

ECLIPSE® 706GWR

Eclipse® Model 706

PROFIBUS PA

Operating Manual

Software Version 1.x

*High Performance, 4th Generation
Guided Wave Radar
Level Transmitter*



Use in conjunction with
I&O manual BE 57-606

Eclipse® Model 706 GWR transmitter with PROFIBUS PA Output

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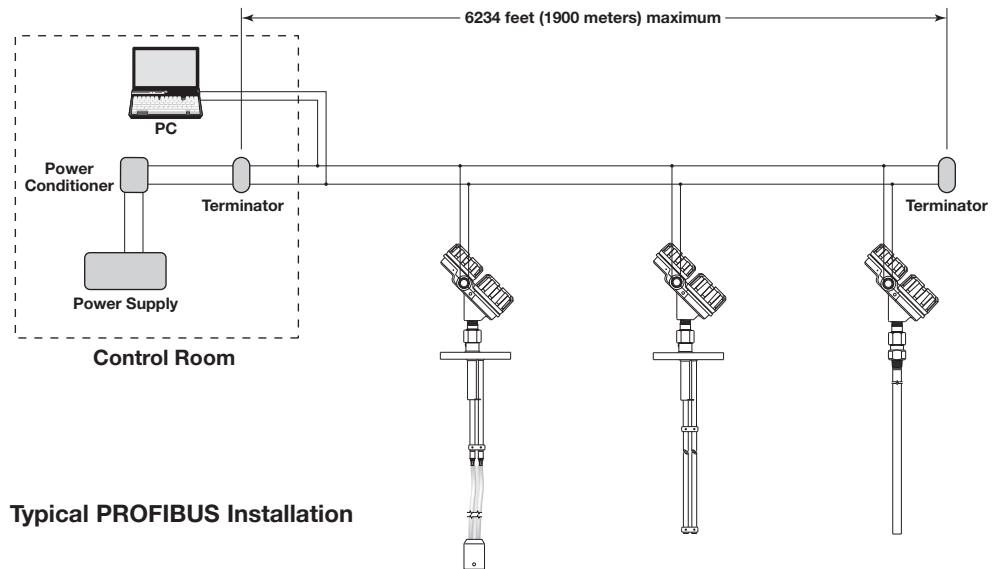
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1.0 PROFIBUS PA™ Overview

1.1 Description

PROFIBUS PA™ 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:

- PROFIBUS PA™ 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 PROFIBUS 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 PROFIBUS PA™ considers the two wires as a network. The network can carry many process variables as well as other information. The Model 706PA transmitter is a PROFIBUS PA™ certified device that communicates with the DPV1 protocol operating at 31.25 kbits/sec. The MBP 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 technical guideline “PROFIBUS PA™ User and Installation Guideline” at www.profibus.com.

1.2 Benefits

The benefits of PROFIBUS PA™ 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 PROFIBUS International requires interoperability, defined as “the ability to operate multiple devices in the same system, regardless of manufacturer, without a loss of functionality.” All PROFIBUS PA™ devices must be tested for interoperability by a PI accredited, independent testing agency. Magnetrol Model 706PA device certification information can be found at www.profibus.com.
2. **Operation:** A PROFIBUS PA™ 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 PROFIBUS PA™ device is determined by the arrangement of a system of blocks. The types of blocks used in a typical User Application are described as follows:

Physical Block describes the characteristics of the PROFIBUS PA™ device such as the device name, manufacturer, and serial number.

Function Blocks are built into the PROFIBUS PA™ devices as needed to provide the desired control system behavior. 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 can provide extended descriptions for each object and provides pertinent information useful for a host system.

DDs are similar to the drivers that your personal computer (PC) uses to operate peripheral devices connected to it.

General PROFIBUS Information:

- The Model 706 supports PA Profile Version 3.02
- The Ident Number issued by the PNO for Magnetrol Model 706 is 0x101A. The Ident Number is included in the name of the GSD file.
- The General Station Description (GSD) file provides information on the features and performance capabilities of a PROFIBUS device to allow easy configuration of PROFIBUS networks with devices from different manufacturers. The manufacturer-specific GSD file for the Model 706PA is MI01101A.gsd. Also, a bitmap file specified in the GSD file provides a symbolic representation of the device for network configuration tools.
- The Model 706PA can also use the profile-specific GSD file PA139707.gsd. If this general GSD file is used, the “Ident number Selector” parameter in the Physical Block must be set to the profile-specific ident number. The default selection of the “Ident Number Selector” parameter is the manufacturer-specific ident number.
- A Device Description is available for configuring the device using Simatic PDM.
- The range of device bus addresses is 0 to 126. 126 is the default address and all units will ship with address 126 unless a non-default address assignment is requested by the customer. The address can be changed via the fieldbus or the local LCD interface.

Additional information can be found at www.profibus.com.

1.3.1 PROFIBUS DD Revision Table

Model 706PA

DD Version	Release Date	Compatible with Model 706PA	
		Firmware	Software Revision
Dev V1 DD v1	March 2018	1.0	V 3.0.1

1.4 Intrinsic Safety

The IEC 61158 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.

IEC 61158 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 Model 706 PA is available with entity IS, FISCO IS, FNICO non-incendive, or explosion proof approvals.

2.0 Function Blocks

2.1 Overview

The Eclipse Model 706 Guided Wave Radar Level Transmitter operates on the principle of Time Domain Reflectometry (TDR).

The Eclipse Model 706PA is a Guided Wave Radar (GWR) level transmitter with twelve PROFIBUS PA™ Blocks (one Physical Block, three Transducer Blocks, and eight 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 measured values and makes them available as an analog value to the network. The AI blocks have scaling conversion, filtering, and alarm functions.

2.1.1 Standard PROFIBUS 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.

BLOCK_OBJECT: Contains the characteristics of the block. This object applies to every block and is placed before the first parameter.

ST_REV A read-only parameter to track changes of static parameters in the associated block. ST_REV will be incremented each time a static parameter is changed.

TAG_DESC (tag descriptor): A user-supplied description of the block.

STRATEGY: A user-specified value that may be used in configuration or diagnostics as a key in sorting block information.

ALERT_KEY: A user-assigned value that may be used in sorting alarms or events generated by a block.

TARGET_MODE: This attribute indicates what mode of operation is desired for the block.

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

The actual mode is set by the block during its execution to reflect the mode used during execution

The permitted mode shows which changes of the target mode are valid for the specific block

ALARM_SUM: This parameter summarized the status of up to 16 block alarms.

2.2 Physical Block

The Physical Block contains data specific to the Model 706PA transmitter, along with some information about the firmware.

NOTE: The Physical Block has no control function.

MODE_BLK: Actual mode must be in AUTO in order for the AI Function blocks in the transmitter to operate.

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

SOFTWARE_REVISION: Revision number of the software of the field device.

HARDWARE_REVISION: Revision number of the hardware of the field device.

DEVICE_MAN_ID: Identification code of the manufacturer of the field device.

DEVICE_ID: Manufacturer specific identification of the device.

DEVICE_SER_NUM: Serial number of the device.

DIAGNOSIS: Detailed information about the device, bitwise coded.

DIAGNOSIS_EXTENSION: Additional detailed information about the device.

DIAGNOSIS_MASK: Definition of supported DIAGNOSIS information-bits.

0 = not supported

1 = supported

DIAGNOSIS_MASK_EXTENSION: Definition of supported DIAGNOSIS_EXTENSION information-bits.

0 = not supported

1 = supported

DEVICE CERTIFICATION: Pertinent certifications of the device.

WRITE_LOCKING: Software write-protection can be enabled or disabled.

FACTORY_RESET: Command for resetting the device for default values. The setting of the bus address is not affected.

- **RESTART_WITH_DEFAULTS:** As RESTART DEFAULT will set all configuration parameters to their default values. Devices need to be reconfigured following activation of this function. The bus address is not affected.
- **WARM_START:** No parameters changed
- **RESET_ADDRESS_TO_DEFAULT:** Other parameters unchanged

DESCRIPTOR: User-definable text string to describe the device within the application.

DEVICE_MESSAGE: User-definable message string used to describe the device within the application of in the plant.

DEVICE_INSTAL_DATE: Installation date of the device.

IDENT_NUMBER_SELECTOR: Selects manufacturer-specific Ident number issued by PNO or profile-specific Ident number to determine features and behavior for interacting with device.

HW_WRITE_PROTECTION: Indicates the position of a write block mechanism (e.g., hardware jumper).

2.3 Analog Input Block

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

- | | |
|----------------------------|------------------|
| 1. Level | 8. Probe Buildup |
| 2. Distance | 9. Volume |
| 3. Interface Level | 10. Flow |
| 4. Upper Thickness | 11. Head |
| 5. Echo Strength | 12. NR Totalizer |
| 6. Ifc Echo Strength | 13. R Totalizer |
| 7. Electronics Temperature | |

2.3.1 AI Block Parameters

The first eight parameters in an AI block are the standard block parameters discussed in section 2.1.1. Additional analog input function block parameters are as follows:

BATCH: A parameter intended to be used in Batch application in line with IEC 61512 Part 1.

OUT: Contains the current measurement value in the configuration engineering unit.

PV_SCALE: High and low scale values used to convert Process Variable Configured by channel into percent.

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

LIN_TYPE: Type of linearization. No linearization is supported in the AI function blocks.

CHANNEL: Selects the measurement value from an active transducer block as the input to the function block.

PV_FTIME: Filter time of the Process Variable.

FSAFE_TYPE: Defines the reaction of a device, if a fault is detected and the quality of the process variable input from the transducer block is BAD.

0 = FSAFE_VALUE is used as OUT

1 = Use last stored valid OUT value

2 = OUT has incorrect calculated value; status remains “bad”.

FSAFE_VALUE: Default value for the OUT parameter, if a fault is detected, and FSAFE_TYPE is 0.

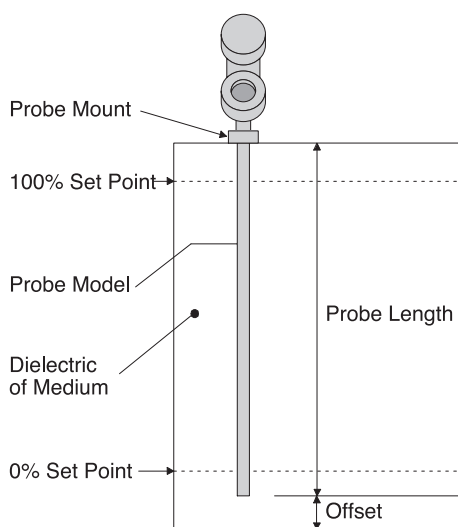
HI_LIM: Value of the upper limit of warnings.

LO_LIM: Value of the lower limit of warnings.

ALARM_HYS: Hysteresis to adjust sensitivity of alarm triggering.

HI_HI_LIM: Value of the upper limit of alarms.

HI_LIM: Value of the upper limit of warnings.



Scaling

LO_LIM: Value of the lower limit of warnings.
LO_LO_LIM: Value of the lower limit of alarms.
HI_HI_ALM: State of the upper limit of alarms.
HI_ALM: State of the upper limit of warnings.
LO_ALM: State of the lower limit of warnings.
LO_LO_ALM: State of the lower limit of alarms.

SIMULATE: For commissioning and test purposes, the input value of the Transducer Block in the AI Block can be modified.

OUT_UNIT_TEXT: Allows the user to write text if a specific unit of the OUT parameter is not in the code list.

