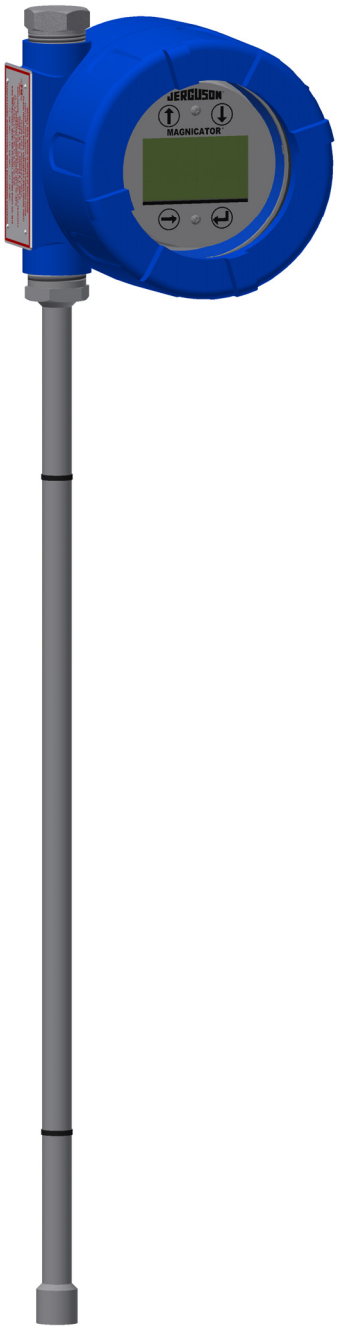
**Installation, Operation, & Maintenance Instructions**
IOM M500.34 per CDC-18-074
2018.02

# JERGUSON® MTII4300™

**Represented By Yates & Company, Inc.  info@yatesco.net  201-345-3101**

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## 1. INTRODUCTION

The Jerguson Model MTII4300™ is a 4-20 mA, loop-powered HART® compatible level transmitter intended to be used in conjunction with the Jerguson Magnicator® magnetic liquid level gage.
The part number designator for the MTII4300™ can be found below.

MODEL NUMBER DESIGNATION
MTII4300-#-#-#-#-#-#-###/###-#

MODEL:

COMM OPTION:
H= HART
S= SIL2 W/HART

HOUSING:
A= ALUMINUM w/ WINDOW (STD.)
S= STAINLESS STEEL w/ WINDOW

TRANSMITTER ORIENTATION:
A= TOP LEFT HAND (STD.)
B= TOP RIGHT HAND
C= BOTTOM RIGHT HAND
D= BOTTOM LEFT HAND

LCD DISPLAY:
M= mA OUTPUT (DEFAULT)
I= INCHES
P= PERCENT
B= MILLIMETERS
C= CENTIMETERS
D= METERS
E= FEET

AGENCY APPROVAL:
F= FM, CL I DIV1, GRP B,C,D, T6

ACTIVE SENSING LENGTH:
IN INCHES

MAX SENSING LENGTH:
IN INCHES, ON 6 INCH INCREMENTS

MOUNTING STYLE:
S= STRAIGHT (STD.)
H= HIGH TEMP EXTENDED

ALARM SETTING:
L= 3.6 mA (DEFAULT)
H= 20.5 mA

There are two main components that make up the MTII4300™. These two components are the electronics housing and the sensor housing (see Figs. 1 & 2). These two components are assembled at the factory and should not be separated in the field.

Figure 1:
MTII4300-HABxxS-xxx/xxx-F Straight, Top Right Hand Assembly

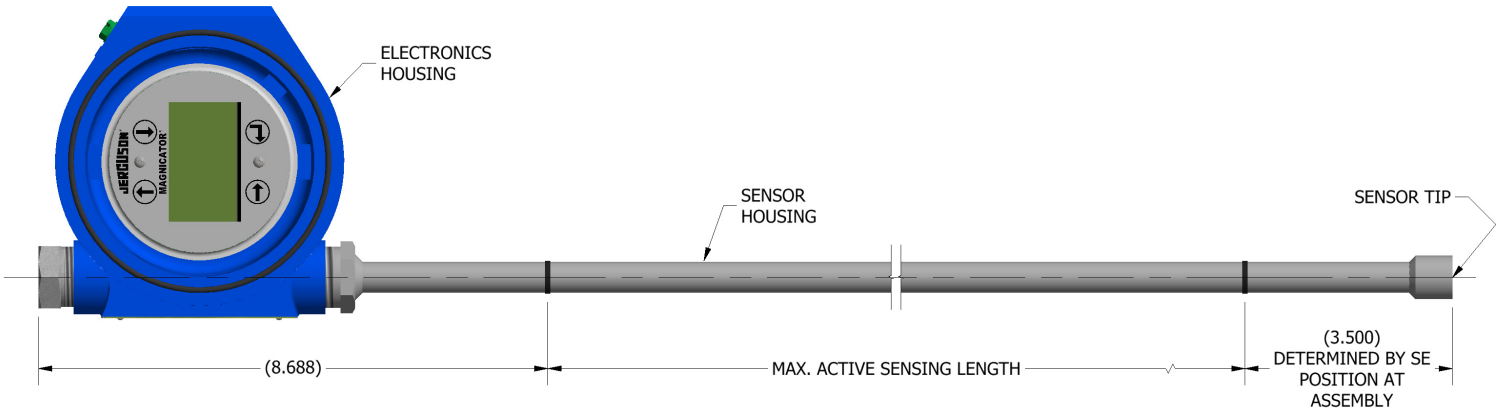




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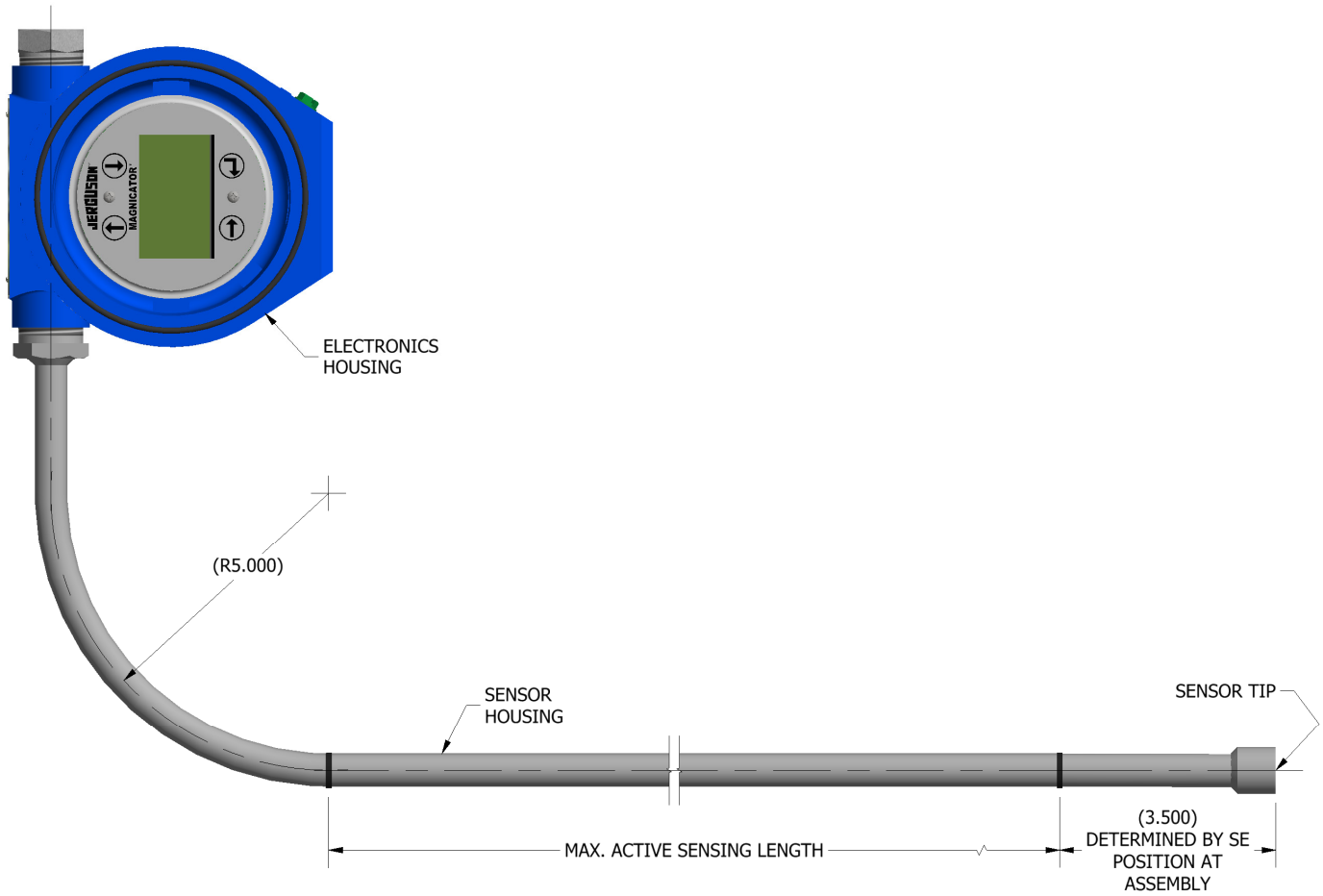
Figure 2:
MTII4300-HABxxH-xxx/xxx-F High Temp., Top Right Hand Assembly




## 2. PRODUCT DESCRIPTION

The MTII4300™ liquid level sensor is a multifunctional transmitter with 4-20 mA loop and HART®. It provides an analog output of level and the HART® digital protocol. Outputs can be monitored using 4-20 mA signal output, a HART® device (hand-held or PC-compatible software), the integral display, or all of the above. The MTII4300™ transmitters are available in a single cavity explosion-proof enclosure.



