ECLIPSE®

Enhanced Model 705 with
FOUNDATION Fieldbus™ Digital Output

705 software v3.x

Use in conjunction with I&O manual BE 57-600

Guided Wave Radar

Level Transmitter

FOUNDATION

/// Magnetrol®
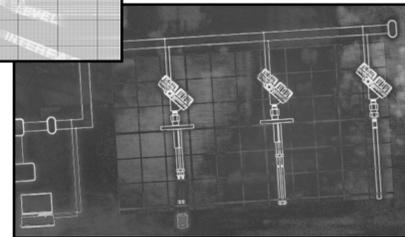
FOUNDATION Fieldbus™ Enhanced Eclipse Model 705 Guided Wave Radar Transmitter

Table of Contents

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.
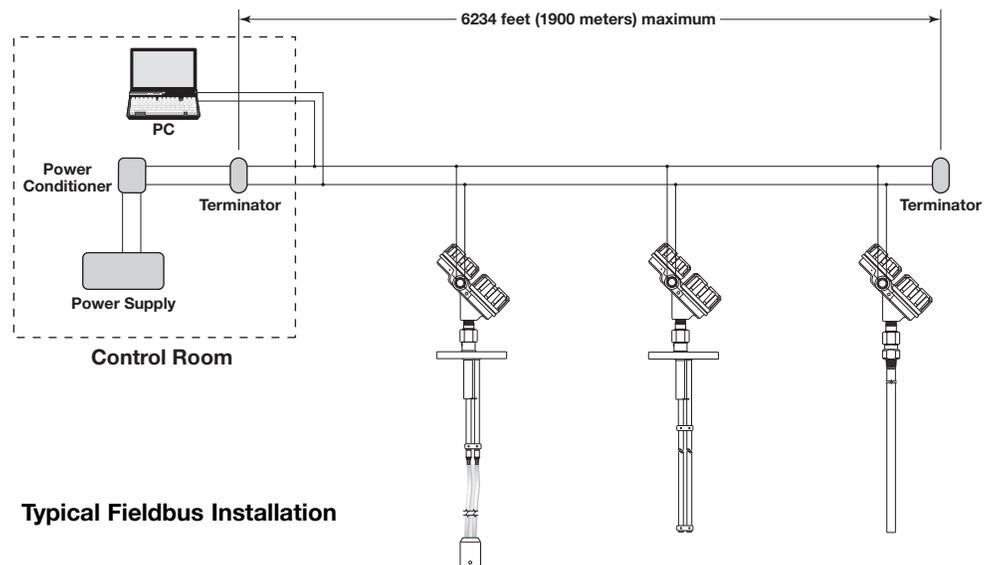
Typical Fieldbus Installation

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 Enhanced Model 705 3X FF 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

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.

Device Descriptions

An important requirement of Fieldbus devices is the inter-operability 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 **www.fieldbus.org**.

NOTE: Please consult your host system vendor for any host-specific files that may be needed.

1.3.1 FOUNDATION fieldbus™ Revision Table

Model 705 3.x

FOUNDATION fieldbus™ Version	FOUNDATION fieldbus™ Release Date	Compatible with 705 Software
Dev V1 DD V1	June 2005	Version 3.0A through Version 3.0K
Dev V2 DD V1	June 2008	Version 3.1A and later

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 default operating class of the Enhanced Eclipse Model 705 with FOUNDATION fieldbus™ is a basic device. However, it is capable of being 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. The operating class can be changed from basic to LAS using a FOUNDATION fieldbus™ configuration tool.

NOTE: The Enhanced Eclipse Model 705 is shipped from the factory with Device Class set to Basic.

2.0   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.
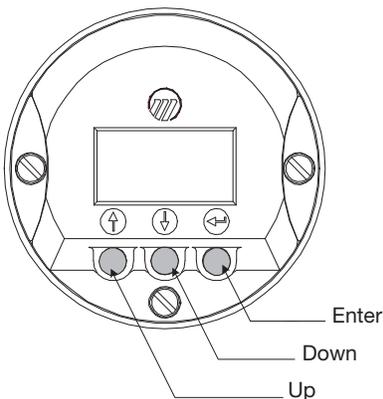
1. Power up the transmitter.

   The display changes every 5 seconds alternating between showing the Status, Level and Analog Input Block 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).
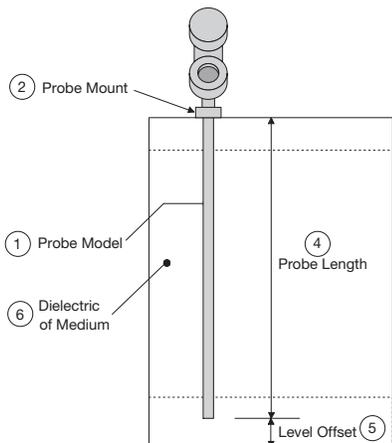
①
```
PrbModel
(select)
```
Select the **Probe Model** to be used
Model 705: 7xA-x, 7xB-x, 7xD-x, 7xE-x, 7xF-F, 7xF-P, 7xF-4, 7xF-x, 7xJ-x, 7xK-x, 7xP-x, 7xQ-x, 7xR-x, 7xS-x, 7xT-x, 7x1-x, 7x2-x, 7x5-x, 7x7-x

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
```
LvlOfst
 xxx.x
```
Enter the **Level Offset** value. Refer to Section 3.3.4 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
```
Dielctrc
(select)
```
Enter the **Dielectric** range for the material to be measured.

