Honeywell

STT700 Series HART/DE Option User's Manual

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About This Manual

This manual provides the details of programming Honeywell STT700 SmartLine Temperature Transmitters for applications involving HART versions 5, 6, and 7 and Honeywell's Digitally Enhanced (DE) communication protocols. For installation, wiring, and maintenance information refer to the *STT700 SmartLine Temperature Transmitter User Manual*, document number #34-TT-25-17.

The configuration of your transmitter depends on the mode of operation and the options selected for it with respect to operating controls, displays and mechanical installation. Details for operations involving the Honeywell Multi-Communication MC Toolkit (MCT404) are provided only to the extent necessary to accomplish the tasks-at-hand. Refer to the associated *MC Toolkit User Manual*, document # 34-ST-25-50 (MCT404) for complete details. The "Reference" section in the front matter of this manual lists document titles and numbers.

The STT700 SmartLine Temperature Transmitter can be digitally integrated with one of two Honeywell systems:

- Experion PKS: you will need to supplement the information in this document with the data and procedures in the *Experion Knowledge Builder.*
- Honeywell's TotalPlant Solutions (TPS): you will need to supplement the information in this document with the data in the *PM/APM SmartLine Transmitter Integration Manual*, which is supplied with the TDC 3000 book set. (TPS is the evolution of the TDC 3000).

Release Information

STT700 Series HART/DE Option User Manual, Document # 34-TT-25-18 (this document)
Rev. 1 July 2017 1st Release

References

The following list identifies publications that may contain information relevant to the information in this document.

STT700 SmartLine Temperature Transmitter Quick Start Installation Guide, # 34-TT-25-19
STT700 SmartLine Temperature Transmitter w/ HART/DE Comms Safety manual, 34-TT-25-20
STT700 SmartLine Temperature Transmitter User manual, # 34-TT-25-17
FDM Offline Configuration User's manual, # 34-CT-25-01.
MC Toolkit (MCT404) User Manual, Document # 34-ST-25-50
PM/APM SmartLine Transmitter Integration manual, # PM 12-410
STT700 Series Temperature, Transmitter, Agency IS Control Drawing, #50133855
MC Toolkit Modem Code Download Instruction Manual, Document # 34-ST-25-33

Patent Notice

The Honeywell STT700 SmartLine Temperature Transmitter family is covered by one or more of the following U. S. Patents: 5,485,753; 5,811,690; 6,041,659; 6,055,633; 7,786,878; 8,073,098; and other patents pending.

Support and Contact Information

For Europe, Asia Pacific, North and South America contact details, see back page or refer to the appropriate Honeywell Solution Support web site:

Honeywell Corporate	www.honeywell.com
Honeywell Process Solutions	www.honeywellprocess.com
SmartLine Temperature	https://www.honeywellprocess.com/smartline-temperature/
Training Classes	http://www.automationccollege.com

Telephone and Email Contacts

Area	Organization	Phone Number
United States and Canada	Honeywell Inc.	1-800-343-0228 Customer Service 1-800-423-9883 Global Technical Support
Global email Support	Honeywell Process Solutions	ask-ssc@honeywell.com

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1 STT700 Physical and Functional Characteristics

1.1 Overview

This section is an introduction to the physical and functional characteristics of Honeywell's STT700 SmartLine Temperature Transmitter.

1.2 Features and Options

The STT700 SmartLine Temperature Transmitter is available in a variety of models for measuring thermocouples, RTD and millivolts and ohm sensor types. Table 1 lists the protocols, human machine interface (HMI), materials, approvals, and mounting bracket options for the STT700.

Table 1 – Features and Options

Feature/Option	Standard/Available Options
Communication Protocols	HART version 7, Digitally Enhanced (DE)
Human-Machine Interface (HMI) Options	No Display
	EU Meter
Calibration	Two-point
Approvals (See Appendix C for details.)	ATEX, CSA, FM, IECx
Mounting Brackets	Pipe mounting and wall mounting brackets in carbon steel and 316 stainless steel.
Integration Tools	Smart Field Communicator (SFC), SmartLine Configuration Tool kit (SCT), MC Toolkit (MCT404), Experion, Field Device Manager (FDM) and Device Type Manager (DTM)

1.2.1 Physical Characteristics

As shown in Figure 1 and Figure 2, the STT700 is packaged in a single module. The elements in this module are connected to the process sensors, measure the process variables, respond to setup commands and execute the software and protocol for the different temperature measurement types.

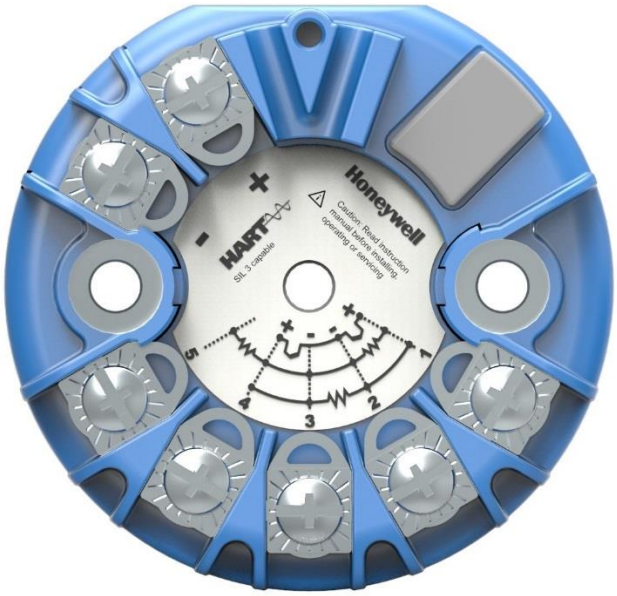


Figure 1 – STT700 HART Temperature Transmitter module

Figure 2 – STT700 DE Temperature Transmitter module

1.2.2 Functional Characteristics

The transmitter measures process temperature and outputs a signal proportional to the measured process variable (PV). Available output communication protocols include analog 4 to 20 mA, Honeywell Digitally Enhanced (DE) and HART protocols.

To set up and make adjustments, the Honeywell Multi-Communication (MC) Toolkit (not supplied with the transmitter) can facilitate setup and adjustment procedures in the case of HART and DE. Certain adjustments can be made through an Experion Station or a Universal Station if the transmitter is digitally integrated with Honeywell's Experion or TPS/TDC 3000 control system for HART and DE transmitters.

1.3 STT700 SmartLine Transmitter Nameplate

The transmitter nameplate mounted on the side of the transmitter module (see Figure 4) lists the model number, physical configuration, electronics options, accessories, certifications, and manufacturing specialties (see Figure 4).

Figure 3 – Nameplate on the side of the transmitter

Figure 4 is an example of a typical STT700 temperature nameplate. The model number format consists of a key number with several table selections.

Key		I		II		III		IV		V		VI		VII		VIII
STT700	-	_ _	-	_ _ _	-	_ _ _ _ _ _	-	_ _ _ _	-	_ _ _	-	_	-	_ _, _ _, _ _	-	00000

Figure 4 –Typical STT700 Nameplate

The transmitter type can be identified from the key number. The letter in the third digit represents one of these basic transmitter types:

T = Temperature

For a complete selection breakdown, refer to the Specification and Model Selection Guide provided as a separate document.

1.4 Safety Certification Information

The approvals name plate contains information and service marks that disclose the transmitter compliance information. Refer to Appendix A in the *STT700 SmartLine Transmitters User's manual*, document number 34-TT-25-17 for details.

1.5 Transmitter Adjustments

For HART and DE, the Honeywell MC Toolkit or other third-party hand-held can make any adjustments to a STT700 SmartLine Temperature Transmitter. Alternately, certain adjustments can be made through the Experion or Universal Station, if the transmitter is digitally integrated with a Honeywell Experion or TPS system.

1.6 EU Meters Options

The STT700 SmartLine Temperature Transmitter is offered with an EU Meter or no display options, see Table 2

Table 2 – Available EU Meter Characteristics

EU Meter	• Compatibility for replacement of existing STT250 installations • 360º rotation in 90º increments • Standard units of measurement: °F, °C, °R, K, Ω, mV & %

2 Communication Modes

2.1 Overview

The STT700 SmartLine Temperature Transmitter can be configured for operation with Honeywell's Digitally Enhanced (DE) communication protocol and HART version 7 communication. This manual addresses the processes to configure and calibrate a transmitter for DE and HART communication.

2.2 Digitally Enhanced (DE) Mode Communication

Although it is unnecessary to put a control loop in manual mode before communicating with a transmitter operating in DE mode, caution is required if there is potential for error in identifying the operating mode.

In DE mode, the PV is available for monitoring and control purposes.

Much of the operation in the Digitally Enhanced (DE) mode is similar to that of analog operation. The essential characteristics of DE mode operation are shown in Figure 5.

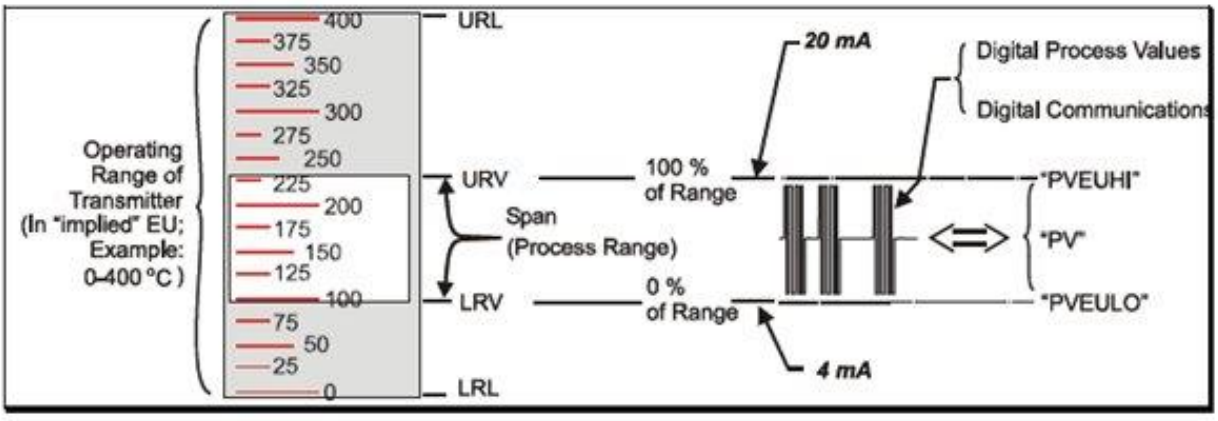


Figure 5 – DE Mode Value Scaling

As indicated at the right of Figure 5, output values of process variables, as well as communications are transferred to a receiving device digitally. The digital coding is Honeywell proprietary, which requires the use of DE-capable Honeywell control equipment.

The use of DE mode offers several advantages:

- **Process Safety:** Unlike analog mode, communications devices do not *bump* the PV value.
- **Accuracy:** Requires less maintenance.
- **Digital communication:** Relatively immune to small variations in circuit resistance or supply voltage.
- **Facilitates Maintenance Tasks:** Honeywell control systems include operating displays that enable direct communication with transmitters operating in DE mode.

2.3 HART Mode Communication

When using MCT404, but before connecting to a HART transmitter, verify that the FDC application is used and not the MC Toolkit application. When using the MC Toolkit application, the MCT404 is set for DE communications, where the current amplitude can *bump* process variables in either point-to-point or in the multi-drop mode in HART.

- Transmitters with HART capability have features that vary among manufacturers and with the characteristics of specific devices. The FDC software application executing on the MCT404 supports the HART Universal, Common Practice and Device Specific Commands which are implemented in the Honeywell transmitters.

As indicated in Figure 6, the output of a transmitter configured for HART protocol includes two primary modes:

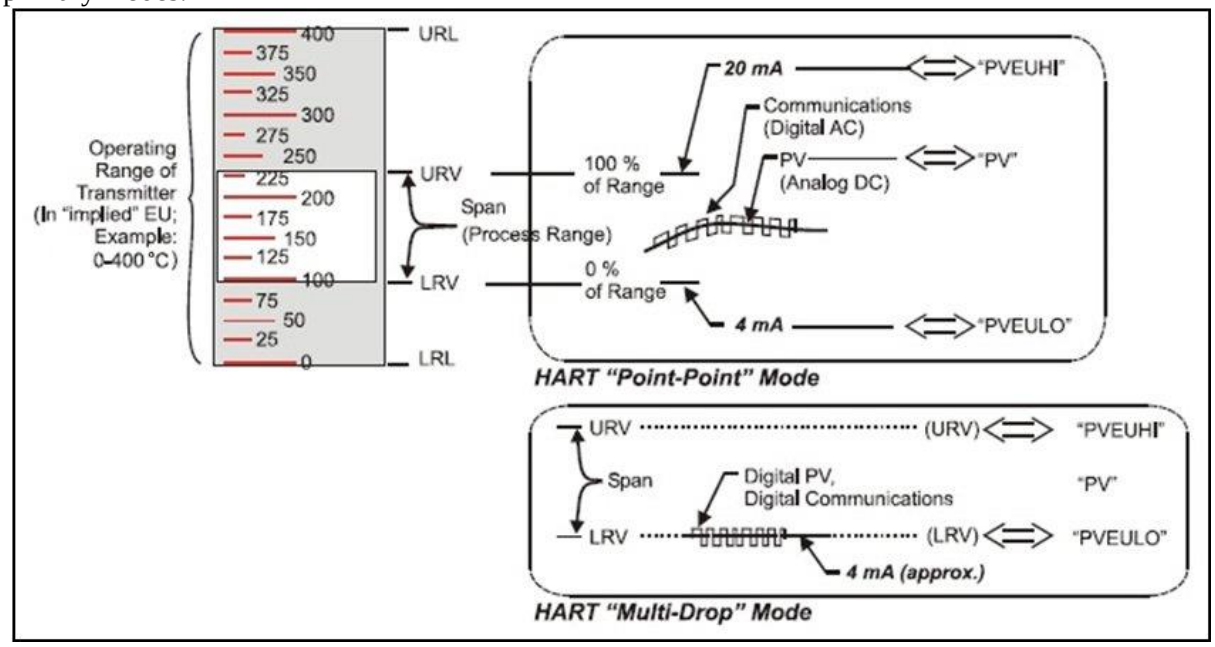


Figure 6 – HART Point-to-Point and Multi-drop Value Scaling

- Point-to-Point Mode, in which one transmitter is connected via a two-conductor, 4-20 mA current loop to one receiver.
- Multi-Drop Mode, in which several transmitters are connected through a two-conductor network to a multiplexed receiver device.

In point-to-point mode, the value of the primary Process Variable (PV) is represented by a 4-20 mA current loop, and is almost identical to that of a transmitter operating in analog mode. Additionally, one device can reside in analog output mode when it is configured in multi-drop. In this case, however, the analog signal is modulated by Frequency Shift Keying (FSK), using frequencies and current amplitude that do not affect analog sensing at the receiver. The accuracy of the analog value must be precisely controlled for accurate sensing. HART communication will not *bump* process variables. In multi-drop mode, up to 16 transmitters in HART 5 (addresses 0-15) and up to 64 transmitters in HART6/7 (addresses 0-63) can exist on the two-conductor network.

3 Configuration Tools and Interfaces

3.1 Overview

This section describes the tools and interfaces involved in configuring a new STT700 SmartLine Temperature Transmitter for HART or DE communication operation. The information in this section also applies to adjusting the configuration of a transmitter that has been in operation and updating one that is currently in operation.

3.2 Pre-requisites

The information and procedures in this manual are based on the assumption that personnel performing configuration and calibration tasks are fully qualified and knowledgeable in the use of the Honeywell MC Toolkit MCT404. The reference to MC Toolkit, Toolkit and MCT404 are used interchangeably as MCT404 is the model name for the Honeywell MC Toolkit product.

Furthermore, we assume that the reader is intimately familiar with the STT700 SmartLine Temperature Transmitter and thoroughly experienced in the type of process application targeted for transmitter deployment. Therefore, detailed procedures are supplied only in so far as necessary to ensure satisfactory completion of configuration tasks.

3.3 Application Design, Installation, Startup, and Operation

The *STT700 SmartLine Temperature Transmitters User's Manual*, document number 34-TT-25-17, provides the details for Application Design, Installation and Startup, Operation, Configuration tools, Maintenance and Calibration.

3.3.1 Organization

This information in this section is arranged in the following sequence:

- MC Toolkit participation in STT700 transmitter setup and configuration:
  1. Physical circuit connections
  2. Application components
  3. Configuration for analog, DE and HART operation
- STT700 transmitter
  1. Health indications
  2. Ability to be configured and operate in a process system

3.4 MC Toolkit Participation

Before using the MC Toolkit, be sure that you are aware of the potential consequences of each procedure, and that you use appropriate safeguards to avoid possible problems. For example, if the transmitter is an element in a control loop, the loop needs to be put in manual mode, and alarms and interlocks (i.e., trips) need to be disabled, as appropriate, before starting a procedure.

3.4.1 MC Toolkit Software Applications

The MC Toolkit has two software applications that apply to the STT700 SmartLine Temperature Transmitter, which are:

- **Field Device Configurator (FDC)**. This application is used for configuring, calibrating, monitoring, and diagnosing HART devices. FDC conforms to the IEC 61804-3 EDDL (Electronic Data Description Language) standard specification. The FDC application is an open solution that supports devices with a registered device description (DD) file compatible with HART Communication Foundation (HCF) requirements.
- **MC Toolkit**. This application is used for configuring, calibrating, monitoring, and diagnosing Honeywell Digitally Enhanced (DE) devices.

Details for working with the MC Toolkit are provided in the *MC Toolkit User Manual*, document #34-ST-25-50 (MCT404). In subsequent sections of this manual, explicit operating instructions are provided only in so far as necessary to complete required tasks and procedures.

3.4.2 Configuration Databases

The MC Toolkit is used to establish and/or change selected operating parameters in a transmitter database.

3.4.3 Configuration

Configuration can be accomplished both online and offline with the transmitter powered up and connected to the MC Toolkit. Online configuration immediately changes the transmitter operating parameters. For offline configuration, transmitter operating characteristics are entered into the MC Toolkit memory for subsequent downloading to a transmitter.

When you set up or configure a transmitter, it can take up to 30 seconds for the value to be stored in it. If you change a value and transmitter power is interrupted before the change is copied to nonvolatile memory, the changed value will not be moved to nonvolatile memory.

3.4.4 MC Toolkit Transmitter Electrical/Signal Connections

Figure 7 displays how to connect the MC Toolkit directly to the terminals of a HART or DE transmitter (top) and a HART-only transmitter (bottom).

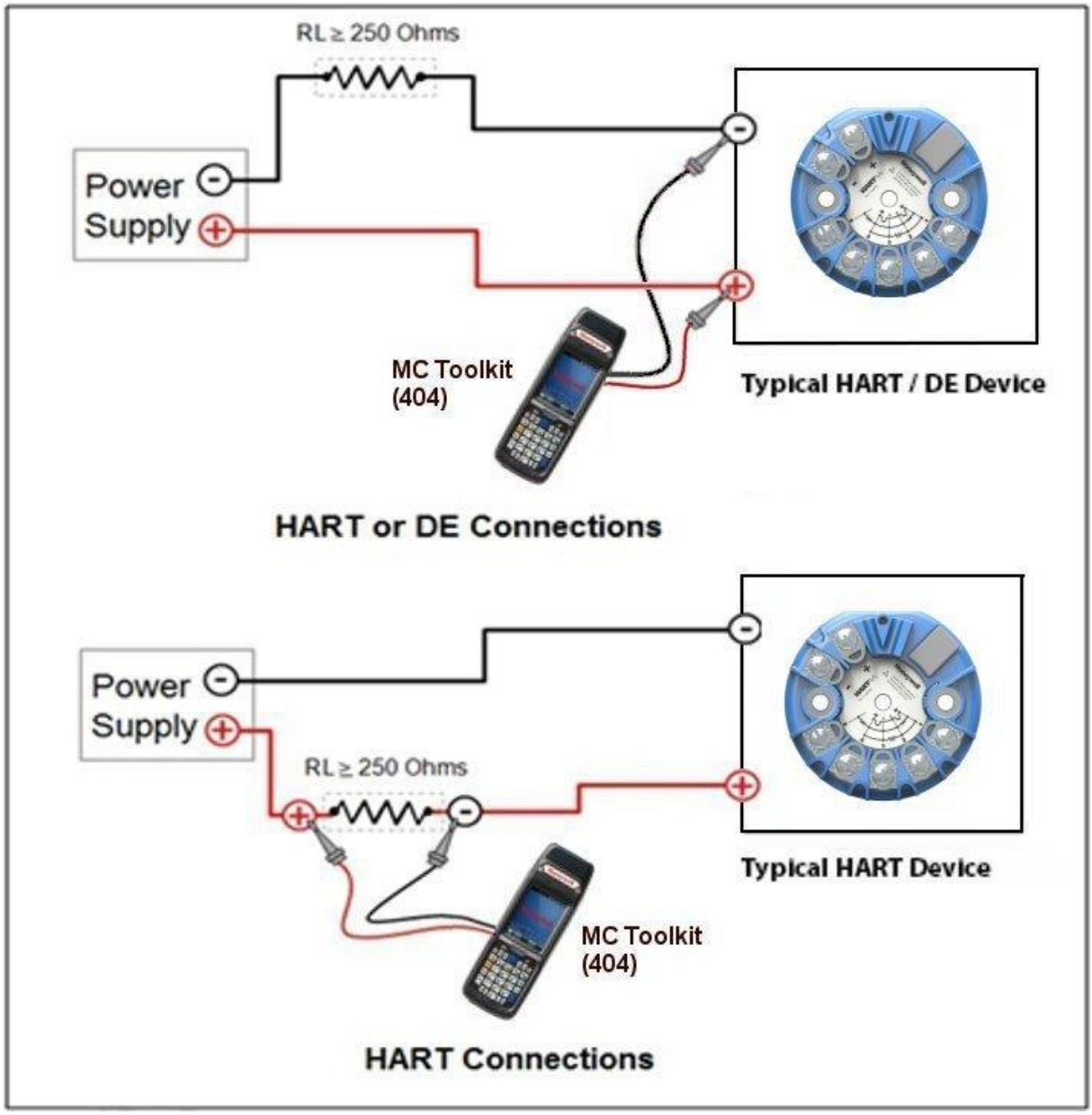


Figure 7 – MC Toolkit-Transmitter Electrical/Signal Connections

4 DE Transmitter Configuration

4.1 Configuration Personnel Requirements

The configuration processes in this section reflect the assumption that you will use the Honeywell MC Toolkit configuration tool to configure an STT700 SmartLine Temperature Transmitter. The **MC Toolkit** application is used to configure Honeywell ST 3000 and SmartLine Pressure Transmitter, STT 3000 Smart Temperature Transmitters, as well as the STT700 SmartLine Temperature Transmitter.

Throughout, the term *transmitter* means the STT700 SmartLine Temperature Transmitter.

The other tools that support DE transmitter configuration are the SmartLine Configuration Toolkit (SCT 3000), Experion PKS, and Smart Field Communicator (SFC).

4.2 MC Toolkit Software Application Overview

Each new STT700 SmartLine Temperature Transmitter is shipped from the factory with a basic configuration installed. This basic configuration must be edited or revised to meet the requirements of your process system.

The **MC Toolkit** application supports both online and offline configuration.

- **Online** operation establishes communication with a DE transmitter for the following tasks:
    - Upload a transmitter database.
    - Configure transmitter parameters.
    - Calibrate a transmitter.
    - Execute diagnostics.
    - Save a configuration to a file.

- **Offline** operation allows to the selection of a basic template, the ability to edit the parameters and the ability download to a transmitter after establishing communication with it. Parameter updates can also be saved in a file without actually downloading them to the transmitter.

