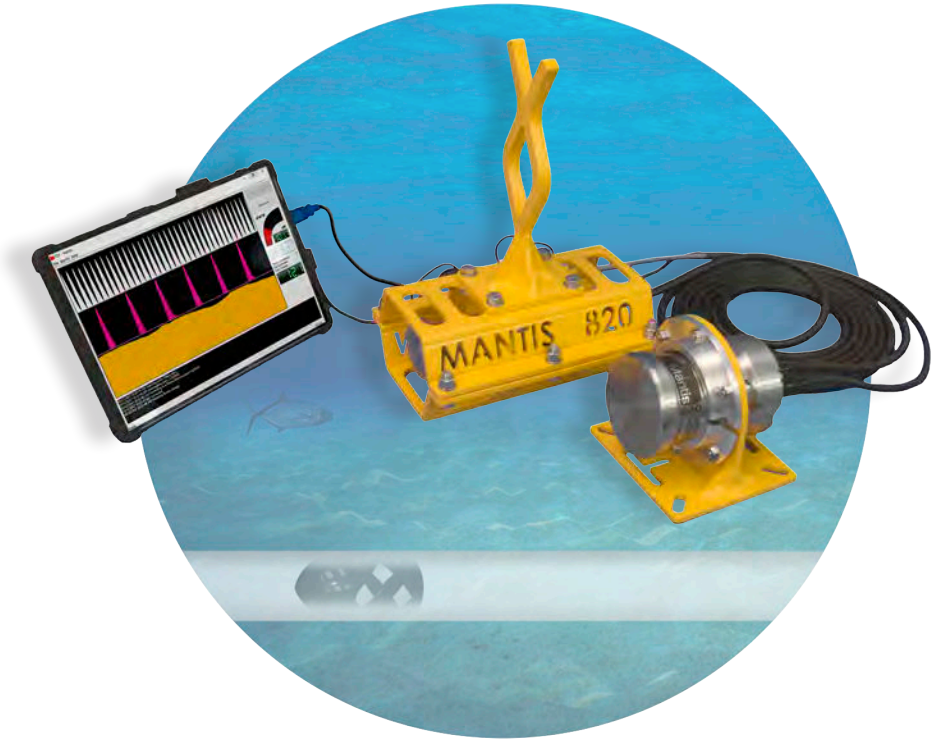
Mantis 820

ROV Tracking Receiver

USER GUIDE



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PIGGING PRODUCTS & SERVICES ASSOCIATION *member*

QUALITY SYSTEM CERTIFICATION DNV·GL ISO 9001

Information in this document is subject to change without notice and applies only to the version of software, hardware, or firmware described on the title page.

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The TRAXALL family of transmitters is covered under United States Patent No. 9172406.

WARNING

Any operation involving work on pipelines containing gases or liquids under pressure is potentially hazardous. It is necessary, therefore, to follow correct procedures in the use of this equipment to maintain a safe working environment.

No person should use this equipment unless fully aware of potential hazards of working with pressurized pipelines and trained in the procedures stated in this manual.

The purchaser of this equipment is responsible for the training and competence of operators and the manner in which it is used.

Contact CDI immediately should any difficulty arise in the use of this equipment.

CONTENTS

OVERVIEW

Features and Capabilities

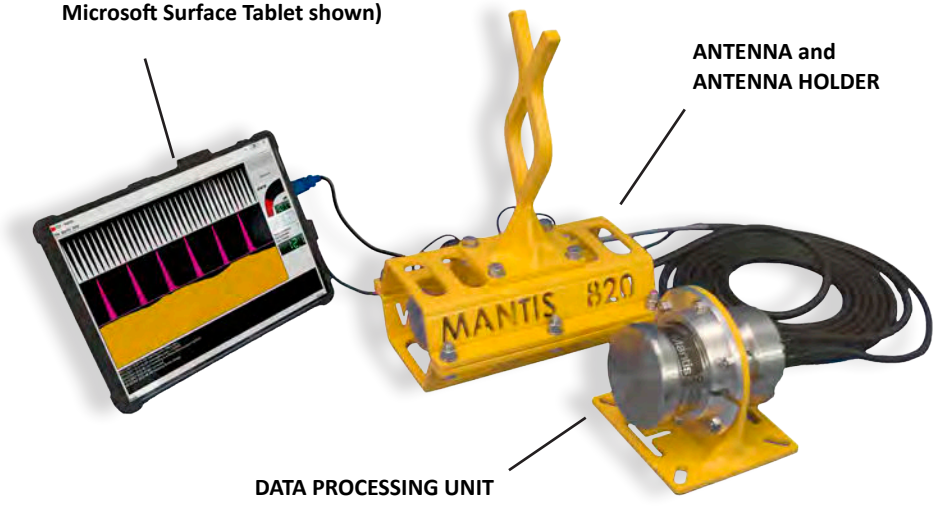
The MANTIS 820 is a deep-water ROV tie-in solution which provides all of the benefits of CDI's multi-frequency electromagnetic pig tracking in a durable and robust package.

The MANTIS 820 can track moving pigs, pinpoint stuck pigs, or set up trip-wire to monitor for slippage or other movements of pigs. The MANTIS 820 can detect industry-standard 22 Hz and/or CDI TRAXALL transmission frequencies.

Components

- Electromagnetic Antenna
- Data Processing Unit (DPU)
- User Interface Software

These features will be explained as you read through the GETTING STARTED and OPERATION sections of this user guide.



Devices Supported by MANTIS

Multi-frequency Transmitters

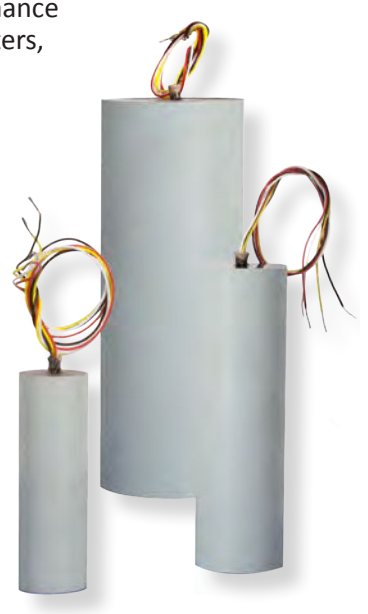
The MANTIS 820 can simultaneously separate and identify up to three transmitter frequencies. Transmission pulse rate of each color-coded CDI X-Series transmitter can be customized with CDI's special *FieldLink Configurator* application (see pg. 29).

Single-frequency ("Legacy") Transmitters

CDI T-series single-frequency (22 Hz) transmitters are available in various sizes, pressure ranges, and pulse rates.

Inline Inspection (ILI) Tool Transmitters

ILI transmitters are similar in performance and function to the T-series transmitters, but in lieu of pressure housings, are designed to work in conjunction with MFL pigs.



WARNING

Always use caution when opening any transmitter that has been in a pressurized environment.

It is possible for pressurized liquid or gas to leak into a transmitter and remain there even after the transmitter has been removed from the pipeline.

Always point the transmitter away from yourself or others when opening a cover or end cap.

GETTING STARTED

Unpacking

The MANTIS is shipped preassembled. It is only necessary to mount the Antenna and DPU to your ROV* and connect the cables.

***NOTE: Component mounting to ROV, power connection, and data connection are the customer's responsibility. (See Power Requirements and Cabling instructions, following pages.)**

NOTE: The Antenna is factory sealed and contains no user-serviceable parts. Do not open or attempt to service antenna. Though not recommended, the DPU can be opened to inspect a fuse. (See pg. 31.)

