Installation and Operating Instructions

Series 508-11-34 and 508-11-734
Check Well™ Level Monitor System
using 408-2200 Electronics
Section 2 - Installation

2.1 Unpacking

Carefully remove the contents of the carton and check each item against the packing list before destroying any packing material. If there is any shortage or damage, report it to the factory immediately.

CAUTION
Protect the insulation from cuts and abrasions during the installation process. A cut in the insulation may cause inaccurate readings or possible system failure.

2.2 Types of Well Gage Installations

The flexible sensing element may be installed in a space between the column (string, drop pipe) and the casing or it may be installed in a plastic or metal gage sounding tube (stilling well). For monitoring wells, the sensing element may be installed in the well or in a gage tube. Refer to Figure 2-1.

A gage tube makes it easier to insert or remove a sensing element when the well is not straight or the insertion area is limited. (Sensing Element rarely needs to be removed.)

Paragraph 2.2.1 describes installing the sensing element between column and casing. Paragraph 2.2.2 describes installing sensing element in a monitoring well. Paragraph 2.2.3 describes installing sensing element in a gage tube and gage tube details.

Additional grounding may be required. See Paragraph 2.3.

2.2.1 Sensing Element Mounted “Free-Hanging” Between Casing Column and Casing

To install the sensing element “free-hanging,” a minimum clearance of 3/4” is required between the casing and the column. If the casing and column are not straight, more clearance may be required. If a well is very deep, adequate clearance is critical to the installation. Refer to Figure 2-2 for installation details.

Figure 2-2
“Free-Hanging” Sensing Element Mounted in a Pumped Well

Figure 2-1
Types of Well Gage Installations
Series 508-11-34 and 508-11-734 Check Well™ Level Monitor System using 408-2200 Electronics

"When the measurement matters"

DREXELBROOK
Engineering Company

An ISO 9001 Certified Company

World Headquarters: Drexelbrook Engineering Co.,
205 Keith Valley Road, Horsham, PA 19044 U.S.A.
(Tel) 215/674-1234, (Fax) 215/674-2731

Europe Headquarters: Drexelbrook Instrumenten,
Bedrijfcentrum Rede, Waalreseweg 17,
5554 HA Valkenswaard, Netherlands
(Tel) +31-(0)40-208-9298, (Fax) +31-(0)40-204-7933

Japan Headquarters: Nihon Drexelbrook,
2 Chrome, 12-7 Minami Gyotoku, Ichikawa City,
Chiba 272-01 Japan
(Tel) 473-56-6513, (Fax) 473-56-6535
If end of gage tube is in intake zone, plug end of tube and add 1/2" holes every 6" in this zone. See Figure 2-6.

**Figure 2-6**  
Gage Tube Ending in Intake Zone  
(Not Recommended)

If the gage tube is installed with the column in place, put a tapered end cap on the bottom section. Using this method, the chamber can slide by the couplings on the discharge line as it is lowered into the well. See Figure 2-7. This is not recommended for deep wells or when clearance is tight.

**Figure 2-7**  
Installing a Gage Tube with Columns in Place

Top of gage tube may be bent underneath gage tube opening in head or brought through head. A 3/4" NPT coupling should be put on top of gage tube, and vent holes added if top of gage tube is brought through. Vent holes should be underneath head for artesian wells. See Figures 2-8 and 2-9.

**Figure 2-8**  
Positioning Gage Tube Brought Through Head

**Figure 2-9**  
Positioning Gage Tube Not Brought Through Head

**Note:** Entire tube may require perforation. See Paragraph 2.3, Grounding.

### 2.2.3.2 Sensing Element in a Metal Gage Tube

Sensing element may be installed in a metal gage tube. Standard sensing elements fit into 3/4" or larger tubes. Special sensing elements are required for 1/2" gage tubes. See Figure 2-4.

This eliminates the need for additional grounding (Paragraph 2.3). If metal gage tube ends in intake zone, see Figure 2.6.
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Addendum #1
Installation

2.3.1.2 Ground Wire in Plastic/Plastic Lined Monitoring Well

Ground wire with a weight may be used. Wire must be mounted through separate opening in opposite side of well from sensing element. See Figure 2-12.

![Diagram of Sensor and Ground Wire Installed in a Plastic Monitoring Well](image)

Figure 2-12
Sensor and Ground Wire Installed in a Plastic Monitoring Well

2.3.2 Perforating the Plastic Gage Tube

An alternate to using a ground wire would be to perforate the entire length of the plastic gage tube with 1/2" holes every 6 inches. See Figure 2-13.

![Diagram of Level Gage Mounted in a Perforated Plastic Gage Tube](image)

Figure 2-13
Level Gage Mounted in a Perforated Plastic Gage Tube

2.3.3 Special Grounding Requirements

There are installation conditions in metal cased wells where the sensing element mounting is not electrically grounded to the water.

1. Sensing element mounted on plastic coupling

2. Sensing element mounted on plastic head.

In either case it is necessary to run a jumper wire from some metal that is in contact with water -- the metal head, the metal column or the metal casing. See Figures 2-14 and 2-15.

![Diagram of Sensing Element Mounted on Plastic Coupling](image)

Figure 2-14
Sensing Element Mounted on Plastic Coupling
Section 1 - INTRODUCTION

1.1 Introduction

This manual provides installation and operating instructions for the Drexelbrook 508-11-34 and 508-11-734 Check Well™ Level Monitor for water table level measurements in underground water wells. The Check Well Level Monitor produces a continuous linear output signal, directly proportional to the level in the well. The output can be used for local or remote monitoring/ recording, alarm signals, and pump control using optional current-actuated relays. The Check Well Level Monitor will ignore particle build-up on the sensing element and oil floating on top of water.

The system can be used for production, remediation, and monitoring of wells up to 800 feet (244 meters) deep. See graph Figure 1.2 for limitations. System is suitable for wells with submerged or shaft pumps. (The Check Well D 303-400 Series systems are available for wells to 3000 feet (914 meters) deep and when drawdown output is required.)

1.2 Model Numbering

508-11-34 Transmitter in NEMA 4X explosionproof housing and an integral sensing element with a 316 SS weight assembly. See Figure 1.1

508-11-734 As above except electronic unit is mounted remotely and system includes 25 ft. of connecting cable and conduit.

1.3 Physical Description

A Check Well measurement system (Figure 1-1) consists of a flexible sensing element with a weight, and a two-wire electronic unit. Line-powered units, indicators, and current relays are available as options.

The electronic unit is a radio frequency level transmitter that produces a 4-20 mA output. The electronic unit is mounted on top of the sensing element or, as an option, mounted remotely using 25 feet of cable. The 408-2200 Check Well transmitter is enclosed in a housing that meets both NEMA 4X and explosionproof specifications.

The sensing element is a flexible polypropylene insulated wire that extends to or below the zero level measuring point. To prevent the sensing element from resting on the sides of the well, spacers are furnished for field installation. A PFA-insulated sensing element is available as an option.