Specific operating details for the MC Toolkit displays are provided in "MC Toolkit Application Software Display Conventions," of the *MC Toolkit User Manual*, (document number #34-ST-25-50 for MCT404) for the following:

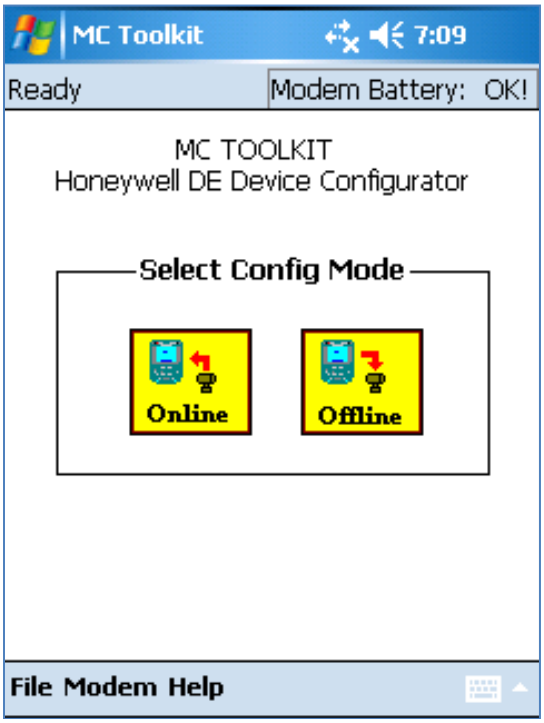
- Navigation
- The MC Toolkit Menu Bar
- File Menu
- Modem Menu
- Help Menu
- Data Entry and Display

4.3 DE Transmitter Online Configuration

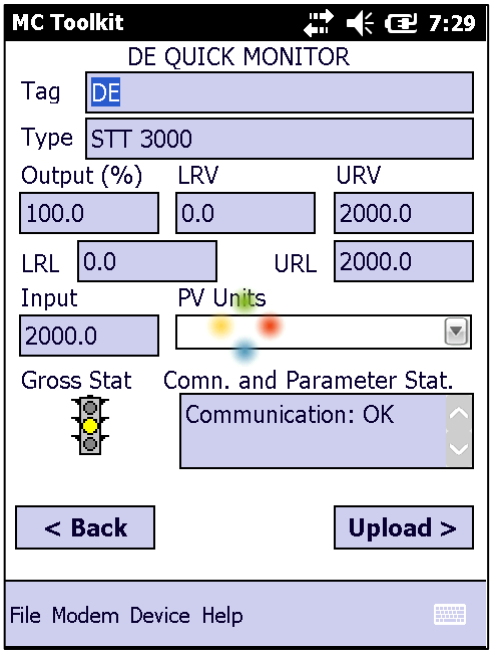
Online configuration consists of establishing communication between the MC Toolkit and a transmitter configured for DE communication. Each transmitter has a configured database, whether new from the factory, a spare, or one to be reconfigured. In any case, the **MC Toolkit** application is used to upload the existing configuration from the transmitter for review and editing.

4.3.1 Uploading a Transmitter Configuration

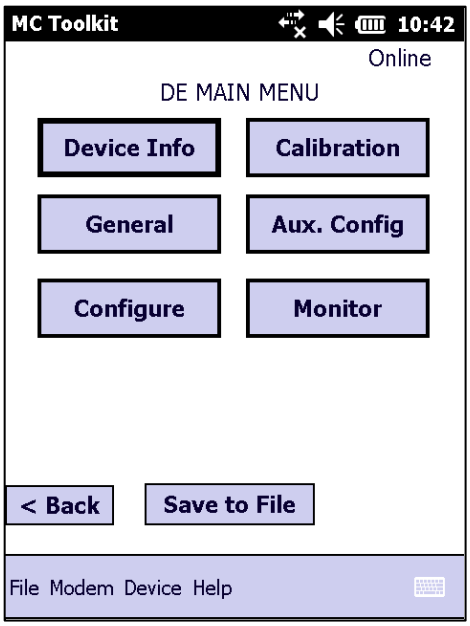
1. Connect a DE transmitter to the MC Toolkit. Be sure that both devices have power applied.
2. Start the **MC Toolkit** application by selecting Start / MC Toolkit on the MC Toolkit / MCT404/202. The MC TOOLKIT Home page will be displayed, see below figure.



3. Select the **Online** button, and establish communication between the Toolkit and the transmitter.
4. When the warning message for connecting to a DE device appears, select **OK**.
5. Process and respond to the three warning pop-ups as appropriate, and then select **OK** in the **Put loop in Manual…** pop-up. The QUICK MONITOR box will be displayed. Typical Quick Monitor dialog is shown below (note that Type will be shown as STT3000).



6. Select **Upload**. A progress bar will be displayed on the QUICK MONITOR box, and when the upload is complete, the DE MAIN MENU will be displayed. Typical DE Main Menu dialog is shown below.

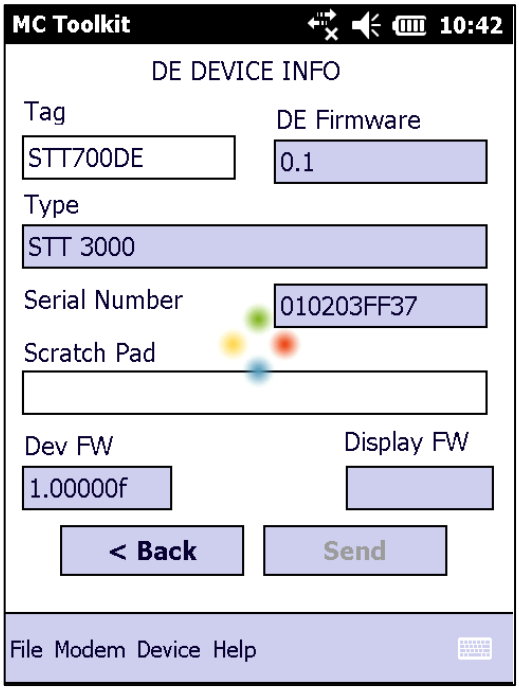


A confirmation request message will be displayed if you select **<Back** for a transmitter that was previously set to Output Mode during calibration, and was not subsequently cleared. If you confirm the message (**Yes** answer), the display will exit the DE MAIN MENU.

4.3.2 Device Information Configuration

In this and subsequent procedures, the notations **R** for read only and **R/W** for read/write are used to indicate if a parameter can be edited.

1. On the DE MAIN MENU, select **Device Info.** The DE DEVICE INFO box will be displayed. Typical DE device information with type and firmware detail is shown here.



2. DE DEVICE INFO parameter attributes and details, Table 3.

Table 3 – Device Information Parameters

Parameter	Read (R) or Read/Write (R/W)	Configuration Details
Tag ID	**R/W**	User ID up to 8 alphanumeric characters.
Type	**R**	Manufacturer's device type identifier
DE Firmware	**R**	Manufacturer's firmware version identifier
PROM ID Number	**R**	PROM ID Number
Scratch Pad	**R/W**	Up to 32 alphanumeric characters
Dev FW	**R**	DE PWA firmware version

3. Select the Back button to go back to the DE MAIN MENU.

4.3.3 General Configuration Parameters

Select the General Button on the DEVICE MAIN MENU page, and configure parameters. See Table 4.

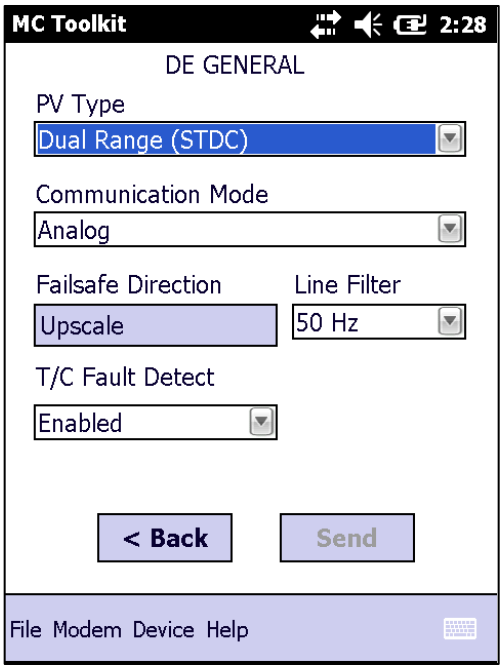


Table 4 – General Configuration Parameters

Parameter	Read (R) or Read/Write (R/W)	Configuration Details
PV Type	**R/W**	Dual Range Smart Transmitter Digital Communications (STDC) or Single Range or Single Range with secondary variable (SV).
Communication Mode	**R/W**	Analog, DE 4-byte, or DE 6-byte
FS Direction (HART only)	**R**	Failsafe (FS) direction: upscale or downscale, switch non-selectable on the electronics module. See the *STT700 SmartLine Temperature Transmitter User Manual* for details.
Line Filter (HART only)	**R**	Non-selectable: 50hz or 60hz.
T/C Fault Detect	**R/W**	Select: Enabled or Disabled.

Select the Back button to go back to the DE MAIN MENU.

4.3.4 DE-Specific Configuration Parameters

Select the Configure button, and configure parameters. See Table 5.

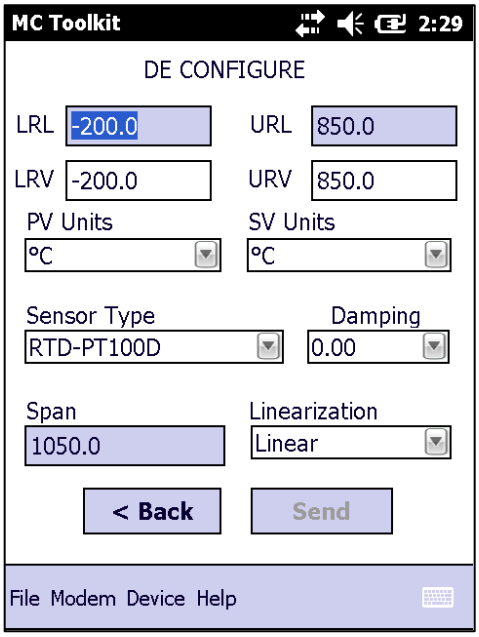


Table 5 – DE Configuration Parameters

Parameter	Read (R) or Read/Write (R/W)	Configuration Details
LRL	**R**	Lower Range Limit, Floating Point
URL	**R**	Upper Range Limit, Floating Point
LRV	**R/W**	Lower Range Value, Floating Point
URV	**R/W**	Upper Range Value, Floating Point
PV Units	**R/W**	Process Variable Units: scaling value selection;
SV Units	**R/W**	Secondary Variable scaling units: °C or °F
Sensor Type	**R/W**	Sensor type used in the Transmitter*
Damping	**R/W**	Select digital noise reduction; (see note below)
Span	**R**	Process Range: URV – LRV, Floating Point

*A dual input model cannot be configured as a single input model.

Select the Back button to go back to the DE MAIN MENU.

4.3.4.1 Notes on Damping (Digital Noise Reduction)

You can adjust the damping time to reduce output noise. In general, set damping to the smallest value reasonable for your process.

4.3.5 DE Auxiliary Configuration

The DE auxiliary configuration menu contains latching status enable/disable option and also CJ compensation selection. When selecting External for the CJ Comp , CJ Temp 0.0 is only applicable choice; the temperature does not vary.

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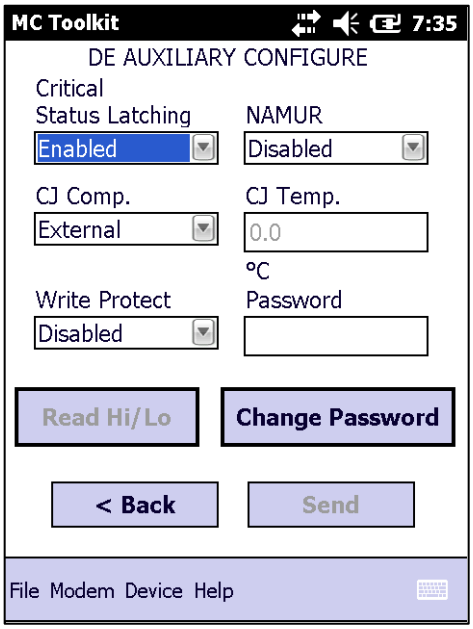
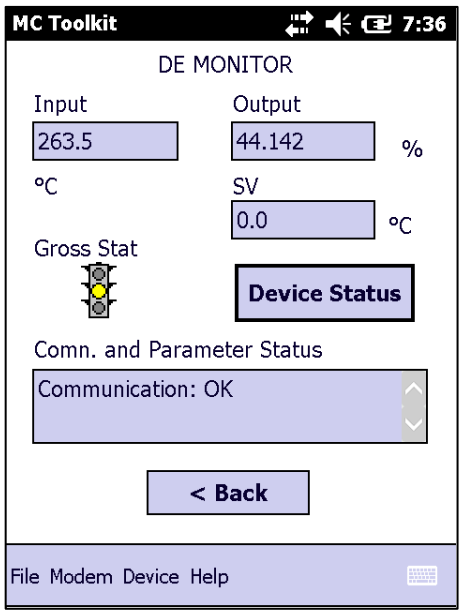


Select the Back button to go back to the DE MAIN MENU.

4.3.6 DE Monitor Status

The DE Monitor menu shows Input PV value, Output percentage value, SV value and Device status option. Table 6 lists the status parameters and their details.



The Device status menu shows Critical, Non critical status along with gross status information.

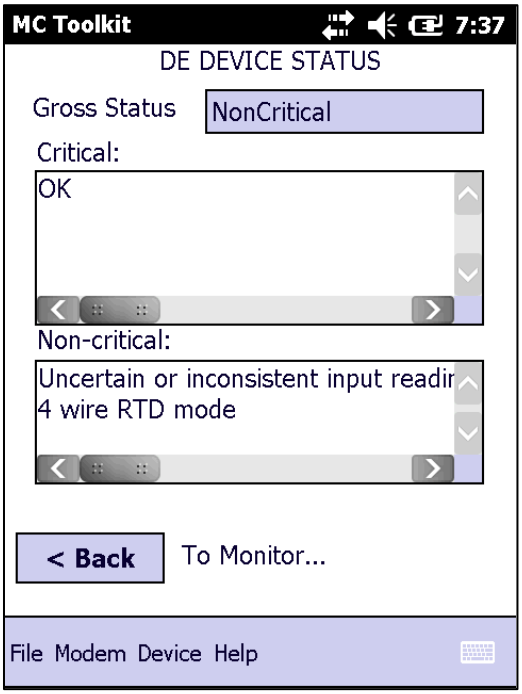


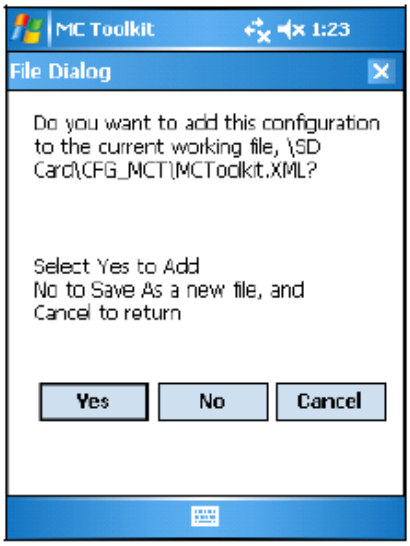
Table 6 – Monitor Parameters

Parameter	Read (R) or Read/Write (R/W)	Configuration Details
Input	**R**	Sensor input in EU
Output	**R**	Loop output as a percent of Span
SV	**R**	Secondary Variable in SV EU
Gross Status	**R**	Gross Transmitter Status. Select the Monitor menu **Device Status** button to display device status.
Communication Status	**R**	Refer to the “Messages and Diagnostic Codes” section of the *MCT404/202 Toolkit* manual.

Select the Back button to go back to the DE MAIN MENU.

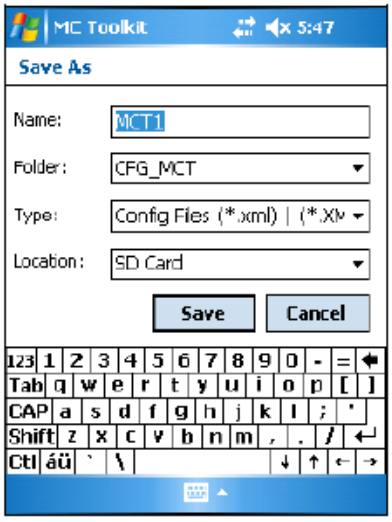
4.3.7 Saving the Configuration to File

1. Display the DE MAIN MENU, and select the **Save to File** button. The File Dialog will be displayed.



2. Save the configuration as described below. As a reminder, please refer to the *MC Toolkit User Manual*, #34-ST-25-50 (MCT404), for complete procedural details.

   a. Select **Cancel** to return to the DE MAIN MENU, and abort saving the configuration.
   b. Select **Yes** to add the configuration to the current working file, and return the display to the DE MAIN MENU.
   c. Select **No** to save to a different file; the Save As screen will be displayed.



   d. The default location and folder are set to **SD Card** and **CFG_MCT**. However, you can type in a new name for the file; the default name is **New1**.
   e. After entering the file name, select the **Save** button to display the DE MAIN MENU.

4.3.8 DE Online Configuration Summary

This concludes the process of configuring an STT700 DE transmitter online. For best operational results, calibrate the transmitter according to the DE calibration in section 6 of this document.

4.4 DE Transmitter Offline Configuration

4.4.1 Overview

This section summarizes the features, and processes for configuring an STT700 SmartLine Temperature Transmitter set for DE operation offline. Refer to the *MC Toolkit User Manual,* #34-ST-25-50 (MCT404), "Offline Configuration" for complete procedural details.

After starting the **MC Toolkit** application, selecting the **Offline** button provides access to the following configuration features:

- **DE Offline File Management** – Open an XML file, select a saved configuration for the selected device and edit the parameters.
- **Save to File** – Save the parameters back to the file.
- **Download** – Download the current offline configuration to a device after establishing connection.

The MC Toolkit can process more than one device type or model. For the purposes of this section, the term *transmitter* refers to the STT700 SmartLine Temperature Transmitter.

4.4.2 DE Offline File Management

Offline configuration allows you to select a basic template, edit its parameter content, and download it to a transmitter after establishing communication. Parameter updates can also be saved in a file without actually downloading to a transmitter.

The MCT404/202 Toolkit is shipped with the two files: **MCToolkit.xml** and **TEMPLMCT.xml**:

- The **MCToolkit.xml** file consists of default configurations for all the supported DE transmitters. The available configurations can be updated and saved back to this file.

- The **TEMPLMCT.XML** is a template file. The contents of this template file **cannot** be edited; however, the template can be saved under a different file name. The contents of the newly named file can be edited.

DE offline file management provides general, configuration, and parameter options. General options provide for communication serial port selection of COM1 through COM8. However, the current configuration of the MCToolkit (also known as Pocket PC) provides only COM1; the other seven serial port designations are reserved for future expansion.

Communication Port Setting = COM1

Offline configuration options provide for confirmation before saving a changed configuration file. Denying confirmation results in having the changes discarded.

In addition to file saving confirmation, DE offline file management provides access to three parameter sets for review and editing:

- **Parameter Set 1** consists of the description of transmitter according to bus type, device type, serial and model number, and the manufacturer.
- **Parameter Set 2** permits entering/editing the values for the LRL, URL, LRV, URV, PV Units, Damping, SV Units, Line Filter frequency, Sensor Type, and the output characterization selection.
- **Parameter Set 3** is oriented primarily to the Honeywell SmartLine Temperature Transmitter models for monitoring purposes.

4.4.3 Save to a File

Saving to a file in offline mode will let you add an edited configuration to a working file. Alternately, if you decide not to save an edited configuration to the current file, you can select a new location and file name for it. The default location and folder for saving configurations is **SD Card** and **CFG MCT**. The default name of a new configuration is **New1**, which you can change for your needs.

4.4.4 Downloading in DE Offline Mode

Downloading a file to a transmitter from the Toolkit requires a communicating connection between the two units. Serial communication is established when you select **DOWNLOAD to Device** from the Toolkit **Select Device** menu. When the download completes, confirmation will be required to affirm that the configuration for the transmitter is to be saved.

4.4.5 DE Offline Parameterization

Section 5.7 “Offline Configuration,” of the *MC Toolkit User Manual, #34-ST-25-50 (MCT404),* contains a list of the basic STT700 SmartLine Temperature Transmitter parameters for DE offline operation.

5 HART Transmitter Configuration

5.1 Overview

Each new STT700 Temperature Transmitter configured for HART protocol is shipped from the factory with a basic configuration database installed. This basic configuration database must be edited or revised to meet the requirements of your process system. The process in this section assumes that you will use the **Field Device Communicator (FDC)** application for HART configuration tasks. The **FDC** application provides the facilities for the online and offline configuration of transmitters operating with HART protocol

Online configuration requires that the transmitter and MC Toolkit are connected and communication between the two have been established. Online configuration provides a set of functions with which to perform various operations on a HART communication network through an active communication link. These operations primarily include configuration, calibration, monitoring, and diagnostics. Typically, these operations could be realized through various constructs exposed by the Device Description (DD) file. In addition, the **FDC** application provides some functions for convenient execution of these functions.

Offline configuration refers to configuring a device when the device is not physically present or communicating with the application. This process enables you to create and save a configuration for a device, even when the device is not there physically. Later when the device becomes available with live communication, the same configuration can be downloaded to the device. This feature enables you to save on device commissioning time and even helps you to replicate the configuration in multiplicity of devices with lesser efforts. Currently, FDC does not support creating offline configuration. However, it supports importing of offline configuration from FDM R310 or later versions. The configurations thus imported can be downloaded to the device from FDC.

The following are the tasks that you need to perform for importing offline configuration in FDC application software and then downloading it to the device.

1. Create offline configuration template in FDM
2. Save the configuration in FDM in FDM format.
3. Import the offline configuration in FDC
4. Download the offline configuration to the device

Note: For details on creating and using offline configuration, refer to section Offline configuration in-FDM Offline Configuration User's Manual, 34-CT-25-01.

5.1.1 Personnel Requirements

The information and procedures in this section are based on the assumption that the person accomplishing configuration tasks is fully qualified and knowledgeable on the use of the MC Toolkit and is intimately familiar with the STT700 SmartLine Temperature Transmitter. Therefore, detailed procedures are supplied only in so far as necessary to ensure satisfactory configuration. The other HART configuration ools are Honeywell Experion in conjunction with FDM, DTMs running on FDM or PACTware, and Emerson 375/475.

5.2 Overview of FDC Homepage

The FDC homepage consists of links for Online Configuration, Offline Configuration, Manage DDs, and Settings. See figure 8 below.

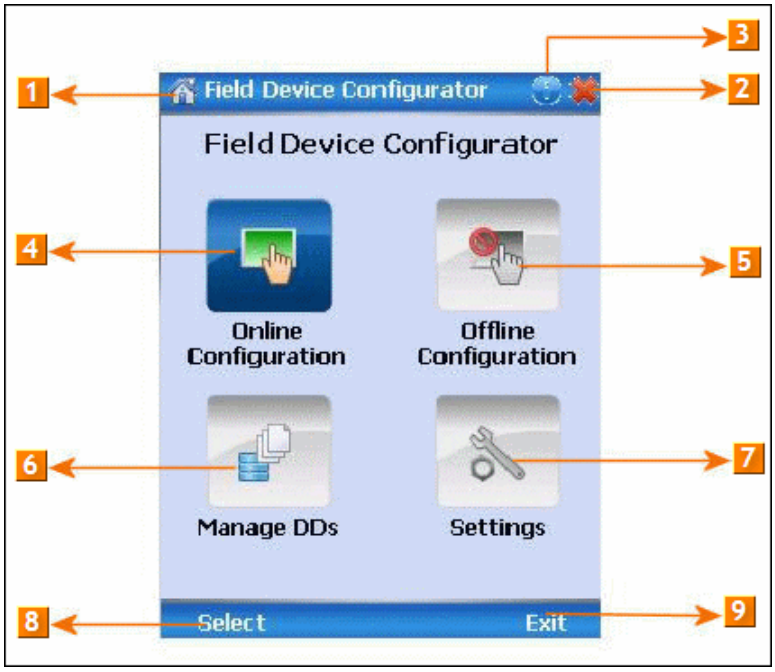


Figure 8 – FDC Homepage

Table 7 lists the items that appear on the FDC homepage and their descriptions.

Table 7 – FDC homepage elements

Items	Description
1	Screen title.
2	Tap to quit FDC.
3	Tap to view the application information.
4	Tap to navigate to Online Configuration screen.
5	Tap to navigate to Offline configuration screen.
6	Tap to navigate to Manage DDs screen.
7	Tap to navigate to Settings screen.
8	Tap to select the highlighted menu option.
9	Tap to quit FDC.

Note: To select a particular option in FDC you can either select the option and then tap **Select** or you can directly double-tap the option.

