



DREDGEPACK®

INSTALLATION MANUAL FOR TRAILING SUCTION HOPPER DREDGE
WITH ENTEK BUBBLER

Revision A, May 2025



HYPACK
a xylem brand

INSTALLATION MANUAL FOR TRAILING SUCTION HOPPER DREDGES USING ENTEK BUBBLER SYSTEM

Thank you for your purchase of this Trailing Suction Hopper Dredge (TSHD) System. Every effort has been made to ensure this system is ready for installation directly from the case in which it has been shipped to you. All components have been bench tested for complete functionality of the system. It is our desire to provide you with the best system possible and to fully support all aspects of your new HYPACK TSHD System.

The purpose of this manual is to guide you in the installation of the DREDGEPACK® system for Trailing Suction Hopper Dredges using the Entek bubbler system. Due to the complexity of the installation, please follow the steps described in this guide. If you have questions, please contact HYPACK Technical Support at help@hypack.com or +1 (860) 635-1500.

The installation of all equipment is the sole responsibility of the client or the reseller. HYPACK personnel may recommend device placement for the best configuration, but it is up to the installer to make sure that the sensors and interface boxes are set up in a safe and effective manner.

Best Regards,
The HYPACK Technical Support Team
help@hypack.com
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TABLE OF CONTENTS

- I. Safety Precautions
- II. Equipment Overview
- III. Installation Instructions
 - A. Dual Antenna GNSS Receiver
 - B. Entek Bubbler System
 - C. Ultrasonic Sensors
 - D. Interface Boxes
 - E. Cables
- IV. Maintenance and Care
- V. FAQ

Revision History

DATE	REVISION	CHANGE DESCRIPTION
August-06-2024	N/A	Initial release
May 28, 2025	A	Added Minimum Installation Required Checklist

Minimum Installation Required Checklist

Use this checklist to ensure your equipment has been installed prior to the arrival of the HYPACK On-site Support Technician to help maximize the time available for interfacing, calibration, and training.

Hopper Dredges with Entek Bubbler - Minimum Installation Required:

NOTE: The HYPACK On-site Support Technician will be in charge of the final connection of the cables.

- ☐ GNSS antennas welded on top of the bridge in accordance with the installation manual.
- ☐ GNSS cables run properly inside the bridge with proper cable pass through or isolation.
- ☐ Welded plates for the rotation sensor in accordance with the installation manual (Optional).
- ☐ Installation of pipes or hoses from the Entek bubbler box to the measuring point.
- ☐ Installation of the compressed air to the Entek bubbler box.
- ☐ Installation of an additional dehumidifier for protecting the pressure sensors.
- ☐ Installation of main pressure control valve.
- ☐ Installation of external pipes for measuring the draft or special valve in the hull.
- ☐ Installation of the main interface box.
- ☐ Power supply for the main interface box.
- ☐ Network cable runs from the main interface box to the bridge.
- ☐ Video cables connect the monitors to the computer.
- ☐ Power supply ready for connecting the GNSS and computer.

Sonar Systems - Minimum Installation Required:

- ☐ Transducer Installation:
 - Sonar system installed (single beam, multibeam, sub-bottom, side scan, magnetometer).
 - Installed locations: Sea chest, moon pool, side/bow mount, towed.
 - Ensure proper cable routing.
- ☐ Positioning Device Installation:
 - GPS or inertial system installed.
 - Antennas and IMU mounted securely.
 - Ensure proper cable routing.
- ☐ Motion and Heading Device Installation:
 - MRU, IMU, or AHRS installed.
 - Antennas and motion device mounted securely.
 - Ensure proper cable routing.
- ☐ LiDAR Installation:
 - Mounting bracket securely installed.
 - Ensure proper cable routing.
- ☐ Offsets Measured: Pre-measure offsets from the Boat Reference Point, if possible.
- ☐ Photo Documentation: If assistance is needed, please provide pictures taken inside and outside of the boat so we can provide our recommendations prior to arrival.

I. Safety Precautions

General Safety Precautions:

- Conduct a thorough risk assessment before starting the installation.
- Ensure that all personnel involved are properly trained in handling equipment and working at heights.
- Use appropriate personal protective equipment (PPE) such as helmets, gloves, safety goggles, and harnesses.
- Communicate clearly with all team members about their roles, the potential hazards, and the safety protocols to be followed.

Working at Heights:

- Use appropriate fall protection equipment such as safety harnesses, lanyards, and anchor points.

Running Cables:

- Plan cable routes to avoid trip hazards.
- Use cable trays, conduits, or cable ties to secure and organize cables.
- Ensure that cables are properly labeled for easy identification and maintenance in the future.
- Follow electrical safety standards and regulations when working with power cables.

