

MFC 4100 HART[®] Communicator

MFC 4101 HART Communicator with Documentation
MFC 4102 HART Communicator with Intrinsic Safety (I.S.)
MFC 4103 HART Communicator with Documentation and I.S.

OPERATOR INSTRUCTION MANUAL



MFC 4100 SERIES OPERATOR INSTRUCTION MANUAL

MFC 4100 HART® Communicator
MFC 4101 Communicator with Documenting capability
MFC 4102 Communicator with Intrinsically Safe (I.S.) rating
MFC 4102 Communicator with Documenting capability & I.S. rating

IMPORTANT NOTICE

Important information on the product is contained in this manual. Read this manual carefully and completely before operating the product. For the safety of the operator and the system, a thorough understanding of this manual is necessary before commissioning, using or maintaining the product.

ASSISTANCE

For customer assistance please contact the local Meriam Representative or Meriam Process Technologies directly. For a geographic listing of Representatives and contact information, visit our web site at www.meriam.com and click on the “Representatives” button. Contact Meriam Process Technologies directly by phone at (216) 281-1100 or by e-mail at meriam@meriam.com. Direct all assistance inquiries to Technical Services.

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Meriam Process Technologies
10920 Madison Avenue
Cleveland, Ohio 44102

TELEPHONE: (216) 281-1100
FAX: (216) 281-0228
E-mail: meriam@meriam.com
Web Site: www.meriam.com

MFC 4100 HART Communicator
OPERATING INSTRUCTIONS
MFC 4100, MFC 4101, MFC 4102, MFT 4103

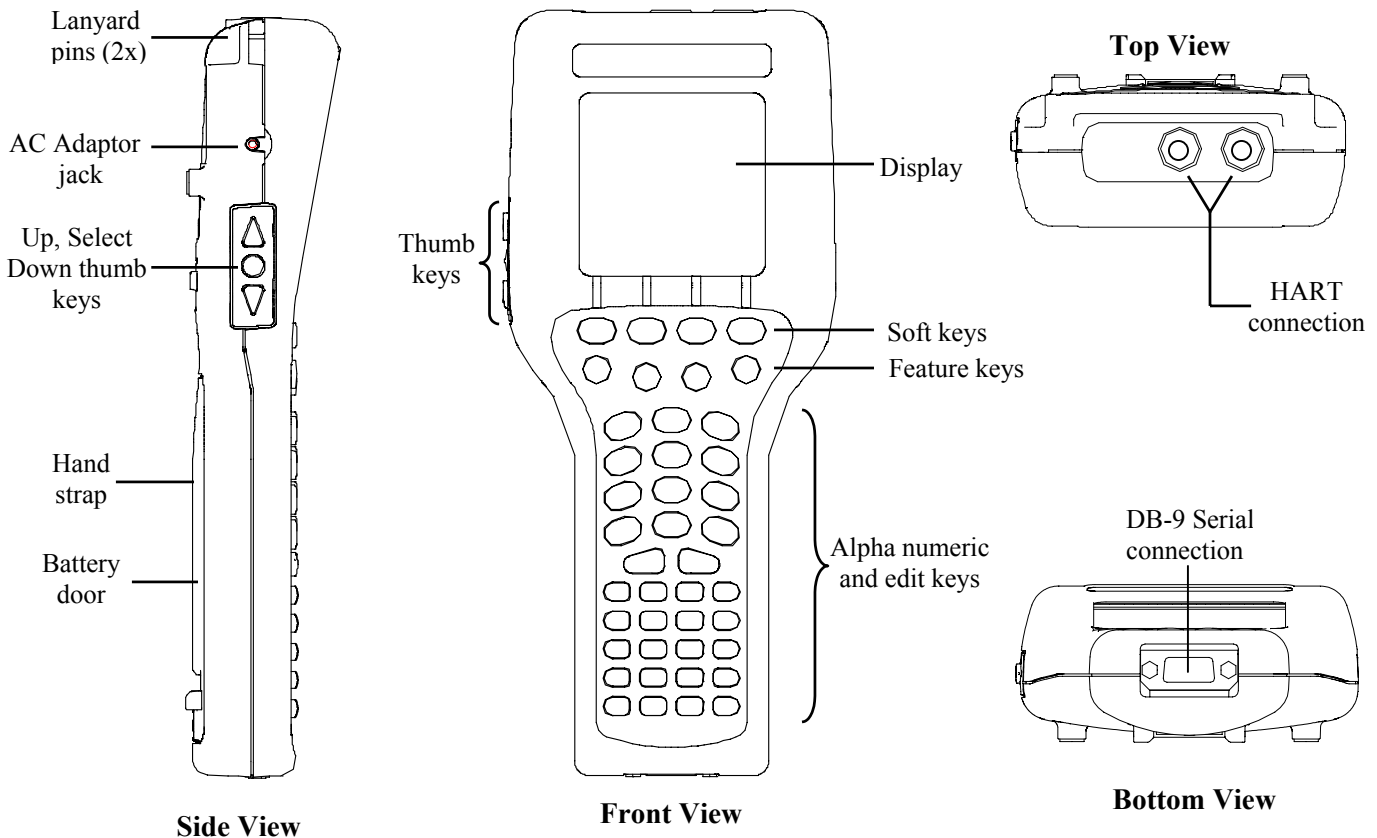
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MFC 4100 HART COMMUNICATOR

The MFC 4100 HART Communicator is the latest handheld communicator in the Meriam family of HART devices. All HART field devices can be configured, polled, and trimmed using the MFC with HART communications. The MFC is a full function HART Communicator supporting Universal, Common Practice and Device Specific commands for commissioning, configuration and maintenance operations.



Note: For Intrinsically Safe MFC models, consult the Hazardous Area Use section of this manual for specific details on use of approved MFCs and applicable restrictions.

DISPLAY OVERVIEW

The display of the MFC 4100 is a 128 x 128 pixel graphic display with backlight. Viewable area is 2.6" x 2.6" for 13 viewable message lines. The display provides three types of information: 1) header information including display titles, HART communication status indicator, SHIFT indicator, alpha or numeric entry mode indicator and battery gauge, 2) main data display section for display of MFC operating menus, HART menus, and device information, and 3) footer information defining the display's soft key functionality.

The following photo depicts the MFC Offline menu and Soft keys:



HEADER LINE SYMBOLS KEY

♥ heart symbol indicates active HART communication

↑ up arrow indicates SHIFT key is on

number sign indicates numeric / symbol entry is the present entry mode for all dual function keys

A letter indicates alpha entry is the present entry mode for all dual function keys

🔋 battery symbol indicates MFC under battery power; filled portion indicates remaining battery

🔌 electrical plug symbol indicates the AC adapter is connecting and powering the MFC

⏸ BUSY BUSY text box replaces either power symbol when the microprocessor is busy executing a previously requested task. Do not press keys when this status symbol is displayed.

KEY PAD OVERVIEW

The MFC keypad has three basic key types: single function keys, dual-function keys, and soft keys with changing definitions.

Single function keys control a dedicated MFC function.

Dual-function keys, through the use of the Alpha Lock or Shift keys, toggle between two separate functions as needed to facilitate data entry.

Soft key functions change depending on the present operating mode. Soft key definitions are displayed at the bottom of the LCD, just above their respective gray soft keys.

The left hand thumb keys can be used to scroll up, scroll down, and to select menu items.

On/Off

ON/OFF

Pressing the ON/OFF key powers up or turns off the MFC. As the unit powers up, an internal diagnostic check is performed. Any abnormalities are posted on the display. The unit will briefly display the MFC model number and then check for a HART device with address of zero. If a device with zero address is found, the MFC immediately goes into online status and displays information about the device. If no device is found, the MFC enters the MFC Main navigation screen. To turn the

MFC off, press and hold the ON/OFF key for approximately .5 seconds. Unit will power down provided a critical HART operation is not in process.



Quick Menu

The Quick Menu key initiates HART communications and then displays ten (10) HART menu choices for the connected device. These menus are used to short cut the traditional HART menus to enable the user to arrive quickly at the desired functions. Typical Quick Menu options include: Main Menu, Config Menu, Rerange, Basic Info, Construction Materials, Display, Sensors, Signal Conditioning, Self Test. Quick Menu is disabled while critical HART operations are in process.

Home



Home

The key sequence **SHIFT, Home** returns the user to the initial or “home” HART menu for the connected device. The Home function is disabled while critical HART operations are in process.



Document

This key provides rapid access to HART communication Save/Send Configs options, List/Edit Configs, and Create Configs functions for all MFC models. For Documenting models MFC 4101 and MFC 4103, this key also provides documenting functions used with the Meriam Device Management System software. Access to this key is disabled while critical HART communications are in process.