Power Requirements

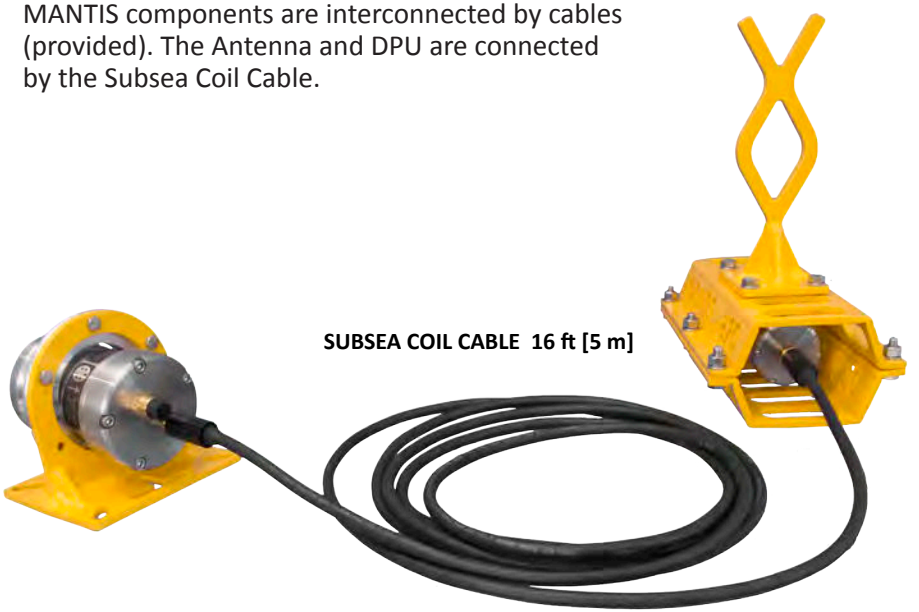
MANTIS requires a 6 to 48 VDC power source (supplied via ROV.)
No batteries are required.

Mounting to ROV

The most common MANTIS-ROV configuration is to mount the DPU onto the ROV chassis. The antenna unit is held by the ROV manipulator jaws or attached directly onto the manipulator arm. Take note of cable lengths when mounting.

Connections

MANTIS components are interconnected by cables (provided). The Antenna and DPU are connected by the Subsea Coil Cable.



Power and Serial connections are via Pigtail or Y-Cable. (See pg. 30 for pinout information).

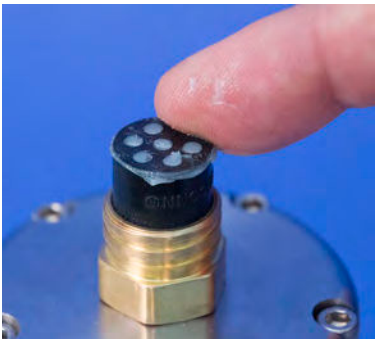
POWER/SERIAL PIGTAIL 2 ft [.6 m]

POWER/SERIAL Y-CABLE 10 ft [3 m]

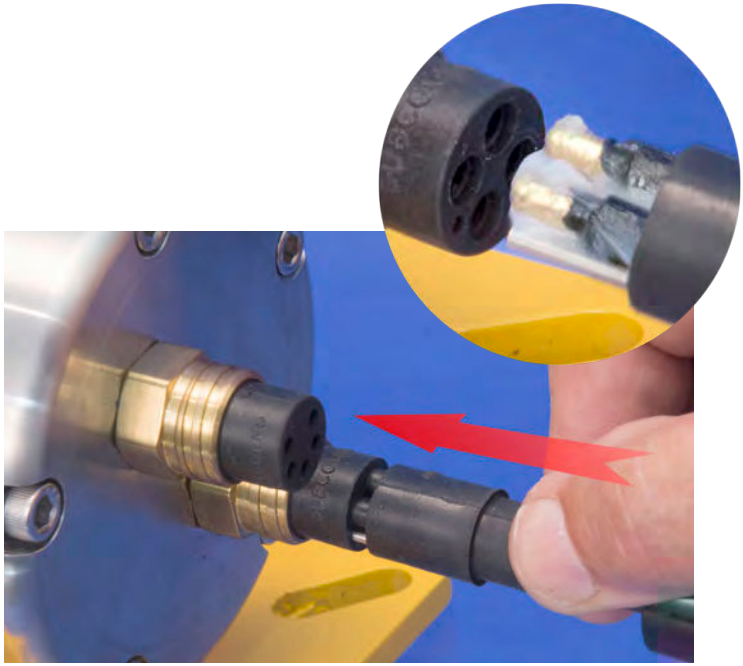
The Windows PC is connected to ROV data source via RS-232 – USB cable. If you have purchased the optional Microsoft Surface Tablet, this cable is included along with the power cable.

SURFACE DATA and POWER CABLES

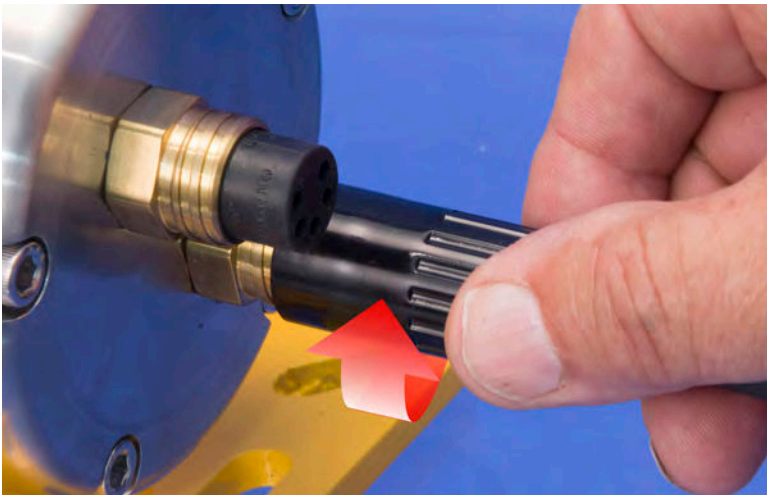
Before connecting components, apply Molykote®44 Medium high-temperature grease to all male connector pins and all female connector sockets. Apply sufficient Molykote to completely cover pins and to fill approximately 1/3 socket depth. This should be done at every connection mating and can be done underwater as well as on land or aboard vessel before deployment.



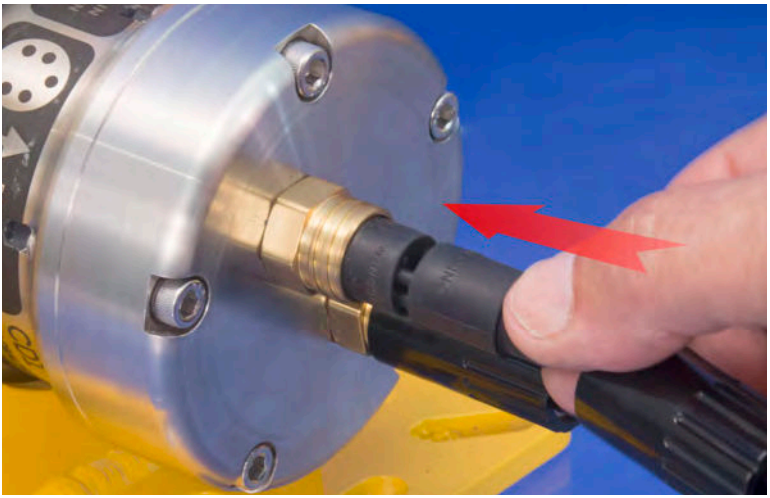
Connect the Subsea Coil Cable to the Data Processing and Antenna as shown (note position of guide pin). Ensure connectors are fully seated into receptacles for maximum watertight protection.

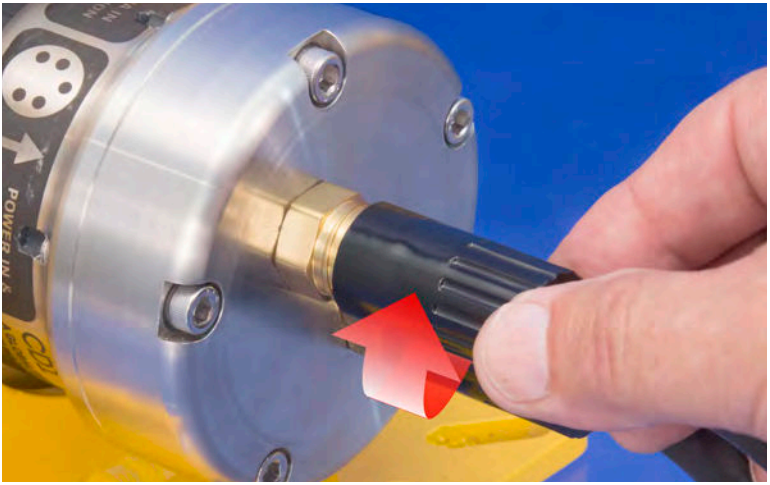


Ensure backshell threads are fully engaged and backshells screwed all the way on.



