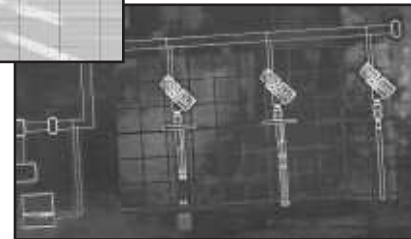
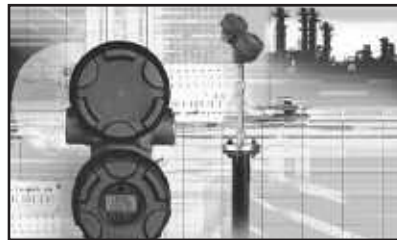




Enhanced Model 705 with
FOUNDATION Fieldbus™ Digital Output
705 software v3.x

FOUNDATION Fieldbus™ Operating Manual

*Guided Wave Radar
Level Transmitter*



Read this Manual Before Installing

This manual provides information on the Enhanced Eclipse Model 705 transmitter with FOUNDATION fieldbus™ Output and should be used in conjunction with Eclipse I&O manual 57-600. It is important that all instructions are read and followed carefully.

Safety Messages

The Eclipse system is designed for use in Category II, Pollution Degree 2 installations. Follow all standard industry procedures for servicing electrical and computer equipment when working with or around high voltage. Always shut off the power supply before touching any components. Although high voltage is not present in this system, it may be present in other systems.

Electrical components are sensitive to electrostatic discharge. To prevent equipment damage, observe safety procedures when working with electrostatic sensitive components.

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and
(2) This device must accept any interference received, including interference that may cause undesired operation.

WARNING! Explosion hazard. Do not connect or disconnect designs rated Explosion proof or Non-incendive unless power has been switched off and/or the area is known to be non-hazardous

Low Voltage Directive

For use in Installations Category II, Pollution Degree 2. If equipment is used in a manner not specified by the manufacturer, protection provided by equipment may be impaired.

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Magnetrol reserves the right to make changes to the product described in this manual at any time without notice. Magnetrol makes no warranty with respect to the accuracy of the information in this manual.

Warranty

All Magnetrol/STI electronic level and flow controls are warranted free of defects in materials or workmanship for one full year from the date of original factory shipment. If returned within the warranty period; and, upon factory inspection of the control, the cause of the claim is determined to be covered under the warranty; then, Magnetrol/STI will repair or replace the control at no cost to the purchaser (or owner) other than transportation.

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Magnetrol's quality assurance system is registered to ISO 9001 affirming its commitment to known international quality standards providing the strongest assurance of product/service quality available.



FOUNDATION fieldbus™ Enhanced Eclipse Model 705 Guided Wave Radar Transmitter

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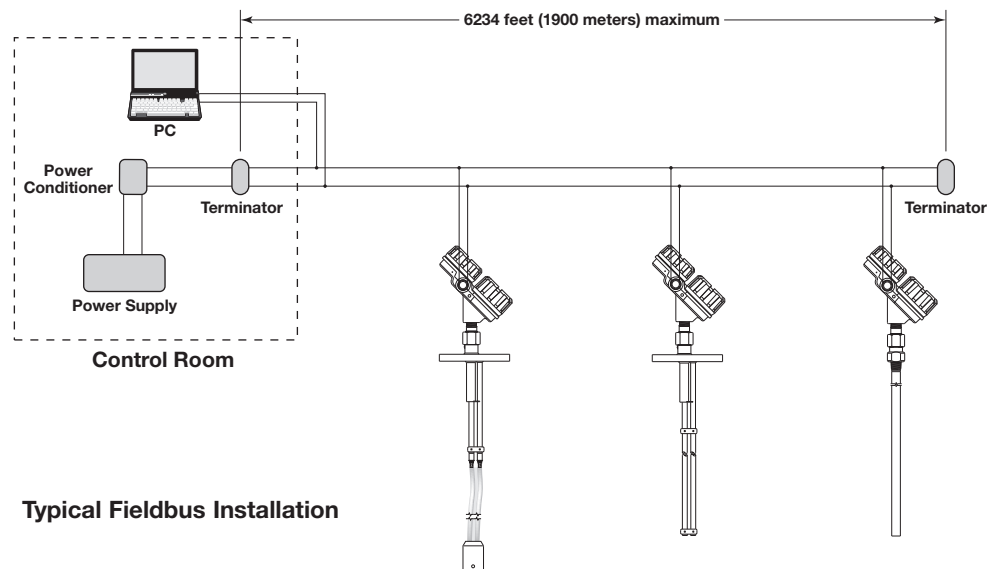
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1.0 FOUNDATION Fieldbus™ Overview

1.1 Description

FOUNDATION fieldbus™ is a digital communications system that serially interconnects devices in the field. A Fieldbus system is similar to a Distributed Control System (DCS) with two exceptions:

- Although a FOUNDATION fieldbus™ system can use the same physical wiring as an existing 4–20 mA device, Fieldbus devices are not connected point to point, but rather are multidropped and wired in parallel on a single pair of wires (referred to as a segment).
- FOUNDATION fieldbus™ is a system that allows the user to distribute control across a network. Fieldbus devices are smart and actually maintain control over the system.



Typical Fieldbus Installation

Unlike 4–20 mA analog installations in which the two wires carry a single variable (the varying 4–20 mA current), a digital communications scheme such as FOUNDATION fieldbus™ considers the two wires as a network. The network can carry many process variables as well as other information. The Enhanced Eclipse Model 705FF transmitter is a FOUNDATION fieldbus™ registered device that communicates with the H1 FOUNDATION fieldbus™ protocol operating at 31.25 kbits/sec. The H1 physical layer is an approved IEC 61158 standard.

An IEC61158 shielded twisted pair wire segment can be as long as 6234 feet (1900 meters) without a repeater. Up to 4 repeaters per segment can be used to extend the distance. The maximum number of devices allowed on a Fieldbus segment is 32 although this depends on the current draw of the devices on any given segment.

Details regarding cable specifications, grounding, termination, and other network information can be found in IEC 61158 or the wiring installation application guide AG-140 at www.fieldbus.org.

1.2 Benefits

The benefits of FOUNDATION fieldbus™ can be found throughout all phases of an installation:

1. **Design/Installation:** Connecting multiple devices to a single pair of wires means less wire and fewer I/O equipment. Initial Engineering costs are also reduced because the Fieldbus Foundation requires interoperability, defined as “the ability to operate multiple devices in the same system, regardless of manufacturer, without a loss of functionality.” All FOUNDATION fieldbus™ devices must be tested for interoperability by the Fieldbus Foundation. Magnetrol Model 705FF device registration information can be found at www.fieldbus.org.
2. **Operation:** With control now taking place within the devices in the field, better loop performance and control are the result. A FOUNDATION fieldbus™ system allows for multiple variables to be brought back from each device to the control room for additional trending and reporting.
3. **Maintenance:** The self-diagnostics residing in the smart field devices minimizes the need to send maintenance personnel to the field.

1.3 Device Configuration

Device Descriptions

The function of a FOUNDATION fieldbus™ device is determined by the arrangement of a system of blocks defined by the Fieldbus Foundation. The types of blocks used in a typical User Application are described as follows:

Resource Block describes the characteristics of the FOUNDATION fieldbus™ device such as the device name, manufacturer, and serial number.

Function Blocks are built into the FOUNDATION fieldbus™ devices as needed to provide the desired control system behavior. The input and output parameters of function blocks can be linked over the Fieldbus. There can be numerous function blocks in a single User Application.

Transducer Blocks contain information such as calibration parameters and sensor type. They are used to connect the sensor to the input function blocks.

An important requirement of Fieldbus devices is the interoperability concept mentioned earlier. Device Description (DD) technology is used to achieve this interoperability. The DD provides extended descriptions for each object and provides pertinent information needed by the host system.

DDs are similar to the drivers that your personal computer (PC) uses to operate peripheral devices connected to it. Any Fieldbus host system can operate with a device if it has the proper DD and Common File Format (CFF) for that device.

The most recent DD and CFF files can be found on the FOUNDATION fieldbus™ web site at fieldbus.org.

1.4 Intrinsic Safety

The H1 physical layer supports Intrinsic Safety (IS) applications with bus-powered devices. To accomplish this, an IS barrier or galvanic isolator is placed between the power supply in the safe area and the device in the hazardous area.

H1 also supports the Fieldbus Intrinsically Safe Concept (FISCO) model which allows more field devices in a network. The FISCO model considers the capacitance and inductance of the wiring to be distributed along its entire length. Therefore, the stored energy during a fault will be less and more devices are permitted on a pair of wires. Instead of the conservative entity model, which only allows about 90 mA of current, the FISCO model allows a maximum of 110 mA for Class II C installations and 240 mA for Class II B installations.

FISCO certifying agencies have limited the maximum segment length to 1000 meters because the FISCO model does not rely on standardized ignition curves.

The Enhanced Eclipse Model 705 is available with entity IS, FISCO IS, FNICO non-incendive, or explosion proof approvals.

1.5 Link Active Scheduler (LAS)

The Enhanced Eclipse Model 705 with FOUNDATION fieldbus™ contains a Link Active Scheduler (LAS). The LAS controls all communication on a FOUNDATION fieldbus™ segment. It maintains the “Live List” of all devices on a segment, coordinates both the cyclic and acyclic timing and, at any given time, controls which device publishes data via Compel data (CD) and Pass Token (PT).

The primary LAS is usually maintained in the host system, but in the event of a failure, all associated control can be transferred to a backup LAS in a field device such as the Enhanced Eclipse Model 705.

2.0 QuickStart Installation

The QuickStart Installation procedures provide the key steps for mounting, wiring, and configuring the Eclipse level transmitter. These procedures are intended for experienced installers of electronic level measurement instruments. See Complete Installation, Section 3.0, for detailed installation instructions.

WARNING: The Model 7xD, 7xR or 7xT overfill probes should be used for Safety Shutdown/Overfill applications. All other Guided Wave Radar probes should be installed so the maximum overfill level is a minimum of 6" (150 mm) below the process connection. This may include utilizing a nozzle or spool piece to raise the probe. Consult factory to ensure proper installation.

2.1 Getting Started

Before beginning the QuickStart Installation procedures, have the proper equipment, tools, and information available.

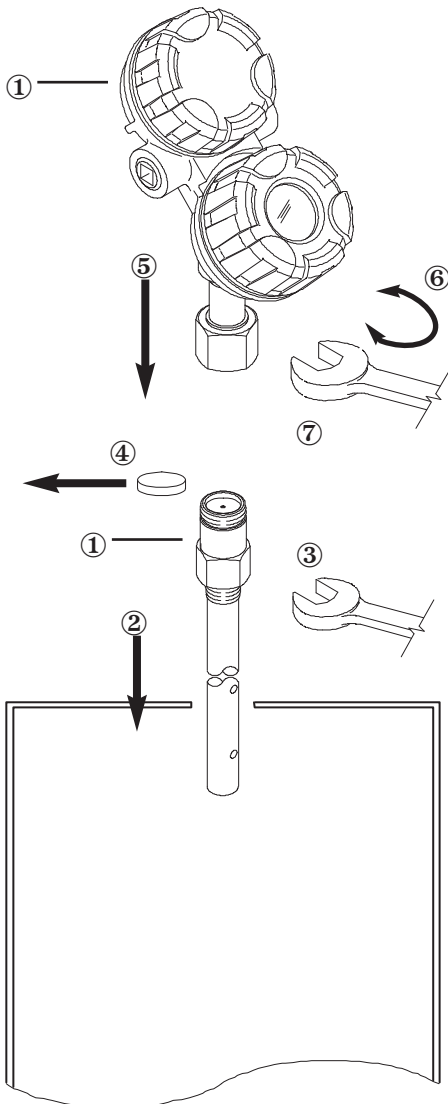
2.1.1 Equipment and Tools

- Open-end wrenches or adjustable wrench to fit the process connection size and type. Coaxial probe 1½" (38 mm), twin rod probe 1⅞" (47 mm), transmitter 1½" (38 mm). A torque wrench is highly desirable.
- Flat-blade screwdriver
- Cable cutter and ⅜" (2.5 mm) hex wrench (Flexible probes only)
- Fieldbus compatible power supply with proper termination

2.1.2 Configuration Information

Some key information is needed to configure the Eclipse transmitter. Complete the following operating parameters table before beginning configuration.

Display	Question	Answer
Probe Model	What probe model is listed on the model information? (first four digits of probe model number)	_____
Probe Mount	Is the probe mounted NPT, BSP, or flange?	_____
Measurement Type	What is the desired measurement? Choices are: Level only, Volume, Interface Level or Interface Level and Volume.	_____
Probe Length	What probe length is listed on the model information? (last three digits of probe model number)	_____
Level Offset	The desired level reading when the liquid is at the end of the probe.	_____
Dielectric	What is the dielectric constant range of the process medium? (<i>Lower layer dielectric for interface applications</i>)	_____



2.2 QuickStart Mounting

NOTE: Confirm the configuration style and process connection size/type of the Eclipse transmitter. Ensure it matches the requirements of the installation before continuing with the QuickStart installation.

- ① Confirm the model and serial numbers on the nameplates of the Eclipse probe and transmitter are identical.

For applications using the Model 7xS steam probe, it is mandatory to keep the transmitter and probe matched as a set.

2.2.1 Probe

- ② Carefully place the probe into the vessel. Align the probe process connection with the threaded or flanged mounting on the vessel.

2.2.2 Transmitter

- ③ Tighten the hex nut of the probe process connection or flange bolts.

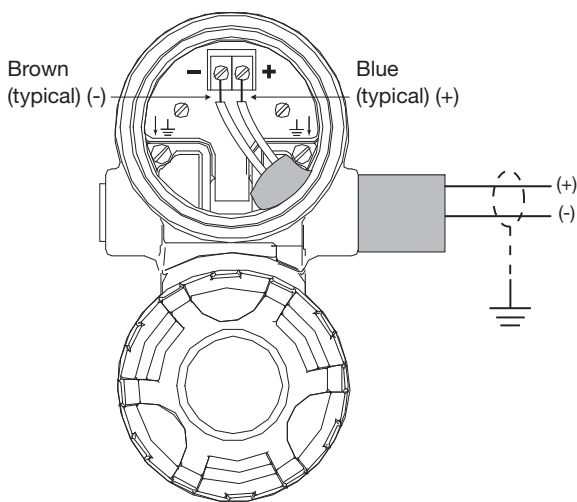
NOTE: Leave the plastic protective cap in place until ready to install the transmitter. Do not use sealing compound or TFE tape on probe connection to transmitter as this connection is sealed by a Viton® O-ring.

- ④ Remove the protective plastic cap from the top of the probe and store for future use. Make sure the top probe connector (female socket) is clean and dry. Clean with isopropyl alcohol and cotton swabs if necessary.
- ⑤ Place the transmitter on the probe. Align the universal connection at the base of the transmitter housing with the top of the probe. Hand tighten the connection.
- ⑥ Rotate the transmitter so that it is in the most convenient position for wiring, configuring, and viewing.
- ⑦ Using a 1½" (38 mm) wrench, tighten the universal connection on the transmitter ¼ to ½ turn beyond hand tight. A torque wrench is highly recommended to obtain 15 ft-lbs. This is a critical connection. DO NOT LEAVE HAND TIGHT.