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### 2.1 MTII4300™ Transmitter Specifications

| PARAMETER | SPECIFICATIONS |
|---|---|
| **Measured Variable:** | Liquid level, interface level |
| **Output:** | 4-20 mA, HART |
| **Full Range:** | 12 to 228 in. (46 to 579 cm) |
| **Non-linearity:** | 0.020% F.S. (Independent BSL) or 1/32 in. (0.794 mm) |
| **Repeatability:** | 0.001% F.S. or 0.015 in. (0.381 mm) |
| **Sensor Operating Temperature:** | -40 to 300°F (-40 to 149°C) Ambient |
| **GAUGE LOOP** | |
| **Input Voltage Range:** | 10.5 to 28 VDC |
| **Reverse Polarity Protection:** | Series diodes |
| **Transient Protection:** | Stage 1: line-to-ground surge suppressors; 2500 Amps peak (8/20 µsec.)<br>Stage 2: line-to-line and line-to-ground transient suppressors; 1500 Watts peak (10/1000 µsec.) |
| **Loop Resistance:** | 250Ω Min, 650Ω Max |
| **CALIBRATION** | |
| **Zero Adjust Range:** | Anywhere within the active length |
| **Span Adjust Range:** | Full Scale 0.5 ft. (152 mm) from zero |
| **ENVIRONMENTAL** | |
| **Humidity:** | 0 to 100% Relative Humidity, non-condensing |
| **Electronics Operating Temp:** | -40 to 160°F (-40 to 71°C) ambient |
| **Vessel Pressure:** | Dependent on float pressure rating |
| **FIELD INSTALLATION** | |
| **Mounting:** | On side of magnetic level gage via brackets and worm gear clamps |
| **Wiring:** | 2-wire connection, Shielded Twisted Pair to screw terminals through a 3/4 in. NPT conduit opening. Min 24 AWG (0.51mm)/ Max 14 AWG (1.6mm), minimum 0.010 in (0.25mm) insulation thickness |
| **DISPLAY** | |
| **Measured Variables:** | Level |
| **Update Rate:** | 3 seconds |
| **HART COMMUNICATIONS** | HART 7.0 |
| **Method of Communication:** | Frequency Shift Keying (FSK) conforms with Bell 202 Modem Standard with respect to baud rate and digital “1” and “0” frequencies. |
| **Baud Rate:** | 1200 BPS |
| **Digital “0” Frequency:** | 2200 Hz |
| **Digital “1” Frequency:** | 1200 Hz |
| **Data Byte Structure:** | 1 Start Bit, 8 Data Bits, 1 Odd Parity Bit, 1 Stop Bit |
| **Digital Process Variable Rate:** | Poll/Response Model 2.0 per second |
| **FACTORY MUTUAL (FM)** | Explosion-proof:<br>Class I, Div 1, Groups B, C, D, T6 Ta=71°C (160°F) |



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### 2.2 Theory of Operation

The MTII4300™ transmitters precisely sense the position of an internal float by applying an interrogation pulse to a waveguide medium. This current pulse causes a magnetic field to instantly surround the waveguide. The magnet installed within the float also creates a magnetic field. Where the magnetic fields from the waveguide and float intersect, a rotational force is created (waveguide twist). This, in turn, creates a reflection of the current pulse that travels along the waveguide.

The head of the transmitter houses the sensing circuit, which detects the reflection pulse and converts it to a digital signal that is able to be evaluated by the programming. The distance from a reference point to the float is determined by measuring the time interval between the initiating current pulse and the return pulse and knowing the precise speed of these pulses. The time interval is converted into a 4 - 20 mA loop signal.

## 3. INSTALLATION/MOUNTING

### Mounting

The MTII4300™ is designed to mount directly to the outside of the Magnicator® chamber.

1. Secure the transmitter to the chamber using the supplied brackets and worm gear clamps.
2. Align the low and high level range markings on the sensor housing with the actual measurement range.
3. Ensure that the clamps are tight.
4. To test if the gauge is properly tightened, pull up on the electronics housing. The gauge should not move.

## 4. ELECTRICAL CONNECTIONS AND WIRING PROCEDURES

### Electrical Connections

It is recommended that each transmitter is properly grounded (see section 4.3 for grounding recommendations). Connect the 24 VDC power supply to the electronics module using the screw terminal block, loop 1 on the electronics module as shown in Figure 3. A typical wiring arrangement is shown in Figure 4. Reference drawing CI-25989.

Figure 3:
Connection Detail

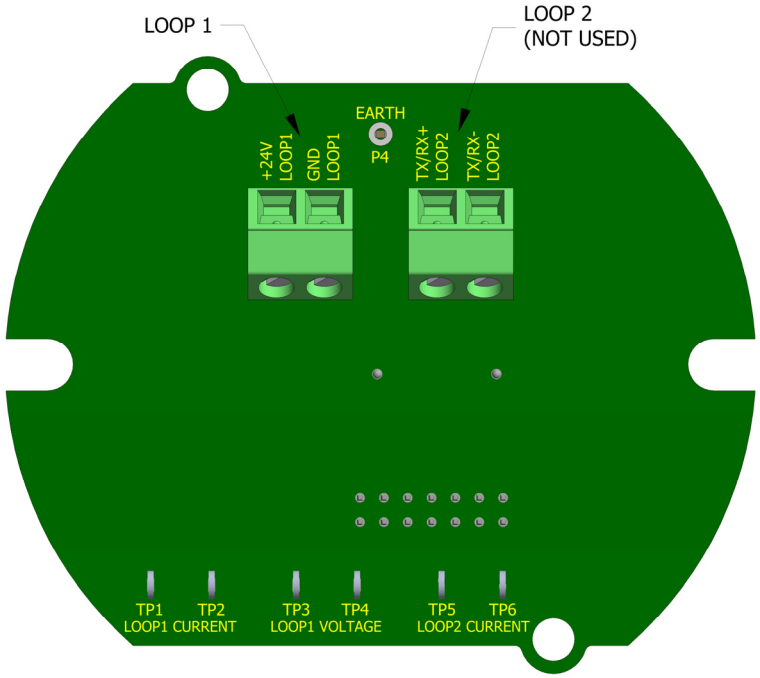




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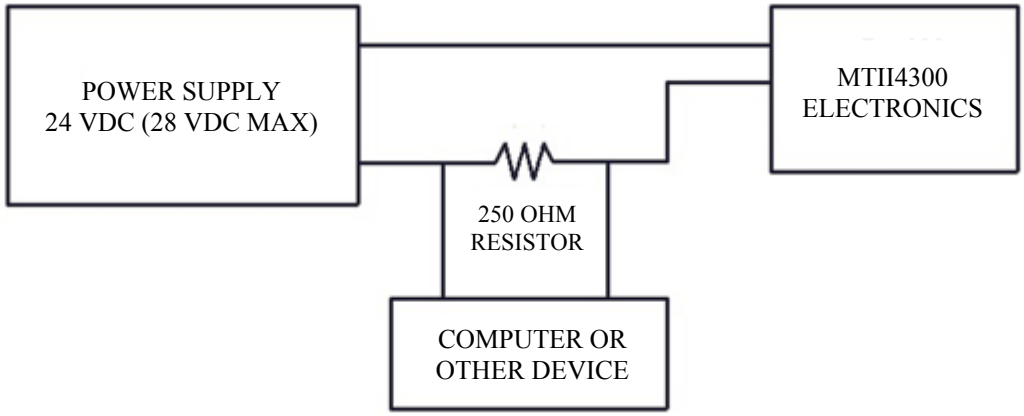
Figure 4:
Wiring Diagram




For explosion-proof installations, wiring shall be in accordance with the National Electric Code ANSI/NFPA 70, Article 501-30.

**Notes:**

1. **Tighten housing cover to the full stop against the O-ring and tighten set screw.**
2. **Use 3/4" NPT connection that is 90° from sensor tube, "Do Not" remove pipe plug from enclosure, opposite of sensor tube.**
3. **Sealing fitting required within 457mm (18") of termination. In high humidity areas, use a breather drain type conduit sealing fitting to minimize moisture intrusion.**

### 4.1 Cable Specifications

| Parameter | Specification |
|---|---|
| **Cable Size:** | Min 24 AWG (0.51mm)/ Max 14 AWG (1.6mm) |
| **Cable Type:** | Shielded, Twisted Pair or Multiple Pair, with Overall Shield; minimum 0.010 in (0.25mm) insulation thickness |
| **Cable Capacitance:** | Less than 30 pF/ft. (98 pF/m) |
| **Cable length:** | Shielded Twisted Pair with overall shield: 10,000 ft. (3,048 m)<br>Multiple pair with overall shield 5,000 ft. (1,524 m) |
| **Cable Rating:** | >5°C (41°F) above maximum ambient temperature |

### 4.2 Safety Recommendations for MTII4300™ Transmitter

Always follow applicable local and national electrical codes and observe polarity when making electrical connections. Never make electrical connections to the MTII4300™ transmitter with power turned on. Make sure that no wire strands are loose or sticking out of the terminal block connection which could short and cause a problem. Make sure that no wire strands, including shield, are in contact with the electronic module enclosure.



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### 4.3 Grounding

Two types of grounds are required for proper operation; shield ground of the wires & earth ground of the unit. The shield ground, from the twisted or multiple pair wire, must be grounded at the power supply. For the earth ground of the unit, the following two methods are acceptable.