---

Figure 1-1
Check Well Measurement System

1.4 Functional Description

The 508-11-34 or 508-11-734 Series Check Level Monitor is used to measure the level of water in a well. The sensing element with 316 SS weight assembly is inserted into the well. The Check Well Level Monitor outputs a continuous linear signal that is directly proportional to the level in the well. The system ignores oil on top of water and effectively measures only the water level.

Radio frequency interference due to walkie-talkies and radio telemetry is ignored using optional RFI filter(s). Also, electrical noise from submerged pumps does not interfere with or affect the reliability of the level signal.

If output oscillates due to water level bouncing, a built-in 20 second time delay may be turned on.

Calibration is verified (without pulling the sensing element from the well) by disconnecting the sensing element at the electronic unit and using a calibration standard. See Section 3.3.4 and 3.3.5.
2.4.3 Mounting a Unit with a Digital Loop Meter

If the electronic unit is furnished with an integral meter and digital indicator, the meter must be pulled out and mounted on the outer stud. The furnished jumper should be connected to the center pin. Refer to DLM4000 Instruction Manual for detailed installation instructions.

2.5 Installing the Sensing Element in the Well

**CAUTION**
Protect the insulation from cuts and abrasions during the installation process. A cut in the insulation may cause inaccurate readings or possible system failure.

See Figure 2-18 for a description of the sensing element.

The bottom of the active section must be at or below lowest measuring point. Zero point can be adjusted above bottom of active section. Bottom weight is inactive.

If sensing element is not in a gage tube (pumped wells) weight should not be in the intake zone. It can be above or below intake zone. See paragraph 2.2.3.1.

Determine if sensing element is the correct length. If not see paragraph 2.6, Field Shortening.

If union is to be used, install union on sensing element as shown in Figure 2-19.

**Note:** If electronic unit is furnished with integral meter with display, the unit housing is slightly larger. The swing radius is 5 inches.

Install spacers every 4 feet by snapping on the flexible cable. See Figure 2-20. Set spacer on a firm surface with the cavities facing up. Push wire into cavity. If ground wire is to be used, align spacers so that cavities are in a line, as described in Paragraph 2.5.4 and Figure 2-22.
1.6 Maximum Insertion Length (IL) vs. Span

This paragraph describes how to calculate the maximum span when calibrating the transmitter with a specific-length sensing element. Refer to Figure 1-2 and use the following procedure. The numbers on the graph are conservative. In most cases, the sensing element can be spanned for longer length.

Note:  
- Weight is inactive
- Insertion Length includes weight

a. Determine type of installation you (will) have. Line A, B, C, or D on graph.

b. Determine insertion length of sensing element.

c. Locate insertion length number on bottom line.

d. Move up vertical insertion length axis until you meet the installation type line (A, B, C or D).

e. Move horizontally across graph to Maximum Span. Read maximum feet for which you can span the sensing element.

f. If desired span exceeds this number, contact factory for options.

Example: Installation type is D. Sensing Element installed in a 3/4" metal gage tube. Sensing Element insertion length = 400 ft. Maximum Calibration Length = 100 ft.

![Graph showing Maximum Insertion Length versus Span](image)

**Figure 1-2**

508-11-34 Check Well System
Maximum Insertion Length (IL) vs. Span
(Also applicable for 508-11-734)
Section 2 - Installation

2.1 Unpacking

Carefully remove the contents of the carton and check each item against the packing list before destroying any packing material. If there is any shortage or damage, report it to the factory immediately.

**CAUTION**
Protect the insulation from cuts and abrasions during the installation process. A cut in the insulation may cause inaccurate readings or possible system failure.

2.2 Types of Well Gage Installations

The flexible sensing element may be installed in a space between the column (string, drop pipe) and the casing or it may be installed in a plastic or metal gage sounding tube (stilling well). For monitoring wells, the sensing element may be installed in the well or in a gage tube. Refer to Figure 2-1.

A gage tube makes it easier to insert or remove a sensing element when the well is not straight or the insertion area is limited. (Sensing Element rarely needs to be removed.)

Paragraph 2.2.1 describes installing the sensing element between column and casing. Paragraph 2.2.2 describes installing sensing element in a monitoring well. Paragraph 2.2.3 describes installing sensing element in a gage tube and gage tube details.

Additional grounding may be required. See Paragraph 2.3.

**Figure 2-1**
Types of Well Gage Installations

2.2.1 Sensing Element Mounted “Free-Hanging” Between Casing Column and Casing

To install the sensing element “free-hanging,” a minimum clearance of 3/4” is required between the casing and the column. If the casing and column are not straight, more clearance may be required. If a well is very deep, adequate clearance is critical to the installation. Refer to Figure 2-2 for installation details.

**Figure 2-2**
“Free-Hanging” Sensing Element Mounted in a Pumped Well

**Figure 2-3**
"Free-Hanging" Sensing Element Mounted in a Pumped Well
2.2.2 Sensing Element Mounted in Monitoring Well

A sensing element that is mounted in a monitoring well is installed as "free-hanging", described in paragraph 2.2.1. See Figure 2-3.

![Figure 2-3](image)

**Figure 2-3**
Level Sensor Mounted “Free-Hanging” in a Monitoring Well

2.2.3 Sensing Element Mounted in a Gage Sounding Tube

If well is not straight and/or sensor clearance is tight, sensing element installation is easier with a gage tube. Standard sensing element requires a 3/4" or larger I.D. pipe tubing.

**NOTE**
A separate gage tube or access should be available for sounding the well.

2.2.3.1 Sensing Element Mounted in a Plastic Gage Sounding Tube

Plastic gage tubes may be made from rigid pipe or flexible tubing. Tube couplings should be used to insure coupling I.D. is not less than the tube I.D.

For ease of installation, the plastic gage tube should be installed at the same time as the pump column. Try to assemble and attach the tube so that its joints fall just below the couplings on the discharge line. Tape or strap tubing to column. See Figure 2-4.

![Figure 2-4](image)

**Figure 2-4**
Level Sensor Mounted in a Gage Tube

**CAUTION**
Gage tube should always extend below sensing element weight.

A pin may be used at bottom of tube to prevent sensor from falling through tube. See Figure 2-5.

![Figure 2-5](image)

**Figure 2-5**
Gage Tube Bottom Stop

The bottom of the gage tube should be located above or below the intake zone so that water cannot be sucked out of the tube.
If end of gage tube is in intake zone, plug end of tube and add 1/2" holes every 6" in this zone. See Figure 2-6.

![Figure 2-6](image)

**Figure 2-6**
Gage Tube Ending in Intake Zone (Not Recommended)

If the gage tube is installed with the column in place, put a tapered end cap on the bottom section. Using this method, the chamber can slide by the couplings on the discharge line as it is lowered into the well. See Figure 2-7. This is not recommended for deep wells or when clearance is tight.

