Honeywell

MC ToolKit

Model MC101

User Manual

Doc. No.:	34-ST-25-20
Release:	0
Last Revision Date:	7/03

Notices and Trademarks

Release 0 July, 2003

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While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

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About This Document

Revision Notes

The following list provides notes concerning all revisions of this document.

Doc ID	Rel ID	Date	Notes
34-ST-25-20	Release 0	07/03	First issue of document.

Contacts

World Wide Web

The following lists Honeywell's World Wide Web sites that will be of interest to our industrial automation and control customers.

Honeywell Organization	WWW Address (URL/e-mail)
Corporate	http://www.honeywell.com
Industrial Measurement and Control	http://content.honeywell.com/imc/
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Field Instruments	http://www.field-measurement.com
Technical Assistance Center	ACE@Honeywell.com (e-mail)

Telephone

Contact us by telephone at the numbers listed below.

	Organization	Phone Number	
United States and Canada	Honeywell Inc. Industrial Automation and Control	1-800-343-0228 1-800-525-7439	Sales Service
	Technical Assistance Center	1-800-423-9883	
	Solution Support Center	1-602-313-3578	
Asia Pacific	Honeywell Asia Pacific Inc. Hong Kong	(852) 8298298	
Europe	Honeywell PACE Brussels, Belgium	[32-2] 728-2111	
Latin America	Honeywell Inc. Sunrise, Florida U.S.A.	(305) 364-2355	

Symbol definitions

The following table lists those symbols used in this document to denote certain conditions.

Symbol	Definition
	This CAUTION symbol on the equipment refers the user to the Product Manual for additional information. This symbol appears next to required information in the manual.
	This WARNING symbol on the equipment refers the user to the Product Manual for additional information. This symbol appears next to required information in the manual.
	WARNING: risk of electrical shock. This symbol warns the user of a potential shock hazard where HAZARDOUS LIVE voltages greater than 30 Vrms, 42.4 Vpeak, or 60 VDC may be accessible.
	ATTENTION, Electrostatic Discharge (ESD) hazards. Observe precautions for handling electrostatic sensitive devices
	Protective Earth (PE) terminal. Provided for connection of the protective earth (green or green/yellow) supply system conductor.
	Functional earth terminal. Used for non-safety purposes such as noise immunity improvement. NOTE: This connection shall be bonded to protective earth at the source of supply in accordance with national local electrical code requirements.
	Earth Ground. Functional earth connection. NOTE: This connection shall be bonded to Protective earth at the source of supply in accordance with national and local electrical code requirements.
	Chassis Ground. Identifies a connection to the chassis or frame of the equipment shall be bonded to Protective Earth at the source of supply in accordance with national and local electrical code requirements.

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Introduction

Purpose/Scope

This manual is intended to facilitate the use of the Honeywell MC Toolkit Model MCT101 communications tool. It is assumed that the user is skilled in the use and maintenance of process transmitters in process control, or that he/she is under direct supervision of others with such skills.

The MC toolkit enables communication with several types of smart transmitters (pressure, temperature, etc) that are available for use in the process control industry.

The emphasis of the information in this manual is directed primarily on the features and use of the MC Toolkit in performing common maintenance tasks relating to transmitter devices, rather than on the features and installation of specific transmitter devices.

It is recommended that that user should have the appropriate manuals available for specific transmitter devices. For background information such as HART communications protocol and network wiring, it is also recommended that the user should obtain publications available from agencies such s the HART Communication Foundation.

Figure 1 Components of the MC Toolkit - w/ Compaq iPAQ

This manual includes information of two types:

- background material that enables a skilled user to select the appropriate procedures in this manual and to apply them in the appropriate sequence, and
- detailed descriptions of the MC Toolkit regarding functions, features, and procedures for applying them

Product Description

The Honeywell MC Toolkit is a handheld communication package that enables convenient and reliable communications with smart transmitters (temperature, pressure, and others) including:

- any Honeywell analog transmitter with Honeywell proprietary digital communications protocol or with DE (Digital Enhanced) communications protocol.
- any Honeywell transmitters with HART communications protocol
- Any HART transmitter from other manufacturers.

> **NOTE:**
> The MC Toolkit supports HART Universal Commands and HART Common Practice Commands for non-Honeywell HART devices.

The MC ToolKit includes the following (separately orderable) components:

- a PDA (Personal Digital Assistant), available in two versions, each with manufacturer's literature
  - Compaq iPAQ 3830/3850/3870 3950/3970, or
  - Symbol 2800 (monochrome or color)
- a DE/HART Modem that provides an electrical/communications connection between the Pocket PC and the Modem
- a Handheld Connector Cable that connects the MC Toolkit to the Modem
- Holster for PDA and Modem
- Honeywell MC Toolkit application software (CD ROM or 3.5" disks)
- Spare Parts (Battery)

Figure 2 Components of the MC Toolkit - w/ Symbol 2800

Both versions of the PDA incorporate the Microsoft Pocket PC Operating System. Honeywell software operates as an application package in the familiar MS Windows environment, and is virtually identical for both versions of the PDA. In either version, this MC Toolkit application can run simultaneously with other Pocket PC applications.

Procedural Considerations

CAUTION! WARNING!

In some cases, the use of a field communicator with a transmitter that is connected on-line can have an adverse effect on process operations.

Before using the MC Toolkit, be certain that you know the potential consequences of each procedure, and that you use the appropriate safeguards to prevent problems. For example, if the transmitter is an element of a control loop, the loop should be placed in the manual operating mode, and alarms and interlocks ("trips") should be disabled as appropriate before beginning the procedure.

The primary factors to be considered are separated into three categories under the following three headings.

The information under the following headings is intended as background for use of the DE Procedures and HART Procedures, which are given in separate sections of this manual.

Transmitter Type and Communication Mode

The MC Toolkit can be used with various types of field transmitters, most of which can be operated in more than one mode.

- Honeywell DE transmitter operating in Smart Analog Mode
- Honeywell DE transmitter operating in Digital Enhanced (DE) Mode
- Honeywell (and other) HART transmitter operating in point-to-point (Analog w/ HART digital mode)
- Honeywell (and other) HART transmitter operating in multi-drop (HART-only digital mode)

The salient characteristics of each item listed, and the implications of each characteristic in procedures are described under Transmitter/Communications Characteristics

Type of Procedure and Prerequisites

The MC Toolkit is designed to provide three basic functions:

- Monitoring
- Configuration
- Calibration

Depending on combinations of factors such as transmitter type, and communications mode, some procedures such as monitoring the performance of a transmitter can be straightforward and innocuous, but in some cases can also require special preparation and precautions.

Special Equipment and/or Environment for Calibration

Typically, a smart transmitter delivered by a major manufacturer today is designed to provide a high degree of precision throughout its operating range, and has been calibrated to a high level of accuracy that is not easy to duplicate in the user's plant process areas. Moreover, the design, materials, and manufacturing process employed will ensure that the instrument will stay within calibration limits for an extended period.

Typically, calibration of a process-connected transmitter will degrade, rather than augment, the capability of a smart transmitter. For this reason, the calibration procedures in this MC Toolkit User Manual include a recommendation that the transmitter is removed from service and is calibrated only in a controlled laboratory environment, using equipment whose precision is certified.

Transmitter/Communications Characteristics

The characteristics of a typical Honeywell Smart Pressure Transmitter are summarized in Figure 3 through Figure 7, following.

Honeywell Transmitter (Analog Mode)

Analog-to-Digital Sensing

As indicated by key number ① in Figure 3, the sensor is a sealed assembly that typically includes three separate sensors: Differential Pressure (DP), Static Pressure (SP) and Temperature (Temp).

Input Characterization

The sensor also includes a PROM, ②, which is Non-Volatile Memory (NVM) that stores "characterization" constants written at the factory, and calibration constants, which can be written at the factory and/or at the user's site. The data in NVM is used in an algorithm in the microprocessor, ③, which is executed continuously to calculate the input value.

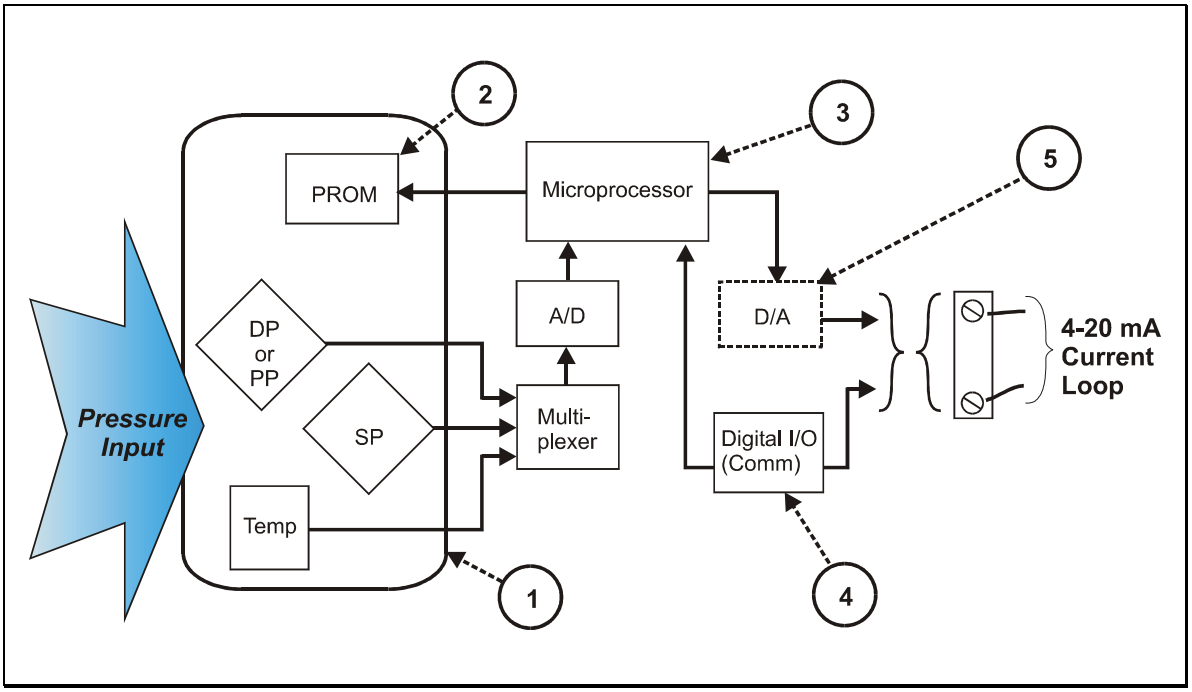


Figure 3 Honeywell ST 3000 Smart Transmitter - Analog mode

The characterization constants, which are written at the factory, are derived from highly precise testing of the sensor's response over a range of temperatures, and from the Lower Range Limit (LRL) to the Upper Range Limit (URL) of the sensor. The purpose of the characterization constants is to compensate for very small inaccuracies in the sensor that are introduced by variations inherent in construction materials, and to ensure that the calculated input is a high-fidelity representation of the analog input (linear or square root), with a precise "zero" reference.

Input Calibration ("Corrects")

To optimize accuracy, the PROM includes storage for calibration constants: Correct Input Zero, Correct LRV, and Correct URV.

The corrects constants provide for optimum accuracy in that they enable fine-tuning of the input calculations, by first correcting at zero input, then bounding the input calculations at the user's operating

range. That is, corrections are applied at the Lower Range Value (LRV) and the Upper Range Value (URV).

Factory calibration can be specified in the purchase order. Also, if precision equipment, suitable environment, and required skill are available at the user's site, input calibration can be done locally.

Reset Corrects

In some cases, the calibration procedure yields unsatisfactory results such that the Corrects constants must be removed from memory. The Reset Corrects erases all three corrects constants, so that only the factory-written characterization constants will be retained in the PROM.

Digital Communication Path

As indicated at key number ④ in Figure 4, the Honeywell Smart Transmitter includes a path for digital communications between the sensor (via the microprocessor) and the 4-20 mA current loop that connects the transmitter to external communications devices such as process control equipment ("receiver") and/or to a MC Toolkit.

Digital to-Analog Conversion and Transfer

The digital-to-analog converter (D/A) shown at key number ⑤ in Figure 3 is shown as a box with a dotted line to indicate that analog output mode is a user-selectable feature, for use in an application whose receiving equipment requires an analog input.

Note that the Digital I/O (Comm) (communications) box is shown in Figure 3 with solid line to indicate that the digital communications path is available at all times, even when analog mode is selected.

Honeywell Transmitter Output - Analog Mode

The diagram in Figure 4 provides an overview of a Honeywell transmitter operating in the analog mode.

Analog (PV Signal) Output

The vertical scale at the left of Figure 4 is an example of the available range (LRL to URL) of a pressure transmitter sensor as built and characterized at the factory. The area of this scale that is highlighted in white represents the configured process operating range (LRV to URV) - in this case, from 100 in H_2O to 225 in H_2O.

Note that Engineering Units (EUs) shown in Figure 4 are included here only for reference. The transmitter does not perform any conversion of the base units value to Engineering Units. All conversion to EUs is performed in the MC Toolkit and/or in other receiving devices such as operating panels associated with control equipment. Default conversion is to inches-H2O @39F.)

The output of a Honeywell transmitter operating in the analog mode is a scaled value (0% - 100%) of current (4 mA to 20 mA), whose lower and upper limits correspond to the configured operating range (LRV-URV), respectively.

At the right of Figure 4, "PVEULO", "PV", and "PVEUHI" are examples of parameter names that appear on Honeywell control equipment, which are used as follows.

Parameter Name	Parameter Description	Display Examples
PVEULO	Process Value , Engineering Units, Low	`PVEULO  100 in H20`
PV	Process Value	`PV  175 in H20`
PVEUHI	Process Value , Engineering Units, Low	`PVEUHI  225 in H20`

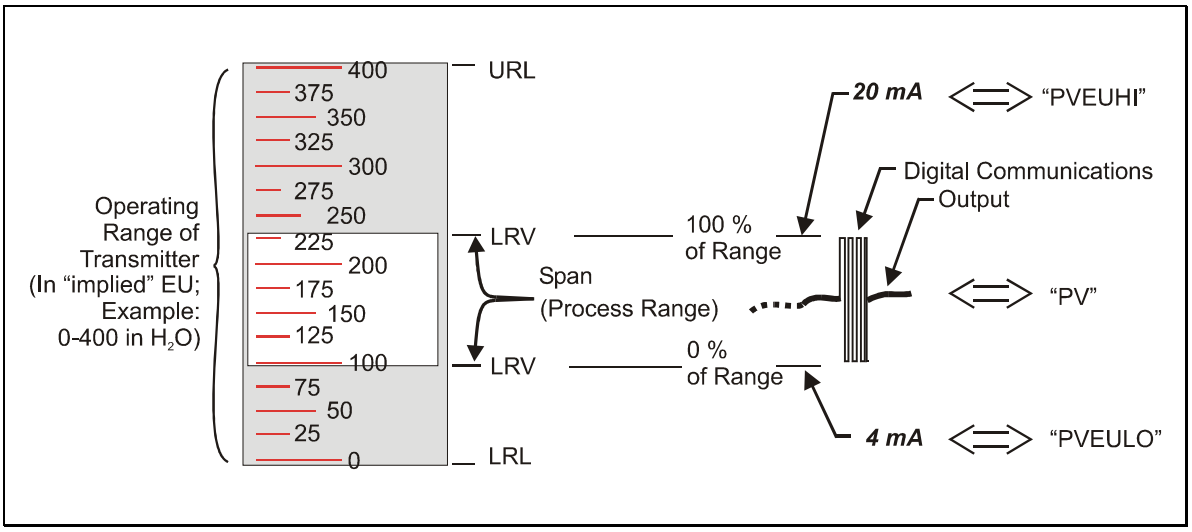


Figure 4 Honeywell Analog Value Scaling

Digital (Communications Signal) Input/Output

As indicated at the right of Figure 4, communications between the MC Toolkit and the Honeywell Smart Transmitter consist of digital pulse strings, with rapid transitions of current level between (approximately) 4 mA and 20 mA.

Caution:

These rapid transitions provide for effective communications, but will interfere adversely with a transmitter operating on-line in a control loop.

The MC Toolkit communicates digitally; exercise caution and good judgement when connecting the unit to an on-line transmitter operating in the analog mode.

Honeywell Transmitter Output - Digital Enhanced Mode

Most of the operation of the Honeywell Smart Pressure Transmitter Digital Enhanced (DE) mode is similar to that of operation in the analog mode. The essential characteristics of operation in DE mode are shown in Figure 5.

As indicated at the right of Figure 5, output values of process variables, as well as digital 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 in the analog mode, communications devices do not "bump" the value of the PV.
accuracy is retained with less maintenance	Digital communications are 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.

	**CAUTION:** Although it in not necessary to put a control loop in manual before communicating with a transmitter operating in DE mode, caution is required if there is any potential for error in identifying operating mode.

Honeywell HART Transmitters

Transmitters with HART capability have features that vary among manufacturers and with the characteristics of specific devices. The MC Toolkit supports the HART Universal, Common Practice, and Device Specific Commands that are implemented in Honeywell HART transmitters.

As the diagram in Figure 6 shows, the Honeywell HART Transmitter is virtually identical to non-HART transmitters, except that the HART version includes a Digital I/O Modulator/Demodulator block (key number ④) instead of the Honeywell DE communications block.

As indicated in Figure 7, the output of the HART includes two primary modes:

- 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 via a two-conductor network to a multiplexed receiver device.

In point-to-point mode, the value of the primary PV is represented by a 4-20 mA current loop, almost identical to that of the Honeywell Transmitter operating in analog mode. In this case however, the analog signal is modulated by Frequency Shift Keying (FSK) methods, using frequencies and a current amplitude that do not affect analog sensing at the receiver.

Note that the accuracy of the analog level must be precisely controlled for accurate sensing, but that HART communications will not "bump" the process variables.

In multi-drop mode, up to 16 transmitters (addresses 0-15) can exist on the two-conductor network, which precludes analog transmission methods. In this case, the same FSK modulation method is used for conveying levels of PV (and other variables) and also for communications.

	**CAUTION:** Before connecting to a HART transmitter, ensure that the MC Toolkit is not set up for DE communications, whose current amplitude can "bump" process variables in either point-to-point mode or in multi-drop mode.

Other HART Transmitters

HART-capable transmitters from any manufacturer and for any specific purpose are designed to common-agreement standards that provide for inter-operability.

Guidelines published by the HART Communication Foundation enables manufacturers to design devices that communicate via a set of standard commands and responses.

The standard set of commands is an integral component of the Honeywell MC Toolkit that enables communication with many HART transmitters from other manufacturers.

The MC Toolkit supports the HART Revision 5.0 Universal Commands and HART Revision 5.0 Common Practice Commands. However, the MC Toolkit supports only a recommended number of Common Practice commands. The MC Toolkit does not support device-specific commands for non-Honeywell transmitters. For more information, refer to tables in the Reference Data section of this manual.

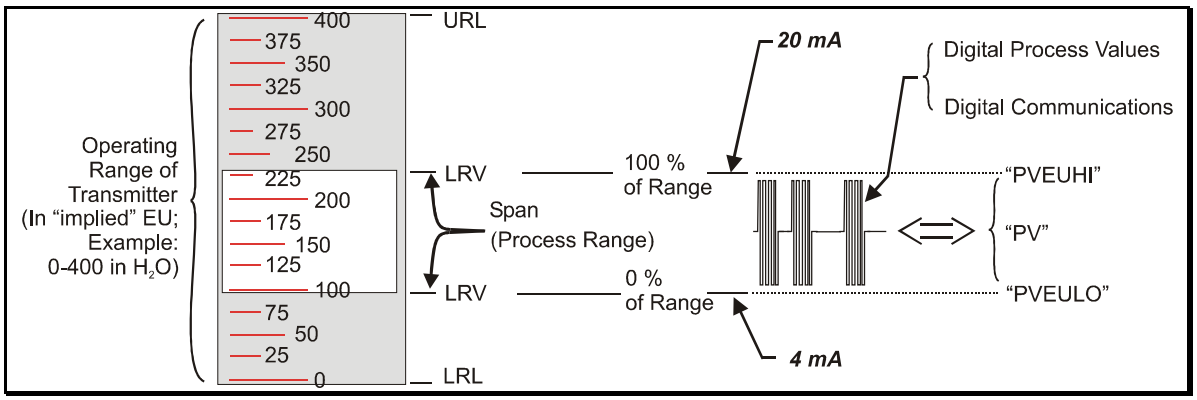


Figure 5 Honeywell DE Mode Value Scaling

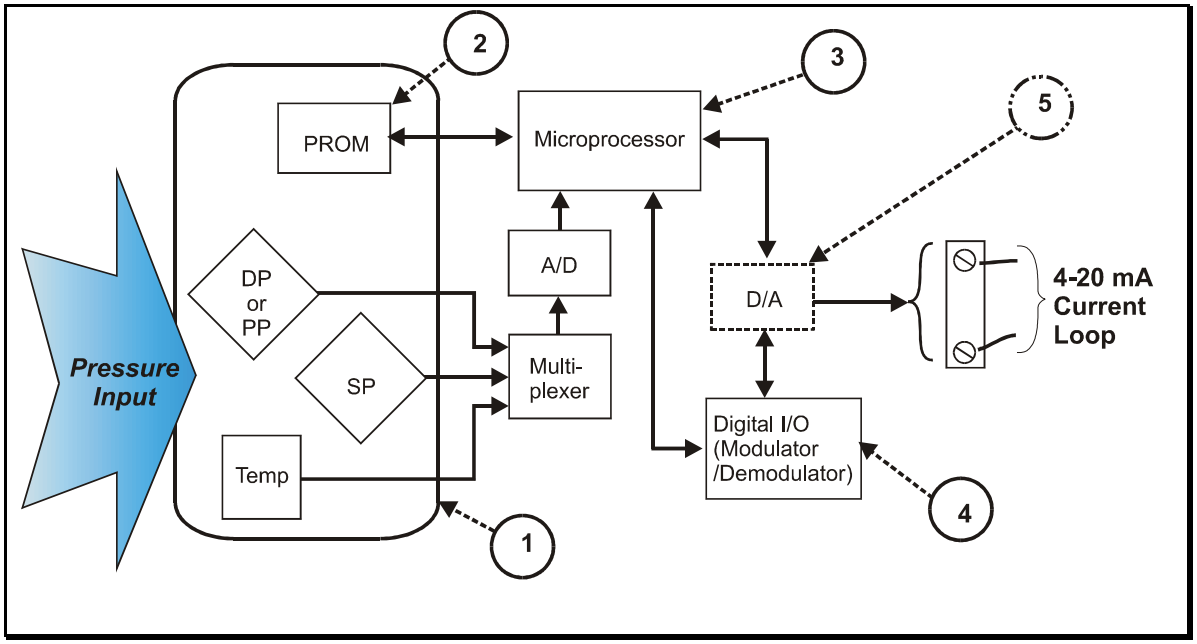


Figure 6 Honeywell (HART) Transmitter Diagram

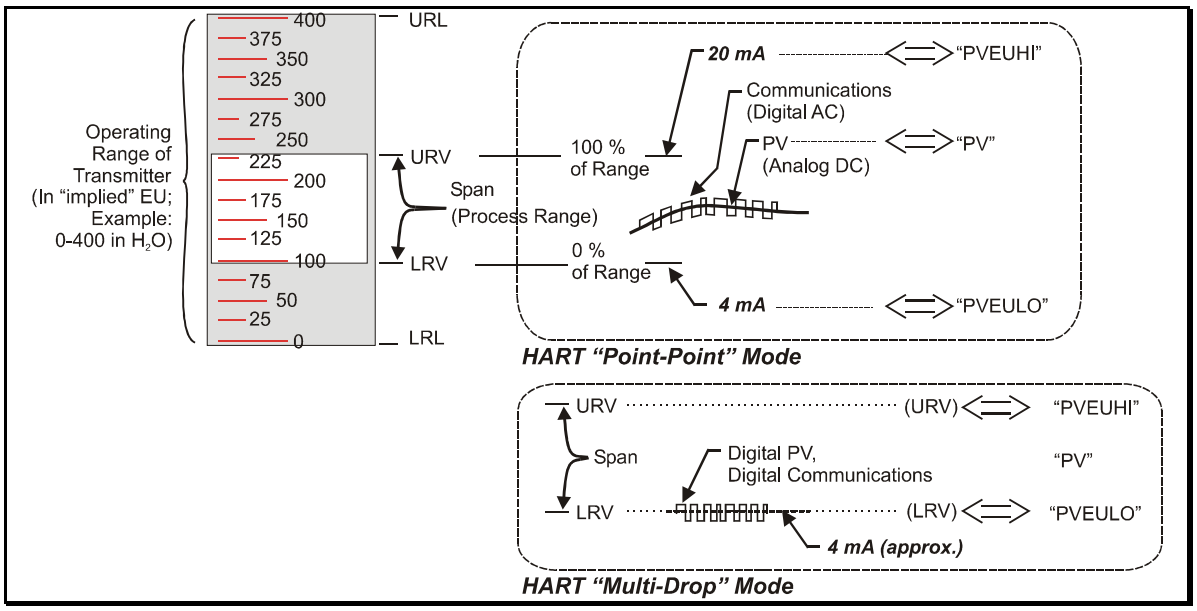


Figure 7 HART Point-point and Multi-Drop Value Scaling

General Procedures

Overview

The MC Toolkit includes Honeywell MC Toolkit software running in the PDA, a general-purpose, hand-held computing device.