5.2.1 Settings

Use this feature to customize FDC. You can customize FDC for device detection, DD selection, and other application settings.

5.2.1.1 Device Identification

Use the following options to configure FDC to identify a device.

1. **Using Poll Address**
    2. **Use poll address 0 only:** Use this to detect a device with the poll address as zero.
    3. **Find first poll address and use**: Use this to detect a device with the first available poll address in the range of poll addresses that are available.
    4. **Use selected poll address**: Use this to detect a device with a specific poll address in the range of zero to 63.
    - **Use From**: Use this to detect a device based on a range of poll addresses.
1. **Using Device TAG**: Use this to detect a device with a known HART tag.
2. **Using Device LONG TAG**: Use this to detect a device with a known HART long tag (applicable for devices with HART 6 or later universal revisions).

Note: If you choose the option Using Device TAG or Using Device LONG TAG, FDC prompts you to enter a device tag/long tag name during device detection.

5.2.1.2 DD selection

Use the following options to configure FDC to select DD files when a DD with matching device revision is not available.

5. **Use DD file of previous device revision**: Use this option to automatically communicate using a DD file having device revision lower than that of the device.
6. **Use generic DD file**: Use this option to automatically communicate to the device using an appropriate generic DD file.
7. **Always ask user**: Use this option to always prompt you with a choice for communicating to the device either using the previous device revision or using a generic DD file.
8. **Always Use Generic**: Use this option to always communicate to the device using generic DD files even if a DD file with matching device revision as the device is present.

Note: A generic DD file is a DD file that provides access and interface to the universal data and features of a HART device.

5.2.1.3 Other settings

Low storage notification: Use this option to set a percentage value and to notify you with a warning message when the available storage card space is less than the percentage set.

Application diagnostics: Use this option to enable or disable the logging infrastructure for application diagnostics. With this option enabled, FDC creates necessary log files for troubleshooting and diagnostics. These files are stored in SD Card\FDC folder.

Note: You must not enable this option unless suggested by Honeywell TAC because this may impact the application performance.

5.2.2 Manage DDs

Using this feature, you can manage the DD files installed with FDC. A DD file contains descriptive information about the functionality of a device. By default, a set of DD files are installed with FDC. However, if you do not have a DD for a given device, you can install it using the "Add DD" feature. Similarly, you can uninstall a DD file or a set of DD files using "Delete DD" feature. You can also directly copy the DD files in appropriate hierarchy using a card reader or "Active Sync/Mobile Device Center" mechanisms. In such a case, you should validate the library view using the "Refresh" feature.

5.2.2.1 Overview

Using Manage DDs, you can view, add, or delete DD files for devices. A list of already available DD files is maintained in the DD Library. FDC lists the installed DD files in a hierarchy as below:

Manufacturer

Device Type

DevRev xx, DDRev yy

DevRev pp, DDRev qq

5.2.2.2 Add a DD file

To add a DD file for a device, perform the following steps.

From the FDC homepage, tap Manage DDs > Select.

The **Manage DDs** dialog box appears.

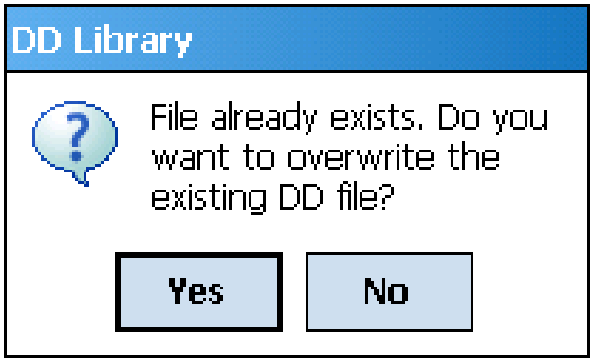
1. Tap **Options** > **Add DD**.

Or

Tap  .

The **ADD DD files** dialog box appears.

2. Browse to the location in which the DD file (**.fm8)** is located and tap **OK**.
3. If the DD file already exists, then the following message appears.



4. Tap **Yes** to overwrite the existing DD files.
5. If the DD file is added successfully, a success message appears.

5.2.2.3 Delete a DD file

Using this option, you can delete a particular version of a DD file. To delete a DD file for a device, perform the following steps.

- From the FDC homepage, tap **Manage DDs** > **Select**.

The **Manage DDs** dialog box appears.

- You can choose to delete DD(s) in one of the following ways:

1. By device manufacturer – Select a device manufacturer to delete all device types and DDs associated with the manufacturer's devices.
2. By device type – Select a device type to delete all DDs associated with the device.
3. By device revision and DD revision – Select the specific entry of device revision, DD revision to delete the specific DD

Tap **Options** > **Delete DD.**

Or

Tap  .

A confirmation message appears.

- Tap **Yes**.

If the DD file is deleted successfully, a success message appears.

- Tap **OK** to return to **DD Library** page.

5.2.2.4 Validating a manually edited library

Besides using the Add/Delete DD features, advanced users may also manipulate a DD library by directly editing the contents of the FDC\Library folder. DD files can also be transferred directly to this location by accessing the SD Card from MCT404 through a card reader and/or by connecting the MCT404 to a PC. In such cases, you must perform the following steps to validate a DD Library, thus edited manually:

3. From the **FDC homepage**, tap **Manage DDs** > **Select**

The **Manage DDs** dialog box appears

4. Tap **Options**.
5. Tap **Refresh Library**.

   Or

   Tap  .

   A confirmation message appears.
6. Tap **Yes**. The DD library is now validated and refreshed.

5.2.3 Online configuration

Using online configuration, you can configure, calibrate, monitor and diagnose a HART device which is connected to MC Toolkit. FDC provides the features to perform these functions through the various constructs offered through the DD file of the device. Besides there are certain other features available under this link for you to conveniently work with a HART device with live communication. After making changes to the device you can also save a snapshot of the device data as history to later transfer it to FDM for record and audit purposes.

5.2.4 Offline configuration

Offline configuration refers to configuring a device offline (without physically connecting to the device) using a template and then downloading the configuration to the device. Presently, FDC application software does not support creating offline configuration. However, it supports importing of offline configuration from FDM (R310 and above).

5.2.5 Online Configuration Overview

Online configuration option provides you a set of functions with which you can perform various operations on a device with an active communication link. These operations primarily include configuration, calibration, monitoring, and diagnostics of a HART device. Typically, these operations could be realized through various constructs exposed by the DD file of the device. In addition, FDC also provides some additional application functions for you to perform these functions more conveniently.

Online configuration includes a set of functions to perform various operations on a transmitter with active communication link. These operations primarily include:

- Identifying a transmitter
- Reading and reviewing transmitter variable values
- Editing transmitter variable values
- Downloading the selected/edited variable set to the transmitter

5.2.5.1 Detecting and loading a device

The device detection and loading process can automatically get started. Depending upon the Device Detection and DD Selection settings you may have chosen, you may be prompted for certain inputs as described in the **Settings** section.

Tap the **Online Configuration button on the Application Home page.**

5.2.6 Overview of Device Homepage

Once the device is detected and loaded successfully, you can view the device homepage for the identified device.

The workspace area on the device homepage consists of four (4) tabs on the left hand side. Selecting a tab displays functions/information associated with that tab on the right hand side.

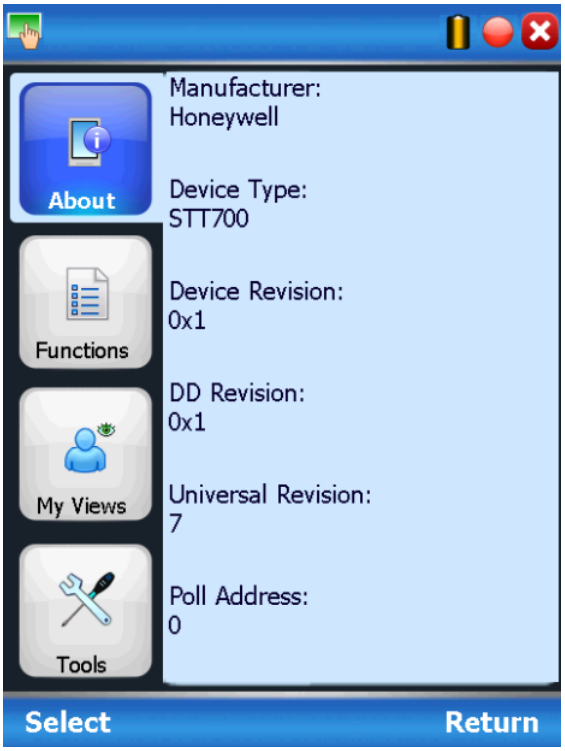


Figure 9 – Device Homepage

Table 8 lists the device health status and their indications.

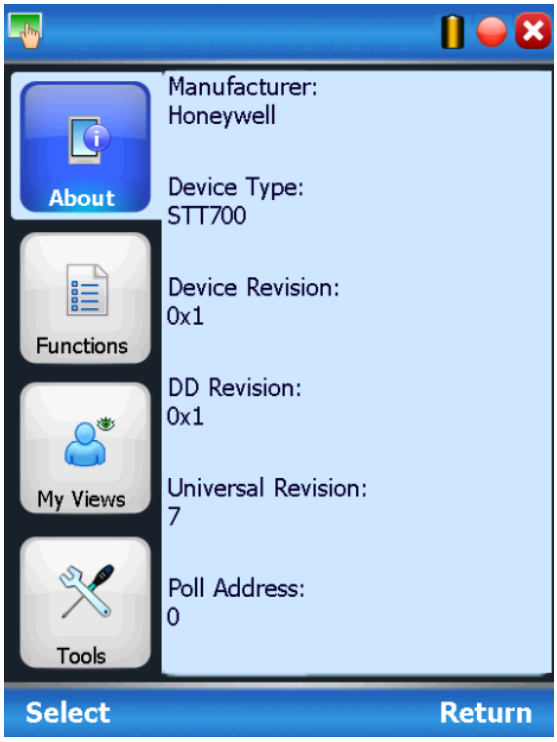
Table 8 – Device health status

Device health icons	Indications
	Indicates there's no health or status indicators reported by the device
	Indicates that the device is potentially reporting a status which needs attention and further investigation. It is advised that you use Device Status under Functions tab to further investigate the details.
	Indicates that the device has lost communication with MC Toolkit

5.2.7 Tabs on the Device Home page

The following are the options that are available on the device homepage.

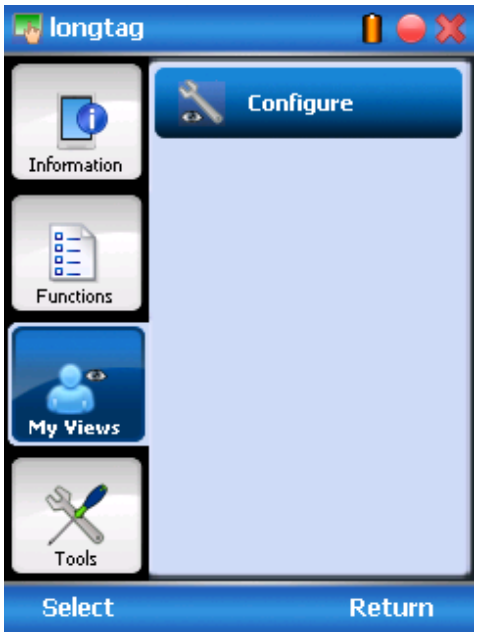
- **Information tab**: Use this option to view the device identity related information. You can view the manufacturer name, device type, device revision, DD revision, and universal revision of the HART device.



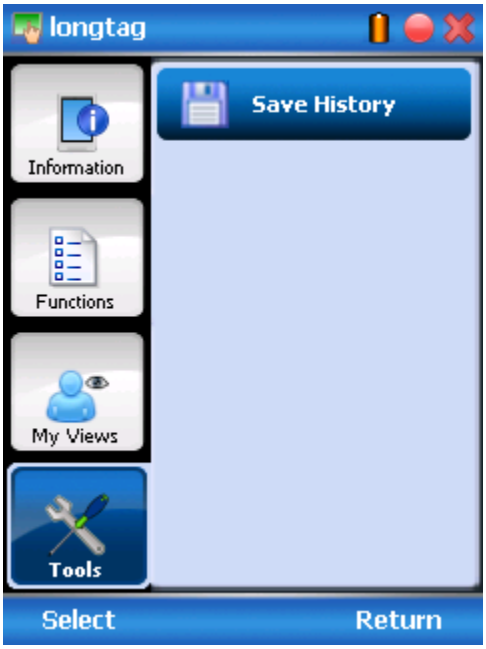
- **Functions tab**: This tab provides various options which you may use for navigating through the device specific user interface and some standard features offered by FDC across all devices.

The icons shown on the right side under this tab shall be referred as “Entry points” throughout the rest of the document.

- **My Views tab:** Quite often, you may be interested only in a set of variables of a device. But navigating through the menu tree of a device may not be helpful because of time and further all variables that you want may not be in the same location. Using this unique feature of FDC, you can now choose what you want to view in a device in your own views. FDC allows you to create two such views per device revision of a specific device type. You can always modify them as per your needs.



- **Tools tab:** This tab is a placeholder for FDC specific tools for providing certain functionality. Currently the only option it provides is called as Save History. Using this option you can save the snapshot of the device variables. This snapshot is saved in a format which can be later imported as a history record in FDM.



5.2.8 Using FDC for various device operations

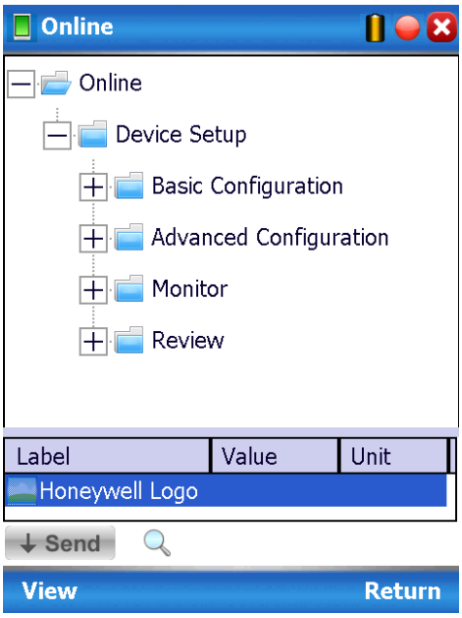
Typical operations with a smart field device involve configuration, calibration, monitoring, and diagnostics. FDC enables you to achieve these operations with a HART device via the various interfaces/constructs exposed through the DD file of the device.

The “Functions” tab under the device home page provides the entry points for navigating through the device specific user interface to perform the above mentioned operations. A device may define up to four entry points in the DD file. All devices shall have at least one entry point, generally referred to as “Online”. Besides the device specific entry points, FDC provides custom entry points for navigational aids to specific types of information/features. One such entry point is called Device Status, which is used for reviewing device health. Another is called Methods List, which is used to navigate to all the methods available in a device.

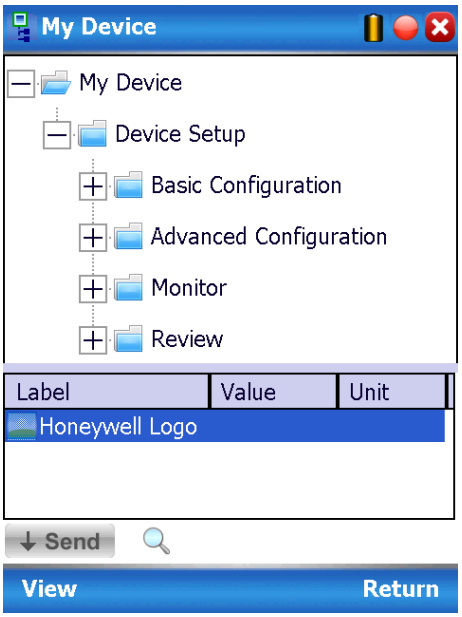
All the device specific entry points represent the device interface, as explained using the Online entry point as an example. All the other device specific entry points have a similar interface except for that the variables and other DD constructs provided under each may vary as indicated by the title of each entry point.

The pages that appear on navigating through the device specific entry points are referred to as “Device Configuration” pages in this document. However it must be noted that this does not prohibit you from performing other device operations as explained above.

Online Device Entry Point: When you tap on to open the Online tab, the device configuration screen appears as shown below. Typical Online Menu is shown below.
The specific Menu items shown are based upon the connected device type.



Alternately you can access the full EDDL features by selecting the "My Device" Tab. The typical My Device Tab is shown below. The specific Menu items shown are based upon the connected device type.



Navigate through the Menus to access various functions. See Table 9 for lists all the parameters in the STT700.

5.2.9 Device Configuration and Parameter Descriptions

Table 9 lists descriptions of all parameters for a HART Transmitter with the Online tab menu path. The same parameters may be accessed from the My Device tab.

Table 9 – HART Transmitter Parameters

Device Setup	**Menus include:**
Basic Configuration	General, Process Variables (PV), 4-20mA Outputs, Summary
Advanced Configuration	Sensors, Calibration, CVD, CVD1, CVD2, Alarm, Services, Summary
Monitor	Dashboard, Device Status, Device Information, Diagnostics, MSG Details
Review	Displays all parameters

Online Menu Flow	Parameter menu/ name	Description/Valid values
Online	Honeywell Logo	Photograph of a STT700 temperature transmitter along with the official “Honeywell” logo

Table 10 – Basic Configuration

Online Menu Flow	Parameter menu/ name	Description/Valid values
Basic Configuration /General		
Device Setup / Basic Configuration / General	Transmitter Install Date	Enter the date of site installation. This is a one-time only configuration.
	Tag	Enter tag identification up to eight alphanumeric characters.
	Long Tag	Enter a long tag name up to 32 alphanumeric characters.
	Date	Enter a date for user information only.
	Descriptor	Enter a descriptor for user information only (up to 16 alphanumeric characters)
	Message	Enter a message up to 32 alphanumeric characters) that will be sent to the Display. The message will be shown on the Display interspersed with the configured screens. To stop displaying the message, select “Clear Display” in the Device Information menu.
	Clear Message	Selecting this option clears the “Message” and it will no longer be sent to the Display.
	Final Asmbly num	Enter the final assembly number of the STT700 temperature transmitter
Basic Configuration / Process Variables		

Device Setup/Basic Configuration/Process Values/PV [Loop]	PV[Loop]	Displays the current value of the Primary Variable (loop PV according to the control mode selected) in user selected engineering units
Device Setup /Basic Configuration/Process Values/SV [Cold Jn. Temperature]	SV [Cold Jn. Temperature]	Displays the current value of the Secondary Variable (CJ temperature) in user selected engineering units
Device Setup /Basic Configuration/Process Values/TV[Sensor 1]	TV [Sensor 1]	Displays the sensor input 1 value
Device Setup /Basic Configuration/Process Values/QV[Sensor 2]	QV [Sensor 2]	Displays the sensor input 2 value
Online/Device Setup/Basic Configuration/ Process Values	PV Unit	Select one of the pre-programmed engineering units. STT700 temperature readings can be displayed in the following engineering units: ^{o}C, ^{o}F, ^{o}Kelvin, ^{o}R, mV, Ohms
	PV Damp	Enter a value for damping of the device output. Entries may be any value from 0.00 to 102.00 seconds.
	SV Unit	Select the desired unit for measurement of the Secondary Variable (cold junction temperature) Selections available are: ^{o}C, ^{o}F, ^{o}R, Kelvin.
Online Menu Flow	Parameter menu/ name	Description/Valid values
Basic Configuration / 4-20mA Outputs		
Device Setup /Basic Configuration/4-20mA Outputs/PV Loop current	PV Loop current	Displays the current value of Analog Output in mA
	PV % rnge	Displays the current value of transmitter output in %
	PV LRV	Displays the current value of the Lower Range Value (input which represents 0% output) in user selected engineering units. This value may be configured to any value within the range.
	PV URV	Displays the current value of the Upper Range Value (input which represents 100% output) in user selected engineering units. This value may be configured to any value within the range.

Online/Device Setup/Basic Configuration/ 4-20mA Outputs	PV Damp	Enter a value for damping of the device output. Entries may be any value from 0.00 to 102.00 seconds.
	Poll Address Loop Current Mode	The following output-related values and operations are available in this menu: Poll Address: Select HART short address 0 to 63. Loop current mode: Select the Loop Current Mode configuration: "Enable": enables loop current mode (analog output will operate as a 4 to 20 mA signal consistent with the transmitter output) "Disable": disables loop current mode (analog output will be fixed at 4 mA)
	NAMUR Option	Select from the following: Namur Selection: select to enable or disable the Namur option for the output. (Refer to the PV Ranges/Limits chart) for effect on output signal. Namur Level: Displays a diagram of the operating range and failsafe range of the Analog output for Normal and Namur configurations.
	PV % range	Displays the current value of transmitter Output in %
	PV LTL	Lower Transducer Limits
	PV UTL	Upper Transducer Limits
Summary	Displays the current values under Basic Configuration Menu for all of the pertinent operating parameters listed in this table. Parameters are not configurable in this menu	

Table 11 – Advanced Configuration

Online Menu Flow	Parameter menu/ name	Description/Valid values
Advanced Configuration/Sensors (The following signal control parameters may be configured in this menu)		
Online/Device Setup/Advanced Configuration/Sensors	CJ Compensation	Select Internal or Fixed Cold Junction Compensation for the temperature measurement. If Internal Compensation is selected, then the Cold Junction temperature is measured using an internal sensor. If Fixed Compensation is selected, the Fixed Cold Junction Temperature Value must be configured and this value is then used for the Cold Junction temperature.
	Fixed CJ Compensation Value	If Fixed CJ Compensation has been selected, enter the desired fixed value of Cold Junction temperature here. Value must be between -50 and 90°C
	MRV	Enter Middle Range value (Applicable for LCM - Split Range type only). Limits are the minimum URL and maximum LRL of the selected Sensor 1 and Sensor 2 IDs. Determines the point of transition of Loop Control between Sensor 1 and Sensor 2 for Split-Range Loop Control Mode.
	Damp-Bumpless Transfer	Enter damping value that will be used when loop control is transferred from one sensor to another. Damping value for the transition of Loop Control between Sensors when Loop Ctrl Mode is Split-Range or Redundant.
	Change Sensor Type/Id Method	Allows user to write the sensor 1/2 type and Sensor 1/2 ID.
	Change Loop Control Mode Method	Allows user to write the Loop control mode**
	Loop Control Mode ** (LCM)	Primary Variable (PV)
	S1	S1
	S2	S2
	Differential	Difference of S1 and S2

Online/Device Setup/Advanced Configuration/Sensors	Average	Average of S1 and S2
	Redundant	When the LCM is configured in redundant mode, the loop is initially controlled via Sensor 1. Should any disconnection occur to Sensor 1 (such as a burnout), the loop control will immediately switch to Sensor 2. Should Sensor 1 be repaired after this time, the LCM will wait 15 seconds and then switch loop control back to Sensor 1. This delay is to prevent an intermittent failure on Sensor 1 from causing the LCM to rapidly switch between Sensor 1 and Sensor 2. Following a power-cycle or a resent, the LCM will normally start up by using Sensor 1 to control the loop. Should Sensor 1 be in a failed condition, the LCM will immediately switch to Sensor 2
	Split Range	S1 ; for S1 < = MRV (Mid-Range Value) S2 ; for S1 > MRV (Mid-Range Value)
	Loop controlled by	Read only parameter Displays the loop controlling sensor
	Latching Alarm	Read only parameter
	Delta Limit	Enter the desired limit value for the PV Delta. When PV Delta exceeds the limit, the PV Excess Delta Alarm will be triggered.
	Excess Delta Detect	Read only parameter. Select to Enable or Disable Excess Delta Detection. When Enabled, an alarm will be triggered when the Delta PV (Sensor 1-Sensor 2 difference) exceeds the configured Delta Limit.
	PV Delta	Read only parameter The difference in measurement between Sensor 1 and Sensor 2 (Sensor 1 value– Sensor 2 value)
	Break Detect	Read only parameter Select to Enable or Disable Sensor Break Detection. It is highly recommended to keep this option Enabled. If there is a break or open in either sensor input, and Break Detect is Enabled, a Critical Status will be generated. If Break Detection is Disabled, no Critical Status is set and the input value will be unreliable.

