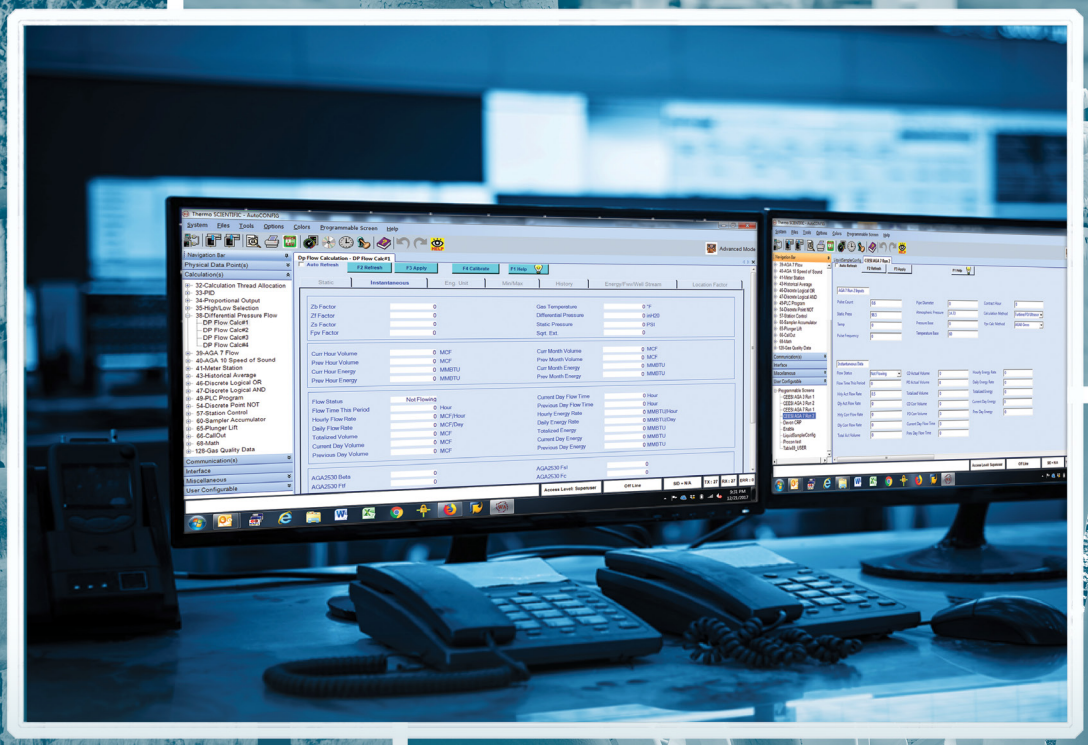
thermo scientific



AutoXP Users Guide

1-0511-006 • August 2023

ThermoFisher SCIENTIFIC

Thermo Fisher Scientific Inc. (Thermo Fisher) makes every effort to ensure the accuracy and completeness of this manual. However, we cannot be responsible for errors, omissions, or any loss of data as the result of errors or omissions. Thermo Fisher reserves the right to make changes to the manual or improvements to the product at any time without notice.

Revision History

Revision Level	Date	Comments
A	02-2018	Initial release (ECO 9377).
B	04-2018	Change Table D-1 to correct polarity (ECO 9461).
C	07-2018	Add CSA Class I Div 2 (ECO 9535).
D	07-2019	Revised per ECO 9808.
E	08-2023	Revised per ECN 20358

FCC Notification

The Thermo Scientific AutoXP flow computer complies with part 15 of the FCC rules.

Caution The AutoXP flow computer must be operated as supplied. Any changes or modifications made to the device without the express written approval of Thermo Fisher Scientific can void the user's authority to operate the equipment. ♦

Note This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the user manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at the user's own expense. ♦

Contents

Chapter 1
Product Overview

General

The Thermo Scientific AutoXP / MVT™ is an explosion proof Class I Div 1 flow computer as well as a Multi-Variable Transmitter. The AutoXP flow computer combines Thermo Fisher Scientific's long legacy of flow computer knowledge with all the latest technology, e.g., low power, high speed data connectivity, and high accuracy. The AutoXP is designed to provide ultimate flexibility to our customers by providing a unit that can be used as a single-run flow computer or smart multi-variable transmitter. This unit can be configured for both gas and liquid applications utilizing today's most common primary devices.

Basic System

Both basic and advanced AutoXP systems are placed in an explosion proof enclosure.

Enclosure

Figure 1-1. AutoXP

Power Supply

The standard instrument is powered by an external 10–30 Vdc power supply. The power input is protected against high surge voltages.

Main Board

The main board contains the primary logic functions of the flow computer and has the following features:

- Interface to the 128 x 65 Graphic display
- Flash memory for program storage and data storage, 2 M x 16
- SRAM memory for data storage, 1 M x 16, battery backed
- Real-time clock (RTC)
- Lithium backup coin cell battery; voltage monitor for the RTC and SRAM circuits allows for data and configuration retention in the event of power failure
- Basic Unit consisting of:
  - One 100-ohm Pt RTD input
  - One Honeywell transducer
  - One local serial communication port
  - One RS232/RS485 host serial communication port
  - One Ethernet communication port with ESD protection for connection to a Local Area Network
- Advance Unit consisting of:
  - Basic Unit
  - Two Analog Inputs
  - One Analog Output
  - Two discrete outputs
  - Two discrete inputs
  - Two pulse inputs
  - Remote RS485 serial communication port dedicated for HART or MVT

Using this Manual

This manual provides a technical description of the product and available options, installation and mounting instructions, basic keypad operating procedures, and maintenance and troubleshooting procedures. For instructions on how to use the Thermo Scientific AutoCONFIG™ instrumentation configuration software with this instrument, refer to the AutoCONFIG software startup guide (p/n 1-0485-068) and the AutoCONFIG software help system.

The information in this manual is designed to aid personnel to correctly and safely install, operate, and / or maintain the system described; however, personnel are still responsible for considering all actions and procedures for potential hazards or conditions that may not have been anticipated in the written procedures. If a procedure cannot be performed safely, it must not be performed until appropriate actions can be taken to ensure the safety of the equipment and personnel. The procedures in this manual are not designed to replace or supersede required or common sense safety practices. All safety warnings listed in any documentation applicable to equipment and parts used in or with the system described in this manual must be read and understood prior to working on or with any part of the system.

The following admonitions are used throughout this manual to alert users to potential hazards or important information. **Failure to heed the warnings and cautions in this manual can lead to injury or equipment damage.**

Warning Warnings notify users of procedures, practices, conditions, etc. which may result in injury or death if not carefully observed or followed. The triangular icon displayed varies depending on the type of hazard (electrical, general). ♦

Caution Cautions notify users of operating procedures, practices, conditions, etc. which may result in equipment damage if not carefully observed or followed. ♦

Note Notes emphasize important or essential information or a statement of company policy regarding an operating procedure, practice, condition, etc. ♦

Tip Tips may also be used in this manual. They are suggestions or things to consider that will help you use the instrument or this manual. ♦

Security Consideration

Warning ThermoFisher Scientific strongly recommends changing passwords before first use/login on this equipment. ▲

Security

Table #213 is a table of passwords that allows user to configure user IDs, passwords, and security levels. The four access levels are:

- Supervisor: The highest security access level. Allows for access to calibration data and modification of all configuration parameters, including passwords.
- Technician: Second highest level of security access. Identical to Supervisor, except cannot modify passwords.
- Control: Can access tables pertaining to control functions only, PID for example.
- Measurement: Can access tables pertaining to measurement functions only, DP flow calculation for example.

A valid user ID and password must be entered for all access levels. If an invalid entry is made, the instrument returns to scrolling through the display list. Refer to the AutoCONFIG software help for instructions on how to set user IDs, passwords, and security access levels. The help system also provides a list of the default security access levels.

The following additional security features have been added to the AutoSERIES flow computers:

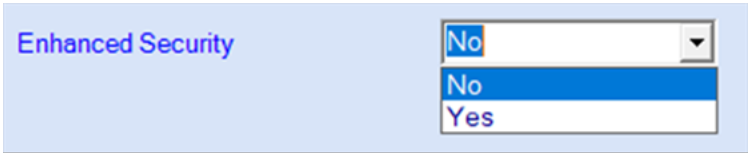
- Security Enhancement: Supports up to 24 character password. See table for compatible versions. California SB-327 Compliance: Each devise will be programmed with unique password.
- Obscure Password: Obscure password in protocol.
- Password Table Encryption: Obscure password table in stored configuration files.

Note All above security features are not applicable to legacy AutoPILOT, AutoMATE, SuperFLOW, Automitter PRO and Automitter devices. ▲

Enhanced Security

With the heightened concern for more protection of RTU information, the previous security philosophy has been enhanced. This enhanced security philosophy now requires a user to first login to an RTU before any data can be viewed or modified or any RTU support operations can be performed.

The new Enhanced Security Mode option has been added to the System Control Table (Table 31), which allows users to Enable/Disable this feature as desired. Enhanced Security option is set to NO (Disabled) by default.



Minimum firmware/software requirements are listed in the table below to support Enhanced security features.

Table 1–1.

Item	Enhanced Security Version
AutoCONFIG	WA32MB0C
AutoFLEX	AX11MB0C
AutoEXEC	AE13MB0W
AutoPILOT PRO	AA20MB0U
AutoXP	AA20MB0U

If you are using firmware version listed in the table above, the following steps are required to activate Enhanced Security function:

1. Change the Table #213 1st entry username/password from the default username/password.

2. Set the Enhanced Security option to Yes.

By enabling Enhanced Security, the RTU will provide the following additional features: -

- RTU will support passwords of up to 24 (alphanumeric) characters in length with an 8 character user name.
- A user will first be prompted to log into the RTU before any access is allowed with AutoCONFIG.

  Note:

  - Older versions of AutoCONFIG that do not support Enhanced Security will not be able to connect as all commands will be rejected by the RTU.

1. User must upgrade AutoCONFIG to latest version to establish communication successfully.

- The User still has the option to disable password functionality and acquire Superuser access by performing following steps for table #213:

1. For Entry #1: Enter Username: 12345 and Password: 12345

2. For Entry #1: All security access levels are checked.

3. All successive entries starting with Table Entry #2 and above, ensure that Password, Username and all Security levels fields are cleared.

Connection scenarios when Passwords are enabled in the RTU

When using different versions of RTU firmware and AutoCONFIG software with new security enhancements, the user must consider following scenarios.

The following test cases apply to the firmware and software versions listed in **Table 1–1** above.

New: Reference to the **Table 1–1** above.

Old: Released versions prior to the versions listed in **Table 1–1** above.

New field RTU software with New AutoCONFIG PC software

1. Enhanced Password Security Disabled or Enabled

   Once AutoCONFIG has established a connection with an RTU, AutoCONFIG will query the RTU to determine the current password access level and prompt the user for a login if necessary.

   - If the password login is unsuccessful AutoCONFIG will abort the login process and disconnect from the RTU.
   - If the password login is successful AutoCONFIG will establish communication with the unit and display the Navigation Bar.

New field RTU software with Old AutoConfig PC software:

1. Enhanced Password Security Disabled

- The AutoCONFIG software will establish connection.
- The user will need to enter the correct username and 8-character password to be able to write to the RTU and view the Password Table #213 or any of the Communications Tables #96.

2. Enhanced Password Security Enabled
   - The AutoCONFIG will not establish communication with the RTU.

Old field RTU software with New AutoConfig PC software

1. RTU firmware does not support Enhanced Password Security feature:
   - The AutoCONFIG will prompt the user for a login information if necessary.
   - If the password login is unsuccessful, the AutoCONFIG will abort the login process and disconnect from the RTU.
   - If password login is successful, the AutoCONFIG will establish communication with RTU.

Off-line functionality with Enhanced Password Enabled

1. New AutoCONFIG PC software
   - Upon loading the saved configuration (built or configured with previous version of AutoCONFIG) the new AutoCONFIG software will query the configuration to determine the current password access level and prompt the user for a login if necessary.
   - If the password login is unsuccessful, the AutoCONFIG will abort the login process and disconnect from the offline configuration.
   - If the password login is successful, the AutoCONFIG will connect to the offline configuration and operation can continue normally with the offline functionality.

2. Old AutoCONFIG PC software:
   - User can only enter the first 8 characters of the password, even if original configuration contains more than 8 characters.
   - When opening a saved configuration file with new AutoCONFIG, the user will be able to connect to the configuration but only in view only mode.

If the user attempts to display any security tables (Password Table #213 or Communications Tables #96) the AutoCONFIG will prompt the user for a password login.

- Making modifications to the configuration will require a user to enter the correct username and up to an 8 character password.

- If the password login is unsuccessful, the AutoCONFIG will indicate that the password was invalid and discard the changes or indicate that the user does not have the proper access level.
- If the password login is successful, the AutoCONFIG will proceed with the parameter change or display of the requested security table.

Note Old AutoCONFIG PC software will only verify first 8 characters of user password to allow user access to configuration file. Recommendation is to update to new AutoCONFIG to take advantage of enhanced security features. ▲

California SB-327 Compliance

Effective since January 1st, 2020, Senate Bill No. 327 requires device manufacturers who operate or sell their products in California to implement reasonable passwords security feature. To conform to the requirements, all AutoSERIES flow computers will be pre-programmed with a unique password for each device manufactured before shipment.

Table 1–2 shows the firmware versions that will have SB-327 security support:

Table 1–2. AutoSERIES Firmware/Software Compatibility

Unit Type	Firmware Version
AutoPILOT PRO	AA21MB0A
AutoXP/AutoSMV	AA21MB0A
AutoEXEC	AE14MB0A
AutoFLEX	AX12MB0A
User Interface Software	
AutoCONFIG	WA33MB0A

EFMRTU SB-327 Password Scheme

1. New SB-327 Firmware Versions (**Table 1–2**) requires a user to enter a username and password when accessing the unit for the 1st time.

   (Below is a typical example of the new login process)

   a. Username: admin

   b. Password: Last 6 digits of Ethernet #1 port MAC address

Example: MAC address 0x401A60D0729A

Username: admin		
Password: Last 6 digits of Ethernet #1 port MAC address		
MAC address	0x401A60**D0729A**	
Example:	Username	Password
	admin	D0729A

Note A user can modify both of these entries, once proper access has been granted. ▲

Compatibility Test Cases

1. The current AutoCONFIG Version WA33MB0A (and all following versions) are backward compatible with current and previously released RTU Firmware version(s).

2. SB-327 firmware and AutoCONFIG version prior to WA33MB0A

   a. Updating the AutoCONFIG to version WA33MB0A. this will allow easy access to the MAC address during the logon process.

3. If upgrading the AutoConfig software is not possible, then the user will need to use the steps listed in the “Upgrade Check List” below to determine the password.

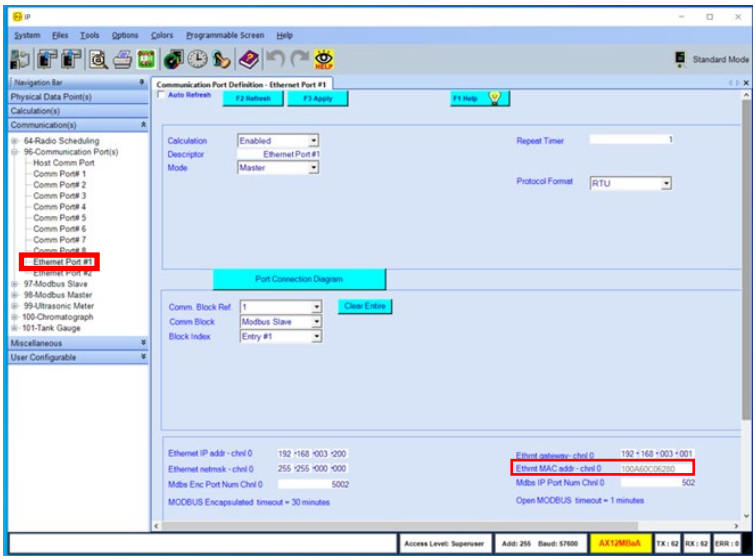
Checklist for upgrading firmware from older version to SB-327 firmware listed in Table 1 above.

1. Obtain required firmware Version(s) listed in **Table 1–1**.

2. Install AutoCONFIG WA33MB0A or use a previously released AutoCONFIG version.

3. Obtain MAC address from the unit prior to upgrade.

   a. MAC address is listed on Table 96.



SB-327 firmware and OLD AutoCONFIG: Obtaining MAC address

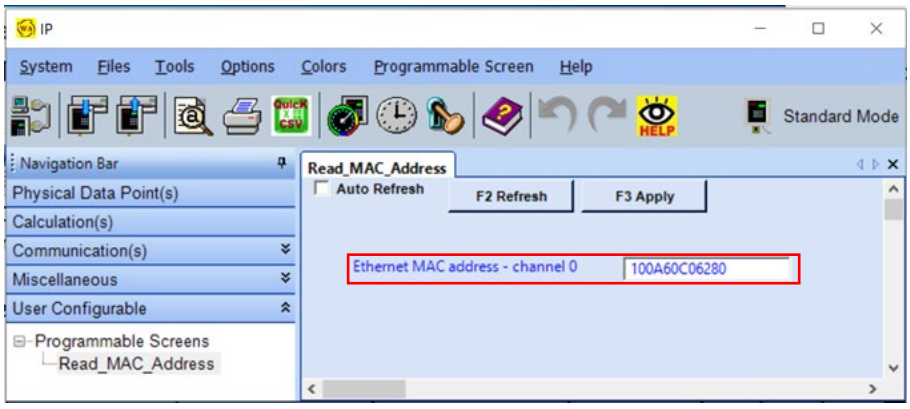
1. If you have already updated the firmware and still using old AutoCONFIG.
   a. Please update AutoCONFIG to WA33MB0A (or later)

      OR

   b. Open Notepad and copy following content and save file as Read_MAC_Address.xml

```
<My_Designed_Screen>
  <AutoConfigScreenVersion>AutoConfig= WA32MBaD,
ProgrammableScreen= 1.0, LoadWithVersion= 1.0, Date= 2/27/2023
11:13:58 AM</AutoConfigScreenVersion>
  <Control xmlns="NewLabel_1">
    <Text xmlns="">Ethernet MAC address - channel 0</Text>
    <Type xmlns="">1</Type>
    <Parent xmlns="">PictureBox1</Parent>
    <Location xmlns="">39,26</Location>
    <Height xmlns="">22</Height>
    <Width xmlns="">204</Width>
    <BackColor xmlns="">-986896</BackColor>
    <NumberOfChildren xmlns="">0</NumberOfChildren>
    <GroupedWith xmlns="">NewText_1</GroupedWith>
    <iDisp xmlns="">0</iDisp>
    <iPtType xmlns="">0</iPtType>
    <iControlType xmlns="">1</iControlType>
    <iBitPos xmlns="">0</iBitPos>
    <LinkedTo xmlns="">31.1.29</LinkedTo>
  </Control>
  <Control xmlns="NewText_1">
    <Text xmlns="">
    </Text>
    <Type xmlns="">2</Type>
    <Parent xmlns="">PictureBox1</Parent>
    <Location xmlns="">256,27</Location>
    <Height xmlns="">20</Height>
    <Width xmlns="">134</Width>
    <NumberOfChildren xmlns="">0</NumberOfChildren>
    <GroupedWith xmlns="">NewLabel_1</GroupedWith>
    <iDisp xmlns="">1</iDisp>
    <iPtType xmlns="">4</iPtType>
    <iControlType xmlns="">2</iControlType>
    <iBitPos xmlns="">0</iBitPos>
    <LinkedTo xmlns="">31.1.29</LinkedTo>
  </Control>
</My_Designed_Screen>
```

c. Import and activate the generated XML file in previous step into AutoCONFIG under “User Configurable Screen”



2. MAC address can also be obtained directly from the CPU board.

Figure 1–1. AutoPILOT PRO

Figure 1–2. AutoEXEC

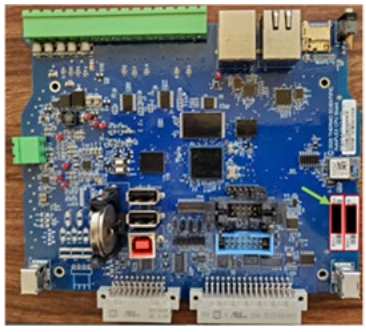


Figure 1–3. AutoFLEX

Figure 1–4. AutoXP/SMV

Password Encryption

On previous versions of the AutoSERIES firmware's/AutoCONFIG the username and passwords held in the database were stored in their original entered format. As part of the implementation of general password security, this information is now encrypted within the database. This ensures that a binary dump of the AutoConfig program or a stored configuration file (generated with the updated AutoConfig program) will not be viewable with a binary editor or similar program.

Password Obfuscation

The new AutoSERIES firmware(s)/AutoConfig software has been enhanced with a new option in the "System Control Table" (Table 31) to enable the "Protocol Password Obfuscation". When enabled, the Protocol Password Obfuscation functionality results in any password exchange between the AutoConfig PC software and the RTU units being unreadable to anyone monitoring that communications line.

- RTUs that support this functionality, and have it enabled, will require an updated AutoConfig PC software version that supports this feature.
- This functionality will be transparent to the user and will be backward compatible to existing installations of RTUs.
- If Obscure Password is set to "Yes" in the RTUs "System Control Table(Table #31), and user is establishing communication using older version of AutoCONFIG, then:
  - The user will not be able to modify any parameters in the RTU. [It is recommended that the user update to latest version of AutoCONFIG in this case]

Password Obfuscation Compatibility:

1. AutoCONFIG: Version WA32MB0B:
   a. Compatible with any AutoSERIES firmware(s) which does **NOT** have “Enhanced Password” and/or “Obscure Password” enabled.

2. AutoCONFIG: Version WA32MB0C:
   a. Compatible with any AutoSERIES firmware(s) which has “Enhanced Password” **Enabled/Disabled** but “Obscure Password” **Disable**.

3. AutoCONFIG: Version WA33MB0A:
   a. Compatible with any AutoSERIES firmware(s) which does have “Enhanced Password” and/or “Obscure Password” **Enabled/Disable**.

Note It is recommended to upgrade to latest version of AutoCONFIG and RTU firmware to support enhanced security features. ▲

Chapter 2
Hardware Description: Basic System

The basic AutoXP system consists of the explosion proof enclosure with mounted Transmitter.

The Enclosure

Figure 2-1. AutoXP Enclosure

Figure 2-2. AutoXP Assembly

Power

The standard instrument is powered by an external 10–30 Vdc power supply.

Power consumption of the basic/advanced AutoXP flow computer is about 0.2 ~ 0.4 W for a typical unit; however, overall power consumption depends upon the I/O configuration and is determined on an individual basis. Every effort has been made to keep power consumption to a minimum.

External Power Source

The voltage range of the standard external power supply is 10–30 Vdc.

See the Installation Guide for installation and wiring instructions.

The AutoXP Basic System

A set of the illustrations are provided in this chapter.

Jumper Setting

The jumper setting for the main board discussed in this section is provided in Appendix C.

Lithium Backup Battery

A Lithium backup coin cell battery is installed on the main board (BH1) to maintain configuration and memory when power is removed from the unit. The in-circuit connection of the Lithium battery is set by switching the S1 direction toward the front edge of the main board.

Tip Loss of configuration or historical data with the backup battery installed may indicate that the Lithium battery needs to be replaced or S1 switch is on off position. ♦

Tip The Lithium battery is a field replaceable item. ♦

Warning The Lithium battery may explode if mistreated. Do not attempt to recharge, disassemble, or burn it. ♦

Transducer Inputs

The expanded I/O board provides two analog inputs for single low-power transducers (0–5 Vdc maximum range). Other transducers with voltage output ranges such as 0.8–3.2 V or 1–5 V units may be used with software scaling provided the 0–5 V limits are not exceeded. Use of 4–20 mA current loop transmitters is not recommended for units powered from small battery sources.

All transmitters are wired to analog input channels 1 through 2 on the terminal board. Maximum cable length between the flow computer and each transmitter is 25 feet.

Each local analog input provides a transmitter signal input (IN), and a transmitter signal return (AGND). The analog inputs on the terminal board are identified in the following Figure 2-3.

The following diagram provides the Analog inputs on the Terminal board.

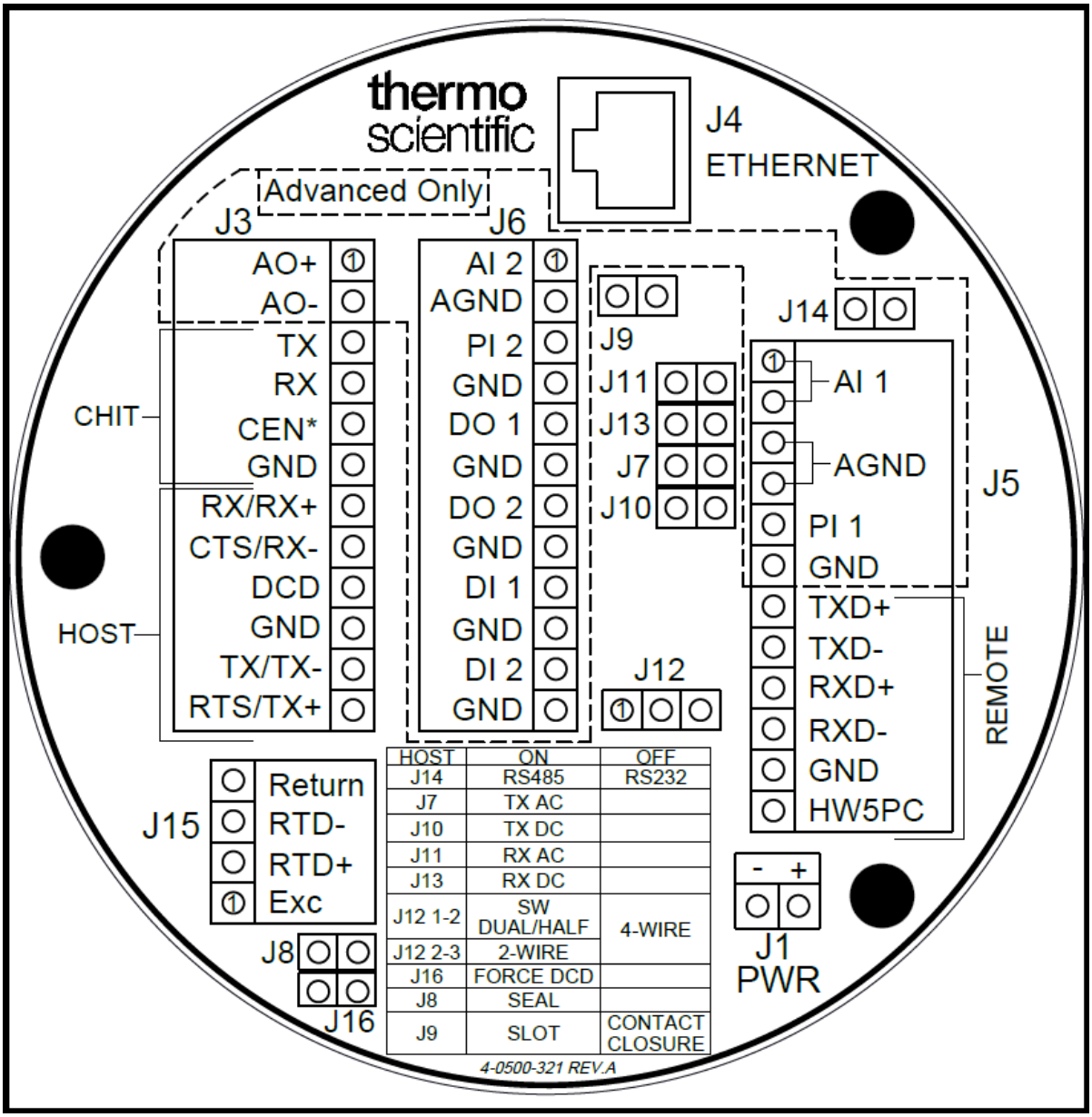


Figure 2-3. Terminal Board

The figure below shows typical connections between the low-power transmitter and local analog inputs. Also shown is the optional use of a 250 ohm resistor for using 4-20 mA.

Thermo Fisher Scientific offers an optional 250 ohm, high precision, axial lead resistor, P/N 5-1270-250, for converting the 4-20 mA current signal to the 1-5V voltage signal, connecting to instrument analog inputs. Contact Thermo Fisher Scientific for resistor availability.