Display Contrast

This key allows the user to adjust the contrast of the LCD display for ambient lighting and user preferences at any time and in any operating mode. Pressing and holding this key cycles through all available contrast settings. If the display is faded or blacked out, simply depress the key until the display returns to an acceptable level. After adjusting Display Contrast, wait at least five (5) seconds before turning unit off to insure storage of new contrast setting. Ambient temperature compensation is included in the MFC 4100.



Back Light

This key provides a backlight to illuminate the display in poor light conditions. Battery life is impacted by long-term use of the backlight feature. An automatic shut off timer is available to the user under the Main Menu’s **MFC** soft key.



Alphanumeric / Symbol Entry

The alphanumeric keys have the heaviest population on the keyboard and are the method of entering data into the MFC. Each MFC display has a default alpha or numeric / symbol entry mode based on the most likely used mode for the display’s function. This reduces user workload to a minimum.



Pressing the ALPHA LOCK key activates the other entry mode at the user’s convenience. Pressing the SHIFT key converts the next key stroke to the inactive entry mode and then automatically reverts back to the default mode. The letter “A” in the display header line indicates the alpha input default is active while a # sign in the display header indicates the numeric / symbol input is the default.



SHIFT

The SHIFT key is used to activate the secondary functions of the MFC’s dual-function keys for the next keystroke only. When the SHIFT key is active, an up arrow ↑ is displayed at the top of the display to the left of the battery power (or AC wall plug) symbol. SHIFT is also used to activate the Page Up and Page Down soft key functions while viewing lists of information (installed DOFs, stored configs, etc...).

Alpha Lock



This key changes the keypad's dual function keys from numeric/symbol entry mode to alpha character entry mode and back. The present entry mode is indicated in the display header line next to the power supply indicator on the upper right of the screen. The letter "A" in the display header line indicates that alpha entry is active while a # sign in the display header indicates that numeric / symbol entry is active.



Left / Right Arrow keys

These keys support cursor movement forward and backward for text / numeric editing needs. The default edit mode is "overwrite." For navigating functions, the left arrow emulates the **Back** soft key and the right arrow emulates the **Select** soft key.



Delete

This editing key will delete the character located above the cursor in a text / numeric string.



Insert

The Insert text edit function is activated by pressing the **Shift, INS** key sequence. Once activated, the next alpha or numeric / symbol keystroke will be inserted into the open text field. The "overwrite" default mode is restored upon completion of the insert operation.



Soft Keys (unlabeled)

The four gray keys located immediately below the display are Soft Keys. The specific functions of these keys change depending on the operating mode of the MFC. Present definitions are displayed at the bottom of the MFC display. The following are examples of Soft Key definitions and their uses:

Up – moves indicator arrow up one line in a menu list

Down – moves indicator arrow down one line in a menu list

Select – selects the indicated menu item

MFC – provides access to MFC configuration settings (Lockout, Backlight timer, Off timer, Clock Edit, PC Comm Mode, and Model Info)

Back – returns to prior display

Inc – Increment the value shown above the cursor

Dec – Decrement the value shown above the cursor

Next / Prev – these keys move to Next or Previous item within the list function accessed. Next and Prev are for navigation only.

Done – Ends data entry session and proceeds with the selected operation

Edit – activate edit function for displayed parameter

Abort – aborts present operation without affecting prior settings or values

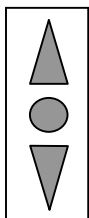
Save – saves the present value

Store – stores the present value

Yes – affirmative response to question presented

No – negative response to question presented

Trim – executes the trim function called for by the HART menu option selected




Thumb operated keys

Up, Select, and Down side keys provide convenient alternate methods of menu navigation. Use these in addition to Soft keys and numbered HART menu lines to make menu navigation fast and easy.

▲ = Up = Prev

● = Select, Edit

▼ = Down = Next

Do not use these keys when the  symbol is displayed.

GENERAL OPERATION

Power options

The MFC 4100 can be powered for portable operation by two each 9-volt alkaline, Lithium or NiMH batteries. Alkaline batteries are standard with the MFC shipment. Meriam offers NiMH batteries and charger cradles (external charge only) as an option. For bench top operations and download operations, an AC adapter (P/N A36742) is recommended.



Located in the upper right corner of the display, this icon displays the remaining battery power. Fresh batteries produce a full black cell body. As the power drains, the black segment retreats indicating remaining power.



When the MFC is used with the optional AC adapter (P/N A36742), the battery circuit is bypassed and a wall plug icon replaces the battery icon on the display header. The AC adapter jack is located on the left side of the MFC.

NOTE: Power icons may temporarily disappear during certain HART Communication operations

Navigating Menus on the MFC display

Several methods of navigating through the MFC menus are available to the user for maximum convenience and utility.

1. **Soft keys:** Use **Up** and **Down** Soft Keys to move cursor arrow to the desired menu option. Then use the **Select** soft key to accept the indicated choice. Soft key navigating tools are found throughout the MFC Main displays and HART communication displays.
2. **Side keys:** **Up**, **Down** and **Select** keys are also provided on the left hand side of the MFC. These keys are thumb operated and provide a convenient alternative to the Soft Key navigation buttons. Side key functionality is not always available in the HART communication displays.
3. **Multi-page lists:** Multi-page lists have a Δ and/or ∇ symbol along the right hand side of the display indicating the existence of information on the previous or next page(s). Several pages of information may need to be viewed when reviewing lists of installed DOFs, stored configuration files or finding a specific device in Offline Mode to create a configuration for. While in these list areas, pressing the SHIFT key changes soft key definitions **Select** and **Back** to **PgUp** and **PgDn**, respectively. To quickly advance to the next page of a list, press **SHIFT** and then the **PgDn** soft key. To retreat to the prior page, press **SHIFT** and then **PgUp**. After **SHIFT** is pressed the **PgUp** and **PgDn** soft keys remain active until the **Up** or **Down** soft key is used or until **SHIFT** is pressed again.
4. **Numbered HART menus:** All HART displays have numbered menu lines when needed. This gives fast access directly to the desired menu line. MFC displays also have numbered menus with the exception of multi-page list screens and the MFC Configuration screen.
5. **HART menu HOME key:** To quickly retreat from any location in the HART menu to the initial HART menu screen for a device, press the **SHIFT, HOME** key sequence. This will return the display to the initial HART screen. The Home function will be disallowed if a critical HART task is in process.
6. **Left / Right Arrow keys:** Emulate **Back** and **Select** soft keys, respectively

Turning on the MFC

Use the dedicated **ON/OFF** key to power up the MFC. A brief diagnostic runs while the Meriam Process Technologies logo, MFC model number, and MFC firmware version is displayed. A message is displayed indicating the MFC is scanning for a HART device at address zero. The following scenarios are possible.

1. If the MFC is connected to a HART device with address zero (and there is sufficient loop resistance), the MFC immediately establishes HART communication with the device. A display similar to the example at right appears. The numbered menus and Soft Keys are then used to commission, re-configure, or maintain the connected device.

Online		♥	#	
3051 : PT-1012D				
1 Device setup				
➡	2	Pres: 0.01 inH2O		
3 AO: 4.001 mA				
4 LRV: 0.00 inH2O				
5 URV: 250.00 inH2O				
Up	Down	Select	Back	

2. If no HART device is connected, a HART device with address $\neq 0$ is connected, or a connected device is not found due to wiring or loop resistance problem, the MFC will enter the MFC Main navigation display depicted at right.
 - 2.1 Select **Online Setup** once a HART device is connected or once the wiring problem is resolved. A proper connection will be indicated when line two changes to “**Device 0 *Online***”.
 - 2.2 Select **Online Setup** if properly connected HART device is setup for Multi-drop loop or Burst Mode operation (device address $\neq 0$). The MFC will immediately initiate a multi-drop poll to find all non-zero addresses on the loop.

MFC Main		♥	#	
Device 0 Not Found				
1 Online Setup				
➡	2	Offline Menu		
Up	Down	Select	MFC	

MFC Main display

The MFC Main display provides access to Online Setup, Offline Menus and to MFC configuration settings via the right hand Soft Key.

1. **Online Setup** is described above in Turning On the MFC.
2. **Offline Menu** is selected to provide access to Offline Utilities such as List / Show DOFs, List / Edit Configurations, and Create Configurations. The number of DOFs installed (HART device profiles) and the number of device Configurations stored are also available on Offline Utilities screen.
3. **MFC Soft Key** is selected to configure MFC settings and view MFC information such as Model, Serial, and Firmware numbers, DOFs installed and Configurations stored.

