

**PCMV Intelligent Field Device Configurator
for use with
IMV31 Density Compensated Level Transmitters**

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1. Introduction

Overview

The PCMV Intelligent Field Device Configurator is a software package providing remote bidirectional communication with the Foxboro IMV25, IMV30 and IMV31 Multivariable Transmitters. It configures all parameters in the transmitters (including configuration for flow rate applications in the IMV30 and level applications in the IMV31), whereas only limited transmitter configuration capability is available from the optional display on the transmitter or from a HART Communicator.

This instruction (MI 020-497) contains information for its use with IMV31 Density Compensated Level Transmitters. Refer to MI 020-496 for information on its use with IMV25 and IMV30 Transmitters.

Features of the configurator when used with IMV31 Transmitters include:

- Capability to read all measurements
- Ability to set up the transmitter for any pertinent application
- Capability to configure density compensated data for level applications
- Test device equations to read predicted level and density
- Accurate reranging without recalibration
- Full screen device database display
- Enhanced device diagnostic capability
- Field-proven FSK communication
- Communication that does not affect output when reading measurements
- User-configurable measurement data graphical trend display
- Capability to reconfigure, copy, and clone databases
- Capability to upload and download device databases
- Capability to print out device databases
- Unlimited device database storage on diskette or hard disk
- Offline configuration (preconfiguration).

The configurator hardware/software package is designed to run from a PC with the following suggested minimum specifications:

- ◆ Windows® ME, Windows NT Workstation 4.0 (SP6), Windows 2000 Professional (SP4), or Windows XP (SP2)

— **NOTE** —

It does not run with Windows 3.1, Windows 95, or Windows CE.

- ◆ 400 MHz Pentium® with 128 MB RAM (256 MB RAM for Windows 2000 professional)
- ◆ 4X CD-ROM drive (8X recommended)
- ◆ Microsoft® mouse or compatible pointing device
- ◆ 20 MB of available hard disk space
- ◆ Internet Explorer 6.0 or greater.

Standard Equipment with the HART® Modem

The standard equipment with the HART modem includes the following items:

- ◆ Configurator software (1 CD)
- ◆ One HART external modem (can be attached by Velcro strips to back side of laptop computers)
- ◆ One 5-foot cable (desktop PC to modem)
- ◆ One 1-foot cable (laptop PC to modem)
- ◆ One 5-foot cable for connecting the modem to device loop wiring or for connecting the optional power supply to a device
- ◆ Velcro strips
- ◆ Instructions
- ◆ Two test clips.

Optional Equipment

The power supply option (120 V ac to 24 V dc converter) is used with devices that require a 24 V dc supply. The option is not required to power the modem because the power for the modem is obtained through the serial port connection to the PC.

PCMV Software Modules

There are three primary software modules automatically installed during the installation of PCMV software. For details of these modules, see “PCMV Software Modules” on page 11.

Reference Documents

For additional and related information, refer to the documents listed in Table 1.

Table 1. Reference Documents

Document	Description
DP 020-432	Dimensional Print – IMV25, IMV30, and IMV31 Multivariable Transmitter
MI 020-383	Instruction – IMV31-T (HART) Multivariable Transmitter
MI 020-427	Instruction – Intrinsic Safety Connection Diagrams
PL 009-020	Parts List – IMV31 Multivariable Transmitter

2. Quick Start

PCMV Configurator

The PCMV configurator software package configures all parameters in the IMV31 Transmitters, whereas only limited transmitter configuration capability is available from the optional display on the transmitter or from a HART Communicator.

PCMV Software Modules

There are three primary software modules automatically installed during the installation of PCMV software.

PCMVcfg

The PCMVcfg module is used for communications with the transmitter and for both configuration and calibration of the transmitter. It also can be used to view transmitter status and diagnostics. When connected to an IMV31 transmitter, it also has an equation test feature which allows you to enter values of raw sensor inputs and display the calculated level and density values for those conditions.

Application Design Conditions

The Application Design Condition module is used to begin the level configuration process by allowing user entry of application parameters such as tank type, tank pressure, head dimensions, temperature sources, and maximum and minimum values of operating conditions. It is accessed from the top level Tools menu or via the Application Design Conditions icon (A) on the toolbar.

PCMVb

The PCMVb module is a subset of the Application Design Conditions module. It is used to configure other details of the level application, including the specific fluid and normal pressure and temperature. It also displays the calculated density at normal operating conditions, using comprehensive equations from Richard Miller's *Flow Measurement Engineering Handbook* and contains an extensive fluid properties database for over 275 fluids.

PCMV Software Installation

Insert the CD into the CD drive on your personal computer. The software has an autostart feature so that if you wait a short while, it automatically starts. Follow the on-screen instructions. If it does not automatically start, use Windows Explorer and double click on the Setup icon. If you have a previous version of PCMV already installed and want to upgrade to the latest version, follow the instructions for removing the old software first. Do **not** use the standard Windows uninstall program. Then proceed with the installation of the new version. Also, assure that no other programs are assigned to the comport you specify.

Communications with the Transmitter

Communication between your personal computer and the transmitter requires a Schneider Electric modem. This is the same modem used with the PC20 and PC50 Configurator software packages. If you need to purchase this modem, contact Global Customer Support.

3. Installation

Configurator Hardware Installation

▲ WARNING

EXPLOSION HAZARD

The modem shipped with the configurator is not intrinsically safe and should not be connected directly to an intrinsically safe circuit. It is permissible to connect these modems to the nonhazardous side of an intrinsically safe barrier.

Failure to follow these instructions can result in death or serious injury.

— **NOTE** —

1. All hardware supplied with PC20 or PC50 configurator software packages can be used with this configurator. Just load the PCMV software into your personal computer and use your existing Schneider Electric hardware. All connections between the computer, the device, and the modem are identical to those used with the PC-Based Schneider Electric configurators.
2. Use a Schneider Electric supplied modem. Other brands of HART modems may not support PCMV. If you need to purchase a Schneider Electric modem, contact Global Customer Support.

Attaching the Modem to the Serial Port

Attach your modem to your computer serial port (COM1 or COM2). If the computer serial port has a 25-pin connector, use a 25-to-9-pin adapter.

Connecting the Modem to a Field Device

— **NOTE** —

1. The loop must have a minimum of 250 ohms between the power supply and the attachment of the modem. Also, two or more transmitters cannot share the same load.
2. The Schneider Electric optional power supply contains the required 250 ohm load.

Figure 1. Transmitter with Remote Power Supply

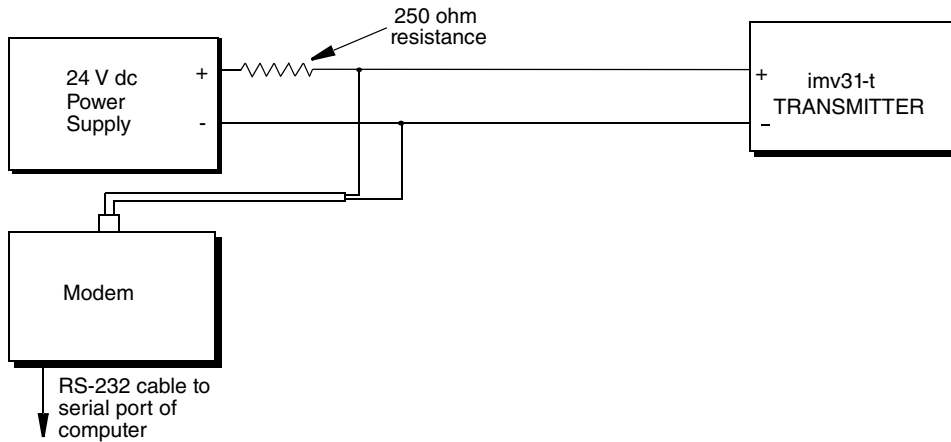
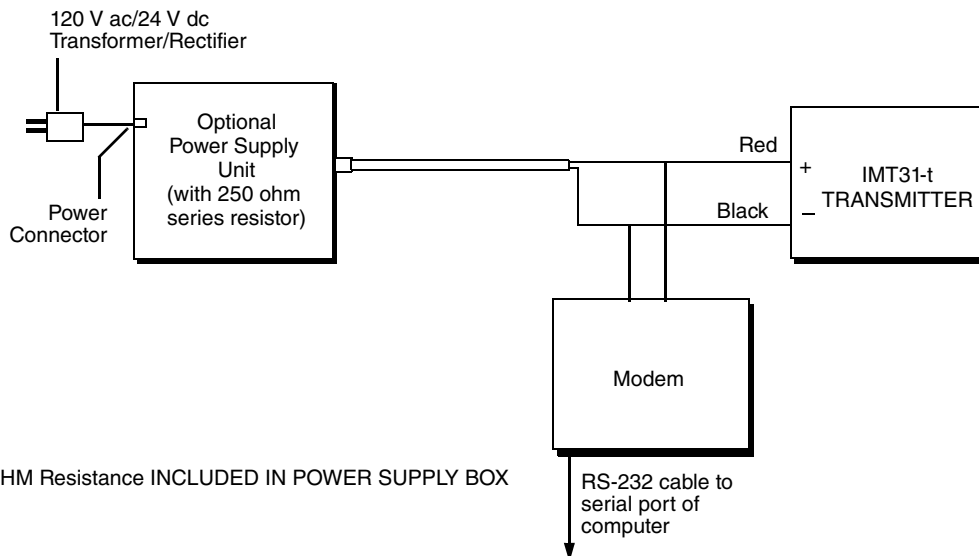


Figure 2. Transmitter with Optional Power Supply



NOTE: 250 OHM Resistance INCLUDED IN POWER SUPPLY BOX

Configurator Software Installation

Perform installation while running the standard Windows installation program. Close all other running programs before starting your installation.

Insert the CD in your computer. It is designed to start automatically. If it does not start after a short while, use Windows Explorer to locate the Setup.exe file on the CD and double-click on it. Then follow instructions to install the configurator program.

The installation procedure is automatic and prompts you for necessary information. The installation program verifies that the PC has the hardware and memory necessary to load and run the configurator.

— NOTE

If you are installing a new version of the PCMV software on a PC that already has PCMV installed, you must uninstall the old version first. You can do this via the “Remove” feature in PCMV software. Then follow the installation procedures above. During the “Remove” procedure, you have the opportunity to save your database. During the “Installation” procedure, you have the opportunity to use your old database.

4. Operation

Starting the Configurator Program

To start the program, double-click the configurator icon or access the program from the Start menu.

General Information

Because the program can perform a variety of functions, some menu items may be missing or “grayed out.” Missing menu items are never allowed for the connected device. Grayed out items are not allowed under the present condition but may be allowed under different conditions. For example, **Connect to Device** would be available for a device that was not connected but grayed out for a device that was already connected.

Top Level Menu Screen (not connected to device)

The Top Level Menu screen, shown in Figure 3, is displayed when your computer is not connected to a device or when no preconfiguration data is loaded onto a window. This screen has pull-down menus for selecting the various functions. Explanations of the menus and functions appear in Table 2.