![Figure 2-7](image)

**Figure 2-7**
Installing a Gage Tube with Columns in Place

Top of gage tube may be bent underneath gage tube opening in head or brought through head. A 3/4" NPT coupling should be put on top of gage tube, and vent holes added if top of gage tube is brought through. Vent holes should be underneath head for artesian wells. See Figures 2-8 and 2-9.

![Figure 2-8](image)

**Figure 2-8**
Positioning Gage Tube Brought Through Head

![Figure 2-9](image)

**Figure 2-9**
Positioning Gage Tube Not Brought Through Head

**Note:** Entire tube may require perforation. See Paragraph 2.3, Grounding.

### 2.2.3.2 Sensing Element in a Metal Gage Tube

Sensing element may be installed in a metal gage tube. Standard sensing elements fit into 3/4" or larger tubes. Special sensing elements are required for 1/2" gage tubes. See Figure 2-4.

This eliminates the need for additional grounding (Paragraph 2.3). If metal gage tube ends in intake zone, see Figure 2.6.
2.2.3.3 Sensing Element in a PVC Coated Galvanized Gage Tube

The sensing element can be installed in a grounded 3/4" I.D. or larger flexible PVC-coated galvanized gage tube. This type of tube can only be used if water will not attack a galvanized surface.

2.2.3.4 Well with Column Positioning Ring.

If well has a positioning ring, this makes it difficult to install level gage. A gage tube is recommended for entire length of sensor. If a partial gage tube is used, the bottom of the tube must be flared to allow removal of sensing element. See Figure 2-10.

See Paragraph 2.3.3 for special grounding situations.

NOTE
When sensing element is in a plastic gage tube, a ground connection to motor is not adequate.

2.3.1 Installing a Ground Wire

A ground wire can be hung parallel to the entire sensing element. For 3/4" gage tubes the ground wire should be bare 1/8" OD, flexible twisted wire, 302, 304, 316 SS or Monel, as required. For larger than 3/4" OD gage tubes, 1/8" or larger ground wire should be used. For 1/2" gage tubes a smaller sensing element and special ground wire is required.

2.3.1.1 Ground Wire in Plastic Gage Tube

Wire must have method of positioning bottom so it will not wrap around sensing element. Drexelbrook furnishes an assembly consisting of a wire, weight and "anchor clip". If this ground wire is not received with equipment, order part #722-538-40. See Figure 2-11.

A union with vent holes is recommended to get ground wire from well to ground connection on the sensing element. See Paragraph 2.4.1.

2.3 Grounding the Sensing Element

A Check Well system requires a good ground. If the sensing element is "free-hanging", directly facing a metal casing or column, or is installed in a metal or PVC coated galvanized gage tube, furthergrounding is not required.

However, when the sensing element is installed in a plastic gage tube, or when the casing or column is plastic or plastic-lined, additional grounding is required.

There are two methods available to obtain an adequate ground in a plastic gage tube:

a) a ground wire, Paragraph 2.3.1
b) perforating the entire plastic gage tube, Paragraph 2.3.2
2.3.1.2 Ground Wire in Plastic/Plastic Lined Monitoring Well

Ground wire with a weight may be used. Wire must be mounted through separate opening in opposite side of well from sensing element. See Figure 2-12.

![Figure 2-12](image)

**Figure 2-12**
Sensor and Ground Wire Installed in a Plastic Monitoring Well

2.3.2 Perforating the Plastic Gage Tube

An alternate to using a ground wire would be to perforate the entire length of the plastic gage tube with 1/2" holes every 6 inches. See Figure 2-13.

![Figure 2-13](image)

**Figure 2-13**
Level Gage Mounted in a Perforated Plastic Gage Tube

2.3.3 Special Grounding Requirements

There are installation conditions in metal cased wells where the sensing element mounting is not electrically grounded to the water.

1. Sensing element mounted on plastic coupling
2. Sensing element mounted on plastic head.

In either case it is necessary to run a jumper wire from some metal that is in contact with water -- the metal head, the metal column or the metal casing. See Figures 2-14 and 2-15.

![Figure 2-14](image)

**Figure 2-14**
Sensing Element Mounted on Plastic Coupling
2.4 Mounting Options

The sensing element may be mounted using a:

a) 3/4" NPT (standard)
b) union (recommended option) Figure 2-16.
c) flange (option)
d) swivel union (option) Figure 2-17.

Figure 2-18 shows a standard NPT and optional flange mount.

2.4.1 Union Mounting

A union or flange mount eliminates the need to turn the sensing element and spacers as the mounting thread is being screwed on or off. Hence, a union makes sensing element installation and removal much easier. A union must be used when sensing element is installed in a plastic tube with a ground wire.

A union part #242-7-66 purchased from Drexelbrook provides two vent holes. One hole is for venting when the sensing element is mounted directly on the gage tube. The second hole may be used to bring out the ground wire. See Figure 2-16.

Figure 2-16 Union Mounting

A swivel union mount is used to install the sensing element when a shaft pump motor interferes with installation. See Figure 2-17.

Figure 2-17 Swivel Mounting
2.4.3 Mounting a Unit with a Digital Loop Meter

If the electronic unit is furnished with an integral meter and digital indicator, the meter must be pulled out and mounted on the outer stud. The furnished jumper should be connected to the center pin. Refer to DLM4000 Instruction Manual for detailed installation instructions.

2.5 Installing the Sensing Element in the Well

**CAUTION**

Protect the insulation from cuts and abrasions during the installation process. A cut in the insulation may cause inaccurate readings or possible system failure.

See Figure 2-18 for a description of the sensing element.

---

The bottom of the active section must be at or below lowest measuring point. Zero point can be adjusted above bottom of active section. Bottom weight is inactive.

If sensing element is not in a gage tube (pumped wells) weight should not be in intake zone. It can be above or below intake zone. See paragraph 2.2.3.1.

Determine if sensing element is the correct length. If not see paragraph 2.6, Field Shortening.

If union is to be used, install union on sensing element as shown in Figure 2-19.

**Note:** If electronic unit is furnished with integral meter with display, the unit housing is slightly larger. The swing radius is 5 inches.

---

**Figure 2-19**

Installing Union with Vent Holes

Install spacers every 4 feet by snapping on the flexible cable. See Figure 2-20. Set spacer on a firm surface with the cavities facing up. Push wire into cavity. If ground wire is to be used, align spacers so that cavities are in a line, as described in Paragraph 2.5.4 and Figure 2-22.
2.5.1 Installing "Free-Hanging" Sensing Element Between Casing and Column.

a. Insert weight into opening and allow to drop. If weight catches, raise sensing element slightly and allow weight to drop until cable is fully extended. Do not "push" wire down the well.

b. Tighten NPT, union or flange.

c. Sensing element is now installed.

2.5.2 Installing Sensing Element in Metal or Fully Perforated Plastic Gage Tube.

Follow instructions in 2.5.1.