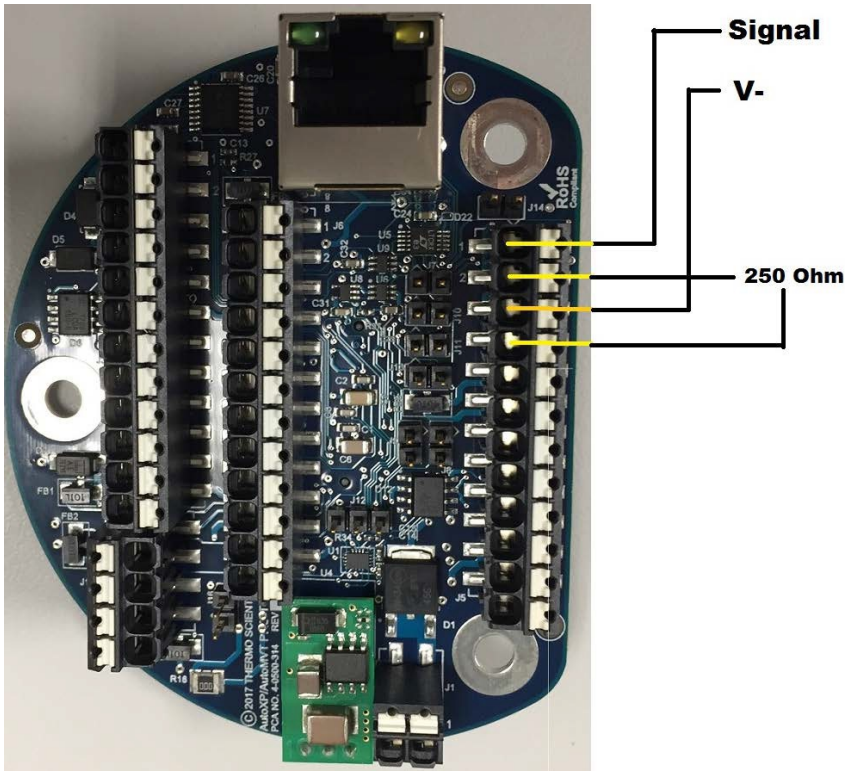


Figure 2-4. Low Power Transmitter and Local Analog Inputs

Connections

J15 on the terminal board is the local RTD connection.

Contact Thermo Fisher Scientific for available RTD assemblies.

Another type of RTD probe with integral metal sheathing may connect to J15 on the main board with up to 25 feet of standard cabling between the probe body and flow computer.

Note For connection drawings and system requirements, refer to the AutoXP Installation Manual.

AutoXP typical configuration switch settings for various inputs are shown in Table 2-1 below.

Table 2–1. AutoXP Typical Switch Configurations

Board	Designator	Description	On	Off	Default
HMI	JP2	Bluetooth development	Development	Auto-run	Off
HMI	JP3	Over The Air Bluetooth update	OTA mode	disable	On
CPU	JP1	Bootloader protect	Protect	Write	On
CPU	JP2	Bluetooth disable	Disable	Enable	Off
CPU	SW1	Battery disconnect switch	Battery Backup	Storage/Cold Start	Off
Terminal	J7	Host TX AC termination	terminated	unterminated	Off
Terminal	J8	Sealing Jumper	Sealed	open	Off
Terminal	J9	Pulse Mode	Slot	Contact	Off
Terminal	J10	Host TX DC termination	terminated	unterminated	Off
Terminal	J11	Host RX AC termination	terminated	unterminated	Off
Terminal	J12 1-2	Host Duplex setting	Software control	4-wire	Off
Terminal	J12 2-3		2-wire		On
Terminal	J13	Host RX DC termination	terminated	unterminated	Off
Terminal	J14	Host mode	RS485	RS232	Off
Terminal	J16	Force DCD	Forced on	From user	Off
I/O	JP3	HART processor configuration	Not Used	Normal operation	Off

Local Serial Communication Port

The terminal board provides one RS232 compatible local communication port (CHIT) for calibration and configuration of the unit using a laptop and Thermo Fisher Scientific configuration software. Thermo Fisher Scientific manufactures optional cable assemblies for this connection. These are listed in the following Table 2-2.

Table 2–2. Cable assemblies for CHIT connector

Assembly P/N	Description
3-0446-090	DB9S connecter with 15-ft cable for use with the six-position connecter
3-0446-090B	DB9S connecter with 25-ft cable for use with the six-position connecter

Bluetooth LE

Bluetooth Low Energy connection is available. A Bluetooth Low Energy Dongle is required to do so.

RS232 Mode

If not used internally, the communication port can interface to any RS232 compatible customer device, such as a radio. Do not exceed +15 Vdc on any of the communication lines. Host communication port RS232 connections are identified in the following Table 2-3.

Table 2–3. Host communication port RS232 connections

Signal	J3 on Terminal Board
RX (Receive)	J3-7
CTS (Clear to Send)	J3-8
TX (Transmit)	J3-11
RTS (Request to Send)	J3-12
DCD (Data Carrier Detect)	J3-9
GND (Ground)	J3-10

Warning Customer equipment and devices must be suitable for the location where they are to be installed. •

Note For RS232 mode, do not install jumper J14. •

Note For RS232 mode without DCD signal, install jumper J16. •

RS485 Mode

The host communication port also supports RS485 communication. To use RS485 mode, jumpers J14 and J16 must be installed. Select RS485 2-wire mode by installing a jumper on J12 pins 2-3. Remove the jumper for 4-wire mode.

Ethernet Port

J4 on the main board is a 10M/100M Ethernet port that supports standard TCP/IP protocol.

Honeywell Smart Transducer Connection

A local Honeywell smart transducer is mounted into the bottom of the AutoXP enclosure. The transducer's 10-pin connector connects to J4 on the back of the main board.

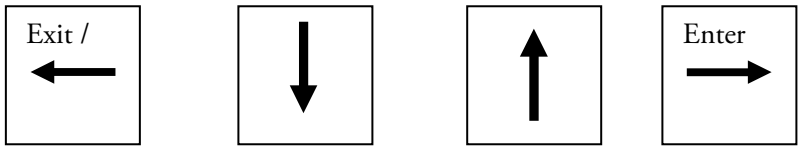
Chapter 3
HMI

The AutoXP HMI display has dimension of 59 mm x 42 mm display with 128 x 65 pixels.

HMI also employs four infra-red resistive UV touch through glass keypads. Low Energy Bluetooth is available for wireless connectivity.

Std Keypad Operation

For the majority of the keypad operation/requirements each key will have the following functions: -



Exit Down Up Enter Keys

EXIT, DOWN, UP, ENTER

Request User ID

User ID will need to be entered as an integer using the following buttons.

Must Enter USER ID	
Key	Function
ENTER	Validate ID
Down or Up	Number

Request User Password

User Password will need to be entered as an integer using the following buttons.

Must Have PASSWORD	
Key	Function
ENTER	Validate Password
Down or Up	Number

User ID and Password must be entered in order to access the Editing/Reviewing Main/Item Menu.

To See DISPLAY LIST	
Key	Function
Enter	Request User ID
Down or Up	Display List
Exit	LCD Welcome Screen

SELECT RUN	
Key	Function
Exit	Go back to Main Menu
ENTER	Init Run Items
Down or Up	Run Select

ITEM MENU	
Key	Function
Exit	Go back to Main/Run Menu Items
ENTER	Init Edit List
Down or Up	Go Desired Item

EDIT MENU	
Key	Function
Exit	Go back to Item Menu
ENTER	Init Sub Menu

EDIT SUBMENU	
Key	Function
Exit	Go Back to Item Menu
ENTER	Init Sub Menu Item
Up or Down	Go to Proffered Sub Menu

Time and Date

Edit Date and Time	
Key	Function
ENTER / EXIT	Accept Entry and exit edit
UP	Increment displayed digit
DOWN	Decrement displayed digit

Real Types

Edit Real Number	
Key	Function
ENTER	Accept Entry and exit edit
UP	Increment digit selection*
DOWN	Decrement digit selection*
DONE	Move to next digit

*Digit Selection

Digit Selection Options													
+	-	.	0	1	2	3	4	5	6	7	8	9	E

String Types

Edit String	
Key	Function
ENTER	Accept Entry and exit edit
UP	Increment digit selection*
DOWN	Decrement digit selection*
DONE	Move to next digit

Bluetooth Operation

JP2 Off - Factory Default - Self Run Mode
On - Bluetooth Disable (Must Power Cycle after Jumper set)

JP3 On - OTA (Over the Air Mode) - Factory Default Mode
Off - Manufacturing Use Only

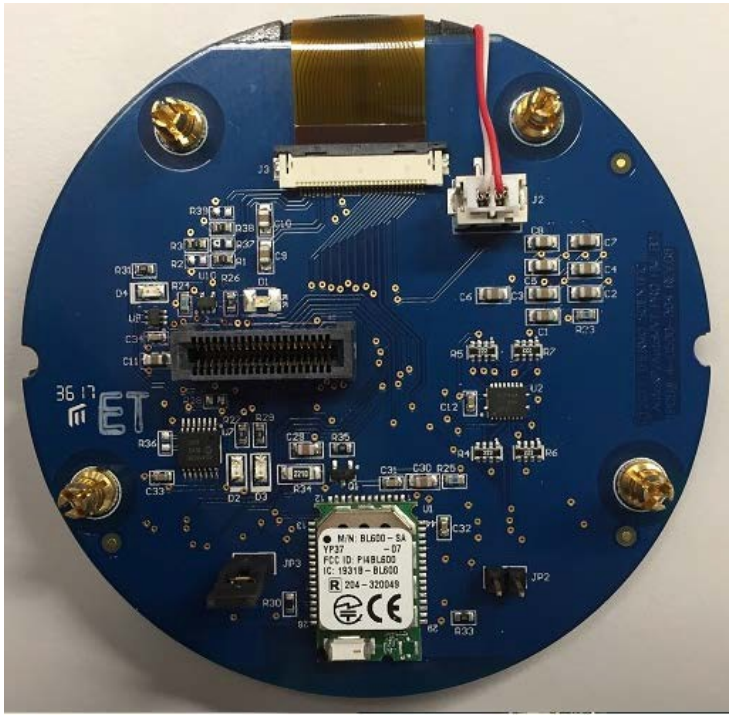


Figure 3-1. Bluetooth Operation JP2 and JP3

Bluetooth Connection

Step 1: Make sure to remove any wire connections into CEN* (J3-pin5 on terminal board)

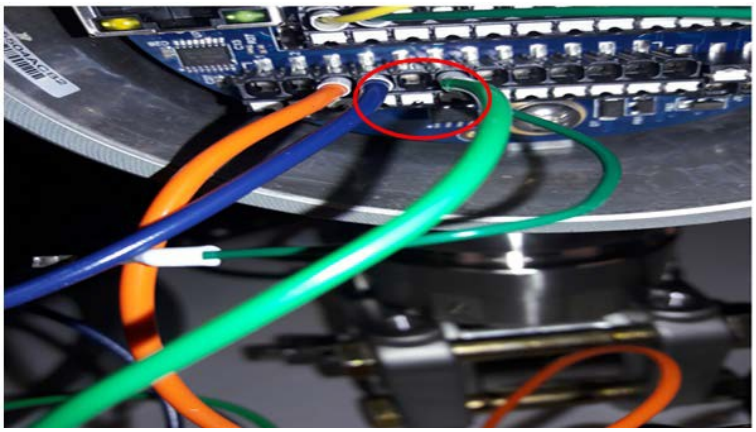


Figure 3-2. Remove wire connections into CEN
J3-pin5 (CEN*) removed

Step 2: Plug BLE dongle into USB port.
Step 3: Run the AutoCONFIG version WA30MB0V or later.
Step 4: Touch one of the keys on AutoXP to keep the unit display live.
Step 5: Locate virtual comm. port number by running device manager on comm. port section.
Step 6: Click “Scan Bluetooth LE” and wait for the process to finish. In case you see “Dongle Comm. Error” message, remove the Bluetooth dongle and reconnect it. Then click Scan once again. This is caused by your PC not responding to the command issued by AutoCONFIG to the dongle.

The following Figure 3-3 is the Dongle Comm Error screen.

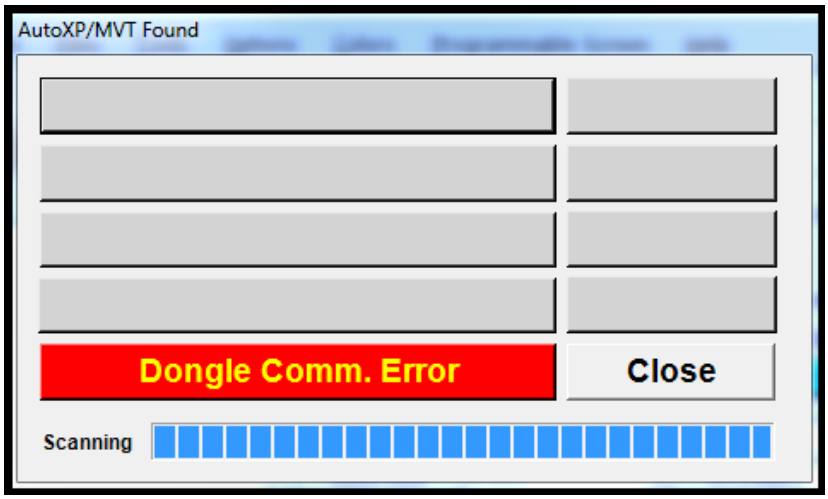


Figure 3-3. Dongle Comm Error

Step 7: Otherwise, AutoCONFIG finds AutoXP/MVT by showing the MAC address. Wait until Scanning Bar reaches the end. Bluetooth Dongle is programmed to scan for 20 seconds.

AutoCONFIG connect screen

Step 8: You may click Save anytime to store the AutoXP MAC with the given file name to a connection file list.

AutoXP/MVT screening

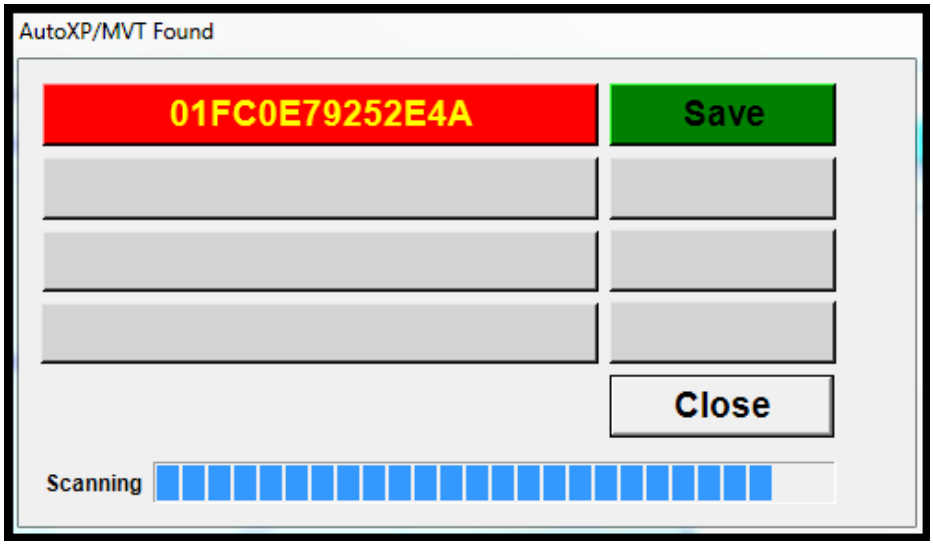


Figure 3-4. MVT found

Step 9: Type in file name. Then click Refresh button as shown below.

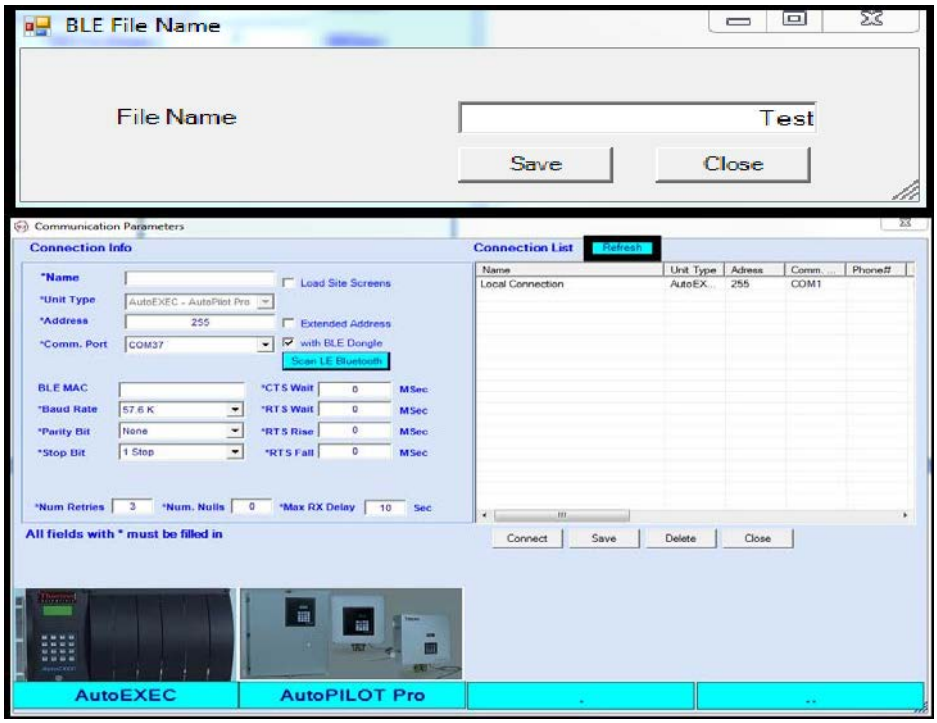


Figure 3-5. BLE File Name/Refresh button

Name AutoXP/MVT device found

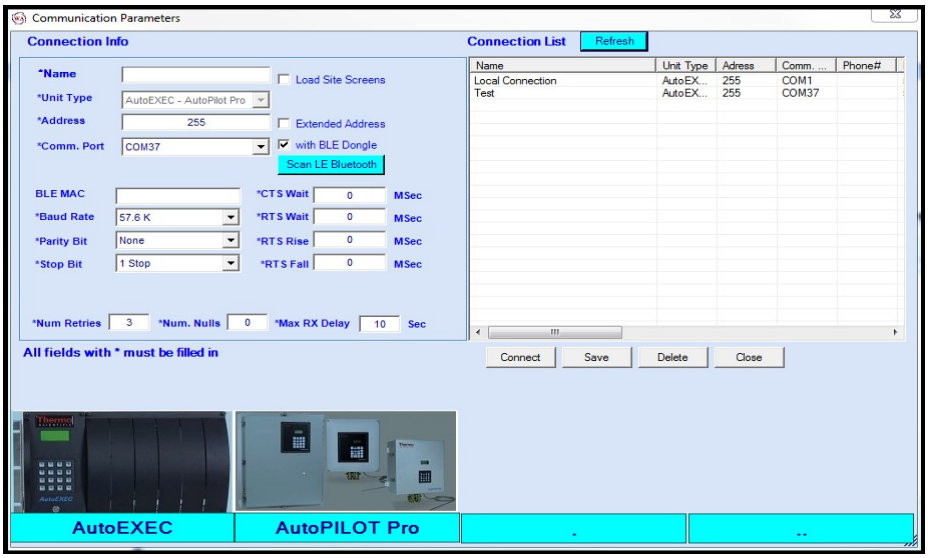


Figure 3-6. MVT device found

BLE MAC address

Step 10: Double click the saved file name, and make sure BLE MAC address is shown below.

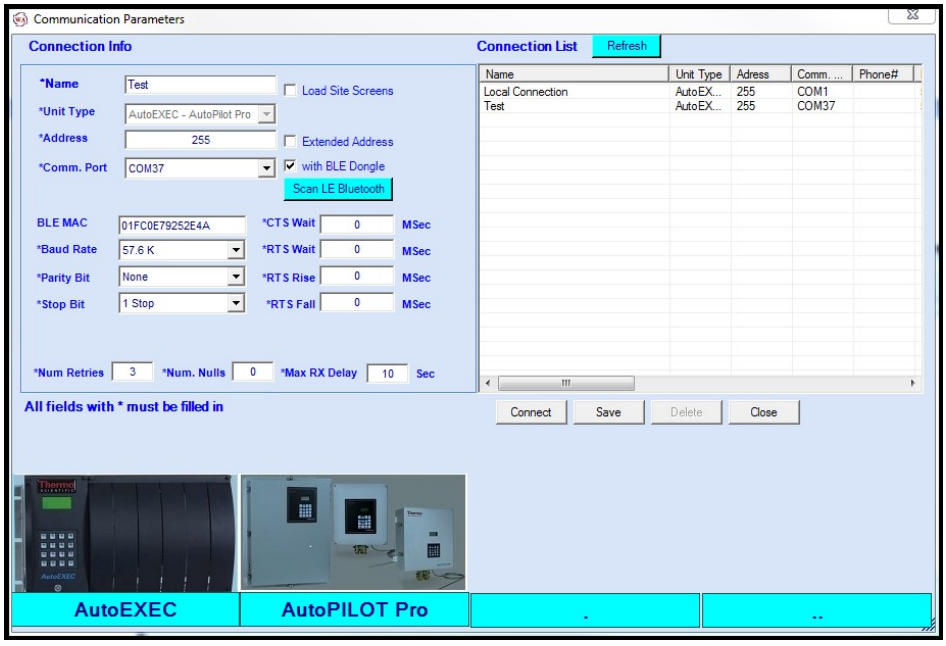


Figure 3-7. BLE MAC address

Step 11: Click Connect. This may take as much as 10 Seconds. Please observe Message Panel located at the bottom of the AutoCONFIG Screen.

Figure 3-8. Connect screen

Unit connecting by Bluetooth

Step 12: The successful connection screen will display AutoXP Firmware ID as shown in Figure 3-9.

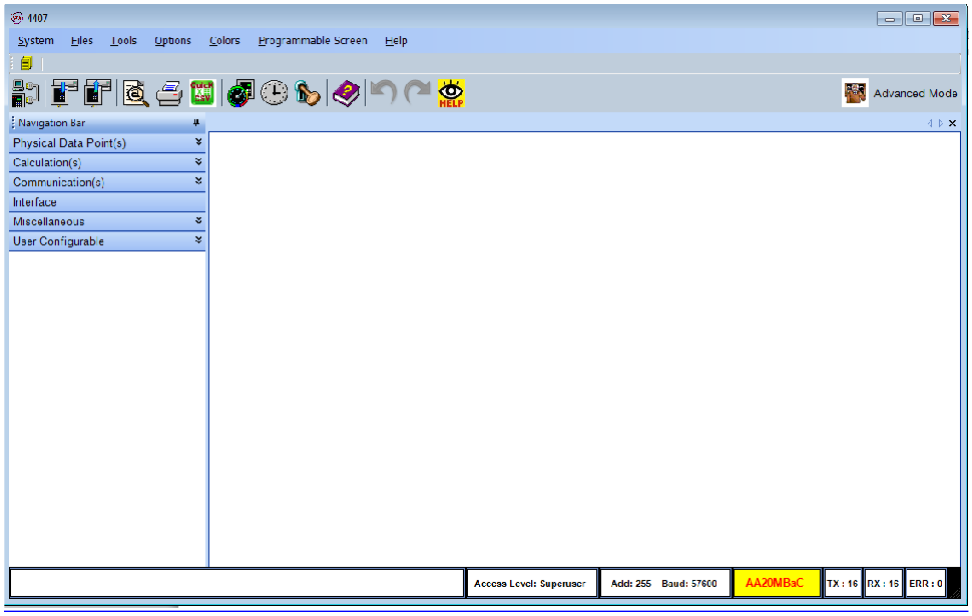


Figure 3-9. Bluetooth connection successful

The unit is now successfully connected to Bluetooth.

Chapter 4
HART Instructions

Introduction

The Thermo Scientific AutoXP Multi Variable Transmitter (MVT) is designed to provide both reliable and accurate Differential Pressure, Static Pressure and Line Temperature measurements. With HART protocol, AutoXP also provides users with access to control or program parameters via a host system, such as AMS, or locally using an Emerson 475 Hand Held Terminal (HHT) or similar.

HART Protocol Overview

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

A complete definition of the protocol interface including all implemented commands can be found in the AutoXP HART Field Device Specification (P/N 1-0500-260).

Enabling HART Communications

HART Functionality on AutoXP can be Enabled/Disabled by setting the required value in the AutoCONFIG System Control Table 31, Entry5 (see Figure 4-1).

Figure 4-1. HART Enabled Functionality

HART Functionality is Enabled by default after a COLD restart of the AutoXP. When setting HART to Enabled, the item "Automitter Mapping" in AutoCONFIG must be set to Disabled (see Figure 4-2).

Figure 4-2. HART AutoMITTER Mapping Disabled

Note: After changing the state of Enabled/Disabled, the user must then perform an I/O rescan or power cycle the AutoXP for the change to take effect.

Wiring & Connections

A typical HART connection for the 4-20mA current loop is shown below (see Figure 4-3). Terminal board pins 1(positive) and 2(negative) are used for the HART interface.

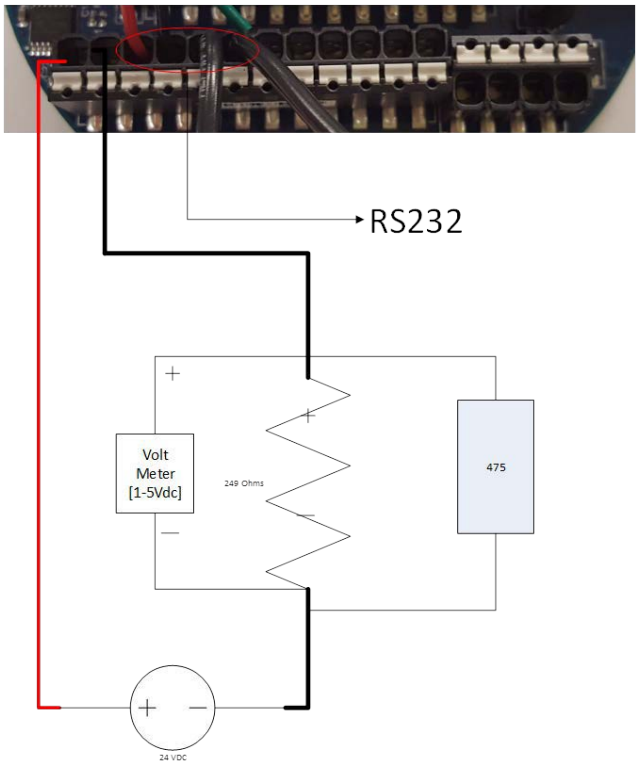


Figure 4-3. Typical HART connection for the 4-20mA current loop

4-20mA Output

The 4-20ma output represents the digital Primary Variable [PV].
For AutoXP the PV can be setup for Differential Pressure, Static Pressure or Line Temperature.

By default, the 4-20mA output is set for Differential Pressure with a Range of 0-100 inches H2O. This can be modified to suit customer requirements using a HART master such as a 475 HHT or AMS PC based system.

4-20 mA Damping

If required, the 4-20mA output can have a damping value applied to smooth out any sudden changes on the current loop.

Damping is entered as an integer representing seconds.

The output will then reply to a step change and the output will achieve 66% of final value after the number of seconds entered.

For example, if five seconds is entered, the output will ramp up to the final step change value such that after 5 seconds the output represents 66% of the final value.

If no damping is required, PV Damping can be set to zeros (0s – the default setting).

Current Loop range

The current loop for the AutoXP has an operating range of 3.8 – 20.8mA.
This allows for an over and under-range of the Primary Variable on the current loop.

HART Masters

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

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

With each host, a Device Description Language (DDL) file will be required to configure/calibrate the AutoXP I/O. The DDL for the AutoXP has been registered and can be obtained directly from the HART Communication Foundation at www.fieldcommgroup.org.

AutoXP 475 DD Menu Structure

This section describes the menu structure used for the MS2011 Device Description (DD). A menu structure for the 475 is provided in Figure 4-65.

The DD was primarily developed for use with an Emerson 475 Hand Held Terminal and this section defines the menu structure based upon the LCD display of the HHT Online Menu.

When first connecting to the AutoXP using a 475 HHT, the initial screen displayed will be the Online Menu.

