Density and Level HART Ops

Operation Guide
P/N 1-0700-1023

Revision A

Part of Thermo Fisher Scientific

Thermo SCIENTIFIC

Density and Level HART Ops

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Revision A

Thermo
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Revision History

Revision Level	Date	Comments
A	09-2015	Initial release per ERO 8709.

Contents

Chapter 1
Introduction

The Thermo Scientific MS2011 is designed to provide both reliable and accurate level and density measurements. With HART protocol, the gauge also provides users with access to control or program parameters via a host system, such as AMS, or locally using an Emerson 475 Hand Held Terminal (HHT).

The gauge consists of a source head containing the radioisotope source and the detector-transmitter. The radioisotope source emits gamma radiation that passes through the process material. The detector measures the energy of the radiation arriving at the detector after passing through the process material and vessel/pipeline walls. The gauge determines the level or density of the process material by measuring the amount of radiation arriving at the detector, which varies with the level or density of the process material.

Note This guide contains information specific to applications using the MS2011 with HART protocol. For information on the standard MS2011, reference the MS2011 user guides listed in Associated Documentation. ▲

Associated Documentation

- DensityPRO NAI installation guide, P/N 1-0702-015
- DensityPRO installation guide, P/N 1-0702-144
- DensityPRO Measurement Systems user guide, P/N 1-0702-016
- LevelPRO installation guide, P/N 1-0702-040
- LevelPRO user guide, P/N 1-0702-039
- HART Field Device Specification, P/N 1-0700-1016
- Gamma Radiation Safety Guide, P/N 717904

Density Application

When configured for density applications, the MS2011 can measure the density of almost any liquid, slurry (solid material in a carrier fluid), emulsion (two different fluids), or solution (a solute material dissolved in a solvent fluid).

After the gauge calculates the process material density, it can convert the measurement into a number of forms.

For slurries, the gauge can provide measurements based on the ratio of solid to carrier. Similar measurements can be made for emulsions and solutions.

By inputting flow data, the gauge can generate mass flow measurements. It can also accept a 4–20 mA current output from a magnetic flow sensor. For applications that require temperature compensation, the gauge accepts a temperature input to compensate the density measurement for changes in process temperature.

The gauge consists of the source head, which contains the radioisotope source, and the detector-transmitter, which contains the scintillator detector, and electronics. The radioisotope source emits gamma radiation that passes through the process material. The detector measures the energy of the radiation arriving at the detector after passing through the process material and vessel walls. The gauge determines the density of the process material by measuring the amount of radiation arriving at the detector, which varies with the density of the process material.

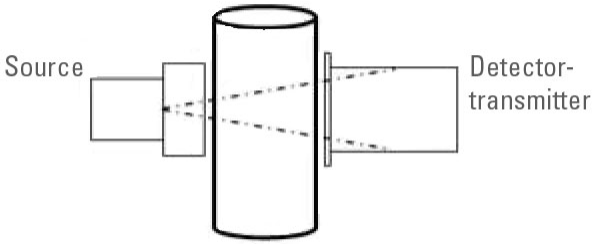


Figure 1-1. DensityPRO

Level Application

When configured for level applications, the MS2011 can measure the level of almost any liquid or solution. In this application the level gauge attaches to the outside of the process vessel or pipe and never contacts the process material.

The gauge can then convert the basic level measurement into a variety of output values as appropriate for specific applications.

The system consists of up to three basic elements: the source head, which contains the radioisotope source; the detector, which converts the incident radiation to a useable electronic signal; and the transmitter, which translates the detector's signal in to a level value.

The radioisotope source emits gamma radiation, which passes through the vessel walls and the process material before arriving at the detector. The detector then measures the level of arriving radiation to determine the level of the process material. The amount of radiation that reaches the gauge varies inversely with the level of the process material.

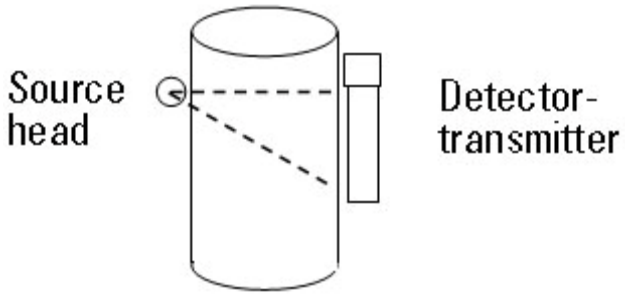


Figure 1-2. LevelPRO

Chapter 2
HART Protocol Overview

The Highway Addressable Remote Transducer (HART) protocol is an industrial protocol that is superimposed on the 4–20 mA analog signal (Output C) of the MS2011. It is an open standard, and full details about HART can be obtained from the HART Communication Foundation at www.fieldcommgroup.org.

A complete definition of the protocol interface including all implemented commands can be found in the MS2011 HART Field Device Specification (P/N 1-0700-1016).

Chapter 3
Wiring & Connections

Note This chapter provides wiring details for HART protocol operation. It is assumed that the instrument has already been installed. Refer to the installation guides listed in Associated Documentation for further information. ▲

The connection for the HART protocol is accessible from the ISIO board of the MS2011.

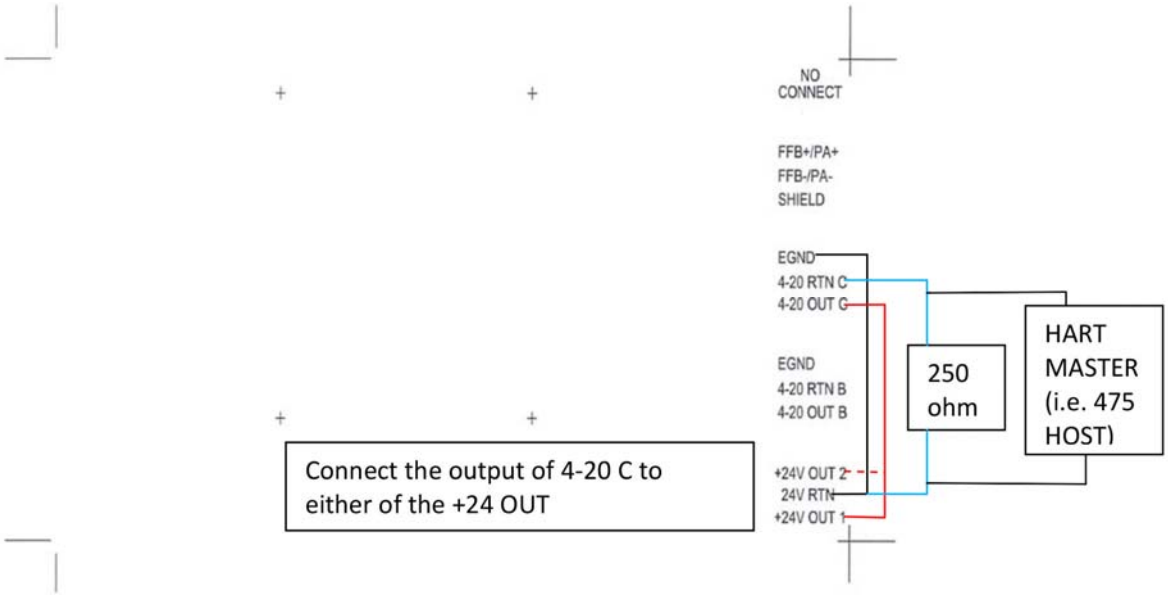


Figure 3-1. Signals on the MS2011 HART protocol connector

Chapter 4
HART Masters

Configuration/interrogation of the MS2011 via HART protocol can be accomplished using either a Primary or Secondary HART Master.

Primary masters can be host systems, such as AMS or SIMATIC PDM. Secondary masters are generally those such as an Emerson 475 Hand Held Terminal.

With each host, a DDL (Device Description Language) file will be required to fully configure the MS2011. The DDL for the MS2011 has been certified and so can be obtained from the HART Communication Foundation at www.fieldcommgroup.org.

Chapter 5
MS2011 DD Menu Structure

This chapter describes the menu structure used for the MS2011 DD. The DD was primarily developed for use with an Emerson 475 Hand Held Terminal, so this section defines the menu structure based upon the LCD display of the HHT.

Chapter 9 shows example menus taken from a 475 simulator connected to an MS2011. A link to a sample view of each menu screen is given in the below tables.

Device Setup Menu

Table 5-1.

Device Setup Menu	
	Process Variables Menu
	Diagnostic/Service Menu
	Basic Setup Menu
	MS2011 Setup Menu
	Review Menu

Process Variables Menu

Table 5-2.

Process Variables Menu	
	Configure Process Variables Menu

Diagnostic/Service Menu

Table 5-3.

Diagnostic/Service Menu	
	Commands Method
	Loop Test Method
	D/A Trim Method
	Status Info Menu

Basic Setup Menu

Table 5-4.

Basic Setup Menu		
	Range Values Menu	
		PV LRV
		PV URV
	Device Information Menu	
		Revision #s
	Update FLASH Method	

MS2011 Setup Menu

Table 5-5.

MS2011 Setup Menu	
	Application Setup Menu
	Application Live Data Menu
	Quick Setup Menu
	Detailed Setup Menu
	Update FLASH Method

Application Setup Menu

Table 5-6.

Application Setup Menu		
	APP1:Setup	
		Modify Application
	APP2:Setup	
		Modify Application
	APP3:Setup	
		Modify Application
	APP4:Setup	
		Modify Application
	Det Map	

Application Live Data Menu

Table 5-7.

Application Live Data Menu	
	APP1:Measurements
	APP1:Totals*
	APP2:Measurements
	APP2:Totals*
	APP3:Measurements
	APP3:Totals*
	APP4:Measurements
	APP4:Totals*

Quick Setup Menu

Note In the table below, where density and level menus differ, Application #1 presents the density menus, while Application #2 presents the level menus. ▲

Table 5-8.

Quick Setup Menu			
	APP1:Quick Setup (Density)		
		Density Setup Menu	
			Material Setup Menu
			Meas#1 Setup Menu
			Pipe Info Menu
		TempComp Setup Menu	
			Eqn1 Coeffs Menu
			Eqn2 Coeffs Menu
		Standardization Menu	
			Standardize
		Gauge Calibration Menu	
			View Cal Points Menu
			Calc Slope Correction Factor Method
			Calibrate

Quick Setup Menu			
	APP2:Quick Setup (Level)		
		Level Setup Menu	
			Level Configuration Setup Menu
			Additional Measurements Menu
			Source Menu
			Counts Menu
		Standardization Menu	
			Standardize
		Calibration Menu	
			View Cal Points Menu
			Edit Point Method
			Delete Point Method
			Calibrate
	APP3:Quick Setup		
	APP4:Quick Setup		

Detailed Setup Menu

Note In the table below, where density and level menus differ, Application #1 presents the density menus, while Application #2 presents the level menus. ▲

Table 5-9.

Detailed Setup Menu			
	System Control Menu		
	System Status Menu		
		Software IDs Menu	
		Reference Volts Menu	
		IO Info Menu	
	Mode/Fault Alarm Setup Menu		
		System Alarm Setup Menu	
			Hold Mode Action
			RBP Alarm Action
			HART Alarm Action
			Sys Fault Action
		Output A Fault Setup Menu	
			Min Alarm
			Max Alarm
			LO Fault
			HI Fault
		Output B Fault Setup Menu	
			Min Alarm
			Max Alarm
			LO Fault
			HI Fault
		Output C Fault Setup Menu	
			Min Alarm
			Max Alarm
			LO Fault
			HI Fault

Detailed Setup Menu			
	Mode/Fault Alarm Setup Menu		
		Application 1 Faults Setup Menu	
			STD Mode
			CAL Mode
			X-Ray Mode Engaged
			IBP Alarm Action
			TOT Overrun
			CAL Abort
			Sensor Over Range
			Sensor Under Range
		Application 2 Faults Setup Menu	
			STD Mode
			CAL Mode
			X-Ray Mode Engaged
			IBP Alarm Action
			TOT Overrun
			CAL Abort
			Sensor Over Range
			Sensor Under Range
		Application 3 Faults Setup Menu	
			STD Mode
			CAL Mode
			X-Ray Mode Engaged
			IBP Alarm Action
			TOT Overrun
			CAL Abort
			Sensor Over Range
			Sensor Under Range

Detailed Setup Menu			
	Mode/Fault Alarm Setup Menu		
		Application 4 Faults Setup Menu	
			STD Mode
			CAL Mode
			X-Ray Mode Engaged
			IBP Alarm Action
			TOT Overrun
			CAL Abort
			Sensor Over Range
			Sensor Under Range
		View Fault Status Menu	
			Mode Status
			Analog O/P A Status
			Analog O/P B Status
			Analog O/P C Status
			APP1 Status
			APP2 Status
			APP3 Status
			APP4 Status
	Commands Method		
		Common Action	
		HOLD Output A	
		HOLD Output B	
		HOLD Output C	
		Alarm Action	
		Exit	

- Detailed Setup Menu
  - Physical IO Menu
    - Current/Voltage Input Menu
      - mA#1 Input Menu
        - View Live Data Menu
        - Setup Menu
          - Range Info Menu
        - View Cal Table Menu
        - Calibrate Input
      - mA#2 Input Menu
        - View Live Data Menu
        - Setup Menu
          - Range Info Menu
        - View Cal Table Menu
        - Calibrate Input
      - Vdc#1 Input Menu
        - View Live Data Menu
        - Setup Menu
          - Range Info Menu
        - View Cal Table Menu
        - Calibrate Input
      - Vdc#2 Input Menu
        - View Live Data Menu
        - Setup Menu
          - Range Info Menu
        - View Cal Table Menu
        - Calibrate Input
    - Digital Input Menu
      - Digin #1 Menu
        - View Menu
        - Setup Digin #1 Menu
      - Digin #2 Menu
        - View Menu
        - Setup Digin #2 Menu

Detailed Setup Menu				
	Physical IO Menu			
		Current Output Menu		
			Current Output A Menu	
				View Live Data Menu
				Setup Menu
				View Cal Table Menu
				Calibrate Output
				Test Output Menu
			Current Output B Menu	
				View Live Data Menu
				Setup Menu
				View Cal Table Menu
				Calibrate Output
				Test Output Menu
			Current Output C Menu	
				View Live Data Menu
				Setup Menu
				View Cal Table Menu
				Calibrate Output
				Test Output Menu
		Relay Output Menu		
			Relay A Menu	
				View Menu
				Setup Menu
			Relay B Menu	
				View Menu
				Setup Menu

- Detailed Setup Menu
  - Detector Menu
    - Detector #1 Menu
      - Setup Menu
        - HV Control Menu
        - Time Constants Menu
        - Dynamic Tracking Menu
        - X-Ray Threshold Menu
      - Counts Menu
      - mA Input Menu
        - View Live Data Menu
        - Setup Menu
          - Range Info Menu
        - View Cal Table Menu
        - Analog Input Calibration
      - RTD Input Menu
        - View Live Data Menu
        - Setup Menu
          - Range Info Menu
        - View Cal Table Menu
        - Analog Input Calibration
      - Status Menu
        - Voltages Menu
        - Status Menu
          - Err#1
          - Err#2
          - SWErr
          - System
        - Other Info Menu

Detailed Setup Menu					
	Detector Menu				
		Detector #1 Menu			
			Diagnosis Menu		
				HV Info Menu	
				Status Menu	
					SysErr
					InitErr
					RuntimeErr
				Counts Menu	
				CPLD Counts Menu	
				Temperatures Menu	
		Detector #2 Menu			
		Detector #3 Menu			
		Detector #4 Menu			
	Application Menu *(Density or Level)*				
		APP1:Density Menu			
			APP1:Setup Menu		
				Density Setup Menu	
					Material Setup
					Meas#1 Setup
					Pipe Info
				Input Config Menu	
					Density
					Temperature
					Pressure
					Flow
					Bulk Solids
				Temp Compensation Menu	
					Eqn1 Coeffs
					Eqn2 Coeffs
				Additional Measurements	
				DET1:Source	
				DET1:Counts	

Detailed Setup Menu					
	Application Menu *(Density or Level)*				
		APP1:Density Menu			
			Standardization Menu		
				Standardize	
			Gauge Calibration Menu		
				View Cal Points Menu	
				Slope Correction Factor Method	
				Calibrate	
			Totals Menu		
				Enable All Totalizers	
				Tot#1 Setup	
				Tot#2 Setup	
				Tot#3 Setup	
				Tot#4 Setup	
			Actions Menu		
			Process Alarms Menu		
				Process Alarms 1-8	
					Process Alarm 1 Menu
					Process Alarm 2 Menu
					Process Alarm 3 Menu
					Process Alarm 4 Menu
					Process Alarm 5 Menu
					Process Alarm 6 Menu
					Process Alarm 7 Menu
					Process Alarm 8 Menu

Detailed Setup Menu					
	Application Menu (Density or Level)				
		APP1:Density Menu			
			Process Alarms Menu		
				Process Alarms 9-16	
					Process Alarm 9 Menu
					Process Alarm 10 Menu
					Process Alarm 11 Menu
					Process Alarm 12 Menu
					Process Alarm 13 Menu
					Process Alarm 14 Menu
					Process Alarm 15 Menu
					Process Alarm 16 Menu
				Status Menu	
	Application Menu (Density or Level)				
		APP2:Level Menu			
			APP1:Setup Menu		
				Level Setup Menu	
				Additional Measurements Menu	
				DET1:Source	
				DET1:Counts	
			Standardization Menu		
				Standardize	
			Gauge Calibration Menu		
				View Cal Points Menu	
				Edit Point	
				Delete Point	
				Calibrate	
			Actions Menu		

Detailed Setup Menu					
	Application Menu (Density or Level)				
		APP2:Level Menu			
			Process Alarms Menu		
				Process Alarms 1-8	
					Process Alarm 1 Menu
					Process Alarm 2 Menu
					Process Alarm 3 Menu
					Process Alarm 4 Menu
					Process Alarm 5 Menu
					Process Alarm 6 Menu
					Process Alarm 7 Menu
					Process Alarm 8 Menu
				Process Alarms 9-16	
					Process Alarm 9 Menu
					Process Alarm 10 Menu
					Process Alarm 11 Menu
					Process Alarm 12 Menu
					Process Alarm 13 Menu
					Process Alarm 14 Menu
					Process Alarm 15 Menu
					Process Alarm 16 Menu
				Status Menu	
		APP3:Density/Level			
		APP4:Density/Level			

Review Menu

Table 5-10.

Review Menu	
	Device Vars
	APP1: Review
	APP2: Review
	APP3: Review
	APP4: Review

Chapter 6
Physical Analog I/O Calibration

This chapter provides information on how to calibrate the physical analog inputs and outputs available on the MS2011.

The MS2011 can support up to 12 analog inputs and 3 analog outputs.

Analog inputs are available on the following cards in the MS2011:

- Two 4-20 mA on the CPU card
- Two 0-10 V on the CPU card
- One 4-20 mA for each detector (maximum of four)
- One RTD input for each detector (maximum of four)

Analog outputs are available on the following cards in the MS2011:

- One 4-20 mA on the CPU card
- Two 4-20 mA on the ISIO card

The HART DD can be used to both configure and calibrate all inputs and outputs available on the MS2011.

Analog Input Calibration

The calibration of each of the 12 possible analog inputs of the MS2011 will always follow the same procedure. This example shows the calibration of analog input mA#1.

1. Go to **Online Menu > Device Setup > MS2011 Setup > Detailed Setup > Physical IO > Current/Vdc Input > mA#1 Input > Calibrate Input**.

2. Accept the warning and remove the loop from any control functions in may be performing.

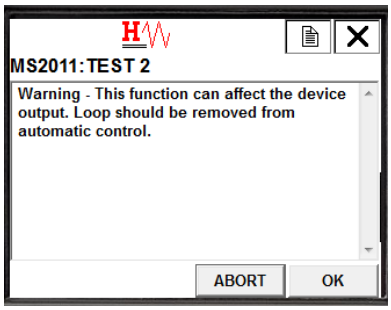


Figure 6-1.

3. Select a two- or three-point input calibration.

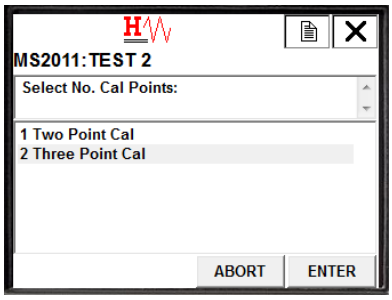


Figure 6-2.

4. Provide the minimum mA input required using a current source (or similar). Press **OK** to continue.

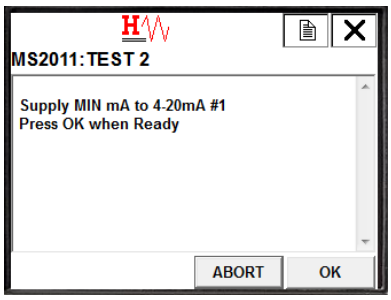


Figure 6-3.

5. The raw minimum value seen by the MS2011 will be displayed. Press **OK** when it is stable.

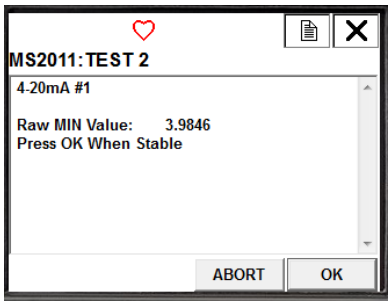


Figure 6-4.

6. Enter the actual value applied to the input of the MS2011.

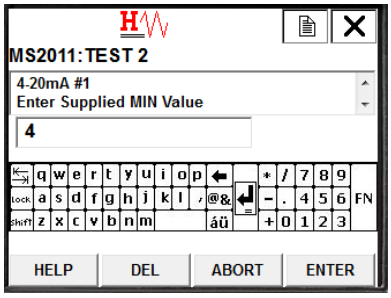


Figure 6-5.

7. Repeat steps 4, 5 and 6 for the mid calibration point, if a three-point calibration is selected, and the max calibration point, supplying the correct current input when requested.

8. After accepting the maximum calibration point, the calibration table within the MS2011 is updated and the database is written to FLASH memory.

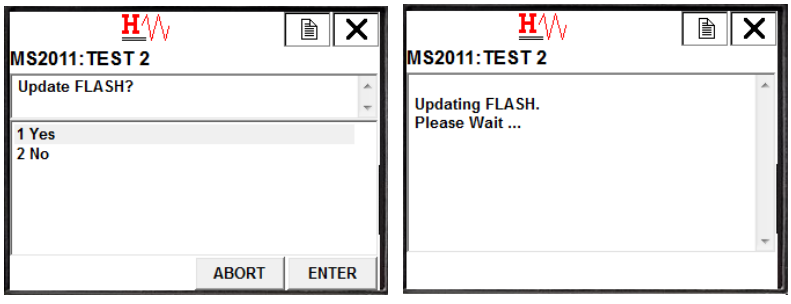


Figure 6-6.