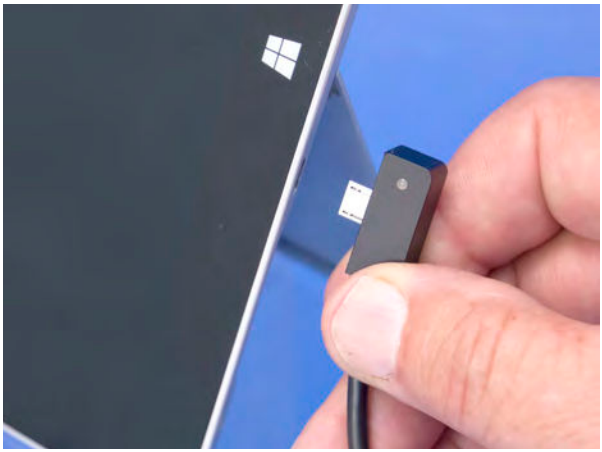
Connect Power/Serial Pigtail or Y-Cable to the DPU.



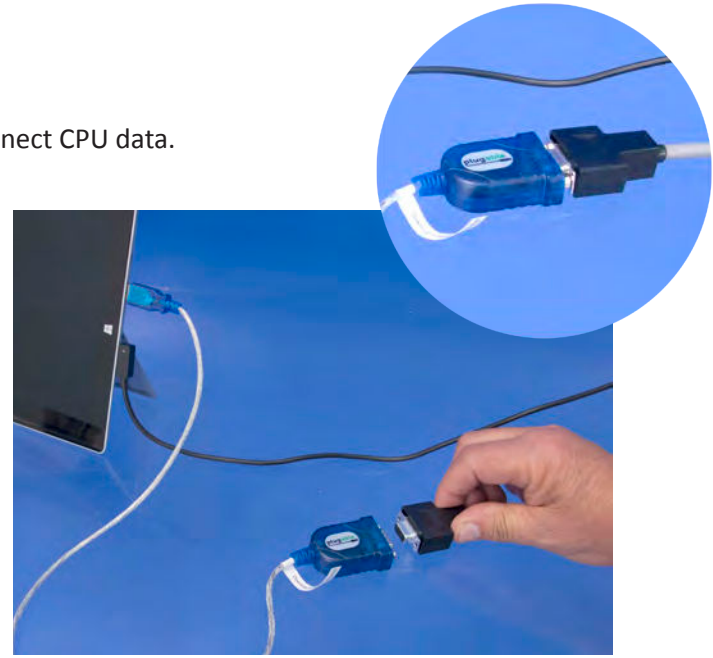


Wire other end to ROV.

Connect CPU power.



Connect CPU data.



OPERATION

The MANTIS Antenna and DPU are always in passive “on” state as long as ROV power is available. If a pig with an active transmitter is within range, MANTIS will detect it and display it on the MANTIS application.

User Interface Software

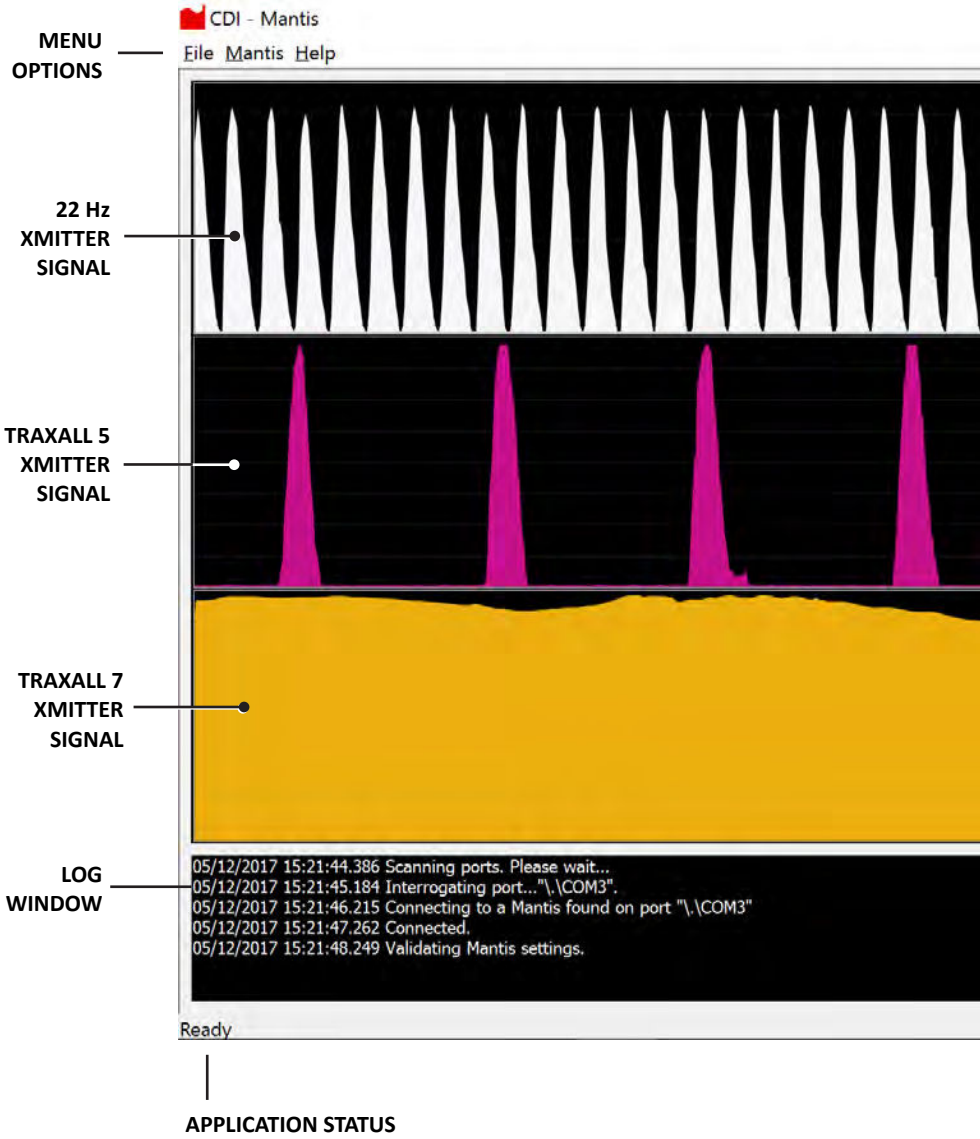
The MANTIS application can be run on any computer configured with Microsoft Windows 10 operating system and is available via free download from CDI. However, many users opt for the turnkey Microsoft Surface Tablet (see pg 28).