This section highlights some of the general-purpose features that facilitate use of the MC Toolkit software.

Headstart on Selected Features of the iPAQ PDA

The following is intended as a primer for using selected Pocket PC features with the MC Toolkit application.

Each of the following descriptions of features includes only the name of the feature and its functionality as it is used with the MC Toolkit. The details of each feature are provided in the HELP information that is included with the PDA.

As you become familiar with the MC Toolkit, you may want to explore other features that are listed and described in the PDA HELP information.

Start-Up and Basic Operation and Navigation

The sequence for starting the Pocket PC and the MC Toolkit operation is illustrated in Figure 8 Start-up - MC Toolkit Application.

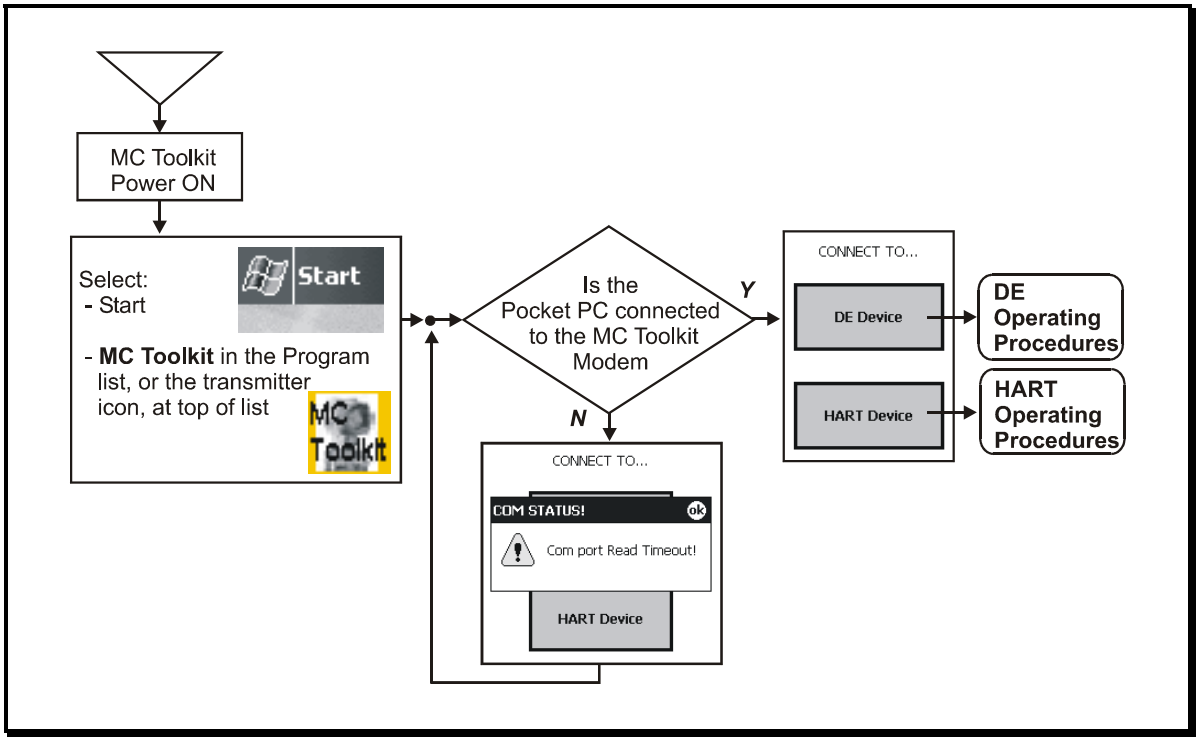


Figure 8 Start-up - MC Toolkit Application

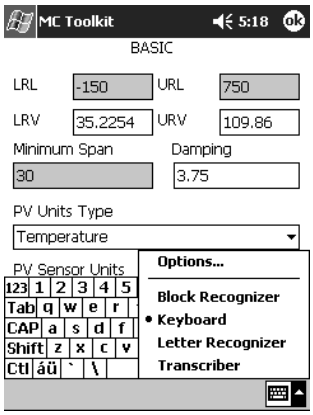
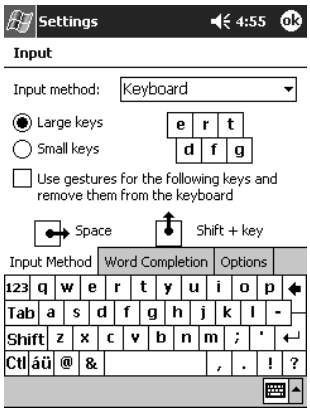
Input Methods: Letter, Numbers, Symbols

The PDA includes four methods for character input: Block Recognizer, Keyboard, Letter Recognizer, and Transcriber.

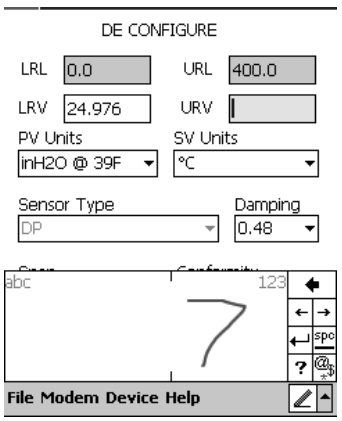
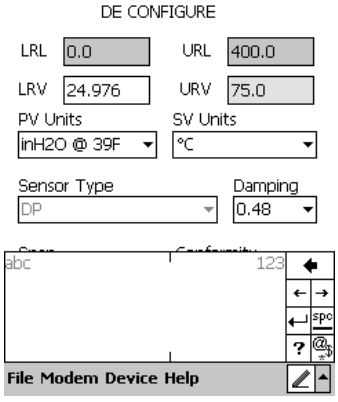
In the Keyboard method, the user selects a text field in display, and then selects a character at a time from a virtual keyboard. Using the keyboard involves familiar concepts that will enable quick and accurate entries.

In the other three methods, the stylus is used to write the desired input directly onto the screen, and each requires some adaptation of user skills. Of these, the Transcriber is probably the most efficient and easiest to use.

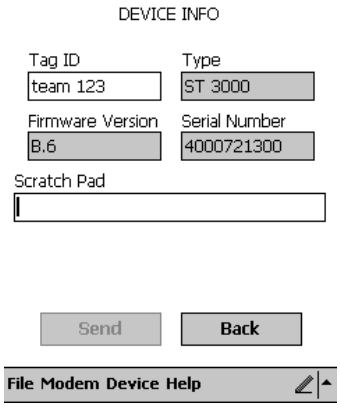
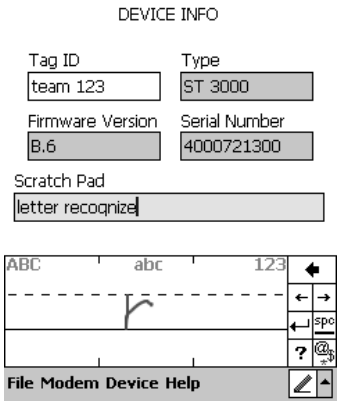
Input Methods: Selections and Options (Examples)

Overview	Display - Input Selection	Display - Input Options
To select an input method, tap the arrow  at the lower-right of the display, then tap the name of the desired input method. To select an option for the selected input method, select **Settings** from the **Start** Menu, **Input** from the Settings menu, and then select the desired input options. Note that the icon next to the selection arrow changes with the method selected.		

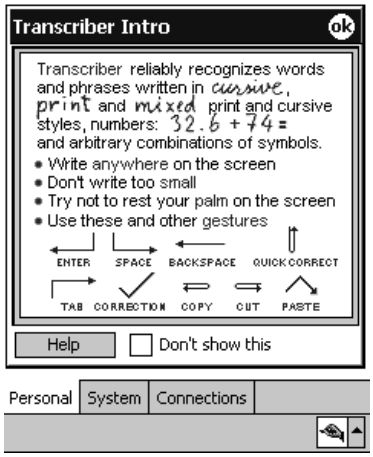
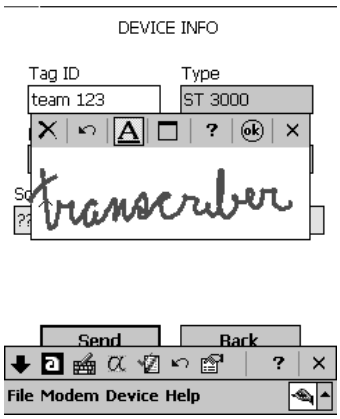
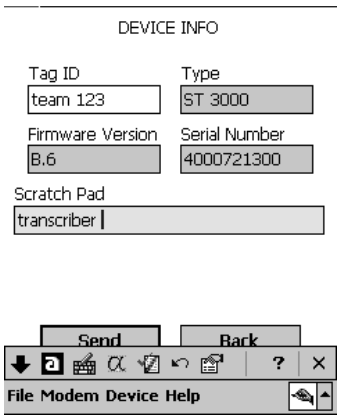
Block Recognizer

Overview	Display - Input Selection	Display - Input Options
In the Block recognizer, the stylus is used to write characters into a letter pad (the box at bottom, on the left) or a numeric pad (on the right). The "**?**" icon is a link to HELP; the @$ icon is a link to a table of symbols.		

Letter Recognizer

Overview	Empty Text Input Port	Completing Entry
In the Letter Recognizer method, characters are simply selected from a virtual QWERTY keyboard. As indicated at right, options include small keys or large keys. Short-cut options such as "gestures" (stylus motion on the screen) and others are also available via the Settings menu.		

Transcriber

Overview	Display - Input Selection	Display - Input Options
Transcriber facilitates entry of text in letters, numbers, and entire words. Extensive HELP is provided for very handy features. 		

MC Toolkit Display Conventions

Navigation

Menu Buttons

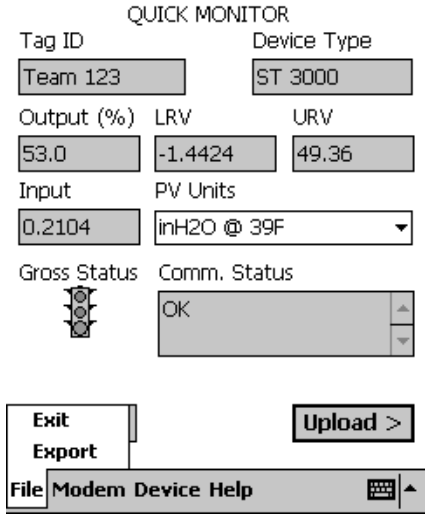
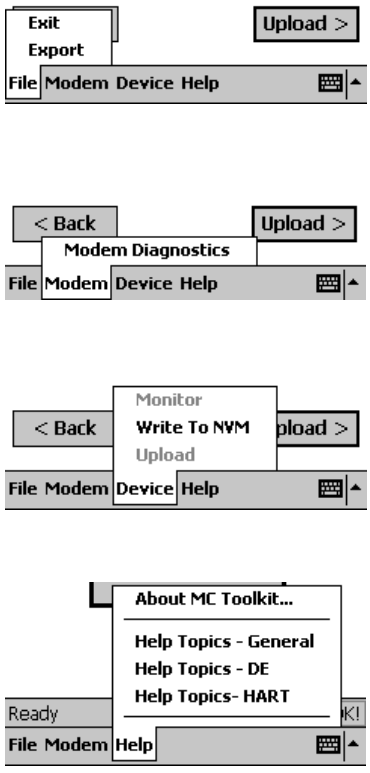
In general, selecting a button in a display will call up the next-lower-level display, whose title is the same or similar to the label on the button. A menu tree for Honeywell DE Displays is given Figure 9, and a menu tree for HART display is given in Figure 10.

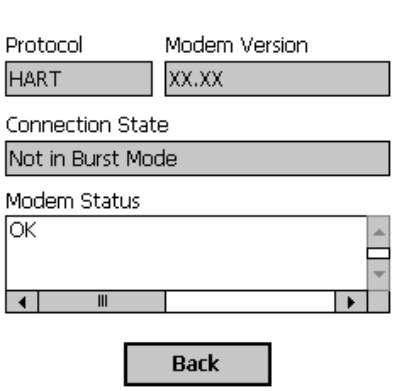
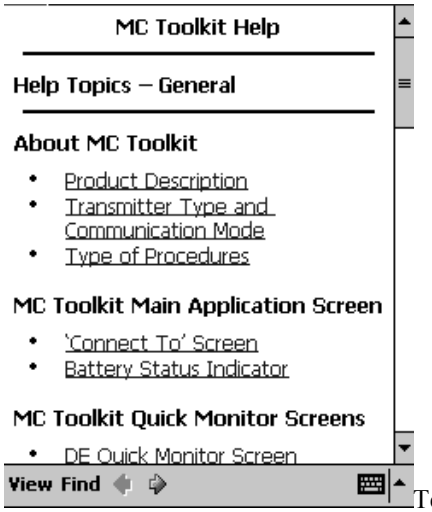
Back Button

In general, selecting the **Back** button at the bottom of any display will call up the next-higher-level (previous) display.

In most displays, the Back button is at bottom-right or bottom-center. When it appears at bottom-left, along with a left-pointing arrow, it indicates that selecting the **Back** button will necessitate a new Upload of data from the transmitter to the MC Toolkit (~ 60 seconds).

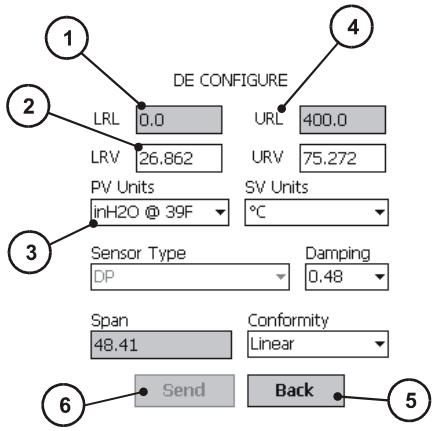
Menu Bar

Menu Bar, Menu Selections, and HELP display		
Menu selections	The menu bar, at the bottom of each display, enables the user to perform file, diagnostic, and utility functions. A typical display is shown below. Menu selections are shown in detail at right 	

Menu Bar, Menu Selections, and HELP display		
File	**Exit** Closes the MC Toolkit application **Export** Enables export of database parameters in XML format, which can be used by other programs such as DocuMint. (Refer to the Reference Data section for more information.) The Export selection is not available until a transmitter database has been uploaded.	To export an XML file, select File, Export. A popup message appears. Select the **OK** button. 
Modem Diagnostics	In DE Mode, the Connection State may be: • Analog • 4 Byte DE • 6 Byte DE In HART mode, the Connection State may be: • Burst Mode • Not in Burst Mode	
HELP display	The Help display is available whenever the MC Toolkit is active. It includes three groups of topics, each of Selectable from the Help Menu - General - DE - HART Each group includes a list of topics. Each topic (in blue, underlined letters) is selectable to provide direct access to the Help information. Dragging the cursor in the scrollbar at right enables viewing of all three groups of topics. At the bottom of each group, a Back to Top selection moves the display to the beginning of the first group of topics. **Note:** The View, Find and (arrows) selections at the bottom of the screen apply to the Help that applies to the Pocket PC, and not to the MC Toolkit application.	

Teh

Data Entry and Display

Key number / Description	Illustration: Key Numbers
1. Box with no arrow and with gray background indicates a read-only (R/) field. Numeric or text values in transmitter are displayed only; user entry or modification is not permitted. 2. Box with white background and with no arrow indicates Read/Write (R/W) text or numeric input field. Values previously stored in memory (of the transmitter or of the MC Toolkit) are displayed. The user can enter or modify values using an appropriate Input Method (e.g., Keyboard). Entering a new value turns the background yellow, indicating that the value in the box is different from the value in memory. When the **Send** button **(6)** is selected, the value in the box is copied to memory in the transmitter, and the background color returns to white. If the user exits the screen before using the Send button, the changes will be ignored. 3. Box with white background and arrow at right indicates a read/write (R/W) selection list. The value previously selected and stored in memory is displayed. Selecting the arrow at right presents a list of available selections, and selecting an item from the list places it in the selection box. If the user exits the screen before using the Send button, the changes will be ignored. 4. The label above the box indicates the meaning of the data inside the box. 5. The **Back** button at the bottom of the display causes the display that was viewed previously to return the screen. 6. The **Send** button is at half intensity when no values have been changed. It changes to full intensity when one or more of the boxes contain a changed value. Selecting the **Send** button when it is highlighted will copy all changed values to memory, and the button will return to half-intensity.	

DE Operating Procedures

Introduction

This section contains procedures for using the MC Toolkit to communicate with Honeywell DE Transmitters.

For specific data relating to parameters involved in the procedures, refer to **Reference Data**.

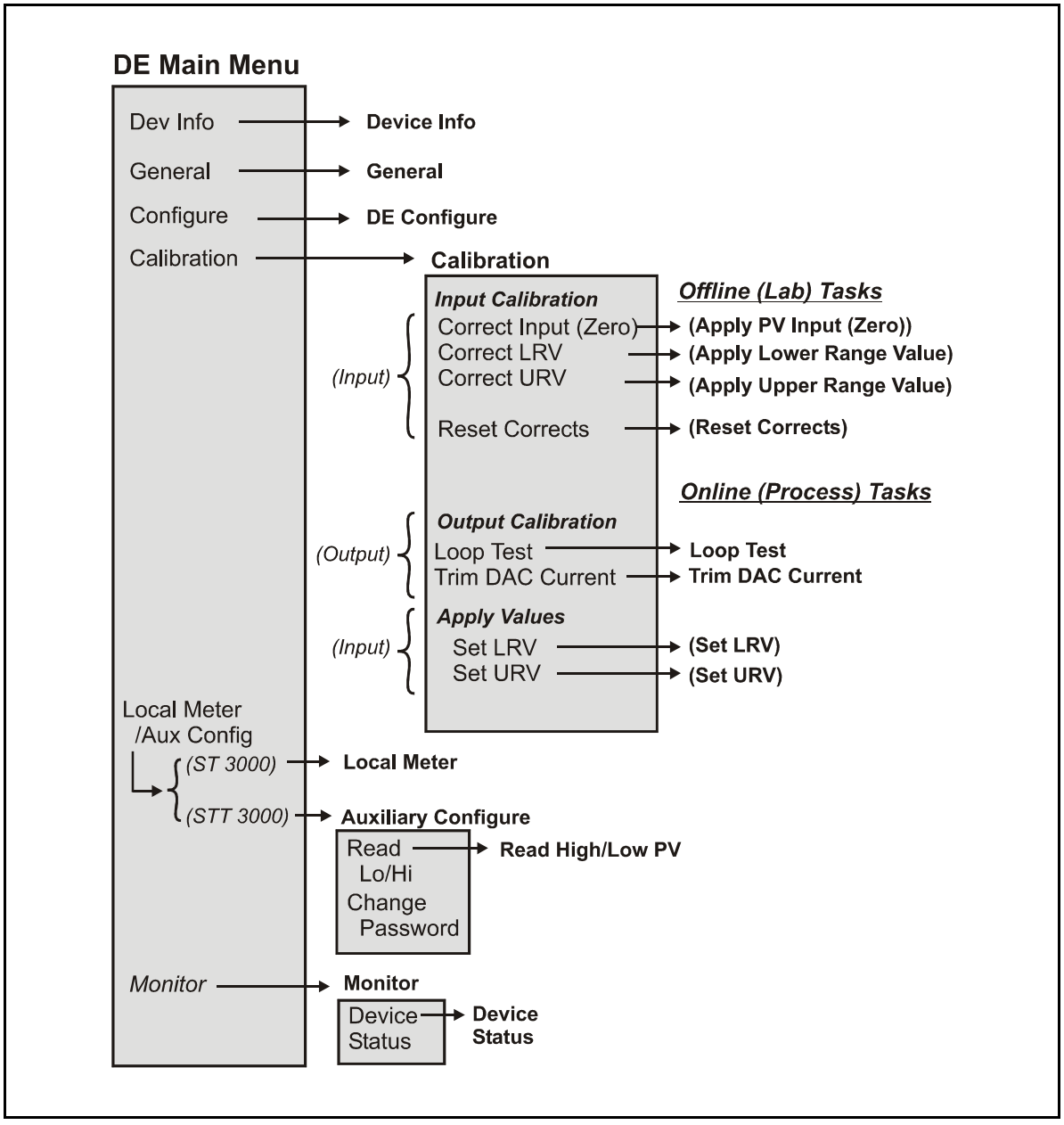


Figure 9 Menu Tree - Honeywell DE Displays

Summary of Operating Procedures

To access displays for Honeywell DE Transmitters:

- Start the MC Toolkit application; the CONNECT TO ... display will appear. (Refer to Figure 8 Start-up - MC Toolkit Application.)
- Upload the database from the transmitter. (The QUICK MONITOR display will enable viewing of key parameters before taking the time for database uploading.) The DE MAIN MENU appears. (Refer to Figure 9 Menu Tree - Honeywell DE Displays in this section.)
- Select the appropriate display from the DE MAIN MENU. (Refer to

Table 3 DE Main Menu Procedures in this section, and to the list of DE displays .)

The content of each display is summarized in Table 1.

Table 1 DE Displays / Tasks Summary

Menu Item	Task	
DEVICE INFO	Enter: Device Type: • Tag ID • Message (in Scratch Pad)	Observe (Read): • Type • Serial Number • Firmware Version
GENERAL	Select: • PV Type Enter: • Comm Mode • Line Filter (STT) • T/C Fault Detect (STT)	Observe (Read): • Failsafe Direction
DE CONFIGURE	Select: • PV Units • SV Units • Conformity (ST) • Damping • Sensor Type (STT) • Linear Enter: • LRV • URV	Observe (Read): • LRL • URL • Span • Sensor Type (ST)
CALIBRATION	Enter/Select: • Correct Input (Zero) • Correct Input (LRV) • Correct Input (URV) • Reset Corrects (Zero, LRV, URV) • Loop Test (Check • Trim DAC Current (Calibrate output current) • Apply Values (that is, re-range LRV and URV to PV input)	Observe (Read): • Input at Zero, LRV, and URV • (Verify) Reset Corrects • Loop Current (continuity) • Output Current level (at 0 %, 100%) • Applied values of LRV and URV
LOCAL METER	Select: • Meter Units (EU) Enter: • Custom Units • (Custom) Flow (EU) value: Upper, Lower	Observe (Read): • Meter Hardware Type •

Menu Item	Task	
MONITOR		Observe (Read): • Input value • Output value • Secondary (Input) value • Gross Status (code) • Device Status (Messages)
Auxiliary Configuration (STT 3000)	Select: • Critical Status Latching • Write Protection • NAMUR • CJ Compensation Enter: • CJ Temp • Password (Write Protection) • New Password	Observe (Read): • High/Low PV Values

Procedural Considerations

Input calibration

Input calibration of pressure transmitters should be done only when necessary, and should be done only under conditions that will ensure accuracy:

- The transmitter should be taken out of service, and should be moved to an area with favorable environmental conditions: clean, dry, and temperature-controlled.
- The source for the input pressure must be very precise, and certified for correct operation.
- The procedures should be done by qualified personnel.

Details of requirements and procedure are given in Table 4.

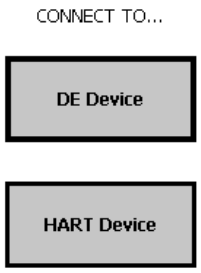
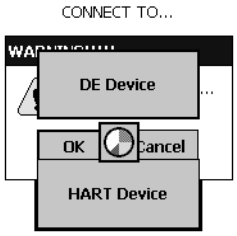
Output Calibration

The ***Loop Test*** procedure is intended as a check for continuity and condition of components in the output current loop. The Loop Test procedure is given in Table 5.

The ***Trim DAC Current*** procedure calibrates the output of the Digital to Analog converter for minimum (0%) and maximum (100%) values of 4 mA and 20 mA, respectively. This procedure is used for transmitters operating on-line in analog mode, to ensure proper operation of the transmitter with all associated circuit components (wiring, power supply, control equipment, etc). It is necessary to use precision test equipment (an ammeter or a voltmeter in parallel with precision resistor). The Trim DAC procedure is given in Table 6.

The ***Apply Values*** procedure uses actual Process Variable input levels for calibrating the range of a transmitter. To measure a liquid level for example, a sight-glass can be used to determine the minimum (0%) and maximum (100%) level in a vessel. The Process Variable is carefully adjusted to stable minimum and maximum levels, and the LRV and URV values are then set by commands from the MC Toolkit. The DE Apply Values procedure is given in Table 7.

Table 2 DE Upload Procedures

<table>
<tr><th colspan="4">DE Upload Procedures</th></tr>
<tr>
<td></td>
<td> 
</td>
<td>Select the DE Device button This Warning message appears.
 