**Note: A proper earth ground should result in a measured resistance of <1 Ω (Ohm).**

1. Run a dedicated earth ground through the conduit and connect directly to the earth ground splice inside of the housing.

2. Run a dedicated earth ground directly to the ground lug on the outside of the enclosure.

**Note: Grounding the transmitter through a threaded conduit connection or painted surface does not provide sufficient grounding for the unit.**

## 5. SYSTEM CHECK

After completing the MTII4300™ wiring, the system is ready to be checked out. Apply power to the unit. Using a DC volt-meter, measure the voltage at loop #1 connections. The voltage must be a minimum of 10.5V. If the voltage levels are too low, shut down the system. Check for shorts, power supply voltage, and excessive loop resistance.

### 5.1 Loop #1 Test

To test loop #1 on a bench, move the float along the operational range of the MTII4300™ transmitter. If functioning properly, the output current will change as the float moves.

## 6. MAINTENANCE

Magnicator® liquid level gages use magnetostrictive technology and only have one moving part, the float. This technology ensures no scheduled maintenance or re-calibration is required.

### 6.1 Removal of Display/Electronics

The MTII4300™ transmitter is designed so that the user may remove the electronics for any reason.

1. Turn off power to transmitter.
2. Remove cover from explosion-proof housing enclosure.
3. Gently pull out the display “Do not twist” and disconnect lead.
4. Disconnect leads from loop 1 terminal block.
5. Using a number one phillips screwdriver remove the two screws holding the top board into the retainer.
6. Gently pull out the top and middle board from the retainer and disconnect sensing element.
7. Using a number one phillips screwdriver remove the four nylon screws holding the bottom board and retainer into the enclosure.
8. Remove the bottom board and retainer and disconnect the ground using a flat head screwdriver.

### 6.2 Installation of Display/Electronics

1. Verify power to transmitter is off.
2. Remove cover from explosion-proof housing enclosure.
3. Secure ground wire to grounding screw using a flat head screwdriver.
4. Insert retainer and bottom board, secure to bottom of enclosure with (4) nylon screws using a number one phillips screwdriver, “Do Not” over tighten screws.
3. Reconnect display and sensing element leads to middle board. Place middle and top board into the retainer with the display connector towards the opening in the retainer.
4. Gently tighten the two number one phillips screws to hold the top board, “Do Not” over tighten the screws.
5. Reconnect power leads to loop 1 terminal block.
6. Reconnect display lead to board set and place the display on top of the board set.
7. Install enclosure cover before applying power.



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## 7. ADJUSTMENTS FOR MTII4300™ TRANSMITTERS (via HART®)

Jerguson has tested and is compliant to HART® ITK 7.2. The device driver file is available for download from HART® Communication Protocol website at http://www.hartcomm.org or from http://www.jerguson.com. Programming via HART® can be done either using the analog setup software via HART® modem or hand held programmer.

Refer to the documentation supplied with your specific HART® software package, or hand held communicator for details on performing sensor calibration. This section describes how the HART® protocol is applied to the MTII4300™ level transmitter only.

Using the HART® interface allows for calibration without having to remove the transmitter from the process or re-position the float. HART® commands 35 and 65 are implemented for this function. Any measured output may be assigned to any variable. Loop #1 is always the primary variable (P.V.); normally level one is assigned to loop #1.

Calibration set points for level one are given as the absolute displacement (in the appropriate units) from the tip of the sensor. For example, if the desired ZERO position for level one is given as 5 inches, the MTII4300™ will produce 4 mA when the float is 5 inches from the tip of the transmitter. If the desired SPAN position for level one is given as 30 inches, the MTII4300™ will produce 20 mA when the float is 35 inches from the tip of the transmitter.

### 7.1 LP-Dashboard Software

Adjustments to the calibration and setup parameters of the HART® interface can be performed using the LP-Dashboard. The software can be run from any Windows 7 or newer OS using a HART® to USB converter.

Perform the following steps to install the setup software and establish communication.

1. Install LP Dashboard setup software from USB stick that came with the level transmitter or go to http://jerguson.com to download the latest version.

2. Connect level transmitter via HART® to USB converter to top board on connections TP3 and TP4 Loop 1 Voltage (see figure 3), Connect USB connection to computer, connect 24 Vdc power to Loop 1 power connector (see Figure 3)..

**Note: Power must be on Loop 1 for HART® communication to work. HART® requires a load resistor to work correctly. Add a 250 Ohm resistor for proper communication. Some PLC cards will have built in load resistors.**



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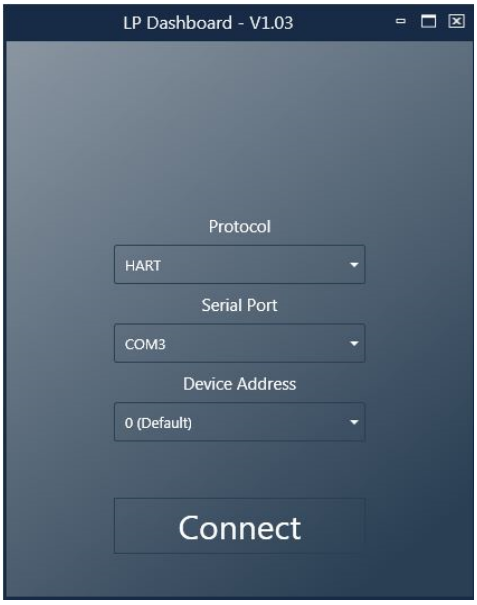
3. Open setup software and select HART® from the pull down menu under Protocol.

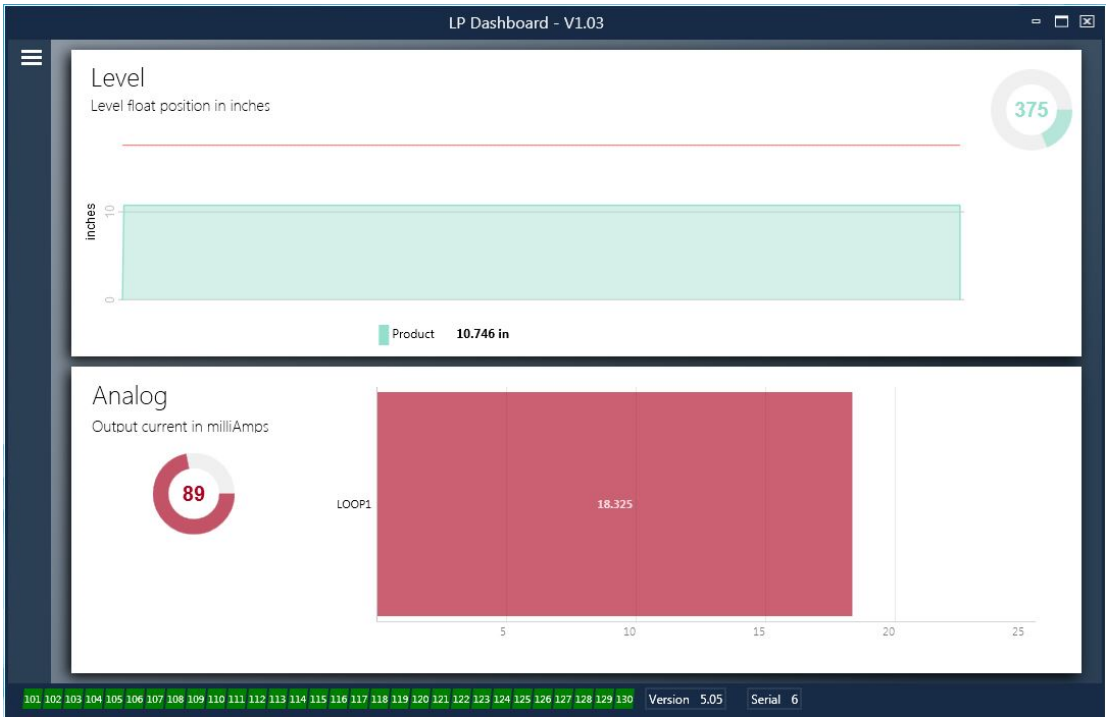
Figure 5:
Initial screen




4. Select COM port. Software will show active components. If you do not know which COM port to select, right click Computer on the desktop and select properties. On the left hand side menu you can click Devise Manager. In Device Manager click on the + sign next to Ports (COM & LPT) to view the list. An error message will appear if HART® does not connect.