2.3 QuickStart Wiring

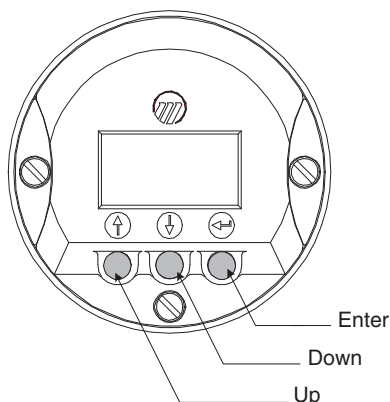
WARNING! Explosion hazard. Do not connect or disconnect equipment unless power has been switched off or the area is known to be non-hazardous.

NOTE: Ensure that the electrical wiring to the Eclipse transmitter is complete and in compliance with all regulations and codes.



1. Remove the cover of the upper wiring compartment of the transmitter.
2. Attach a conduit fitting and mount the conduit plug in the spare opening. Pull the power supply wire through the conduit fitting.
3. Connect shield to an earth ground at power supply.
4. Connect the positive supply wire to the (+) terminal and the negative supply wire to the (-) terminal. For Explosion Proof Installations, see Wiring, Section 2.5.3.
5. Replace the cover and tighten.

2.4 QuickStart Configuration

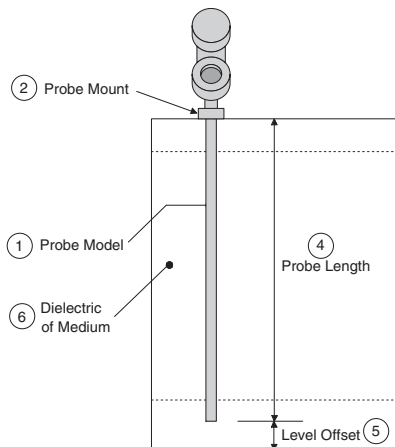


The Eclipse transmitter comes partially configured from the factory but can be reconfigured in the shop (disregard fault message due to unattached probe). The minimum configuration instructions required in the field follow. Use the information from the operating parameters table in Section 2.1.2 before beginning configuration.

1. Power up the transmitter.
The display changes every 5 seconds alternating between showing the Status and Level values.
2. Remove the cover of the lower electronic compartment.
3. Use the Up or Down Arrow () keys to move from one step of the configuration program to the next step.
4. Press the Enter Arrow () key. The last character in the first line of the display changes to an exclamation point (!).

PrbModel
xxx
5. Use the Up or Down Arrow () keys to increase or decrease the value in the display or to scroll through the choices.
6. Press the Enter Arrow () key to accept a value and move to the next step of the configuration program (the default password is 1).
7. After entering the last value, allow 10 seconds before removing power from the transmitter.

The following configuration entries are the minimum required for configuration (the default password is 1 from the LCD/keypad).



- | | | |
|---|-----------------------|--|
| ① | PrbModel
(select) | Select the Probe Model to be used
Model 705: 7xA-x, 7xB-x, 7xD-x, 7xE-x, 7xF-F, 7xF-P, 7xF-4, 7xF-x, 7xJ-x, 7xK-x, 7xP-x, 7xR-x, 7xS-x, 7xT-x, 7x1-x, 7x2-x, 7x5-x, 7x7-x |
| ② | PrbMount
(select) | Select the type of Probe Mounting to vessel (NPT, BSP, or flange). |
| ③ | MeasType
(select) | Select from Level Only, Level and Volume, Interface Level or Interface Level and Volume. |
| ④ | Probe Ln
xxx.x | Enter the exact Probe Length as printed on the probe nameplate. |
| ⑤ | Lvloffst
xxx.x | Enter the Level Offset value. Refer to Section 4.3.4 for further information. (The unit is shipped from the factory with offset = 0; i.e., all measurements are referenced to the bottom of the probe). |
| ⑥ | Dielectrc
(select) | Enter the Dielectric range for the material to be measured. |

3.0 Complete Installation

This section provides detailed procedures for properly installing and configuring the Eclipse Guided Wave Radar Level Transmitter.

3.1 Unpacking

Unpack the instrument carefully. Make sure all components have been removed from the packing material. Check all the contents against the packing slip and report any discrepancies to the factory.

Before proceeding with the installation, do the following:

- Inspect all components for damage. Report any damage to the carrier within 24 hours.
- Make sure the nameplate model number on the probe and transmitter agree with the packing slip and purchase order.
- Record the model and serial numbers for future reference when ordering parts.

Model Number

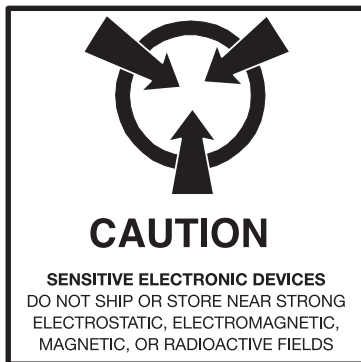
Serial Number

3.2 Electrostatic Discharge (ESD) Handling Procedure

Magnetrol's electronic instruments are manufactured to the highest quality standards. These instruments use electronic components that may be damaged by static electricity present in most work environments.

The following steps are recommended to reduce the risk of component failure due to electrostatic discharge.

- Ship and store circuit boards in anti-static bags. If an anti-static bag is not available, wrap the board in aluminum foil. Do not place boards on foam packing materials.
- Use a grounding wrist strap when installing and removing circuit boards. A grounded workstation is recommended.
- Handle circuit boards only by the edges. Do not touch components or connector pins.
- Make sure that all electrical connections are completely made and none are partial or floating. Ground all equipment to a good, earth ground.



3.3 Before You Begin

3.3.1 Site Preparation

Each Eclipse transmitter is built to match the specific physical specifications of the required installation. Make sure the probe connection is correct for the threaded or flanged mounting on the vessel or tank where the transmitter will be placed. See Mounting, Section 3.4.

Make sure that the wiring between the power supply and Eclipse transmitter are complete and correct for the type of installation.

When installing the Eclipse transmitter in a general purpose or hazardous area, all local, state, and federal regulations and guidelines must be observed. See Eclipse Installation & Operating Manual 57-600, Wiring, Section 2.5.

3.3.2 Equipment and Tools

No special equipment or tools are required to install the Eclipse transmitter. The following items are recommended:

- Open-end wrenches or adjustable wrench to fit the process connection size and type. Coaxial probe 1½" (38 mm), twin rod probe 1⅞" (47 mm), transmitter 1½" (38 mm). A torque wrench is highly desirable.
- Flat-blade screwdriver
- Fieldbus compatible power supply with proper termination

3.3.3 Operational Considerations

Operating specifications vary based on Probe model number.

3.4 Mounting

The Eclipse transmitter can be mounted to a tank using a variety of process connections. Generally, either a threaded or flanged connection is used. For information about the sizes and types of connections available, see Probe Model Numbers, Section 8.5.2.

NOTE: Do not place insulating material around any part of the Eclipse transmitter including the probe flange as this may cause excessive heat buildup.

Make sure all mounting connections are properly in place on the tank before installing the probe. Compare the nameplate on the probe and transmitter with the product information; make sure the Eclipse probe is correct for the intended installation.

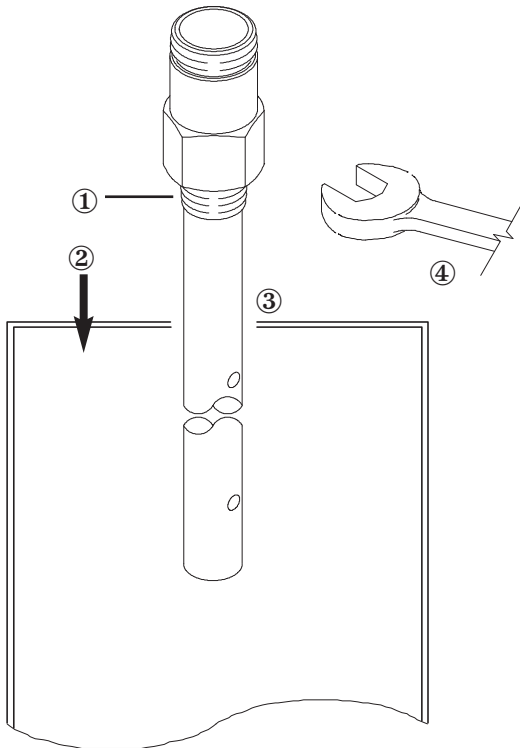
WARNING! The Model 7xD, 7xR or 7xT overfill probes should be used for Safety Shutdown/Overfill applications. All other Guided Wave Radar probes should be installed so the maximum overfill level is a minimum of 6" (150 mm) below the process connection. This may include utilizing a nozzle or spool piece to raise the probe. Consult factory to ensure proper installation.

WARNING! Do not disassemble probe when in service and under pressure.

3.4.1 Installing a Coaxial Probe (Models 7xA, 7xD, 7xP, 7xR, 7xS, and 7xT)

Before installing, make sure the:

- Model and serial numbers on the nameplates of the Eclipse probe and transmitter are identical.
- Probe has adequate room for installation and has unobstructed entry to the bottom of the vessel. The Model 7xD (High Temp./High Pressure) probe, Model 7xP (High Pressure) probe, Model 7xR (Overfill) probe, Model 7xS (Steam) probe and Model 7xT (Interface) probe require added clearance.
- Process temperature, pressure, dielectric, and viscosity are within the probe specifications for the installation.
- Model 7xD (High Temp./High Pressure) probes should be handled with extra care due to the ceramic spacers used throughout their length.



3.4.1.1 To install a coaxial probe:

- ① Make sure the process connection is at least $\frac{3}{4}$ " NPT or a flanged mounting.
- ② Carefully place the probe into the vessel. Align the gasket on flanged installations.
- ③ Align the probe process connection with the threaded or flanged mounting on the vessel.
- ④ For threaded connections, tighten the hex nut of the probe process connection. For flanged connections, tighten flange bolts.

NOTE: If the transmitter is to be installed at a later time, do not remove the protective cap from the probe. Do not use sealing compound or TFE tape on probe connection to transmitter as this connection is sealed by a Viton® O-ring.

3.4.2 Installing a Twin Rod Probe (Models 7xB, 7x5, and 7x7)

Before installing, make sure the:

- Model and serial numbers on the nameplates of the Eclipse probe and transmitter are identical.
- Probe has adequate headroom for installation and has unobstructed entry to the bottom of the vessel.
- Process temperature, pressure, dielectric, viscosity, and media buildup are within the probe specifications for the installation.

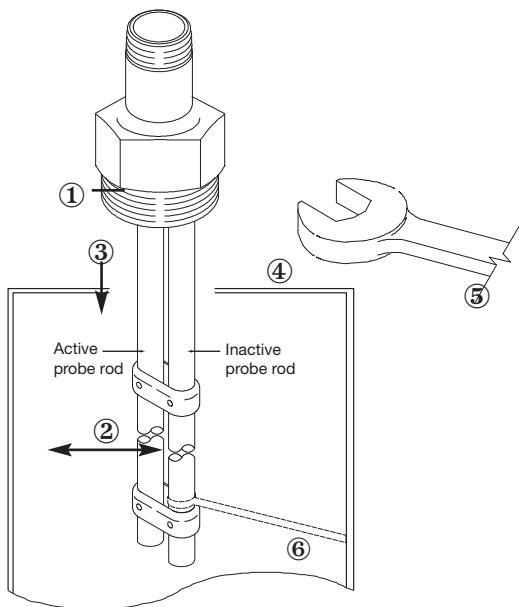
Nozzles:

The 7xB/7x5/7x7 Twin Rod probes may be susceptible to objects that are in close proximity. The following rules should be followed for proper application:

1. Nozzles should be 3" (80 mm) diameter or larger.
2. 7xB/7x5/7x7 Twin Rod probes should be installed such that the active rod is >1" (25 mm) from metallic objects such as pipes, ladders, etc., (a bare tank wall parallel to the probe is acceptable).

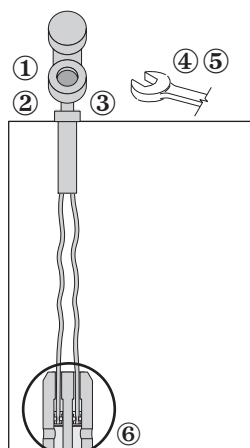
3.4.2.1 To install a rigid twin rod probe:

- ① Make sure the process connection is at least 2" NPT or a flanged mounting.
- ② Make sure that there is at least 1" (25 mm) spacing between the active probe rod and any part of the tank (walls, stillwell, pipes, support beams, mixer blades, etc.). Minimum stillwell diameter for Twin Rod probe is 3".
- ③ Carefully place the probe into the vessel. Align the gasket on flanged installations.
- ④ Align the probe process connection with the threaded or flanged mounting on the vessel.
- ⑤ For threaded connections, tighten the hex nut of the probe process connection. For flanged connections, tighten flange bolts.
- ⑥ Probe can be stabilized by attaching the inactive probe rod to vessel.



NOTE: If the transmitter is to be installed at a later time, do not remove the protective cap from the probe. Do not use sealing compound or TFE tape on probe connection to transmitter as this connection is sealed by a Viton® O-ring.

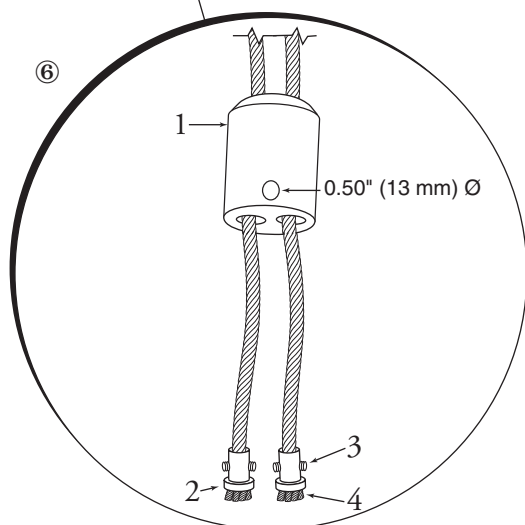
3.4.2.2 To install a Model 7x7 standard flexible twin rod probe:



- ① Make sure the process connection is at least 2" NPT or a flanged mounting.
- ② Make sure that there is at least 1" (25 mm) spacing between the active probe rod and any part of the tank (walls, stillwell, pipes, support beams, mixer blades, etc.). Minimum stillwell diameter for Twin Rod probe is 3".
- ③ Carefully place the probe into the vessel. Align the gasket on flanged installations.
- ④ Align the probe process connection with the threaded or flanged mounting on the vessel.
- ⑤ For threaded connections, tighten the hex nut of the probe process connection. For flanged connections, tighten flange bolts.