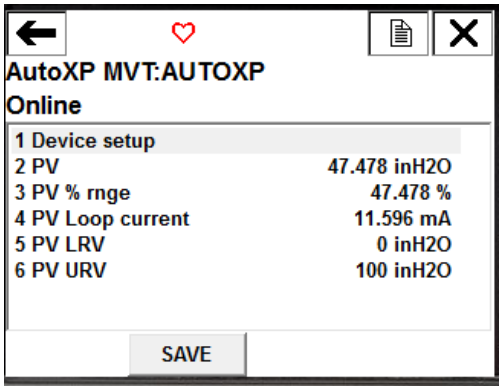


Figure 4-4. Initial Online Menu

Device setup Menu [475 key sequence 1]

The Device Setup Menu is accessed via the Online Menu.

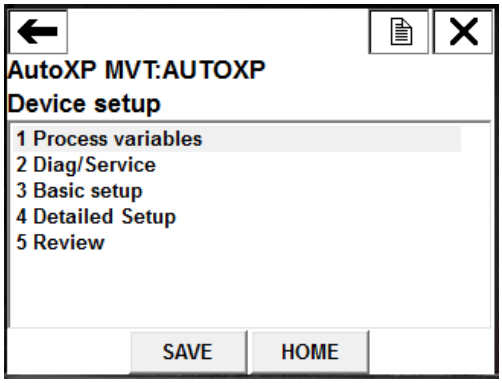


Figure 4-5. Device Setup Menu

This menu allows access to the configuration, live information and diagnostics for AutoXP MVT.

Process Variables Menu [475 key sequence 1, 1]

The Process Variables Menu displays the Primary Variable[PV], Secondary Variable[SV], Tertiary Variable[TV] and Quaternary Variable[QV] supported by AutoXP MVT.

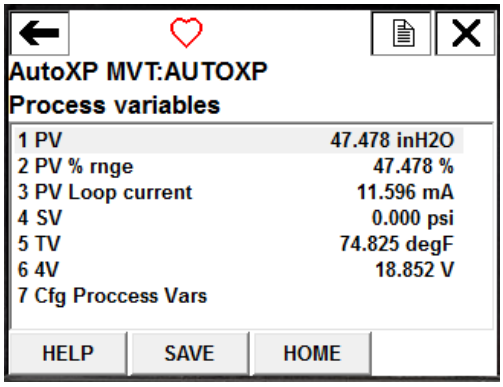


Figure 4-6. Process Variables Menu

Cfg Process Vars Menu [475 key sequence 1, 1, 7]

The Cfg Process Vars Menu is used to configure/allocate each of the process variables to items within the AutoXP MVT.

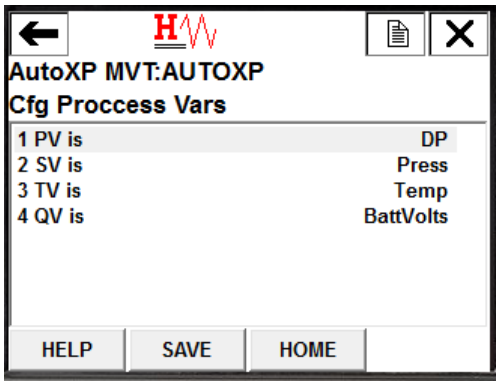


Figure 4-7. Cfg Process Vars Menu

Each process variable PV, SV, TV or QV can be allocated to one of the following items:

- Differential Pressure
- Static Pressure
- RTD Temperature
- Battery Voltage

Diag/Service Menu [475 key sequence 1, 2]

The Diag/Service Menu is used to verify the status of the AutoXP MVT and also to perform calibration/verification of the analog inputs and 4-20mA output.

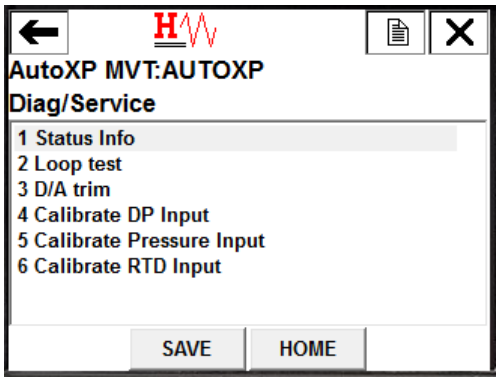


Figure 4-8. Diag/Service Menu

Status Info Menu [475 key sequence 1, 2, 1]

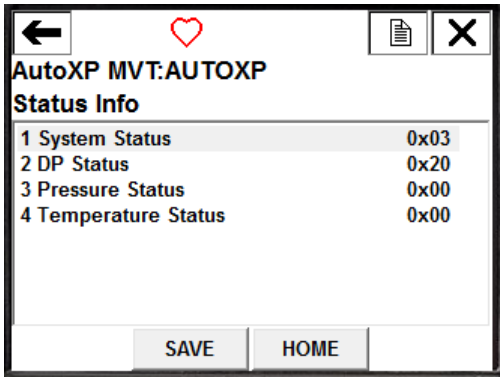


Figure 4-9. Status Info Menu

Status Info Menu allows the user to monitor the alarm status of the following items:

System Status [475 key sequence 1, 2, 1, 1]

DP:IO Failure	OFF|ON
PRESS:IO Failure	OFF|ON
RTD:IO Failure	OFF|ON
Low Battery Volts	OFF|ON

DP Status [475 key sequence 1, 2, 1, 2]

DP: LO ALARM	OFF|ON
DP: LOLO Alarm	OFF|ON
DP: HI Alarm	OFF|ON
DP: HIHI Alarm	OFF|ON
DP: Out Of Range	OFF|ON
DP: ManOvrd	OFF|ON
DP: In Calibration	OFF|ON

Pressure Status [475 key sequence 1, 2, 1, 3]

PRESS: LO ALARM	OFF|ON
PRESS: LOLO Alarm	OFF|ON
PRESS: HI Alarm	OFF|ON
PRESS: HIHI Alarm	OFF|ON
PRESS: Out Of Range	OFF|ON
PRESS: ManOvrd	OFF|ON
PRESS: In Calibration	OFF|ON

RTD Temp Status [475 key sequence 1, 2, 1, 4]

RTD: LO ALARM	OFF|ON
RTD: LOLO Alarm	OFF|ON
RTD: HI Alarm	OFF|ON
RTD: HIHI Alarm	OFF|ON
RTD: Out Of Range	OFF|ON
RTD: ManOvrd	OFF|ON
RTD: In Calibration	OFF|ON

Loop Test [475 key sequence 1, 2, 2]

Loop Test is used to verify the 4-20mA current output of the AutoXP MVT.

The associated method will automatically run and can supply any required mA value from between 4 and 20mA so that the current loop can be verified when connecting to a host device.

1. After selection of the required input for calibration a warning is provided to remove the AutoXP MVT output from any automatic control.

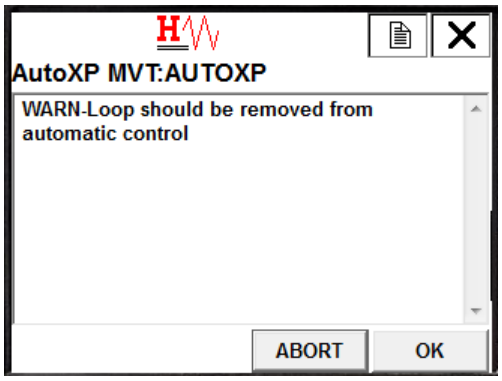


Figure 4-10. Warning to remove MVT output from automatic control

2. Select required output to force onto the 4-20mA loop:
   If 4mA or 20mA selected, go to step 4 below.
   If Other selected, go to step 3 below.
   If End selected, Loop Test is exited. Go to step 6 below.

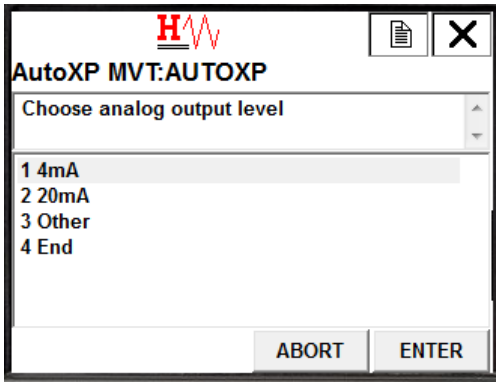


Figure 4-11. Choose analog output level

3. Enter required value to output.

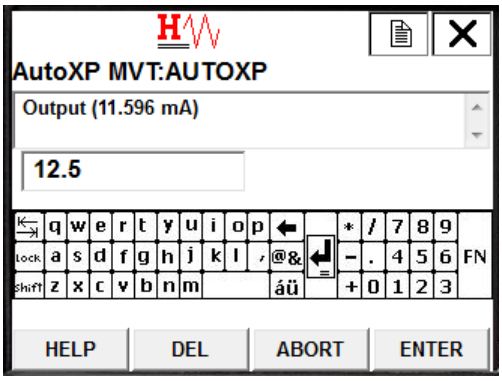


Figure 4-12. Enter required value

4. Required output is forced onto the 4-20mA current loop.

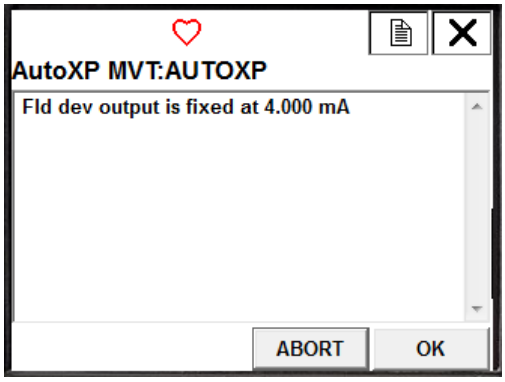


Figure 4-13. Required output fixed

5. Press OK to return to step 2 or Press Abort to exit the Loop Test.
6. Current Loop Test is complete.

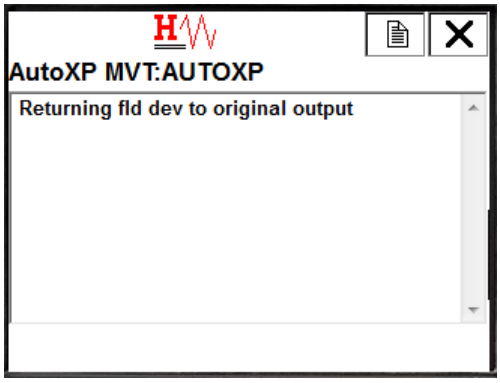


Figure 4-14. Current Loop Test complete

D/A Trim [475 key sequence 1, 2, 3]

D/A Trim is used to calibrate the 4-20mA output of the AutoXP MVT.

The associated method will automatically run and request a user to connect a reference meter to measure the current on the 4-20mA current loop.

Points are calibrated at 4mA and 20mA as follows:

1. After selection of D/A Trim, a warning is provided to remove the AutoXP MVT output from any automatic control.

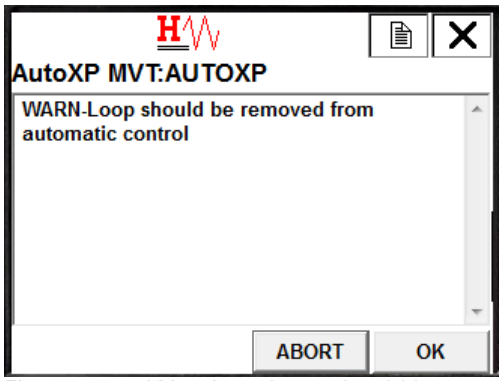


Figure 4-15. Warning - Loop should be removed from automatic control

2. The user is requested to connect a reference meter for Loop calibration.

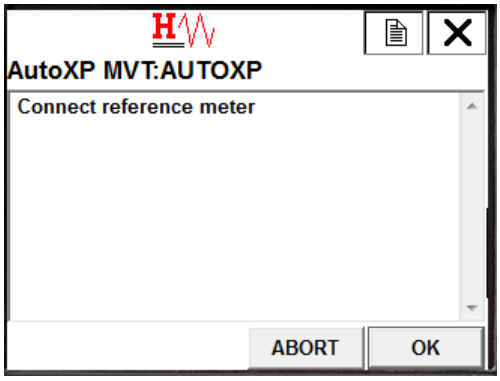


Figure 4-16. Connect reference meter

3. 4mA is forced onto the current Loop.

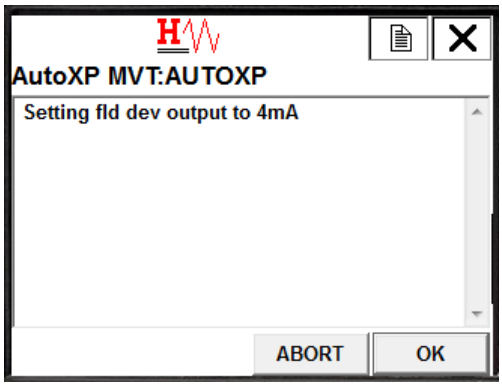


Figure 4-17. Setting fld dev output to 4mA

4. User enters actual measured value.

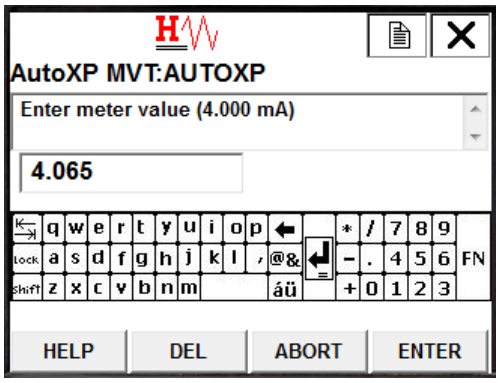


Figure 4-18. Enter meter value

5. AutoXP will modify the output to provide 4mA. If the output goes to 4mA, proceed to step 6 below. If the output is not 4mA, go back to step 4.

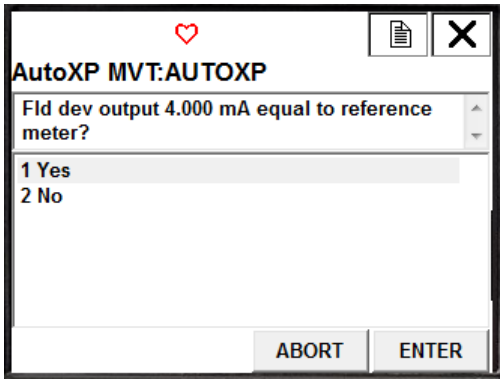


Figure 4-19. Fld dev output

6. 20mA is forced onto the current loop.

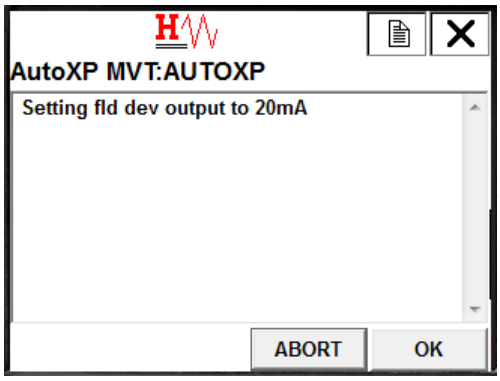


Figure 4-20. Setting fld dev output to 20mA

7. User enters actual measured value.

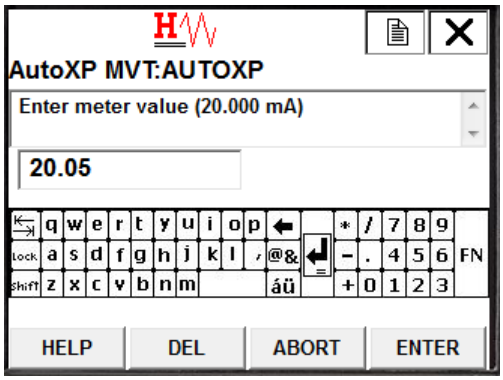


Figure 4-21. Enter meter value

8. AutoXP will modify the output to provide 20mA. If the output goes to 20mA, proceed to step 9 below. If the output is not 20mA, go back to step 7.

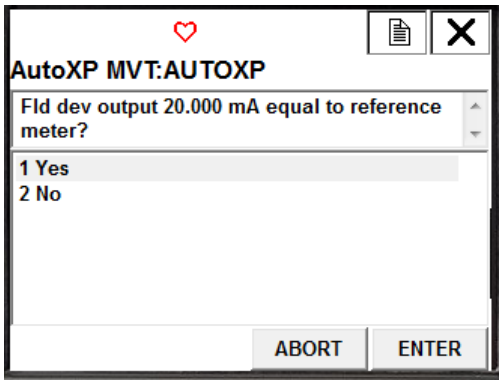


Figure 4-22. Fld dev output 20.000mA

9. D/A Trim is complete. The 4-20mA output will be returned to its original value.

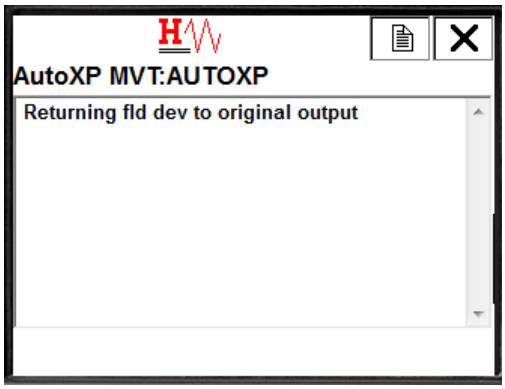


Figure 4-23. Returning fld dev to original output

Input Calibration

The following inputs can be calibrated from the Diag/Service Menu:

- Calibrate Differential Pressure Input [475 key sequence 1, 2, 4]
- Calibrate Static Pressure Input [475 key sequence 1, 2, 5]
- Calibrate RTD Temperature Input [475 key sequence 1, 2, 6]

In each case, a 1, 2 or 3 point calibration can be performed.
A DD method is automatically launched that will step the user through the calibration procedure.

Common DD Calibration Method

With all 3 inputs, the calibration method/procedure is identical.
In this section we look at the calibration procedure for the RTD temperature input.
Both Differential Pressure and Pressure inputs will follow the same sequence:

1. After selection of the required input for calibration, a warning is provided to remove the AutoXP MVT output from any automatic control.

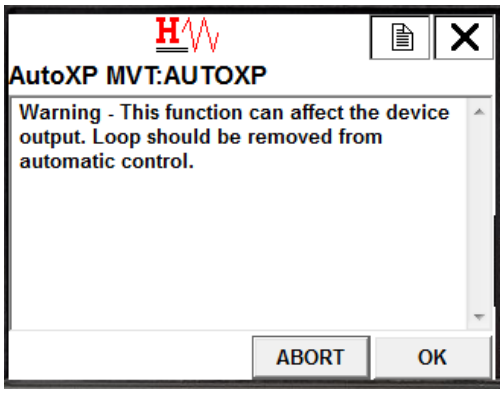


Figure 24. Remove Loop from automatic control

2. Select the required number of calibration points.
   Here we are selecting a 3 point calibration.

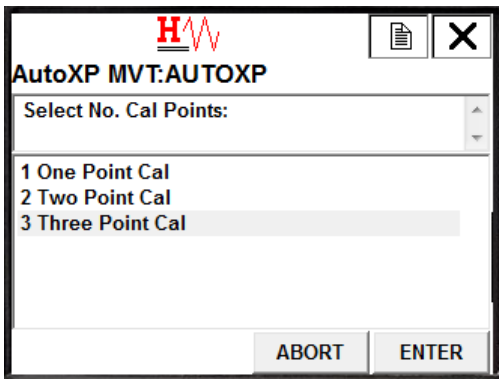


Figure 4-25. Select Number of Cal Points

3. Supply Minimum Input to RTD Input.

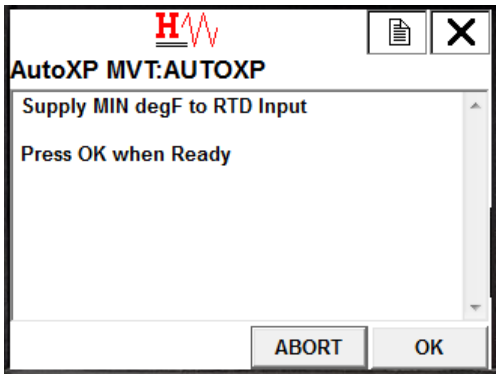


Figure 4-26. Supply Minimum Input to RTD Input

4. DD will display live updates of actual input value.

5. Press ENTER/OK when value is stable.

Figure 4-27. Actual input value display

6. Enter actual value supplied to the input.

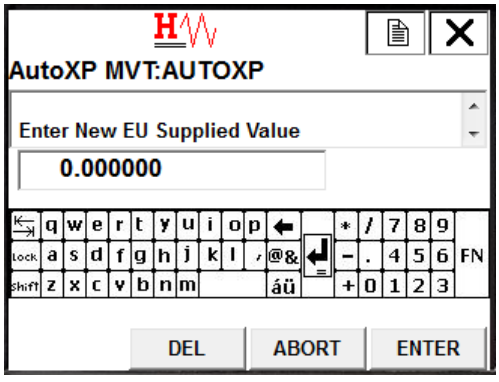


Figure 4-28. Enter New EU Supplied Value

7. If a 1 point calibration is required, go to step 17 below.

8. If a 2 point calibration is required, go to step 13 below.

For a 3 point calibration, supply a mid-range value to the input.

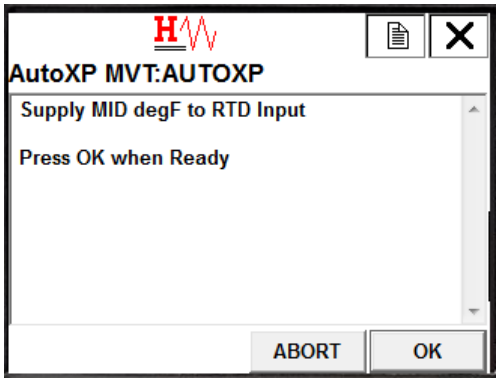


Figure 4-29. Supply MID degF to RTD Input

9. DD will display live updates of actual input value.

10. Press ENTER/OK when value is stable.

Figure 4-30. EU Value

11. Enter actual Mid value supplied to the input.

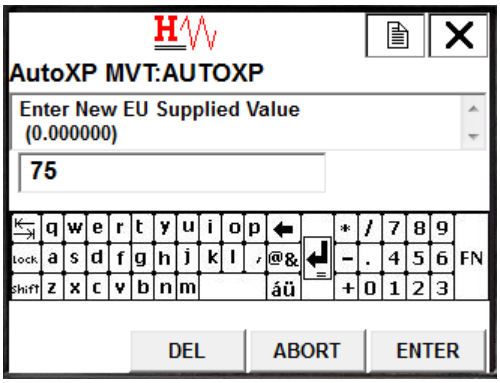


Figure 4-31. Enter actual MID value supplied to the input

12. Supply a full-scale/Max value to the input.

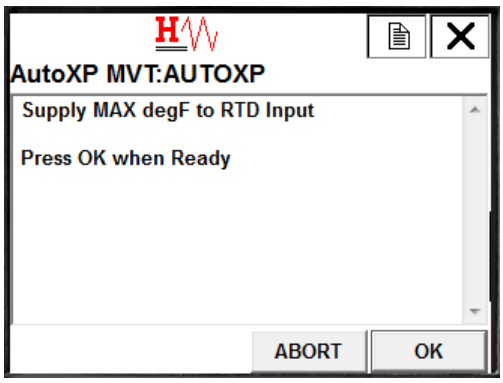


Figure 4-32. Supply full scale/Max value to input

13. DD will display live updates of actual input value.

14. Press ENTER/OK when value is stable.

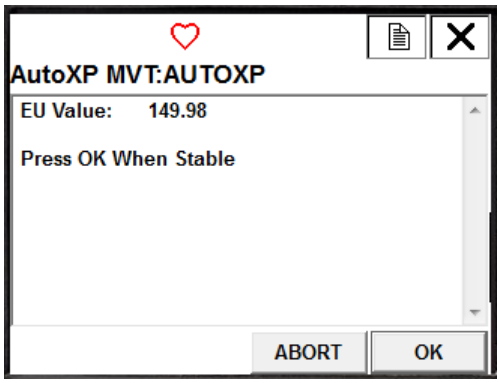


Figure 4-33. Live updates of actual input value

15. Enter actual Max value supplied to the input.

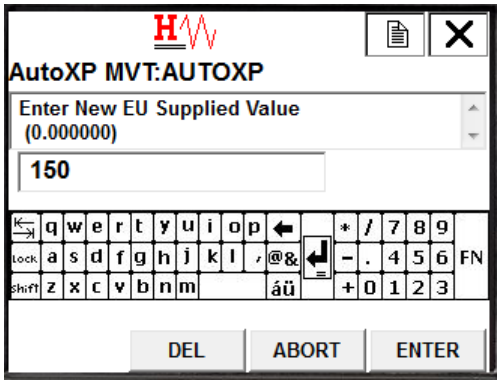


Figure 4-34. Enter New EU Supplied Value

16. DD will update calibration within the AutoXP.

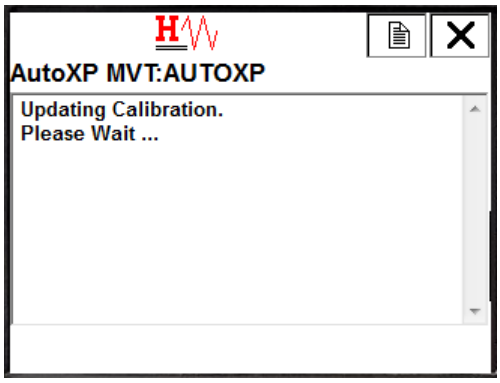


Figure 4-35. Updating Calibration

17. Calibration is complete and user can return to the DD Diag/Service Menu.

Figure 4-36. Calibration Complete

Basic Setup Menu [475 key sequence 1, 3]

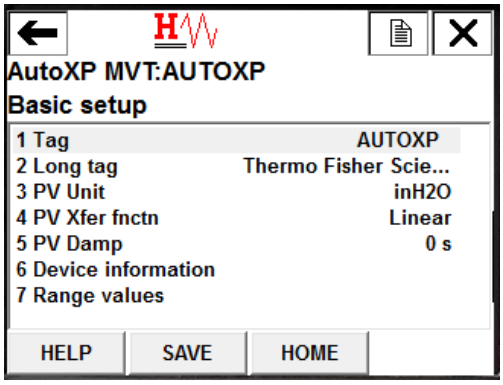


Figure 4-37. Basic Setup Menu

The Basic Setup Menu is used to configure standard HART variables such as Tag, P Units and Damping. Sub menus allow for Device Information and PV Range Values to be configured.

Device Information Menu [475 Key Sequence 1, 3, 6]

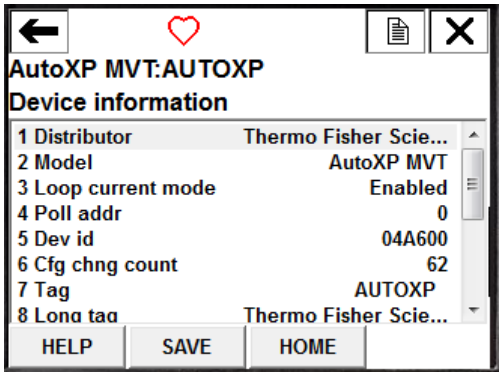
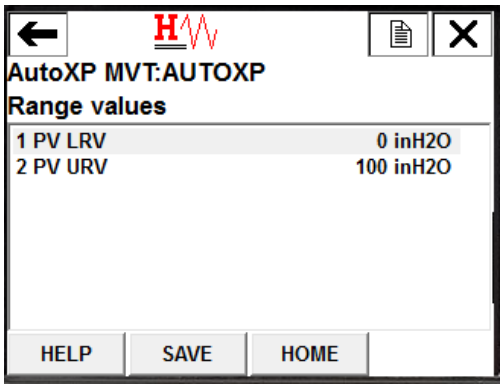


Figure 4-38. Device Information

Device Information Menu allows a user to Configure/View the following HART variables:

- Distributor
- Model
- Loop Current Mode
- Poll Address
- Device ID
- Config Change Count
- Tag
- Long Tag
- Date
- Write Protect Mode
- Descriptor
- Message
- Final Assembly Number
- Revision Info

Range Values Menu [475 Key Sequence 1, 3, 7]



4-39. Range Values Menu

Range Values Menu allows a user to configure the following HART variables: -

- PV Lower Range Value
- PV Upper Range Value

These values are effectively the 4-20mA Zero and Full Scale values.