### 7.1.1 Home Screen

Figure 6:
Home Screen



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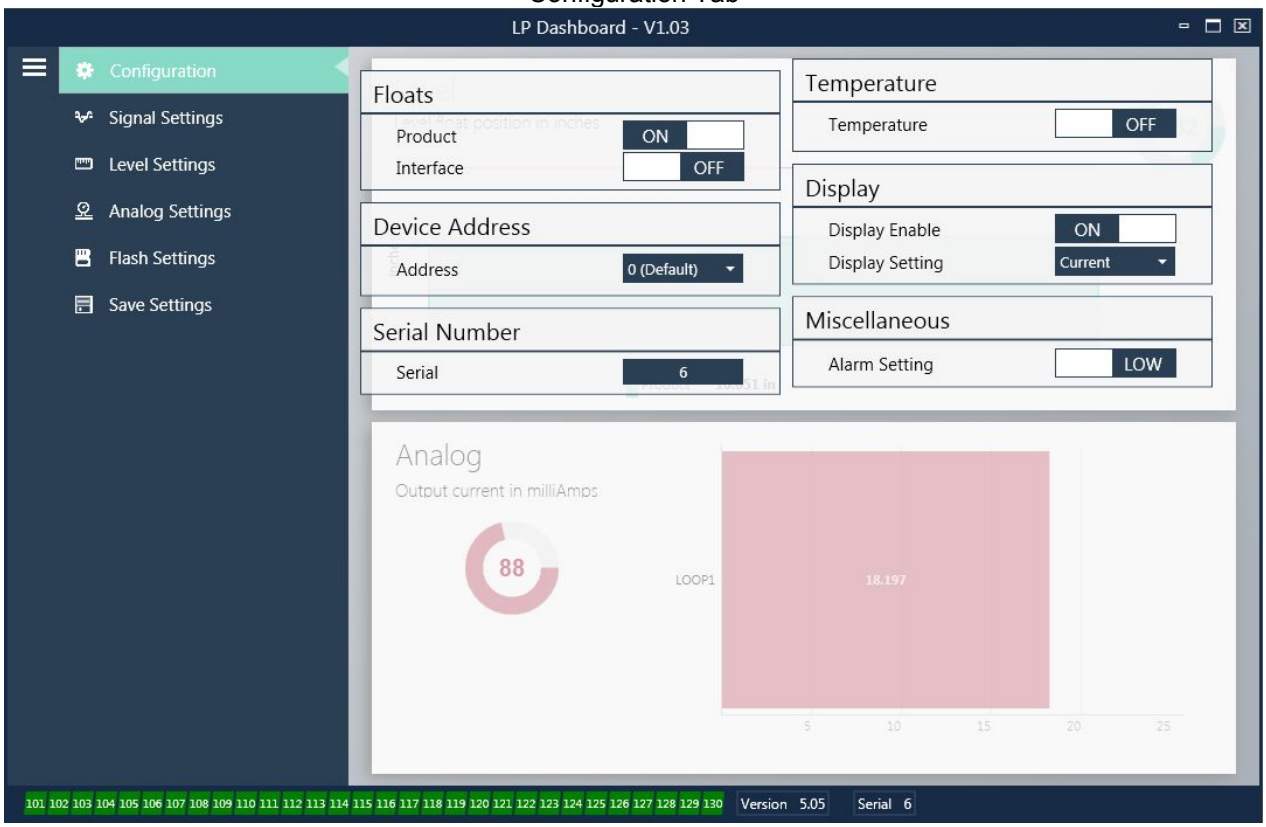
The level panel on top shows the level measurement for the Product level. The bold numbers are the numerical level and the graph is a time lapse of the graphical representation of the numbers. The red line is the approximate maximum level based off of the order length of the level transmitter. The numbers on the top right of the level panel are the Trigger Level for the product float. These are a representation of how strong of a return signal the level transmitter is experiencing.

The analog panel is on the bottom. On the left side is the graphical and numerical value for percent full ranging from 0 to 100 percent. The bar graph in the middle is the current output level with the numerical value shown in the middle.

Across the bottom of the Home Screen is the visual indication of the fault codes from section 10. Green indicates no fault and red indicates fault. Next is the firmware version in the middle and the serial number on the far right.

### 7.1.2 Configuration Screen

Figure 7:
Configuration Tab




The Configuration tab allows the level transmitter to be configured for the specific application.

**Factory Set:**

**Product Float:** Default setting of ON for all applications.

**Interface Float:** Default setting of ON if ordering 2 Loops. Default setting of OFF if ordering 1 Loop. If the number of floats turned on is different from the number of floats physically on the level transmitter the level transmitter will go into Fault.

**Serial Number:** Serial Number assigned by MTS at the time of manufacture. The serial number is used for tracking and replacement parts. Do not change.



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**Temperature:** Default setting of OFF (unavailable on MTII4300™)

**Display Enable:** Default setting of ON. Display can be turned off by changing to OFF and cycling power.

**User Configurable:**

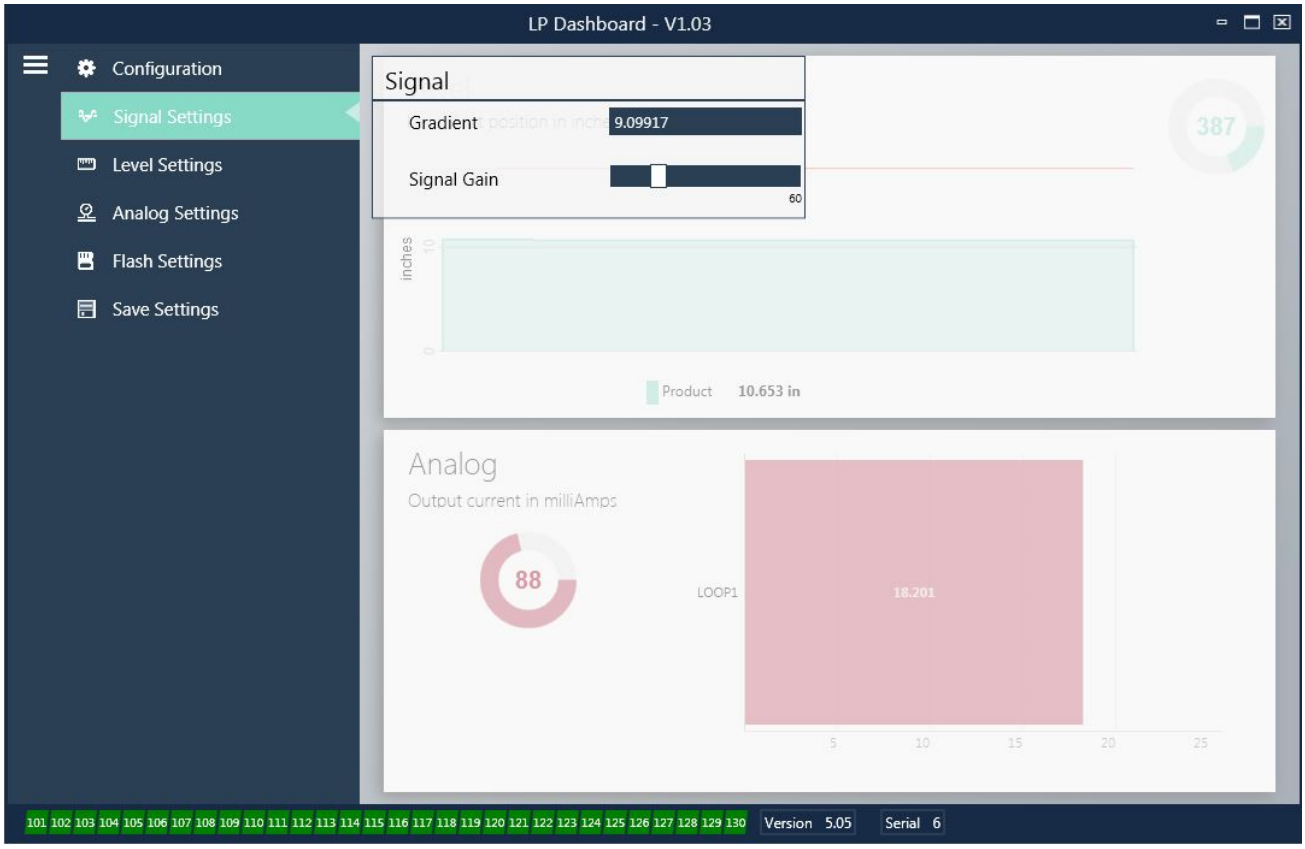
**Device Address:** The end user can configure the HART address when using a multi-node network. Default address is 0 and should not be changed unless using a multi-node network.

**Display Setting:** Allows the end user to configure the display. Available options are engineering units, current output, or percent full. Default setting is current**.**

**Alarm Setting:** Allows the end user to select a Low (≤3.6 mA) or High (≥22 mA) alarm fault state. The default alarm is Low alarm. Both alarms are NAMUR NE 43 compliant.

### 7.1.3 Signal Settings Screen

Figure 8:
Signal Settings Tab




**Factory Set:**

**Gradient:** Is the speed at which the magnetostrictive signals travel along the sensing element. Typical range is from 8.9 to 9.2. Do not change unless replacing the sensing element. Changing this number will directly affect accuracy.



