

Z Axis-2F™

Dual Frequency Hydrographic Echo Sounder USER MANUAL

ENGLISH EDITION (Rev. 3)
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Unabara Hydrographics™

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www.unabarahydrographics.com

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Z Axis-2F™

Dual Frequency Hydrographic Echo Sounder

Product Overview

Your Z Axis-2F™ provides not only a 200 Khz. (nominal) frequency channel (F1), but also a second frequency in the low frequency range (i.e. 30 Khz., 28 Khz., 24 Khz., 18 Khz., 12 Khz., or 10 Khz. user selectable); (F2).

Unabara's Z Axis-2F™ brings a number of "firsts" to the industry. Our product is the result of vertical integration of design and manufacture. The Z Axis-2F™ was designed in and is manufactured in our facility in Louisiana. We do not use low performance "off-the-shelf" acoustic transducers as many echo sounder manufacturers do. Our transducer element is our proprietary design integral to the Below Surface Unit (BSU). In other manufacturer's echo sounders, low frequencies are generated by linear echo sounder and transducer designs which result in significant transducer "ringing" which increases the minimum depth in which the echo sounder can be used; practical operation in very shallow waters is thus not an option; also, vertical spatial resolution between the surficial bottom (defined by F1 frequency) and the consolidated bottom (defined by F2 frequency) is poor; further, side lobes of the transducer result in echo returns outside of the area in which the user desires to have ensonified. In shallow waters, reverberation associated with low frequencies, together with side lobe acoustic noise, essentially make the low frequency channel unreliable. Lastly, such transducer designs have wide acoustic beam widths; typically, 26 or more degrees. This results in an ensonified bottom area so large that small details of the sea bottom, including differing depths, can go undetected. In short, horizontal spatial resolution of the sea bottom is poor.

To eliminate the poor minimum depth, poor vertical resolution, and poor horizontal spatial resolution of conventional echo sounders, the Z Axis-2F™ utilizes Unabara's proprietary synthetic beam technology which provides a low frequency beam width narrowed to 3.5 degrees, with minimum ringing, and no side lobes. In shallow waters, if the Z Axis-2F's™ ensonified bottom diameter was about seven inches, the ensonified diameter of a conventional echo sounder would be about five feet; Thus the Z Axis-2F™ provides nine times better horizontal resolution along the sea floor survey line than the conventional hydrographic echo sounder.

Knowing the diameter of the circular footprint of ensonification (Cell Size) is always beneficial to the hydrographer. With conventional echo sounders, low frequency beamwidth tends to be much wider than that of the high frequency beamwidth. Simply put, since the two derived depths are from different sized cells, direct comparison of the two depths of a specific point on the sea bottom is not precisely possible. With the Z Axis-2F™, the directivity and beamwidths of the high frequency and low frequency are more closely aligned. Thus depths derived from F1 and F2 are from pretty much the same point on the sea bottom.

General Specifications for Z Axis-2F™

- Frequency Range: 200 Khz. (nominal) and 30, 28, 24,18, 12 or 10 Khz.
- Beamwidth: F1 200 Khz. = 5 deg. (-3 dB); F2 30,28,24,18, 12, 10 Khz. = 3.5 deg.
- Transducer Elements: Integrated into Below Surface Unit (BSU)
- Electronics: All Integrated into Below Surface Unit (BSU)
- Input Power: 12 VDC nominal (150 ma. maximum @ 20 hz. ping rate)
- Cable Length (BSU to Surface): 4.5 meters (15 feet); Extension cables are optional.
- BSU Size: 4.0 inch Diameter; 5.5 inch Height
- BSU Weight: 2 lbs (in air)
- BSU Mounting: 1.25 inch NPT Pipe (Optional adapter for 1 inch OD Survey Rod)
- Depth Ranges: Metric = 25m, 50m, 100 m, AUTO
English = 80 ft, 160 ft, 320 ft, AUTO
- Minimum Depth: 0.24 meters (0.8 feet)
- Maximum Depth: 100 meters (330 ft.)