Probe can be shortened in the field:

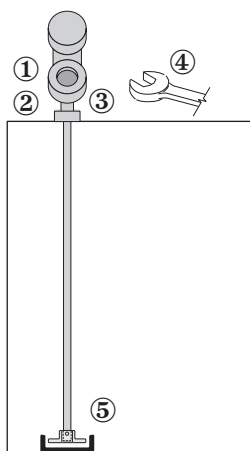
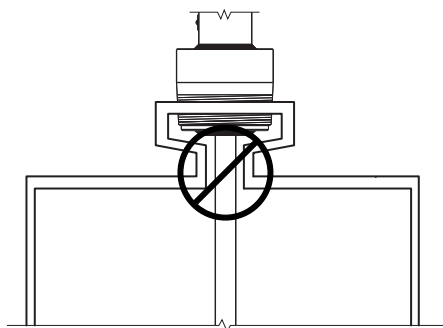
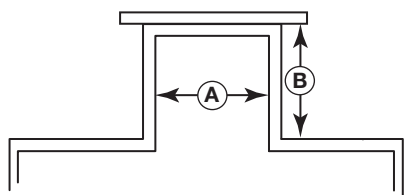
- ⑥ a. Raise the weight (1) to expose the two securing devices (2).
- b. Loosen the two #10-32 set screws (3) on both securing devices using a $\frac{3}{32}$ " (2.5 mm) hex wrench and slide the securing devices off of the probe.
- c. Slide the TFE weight off of the probe.
- d. Cut and remove the required cable (4) length.
- e. Remove $\frac{3}{8}$ " of the rib between the two cables.
- f. Strip $\frac{5}{8}$ " (16 mm) of coating from the two cables.
- g. Slide the TFE weight back on to the probe.
- h. Reattach securing device and tighten screws.
- i. Enter new probe length (inches or cm) in software.



3.4.3 Installing a Single Rod Probe (Models 7x1, 7x2, 7xF, 7xJ)

Before installing, make sure the:

- Model and serial numbers on the nameplates of the Eclipse probe and transmitter are identical.
- Probe has adequate headroom for installation and has unobstructed entry to the bottom of the vessel.
- Process temperature, pressure, dielectric, viscosity, and media buildup are within the probe specifications for the installation.
- Nozzle does not restrict performance by ensuring the following:
 1. Nozzle is <2" (50mm) diameter.



2. Ratio of Diameter: Length (A:B) is 1:1 or greater; any ratio <1:1 (e.g., a 2"× 6" nozzle = 1:3) may require a Blocking Distance and/or DIELECTRIC adjustment (see Eclipse Installation & Operating Manual 57-600, Section 2.6.5.2, Measurement Type: Level and Volume).

3. No pipe reducers (restrictions) are used.

- Probe is kept away from conductive objects to ensure proper performance. See Probe Clearance Table below. A lower gain (increase in DIELECTRIC setting) may be necessary to ignore certain objects.

PROBE CLEARANCE GUIDELINES

Distance to Probe	Acceptable Objects
<6"	Continuous, smooth, parallel conductive surface, for example a metal tank wall; important that probe does not touch wall
>6"	<1" (25mm) diameter pipe and beams, ladder rungs
>12"	<3" (75mm) diameter pipe and beams, concrete walls
>18"	All remaining objects

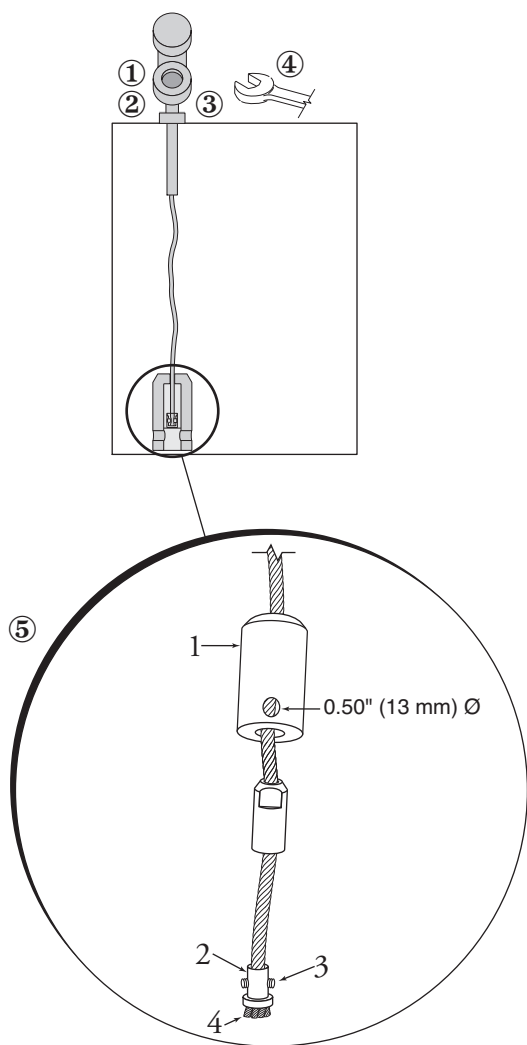
3.4.3.1 To install a Model 7xF rigid single rod probe:

- Make sure the process connection is at least 2" NPT or a flanged mounting.
- Carefully place the probe into the vessel. Align the gasket on flanged installations.
- Align the probe process connection with the threaded or flanged mounting on the vessel.
- For threaded connections, tighten the hex nut of the probe process connection. For flanged connections, tighten flange bolts.
- Probe can be stabilized by placing into a non-metallic cup or bracket at the bottom of the probe. A TFE bottom spacer (P/N 89-9114-001) is optional for mounting into a metallic cup or bracket.

NOTE: If the transmitter is to be installed at a later time, do not remove the protective cap from the probe. Do not use sealing compound or TFE tape on probe connection to transmitter as this connection is sealed by a Viton® O-ring.

3.4.3.2 To install a Model 7x1 flexible single rod probe:

- Make sure the process connection is at least 2" NPT or a flanged mounting.
- Carefully place the probe into the vessel. Align the gasket on flanged installations.



- ③ Align the probe process connection with the threaded or flanged mounting on the vessel.
- ④ For threaded connections, tighten the hex nut of the probe process connection. For flanged connections, tighten flange bolts.
- ⑤ Probe can be shortened in field:
 - a. Raise TFE weight (1) exposing securing device (2).
 - b. Loosen both #10–32 set screws (3) using $\frac{3}{32}$ " (2.5 mm) hex wrench and remove securing device.
 - c. Cut and remove needed cable (4) length.
 - d. Reattach securing device and tighten screws.
 - e. Enter new probe length (inches or cm) in software.
- ⑥ Probe can be attached to the tank bottom using the 0.50" (13 mm) $\varnothing$ hole provided in the TFE weight. Cable tension should not exceed 20 lbs.

3.4.4 Installation Guidelines

Models 7x2/7x5 Bulk Solids Probes

The Model 7x2 and 7x5 Bulk Solids probes are designed for a 3000 lb. (1360 kg) pull-down force for use in applications such as sand, plastic pellets and grains. It is offered with a maximum 75-foot (22 meter) probe length.

Model 7x2 Single Rod — dielectric ≥ 4

Model 7x5 Twin Rod — dielectric ≥ 1.9

NOTE: Avoid cement, heavy gravel, etc.

3.4.4.1 Applications

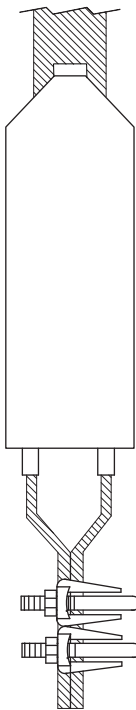
1. Plastic pellets, sugar: Dielectric constant 1.9-2.0
2. Grain, seeds, sand: Dielectric constant 2.0-3.0
3. Salts: Dielectric constant 4.0-7.0
4. Metallic powder, coal dust: Dielectric constant >7

3.4.4.2 Mounting recommendations

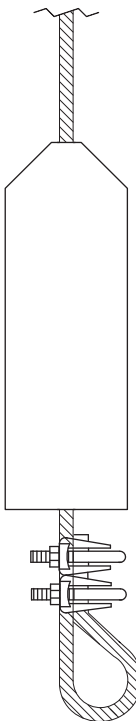
1. Use a weight instead of securing the probe to the vessel.
2. Mount probe at least 12 inches from the wall. Ideal location is $\frac{1}{4}$ to $\frac{1}{2}$ the diameter to average the angle of repose.
3. A metal flange must be used when mounting on plastic vessels.

3.4.4.3 To install a Model 7x5 bulk solids flexible twin rod probe:

- ① Make sure the process connection is at least 2" NPT or a flanged mounting.



**Model 7x5 Dual Rod
Bulk Solids Probe**



**Model 7x2 Single Rod
Bulk Solids Probe**

- ② Make sure that there is at least 1" (25 mm) spacing between the active probe rod and any part of the tank (walls, stillwell, pipes, support beams, mixer blades, etc.). Minimum stillwell diameter for Twin Rod probe is 3".
- ③ Carefully place the probe into the vessel. Align the gasket on flanged installations.
- ④ Align the probe process connection with the threaded or flanged mounting on the vessel.
- ⑤ For threaded connections, tighten the hex nut of the probe process connection. For flanged connections, tighten flange bolts.

Refer to Bulk Solid Guidelines, Section 2.4.4.

Probe can be shortened in the field:

- ⑥ a. Loosen and remove the two cable clamps.
- b. Slide the weight off of the probe.
- c. Cut the cable to the required length.
- d. Remove 12 inches of the rib between the two cables.
- e. Strip 6 inches of coating from the two cables.
- f. Slide the weight back on to the probe.
- g. Reinstall the two cable clamps and tighten.
- h. Enter the new probe length (inches or cm) in software.

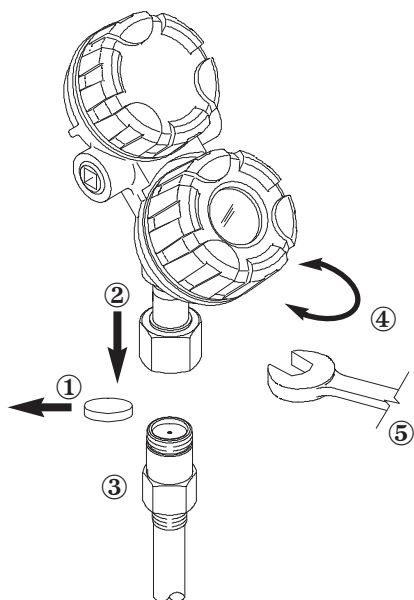
3.4.4.4 To install a Model 7x2 bulk solids flexible single rod probe:

- ① Make sure the process connection is at least 2" NPT or a flanged mounting.
- ② Carefully place the probe into the vessel. Align the gasket on flanged installations.
- ③ Align the probe process connection with the threaded or flanged mounting on the vessel.
- ④ For threaded connections, tighten the hex nut of the probe process connection. For flanged connections, tighten flange bolts.
- ⑤ Probe can be shortened in field:
- ⑥ a. Loosen and remove the two cable clamps.
- b. Slide the weight off of the probe.
- c. Cut the cable to the required length plus 6.38".
- d. Slide the weight back on to the probe.
- e. Reinstall the two cable clamps and tighten.
- f. Enter the new probe length (inches or cm) in software.

3.4.5 Installing the Transmitter

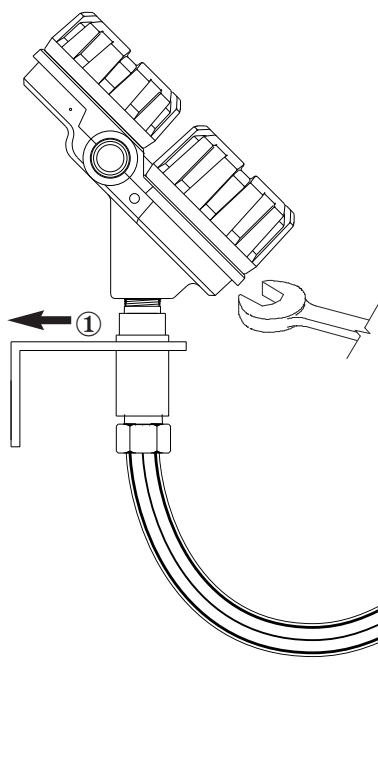
The transmitter can be ordered for installation as an Integral or Remote configuration.

3.4.5.1 Integral Mount



- ① Remove the protective plastic cap from the top of the probe. Put the cap in a safe place in case the transmitter has to be removed later.
- ② Place the transmitter on the probe. Be careful not to bend or dirty the gold, high frequency (male) connector.
- ③ Align the universal connection at the base of the transmitter housing with the top of the probe. Hand tighten the connection.
- ④ Rotate the transmitter to face the most convenient direction for wiring, configuration, and viewing.
- ⑤ When the transmitter is facing the desired direction, use a 1½" (38 mm) wrench to tighten the universal connection on the transmitter to 15 ft-lbs. A torque wrench is highly recommended. This is a critical connection. **DO NOT LEAVE HAND TIGHT.**

3.4.5.2 Remote Mount



- ① Mount the transmitter/remote bracket as an assembly within 33" (84 cm) of the probe. **DO NOT REMOVE TRANSMITTER FROM BRACKET.**
- ② Remove the protective plastic cap from the top of the probe. Put the cap in a safe place in case the transmitter has to be removed later.
- ③ Align the universal connection at the end of the remote assembly with the top of the probe. Using a 1½" (38 mm) wrench, tighten the universal connection on the transmitter to 15 ft-lbs. A torque wrench is highly recommended. This is a critical connection. **DO NOT LEAVE HAND TIGHT.**

4.0 Function Blocks

4.1 Overview

The Enhanced Eclipse Model 705 Guided Wave Radar Level Transmitter operates on the principle of Time Domain Reflectometry (TDR). Refer to Bulletins 57-101 and 57-600 for more detailed information on the Eclipse product family.

The Enhanced Eclipse Model 705FF is a Guided Wave Radar (GWR) level transmitter with six FOUNDATION fieldbus™ Function Blocks (one Resource Block, one Transducer Block, and four Analog Input blocks). The idea of Function Blocks, which a user can customize for a particular application, is a key concept of Fieldbus topology. Function Blocks consist of an algorithm, inputs and outputs, and a user-defined name.

The TRANSDUCER block output is available to the network through the ANALOG INPUT blocks.

- The ANALOG INPUT blocks (AI) take the TRANSDUCER block level or volume values and makes them available as an analog value to other function blocks. The AI blocks have scaling conversion, filtering, and alarm functions.

4.1.1 Universal Fieldbus Block Parameters

The following are general descriptions of the parameters common to all blocks. Additional information for a given parameter is described later in that specific block section.

ST_REV (static data revision): a read only parameter that gives the revision level of the static data associated with the block. This parameter will be incremented each time a static parameter attribute value is written and is a vehicle for tracking changes in static parameter attributes.

TAG_DESC (tag descriptor): a user assigned parameter that describes the intended application of any given block.

