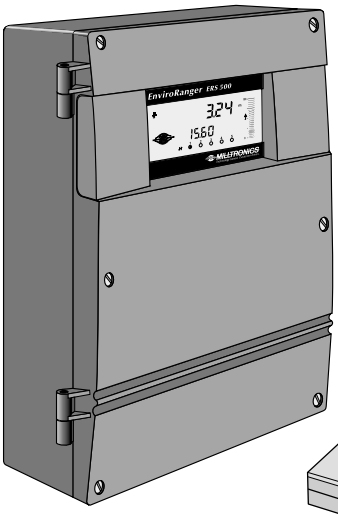
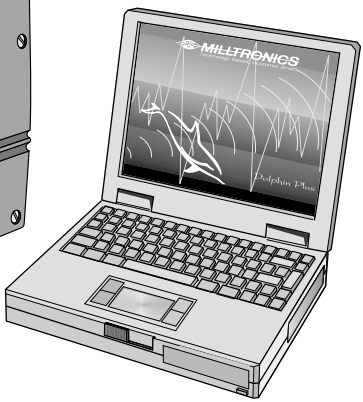
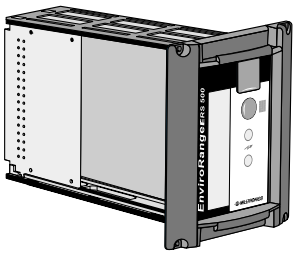
MILLTRONICS

# ENVIRORANGER ERS 500
## PARAMETER REFERENCE

Instruction Manual PL-603 April 2001

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Rev. 1.3

ENVIRORANGER ERS 500

**Safety Guidelines**

Warning notices must be observed to ensure personal safety as well as that of others, and to protect the product and the connected equipment. These warning notices are accompanied by a clarification of the level of caution to be observed.

**Qualified Personnel**

This device/system may only be set up and operated in conjunction with this manual. Qualified personnel are only authorized to install and operate this equipment in accordance with established safety practices and standards.

**Warning:** This product can only function properly and safely if it is correctly transported, stored, installed, set up, operated, and maintained.

**Note:** Always use product in accordance with specifications.



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# Table of Contents

# About the EnviroRanger ERS 500…

The EnviroRanger is intended for advanced water and wastewater applications. This device can handle virtually all of your pump control and level monitoring needs – often replacing expensive PLCs and integrating into a SCADA system for a fraction of the cost of competitive systems.

**The EnviroRanger is programmable.**
It can be configured for nearly any water or wastewater application, control up to five pumps, gates, or alarms – and can communicate its status by way of direct serial connection, modem, or industrial communication network.

**The EnviroRanger is flexible.**
It can take discrete input from pumps or other devices to modify its operation, and can also time events to maximize efficiency or minimize cost.

**The EnviroRanger is upgradeable.**
Its basic features can be further enhanced with any of the following:

**Hardware Upgrades**
- I/O Analog Cards
- RAM memory
- Discrete inputs

**Software Upgrades**
- Dual Point
- Data Logging

# About the Parameter Reference…

This is the third in the series of four manuals in the ERS library.

| Manual | Uses |
|---|---|
| **User Guide** (PL-600) | • Learn how to program the unit<br>• Example applications<br>• Principles of operation |
| **Installation Guide** (PL-601) | • Outline diagrams<br>• Wiring diagrams<br>• Installation requirements |
| **Communications Reference** (PL-602) | • MODBUS register mapping<br>• Modem configuration |
| **Parameter Reference** (PL-603) | • Parameter values<br>• Parameter uses |

# Using this Manual...

| Information | Section | Page |
|---|---|---|
| Find information about a parameter. | Parameter Reference | 7 |
| To look up a concept or keyword. | Index | 144 |

**Note:** Factory settings or preset values are marked with the *.

# About Configuring ERS 500 Parameters...

The primary method of configuring the EnviroRanger is using Milltronics **Dolphin Plus** software and a serial connection to the device.

Configuring the EnviroRanger using the optional **Hand Programmer** is possible but is not recommended for complex installations.

As a rule of thumb, if your application falls into one of the pre-configured applications outlined in the EnviroRanger User Guide, then use the hand programmer. If your application is more complex than this, then we suggest that you use Dolphin Plus. To purchase a copy of Dolphin Plus, contact your Milltronics representative.

# About Power Interruptions...

All operator programming is stored in non-volatile memory, and is unaffected by power interruptions. Reporting functions use volatile RAM with battery backup.

# Parameter Reference

## P000 Lock

*Use this parameter to secure the EnviroRanger from changes.*

| Primary Index | global | | |
|---|---|---|---|
| Value | 1954 | * | off (programming permitted) |
| | -1 | | simulation controls (relays energize based on simulated level) |
| | other | | lock activated (programming secured) |
| Related | • P132 Pump Start Delay on page 28<br>• Simulation in the EnviroRanger User Guide. | | |

**WARNING**
**Use this lock as backup security only. It uses a fixed value which can be discovered by unauthorized personnel.**

Access this parameter directly (type the number 000) and enter any value (other than 1954) to secure the programming lock. To unlock the EnviroRanger, access this parameter and enter the value “1954”.

# Quick Start (P001 to P009)

## P001 Operation

*Sets the type of measurement required for the application.*

| Primary Index | Standard Mode | | Dual Point Mode |
|---|---|---|---|
| | global | | level |
| Value: | 0 | | Out-of-service |
| | 1 | | Level – how full the vessel is (a.k.a. volume – P050) |
| | 2 | | Space – how empty the vessel is (a.k.a. ullage – P050) |
| | 3 | * | Distance – distance from transducer to material |
| | 4 | | DPD – dual point difference |
| | 5 | | DPA – dual point average |
| | 6 | | OCM – flow rate in an open channel |
| | 7 | | Pump Totalizer – total pumped volume |
| Alters | • P600 Primary Measuring Device on page 88 | | |

**If you have Single Point Mode (base unit)…**
Normally there is a single level measurement point and all relevant parameters are global. For “DPD” or “DPA” operation, either 2 transducers of the same type are required, or one transducer and one mA input. If two

transducers are used, all transducer parameters become indexed, and a third level point is calculated.

- DPD (difference) = Point 1 - Point 2
- DPA (average) = (Point 1 + Point 2) / 2

For these operations any of three level points (transducer 1, transducer 2, or the calculated point) can be used to trigger relays (see P110 Level Source on page 20).

**If you have Dual Point Mode (optional)…**
With the Dual Point option installed the EnviroRanger is able to control three independent applications – one on each transducer plus the calculated level. Each application type is defined in P001 on index 1, 2, or 3.

| **Operation [index]** | **Available Values** |
|---|---|
| P001[1] | 1, 2, 3, 6, 7 |
| P002[2] | 1, 2, 3, 6, 7 |
| P003[3] | 4, 5 |

So, when programming a unit with the Dual Point option you can specify any of the three level points (transducer 1, transducer 2, or the calculated level point) for any parameter indexed by "level".



## P002 Material

*The type of material being measured, normally liquid.*

| **Primary Index** | **Standard Mode** | | **Dual Point Mode** |
|---|---|---|---|
| | global | | transducer |
| **Values** | 1 | * | Liquid or horizontal solid surface |
| | 2 | | Solid or angled surface |
| **Alters** | • P830 TVT Type on page 130 | | |

For most EnviroRanger applications this entry will be liquid or slurry (value 1) but the application could also involve solids.

## P003 Maximum Process Speed

*Determines how quickly the EnviroRanger reacts to level changes.*

| **Primary Index** | transducer | | |
|---|---|---|---|
| **Values:** | 1 | | Slow (0.1 m/min) |
| | 2 | * | Medium (1 m/min) |
| | 3 | | Fast (10 m/min) |

| | |
|---|---|
| **Alters** | • P070 Failsafe Timer on page 18<br>• P700 Max Fill Rate on page 104<br>• P701 Max Empty Rate on page 105<br>• P702 Filling Indicator on page 105<br>• P703 Emptying Indicator on page 105<br>• P704 Rate Filter on page 106<br>• P710 Fuzz Filter on page 108<br>• P713 Echo Lock Window on page 109<br>• P727 Scan Delay on page 110<br>• P841 Long Shot Number on page 133 |
| **Related** | • Failsafe (P070 to P072) on page 18<br>• P121 Pump by Rate on page 25<br>• Measurement Verification (P710 to P713) on page 108<br>• Transducer Scanning (P726 to P728) on page 110<br>• Rate (P700 to P708) on page 104<br>• P905 Transmit Pulse on page 136 |

Use the setting which is just fast enough to keep up with your process. Slower settings provide higher accuracy while faster settings allow for more level fluctuations.

## P004 Transducer

*Specifies the Milltronics transducer connected to the unit.*

| **Primary Index** | **Standard Mode** | | **Dual Point Mode** |
|---|---|---|---|
| | global | | transducer |
| **Values** | 0 | * | No transducer attached (preset for Dual Point) |
| | 1 | | ST-25 |
| | 2 | | ST-50 |
| | 100 | | STH |
| | 101 | | XCT-8 |
| | 102 | * | XPS-10 (preset for Standard Mode) |
| | 103 | | XCT-12 |
| | 104 | | XPS-15 |
| | 112 | | XRS-5 |
| | 250 | | Auxiliary mA input #1 |
| | 251 | | Auxiliary mA input #2 (see note below) |
| **Related** | • mA Input (P250 to P254) on page 41<br>• P842 Short Shot Frequency on page 133<br>• P843 Long Shot Frequency on page 133<br>• P844 Short Shot Width on page 134<br>• P845 Long Shot Width on page 134<br>• P852 Short Shot Range on page 135 | | |

Enter the type of transducer(s) connected to the EnviroRanger. If multiple transducers are used they must be of the same type.

**Note:**
Auxiliary mA input #2 is only available if cards 2I/2O or card 4AI are used.

# P005 Units

*Specifies the units used for dimensional values.*

| | | | |
|---|---|---|---|
| **Primary Index** | global | | |
| **Values:** | 1 | * | Meters |
| | 2 | | Centimeters |
| | 3 | | Millimeters |
| | 4 | | Feet |
| | 5 | | Inches |
| **Alters** | • P006 Empty on page 10<br>• P007 Span on page 11<br>• P060 Decimal Position on page 16<br>• P603 Maximum Head on page 90<br>• P605 Zero Head on page 91<br>• P620 Low Flow Cutoff on page 94<br>• P921 Material Measurement on page 139<br>• P926 Head Measurement on page 140<br>• P927 Distance Measurement on page 140 | | |

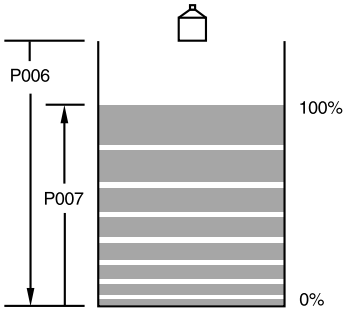
Changing this value automatically changes the units displayed for many parameters. Existing values are converted and do not have to be re-entered.

# P006 Empty

*The distance in "units" (P005) from the face of the transducer to the process empty point.*

| | |
|---|---|
| **Primary Index** | transducer |
| **Values** | Range: 0.000 to 9999 |
| | Preset: 5.000m (or equivalent depending on units) |
| **Alters** | • P007 Span on page 10 |
| **Altered By** | • P005 Units on page 10 |
| **Related** | • P800 Near Blanking on page 121<br>• P921 Material Measurement on page 139<br>• P927 Distance Measurement on page 140 |

Setting this value also sets Span (P007) unless Span was already set to another value.



# P007 Span

*Span is the range of levels that the equipment is set to measure.*

| | |
|---|---|
| **Primary Index** | level |
| **Values** | Range: 0.0 to 9999 |
| | Preset: based on Empty (P006) |
| **Alters** | • P605 Zero Head on page 91<br>• P112 Relay "on" Setpoint on page 21<br>• P113 Relay "off" Setpoint on page 21 |
| **Altered By** | • P005 Units on page 10<br>• P006 Empty on page 10 |
| **Related** | • Volume (P050 to P055) on page 12<br>• P800 Near Blanking on page 121<br>• P921 Material Measurement on page 139<br>• P922 Space Measurement on page 139<br>• P926 Head Measurement on page 140 |

Span is preset for a value close to the maximum available. Enter a value that reflects the maximum range of your application.

Always prevent the monitored surface from approaching within 0.33 m (1 ft) of the transducer face as this is the minimum blanking for most Milltronics transducers (some require more blanking – see your transducer manual).

Many other parameters are set as a percentage of span (even if they are entered in units). The values of these other parameters may change if the span is altered after installation and they are measured based on level (upwards from Empty towards the transducer face).

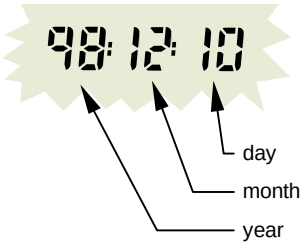
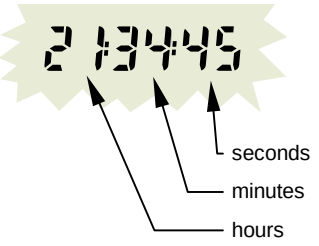
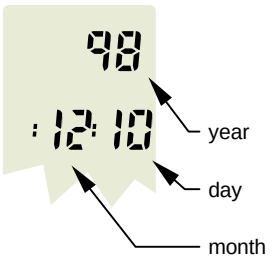
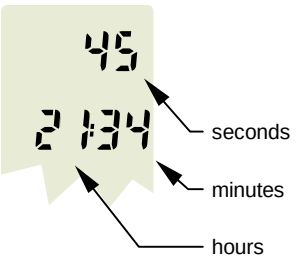
All volumes are based on span so it should be set for the maximum volume point if volume calculations are needed.

# P008 Date

*Date is the current date in the format: YY:MM:DD.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: 70:01:01 to 69:12:31 |
| **Related** | • P009 Time on page 12. |

The date is entered using the numeric keypad and the decimal "." key. For example, to enter December 10, 1998 type in the value "98.12.10".

| Display | Date | Time |
|---|---|---|
| Wall mount |  |  |
| Rack or Panel |  |  |

**Year 2000 Compliance**

00-69 Assumed to be the years 2000 to 2069

70-99 Assumed to be the years 1970 to 1999

## P009 Time

*Time is the current time in 24-hour format: HH:MM:SS.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: 00:00:00 to 23:59:59 |
| **Related** | • P008 Date on page 11. |

The time is entered using the numeric keypad and the decimal "." key. For example, to enter 9:34:45 p.m. you would type in the value "21.34.45".

# Volume (P050 to P055)

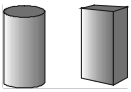
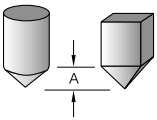
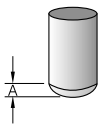
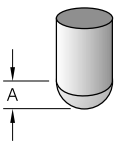
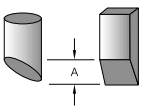
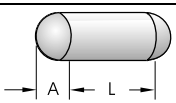
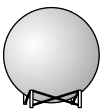
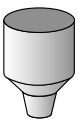
To enable the EnviroRanger to show readings based on vessel or wet well volume (rather than level) use these parameters.

## P050 Tank Shape

*Enter the Tank Shape value that matches the monitored vessel or wet well.*

When Operation is "level" (P001 = 1), liquid (material) volume is calculated. Alternatively, when Operation is "space" (P001 = 2), remaining vessel capacity is calculated.

In the RUN mode, Readings are displayed in percent of maximum volume. To convert Readings to volumetric units, see Max Volume (P051).

| Primary Index | Standard Mode | | Dual Point Mode |
|---|---|---|---|
| | global | | transducer |
| Values | # | Shape | Description |
| | 0 | * | volume calculation not required (preset) |
| | 1 |  | flat level bottom |
| | 2 |   | cone / pyramid bottom |
| | 3 |   | parabola bottom |
| Values (cont'd) | # | Shape | Description |
| | 4 |   | half sphere bottom |
| | 5 |   | flat sloped bottom |
| | 6 |  | flat ends |
| | 7 |   | parabola ends |
| | 8 |  | sphere |
| | 9 |  | universal linear |
| | 10 |  | universal curved |

| | |
|---|---|
| **Related** | • P051 Maximum Volume on page 14<br>• Pump Efficiency (P180 to P186) on page 39<br>• P001 Operation on page 7<br>• Pumped Volume Totalizer (P622 to P623) on page 95<br>• P920 Reading Measurement on page 138 |

## P051 Maximum Volume

*For Readings in volumetric units (rather than percent), enter the vessel volume between Empty (P006) and Span (P007).*



| **Primary Index** | **Standard Mode** | **Dual Point Mode** |
|---|---|---|
| | global | transducer |
| **Values** | Range: 0.0 to 9999 | |
| | Preset: 100.0 | |
| **Alters** | • P060 Decimal Position on page 16 | |
| **Related** | • P006 Empty on page 10<br>• P007 Span on page 11<br>• P924 Volume Measurement on page 139 | |

Any volume units can be used as volume is calculated from empty to maximum span, and is scaled according to the Tank Shape (P050) value.