2.5.3 Installing Sensing Element in PVC-Covered, Flexible Metal (Galvanized) Gage Tube.
(See Figure 2-21.)

a. Remove well cover.

b. Cut one end of conduit square.

c. Attach PVC coupling (A) on bottom of flexible tube (B). Use PVC primer on mating parts, then affix with PVC cement.

d. Insert flexible conduit in well.

e. Insert Seal-Tyte fitting (C) near top of tube. Position just under well head cover.

f. Feed tube through bottom of well head cover. Tighten Seal-Tyte fitting and reset cover.

g. Slip mounting plate (D) over conduit.

h. Mount lower 2 part of union (E) on to Seal-Tyte fitting.

i. Mount upper part of union to sensing element.
j. Attach (push) spacers to sensing element (1 every 4 feet.)

k. Feed sensing element into tube.

l. Tighten union.

m. Add conduit and shorten sensing element cable per instructions in paragraph 2.6, if required.

NOTE
Hardware kit part #285-1-92 includes parts A, C, D and E.

User must verify that galvanized metal is chemically compatible with specific well water.

2.5.4 Installing Sensing Element in PVC (not fully perforated) Gage Tube
(a ground wire and a union or flange mounting are required).

a. Check ground wire length and confirm it is longer than the sensing element and has excess wire to reach the ground connection on the sensing element mounting.

b. Install union if used.

c. Align spacer cavities in a row. See Figure 2-22.

d. If gage tube is 1" or less, feed both sensing element and ground wire through same opening. Insert top of ground wire through hole in union. The wire must be carefully fed down with the sensing element so that it sits in spacer cavity. See Figure 2-22.

e. Tighten union or flange. Connect top of ground wire to sensing element ground connection.

f. If Drexelbrook ground wire 722-538-40 (for 3/4" and 1" gage tubes) is used, it has a weight and anchor clip. The weight will pull wire down the well. The anchor clip will hold ground wire in place. If wire needs to be removed, additional force will cause clip to spring, allowing for easy removal.

g. If gage tube is greater than 1", ground wire may be fed into tube before installing sensing element.

![Diagram](image)

**Figure 2-22**
Aligning Spacers
(when ground wire is used inside plastic gage tube)

2.5.5 Installing Sensing Element in a Monitoring Well without Ground Wire (Metal Casing).

a. Install as described in paragraph 2.5.1.

2.5.6 Installing Sensing Element in a Monitoring Well with Ground Wire (Plastic Casing)

a. Install sensing element as described in paragraph 2.5.1.
b. Install ground wire with weight on opposite side of well from sensing element. See Figure 2-23.

**NOTE**
Sensing element must hang free. Allow weight to pull it down; do not push cable down the well.

![Diagram of Sensing Element Installation](image)

**Figure 2-23**
Installing Level Sensor and Ground Wire in Plastic/Plastic-Lined Monitoring Well

### 2.6 Adjusting the Length of the Sensing Element

The sensing element can be shortened in the field using the following procedure. Refer to Figure 2-24. A field shortening kit (389-1-22) is furnished with each sensing element.

a. **Install Sensing Element in Vessel**

   The lowest point of the active section must be at or below lowest measuring point. Zero point can be adjusted above bottom of active section.

   If sensing element is not in a gage tube, weight should not be in the pump intake. Weight can be above or below intake zone.

b. **Determine Desired Length as Follows:**

1. Loosen two set screws in clamping block @ and remove.
2. Loosen nuts and set screws in gland ③.
3. Unscrew compression plug @ from gland ③ (approximately two turns).
4. Carefully pull cable ③ and adjust to desired length.

c. **Tighten compression plug @ and gland ③ to 75 in. lbs.**

d. **Remove swage @ and cut cable 4" above washer/support ③. Strip cable.**

e. **Slide new swage kit ③ into position, and crimp on cable using crimping tool or pliers.**

f. **Slide clamping block back into position and tighten set screws.**

g. **Tighten set screw in gland ③ and replace nuts.**

h. **Cut off excess cable above clamping block.**
2.7 Wiring the Check Well Unit  
(Integral with Sensing Element)

The signal connections are made to the terminal strip(s) on the chassis. Due to the low power consumption of the instrument, the wiring need only be light gauge.

Figure 2-25 details the wiring for the integral electronic unit and shows a typical 4-20 mA loop circuit. The maximum power supply is 30 Vdc. The maximum loop resistance (including any barriers) is 650 ohms with 24 Vdc supply. If other than a 24 Vdc power supply is used, the following formula computes the maximum load resistance:

\[ R_{\text{max}} = \frac{V_{\text{supply}} - 11}{0.02} \text{ ohms} \]

When wiring the circuit loop, put all 4-20 mA loop devices in series. Voltage driven devices require a series resistance.

Figure 2-25  
Wiring the Integral Unit
2.7.1 Check Well with Integral Meter

If the electronic unit is furnished with an meter and indicator housing, refer to Figure 2-26 for wiring connections.

2.7.2 Intrinsic Safety Barriers

**CAUTION**

Before using intrinsic safety barriers, read the manufacturer's instructions for barrier operation. Barriers supplied by Drexelbrook Engineering Company, and prewired to the power supply, have already been tested for proper operation.

The Check Well 408-2200 electronic unit has a built-in current limiter which holds the signal current to a maximum of 35 mA.

Ensure that the barriers being used will limit current to less than 35 mA. Make sure that the voltage applied will not exceed the barrier voltage rating.

Figure 2-26
Wiring the Unit with Digital Indicator Meter
Installation

2.8 Wiring the Check Well Unit
(Remote from Sensing Element)

Figure 2-27 shows the wiring for a remote Check Well unit. The loop resistance is the same as with an integral unit — 650 ohms with 24 vdc supply. If other than a 24 vdc power supply is used, the following formula computes the maximum load resistance.

\[
R_{\text{max}} = \frac{V_{\text{supply}} - 11}{0.02} \text{ ohms}
\]

Figure 2-27
Wiring the Remote Unit

[Diagram showing wiring details and components]
2.9 RFI Filters

Radio Frequency Interference (RFI) filters (Figure 2-28) are designed to protect Drexelbrook RF level transmitters from the interference of outside radio transmissions. Without this protection, those interfering transmissions can cause an error in the output of the transmitter. For protection up to 460 MHz, all electrical lines to and from the transmitter housing must be filtered. Each filter should be close-coupled to the housing, and the housing should be earth-grounded.

Figure 2-28
RFI Filters
Operation / Calibration

Section 3 - OPERATION / CALIBRATION

3.1 Controls and Adjustments

3.1.1 Zero and Fine Span Controls

The Zero and Fine Span controls are located on the chassis top panel, as shown in Figure 3-1.

![Zero and Fine Span Controls](image)

**Figure 3-1**
Zero and Fine Span Controls

The Zero control provides continuous adjustment of the minimum current point.

**NOTE**
Under normal circumstances, the interaction between zero and fine span should be less than 1%. If this interaction becomes greater than 1%, consult factory for assistance. However, the zero setting is different depending on step span position.