Detailed Setup Menu [475 key sequence 1, 4]

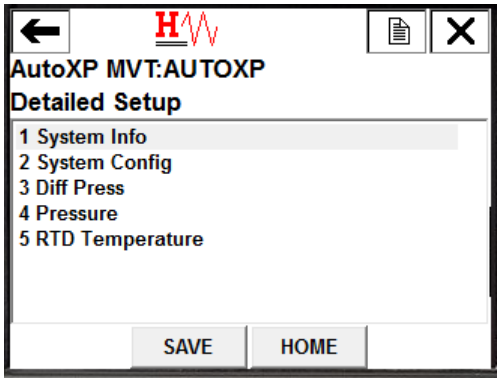


Figure 4-40. Detailed Setup Menu

The Detailed Setup Menu is used to configure/view the AutoXP specific variables. The Menu has the following 5 sub menus that are used to configure/view System and Input Configuration:

1. System Info
2. System Config
3. Diff Press
4. Pressure
5. RTD Temperature

System Info Menu [475 Key Sequence 1, 4, 1]

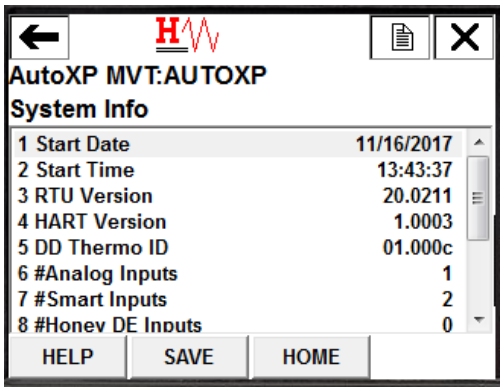


Figure 4-41. System Info Menu

System Info Menu provides general information about the AutoXP MVT as follows:

- Start Date
- Start Time
- RTU Version
- HART Version
- DD Thermo ID
- #Analog Inputs
- #Smart Inputs
- #Honeywell DE Inputs
- #Accumulator Inputs
- #Discrete Inputs
- #Analog Outputs
- #Discrete Outputs

Note: Each item above is read only

System Config Menu [475 Key Sequence 1, 4, 2]

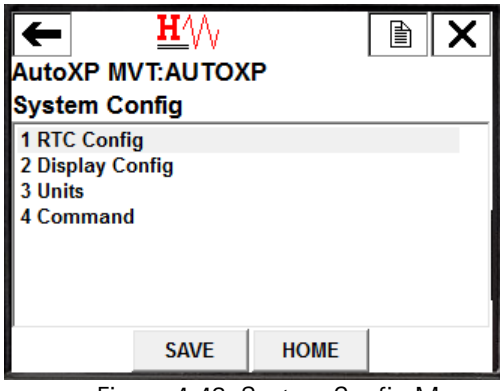


Figure 4-42. System Config Menu

System Config Menu allows a user to configure the RTC, Display and Input Units Selection for the AutoXP MVT. A menu is also provided to allow various reset commands to be issued to the device as follows:

- RTC Config
- Display Config
- Units
- Command

RTC Config Menu [475 Key Sequence 1, 4, 2, 1]

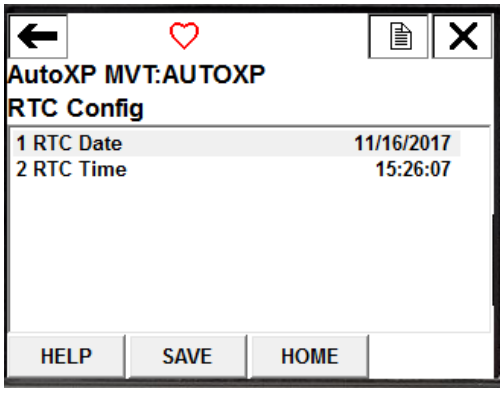


Figure 4-43. RTC Config Menu

RTC Config Menu is used to display/configure the RTC Time and Date within the AutoXP MVT.

- RTC Date
- RTC Time

Date format is always displayed in mm/dd/yyyy format.

Display Config Menu [475 Key Sequence 1, 4, 2, 2]

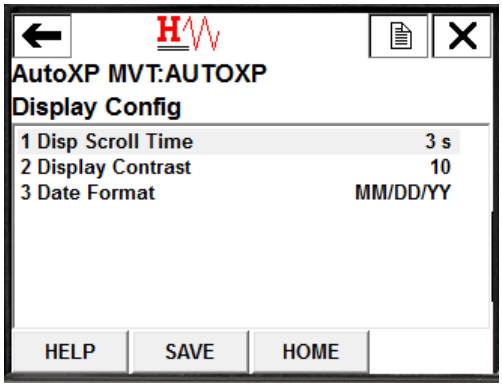


Figure 4-44. Display Config Menu

Display Config Menu is used to configure the following items:

- Display Scroll Time
- Display Contrast
- Display Date Format

Units Menu [475 Key Sequence 1, 4, 2, 3]

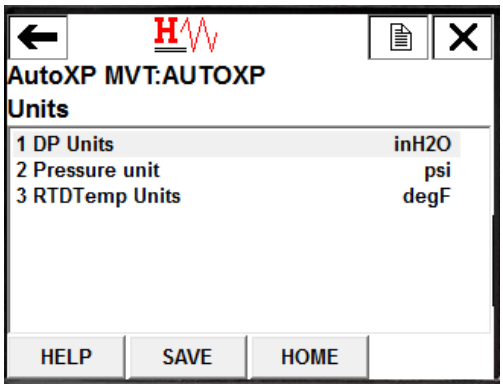


Figure 4-45. Units Menu

Units Menu is used to display/configure the units for the 3 input variables:

- DP Units
- Pressure Units
- RTD Temp Units

Command Menu [475 Key Sequence 1, 4, 2, 4]

Command Menu is used to access the Reset Method for the AutoXP.

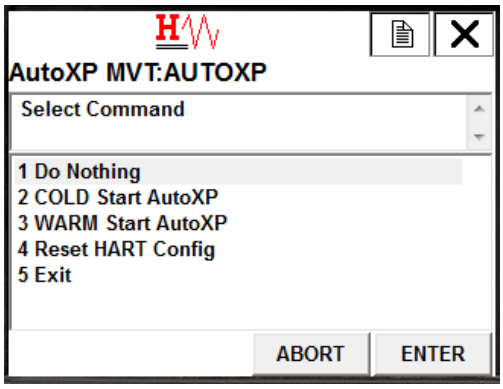


Figure 4-46. Command Menu

Cold Start AutoXP

1. Selecting Cold Start will display a warning that ALL Configurations will be reset to default values.

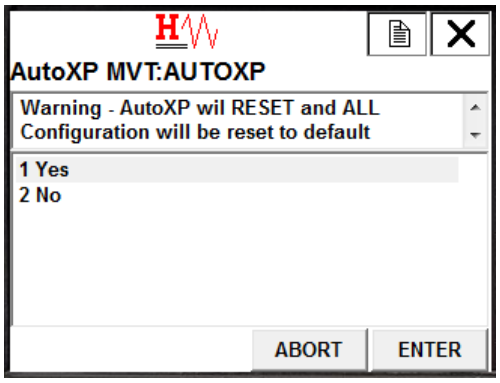


Figure 4-47. Selecting Cold Start

2. Selecting No will return the user to the System Config Menu.

3. If Yes is selected, ALL Configurations will be reset with the following display asking the user to wait.

Figure 4-48. Performing COLD Start

4. After about 30 seconds, the display will return to the System Config Menu.

Warm Start AutoXP

1. Selecting Warm Start will display a warning that ALL Configurations will be reset to the default values.

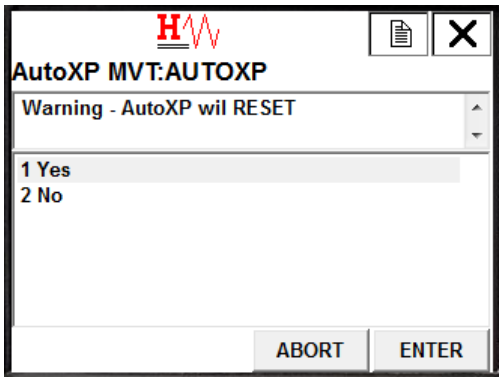


Figure 4-49. Selecting Warm Start

2. Selecting No will return the user to the System Config Menu.

3. If Yes is selected, ALL Configurations will be reset with the following display asking the user to wait.

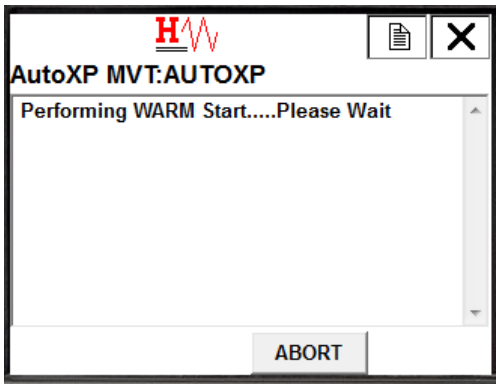


Figure 50. Performing Warm Start

4. After about 30 seconds, the display will return to the System Config Menu.

Reset HART Config

1. Selecting Reset HART Config will display a warning that HART Configuration will be reset to default values.

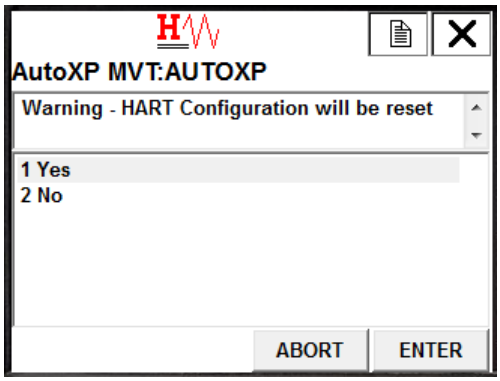


Figure 4-51. Reset HART Config

2. Selecting No will return the user to the System Config Menu.

3. If Yes is selected, ALL HART Configurations will be reset with the following display asking the user to wait.

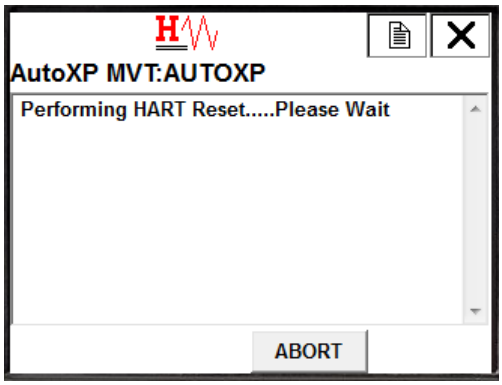


Figure 4-52. Performing HART Reset

4. After about 15 seconds, the display will return to the System Config Menu.

Input Configuration Menus

The Detailed Setup Menu allows access to the following Input Configuration Menus:

- Differential Pressure [475 Key Sequence 1, 4, 3]
- Static Pressure [475 Key Sequence 1, 4, 4]
- RTD Temperature [475 Key Sequence 1, 4, 5]

The menu tree for each of the inputs is identical so only one (RTD Temperature) menu sequence is shown below:

DP Live Data [475 Key Sequence 1, 4, 3, 1]
Pressure Live [475 Key Sequence 1, 4, 4, 1]
RTD Live Data [475 Key Sequence 1, 4, 5, 1]

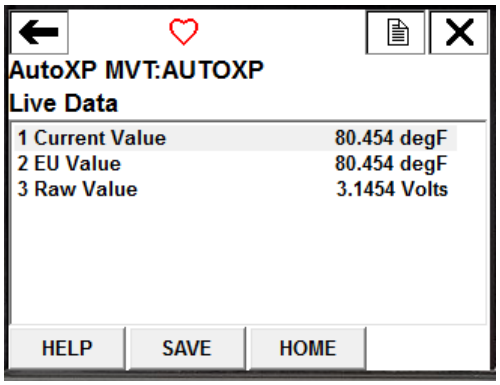


Figure 4-53. Detailed Setup Menu

The Live Data Menu allows a user to view Current, EU and Raw values for the selected Input.

Manual Config [475 Key Sequence 1, 4, 5, 2]

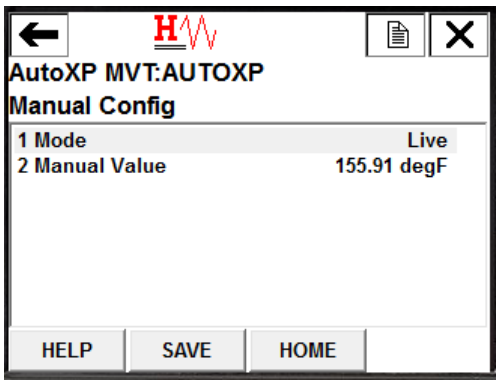


Figure 4-54. Manual Config

The Manual Config Menu is used to set the mode of the input (LIVE|MANUAL).
When set to LIVE, the current value is the EU Value from the live input.
When set to MANUAL, a Manual Value can be entered. This value is then used as the Current Value in the Live Input Data.

Alarm Limits Menu [475 Key Sequence 1, 4, 5, 3]

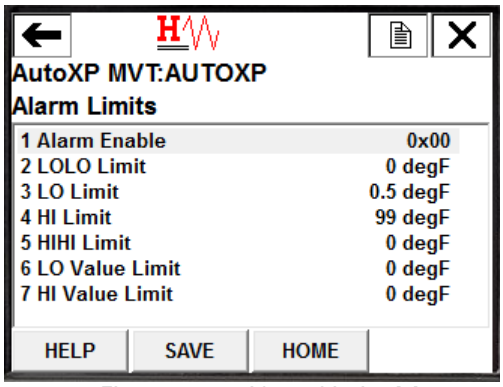


Figure 4-55. Alarm Limits Menu

The Alarm Limits Menu is used to set alarm limit values for the selected input.

- LOLO Limit Alarm is set when the Input goes below the LOLO Limit value.
- LO Limit Alarm is set when the Input goes below the LO Limit value.
- HI Limit Alarm is set when the Input goes above the HI Limit value.
- HIHI Limit Alarm when the Input goes below the HIHI Limit value.
- LO Value Alarm is generated when the input goes below this set threshold.
- HI Value Alarm is generated when the input goes below this set threshold.

Alarm Enable [475 Key Sequence 1, 4, 5, 3, 1]

Alarm Enabled is selected to turn on/off the associated alarm.

In the following screen, only LO Alarm, HI Alarm and LO Value Alarm will annunciate in the HART additional Status Bytes.

LOLO, HIHI and HI Value Alarms are disabled.

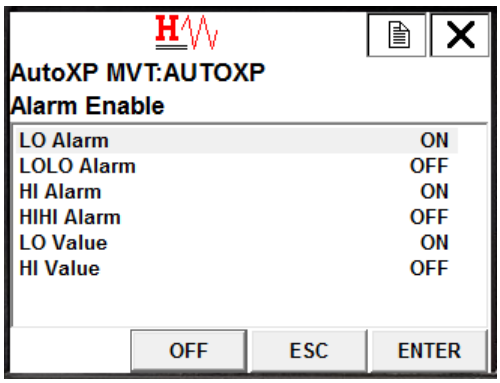


Figure 4-56. Alarm Enable Menu

Calibrate RTD Input [475 Key Sequence 1, 4, 5, 4]

Calibration of the input can be accessed via the Input Menu.

The method for calibration of the input is identical to that of the calibration from the Diag/Service.

Current Calibration Constants Menu [475 Key Sequence 1, 4, 5, 5]

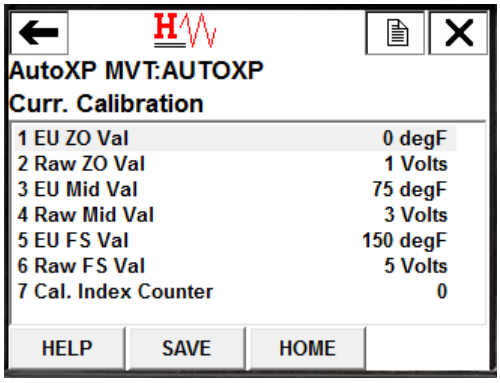


Figure 4-57. Current Calibration Constants Menu

The Current Calibration Menu shows the three point calibration table for the input. Item 7 of the menu shows the Calibration Index Count which is incremented after each calibration. Monitoring this count is used to determine if a new calibration has been performed.

Previous Calibration Constants Menu [475 Key Sequence 1, 4, 5, 6]

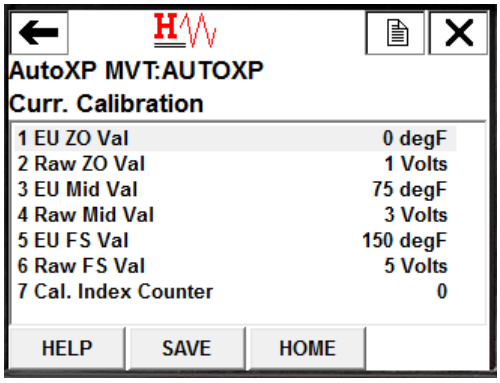


Figure 4-58. Previous Calibration Constants Menu

The previous Current Calibration Menu shows the three point calibration table for the input prior to the last successful calibration.

By comparing the two previous and current calibration constants, an idea of the performance of the input can be determined.

Review Menu [475 Key Sequence 1, 5]

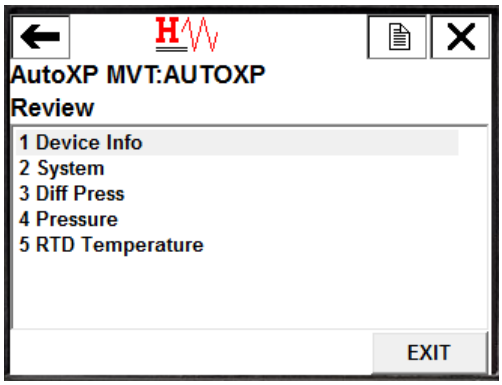


Figure 4-59. Review Menu

The Review Menu can be used to read the setup of the AutoXP as a list of variables.

Items within each sub menu are listed contiguously and are READ ONLY for review purposes only.

Device Info [475 Key Sequence 1, 5, 1]

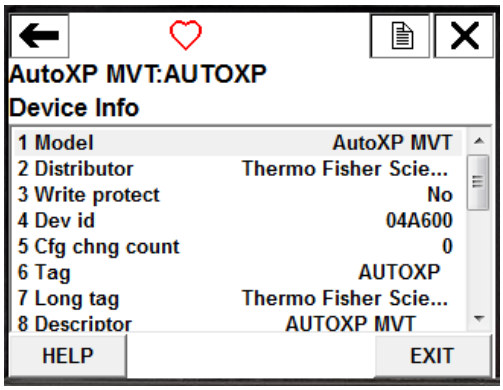


Figure 4-60. Device Info Menu

System [475 Key Sequence 1, 5, 2]

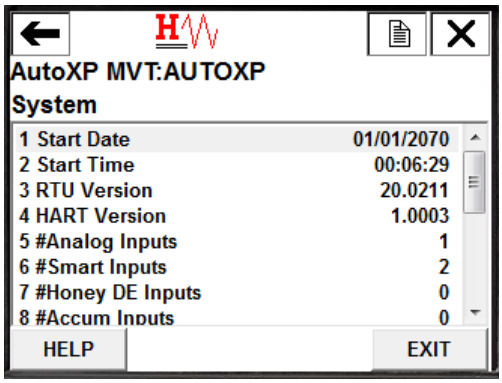


Figure 4-61. System Menu

Diff Press [475 Key Sequence 1, 5, 3]

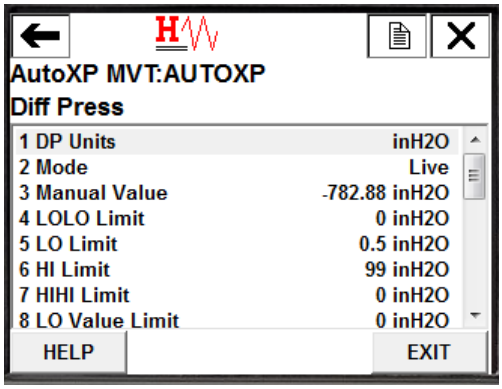


Figure 4-62. Diff Press Menu

Pressure [475 Key Sequence 1, 5, 4]

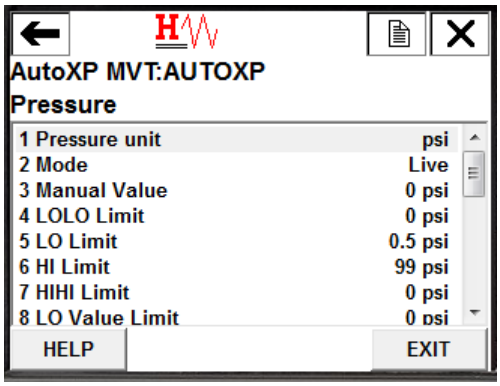


Figure 4-63. Pressure Menu

RTD Temperature [475 Key Sequence 1, 5, 5]

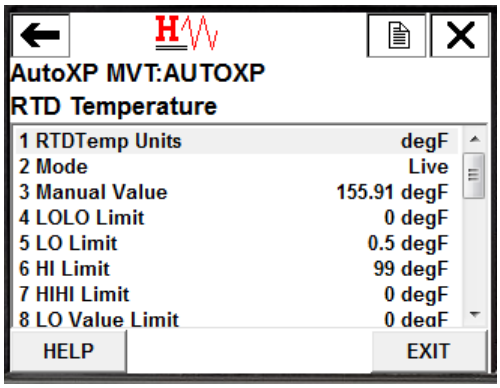


Figure 4-64. RTD Temperature Menu

AutoXP MVT DD Menu Structure for 475

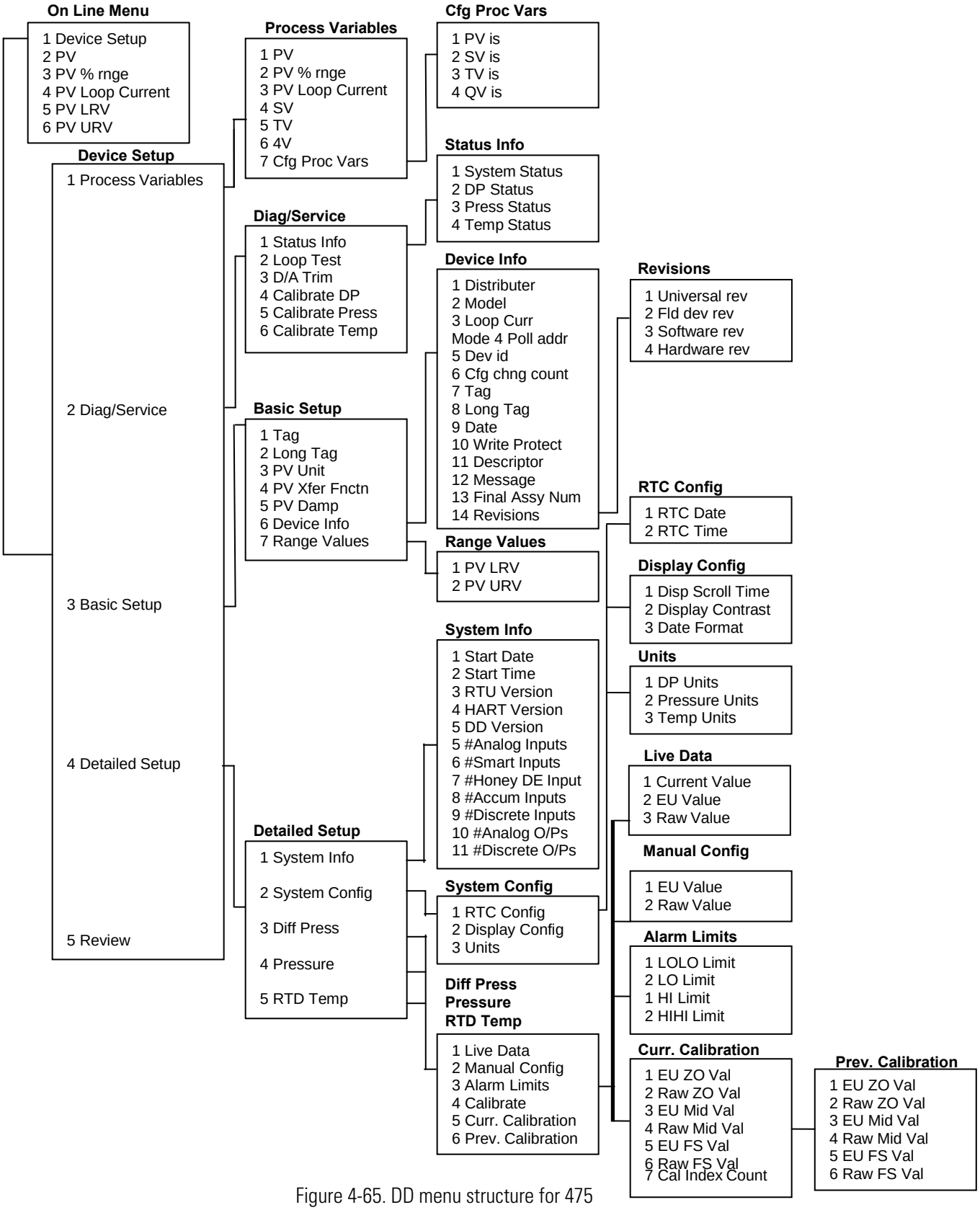


Figure 4-65. DD menu structure for 475

AMS Type Masters

The AutoXP Device Description can be imported into PC HART masters such as Fisher Rosemount's AMS Asset Management Tool.

This section describes the PC Type interface available when connected to a PC HART master.

Configure/Setup Screens

Basic Setup

After selecting Configure/Setup from the menu tree, the Basic Setup screen will be displayed.

Device Information Tab

This screen allows access to the basic HART Configuration for the AutoXP.

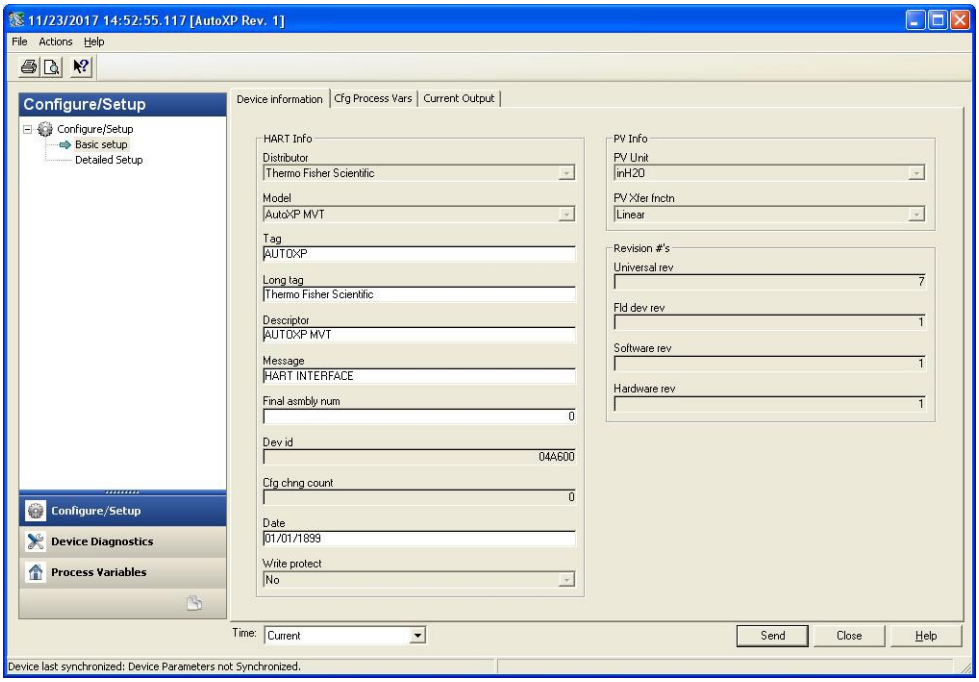


Figure 4-67. Device Information Tab

Config Process Variables Tab

This screen allows the 4 HART process variables to be allocated to the required variables within the AutoXP.