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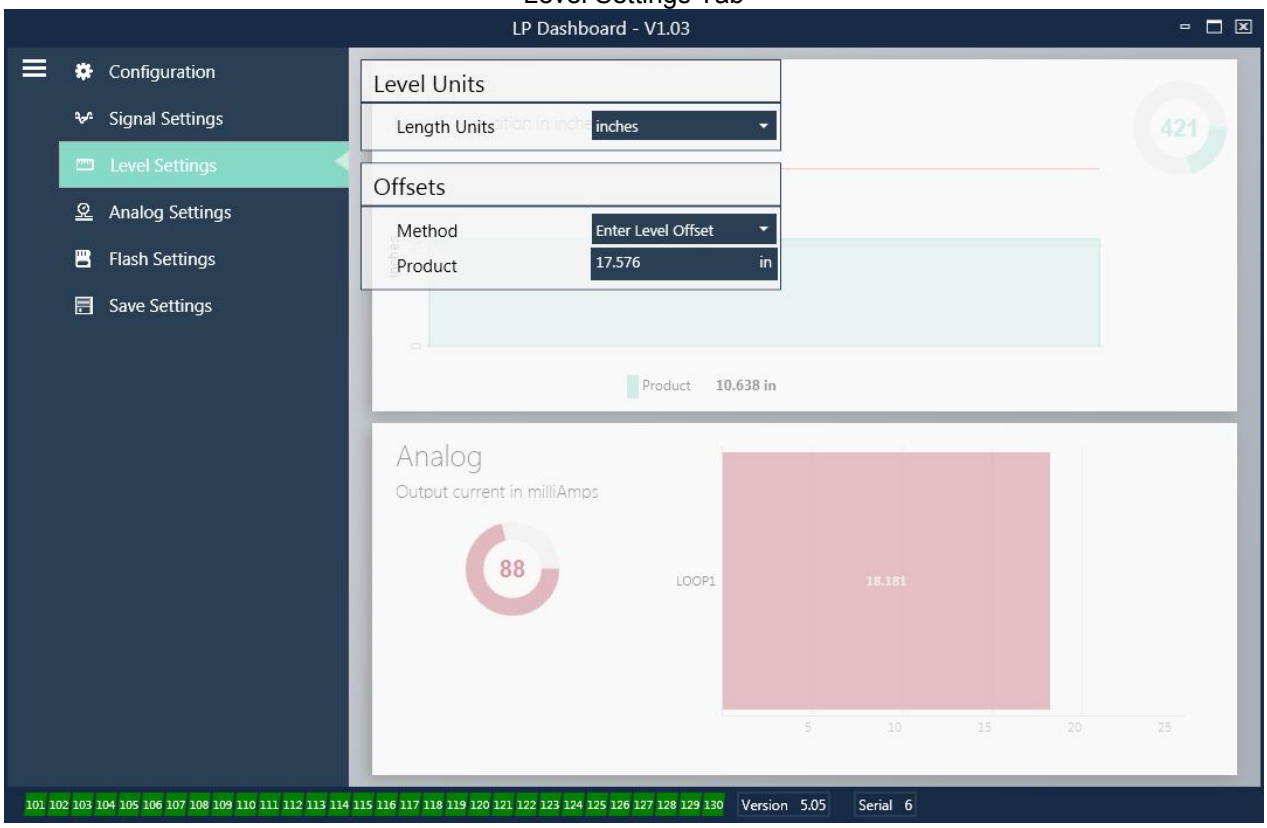
**Signal Gain:** Is the strength of the interrogation pulse. Jerguson® uses the same electronics for all lengths and adjusts the signal based on the order length. Do not change unless instructed to do so by the factory.

### 7.1.4 Level Settings Screen

Figure 9:
Level Settings Tab




**Factory Set:**

**Method – Enter Level Offset:** A calibration method that directly changes the offset of the level measurement. The offset is the zero reference point used in determining the level output. Do not use without factory guidance.

**Product Offset:** The full length of the level transmitter including order length, inactive zones, and mounting length. Do not change the Enter Level Offset method without factory guidance. The offset will change after using the Enter Current Tank Level for the product. The Product Offset and Interface Offset are independent of one another.

**Interface Offset:** The full length of the level transmitter including order length, inactive zones, and mounting length. Do not change the Enter Level Offset method without factory guidance. The offset will change after using the Enter Current Tank Level for the Interface. The Product Offset and Interface Offset are independent of one another.

**User Configurable:**

**Length Units:** The unit of measurement used for engineering units. Default is inches if ordered in inches and mm if ordered in mm. Options include inches, feet, millimeters, centimeters, and meters.



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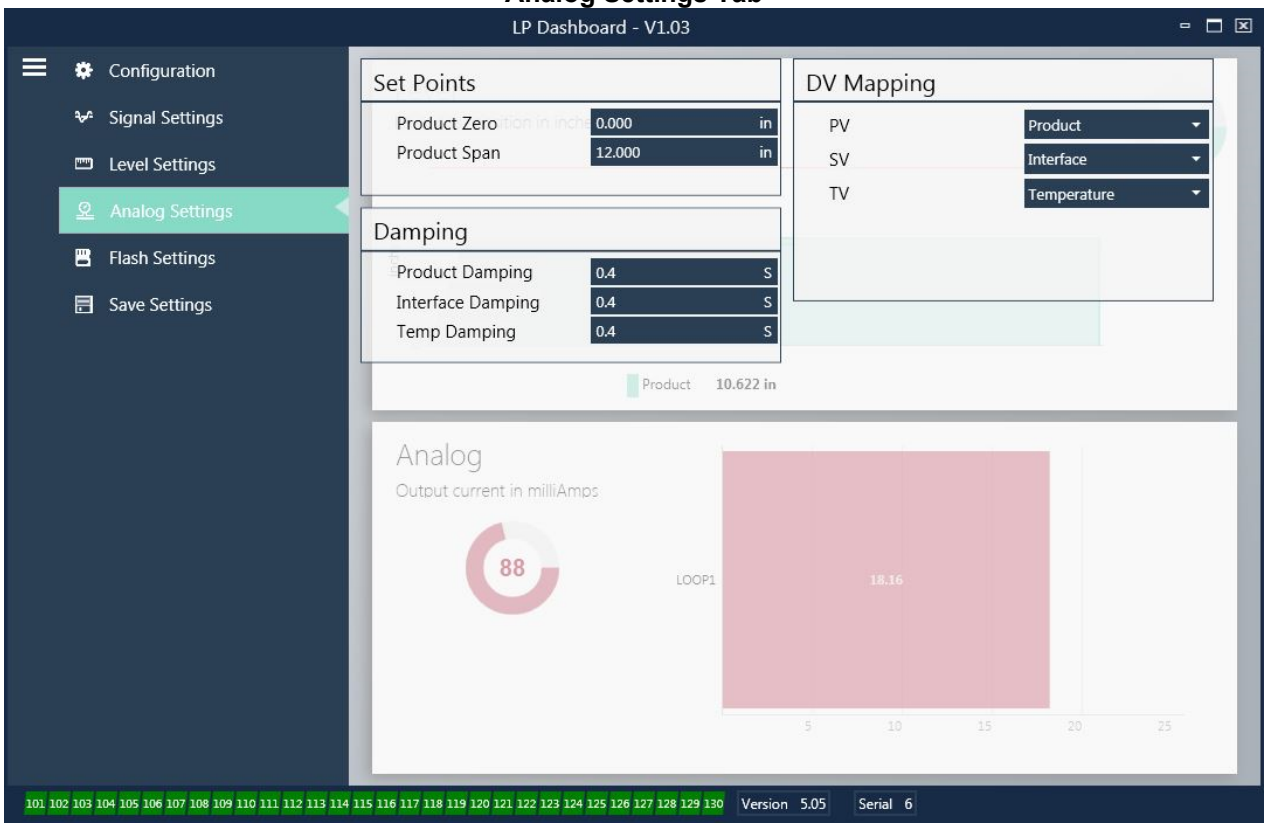
**Method - Enter Current Tank Level:** A calibration method that calibrates the level transmitter based off of one point of measurement. Select Enter Current Tank Level from the Method drop down box. Go to Product Level and enter value of current product level based off of a manual measurement while the tank level is not changing. Go to Interface Level and enter value of current interface level based off of a manual measurement while the tank is not changing. Click Update box in lower left corner when it appears. Level transmitter is now calibrated.

### 7.1.5 Analog Settings Screen

**Figure 10:**
**Analog Settings Tab**




**Factory Set:**

**PV:** Is the Primary Variable in HART® and the default setting is the Product Level. This determines which variable is output on Loop 1.

**SV:** Is the Secondary Variable in HART® and the default setting is the Interface Level. This determines which variable is output on Loop 2. The same variable can be output on Loop 1 and Loop 2.

**TV:** Is the Tertiary Variable in HART® and the default setting is Temperature. The TV can only be viewed via HART®.

**User Configurable:**

**Product Zero:** The Zero, 4 mA, and/or LRV for the product level. Default setting is the minimum level reading outside the inactive zone. The Zero should always be within the active measuring range and at least 50 mm (2 in.) away from the Span. The Zero and Span can be reversed.

**Product Span:** The Span, 20 mA, and/or URV for the product level. Default setting is the order



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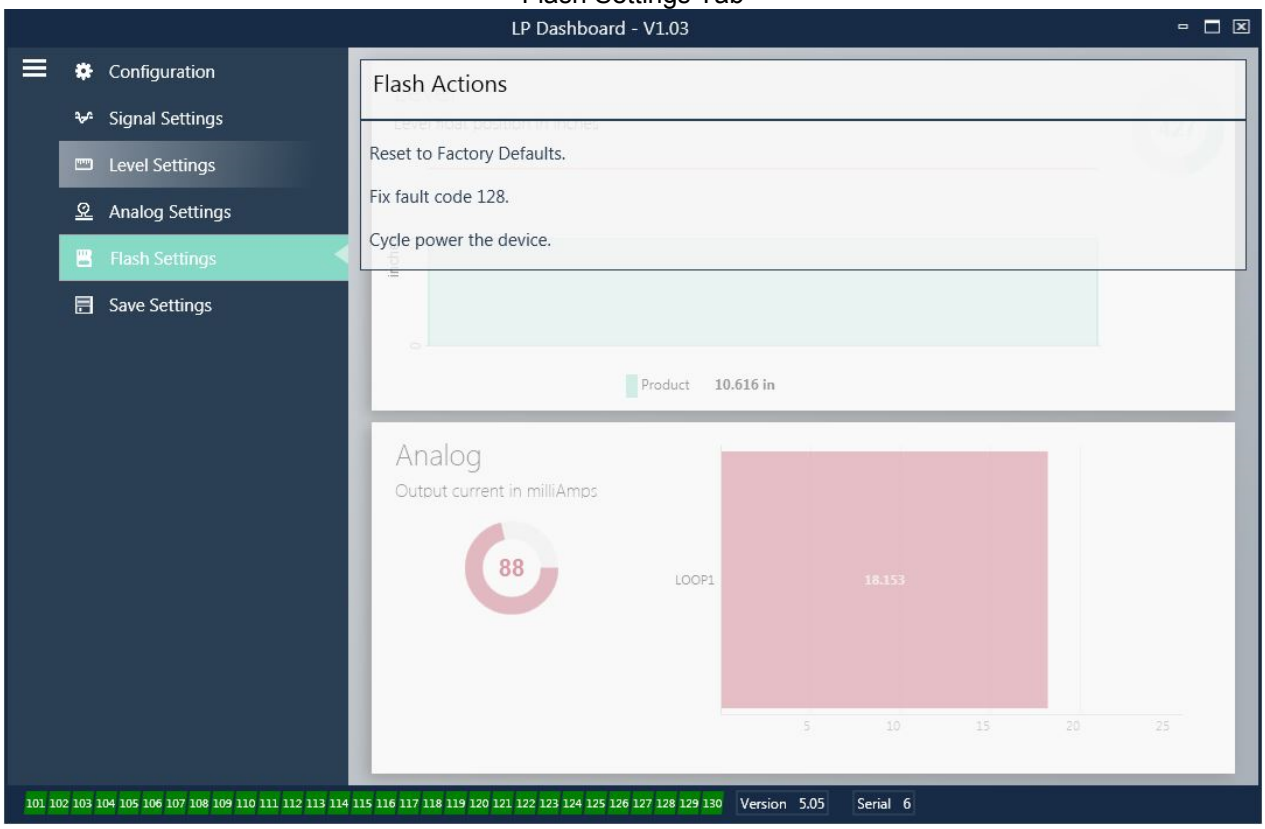
length minus 25 mm (1 in.). The Span should always be within the active measuring range and at least 50 mm (2 in.) away from the Zero. The Zero and Span can be reversed.