9. The loop may be returned to automatic control, if it is required and input calibration method is complete.

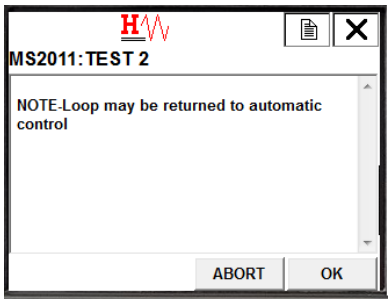


Figure 6-7.

Analog Output Calibration

The physical current outputs on the MS2011 are situated on both the CPU and ISIO cards. All of these outputs are configured and calibrated using the HART DD.

Follow the steps below to calibrate Output A using the 475 HHT.

1. Go to **Online Menu > Device Setup > MS2011 Setup > Detailed Setup > Physical IO > Current Output > Current Output A > Calibrate Output**.

2. Accept the warning and remove the loop from any control functions it may be performing.

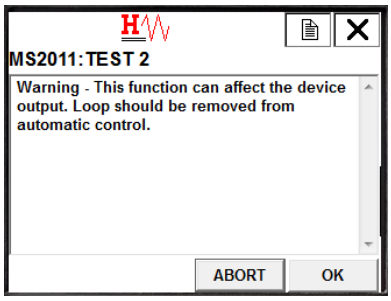


Figure 6-8.

3. Select the number of required calibration points. Enter **1** for a two-point calibration or **2** for a three-point calibration.

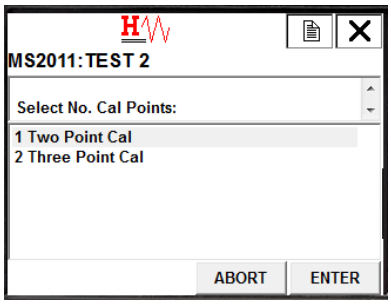


Figure 6-9.

4. Type in the required minimum current to be sent to the output and press Next. The MS2011 will then force what it thinks is the required mA value on the output.

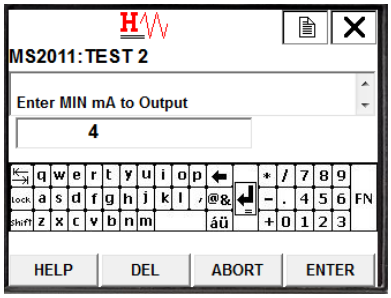


Figure 6-10.

5. Using a calibrated multi-meter or other measuring device, read the current output by the MS2011 and enter the measured value.

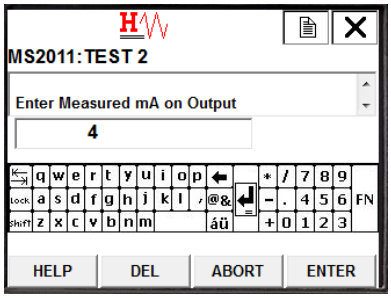


Figure 6-11.

6. Repeat steps 4 and 5 for the mid calibration point (three-point calibration only) and maximum calibration point.

7. After the maximum calibration point has been entered, enter **1** to accept the calibration or **2** to reject the calibration.

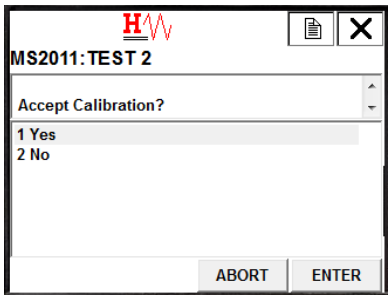


Figure 6-12.

8. After accepting the calibration, the table for the analog output will be updated. Now the loop may be returned to automatic control.

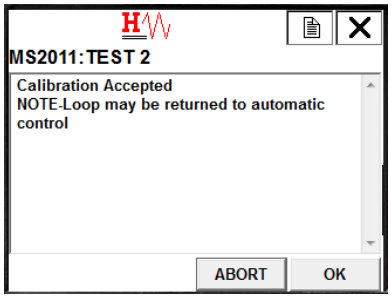


Figure 6-13.

9. Finally, the user is asked to update the FLASH memory within the MS2011.

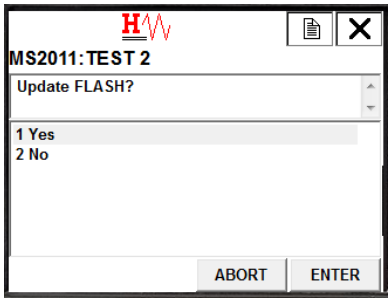


Figure 6-14.

10. Should the user select **1** (Yes), the FLASH memory within the MS2011 is updated.

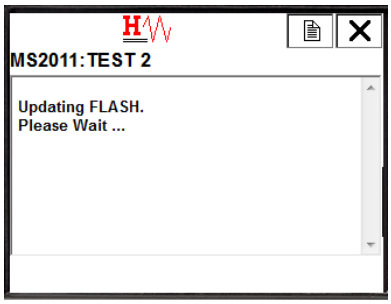


Figure 6-15.

Chapter 7
Level Standardization & Calibration

This chapter provides instructions on how to use the 475 HHT DD methods and menus to standardize and calibrate the MS2011 for a level application.

Note For detailed discussion on standardization and calibration, reference the LevelPRO user guide, P/N 1-0702-039. ▲

Perform Standardization

Note It is best practice to empty the tank and standardize during the initial setup process. ▲

Follow the below procedure to perform standardization.

1. Empty the tank entirely, or to a level that is well below the bottom of both the source and detector.

2. Open the shutter(s).

Note The shutter(s) will need to be open and the vessel empty (maximum radiation on the detector) for at least 30 minutes prior to performing the standardization or calibration cycle. This wait time is necessary for proper orientation of the gauge. ▲

3. Go to **Online Menu > Device Setup > MS2011 Setup > Detailed Setup > Application > APPn:Level > APPn:Standardization**.

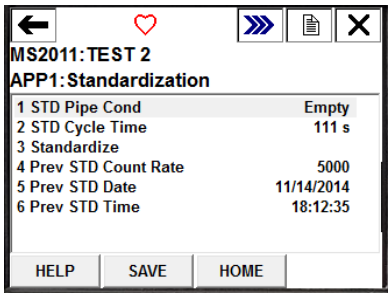


Figure 7-1.

4. Select the required pipe/vessel condition, usually Empty for standardization, and the standardization cycle time, in seconds.

5. Select **Standardize** to begin the standardization process, at which point the user is asked to remove the loop from any automatic control. Press **OK**.

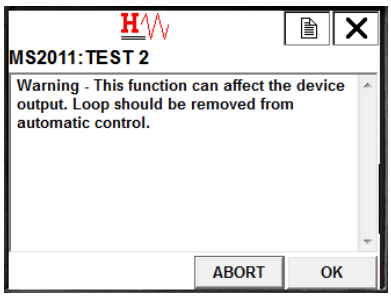


Figure 7-2.

6. Select **Yes** to begin standardization or **No** to abort.

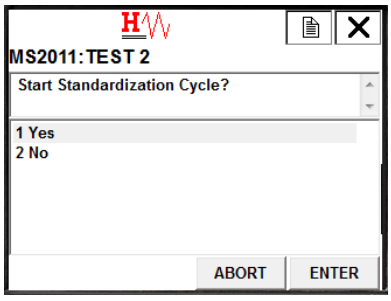


Figure 7-3.

7. The DD will wait for standardization to begin.

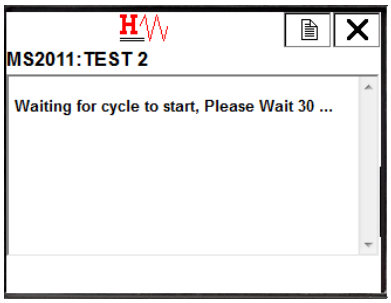


Figure 7-4.

8. Once standardization begins, the time remaining will be displayed. Enter **3** to refresh the displayed cycle time, **1** to finish the standardization cycle early or **2** to interrupt and abort the standardization cycle.

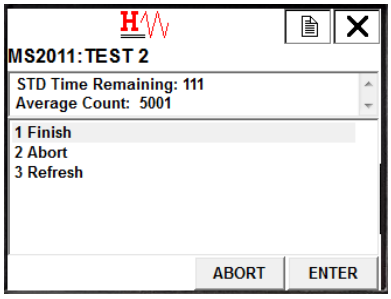


Figure 7-5.

9. If **Refresh** is selected and the cycle time remaining has reached zero, or if the user selected **Finish**, the method will display that the cycle is complete.

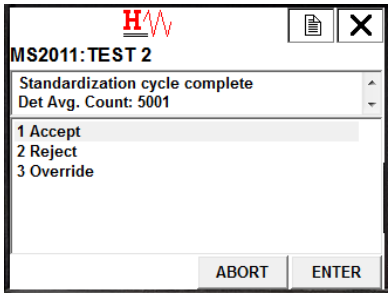


Figure 7-6.

   a. Selecting **1** (Accept) accepts the average count value for the standardization and gives the user the option to update the database within the MS2011 FLASH memory.

   b. Selecting **2** (Reject) rejects the standardization.

   c. Selecting **3** (Override) allows the user to enter an override value for the detector average count, after which the standardization is accepted. The user is then given the option to update the database within the MS2011 FLASH memory.

Perform Calibration

Caution If you do not calibrate the gauge, some tanks might overflow without reaching the tank full level. This can occur if the radiation measured at the detector when the tank is full (process level at the top of the detector) is greater than the assumed background radiation. If your application requires accurate level measurements, perform a calibration. ▲

Note It is a good idea to calibrate at the tank-full level first, then at several intermediate levels, especially where the tank or gauge geometry changes. ▲

Follow these steps to perform a calibration.

1. If necessary, set up the gauge.

2. Standardize according to Perform Standardization.

3. Fill the tank with process material to the particular level of interest. Measure the level accurately and keep it as steady as possible.

4. Before starting the calibration cycle, ensure the cycle time has been intered, in seconds, by selecting the variable **CAL Cycle Time** in the calibration menu, via **Online Menu > Device Setup > MS2011 Setup > Quick Setup > APPn:Quick Setup > APPn:Gauge Calibration**.

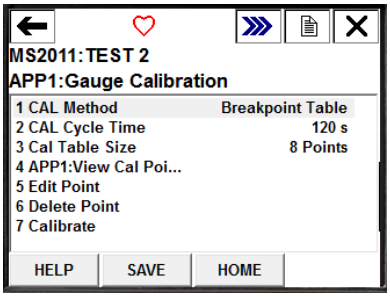


Figure 7-7.

5. Select **Calibrate** to start the calibration and press **OK**.

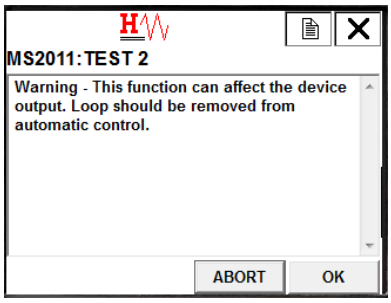


Figure 7-8.

6. Select the point to be calibrated. If no prior calibration has been performed, the first point will be calibrated. Should calibration points already exist in the calibration table, the user must select the last point in the list to calibrate a new point.

   In the figure below, there are already eight points in the calibration table, so the ninth point is selected.

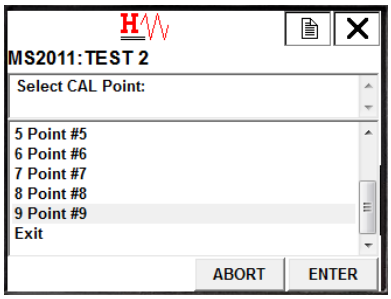


Figure 7-9.

7. Enter the level for the calibration point and press **Enter**.

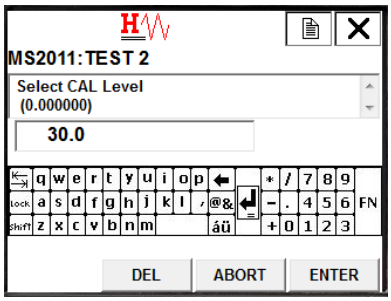


Figure 7-10.

8. Press **1** to start calibration or **2** to abort.

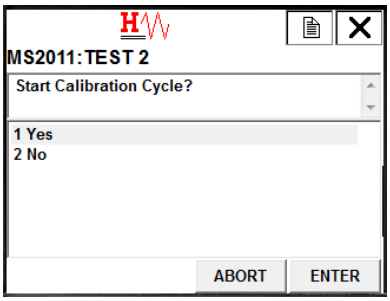


Figure 7-11.

9. DD will wait for the MS2011 to begin its calibration cycle.

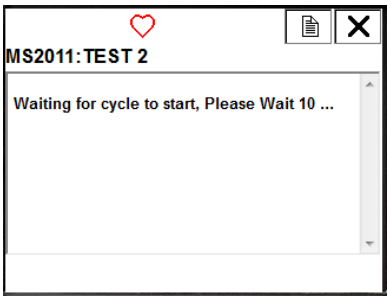


Figure 7-12.

10. Once started, the calibration cycle progress is displayed on the screen. Press **3** (Refresh) to update the cycle information, **1** (Finish) to complete the calibration cycle early or **2** (Abort) to exit calibration.

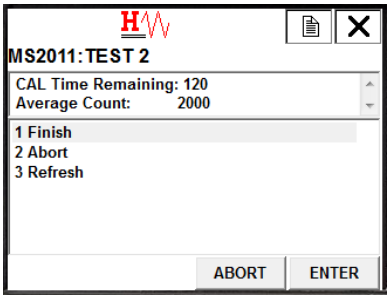


Figure 7-13.

11. If **Refresh** is selected and the cycle time has reached zero, or if the user chooses to finish the calibration early, the results of the calibration cycle are displayed. Select **1** to accept, **2** to reject, or **3** to override the calibration counts.

Note Should the cycle time not be at 0 after refreshing, the cycle time and average count are updated at the top of the screen. ▲

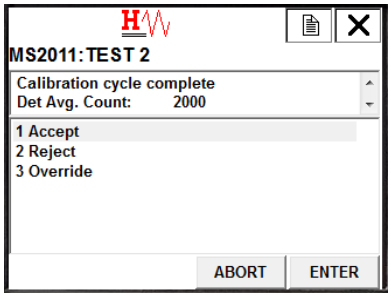


Figure 7-14.

12. After accepting the calibration, the display will indicate that the calibration point is written to the MS2011. The 475 will then read the calibration table so the order of calibration points in its internal table is correct.

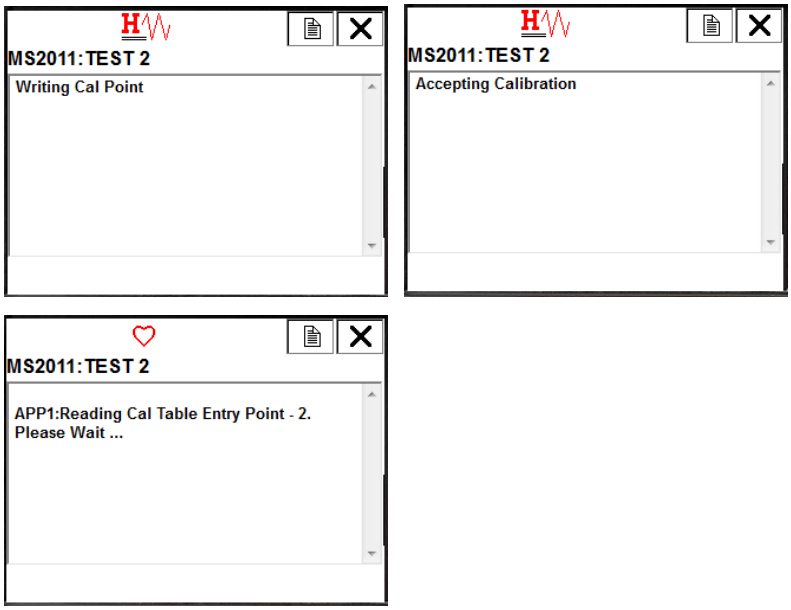


Figure 7-15.

13. After the calibration point is written, the user has the option of updating the internal FLASH memory of the MS2011. Select **1** (Yes) to update, or **2** (No) to continue without updating.

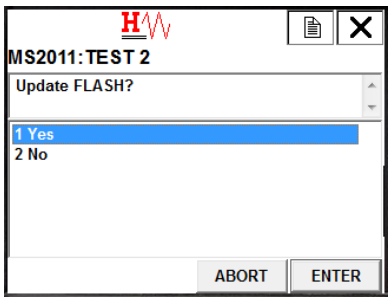


Figure 7-16.

Note By not updating FLASH memory, the new calibration table may be lost upon a power cycle of the MS2011. ▲

Note Should the user wish to override the detector average count, the new value for the average count should be entered. Upon entry, the calibration point is accepted in the sequence shown in step 12, followed by a request to update the FLASH as shown in step 13. ▲

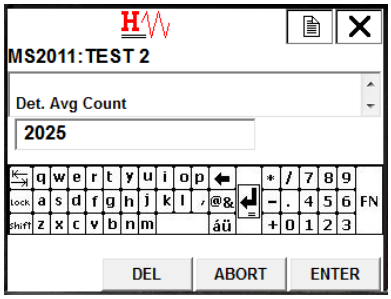


Figure 7-17.

Chapter 8
Density Standardization & Calibration

This chapter provides instruction on how to use the 475 HHT DD methods and menus to standardize and calibrate the MS2011 for a density application.

Note For detailed discussion on standardization and calibration, reference the DensityPRO Measurement Systems user guide, P/N 1-0702-016. ▲

Perform Standardization

Follow this procedure to perform standardization.

1. Put the gauge head and pipe in one of the following standard configurations. Use the same standard configuration during every standardization.
   a. Pipe full of carrier
   b. Pipe empty
   c. Pipe full of process material

2. Open the source shutter.

3. From the Online Menu go to **Device Setup > MS2011 Setup > Detailed Setup > Application > APPn:Density > APPn:Standardization**.

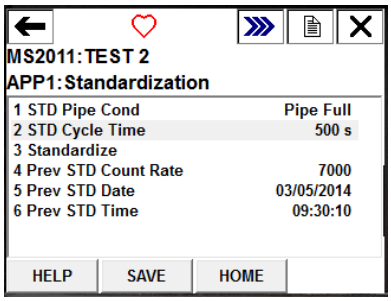


Figure 8-1.

4. Confirm STD Pipe Condition is correct and enter the required standardization cycle time, in seconds.

5. Select **Standardize**, and, when prompted, remove the loop from automatic control.

6. Enter the standardization density in g/cc.

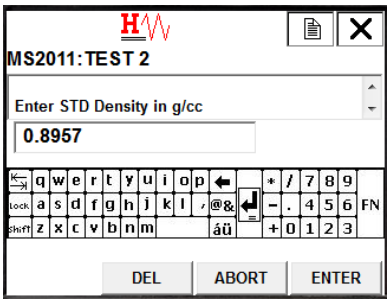


Figure 8-2.

7. Select **1** to start the standardization cycle or **2** to abort standardization.

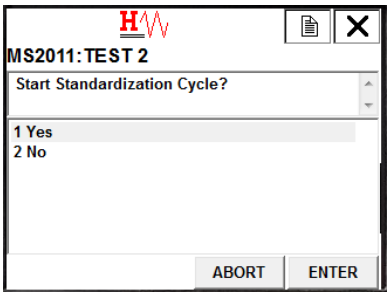


Figure 8-3.

8. If the user selects **Yes**, the DD will wait for the standardization to begin.

Note If standardization is not commenced after 30 seconds, it will be aborted. ▲

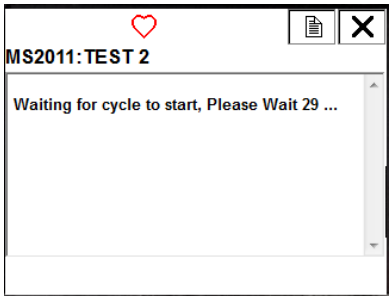


Figure 8-4.

9. Once standardization begins, the time remaining and average detector count will be displayed. Select **1** to finish the standardization cycle early, **2** to abort the standardization cycle or **3** to refresh the displayed standardization information.

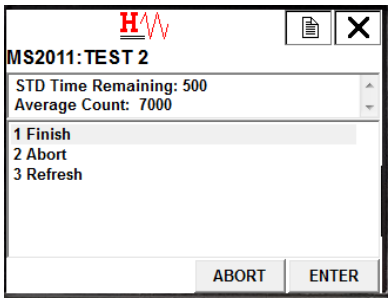


Figure 8-5.

10. If, after selecting **Refresh**, the time remaining has reached zero, or if the user has selected **Finish** to end standardization early, the below screen will be displayed. Enter **1** to accept the displayed detector count, **2** to reject the detector count, or **3** to override the detector count with a user-entered value.

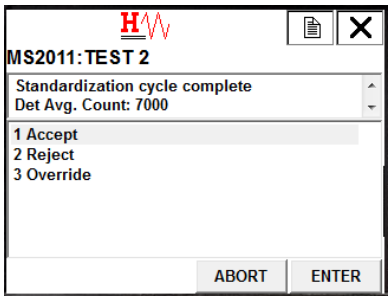


Figure 8-6.

11. After accepting the standardization, the standardization cycle will be accepted and written to the MS2011.

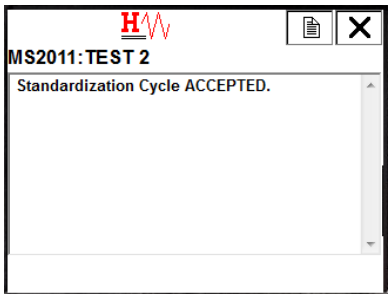


Figure 8-7.

12. In the event the user decides to override the Detector Average Count in step 10, a new value must be entered before the standardization cycle is accepted.

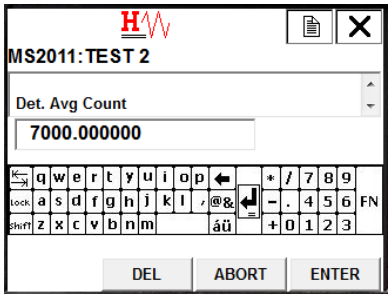


Figure 8-8.