</td>
<td>If the MC Toolkit is connected to a DE Device, select the OK button.
 
</td>
</tr>
<tr>
<td>  </td>
<td>Note:
This Warning appears only if the transmitter is configured for operation in analog mode.

WARNING!
Before proceeding, if the transmitter is part of a control loop, ensure that interlocks and alarms are secured and that the loop is in Manual control.

Then, select the OK button in the popup message. The display at right appears.</td>
<td> 

Use this display to

- Verify device identification and to monitor Gross Status process conditions

- Select the desired Units for the Process Variable input using the PV Units drop-down list.</td>
<td>Select the Upload button; the wait cursor and progress bar appear.
 

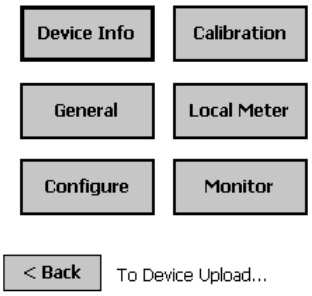
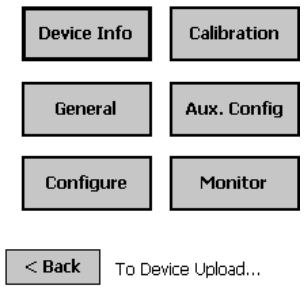
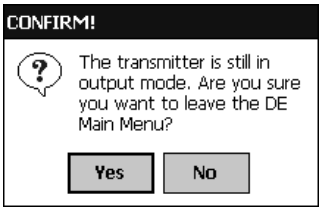
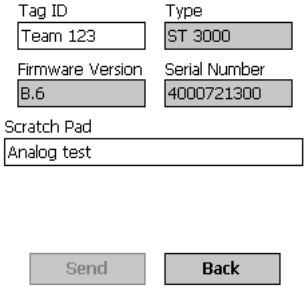
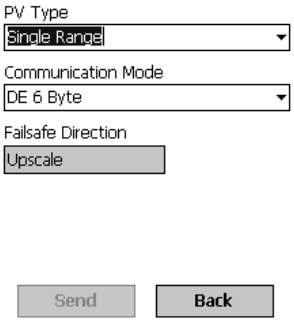
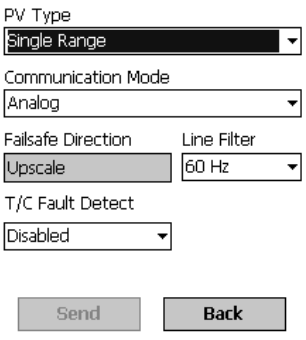
Then, the Main Menu for an ST 3000 Transmitter appears.

DE MAIN MENU

Device Info | Calibration
General | Local Meter
Configure | Monitor

< Back To Device Upload...</td>
</tr>
</table>

Table 3 DE Main Menu Procedures

<table>
<tr><th colspan="4">DE Main Menu Procedures</th></tr>
<tr><td>DE Main Menu</td><td>(ST 3000)
DE MAIN MENU
 
</td><td>(STT 3000)
DE MAIN MENU
 
</td><td>Note:
This message appears if the Back button is selected if the transmitter was set to Output Mode (in Calibration procedures), and the Output was not later cleared.
 
</td></tr>
<tr><td>Device Info</td><td>DEVICE INFO
 
</td><td colspan="2">Tag ID (r/w)
User ID up to 8 alphanumeric characters (suggestion: relate to functional process entities and/or plant areas).
Type (r)
Manufacturer's device type identifier (typically, a model number)
Firmware Version (r)
Manufacturer's Firmware version identifier
Serial Number (r)
Manufacturer
Scratch Pad (r/w)
Up to 32 alphanumeric characters (suggestion: messages to control room regarding observed/assigned operational status)</td></tr>
<tr><td>General</td><td>(ST 3000)
GENERAL
 
</td><td>(STT 3000)
GENERAL
 
</td><td>PV Type (r/w)
Select: Dual Range (STDC) or Single Range or Single Range w/SV
Communication Mode
(r/w) Select: Analog or DE 4 Byte or DE 6 Byte
FS Direction (r)
(Upscale or Downscale; selection is jumpered in the transmitter).
Line Filter (r)
Select: 50hz or 60hz.
T/C Fault Detect (r/w):
Select: Enabled or Disabled.</td></tr>
</table>

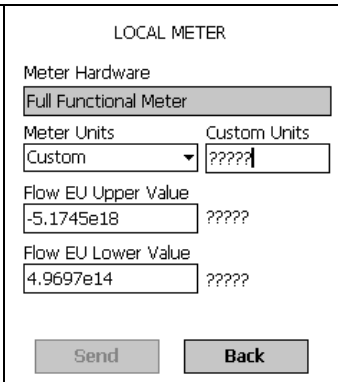
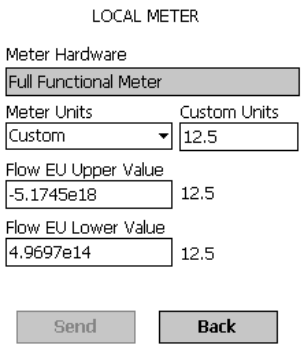
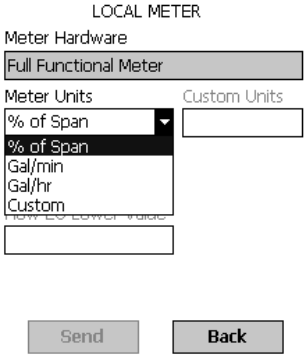
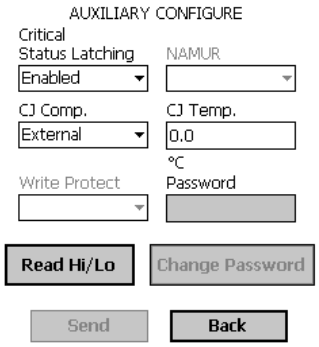
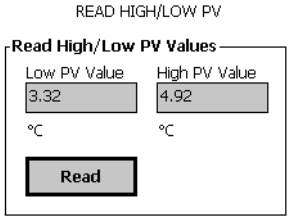
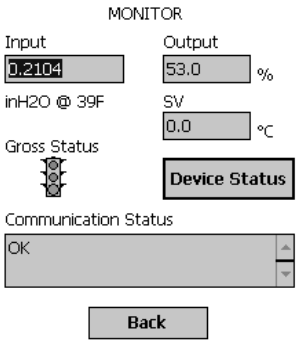
<table>
<tr><th colspan="4">DE Main Menu Procedures</th></tr>
<tr>
<td>DE Configure</td>
<td>ST 3000
DE CONFIGURE
LRL 0.0 URL 400.0
LRV -0.021553 URV 224.42
PV Units inH2O @ 39F SV Units °C
Sensor Type DP Damping 0.48
Span 224.44 Conformity Linear
Send Back

STT 3000
DE CONFIGURE
LRL 0.0 URL 400.0
LRV -1.4424 URV 49.36
PV Units °C SV Units °C
Sensor Type T/C-J Damping 3.10
Span 50.802 Linearization Linear
Send Back</td>
<td colspan="2">LRL (r): Lower Range Limit
URL (r): Upper Range Limit
LRV (r/w): Lower Range Value
URV (r/w): Upper Range Value
PV Units (r/w)
Selection of scaling value (default: inches of H2O@39)
SV Units (r/w)
Selection of scaling value (^{0}C/^{0}F)
Sensor Type (r)
Sensor Type associated with the transmitter
Damping (r/w)
Selection of level of digital noise reduction
Span (r)
Process Range (URL - LRL)
Conformity (r/w) (ST 3000)
Selection of conformity to input form: Linear or Square Root
Linearization (r/w) (STT 3000)
Selection of conformity to input form: Linear or Non Linear</td>
</tr>
<tr>
<td>Calibra-tion</td>
<td>CALIBRATION
Input Calibration
Corr. Input (zero) Correct LRV
Reset Corrects Correct URV
Output Calibration Apply Values
Loop Test Set LRV
Trim DAC Curr. Set URV
Back</td>
<td>For more information, refer to:

Table 4, Table 5, Table 6, Table 7.</td>
<td></td>
</tr>
<tr>
<td>Local Meter

(ST 3000)</td>
<td>LOCAL METER
Meter Hardware
Full Functional Meter
Meter Units in. of Hg at 0C Custom Units
Flow EU Upper Value
Flow EU Lower Value
Send Back</td>
<td>LOCAL METER
Meter Hardware
Full Functional Meter
Meter Units % of Span Custom Units
% of Span
Gal/min
Gal/hr
Custom
Send Back</td>
<td>Meter Hardware (r)
Type designation of meter associated with the transmitter
Meter Units (r/w)
Selection EUs for Local Meter
Custom Units (r/w)
(Refer to Transmitter User Manual).
Flow EU Upper Value (r/w)
Selection of standard Engineering Units for Flow Upper Value
Flow EU Lower Value (r/w)
Selection of standard Engineering Units for Flow Lower Value</td>
</tr>
</table>

<table>
<tr><th colspan="4">DE Main Menu Procedures</th></tr>
<tr>
<td>Local Meter

(ST 3000 example)</td>
<td> 
</td>
<td> 
</td>
<td> 
</td>
</tr>
<tr>
<td>Auxiliary Configure</td>
<td> 
</td>
<td>Critical Status Latching
Select Enabled or Disabled.
NAMUR
Select Enabled or Disabled.
(Disable requires that Write Protect is set to Not Write Protected.)
CJ Temp.
Enter External Cold Junction Temperature.
Select the Read HI/LO button to call up the READ HIGH/LOW PV display.</td>
<td>Select the Read button to display the lowest and the highest PV values since last read.
 
</td>
</tr>
<tr>
<td>Monitor</td>
<td> 

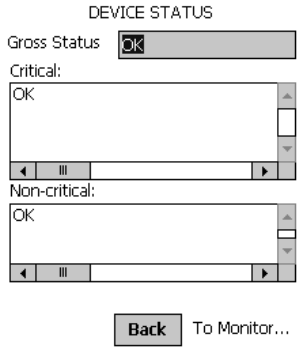
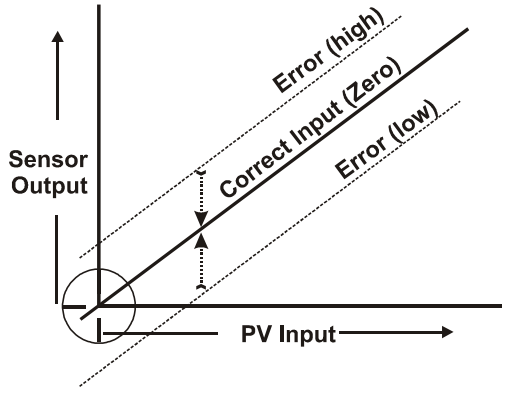
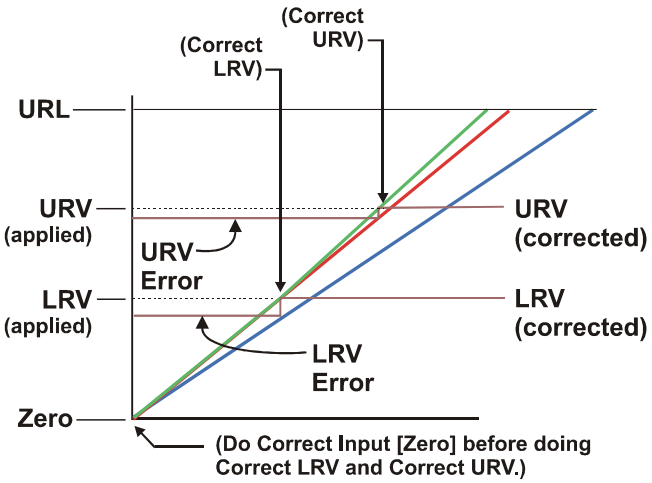
Input (r)
Sensor input in Engineering Units
Output (r)
Loop output as percent of Span</td>
<td>SV (r)
Secondary Variable in Engineering Units
Gross Status (r)
Gross transmitter status. Select the Device Status button to call up the Device Status display.
Communication Status (r)
For status information, refer to the section on Messages and Diagnostic Codes.</td>
<td> 
</td>
</tr>
</table>

Table 4 Input Calibration (DE Transmitters) - Correct Input (Zero), LRV, URV; Reset Corrects

Input Calibration (De Transmitters) - Correct Input (Zero), LRV, URV; Reset Corrects	
Requirements: • Input source, with accuracy of at least 0.04% • resistor, at least 250-ohms • Voltmeter or Ammeter • 24 Vdc Power Supply (nominal) • Clean work area with suitable environmental conditions. • Pressure Transmitter must be level. **Overview of Procedures:** The Zero-Correct procedure establishes the correct ***vertical positioning*** of the response profile. The LRV Correct and URV Correct procedures establish the correct ***slope*** of the response profile in the process operating range by rotating the response profile around the zero-reference point as a pivot. The Zero-Correct procedure can be done at any time during the Correct LRV and Correct URV procedures in the same calibration session. The Correct LRV and Correct URV procedure should never be performed without first performing the Correct Input (Zero) procedure in the same calibration session.	**Objective(s):** Using a precision PV input source as a reference, command the transmitter to write calibration coefficients to Non-Volatile Memory associated with transmitter input hardware and software. • Correct Input (Zero) • Correct LRV • Correct URV  

Input Calibration (De Transmitters) - Correct Input (Zero), LRV, URV; Reset Corrects

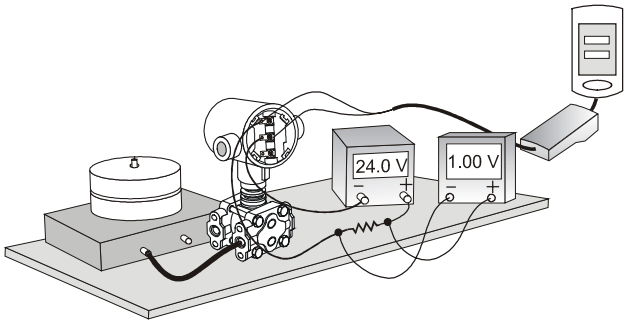
Set-Up On Bench

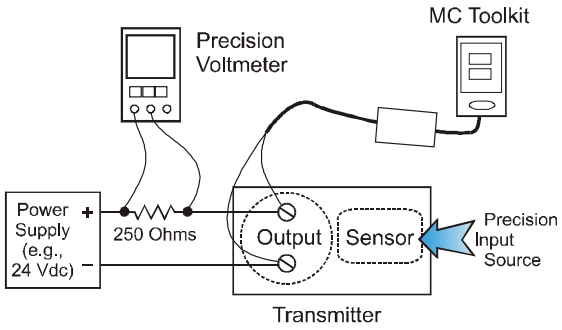
A typical bench set-up is shown at right.

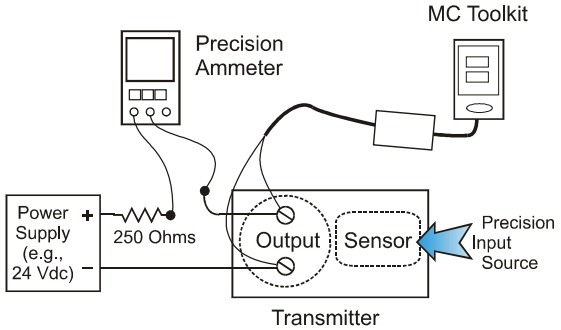
Connect the MC Toolkit as indicated, and establish communication with the transmitter.

For these procedures, components in the current loop are not critical, provided that they support reliable communication between the transmitter and the MC Toolkit.

If a Honeywell ST 3000 Pressure Transmitter is being calibrated, positioning (leveling) is important, because the meter body contains fluids that can affect zero sensing.







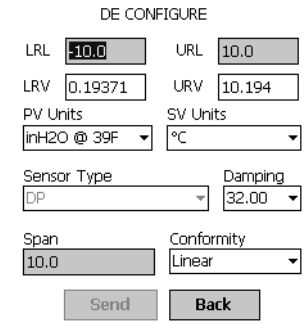
Enter (configure) values for LRV and URV

From the DE MAIN MENU, select **Configure** to call up the DE CONFIGURE display.

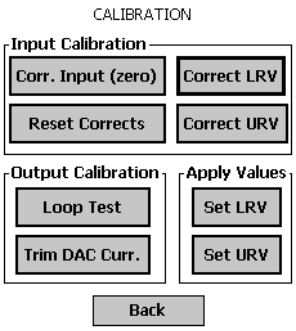
a. Use the **PV Units** to select the appropriate Engineering Units.

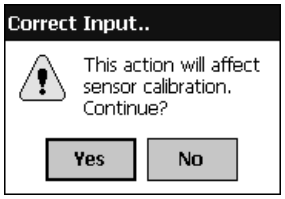
b. Using the keyboard, enter the desired **LRV** and **URV** values.

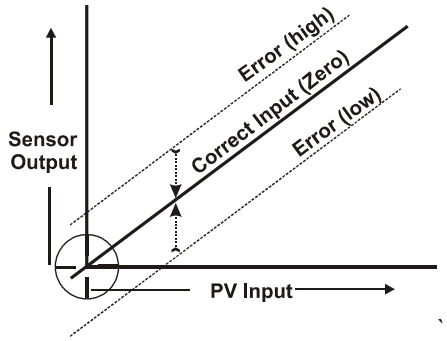
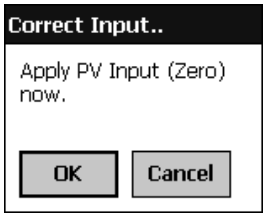
c. Select the **Send** button to copy all newly entered values to the transmitter. When the copy operation is complete, **Send** will be displayed in half intensity.



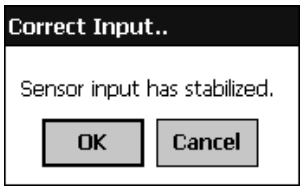
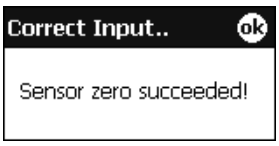
<table>
<tr><th colspan="4">Input Calibration (De Transmitters) - Correct Input (Zero), LRV, URV; Reset Corrects</th></tr>
<tr><td>Call up Calibration display</td><td>Navigate to the DE Calibration display as follows.

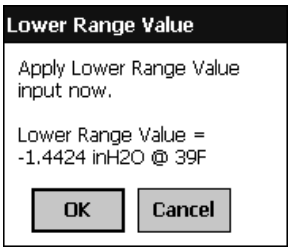
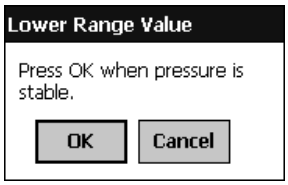
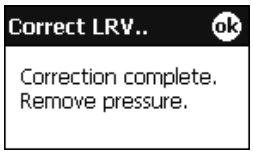
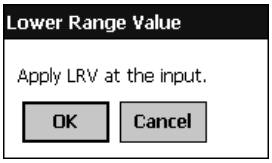
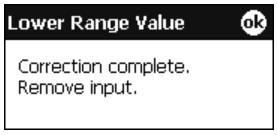
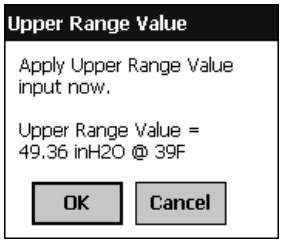
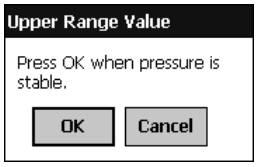
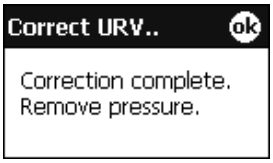
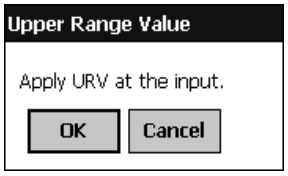
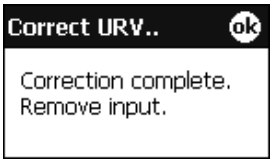
Select Back (go to DE Main Menu), then select the Calibration button.</td><td> 
</td><td></td></tr>
<tr><td rowspan="3">Correct Input at Zero</td><td>Select Corr. Input (zero).

This message appears.
 

NOTE:
The PV Input (Zero) refers to a known standard such as zero pressure (e.g.: vent both sides of a DP transmitter).</td><td>As indicated below, this procedure will shift the slope up or down to eliminate the error at the zero reference. The slope (angle) of the response is unchanged.
 
</td><td></td></tr>
<tr><td>Select Yes in the message box above; this message appears.
 
</td><td>At this point, ensure that the value of the PV applied at the input is exactly Zero.

Then, select the OK button in the popup message.

This action sends the Correct Input (Zero) command to the transmitter, which adjusts the input calculation.</td><td></td></tr>
<tr><td>Wait until this message appears.
 
</td><td>When the transmitter has completed the Zero Correction, this message appears.
 
</td><td>Select the OK button to acknowledge.</td></tr>
</table>

Input Calibration (De Transmitters) - Correct Input (Zero), LRV, URV; Reset Corrects			
Correct Input at LRV **(ST 3000)**	Select the **Correct LRV** button. This message appears.  Adjust the PV input pressure to the ***exact value of the LRV*** entered in the DE CONFIGURE display.	Select the **OK** button; this message appears.  Observe the input pressure at the applied value; when it is stable, select the **OK** button.	When the transmitter has completed the LRV correction, this message appears.  Select **OK** to acknowledge.
Correct Input at LRV **(STT 3000)**	Select the **Correct LRV** button. This message appears. 	Adjust the input temperature to the ***exact value of the LRV*** entered in the DE CONFIGURE display.	Select the **OK** button; this message appears.  Select the **OK** button to acknowledge
Correct Input at URV **(ST 3000)**	Select the **Correct URV** button. This message appears. 	Adjust the PV input pressure to the ***exact value of the URV*** entered in the DE CONFIGURE display.  Select the **OK** button.	When the transmitter has completed the URV correction, this message appears.  Select **OK** to acknowledge.
Correct Input at URV **(STT 3000)**	Select the **Correct URV** button. This message appears. 	Adjust the input temperature to the ***exact value of the URV*** entered in the DE CONFIGURE display.	Select the **OK** button; this message appears.  Select the **OK** button to acknowledge

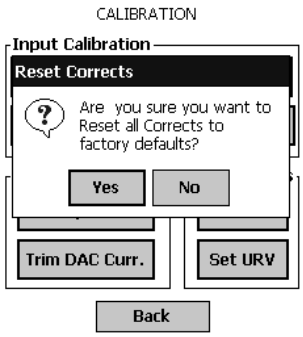
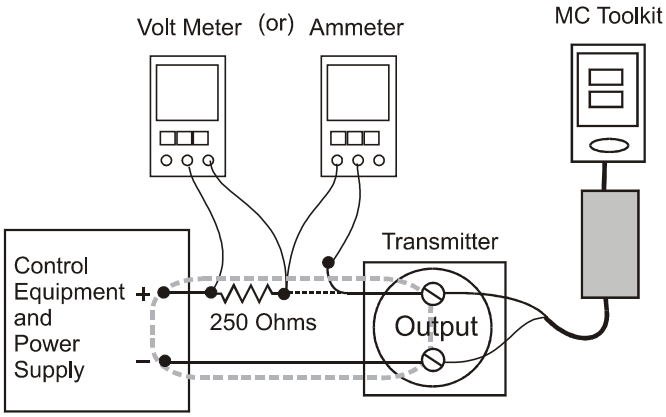
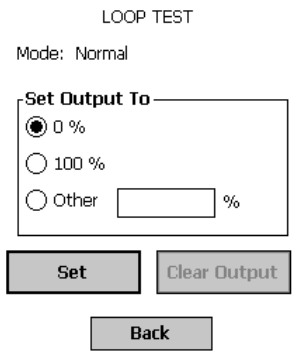
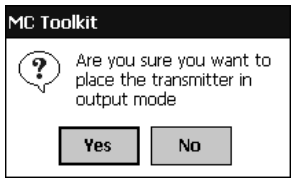
Input Calibration (De Transmitters) - Correct Input (Zero), LRV, URV; Reset Corrects			
Reset Corrects	**Note:** This function commands the transmitter to overwrite all user input corrections with factory default ("characterization") values. It is intended for use only when excessive corrections render the transmitter inaccurate.		If corrects should not be overwritten with factory values, select the **No** button. If corrects need to be overwritten, select the **Yes** button. The timer will appear briefly, indicating the operation is performed.

Table 5 Output Calibration - Loop Test

<table>
<tr><th colspan="4">Output Calibration - Loop Test</th></tr>
<tr><td>Objective</td><td>Verify the integrity of electrical components in the output current loop.