MFC Main		♥	#	
Device 0 *On-line*				
➡	1	Online Setup		
	2	Offline Menu		
Up	Down	Select	MFC	

Configuration		#	
Current Settings			
Lockout : Disabled			
➡	Backlight: 2 min		
Off Timer: Disabled			
Clock Edit			
Enter PC Comm. Mode			
Model Info			
Up	Down	Select	Back

MFC Configurations Settings

Lockout Feature

The MFC HART Communicator can be programmed to lock out certain standard functions that a supervisor may wish to control. The functions included are used to set up the MFC for normal use, change online HART device configurations, create offline HART device configurations, update the installed DOFs list (HART device profiles), or to update the MFC's operating firmware. For example, locking out the Configs feature turns the MFC into a read only HART communicator while locking out DOFs and Firmware prevents unauthorized updates. The lock out can be limited to individual Lockout Details items or all Lockout Details items can be locked out at one time.

To enable the lockout feature, move the selection cursor **➡** to the **Lockout** menu option on the Configuration screen (see above). Choose the **Lockout** selection by pressing the **Select** soft key. The MFC will enter the **Lockout Enable / Disable Screen**. The current status is shown and three choices are provided:

Configuration	#		
Lockout	:	Disabled	
➡ Disabled			
Enabled			
View Details			
Up	Down	Select	Back

Lockout Enable / Disable Screen

Configuration	#		
Lockout Details			
➡ All	:	Disabled	
Setting	:	Disabled	
DOFs	:	Disabled	
Configs	:	Disabled	
Firmware	:	Disabled	
Up	Down	Select	Back

Lockout View Details Screen

Disabled: All lockout features are disabled and all options on the menu are accessible for reconfiguration.

Enabled: Enables the lockout selections that are set in the **Lockout Details** screen (above left).

View Details: This option takes the user to the **Lockout Details** screen listing all MFC parameters that can be protected by lockout (see above left). Individual functions can be locked or, if preferred, the lockout can be set to deny unauthorized access to all parameters.

To enable the lockout option, select **Enabled** on **Lockout Enable / Disable Screen** by scrolling **Down** and pressing **Select**. The screen will switch back to the original **Settings** screen that now shows the lockout status as Enabled.

Scroll **Down** to **View Details**, and press **Select**. This screen allows the user to choose which parameters to lockout. Use the **Up** and **Down** keys to scroll through the selections and press **Select** to choose the desired setting(s). The screen will change and prompt you to **Enable** or **Disable** lockout for that function. Scroll **Down** to **Enable** and press **Select**.

Lockout Code

At this point the user will be prompted to enter a 3-digit lockout code. This code will be required to gain access and change any parameter previously locked out. Use the **Increment**, **Decrement** and **Next** Soft Keys to input a lockout code value. Alternatively you may use the green keys for **Increment** and **Decrement** functions. When you are satisfied with the lockout code value, press **Store**.

IMPORTANT: After the code is entered, the user must cycle the power to activate the lockout mechanism!

BE SURE TO SAVE THIS CODE IN A SAFE PLACE IN THE EVENT YOU FORGET THE NUMBER. ACCESS TO LOCKED-OUT FEATURES WILL BE DENIED WITHOUT THE PROPER CODE.

To Disable Lockout

When you wish to use a function or edit a value that is protected by the lockout code, enter the three digit Lockout code when prompted and press **Save**. You will now be able to use the function or edit the setting as normal. Entering an incorrect code will display the message “Incorrect Code” and allow you to try again.

Changing the Lockout Code

To change the lockout code, disable the lockout function for all the parameters selected, shut the unit off, and follow the procedures outlined above.

Backlight (off timer)

To conserve battery life, the MFC 4100 series allows the user to set the backlight to shut off after a certain period of keypad inactivity. To change the backlight off timer on the unit, scroll **Down** to **Backlight** and press **Select**. Scroll **Up** or **Down** to the auto shut-off time desired. Press **Save** to select the new value.

The shutoff timer can be disabled or set to shut off after time periods of from 1 minute up to 30 minutes.

NOTE: The Backlight Off Timer is disabled when the optional AC Adapter (P/N A36742) is powering the MFC.

Off Timer

To conserve battery life, the MFC 4100 series allows the user to set the unit to shut off after a certain period of keypad inactivity. To change the off timer on the unit, scroll **Down** to **Off Timer** and press **Select**. Scroll **Up** or **Down** to the auto shut-off time desired. Press **Save** to select the new value.

The shutoff timer can be disabled or set to shut off after time periods of from 1 minute up to 2 hours.

NOTE: The Off Timer is disabled when the optional AC Adapter (P/N A36742) is powering the MFC.

Clock Edit

The Clock Edit option allows the user to correct the date and time of the MFC’s internal clock. To select the **Clock Edit** feature, make sure the pointer arrow is pointed to this selection. If not, scroll the arrow **Down** using the soft keys. Choose **Clock Edit** by pressing the **Select** soft key.

Choose a clock or date option to adjust by scrolling **Up** or **Down**. Press **Select** to choose that option. Enter the correct value using the numeric keypad and text edit key if needed. When complete, press **Done**. You will be asked if you wish to save the new data. Press **Yes** to accept the new value. Pressing **No** will take you back to the **Clock Edit** without making any changes to the MFC clock.

NOTE: When replacing the batteries, the date and time will remain active. Date & time information is continuously powered by an internal, 10-year life back-up battery. This battery is not serviceable by the user.

Enter PC Comm. Mode

When the MFC is connected to a PC for updates via MFx Installer (see MFx Installer section in this manual), a DB-9 serial cable is used. Occasionally a DB-9 Serial cable is encountered that does not have a DTR line. The DTR line is important to the update process because it is used to initiate and confirm communication between the two machines. If a DB-9 cable without a DTR line is used, the MFC must be manually placed

in the **Enter PC Comm. Mode**. Go to the MFC Main display and select **MFC**. Scroll down to the **Enter PC Comm. Mode** menu option and press **Select**. Proceed with update and cycle MFC power when the update is complete. It is recommended to use fresh batteries or an AC adaptor during update procedures. This mode will automatically time-out after approx. 2 minutes of inactivity and return to the main display.

Battery Installation & Removal – all MFC models

The MFC monitors battery condition and displays a “REPLACE BATTERY” notice when the batteries get low. The MFC will function for a short period of time after the notice is posted.

To install or remove the batteries, remove any soft case or protective boot and turn the MFC face down on a work surface. Use a flat screwdriver to loosen the captive screw holding the battery door closed and remove door. Replace batteries and make sure all connections are firmly secured. Replace door, tighten screw and replace the soft case or boot.

Note: Replace both 9-volt batteries at once with all alkaline, all lithium or all NiMH cells. Do not mix alkaline, lithium or NiMH batteries with each other or with other battery types. Battery replacement is recommended when the “Replace Batteries” notice is posted on the display; however, the MFC will function for a time after the notice is posted.

Note: For Intrinsically Safe MFC models, replace batteries only in Non-Hazardous Areas. Replace batteries with approved types only. See the MFC Intrinsic Safety Control Document in the Appendix of this manual for approved battery details.

External Connections to MFC

1. AC Adapter – The MFC 4100 can be powered by external AC Adapter connected to the jack located on the left side of the MFC. P/N A36742 bypasses the battery circuit to power the unit. The battery symbol in the display header is replaced by a wall plug symbol.

WARNING: Serious injury or death may result from explosions. Do not make connection to the AC adapter jack in a hazardous area. Use the AC adapter only in non-hazardous areas.

2. HART lead set – All MFC models are equipped with a standard size banana jack on 0.75” center. The lead set supplied with the MFC has a standard banana plug on one end and mini-grabbers on the other for convenient connections.

Note: For Intrinsically Safe MFC models, verify the instruments in the loop are installed in accordance with intrinsically safe field wiring practices before making connection from the field device to the MFC’s HART jack. See Hazardous Area Use Section of this manual for Intrinsically Safe guidelines / restrictions.

3. DB-9 Connection Port – All MFC models are equipped with a standard DB-9 connection for RS-232 communications located on the MFC’s bottom end. The DB-9 provides the hardware interface to facilitate download / upload operations from a host PC. This connection port facilitates download of MFC firmware improvements, HART[®] Device Object Files (DOFs) and documenting operations (Documenting options pending). All MFC upgrades are available via the Meriam Process Technologies Download Site accessible from www.meriam.com. The MFC will not need to be returned to Meriam for firmware updates or for the addition of DOF files.

Note: Do not use the DB-9 connection port in Hazardous Areas. Use in non-hazardous areas only. See Intrinsic Safety Control Document in the Appendix for more details on I. S. MFC units.