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

Transducer scaling, called PV_SCALE, is applied to the PV from the CHANNEL to produce the FIELD_VAL in percent. Units of PV_SCALE are the same as the units of the TRANSDUCER BLOCK process variable configured by channel.

Damping Filter is a feature of the AI Block. PV_FTIME parameter is the 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.

2.3.2 Local Display of Analog Input

Transducer Block Output

The ECLIPSE Model 706 PA transmitter incorporates a useful feature that allows the 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 change (or view) 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. For example:

- 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 may not reflect the transducer measurement.



LCD Screen

2.3.2.1 AI Out Display Screens

The Analog Input Block Out values can be conditionally displayed as part of the “rotating” home menu screens. A representative example is shown at left.

The screens will be formatted as shown with:

- Physical Device Tag (Selectable)
- Measured Value Status (Bad, Good, Uncertain)
- Bar Graph

For example, “AI1_Level” would be the most commonly used AI Out screen.

“AI2---” would be displayed when the channel value is 0 [uninitialized] for AI block 2.

Because the Model 706 transmitter has eight (8) 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 on the LCD.

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

NOTE: In the photo at left, status is shown as “Bad out of Service”. This message could be shown prior to commissioning.

Device Address screen

The address can be changed to any number from 0 to 126, and changing the address does not require use of the advanced password. (Note: changing or resetting the address results in a reset of the transmitter.)

Physical Device Tag screen

The Tag can be set using the keypad and local display, or from the Profibus interface.

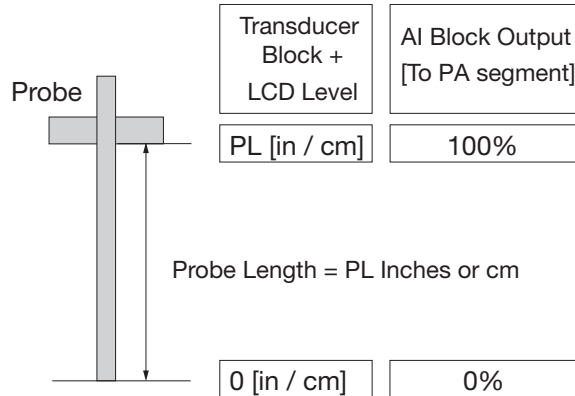
The [AI Block] PV Scale values are automatically converted to appropriate values if the units for the channel used by an AI block are changed. For example, if PV Scale Upper Value is 240 inches and Channel is Level, if Level Units is changed from inches to feet, PV Scale Upper Value will automatically change to 20 [feet].

2.3.3 AI Block Configuration

Below are shown some examples of various typical AI Block configurations.

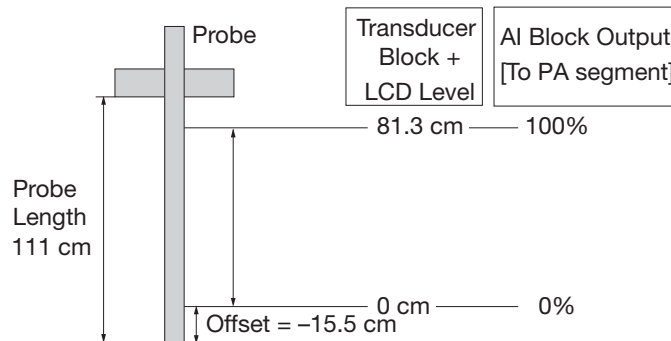
NOTE: Probe Length and Level Offset are transducer block parameters.

Example 1: standard configuration for transmitter with probe of length PL inches or cm.
[setup by factory as part of final assembly procedure]



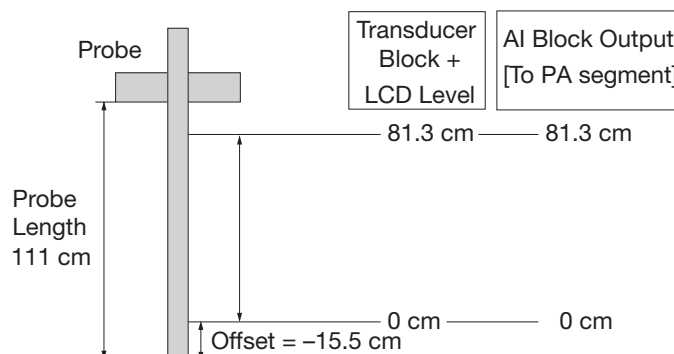
Configuration	
Probe Length	PL
Level Offset	0
PV Scale Lower Value	0
PV Scale Upper Value	PL
PV Scale Units	in/cm
Out Scale Lower Value	0
Out Scale Upper Value	100
Out Scale Units	%
Characterization Type	Linear

Example 2: end user desires 0 to 100% output for a subset of the measurable region [probe]
[e.g., for a chamber application]



Configuration	
Probe Length	111
Level Offset	-15.5
PV Scale Lower Value	0
PV Scale Upper Value	81.3
PV Scale Units	cm
Out Scale Lower Value	0
Out Scale Upper Value	100
Out Scale Units	%
Characterization Type	Linear

Example 3: same configuration as previous except Direct [no] scaling setup in AI block
Output to PA segment is in cm



Configuration	
Probe Length	111
Level Offset	-15.5
PV Scale Lower Value	0
PV Scale Upper Value	81.3
PV Scale Units	cm
Out Scale Lower Value	0
Out Scale Upper Value	81.3
Out Scale Units	cm
Characterization Type	Direct

2.4 GWR Transducer Block

The TRANSDUCER block is a custom block containing parameters that support the Model 706PA 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, and contain both read-only and read-write parameters.

- 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 remains in AUTO mode even when the local interface (keypad) is used to change a parameter online.

3.0 Model 706 Transmitter Configuration

Although the ECLIPSE Model 706 transmitter can be delivered pre-configured from the factory, it can also be easily reconfigured in the shop or at the installation using the local LCD/Keypad. Bench configuration provides a convenient and efficient way to set up the transmitter before going to the tank site to complete the installation.

NOTE: The transmitter can be configured without the probe. Disregard the “No Probe” diagnostic indicator that will appear.

3.1 Configuration Information

To utilize the QuickStart menu available on the ECLIPSE Model 706, some key information is required for configuration.

Gather the information and complete the following operating parameters table before beginning configuration.

NOTES: The QuickStart menu is available for Level Only applications.

1. Refer to Section 3.5 for configuration menus for Interface, Volume or Flow applications.
2. These configuration steps are not necessary if the transmitter was pre-configured prior to shipment.

Display	Question	Answer
Level Units	What units of measurement will be used? (inches, millimeters, centimeters, feet or meters)	_____
Probe Model	What probe model is listed on the model information? (first three digits of probe model number)	_____
Probe Mount	Is the probe mounted NPT, BSP, or flange? (Refer to probe model.)	_____
Probe Length	What probe length is listed on the probe model information? (last three digits of the probe model number)	_____
Level Offset	The desired level reading when the liquid is at the tip of the probe. (Refer to Section 2.3.3 for more information.)	_____
Dielectric Range	What is the dielectric constant range of the process medium?	_____

3.2 Menu Traversal and Data Entry

The four push buttons offer various forms of functionality for navigation and data entry.

The Model 706 user interface is hierarchical in nature, best described as a tree structure. Each level in the tree contains one or more items. Items are either menu labels or parameter names.

- Menu labels are presented in all capital letters
- Parameters are capital words

3.2.1 Navigating the Menu

- ⇧ **UP** moves to the previous item in the menu branch.
- ⇩ **DOWN** moves to the next item in the menu branch.
- ⇐ **BACK** moves back one level to the previous (higher) branch item.
- ⇒ **ENTER** enters into the lower level branch or switches to the entry mode. Holding the ENTER down on any highlighted menu name or parameter will show help text for that item.



3.2.2 Data Selection

This method is used for selecting configuration data from a specific list.

⇧ **UP** and ⇩ **DOWN** to navigate the menu and highlight the item of interest

⇨ **ENTER** allows modification of that selection

⇧ **UP** and ⇩ **DOWN** to choose new data selection

⇨ **ENTER** to confirm selection

Use ⇧ **BACK** (Escape) key at any time to abort the procedure and escape to previous branch item.

3.2.3 Entering Numeric Data Using Digit Entry

This method is used to input numeric data, e.g., Probe Length or level offset.





Push button		Keystroke Action
⇧	Up	Moves up to the next highest digit (0,1,2,3,....,9 or decimal point). If held down the digits scroll until the push button is released.
⇩	Down	Moves up to the next lowest digit (0,1,2,3,....,9 or decimal point). If held down the digits scroll until the push button is released.
⇧	Back	Moves the cursor to the left and deletes a digit. If the cursor is already at the leftmost position, then the screen is exited without changing the previously saved value.
⇨	Enter	Moves the cursor to the right. If the cursor is located at a blank character position, the new value is saved.

All numeric values are left-justified, and new values are entered from left to right. A decimal point can be entered after the first digit is entered, such that .9 is entered as 0.9.

Some configuration parameters can have a negative value. In this case, the leftmost position is reserved for the sign (either "-" for a negative value, or "+" for a positive value).

3.2.4 Entering Numeric Data Using Increment/Decrement





Use this method to input the following data into parameters such as Failure Alarm Delay.

Push button		Keystroke Action
	Up	Increments the displayed value. If held down the digits scroll until the push button is released. Depending on which screen is being revised, the increment amount may increase by a factor of 10 after the value has been incremented 10 times.
	Down	Decrements the displayed value. If held down the digits scroll until the push button is released. Depending on which screen is being revised, the decrement amount may increase by a factor of 10 after the value has been decremented 10 times.
	Back	Returns to the previous menu without changing the original value, which is immediately re-displayed.
	Enter	Accepts the displayed value and returns to the previous menu.

3.2.5 Entering Character Data

This method is used for parameters requiring alphanumeric character entry, such as for entering tags, etc.

General Menu Notes:

Push button		Keystroke Action
	Up	Moves to the previous character (Z...Y...X...W). If held down, the characters scroll until the push button is released.
	Down	Moves to the next item character (A...B...C...D). If held down, the characters scroll until the push button is released.
	Back	Moves the cursor back to the left. If the cursor is already at the leftmost position, then the screen is exited without changing the original tag characters.
	Enter	Moves the cursor forward to the right. If the cursor is at the rightmost position, then the new tag is saved.

3.3 Password Protection

The ECLIPSE Model 706 transmitter has three levels of password protection to restrict access to certain portions of the menu structure that affect the operation of the system. The user password can be changed to any numerical value up to 59999. When the transmitter is programmed for password protection, a password is required whenever configuration values are changed.

User Password

The User Password allows the customer to limit access to the basic configuration parameters.

The default User Password installed in the transmitter at the factory is 0. (With a password of 0, the transmitter is no longer password protected and any value in the basic user menus can be adjusted without entering a confirming password.)

NOTE: If a User Password is not known or has been misplaced, the menu item New Password in the DEVICE SETUP/ADVANCED CONFIG menu displays an encrypted value representing the present password. Contact Technical Support with this encrypted password to retrieve the original User Password.

Advanced Password

Certain portions of the menu structure that contain more advanced parameters are further protected by an Advanced Password.

This password will be provided, when necessary, by Factory technical support.

Factory Password

Calibration-related and other factory settings are further protected by a Factory Password.

3.4 Model 706 Menu: Step-By-Step Procedure

The following tables provide a complete explanation of the software menus displayed by the ECLIPSE transmitter. The menu layout is similar between the local Keypad/LCD interface, the DD, and the DTM.