3.1.2 Step Span and Fine Span Controls

The Step Span (Figure 3-2) and Fine Span controls also work together to provide continuous adjustment of the change in capacitance required to produce full scale current. Each Step Span position advances the range in inches or feet to approximately three times the previous setting. The Fine Span provides continuous adjustment between the Step Span positions.

![Step Span Switch](image)

**Figure 3-2**
Step Span Switch

3.2 Start Up

Before applying power to the instrument, be sure that the input power will be from 11 to 30 VDC at 20 mA. Check all wiring connections, observing polarity of the output loop.

**CAUTION**

Explosionproof Units in Hazardous Areas without intrinsic safety barriers: Before the explosionproof housing cover is removed to calibrate the instrument, the area must be checked and known to be nonhazardous. When calibration is complete, the housing cover must be replaced. Each lead from the explosionproof case must be equipped with an approved seal fitting.
3.3 Calibration Procedures

There are three methods of calibration in well applications.

3.3.1 Calibration Procedure when well can be pumped down and partially recovered:

a. Set fine span to extreme counterclockwise position.
b. Refer to chart in Table 3-3 for the correct step span position. Set step span.
c. With well level down to zero calibration point, adjust the Zero control until the output is 4 mA (0%).
d. Raise level to maximum or as high as possible. Reading may be less than or go over full scale. This is acceptable.
e. Adjust the span control until output is 20 mA (100%) or reading the actual level.
f. If Capacitance Substitution Box is available (401-6-8 or 401-6-81), use to record calibration values for future maintenance. See paragraph 3.3.4 for use of this Calibration Box. See Worksheet 3-3 for form to record data.

<table>
<thead>
<tr>
<th>Calibration Range in Ft. vs. Step Span Position</th>
<th>3</th>
<th>4</th>
<th>5*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step Switch Position**</td>
<td>6 - 35 Ft. (1.8 - 10.7 m)</td>
<td>18 - 105 Ft. (5.5 - 32 m)</td>
<td>Over 100 Ft. (30.5 m)</td>
</tr>
</tbody>
</table>

*Step Span 5 is obtained by turning on all 5 Step Span switches to the right.

**See Figure 3-2 for location of Step Span switches.

Table 3-3
Step Span Chart
**Operation / Calibration**

**WORKSHEET 3-3**

Well Level Calibration / Data Form

Use this form when well can be pumped down and partially recovered.

Plant Site: ____________________  Completed by: ____________________

Order #: ______________  Co.: ______________  Date: ______________

Well ID #: __________  Model #: 508-11-34  Transmitter #: 408-2200-001

Well Material: Carbon Steel: ___  Plastic (PVC, etc.): ___  Plastic Lined: ___


Sensing Element IL: ________  Sensing Element Active Length: ________

Precalibration Calculations:  Static Well Level: __________ ft.

Zero Capacitance 0% (4ma): ________ pf

Span Capacitance 100% (20ma): ________ pf

Final Calibration after trimming:

Use C-Box (401-6-8) to record Values.

Zero Capacitance: __________ pf  Feet of Water: __________ ft.

Span Capacitance: __________ pf  Feet of Water: __________ ft.

---

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3.3.2 Calibration Procedure
When Level Cannot Be Changed

Use a Capacitance Substitution Box (C-Box) (Model #401-6-8 or 401-6-B1) to simulate the 0% and 100% signals.

a. Set fine span to extreme counterclockwise position.

b. Refer to chart in Table 3-3 for the correct step span position. Set transmitter to this step span.

c. Calculate Zero Capacitance by completing worksheet 3-4, (A) thru (F).

d. Calculate Span Capacitance by completing worksheet 3-4, (G) thru (J).

e. Disconnect sensing element from electronics. Connect C-Box to transmitter as shown on Figure 3-6.

f. Enter correct Capacitance in C-Box. Adjust the Zero control until the output is 4 mA (0% level).

g. With C-Box still connected, enter correct Capacitance in C-Box. Adjust the fine Span control until the output is 20 mA (100% level).

If unable to reach 100% (20 mA) increase step span one step and readjust fine span. If unable to get down to 100%, decrease step span one step and readjust fine span.

h. Disconnect C-Box from transmitter and reconnect the sensing element. System is now calibrated.

i. To increase accuracy, sound well when level is significantly different & adjust zero to make output agree

j. Record C-Box values for future calibration check.

---

**Request or Make Extra Copies for Each Well**

---

**I. Zero Capacitance:**
Total length of active sensing element.
(Total active length is IL minus weight-length)

Number of feet of sensing element covered at low point.

Multiply (B) X (41.9)

Number of feet of Sensing Element above water at low point. (A) - (B)

Air Capacitance (sensing element)

1. Installed free hanging, Use:
   5 pF/Ft.

2. Installed in plastic gage tube with ground wire,
   Use:
   9 pF/Ft.

3. Installed in perforated plastic gage tube,
   Use:
   8 pF/Ft.

4. Installed in metal gage tube, Use:
   12 pF/Ft.

   Use pF/ft. from 1, 2, 3, or 4

Multiply (D) X (E) = Zero Capacitance (4 mA)

**F** pF

---

**II. Span (Full Scale) Capacitance:**
Number of feet between 0% (4 mA) & 100% (20 mA)

Delta Capacitance (Sensing Element)

1. Installed free hanging, Use:
   36.9 pF/Ft.

2. Installed in plastic gage tube with ground wire,
   Use:
   34.9 pF/Ft.

3. Installed in perforated plastic gage tube
   33.9 pF/Ft.

4. Installed in metal gage tube
   29.9 pF/Ft.

   Use pF/ft. from 1, 2, 3 or 4

Multiply (G) X (H)

Add (F) + (I) = Span Capacitance (20 mA)

---

**Worksheet 3-4**
Calibration Worksheet When Level Cannot be Changed
(for use with 700-5-34 Polypropylene Sensing Element)

---

* See Figure 2-1 for drawing showing "free-hanging" sensing element.