HAZARDOUS AREA USE

Intrinsically Safe Certification

The MFC 4102 and MFC 4103 HART Communicators are available with Intrinsically Safe Certification for use in Class I, Division I, Groups A, B, C, and D, T5 hazardous areas. Refer to the Intrinsically Safe Control Document in the Appendix of this instruction manual for more details. The certification is to CAN /CSA-22.2 No.1010.1 & 157-92 and UL913 Fifth Edition Rev 2/21/97.

The following table identifies MFC model numbers and Areas of acceptable use.

Model Number	Non-hazardous Area	Hazardous Area
MFC 4100	√	NO
MFC 4101	√	NO
MFC 4102	√	√
MFC 4103	√	√

MFCs with Intrinsically Safe certification can be identified by model number (see table above or the Intrinsically Safe Control Document in the Appendix) or by a special label on the unit. A sample of the label is shown below.



WARNING: *Serious injury or death may result from explosions. Do not make connection to the DB – 9 connection port or to the AC adapter jack while in a hazardous area.*

WARNING: *Serious injury or death may result from explosions. Before making electrical connections to an Intrinsically Safe MFC at the HART jacks, verify the instruments in the loop are installed in accordance with intrinsically safe field wiring practices.*

Note: *Restrictions apply to the use of Intrinsically Safe MFC units in hazardous areas. Refer to the Intrinsically Safe Control Document in the Appendix for exact details. Meriam Process Technologies reserves the right to revise the Control Document without notice. Contact Meriam Process Technologies (phone (216) 281-1100) for the current Intrinsically Safe Control Document.*

For Intrinsically Safe MFC models, consult the Hazardous Area Use section of this manual for restrictions, for special instructions in use, and for electrical connections.

HART® Communications with the MFC 4100

Overview

The MFC 4100 HART communicator provides device specific HART communication functions that allow the user to poll, configure and maintain supported HART field device. The MFC 4100 uses Universal, Common Practice and Device Specific commands to facilitate communication with a HART field device. Use the MFC to commission devices, operational re-configuration needs, or maintain devices through analog and sensor trim adjustments and many other features.

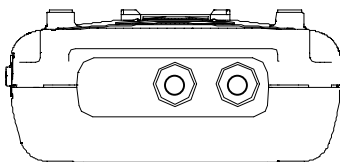
The MFC 4100 will communicate with any HART device through Universal and Common Practice Commands using the standard Generic DOF (Device Object File) but must have the DOF for a specific HART device installed before it can execute Device Specific Commands. Consult the large and growing list of available DOFs at www.meriam.com for an up to date list of HART devices with device specific support. The list is found under “Available DOFs” button on the home page. When HART device support for new devices becomes available, the MFC can be easily field updated via Internet downloads.

HART Commands

Three HART command types are used by the MFC 4100 to communicate with HART field devices. First, *Universal Commands* are primarily used to identify a field device by its model number and tag number and to read process data from the device. This communication is referred to as “polling”. The MFC 4100 can poll any Hart Device. Second, *Common Practice Commands* are used for calibration and maintenance functions that are common to many devices. An example of this would be trims or adjustments for the devices’ analog outputs. Third, *Device Specific Commands* are used to handle functions that are unique to a particular device or manufacturer. Examples of these commands include sensor zero, sensor trim, calibration curve characterization, density inputs required for calculations made by the HART device or other configuration functions unique to the specific device.

HART Connections

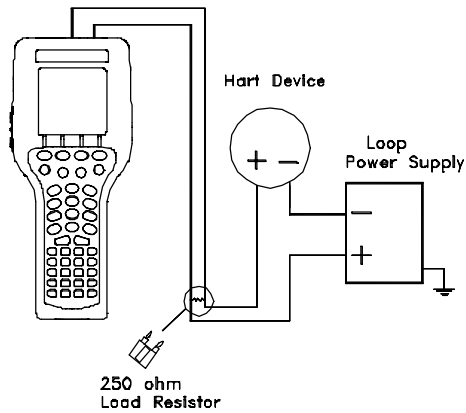
HART connections are made using two standard banana jacks (3/4” center) located at the top end of the MFC 4100. Refer to the following diagram. Polarity is not a concern for HART connections so both jack collars are black. Meriam supplies a HART lead kit (P/N A36744) complete with mini-grabber connections and a 250 Ω load resistor with each model MFC 4100.



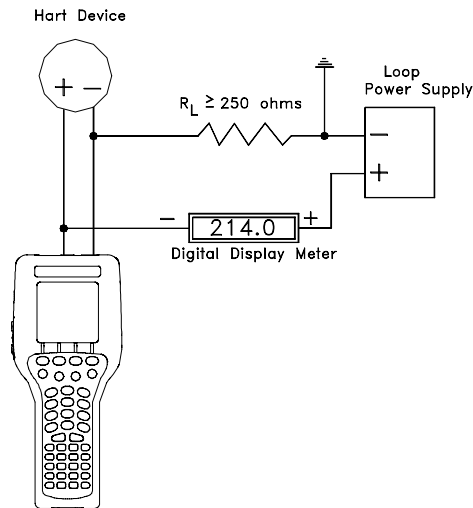
MFC 4100 with HART®

HART® connections are standard banana jacks (3/4” center)

For low load loops (less than 250 Ω), a 250 Ω resistor will need to be added to the loop to insure reliable HART communications. Meriam supplies a 250 Ω load resistor in the form of a standard adaptor (P/N A36821). Refer to the following diagram for connection details.



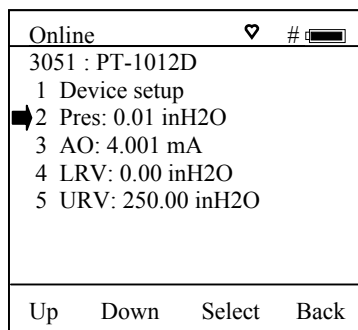
When connecting the MFC 4100 to a loop with a resistive load greater than 250 Ω s, the HART jacks may be connected across the loop + and - or to the HART device communication terminals. Refer to the following diagram for connecting across the loop + and -.



Connecting to the MFC communication terminals

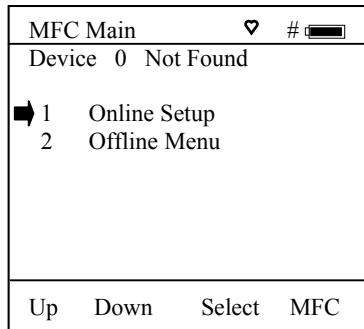
HART[®] Communications

Upon power up the MFC automatically detects if a field device is connect and attempts to establish HART communications. When a device with address zero is found, the MFC provides feedback to the user and starts the initial HART display for the connected device. See an example of Online Mode below.

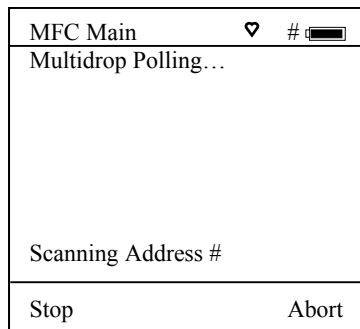


Online HART Screen

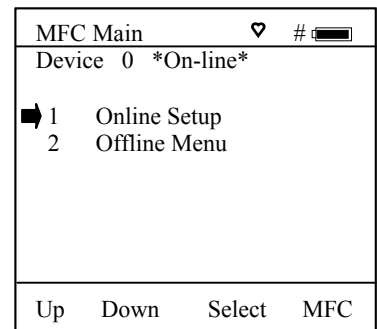
When no device connection is detected or a device with non-zero (Multi-drop or Burst Mode) address is found, the message **Device 0 Not Found** is displayed and the MFC enters the **MFC Main** navigation screen. The **MFC Main** screen allows the user to launch a multi-drop poll to find all devices with non-zero addresses on the loop, to manually start an Online poll, or to enter Offline Mode.



MFC Main Navigation Screen
No device or Non-zero address found



Mult-drop Polling Screen
Multi-drop & Burst Mode Support



MFC Main Navigation Screen
Manually launch polling on Device 0

Multi-drop Poll

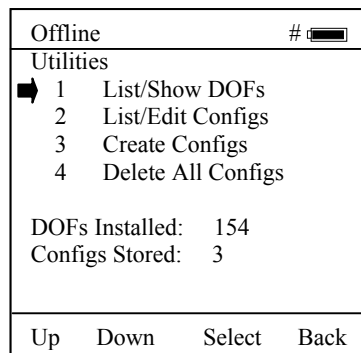
To initiate a Multi-drop Poll, select the **Online Setup** option from the **MFC Main** screen when the **Device 0 Not Found** message is displayed. This function polls for all non-zero addresses (1 – 15). Located addresses are listed on the display as the remaining addresses are checked. When polling is complete, or upon pressing **Stop** after the address of interest is found, use the soft key controls to select the address of interest. The initial HART menu for the device selected will then be displayed for use.