Use these tables as a step-by-step guide to configure the transmitter based on the desired measurement type from the following selections:

- Level Only
- Interface & Level
- Level & Volume
- Flow

HOME SCREEN

The Home Screen consists of a “slide show” sequence of Measured Values screens which are rotated at 2-second intervals. Each Home Measured Value screen can present up to four information items:

- **Physical Device Tag**
- **Measured Value**
Label, Numerical Value, Units
- **Status**
Will be displayed as text
- **Bar Graph** (shown in %)
Bar graph is only displayed on AI_OUT screens shown in % based on PV scale configuration.

The Home Screen presentation can be customized by viewing or hiding some of these items. See DISPLAY CONFIG under the DEVICE SETUP menu in Section 3.5 — Configuration Menu.

At left is an example of a Home Screen for a Model 706 configured for a Level Only application.



Home Screen

MAIN MENU

Pressing any key on the Home Screen will present the Main Menu, consisting of three basic menu labels shown in all capital letters.

DEVICE SETUP

DIAGNOSTICS

MEASURED VALUES

As shown, the reverse video represents a cursor identifying the selected item, which will appear in reverse video on the LCD. The actions of the keys at this point are:



Main Menu Screen

Push button		Keystroke Action
↑	Up	No action as the cursor is already at the first item in the MAIN MENU
↓	Down	Moves the cursor to DIAGNOSTICS
←	Back	Moves back to HOME SCREEN, the level above MAIN MENU
↵	Enter	Presents the selected item, DEVICE SETUP

- NOTES:
1. Items and parameters that are shown in lower level menus will depend on the Measurement Type chosen. Those parameter not applicable to the present Measurement Type will be hidden.
 2. Holding down the Enter key when the cursor is highlighted over a parameter or menu will provide additional information about that item.

DEVICE SETUP

Choosing DEVICE SETUP from the MAIN MENU will result in an LCD presentation as shown at left.

The small down arrow shown at the right hand side of the screen is the indication that more items are available below and can be accessed by pressing the DOWN key.

Section 3.5 shows the entire tree menu for the Model 706 DEVICE SETUP Menu.

DIAGNOSTICS

Refer to Section 4.0

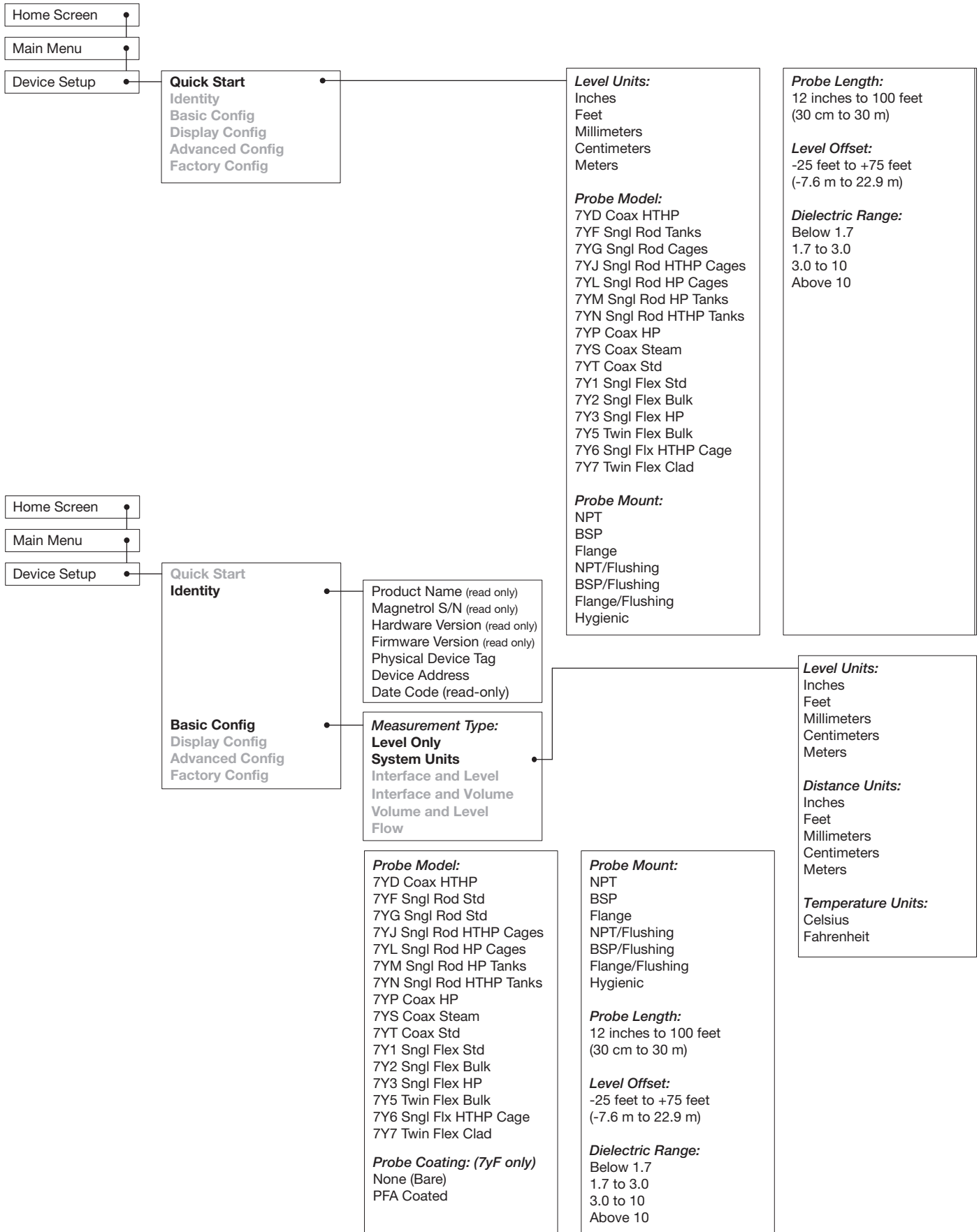
MEASURED VALUES

Allows the user to scroll through all of the available measured values for the measurement type chosen.

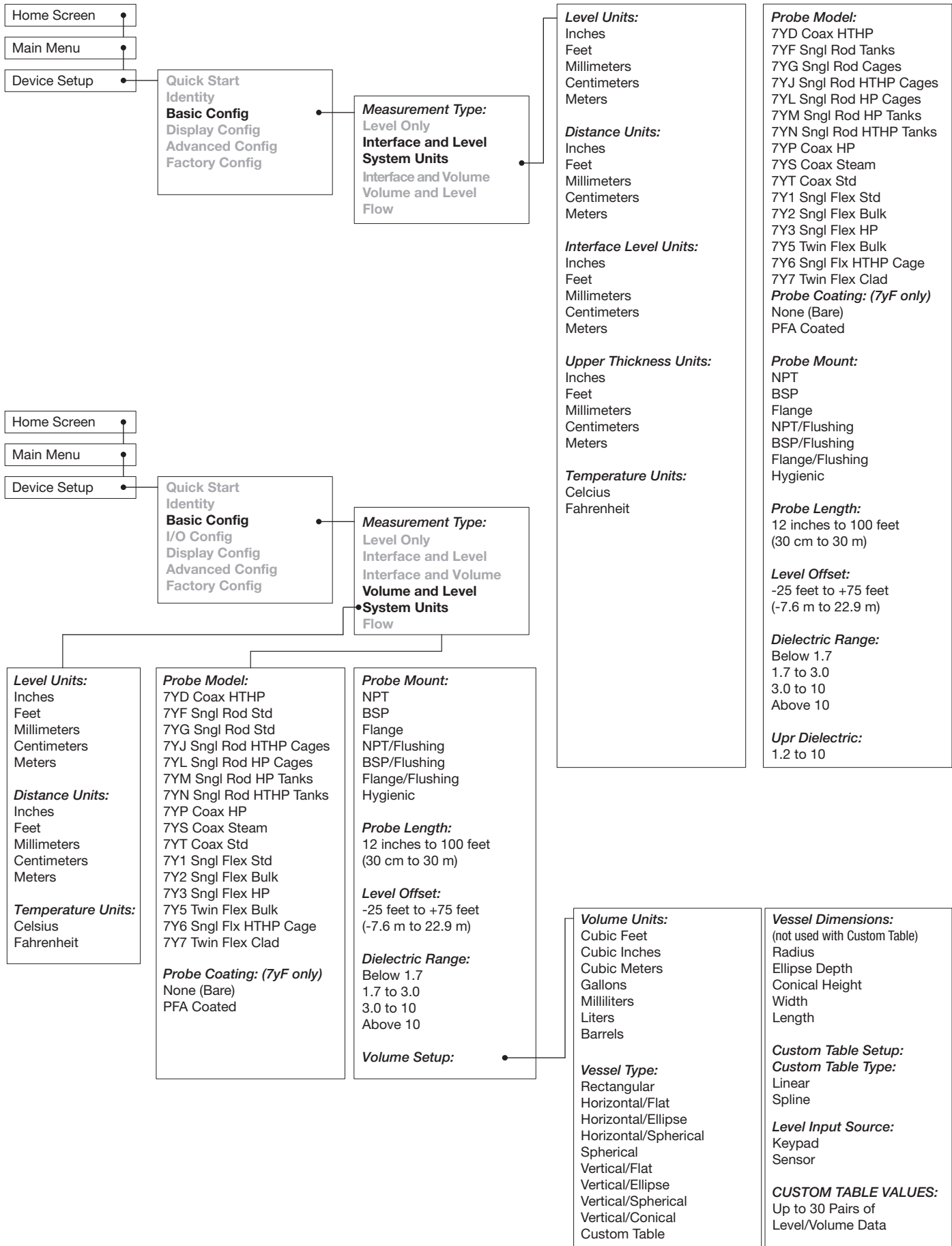


Device Setup Screen

3.5 Model 706 Configuration Menu — Device Setup



3.5 Model 706 Configuration Menu — Device Setup



Home Screen
Main Menu
Device Setup

Quick Start
Identity
Basic Config
Display Config
Advanced Config
Factory Config

Measurement Type:
Level Only
Interface and Level
System Units
Interface and Volume
Volume and Level
Flow

Level Units:
Inches
Feet
Millimeters
Centimeters
Meters

Distance Units:
Inches
Feet
Millimeters
Centimeters
Meters

Interface Level Units:
Inches
Feet
Millimeters
Centimeters
Meters

Upper Thickness Units:
Inches
Feet
Millimeters
Centimeters
Meters

Temperature Units:
Celsius
Fahrenheit

Probe Model:
7YD Coax HTHP
7YF Sngl Rod Tanks
7YG Sngl Rod Cages
7YJ Sngl Rod HTHP Cages
7YL Sngl Rod HP Cages
7YM Sngl Rod HP Tanks
7YN Sngl Rod HTHP Tanks
7YP Coax HP
7YS Coax Steam
7YT Coax Std
7Y1 Sngl Flex Std
7Y2 Sngl Flex Bulk
7Y3 Sngl Flex HP
7Y5 Twin Flex Bulk
7Y6 Sngl Flx HTHP Cage
7Y7 Twin Flex Clad

Probe Coating: (7yF only)
None (Bare)
PFA Coated

Probe Mount:
NPT
BSP
Flange
NPT/Flushing
BSP/Flushing
Flange/Flushing
Hygienic

Probe Length:
12 inches to 100 feet
(30 cm to 30 m)

Level Offset:
-25 feet to +75 feet
(-7.6 m to 22.9 m)

Dielectric Range:
Below 1.7
1.7 to 3.0
3.0 to 10
Above 10

Updr Dielectric:
1.2 to 10

Home Screen
Main Menu
Device Setup

Quick Start
Identity
Basic Config
I/O Config
Display Config
Advanced Config
Factory Config