Enter

Down

Up

② Probe Mount
① Probe Model
⑥ Dielectric of Medium
④ Probe Length
⑤ Level Offset

3.0 Function Blocks

3.1 Overview

The Enhanced Eclipse Model 705FF is a Guided Wave Radar (GWR) level transmitter with seven FOUNDATION fieldbus™ Function Blocks (one Resource Block, one Transducer Block, four Analog Input Blocks, and one PID Block). 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.

3.1.1 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.

3.2   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 **most** 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 Soft Write Lock.

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 seconds 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 subcode 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.

3.3   Transducer Block

The 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. The Transducer Block must be placed back in service from the Host system.

3.3.1 Transducer Block Parameters

The first six parameters in the TRANSDUCER block are the universal parameters discussed in section 3.1.1. 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 TRANS-DUCER 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.

If **DEVICE_STATUS** indicates a problem, refer to Section 6.1, Troubleshooting (those parameters which are shaded are password-protected).

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

3.3.2 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 Host system 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 Host system.

3.3.3 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 -300 inches to 600 inches. Refer to Section 3.3.4 for additional information.

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

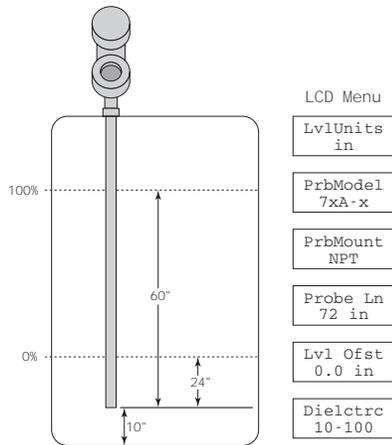NOTE: All dielectric ranges are not available with all probes.

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. This parameter should be set 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.)

Probe Mount

100% Set Point

Probe Model

Dielectric of Medium

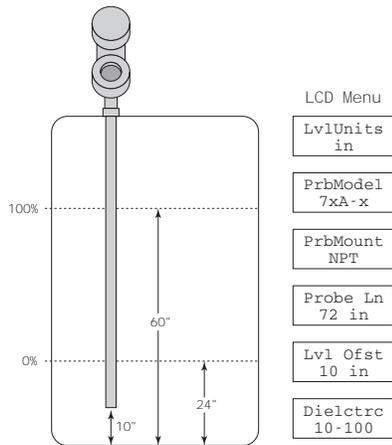0% Set Point

Probe Length
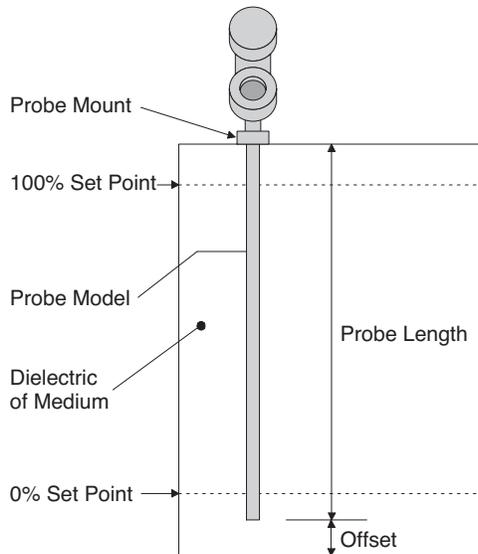
Offset

3.3.4 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.

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.

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.
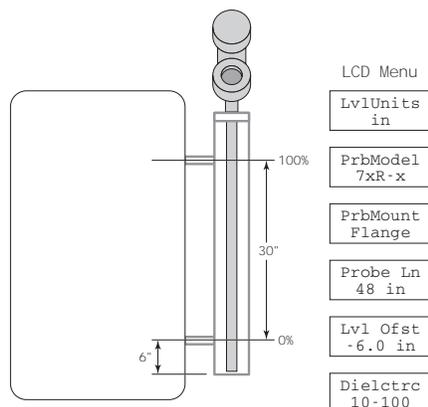
Example 3:
Application calls for a 48-inch cage-coaxial flanged probe measuring water in a chamber with the bottom of the probe 6 inches below the lower process connection. The user wants the 0% point to be 0 inches at the bottom process connection and the 100% point to be 30 inches at the top process connection.

Example 1

Example 2

Example 3

14   57-640 Eclipse Guided Wave Radar Transmitter - Foundation fieldbus

3.4 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 precisely calibrated from the factory.

On the other hand, part of the advantage of FOUNDATION fieldbus™ is to provide the ability to monitor changes and make 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.

3.4.1 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.

3.4.2 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.

Refer to the table in section 1.3.1.