Manual Launch of Device 0 Poll

When the message **Device 0 *On-line*** is displayed on the MFC Main navigation screen, selecting **Online Setup** will launch HART communication with the device. The message indicates that a HART device with address 0 has been detected at the HART connection and the MFC is standing by to initiate communications. The **Device 0 *On-line*** message is shown 1) if a physical connection is made to a HART device after the MFC power is turned on or 2) if the user exits from a HART communication session using the soft key controls provided.

Offline Menu Mode

The **Offline Menu** gives the user access to lists and functions that can be viewed or performed in Offline Mode at the user's convenience for the purposes of reviewing the MFC's DOF list, reviewing stored device configurations or creating HART configurations. Stored configurations can be also be edited and then applied later to a connected HART device. When the **Offline Menu** is selected from the **MFC Main** navigation screen, the following display is shown.



Hart Offline Menu Screen

List / Show DOFs:

Provides a list of installed DOFs (Device Object Files) used by the MFC to communicate with HART devices. Lists can be view by Manufacturer, by Device Name or by stepping through all Devices one at a time. Use the soft key controls to move through the list. Pressing the SHIFT key changes soft key definitions **Down** and **Up** to **PgUp** and **PgDn**. To quickly advance to the next page of a list, press **SHIFT** and then the **PgDn** soft key. To retreat to the prior page, press **SHIFT** and then **PgUp**. Once engaged, the **PgUp** and **PgDn** soft keys remain active until the **Up** or **Down** soft keys or **SHIFT** is pressed again.

List / Edit Configs:

This screen lists all stored HART configurations by Tag Number. The configurations stored enable fast commissioning of replacement devices, cloning of existing systems, or re-configuring for changes in process conditions or batch runs. Any configuration in the list can be sent to another HART device of the same manufacture and model. The display can show 20 character tag numbers. Truncated tags are listed if more than 20 characters are used. Moving the cursor down to the tag of interest and pressing the **Select** soft key will provide a detailed information screen, including full tag number up to 28 characters, for the tag of interest (see example below, right).

The editing function allows review of all HART parameters in a configuration and modification of editable parameter. The edit function can be locked out if desired (see the **Lockout** section of this manual for more information). To view detailed information of a stored configuration, Move the cursor to the desired tag number and press the Select soft key. The Config Detail screen (see example at right) provides information to help the user confirm the identity, origin, and save date/time of the configuration. Pressing Select again opens the configuration for review or offline editing.

New configurations saved are added to the bottom of the List / Edit Config list. If multiple entries for one device are shown, the most recently saved configuration is always shown at the bottom.

Entries in the List / Edit Config list may have been saved or created from various sources. Possible sources include the save command from a connected HART device, created in the MFC using the **Create Configs** function, copied from another configuration and renamed, or created by editing an existing file. An MFC with Documenting option (MFC 4101, MFC 4103) will also list configurations downloaded from the separately available Device Management System software from Meriam (see www.meriam.com/dm_solns.htm for more information). Tag numbers, date / time of save, type of configuration stored, and other information are displayed under **List/Edit Configs**. Configuration types are:

- Complete Config = saved from connected device in Online mode, or a complete config that was downloaded from DMS
- Default Config = created by MFC in Offline mode, or created in DMS and downloaded to MFC
- Edit Vars Only = created by editing an existing configuration and includes only the edited parameters
- MVar Primary Cfg = for multivariable devices – Primary Variable configuration
- MVar Sub Config = for multivariable devices – Sub-configuration (secondary, tertiary, fourth, etc variables)

Offline	#	
List/Edit Configs		
PT-105A		
PT-105B		
DPT-201C		
TT-312A		
TT-312A		
FE-201		
FE-201		
PT-6174		
Up	Down	Select Back

**Offline List / Edit
Configs Screen**

Offline	#	
List/Edit Configs		
Tag: PT-105A		
Device ID 1365		
PV: Pressure		
Endress + Hauser		
Cerabar S		
Complete Config		
Uses DOF 11070702		
51 Variables		
12/18/03 4:58 PM		
Copy	Del	Select Back

**Offline List / Edit
Configs Detail Screen**

Create Configs:

The **Create Configs** function allows the user to configure a HART device file in Offline Mode for sending to the intended device later when connected in the Online Mode. Use the soft key controls to move through the list and select the device model number required. The menus prompt the user to make the necessary configuration selections, tag the file for later retrieval and use, and edit configuration lines as required. This function can be locked out. See the Lockout Section of this manual for more information.

Delete All Configs:

The **Delete All Configs** function clears **all** configurations from memory (including active and hidden configs). When this menu option is selected, the MFC will ask “Delete ALL Configs... ARE YOU SURE???” Select **Yes** to clear **all** stored configurations from memory.

Delete Configs / Clearing Configuration Memory:

Individual stored Configurations may be deleted with MFC **Del** soft key functions (see example at right). A delete confirmation screen is provided to prevent unintended deletions. The **Del** key only hides the record from the MFC screen; it does not clear memory space. The editing function can be locked out. See the Lockout Section of this manual for more information.

(To clear **all** configurations from memory (including active and hidden configs), enter the **HART Offline Menu Screen** and select the **Delete All Configs** option. The MFC will ask “Delete ALL Configs... ARE YOU SURE???” Select **Yes** to clear **all** stored configurations from memory.)

Offline	#	
List/Edit Configs		
Tag: PT-105A		
Device ID 1365		
PV: Pressure		
Endress + Hauser		
Cerabar S		
Complete Config		
Uses DOF 11070702		
51 Variables		
12/18/03 4:58 PM		
Copy	Del	Select Back

**Offline List / Edit
Configs Detail Screen**

Online Setup Mode

Online Setup is the normal HART communication mode for the MFC. This mode enables communication with HART field devices at the Universal, Common Practice and Device Specific Command levels for full device setup and functionality.

Menus displayed for the connected device follow the HART device manufacturer’s menu structure for the connected device. Consult the device manual for menu structure details.

MFC features two unique online features for added convenience to the user.

1. **Live HART connection monitor:** MFC display lets you know from the Main navigation screen when a device is * **On-line** * and ready for communication.
2. **Review/Edit:** this menu option allows the user to review configurations line-by-line. MFC supports editing of the configuration once the line of interest is located.

Device Setup	♥	#	
3051 :PT-1012D			
1 Process variables			
2 Diag/Service			
3 Basic setup			
4 Detailed setup			
5 Save/Send			
6 Review/Edit			
Up	Down	Select	Back

Online Device Setup Screen

Communications Trouble Shooting

If an operating HART device is connected to the MFC but the “Device 0 Not Found” notification is received, a Multidrop Poll may be executed to determine if the connected device has a non-zero address.

Select **Online Setup** from the MFC Main navigation screen to initiate the multi-drop poll. If the “No Devices Found” message is received, then the loop connections to the MFC should be carefully checked.

If an operating HART device with address zero (0) is connected to the MFC but the “Device 0 Not Found” notification is received, the loop connections to the MFC should be carefully checked.

Make sure all connections are correct and secure. Check for shorts, open circuits and multiple grounds.

Determine if the loop resistance is greater than 250Ω and less than 1100Ωs. If less than 250 Ω then use the supplied 250 Ω load resistor in series with the loop (see diagram HART Connections section).

If communication is still not established, check the **List / Show DOFs** menu under **Offline Menu**. Check the list for the presence of the “Generic” DOF under the manufacturer name “Meriam.” If “Generic” is found, then HART communication is possible when the device is properly wired and connected to the MFC (see connection troubleshooting details above).

When the message “Generic” is displayed after connecting to a HART device there are two possible causes:

- 1) No device specific DOF for that device is currently installed in MFC memory. Check the Meriam Download Site for availability of the DOF needed by clicking on the Download Site button at www.meriam.com and entering the User Name and Password provided with MFC shipment. For download instructions, see the DOF Download Site Information section of this manual.
- 2) The Meriam DOF “Device Library” is missing or has become corrupted. Without this DOF, the MFC may not recognize a connected device. Check the **List / Show DOFs** menu option of **Offline Menu**


More Status Message

HART device events (diagnostic flags) cause the MFC to display a “More Status Message” at the bottom of the display. This message is a notice to the user that one or more diagnostic warnings are available in the Review Status menu option of the connected device. Upon receipt of this message, enter the **HART** mode and select Detailed Setup / Diagnostics – Service / Test – Status / View Status to retrieve the diagnostic information.

Save / Send Configuration Functions

HART device configurations may be saved to MFC memory or sent from MFC memory to a HART device in all MFC model numbers. These functions are useful for cloning a device configuration for use in another transmitter of the same configuration, for recording as-found and as-left configurations for later review, for returning HART devices to previously used configurations, etc...