STRATEGY: a user assigned parameter that identifies groupings of blocks associated with a given network connection or control scheme.

ALERT_KEY: a user assigned parameter which may be used in sorting alarms or events generated by a block.

MODE_BLK: a structured parameter composed of the actual mode, the target mode, the permitted mode(s), and the normal mode of operation of a block.

- The actual mode is set by the block during its execution to reflect the mode used during execution.
- The target mode may be set and monitored through the mode parameter.

- The permitted modes are listed for each block.
- The block must be in an automatic mode for normal operation.

NOTE: The MODE_BLK target parameter must be OOS (out of service) to change configuration and calibration parameters in that function block (when in OOS, the normal algorithm is no longer executed and any outstanding alarms are cleared).

All blocks must be in an operating mode for the device to operate. This requires the Resource Block to be in “AUTO” and the Transducer Block to be in “AUTO” before the Function Blocks can be placed in a mode other than OOS (out of service).

BLOCK_ERR: a parameter that reflects the error status of hardware or software components associated with, and directly affecting, the correct operation of a block.

NOTE: A BLOCK_ERR of “Simulation Active” in the Resource Block does not mean simulation is active—it merely indicates that the simulation (hardware) enabling jumper is present.

4.2 Resource Block

The RESOURCE block contains data specific to the Enhanced Model 705 transmitter, along with some information about the firmware.

NOTE: The Resource Block has no control function.

MODE_BLK: Must be in AUTO in order for the remaining blocks in the transmitter to operate.

NOTE: A Resource Block in “out of service” will stop all function block execution in the transmitter.

RS_STATE (Resource State): identifies the state of the RESOURCE block state machine. Under normal operating conditions, it should be “On-Line.”

DD_RESOURCE: a string identifying the tag of the resource that contains the Device Description for this device.

MANUFAC_ID: contains Magnetrol International’s FOUNDATION fieldbus™ manufacturer’s ID number, which is 0x000156.

DEV_TYPE: the model number of the Enhanced Eclipse Model 705 transmitter (0x0001). It is used by interface devices to locate the Device Descriptor (DD) file for this product.

DEV_REV: contains the firmware revision of the Enhanced Eclipse Model 705 transmitter. It is used by interface devices to correctly select the associated DD.

DD_REV: contains the revision of the DD associated with the version of firmware in the Enhanced Eclipse Model 705 transmitter. It is used by interface devices to correctly select the associated DD.

RESTART: Default and Processor selections are available. Default will reset the Model 705 to the established block configuration.

NOTE: As RESTART DEFAULT will set **all** configuration parameters to their default values. Devices need to be reconfigured following activation of this function

FEATURES: a list of the features available in the transmitter. The Model 705 features include Reports, and Software Write Locking.

FEATURES_SEL: allows the user to turn Features on or off.

CYCLE_TYPE: identifies the block execution methods that are available.

CYCLE_SEL: allows the user to select the block execution method.

MIN_CYCLE_T: the time duration of the shortest cycle interval. It puts a lower limit on the scheduling of the resource.

NV_CYCLE_T: the minimum time interval between copies of non-volatile (NV) parameters to NV memory. NV memory is only updated if there has been a significant change in the dynamic value and the last value saved will be available for the restart procedure. A value of "0" means it will never be automatically copied. Entries made by human interface devices to NV parameters are copied to non-volatile memory at the time of entry.

NOTE: After completing a large copy, allow several minutes before removing power from the Eclipse Model 705 transmitter to ensure that all data has been saved.

FREE_SPACE: shows the amount of available memory for further configuration. The value is zero percent in a pre-configured device.

FREE_TIME: the amount of the block processing time that is free to process additional blocks.

SHED_RCAS: the time duration at which to give up computer writes to function block RCas locations. Shed from RCas will never happen when SHED_RCAS = 0.

SHED_ROUT: the time duration at which to give up computer writes to function block ROut locations. Shed from ROut will never happen when SHED_ROUT = 0.

FAULT_STATE, SET_FSTATE, CLR_FSTATE: these only apply to output function blocks. (The Model 705 has no output function blocks).

MAX_NOTIFY: the maximum number of alert reports that the transmitter can send without getting a confirmation.

The user can set the number low, to control alert flooding, by adjusting the LIM_NOTIFY parameter value.

LIM_NOTIFY: the maximum numbers of unconfirmed alert notify messages allowed. No alerts are reported if set to zero.

CONFIRM_TIME: the time that the transmitter will wait for confirmation of receipt of a report before trying again. Retry will not occur if CONFIRM_TIME = 0.

WRITE_LOCK: When set to LOCKED, will prevent any external change to the static or non-volatile data base in the Function Block Application of the transmitter. Block connections and calculation results will proceed normally, but the configuration will be locked.

UPDATE_EVT (Update Event): is an alert generated by a write to the static data in the block.

BLOCK_ALM (Block Alarm): is used for configuration, hardware, connection, or system problems in the block. The cause of any specific alert is entered in the subcode field. The first alert to become active will set the Active status in the Status attribute. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the Active status, if the sub-code has changed.

ALARM_SUM (Alarm Summary): contains the current alert status, the unacknowledged states, the unreported states, and the disabled states of the alarms associated with the block.

ACK_OPTION (Acknowledge Option): selects whether alarms associated with the block will be automatically acknowledged.

WRITE_PRI (Write Priority): the priority of the alarm generated by clearing the write lock.

WRITE_ALM (Write Alarm): the alert generated if the write lock parameter is cleared.

ITK_VER (ITK Version): contains the version of the Interoperability Test Kit (ITK) used by the Fieldbus Foundation during their interoperability testing.

4.3 GWR Transducer Block

The GWR TRANSDUCER block is a custom block containing parameters that support the Enhanced Eclipse Model 705 level transmitter. It contains the GWR probe configuration, diagnostics, and calibration data, and outputs level with status information.

The TRANSDUCER block parameters are grouped in a useful configuration. There are both read-only parameters and read-write parameters within the TRANSDUCER block.

- The read-only parameters report the block status and operation modes.
- The read-write parameters affect the function block basic operation, level transmitter operation, and calibration.

The Transducer Block will automatically be changed to “Out of Service” when the local interface (keypad) is used to change a parameter online.

4.3.1 GWR Transducer Block Parameters

The first six parameters in the GWR TRANSDUCER block are the universal parameters discussed in section 4.1.1. The universal parameters are followed by these additional required parameters:

UPDATE_EVT (Update Event): an alert generated by a write to the static data in the TRANSDUCER block.

Another important parameter found later in the TRANSDUCER block list is **DEVICE_STATUS**, which displays the status of the device. If more than one message exists, then the messages are displayed in priority order. Refer to Section 8.1.2, Error Messages.

If **DEVICE_STATUS** indicates a problem, refer to Section 8.1, Troubleshooting (those parameters which are shaded are password-protected).

For a complete list of Transducer Block Parameters, refer to table in the Appendix.

4.3.2 Password Parameters

To change a parameter at the local user interface, a value matching the user password must be entered (Default=1). If the user password is entered, the instrument is in the user mode. After 5 minutes with no keypad activity, the entered password expires.

Factory password is for use by trained factory personnel only.

From the network, the instrument always behaves as if it is in the user mode by default. In other words, it is not necessary to enter the user password in order to write parameters from the network.

4.3.3 Eclipse Model 705 Configuration Parameters

This set of parameters within the Transducer Block is important and required to configure every Eclipse Model 705 transmitter.

PROBE_MODEL: Select the choice that corresponds to the first four digits of the model number of the probe. An “x” in the selection means that character is variable (the probe model number is shown on the nameplates attached to both the transmitter and probe). For example, 7xA-x should be chosen for probe models beginning with 7EA or 7MA.

PROBE_MOUNT: Select the type of mounting on the probe. The choices are NPT, BSP, and Flange.

MEASUREMENT_TYPE: Select from LEVEL ONLY, LEVEL AND VOLUME, INTERFACE, or INTERFACE AND VOLUME.

PROBE_LENGTH: Enter the exact length of the probe. The probe length is shown as the last three digits of the probe model number printed on the nameplates attached to the transmitter and probe. PROBE_LENGTH is shown in SENSOR_UNITS.

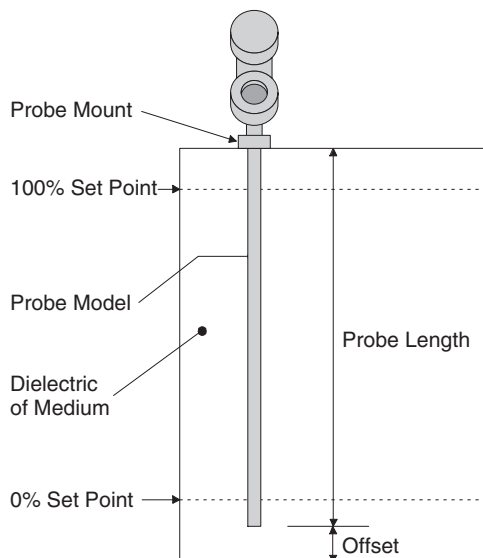
LEVEL_OFFSET: Enter the distance from the probe tip to the desired 0% reference in PROBE_UNITS. The acceptable range is from -24 inches to 600 inches. Refer to Section 4.3.4 for additional information.

DIELECTRIC_RANGE: Select from 10–100, 3–10, 1.7–3.0, or 1.7–1.4

NOTE: All dielectric ranges are not available with all probes.

If an unsupported dielectric range is selected, the transmitter will give a negative response and the value displayed will revert to its previous value.

THRESHOLD: The threshold can be set as either FIXED or CFD. The factory default is CFD. This parameter should only be changed to FIXED in those applications measuring total level having a lower dielectric material over a higher dielectric material. A typical example for FIXED Threshold is a hydrocarbon application having water bottoms.

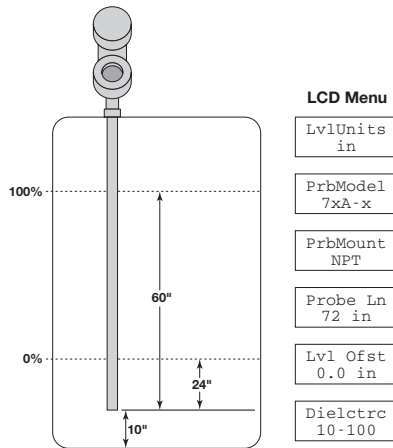


4.3.4 Offset Description

The parameter referred to as LEVEL_OFFSET in the Transducer Block is the desired level reading when liquid surface is at the end of the probe. The Eclipse transmitter is shipped from the factory with LEVEL_OFFSET set to 0. With this configuration, all measurements are referenced from the bottom of the probe. See Example 1.

Example 1 (LEVEL_OFFSET = 0 as shipped from factory):

Application calls for a 72-inch NPT Coaxial probe in water with the bottom of the probe 10 inches above the bottom of the tank. The user wants the 0% point at 24 inches and the 100% point at 60 inches as referenced from the bottom of the probe.

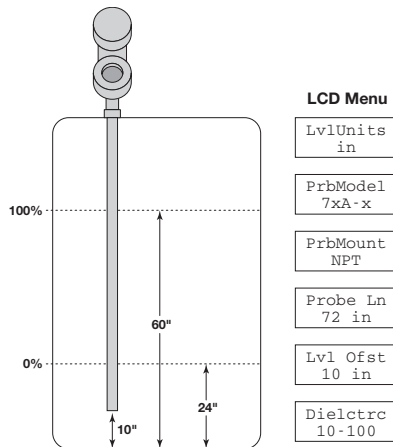


Example 1

In those applications in which it is desired to reference all measurements from the bottom of the vessel, the value of LEVEL_OFFSET should be changed to the distance between the bottom of the probe and the bottom of the vessel as shown in Example 2.

Example 2:

Application calls for a 72-inch NPT coaxial probe in water with the bottom of the probe 10 inches above the bottom of the tank. The user wants the 0% point at 24 inches and the 100% point at 60 inches as referenced from the bottom of the tank.

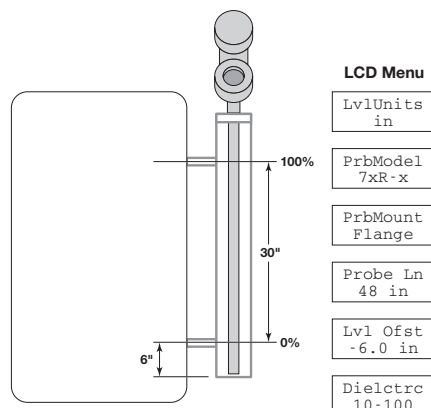


Example 2

When the Eclipse transmitter is mounted in a chamber/bridle, it is usually desirable to configure the unit with the 0% point at the lower process connection and the 100% point at the upper process connection. The span is the center-to-center dimension. In this case, a negative LEVEL_OFFSET needs to be entered. In doing so, all measurements are then referenced at a point up on the probe as shown in Example 3.

Example 3:

Application calls for a 48-inch cage-coaxial flanged probe measuring water in a chamber with the bottom of the probe 6 inches below the lower process connection. The user wants the 0% point to be 0 inches at the bottom process connection and the 100% point to be 30 inches at the top process connection.



Example 3

4.4 User-Calibration Parameters

One of the main advantages of the Enhanced Eclipse Model 705 GWR transmitter is that the device does not need to be calibrated in the field. Every Enhanced Eclipse Model 705 transmitter is shipped from the factory precisely calibrated.

On the other hand, part of the advantage of FOUNDATION fieldbus™ is to provide the ability to monitor changes and adjustments to a transmitter. The Fieldbus™ concept allows a user to make calibration adjustments if deemed necessary.

NOTE: The original factory calibration settings are restored when a new probe length value is assigned.

It is highly recommended that factory calibration be used for optimum performance.

Contact the factory for information on how to perform a User Calibration.

4.4.1 Factory Parameters

The factory-adjustable calibrated parameters are WINDOW, CONVERSION_FACTOR, and SCALE_OFFSET.

WINDOW is used to adjust for the variations in the analog section of the Eclipse TDR measurement engine. CONVERSION_FACTOR and SCALE_OFFSET are the main factory calibration settings.

The following parameters are used for either troubleshooting or are parameters adjusted at the factory. They should never be changed in the field.

WINDOW: determines the amount of delay between the generation of the transmitted signal pulse and the start of the measurement cycle.

FID_TICKS: a measure of the time to the fiducial (reference) pulse.

FID_TICKS_SPREAD: provides an indication of the stability of the FID_TICKS measurement.

LEVEL_TICKS: a measure of the time to the level of the product being measured.

LEVEL_TICKS_SPREAD: provides an indication of the stability of the LEVEL_TICKS measurement.

CONVERSION_FACTOR: the slope of the factory-set calibration line.

SCALE_OFFSET: the intercept of the calibration line.

4.4.2 Firmware Version

The last parameter in the TRANSDUCER block gives the firmware version of the transmitter.

FIRMWARE_VERSION: displays the version of the firmware.

NOTE: The user should compare the DD file and revision number of the device with the HOST system to ensure they are at the same revision level.