**Note:**
Ensure that the chosen units allow the volume to be displayed on the LCD.

**Examples:**
1. If max. volume = 3650 $m^3$, enter 3650.
2. If max. volume = 267500 gallons, enter 267.5 (1000's of gallons).

## P052 Tank Dimension 'A'

*This is dimension 'A' as used in P050 Tank Shape on page 12.*

| **Primary Index** | **Standard Mode** | **Dual Point Mode** |
|---|---|---|
| | global | transducer |
| **Values** | Range: 0.000 to 9999 | |
| | Preset: 0.000 | |
| **Related** | • P050 Tank Shape on page 12. | |

Enter the height of the tank bottom if P050 = 2,3,4, or 5, or the length of one end section of the tank if P050 = 7, in Units (P005).

# P053 Tank Dimension 'L'

*This is dimension 'L' as used in P050 Tank Shape on page 12.*

| Primary Index | Standard Mode | Dual Point Mode |
|---|---|---|
| | global | transducer |
| Values | Range: 0.000 to 9999 | |
| | Preset: 0.000 | |
| Related | • P050 Tank Shape on page 12. | |

Enter the tank length (excluding both end sections) if P050 = 7.



# P054 Breakpoint Levels (Universal Volume Calculation)

*When the tank shape is too complex for any of the preconfigured shapes you can specify the volume based on segments.*

| Primary Index | Standard Mode | Dual Point Mode |
|---|---|---|
| | global | transducer |
| Secondary Index | breakpoint | |
| Values | Range: 0.000 to 9999 | |
| Related | • P055 Volume Breakpoints (Universal Volume Calculation) on page 15 | |

Enter up to 10 level breakpoints (where volume is known) if P050 = 9 or 10.

**To enter a Level Breakpoint...**

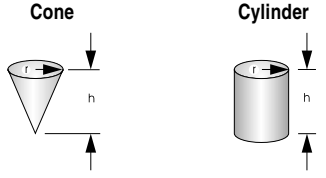
1. Go to Parameter P054
2. For each index enter a breakpoint in measurement units
3. Ensure that each breakpoint corresponds to the same index for P055

# P055 Volume Breakpoints (Universal Volume Calculation)

*Each segment defined by the level breakpoints (P055) requires a volume to allow the EnviroRanger to make the level-to-volume calculations.*

| Primary Index | Standard Mode | Dual Point Mode |
|---|---|---|
| | global | transducer |
| Secondary Index | breakpoint | |
| Values | Range: 0.0 to 9999 | |
| | Preset: 0.000 | |
| Related | • P054 Breakpoint Levels (Universal Volume Calculation) on page 15 | |

**Some typical volume calculations are:**




$V = (1/3)\pi r^2 h$ $V = \pi r^2 h$

**To enter a Volume Breakpoint...**

1. Go to Parameter P055
2. For each index enter a volume
3. Ensure that each volume corresponds to the same index for P054



# Display and Reading (P060 to P062)

**Alter the following parameters to:**

- Change the number of decimal places displayed
- Convert the Reading to alternate units
- Reference measurements to other than Empty (P006) or Span (P007)

## P060 Decimal Position

*Defines the maximum number of decimal places used on the LCD.*

| **Primary Index** | level | | |
|---|---|---|---|
| **Values** | 0 | | no digits after the decimal point |
| | 1 | | 1 digit after the decimal point |
| | 2 | * | 2 digits after the decimal point |
| | 3 | | 3 digits after the decimal point (limited by device resolution) |
| **Alters** | • P607 Flowrate Decimal on page 92 | | |
| **Altered By** | • P005 Units on page 9<br>• P051 Maximum Volume on page 14 | | |
| **Related** | • P920 Reading Measurement on page 138 | | |

In the RUN mode, the decimal position is adjusted to prevent the number of digits from exceeding the display capabilities. To keep the decimal place from shifting, reduce the number of decimal places to that shown at 100%.

e.g. If 100% is 15m, use two decimal places for readings of 15.00 or 12.15.

# P061 Convert Reading

*Multiplies the current value by the specified amount to allow for scaling.*

| | |
|---|---|
| **Primary Index** | level |
| **Values** | Range: -999 to 9999 |
| | Preset: 1.000 |
| **Related** | • P920 Reading Measurement on page 138 |

**Examples:**

- If the measured value is in feet, enter 0.3 to display the number of yards
- For simple linear volume conversions enter the volume measurement per unit to get the correct conversion. For example, if the reservoir contains 100 litres per vertical meter, use 100 to get the reading in litres.

**Notes:**

- This method does not calculate volume. It must not be used in place of the volume parameters if any volume dependent features (such as pump efficiency) are used. To calculate true volumes see Volume (P050 to P055) on page 12.
- Avoid entering a value that, when multiplied by the maximum current Reading, could exceed the display capabilities. If a value exceeds five digits then the “EEEE” is displayed.

# P062 Offset Reading

*Adds the specified value to the level reading, usually to reference the reading to sea level or another datum level.*

| | |
|---|---|
| **Primary Index** | level |
| **Values** | Range: -999 to 9999 |
| | Preset: 0.000 |
| **Related** | • P920 Reading Measurement on page 138 |

The operation of the device is not affected by the Offset Reading. This value is used for display purposes only. All control measurements are still referenced to Empty.

# Failsafe (P070 to P072)

## P070 Failsafe Timer

*The time for invalid measurements to elapse before Failsafe State activates.*

| Primary Index | Standard Mode | Dual Point Mode |
|---|---|---|
| | global | transducer |
| Values | Range: 0.000 to 9999 | |
| | Preset: 10.00 minutes | |
| Alters | • P071 Failsafe Material Level on page 18 | |
| Altered By | • P003 Maximum Process Speed on page 8. | |
| Related | • P129 Relay Failsafe on page 26 | |

**Once activated, the Failsafe State initiates the following:**

1. P071 Failsafe Material Level (page 18) activates as the material level reading.
   a. The unit responds to the new level as programmed (control and alarm relays activate as defined by the programming)
   b. Individual relays can have independent failsafe responses. See P129 Relay Failsafe on page 26.
2. The appropriate error is displayed:
   a. **LOE** for loss of echo from the transducer
   b. **Short** for a shorted transducer cable
   c. **Open** for a cut transducer cable
   d. **Error** for all other problems

When modifying the preset value, use one that is short enough to protect the process but long enough to avoid false alarms. Only use no delay for testing.

## P071 Failsafe Material Level

*The material level reported when a Failsafe State is initiated.*

| Primary Index | level | | |
|---|---|---|---|
| Values | 0.000 to 9999 | | Value in units or % (to 150% of span) |
| | HI | | Level goes to maximum span |
| | LO | | Level goes to 0 span (Empty) |
| | HOLd | * | Level remains at last reading |
| Related | • P001 Operation on page 7<br>• P006 Empty on page 10<br>• P007 Span on page 11<br>• P111 Relay Control Function on page 21<br>• P112 Relay “on” Setpoint on page 21<br>• P113 Relay “off” Setpoint on page 21<br>• P129 Relay Failsafe on page 26 | | |

Select the Failsafe Material Level based upon the relay operation required during failsafe operation.

**Selecting HI, LO, or HOLd**

1. Press [▲%] to display the Auxiliary Function symbol,
2. Press [▲] or [▼] as required to scroll to the desired option,
3. Press [↵] to enter the value.

**Entering a Measurement**

To enter a specific Failsafe Material Level within -50 to 150% of Span (P007), in Units (P005) or % of Span.

**Relay reaction**

The way in which relay programming reacts to the failsafe level depends on P129 Relay Failsafe (page 26). By default:

- Alarm relays have P129 = "OFF" and so react to the Failsafe Material Level.
- Control relays have P129 = "dE" and so de-energize the relay when the unit enters Failsafe mode regardless of the Failsafe Material Level.



## P072 Failsafe Level Advance

*The speed the ERS advances to and returns from the Failsafe Material Level.*

| **Primary Index** | level | | | |
|---|---|---|---|---|
| **Values** | 1 | * | Restricted | advances to/from Failsafe Material Level as set by P003, P700 and P701. |
| | 2 | | Immediate | Failsafe Material Level assumed right away |
| | 3 | | Fast Back | Failsafe Level Advance is restricted, returns to a new measured material level. |
| **Related** | • P003 Maximum Process Speed on page 8<br>• P700 Max Fill Rate on page 104<br>• P701 Max Empty Rate on page 105<br>• P070 Failsafe Timer on page 18<br>• P071 Failsafe Material Level on page 18 | | | |

# Relays (P100 to P119)

The EnviroRanger has five relays, (or digital outputs), used to control devices and alarms. While the number of devices is limited by the relays, all control functions are accessible through software (Refer to the Communications Reference) and each parameter is indexed to the five relays. (Refer to the Special Parameters section in the User Guide).

**Preset Applications (P100)**

The EnviroRanger makes standard applications easier to program by providing an extensive list of presets.

**Control Functions (P111)**

Each relay can be configured independently to take advantage of the ERS 500's flexibility. Configure the relays independently to take advantage of advanced features. Start with a preset application and then change the required parameters to make the task more efficient.

**Setpoints (P112, P113, P114, P115)**
Each relay is triggered by one or more setpoints. The setpoints can be based on absolute level (P112, P113), rate of change (P702, P703), or time (P114, P115). Each different control function specifies which setpoints are required.

## P100 Preset Applications

*There are six preset applications to configure or bench test the unit.*

| | | | |
|---|---|---|---|
| **Primary Index** | global | | |
| **Values** | Range: 1 to 3 | | |
| | 0 | * | off |
| | 1 | | wet well 1 |
| | 2 | | wet well 2 |
| | 3 | | reservoir 1 |
| | 4 | | reservoir 2 |
| | 5 | | screen |
| | 6 | | alarms |
| **Alters** | • P110 Level Source on page 20<br>• P111 Relay Control Function on page 21.<br>• P112 Relay "on" Setpoint on page 21<br>• P113 Relay "off" Setpoint on page 21<br>• P121 Pump by Rate on page 25 | | |
| **Related** | • P001 Operation on page 7 | | |

Select an application that is similar to yours and change the parameters required. If none suit, then refer to P111 Relay Control Function on page 21.

**Note:**
Programming the relays independently is the most common method used.

For screen applications (P100=5) the EnviroRanger's operation must be set to difference (P001=4).

## P110 Level Source

*The level source on which the indexed relay matches setpoints.*

| | | | |
|---|---|---|---|
| **Primary Index** | relay | | |
| **Values** | Range: 1 to 3 | | |
| | 1 | * | Point # 1 = transducer 1 |
| | 2 | | Point # 2 = transducer 2 |
| | 3 | | Point # 3 = difference (P001=4) or average (P001=5) |
| **Altered By** | • P001 Operation on page 7<br>• P100 Preset Applications on page 20 | | |

**In Single Point Mode (standard):**
Points 2 and 3 are available only if Operation is set for difference or average (P001 = 4 or 5).

**In Dual Point Mode (optional):**
Point 2 is always available, and Point 3 is available only if Operation is set for difference or average (P001 = 4 or 5)

## P111 Relay Control Function

*The control algorithm used to trip the relay.*

| | |
|---|---|
| **Primary Index** | relay |
| **Values** | See the Values for P111 table on page 22 |
| **Altered By** | • P100 Preset Applications on page 20 |

Use zero "0" (preset) to disable control of the indexed relay.

## P112 Relay "on" Setpoint

*The process point at which the relay changes from its "normal" state.*

| | |
|---|---|
| **Primary Index** | relay |
| **Values** | Range: -999 to 9999 |
| | Preset: ---- |
| **Altered By** | • P007 Span on page 11 |
| **Related** | • P100 Preset Applications on page 20<br>• P111 Relay Control Function on page 21<br>• P113 Relay "off" Setpoint on page 21 |

For most applications this is the point at which the relay is tripped. For "in-bounds" and "out-of-bounds" alarms it is the high point in the specified range. This parameter is set according to Span (P007) even when another reading, such as volume, is shown on the LCD.

## P113 Relay "off" Setpoint

*The process point at which the relay returns to its "normal" state.*

| | |
|---|---|
| **Primary Index** | relay |
| **Values** | Range: -999 to 9999 |
| | Preset: ---- |
| **Altered By** | • P007 Span on page 11 |
| **Related** | • P100 Preset Applications on page 20<br>• P111 Relay Control Function on page 21<br>• P112 Relay "on" Setpoint on page 21 |

For most applications this is the point at which the relay is reset. For "in-bounds" and "out-of-bounds" alarms it is the low point in the specified range. This parameter is set according to Span (P007) even when another reading, such as volume, is shown on the LCD.

**Values for P111**

| Control | Type | #[1] | Relay Control |
|---|---|---|---|
| **General** | Off | 0 * | Relay set off, no action (preset) |
| **Alarm** | Level | 1 | based on level setpoints "on" and "off" |
| | In Bounds | 2 | when level enters the range between "on" and off" setpoints |
| | Out of Bounds | 3 | when level exits the range between "on" and off" setpoints |
| | Rate of Change | 4 | based on rate setpoints "on" and "off" |
| | Temperature | 5 | based on temperature setpoints "on" and "off" |
| | Loss of Echo (LOE) | 6 | when echo is lost |
| | Cable Fault | 7 | when the circuit to a transducer is opened |
| | Pump Efficiency | 8 | based on pump volume calculations (P512) |
| | Time of Day | 9 | based on the clock |
| | Clock Failure | 10 | the clock module fails |
| | Pump Failure | 11 | based on P510 |
| | Power Failure | 12 | based on P519 |
| **Flow** | Totalizer | 40 | every $10^{y}$ units (P640-P645) |
| | Flow Sampler | 41 | every n x $10^{y}$ units (P641-P645) or time duration P115) |
| **Pump** | Fixed Duty Assist | 50 | at fixed "on" and "off" setpoints and allows multiple pumps to run |
| | Fixed Duty Backup | 51 | at fixed "on" and "off" setpoints and allows only one pump to run |
| | Alternate Duty Assist | 52 | at rotating "on" and "off" setpoints and allows multiple pumps to run |
| | Alternate Duty Backup | 53 | at rotating "on" and "off" setpoints and allows only one pump to run |
| | Service Ratio Duty Assist | 54 | on service ratio at "on" and "off" setpoints and allows multiple pumps to run |
| | Service Ratio Duty Backup | 55 | on service ratio at "on" and "off" setpoints and allows only one pump to run |
| | First In First Out (FIFO) | 56 | as Alternate Duty Assist, resets the relay from staggered "off" setpoints. |
| **Control** | Time | 60 | based on "duration" and "interval" setpoints |
| | Overflow | 61 | based on overflow event. |
| | Aeration | 62 | based on "duration" and "interval" setpoints timed from when pump relays shut off |
| | Gate | 63 | used to drive a gate based on "on", "interval", and "duration" setpoints |
| | Flush Valve | 64 | used to control a pump flushing device based on Flush Systems (P170 to P173) |
| | Communication | 65 | based on input from external communications. See the EnviroRanger Communications Reference for further information. |

[1] When reading and setting this parameter through Modbus or SmartLinx communications the parameter values are mapped to different numbers. See the EnviroRanger Communications Reference (PL-602) for Modbus information or the relevant SmartLinx® manual.

# P114 Relay “Duration” Setpoint

*The length of time in minutes the relay is to be energized.*

| | |
|---|---|
| **Primary Index** | relay |
| **Values** | Range: 0.000 to 9999 |
| | Preset: ---- |
| **Altered By** | • P100 Preset Applications on page 20 |
| **Related** | • P111 Relay Control Function on page 21 (P111=9,60,62,63)<br>• P115 Relay “Interval” Setpoint on page 23<br>• P134 Pump Exercising on page 28 (P111=50 to 56) |

This value must be less than the “interval” setpoint or the relay will never reset.