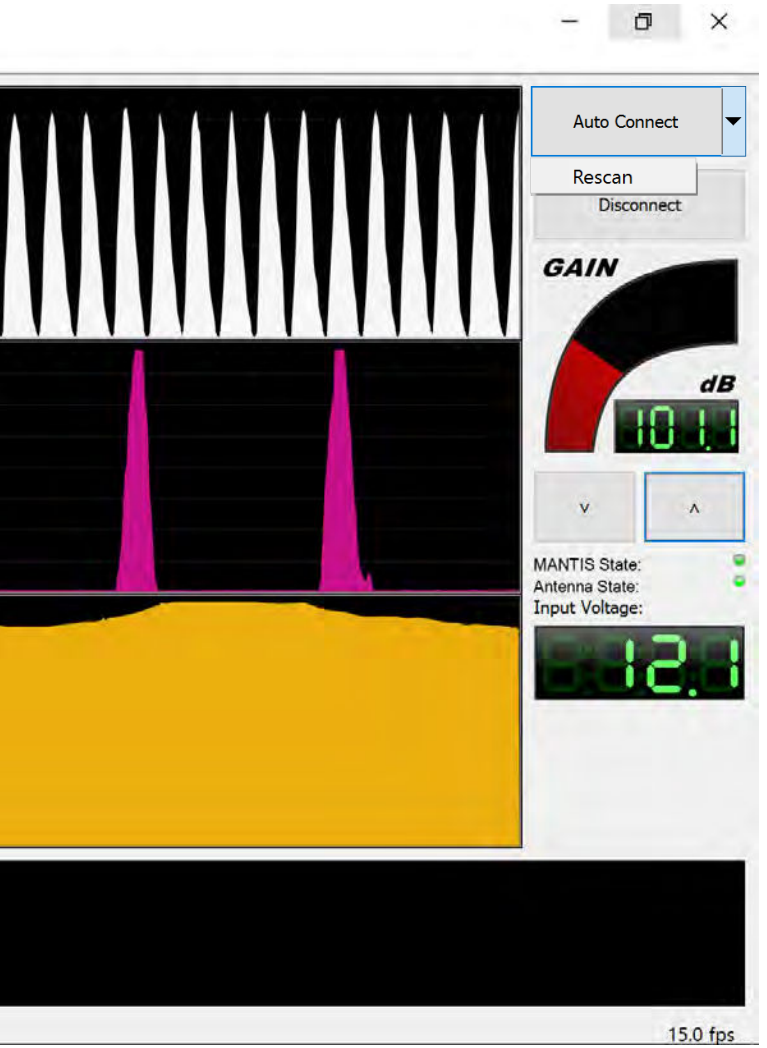
Press the power button on top of the tablet. Upon system boot, select* the MANTIS icon .

* The interface for the Microsoft Surface Tablet is primarily a touch screen, though a mouse or keyboard may be employed if desired. The MANTIS application requires minimal input.

MANTIS Display Overview

Menu options, controls, and data display are detailed on the following pages.





DATA CONNECT /DISCONNECT /RESCAN

SIGNAL GAIN INDICATOR

GAIN CONTROL

CONNECTION INDICATORS

INPUT VOLTAGE INDICATOR

DATA FRAME RATE

Menu Options

Menu Options

File

Exit

Closes the Mantis application

Mantis

Connect

Initiates communication with Mantis DPU

Disconnect

Ends communication with Mantis DPU

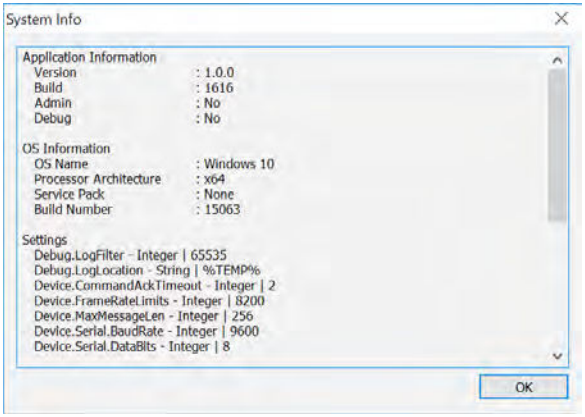
Update Mantis Firmware

To be used when directed by CDI Tech Support

Help

System Info

Information for CDI Tech Support personnel



Help

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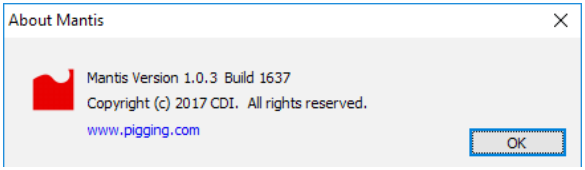
About Mantis...

Mantis Version and Build numbers



Controls and Indicators

DATA CONNECT /DISCONNECT /RESCAN

SIGNAL GAIN INDICATOR

GAIN CONTROL

CONNECTION INDICATORS

INPUT VOLTAGE INDICATOR

DATA FRAME RATE

Controls and Indicators

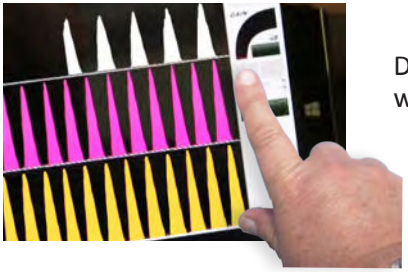
Data Connect/Disconnect/Rescan
Auto Connect is the default but will search each serial port for a MANTIS device.

Rescan will add any available serial ports added after MANTIS application was launched.

Signal Gain Indicator
Displays decibel gain added to transmitter signal.

Signal Gain Control
Enhance or decrease signal gain as desired for most effective display.

Clipped or truncated waveforms may hinder proper interpretation.



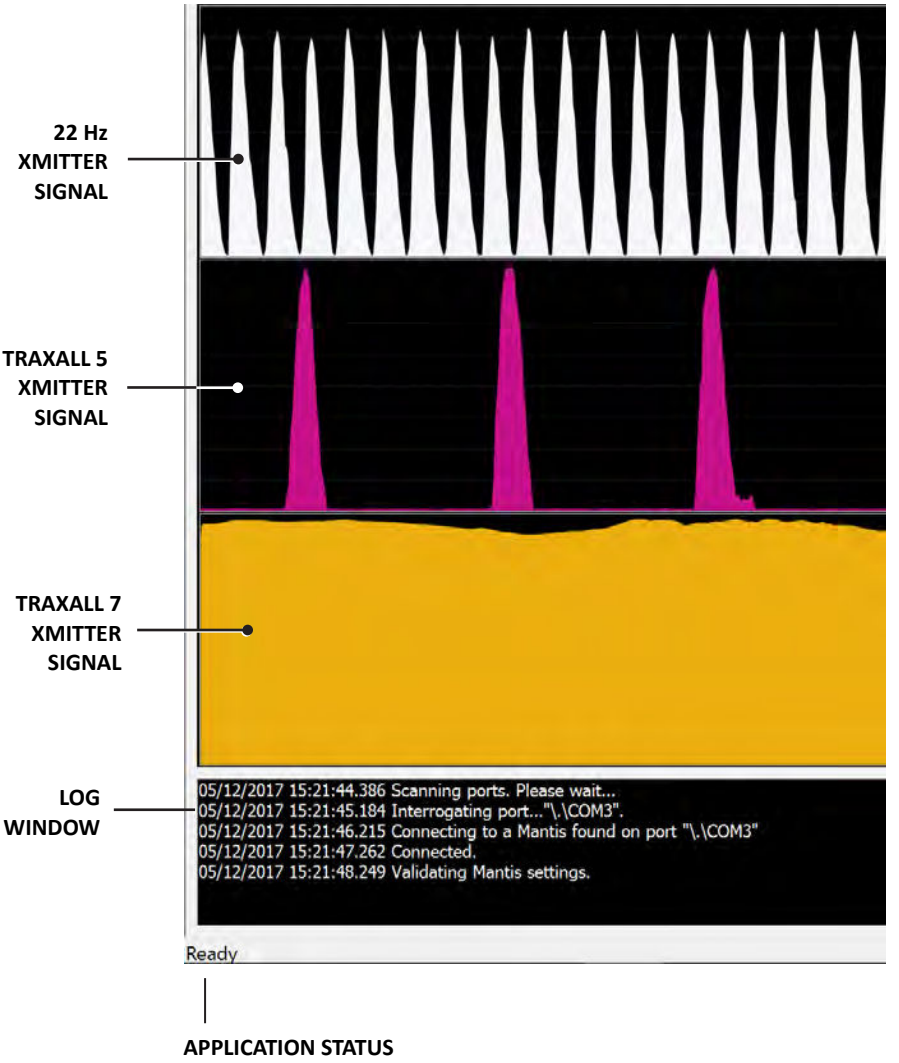
Decrease gain to contain waveform within display area.