Measurement Type:
Level Only
Interface and Level
Interface and Volume
Volume and Level
System Units
Flow

Level Units:
Inches
Feet
Millimeters
Centimeters
Meters

Distance Units:
Inches
Feet
Millimeters
Centimeters
Meters

Temperature Units:
Celsius
Fahrenheit

Probe Model:
7YD Coax HTHP
7YF Sngl Rod Std
7YG Sngl Rod Std
7YJ Sngl Rod HTHP Cages
7YL Sngl Rod HP Cages
7YM Sngl Rod HP Tanks
7YN Sngl Rod HTHP Tanks
7YP Coax HP
7YS Coax Steam
7YT Coax Std
7Y1 Sngl Flex Std
7Y2 Sngl Flex Bulk
7Y3 Sngl Flex HP
7Y5 Twin Flex Bulk
7Y6 Sngl Flx HTHP Cage
7Y7 Twin Flex Clad

Probe Coating: (7yF only)
None (Bare)
PFA Coated

Probe Mount:
NPT
BSP
Flange
NPT/Flushing
BSP/Flushing
Flange/Flushing
Hygienic

Probe Length:
12 inches to 100 feet
(30 cm to 30 m)

Level Offset:
-25 feet to +75 feet
(-7.6 m to 22.9 m)

Dielectric Range:
Below 1.7
1.7 to 3.0
3.0 to 10
Above 10

Volume Setup:

Volume Units:
Cubic Feet
Cubic Inches
Cubic Meters
Gallons
Milliliters
Liters
Barrels

Vessel Type:
Rectangular
Horizontal/Flat
Horizontal/Ellipse
Horizontal/Spherical
Spherical
Vertical/Flat
Vertical/Ellipse
Vertical/Spherical
Vertical/Conical
Custom Table

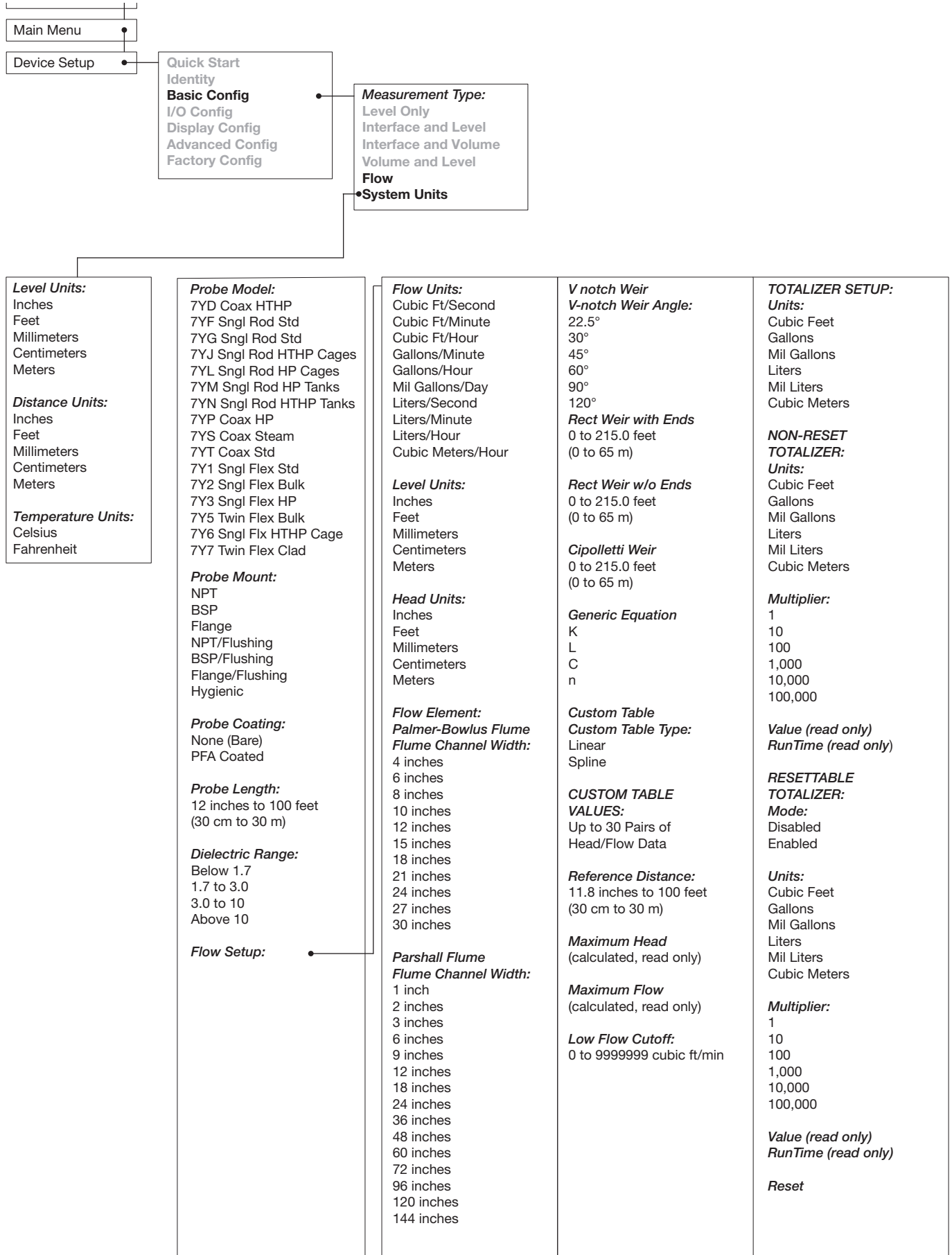
Vessel Dimensions:
(not used with Custom Table)
Radius
Ellipse Depth
Conical Height
Width
Length

Custom Table Setup:
Custom Table Type:
Linear
Spline

Level Input Source:
Keypad
Sensor

CUSTOM TABLE VALUES:
Up to 30 Pairs of
Level/Volume Data

3.5 Model 706 Configuration Menu — Device Setup



Level Units:
 Inches
 Feet
 Millimeters
 Centimeters
 Meters

Distance Units:
 Inches
 Feet
 Millimeters
 Centimeters
 Meters

Temperature Units:
 Celsius
 Fahrenheit

Probe Model:
 7YD Coax HTHP
 7YF Sngl Rod Std
 7YG Sngl Rod Std
 7YJ Sngl Rod HTHP Cages
 7YL Sngl Rod HP Cages
 7YM Sngl Rod HP Tanks
 7YN Sngl Rod HTHP Tanks
 7YP Coax HP
 7YS Coax Steam
 7YT Coax Std
 7Y1 Sngl Flex Std
 7Y2 Sngl Flex Bulk
 7Y3 Sngl Flex HP
 7Y5 Twin Flex Bulk
 7Y6 Sngl Flx HTHP Cage
 7Y7 Twin Flex Clad

Probe Mount:
 NPT
 BSP
 Flange
 NPT/Flushing
 BSP/Flushing
 Flange/Flushing
 Hygienic

Probe Coating:
 None (Bare)
 PFA Coated

Probe Length:
 12 inches to 100 feet
 (30 cm to 30 m)

Dielectric Range:
 Below 1.7
 1.7 to 3.0
 3.0 to 10
 Above 10

Flow Setup:

Flow Units:
 Cubic Ft/Second
 Cubic Ft/Minute
 Cubic Ft/Hour
 Gallons/Minute
 Gallons/Hour
 Mil Gallons/Day
 Liters/Second
 Liters/Minute
 Liters/Hour
 Cubic Meters/Hour

Level Units:
 Inches
 Feet
 Millimeters
 Centimeters
 Meters

Head Units:
 Inches
 Feet
 Millimeters
 Centimeters
 Meters

Flow Element:
Palmer-Bowlus Flume
Flume Channel Width:
 4 inches
 6 inches
 8 inches
 10 inches
 12 inches
 15 inches
 18 inches
 21 inches
 24 inches
 27 inches
 30 inches

Parshall Flume
Flume Channel Width:
 1 inch
 2 inches
 3 inches
 6 inches
 9 inches
 12 inches
 18 inches
 24 inches
 36 inches
 48 inches
 60 inches
 72 inches
 96 inches
 120 inches
 144 inches

V-notch Weir
V-notch Weir Angle:
 22.5°
 30°
 45°
 60°
 90°
 120°

Rect Weir with Ends
 0 to 215.0 feet
 (0 to 65 m)

Rect Weir w/o Ends
 0 to 215.0 feet
 (0 to 65 m)

Cipolletti Weir
 0 to 215.0 feet
 (0 to 65 m)

Generic Equation
 K
 L
 C
 n

Custom Table
Custom Table Type:
 Linear
 Spline

CUSTOM TABLE
VALUES:
 Up to 30 Pairs of
 Head/Flow Data

Reference Distance:
 11.8 inches to 100 feet
 (30 cm to 30 m)

Maximum Head
 (calculated, read only)

Maximum Flow
 (calculated, read only)

Low Flow Cutoff:
 0 to 9999999 cubic ft/min

TOTALIZER SETUP:
Units:
 Cubic Feet
 Gallons
 Mil Gallons
 Liters
 Mil Liters
 Cubic Meters

NON-RESET TOTALIZER:
Units:
 Cubic Feet
 Gallons
 Mil Gallons
 Liters
 Mil Liters
 Cubic Meters

Multiplier:
 1
 10
 100
 1,000
 10,000
 100,000

Value (read only)
RunTime (read only)

