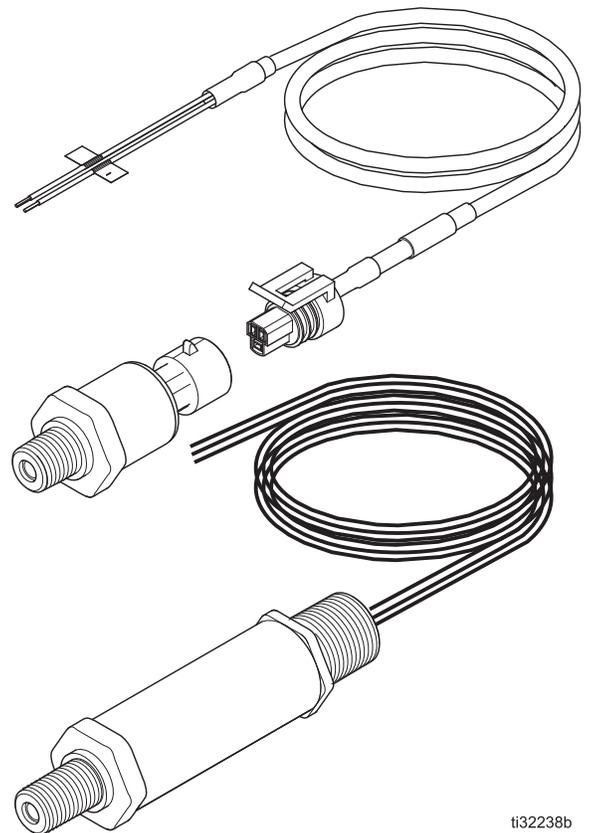Instructions

Tank Level Monitoring Kit

3A5375C

EN

For monitoring the volume of liquids in chemical tanks used with the Harrier+ Controller (Series B or higher) and Graco chemical injection systems. For professional use only.

See page 2 for model information.

Important Safety Instructions
Read all warnings and instructions in this manual and in your Harrier+ Controller and Control Box manuals. Save all instructions.

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Contents

Related Manuals

Manual No.	Description
3A4130	Harrier+ Chemical Injection Controller, Instructions
3A4747	Chemical Injection System Solar Control Box, Instruction-Parts
3A5187	Chemical Injection AC Control Box, Instruction-Parts

Models

Part No.	Description
B32771	Tank Level Monitor
B32873	Hazardous Location Tank Level Monitor

Warnings

The following warnings are for the setup, use, grounding, maintenance, and repair of this equipment. The exclamation point symbol alerts you to a general warning and the hazard symbols refer to procedure-specific risks. When these symbols appear in the body of this manual or on warning labels, refer back to these Warnings. Product-specific hazard symbols and warnings not covered in this section may appear throughout the body of this manual where applicable.

⚠ **WARNING**	
	FIRE AND EXPLOSION HAZARD When flammable fluids are present in the work area, such as gasoline and windshield wiper fluid, be aware that flammable fumes can ignite or explode. To help prevent fire and explosion: • Use equipment only in well-ventilated area. • Eliminate all ignition sources, such as cigarettes and portable electric lamps. • Ground all equipment in the work area. • Keep work area free of debris, including rags and spilled or open containers of solvent and gasoline. • Do not plug or unplug power cords or turn lights on or off when flammable fumes are present. • Use only grounded hoses. • **Stop operation immediately** if static sparking occurs or you feel a shock. Do not use equipment until you identify and correct the problem. • Keep a working fire extinguisher in the work area.
	ELECTRIC SHOCK HAZARD This equipment must be grounded. Improper grounding, setup, or usage of the system can cause electric shock. • Turn off and disconnect power at main switch before disconnecting any cables and before servicing or installing equipment. • Connect only to grounded power source. • All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.
	EQUIPMENT MISUSE HAZARD Misuse can cause death or serious injury. • Do not operate the unit when fatigued or under the influence of drugs or alcohol. • Do not exceed the maximum working pressure or temperature rating of the lowest rated system component. See **Technical Specifications** in all equipment manuals. • Use fluids and solvents that are compatible with equipment wetted parts. See **Technical Specifications** in all equipment manuals. Read fluid and solvent manufacturer's warnings. For complete information about your material, request Safety Data Sheet (SDS) from distributor or retailer. • Turn off all equipment and follow the **Pressure Relief Procedure** when equipment is not in use. • Check equipment regularly. Repair or replace worn or damaged parts immediately with genuine manufacturer's replacement parts only. • Do not alter or modify equipment. Alterations or modifications may void agency approvals and create safety hazards. • Make sure all equipment is rated and approved for the environment in which you are using it. • Use equipment only for its intended purpose. Call your distributor for information. • Route hoses and cables away from traffic areas, sharp edges, moving parts, and hot surfaces. • Keep children and animals away from work area. • Comply with all applicable safety regulations.