13. After accepting the standardization cycle, the user is given the option to update the FLASH memory in the MS2011 database.

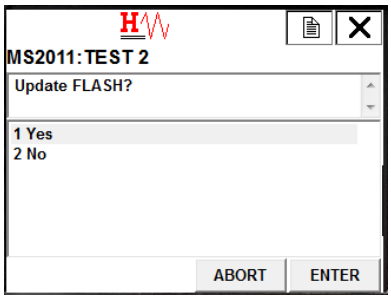


Figure 8-9.

Note Should the FLASH memory not be updated, the standardization information may be lost upon a power cycle of the MS2011. ▲

Perform Calibration

The steps below describe how to calibrate the gauge for a density application.

1. Standardize according to Perform Standardization.

2. Fill the pipe with process material at a density in the range of interest. Keep the process density as stable as possible during the calibration measurement, and be ready to take samples of the material during the calibration cycle.

3. From the Online Menu, go to **Device Setup > MS2011 Setup > Detailed Setup > Application > APPn:Density > APPn:Gauge Cal**.

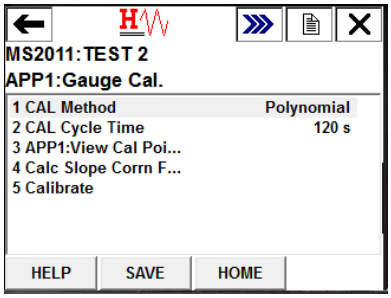


Figure 8-10.

4. Ensure CAL Method is set for Polynomial, and set the required CAL Cycle Time in seconds.

5. Select **Calibrate** and, when prompted, remove the loop from automatic control.

6. Select the calibration point to be performed.

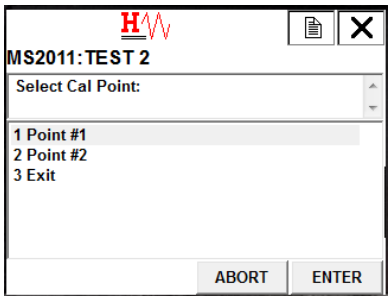


Figure 8-11.

Note For a polynomial calibration, Point #1 is generally the standardization value. ▲

7. After selecting either Point #1 or Point #2, enter the required calibration density in g/cc.

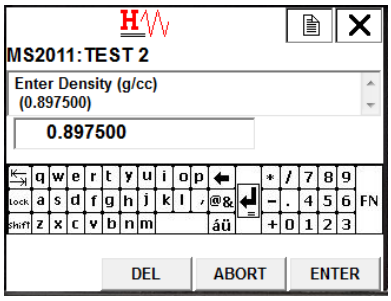


Figure 8-12.

8. After entering the density, the user is prompted to begin the calibration cycle. Select **1** to begin calibration or **2** to abort.

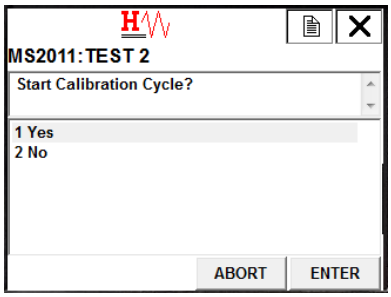


Figure 8-13.

9. Upon selecting **1** (Yes), the DD will wait 10 seconds for the calibration to begin.

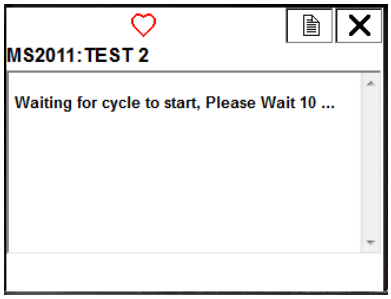


Figure 8-14.

10. Once started, the calibration cycle progress is displayed on the screen. Press **3** to refresh the cycle information, **1** to finish the calibration cycle early, or **2** to abort the calibration.

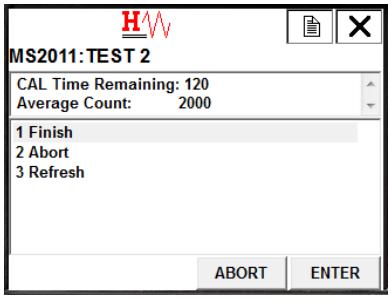


Figure 8-15.

11. If, after selecting **Refresh**, the time remaining has reached zero, or if the user has selected **Finish** to end calibration early, the results of the calibration cycle are displayed. Enter **1** to accept the calibration counts, **2** to reject the calibration counts, or **3** to override the calibration counts.

Note Should the cycle time not have reached zero when refreshed, the cycle time and average count are updated at the top of the screen. ▲

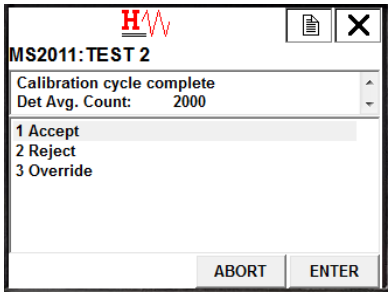


Figure 8-16.

12. After accepting the calibration, the display will indicate that the calibration point is accepted and written to the MS2011.

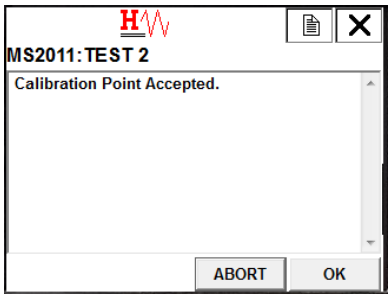


Figure 8-17.

13. In the event the user decides to override the Detector Average Count in step 11, a new value must be entered before the calibration cycle is accepted.

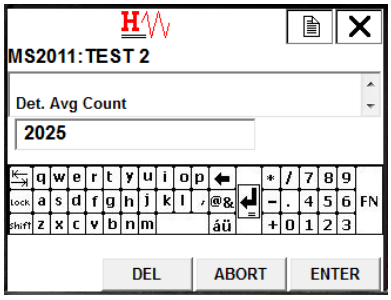


Figure 8-18.

14. After the calibration point is written, the user is given the option of updating the internal FLASH memory in the MS2011. Select **1** to update the FLASH memory or **2** to continue without updating.

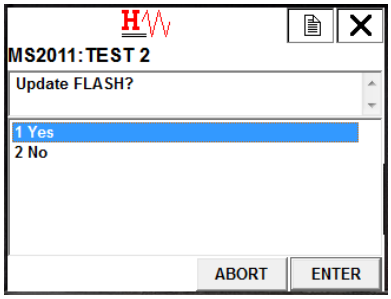


Figure 8-19.

Note By not updating the FLASH memory, the new calibration table may be lost upon a power cycle of the MS2011. ▲

Chapter 9
Menu Samples

Online Menu

The Online menu is the initial menu displayed when connecting to the MS2011.

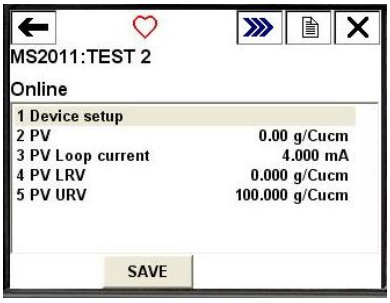


Figure 9-1.

Device Setup Menu

The Device Setup menu allows access to the full configuration of the MS2011.

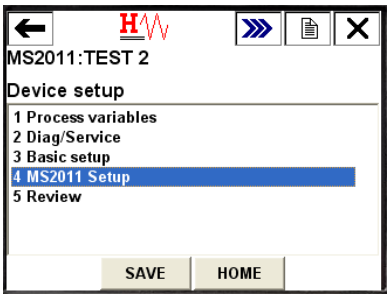


Figure 9-2.

Process Variables Menu

This menu displays four process variables and allows the user to configure the source for process variables.

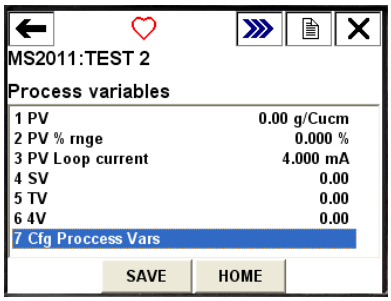


Figure 9-3.

Configure Process Variables Menu

Up to four process variables can be configured and allocated to any of the four variables for any application.

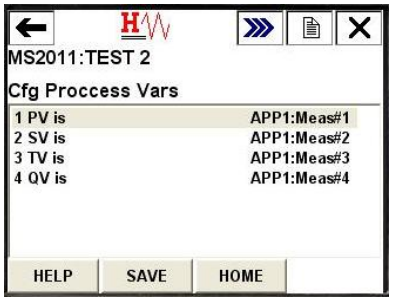


Figure 9-4.

Diagnostic/ Service Menu

Diagnostic menus allow a user to perform MS2011-specific commands, calibrate and test the HART current loop and view the current MS2011 status.

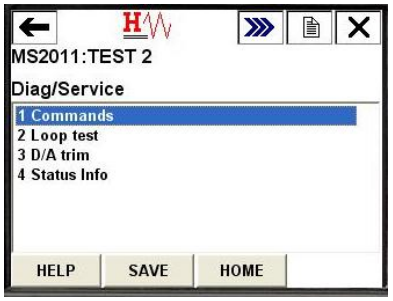


Figure 9-5.

Commands Method

This method enables a user to perform specific commands to control the operation of the MS2011.

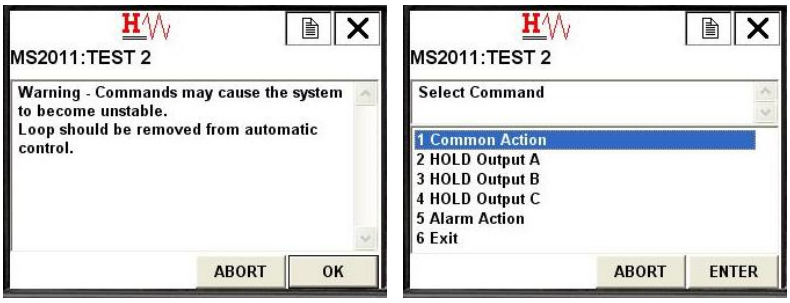


Figure 9-6.

Loop Test Method

This method allows a user to provide a fixed current output on the HART 4-20 mA current loop.

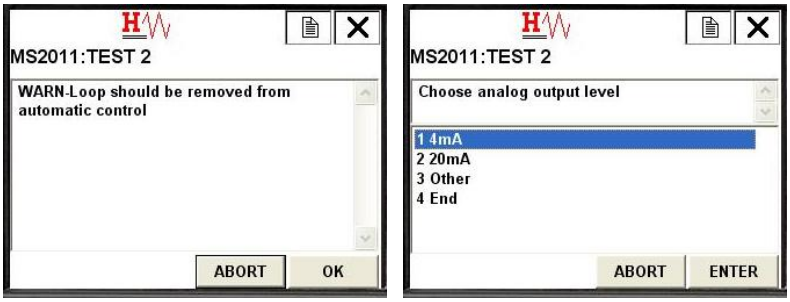


Figure 9-7.

D/A Trim Method

This method is used to perform a calibration of the HART 4-20 mA current loop (Output C of the MS2011).

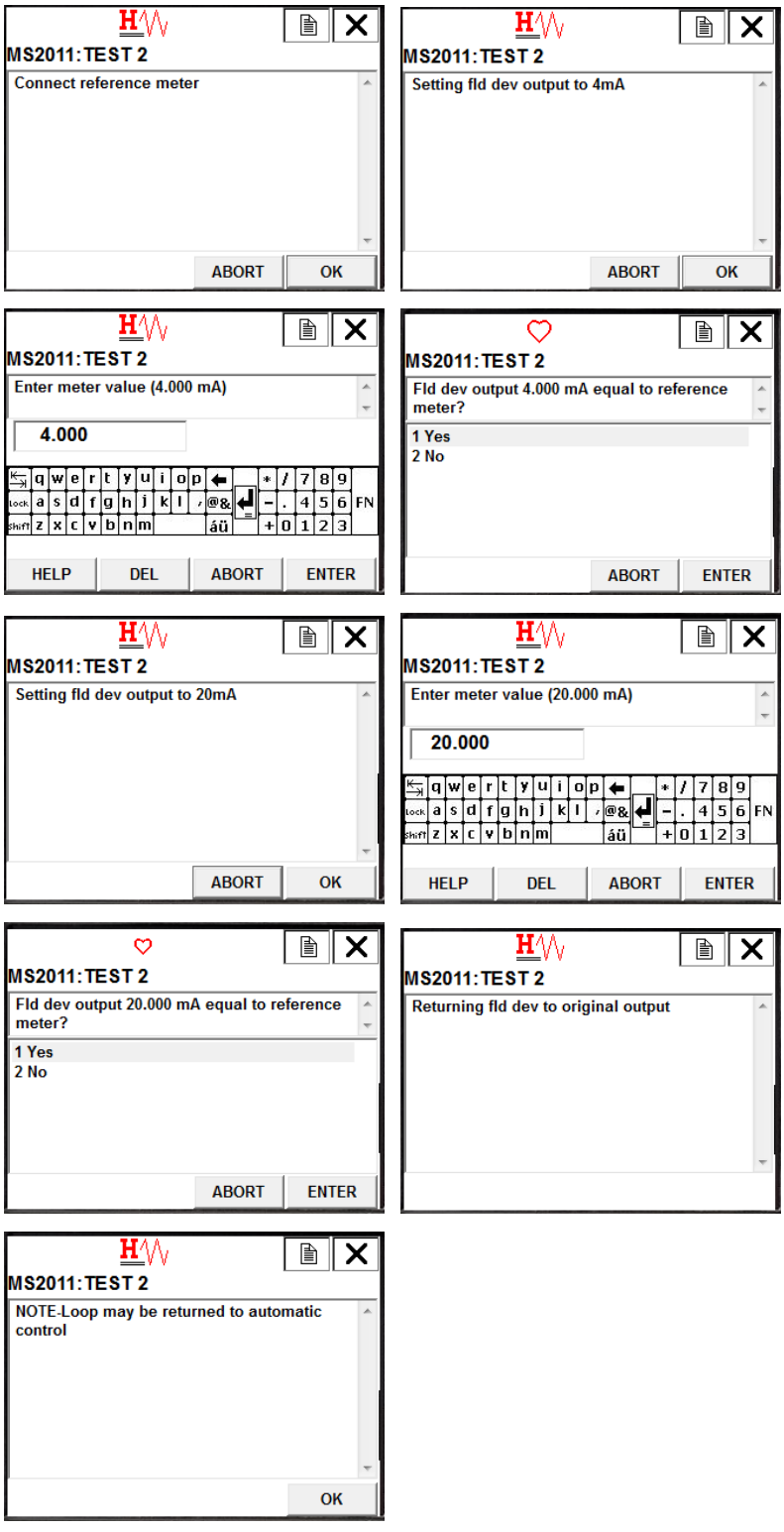


Figure 9-8.

Status Info Menu

The Status Info menu is used to display the current status of the MS2011. A non-zero value indicates an alarm status is set. Selecting the status item will display the meaning of each of the bits within each byte.

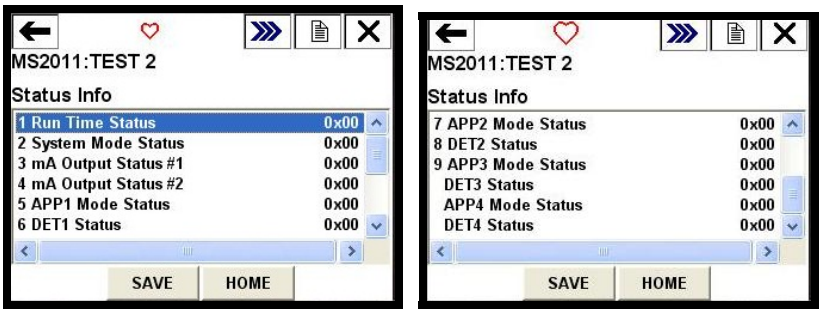


Figure 9-9.

Basic Setup Menu

The Basic Setup menu is used to configure the basic HART information for the MS2011.

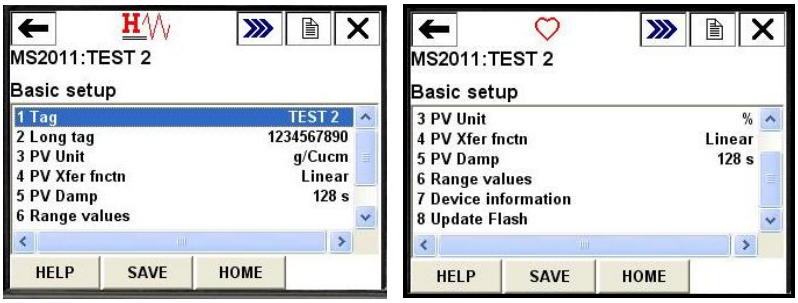


Figure 9-10.

Range Values Menu

The Range Values menu configures the primary variable upper and lower range values for the HART 4-20 mA current loop.

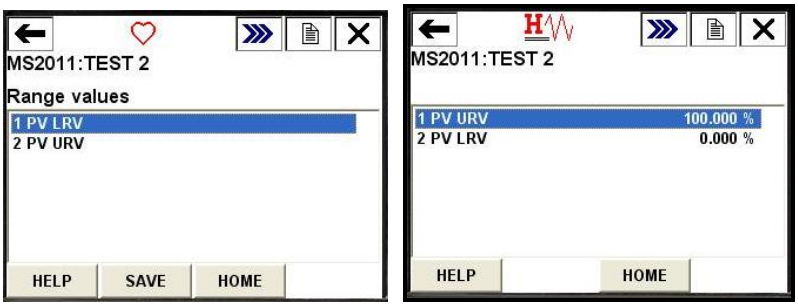


Figure 9-11.

Device Information Menu

The Device Information menu allows a user to configure the standard HART information for the MS2011.

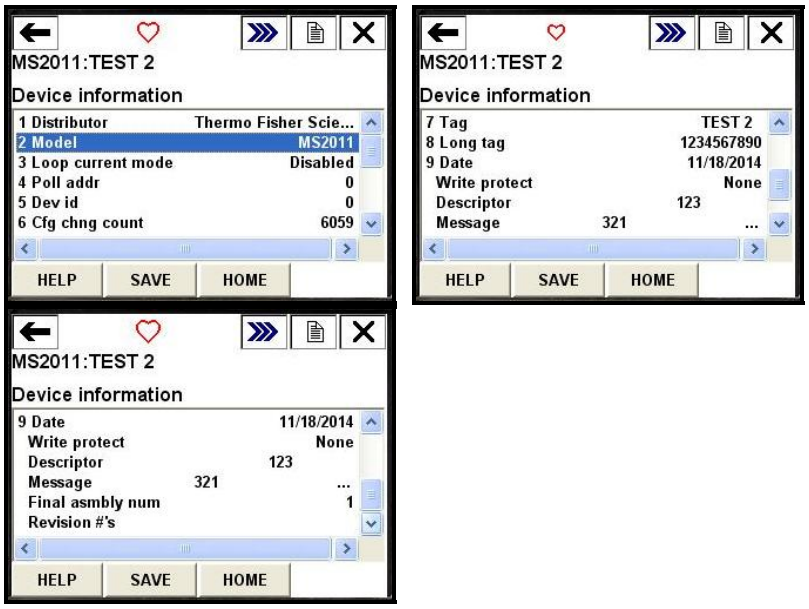


Figure 9-12.

Update FLASH Method

The Update FLASH menu is used to allow the configuration changes within the MS2011 to be written to FLASH memory.

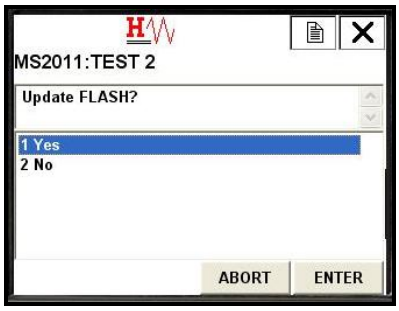


Figure 9-13.

Note It is important that this method is performed after a change has been made to the configuration of the MS2011 database. ▲

MS2011 Setup Menu

The MS2011 Setup menu is used to access the full configuration of the device-specific configuration of the MS2011.

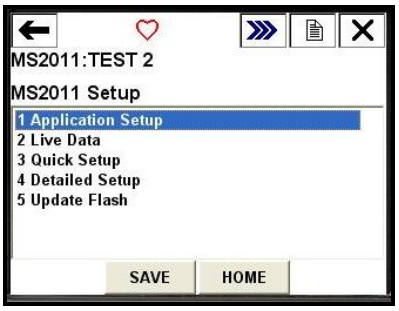


Figure 9-14.

Application Setup Menu

The Application Setup menu configures up to four separate applications on the MS2011. Each application can be configured independently for either level or density measurement. Generally, an integrated unit will only have a single application configured.

Figure 9-15.

App1:Setup Menu

The Application 1 Setup menu allows the configuration of either a level or density application. Should a change be made to either the density type or oilfield units, the application's configuration within the MS2011 will reset to a preset default condition.

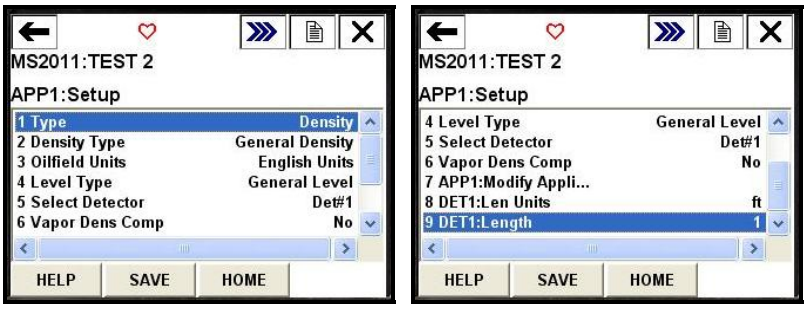


Figure 9-16.

Note The setup screens for Applications 2, 3 and 4 are identical to Application 1, with the exception that the cascaded level option is only available on Application 1. ▲

Modify Application

The below method should be used when initially configuring an application. The method will step the user through the stages of setting up the application.