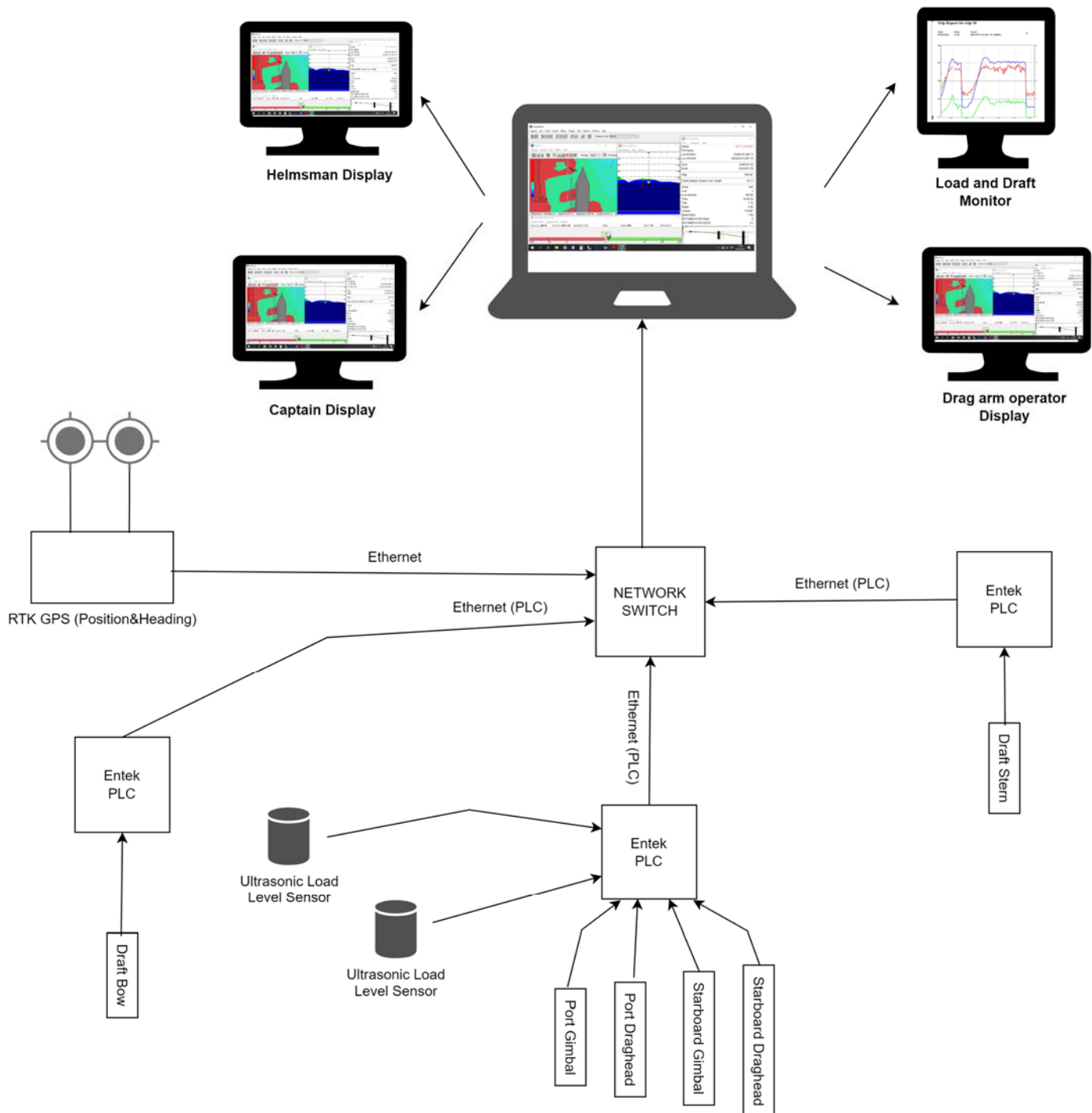
Welding Metal Plates:

- Provide proper ventilation in the welding area to prevent exposure to fumes and gases. Use welding screens or curtains to shield nearby workers from the welding arc.
- Train personnel in safe welding practices and the proper use of welding equipment.
- Inspect all ladders, scaffolds, and elevated work platforms before use.
- Secure tools and materials to prevent them from falling and causing injuries to workers below.

II. Equipment Overview

Each DREDGEPACK® system for trailing suction hopper dredges (TSHD) is individually designed to fit the customer's needs. The following sensors are required for the correct operation of the TSHD System with DREDGE-PACK®. There are some optional sensors presented that are needed only in special cases. When you receive your equipment, please verify it is complete. If you have any questions, please let us know.

The following diagram illustrates the most common setup for this system:



A. Dual Antenna GNSS Receiver: This device is used to determine the position and heading of the dredge. The main antenna is used to calculate positions and elevations (RTK tides). The receiver uses the secondary antenna to calculate the dredge heading. This solution includes two antennas, the GNSS receiver, and the cables.



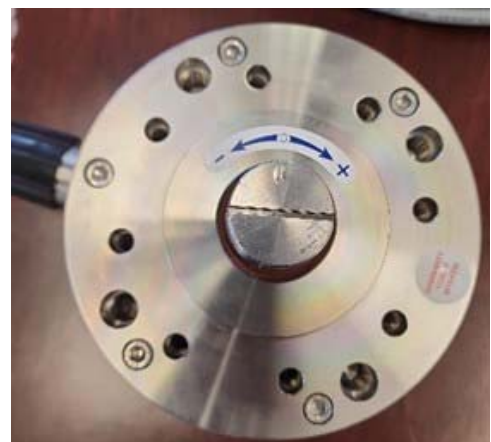
B. Entek Bubbler System: The air bubbler depth gauge is designed to provide accurate depth measurements without the need for costly sensors to be located underwater. This drastically increases sensor life and reduces maintenance requirements. The box includes a power adapter, but additional parts are required for the installation.



C. Ultrasonic Sensors: These sensors are used to determine the amount of material in the hopper. Two are included with the system.



D. Arm Swing Sensors (Optional): Additional swing sensors can be installed on each arm to control the position of the drag head and protect the arm from excessive stress during operation.