⚠ **WARNING**

	PERSONAL PROTECTIVE EQUIPMENT
	Wear appropriate protective equipment when in the work area to help prevent serious injury, including eye injury, hearing loss, inhalation of toxic fumes, and burns. Protective equipment includes but is not limited to:
	• Protective eyewear, and hearing protection.
	• Respirators, protective clothing, and gloves as recommended by the fluid and solvent manufacturer.

Installation

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All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.

NOTICE

Fluids may expand when frozen and push against the sensor's pressure port. To avoid overpressure damage when the tank level monitor is not in use or with power applied to it, the sensor should mounted or stored in a vertical position with the electrical connection pointing upward.

Grounding

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The equipment must be grounded to reduce the risk of static sparking and electric shock. Electric or static sparking can cause fumes to ignite or explode. Improper grounding can cause electric shock. Grounding provides an escape wire for the electric current.

Sensor: ground through the tank manifold.

Tank manifold: grounded through electrically conductive lines.

Fluid supply tank: follow local code.

Attach Tank Level Sensor Wires to Harrier+ Controller

1. Disconnect power to the control box. Refer to your control box manual listed in **Related Manuals** on page 2.

2. Remove the plug from one of the unused holes in the control box. A watertight cord grip is included for a 1/2 in. npt knockout.

3. Route the wires through the hole and to the DIN rail terminal block.

4. Connect the wires to the DIN rail terminal block, using the following table for identification and placement of the wires. Refer to your control box manual for terminal block location and wiring.

Terminal	Label
21	TLM (Tank Level Monitor) Power (+)
22	TLM (Tank Level Monitor) Signal (-)

NOTE: for applications requiring hazardous location ratings, the sensor will come with 3-40 inch wire leads Red = Power (+), Black = signal (-),white = not used

Color	Meaning	Symbol
Red	Power	+
Black	Signal	-
White	Not Used	

Connectors are to be supplied by the customer. The sensor includes a 1/2 in. npt(m) threaded conduit connection. Wiring on a hazardous location sensor must take place after the sensor is attached to the tank.

Attach Tank Level Sensor to Tank Manifold

1. Close the valve leading from the tank to prevent the flow of fluid to the tank manifold (3).

2. Apply sealing tape, or an equivalent sealant, to the threads of the sensor (1).

3. Attach the 1/4 in. npt (m) sensor (1) to an unused 1/4 in. npt (f) port on the tank manifold (3).

NOTE: The sensor (1) should be at or below the tank outlet, and the top of the sensor (1) must be above the bottom of the tank for vertical and horizontal tanks. See **Tank Selection Screen** on page 7. Custom tanks may have the sensor (1) below the bottom of the tank.


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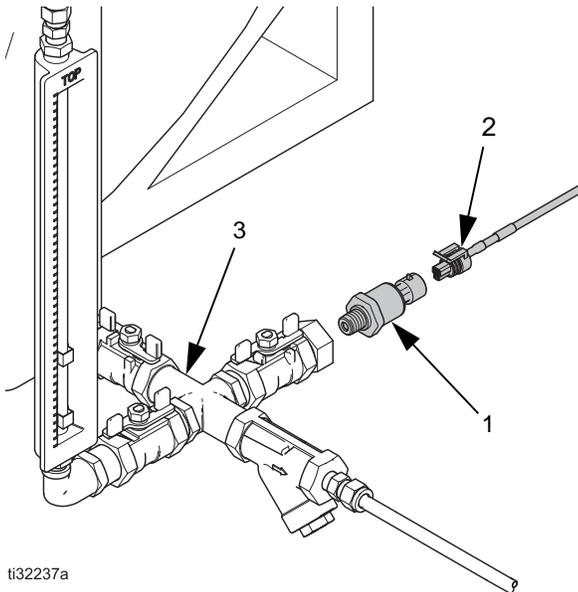
FIG. 1: Attach tank level sensor to tank manifold