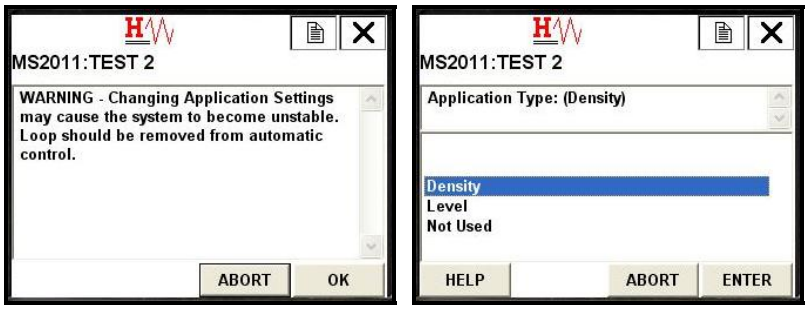


Figure 9-17.

Det Map

The Detector Map menu shows the available detectors present on the MS2011. For an integrated MS2011, only detector 1 will be present.

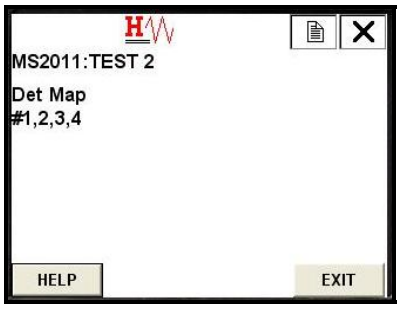


Figure 9-18.

Live Data Menu

This menu allows access to the measurement and totals for an application.

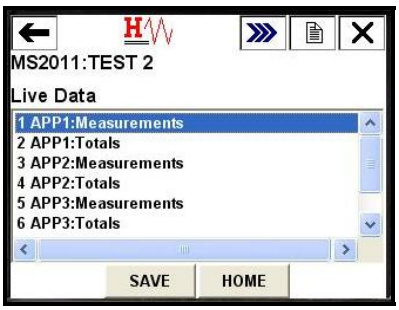


Figure 9-19.

Note Totals are not available for a level application, and so will not be available in the Live Data menu. ▲

Measurements Menu

The Measurements menu shows the live values for each of the configured menus for the application. Up to four measurements can be configured, so a maximum of four application measurements may be displayed.

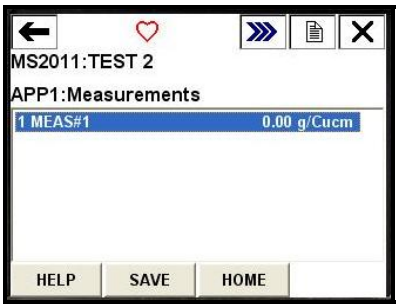


Figure 9-20.

Totals Menu

The four totalizers available for each density application are displayed on this menu.

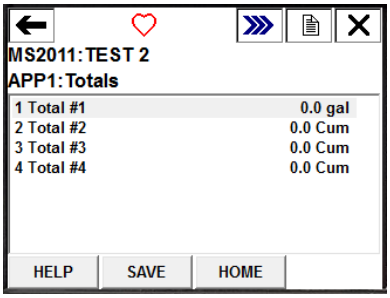


Figure 9-21.

Note Totals are not available for level applications. ▲

Quick Setup Menu

The Quick Setup menu allows a user to configure the basic configuration items for the quick setup of an application. Up to four applications can be configured via this menu.

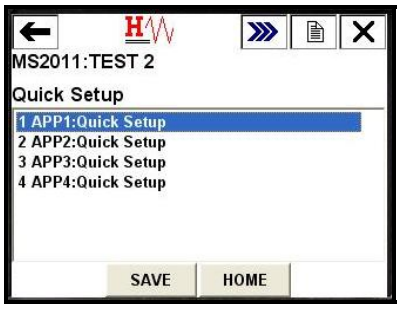


Figure 9-22.

Quick Setup, Density

The Quick Setup menu for density allows a user to configure the primary measurement and perform standardization and calibration to initially configure the application. Temperature compensation setup can also be configured via this menu.

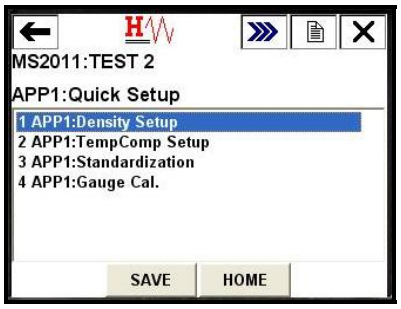


Figure 9-23.

Density Setup Menu

The Density Setup menu configures the primary measurement for the density application.

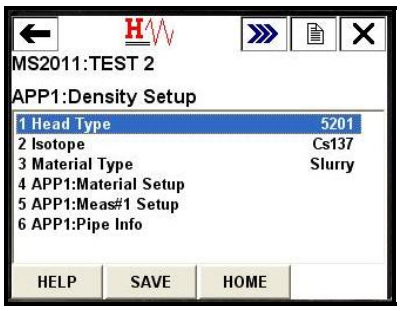


Figure 9-24.

Material Setup

This menu sets up the parameters for the process material of the density application.

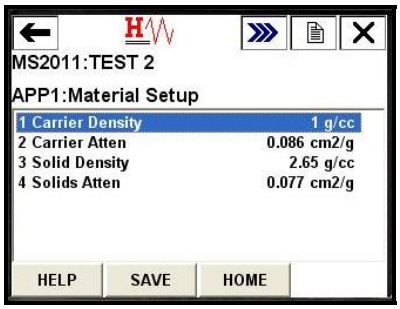


Figure 9-25. Slurry application

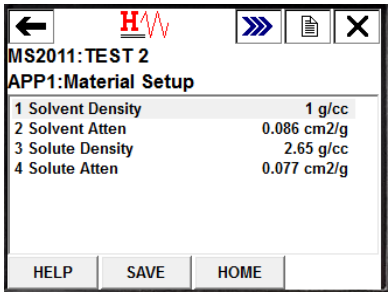


Figure 9-26. Solution application

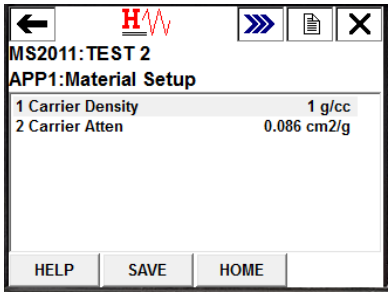


Figure 9-27. Single-phase application

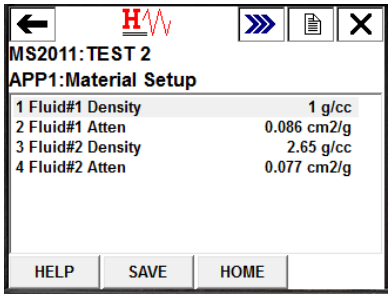


Figure 9-28. Emulsion application

Meas#1 Setup Menu

The Meas#1 Setup menu defines the variable type, units and displayed decimal places for the primary measurement of the density application.

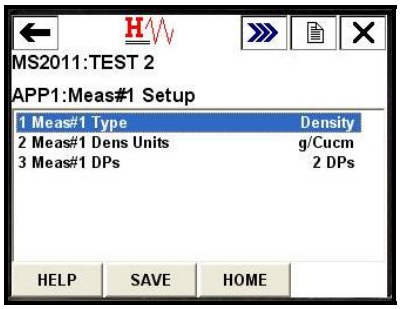


Figure 9-29.

Pipe Info Menu

The Pipe Info menu configures the pipe information for the application.

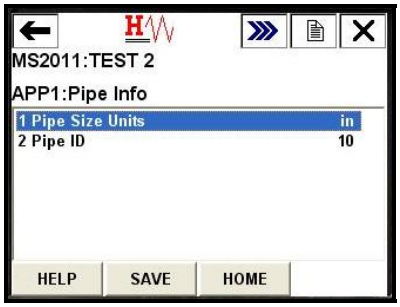


Figure 9-30.

TempComp Setup Menu

The Temperature Compensation Setup menu allows users to setup the various parameters for the temperature-compensated density calculation. Up to two polynomial compensation curves can be configured via this menu.

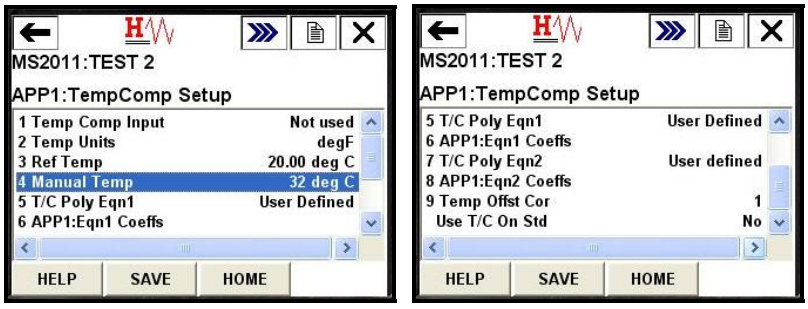


Figure 9-31.

Eqn1 Coeffs Menu

This menu allows the configuration of the four coefficients for the temperature compensation calculation of equation #1.

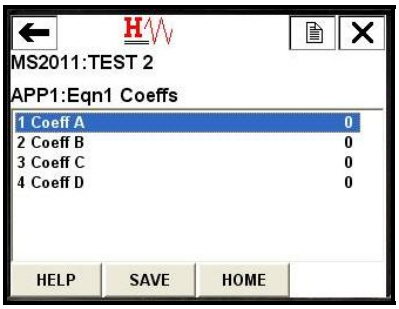


Figure 9-32.

Eqn2 Coeffs Menu

This menu allows the configuration of the three coefficients for the temperature compensation calculation of equation #2.

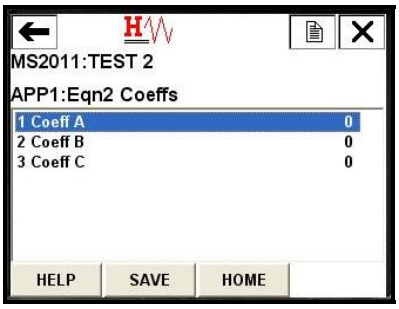


Figure 9-33.

Standardization Menu

This menu access the standardization parameters and methods. For a detailed explanation of the standardization method for density applications, see Perform Standardization.

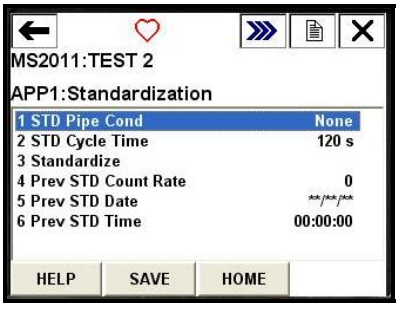


Figure 9-34.

Gauge Calibration Menu

This menu access the calibration parameters and methods. For a detailed explanation of the calibration method for density applications, see Perform Calibration.

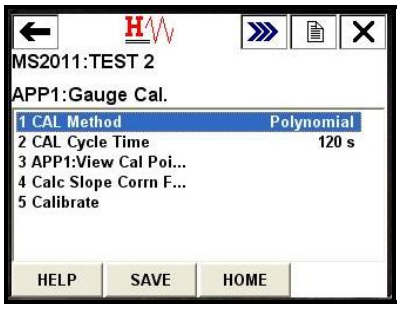


Figure 9-35.

View Cal Points Menu

The View Cal Points menu allows the user to view information on the two polynomial calibration points for the density application.

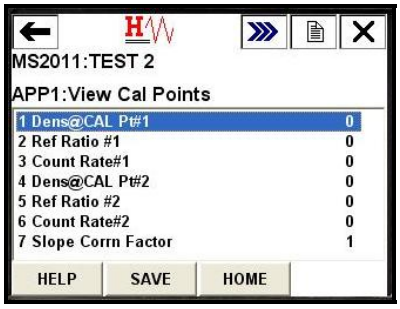


Figure 9-36.

Calc Slope Corrn Factor

The slope correction method can be used to recalculate the slope correction factor for the calibration table, should a value within the table be modified manually.

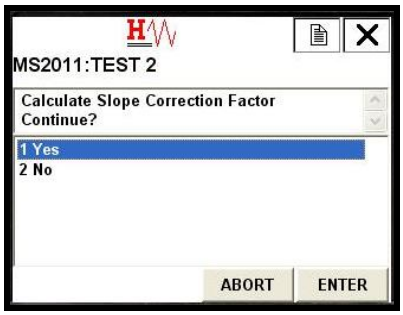


Figure 9-37.

Quick Setup, Level

The Quick Setup menu for level allows the user to configure the primary measurement and perform standardization and calibration to initially configure the application.

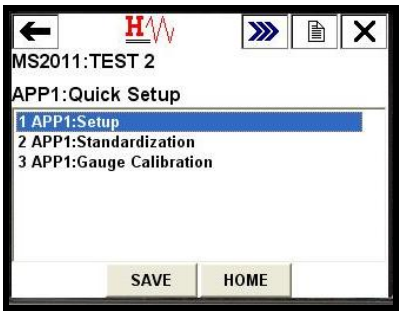


Figure 9-38.

Level Setup

The Level Setup menu allows access to menus for the full configuration of the level input.

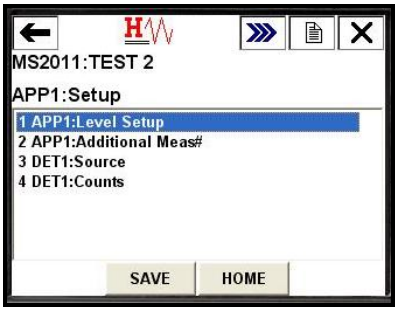


Figure 9-39.

Level Setup

The Level Setup menu sets up the basic primary configuration for a level measurement.

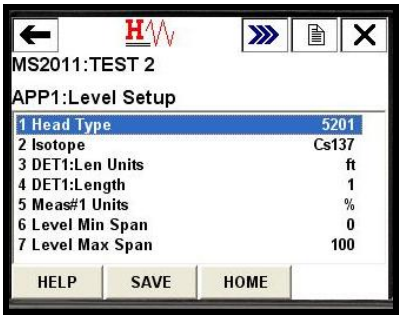


Figure 9-40.

- Additional Measurements

  The Additional Measurements menu allows the user to configure up to three other measurements based upon the primary level measurement.

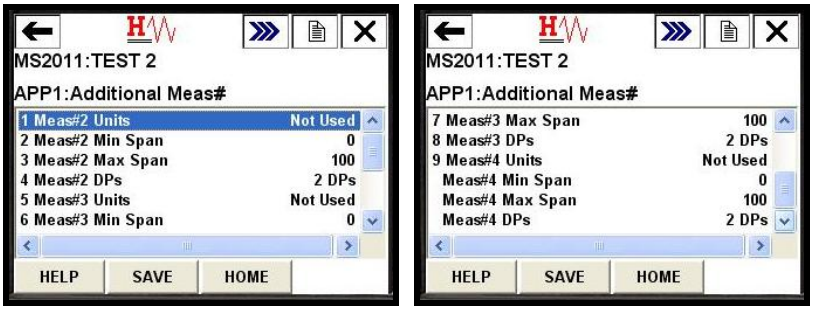


Figure 9-41.

- Source

  The Source menu allows for the configuration of the target source used by the level measurement.

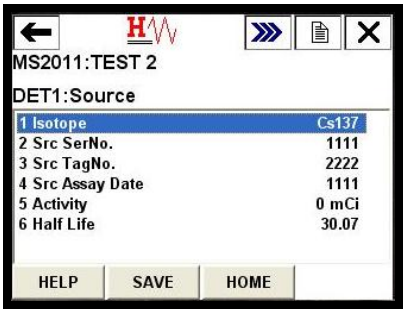


Figure 9-42.

- Counts

  The Counts menu provides information and configuration for the measured counts from the detector used for level measurement.

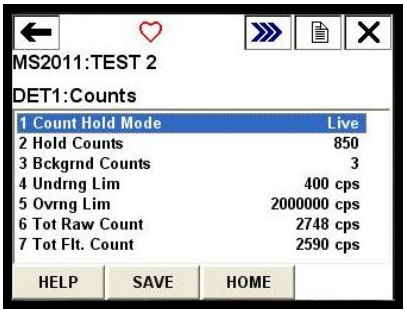


Figure 9-43.

Standardization Menu

This menu accesses the standardization parameters and methods. For a detailed explanation of the standardization method for level applications, see Perform Standardization.

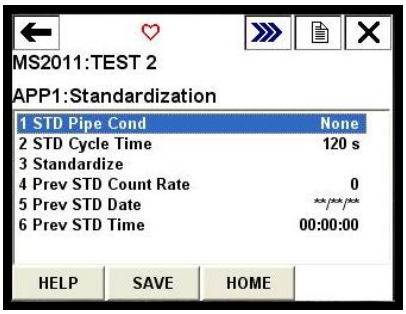


Figure 9-44.

Gauge Calibration

This menu accesses the calibration parameters and methods. For a detailed explanation of the calibration method for level applications, see Perform Calibration.

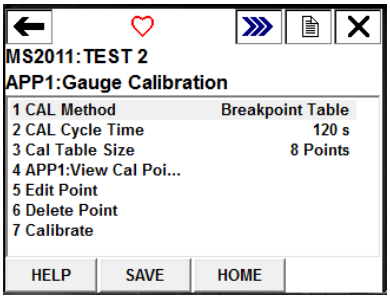


Figure 9-45.

View Cal Points

The Veiw Cal Points menu is used to view up to 10 breakpoint table entries for the level application.

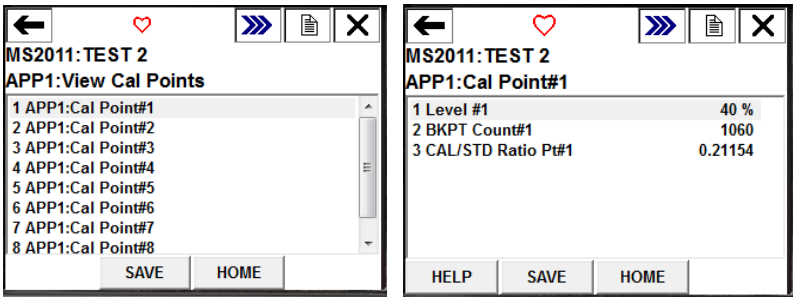


Figure 9-46.

Edit Point

The Edit Point method is used to modify a selected calibration point within the breakpoint table.

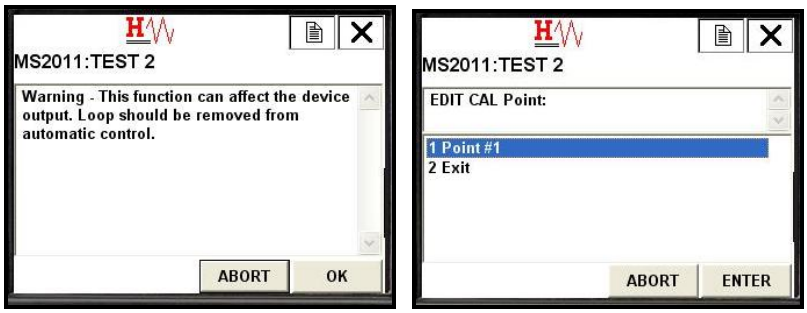


Figure 9-47.

Delete Point

The Delete Point method is used to remove a selected calibration point within the breakpoint table.

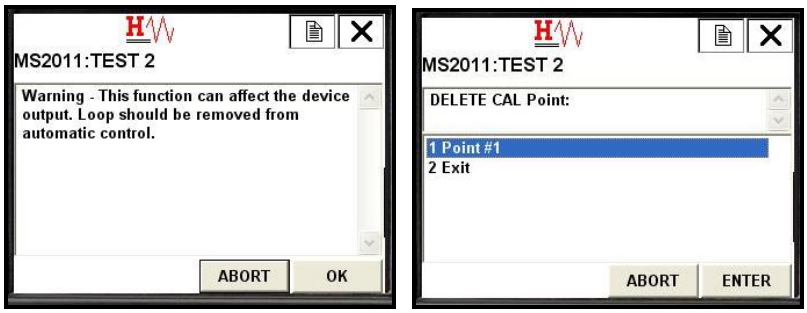


Figure 9-48.

Calibrate

For a detailed explanation of level calibration, refer to Perform Calibration.

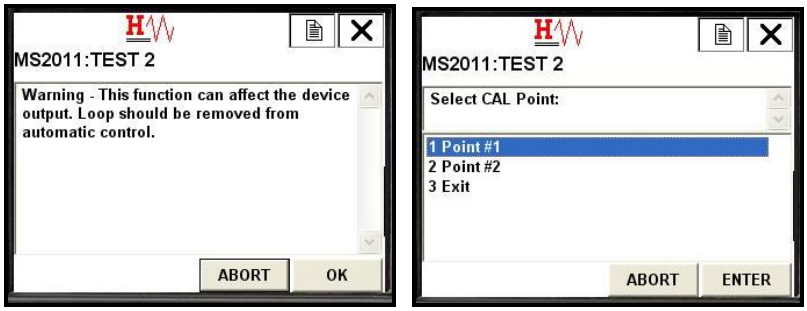


Figure 9-49.

Detailed Setup Menu

The Detailed Setup menu allows for the complete configuration of all application and system parameters within the MS2011.

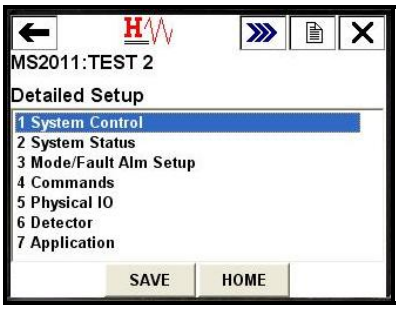


Figure 9-50.

System Control Menu

The System Control menu allows for the configuration of system information such as time, date, LCD scroll rates and contrast.

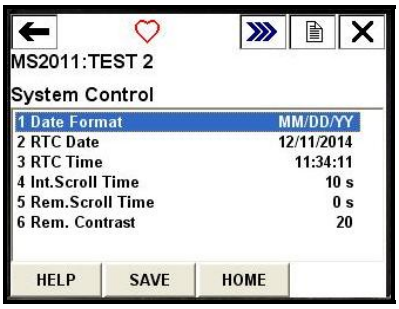


Figure 9-51.

System Status Menu

The System Status menu displays system information for the MS2011 and provides access to menus with additional system information.

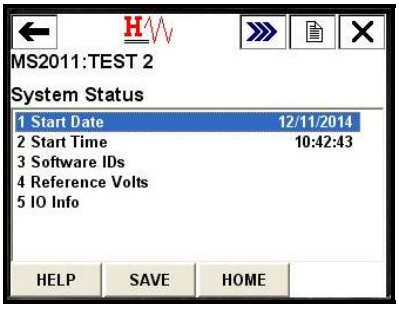


Figure 9-52.