RESETTABLE TOTALIZER:
Mode:
 Disabled
 Enabled

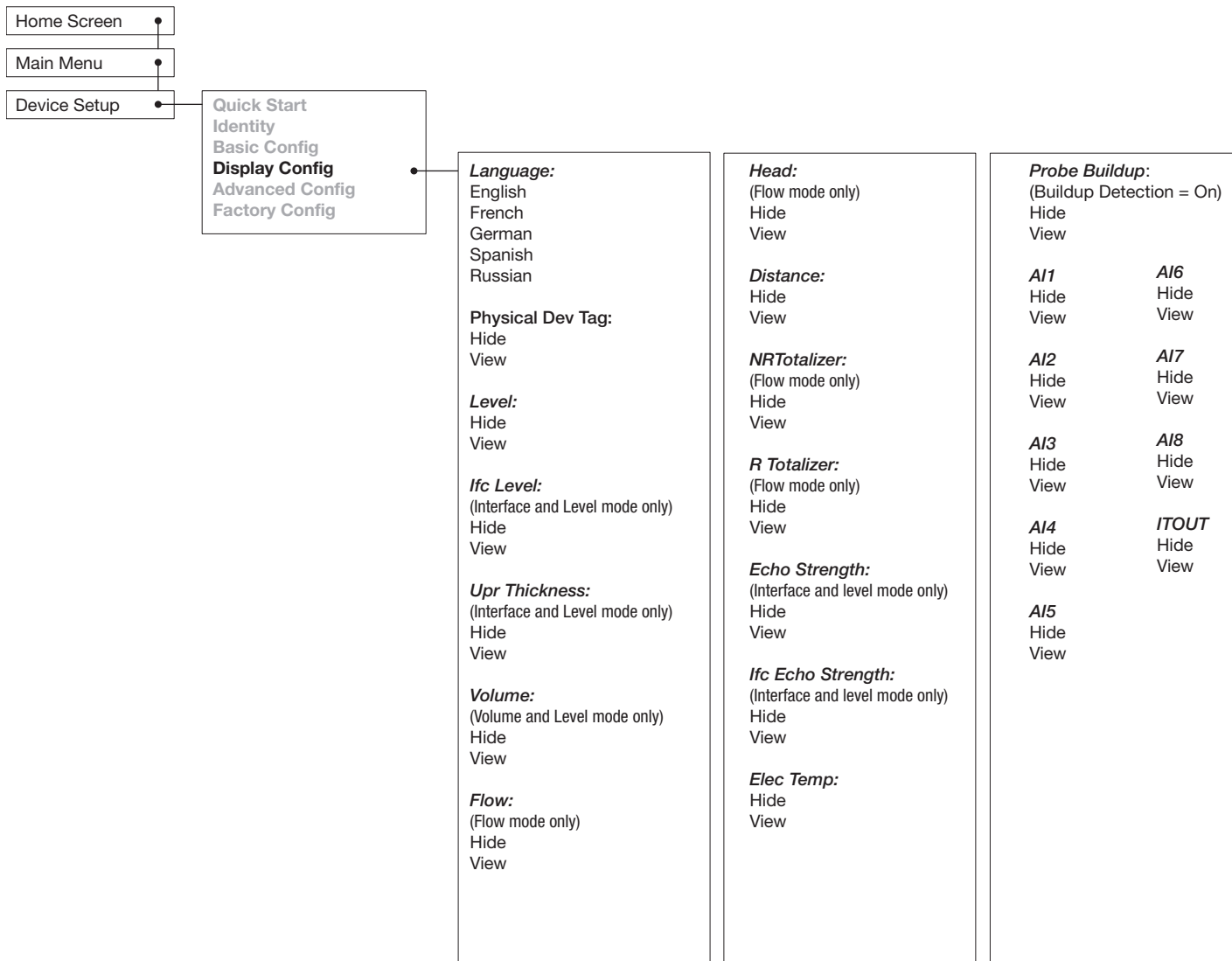
Units:
 Cubic Feet
 Gallons
 Mil Gallons
 Liters
 Mil Liters
 Cubic Meters

Multiplier:
 1
 10
 100
 1,000
 10,000
 100,000

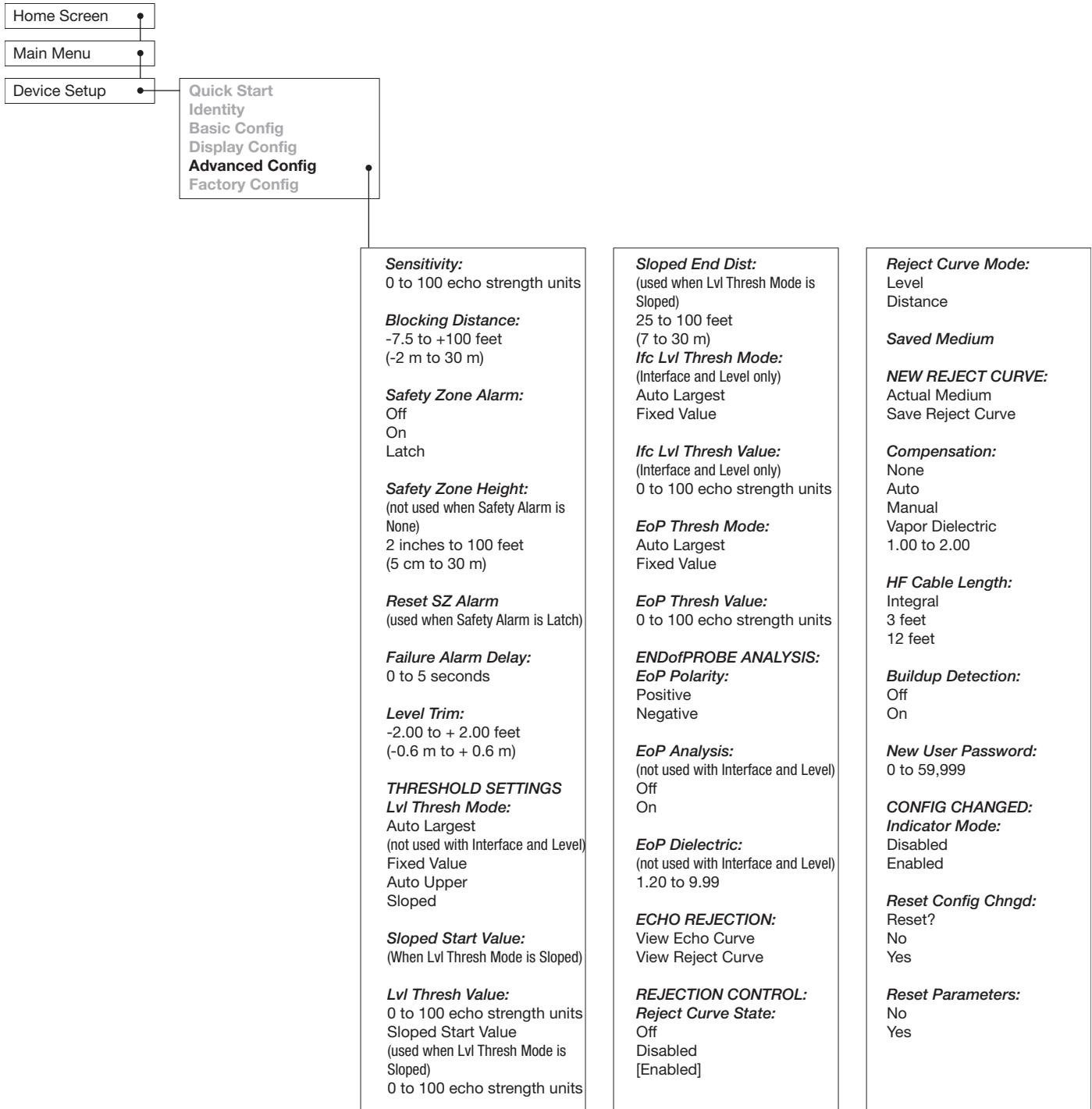
Value (read only)
RunTime (read only)

Reset

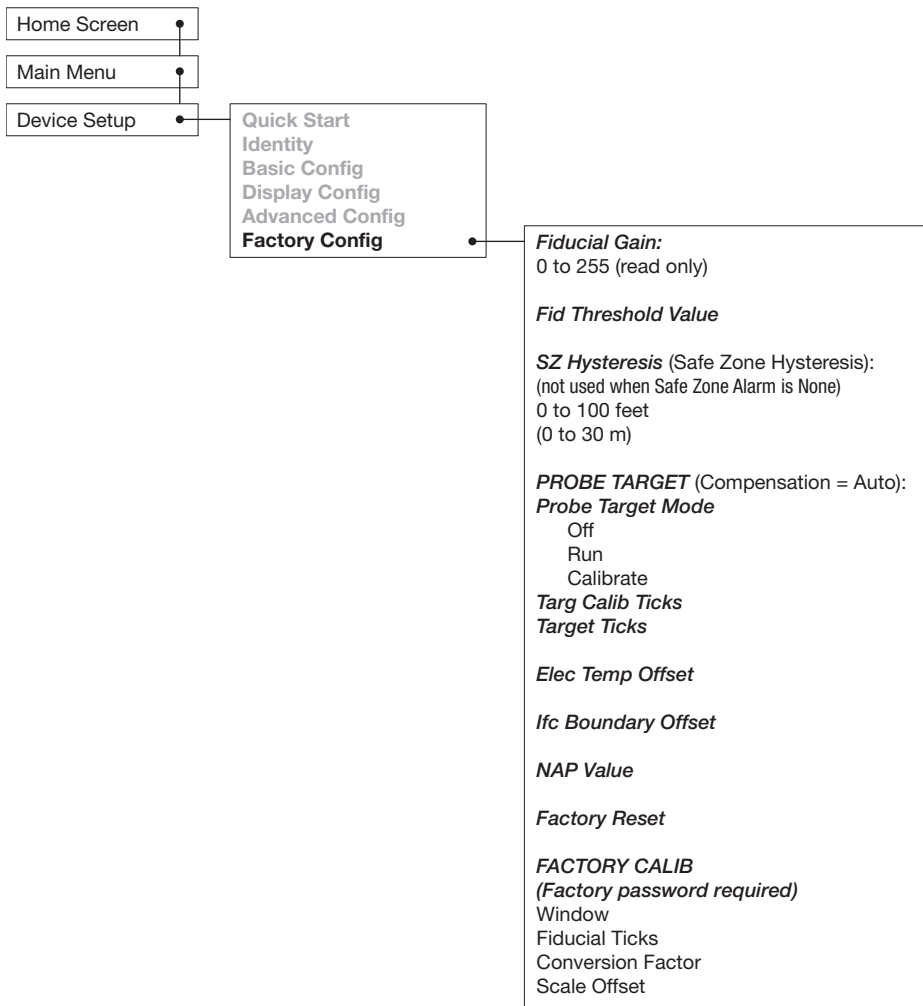
3.5 Model 706 Configuration Menu — Device Setup



3.5 Model 706 Configuration Menu — Device Setup



3.5 Model 706 Configuration Menu — Device Setup



4.0 Troubleshooting and Diagnostics

The ECLIPSE Model 706 transmitter is designed and engineered for trouble-free operation over a wide range of operating conditions. The transmitter continuously runs a series of internal self-tests and displays helpful messages on the large graphic liquid crystal display (LCD) when attention is required.

The combination of these internal tests and diagnostics messages offer a valuable proactive method of troubleshooting. The device not only tells the user what wrong, but also, and more importantly, offers suggestions on how to solve the problem.

All of this information can be obtained directly from the transmitter on the LCD, remotely from the PROFIBUS host system, or by utilizing the ECLIPSE Model 706 PA DD.

The EDD implemented for the Profibus 706 makes use of enhanced DD language features to provide Echo Curve displays (including Echo History), a trend chart, etc. and to present items in a well-organized DTM-like manner (also includes a Setup Wizard).

4.1 Diagnostic Parameters

As mentioned above, the ECLIPSE Model 706 measurement engine runs through a series of self-tests and will detect and report fault operations. The TRANSDUCER BLOCK displays this diagnostic information in the DEVICE STATUS parameter.

Note: Within the TRANSDUCER BLOCK, BLOCK_ERROR is not used except for indicating Out of Service (OOS).

For the first few seconds after power is applied to the Model 706 transmitter, the LEVEL_STATUS/QUALITY is “Uncertain,” the SUB_STATUS is “Initial value,” and the LIMIT attribute is shown as “Constant.”

When the Model 706 is operating properly, the LEVEL_STATUS/QUALITY is shown as “GOOD,” and the SUB_STATUS is “Non-Specific.”

While changing any transmitter parameters using the local display or through a 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.”

If the Model 706 fails to find a measurable level, 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, and the LIMIT attribute is “Constant.”

Refer to Section 4.2 for additional information.

4.1.1 Diagnostics (Namur NE 107)

The ECLIPSE Model 706 transmitter includes an exhaustive list of Diagnostic Indicators which follow the NAMUR NE 107 guidelines.

NAMUR is an international user association of automation technology in process industries, whose goal is to promote the interest of the process industry by pooling experiences among its member companies. In doing so, this group promotes international standards for devices, systems, and technologies.

The objective of NAMUR NE 107 was essentially to make maintenance more efficient by standardizing diagnostic information from field devices. This was initially integrated via FOUNDATION Fieldbus, but the concept applies regardless of the communication protocol.