Default Configuration will be:

- PV is DP
- SV is Pressure
- TV is RTD Temperature
- QV is Battery Volts

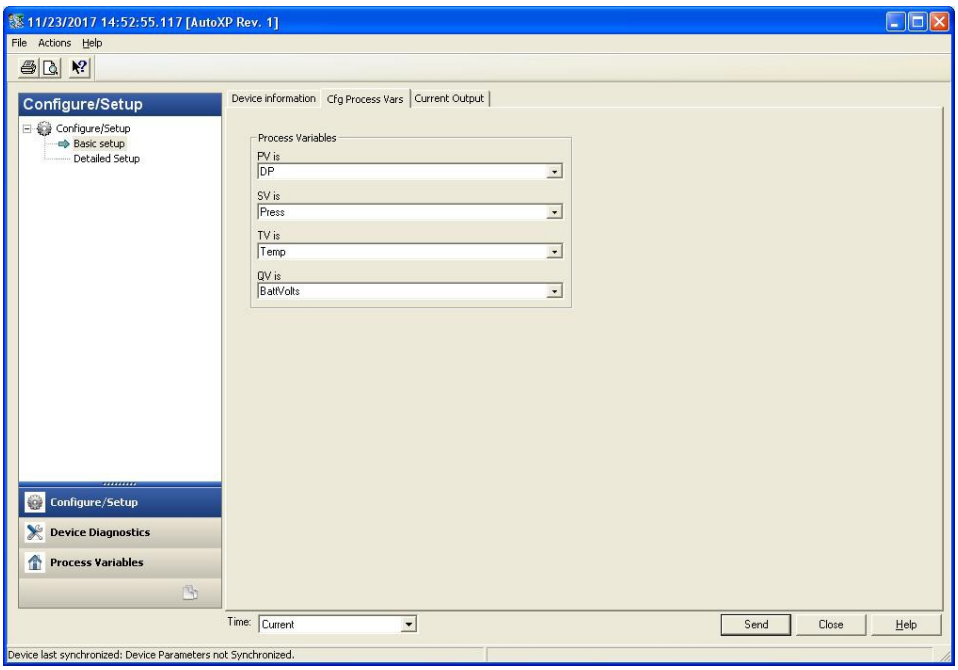


Figure 4-67. Config Process Variables Tab

Current Output Tab

This screen is used to configure, test and calibrate the 4-20mA output.

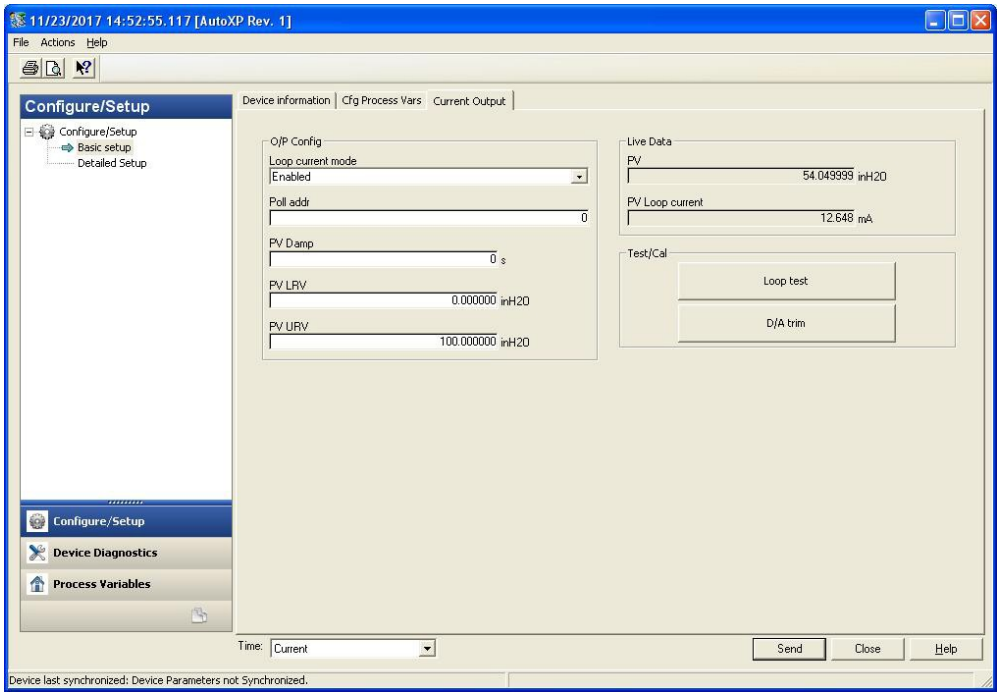


Figure 4-68. Current Output Tab

Loop Test

Loop Test is used to verify the 4-20mA current output of the AutoXP MVT.
The associated method will automatically run and can supply any required mA value from between 4 and 20mA so that the current loop can be verified when connecting to a host device.
The user is advised to remove loop from any automatic control.

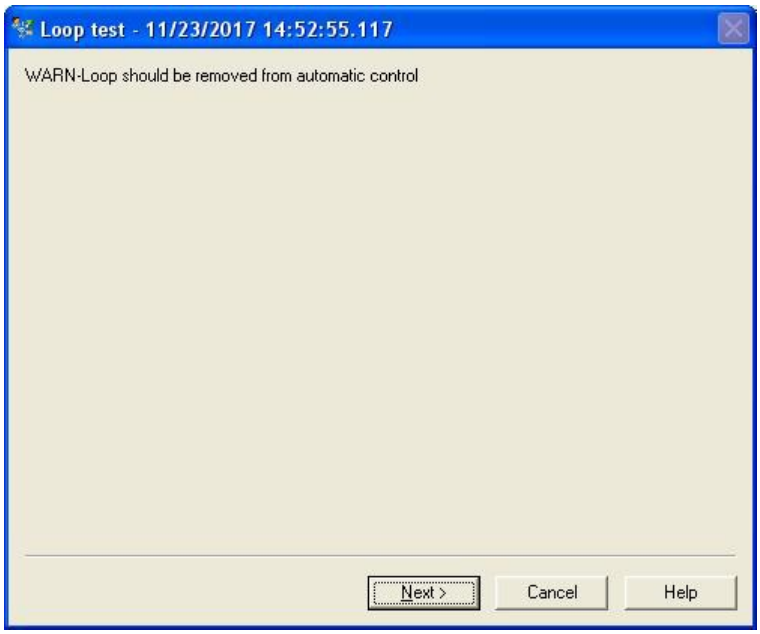


Figure 4-69. Loop test

User selects required loop output.

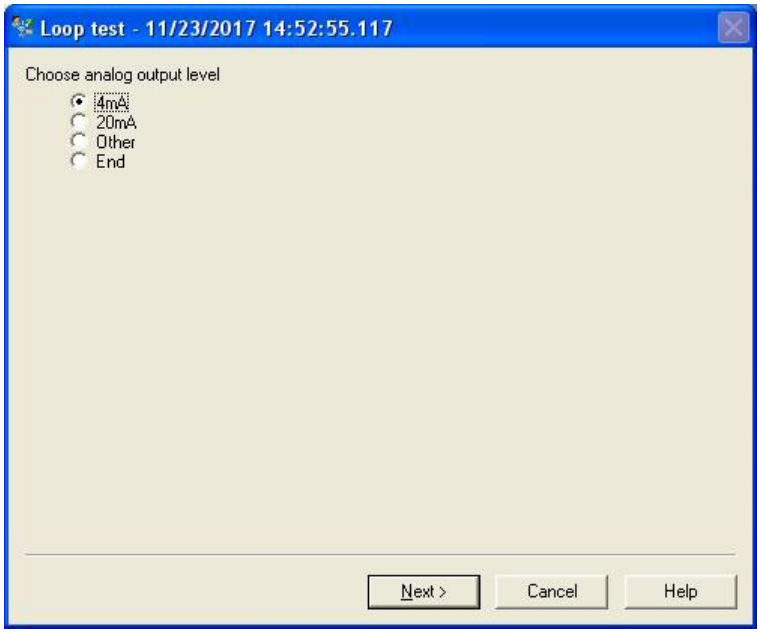


Figure 4-70. Select required loop output

If Other was selected, the required Output current must be entered.

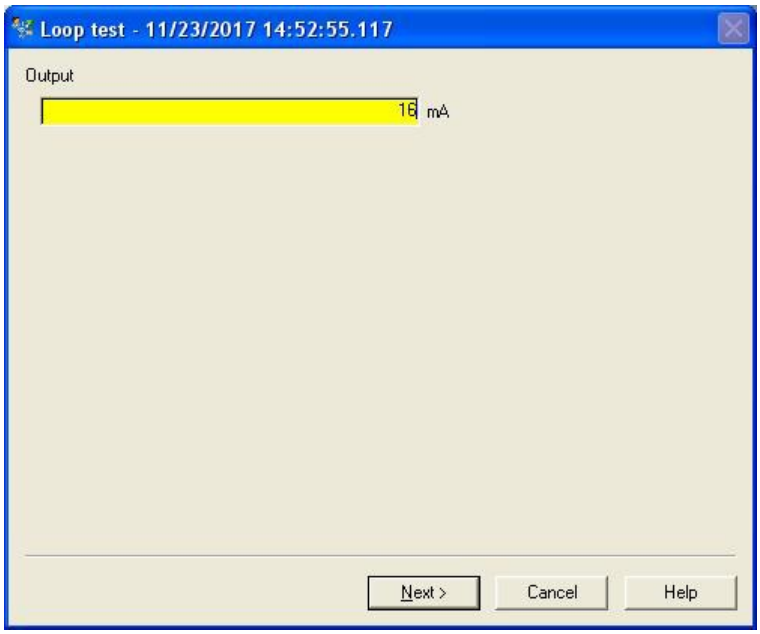


Figure 4-71. Enter other output value

Output is forced to requested value.

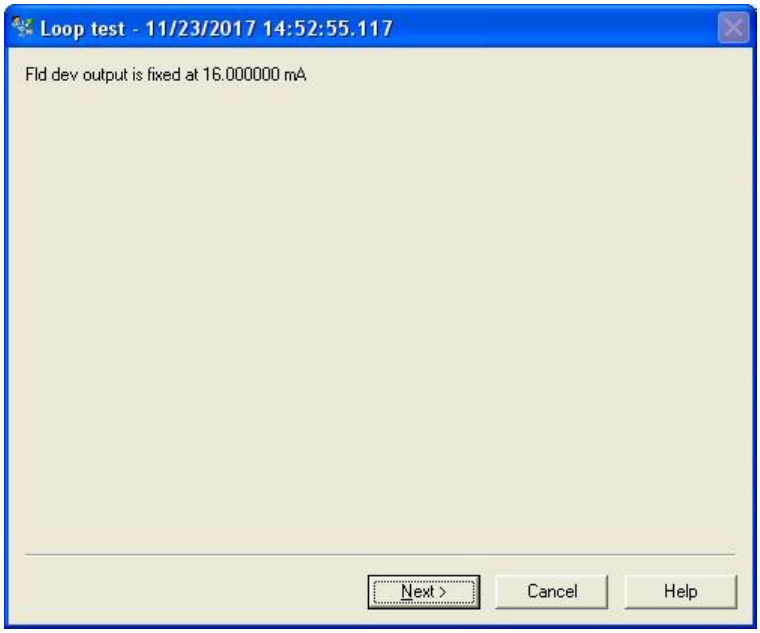


Figure 4-72. Requested value output

On exit from method, the output is returned to its original state.

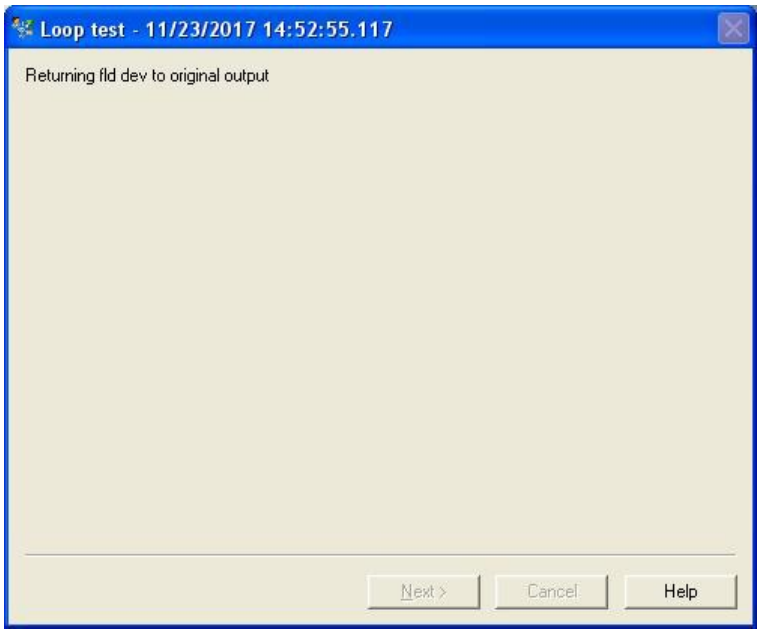


Figure 4-73. Output returned to original state

Method is complete. Press Finish to close the dialog.

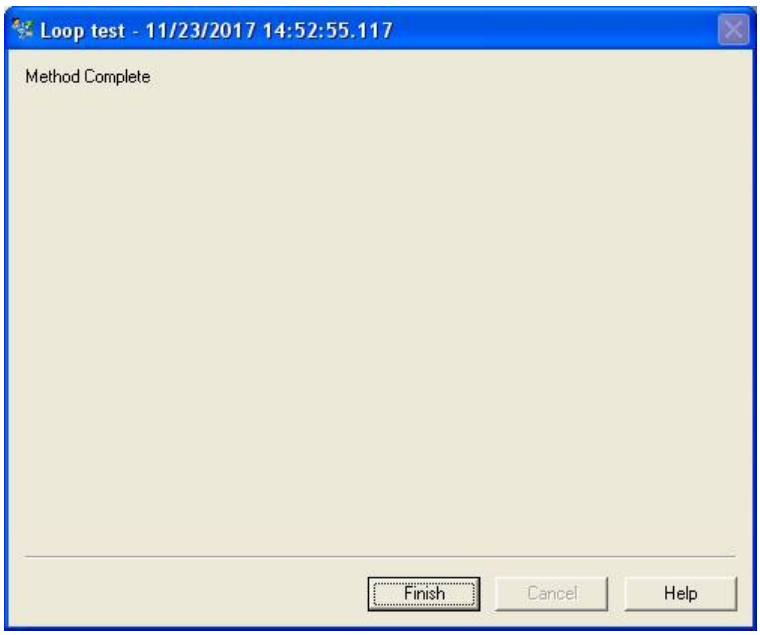


Figure 4-74. Method complete

D/A Trim

D/A Trim is used to calibrate the 4-20mA output of the AutoXP MVT.
The associated method will automatically run and request a user to connect a reference meter to measure the current on the 4-20mA current loop.
Points are calibrated at 4mA and 20mA as follows:

1. After selection of D/A Trim, a warning is provided to remove the AutoXP MVT output from any automatic control.

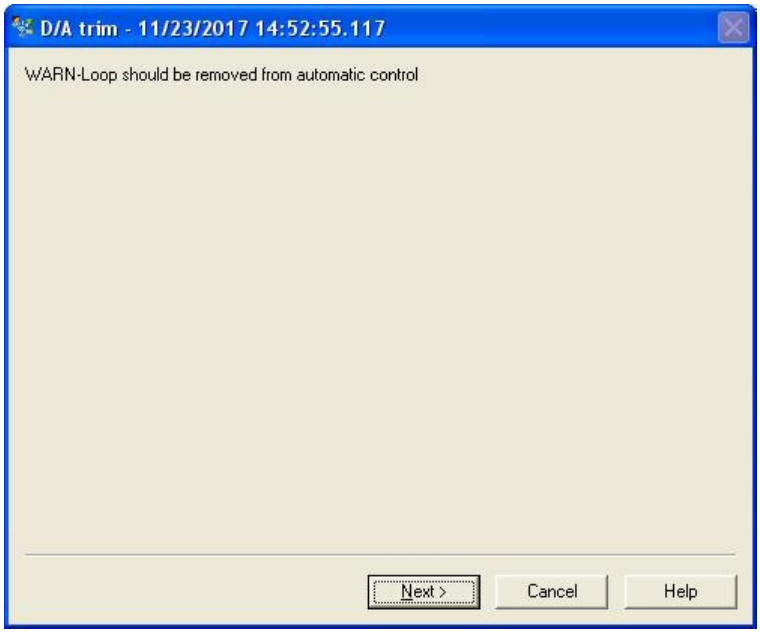


Figure 4-75. Remove Loop from automatic control

2. User is requested to connect a reference meter for loop calibration.

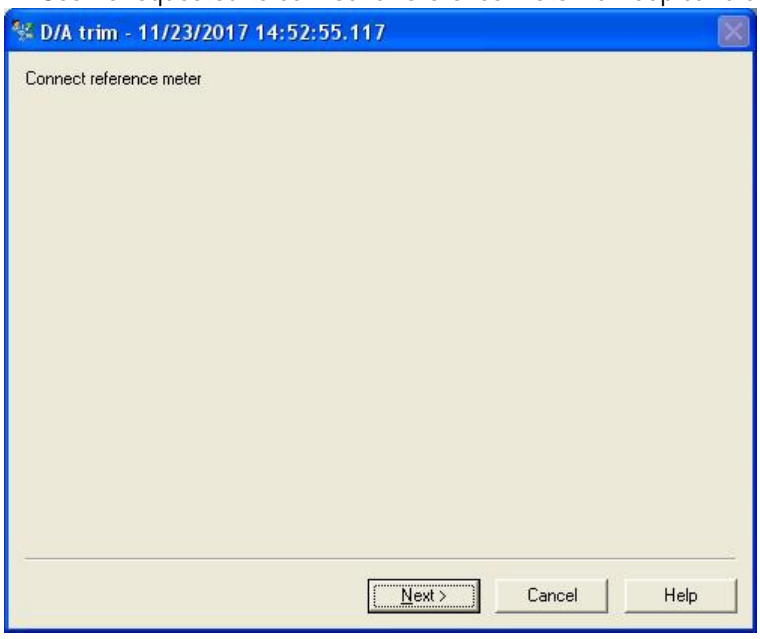


Figure 4-76. Connect reference meter

3. 4mA is forced onto current loop.

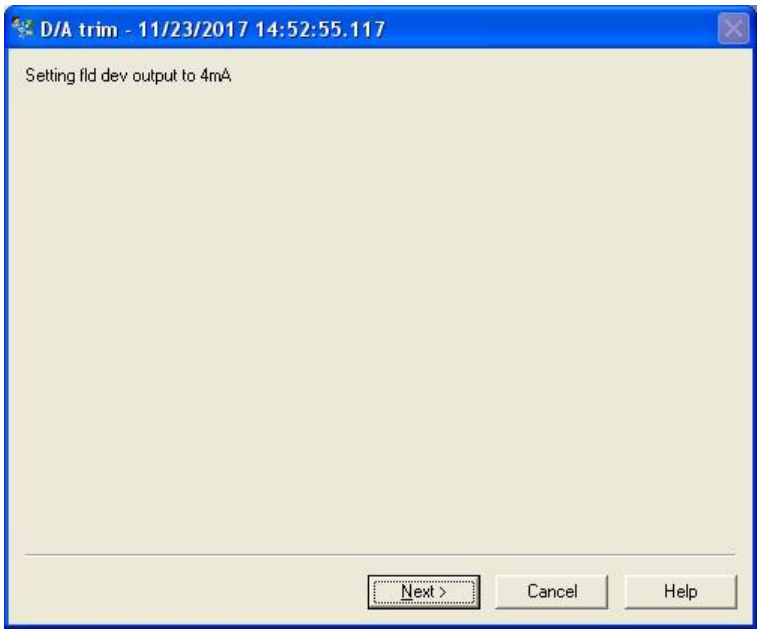


Figure 4-77. Setting fld dev output to 4mA

4. User enters actual measured value.

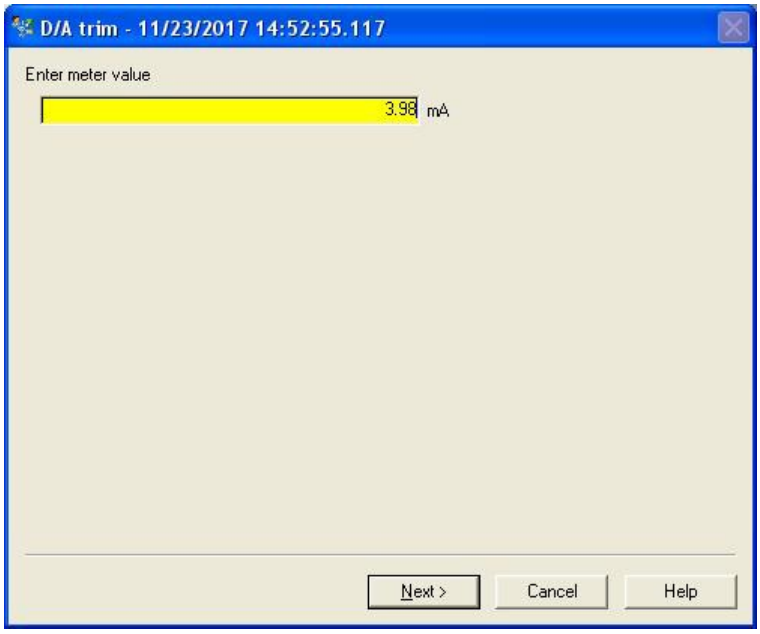


Figure 4-78. Enter meter value

5. AutoXP will modify the output to provide 4mA.

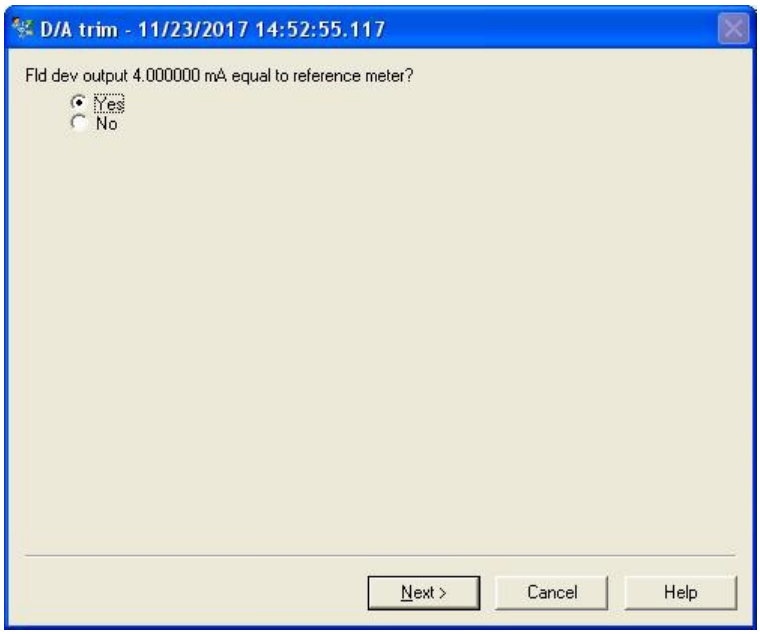


Figure 4-79. Fld dev output equal to reference meter

If the output goes to 4mA, proceed to step 6 below.
If the output is not 4mA, go back to step 4.

6. 20mA is forced onto the current loop.

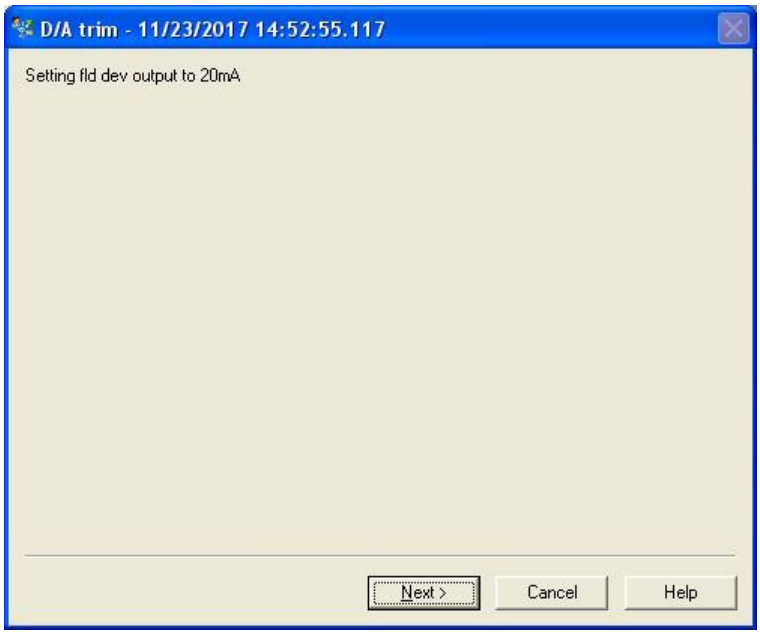


Figure 4-80. Setting fld dev output to 20mA

7. User enters actual measured value.

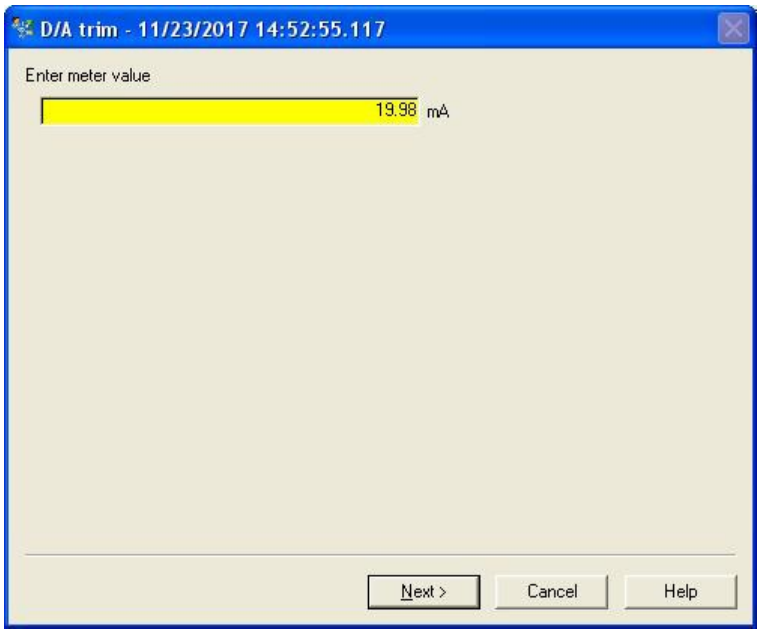


Figure 4-81. Enter meter value.

8. AutoXP will modify the output to provide 20mA.

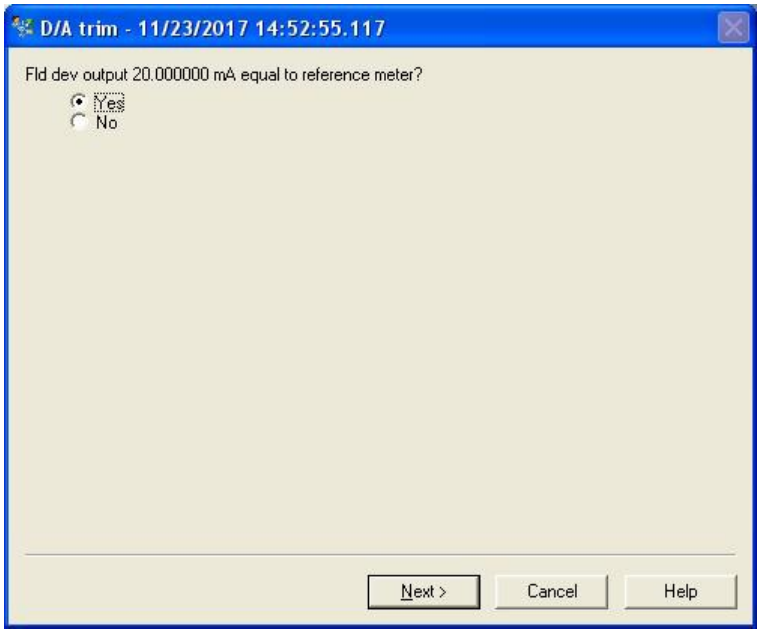


Figure 4-82. Fld dev output equal to reference meter

If the output goes to 20mA, proceed to step 9 below.
If the output is not 20mA, go back to step 7.