- Key Features:
 - Autonomous Stand-alone Operation after setup
 - Integrated VLSI-ASIC Electronics & Transducer (in BSU)
 - Narrow acoustic beam widths utilizing Unabara's proprietary synthetic beam technology.
 - SVEL Correction: 1400 to 1800 m/s (4600 to 5900 m/s)
 - Transducer Offset (Draft) Correction
 - User adjustable Blanking Gate (cancels thermocline effects)
 - AI Machine Learning based Sea Bottom Tracking Gate
 - User selectable Ping Rates (5, 10, 20 Hz.)
 - Calculation & Display of Ensonified Cell Diameter
 - Depth Units: Feet or Meters
 - Depth Resolution: +/- 1 cm
 - Depth Accuracy: 0.1% of indicated depth
 - Data Sentences: NMEA-XDR, ODOM DBT, or DESO-20
 - COM Ports: COM 1 to PC for Control/Display; COM 2 Data Out (RS-232 or USB available for both COM ports)
 - PC Software Compatibility: Windows XP thru Windows 10
 - Optional external rechargeable LiFePO4 Battery Pack (with Charger; Charger A.C. input = 100 to 240 vac., 50/60 Hz.); Fully charged battery will power the Z Axis-2F™ for ~40 hrs.

Unabara's Z Axis-2F™ Hydrographic Echo Sounder utilizes your survey system's Windows laptop PC (or pad/tablet) as a control and display device; operation can be standalone or in the background of your HydroMagic™, HYPACK™ or other mapping software. All electronics and transducer elements are contained in a single underwater package denoted the Below Surface Unit (BSU). The BSU has two communication ports; COM 1 is dedicated as the control and display port to communicate with the Z Axis-2F software APP which will be installed on the user's PC. *The user will use COM 1 to setup the Z Axis-2F™ either at the land facility or onboard the survey boat. If the user does not need to have real-time display of depths (on Windows laptop/tablet/pad), he need not even connect COM 1 to any device onboard while doing the survey; he can simply input F1 and F2 derived depth data to his data collector via COM 2.*

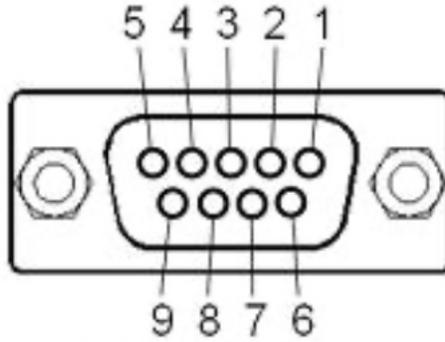
COM 2 provides depth information to your PC or Data Collector (Trimble, Carlson, Leica, Topcon or others) in standard industry formats selectable by the user from NMEA-XDR, ODOM DBT, or DESO-20. Baud rate is selectable up to 115,200; 8N1.

Data from COM 2 is used by your hydrographic mapping software (HydroMagic™, HYPACK™, or the like) to generate an echogram display if desired, and to provide real-time depths needed by your mapping software for other purposes; or, COM 2 can be used simply to output the two depths (Z data) to the user's data controller for logging.

Both COM ports are RS-232 type but each Z Axis-2F™ is provided with two RS-232 to USB adapter cables to use if your PC or data controller has only USB ports.

Connecting Z Axis-2F™ BSU to Windows Device/PC and/or Data Collector

The BSU is furnished with a 4.5 meter (15 feet) cable attached; an optional 3 meter extension cable is available. The above water end of this cable has a connector which attaches to the "Y" Adapter Cable assembly. This assembly has DB-9 connectors for **COM 1 (RED shell)** and **COM 2 (YELLOW shell)** which plug directly into your PC's serial ports. If you only have USB ports on your PC, refer to the instructions provided with the two RS-232 to USB converter cables supplied with your Z Axis-2F™. If you are using a data collector to log Z depth(s) data along with X,Y GPS data, your data collector will connect to COM 2. (see female DB-9 pinout information on next page). This cable also supplies 12 volts d.c. power to the BSU.