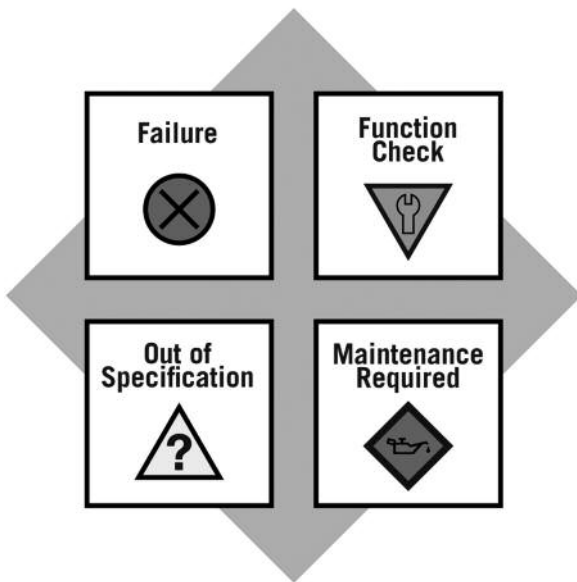
According to the NAMUR NE107 recommendation, "Self Monitoring and Diagnosis of Field Devices," fieldbus diagnostic results should be reliable and viewed in the context of a given application. The document recommends categorizing internal diagnostics into four standard status signals:

- Failure
- Out of Specification
- Function Check
- Maintenance required

In essence, this approach ensures that the right diagnostic information is available to the right person-at the right time. In addition, it allows diagnostics to be applied, as most appropriate, for a particular plant application (such as process control engineering or asset management maintenance). Customer specific mapping of diagnostics to these categories allows for flexible configuration depending on the user's requirements.

From an external Model 706 transmitter perspective, diagnostic information includes measurement of process conditions, in addition to detection of internal device or system anomalies.

The PROFIBUS PA version of the Model 706 transmitter was implemented according to the PROFIBUS Profile for Process Control Devices, which is consistent with the objectives of NE 107.



Refer to the table below for a complete listing of the Model 706 diagnostic indicators, along with their explanations, default categories, and recommended remedies.

NOTES: 1) The remedies shown in this table can also be seen on the transmitter LCD by viewing the present status screen when the device is in a diagnostic condition.

2) Those indicators showing “Failure” as the default result in an alarm condition.

4.1.2 Diagnostic Indication Simulation

The Model 706PA DD allows for the ability to manipulate diagnostic indicators mapped to NE-107 alarm categories in the Physical Block. Intended as a means to verify the configuration of the diagnostic parameters and connected equipment, a user can manually change any indicator in the Physical Block to and from the active state.

4.1.3 Diagnostic Indicator Table

Below is a listing of the Model 706 diagnostic indicators, showing their priority, explanations and recommended remedies. (Priority 1 is highest priority.)

Priority	Indicator Name	Default Category	Explanation	Remedy (Context Sensitive Help)
1	Software Error	Failure	Unrecoverable error occurred in stored program.	Contact MAGNETROL Technical Support.
2	RAM Error	Failure	RAM (read/write) memory failing.	
3	ADC Error	Failure	Analog-to-digital converter failure.	
4	EEPROM Error	Failure	Non-volatile parameter storage failing.	
5	Analog Board Error	Failure	Unrecoverable hardware failure.	
6	Spare Indicator 1	OK	Reserved for future use.	
7	Default Parameters	Failure	Saved parameters are set to default values.	Perform complete Device Configuration.
8	No Probe	Failure	No Probe Connected.	Ensure “Model 706 Style” probe is attached. Torque HF nut. Clean gold pin on transmitter and socket on probe. Contact MAGNETROL Technical Support.
9	No Fiducial	Failure	Reference signal too weak to detect.	Torque HF nut. Clean gold pin on transmitter and socket on probe. Check settings: Fiducial Gain HF Cable Length Window Increase Fid Gain. Contact MAGNETROL Technical Support.

4.1.3 Diagnostic Indicator Table

Priority	Indicator Name	Default Category	Explanation	Remedy
10	No Echoes	Failure	No signal detected anywhere on probe.	Check settings: Dielectric Range Sensitivity EoP Thresh Value Increase Sensitivity. Lower EoP Thresh. View Echo Curve.
11	Echo Lost	Failure	Signal from upper liquid too weak to detect.	Check settings: Upper Dielectric, Blocking Distance, Sensitivity Ensure Upr Level is below blocking distance. View Echo Curve.
12	Spare Indicator 2	OK	Reserved for future use.	
13	EoP Above ProbeEnd	Failure	End of Probe appears above Probe Length	Check settings: Probe Length Decrease Sensitivity Increase Blocking Distance View Echo Curve.
14	Lvl Below ProbeEnd	Failure	Level signal appears beyond Probe Length. (Possible water bottom situation)	Check settings: Probe Model, Probe Length, Level Threshold = Fixed Increase Sensitivity View Echo Curve.
15	EoP Below ProbeEnd	Failure	End of Probe appears beyond Probe Length.	Check settings: Probe Length Dielectric Range Sensitivity View Echo Curve.
16	Safety Zone Alarm	Failure	Risk of echo loss if liquid rises above Blocking Distance.	Ensure that liquid cannot reach Blocking Distance.
17	High Volume Alarm	Failure	Volume calculated from Level reading exceeds capacity of vessel or custom table.	Check settings: Vessel Dimensions, Custom Table entries
18	High Flow Alarm	Failure	Flow calculated from Distance reading exceeds capacity of flow element or custom table.	Check settings: Flow Element Reference Distance Gen Eqn Factors Custom Table entries
19	Spare Indicator 3	OK	Reserved for future use	
20	Initializing	Invalid Process Condition	Distance measurement is inaccurate while internal filters are settling.	Standard start-up message. Wait for up to 10 seconds.
21	TB Config Changed	OK	A transducer block parameter has been modified from the User Interface.	If desired, reset Config Changed indicator in ADVANCED CONFIG menu.

4.1.3 Diagnostic Indicator Table

Priority	Indicator Name	Default Category	Explanation	Remedy
22	Spare Indicator 4	OK	Reserved for future use.	
23	Spare Indicator 5	OK	Reserved for future use.	
24	Spare Indicator 6	OK	Reserved for future use.	
25	Ramp Interval Error	Check Request	Internal signal timing out of limits causing inaccurate distance measurement.	Check accuracy of Level reading. Replace transmitter electronics. Contact MAGNETROL Technical Support.
26	High Elec Temp	Invalid Process Condition	Electronics too hot. May compromise level measurement or damage instrument.	Shield transmitter from heat source or increase air circulation. Locate transmitter remotely in a cooler area.
27	Low Elec Temp	Invalid Process Condition	Electronics too cold. May compromise level measurement or damage instrument.	Insulate transmitter. Locate transmitter remotely in a cooler area.
28	Calibration Req'd	Check Request	Factory calibration has been lost. Measurement accuracy may be diminished.	Return transmitter to factory for recalibration.
29	Echo Reject Invalid	Check Request	Echo Rejection inoperative. May report erroneous Level readings. Upr Echo may be lost near top of probe.	Save a fresh Echo Rejection Curve.
30	Spare Indicator 7	OK	Reserved for future use.	
31	Inferred Level	OK	Distance measurement calculated indirectly from probe elongation. Level reading is only approximate.	Verify Level reading. If incorrect, compare Dielectric Range against EoP Dielectric reading.
32	Totalizer Data Lost	Invalid Process Condition	Non-volatile Totalizer Data storage failing.	Contact MAGNETROL Technical Support.
33	No Probe Target	Immediate Check Request	Not actively compensating	Check settings: Probe Model Sensitivity
34	Dry Probe	OK	No liquid is contacting probe. Level at unknown distance beyond probe.	If unexpected, verify proper probe length for application.
35	Spare Indicator 8	OK	Reserved for future use.	
36	Low Echo Strength	Check Request	Risk of Echo Lost due to weak signal.	Check settings: Dielectric Range Sensitivity View Echo Curve.
37	Low Ifc Echo Str	Check Request	Risk of Interface Echo Lost due to weak signal.	Check settings: Dielectric Range Sensitivity View Echo Curve.
38	Spare Indicator 9	OK	Reserved for future use.	
39	Spare Indicator 10	OK	Reserved for future use.	
40	Sequence Record	OK	A Sequence Record number has been stored in Event Log.	If desired, report Sequence Record number to factory.

The ECLIPSE Model 706 offers the ability to do Trending and Echo Curve analysis via the local graphical LCD or by using SIMATIC PDM and the Model 706 DD.

4.1.4 Diagnostic Help

Selecting DIAGNOSTICS from the MAIN MENU presents a list of five ITEMS from the top level of the DIAGNOSTICS tree.

When Present Status is highlighted, the highest MAGNETROL priority active diagnostic indicator (numerically lowest in Table 4.1.3) is displayed on the bottom LCD line as shown above. Pressing the ENTER key moves the active diagnostic indicator to the top line outdented and presents in the lower area of the LCD a brief explanation of and possible remedies for the indicated condition. A blank line separates the explanation from the remedies. Additional active diagnostic indicators, if any, appear with their explanations in descending priority order. Each additional active indicator name-explanation pair is separated by a blank line from the one above.

If the explanation and remedy text (and additional name-explanation pairs) exceeds the available space, a ↵ appears in the rightmost column of the last line indicating more text below. In this situation, the DOWN key scrolls the text up. Similarly, while text exists above the upper line of the text field, a ⤴ appears in the rightmost column of the top (text) line. In this situation, the UP key scrolls the text down. Otherwise the DOWN and UP keys are inoperative. In all cases the ENT or BACK key reverts to the previous screen.

When the transmitter is operating normally and the highlight cursor is positioned on Present Status, the bottom LCD line displays “OK” because no diagnostic indicators are active.

EVENT HISTORY – This menu displays the parameters related to diagnostic event logging.

ADVANCED DIAGNOSTICS – This menu displays parameters related to some of the advanced diagnostics available within the Model 706.

INTERNAL VALUES – Displays read-only internal parameters.

ELEC TEMPERATURES – Displays temperature information as measured in the potted module in degrees F or C.

ECHO CURVES – This menu allows the user to display the live Echo Curve and Echo Rejection on the LCD.



ECHO HISTORY SETUP – The Model 706 contains the unique and powerful feature that allows waveforms to be automatically captured based on Diagnostic Events, Time or both. This menu contains those parameters that configure that feature.

Eleven (11) waveforms can be saved directly into the transmitter.

- Nine (9) Troubleshooting Curves
- One (1) Echo Rejection Curve
- One (1) Reference Curve

TREND DATA – A 15-minute trend of the PV can be displayed on the LCD.

4.2 Diagnostic Parameters

Each detected diagnostic condition potentially affects the status of one or more of the Transducer Block output parameters.

The Process Variable Status is described by three characteristics—Quality, Sub-status and Limit.

The following table assigns the proposed values of these characteristics, in order of decreasing priority, for each of the diagnostic conditions and/or device configurations.