# P115 Relay “Interval” Setpoint

*The length of time in hours between timed starts.*

| | |
|---|---|
| **Primary Index** | relay |
| **Values** | Range: 0.000 to 9999 |
| | Preset: ---- |
| **Altered By** | • P100 Preset Applications on page 20 |
| **Related** | • P111 Relay Control Function on page 21 (P111=9,60,62,63)<br>• P114 Relay “Duration” Setpoint on page 23<br>• P134 Pump Exercising on page 28 (P111=50 to 56) |

This value must be greater than the “duration” or the relay will never reset.

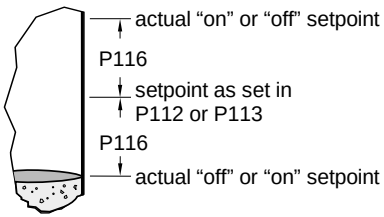
# P116 Dead Band

*The distance above and below the bound alarm setpoints.*

| | |
|---|---|
| **Primary Index** | relay |
| **Values** | Range: 0.000 to 9999 |
| | Preset: 2% of span |
| **Related** | • P111 Relay Control Function on pge 21<br>• P112 Relay “on” Setpoint on page 21<br>• P113 Relay “off” Setpoint on page 21 |

For “in-bounds” and “out-of-bounds” Relay Functions (P111 = 2 and 3 respectively) a dead band prevents relay chatter due to material level fluctuations at both the upper and lower setpoints.

Enter the dead band in either percent of span or units of measure (P005). The dead band value is applied both above and below the upper and lower bound setpoints as shown in the figure.



# P118 Relay Output Logic

*The logic applied to relays to determine the contact open or closed state.*

| Primary Index | relay | | | | |
|---|---|---|---|---|---|
| Values | Value | | Logic | Alarm contact | Pump or control contact |
| | 2 | * | positive | Normally Closed | Normally Open |
| | 3 | | negative | Normally Open | Normally Closed |
| Related | • P111 Relay Control Function on page 21 | | | | |

The relay contact operation is “normally closed” for alarms and “normally open” for controls. See P111 Relay Control Function for more information.

**Power Failure**
When power is cut to the EnviroRanger, its relays fail in the following states:

| Rack or Panel Mount | |
|---|---|
| **Relay** | **Fail State** |
| 1-4 | Open |
| 5 | Closed |

| Wall Mount | |
|---|---|
| **Relay** | **Fail State** |
| 1-4 | Open |
| 5 | Open or Closed[2] |

To use relay 5 as a general alarm indicator, set P118 to “3 – negative logic” and wire the alarm for normally open operation. When an alarm event occurs (see below) or when power is cut the circuit closes and the alarm sounds.

**Positive Logic**
In software all relays are programmed the same way, with “on” setpoints indicating when to change the relay contact state (open or closed). This parameter allows the reversal of the operation so that relay contacts can be “normally closed” or “normally open.” P118 is preset to “2” which is positive logic.

**Negative Logic**
When P118 = 3 (negative logic) the operation for the indexed relay is reversed from normal.

# P119 Relay Logic Test

*Used to force the relay control logic into an “activated” or “de-activated” state.*

| Primary Index | relay | | |
|---|---|---|---|
| Values | 0 | * | off – control from EnviroRanger algorithms |
| | 1 | | activate relay control |
| | 2 | | de-activate relay control |
| Related | • P111 Relay Control Function on page 21 | | |

[2] Relay 5 is a Form C type on the Wall mount EnviroRanger so you can wire it either normally open or normally closed. Check the wiring before programming.

Use this parameter to test your site wiring and control logic programming. Forcing the relay to an activated or de-activated state is similar to the EnviroRanger detecting an event and responding to it. This is helpful in testing new installations and diagnosing control problems.

# Pump Setpoint Modifiers (P121 and P122)

These parameters provide alternate ways of starting the pumps in the pump group. See the section on Pump Control in the EnviroRanger User Guide for descriptions of the pump control algorithms.



## P121 Pump by Rate

*Used to set the pump relays to accept control by rate of level change once the first "on" setpoint is reached.*

| Primary Index | Standard Mode | | Dual Point Mode |
|---|---|---|---|
| | transducer | | level |
| Values | 0 | * | off (pump by level) |
| | 1 | | on (pump by rate) |
| Related | • P007 Span on page 11<br>• P111 Relay Control Function on page 21<br>• P132 Pump Start Delay on page 28<br>• Rate (P700 to P708) on page 104 | | |

Use this function when there are multiple pumps which should be controlled by rate of level change rather than setpoints.

The delay between pump starts is set by P132 Pump Start Delay on page 28.

This only applies to any relays set to pump control (P111 = 50 to 56).

**Notes:**
- All pump control relay "on" and "off" setpoints must be the same value.
- If the level is within 5% of Span (P007) of the "off" setpoint then the next pump is not started.

## P122 Pump Service Ratio

*Selects pump usage based on the run time ratio rather than last used.*

| Primary Index | relay |
|---|---|
| Values | Range: 0.000 to 9999 |
| | Preset: 20.00 |
| Related | • P111 Relay Control Function on page 21 |

This parameter only relates to relays with P111=54 or 55.

To make this parameter useful, assign it to all of the pump relays. The number assigned to each pump relay represents the ratio that is applied when determining the next pump to start or stop.

**Notes:**

- The EnviroRanger will not sacrifice other pumping strategies to ensure that the ratio is held true.
- If the pump relays are set to the same value then the ratio equals 1:1 and all pumps are used equally (preset).



# Independent Relay Failsafe (P129)

## P129 Relay Failsafe

*Sets the failsafe operation per relay to allow for more flexible programming.*

| | | | |
|---|---|---|---|
| **Primary Index** | relay | | |
| **Values** | OFF | * | response governed by P071 Failsafe Material Level (page 18) |
| | HOLd | | for "last known" relay state retention |
| | dE | * | to have the relay de-energize immediately on failsafe |
| | En | | to have the relay energize immediately on failsafe |
| **Altered By** | • P071 Failsafe Material Level on page 18 | | |
| **Related** | • P070 Failsafe Timer on page 18<br>• P111 Relay Control Function on page 21 | | |

Use this for operations independent of the Failsafe Material Level (P070).

Relay Failsafe is only available for the following relay functions (P111) and not used for any other relay control function.

| Relay Function (P111) | Preset (P129) |
|---|---|
| 1 – level alarm | OFF |
| 2 – in bounds alarm | |
| 3 – out of bounds alarm | |
| 4 – rate of change alarm | |
| 5 – temperature alarm | |
| 9 – time of day alarm | |
| 50 to 56 – all pump controls | dE |

**To select an independent Relay Failsafe value:**

1. Press [%] to display to the Auxiliary Function symbol,
2. Press [▲] or [▼] to scroll to the failsafe options.
3. Press [↵] with the desired option displayed.

# Advanced Pump Control Modifiers (P130 to P136)

These parameters affect only relays set to pump operation (P111 = 50 to 56).

## P130 Pump Run-On Interval

*The number of hours between pump run-on occurrences.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: 0.000 to 1000 |
| | Preset: 0.000 (pump run-on disabled) |
| **Related** | • Advanced Pump Control Modifiers (P130 to P136) on page 27 |

To clear sediment in a “pump-down” wet well, run the pump after the normal “off” setpoint is reached to force some solid material through. This parameter sets the time between such events. Only the last pump running can run-on.

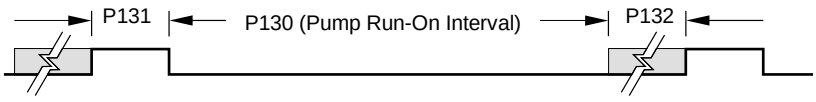
**Note:**
This feature cannot be used when the EnviroRanger is set to average or differential (P001 = 4 or 5).

## P131 Pump Run-On Duration

*The number of seconds that the pump runs-on.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: 0.0 to 9999 |
| | Preset: 0.000 |
| **Related** | • Advanced Pump Control Modifiers (P130 to P136) on page 27 |

Your pump capacity will determine the amount of material that can be removed. Choose a value long enough to clean out the vessel bottom, yet short enough not to run the pump dry. Also be sure that this value does not overlap with P130 (Interval). The timing should look something like this:



## P132 Pump Start Delay

*The minimum delay (in seconds) between pump starts.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: 0.0 to 9999 |
| | Preset: 10 seconds |
| | Value is divided by 10 in simulation mode. |
| **Related** | • Advanced Pump Control Modifiers (P130 to P136) on page 27<br>• P121 Pump by Rate on page 25. |

Use this feature to reduce a power surge from all pumps starting at the same time. This delay determines when the next pump is permitted to start.

## P133 Pump Power Resumption Delay

*The minimum delay before the first pump restart after power failure.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: 0.000 to 9999 |
| | Preset: 10 seconds |
| **Related** | • Advanced Pump Control Modifiers (P130 to P136) on page 27<br>• P132 Pump Start Delay on page 28 |

This reduces the surge from the first pump starting immediately on power resumption. When this delay expires, other pumps will start as per P132.

## P134 Pump Exercising

*Runs the pump periodically to reduce pump corrosion or sediment build up.*

| | | | |
|---|---|---|---|
| **Primary Index** | relay | | |
| **Values** | 0 | * | off |
| | 1 | | on (use P114 and P115 for timing information) |
| **Related** | • P114 Relay "Duration" Setpoint on page 23<br>• P115 Relay "Interval" Setpoint on page 23 | | |

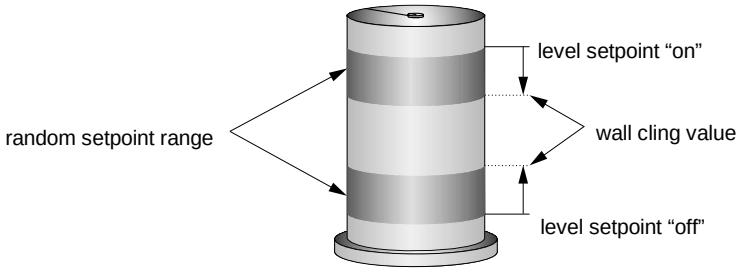
If a pump remains idle for the time as defined by P115 (Interval) then the pump runs for the time specified by P114 (Duration).

## P136 Wall Cling Reduction

*Varies the upper and lower setpoints to reduce material buildup on the walls.*

| | Standard Mode | Dual Point Mode |
|---|---|---|
| **Primary Index** | global | transducer |
| **Values** | Range: 0.000 to 9999 | |
| | Preset: 0.000 | |

This value is the range in which the setpoints are allowed to deviate in percent or units. The Relay Setpoints “on” and “off” values are randomly varied inside the range to ensure that the material level does not consistently stop at the same point.






## P137 Pump Group

*Puts pumps into groups for multiple pump rotations on one transducer.*

| | | | |
|---|---|---|---|
| **Primary Index** | relay | | |
| **Values** | Range: 1 to 2 | | |
| | 1 | * | group 1 |
| | 2 | | group 2 |
| **Alters** | • P111 Relay Control Function on page 21 when P111=52 (Alternate duty assist) or 53 (Alternate duty backup) | | |

This feature groups pumps (relay points 1 - 5) into groups 1 or 2. It is applied to pump rotation and occurs independently within each group.

# Pump Energy Cost Reduction (P140 to P145)

Use these parameters to maximize your unit’s operation during periods of low energy cost and minimize its operation during periods of high cost. They only affect relays set to pump operation (P111 = 50 to 56)

**The methods used to achieve this are:**

1. Emptying the wet well just prior to the high cost period, regardless of material level (P141, P142, and P143)
2. Changing setpoints for high cost and low cost periods (P144 and P145)

## P140 Energy Saving

*Shifts pump operation to low cost periods from more expensive ones.*

| | | | |
|---|---|---|---|
| **Primary Index** | global | | |
| **Values** | 0 | * | off |
| | 1 | | on (do not pump during peak energy cost, if possible) |
| | 2 | | on but allow override (see page 33) |
| **Related** | • Energy Cost Reduction Override (P148 to P149) on page 33 | | |

## P141 Peak Start Times

*The time of day when high-energy costs (to be avoided) start.*

| | |
|---|---|
| **Primary Index** | break point |
| **Values** | Range: 00:00 to 23:59 |
| | Format: HH:MM |
| | Preset: 00:00 |
| **Related** | • P142 Peak End Time on page 30 |

Used in conjunction with P142 (Peak End Time) to define the high cost period and indexed by the number required in a 24-hour span. (Up to 10).

## P142 Peak End Time

*The time of day when high energy costs (to be avoided) end.*

| | |
|---|---|
| **Primary Index** | break point |
| **Values** | Range: 00:00 to 23:59 |
| | Format: HH:MM |
| | Preset: 00:00 |
| **Related** | • P141 Peak Start Times on page 30 |

Used in conjunction with P141 (Peak Start Time) to define the high cost period and indexed by the number required in a 24-hour span. (Up to 10). All end times must have the same index value as the corresponding start time.

## P143 Peak Lead Time

*The time before the Peak Start Time that the ERS 500 will begin pumping.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: 0.000 to 1440 |
| **Related** | • P142 Peak End Time on page 30<br>• P141 Peak Start Times on page 30 |

This value determines when pumping should start to ensure the level is as far as possible from the Relay Setpoint “on” (P112) level. (If level is already within 5% of Span from Relay Setpoint “off” (P113) level, no action occurs). If multiple pump stations are series linked, ensure the Peak Lead Times entered are sufficient to attain the desired level in all stations before the high-energy cost period occurs.

## P144 Peak “On” Setpoint

| | |
|---|---|
| **Primary Index** | relay |
| **Values** | Range: 0.000 to 9999 |
| | Preset: 0.000 |
| **Related** | • P145 Peak “Off” Setpoint on page 31 |

To allow the level to go beyond the normal Relay Setpoint “on” before a pump is started, enter the value to be used for the high-energy cost period.

## P145 Peak “Off” Setpoint

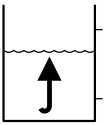
| | |
|---|---|
| **Primary Index** | relay |
| **Values** | Range: 0.000 to 9999 |
| | Preset: 0.000 |
| **Related** | • P144 Peak “On” Setpoint on page 30 |

To stop the pump(s) before the normal Relay Setpoint “off” and reduce pump-running time. Enter the value to be used for the high cost period.

## Energy Savings Example

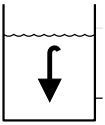
The following example illustrates high energy cost usage reduction and/or elimination by utilizing the EnviroRanger Pump Energy Cost Reduction features on a wet well (pump down application).

15:30
(3:30pm)



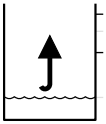

**Normal Operation**
Uses the standard “on” and “off” setpoints (P112 / P113). Energy cost is at minimum.

16:30
(4:30pm)



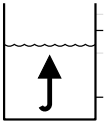

**Peak Lead time (P143 = 60 minutes)**
Pumps down the wet well regardless of the Relay “on” Setpoints. This ensures that the wet well starts the high cost period at the pumps’ “off” setpoint. Energy cost is at minimum.

17:30
(5:30pm)




**Peak Start Time (P141 = 17:30)**
Starts using the energy savings setpoints (P144 and P145). Energy cost is at maximum.

21:30
(9:30pm)




**Peak End Time (P142 = 21:30)**
Returns to normal setpoints (P112 and P113). Energy cost returns to minimum.

**Note:**
When the Peak “on” Setpoint is not reached, no energy is used during the "high cost" period. If the Peak “on” Setpoint is reached, the Wet Well is only pumped down to 60%, thereby minimizing "high cost" energy usage.

# P146 Time of Day Setpoint

| | |
|---|---|
| **Primary Index** | relay |
| **Values** | Range: 00:00 to 23:59 |
| | Format: HH:MM |

Sets the time at which a relay set for time day alarm (P111=9) will trip.

# Energy Cost Reduction Override (P148 to P149)

Use these parameters to specify an override of the Pump Energy Cost Reduction Parameters (P140 to P145). They only affect relays set to pump operation (P111 = 50 to 56).

**There are two conditions that can trigger an override:**

1. specific instructions from a discrete input, and
2. an overflow/underflow condition as per P169 Flow Condition on page 37

**Note:**
P169 Flow Condition is set when an overflow or underflow condition is detected according to the user-defined settings in P160 on page 34



## P148 Manual Override

*Sets the discrete input that will trigger an override*

| Primary Index | global | | |
|---|---|---|---|
| Values | 0 | * | off (no manual override) |
| | 1-8 | | discrete input (base unit) |
| | 9-16 | | discrete input (with optional input board) |
| Related | • P140 Energy Saving on page 29<br>• P149 Energy Override Status on page 33<br>• P160 Overflow / Underflow Level Source on page 34<br>• P169 Flow Condition on page 37<br>• Discrete Input Functions (P270 to P275) on page 48 | | |

This input is in effect as long as it is asserted and does not unlatch after the high-energy period.