4.5 Analog Input Block

The ANALOG INPUT (AI) block takes the manufacturer's input data, selected by channel number, and makes it available to other function blocks at its output:

1. Level
2. Volume
3. Interface
4. Interface Volume

4.5.1 AI Block Parameters

PV: Either the primary analog value for use in executing the function, or a process value associated with it.

OUT: The primary analog value calculated as a result of executing the function block.

SIMULATE: Allows the transducer analog input or output to the block to be manually supplied when simulate is enabled. When simulate is disabled, the simulate value and status track the actual value and status

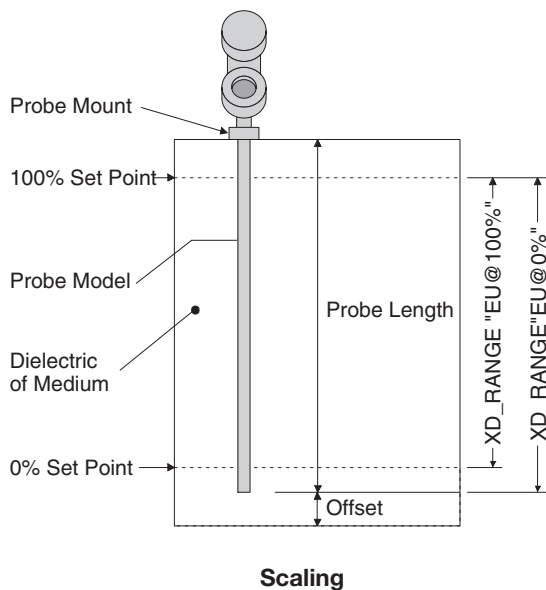
XD_SCALE: The high and low scale values, engineering units code, and number of digits to the right of the decimal point used with the value obtained from the transducer for a specified channel.

OUT_SCALE: The high and low scale values, engineering units code, and number of digits to the right of the decimal point to be used in displaying the OUT parameter.

GRANT_DENY: Options for controlling access of host computers and local control panels to operating, tuning, and alarm parameters of the block.

IO_OPTS: Option which the user may select to alter input and output block processing.

STATUS_OPTS: Options which the user may select in the block processing of status.



CHANNEL: The number of the logical hardware channel that is connected to this I/O block. This information defines the transducer to be used going to or from the physical world.

L_TYPE: Determines if the values passed by the transducer block to the AI block may be used directly (Direct) or if the value is in different units and must be converted linearly (Indirect), or with square root (Ind Sqr Root), using the input range defined for the transducer and the associated output range.

LOW_CUT: Limit used in square root processing.

PV_FTIME: Time constant of a single exponential filter for the PV, in seconds.

FIELD_VAL: Raw value of the field device in % of PV range, with a status reflecting the Transducer condition, before signal characterization (L_TYPE) or filtering (PV_FTIME).

UPDATE_EVT: This alert is generated by any change to the static data.

BLOCK_ALM: The block alarm is used for all configuration, hardware, connection failure or system problems in the block.

ALARM_SUM: The current alert status, unacknowledged states, unreported states, and disabled states of the alarms associated with the function block.

ACK_OPTION: Selection of whether alarms associated with the function block will be automatically acknowledged.

ALARM_HYS: Amount the PV must return within the alarm limits before the alarm condition clears. Alarm hysteresis expressed as a percent of the span of the PV.

HI_HI_PRI: Priority of the high high alarm.

HI_HI_LIM: The setting for high high alarm in engineering units.

HI_PRI: Priority of the high alarm.

HI_LIM: The setting for high alarm in engineering units

LO_PRI: Priority of the low alarm.

LO_LIM: The setting for low alarm in engineering units.

LO_LO_PRI: Priority of the low low alarm.

LO_LO_LIM: The setting for low low alarm in engineering units.

HI_HI_ALM: The status for high high alarm and its associated time stamp.

HI_ALM: The status for high alarm and its associated time stamp.

LO_ALM: The status for low alarm and its associated time stamp.

LO_LO_ALM: The status for low low alarm and its associated time stamp.

The TRANSDUCER and AI block's MODE_BLK parameter must be set to AUTO to pass the PV Value through the AI to the network.

Transducer scaling, called XD_SCALE, is applied to the PV from the CHANNEL to produce the FIELD_VAL in percent. Valid XD_SCALE in engineering units is limited to the five allowable codes of meters (m), centimeters (cm), feet (ft), inches (in), and percent (%) for the Level channels, or gallons, liters, % for the volume channels.

The AI can have a BLOCK_ERR when:

1. Channel is not set correctly.
2. XD_SCALE does not have suitable engineering units or has range incompatibility.
3. SIMULATE parameter is active
4. AI block MODE is O/S (out of service).

NOTE: This can be caused by the Resource Block being OOS or the AI Block not scheduled for execution.

5. L-TYPE not set or set to Direct with improper OUT_SCALE.

The AI uses the STATUS_OPTS setting and the TRANSDUCER PV LIMIT value to modify the AI PV and OUT QUALITY.

Damping Filter is a feature of the AI block. PV_FTIME parameter is time constant of a single exponential filter for the PV, in seconds. This parameter can be used to dampen out fluctuation in level due to excessive turbulence.

The AI block has multiple ALARM functions that monitor the OUT parameter for out of bound conditions.

6.0 Diagnostic Parameters

The Eclipse Model 705 GWR measurement engine runs through a series of self-tests and will detect and report faulty operation. The GWR TRANSDUCER BLOCK displays these faults in the DEVICE_STATUS parameter. Refer to Section 8.1.2 for more information on specific faults and warnings.

BLOCK_ERROR is not used except for indicating Out of Service (OOS).

When the Model 705 transmitter is initially powered on, the measurement engine does not have enough valid measurement cycles to make a decision about the output level. For the first sixteen measurement cycles after power is applied, the QUALITY is “Uncertain,” the SUB_STATUS is “Initial value,” and the LIMIT attribute is “Constant.”

When the Model 705 is operating correctly, the QUALITY is shown as “GOOD,” and the SUB_STATUS is “Non-Specific.”

While changing the transmitter operational parameters using the local display or through the system configuration tool (with the MODE_BLK in OOS), the output might be inaccurate because of the changing parameters. When the device is in a mode where operational parameters can be changed, the GWR TRANSDUCER BLOCK will still output level but the QUALITY will be shown as “Bad” and the SUB_STATUS is “Out of Service.”

When the Enhanced Model 705 measurement cycle fails to find a valid output level, the transmitter maintains the last good value as the output and flags the failure. The LIMIT attribute is the same as the last good measurement. Excessive disrupted cycles causes the transmitter to go into a defined operational mode based on the cause of the disrupted cycles.

When the Enhanced Model 705 detects a level above the highest measurement point of the probe the operational mode is shown as “May Be Flooded.” This is due to the fact that, since the actual level location above the top of some probes is not known, the output may not be accurate.

The Model 705 operational mode is DRY_PROBE when the level is below the end of the probe. Again, the output may not be accurate, since the location of the level below the end of the probe is not known. The GWR TRANSDUCER BLOCK output is calculated as LEVEL_OFFSET.

When in the dry probe condition, the Model 705 compares the measured length of the probe to the value entered into the PROBE_LENGTH parameter. If the measured value

does not match PROBE_LENGTH, a fault is reported. The QUALITY will be shown as “Bad,” and the SUB_STATUS is “Configuration error.”

If the Model 705 fails to find a measurable level, either due to an actual loss of a level signal or the loss of a proper Fiducial (reference) signal, the GWR TRANSDUCER BLOCK maintains the last good value as the output and flags the failure. The QUALITY is “Bad,” the SUB_STATUS is “Sensor failure” for no level (or “Device failure” for loss of the Fiducial), and the LIMIT attribute is “Constant.”

6.1 Simulation Feature

The Eclipse Model 705 with FOUNDATION fieldbus™ supports the Simulate feature in the Analog Input block. The Simulate feature is typically used to exercise the operation of an AI block by simulating a TRANSDUCER block input.

This feature can not be activated without the placement of a hardware jumper. This jumper is installed as standard on the Eclipse Model 705, and is placed in an inconvenient location to avoid inadvertent disabling of this feature.

NOTE: A BLOCK_ERR of “Simulation Active” in the Resource Block does not mean simulation is active—it merely indicates that the simulation (hardware) enabling jumper is present.

Contact the factory for instructions on how to remove this jumper and permanently disable the Simulate feature.

7.0 Documentation

The following two tables are examples of data sheets describing what information is need to fully specify a Fieldbus device. The first table shows one device per page, while table 2 is intended for multiple devices.

Refer to “FOUNDATION fieldbus™ System Engineering Guidelines—AG-181” for additional information. This document can be found at www.fieldbus.org.

7.1 Fieldbus Data Sheet for Individual Instrument

Fieldbus Function Blocks	Segment Information	Miscellaneous Information
☐ Analog Input (AI) _____ Number _____ Execution Time (msec)	☐ Arithmetic (A) _____ Execution Time (msec) ☐ Digital Alarm (DA) _____ Execution Time (msec)	Device: Segment # _____
☐ Discrete Input (DI) _____ Number _____ Execution Time (msec)	☐ Calculate _____ Execution Time (msec) ☐ Analog Alarm (AA) _____ Execution Time (msec)	LAS Capable: ☐ YES ☐ NO Device current draw (mA): In-rush current (mA):
☐ Bias/Gain Settings (BG) _____ Execution Time (msec)	☐ Deadtime (D) _____ Execution Time (msec)	Device Lift-off (minimum) voltage:
☐ Manual Loader _____ Execution Time (msec)	☐ Complex Analog Output (CAO) _____ Execution Time (msec)	Device capacitance:
☐ Proportional/Integral/Derivative (PID) _____ Execution Time (msec)	☐ Step Output PID (SOPID) _____ Execution Time (msec)	Polarity Sensitive: ☐ YES ☐ NO
☐ Analog Output (AO) _____ Number _____ Execution Time (msec)	☐ Set Point Ramp Generator _____ Execution Time (msec)	DD Revision:
☐ Discrete Output (DO) _____ Number _____ Execution Time (msec)	☐ Signal Characterizer (SC) _____ Execution Time (msec)	CFF Revision: Tested with ITK revision
☐ Control Selector (CS) _____ Execution Time (msec)	☐ Digital Human Interface (DHI) _____ Execution Time (msec)	NOTES:
☐ Proportional/Derivative (PD) _____ Execution Time (msec)	☐ _____ _____ Execution Time (msec)	
☐ Ratio _____ Number _____ Execution Time (msec)		

7.2 Fieldbus Data Sheet for Multiple Devices

	1	2	3	4	5	6	7	8	9	10	11	12
TAG NUMBER												
Number of Als												
AI Execution Time (msec)												
Number of AOs												
AO Execution Time (msec)												
Number of SSs												
SS Execution Time (msec)												
Number of TOTs												
TOT Execution Time (msec)												
Number of ARs												
AR Execution Time (msec)												
Number of PIDs												
PID Execution Time (msec)												
Number of _____												
Execution Time												
Number of _____												
Execution Time												
Number of _____												
Execution Time												
Number of _____												
Execution Time												
Number of _____												
Execution Time												
Number of _____												
Execution Time												
Channel												
I.S. Segment (If applicable)												
LAS Capable (Yes/No)												
DD Revision												
ITK Revision												
Polarity Sensitive (Yes/No)												
CFF Revision												

8.0 Reference Information

8.1 Troubleshooting

WARNING!

Explosion hazard. Do not connect or disconnect equipment unless power has been switched off or the area is known to be non-hazardous.

The Eclipse transmitter is designed and engineered for trouble-free operation over a wide range of operating conditions. Common transmitter problems are discussed in terms of their symptoms and recommended corrective actions. Information on how to handle material buildup on the probe is also provided in this section.

8.1.1 Troubleshooting System Problems

Symptom	Problem	Solution
LEVEL and % OUTPUT values are inaccurate.	Basic configuration data is questionable.	Reconfigure the Probe Model and/or Probe Mount, Probe Length or Level Offset. 1) Ensure the Level is accurate. 2) Verify EU0% and EU100% Loop values.
	Interface level has significant emulsion.	Examine process to reduce/eliminate emulsion layer.
LEVEL readings are repeatable but consistently high or low from actual by a fixed amount.	Configuration data does not accurately match probe length or tank height.	Ensure proper Probe Model and probe length. Adjust trim level value by the amount of noted inaccuracy.
LEVEL and % OUTPUT values fluctuate.	Turbulence	Increase the Damping factor until the readings stabilize.
	High Frequency connection	Check Fid Spread (should be stable within ± 10 counts).
LEVEL and % OUTPUT values all reading low vs. actual.	Lower dielectric material over higher dielectric material, e.g., oil over water	Select Fixed Threshold option.
	Coating, clumping or buildup on probe	These may be expected inaccuracies due to affect on pulse propagation.
	Dense, water based foam	These may be expected inaccuracies due to affect on pulse propagation.
Level Reading on Display is stuck at full scale.	Software believes probe is flooded (level near very top of probe).	Check actual level. If probe is not flooded, Check for buildup or obstructions near top of probe. Select higher dielectric range. Check for condensation in probe connection. Add Blocking Distance.
LEVEL and % OUTPUT values values all at maximum level.	Possible configuration issue with single rod probe	1) Increase Blocking Distance 2) Increase Dielectric Range
LEVEL and % OUTPUT values reading high vs. actual.	Possible obstruction in tank affecting single rod probe	1) Increase Dielectric Range until obstruction is ignored 2) Relocate probe away from obstruction
LEVEL value reading high when should be zero.	Transmitter loose or disconnected from probe	Ensure transmitter connected securely to probe.

NOTE: When consulting the factory concerning improper operation, use proper tables on Pages 65-67. Enter all data when transmitter is working CORRECTLY or INCORRECTLY.

8.1.2 Status Messages

Display Message	Description	Comment
OK	None	Normal operating mode
Initial	None	Program is Initializing. This is a transient condition.
DryProbe	None	Normal message for a dry probe. End of probe signal is being detected.
EOP Low	End of Probe signal from a dry probe is out of range	1) Ensure probe length is entered correctly 2) Set transmitter to a lower dielectric range 3) Consult factory
EOP High	End of Probe signal is out of range	1) Ensure probe length is entered correctly 2) Consult factory
WeakSgnl	None. Signal amplitude is lower than desired.	1) Set transmitter to lower dielectric range 2) Increase sensitivity
Flooded?	Loss of level signal possibly due to flooding, twin rod probes only	1) Decrease level in vessel 2) Set transmitter to lower dielectric range 3) Replace with Model 7xR Overfill probe
NoSignal	No level signal being detected.	1) Ensure dielectric setting is correct for measured medium 2) Increase sensitivity 3) Confirm that the probe type is proper for the dielectric of the medium 4) Consult factory
No Fid	Fiducial signal is not being detected	1) Check connection between probe and transmitter 2) Check for moisture on top of probe 3) Check for damaged gold pin on the high frequency connector 4) Consult factory
FidShift	FidTicks shifted from expected value	1) Check connection between probe and transmitter 2) Check for moisture on top of probe 3) Check for damaged gold pin on the high frequency connector 4) Consult factory
SZ Alarm	Safety Zone alarm has been tripped	Decrease level in vessel
Hi Temp	Present temperature in electronics compartment is above +80° C	1) Transmitter may need to be moved to ensure ambient temperature is within specification 2) Change to remote mount transmitter

8.1.2 Status Messages

Display Message	Description	Comment
Lo Temp	Present temperature in electronics compartment is below -40° C.	1) Transmitter may need to be moved to ensure ambient temperature is within specification 2) Change to remote mount transmitter
HiVolAlm	Level more than 5% above highest point in strapping table.	Verify strapping table is entered correctly. None. Signal amplitude is lower than desired.
Sys Warn	Unexpected but non-fatal software event	Consult factory
Default Cal	Factory set default calibration parameters are in use, level reading may be inaccurate	Consult factory
SlopeErr	Ramp circuit generating improper voltage	Consult factory
No Ramp	No End-of-Ramp signal detected	Consult factory
Default Params	Internal non-volatile parameters have been defaulted	Consult factory

8.1.3 FF Segment Checklist

There can be several reasons for a FOUNDATION fieldbus™ installation to be in a faulty condition. In order to assure that communication can be established, the following requirements must be met.