3.5 Analog Input Block

The ANALOG INPUT (AI) block takes the Eclipse Model 705 input data, selected by channel number, and makes it available to other function blocks at its output:

Channel	Process Value
1	Level
2	Volume
3	Interface
4	Interface Volume
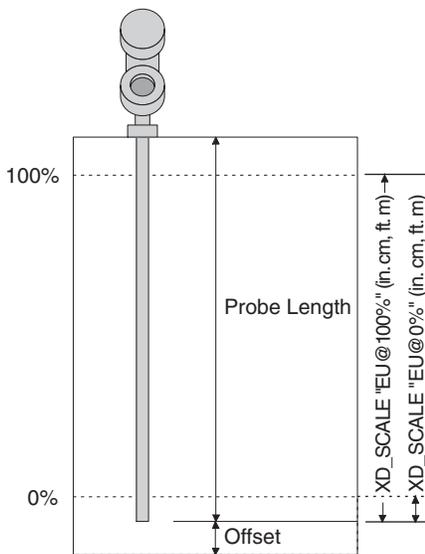
3.5.1 AI Block Parameters

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.

100%

Probe Length

XD_SCALE "EU @100%" (in.cm, ft.m)

XD_SCALE "EU@0%" (in.cm, ft.m)

0%

Offset

Default Scaling

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: Status for high alarm and associated time stamp.

LO_ALM: Status for low alarm and 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 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 blocks 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 block 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. The PV_FTIME parameter is a 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.

3.5.2 Local Display of Analog Input Transducer Block Output

The Model 705 3x FOUNDATION fieldbus™ Device Revision 2 transmitter incorporates a feature that allows the device's Analog Input [AI] block Out values to be displayed on the local LCD.

NOTE: There are many reasons that AI block Out values can deviate from the measurement value originating in the Transducer block, and because the keypad and local display will only provide access to Transducer block parameters, there is no way to explore or change the other fieldbus configuration items affecting the AI block output using the keypad and LCD.

These screens should only be considered as measured value indicators for configured transmitters.

- The screens are not used for commissioning or diagnostic / troubleshooting purposes.
- Prior to full fieldbus configuration (transmitter assigned a permanent address, AI block(s) configured and scheduled for execution, etc.), the value displayed will not reflect the transducer measurement. (Pre-configuration values will typically be 0).

3.5.2.1 AI Out Display Screens

The Analog Input Out values will be conditionally displayed as part of the "rotating" home menu screens.

The screens will be formatted as shown where # in the title is the number of the AI block (1, 2, 3, or 4) and mmm is one of: "Lvl", "Vol", "Ifc", "IfV", "---" depending on the value of the associated AI block's Channel parameter.

- For example, "AI1Lvl" would be the most commonly used AI Out screen.
- "AI2---" would be displayed when the channel value is 0 [uninitialized] for AI block 2.

The Out value will be displayed subject to limitations necessary for a 6-character display [999999 > Value > -99999].

Representative examples are shown below:

Analog Input block #

AI block channel measurement type

```
*AI#mmm*
######uu
```

Out Scale units abbreviation

Out Value

Analog Input Out Display

```
*AI1Lvl*        *AI3Ifc*        *AI1Vol*
 99.5 cm         0.0 %          999999 L
```

Because the Model 705 transmitter has four Analog Input blocks any or all of which may be used in particular applications, a Transducer block parameter controls which AI block Out values will be displayed.

The fieldbus presentation of this parameter will be similar to that shown at left (host system dependent).

Any or all (or none) of the AI block Out values can be selected for display on the LCD.

The local LCD version of this parameter is shown differently due to the limitations of the LCD:

LCD label: **"AI Disp "**

The default value of the Local AI Display parameter will be such that AI 1 Out is selected.

Local AI Display

- [✓] AI1 Out
- [ ] AI2 Out
- [ ] AI3 Out
- [ ] AI4 Out

None	AI4
AI1	AI1+AI4
AI2	AI2+AI4
AI1+AI2	AIs1,2,4
AI3	AI3+AI4
AI1+AI3	AIs1,3,4
AI2+AI3	AIs2,3,4
AIs1,2,3	All AIs

Analog Input Out Values To Be Displayed

3.6 PID Block

The PID Function Block contains the logic necessary to perform Proportional/Integral/Derivative (PID) control. The block provides filtering, set point limits and rate limits, feedforward support, output limits, error alarms, and mode shedding.

Although most other function blocks perform functions specific to the associated device, the PID block may reside in any device on the network. This includes a valve, a transmitter, or the host itself.

The Enhanced Model 705 3X PID Block implementation follows the specifications documented by the Fieldbus Foundation.

3.6.1 PID Block Parameters

ACK_OPTION: Used to set auto acknowledgement of alarms.

ALARM_HYS: The amount the alarm value must return to before the associated active alarm condition clears.

ALARM_SUM: The summary alarm is used for all process alarms in the block.

ALERT_KEY: The identification number of the plant unit.

ALG_TYPE: Selects filtering algorithm as Backward or Bi-linear.

BAL_TIME: The specified time for the internal working value of bias to return to the operator set bias.

BKCAL_IN: The analog input value and status for another blocks BKCAL_OUT output.

BKCAL_HYS: The amount the output must change away from its output limit before the limit status is turned off, expressed as a percent of the span of the output.

BKCAL_OUT: The value and status required by the BKCAL_IN input for another block.

BLOCK_ALM: Used for all configuration, hardware, connection failure, or system problems in the block.

BLOCK_ERR: Reflects the error status associated with the hardware or software components associated with a block.

BYPASS: Used to override the calculation of the block.

CAS_IN: The remote setpoint value from another block.

CONTROL_OPTS: Allows one to specify control strategy options.

DV_HI_ALM: The DV HI alarm data.