Software IDs Menu

The Software IDs menu shows both the software identifier and, where applicable, compile dates and times for all firmware components of the MS2011 system.

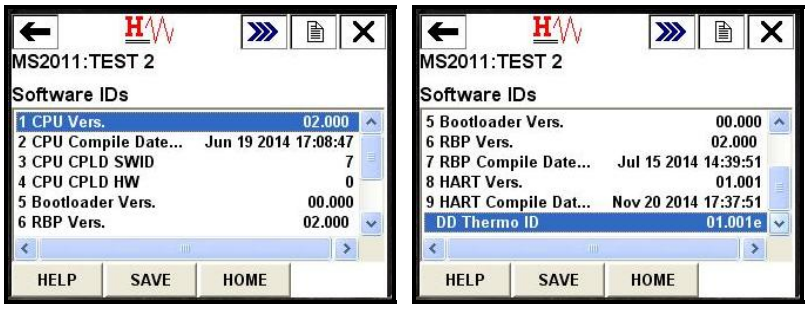


Figure 9-53.

Reference Volts Menu

The Reference volts menu shows the live voltage rail information for the MS2011.

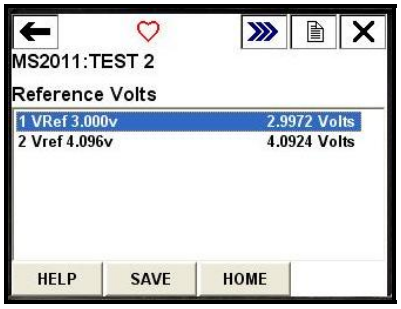


Figure 9-54.

IO Info Menu

The IO Information menu displays the current IO availability for the MS2011.

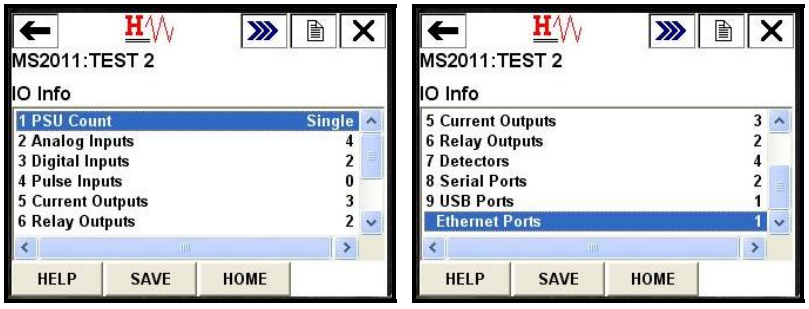


Figure 9-55.

Mode/Fault Alarm Setup Menu

The Mode/Fault Alarm Setup menu allows the user to configure output, application and system alarms.

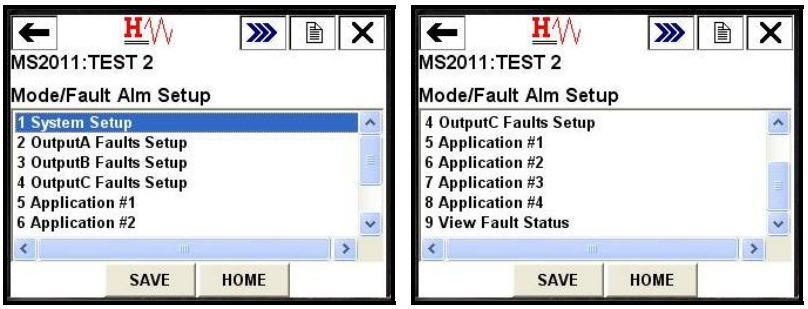


Figure 9-56.

System Alarm Setup Menu

The System Alarm Setup menu allows a user to configure alarms and subsequent actions for the system states shown below.

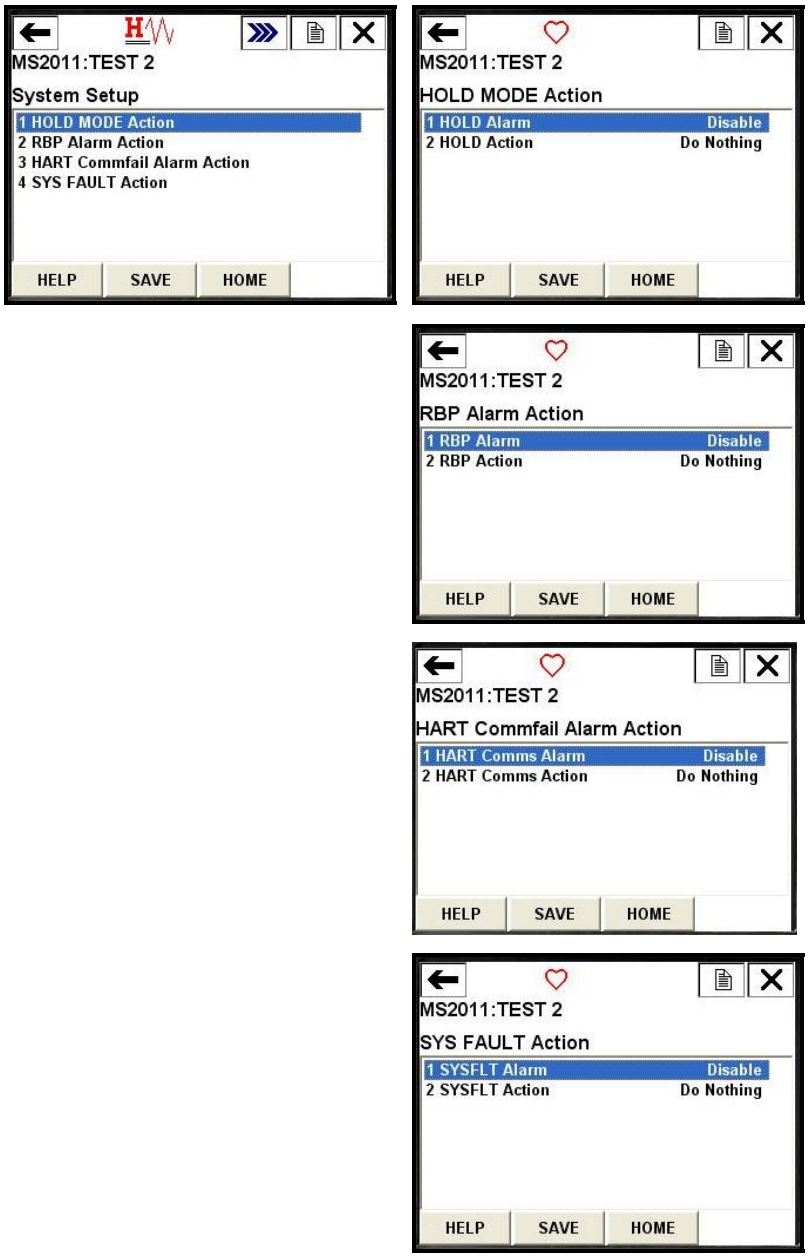


Figure 9-57.

Output A Faults Setup Menu

The Output A Faults Setup menu allows the user to configure alarms and subsequent actions for the Analog Output A alarms shown below.

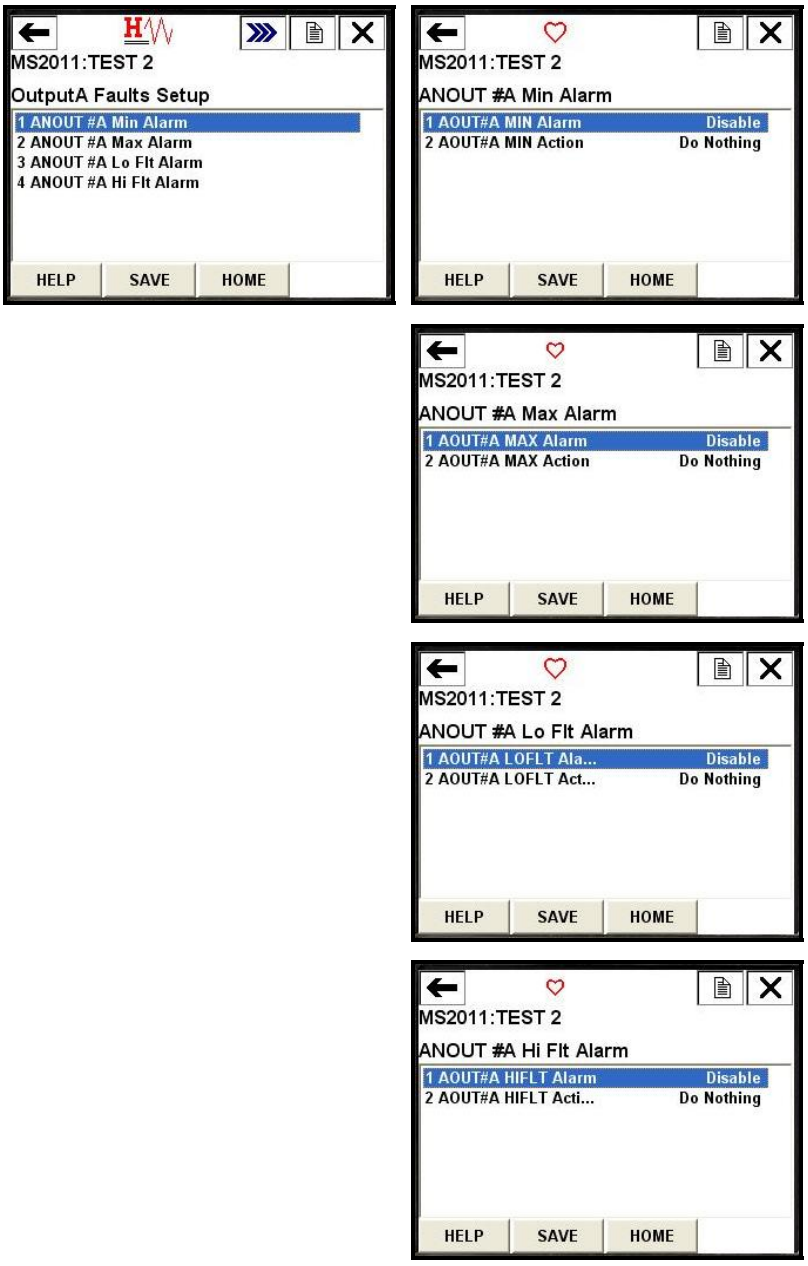


Figure 9-58.

Output B Faults Setup Menu

The Output B Faults Setup menu allows the user to configure alarms and subsequent actions for the Analog Output B alarms shown below.

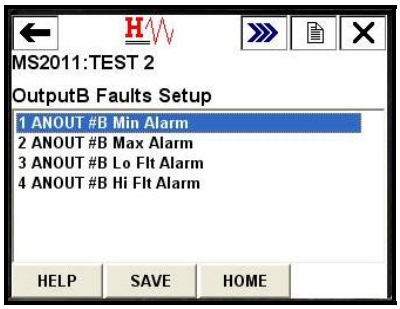


Figure 9-59.

Note The submenus for Output B Faults are identical to those of Output A. ▲

Output C Faults Setup Menu

The Output C Faults Setup menu allows the user to configure alarms and subsequent actions for the Analog Output C alarms shown below.

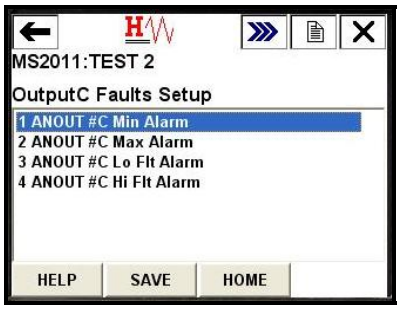


Figure 9-60.

Note The submenus for Output C Faults are identical to those of Output A. ▲

Application #1 Menu

The Application #1 Faults Setup menu allows the user to configure alarms and subsequent actions for the application states shown below.

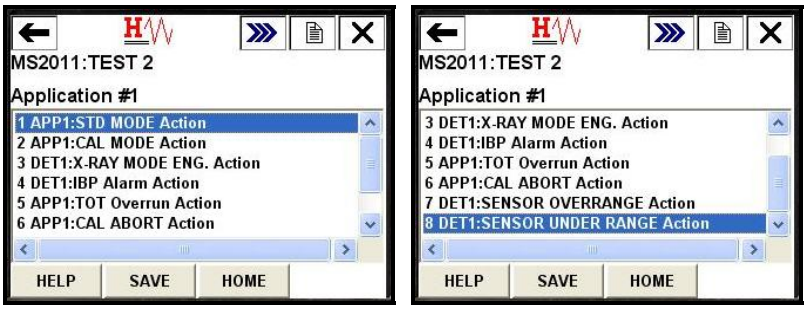


Figure 9-61.

Note Applications #2 - #4 are identical. ▲

View Fault Status Menu

The View Fault Status menu shows current fault statuses of the MS2011.

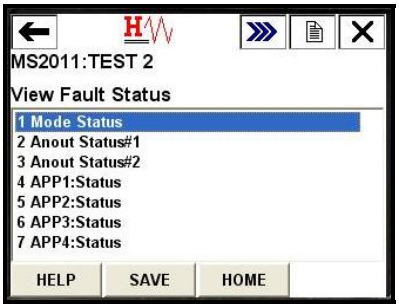


Figure 9-62.

- Mode Status Menu

  The Mode Status menu shows the current status of the system mode fault alarms.

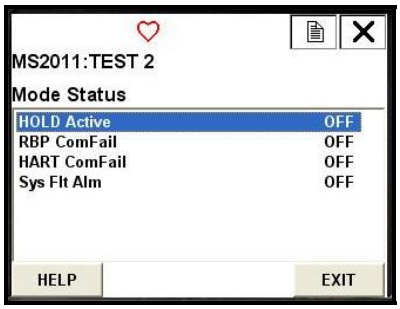


Figure 9-63.

- Anout Status#1 Menu

  The Analog Output Status #1 menu shows the current status of the analog output fault alarms.

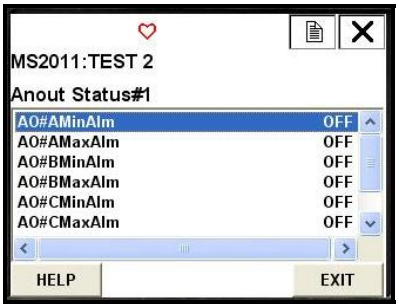


Figure 9-64.

- Anout Status#2 Menu

  The Analog Output Status #2 menu shows the next page of the current status of the analog output mode fault alarms.

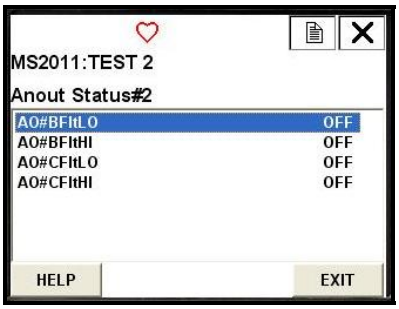


Figure 9-65.

- App1:Status Menu

  The Application #1 Status menu shows the current status of the application #1 mode fault alarms.

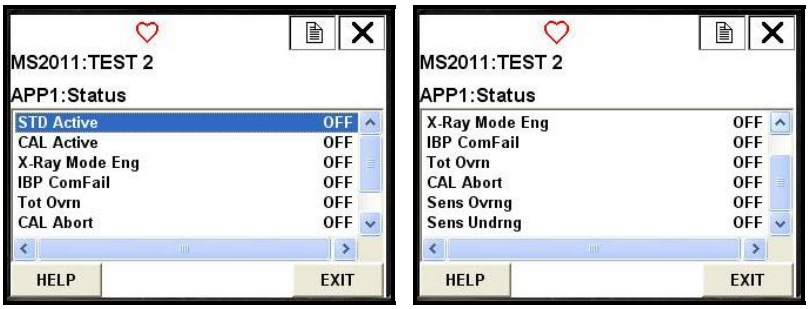


Figure 9-66.

Note Applications #2 - #4 have the same status alarm menu. ▲

Commands Menu

The Commands method allows a user to perform various commands to control the MS2011 applications, outputs and alarms.

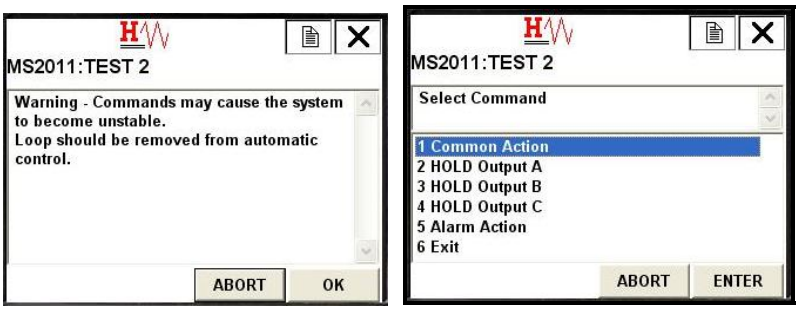


Figure 9-67.

Physical IO Menu

The Physical IO menu allows access to other menus that configure all the system IO within the MS2011.

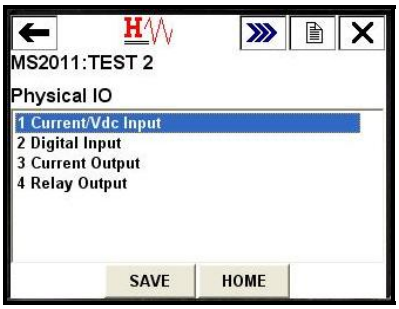


Figure 9-68.

Current/Voltage Input Menu

The Current/Voltage Input menu allows access to the physical system analog inputs of the MS2011.

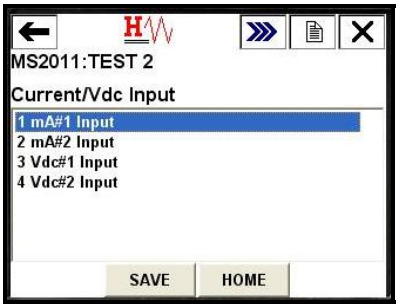


Figure 9-69.

- mA#1 Input Menu

  The mA#1 Input menu fully configures, calibrates and monitors the first current input on the MS2011.

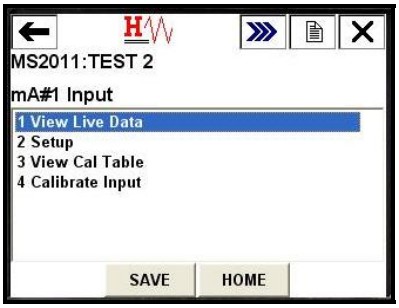


Figure 9-70.

Note Menus for mA#2, Vdc#1 and Vdc#2 follow the same structure. ▲

◊ View Live Data Menu

The View Live Data menu shows the input values and status for the analog input.

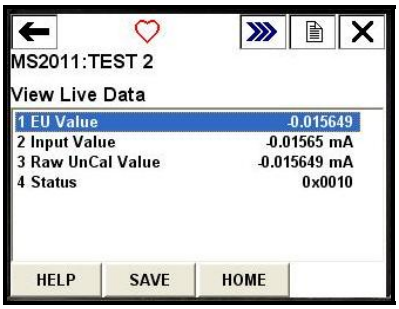


Figure 9-71.

Note Menus for mA#2, Vdc#1 and Vdc#2 follow the same structure. ▲

- Status

  The Status menu expands the status code displayed in the above menu to identify any alarms present on the analog input.

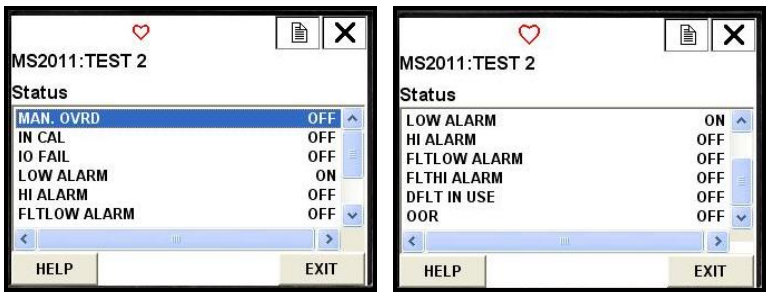


Figure 9-72.

◊ Setup Menu

The Setup menu allows a user to configure the analog input.

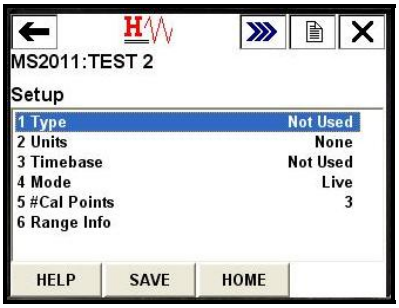


Figure 9-73.

- Range Info Menu

  The Range Info menu is used to configure the range limits and manual value for the analog input.

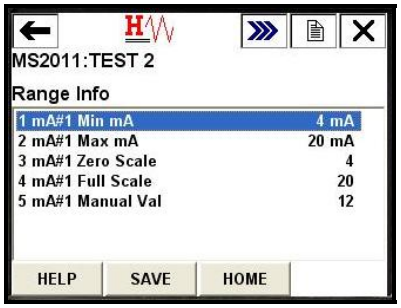


Figure 9-74.

◊ View Cal Table Menu

The View Cal Table menu shows the three-point calibration table for the analog input. Should a two-point calibration be performed, the mid points are generated automatically in the analog input calibration method.

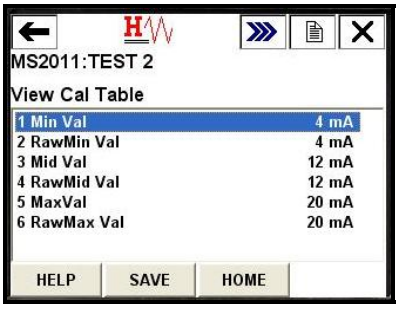


Figure 9-75.

◊ Calibrate Input Method

A detailed explanation of the analog input calibration procedure is given in the Analog Input Calibration section of this document.

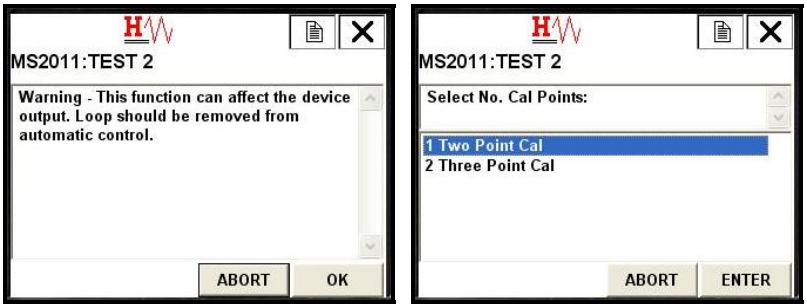


Figure 9-76.