** See Figure 2-10 for drawing showing Perforated Gage Tube
3.3.3 Alternate Calibration Method
(To Achieve Maximum Accuracy)

When using this method of calibration it is necessary to have a Capacitance Substitution Box (C-Box) model #401-5-8, 401-6-81 or 401-18-20 and a digital meter.

a. Set zero and span knobs per Worksheet 3.5.
b. Hook a millimeter suitable to read 19.99 mA in series with the loop.
c. Sound well level to determine amount of the sensing element covered. Record on Worksheet 3.5 at (A).
d. Record the transmitter milliamp reading corresponding to Step 3 at (B).
e. Change well level (either up or down). Remeasure the well level to determine the amount of sensing element covered. Record new level at (D).
f. Record the transmitter milliamp reading corresponding to Step 5 at (E).
g. Disconnect the sensing element and connect the C-Box per Figure 3.6.
h. Adjust the C-Box until you get the mA reading at (B). Record the C-Box reading at (C).
i. Adjust C-Box until you get mA reading at (E) Record C-Box reading at (F).
j. Record maximum desired span level at (G)
k. Calculate the expected mA readings (K) & (N) for these 2 levels per Section II of worksheet and enter at (K) & (N)
l. Set the C-Box to the pF value (C) or (F), whichever is lower.
m. Adjust the Fine zero control on the transmitter until it produces the corresponding mA reading (K) or (N).

n. Set the C-Box to the pF value (C) or (F), whichever is higher.
o. Adjust the Fine Span control on the transmitter until it produces the desired mA reading (K) or (N)
p. Repeat Step 10 to 13 until both readings agree with the expected mA.
q. Adjust C-Box until you get 4 mA. Record C-Box setting Cz (zero capacitance setting).
r. Adjust C-Box until you get 20 mA. Record C-Box setting Cs (Span- 100% capacitance setting)
s. These are now your Zero and Span calibration settings. Record permanently for future requirements.

1. Recording of readings:
   - Level (Step c): (A) _____ ft. (Meters)
   - mA Reading (Step d): (B) _____ mA
   - C-box setting (Step h): (C) _____ pF
   - Level (Step e): (D) _____ ft. (Meters)
   - mA Reading (Step f): (E) _____ mA
   - C-Box Setting (Step i): (F) _____ pF
   - Max. Span (Step j): (G) _____ ft. (Meters) (This is 100% point or 20 mA)

2. Calculation of Correct mA Readings:

   \((A) / (G) = (H) \) _____ ft. (Meters)

   \((H) \times 16 = (J) \) \[ \text{mA} \]

   \((J) + 4 = (K) \) \[ \text{mA} \]

   \((D) / (G) = (L) \) _____ ft. (Meters)

   \((L) \times 16 = (M) \)

   \((M) + 4 = (N) \) \[ \text{mA} \]

   \(K \) & \( N \) are the corrected mA values for the recorded levels.

3. Final Capacitance Settings Recorded for Future Reference

   \( Cz = \) \[ \text{pf} \] (Zero - 4mA - Capacitance Setting)

   \( Cs = \) \[ \text{pf} \] (Span - 20ma - 100% Capacitance Setting)

   Well #: ___________________ Inst Tag #: ___________________

Worksheet 3-5
(Alternate Calibration Method)
3.3.4 Recording Calibration and Recalibration

Whenever it is desired to check or reset the calibration, or replace the instrument, a Calibration Substitution Box (C-Box) (Model 401-6-8 or 401-6-18) may be used as a substitute for the sensing element. To use this C-Box proceed as follows:

A. Disconnect the sensing element wires.

B. Connect the C-Box to the instrument. See Figure 3-5.

C. Set the C-Box to the recorded values.

D. If a replacement unit is being installed:

1. Set transmitter step span control to step number as on removed transmitter. If unknown see Table 3-3.
2. Set C-Box to previous recorded 0% (4 mA) reading. Adjust transmitter zero control so that output reads 0% (4 mA).
3. Set C-Box to previously recorded 100% (20 mA) reading. Adjust transmitter fine control until output reads 100% (20 mA). If unable to reach 100% increase step span 1 step and readjust fine span. If unable to get down to 100%, decrease step span 1 step and readjust fine zero.

E. If you are checking calibration of an installed unit, use steps D2 and D3.

F. Retain C-Box values for future reference.

G. Disconnect the calibration standard and reconnect the center wire to sensing element.

Unit is ready for operation.

When replacing a malfunctioning electronic unit, the replacement chassis can be calibrated on the bench using C-Box and then installed in the field.

Figure 3-5
Calibration Substitution Box

3.3.5 Verifying Calibration

NOTE

The level in a gage tube can vary from the well level. Proper gage tube design and installation will minimize the variance. Some gage design considerations are discussed in section 2.2.3. However, when well is drawing down, the level in the gage tube will always be different for a period of time.

A well sounder is required to verify well calibration. If no oil is present the sounder must be slowly and carefully dropped to insure an accurate measurement. If oil or organics are present on top of the water, the sounder must be lowered several feet below water level, pause to allow oil/organics to drain, then slowly raise to the water level.
SECTION 4  TROUBLESHOOTING

4.1 Introduction

The Check Well 408-2200 Series instruments are designed to give years of unattended service. No periodic or scheduled maintenance is required.

A spare electronic chassis is recommended for every 10 units so that, in case of a failed unit, a critical application will not be held up while the unit is returned to the factory for repair.

If a difficulty occurs when operating the Check Well system, mentally divide the system into its component parts and test each part individually for proper operation.

These troubleshooting procedures should be followed in checking out the system. If attempts to locate the difficulty fail, notify your local factory representative or call the factory direct using the toll-free number 1-800-527-6297.

4.2 Checking the Sensing Element

a. With an analog ohmmeter*, check the resistance of the sensing element-to-ground with level below the sensing element. See Figure 4-1. Resistance should be infinite. Resistance less than 1 megohm indicates excessive leakage, probably due to product or condensation in the transmitter housing/condutlet, or around the sensing element gland/packing nut area. (Consult factory if you get a low resistance reading.)

*A digital ohmmeter may produce erroneous readings.

b. Check the resistance of the sensing element-to-ground with level in the active section of the sensing element. See Figure 4-2. Resistance readings less than 1 megohm indicate either defects in the sensing element insulation.

c. Coating error is characterized by high output with falling level, and a sharp drop to 0% when the material goes below the tip of the sensing element. To verify a coating problem, wipe the coating off the sensing element and recheck instrument operation. If the instrument reads correctly after cleaning, consult the factory for the best solution to the problem. A coating error would be a very unusual occurrence and factory should be consulted if this happens.
4.3 Checking the Two-Wire Loop.

If capacitance values for 4 and 20 mA points have not been recorded for this unit, it is suggested that they be recorded prior to starting this test. Otherwise, note and record step span and zero setting.

a. Do not change or touch factory adjustments. Refer to Figure 4-3.

b. Disconnect the sensing element wires. Disconnect the power from terminals (+) and (-). Measure the open circuit voltage from the power supply. Voltage should be between 11 and 30 VDC.

c. Connect the signal wires to terminals (+) and (-). Turn the Step Span to Position #1. Put Fine Span control completely clockwise and adjust the zero to obtain 20 mA output.

d. Measure the voltage between terminals (+) and (-). Voltage should be between 11 and 30 VDC. If there is less than the minimum 11 volts required, the loop has too much resistance or not enough power supply voltage.

e. If, in Step d above, the voltage is less than 11 VDC, disconnect the power supply and signal wires to the unit. Short the wires that were removed from the power supply (+) and (-) of the electronic unit. The graph below will tell you when the resistance is too large. See Figure 4-4.