DV_HI_LIM: The setting for the alarm limit used to detect the deviation high alarm condition.

DV_HI_PRI: The priority of the deviation high alarm.

DV_LO_ALM: The DV LO alarm data.

3.6.1 PID Block Parameters (cont.)

DV_LO_LIM: The setting for the alarm limit used to detect the deviation low alarm condition.

DV_LO_PRI: The priority of the deviation low alarm.

FF_GAIN: The feedforward gain value.

FF_SCALE: The high and low scale values associated with FF_VAL.

FF_VAL: The feedforward control input value and status.

GAIN: The proportional gain value. This value cannot equal zero.

GRANT_DENY: Options for controlling access of host computers to alarm parameters of the block.

HI_ALM: The HI alarm data

HI_HI_ALM: The HI HI alarm data

HI_HI_LIM: The setting for the alarm limit used to detect the HI HI alarm condition.

HI_HI_PRI: The priority of the HI HI Alarm.

HI_LIM: The setting for the alarm limit used to detect the HI alarm condition.

HI_PRI: The priority of the HI alarm.

IN: The connection for the PV input from another block.

LO_ALM: The LO alarm data.

LO_LIM: The setting for the alarm limit used t detect the LO alarm condition.

LO_LO_ALM: The LO LO alarm data.

LO_LO_PRI: The priority of the LO LO alarm.

LO_PRI: The priority of the LO alarm.

MATH_FORM: Selects equation form (series or standard).

MODE_BLK: The actual, target, permitted, and normal modes of the block.

OUT: The block input value and status.

OUT_HI_LIM: The maximum output value allowed.

OUT_LO_LIM: The minimum output value allowed.

OUT_SCALE: The high and low scale values associated with OUT.

PV: The process variable use in block execution.

PV_FTIME: The time constant of the first order PV filter.

PV_SCALE: The high and low scale values associated with PV.

3.6.1 PID Block Parameters (cont.)

RATE: The derivative action time constant.

RCAS_IN: Target setpoint and status that is provided by a supervisory host.

RCAS_OUT: Block setpoint and status that is provided to a supervisory host.

RESET: The integral action time constant.

ROUT_IN: Block output that is provided by a supervisory host.

ROUT_OUT: Block output that is provided to a supervisory host.

SHED_OPT: Defines action to be taken on remote control device timeout.

SP: The target block setpoint value.

SP_HI_LIM: The highest SP value allowed.

SP_LO_LIM: The lowest SP value allowed.

SP_RATE_DN: Ramp rate for downward SP changes.

SP_RATE_UP: Ramp rate for upward SP changes.

STATUS_OPTS: Allows one to select options for status handling and processing.

STRATEGY: Can be used to identify grouping of blocks.

ST_REV: The revision level of the static data associated with the function block.

TAG_DESC: The user description of the intended application of the block.

TRK_IN_D: Discrete input that initiates external tracking.

TRK_SCALE: The high and low scale values associated with TRK_VAL.

TRK_VAL: The value applied to OUT in LO mode.

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

4.0   Model 705 Menu: Step by Step Procedures

The following table describes the software menu displayed by the Eclipse FOUNDATION fieldbus™ transmitter for "Level Only" measurement. Use this table as a step by step guide to configure the transmitter.

The second column presents the menus shown on the transmitter display. The displays are in the order they would appear if the arrow keys were used to scroll through the menu. The numbers on the first column are not shown in the display. They are only provided as reference.

The fourth column provides the actions to take when configuring the transmitter. Additional information or an explanation of an action is given in the fifth column. (Shaded sections are factory menu items).

4.1   Measurement Type: Level Only

	Display	Password	Action	Comment
1	*Status* *Level* *AI1Lvl*	None	Transmitter Display	MeasType = Lvl Only
2	Level xxx.x lu	None	Transmitter Display	All MeasType selections
3	AI1 Lvl xx.x lu	None	Transmitter Display	All MeasType selections
4	PrbModel (select)	User	**Select** the type of probe used	Select from **7xA-x, 7xB-x, 7xD-x, 7xE-x, 7xF-E, 7xF-F, 7xF-x, 7xF-4, 7xF-P, 7xG-x, 7xJ-x, 7xK-x, 7xL-x, 7xM-x, 7xN-x, 7xP-x, 7xQ-x, 7xR-x, 7xS-x, 7xT-x7x1-x, 7x2-x, 7x5-x, 7x7-x**
5	PrbMount (select)	User	**Select** the type of probe mounting	**Select** from NPT, BSP or Flange
6	MeasType (select)	User	**Select** type of measurement	**Select** from Lvl Only, Lvl&Vol, Intrface, Ifc&Vol
7	SnsrUnit (select)	User	**Select** the Sensor units	**Select** from cm, inches, feet, meters
8	Probe Ln xxx.x su	User	**Enter** the exact length of the probe	11.8 to 900 in (30 to 2286 cm)
9	Lvl Ofst xxx.x plu	User	**Enter** desired Level reading when probe is dry	-90 to 300 in (-228.6 to 762 cm)
10	Senstvty xxx	Superuser or user	**Adjust** gain value upward or downward to sense liquid surface	(Superuser password required for dual element probes.)
11	BlockDis xx.x su	User	**Enter** distance below reference point where level is not sensed	-99.9 to 2286 cm (-39.3 to 900 in)
12	SftyZone (select)	User	**Select** behavior when level is sensed in safety zone	Off, On, Latch

