (20 - 2000) - RF output Power in dBm / mW
FHOP	(1 - 128) - Frequency Hoping Pattern number LINK FHOP command can be processed 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
RTR	Base Unit 0 - No Retransmission in the wireless cluster 1- There is Repeater Remote Unit 0 - Auto Detect (Base or Repeater) 1 - Receive from Repeater 2 - Receive from Base

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.

3.3. Serial Interfacing Commands

3.3.1. 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
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)

3.3.2. 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 Communications 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).

3.4. Special Commands

3.4.1. 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 [*Parameter Name*] [*Parameters List*] [*/?*]

Parameter Name	Parameter List
IMAGE	0 - selects the factory loaded real-time software/firmware image 1 - selects the user updated real-time software/firmware image
CFG	0 - selects the factory default configuration 1 - selects user modified configuration

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

3.4.2. 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
```

3.4.3. 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.

3.4.4. SLEEP

The SLEEP command determines the sleep mode parameters. The sleeping AW400 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

3.5. Diagnostics and Identification Commands

3.5.1. 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: 31 - AW400
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:

```
AW400 UHF Radio Modem, ArWest Communications
Product ID =31
S/N =000000000007
Hardware =Ver. 1.0
Software =Ver. 1.6 Rev 12 B9
BootLoader =Ver. 2.0 Rev 01
```

3.5.2. 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	403.000000 to 470.000000 MHz - Displays the central frequency of the operating channel.

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