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

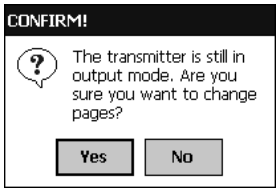
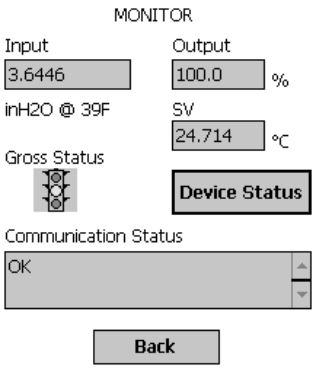
For these procedures, values of components in the current loop are not critical, provided that they support reliable communication between the transmitter and the MC Toolkit.</td><td colspan="2"> 
</td></tr>
<tr><td>Loop Test</td><td>In the Output Calibration box, select the Loop Test button; the display at right appears.

Select the desired constant-level Output: 0 %, 100 %, or Other (any of 0 % - 100 %).</td><td> 
</td><td>Select the Set button.
 

Select the Yes button, and observe the output current at 0%, 100%, or Other (user-entered) %.</td></tr>
<tr><td></td><td>Note:

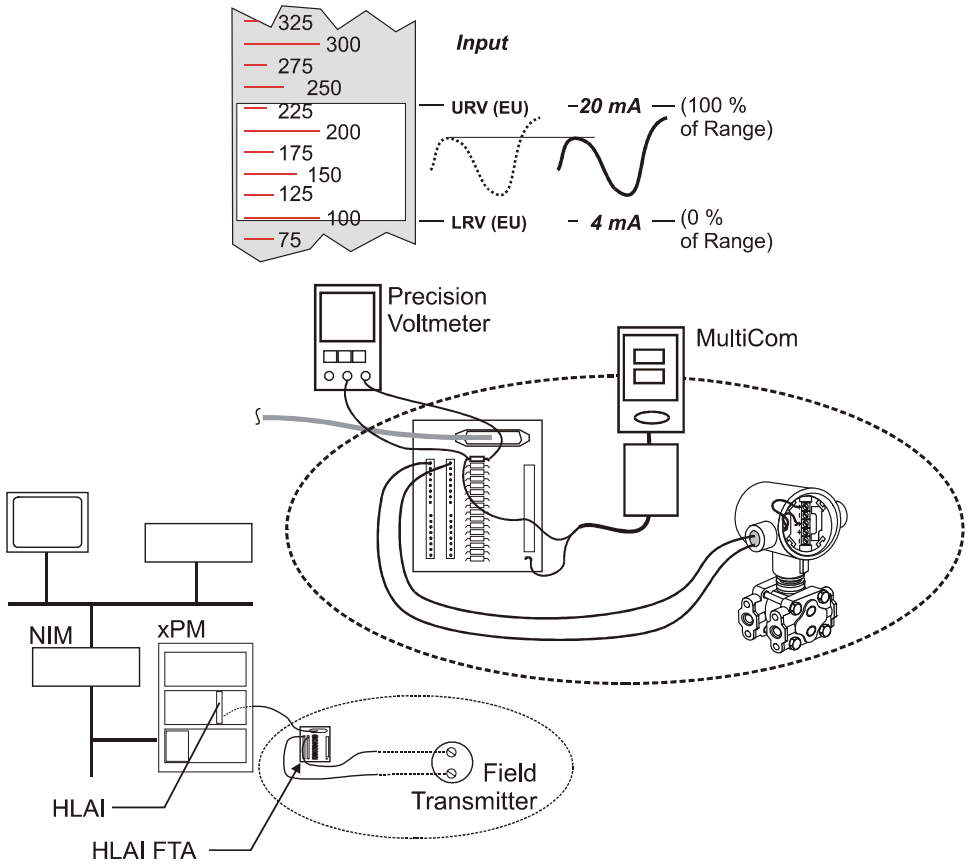
If the transmitter is in Analog mode, you can observe the output on an externally connected meter or on a Local Meter.

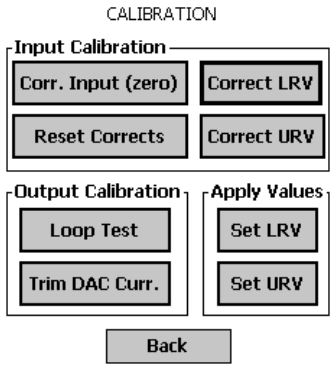
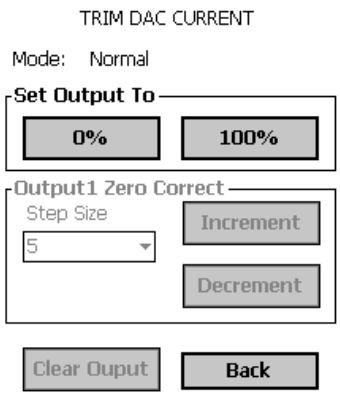
In DE Mode, the output can be observed on the Local Meter or on the Monitor display on the MC Toolkit.</td><td>To view the Monitor display, navigate Back from the LOOP TEST display and select the MONITOR display.

This popup appears; select Yes to continue.
 
</td><td>Example:
DE output (100 %), as viewed on the MC Toolkit.
 
</td></tr>
</table>

<table>
<tr><th colspan="4">Output Calibration - Loop Test</th></tr>
<tr>
<td>Example</td>
<td>The displays at right illustrate a Set Output selection and setting of Other, at 57 %.</td>
<td>LOOP TEST
Mode: Output Mode
Set Output To
0 %
100 %
Other 57 %
Set | Clear Output
Back</td>
<td>MONITOR
Input 3.6434
Output 57.001 %
inH2O @ 39F
SV 24.896 °C
Gross Status
Device Status
Communication Status
OK
Back</td>
</tr>
<tr>
<td> 
!!
Unintended exit in Output Mode?
!!</td>
<td>Caution:
If Yes was selected as above in the CONFIRM! popup message, it is possible to exit MC Toolkit application while the Output is fixed at constant current.</td>
<td>This message at right appears if the user performs an operation on the MC Toolkit that will terminate the connection to the transmitter while the transmitter is in output mode.</td>
<td>Select Yes button only if constant-current Output with the MC Toolkit is intended.
MC Toolkit
The transmitter is still in output mode. Are you sure you want to terminate the connection?
Yes | No
Otherwise, select the No button, go back to the LOOP TEST display, and select the Clear Output button.</td>
</tr>
</table>

Table 6 DE Output Calibration - Trim DAC Current

<table>
<tr><th colspan="4">DE Output Calibration - Trim DAC Current</th></tr>
<tr><td>Overview of Objectives</td><td colspan="3">For a DE transmitter operating in analog mode in a user's application, calibrate the analog output current to the PV input range. That is, adjust the output such that 4 mA corresponds to 0% (LRV), and 20 mA corresponds to 100% (URV).
 
</td></tr>
<tr><td>Call up display</td><td>In the DE MAIN MENU, select the Calibration button.

The CALIBRATION menu appears.</td><td> 
</td><td>Select the Trim DAC Curr. button; this display appears.
 
</td></tr>
</table>

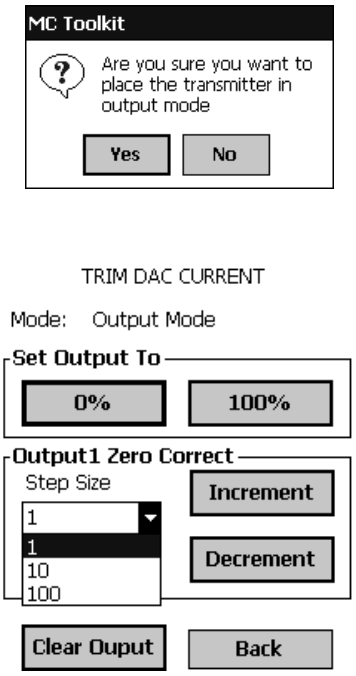
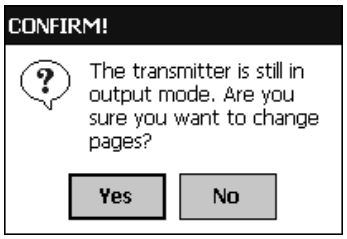
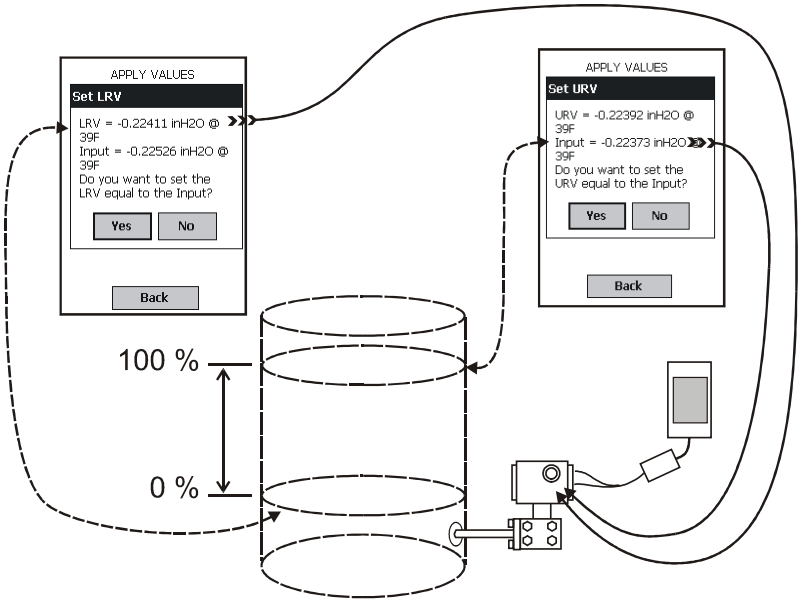
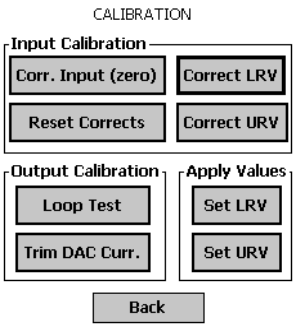
DE Output Calibration - Trim DAC Current		
Trim Output Current	Select the **Set Output To 0%** button or the **100%** button. The message popup at right appears. **Caution:** In Output Mode, output current is fixed at 0% or 100%. Ensure that the loop is in Manual control. Select the **Yes** button, and at the meter, observe the level of loop current. **NOTE:** On the voltmeter, 4 mA corresponds to 1 volt. Using the MC Toolkit, adjust the loop current to the Zero Percent level (4 mA). If the current is low, tap the **Increment** button; if it is high, tap the **Decrement** button, and observe the change on the meter. **NOTE:** If the error is large, you can accelerate the adjustment rate by changing the Step Size to 10 or to 100. When the zero current level (4 mA) is achieved, select the **Set Output To 100 %** button. **NOTE:** On the voltmeter, 20 mA corresponds to 5 volts. Use the Increment and/or Decrement buttons to adjust the output current to 20 mA. When the 100% current level (20 mA) is achieved, select the **Clear Output** button. (Note that the button changes to half intensity.)	
? **Change display while in Output Mode** **?**	If you select the **Back** button before selecting the **Clear Output** button, the display at right will appear. If you are sure that you want to remain in Output Mode while viewing other displays, select the **Yes** button; otherwise, select the **No** button, and the **Clear Output** button	

Table 7 DE Calibration - Apply Values

<table>
<tr><th colspan="4">De Calibration - Apply PV values to Set LRV and Set URV</th></tr>
<tr><td>Overview of Objectives:</td><td colspan="3">

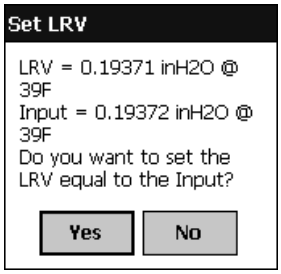
Manually set the Process Variable input to 0%, and apply this value to Set LRV;
Manually set the Process Variable input to 100%, and apply this value to Set URV.

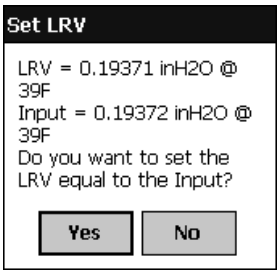
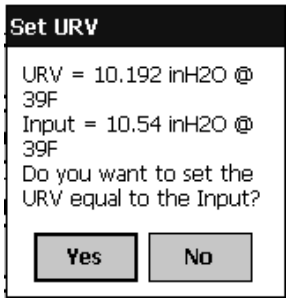
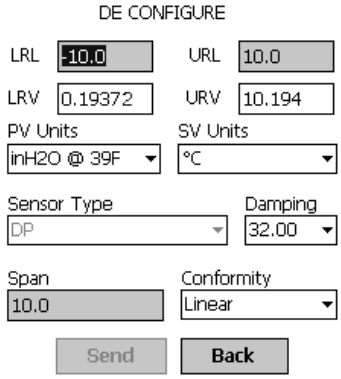
NOTE:
This procedure applies to DE Transmitters operating in DE Mode as well as to those operating in Analog (current) Mode.


</td></tr>
<tr><td></td><td>On the DE MAIN MENU, select the Calibration button.
 
</td><td>In the Apply Values group, select the Set LRV button.

The popup message at right appears.

Note:
The value of the Input indicated in this message updates only when the popup message is called up.

To update this value, select the No button, and again select the Set LRV button in the CALIBRATION display.</td><td> 
</td></tr>
</table>

De Calibration - Apply PV values to Set LRV and Set URV			
Set LRV	While observing the PV value at the physical process element, (using a sight glass, for example) adjust the Process Variable to the desired Minimum (0 %) level, then select **Set LRV** 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 URV	While observing the PV value at the physical process element, (using a sight glass, for example) adjust the process variable to the desired Maximum level, then select **Set URV.** 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.		
Verify settings	The results of the Set LRV and Set URV actions can be verified by calling up the **DE CONFIGURE** display.		

HART Procedures

Introduction

This section contains procedures for using the MC Toolkit to communicate with Honeywell and non-Honeywell Transmitters with HART communications protocol. In some cases, the Honeywell transmitters differ somewhat from non-Honeywell transmitters, separate procedures are provided as appropriate.

For specific data relating to parameters involved in the procedures, refer to **Reference Data**.

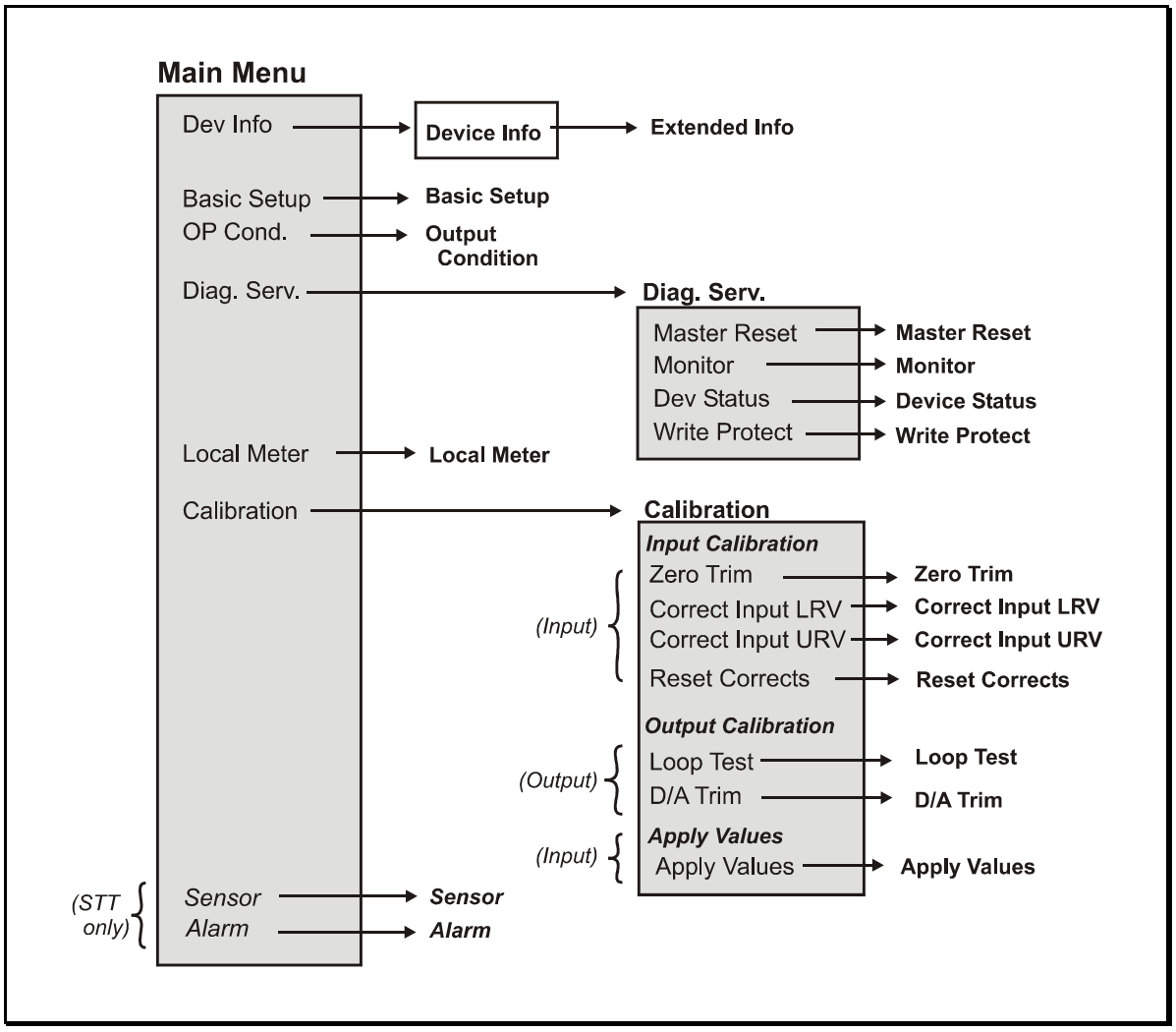


Figure 10 Menu Tree - Honeywell HART Displays

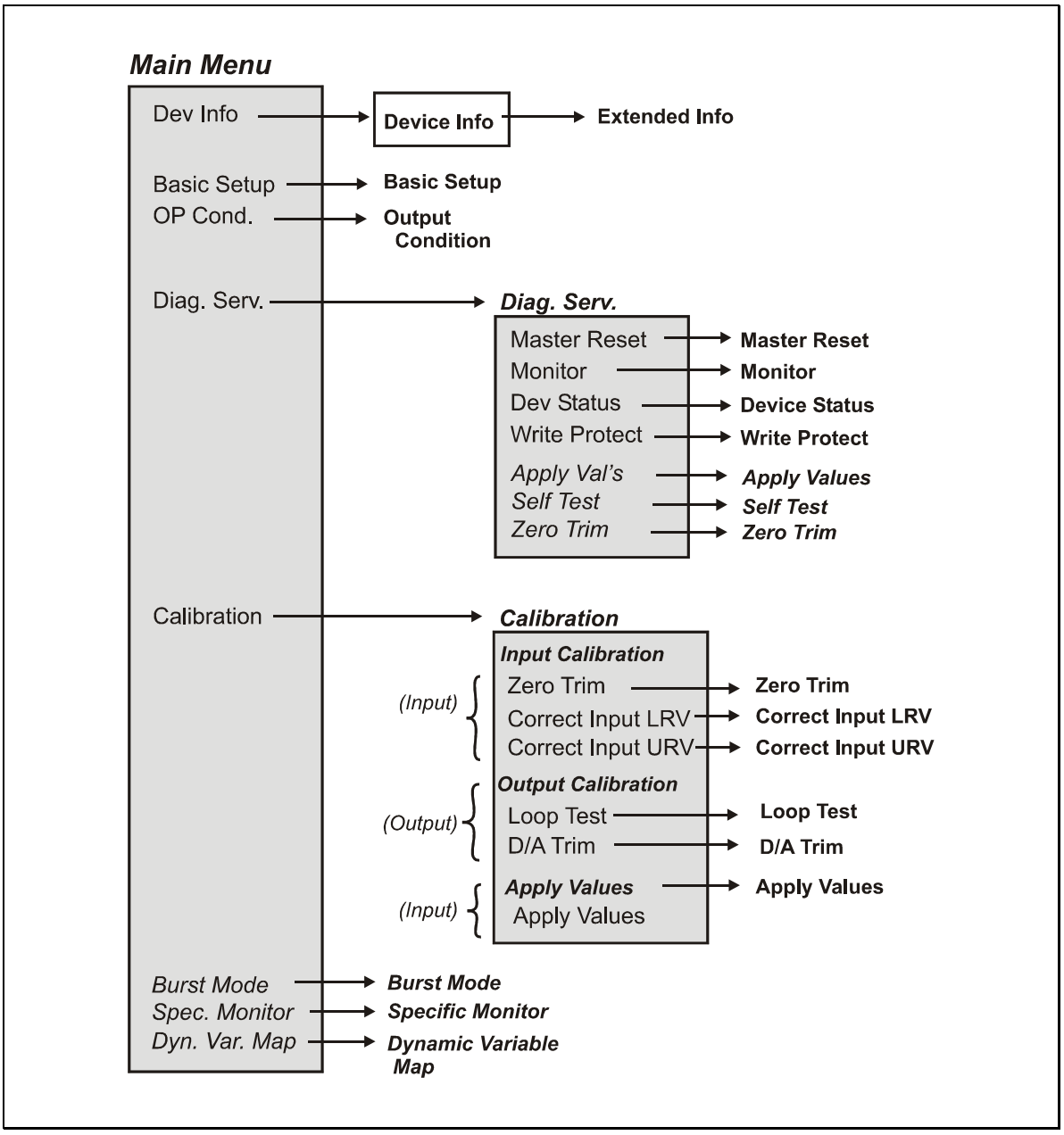


Figure 11 Menu Tree: non-Honeywell HART Displays

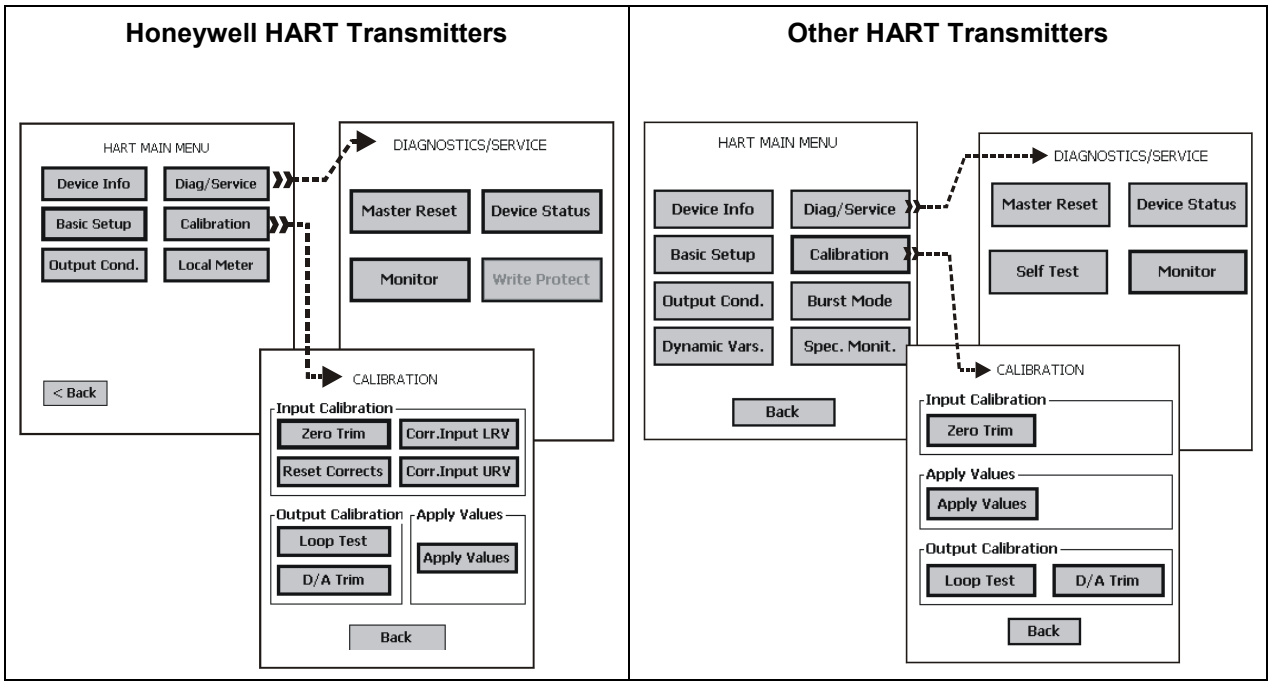


Figure 12 HART Menus (Display Summary)

General Procedures

To access displays for HART Transmitters:

- Start the MC Toolkit application; the CONNECT TO ... display will appear. (Refer to Figure 8 Start-up - MC Toolkit Application).
- Upload the database from the transmitter. (Refer to Table 9 in this section.)
  - (The QUICK MONITOR display will enable viewing of key parameters before beginning other procedures.)
  - The HART MAIN MENU appears.
- Select the appropriate display from the HART MAIN MENU. (Refer to Table 10 Honeywell HART Main Menu Procedure in this section, and to the following task list.)