Connection Indicators
MANTIS & Antenna: Normal (ready) state No connection
MANTIS: Flashing green = normal operation
MANTIS: Port open but no data transfer
Antenna: Incorrect antenna connection

Input Voltage Indicator
Mantis system requires 6–48 VDC.

Data Frame Rate
Mantis display rate in frames per second.

Data Display



Data Display

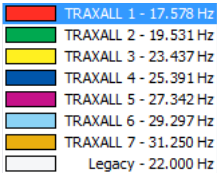
MANTIS monitors the industry-standard (“Legacy”) 22 Hz transmitter frequency plus two CDI-proprietary frequencies. These are detected and displayed simultaneously and independently of each other.

22 Hz Transmitter Signal
Real-time display of 22 Hz electromagnetic signal*

Traxall 5 Transmitter Signal
Real-time display of Traxall 5 electromagnetic signal**

Traxall 7 Transmitter Signal
Real-time display of Traxall 7 electromagnetic signal**

*Traditional industry-standard pipeline transmitters operate on a 22 Hz frequency. These include CDI CD42 series as well as transmitters made by other companies.



**In addition to 22 Hz, MANTIS receives Frequencies 5 and 7 of these CDI Traxall colorized frequencies.

Log Window
Date/time annotation of system port connection status.

Application Status
Standard Windows ready state indication.

OPERATION (Cont.)

Pig Tracking/Passage Detection (Antenna Parallel to Pipeline)

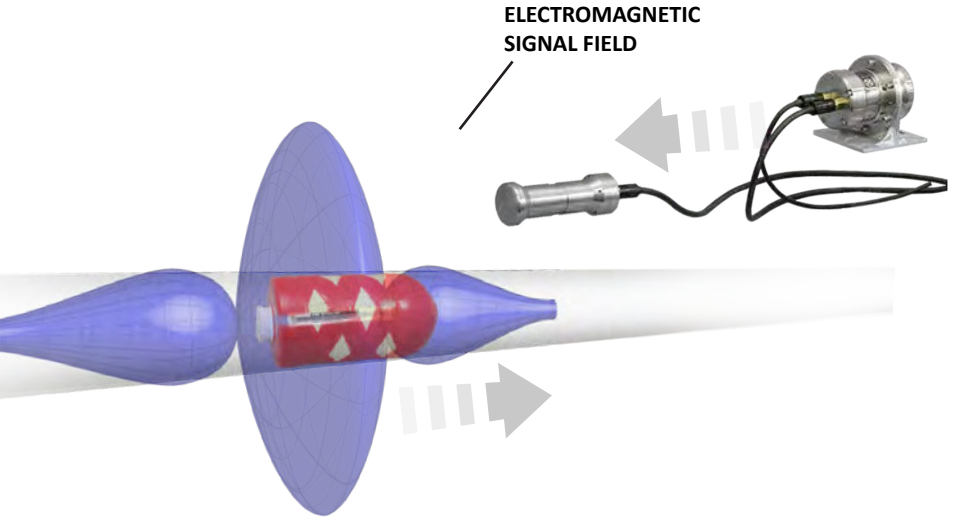
MANTIS can track moving pigs as the ROV moves along a pipeline and/or detect passage when deployed at a fixed location. MANTIS antenna orientation is **parallel** to the pipeline for this operation.

Whether both ROV and pig are moving or one is stationary, the principle is the same: as the transmitter electromagnetic signal reaches the antenna, the DPU will send the signal to the ROV multiplexer where it will be fed to the ROV shack and decoded.

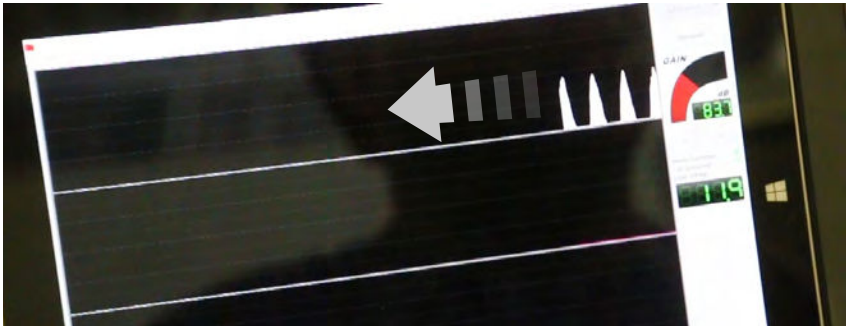
Whether detecting a passage, tracking, or locating, you are looking for the maximum (peak) wave of a transmitter signal.

Magnetic fields are three-dimensional. This is a 3-D representation of how MANTIS “sees” an electromagnetic field when the antenna coil is parallel to an active transmitter.

Here, a transmitter configured for pulse-mode at 22-Hz has come into range.

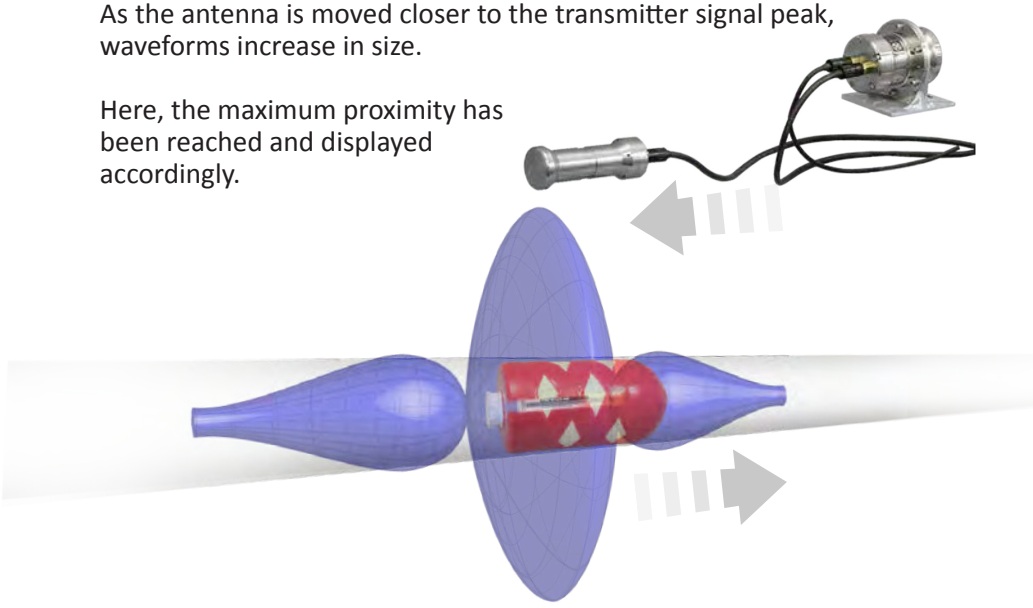


As this happens, the first waveforms will appear in real-time and crawl right to left across the screen.

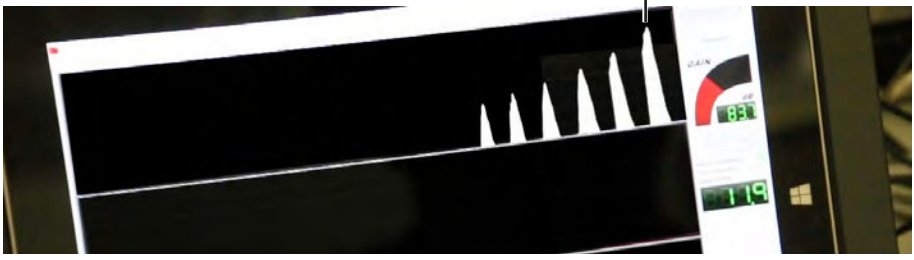


As the antenna is moved closer to the transmitter signal peak, waveforms increase in size.

Here, the maximum proximity has been reached and displayed accordingly.