Figure 3. Top Level Menu Screen (when not connected to a device)

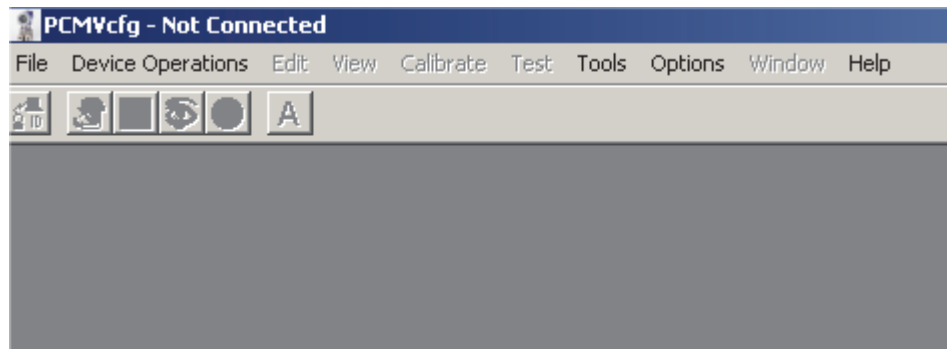


Table 2. Top Level Menu – Description of Functions

Top Level Menu Pick	Submenu Pick	Description
File	<u>N</u> ew...	Creates a preconfiguration database using one of several default databases as a template.
	<u>O</u> pen...	Opens an existing configuration database.
	<u>E</u> xit	Quits the application.
Device Operations	<u>C</u> onnect to Device...	Connects to a device.

Table 2. Top Level Menu – Description of Functions (Continued)

Top Level Menu Pick	Submenu Pick	Description
Tools	Application Design Conditions	Accesses configuration of level and density parameters
	Configuration Report...	Accesses a copy of a configuration database that can be produced in hard copy form or that can be e-mailed for ordering or troubleshooting.
	Options	Connect at Startup - Enables connection to a device at startup.
		Confirm Device Connect - Enables a confirmation before connection to a device.
	AutoDisconnect after NoComs - Enables an automatic disconnect upon problem connecting to a device.	
Options	Access Level Password	Accesses advanced troubleshooting functions. These functions are only used in consultation with Schneider Electric.
Help	About	Displays the software version number of the configurator.

Preconfiguring a Device (offline configuration)

The PCMV Configurator enables you to create a new configuration file from one of several default databases, from a previously created and saved file, or from the configuration of a connected device. You can then download the new configuration to a connected device or save it to a file.

— NOTE —

When opening a .cfg file that was created on a different PC, PCMVb information is present in the configuration (.cfg) file and automatically added to the PCMVb database on your PC (as a record on the hard drive).

To start from a default database, select **New** in the **File** menu and then select **IMV31** from the **Device Type** menu, **HART** from the **Protocol** menu, and the **Span Limit** code combination that represents the **Differential Pressure Measurement/Pressure Measurement** of your transmitter. To start from a previously created and saved file, select **Open** from the **File** menu and select the desired file. Click on the **OK** button.

— NOTE —

To access **New** or **Open** in the **File** menu, you must **not** be connected to a device.

When you have finished your new configuration, use **Save As** in the **File** menu to save it.

Connecting to a Device

To connect to a device, first hardwire to your device. If the **Connect at Startup** option is configured, the configurator automatically connects to the device upon startup. If the **Connect at Startup** option is not configured, select **Connect to Device** in the **Device Operations** menu. The **Company ID** and **Connection Details** screen appears. See Figure 4.

Company ID is rarely required. It is only used to distinguish between two transmitter data bases on your computer with the same **Tag Number**.

In **Connection Details**, specify **HART** if connecting to a transmitter. **DEMO** enables you to simulate a transmitter when one is not connected.

If you selected HART, you are asked to specify the COM port to which you are connecting. If you selected DEMO, the only selection in the picklist is MV (for multivariable).

If you selected HART, when you click on the OK button, you are asked to specify the polling address. Select 0 unless you are using multidrop communication.

Figure 4. Company ID and Connection Details Screen



Also see “Online Configuration - connected to a transmitter” on page 35.

Top Level Menu Screen (connected to a device)

The Top Level Menu screen, shown in Figure 5, is displayed when connected to a device or when preconfiguration data is loaded onto a window. This screen has pull-down menus for selecting the various functions. Explanations of the menus and functions appear in Table 3.

Figure 5. Top Level Menu Screen (when connected to a device)

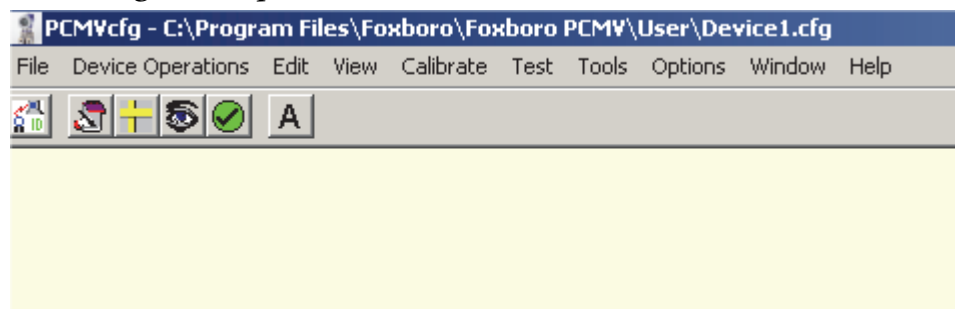


Table 3. Device Top Level Menu – Description of Functions

Top Level Menu Pick	Submenu Pick	Description
File	<u>S</u> ave	Saves the active document.
	Save <u>A</u> s...	Saves the configuration to a file.
	E <u>x</u> it	Quits the application.
<u>D</u> evice Operations	Disconnect from Device	Disconnects from a device.
	Download Configuration	Downloads the configuration file to the connected device.
<u>E</u> dit	C <u>o</u> py	Copies logged data to the computer clipboard.
	Device Configure...	Edits the configuration database.
	C <u>o</u> mpare...	File vs File - Compares the current configuration against a stored database.
		Device vs File - Compares the current configuration against the values in the device.
<u>V</u> iew	T <u>o</u> olbar	Shows or hides the toolbar.
	Status <u>B</u> ar	Shows or hides the status bar.
	<u>A</u> ctivity Log	Shows or hides the activity log.
	<u>S</u> can Data	Continuously displays the measurement or raw input data.
	T <u>r</u> end Measurements	Displays a trend graph.
<u>C</u> alibrate	<u>C</u> alibration...	Performs a calibration procedure.
<u>T</u> est	Device <u>S</u> tatus...	Displays status and diagnostic information from the device.
	<u>O</u> utput Override...	If configured to 4-20 mA output, sets output to a specific mA value to test other devices in the loop. If configured to Digital output, sets output to a specific digital value to test I/A Series [®] system wiring and displays.
	Scan <u>R</u> aw Inputs...	Displays raw inputs for some types of device.
	Test Device Equations...	Displays level and density data and enables you to see the results of changing D/P, A/P, and temperature raw inputs.
	Go <u>O</u> nline	Places the device in on-line mode.
	Go <u>O</u> ffline	Places the device in off-line mode.
	Get ID	Re-establishes the connection with the device.
	Get ID (w/reload)	Resynchronizes the database back to the device.
<u>T</u> ools	Edit Application Design Conditions...	Accesses configuration of level and density parameters.
	<u>C</u> onfiguration Report...	Accesses a copy of the configuration database that can be produced in hard copy form or that can be e-mailed for ordering or troubleshooting.
	<u>O</u> ptions	Connect at Startup - Enables connection to a device at startup.
		Confirm Device Connect - Enables a confirmation before connection to a device.
	AutoDisconnect after NoComs - Enables an automatic disconnect upon problem connecting to a device.	
<u>O</u> ptions	Access Level Password	Accesses advanced troubleshooting functions. These functions are only used in consultation with Schneider Electric.
<u>W</u> indow	<u>C</u> ascade	Arranges windows so they overlap.
	Tile <u>H</u> orizontal	Arranges windows as horizontal tiles.
	Tile <u>V</u> ertical	Arranges windows as vertical tiles.
	<u>A</u> rrange icons	Arranges icons at the bottom of the window.
<u>H</u> elp	<u>A</u> bout	Displays the software version number of the configurator.

Toolbar, Status Bar, and Activity Log

The program is equipped with a toolbar at the top of the screen, a status bar at the bottom, and an activity log just above the status bar. Any of the three can be shown or hidden at any time by using the View menu. The icons on the toolbar are shown in Figure 6. A listing of the features and descriptions for the toolbar is given in Table 4.



Table 4. Toolbar Features and Descriptions

Item	Feature	Description
1	Get ID (Reconnect)	Reconnect to the device.
2	Configuration	Access Configuration menus.
3	Calibration	Access Calibration menus.
4	Scan Measurements	Access Measurements screen.
5	View Status	Access Status screen.
6	Application Design Conditions	Access configuration of level and density parameters.

The status bar displays, from left to right, the mode, the current device state, and the device version number.

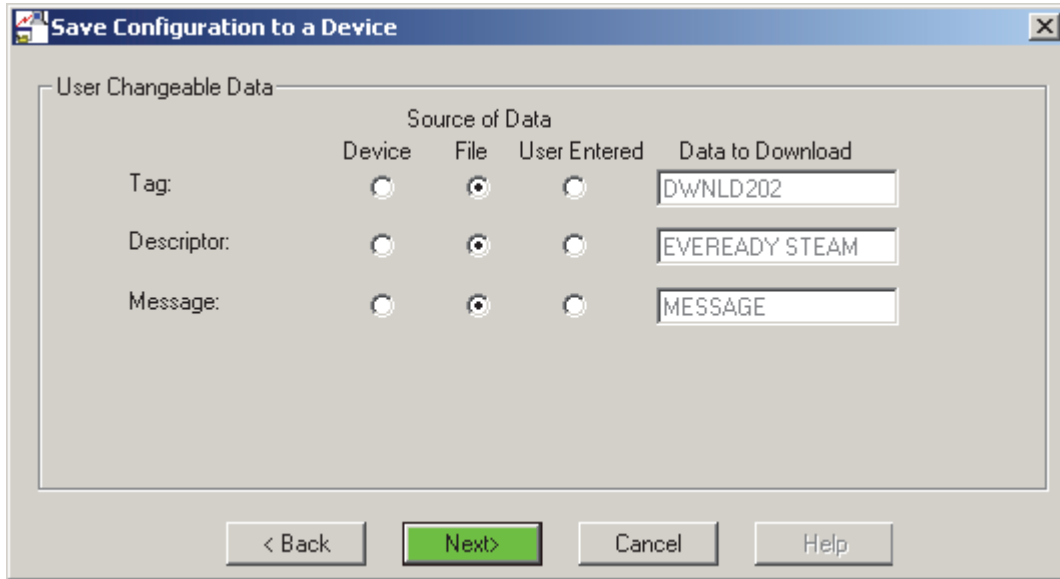
The activity log displays a list of events and the time they took place.

Downloading a Configuration File to a Device

After connecting to a transmitter, an existing `.cfg` file can be downloaded to the transmitter. If the `.cfg` file contains PCMVb information, the program checks to see if the tag number record exists in the PCMVb database on the computer hard drive and allows you to create or update the record in the database using data from the `.cfg` file.

1. Select **Download Configuration** from the **Device Operations** menu.
2. On the **Save Configuration to a Device** screen, click on the browse button for a list of the available configuration files. Double click on your selection. The **Save Configuration to a Device** screen reappears.
3. Click on the **Next** button. The **User Changeable Data Screen** is displayed.
4. From this screen specify the source of the **Tag**, **Description**, and **Message**. Select each to be from the connected **Device**, the selected **File**, or **User Entered** data. Figure 7 shows a Sample User Changeable Data Screen for HART transmitters.
5. When done, click on the **Next** button. The **Calibration to Download** screen is displayed showing the device calibration and file calibration data.
6. Select **Use Device Calibration** or **Use File Calibration** and click on the **Download** button.