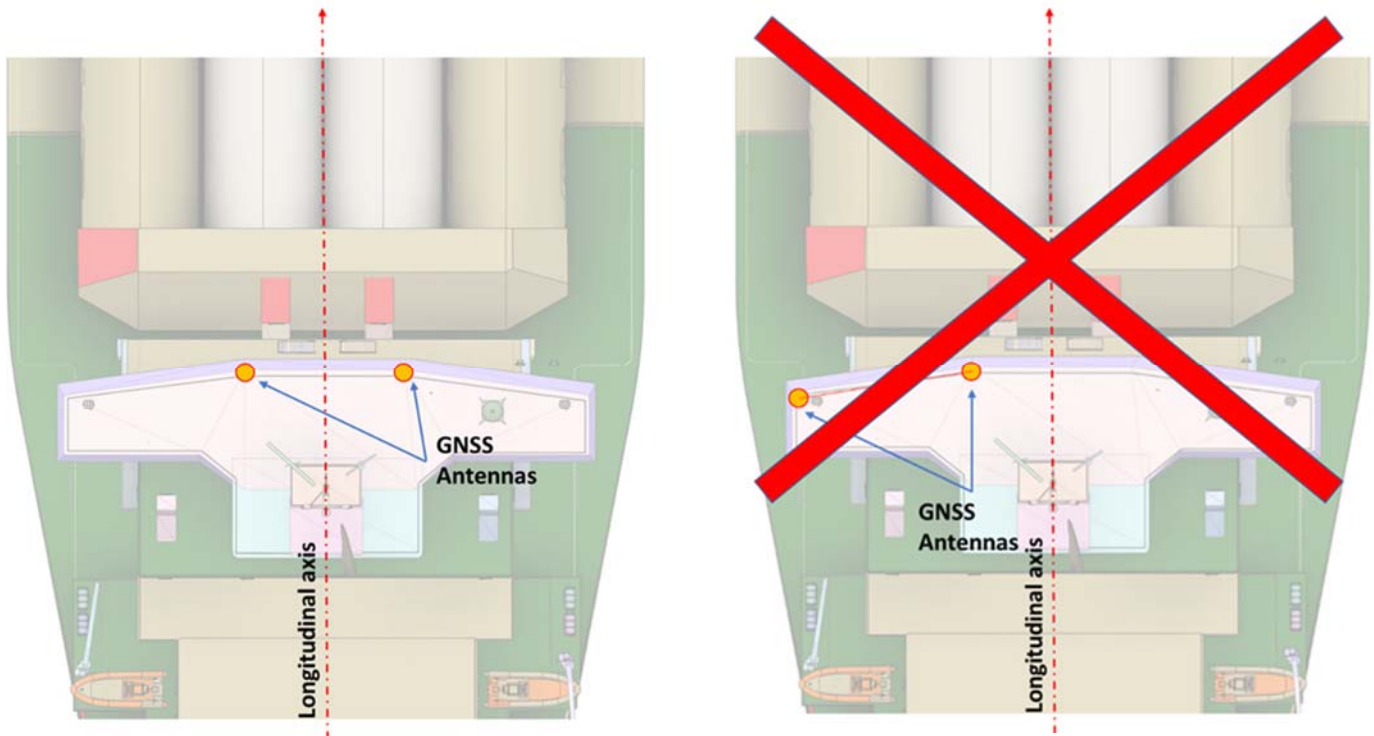
III. Installation Instructions

A. Dual Antenna GNSS Receiver

DREDGEPACK® requires dredge position and heading. The best method to obtain this data is to use a dual antenna GNSS receiver.

- Dredge Position: The main antenna can be used for calculating the position and elevation of the dredge. For increased performance, the GNSS receiver can be upgraded to have low uncertainty using RTK (Real Time Kinematic) calculations and should be combined with a source of corrections (RTCM or CMR). Necessary antennas, cables and interfaces are included in the package. We can also provide a radio modem and RTK base station upon request.
- Dredge Heading: We offer a GNSS receiver that can calculate the heading using the secondary antenna.

For better satellite coverage, we recommend installing the GNSS antennas on top of the bridge free of obstacles. To avoid measuring complicated offsets, install the antennas perpendicular to the longitudinal axis of the dredge, as shown in the following images. We suggest installing them equidistant to the longitudinal axis of the dredge.



WARNING: WHEN INSTALLING THE ANTENNAS, AVOID PLACING THEM ARBITRARILY. THAT WOULD REQUIRE ADDITIONAL MEASUREMENTS AND CALCULATIONS TO OBTAIN THE YAW OFFSET.

The antennas require a 5/8-11 UNC bolt or threaded rod.

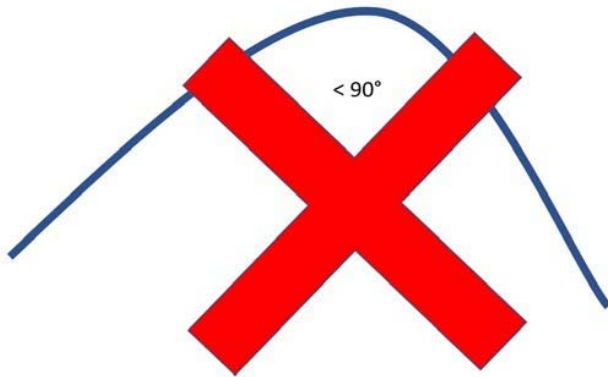
WARNING: DO NOT WELD THE SCREW WITH THE ANTENNAS SCREWED IN. THIS COULD CAUSE SERIOUS DAMAGE TO THE ANTENNA.



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Either antenna can be assigned as the main antenna. It is important to identify the cable of the main antenna because it must be connected to Port 1 of the GNSS receiver. You will need to run the cables inside the bridge. The installation could last longer if a proper pass through and insulation is installed before running the antennas to the bridge.