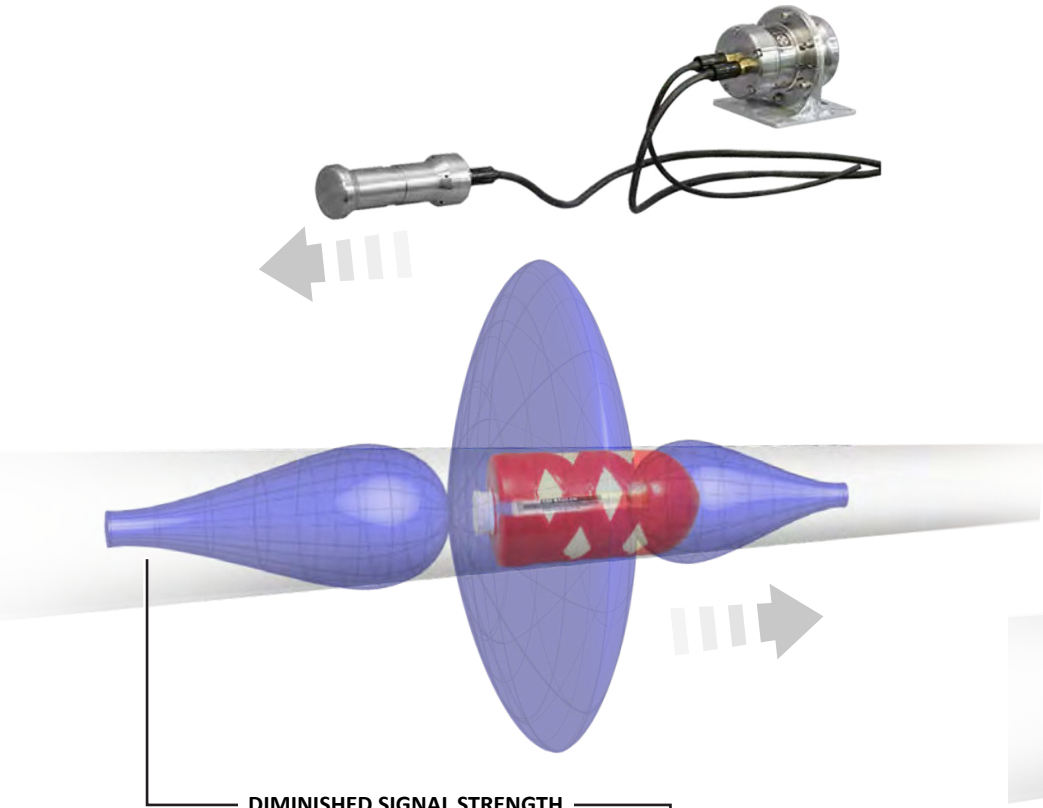


SIGNAL PEAK



Pig Tracking/Passage Detection (Cont.)

As the transmitter is overtaken by or passes the MANTIS antenna, the signal and resulting waveforms will diminish.



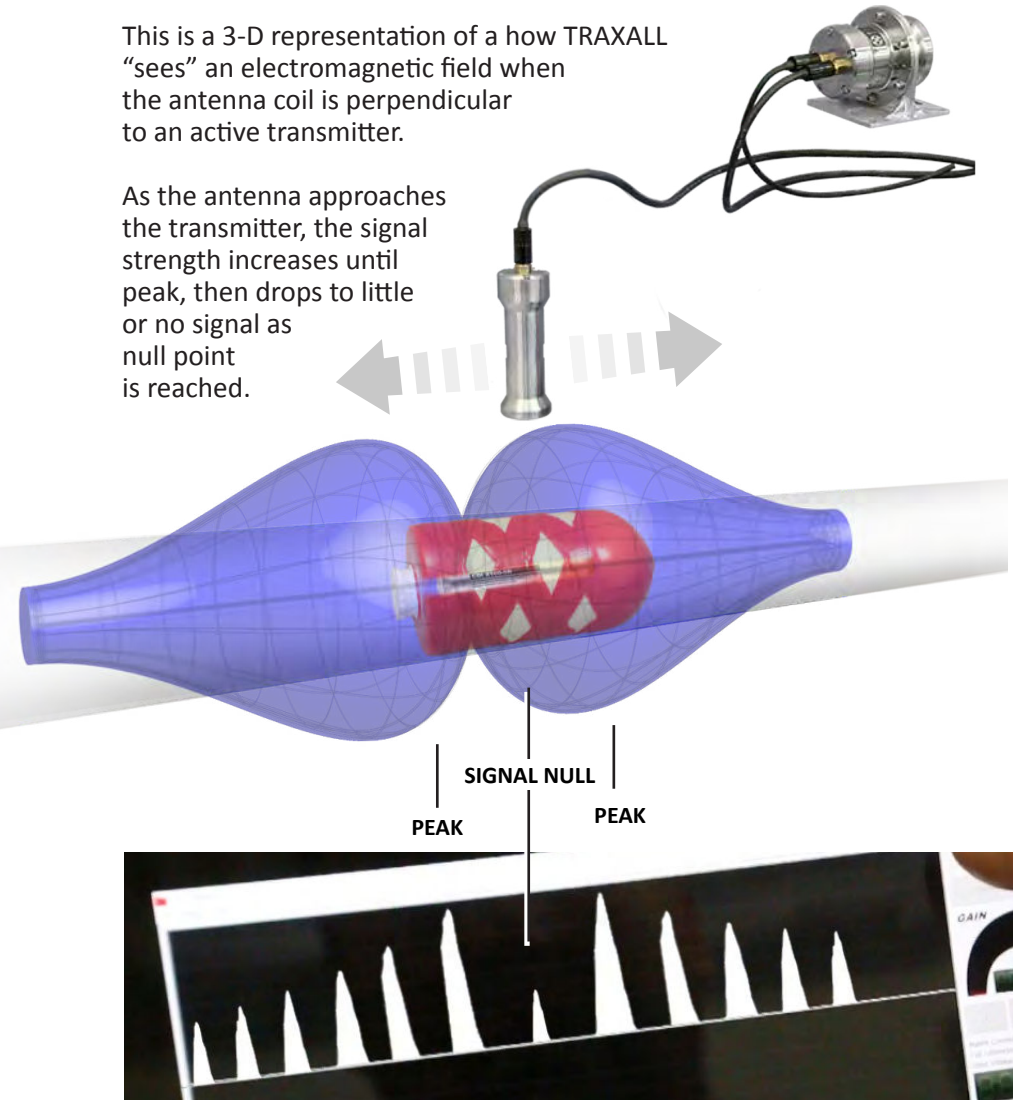
DIMINISHED SIGNAL STRENGTH

Pig Pinpointing (Antenna Perpendicular to Pipeline)

Once a pig has been tracked down, pinpointing will give you a precise location. Pinpointing differs from tracking/locating in that you are looking for the minimum (null) of a transmitter signal rather than a peak. Orient the MANTIS antenna **perpendicular** to the pipeline for this operation.

This is a 3-D representation of a how TRAXALL "sees" an electromagnetic field when the antenna coil is perpendicular to an active transmitter.

As the antenna approaches the transmitter, the signal strength increases until peak, then drops to little or no signal as null point is reached.



OPTIONAL EQUIPMENT

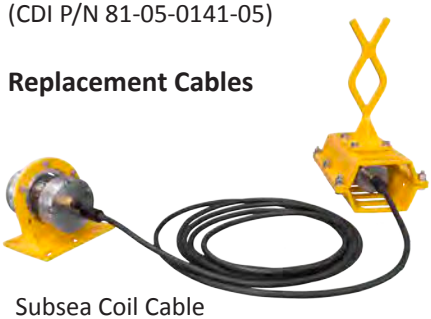
Microsoft Surface Tablet

The Microsoft Surface Tablet is a turnkey system preconfigured with MANTIS software and RS-232 – USB converter cable.