Figure 7. Sample User Changeable Data Screen

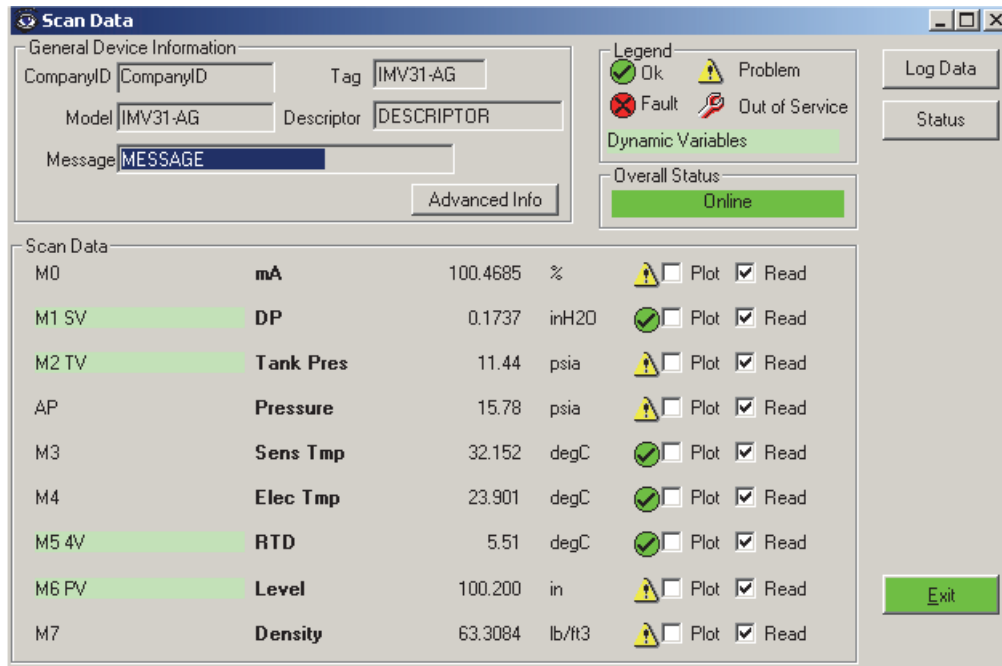


Scanning Measurements

Once the configurator is connected to your device, you can display the Scan Data screen. This screen continuously reads and displays the current values of the equivalent mA output (in percent), measurements, and calculations and the status of each.

To display this screen, select Scan Data and then Measurements from the top level View menu. You can also access Scan Measurements via the Scan Data icon on the toolbar.

Figure 8. Sample Scan Data Screen



Explanation of Measurement Designations

The measurement designations used for measurements and calculations as listed below:

M0 = (mA) Equivalent mA output in percent

M1 = (DP) Differential pressure

M2 = (Tank Pres) Tank pressure

AP = (Pressure) Pressure

M3 = (Sens Tmp) Sensor temperature

M4 = (Elec Tmp) Electronics temperature

M5 = (RTD) RTD temperature

M6 = (Level) Level

M7 = (Density) Density calculation

NOTE

M2 is the pressure in the tank above the liquid. It is normally different than the AP pressure measured by the transmitter.

Explanation of Highlighted Values

The measurements/calculations that are highlighted are those selected as the primary, secondary, tertiary, and 4th measurements

Explanation of Status Symbols

The “check mark” symbol in a green circle indicates that everything is OK with the measurement; the “X” symbol in a red circle, that there is a fault with the measurement; the “!” symbol in a yellow triangle, that there is some problem with the measurement; and the “Wrench” symbol, that the measurement is out of service (configured off). Examples of problem measurements (“!” symbol) are a measurement that is out of valid range and a calculation that relies on a measurement which is out of valid range.

Reading and Plotting Data

You can add (or delete) any measurements/calculations that you are interested (or not interested) in from the scan and plot (or not plot) the curve of any you are interested (or not interested) in by selecting or deselecting the **Read** and **Plot** boxes at the right of the screen.

Advanced Info Button

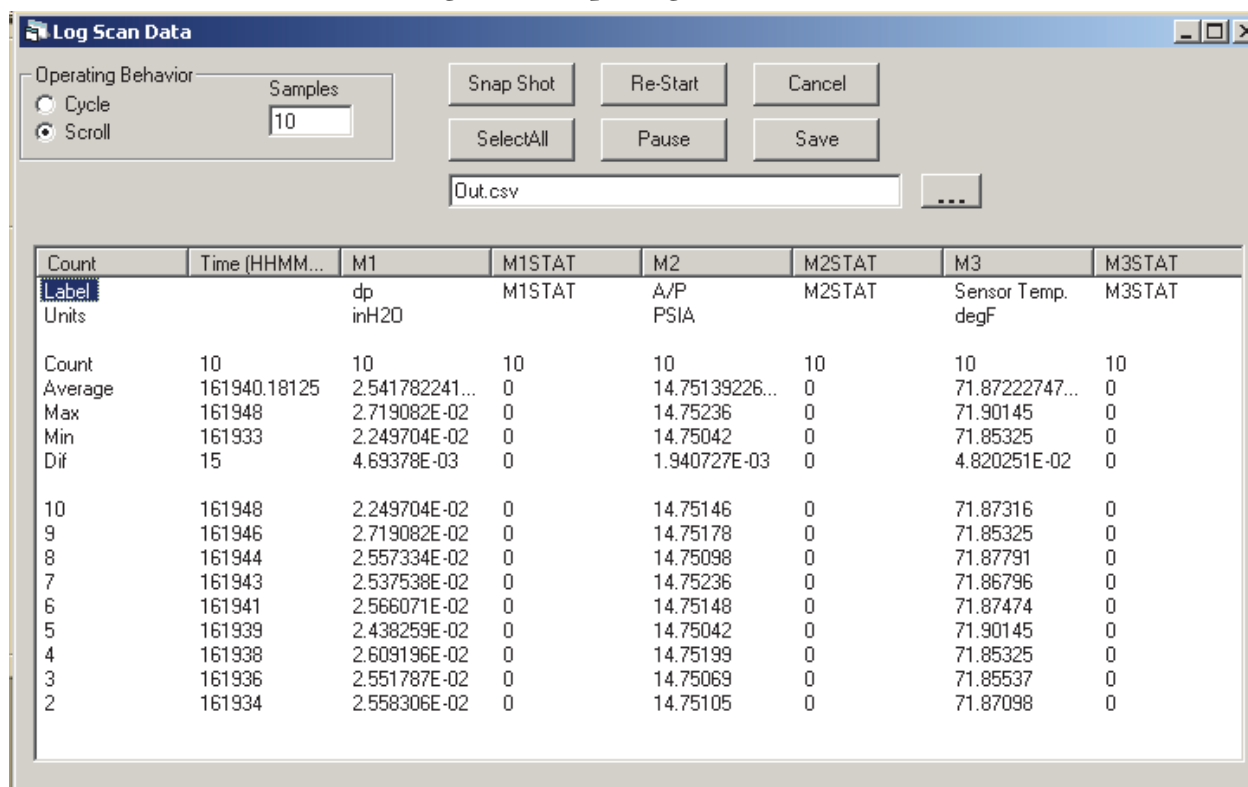
The **Advanced Info** button gives you the sensor ID, electronics serial number, manufacturing information, and device information. Clicking on the **General Info** button brings you back to the original display.

Log Data Button

The **Log Data** button enables you to create a log of the data you have selected to scan with your Scan Data screen. This log also shows the count, average, maximum, minimum, and difference of the readings. Pressing this button produces the Log Data Screen. See Figure 9. Using this screen, you can present the information in different ways.

In **Samples**, you can set the number of readings shown at one time. In the **Cycle - Scroll** selection, you can establish the order of presentation of the readings. You can stop the process with the **Pause** button which then becomes the **Start** button to continue the readings. At any time you can restart the process with the **Restart** button. The **Snap Shot** button records the next number of readings (established in the **Samples** field) and stops the process. The **Select All** button places the readings on your computer clipboard. You can save the data at any time with the **Save** Button. The **Cancel** button returns you to the Scan Data screen.

Figure 9. Sample Log Data Screen



Status Button

The **Status** button provides similar information to that produced by the Device Status Function which is described on page 39.

Scanning Raw Inputs

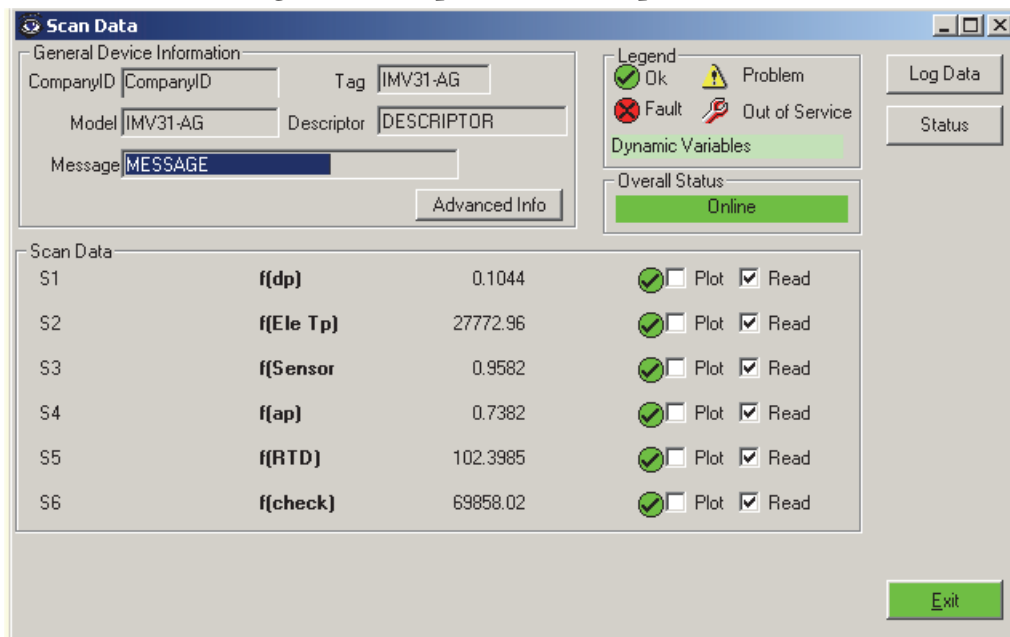
Once the configurator is connected to your device, you can display the Scan Raw Inputs screen. This screen continuously reads and displays the current values of raw inputs to your device. The values are primarily used in troubleshooting problems by Schneider Electric personnel.

- S1 = D/P input (unitless)
- S2 = ETMP input (unitless)
- S3 = STMP input (unitless)
- S4 = A/P input (unitless)
- S5 = RTD input (ohms)
- S6 = Validation of inputs S1, S3, and S4

The Scan Raw Input function is accessed by selecting **Scan Data** from the top level **View** menu and then selecting **Raw Inputs** or by selecting **Scan Raw Inputs** from the top level **Test** menu. A sample Raw Inputs screen is shown in Figure 10.

For information on the **Advanced Info**, **Log Data**, and **Status** buttons, see “Scanning Measurements” on page 22.

Figure 10. Sample Scan Raw Inputs Screen



Reading and Plotting Data

You can add (or delete) any measurements/calculations that you are interested (or not interested) in from the scan and plot (or not plot) the curve of any you are interested (or not interested) in by selecting or deselecting the **Read** and **Plot** boxes at the right of the screen.