NOTE:
Although some of the MC Toolkit displays (and procedures) for Honeywell transmitters differ from those for non-Honeywell transmitters, the MC toolkit automatically provides the appropriate displays. Although the user is not required to make any selections in the displays, he must be aware of transmitter type to select the appropriate procedures in this manual.

Table 8 HART Displays / Tasks Summary

Menu Item	Task	
DEVICE INFO	Enter: Device Type: • Tag ID • Message • Descriptor	Observe (Read): • Model • Device ID • Manufacturer
BASIC SETUP	Enter: • LRV • URV Select: • PV Sensor Units • Damping (Time) • SV units • Transfer Function (ST 3000)	Observe (Read): • LRL • URL • Sensor Type
OUTPUT CONDITION	Select: • Poll Adrs (0-15) • Scaled D/A Trim (Output Calibration procedure) • NAMUR (STT 3000)	Observe (Read): • PV Output • Alarm Direction • Requested Preambles
ALARM (STT 3000)	Select: • Break Detect • Latching Alarm • Clear Latching	
DIAGNOSTICS /SERVICE	Select (Procedure): • Master Reset • Device Status • Monitor (Output: mA, %; PV Output, SV) • Write Protect (Enter/Change Password)	
CALIBRATION	Select (Procedure): ***Input Calibration*** • Zero Trim • Correct Input LRV • Correct Input URV • Reset Corrects ***Output Calibration*** • Loop Test • D/A Trim ***Input (Re-Range to PV)*** • Apply Values (LRV, URV)	
Local Meter (ST 3000 only)	Select: • Meter Units (EU) Enter: • Custom Units (conversion constant) • (Custom) EU Flow: Low/High	Observe (Read): • Meter Type
Sensor (STT 3000)	Select: • Sensor Type • Line (AC) Filter • CJ Compensation •	Observe (Read): • RTD Wire Selection

Menu Item	Task	
EXTENDED INFO		Observe (Read): • Universal Rev. • Software Rev. • Field Device Rev. • Poll Address • PROM ID • # Req. Preams • PV Sensor S/N • Final Assembly #
DYNAMIC VARS	Enter: • Primary Variable Code • Secondary Variable Code • Tertiary Variable Code • Quaternary variable Code	
BURST MODE	Select: • Burst Mode • Burst Options	
SPEC. MONITOR	Select: • No. of Var's Query • Device variable	Observe (Read) : • Values of selected variables

Procedural Considerations

The details of procedures vary with device type. This section contains a set of procedures for Honeywell HART Transmitters, and separate set of procedures for non-Honeywell HART devices.

Input Calibration

Input calibration of transmitters should be done only when necessary, and should be done only under conditions that will ensure accuracy:

- The transmitter should be taken out of service, and should be moved to an area with favorable environmental conditions: clean, dry, and temperature-controlled.
- The source for the input pressure must be very precise, and must be certified for correct operation.
- The procedures should be done by qualified personnel.

For Honeywell HART devices, input calibration procedures are given in Table 12 through Table 14, and for non-Honeywell HART devices, the procedure (Zero Trim) is given in Table 20.

Output Calibration

The ***Loop Test*** procedure is intended as a check for continuity and condition of components in the output current loop. The procedure for Honeywell HART devices is given in Table 15, and for non-Honeywell devices, it is given in Table 22.

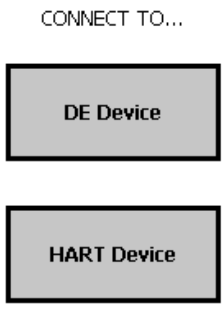
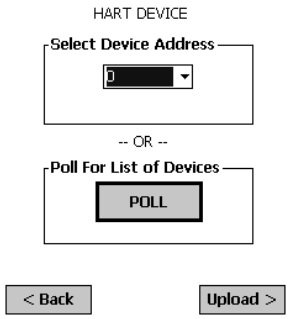
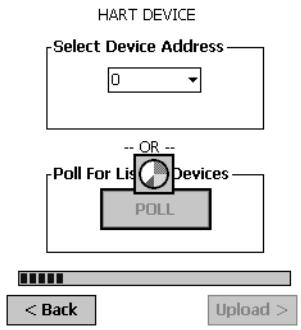
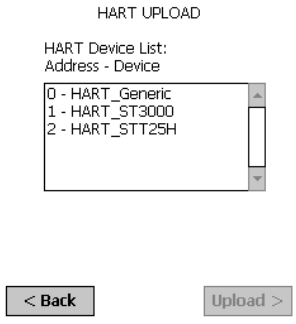
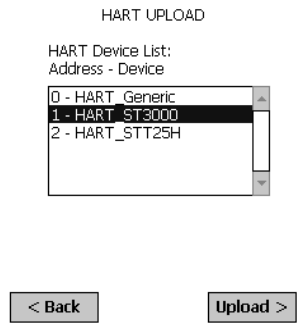
The ***D/A Trim*** procedure calibrates the output of the Digital to Analog converter for minimum (0%) and maximum (100%) values of 4 mA and 20 mA, respectively. This procedure is used for transmitters operating on-line in analog mode, to ensure proper operation of the transmitter with all associated circuit components (wiring, power supply, control equipment, etc). It is necessary to use precision test equipment (a voltmeter and in-circuit resistor or an ammeter).

The procedure for Honeywell HART devices is given Table 16, and for non-Honeywell HART devices, it is given in Table 23.

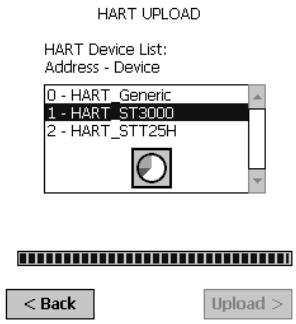
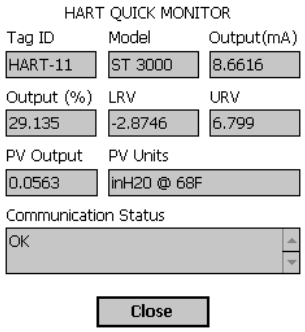
The ***Apply Values*** procedure uses actual Process Variable input levels for calibrating the range of a transmitter. To measure a liquid level for example, a sight-glass can be used to determine the minimum (0%) and maximum (100%) level in a vessel. The PV is carefully adjusted to stable minimum and maximum levels, and the LRV and URV values are then set by commands from the MC Toolkit.

For Honeywell HART devices, the procedure is given in Table 17, and for non-Honeywell Hart devices, it is given in Table 21.

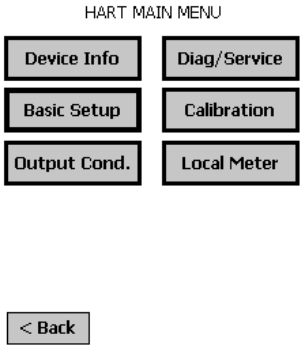
Table 9 HART Device UPLOAD Procedure

HART Device UPLOAD Procedure			
Initiate Connection	(Refer to Figure 8.) 	Select the **HART Device** button; this display appears. 	Select the **OK** button to initiate communications.
Device Polling and Selection		If you know the address of the device on the HART network, select it in the Address drop-down box. - or - If you don't know the address of the device, select the **POLL** button. The MC toolkit will look for devices on all addresses (0-15), and will then list the addresses of all transmitters that respond.	
	When the **POLL** button is selected, the MC toolkit will look for devices on all addresses (0-15), and will then list the addresses of all transmitters that respond. Note that at this point, the **UPLOAD** button is half intensity (inactive).		Select the device from the list. 

<table>
<tr><th colspan="4">HART Device UPLOAD Procedure</th></tr>
<tr>
<td>Initiate Upload</td>
<td>Select the UPLOAD button.

A wait cursor and a progress bar appear while the database is copied from the device to the MC ToolKit (~ 10 seconds).</td>
<td> 
</td>
<td>When the Quick Monitor display appears, use it to assess transmitter conditions.
 

Then, select the Close button.</td>
</tr>
<tr>
<td>HART MAIN MENU</td>
<td>Then, the HART MAIN MENU appears.

The MC Toolkit automatically determines the type of transmitter device, and includes the appropriate MENU content for Honeywell or non-Honeywell devices.</td>
<td>(Honeywell HART ST 3000)
 

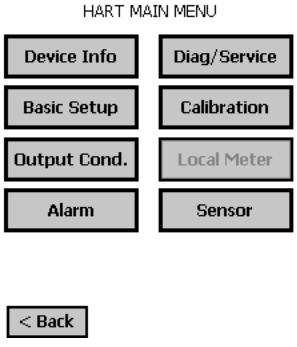
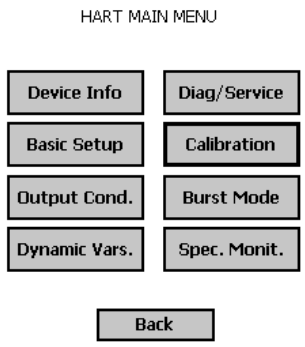
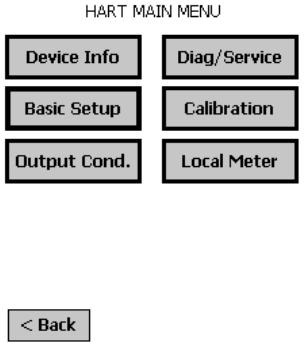
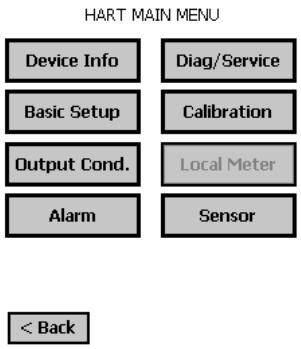
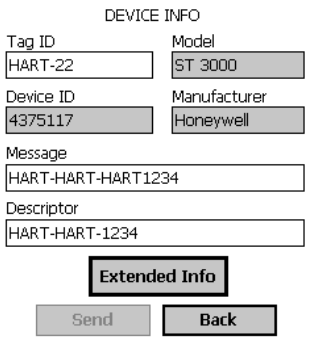
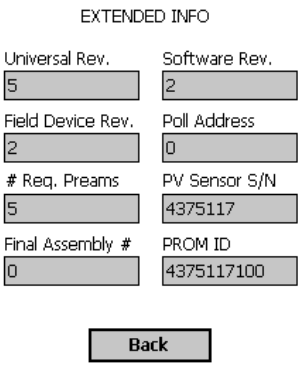
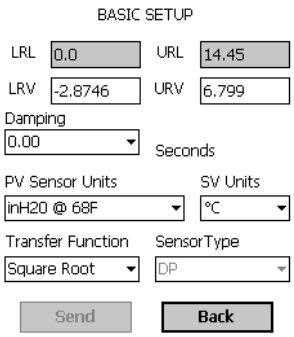
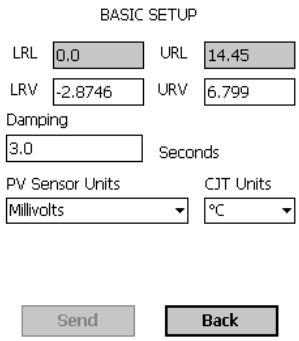
Honeywell HART STT 25H
 
</td>
<td>(non-Honeywell HART Device)
 
</td>
</tr>
</table>

Table 10 Honeywell HART Main Menu Procedure

Honeywell HART Main Menu Procedures			
Menu styles:	Honeywell ST 3000 HART Transmitter Note that the **Alarm** and **Sensor** functions are not available. 		Honeywell STT25H Transmitter Note that the **Local Meter** function is not available 
Device Info	Tag ID - Enter up to 8 characters Message - Enter up to 32 characters Descriptor - Enter up to 16 characters		

<table>
<tr><th colspan="4">Honeywell HART Main Menu Procedures</th></tr>
<tr><td>Basic Setup</td><td colspan="3">
<u>Honeywell ST 3000</u>


Transfer Function - Linear or Square Root (select)
SV Units - Engineering Units for Secondary Variable (select)
Sensor Type- DP, GP, AP (read):

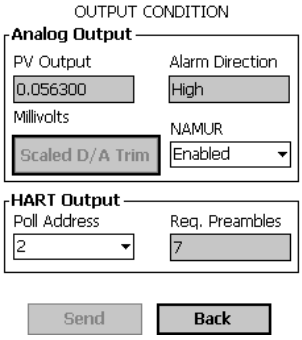
<u>Honeywell STT 3000</u>


CJT Units - Engineering Units for Cold Junction Temperature (select)
</td></tr>
<tr><td></td><td colspan="3">LRL - Lower Range Limit; URL - Upper Range Limit (read)
LRV - Lower Range Value ; URV - Upper Range Value (enter or read)
PV Sensor Units (r/w) - Engineering Units (select)
Damping - Filtering factor for process "noise" (in seconds - select)</td></tr>
<tr><td>Output Condition</td><td>HART Output
Poll Address

To change the Poll Address (0-15) of the connected device:

• Select the desired address from the pull-down list

• Select the Send button.

Scaled D/A Trim - (Refer to Table 23 for more information.)</td><td>


</td><td>Alarm Direction - Failsafe (Upscale | Downscale) jumpered or switched in field device)

NAMUR - Select output levels: Standard or NAMUR

Req. Preambles - Number of preambles required</td></tr>
<tr><td>Alarm</td><td>Break Detect - select Disabled or Enabled
When Enabled, the transmitter checks for open Thermocouple.

Latching Alarm - select Disabled or Enabled
When Enabled, the output remains in Failsafe until the critical status condition is cleared, and the transmitter is reset.</td><td>When Disabled, if the transmitter goes to Failsafe, the transmitter will clear Failsafe as soon as the critical status condition is cleared.

Click on the Clear Latching button to clear the Failsafe condition if the Latching Alarm is Enabled.</td><td>


</td></tr>
</table>

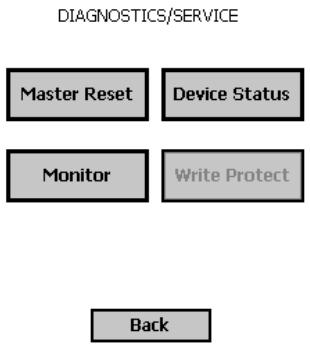
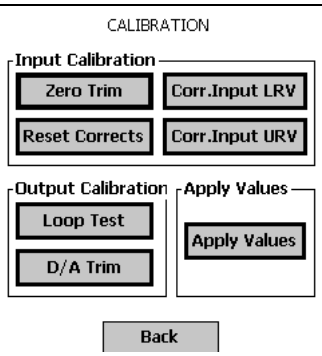
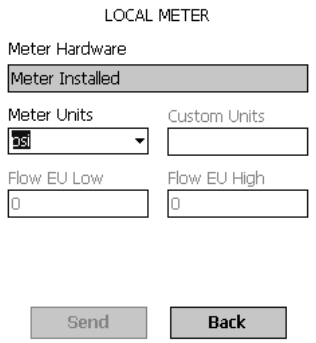
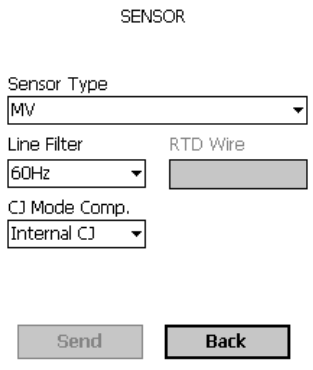
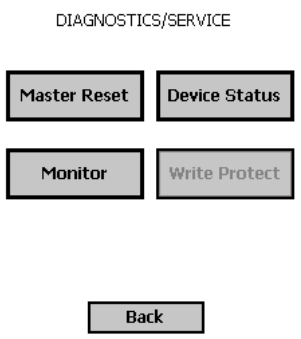
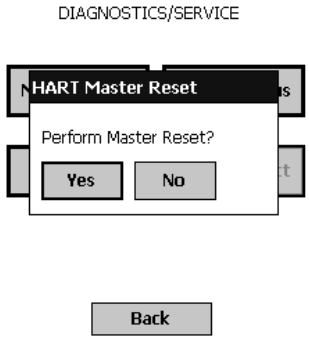
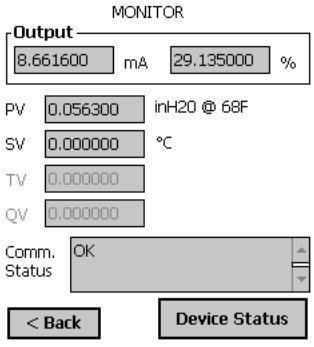
Honeywell HART Main Menu Procedures			
Diagnostics /Service Menu	Refer Table 11 for more information.		
Calibration Menu	Refer to: Table 12 - Zero Trim Table 14 - Reset Corrects Table 15 - Loop Test Table 16 - D/A Trim		Refer to: Table 13 - Corr. Input LRV and Corr. Input URV Table 17 - Apply Values
Local Meter	Local Meter refers to a meter installed integrally in an ST 3000 transmitter, or to a remote-mounted meter that is associated with the ST 3000 transmitter. Meter Units - Engineering Units associated with the Local Meter		For more information, refer to the user manuals(s) for the transmitter and/or for the Remote Meter Assembly (RMA 3000).
Sensor	Sensor refers to a temperature transmitter sensor. Sensor Type - Select from list. (See Reference Data section for more information.) Line Filter - Select: 50 Hz/60 Hz. CJ Mode Comp. - (Cold Junction Mode Compensation) Select: Internal/External RTD Wire - If the sensor is an RTD type, this field indicates whether it is a 3-wire or a 4-wire RTD.		

Table 11 Honeywell HART Diagnostics/Service Menu Procedures

Honeywell HART Diagnostics/Service Menu Procedures			
Menu			
Master Reset	Master Reset is the functional equivalent of cycling power on the transmitter. No parameters are changed. Select the **Master Reset** button, then confirm by selecting the **Yes** button.		
Monitor	The Monitor display enables viewing of transmitter status and of the value of the output. PV - Primary variable SV - Secondary variable TV - Tertiary variable QV - Quaternary variable		Selecting the **Device Status** button calls up the DEVICE STATUS display (see above). For status information, refer to the section on Messages and Diagnostic Codes.

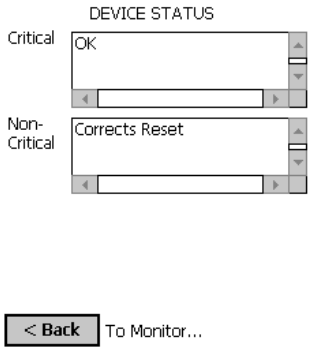
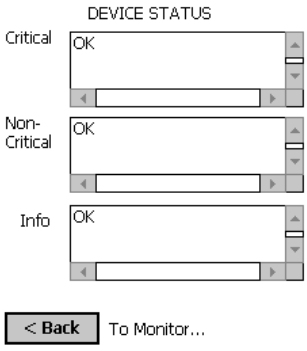
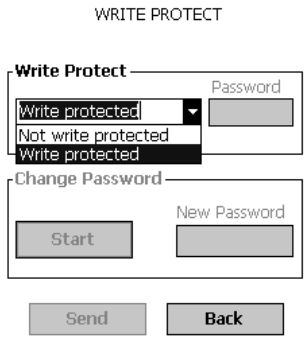
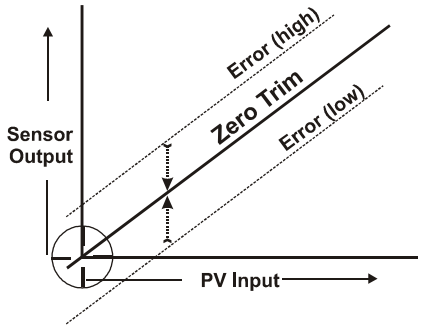
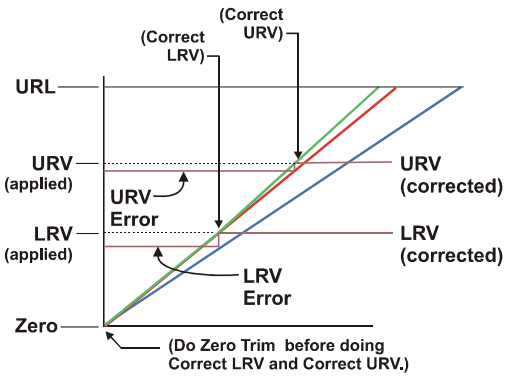
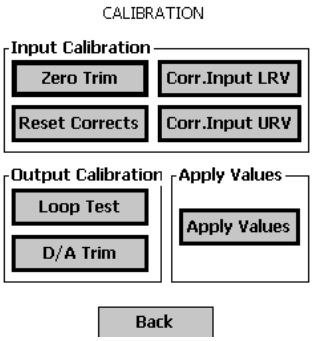
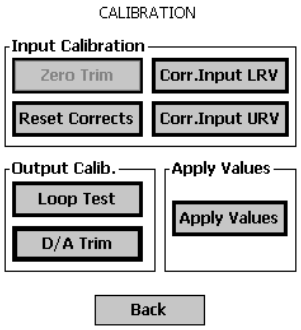
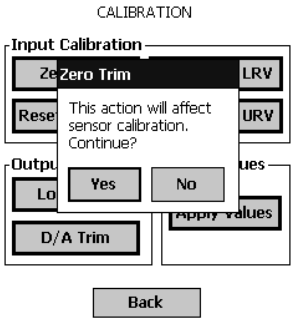
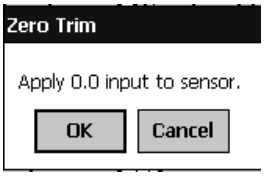
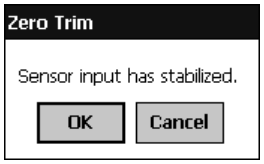
Honeywell HART Diagnostics/Service Menu Procedures			
Device Status	The Critical status block lists the conditions that render the transmitter device inoperable. The Non-Critical status block lists advisories of conditions that are noteworthy, but that do not cause non-operability. Refer to the section on Messages and Diagnostic Codes.		
Write Protect	The **Write Protect** function is available for the Honeywell STT 250 Temperature Transmitter. Provides write protection for all parameters. To enable write protection, select Write protected, then select the **Send** button. To disable Write Protection, select Not write protected, enter the password, and then select the Send button.	 The password can be changed only when Not Write Protected. To **Change Password**, select the Start button, type in the new password, and then select the **Send** button.	

Table 12 Honeywell HART Calibration - Zero Trim

Honeywell HART Calibration Zero Trim		
Overview of Objectives	**Requirements:** • Input source, with accuracy of at least 0.04% • resistor, at least 250-ohms • Voltmeter or Ammeter • 24 Vdc Power Supply (nominal) • Clean work area with suitable environmental conditions. • Pressure Transmitter must be level. **Overview of Procedures:** The Zero-Correct procedure establishes the correct ***vertical positioning*** of the response profile. The LRV Correct and URV Correct procedures establish the correct ***slope*** of the response profile by rotating the response profile around the zero-reference point as a pivot. The Zero-Correct procedure can be done at any time during the Correct LRV and Correct URV procedures in the same calibration session. The Correct LRV and Correct URV procedure should never be performed without first performing the Correct Input (Zero) procedure in the same calibration session. The transmitter should be removed from service and moved to a clean area. The input source should be derived from a precision input source such as a dead-weight tester.	**Objective(s):** Using a precision PV input source as a reference, command the transmitter to write calibration coefficients to NVM associated with transmitter input hardware and software. • Correct Input (Zero) • Correct LRV • Correct URV  

<table>
<tr><th colspan="4">Honeywell HART Calibration Zero Trim</th></tr>
<tr><td>Menu</td><td><u>Honeywell ST 3000</u>
(Note - Zero Trim is available.)
 
</td><td><u>Honeywell STT 3000</u>
(Note - no Zero Trim.)
 
</td><td></td></tr>
<tr><td>Zero Trim</td><td>NOTE:
This procedure will change LRV and URV settings.
Select Zero Trim. The first of a series of Pop-Up messages appears.
 
</td><td>To acknowledge the message, select the Yes button; another message appears.
 
</td><td>Apply the zero-reference input source to the sensor.
Select the OK button, and wait for this message:
 

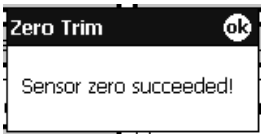
Select the OK button; the following message should appear.
 
</td></tr>
</table>

Table 13 Honeywell HART Calibration - LRV and URV

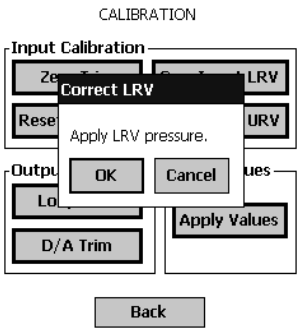
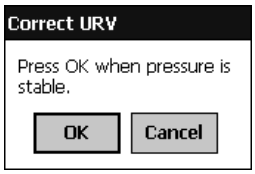
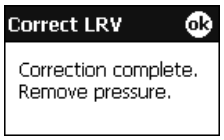
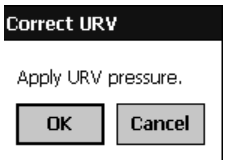
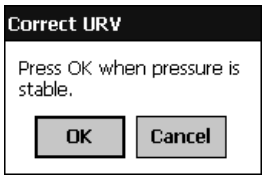
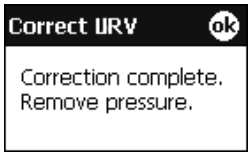
Correct LRV	Select **Corr. Input LRV**  Connect precision input pressure source, and set to the desired Lower Range Value.	Ensure that pressure input source is correct and is not varying. Then, to set the LRV parameter in the transmitter to the applied value, select **OK** in the pop-up window.  	The LRV value is stored in the transmitter. 
Correct URV	Select **Correct Input URV**.  Connect precision input pressure source, and set to the desired Upper Range Value.	Ensure that pressure input source is correct and is not varying. Then, to set the LRV parameter in the transmitter to the applied value, select **OK** in the pop-up window.  	The URV value is stored in the transmitter. 