4. Use a wrench on the hex shoulder to tighten the sensor (1). DO NOT use a pipe wrench on the sensor's housing.

5. Plug the wiring harness (2) into the sensor (1) (for ordinary location sensor only).

6. Reconnect power to the control box.

7. Open the valve from the tank to the tank manifold (3).

8. Continue to **Harrier+ Setup** on page 7.

Sensor Orientation and Measurement Location

The sensor (1) can be oriented either horizontally or vertically. However, the orientation is important to consider during the **Harrier+ Setup** on page 7.

If the sensor (1) is horizontal, measurements are from the top of the sensor (1).

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Measure from top of sensor here
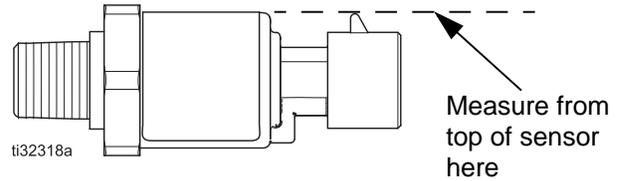
FIG. 2: Horizontal measurement location

If the sensor (1) is vertical, measurements are from about a 1/4 in. above the hex shoulder.

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0.25 in.

Measure from here

Hex shoulder
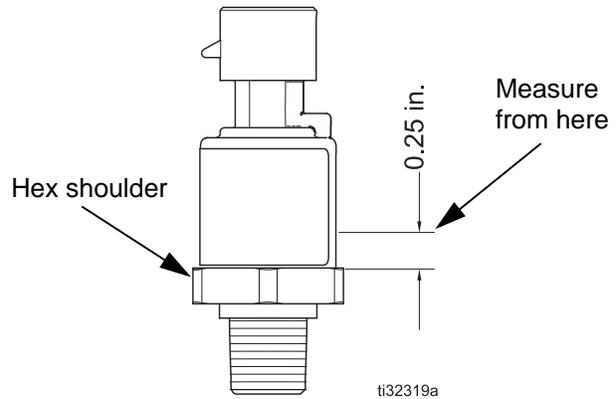
FIG. 3: Vertical measurement location

Harrier+ Setup

Soft Key Message

| NOTICE |
| --- |
| To prevent damage to soft key buttons, do not press the buttons with sharp objects such as pens, plastic cards, or fingernails. |

Tank Selection Screen

NOTE: The tank should have a minimum fluid height of 15 in. for the most accurate setup.

1. Power on the Harrier+ controller (Series B or higher). Refer to the Harrier+ controller manual listed in **Related Manuals** on page 2.

2. Wait 3 minutes before proceeding.

NOTE: The sensor needs full fluid pressure on it for at least 3 minutes after power is applied to the sensor.

3. Press and hold the Enter key for 3 seconds to access the Configuration screen.

4. Use the Up/Down arrows to move the cursor to highlight TANK LEVEL and press Enter to display the Tank Selection screen.

Vertical Tank Settings
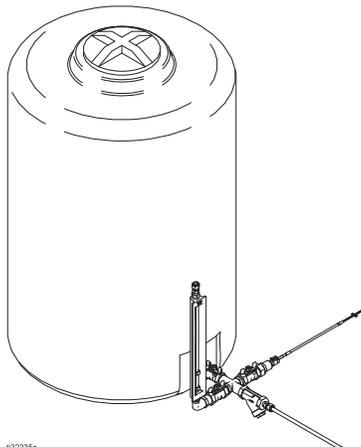
FIG. 4: Vertical Tank Configuration

Vertical tanks are any vertically-oriented cylinders, with a maximum height of 11.5 ft. (3.5 m) and the sensor above the bottom of the tank.

