

# Rosemount™ 3490 Series

4–20 mA + HART® Compatible Controller



**HART**  
COMMUNICATION PROTOCOL



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# Rosemount™ 3490 Series Universal Control Unit

## NOTICE

Read this manual before working with the product. For personal and system safety, and for optimum product performance, make sure you thoroughly understand the contents before installing, using, or maintaining this product.

For technical assistance, contacts are listed below:

### Customer Central

Technical support, quoting, and order-related questions.

United States: 1 800 999 9307 (7:00 am to 7:00 pm CST)

Asia Pacific: 65 777 8211

Europe/Middle East/Africa: 49 (8153) 9390

### North American Response Centers

Equipment service needs.

1 800 654 7768 (24 hours — includes Canada)

Outside of these areas, contact your local Emerson™ Process Management representative.

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## ⚠ CAUTION

The products described in this document are NOT designed for nuclear-qualified applications.

Using non-nuclear qualified products in applications that require nuclear-qualified hardware or products may cause inaccurate readings.

For information on Rosemount nuclear-qualified products, contact your local Emerson Process Management Sales Representative.

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## ⚠ WARNING

Replacement equipment or spare parts not approved by Emerson for use as spare parts could reduce the capabilities of the Rosemount 3490 Series Control Unit, and may render the instrument dangerous.

- Use spare parts supplied or sold by Emerson.
-

**▲ WARNING**

**Failure to follow these installation guidelines could result in death or serious injury.**

- The Rosemount 3490 Series Control Unit must be installed, connected, commissioned, operated, and maintained by suitably qualified personnel only, observing any national and local requirements that may apply.
- Use the equipment only as specified in this manual. Failure to do so may impair the protection provided by the equipment.

**Explosions could result in death or serious injury.**

- Please review the approvals section of this reference manual for any restrictions associated with an installation.

**Electrical shock could cause death or serious injury.**

- If the control unit is installed in a high voltage environment and a fault condition or installation error occurs, high voltage may be present on leads and terminals.
  - Use extreme caution when making contact with the leads and terminals.
  - Make sure that power to the control unit is off while making connections.
-



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# Section 1 Introduction

## 1.1 Using this manual

This manual provides installation, configuration and maintenance information for the Rosemount™ 3490 Series Control Unit (“control unit”).

[Section 2: Control Unit Overview](#) contains an overview of the wall- and panel-mounting versions, transmitter inputs, control functions, and front panel features.

[Section 3: Installation](#) contains mechanical and electrical installation instructions.

[Section 4: Getting Started](#) contains instructions for powering on the control units the first time with a new HART® transmitter connected, followed by a quick tour of the menu system and instructions for configuring the control unit using the front panel.

[Section 5: Troubleshooting](#) contains instructions for replacing the fuse and a guide to the health check system, which includes tests, calibrations, live readings, and diagnostic data for the control unit.

[Appendix A: Specifications and Reference Data](#) contains specification data and ordering information.

[Appendix B: Product Certifications](#) contains European directive information, hazardous locations certifications and approval drawings.

[Appendix C: Menus and Parameter](#) contains full menu maps for the control unit and generic HART transmitters.

[Appendix D: Additional Features](#) contains instructions for restoring the factory default settings and for using the advanced menu for accessing parameter screens quickly.

[Appendix E: Support for HART® Transmitters](#) contains an overview of fully supported Rosemount 3100 Series Transmitters and generic support using Universal and Common Practice Commands.

## 1.2 Control unit versions and software releases

The following control unit versions are covered in this product manual:

- Rosemount 3491 Standard Control Unit
- Rosemount 3492 Differential Control Unit
- Rosemount 3493 Logging Control Unit

The software release covered in this product manual is issue 4.00.00 (and above).

## 1.3 Product recycling/disposal

Recycling of equipment and packaging should be taken into consideration. The product and packaging should be disposed of in accordance with local and national legislation.

## Section 2 Control Unit Overview

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### 2.1 About the Rosemount™ 3490 Series Control Unit

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#### Note

A full specification for the control unit is in [Appendix A: Specifications and Reference Data](#).

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#### 2.1.1 Wall and panel mounting options

The wall mounting option has a tough, weatherproof enclosure for internal or external installation. There are two styles: IP-rated wall mount and NEMA® 4X-rated wall mount.

The panel mounting option has a black enclosure, and is designed for control room panel or cabinet installation.

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**Figure 2-1. Mounting Options**

**IP-rated wall mount**



**NEMA4X-rated wall mount**



**Panel mount**



## 2.1.2 4–20mA HART® transmitter input options

4–20mA HART transmitter input options:

- The Rosemount 3491 Standard Control Unit and the Rosemount 3493 Logging Control Unit accepts one 4–20mA or HART transmitter input.
- The Rosemount 3492 Differential Control Unit accepts two HART transmitter inputs.

### Note

The Rosemount 3490 Series is designed for non hazardous (safe) area installation, but can be connected to a transmitter installed in a hazardous area. See [Appendix B: Product Certifications](#) for the control unit certifications.

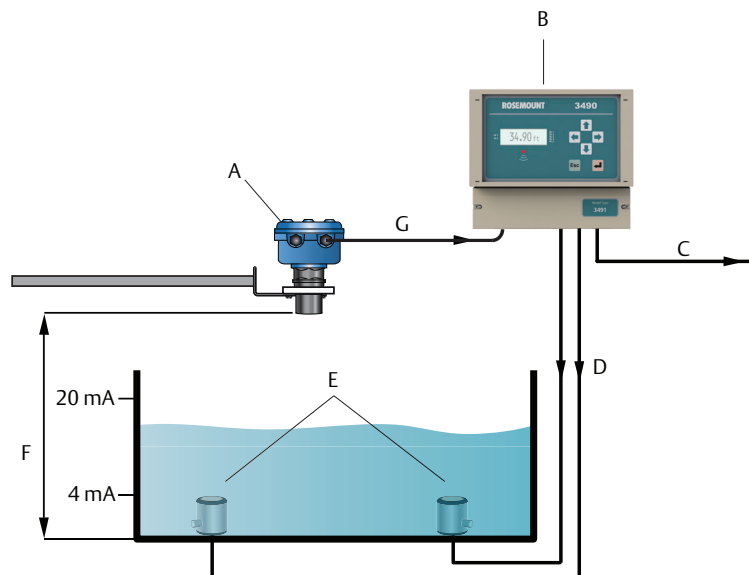
## 2.1.3 Control functionality

Control functionality is provided by five SPDT voltage-free contact relays in the control unit (see [Figure 2-2 on page 4](#)). The five relay outputs are fully field adjustable to perform a wide variety of control, fault indication, or alarm duties.

For applications where the control unit functionality is linked to other external events, there are two digital input ports for accepting contact closure signals.

The isolated 4–20 mA signal output from the control unit is driven by a Primary/Process Value (PV) e.g. level.

**Figure 2-2. Typical Application**



- A. Rosemount 3102 or 3105 Level Transmitter
- B. Rosemount 3490 Series Control Unit
- C. 4–20 mA signal output
- D. Relay

- E. Pump
- F. Transmitter bottom reference
- G. 4–20 mA and HART signal input

## 2.2 Control unit functions

### 2.2.1 Standard functions

The Rosemount 3490 Series Control Unit (“control unit”) provides these standard functions:

- Calculation and display of the control unit PV.  
The control unit PV is typically a live transmitter reading, which can be any measured value e.g. level, temperature, or Pressure.  
Alternatively, the control unit PV is a volume or flow value calculated using the live transmitter level reading. The control unit is pre-programmed with standard tank shapes and flow algorithms to simplify the configuration for calculating volume or flow from the live transmitter level reading. A 20-point programmable look-up table is provided for non-standard applications.
- Output of measured variable as an isolated 4–20 mA signal  
The output signal is driven by the control unit PV.
- Relay control functions  
There are five freely assignable relay outputs. By default, Relay 5 is a fault relay but can be assigned to a control duty. The other relays are available to operate at user-entered PV values.  
The control unit is pre-programmed with popular pump control routines for wet well and sump control, along with energy saving overrides.
- Voltage-free (digital) contact closure inputs  
There are two digital input ports for accepting contact closure signals to override control unit functions.
- HART transmitter interrogation and programming  
Any HART transmitter can be connected. The control unit recognizes the transmitter as an “unknown instrument” but supports the Universal and Common Practice HART commands (see [Appendix E: Support for HART® Transmitters](#)).  
When a Rosemount 3100 Series Transmitter is connected, the control unit recognizes the transmitter and allows full access to the transmitter’s configuration parameters. Refer to the Rosemount 3101/3102/3105 [Reference Manual](#) or Rosemount 3107/3108 [Reference Manual](#) for full information about programming the transmitter parameters (e.g. transmitter bottom reference) using the control unit and other HART-based devices.

### 2.2.2 Difference, sum, and product functions (Rosemount 3492 only)

The Rosemount 3492 Differential Control Unit has all the functions of the standard control unit, plus extra functions for calculating the difference, sum, or product of two separate inputs from HART transmitters.

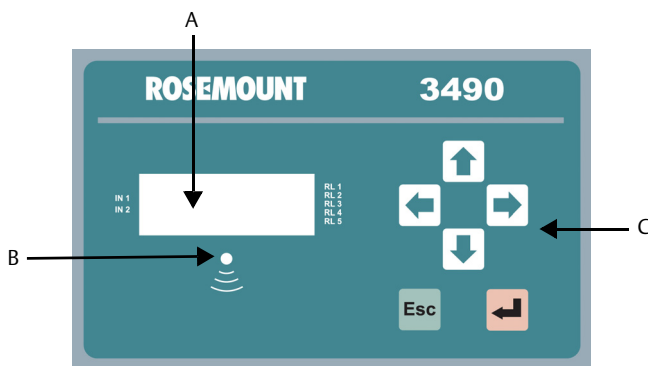
### 2.2.3 Data logging functions (Rosemount 3493 only)

The Rosemount 3493 Logging control unit has all the functions of the standard control unit, plus a 7000 event logging function.

## 2.3 Control unit front panel

This front panel fascia has an integral keypad, display, and health status LED.

Figure 2-3. Front Panel Fascia



- A. 4-line back-lit LCD display
- B. Status LED
- C. Keypad

### 2.3.1 Keypad

The membrane keypad has six function buttons (Table 2-1). The buttons are used for navigating a menu system and for viewing or changing application parameters.

Table 2-1. Keypad Function Buttons

Button	What the button will do
	When the PV is shown, use the red (enter) button to access the menu system. At other times, this button is for selecting a menu option and for confirming something.
	When navigating the menu system, the up arrow button is for moving upwards one line. At other times, this button is for scrolling through a list of alphanumeric characters or a list of options.
	When navigating the menu system, the down arrow button is for moving downwards one line. At other times, this button is for scrolling through a list of alphanumeric characters or a list of options.
	The left arrow button is for moving left e.g. to another character when editing a parameter value.
	The right arrow button is for moving right e.g. to another character when editing a parameter value.
	When navigating the menu system, use the escape button to return to a previous menu level and the Full PV display. At other times, e.g. while editing, the button is for restoring a setting that is being edited.

### 2.3.2 Status LED

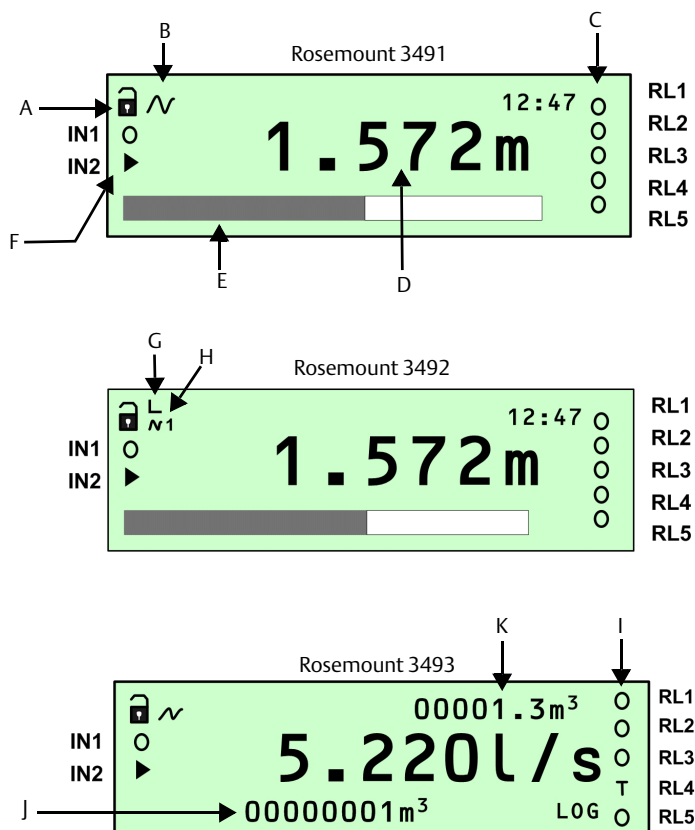
The LED is positioned just below the LCD display (Figure 2-3 on page 6). It flashes once per second to indicate that the control unit and transmitters are operating correctly. The LED is constantly lit if there are operating difficulties e.g. a transmitter fault.

## 2.3.3 Display

After the power-up and self-checks are completed, the Full PV display is presented. The default Full PV display typically features a digital clock, a measured variable with display units, and status icons. There are some display differences between control units:

- On the Rosemount 3491 and 3492, a bar graph indicates the 4–20 mA output signal. The Rosemount 3493 display can be changed to show the bar graph.
- On the Rosemount 3492, an extra icon on the first line and indicates if one or two HART transmitters connected to the control unit.
- On the Rosemount 3493, there are two totalizers displayed; one above and one below the control unit PV.

Figure 2-4. Typical Control Unit Displays



- |   |   |
|---|---|
| <p>A. Program/Run App mode (locked padlock = Run App)</p> <p>B. HART transmitter communicating (absent if Idle)</p> <p>C. Relay (RL) status: O = De-energized, ▶ = Energized,<br/>A = Alarm, S = Sampler, T = Totalizer</p> <p>D. PV of control unit</p> <p>E. Bar graph of 4–20 mA output</p> <p>F. Digital input status: O = Open, ▶ = Closed</p> <p>G. HART transmitter allocated:<br/>Left vertical bar = Tx1; Right vertical bar = Tx2</p> | <p>H. HART transmitter communicating<br/>(1=Tx1, 2=Tx2)</p> <p>I. Relay (RL) status: O = De-energized, ▶ = Energized,<br/>A = Alarm, S = Sampler, T = Totalizer</p> <p>J. Totalizer 1</p> <p>K. Totalizer 2 (daily total)</p> |
|---|---|

After a period of keypad inactivity, the display automatically changes to the *Large PV Display*. This shows only the control unit PV and display units, but in a larger character size to facilitate easier viewing.

To restore the *Full PV display*, select the red (enter) button.

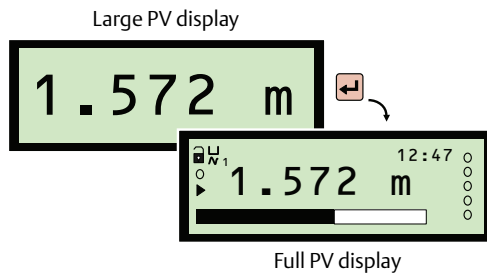
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**Note**

The Large PV display feature can be switched off using parameter P574. See “Display configuration options” on page 103.

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**Figure 2-5. Large PV Display**





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## Section 3 Installation

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Mounting the control unit .....	page 12
Electrical installation .....	page 14

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### 3.1 Safety messages

Procedures and instructions in this manual may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a caution symbol (⚠). The external hot surface symbol (🔥) is used when a surface is hot and care must be taken to avoid possible burns. If there is a risk of an electrical shock the (⚡) symbol is used. Refer to the safety messages listed at the beginning of each section before performing an operation preceded by this symbol.

#### **⚠ WARNING**

##### **Failure to follow installation guidelines could result in death or serious injury.**

- The Rosemount™ 3490 Series Control Unit (“control unit”) must be installed, connected, commissioned, operated, and maintained by suitably qualified personnel only, observing any national and local requirements that may apply.
- Use the control unit only as specified in this manual. Failure to do so may impair the protection provided by the equipment.

##### **Explosions could result in death or serious injury.**

- Please review the approvals section of this reference manual for any restrictions associated with an installation.

##### **Electrical shock could cause death or serious injury.**

- If the control unit is installed in a high voltage environment and a fault condition or installation error occurs, high voltage may be present on leads and terminals.
  - Use extreme caution when making contact with the leads and terminals.
  - Make sure that power to the control unit is off while making connections.
-

## 3.2 Considerations before installation

### Note

The Rosemount 3490 Series is designed for non-hazardous (safe) area installation, but can power and take input from an intrinsically safe transmitter installed in a hazardous area. See [Appendix B: Product Certifications](#) for the control unit certifications.

### 3.2.1 Safety considerations

#### Guidelines

1. This product is classified type A in accordance with European EMC directive 2004/108/EC. To ensure electro-magnetic compatibility, in any member country, this product should not be installed in a residential area.
2. Do not mount the control unit on a structure that is subject to vibration, or in a position where damage may be caused by impact, thermal stress or liquid ingress.
3. The fuse must only be replaced with the type specified.
4. If the equipment is likely to come into contact with aggressive substances, it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected, thus ensuring that the type of protection is not compromised.  

Aggressive Substances - e.g. acidic liquids or gases that may attack metals or solvents that may affect polymeric materials.

Suitable Precautions - e.g. regular checks as part of routine inspections or establishing from the material's data sheet that it is resistant to specific chemicals.
5. The user should not repair this equipment.
6. Terminal 30 (intrinsically safe earth/ground) of the panel mount control unit must be connected to a high integrity earth/ground point.  

For a wall mount control unit, it is recommended that Terminal 30 is connected to a high integrity earth/ground point
7. A mains-powered control unit must not be connected to a supply exceeding 250 V r.m.s. or dc, or to apparatus containing a source of voltage exceeding 250 V r.m.s. or dc.
8. A direct current (dc) powered control unit must not be connected to a supply exceeding 30 Vdc or apparatus containing a source of voltage exceeding 30 Vdc.
9. The intrinsically safe outputs of the control unit may be connected to certified equipment used in a hazardous area. Refer to [Appendix B: Product Certifications](#) for details of relevant certifications.
10. Cable between the control unit and transmitter should be shielded, twisted-pair with the shield connected to terminal 3 (marked with earth symbol) on the control unit. The shield should be left unconnected at the transmitter unless there is a terminal specifically provided for this purpose.

11. Cable runs should be separate from any high voltage or mains cables to avoid crosstalk or interference.
12. Refer to the technical data in [Appendix A: Specifications and Reference Data](#).

## 3.2.2 Mounting the panel version



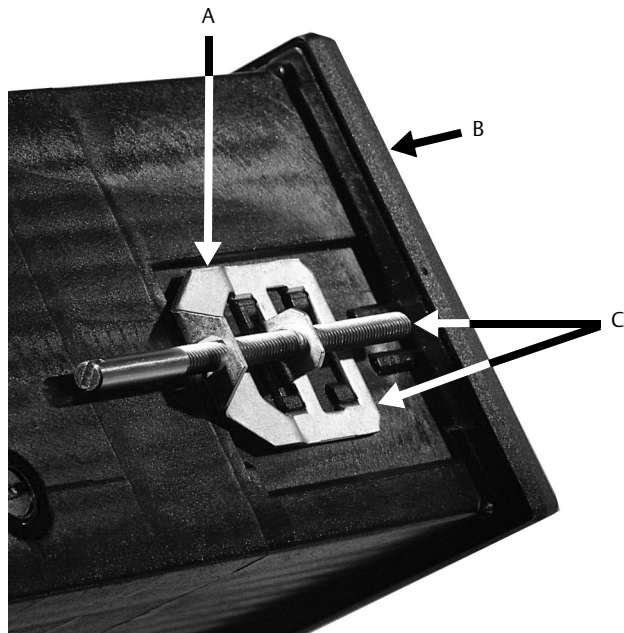
### Guidelines

- This housing is rated IP40 and is designed for panel mounting in a weatherproof environment. An optional fascia overlay hood is available which improves the IP rating to IP65 – see [Table A-2 on page 123](#) for ordering information.
- Do not mount the control unit on a structure that is subject to vibration, or in a position where damage may be caused by impact, thermal stress, or liquid ingress.
- Where three or more units are fitted in the same cabinet or panel, ensure that there is adequate air circulation to aid cooling. It is recommended that an air circulation fan be fitted.
- The control unit requires at least 6.5-in. (165 mm) clearance behind the mounting panel to avoid cable fouling.
- After mounting the control unit, all wiring is made at the rear of the unit using the two part terminal blocks provided. (A pre-wired data download socket suitable for front panel mounting is provided on the Rosemount 3493 Control Unit).
- Mount the control unit on a panel with thickness 1.5 to 10 mm, ensuring the panel is strong enough to support the 2.6 lb. (1.2 kg) weight of the unit.
- Ensuring there is enough clearance behind the chosen position in the panel (6.5-in./165 mm minimum), cut a horizontal slot 5.43-in. (138 mm) long by 2.68-in. (68 mm) high in the panel and remove any rough edges.

### Procedure

1. Unpack the two screw clips provided.
2. Identify the lugs (protrusions) in the recesses on each side of the control unit. (Ignore the recesses on the top and bottom of the control unit).
3. Holding the screwdriver-slot-end of the threaded spindle of one of the screw clamps and looking at the control unit rear, engage a screw clamp frame onto the control unit side (see [Figure 3-1 on page 12](#)) and see how the four steel lugs (protrusions) of the screw clamp frame engage with the lugs of the control unit. Gently pull the screw clamp for the lugs to engage with each other.
4. Remove the screw clamps from both of the screw clamp frames.
5. Slide the control unit into the panel, ensuring that the panel seal provided is in place behind the front panel bezel.
6. Re-fit the screw clamps, one on each side, and tighten with a screwdriver to clamp the control unit against the panel.
7. For electrical connections, see [“Making electrical connections on panel-mount units” on page 16](#).

Figure 3-1. The Fitted Screw Clamp



- A. Screw clamp frame
- B. Front panel bezel
- C. Screw clamp with threaded spindle

## 3.3 Mounting the control unit

### 3.3.1 Mounting the IP-rated wall mount version



#### Guidelines

- This housing is rated IP65. It is suitable for mounting outside, but this should be above any flood level, away from any overflow path, and away from direct sunlight.
- Do not mount the control unit on a structure that is subject to vibration, or in a position where damage may be caused by impact, thermal stress, or liquid ingress.
- The mass of the mains powered unit is 1.4 kg, and the dc powered unit is 1.0 kg. To conform with safety requirements, the wall on which the unit is mounted should be capable of supporting four times this weight.
- It is not necessary, or advisable, to remove the upper part of the unit housing that contains the LCD display and keypad. There are no user serviceable parts inside. The control unit must not be modified in any way.

#### Procedure

1. Mount the unit on a suitable wall or structure using the fixing points shown on [Figure A-1 on page 120](#).
2. Make the electrical connections (see [“Making electrical connections on wall-mount units” on page 14](#)).

### 3.3.2 Mounting the NEMA 4X-rated wall mount version



#### Guidelines

- This housing is rated NEMA 4X. It is suitable for mounting outside, but this should be above any flood level, away from any overflow path, and away from direct sunlight.
- Do not mount the control unit on a structure that is subject to vibration, or in a position where damage may be caused by impact, thermal stress, or liquid ingress.
- The mass of the mains powered unit is 3.5 kg, and the dc powered unit is 3.1 kg. To conform with safety requirements, the wall on which the unit is mounted should be capable of supporting four times this weight.
- It is not necessary, or advisable, to remove the upper part of the unit housing that contains the LCD display and keypad. There are no user serviceable parts inside. The unit must not be modified in any way.
- Control units are not supplied with cable entries for connections to the field mounted transmitter or the mains power supply. However, the Rosemount 3493 Control Unit has a download socket factory pre-fitted.
- It is the responsibility of the user to ensure that cable glands and connection to the control unit are in accordance with the local or national standards. To maintain the type 4X rating of the enclosure, type 4X connections must be used.

#### Procedure

1. Mount the unit on a suitable wall or structure using the fixing points shown in [Figure A-2 on page 121](#).
2. Make the electrical connections (see [“Making electrical connections on wall-mount units” on page 14](#)).

## 3.4 Electrical installation

### ▲ WARNING

**It is the responsibility of the installer to:**

- Refer to safety data and electrical specifications in [Appendix A: Specifications and Reference Data](#).
- Refer to the certifications and control drawings in [Appendix B: Product Certifications](#).
- Check and obtain any work permits required before applying power to the unit.
- Observe all local regulations and approval requirements.
- Ensure the wiring is suitable for the load current.
- Ensure the wiring insulation is suitable for the voltage, temperature, and environment of the installation.
- Drill holes in the base of the NEMA® 4X-rated control unit for fitting cable glands.
- Ensure suitable cable glands or conduit connections are used when wiring to the control unit to maintain enclosure integrity.
- Never remove or modify the mechanical barriers separating the terminal area from the main enclosure and separating the transmitter input terminals from other terminals.

### 3.4.1 Making electrical connections on wall-mount units

**Note**

Use only 167 °F (75 °C) copper conductors for field wiring.

All field wiring connections are accessible by removing the lower terminal cover, which is secured by two screws on the IP-rated version and by four screws on the NEMA 4X rated version.

The cabling between the Rosemount 3490 Series Control Unit (“control unit”) and a transmitter should be a screened (shielded), twisted-pair type with the cable screen (shield) connected to terminal 3 (marked with earth/ground symbol) on the control unit. The cable screen (shield) should be left unconnected at the transmitter end unless there is a terminal specifically provided for this purpose.

Cable runs should be separate from any high voltage or mains cables to avoid crosstalk or interference.

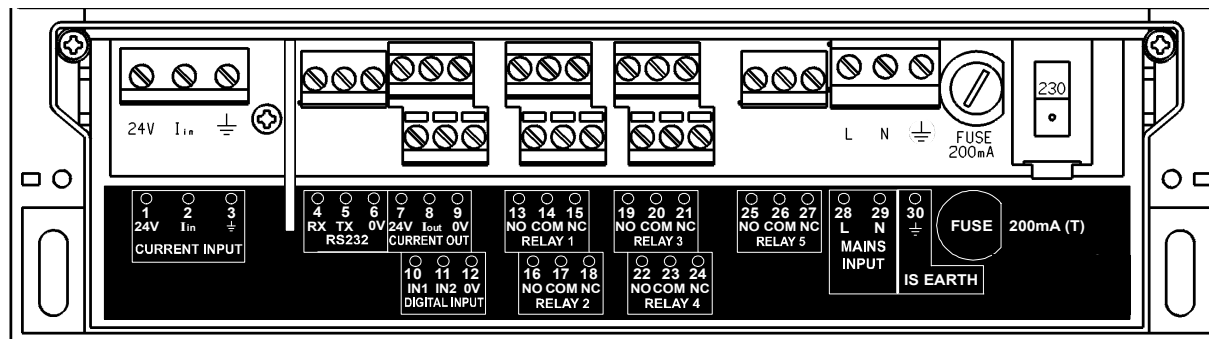
[Figure 3-3 on page 16](#) shows the layout of the control unit terminals. All terminal blocks are suitable for wires 14 to 26 AWG (0,5 to 1,5 mm<sup>2</sup>), except the mains terminals which are suitable for wires 10 AWG (2,5 mm<sup>2</sup>). Insulation should be stripped back 1/4-in. (7 mm).

Transmitter connections are made on the left side of the terminals enclosure. Connecting the intrinsically safe earth/ground (terminal 30) to a high integrity earth/ground point is recommended if the transmitter connected to terminals 1 and 2 is in a hazardous area.

**Note**

In intrinsically safe systems, apparatus connected to the Rosemount 3490 Series Control Unit must not be supplied from a voltage greater than 250 V r.m.s. or 250 Vdc.

Figure 3-2. Connection Terminals Layout (for Mains-Powered Wall-Mount Unit)



The dc powered unit has a slightly different layout – terminals 31 and 32 replace terminals 28 and 29.

Table 3-1. Connection Terminal Descriptions (Wall-mount Control Unit)

Terminal	Function	Terminal marking
1	Loop supply	24V
2	Current input	Iin
3	Cable screen Earth	(Earth symbol)
4-6	RS232	RX-TX-0V
7-9	Current output	24V-Iout-0V
10-12	Digital input 1 and 2	IN1-IN2-0V
13-15	Relay 1	NO-COM-NC
16-18	Relay 2	NO-COM-NC
19-21	Relay 3	NO-COM-NC
22-24	Relay 4	NO-COM-NC
25-27	Relay 5	NO-COM-NC
28-29 <sup>(1)</sup>	Mains input	L-N
30	I.S. Earth/Ground	(Earth/Ground symbol)
31 <sup>(2)</sup>	Negative	-
32 <sup>(2)</sup>	Positive	+

1. Mains-powered control unit only.
2. Direct current (dc) powered control unit only.

## Cable glands for the IP-rated wall-mount unit

The five cable-entry positions are pre-drilled to accept M20 cable glands. The Rosemount 3493 Control Unit has a data download socket factory pre-fitted in one of these cable-entry positions. See “RS232 connections” on page 22 for information about this socket.

Two cable glands, rated IP65 and suitable for cable with outside diameter 4 to 7 mm, are supplied for use with the mains supply and transmitter cable. M20 blanking plugs are supplied for the other three cable entry positions.

All glands and blanking plugs are supplied in a plastic bag. The installer must fit these, or suitable equivalents, in place of the transit red-caps, to ensure weatherproofing of the control unit.

The white sealing washers (supplied in the plastic bag) must be fitted on the outside of the enclosure under the blanking plugs.

## Cable gland and conduits for the NEMA 4X-rated wall-mount unit

The Rosemount 3493 Control Unit has a data download socket factory pre-fitted. See “RS232 connections” on page 22 for information about this socket.

Refer to the Rosemount 3490 Series [Quick Start Guide](#) for information about where holes can be drilled for fitting cable glands.

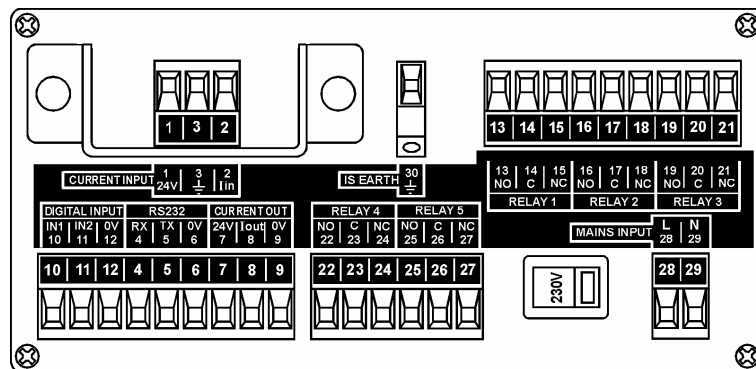
### 3.4.2 Making electrical connections on panel-mount units

Field wiring connections are made to the back of the panel-mount control unit using the two-part (plug/socket) terminal connectors provided. [Figure 3-3](#) shows the rear panel.

#### Note

The plug/socket terminal connectors on the panel mount unit are polarized (keyed) to prevent inter-changeability and incorrect connection.

**Figure 3-3. Connection Terminals Layout (Mains-powered Panel-mount Unit)**



The dc powered control unit has a slightly different layout – terminals 31 and 32 replace terminals 28 and 29.



**Table 3-2. Connection Terminal Descriptions (Panel-mount Control Unit)**

Terminal	Function	Terminal marking
1	Loop supply	24V
2	Current input	lin
3	Cable screen Earth	(Earth symbol)
4-6	RS232	RX-TX-0V
7-9	Current output	24V-Iout-0V
10-12	Digital input 1 and 2	IN1-IN2-0V
13-15	Relay 1	NO-COM-NC
16-18	Relay 2	NO-COM-NC
19-21	Relay 3	NO-COM-NC
22-24	Relay 4	NO-COM-NC
25-27	Relay 5	NO-COM-NC
28-29 <sup>(1)</sup>	Mains input	L-N
30	I.S. Earth	(Earth symbol)
31 <sup>(2)</sup>	Negative	-
32 <sup>(2)</sup>	Positive	+

1. Mains-powered control unit only.
2. Direct current (dc) powered control unit only.

Cabling between the Rosemount 3490 Series Control Unit (“control unit”) and a transmitter should be a screened (shielded), twisted-pair type with the cable screen (shield) connected to terminal 3 (marked with earth/ground symbol) on the control unit. The cable screen (shield) should be left unconnected at the transmitter end unless there is a terminal specifically provided for this purpose. Cable runs should be separate from any high voltage or mains cables to avoid crosstalk or interference.

Connect terminal 30 (intrinsically safe earth/ground) to a high integrity earth/ground point if the transmitter connected to terminals 1 and 2 is in a hazardous area. This is a special condition for some intrinsically safe approvals listed in [Appendix B: Product Certifications](#).

### 3.4.3 Power connections

When the control unit is powered by mains alternating current (ac) power, select the voltage as 115 V or 230 V using the voltage-selector slide switch.

When the control unit is direct current (dc) powered, ensure the supply is adequate (15 to 30 Vdc). Do not exceed 30 Vdc.

A switch or circuit breaker should be installed in close proximity to the instrument, and labeled as such. Although the Rosemount 3490 Series Control Unit meets all European standards for surge immunity on power and signal lines, it is recommended that lightning suppressors are also fitted if local conditions make this advisable.

### 3.4.4 Earthing connections

The IP-rated Rosemount 3490 Series Control Unit is double insulated and does not require a mains earth.

Do not connect terminal 30 to a mains earth. Terminal 30 is provided for use as an intrinsically safe (or functional) earth connection, which must be used when a transmitter is mounted in a hazardous area and is connected to terminals 1 and 2.

Terminal 3 is to be used for connection of a twisted-pair cable screen (shield) when the control unit is powering the transmitter (see [Figure 3-4 on page 19](#)). This screen (shield) should be left unconnected at the transmitter end unless there is a terminal provided for this purpose.

On the NEMA 4X-rated control unit, protective earth cables must be connected to at least one of the bonding points on the inside of the enclosure. Bonding between cable/conduit entries is not automatic and must be provided as part of the installation.

When connected to equipment located in a hazardous area, not meeting the requirements of clause 6.3.13 (Isolation of circuits from earth or frame) in IEC 60079-11:2006 (EN 60079-11:2007), equipotential earthing must be ensured between the equipment and the intrinsically safe earth. An example of equipotential earthing is a cable with a cross-sectional area greater than 4 mm<sup>2</sup> and a resistance of less than 1 ohm.

### 3.4.5 Transmitter connections and cabling

Connection of a transmitter to the control unit does not confer intrinsic safety on the transmitter. It is the responsibility of the user to ensure any transmitter installed in a hazardous area is suitable for use and certified accordingly. The installation should be in accordance with a recognized code of practice.

Check that the electrical parameters of the installed system of control unit, transmitter, any loop-powered devices, and interconnecting cable to ensure compliance with the product certificates and technical data. Particular attention must be given to the cable and the transmitter to ensure that the total capacitance and inductance limits stated in the technical data in [Appendix B: Product Certifications](#) are not exceeded.

Cable joints are allowable in cabling the transmitter, provided that the joint is made within an IP20/NEMA 3 (minimum) enclosure suitable for the environment, and that wiring withstands a test voltage of 500 V r.m.s. to earth.

The maximum length of cable permissible between the transmitter and control unit is determined by limits imposed by the intrinsic safety certificates of the instruments and control drawings.

No other outputs from the control unit must be routed through a hazardous area unless protected by an additional I.S. Barrier (not supplied).

It is the responsibility of the user to ensure that any transmitter is installed in accordance with the manufacturer's instructions supplied with the transmitter.

Cable between the control unit and the transmitter should be shielded twisted-pair with the shield connected to terminal 3 (marked with earth symbol) on the control unit.

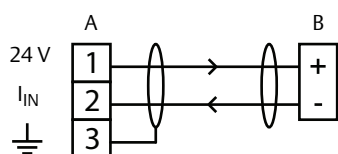
The shield should be left unconnected at the transmitter unless there is a terminal specifically provided for this purpose.

Cable runs should be separate from any high voltage or mains cables to avoid crosstalk or interference. Multi-core cable may be used if the other cores carry only low voltage (24 Vdc nominal) signals and each pair of cores is individually screened (shielded).

Loop-powered transmitters must be connected to terminals 1, 2, and 3 on the control unit (see Figure 3-4).

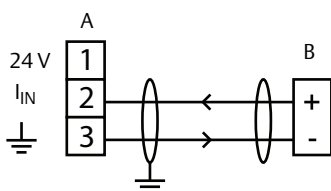
The control unit supplies 23 Vdc from a 400 Ohm source to power transmitters. Separately powered transmitters must be connected to terminals 2 and 3 (see Figure 3-5).

**Figure 3-4. Loop-powered Transmitter Connections**



A. Control unit  
B. Transmitter

**Figure 3-5. Self-powered Transmitter Connections**



A. Control unit  
B. Transmitter

### 3.4.6 Connecting HART transmitters to the Rosemount 3492

The Rosemount 3492 Control Unit takes the input from two HART transmitters and calculates the sum, difference, or product of the two inputs.

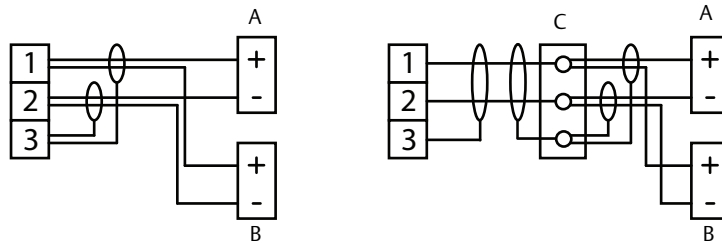
**Note**

The transmitters must be HART compatible for the Rosemount 3492 to operate correctly.

Connection of the two transmitters to the Rosemount 3492 can be done by:

- cabling both transmitter cables wired directly into Current Input terminals on the Rosemount 3492 (Figure 3-6), or
- using a single cable wired directly into Current Input terminals with the two transmitters connected to this single cable via a suitable junction box (Figure 3-6).

Figure 3-6. Connecting Two HART transmitters



A. HART transmitter Tx1  
B. HART transmitter Tx2  
C. Junction box.

For correct operation, each HART transmitter must be changed to “multi-drop” mode to allow them to communicate with the Rosemount 3492 Control Unit through a common connection. Each HART transmitter must therefore have their poll address changed from the factory default address of “0” to a unique address.

The Rosemount 3492 Control Unit is used to achieve this address change, but requires the transmitters to be connected in a specific sequence as detailed here:

1. With the power supply turned off, connect the first HART transmitter to the Current Input terminals on the control unit (see Figure 3-6).
2. Check the voltage-selector-switch is set for the correct voltage on the mains-powered control unit (115 or 230 Vac), and then turn the power on.
3. After applying power, the control unit searches for a HART transmitter.

A HART transmitter with the factory default polling address of 0 is found after 15 seconds. The control unit automatically changes the Transmitter Poll Address from “0” to “1” and it is designated Tx1 (Transmitter 1) and assigned to Channel 1.

The control unit reads parameters from the HART transmitter and makes them available for local interrogation and programming within the menu system.

4. When an unconfigured Rosemount 3100 Series Level Transmitter is being used for the first time, a prompt appears asking for the Transmitter [1] Bottom Reference. If commissioning the system now, edit and save a new Transmitter Bottom Reference or keep the existing Transmitter Bottom Reference. After the start-up process is complete, the display appears showing a measurement e.g. liquid level or the menu system.

If the system is not to be commissioned at this time, simply switch off the power and the same prompt re-appears when switching on the power next time. The Transmitter Bottom Reference can be changed later, but it is better to get it correct now.