	Display	Password	Action	Comment
13	SZHeight xx.x su	User	**Enter** distance below BlockDis where SZ Fault will be asserted	5.1 to 2286 cm (2 to 900 in)
14	SZ Latch Reset	User	**Press** Enter to clear a Safety Zone latch	
15	Threshld (select)	User	**Select** from CFD, Fixed	For interface, refers to threshold for upper level pulse
16	Trim Lvl xx.x su	Superuser or user	**Enter** value to adjust Level reading	-20.0 inches <= Lvl Trim <= +20.0 inches (Superuser password required if negative fiducial.)
17	AI Disp	User	Transmitter Display	AI Block Display
18	LvlTicks xxxxx	User	Diagnostic Display	Time of flight from fiducial to level signal
19	New Pass xxx	User	**Enter** new password (0-255)	Displays encrypted value of present password
20	Language (select)	User	**Select** from English, Spanish, French, German	Language choice for LCD display
21	Mdl705FF Ver 3.xx	None	Transmitter Display	Product identification Firmware version
22	DispFact (select)	None	**Select** Yes to display factory parameter menus	
23	History Status	None	Diagnostic Display to view present status and recent exceptions	
24	Run Time xxxx.x h	None	Diagnostic Display showing elapsed time since power on	Cleared to zero with History Reset
25	History Reset	Superuser	**Press** Enter and select yes to clear history	Reset History Data
26	HF Cable Select	Superuser	Select length of remote extension cable	Select from integral, 3-foot, 12-foot
27	FidTicks xxxx	None	Diagnostic Display	Time of flight from start of ramp to fiducial
28	Fid Sprd xxx	None	Diagnostic Display	Spread in fiducial ticks readings
29	Fid Type (select)	Superuser	Superuser parameter	**Select** from Positive, Negative. Selection only allowed for some probes, fixed for others
30	Fid Gain xxx	Superuser	Superuser parameter	
31	Window xxx	Factory	Factory Parameter	Calibration parameter
32	Conv Fct xxxx	Factory	Factory Parameter	Calibration parameter
33	Scl Ofst xxx	Factory	Factory Parameter	Calibration parameter

	Display	Password	Action	Comment
34	Neg Ampl xxx	Superuser	Superuser parameter	Diagnostic parameter
35	Pos Ampl xxx	Superuser	Superuser parameter	Diagnostic parameter
36	Signal xxx	None	Diagnostic Display	Indication of level signal amplitude
37	Compsate	Superuser	Superuser Parameter	Select from None, Manual, Auto
38	DrateFct xxxx	None	Diagnostic Display	Compsate = Auto, velocity derating factor
39	TargAmpl xxxx	None	Diagnostic Display	Compsate = Auto, target negative threshold amplitude
40	Targ Tks xxxx	None	Diagnostic Display	Compsate = Auto, measured time of flight from fiducial to target
41	Targ Cal xxxx	Superuser	Diagnostic Display	Compsate = Auto, calibrated time of flight from fiducial to target in room temperature air
42	OperMode (select)	Superuser	Superuser parameter	Compsate = Auto, select from Run, Cal, Off
43	7xK Corr xxx	Superuser	Superuser parameter	Probe Model = 7xK, Distance in mm from fiducial to user reference point
44	Snsr Val xxx.x su	None	Distance to the target relative to the sensor reference point.	
45	CalPtLo xxx.x su	Superuser	The lower calibrated point of Sensor Value. It refers to PrLvl Lo.	In Sensor Units (Do Not Adjust)
46	CalPtHi xxx.x su	Superuser	The higher calibrated point of Sensor Value. It refers to PrLvl Hi.	In Sensor Units (Do Not Adjust)
47	ProbeLvl xxx.x plu	None	Level on the probe relative to the end of the probe.	
48	PrLvl Lo xxx.x plu	Superuser	Value of PrLvl at SnrCalLo.	In Probe Level Units
49	PrLvl Hi xxx.x plu	Superuser	Value of PrLvl at SnrCalHi.	In Probe Level Units
50	ElecTemp xxx C	None	Diagnostic Display	Present temperature in electronics compartment (degrees Celsius)
51	Max Temp xxx C	Superuser	Diagnostic Display	Maximum electronics temperature recorded
52	Min Temp xxx C	Superuser	Diagnostic Display	Minimum electronics temperature recorded
53	SZ Hyst xx.x su	Superuser	Superuser Parameter	Safety Zone hysteresis height

5.0 Diagnostic Parameters

The Eclipse Model 705 measurement engine runs through a series of self-tests and will detect and report faulty operation. The TRANSDUCER BLOCK displays these faults in the DEVICE_STATUS parameter. Refer to Section 6.1.2 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 few seconds after power is applied, the LEVEL_STATUS/QUALITY is "Uncertain," the SUB_STATUS is "Initial value," and the LIMIT attribute is "Constant."

When the Model 705 is operating properly, the LEVEL_STATUS/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 set to OOS, the 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.

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 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 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."

Refer to Section 6.1.2 for additional information.

5.1 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, if necessary, permanently disable the Simulate feature.

6.0 Reference Information

6.1 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.