Explanation of Status Symbols

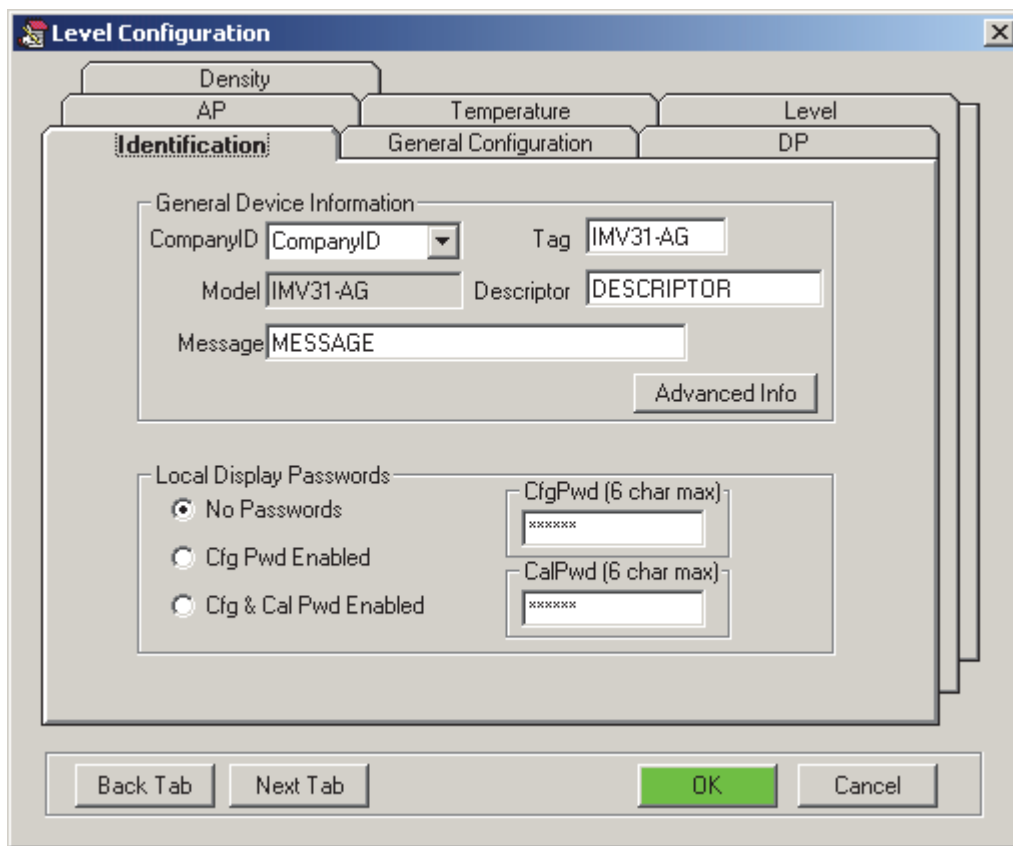
The “check mark” symbol in a green circle indicates that everything is OK with the measurement; the “X” symbol in a red circle, that there is a fault with the measurement; the “!” symbol in a yellow triangle, that there is some problem with the measurement; and the “Wrench” symbol, that the measurement is out of service (configured off).

Configuration Function

The Configuration function allows editing of the device database. This function is accessed via the top level **Edit** menu or by the Configuration icon on the toolbar. Seven tabs are selectable from this screen. Upon accessing the configuration function, the **Identifier** tab is displayed.

Identification Tab Screen

Figure 11. Sample Identification Tab Screen

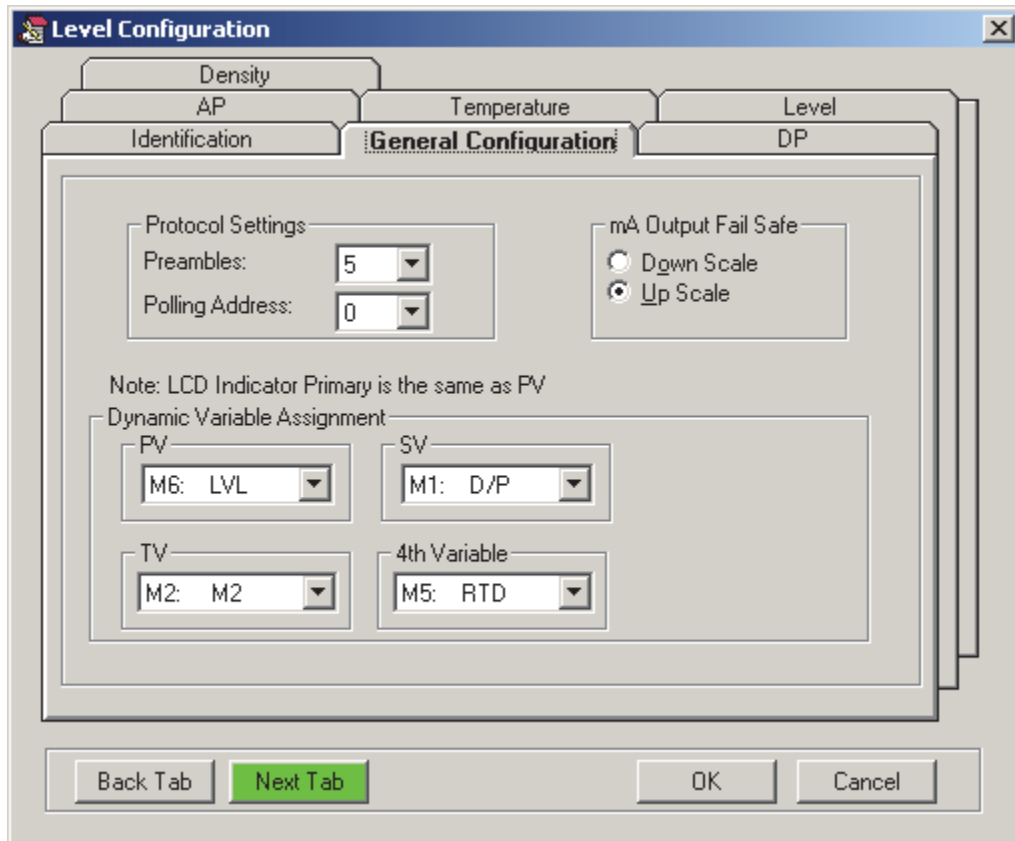


Field	Entry
General Device Information	
CompanyID	Rarely required. Only used to distinguish between two transmitters data bases on your computer with the same Tag Number.
Model	Shows the model number and sensor code of the device (IMV31-BD, for example).
Tag	Enter maximum of 8 characters. The Tag Number is used to identify your device in the Application Design Conditions.
Descriptor	Enter maximum of 16 characters. Optional, used for reference only.
Message	Enter maximum of 31 characters. Optional, used for reference only.

Field	Entry
Advanced Info Button	Shows the sensor ID number, the electronic serial number, and a manufacturing number.
Local Display Passwords	
CfgPwd	Enter the password that allows you to change the configuration at the local display.
CalPwd	Enter the password that allows you to change both the configuration and calibration at the local display.

General Configuration Tab Screen

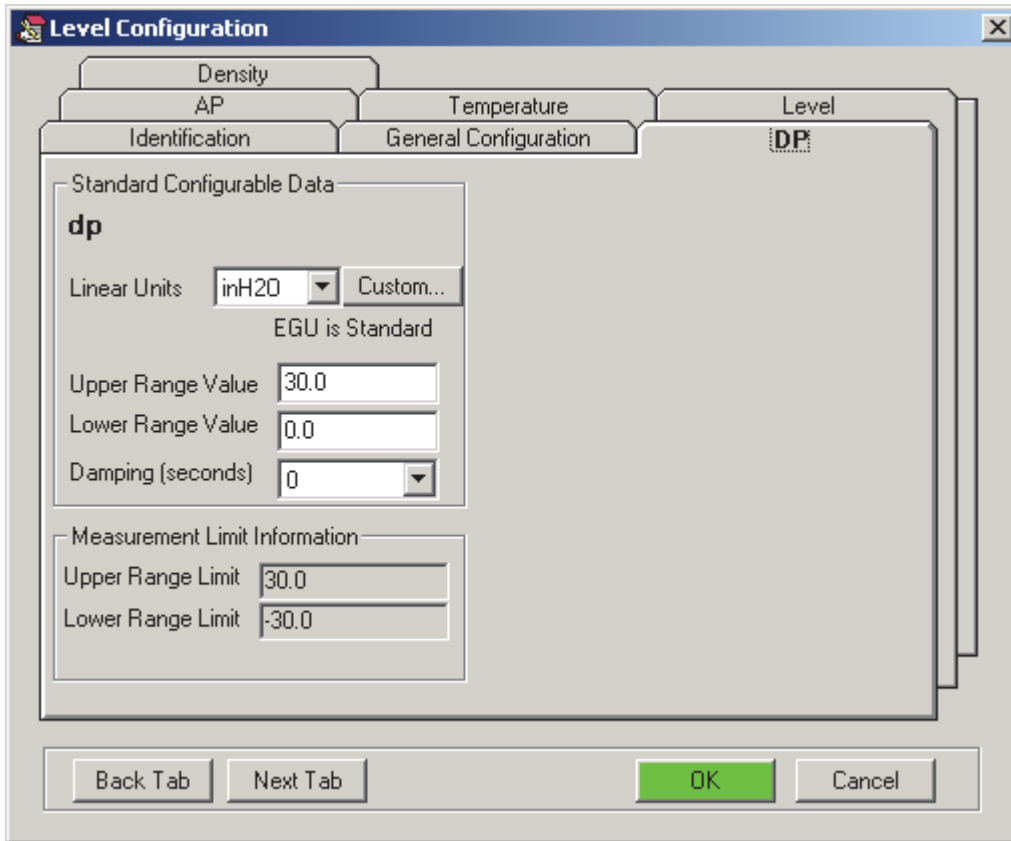
Figure 12. General Configuration Tab Screen



Field	Entry
Protocol Settings	
Preambles	Select Preambles setting from 3 to 20.
Polling Address	Select Polling Address from 0 to 15.
mA Output Fail Safe	Select Downscale or Upscale
Dynamic Variable Assignment	
PV	For each variable, assign as D/P, M2, LVL, or DENS.
SV	For each variable, assign as D/P, M2, STMP, ETMP, RTD, LVL, or DENS.
TV	
4th Variable	

DP (M1) Tab Screen

Figure 13. DP (M1) Tab Screen



Field	Entry
Std Configurable Data	
Linear Units	Select from menu of pressure units.
Custom Button	Enables use of custom units. See Figure 14.
Upper Range Value	Enter the value at which the device outputs 20 mA. (a)
Lower Range Value	Enter the value at which the device outputs 4 mA. (a)
Damping	Enter one of eight choices from No Damping to 32 seconds.
Meas. Information	
Upper Range Limit	Shows the Upper Range Limit of the device.
Lower Range Limit	Shows the Lower Range Limit of the device.

a. These values are applicable when 4-20 output mode is assigned to this measurement. They also set the points at which the optional indicator flashes to indicate an out-of-range condition if this is the primary measurement.