---

**Note**

If the *Re-connecting to Digital Transmitter* message does not appear, check that the operating mode of the control unit is set to *Run App mode* (see [page 37](#)) and that the Input Channel Source is set for a digital HART input (see [page 43](#) or [page 49](#)).

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5. Turn the power supply off and connect the second HART transmitter (see [Figure 3-6](#)), such that both HART transmitters are connected at the same time.
6. Turn the power supply on.
7. The control unit searches for, and detects, the two connected HART transmitters.  
After the second HART transmitter is found, the control unit automatically changes the Transmitter Poll Address from “0” to “2” and it is designated *Tx2* (Transmitter 2) and assigned to Channel 2.  
The control unit reads parameters from the HART transmitter and makes them available for local interrogation and programming within the menu system.
8. When a unconfigured Rosemount 3100 Series Level Transmitter is being used for the first time, a prompt appears asking for the Transmitter (2) Bottom Reference.  
If commissioning the system now, edit and save a new Transmitter Bottom Reference or keep the existing Transmitter Bottom Reference. After the start-up process is complete, the display appears showing a measurement e.g. liquid level or the menu system.  
If the system is not to be commissioned at this time, simply switch off the power and the same prompt re-appears when switching on the power next time. The Transmitter Bottom Reference can be changed later, but it is better to get it correct now.
9. The two HART transmitters are now known to the control unit, and will be remembered each time the power is switched off and on.

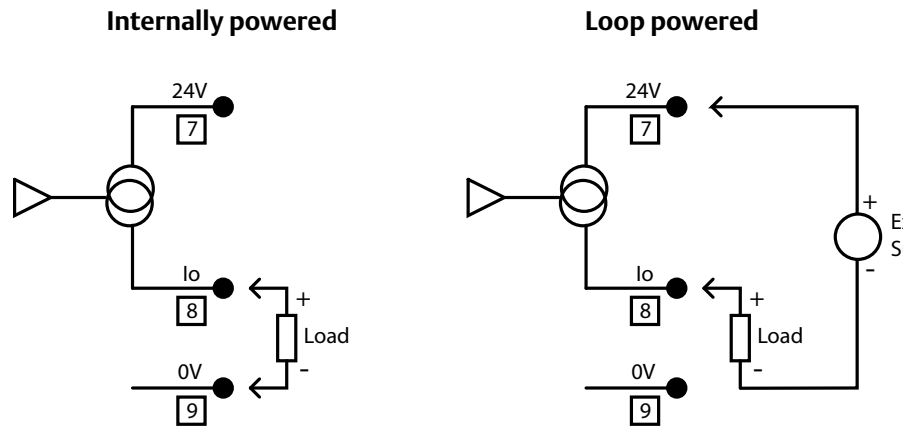
### 3.4.7 Relay connections

Terminal connections are shown in [Table 3-1 on page 15](#) and [Table 3-2 on page 17](#).

### 3.4.8 Current output connections

The Current Output may be connected in internally-powered or loop-powered mode, as shown in [Figure 3-7](#). In loop-powered mode, an external power source is required. A minimum of 2.5 Vdc is required across terminals 7 and 8 for correct operation. The voltage must not exceed 30 Vdc.

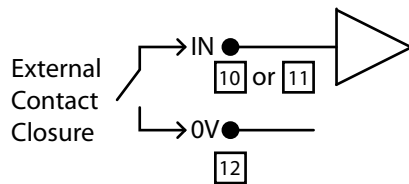
**Figure 3-7. Alternative Output Current Configurations**



### 3.4.9 Digital control voltage-free contact inputs

There are two trigger inputs, IN1 and IN2. Each input is connected as shown in [Figure 3-8](#).

**Figure 3-8. External Trigger Input Connections**



### 3.4.10 RS232 connections

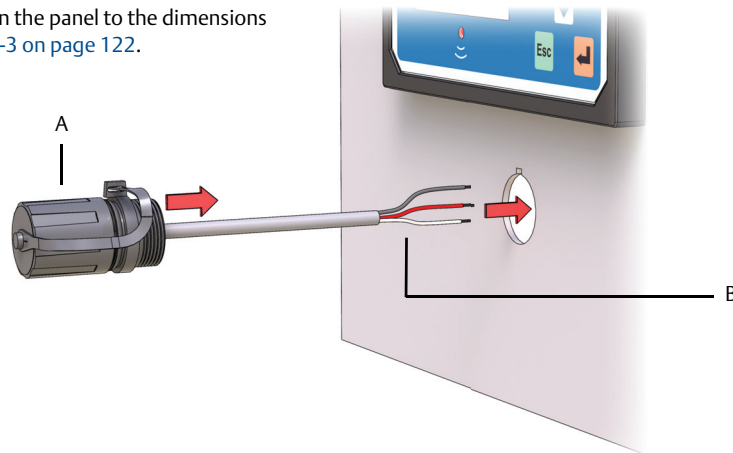
The RS232 connections, terminals 4, 5 and 6, are for downloading logged data to a PC or a hand-held device.

- The wall-mountable Rosemount 3493 Control Unit is factory pre-fitted with a RS232 data-download socket, which is also pre-wired to terminals 4, 5, and 6.
- The panel-mountable Rosemount 3493 Control Unit is supplied with a data-download socket ready to be fitted to a panel (see [Figure 3-9 on page 23](#)), which then needs to be wired to terminals 4, 5, and 6 on the rear of the control unit (see [Figure 3-10 on page 24](#)).

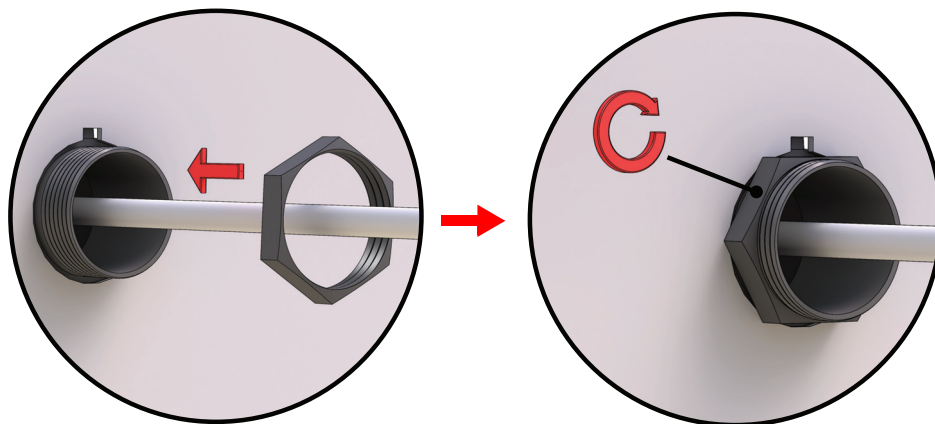
When there is data to be downloaded using Rosemount LogView or other software, connect the RS232 data-download cable supplied with the socket ([Figure 3-11 on page 24](#)).

**Figure 3-9. Fitting the RS232 Data-download Socket to a Panel**

Cut-out the hole in the panel to the dimensions shown in Figure A-3 on page 122.



Use the supplied mini-B nut to secure the socket to the panel.



- A. RS232 socket with cap fitted.
- B. RS232 socket flying lead.

Figure 3-10. Wiring the Socket Flying Lead to Terminals 4, 5, and 6 (Panel Mount Unit)

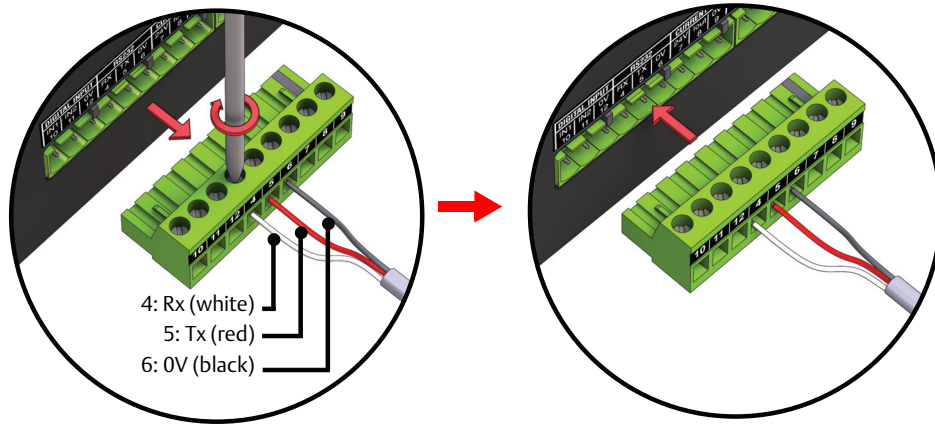
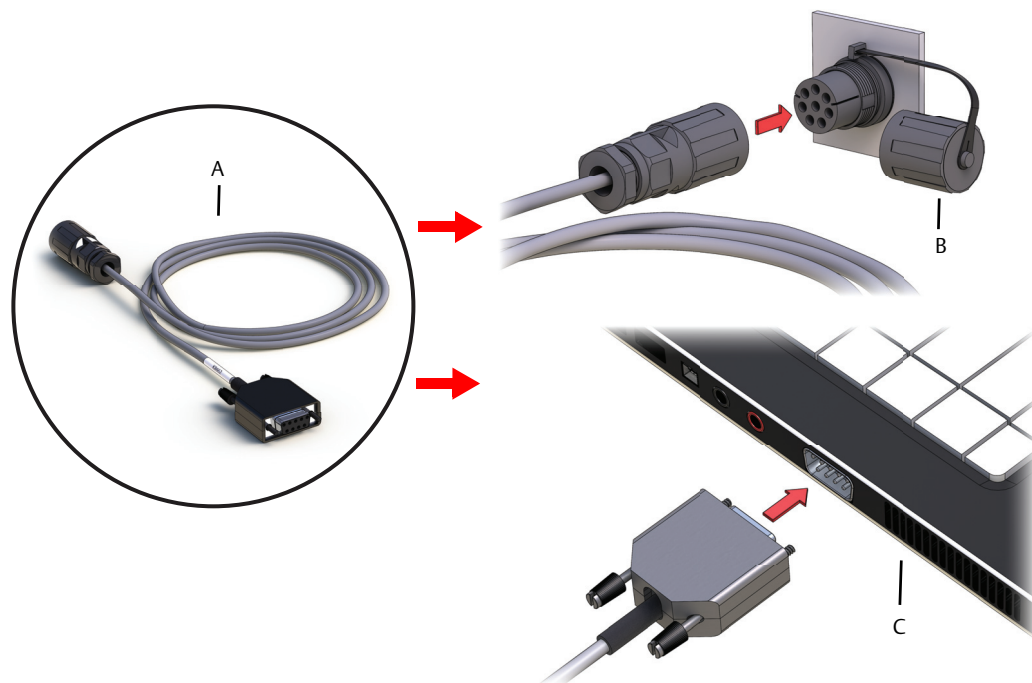


Figure 3-11. Connecting the RS232 Data-download Cable



- A. RS232 data-download cable.
- B. Unscrewed socket cap.
- C. See Rosemount LogView [Reference Manual](#) for further information on downloading logged data.



## Section 4 Getting Started

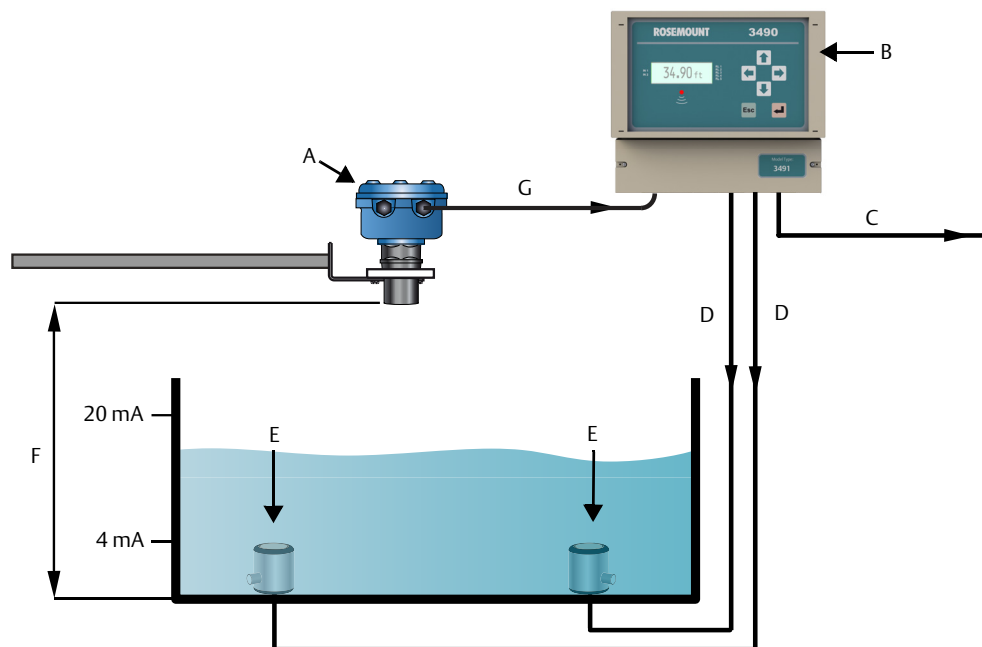
First time power-up .....	page 25
Menu system .....	page 28
Programming the control unit .....	page 30

### 4.1 First time power-up

#### 4.1.1 Rosemount™ 3491 and 3493 Control Unit

The Rosemount 3491/3493 accepts the input from a single HART® or 4–20 mA transmitter. Connect the transmitter to the Current Input terminals on the control unit as explained in the section “Electrical installation” on page 14.

**Figure 4-1. Rosemount 3491/3493 Control Unit and One Transmitter**

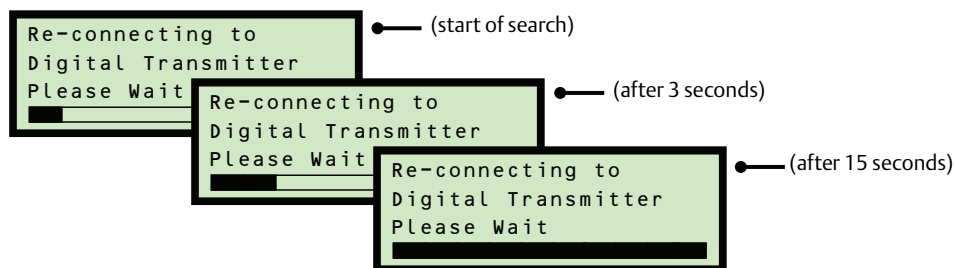


- A. Rosemount 3102 or Rosemount 3105 Level Transmitter
- B. Rosemount 3490 Series Control Unit
- C. 4–20 mA signal output
- D. Relay
- E. Pump
- F. Transmitter bottom reference
- G. 4–20 mA and HART signal input

## 4.1.2 Switching on with one new HART transmitter connected

After applying power, the control unit first displays the control unit version e.g. Rosemount 3491 and the software version. It then automatically searches for a HART transmitter.

**Figure 4-2. Searching for HART Transmitter**



A HART transmitter with the factory default polling address of 0 is found after 15 seconds. When found by the controller, it is designated Tx1(Transmitter 1) and assigned to Channel 1.

However, if the polling address is in the range 1 to 15, a prompt appears allowing the polling address and the tag name to be changed. This is optional, and selecting the **red (enter)** button continues the start-up process.

At this time, the control unit reads parameters from the HART transmitter and makes them available for local interrogation and programming within the control unit menu system.

When an unconfigured Rosemount 3100 Series Level Transmitter is being used for the first time, a prompt appears asking for the transmitter bottom reference (Figure 4-3). This value automatically sets the 4–20 mA output span of the transmitter.

If the system is not to be commissioned at this time, simply switch off the power and the same prompt re-appears when switching on the power next time. The Transmitter Bottom Reference can be changed later, but it is better to get it correct now.

If commissioning the system now, edit and save a new transmitter bottom reference or keep (save) the existing transmitter bottom reference (Figure 4-3).

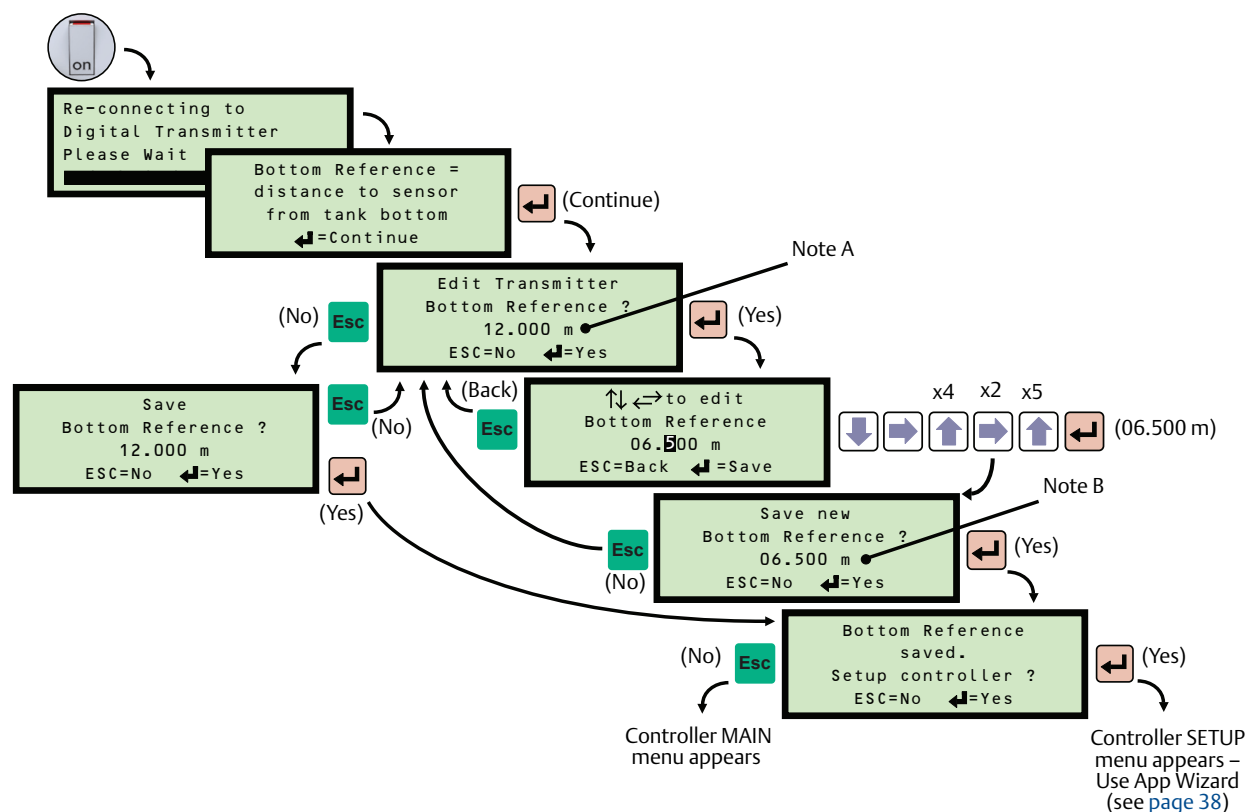
### Note

If the *Re-connecting to Digital Transmitter* message does not appear, check the operating mode of the control unit is set to *Run App mode* (see page 37) and the Input channel source is set for a digital HART input (see page 47 or page 49).

After the start-up process is complete, the display appears showing a measurement e.g. liquid level or the menu system. The value on the display is the Primary/Process Variable (PV) of the control unit, but this can be changed (see “Display configuration options” on page 103).

Whenever power is lost and restored, the control unit re-establishes digital communications with the HART transmitter and the PV display re-appears.

Figure 4-3. Prompts for Transmitter Bottom Reference



A. Default bottom reference as read from a Rosemount 3107 Transmitter configured with metric base units. Example is for illustration only.  
B. The 6.500 m has been used here as an example new bottom reference. Enter the value that is required for your level measurement.

### 4.1.3 Switching on with one 4–20 mA transmitter connected

After applying power with a 4–20 mA transmitter connected, the Full PV Display appears and indicates a control unit PV of zero. It is then necessary to configure the control unit for a 4–20 mA input instead of a digital HART input.

See “Optional change: transmitter input channel settings (advanced users)” on page 42 for this procedure.

### 4.1.4 Rosemount 3492

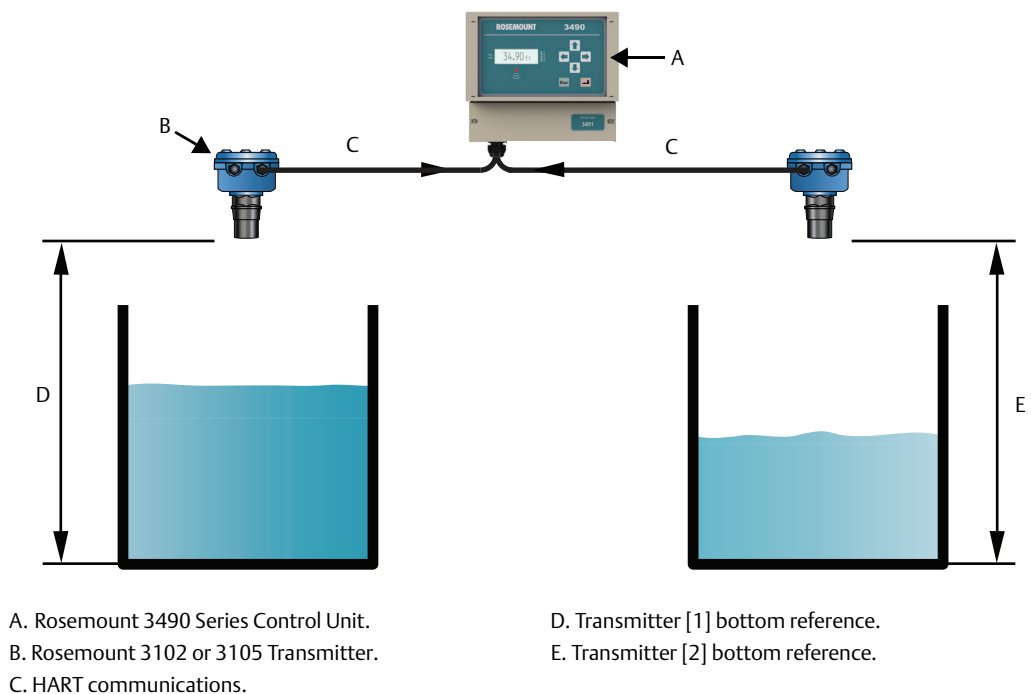
The Rosemount 3492 takes the input from two HART transmitters and calculates a single sum, difference, or product of the two inputs.

It is important to connect the two HART transmitters in the correct sequence, as detailed in “Connecting HART transmitters to the Rosemount 3492” on page 19.

After both HART transmitters are connected, the top-left corner shows communications with both transmitters by alternating 1 and 2 next to the digital communications icon.

The factory default configuration shows the reading from the first connected transmitter (Tx1). This configuration can be changed to show the sum, difference or product of the readings from both transmitters.

Figure 4-4. The Rosemount 3492 Control Unit with Two HART Transmitters



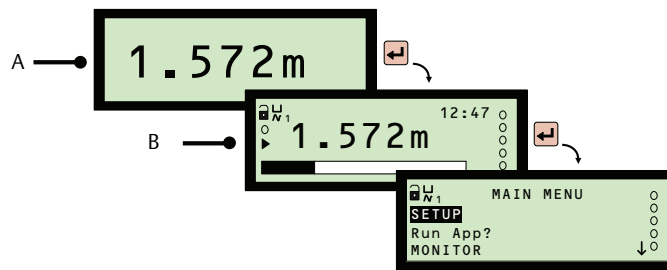
## 4.2 Menu system

Follow these instructions for a quick tour of the menu system:

1. This tour begins at the *Full display* or *Large PV display* (Figure 4-5 on page 29). If already within the menu system, use the **Esc** button repeatedly until the *Full display* re-appears.
2. Select the **red (enter)** button to display the *MAIN MENU* (Figure 4-5 on page 29). The *MAIN MENU* is the top level of the menu system.
3. Navigation of the menu system is achieved by using the **arrow** buttons, the **red (enter)** button, and the **Esc** button. The **Esc** button returns you to the previous menu level, unless you are at the top level.
4. The highlighted and blinking text indicates what menu option will be selected if the **red (enter)** button was pressed now. Do not press it yet.
5. The ↓ symbol on the display indicates there are further menu options available, accessible by using the **down arrow** button.  
An ↑ symbol indicates there are further menu options available, accessible by using the **up arrow** button.

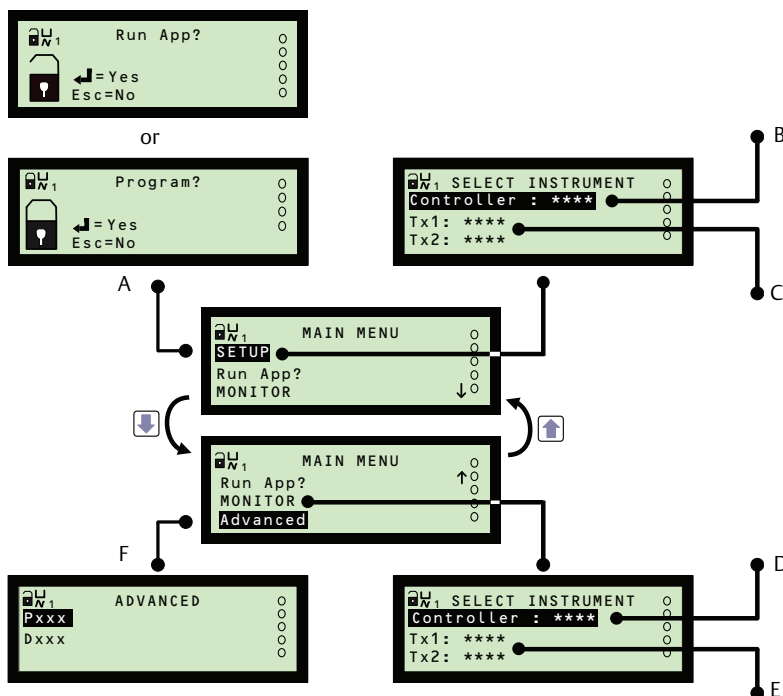
6. The MAIN MENU sits above a series of sub-menus, which lead to further levels of sub-menus that lead to parameter screens (see [Figure 4-6 on page 30](#)).
7. Select the **red (enter)** button to select the highlighted menu option *SETUP*.
8. The *SELECT INSTRUMENT* menu now appears. This screen is for selecting whether to enter the setup menu for the control unit (controller) or a found HART transmitter. If there are no HART transmitters connected, Step 7 results in the *SETUP* menu for the control unit appearing straight away. Skip to Step 10.
9. Select the **red (enter)** button to select the highlighted menu option **Controller: \*\*\*\***.
10. The control unit *SETUP* menu now appears with menu options *APPLICATION*, *DISPLAY*, and *OUTPUT* visible.
11. Use the **down arrow** button to highlight *OUTPUT* and then select the **red (enter)** button to select and enter the *OUTPUT* menu.
12. The *OUTPUT* menu now appears with menu options *CURRENT OUTPUT*, *RELAY*, *TOTALIZER*, *PV DAMPING*, *ALARM*, and *FAULT*.
13. Explore these menu options to see screens for setting-up for an application and for displaying read-only information.
14. After exploring, hold down the **Esc** button once to return to the *MAIN MENU*.

**Figure 4-5. Menu System Entry**



- A. Large PV display.
- B. Full display showing PV in normal size characters and other information.

Figure 4-6. Main Menu overview



- A. Toggles the operating mode of the control unit. An open padlock indicates that Program mode is selected and parameter values can be changed.
- B. Selecting Controller: \*\*\*\* leads to the SETUP menu for setting up the control unit for an application.
- C. Selecting Tx1: \*\*\*\* leads to the SETUP menu for HART transmitter Tx1 operations (and similarly for Tx2 on the Rosemount 3492). The Transmitter Bottom Reference for Tx1 (and similarly for Tx2) can be changed here.
- D. Selecting Controller: \*\*\*\* leads to menus for viewing live readings and diagnostic information for control unit.
- E. Selecting Tx1: \*\*\*\* leads to menus for viewing live readings and diagnostic information from the HART transmitter Tx1 (and similarly for Tx2 on the Rosemount 3492).
- F. Advanced access menu for advanced users to directly select parameter screens when the parameter number is known. For a guide to this, see [Appendix D: Additional Features](#).

## 4.3 Programming the control unit

This section covers programming using the front panel of the Rosemount 3490 Series Control Unit (“control unit”) to make changes to the factory default set-up.

Use the Application Wizard (“App Wizard”) to easily set-up the control unit for a level, flow, or contents volume application, and then optionally adjust the set-up by editing parameters in the menu system. See [Appendix C: Menus and Parameter](#) for a full list of menus and parameters.

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#### Note

If a Rosemount 3100 Series Transmitter is connected, refer to the Rosemount 3101/3102/3105 [Reference Manual](#) or Rosemount 3107/3108 [Reference Manual](#) for full information about programming the transmitter parameters (e.g. Transmitter Bottom Reference) using the control unit and other HART-based devices.

For information about how the control unit supports other HART transmitters, see [Appendix C: Menus and Parameter](#) and [Appendix E: Support for HART® Transmitters](#).

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## 4.3.1 Parameter basics

The control unit has menu-based parameters for programming – setting up for an application, adjusting default settings, etc. – and for viewing information.

Parameters are populated throughout the menu system. They are grouped in sub-menus, which are organized for intuitive programming. Each parameter has a unique 3-digit identification number, prefixed by a 'P' (if programmable) or a 'D' (if for display only).

---

#### Note

A full list of menus and parameters is in [Appendix C: Menus and Parameter](#).

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With some experience, it becomes easy to locate parameters. Alternatively, parameters can be accessed directly by entering their unique 3-digit identification number. Details of this Advanced access feature are in [Appendix D: Additional Features](#).

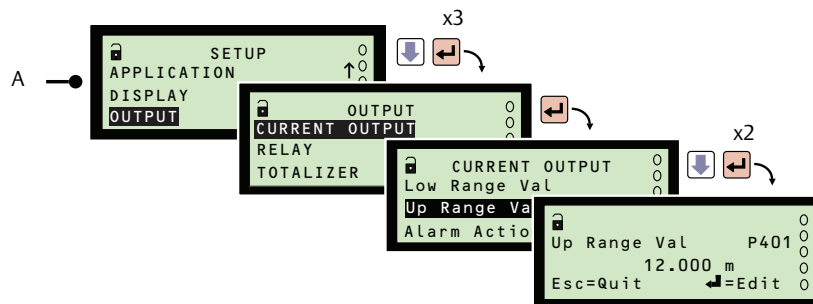
To understand the basics about editing a parameter setting, follow the worked examples for editing a numerical parameter and the calendar date parameter.

### Editing a numerical parameter

1. Navigate to the *Up Range Value parameter* screen (see [Figure 4-7](#)).
2. When entering any *parameter* screen, it is in *View Mode* ([Figure 4-8 on page 33](#)). Help with what can be done next is on display line 4.  
(In *View Mode*, the **Esc** button is used to leave (quit) the parameter screen. The *SETTINGS* menu then re-appears, as seen before selecting the parameter).
3. To enter *Edit Mode*, select the **red (enter)**.
4. A “+” appears ([Figure 4-8](#)) to show this positive sign can be changed to be a negative sign. The **up arrow** or **down arrow** cycles between “+” and “-”. (Also, note that on display line 4, “Edit” has changed to be “Save”)
5. Change the number from “+12.000” to “+6.500” ([Figure 4-8](#)):
  - a. Select the **right arrow** button once to move right and highlight the “1”. (The left arrow can be used to move the highlight back one space).
  - b. Select the **up arrow** button five times to change the “1” to a “6”. (The down arrow can also be used to scroll down through the numbers and decimal point).

- c. Select the **right arrow** button once to highlight the “2”.
  - d. Select the **down arrow** button three times to change the “2” to a **decimal point**.
  - e. Select the **right arrow** button once to highlight the **original decimal point**.
  - f. Select the **down arrow** button six times to change the **original decimal point** to a “5”.
- (Note that other button press sequences could have been used to edit 6.500).
6. Select the **red (enter)** button to save the **+6.500** and return to *View Mode*.  
(Note that on display line 4, *Save* has changed back to *Edit*).
  7. Select the **Esc** button to return to the *SETTINGS* menu.

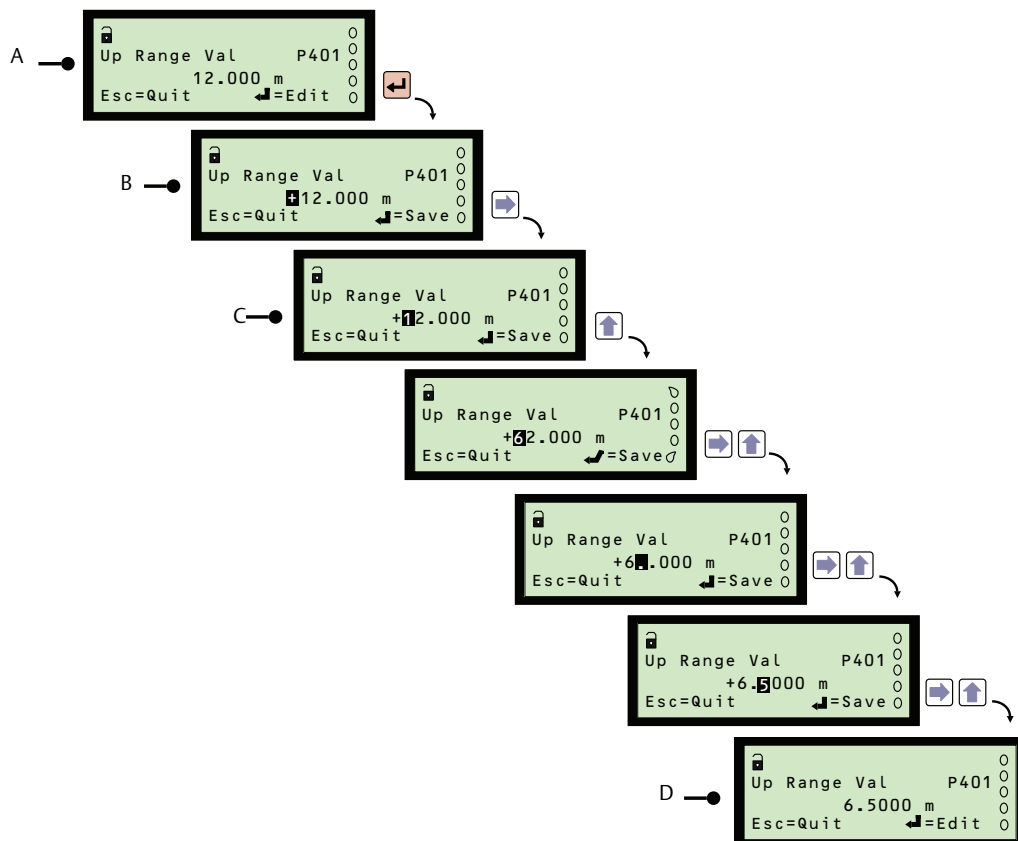
**Figure 4-7. Navigation to Numerical Parameter Screen**



A. This is the SETUP menu for the control unit – see [Figure 4-6 on page 30](#) for how to get here.



Figure 4-8. Example: Editing a Numerical Value



- A. When entering any parameter screen, it is in *View Mode*. Help with what can be done next is on display line 4.
- B. Parameter is in *Edit Mode*. In this mode, selecting **Esc** button restores the original setting and returns to *View Mode*.
- C. The up arrow button is used to scroll up through the numbers and decimal point, and the down arrow button scrolls down through the numbers and decimal point.
- D. Parameter has returned to *View Mode*.

## Editing the calendar date parameter

1. Navigate to the *Date parameter* screen (see [Figure 4-9 on page 34](#)).
2. When entering any parameter screen, it is in *View Mode* ([Figure 4-10 on page 34](#)). Help with what can be done next is on display line 4.  
(In *View Mode*, the **Esc** button is used to leave (quit) the parameter screen. The *SETTINGS* menu then re-appears, as seen before selecting the parameter).
3. To enter *Edit Mode*, select the **red (enter)** button.
4. The “**3**” is highlighted to show this digit can now be edited ([Figure 4-10](#)).  
(Also, note that on display line 4, *Edit* has changed to be *Save*).
5. Change the calendar date from “**30/01/14**” to “**31/01/14**”:



## 4.3.2 Menu navigation basics

In this section and throughout this manual, a simple notation has been used to guide you to a particular *menu* screen or *parameter* screen. This avoids the need for detailed navigation instructions.

Consider the navigation instructions to be followed before arriving at the *ADVANCED* menu. For the purpose of this example, the starting point is the Full PV Display.

In the notation form, this is simply:

1. Navigate to *MAIN MENU*>*ADVANCED*

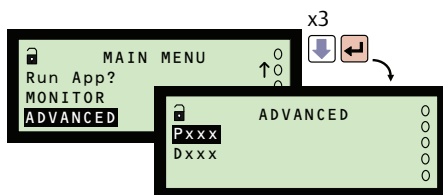
Without the notation, this translates into these instructions:

1. Select the **red (enter)** button to display the *MAIN MENU* screen.
2. Select the **down arrow** button three times until *ADVANCED* is highlighted and blinking.
3. Select the **red (enter)** button once.

If square brackets are used in the notation, e.g. *MAIN MENU*>*SETUP*>[*CONTROL UNIT*], it indicates that the bracketed menu does not appear in all circumstances.

When no HART transmitters are used, the *SELECT INSTRUMENT* screen does not appear. As there is no need to select the control unit menu or a HART transmitter (Tx1 or Tx2) menu, the menus that appear after selecting *MAIN MENU/SETUP* are purely for the control unit.

Figure 4-11. Navigating to *ADVANCED* Menu



## 4.3.3 Programming of the control unit

### Step 1: Put the unit into Program mode

Put the control unit into *Program mode*. (The factory default is for it to be in Program mode). See “Run App and Program operating modes” on page 37.

### Step 2: Use the App Wizard

Use the Application Wizard (App Wizard) to easily set-up the control unit for a level, flow, or contents volume application, and then optionally adjust the set-up by editing parameters in the menu system. For examples of using App Wizard, see “Application Wizard” on page 38.

---

**Note**

Before using App Wizard with a 4–20 mA transmitter, the Input Channel 1 source parameter P111 on the control unit must be set for a 4–20 mA input (see [page 44](#)).

Level and volume measurement duties are not available on the Rosemount 3493 Logging Control Unit.

---

## Step 3: Optional changes after using the App Wizard

### Change system settings

This includes how to switch on the keyboard sound, setting the date/time, and changing language. See “Optional change: system settings” on [page 42](#).

### Change transmitter input channel settings (advanced users)

This is for advanced users and looks in-depth at how the input channels are used to obtain the control unit PV from a transmitter.

See “Optional change: transmitter input channel settings (advanced users)” on [page 42](#)

For most users, the App Wizard will set-up the majority of applications with no need of direct changes to input channel parameters.

### Change application settings (advanced users)

This is for advanced users and looks in-depth at further processing of PV values to get content (volume) or flow rate values, which can be shown on the display. A totalizer function can also be set-up. For most users, the App Wizard will set-up the majority of applications with no need of direct changes to application parameters.

See “Volumetric contents and flow measurement applications (advanced users)” on [page 51](#) and “Using a plotted profile for calculating volume or flow” on [page 60](#).

### Change the digital input settings

This includes how to allocate actions to digital inputs (IN1 and IN2).

See “Digital inputs IN1 and IN2” on [page 62](#).

### Change output settings

This includes setting-up the 4–20 mA output and relay outputs.

See “Set-up the current output” on [page 68](#) and “Set-up the relays” on [page 69](#).

### Set-up other features

This includes configuring data logging ([page 64](#)), alarm handling ([page 92](#)), the display ([page 103](#)), serial communications ([page 105](#)), and PIN security ([page 106](#)).