**Note:**
The ERS 500 base unit has 8 discrete inputs. An optional board can expand this to 16. Refer to the Installation Guide for more information.

## P149 Energy Override Status

*Displays the status of the Energy Override feature.*

| Primary Index | relay | | |
|---|---|---|---|
| Values | Format: view only | | |
| | 0 | * | there is no override |
| | 1 | | override by P169 |
| | 2 | | override by P148 |
| | 3 | | override by P169 and P148 |
| Related | • P148 Manual Override on page 33<br>• P169 Flow Condition on page 37 | | |

The Energy Cost Reduction parameters can be overridden if P169 is set to indicate either an overflow or and underflow condition, and/or P148 is set so that a discrete input will report an offending condition.

# Overflow / Underflow (P160 to P169)

## P160 Overflow / Underflow Level Source

*Defines the method and source used to detect a flow condition.*



| **Primary Index** | global | | | |
|---|---|---|---|---|
| **Values** | Format: x:y, where x=type and y=point | | | |
| | Preset: 0:0 | | | |
| | **Input** | | **x** | **y** |
| | Overflow | Transducer level | **1** | 1 – transducer 1<br>2 – transducer 2<br>3 – average or difference (P001=4 or 5) |
| | | Discrete Input | **2** | 0 to 8 – with base unit<br>9 to 16 – with 8DI card |
| | Underflow | Transducer level | **3** | 1 – transducer 1<br>2 – transducer 2<br>3 – average or difference (P001=4 or 5) |
| | | Discrete Input | **4** | 0 to 8 – with base unit<br>9 to 16 – with 8DI card |
| | Overflow | Transducer rate of change | **5** | 1 – transducer 1<br>2 – transducer 2<br>3 – average or difference (P001=4 or 5) |
| | Underflow | Transducer rate of change | **6** | 1 – transducer 1<br>2 – transducer 2<br>3 – average or difference (P001=4 or 5) |
| **Related** | • Energy Cost Reduction Override (P148 to P149) on page 33 | | | |

**Example:**
To configure a float at discrete input #5 to trigger an overflow event, then assign P160 a value of 2:5. Use 0:0 to disable overflow logging. If either value is set to "0" then no overflow or underflow action is enabled.

To enter a colon ":", press the decimal "." button on the keypad.

**Notes:**
- You must specify the correct overflow or underflow settings for your "on" and "off" setpoints. If these values don't match (for example, Overflow set as 1:1 and "on" setpoint below "off" setpoint) then no action is taken.
- The ERS 500 base unit has 8 discrete inputs. An optional board can expand this to 16. Refer to the Installation Guide for more information.

## P161 Overflow / Underflow Setpoint "On"

*The point at which the flow event is triggered.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: 0.000 to 9999 |
| | Preset: 0.000 |
| **Related** | • P162 Overflow / Underflow Setpoint "Off" on page 35 |

This setpoint is used only if the level source (P160) is a transducer or mA input. If a discrete input is being used then this parameter is ignored.

**Notes:**

- For overflow events the "on" setpoint must be above the "off" setpoint or no events are logged.
- For underflow events the "off" setpoint must be above the "on" setpoint or no events are logged.
- When *Transducer Rate of Change* is selected as Level Source (P160, with value x being 5 or 6), "on" and "off" setpoints (P161 and P162) are used to specify the rate setpoints. To specify the overflow setpoints, use positive numbers for P161 and P162, and for the underflow setpoints, use negative. This is similar to a P111 = 4 rate alarm with P112 and P113 rate setpoints.

## P162 Overflow / Underflow Setpoint "Off"

*The point at which the flow event is reset.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: 0.000 to 9999 |
| | Preset: 0.000 |
| **Related** | • P161 Overflow / Underflow Setpoint "On" on page 35 |

This setpoint is used if the level source (P160) is a transducer or mA input. If a discrete input is being used then this parameter is ignored.

## P163 Overflow / Underflow Time Delay

*Defines the time, in seconds, used to calm (debounce) the flow condition inputs.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: 0.000 to 9999 |
| | Preset: 5.0 |
| **Related** | • P164 Overflow / Underflow Maximum Duration on page 36. |

This debounce timer keeps the unit from logging momentary flow conditions and is used when the level source is no longer "on". The flow condition remains in effect for the time specified in case the level source detects a flow

condition again. A value of zero “0” disables the timer, and it is ignored unless the level source (P160) is a discrete input (value x=2 or 4).

## P164 Overflow / Underflow Maximum Duration

*Defines the maximum time that a flow condition can remain in effect.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: 0.000 to 9999 |
| | Preset: 360.0 |
| **Related** | P163 Overflow / Underflow Time Delay on page 35 |

**A flow condition is reset by one of three events:**

- The measured level moves past the “off” setpoint (P162)
- The discrete input (if used) is reset and the time delay (P163) expires
- The time of the flow condition exceeds the Flow Max Duration (P164) value

When the flow condition is reset, any forced relays revert back to their normally-programmed state. Ensure that the time given here is appropriate for the application. “0” disables this feature.

## P165 Overflow / Underflow Relay Action

*Determines how relays operate during a flow condition.*

| | | | |
|---|---|---|---|
| **Primary Index** | relay | | |
| **Values** | 0 | * | no action |
| | 1 | | forced on during overflow event |
| | 2 | | forced off during overflow event |
| **Related** | • P111 Relay Control Function on page 21 | | |

Use this feature to activate on an overflow or underflow condition. It is useful for tracking CSO or for using floats to bypass the normal pump control. Only relays that have been configured with a Relay Control Function (P111) of “alarm” or “pump” can be used.

## P166 Overflow Discharge Volume Source

*Determines the transducer used to calculate discharge volume.*

| | | | |
|---|---|---|---|
| **Primary Index** | global | | |
| **Values** | 0 | * | Disabled |
| | 1 | | Ultrasonic Transducer 1 |
| | 2 | | Ultrasonic Transducer 2 |
| **Alters** | • P316 Overflow Event Volume on page 55 | | |
| **Related** | • P001 Operation on page 7<br>• P600 Primary Measuring Device on page 88 | | |

To use a transducer to calculate discharge volume, it must be set as an OCM device. For more details, see Operation (P001) and OCM Measuring Device (P600).

If this parameter is disabled (as it is in its default setting), then Overflow Event Volume (P316 ), will display its default view (----)

## P169 Flow Condition

*Indicates if the unit is in an overflow or underflow condition.*

| | | | |
|---|---|---|---|
| **Primary Index** | global | | |
| **Values** | Format: View only | | |
| | 0 | * | normal operation |
| | 1 | | in overflow condition |
| | 2 | | in underflow condition |
| **Alters** | • Overflow / Underflow Records (P313 to P316) on page 54 | | |
| **Related** | • P149 Energy Override Status on page 33 | | |



# Flush Systems (P170 to P173)

Use this feature to control an electrically operated flush valve on a pump to divert some pump output back into the wet well to stir up sediment.

**Notes:**
- The settings of these parameters affect the operation of all relays with P111 set to "64 – Flush Valve."
- If any of the following parameters are set to 0, this feature will not work.
- In Dual Point mode, a flush valve can be set up for each of the three available level inputs (P001 = 4 or 5).

## P170 Flush Pump

*The number of the pump relay that triggers the flushing device.*

| **Primary Index** | **Standard Mode** | **Dual Point Mode** |
|---|---|---|
| | global | relay |
| **Primary Index** | global | |
| **Values** | Range: 0 to 5 | |
| | Preset: 0 | |
| **Related** | • P111 = 64, Flush Valve | |

**Standard Mode**
Enter the EnviroRanger relay number of the pump with the flush valve. The activation of this pump relay drives the usage of the flush system. Both P172 Flush Interval and P171 Flush Cycles are based on the operation of this relay and control any relay set to P111 = 64, Flush Valve.

**Dual Point Mode**
The indexed relay is the one that controls the flush device. The value is the pump relay that is watched by the flush system. Enter the pump relay value into the parameter at the flush relay index.

**For Example**
If you need to watch pump relay 1 to control a flush valve on relay 2 you would set P170[2]=1.

## P171 Flush Cycles

*The number of pump cycles for which flush control is required.*

| Primary Index | Standard Mode | Dual Point Mode |
|---|---|---|
| | global | relay |
| **Primary Index** | global | |
| **Values** | Range: 0 to 9999 | |
| | Preset: 0 | |
| **Related** | • P111 = 64, Flush Valve | |

**If three flush cycles are required after every 10 pump cycles then:**
P172 (Flush Interval) = 10
P171 (Flush Cycles) = 3

## P172 Flush Interval

*The number of pump cycles which occur before flush control is enabled.*

| Primary Index | Standard Mode | Dual Point Mode |
|---|---|---|
| | global | relay |
| **Primary Index** | global | |
| **Values** | Range: 0 to 9999 | |
| | Preset: 0 | |
| **Related** | • P111 = 64, Flush Valve | |

To start a new flush cycle every ten times the pumps are run, set this to “10”.

## P173 Flush Duration

*The length of time for each flush cycle that the flush control is active.*

| Primary Index | Standard Mode | Dual Point Mode |
|---|---|---|
| | global | relay |
| **Primary Index** | global | |
| **Values** | Range: 0.000 to 9999 | |
| | Preset: 0.000 | |
| **Related** | • P111 = 64, Flush Valve | |

# Pump Efficiency (P180 to P186)

The efficiency of the pumps is calculated on volume change in the wet well or reservoir. Any application using pump efficiency must have accurate values in the Volume (P050 to P055) parameters starting at page 12.

Pump faults can also be indicated by input from pump interlocks. See Pump Interlock Allocation (P500 to P509) on page 77 for more information.

## P180 Pump Capacity Reference

*The setpoint of Pump Capacity (P183) which triggers a low efficiency alert.*

| | |
|---|---|
| **Primary Index** | relay |
| **Values** | Range: 0.000 to 100.0 |
| **Related** | • P111 Relay Control Function on page 21<br>• Pump Control in the EnviroRanger User Guide<br>• Volume (P050 to P055) on page 12. |

This value is entered in percent of P183 Pump Rated Capacity, and is compared to the calculated value when the pump is started. If it does not change as quickly as it should then a pump low efficiency alert is triggered.

## P181 Pump Capacity Time

*The time, in seconds, that the actual pump capacity (P182) is calculated.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: 0.000 to 9999 |
| | Preset: 180 (sec) |
| **Related** | • P182 Pump Measured Capacity on page 39 |

If another pump is about to start or stop, or this pump is about to stop, the time is cut short and the calculation is done prematurely. The user can ensure that another pump does not start before the pump rate has achieved its operating value by increasing the pump start delay (P132).

## P182 Pump Measured Capacity

*The actual Pump Capacity value divided by P181 (Pump Capacity Time).*

| | |
|---|---|
| **Primary Index** | relay |
| **Values** | Range: 0 to 9999 (view only) |
| **Related** | • P181 Pump Capacity Time on page 39 |

To estimate the Pump Rated Capacity (P183), run a pump cycle, and view this parameter. Results are in volume (P051) units or percent per minute of pumped material if Volume has been set. Otherwise results are in units (P005) or percent of span (P007) per minute of pumped material.

## P183 Pump Rated Capacity

*The capacity for which the pump is rated.*

| | |
|---|---|
| **Primary Index** | relay |
| **Values** | Range: 0 to 9999 |
| | Preset: 100 |
| **Related** | • P180 Pump Capacity Reference on page 39. |

Enter the value in volume (P051) units per minute if Volume has been set. Otherwise, enter the value in level units (P005) per minute.

## P184 Pump Low Efficiency Counter Setpoint

*The number of low efficiency events (P180) before action (P185) takes place.*

| | |
|---|---|
| **Primary Index** | relay |
| **Values** | Range: 0 to 9999 |
| | Preset: 3 |
| **Related** | • P180 Pump Capacity Reference on page 39<br>• P185 Pump Low Efficiency Action on page 40. |

## P185 Pump Low Efficiency Action

*The action taken when the counter (P186) reaches the setpoint (P184).*

| | | | |
|---|---|---|---|
| **Primary Index** | relay | | |
| **Values** | 0 | * | No action |
| | 1 | | Alarm (any relays set for P111=8), set P512=1 |
| | 2 | | Alarm, remove indexed pump from the duty schedule, set P510=1, P512=1 |
| **Alters** | • P510 Pump Failed Status on page 83<br>• P512 Pump Low Efficiency Fault Status on page 84 | | |
| **Related** | • P184 Pump Low Efficiency Counter Setpoint on page 40<br>• P186 Pump Low Efficiency Counter on page 40. | | |

When the action removes a pump from the duty schedule P512 Pump Low Efficiency Fault is set. See the description on page 84 for details.

## P186 Pump Low Efficiency Counter

*The current count of low efficiency events.*

| | |
|---|---|
| **Primary Index** | relay |
| **Values** | Range: 0 to 9999 (view only) |
| **Related** | • P180 Pump Capacity Reference on page 39.<br>• P184 Pump Low Efficiency Counter Setpoint on page 40<br>• P185 Pump Low Efficiency Action on page 40. |

This counter is iterated when the Pump Capacity Reference (P180) value isn't achieved by the indexed pump.

When this value reaches the Pump Low Efficiency Counter Setpoint (P184) then a Pump Low Efficiency Action (P185) is taken.

**The value is reset to 0 when:**

- The Pump Capacity Reference percent is achieved
- P510 is reset

# mA Output (P200 to P219)

These parameters are only available if an Optional I/O card is installed.

## P200 mA Output Range

*Determines the mA output range.*

| **Primary Index** | mA output | | |
|---|---|---|---|
| **Values** | 0 | | off |
| | 1 | | 0 to 20 mA |
| | 2 | * | 4 to 20 mA |
| | 3 | | 20 to 0 mA |
| | 4 | | 20 to 4 mA |
| **Related** | • P911 mA Output Value on page 137 | | |

If 1 or 2 is selected, the mA output is directly proportional to the mA Function. If 3 or 4 is selected, then the output is inversely proportional.

## P201 mA Output Function

*Use this feature to alter the mA output/measurement relationship.*

| **Primary Index** | mA output | | | |
|---|---|---|---|---|
| **Values** | **alue** | | **nA function** | **Operation (P001)** |
| | 0 | * | off | |
| | 1 | | level | "level", "differential", or "average" |
| | 2 | | space | "space" |
| | 3 | | distance | "distance" |
| | 4 | | volume | "level" or "space" |
| | 5 | | flow | "OCM" |
| | 6 | | head | |
| | 7 | | volume rate | |
| | 8 | | mA input | |
| | 9 | | comms input | |
| **Related** | • P202 mA Output Allocation on page 42<br>• P911 mA Output Value on page 137 | | | |

## P202 mA Output Allocation

*The input source from which the mA output is calculated.*

| | | | |
|---|---|---|---|
| **Primary Index** | mA output | | |
| **Values** | 1 | * | Point 1 |
| | 2 | | Point 2 |
| | 3 | | Point 3 |
| **Related** | • P201 mA Output Function on page 41 | | |

Enter the Point Number the mA output is to be based upon. This value will depend on whether mA function (P201) is set as transducer or mA input.

If P201 uses a transducer, this parameter can only be altered if P001 (Operation) is set for DPD or DPA. The values would be 1 for Single Point applications, 1-2 for Dual Point, or 1-3 for DPD or DPA configurations.

If P201 uses mA input, then the values will range from 1 to 5 depending on the optional Analog I/O boards installed.

## P203 mA Output Value / Transducer

*The current mA output value for the Point Number displayed.*

| | |
|---|---|
| **Primary Index** | Transducer |
| **Values** | Range: 0.000 to 22.00 (view only) |

This displays as an Auxiliary Reading when 5 mA is pressed in the RUN mode and does not include adjustments made using Trim features (P214 / P215).

**Note:**
This parameter is applicable only if any mA output has the transducer Point Number as its input source (see P201 and P202).