- Device supply voltage must be higher than 9 VDC with a maximum of 32 VDC.
- Total current draw of a given segment cannot exceed the rating shown on the power conditioner and/or barrier.
- Device polarity must be correct.
- Two 100 Ω , 1 μ F terminators must be connected to the network—one at each end of the segment.
- Cable length plus spur length must not exceed the following values:

Number of Spurs	1 Device	2 Devices	3 Devices	4 Devices
25–32	—	—	—	—
19–24	100 ft. (30 m)	—	—	—
15–18	200 ft. (60 m)	100 ft. (30 m)	—	—
13–14	300 ft. (90 m)	200 ft. (60 m)	100 ft. (30 m)	—
1–12	400 ft. (120 m)	300 ft. (90 m)	200 ft. (60 m)	100 ft. (30 m)

Pair	Shield	Twisted	Size	Length	Type
Single	Yes	Yes	AWG 18 (0.8 mm ²)	6,200 ft. (1,900 m)	A
Multi	Yes	Yes	AWG 22 (0.32 mm ²)	3,900 ft. (1,200 m)	B
Multi	No	Yes	AWG 26 (0.13 mm ²)	1,300 ft. (400 m)	C
Multi	Yes	No	AWG 16 (1.25 mm ²)	650 ft. (200 m)	D

- The cable shield is to be hard grounded only at one point close to the DCS. In addition, the cable shield can be capacitively grounded in multiple places to improve EMC protection.
- Ensure all devices are on the “live list,” and the schedule has been downloaded.
- Ensure the device identity is in the Resource Block.
- Ensure that the Resource Block, then the Transducer Block, and lastly the Function Block(s) are in “Auto” mode rather than Out of Service (OOS).

If all of these requirements are met, a stable communication should be established.

8.2 Agency Approvals

AGENCY	MODEL APPROVED	APPROVAL CATEGORY	APPROVAL CLASSES
FM 	705-52XX-1XX 705-52XX-2XX	Intrinsically Safe	Class I, Div. 1; Groups A, B, C, & D Class II, Div. 1; Groups E, F, & G T4 Class III, Type 4X IP66 Entity/FISCO
	705-52XX-3XX 705-52XXX-4XX	Explosion Proof ① (with Intrinsically Safe probe)	Class I, Div. 1; Groups B, C & D Class II, Div. 1; Groups E, F, & G T4 Class III, Type 4X IP66
	705-52XX-XXX 705-52XX-XXX	Non-Incendive Suitable for: ②	Class I, Div. 2; Groups A, B, C, & D Class II, Div. 2; Groups F & G T4 Class III, Type 4X IP66
CSA 	705-52XX-1XX 705-52XX-2XX	Intrinsically Safe	Class I, Div. 1; Groups A, B, C, & D Class II, Div. 1; Group G T4 Class III, Type 4X Entity/FISCO
	705-52XX-3XX 705-52XX-4XX	Explosion Proof ① (with Intrinsically Safe probe)	Class I, Div. 1; Groups B, C & D Class II, Div. 1; Group G T4 Class III, Type 4X
	705-52XX-XXX 705-52XX-XXX	Non-Incendive Suitable for: ②	Class I, Div. 2; Groups A, B, C, & D Class II, Div. 2; Group G T4 Class III, Type 4X
ATEX 	705-52XX-AXX 705-52XX-BXX	Intrinsically Safe	Ⓔ II 1G, EEx ia IIC T4
	705-52XX-CXX 705-52XX-DXX	Flame Proof ①	Ⓔ II 1/2G, EEx d [ia] IIC T4
	705-52XX-EXX 705-52XX-FXX	Non-sparking ②	Ⓔ II 3G, EEx n II T4..T6

① Factory Sealed: This product has been approved by Factory Mutual Research (FM), and Canadian Standards Association (CSA), as a Factory Sealed device.

② Measured media inside vessel must be non-flammable only.



These units are in conformity of:

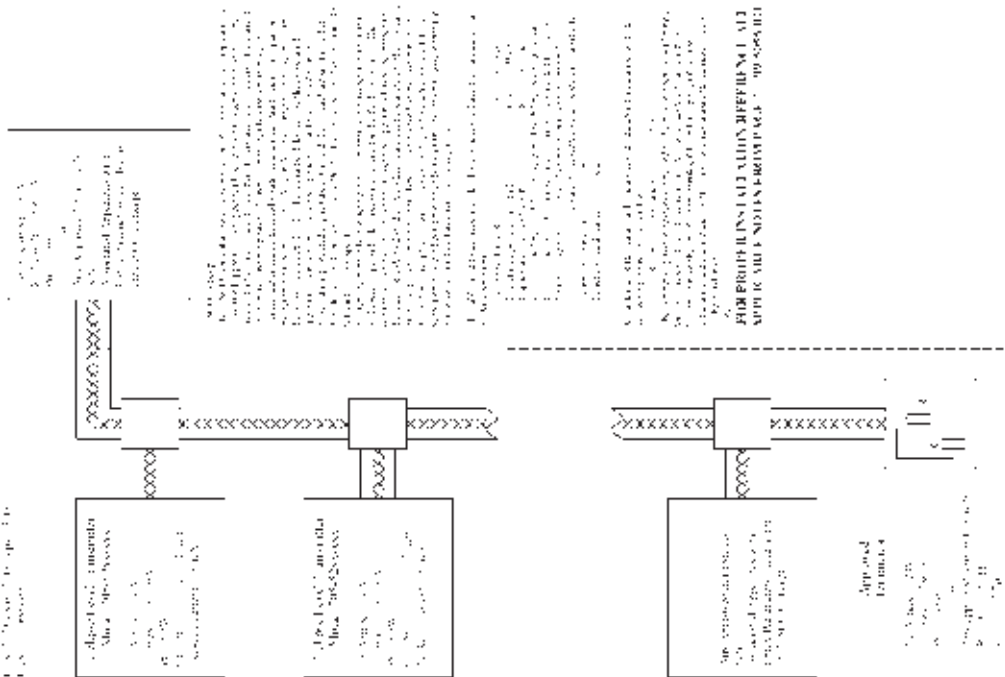
1. The EMC Directive: 89/336/EEC. The units have been tested to EN 61000-6-2/2001 and EN 61000-6-4/2001.
2. Directive 94/9/EC for equipment or protective system for use in potentially explosive atmospheres.

8.2.1 Agency Specifications – FOUNDATION fieldbus™ System

FOUNDATION fieldbus™
 FOUNDATION fieldbus™
 FOUNDATION fieldbus™

UNCLASSIFIED INFORMATION

HAZARDOUS INFORMATION



Magnetrol
 SYSTEM DRAWING
 MODEL 705-52XX
 TRANSMITTER

DATE: 01/18/00
 BY: J. B. B. (JBB)
 CHECKED: J. B. B. (JBB)
 APPROVED: J. B. B. (JBB)

01/18/00
 01/22/00
 06/22/00

099-5055
 C

8.3 Specifications

8.3.1 Functional

System Design	
Measurement Principle	Guided time-of-flight via time domain reflectometry
Input	
Measured Variable	Level, determined by the time-of-flight of a guided radar pulse from transmitter to product surface and back
Zero and Span	6 inches to 75 feet (15 to 2286 cm)
User Interface	
Keypad	3-button menu-driven data entry and system security
Indication	2-line × 8-character display
Digital Communication	FOUNDATION fieldbus™, H1 (31.25 kbits/sec)
Interoperability test kit (ITK Revision)	ITK 4.61
LAS capable	Yes, Device type: Linkmaster
Minimum Operating Voltage	9 VDC
Quiescent Current Draw	17 mA
DEV Revision	0X01
Function Blocks	AI_1, AI_2, AI_3, AI_4
Polarity Sensitive	No
Damping	Adjustable 0-10 seconds
Block Execution Time	15 msec
Power (Measured at instrument terminals)	
Fieldbus General Purpose/Explosion Proof	9 to 32 VDC (17 mA maximum current draw)
IS/FISCO/FNICO	9–32 VDC (17 mA maximum current draw)
Housing	
Material	Aluminum A356T6 (<0.20% copper), optional 316 stainless steel
Cable Entry	¾" NPT and M20

Environment

Operating Temperature	-40 to +175° F (-40 to +80° C)
Display Function Operating Temperature	-5 to +160° F (-20 to +70° C)
Storage Temperature	-50 to +175° F (-40 to +80° C)
Humidity	0-99%, non-condensing
Electromagnetic Compatibility	Meets CE Requirements: EN 50081-2, EN 50082-2
Note: Twin Rod and Single Rod probes must be used in metallic vessel or stillwell to maintain CE requirement.	
Mounting Affects: Twin Rod	Active rod must be mounted at least 1" (25 mm) from any surface or obstruction. Minimum stillwell diameter for Twin Rod probe is 3".
Single Rod	Nozzles do not restrict performance by ensuring the following:
	No nozzle is <2" (50 mm) diameter
	Ratio of Diameter: Length is 1:1 or greater;
	any ratio <1:1 (e.g., a 2" x 6" nozzle = 1:3) may require a Blocking Distance and/or DIELECTRIC adjustment (see Section 2.6.5)
	No pipe reducers are used
	Obstructions (See Probe Clearance Table, page 44)
	Keep conductive objects away from probe to ensure proper performance
Shock Class	ANSI/ISA-S71.03 Class SA1
Vibration Class	ANSI/ISA-S71.03 Class VC2

8.3.2 Performance - Model 705

Reference Conditions ②	Reflection from water at +70° F (+20° C) with 72" coaxial probe (CFD threshold)
Linearity ③	Coaxial/Twin Rod Probes: <0.1% of probe length or 0.1 inch (whichever is greater)
	Single Rod Probes: <0.3% of probe length or 0.3 inch (whichever is greater)
Measured Error	Coaxial/Twin Rod Probes: ±0.1% probe length or 0.1 inch (whichever is greater)
	Single Rod Probes: ±0.5% probe length or 0.5 inch (whichever is greater)
Resolution	±0.1 inch
Repeatability	<0.1 inch
Hysteresis	<0.1 inch
Response Time	<1 second
Warm-up Time	<5 seconds
Operating Temp. Range	-40° to +175° F (-40° to +80° C)
LCD Temp. Range	-5° to +160° F (-20° to +70° C)
Ambient Temp. Effect	Approximately +0.02% of probe length/ ° C
Process Dielectric Effect	<0.3 inch within selected range
Humidity	0-99%, non-condensing
Electromagnetic Compatibility	Meets CE requirements (EN-61000-6-2/2001, 61000-6-4/2001)
	(Twin and Single Rod probes must be used in metallic vessel or stillwell to maintain CE requirement)

② Specifications will degrade with Model 7xB, 7xD, and 7xP probes and/or Fixed threshold configuration.

③ Top 24 inches of Model 7xB probe: 1.2 inches (30 mm). Specification for top 48 inches of single rod will be application dependent.

8.3.3 Performance - Model 705 Interface

Reference Conditions	Reflection from liquid of selected dielectric at +70° F (+20° C) with 72" probe
Linearity	<0.5 inch
Measured Error	Upper layer ±1 inch Interface layer ±1 inch (clean distinct interface required)
Upper Layer Dielectric	1.4–5.0
Interface Layer Dielectric	>15
Resolution	±0.1 inch
Repeatability	<0.5 inch
Hysteresis	<0.5 inch
Response Time	<1 second
Warm-up Time	<5 seconds
Operating Temp. Range	-40° to +175° F (-40° to +80° C)
LCD Temp. Range	-5° to +160° F (-20° to +70° C)
Ambient Temp. Effect	Approximately ±0.02% of probe length/ ° C
Humidity	0-99%, non-condensing
Electromagnetic Compatibility	Meets CE requirements (EN-61000-6-2/2001, EN 61000-6-4/2001)

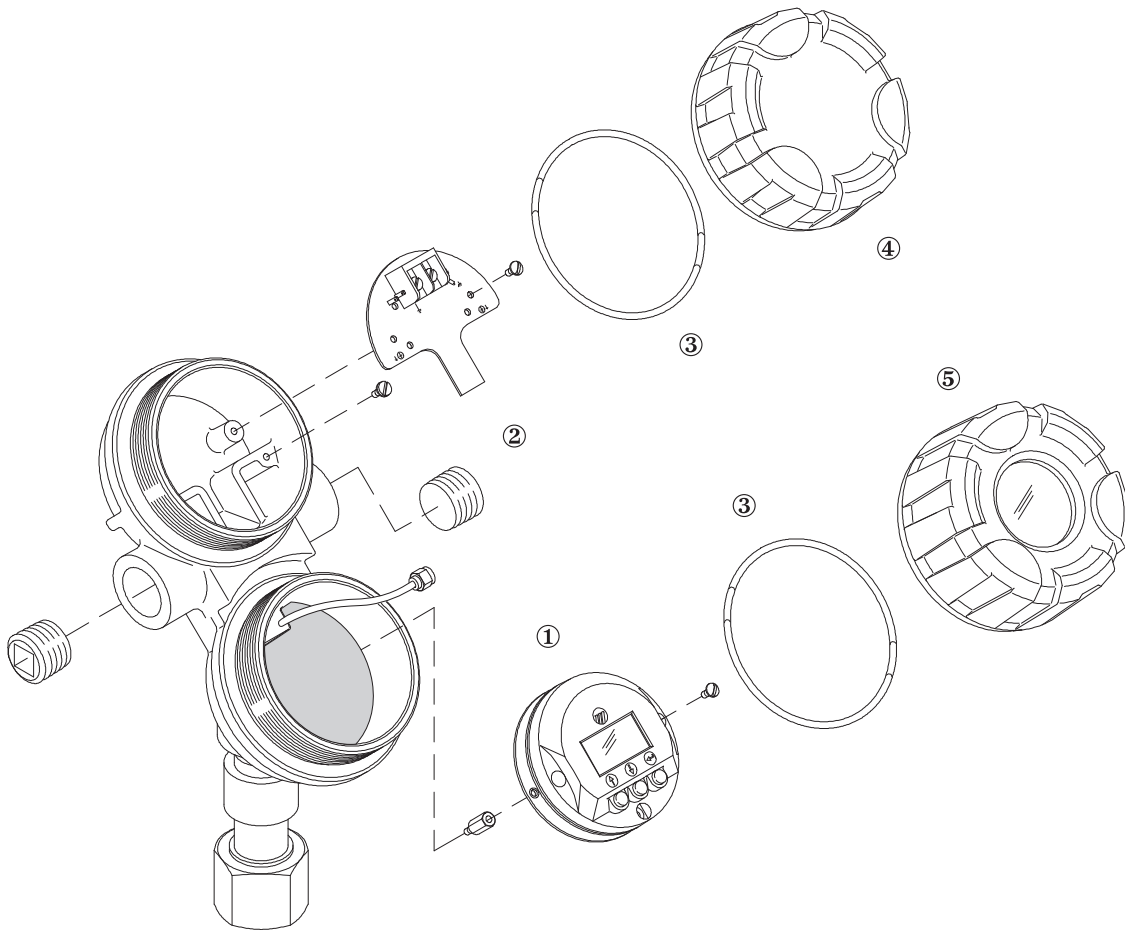
8.4 Parts

8.4.1 Replacement Parts

Item	Description	Part Number
①	Electronic module FOUNDATION fieldbus™	Z 031-2841-001
②	Terminal board FOUNDATION fieldbus™	Explosion Proof FISCO Z 030-9151-003 Z 030-9151-004
③	O-ring (Viton) (Consult Factory for alternative O-ring materials)	012-2201-237
④	Housing cover without glass	004-9193-003
⑤	Housing cover with glass (GP, IS) (XP)	036-4410-001 036-4410-003