NOTE: Volume is entered as gallons or liters, depending on the Harrier+ controller setup.

1. On the Tank Selection screen, press Enter to display a list of tank options.

FIG. 5

2. Use the Up/Down arrows to highlight VERTICAL and press Enter to display the Vertical Tank Settings screen.

3. Highlight the MAXIMUM VOLUME field, press Enter, and use the arrow keys to highlight and select values for each digit of the maximum tank volume. Press Enter to save the maximum volume setting.
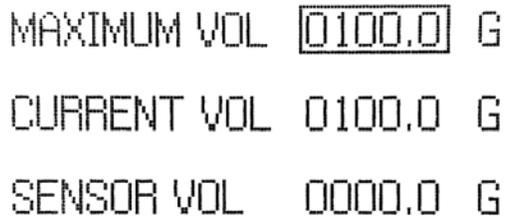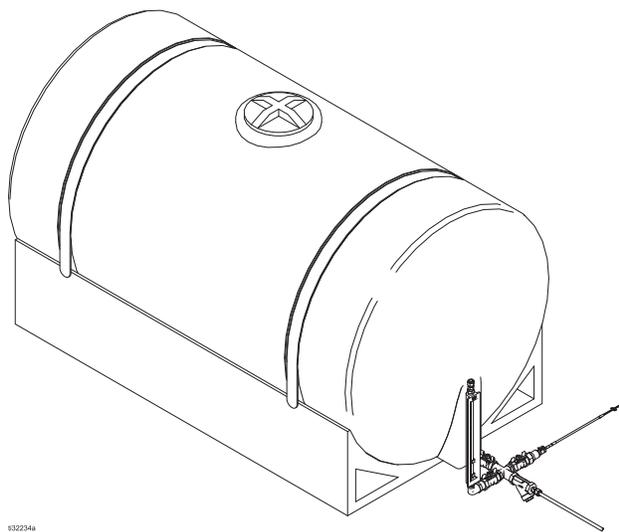

FIG. 6

NOTE: Maximum volume cannot exceed 9999.9 gallons (37849.6 liters)

4. Highlight the CURRENT VOLUME field, press Enter, and use the arrow keys to highlight and select values for each digit of the current liquid volume in the tank. Press Enter to save the current volume setting.

5. Highlight the SENSOR VOLUME field, press Enter, and use the arrow keys to highlight and select values for each digit of the volume measured from the sensor. (See **Sensor Orientation and Measurement Location** on page 6.) Press Enter to save the sensor volume setting.

6. Press Reset to return to the Tank Selection screen.
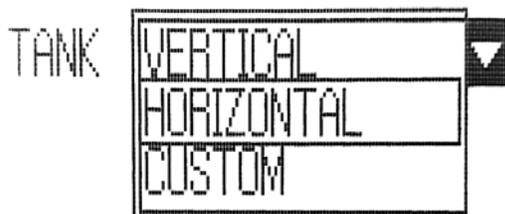
Horizontal Tank Settings

FIG. 7: Horizontal Tank Configuration

Horizontal tanks are any horizontally-oriented cylinders with the sensor above the bottom of the tank.

NOTE: Volume is entered as gallons or liters, depending on the Harrier+ controller setup.