9. D/A Trim is complete and the 4-20mA output will return to its original value.

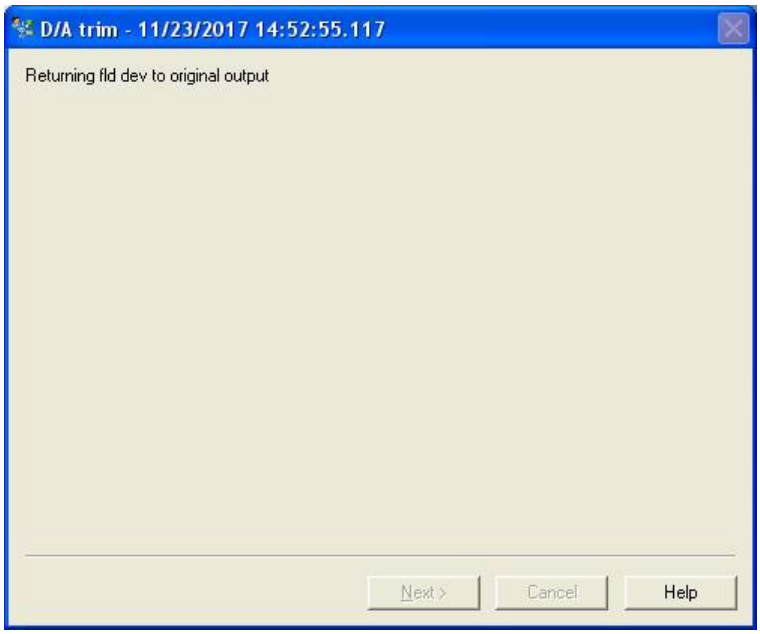


Figure 4-83. Return fld dev to original output

The loop can now be returned to automatic control.

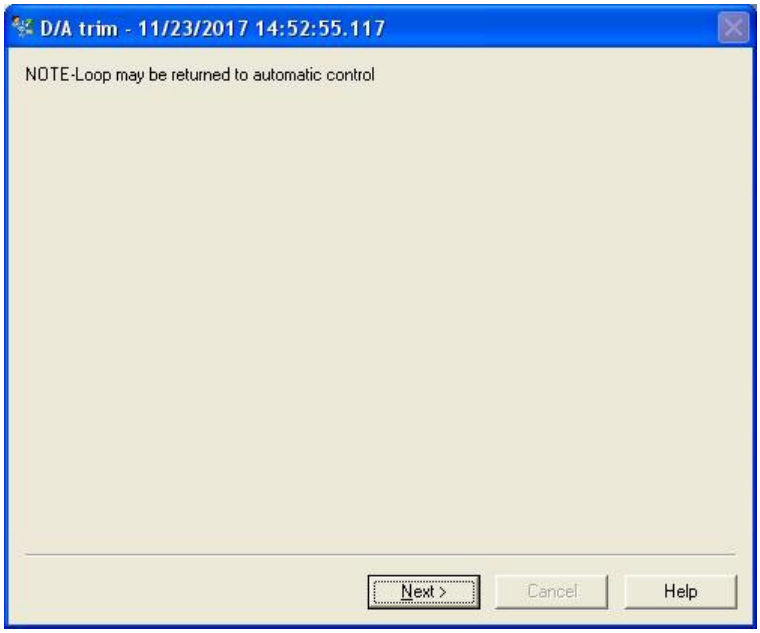


Figure 4-84. Loop returned to automatic control

Method is complete. Press Finish to close Dialog.

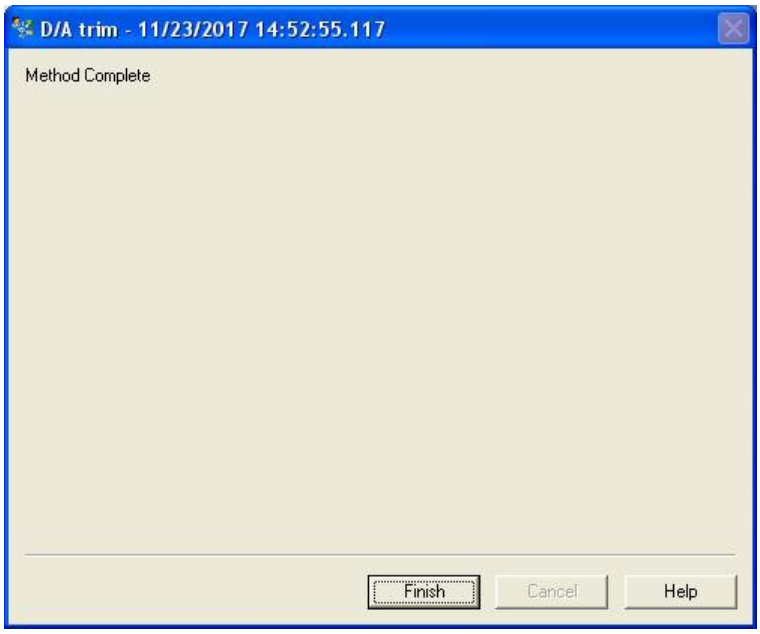


Figure 4-85. Method Complete

Detailed Setup Menu

The Detailed Setup Menu is used to configure/view the AutoXP specific variables. The Menu has the following six sub menus that are used to configure/view System and Input Configuration:

- System Info
- System Config
- Diff Press
- Pressure
- RTD Temperature
- System Info Tab

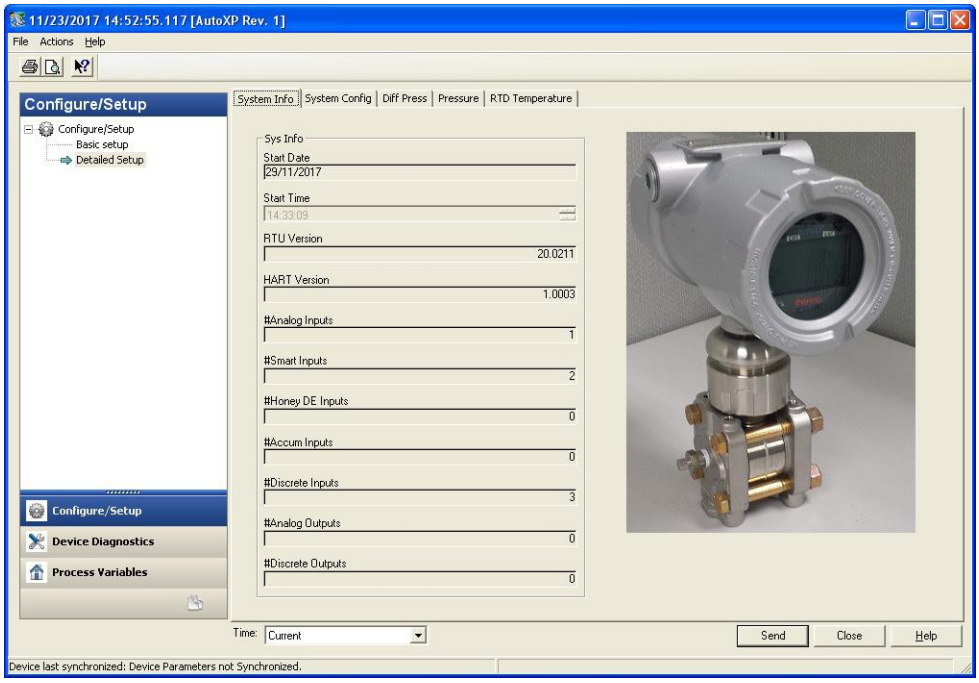


Figure 4-86. Detailed Setup Menu

System Config Tab

System Config Menu allows a user to configure the RTC, Display and Input Units Selection for the AutoXP MVT.

A button is also provided to allow various reset commands to be issued to the device as follows:

- Command Method

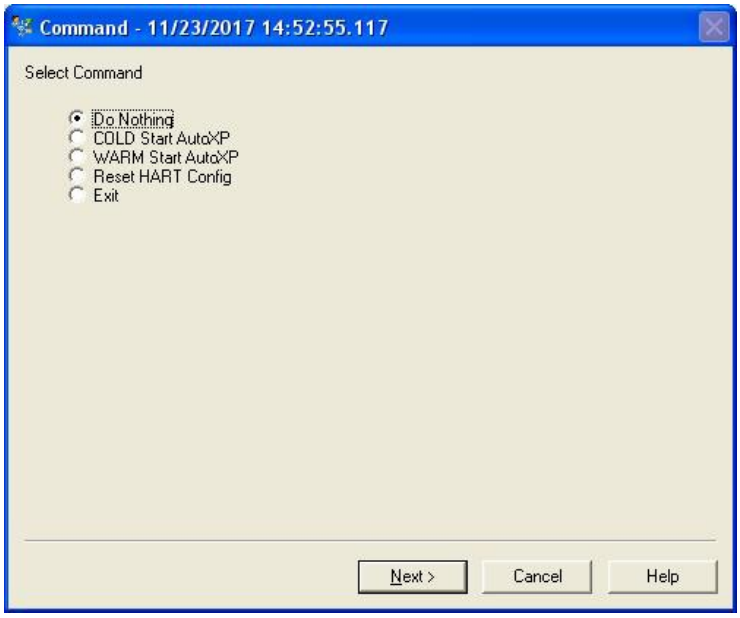


Figure 4-87. Command Method

Diff PressTab

This screen allows configuration, calibration and monitoring of the Differential Pressure Input for the AutoXP MVT.

Pressing Calibrate DP Input will start the input calibration method.

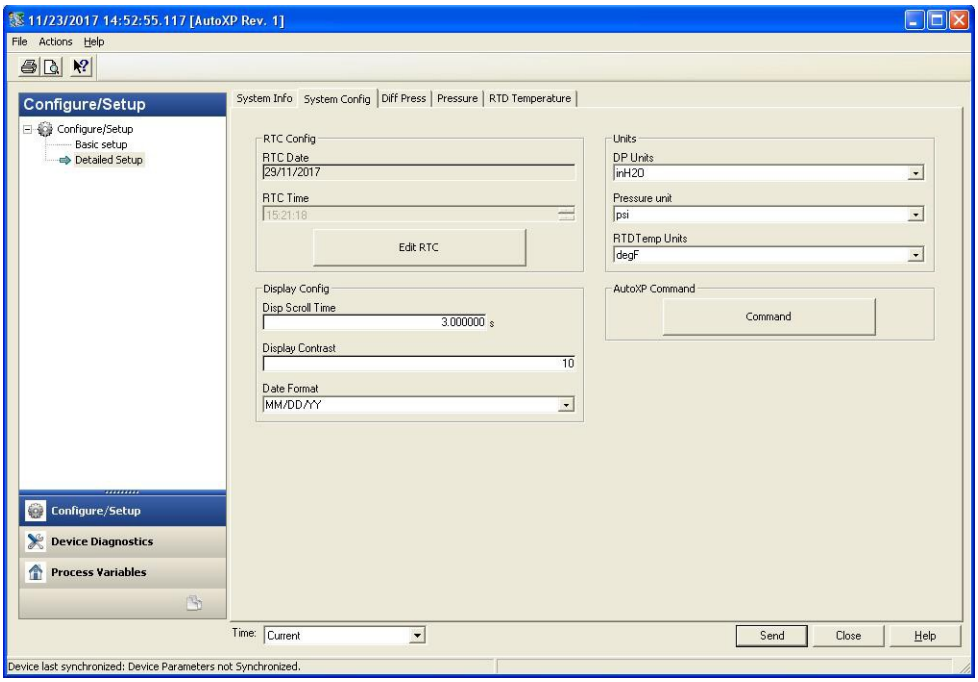


Figure 4-88. Diff Press Tab

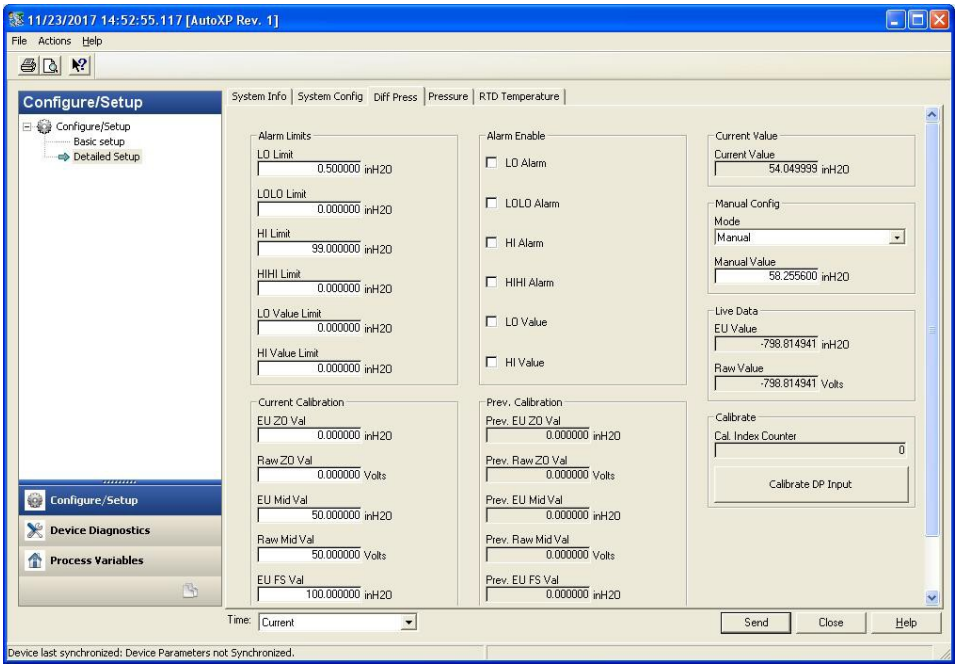


Figure 4-89. Detailed Setup

Pressure Tab

This screen allows configuration, calibration and monitoring of the Pressure Input for the AutoXP MVT.

Pressing Calibrate Pressure Input will start the input calibration method.

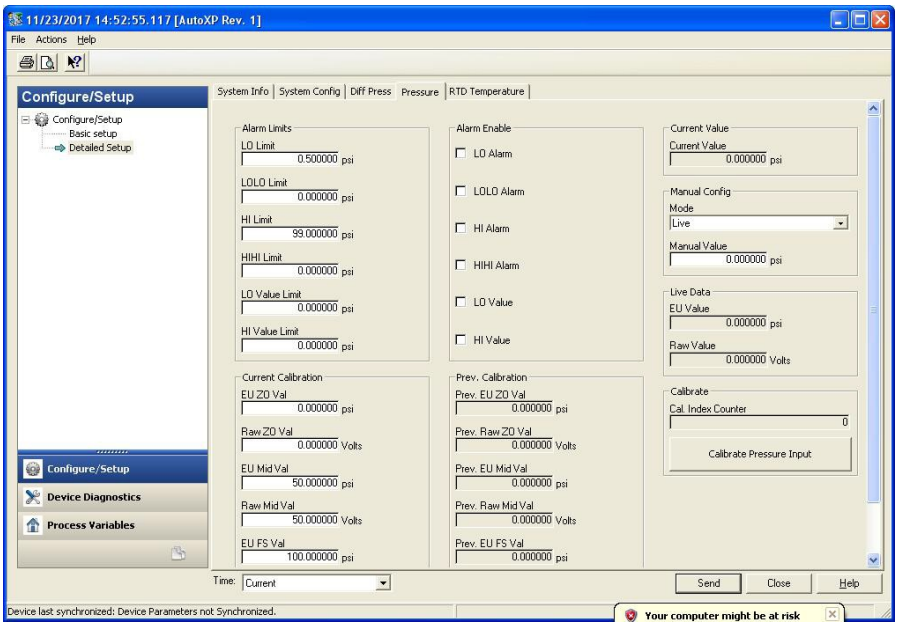


Figure 4-90. Pressure Tab

RTD Temperature Tab

This screen allows configuration, calibration and monitoring of the RTD Temperature Input for the AutoXP MVT.

Pressing Calibrate RTD Input will start the input calibration method.

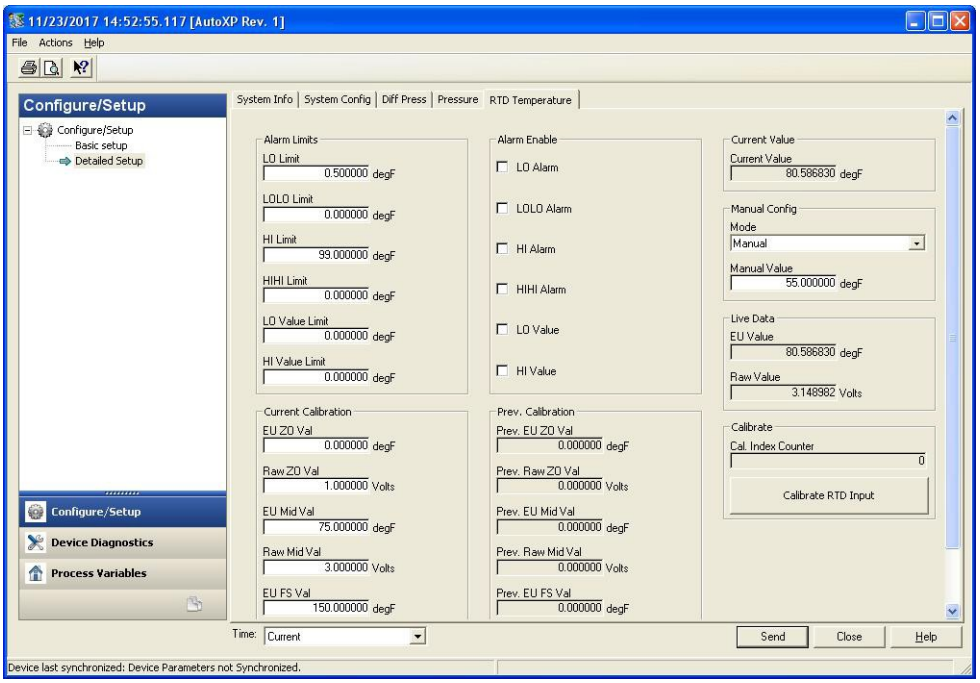


Figure 4-91. RTD Temperature Tab

Common DD Calibration Method

With all 3 inputs, the calibration method/procedure is identical.
In this section we look at the calibration procedure for the RTD temperature input.
Both DP and Pressure inputs will follow the same sequence.

1. After selection of the required input for calibration, a warning is provided to remove the AutoXP MVT output from any automatic control.

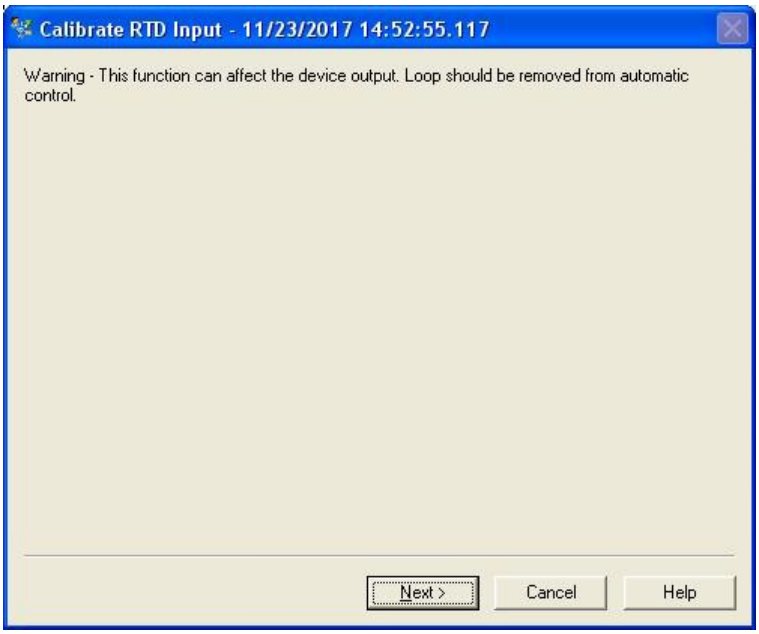


Figure 4-92. Calibrate RTD Input

2. Select the required number of calibration points.
   Here we are selecting a Three Point Calibration.

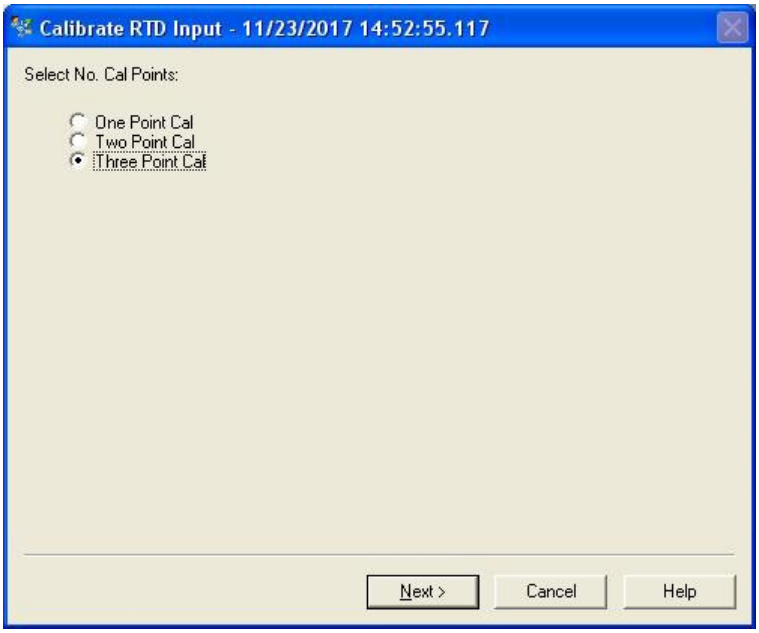


Figure 4-93. Three Point Calibration

3. Apply Minimum Input to RTD Input.

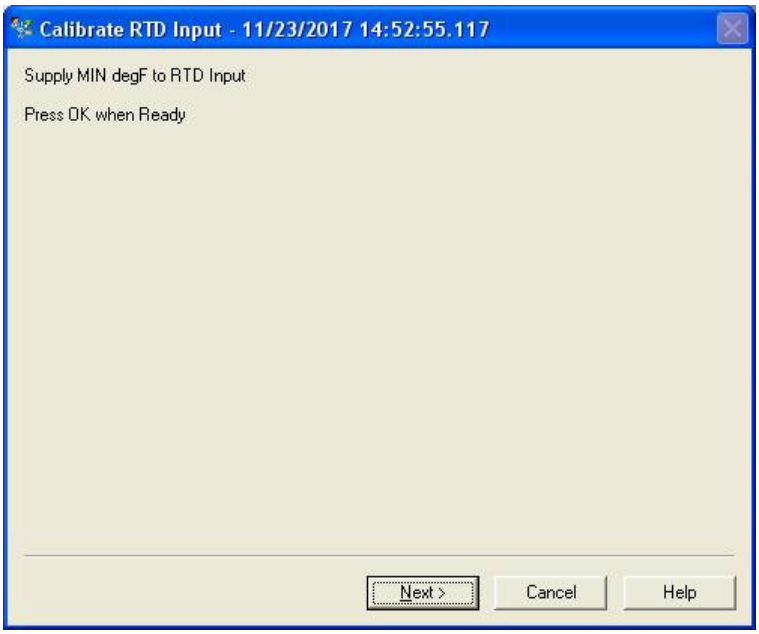


Figure 4-94. Supply MIN degF to RTD Input

6. DD will display live updates of actual input value.
5. Press Next > when value is stable.

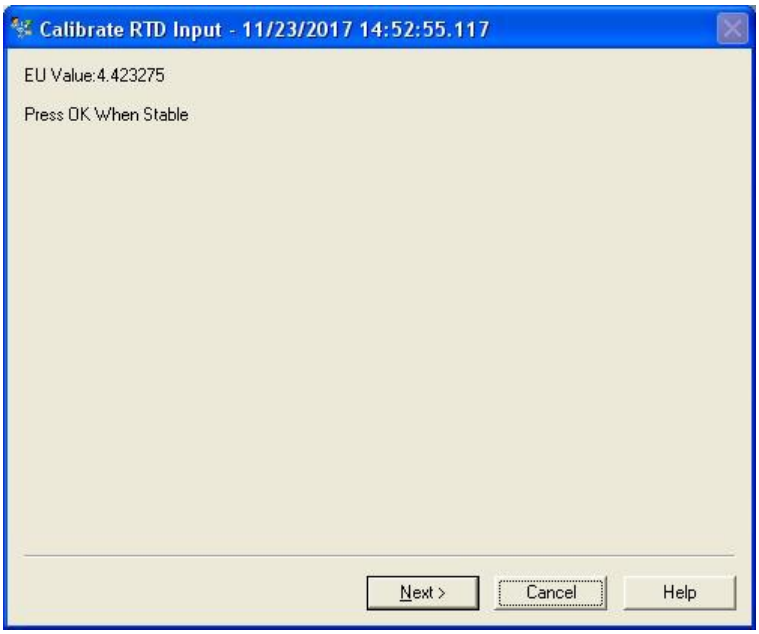


Figure 4-95. Press Next when value is stable

6. Enter actual value supplied to the input

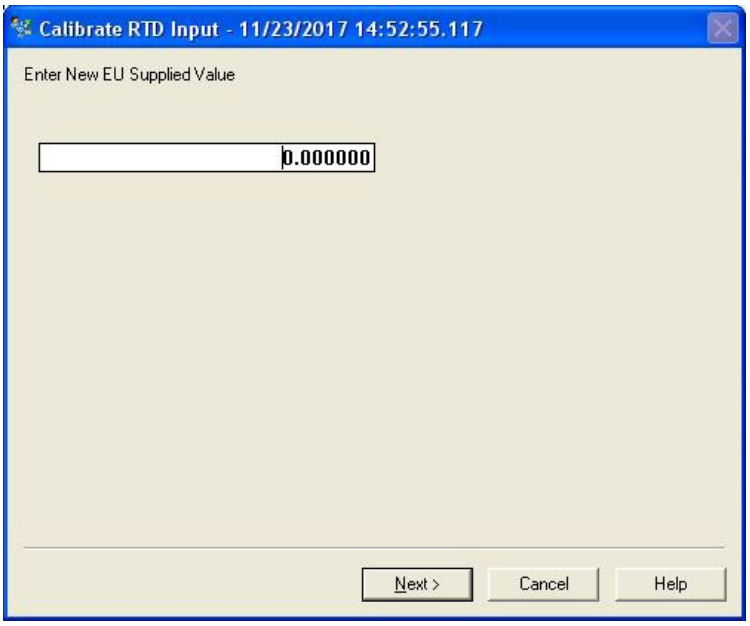


Figure 4-96. Enter New EU Supplied Value

7. If a one point calibration is required, go to step 17.
8. If a two point calibration is required, go back to step 13.
   For a three point calibration, supply a mid-range value to the input.