Table 14 Honeywell HART Calibration - Reset corrects

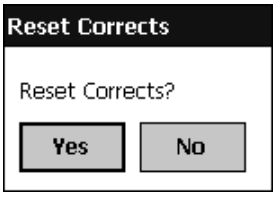
Reset Corrects	**Note:** This function commands the transmitter to overwrite all user input corrections with factory default ("characterization") values. It is intended for use only when excessive corrections render the transmitter inaccurate.	Select the **Reset Corrects** button. 	.

Table 15 Honeywell HART Calibration - Loop Test

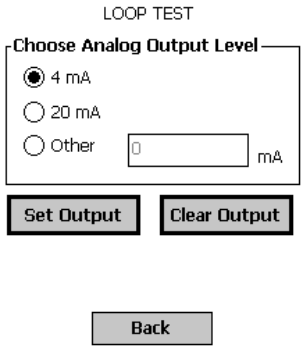
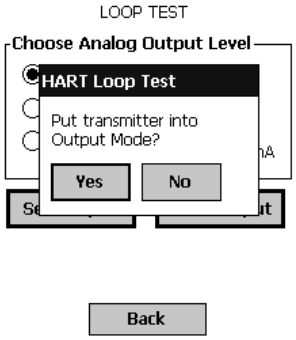
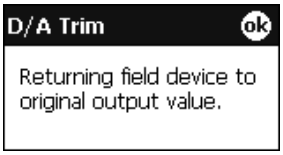
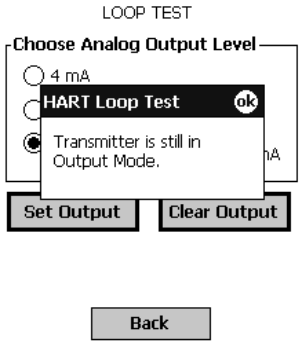
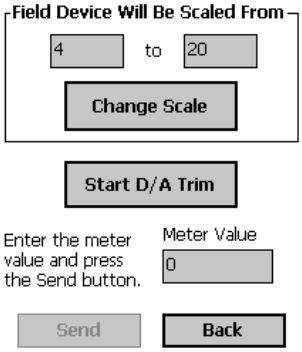
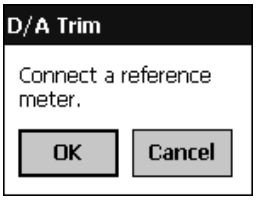
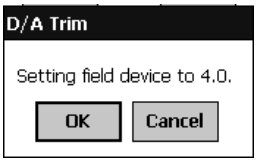
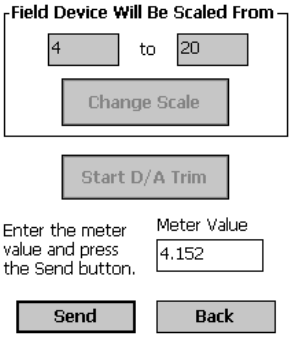
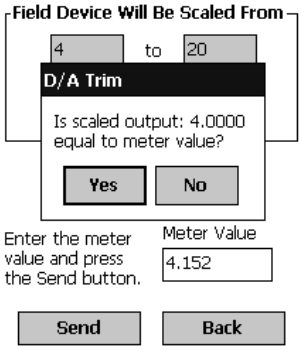
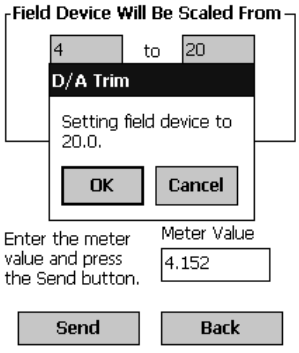
Honeywell HART Calibration - Loop Test			
Loop Test	This function verifies the integrity of the physical components of analog output loop current in a process application To observe output current levels, connect a voltmeter or current meter into the current loop.		Select the desired current level, then select **Set Output**. 
	Observe the meter, and select **Yes** in the popup message to command the transmitter to go to the selected current level. To return to the input-dependent current level, select **Clear Output**; this popup message appears. 	If the **Back** button is selected before using the Clear Output command, the message at right appears. To go back to the Calibration Menu, select **OK** in the popup, select the **Clear Output** button, then select the **Back** button.	

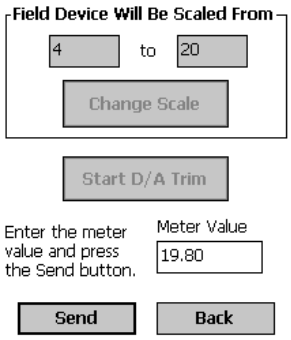
Table 16 Honeywell HART Calibration - D/A Trim

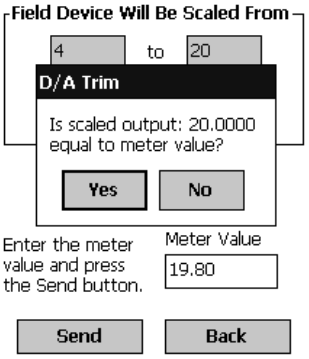
Honeywell HART Calibration - D/A Trim			
D/A Trim	**NOTE:** This procedure calibrates the value of the analog output current at minimum (0%) and maximum (100%) values. To begin, select the **D/A Trim** button on the Calibration menu. .	This display appears. 	Select the **Start D/A Trim** button. A popup message appears. 
Calibrate 4 mA Output	Connect a voltmeter or ammeter into the current loop. Then, select the **OK** button in the popup; the next message popup appears. 	Observe the meter, and select the **OK** button in the popup message to command the transmitter to go to 4.0 mA output. In the Meter Value field, key-in the value (in milliamps) observed on the meter, as indicated in the example at right. Note: If you are using a voltmeter, use the calculator to convert the voltage value to mA.	In this example, the observed value of 1.038 V is converted to 4.152 mA. 
	Select **Send**; the keyed-in value is copied to the transmitter output algorithm. Again, observe the resulting mA output on the connected meter. If the observed value ***is not*** 4.000 mA, select **No** in the popup message, enter the observed current value, and select Send. Repeat until the observed value is 4.000 mA.	If the observed value ***is*** 4.000 mA, select **Yes**. The popup message shown at right appears. 	Select **OK** to proceed to 20.0 mA calibration. 

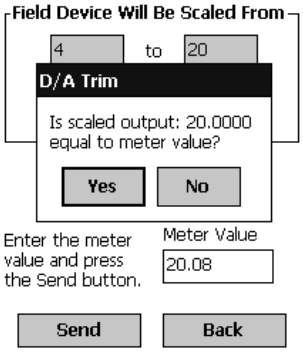
<table>
<tr><th colspan="4">Honeywell HART Calibration - D/A Trim</th></tr>
<tr>
<td>Calibrate 20 mA Output

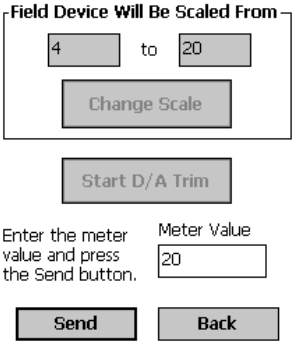
(Example 1)</td>
<td>The 20 mA calibration display appears.

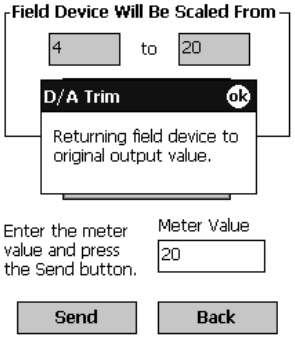
Again, observe the resulting mA output on the connected meter.</td>
<td>In the example at right, meter indication of 4.97 V is converted to 19.80 mA and entered into the Meter Value field.

Select Send to copy the entered value to the transmitter output algorithm.</td>
<td> 
</td>
</tr>
<tr>
<td>Calibrate 20 mA Output

(Example 2)</td>
<td> 
</td>
<td>In the example at right, the corrected value was 5.02 V (20.08 mA).

This new value is entered and Send is selected again.</td>
<td> 
</td>
</tr>
<tr>
<td></td>
<td>The new value is observed as 5.00 V (20.00 mA), which is entered into the Meter Value field.

 
</td>
<td>When the Send button is selected, this display appears.

 
</td>
<td>The calibration is completed, but the 20.00 mA calibration value is retained until OK in the popup message is selected.

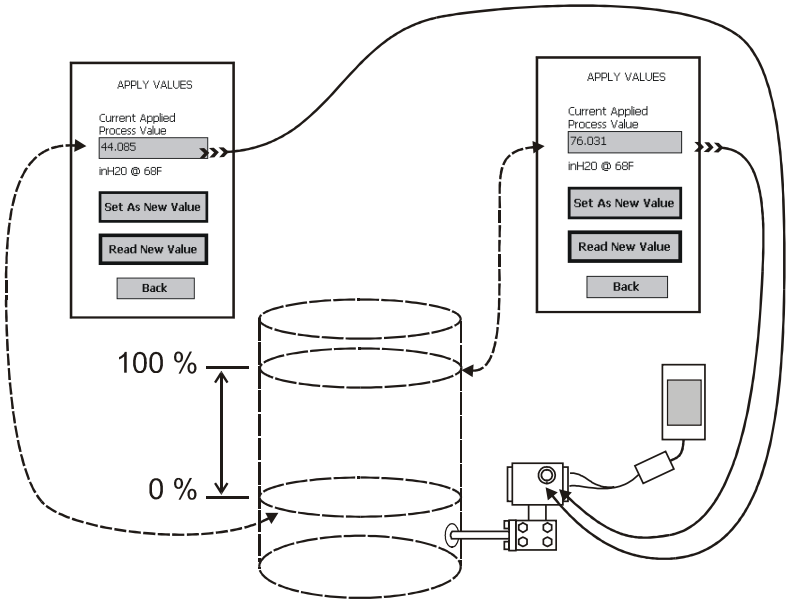
When the OK button is selected, the output current goes back to tracking the input value, and the popup message disappears.

Select Back to return to the CALIBRATION menu.</td>
</tr>
</table>

Table 17 Honeywell HART Calibration - Apply Values

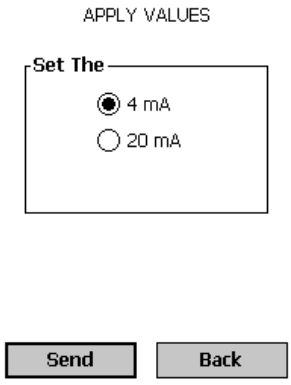
<table>
<tr><th colspan="4">Honeywell HART Calibration - Apply Values</th></tr>
<tr><td>Overview of Objectives</td><td colspan="3">

Manually set Process Variable input to 0%, and apply this value to Set LRV (output) at 4 MA.
Manually set Process Variable input to 100%, and apply this value to set URV (output) at 20 mA.

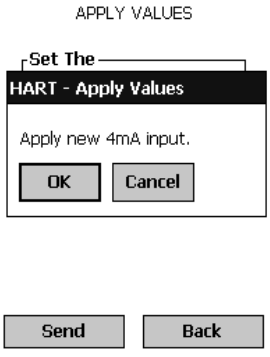


</td></tr>
<tr><td>(Adjust and View Process Variable input value at LRV.)</td><td>This function uses actual process values to calibrate input of LRV and URV.

Physically observe the value of the Process Variable, and adjust it manually to the desired LRV value.

Select the Apply Values button on the Calibration menu; the display at right appears.</td><td> 
</td><td>Select the Send button.

This popup message appears.

 
</td></tr>
</table>

<table>
<tr><th colspan="4">Honeywell HART Calibration - Apply Values</th></tr>
<tr><td>Apply Values:

LRV</td><td colspan="2">Select the OK button. The display at right appears.

The Current Applied Process Value field shows the value of the Process Value. A new sample of the input level is displayed each time the user selects the Read New Value button.

Adjust the process variable to the desired value while repeatedly selecting the Read New Value button to monitor and verify the input value.</td><td>APPLY VALUES

Current Applied Process Value
-0.00557375
psi
Set As New Value
Read New Value
Back</td></tr>
<tr><td>(Write input value as LRV.)</td><td>When the Process Variable is stabilized at the desired input level, select the Set New Value button.

The popup at right appears.

Select the OK button to write the input value as the LRV calibration value; and the popup message box will disappear.</td><td>APPLY VALUES

HART - Apply Values
Apply current applied value to LRV?
OK Cancel
Read New Value
Back</td><td>APPLY VALUES

Set The
4 mA
20 mA
Send Back</td></tr>
<tr><td>(Adjust and View Process Variable input value at URV.)</td><td>Select the 20 mA button. The popup at right appears.

APPLY VALUES
Set The
4 mA
20 mA
Send Back</td><td>This display at right is the same one used for applying PV input as LRV value.

Adjust the PV input to the desired URV level while using the Read New Value button for monitoring.</td><td>APPLY VALUES

Current Applied Process Value
12.282
psi
Set As New Value
Read New Value
Back</td></tr>
</table>

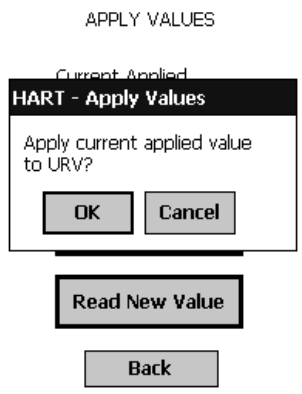
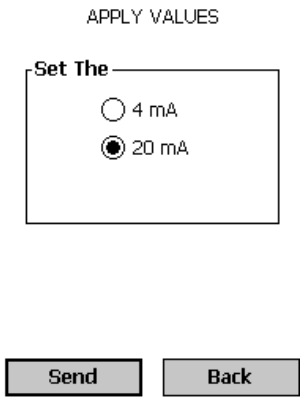
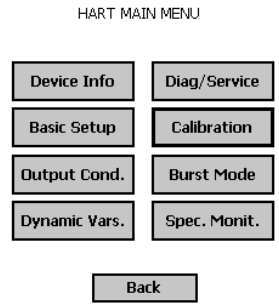
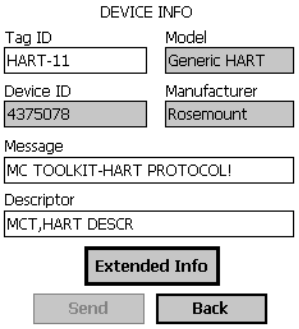
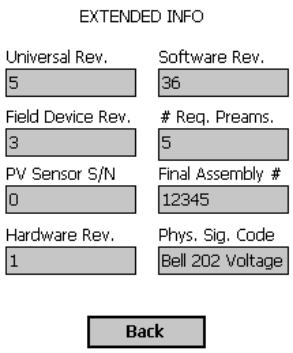
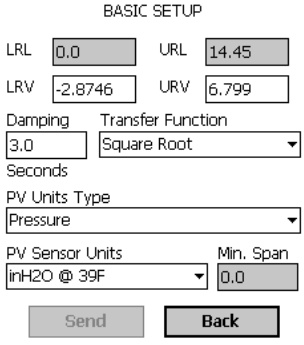
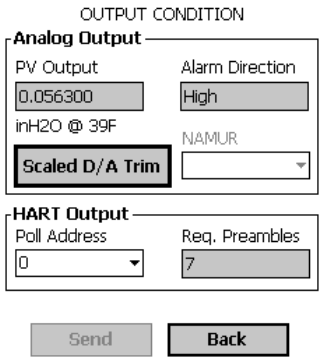
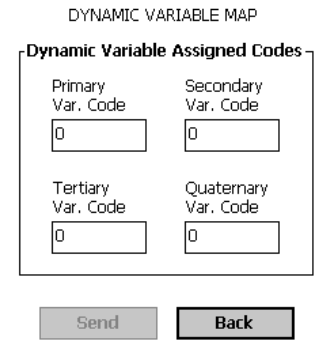
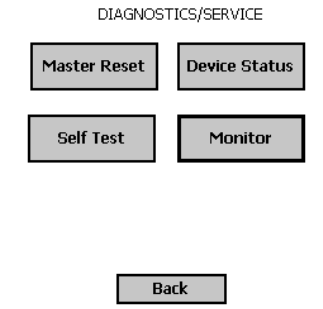
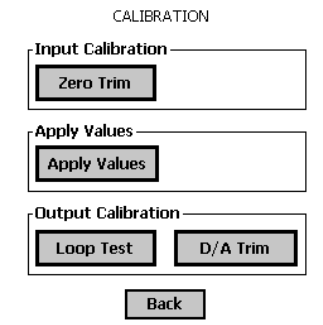
Honeywell HART Calibration - Apply Values			
(Write input value as URV.)	When the PV is stabilized, select the **Set as New Value** button. This popup at right appears. Select the **OK** button to write the input value as the URV calibration value; and the popup message box will disappear.		

Table 18 HART Main Menu Procedures (non-Honeywell Transmitters)

HART Main Menu Procedures (non-Honeywell Transmitters)			
HART Main Menu			
Device Info		Tag ID (R/W) up to 8 Alphanumeric characters Message (R/W) up to 32 Alphanumeric characters Descriptor (R/W) up to 16 Alphanumeric characters Note: Check site policies for appropriate entries. Selecting the **Extended Info** button calls up read-only information that was written to non-volatile memory by the device manufacturer.	
Basic Setup		LRV (r/w) Real Number, between values of LRL and URL URV (r/w) Real Number, between values of LRL and URL Damping (r/w) Noise-filtering factor (in seconds - select) Transfer Function (r/w) (Select from list) PV Units Type (r/w) (Select from list.) PV Sensor Units Type (r/w) (Select from list.)	PV Units Type (r/w) (Select from list.) PV Sensor Units Type (r/w) (Select from list.) **Note:** Refer to the Reference Data section on for lists of selections for each parameter.

HART Main Menu Procedures (non-Honeywell Transmitters)			
Output Condition		Analog Output: • PV Output (current value) • Alarm Direction - Low/High • Scaled D/A Trim Calls the D/A Trim display. (Refer to Table 23 for more information.)	HART Output: • Poll Address - Select (0-15), the select **Send** Req. Preambles - Number of requested preambles
Dynamic Variables		Displays the Device Variable numbers that are assigned to the Primary, Secondary, Tertiary, and Quaternary variables. Can also be assigned by the user.	
Diagnostics /Service		For more information, refer to Table 19.	
Calibration		For more information, refer to: Table 20 (Zero Trim) Table 21 (Apply Values) Table 22 (Loop Test) Table 23 (D/A Trim)	

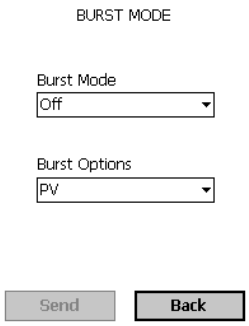
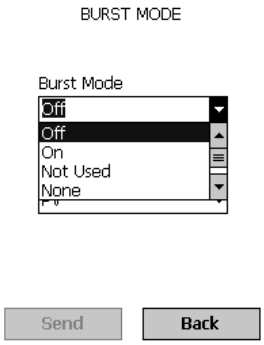
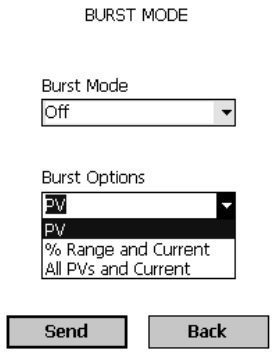
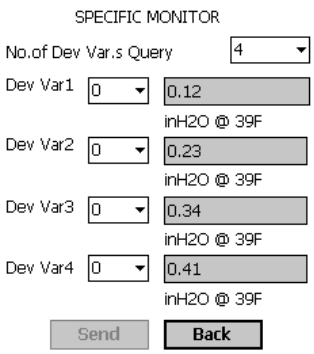
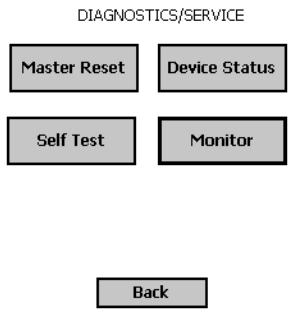
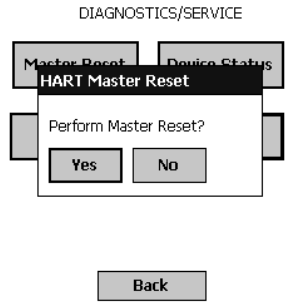
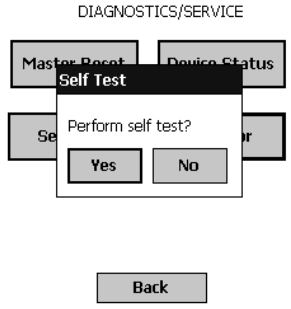
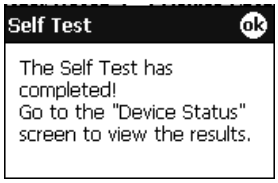
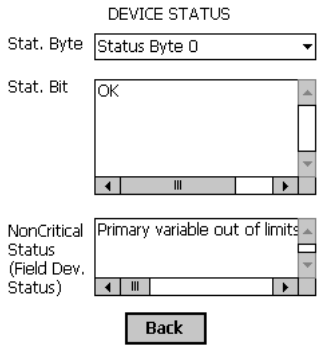
HART Main Menu Procedures (non-Honeywell Transmitters)			
Burst Mode		Burst Mode - select Off or On. 	Burst Options - select PV or % Range and Current or all PVs and Current. 
Spec. Monitor	Enables the user to view outputs of up to four variables. For more information, refer to the user manual for the transmitter.		No. of Dev Var.s Query - Select number (1-4) of variables to be viewed Dev Var n - select index number of variable. (Refer to the user manual for the field device.)

Table 19 HART Diagnostics/Service (non-Honeywell Transmitters)

HART Diagnostics/Service (non-Honeywell Transmitters)			
Diagnostics /Service Menu			
Master Reset		Selecting the **Master Reset** button, and then the **Yes** button in the popup message commands the transmitter to perform the equivalent of a power cycle.	The parameters that are affected vary with device type; refer to the user manual for the transmitter.
Self Test		Selecting the **Self Test** button, and then the **Yes** button in the popup message commands the transmitter to perform a self-diagnostic test.	When the Self-Test is completed, this popup message appears. 
Device Status		This display indicates which status bits are/are not set. Refer to the user manual for the transmitter for status information. For status information, refer to the user manual for the field device.	

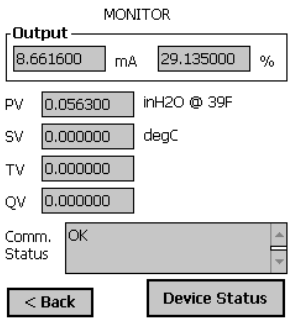
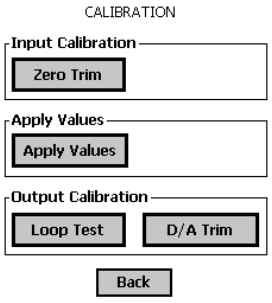
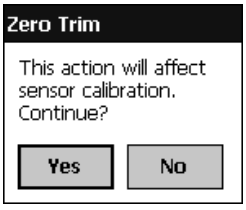
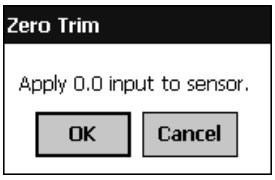
HART Diagnostics/Service (non-Honeywell Transmitters)			
Monitor	The Monitor display enables viewing of transmitter status and of the value of the output. PV - Primary variable SV - Secondary variable TV - Tertiary variable QV - Quaternary variable		Selecting the **Device Status** button calls up the DEVICE STATUS display (see above). For status information, refer to the section on Messages and Diagnostic Codes.

Table 20 HART Calibration - Zero Trim (non-Honeywell Transmitter)

<table>
<tr><th colspan="4">HART Calibration - Zero Trim (non-Honeywell Transmitter)</th></tr>
<tr><td>Overview of Objective</td><td colspan="3">Requirements:
• Precision input source
• (See Note at right.)
Overview:
The Zero-Trim procedure establishes zero reference point of the input-response profile.</td></tr>
<tr><td></td><td colspan="3">Note:
This procedure outlines the steps for using the MC Toolkit with various non-Honeywell HART transmitters.
For specific requirements, refer to the user manual for the transmitter being calibrated.</td></tr>
<tr><td>Zero Trim</td><td> 
</td><td>Select Zero Trim. The first of a series of pop-up message appears.
 