**Interface Zero:** The Zero, 4 mA, and/or LRV for the interface level. Default setting is the minimum level reading outside the inactive zone. The Zero should always be within the active measuring range and at least 50 mm (2 in.) away from the Span. The Zero and Span can be re- versed. If there is no Interface Level then the boxes will not be shown.

**Interface Span:** The Span, 20 mA, and/or URV for the interface level. Default setting is the order length minus 25 mm (1 in.). The Span should always be within the active measuring range and at least 50 mm (2 in.) away from the Zero. The Zero and Span can be reversed. If there is no interface Level then the boxes will not be shown.

### 7.1.6 Flash Settings Screen

Figure 11:
Flash Settings Tab




**Reset to Factory Defaults:** Allows the end user to reset all settings back to the original settings as they were when they left the factory. This is intended to be used as a first step in trouble shooting. Do note, the Zero and Span set points will reset to factory settings.

**Fix fault code 128:** If fault code 128 appears red then click the link on the Dashboard to clear the fault.

**Cycle power the device:** Allows the end user to have the level transmitter automatically turn power off, turn power on, and reboot the device.



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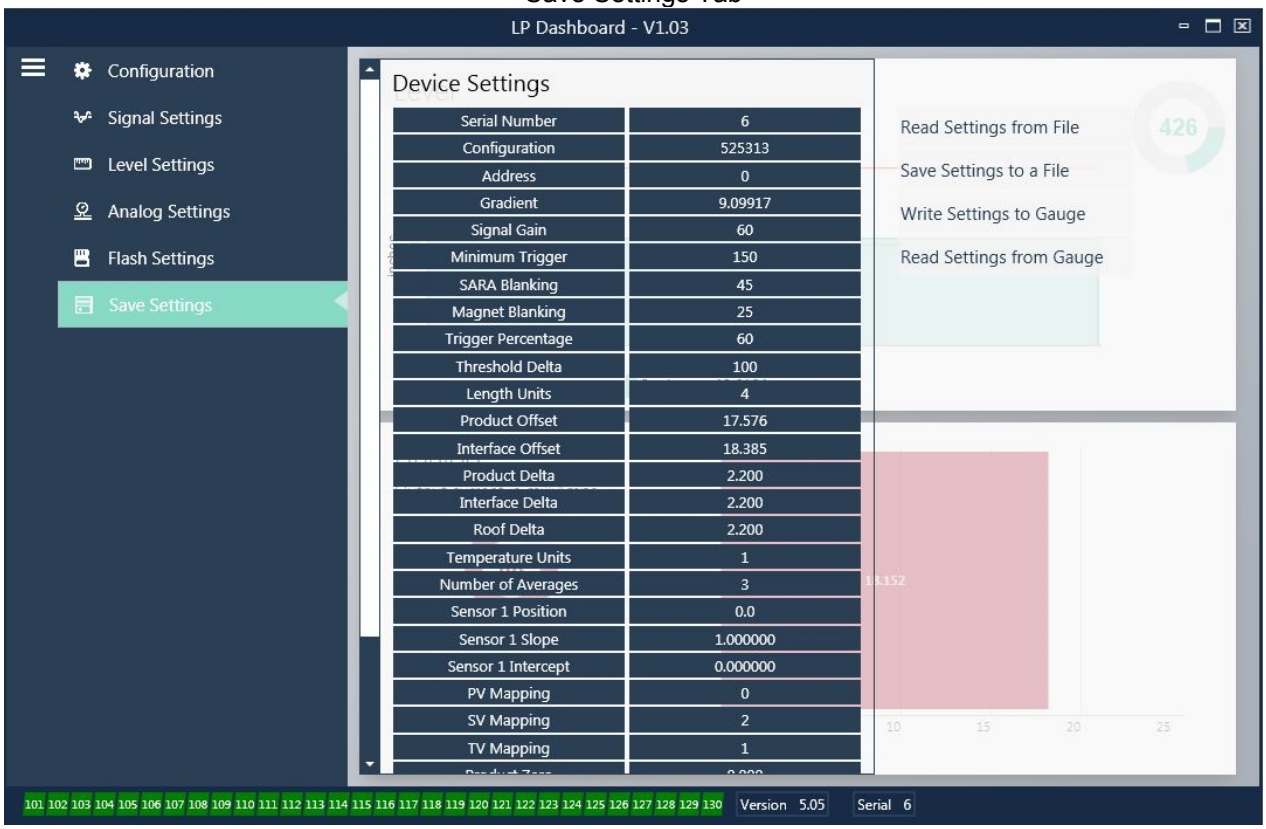
### 7.1.7 Save Settings Screen

Figure 12:
Save Settings Tab




**User Configurable:**

**Read Settings from File:** Allows the end user to upload factory parameters from a backup file to the LP Dashboard. This task is usually performed from a saved backup file or the original backup file maintained by Jerguson®.

**Save Settings to a File:** Allows the end user to download a backup file of factory parameters from the LP Dashboard to a PC. This task is usually performed after Read Settings from Gauge. **Note: wait until all settings have changed from Red to White before writing as the color change signals that the settings have been updated.**

**Write Settings to Gauge:** Allows the end user to program the level transmitter with the factory parameters displayed on the LP Dashboard. This task is usually performed after Read Settings from File.

**Read Settings from Gauge:** Allows the end user to update all of the factory parameters displayed on the screen. All settings will turn Red and then will turn White as they update.

**Note: A copy of the backup file is maintained by MTS including all factory parameters as the level transmitter was originally setup after completing testing and calibration at the factory. Jerguson® can provide a copy of the backup file upon request based off of the serial number of the level transmitter. Contact Jerguson® Technical Support for assistance.**



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**7.2 Handheld Communicator**
The MTII4300™ transmitter can be re-calibrated using a Rosemount model 375 or 475 hand held HART® field communicator. Follow the simple instructions below to reset the low and high values for loop #1. Only loop #1 can be calibrated with the HART® field communicator.

**Note: Due to physical differences between production units, after performing the following instructions, a functional test on the magnetic level gage is recommended to ensure the accuracy of the 4mA & 20mA set points. Minor adjustments may be required.**

**RULES:**
1. Be sure the MTII4300™ is connected to a clean 24 VDC power supply. Use a linear supply; it is not recommended to use a switching type power supply. Switching type power supplies have small ripples in the power that can adversely affect the operation of the transmitter. HART® cannot tolerate more than a 25 mV voltage ripple.
2. If the unit is installed in a live application, place your automatic controllers in manual mode and be advised that the output current will change during calibration.
3. Follow safe working procedures as applicable for working on live equipment in a hazardous location. When safety is secured, remove housing cover.
4. Connect the HART® communicator across a 250 ohm resistor in series with the negative lead.
5. Power on the HART® terminal. The terminal will go into self-test, then into the main screen. If not connected properly, you will get a "No device found" message.
6. From the main screen, press keypad key #1, "Device Setup".
7. From the "Device Setup" screen, press key #3, "Basic Setup".
8. Press key #4. You are now in "Range Values" screen.

**To set low value**
To set the low value (4 mA), select key #2, PV LRV (Process Variable, Lower Range Value). You are now in the PV LRV screen. The current low value is displayed. Below this value is a highlighted value. To change the lower value, key in the desired value. You may use whole numbers or whole numbers and decimal numbers (example 3.5 = 3.50 inches is shown; if 4 inches is desired, key in 4) Whole numbers will be entered as their decimal equivalents by HART® automatically. When the new desired low value is keyed in, press the "ENTER" button located below the LCD display. To write the changed lower value to memory, press the "SEND" key now. Next you will see two "WARNING" screens that ask if you are sure. If you're new low value is correct, press "OK" for both messages. This action resets the Lower Range Value, or 4 mA position, into the transmitter's memory. Go back to the "Range Values" screen to verify that the new parameters have been accepted into the transmitter memory.