Digital Input Menu

The digital input menu allows access to configuration and information screens for the two digital inputs of the MS2011.

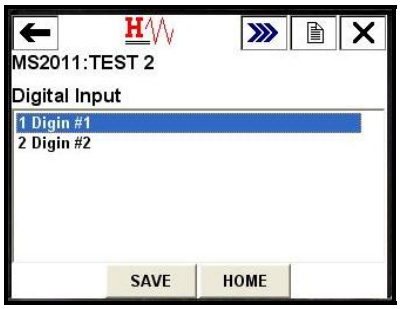


Figure 9-77.

- Digin #1 Menu

  The Digital #n menu allows a user to view and configure the selected digital input.

Figure 9-78.

◊ View Menu

The View Digital #n menu shows the current input value and status for the input.

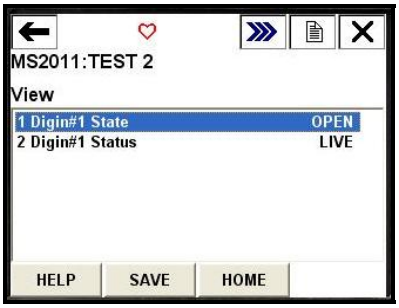


Figure 9-79.

◊ Setup Digin #1 Menu

The Setup Digital #n menu allows a user to fully configure the requirements for the selected digital input.

Figure 9-80.

Note Setup for digital input #2 is identical to that of digital input #1. ▲

Current Output Menu

The current output menu allows access to the configuration and information menus for each of the three analog outputs of the MS2011.

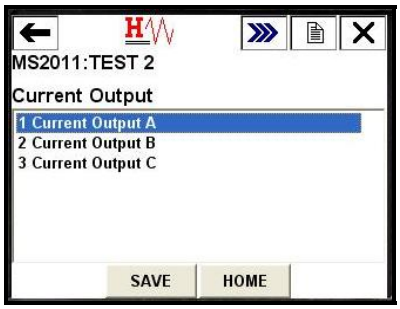


Figure 9-81.

- Current Output A Menu

  The Current Output #n menu allows the user to view, set up, calibrate and test the selected current output.

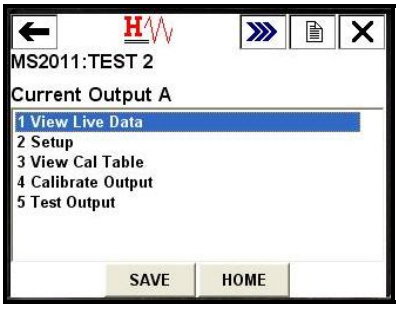


Figure 9-82.

◊ View Live Data Menu

The View Live Data menu shows the current live information and status for the selected analog output.

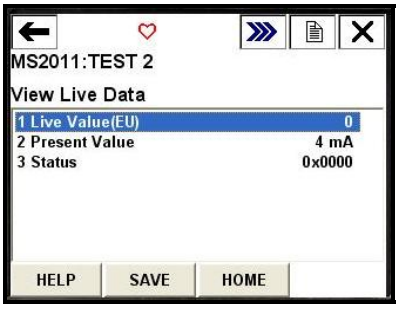


Figure 9-83.

- Status Menu

  The Status menu expands the status code displayed in the menu above to identify any alarms present on the analog output.

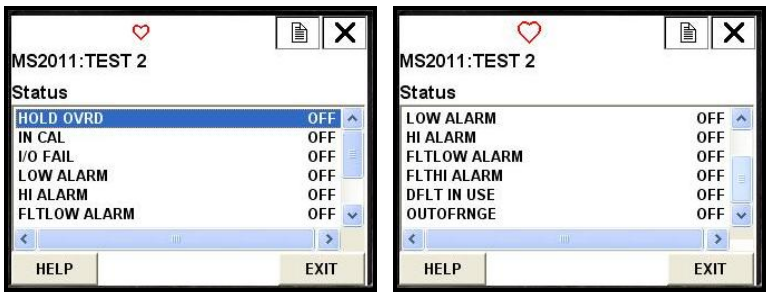


Figure 9-84.

◊ Setup Menu

The Setup menu is used to configure the source, range information and alarm setup for the selected analog input.

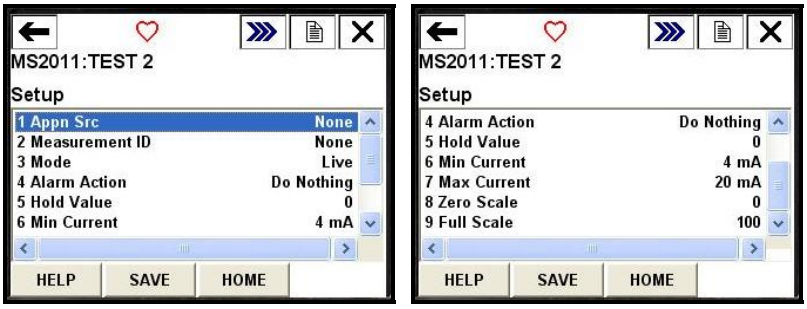


Figure 9-85.

◊ View Cal Table Menu

The View Cal Table menu shows the three-point calibration table for the analog output. Should a two-point calibration be performed, the mid points are generated automatically in the analog output calibration method.

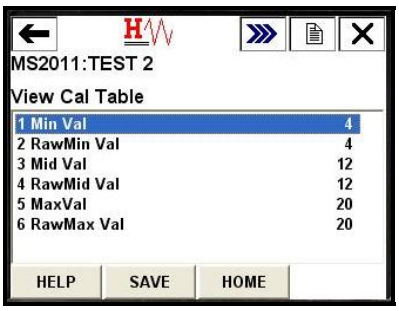


Figure 9-86.

◊ Calibrate Output

A detailed explanation of the analog output calibration procedure is given in the Analog Output Calibration section of this document.

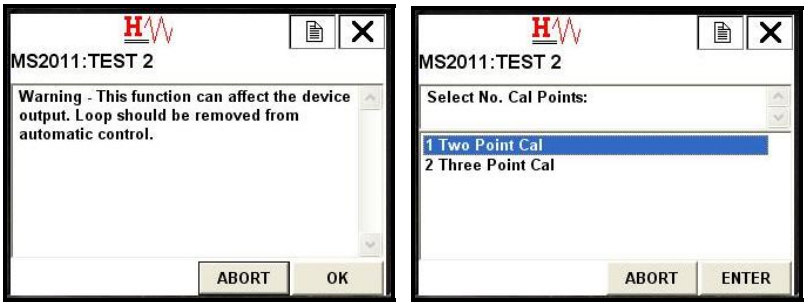


Figure 9-87.

◊ Test Output Menu

The Test Output menu is used to set a fixed value on the selected current output.

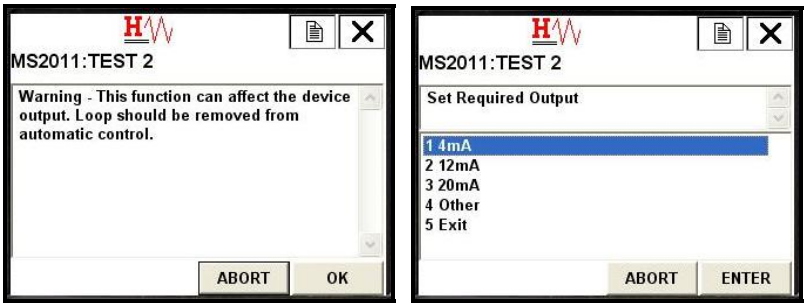


Figure 9-88.

Relay Output Menu

The Relay Output menu provides access to the configuration and information for the two relay outputs available on the MS2011.

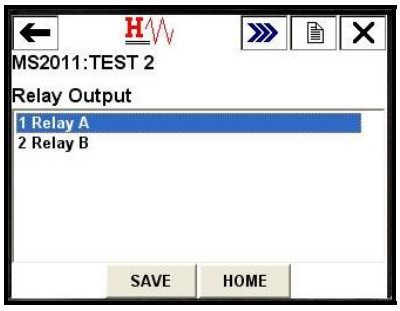


Figure 9-89.

- Relay A Menu

  The Relay #n menu provides access to the view and setup menus for the selected relay.

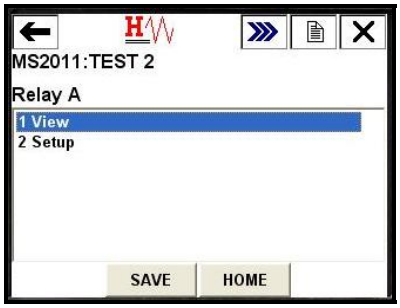


Figure 9-90.

◊ View Menu

The View Relay #n Output menu shows the current state and status of the selected relay output.

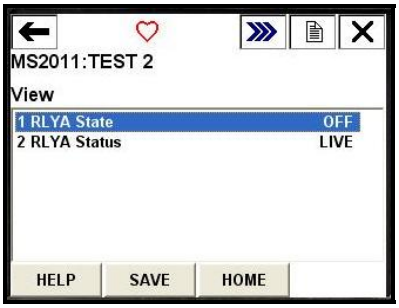


Figure 9-91.

◊ Setup Menu

The Setup Relay #n Output menu is used to fully configure the selected relay of the MS2011.

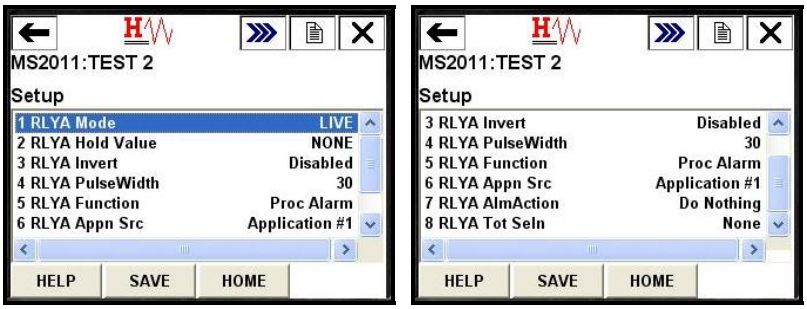


Figure 9-92.

Detector Menu

The detector menu provides access to each of the four available detectors on the MS2011.

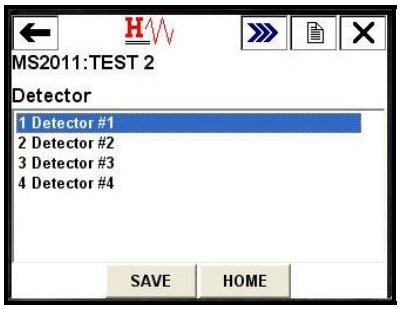


Figure 9-93.

Detector #1 Menu

The Detector #n menu provides access to the information and configuration of the selected detector.

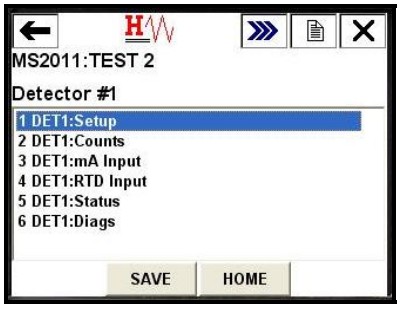


Figure 9-94.

Note Detectors #2 - #4 are identical. ▲

- Setup Menu

  The detector Setup menu fully configures the detector.

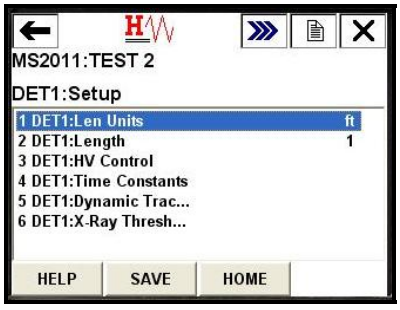


Figure 9-95.

◊ HV Control Menu

The HV Control menu configures the high voltage control setup for the detector.

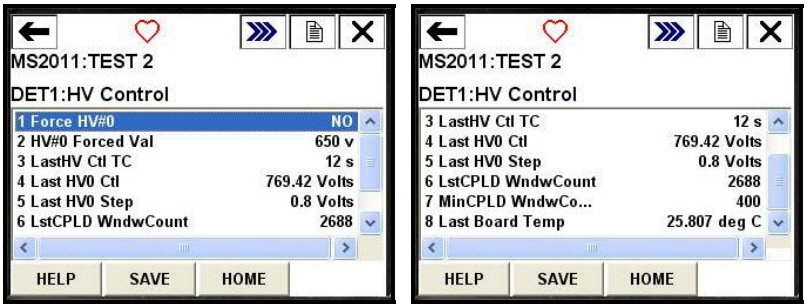


Figure 9-96.

◊ Time Constants Menu

The Time Constants menu sets up the internal filtering for the density and flow calculations within the application/detector.

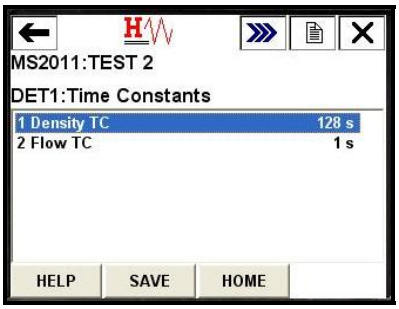


Figure 9-97.

◊ Dynamic Tracking Menu

The Dynamic Tracking menu sets up the parameters for the dynamic tracking function of the detector.

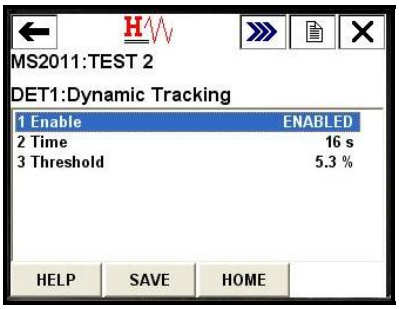


Figure 9-98.

◊ X-Ray Threshold Menu

The X-Ray Threshold menu sets up the parameters for the X-ray threshold function of the detector.

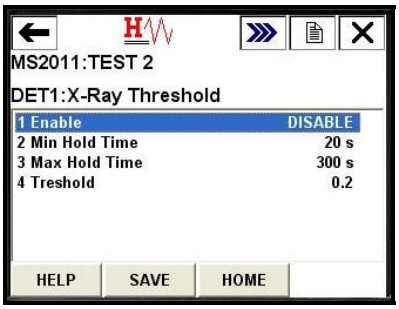


Figure 9-99.

- Counts Menu

The detector Counts menu simply shows the live, filtered counts returned by the detector.

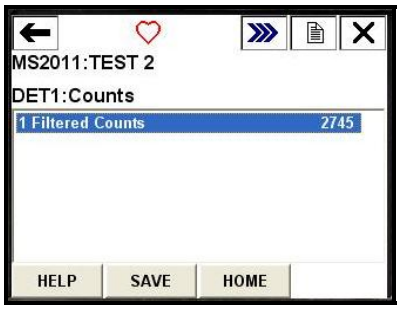


Figure 9-100.

- mA Input Menu

The mA Input menu fully configures and displays the status of the current input on the detector itself.

The menu structure and parameters are identical to those shown for mA#1 input in the mA#1 Input Menu section.

- RTD Input Menu

  The RTD Input menu fully configures and displays the status of the RTD input on the detector itself.

  The menu structure and parameters are similar to those shown for input mA#1, with two exceptions. In the RTD Input menu, the user must select the RTD Type, and, in the Range Info menu, only the minimum and maximum range values are available.

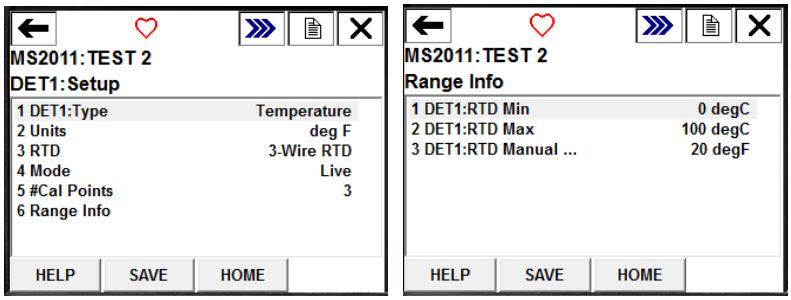


Figure 9-101.

- Status Menu

  This Status menu provides access to the status menus for the selected detector.

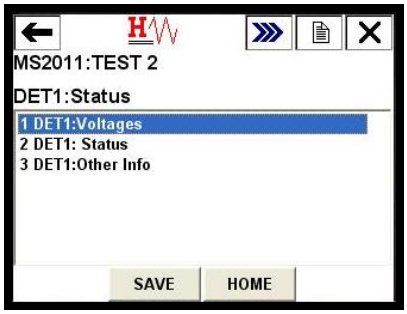


Figure 9-102.

◊ Voltages Menu

The Voltages menu shows the live values for the measured voltages on the detector itself.

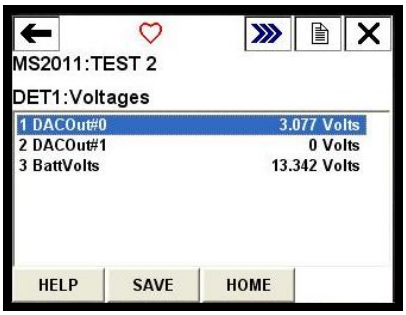


Figure 9-103.

◊ Status Menu

This Status menu shows the status codes returned for each of the below status items.

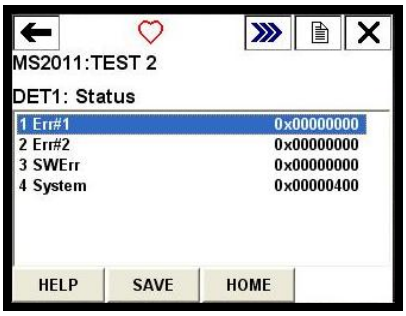


Figure 9-104.

- Err#1

  Err#1 expands on the status code for the Err#1 value in the status menu shown in 9-103.

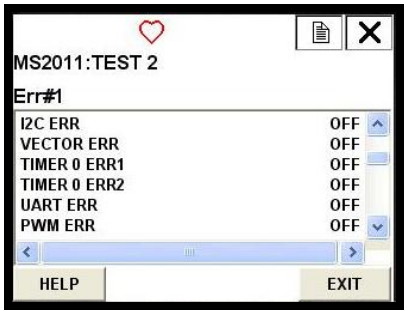


Figure 9-105.

- Err#2

Err#2 expands on the status code for the Err#2 value in the status menu shown in 9-103.

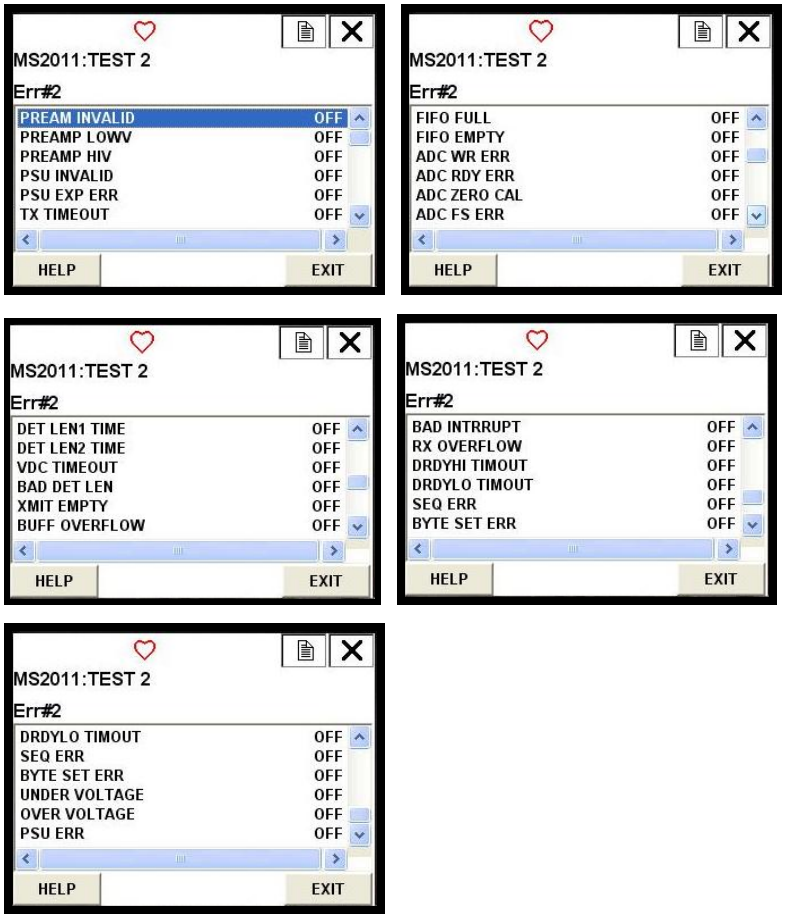


Figure 9-106.

- SWErr

SWErr expands on the status code for the SWErr value in the status menu shown in 9-103.

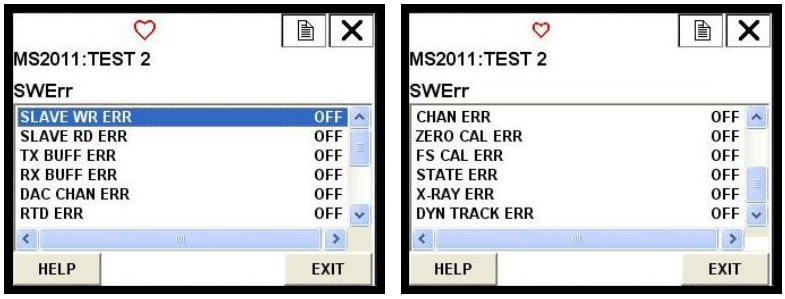


Figure 9-107.

- System

  System expands on the status code for the System value in the status menu shown in 9-103.