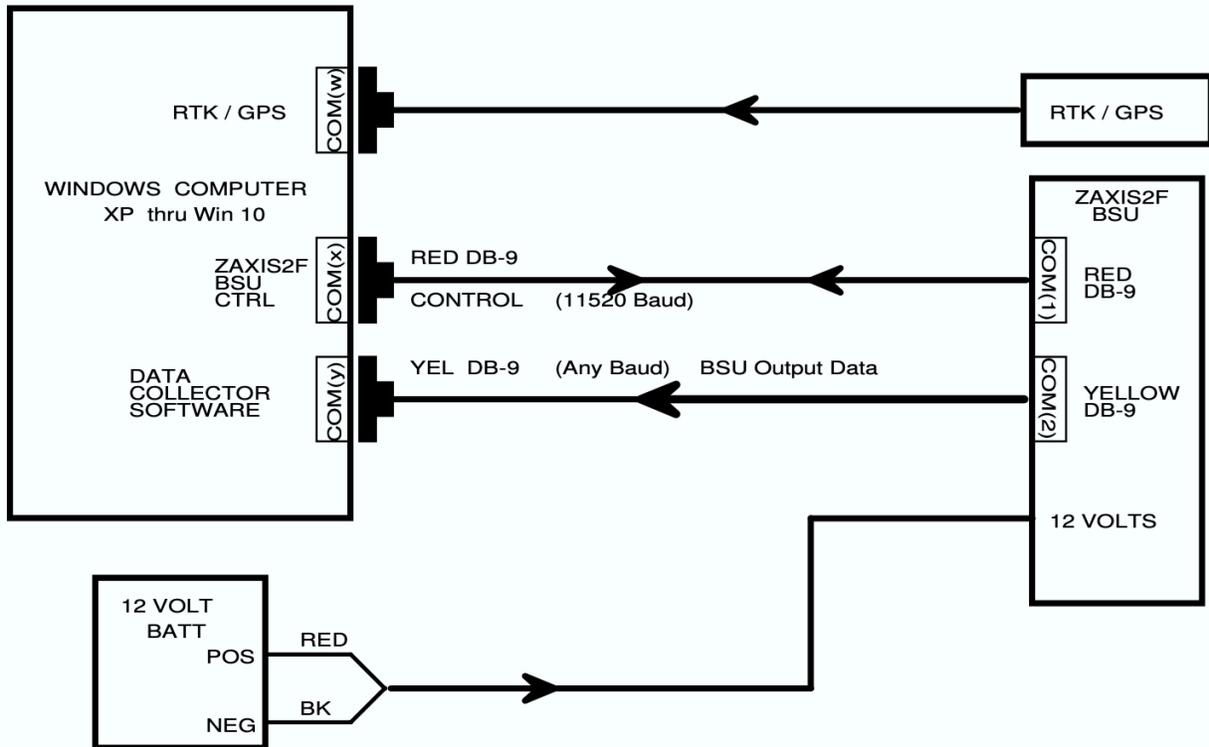


Female DB-9

The pin numbers shown for the female DB-9 connector shown above are based upon the viewer facing the female sockets of the DB-9; this pin allocation applies to both the BSU's COM 1 (RED connector) and COM 2 (Yellow connector).

PIN allocation: Pin 2 = TXD, Pin 3 = RXD, Pin 5 = Ground

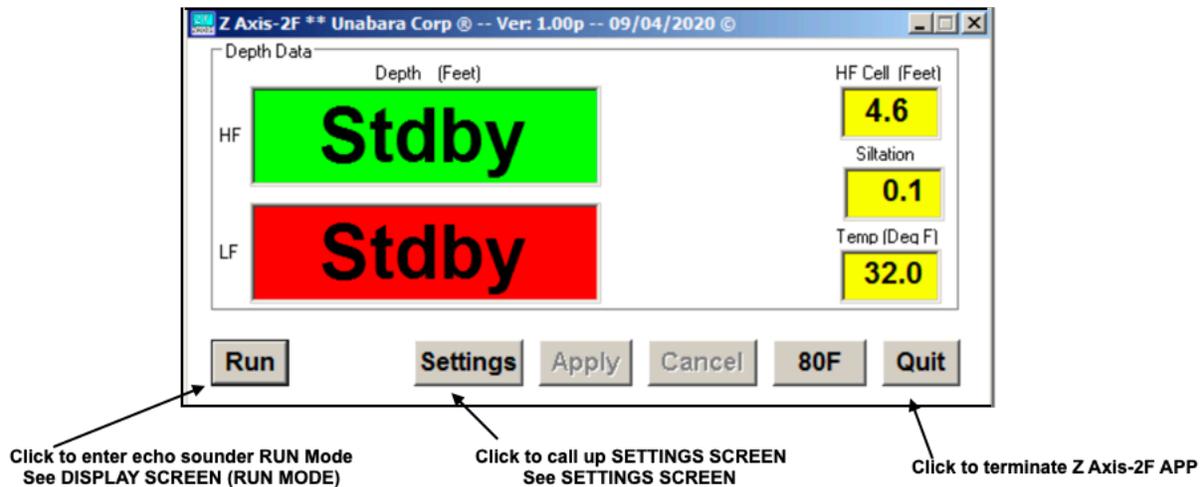
Below is a diagram which summarizes the system integration of the Z Axis-2F™.



This concludes the hardware interface instructions for your Z Axis-2F™. Before moving on to the “Quick Start” instructions to install and use the Z Axis-2F™ PC APP, please review the next three pages which describe the PC screens (GUI) associated with this APP. Knowledge of the location and function of “buttons” and displays are required to install and initialize the PC APP.