1. On the Tank Selection screen, press Enter to display a list of tank options.

FIG. 8

2. Use the Up/Down arrows to highlight HORIZONTAL and press Enter to display the Horizontal Tank Settings screen.

3. Highlight the MAXIMUM VOLUME field, press Enter, and use the arrow keys to highlight and select values for each digit of the maximum tank volume. Press Enter to save the maximum volume setting.
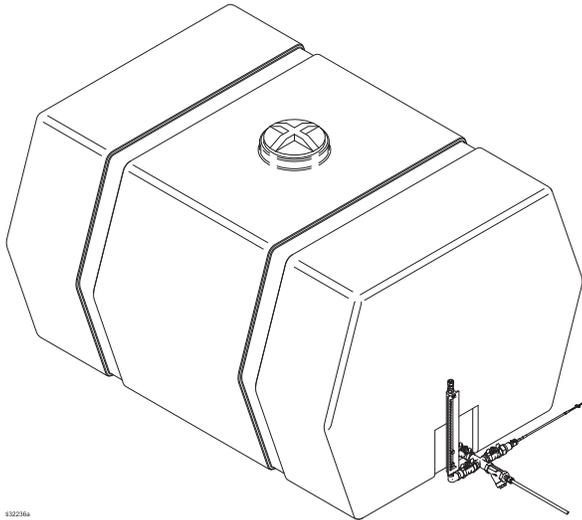

FIG. 9

NOTE: Maximum volume cannot exceed 9999.9 gallons (37849.6 liters)

4. Highlight the CURRENT VOLUME field, press Enter, and use the arrow keys to highlight and select values for each digit of the current liquid volume in the tank. Press Enter to save the current volume setting.

5. Highlight the SENSOR VOLUME field, press Enter, and use the arrow keys to highlight and select values for each digit of the volume measured from the sensor. (See **Sensor Orientation and Measurement Location** on page 6.) Press Enter to save the sensor volume setting.

6. Press Reset to return to the Tank Selection screen.

Custom Tank Settings

FIG. 10: Custom Tank Configuration

Custom tanks are any shape, with the sensor either above or below the bottom of the tank.

NOTE: Height is entered as inches or centimeters from the bottom of the tank (C). (See **Example of Custom Tank Configuration** on page 11.) Volume is entered as gallons or liters, depending on the Harrier+ controller setup.

1. On the Tank Selection screen, press Enter to display a list of tank options.

FIG. 11

2. Use the Up/Down arrows to highlight CUSTOM and press Enter to display the Custom Tank Settings screen.

3. Highlight the CURRENT HEIGHT field, press Enter, and use the arrow keys to highlight and select values for each digit of the current height (A) of liquid in the tank. (See **Example of Custom Tank Configu-**

ration on page 11.) Press Enter to save the current height setting.

FIG. 12

4. Highlight the SENSOR HEIGHT field, press Enter, and use the arrow keys to highlight and select values for each digit of height from the sensor (B) to the bottom of the tank. (See **Sensor Orientation and Measurement Location** on page 6 and **Example of Custom Tank Configuration** on page 11.) Press Enter to save the current volume setting.

5. Highlight the SENSOR LOCATION field, press Enter, and select ABOVE or BELOW, indicating the sensor's location relative to the bottom of the tank (See **Interpreting Tank Levels**, on page 11)

6. Highlight the first field in the first row of the VOL/LVL table

FIG. 13

NOTE: Maximum volume cannot exceed 9999.9 gallons (37849.6 liters)

a. Use the arrow keys to highlight and select values for each digit in the first volume measurement. Press Enter to save the volume value.

b. Use the arrow keys to highlight the second field in the first row, and use the keys to highlight and select each digit in the height (or level) of the first volume measurement. Press Enter to save the level value.

7. Repeat Step 6 for volume/level pair for the tank. The more pairs entered, the greater the accuracy of the tank level monitor.

8. Press Reset to return to the Tank Selection screen.

NOTE: to clear an entry in the table enter 9999.9 and press enter.

FIG. 14

Interpreting Tank Levels

To accurately interpret tank level from the pressure measured by the sensor, enter a number of data points correlating volume to a corresponding height above the bottom of the tank (C).

A maximum of 20 data points can be entered in any order. The controller software will automatically sort these by gallon from smallest to largest, however, the screen will remain as entered. (See **Example of Custom Tank Configuration**)

Many tanks will already have volume measurements along the side of the tank. Each measurement and its height above the bottom of the tank (C) can be entered on each table row in the following step.