RS-232 – USB Converter Cable

If you are using a computer other than the Surface Tablet, a standalone RS-232 – USB cable adapter is available. (CDI P/N 81-05-0141-05)

Replacement Cables



Subsea Coil Cable
(CDI P/N 80-07-0011-00)

Power/Serial Pigtail
(CDI P/N 80-07-0012-00)

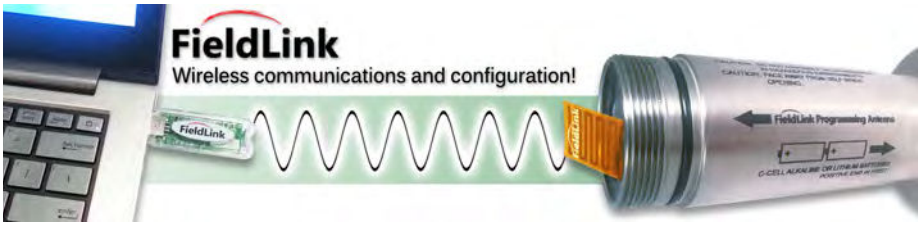
Power/Serial Y-Cable
(CDI P/N 80-07-0012-00)

CDI X-100, X-200, X-300, and X-400 TRAXALL-compatible Transmitters offer both programmable frequency and power control through CDI's proprietary FieldLink wireless communications system.

Frequency Control allows the operator to configure the transmitter to one of TRAXALL's colorized frequencies, or the 22 Hz legacy frequency for backward compatibility with CDI's CD42 receiver or competitive receivers.

Power Control allows the operator to directly manage a trade-off between transmitter range vs. battery life. For example, you can set output power to maximum for short runs/long range, or reduce output power for long runs/long battery life.

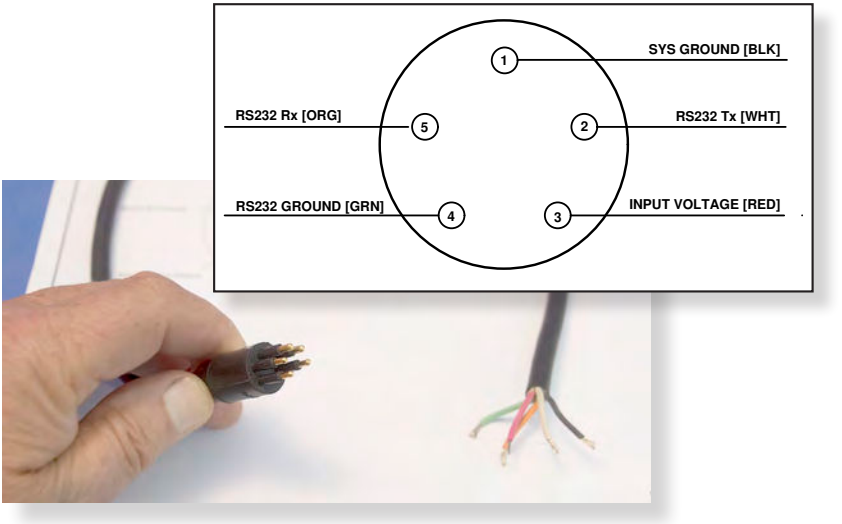
FieldLink is CDI's proprietary wireless communications network. Each X-Series transmitter comes with a built-in radio frequency antenna. By connecting a supplied radio frequency USB device, any Windows PC or laptop can be used to configure a transmitter.



POWER AND SERIAL CABLE WIRING

MANTIS requires a 6 to 48 VDC power source and RS-232 signal input; both to be supplied from the ROV via either Y-Cable or Pigtail.

Regardless of cable used, connect leads to ROV as shown in this face view of the male connector:



PIN	COLOR	SYSTEM	DESCRIPTION
1	BLACK	MAIN POWER	TIE DIRECTLY TO POWER SYSTEM GROUND TERMINAL (–)
2	WHITE	RS232	SERIAL DATA TRANSMIT FROM MANTIS MAIN UNIT
3	RED	MAIN POWER	TIE DIRECTLY TO MAIN SUPPLY VOLTAGE (+6 TO +48 VDC)
4	GREEN	RS232	SERIAL GROUND CONNECTION
5	ORANGE	RS232	SERIAL DATA RECEIVE TO MANTIS MAIN UNIT

WARNING: Improper wiring may result in damage to the MANTIS unit and/or ROV.

TROUBLESHOOTING

In the unlikely event of system failure, the following steps are recommended:

1. Virtual (Data) Connection

Ensure MANTIS is linked to an active serial port. If serial connection has been disrupted - even momentarily - rerun the Auto Connect menu command. If serial ports were added or removed after MANTIS application was launched, run Rescan.

2. Physical Connections

Ensure all cable connectors are firmly seated. Check all cables for breaks, kinks, or other damage.

Ensure power and signal connections are in order (per previous page).

3. Check Transmitter

Ensure all transmitters are functioning properly. It is recommended that fresh batteries be installed in each transmitter before a pigging operation.

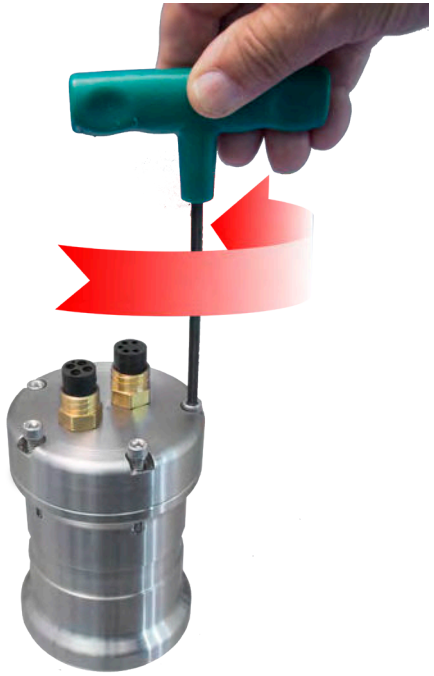
4. DPU Fuse

The DPU is the only user-serviceable MANTIS component.
If none of the above steps are successful it may be necessary to check the DPU internal fuse.

4**. DPU Fuse (cont.)**

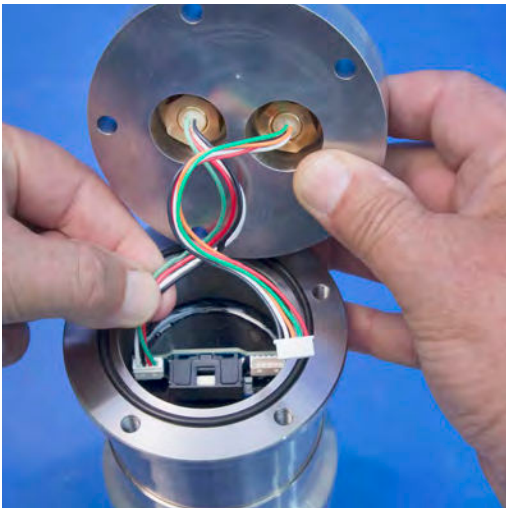
a. Remove cover

Remove capscrews with 3/16-in Allen wrench.



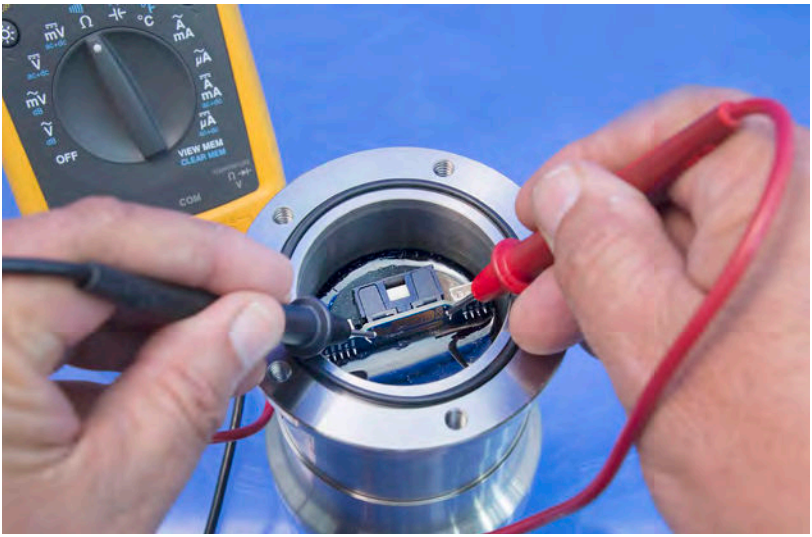
b**. Disconnect Cables**

This must be done before setting cover down. Support cover until both connectors are removed.



c. Test Fuse Continuity

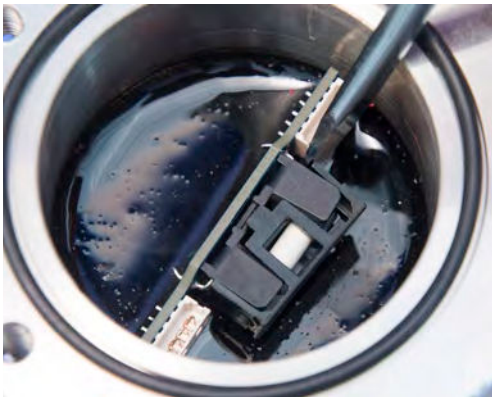
Continuity may be tested without removing the fuse holder. Apply ohm meter test leads to fuse holder terminals.