Z Axis-2F™ APP Screens & Use

Your Z Axis-2F™ APP has two screens as part of its graphical user interface (GUI); those being **DISPLAY** screen and **SETTINGS** screen. When booting up the APP, the Display screen will be shown in the STANDBY mode (see below). Once put in the RUN mode, the Display screen will provide dual depth data and other information (see second page forward). The SETTINGS screen (next page) is used to enter all user desired parameter selections.



DISPLAY SCREEN (STANDBY MODE)

Z Axis-2F ** Below Surface Unit (BSU) Settings

Configuration Parameters

Offset (F) UP DN

Svel (F/S) UP DN

Blanking (F) UP DN

Units UP DN

Gate UP DN

Freq UP DN

Max Ping (Hz) UP DN

Control Com Port UP DN

BSU Data Output

Output Format UP DN

Data Port Baud UP DN

PC Data Com Port UP DN

Offset = Draft + Tide

Select COM PORT on PC/Data Collector (which connects to COM 1 - Red DB-9 from Y-Adapter cable of BSU)

Output Format (from Com 2 - Yellow DB-9 on BSU Adapter Cable) to be selected by user.

Sounding Rate (Select 5, 10, or 20 Hz.)

Select Feet or Meters

Sound Velocity (Use UP/DOWN controls to enter applicable velocity)

Gate ON/OFF

Frequency of Lower Channel (User selectable 30, 28, 24, or 18 Khz.)

Default = NONE

Data Port Baud (from COM 2- Yellow DB-9) to be selected as desired by user.

Blanking (Use UP/DN controls to select the depth above which user wants echo returns ignored; used to keep thermoclines, pycnoclines, or biological layers from causing false depth returns)

SETTINGS SCREEN

REAL-TIME DEPTH (200 Khz. derived) → HF 65.55

REAL-TIME DEPTH (Low Frequency derived) → LF 65.71

Diameter of circular ensonification footprint at the depth shown (based upon the high frequency beam width) → HF Cell (Feet) 4.6

Thickness of unconsolidated sediment layer above the hard consolidated sediment layer → Siltation 0.1

Sea Surface Temperature → Temp (Deq F) 31.9

Click to put in STANDBY Mode → Stdby

Click to cause SETTINGS menu block to be shown; then make changes as you desire. Click again to cause the SETTINGS block to disappear. NOTE: User must first click on the APPLY block to save changes made to the SETTINGS screen! → Settings

Click to step thru and select desired depth range or AUTO → 80F

IMPORTANT NOTE!
When making changes on the SETTINGS screen, user must select APPLY to save any changes made before closing SETTINGS screen.

DISPLAY SCREEN (RUN MODE)

Installing the Z Axis-2F™ PC APP Software

Your Z Axis-2F™ is supplied with a USB-Memory Pod which contains the required Z Axis-2F™ PC APP software and SOFTWARE LICENSE AGREEMENT. After reading and agreeing to the license, instructions (*Installation Wizard*) will step the user thru installation of the APP. The memory pod also contains this User Manual (in PDF format).

Unabara Z Axis-2F™ Quick Start Setup – Version 1.0 (September 13, 2020)

Step #1: Install the Z Axis-2F™ PC software (from Memory Pod). Begin the software installation by clicking on “ZAxis2F Installation V1.xx.exe”.

Step #2: Install the two USB serial Com Ports supplied with the Z Axis-2F™, one at a time. Open the Windows Device Manager >> COM PORTS and plug in the first USB serial adapter. When the com port enumeration is complete, the assigned com port will be displayed. The Z Axis-2F™ Below Surface Unit (BSU) DB-9 connector with the RED hood should be plugged into this serial port to control and configure the Z Axis-2F™ BSU. The baud rate settings for this port is always 115200 baud, 8, n, 1.

Step #3: Next plug in the second USB serial com port and wait for it to enumerate. The com port number assignment will be displayed in the Windows Device Drivers. The baud rate for this com port can be set at any of the standard baud rates, but 11500 baud, 8, n, 1 is suggested. This will be the dual frequency bathymetry data input to your data collector software, ie: HydroMagic™, HYPACK™ and etc.. The Z Axis-2F™ BSU DB-9 connector with the YELLOW hood should be connected to this com port.

Step #4: Connect positive 12 Volts D.C. to the RED wire on the BSU adapter cable and negative 12 Volts D.C. to the BLACK wire. The Z Axis-2F™ has reverse power protection to prevent BSU damage in case of improper power connection.