Online/Device Setup/Advanced Configuration/Sensors	Sensor 1	Sensor 1 Config Parameters: Displays the information related to the Sensor 1 Type, Sensor 1 ID Displays range information of the Sensor 1. The following limits are read only: LRL1: Lower range limit for sensor 1 URL1: Upper range limit for sensor 1 LTL1: Lower transducer limit for sensor 1 UTL1: Upper Transducer limit for sensor 1 Allows user to configure “Lower calib Point 1”,“Upper Calib Point 1”, “Sensor 1 wire Type for RTD/OHM”,”Sensor 1 Bias” and “Sensor 1 install date”
	Sensor 2	Sensor 2 Config Parameters: Displays the information related to the Sensor 2 Type, Sensor 2 ID Displays range information of the Sensor 2. The following limits are read only: LRL2 Lower range limit for sensor 2 URL2 Upper range limit for sensor 2 LTL2: Lower transducer limit for sensor 2 UTL2: Upper Transducer limit for sensor 2 Allows user to configure “Lower calib Point 2”,“Upper Calib Point 2”, ”, “Sensor 2 wire Type for RTD/OHM”,”Sensor 2 Bias” and “Sensor 2 install date”
Device Setup/Advanced Configuration/Sensors/ RTD/OHM Wiring Diagram or TC/mV Wiring Diagram	RTD/OHM Wiring Diagram Or TC/mV Wiring Diagram	Wiring diagram representing typical connections for different sensor input types for the STT700 temperature transmitter. This diagram will update dynamically as per sensor type configured.

** In case of dual input device user has option to configure LCM as one of the following:
S1 (Input 1), S2 (Input 2), Differential, Average, Redundant and Split Range.

Online Menu Flow	Parameter menu/ name	Description/Valid values
Advanced Configuration/Calibration		
Online/Device Setup/Advanced Configuration/Calibration	PV Levels	Displays a graphic representation of all PV ranges and limits for the STT700 temperature transmitter
	Calibration Methods	The following calibration methods are available: Apply Values: performs a Set LRV and/or Set URV to configure the LRV/URV to applied inputs. D/A Trim: performs an analog output calibration at 4.0000 and 20.000 mA (0% and 100% output).
	Sensor 1 Calibration	S1 Cal Hi Correct : Perform an input 1 calibration correction by applying process input at the configured High calibration point. S1 Cal Lo Correct: Perform an input 1 calibration correction by applying process input at the configured Low calibration point. S1 Reset Corrects: Clear all user calibration adjustments. S1 Cal Hi Records: Displays the time and date history records for the last three URV Correct calibrations. S1 Cal Lo Records: Displays the time and date history records for the last three LRV Correct calibrations. S1 Reset Correct Records: Displays the time and date history records for the last three times Reset Corrects was issued.
	Sensor 2 Calibration	S2 Cal Hi Correct : Perform an input 2 calibration correction by applying process input at the configured High calibration point. S2 Cal Lo Correct: Perform an input 2 calibration correction by applying process input at the configured Low calibration point. S2 Reset Corrects:

Online/Device Setup/Advanced Configuration/Calibration		Clear all user calibration adjustments. S2 Cal Hi Records: Displays the time and date history records for the last three URV Correct calibrations. S2 Cal Lo Records: Displays the time and date history records for the last three LRV Correct calibrations. S2 Reset Correct Records: Displays the time and date history records for the last three times Reset Corrects was issued.
Online Menu Flow	Parameter menu/ name	Description/Valid values
Advanced Configuration/CVD (Callendar-Van Dusen constants)		
Online/Device Setup/Advanced Configuration/CVD	CVD 1 Activate	CVD 1 ON: CVD feature enabled for Sensor 1 CVD 1 OFF: CVD feature disabled for Sensor 1
Online/Device Setup/Advanced Configuration/CVD	CVD 2 Activate	CVD 2 ON: CVD feature enabled for Sensor 2 CVD 2 OFF: CVD feature disabled for Sensor 2
Advanced Configuration/CVD1 (Callendar-Van Dusen constants for sensor 1)		
Online/Device Setup/Advanced Configuration/CVD 1 Coefficients	Write CVD 1 Coefficients	User can configure CVD coefficients R0, Alpha, Delta and Beta
	CVD 1 Low Limit	CVD 1 resistance for corresponding the low temperature calibration point
	CVD 1 High Limit	CVD 1 resistance for corresponding the high temperature calibration point
	R0	Resistance at 0°C
	Alpha	Alpha CVD coefficient for sensor 1
	Delta	Delta CVD coefficient for sensor 1
	Beta	Beta CVD coefficient for sensor 1

Advanced Configuration/CVD2 (Callendar-Van Dusen constants for sensor 2)		
Online/Device Setup/Advanced Configuration/CVD 2 Coefficients	Write CVD 2 Coefficients	User can configure CVD 2 coefficients R0, Alpha, Delta and Beta
	CVD 2 Low Limit	CVD 2 resistance for corresponding the low temperature calibration point
	CVD 2 High Limit	CVD 2 resistance for corresponding the high temperature calibration point
	R0	Resistance at 0°C
	Alpha	Alpha CVD coefficient for sensor 2
	Delta	Delta CVD coefficient for sensor 2
	Beta	Beta CVD coefficient for sensor 2
Advanced Configuration/Alarm		
Online/Advanced Configuration/Alarm	Excess Delta Detect	Enable or Disable Excess Delta detection. When Enabled, an alarm will be triggered when the Delta PV (Sensor 1-Sensor 2 difference) exceeds the configured Delta Limit.
	Latching Alarm	Enable or Disable Latching Alarm. When Enabled, critical fault is latched until user acknowledges that the fault condition does not persist.
	Break Detect	Select to Enable or Disable Sensor Break Detection. It is highly recommended to keep this option Enabled. If there is a break or open in either Sensor input, and Break Detect is Enabled, a Critical Status will be generated. If Break Detection is Disabled, no Critical Status is set and the input value will be unreliable

Online Menu Flow	Parameter menu/ name	Description/Valid values
Advanced Configuration/Services		
Online/Device Setup/Advanced Configuration/ Services	Write Protect	Displays the current configuration of the write protect function. Write Protect is “Enabled” if the firmware write protect has been enabled.
	Write Protect	Displays the current configuration of the write protect function. Write Protect is “Yes” (enabled) the firmware write protect has been enabled.
	Write Protect On/Off	Configure the firmware write protect option. Write Protect selections are: “Enable”: enables the firmware write protect option (changes in configuration parameters will not be permitted). “Disable”: disables the firmware write protect option (requires a password). A 4-digit password is required to change the Write Protect option from “Enabled” to “Disabled” to allow configuration changes. The default password is “0000”, and can be re-configured by the user.
	Master Reset	Selecting this option will cause a Master Reset of the transmitter, which is the equivalent to power cycling the device.
	Change Password	Change the write protect password to a new 4-digit code.
	Burnout Sel.	Read only parameter that specifies failsafe current value. If the selection is low then device sets loop current to less than 3.6 mA when there is critical fault. If the selection is high then device sets loop current to 21.5 mA when there is critical fault.
	Reset/Forgot Password	This method is used either to change or reset the write protect password. This password is required to disable write protection where user can perform device configuration.

Online/Device Setup/Advanced Configuration/Services	Loop Test	This function enables the user to test the Analog Output measurement at any value over the full operational range. Select a current value to apply to the output and verify the measured current on the loop with a calibrated meter. Note that this function is only available when "Loop mA" (Loop Current mode) is Enabled.
	Lock/Unlock Device	Select the Lock state for access by HART configuration tools. If "Yes" is selected to lock the device, also select "Yes" or "No" to choose whether or not the lock is "permanent." If the lock is not permanent, it will be cleared on power cycle or Master Reset of the device. If "Yes" is selected to unlock the device, the lock state will be cleared.
Summary	Displays the current values under Advanced Configuration Menu for all of the pertinent operating parameters listed in this table. Parameters are not configurable in this menu	

Table 12 – Monitor

Online Menu Flow	Parameter menu/ name	Description/Valid values
Monitor/Dashboard		
Online/Device Setup/Monitor/Dashboard	PV LRV	Displays the current value of the Lower Range Value (input which represents 0% output) in user selected engineering units. This value may be configured to any value within the range as per selected loop control mode (It will be computed depending on LTL1, UTL1, LTL2 and UTL2.
	PV URV	Displays the current value of the Upper Range Value (input which represents 100% output) in user selected engineering units. This value may be configured to any value within the range as per selected loop control mode (It will be computed depending on LTL1, UTL1, LTL2 and UTL2.
	PV LTL	Lower Transducer Limits
	PV UTL	Upper Transducer Limits
	PV Delta	Read only parameter Displays the absolute difference between the two measured temperature inputs (Sensor 1 temperature value - Sensor 2 temperature value).
Monitor/Dashboard/Process Monitoring		
Online/Device Setup/Monitor/Dashboard /Process Monitoring	PV Meter	Displays a gauge meter representation of the current value of the Primary Variable (temperature input)
	PV [Loop]	Displays the current value of the Primary Variable (temperature input) in user selected engineering units
	Trend of PV	Displays a trending chart of the current value of the Primary Variable (temperature input).
	SV Meter	Displays a gauge meter representation of the current value of the Secondary Variable (CJ temperature).
	SV [Cold Jn. Temperature]	Displays the current value of the Secondary Variable (CJ temperature) in user selected engineering units.
	Trend of SV	Displays a trending chart of the current value of the Secondary Variable (CJ temperature)

Online/Device Setup/Monitor/Dashboard /Process Monitoring	TV Meter	Displays a gauge meter representation of the current value of the Tertiary Variable (Sensor 1 temperature).
	TV [Sensor 1]	Displays the current value of the Tertiary Variable (Sensor 1 temperature) in user selected engineering units.
	Trend of TV	Displays a trending chart of the current value of the Tertiary Variable (Sensor 1 temperature).
	QV Meter	Displays a gauge meter representation of the current value of the Quaternary Variable (Sensor 2 temperature).
	QV [Sensor 2]	Displays the current value of the Quaternary Variable (Sensor 2 temperature) in user selected engineering units.
	Trend of QV	Displays a trending chart of the current value of the Tertiary Variable (Sensor temperature).
	ET Meter	Displays a gauge meter representation of the current value of the Electronics Temperature.
	Core Temperature	Displays the current value of Core Temperature in degrees Celsius.
	Trend of ET	Displays a trending chart of the current value of the Electronics Temperature.
	AO Meter	Displays a gauge meter representation of the current value of the Analog Output.
	PV Loop Current	Displays the current value of Analog Output in mA.
	Trend of AO	Displays a trending chart of the current value of the Analog Output.
	PV AO %	Displays a bar graph of the current value of the Analog Output.
	PV % rnge	Displays the current value of transmitter Output in %.

Online Menu Flow	Parameter menu/ name	Description/Valid values
Monitor/Device Status		
Online/Device Setup/Monitor/Device Status	Overall Status	Displays a pictorial representation of the current device status.
	Critical	Displays all possible Critical Status faults and indicates OFF for inactive faults or ON for active faults.
	Non-Critical	Displays the first set of possible Non-Critical Status faults and indicates OFF for inactive faults or ON for active faults.
	Non-Critical	Displays the first set of possible Non-Critical Status faults and indicates OFF for inactive faults or ON for active faults.
	Non-Critical	Displays the first set of possible Non-Critical Status faults and indicates OFF for inactive faults or ON for active faults.
	Non-Critical	Displays the second set of possible Non-Critical Status faults and indicates OFF for inactive faults or ON for active faults.
	Ext dev status	Displays all possible Extended Device Status faults and indicates OFF for inactive faults or ON for active faults.
	Additional Status	Displays an advanced diagnostic detailed breakdown of all Critical and Non-Critical faults

Online Menu Flow	Parameter menu/ name	Description/Valid values
Monitor/ Device Information		
Online/Device Setup/Monitor/ Device Information	Transmitter Install Date	Displays the Transmitter Install Date
	Tag	Displays Tag details
	Long Tag	Displays Long Tag details
	Cfg chng count	Displays Configuration Change Counter.
	Date	Displays date for user entered information only.
	Descriptor	Displays descriptor for user entered information only.
	Cfg chng count	Configuration Change Counter – the counter keeps track of the number of times any configuration parameter has been changed
	Message	Displays user entered message
	Clear Message	Selecting this option clears the “Message” and it will no longer be sent to the display.
	Dev ID	Displays the HART unique long address of the STT700 temperature transmitter.
	Final Asmbly num	Displays the final assembly number of the STT700 temperature transmitter.
	Universal rev	Displays the HART Universal Revision of the STT700 temperature transmitter.
	Fld dev rev	Displays Field Device Revision of the STT700 temperature transmitter.
	Software rev	Displays the Electronics Board Software Revision of the STT700 temperature transmitter.
	Manufacturer	Displays Manufacturer of the STT700 temperature transmitter: Honeywell International
	Model	Displays Model number of the STT700 temperature transmitter: STT700
	Model Number	Displays the full order model number of the STT700 temperature transmitter.

Online Menu Flow	Parameter menu/ name	Description/Valid values
Monitor/Diagnostics		
Online/Device Setup/Monitor/Diagnostics	Adv Diagnostics	Displays Advanced Diagnostics details for tracking basic device operation. For more detailed information on Advanced Diagnostics, refer to HART Advanced Diagnostics section in this Manual. Diagnostic information includes: Installation and Device Life details Operating Voltage details Core Temperature Diagnostics details Power Up Diagnostics details.
	Error Log	Available to enable and disable error logging. If error log is enabled, all critical errors triggered will be logged with a time stamp.
	Variables Monitoring	PV Tracking CJ Tracking

MSG Details		
Online/Device Setup/Monitor/MSG Details	Inputs & Outputs	No.Of Inputs Analog Output Digital Protocol
	Agency Approvals	Approvals Safety
	Tx Housing & Elec. Sel	Housing Material End Cap & Material Housing End cap Integral Display Buttons Languages Lightning protection
	Accessory Selections	Mounting Bracket Type Material Customer Tag Type Unassembled conduit Plugs & Adapters
	Configuration Selections	Diagnostics Write protect Failsafe High & Low Output Limits General Configuration

	Accuracy & Calibration	Accuracy Calibration Range Calibration Quantity
	Certificates & Warranty	Certifications & Warranty
	Factory	Factory Identification

Review		
Online/Device Setup/Review		Displays the current values for all of the pertinent operating parameters listed in this table, plus revision information. Parameters are not configurable in this menu.

The sections below give some examples as to how to edit the configuration parameters and execute Methods.

5.2.10 Procedure to Enter the Transmitter Tag

1. From the **My Device** menu, make the following menu selections:
2. My Device>Device Setup>Basic Configuration>General>Tag Click **Edit**. The **Tag** screen will be displayed.
3. Key in the tag name (for example: STT700) which can be a maximum of eight characters.
4. Click **OK**. The **Send to Device** screen will be displayed.
5. Select the **Tag** check box.
6. Click **Send** to download the change to the Transmitter, or Click **Return** to continue making changes.

5.2.11 Selecting the Process Variable (PV) Unit of Temperature Measurement


Engineering units affect the values of the LRV and URV. After changing the PV engineering units to the transmitter, verify changes to the units paramter, the LRV, and the URV.

The temperature measurement can be displayed in one of the pre-programmed engineering units.

1. From **My Device** menu, make the following menu selections:

   My Device>Device Setup>Basic Configuration>Process Values>PV Unit

   Click **Edit.** You will be warned that if you change the value of the variable it will change the loop current, which may upset the control process.
2. Click **Yes** to continue. The PV Unit screen will be displayed with a list of measurement units, as per sensor type configuration as follows:
   - Deg C
   - Deg F
   - Deg R
   - Kelvin
   - mV
   - Ohms
3. Select the desired **PV Unit**, and click **OK**. indicating if you select this value, the variables that use it as the units code will start in the previous units until this value is sent to the transmitter.
4. Click **OK** to continue or **Abort** to discard the change.
5. Click **Send**. The Send to Device screen will be displayed.
6. Select the **PV Unit** check box.
7. Click **Send** to download the change to the transmitter or **Return** to continue making changes.

5.2.12 Setting PV URV, and LRV Values

STT700 transmitters are calibrated at the factory with ranges using deg C. For a reverse range, enter the upper range value as the LRV and the lower range value as the URV.

The LRV and URV values can be entered with the Toolkit keypad or by applying the corresponding temperature values directly to the transmitter. Use the following procedure to key in the range values.

- Starting at the My Device menu, make the following menu selections:
  Device Setup > Basic Configuration > 4-20mA Outputs
  Click **Edit**. The "WAO List*" screen will be displayed.
- Select **PV LRV** and click **Edit**. You will be warned that if you change the value of the variable it will change the loop current, which may upset the control process.
- Click **Yes** to continue.
- Enter the desired **PV LRV** value.
- Click **OK**.
- Choose **PV URV**.
- Add the desired URV setting value
- Press **ENTER**.
- Select the **PV URV**, and click **Edit**. You will be warned that if you change the value of the variable, it will change the loop current, which may upset the control process.
- Click **Yes** to continue.
- Click **Return** to go back to the **Basic Configuration** menu.
- Click **Send**. The Send to Device screen will be displayed.

*WAO = WRITE AS ONE (grouping of parameters for editing, for example you can edit PV URV and PV LRV in one shot if URV LRV is provided under WAO list)

5.2.13 Setting Range Values for Applied Temperature

When setting the range values using applied temperature, the URV changes automatically to compensate for any changes in the LRV and to maintain the present span (URV – LRV). When entering the LRV using the Tookit keypad, the URV does not change automatically. If you use the applied temperature method, and need to change the LRV and URV, **change the LRV first**. You can also use the local zero and span adjustments on the transmitter to set the LRV and URV values.

1. Starting at the **My Device** menu, make the following menu selections:
   Device setup > Advanced Configuration>Calibration > Calibration Methods > Apply values.
2. Click **Execute**. You will be warned to remove the loop from automatic control. After doing so, press **OK** to continue.
3. Select **4mA** from the list, and then click **OK**. A message will prompt you to apply a new 4 mA input.
4. Click **OK**; otherwise, click **Abort**.

5. When the **Current applied process value:** is displayed, choose **Select as 4mA value**, and click **OK**.
6. Repeat steps 2 through 4 to set the URV to the applied input temperature for 20 mA output.
7. Click **Return** to go back to the Calibration menu.
8. Click **Send**. The Send to Device screen will be displayed.
9. Select the **Apply Values** check-box.
10. Click **Send** to download the change to the transmitter, or click **Return** to continue making changes.

5.2.14 Saving device history

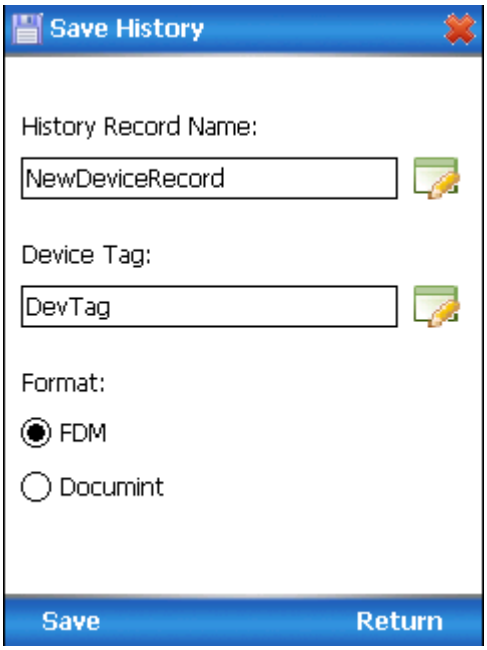
FDC provides you a feature wherein you can save the device configuration snapshot as history. This history record may then be transferred to a central asset management database such as FDM.
Using this feature you can save the device configuration snapshot as device history of a connected device at any given time in a predefined location. The following are the features of save device history option.

- Two formats of history are supported: FDM and DocuMint (legacy application).
- Only one snapshot per device instance is allowed to be saved and you can save the snapshot of a device any number of times overwriting the existing one.

To save device history, perform the following steps.

1. On Device Home page, tap Tools.
2. Select **Save History** and tap **Select**

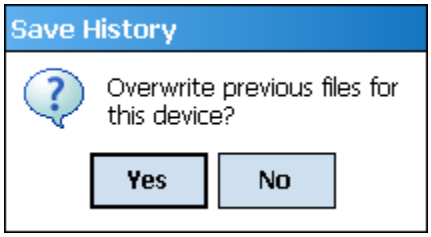
   The **Save History** page appears.



3. Enter the **History Record Name** using the keypad and tap **OK**. History Name field accepts alphanumeric characters, underscore, and no other special characters.
4. Enter the **Device Tag** using the keypad and tap **OK**. Device Tag field accepts alphanumeric characters, underscore, and no other special characters.

Note: The device can be identified with **History Record Name** and **Device Tag** in FDM, once the record is imported in FDM, provided the device is not already present in the FDM network.

5. Select the **Format**. The following are the available formats:
   i. FDM
   ii. DocuMint
6. Tap **Save** to save device history record.
7. If a history record for this device already exists, the following warning message appears.



8. Tap **Yes** to overwrite the existing name. A overwrite success message appears.
9. Tap **OK** to return to **Device Home** page.

5.2.15 Exporting device history records to FDM

The history snapshot saved in FDC can be imported into FDM for record and audit purposes. This is enabled by the standard Import/Export wizard in FDM. This way FDM allows synchronizing the device configuration data through the MC Toolkit handheld.

To export device history from FDC and import it in FDM, perform the following steps.

1. Connect your MC Toolkit handheld to your computer as described earlier.
2. Browse to the folder on your computer, **SD Card > FDC > Resources > History**.
3. The FDC history records are named as per the following convention for the primary name: **DeviceTag_ManufacturerIDDeviceTypeDeviceRevisionDDRevision_DeviceID**
4. Copy the desired Device History Record files (with .fdm extension) from the above mentioned location to a temporary location on FDM Client computer.
5. Use FDM Import/Export wizard to import the history records into FDM. After you import successfully:
   - The snapshot would get imported into FDM database and appear as a history record for the corresponding device in FDM.
   - The Audit Trail entry for such a record identifies it as being imported through the MC Toolkit handheld.
   - If the device is not part of any of the FDM configured networks, it would appear under '**Disconnected Devices'** in FDM network view.
   - All operations allowed on Device History Record in FDM will be allowed for the record imported through the MC Toolkit handheld.

Note: For more details on using FDM Import/Export feature, refer to section Importing and Exporting Device History in FDM User's Guide.

5.2.16 Exporting device history records to DocuMint

To export device history from FDC and import it in FDM, perform the following steps.

1. Connect your MC Toolkit handheld to your computer as described earlier.
2. Browse to the folder on your computer, SD Card > FDC > Resources > History.
3. The FDC history records are named as per the following convention for the primary name: DeviceTag_ManufacturerIDDeviceTypeDeviceRevisionDDRevision_DeviceID
4. Copy the desired Device History Record files (with .xml extension) from the above mentioned location to a temporary location on the DocuMint system.
5. For Importing in DocuMint: Select Procedures > Import or the Import option in the tool bar.

Note: For more details on using DocuMint Import feature, refer to section importing from XML File in Document Help.

5.2.17 Custom Views

FDC provides you a unique feature wherein you can choose what you want to view in a device and thus creating your own custom views. This is a very convenient utility when you are interested in select few variables in a device and saves you the time for navigating through the menus.
You can create two views per device type with maximum of 10 variables selected for each custom view.

To create/modify the custom views, perform the following.

- On **Device Home** page, tap **My Views**.
- Tap Configure and tap Select.

  The Configure My Views dialog box appears.
- To customize **View1** and **View2**, select the variables by checking the box against desired variables.
- Tap  or  to navigate to previous and next set of variables.
- Once done, tap **Options** to select **Save My Views**.

  Two custom views are ready with selected variables.