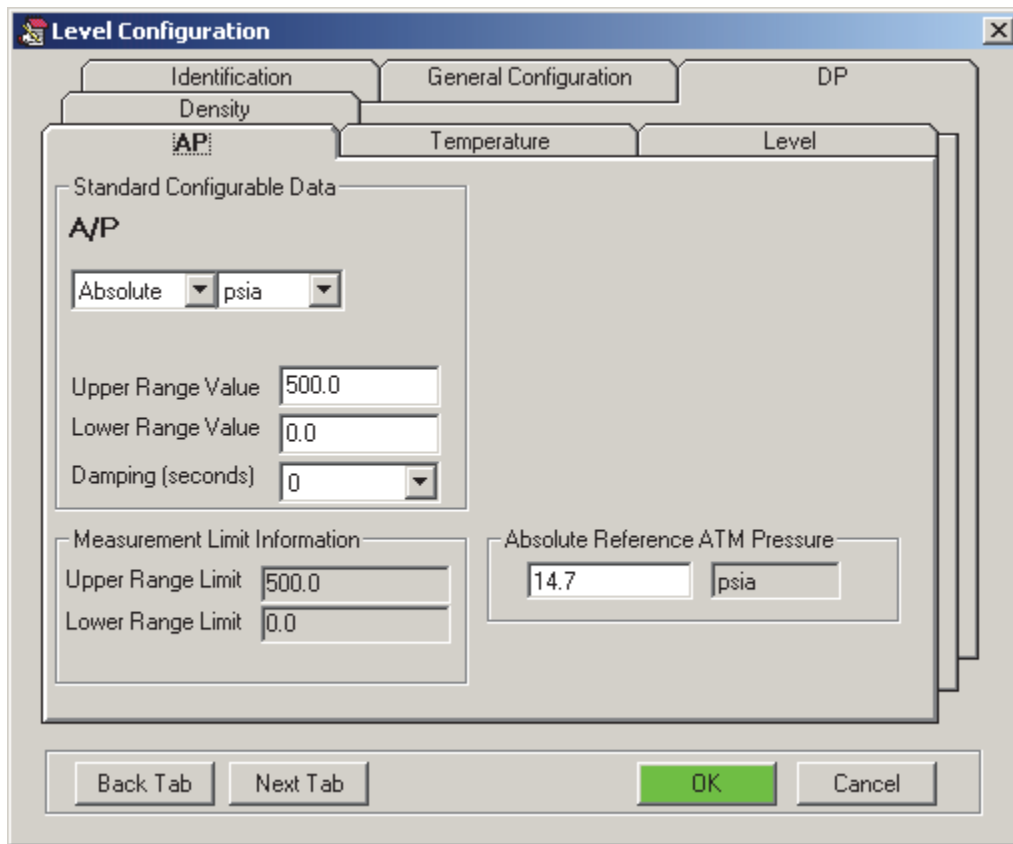
Figure 14. Sample dp Custom EGU Configuration Screen

Field	Entry
Custom Eng Config	
Label EGU - Custom Value	Enter the name of your custom units (6 characters maximum).
Label EGU - Reference Value	Select a reference unit that is convenient for conversion to your custom unit.
URV - Custom Value	Enter the value in custom units equal to the URV value in the reference units selected.
LRV - Custom Value	Enter the value in custom units equal to the LRV value in the reference units selected.

The custom units and the upper and lower range values in those units then appear on your DP (M1) Tab Screen.

AP (M2) Tab Screen

Figure 15. AP (M2) Tab Screen

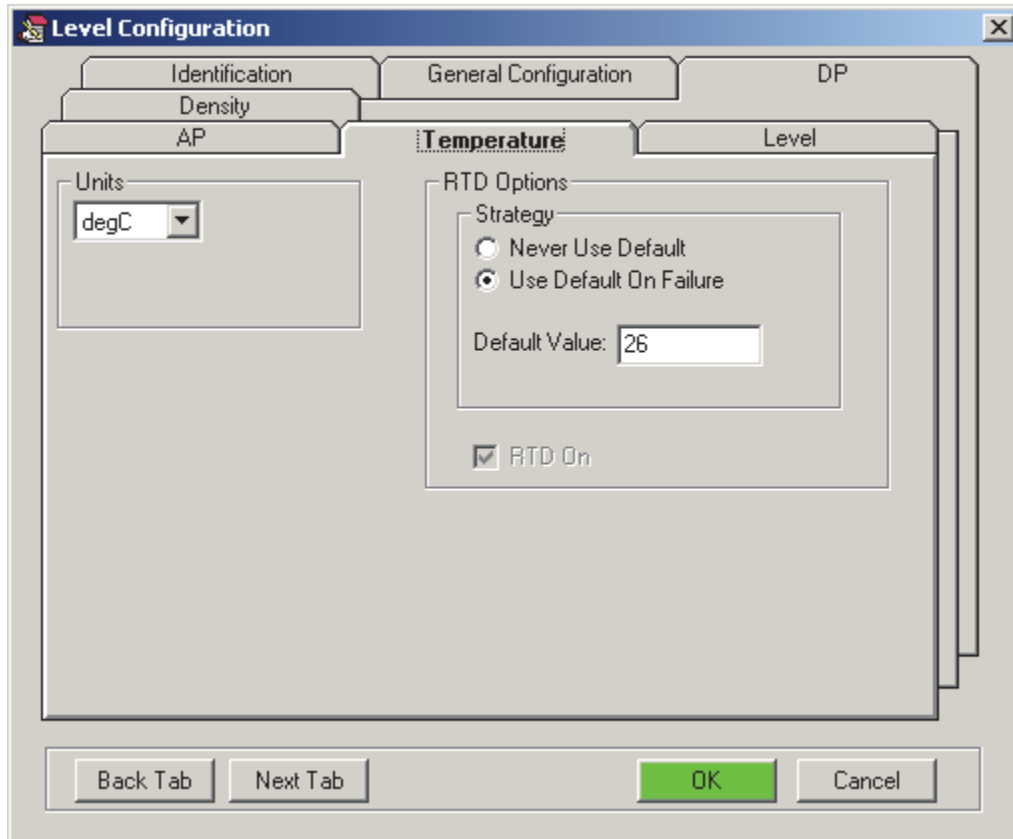


Field	Entry
Std Configurable Data	
Units	Select AbsoLute or Gauge pressure and then select the unit type from the menu of pressure units. (a)
Upper Range Value	Enter the value at which the device outputs 20 mA. (b)
Lower Range Value	Enter the value at which the device outputs 4 mA. (b)
Damping	Enter one of eight choices from No Damping to 32 seconds.
Meas. Information	
Upper Range Limit	Shows the Upper Range Limit of the device.
Lower Range Limit	Shows the Lower Range Limit of the device.
Absolute Reference ATM Pressure	Enter the ambient atmospheric pressure. (a)

- a. Gauge pressure is equal to the measured absolute pressure minus the value entered in Reference ATM Pressure. It is not referenced to varying atmospheric pressure.
- b. These values are applicable when 4-20 output mode is assigned to this measurement. They also set the points at which the optional indicator flashes to indicate an out-of-range condition if this is the primary measurement.

Temperature (M5) Tab Screen

Figure 16. Temperature (M5) Tab Screen

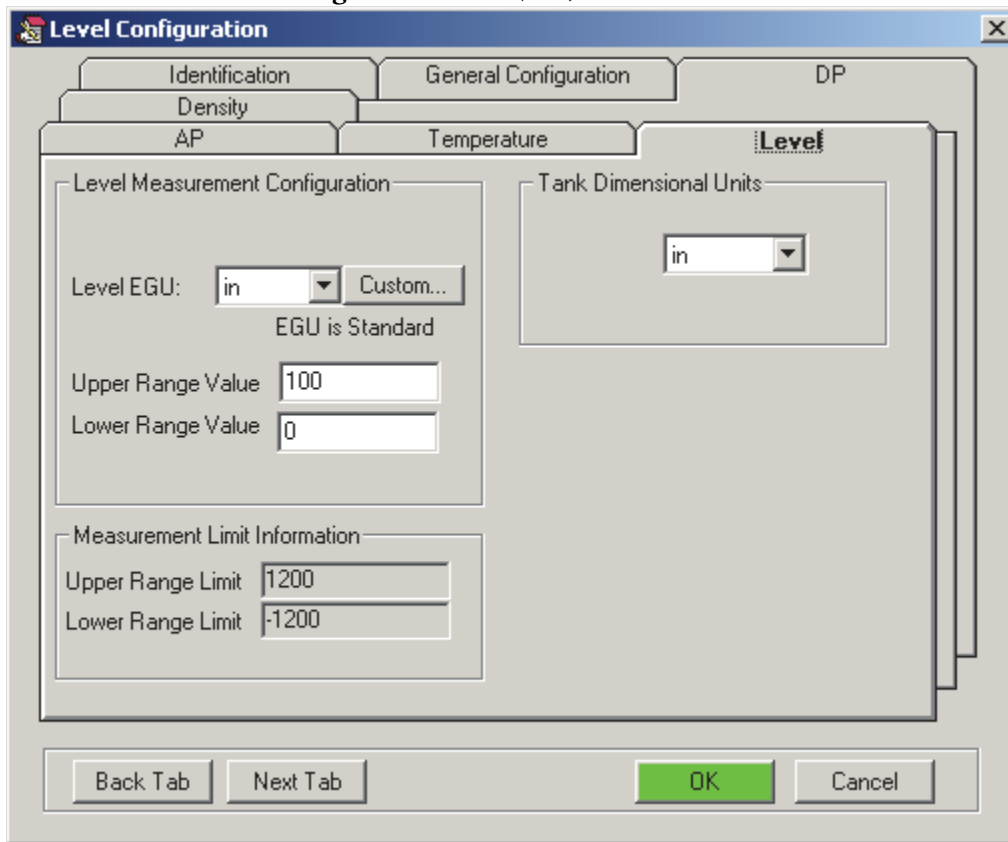


Field	Entry
Units	Select degF, degR, degC, or degK from menu of temperature units.
RTD Options	
RTD Strategy	Select Never Use Default or Use Default on Failure.
Default Value	Enter the default value (in units specified).
RTD On	√ = RTD Measurement On; Blank = Measurement Off. (a)

a. You cannot deselect RTD On if RTD is selected as the source in Application Design Conditions (see page 41).

Level (M6) Tab Screen

Figure 17. Level (M6) Tab Screen



Field	Entry
Level Measurement Configuration	
Level EGU	Select from menu of level units.
Custom Button	Enables use of custom units. See Figure 18.
Upper Range Value	Enter the value at which the device outputs 20 mA. (a)
Lower Range Value	Enter the value at which the device outputs 4 mA. (a)
Measurement Limit Information	
Lower Range Limit	Shows value of Lower Range Limit.
Upper Range Limit	Shows value of Upper Range Limit.
Tank Dimensional Units	Select from menu of units.

a. These values are applicable when 4-20 output mode is assigned to this measurement. They also set the points at which the optional indicator flashes to indicate an out-of-range condition if this is the primary measurement.

NOTE

Level measurement requires additional configuration. See “Application Design Conditions” on page 41.