- NOTES: 1) Only the highest priority status will be indicated for a given process variable.
- 2) If a process variable is not listed for a given diagnostic condition and/or device configuration, the status of that process variable is not affected and will be shown as Good::Non-specific: Not limited

Diagnostic/Condition	Process Variables	Quality	Sub-status	Limit
Level TB → OOS	Level Distance Interface Level Upper Thickness Echo Strength Ifc Echo Strength Probe Buildup Elec Temperature	Bad	Out of Service	Not Limited
Vol TB → OOS	Volume	Bad	Out of Service	Not Limited
Flow TB → OOS	Flow Head Nr Totalizer R Totalizer	Bad	Out of Service	Not Limited
Analog Board Error	All PVs except Elec Temperature	Bad	Sensor Failure	Constant limited
No Probe	All PVs except Elec Temperature	Bad	Sensor Failure	Constant limited

Diagnostic/Condition	Process Variables	Quality	Sub-status	Limit
No Echoes	All PVs except Elec Temperature	Bad	Sensor Failure	Constant limited
Lvl Below ProbeEnd	All PVs except Elec Temperature	Bad	Sensor Failure	Constant limited
EoP Below ProbeEnd	All PVs except Elec Temperature	Bad	Sensor Failure	Constant limited
Software Error	All PVs	Bad	Device Failure	Constant limited
RAM Error	All PVs	Bad	Device Failure	Constant limited
ADC Failure	All PVs	Bad	Device Failure	Constant limited
EEPROM Error	All PVs	Bad	Device Failure	Constant limited
No Fiducial	All PVs except Elec Temperature	Bad	Device Failure	Constant limited
Echo Lost	All PVs except Elec Temperature	Bad	Device Failure	Not limited
Inferred Level	Echo Strength Ifc Level Upper Thickness Ifc Echo Strength Probe Buildup	Good	Non-specific	Constant limited
Totalizer Data Lost	NR Totalizer R Totalizer	Bad	Config Error	Not limited
Default Parameters	All PVs	Bad	Config Error	Not limited
EoP Above ProbeEnd	All PVs except Elec Temperature	Bad	Config Error	Not limited
Buildup Detection disabled	Probe Buildup	Bad	Config Error	Constant limited
MeasType != Interface & Level	Ifc Level Upper Thickness Ifc Echo Strength	Bad	Config Error	Constant limited
MeasType != Volume & Level	Volume	Bad	Config Error	Constant limited
MeasType != Flow	Flow Head NR Totalizer R Totalizer	Bad	Config Error	Constant limited
MeasType = Flow and R Totalizer Mode off	R Totalizer	Bad	Config Error	Constant limited
High Volume Alarm	Volume	Bad	Config Error	High limited
High Flow Alarm	Flow Head	Bad	Non-Specific	High limited
Safety Zone Alarm	Level Ifc Level Upper Thick Distance Volume Head Flow	Bad	Non-Specific	Not limited

Diagnostic/Condition	Process Variables	Quality	Sub-status	Limit
Initializing	All PVs except Elec Temperature	Uncertain	Initial Value	Constant limited
Dry Probe	Distance	Good	Non-Specific	High limited
	Level Ifc Level Upper Thickness Volume Flow Head	Good	Non-Specific	Low limited
	NR Totalizer R Totalizer	Good	Non-Specific	Constant limited
TB Config Changed	All PVs	Good	Non-Specific	Not limited
Ramp Interval Error	All PVs	Good	Non-Specific	Not limited
High Elec Temp	All PVs	Good	Non-Specific	Not limited
Low Elec Temp	All PVs	Good	Non-Specific	Not limited
Calibration Req'd	All PVs	Good	Non-Specific	Not limited
Echo Reject Invalid	All PVs	Good	Non-Specific	Not limited
No Probe Target	All PVs	Good	Non-Specific	Not limited
Low Echo Strength	All PVs	Good	Non-Specific	Not limited
Low Ifc Echo Strength	All PVs	Good	Non-Specific	Not limited
Sequence Record	All PVs	Good	Non-Specific	Not limited

4.3 PROFIBUS PA Segment Checklist

There can be several reasons for a PROFIBUS PA 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.
- 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 that the Physical 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.

Appendix A

Level (and Interface) Transducer Block Table

Item	Parameter Name	Parameter Label
0	BLOCK_STRUCTURE	BLOCK STRUCT
1	ST_REV	Static Revision
2	TAG_DESC	Tag Description
3	STRATEGY	Strategy
4	ALERT_KEY	Alert Key
5	MODE_BLK	Block Mode
6	BLOCK_ERR	Block Error
7	UPDATE_EVT	Update Event
8	BLOCK_ALM	Block Alarm
9	TRANSDUCER_DIRECTORY	Transducer Directory
10	TRANSDUCER_TYPE	Transducer Type
11	XD_ERROR	Transducer Error
12	COLLECTION_DIRECTORY	Collection Directory
13	MEASUREMENT_TYPE	Measurement Type
14	LEVEL	Level
15	LEVEL_UNIT	Level Unit
16	DISTANCE	Distance
17	DISTANCE_UNIT	Distance Unit
18	PROBE_MODEL	Probe Model
19	PROBE_COATING	Probe Coating
20	PROBE_MOUNT	Probe Mount
21	PROBE_LENGTH	Probe Length
22	PROBE_LEVEL_OFFSET	Level Offset
23	DIELECTRIC_RANGE	Dielectric Range
24	SENSITIVITY	Sensitivity
25	BLOCKING_DISTANCE	Blocking Distance
26	SAFETY_ZONE_MODE	Safety Zone Mode
27	SAFETY_ZONE_HEIGHT	Safety Zone Height
28	RESET_SAFETY_ZONE_LATCH	Reset SZ Latch
29	ALARM_DELAY	Failure Alarm Delay
30	LEVEL_TRIM	Level Trim
31	LEVEL_THRESHOLD_MODE	Level Threshold Mode
32	LEVEL_THRESHOLD_VALUE	Level Threshold Value
33	SLOPED_START_VALUE	Sloped Start Value
34	SLOPED_END_DISTANCE	Sloped End Distance

35	EOP_THRESHOLD_MODE	EoP Threshold Mode
36	EOP_THRESHOLD_VALUE	EoP Threshold Value
37	INTERFACE_LEVEL	Interface Level
38	INTERFACE_LEVEL_UNIT	Interface Level Unit
39	UPPER_THICKNESS	Upper Thickness
40	UPPER_THICKNESS_UNIT	Upper Thickness Unit
41	UPPER_LIQUID_DIELECTRIC	Upper Dielectric
42	IFC_LEVEL_THRESH_MODE	Ifc Level Thresh Mode
43	IFC_LEVEL_THRESH_VALUE	Ifc Level Thresh Value
44	REJECT_CURVE_STATE	Reject Curve State
45	REJECT_CURVE_MODE	Reject Curve Mode
46	SAVED_MEDIUM_LOCATION	Saved Media Location
47	NEW_MEDIUM_LOCATION	New Media Location
48	END_OF_PROBE_ANALYSIS	End of Probe Analysis
49	EOP_POLARITY	EoP Polarity
50	EOP_DIELECTRIC	EoP Dielectric
51	COMPENSATION_MODE	Compensation Mode
52	VAPOR_DIELECTRIC	Vapor Dielectric
53	HF_CABLE_LENGTH	HF Cable Length
54	BUILDUP_DETECTION	Buildup Detection
55	PARAMETER_RESET	Parameter Reset
56	FIDUCIAL_TICKS	Fiducial Ticks
57	FIDUCIAL_STRENGTH	Fiducial Strength
58	LEVEL_TICKS	Level Ticks
59	ECHO_STRENGTH	Echo Strength
60	INTERFACE_TICKS	Interface Ticks
61	IFC_ECHO_STRENGTH	Ifc Echo Strength
62	IFC_MEDIUM_BOUNDARY	Ifc Medium Boundary
63	INTERFACE_MEDIUM	Interface Medium
64	TARGET_TICKS	Target Ticks
65	TARGET_ECHO_STRENGTH	Target Echo Strength
66	VAPOR_MEASURED_DIELECTRIC	Vapor Measured Dielectric
67	EOP_TICKS	EoP Ticks
68	EOP_ECHO_STRENGTH	EoP Echo Strength
69	EOP_DISTANCE	EoP Distance
70	EOP_MEASURED_DIELECTRIC	EoP Measured Dielectric
71	ELECTRONICS_TEMPERATURE	Electronics Temp
72	TEMPERATURE_UNIT	Temperature Unit

73	MAX_ELECTRONICS_TEMP	Max Elec Temp
74	MIN_ELECTRONICS_TEMP	Min Elec Temp
75	RESET_ELECTRONICS_TEMPS	Reset Electronic Temps
76	PROBE_BUILDUP	Probe Buildup
77	PROBE_BUILDUP_UNIT	Probe Buildup Unit
78	BUILDUP_LOCATION	Buildup Location
79	BUILDUP_RATE	Buildup Rate
80	CHECK_BUILDUP_REQUEST	Check Buildup
81	ENTER_PASSWORD	Enter Password
82	FIDUCIAL_GAIN	Fiducial Gain
83	FID_THRESHOLD_VALUE	Fid Threshold Value
84	SAFETY_ZONE_HYSTERESIS	SZ Hysteresis
85	ELEC_TEMP_OFFSET	Elec Temp Offset
86	IFC_BOUNDARY_OFFSET	Ifc Boundary Offset
87	NAP_VALUE	NAP Value
88	n/a	n/a
89	PROBE_TARGET_MODE	Probe Target Mode
90	TARGET_CALIB_TICKS	Target Calib Ticks
91	WINDOW_GWR	Window
92	CONVERSION_FACTOR	Conversion Factor
93	SCALE_OFFSET	Scale Offset
94	M7YK_SCALE_OFFSET	7XK Scale Offset
95	FACTORY_PARAMETER_1	Factory Parameter 1
96	FACTORY_PARAMETER_2	Factory Parameter 2
97	FACTORY_PARAMETER_3	Factory Parameter 3
98	FACTORY_PARAMETER_4	Factory Parameter 4
99	MAGNETROL_SERIAL_NUMBER	Magnetrol S/N
100	DATE_CODE	Date Code
101	CONFIG_CHANGED_MODE	TB Config Chgd Mode
102	RESET_CONFIG_CHANGED	Reset Config Changed
103	USER_PASSWORD	New User Password
104	LOCAL_DISP_MEAS_VALUES	Local Disp Meas Values
105	LOCAL_DISP_LANGUAGE	Local Disp Language
106	LOCAL_DISP_PHYS_DEV_TAG	Local Disp Phys Dev Tag
107	FIRMWARE_VERSION	Firmware Version
108	HARDWARE_VERSION	Hardware Version
109	PRESENT_STATUS	Present Status
110	STATUS_INDICATORS_1	Status Indicators

111	STATUS_INDICATORS_2	Status Indicators
112	STATUS_INDICATORS_3	Status Indicators
113	STATUS_INDICATORS_4	Status Indicators
114	STATUS_INDICATORS_5	Status Indicators
115	STATUS_INDICATORS_6	Status Indicators
116	TREND_LEVEL_VALUE	Level
117	TREND_DISTANCE_VALUE	Distance
118	TREND_IFC_LEVEL_VALUE	Interface Level
119	TREND_UPPER_THICK_VALUE	Upper Thickness
120	TREND_ECHO_STR_VALUE	Echo Strength
121	TREND_IFC_ECHO_STR_VALUE	Ifc Echo Strength
122	DEVICE_CLOCK	Device Clock
123	DEVICE_RUN_TIME	Run Time
124	HISTORY_CONTROL	History Control
125	HISTORY_CAPTURE_TIME	History Capture Time
126	HIST_ENTRY1	Event History 1
127	HIST_ENTRY2	Event History 2
128	HIST_ENTRY3	Event History 3
129	HIST_ENTRY4	Event History 4
130	HIST_ENTRY5	Event History 5
131	HIST_ENTRY6	Event History 6
132	HIST_ENTRY7	Event History 7
133	HIST_ENTRY8	Event History 8
134	HIST_ENTRY9	Event History 9
135	HIST_ENTRY10	Event History 10
136	RESET_HISTORY	Reset History
137	ECHO_HIST_TRIGGER_MODE	Echo Hist Trigger Mode
138	ECHO_HIST_TIME_TRIGGER	Echo Hist Time Trigger
139	ECHO_HIST_EVENTS_TRIGGER	Echo Hist Events Trigger
140	ECHO_REJECTION_LOG	Echo Rejection
141	ECHO_REFERENCE_LOG	Echo Reference
142	ECHO_HISTORY_LOG1	Echo History 1
143	ECHO_HISTORY_LOG2	Echo History 2
144	ECHO_HISTORY_LOG3	Echo History 3
145	ECHO_HISTORY_LOG4	Echo History 4
146	ECHO_HISTORY_LOG5	Echo History 5
147	ECHO_HISTORY_LOG6	Echo History 6
148	ECHO_HISTORY_LOG7	Echo History 7