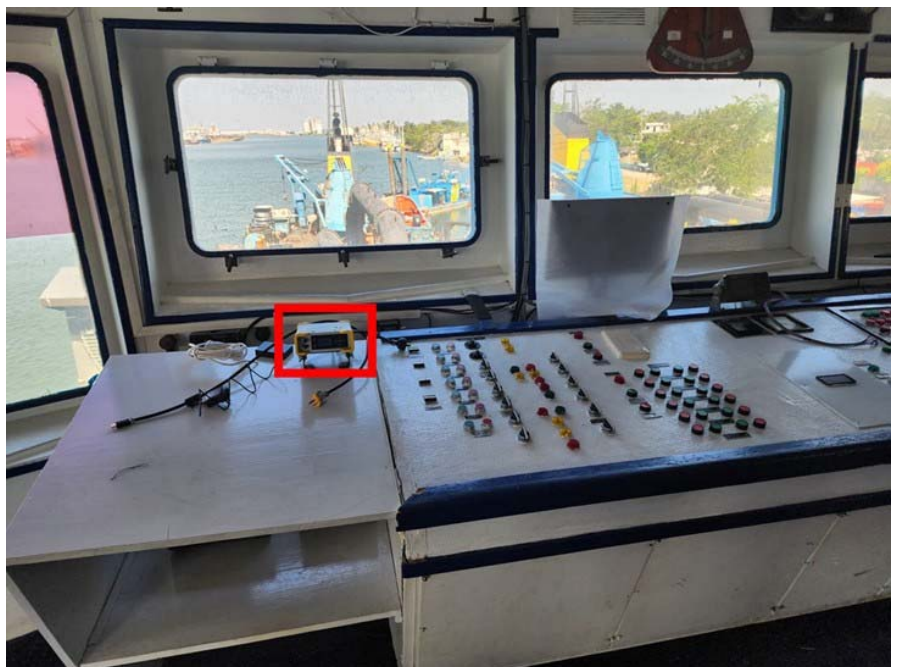


WARNING: AVOID BENDING THE ANTENNA CABLES MORE THAN 90 DEGREES DURING INSTALLATION. THIS COULD BREAK THE INTERNAL CORES IN THE CABLE.

The GNSS receiver can be placed anywhere in the bridge because the connection to the computer uses a network cable (UTP CAT5E or CAT6). We recommend placing the GNSS receiver as close as possible to the PC.

The GNSS receiver, bubblers system, and computer come with a power adapter that converts AC voltage to DC voltage. It is necessary to have an outlet that delivers 110VAC~120VAC or 220VAC~240VAC. Additionally, we recommend installing a UPS (universal power supply) to prevent damage to the equipment.

It is beneficial to identify a place on the bridge to house the computer and receiver before the installation to avoid moving the equipment in the future. In some cases, a stand for the PC is necessary to provide a better view for the operator.

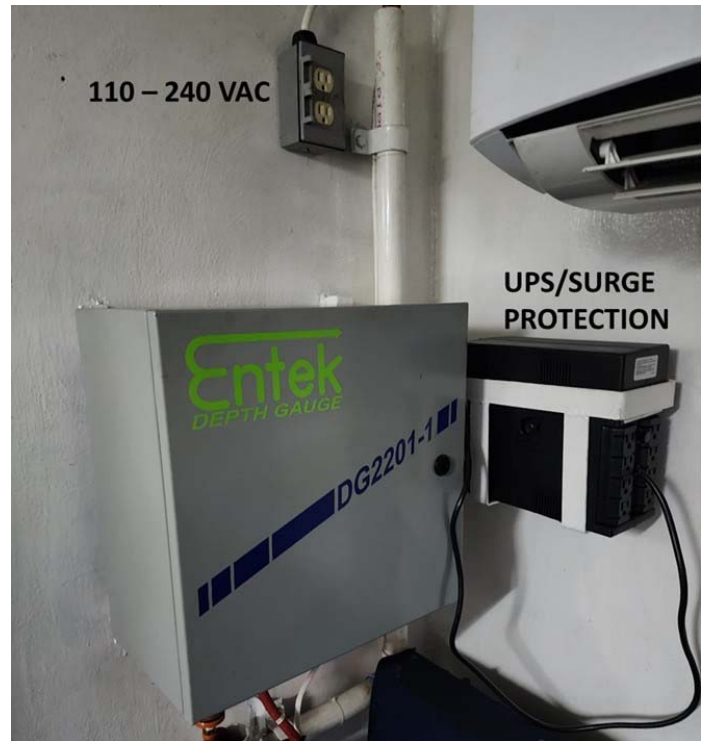


B. Entek Bubbler System

Bubbler System Box

The bubbler system boxes should either be installed close to the bridge or close to the measuring points. Depending on the dredge specifications, one or several bubbler boxes can be provided to optimize the installation, maximize performance, and improve ease of maintenance. We normally provide 1-channel boxes to be installed as close as possible to the bow or stern draft measuring point. All components are housed in a NEMA 4 rated enclosure and include a convenient purge function for each channel.

The bubbler system box has a power adapter that transforms from AC voltage to DC voltage. It is necessary to have an outlet that delivers 110VAC – 240 VAC. It is suggested to install a UPS (universal power supply) and surge protection to avoid damage when the dredge changes the main power supply. The integrated electronic control unit (ECU) can communicate with DREDGEPACK® via serial or Ethernet connection.