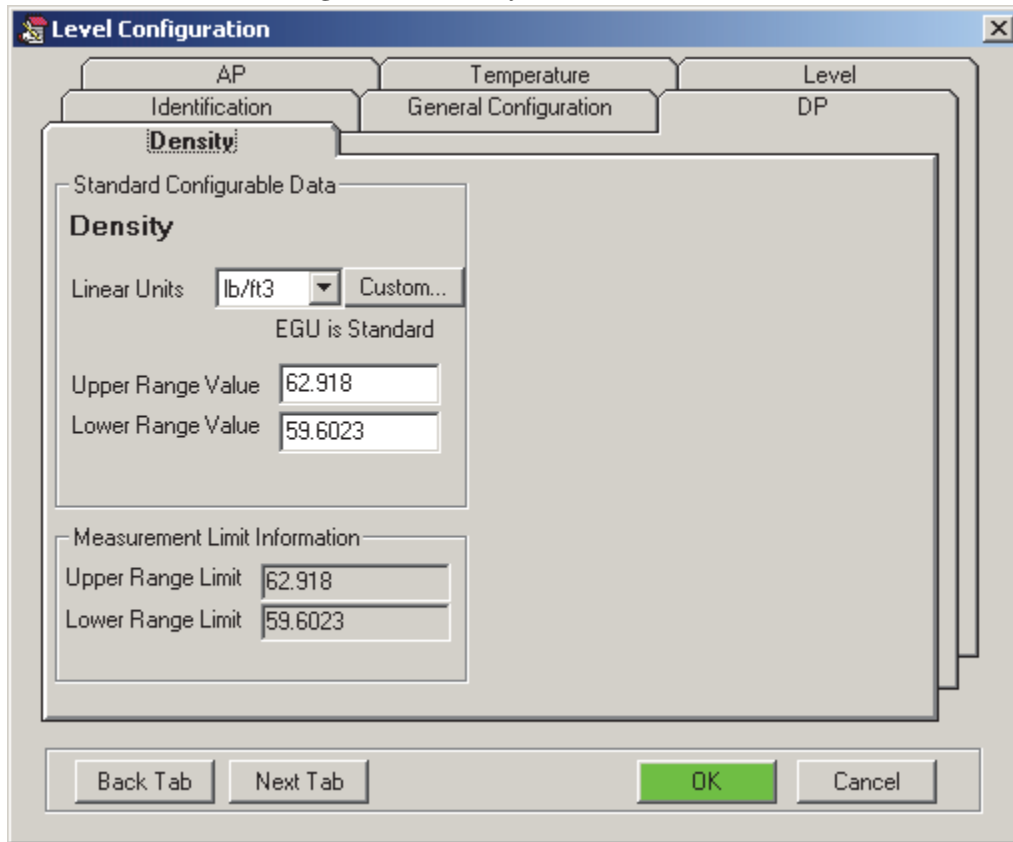
Figure 18. Sample Flow Custom EGU Configuration Screen

Field	Entry
Custom Eng Config	
Label EGU - Custom Value	Enter the name of your custom units (6 characters maximum).
Label EGU - Reference Value	Select a reference unit that is convenient for conversion to your custom unit.
Ref - Reference Value	The value of the URV in the units selected appears as a default value. You can change this to a number that is convenient for your conversion (for example 1 or 1000).
Ref - Custom Value	Enter the value in custom units equal to the reference value in reference units.

The custom units and the upper and lower range values in those units then appear on your Level (M6) Tab Screen.

Density (M7) Tab Screen

Figure 19. Density (M7) Tab Screen



Field	Entry
Standard Configurable Data	
Linear Units	Select from menu of density units.
Custom Button	Enables use of custom units. See Figure 18.
Upper Range Value	Enter the value at which the device outputs 20 mA. (a)
Lower Range Value	Enter the value at which the device outputs 4 mA. (a)
Measurement Limit Information	
Upper Range Limit	Shows value of Upper Range Limit.
Lower Range Limit	Shows value of Lower Range Limit.

a. These values are applicable when 4-20 output mode is assigned to this measurement. They also set the points at which the optional indicator flashes to indicate an out-of-range condition if this is the primary measurement.

NOTE

Density calculation requires additional configuration. See “Application Design Conditions” on page 41.

Saving Configuration Information

A configuration can be created or revised when connected to a transmitter and the configuration file saved. Configuration can also be done in an offline mode and the configuration saved to a file and downloaded to a transmitter at a later time.

Offline Configuration - not connected to a transmitter

When you save a configuration, using the Save or Save As functions, PCMV creates a file with a `.cfg` extension. This file contains all your configuration information. The user fluid information entered in PCMVb is also automatically saved as a record on the hard drive of the computer used to create the configuration. It is saved by tag number (for a given Company ID). If you save the configuration after returning from PCMVb, the user-entered information from PCMVb is also saved in the configuration file. This allows a configuration to be done offline on one computer and moved to another computer.

Online Configuration - connected to a transmitter

Changes in PCMVcfg can be saved by making selecting OK on the configuration tab screens. If making changes in PCMVb, select Save and then Download Using PCMVcfg.

After downloading, save your configuration to a file as described above in the Offline Configuration section. A PCMVb database record is also saved on the PC hard drive.

Some of the detailed information entered in the PCMVb section of the configurator, such as fluid names and custom fluid data, is not downloaded and stored in the transmitter. Instead, the configurator uses this entered information to calculate a set of application-specific coefficients that are downloaded to the transmitter to configure it for its intended application.

If you save the configuration after returning from PCMVb, all the user-entered information from PCMVb, including fluid names, and so forth, is saved in the configuration file. This allows a configuration to be done offline on one computer and moved to another computer.

When connecting to a transmitter, PCMV initially reads the existing database in the transmitter. If you already have a `.cfg` file for this IMV31 transmitter, do not immediately save this uploaded database to the same `.cfg` file because some of the PCMVb data that may have been saved in the original `.cfg` file could be lost. This happens because the file is overwritten by data from the transmitter that may not have all the PCMVb information. The file still has all the correct coefficients and is a valid file for downloading to a transmitter. It just may not contain some of the user inputs.

To update an existing `.cfg` file without losing any PCMVb data, perform one of the following two procedures:

1. If the transmitter was previously configured on the same PC or the `.cfg` file was previously opened on the PC, a record already exists on the PC's hard drive. Open **Application Design Conditions** and click OK to enter PCMVb. Even if you do not need to change any data in PCMVb, step through using **Next** and **Save** buttons, download to the device, and then save your `.cfg` file.

2. If the PC had never been used to configure this transmitter or the .cfg file had never been opened on this PC, the record does not exist on the hard drive. Do either one of the following:
 - a. Temporarily disconnect from the transmitter and open the existing .cfg file. This installs a record on the hard drive. Then reconnect to the transmitter and follow the Procedure #1 above.
 - b. Do not disconnect from the transmitter. Follow the procedure #1 above except check and edit any information in PCMVb as required. Some editing is required since the record for this transmitter was not on the PC's hard drive.

Copy Function

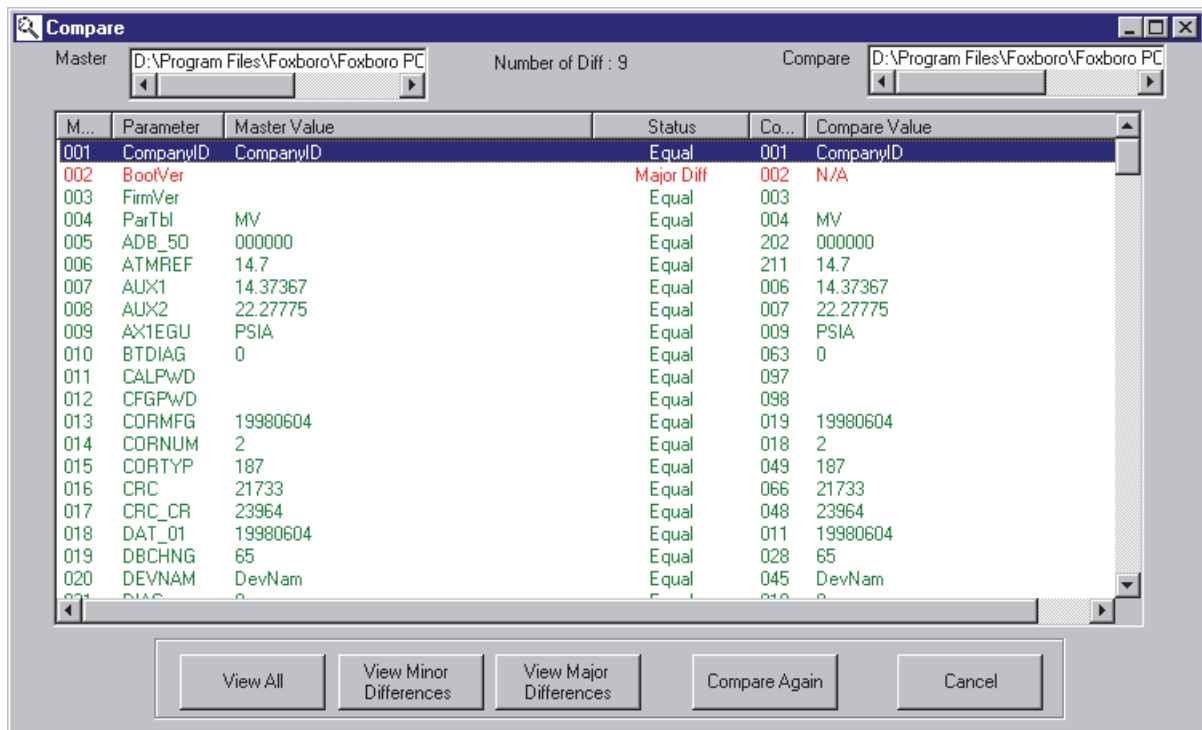
The Copy function allows you to copy logged data onto the computer clipboard for printout or other uses. The Copy function is accessed via the top level **Edit** menu.

Compare Function

The Compare function allows you to compare values of various parameters in one file with those in another or with those in the connected device. The Compare function is accessed via the top level **Edit** menu. You are asked to select **File vs File** or **File vs Device**. If you select the former, you are asked to specify the first and then the second files to be compared. If you select the latter, you are asked to specify the file to be compared with the connected device.

A sample of a Compare screen is shown in Figure 20. All parameters, whose values are equal are shown in green; those that are different, are shown in red. The number of differences are shown at the top of the screen. To view only those parameters with significant but minor differences, select **View Minor Differences**. The number of differences is less than when viewing all differences. To view only those parameters with major differences, select **View Major Differences**. To go back to viewing all differences, select **View All**. To update the comparison, select **Compare Again**.

Figure 20. Sample Compare Screen



Calibration Function

With this function, you can perform the following calibrations:

- ◆ mA Output: 4 mA and 20 mA
- ◆ DP: Cal @ Zero
Cal @ LRV
Cal @ URV
Cal @ 1 User Entered point, Last Cal Point: xxxx
Cal @ 2 User Entered points, Last Lower Cal Pt: xxxx/Upper Cal Pt: yyyy
- ◆ Pressure: Cal AP @ 1 User Entered Pt^(1,2)
Cal AP @ 2 User Entered Pts^(1,2)
Cal M2 @ 1 User Entered Pt⁽³⁾
- ◆ Sens Temp: Cal 1 User Entered Point
- ◆ Elec Temp: Cal 1 User Entered Point
- ◆ RTD: Cal 1 User Entered Point
- ◆ Level: Cal M6 Level Zero Calibration
Cal M6 Level Span Calibration