Figure 4-3
Loop Check

Figure 4-4
Loop Resistance
4.4 Testing the Electronic Unit

If capacitance values for 4 and 20 mA points have not been recorded for this unit, it is suggested that they be recorded prior to starting this test. Otherwise, note and record step span and zero settings.

Check the operation of the electronic unit using the following steps.

a. Remove the sensing element and signal wires from the transmitter.

b. Put the Step Span in position #1 and the Fine Span in the full counterclockwise position. See Figure 4-5.

c. Observing polarities, connect a DC millimeter and DC power supply (13 to 30V) in series, and complete the loop by connecting to the (+) and (-) terminals. See Figure 4-6.

d. Adjust the Zero until the meter reads 0% (4 mA).

e. Connect a 100 pF capacitor between terminals F and G (sensing element and ground). The output should read between 40% and 70% (10-15 mA). If so, the instrument is working correctly. Turning the Fine Span changes the input a known amount. This checks the operation and gain of the transmitter.

f. If the difficulty has not been located at this point, proceed to the Drift Check (output checkout procedure).

4.4.1 Drift Check

If the output of a transmitter seems to be drifting, it is important to determine whether the drift is in the transmitter or in the sensing element.

a. Remove the sensing element wire from the transmitter.

b. Without disturbing the calibration settings, connect a capacitance standard or an NPO capacitor* across the sensing element to ground input. Adjust the capacitance standard or select a capacitor value that will bring the unit on scale.

If steps in 4.4 have been completed and NPO capacitor is being used, return step span to original setting.

*The capacitor should remain stable with changes in temperature.

Figure 4-5
Step Span Switch, and Zero and Span Controls

c. Observe the reading over a 24-hour period to see if it is stable.

d. If the reading is stable, the sensing element or the application must be the source of the drift. If the reading drifted, return the instrument for repair. Be sure to mark on the tag that the problem is drift. (List the capacitor size and mA deviation.)
### Troubleshooting

#### 4.5 List of Some Possible Problems and Causes

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSE</th>
<th>CHECKOUT</th>
</tr>
</thead>
</table>
| 1. Transmitter reads 20 mA or greater even when well is not full. | a. Calibration is wrong.  
   b. Transmitter malfunction.  
   c. Water in unit housing conduit.  
   d. Cut in sensing element insulation. | a. Sec. 3.3  
   b. Sec. 4.4.1  
   c. Sec. 4.2  
   d. Sec. 4.2 |
| 2. Transmitter never reaches 20 mA even though the well is full, or the output reading is non-linear at the upper end of the scale. | a. Unvented gage tube.  
   b. Load resistance of loop too high.  
   c. Calibration is wrong.  
   d. Transmitter malfunction.  
   e. Plugged or unvented gage tube. (Also see Problem 5) | a. Figure 2.5  
   b. Sec. 4.3  
   c. Sec. 3.3  
   d. Sec. 4.4.1  
   e. Unplug vent or gage tube |
| 3. Transmitter is drifting. | a. Moisture in sensing element gland.  
   b. Water in unit housing or conduit.  
   c. Transmitter malfunction.  
   d. Cut in sensing element insulation.  
   e. Calibration is wrong. | a. Sec. 4.2  
   b. Sec. 4.2  
   c. Sec. 4.4  
   d. Sec. 4.2  
   e. Sec. 3.3 |
| 4. Transmitter is erratic. Output reading jumps anywhere from 10% to 100%. | a. Radio frequency interference.  
   b. Sec. 4.2 |
| 5. Sensing element installed in gage tube, and readings are incorrect. | a. Sensing element touching gage tube.  
   b. Reading lower than actual level: Air trapped in gage tube. (non-vented)  
   c. Calibration is wrong.  
   d. Inadequate grounding. | a. Install or adjust spacers. Sec. 2.5  
   b. Put holes in gage tube to allow air to escape. Sec. 2.2.3  
   c. Sec. 3.3  
   d. Sec. 2.3 |
| 6. Transmitter reading 5% to 10% or greater in error. | a. Calibration is wrong.  
   b. Heavy conductive buildup on sensing element. | a. Sec. 3.3  
   b. Sec. 4.2 |
SECTION 5  FACTORY AND FIELD SERVICE ASSISTANCE

5.1 Telephone Assistance

If you are having difficulty with your Drexelbrook equipment, and attempts to solve the problem have failed, notify your local Drexelbrook representative, or call the factory toll free at 1-800-527-6297. Drexelbrook Engineering Company is located at 205 Keith Valley Road, Horsham, PA USA 19044. To help us solve your problem quickly, please have as much of the following information as possible when you call:  (Fax 215-674-2731)

Instrument Model # 408-2200
Sensing Element Model # 700-5-34
Insertion Length
P.O. #
& Date
Cable Length (if remote electronics)
Brief Description of the Problem

Checkout Procedures that Failed

5.2 Equipment Return

DO NOT return equipment without first contacting the factory for a return authorization number. Any equipment being returned must include the following information in addition to that above.

Reason for Return
Return Authorization #
Person to Contact at You Company
Your “Ship To” Address

If available, please include the original P.O. # and the original Drexelbrook order # also.

To keep the paperwork in order, include a purchase order with returned equipment, even though it may be coming back for warranty repair. You will not be charged if the equipment is covered under warranty. Please return your equipment with freight charges prepaid. We regret that we cannot accept collect shipments.

Standard electronic units are generally in factory stock. If the application is critical, a spare electronic chassis should be kept on hand.

5.3 Field Service

Trained field service engineers are available on a time-plus-expense basis to assist in start-ups, diagnosing difficult application problems, or in-plant training of personnel. Contact the service department for further details.

5.4 Customer Training

Periodically, the Drexelbrook instrument training seminars for customers are held at the factory. These sessions are guided by Drexelbrook engineers and specialists, and provide detailed information on all aspects of level measurement, including theory and practice of instrument operation. For more information about these valuable workshops, write to Drexelbrook Engineering, Attn: Communications/Training Group, or call direct (215) 674-1234 or Fax 215-674-2731.)
ADDENDUM #1
700-5-34-CD2
### Production Wells

**Level Sensor Mounted "Free Hanging" Between Casing & Column (3/4 Clearance Required)**

- **Figure 1**

**Level Sensor Mounted in Metal Gage Tube (See Note 4) Minimum 3/4 ID. Standard (1/2 ID. Special)**

- **Figure 2**

**Notes:**

1. For detailed system mounting and wiring drawings see applicable system drawing 508-11-34-CD1, 508-11-734-CD1, 303-401-20-CD1, 303-421-20-CD1, 303-431-20-CD1.

2. Bottom of weight must be above or below intake zone.

3. Bottom of tube must be positioned above or below intake zone so that pump will not suck water out of gage tube.

4. Metal gage tube may be tubing, pipe, or flexible with PVC coating. A gage sounding tube allows for easier sensing element installation and removal. When well has multiple aquifers, a gage tube is required.