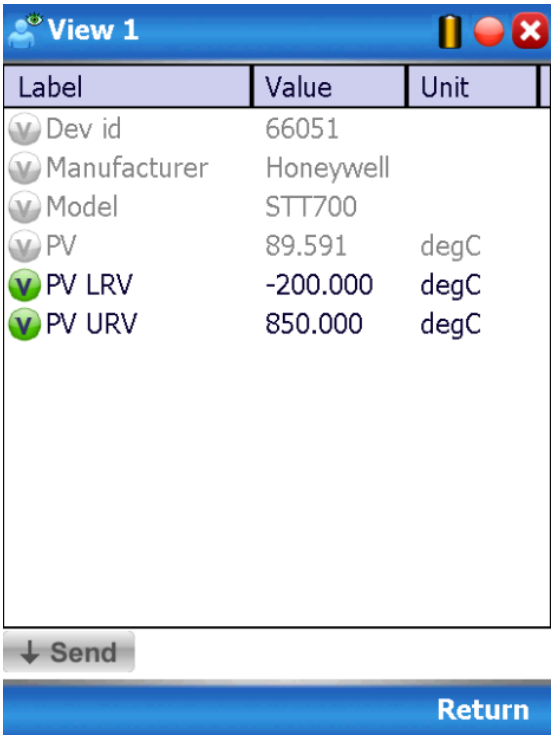
  Note: Since a custom view can contain only up to 10 variables each, a warning is displayed if you have selected more than 10 variables.

To rename the views, perform the following.

- Tap **Options** > **Rename View1**.

  A dialog box appears informing you to enter the name.
- Tap **Ok**.
- Tap Option>Save to persist the change
- Tap **Return** to return to My Views page. You would see two options with the names you gave to the newly created views.

Note: To view the custom views, tap **My View 1** > **Select**.
The My View 1 page appears. Example View1 is shown. Based on the connected device model, you can select the applicable parameters



Edit the parameters that are Read / Write and select Send.

For more details on any of the FDC features, refer the "*MC Toolkit User Manual*, document #34-ST-25-50 (MCT404)."

5.2.18 Offline Configuration

5.2.18.1 Overview

Offline configuration refers to configuring a device when the device is not physically present or communicating with the application. This process enables you to create and save a configuration for a device, even when the device is not there physically. Later when the device becomes available with live communication, the same configuration can be downloaded to the device.

This feature enables you to save on device commissioning time and even helps you to replicate the configuration in multiplicity of devices with lesser efforts. Currently, FDC does not support creating offline configuration. However, it supports importing of offline configuration from FDM R310 or later versions. The configurations thus imported can be downloaded to the device from FDC.

The following are the tasks that you need to perform for importing offline configuration in FDC application software and then downloading it to the device.

- Create offline configuration template in FDM
- Save the configuration in FDM in FDM format.
- Import the offline configuration in FDC
- Download the offline configuration to the device

Note: For details on creating and using offline configuration, refer to section Offline configuration in FDM User's Guide.

5.2.18.2 Importing offline configuration

Using this feature you can import offline configuration template. The offline configuration template has to be created in FDM and saved in FDM format. Copy the .fdm files into the storage location of the FDC.

To import an offline configuration, perform the following steps.

1. On the FDC homepage, tap Offline Configuration > Select.

   The **Offline Configurations** page appears.
2. Tap Options > Import.
3. The Select a File dialog box appears.
4. Navigate to the location where the offline configuration template is stored.
5. Select the required offline configuration template from the list.
6. Double-tap and the offline configuration template is imported.

   A success message appears.

   Note: In case if the offline configuration template is already imported, an overwrite message appears.

7. Tap OK to return to the Offline Configurations page. The device details appear on the bottom of the page.

5.2.18.3 Deleting offline configuration

Using this feature you can delete an offline configuration template.

To delete an offline configuration, perform the following steps.

1. On the FDC homepage, tap Offline Configuration > Select.
   The **Offline Configurations** page appears.
2. Select the required offline configuration template from the list.
3. Tap Options > Delete. A warning message appears.
4. Tap Yes to delete the offline configuration template.

5.2.18.4 Downloading an offline configuration

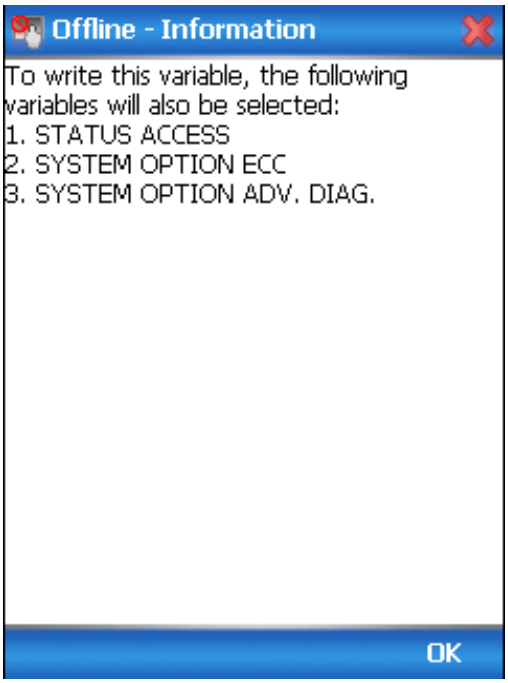
Using this feature, you can download the offline configuration when the device is online.

To download an offline configuration, perform the following steps.

1. On the FDC homepage, tap **Offline Configuration > Select**.
2. The Offline Configurations page appears.
3. Select the required offline configuration template from the list.
4. Tap Options > Download.
   The Offline – Select Variables page appears with the all the variables.

Note: By default, all the variables selected in FDM will appear as selected and non-editable variables appear in grey color.

5. Select the required variable. In case you select a dependent variable, then variables on which it is dependent on will also be selected and the following warning appears.

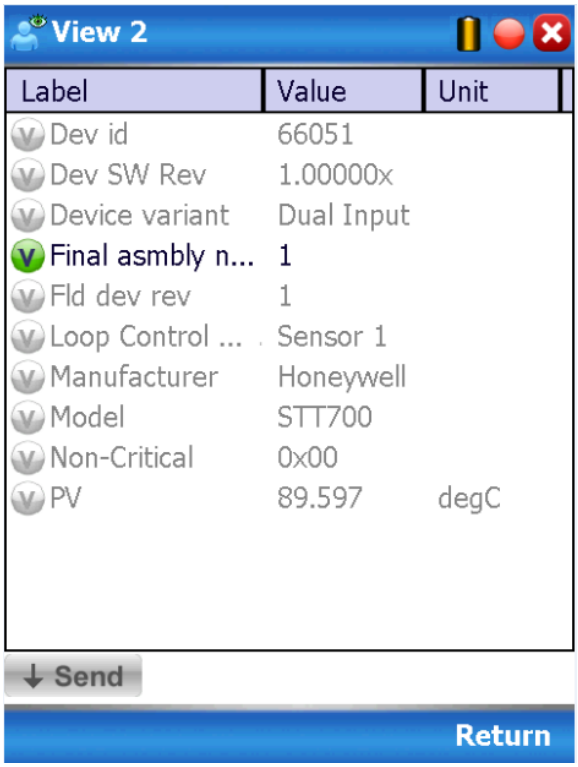


6. Tap **OK** to return to the offline wizard.

7. Tap **Next**.

   The Offline – Review and Send page appears with the list of selected variables.

8. Tap **Send** and the process to send the variables to the device starts. Once the downloading is complete, the following page appears. Typical screen is shown here.



Note: If the variables are downloaded successfully, status appears as **SUCCESS** in green color; and if failed, status appears as **FAILED** in red color.

9. Tap **Finish** to return to **FDC Homepage**.

6 DE Calibration

6.1 Overview

The STT700 SmartLine Temperature Transmitter does not require periodic calibration to maintain accuracy. Typically, calibration of a process-connected transmitter may degrade, rather than augment its capability. For this reason, it is recommended that the transmitter be removed from service before calibration. Moreover, calibration should be accomplished in a controlled, laboratory-type environment, using certified precision equipment.

6.2 Calibration Recommendations

If the transmitter is digitally integrated with a Honeywell control system, like the Total Plant Solution (TPS) or Experion PKS system, you can initiate range calibration and associated reset functions through displays at the Universal Station, Global User Station (GUS), or Experion Station. However, a range calibration using the MC Toolkit with the transmitter removed from service is recommended.

Calibration with the transmitter removed from service needs to be accomplished in a controlled environment. Details for performing a calibration reset through the Universal Station are provided in the *PM/APM SmartLine Transmitter Integration Manual*, PM12-410, which is part of the TDC 3000^X system book set.

6.3 Test Equipment Required for Calibration

Depending upon the type of calibration you choose, you may need any of the following test equipment to accurately calibrate the transmitter:

- Digital voltmeter or millimeter with 0.01% accuracy or better
- Honeywell MC Toolkit: Use the **MC Toolkit** application to calibrate the STT700 DE model and the **FDC** application to calibrate the STT700 HART model.
- Calibration-standard input source with a 0.01% accuracy
- 250 ohm resistor with 0.01% tolerance or better.

6.4 Analog Output Signal Calibration

The transmitter analog output can be calibrated at its zero (0) and 100% levels using a constant current source mode. The transmitter does not have to be removed from service for the analog output signal calibration procedure.

The following procedure provides the steps for calibrating the output signal for a transmitter in the analog mode. The procedure is similar for a transmitter in the DE mode, but the MC Toolkit is required to read the output in percent in place of current or voltage. Figure 10 illustrates the test setup for the analog output calibration process.

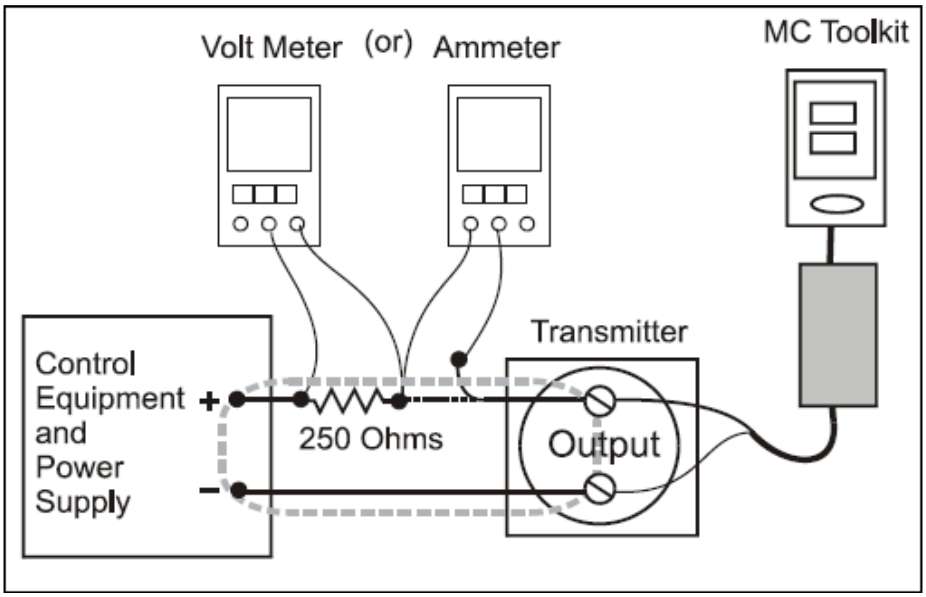
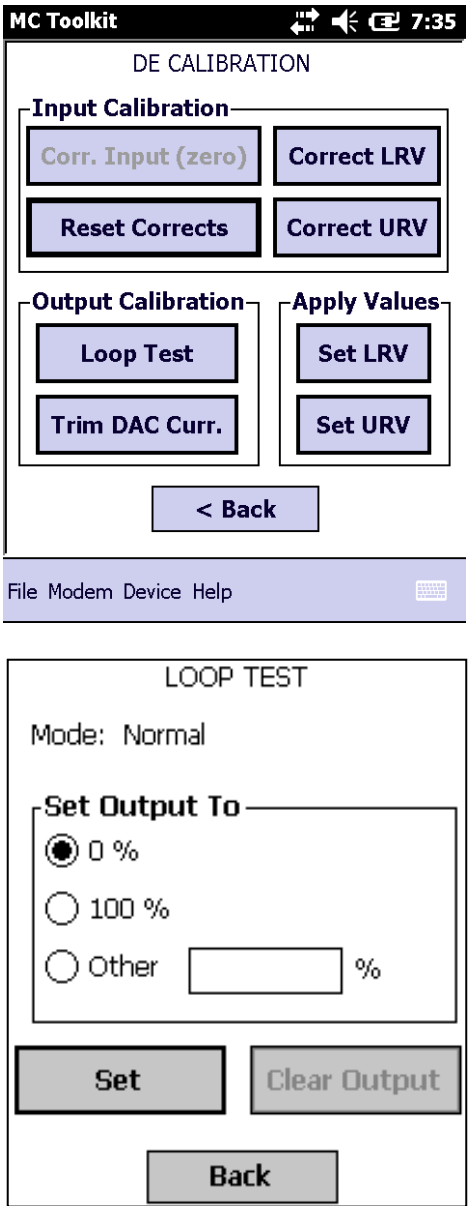


Figure 10 – Analog Output Calibration Test Setup

1. Verify the integrity of the electrical components in the output current loop.
2. Connect the MC Toolkit as indicated, and establish communication with the transmitter. For these procedures, values of components in the current loop are not critical, if they support reliable communication between the transmitter and the MC Toolkit.
3. Start the MC Toolkit application, and establish communication with the transmitter.
4. In the Output Calibration box, select the **Loop Test** button to display the LOOP TEST box.
5. Select the desired constant-level Output: **0 %**, **100 %**, or **Other** (any of **0 % - 100 %)**.



6. Select the **Set** button. You will be prompted to confirm that you want to put the transmitter in output mode.
7. Select **Yes**, and note the output current at 0%, 100% or the other value established in the previous step. With the transmitter in analog mode, you can observe the output on an externally connected meter or on a display. In DE mode, the output can be observed on the display or on the monitor display of the MC Toolkit.
8. To view the Monitor display, navigate back from the LOOP TEST display, and select the MONITOR display. A confirmation prompt will be displayed for you to verify that you want to change pages. Select **Yes**.

6.5 Calibrating Range Using the MC Toolkit

The range calibration involves two procedures, one to calibrate the input, the other to calibrate the output. This section provides details on both procedures.

6.6 Conditions for Input Calibration

Calibrate the transmitter input only when necessary, and under conditions that will ensure accuracy:

- Remove the transmitter out of service, and move it to an area with favorable environmental conditions, for example, clean, dry, and temperature-controlled
- The source for the input temperature must be precise, and certified for correct operation.
- Qualified personnel are required for the input calibration procedure.

To optimize accuracy, the PROM includes storage for calibration constants: Correct LRV, and Correct URV. These constants provide for optimum accuracy in that they enable fine-tuning of the input calculations by first correcting at zero input, then by bounding the input calculations at the selected operating range. Corrections are applied at the Lower Range Value (LRV) and the Upper Range Value (URV).

Factory calibration can be specified when you order your transmitter. Also, if precision equipment, suitable environment, and required skill are available at your site, input calibration can be done locally.

The procedure requires a precision temperature source with an accuracy of 0.04% or better to do a range calibration. Factory calibration of the STT700 temperature transmitter is accomplished with inches-of- water ranges referenced to a temperature of 39.2 °F (4°C).

6.7 Input Calibration Procedures Description

The input calibration process consists of the following three parts:

- Correcting the input LRV.
- Correcting the input URV.

For the input calibration procedure, current loop component tolerances and values are not critical if they support reliable communication between the transmitter and the MC Toolkit. Refer to the STT700 SmartLine Transmitter User's Manual, 34-TT-25-17.

For the input calibration procedures, connect the test setup illustrated in Figure 11. Either voltage mode (voltmeter across the resistor) or current mode (ammeter in series with the resistor) is satisfactory.

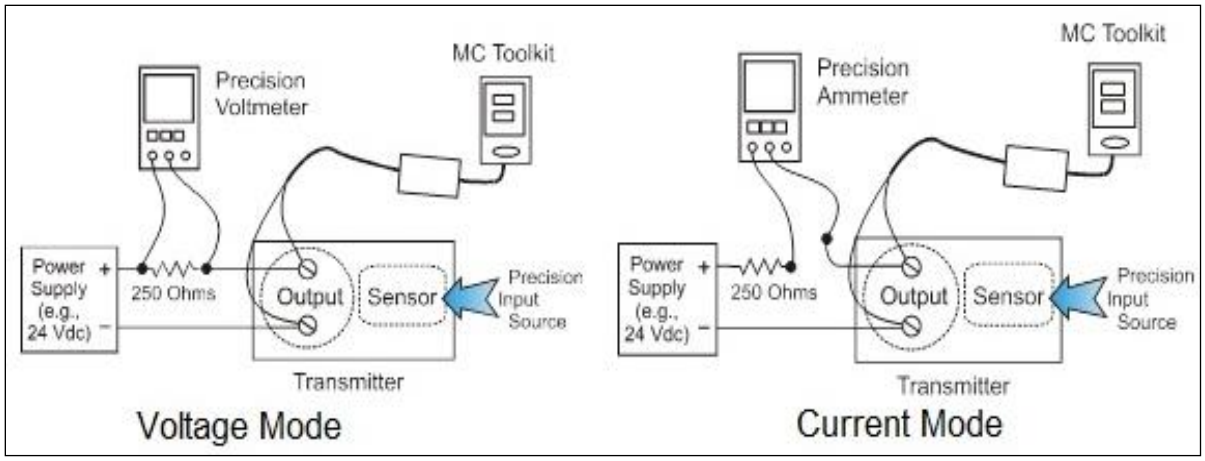


Figure 11 – Input Calibration Connections

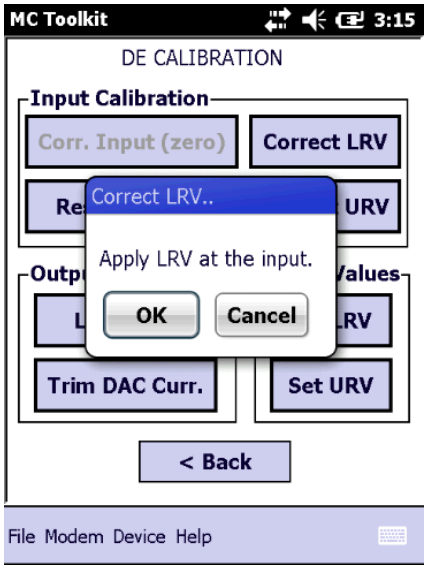
6.8 Input Calibration Procedure

6.8.1 Correct Input at the Lower Range Value (LRV)

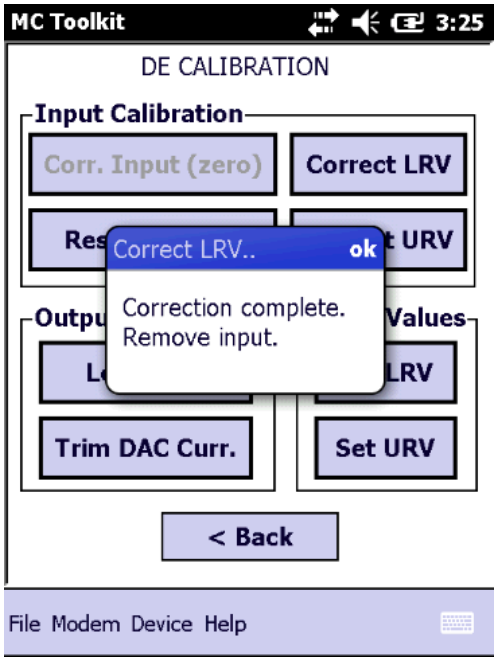
This section describes the action to correct the input at the Lower Range Value (LRV). To begin, enter the appropriate values before doing the calibration. Configure sensor type to mV or TC or RTD or Ohms for the input which you are going to perform calibration. Below snapshots are examples of sensor type TC-E.

These values are entered in Device Setup/Sensors/Sensor 1/Sensor 1 Config Params menus, thus the first set is for LRV1 Correct and URV1 Correct and the second set is for LRV2 Correct and URV2 Correct.

1. Select the **Correct LRV** button on the CALIBRATION display.
2. Select the **Correct LRV** button. This message appears:



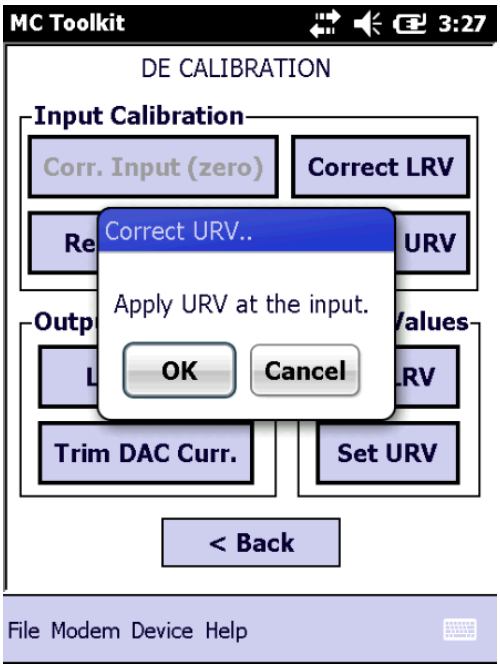
3. Adjust the PV input Temperature to the ***exact value of the LRV*** entered in the DE CONFIGURE display.
4. Select the **OK** button
5. Observe the input temperature at the applied value; when it is stable, select the **OK** button.
6. When the transmitter has completed the LRV correction, this message appears:



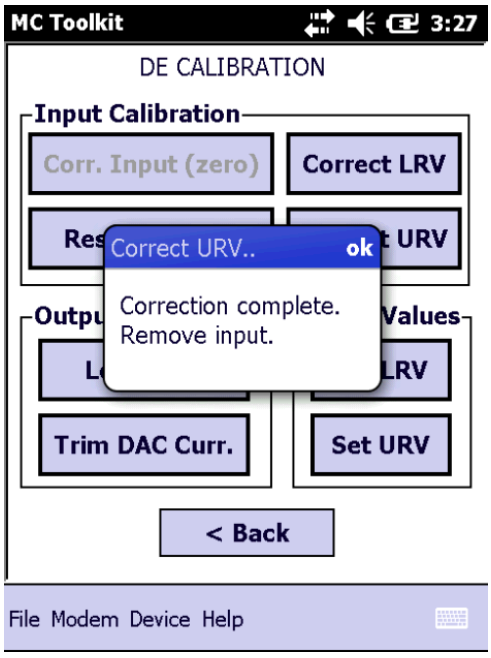
7. Select **OK** to acknowledge.

6.8.2 Correct Input at URV

1. Select the **Correct URV** button. This message appears.



2. Adjust the PV input Temperature to **the *exact value of the URV*** entered in the DE CONFIGURE display.
3. Select the **OK** button.
4. When the transmitter has completed the URV correction, this message appears.



5. Select **OK** to acknowledge.

6.9 DE Output Calibration

6.9.1 Output Calibration Preparation

This procedure applies to DE transmitters operating in analog (current) mode only. First, verify the integrity of the electrical components in the output current loop. Make the connections shown in Figure 12, and establish communication with the transmitter.

Connect the MC Toolkit as indicated, and establish communication with the transmitter.

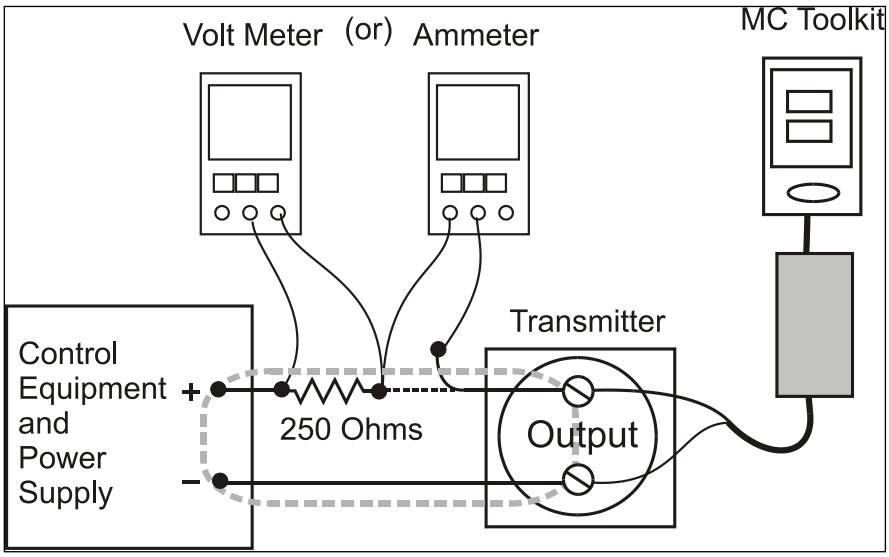


Figure 12 – Output Calibration Test Connections

The purpose of analog output calibration is to verify the integrity of electrical components in the output current loop. For output calibration, establish the test set up shown in Figure 13. Values of components in the current loop are not critical if they support reliable communication between the transmitter and the MC Toolkit.