Example of Custom Tank Configuration

FIG. 15 is the cross-section of a possible custom tank. Volume is shown along the side of the tank. Height (or level) is measured from the bottom of the tank. The top of the sensor is below the bottom of the tank.
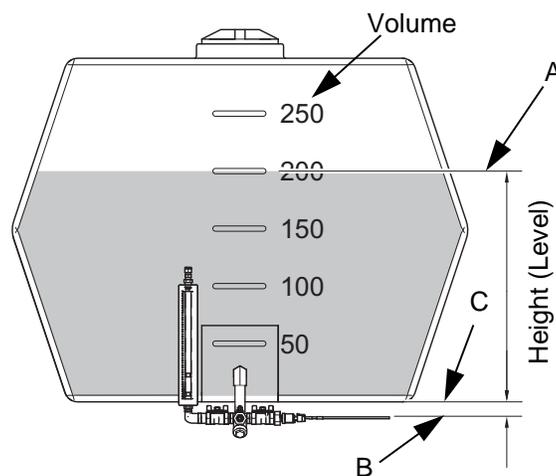

FIG. 15: Custom tank heights

The custom tank setting for this example would be as follows:

CURRENT HEIGHT (A): 20 inches
SENSOR HEIGHT (B): 3 inches
SENSOR LOCATION (B): BELOW

	VOL (GAL)	LVL (IN)
1	50	5
2	100	10
3	150	15
4	200	20
5	250	25

Alarm Setup

NOTE: Volume is entered as gallons or liters, depending on the Harrier+ controller setup.

1. Power on the Harrier+ controller.

2. Press and hold the Enter key for 3 seconds to access the Configuration screen.

3. Use the Up/Down arrows to move the cursor to highlight ALARMS and press Enter to display the Alarm Selection screen.

4. On the Tank Selection screen, press Enter to display a list of Alarm options.

5. Use the Up/Down arrows to highlight TANK and press Enter to display the Tank Alarm Settings screen.

6. Highlight the LOW TANK NOTIFY field, press Enter, and use the arrow keys to highlight and select values for each volume digit. Press Enter to save the low tank setting.

    - LOW TANK NOTIFY is the volume at which the user will be notified by email (per notification settings) so that the tank can be refilled before the pump is automatically shut off.

7. Highlight the LOW TANK SHUTOFF field, press Enter, and use the arrow keys to highlight and select values for each volume digit. Press Enter to save the low tank setting.

    - LOW TANK SHUTOFF is the volume at which the pump is automatically shut off to avoid pumping a dry tank.

NOTE: Tank level will be ignored if both LOW TANK NOTIFY and LOW TANK SHUTOFF are set to "0".

8. Highlight the FLOW VERIFY field, press Enter, and select ENABLE or DISABLE. Selecting ENABLE displays the VERIFY PERCENT field.

    - FLOW VERIFY is enabled to correlate the Harrier+ totalizer with the tank level calculated by the tank level monitor.

9. Highlight the VERIFY PERCENT field, press Enter, and use the arrow keys to highlight and select values for each digit of the percentage.

    - VERIFY PERCENT is the maximum allowable correlation difference between the daily totalizer and daily tank level change. A typical setting is 20%.

10. Press Reset to return to the Alarm Selection screen.

Troubleshooting

Problem	Cause	Solution
Tank level monitor not working	Faulty sensor data	Repeat **Harrier+ Setup** on page 7.
	Loose wire connections	Check or reconnect wire connections at the sensor and in the control box.
	Broken wire continuity between sensor and control box	**Replace Tank Level Monitor Harness** on page 14.
	Faulty sensor	**Replace Tank Level Monitor Sensor** on page 14.
Flow verify alarm	Poor correlation between the Harrier+ totalizer and the tank level monitor	Repeat **Harrier+ Setup** on page 7.
		Determine the Harrier+ K-factor using an accurate calibration column. Use Calibration Column Kit B32208.

Repair

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All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.				

Replace Tank Level Monitor Harness

NOTE: This procedure requires the Tank Level Monitor Harness Kit (B32773) (2).

1. Disconnect power to the control box. Refer to your control box manual listed in **Related Manuals** on page 2.

2. Unplug the wiring harness (2) from the sensor.

3. Disconnect the wires from the DIN rail terminal block, and discard.

4. Plug the new wiring harness (2) from the replacement kit to the sensor.

5. **Attach Tank Level Sensor Wires to Harrier+ Controller**, on page 5, using the wires from the replacement kit.