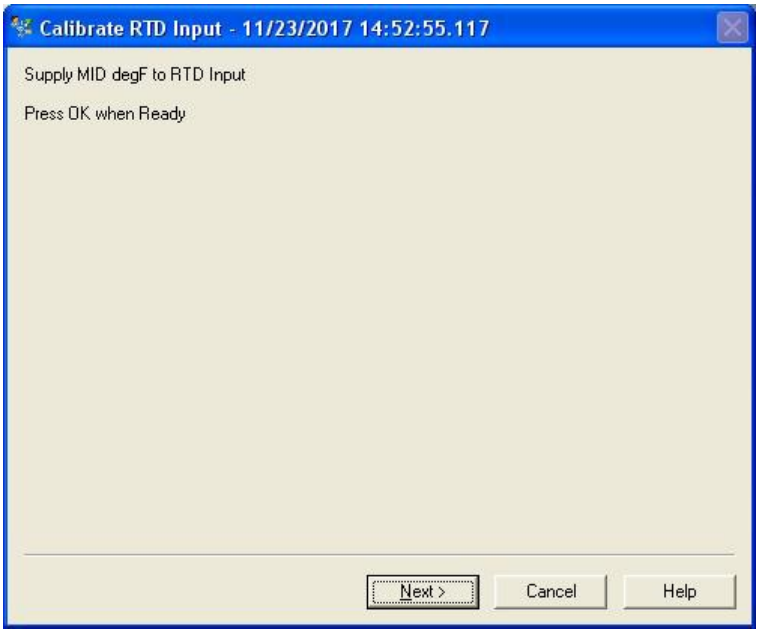


Figure 4-97. Supply MID degF to RTD Input

9. DD will display live updates of actual input value.
10. Press ENTER/OK when value is stable.

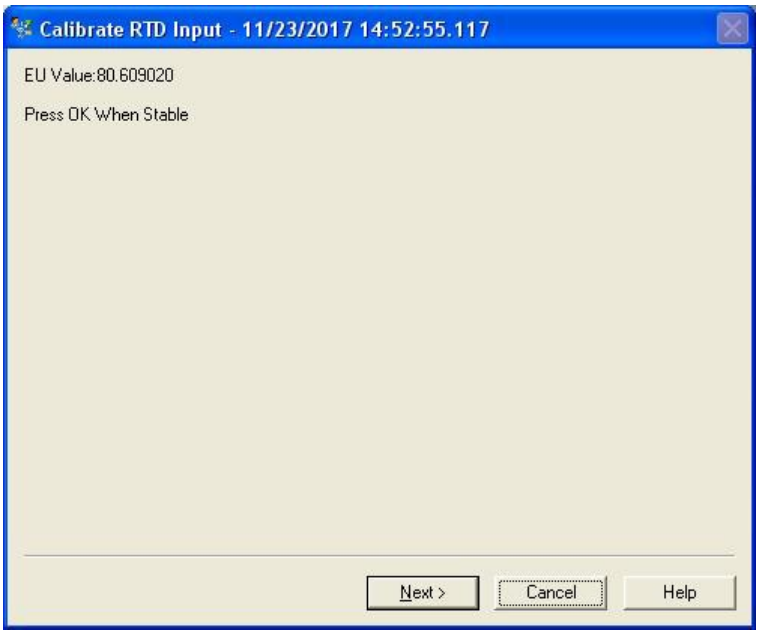


Figure 4-98. Actual Input Value

11. Enter actual Mid value supplied to the input

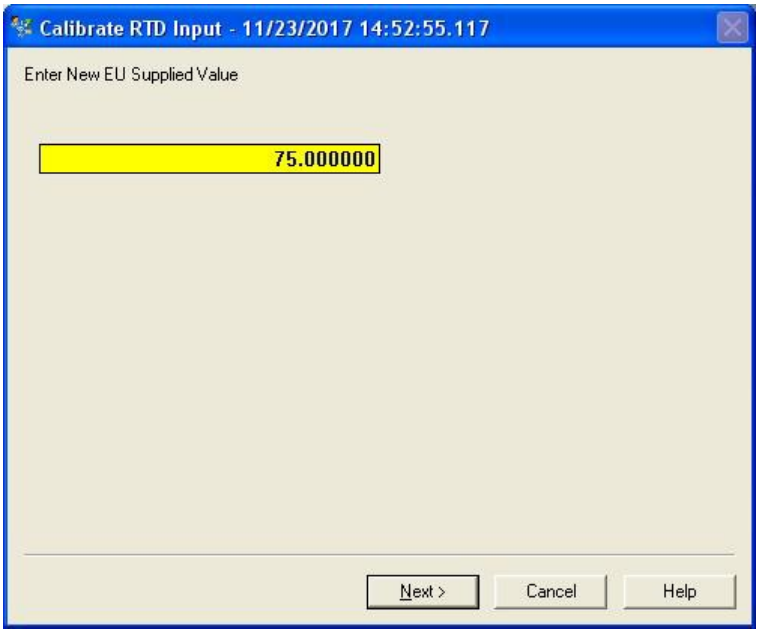


Figure 4-99. Enter New EU Supplied Value

12. Supply a full-scale/Max value to the input

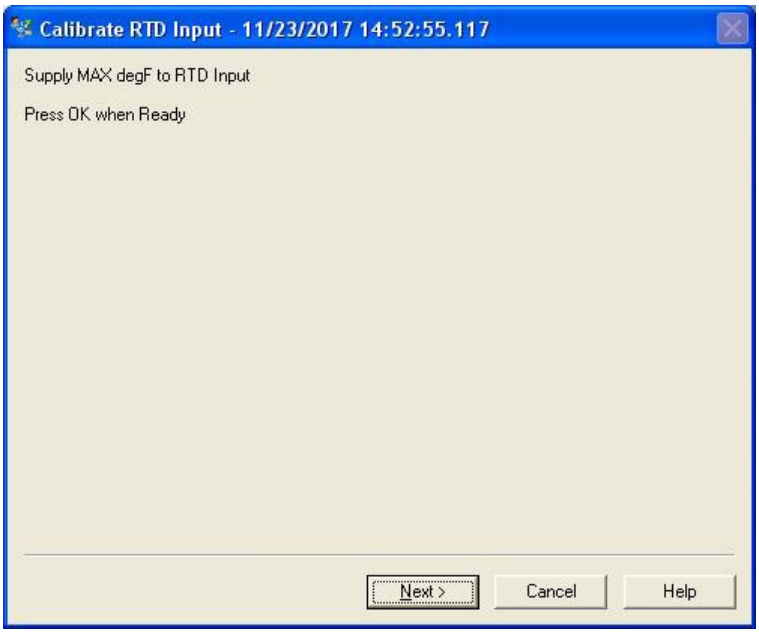


Figure 4-100. Supply MAX degF to RTD Input

13. DD will display live updates of actual input value.
14. Press Next when value is stable.

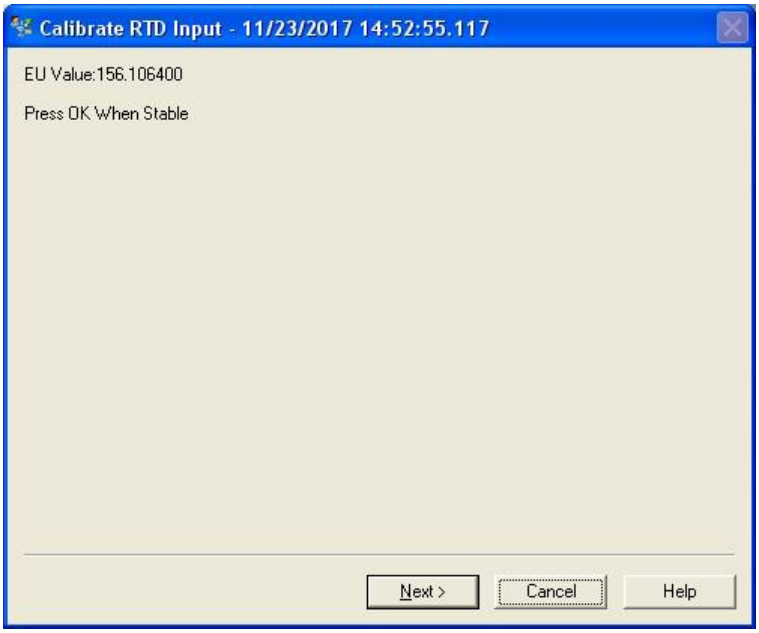


Figure 4-101. Press Next when value is stable

15. Enter actual Max value applied to the input.

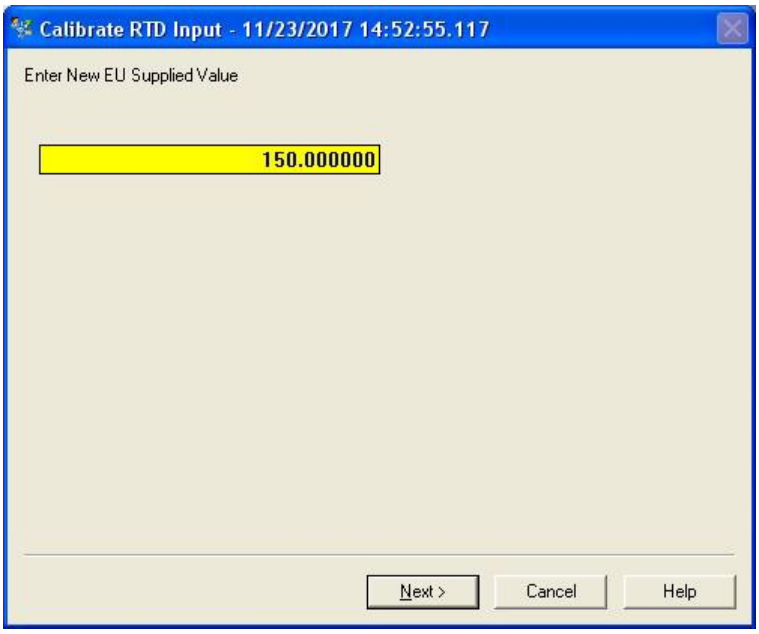


Figure 4-102. Enter New EU Supplied Value

16. DD will update calibration within the AutoXP.

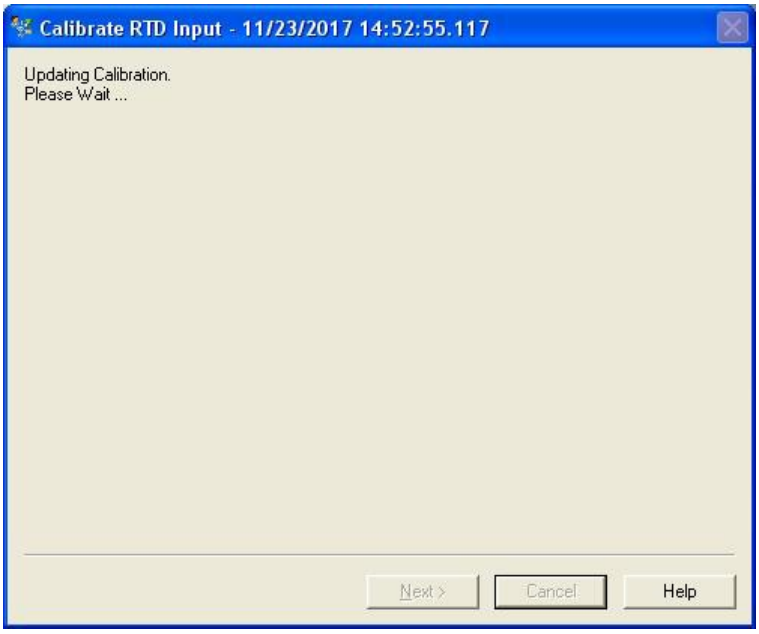


Figure 4-103. Update Calibration

17. Calibration is complete and user can return to the DD Diag/Service Menu.

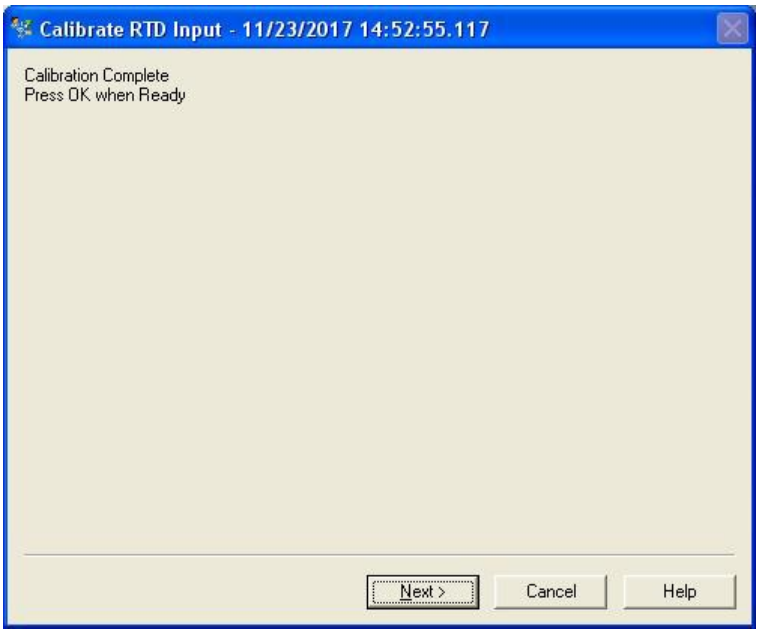


Figure 4-104. Calibration Complete

18. Method is complete. Press Finish to close the Dialog box.

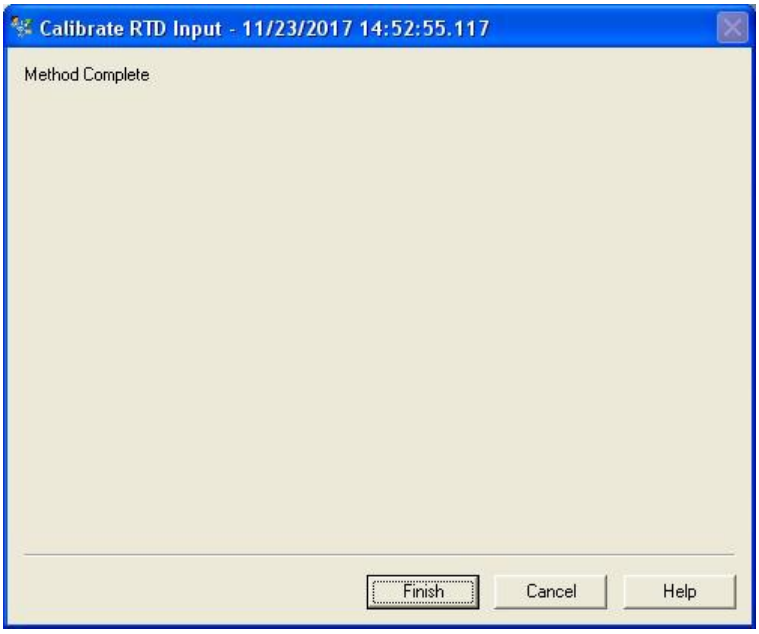


Figure 4- 105. Method Complete

Device Diagnostics Screen

The Device Diagnostic Screen will indicate any device faults present on the AutoXP as shown below:

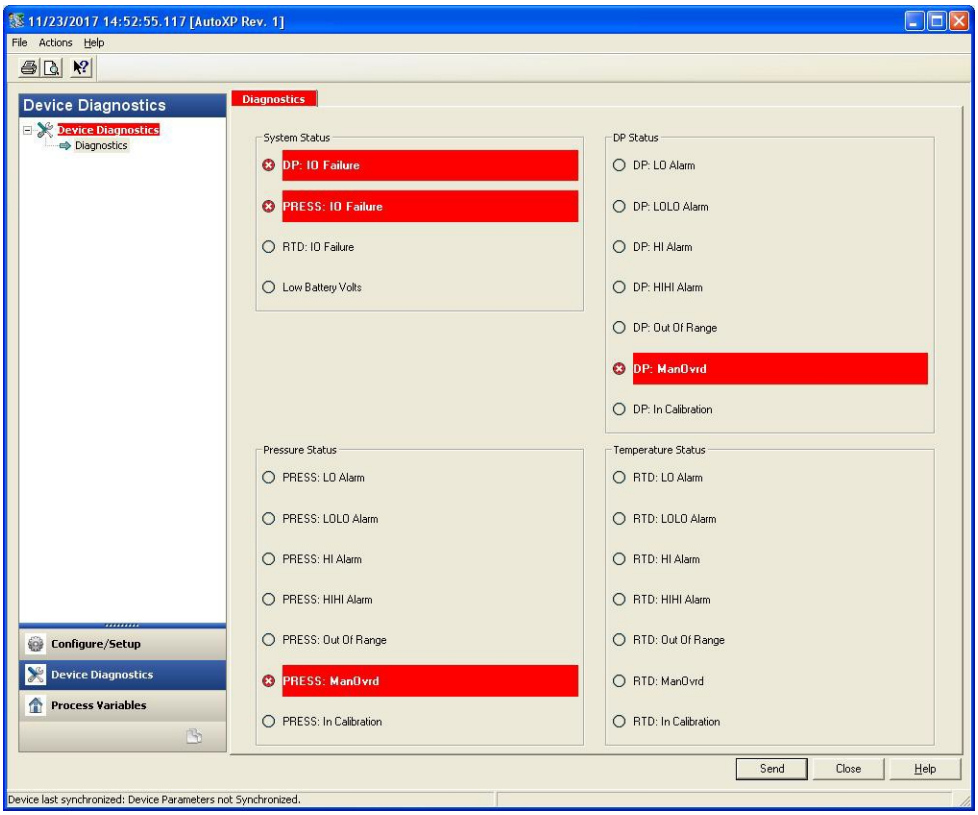


Figure 106. Device Diagnostic Screen

Process Variables

The Process Variables Screen below shows the live HART values and current output information.

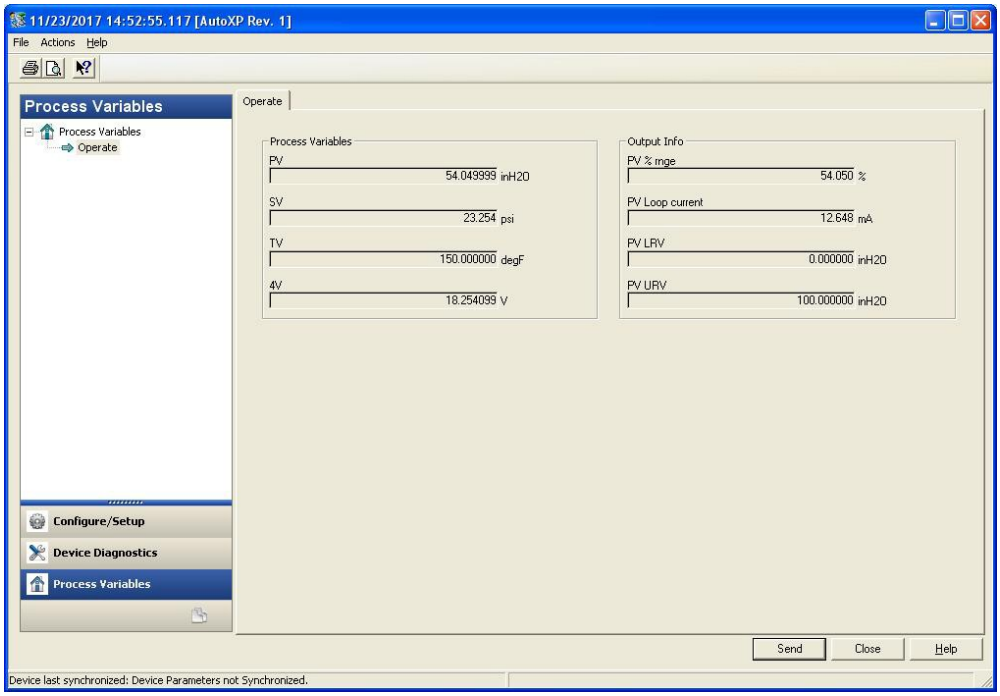


Figure 4-107. Process Variables Screen

HART Default Configuration

After a Cold Restart, the Basic Initial HART Configuration is as follows:

Table 4-1. Basic HART Configuration

Item	Default
Tag	AUTOXP
Long Tag	Thermo Fisher Scientific
PV Unit	inH2O
PV Transfer Function	Linear
PV Damping	0s
Poll ID	0
Loop Current Mode	Enabled
Descriptor	AUTOXP MVT
Message	HART INTERFACE
Final Assembly Number	0
PV LRV	0 inH2O
PV URV	100 inH2O
PV is	DP
SV is	Pressure
TV is	Temperature
QV is	Battery Volts
Display Scroll Time	3s
Display Contrast	10
Display Date Format	MM/DD/YY
DP Units	inH2O
Pressure Units	PSI
RTDTemp	Deg F

Table 4-1. Basic HART Configuration (continued)

Item	Default
Units	
DP Mode	Live
DP Alarm Enable	0x00
Pressure Mode	Live
Pressure Alarm Enable	0x00
RTD Temp Mode	Live
RTD Temp Alarm Enable	0x00

Chapter 5
Functional Description

Flow Computer Tasks

This chapter provides a functional description of the AutoXP. For additional details, such as instructions on configuring calculations or performing calibrations, refer to the AutoCONFIG software help system.

Meter Types

The AutoXP flow computer provides support for both Gas and Liquid on differential pressure meter and linear meter types. For differential pressure meters, the instrument supports orifice, V-Cone, annubar, and slotted DP installations. For linear meters, the instrument supports turbine and ultrasonic installations, Coriolis Meter.

Equations

The following equations/tables are used in combinations specified by the AGA as well as API Liquid Tables.

Super Compressibility

Super compressibility is run once per second for all meter runs. Users may select from the following regardless of the meter type:

- AGA 8 Gross Method – 1992
- AGA 8 Detail Method – 1992
- AGA 8 Short Form – 1985
- NX-19
- NX-19 Analysis
- GERG

Liquid API Tables

- Table 23/24 E (NGL, LPG)
- VCF (CH. 11.1 2004)
- Propylene (CH. 11.3.3.2)
- Ethylene (API 2565/CH 11.3.2.1)
- Ethylene (NBS 1045)
- Volume correction factor (VCF) Consistent with API 2540/ASTM D1250-80/IP 200
- 5/6 A/B
- 23/24 A/B
- 53/54 A/B
- 6/24/54 C
- CH. 11.1 2004; Note: natural gas liquids (NGL) and liquefied petroleum gases (LPG): OLD 23/24, OLD 53/54
- Table E is new standard to replace OLD 23/24
- Correction for effect of pressure on liquid Ch. 11.2.1/Ch. 11.2.2; Ch. 11.2.1M/Ch. 11.2.2M (compressibility factors for hydrocarbons), equilibrium pressure
- Propylene density API Ch. 11.3.3.2
- Ethylene density API 2565 (Ch. 11.3.2.1); Ethylene NBS 1045
- Live density input Thermo Scientific Sarasota liquid density meter, Solartron, UGC, 4-20 mA

Differential Meters

The differential meter calculations are run once per second for all meter runs. Users may select from the following for differential type meters:

- AGA 3 / ASTM 2530-1992
- AGA 3-1985
- GOST
- V-Cone
- Annubar
- Slotted-DP

Linear Meters

Linear meter calculations are run once per second for all meter runs. Per AGA 7 and AGA 9, the equation is fixed at AGA 7 for both turbine and ultrasonic meter installations.

The AGA 5 energy calculation is run once per second for all meter runs.

Energy Diagnostic

For diagnostic and alarming purposes specifically in ultrasonic applications, the AGA 10 – Speed of Sound equation is run once per second. The calculated value is compared to the measured value as retrieved from the ultrasonic device via a communications port. If the calculated value deviates from the measured value by a user configurable amount, an alarm is generated.

Factors

Fwv

The water vapor factor is a direct multiplier into the flow equation that compensates for any water vapor in the system. The number is a value close to the one derived from the following equation:

$$Fwv\ 1 - [\ (\ (lb./\ mmcf)\ \ 21.\ 0181)/\ 1000000].$$

Manual: Enter the Fwv directly (usually approximately .98).

Partial Calculation: Enter the pounds of water per million cubic feet of gas to enable the flow computer to calculate Fwv.

Full Calculation: This method assumes a fully saturated gas and uses the current pressure and temperature of the gas to calculate what the water content should be. The results of this calculation are then used as the input into the Fwv equation to obtain the Fwv factor.

Caution The water content equation used for the full calculation method is not an AGA sanctioned equation. Care should be taken in custody transfer applications. For custody transfer applications, the manual or partial calculation methods should be used using lab results or AGA test methods for determining water vapor content. ♦

Fws

A full well stream factor is provided for production applications that require compensation for well stream conditions. This value defaults to 1.0 and is a direct multiplier into the flow rate equation.

Turbine Meter Linearization

A 10-point break-pair table of K-Factor versus Frequency is utilized for the linearization of turbine meter K Factors. Individual tables are used for each meter run configured as a linear meter. Interpolation of the K-Factor between table points may be enabled and disabled on an individual meter run basis.

Averaging Techniques

Users may configure the AutoXP flow computer to support one of the four averaging techniques as outlined in the API Ch. 21.1.

1. Flow dependent time-weighted linear averaging
2. Flow dependent time-weighted formulaic averaging
3. Flow weighted linear averaging
4. Flow weighted formulaic averaging

For differential type meters, the square root of the measured differential pressure is used as the weight value in averaging techniques 3 and 4. For linear type meters, the Actual Flow Delta Volume is used as the weight value.

A calibration routine is used for all analog inputs. The unit is capable of 2- or 3-point calibrations as well as a single point for re-zero. All calibration changes are logged in the audit trail with the old and new values for each of the calibration points.

Calibration As Found/As Left

The unit also allows for the verification of all analog inputs through an As Found / As Left procedure as outlined in the API Ch 21.1. Separate audit codes are used for As Found versus As Left audits.

Historical Data

The unit keeps historical logs for all meter run data as well as audit/alarm (event) logs for each meter run configured. For each meter run, the system defaults include:

- Hourly logs: storage for 840 hourly records (35 days)
- Daily logs: storage for 65 records
- Events: storage for the last 200 events

The data stored in these logs is configurable. AutoCONFIG Table #226 is reserved for DP flow calculations, and Table #227 is reserved for AGA 7 flow calculations. The structure for both tables is shown below.

Table 5–1. Structure of historical data log for DP and AGA 7 flow calculations

Field	Type	I	Description
1	Byte	I	History Log Item #1 Index
2	Byte	I	History Log Item #2 Index
3	Byte	I	History Log Item #3 Index
:	:	:	:
:	:	:	:
36	Byte	I	History Log Item #36 Index

History log index definitions for DP flow calculations are listed in the following table. Items with non-zero indices will be included in the log in the order specified.

Table 5–2. DP flow calculation history log index definitions

History Log Index	Definition
0	Undefined
1	Pipe Diameter (Snapshot)
2	Orifice Diameter (Snapshot)
3	Atmospheric Pressure (Snapshot)
4	Pressure Base (Snapshot)
5	Temperature Base (Snapshot)
6	Average Differential Pressure
7	Average Static Pressure
8	Average Gas Temperature
9	Flow Status (Snapshot)
10	Accumulated Volume (Current Log Period)

History Log Index	Definition
11	Accumulated Energy (Current Log Period)
12	Hourly Flow Rate (Snapshot)
13	Daily Flow Rate (Snapshot)
14	Hourly Energy Rate (Snapshot)
15	Daily Energy Rate (Snapshot)
16	Totalized Volume (Snapshot Non-resettable Accumulator)
17	Current Day Volume (Snapshot)
18	Current Day Energy (Snapshot)
19	Flow Time (Minutes) (Current Log Period)
20	Today Flow Time (Minutes) (Snapshot)
21	Average Square Root Extension
22	Average C' Prime
23	Average Fwv Water Content
24	Average Fwv Correction Factor
25	Average Full Well Stream Correction Factor
26	Average Fpwl Factor
27	Average BTU
28	Average Gravity
29	Average Methane Content
30	Average Nitrogen Content
31	Average Carbon Dioxide Content
32	Average Ethane Content
33	Average Propane Content
34	Average Water Content
35	Average Hydrogen Sulfide Content
36	Average Hydrogen Content
37	Average Carbon Monoxide Content
38	Average Oxygen Content
39	Average I-Butane Content
40	Average N-Butane Content
41	Average I-Pentane Content
42	Average N-Pentane Content
43	Average C6+ Content

History Log Index	Definition
44	Average N-Hexane Content
45	Average N-Heptane Content
46	Average N-Octane Content
47	Average N-Nonane Content
48	Average N-Decane Content
49	Average Helium Content
50	Average Argon Content
51	Average Air Content
52	Calculation ID
53–255	Undefined

History log index definitions for AGA 7 flow calculations are listed in the following table. Items with non-zero indices will be included in the log in the order specified.