</td><td> 

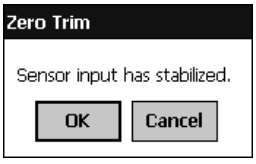
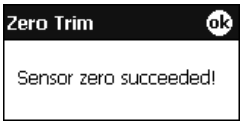
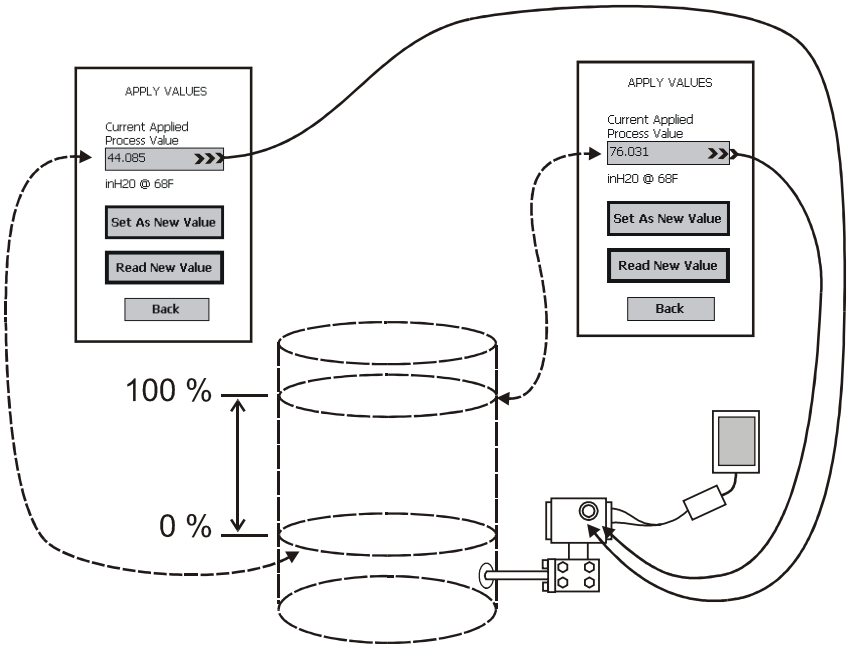
Apply the zero-reference input source to the sensor.</td></tr>
<tr><td></td><td>Wait for the message at right to appear.
Then, select the OK button.</td><td> 
</td><td> 
</td></tr>
</table>

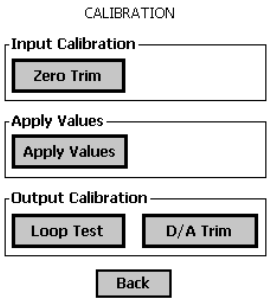
Table 21 Calibration - Apply Values (non-Honeywell Transmitter)

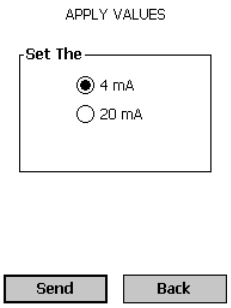
<table>
<tr><th colspan="4">Calibration - Apply Values (non-Honeywell Transmitter)</th></tr>
<tr><td>Overview of Objectives</td><td colspan="3">

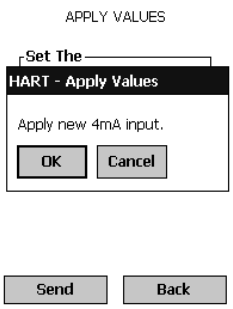
Manually set Process Variable input to 0%, and apply this value to Set LRV (output) at 4 MA.
Manually set Process Variable input to 100%, and apply this value to set URV (output) at 20 mA.



</td></tr>
<tr><td>Apply Values

(4mA - LRV)</td><td>


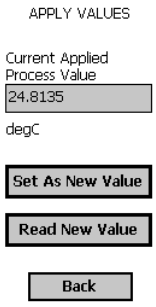
Select Apply Values.
</td><td>


Select 4mA.
</td><td>


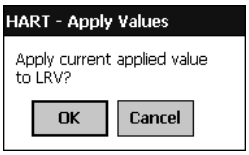
</td></tr>
</table>

<table>
<tr><th colspan="4">Calibration - Apply Values (non-Honeywell Transmitter)</th></tr>
<tr><td></td><td>Select the OK button. The display at right appears.

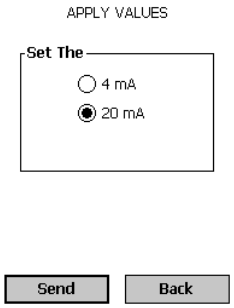
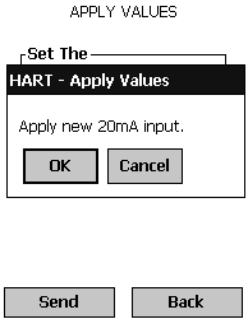
The Current Applied Process Value field shows the value of the Process Value. A new sample of the input level is displayed each time the user selects the Read New Value button.

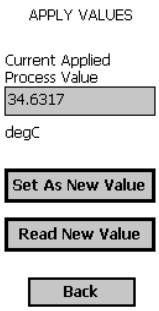
Adjust the process variable to the desired LRV while repeatedly selecting the Read New Value button to monitor and verify the input value.</td><td> 

When the Process Variable is stabilized at the desired input level, select the Set New Value button.

The popup at right appears.</td><td> 

Select the OK button to write the input value as the LRV calibration value; the popup message box will disappear.</td></tr>
<tr><td rowspan="2">Apply Values

(20 mA-URV))</td><td>Select the 20 mA button. The popup at right appears.
 
</td><td> 

Adjust the process variable to the desired LRV while repeatedly selecting the Read New Value button to monitor and verify the input value.</td><td> 

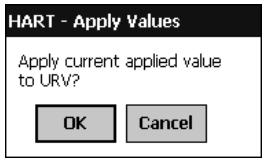
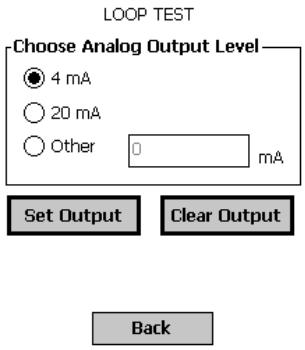
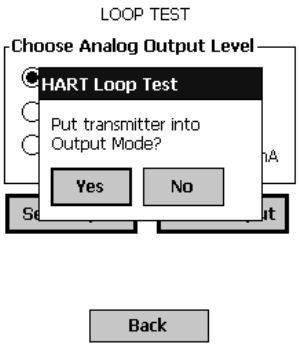
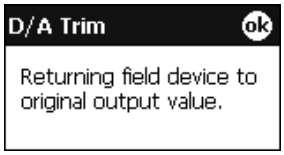
When the Process Variable is stabilized at the desired input level, select the Set New Value button.</td></tr>
<tr><td>This popup message appears.
 
</td><td>Select the OK button to write the input value as the URV calibration value.</td><td></td></tr>
</table>

Table 22 HART Calibration - Loop Test (non-Honeywell Transmitters)

<table>
<tr><th colspan="4">HART Loop Test (non-Honeywell Transmitters)</th></tr>
<tr><td rowspan="2">Loop Test</td><td>This function verifies the integrity of the physical components of analog output loop current in a process application

To observe output current levels, connect a voltmeter or current meter into the current loop.</td><td> 
</td><td>Select the desired current level, then select Set Output.
 
</td></tr>
<tr><td>Observe the meter, and select Yes in the popup message to command the transmitter to go to the selected current level.

To return to the input-dependent current level, select Clear Output; this popup message appears.
 
</td><td>If the Back button is selected before using the Clear Output command, the message at right appears.

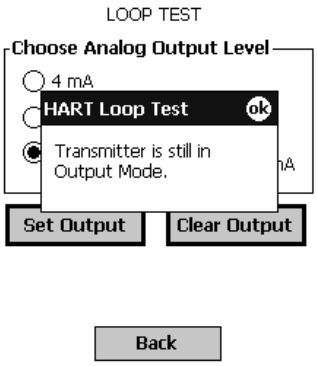
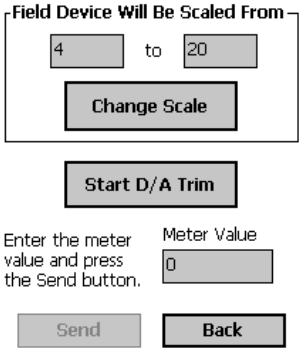
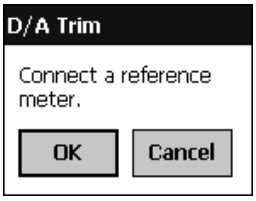
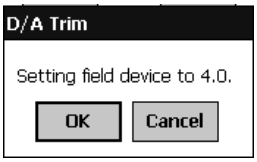
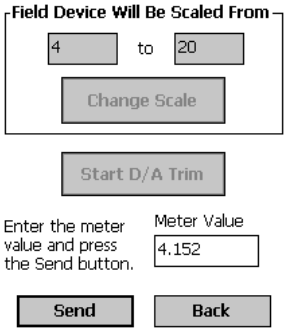
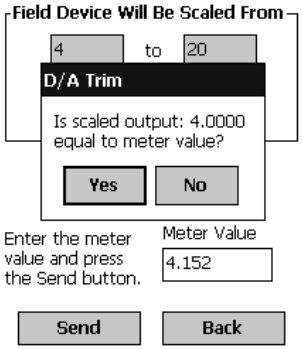
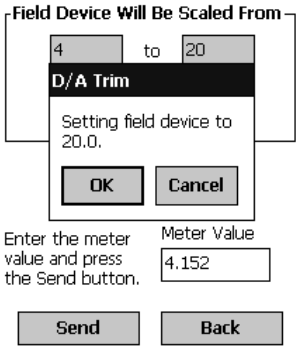
To go back to the Calibration Menu, select OK in the popup, select the Clear Output button, then select the Back button.</td><td> 
</td></tr>
</table>

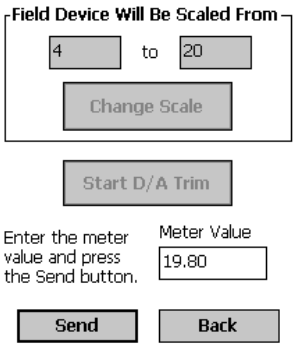
Table 23 HART Calibration - D/A Trim (non-Honeywell Transmitters)

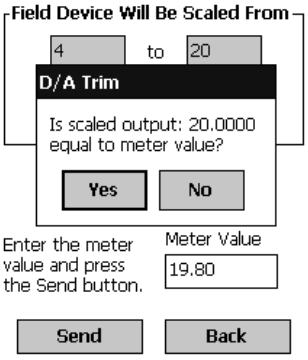
Honeywell HART Calibration - D/A Trim			
D/A Trim	**NOTE:** This procedure calibrates the value of the analog output current at minimum (0% and maximum (100%) values. To begin, select the **D/A Trim** button on the Calibration menu. .	This display appears. 	Select the **Start D/A Trim** button. A popup message appears. 
Calibrate 4 mA Output	Connect a voltmeter or ammeter into the current loop. Then, select the **OK** button in the popup; the next message popup appears. 	Observe the meter, and select the **OK** button in the popup message to command the transmitter to go to 4.0 mA output. In the Meter Value field, key-in the value (in milliamps) observed on the meter, as indicated in the example at right. Note: If you are using a voltmeter, use the calculator in the PDA to convert the voltage value to mA.	In this example, the observed value of 1.038 V is converted to 4.152 mA. 
	Select **Send**; the keyed-in value is copied to the transmitter output algorithm. Again, observe the resulting mA output on the connected meter. If the observed value ***is not*** 4.000 mA, select **No** in the popup message, enter the observed current value, and select Send. Repeat until the observed value is 4.000 mA.	If the observed value ***is*** 4.000 mA, select **Yes**. The popup message shown at right appears. 	Select **OK** to proceed to 20.0 mA calibration. 

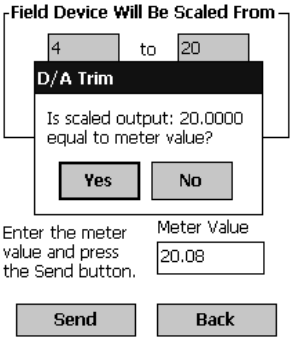
<table>
<tr><th colspan="4">Honeywell HART Calibration - D/A Trim</th></tr>
<tr>
<td>Calibrate 20 mA Output

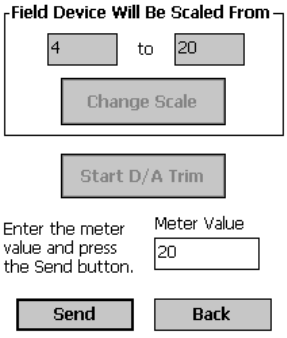
(Example 1)</td>
<td>The 20 mA calibration display appears.

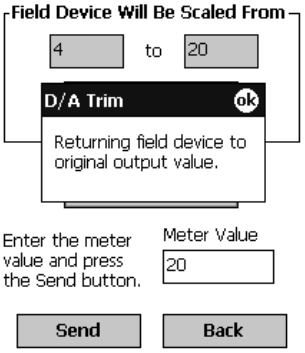
Again, observe the resulting mA output on the connected meter.</td>
<td>In the example at right, meter indication of 4.97 V is converted to 19.80 mA and entered into the Meter Value field.

Select Send to copy the entered value to the transmitter output algorithm.</td>
<td> 
</td>
</tr>
<tr>
<td>Calibrate 20 mA Output

(Example 2)</td>
<td> 
</td>
<td>In the example at right, the corrected value was 5.02 V (20.08 mA).

This new value is entered and Send is selected again.</td>
<td> 
</td>
</tr>
<tr>
<td></td>
<td>The new value is observed as 5.00 V (20.00 mA), which is entered into the Meter Value field.

 
</td>
<td>When the Send button is selected, this display appears.

 
</td>
<td>The calibration is completed, but the 20.00 mA calibration value is retained until OK in the popup message is selected.

When the OK button is selected, the output current goes back to tracking the input value, and the popup message disappears.

Select Back to return to the CALIBRATION menu.</td>
</tr>
</table>

Messages and Diagnostic Codes

Messages and Diagnostic Codes

Table 24 MC Toolkit Error Messages

MC TOOLKIT ERROR MESSAGES	
MESSAGE	CORRECTIVE ACTION
Another Secondary master has been detected! HART Protocol does not support more than one secondary master on the HART Network.	Remove one of the secondary masters from the network.
Checksum error on Modem Response!	A noisy environment can cause this error. Repeat the command again.
Com Port Read Timeout!	Ensure that the Honeywell supplied modem cable is used and that the connections are secure. Make sure the modem has a good battery.
Com read Error! Error writing to Com Port! Error writing to Com Port! EscapeCom function Error! GetCommState Error!	Make sure ActiveSync is not running. If several programs are active, try closing one or more open programs. Stop the MC Toolkit application by doing File | Exit and restart the program. Use the Pocket PC hardware reset. See your Pocket PC documentation reset the unit. Caution: If the Symbol PPT 2800 computer is reset, it will lose all its installed programs and data. The program will have to be installed again. Make sure you are using a Honeywell approved Pocket PC.
Host Failed to get good response from the Modem!	Ensure that the Honeywell supplied modem cable is used and that the connections are secure. Make sure the modem has a good battery.
Invalid Command number from the Modem!	Communications problem between the Pocket PC and the modem. Repeat the command again.
Invalid Handle Value!	Make sure ActiveSync is not running. If Several programs are active, try closing one or more open programs. Stop the MC Toolkit application by doing File | Exit and restart the program. Use the Pocket PC hardware reset. See your Pocket PC documentation reset the unit. Caution: If the Symbol PPT 2800 computer is reset, it will lose all its installed programs and data. The program will have to be installed again. Make sure you are using a Honeywell approved Pocket PC.

MC TOOLKIT ERROR MESSAGES	
Memory Error	If several programs are active, try closing one or more open programs. Too many programs installed in the Pocket PC. Check the Pocket PC free memory. Uninstall programs if need to release memory. Too many data files in the Pocket PC. Check the Pocket PC free memory. Delete unused data files to release memory. Use the Pocket PC hardware reset. See your Pocket PC documentation reset the unit. Caution: If the Symbol PPT 2800 computer is reset, it will lose all its installed programs and data. The program will have to be installed again.
Message length is longer than expected	Communications problem between the Pocket PC computer and the modem. Repeat the command again.
Message length is shorter than expected	
Modem bad checksum	This could indicate a defective modem. Repeat the command again. If the problem persist contact Honeywell TAC.
Modem Buffer overflow	Communications problem between the Pocket PC computer and the modem. Repeat the command again.
Modem busy	
Modem framing error	
Modem illegal command	
Modem illegal data	
Modem network error	
Modem Transmitter Serial Error!	
No Response from the Transmitter	Make sure that the MC Toolkit field connections are connected to the transmitter. Verify the transmitter is wired correctly and that it is powered. If connected to a DE transmitter, make sure the polarity of the cables connecting to the transmitter is correct. If connected to a HART transmitter, make sure the address number is correct. Make sure the correct protocol for the transmitter is selected. A defective transmitter can also cause this error message. Verify that a 250 ohm resistor in series with the transmitter.
Resume Monitor Thread Failed!	Close all the other running applications. Restart MC Toolkit application.

MC TOOLKIT ERROR MESSAGES	
Serial Port is not Available	Make sure ActiveSync is not running. If Several programs are active, try closing one or more open programs. Stop the MC Toolkit application by doing File | Exit and restart the program. Use the Pocket PC hardware reset. See your Pocket PC documentation reset the unit. Caution: If the Symbol PPT 2800 computer is reset, it will lose all its installed programs and data. The program will have to be installed again. Make sure you are using a Honeywell approved Pocket PC.
SetCommMask Error!	
SetCommState Error!	
SetCommTimeouts Error!	
Suspend monitor Thread Failed! Upload Cannot Continue.	System failed to suspend the monitor function
Too Many bytes received on ComPort!	Repeat the command. If the problem persist contact Honeywell TAC.
Transmitter-Modem Receive Buffer overflow!	This could indicate a software problem with the MC Toolkit Software. Repeat the command again. If the problem persist contact Honeywell TAC.
Unknown Error!	This could indicate a defective modem. Repeat the command again. If the problem persist contact Honeywell TAC.

Table 25 DE Messages

DE MESSAGES	
Write NVM Failed	Write to transmitter Non-Volatile Memory failed.
Unknown Device	MC Toolkit does not support this transmitter.
Invalid Range	User-entered value is too high or too low.
Invalid Request	This transmitter does not support the command requested.
NACK	MC Toolkit sensed Non-Acknowledgement of message to the Transmitter.
Illegal Operation	Typically caused by an invalid parameter or an attempt to perform an operation in a mode not allowed by the transmitter.
Transmitter in Local Mode	Transmitter in Factory Mode
Transmitter is Busy	Transmitter was communicating when MC Toolkit sent message to transmitter.
Invalid operation on Write Protected Field	Attempt to write to a protected field.
Undefined Gross Status Byte from the Transmitter	The transmitter has reported a status indication not understood by MC Toolkit.
Gross Status Reserved Bit Set	The transmitter has reported a status indication not understood by MC Toolkit.
Data Inaccessible	Unable to access the parameter value.
Bad character in Scratchpad	The scratchpad contains an invalid data byte.
Invalid Float value	Value is not a valid floating point value.
Value Out of Range	User-entered number is too high or too low.
Transmitter is in DE Mode. D/A Trim is allowed only in Analog Mode.	DE mode is digital only (no digital-to-analog conversion).
The transmitter is in Output Mode. Are you sure you want to terminate the connection?	User tried to Exit MC Toolkit application while the DE Transmitter is still in Output Mode.
The changes you have made are about to be sent to the transmitter. Continue?	Values entered into this display will be written into transmitter memory.
Please make sure you are connected to a DE device. Sending DE commands to a non-DE device could potentially cause a process upset.	DE communications (~ 4-20 mA amplitude) could cause erroneous transmission in non-DE protocols.
Leaving the Main Menu will require an upload in order to return. Are you sure you want to do this?	A new Upload will require approximately 60-second wait.
Put loop in Manual ... Trips secured?	Changing values of transmitter parameters can cause process upset.

DE MESSAGES	
Conformity must be square root to select this unit.	Units for Flow indications are available only when Square Root conformity is selected.
Are you sure you wand to Reset All Corrects to factory defaults?	Executing Reset All Corrects will overwrite all user input calibration values (Zero, LRV, URV) with factory-default values.
Are you sure you want to place the transmitter in output mode (?)	In Output Mode, output current will be set to the selected constant value, rather than to calculated
Square Root is not allowed for GP and AP Sensor Types.	Square Root conformity is available only for FLOW (DP) input applications.

Table 26 HART Messages

HART MESSAGES	
Bad Manufacturer Code	MC Toolkit does not recognize the manufacturer code from the transmitter.
Bad Status code from the transmitter	MC Toolkit does not recognize the status code from the transmitter.
Bad Start character on HART Message!	First byte in HART response message is not a valid byte(valid bytes:0x02,0x82,0x06,0x86,0x01,0x81)
Device specific command error	Possible error codes 6, 8, 9, 10, 11, 12, 13, 14 and 15. Subset of these is defined for commands. If any value other than these subset values, this message is displayed.
Error code 02: Invalid Selection	The selection is not valid.
Error code 03:Passed parameter too large	Entered value is too large.
Error code 04:Passed parameter too small	Entered value is too small.
Error code 05:Too few data bytes received	Internal error. Repeat command.
Error code 06:Wrong Password!	The password entered is incorrect.
Error code 07:In Write Protect Mode	The transmitter is in Write Protect Mode.
Error Code 08:Set to Nearest Possible Value	Set to Nearest Possible Value
Error Code 09:Applied process too high	Applied process too high or out of range.
Error code 09:LRV too high	LRV is too high or out of range.
Error Code 09:Not in Proper Current Mode	Not in Proper Current Mode
Error Code 10:Applied process too low	Applied process too low or out of range.
Error code 10:LRV too low	LRV too low or out of range.
Error Code 11:Excess correction attempted	Attempted correction value is out of range.
Error Code 11:Invalid Transmitter variable	Selected variable is invalid for this transmitter.
Error Code 11:Transmitter in Multidrop Mode!	Action could not be completed because the transmitter is in multidrop mode.
Error code 11:URV too high	URV too high or out of range.
Error Code 12:Invalid Units	Invalid Units
Error code 12:URV too low	URV too low or out of range.
Error code 13:Parameter out of limits	Parameter is out of the valid range.
Error code 14:Span Too Small	Span Too Small
Error Code 14:Warning:New LRV pushed URV over Sensor Limit	The new URV has caused the URV to go over the sensor limits.
Error code 16:Access restricted	Access to the parameter is not allowed.
Error code 32:Device is Busy!	Device is currently busy; try command again.
Error Code 64: Command not implemented in the Transmitter!	Action is not supported by the transmitter.