If fuse is blown, proceed to step d. If fuse has continuity, replace cover (Step f) and contact CDI Support for further instructions.

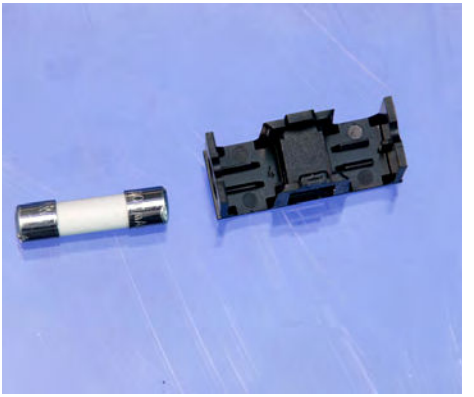
d. Remove Fuse Holder

Carefully pry out fuse holder.



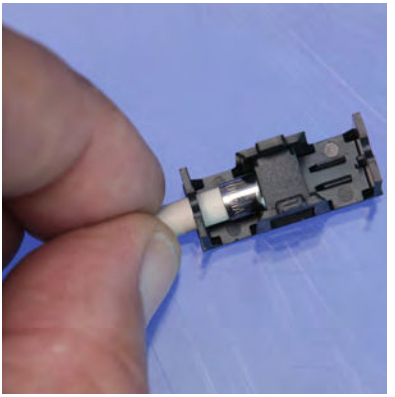
e. Remove Fuse From Holder

Once holder is removed from DPU, fuse will slip out. Renew fuse.



f. Replace Holder

Replace fuse and carefully snap holder back into place.



g. Renew O-Ring

Renewing O-ring* is highly recommended before reassembling DPU. If a spare is unavailable, ensure O-ring is serviceable. A brittle and/or deformed O-ring may not properly seal.

Lubricate O-ring with light coating of Molykote® or petroleum jelly to O-ring before replacing.

*CDI P/N 700-50-2146-70

g. Renew O-Ring (cont.)

Inspect O-ring groove. Ensure it is free of dents, deformities, nicks, and/or foreign objects. Ensure O-ring is firmly re-seated before installing cover.

h. Reconnect Cables

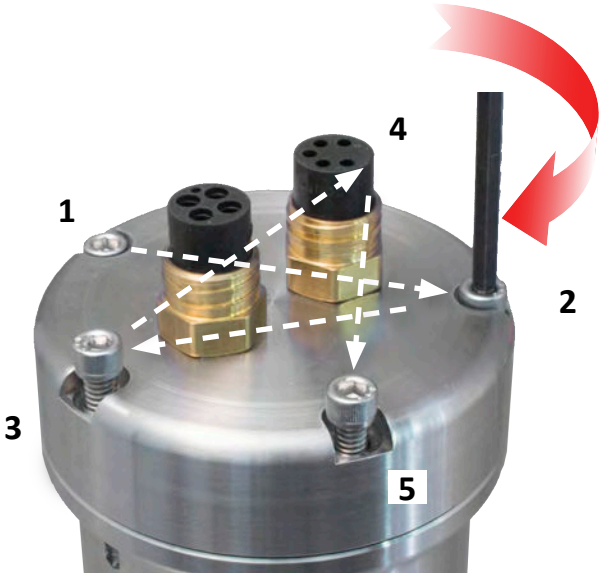
Reconnect cables. Twist cover to loop cables.

i. Replace Cover

Position cover. Ensure cover is properly seated and wiring is completely tucked inside unit.

j. Replace Capscrews

Position cover and insert screws. Turn each until snug, then tighten all in a “star” sequence pattern. Do not over-tighten.



If MANTIS fails to operate after fuse replacement, contact CDT Tech Support (1+918-258-6068) for further instructions.

WARRANTY

All equipment sold by Control Devices, Incorporated (CDI) is warranted for a period of one (1) year from the date of shipment to Purchaser, providing the instrument or equipment has not been modified, abused, or used for purposes which it was not designed for.

Batteries, probes, leads, magnets, and other consumables subject to wear are not covered by this warranty. CDI will repair or replace faulty equipment during the warranty period when the cause is a defect arising from faulty design, materials or workmanship.

Operating equipment while in a damaged condition nullifies this warranty.

Making a Warranty Claim

Equipment being considered for warranty repair, or a representative sample thereof, must be returned to CDI at the Purchaser's expense. The equipment must be accompanied by the Purchaser's written order* describing the defect(s) and authorizing CDI to invoice the Purchaser for any charges not covered by the warranty.

Upon receipt of the equipment and Purchase Order, CDI will examine the equipment and make a determination of the nature and cause of the defect. If the defect is not covered by the warranty, CDI will quote to Purchaser the cost for replacement or repair equipment, and will not proceed until Purchaser delivers a written acceptance of the quotation.

During the one year warranty, CDI will bear the cost to return units repaired under the warranty back to the Purchaser's domestic premises. CDI will return units to foreign countries at Purchaser's expense.

* Contact CDI at 1-918-258-6068 (worldwide), ext 143 for *CDI RMA Form FM–03–0089*

Care and Maintenance

Equipment designed by CDI is protected against the environment in which it is intended to operate. Much of the equipment is designed for prolonged use in the field without any special maintenance other than routine battery replacements. It is the Purchaser's responsibility to insure that proper precautions are taken during installation and operation so that weather seals are in place, routine maintenance occurs, etc. Failure to perform these operations nullifies this warranty.

CDI equipment should only be operated by qualified personnel who are familiar with any and all manuals and procedures for said equipment's operation.

Service and Repairs

Cost for repairs not covered by the warranty or carried out after the warranty period has expired will be charged at the current hourly or set service rate, plus the cost of materials, upon approval by Purchaser.

Equipment for repair must be sent at the Purchaser's expense and be accompanied by the Purchaser's written order describing the defect and authorizing CDI to invoice the Purchaser for labor, materials and return delivery cost.

No service or repair will be undertaken until an approved written order is received from the Purchaser.

SYSTEM SPECIFICATIONS

Devices Detected:	Electromagnetic
Frequencies Detected:	22 Hz + two TRAXALL frequencies
Detection Direction:	Bi-Directional
Passage Visual Indicator:	MANTIS Application Computer Display
Power Input:	ROV 6 VDC to 48 VDC
Output:	RS-232 Bi-Directional Serial Data Stream
Water Depth:	3,000 meters [9,842 ft]
Max. Operating Pressure	303 bar [4,388 psi]
Housing Material:	304L Stainless Steel
Overall Dimensions:	DPU: 5.4 x 3.75 in. [137 mm x 95 mm] Antenna: 7.1 x 2.5 in. [180 mm x 63 mm]

ABOUT CDI

CDI is a family-owned and operated business located in Broken Arrow, Oklahoma, just 12 miles from downtown Tulsa. Incorporated in 1982, CDI has proudly been manufacturing products in the United States for more than 32 years. CDI currently employs 45 people in the areas of electronics and mechanical design, software and firmware programming, electronics manufacture, machining, and more.

All CDI products are designed and built completely in-house utilizing an on-premises machine shop boasting six fully-automated CNC machines as well as full-time electronics assembly personnel.