The Save / Send function may be accessed in one of two ways:

1. Press the Document key  on the MFC for the screen shown at right. Then select the “Save/Send Configs” menu option to launch a HART communication poll and use the Save / Send options.
2. Use the Save / Send menu option within the HART device’s standard menu. The MFC would be in Online mode in this case. Save / Send is normally found under the “Device Setup” menu option on the initial HART display for the device.

Document	#		
Utilities			
1	Save/Send Configs		
2	List/Edit Configs		
3	Create Configs		
Configs Stored: 98			
Up	Down	Select	Back

Document Key Menu Screen

Documenting HART Configurations with Meriam DMS software


The Documentation order option for MFC 4101 and MFC 4103 models provides additional functionality for use with the Meriam Device Management System (DMS) software. DMS is a database product for complete device management services including calibration with the Meriam MFT 4000 Series of multifunction calibrators and HART configuration documentation with the MFC 4101 and 4103. Complete device histories are maintained in the database. For HART devices these histories can include as-found and as-left HART configuration data to complete this important part of a device's history.

Document		#	█
Utilities			
➤	1	Save/Send Configs	
	2	List/Edit Configs	
	3	Create Configs	
Configs Stored:		98	
Up	Down	Select	Back

Document Key Menu Screen



MFC 4101 / 4103 with Meriam Device Management System

The Document key  on the MFC 4101 and MFC 4103 models will save configurations in as-found or as-left categories as selected by the user. These configuration files can be uploaded later to DMS. When the **Save/Send Configs** menu option is selected the MFC automatically polls for an Online device for subsequent user selections.

DMS can also be used as a configuration repository ready to download stored device configurations for batch runs or changes in operating requirements. New configurations can be downloaded to MFC memory for later recall and use in the field.

MFC 4100 Device Specific & Generic HART® Communications

Meriam supports a large and growing number of Device Specific DOFs (Device Object Files). For a current listing of HART® devices with full Device Specific communication support, go to www.meriam.com and click on the “Available DOFs” button. Information found there can be sorted by manufacturer name or model number.

To facilitate communication with HART devices that are not yet supported with Device Specific DOF files or that do not require DOF files, the MFC 4100 includes Generic HART Communication capability. This allows the user to communicate with any HART device using Universal and Common Practice commands to poll, configure, and maintain HART devices. Specific functions supported include most polling, tagging, device configuration and trim operations for analog outputs. Generic communications do not support Device Specific commands for higher order HART functions (see the **HART® Commands** section of this manual or the instruction manual for the HART device of interest for more information on the three command levels).

Using Generic HART Communication

The MFC 4100's Generic HART Communication mode starts automatically when HART communication is initiated with a device for which no Device Specific DOF (device object file) is found to match the connected

HART device name. When this occurs, line two of the display will indicate “Generic” and the device tag number.

In general, the Generic HART mode operates similarly to its device specific DOF counterpart (see HART Communication section of this manual for more details). However, the MFC does not display Device Specific related communication menus or options when in the Generic communication mode. For example, the Zero and Sensor trim menu options (normally executed by Device Specific commands) are not displayed for pressure transmitters without DOF support. Please see the **Download Site** section of this manual for information on downloading the latest Device Specific DOF files to your MFC.

DOF / Firmware Download Site

Overview

One of the unique features of the MFC 4100 Series is the built-in ability to have firmware upgrades installed by the user at his location. The Meriam Download Site is accessible over the Internet and provides for the convenient download of new or revised firmware and DOF's (Device Object Files) for HART communication. MFC units already in service in the field do not need to be returned to the factory for firmware upgrades or improvements released by Meriam. The user can simply download the files to a PC having Internet access and upgrade the MFC firmware using the MFx Installer PC utility. DOF's are also available on this site. The Download Site enables users to stay current as Meriam releases new DOF's or revisions of existing ones.

Who has access to the Download Site?

All MFC purchasers have unlimited access to the Download Site for six months from date of shipment. These customers may download any published file from the site to their MFC upon entry of the proper authenticating codes (shipped with unit). After the initial six-month period, the Download Site is available with paid annual subscription fee. Contact Meriam Process Technologies at (216) 281-1100 or meriam@meriam.com for more information and to purchase annual subscriptions.

PC Requirements for Download Operations

Meriam recommends IBM compatible Pentium I PCs or higher for download operations. The PC should have an available RS-232 port, minimum modem speed of 28K and access to Internet service.

Preparing the MFC

All MFC models come ready to connect to an IBM compatible PC using the DB-9 socket located at the bottom of the MFC enclosure. A six-foot male DB-9 to female DB-9 cable (P/N A90047-00052) is available from Meriam. Similar cables are acceptable. Connect the MFC to the PC and power up the MFC using fresh internal batteries or the optional AC Adapter (P/N A36742). The MFC is ready for download operations.

Preparing to Download

Establish connection to the Download Site by going to the Meriam Process Technologies website at www.meriam.com. Click on the “Download Site” button on the home page navigation bar to access all download functions. A list of currently available DOF's for HART device communication can be viewed at the www.meriam.com website. Click the “Available DOFs” button on the home page navigation bar to view an up to date list of available DOF's.

Using the Download Site

The landing page of the Download Site requires the user to enter a valid User Name and Password to authenticate user identity and permit entry to the Site. These two codes are initially assigned by Meriam and can be found on a card included with shipment. Locate the card and place in a safe place for future reference.

Once a user is logged on to the Site, the **Latest Release Notes** screen appears listing and describing the most recent firmware releases posted and the posting date. Individual files can be downloaded from the detailed description page of each DOF or firmware file listed. Also available on this screen are the navigation buttons for **Current Release Notes**, **File Download Area**, and **Subscriber Options**.

The **Current Release Notes** screen describes the most recent firmware releases available and dates posted. Five (5) columns are shown on this page: Date, Title, Description, Manufacturer, Model. These categories will assist the user in finding the release descriptions of the DOF, MFC Installer or MFC Firmware releases of interest. Individual files can be downloaded from the detailed description page of each DOF or firmware file listed. Each column can be sorted to assist searches of the release database. Also available on this screen are the navigation buttons for **Latest Release Notes**, **File Download Area**, and **Subscriber Options**.

The **File Download Area** screen is the actual download page. Select from a list of downloadable firmware files (including MFx Installer Utility, MFC Firmware, MFC Documentation Firmware and DOF's) by locating the file name of interest with the PC mouse and left clicking. Dialog boxes guide the user through the process. Multiple files can be downloaded using a Java applet that must first be loaded onto the host PC. Dialog boxes again guide the user through the process. Subsequent downloads of multiple files will be handled by the Java applet stored in the host PC memory. Also available on this screen are the navigation buttons for **Latest Release Notes**, **Current Release Notes**, and **Subscriber Options**.

Subscriber Options

The **Subscriber Options** screen provides useful account information. User Name and Password for the account are listed, as well as the subscription expiration date. In addition, this screen allows the user to customize the account Password. The user should also provide an e-mail address that allows Meriam to provide notification of new firmware updates, DOF releases, and subscription period expiration. Press the "Update Subscriber Options" button to save all **Subscriber Options** changes.

To report any difficulties with downloading operations, please contact Meriam Process Technologies at (216) 281-1100 or meriam@meriam.com.

MFx Installer Utility

MFx Installer utility should be loaded onto the host PC from the instruction manual CD (included with MFC shipment) or from the Meriam Download Site where it can be found on the **File Download Area** page. MFx Installer coordinates the download operations from the host PC to the MFC. Periodic improvements may be incorporated into this Utility. Therefore, Meriam recommends periodic comparison of the MFx Installer version installed on the host PC to the latest available version on the Download Site to insure use of the an up to date Utility tool. Directions for using MFx Installer are found under the Help Tool Bar selection.

RETURNING THE MFC FOR REPAIR

In the event that a MFC requires service and must be returned to the factory for repair, please contact your local Meriam Process Technologies Representative (see list and contact information at www.meriam.com) or contact the factory direct at the numbers listed below.

Please do not send any unit in for repair without first contacting Meriam Process Technologies or Representative for a Return Material Authorization (RMA) number. This number will be provided by the Meriam Repair Department when you call, fax or e-mail your information. An RMA number must accompany all incoming packages to insure proper tracking, processing and repair work.