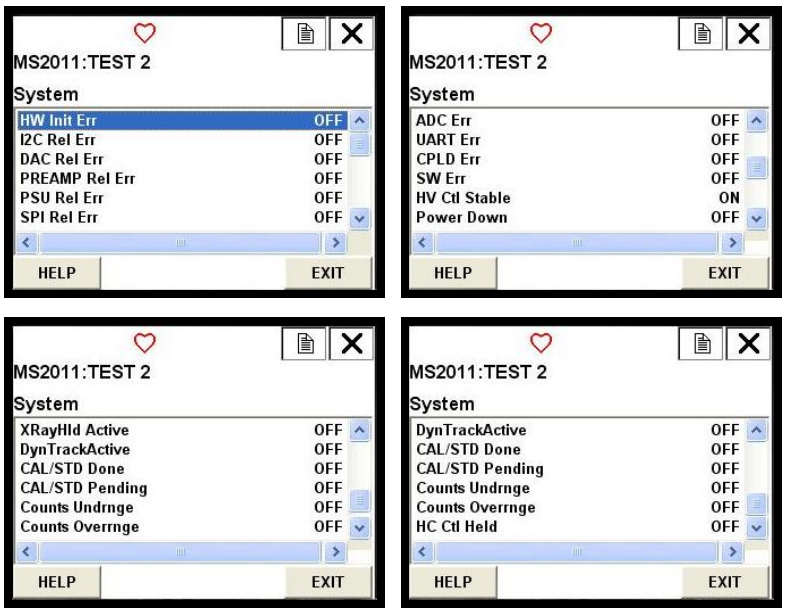


Figure 9-108.

◊ Other Info Menu

The Other Info menu provides additional information for the selected detector.

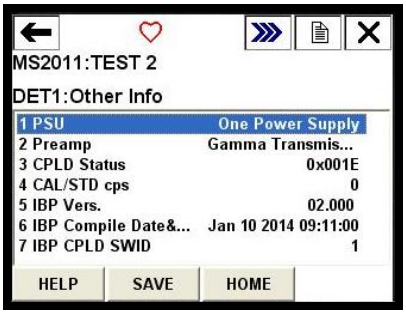


Figure 9-109.

- Diagnosis Menu

  The Diagnosis menu provides status and information on the current performance of the selected detector.

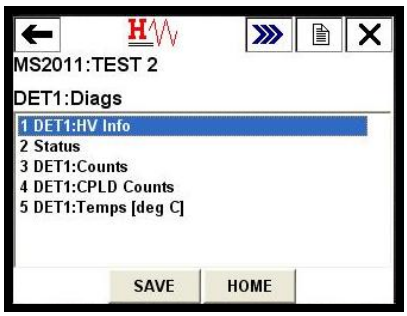


Figure 9-110.

◊ HV Info Menu

The High Voltage Information menu provides diagnostic information on the status of the high voltage control algorithm within the selected detector of the MS2011.

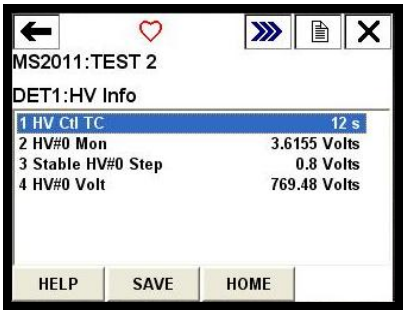


Figure 9-111.

◊ Status Menu

This Status menu shows the coded, diagnostic status for the detector or application.

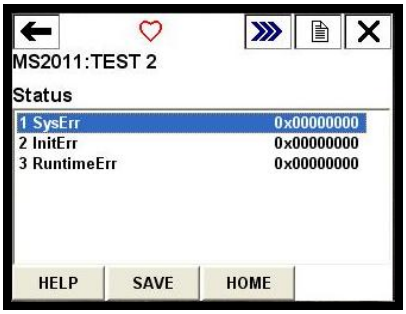


Figure 9-112.

- SysErr

  SysErr expands on the status code for the SysErr value in the Status menu shown in 9-111.

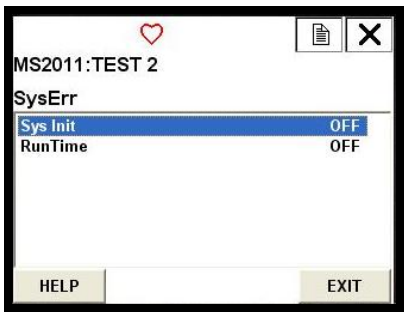


Figure 9-113.

- InitErr

  InitErr expands on the status code for the InitErr value in the Status menu shown in 9-111.

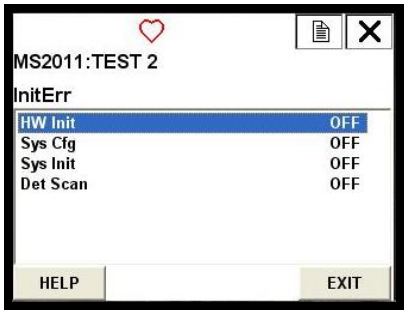


Figure 9-114.

- RuntimeErr

  RuntimeErr expands on the status code for the RuntimeErr value in the Status menu shown in 9-111.

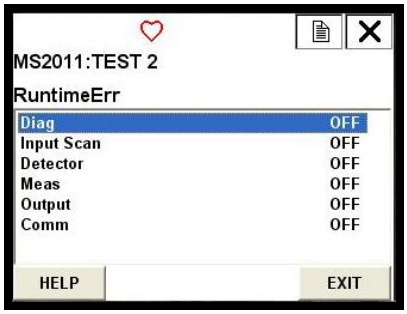


Figure 9-115.

◊ Counts Menu

The Counts menu shows the counter information for the selected detector.

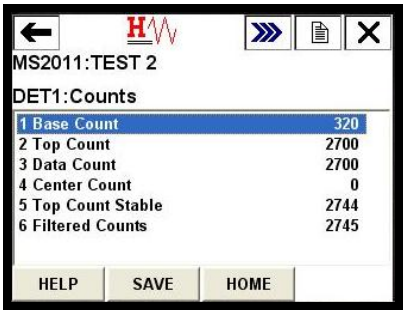


Figure 9-116.

◊ CPLD Counts Menu

The CPLD Counts menu shows the count information for the selected detector.

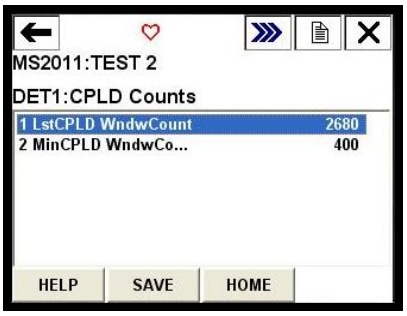


Figure 9-117.

◊ Temperatures Menu

The Temperatures menu shows the diagnostic temperature information for the selected detector.

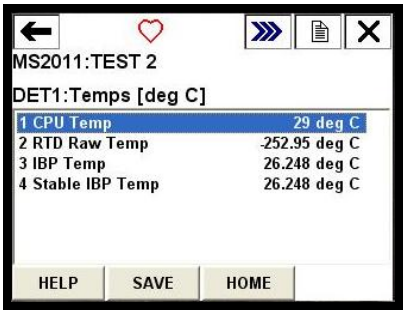


Figure 9-118.

Application Menu

The Application menu provides access to configuration and setup menus for up to four applications.

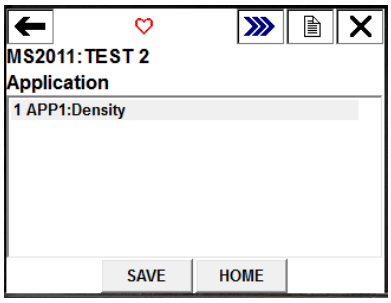


Figure 9-119.

Density Menu

Like the Quick Setup menu for density, the detailed setup men allows a user to configure the primary measurement and perform standardization and calibration to configure the application. The menu may also be used to configure totalization, measurement actions and process alarms.

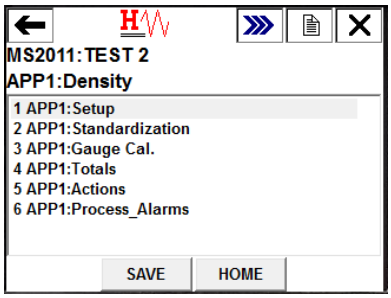


Figure 9-120.

- Setup Menu

  The Setup menu for density allows the user to fully configure the density application.

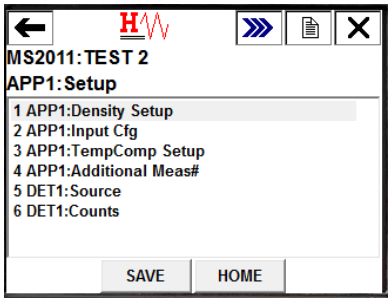


Figure 9-121.

◊ Density Setup Menu

The Density Setup menu configures the primary measurement for the density application.

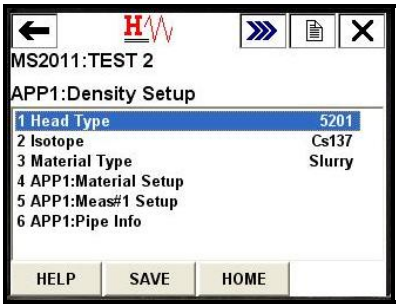


Figure 9-122.

- Material Setup Menu

This menu sets up the parameters for the process material for the density application.

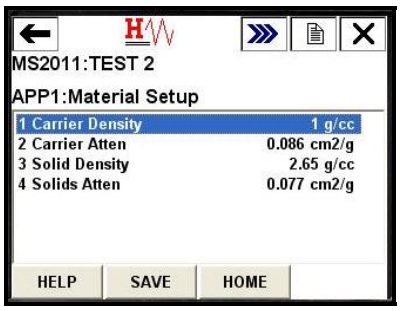


Figure 9-123. Slurry application

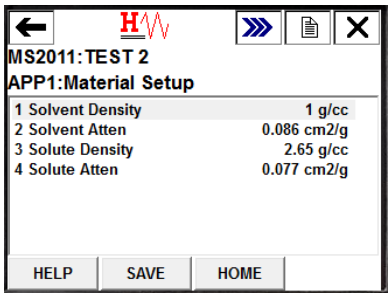


Figure 9-124. Solution application

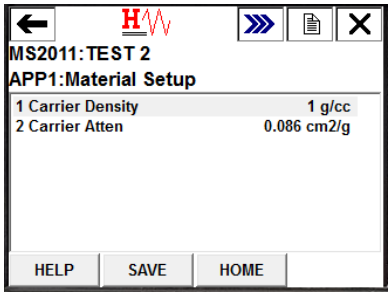


Figure 9-125. Single-phase application

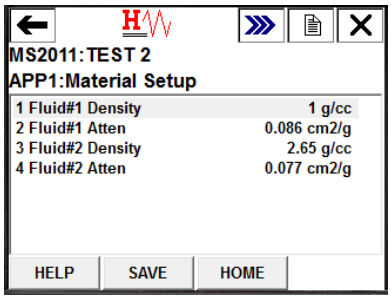


Figure 9-126. Emulsion application

- Meas#1 Setup Menu

  The Meas#1 Setup menu defines the variable type, units and displayed decimal places for the primary measurement of the density application.

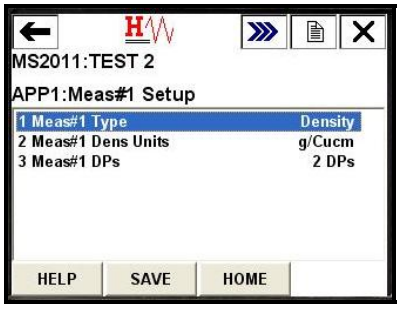


Figure 9-127.

- Pipe Info Menu

  The Pipe Info menu configures the pipe information for the application.

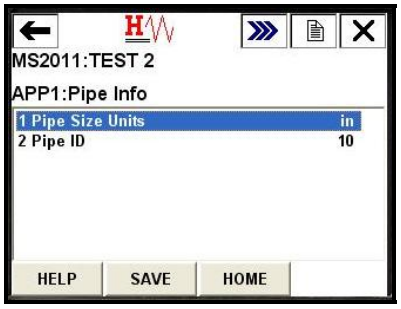


Figure 9-128.

◊ Input Cfg Menu

The Input Configuration menu allows the user to configure additional variables that might be used in a density application.

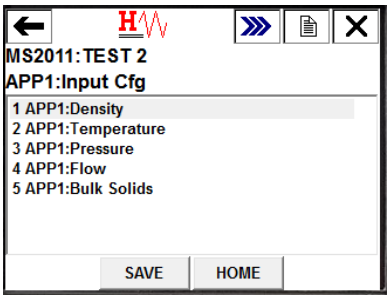


Figure 9-129.

- Density Menu

  The APPn:Density menu allows the configuration of a density variable independent from the detector density measurement. Both the input source and the units are available for configuration.

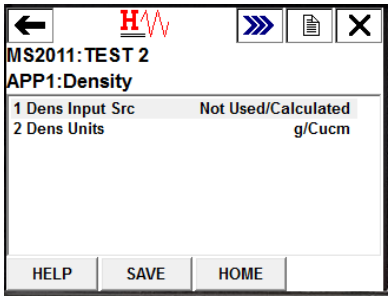


Figure 9-130.

- Temperature Menu

  The APPn:Temperature menu allows the configuration of a temperature measurement variable. Both the input source and the units are available for configuration.

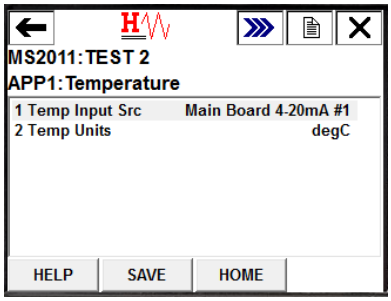


Figure 9-131.

- Pressure Menu

  The APPn:Pressure menu allows the configuration of a pressure measurement variable. Both the input source and units are available for configuration.

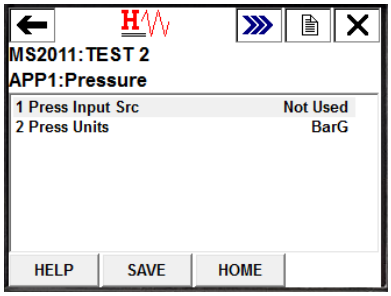


Figure 9-132.

- Flow Menu

  The APPn:Flow menu allows the configuration of a flow-related measurement variable. Both the input source and units are available for configuration.

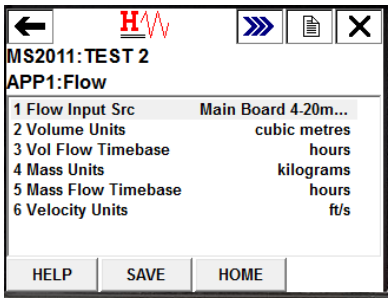


Figure 9-133.

- Bulk Solids Menu

  The APPn:Bulk Solids menu allows the configuration of bulk flow units and associated bulk density units.

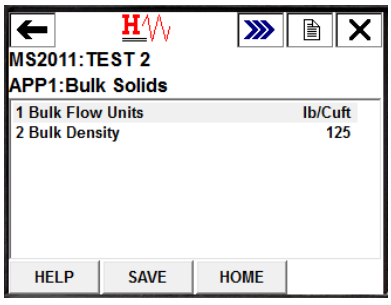


Figure 9-134.

◊ TempComp Setup Menu

The Temperature Compensation Setup menu allows the user to set up the various parameters for the temperature compensated density calculations. Up to two polynomial compensation curves can be configured via this menu.

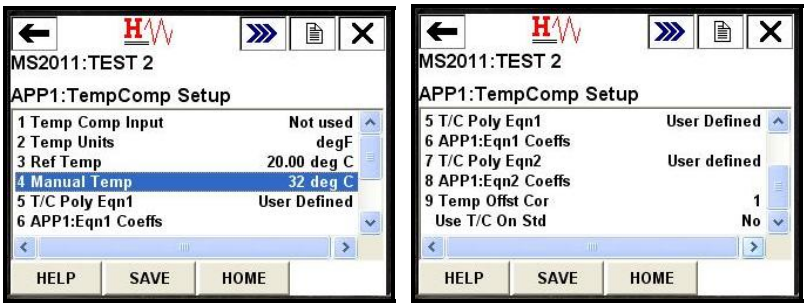


Figure 9-135.

- Eqn1 Coeffs Menu

  This menu allows the configuration of the four coefficients for the temperature compensation calculation of equation #1.

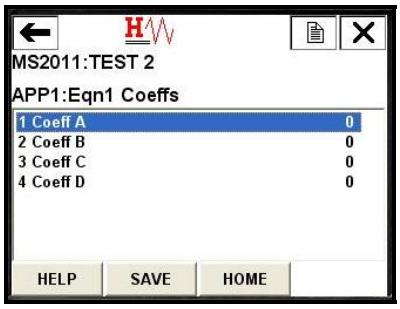


Figure 9-136.

- Eqn2 Coeffs Menu

  This menu allows the configuration of the three coefficients for the temperature compensation calculation of equation #2.

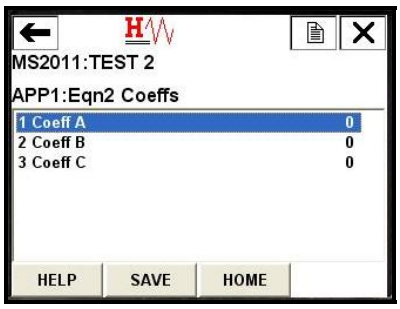


Figure 9-137.

◊ Additional Meas# Menu

The Additional Measurement menu allows the user to configure up to three other measurements.

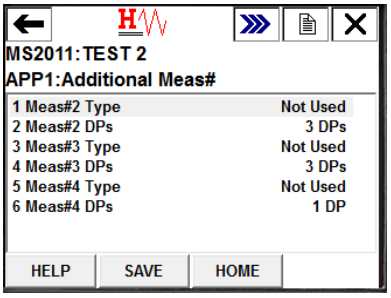


Figure 9-138.

◊ Source Menu

The Source menu allows for the configuration of the target source used by the density measurement.

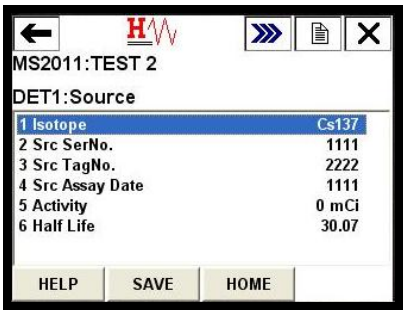


Figure 9-139.

◊ Counts Menu

The Counts menu provides information and configuration for the measured counts from the detector used for density measurement.

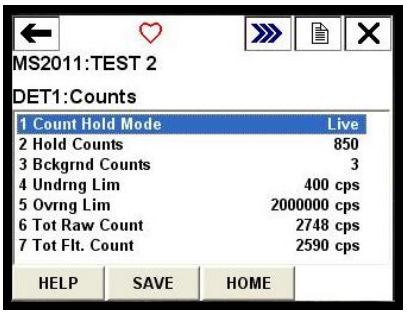


Figure 9-140.

- Standardization Menu

  This menu access the standardization parameters and methods. For a detailed explanation of the standardization method for density applications, see Perform Standardization.

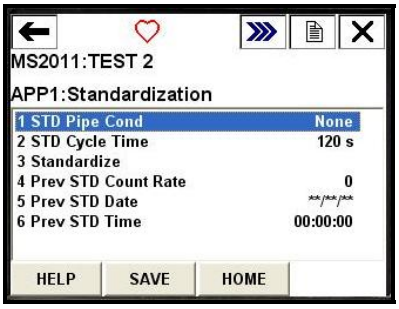


Figure 9-141.

- Gauge Cal Menu

  The Gauge Calibration menu access the calibration parameters and methods. For a detailed explanation of the calibration method for density applications, see Perform Calibration.

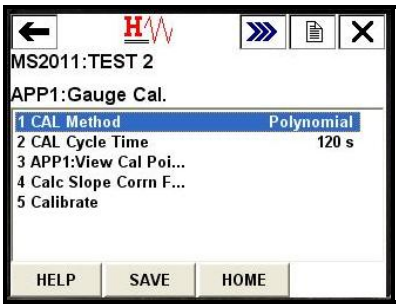


Figure 9-142.

◊ View Cal Points Menu

The View Cal Points menu allows the user to view information about the two polynomial calibration points for the density application.

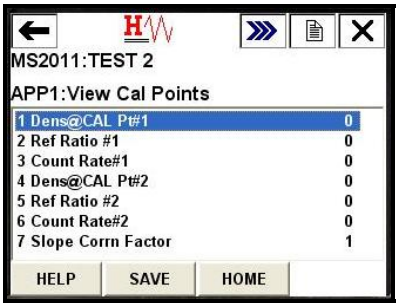


Figure 9-143.

◊ Calc Slope Corrn Factor

Calculate Slope Correction Factor allows the user to recalculate the slope correction factor for the calibration table in the event a value within the table has been modified manually.

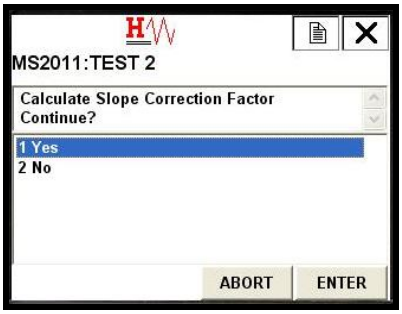


Figure 9-144.

- Totals Menu

  The Totals menu allows access to the configuration menus for up to four totalizers. A global configuration to enable/disable all totalizers is also available on this menu.

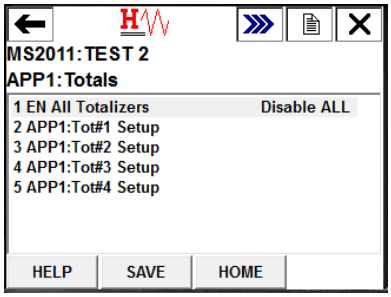


Figure 9-145.

◊ Tot#1 Setup

Tot#n Setup allows the user to configure the source and set up the selected totalizer.

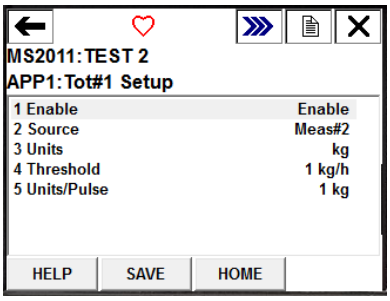


Figure 9-146.

- Actions Menu

  The Actions menu is used to control the Hold/Live status of an application measurement. Up to four measurements may be configured for each application. Only those measurements enabled are available for configuration. A hold value, the value used when the status changes from Live to Hold, may be entered.