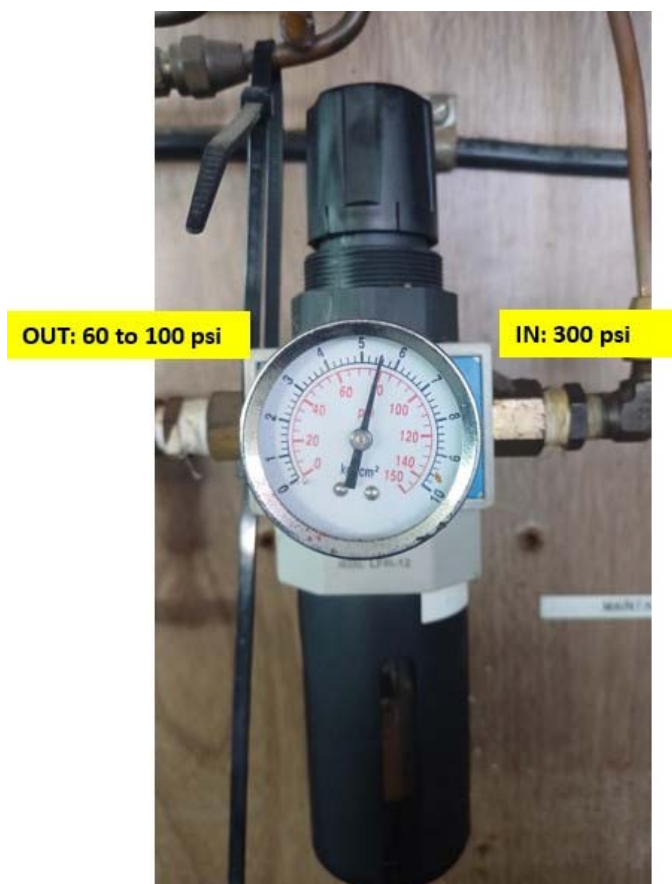
Air Supply & Pressure Regulation

Each bubbler system box needs a constant feed of air supply. The system requires less than 1 CFM. The required pressure for operating the system properly is within 60 psi to 150 psi.

WARNING: DO NOT EXCEED 150 PSI. HIGHER PRESSURES COULD DAMAGE THE SENSORS AND INTERNAL CONNECTIONS.

For controlling the pressure that goes to the box, it is necessary to install a special valve that can maintain the pressure delivered. This valve connects to the main system. Normally, the main system has a high pressure that can be 300 psi, 400 psi, or more. This valve will reduce the pressure to a range of 60 to 100 psi.

Pictured is an example of a pressure regulator installed before the bubbler system.



Air Lines

For the air in and air out lines, you can use flexible or fixed lines made of copper or hoses made from different materials. The most important part when selecting the air lines is to make sure they are suitable for the working pressure (60 to 150 psi) and that they are resistant to the environmental conditions. An air hose may be viable at diameters of 1/8, 1/4, or 3/8 of an inch.

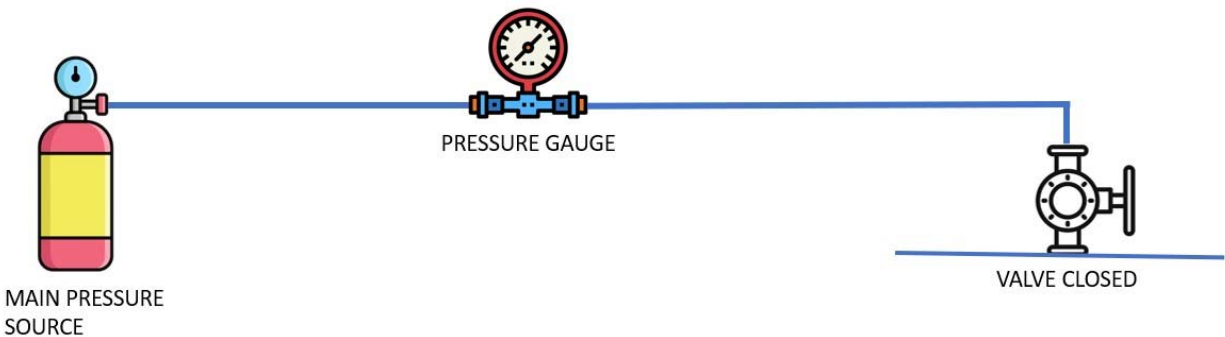
WARNING: IT IS CRITICAL TO CHECK FOR LEAKS IN THE AIR OUT LINES. ANY LEAKS WILL AFFECT THE SYSTEM'S PERFORMANCE.

A leak test can be performed for each channel by using compressed air that exceeds the normal operating pressure. Since each channel operates at 50 psi, the leak test needs to be performed at 150 psi at minimum to identify leaks.

- Leak test for draft channels: Normally the draft channels are connected to a valve in the keel.

To perform a leak test:

- (1) Close the valve.
- (2) Install a pressure gauge to check the pressure drop.
- (3) Apply 150 psi to the line.
- (4) Close the main pressure source.
- (5) Wait 20 minutes and check if the pressure dropped from the initial value.



- Leak test for arm channels: The arm channels are not connected to a valve.

To perform a leak test:

- (1) Install a pressure gauge at the end of the channel.
- (2) Apply 150 psi to the line.
- (3) Close the main pressure source.
- (4) Wait 20 minutes and check if the pressure dropped from the initial value.