8.4.2 Recommended Spare Parts

Item	Description	Part Number
①	Electronic module FOUNDATION fieldbus™	Z 031-2844-001
②	Terminal board FOUNDATION fieldbus™	Z 030-9151-003



8.5 Model Numbers

8.5.1 Transmitter

BASIC MODEL NUMBER

705	Eclipse Guided Wave Radar Level Transmitter
-----	---

POWER

5	24 VDC, Two-wire
---	------------------

SIGNAL OUTPUT

1	4-20 mA with HART
2	FOUNDATION fieldbus™ Digital Communications (English only)

OPTIONS

0	None
---	------

ACCESSORIES

0	No digital display and keypad
A	Digital display and keypad

MOUNTING/CLASSIFICATION

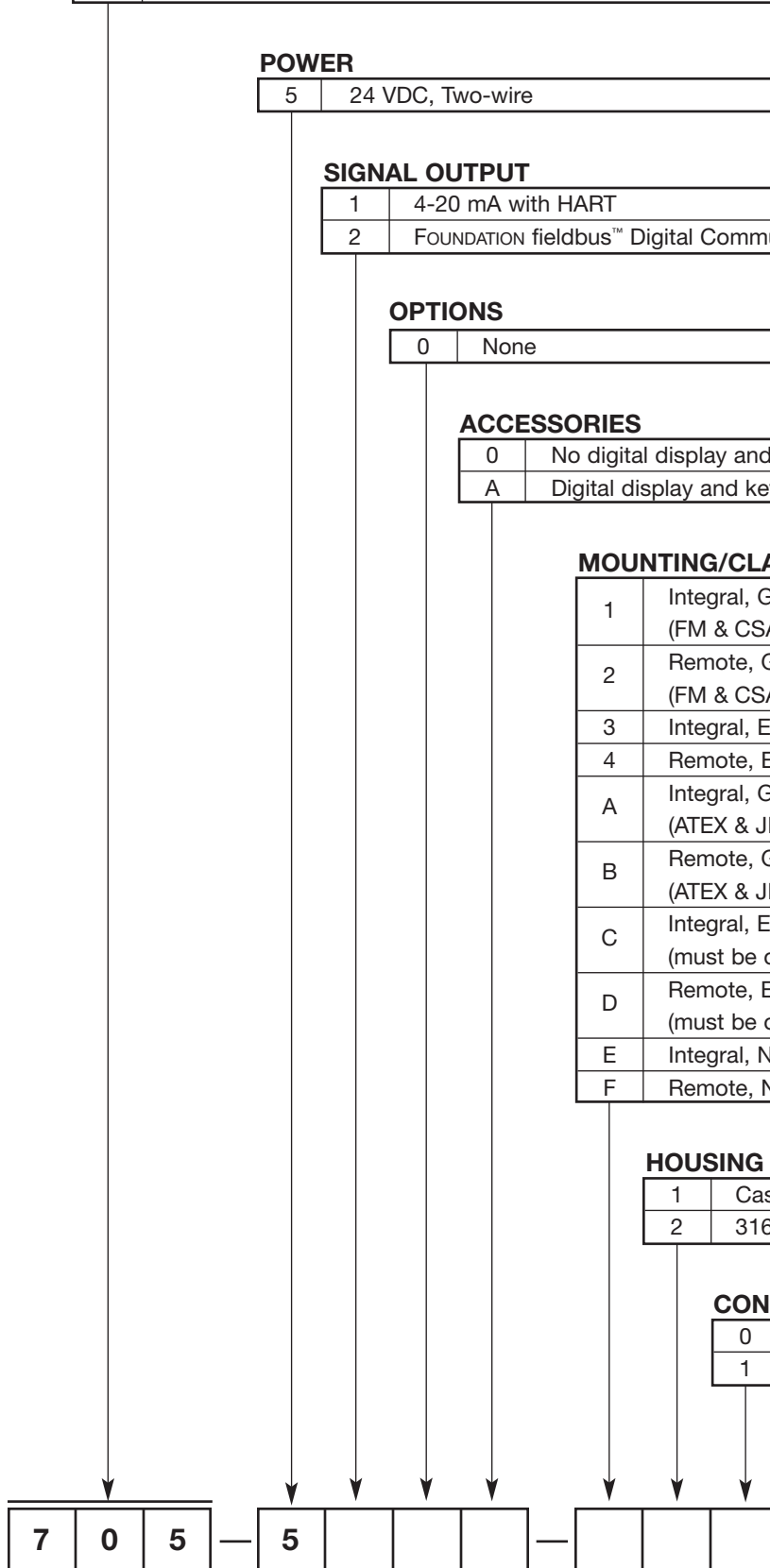
1	Integral, General Purpose & Intrinsically Safe (FM & CSA), Non-incendive (Class I, Div. 2)
2	Remote, General Purpose & Intrinsically Safe (FM & CSA), Non-incendive (Class I, Div. 2)
3	Integral, Explosion Proof (FM & CSA)
4	Remote, Explosion Proof (FM & CSA)
A	Integral, General Purpose & Intrinsically Safe (ATEX & JIS EEx ia IIC T4)
B	Remote, General Purpose & Intrinsically Safe (ATEX & JIS EEx ia IIC T4)
C	Integral, Explosion Proof (ATEX EEx d ia IIC T4) (must be ordered with Conduit Connection Codes 0 and 1)
D	Remote, Explosion Proof (ATEX EEx d ia IIB T4) (must be ordered with Conduit Connection Codes 0 and 1)
E	Integral, Non-incendive (ATEX EEx n IIC T6) (Model 705 only)
F	Remote, Non-incendive (ATEX EEx n IIC T6) (Model 705 only)

HOUSING

1	Cast aluminum, dual compartment, 45° angle
2	316 stainless steel, dual compartment, 45° angle

CONDUIT CONNECTION

0	3/4" NPT
1	M20



8.5.2 Probe

BASIC MODEL NUMBER

7E	Eclipse GWR probe, English unit of measure
7M	Eclipse GWR probe, Metric unit of measure

CONFIGURATION/STYLE

A	Coaxial, ¾" process connection or larger	(Dielectric range ≥1.4)
B	Twin Rod, 2" NPT or 3" flanged process connection or larger	(Dielectric range ≥1.9)
D	Coaxial, High Temperature/High Pressure, ¾" process conn. or larger	(Dielectric range ≥1.4)
F	Single Rod, Rigid, 2" process connection or larger	(Dielectric range ≥1.9)
J	Single Rod, Rigid, High Temperature/High Pressure	(Dielectric range ≥ 1.9)
P	Coaxial, High Pressure, ¾" process connection or larger	(Dielectric range ≥1.4)
R	Coaxial, Overfill, ¾" process connection or larger	(Dielectric range ≥1.4)
S	Coaxial, Hot Water/Steam, ¾" process connection or larger	(Dielectric range ≥10)
1	Single Rod, Flexible, 2" process connection or larger	(Dielectric range ≥1.9)
2	Single Rod, Flexible Bulk Solid, 2" process connection or larger	(Dielectric range ≥4.0)
5	Twin Rod, Flexible Bulk Solid, 2" process connection or larger	(Dielectric range ≥1.9)
7	Twin Rod Flexible, 2" NPT or 3" flanged process connection or larger	(Dielectric range 1.9–10)

MATERIAL OF CONSTRUCTION

A	316/316L stainless steel
B	Hastelloy C, Configuration/Style codes A, B, F and R only
C	Monel, Configuration/Style codes A, B, F and R only
E	Sanitary, 316/316L stainless steel (20 Ra finish), Configuration/Style code F only, Process connections codes 4P, 5P, and 6P only
F	PFA faced flange, 2" to 4", 150# to 300#, Configuration/Style code F only, Process connection codes 43, 44, 53, 54, 63, 64, DA, DB, EA, EB, FA, and FB only
K	316/316L stainless steel probe and process connection, ASME B31.1 specifications (model 7xS only)
P	Paint Probe, 316/316L SS, ¾" process connection or larger Configuration/Style code F only: maximum length 72"
4	PFA insulated rod, 2" NPT process connection or larger, Configuration/Style code F only

PROCESS CONNECTION SIZE/TYPE

Refer to pages 44 and 45 for selections

O-RINGS

0	Viton® GFLT
1	EPDM (Ethylene Propylene Rubber)
2	Kalrez 4079
8	Aegis PF128
N	None (Use with probes 7xD, 7xP, 7xF-E, 7xF-F, 7xF-P)

LENGTH – PROBE MODELS 7xA, 7xB, 7xD, 7xF, 7xJ, 7xP, 7xR & 7xS

24" to 240" (60 cm to 610 cm) (7xS only: 180" (457 cm) maximum)
(unit of measure is determined by second digit of Model Number)

Examples: 24 inches = 024; 60 centimeters = 060

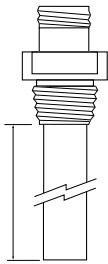
LENGTH – PROBE MODEL 7x1, 7x2, 7x5 & 7x7

3' to 75' (1 to 22 m) – (7x2, 7x5 & 7x7 only: 5' (1.5 m) minimum)
(unit of measure is determined by second digit of Model Number)

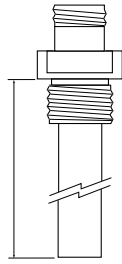
Examples: 30 feet = 030; 10 meters = 010



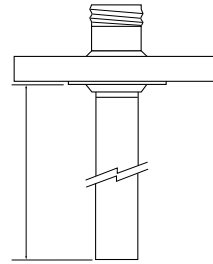
8.5.2 Probe



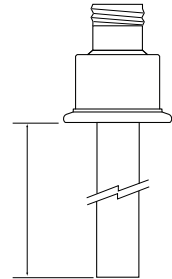
Insertion Length
NPT Process Connection



Insertion Length
BSP Process Connection



Insertion Length
ANSI or DIN Welded Flange



Insertion Length
Sanitary Flange

PROCESS CONNECTION SIZE/TYPE

THREADED CONNECTIONS

11	¾" NPT Thread ①
22	1" BSP Thread ①
41	2" NPT Thread ③
42	2" BSP Thread ③

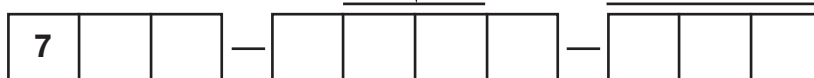
ANSI RAISED FACE FLANGE CONNECTIONS

23	1" 150#	ANSI Raised Face Flange ①	48	2" 2500#	ANSI Raised Face Flange ②
24	1" 300#	ANSI Raised Face Flange ①	53	3" 150#	ANSI Raised Face Flange
25	1" 600#	ANSI Raised Face Flange ②	54	3" 300#	ANSI Raised Face Flange
27	1" 900/1500#	ANSI Raised Face Flange ②	55	3" 600#	ANSI Raised Face Flange ②
28	1" 2500#	ANSI Raised Face Flange ②	56	3" 900#	ANSI Raised Face Flange ②
33	1½" 150#	ANSI Raised Face Flange ①	57	3" 1500#	ANSI Raised Face Flange ②
34	1½" 300#	ANSI Raised Face Flange ①	58	3" 2500#	ANSI Raised Face Flange ②
35	1½" 600#	ANSI Raised Face Flange ②	63	4" 150#	ANSI Raised Face Flange
37	1½" 900/1500#	ANSI Raised Face Flange ②	64	4" 300#	ANSI Raised Face Flange
38	1½" 2500#	ANSI Raised Face Flange ②	65	4" 600#	ANSI Raised Face Flange ②
43	2" 150#	ANSI Raised Face Flange ①	66	4" 900#	ANSI Raised Face Flange ②
44	2" 300#	ANSI Raised Face Flange ①	67	4" 1500#	ANSI Raised Face Flange ②
45	2" 600#	ANSI Raised Face Flange ②	68	4" 2500#	ANSI Raised Face Flange ②
47	2" 900/1500#	ANSI Raised Face Flange ②			

ANSI RING JOINT FLANGE CONNECTIONS

3K	1½" 600#	ANSI Ring Joint Flange ②	5L	3" 900#	ANSI Ring Joint Flange ②
3M	1½" 900/1500#	ANSI Ring Joint Flange ②	5M	3" 1500#	ANSI Ring Joint Flange ②
3N	1½" 2500#	ANSI Ring Joint Flange ②	5N	3" 2500#	ANSI Ring Joint Flange ②
4K	2" 600#	ANSI Ring Joint Flange ②	6K	4" 600#	ANSI Ring Joint Flange ②
4M	2" 900/1500#	ANSI Ring Joint Flange ②	6L	4" 900#	ANSI Ring Joint Flange ②
4N	2" 2500#	ANSI Ring Joint Flange ②	6M	4" 1500#	ANSI Ring Joint Flange ②
5K	3" 600#	ANSI Ring Joint Flange ②	6N	4" 2500#	ANSI Ring Joint Flange ②

- ① Configuration/Style Codes A, D, P, R & S only.
 ② Configuration/Style Codes D & P only.
 ③ Configuration/Style Codes B, F, 1, 2, 5 & 7 only.