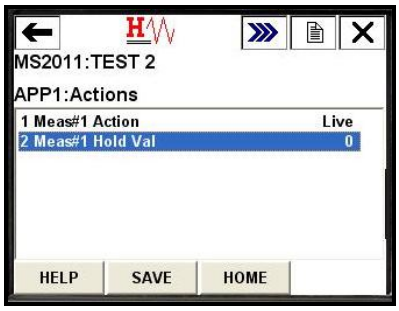


Figure 9-147.

- Process_Alarms Menu

  Up to 16 process alarms are available on the MS2011. This menu provides setup access to the 16 alarms.

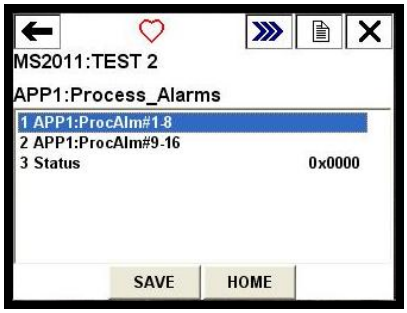
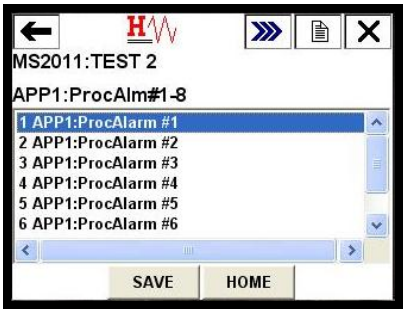


Figure 9-148.

◊ ProcAlm#1-8 Menu

This menu provides access to the first eight process alarms.



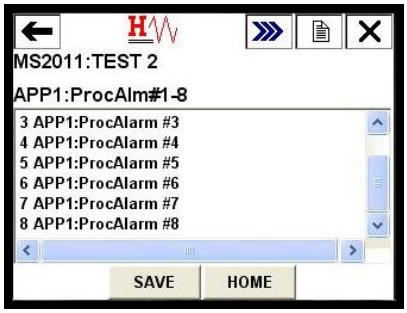


Figure 9-149.

- ProcAlarm #1 Menu

  The Process Alarm #n Menu enables an alarm to be set up and configured.

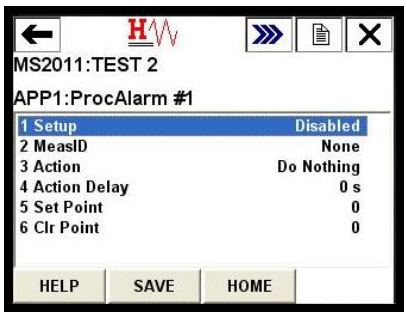


Figure 9-150.

Note All 16 alarm menu screens are identical. ▲

◊ ProcAlm#9-16 Menu

This menu provides access to the last eight process alarms.

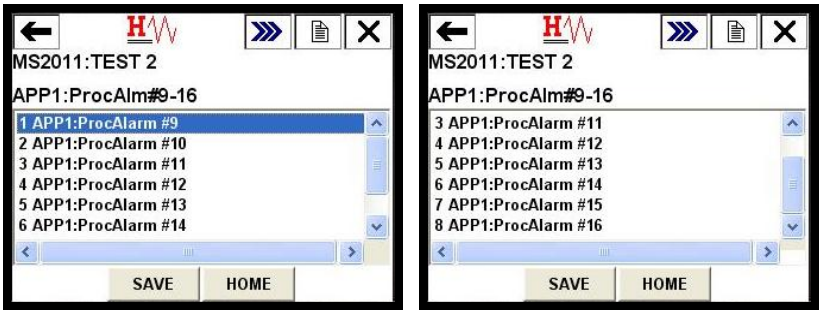


Figure 9-151.

◊ Status Menu

The process alarm Status menu indicates the current status of all 16 process alarms.

Figure 9-152.

Level Menu

Like the Quick Setup menu, the Detailed Setup menu for level allows a user to configure the primary measurement and perform standardization and calibration to configure an application. The menu is also used to configure measurement actions and process alarms.

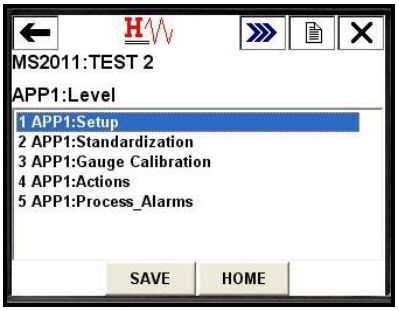


Figure 9-153.

- Setup Menu

  This Setup menu allows access to menus for the full configuration of the level input.

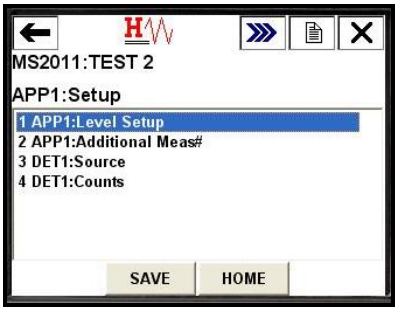


Figure 9-154.

◊ Level Setup

The Level Setup menu sets up the basic primary configuration for a level measurement.

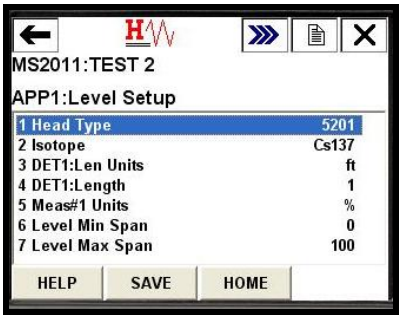
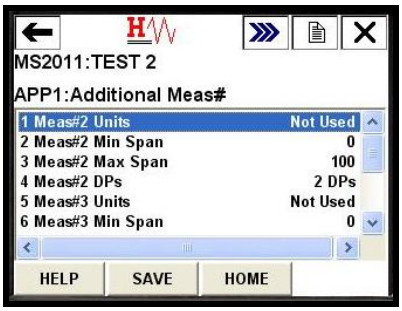


Figure 9-155.

◊ Additional Meas# Menu

The Additional Measurement menu allows the user to configure up to three other measurements based upon the primary level measurement.



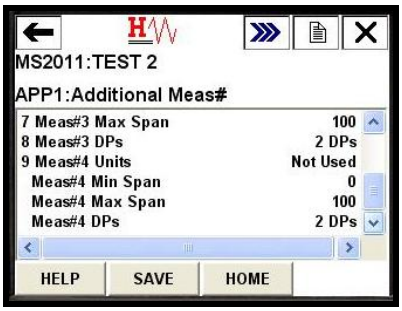


Figure 9-156.

◊ Source Menu

The Source menu allows for the configuration of the target source used by the level measurement.

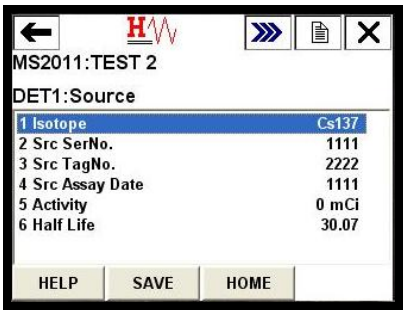


Figure 9-157.

◊ Counts Menu

The Counts menu provides information and configuration for the measured counts from the detector used for density measurement.

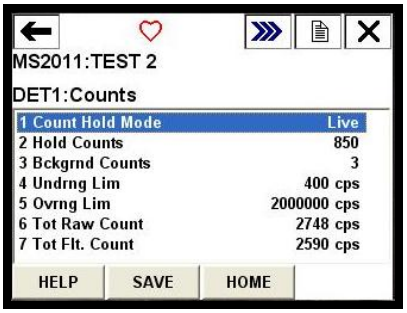


Figure 9-158.

- Standardization Menu

This menu access the standardization parameters and methods. For a detailed explanation of the standardization method for level applications, see Perform Standardization.

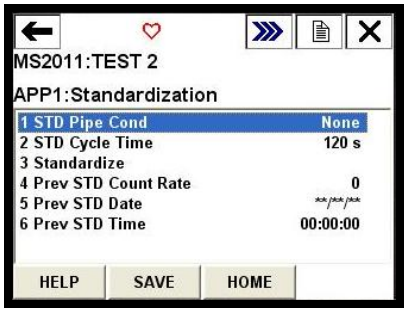


Figure 9-159.

- Gauge Cal Menu

The Gauge Calibration menu access the calibration parameters and methods. For a detailed explanation of the calibration method for level applications, see Perform Calibration.

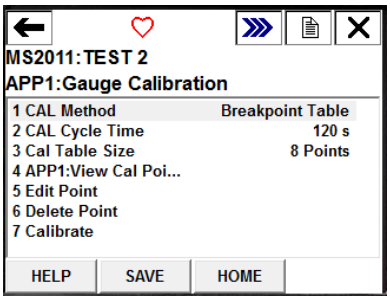


Figure 9-160.

◊ View Cal Points Menu

The View Cal Points menu allows the user to view up to 10 breakpoint calibration table entries for a level application.

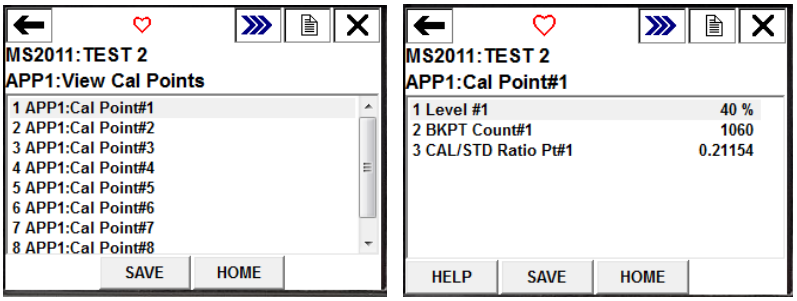


Figure 9-161.

◊ Edit Point

The Edit Point method modifies a selected calibration point within the breakpoint table.

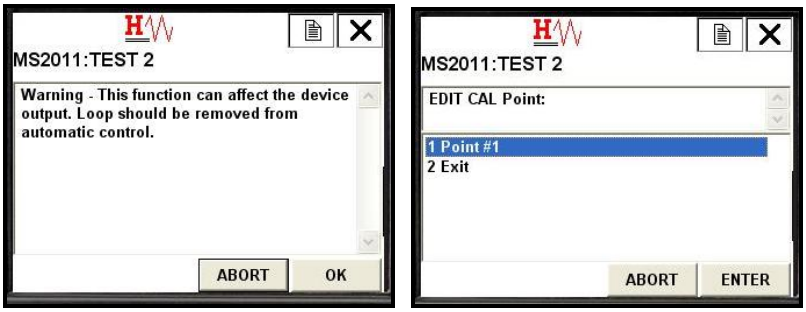


Figure 9-162.

◊ Delete Point

The Delete Point method removes a selected calibration point within the breakpoint table.

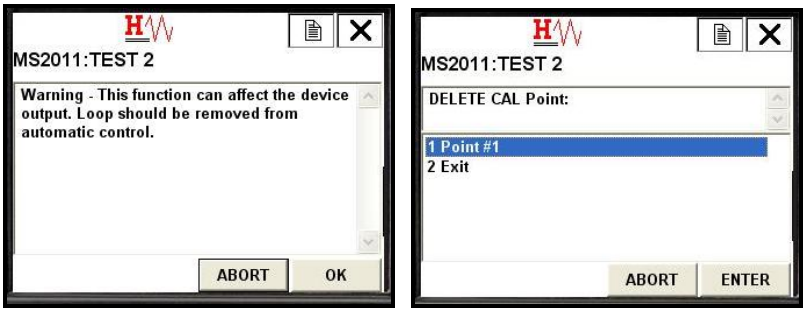


Figure 9-163.

◊ Calibrate

For a detailed explanation of level calibration, refer to Perform Calibration.

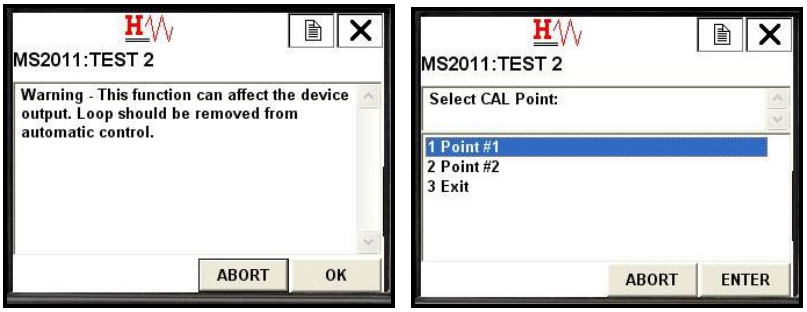


Figure 9-164.

- Actions Menu

  The Actions menu is used to control the Hold/Live status of an application measurement. Up to four measurements may be configured for each application. Only those measurements enabled are available for configuration. A hold value, the value used when the status changes from Live to Hold, may be entered.

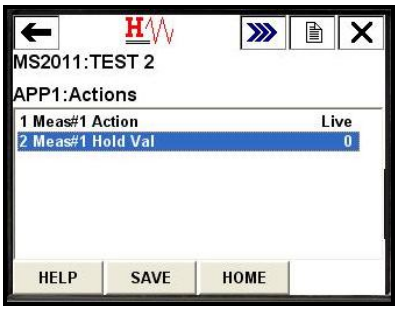


Figure 9-165.

- Process_Alarms Menu

  Up to 16 process alarms are available on the MS2011. This menu provides setup access to the 16 alarms.

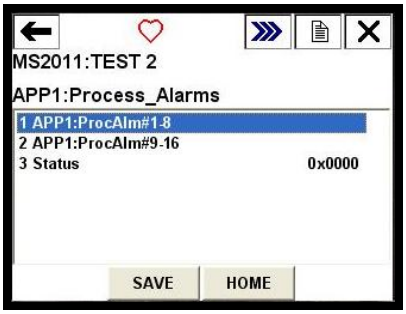


Figure 9-166.

◊ ProcAlm#1-8 Menu

This menu provides access to the first eight process alarms.

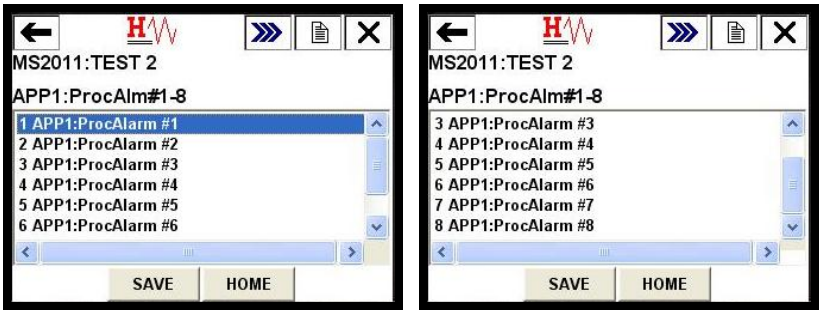


Figure 9-167.

- ProcAlarm #1 Menu

  The Process Alarm #n Menu enables an alarm to be set up and configured.

Figure 9-168.

Note All 16 alarm menu screens are identical. ▲

◊ ProcAlm#9-16 Menu

This menu provides access to the last eight process alarms.

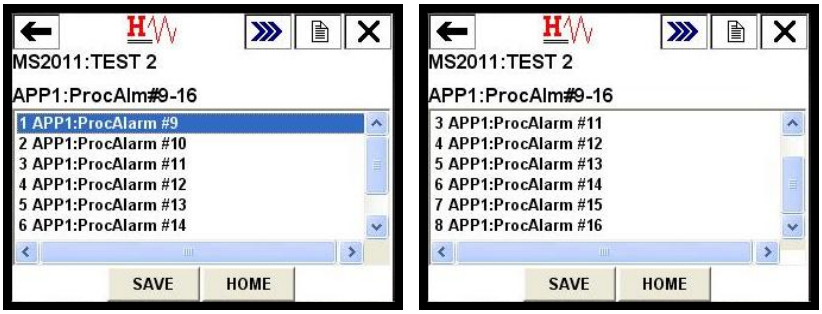


Figure 9-169.

◊ Status Menu

The process alarm Status menu indicates the current status of all 16 process alarms.

Figure 9-170.

Review

The Review menu allows access to the review menus of the device variables and each of the four applications.

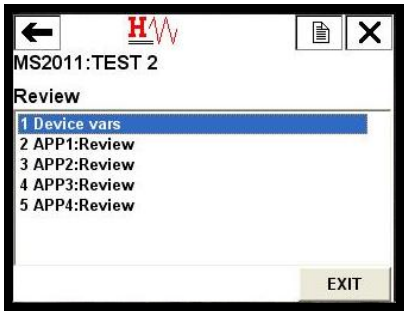


Figure 9-171.

Device Vars Menu

The Device Variables review menu provides a read-only view of the HART device variable parameters in the MS2011.

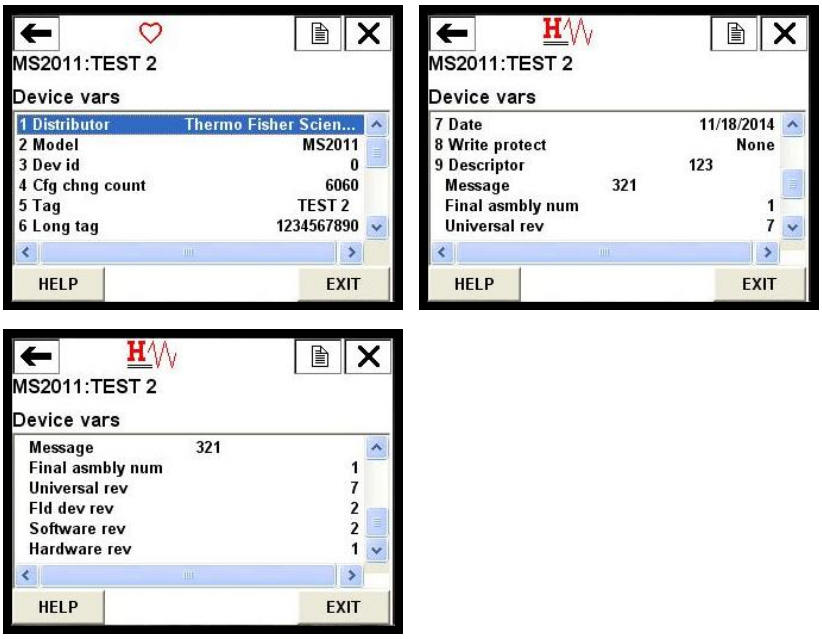


Figure 9-172.

APPn:Review Menu

The APPn:Review menu lists the parameters used for the application. Below is an example of a review for a level application within the MS2011.

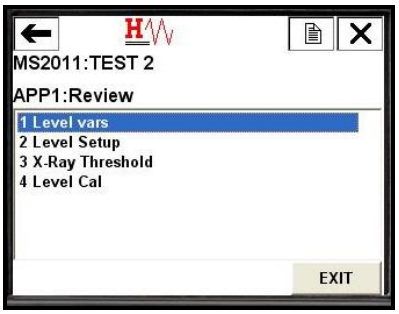


Figure 9-173.

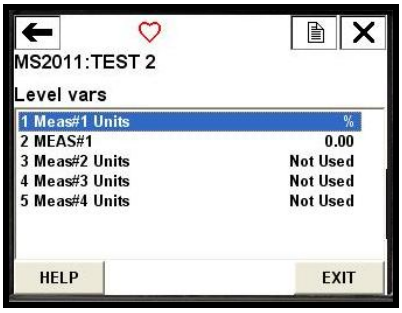


Figure 9-174. Level variables

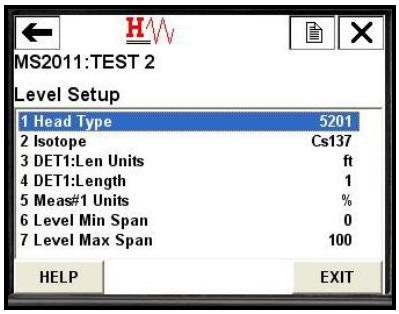


Figure 9-175. Level setup

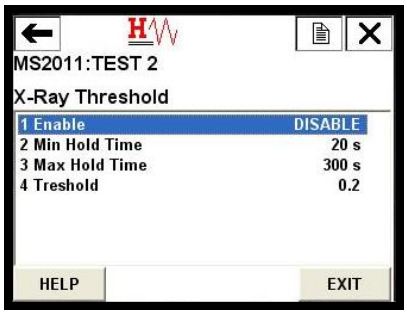
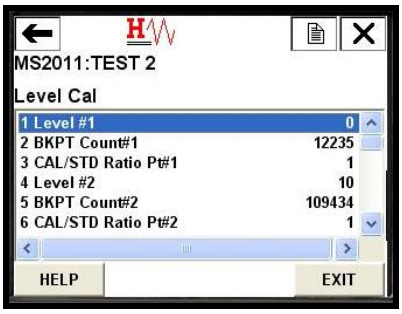
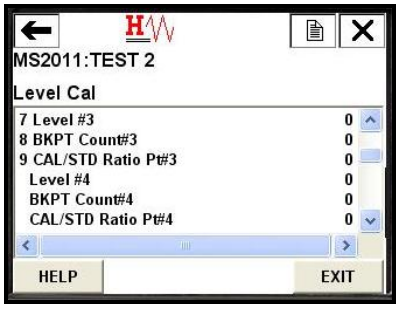
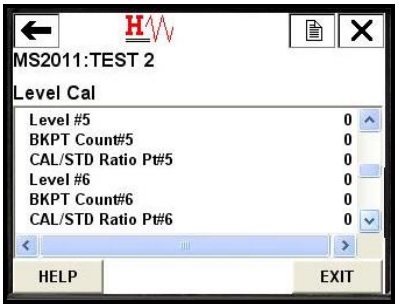
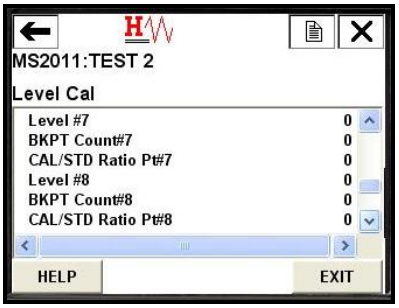


Figure 9-176. X-ray threshold









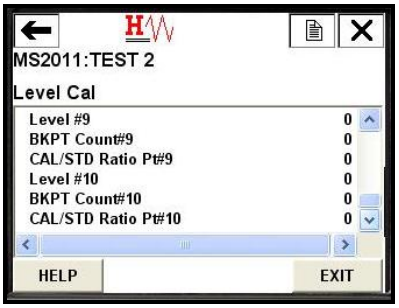


Figure 9-177. Level calibration

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