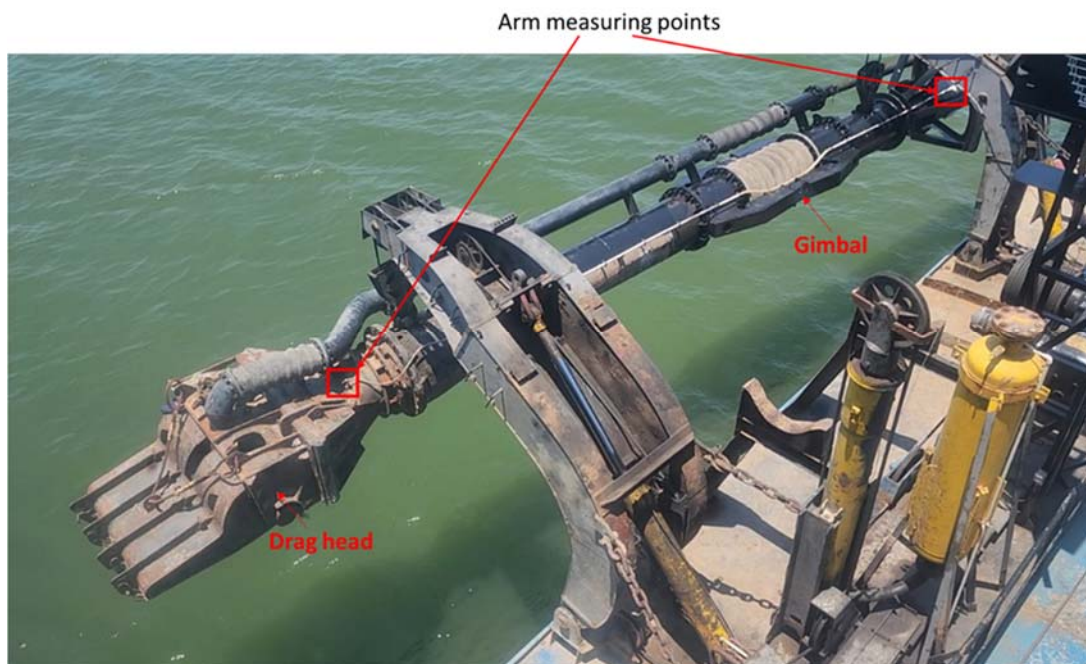
Air Dehumidifier

The bubbler box has an internal dehumidifier that protects the sensors from damage due to moisture or particulates. For further protection, it is recommended to install an additional dehumidifier external to the box.

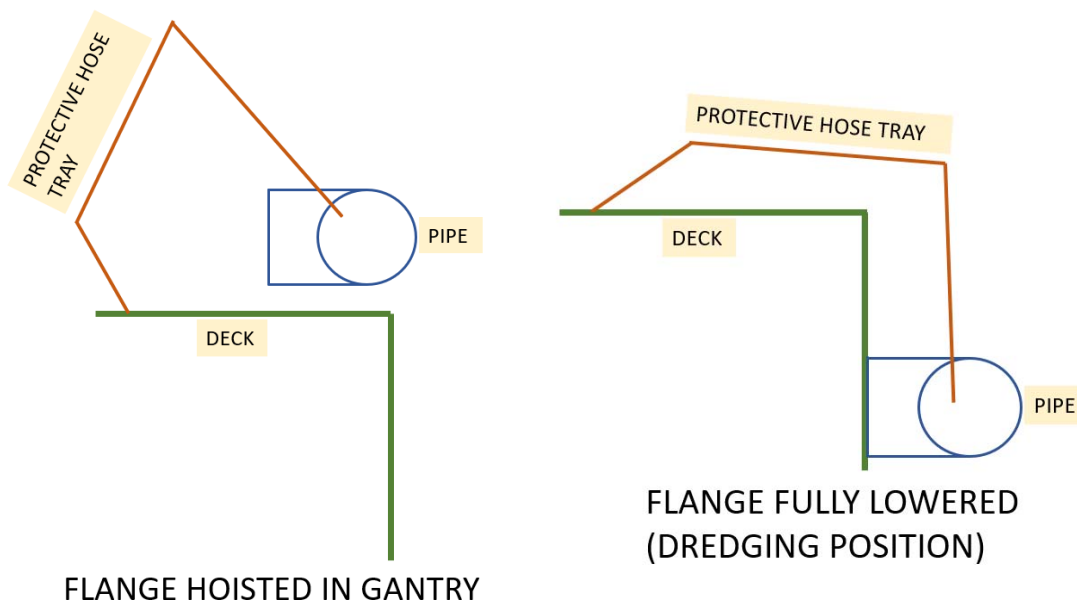
Depth Measuring Points

The bubbler system uses air pressure at certain measuring points to determine the draft and the depth of the arms.

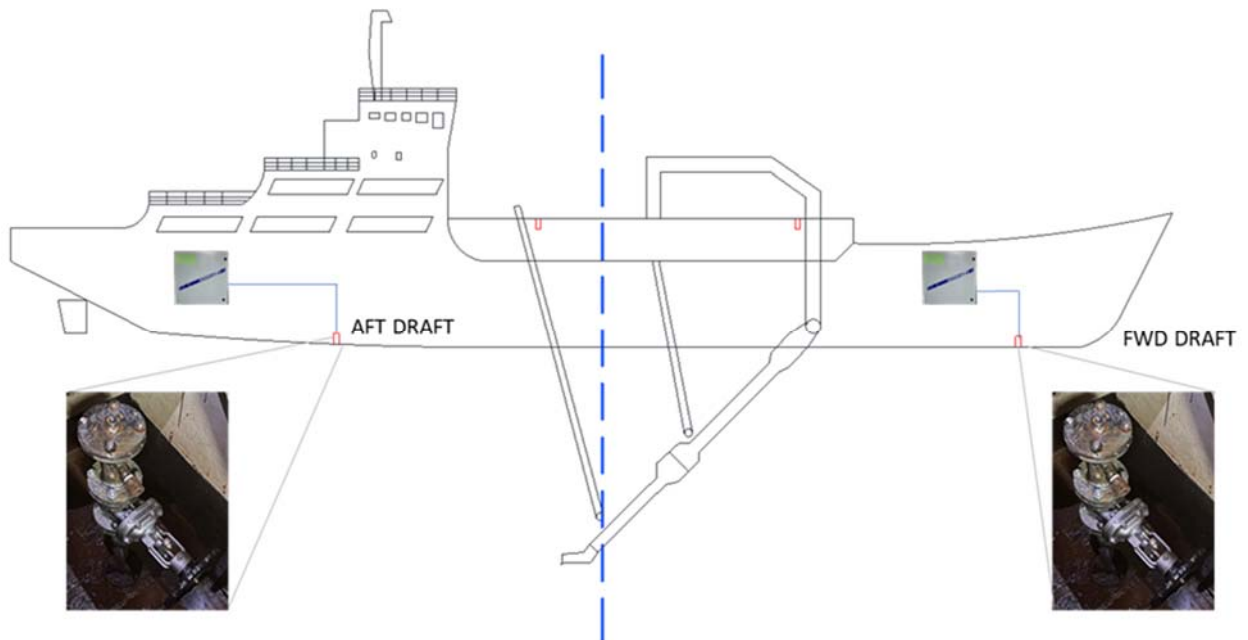
- Arms: For each arm, it is necessary to install a hose from one of the channels to a point near the gimbal, and another hose to a point near the drag head.