By default, security restrictions are switched off and the user has access to all parameters. After programming (configuring) is complete, a PIN security code can be used to prevent unauthorized access. For details, refer to Section “PIN Security” on [page 106](#).

## Step 4: Put the unit into Run App mode

Put the control into *Run App* mode (see below).

For checks (e.g. auto-cycle of the control unit PV, diagnostics, and fault-finding), see [Section 5: Troubleshooting](#).

There is trouble-shooting information in [Section 5: Troubleshooting](#). Alternatively, the control unit can be re-set to the factory defaults as guided in the section “Restoring the factory defaults” on page 137.

### 4.3.4 Run App and Program operating modes

#### Menu: MAIN MENU/Run App? (or MAIN MENU/Program?)

There are two operating modes on the control unit: Run App and Program.

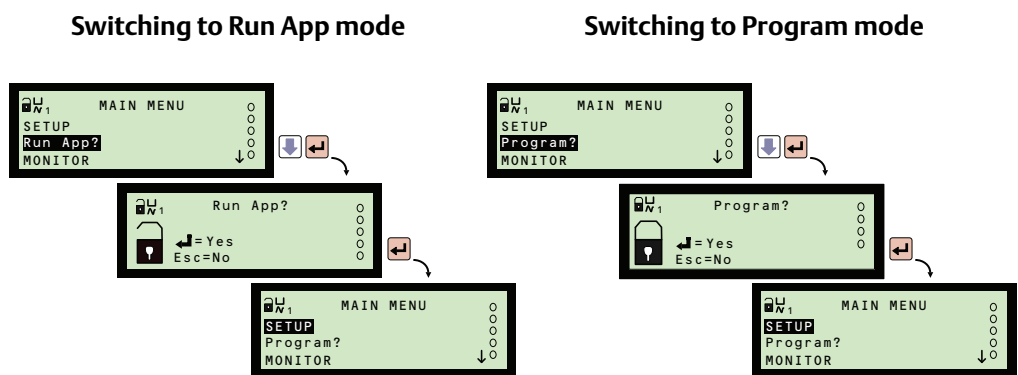
Select the **red (enter)** button at the *Run App?* or *Program?* screen to switch between these two operating modes ([Figure 4-12](#)).

An open padlock icon indicates the control unit is presently in the Program mode. In this mode, the unit can be programmed. The Current Output and all Relay Outputs are frozen unless allocated to totalizing and sampler duties. Fault relays are de-energized.

A closed padlock icon indicates that the control unit is presently in the Run App mode. In this mode, most of the unit cannot be programmed. The Current Output and all Relay Outputs operate as normal.

The *Program?* screen ([Figure 4-12](#)) appears automatically if an attempt is made to edit a parameter in *Run App* mode. A security PIN can be set-up to restrict this mode change.

**Figure 4-12. Switching Between Run App and Program Modes**



## 4.3.5 Application Wizard

Use the Application Wizard (App Wizard) to easily set-up the control unit for an application.

If a message appears saying that the units are not set, it is because the HART transmitter has not been found by the control unit when power was applied. Change the operating mode from Program to Run App mode and the control unit will attempt to re-connect to the transmitter.

---

### **Note**

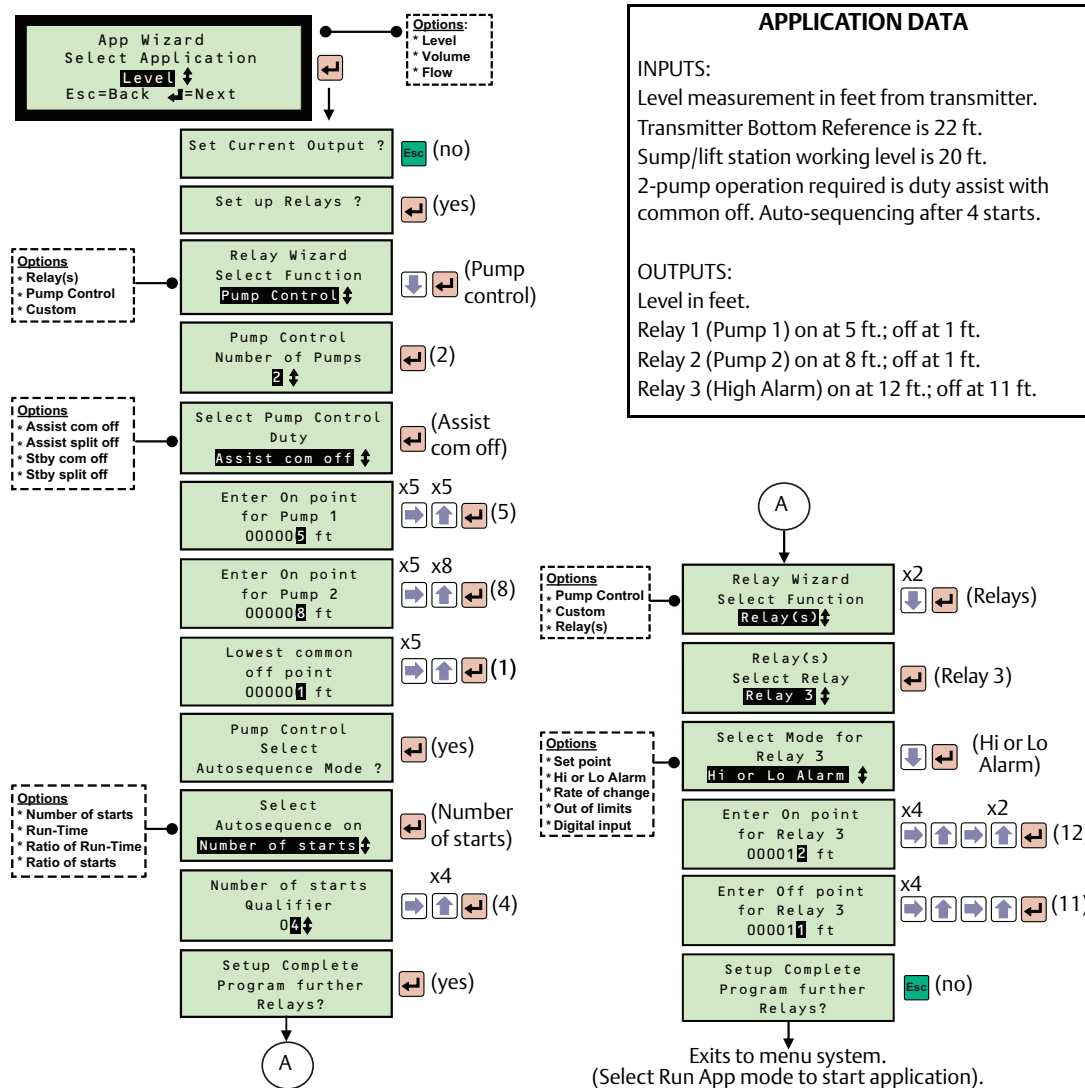
When using a Rosemount 3492 Differential Control Unit, it is necessary to select Difference, Sum, Product, or Independent (and channel) before Level/Volume/Flow can be selected.

Level and volume measurement duties are not available on the Rosemount 3493 Logging Control Unit.

---

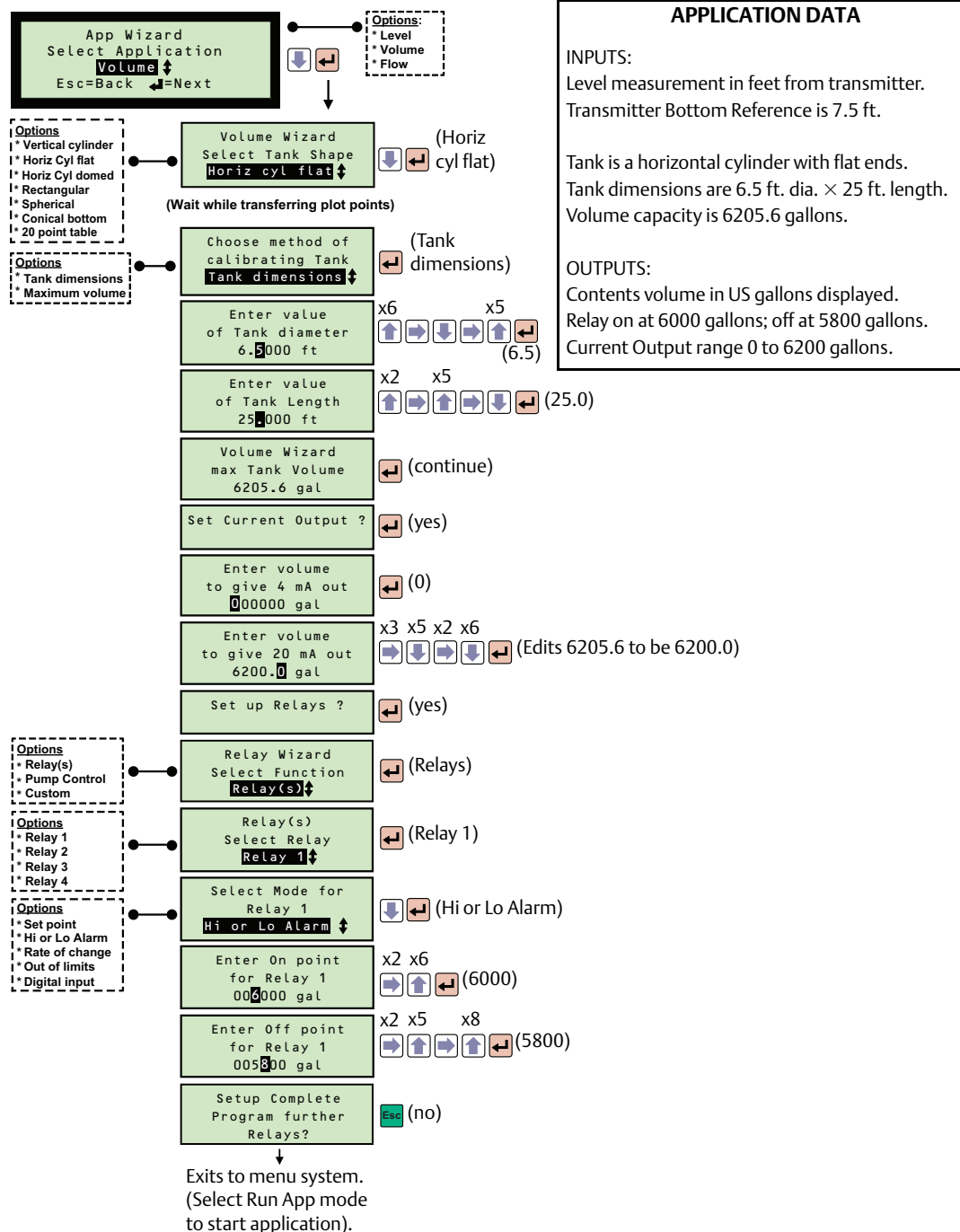
## Using the App Wizard to set-up a level application

Figure 4-13. App Wizard Example: Pump Control with High Alarm



## Using the App Wizard to set-up a contents volume application

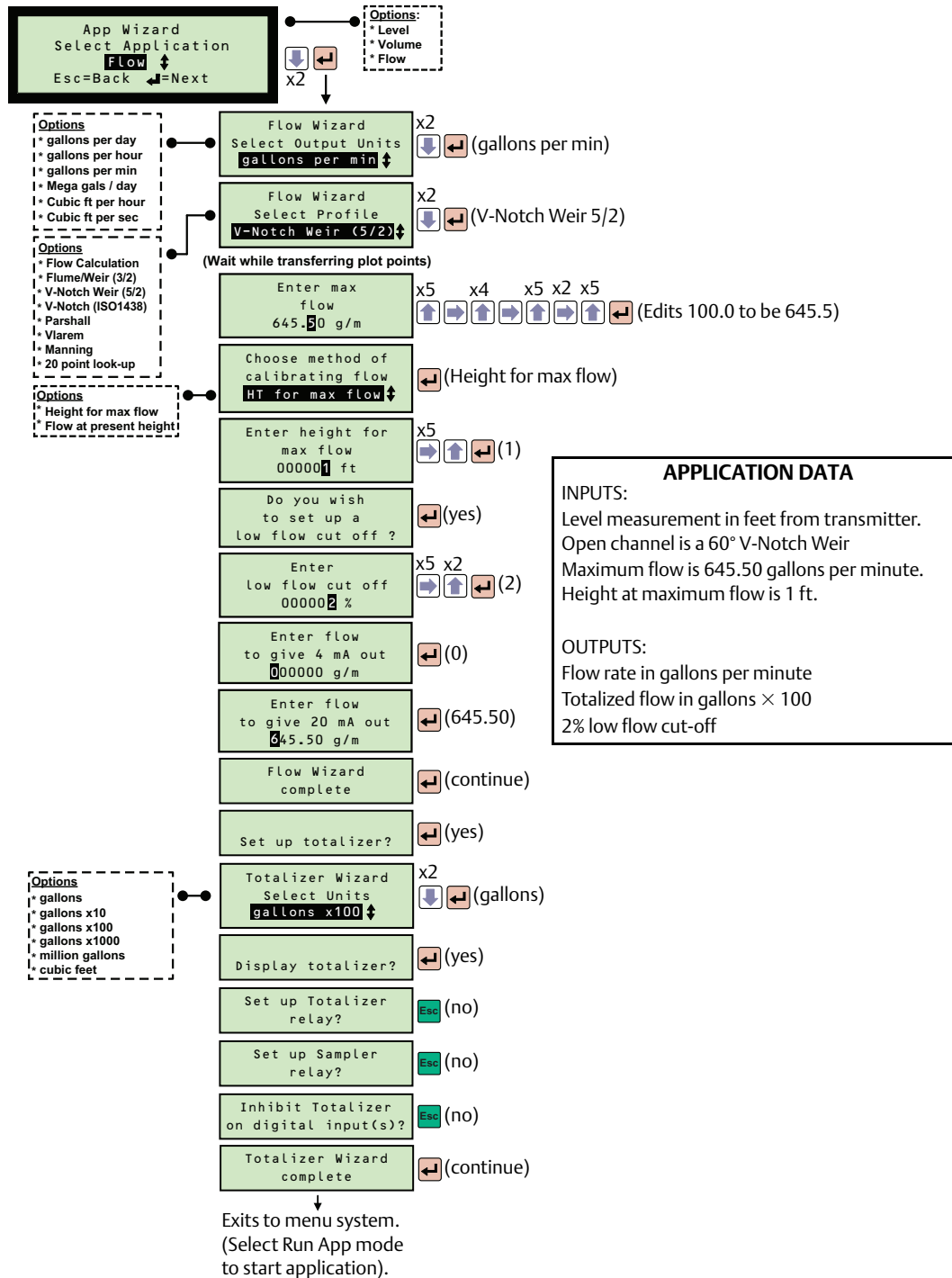
Figure 4-14. App Wizard Example: Tank Volume with High Alarm





## Using the App Wizard to set-up a flow application

Figure 4-15. App Wizard Example: Open Channel Flow with 60° V-Notch Weir



## 4.3.6 Optional change: system settings

**Menu: SETUP>[CONTROLLER>]SYSTEM>SETTINGS**

### Calendar clock

**P730** Date

Set the calendar date in the format as selected by P734.

**P731** Time

Set the clock time. The 24-hour clock format is supported.

**P734** Date format (Default setting is “dd/mm/yy”)

Choose between “dd/mm/yy”, “yy/mm/dd”, and “mm/dd/yy”.

### Keypad sound

**P735** Keypad Sound (Default setting is “Off”)

If you want the keypad sound switched on, select **On** from the option list.

### Language

**P737** Language (Default setting is “English”)

If you wish to change the language used on-screen, there is a choice of other languages.

## 4.3.7 Optional change: transmitter input channel settings (advanced users)

Sections 4.3.7 to 4.3.10 are for advanced users. They explain in-depth what transmitter inputs are supported on the control unit, and how to program (configure) the operation of those transmitter inputs to result in a control unit PV.

The resulting control unit PV is indicated on the factory-default configured display.

For most users, the App Wizard will set-up the majority of applications with no need of direct changes to input channel parameters.

### Transmitter input channels on the Rosemount 3491 and 3493

The Rosemount 3491/3493 Control Unit supports the connection of a single 4–20 mA or HART transmitter. There is one transmitter input channel and it is referred to as Input Channel 1.

For a 4–20 mA transmitter, see:  
“Programming Input Channel 1 for a 4–20 mA input (advanced users)” on page 43.

For a HART transmitter, see:  
“Programming Channel 1 for a HART input (advanced)” on page 47.

## Transmitter input channels on the Rosemount 3492

The Rosemount 3492 Control Unit supports the connection of two HART transmitters, but not two 4–20 mA transmitters. The input channels and are referred to as Input Channel 1 and Input Channel 2.

For two HART transmitters, see:

- “Programming Channel 1 for a HART input (advanced)” on page 47.
- “Programming Channel 2 for a HART input (Rosemount 3492 and advanced users only)” on page 49.

### Sum, difference, or product calculations using input channels 1 and 2

Parameter P150 selects how final values from transmitter input channels 1 (D851) and 2 (D852) are processed together – sum, difference, or product calculation – before being output to parameters D800, D801, D802, or D803 ('Answers').

The factory default programming (configuration) for P150 is to allow values from D851 to go straight to D800.

For a graphical overview, see [Figure 4-17](#) and [Figure 4-18](#) on page 46.

## 4.3.8 Programming Input Channel 1 for a 4–20 mA input (advanced users)

This section explains how to program (configure) the operation of the Input Channel 1 on the control unit when a 4–20 mA transmitter is connected. Do not connect a second transmitter.

Please read this section together with the graphical overview in [Figure 4-16](#) on page 46.

The final result of the Input Channel 1 processing is stored in D800 and is referred to as the control unit PV. It is shown on the factory default configuration of the display.

### Essential parameters to program

#### Select displayed units for the control unit PV

First, it is essential to know the units for the measurements coming from the transmitter. When this is known, navigate the menu system to *SETUP>[CONTROLLER]>DISPLAY>PV Units* for the PV Units parameter P200 and then select the measurement units that are to be shown for the control unit PV on the display.

Please note that the PV Units parameter (P200) does not automatically convert the transmitter input or the control unit PV into alternative units. It is necessary to enter a conversion factor into parameter P114 (see the descriptions that follow).

#### Set Input Channel 1 to receive input from a 4–20 mA transmitter

1. Navigate to the menu *SETUP>[CONTROLLER]>INPUT CHANNEL>Ch1 I/P Source* for the Ch1 I/P Source parameter P111.
2. Select **mA in 1** from the option list.

---

**Note**

The built-in Application (App) Wizard is an easy-to-use configuration tool that can be used to automatically populate values and settings in the input channel parameters.

Navigate to *SETUP>[CONTROLLER]>APPLICATION>App Wizard*

Before using the App Wizard with a 4–20 mA transmitter, the Input Channel 1 source parameter P111 on the control unit must be set for a 4–20 mA signal input; this is not the factory default setting for P111.

---

## Optional parameters and how the 4–20 mA signal is processed

Figure 4-16 on page 46 shows how the 4–20 mA input signal is processed through Input Channel 1 and which parameters and processing stages affect the resulting control unit PV.

### Signal conditioning and damping stages

Analog measurements (level, pressure, and temperature, etc.) are input to the control unit as a 4–20 mA signal, and pass through a conditioning stage (to remove spikes) and a damping stage (to smooth out large jumps in signals).

The damping can be adjusted by changing the time setting (in seconds) in parameter P321. Navigate to the menu *SETUP>[CONTROLLER]>INPUT CHANNEL>Cur I/P Damping*.

### Signal limits check

The signal is then checked to ensure it is within the range of 3.7 to 20.75 mA. Signals outside this range cause an alarm condition, which may be externally signaled using a control unit relay (see “Alarm indication selection” on page 92).

### Conversion of signal into a percentage value

By default, the mA signal (readable via D840) is converted (normalized) into a percentage in the range 0 to 100% (readable via D842), where 4 mA is 0% and 20 mA is 100%.

---

**Note**

The control unit can process mA input values in the range 3.8 to 20.5 mA.

Read-only parameters D840 and D842 are in the menu *MONITOR>DIAGNOSTICS*.

---

### Applying the optional percentage offset adjustment

P112 is a positive, negative, or zero offset adjustment of the converted (normalized) percentage. This offset feature can be used to accommodate a standing level in a tank.

---

**Note**

The output from this adjustment is readable in D802 and is the Tertiary Value (TV) of the control unit.  $D802 = D842 + P112$

P112 is in the menu *SETUP>[CONTROLLER]>INPUT CHANNEL>Ch 1 I/P Offset*

---

---

### Applying the scaling factor to get the required units

Changing the PV display units (P200) does not automatically convert the control unit PV to be in alternative units. A user-entered value in P114 is used to convert (scale) the off-set-adjusted percentage value (D802) to a new value (D801) that is in the required measurement units.

If the mA input represents a liquid level, simply set P114 to the level represented by 20 mA.

---

#### Note

D801 is the Secondary Value (SV) of the control unit.  $D801 = (D802/100) \times P114$

P114 is not applied if the PV display units (P200) are already configured to be “%”.

P114 is in the menu *SETUP>[CONTROLLER]>INPUT CHANNEL>Ch1 Pre Scale*.

Read-only parameters D80\* are in the menu *MONITOR>READINGS*

---

### Optional calculation of contents (volumetric) or flow measurement

By selecting a vessel profile or calculation using P113, a level measurement in D801 can be used to calculate a volume measurement or open channel flow rate that is then stored in D851. The programming (configuring) required for this is in “[Volumetric contents and flow measurement applications \(advanced users\)](#)” on page 51.

### Applying an optional low volume or flow rate cut-off action

The channel 1 output result in D851 can be forced to zero when it falls below a positive threshold, which is a percentage of the maximum flow. Enter the percentage in P117. By default, the setting is “None” to switch off this optional check.

This feature is particularly useful in an open channel flow application where a small standing or remaining liquid level in the channel would cause continued totalizing of flow when no actual flow exists. As a guide, set P117 to a positive value of 2% of maximum flow to overcome this problem.

---

#### Note

P117 is in the menu *SETUP>[CONTROLLER]>INPUT CHANNEL>Ch1 Low Cut-off*

---

### Applying optional damping to the control unit PV

P210 allows the to smooth out large steps in calculated values (D851).

---

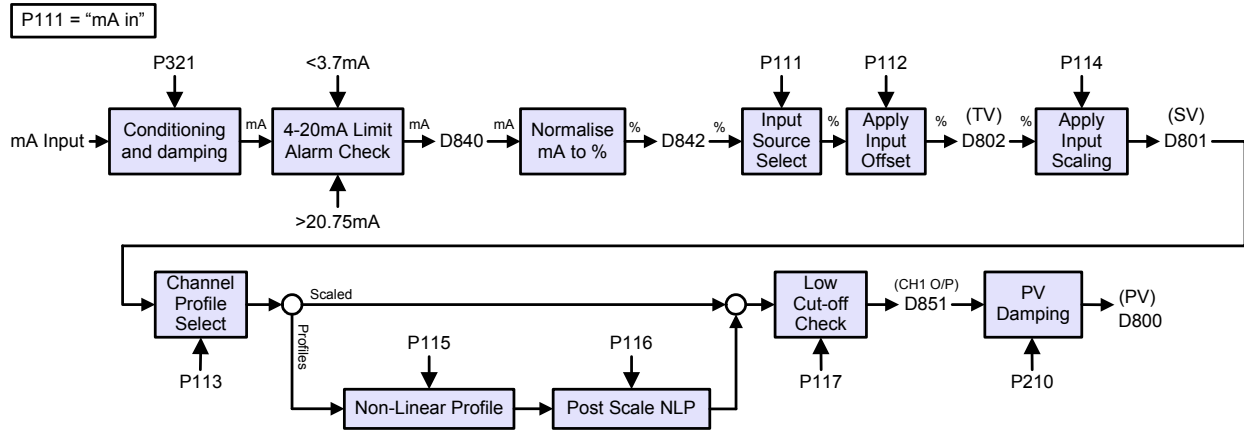
#### Note

P210 is in the menu *SETUP>[CONTROLLER]>OUTPUT>PV DAMPING>MCU PV DAMPING*

D851 is in the menu *MONITOR>DIAGNOSTICS>CHANNELS>Ch1 Output*

---

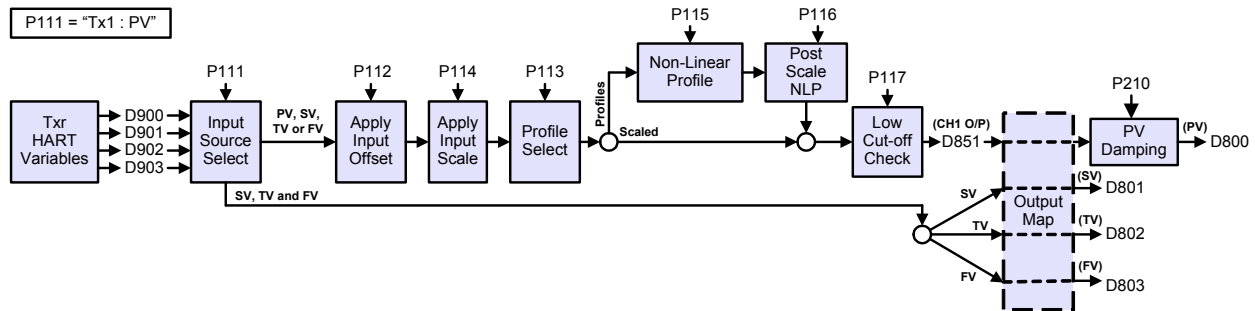
Figure 4-16. Transmitter Input Channel 1 for 4–20 mA Input



Optional damping of mA readings ten times a second:  $mA = [mA\_before + ((mAnow - mA\_before)/(1+10 \times P321))]$

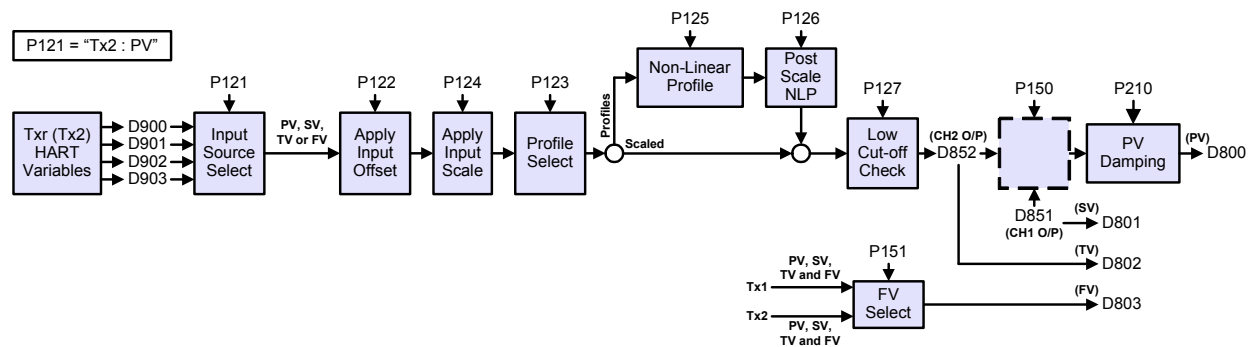
Optional damping of control unit PV ten times a second:  $D800 = [D800before + ((D800now - D800before)/(1+10 \times P210))]$

Figure 4-17. Transmitter Input Channel 1 for HART Input



Optional damping of control unit PV ten times a second:  
 $D800 = [D800before + ((D800now - D800before)/(1+10 \times P210))]$

Figure 4-18. Transmitter Input Channel 2 for HART Input



Optional damping of control unit PV ten times a second:  
 $D800 = [D800before + ((D800now - D800before)/(1+10 \times P210))]$

## 4.3.9 Programming Channel 1 for a HART input (advanced)

This section explains how to program (configure) the operation of the Input Channel 1 on the control unit when a HART transmitter is connected. Read this section together with the graphical overview in [Figure 4-17 on page 46](#).

---

### Note

Parameters from the HART transmitter are available on the control unit from the *SETUP* and *MONITOR* menus, selectable from the main menu.

---

## Essential parameter to program

### Set Input Channel 1 to receive HART digital data from a transmitter

1. Navigate to the Ch1 I/P Source parameter P111:  
*SETUP>[CONTROLLER>]INPUT CHANNEL>Ch1 I/P Source (on 3491/3)*  
*SETUP>[CONTROLLER>]PV CALCULATION>CHANNEL 1>Ch1 I/P Source (on 3492)*
2. Select **Tx1: PV** from the option list.

---

### Note

The built-in Application (App) Wizard is an easy-to-use configuration tool that can be used to automatically populate values and settings in the input channel parameters.

Navigate to: *SETUP>[CONTROLLER>]APPLICATION>>App Wizard*

Before using the App Wizard, the Input Channel 1 parameter P111 on the control unit must be set for a HART input. This is the factory default setting for P111.

---

## Optional parameters and how the HART data is processed

[Figure 4-17 on page 46](#) shows how the HART data is processed through Input Channel 1 and shows which parameters and processing stages affect the result from Input Channel 1.

### HART digital data is continuously read from the transmitter

The HART transmitter digitally communicates pre-calculated values of four HART variables Primary Variable (PV), Secondary Variable (SV), Tertiary Variable (TV), and Fourth Variable (FV) to the Rosemount 3490 Series Control Unit.

### Selection of a HART variable as source for further processing

Parameter P111 selects one of the four HART variables (PV, SV, TV, or FV) on the transmitter to be the source for further processing to get a result from Input Channel 1. The unselected HART variables are mapped to control unit D80x parameters (see [Figure 4-17 on page 46](#)).

---

### Note

In [Figure 4-17 on page 46](#), the selected source is the HART Primary Variable (PV). Alternatively, **Tx1: SV**, **Tx1: TV**, or **Tx1: FV** can be selected.

Read-only parameters D80\* are in the menu *MONITOR>READINGS*

---

---

### Applying the optional offset adjustment to the selected source

Parameter P112 is a positive, negative, or zero offset for adjustment of the selected HART variable. As an example, this feature may be used to handle a standing level in a tank.

---

#### Note

P112 is in the menu:

*SETUP>[CONTROLLER]>INPUT CHANNEL>Ch1 I/P Offset (on 3491/3) or  
SETUP>[CONTROLLER]>PV CALCULATION>CHANNEL 1>Ch1 I/P Offset (on 3492)*

---

### Applying the optional scaling and profiling to the selected source

If volumetric or flow values are in the selected HART variable, set parameter P113 to Scaled.

Use parameter P114 to convert (scale) the value into units that match the selected display units (P200, P201, P202 or P203, as applicable in *SETUP>[CONTROLLER]>DISPLAY*).

If level values are in the selected HART variable, parameter P113 can be set to Scaled if wanting just level measurement, and then use parameter P114 as described above. By selecting profile calculation using P113, a level value can be used to calculate a volumetric or open channel flow rate. The programming (configuring) required for this can be found in “Volumetric contents and flow measurement applications (advanced users)” on page 51.

---

#### Note

P113 and P114 are in the sub-menus/Ch1 Profile and/Ch1 Pre scale at:

*SETUP>[CONTROLLER]>INPUT CHANNEL (on 3491/3) or  
SETUP>[CONTROLLER]>PV CALCULATION>CHANNEL 1 (on 3492)*

---

### Applying an optional low-cut-off action

The channel 1 output result in D851 can be forced to zero when it falls below a positive threshold, which is a percentage of the maximum flow. Enter the percentage in P117. By default, the setting is “None” to switch off this optional check.

This feature is particularly useful in an open channel flow application where a small standing or remaining liquid level in the channel would cause continued totalizing of flow when no actual flow exists. As a guide, set P117 to a positive value of 2% of maximum flow to overcome this problem.

---

#### Note

P117 is in this menu:

*SETUP>[CONTROLLER]>INPUT CHANNEL>Ch1 Low Cut-off (on 3491/3) or  
SETUP>[CONTROLLER]>PV CALCULATION>CHANNEL 1>Ch1 Low Cut-off (on 3492)*

---

### Applying optional damping to the control unit P

P210 is for applying damping to smooth out big steps in calculated values in D851.

---

#### Note

P210 is in the menu *SETUP>[CONTROLLER]>OUTPUT>PV DAMPING>MCU PV DAMPING*

D851 is in the menu *MONITOR>DIAGNOSTICS>CHANNELS>Ch1 Output*

---



## 4.3.10 Programming Channel 2 for a HART input (Rosemount 3492 and advanced users only)

This section explains how to program (configure) the operation of the Input Channel 2 on the control unit when a HART transmitter is connected. Read this section together with the graphical overview in [Figure 4-18 on page 46](#).

---

### Note

Parameters from the HART transmitter are available on the control unit from the *SETUP* and *MONITOR* menus, selectable from the main menu.

---

## Essential parameter to program

### Set Input Channel 2 to receive HART digital data from a transmitter

1. Navigate to:  
*SETUP>[CONTROLLER>] INPUT CHANNEL>[CHANNEL 2>] Ch2 I/P Source*  
for the Ch2 I/P Source parameter P121.
2. Select **Tx2: PV** from the option list.

---

### Note

The built-in Application (App) Wizard is an easy-to-use configuration tool that can be used to automatically populate values and settings in the input channel parameters.

Navigate to: *SETUP>[CONTROLLER>]APPLICATION>App Wizard*

Before using the App Wizard, the Input Channel 2 parameter P121 on the control unit must be set for a HART input. This is the factory default setting for P121.

---

## Optional parameters and how the HART data is processed

[Figure 4-18 on page 46](#) shows how the HART data is processed through Input Channel 2 and shows which parameters and processing stages affect the result from Input Channel 2.

### HART digital data is continuously read from the transmitter

The HART transmitter digitally communicates pre-calculated values of four HART variables Primary Variable (PV), Secondary Variable (SV), Tertiary Variable (TV), and Fourth Variable (FV) to the control unit.

### Selection of a HART variable as source for further processing

Parameter P121 selects one of the four HART variables (PV, SV, TV, or FV) on the transmitter to be the source for further processing to get a result from Input Channel 2. The unselected HART variables are mapped to control unit D80x parameters.

---

### Note

In [Figure 4-18 on page 46](#), the selected source is the HART Primary Variable (PV). Alternatively, Tx2: SV, Tx2: TV, or Tx2: FV could have been selected.

Read-only parameters D80\* are in the menu *MONITOR>READINGS*

---

---

### Applying the optional offset adjustment to the selected source

P122 is a positive, negative, or zero offset for adjustment of the selected HART variable.

As an example, this feature may be used to accommodate a standing value of level in a tank. P122 is at *SETUP>[CONTROLLER>]PV CALCULATION>CHANNEL 2>Ch2 I/P Offset*.

### Applying the optional scaling and profiling to the selected source

If volumetric or flow values are in the selected HART variable, set parameter P123 to Scaled. Use parameter P124 to convert (scale) the value into units that match the selected display units (P200, P201, P202, or P203, as applicable in *SETUP>[CONTROLLER>]DISPLAY*).

If level values are in the selected HART variable, parameter P123 can be set to Scaled if wanting just level measurement, and then use parameter P124 as described in the paragraph above. By selecting profile calculation using P123, a level value can be used to calculate a volumetric or open channel flow rate. The programming (configuring) required for this can be found in “[Volumetric contents and flow measurement applications \(advanced users\)](#)” on page 51.

---

#### Note

P123 and P124 are in the sub-menus *>Ch2 Profile* and *>Ch2 Pre scale* at:  
*SETUP>[CONTROLLER>]PV CALCULATION>CHANNEL 2*

---

### Applying an optional low-cut-off action

The channel 2 output result in D852 can be forced to zero when it falls below a positive threshold, which is a percentage of the maximum flow. Enter the percentage in P127.

By default, the setting is “None” to switch off this optional check.

This feature is particularly useful in an open channel flow application where a small standing or remaining liquid level in the channel would cause continued totalizing of flow when no actual flow exists. As a guide, set P127 to a positive value of 2% of maximum flow to overcome this problem.

---

#### Note

P127 is in this menu *SETUP>[CONTROLLER>]PV CALCULATION>CHANNEL 2>Ch2 Low Cut-off*

---

### Applying optional damping to the control unit PV

P210 is used to apply damping to smooth out big steps in calculated values in D852.

---

#### Note

P210 is in the menu *SETUP>[CONTROLLER>]OUTPUT>PV DAMPING/MCU PV DAMPING*  
D852 is in the menu *MONITOR>DIAGNOSTICS/CHANNELS/Ch2 Output*

---

### 4.3.11 Volumetric contents and flow measurement applications (advanced users)

Sections 4.3.12 to 4.3.18 are for advanced users. They explain in-depth how the can be set-up to use level measurements to calculate:

- volumetric contents of a linear (uniform) shaped, covered vessel.
- volumetric contents of a non-linear (non-uniform) shaped, covered vessel.
- flow in non-linear (non-uniform) shaped channels, which can then be totalized.
- flow in pre-programmed open channel flumes, which can then be totalized.

The control unit has a built-in library of popular vessel profiles for volume of contents calculations and standard open channel profiles for flow calculations.

For other vessel and channel profiles, see “Set-up flow calculations for non-linear/non-uniform open channel profiles (advanced users)” on page 55.

### 4.3.12 Set-up the volumetric contents calculations for a popular linear/uniform vessel (advanced users)

The control unit can use level measurements to calculate the volumetric contents of a linear (uniform) shaped, closed vessel e.g. a vertical cylinder or rectangular vessel.

#### Essential parameters to program

##### Set-up volumetric contents calculations for a linear (uniform) vessel

Parameter P113 (or P123) must be set to Scaled, which establishes that the volume of the vessel contents is linearly derived from the liquid level measured by a transmitter (D801).

Parameter P114 (or P124) must be set to:

- maximum contents volume of the vessel (if 4–20 mA level transmitter is used)  
OR
- cross-sectional area of the vessel per unit of level measurement (if a HART level transmitter is used)

---

**Note**

For a 4–20 mA transmitter measuring level, the volume is calculated as:  
 $D851 = D801$  where  $D801 = (D802/100) \times P114$

For a HART level transmitter measuring level for Input Channel 1, the volume is calculated as:  $D851 = (P114 \times \text{Level measurement after offset } P112)$  is applied)

For a HART level transmitter measuring level for Input Channel 2, the volume is calculated as:  $D852 = (P124 \times \text{Level measurement after offset } P122)$  is applied)

P113 and P114 are in sub-menus/Ch1 Profile and/Ch1 Pre scale at:  
*SETUP>[CONTROLLER]>INPUT CHANNEL* (on 3491/3493) or  
*SETUP>[CONTROLLER]>PV CALCULATION>CHANNEL 1* (on 3492)

P123 and P124 are in sub-menus/Ch2 Profile and/Ch2 Pre scale at:  
*SETUP>[CONTROLLER]>PV CALCULATION>CHANNEL 2* (on 3492)

Read-only parameters D80\* are in the menu *MONITOR>READINGS*

---

### 4.3.13 Set-up the volumetric contents calculations for a popular non-linear/non-uniform shaped vessel (advanced users)

The control unit can use level measurements to calculate the volumetric contents of a non-linear (non-uniform) shaped, closed vessel.

The control unit has a library of popular non-linear vessel shapes:

- Horizontal cylinder with flat ends.
- Spherical vessel.
- Horizontal cylinder with domed ends.

Examples of popular applications are shown in [Figure 4-19 on page 54](#).

---

**Note**

For other vessel shapes, see “Set-up flow calculations for non-linear/non-uniform open channel profiles (advanced users)” on page 55.

---

## Essential parameters to program

### Select a popular non-linear vessel shape

Use P113 (or P123) to select a non-linear vessel shape from the option list. The control unit then automatically populates P115 (or P125) with data from the built-in library.