**NOTE: This value is ~1/2" less than the measured distance from the set point position to the sensor tip, as per Figure 1 or 2.**

**CAUTION! Never enter a value that is longer than the max. active sensing length (as defined in the model number) + 3".**

**To set high value**
You should now be in the "Range Values" screen. To set the 20 mA (Upper Range), press key #1. You are now in the "PV URV" (Process Variable, Upper Range Value) screen. As in the lower value screen, the current value is displayed with a highlighted number below it. To change the upper value, key in the desired value. You may use whole numbers or whole numbers and decimal numbers (40 = 40 inches, or 40.5 = 40.50 inches). Whole numbers will be entered as their decimal equivalents by HART® automatically. Key in the desired upper range value desired. Press the "ENTER" button. You are back in the "Range Values" screen. If the numbers for lower and upper are correct, press the "SEND" key. You will get a "WARNING!" Press the "OK" button. You will again get "WARNING!" Press"OK" again. Startup is now complete.

**NOTE: This value is ~1/2" less than the measured distance from the set point position to the sensor tip, as per figure 1 or 2.**



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**CAUTION! Never enter a value that is longer than the max. active sensing length (as defined in the model number) + 3".**

### 7.3 Display Menu

All MTII4300™ are shipped with a stylus (P/N V22130) to be used for manipulating the display. The stylus is designed to allow for programming of the unit without removing the enclosure lid. When using the stylus make sure to align the stylus with the shape outlined around the buttons in the same orientation. Failure to correctly align the stylus can cause the display to not fuction properly.

**NOTE: Do not use any device other than the Jerguson® stylus to operate the display on the MTII4300™. Improper use of the stylus can cause the display to not fuction properly.**

### 7.4 Operation Modes

The MTII4300™ level transmitter runs in one of the following modes of operation. You can use these modes to calibrate and set up various operating parameters.

#### 7.4.1 Run Mode

Run mode is the primary mode of operation. This mode will perform measurements, display data, and respond to HART® commands.

#### 7.4.2 Program Mode

Program mode is the primary mode for commissioning and troubleshooting the level transmitter. The full menu and available functions are shown in section 8.5 Menu Structure. To enter program mode use the Stylus and press the Enter Key as shown in section 8.4 display Diagram. Program Mode is protected by a password to keep unwarranted changes from occurring. The factory default password is 10901. When in program mode, remote communications are not functional. An automatic timeout feature is provided so that the transmitter does not remain inadvertently in program mode. The timeout is set for 1 minute before prompted for additional time. Total timeout is 2 minutes.

**NOTE: Whenever program mode is exited from the display, the unit will reset itself to ensure all changes have been accepted. The reset will take approximately 5 seconds before the level transmitter is able to respond to commands. In program mode, the transmitter will not respond to incoming HART® commands. A busy error will be sent to the controller to notify the unit is in program mode. This function will prevent a user at a remote terminal from programming the unit while a user is accessing program mode from the display.**



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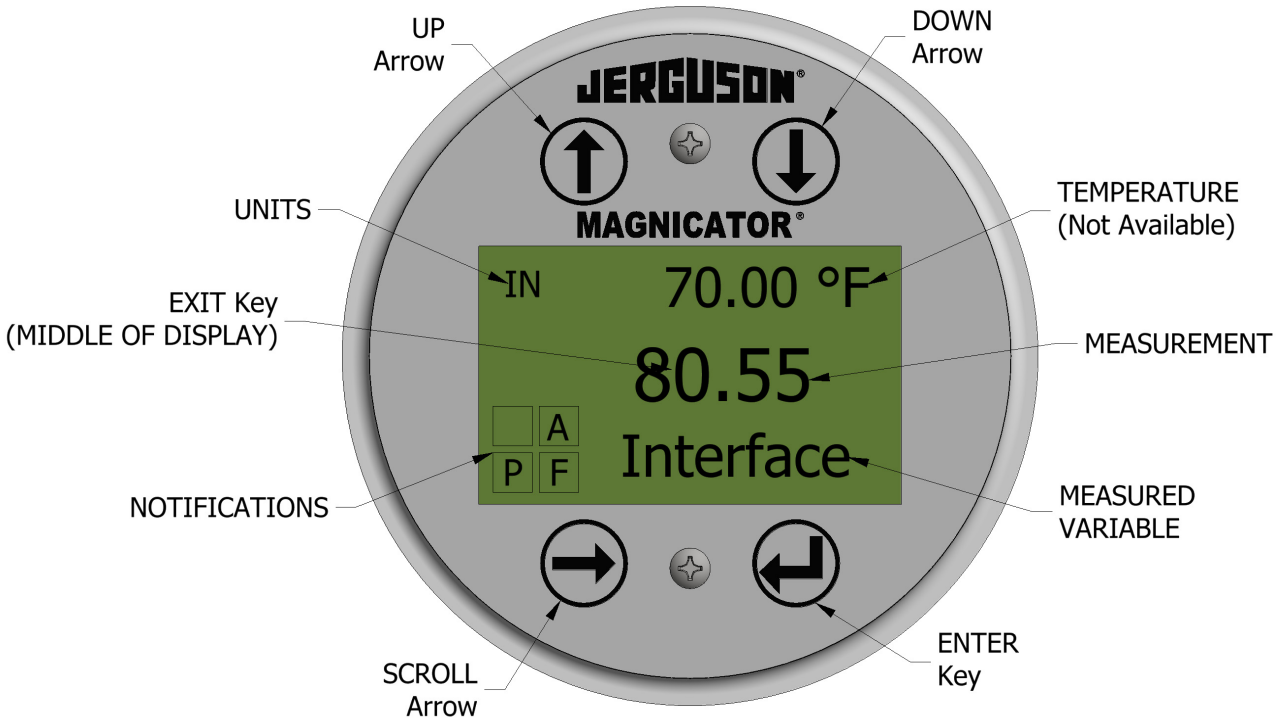
### 7.5 Display Diagram

Figure 13:
Display




**UP Arrow** – Used to move cursor on screen up, to increase number and to view alarm codes.
**DOWN Arrow** – Used to move cursor on screen down, decrease number and to view fault codes.
**SCROLL Arrow** – Used to move cursor on screen to the right, cursor will cycle back
**ENTER Key** – Used to enter Program Mode, select Highlighted Item, and Confirm Selection
**EXIT Key** – Hidden key in the middle of the display that is used to exit menu at any time
**MEASURED VARIABLE** – The process variable that is selected to display. The display will automatically scroll between selected variables.
**MEASUREMENT** – The numerical value for the MEASURED VARIABLE shown on the display.
**UNITS** – Unit of measurement for the MEASURED VARIABLE shown on the display.
**TEMPERATURE** – (Unavailable on the MTII4300™)
**NOTIFICATIONS** – Four squares with letters. Top left square is blank. Top right square, "A" will only show when there is an alarm. Toggle the UP Arrow key to view alarms. Bottom right square, "F" will only show when there is a fault. Toggle the DOWN Arrow key to view error codes. Bottom left square, "P" will only show when the unit is being programmed remotely.



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**7.6 Menu Structure**

The factory password for entering the display is 10901.

- Data From Device
  - Display
  - Units
    - Length Units
    - Temp Units
  - Set Points
    - Prd LVR (4 mA)
    - Prd URV (20 mA)
    - Prd Current LRV
    - Prd Current URV
    - Int LRV (4 mA) (Optional)
    - Int URV (20 mA) (Optional)
    - Int Current LRV (Optional)
    - Int Current URV (Optional)
  - Alarm Select
  - Signal Strength
    - Prd Trig Lvl
    - Int Trig Lvl

- Calibrate
  - Product Level
    - Current Level
    - Offset
  - Interface Level
    - Current Level
    - Offset

- Factory
  - Settings
    - Gradient
    - Serial Number
    - HW Revision
    - SW Revision
    - SARA Blanking
    - Magnet Blanking
    - Gain
    - Min Trig Level
  - Temp Setup
  - Temp Enable
    - No of Temp
  - Float Config
    - Loop 1
    - Loop 2
  - Damping
    - Loop 1
    - Loop 2
  - Auto Threshold
  - Reset to Factory



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### 7.6.1 Data From Device

**Display**
Allows the user to select what the display shows; engineering units, mA, or percent.

**Units**
Allows the user to change the selected Length Units: Millimeters, Centimeters, Meters, Inches, and Feet.

**Set Points**
Allows the user to change the 4 and 20 mA set points in two ways. The user can select Prd LRV (4 mA), Prd URV (20 mA), Int LRV (4 mA), and or Int URV (20 mA) to enter the desired location for the set points in engineering units. Alternatively the user can use Prd current LRV, Prd Current URV, Int Current LRV, and/or Int Current URV and move the float to the desired location of the set points while setting the 4 and 20 mA locations.

**Alarm Select**
Allows the user to choose between a High Alarm (≥20.5 mA) and a Low Alarm (≤3.6 mA) for software alarm faults. The default setting is Low Alarm. MTII4300™ complies with NAMUR NE 43.

**Signal Strength**
Allows the user to view the strength of the return signal for the product float (Prod Trig Lvl) and the Interface float (Int Trig Lvl). If the Interface float is not active no signal can be viewed.

### 7.6.2 Calibrate

**Product Level**
Allows the user to change the level in engineering units if needed. Typically this is not needed for analog output units. The user should use the Current Level selection and enter the current position of the float. The user is advised not to use the Offset feature without help from Technical Support.

**Interface Level**
Allows the user to change the level in engineering units if needed. Typically this is not needed for analog output units. The user should use the Current Level selection and enter the current position of the float. The user is advised not to use the Offset feature without help from Technical Support.