NOTE

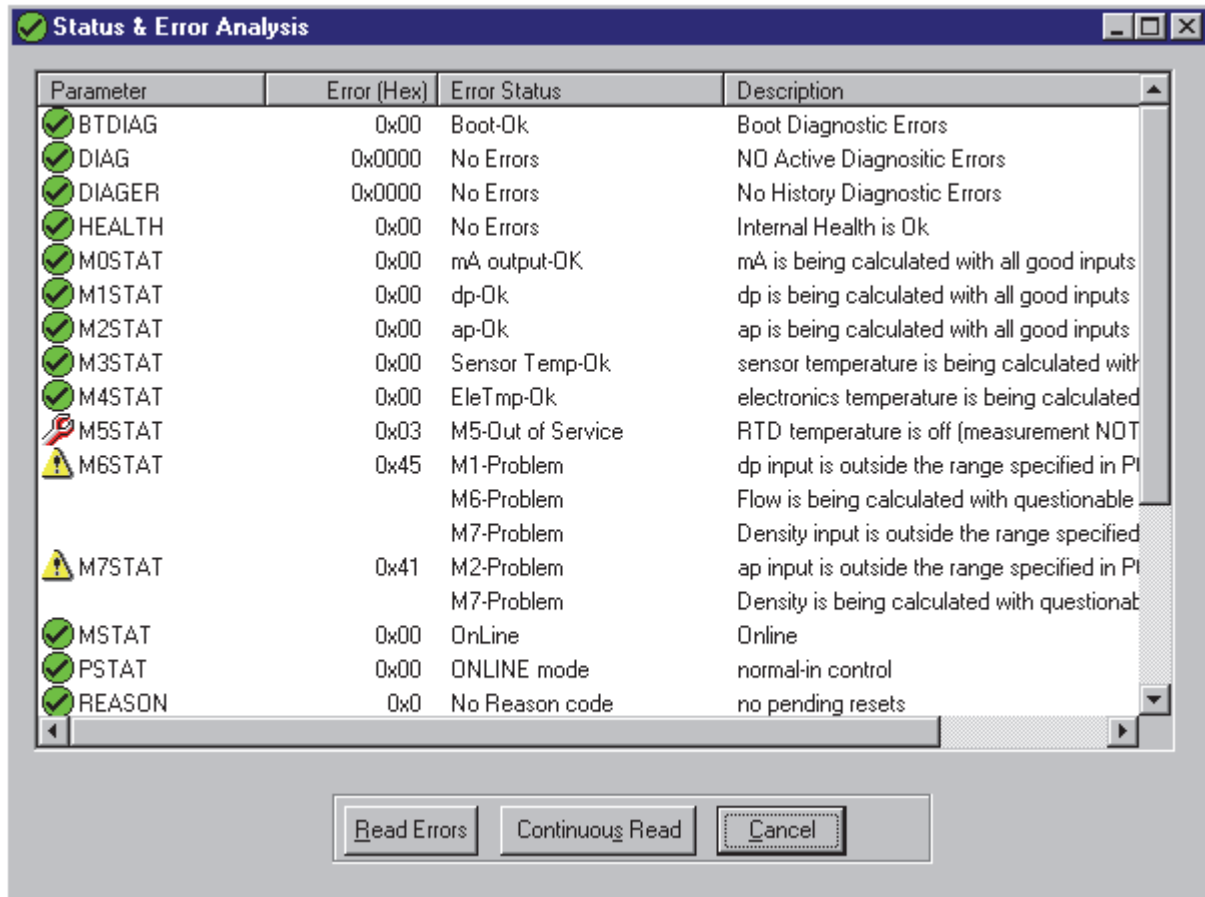
1. If the transmitter is configured for absolute pressure units, enter the current barometric pressure when the transmitter is vented to atmosphere.
 2. AP is the pressure at the sensor connection. Cal AP allows you to perform a traditional ‘bench’ calibration of pressure measurement with no tank fluid head pressures applied.
 3. M2 is the tank pressure above the tank liquid. Cal M2 allows you to perform a 1-point calibration of tank pressure. The transmitter adjusts for all fluid head pressures for the selected tank type and assumes that the fluid filled upper wet leg, if applicable, is present during the calibration.
-

The Calibration function is accessed via the top level **Calibrate** menu.

Device Status Function

The Device Status function interrogates the connected device and displays the error number (hex) and the error status or the notation **No Errors**. The function is accessed via the top level **Test** menu or the **View Status** icon on the toolbar. A sample Status & Error Analysis screen is shown in Figure 21. To update the data on the screen, click on the **Read Errors** button. To have the data continuously updated, click on the **Continuous Read** button.

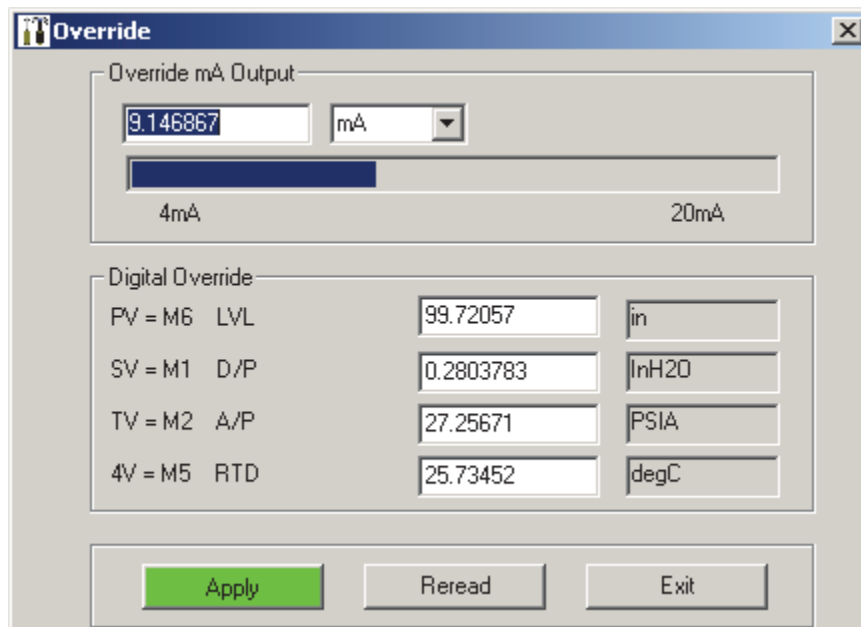
Figure 21. Sample Status & Error Analysis Screen



Output Override

The transmitter can be set to output a mA value to test or adjust other devices in the loop. The Output Override function is accessed via the top level **Test** menu. When you are finished, click the **Apply** button.

Figure 22. Sample Output Override Screen



Go On-line Function

All functions normally return to on-line status unless the device was disconnected during operation. However, this function enables you to force the device back to on-line mode if necessary. The Go On-line function is accessed via the top level **Test** menu.

Go Off-line Function

Normally, the device should remain on-line. However, this function enables you to force the device off-line if necessary. The Go Off-line function is accessed via the top level **Test** menu.

Get ID Function

The Get ID function re-establishes the connection with the device. This function is accessed via the top level **Test** menu.

Get ID (w/reload) Function

The Get ID (w/reload) function resynchronizes the database back to the device. This function is accessed via the top level **Test** menu or from the **GetID (RE-CONNECT)** icon on the toolbar.

Access Level Password

The Access Level Password enables you to access advanced troubleshooting functions. This function is only used in consultation with Schneider Electric. Access Level Password is located in the top level **Options** menu.

Configuration Report Function

The Configuration Report function enables a configuration database file to be accessed. You then can print a hard copy or e-mail it to Schneider Electric for ordering or troubleshooting. The Configuration Report function is accessed via the top level **Tools** menu.

Application Design Conditions

To configure your device for level measurement and density calculations, you must configure the application as well as the Level Tab screen or Density Tab screen described above. To do this, select **Edit Application Design Conditions** from the top level **Tools** menu or via the Application Design Conditions icon (A) on the toolbar. One of the following Level Configurator screens is displayed.

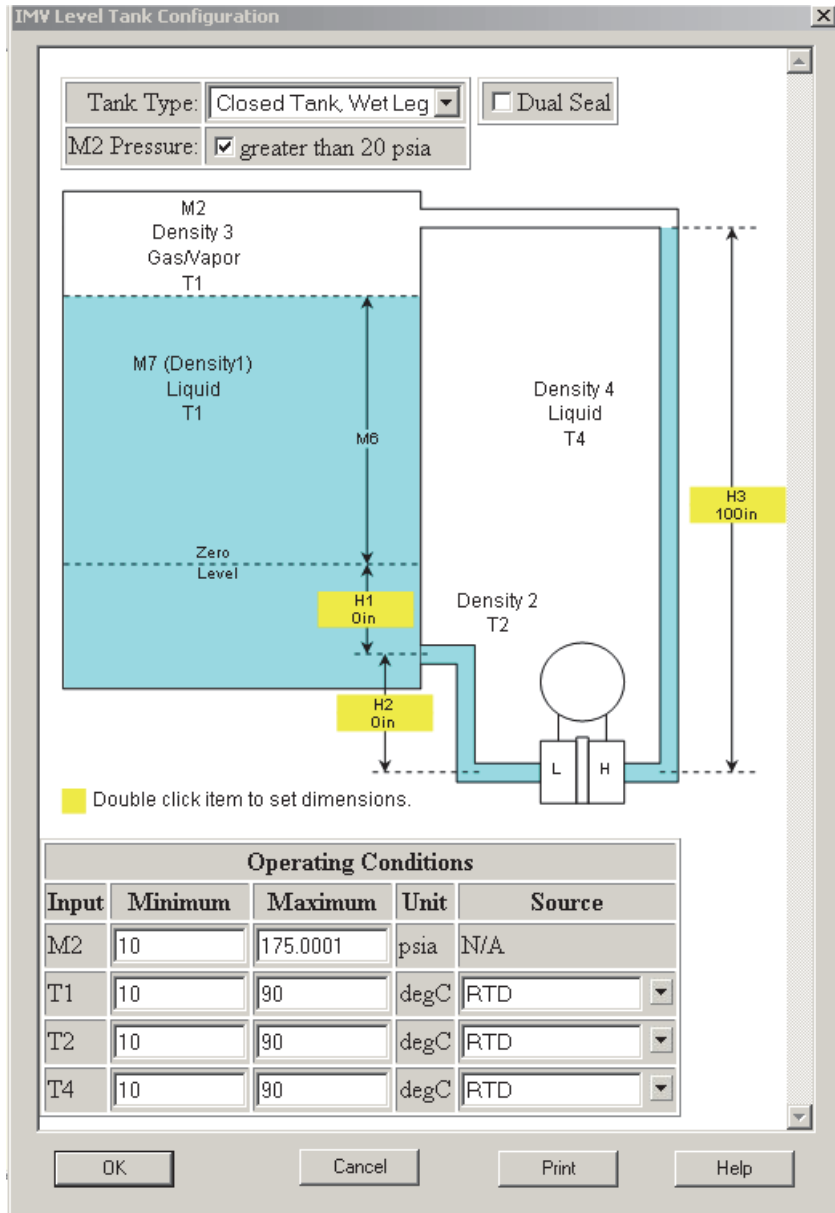
- ◆ Open Tank
- ◆ Closed Tank, Dry Leg
- ◆ Closed Tank, Wet Leg (with or without dual seal)
- ◆ Boiler Drum

A sample of this screen (Closed Tank Wet Leg) is shown in Figure 23.

To set the design conditions of your application, perform the following:

1. In **Tank Type**, select one of the four types shown above
2. Specify **Dual Seal** if applicable: ✓ = Dual Seal; Blank = No Dual Seal.
3. Specify **M2 Pressure**: ✓ = Greater than 20 psia; Blank = Not greater than 20 psia.
4. Enter values for **H1**, **H2**, and **H3** (if applicable)
5. Specify the **Source of T1**, **T2**, and **T4** (if applicable) as **RTD**, **Sensor Temp**, **Electronics Temp**, or **User Value**. If you select **User Value**, enter a value.
6. Enter **Minimum** and **Maximum** values for each **Operating Condition**.
7. Click on **OK** when finished.

Figure 23. Sample Level Configurator Screen



8. You now proceed to the next part of your application configuration (PCMVb).

— **NOTE** —

Even if you do not need to change any data in PCMVb, it is important that you step through each of the steps.

9. Following the displayed the instructions, enter the application parameters. Click on the Next button to advance to subsequent screens.
10. Repeat Step 8 for each section of PCMVb. When complete, answer Yes to the question, Save level configuration to the device?
11. Save your configuration to your PC as a .cfg file.