The volumetric contents calculations for these non-linear profiles require an input value over the range 0.0 to 1.0. Parameter P114 (or P124) is therefore used to convert (scale) the input signal to a value within the range 0.0 to 1.0 for the volume calculation.

---

**Note (Rosemount 3491/3493)**

P113, P114, and P115 are in the menus *SETUP>[CONTROLLER]>INPUT CHANNEL>Ch1 Profile,>Ch1 Pre scale, and >Ch1 NLP Data* respectively.

---

---

**Note (Rosemount 3492)**

P113, P114, and P115 are in these menus

*SETUP>[CONTROLLER]>PV CALCULATION>CHANNEL 1>Ch1 Profile,>Ch1 Pre scale, and >Ch1 NLP Data* (respectively)

P123, P124, and P125 are in these menus

*SETUP>[CONTROLLER]>PV CALCULATION>CHANNEL 2>Ch2 Profile,>Ch2 Pre scale, and >Ch2 NLP Data* (respectively)

---

**Setting P114 when a 4–20 mA level transmitter is connected**

The 4–20 mA level transmitter should ideally provide a mA signal that is already scaled for the full vessel height. P114 (or P124) can then be kept set at the default value of 1.0.

If the mA signal is not scaled for the full vessel height, P114 (or P124) must be programmed with a value to convert (scale) the mA signal to be in the range 0.0 to 1.0.

For example, if the maximum current is below 20 mA for a full vessel, say 18 mA, set  $P114 = 16 \times (18 - 4) = 1.143$

**Setting P114 (or P124) when a HART level transmitter is connected**

The maximum level measurement from the HART transmitter must be equal to the height of the liquid when the vessel is full.

The level measurement, after any input offset has been applied, must be re-scaled to the range 0.0 to 1.0 ready for input to the NLP calculation.

For example, if the level measurement range is 0.0 to 4.0, set  $P114 = (1.0/4.0) = 0.25$

**Setting P116 (or P126) to the maximum volume of the vessel**

Parameter P116 (or P126) must be programmed with the volume of the contents in a full vessel in the units chosen (P200, P201, P202, or P203, as applicable to the transmitter input channel).

The level measurement value, which is now in the range 0.0 to 1.0, is multiplied by the P116 (or P126) value to get the volume of the contents. The resulting volume is then passed to the optional low volume cut-off action. See pages 45, 48, or 50, as applicable.

---

**Note (Rosemount 3491/3493)**

P116 is in the menu *SETUP>[CONTROLLER]>INPUT CHANNEL>Ch1 Post Scale*

P20x parameters are in the menu *SETUP>[CONTROLLER]>DISPLAY*

---

**Note (Rosemount 3492)**

P116 is in this menu *SETUP>[CONTROLLER]>PV CALCULATION>CHANNEL 1>Ch1 Post Scale*

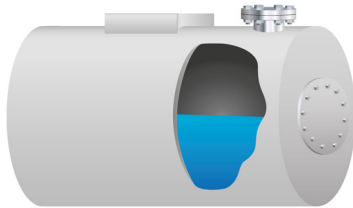
P126 is in this menu *SETUP>[CONTROLLER]>PV CALCULATION>CHANNEL 2>Ch2 Post Scale*

P20x parameters are in the menu *SETUP>[CONTROLLER]>DISPLAY*

---

**Figure 4-19. Popular Non-linear (Non-uniform) Vessel Applications**

P113/P123 = Horiz Cyl Flat  
(Horizontal Cylinder, Flat Ends, Slope Ignored)



P114/P124 = (1.0/Diameter of tank)  
P115/P125 = Plotted non-linear profile of tank  
P116/P126 = Full volume of ideal cylindrical tank

P113/P123 = Spherical



P114/P124 = (1.0/Diameter of tank)  
P115/P125 = Plotted non-linear profile of tank  
P116/P126 = Full volume of ideal spherical tank

P113/P123 = Conical



P114/P124 = (1.0/Maximum level)  
P115/P125 = Plotted non-linear profile of tank  
P116/P126 = Full volume of ideal conical tank

**Note**

The non-linear profile (NLP) is plotted automatically when editing P113/P123 manually or when using the Application (App) Wizard, except for the Conical NLP.

Menu: *SETUP>[CONTROLLER]>APPLICATION>App Wizard*

P115/P125 is plotted with a simple cone if P113/P123 is set to Conical manually.

## 4.3.14 Set-up flow calculations for non-linear/non-uniform open channel profiles (advanced users)

The Rosemount 3490 Series Control Unit can use level measurements to calculate flow in open channels, which can then be totalized. The control unit has a library of popular non-linear profiles for flow:

- Flume 3/2
- V-Notch 5/2
- Manning formula

Figure 4-20 on page 56 shows a typical open channel flow structure.

### Essential parameters to program

---

#### Note

P200 (PV units) must be changed from % to the required units of measurement. The parameter P200 is in the menu *SETUP>[CONTROLLER]>DISPLAY*

---

#### Select a standard non-linear open channel profile

Use P113 (or P123) to select **V Notch (5/2)**, **Flume (3/2)** or **Manning** from the option list. The control unit then automatically populates P115 (or P125) with data from the built-in library.

The flow calculations for these non-linear profiles require an input value over the range 0.0 to 1.0. Parameter P114 (or P124) is therefore used to convert (scale) the input signal to be a value within the range 0.0 to 1.0 for the flow calculation.

---

#### Note (Rosemount 3491/3493)

P113, P114, and P115 are in the menus *SETUP>[CONTROLLER]>INPUT CHANNEL>Ch1 Profile,>Ch1 Pre scale, and>Ch1 NLP Data* respectively.

---

---

#### Note (Rosemount 3492)

P113, P114, and P115 are in these menus:

*SETUP>[CONTROLLER]>PV CALCULATION>CHANNEL 1>Ch1 Profile,>Ch1 Pre scale, and>Ch1 NLP Data* (respectively)

P123, P124, and P125 are in these menus:

*SETUP>[CONTROLLER]>PV CALCULATION>CHANNEL 2>Ch2 Profile,>Ch2 Pre scale, and>Ch2 NLP Data* (respectively)

---

When using the App Wizard, select **V-Notch Weir (5/2)**, **Flume/Weir (3/2)**, or **Manning** at the prompt for a profile. This populates parameter P113 (or P123).

### Setting P114 (or P124) when a 4–20 mA level transmitter is connected

The 4–20 mA level transmitter should ideally provide a mA signal that is already scaled for the full level range expected in the flow channel. P114 (or P124) can then be kept set at the default value of 1.0.

If the mA signal is not scaled for the full level range of the channel, P114 (or P124) must be programmed with a value to convert (scale) the mA signal to be a value in the range 0.0 to 1.0. For example, if the maximum current is below 20 mA for a full channel, say 12 mA, set  $P114 = 16 \times (12 - 4) = 2$ .

### Setting P114 (or P124) when a HART level transmitter is connected

The maximum level measurement from the HART transmitter must be equal to the height of the liquid when the channel is full.

The level measurement, after any input offset has been applied, must be re-scaled to the range 0.0 to 1.0 ready for input to the NLP calculation.

For example, if the level measurement range is 0.0 to 1.5 m, set  $P114 = (1.0/1.5) = 0.667$

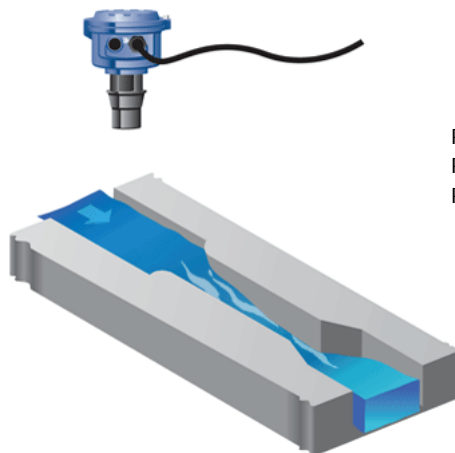
### Setting P116 (or P126) to the maximum flow expected in the channel

Finally, parameter P116 (or P126) must be programmed with the maximum flow expected in the channel, which will occur at the maximum liquid level in the channel.

The control unit Primary/Process Value (D800) for the flow rate is derived by applying the normalized transmitter input (range 0.0 to 1.0) to the profile, and then converting (scaling) by parameters P114 and P116 (or P124 and P126).

### Figure 4-20. Non-linear Open Channel Profile Example

P113 = "Flume (3/2)" (using 3/2 power law) (To BS3680)



P114 =  $(1.0/\text{Maximum height of flow in channel})$   
P115 = Plotted non-linear profile of channel  
P116 = Maximum flow at maximum flow height



## 4.3.15 Set-up open channel flow calculations for pre-programmed flat, parabolic, and Parshall flumes (advanced users)

The Rosemount 3490 Series Control Unit (“control unit”) has a library of data to set-up open channel flow calculations with flat, parabolic, and Parshall flumes.

### Essential parameters to program

---

#### Note

Flow calculations require the transmitter input channel(s) to be providing continuous level measurements (see [page 42](#)). Also, P200 (control unit PV units) must be changed from the default % to the required flow measurement units.

---

#### Select a flume

Use parameter P113 (or P123) to select a flume from the option list. The control unit then automatically populates parameter P115 (or P125) with data from the built-in library.

The control unit uses P115 (or P125) in a different way to when a plotted profile is required. For flat and parabolic flumes, it is used to store values for the flow calculation in cubic metres per hour (m<sup>3</sup>/hour) where flow Q is given by:

$$Q = k \times (h \times \text{mul})^{\text{Pwr}}$$

where h is the height of channel flow, and k and Pwr are factors.

When a **flat** or **parabolic** flume is selected, P115/P125 (Pwr, k, and mul factors) and P116/P126 are populated for measuring flow in metric units of cubic metres per hour (m<sup>3</sup>/hour).

When a **Parshall** flume is selected, P115/P125 (Pwr, k, and mul factors) and P116/P126 are populated for measuring flow in imperial units of US gallons per minute (GPM).

For flow measurement in alternative units, with automatic scaling of the control unit PV, use the App Wizard (menu: *SETUP>[CONTROLLER]>APPLICATION>App Wizard*). The choice of units offered depends on whether the transmitter is measuring in metric or imperial units. When using the App Wizard, select **Parshall** or **Vlarem** at the prompt for a profile, and the next prompt then allows selection of the pre-defined calculation e.g. Flume Flat 1.

---

#### Note

This modified version of the standard “ $Q=k \times h^{\text{Pwr}}$ ” flow formula allows the use of a multiplier (mul) factor. This extra factor can account for irregularities or errors in the flow structure, but should only be manually entered where errors can be quantified.

Pre-defined values for factors k, mul and Pwr of each standard flow structure in the library are shown in [Table 4-1 on page 59](#) and [Table 4-2 on page 60](#). Depending on the derivation of k and the level units, the h value is scaled by a different mul factor.

Experienced users can manually enter the values of k, mul or Pwr for applications. To edit these, set P113/P123 to be “Flume \* \* \*” and then edit k, mul or Pwr at parameter P115/P125. Use the **down arrow** button to display the mul value.

---

When a flume is selected from this list, the control unit also populates parameters P400 and P401 (current output span), P530 (totalizer factor), and P531 (totalizer units of m<sup>3</sup> or galx100).

---

**Note (Rosemount 3491/3493)**

P113, P115, and P116 are in the menus *SETUP>[CONTROLLER]>INPUT CHANNEL>Ch1 Profile,>Ch1 NLP Data, and>Ch1 Post Scale* respectively

---

**Note (Rosemount 3492)**

P113, P115, and P116 are in the menus *SETUP>[CONTROLLER]>PV CALCULATION>CHANNEL 1>Ch1 Profile,>Ch1 NLP Data, and>Ch1 Post Scale* respectively

P123, P125, and P126 are in the menus *SETUP>[CONTROLLER]>PV CALCULATION>CHANNEL 2>Ch2 Profile,>Ch2 NLP Data, and>Ch2 Post Scale* respectively

---

### 4.3.16 Set-up Kindsvater Shen (V-notch ISO1438) flow calculations

P113/P123 = “Kindsvater Shen”

This flow calculation requires just the angle of the V-notch to be entered in parameter P115 (or P125) to calculate a flow value over the weir. The head level measurement needs to be in units of metres and the resultant flow value is in cubic metres per second (m<sup>3</sup>/s).

---

**Note**

Flow calculations require the transmitter input channel(s) to be providing continuous level measurements (see [page 42](#)). Also, P200 (control unit PV units) must be changed from the default % to the required flow measurement units.

When using the App Wizard, select **V-Notch (ISO1438)** at the prompt for a profile. The App Wizard allows the selection of alternative flow units for the output result.

---

### 4.3.17 Set-up exponential flow law calculations

P113/P123 = “Flow calculation”

Exponential laws are supported by selecting this profile option, and manually entering values of k-factor, power, and mul into parameters P115 (or P125).

The output is derived from the input value using:  $Q = k \times (\text{mul} \times \text{Input})^{\text{pwr}}$

For example, consider an application with a rectangular weir and level measurements in ft. When the flow rate (Q) is 2000 GPM, the gauged head (Input) is known to be 0.792 ft. Terms mul is 1.000 and pwr is 1.5 for a rectangular weir.

Therefore, k is calculated as  $Q/(\text{mul} \times \text{Input})^{\text{pwr}} = 2000/(1 \times 0.792)^{1.5} = 2837.5$

---

**Note**

Flow calculations require the transmitter input channel(s) to be providing continuous level measurements (see [page 42](#)). Also, P200 (control unit PV units) must be changed.

---

**Table 4-1. Pre-programmed Flow Calculation Factors (Vlarem – Flat and Parabolic Flumes)**

Profile (P113 or P123)	k (P115 or P125)	Pwr (P115 or P125)	Mul (P115 or P125)	P116 (or P126)
Flume Flat 1	0.1347877	1.5	0.01	3600.0
Flume Flat 2	0.1782664	1.5	0.01	3600.0
Flume Flat 3	0.3134177	1.5	0.01	3600.0
Flume Flat 4	0.5417157	1.5	0.01	3600.0
Flume Flat 5	0.8111058	1.5	0.01	3600.0
Flume Flat I	0.1322	1.5	0.01	3600.0
Flume Flat II	0.1777	1.5	0.01	3600.0
Flume Flat III	0.21758	1.5	0.01	3600.0
Flume Flat III bis	0.32835	1.5	0.01	3600.0
Flume Flat III ter	0.272	1.5	0.01	3600.0
Flume Flat IV	0.3521726	1.5	0.01	3600.0
Flume Flat V	0.442932	1.5	0.01	3600.0
Flume Flat V bis	0.4005	1.5	0.01	3600.0
Flume Flat VI	0.4990569	1.5	0.01	3600.0
Flume Flat VII	0.6237	1.5	0.01	3600.0
Flume Flat VIII	0.88116	1.5	0.01	3600.0
Flume Flat VIII bis	0.798	1.5	0.01	3600.0
Flume Flat IX	1.065186	1.5	0.01	3600.0
Flume Flat IX bis	0.8148	1.5	0.01	3600.0
Flume Flat X	1.3222761	1.5	0.01	3600.0
Flume Flat X bis	1.609	1.5	0.01	3600.0
Flume Flat X ter	1.064884	1.5	0.01	3600.0
Flume Flat XI	1.65099	1.5	0.01	3600.0
Flume Para 1	0.39885	2.3	0.01	3600.0
Flume Para 2	0.44187	2.3	0.01	3600.0
Flume Para 3	0.46362	2.2	0.01	3600.0
Flume Para 4	0.54419	2.2	0.01	3600.0
Flume Para 5	0.61851	2.1	0.01	3600.0
Flume Para 6	0.71726	2.1	0.01	3600.0
Flume Para 7	0.77152	2.1	0.01	3600.0
Flume***	(User)	(User)	(User)	3600.0

**Note**

Vlarem flumes most commonly are used for open channel flow applications in Belgium. When selecting a Vlarem flume from the above list, the PV flow units are automatically set to m<sup>3</sup>/hr and the display configured to show the SV (level in cm on top line) and totalizer in m<sup>3</sup> (on bottom line). The transmitter base units must be set to metres.

**Table 4-2. Pre-programmed Flow Calculation Factors (Parshall Flumes)**

Profile (P113 or P123)	Pwr (P115 or P125)	k (P115 or P125)	mul (P115 or P125)	P116 (or P126)
Parshall 1-in	1.550	151.7	1.0	1.0
Parshall 2-in	1.550	303.4	1.0	1.0
Parshall 3-in	1.547	445.2	1.0	1.0
Parshall 6-in	1.580	924.5	1.0	1.0
Parshall 9-in	1.530	1378	1.0	1.0
Parshall 1 ft	1.522	1795	1.0	1.0
Parshall 1.5 ft	1.538	2693	1.0	1.0
Parshall 2 ft	1.550	3590	1.0	1.0
Parshall 3 ft	1.566	5386	1.0	1.0
Parshall 4 ft	1.578	7181	1.0	1.0
Parshall 5 ft	1.587	8976	1.0	1.0
Parshall 6 ft	1.595	10770	1.0	1.0
Parshall 8 ft	1.607	14360	1.0	1.0
Parshall 10 ft	1.600	17672	1.0	1.0
Parshall 12 ft	1.600	20982	1.0	1.0

### 4.3.18 Using a plotted profile for calculating volume or flow

When parameter P113 (or P123) is set to “special”, the parameter P115 (or P125) is used for defining a 20-point look-up table that represents the profile of a vessel or open flow channel that is not in the control unit library.

**Note**

When using the App Wizard, select **20 point look-up** at the prompt for a profile.

Each point is a Cartesian co-ordinate (X, Y). The X value represents a level, and the Y value is the corresponding volume or flow rate. The X points are at user-defined intervals, typically in equal increments (5%) of maximum height.

These X points may be entered as levels (in the same units as the transmitter) and the Y points entered as the corresponding volumes or flow rates for those levels (in the same units as selected for the control unit Primary/Process Value). See [Figure 4-21 on page 61](#), right-hand graph.

Parameters P114 (or P124) and P116 (or P126) need only be set to 1.0 for this method. The volume or flow rate for the control unit PV is then derived from the plotted profile using the live level measurements and interpolation between the plot points.

The X and Y points can also be converted (normalized) to be in the range 0.0 to 1.0 before being entered manually (see [Figure 4-21 on page 61](#), left-hand graph). A value is then derived from the plotted profile using the live level measurements that are already converted (normalized) by the Transmitter Input Channel processing. Parameter P116 (or P126) is then applied to the derived value to obtain the volume or flow rate for the control unit PV.

**Note (Rosemount 3491/3493)**

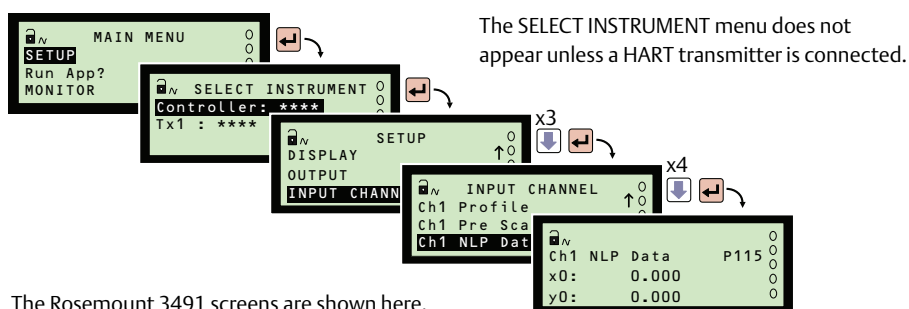
P113 to P116 are in the menus *SETUP>[CONTROLLER]>INPUT CHANNEL>Ch1 Profile,>Ch1 Pre scale,>Ch1 NLP Data, and>Ch1 Post Scale*

**Note (Rosemount 3492)**

P113 to P116 are in the menus *SETUP>[CONTROLLER]>PV CALCULATION>CHANNEL 1>Ch1 Profile,>Ch1 Pre scale,>Ch1 NLP Data, and>Ch1 Post Scale*

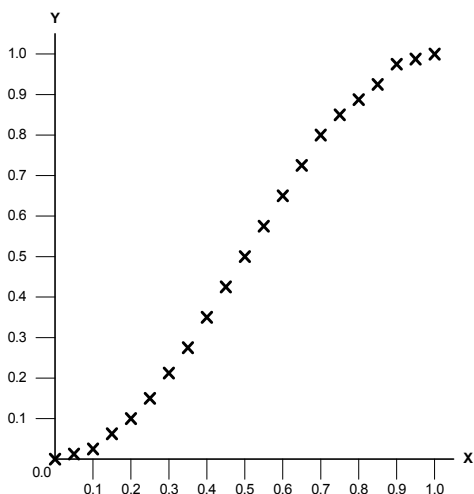
P123 to P126 are in the menus *SETUP>[CONTROLLER]>PV CALCULATION>CHANNEL 2>Ch2 Profile,>Ch2 Pre scale,>Ch2 NLP Data, and>Ch2 Post Scale*

**Figure 4-21. Navigation to P115 Parameter Screen**

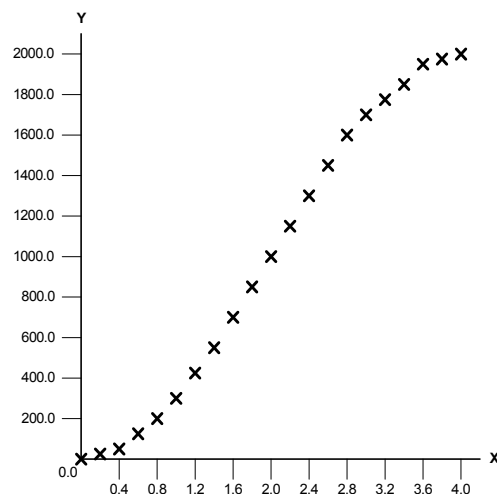


**Figure 4-22. Example Plotted Profile for Spherical Vessel**

Normalized units (range 0.0 to 1.0)



Actual level (X) and volume (Y) units



---

## How to edit the 'look-up' table (P115/P125)

1. Parameter P113/P123 must first be set to be “Special”.
2. Navigate to the P115/P125 parameter screen (see [Figure 4-21 on page 61](#)).
3. Select the **red (enter)** button once to select point 0.  
Before editing, you can use the **down arrow** button to page down to another point or use the **Esc** button to return to the menu.
4. With **X0:** highlighted, use the **right arrow** button to move across to the X0 value.
5. Use the **up arrow** or **down arrow** buttons to edit the X0 value.
6. Select the **red (enter)** button once to confirm the new X0 value.
7. With **Y0:** highlighted, use the **right arrow** button to move across to the Y0 value.
8. Use the **up arrow** or **down arrow** buttons to edit the Y0 value.
9. Select the **red (enter)** button once to confirm the new Y0 value.
10. To edit X0 and Y0 again, return to step 2. Otherwise, use the **down arrow** button to display the page with X1 and Y1 or use the **Esc** button to return to the menu.
11. Repeat for all points in the profile.  
An X point with 0.0 terminates the profile (unless it is point X0, Y0).

---

### Note

The Esc button can be used during editing to abort and restore the original values; it needs to be selected again to move back to the 'X' or 'Y' text.

---

## 4.3.19 Digital inputs IN1 and IN2

Digital inputs IN1 and IN2 can be programmed to perform an action whenever they are triggered.

---

### Note

See for “[Digital control voltage-free contact inputs](#)” on [page 22](#) terminal connections.

Digital input IN1 and IN2 statuses are shown on the left-hand side of the display:  
o = inactive or ▶ = active.

Parameter D835 shows the statuses of the inputs: active (1) or inactive (0).  
First digit represents IN1. The second digit represents IN2.

---

## How to allocate an action to IN1 or IN2

1. Navigate to:  
*SETUP>[CONTROLLER>]DIGITAL INPUT>DIGITAL INPUT 1 or >DIGITAL INPUT 2*
2. Use the action selection parameter P340 (for IN1) or P345 (for IN2) to select a trigger action from the option list. [Table 4-3](#) lists all the options and explains their purpose.
3. Use the delay parameter P341 (for IN1) or P346 (for IN2) if a delay is needed before an action is performed. The setting format is m:s (minutes and seconds).
4. Use the on-state parameter P342 (IN1) or P347 (IN2) to change the logic of the input for triggering an action. Options are:  
**Closed** (default) – action is triggered when the voltage-free contact is closed, or  
**Open** – action is triggered when the voltage-free contact is open.

**Table 4-3. Digital Input Actions**

Action	Action that occurs while digital input is triggered
Free	Digital Input has no allocated action. This is the factory default setting.
Alarm <sup>(1)</sup>	Forces an alarm condition, which is indicated if specified in the <i>OUTPUT&gt;ALARM</i> menu.
Fault <sup>(2)</sup>	Forces an fault condition, which is indicated if specified in the <i>OUTPUT&gt;FAULT</i> menu.
Program mode	Changes the control unit operating mode to Program (open padlock).
Hold totalizer	Freezes the internal totalizer.
Hold MCU PV	Prevents the control unit PV value (D800) from being updated.
Suppress Alarm	If the digital input is active when an alarm condition is present, a message is displayed indicating the alarm is being overridden. Alarm relay is held on.
Display Msg <sup>(3)</sup>	Displays a user-defined message (P241).
Log Input <sup>(4)</sup>	When the next data logging interval elapses, flag the data logged as a 'bad sample' if the digital input has been active.
Pump-down <sup>(5)</sup>	Invoke a pump-down operation.
Lock Params	Prevent 'P' prefixed parameters from being edited.
Protect totalizer 1	Prevent totalizer 1 from being reset.
Reset totalizer 2 <sup>(6)</sup>	Reset totalizer 2.

1. See "Set-up alarms" on page 92 for information about alarms and features they affect.
2. See "Fault mode relay" on page 83 for how to indicate fault conditions using a relay output.
3. *SETUP>[CONTROLLER>]APPLICATION>Message*.
4. Data logging is available on the Rosemount 3493.
5. The pump-down feature available on the Rosemount 3491 and Rosemount 3492. See "Pump-down (Rosemount 3491 and 3492 only)" on page 86 for further information.
6. Totalizer 2 is available on the Rosemount 3492 and Rosemount 3493.

## 4.3.20 Data logging on the Rosemount 3493

The Rosemount 3493 can record (log) up to 7000 events at regular intervals.

- Each event is a parameter value. The parameter to be recorded (logged) is the one selected for the middle section of the display (see [Figure 2-4 on page 7](#)), which is typically the control unit Primary/Process Variable (PV).
- If the Rosemount 3493 has been set-up to totalizer, the daily value of the totalizer at midnight is also logged. Up to 60 midnight totalized values are held in memory. This is in addition to the memory for 7000 events.
- The maximum value of the parameter in each 24-hour period is also logged.

The Rosemount 3493 gives a visual indication that logging of data is underway by flashing “LOG” in the bottom, right-hand corner of the *Full PV display*.

---

### Note

Logged data may be downloaded at any time using the RS232 data download socket, supplied with a Rosemount 3493 (see “[RS232 connections](#)” on page 22), and Rosemount LOG-VIEW software running on a Windows PC.

See “[Serial communications](#)” on page 105 for RS232 communication parameters.

---

### Menu: **SETUP>[CONTROLLER>]LOGGING**

**P590** Log Interval (Default is 15 minutes)

- The logging interval is the period over which the *parameter-to-be-logged* is sampled every five seconds and then averaged at the end. The averaged value is then logged.

An interval value of 15 minutes logs the averaged value at 15-minute intervals, which equates to 50 days elapsed time.

**P591** Fast Log (Fast log mode) (Default is 0)

- If the parameter-to-be-logged value is higher than a user-entered value (P591), the 3493 automatically moves to a fast log mode.

The parameter-to-be-logged is then logged once every minute until the logged value is less than P591. Fast logged values are tagged for easy identification when examining logged data.

**P593** Low Mem Alarm (Default is 0%)

- An alarm can be raised to indicate when the unused memory falls to below a user-defined percentage (P593). See “[Set-up alarms](#)” on page 92 for selecting if this alarm is indicated by a relay output, driving the output current to a set level, or both.

When the memory is full, logged data is either overwritten or the data logging stops, as determined by parameter P592.

- Parameter D846 shows the percentage of free memory remaining for data logging.

**P592** Data Overwrite (Default is “On”)

- After the logging memory is full, there is a choice to continue data logging and overwrite the oldest data (On) or to stop data logging (Off).



## Starting, stopping and resetting the logger

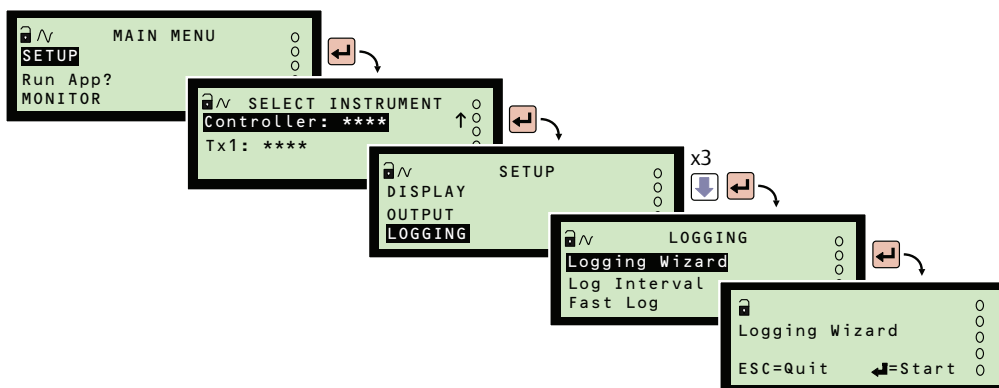
To start data logging, change the logging interval (P590) from 0 to the interval required. Logging is now activated.

Changing the logging interval from 0 to a logging interval in minutes will clear all data logged (i.e. clear the 7000 event-memory plus the 60 midnight totals).

Changing the log interval from a non-zero interval (e.g. 15 minutes) to a new non-zero interval (e.g. five minutes) will clear the 7000 event-memory).

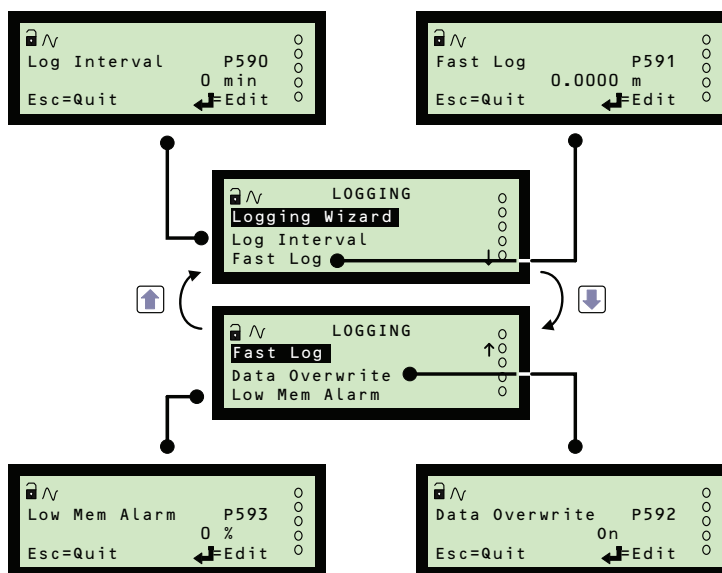
To stop data logging, change the logging interval (P590) back to zero. Note, when the data logging interval is re-set, all logged data will be cleared from the logging memory.

Figure 4-23. Navigation to LOGGING Menu



The *SELECT INSTRUMENT* menu does not appear unless a HART transmitter is connected.

Figure 4-24. Menu Map for LOGGING Screens



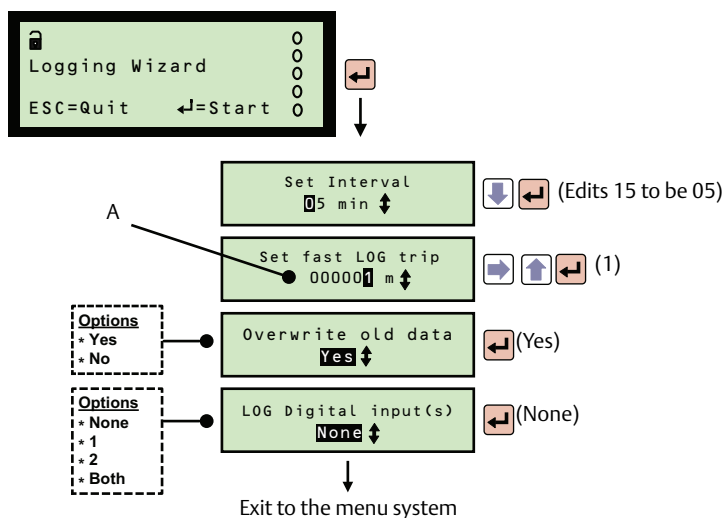
## Using the Logging Wizard for data logging of level measurements

The Logging Wizard is the easiest way to set-up the data logging feature after the main application is set-up.

As an example, consider data logging of the control unit PV value (D800) every five minutes; the control unit PV is a level measurement in metres. When that level measurement is at one metre or more, the Fast Log mode is required to activate. When the memory is full, old data is overwritten.

1. Navigate to the Logging Wizard screen in the menu system (Figure 4-23 on page 65).
2. Start the Logging Wizard by selecting the **red (enter)** button *once*. Change the operating mode to **Program** (Figure 4-12 on page 37), if prompted.
3. Work through the wizard prompts (Figure 4-25) until the menu system re-appears. Key presses for the wizard example are provided alongside the prompts.
4. Change the operating mode to **Run App** (Figure 4-12 on page 37).
5. Select the **Esc** button repeatedly until the *Full PV display* appears. In the bottom-right of the display is now the word LOG, flashing to indicate that data logging is operating.

Figure 4-25. Logging Wizard Example with Data Logging of Level Measurements



A. Measurement units for this wizard are dependent on control unit PV display units selected using P200.

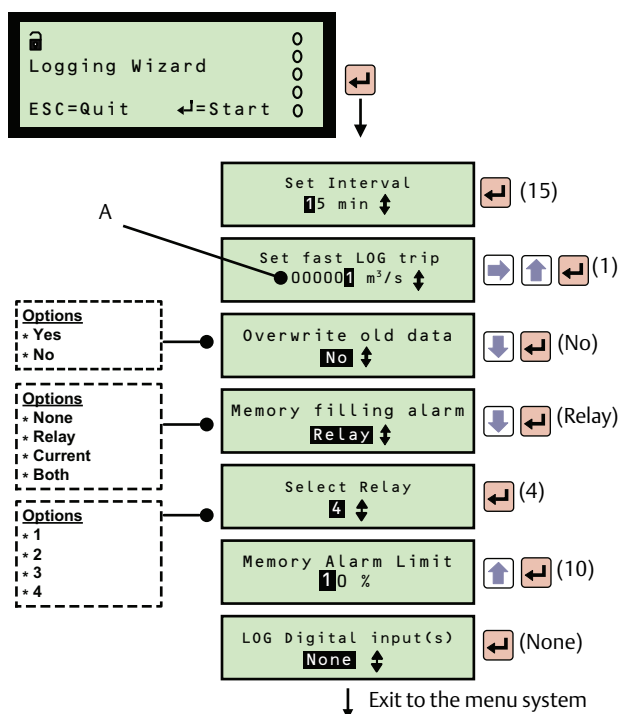
## Using the Logging Wizard for data logging of flow measurements

The Logging Wizard is the easiest way to set-up the data logging feature after the main application is set-up.

As an example, consider data logging of the control unit PV value (D800) every 15 minutes; the control unit PV is a flow measurement in cubic metres per second. When the flow measurement is at 1 cubic metre per second or more, the Fast Log mode is required to activate. When the memory is at 90% of capacity, a relay is activated instead of overwriting old data.

1. Navigate to the Logging Wizard screen in the menu system (Figure 4-23 on page 65).
2. Start the Logging Wizard by selecting the **red (enter)** button *once*. Change the operating mode to **Program** (Figure 4-12 on page 37), if prompted.
3. Work through the wizard prompts (Figure 4-26) until the menu system re-appears. Key presses for the wizard example are provided alongside the prompts.
4. Change the operating mode to **Run App** (Figure 4-12 on page 37).
5. Select the **Esc** button repeatedly until the *Full PV display* appears. In the bottom-right of the display is now the word LOG, flashing to indicate that data logging is operating.

Figure 4-26. Logging Wizard Example with Data Logging of Flow Measurements



A. Measurement units for this wizard are dependent on control unit PV display units selected using P200.

## 4.3.21 Set-up the current output

The current output is for transmitting the control unit PV value (D800) as a 4–20 mA signal. The output is calculated by using the range values of parameters P400 and P401.

Consider a control unit PV value of 5 metres and the PV range is 0 to 10 metres:

- 0 metres is represented by a 4 mA signal (0%)
- 5 metres is represented by a 12 mA signal (50%)
- 10 metres is represented by 20 mA signal (100%)

Therefore, the Current Output would output the PV value five metres as a 12 mA signal.

---

### Note

The current output is frozen while the control unit is in the program operating mode.

---

### Menu: **SETUP>[CONTROLLER>]OUTPUT>CURRENT OUTPUT**

- P400** Low Range Val (Factory default is 0.0)
- This is the minimum control unit PV value represented by 4 mA.
- P401** Up Range Val (Factory default is 100.0)
- This is the maximum control unit PV value represented by 20 mA.
- P402** Alarm Actions (Factory default is 3.6 mA)
- Optional for determining how an alarm, if selected in the **ALARM** menu, is indicated on the Current Output. Options for P402 are:
    - 3.6 mA – fix current output to 3.6 mA to force a low current limit alarm.
    - 3.75 mA – fix current output to 3.75 mA to force a low current limit alarm.
    - Hold – freeze the current output at the present value.
    - 21 mA – fix current output to 21 mA to force high current limit alarm.
    - 21.75 mA – fix current output to 21.75 mA to force high current limit alarm.
    - 22.5 mA – fix current output to 22.5 mA to force high current limit alarm.
- See also [Table 4-8 on page 88](#) for a summary of reporting methods for Alarms.

---

### Note

The 3.75 mA and 21.75 mA options are the Rosemount standard.  
The 3.6 mA and 22.5 mA options are the NAMUR NE43 standard.

There is another alarm condition when the current output has reached the linear limit i.e. saturated. For the Rosemount Standard, this is  $\leq 3.9\text{mA}$  or  $\geq 20.8\text{mA}$ . For the NAMUR NE43 standard, this is  $\leq 3.8\text{mA}$  or  $\geq 20.5\text{mA}$ .

---

- P404** mA Mode (Factory default is “Instantaneous”)
- On the Rosemount 3493, this optional parameter is for assigning the Current Output to follow a rolling average of the calculated control unit PV (typically flow). To do this, select the **Rolling** option.

The time period for the rolling averaging is set using P590, which is also for setting the logging interval (see “Data logging on the Rosemount 3493” on page 64).

- P210** MCU PV Damping (Factory default is 0)
- This is used to apply damping to smooth out big steps in calculated control unit Primary/Process values (PV).

## 4.3.22 Set-up the relays

### An overview of the relay functions

Relays 1 to 4 are normally On Point/Off Point control relays which may be used to start/stop pumps or open/close valves at different level points. The relay energizes at one level point and then de-energizes at a different level point.