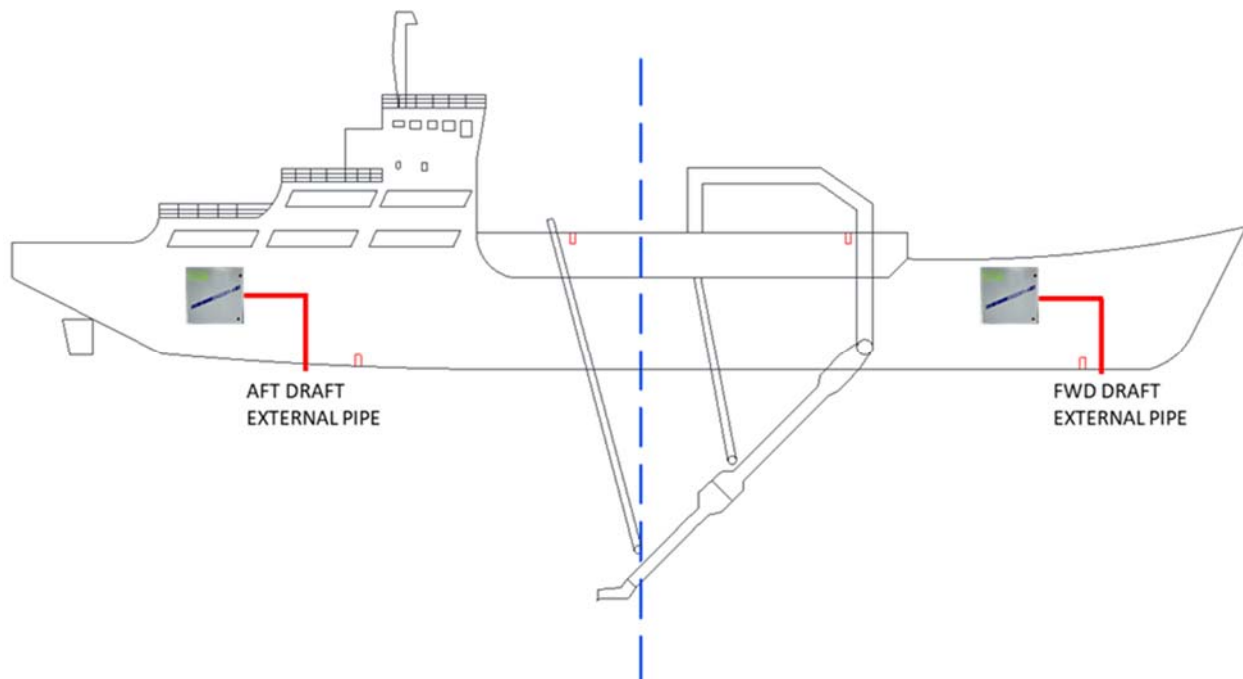
When possible, run the air lines through the elbow or the structures that hold the arm. This will protect the air lines from potential damage. When this is not possible, it is necessary to add a retractable, protective hose tray.



- Draft: One of the options for getting the draft measurement is installing special valves on the hull which allow air to flow from the bubbler box to the measuring point.



If the dredge doesn't have a special valve installed on the keel, the draft measuring point can be installed using an external pipe that can be run on the hull. To ensure correct readings, it is required that the end of the air line is always submerged.

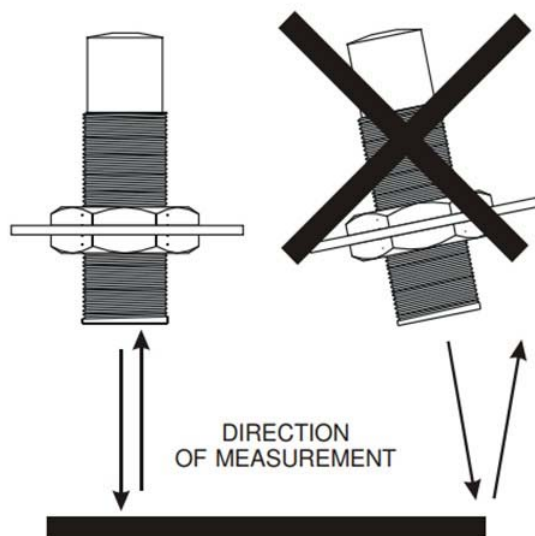


C. Ultrasonic Sensors

To best measure the material in the hopper, there must be one sensor installed forward, and one aft. It is recommended that they be installed opposite each other, aligned with the dredge's longitudinal axis. Avoid installing them both on the same side of that axis, as that will result in incorrect volume calculations.



Mount the sensors at least 20cm (8 in) away from the inner walls of the hopper. They should be installed perpendicular to the target surface. These sensors have a 12 degree beam.



D. Interface Boxes

The interface boxes connect to the switch via ethernet. They can be installed a maximum of 300ft (100m) from the switch, as performance degrades with longer cables. Since a dredge is a noisy environment, it is best to use a shielded UTP cable that protects the internal pairs from electromagnetic interference. To increase the reliability of the connection, it is recommended to use a UTP cable rated for outdoor use.

E. Cables

For this system it is necessary to run two cables, one per ultrasonic sensor, to the Entek Bubbler System Box. The cable can be 24 - 26 AWG. Each cable needs to have three cores: Two for power and one for sending the 4–20 mA signal.