6. Reconnect power to the control box.

7. Continue to **Harrier+ Setup** on page 7.

Replace Tank Level Monitor Sensor

**NOTE:** This procedure requires the Tank Level Monitor Sensor Kit (B32849) (1).

1. Disconnect power to the control box. Refer to your control box manual listed in **Related Manuals** on page 2.

2. Unplug the wiring harness (2) from the sensor (1).

3. Close the valve leading from the tank to prevent the flow of fluid to the tank manifold.

4. Remove the old sensor (1) from the tank manifold.

5. **Attach Tank Level Sensor to Tank Manifold**, on page 6, using the sensor (1) from the replacement kit.

6. Reconnect power to the control box.

7. Open the valve from the tank to the tank manifold.

8. Continue to **Harrier+ Setup** on page 7.

Kits and Accessories

Part	Description
B32208	Calibration Column Kit (not shown)
B32868	28 Foot Cable Kit

Tank Level Monitor Kit Part List (B32771)
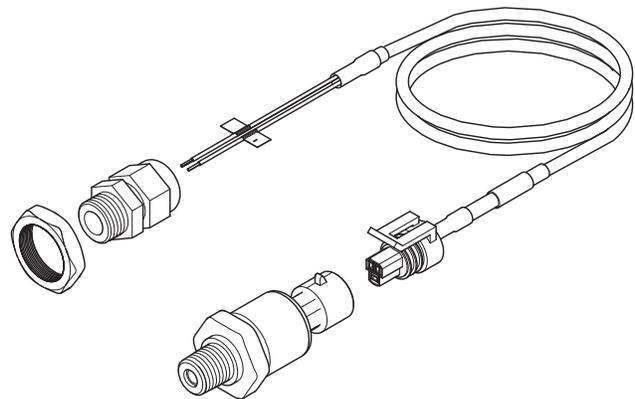
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FIG. 16

Ref.	Part	Description	qty
1	B32849	Sensor, Pressure (1)	1
2	B32773	Harness, Sensor, Pressure (14 ft.) (2)	1
3	--	Label, Identification, Sensor	1
4	--	Busting, Strain Relief	1
5	--	Nut, Strain Relief, 1/2 npt	1

Technical Specifications

Tank Level Monitoring Kit		
	US	**Metric**
Maximum fluid height (for water)	11.5 ft	3.5 m
Maximum tank volume	9999.9 gal.	37849.6 l
Cable length	14 ft	4.3 m
Sensor fitting size	1/4 in. npt(m)	
Environmental temperature range	- 40°–140°F	- 40°–60°C
Wetted parts	316 SST	
Sensor voltage	24 VDC	
Sensor amperage	20 mA	

Graco Standard Warranty

Graco warrants all equipment referenced in this document which is manufactured by Graco and bearing its name to be free from defects in material and workmanship on the date of sale to the original purchaser for use. With the exception of any special, extended, or limited warranty published by Graco, Graco will, for a period of twelve months from the date of sale, repair or replace any part of the equipment determined by Graco to be defective. This warranty applies only when the equipment is installed, operated and maintained in accordance with Graco's written recommendations.

This warranty does not cover, and Graco shall not be liable for general wear and tear, or any malfunction, damage or wear caused by faulty installation, misapplication, abrasion, corrosion, inadequate or improper maintenance, negligence, accident, tampering, or substitution of non-Graco component parts. Nor shall Graco be liable for malfunction, damage or wear caused by the incompatibility of Graco equipment with structures, accessories, equipment or materials not supplied by Graco, or the improper design, manufacture, installation, operation or maintenance of structures, accessories, equipment or materials not supplied by Graco.

This warranty is conditioned upon the prepaid return of the equipment claimed to be defective to an authorized Graco distributor for verification of the claimed defect. If the claimed defect is verified, Graco will repair or replace free of charge any defective parts. The equipment will be returned to the original purchaser transportation prepaid. If inspection of the equipment does not disclose any defect in material or workmanship, repairs will be made at a reasonable charge, which charges may include the costs of parts, labor, and transportation.

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