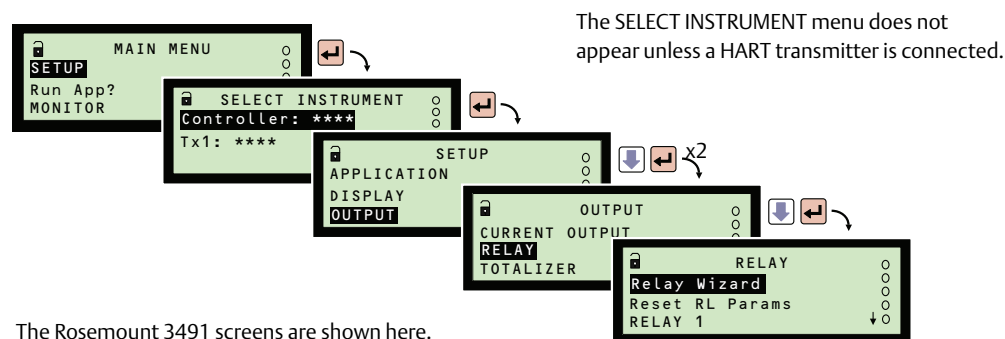
Relays can also be programmed as Out-of-limit Alarm relays which energize between defined points and de-energize outside those points. The relays may also be programmed to perform auto-sequences and auxiliary functions such as pump-down operations, pump rotations to equalize wear, and de-sludge/cleaning. For further details, see “Other relay modes” on page 71.

Relay 5 is normally a Fail-safe Fault relay but may be re-allocated to another duty.

### How to start and use the Relay Wizard

Relays can be programmed easily using the Relay Wizard, accessible by navigating to the RELAY menu. The Relay Wizard also forms a part of the Application (App) Wizard.

Figure 4-27. Navigating to the RELAY Screen



### Understanding the relay status icons on the display

The relay status icons on the Full PV display have the following meanings:

- ▶ = Relay is energized
- 0 = Relay is de-energized
- A = Alarm relay (see page 92 about alarms)
- S = Sampler relay
- T = Totalizing relay

---

## How to reset the relay parameters only to factory defaults

To reset all relay parameters to their factory defaults, do the following:

1. Navigate to *SETUP>[CONTROLLER]>OUTPUT>RELAY>Reset RL param*
2. If you wish to proceed, select the **red (enter)** button once. (Otherwise, use the **Esc** button to exit to the RELAY menu).
3. Wait until the “Please wait...” message disappears.
4. Select the **Esc** button to exit to the RELAY menu.

---

### Note

Setting the relays to their factory default state in this way does NOT reset any other parameters to their default state.

---

## How to set-up an on/off point control relay

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### Note

Relays are frozen while the control unit is in **Program** mode, preventing all relay operations apart from Totalizer and Sampler relays.

---

Relay outputs 1 to 4 can be programmed to be an On/Off Point control relay.

**Menus: SETUP>[CONTROLLER]>OUTPUT>RELAY>RELAY 1,>RELAY 2, etc.**

Relay 1 (RL1)

- When relay RL1 mode (P410) is Set Point:  
relay RL1 is energized at P411 (on point) and de-energized at P412 (off point)

Relay 2 (RL2)

- When relay RL2 mode (P420) is Set Point:  
relay RL2 is energized at P421 (on point) and de-energized at P422 (off point)

Relay 3 (RL3)

- If relay RL3 mode (P430) is Set Point:  
relay RL3 is energized at P431 (on point) and de-energized at P432 (off point)

Relay 4 (RL4)

- If relay RL4 mode (P440) is Set Point:  
relay RL4 is energized at P441 (on point) and de-energized at P442 (off point)

In a basic emptying application, the On Point (e.g. P411) is programmed to be greater than the Off Point (e.g. P412). The Set Point relay energizes when the control unit PV (D800) exceeds the On Point and de-energizes when the PV value drops below the Off Point.

In a basic filling application, the On Point (e.g. P411) is programmed to be less than the Off point (e.g. P412). The Set Point relay energizes when the control unit PV (D800) falls below the On point and de-energizes when the PV value rises above the Off Point.

There are set point relays modes for the control unit SV value (D801), TV value (D802) and FV value (D803). For details of these D80\* parameters, see “Optional change: transmitter input channel settings (advanced users)” on page 42.

## Relay safeguard options

**Menus:** SETUP>[CONTROLLER]>OUTPUT>RELAY>RELAY 1,/RELAY 2, etc.

**P413** RL1 Min On (Factory default: 0:00 m:s)

Defines the minimum time (minutes and seconds) that relay RL1 will stay energized before de-energising. This is an optional override (safeguard) to allow sufficient time for connected equipment to respond.

**P414** RL1 Max On Factory default: 0:00 m:s)

Defines the maximum time (minutes and seconds) that relay RL1 will stay energized before de-energising. This is an optional override (safeguard) to prevent overuse of connected equipment.

**P415** RL1 Min Off (Factory default: 0:00 m:s)

Defines the minimum time (minutes and seconds) that relay RL1 will stay de-energized before energising. This is an optional override (safeguard) to avoid overuse of connected equipment.

**P423** to **P425** are the equivalents for relay RL2.

**P433** to **P435** are the equivalents for relay RL3.

**P443** to **P445** are the equivalents for relay RL4.

**P453** to **P455** are the equivalents for relay RL5.

## Other relay modes

Table 4-4 on page 72 is a list of all relay modes.

Relay modes automatically enable and disable special control functions, special alarms and pumped volume totalizing as shown in Table 4-5 on page 73.

Descriptions of relay modes and the auxiliary functions follow Table 4-5.

Table 4-4. Relay Modes

Relay mode	Purpose of relay mode	Auxiliary functions
None	Relay is not used	No
Set point SV	On/Off Point control using SV (D801) – see “How to set-up an on/off point control relay” on page 70.	Yes
Set point TV	On/Off Point control using TV (D802) – see “How to set-up an on/off point control relay” on page 70.	Yes
Set point FV	On/Off Point control using FV (D803) – see “How to set-up an on/off point control relay” on page 70.	Yes
Assist	Duty Assist, On/Off Point Control and Auto Sequence – see “Duty Assist relay with common off points” on page 74. – see “Duty Assist with split off points” on page 77. – see “Auto-sequence (Rosemount 3491 and 3492 only)” on page 85.	Yes
Stby com off	Duty Standby, Common Off and Auto Sequence – see “Standby, Common Off mode relay” on page 79 – see “Auto-sequence (Rosemount 3491 and 3492 only)” on page 85.	Yes
Stdb split off	Duty Standby, Split Off and Auto Sequence – see “Standby, Split Off mode relay” on page 81. – see “Auto-sequence (Rosemount 3491 and 3492 only)” on page 85.	Yes
Digital Input 1	Relay energizes while Digital Input 1 (IN1) is active.	Yes
Digital Input 2	Relay energizes while Digital Input 2 (IN2) is active.	Yes
Sampler	Relay outputs sampler pulses – see “Sampler mode relay” on page 83.	No
RoC	Relay is energized if the rate of change of the control unit PV is out-of-limits – see “Rate of Change mode relay” on page 84.	Yes
Digital input 1+2	Relay is energized while Digital Input 1 (IN1) and 2 (IN2) are both active	Yes
Off	Relay is always de-energized	No
Set Point	On/Off Point Control using PV (D800) – see “How to set-up an on/off point control relay” on page 70.	Yes
Alarm	Relay is allocated to alarm indication duty – see “Set-up alarms” on page 92 for details of alarm handling.	Yes
Hi or Lo Alarm	High alarm limit (using On/Off Point Control): – The On Point must be greater than the Off Point. – Relay energizes when the PV (D800) is greater than the On Point. – Relay de-energizes when the PV (D800) is less than the Off Point.  Low alarm limit (using On/Off Point Control): – The On Point must be less than the Off Point. – Relay energizes when the PV (D800) is less than the Off Point. – Relay de-energizes when the PV (D800) is greater than the On Point.  An “A” is shown by the RL1 icon status (on the Full PV Display) when there is a high or low alarm. (The section “Set-up alarms” on page 92 is not applicable).	Yes
Totalizer	Relay outputs totalizer pulses (Rosemount 3491 only) – see “Totalizer mode relay” on page 83.	No
Totalizer 1	Relay outputs totalizer 1 pulses (Rosemount 3492/3493 only) – see “Totalizer mode relay” on page 83.	No
Totalizer 2	Relay outputs totalizer 2 pulses (Rosemount 3492/3493 only) – see “Totalizer mode relay” on page 83.	No
Fault	Indicate fault condition by de-energizing relay – see “Fault mode relay” on page 83.	No
Custom	To set-up a custom relay operation, see “Custom mode relay” on page 87.	No
PV limits	Relay energizes while control unit PV value (D800) is within on/off point limits. – see “PV Limits mode relay” on page 84.	Yes
On	Relay is always energized	No



**Table 4-5. Auxiliary Functions for Relay Modes- Special Control Functions**

Relay mode	Set points	Auto sequence <sup>(1)</sup>	Energy saving	Scum line <sup>(1)</sup>	Pump down <sup>(1)</sup>	Custom
Set point (PV)	Yes	N/A	Yes	Yes	Yes	N/A
Set Point (SV)	Yes	N/A	Yes	Yes	Yes	N/A
Set Point (TV)	Yes	N/A	Yes	Yes	Yes	N/A
Set Point (FV)	Yes	N/A	Yes	Yes	Yes	N/A
Assist	Yes	Yes	Yes	Yes	Yes	N/A
Stby Com-off	Yes	Yes	Yes	Yes	Yes	N/A
Stby Split-off	Yes	Yes	Yes	Yes	Yes	N/A
Digital Inputs	N/A	N/A	N/A	N/A	N/A	N/A
Sampler	N/A	N/A	N/A	N/A	N/A	N/A
Rate change	Yes	N/A	N/A	N/A	N/A	N/A
Off	N/A	N/A	N/A	N/A	N/A	N/A
Alarm	Yes	N/A	N/A	N/A	N/A	N/A
Hi/Lo Alarm	Yes	N/A	N/A	N/A	N/A	N/A
Totalizer	N/A	N/A	N/A	N/A	N/A	N/A
Fault	N/A	N/A	N/A	N/A	N/A	N/A
Custom	N/A	N/A	N/A	N/A	N/A	N/A
PV Limits	Yes	N/A	N/A	N/A	N/A	N/A
On	N/A	N/A	N/A	N/A	N/A	N/A
	<a href="#">page 70</a>	<a href="#">page 85</a>	<a href="#">page 86</a>	<a href="#">page 86</a>	<a href="#">page 86</a>	<a href="#">page 87</a>

1. Option available on the Rosemount 3491 and 3492 only.

**Table 4-6. Auxiliary Functions for Relay Mode - Special alarms**

Relay mode	Relay ops	Pump efficiency	Pumped volume	Relay run time	No activity	Rising level
Set point (PV)	Yes	Yes	N/A	Yes	Yes	N/A
Set Point (SV)	Yes	Yes	N/A	Yes	Yes	N/A
Set Point (TV)	Yes	Yes	N/A	Yes	Yes	N/A
Set Point (FV)	Yes	Yes	N/A	Yes	Yes	N/A
Assist	Yes	Yes	Yes	Yes	Yes	Yes
Stby Com-off	Yes	Yes	Yes	Yes	Yes	Yes
Stby Split-off	Yes	Yes	Yes	Yes	Yes	Yes
Digital Inputs	Yes	N/A	N/A	Yes	Yes	N/A
Sampler	N/A	N/A	N/A	N/A	N/A	N/A
Rate change	Yes	N/A	N/A	Yes	Yes	N/A
Off	N/A	N/A	N/A	N/A	N/A	N/A
Alarm	N/A	N/A	N/A	N/A	N/A	N/A
Hi/Lo Alarm	N/A	N/A	N/A	N/A	N/A	N/A
Totalizer	N/A	N/A	N/A	N/A	N/A	N/A
Fault	N/A	N/A	N/A	N/A	N/A	N/A
Custom	N/A	N/A	N/A	N/A	N/A	N/A
PV Limits	Yes	N/A	N/A	Yes	Yes	N/A
On	N/A	N/A	N/A	N/A	N/A	N/A
	<a href="#">page 89</a>	<a href="#">page 90</a>	<a href="#">page 91</a>	<a href="#">page 89</a>	<a href="#">page 89</a>	<a href="#">page 90</a>

## Duty Assist relay with common off points

This function requires two or more Assist mode relays. Two or more of these relays can be energized at the same time (assisting), and they all de-energize at a common off point.

An Assist relay uses its On Point and Off Point parameters in a similar way to a Set Point mode relay. A typical application would be emptying a wet well/lift station.

The worked example here illustrates how the function works. To keep the example simple, the auto-sequencing options are not considered.

### Example wet well/lift station application (emptying operation due to rising level) using assist mode relays and common off points

Consider an application with two relay outputs, RL1 and RL2, connected to individual pumps in a wet well/lift station. The control unit PV value (D800) is a level measurement in metres (m).

- In [Figure 4-28](#), both Pump 1 and Pump 2 are off because the liquid level is at a satisfactory level, below 5 m
- When the level rises above 5 m (On point, P411), the relay RL1 is energized to start Pump 1 ([Figure 4-29](#))
- If the level continues to rise and is above 8 m (On point, P421), relay RL2 is energized to start Pump 2 and assist Pump 1. Relay RL1 stays energized to keep Pump 1 pumping ([Figure 4-30](#))
- Pump 1 and Pump 2 continue to pump down until the level falls to below 2 m (Off Point, P412 and P422), at which relays RL1 and RL2 de-energize to switch off both pumps ([Figure 4-31](#)).

In this emptying application, the common off point is P412 (Off point, relay RL1) and P422 (Off point, relay RL2), both of which are at the 2 m level.

#### Note

If Pump 1 had kept the level below 8 m, it would stay switched on until the level is 2 m. Safeguards to prevent over-use of a pump are in [“Relay safeguard options” on page 71](#).

**Figure 4-28. Pump 1 and Pump 2 are Off (Level Okay)**

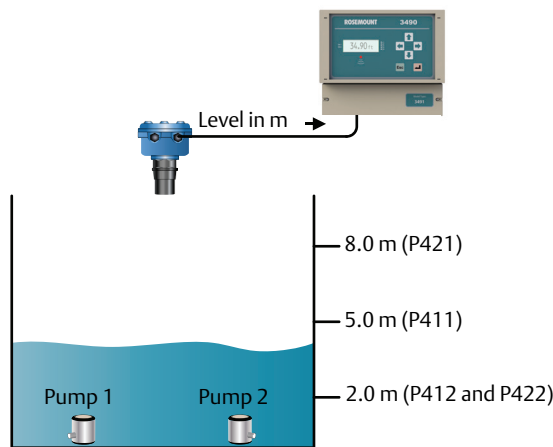


Figure 4-29. Pump 1 is On (Rising Level Above 5 m)

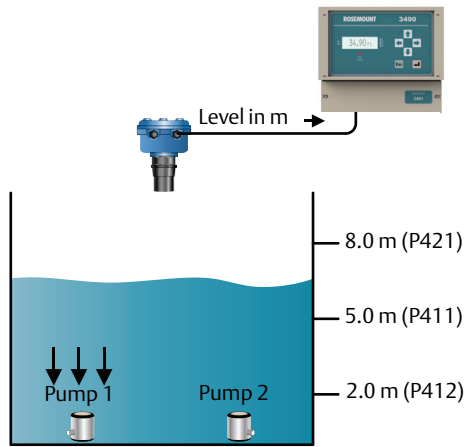


Figure 4-30. Pump 1 and Pump 2 are On (Rising Level Above 8 m)

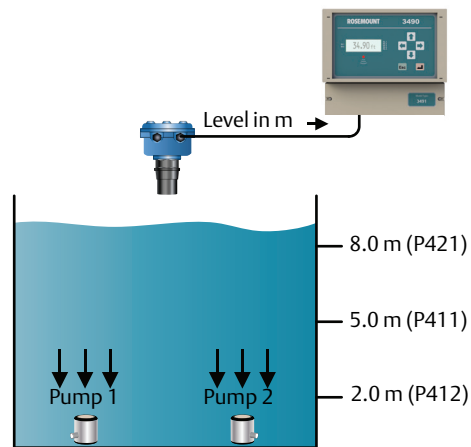
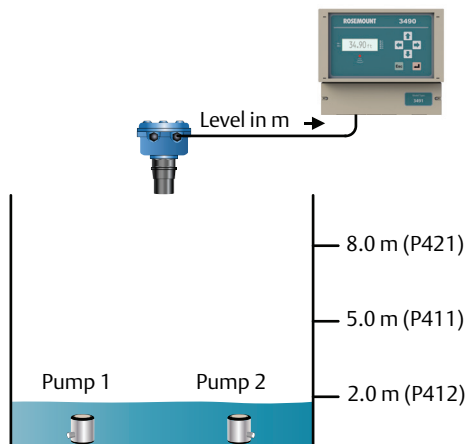


Figure 4-31. Pump 1 and Pump 2 are Off (Falling Level Below 2 m)



## Duty Assist with split off points

This function requires two or more Assist mode relays. Two or more of these relays can be energized at the same time (assisting), and they all de-energize at a split off points.

An Assist relay uses its On Point and Off Point parameters in a similar way to a Set Point mode relay. A typical application would be emptying a wet well/lift station.

The worked example here illustrates how the function works. To keep the example simple, the auto-sequencing options are not considered.

### Example wet well/lift station application (emptying operation due to rising level) using assist mode relays and split (separate) off points

Consider an application with two relays, RL1 and RL2, connected to individual pumps in a wet well. The control unit PV value (D800) is a liquid level measurement in metres.

- In [Figure 4-32](#), both Pump 1 and Pump 2 are off because the liquid level is at a satisfactory level, below 5 m
- When the level exceeds 5 m (On Point, P411), relay RL1 is energized to start Pump 1 ([Figure 4-33](#))
- When the level exceeds 8 m (On Point, P421), relay RL2 is energized to start Pump 2 and assist Pump 1. Relay RL1 stays energized to keep Pump 1 pumping ([Figure 4-34](#))
- When the level falls to below 3.5 m (Off point, P422), relay RL2 de-energizes to switch off Pump 2 ([Figure 4-35](#))
- When the level falls to below 2 m (Off point, P412), relay RL1 de-energizes to switch off Pump 1

#### Note

If Pump 1 keeps the level below 8 m, it would stay switched on until the level is 2 m. Safeguards to prevent overuse of pumps are in [“Relay safeguard options” on page 71](#).

**Figure 4-32. Both Pump 1 and Pump 2 are Off (Level Okay)**

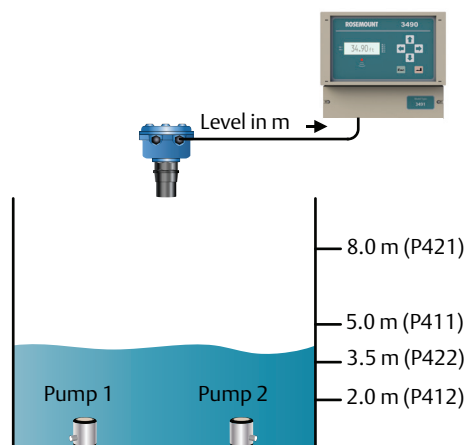


Figure 4-33. Pump 1 is On (Rising Level above 5 m)

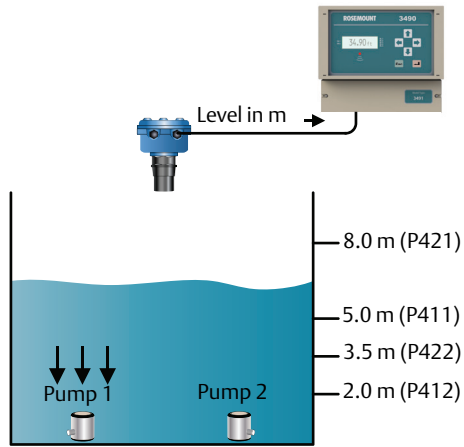


Figure 4-34. Pump 1 and Pump 2 are On (Rising Level above 8 m)

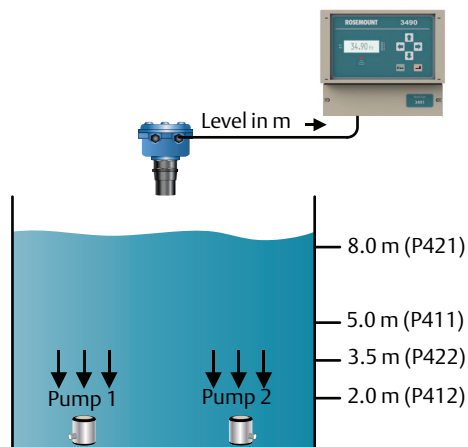
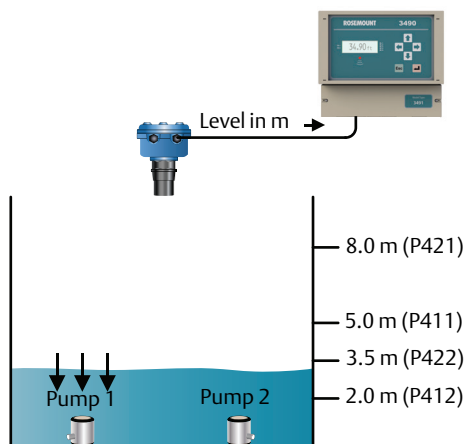


Figure 4-35. Pump 1 is On and Pump 2 is Off (Falling Level Below 3.5 m)



## Standby, Common Off mode relay

This function requires two or more Standby, Common Off mode relays. Only one of these relays is energized at any one time and the others are on standby to take over when needed.

A Standby, Common Off relay uses its On Point and Off Point parameters in a similar way to a Set Point mode relay. A typical application would be emptying a wet well/lift station.

The worked example here illustrates how the function works. To keep the example simple, the auto-sequencing options are not considered.

### Example wet well application (emptying operation due to rising level) using standby, common off point relays

Consider an application with two relay outputs, RL1 and RL2, connected to individual pumps in a wet well. The control unit PV value (D800) is a liquid level measurement in metres (m).

- In [Figure 4-36](#), both Pump 1 and Pump 2 are off because the liquid level is at a satisfactory level, below 5 m
- When the level rises above 5 m (On point, P411), the relay RL1 is energized to start Pump 1 ([Figure 4-37](#))
- If the level continues to rise and is above 8 m (On point, P421), the relay RL2 is energized to start Pump 2. Relay RL1 is de-energized to switch off Pump 1 ([Figure 4-38](#))
- Pump 2 continues to pump until the level falls below 2 m (Off Point, P412), at which relay RL2 will de-energize to switch off Pump 2. (Pump 1 is already switched off).  
In this emptying application, the common off point is P412 (Off point, relay RL1) and P422 (Off point, relay RL2), both of which are at the 2 m level.

#### Note

If Pump 1 had kept the level below 8 m, it would stay switched on until the level is 2 m. Safeguards to prevent over-use of a pump are in [“Relay safeguard options”](#) on [page 71](#).

**Figure 4-36. Pump 1 and Pump 2 are Off (Level Okay)**

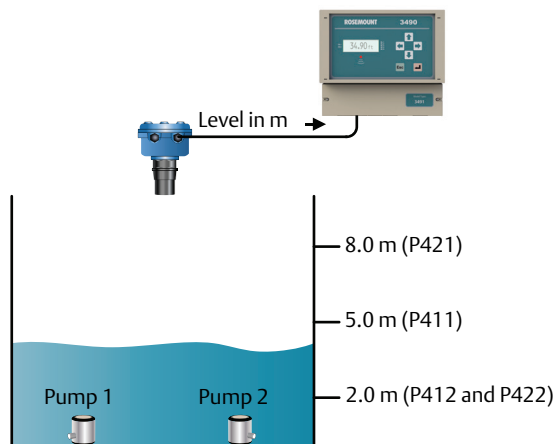


Figure 4-37. Pump 1 is On (Rising Level Above 5 m)

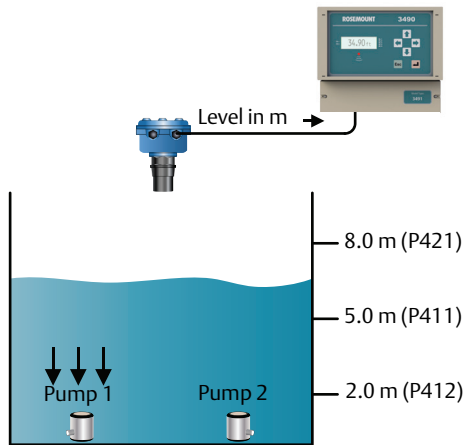
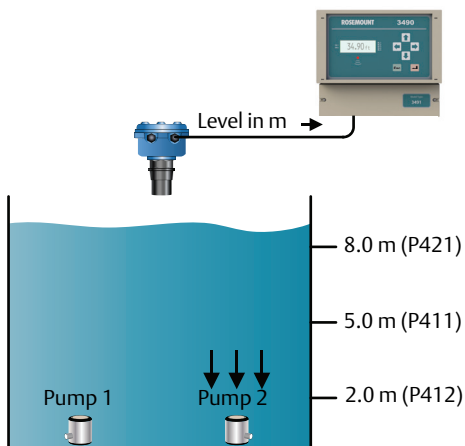


Figure 4-38. Pump 1 is Off and Pump 2 is On (Rising Level Above 8 m)





## Standby, Split Off mode relay

This function requires two or more Standby, Split Off Point mode relays. Only one of these relays is energized at any one time and the others are on standby to take over when needed.

A Standby, Split Off Point relay uses its On Point and Off Point parameters, just like a Set Point mode relay. A typical application would be emptying a wet well/lift station.

The worked example here illustrates how the function works. To keep the example simple, the auto-sequencing options are not considered.

### Example wet well/lift station application (emptying operation due to rising level) using standby, split off point relays

Consider an application with two relays, RL1 and RL2, connected to individual pumps in a wet well. The control unit PV value (D800) is a liquid level measurement in metres.

- In [Figure 4-39](#), both Pump 1 and Pump 2 are off because the liquid level is at a satisfactory level, below 5 m
- When the level exceeds 5 m (On Point, P411), relay RL1 is energized to start Pump 1. ([Figure 4-40](#))
- When the level exceeds 8 m (On Point, P421), relay RL2 is energized to start Pump 2. Relay RL1 is de-energized to switch off Pump 1 ([Figure 4-41](#))
- When the level falls to below 5 m (Off point, P422), relay RL2 de-energizes to switch off Pump 2. Relay RL1 is energized to switch on Pump 1 ([Figure 4-42](#))

In this emptying application, the switch off point for Pump 2 is 5 m; the On Point for relay 1 P411 (On point, relay RL1) is used. P422 (Off point, relay RL2) is ignored.

- When the level falls below 2 m (Off point, P412), relay RL1 de-energizes to switch off Pump 1

#### Note

If Pump 1 keeps the level below 8 m, it would stay switched on until the level is 2 m. Safeguards to prevent overuse of pumps are in [“Relay safeguard options” on page 71](#).

**Figure 4-39. Pump 1 and Pump 2 are Off (Level Okay)**

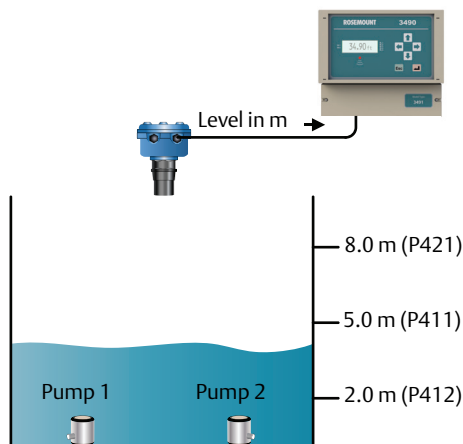


Figure 4-40. Pump 1 is On (Rising Level Above 5 m)

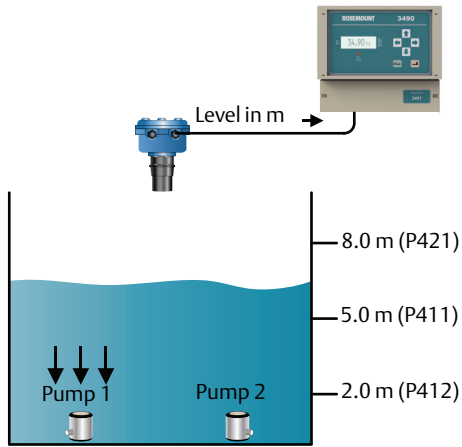


Figure 4-41. Pump 1 is Off and Pump 2 is On (Rising Level Above 8 m)

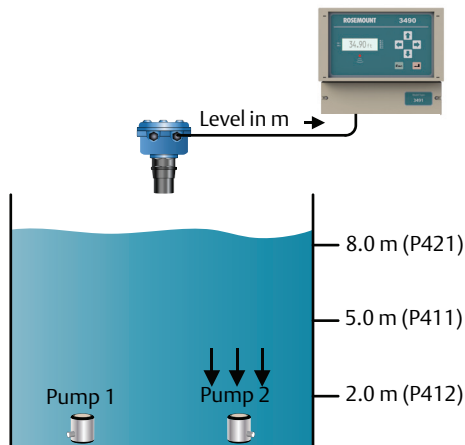
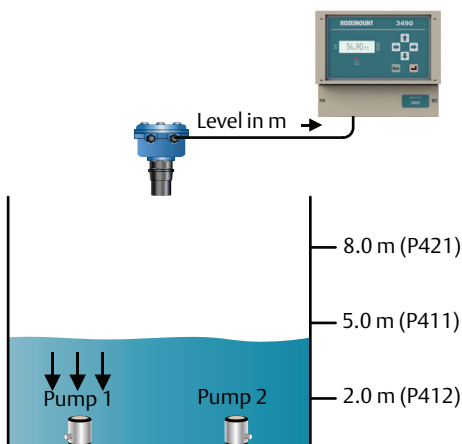


Figure 4-42. Pump 1 is On and Pump 2 is Off (Falling Level Below 5 m)



---

## Totalizer mode relay

**Menu:** SETUP>[CONTROLLER>]OUTPUT>TOTALIZER

A Totalizer relay can output a pulse for each time that the internal totalizer count (D828) increments. The duration of the pulse may set using parameter P534.

**P534** Pulse Width (Factory default is 100)

- The duration controls both the 'On' time and the 'Off' time - i.e. the pulse width - and may be set to a value between 10ms and 2.5 seconds in steps of 10ms.

---

### Note

If the totalizer count is running faster than the relay can produce pulses, an internal accumulator stores the excess pulses. The stored excess pulses are output by the Totalizer relay after the totalizer count rate reduces.

---

## Sampler mode relay

Sampler relays output pulses at a slower rate than a Totalizer relay. The Sampler relay can be used as a coarse totalizer or as a trigger to an external event.

**Menu:** SETUP>[CONTROLLER>]OUTPUT>TOTALIZER

**P535** Sampler Factor (Factory default is 0)

- This is for defining the frequency of the Sampler pulse. For example, a value of 100 means that the Sampler relay outputs a single pulse for every 100<sup>th</sup> increment to the Totalizer Count (D828/D829)
- The pulse width is the same as selected for the Totalizer relay (P534)

---

### Note

For information on setting up the totalizer, see [page 96](#) onwards.

---

## Fault mode relay

Fault relays de-energize when a particular fault condition exists. Parameter D831 shows a list of active faults. [Table 4-8 on page 88](#) has a summary of reporting methods for faults.

**Menu:** SETUP>[CONTROLLER>]OUTPUT>FAULT

**P560** System Fault (Factory default is Both)

- Fault relay de-energizes while there is a control unit fault and the option is Both or Relay

**P561** CU Temp Fault (Factory default setting is None)

- Fault relay de-energizes while the CPU temperature rises above 65 °C and the option is Both or Relay. Read-only parameter D844 shows the live temperature reading

**P562** Xmtr Fault (Factory default setting is None)

- Fault relay de-energizes while a HART transmitter signals a fault and the option is Both or Relay

- P563** Digital Input (Factory default setting is None)
- Fault relay de-energizes while digital input IN1 or IN2 is triggered and the option is
  - Both or Relay
  - See “Digital inputs IN1 and IN2” on page 62 for how to select the **Fault** action required for this feature

---

**Note**

Faults can be indicated using the output current if the Current or Both options are selected (see “Set-up the current output” on page 68).

---

## PV Limits mode relay

**Menus:**

**SETUP>[CONTROLLER]>OUTPUT>RELAY>RELAY 1,/RELAY 2, etc.**

This relay mode uses the relay On Point and Off Points (e.g. P411 and P412) as high and low limit alarms for the control unit PV value (D800). The points can be in any order of value.

The relay is energized while the PV value exceeds the higher limit point value or while it is below the lower limit point value.

## Rate of Change mode relay

**Menus:**

**SETUP>[CONTROLLER]>OUTPUT>RELAY>RELAY 1,>RELAY 2, etc. and  
MONITOR>[CONTROLLER]>READINGS>Rate of Change**

A rate of change value for the control unit PV value (D800) is calculated every 5 seconds in units of PV per minute:

$$D809 = (PV_{\text{now}} - PV_{5 \text{ seconds ago}}) \times 12$$

The On and Off points of a Rate of Change (RoC) mode relay are used as high and low limits for read-only parameter D809. Limit values are in units of PV per minute (PV/min) and can be in any order of value. The relay is energized while D809 exceeds the higher limit value or falls below the lower limit value.

Typically, where the PV value is a liquid level measurement, the RoC relay can be used to warn of a quickly rising or falling liquid level. Alternatively, the RoC mode relay can be used for controlling the rate of liquid flow.

For further uses of D809, see “Pump Efficiency alarm (Rosemount 3491 and 3492 only)” on page 90 and “Pumped volume totalizing” on page 91.

## Pump on delay

Menu: SETUP>[CONTROLLER]>OUTPUT>RELAY>OVERRIDES

- P499** Pump On Delay (Factory default is “3 s”)
- This function is to prevent pumps from all being switched on simultaneously, which could cause a massive surge.
  - When multiple relays are used for pump control (or as a set point) and power is lost, this function provides a delay of zero up to nine seconds (three seconds by default) for the second, third, fourth, and fifth relay when power is re-established.

## Auto-sequence (Rosemount 3491 and 3492 only)

(Special Control Function – see Table 4-5 on page 73 for a full list)

Optional automatic rotation of the leading (most used) relay can be applied to Assist or Standby mode relays. To use these options, two or more relays must have the same mode. The lowest numbered relay is initially the lead relay.

### Note

The rotation of relays is performed without the actual swapping of values between relay parameters.

- P270** Auto Seq Enable (Factory default is “Off”)
- Select a rotation auto-sequence. All options are summarized in Table 4-7.
- P271** Auto Seq Qual (Factory default is 0)
- This defines the threshold (e.g. how many starts) before applying an auto-sequence to rotate the 'lead' to the next relay with the same mode.

**Table 4-7. Auto-sequence Options**

Option	Rotation basis
Standby Starts	For Standby mode relays only - rotation is based on how many times the 'leading' relay has been energized compared to parameter P271.
Stdby On Time	For Standby mode relays only - rotation is based on the hours that the 'leading' relay has been energized compared to parameter P271.
Stdby Ratio T <sup>(1)</sup>	For two Standby mode relays only - rotation is based on the ratio of ON time for two relays compared to P271.
Stdby Ratio S <sup>(1)</sup>	For two Standby mode relays only - rotation based on the ratio of starts (times energized) compared to P271.
Assist Starts	Rotation of 'leading' Assist mode relay is based on how many times it has been energized compared to P271.
Assist On Time	Rotation of 'leading' Assist mode relay is based on the hours that it has been energized compared to P271.
Assist Ratio T <sup>(1)</sup>	For two Assist mode relays only - rotation based on the ratio of ON time for the two relays compared to P271.
Assist Ratio S <sup>(1)</sup>	For two Assist mode relays only - rotation based on the ratio of starts (times energized) compared to P271.
Off	No rotation required.

1. Ratio is based on the first two lowest-numbered relays with the same mode.

## Energy saving

(Special Control Function – see [Table 4-5 on page 73](#))

### Menu: **SETUP>[CONTROLLER>]OUTPUT>RELAY>OVERRIDES**

**P275** Engy Save Strt (Factory default is 0:00 h:m)

- Set the time of day at which selected relays (P276) will energize until each relay Off Point is reached. The energy saving start time is valid for one minute; if missed by the control unit being in Program mode, no action is taken when subsequently put into Run App mode.

**P276** Engy Save RL (Factory default is 00000)

- Select relays for the operation associated with parameter P275.
- Each digit represents a relay. Relay RL1 is selected by editing the first digit to be a “1”. Similarly, relay RL5 is selected with the fifth digit. To de-select a relay, change the appropriate digit back to a “0”.

## Scum line prevention (Rosemount 3491 and 3492 only)

(Special Control Function – see [Table 4-5 on page 73](#) for a full list of auxiliary relay functions)

This special control function is normally used with a pump control application to provide a small variance in the start and stop level for the pump. It will help to prevent a build-up of scum on the side of a wet well or sump.

### Menu: **SETUP>[CONTROLLER>]OUTPUT>RELAY>OVERRIDES**

**P277** Scum line var (Factory default is 0.0)

- This parameter defines a maximum variance in the On Points and Off Points of selected relays (P278). The variance is entered in the units of the On/Off Point, spaced in ten equal increments within the On Point and Off Point limits. Each time the selected relays (P278) de-energize, the variance moves on an increment.

**P278** Scum line RL (Factory default is 00000)

- Select relays for the operation associated with parameter P277.
- Each digit represents a relay. Relay RL1 is selected by editing the first digit to be a “1”. Similarly, relay RL5 is selected with the fifth digit. To de-select a relay, change the appropriate digit back to a “0”.

## Pump-down (Rosemount 3491 and 3492 only)

(Special Control Function – see [Table 4-5 on page 73](#) for a full list)

In a pump-down application, the lowest relay Off Point (‘pump off’ level) is normally a fixed level above the Transmitter Bottom Reference point. However, it is sometimes required to make the pumps continue to run for a period past the Off Point or run down the level to the Transmitter Bottom Reference point. This can clear a sump of sludge that may have collected at the bottom.

Pump-down can be initiated automatically at pre-set intervals. A digital input can also initiate pump-down at any time and this will re-set the interval before the next pump-down.

Pump-down automatically stops when the control unit PV (D800) is zero or after 20 minutes if a duration (P274) has not been programmed, whichever is the shorter period.

---

**Note**

For details on configuring a digital input to initiate a pump-down operation, see “Digital inputs IN1 and IN2” on page 62.

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**Menu: SETUP>[CONTROLLER]>OUTPUT>RELAY>OVERRIDES**

The relay mode must be Set point, Assist or, Standby, and parameters P272 to P274 edited to set-up the pump down operation.

- P272** Pump down RL (Factory default is 00000)
- This is for selecting relays for a pump-down operation.
  - Each of the five digits represents a relay. Relay RL1 is selected by editing the first digit to a “1”. Similarly, relay RL5 is selected by editing the fifth digit. To de-allocated, edit the appropriate digit back to a “0”.
- P273** Pump down Int (Factory default is 000:00 h:m)
- This defines a fixed interval (hours and minutes) between pump-downs.
- P274** Pump down Dur (Default setting is 00:00)
- This defines the period (hours and minutes) that the relay will remain energized for the pump-down. Safeguards may extend or reduce this period (see “Relay safeguard options” on page 71).
- D845** Next pump-down h:m (Factory default is 000:00)
- This shows the time remaining before the next pump-down is started. The display shows 000:00 if a pump-down is in progress or if it is not set-up.

## Custom mode relay

(Special Control Function – see Table 4-5 on page 73 for a full list)

A custom mode relay is typically used together with a secondary external device to provide a voltage-free contact connected to one of the controller digital inputs (IN1 or IN2).

For example, this function may be used to provide a low flow cut-off for a pump control if the pump is provided with a flow/no-flow switch. A second relay contact assigned to pump control would then be wired in series with the Custom mode relay to provide the low flow cut-off.

**Menu: SETUP>[CONTROLLER]>APPLICATION>CUSTOM**

- P250** Start On (Factory default is “None”)
- Relay energizes when the selected condition is true. See also Table 4-8 on page 88.
- P251** Stop On (Factory default is “None”)
- Relay de-energizes when the selected condition is true. See also Table 4-8 on page 88.