149	ECHO_HISTORY_LOG8	Echo History 8
150	ECHO_HISTORY_LOG9	Echo History 9
151	DELETE_ECHO_HISTORY	Delete Echo History
152	SAVE_ECHO_CURVE	Save Echo Curve
153	VIEW_ECHO_CURVE	View Echo Curve
154	WAVEFORM_SUMMARY	Waveform Summary
155	ECHO_CURVE_DATA	Echo Curve Data
156	ECHO_DATA_INDEX	Echo Data Index
157	DATA_LOG_SETUP	Data Log Setup
158	DATA_LOG_SUMM_READ_REQ	Log Summary Read Req
159	DATA_LOG_SUMMARY	Data Log Summary
160	DATA_LOG_INDEX	Data Log Index
161	DATA_LOG_RECORDS	Log Data
162	PD_TAG_APPL_IMAGE	PD Tag

Volume Transducer Block Table

Item	Parameter Name	Parameter Label
0	BLOCK_STRUCTURE	BLOCK STRUCT
1	ST_REV	Static Revision
2	TAG_DESC	Tag Description
3	STRATEGY	Strategy
4	ALERT_KEY	Alert Key
5	MODE_BLK	Block Mode
6	BLOCK_ERR	Block Error
7	UPDATE_EVT	Update Event
8	BLOCK_ALM	Block Alarm
9	TRANSDUCER_DIRECTORY	Transducer Directory
10	TRANSDUCER_TYPE	Transducer Type
11	XD_ERROR	Transducer Error
12	COLLECTION_DIRECTORY	Collection Directory
13	MEAS_TYPE	Measurement Type
14	VOLUME	Volume
15	VOLUME_UNIT	Volume Unit
16	LEVEL_VALUE	Level
17	LEVEL_UNIT	Level Unit
18	VESSEL_TYPE	Vessel Type
19	VESSEL_RADIUS	Vessel Radius
20	VESSEL_ELLIPSE_DEPTH	Vessel Ellipse Depth

21	VESSEL_CONICAL_HEIGHT	Vessel Conical Height
22	VESSEL_WIDTH	Vessel Width
23	VESSEL_LENGTH	Vessel Length
24	VOLUME_TABLE_TYPE	Volume Table Type
25	LEVEL_INPUT_SOURCE	Level Input Source
26	VOLUME_TABLE_LENGTH	Volume Table Length
27	VOLUME_TABLE_PT_01	Volume Table Pt 01
28	VOLUME_TABLE_PT_02	Volume Table Pt 02
29	VOLUME_TABLE_PT_03	Volume Table Pt 03
30	VOLUME_TABLE_PT_04	Volume Table Pt 04
31	VOLUME_TABLE_PT_05	Volume Table Pt 05
32	VOLUME_TABLE_PT_06	Volume Table Pt 06
33	VOLUME_TABLE_PT_07	Volume Table Pt 07
34	VOLUME_TABLE_PT_08	Volume Table Pt 08
35	VOLUME_TABLE_PT_09	Volume Table Pt 09
36	VOLUME_TABLE_PT_10	Volume Table Pt 10
37	VOLUME_TABLE_PT_11	Volume Table Pt 11
38	VOLUME_TABLE_PT_12	Volume Table Pt 12
39	VOLUME_TABLE_PT_13	Volume Table Pt 13
40	VOLUME_TABLE_PT_14	Volume Table Pt 14
41	VOLUME_TABLE_PT_15	Volume Table Pt 15
42	VOLUME_TABLE_PT_16	Volume Table Pt 16
43	VOLUME_TABLE_PT_17	Volume Table Pt 17
44	VOLUME_TABLE_PT_18	Volume Table Pt 18
45	VOLUME_TABLE_PT_19	Volume Table Pt 19
46	VOLUME_TABLE_PT_20	Volume Table Pt 20
47	VOLUME_TABLE_PT_21	Volume Table Pt 21
48	VOLUME_TABLE_PT_22	Volume Table Pt 22
49	VOLUME_TABLE_PT_23	Volume Table Pt 23
50	VOLUME_TABLE_PT_24	Volume Table Pt 24
51	VOLUME_TABLE_PT_25	Volume Table Pt 25
52	VOLUME_TABLE_PT_26	Volume Table Pt 26
53	VOLUME_TABLE_PT_27	Volume Table Pt 27
54	VOLUME_TABLE_PT_28	Volume Table Pt 28
55	VOLUME_TABLE_PT_29	Volume Table Pt 29
56	VOLUME_TABLE_PT_30	Volume Table Pt 30
57	VOLUME_HIGH_LIMIT	Volume High Limit
58	LEVEL_LOW_LIMIT	Level Low Limit

59	LEVEL_HIGH_LIMIT	Level High Limit
60	ENTER_PASSWORD	Enter Password
61	PRESENT_STATUS	Present Status
62	STATUS_INDICATORS_1	Status Indicators
63	STATUS_INDICATORS_2	Status Indicators
64	STATUS_INDICATORS_3	Status Indicators
65	STATUS_INDICATORS_4	Status Indicators
66	STATUS_INDICATORS_5	Status Indicators
67	STATUS_INDICATORS_6	Status Indicators
68	TREND_VOLUME_VALUE	Volume

Flow Transducer Block Table

Item	Parameter Name	Parameter Label
0	BLOCK_STRUCTURE	BLOCK STRUCT
1	ST_REV	Static Revision
2	TAG_DESC	Tag Description
3	STRATEGY	Strategy
4	ALERT_KEY	Alert Key
5	MODE_BLK	Block Mode
6	BLOCK_ERR	Block Error
7	UPDATE_EVT	Update Event
8	BLOCK_ALM	Block alarm
9	TRANSDUCER_DIRECTORY	Transducer Directory
10	TRANSDUCER_TYPE	Transducer Type
11	XD_ERROR	Transducer Error
12	COLLECTION_DIRECTORY	Collection Directory
13	MEAS_TYPE	Measurement Type
14	FLOW	Flow
15	FLOW_UNIT	Flow Unit
16	HEAD	Head
17	HEAD_UNIT	Head Unit
18	DISTANCE_VALUE	Distance
19	DISTANCE_UNIT	Distance Unit
20	NR_TOTALIZER_MULTIPLIER	NR Totalizer Multiplier
21	NR_TOTALIZER	NR Totalizer
22	NR_TOTALIZER_UNIT	NR Totalizer Unit
23	NR_TOTALIZER_TIME	NR Totalizer Time

24	R_TOTALIZER_MODE	R Totalizer Mode
25	R_TOTALIZER_MULTIPLIER	R Totalizer Multiplier
26	R_TOTALIZER	R Totalizer
27	R_TOTALIZER_UNIT	R Totalizer Unit
28	R_TOTALIZER_TIME	R Totalizer Time
29	RESET_R_TOTALIZER	Reset R Totalizer
30	REFERENCE_DISTANCE	Reference Distance
31	MAXIMUM_HEAD	Maximum Head
32	MAXIMUM_FLOW	Maximum Flow
33	LOW_FLOW_CUTOFF	Low Flow Cutoff
34	FLOW_ELEMENT	Flow Element
35	PALMER_BOWL_FLUME_WIDTH	Palmer Bowl Flume Width
36	PARSHALL_FLUME_WIDTH	Parshall Flume Width
37	V_NOTCH_WEIR_ANGLE	V Notch Weir Angle
38	WEIR_CREST_LENGTH	Weir Crest Length
39	GENERIC_EQN_K_FACTOR	Generic Eqn K Factor
40	GENERIC_EQN_L_FACTOR	Generic Eqn L Factor
41	GENERIC_EQN_C_FACTOR	Generic Eqn C Factor
42	GENERIC_EQN_N_FACTOR	Generic Eqn n Factor
43	FLOW_TABLE_TYPE	Flow Table Type
44	FLOW_TABLE_LENGTH	Flow Table Length
45	FLOW_TABLE_PT_01	Flow Table Pt 01
46	FLOW_TABLE_PT_02	Flow Table Pt 02
47	FLOW_TABLE_PT_03	Flow Table Pt 03
48	FLOW_TABLE_PT_04	Flow Table Pt 04
49	FLOW_TABLE_PT_05	Flow Table Pt 05
50	FLOW_TABLE_PT_06	Flow Table Pt 06
51	FLOW_TABLE_PT_07	Flow Table Pt 07
52	FLOW_TABLE_PT_08	Flow Table Pt 08
53	FLOW_TABLE_PT_09	Flow Table Pt 09
54	FLOW_TABLE_PT_10	Flow Table Pt 10
55	FLOW_TABLE_PT_11	Flow Table Pt 11
56	FLOW_TABLE_PT_12	Flow Table Pt 12
57	FLOW_TABLE_PT_13	Flow Table Pt 13
58	FLOW_TABLE_PT_14	Flow Table Pt 14
59	FLOW_TABLE_PT_15	Flow Table Pt 15
60	FLOW_TABLE_PT_16	Flow Table Pt 16
61	FLOW_TABLE_PT_17	Flow Table Pt 17

62	FLOW_TABLE_PT_18	Flow Table Pt 18
63	FLOW_TABLE_PT_19	Flow Table Pt 19
64	FLOW_TABLE_PT_20	Flow Table Pt 20
65	FLOW_TABLE_PT_21	Flow Table Pt 21
66	FLOW_TABLE_PT_22	Flow Table Pt 22
67	FLOW_TABLE_PT_23	Flow Table Pt 23
68	FLOW_TABLE_PT_24	Flow Table Pt 24
69	FLOW_TABLE_PT_25	Flow Table Pt 25
70	FLOW_TABLE_PT_26	Flow Table Pt 26
71	FLOW_TABLE_PT_27	Flow Table Pt 27
72	FLOW_TABLE_PT_28	Flow Table Pt 28
73	FLOW_TABLE_PT_29	Flow Table Pt 29
74	FLOW_TABLE_PT_30	Flow Table Pt 30
75	ENTER_PASSWORD	Enter Password
76	PRESENT_STATUS	Present Status
77	STATUS_INDICATORS_1	Status Indicators
78	STATUS_INDICATORS_2	Status Indicators
79	STATUS_INDICATORS_3	Status Indicators
80	STATUS_INDICATORS_4	Status Indicators
81	STATUS_INDICATORS_5	Status Indicators
82	STATUS_INDICATORS_6	Status Indicators
83	TREND_FLOW_VALUE	Flow
84	TREND_HEAD_VALUE	Head

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.

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UNDER RESERVE OF MODIFICATIONS

European Headquarters & Manufacturing Facility

Heikensstraat 6
9240 Zele, Belgium

Tel: +32-(0)52-45.11.11 • Fax: +32-(0)52-45.09.93

e-mail: info@magnetrol.be

www.magnetrol.com