Shielded cables are preferred to protect the signals from any interference. A dredge is a noisy environment and the signals need to travel long distances, making shielded cables an important part of ensuring signal quality.

IV. Maintenance and Care

- Regular cleaning: Wipe down the GNSS receiver, cables, and antennas with a soft, dry cloth to remove dust, dirt, and debris. This can help prevent damage and ensure proper functionality.
- Cable inspection: Check the cables for any signs of wear, fraying, or damage. Replace any damaged cables to prevent signal loss or data errors.
- Line inspection: Check each of the channels and the main pressure line to identify leaks that affect proper system performance.
- Antenna alignment: Periodically check the alignment of the GPS antennas to ensure they are oriented correctly for optimal signal reception.
- Environmental protection: Protect the GPS receiver, cables, and antennas from extreme temperatures, moisture, and physical impact to prevent damage.
- Performance testing: Periodically test the GPS receiver to ensure it provides accurate positioning and navigation data.

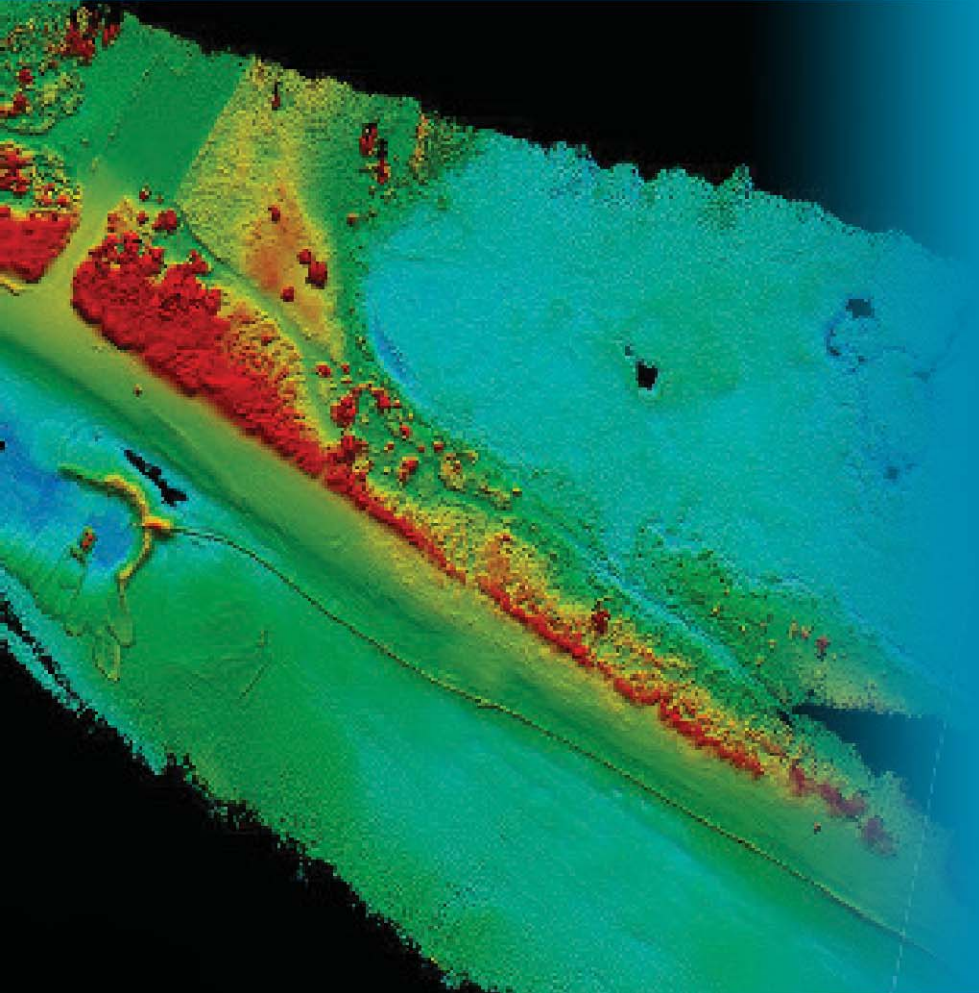
V. FAQ

Q: Does the user need to open the boxes when they are delivered?

A: Yes. Verify that all the equipment was received by checking if everything requested is included in the box. We also recommend carefully putting all accessories and cables back in the box to avoid any issues during the installation and integration procedures.

Q: Can the installer call support for additional instructions?

A: Yes. HYPACK can provide additional details in order to perform the best installation possible. Call +1 (860) 635 - 1500 or send an email to help@hypack.com.



Why Choose HYPACK

- Simple and intuitive to use
- Industry-leading software solutions
- Interfaces with a variety of sensors
- Unparalleled technical support

HYPACK – A Xylem brand has been a world leader in software development for the hydrographic and dredging industry since 1984. Our software is one of the most widely used hydrographic software packages in the world, with more than 10,000 users in over 140 countries.

Our commitment to the industry, and partnership with manufacturers, allows us to provide a solution for all your surveying needs; from a simple area to the most complex project, our software solution can help.

Our suite of software packages will provide you the tools needed to design your survey or dredging operation, collect your data, apply corrections to soundings, remove outliers and invalid points, plot field sheets, and export data to CAD. It also allows you to compute volume quantities, generate contours, create side-scan mosaics and create/update electronic charts. Our hundreds of sensor inputs provide the connection for positioning GNSS and inertial systems, single beam and multibeam echosounders, side scan and sub-bottom sonars, magnetometers, velocity sensors, and more. Whether you are collecting hydrographic survey data, environmental data, or just positioning your vessel in an engineering project, the software will provide the tools needed.

Our mission is not just to provide the tools needed for surveying applications, but to educate and train folks that need to do survey work.



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