- P252** Stop If (Factory default is “None”)
- Relay de-energizes when the selected condition is true  
See also [Table 4-8 on page 88](#). P252 is a fail-safe for P251.
- P253** Start Time (Factory default is “7:00” - i.e. 7AM)
- This defines the clock time for when a Custom mode relay operation will begin (if P250 = Time) or end (if P251 = Time).
- P254** Interval (Factory default is “1:00” i.e. 1hr 0min)
- This is for defining the interval for repeating a Custom mode relay operation. P255 and P256 are for setting up a second starting time and an associated interval.
- P257** Max Retries (Factory default is 10)
- This defines the maximum number of failed attempts to perform Custom mode relay operations before it is deemed an alarm condition.
  - The alarm condition can happen if the control unit is in Program mode, which prevents all Custom mode relay operations from starting. Also, it can happen when the maximum time for an energized relay (relay safeguard, [page 71](#)) has been reached and is preventing a Custom mode relay operation from completing. For alarm indication options, see “[Set-up alarms](#)” on [page 92](#).

**Table 4-8. P250/P251/P252 Options**

Options	Purpose of option	Start on (P250)	Stop on (P251)	Stop if (P252)
None	Switched off.	Yes	Yes	Yes
Time	P253 and P254 determine when a Custom mode relay is to be energized.	Yes	Yes	N/A
PV > Level	Energize a Custom mode relay when the control unit PV value (D800) is greater than the relay On Point.	Yes	N/A	N/A
PV < Level	De-energize a Custom mode relay when the control unit PV value (D800) less than the relay On point.	N/A	Yes	Yes
Ext Trig <sup>(1)(2)</sup>	Energize a Custom mode relay when a digital input is active.	Yes	Yes	Yes
Ext Trig Xs <sup>(1)(2)</sup>	When a Digital Input is active, de-energize a Custom mode relay after X seconds delay.	N/A	N/A	Yes

- This does not require Digital Input IN1 or IN2 to be allocated an action.
- Abbreviations: “Ext Trig” = External Trigger (Digital Input).

**Note**

For any of the alarms below to be indicated by a relay or current output, an indication method must be selected. See “[Alarm indication selection](#)” on [page 92](#) for details.



## Relay Operations alarm

(Special alarm – see [Table 4-5 on page 73](#) for a full list of auxiliary relay functions)

**Menu:** [SETUP>\[CONTROLLER>\]APPLICATION>ALARM](#)

- P491** RL operations (Factory default is 0)
- It is an alarm condition when the number of operations done by a selected relay (P492) is higher than the number in P491.
  - Relay operation counters parameters D811 to D815 are in the *MONITOR* menu. See also “[Health checking the control unit](#)” on page 109.
  - For alarm indication options, see “[Set-up alarms](#)” on page 92.
- P492** RL ops rly sel (Factory default is “Disabled”)
- Select the relay for the monitoring operation associated with parameter **P491**.

## Relay Run-time alarm

(Special alarm – see [Table 4-5 on page 73](#) for a full list of auxiliary relay functions)

**Menu:** [SETUP>\[CONTROLLER>\]APPLICATION>ALARM](#)

- P493** RL runtime (Factory default is 0:00 h:m = OFF)
- It is an alarm condition when a relay, selected by P494, has been energized for longer than the period (hours and minutes) set by P493.
  - Run-time counters parameters D821 to D825 are in the *MONITOR* menu. See also “[Health checking the control unit](#)” on page 109.
  - For alarm indication options, see “[Set-up alarms](#)” on page 92.
- P494** RL run rly sel (Factory default is “Disabled”)
- Select the relay for the monitoring operation associated with parameter P493.

---

### Note

For any of the alarms below to be indicated by a relay or current output, an indication method must be selected. See “[Alarm indication selection](#)” on page 92 for details.

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## No Activity alarm

(Special alarm - see [Table 4-5 on page 73](#) for a full list of auxiliary relay functions)

**Menu:** [SETUP>\[CONTROLLER>\]APPLICATION>ALARM](#)

- P497** No Activity Del (Factory default is 0:00 h:m)
- It is an alarm condition if there is no relay activity for the period (hours and minutes) defined by parameter P497. Relays are selected for monitoring using parameter P498. The alarm condition is cleared when any of the monitored relays are energized.
  - For alarm indication options, see “[Set-up alarms](#)” on page 92.

- P498** No Activity RL (Factory default is 00000)
- Select relays for the relay inactivity monitoring operation.
  - Each digit represents a relay. Relay RL1 is selected for monitoring by editing the first digit to be a “1”. Similarly, relay RL5 is selected with the fifth digit. To de-select a relay, change the appropriate digit back to a “0”.

## Rising Level alarm

(Special alarm – see [Table 4-5 on page 73](#) for a full list of auxiliary relay functions)

**Menu:** **SETUP>[CONTROLLER>]APPLICATION>ALARM**

- P490** R Lev alm del (Factory default is 0:00 m:s)
- The Rising Level alarm requires a minimum of one Assist or Standby mode relay. If any Standby relay is energized, monitoring of the rising level is activated. For Assist relays, they must all be energized for monitoring of the rising level to be activated.  
  
A timed delay (P490) starts after the monitoring is activated. If the level is still rising after the delay time has expired and the calculated rate of change of the control unit PV (D800) is positive, the result is a Rising Level alarm condition. The alarm condition stops as soon as the rate of change is negative, indicating a falling level.
  - For the Rising Level alarm to be indicated by a relay output or the current output, a method must be selected. See “[Set-up alarms](#)” on page 92.
  - See also “[Rate of Change mode relay](#)” on page 84.

## Pump Efficiency alarm (Rosemount 3491 and 3492 only)

(Special alarm – see [Table 4-5 on page 73](#) for a full list of auxiliary relay functions)

The pump efficiency feature allows an alarm to be indicated (P550, P4\*1) if the calculated pump efficiency falls below a defined limit (P495).

**Menu:** **SETUP>[CONTROLLER>]APPLICATION>ALARM**

- P495** Pump effy limit (Factory default is 0% = OFF)
- It is an alarm condition while the calculated pump efficiency is below the limit defined by P495. The pump efficiency calculation is based on the rate of change of the control unit PV (D800) and is independently monitored for each selected relay (P496).
  - Pump efficiency values for relays are saved in D861 to D864, located in the **MONITOR** menu. See “[Health checking the control unit](#)” on page 109.
- P496** Pump effy RL (Factory default is 0000)
- Select relays for pump efficiency limit monitoring operation.
  - Each digit represents a relay. Relay RL1 is selected by editing the first digit to be a “1”. Similarly, relay RL4 is selected with the fourth digit. (Relay RL5 does not support this feature.) To de-select a relay, change the appropriate digit to a “0”.

Pump efficiency (PE) is calculated using the rate of change (RoC) of the control unit PV while a relay is energized. The PE value is saved in D86\*; the “\*” is the number of the relay (1 to 4).

The calculation assumes that liquid continues to enter the well or tank at the rate just prior to the relay energizing (pump starting).

The control unit continuously calculates the rate of change, sampling a new control unit PV every 5 seconds (as described in Section “Rate of Change mode relay” on page 84).

Over the next 9 pump starts, a further 9 change of RoC values are stored such that the control unit can then calculate an average value in change of RoC. This average value, “RoC100” is then taken as being equivalent to the pump operating at 100% efficiency. A value of 100% is then stored in D86\*.

Each subsequent pump start, and change in RoC thereafter, is used in a rolling average calculation for a new average value in change of RoC, RoCnew, which is then compared to the previous value “RoC100” and a new PE percentage value calculated using:

$$PE \% = (RoC_{new}/RoC_{100}) \times 100$$

If the resulting PE is greater than 100%, the RoC100 is updated to the new value and the PE is re-stated as 100% based on this new value.

If the resulting PE is less than 100%, then the PE is calculated as above and stored in D86\*.

If the PE is below the limit set (P495), the PE alarm condition is true. To indicate an alarm by Relay or Current Output, a method must be selected (see “Set-up alarms” on page 92).

---

#### Note

The alarm condition is automatically cleared if the calculated PE rises above the limit (P495) by 5% or more.

---

## Pumped volume totalizing

(Totalizer Option – see Table 4-5 on page 73 for a full list of auxiliary relay functions)

This function is for calculating the total throughput in a contents volume application.

The control unit monitors the change in volume when no pumps are running i.e. when any Assist or Standby mode relay is de-energized. It calculates the rate of change (RoC) of the control unit PV (D800) every five seconds and then converts it to a rate of change per minute for displaying as parameter D809.

When a pump is turned on, the control unit assumes that the rate of inflow remains the same as it was just before starting the pumps. The RoC value (D809) is frozen while the pumps are on i.e. when any Assist or Standby mode relay is energized.

To totalize pumped volume, the control unit PV (D800) must be in volume units so that the RoC value (D809) is in units of volume per minute. The control unit integrates this volume every second and increments the totalizer for every integer unit.

If the RoC value (D809) is 12 m<sup>3</sup> per minute and the Total factor parameter (P530) is set to 1.0 (m<sup>3</sup>), the Totalizer count (D828) increments every five seconds (<sup>1</sup>/<sub>12</sub><sup>th</sup> of a minute).

---

#### Note

The Totalizer Wizard can be used to set-up pumped volume totalizing.

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**Menu: SETUP>[CONTROLLER>]OUTPUT>TOTALIZER**

- P530** Total factor (Factor default is 0.0)
- One count is added to the Totalizer count (D828) for a quantity defined by P530.
- P531** Total units (Factory default is “None”)
- Pumped volume totalizing is enabled by the totalizer units (P531) being set to PVol. (This parameter also defines the display units for parameter D828).

---

**Note**

For other associated parameters, see “Set-up totalizing on the Rosemount 3491 control unit” on page 96.

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## 4.3.23 Set-up alarms

### Alarms

The control unit can detect the following alarm conditions:

- Control unit PV is out-of-limits
- Current Output saturated (Standard:  $\leq 3.9\text{mA}$  or  $\geq 20.8\text{mA}$ , NAMUR NE43:  $\leq 3.8\text{mA}$  or  $\geq 20.5\text{mA}$ )
- Logging memory filling (Rosemount 3493)
- Logging memory full (Rosemount 3493)
- Digital input is configured to force an alarm when active
- Maximum number of failed Custom relay operation attempts
- Current Input saturated
- Rising liquid level
- Relay operation count limit exceeded
- Relay run time limit exceeded
- Low pump efficiency (Rosemount 3491 and Rosemount 3492 only)
- Relay inactivity

Parameter D830 shows a list of active alarms. Alarms are indicated using relay outputs and the current output. [Table 4-8 on page 88](#) has a summary of reporting methods for alarms.

### Alarm indication selection

**Menu: SETUP>[CONTROLLER>]OUTPUT>ALARM**

For each alarm, there is a dedicated parameter in the *ALARM* menu for selecting the method of indication for that alarm. Options for parameters P540 to P551 are:

- **None** – if the alarm is to be indicated (default factory setting)
- **Both** – alarm is indicated by an Alarm mode relay and output current
- **Current** – alarm is indicated by the output current only
- **Relay** – alarm is indicated by an Alarm mode relay only

For information on Alarm mode relays, see [“Set-up the relays” on page 69](#).

Parameter P402 is used to decide how the output current indicates an alarm condition. See [“Set-up the current output” on page 68](#) for alarm action options.

- P540** PV Over Limits (Factory default is “None”)
- Select the indication method for the alarm condition that happens while the control unit PV value is outside pre-set limits. See also [“PV Limits mode relay” on page 84](#).
- P541** mA Out Sat (Factory default is “None”)
- Select the indication method for the alarm condition that happens while the output current is  $\leq 3.8$  mA or  $\geq 20.5$  mA.
- P542** Log mem filling (Factory default is “None”)
- Select the indication method for the alarm condition that happens while the available logging memory is low. See also [“P593 Low Mem Alarm \(Default is 0%\)” on page 64](#).
- P543** Digital Input (Factory default is “None”)
- Select the indication method for the alarm condition that happens while a digital input, configured with an action to force this alarm, is energized.
  - See [“Digital inputs IN1 and IN2” on page 62](#) for how to select the **Alarm** action required for this feature.
- P544** Max retries (Factory default is “None”)
- Select the indication method for the alarm condition that happens while a Custom relay operation is unable to complete, even after a pre-set number of attempts (P257).
  - See also [“Custom mode relay” on page 87](#) for information.
- P545** mA In Sat (Factory default is “None”)
- Select the indication method for the alarm condition that happens while the output current is saturated i.e.  $\leq 3.7$  mA or  $\geq 20.75$  mA.
- P547** Rising Level (Factory default is “None”)
- Select the indication method for the Rising Level alarm condition.
  - See [“Rising Level alarm” on page 90](#) for information.
- P548** RL Operations (Factory default is “None”)
- Select the indication method for the alarm condition that happens while a relay operation counter is higher than a pre-set limit.
  - See [“Relay Operations alarm” on page 89](#) for information.
- P549** RL runtime (Factory default is “None”)
- Select the indication method for the alarm condition that happens while a relay is energized for longer than a pre-set period.
  - See [“Relay Run-time alarm” on page 89](#) for information.

- P550** Pump efficiency (Factory default is “None”)
- Available on the Rosemount 3491 and 3492 control units only.
  - Select the indication method for the alarm condition that happens while the calculated pump efficiency falls below a pre-set limit.
  - See “[Pump Efficiency alarm \(Rosemount 3491 and 3492 only\)](#)” on page 90 for information.
- P551** No activity (Factory default is “None”)
- Select the indication method for the alarm condition that happens while any selected relay is de-energized for longer than a pre-set period.
  - See “[No Activity alarm](#)” on page 89 for information.

**Table 4-9. Control Unit Reporting of Alarms and Faults**

Category	Source	Cause	As seen on screen	Status LED	Full PV display	Relay output	Current output	Alarm report (D830)	Fault report (D831)
Alarm	3490	Current Output reached linear limit	mA o/p Sat	N/A	N/A	Yes	Yes	Yes	N/A
		Logging memory almost full	Lg Mem Filling	N/A	N/A	Yes	Yes	Yes	N/A
		Logging memory is full	Log Mem Full	N/A	N/A	N/A	Yes	Yes	N/A
		Digital Input 1 active	Digital In 1	N/A	N/A	Yes	Yes	Yes	N/A
		Digital Input 2 active	Digital In 2	N/A	N/A	Yes	Yes	Yes	N/A
		Alarm suppressed by digital input	Alarm Suppressed	N/A	N/A	N/A	N/A	Yes	N/A
		Custom relay operation retries exceeded	Max Retries	N/A	N/A	Yes	Yes	Yes	N/A
		Current input below lower linear limit	mA In Low	N/A	N/A	Yes	Yes	Yes	N/A
		Current input above higher linear limit	mA In High	N/A	N/A	Yes	Yes	Yes	N/A
		Raising level despite relays on	Rising Level	N/A	N/A	Yes	Yes	Yes	N/A
		Relay number of operations exceeded	Relay Operations	N/A	N/A	Yes	Yes	Yes	N/A
		Relay run-time exceeded	Relay Runtime	N/A	N/A	Yes	Yes	Yes	N/A
		Pump efficiency below limit <sup>(1)</sup>	Pump Efficiency	N/A	N/A	Yes	Yes	Yes	N/A
		No activity of Control Relay	No activity	N/A	N/A	Yes	Yes	Yes	N/A
	Xmtr	Transmitter PV out-of-limits	PV OL	N/A	N/A	N/A	Yes	Yes	N/A

Table 4-9. Control Unit Reporting of Alarms and Faults

Category	Source	Cause	As seen on screen	Status LED	Full PV display	Relay output	Current output	Alarm report (D830)	Fault report (D831)
Fault	3490	Rom checksum error	ROM Error	Constant	Yes	Yes	Yes	N/A	Yes
		RAM test error	RAM Error	Constant	Yes	Yes	Yes	N/A	Yes
		Real Time Clock Fault	Clock fault	Constant	Yes	Yes	Yes	N/A	Yes
		EEPROM Signature Error	EEPROM Sig err	Constant	Yes	Yes	Yes	N/A	Yes
		EEPROM checksum error	EEPROM CKS err	Constant	Yes	Yes	Yes	N/A	Yes
		ADC error	ADC_error	Constant	Yes	Yes	Yes	N/A	Yes
		Control Unit temperature out-of-limits	CU Temp OL	Constant		Yes	Yes	N/A	Yes
	Xmtr	Field Device Malfunction	Xmtr Fault	Constant	Yes	Yes	Yes	N/A	Yes

1. The pump efficiency feature is on Rosemount 3491 and 3492 control units.

## 4.3.24 Set-up totalizing on the Rosemount 3491 control unit

### Totalizer (cumulative totalized flow) on the Rosemount 3491

The Rosemount 3491 has an internal 8-digit totalizer that is updated several times every second.

#### Note

The totalizer operates with an input of the control unit PV (**D800**) in units per second. When the PV is a volumetric flow rate (e.g. m<sup>3</sup>/hour), the totalizer can accumulate this flow volume and give the total volume throughput.

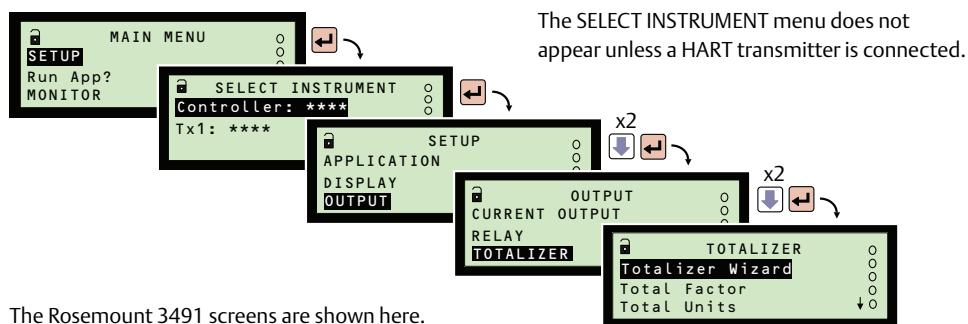
The totalizer can be easily set-up using the Totalizer Wizard, accessible by navigating to the *TOTALIZER* menu. The Totalizer Wizard also forms a part of the Application (App) Wizard. See “Using the App Wizard to set-up a flow application” on page 41 for a totalizing example. After using a wizard, adjustments can be made to the totalizer parameters.

#### Note

The wizard requires the totalizer source parameter to have suitable units selected e.g. m<sup>3</sup>/hour. If no suitable units are selected, an 'invalid units' message appears.



Figure 4-43. Navigating to the TOTALIZER menu



### Menu: SETUP>[CONTROLLER]>OUTPUT>TOTALIZER

**P530** Total Factor (Factor default is 0.0)

- One count is added to the Totalizer Count (**D828**) for a quantity of liquid as defined by this parameter. The display units for **D828** is defined by **P531**.

**P531** Total Units (Factory default is “None”)

- This parameter defines the units for the Totalizer Count (**D828**).

When using totalizer units of gal, an 8-digit totalizer increments rapidly and rolls over too frequently. To help, alternative totalizer units of gal×10, gal×100, gal×1000, and Mgal are available for selection. When these special units are selected after selecting gal units, the totalizer factor (**P530**) is automatically re-scaled by ×10, ×100, ×1000, or ×1000000 depending on the selection. Similarly, re-scaling is automatic for ltr×10, ltr×100, etc. after selecting ltr as totalizer units.

See “Using the App Wizard to set-up a flow application” on page 41 for a flow application example where gal×100 totalizer units are needed.

**P534** Pulse Width (Factory default is “100 ms”)

- A Totalizer mode relay is energized for a programmed duration (**P534**) each time the Totalizer Count (**D828**) is incremented. Parameter **P534** controls the pulse width (i.e. the pulse ‘on’ time) and is between 10 ms and 2.5 s, changeable in steps of 10 ms.
- Parameter **P534** also defines the pulse width for a Sampler mode relay (see “Set-up the relays” on page 69).
- See “Set-up the relays” on page 69 for information on Totalizer mode relays.

### Menu: MONITOR>[CONTROLLER]>READINGS>TOTALIZER

**D828** Totalizer

- This parameter displays the Totalizer Count. To add this to the Full PV Display, see “Display configuration options” on page 103.

## How to reset the totalizer on Rosemount 3491

**Menu:** MONITOR>[CONTROLLER>]READINGS>TOTALIZER

To re-set a totalizer to zero, display the Totalizer Count parameter D828 and then select the button corresponding to **Reset** command on display line 4.

The totalizer may have password (PIN) protection to prevent unauthorized persons from re-setting the total. See “PIN Security” on page 106 for full details of PIN security.

### 4.3.25 Set-up totalizing on Rosemount 3492 Control Unit

The Rosemount 3492 has two independent, internal 8-digit totalizers, Totalizer 1 and Totalizer 2, which are updated several times every second.

The totalizers can be easily set-up using the Totalizer Wizard, accessible by navigating to the *SETUP>[CONTROLLER>]OUTPUT>TOTALIZER* menu. The Totalizer Wizard also forms a part of the Application (App) Wizard.

---

#### Note

The wizards require the totalizer source parameter to have suitable units selected e.g. m<sup>3</sup>/hour. If no suitable units are selected, an 'invalid units' message appears.

See “Using the App Wizard to set-up a flow application” on page 41 for a totalizing example. After using the wizard, adjustments can be made to the totalizer parameters.

---

## Set-up Totalizer 1

---

#### Note

The totalizer operates with an input of control unit PV (**D800**) in units per second. If the PV is a volumetric flow rate (e.g. m<sup>3</sup>/hour), the totalizer can accumulate this flow volume and give the total volume throughput.

---

**Menu:** SETUP>[CONTROLLER>]OUTPUT>TOTALIZER

- P530** Total 1 factor (Factor default is 0.0)
- One count is added to the Totalizer count (D828) for a quantity of flow as defined by this parameter. The unit of measurement for D828 is defined by parameter P531.
- P531** Total 1 units (Factory default is “None”)
- This parameter defines the units for the Totalizer 1 Count (**D828**).  
When using totalizer units of gal, an 8-digit totalizer increments rapidly and rolls over too frequently. To help, alternative totalizer units of gal×10, gal×100, gal×1000, and Mgal are available for selection. When these special units are selected after selecting gal units, the totalizer factor (P530) is automatically re-scaled by ×10, ×100, ×1000, or ×1000000 depending on the selection. Similarly, re-scaling is automatic for ltr×10, ltr×100, etc. after selecting ltr as totalizer units.

---

See “Using the App Wizard to set-up a flow application” on page 41 for a flow application example where  $\text{gal} \times 100$  totalizer units are needed.

- P534** Pulse Width (Factory default is “100ms”)
- A Totalizer mode relay is energized for a programmed duration (P534) each time the Totalizer count (D828 or D829) is incremented.
  - P534 controls the pulse width (i.e. the pulse 'on' time) and is between 10 ms and 2.5 s, changeable in steps of 10 ms.
  - Parameter P534 also defines the pulse width for a Sampler mode relay (see “Set-up the relays” on page 69).

**Menu:** MONITOR>[CONTROLLER>]READINGS>TOTALIZER

- D828** Totalizer 1
- This read-only parameter displays the Totalizer 1 Count. To add this to the *Full PV* display, see “Display configuration options” on page 103.

---

**Note**

A Totalizer mode relay can be configured to output a pulse for each increment (by one) to the Totalizer 1 Count parameter. See “Set-up the relays” on page 69 for information on Totalizer mode relays.

---

## Set-up Totalizer 2

Totalizer 2 operates in the same way as Totalizer 1, but counts the parameter selected by P536. Parameter P536 offers a choice of control unit PV, SV, TV, and FV.

### Menu: **SETUP>[CONTROLLER>]OUTPUT>TOTALIZER**

**P532** Total 2 factor (Factor default is 0.0)

- One count is added to the Totalizer 2 Count (D829) for a quantity of liquid as defined by this parameter. The units for D829 is defined by P533.

**P533** Total 2 units (Factory default is “None”)

- This parameter defines the units for the Totalizer 2 Count (D829).

When using totalizer units of gal, an 8-digit totalizer increments rapidly and rolls over too frequently. To help, alternative totalizer units of gal×10, gal×100, gal×1000, and Mgal are available for selection. When these special units are selected after selecting gal units, the totalizer factor (P532) is automatically re-scaled by ×10, ×100, ×1000, or ×1000000 depending on the selection. Similarly, re-scaling is automatic for ltr×10, ltr×100, etc. *after* selecting ltr as totalizer units.

See “Using the App Wizard to set-up a flow application” on page 41 for a flow application example where galx100 totalizer units are needed.

**P534** Pulse Width (Factory default is “100ms”)

- A Totalizer mode relay is energized for a programmed duration (P534) each time the Totalizer count (D828 or D829) is incremented.
- P534 controls the pulse width (i.e. the pulse 'on' time) and is between 10 ms and 2.5 s, changeable in steps of 10 ms.
- Parameter P534 also defines the pulse width for a Sampler mode relay (see “Set-up the relays” on page 69).

**P536** Totalizer 2 Source (Factory default is “None”)

- If requiring Totalizer 2, select a parameter to be totalized.

### Menu: **MONITOR>[CONTROLLER>]READINGS>TOTALIZER**

**D829** Totalizer 2

- This read-only parameter displays the Totalizer 2 Count. To add this to the Full PV Display, see “Display configuration options” on page 103.

## How to reset the totalizers on the Rosemount 3492

To re-set a totalizer to zero, display the Totalizer Count parameter e.g. D828 and then select the button corresponding to **Reset** command on display line 4.

The totalizers may have password (PIN) protection to prevent unauthorized persons from re-setting the totals. See “PIN Security” on page 106 for full details of PIN security.

## 4.3.26 Set-up totalizing on Rosemount 3493 Control Unit

The Rosemount 3493 Control Unit has two totalizers: Totalizer 1 and Totalizer 2.

The totalizers can be easily set-up using the Totalizer Wizard, accessible by navigating to the *SETUP>[CONTROLLER]>OUTPUT>TOTALIZER* menu. The Totalizer Wizard also forms a part of the Application (App) Wizard.

---

### Note

The wizards require the totalizer source parameter to have suitable units selected e.g. m<sup>3</sup>/hour. If no suitable units are selected, an 'invalid units' message appears.

---

See “Using the App Wizard to set-up a flow application” on page 41 for a totalizing example. After using the Totalizer or App Wizard, changes can be made to the totalizer parameters.

### Set-up Totalizer 1 (cumulative totalized flow)

This is an 8-digit totalizer showing cumulative totalized flow through a flow structure.

---

### Note

Totalizer 1 operates with an input of control unit PV (D800) in units per second. If the PV is a volumetric flow rate (e.g. m<sup>3</sup>/hour), the totalizer can accumulate this flow volume and give the total volume throughput. See “Pumped volume totalizing” on page 91 for pumped volume totalizing.

---

### Menu: SETUP>[CONTROLLER]>OUTPUT>TOTALIZER

- P530** Total 1 Factor (Factor default is 0.0)
- One count is added to the Totalizer Count (D828) for a quantity of liquid as defined by this parameter. The display units for D828 is defined by P531.
- P531** Total 1 Units (Factory default is “None”)
- This parameter defines the units for the Totalizer Count (D828).  
When using totalizer units of gal, an 8-digit totalizer increments rapidly and rolls over too frequently. To help, alternative totalizer units of gal×10, gal×100, gal×1000, and Mgal are available for selection. When these special units are selected *after* selecting gal units, the totalizer factor (P530) is automatically re-scaled by ×10, ×100, ×1000, or ×1000000 depending on the selection. Similarly, re-scaling is automatic for ltr×10, ltr×100, etc. after selecting ltr as totalizer units.  
See “Using the App Wizard to set-up a flow application” on page 41 for a flow application example where gal×100 totalizer units are needed.
- P534** Pulse Width (Factory default is “100ms”)
- A Totalizer mode relay is energized for a programmed duration (P534) each time the Totalizer count (D828/D829) is incremented.
  - P534 controls the pulse width (i.e. the pulse 'on' time) and is between 10 ms and 2.5 s, changeable in steps of 10 ms.
  - Parameter P534 also defines the pulse width for a Sampler mode relay (see “Set-up the relays” on page 69).

---

**Note**

See “Set-up the relays” on page 69 for information on Totalizer mode relays.

---

**Menu: MONITOR>[CONTROLLER>]READINGS>TOTALIZER****D828** Totalizer 1

- This read-only parameter displays the Totalizer 1 count, which is the cumulative totalized flow. To add this to the Full PV Display, see “Display configuration options” on page 103

**Set-up Totalizer 2 (daily totalized flow)**

This is an 8-digit totalizer showing daily total flow (midnight to midnight) through a flow structure. It is automatically re-set to zero at each midnight.

---

**Note**

A control unit relay can be configured to output a pulse for each increment to the Totalizer Count parameter. See “Set-up the relays” on page 69 for how to do this.

---

**Menu: SETUP>[CONTROLLER>]OUTPUT>TOTALIZER****P532** Total 2 Factor (Factor default is 0.0)

- One count is added to the Totalizer 2 Count (D829) for a quantity of liquid as defined by this parameter. The display unit of measurement for D829 is defined by P533.

**P533** Total 2 Units (Factory default is “None”)

- This parameter defines the units for the Totalizer 2 Count (D829).

**P534** Pulse Width (Factory default is “100 ms”)

- A Totalizer mode relay is energized for a programmed duration (P534) each time the Totalizer Count (D828 or D829) is incremented.
- P534 controls the pulse width (i.e. the pulse 'on' time) and is between 10 ms and 2.5 s, changeable in steps of 10 ms.
- Parameter P534 also defines the pulse width for a Sampler mode relay (see “Set-up the relays” on page 69).

---

**Note**

See “Set-up the relays” on page 69 for information on Totalizer mode relays.

---

**P536** Total 2 Source (Factory default is “MCU PV”)

- Use this to select whether the control unit PV (D800), SV (D801), TV (D802) or FV (D803) value is to be totalized over a 24 hours period for the Totalizer 2 Count (D829). Alternatively, select None if not requiring Totalizer 2.

See “Optional change: transmitter input channel settings (advanced users)” on page 42 for details of PV, SV, TV, and FV.

- P537** Total 2 dec pl (Factory default is 1)
- Use this to set the number of decimal places to be shown when displaying the Totalizer 2 Count (D829).

**Menu:** MONITOR>[CONTROLLER>]READINGS>TOTALIZER

- D829** Totalizer 2
- This read-only parameter displays the Totalizer 2 count, which is the daily flow total for the present day. It is reset to zero at midnight.  
To add this value to the PV display, see “[Display configuration options](#)” on [page 103](#). When showing on the upper display line, use the **left arrow** or **right arrow** buttons to scroll through daily flow totals from the previous 365 days. The **Esc** button restores the upper display line to show the daily flow total value for the present day.

## How to reset the totalizers on the Rosemount 3493

To reset a totalizer to zero, display the totalizer count parameter e.g. D828 and then select the button that corresponds to **Reset** command on display line 4.

Totalizers may have password (PIN) protection to prevent unauthorized persons from re-setting the totals. See “[PIN Security](#)” on [page 106](#) for full details of PIN security.

### 4.3.27 Display configuration options

The factory default configuration of the full display can be changed to show different graphic and text information.

**Menu:** SETUP>[CONTROLLER>]OUTPUT>DISPLAY

- P570** Display Upper (Factory default is “P731-Time”)
- Select from the multiple-choice list of parameters (see [Table 4-10 on page 104](#)). For example, a totalizer count can be displayed when D828-Totalizer is selected. If it will fit, the clock time will also be displayed alongside the selected parameter.
- P571** Display Middle (Factory default is “D800-PV”)
- Select from the multiple-choice list of parameters (see [Table 4-10 on page 104](#)). For example, the control unit Secondary Value (SV) value can be displayed when D801-SV is selected.
- P572** Display Lower (Factory default is “Bar graph”)
- Select from the multiple-choice list of parameters (see [Table 4-10 on page 104](#)). For example, you can display a user-defined message (P241) when the 'P241' option is selected.
- P573** Decimal places (Factory default is 3)
- Use this to adjust the number of decimal places. Range 0 to 5. Alternatively, select “Disabled” (Auto) for the control unit to automatically choose the number of decimal places for a displayed parameter value.
- P574** Display size (Factory default is “Large”)
- Use this to adjust whether the display shows the *Large PV* display after a period of keypad inactivity, or remains showing the *Full PV* display.

- P575** Back light (Factory default is “On”)
- Select from **On** (always on), **Off** (always off) or **Auto** (goes on when using keypad; goes off after five minutes of inactivity).

**Table 4-10. Full PV Display Options**

P570/1/2 options	Parameters
None	(Nothing selected)
D800-PV	Control unit Primary/Process Variable (PV)
D801-SV	Control unit SV value
D802-TV	Control unit TV value
D803-FV	Control unit FV value
D805-%mA Out	Percentage of Current Output (4–20 mA span)
D806-mA Output	Actual output current
D809-RoC	Rate of Change of control unit PV
D828-Totalizer	Totalizer value (for the 3491)
D828-Totalizer 1	Totalizer 1 value (for the 3492 and 3493)
D829-Totalizer 2	Totalizer 2 value (for the 3492 and 3493)
D821-RL1 RTime	Running time for relay RL1, if energized
D822-RL2 RTime	Running time for relay RL2, if energized
D823-RL3 RTime	Running time for relay RL3, if energized
D824-RL4 RTime	Running time for relay RL4, if energized
D825-RL5 RTime	Running time for relay RL5, if energized
D840-mA Input	Actual current input
D844-Internal C	Temperature inside of the control unit
D846	Logging memory remaining
D900-PV In	Transmitter PV (Primary Variable)
D901-SV In	Transmitter SV (Secondary Variable)
D902-TV In	Transmitter TV (Tertiary Variable)
D903-FV In	Transmitter FV (Fourth Variable)
P240-Descript <sup>(1)</sup>	Free-form description
P241-Message <sup>(1)</sup>	Free-form message
P242-Tag <sup>(1)</sup>	Free-form tag name
P730-Date	Date
P731-Time	Time of day
Bar graph	Bar graph for Current Output (for lower display only)

1. Parameter is in menu: *SETUP>[CONTROLLER]>APPLICATION*



## 4.3.28 Serial communications

This section is applicable if the RS232 serial port of a communication device (e.g. a PC) is connected:

- directly to the RS232 terminals of the Rosemount 3491 or 3492 Control Unit or
- indirectly via factory-fitted data download socket of the Rosemount 3493 control unit

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### Note

See “RS232 connections” on page 22 for connections details.

---

### Menu: **SETUP>[CONTROLLER>]SYSTEM>COMMUNICATIONS**

- P710** Address (Factory default is 0)
- Keep the factory default setting.
- P711** Interface
- Select between **Log download** (Rosemount 3493), **RS232 HART**, or None.
- P712** Baud Rate (Factory default is 1200 or 9600)
- This must be the same as set for the RS232 serial port of the communication device. Range is 1200 to 115200.
- P713** Start Bits (Factory default is 1)
- This must be the same as set for the RS232 serial port of the communication device. Range is 0 to 9.
- P714** Data Bits (Factory default is 8)
- This must be the same as set for the RS232 serial port of the communication device. Range is 0 to 9.
- P715** Parity (Factory default is “Even”)
- This must be the same as set for the RS232 serial port of the communication device. Options are Even, Odd or None.
- P716** Stop Bits (Factory default is 1)
- This must be the same as set for the RS232 serial port of the communication device. Range is 0 to 9.

### 4.3.29 PIN Security

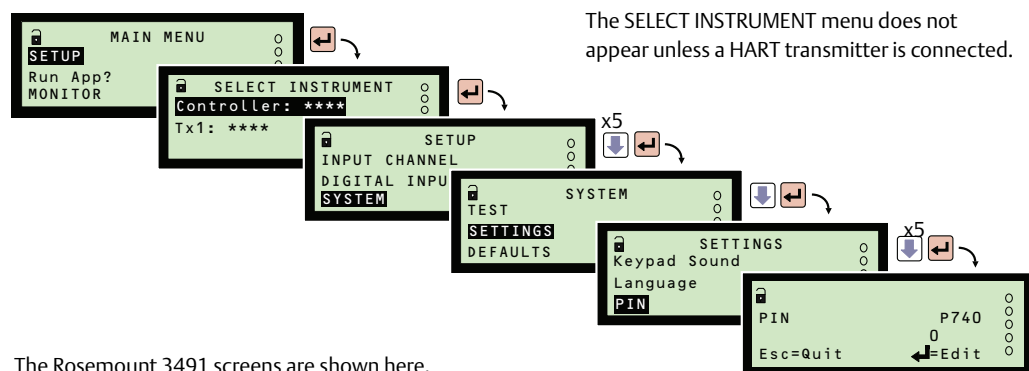
Personal Identification Number (PIN) security prevents unauthorized people from configuring the control unit. Typically, this is set-up when all the other programming has been completed. As with bankcards, there is one PIN number.

The factory default is for PIN security to be inactive. To activate, navigate the menu system to the PIN screen and edit a 4-digit personal identification number (PIN) that you want. The PIN is edited with the arrow keys and confirmed with the red (enter) button; the 4-digit PIN will then be replaced by “- - - -” to indicate that PIN security is active. (By default, the PIN is “0” if inactive).

After PIN security is activated, a prompt for the PIN appears when needed for authorization. If correctly entered, no further PIN requests are made unless there is a period of keypad inactivity, or the *Cancel Password* option is selected from the MAIN MENU screen.

If the PIN number has been forgotten, contact Emerson Process Management for assistance. Ensure you have the serial number of the control unit available. It is located in the menu system at: *SETUP>[CONTROLLER]>SYSTEM>FIXED>Serial No.*

Figure 4-44. Navigating to the PIN set-up screen



## Section 5 Troubleshooting

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Safety messages .....	page 107
Servicing the control unit .....	page 107
Health checking the control unit .....	page 109
Service support .....	page 116

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### 5.1 Safety messages

Procedures and instructions in this manual may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a caution symbol (⚠). The external hot surface symbol (🔥) is used when a surface is hot and care must be taken to avoid possible burns. If there is a risk of an electrical shock the (⚡) symbol is used. Refer to the safety messages listed at the beginning of each section before performing an operation preceded by this symbol.

#### **⚠ WARNING**

**Failure to follow these installation guidelines could result in death or serious injury.**

- The Rosemount™ 3490 Series Control Unit (“control unit”) must be installed, connected, commissioned, operated, and maintained by suitably qualified personnel only, observing any national and local requirements that may apply.
- Use the control unit only as specified in this manual. Failure to do so may impair the protection provided by the equipment.

**Explosions could result in death or serious injury.**

- Please review the approvals section of this reference manual for any restrictions associated with an installation.

**Electrical shock could cause death or serious injury.**

- If the control unit is installed in a high voltage environment and a fault condition or installation error occurs, high voltage may be present on leads and terminals.
- Use extreme caution when making contact with the leads and terminals.
- Make sure that power to the control unit is off while making connections.

### 5.2 Servicing the control unit

Before servicing, **disconnect the power.**

No maintenance is required beyond occasional cleaning of the enclosure with a damp cloth. Solvents or bleaches should not be used.

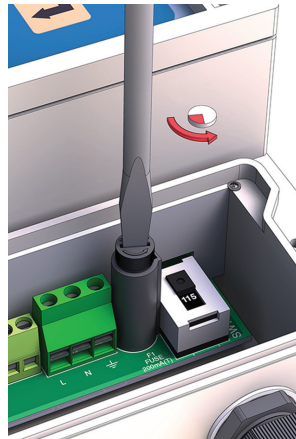
**Do not modify or repair the unit.** There are no spare parts for the Rosemount 3490 Series Control Unit. If a problem persists, contact the nearest Emerson™ Process Management representative (see “Service support” on page 116).

## 5.2.1 Replacing the fuse on mains ac-powered control units

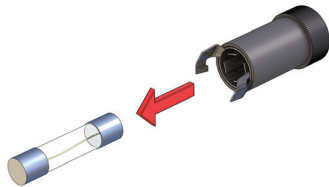
Before starting, **disconnect the power**. Follow the procedure in [Figure 5-1](#) (IP65 and NEMA® 4X units) or [Figure 5-2](#) (panel-mount unit). See “[Electrical](#)” on page 117 for the fuse type.