For a DE transmitter operating in analog mode, calibrate the analog output current to the Process Variable (PV) input range such that 4 mA corresponds to the LRV of 0% and 20 mA corresponds to the URV of 100%. Figure 13 shows the PV scale and representative process system connections.

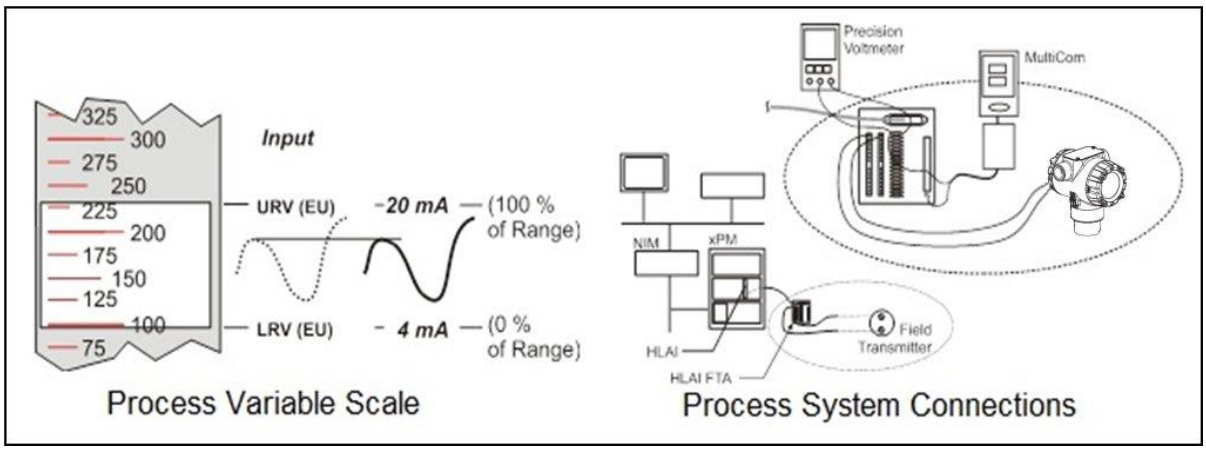
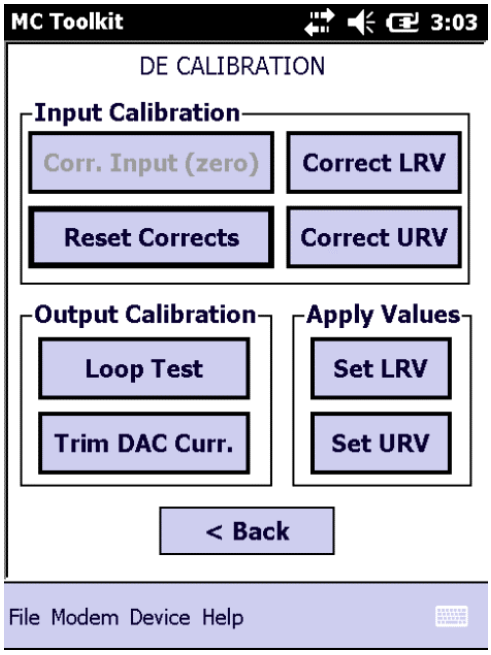
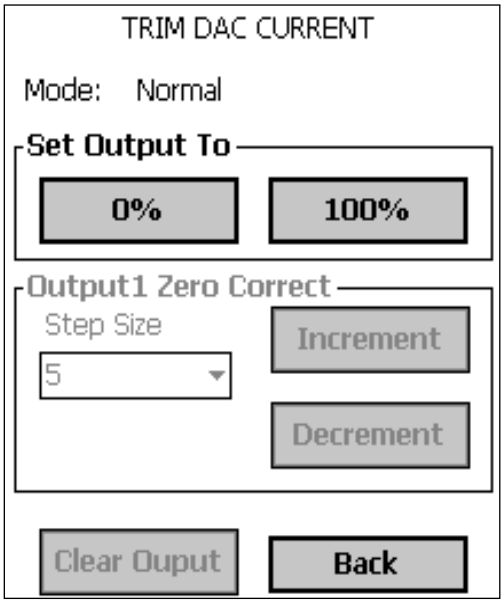


Figure 13 – DE Analog Mode Scaling and Test Connections

1. Start the MC Toolkit application such that the DE MAIN MENU is displayed.
2. Select the **Calibration** button to display the CALIBRATION menu.



3. Select **Trim DAC Curr.** To display the TRIM DAC CURRENT box.



4. Trim output current as follows:

a. Select **Set Output To 0%** or **100%**. You will be prompted to confirm that you want to place the transmitter in output mode.
b. Verify that the loop is in manual control. In output mode, output current is fixed at the 0% or 100% level as selected in the TRIM DAC CURRENT box in the previous step.
c. Select **Yes**, and observe the loop current level. A meter reading of 4 mA corresponds to 1 volt.
d. Use the MC Toolkit to adjust the loop current to the Zero Percent level (4mA). If the current is low, tap the **Increment** button; if the current is high, tap the **Decrement** button. Note that the value on the meter changes accordingly. If the error is large, accelerate the adjustment rate by changing the Step Size to 10 or 100.
e. After establishing the zero current level (4 mA), select **Set Output To 100%**. A meter reading of 20 mA corresponds to 5 volts.
f. Use the **Increment** or **Decrement** button, as necessary to adjust the output current to 20 mA. When the current reaches the 20 mA level, select **Clear Output**; the button will change to half-intensity.

5. Change the display in output mode as follows:
   a. Selecting the **Back** button before selecting the **Clear Output** button, you will be prompted to confirm that you want to clear the output.
   b. If you want to stay in output mode while viewing other displays, select **Yes**; otherwise, select **No** and the **Clear Output** button.

6.10 Manually Setting the Process Variable Range

This procedure applies to DE transmitters operating in both DE mode and analog (current) mode. During this procedure, the PV input will be set to 0%, which will be applied as the LRV. Further, the PV input will be set to 100% and applied as the URV.

1. Establish the test connections shown below. Then start the MC Toolkit application to display the DE MAIN MENU.

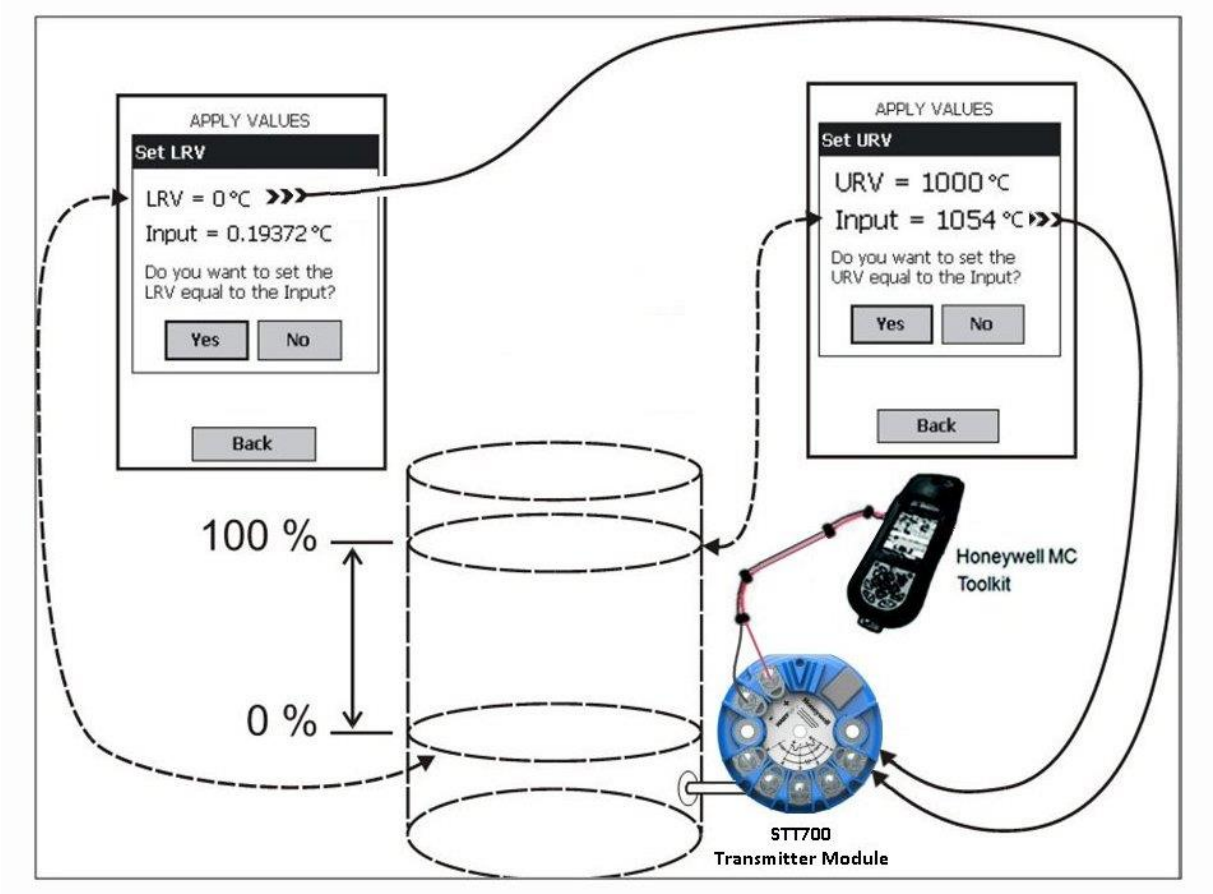
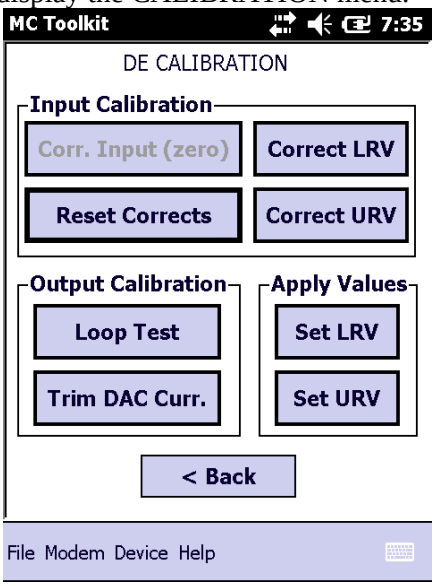
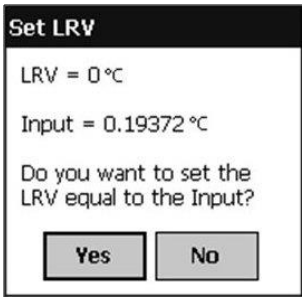


Figure 14 – Setup to Manually Set the PV LRV and URV

Select the **Calibration** button to display the CALIBRATION menu.

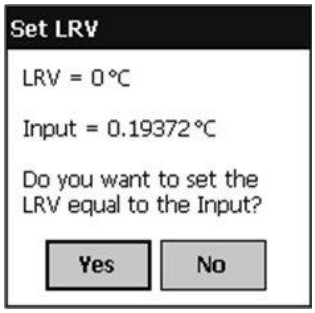


2. In the **Apply Values** group, select **Set LRV**. The following message will be displayed;



   a. The value of the input shown in the Set LRV box above updates only when the popup is called up.
   b. To update the input value, select **No**, and then select the **Set LRV** button in the CALIBRATION display.

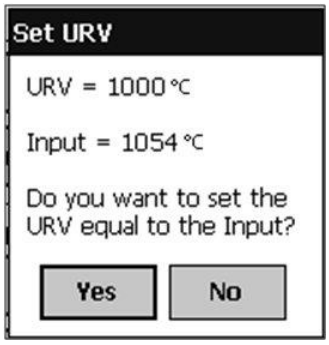
3. Set the LRV as follows:
   a. While observing the PV value at the physical process element, adjust it to the desired minimum (0 %) level, then select **Set LRV.**
   b. If the displayed value is satisfactory, select **Yes** to copy the Input Value to the LRV in the Transmitter. If not, select **NO** and repeat this step.



Set the URV as follows:

c. While observing the PV value at the physical process element, adjust the process variable to the desired maximum level, and then select **Set URV.**

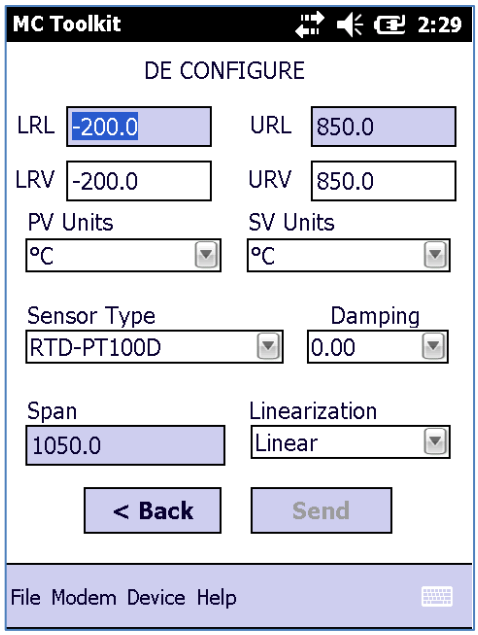
d. If the displayed value is satisfactory, select **Yes** to copy the Input Value to the URV in the transmitter. If not, select **NO** and repeat this step.



4. Verify the LRV and URV settings as follows:

a. Call up the DE CONFIGURE display, and observe that the settings are established in Steps 4 and 5.

b. This concludes the procedure to manually set the operating range.

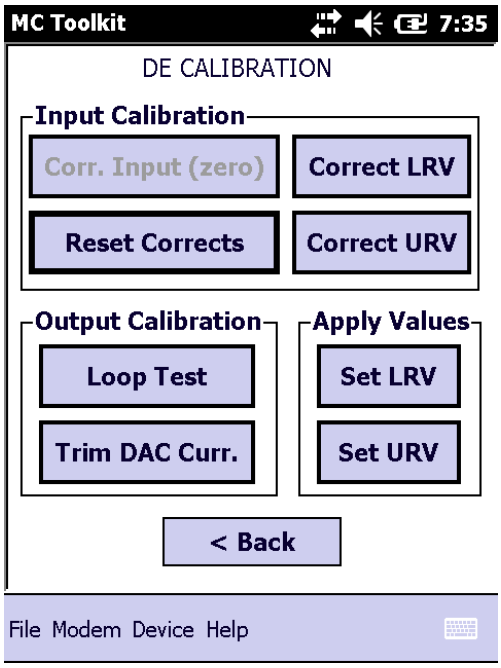


6.11 Procedure to Reset Calibration

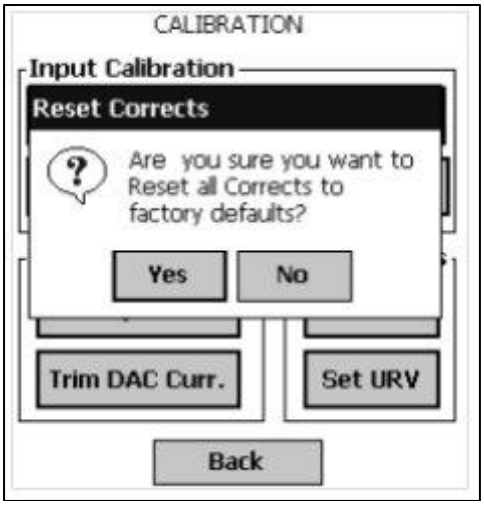
A STT700 SmartLine HART Temperature Transmitter can have its incorrect calibration data erased by resetting the device back to default values using the MC Toolkit. The default values return the transmitter calibration to the original factory *characterization* values. However, note that this is not the *final factory calibration*, which is performed per the ordered range.

Incorrect or inaccurate user calibrations may be reset by performing a Reset Correct operation. This calibration reset will return the device to *original factory calibration accuracy*. Factory calibration is extremely accurate and user calibration is not typically recommended. However, if user calibration to a customized range is desired, it is recommended that the input calibration procedures be performed again after the calibration reset.

1. Figure 7 shows the typical test connections.
2. Start the MC Toolkit application into operation such that the DE MAIN MENU is displayed, and establish communication with the transmitter.
3. From the DE MAIN MENU, select **Calibration**. The CALIBRATION menu will be displayed. The typical Calibration Menu based on the device model respective menu items will be shown.



4. Select **Reset Corrects**. The following prompt will be displayed.



5. If corrects should not be overwritten with factory values, select **No**. If corrects need to be overwritten, select **Yes**. The timer will appear briefly, indicating the operation is performed

This function commands the transmitter to overwrite all user input corrections with factory default ("characterization") values. It is intended for use only when excessive corrections render the transmitter inaccurate. It is highly recommended that input calibration procedure be performed after calibration reset.

7 HART Calibration

7.1 About This Section

This section provides information about calibrating a transmitter's analog output and measurement range. It also covers the procedure to reset calibration to the default values as a quick alternative to measurement range calibration.

This section includes the following topics:

- How to calibrate a transmitter's analog output circuit using a communicator
- How to perform a two-point calibration of a transmitter
- How to perform a correct reset to return a transmitter calibration to its default values.

7.1.1 About Calibration

The STT700 SmartLine Transmitter does not require calibration at periodic intervals to maintain accuracy. If a recalibration is required, we recommend that perform a bench calibration with the transmitter removed from the process and located in a controlled environment to get the best accuracy.

Before recalibrating a transmitter's measurement range, please calibrate its analog output signal.

7.1.2 Equipment Required

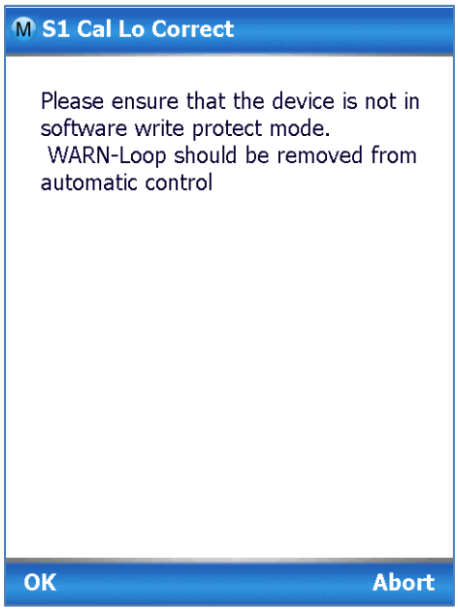
Depending on the selected calibration, you may need any of the following test equipment items to accurately calibrate the transmitter:

- Digital voltmeter or millimeter with 0.01% accuracy or better
- MC Toolkit calibration standard temperature source with a 0.02% accuracy
- 250 ohm resistor with 0.01% tolerance or better.

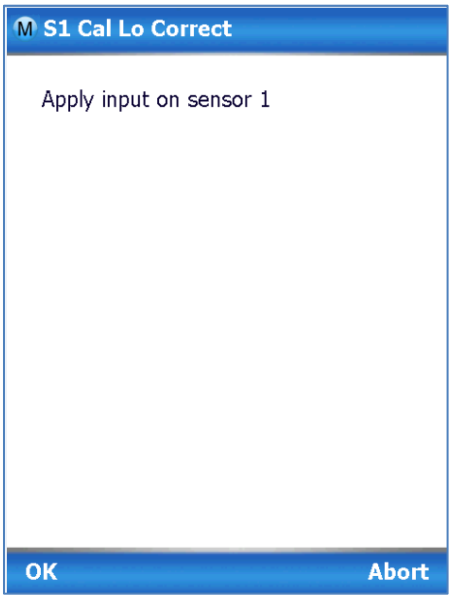
7.1.3 Input Calibration Procedure

7.1.3.1 Correct Sensor 1 / 2 Input at Low Calibration Point

1. After Low and High Calibration points have been entered, as described above, select the **S 1 / 2 cal lo Corrects** button on the CALIBRATION display.
2. Select the **S 1 / 2 cal lo Corrects** button. This message appears:

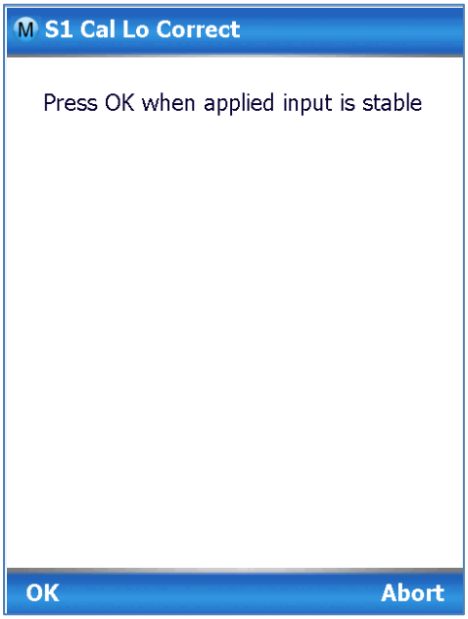


3. Check the device is not in write protect mode and press OK
4. Enter calibration date (MM/DD/YY), OK
5. Enter calibration Time (Hour), OK. Entre calibration time (minute), OK
6. Apply Input on Sensor 1.

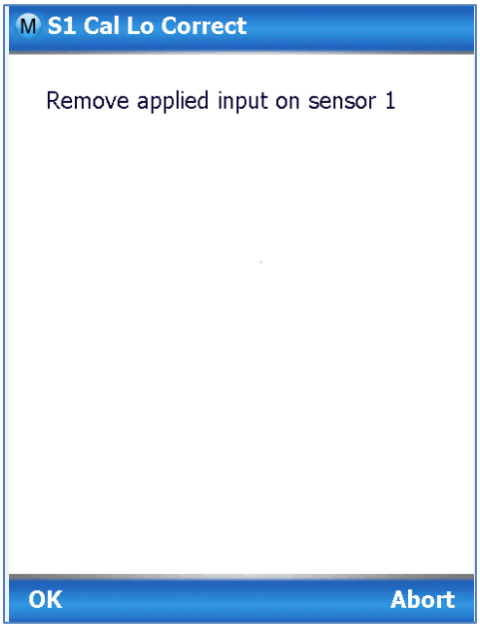


7. Adjust the PV input temperature to the ***exact value of the Lower calibration value*** entered in the CONFIGURE display. Select the **OK** button.

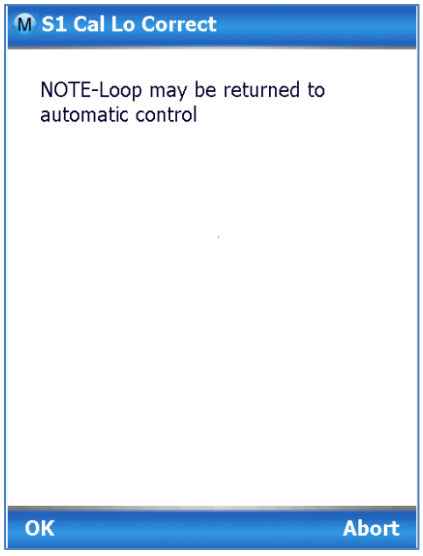
8. Observe the input temperature at the applied value; when it is stable, select the **OK** button.



9. A screen appears to Remove applied input on sensor 1.



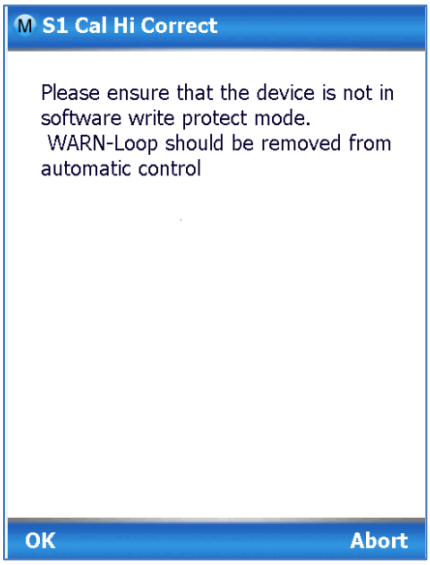
10. When the transmitter has completed the S 1 / 2 Cal lo correction, this message appears:



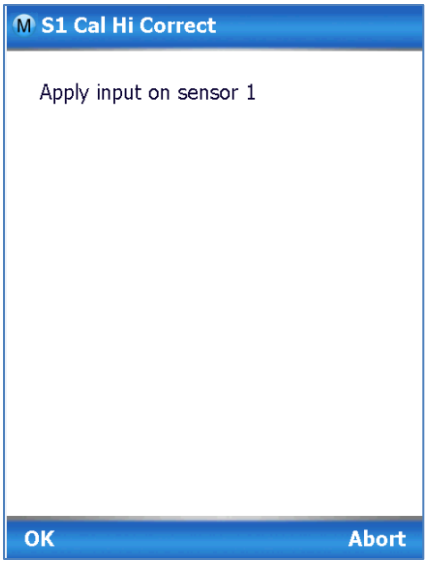
11. Select **OK** to acknowledge.