6.1.1 Troubleshooting System Problems

Symptom	Problem	Solution
LEVEL and AI 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 EU_0% and EU_100% 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 AI OUTPUT values fluctuate.	Turbulence	Increase the AI Block process value filter time until the readings stabilize.
	High Frequency connection	Check Fid Spread (should be stable within ±10 counts).
LEVEL and AI 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 AI OUTPUT values values all at maximum level.	Possible configuration issue with single rod probe	1) Increase Blocking Distance 2) Increase Dielectric Range
LEVEL and AI 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 33-34. Enter all data when transmitter is working CORRECTLY or INCORRECTLY.

6.1.2 Device Status Parameter in the Transducer Block

The following table lists the conditions indicated in the Device Status parameter. It also shows the affect the condition has on PV status, Sub-Status and Limit, XD ERROR and BLOCK ALARM are not affected by these conditions directly.

Device Status				PV Status Quality	PV Sub Status	Limit
Type	Label	Bit #	Value			
Mode	OK	15	0x00008000	Good	Non-Specific	Not Limited
Mode	User Access	7	0x00000080	Bad	OOS	Not Limited
Mode	Factory Access	5	0x00000020	Bad	OOS	Not Limited
Fault	Default Params	28	0x10000000	Bad	Configuration Error	Not Limited
Fault	No End of Ramp	27	0x08000000	Bad	Device Failure	Constant Limited
Fault	Lvl<Probe Length	23	0x00800000	Bad	Sensor Failure	Constant Limited
Fault	No Fiducial	21	0x00200000	Bad	Device Failure	Constant Limited
Fault	Safety Zone FLT	20	0x00100000	Bad	Non-Specific	Not Limited
Fault	No Signal	19	0x00080000	Bad	Sensor Failure	Constant Limited
Fault	EOP<Probe Length	18	0x00040000	Bad	Sensor Failure	Constant Limited
Fault	EOP High	17	0x00020000	Bad	Configuration Error	Not Limited
Fault	High Volume Fit	16	0x00010000	Bad	Configuration Error	High Limited
Warning	Hi Temperature	11	0x00000800	No Effect	No Effect	No Effect
Warning	Lo Temperature	10	0x00000400	No Effect	No Effect	No Effect
Warning	Default Cal	9	0x00000200	No Effect	No Effect	No Effect
Warning	Initializing	4	0x00000010	No Effect	Initial Value	Constant Limited
Warning	May be Flooded	3	0x00000008	No Effect	No Effect	High Limited
Warning	Dry Probe	2	0x00000004	No Effect	No Effect	Low Limited
Warning	Weak Signal	1	0x00000002	No Effect	No Effect	No Effect
Warning	No Steam Target	6	0x00000040	No Effect	No Effect	No Effect

The first three conditions are Type Mode. If everything is running normally and there are no Faults or Warnings, then the device indicates it is "OK" an the local display and in Device Status. If a password is entered through the local display, the Transducer Block is taken Out of Service if it is not already and the User Access or Factory Access will be indicated in Device Status. This will indicate to the operator that an attempt is being made to modify a parameter value. No indication is given on the Fieldbus network if someone is only viewing parameters on the local display.

The next set of conditions is device faults. The device will most likely not be able to measure level correctly if one or more of these conditions occur. The condition will be indicated in Device Status and will affect PV Status, Sub-Status and Limit as indicated.

The next set of conditions is the device warnings. The condition will not jeopardize the level measurement. However, knowledge of the condition may be useful in troubleshooting the device.

The following table describes the conditions that can be seen in Device Status:

Display Message	Action	Comment
OK	None	Normal operating mode.
User Access	Password at the local display.	Parameter values are being changed through the local interface. Make sure Transducer Block is taken out of service.
Factory Access	Password at the local display.	Parameter values are being changed through the local interface. Make sure Transducer Block is taken out of service.
Default Params	Internal non-volatile parameters have been defaulted.	Consult factory.
No End of Ramp	No End-of Ramp signal detected.	Consult factory.
Lvl<Probe Length	Apparent position of the upper level pulse is beyond the end of the probe.	1) Check entered Probe Length. 2) Change Threshold to Fixed.
No Fiducial	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 in the high frequency connector. 4) Consult factory.
Safety Zone Flt	Safety Zone Alarm has been tripped.	Decrease level in vessel.
No Signal	No level signal being detected.	1) Ensure Dielectric setting is correct for the measured medium. 2) Increase Sensitivity 3) Confirm Probe Model is proper for the dielectric of the medium. 4) Consult factory.
EOP<Probe Length	End of Probe signal from a dry probe is out of range.	1) Ensure the Probe Length is entered correctly. 2) Set Dielectric to a lower dielectric range. 3) Consult factory. 4) Ensure proper Blocking Distance.
EOP High	End of Probe signal is out of range.	1) Ensure Probe Length is entered correctly. 2) Consult factory.
High Volume Flt	Level more than 5% above highest point in strapping table.	1) Verify strapping table is entered correctly. 2) Signal amplitude may be lower than desired.
Hi Temperature	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.
Lo Temperature	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 transmitter.
Default Cal	Factory set default calibration parameters are in use. Level reading may be inaccurate.	Consult factory.
Initializing	None	Program is initializing. This is a transient condition.
May be Flooded	Loss of level signal possibly due to flooding. Twin Rod probes only.	1) Decrease level in vessel. 2) Set Dielectric to lower range value. 3) Replace with Model 7xR Overfill probe.
Dry Probe	None	Normal message for a dry probe. End of Probe signal is being detected in correct location.
Weak Signal	None. Signal amplitude is lower than desired.	1) Set Dielectric to a lower range value. 2) Increase Sensitivity.