**Figure 5-1. Fuse Replacement Procedure (Wall-mount Control Unit)**

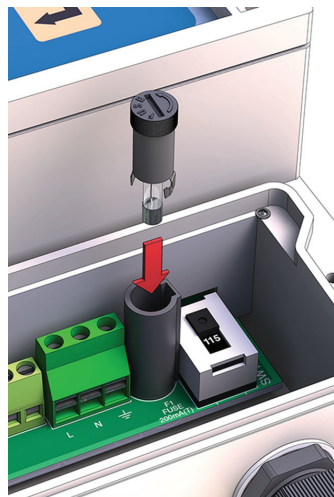
Carefully turn the flat-bladed screwdriver anti-clockwise, until the fuse-holder is released.



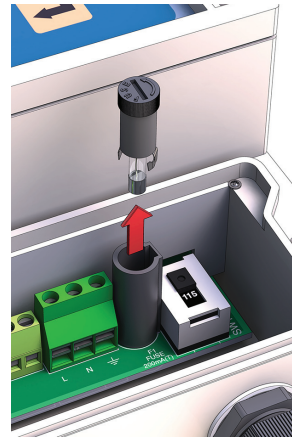
Pull the old fuse out from the fuse-holder.



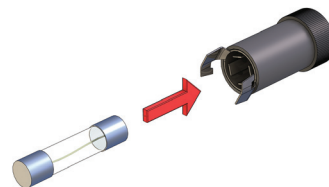
Carefully place the fuse-holder back, noting the vertical position of the notch.



Lift the fuse-holder upwards and away from the control unit.



Push the new fuse into the fuse-holder.

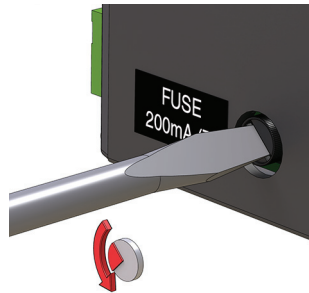


Push the fuse-holder downwards, and then twist clockwise until the fuse-holder stays in position.

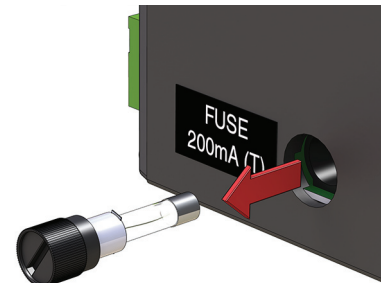


**Figure 5-2. Fuse Replacement Procedure (Panel-mount Control Unit)**

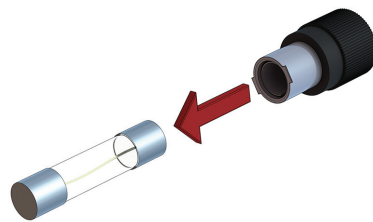
Carefully turn the flat-bladed screwdriver anti-clockwise, until the fuse-holder is released.



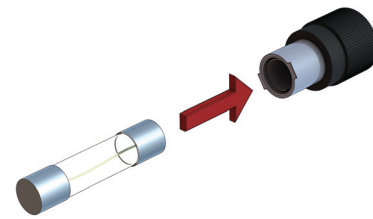
Lift the fuse-holder away from the control unit.



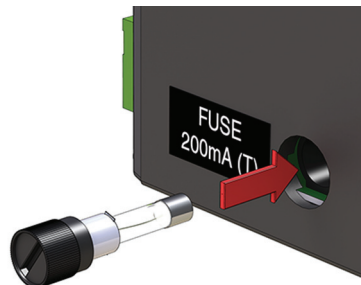
Pull the old fuse out from the fuse-holder.



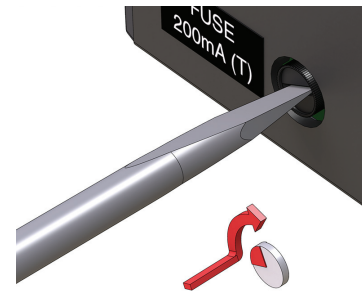
Push the new fuse into the fuse-holder.



Carefully place the fuse-holder back, noting the angled position of the notch.



Push the fuse-holder inwards, and then twist clockwise until the fuse-holder stays in position.



## 5.3 Health checking the control unit

This section is a guide to the health check system, which includes tests, calibrations, live readings, and diagnostic data for the control unit.

### 5.3.1 Simulation (self-test)

#### Menu: **SETUP>[CONTROLLER>]APPLICATION>SIMULATION**

The Simulation (or Self-Test) function is selected by Selecting the **red (enter)** button at the *SIMULATION* screen.

To start, select the **up arrow** button once.

When started, the control unit Primary/Process Value (PV) is driven up to a maximum value (P401) and then driven down to a minimum value (P400), continuously, therefore exercising the Current Output and relays. It always begins at the 4 mA point.

A single cycle takes approximately 100 seconds to complete.

To pause at any time, select the **up arrow** button. When paused, selecting the **up arrow** button once will resume the cycle. You can also Select the **down arrow** to pause, and select it again to change direction of the cycle.

To quit at any time, even when paused, Select the **Esc** button once to exit immediately to the *Full PV* display. The PV value calculation then immediately resumes being based on the transmitter inputs.

### 5.3.2 Display test

#### Menu: **SETUP>[CONTROLLER>]SYSTEM>TEST>DISPLAY**

The Display Test function is started by selecting the **red (enter)** button at the *DISPLAY* screen.

When the test is started, a pre-defined pattern sequence exercises all the LCD display pixels. After several seconds, the test ends by displaying the model code and software version number.

To re-run the Display Test, select the **red (enter)** button again. Otherwise, select the **Esc** button to exit to the menu.

### 5.3.3 Calibration of the Current Input ( $I_{in}$ )

#### Menu: **SETUP>[CONTROLLER>]SYSTEM>TEST>CURRENT INPUT**

##### Procedure for 4 mA input calibration

1. Apply 4 mA to the Current Input ( $I_{in}$ ) terminal.  
(See “Electrical installation” on page 14 for terminal connections).
2. Select the **4 mA In Adjust** menu option.
3. Select the **red (enter)** button once.

#### Procedure for 20 mA input calibration

1. Apply 20 mA to the Current Input ( $I_{in}$ ) terminal.  
(See “Electrical installation” on page 14 for terminal connections).
2. Select the **20 mA In Adjust** menu option.
3. Select the **red (enter)** button once.

### 5.3.4 Fixing the Current Output ( $I_{out}$ )

#### Menu:

**SETUP>[CONTROLLER>]SYSTEM>TEST>CURRENT OUTPUT**

#### Procedure for temporarily fixing the Current Output

1. Select the **Set Current** menu option.
2. Edit a mA value in the range 4–20 mA.
3. Save the mA value to then fix the output current from the Current Output ( $I_{out}$ ) terminal at that level.  
(See “Electrical installation” on page 14 for terminal connections).

Selecting the **Esc** button will exit to the menu and restore the output current to the level corresponding to the control unit PV (D800).

### 5.3.5 Calibration of the Current Output ( $I_{out}$ )

#### Menu:

**SETUP>[CONTROLLER>]SYSTEM>TEST>CURRENT OUTPUT**

#### Procedure for 4 mA output calibration

1. Select the **4 mA Out Adjust** menu option.
2. Measure the output current from the Current Output ( $I_{out}$ ) terminal.  
(See “Electrical installation” on page 14 for terminal connections).
3. If the measured current is not 4 mA, edit the existing value to be the actual mA reading and then save it.

#### Procedure for 20 mA output calibration

1. Select the **20 mA Out Adjust** menu option.
2. Measure the output current from the Current Output ( $I_{out}$ ) terminal.  
(See “Electrical installation” on page 14 for terminal connections).
3. If the measured current is not 20 mA, edit the existing value to be the actual mA reading and then save it.

## 5.3.6 Monitoring the control unit readings

### Menu: **MONITOR>[CONTROLLER>]READINGS**

#### Answers

- D800** PV ANSWERS/PV
- This is the live control unit Primary/Process Value (PV).
- D801** SV ANSWERS/SV
- This is the live control unit Secondary Value (SV).
- D802** TV ANSWERS/TV
- This is the live control unit Third/Tertiary Value (TV).
- D803** FV ANSWERS/FV
- This is the live control unit Fourth Value (FV).

---

#### Note

PV, SV, TV, and FV are described in the section “[Optional change: transmitter input channel settings \(advanced users\)](#)” on page 42.

---

- D804** Ullage
- This indicates how much a vessel or open-channel falls short of being full. It is calculated as the difference between the upper range value (URV) of the Current Output and the control unit PV i.e.  $D804 = (P401 - D800)$
- D805** % Current Output ANSWERS/% Current Out
- This indicates the present amount of electrical current being output from the 4–20 mA Current Output as a percentage.

---

#### Note

The output current is while the control unit is in the **Program** operating mode.

---

- D806** Current O/P ANSWERS/Current Output
- This indicates the present amount of electrical current being output from the 4–20 mA Current Output as a mA value.

#### Rate of change

- D809** Rate of Change Rate of Change
- This indicates the calculated rate of change of the control unit PV.  
See also “[Rate of Change mode relay](#)” on page 84 for how to use parameter D809.

#### Relay

- D811** RL1 Ops RELAY/RELAY OPERATIONS
- This indicates the number of operations carried out by relay RL1. It can be re-set to zero by selecting the **red (enter)** button when displaying D811.



The operation count is used by the Relay Operations Alarm feature (see “Relay safeguard options” on page 71).

D812 to D815 are the operation counters for other relays.

**D820** Relay Status RELAY/Relay Status

- This indicates a series of 0 and 1 digits which represent the de-energized (0) or energized (1) relays. The first digit represents Relay RL1, the second digit represents Relay RL2, etc.

**D821** RL1 Run-Time RELAY/RELAY RUN TIME

- This indicates the total time that relay RL1 has been energized for the present relay operation. It is cumulative i.e. does not reset when the relay RL1 is de-energized.

The run-time is used by the Relay Run Time Alarm feature. (see “Relay Operations alarm” on page 89).

D822 to D825 are the running times for the other relays.

### Totalizer (Rosemount 3491 only)

**D828** Totalizer Totalizer

- This indicates the totalizer count.

See “Set-up totalizing on the Rosemount 3491 control unit” on page 96 for details of the totalizing feature on the 3491.

### Totalizer (Rosemount 3492 and 3493 only)

**D828** Totalizer 1 Totalizer

- This indicates the Totalizer 1 count.

See “Set-up totalizing on the Rosemount 3491 control unit” on page 96 for details of the totalizing feature on the Rosemount 3492.

See “Set-up totalizing on Rosemount 3493 Control Unit” on page 101 for details of the totalizing feature on the Rosemount 3493.

**D829** Totalizer 2 Totalizer

- This displays the Totalizer 2 count.

See “Set-up totalizing on Rosemount 3492 Control Unit” on page 98 for details of the totalizing feature on the 3492.

See “Set-up totalizing on Rosemount 3493 Control Unit” on page 101 for details of the totalizing feature on the 3493.

### Alarm report

**D830** Alarm Report

- This is for viewing live alarms.

The highest priority alarm is listed first. Use the **up/down arrow** buttons to scroll through the list if more than one alarm exists. If there are no live alarms, the alarm report indicates “none”.

See Table 4-8 on page 88 for a summary of other alarm reporting features.

## Fault report

### D831 Fault Report

- This is for viewing live faults.

The highest priority fault is listed first. Use the **UP/DOWN-ARROW** buttons to scroll through the list if more than one fault exists. If there are no live faults, the fault report indicates “none”.

See [Table 4-8 on page 88](#) for a summary of other fault reporting features.

## 5.3.7

## Diagnostic data for the control unit

### Menu: **MONITOR>[CONTROLLER>] DIAGNOSTICS**

#### I/P status (input status)

### D835 I/P Status

- This indicates a series of 0 and 1 digits which represent the inactive (0) and active (1) digital trigger inputs.

The first digit represents digital trigger input **IN1**, and the second digit represents digital trigger input **IN2**.

#### Current i/p (current input)

### D840 Current I/P

- This indicates the present electrical input current in mA.

See the section “[Optional change: transmitter input channel settings \(advanced users\)](#)” on [page 42](#) for how this parameter is used.

#### mA input

### D842 mA Input %

- This indicates the present electrical input current as a percentage of the 4–20 mA range.

See “[Optional change: transmitter input channel settings \(advanced users\)](#)” on [page 42](#) for how this parameter is used.

#### CU temperature

### D844 CU Temperature

- This indicates the present operating temperature within the Rosemount 3490 Series Control Unit. If above 65 °C, it is a fault condition (see “[Fault mode relay](#)” on [page 83](#)).

#### Next pump down

### D845 Next Pump down

- This indicates the time remaining before the next pump-down is started.

See “[Pump-down \(Rosemount 3491 and 3492 only\)](#)” on [page 86](#) for feature details.

### Free memory (Rosemount 3493 only)

#### D846 Free Memory

- This indicates the percentage of free memory remaining for the data logging feature.  
See “P593 Low Mem Alarm (Default is 0%)” on page 64 for the Low Memory Alarm feature details.

### Date of change

#### D848 Date of Change

- This indicates the date on which a parameter was last edited.

### 1st pwr date

#### D849 1st Pwr Date

- This indicates the date on which the control unit was first powered-up.

### Transmitter channels

#### D851 Ch1 Output

- This indicates the result from Transmitter Input Channel 1.  
See “Optional change: transmitter input channel settings (advanced users)” on page 42 for how this value is calculated.

#### D852 Ch2 Output

- This indicates the result from Transmitter Input Channel 2.  
See “Optional change: transmitter input channel settings (advanced users)” on page 42 for how this value is calculated.

### Pump efficiency

#### D861 Pump effy RL1

- This shows the pump efficiency percentage for relay RL1.  
See also “Pump Efficiency alarm (Rosemount 3491 and 3492 only)” on page 90.

**D862** to **D864** indicate the pump efficiencies for the relays **RL2**, **RL3**, and **RL4**. Note that this pump efficiency calculation is not available for relay **RL5**.

## 5.3.8

## Model code, serial number, and software and hardware revisions

The factory-set values of the following parameters may be requested from you if you ever contact Emerson Process Management for help with this product. They can't be edited.

### Menu: **SETUP>[CONTROLLER>] SYSTEM>FIXED**

#### D750 Model Code

- This is the full model number of your Rosemount 3490 Series Control Unit.  
See “Ordering information” on page 123 for interpreting the codes used in the model number.

**D751** Serial No (serial number)

- This is the unique serial number of the Rosemount 3490 Series Control Unit.

**D752** H/W Revision

- This is the revision number of the particular build of your Rosemount 3490 Series Control Unit.

**D753** S/W Revision

- This is the revision number of the software release that is running on the Rosemount 3490 Series Control Unit.

## 5.4 Service support

To expedite the return process outside of the United States, contact the nearest Emerson Process Management representative.

Within the United States, call the Emerson Process Management Instrument and Valves Response Center using the 1 800 654 7768 toll-free number. This center, available 24 hours a day, will assist you with any needed information or materials.

The center will ask for product model and serial numbers, and will provide a Return Material Authorization (RMA) number.

# Appendix A Specifications and Reference Data

Specifications .....	page 117
Dimensional drawings .....	page 120
Ordering information .....	page 123

## A.1 Specifications

### A.1.1 General

#### Products

Rosemount™ 3491 Standard Control Unit, Rosemount 3492 Differential Control Unit, and Rosemount 3493 Logging Control Unit

#### Mounting styles

Wall or panel mount

#### Power options

AC mains or DC

### A.1.2 Display

#### Type

Dot matrix LCD display, 32 × 122 pixels, back lit

#### Location

Integrated into enclosure

#### Indicators

Red LED for health status

### A.1.3 Electrical

#### AC mains power supply input

115 or 230 Vac ± 10% (switch selectable)

Power consumption: 10 VA nominal, 18 VA maximum

Fuse: 200 mA(T), 5 × 20 mm, 250 V

#### DC power supply input

15 to 30 Vdc, 30 Vdc maximum

Power consumption: 9 W maximum

#### Current input

4–20 mA (Earth referenced in control unit) or HART® digital communications (revisions 5, 6, and 7)

One HART transmitter on the Rosemount 3491 and 3493, and two HART transmitters on the Rosemount 3492

The Rosemount 3490 Series provides an intrinsically safe power supply to an intrinsically safe approved transmitter mounted in a hazardous area.

The control unit provides a nominal 24 Vdc supply, but this output varies at the terminals depending on electrical load conditions (see [Table E-1 on page 142](#)).

#### Trigger inputs

2 voltage-free contact closures

#### Relays

5 x SPDT, 5 A at 240 Vac

#### Current output

Signal range (nominal): 4–20 mA

Output range (linear):

3.8 to 20.5 mA  
(user-selectable alarm current of 3.6, 21, or 22.5 mA)

or  
3.9 to 20.8 mA  
(user-selectable alarm current of 3.75 or 21.75mA)

Load: R<sub>max</sub> is 2370 Ohms (see [Table E-1 on page 142](#))

Resolution: 12-bit

Regulation: < 0.1% over load change from 0 to 600 Ohms

Isolation: Isolated from other terminals to 500 Vdc

Update rate (software): five times per second

### Cable entry

- IP-rated wall mount enclosure:  
5 positions pre-drilled, 2 cable glands and 3 blanking plugs supplied
- NEMA-4X-rated wall mount enclosure:  
Positions require drilling by user, glands/conduits and blanking plugs are not supplied
- Panel enclosure:  
Direct wiring to terminal blocks at rear

### Cable connection

- Wall mount enclosure:  
Cage clamp terminal blocks in separate terminal compartment
- Panel mount enclosure:  
2-part cage clamp terminal blocks at rear

## A.1.4 Mechanical

### Material selection

Emerson™ Process Management provides a variety of Rosemount product with various product options and configurations including materials of construction that can be expected to perform well in a wide range of applications. The Rosemount product information presented is intended as a guide for the purchaser to make an appropriate selection for the application. It is the purchaser's sole responsibility to make a careful analysis of all process parameters (such as all chemical components, temperature, pressure, flow rate, abrasives, contaminants, etc.), when specifying product, materials, options and components for the particular application. Emerson Process Management is not in a position to evaluate or guarantee the compatibility of the process fluid or other process parameters with the product, options, configuration or materials of construction selected.

### Materials of construction (wall mount)

Polycarbonate enclosure and cover

IP-rated wall mount: 304SST cover fixing screws

NEMA-4X-rated wall mount:

Polyester and Alloy 400 fastening

UV resistant Polycarbonate membrane keypad

Nylon cable glands and blanking plugs  
(IP-rated wall mount version only)

### Materials of construction (panel mount)

Noryl PPO enclosure and cover

Carbon Steel/Zinc plated fascia fixing screws

UV resistant Noryl PPO membrane keypad

Nylon + PBT terminal blocks with plated fittings

### Dimensions

See [Dimensional drawings](#) on pages 120 to 122

### Weight

- IP-rated wall mount:  
1.4 kg (mains control unit) or 1.0 kg (DC control unit)
- NEMA-4X-rated wall mount:  
3.5 kg (mains control unit) or 3.1 kg (DC control unit)
- Panel mount:  
1.2 kg (mains control unit) or 0.8 kg (DC control unit)

## A.1.5 Environment

### Ambient temperature

-40 to 55 °C (-40 to 131 °F)

See [Appendix B: Product Certifications](#) for approval temperatures ranges.

### Relative humidity

- Wall mount: 100%
- Panel mount: 90% non-condensing

### Electrical safety

EN61010-1

### Ingress protection

- IP-rated wall mount: IP65 indoor/outdoor
- NEMA-4X-rated wall mount: NEMA 4X indoor/outdoor
- Panel mount:  
IP40 indoor mount (or IP65 if with optional hood)

### Maximum vibration

Control room: 0.1 to 9 Hz 1.5 mm displacement peak amplitude/9 to 200 Hz 0.5 g

**Installation category**

Category III: Supply voltage < 127Vac (IEC60664)

Category II: Supply voltage < 254Vac (IEC60664)

**Pollution degree**

2 (IEC60664)

**Maximum altitude**

2000 m

**Electromagnetic compatibility**

Emissions and immunity  
(for IP-rated wall mount and panel mount): EN61326-1

**Certifications**

Intrinsically Safe associated apparatus.

See “Product Certifications” on page 125.

## A.2 Dimensional drawings

Figure A-1. IP-Rated Wall-Mount Control Unit

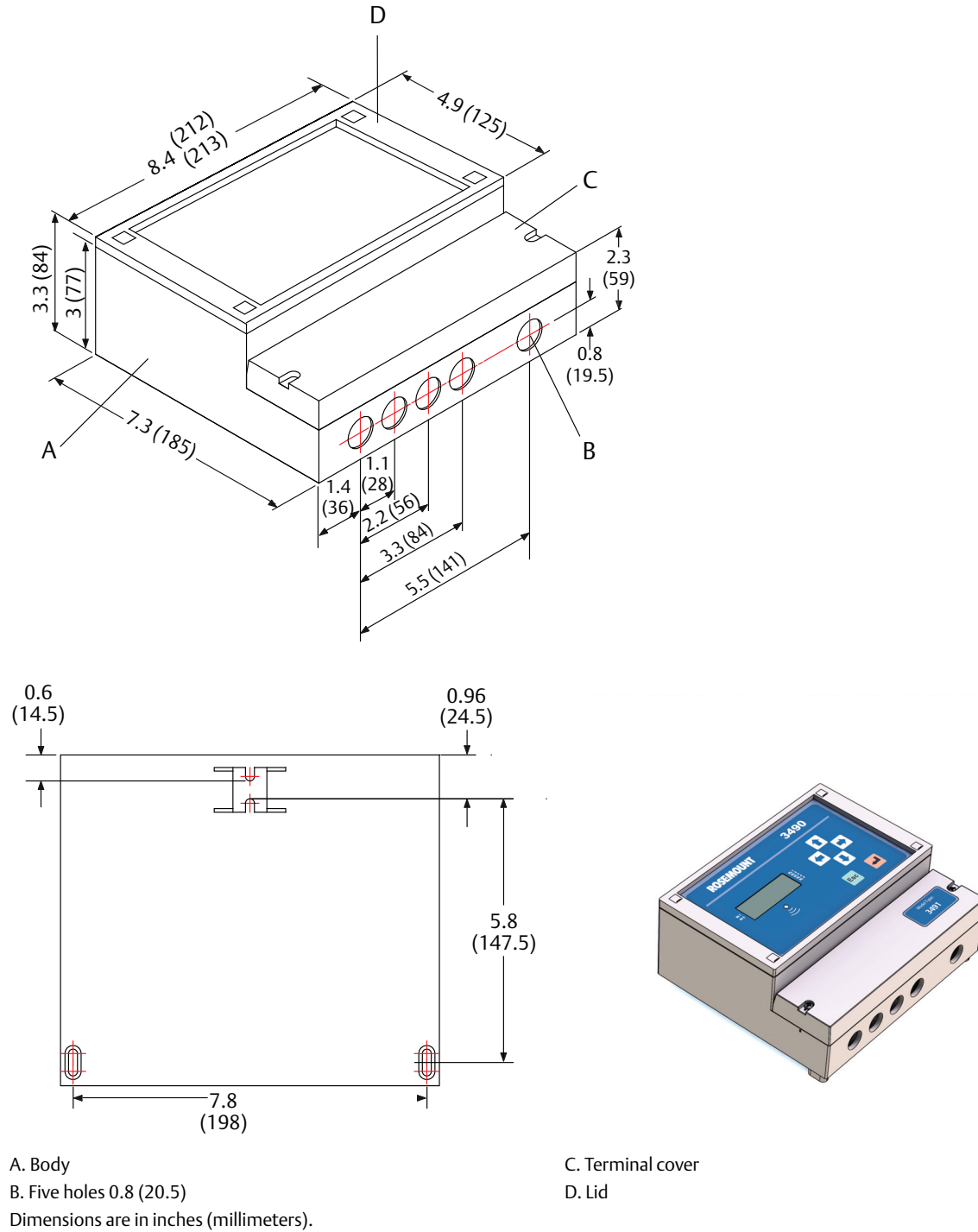
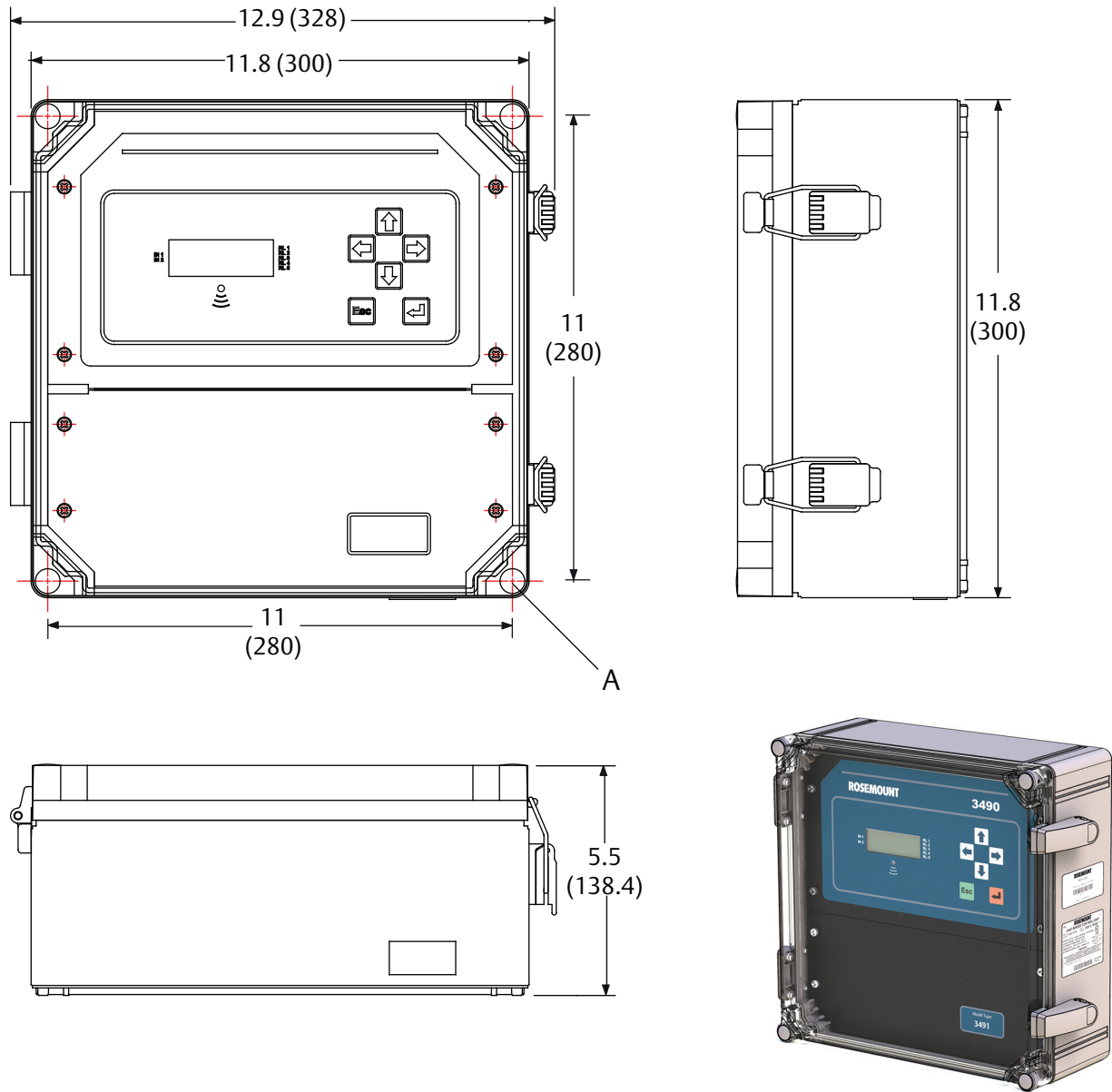


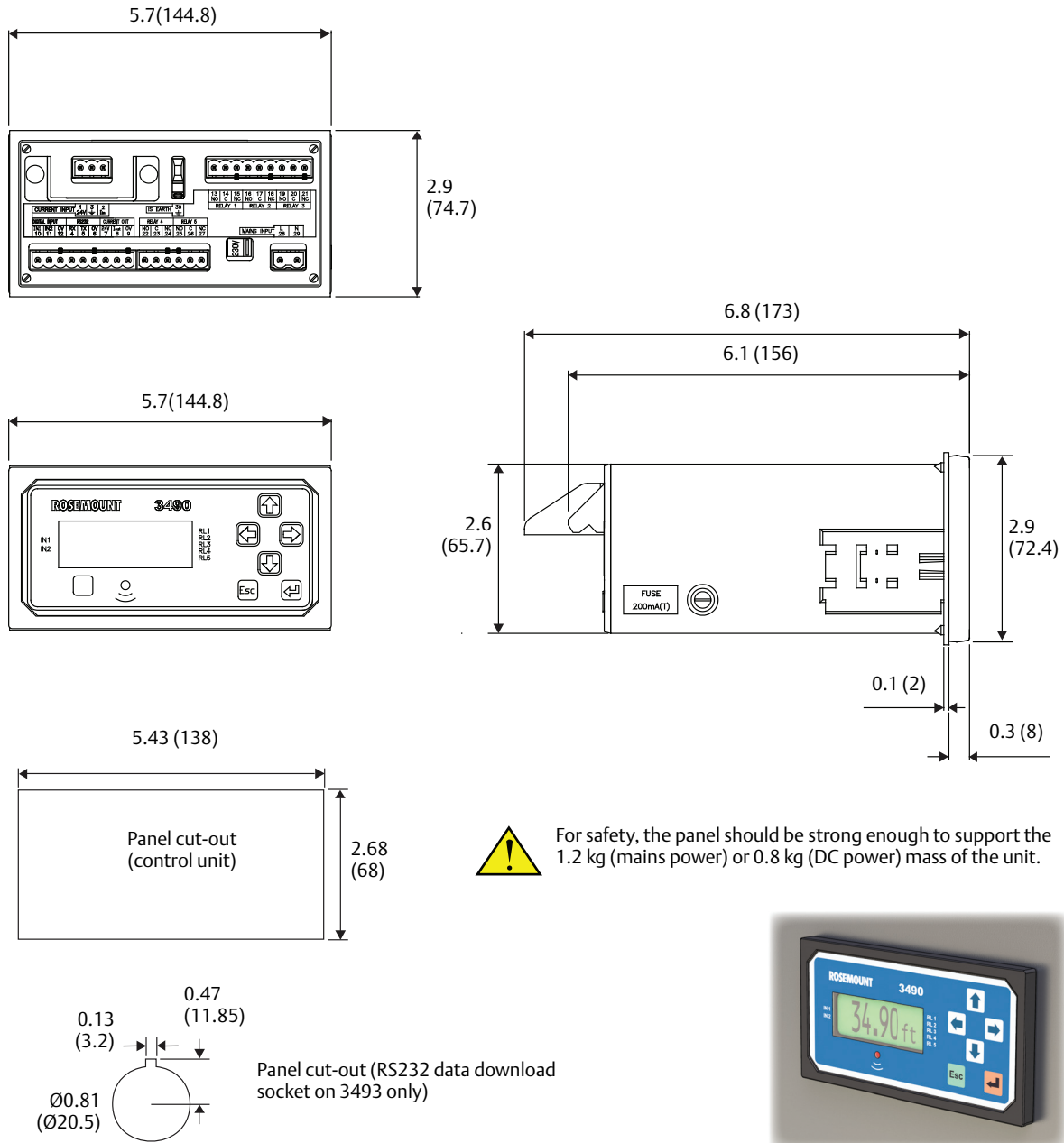


Figure A-2. NEMA-4X-rated Wall Mounted Control Unit



A. four mounting holes 0.3 (8)  
Dimensions are in inches (millimeters).

Figure A-3. Panel Mount Control Unit



Dimensions are in inches (millimeters).

## A.3 Ordering information

**Table A-1. Rosemount 3491, 3492, and 3492 Ordering Information**

The starred options (★) represent the most common options and should be selected for best delivery. The non-starred offerings are subject to additional delivery lead time.

Model	Product description	
3491	Standard Control Unit	
3492	Differential Control Unit	
3493	Logging Control Unit	
<b>Signal output</b>		
L	4–20 mA	★
<b>Power supply</b>		
1	115/230 Vac	★
2	24 Vdc	★
<b>Enclosure/mounting</b>		
P6	Wall mounting, IP65	★
P7	Panel mounting, IP40	★
P4	Wall mounting, NEMA 4X	★
<b>Product certificates</b>		
I1	ATEX Intrinsically Safe	★
I3	NEPSI Intrinsically Safe	★
I5 <sup>(1)</sup>	USA Intrinsically Safe	★
I6 <sup>(1)</sup>	CSA Intrinsically Safe	★
I7	IECEx Intrinsically Safe	★
IM	Technical Regulation Customs Union (EAC) Intrinsically Safe	★
<b>Typical model number: 3491 L 1 P4 I5</b>		

1. Enclosure/mounting codes P4 or P7 are required for this option.

**Table A-2. Accessory Ordering Information**

The Standard offering represents the most common models and options. These options should be selected for best delivery. The Expanded offering is manufactured after receipt of order and is subject to additional delivery lead time.

Accessory		
03490-7001-0001	IP65 hood kit for panel-mountable control unit (P7 option in Table A-1)	★



# Appendix B Product Certifications

## B.1 European Directive Information

The EC declaration of conformity for all applicable European directives for this product can be found in the Rosemount 3490 Series [Product Certifications and Safety Manual](#) and on [EmersonProcess.com/Rosemount](http://EmersonProcess.com/Rosemount).

## B.2 Hazardous Location Certifications

The control unit is mounted in a non-hazardous area, and provides a protected (intrinsically safe) direct current supply to a transmitter in a hazardous area. See [Table E.1 on page 141](#) for further information.

### B.2.1 North American and Canadian approvals

#### Canadian Standards Association (CSA) intrinsically safe approvals – certified to US standard

- I5** Project ID: 1830310  
Intrinsically safe for  
Class I, Division 1, Groups A, B, C, and D  
Intrinsically safe for Class 1, Zone 0, Group IIC [Ex ia]  
Ambient Temperature: -40 to +55 °C  
Control Drawing: 71097/1201  
(see [Figure B-1 on page 126](#))  
 $U_o = +27.3 \text{ V}$ ,  $I_o = 96.9 \text{ mA}$ ,  $P_o = 0.66 \text{ W}$ ,  $L_a = 2.26 \text{ mH}$ ,  
 $C_a = 70 \text{ nF}$

#### Canadian Standards Association (CSA) intrinsically safe approvals

- I6** Project ID: 1830310  
Intrinsically safe for  
Class I, Division 1, Groups A, B, C, and D  
Intrinsically safe for Class 1, Zone 0, Group IIC [Ex ia]  
Ambient Temperature: -40 to +55 °C  
Control Drawing: 71097/1201  
(see [Figure B-1 on page 126](#))  
 $U_o = +27.3 \text{ V}$ ,  $I_o = 96.9 \text{ mA}$ ,  $P_o = 0.66 \text{ W}$ ,  $L_a = 2.26 \text{ mH}$ ,  
 $C_a = 70 \text{ nF}$

### B.2.2 European approvals

#### ATEX intrinsically safe approvals

- I1** Certificate numbers:  
SIRA 06ATEX7128 (Wall Mount),  
SIRA 06ATEX7129X (Panel Mount)  
Intrinsically safe for II(1) G D, [Ex ia] IIC, [Ex ia Da] IIIC  
Ambient temperature: -40 °C to +55 °C  
 $U_o = +27.3 \text{ V}$ ,  $I_o = 96.9 \text{ mA}$ ,  $P_o = 0.66 \text{ W}$ ,  
 $L_i = 0.22 \text{ mH}$ ,  $C_i = 0.6 \text{ nF}$

#### Special Conditions for Safe Use:

1. Terminal 30 must be earthed in the safe area to a high integrity earth/ground point in a non-hazardous area.
2. See also the Rosemount 3490 Series [Product Certifications and Safety Manual](#) for ATEX and IECEx conditions for safe use.

### B.2.3 International approvals

#### National Supervision and Inspection Centre for Explosion Protection and Safety Instrumentation (NEPSI) intrinsically safe approval

- I3** Certificate number: GYJ11.1710X  
Intrinsic safety: [Ex ia Ga] IIC

#### International Electrotechnical Commission (IEC) intrinsically safe approvals

- I7** Certificate Number: IECEx SIR 06.0104X  
Intrinsically safe for [Ex ia] IIC, [Ex ia Da] IIIC  
Ambient temperature: -40 °C to +55 °C  
 $U_o = +27.3 \text{ V}$ ,  $I_o = 96.9 \text{ mA}$ ,  $P_o = 0.66 \text{ W}$ ,  
 $L_i = 0.22 \text{ mH}$ ,  $C_i = 0.6 \text{ nF}$

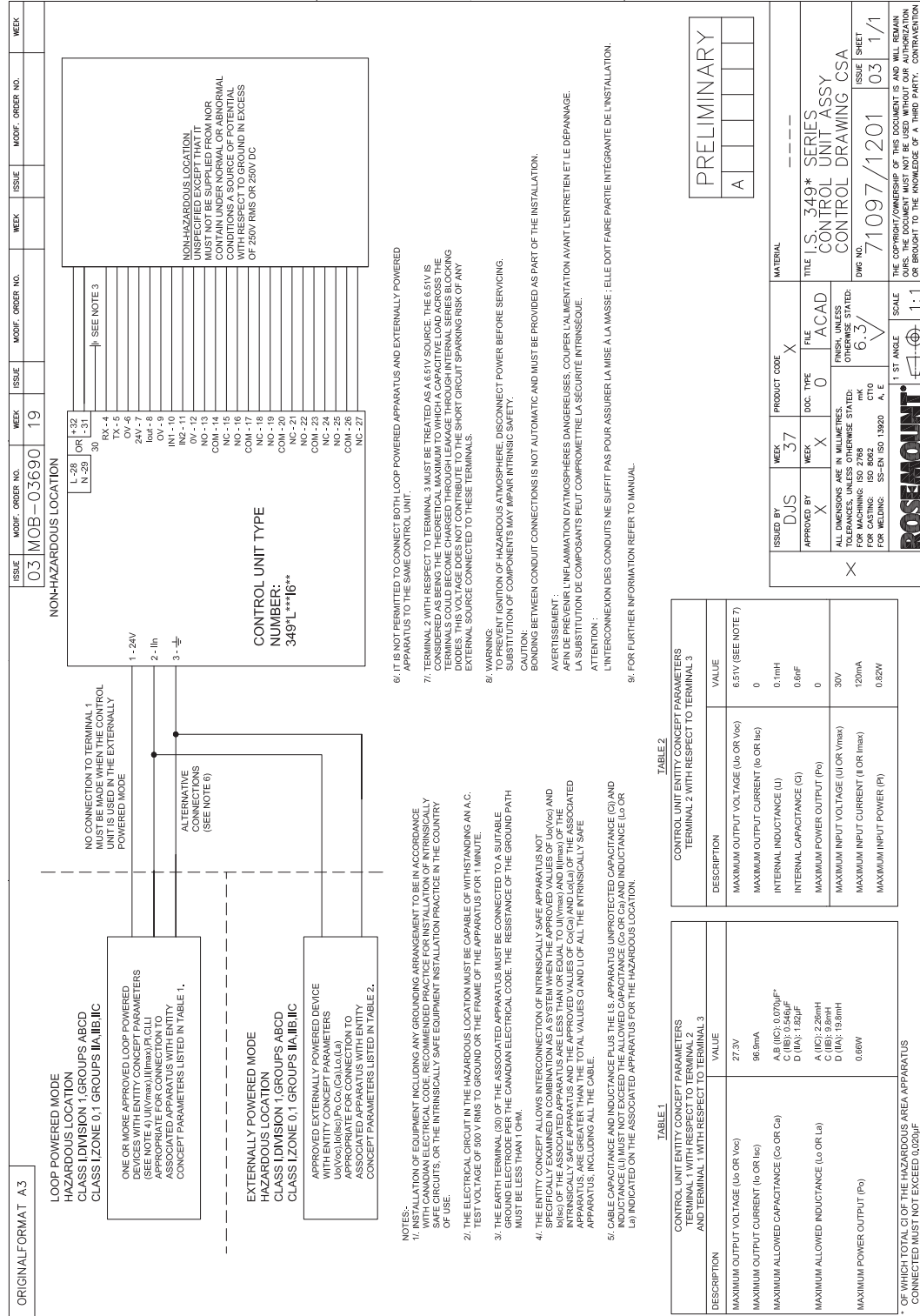
#### Special Conditions for Safe Use:

1. Terminal 30 of the panel mount control unit (349\*\*\*P7\*\*\*) shall be earthed/grounded in the safe area using a high integrity earth/ground.
2. See also the Rosemount 3490 Series [Product Certifications and Safety Manual](#) for ATEX and IECEx conditions for safe use.