```
RSSI =-106 dBm
BER =0E-0
FREQ =440.000000 MHz
CHAN =-4
TEMP =23
SYNC =0
TTL1 =1
TTL2 =1
MODE =FIXED
```

SPECIFICATIONS

A.1. AW400 UHF Modem Specifications

The following sections provide specifications for the modem and its internal components.

A.1.1. General Radio Specifications

Table A-1. General Radio Specifications

Parameter	Specification
Operating Frequency Range	406 - 470 MHz
Channel Spacing	25/20/12.5/6.25 kHz
Data Rate (25kHz Channel Spacing)	9600 bps – DBPSK/GMSK 19200 bps – DQPSK/4FSK 28800 bps – D8PSK 38400 bps – D16QAM
Data Rate (20kHz Channel Spacing)	7500 bps – DBPSK/GMSK 15000 bps – DQPSK/4FSK 22500 bps – D8PSK 30000 bps – D16QAM
Data Rate (12.5kHz Channel Spacing)	4800 bps – DBPSK/GMSK 9600 bps – DQPSK/4FSK 14400 bps – D8PSK 19200 bps – D16QAM
Data Rate (6.25 kHz Channel Spacing)	2400 bps – DBPSK 4800 bps – DQPSK 7200 bps – D8PSK 9600 bps – D16QAM
System Gain for DBPSK modulation (Antenna gain is not included)	149 dB (for 25 kHz Channel Spacing) 149 dB (for 20 kHz Channel Spacing) 151 dB (for 12.5 kHz Channel Spacing) 152 dB (for 6.25 kHz Channel Spacing)
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	11 miles / 18 km
Input/Output	Serial (RS232) up to 115200 bps

A.1.2. Environmental Specifications

Table A-2 lists the modem's environmental specifications.

Table A-2. Environmental Specifications

Parameter	Specification
Temperature	Operating –40°C to +60°C Storage –40°C to +85°C
Environmental	IP 66
Dimensions (H x W x D)	152 mm x 84 mm x72 mm
Weight	900 g
Power Supply Voltage	+9 to +16 VDC nominal
Power Consumption (Average)	6W / 2W / 0.05W –Transmit / Receive / Sleep
Housing/Color	Aluminum / Two-tone Silver / Gray
Antenna Connector	BNC, 50WΩ

A.1.3. Transmitter Specifications

Table A-3 lists the transmitter specifications.

Table A-3. Transmitter Specifications

Parameter		Specification
Output Power	DBPSK/GMSK DQPSK/4FSK D8PSK D16QAM	13 dBm to 33 dBm in 1 dB steps (32 mW to 2 W) 13 dBm to 33 dBm in 1 dB steps (32 mW to 2 W) 13 dBm to 33 dBm in 1 dB steps (32 mW to 2 W) 13 dBm to 33 dBm in 1 dB steps (32 mW to 2 W)
Output Power Control Accuracy		±1.5 dB (at normal test conditions) +2.0 dB and -3.0 dB (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 (Conducted) 25/12.5/6.25 kHz CS		Part §90.210 (C, D, E) for USA and Canada 60 dBc for Europe
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)

A.1.4. Receiver Specifications

Table A-4 lists the receiver specifications.

Table A-4. Receiver Specifications

Parameter		Specification
Noise Figure		4 dB
Receiver Sensitivity (BER 1x10-4, 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

A.2. Connector Specifications

DB15 Connector

This provides DB15 connectivity for the AW400 with a DB9 for connection to a PC/CE Device for configuration.

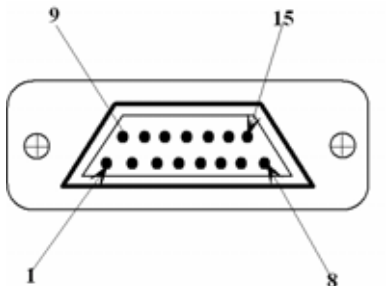

Figure A-1. DB15 Connector

Table A-5. Power Connector Specifications

Number	Signal Name	Dir	Details
1	DCD	O	Data Carrier Detect
2	DSR	O	Data Set Ready
3	RTS	I	Request To Send
4	DATAIN	I	Data from PC Serial Port to Modem
5	Reserved		Do not use
6	Reserved		Do not use
7	Reserved		Do not use
8	PWRIN		DC Power between 9 and 16 VDC
9	DTR	I	Data Terminal Ready
10	CTS	O	Clear To Send
11	DATAOUT	O	Data from Modem to PC Serial Port
12	Reserved		Do not use
13	Reserved		Do not use
14	Reserved		Do not use
15	GND		DC Power and Signal to Ground

External Antenna RF Connector

The external antenna connector type is a TNC RF connector.

UHF RADIO USAGE

Many countries require a license for radio users (such as the United States). Be sure you comply with all local laws while operating a UHF radio.

Surveying in RTK mode has made UHF the most popular choice for communications between base and rover receivers. Know the strengths and weaknesses of this technology to get the best use out of your receiver.

The quality and strength of the UHF signals translates into range for UHF communications.

The system's range will greatly depend on the local conditions. Topography, local communications and even meteorological conditions play a major role in the possible range of RTK communications.

If needed, use a scanner to find clear channels for communication.

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.

C.1. General Warnings

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 AW400 SHOULD NEVER BE USED IN DANGEROUS ENVIRONMENTS.

C.2. Power Supply

Connect the supplied adapter to the side of the unit in the slot. Plug the two-prong end of the power cord to an AC100-240V outlet. If you have difficulty inserting the plug, turn it over and reinsert it. If the unit will not the used for a long time, disconnect the plug from the outlet.

Note: Before plugging the power cord into an AC outlet, make sure that all the connections have been made.

CAUTION: *To reduce the risk of electric shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so.*

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 adapter will suspend operation. If the voltage supplied is above the maximum specification, the adapter 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 adapter, make sure that the power source matches the adapter's voltage and current requirements.*

C.3. Usage Warnings

If this product has been dropped, altered, transported or shipped without proper packaging, or otherwise treated without care, erroneous measurements may occur.

Note: Do not connect or disconnect equipment with wet hands, you are at risk of electric shock if you do!

Inform ArWest immediately if this product does not function properly. Only allow authorized ArWest warranty service centers to service or repair this product.

Warning: *To avoid the equipment serious damage, do not switch the modem to transmit mode if RF antenna is not connected.*

CAUTION: *Never attempt connecting/disconnecting the serial cable while supply is plugged in. Always remove supply from AC power before connecting/disconnecting serial cable.*

WARRANTY TERMS

ArWest Communications Corp., Inc. (“Company”) warrants, to the end-user only, that the Narrow Band Radio Modems (“Radios”) purchased (a) conforms to the Company’s published specifications for the model purchased, and (b) is free from defects in material or workmanship. The duration of this warranty is twelve (12) months[1] from date of purchase and any claim for breach of warranty must be brought to the Company’s attention within such twelve (12) month period and the Receiver must be returned for action on any such claim within twelve (12) months from the date of purchase. Within a reasonable period of time after a claim, the Company will correct any failure of the Radio to conform to specifications or any defect in materials or workmanship, or replace the Radio, or, at its option, provide a full refund of the purchase price. A repaired or replaced product is warranted for 90 days from the date of return shipment to the buyer, or for the balance of the original warranty period, whichever is longer. These remedies are the buyer’s exclusive remedies for breach of warranty.

To obtain warranty service, the buyer must return the Radio, postage-paid, with proof of the date of original purchase and the buyer's return address to the Company or an authorized service center. The Company will not be responsible for any loss or damage to the product incurred while it is in transit or is being shipped for repair. It is the buyer's responsibility to arrange for insurance, if the buyer so desires.

The Company does not warrant (a) any product, components or parts not manufactured by the Company, (b) defects caused by failure to provide a suitable installation environment for the Radio, (c) damage caused by disasters such as fire, flood, wind, and lightning, (e) damage caused by unauthorized attachments or modification, (f) damage during shipment, (g) any other abuse or misuse by the buyer, (h) that the Radio will be free from any claim for infringement of any patent, trademark, copyright or other proprietary right, including trade secrets.

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1. The warranty against defects in ArWest adapter, antenna, battery, charger, or cable is 90 days.

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We appreciate your comments and suggestions for improving this publication.

I use the following ArWest product _____

for _____

Please circle a response for each of the statements below:

1 = Strongly Agree 2 = Agree 3 = Neutral 4 = Disagree 5 = Strongly Disagree

The manual is well organized.	1 2 3 4 5
I can find the information I want.	1 2 3 4 5
The information in the manual is accurate.	1 2 3 4 5
I can easily understand the instructions.	1 2 3 4 5
The manual contains enough examples.	1 2 3 4 5
The examples are appropriate and helpful.	1 2 3 4 5
The layout and format are attractive and useful.	1 2 3 4 5
The illustrations are clear and helpful.	1 2 3 4 5
The manual is:	too long just right too short

Please answer the following questions:

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