7.1.4 Correct Input at Sensor 1 / 2 Calibration High Point

1. Select the S 1 / 2 Cal Hi Corrects button. This message appears.

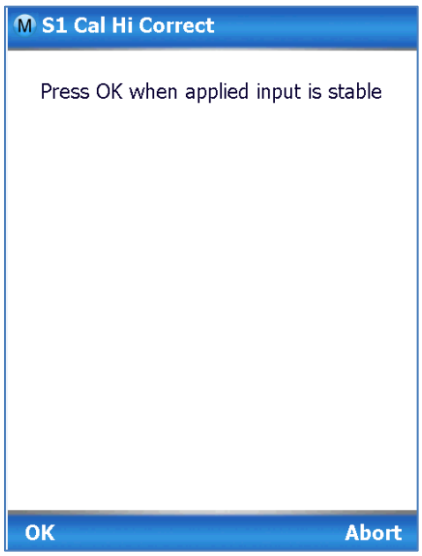


1. Check the device is not in write protect mode and press OK
2. Enter calibration date (MM/DD/YY), OK
3. Enter calibration Time (Hour), OK. Entre calibration time (minute), OK
4. Apply input on Sensor 1.

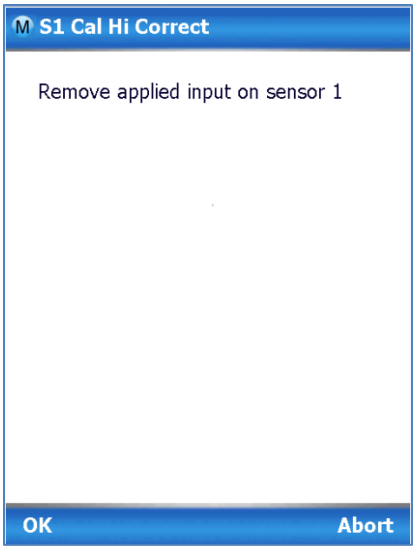


5. Adjust the PV input Temperature to **the *exact value of the Sensor1 high calibration point*** entered. Select the **OK** button.

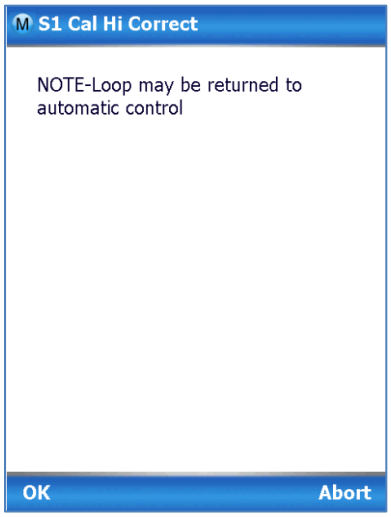
6. Observe the input temperature at the applied value; when it is stable, select the **OK** button.



7. A screen appears Remove applied input on sensor 1.



8. When the transmitter has completed the Sensor 1 high calibration point correction, this message appears.



9. Select **OK** to acknowledge.

All procedures in this manual assume the transmitter is configured for Loop Current Mode enabled).

7.2 Analog Output Signal Calibration

With a transmitter in its constant current source mode, its analog output circuit can be calibrated at 0 (zero) % and 100% levels. It is not necessary to remove the transmitter from service.
The following procedure is used for analog output signal calibration. You can calculate milliamperes of current from a voltage measurement as follows: Dc milliamps = 1000 X voltage/resistance

IMPORTANT: Be sure that the accuracy of the resistor is 0.01% or better for current measurements made by voltage drop.

1. Connect the MC Toolkit across loop wiring, and turn it on. See Figure 7 for a sample test equipment hookup.
2. Launch the FDC application.
3. On the Home page, select Online and establish a connection with the device as follows.
4. Check that the device is not in the Write Protect mode.
5. Select the My Device menu, and choose from the following menus:
    a. Device setup \Advanced Configuration\ Calibration \ Calibration Methods \ D/A trim
6. You will be prompted to remove the loop from automatic control; after removing the loop from automatic control, press OK.
7. When a prompt appears, connect a precision milliammeter or voltmeter (0.01% accuracy or better) in the loop to check readings, and press OK. The following prompts will be displayed:
    - Setting field device to output to 4mA. Press OK
    - Enter meter value. Key in the meter value, and press ENTER.
    - Field device output 4.000 mA equal to reference meter?

      1 Yes, 2 No
        1. If the reference meter is not equal to the field device output then select No and press Enter
        2. Key in the new meter value
        3. Return back to the “Enter Meter Value” prompt until the field device output equals the reference meter
        4. Select Yes and press Enter
8. The following display prompts will appear:
    - Setting field device output to 20mA. Press OK
    - Enter meter value. Key in the meter value, and press ENTER.
    - Field device output 20.000 mA equal to reference meter?

      1 Yes, 2 No
        1. If the reference meter is not equal to the field device output then select No and press Enter
        2. Key in the new meter value
        3. Return back to the ”Enter Meter Value” prompt until the field device output equals the reference meter
        4. Select Yes and press Enter
9. The prompt notifies you that the field device will be returned to its original output

7.3 Calibrating Analog Inputs

The STT700 SmartLine Temperature Transmitter supports two-point input calibration. This result of this calibration is that when two points in a range are calibrated, all points in that range adjust to the calibration.
Calibration High and Low points should always be calibrated both at the same time.
This procedure assumes that the transmitter has been removed from the process and is located in a controlled environment.

IMPORTANT! You must have a precision calibrator source with an accuracy of 0.02% or better to do an input calibration. Note that the factory calibrates STT700 SmartLine Temperature Transmitters temperature in deg C.

7.3.1 Correcting the Low Calibration Point

1. Figure 7 shows typical test connections. As shown, connect the power supply and communicator to the signal terminals of the transmitter terminal block.
2. Connect the precision calibrator source to the sensor (to be corrected) inputs of the transmitter.
3. Turn on the power supply, and allow the transmitter to become stable.
4. Turn the MC Toolkit on, start the FDC application.
5. On the FDC Home page, select Online, and establish communication with the transmitter.
6. Check that the device is not in the Write Protect mode.
7. The Lower Calibration Point and Upper Calibration Point values must be entered in the respective sensor config parameters in the Sensors menu. These calibration points are used in the S 1 / 2 Cal Lo Correct and S 1 / 2 Cal Hi Correct methods (not LRV and URV).
8. Select the My Device menu, and choose from the following selections:
    - Device Setup \ Advanced Configuration\Calibration \ Calibration Methods \ Sensor (1 or 2) Cal Lo Correct
9. You will be prompted to remove the loop from automatic control. After removing the loop from automatic control, press OK.
10. When prompted, adjust the temperature source to apply value equal to the Lower Calibration Point, and press OK.
11. When the temperature stabilizes, wait for 5 seconds, then press OK.
12. When prompted, remove temperature.
13. On the next prompt – “Please enter Calibration Date in MM/DD/YYYY format. Enter the Calibration date (for example “05/27/2009”) and press Enter.
14. On the next prompt - "Please enter the current calibration time in 24 Hr format (Hours Field)", enter the Hours field HH (for example, "12"), and press ENTER
15. On the next prompt – “Please enter current Calibration Time (Minute field),” enter the Minutes field MM (for example “23”), and press ENTER.
16. When prompted to return the loop to automatic control, press ENTER

NOTE: If you are calibrating Calibration High and Low Points at the same time, do not power down and start up again after the S 1 / 2 cal. Lo Point steps, just go to step 1 of the S 1 / 2 cal. Hi Point procedure below.

7.3.2 Correcting the High Calibration Point

Assuming that you have just finished the S 1 / 2 cal Lo correct, select the My Device menu to proceed further.

1. Select the My Device menu, and choose one of the following options:
    a. Device Setup \ Advanced Configuration\Calibration \ Calibration Methods \ Sensor (1 or 2) Cal Hi Correct
2. You will be prompted to remove the loop from automatic control. After removing the loop from automatic control, press OK.
3. When prompted, adjust the temperature source to apply value equal to the Upper Calibration Point, and press OK.
4. When the temperature stabilizes, wait for 5 seconds, then press OK.
5. When prompted, remove temperature.
6. On the next prompt – "Please enter Calibration Date in MM/DD/YYYY format. Enter the Calibration date (for example "05/27/2009") and press Enter.
7. On the next prompt - "Please enter the current calibration time in 24 Hr format (Hours Field)", enter the Hours field HH (for example, "12"), and press ENTER
8. On the next prompt – "Please enter current Calibration Time (Minute field)," enter the Minutes field MM (example "23"), and press ENTER.
9. When prompted to return the loop to automatic control, press ENTER

7.3.3 Resetting Calibration

STT700 SmartLine HART Temperature Transmitter can erase incorrect calibration data by resetting the device back to *final factory calibration*, which is performed per the ordered range. The Corrects Reset command returns the zero and span calibration factors to the original precise factory calibration.

Incorrect or inaccurate user calibrations may be reset by performing a Reset Correct operation. This calibration reset will return the device to *original factory calibration accuracy*. Factory calibration is extremely accurate and user calibration is not typically recommended. However, if user calibration to a customized range is desired, it is recommended that the input calibration procedures be performed again after the calibration reset.

The following procedure is used to reset calibration data to factory calibrated range using a communicator.

1. Connect the MC Toolkit per Figure 7 across the loop wiring and turn on.
2. Turn the MC Toolkit on, start the FDC application.
3. On the FDC Home page, select Online, and establish communication with the transmitter.
4. Select the My Device menu, and choose from the following selections:
5. Device Setup \ Advanced Configuration\Calibration \ Calibration Methods \ Reset Corrects (Sensor)
6. You will be prompted to remove the loop from automatic control. After removing the loop from automatic control, press OK.
7. You will be notified that a Reset Corrects is about to occur. Press OK
8. When the message "Reset Corrects OK" appears, press OK. The previous calibration "Corrects" are removed and calibration is reset to the factory values.
9. When prompted to return the loop to automatic control, press OK

7.3.4 STT700 Calibration Records

A history of the date and time of the last three calibration procedures is available for this HART device. Run the Methods and follow the screen prompts to read the calibration records.

Select "My Device\Device Setup\Advanced Configuration\Calibration" to select the following calibration records

- Cal Hi Correct Records
- Cal Lo Correct Records
- Reset Corrects Records for Sensor 1 / 2

Table 13 – Calibration Records

Calibration Record	Description
S 1 / 2 Cal Lo Records	
Curr Cal Lo Records	Date and Time of current LRV correct done displayed in mm/dd/yyyy format
Last Cal Lo Records	Date and Time of last LRV correct done displayed in mm/dd/yyyy format
Prev Cal Lo Records	Date and Time of previous LRV correct done displayed in mm/dd/yyyy format
S 1 / 2 Cal Hi Records	
Curr Cal Hi Records	Date and Time of current URV correct done displayed in mm/dd/yyyy format
Last Cal Hi Records	Date and Time of last URV correct done displayed in mm/dd/yyyy format
Prev Cal Hi Records	Date and Time of previous URV correct done displayed in mm/dd/yyyy format
Reset Correct Records	
Curr Corrects Sensor Rec	Date and Time of current Reset corrects done for Sensor displayed in mm/dd/yyyy format
Last Corrects Sensor Rec	Date and Time of last Reset corrects done for Sensor displayed in mm/dd/yyyy format
Prev Corrects Sensor Rec	Date and Time of previous Reset corrects done for Sensor displayed in mm/dd/yyyy format

8 HART Advanced Diagnostics

8.1 About This Section

This section provides information about the Advanced Diagnostic features in the STT700 SmartLine Temperature Transmitter.

8.2 Advanced Diagnostics

Table 14 – Viewing Advanced Diagnostics

What you want to view	What to do
Advanced Diagnostic menu parameters are: • Installation and Device Life • Operating Voltage • Core Temperature Diag Power-up diagnostics.in Advanced Diagnostic menu parameters are: • Installation and Device Life • Operating Voltage • Core Temperature Diag • Power-up diagnostics.	Select Start/FDC to Launch the FDC application on the MC Toolkit. On the Home page, select Online and establish connection with the device. Select My Device\Device Setup\Monitor\Diagnostics\Adv Diagnostics.
• PV Tracking Diagnostics • Cold Jn. Temperature Tracking Diagnostics	Select Start/FDC to Launch the FDC application on the MC Toolkit. On the Home page, select Online and establish connection with the device. Select My Device\Device Setup\Monitor\Diagnostics\Variables Monitoring.

8.2.1 Transmitter Install Date

Online\Device Setup\Basic Configuration\General	Transmitter Install date	Description	Date of device installation. Date displayed in mm/dd/yyyy format where mm=month, dd=day, yyyy=year
		Set-up	User enters a date once during device lifetime. Once date is entered no further updates are possible and value becomes read only and is permanently saved.

Method and Parameter

The terms Method and Parameter referenced in the table below follow the same meaning as applied used with device descriptions. Specifically,

> **Parameter:** The value of the parameter presented to the user. If the parameter can be modified (i.e., the parameter's handling allows it), then the user can modify its value. There is a dependency with an input parameters entered.
>
> **Method:** Methods interact with the field device and the user to perform a consistent and repeatable execution of a SOP (Standard Operating Procedure). Method can be defined by two scenarios: one is to show multiple data in one single line or second is to get the output data.

8.2.2 PV Tracking Diagnostics

The below table provides diagnostic details related to process variable tracking such as high / low value recorded and retention of the record into Non-Volatile Memory (NVM) of the transmitter. The table lists the methods to configure the limits for tracking PV Low and High values and methods to read the diagnostic parameter values.

Table 15 – PV Tracking

PV - High or Low Values	PV Low Value	Method	Description	"PV Low Value" method will give the details of Minimum PV value that the device has experienced, in user selected units along with time stamp
			Set-up	None. Value initialized to PV value prior to leaving the factory. Updates with current PV automatically when powered at installation location after one minute.
			NVM*	Update after every 7.5 hours.
	PV High Value	Method	Description	The "PV High Value" method will give the details of Maximum PV value that the device has experienced, in user selected units along with time stamp.
			Set-up	None. Value initialized to PV value prior to leaving the factory. Updates with current PV automatically when powered at installation location after one minute.
			NVM	Update after every 7.5 hours

PV - High or Low Alarm Counter	PV Low Alarm Limit	Parameter	Description	Lower Transducer Limit corresponds to specified lower operating limit in user-selected eng unit.
			Set-up	None.
			NVM	Backup immediately into NVM
	PV Low Alarm Counter	Parameter	Description	Counter that counts the number of time PV crosses below the PV Low Alarm Limit.
			Set-up	None
			NVM	Backup immediately into NVM
	PV High Alarm Limit	Parameter	Description	Upper Transducer Limit corresponds to specified upper operating limit in user-selected eng unit.
			Set-up	None.
			NVM	Backup immediately into NVM
	PV High Alarm Counter	Parameter	Description	Counter that counts the number of times PV crosses above the PV High Alarm Limit.
			Set-up	None
			NVM	Backup immediately into NVM
	Change PV Alarm Limits	Method	Description	This method will allow the user to change PV high and low alarm limit
			Set-up	None – initialized to zero prior to leaving the factory.
			NVM	Saves user changes/updates of PV Alarm limits immediately into Non-volatile memory

Reset PV Tracking Values	Reset All	Method	Description	This method will reset all PV diagnostics. It resets PV high and low values and its time stamp, PV high and low alarm limits, PV high and low alarm counters. Upon reset, the default data will get saved in diagnostics variables and also gets saved in non-volatile memory.
			Set-up	None
			NVM	Backup immediately into NVM
	Reset PV High Value	Method	Description	This method will reset PV high value that is tracked
			Set-up	None
			NVM	Update after every 7.5 hours.
	Reset PV Low Value	Method	Description	This method will reset PV low value that is tracked
			Set-up	None
			NVM	Update after every 7.5 hours.
	Reset PV High Alarm Counter	Method	Description	This method will reset PV high alarm counter
			Set-up	None
			NVM	Backup immediately into NVM
	Reset PV Low Alarm Counter	Method	Description	This method will reset PV low alarm counter
			Set-up	None
			NVM	Backup immediately into NVM

* NVM = non-volatile memory

8.2.3 Cold Junction Tracking

The below table provides the diagnostic details related to Cold Junction temperature tracking such as high /low value recorded and retention of the record into Non-Volatile Memory (NVM) of the transmitter. The table lists the methods to configure the limits for tracking Cold Junction Low and High values and methods to read the recorded diagnostic parameter values.

Table 16 – Cold Junction Tracking

Cold Junction High or Low Values	Cold Junction Low Value	Method	Description	Executing this method will give the details of lowest temperature experienced by the device along with time stamp
			Set-up	None - value initialized to Max SV Limit value prior to leaving the factory. Updates to current CJ temperature are automatic when powered at installation location after one minute.
			NVM	Update after every 7.5 hours.
	Cold Junction High Value	Method	Description	Executing this method will give the details of Highest temperature experienced by the device along with time stamp.
			Set-up	None - value initialized to Min SV Limit value prior to leaving the factory. Updates to current CJ temperature are automatic when powered at installation location after one minute.
			NVM	Update after every 7.5 hours.
Cold Junction High or Low Alarm Counter	Cold Junction Low Alarm Limit	Parameter	Description	CJ temperature (SV) lower operating limit from specification.
			Set-up	None.
			NVM	Backup immediately into NVM
	Cold Junction Low Alarm Counter	Parameter	Description	Counter that counts the number of times SV crosses below the SV Low Alarm Limit.
			Set-up	None
			NVM	Backup immediately into NVM
	Cold Junction High Alarm Limit	Parameter	Description	CJ temperature (SV) upper operating limit from specification.
			Set-up	None.
			NVM	Backup immediately into NVM
	Cold Junction High Alarm Counter	Parameter	Description	Counter that counts the number of time SV crosses above the SV High Alarm Limit.
			Set-up	None
			NVM	Backup immediately into NVM
	Change Cold Junction Alarm Limits	Method	Description	Executing this method will allow user to change Cold Junction high and low alarm limit
			Set-up	None – initialized to zero prior to leaving the factory.
			NVM	Backup immediately into NVM

Reset Cold Junction Tracking Values	Reset All	Method	Description	Executing this method will reset all Cold Junction diagnostics. It resets SV high and low values and the time stamp, SV high and low alarm limits, SV high and low alarm counters.
			Set-up	None
			NVM	Backup immediately into NVM
	Reset Cold Junction High Value	Method	Description	Executing this method will resets Cold Junction high value
			Set-up	None
			NVM	Update after every 7.5 hours.
	Reset Cold Junction Low Value	Method	Description	Executing this method will reset Cold Junction low value
			Set-up	None
			NVM	Update after every 7.5 hours.
	Reset Cold Junction High Alarm Counter	Method	Description	Executing this method will reset Cold Junction high alarm counter
			Set-up	None
			NVM	Backup immediately into NVM
	Reset Cold Junction Low Alarm Counter	Method	Description	Executing this method will reset Cold Junction low alarm counter
			Set-up	None
			NVM	Backup immediately into NVM

8.2.4 CT Tracking Diagnostics

The below table provides the diagnostic details related to Core Temperature such as high / low values recorded and retention of the record into Non-Volatile Memory (NVM) of the transmitter. The table lists the methods to read the diagnostic parameter values.

Table 17 – Core Temperature Diagnostics

Core Temperature (CT)	Parameter	Description	Core Temperature Value. Units are same degree units as selected for SV (Secondary Variable).
		Set-up	None.
CT High Value	Parameter	Description	Highest core temperature experienced by the device. Units are same degree units as selected for SV (Secondary Variable).
		Set-up	None.
		NVM	Update every 7.5 hour.
CT Up Count	Parameter	Description	Counter that counts Core temperature (CT) exceeding upper operating limit from specification.
		Set-up	None.
		NVM	Update every 7.5 hour.
CT Up Event	Method	Description	Executing this method will give details of the time since last event in minutes
		Example	Core Temperature range is -40°C (-40°F) to 125°C (257°F) for a total span of 165°C (329°F). CT Up Event will log when CT is greater than -10% of CT Max value
		Set-up	None – calculation is automatic.
		NVM	Update every 7.5 hour.
CT Low Value	Parameter	Description	Lowest core temperature experienced by the device. Units are same degree units as selected for SV (Secondary Variable).
		Set-up	None.
		NVM	Update every 7.5 hour.
CT Down Count	Parameter	Description	Counter that counts, Core temperature (CT) exceeding lower operating limit from specification.
		Set-up	None.
		NVM	Update every 7.5 hour.
CT Down Event	Method	Description	Executing this method will give details of the time since last event in minutes.
		Example	Core Temperature range is -40°C (-40°F) to 125°C (257°F) for a total span of 165°C (329°F). CT Down Event will log when CT is less than 10% of CT Min value
		Set-up	None – calculation is automatic.

8.2.5 Installation and Device Life

The below table provides the diagnostic details related to installation and device life such as install dates of transmitter sensors, service life and time in service recorded, and saving of the record into Non-Volatile Memory (NVM) of the transmitter.

Table 18 – Installation and Device Life Diagnostics

Transmitter Install Date	Parameter	Description	Transmitter install date written into device
		Set-up	None
		NVM	Update into NVM immediately
		Note	One time writable into device
Sensor 1 Install date	Parameter	Description	Sensor1 Install date written into device
		Set-up	None
		NVM	Update into NVM immediately
Sensor 2 Install Date	Parameter	Description	Sensor2 Install date written into device
		Set-up	None
		NVM	Update into NVM immediately
Time in Service	Parameter	Description	Total time of the device being operational in minutes.
		Set-up	None.
		NVM	Update into NVM immediately
Service Life	Parameter	Description	Value of the device life already consumed.
		Set-up	None – units always in %.
		NVM	Update every 7.5 hour.

8.2.6 Operating Voltage Diagnostics

The below table provides the diagnostic details related to operating voltage parameters such as minimum, current output voltages, terminal voltage and Vcc recorded and retention of the record into Non-Volatile Memory (NVM) of the transmitter. The table lists the methods to read the diagnostic parameter values.

Table 19 – Operating Voltage Diagnostics

Current Op Voltage	Parameter	Description	Operating voltage available at device terminals.
		Set-up	None – units always in volts.
		NVM	None – no action
		Note	Accuracy is not specified for this measurement. This value is intended to be used for informational purposes only and should not be used for control.
Min Op Voltage	Parameter	Description	Minimum operating voltage experienced by device at terminals since last reset of operating voltage parameters.
		Set-up	User can reset as desired using method described in item below.
		NVM	Backup once each 7.5 hour period

Vcc	Parameter	Description	Process voltage in volts
		Set-up	None
		NVM	None – no action
Time Since Last Voltage Low	Method	Description	Executing this method will Displays time since last minimum operating voltage event in minutes.
		Set-up	User can reset as desired using method described in item below.
		NVM	Update every 7.5 hour.
Reset Operating Voltage Parameters	Method	Description	Executing this method Causes “Min Op Voltage” to be set to 32 volts and “Time Since Last Event” to be reset to zero. Within a short period of time “Min Op Voltage” will assume operating voltage value.
		Set-up	User actuates as desired.

8.2.7 Power Up Diagnostics

The below table provides the diagnostic details related to device power cycle count recorded and saving the record details into Non-Volatile Memory (NVM) of the transmitter. The table lists the methods to read the diagnostic parameter values.

Table 20 – Power Up Diagnostics

Power Cycles	Parameter	Description	Total number of power resets experienced by the unit.
		Set-up	None – initialized to zero prior to leaving factory.
		NVM	Updates at power up.
Time since Last Power Cycle	Method	Description	Executing this method displays time since last power-up in minutes.
		Set-up	None.
		NVM	This will get reset at each power cycle.