# Independent mA Setpoints (P210 and P211)

Use these features to reference the minimum and/or maximum mA output to any point in the measurement range.

| If P201—mA Function is set for.. | Then… |
|---|---|
| "level", "space", or "distance", | enter the material level in Units (P004) or percent of Span (P007) as referenced to Empty (P006) |
| "volume", | enter the volume in Max Volume (P051) units or as a percent of Max Volume. |
| "flow" | enter the flowrate in OCM Max Flow (P604) units or as a percent of OCM Max Flow. |
| "head" | enter the head in level units (P004) or percent of Max Head (P603). |
| "volume rate" | enter the volume rate in volume / min. Ensure the % symbol is displayed before attempting to enter a % value. |
| “Echo mA input” or “Communication control” | these features are not used |

**Note:**
The number of indexes showing in the following parameters will be 2, or 4, depending on the optional Analog Input/Output board installed.

## P210 0/4 mA Output Setpoint

*The process level that corresponds to the 0 or 4mA value.*

| | |
|---|---|
| **Primary Index** | mA output |
| **Values** | Range: -999 to 9999 |
| **Related** | • P211 20 mA Output Setpoint on page 43 |

Enter the value (in applicable units or %) to correspond to 0 or 4 mA.

## P211 20 mA Output Setpoint

*The process level that corresponds to the 20 mA value.*

| | |
|---|---|
| **Primary Index** | mA output |
| **Values** | Range: -999 to 9999 |
| **Related** | • P210 0/4 mA Output Setpoint on page 43 |

Enter the value (in applicable units or %) to correspond to 20 mA.

# mA Output Limits (P212 and P213)

Use these features to adjust the minimum and/or maximum mA output values, which should typically suit the input limit requirements of the external device.

## P212 mA Output Min Limit

*The minimum mA output value (in mA) to be produced.*

| | |
|---|---|
| **Primary Index** | mA output |
| **Values** | Range: 0.000 to 22.00 |
| | Preset: 0.0 or 3.8 |
| **Related** | • P200 mA Output Range on page 41<br>• P213 mA Output Max Limit on page 44 |

Preset is determined by mA Function (P200). If P200 = 1 or 3, then the preset is 0.0, or if P200 = 2 or 4, then the preset is 3.8.

## P213 mA Output Max Limit

*The maximum mA output value (in mA) to be produced.*

| | |
|---|---|
| **Primary Index** | mA output |
| **Values** | Range: 0.000 to 22.00 |
| | Preset: 20.2 mA |
| **Related** | • P200 mA Output Range on page 41P212 mA Output Min Limit on page 44 |

# mA Output Trim (P214 to P215)

This does not affect the P203 value shown, and is used when recalibration of an external device is impractical or an uncalibrated card has been installed.

## P214 4 mA Output Trim

*Used to calibrate the 4 mA output.*

| | |
|---|---|
| **Primary Index** | mA output |
| **Values** | Range: 0 to 9999 |
| **Related** | • P215 20 mA Output Trim on page 45 |

Adjust this value so the device indicates 4.000 mA when P214 is accessed.

## P215 20 mA Output Trim

*Used to calibrate the 20 mA output.*

| | |
|---|---|
| **Primary Index** | mA output |
| **Values** | Range: 0 to 9999 |
| **Related** | • P214 4 mA Output Trim on page 44 |

Adjust this value so the device indicates 20.00 mA when P215 is accessed.

# mA Output Failsafe (P219)

## P219 mA Output Failsafe

*Use for failsafe operation, independent of the Failsafe Material Level (P071).*

| | | | |
|---|---|---|---|
| **Primary Index** | mA output | | |
| **Values** | Range: 0.000 to 22.00 | | |
| | "OFF" | * | mA output responds to Failsafe Material Level (P071). |
| | "HOLd | | the "last known" value is held until normal operation resumes |
| | "LO" | | produce the "Empty" mA output immediately. |
| | "HI" | | produce the "Span" mA output immediately. |
| **Related** | • P201 mA Output Function on page 41 | | |

**To select an independent mA Failsafe option:**

1. Press [▲%] to display the Auxiliary Function symbol,
2. Press [▲] or [▼] to scroll access the failsafe options.
3. Press [↵] when the desired option displayed.

Or, to produce an mA output at a specific value, enter the value required. This is used only if mA output is allocated to a transducer (P201 = 1 to 7).

# mA Input (P250 to P254)

## P250 mA Input Range

*The mA output range of the connected mA device.*

| | | | |
|---|---|---|---|
| **Primary Index** | mA input | | |
| **Values** | 1 | | 0 to 20 mA |
| | 2 | * | 4 to 20 mA |

Ensure this range corresponds to the output range of the external device. All level measurements will equate % of Span with the % of the mA range.

## P251 0 or 4 mA Input Level

*The process level that corresponds to the 0 or 4 mA value.*

| | |
|---|---|
| **Primary Index** | mA input |
| **Values** | Range: -999 to 9999% |
| | Preset: 0% |
| **Related** | • P006 Empty on page 10.<br>• P007 Span on page 11. |

When using an external mA signal to determine level, the input range must be scaled to give accurate results.

## P252 20 mA Input Level

*The process level that corresponds to the 20 mA value.*

| | |
|---|---|
| **Primary Index** | mA input |
| **Values** | Range: -999 to 9999% |
| | Preset: 100% |
| **Related** | • P006 Empty on page 10.<br>• P007 Span on page 11. |

Input range is scaled for accuracy if an external mA signal calculates level

## P253 Input Filter Time Constant

*The time constant used in the mA input filter to dampen signal fluctuations.*

| | |
|---|---|
| **Primary Index** | mA input |
| **Values** | Range: 0 to 9999 |
| | Preset: 0 |

This number in seconds is used in the damping calculations. Larger values damp more than smaller values and “0” disables the signal filter.

## P254 Scaled mA Input Value

*The resulting level value after scaling.*

| | |
|---|---|
| **Primary Index** | mA input |
| **Values** | Range: 0 to 9999 (view only) |
| | Preset: calculated from the input mA signal |

This parameter is calculated from the input mA signal.

# mA Input Trim (P260 to P262)

Your EnviroRanger has been calibrated at the factory, so only use these parameters if you know that it requires recalibration, or if you have installed an optional I/O card yourself.

**Note:**
- Ignore any values given in (P261 4 mA Trim) or (P262 20 mA Trim).



## P260 mA Raw Input

*Shows the raw mA input supplied by the external device.*

| | |
|---|---|
| **Primary Index** | mA input |
| **Values** | Range: 0.000 to 20.00 (view only) |
| **Related** | • P261 4 mA Trim on page 47<br>• P262 20 mA Trim on page 47 |

## P261 4 mA Trim

*Calibrates the mA input to the bottom (4 mA) level.*

| | |
|---|---|
| **Primary Index** | mA input |
| **Values** | Range: 0.000 to 9999 |
| **Related** | • P260 mA Raw Input on page 47<br>• P262 20 mA Trim on page 47 |

**To calibrate the unit:**
1. Connect a trusted 4 mA source to the mA inputs on the terminal block
2. Press [↵].
3. L.CAL is shown on the LCD

## P262 20 mA Trim

*Calibrates the mA input to the top (20 mA) level.*

| | |
|---|---|
| **Primary Index** | mA input |
| **Values** | Range: 0.000 to 9999 |
| **Related** | • P261 4 mA Trim on page 47<br>• P262 20 mA Trim on page 47 |

**To calibrate the unit:**
1. Connect a trusted 20 mA source to the mA inputs on the terminal block
2. Press [↵]
3. H.CAL is shown on the LCD

# Discrete Input Functions (P270 to P275)

**Discrete inputs can be used for the following:**

- P160 Overflow / Underflow Level Source as described on page 34
- Pump Interlock Allocation (P500 to P509)as described on page 77
- Passing other information to a remote system through communications

Use the parameters listed above to have discrete inputs modify the unit's operation, use the following parameters to configure the discrete input itself.

See also the Pump Control section in the EnviroRanger User Guide for a detailed description of the EnviroRanger's pump control algorithms, including how the discrete inputs alter its operation.

**Note:**
The ERS 500 base unit has 8 discrete inputs. An optional board can expand this to 16. Refer to the Installation Guide for more information.



## P270 Discrete Input Function

*The way in which discrete signals are interpreted by the EnviroRanger.*

| **Primary Index** | discrete input | | |
|---|---|---|---|
| **Values** | 0 | | Forced Off |
| | 1 | | Forced On |
| | 2 | * | Normally Open – 0 (DI open), 1 (DI closed) |
| | 3 | | Normally Closed – 0 (DI closed), 1 (DI open) |
| | 4 | | Pulse Counter |
| | 5 | | Frequency Input |
| **Related** | • Pump Interlock Allocation (P500 to P509)a on page 77<br>• Pump Control section in the EnviroRanger User Guide<br>• P275 Scaled Discrete Input Value on page 50 | | |

P270 functions are only available for the advanced inputs (index 7 and 8). Use the values 0 and 1 to test an installation as they simulate an on or off state. Use 2 and 3 for normal operation, and 4 or 5 affect the pump control algorithms. These values can be read by a SCADA system.

## P271 Frequency Input 0Hz Offset

*The value associated with 0Hz frequency input.*

| **Primary Index** | discrete input |
|---|---|
| **Values** | Range: -999 to 9999 |
| | Preset: 0 (frequency input)<br>---- (for other inputs) |
| **Related** | • P270 Discrete Input Function on page 48 |

When the discrete input receives a signal of less than 1Hz, this parameter determines what the scaled value is. This parameter is valid only for discrete inputs set to the “Frequency Input (5)” function.

## P272 Discrete Input Multiplier

*The upper value for Frequency Input or the increment value for a Pulse Counter.*

| | |
|---|---|
| **Primary Index** | discrete input |
| **Values** | Range: 0.0 to 9999 |
| | Preset: 1.0 (pulse counter input)<br>100.0 (frequency input)<br>---- (for other inputs) |
| **Related** | • P270 Discrete Input Function on page 48 |

This parameter works with both the “Pulse Counter (4)” and the “Frequency Input (5)” functions.

**Pulse Counter (P270 = 4)**
Sets the value to iterate for every pulse received. This allows the input value to be scaled as it is totalized. For example, a value of ten “10” here adds 10 to the count for every pulse received.

If you change this value the pulse total (P275) resets to zero “0”.

**Frequency Input (P270 = 5)**
Sets the displayed value when the input is at the upper frequency range. Use with P273 Frequency Input Upper Frequency.

## P273 Frequency Input Upper Frequency

*The maximum frequency allowed on a discrete input.*

| | |
|---|---|
| **Primary Index** | discrete input |
| **Values** | Range: 0.000 to 20.00 |
| | Preset: 20.0 (frequency input)<br>---- (other) |
| **Related** | • P270 Discrete Input Function on page 48<br>• P272 Discrete Input Multiplier on page 49 |

Set in kHz, P273 determines when the scaled value shows the value of P272. Frequency inputs greater than the value specified are scaled above P272.

## P274 Frequency Input Filter Time Constant

*The time constant used in the discrete input filter to dampen fluctuations.*

| | |
|---|---|
| **Primary Index** | discrete input |
| **Values** | Range: 0.000 to 9999 |
| | Preset: 0 (frequency input)<br>---- (other) |
| **Related** | • P270 Discrete Input Function on page 48 |

The number of seconds used in the damping calculations. Larger values damp more than smaller ones. 0 disables the signal filter. This parameter is valid only for discrete inputs set to the "Frequency Input (5)" function.

## P275 Scaled Discrete Input Value

*The current value of the discrete input after any scaling is applied.*

| | | |
|---|---|---|
| **Primary Index** | discrete input | |
| **Values** | Display: view only | |
| | Values: dependent on the function of the discrete input | |
| | **Range of Values** | **Function (P270)** |
| | 1 | Forced On |
| | 0 | Forced Off |
| | 0 (DI open), 1 (DI closed) | Normally Open |
| | 0 (DI closed), 1 (DI open) | Normally Closed |
| | 0 to 9999 (higher through communications) | Pulse Counter |
| | 0 to 9999 (higher through communications) | Frequency Input |
| **Related** | • Pump Interlock Allocation (P500 to P509) on page 77<br>• Pump Fault Status (P510 to P515) on page 83<br>• Pump Control Source (P520 to P524) on page 86 | |

Readings are updated continuously even in program mode. Frequency inputs can be viewed as percent of P273 by pressing the percent button ([%]) on the hand programmer. Press [C] [↵] to reset the pulse counter (P270 = 4 only).

The value is used by pump interlocks or overflow detection to signal an event. 0 is a logical false and 1 is a logical true.

# Standard Data Logging (P300 to P321)

- To view Data Logging time stamps press [%] and then [9].
- To view date stamps press [%] and then [0].

All records can be reset by pressing [C] [↵].

# Record Temperatures (P300 to P303)

These features display a log of record high and / or low temperatures in °C.

When a parameter relating to a TS-3 Temperature Sensor is accessed, the Point Type display changes to the TS-3 symbol. If the unit is powered up without a temperature sensor connected, the value –50C is displayed. This information can help trace problems with both built in and external temperature sensors.



## P300 Temperature, Transducer Max

*View the highest temperature encountered, as measured by the temperature sensor in the transducer (if applicable).*

| | |
|---|---|
| **Primary Index** | transducer |
| **Values** | Range: - 50 to 150°C (view only) |
| | Preset: - 50°C |
| **Related** | • P301 Temperature, Transducer Min on page 51 |

Press [c] [↵] to reset the log after a short circuit on the transducer wiring.

## P301 Temperature, Transducer Min

*View the lowest temperature encountered, as measured by the temperature sensor in the transducer (if applicable).*

| | |
|---|---|
| **Primary Index** | transducer |
| **Values** | Range: - 50 to 150°C (view only) |
| | Preset: 150°C |
| **Related** | • P300 Temperature, Transducer Max on page 51 |

Press [c] [↵] to reset the log after an open circuit on the transducer wiring.

## P302 Temperature, Sensor Max

*View the highest temperature encountered, as measured by the TS-3 Temperature Sensor (if applicable).*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: - 50 to 150°C (view only) |
| | Preset: - 50°C |
| **Related** | • P303 Temperature, Sensor Min on page 51 |

Press [c] [↵] to reset the log after a short circuit on the transducer wiring.

## P303 Temperature, Sensor Min

*View the lowest temperature encountered, as measured by the TS-3 Temperature Sensor (if applicable).*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: - 50 to 150°C (view only) |
| | Preset: 150°C |
| **Related** | • P302 Temperature, Sensor Max on page 51 |

Press [c] [↵] to reset the log after an open circuit on the transducer wiring.

# Record Readings (P304 and P305)

This identifies the occurrence of the record high and low level readings. Press [c] [↵] to reset these values once the installation is working correctly.

## P304 Reading Max

*View the highest Reading calculated (in normal Reading units or %).*

| | |
|---|---|
| **Primary Index** | level |
| **Values** | Range: -999 to 9999 (view only) |
| **Related** | • P305 Reading Min on page 52 |

## P305 Reading Min

*View the lowest Reading calculated (in normal Reading units or %).*

| | |
|---|---|
| **Primary Index** | level |
| **Values** | Range: -999 to 9999 (view only) |
| **Related** | • P304 Reading Max on page 52 |

# Pump Records (P309 to P312)

These features to identify pump usage. if the associated Relay Function (P111) is set for any "pump control" feature. The value displayed pertains to the pump connected to the associated terminals.

Enter a value to set the current record to that value. This can be used if a pump is added with a known number of hours logged or the value can be reset to zero “0” after maintenance.

## P309 Pump Run Time

*Displays the amount of time in minutes since a relay was last activated.*

| | |
|---|---|
| **Primary Index** | relay |
| **Values** | Range: 0 to 9999 minutes |
| **Related** | • Relay Function (P111) set for any "pump control" feature |

This parameter measures the length of time since a relay was asserted, most often to determine how long a pump has been running. Alternatively, it can monitor a relay to show how long it has been in a state of alarm. It is reset every time the relay is activated.

## P310 Pump Hours

*View or reset the accumulated "ON" time for the displayed Relay Number.*

| | |
|---|---|
| **Primary Index** | relay |
| **Values** | Range: 0.000 to 9999 |
| **Related** | • Relay Function (P111) set for any "pump control" feature |

This value is displayed with a floating decimal point. (i.e. the more figures displayed before the decimal, the fewer displayed after). It is the value displayed when 2 is pressed in the RUN mode as described in the section *About the EnviroRanger* in the User Guide.

## P311 Pump Starts

*View or reset the accumulated number of times the displayed Relay Number has been "on".*

| | |
|---|---|
| **Primary Index** | relay |
| **Values** | Range: 0 to 9999 |
| **Related** | • Relay Function (P111) set for any "pump control" feature |

This value is displayed when 2 is pressed and held for 5 seconds in RUN mode as described in the section *About the EnviroRanger* in the User Guide.