HART MESSAGES	
Error on Burst Response!	The burst message contained a communications error.
HART Communication Error!	MC Toolkit detected a communications error in the HART message.
Invalid command number from the Transmitter. Please make sure that another secondary master is not on the network!	The HART protocol supports only one secondary master on the network.
Manufacturer Code not be found	Manufacturer Code not be found
No device found!	No HART devices could be found on the network.
Non primary variable out of limits	Process applied to the non-primary variable is outside the operating limits of the field device.
Parity Error!	Bit 6 on first response code byte set. MC Toolkit detected a communications error in the HART message.
Overrun Error!	Bit 5 on first response code byte set
Framing Error!	Bit 4 on first response code byte set. MC Toolkit detected a communications error in the HART message.
Checksum Error!	Bit 3 on first response code byte set
Reserved Field Error!	Bit 2 on first response code byte set
Receive Buffer Overflow!	Bit 1 on first response code byte set
Primary variable out of limits	Process applied to the primary variable is outside the operating limits of the field device.
Undefined Response code for the command associated with the current operation!	Response code (First byte) value 1 is returned from the transmitter. This response value is undefined in the currently supported HART devices

Table 27 ST 3000 Device Status Messages (DE)

ST3000 DEVICE STATUS MESSAGES (DE)	
CRITICAL	Meter Body Fault
	Characterization PROM Fault or bad checksum
	SUSPECT INPUT: The input process data seems wrong
	Electronics Fault(A). MDU/DAC Compensation Fault
	Electronics Fault(B)-RAM Fault
	Electronics Fault(C)-NVM Fault
	Electronics Fault(D)-NVM Fault
	Electronics Fault(E)-NVM Fault
NON CRITICAL	Meter Body Sensor Over Temperature(>125C)
	ZERO correction value is outside the acceptable limits for accurate operation
	SPAN correction value is outside the acceptable limits for accurate operation
	Transmitter is in the OUTPUT mode and is using a fixed output that is "not from the process"
	Meter Body Overload
	Meter Body Fault: The pressure input is greater than two times the URL of the transmitter
	Calibration correction values are Reset to Factory default
	Data for the DAC Temperature compensation is corrupted

Table 28 STT Device Status Messages (DE)

STT DEVICE STATUS MESSAGES (DE)	
CRITICAL	Power up self test failure
	Isolated Microprocessor Communications Failure: An electronics failure was detected on the isolated electronics
	An open circuit detected at the input. Note: Power cycling is not required to reset this critical status
	Factory calibration data is corrupted
	User Configuration data is corrupted
	Isolated microprocessor NVM write failure
	User NVM write failure
	STT body ambient temperature out of specification (-40 to +85 deg C)
NON CRITICAL	Uncertain or inconsistent input reading
	Input measurement is out of specification for this STT Configuration
	Low quality CJ compensation temperature reading
	The zero correction value is outside the acceptable limits for accurate operation
	The SPAN correction value is outside the acceptable limits for accurate operation
	The transmitter is in the OUTPUT MODE and using a fixed output that is ""not from the process""
	User correction active
	Suspect Input
	Backup thermocouple is active
	Input Status not Latched
	Custom Input Sensor
	Redundant T/C Mode
	Delta Temperature Mode
	4 wire RTD mode

Table 29 ST 3000 Device Status Messages (HART)

ST3000 DEVICE STATUS MESSAGES (HART)	
CRITICAL	Invalid Database
	PROM Failure
	Suspect Input
	DAC Diode Fault
	NVM Fault
	RAM Fault
	PROM Fault
	PAC Fault
NON CRITICAL	Sensor Over-temperature
	Excess Zero Correction
	Excess Span Correction
	In Output Mode
	M.B. Overload
	Meter Body Fault
	Corrects Reset
	No DAC Temp. Compensation
	Primary variable out of limits
	Non primary variable out of limits
	Loop current saturated - Analog output 1 and its digital representation are outside the operating limits of the field device.
	Loop current fixed - Analog output 1 and its digital representation are in fixed mode and are not responding to input changes.
	Cold Start A reset or self test of the device has occurred, or power has been removed or applied.
	Configuration changed
	Device Malfunction - Field device has malfunctioned due to a hardware error or failure.

Table 30 STT Device Status Messages (HART)

STT DEVICE STATUS MESSAGES (HART)	
CRITICAL	RAM Failure
	ADC Failure
	Input Open
	Factory Calibration Corrupted
	User Configuration Corrupted
NON CRITICAL	Ambient Temp. Out of Range
	Uncertain Input
	Input Out of Spec.
	Output Saturated
	In Current Fixed Mode
	User Correct Active
INFORMATION	Suspect Input
	Non-Latched
	4 Wires RTD/Ohm
	Primary variable out of limits
	Non primary variable out of limits
	Loop current saturated
	Loop current fixed
	Cold Start
	Configuration changed
	Device Malfunction

Reference Data

Table 31 Glossary

Item	Definition	Description
Conformity	Response form of sensor.	User selection of PV conversion algorithm: Linear or Square Root
D/A Trim	Digital to Analog Trim	Adjustment to digital-to analog (output) conversion algorithm that aligns minimum and maximum values of scaled digital range to minimum (0%) and maximum (100%) values of analog output.
Damping		Digital algorithm in transmitter MPU that reduces noise in a PV that is generated in the process or induced in transmitter components.
EU	Engineering Units	A standard scale of values, selected by the user from a standard set for convenient display and interpretation.
Input		1. Physical property (e.g., pressure) applied to a sensor 2. Digital value, calculated in the transmitter, that represents magnitude of the physical input
Local Meter		A device associated with a single transmitter and installed locally (in the transmitter housing) or remotely (in a separate housing) that displays variables sensed or calculated in the transmitter.
Loop Test		(In Analog Mode only) a set of commands from the HHC that causes the transmitter to provide 0% (4 mA) and 100% (20 mA) for testing proper operation of all components of the current loop.
LRL	Lower Range Limit	Minimum value in the useful range of the physical property of a transmitter at which a sensor can operate.
LRV	Lower Range Value	Minimum value in a continuous range of "normal" process values.
Meter Units		User-selected scale of values that provides for convenient interpretation of values in the associated transmitter.
Output		Analog or digital value, calculated from the input, that is transferred from the transmitter to a receiver (e.g., process control equipment)
PV	Process Variable	Measured magnitude of a primary physical property such as pressure or temperature.
PV Input		Physical property such as pressure or temperature, applied to an input sensor
PV Units	Process Variable Units	Standard scale of values of a PV, selected by the user for convenient display and interpretation.
Sensor Type		Standardized designation of the physical design property of a sensor (e.g., DP, AP for pressure TC, RTD for temperature.)

Item	Definition	Description
Span		The continuous range of values in the "normal" operating range of PV values (that is, URV-LRV).
SV	Secondary Variable	A measured physical value of a physical property (e.g., temperature) that relates to the measured primary physical property (e.g., pressure).
SV Units	Secondary Variable Units	Standard scale of values of an SV, chosen by the user for convenient display and interpretation.
URL	Upper Range Limit	Minimum value in the useful range of the physical property of a transmitter sensor can operate.
URV	Upper Range Value	Maximum value in a continuous range of "normal" process values.
SEND		Command from the HHC to copy the values of displayed parameters to either the transmitter to which it is connected, or to (NV? memory) in the HHC.

Honeywell DE Fields and Values

Table 32 DE Fields and Values

Dialog	Field	Value		
Device Info	Tag ID	Tag id (8 chars.)		
	Type	Transmitter type		
	Firmware version	Firmware version of the transmitter		
	Serial number	Serial number of transmitter		
	Scratch pad	32 chars.		
General	PV Type	Dual Range (STDC)	Single Range	Single Range w/SV
	Communication mode	Analog	DE 4 byte	DE 6 byte
	Failsafe Direction	Upscale	Downscale	
	Line Filter (STT only)	50 Hz	60 Hz	
	T/C Fault Detect (STT only)	Enabled	Disabled	
DE Configure	LRL, URL, LRV, URV	Floating point		
	PV Units (STT only)	°C °F	K	°R
	PV Units (ST only)	InH2O @ 39F InH2O @ 68F MmHg @ 0C Psi KPa	MPa mBar bar g/cm² kg/cm²	inHg @ 32F mmH2O @ 4C mH2O @ 4C ATM InH2O @ 60F
	SV Units	°C	°F	
	Sensor Type (STT only)	T/C J T/C K T/C T T/C S T/C R T/C E T/C B	T/C N RTD-PT100J Millivolts RTD-PT100D RTD-PT200 RTD-PT500 RTD-Ni500	RTD-Cu10 RTD-Cu25 T/C–RH Radiamatic T/C–W5W26 T/C–W3W25 Ohms T/C-NiNiMo
	Sensor Type (ST only)	DP	AP	GP
	Damping (STT only)	0.00 0.30 0.70 1.50	3.10 6.30 12.70	25.50 51.10 102.30
	Damping (ST only)	0.00 0.16 0.32 0.48	1.00 2.00 4.00	8.00 16.0 32.0

Dialog	Field	Value		
DE Configure (continued)	Span	Floating point	(URV – LRV)	
	Linearization (STT only)	Linear	Non-Linear	
	Conformity (ST only)	Linear	Square Root	
Auxiliary Configure (STT only)	Critical Status Latching	Enabled	Disabled	
	NAMUR	Enabled	Disabled	
	CJ Compensation	Internal	External	
	CJ Temperature	Floating point		
	Write Protection	Enabled	Disabled	
	Password	Write protection password (4 digits)		
Change Password (STT only)	New Password	4 digits		
	Confirm New Password	4 digits		
Monitor	Input	Transmitter input in engineering units (floating point)		
	Output	Transmitter output in percent (floating point)		
	SV	Secondary variable (floating point)		
Device Status	Gross Status	Critical	Non-Critical	Invalid Database
	Critical	Critical status strings		
	Non-Critical	Non-critical status strings		
Local Meter (ST only)	Meter Hardware	Full Functional Meter Meter, NO Local Span or Zero	No Meter, Local Span & Zero	No Meter Installed
	Meter Units	% inH2O @ 39F mmHg @ 0C psi kPa mPa	mBar bar g/cm² kg/cm² mmH2O @ 4C	mHg @ 0C mH2O 4C GPM GPH Custom
	Custom Units	8 characters		
	Flow EU Upper Value	Floating point		
	Flow EU Lower Value	Floating point		

Honeywell HART Fields and Values

Table 33 HART Fields and Values

Dialog	Field	Value		
Device Info	Tag ID	8 chars		
	Model	Transmitter type		
	Device ID	Transmitter's device ID		
	Manufacturer	String		
	Message	32 chars		
	Descriptor	16 chars		
Extended Info	Universal Rev.	Numerical		
	Software Rev.	Numerical		
	Field Device Rev.	Numerical		
	Poll Address	Numerical		
	# Req. Preams	Numerical		
	PV Sensor S/N	Numerical		
	Final Assembly #	Numerical		
	PROM ID	Numerical		
Basic Setup	LRL, URL, LRV, URV	Floating point		
	PV Sensor Units (ST only)	InH2O @ 68F InHg @ 0C FtH2O @ 68F MmH2O @ 68F MmHg @ 0C Psi	Bar Mbar g/cm² kg/cm² pascals kPa	Torr ATM InH2O @ 60F MPa InH2O @ 4C MmH2O @ 4C
	PV Sensor Units (STT only)	°C °F	°R Kelvin	MV Ohms
	Sensor Type (ST only)	DP	AP	GP
	SV Units	°C °F	°R	Kelvin
	Transfer Function	Linear	Square root	
	Damping (ST only)	0.00 0.16 0.32 0.48	1.00 2.00 4.00	8.00 16.0 32.0
	Damping (STT only)	Floating point between 0 and 100		

Dialog	Field	Value		
Output Condition	PV Output	Floating point		
	Alarm Direction	High	Low	
	NAMUR (STT only)	Enabled	Disabled	
	Poll Address	0 - 15		
	Req. Preambles	Numerical		
Device Status	Critical	String		
	Non-Critical	String		
	Info (STT only)	String		
Monitor	Output (ma)	Output current (floating point)		
	Output (%)	Output percent (floating point)		
	PV	Primary variable output in engineering units (floating point)		
	SV	Secondary variable in engineering units (floating point)		
	TV	Tertiary variable in engineering units (floating point)		
	QV	Quaternary variable in engineering units (floating point)		
Local Meter (ST only)	Meter Hardware	Meter Installed	No Meter Installed	
	Meter Units	% of Span inH2O @ 4C mmHg @ 0C psi kPa mPa	mBar bar g/cm² kg/cm² mmH2O @ 4C	inHg @ 0C mH2O @ 4C gal/min gal/hr Custom
	Custom Units	8 chars		
	Flow EU High	Floating point		
	Flow EU Low	Floating point		
Alarm (STT only)	Break Detect	Enabled Disabled		
	Latching Alarm	Enabled Disabled		
Sensor (STT only)	Sensor Type	MV T/C-E T/C-J T/C-K T/C-N	T/C-T T/C-S T/C-R T/C-B	JPT 100 PT100 PT200 Ohms
	Line Filter	50 Hz	60 Hz	
	RTD Wire	3 Wire	4 Wire	
	CJ Mode Compensation	Internal CJ	External CJ	

Dialog	Field	Value		
Write Protect (STT only)	Write Protect	Write protected	Not write protected	
	Password	4 chars		
	New Password	4 chars		

Generic HART Fields and Values

Table 34 Generic HART Fields and Values

Dialog	Field	Value		
Device Info	Tag ID	8 chars		
	Model	Transmitter type		
	Device ID	Transmitter's device ID		
	Manufacturer	String		
	Message	32 chars		
	Descriptor	16 chars		
Extended Info	Universal Rev.	Numerical		
	Software Rev.	Numerical		
	Field Device Rev.	Numerical		
	Hardware Revision	Numerical		
	# Req. Preams	Numerical		
	PV Sensor S/N	Numerical		
	Final Assembly #	Numerical		
	Physical Signaling Code	Numerical		
Basic Setup	LRL, URL, LRV, URV	Floating point		
	Minimum Span	Floating point		
	Damping	Floating point		
	PV Units Type	Temperature Pressure Volumetric flow Velocity Volume Length Time Mass	Mass flow Mass per volume Viscosity Electromagnetic unit of electric potential Electrostatic unit of current	Electromagnetic unit of resistance Energy Power Radial velocity Miscellaneous Generic
	PV Sensor Units			
	Temperature	degC degF	degR	Kelvin
	Pressure	inH2O @ 39F inHg @ 32F ftH2O @ 68F mmH2O @ 68F mmHg @ 0C psi	bar Mbar g/cm² kg/cm² Pascals KPa	torr ATM inH2O @ 60F MPa inH2O @ 4C mmH2O @ 4C

Dialog	Field	Value		
Basic Setup (Continued)	*Volumetric Flow*	ft³/min gal/min l/min ImpGal/min m³/hr gal/s MillionGal/day l/s MillionL/day ft³/s	ft³/day m³/s m³/day ImperialGal/hr ImperialGal/day norm. m³/hr norm. l/hr std. ft³/min ft³/hr	m³/min bbl/s bbl/min bbl/hr bbl/day gal/hr ImperialGal/s l/hr gal/day
	Velocity	ft/s m/s	in/s in/min	ft/min m/hr
	Volume	gal liter Imperial Gal m³ bbl	bushel yd³ ft³ in³ liquid bbl	normal m³ normal liter std ft³ hectoliter
	Length	ft meter	in cm	mm
	Time	min sec	hr	day
	Mass	gram kg Metric Ton	lb Short Ton	Long Ton ounce
	Mass Flow	g/s g/min g/hr kg/s kg/min kg/hr kg/day	MetTon/min MetTon/hr MetTon/day lb/s lb/min lb/hr	lb/day ShTon/min ShTon/hr ShTon/day LTon/hr LTton/day
	Mass Per Volume	SGU g/cm³ kg/m³ lb/gal lb/ft³ g/ml	kg/l g/l lb/in³ ShTon/yd³ degTwaddell	degBaum (heavy) degBaum (light) degAPI ug/l ug/m³
	Viscosity	centistokes	centipoises	
	Electromagnetic Unit of Electric Potential	mV	V	
	Electrostatic Unit of Current	mA		
	Electromagnetic Unit of Resistance	Ohm	kOhms	

Dialog	Field	Value		
Basic Setup (Continued)	*Energy*	newton-meter deka therm foot pound force	kilowatt hour Mjoule	btu Mcalorie
	Miscellaneous	Hz uMho Percent, pH mSiemen/cm uSiemen/cm Newton degBrix % solids/wt	% solids/vol degBalling proof/vol proof/mass parts/million degrees radian % consistency volume %	ml/l ul/l % LEL ppb % SteamQual ftin16 ft^3/lb pFarads % plato
	Generic	Use Enumeration Not Used	None Unknown	Special
	Transfer Function	Linear Square Root Sq. Root 3rd Power Sq. Root 5th Power Special Curve	Square Discrete(switch) Sq. Rt+Spec. Curve Sq. Rt 3rd+Spec. Curve	Sq. Rt 5th+Spec. Curve Not Used None Unknown
	PV Output	Floating point		
	Alarm Direction	High	Low	
	NAMUR	Not applicable for Generic HART transmitter		
	Poll Address	0 - 15		
	Req. Preambles	Numerical		
Dynamic Variable Map	Primary Var. Code	Numerical		
	Secondary Var. Code	Numerical		
	Tertiary Var. Code	Numerical		
	Quaternary Var. Code	Numerical		
Diagnostics/Service	Master Reset	Performs a Master Reset of device		
	Device Status	Displays the Device Status screen		
	Self Test	Performs a Self Test of the device		
	Monitor	Displays the Monitor screen		

Dialog	Field	Value		
Device Status	Status Byte	Status Byte 0 - Status Byte 15		
	Status Bit	Status Bit 0 - Status Bit 7 OK		
	Non Critical Status (Field Device Status)	Primary Variable Out of Limits Non Primary Variable Out of Limits Loop Current Saturated	Loop Current Fixed More Status Available Cold Start	Configuration Changed Device Malfunction
Monitor	Output (mA)	Floating point		
	Output (%)	Floating point		
	PV	Floating point		
	SV	Floating point		
	TV	Floating point		
	QV	Floating point		
	Comm. Status	String value		
	Device Status	Displays the Device Status screen		
Calibration	Zero Trim	Performs a Zero Trim		
	Apply Values	Displays the Apply Values screen		
	Loop Test	Displays the Loop Test screen		
	D/A Trim	Displays the D/A Trim screen		
Apply Values, screen 1	Set the (output current to)	4 mA	20 mA	
Apply Values, screen 2	Current Applied Process Value	Floating point		
	Set As New Value	Sets the LRV or URV equal to the value in the Current Applied Process Value edit box.		
	Read New Value	Updates the Current Applied Process Value edit box		
Loop Test	Mode	Normal	Output Mode	
	Choose Analog Output Level	4 mA	20 mA	Other
	Other	Floating point		
	Set Output	Sets the device output		
	Clear Output	Clears the Output Mode		
D/A Trim	Field Device Will Be Scaled From	Floating Point		
	Change Scale	Activates the 2 edit boxes mentioned above.		
	Start D/A Trim	Starts the D/A Trim process		
	Meter Value	Floating point		

Dialog	Field	Value		
Burst Mode	Burst Mode	Off On	Not Used None	Unknown Special
	Burst Options	PV	% Range and Current	All PVs and Current
Specific Monitor	Number of Device Variables to Query	1 - 4		
	Dev. Var. 1	0 - 22		
	Dev. Var. 2	0 - 22		
	Dev. Var. 3	0 - 22		
	Dev. Var. 4	0 - 22		
	Dev. Var. 1	Floating point		
	Dev. Var. 2	Floating point		
	Dev. Var. 3	Floating point		
	Dev. Var. 4	Floating point		

Table 35 HART Universal Commands

Command Number	Function
0	Read Unique Identifier
1	Read Primary Variable
2	Read Current and % of Range
3	Read Current and Four Dynamic Variables
6	Write Polling Address
12	Read Message
13	Read Tag, Descriptor, Date
14	Read PV Sensor information
15	Read Output information
16	Read final assembly number
17	Write Message
18	Write Tag, Descriptor, Date

Table 36 HART Common Practice Commands

Command Number	Function
33	Read Transmitter Variables
34	Write Damping Value
35	Write Range Values
36	Set Upper Range Value
37	Set Lower Range Value
40	Enter/Exit fixed current mode
41	Perform Device Self-test
42	Perform Master Reset
43	Set(trim) PV Zero
44	Write PV Units
45	Trim DAC Zero
46	Trim DAC Gain
47	Write Transfer Function
48	Read additional device status
50	Read Dynamic Variable Assignments
51	Write Dynamic Variable Assignments
53	Write Transmitter Variable Units
105	Read Burst mode configuration
107	Write Burst Device Variables
108	Write Burst mode command number
109	Burst mode control

XML Database (Samples)

For the first release of the MC Toolkit, the XML database files that can be exported from the MC Toolkit to Documint (or other XML file utility) includes thirteen items. The specific content of each file depends on the type of field device from which it is exported, but the form of each item is the same for all devices.

Example:

```
<Field name="Bus Type">HART</Field>
<Field name="Parameter Name">Parameter Value</Field>
```

Two samples of XML files are given below - one for a Honeywell STT 3000 Smart Temperature Transmitter, and the other for a non-Honeywell (or "generic") device by Smar.

An explanation of the parameters/values for eacn XML item is given in the table that follows the samples.

XML Sample - Honeywell DE

```
*****************************************************
<Record>
<Field name="Bus Type">DE</Field>
<Field name="Device">STT 3000</Field>
<Field name="Tag ID">XXXXXXXX</Field>
<Field name="Serial Number">B125340037</Field>
<Field name="Manufacturer">Honeywell</Field>
<Field name="Model Number">1.5</Field>
<Field name="Transfer Function">1</Field>
<Field name="Input Range : In Low">-20.0</Field>
<Field name="Input Range : In High">107.5</Field>
<Field name="Input Range : In Units">0</Field>
<Field name="Output Range : Out Low">4.00</Field>
<Field name="Output Range : Out High">20.00</Field>
<Field name="Output Range : Out Units">mA</Field>
</Record>
```

XML Sample - non-Honeywell HART

```
*******************************************************
<Database>
<Table name="Instrument">
<Record>
<Field name="Bus Type">HART</Field>
<Field name="Device">Generic</Field>
<Field name="Tag ID">SMAR</Field>
<Field name="Serial Number">816923</Field>
<Field name="Manufacturer">62</Field>
<Field name="Model Number">12345</Field>
<Field name="Transfer Function">0</Field>
<Field name="Input Range : In Low">-10.0</Field>
<Field name="Input Range : In High">100.0</Field>
<Field name="Input Range : In Units">39</Field>
<Field name="Output Range : Out Low">1.00</Field>
<Field name="Output Range : Out High">5.00</Field>
<Field name="Output Range : Out Units">58</Field>
</Record>

*****************************************************
```

Field #	Parameter Name	Parameter Description
1	`Bus Type`	Protocol type
2	`Device`	Classification of device type: Honeywell DE (ST 3000, STT 3000, Honeywell HART (STT25H), or generic (non-Honeywell) HART
3	`Tag ID`	User-defined identifier
4	`Serial Number`	Serial Number of device (assigned by Manufacturer)
5	`Manufacturer`	a. Name of Manufacturer (Honeywell) b. Numeric Code for Manufacturer's Name
6	`Model Number`	a. Firmware Version (Honeywell DE Transmitter) b. Final assembly number (Honeywell HART and generic HART)
7	`Transfer Function`	Code for output form (0= Linear; 1= Square Root)
8	`Input Range : In Low`	LRV
9	`Input Range : In High`	URV
10	`Input Range : In Units`	Code for Engineering Units (PV Input)
11	`Output Range : Out Low`	Output Range 0 % value (1 V or 4 mA)
12	`Output Range : Out High`	Output Range 100 % value (5 V or 20 mA)
13	`Output Range : Out Units`	a. mA or Volts (Honeywell DE) b. Numeric Code for Engineering Units (HART)

Maintenance

Modem Battery Replacement

The battery should be replaced:

- when, in the Modem Diagnostics display (in the Modem Status box) one of these messages appears
  - Modem Battery: Low
  - Modem Battery: Unknown (after checking wiring connections)
- in periodic maintenance, when voltmeter test indicates low voltage.

⚠	**WARNING !!** Never remove the cover of the battery compartment, or attempt battery replacement in areas designated as having a potentially Explosive atmosphere.

Table 37 Battery Removal and Replacement Procedure

Step	Action
⚠	**WARNING !!** Do not perform this procedure in an area designated as having a potentially explosive atmosphere.
1	Remove the screw that holds the battery cover in place, and remove the cover from the battery compartment.
2	Press lightly on the bottom of the battery as shown in the picture below, rotating the battery outward at the top. Note the orientation of the battery in the compartment, and then remove it from the case.
	
3	Noting orientation of the new battery and the terminals, insert the new battery into the case.
4	Replace the cover and the retaining screw.

MC Toolkit Software Installation/Maintenance

Overview

Before using your MC Toolkit, you will need to install the software in your Pocket PC. To enable installation, it is necessary to establish a partnership between your desktop PC and the handheld computer. Follow the Pocket PC instructions provided by the manufacturer of the Pocket PC on how to install ActiveSync, and on how to establish a connection to your Pocket PC. The ActiveSync software is provided on the CD-ROM disk that came with your Pocket PC, or it can be obtained directly from Microsoft at:

http://www.microsoft.com/pocketpc/downloads/activesync.asp

To install the MC Toolkit software, place the MC Toolkit CD-ROM in your computer, and run the "Setup.exe" program. The installation program will appear. Follow the onscreen instructions to complete the installation. Once the software is installed, it can be run by selecting "MC Toolkit" from the Start menu on your Pocket PC.

Note:
The handheld computer needs to be connected to the MC Toolkit Modem for the MC Toolkit software to operate correctly. If the modem is not connected to the handheld computer, an error message will appear.

Use the short interface cable provided for this purpose.

Replacement Parts

Table 38 Replacement Parts

Description	Part Number
Pocket PC Handheld	
Compaq IPAQ 3950	51452982-501
Compaq IPAQ 3970	51452982-502
Symbol 2800 Monochrome	51452717-502
Symbol 2800 Color	51452717-501
Interface Hardware	
DE/HART Modem	51453372-501
Holster	
Compaq IPAQ Holster	51452720-501
Symbol 2800 Holster	51452719-501
Field Connection Cable (Modem-to-PDA)	
Compaq IPAQ 3700 Series	51452983-501
Compaq IPAQ 3800/3900	51452987-501
Symbol 2800 Series	51452721-501
Field Connection Cable (Modem-to-Transmitter)	
6 Ft. - Standard	30752453-501
20 Ft.	30752453-505
Software	
CD ROM - Standard	51453286-501
3.5" Disks	51453287-501