To assist us in processing your repair request, please have the Model & Serial Number of the unit available when you call. This information is located on the MFC label. This information can also be obtained directly from the MFC display by pressing the **MFC** Soft Key from the **MFC Main** display. *See the **MFC Main display** section in this manual for more details.*

Meriam Process Technologies
10920 Madison Avenue
Cleveland, Ohio 44102

TELEPHONE: (216) 281-1100
FAX: (216) 281-0228
E-mail: meriam@meriam.com
Web Site: www.meriam.com

APPENDIX

PRODUCT SPECIFICATIONS OVERVIEW

BASE UNIT: 10" L x 4.25" W x 1.65"D ABS plastic case with optional shock absorbing boot, 19ozs. including batteries

DISPLAY: 128 x 128 pixel graphic display, 2.6" x 2.6" viewable area, backlight

POWER: two (2) 9-volt alkaline batteries, two (2) 9-volt Lithium batteries, two (2) 9-volt NiMH batteries or optional 100 – 240 Vac power adapter (P/N A36742)

TEMPERATURE SPECIFICATIONS:

Storage: -40° F to 140° F (-40° C to 60° C)

Operating: 23° F to 122° F (-5° C to 50° C)

CONNECTIONS: HART: Standard banana jacks (½" center)
PC Data transfer: DB-9 serial connector
Power: AC Adapter jack

AUTO SHUT-OFF - occurs after user-selected period of keypad inactivity or can be disabled, both MFC and backlight

DIAGNOSTICS – MFC 4100 self-tests upon power up. Advisories are posted on the display.

APPROVALS: Class I, Div I, Groups A, B, C, D, T5 certified by MET Laboratories, Inc per UL3111-1, CAN/CSA-22.2 No. 1010.1 & 157-92 and UL913, Fifth Edition, Rev. 2/21/97

CONTRAST – direct adjustment of display contrast in any mode; automatic compensation for ambient temperature changes

SECURITY LOCKOUT – MFC 4100 Settings can be locked out entirely or by specific feature.

CE CE compliance

MEMORY – separate, dedicated, non-volatile flash memory for MFC firmware, DOFs, and Configurations

DOF Memory: 600 HART devices (based on average DOF size)

Configuration Memory: 200 HART devices (based on average configuration size)

ORDERING INFORMATION

BASE UNIT MODEL No & DESCRIPTION:

MFC 4100 HART Communicator

MFC 4101 HART Communicator with Documenting capability (via Meriam DMS software)

MFC 4102 HART Communicator with Intrinsically Safe certification. I.S. certification by MET Laboratories per testing to UL3111-1 First Edition Rev. 6/30/94, CAN/CSA-22.2 No. 1010.1 & 157-92 and UL913 Fifth Edition

MFC 4103 HART Communicator with both Documenting and Intrinsically Safe certification

ORDER OPTIONS

-0 Rear hand strap only: no carrying case, no protective boot required

-1 Fitted, use-in-place, soft carrying case with adjustable shoulder strap and pocket for HART leads

-2 Slip-on, protective red boot with adjustable, detachable hanging strap

ACCESSORIES

A36885	Protective red boot provides degree of protection against drop related damage; slip on
A900529-00014	HART Test Lead Kit (inc'd w/ MFC) - std banana plugs, mini-grabbers, 250 Ω resistor
A36821	Std size 250 Ω shunt resistor (inc'd w/ MFC) - req'd for HART low resistance loops
A900447-00052	DB-9 cable, Male x Female, 6 ft length
A36875	MFC carrying case (inc'd w/ MFC) - custom soft case with adjustable shoulder strap and HART lead compartment
A36884	Adjustable, detachable hanging strap (inc'd w/ MFC) clips directly to MFC attach points
A900614-00006	9 Volt Alkaline Battery (inc'd w/ MFC) (2 req'd)
A900614-00009	9 Volt Lithium Battery (2 req'd), approx 3x life of alkaline batteries, best for cold service
A900614-00015	Volt NiMH Batteries (2 req'd), approx 2x life of alkaline batteries
A36888	NiMH battery charger
A36742	Power adapter, 100 Vac to 240 Vac, 50-60 Hz
A36755	Universal plug adapter kit for A36742 power adapter
F/N 4100:440	Paper instructions for MFC 4100 (PDF instructions sent with each MFC on CD)

Intrinsic Safety Control Document

MFC 410X HART Communicator

NON-HAZARDOUS LOCATION

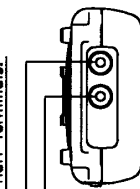
HAZARDOUS LOCATION

Batteries: (2) 9 VDC Alkaline or NiMH, battery replacement, (removal/installation), shall only be performed in a non-hazardous area. Do not mix new with used batteries or of different type of manufacturers.

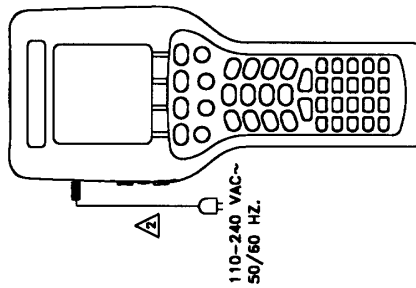
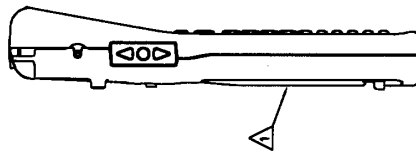
AC/DC adapter may be used, (Meriom P/N A900615-00016)

RS232 port may be used.

Max. power dissipation is 1.35W MAX., (DOF downloading), 0.5W MAX. normal use.
Input Voltage 9VDC Max.



30 VDC Max.
Hart Comm.



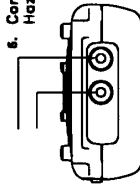
RS232 Comm.
to PC.

Intrinsically Safe/Securite intrinseque Class I; Groups A, B, C, D; T5

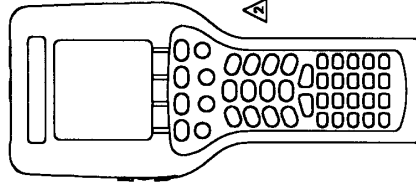
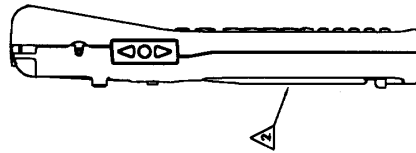
WARNINGS/AVERTISSEMENTS:
Substituting of Components may Impair Intrinsic Safety!
LA SUBSTITUTION DE COMPOSANTS PEUT COMPROMETTRE LA SECURITE INTRINSEQUE;
3. RS232 comm. port must not be used.

4. AC/DC Adapter must not be used.
5. Pmax (Hazardous Location Use) = 0.5W MAX.
6. Consult Manual for additional information regarding Hazardous location use.

7. Do not replace, remove or install batteries or mix new with used batteries or of different type or manufacture.
NE PAS REMPLACER, ENLEVER OU INSTALLER DES PILES OU MELANGE NOUVEL AVEC LES PILES UTILISEES OU DE TYPE OU DE FABRICANT DIFFERENT.



Hart Terminal:
Connect to Certified Intrinsically Safe circuit only for Hart Comm.
Vmax= 30VDC Max Imax= 100mA
CI= 1.24uF LI= 0
Notes: Capacitance and inductance values connected to the intrinsically safe circuit are not to exceed the values specified by the entity parameters.



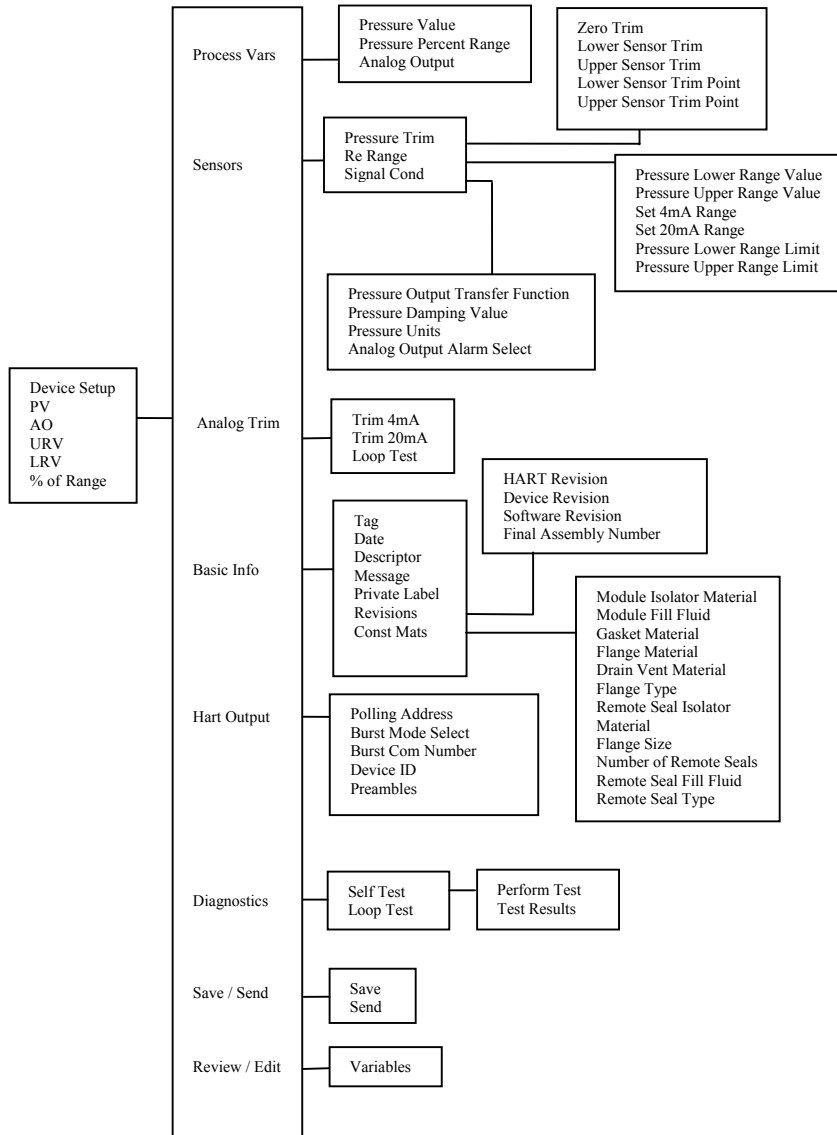
To prevent ignition of hazardous atmospheres, batteries must only be changed in an area known to be non-hazardous.
AFIN DE PREVENIR L'INFLAMMATION D'ATMOSPHERES DANGEREUSES, NE CHANGER LES BATTERIES QUE DANS DES EMPLACEMENTS DESIGNES NON DANGEREUX.