## P312 Pump Run Ons

*View or reset the accumulated number of times the displayed Relay Number has been held "on" via Run On Interval (P130).*

| | |
|---|---|
| **Primary Index** | relay |
| **Values** | Range: 0 to 9999 |
| **Related** | • Relay Function (P111) set for any "pump control" feature |

# Overflow / Underflow Records (P313 to P316)

Flow events are logged immediately, so if the system is in overflow state when the overflow records are viewed, then the first record shows the current event. The index contains 20 entries with 1 being the most recent. When more than 20 records are stored new ones will "wrap" and write over the oldest ones. These records cannot be reset.

**The following information is recorded:**

- Date
- Time
- Duration
- Volume Discharged

**To view Overflow Records**

1. Enter Program mode and press [⇔] twice to highlight the index field The field shows two underscores _ _
2. Type the index number.
3. Use [▲] and [▼] to scroll through the records



## P313 Overflow/Underflow Event Dates

*View the dates of the 20 most recent events in the format YY:MM:DD.*

| | |
|---|---|
| **Primary Index** | CSO Log |
| **Values** | Range: 70:01:01 to 69:12:31 (view only) |
| | Blank entries show as 70:01:01. |
| **Related** | • Overflow / Underflow (P160 to P169) on page 34<br>• P314 Overflow/Underflow Event Times on page 54 |

**Notes:**

- On rack and panel displays, the year overwrites the index number.
- See page 11 for Date and Time display formats.

## P314 Overflow/Underflow Event Times

*View the times, in 24-hour format HH:MM:SS of the 20 most recent events.*

| | |
|---|---|
| **Primary Index** | CSO Log |
| **Values** | Range: 00:00:00 to 23:59:59 (view only) |
| | Blank entries show as 00:00:00. |
| **Related** | • Overflow / Underflow (P160 to P169) on page 34<br>• P313 Overflow/Underflow Event Dates on page 54. |

On rack and panel displays, the seconds overwrite the index number.

# P315 Overflow/Underflow Event Duration

*View the duration, in minutes of the 20 most recent overflow events.*

| | |
|---|---|
| **Primary Index** | CSO Log |
| **Values** | Range: 0.00 to 9999 (view only) |
| | Blank entries show as 0.00. |
| **Related** | • Overflow / Underflow (P160 to P169) on page 34 |

# P316 Overflow Event Volume

*Displays the volume discharged in each of the last 20 overflow events.*

| | |
|---|---|
| **Primary Index** | CSO Log |
| **Values** | Range: 0 to 9999 (view only) |
| | Default view: ---- |
| **Altered By** | • P604 Maximum Flow on page 91<br>• P606 Time Units on page 92<br>• P608 Flowrate Units on page 93 |
| **Related** | • P001 Operation on page 7<br>• Overflow / Underflow (P160 to P169) on page 34<br>• P315 Overflow/Underflow Event Duration on page 55<br>• P600 Primary Measuring Device on page 88 |

**This can be used to calculate volume discharged if:**

- Overflow/Underflow Level Source (P160) is set to monitor for an overflow
- The transducer in Overflow Discharge Volume Source (P166) is set for OCM

If absolute units of measurement have already been selected in Flowrate units (P608 ≠ 0), then Overflow Volume (P316) will be displayed. The time units displayed in P608 are irrelevant here as this material was discharged during an overflow event with a known duration (P315).

If Flowrate units (P608) is set at zero (ratiometric), then the value for Overflow Volume (P316) is shown in the following format:

*Flow Units (P604) x Time Units (P606)*

**Notes:**

- OCM volume cannot be monitored if the transducer is already set to monitor pumped volume (P001 = 7 ).
- If Overflow Discharge Volume Source (P166) is disabled (as it is in its default setting), then this parameter will display its default view (----).

# Flow Records (P320 and P321)

These features are enabled if Operation is set for "OCM" (P001 = 6), or an OCM device is defined (P600≠0). Use them to identify the occurrence of the record high and low flow rates as displayed in OCM Max Flow (P604) units, or as a percent of OCM Max Flow. Press [c] [↵] to reset these values once the installation is working correctly.

## P320 Flow Max

*View the highest flow rate calculated (in units or %).*

| Primary Index | Standard Mode | Dual Point Mode |
|---|---|---|
| | global | transducer |
| **Values** | Range: -999 to 9999 (view only) | |
| **Related** | • P604 Maximum Flow on page 91 | |

## P321 Flow Min

*View the lowest flow rate calculated (in units or %).*

| Primary Index | Standard Mode | Dual Point Mode |
|---|---|---|
| | global | transducer |
| **Values** | Range: -999 to 9999 (view only) | |
| **Related** | • P604 Maximum Flow on page 91 | |

# LCD Totalizer (P322 and P323)

Use these features to view, reset, or preset the 8 digit display totalizer when Operation is set for "OCM" or "Pumped Volume" (P001 = 6 or 7). The 8 digit totalizer is divided into 2 groups of 4 digits. The 4 least significant totalizer digits are stored in P322 and the 4 most significant digits are stored in P323. Adjust these values separately to set a new total.

**Example**

| P323 | P322 | Totalizer Display |
|---|---|---|
| 0017 | 6.294 | 00176.294 |

Totalizer units are dependent upon programming. Enter zero "0" (if desired) to reset the totalizer to zero. Alternatively, enter any other (applicable) value, to preset the totalizer to the value desired.

**Note:**
A second point is available only if the Dual Point Feature is enabled. See Enabling Optional Features (P343 to P348) on page 62 for more details.

## P322 LCD Total Low

*View and / or alter the 4 least significant digits of the totalizer value.*

| Primary Index | Standard Mode | Dual Point Mode |
|---|---|---|
| | global | transducer |
| **Values** | Range: 0.000 to 9999 | |
| **Related** | • P630 LCD Totalized Multiplier on page 97<br>• P633 LCD Totalized Decimal Position on page 97<br>• P737 Primary Reading on page 113 | |

## P323 LCD Total High

*View and / or alter the 4 most significant digits of the totalizer value.*

| Primary Index | Standard Mode | Dual Point Mode |
|---|---|---|
| | global | transducer |
| **Values** | Range: 0.000 to 9999 | |
| **Related** | • P630 LCD Totalized Multiplier on page 97<br>• P633 LCD Totalized Decimal Position on page 97<br>• P737 Primary Reading on page 113 | |

# Profile Records (P330 to P337)

**WARNING:**
**These parameters are for authorized service personnel or Technicians familiar with Milltronics echo processing techniques.**

These features can record up to 10 Echo profiles, initiated manually (P330), or automatically (P331 et al). See Scope displays (P810) for echo profile viewing hardware / software requirements. If 10 Profiles are already saved, addresses 1 through 10 are filled, the oldest automatically initiated record is overwritten. Manually initiated records are not automatically overwritten. All records are automatically deleted in the event of a power interruption.

When a record is displayed, results are based on current programming (which may have been altered since the record was saved). This permits the effect on the echo profile to be observed when changing an echo parameter.

# P330 Profile Record.

*Records profiles for later viewing.*

| Primary Index | echo profile | |
|---|---|---|
| Values | Code | Description |
| | ---- | no record |
| | A1 | automatically recorded profile from transducer 1 |
| | A2 | automatically recorded profile from transducer 2 |
| | U1 | manually recorded profile from transducer 1 |
| | U2 | manually recorded profile from transducer 2 |



**In addition to being a profile records library, this provides two functions:**

- manually records and saves echo profiles
- displays an echo profile, recorded manually or automatically, (oscilloscope).

**To select a record address**

1. Enter Program mode and press [⇔] twice to highlight the index field
   The field shows two underscores _ _
2. Type the index number. The profile record information is shown
3. Use [▲] and [▼] to scroll through the records

**To manually record a profile**

Press [⇓] to fire the transducer and record the echo profile into the internal scope buffer for display.

For differential or average operation (P001 = 4 or 5), access scope Displays (P810) parameter to select the transducer number.

**To save a manual record**

Press [↵] to copy the echo profile record in the scope buffer and save it in the selected address in the record library. The parameter value field displays the new record information.

**To display a record**

Press [▲%] to enter display auxiliary mode and then:

- Press [9] to display the time the profile was taken
- Press [0] to display the date the profile was taken
- Press [⇓] to copy the current echo profile into the scope buffer for display on an oscilloscope or Dolphin Plus

**To delete a record**

Press [C] and then [↵] to delete the echo profile record in the selected address. The value returns to - - - -.

## P331 Auto Record Enable

*Use this feature to enable / disable the Auto Profile Record function.*

| Primary Index | global | | |
|---|---|---|---|
| Values | Range: 0 to 1 | | |
| | 0 | * | Off |
| | 1 | | On |

## P332 Auto Record Transducer

*Use this feature to specify the Transducer Point Number for which Auto Profile Records are saved.*

| Primary Index | global | | |
|---|---|---|---|
| Values | Range: 0 to 2 | | |
| | 0 | | Any transducer |
| | 1 | * | Transducer 1 |
| | 2 | | Transducer 2 |
| Altered By | • P001 Operation = 4 or 5, on page 7 | | |

This feature is preset to Point Number 1. (Alteration is only required if "differential" or "average" Operation (P001 = 4 or 5) is selected).

## P333 Auto Record Interval

*Enter the time to elapse after an Auto Profile Record is saved before another Auto Profile Record can be saved (subject to all other restrictions).*

| Primary Index | global |
|---|---|
| Values | Range: 0.0 to 9999 (minutes) |
| | Preset: 120 |

# Auto Record “On” and “Off” Setpoints (P334 to P337)

Use Auto Record “on” Setpoint (P334) and Auto Record “off” Setpoint (P335) to define the boundaries within which the level must be, for the resultant Echo Profile to be considered for an Auto Profile Record.

If "----" is displayed for either P334 or P335, Auto Profile Records are saved regardless of current level (subject to all other restrictions).

Enter the level value in Units (P005) or percent of Span (P007) as referenced to Empty (P006).

## P334 Auto Record “On” Setpoint

*Enter the critical level which, in conjunction with Auto Record “off” Setpoint, defines the boundaries for Auto Profile Records to be saved.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: -999 to 9999 |
| **Related** | • P335 Auto Record “off” Setpoint on page 60<br>• P336 Auto Record Filling / Emptying on page 60<br>• P337 Auto Record LOE Time on page 61 |

## P335 Auto Record “off” Setpoint

*Enter the critical level which, in conjunction with Auto Record “on” Setpoint, defines the boundaries for Auto Profile Records to be saved.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: -999 to 9999 |
| **Related** | • P334 Auto Record “On” Setpoint on page 60<br>• P336 Auto Record Filling / Emptying on page 60<br>• P337 Auto Record LOE Time on page 61 |

## P336 Auto Record Filling / Emptying

*Use this feature to restrict Auto Profile Records from being saved unless the level is rising, falling or either.*

| | | | |
|---|---|---|---|
| **Primary Index** | global | | |
| **Values** | 0 | * | Auto Profile Record on filling or emptying |
| | 1 | | Auto Profile Record on filling only |
| | 2 | | Auto Profile Record on emptying only |
| **Related** | • P334 Auto Record “On” Setpoint on page 60<br>• P335 Auto Record “off” Setpoint on page 60<br>• P337 Auto Record LOE Time on page 61<br>• P702 Filling Indicator on page 105<br>• P703 Emptying Indicator on page 105 | | |

If the level changes at a rate in excess of the corresponding Filling / Emptying Indicator (P702 / P703) values, the Echo Profile is saved subject to this and other Auto Profile Record restrictions.

## P337 Auto Record LOE Time

*Limits Auto Profile Records from being saved unless extended LOE occurs.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: 0.0 to 9999 (seconds) |
| | Preset: 0.0 |
| **Related** | • P334 Auto Record “On” Setpoint on page 60<br>• P335 Auto Record “off” Setpoint on page 60<br>• P336 Auto Record Filling / Emptying on page 60 |

If the LOE condition exceeds the period entered the Echo Profile is saved. When set for "0" LOE is not required for an Auto Profile Record to be saved.



# Installation Records (P340 to P342)

## P340 Date of Manufacture

*View the date of manufacture of this EnviroRanger unit.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Format: YY:MM:DD (view only) |
| **Related** | • P341 Run Time on page 61<br>• P342 Start Ups on page 61 |

See page 11 for the Date display format.

## P341 Run Time

*View the number of days this EnviroRanger has been in operation.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: 0.000 to 9999 (view only) |
| **Related** | • P340 Date of Manufacture on page 61<br>• P342 Start Ups on page 61 |

The Run Time value is updated once a day, and cannot be reset. However, in the event of a power interruption, the counter won’t advance, so that a unit that is powered down on a regular basis will not have an accurate value.

## P342 Start Ups

*The number of times power has been applied since the Date Of Manufacture.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: 1 to 9999 (view only) |
| **Related** | • P340 Date of Manufacture on page 61<br>• P341 Run Time on page 61 |

# Enabling Optional Features (P343 to P348)

## P345 Serial Number, Date Portion

*Date portion of product serial number*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Format: YY:MM:DD |
| **Related** | • P346 Serial Number, on page 62<br>• P347 Detected Hardware on page 62<br>• P348 Feature Status on page 62 |

## P346 Serial Number, Numeric Portion

*Numeric portion of product serial number*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: 100-999 |
| **Related** | • P345 Serial Number, on page 62<br>• P347 Detected Hardware on page 62<br>• P348 Feature Status on page 62 |

## P347 Detected Hardware

*Describes the add-on hardware that the product currently detects.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: 0000 to FFFF (hex) |
| **Related** | • P346 Serial Number, on page 62<br>• P345 Serial Number, on page 62<br>• P348 Feature Status on page 62 |

**Note:**
This parameter does not detect SmartLinx cards.

## P348 Feature Status

*Describes the features that the product currently supports.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: 0000 to FFFF (hex) |
| **Related** | • P346 Serial Number, on page 62<br>• P345 Serial Number, on page 62<br>• P347 Detected Hardware on page 62 |

# Alarm and Event Trigger System (P420 to P430)

This is an independent software module that can monitor up to 32 separate parameters. It compares the parameter's status to a user-defined setpoint each level cycle, and initiates a predetermined task when it is reached.

**Examples of a software task that the System can launch include:**

- Data Logging
- Report by Exception

**Note:**
An invalid parameter value will disable the trigger, and set the value to ∅.



## P420 Parameter to Monitor

*The parameter that is being monitored by the Alarm Event Trigger System.*

| | | | |
|---|---|---|---|
| **Primary Index** | trigger | | |
| **Values** | Range: 0 to 999 | | |
| | 0 | * | off |
| | 1-999 | | the parameter being monitored |
| **Related** | • P421 Primary Index to Monitor on page 63 | | |

When P420 monitors P009 (Time), it is considered a *Periodic Event Trigger.* It will assert when the P009 clock reaches the start time set by P422, and negate at the approximate period midpoint. Trigger asserts will then occur every period as set by P423. See the User Guide for application examples.

**Note:**
The monitored parameter cannot be a "split value" parameter such as 807 – Noise.

## P421 Primary Index to Monitor

*The primary index being monitored by the Alarm Event Trigger System.*

| | |
|---|---|
| **Primary Index** | trigger |
| **Values** | Range: 1 to 99 |
| **Related** | • P420 Parameter to Monitor on page 63 |

The value is the point number of the parameter in P420. Parameters that are indexed globally do not have point numbers, and a 1 should be entered.

## P422 On Setpoint

| | |
|---|---|
| **Primary Index** | trigger |
| **Values** | Format and Range: dependant on parameter |
| **Altered By** | • P420 Parameter to Monitor on page 63 |
| **Related** | • P423 Off Setpoint64 |

The monitored parameter sets the display format, ex Time (P009) = HH:MM.

## P423 Off Setpoint

| | |
|---|---|
| **Primary Index** | trigger |
| **Values** | Format: dependant on parameter |
| **Altered By** | • P420 Parameter to Monitor on page 63 |
| **Related** | • P422 On Setpoint on page 64 |



## P424 Trigger State

*Displays the status of the current trigger.*

| | | | |
|---|---|---|---|
| **Primary Index** | trigger | | |
| **Values** | Format: view only | | |
| | 0 | | normal |
| | 1 | | activated |
| **Alters** | • P485 Trigger Type on page 77 | | |
| **Related** | • P420 Parameter to Monitor on page 63 | | |

## P430 Log Trigger

*Configures the Trigger Alarm Logging System.*

| | | | |
|---|---|---|---|
| **Primary Index** | trigger | | |
| **Values** | 0 | | off |
| | 1 | | log every change in this trigger |
| **Alters** | • P431 Reset Alarm Log on page 65 | | |
| **Related** | • P420 Parameter to Monitor on page 63 | | |

This is related to the Trigger Alarm Logging System (below), and is used to disable the system (0), or set it to log changes in the trigger state (1).