#### Technical Regulation Customs Union (EAC)

- IM** Certificate number: TC RU C-GB.AA87.B.00117  
Intrinsically safe for:  
[Ex ia] IIC  
Ambient temperature: -40 °C to +55 °C  
 $U_o = +27.3 \text{ V}$ ,  $I_o = 96.9 \text{ mA}$ ,  $P_o = 0.66 \text{ W}$ ,  
 $L_i = 0.22 \text{ mH}$ ,  $C_i = 0.6 \text{ nF}$

Figure B-1. System Control Drawing for Hazardous Area Installation (I5 and I6)



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## Appendix C      Menus and Parameter

This section contains the full menu system maps for:

- Rosemount™ 3490 Series Control Units – see [Table C-1 on page 128](#)
- Generic HART® 4, 6, and 7 transmitters – see [Table C-2 on page 134](#)

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### Note

If a Rosemount 3100 Series Transmitter is connected, refer to the Rosemount 3101, 3102, and 3105 [Reference Manual](#) and Rosemount 3107 and 3108 [Reference Manual](#) for full information about programming the transmitter parameters (e.g. Transmitter Bottom Reference) using the Rosemount 3490 Series Control Unit or other HART-based devices.

---

Table C-1. Rosemount 3490 Series Control Unit

MAIN MENU	Menu Level 2	Menu Level 3	Menu Level 4	Param.	Parameter Name	Units	Defaults	Min	Max	Ref. pages		
Cancel password				-	Cancel password	-	-	-	-	106		
SETUP <sup>(1)</sup>	APPLICATION	App Wizard		-	App Wizard	-	-	-	-	38		
		SIMULATION			Simulation	-	-	-	-	110		
		Description		P240	Description	-	3490 CON...	-	-	104		
		Message		P241	Message		MESSAGE	-	-	104		
		Tag		P242	Tag		(349x)	-	-	104		
	DISPLAY	Display Upper		P570	Display Upper		P731-Time	-	-	104		
		Display Middle		P571	Display Middle		D800-PV	-	-	104		
		Display Lower		P572	Display Lower		Bar graph	-	-	104		
		Decimal places		P573	Decimal places		3			104		
		PV Units		P200	PV Units	-	%	-	-	42		
		SV Units		P201	SV Units	-	None	-	-	42		
		TV Units		P202	TV Units	-	%	-	-	42		
		FV Units		P203	FV Units	-	None	-	-	42		
		Display size		P574	Display size	-	Large	-	-	104		
		Backlight		P575	Backlight	-	On	-	-	104		
	OUTPUT	CURRENT OUTPUT	Low Range Val		P400	Low Range Val	as P200	0	-	-	68	
			Up Range Val		P401	Up Range Val	as P200	100	-	-	68	
			Alarm Action		P402	Alarm Action	-	3.6 mA	-	-	68	
			mA Source		P405	mA Source	-	MCU PV			68	
		RELAY	Relay Wizard		-	Relay Wizard	-	0	-	-	69	
			Reset RL Params			Reset RL Params	-	-	-	-	70	
			RELAY 1	RELAY 1		P410	Relay 1 Mode	-	Free	-	-	70
				RELAY 1 On Point		P411	Relay 1 On Point	As P200	0	-	-	70
				RELAY 1 Off Point		P412	Relay 1 Off Point	As P200	0	-	-	70
				RELAY 1 Minimum On Time		P413	Relay 1 Minimum On Time	mm:ss	000:00	-	-	70
				RELAY 1 Maximum On Time		P414	Relay 1 Maximum On Time	mm:ss	000:00	-	-	70
				RELAY 1 Minimum Off Time		P415	Relay 1 Minimum Off Time	mm:ss	000:00	-	-	70
			RELAY 2	RELAY 2		P420	Relay 2 Mode	-	None	-	-	70
				RELAY 2 ON Point		P421	Relay 2 ON Point	As P200	0	-	-	70
				RELAY 2 OFF Point		P422	Relay 2 OFF Point	As P200	0	-	-	70
				RELAY 2 Minimum On Time		P423	Relay 2 Minimum On Time	mm:ss	000:00	-	-	70
				RELAY 2 Maximum On Time		P424	Relay 2 Maximum On Time	mm:ss	000:00	-	-	70
				RELAY 2 Minimum Off Time		P425	Relay 2 Minimum Off Time	mm:ss	000:00	-	-	70
			RELAY 3	RELAY 3		P430	Relay 3 Mode	-	None	-	-	70
				RELAY 3 ON Point		P431	Relay 3 ON Point	As P200	0	-	-	70
RELAY 3 OFF Point		P432		Relay 3 OFF Point	As P200	0	-	-	70			
RELAY 3 Minimum On Time		P433		Relay 3 Minimum On Time	mm:ss	000:00	-	-	70			
RELAY 3 Maximum On Time		P434		Relay 3 Maximum On Time	mm:ss	000:00	-	-	70			
RELAY 3 Minimum Off Time		P435		Relay 3 Minimum Off Time	mm:ss	000:00	-	-	70			



MAIN MENU	Menu Level 2	Menu Level 3	Menu Level 4	Param.	Parameter Name	Units	Defaults	Min	Max	Ref. pages
(SETUP)	(OUTPUT)	(RELAY)	RELAY 4	P440	Relay 4 Mode	-	None	-	-	70
				P441	Relay 4 ON Point	As P200	0	-	-	70
				P442	Relay 4 OFF Point	As P200	0	-	-	70
				P443	Relay 4 Minimum On Time	mm:ss	000:00	-	-	70
				P444	Relay 4 Maximum On Time	mm:ss	000:00	-	-	70
			P445	Relay 4 Minimum Off Time	mm:ss	000:00	-	-	70	
			RELAY 5	P450	Relay 5 Mode	-	None	-	-	70
				P451	Relay 5 ON Point	As P200	0	-	-	70
				P452	Relay 5 OFF Point	As P200	0	-	-	70
				P453	Relay 5 Minimum On Time	mm:ss	000:00	-	-	70
				P454	Relay 5 Maximum On Time	mm:ss	000:00	-	-	70
				P455	Relay 5 Minimum Off Time	mm:ss	000:00	-	-	70
			ALARM	P490	Rising level alarm delay	mm:ss	000:00	-	-	90
				P491	Relay operations alarm limit	-	0	-	-	89
				P492	Relay operations relay select	-	Disabled	-	-	89
				P493	Relay runtime alarm limit	hh:mm	00:00	-	-	89
				P494	Relay runtime relay select	-	Disabled	-	-	90
				P495 <sup>(2)</sup>	Pump efficiency limit	-	0	-	-	90
				P496 <sup>(2)</sup>	Pump efficiency relay select	-	0	-	-	90
				P497	No activity delay	hh:mm	00:00	-	-	89
				P498	No activity relay	hh:mm	00:00	-	-	89
			OVERRIDES	P499	Pump On Delay	s	3	0	9	85
				P270 <sup>(3)</sup>	Auto Sequence Enable	-	Off	-	-	85
				P271 <sup>(3)</sup>	Auto Sequence Qualifier	-	0	-	-	85
				P272 <sup>(3)</sup>	Pump-down Relay	-	0	-	-	87
				P273 <sup>(3)</sup>	Pump-down Interval	hh.mm	00:00	-	-	87
				P274 <sup>(3)</sup>	Pump-down Duration	hh.mm	00:00	-	-	87
				P275	Energy Saving Start Time	hh.mm	00:00	-	-	86
				P276	Energy Saving Relay Select	-	0	-	-	86
				P277 <sup>(3)</sup>	Scum Line Prevention variance	-	0	-	-	86
				P278 <sup>(3)</sup>	Scum Line Prevention relay	-	0	-	-	86
			CUSTOM	P250	Start On	-	None	0	4	87
				P251	Stop On	-	None	0	3	87
				P252	Stop If	-	None	0	253	87
				P253	Start Time	hh.mm	07:00	-	-	87
				P254	Interval	hh.mm	01:00	-	-	87
				P255	Start Time #2	hh.mm	00:00	-	-	87
				P256	Interval #2	hh:mm	00:00	-	-	87
				P257	Max Retries	-	10	0	250	87, 92

MAIN MENU	Menu Level 2	Menu Level 3	Menu Level 4	Param.	Parameter Name	Units	Defaults	Min	Max	Ref. pages	
(SETUP)	(OUTPUT)	TOTALIZER <sup>(4)</sup>	Totalizer Wizard		Totalizer Wizard	-	0	-	-	92, 96, 101	
			Total [1] Factor	P530	Totalizer [1] Factor	-	0	0	-	92, 96, 101	
			Total [1] Units	P531	Totalizer [1] Units	-	0	0	-	92, 96, 101	
			Total 2 Factor	P532	Totalizer 2 Factor	-	0	0	-	96	
			Total 2 Units	P533	Totalizer 2 Units	-	0	0	-	96	
			Total 2 Source	P536	Totalizer 2 Source	-	0	-	-	96	
			Pulse Width	P534	Pulse Width	ms	100	10	2500	92, 96, 101	
			Sample Factor	P535	Sampler Factor	-	0	0	-	92, 96, 101	
			Total 2 dec pl	P537 <sup>(5)</sup>	Total 2 decimal places	-	1	-	-	96	
			PV DAMPING	MCU PV Damp...	P210	MCU PV Damping	s	0	-	-	43
			ALARM	PV over Limits	P540	PV Over Limits	-	None	-	-	92
				mA Out Sat	P541	Current Output Saturated	-	None	-	-	92
				Memory Filling	P542	Memory Filling <sup>(6)</sup>	-	None	-	-	92
				Digital Input	P543	Digital Input	-	None	-	-	92
				Max Retries	P544	Maximum number of retries	-	None	-	-	92
				mA In Sat	P545	Current Input Saturated	-	None	-	-	92
				Rising Level	P547	Rising Level	-	None	-	-	92
				RELAY	P548	Relay operations	-	None	-	-	92
					P549	Relay runtime	-	None	-	-	92
			P550		Pump efficiency	-	None	-	-	92	
				P551	No activity	-	None	-	-	92	
			FAULT	System Fault	P560	System Fault	-	Both	-	-	83
				CU Temp Fault	P561	Control Unit TemperatureFault	-	None	-	-	83
				Xmtr Fault	P562	Transmitter Fault	-	Both	-	-	83
				Digital Input	P563	Digital Input	-	None	-	-	83
			LOGGING <sup>(6)</sup>			Logging Wizard	-	0	-	-	66
					P590	Logging Interval	min	0	0	99	64
					P591	Fast logging select mode	as P200	0 (=Off)	0	-	64
					P592	Do/Do not overwrite old data	-	On	-	-	64
					P593	Low memory alarm threshold	%	0	0	99	64
			INPUT CHANNEL (3491/3493)	Ch1 I/P Source	P111	Ch1 I/P Source		Tx1 : PV	-	-	43, 47
				Ch1 I/P Offset	P112	Channel 1 Input Offset	-	0	-	-	43, 47
				Ch1 Profile	P113	Channel 1 Profile	-	Scaled	-	-	43, 47
				Ch1 Pre Scale	P114	Channel 1 Input Scale Factor	-	1	-	-	43, 47
				Ch1 NLP Data	P115	Channel 1 Non-Linear Data	-	0	-	-	43, 47
				Ch1 Post Scale	P116	Channel 1 Post Scale	-	1	-	-	43, 47
				Ch1 Low Cut-off	P117	Channel 1 Low Cut-off	as P201	None	-	-	43, 47
				Cur I/P Damping	P321	Current Input 1 Damping	sec	5	0	99.9	43, 47

MAIN MENU	Menu Level 2	Menu Level 3	Menu Level 4	Param.	Parameter Name	Units	Defaults	Min	Max	Ref. pages	
(SETUP)	PV CALCULATION (3492)	CHANNEL 1	Ch1 I/P Source	P111	Channel 1 Input Source		Tx1 : PV	-	-	43, 47	
			Ch1 I/P Offset	P112	Channel 1 Input Offset	-	0	-	-	43, 47	
			Ch1 Profile	P113	Channel 1 Profile	-	Scaled	-	-	43, 47	
			Ch1 Pre Scale	P114	Channel 1 Input Scale Factor	-	1	-	-	43, 47	
			Ch1 NLP Data	P115	Channel 1 Non-Linear Data	-	0	-	-	43, 47	
			Ch1 Post Scale	P116	Channel 1 Post Scale	-	1	-	-	43, 47	
			Ch1 Low Cut-off	P117	Channel 1 Low Cut-off	as P201	None	-	-	43, 47	
		CHANNEL 2	Ch2 I/P Source	P121	Channel 2 Input Source		Tx2 : PV	-	-	49	
			Ch2 I/P Offset	P122	Channel 2 Input Offset	-	0	-	-	49	
			Ch2 Profile	P123	Channel 2 Profile	-	Scaled	-	-	49	
			Ch2 Pre Scale	P124	Channel 2 Input Scale Factor	-	1	-	-	49	
			Ch2 NLP Data	P125	Channel 2 Non-Linear Data	-	0	-	-	49	
			Ch2 Post Scale	P126	Channel 2 Post Scale	-	1	-	-	49	
			Ch2 Low Cut-off	P127	Channel 2 Low Cut-off	as P202	None	-	-	49	
	Output Mapping			P150	Output Mapping	-	Ch1	-	-	49	
	MCU FV Source			P151	MCU Fourth Variable Source	-	Tx1: FV	-	-	49	
	Cur I/P Damping			P321	Current Input 1 Damping	sec	5	0	99.9	43, 47	
	DIGITAL INPUT	DIGITAL INPUT 1	Dig In1 Action	P340	Digital Input 1 Action	-	Free	-	-	60	
			Dig In1 Delay	P341	Digital Input 1 Delay	mm.ss	000:00	-	-	60	
			Dig In1 Active	P342	Digital Input 1 Active	-	Closed	-	-	60	
		DIGITAL INPUT 2	Dig In2 Action	P345	Digital Input 2 Action	-	Free	-	-	60	
			Dig In2 Delay	P346	Digital Input 2 Delay	mm:ss	000:00	-	-	60	
			Dig In2 Active	P347	Digital Input 2 Active	-	Closed	-	-	60	
	SYSTEM	TEST	DISPLAY		Display Test	-	-	-	-	110	
			CURRENT INPUT	4mA input adjust			-	-	-	-	110
				20mA input adjust			-	-	-	-	111
				CURRENT OUTPUT	P700	4mA output adjust	-	-	-	-	111
			P701	20mA output adjust	-	-	-	-	-	111	
			P702	Set Current	mA	0	-	-	-	111	
		SETTINGS	Date	P730	Date	-	(Factory)	-	-	42	
			Time	P731	Time	-	-	-	-	42	
			Date Format	P734	Date format	-	dd/mm/yy	-	-	42	
			Keypad Sound	P735	Keypad sound on/off	-	Off	-	-	42	
Language			P737	Language	-	English	-	-	42		
PIN			P740	PIN	-	0			106		
DEFAULTS					-	LOAD FACTORY DEFAULTS	-	-	-	137	
Transmitter Wizard				-	Transmitter Wizard	-	-	-			

MAIN MENU	Menu Level 2	Menu Level 3	Menu Level 4	Param.	Parameter Name	Units	Defaults	Min	Max	Ref. pages
(SETUP)	(SYSTEM)	COMMUNICATION	Address	P710	Comms address of control unit	-	0	0	15	105
			Interface	P711	Interface type	-	See <sup>(7)</sup>	-	-	105
			Baud Rate	P712	Baud rate	-	See <sup>(8)</sup>	-	-	105
			Start Bits	P713	Number of start bits	-	1	1	2	105
			Data Bits	P714	Number of data bits	-	8	7	8	105
			Parity	P715	Parity of data	-	Odd	-	-	105
			Stop Bits	P716	Number of stop bits	-	1	1	2	105
		FIXED	Model Code	D750	Model code	-	(Factory)	-	-	115
			Serial No	D751	Serial Number - Control Unit	-	(Factory)	-	-	115
			H/W Revision	D752	Hardware Revision	-	(Factory)	-	-	115
			S/W Revision	D753	Software Version	-	(Factory)	-	-	115
			HART	D760	Manufacturer's Code	-	(RMT)	-	-	115
				D761	Unique ID	-	(Factory)	-	-	-
				D762	Universal command revision	-	5	-	-	-
				D763	Txr spec. command revision	-	2	-	-	-
				D764	Pre-amble bytes	-	5	-	-	-
				D765	Flags	-	1	-	-	-
Run App?/Program?				-	Run App?/Program?	-	-	-	37	
MONITOR <sup>(1)</sup>	READINGS	ANSWERS	PV	D800	Primary/Process Variable	As P200	-	-	-	42 - 43, 112
			SV	D801	Secondary Variable	As P201	-	-	-	42 - 43, 112
			TV	D802	Tertiary Variable	As P202	-	-	-	42 - 43, 112
			FV	D803	Fourth Variable	As P203	-	-	-	42 - 43, 112
			Ullage	D804	Ullage	As P200	-	-	-	112
			% Current Out	D805	% Current Output	%	-	-	-	112
			Current O/P	D806	Current Output	mA	-	-	-	112
		Rate of Change	D809	Rate of PV change	PV/min	-	-	-	84, 91, 112	
		RELAY	RELAY OPERATIONS	D811	Relay 1 Operations Counter	-	0	-	-	89, 112
				D812	Relay 2 Operations Counter	-	0	-	-	89, 112
				D813	Relay 3 Operations Counter	-	0	-	-	89, 112
				D814	Relay 4 Operations Counter	-	0	-	-	89, 112
				D815	Relay 5 Operations Counter	-	0	-	-	89, 112
			Relay Status	D820	Relay Status	-	-	-	-	112
			RELAY RUN TIME	D821	Relay 1 run-time	hh:mm	-	-	-	89, 112
				D822	Relay 2 run-time	hh:mm	-	-	-	89, 112
				D823	Relay 3 run-time	hh:mm	-	-	-	89, 112
				D824	Relay 4 run-time	hh:mm	-	-	-	89, 112
		D825		Relay 5 run-time	hh:mm	-	-	-	89, 112	
		Totalizer	D828	Totalizer 1 value <sup>(4)</sup>	As P531	-	0	-	96, 113	
			D829	Totalizer 2 value <sup>(4)</sup>	As P533	-	0	-	96, 113	
		Alarm Report	D830	Alarm Report	-	None	-	-	92, 113	
		Fault Report	D831	Fault Report	-	None	-	-	83, 113	

MAIN MENU	Menu Level 2	Menu Level 3	Menu Level 4	Param.	Parameter Name	Units	Defaults	Min	Max	Ref. pages
(MONITOR)	DIAGNOSTICS	I/P Status		D835	Digital Input status	-	-	-	-	60, 114
		Current I/P		D840	Current Input	mA	-	-	-	42, 114
		mA Input %		D842	Current Input %	%	-	-	-	42, 114
		CU Temperature		D844	Temperature of Control Unit	°C	-	-	-	83, 114
		Next Pump down		D845	Time to next pump-down	hh:mm	-	-	-	86, 114
		Free memory		D846	Logging memory free <sup>(6)</sup>	%	-	-	-	64, 115
		Date of Change		D848	Date of last change	dmy	--/--/--	-	-	115
		1st Pwr Date		D849	Data of 1st power-on	dmy	--/--/--	-	-	115
		CHANNELS <sup>(9)</sup>		Ch1 Output	D851	Channel 1 Output	As P201	-	-	-
			Ch2 Output	D852	Channel 2 Output	As P202	-	-	-	49, 115
	PUMP EFFICIENCY <sup>(2)(10)</sup>		Pump effy RL1	D861	Pump efficiency RL1	%	-	-	-	90, 115
			Pump effy RL2	D862	Pump efficiency RL2	%	-	-	-	90, 115
			Pump effy RL3	D863	Pump efficiency RL3	%	-	-	-	90, 115
		Pump effy RL4	D864	Pump efficiency RL4	%	-	-	-	90, 115	
ADVANCED	Pxx			-	-	-	-	-	-	138
	Dxx			-	-	-	-	-	-	138

1. Selecting SETUP menu presents a SELECT INSTRUMENT screen if a HART transmitter is assigned to a Current Input channel. Select CONTROL UNIT tag to see Menu Level 2 options.
2. The pump efficiency calculation is available on the Rosemount 3491 and 3492 - see "Pump Efficiency alarm (Rosemount 3491 and 3492 only)" on page 90.
3. Relay override features are available on the Rosemount 3491 and 3492 - see "Set-up the relays" on page 69.
4. There is one totalizer on the Rosemount 3491. There are two totalizers on the Rosemount 3492 and 3493.
5. The "Totalizer 2" display option is available on the Rosemount 3493 only - see "Set-up totalizing on the Rosemount 3491 control unit" on page 96.
6. Data logging is available on the Rosemount 3493 only - see "Data logging on the Rosemount 3493" on page 64.
7. Factory default is "Log download" on the Rosemount 3493 and is "RS232 HART" on the Rosemount 3491 and 3492.
8. Factory default is "1200" for the Rosemount 3493, and "9600" for the Rosemount 3491 and 3492.
9. The second channel output is on the Rosemount 3492 only.
10. Relay 5 does not support the pump efficiency calculation.

Table C-2. Generic HART 5, 6, and 7 transmitters

MAIN MENU	Menu Level 2	Menu Level 3	Menu Level 4	Menu Level 5	Param.	Parameter Name	HART 5	HART 6	HART 7	
SETUP	DUTY	IDENTITY	Message		P000	Message	Yes	Yes	Yes	
			Tag		P001	Tag	Yes	Yes	Yes	
			Descriptor		P002	Descriptor	Yes	Yes	Yes	
			Long Tag		P091	Long Tag <sup>(1)</sup>	–	Yes	Yes	
		SET PV ZERO		–	SET PV ZERO	–	Yes	Yes		
		Transfer Function		P019	Transfer Function	–	Yes	Yes		
		UNITS		P012	PV Units	Yes	Yes	Yes		
		OUTPUT	VARIABLE ASSIGNMENT	PV Assignment		P006	PV Assignment	–	Yes	Yes
				SV Assignment		P007	SV Assignment	–	Yes	Yes
				TV Assignment		P008	TV Assignment	–	Yes	Yes
				QV Assignment		P009	QV Assignment	–	Yes	Yes
			CURRENT	Upper Range Value		P015	Upper Range Value	Yes	Yes	Yes
				Lower Range Value		P016	Lower Range Value	Yes	Yes	Yes
				Loop Current Activ.		P017	Loop Current Active	–	Yes	Yes
				Damping		P020	Damping	Yes	Yes	Yes
				Range Value Units		–	Range Value Units	–	Yes	Yes
				SYSTEM		TRIM	Fix Current Output	–	Fix Current Output	Yes
					Trim 4 mA	–	Trim 4 mA	Yes	Yes	Yes
					Trim 20 mA	–	Trim 20 mA	Yes	Yes	Yes
				TEST	Simulate PV	P098	Simulate PV	–	Yes	Yes
					Locate Dev	P099	Locate Device (Squawk)	–	Yes	Yes
				DATE/TIME	Present Date	P051	Present Date	–	–	Yes
					Present Time	P052	Present Time	–	–	Yes
				RESET	RESTART	–	RESTART	–	Yes	Yes
					MASTER R.	–	MASTER R.	Yes	Yes	Yes
					FLUSH DR	–	FLUSH DR	–	Yes	Yes
				BURST	CANCEL BURST 0	–	CANCEL BURST 0	–	Yes	Yes
					CANCEL BURST 1	–	CANCEL BURST 1	–	–	Yes
					CANCEL BURST 2	–	CANCEL BURST 2	–	–	Yes
				SECURITY	Write Protect Code	D978	Write Protect Code	–	Yes	Yes
					Lock Status	D979	Lock Status	–	Yes	Yes
					UNLOCK DEVICE	–	UNLOCK DEVICE	–	Yes	Yes
				FIXED	Final Assy Number	P004	Final Assy Number	Yes	Yes	Yes
					Xducer Serial Num.	P005	Xducer Serial Number	Yes	Yes	Yes
					Hardware Revision	D952	Hardware Revision	Yes	Yes	Yes
					HART	D950	HART Device Type	–	Yes	Yes
						D951	Poll Address	Yes	Yes	Yes
						D953	Software Revision	Yes	Yes	Yes
						D960	Manufacturer	–	Yes	Yes
						D961	Device ID	Yes	Yes	Yes

MAIN MENU	Menu Level 2	Menu Level 3	Menu Level 4	Menu Level 5	Param.	Parameter Name	HART 5	HART 6	HART 7		
(SETUP)	(DUTY)	(SYSTEM)	(FIXED)	(HART)	D962	HART Revision	Yes	Yes	Yes		
					D963	Device Revision	Yes	Yes	Yes		
					D964	Request Preambles	-	Yes	Yes		
					D966	Response Preambles	-	Yes	Yes		
					D967	Max Number of Dev Variables	-	Yes	Yes		
MONITOR	READINGS	VARIABLES	Primary Variable		D900	Primary Variable	Yes	Yes	Yes		
			Secondary Variable		D901	Secondary Variable	Yes	Yes	Yes		
			Tertiary Variable		D902	Tertiary Variable	Yes	Yes	Yes		
			Quaternary Variable		D903	Quaternary Variable	Yes	Yes	Yes		
		CURRENT	Current Output		D906	Current Output	Yes	Yes	Yes		
			% Current Output		D905	% Current Output	Yes	Yes	Yes		
		DIAGNOSTICS	HISTORY	Date		P003	Date	Yes	Yes	Yes	
				Conf. Change Counter		P968	Conf. Change Counter	-	Yes	Yes	
			STATUS	DEV SPEC 1	Field Device Status		D981	Field Device Status	-	Yes	Yes
					Additional Status 0		D982	Additional Status 0	-	Yes	Yes
	Additional Status 1				D983	Additional Status 1	-	Yes	Yes		
	Additional Status 2				D984	Additional Status 2	-	Yes	Yes		
	Additional Status 3				D985	Additional Status 3	-	Yes	Yes		
	Additional Status 4				D986	Additional Status 4	-	Yes	Yes		
	Additional Status 5				D987	Additional Status 5	-	Yes	Yes		
	STANDARD			Extended Dev Stat..		D988	Extended Dev Status	-	Yes	Yes	
				Device Op Mode		D989	Device Op Mode	-	Yes	Yes	
				Standard Status 0		D990	Standard Status 0	-	Yes	Yes	
				Standard Status 1		D991	Standard Status 1	-	Yes	Yes	
				Analog Chan Sat.		D992	Analog Chan Sat.	-	Yes	Yes	
				Standard Status 2		D993	Standard Status 2	-	Yes	Yes	
				Standard Status 3		D994	Standard Status 3	-	Yes	Yes	
				Analog Chan Fixed		D995	Analog Chan Fixed	-	Yes	Yes	
	DEV SPEC 2			Additional Stat 14		D996	Additional Stat 14	-	Yes	Yes	
				Additional Stat 15		D997	Additional Stat 15	-	Yes	Yes	
			Additional Stat 16		D998	Additional Stat 16	-	Yes	Yes		
			Additional Stat 17		D999	Additional Stat 17	-	Yes	Yes		
	TRANSDUCER		Upper Xducer Limit		D941	Upper Xducer Limit	-	Yes	Yes		
			Lower Xducer Limit		D942	Lower Xducer Limit	-	Yes	Yes		
		Xducer Min Span		D943	Xducer Min Span	-	Yes	Yes			
	COMMS STATS	STX Count		D969	STX Count	-	-	Yes			
		ACK Count		D970	ACK Count	-	-	Yes			

1. The control unit LCD display supports the viewing and editing of up to 16 characters.





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# Appendix D Additional Features

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## D.1 Restoring the factory defaults

### D.1.1 How to restore the factory default settings

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#### Note

The factory defaults may not be the same as the settings when shipped from the factory. It is advisable to keep a record of settings, if possible.

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#### Procedure to restore the control unit to the factory defaults, erasing all user-entered data

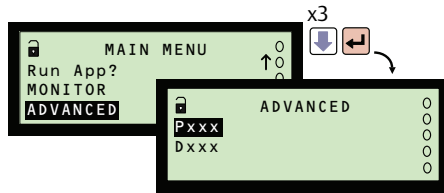
1. If there are HART® transmitters connected:
  - a. Navigate to *SETUP>[CONTROLLER]>SYSTEM>Transmitter Wizard*
  - b. Start the Wizard, and use the **Remove** option for *each connected transmitter*.  
This removal action clears the control unit memory of all transmitter data that has been uploaded from a HART transmitter, including the Transmitter Bottom Reference.
2. Navigate to the *SETUP>[CONTROLLER]>SYSTEM>DEFAULTS* menu (see [Figure 8](#)).
3. Select the **red (enter)** button twice and then wait until “Done”.
4. Switch off the power to the control unit.
5. If there are two transmitters connected to a Rosemount™ 3492 Control Unit:
  - a. Switch off power to the control unit.
  - b. Remove the second transmitter associated with Transmitter Input Channel 2.
  - c. Switch on power to the control unit.
6. Put the control unit into **Run App** mode (to automatically find a HART transmitter)
7. If the control unit is a Rosemount™ 3492 Control Unit:
  - a. Switch off power to the control unit.
  - b. Re-connect the second transmitter.
  - c. Switch on power to the control unit.
8. Turn back to [Section 4: Getting Started](#), to start again.

## D.2 ADVANCED parameter access

The ADVANCED parameter access is selected from the *MAIN MENU* (see [Figure D-1](#)).

It provides a quick and direct access to parameter screens without traversing the menu system. All that is required is the entry of the unique 3-digit identification (ID) number for a parameter. [Appendix C: Menus and Parameter](#) has a list of all parameters and their identification numbers.

**Figure D-1. Navigating to ADVANCED Menu**

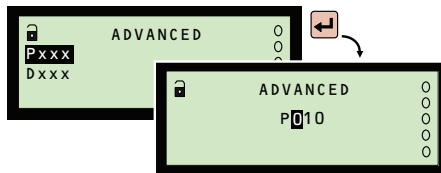


Both 'P' and 'D' prefixed parameters can be accessed through separate selection screens. After entering the *ADVANCED* menu, select **Pxxx** or **Dxxx** (see [Figure D-2](#)).

Next, input a valid identification number using the arrow buttons (010 is the default) and select the **red (enter)** button to confirm and make that parameter screen appear (see [Figure D-3](#)). When an input parameter number is not valid, the nearest valid parameter is displayed instead (see [Figure D-4 on page 139](#)).

Selecting the **Esc** button allows a new number to be input to access another parameter. This is very convenient when checking on more than one parameter.

**Figure D-2. Pxxx or Dxxx Selection**



**Figure D-3. Pxxx Editing Example with Valid Parameter Number**

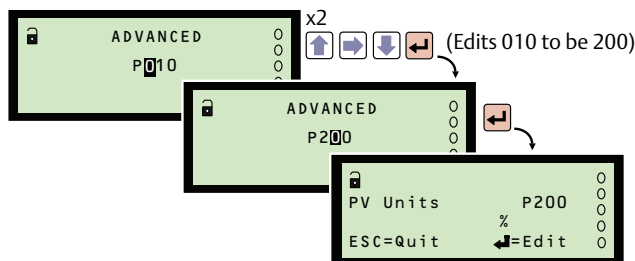
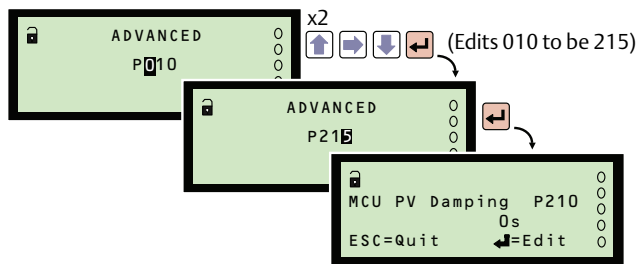
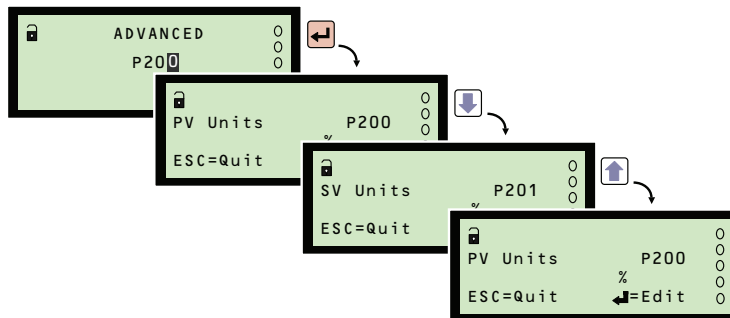


Figure D-4. Pxxx Editing with No Valid Parameter Number



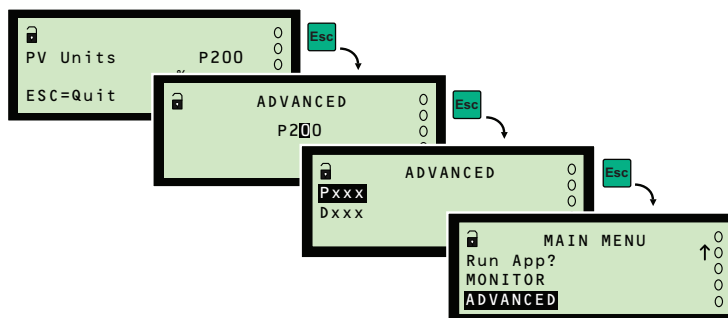
While displaying a parameter, after using this direct feature, the **up arrow** or **down arrow** buttons can scroll through adjacent parameters (see Figure D-5).

Figure D-5. Scrolling Through Adjacent Parameters



Use the **Esc** button to return to the **Pxxx** or **Dxxx** selection screen. To exit to the **MAIN MENU**, select the **Esc** button repeatedly (see Figure D-6).

Figure D-6. Returning to the Menu System





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# Appendix E Support for HART® Transmitters

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## E.1 Overview

The Rosemount™ 3490 Series Control Unit (“control unit”) is able to accept digital data from any HART 5/6/7 compatible transmitter. However, the control unit is not Device Descriptor (DD) based and only fully supports transmitters that have been factory programmed into the on-board library.

## E.2 Fully supported HART transmitters

Fully supported HART transmitters, where all parameters of the transmitter are accessible for reading and writing by the control unit:

- Rosemount 3102 Level Transmitter (HART 5)
- Rosemount 3105 Level Transmitter (HART 5)
- Rosemount 3107 Level Transmitter (HART 5)
- Rosemount 3108 Flow Transmitter (HART 5)

---

### Note

If a Rosemount 3100 Series Transmitter is connected, refer to the Rosemount 3101/3102/3105 [Reference Manual](#) or Rosemount 3107/3108 [Reference Manual](#) for full information about programming the transmitter parameters.

---

## E.3 Generic support for HART transmitters

### E.3.1 Compatibility between transmitter and control unit

The control unit is designed to provide an intrinsically safe power supply to power a I.S.-approved transmitter that is field-mounted in a hazardous area. The control unit provides a nominal 24 Vdc supply.

Communication with the transmitter is HART, provided the transmitter current output is configured in a passive mode to enable the control unit to power the current loop.

The addition of components (both resistive and semiconductor) as part of the I.S certification and HART communication result in the terminal voltage varying with load current. Increasing the load current in the loop results in a decrease in the terminal output voltage of the control unit. Most HART transmitters require a minimum input voltage to work correctly, and for HART communication to function. For example, a Rosemount 3105 Ultrasonic Level Transmitter can operate over a voltage range of 12 to 40 Vdc (12 to 30 Vdc for intrinsically safe installations). Consideration must be given to the loop resistance of the cable connecting the transmitter to the controller to ensure sufficient input voltage is available at the transmitter.

Care must be taken in checking compatibility of the control unit when selecting the required HART transmitter. Ensure that the input voltage requirements of the transmitter and the loop resistance are below the limits given in [Table E-1 on page 142](#).

Some Explosion-proof (Exd) rated transmitters have a high input voltage requirement which can result in HART communication failing to function at high loop currents. For example, the Explosion-proof version of the Rosemount 5400 Series Transmitter has a minimum input voltage requirement as follows:

- 15.5 Vdc at 21.75 mA
- 20 Vdc at 3.75 mA

The Exd version of Rosemount 5400 Series Transmitter would not be suitable for use with the control unit.

[Table E-1](#) shows the minimum control unit terminal output voltage (worst case conditions) for varying load conditions.

**Table E-1. Minimum Control Unit Terminal Output Voltages**

Load current mA	Rosemount 3490 terminal voltage Vdc	Maximum loop resistance ohms	
3.75	20.9	2370	Minimum fault current
4.0	20.8	2195	Normal minimum output
20.0	13.9	95	Normal maximum output
21.75	13.5	50	Maximum o/p Rosemount fault level
22.5	12.8 <sup>(1)</sup>	35	Maximum o/p NAMUR NE43 fault level

1. Minimum output voltage is 12.8 Vdc. The maximum loop resistance quoted ensures there will be at least 12 Vdc available at the transmitter.

## E.3.2 Universal and common practice commands

Support for the Universal and Common Practice commands of all other HART 5/6/7 transmitters is provided in accordance with HART practice.

Table C-2 on page 134 shows the menu structure and parameters for generic HART 5/6/7 transmitters parameters as seen on a control unit and other HART-based devices.

### Universal commands

- #0 Read unique identifier
- #1 Read primary variable
- #2 Read loop current and percent of range
- #3 Read dynamic variables and loop current
- #6 Write polling address
- #7 Read loop configuration
- #12 Read message
- #13 Read tag, descriptor, date
- #14 Read primary variable transducer information
- #15 Read device information
- #16 Read final assembly number
- #17 Write message
- #18 Write tag, descriptor, date
- #19 Write final assembly number
- #20 Read long tag
- #22 Write long tag
- #31 Indicates extended command number in data field
- #38 Reset configuration changed flag
- #48 Read additional device status

## Common practice commands

- #33 Read device variables
- #34 Write primary variable damping value
- #35 Write primary variable range values
- #36 Set primary variable upper range value
- #37 Set primary variable lower range value
- #40 Enter/exit fixed current mode
- #41 Perform self test
- #42 Perform device reset
- #43 Set primary variable zero
- #44 Write primary variable units
- #45 Trim loop current zero
- #46 Trim loop current gain
- #47 Write primary variable transfer function
- #50 Read dynamic variable assignments
- #51 Write dynamic variable assignments
- #59 Write number of response preambles
- #71 Lock device
- #72 Squawk
- #76 Read lock device status
- #79 Write device variable
- #89 Set real-time clock
- #90 Read real-time clock
- #95 Read device communication statistics
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- #109 Burst mode control



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