Step #5: Open the Z Axis-2F™ PC application program by clicking the “ZAxis2F v1.xx.exe” program file, making sure that the Z Axis-2F™ BSU has been powered up first. The Z Axis-2F™ BSU has its configuration parameters stored in an initialization file in the PC application program. Every time the PC application program is opened, it is opened in the “Stdby” mode which allows parameters to be changed and then writes any changed parameters to the BSU and these changes are stored the BSU’s flash memory.

Step #6: While in the “Stdby” mode for the **first time** setup, open the “Settings” window by clicking on the “Setting” button. Then assign the BSU’s COM 1 (RED)

“Control Com Port” number. This will be the com port number of the port assigned to the DB-9 connector with the RED hood in step #2. This BSU COM 1 (RED) handles bi-directional control and depth data between the BSU and the PC and MUST always be set to a baud of 115200 b/s.

Step #7: If a data collector program such as HydroMagic™ or HYPACK™, etc. is used, then data input to the data collector is supplied via the BSU’s COM 2 (YELLOW) DB-9. To use it, the BSU’s data output baud rate must match the data collector baud rate setting. To set the BSU COM 2 (YELLOW) output baud rate, select the baud rate from the “Data Port Baud” dialogue box. Next select the BSU COM 2 (YELLOW) data output sentence to input to data collector program. Go to the “BSU Data Output Format” dialogue box and select “ODOM-DBT”, “DESO-20”, or “NMEA-XDR” data string.

Step #8: While in “Stdby” mode, set the “PC Data Com Port” to “NONE” in the dialogue box and then click the “Apply” button to save changes (see Note #3). The PC Data Com Port is not used for standard Z Axis-2F™ systems.

Step #9: At this point the Z Axis-2F™ is minimally configured to output dual frequency depth data to your external data collector program. Click the “Apply” button to save all changes so far.

Step #10: To begin collecting dual frequency data click the “Run” button or continue BSU configuration.

Step #11: While in “Stdby” mode, set the units of measure in “Feet” or “Meters” from the Units dialogue box and click “Apply” to save changes.

Step #12: While in “Stdby” mode, set the maximum range gate by toggling the “80F”, “160F”, “320F”, “Auto” or “25M”, “50M”, “100M”, “Auto” button and then click “Apply” to save changes.

Step #13: While in “Stdby” mode, set the BSU operating frequencies. The primary (high) frequency is by default set to 200KHz and the secondary (low) frequency is selectable from 30 KHz to 10 KHz using the “Freq” dialogue box and click “Apply” to save changes.

Step #14: While in “Stdby” mode, set the “Svel” by using the “DN” or “UP” arrow buttons on either side of the “Svel” dialogue box and then click the “Apply” button to save changes.

Step #15: While in “Stdbby” mode, set the transducer offset (draft) by using the “DN” or “UP” arrow buttons on either side of the “Offset” dialogue box and then click the “Apply” button to save changes.

Step #16: While in “Stdbby” mode, set the “Blanking” by using the “DN” or “UP” arrow buttons on either side of the “Blanking” dialogue box and then click the “Apply” button to save changes.

Step #17: While in “Stdbby” mode, to set the adaptive bottom tracking gate “ON” or “OFF, toggle the “Gate” button in the “Gate” dialogue box and then click the “Apply” button to save changes.

Step #18: While in “Stdbby” mode, set the “Max Ping Rate” by selecting “20”, “10” or “5” Hz from the “Max Ping Rate” dialogue box and then click the “Apply” button to save changes.

Step #19: To begin collecting depth(s) data, click on RUN.

Notes:

- 1.) Once configured the BSU can be operated stand-alone from the configuration within the BSU’s internal flash memory and will survive power downs.
- 2.) While BSU is in the “Stdbby” the BSU is still transmitting and acquiring dual frequencydepth data. This is to prevent data acquisition interruption during BSU reprogramming.
- 3.) Your standard version Z Axis-2F™ does not utilize the “PC Data Com Port” function. Ignore this function and always select NONE in the menu block.
- 4.) Always disconnect 12 vdc power when BSU is not in the water.

Appendix A

Data Formats available from BSU COM 2 Port (Yellow DB-9 Connector)

ODOM DBT (Odom EchoTrac)

Feet: **ET B 00655 00656**

Meters: **et B 01998 02002**

DESO-20

Feet: **DA00065.69fDB00065.66f**

Meters: **DA00020.03mDB00019.98m**

NMEA-XDR

Feet: **\$SDXDR,D,065.5,f,XDHI,D,065.6,f,XDLO*58**

Meters: **\$SDXDR,D,19.97,M,XDHI,D,20.03,M,XDLO*5C**

Baud: 9600 to 115200 (8, n, 1)