Table 5–3. AGA 7 flow calculation history log index definitions

History Log Index	Definition
0	Undefined
1	Pipe Diameter (Snapshot)
2	Average Meter Factor
3	Atmospheric Pressure (Snapshot)
4	Pressure Base (Snapshot)
5	Temperature Base (Snapshot)
6	Accumulated Pulses
7	Average Static Pressure
8	Average Gas Temperature
9	Flow Status (Snapshot)
10	Accumulated Volume (Current Log Period)
11	Accumulated Energy (Current Log Period)
12	Hourly Flow Rate (Snapshot)
13	Daily Flow Rate (Snapshot)
14	Hourly Energy Rate (Snapshot)
15	Daily Energy Rate (Snapshot)

History Log Index	Definition
16	Totalized Volume (Snapshot Non-resettable accumulator)
17	Current Day Volume (Snapshot)
18	Current Day Energy (Snapshot)
19	Flow Time (Current Log Period)
20	Today Flow Time (Snapshot)
21	Actual Accumulated Volume (Current Log Period)
22	Average Volume Correction Factor
23	Average Fwv Water Content
24	Average Fwv Correction Factor
25	Average Full Well Stream Correction Factor
26	Average Fpwl Factor
27	Average BTU
28	Average Gravity
29	Average Methane Content
30	Average Nitrogen Content
31	Average Carbon Dioxide Content
32	Average Ethane Content
33	Average Propane Content
34	Average Water Content
35	Average Hydrogen Sulfide Content
36	Average Hydrogen Content
37	Average Carbon Monoxide Content
38	Average Oxygen Content
39	Average I-Butane Content
40	Average N-Butane Content
41	Average I-Pentane Content
42	Average N-Pentane Content
43	Average C6+ Content
44	Average N-Hexane Content
45	Average N-Heptane Content
46	Average N-Octane Content
47	Average N-Nonane Content
48	Average N-Decane Content

History Log Index	Definition
49	Average Helium Content
50	Average Argon Content
51	Average Air Content
52	Average M Correction Factor
53	Main Rotor Pulses
54	Sensor Rotor Pulses
55	Average Delta A Deviation
56	Average Main Rotor Factor
57	Average Sensor Rotor Factor
58	Calculation ID
59–255	Undefined

Table 5–4. Liquid Content

History Log Index	Definition
1	Meter Number
2	Product Number
3	Hourly Opening Volume Totalizer IV
4	IV Gross Total
5	Hourly Opening Mass Totalizer
6	Cumm Mass Total (PRD)
7	Contact Hour Opening Volume Totalizer IV
8	IV Daily Gross Total
9	Drive Gain
10	FWA Density API
11	FWA Density API@60F
12	FWA Meter Factor
13	Shrinkage Factor
14	Water Cut
15	FWA Pressure
16	FWA Temperature
17	FWA CTL/VCF
18	FWA CPL
19	Avg. Frequency

20	Cumm Gross Total (PRD)
21	Prvious Day Gross Total (PRD)
22	Cumm Net Total (PRD)
23	Prvious Day Net Total (PRD)
24	S/W Volume
25	AVG Temperature

Table 5–5. Batch Content

History Log Index	Definition
1	Meter Number
2	Batch Number
3	Batch Start Date
4	Batch Start Time
5	Batch End Date
6	Batch End Time
7	FWA Density API
8	FWA Temperature
9	FWA Density API@60F
10	Ticket BS&W Factor
11	FWA Temperature
12	FWA Pressure
13	FWA CTL/VCF
14	FWA CPL
15	FWA CTPL
16	Meter Factor
17	IV Open (FP)
18	IV Close (FP)
19	IV Total (PRD)
20	Gross Total (PRD)
21	S/W Volume (PRD)
22	Net Total (PRD)
23	Cumm Gross Total (FP)
24	Cumm Net Total (FP)
25	Avg. GSV Flowrate
26	Avg. NSV Flowrate

27	Delivery / Time
28	Preset Volume (bbls)
29	Driver ID #
30	Alternate Ticket **#**

Security

The AutoCONFIG Table #213 is a table of passwords that allows you to configure user IDs, passwords, and security access levels. The four access levels are:

- Supervisor: The highest security access level. Allows for access to calibration data and modification of all configuration parameters, including passwords.
- Technician: Second highest level of security access. Identical to Supervisor, except cannot modify passwords.
- Control: Can access tables pertaining to control functions only, PID for example.
- Measurement: Can access tables pertaining to measurement functions only, DP flow calculation for example.

A valid user ID and password must be entered for all access levels. If an invalid entry is made, the instrument returns to scrolling through the display list. Refer to the AutoCONFIG software help for instructions on how to set user IDs, passwords, and security access levels. The help system also provides a list of the default security access levels.

When users log in, flow is not affected unless the unit is in maintenance mode. Before entering maintenance mode, the unit asks the user if the inputs should be frozen.

Communication Functions

The AutoXP flow computer uses one communications port definition block per serial port. The block can be used to specify the port as a Master or Slave. When in Master mode, the communications block references contain pointers to any combination of the following types of Master blocks:

- Modbus master communications blocks – Read/Write Modbus Data
- Smart Transducer communications blocks – Read Smart Transducer Data
- Chromatograph communications blocks – Read Gas Quality Data
- Tank gauge communications blocks – Read Tank Gauge Data

When in Slave mode, the communications block references contain pointers to a list of Modbus slave communications blocks and optionally an alarm callout block.

Table 5–6. AutoCONFIG Table #96: Communications port definition table

Field	Description
1	Communications Port Descriptor Text – Text Table Index (16-character ASCII string)
2	Communications Port Mode: 0 = Master Mode 1 = Slave Mode
3	Communications Port Enable: 0 = Port Disabled 1 = Port Enabled
4	Communications Port Baud Rate: 0 = 300 1 = 600 2 = 1200 3 = 2400 4 = 4800 5 = 9600 6 = 19200 7 = 38400 8 = 76800 9 = 115200
5	Communications Port Data Bits: 0 = 7 bits 1 = 8 bits

Field	Description
6	Communications Port Parity: 0 = None 1 = Even 2 = Odd 3 = Mark
7	Communications Port Stop Bits: 0 = 1 1 = 1.5 2 = 2
8	Communications Port RTS Delay (milliseconds) 10 msec. Resolution
9	Communications Port Handshaking: 0 = None 1 = RTS/CTS
10	Master Mode Repeat Timer (seconds)
11	Slave Mode Communications Address
12	Slave Mode Write Enable: 0 = Write Disabled 1 = Write Enabled
13	Slave Mode Protocol Format: 0 = Modbus ASCII 1 = Modbus RTU
14	Slave Mode Communications Options (Bit Encoded)
15	Slave Mode Callout Block Index
16	Slave Mode Password #1 Modbus Register Number
17	Slave Mode Password #1 Value
18	Slave Mode Password #1 Security Access Mask: Bit 0 = Operator Access Bit 1 = Supervisor Access Bit 2 = Maintenance Access Bit 3 = Engineer Access Bits 4–7 = Undefined
19	Slave Mode Password #2 Modbus Register Number
20	Slave Mode Password #2 Value
21	Slave Mode Password #2 Security Access Mask
22	Slave Mode Password #3 Modbus Register Number
23	Slave Mode Password #3 Value
24	Slave Mode Password #3 Security Access Mask

Field	Description
25	Slave Mode Password #4 Modbus Register Number
26	Slave Mode Password #4 Value
27	Slave Mode Password #4 Security Access Mask
28	Slave Mode Password #5 Modbus Register Number
29	Slave Mode Password #5 Value
30	Slave Mode Password #5 Security Access Mask
31	Master/Slave Communications Block Reference #1
32	Master/Slave Communications Block Reference #2
33	Master/Slave Communications Block Reference #3
:	:
:	:
286	Master/Slave Communications Block Reference #256

Table 5–7. AutoCONFIG Table #97: Modbus slave communication block table

Field	Description
1	Modbus Slave Starting Register Number
2	Number of Registers (in this block)
3	Write Enable: 0 = Write Disabled 1 = Write Enabled (Does not apply for Historical Data Block Reference or Alarm/Audit Log Data Block Reference)
4	Register Format: 0 = Discrete 1 = 32-Bit Floating Point – 32-Bit Register 2 = 32-Bit Floating Point – 2 16-Bit Register 3 = 16-Bit Word 4 = Byte (Does not apply for Historical Data Block Reference or Alarm/Audit Log Data Block Reference)
5	Modbus Register Item #1 (Starting Register Number + 0)
6	Modbus Register Item #2 (Starting Register Number + 1)
7	Modbus Register Item #3 (Starting Register Number + 2)
:	:
104	Modbus Register Item #100 (Starting Register Number + 99)

Table 5–8. AutoCONFIG Table #98: Modbus master communication block table

Field	Description
1	Modbus Master Communications Enable: 0 = Disabled 1 = Enabled
2	Modbus Master Communications Type: 0 = Read 1 = Write
3	Modbus Master Communications Address
4	Modbus Master Communications Status: 0 = Communications OK 1 = Illegal Function 2 = Illegal Data Address 3 = Illegal Data Value 4 = No Response 5 = Transmit Failure
5	Modbus Master Communications Options (Bit Encoded): 0 = 32-Bit Float 1 = 16-Bit Float #1 2 = 16-Bit Float #2 3 = AutoMITTER
6	Modbus Master Communications Protocol Format: 0 = Modbus ASCII 1 = Modbus RTU
7	Modbus Master Starting Register Number
8	Number of Registers (in this block)
9	Modbus Register Item #1 (Starting Register Number + 0)
10	Modbus Register Item #2 (Starting Register Number + 1)
11	Modbus Register Item #3 (Starting Register Number + 2)
:	:
:	:
58	Modbus Register Item #50 (Starting Register Number + 49)

Chapter 6
Maintenance

Warning For hazardous area installations: In the event of a fault condition, the AutoXP flow computer cannot be serviced by the customer. No repair to faulty assemblies should be attempted. Faulty assemblies must be replaced with identical replacements. All repairs or part replacements must be done by Thermo Fisher or its appointed repair agent. Contact Thermo Fisher for instructions. ♦

Replacing the Main Board

Follow the procedure below to replace the main board.

Warning Ensure power is off and the area is non-hazardous before performing this procedure. ♦

1. Replacing the main board:

    a. Remove the HMI board by pulling two snap in connector on top and other two at the bottom.

    b. Pull the bracket that holds Main board gently from the snap- in connector on top and the other two connectors at the bottom.

    c. Remove the Transducer connector from the main board.

    d. Unscrew the I/O board if it is mounted on to XP board by removing three screws.

    e. To remove the XP main board, unscrew one cross screw from the bracket. If the I/O board was not installed, the main board is held by four screws.

2. Replace new XP Motherboard by reversing the steps from 1. ‘Replacing the Main Board’ above.

Replacing Option Boards

To replace an option board, follow this general procedure.

Warning Ensure power is off and the area is non-hazardous before performing this procedure. •

1. Rotate the front glass cap counter clockwise.
2. Remove HMI board from the bracket.
3. Pull out the Bracket
4. Disconnect transducer connector.
5. Remove the I/O Board and unscrew three screws mounted on top of the AutoXP motherboard.
6. Place new I/O board and reverse the steps 5 to 1.

Replacing the Backup Battery

The Lithium coin backup battery is located at BH1 on the back of the AutoXP main board. It is a field replaceable item.

Warning The Lithium battery may explode if mistreated. Do not attempt to recharge, disassemble, or burn it. •

Warning Ensure power is off and the area is non-hazardous before performing this procedure. •

1. Open the front glass cap by rotating counter clockwise.
2. Gently lift up and down to pull the bracket.
3. Disconnect transducer connector.
4. Install the new battery, ensuring it is secured by the retainer.
5. Reverse the procedure 3 to 1.

Upgrading the Firmware

1. Use the AutoCONFIG software to connect to the flow computer whose firmware you want to upgrade.
2. From the main menu, go to System > Flash RTU.
3. Browse to the location where you stored the S19 file, and double-click the file.
4. The software will ask if you want to perform the task, as all data will be erased. Click Yes.
5. The flow computer will display the status of the firmware upgrade. If communication is not established or is lost during the flashing process, follow these steps to reestablish communications with the unit.
   a. Use the AutoCONFIG software to warm boot the RTU (Tools > Warm Restart). If the flow computer finds that the application image is invalid, "AutoPILOT Pro XP B-2" should be displayed on the LCD.
   b. An alternate method of warm booting the flow computer is to set SW 1 to Switch 4 on the main board. The flow computer will display "AutoXP B-5" on the LCD, indicating that the bootloader has control.
   c. Try to connect to the flow computer. The software will attempt to establish communication again and fail because the flow computer is already in the bootloader. These communication timeouts are normal.
   d. Once the flow computer fails communications and a blank screen is presented, select File > Flash RTU.
   e. At the prompt, select the new flash file. The flow computer will fail several more times (again because the flow computer is already in the bootloader) and then will resume reflashing the flow computer normally.
6. Upon completion, the flow computer will display that the download is complete, and the software will inform you that the download has been successful. Click OK. If AutoXP Main board SW 1 is on, turn it off.
7. Establish communications with the flow computer. The No Display List screen will appear on the flow computer display. You will need to re-enable any calculations that were running before the upgrade.

Chapter 7
Getting Help

Contact Information

If the unit is not performing satisfactorily, the local representative is your first contact for support and is well equipped to answer questions and provide application assistance. You can also contact Thermo Fisher directly at any of the locations below.

Process Instruments		
27 Forge Parkway Franklin, MA 02038 USA Ph:+1 (800) 437-7979	Ion Path, Road Three Winsford, Cheshire CW73GA UK Ph: +44 (0) 1606 548700 Fax: +44 (0) 1606 548711	Unit 702-715, 7th Floor Tower West Yonghe Beijing China 100007 Ph: +86 (10) 8419-3588 Fax: +86 (10) 8419-3580
C327, TTC Industrial Area MIDC Pawane New Mumbai 400 705, India Ph: +91 (22) 4157 8800		
www.thermofisher.com		

Warranty

Thermo Scientific products are warranted to be free from defects in material and workmanship at the time of shipment and for one year thereafter. Any claimed defects in Thermo Scientific products must be reported within the warranty period. Thermo Fisher shall have the right to inspect such products at Buyer's plant or to require Buyer to return such products to Thermo Fisher plant.

In the event Thermo Fisher requests return of its products, Buyer shall ship with transportation charges paid by the Buyer to Thermo Fisher plant. Shipment of repaired or replacement goods from Thermo Fisher plant shall be F.O.B. Thermo Fisher plant. A quotation of proposed work will be sent to the customer. Thermo Fisher shall be liable only to replace or repair, at its option, free of charge, products that are found by Thermo Fisher to be defective in material or workmanship, and which are reported to Thermo Fisher within the warranty period as provided above. This right to replacement shall be Buyer's exclusive remedy against Thermo Fisher.

Thermo Fisher shall not be liable for labor charges or other losses or damages of any kind or description, including but not limited to, incidental, special or consequential damages caused by defective products. This warranty shall be void if recommendations provided by Thermo Fisher or its Sales Representatives are not followed concerning methods of operation, usage and storage or exposure to harsh conditions.

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Appendix A
Ordering Information

Replacement Parts

Table A–1. Calibration Tools

Part Number	Description
3-0465-062-	ASSY, RTD Calibrator – 3 POINT

Table A–2. Communication

Part Number	Description
3-0500-546-	Bluetooth Dongle
3-0446-090	PC-Lemo Cable (15 feet)
3-0446-090-B	PC-Lemo Cable (25 feet)

Table A–3. Cable Assembly

Part Number	Description
3-0500-091	Cable, AutoWAVE Programming
3-0482-013	Antenna Cable (35 feet)

Table A–4. PCA Board

Part Number	Description
3-0500-305-SP	AutoXP, HMI PCBA Spare Kit
3-0500-308-SP	AutoXP, I/O PCBA Spare Kit
3-0500-311-SP	AutoXP, CPU PCBA Spare Kit
3-0500-314-SP	AutoXP, Terminal PCBA Spare Kit
3-0500-315-SP	AutoXP, Enclosure Internal Mounting Kit
5-3023-052-SP	AutoXP, 1500PSI CS HW Spare Kit
5-3023-053-SP	AutoXP, 1500PSI SS HW Spare Kit
5-3023-054-SP	AutoXP, 4500PSI CS HW Spare Kit
5-3023-055-SP	AutoXP, 4500PSI SS HW Spare Kit
5-3023-056-SP	AutoXP, NACE HW Spare Kit
5-1270-250	250 ohms, high precision, axial lead resistor

Table A–5. Manuals

Part Number	Description
1-0511-005	AutoXP Installation Guide
1-0511-006	AutoXP Users Guide

Appendix B
Specifications

Results may vary under different operating conditions.

Table B–1. System specifications

Main board	- 32-bit, 60 MHz micro computer unit. - SRAM memory for data storage, 2 MB, battery backed. - Real-time clock (RTC). - Lithium backup battery; voltage monitor for the RTC and SRAM circuits allows for data and configuration retentions in the event of power failure. - Local I/O consisting of - One 100-ohm Pt RTD input; full scale ± 0.6°F over operating temperature range - One local serial communication port (CHIT) - Low Energy Bluetooth (Port Sharing with CHIT) - One local Honeywell smart transducer connection - One RS232/RS485 host serial communication port - One 10/100 Ethernet communication port with ESD protection
IO Expansion	- One Analog Out - Two Analog In - Remote 485 Port for other MVT connection - Two digital outputs - Two digital inputs - Two pulse inputs up to 10 KHz
Display	128x65 Back-lit Graphic LCD.
Keypad	4 infra-red touch through glass keys
Temperature range	-40°C to +85°C.
Power supply	Standard 10–30 Vdc Class 2 power circuit, external power supply.

Table B-2. Certifications

CSA	Class 1, Div. 1, Groups B, C & D, T5C (Temp -40°C to +85° C) Class 1, Div. 2, Groups B, C &D, T4C (Temp -40°C to +85°
Temperature range	(Temp -40°C to +85°C.
Power supply	Standard 10–30 Vdc external power supply.

Appendix C
Main Board Switch Settings

Switch Settings

Factory Setting

The factory setting (default) for switch S1 is off (see Figure C-1). SW1 default settings are provided in Table C-1.

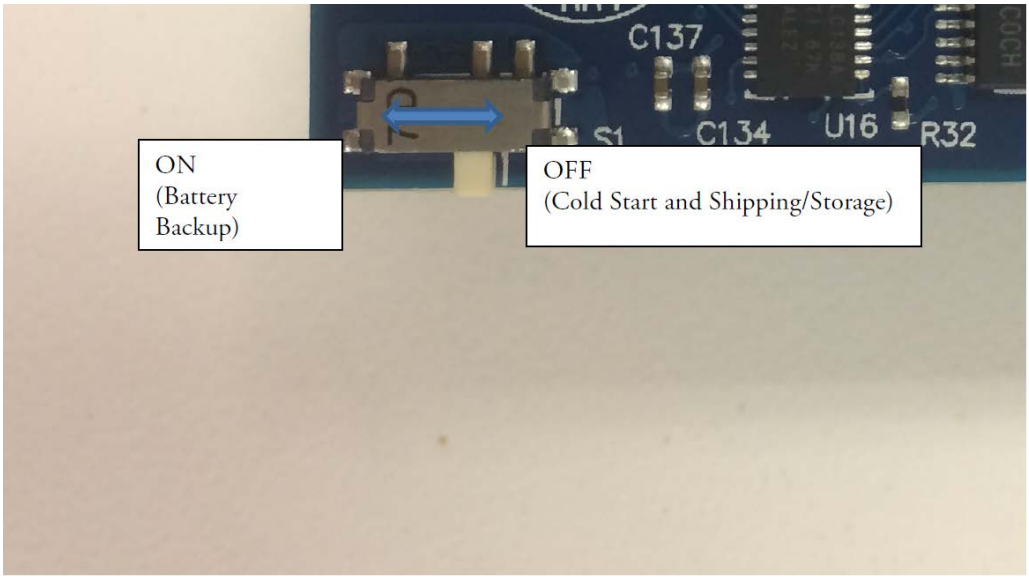

Figure C-1. S1 switch on Main Board

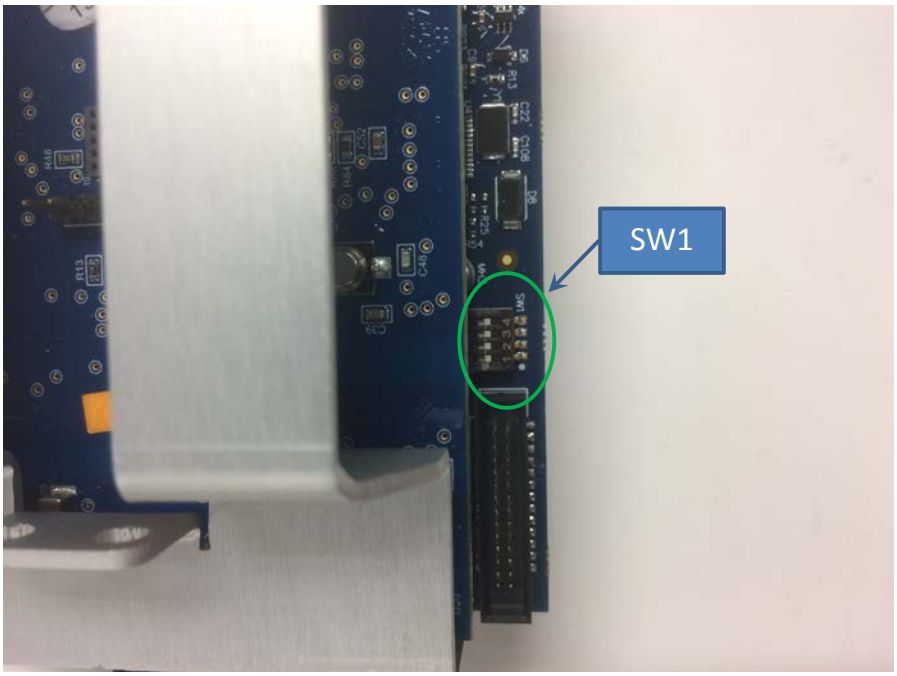

Figure C-2. Main Board Switch SW1 Location

Table C-1. Main Board Switch SWI Default Conditions

SW1	Description	Function	Default
1	Boot loader selection	CPU runs the boot loader upon power-up when the switch is on.	Off
2	Debugger selection	CPU runs the debugger upon power-up when the switch is on. Function not available.	Off
3	Continuous power on	System stays in wake-up mode when the switch is on.	Off
4	System reset	Momentarily switch on to reset the system.	Off

Appendix D
Terminal Board Connectors & Jumpers

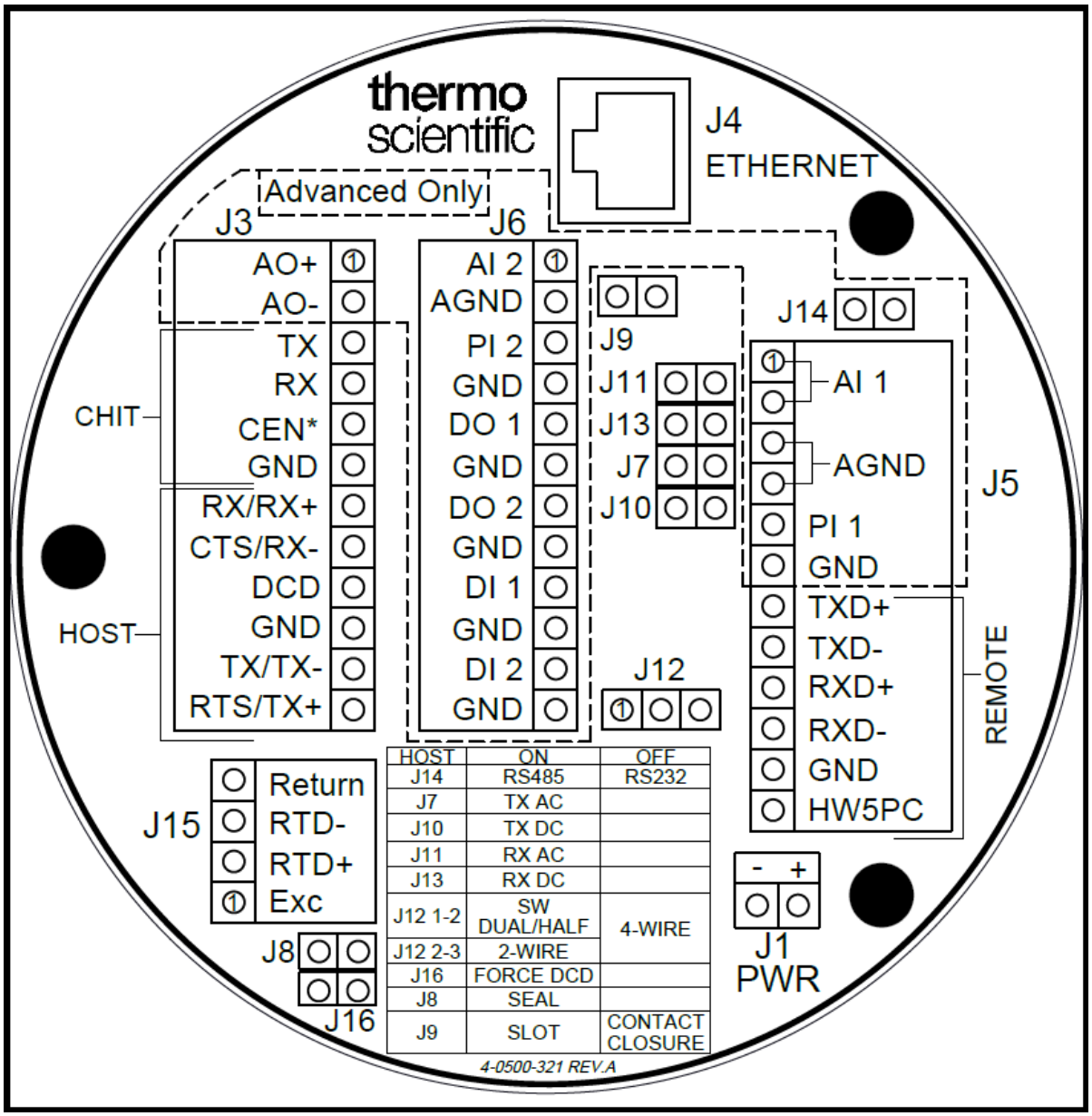

Figure D-1. Terminal Board

Connectors

Table D–1. Terminal Board Connectors

J1	Connector	Description	Comment
-	Negative	Vdc 10-30 -	
+	Positive	Vdc 10-30 +	

J3 Top	Connector	Description	Comment
1	AO+	Analog Out +	
2	AO-	Analog Out -	
3	TX	Local CHIT Port	
4	RX	Local CHIT Port	
5	CEN	Local CHIT Port	
6	GND	Local CHIT Port	
7	RX/RX+	Host Port	
8	CTS/RX-	Host Port	
9	DCD	Host Port	
10	GND	Host Port	
11	TX/TX-	Host Port	
12	RTS/TX+	Host Port	

J4	Connector	Description	Comment
-	Ethernet	RJ 485	

J6 Top	Connector	Description	Comment
1	AI 2	Analog Input 1 +	
2	AGND	Analog Input 1 -	
3	PI 2	Pulse Input 2 +	
4	GND	Pulse Input 2 -	
5	DO 1	Discrete Out 1 +	
6	GND	Discrete Out 1 -	
7	DO 2	Discrete Out 2 +	
8	GND	Discrete Out 2 -	
9	DI 1	Discrete Input 1 +	
10	GND	Discrete Input 1 -	
11	DI 2	Discrete Input 2 +	
12	GND	Discrete Input 2 -	

J14 Top	Connector	Description	Comment
1	AI 1	Analog In 1 +	
2	AI 1	Analog In 1 +	
3	AGND	Analog In 1 -	
4	AGND	Analog In 1 -	
5	PI 1	Pulse Input 1 +	
6	GND	Pulse Input 1 -	
7	TXD+	Remote 485 TX+	Reserved for HART or MVT
8	TXD-	Remote 485 TX-	Reserved for HART or MVT
9	RXD+	Remote 485 RX+	Reserved for HART or MVT
10	RXD-	Remote 485 RX-	Reserved for HART or MVT
11	GND		
12	HW5PC		

J15 Top	Connector	Description	Comment
1	Return	RTD return	
2	RTD -	RTD -	
3	RTD+	RTD +	
4	Exc		

Jumpers

Table D–2. Terminal Board Jumpers

Jumper	On	Off	Comment
J14	RS485	RS232	
J7	TX AC		
J10	TX DC		
J11	RX AC		
J13	RX DC		
J12 1-2	SW DUAL/HALF		
J12 2-3	2-Wire Mode	4 Wire Mode	
J16	Force DCD		
J8	Seal		
J9	Slot Sensor	Contact Closure	

USA
27 Forge Parkway
Franklin, MA 02038
Ph: (800) 437-7979
Fax: (713) 272-2273
orders.process.us@thermofisher.com

India
C/327, TTC Industrial Area
MIDC Pawane
New Mumbai 400 705, India
Ph: +91 22 4157 8800
india@thermofisher.com

China
+Units 702-715, 7th Floor
Tower West, Yonghe
Beijing, China 100007
Ph: +86 10 84193588
info.eid.china@thermofisher.com

Europe
Ion Path, Road Three,
Winsford, Cheshire CW73GA UK
Ph: +44 1606 548700
Fax: +44 1606 548711
sales.epm.uk@thermofisher.com

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Find out more at **thermofisher.com/AutoXP**