### 7.6.3 Factory

**Settings**
Menu section that contains factory parameters. Do not edit these parameters without talking to Technical Support.

**Gradient**
The gradient is a calibration factor that is unique for each transmitter. Typical values are between 8.9 and 9.2 µs/in. Do not change.

**Serial Number**
The Serial Number is the unique identifier for the unit and should not be changed. The serial number is used for tracking and determining spare parts.

**SARA Blanking**
Initial blanking distance from the head of the level transmitter. Do not change.

**Magnet Blanking**
Blanking distance between two floats. Do not change.

**Gain**
Measurement of how large an interrogation signal is used. Do not change without Technical Support.



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**Min Trig Level**
Threshold level for return signal to qualify as a valid signal and not noise. Do not change without Technical Support.

**Temp Setup (Unavailable on the MTII4300™)**

**No. of Temp (Unavailable on the MTII4300™)**

**Float Config (Not used)**

**Damping**
Damping slows the rate of change for the output signal. It does not change the output but dampens how quickly the output follows the change in the float position. The standard rate of change would have the damping set to 0.4 seconds.

**Auto Threshold**
Do not disable.

**Reset to Factory**
Allows the user to reset the electronics to the original factory settings. This should be used to return the electronics to a known good state when troubleshooting.

## 8. ALARMS

The MTII4300™ has two separate types of alarms featuring both a software fault alarm and a hardware fault alarm.

### 8.1 Software Fault Alarm

MTII4300™ offers a software fault alarm that will force the 4-20 mA output into an either a low or high alarm state. The default setting from the factory is a low alarm state. The low alarm state is ≤ 3.6 mA and the high alarm state is ≥ 20.5 mA. The software fault alarm follows the recommendations set forth by NAMUR NE 43. Typical faults that will cause a software fault alarm are a missing float, the float in the inactive range, and the level transmitter looking for the wrong number of floats.

### 8.2 Hardware Fault Alarm

MTII4300™ offers a hardware fault alarm that will force the 4-20 mA output into a low alarm. The hardware low alarm is 3.2 mA. The hardware low alarm is triggered when the internal diagnostics of the level transmitter have detected a hardware issue with the 4-20 mA output.



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## 9. TROUBLESHOOTING:

| Symptom | Possible Cause | Action |
|---|---|---|
| No communication with transmitter | No power/low voltage | Check voltage at transmitter, 10.5 to 28 VDC |
| | Wiring incorrect | Reference installation drawing CI-25898, Reference Installation/Mounting section 3 of IOM |
| | Wrong address (Driver) | DDA factory defualt is “192”<br>Modbus factory default is “247” |
| | Wrong protocol | Confirm software and transmitter are same protocol (eg. HART®) |
| | No resister inline | Add 250 Ohm resister |
| | Improper Installation | Verify per factory recomendation |
| Missing magnet error or Alarm output | Float not recognized | Confirm that the float is installed and is orientated correctly. Confirm column has level |
| | Float is in the dead zone | Raise float to see if error stops |
| | Wrong number of floats selected | Confirm that the number of floats on the transmitter and the number of floats the transmitter is attempting to verify are the same. |
| | Gain needs to be ajusted | Consult Factory |
| | Improper Installation | Verify per factory recomendation |
| Trigger level error | Gain needs to be adjusted | Consult Factory |
| | SE is damaged | Consult Factory |
| | Min. trigger level needs adjusted | Consult Factory |



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## 10. ERROR CODES (Faults):

Fault Code 101:

- Missing Magnet:
  Cause: The Magnet is not installed or has insufficient signal
  Action: Verify float is installed and not in dead zone. Ensure gain is set to provide adequate signal and the minimum trigger is set correctly.

Fault Code 102:

- Measurement Read Fault
  Cause: The internal measurement hardware communication is corrupted.
  Action: Cycle power to sensor. If proper operation is not restored, return to factory.

Fault Code 103:

- NRE Fault:
  Cause: The program operation is incorrect due to hardware failure.
  Action: Cycle power to sensor. If proper operation is not restored, return to factory.

Fault Code 104:

- CTR Fault:
  Cause: The program operation is incorrect due to hardware failure.
  Action: Cycle power to sensor. If proper operation is not restored, return to factory.

Fault Code 105:

- Extra Lobe Fault:
  Cause: The magnet signal is distorted due to the gain or threshold being set too low.
  Action: Adjust the gain and threshold settings.

Fault Code 106:

- Missing Lobe Fault:
  Cause: The magnet signal is distorted due to the gain or threshold being set too low.
  Action: Adjust the gain and threshold settings.

Fault Code 107:

- Measurement Delta Fault:
  Cause: The magnet position has moved to far from the last position.
  Action: Increase programmed value of the magnet reading delta parameter or change the sensor configuration to disable noise detect.

Fault Code 108:

- Measurement Position Fault:
  Cause: The program operation is incorrect due to hardware failure.
  Action: Cycle power to sensor. If proper operation is not restored, return to factory.

Fault Code 109:

- Peak Fault:
  Cause: The magnet signal is to strong or weak.
  Action: Increase or decrease programmed gain setting.

Fault Code 110:

- Voltage Threshold Fault:
  Cause: The program operation is incorrect due to hardware failure.
  Action: Cycle power to sensor. If proper operation is not restored, return to factory.



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Fault Code 111:

- Current Readback Fault:
  Cause: There is an issue with the power supply, excessive load resistance or ADC calibration values.
  Action: Improper installation. Return to factory.

Fault Code 112:

- 2.5 V Supply Fault:
  Cause: The program operation is incorrect due to hardware failure.
  Action: Cycle power to sensor. If proper operation is not restored, return to factory.

Fault Code 113:

- 3.3 V Supply Fault:
  Cause: The program operation is incorrect due to hardware failure.
  Action: Cycle power to sensor. If proper operation is not restored, return to factory.

Fault Code 114:

- VCC Supply Fault:
  Cause: The program operation is incorrect due to hardware failure.
  Action: Cycle power to sensor. If proper operation is not restored, return to factory.

Fault Code 115:

- Clock Calibration Fault:
  Cause: The program operation is incorrect due to hardware failure.
  Action: Cycle power to sensor. If proper operation is not restored, return to factory.

Fault Code 116:

- Task Not Run Fault:
  Cause: The program is experiencing unexpected processing time demand.
  Action: Cycle power to sensor. If proper operation is not restored, return to factory.

Fault Code 117:

- Task Overtime Fault:
  Cause: The program is experiencing unexpected processing time demand.
  Action: Cycle power to sensor. If proper operation is not restored, return to factory.

Fault Code 118:

- DCA Communication Fault
  Cause: There is an issue with the power supply or excessive load resistance.
  Action: Cycle power to sensor. If proper operation is not restored, return to factory.

Fault Code 119:

- DAC Current Fault:
  Cause: There is an issue with the power supply or excessive load resistance.
  Action: Cycle power to sensor. If proper operation is not restored, return to factory.

Fault Code 120:

- DAC Over Temperature Fault:
  Cause: DAC hardware failure.
  Action: Cycle power to sensor. If proper operation is not restored, return to factory.

Fault Code 121:

- DAC Voltage Fault:
  Cause: DAC hardware failure.
  Action: Cycle power to sensor. If proper operation is not restored, return to factory.

Fault Code 122:



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- DAC Bus Fault:
  Cause: DAC hardware communication is corrupted.
  Action: Cycle power to sensor. If proper operation is not restored, return to factory.

Fault Code 123:

- ADC Bus Fault:
  Cause: ADC hardware communication is corrupted.
  Action: Cycle power to sensor. If proper operation is not restored, return to factory.

Fault Code 124:

- Span Fault:
  Cause: The measurement set points are closer than the minimum span.
  Action: Adjust programmed set points as needed.

Fault Code 125:

- Product Range Fault:
  Cause: The product magnet is outside of the set points.
  Action: Verify that the magnets are positioned within expected measuring range. Adjust programmed setpoints as needed.

Fault Code 126:

- Interface Range Fault:
  Cause: The interface magnet is outside the setpoints.
  Action: Verify that the magnets are positioned within expected measuring range. Adjust programmed setpoints as needed.

Fault Code 127:

- Configuration Data Range Fault:
  Cause: The configuration data is corrupted.
  Action: Cycle power to sensor. If proper operation is not restored, return to factory.

Fault Code 128:

- Configuration Data Corruption Fault:
  Cause: The configuration data is corrupted.
  Action: Cycle power to sensor. If proper operation is not restored, return to factory.

Fault Code 129:

- Firmware Corruption Fault:
  Cause: The firmware is corrupted.
  Action: Cycle power to sensor. If proper operation is not restored, return to factory.

Fault Code 130:

- Program Fault:
  Cause: An internal error has occurred.
  Action: Cycle power to sensor. If proper operation is not restored, return to factory.



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## 11. SPARE PARTS

| Part Description | Part No. |
|---|---|
| MTII4300™, Stylus (Magnet) | V22130 |
| MTII4300™, Display | V22247 |
| MTII4300™, Loop Board Set | V22246 |
| MTII4300™, Mounting Hardware Kit for 2.0" Pipe Chamber (See Note 1) | S24302 2.0 |
| MTII4300™, Mounting Hardware Kit for 2.5" Pipe Chamber (See Note 1) | S24302 2.5 |
| MTII4300™, Mounting Hardware for Kit 3.0" Pipe Chamber (See Note 1) | S24302 3.0 |

**Note:**

1. **Each mounting hardware kit includes one clamp assembly and one worm gear clamp. One kit for every 12" of sensor tube.**

## Technicians Notes:



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