5. A metal union mounting is recommended for ease of sensing element installation and removal.
MONITORING / OBSERVATION WELLS

LEVEL SENSOR MOUNTED "FREE HANGING" INSIDE METAL CASING

GROUND CONNECTION
LEVEL GAGE
MOUNTED HEAD
METAL CASING
MINIMUM 3/4 I.D.
(19.05)
FLEXIBLE SENSING ELEMENT
SPACERS (FURNISHED WITH SENSING ELEMENT)
WEIGHT (INACTIVE)

FIGURE 3

LEVEL SENSOR MOUNTED "FREE HANGING" INSIDE PLASTIC/PLASTIC LINED CASING (GROUND IS REQUIRED)

GROUND WIRE & LEVEL GAGE ON OPPOSITE SIDES OF WELL
1/4 HOLE REQUIRED TO FEED WIRE FROM INSIDE

LEVEL GAGE
UNION OPTIONAL (NOTE 6)
PLASTIC/PLASTIC LINED CASING (3"-4" I.D., TYPICAL)
(76.2-101.6)
FLEXIBLE SENSING ELEMENT
SPACERS (FURNISHED WITH SENSING ELEMENT)
WEIGHT (INACTIVE)

FIGURE 4

NOTE:
6. METAL UNION MOUNTING IS RECOMMENDED FOR EASE OF SENSING ELEMENT INSTALLATION AND REMOVAL.
PRODUCTION WELLS WITH PLASTIC GAGE TUBES (NOTE 7)

LEVEL SENSOR MOUNTED IN PLASTIC GAGE TUBE
(GROUND IS REQUIRED, NOTE 8, 10)

LEVEL GAGE
GROUND CONNECTION
VENT HOLES
CASING
S.S. GROUND WIRE WITH ANCHOR CLIP
P/N 722-538-40
SEE NOTES 8 AND 10

PVC GAGE TUBE
(3/4" OR LARGER)
FLEXIBLE SENSING ELEMENT
SPACERS (FURNISHED WITH SENSING ELEMENT)
FLEXIBLE WEIGHT (INACTIVE)

12 (304.8) MINIMUM

BOTTOM OF GAGE TUBE DETAIL
SEE FIGURE 7

LEVEL GAGE MOUNTED IN PERFORATED PLASTIC GAGE TUBE (SEE NOTES B AND 9)

GROUND CONNECTION
FROM METAL HEAD OR COLUMN
LEVEL GAGE
LEVEL GAGE CONNECTION
MOUNTING 3/4 NPT
3/4" NPT PLASTIC COUPLING (FEMALE)
(CEMENTED TO CONDUIT)
METAL HEAD
PVC ELECTRICAL CONDUIT OR TUBING
1/2" HOLES RANDOMLY PLACED OVER ENTIRE LENGTH
OF EACH SECTION EVERY SIX INCHES

BOTTOM OF GAGE TUBE DETAIL
SEE FIGURE 7

BOTTOM OF THE GAGE TUBE SHOULD BE POSITIONED ABOVE OR BELOW THE INTAKE ZONE, SO THAT THE PUMP WILL NOT SUCK WATER OUT OF THE GAGE TUBE. FOR AN ALTERNATE SEE FIGURE BC.

NOTES:
7. WHEN WELLS ARE NOT STRAIGHT, A GAGE SOUNDING TUBE ALLOWS FOR EASIER SENSING ELEMENT INSTALLATION AND REMOVAL. WHEN UNIT HAS MULTIPLE AQUIFERS, A GAGE TUBE IS REQUIRED.
8. A GOOD ELECTRICAL GROUND IS REQUIRED. A PLASTIC GAGE TUBE INTERFERS WITH THIS GROUND.
9. ADDITIONAL GROUNDING IS NOT REQUIRED WHEN SENSING ELEMENT IS INSTALLED IN A PERFORATED PLASTIC GAGE TUBE PER FIGURE 6.
10. FIGURE 5 GROUND WIRE TO BE 1/8 OD, IF USED IN 3/4 GAGE TUBE. TO BE 1/8 OR LARGER IF USED WITH LARGER THAN 3/4 TUBE. IT MUST BE FIXED SO IT WILL NOT TWIST.
GAGE TUBE INSTALLATION DETAILS

GAGE TUBE BROUGHT THRU HEAD

GROUND WIRE
(REQUIRED TO METAL HEAD IF GROUND WIRE NOT USED IN GAGE TUBE)

LEVEL GAGE

3/4 NPT

PLASTIC

3/4 COUPLING

WELL HEAD

GAGE TUBE MUST BE VENTED INSIDE OR OUTSIDE WELL (NOTE 11)

FIGURE 8A

GAGE TUBE NOT BROUGHT THRU HEAD

OPENING FOR LEVEL GAGE

HEAD

COLUMN

STRAPS
(OPTIONAL)

GAGE TUBE TOP MAY BE BENT UNDER OPENING

FIGURE 8B

INSTALLING GAGE TUBE WITH COLUMN IN PLACE GAGE.

GAGE TUBE ENDING IN INTAKE ZONE
(NOT RECOMMENDED NOTE 12)

INTAKE ZONE

1/2" HOLES RANDOMLY PLACED EVERY 6" THRU INTAKE ZONE

BOTTOM CAP

FIGURE 8C

A PIN MAY BE USED AT BOTTOM TO PREVENT SENSOR FROM FALLING THRU

FIGURE 8D

TUBE

1/2" HOLES (12.7)

TUBE

USE BOTTOM CAP WITH TAPERED AND ROUNDED END TO SLIDE PAST DISCHARGE LINE COUPLINGS, WHEN INSTALLING GAGE TUBE AFTER PUMP

FIGURE 8E

NOTES:

11. ARTESIAN WELLS MUST BE VENTED INSIDE SO THAT, UNDER PRESSURE, WATER WILL STAY IN THE WELL.
12. IF GAGE TUBE ENDS IN THE INTAKE ZONE, CARE MUST BE USED TO PREVENT PUMP FROM SUCKING WATER OUT THE TUBE.
SENSING ELEMENT MOUNTING OPTIONS

Union Mounting (Recommended Note 13)

Ground Connection

3/4 NPT

Figure 9A

NPT Mounting

Ground Connection

3/4 NPT

Figure 9B

Flange Mounting

Ground Connection

Flange 1" or larger

Figure 9C

Mounting in 1" Hole

Ground Wire (Required to Metal Head or Column)

3/4 NPT

Figure 9D

Swivel Mounting Assembly (To Avoid Shaft Motor or Column)

Ground Connection

3/4 NPT

Figure 9E

NOTE:
13. A METAL UNION MOUNTING IS RECOMMENDED FOR EASE OF SENSING ELEMENT INSTALLATION AND REMOVAL
NOTES:
14. A GOOD ELECTRICAL GROUND IS REQUIRED FROM SENSING ELEMENT CABLE, THRU WATER, METAL CASING OR COLUMN, AND METAL HEAD, TO SENSING ELEMENT MOUNTING.