Test Device Equations Function

The Test Device Equations Function enables you to substitute entered values for raw sensor inputs and display the calculated level and density values outputted from the transmitter. The Test Device Equations function is accessed via the top level **Test** menu. To use this function, enter test values in the **Raw Inputs** boxes and select **Apply**. The results are shown in the **Level Data** boxes directly below.

— **NOTE** —

Because the level equations reside in the IMV31 (not in the computer used for the PVMV configurator), there is a short wait before the results are displayed.

Figure 24. Sample Test Device Equations Screen

Density and Level Data		
Level Data		
Height 1	0	in
Height 2	0	in
Height 3	100	in
Density		
Fluid Material 1	WATER	
Fluid Material 3	AIR	
Fluid Material 4	WATER	
Limits		
Pressure	10	175.0001 psia
Density 1, 3 Temp.	10	90 degC
Density 2 Temp.	10	90 degC
Density 4 Temp.	10	90 degC
Density	59.60225	62.91797 lb/ft3
Level	-1200	1200 in

Test Level Coefficients		
Raw Inputs		
D/P	0.7008805	inH2O
A/P	15.73041	psia
RTD	5.469377	degC
Sensor Temperature	32.26496	degC
Electronics Temperature	23.73946	degC
Level Data		
Tank Pressure	11.8874	psia
Density	62.3577	lb/ft3
Density 2	62.3437	lb/ft3
Density 3	0.0612	lb/ft3
Density 4	62.4351	lb/ft3
Level	100.9264	in

Buttons: **Apply** (highlighted), **ReRead**, **Exit**

Boiler Drum Level Configuration Procedure

Basic Level Configuration

1. Connect the IMV31 transmitter to the PCMV configurator software.

⚠ CAUTION

RISK OF UNINTENDED OPERATION

If performing a preconfiguration without the transmitter connected, select **File, New, IMV31** and make sure to select the HART protocol and DP/AP range that match the transmitter. The transmitter will not accept a download file if these selections do not match.

Failure to follow these instructions can result in injury or equipment damage.

2. Select the icon on the toolbar for Device Configuration. See Figure 6.
3. In the Identification tab, enter the tag number. See Figure 11.

⚠ CAUTION

RISK OF UNINTENDED OPERATION

Database records are stored on the PC based on the customer name and the tag number. Make sure that the tag number is unique. The customer name is important only if the PC is used to service multiple customers so that records of commonly used tag numbers, such as LT01, can be uniquely identified.

Failure to follow these instructions can result in injury or equipment damage.

4. In the General Configuration tab, make sure that M6: LVL is selected as the primary variable. See Figure 12. This will assign the level measurement to the 4 -20 mA output.
5. Select units in the DP and AP tabs. See Figures 13 and 15.

The Lower Range and Upper Range Values for DP and AP do not matter because the Level measurement is the Primary Variable assigned the 4-20 mA output.

6. Select the unit in the Temperature tab. See Figure 16. This unit will apply to all temperature measurements.

For PCMV software (pre-configuration and IMV31 transmitters shipped prior to August 2009, the RTD is defaulted to RTD On and cannot be reconfigured until the boiler configuration is complete. For units shipped in August 2009 or later, the RTD is defaulted to off and can be reconfigured in this step.

RTD Strategy only matters if the RTD is going to be set to On.

7. Select the Level and Dimensional units in the Level tab. See Figure 17.

Enter the Level LRV and URV values. The LRV and URV values are important as these define the 4 mA and 20 mA points for the level measurement.

— NOTE —

The Level Measurement Lower Range Value (LRV) and Upper Range Value (URV) are referenced to the H1 value set in a later step. H1 is the user set datum defining the 0 level point and is referenced to the lower leg tap point in the drum.

Example 1:

H1 = 0 in (zero level is set at the lower tap)

LRV = 0 in (the 4 mA point is set to zero level at the lower tap)

URV = 50 in (the 20 mA point is set 50 inches above the lower tap)

Example 2:

H1 = 30 in (the zero level point is 30 inches above the lower tap)

LRV = -30 in (the 4 mA point is at the lower tap and 30 inches below the zero level datum)

URV = 20 in (the 20 mA point is 50 inches above the lower tap and 20 inches above the zero level datum)

8. Select the units in the Density tab. See Figure 19. As with DP and AP, the Lower Range and Upper Range Values do not matter.
9. Select OK to save the basic level configuration to the transmitter. If performing a pre-configuration, this will be saved to a file when the boiler configuration is complete.

Boiler Drum Configuration

1. Select the **A** icon on the toolbar for IMV Level Tank Configuration. See Figure 6. and then Figure 23.
2. Select **Boiler Drum** as the **Tank Type**. This simplifies the boiler drum configuration by pre-populating the process fluid selections with water/steam.

— NOTE —

IMV31 Transmitters shipped in August 2009 or later support the special boiler drum case where the upper wet leg fluid is not water. To configure this case, select **Closed Tank, Wet Leg** as the **Tank Type**, check **M2 Pressure: greater than 20 psia** and manually enter the process fluids.

▲ CAUTION

RISK OF UNINTENDED OPERATION

For boiler drum applications, the IMV31 transmitter is mounted with the high side connected to the upper wet leg. Incorrect installation will result in an incorrect Level measurement.

Failure to follow these instructions can result in injury or equipment damage.

3. Enter the values for H1 (height from lower leg tap to zero level point), H2 (height from transmitter connection to the lower leg tap), and H3 (height from transmitter connection to upper leg tap) by double clicking on one of the highlighted values on the tank diagram.

▲ CAUTION**RISK OF UNINTENDED OPERATION**

The accuracy of the H1, H2 and H3 entries directly affects the accuracy of the level measurement.
Failure to follow these instructions can result in injury or equipment damage.

▲ CAUTION**RISK OF UNINTENDED OPERATION**

The H1 value is directly related to the Level measurement LRV and URV that define the 4 and 20 mA points. (See the Level measurement LRV and URV step in the previous section).
Failure to follow these instructions can result in injury or equipment damage.

▲ CAUTION**RISK OF UNINTENDED OPERATION**

The H2 and H3 values must be updated whenever there are changes made to the lengths of the lower and upper wet legs.

For example, 10 feet are added to both legs to mount the IMV31 transmitter below the tank, 10 feet lower than originally planned.

If this were a differential pressure transmitter, it could be argued that the extra 10 feet of water column on each side cancels out, and that the DP is unaffected.

However, level is a calculated measurement with density and other compensations. Incorrect H2 and H3 values could potentially cause significant errors in the level measurement.

Failure to follow these instructions can result in injury or equipment damage.

4. Select the Sources for the three temperature measurements.

T1 is the internal tank temperature. Select RTD if an RTD is used. Typically an RTD is not used on boiler drums. Select Saturation Temp and the transmitter will calculate the saturation temperature based on the drum pressure.

Sensor Temp is typically selected for T2 and T4. If an RTD is used for T1, it is important **not** to select RTD for T2 and T4 as the tank and the legs cannot use the same temperature input for boiler drum applications.

5. Enter the minimum and maximum operating values for M2, T1, T2 and T4. These values should cover the normal operating range with some margin, and must be at least 10% beyond the normal operating point to be entered in the next step.
 Setting limits too tight may result in unnecessary status error messages if the values are slightly exceeded. However, impractical limits for boilers such as minimums of 0 psia (full vacuum) and 0 degrees C should be avoided.

NOTE

Since boilers are at elevated pressures and temperatures during normal operation, selected limits for M2 and T1 may result in status error messages when the IMV31 transmitter is taken out of service and bench checked. These errors can usually be ignored, as they are typically the result of the transmitter being outside of the operating conditions rather than a product problem. However, if this is undesirable, the lower operating limits can be extended to cover ambient temperature and pressure conditions without affecting the IMV31 performance in boiler applications.

Select OK.

- At the Water in Drum screen enter the normal operating point for the drum pressure and click on **Apply**. The saturation temperature will be calculated. If the pressure value is rejected, make sure that the M2 and T1 limits selected in the previous step are broad enough to cover the entered value.

Once the value is accepted, click on **Next** and then **Save**.

Figure 25. Sample Water in Drum Screen

Water in drum
Compressed Water Properties Computation

Apply Next

Normal Pressure: 100.0000 psia,abs
Normal Temperature: 164.34 degC

Temperature (Saturation): 164.34 degC

- Select **Save** on the Steam screen.

Figure 26. Sample Steam Screen

Steam

Normal Operating Point

Pressure: 100.0000 psia,abs
Temperature: 164.34 degC

Calculated Values of Normal Operating

Density: 0.2256 lbm/ft³

Save

- The next screen is the Water in Upper Leg screen. Enter the normal operating temperature point for the wet leg and select **Apply**. This should be safely within the limits selected for T4. If not, broaden the T4 limits.

Once the value is accepted, select **Next** and then **Save**.

Figure 27. Sample Water in Upper leg Screen

Water in upper leg
Compressed Water Properties Computation

Apply Next

Normal Pressure: 100.0000 psia,abs
Normal Temperature: 28.25 degC
Temperature (Saturation): 164.34 degC

9. Save the configuration to the device. (Perform this step even if performing a pre-configuration.)
10. Return to the Device Configuration, Temperature tab if necessary to turn off the RTD measurement and select OK to save this change. Note that other changes can be made in Device Configuration and saved at this time without affecting the IMV Level Tank Configuration.

If the RTD measurement is On, the IMV31 transmitter checks for an RTD input. If an RTD is left On and an RTD is not used, the transmitter will continually flash a status error message on the display. This will not otherwise affect the instrument performance. To avoid the status error, make sure that the RTD measurement is Off if an RTD is not in use. Select **File, Save as**, to save the configuration to the PC. This file can then be downloaded to a transmitter at a later time.

Verification

1. With the configured IMV31 transmitter connected to PCMV, select **Test** and **Test Device Equations**. See Figure 24. This will put the transmitter into an Override mode and allow the user to override the live sensor inputs with user entered sensor input values, while using the transmitter's stored data and calculations to check level and density measurements.
2. Enter a selected, D/P, A/P, RTD, Sensor Temperature and Electronics Temperature and select **Apply**. Wait several seconds and select **Reread**.

The IMV31 transmitter's M2, level, and density outputs will be displayed.

Note that M2 is the tank pressure based on the AP input adjusted for the head pressure of the upper wet leg.

Note that the relationship between DP and level is not directly obvious. For instance, an entry of 0 D/P does not represent a drum level equal to level of the wet leg, but instead represents a level for an overflowing tank. This is because the density of the liquid water in the tank at saturation temperature is less than the density of the water in the leg.

Similarly, entering a D/P equal to the column of water in the upper wet leg minus the lower wet leg does not represent a tank level at the lower tap. Instead it represents a level below the lower tap. This is because the transmitter considers that whatever portion of the tank that is not filled with liquid water is filled with steam and the head pressure of the steam at elevated pressures is part of the level calculation.

Neither of these examples is realistic in the actual drum, indicating that the actual range of the D/P in the application is less than the head of water between the upper and lower taps.

3. The device will automatically return to Online mode when exiting Test Device Equations.

Bench Operation

Once configured, the IMV31 is optimized for performance in the intended application. Unlike a DP or AP transmitter, the IMV31 is not typically in an ideal state for bench operation.

1. The IMV31 may flash status error messages on the bench if an RTD is not connected or if the pressure or temperature is outside of the application ranges.
2. When configured for an upper wet leg application, the IMV31 assumes that there is a full wet leg present, even when the wet leg isn't there.

For boiler drum applications, the tank temperature is assumed to be at the saturation temperature for the applied pressure.

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