8.5.2 Probe

SANITARY FLANGE CONNECTIONS

3P	1½" Triclover® type, 16 AMP Sanitary Flange
4P	2" Triclover type, 16 AMP Sanitary Flange
5P	3" Triclover type, 16 AMP Sanitary Flange
6P	4" Triclover type, 16 AMP Sanitary Flange

PROPRIETARY AND SPECIALTY FLANGE CONNECTIONS

4R	2" 150#	ANSI Raised Face Carbon Steel Flange with Top Hat
4S	2" 300/600#	ANSI Raised Face Carbon Steel Flange with Top Hat
5R	3" 150#	ANSI Raised Face Carbon Steel Flange with Top Hat
5S	3" 300/600#	ANSI Raised Face Carbon Steel Flange with Top Hat
TT	3½" 600#	Fisher® - Proprietary Carbon Steel (249B) Torque Tube Flange
TU	3½" 600#	Fisher - Proprietary 316 Stainless Steel (249C) Torque Tube Flange
UT	3½" 600#	Masoneilan® - Proprietary Carbon Steel Torque Tube Flange
UU	3½" 600#	Masoneilan - Proprietary 316 Stainless Steel Torque Tube Flange
UV	3½" 600#	Masoneilan - Proprietary Carbon Steel Torque Tube Flange with Top Hat
UW	3½" 600#	Masoneilan - Proprietary 316 Stainless Steel Steel Torque Tube Flange with Top Hat

DIN FLANGE CONNECTIONS

BA	DN 25, PN 16	DIN 2527 Form B Flange ①	DG	DN 50, PN 250	DIN 2527 Form E Flange ②
BB	DN 25, PN 25/40	DIN 2527 Form B Flange ①	DH	DN 50, PN 320	DIN 2527 Form E Flange ②
BC	DN 25, PN 64/100	DIN 2527 Form E Flange ②	DJ	DN 50, PN 400	DIN 2527 Form E Flange ②
BF	DN 25, PN 160	DIN 2527 Form E Flange ②	EA	DN 80, PN 16	DIN 2527 Form B Flange
BG	DN 25, PN 250	DIN 2527 Form E Flange ②	EB	DN 80, PN 25/40	DIN 2527 Form B Flange
BH	DN 25, PN 320	DIN 2527 Form E Flange ②	ED	DN 80, PN 64	DIN 2527 Form E Flange ②
BJ	DN 25, PN 400	DIN 2527 Form E Flange ②	EE	DN 80, PN 100	DIN 2527 Form E Flange ②
CA	DN 40, PN 16	DIN 2527 Form B Flange ①	EF	DN 80, PN 160	DIN 2527 Form E Flange ②
CB	DN 40, PN 25/40	DIN 2527 Form B Flange ①	EG	DN 80, PN 250	DIN 2527 Form E Flange ②
CC	DN 40, PN 64/100	DIN 2527 Form E Flange ②	EH	DN 80, PN 320	DIN 2527 Form E Flange ②
CF	DN 40, PN 160	DIN 2527 Form E Flange ②	EJ	DN 80, PN 400	DIN 2527 Form E Flange ②
CG	DN 40, PN 250	DIN 2527 Form E Flange ②	FA	DN 100, PN 16	DIN 2527 Form B Flange
CH	DN 40, PN 320	DIN 2527 Form E Flange ②	FB	DN 100, PN 25/40	DIN 2527 Form B Flange
CJ	DN 40, PN 400	DIN 2527 Form E Flange ②	FD	DN 100, PN 64	DIN 2527 Form E Flange ②
DA	DN 50, PN 16	DIN 2527 Form B Flange	FE	DN 100, PN 100	DIN 2527 Form E Flange ②
DB	DN 50, PN 25/40	DIN 2527 Form B Flange	FF	DN 100, PN 160	DIN 2527 Form E Flange ②
DD	DN 50, PN 64	DIN 2527 Form E Flange ②	FG	DN 100, PN 250	DIN 2527 Form E Flange ②
DE	DN 50, PN 100	DIN 2527 Form E Flange ②	FH	DN 100, PN 320	DIN 2527 Form E Flange ②
DF	DN 50, PN 160	DIN 2527 Form E Flange ②	FJ	DN 100, PN 400	DIN 2527 Form E Flange ②

① Configuration/Style Codes A, D, P, R & S only.

② Configuration/Style Codes D & P only.



8.6 References

1. FOUNDATION fieldbus™, A Pocket Guide
Ian Verhappen, Augusto Pereira
2. FOUNDATION fieldbus™—System Engineering Guidelines, AG-181

Appendix – Transducer Block Parameters

ITEM	PARAMETER NAME	PARAMETER LABEL
0	BLOCK_STRUCTURE	BLOCK STRUCT
1	ST_REV	ST REV
2	TAG_DESC	TAG DESC
3	STRATEGY	STRATEGY
4	ALERT_KEY	ALERT KEY
5	MODE_BLK	MODE BLK
6	BLOCK_ERR	BLOCK ERR
7	UPDATE_EVT	UPDATE EVT
8	BLOCK_ALM	BLOCK ALM
9	TRANSDUCER_DIRECTORY	XD DIRECTORY
10	TRANSDUCER_TYPE	XD TYPE
11	XD_ERROR	XD ERROR
12	COLLECTION_DIRECTORY	COLLECT DIR
13	LEVEL	Level
14	LEVEL_UNIT	Level Unit
15	PROBE_LEVEL	Probe Level
16	PROBE_LEVEL_UNIT	Probe Level Unit
17	SENSOR_VALUE	Sensor Value
18	SENSOR_UNIT	Sensor Unit
19	SENSOR_OFFSET	Sensor Offset
20	CAL_TYPE	Cal Type
21	CAL_POINT_LO	Cal Point Lo
22	CAL_POINT_HI	Cal Point Hi
23	PROBE_LEVEL_LO	Probe Lvl Lo
24	PROBE_LEVEL_HI	Probe Lvl Hi
25	LEVEL_OFFSET	Level Offset
26	SENSOR_HIGH_LIMIT	Sensor Hi Lmt
27	SENSOR_LOW_LIMIT	Sensor Lo Lmt
28	PROBE_MODEL	Probe Model
29	PROBE_MOUNT	Probe Mount
30	MEASUREMENT_TYPE	Measurement Type
31	PROBE_LENGTH	Probe Length
32	DIELECTRIC_RANGE	Dielctric Rng
33	SENSITIVITY	Sensitivity
34	BLOCKING_DISTANCE	Blocking Distance
35	SAFETY_ZONE_MODE	SafeZone Mode
36	SAFETY_ZONE_HEIGHT	SafeZone Ht
37	SAFETY_ZONE_LATCH_RESET	SZ Latch Rst
38	THRESHOLD	Threshold
39	TRIM_LEVEL	Trim Level
40	VOLUME	Volume
41	VOLUME_UNIT	Volume Unit
42	INTERFACE	Interface
43	INTERFACE_UNIT	Ifc Unit
44	UPPER_LIQUID_DIELECTRIC	Upr Liq Diel
45	INTERFACE_THRESHOLD	Ifc Threshld
46	INTERFACE_VOLUME	Ifc Vol
47	INTERFACE_VOLUME_UNIT	Ifc Vol Unit
48	STRAP_TABLE_LENGTH	Strap Table Length
49	TABLE_VOLUME_UNIT	Table Volume Unit
50	STRAPPING_TABLE_POINT01	StrapTbl Pt01
51	STRAPPING_TABLE_POINT02	StrapTbl Pt02
52	STRAPPING_TABLE_POINT03	StrapTbl Pt03
53	STRAPPING_TABLE_POINT04	StrapTbl Pt04
54	STRAPPING_TABLE_POINT05	StrapTbl Pt05
55	STRAPPING_TABLE_POINT06	StrapTbl Pt06

ITEM	PARAMETER NAME	PARAMETER LABEL
56	STRAPPING_TABLE_POINT07	StrapTbl Pt07
57	STRAPPING_TABLE_POINT08	StrapTbl Pt08
58	STRAPPING_TABLE_POINT09	StrapTbl Pt09
59	STRAPPING_TABLE_POINT10	StrapTbl Pt10
60	STRAPPING_TABLE_POINT11	StrapTbl Pt11
61	STRAPPING_TABLE_POINT12	StrapTbl Pt12
62	STRAPPING_TABLE_POINT13	StrapTbl Pt13
63	STRAPPING_TABLE_POINT14	StrapTbl Pt14
64	STRAPPING_TABLE_POINT15	StrapTbl Pt15
65	STRAPPING_TABLE_POINT16	StrapTbl Pt16
66	STRAPPING_TABLE_POINT17	StrapTbl Pt17
67	STRAPPING_TABLE_POINT18	StrapTbl Pt18
68	STRAPPING_TABLE_POINT19	StrapTbl Pt19
69	STRAPPING_TABLE_POINT20	StrapTbl Pt20
70	FID_TICKS	Fid Ticks
71	FID_SPREAD	Fid Spread
72	LEVEL_TICKS	Lvl Ticks
73	INTERFACE_TICKS	Ifc Ticks
74	INTERFACE_MEDIUM	Ifc Medium
75	ENTER_PASSWORD	Enter Password
76	NEW_PASSWORD	New User Password
77	DEVICE_STATUS	Device Status
78	HISTORY_MESSAGE	History Message
79	HISTORY_CONTROL	History Control
80	RESET_HISTORY	Reset History
81	FID_TYPE	Fid Type
82	FID_GAIN	Fid Gain
83	WINDOW	Window
84	CONVERSION_FACTOR	Conv Factor
85	SCALE_OFFSET	Scale Offset
86	NEGATIVE_THRESHOLD_AMPLITUDE	NegThrsh Ampl
87	INTERFACE_THRESHOLD_AMPLITUDE	IfcThrsh Ampl
88	POSITIVE_THRESHOLD_AMPLITUDE	PosThrsh Ampl
89	SIGNAL	Signal
90	COMPENSATION	Compensation
91	DERATE_FACTOR	Derate Factor
92	TARGET_AMPLITUDE	Target Amplitude
93	TARGET_TICKS	Target Ticks
94	TARGET_CAL	Target Cal
95	TARGET_OPERATING_MODE	Target OperMode
96	7XK_DISTANCE_CORRECTION	7XK Dist Corr
97	ELECTRONICS_TEMPERATURE	Elec Temp
98	MAX_ELECTRONICS_TEMPERATURE	Max Elec Temp
99	MIN_ELECTRONICS_TEMPERATURE	Min Elec Temp
100	RESET_ELECTRONICS_TEMPERATURE	Reset Elect Temp
101	SAFETY_ZONE_HYSTERESIS	SafeZone Hyst
102	ECHO_SUMMARY	Echo Summary
103	ECHO_DATA	Echo Data
104	ECHO_DATA_INDEX	EchoData Indx
105	WAVEFORM_SELECTION	Waveform Selection
106	STEAM_CAL_MOUNT	Steam Cal Mount
107	NON_VOL_STAT	Non Vol Stat
108	DATE_CODE	Date Code
109	MAGNETROL_SERIAL_NUMBER	Magnetrol S/N
110	FIRMWARE_VERSION	Firmware Ver



Enhanced Model 705

Eclipse Guided Wave Radar Transmitter

FOUNDATION Fieldbus™ Configuration Data Sheet

Copy blank page and store calibration data for future reference and troubleshooting.

Item	Value	Value	Value	TROUBLESHOOTING	
Vessel Name					
Vessel #					
Process Medium					
Tag #					
Electronics Serial #				Working Value	Non-Working Value
Probe Serial #					
Level					
Volume (optional)					
Interface (optional)					
Interface Volume (opt.)					
Probe Model					
Probe Mount					
Measurement Type					
Level Units					
Probe Length					
Level Offset					
Volume Units (opt.)					
Strapping Table (opt.)					
Dielectric					
Sensitivity					
EU_0%					
EU_100%					
Damping					
Blocking Distance					
Safety Zone Fault					
Safety Zone Height					
Safety Zone Alarm					
Threshold					
Interface Threshold					
Level Trim					
Level Ticks					
Interface Ticks (opt.)					
<Window>					
Range					



Enhanced Model 705

Eclipse Guided Wave Radar Transmitter

FOUNDATION Fieldbus™ Configuration Data Sheet

Copy blank page and store calibration data for future reference and troubleshooting.

Item	Value	Value	Value	TROUBLESHOOTING	
				Correct Value	Incorrect Value
Gain					
Conversion Factor					
Scale Offset					
# of Ticks					
Drate Rct					
Targ Rat					
Targ Tks					
Targ Cal					
DispMode					
Threshold					
Software Version					
New Password					
Name					
Date					
Time					

Service Policy

Owners of Magnetrol/STI controls may request the return of a control or any part of a control for complete rebuilding or replacement. They will be rebuilt or replaced promptly. Controls returned under our service policy must be returned by Prepaid transportation. Magnetrol/STI will repair or replace the control at no cost to the purchaser (or owner) other than transportation if:

1. Returned within the warranty period; and
2. The factory inspection finds the cause of the claim to be covered under the warranty.

If the trouble is the result of conditions beyond our control; or, is NOT covered by the warranty, there will be charges for labor and the parts required to rebuild or replace the equipment.

In some cases it may be expedient to ship replacement parts; or, in extreme cases a complete new control, to replace the original equipment before it is returned. If this is desired, notify the factory of both the model and serial numbers of the control to be replaced. In such cases, credit for the materials returned will be determined on the basis of the applicability of our warranty.

No claims for misapplication, labor, direct or consequential damage will be allowed.

Return Material Procedure

So that we may efficiently process any materials that are returned, it is essential that a "Return Material Authorization" (RMA) number be obtained from the factory prior to the material's return. This is available through Magnetrol/STI's local representative or by contacting the factory. Please supply the following information:

1. Company Name
2. Description of Material
3. Serial Number
4. Reason for Return
5. Application

Any unit that was used in a process must be properly cleaned in accordance with OSHA standards, before it is returned to the factory.

A Material Safety Data Sheet (MSDS) must accompany material that was used in any media.

All shipments returned to the factory must be by prepaid transportation.

All replacements will be shipped F.O.B. factory.

Eclipse Guided Wave Radar transmitters may be protected by one or more of the following U.S. Patent Nos. US 6,062,095; US 6,247,362; US 6,588,272; US 6,626,038; US 6,640,629; US 6,642,807; US 6,690,320; US 6,750,808; US 6,801,157. May depend on model.



5300 Belmont Road • Downers Grove, Illinois 60515-4499 • 630-969-4000 • Fax 630-969-9489 • www.magnetrol.com
 145 Jardin Drive, Units 1 & 2 • Concord, Ontario Canada L4K 1X7 • 905-738-9600 • Fax 905-738-1306
 Heikensstraat 6 • B 9240 Zele, Belgium • 052 45.11.11 • Fax 052 45.09.93
 Regent Business Ctr., Jubilee Rd. • Burgess Hill, Sussex RH15 9TL U.K. • 01444-871313 • Fax 01444-871317



5300 Belmont Road • Downers Grove, Illinois 60515-4499 • 630-969-4028 • Fax 630-969-9489 • www.sticontrols.com

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