6.1.3 FF Segment Checklist

There can be several reasons for a FOUNDATION fieldbus™ installation to be in a faulty condition. In order to ensure 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 μF 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 mm²)	6,200 ft. (1,900 m)	A
Multi	Yes	Yes	AWG 22 (0.32 mm²)	3,900 ft. (1,200 m)	B
Multi	No	Yes	AWG 26 (0.13 mm²)	1,300 ft. (400 m)	C
Multi	Yes	No	AWG 16 (1.25 mm²)	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 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, stable communication should be established.

6.2 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	ITEM	PARAMETER NAME	PARAMETER LABEL
0	BLOCK_STRUCTURE	BLOCK STRUCT	58	STRAPPING_TABLE_POINT08	StrapTbl Pt08
1	ST_REV	ST REV	59	STRAPPING_TABLE_POINT09	StrapTbl Pt09
2	TAG_DESC	TAG DESC	60	STRAPPING_TABLE_POINT10	StrapTbl Pt10
3	STRATEGY	STRATEGY	61	STRAPPING_TABLE_POINT11	StrapTbl Pt11
4	ALERT_KEY	ALERT KEY	62	STRAPPING_TABLE_POINT12	StrapTbl Pt12
5	MODE_BLK	MODE BLK	63	STRAPPING_TABLE_POINT13	StrapTbl Pt13
6	BLOCK_ERR	BLOCK ERR	64	STRAPPING_TABLE_POINT14	StrapTbl Pt14
7	UPDATE_EVT	UPDATE EVT	65	STRAPPING_TABLE_POINT15	StrapTbl Pt15
8	BLOCK_ALM	BLOCK ALM	66	STRAPPING_TABLE_POINT16	StrapTbl Pt16
9	TRANSDUCER_DIRECTORY	XD DIRECTORY	67	STRAPPING_TABLE_POINT17	StrapTbl Pt17
10	TRANSDUCER_TYPE	XD TYPE	68	STRAPPING_TABLE_POINT18	StrapTbl Pt18
11	XD_ERROR	XD ERROR	69	STRAPPING_TABLE_POINT19	StrapTbl Pt19
12	COLLECTION_DIRECTORY	COLLECT DIR	70	STRAPPING_TABLE_POINT20	StrapTbl Pt20
13	LEVEL	Level	71	FID_TICKS	Fid Ticks
14	LEVEL_UNIT	Level Unit	72	FID_SPREAD	Fid Spread
15	PROBE_LEVEL	Probe Level	73	LEVEL_TICKS	Lvl Ticks
16	PROBE_LEVEL_UNIT	Probe Level Unit	74	INTERFACE_TICKS	Ifc Ticks
17	SENSOR_VALUE	Sensor Value	75	INTERFACE_MEDIUM	Ifc Medium
18	SENSOR_UNIT	Sensor Unit	76	ENTER_PASSWORD	Enter Password
19	SENSOR_OFFSET	Sensor Offset	77	NEW_PASSWORD	New User Password
20	CAL_TYPE	Cal Type	78	DEVICE_STATUS	Device Status
21	CAL_POINT_LO	Cal Point Lo	79	HISTORY_MESSAGE	History Message
22	CAL_POINT_HI	Cal Point Hi	80	HISTORY_CONTROL	History Control
23	PROBE_LEVEL_LO	Probe Lvl Lo	81	RESET_HISTORY	Reset History
24	PROBE_LEVEL_HI	Probe Lvl Hi	82	HF_CABLE	HF Cable
25	LEVEL_OFFSET	Level Offset	83	FID_TYPE	Fid Type
26	SENSOR_HIGH_LIMIT	Sensor Hi Lmt	84	FID_GAIN	Fid Gain
27	SENSOR_LOW_LIMIT	Sensor Lo Lmt	85	WINDOW_705	Window
28	PROBE_MODEL	Probe Model	86	CONVERSION_FACTOR	Conv Factor
29	PROBE_MOUNT	Probe Mount	87	SCALE_OFFSET	Scale Offset
30	MEASUREMENT_TYPE	Measurement Type	88	NEGATIVE_THRESHOLD_AMPLITUDE	NegThrsh Ampl
31	PROBE_LENGTH	Probe Length	89	INTERFACE_THRESHOLD_AMPLITUDE	IfcThrsh Ampl
32	DIELECTRIC_RANGE	Dielctric Rng	90	POSITIVE_THRESHOLD_AMPLITUDE	PosThrsh Ampl
33	SENSITIVITY	Sensitivity	91	SIGNAL	Signal
34	BLOCKING_DISTANCE	Blocking Distance	92	COMPENSATION	Compensation
35	SAFETY_ZONE_MODE	SafeZone Mode	93	DERATE_FACTOR	Derate Factor
36	SAFETY_ZONE_HEIGHT	SafeZone Ht	94	TARGET_AMPLITUDE	Target Amplitude
37	SAFETY_ZONE_LATCH_RESET	SZ Latch Rst	95	TARGET_TICKS	Target Ticks
38	THRESHOLD	Threshold	96	TARGET_CAL	Target Cal
39	TRIM_LEVEL	Trim Level	97	TARGET_OPERATING_MODE	Target OperMode
40	LOCAL_AI_DISPLAY	Local AI Display	98	7XK_DISTANCE_CORRECTION	7XK Dist Corr
41	VOLUME	Volume	99	ELECTRONICS_TEMPERATURE	Elec Temp
42	VOLUME_UNIT	Volume Unit	100	MAX_ELECTRONICS_TEMPERATURE	Max Elec Temp
43	INTERFACE	Interface	101	MIN_ELECTRONICS_TEMPERATURE	Min Elec Temp
44	INTERFACE_UNIT	Ifc Unit	102	RESET_ELECTRONICS_TEMPERATURE	Reset Elect Temp
45	UPPER_LIQUID_DIELECTRIC	Upr Liq Diel	103	SAFETY_ZONE_HYSTERESIS	SafeZone Hyst
46	INTERFACE_THRESHOLD	Ifc Threshld	104	ECHO_SUMMARY	Echo Summary
47	INTERFACE_VOLUME	Ifc Vol	105	ECHO_DATA	Echo Data
48	INTERFACE_VOLUME_UNIT	Ifc Vol Unit	106	ECHO_DATA_INDEX	EchoData Indx
49	STRAP_TABLE_LENGTH	Strap Table Length	107	WAVEFORM_SELECTION	Waveform Selection
50	TABLE_VOLUME_UNIT	Table Volume Unit	108	NSP_VALUE	NSP Value
51	STRAPPING_TABLE_POINT01	StrapTbl Pt01	109	FACTORY_PARAM_1	Factory Param 1
52	STRAPPING_TABLE_POINT02	StrapTbl Pt02	110	FACTORY_PARAM_2	Factory Param 2
53	STRAPPING_TABLE_POINT03	StrapTbl Pt03	111	STEAM_CAL_MOUNT	Steam Cal Mount
54	STRAPPING_TABLE_POINT04	StrapTbl Pt04	112	NON_VOL_STAT	Non Vol Stat
55	STRAPPING_TABLE_POINT05	StrapTbl Pt05	113	DATE_CODE	Date Code
56	STRAPPING_TABLE_POINT06	StrapTbl Pt06	114	MAGNETROL_SERIAL_NUMBER	Magnetrol S/N
57	STRAPPING_TABLE_POINT07	StrapTbl Pt07	115	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		
Vessel Name					
Vessel #					
Process Medium					
Tag #					
Electronics Serial #				TROUBLESHOOTING	
Probe Serial #				**Working Value**	**Non-Working Value**
Level					
Volume (optional)					
Interface (optional)					
Interface Volume (opt.)					
Probe Model					
Probe Mount					
Measurement Type					
Sensor Units					
Probe Length					
Level Offset					
Volume Units (opt.)					
Strapping Table (opt.)					
Dielectric					
Sensitivity					
Blocking Distance					
Safety Zone Fault					
Safety Zone Height					
Safety Zone Alarm					
Threshold					
Interface Threshold					
Level Trim					
Level Ticks					
A. I. Disp					
Dev Addr					
Interface Ticks (opt.)					
Fid Ticks					
<Software Version>					