Batteries approved for intrinsic safe location use are:

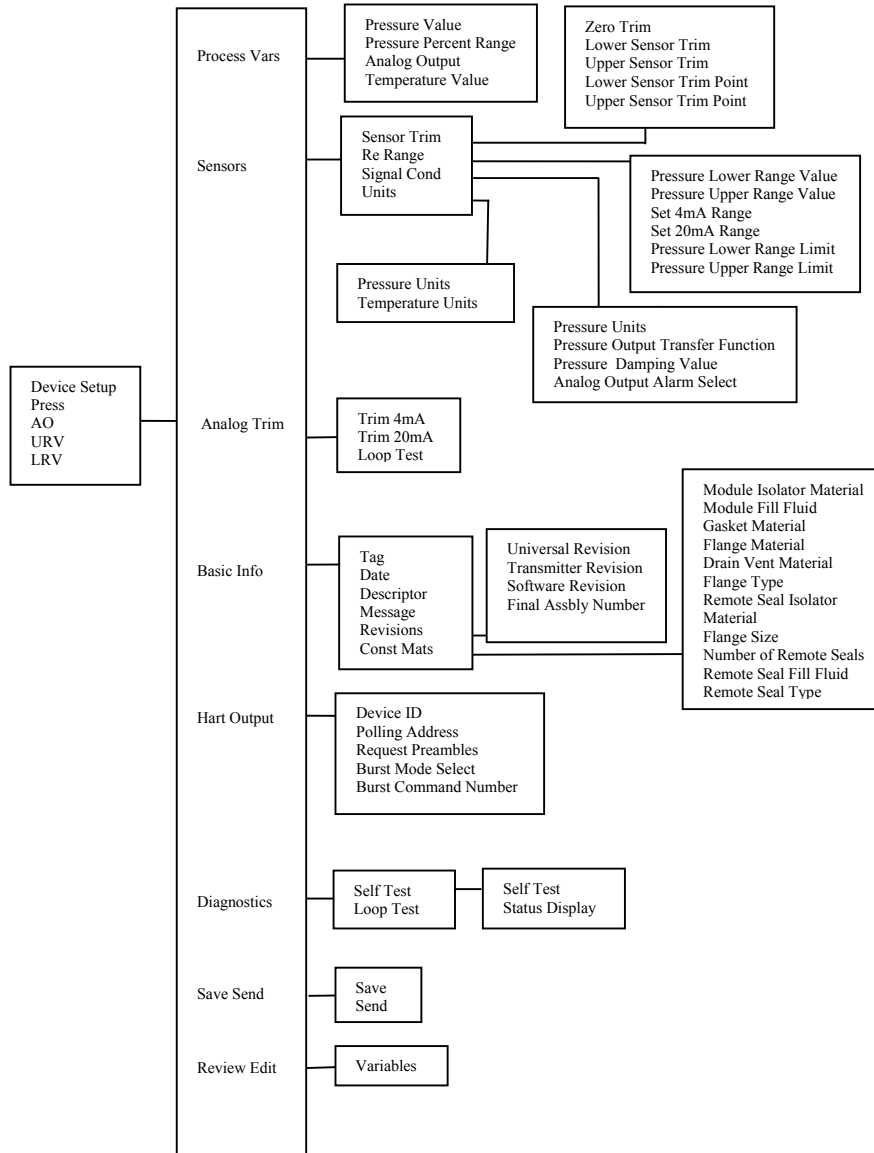
- (2)9VDC Alkaline: Duracell PC1604/MN1604 (Meriom P/N A900614-00006) or
- (2)9VDC NiMH: Harding Energy Quest HW9V160 (Meriom P/N A900614-00015)

MFC 410X Series Intrinsic Safety Control Drawing

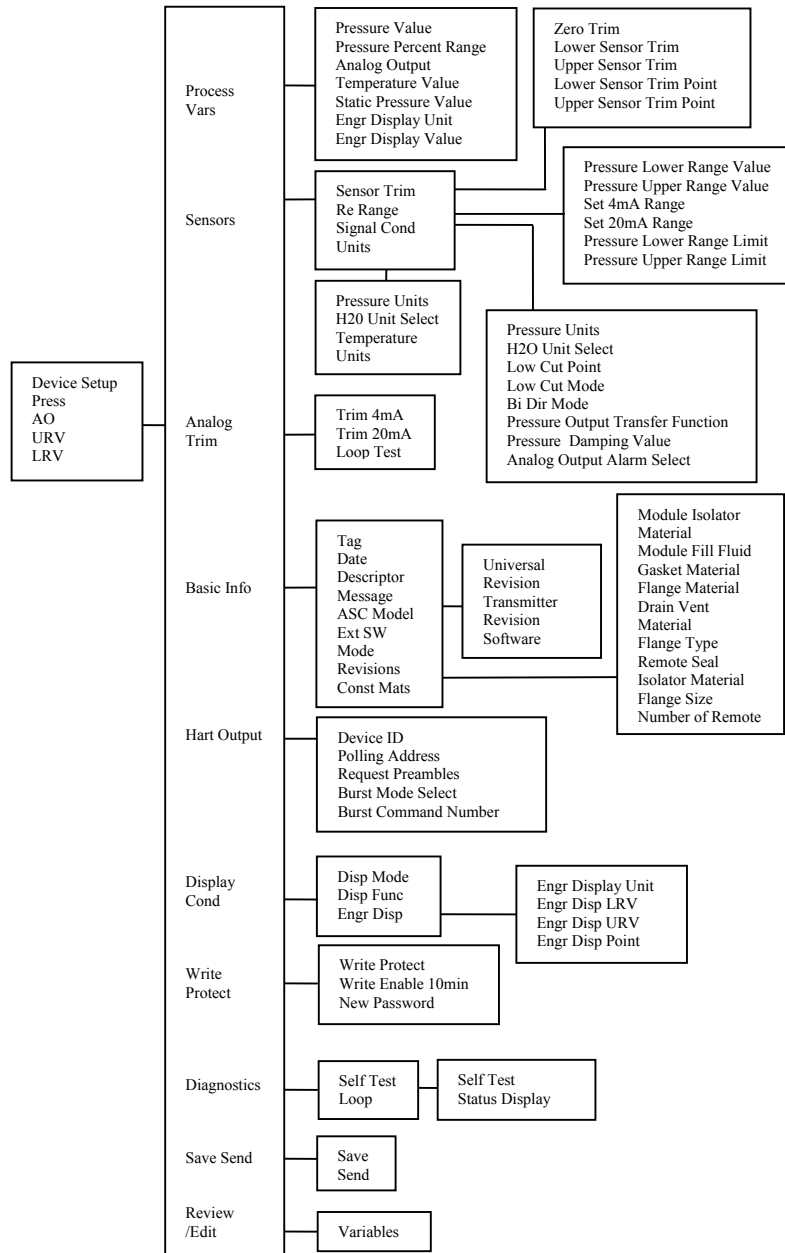
1151 Rev. 5 Menu Tree



3051C Rev. 2 Menu Tree



EJA Rev. 2 Menu Tree



EJA Rev. 1 Menu Tree