9 Troubleshooting and Maintenance

Troubleshooting and maintenance is supported by specific diagnostic information available from the transmitter. Detailed diagnostic messages are available for the STT700 with HART or DE protocol versions.

9.1 HART Diagnostic Messages

Table 21 critical and non-critical (warning) HART diagnostic messages.

Table 21 – HART Diagnostic Messages

Critical Diagnostics	Description	More Details (Cause and Resolution)
Elec. Mod. Diag Failure	Diagnostics failure (like ROM/RAM corrupt etc)	Action: Reset the device. If the problem persists replace the Electronics module Note: Select 'Device Status - Additional Status' to see which of these conditions are set.
Elec. Mod. DAC Failure	Failure related to DAC which regulates 4-20mA loop	Action: Reset the device. If problem persist, replace the Electronics Module. Note: Select 'Device Status - Additional Status' to see which of these conditions are set.
Sensor Input Failure	Input sensor may be open/short/out of range	"Failure in sensing section. Any of the following conditions can cause this failure: 1. Input 1 Fault 2. Input 2 Fault. Check the sensor Input connections. 3. Suspect Input. Check sensor and connections. If the connections are ok, and problem persists, replace the Electronics Module board Note: Select 'Device Status - Additional Status' to see which of these conditions are set
Char/Cal Data Corrupt	Factory Calibration data is corrupted	Characterization / Calibration data is corrupted or missing. Replace Device if error persists upon power cycle
Config Data corrupt	NVM data corrupted	Action: Power cycle the device. If the problem persists, replace the Electronics Module.

Non-Critical Diagnostics	Description	More Details (Cause and Resolution)
CT Out of Range	MCU temperature of the device is out of range	Core Temperature Out Of Range (-36C to 112.5C). If it is certain that the reading is in error, then contact your vendor.
No Factory Calibration	Factory Calibration data is not available, device is not Factory Calibrated	The transmitter has not been calibrated by the factory. Contact your vendor.
PV Out of Range	Process value measured is out of range	Loop PV is out of configured URV and LRV. Check your process temperature. Adapt the span. Check range and, if required, replace transmitter with one that has a wider range.
CJ Out of Limits SV Bad	Cold junction sensor temperature or device terminal temperature is out of limits (-40C, 85C is the range)	The ambient temperature measured is out of the transmitter specifications (-40°C to 85°C) Take steps to isolate the device from the temperature source
Sensor1 excess LRV correct	Applied input 1 value and measured value differ by more than 1.5% span at low calibration point	This non critical flag will be set when difference between applied Input 1 LRV value and measured value exceeds 1.5% of span Perform Reset correct
Sensor1 excess URV correct	Applied input 1 value and measured value differ by more than 1.5% span at high calibration point	This non critical flag will be set when difference between applied Input 1 URV value and measured value exceeds 1.5% of span Perform Reset correct
Suspect Input	MCU Reference voltages are beyond limits and hence inputs measured may not be correct	MCU Reference voltages are beyond limits and hence inputs measured may not be correct. Replace the sensor based on Input 1/ Input 2 measurement suspect
Fixed Current Mode	The 4-20mA loop is put in fixed current mode and is not following the PV value	Output current is fixed and not varying as per input. Loop current mode is disabled or Loop Test is active. Enable loop current mode if it is disabled or exit the Loop Test mode if active, to return to normal operation.
Input1 Fault	Input1 may be open/short	There is a problem with the Input 1 sensor. Verify sensor connections and configurations
Input2 Fault	Input2 may be open/short	There is a problem with the Input 2 sensor. Verify sensor connections and configurations
Analog Output Saturated	This status is set when loop current is set to out of 4-20 mA (generally when PV out of range)	Calculated analog output is either above or below the specified Loop Current Limits. The transmitter input is not in specified range. Check the transmitter input
Excess Delta Detect	Sensor 1 and Sensor2 measured values differ by more than a user defined threshold	This will be set when delta value exceeds delta limit. When Excess Delta Alarm is Disabled, and device is in non-redundant mode, this status indicates that the difference between two sensor inputs has crossed the applicable delta limit
ADC Fault	ADC Reference voltages are beyond working correct limits	Controller ADC fault. Replace device if error persists upon power cycle

Sensor2 excess LRV correct	Applied input 2 value and measured value differ by more than 1.5% span at low calibration point	This will be set when difference between applied Input 2 LRV value and measured value exceeds 1.5% of span
Sensor2 excess URV correct	Applied input 2 value and measured value differ by more than 1.5% span at high calibration point	This will be set when difference between applied Input 2 URV value and measured value exceeds 1.5% of span
Input1 Out Of Range	Measured value of Sensor1 is out of range	Input 1 temperature is greater than Sensor 1 URL or less than Sensor 1 LRL Set when the input at first sensor is either under range or over range
Input2 Out Of Range	Measured value of Sensor2 is out of range	Input 2 temperature is greater than Sensor 2 URL or less than Sensor 2 LRL. Set when the input at second sensor is either under range or over range
Watchdog reset	Watchdog has reset (it may be due to FW failure or HW failure)	Controller watchdog has reset
Supply Voltage Fault	MCU or DAC Reference voltages are beyond limits	This is set when one of the supply voltages (DAC Loop / MCU) in the device is outside its specification limits. Check the transmitter supply voltage
SIL Diagnostics	RAM/NVM database corrupt	Advance diagnostics data is corrupted. Power cycle the device

9.2 DE Diagnostic Details

Table 22 – DE lists and describes the DE critical and non-critical DE diagnostic details.

Table 22 – DE Critical and Non-Critical Diagnostic Details

Fault	MCT/SCT 3000 message	POSSIBLE CAUSE	Resolution
Critical Diagnostics	Self-test fail at power up.	The device has detected corruption in a RAM or ROM memory location. Or The device has detected an interruption in the proper flow of functional operations.	Try to restart the device. If the status persists, contact your vendor.
	Isolated Microprocessor communication failure	The loop current value is greater than actual required value. This might be due to some component is damaged and taking more current than expected. The loop current value is below the actual required value.	Power cycle the device. Check the power supply and loop resistance are within specifications. If they are, then contact your vendor.
	Open circuit detected at input (Input1- open/short, suspect input)	Bad sensor wire connection.	Verify the applicable sensor wiring and check the sensor for failure.

Critical Diagnostics	Factory calibration corrupted	This indicates that device is not characterized or the characterization data is corrupted. This has an impact on accuracy of device measurements at different temperatures	Try to restart the device. If the status persists, contact your vendor.
	User configuration data is corrupted	The diagnostic of the configuration area stored in the non-volatile memory has failed	Try to restart the device. Re-calibrate or reconfigure the device. If the problem persists, contact your vender.
Non Critical Diagnostics	STT body type ambient temperature is outside of specification range (-40 to +85 C)	Device internal temperature exceeded the operating temperature range specification which is -40 to +85 degrees Celsius.	Ensure that the process temperature is within the operating temperature range of the transmitter (-40 to +85 degrees Celsius). If it is certain that the reading is in error, then contact your vendor.
	Uncertain or inconsistent input readings	This indicates device is not calibrated and impacts the accuracy of measurements.	Contact your vendor.
	Input measurement is out of specification for this configuration	PV value is not within LRV and URV	Check your process temperature. Adapt the span.
	Low quality CJ compensation temperature reading	The ambient temperature measured is out of the transmitter specifications (-40°C to 85°C or -40°F to 185°F)	The transmitter works in ambient temperature conditions out of its specification, the measure can be perverted
	Zero correction is out of limits	Input applied exceeds 5% of expected value	Perform Reset correct
	Span correction is out of limits	Input applied exceeds 5% of expected value	Perform Reset correct
	Output mode	The output is fixed at a specific value and not representing the applied input.	Clear output mode to return to normal operation.
	User correction active	Transmitter has been trimmed for particular sensor range. This can be done by keying in LRV/URV, CORRECT, ENTER with exact LRV and URV input values to enable improved accuracy over the specifications.	When performing a Reset Correct command or a sensor type change, the transmitter will lose this sensor correction and fall back to the original factory calibration.
Information Status	Input suspect	Measured voltage references are incorrect. CJ temperature and electronics temperature differ by more than 10 degC	Check loop voltage if it is corrects then contact your vender.
	Input status not latched	Latching is disabled	Enable latching
	4 wire RTD mode	4 wire RTD / ohm wire is connected	Information status bit

10 - DTMs

10.1 Introduction

STT700 HART models support DTMs running on PACTware or FDM / Experion. To set up the DTM network on the FDM/Experion, refer to the *FDM/Experion User Guide*. In this manual, the procedure is given to run the STT700 HART DTM on PACTware (Version 4.1 or above).

10.2 Components

In order to use the STT700 HART DTM, the following items are recommended:

- PACTware or some other container application.
- Microsoft .NET Framework
- Current HART Communication DTM
    - Free version of HART Communication DTM is available for download from CodeWrights website.
- Honeywell HART DTM Library
- HART USB or RS-232 modem
    - Viator modem from MacTek

10.3 Downloads

- **Download 1**: PACTware 4.x and .NET 2.0
  Download from www.pactware.com
- **Download 2**: HART Communication DTM\
  Download from http://www.codewrights.biz/
- **Download 3**: Honeywell HART DTM Library
  Download from HPS website

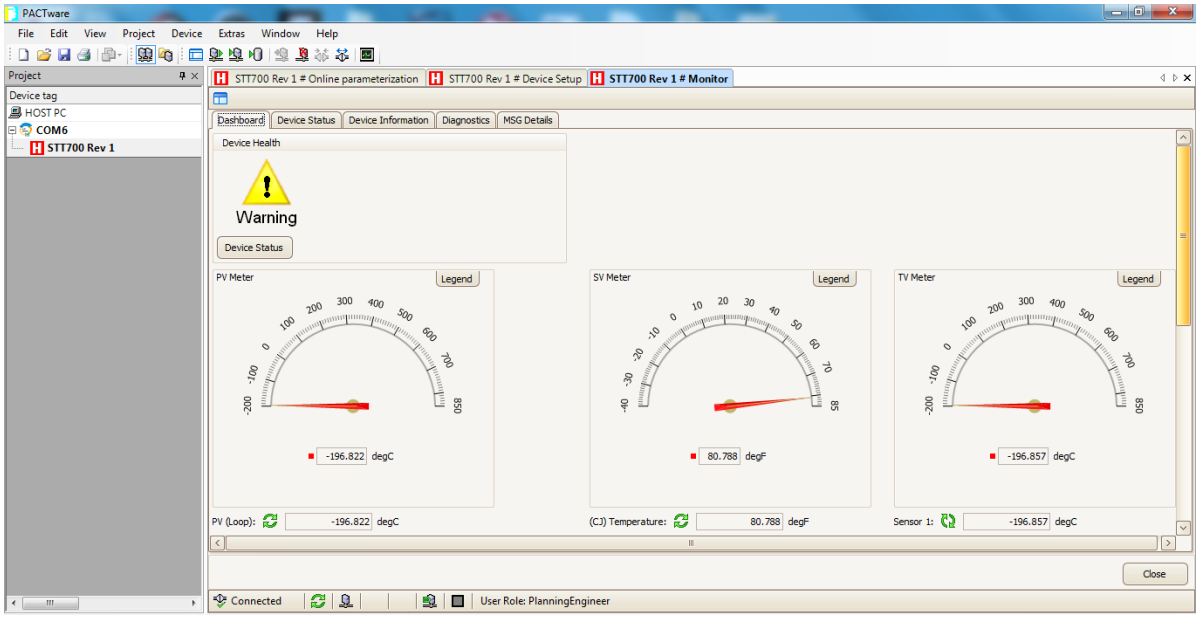
10.4 Procedure to Install and Run the DTM

- Install the Download 1, 2, or 3 from above.
- Connect the transmitter to the 30 V DC power supply with a 250 ohm loop resistor.
- Connect the Viator modem terminals to the transmitter power terminals.
- Connect the Viator modem connector to the PC COM port.
- Run PACTware. Select Update Device Catalog before adding Device (before adding HART Comm DTM).
- Add Device – Add HART Comm DTM.
- Right click on HART DTM, select Connect.
- Right Click on HART Comm DTM and select Add device.
- Add the Device DTM from for your device from the list (for example: STT700 DevRev 1).
- Right Click on Device DTM, and select Connect.
- Right click on Device DTM, and select Parameter/online parameterization. Status should display “Connected” which then allows configuration, calibration etc. to be done.
- Browse through the menus to access various parameters and functions

The following sections provide a high level overview of STT700 DTM screens. The menu structure is similar to the MC Toolkit FDC application and behavior of the parameters / methods is the same as the MC Toolkit FDC application. Refer to Table 9 for a complete listing of all the parameters and details. In the following sections, emphasis is given to show the various DTM screens.

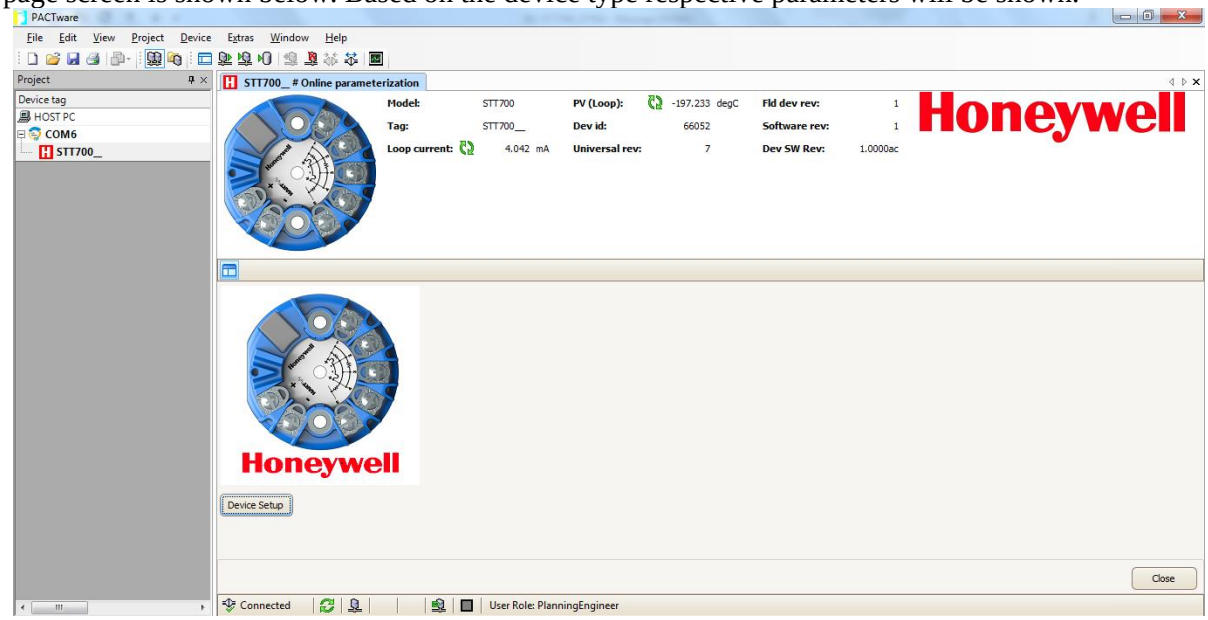
10.5 STT700 Dashboard

The dashboard screen will display the overall device health along with all the device variables in dial gauge format.



10.6 STT700 Online Parameterization

On selecting Parameter/Online Parameterization, the DTM home page will be displayed. Typical home page screen is shown below. Based on the device type respective parameters will be shown.



10.6.1 Device Health

Device Health shows Overall Device Status Image and “Device Status” Button/Link will invoke the Device Status screen.

Overall Device Status will be either Normal, Warning or Failure depending upon the health of the device:

Overall Device Status will be shown on each of the DTM pages so that the current status of the device is visible from any screen

10.6.2 Device Icon / Honeywell Logo

This will display the Honeywell Logo, Transmitter icon.

10.6.3 Process Variables

The Process variable displayed will be PV, SV, TV, QV, % Range and Loop Current.

10.6.4 Shortcuts

Device Setup has four (4) different menus: 1.Basic Configuration Menu 2.Advanced Configuration Menu 3.Monotor Menu 4.Review Menu. Details are shown below.

1. **Basic Configuration**

This menu item facilitates configuration of basic items like transmitter install date, tag, long tag, date, descriptor, final assembly number, message, PV/SV units, PV URV / PV LRV, PV damp, NAMUR, poll address, loop current mode etc.

2. **Advanced Configuration**

This menu item facilitates the configuration of temperature measurements for the connected input sensor types, loop control modes, sensor type configuration, calibration of sensors, latching, master reset, write protect, device lock/unlock etc.

3. **Monitor**

This menu item provides visualization of the complete picture of the device like device health status, device information, process variables tracking, advanced diagnostics, error logs and MSG (model selection guide) details.

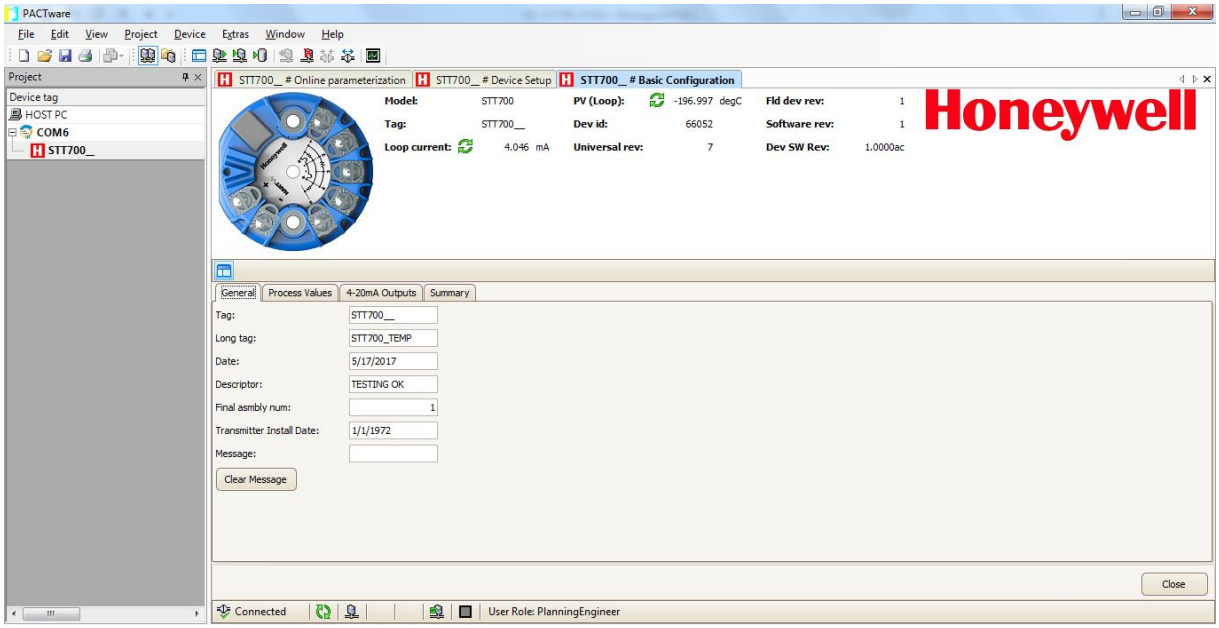
4. **Review**

This menu item will show the complete picture of device configuration parameters .

Refer to the Table 9 for more details

10.7 Basic Configuration Page

The Basic Configuration page provides a view to the most common configuration items, as shown below.



10.7.1 Device Information

The Device Information tab allows access to both read only parameters and read/write parameters, and provides access to message, clear message and maintenance mode.

Refer to Table 9 for more details

10.7.2 Model Number

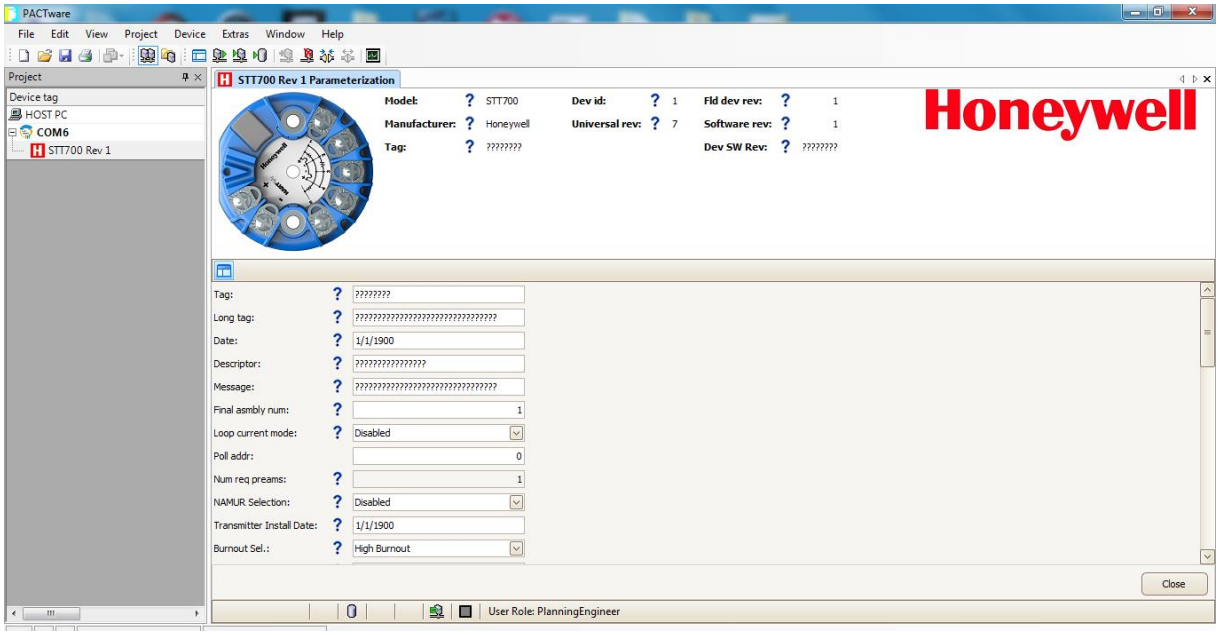
The Model number function will display the STT700 model number.

10.7.3 Device Assembly

A detailed image of the STT700 is displayed when invoking the Device Assembly function.

10.8 STT700 Offline Parameterization

On selecting Parameter/ Parameterization, the Offline parameter configuration page will be displayed.



Upon making changes, select Device / Load to Device to download the Offline Configuration to the connected device.

11 HART DD Binary File Format Compatibility Matrix

"Host - STT700 - HART DD binary file format" compatibility matrix	
Host	DD file format to be used
Experion R410	Fm8
Experion R400 to R300	Fm6
Experion below R300	fms
FDM R430	Fm8
FDM R410 – R302	Fm6
FDM Below R302	fms

Refer the respective tools' User Manual for details on loading the DD file in these tools.

Glossary

AWG	American Wire Gauge
C/J	Cold Junction
CVD	Callendar-Van Dusen is an equation that describe the relationship between resistance (R) and temperature (t) of platinum resistance thermometers (RTD)
DD	Device Description
DE	Digital Enhanced Communications Mode
DTM	Device Type Manager
EMI	Electromagnetic Interference
EEPROM	Electrically Erasable Programmable Read Only Memory
FDM	Field Device Manager
FTA	Field Termination Assembly
HART	Highway Addressable Remote Transducer
HCF	HART Communication Foundation
Hz	Hertz
LRL	Lower Range Limit
LRV	Lower Range Value
mAdc	Milliamperes Direct Current
MCT	MC Toolkit
mV	Millivolts
Nm	Newton·meters
NPT	National Pipe Thread
NVM	Non-Volatile Memory
PM	Process Manager
PV	Process Variable
PWA	Printed Wiring Assembly
RFI	Radio Frequency Interference
RTD	Resistance Temperature Detector
SCT	SmartLine Configuration Toolkit
SFC	Smart Field Communicator
STIM	Temperature Transmitter Interface Module
STIMV IOP	Temperature Transmitter Interface Multivariable Input/Output Processor
T	Temperature

T/C	Thermocouple
URL	Upper Range Limit
URV	Upper Range Value
US	Universal Station
Vac	Volts Alternating Current
Vdc	Volts Direct Current
WAO	WRITE AS ONE (grouping of parameters for editing, for example you can edit PV URV and PV LRV in one shot if URV LRV is provided under wao list)

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