Enhanced Model 705
Eclipse Guided Wave Radar Transmitter
FOUNDATION Fieldbus™ Configuration Data Sheet

Magnetrol®

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

Item	Value	Value	Value	TROUBLESHOOTING	
				Working Value	**Non-Working Value**
FidTicks					
FidSprd					
Fid Type					
HF Cable					
Fid Gain					
Window					
Conv Fct					
Scl Ofst					
Neg Ampl					
Pos Ampl					
Signal					
Compsate					
DrateFct					
Targ Ampl					
Targ Tks					
Targ Cal					
OperMode					
7xKCorr					
ElecTemp					
Max Temp					
Min Temp					
SZ Hyst					
Name **Date** **Time**					

Notes

IMPORTANT

SERVICE POLICY

Owners of Magnetrol products 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. Magnetrol International will repair or replace the control, at no cost to the purchaser, (or owner) *other than transportation cost* if:

a. Returned within the warranty period; and,
b. The factory inspection finds the cause of the malfunction to be defective material or workmanship.

If the trouble is the result of conditions beyond our control; or, is **NOT** covered by the warranty, there will be charges for labour 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, labour, direct or consequential damage will be allowed.

RETURNED MATERIAL PROCEDURE

So that we may efficiently process any materials that are returned, it is essential that a "Return Material Authorisation" (RMA) form will be obtained from the factory. It is mandatory that this form will be attached to each material returned. This form is available through Magnetrol's local representative or by contacting the factory. Please supply the following information:

1. Purchaser Name
2. Description of Material
3. Serial Number and Ref Number
4. Desired Action
5. Reason for Return
6. Process details

Any unit that was used in a process must be properly cleaned in accordance with the proper health and safety standards applicable by the owner, before it is returned to the factory.

A material Safety Data Sheet (MSDS) must be attached at the outside of the transport crate or box.

All shipments returned to the factory must be by prepaid transportation. Magnetrol *will not accept* collect shipments.

All replacements will be shipped Ex Works.