# Trigger Alarm Logging System (P431 to P435)

This records an alarm log for each change to a trigger as set by the Alarm and Event Trigger System (P420 to P430). For it to function, the optional Expansion Memory card must be installed, and the Data Logging option

must be enabled (Enabling Optional Features (P343 to P348), page 62). To log an actual value for a watched parameter, then configure the Data Logging Parameters (P440 to P453) as described on page 66.

**The following information is recorded in the alarm log:**

- Trigger number (P432)
- Date/Time stamp (P433)
- Trigger Status (P434)
- Number of Entries in the Log (P435)

## P431 Reset Alarm Log

*Returns the parameter to its default state.*

| | | | |
|---|---|---|---|
| **Primary Index** | global | | |
| **Values** | 0 | | No change |
| | 1 | | Reset Log (clears all alarms from log) |
| **Altered By** | • Enabling Optional Features (P343 to P348) on page 62. | | |
| **Related** | • Alarm and Event Trigger System (P420 to P430) on page 63. | | |

## P432 Last Trigger Logged

*Displays the last alarm or event trigger that was logged.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: 1 to 32 |
| **Altered By** | • Enabling Optional Features (P343 to P348) on page 62. |
| **Related** | • Alarm and Event Trigger System (P420 to P430) on page 63. |

The value of this parameter represents the trigger number.

## P433 Date/Time Stamp

*Displays the time that the trigger was activated.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: 00:00:00 to 23:59:59 |
| **Altered By** | • Enabling Optional Features (P343 to P348) on page 62. |
| **Related** | • Alarm and Event Trigger System (P420 to P430) on page 63. |

See page 11 for the Date and Time display format.

## P434 Trigger Status

*Displays the current state of the trigger.*

| | | | |
|---|---|---|---|
| **Primary Index** | global | | |
| **Values** | Format: view only | | |
| | 1 | | Trigger Asserted |
| | 2 | | Trigger Negated |
| **Altered By** | • Enabling Optional Features (P343 to P348) on page 62. | | |
| **Related** | • Alarm and Event Trigger System (P420 to P430) on page 63. | | |



## P435 Number Entries

*Displays the number of alarm records that are in the log.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: 0 to 2880 |
| **Altered By** | • Enabling Optional Features (P343 to P348) on page 62. |
| **Related** | • Alarm and Event Trigger System (P420 to P430) on page 63. |

# Data Logging Parameters (P440 to P453)

This works in conjunction with the Alarm and Event Trigger and the Communications Systems to log a record for a pre-defined event. It can monitor up to 10 parameters.

**The following conditions are necessary:**

- Alarm and Event Trigger System (P420 to P430) (page 63) is configured.
- The optional Expansion Memory Card is installed
- The optional Data Logging Feature is enabled (see page 62)

## P440 Data Logging

*Configures the Data Logging System.*

| | | | |
|---|---|---|---|
| **Primary Index** | global | | |
| **Values** | 0 | Off | Data logging is not running |
| | 1 | On | Logging, and configuration allowed |
| **Altered By** | • Enabling Optional Features (P343 to P348) on page 62. | | |
| **Related** | • Alarm and Event Trigger System (P420 to P430) on page 63. | | |

## P441 Logged Parameter

*The parameter being recorded by the Data Logging System.*

| | | | |
|---|---|---|---|
| **Primary Index** | data logging | | |
| **Values** | Range: 0 to 2000 | | |
| | 0 | * | off |
| | 1-999 | | Selected parameter to log |
| **Altered By** | • Enabling Optional Features (P343 to P348) on page 62. | | |
| **Related** | • Alarm and Event Trigger System (P420 to P430) on page 63.<br>• P420 Parameter to Monitor on page 63 | | |

Normally, you can read the data of the parameter as if it was displayed on the LCD. If the parameter is a "split value" data type then it must be decoded. See the EnviroRanger ERS 500 Communications Reference for details on decoding a split value data type.

**Notes:**
- If the value of P441 is changed, the existing data log is reset.
- P807 Noise cannot be logged.

## P442 Logged Parameter's Primary Index

*The Primary Index that is being recorded by the Data Logging System.*

| | | | |
|---|---|---|---|
| **Primary Index** | data logging | | |
| **Values** | Range: dependant on parameter being monitored | | |
| | 1 | | global |
| **Altered By** | • Enabling Optional Features (P343 to P348) on page 62. | | |
| **Related** | • Alarm and Event Trigger System (P420 to P430) on page 63. | | |

**Note:**
If the value of P442 is changed, the existing data log is reset.

## P443 Data Type

*The type of data to be recorded in the log.*

| | | | |
|---|---|---|---|
| **Primary Index** | data logging | | |
| **Values** | 0 | | Not Configured |
| | 1 | | Instantaneous value |
| | 2 | | Averaged value |
| **Altered By** | • P420 Parameter to Monitor on page 63<br>• Enabling Optional Features (P343 to P348) on page 62. | | |
| **Related** | • Alarm and Event Trigger System (P420 to P430) on page 63. | | |

The instantaneous value occurs at the time of the trigger. The Averaged value can only be used when a periodic trigger is set at regular intervals

(P420=9, see P420 Parameter to Monitor on page 63). The logged data is an average of all readings, and updated each time the trigger is activated.

## P444 Log Storage Type

*The method in which the data is stored in the log.*

| | | | |
|---|---|---|---|
| **Primary Index** | data logging | | |
| **Values** | 0 | | Inactive/Full |
| | 1 | | circular |
| | 2 | | fill and stop |
| **Altered By** | • Enabling Optional Features (P343 to P348) on page 62. | | |
| **Related** | • Alarm and Event Trigger System (P420 to P430) on page 63.<br>• P447 Log Reset on page 69 | | |

If this parameter is set to zero "0", then no logging will occur. If the circular storage type is chosen (1), then new entries will overwrite old ones when the log is full. If the fill and stop option is selected (2), then logging will cease once capacity is reached and the value is set to 0. The log must be reset in order to begin collecting data again (see P447). A log can be disabled or paused by setting it to 0, and will continue where it left off when reactivated.

## P445 Data Log Trigger

*Sets the trigger number that will activate the logging system*

| | |
|---|---|
| **Primary Index** | data logging |
| **Values** | Range: 0 to 32 |
| **Altered By** | • Enabling Optional Features (P343 to P348) on page 62. |
| **Related** | • Alarm and Event Trigger System (P420 to P430) on page 63. |

This refers to the Alarm and Event Trigger System (P420 to P430) on page 63. The value of P445 will be equal to the trigger number that is the primary index of parameters P420 to P430. For example, if P420[7]=009, then this would be considered trigger #7, so the value of P445 should be set to 7.

## P446 Trigger Type

*Specifies the trigger state that will activate the Data Logging System.*

| | | | |
|---|---|---|---|
| **Primary Index** | data logging | | |
| **Values** | 1 | | Trigger Activated |
| | 2 | | Trigger Negated |
| | 3 | | Both |
| **Altered By** | • Enabling Optional Features (P343 to P348) on page 62. | | |
| **Related** | • Alarm and Event Trigger System (P420 to P430) on page 63. | | |

1. P446 = 1, will initiate a log once a trigger is turned on.
2. P446 = 2, will initiate a log when the trigger is turned off.
3. P446 = 3 will log one report when turned on, and another when turned off.

## P447 Log Reset

*Resets the Data Logging System.*

| | | | |
|---|---|---|---|
| **Primary Index** | data logging | | |
| **Values** | Range: 0 to 1 | | |
| | 0 | | No change |
| | 1 | | Reset log |
| **Altered By** | • Enabling Optional Features (P343 to P348) on page 62.<br>• P444 Log Storage Type on page 68 | | |
| **Related** | • Alarm and Event Trigger System (P420 to P430) on page 63. | | |

When a value of 1 is entered, the log will reset, and all data is cleared.

## P450 Last Reading

*Displays the last logged value for the data log.*

| | |
|---|---|
| **Primary Index** | data logging |
| **Values** | Display: dependant on logged parameter |
| **Altered By** | • Enabling Optional Features (P343 to P348) on page 62. |
| **Related** | • Alarm and Event Trigger System (P420 to P430) on page 63.<br>• P451 Last Reading Time Stamp on page 69 |

## P451 Last Reading Time Stamp

*Displays the time that the last reading was logged.*

| | |
|---|---|
| **Primary Index** | data logging |
| **Values** | Range: 00:00:00 to 23:59:59 |
| **Altered By** | • Enabling Optional Features (P343 to P348) on page 62. |
| **Related** | • Alarm and Event Trigger System (P420 to P430) on page 63.<br>• P450 Last Reading on page 69 |

See page 11 for Time display format.

## P452 Number of Entries

*Displays the number of entries in the data log.*

| | |
|---|---|
| **Primary Index** | data logging |
| **Values** | Range: 0 to 2880 |
| **Altered By** | • Enabling Optional Features (P343 to P348) on page 62.<br>• P447 Log Reset on page 69 |
| **Related** | • Alarm and Event Trigger System (P420 to P430) on page 63. |

The maximum value is 5000 (even in a circular queue), and is set to 0 when the log is reset (see P447 Log Reset on page 69).

## P453 Log Status

*Displays the trigger state responsible for data logging.*

| | | | |
|---|---|---|---|
| **Primary Index** | data logging | | |
| **Values** | Format: view only | | |
| | 0 | | Inactive/Full |
| | 1 | | Active (Trigger Activated) |
| | 2 | | Active (Trigger Negated) |
| **Altered By** | • Enabling Optional Features (P343 to P348) on page 62. | | |
| **Related** | • Alarm and Event Trigger System (P420 to P430) on page 63.<br>• P446 Trigger Type on page 68 | | |

# Statistical Calculations (P454 to P458)

These parameters generate statistical information from logged data.

## P454 Statistics Log

*Determines which log will be used for statistical calculations.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: 1 to 10 |
| **Alters** | • P455 Statistic Type on page 71 |
| **Related** | • Data Logging Parameters (P440 to P453) on page 66 |

# P455 Statistic Type

*Selects the type of statistical data the user wants to view.*

| Primary Index | global | | |
|---|---|---|---|
| Values | 1 | | Current Hour |
| | 2 | | Current Day |
| | 3 | | Current Week |
| | 4 | | Current Month |
| | 5 | | Previous Hour |
| | 6 | | Previous Day |
| | 7 | | Previous Week |
| | 8 | | Previous Month |
| | 9 | | Previous 60 minutes |
| | 10 | | Previous 24 hours |
| Related | • Data Logging Parameters (P440 to P453) on page 66 | | |

Values 9 and 10 are statistical values (average, minimum and maximum) derived from values stored in the log, and not individual readings.

**Note:**
These statistics can take a considerable amount of time to generate.

# P456 Averaged Value

*Displays the Averaged Value of the selected data log.*

| Primary Index | global |
|---|---|
| Values | Format: dependant on the type of data being logged. |
| Altered By | • P454 Statistics Log on page 70<br>• P455 Statistic Type on page 71 |
| Related | • Data Logging Parameters (P440 to P453) on page 66 |

This parameter will display the statistical value that is set in P455 (Statistic Type) for the data log that is specified in P454 (Statistics Log). The units displayed are relative to the parameter being logged.

**Note:**
This parameter cannot be used to average time or date parameters.

## P457 Minimum Value

*Displays the minimum value for the parameter being logged.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Format: -999 to 9999 |
| **Altered By** | • P455 Statistic Type on page 71 |
| **Related** | • Data Logging Parameters (P440 to P453) on page 66<br>• P458 Maximum Value on page 72 |

This parameter records and displays the minimum value of the watched parameter during the reading time as specified in P455 (Statistic Type). The units displayed are relative to the parameter being logged.

## P458 Maximum Value

*Displays the maximum value for the parameter being logged.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Format: -999 to 9999 |
| **Altered By** | • P455 Statistic Type on page 71 |
| **Related** | • Data Logging Parameters (P440 to P453) on page 66<br>• P457 Minimum Value on page 72 |

This parameter records and displays the maximum value of the watched parameter during the reading time as specified in P455 (Statistic Type). The units displayed are relative to the parameter being logged.

# Report by Exception (P470 to P472)

Use these parameters to configure the EnviroRanger Report by Exception System to alert a SCADA system or HMI to a defined event. Up to 32 separate parameters can be monitored using this system with alerts sent through a modem or a direct RS-232 or RS-485 connection.

**The information included in a report to a host machine includes:**

- The numeric unit identifier
- The date and time that the exception occurred
- The number and type of exception
- A user-defined value from the watched parameter

**Note:**
The Report by Exception System will not operate unless the Alarm and Event Trigger System (P420 to P430) on page 63 is properly configured.

# P470 Unit identifier

*The numeric identifier that is unique to this EnviroRanger unit.*

| | | | |
|---|---|---|---|
| **Primary Index** | global | | |
| **Values** | 0 | * | disables report by exception |
| | 1 to 9999 | | unit identifier value |
| **Altered By** | • Alarm and Event Trigger System (P420 to P430) on page 63. | | |
| **Related** | • ModBus Master (P473 to P476) on page 74. | | |

This numeric identifier is defined by the user, and is contained in the report that is transmitted from this EnviroRanger unit to identify the source of the transmission to the host. A value of zero "0" in this parameter disables the Report by Exception System.



# P471 Report by Exception Destination

*Selects the communications port to be used.*

| | | | |
|---|---|---|---|
| **Primary Index** | global | | |
| **Values** | 0 | | disables report by exception |
| | 1 | | RJ-11 |
| | 2 | | Terminal Block (RS-232) |
| | 3 | | RS-485 |
| **Related** | • Enabling Optional Features (P343 to P348) on page 62. | | |

A value of zero "0" disables reporting of exceptions, but they can still be generated and stored in the Modbus Map. For the report to be read, the remote host must initiate a connection.

The Report by Exception system uses triggers to initiate a report and polling from external hosts can be used to retrieve it. This is especially relevant when the EnviroRanger is configured as a slave, as the Modbus master will not pre-empt the slave.

**Note:**
Use of RS-485 (P471=3) requires an optional card. Contact your Milltronics representative to obtain the card, and consult the EnviroRanger Installation Guide on what to do with it.

# P472 Error Status

*Displays the status of the last exception that was generated.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | See tables below |
| **Related** | • ModBus Master (P473 to P476) on page 74. |

**Error Codes as Reported by an Unsolicited Slave**

| Code | Name | Meaning |
|---|---|---|
| 0 | Successful | Connection took place. This is the default. |
| 1-99 | Driver generated error | Exception codes are placed here by the Modbus Master. See the Communications Reference for details. |
| 100 | Could Not Connect | The connection attempt has failed, but more numbers will be tried. |
| 105 | All Connection Attempts Failed | No further attempts will be made to send this exception, but it can still be retrieved if the unit is polled before another exception occurs. |

**Error Codes as Reported by a Master**

| Code | Name | Meaning |
|---|---|---|
| 101 | Unrecognized Message | The transmission could not be recognized as a valid message. |
| | | **Possible causes:**<br>• CRC/LRC Errors<br>• Incomplete Messages<br>• Wrong or incorrectly formatted protocol |
| 102 | Stopped Driver Before Reply | The Master was waiting for a reply, but the driver was stopped before it came. |
| 103 | Time Out Error | The Master timed out while waiting for a reply, but is still trying. |
| 104 | Failed Retries | All Tries have failed. If a modem is attached, then the next number is tried. Otherwise, this is the final failure message. |
| 106 | Unexpected Message | The Master received a message it did not expect |
| | | **Possible causes:**<br>• Slave responded after Master timed out (increase timeout)<br>• Another Master is connected (only 1 Master is allowed) |

# ModBus Master (P473 to P476)

## P473 Slave address

*This is the Modbus Address of the slave that the unit will send messages to.*

| | | | |
|---|---|---|---|
| **Primary Index** | global | | |
| **Values** | Range: 0 to 247 | | |
| | 0 | * | Broadcast |
| | 1-247 | | Slave Address |
| **Related** | • Report by Exception (P470 to P472) on page 72. | | |

## P474 Slave start register

*The start address in the slave's 4x-register area that the unit will write to.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: 1 to 9999 (default = 1) |
| **Related** | • Report by Exception (P470 to P472) on page 72. |

The value is added to 40000 to determine the destination address.

## P475 Number of tries

*The number of attempts that the unit will make to connect.*

| | | | |
|---|---|---|---|
| **Primary Index** | global | | |
| **Values** | 0 | * | Non-stop |
| | 1-9999 | | The number of tries |
| **Altered By** | • P473 Slave address on page 74 | | |
| **Related** | • Report by Exception (P470 to P472) on page 72.<br>• P476 Timeout delay on page 75 | | |

If P473 Slave address is set to zero “0”, then this parameter is ignored.

## P476 Timeout delay

*Determines the time that the unit will wait for replies before timing out.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: 1 to 9999 milliseconds |
| | Default = 3000 or 3 seconds |
| **Altered By** | • P473 Slave address on page 74 |
| **Related** | • Report by Exception (P470 to P472) on page 72.<br>• P475 Number of tries on page 75. |

If P473 Slave address is set to zero “0”, then this parameter is ignored.

# Report Generation (P481 to P485)

Use these parameters to configure the Report Generation system

**The following conditions can be determined:**

- the Parameter and primary index to be reported on
- the format in which the data is transmitted.
- the trigger that is monitored in order to generate a report
- the state that the trigger is in that will generate a report.

## P481 Report Generation Parameter

*Selects the Parameter number to be reported on.*

| | | | |
|---|---|---|---|
| **Primary Index** | report | | |
| **Values** | 0 | | disabled |
| | 1-999 | | Selected parameter to report on |
| **Related** | • Alarm and Event Trigger System (P420 to P430) on page 63 | | |

## P482 Report Generation Primary Index

*Selects the primary index of the Parameter to be reported on.*

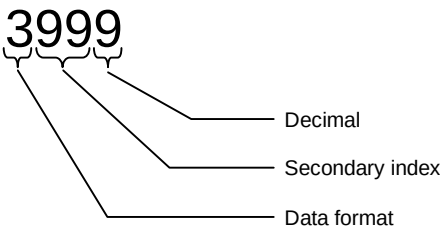
| | |
|---|---|
| **Primary Index** | report |
| **Values** | Range: dependant on parameter being reported on. |
| | Default: 1 |
| **Related** | • Alarm and Event Trigger System (P420 to P430) on page 63 |

Value is tied to the number of indexes of the parameter being reported on.

## P483 Report Generation Format

*Determines how the data is transmitted.*

| | |
|---|---|
| **Primary Index** | report |
| **Values** | Range: 0 to 3999 (see below for format) |
| **Related** | • Alarm and Event Trigger System (P420 to P430) on page 63 |




This is the format of the parameter as defined by the decimal offset for the format registers in the ModBus register map. Add 1000 to have the least significant word given first and add 2000 for float.

## P484 Trigger Number

*Sets the trigger number used to initiate an exception.*

| | | | |
|---|---|---|---|
| **Primary Index** | report | | |
| **Values** | Range: 0 to 32 | | |
| | 0 | | No trigger number used |
| **Altered By** | • P420 Parameter to Monitor on page 63 | | |
| **Related** | • Alarm and Event Trigger System (P420 to P430) on page 63 | | |

This refers to the Alarm and Event Trigger System (P420 to P430) on page 63. The value of P484 will be equal to the trigger number that is the primary index of parameters P420 to P430. For example, if P420[7]=009, then this would be considered trigger #7, so the value of P484 should be set to 7.

## P485 Trigger Type

*Indicates the trigger state that initiates a report.*

| | | | |
|---|---|---|---|
| **Primary Index** | report | | |
| **Values** | Range: 1 to 3 | | |
| | 1 | | Trigger Activated |
| | 2 | | Trigger Negated |
| | 3 | | Both |
| **Altered By** | • P424 Trigger State on page 64 | | |
| **Related** | • Alarm and Event Trigger System (P420 to P430) on page 63<br>• P422 On Setpoint on page 64<br>• P423 Off Setpoint on page 64 | | |

**If P424 is set for an activated Trigger State, then P485 can be as follows:**

1. P485 = 1, will initiate a log once a trigger is turned on.
2. P485 = 2, will initiate a log when the trigger is turned off.
3. P485 = 3 will log one report when turned on, and another when turned off.

# Pump Interlock Allocation (P500 to P509)

Discrete inputs allow you to feed pump information to the EnviroRanger so that it can modify pump algorithms. See the sections on Pump Control or Discrete Inputs in the User Guide for more information.

All of these parameters are indexed by pump relay. All relays are available for indexing but only those set to pump control in the Relay Control Function (P111 = 50 to 56) will be affected by these parameters. For most pump applications only a simple discrete input is required. Inputs 7 and 8 can be used but must be configured as P270 = 3 or 4.

When a pump is determined to be in failed state the appropriate Pump Fault Status (P510 to P515) parameter (page 83) is set to one “1” and any programmed actions take place.

**Note:**
The EnviroRanger base unit has eight "8" discrete inputs. An optional board can expand this number to "16". Refer to the Installation Guide for instructions on the proper installation and wiring of this optional board.

**See Also**

- Connecting a Pump Control Interlock in the EnviroRanger User Guide.
- Pump Fault Status (P510 to P515) on page 83
- Pump Control Source (P520 to P524) on page 86
- The Pump Control section of the EnviroRanger User Guide.
- The Discrete Input section of the EnviroRanger User Guide.

## P500 Pump Auto Allocation

*Determines whether the indexed pump relay is controlled by the EnviroRanger or by a manual override switch.*

| | | | |
|---|---|---|---|
| **Primary Index** | relay | | |
| **Values** | 0 | * | No override switch |
| | 1-8 | | discrete input (base unit) |
| | 9-16 | | discrete input (with optional input board) |
| **Alters** | • P520 Pump Available on page 86<br>• P521 Pump in Local Auto on page 86 | | |
| **Related** | • P275 Scaled Discrete Input Value on page 50<br>• P270 Discrete Input Function on page 48 | | |

A value of zero "0" indicates that the pump relay does not use a physical manual override switch. A value of 1 to 8 (or 16) indicates the discrete input that is set to watch for auto or manual status.

With P270 as preset (NO circuit), the value generated by the discrete input (P275) is interpreted:

| P275 Value | P500 Meaning |
|---|---|
| 0 | Pump in manual |
| 1 | Pump in auto |

**Note:**
P500 is reversed from most other interlock parameters, "1" is the normal state and "0" is the exception state.

**For Example**
If a three-position "Run/Off/Auto" switch is connected to discrete input 3 with the following contacts:

| Switch Position | Discrete Input #3 Circuit |
|---|---|
| Run | Open |
| Off | Open |
| Auto | Closed |

Then, for an EnviroRanger with three pumps, the following parameters would be set

| Parameter | Index | Value | Description |
|---|---|---|---|
| P500 | 1 | 3 | Sets all three pumps to respect the switch position. |
| P500 | 2 | 3 | |
| P500 | 3 | 3 | |
| P270 | 3 | 2 | Auto operation = closed circuit |

## P501 Pump Remote Control Allocation

*Determines whether remote access to pump control is enabled.*

| | | | |
|---|---|---|---|
| **Primary Index** | relay | | |
| **Values** | 0 | * | No Discrete Inputs used |
| | 1-8 | | discrete input (base unit) |
| | 9-16 | | discrete input (with optional input board) |
| **Alters** | • P515 Pump Remote Control Status on page 85 | | |
| **Related** | • P275 Scaled Discrete Input Value on page 50 | | |

A value of 0 indicates that no discrete inputs are used. In this case P515 Pump Remote Control Status defaults to 0 and can be set through communications. A value of 1 to 16 indicates the discrete input being used to watch for remote control status.

When remote control is disabled then remote hosts cannot affect pump control directly. See the EnviroRanger Communications Reference for more information on controlling the device from a remote system.

The value is reported in P515 and comes from P275 indexed to the specified input.

| P275 Value | P501 Meaning |
|---|---|
| 0 | Pump in local only |
| 1 | Pump available for remote control |

## P502 Power Failure Allocation

*Determines if the site is experiencing a power failure.*

| | | | |
|---|---|---|---|
| **Primary Index** | global | | |
| **Values** | 0 | * | No Discrete Inputs used |
| | 1-8 | | discrete input (base unit) |
| | 9-16 | | discrete input (with optional input board) |
| **Alters** | • P519 Power Failure Status on page 86 | | |
| **Related** | • P275 Scaled Discrete Input Value on page 50<br>• Power Failure Alarm (P111 = 12) | | |

Use this parameter when the EnviroRanger is supplied with backup power and the pumps are not. The specified Discrete Input supplies its power status to P275 Scaled Discrete Input Value) which in turn passes the information on to P502.

| P275 Value | P502 Meaning |
|---|---|
| 0 | Power normal |
| 1 | Power failure detected |

**If a power failure is detected:**

- A power failure event is initiated and any relays set for power failure alarm (P111 = 12) are triggered
- All new pump alarms are ignored (existing alarms remain in effect)
- Pumps are stopped

**When the power resumes and the discrete input returns to its normal state:**

- The power failure event ends and alarms are reset
- The pumps start based on their setpoints (P112 and P113) and the delay parameters (P132 and P133)
- The value is reported in P519 Power Failure Status.



## P503 Pump Run Status Allocation

*Determines whether the indexed pump is running.*

| | | | |
|---|---|---|---|
| **Primary Index** | relay | | |
| **Values** | 0 | * | Pump does not use a pump interlock |
| | 1-8 | | discrete input (base unit) |
| | 9-16 | | discrete input (with optional input board) |
| **Alters** | • P511 Pump Run Fault Status on page 84 | | |
| **Related** | • P275 Scaled Discrete Input Value on page 50<br>• P504 Pump Run Status Time Delay on page 81 | | |

When EnviroRanger activates a pump relay it assumes that the pump is running. To verify this assumption a circuit can be set up to confirm the run status from the motor starter to a discrete input.

A value of 0 indicates that the pump does not use a “running” interlock. A value of 1 to 16 forces the discrete input to watch for running status.

The specified Discrete Input supplies the value of the interlock to P275 Scaled Discrete Input Value) which in turn passes the on to P503.

| P275 Value | P503 Meaning |
|---|---|
| 0 | Pump not running |
| 1 | Pump running |

The value of this fault is then reported to P511 Pump Run Fault Status.

If the pump is activated by the EnviroRanger and the Run Status input is not set then the EnviroRanger assumes that the pump has failed and will remove that pump from the duty cycle.

## P504 Pump Run Status Time Delay

*Specifies the time, in seconds, between when the EnviroRanger commands a pump to run and when it starts checking the status of the discrete input.*

| | |
|---|---|
| **Primary Index** | relay |
| **Values** | Range: 0000 to 9999 |
| | Preset: 5 (sec) |
| **Related** | • P503 Pump Run Status Allocation on page 80 |

To use this time delay a relay must have P503 Pump Run Status Allocation set to a discrete input.

Once the unit is instructed to check the status of the discrete input, it will continue to do so as long as the pump has been commanded to run.

## P505 Pump Fault "A" Allocation

*Detects whether there is a fault on the indexed pump.*

| | | | |
|---|---|---|---|
| **Primary Index** | relay | | |
| **Values** | 0 | * | Pump does not use fault interlocks |
| | 1-8 | | discrete input (base unit) |
| | 9-16 | | discrete input (with optional input board) |
| **Alters** | • P513 Pump Fault "A" Status on page 85 | | |
| **Related** | • P275 Scaled Discrete Input Value on page 50 | | |

When a pump is capable of reporting faults in operation it can be connected to a discrete input and this information can be used by EnviroRanger to modify its pump control algorithms.

A value of zero "0" indicates that the pump does not use fault interlocks. A value of 1 to 16 indicates the discrete input to watch for operation status.

The specified Discrete Input supplies the value to P275 Scaled Discrete Input Value) which in turn passes the information on to P505.

| P275 Value | P505 Meaning |
|---|---|
| 0 | Pump ok |
| 1 | Pump in fault condition |

When the pump enters a fault condition it is removed from the duty cycle.

## P506 Pump Fault "B" Allocation

*Detects whether there is a fault on the indexed pump.*

| | | | |
|---|---|---|---|
| **Primary Index** | relay | | |
| **Values** | 0 | * | Pump does not use fault interlocks |
| | 1-8 | | discrete input (base unit) |
| | 9-16 | | discrete input (with optional input board) |
| **Alters** | • P514 Pump Fault "B" Status on page 85 | | |
| **Related** | • P275 Scaled Discrete Input Value on page 50 | | |

When a pump is capable of reporting faults in operation it can be connected to a discrete input and this information can be used by EnviroRanger to modify its pump control algorithms.

A value of zero "0" indicates that the pump does not use fault interlocks. A value of 1 to 16 indicates the discrete input to watch for operation status.

The specified Discrete Input supplies the value to P275 Scaled Discrete Input Value) which in turn passes the information on to P506.

| P275 Value | P506 Meaning |
|---|---|
| 0 | Pump ok |
| 1 | Pump in fault condition |

When the pump enters a fault condition it is removed from the duty cycle.

## P509 Pump Reset Allocation

*Resets the pump fault status parameters using a momentary contact.*

| | | | |
|---|---|---|---|
| **Primary Index** | relay | | |
| **Values** | 0 | * | No Discrete Input watched for reset |
| | 1-8 | | discrete input (base unit) |
| | 9-16 | | discrete input (with optional input board) |
| **Alters** | • P510 Pump Failed Status on page 83 | | |
| **Related** | • P275 Scaled Discrete Input Value on page 50 | | |

When a contact is made on the referenced discrete input all pump faults are reset for the indexed pump and that pump is put back into the duty schedule.

A value of zero "0" indicates that no discrete inputs are watched for reset. In this case any pump faults must be reset using the hand programmer and P510 or through communications. A value of 1 to 16 indicates the discrete input to watch for pump reset.

To allow the contact to reset all pumps use index zero "0".

The discrete input only works in run or simulation modes and is triggered by the change in state of P275 from 0 to 1.

# Pump Fault Status (P510 to P515)

Use these parameters to determine which condition failed the indexed pump. All relays are available for indexing but only those set to pump control in the Relay Control Function (P111 = 50 to 56) will be affected by these parameters. Once the cause of the failure condition is fixed, use a push button connected to a discrete input (P509) or the parameter P510 to reset a failure condition.

Once back in run mode, if the indexed pump relay symbol stops flashing on the LCD then that pump has returned to normal status. If it keeps flashing then there is still a failure reported, or the pump is still in manual mode, and the pump relay will not be used.

All of these parameters are latched and will not reset automatically. Use P510 to reset all status parameters for an indexed pump relay.

**To reset the fault status, do one of the following:**

- Change the parameter value to 0
- Change the pump low volume alarm bit to 0 using communications.



## P510 Pump Failed Status

*Reports whether the indexed pump has failed and allows for reset.*

| | | | |
|---|---|---|---|
| **Primary Index** | relay | | |
| **Values** | 0 | * | normal operation |
| | 1 | | pump failed |
| **Alters** | • P186 Pump Low Efficiency Counter on page 40<br>• P511 Pump Run Fault Status on page 84<br>• P512 Pump Low Efficiency Fault Status on page 84<br>• P513 Pump Fault “A” Status on page 85<br>• P514 Pump Fault “B” Status on page 85 | | |
| **Altered By** | • P509 Pump Reset on page 82 | | |
| **Related** | • P503 Pump Run Status Allocation on page 80<br>• P505 Pump Fault “A” Allocation on page 81<br>• P506 Pump Fault “B” on page 82<br>• P185 Pump Low Efficiency Action on page 40 | | |

When any of the other status parameters (listed below) is set to 1 (failed) then this parameter is also set to 1. The parameter is indexed by relay.

Before resetting this parameter to 0, check the other 510-series parameters to determine which one caused the fault. This parameter will show a “1” rather than a “0”.

When a pump fails the value for the indexed relay changes from 0 to 1. It remains in failed state (1) until reset through communications, the hand programmer, or a push button connected to a discrete interlock (P509).

Reset this latched parameter by changing the indexed value to 0.

**Resetting this parameter resets all of these other parameters to 0:**

- P510 Pump Failed Status
- P511 Pump Run Fault Status
- P512 Pump Low Efficiency Fault (from P185)
- P513 Pump Fault "A" Status
- P514 Pump Fault "B" Status
- P186 Pump Low Efficiency Counter



## P511 Pump Run Fault Status

*Reports status of P503 Pump Run Status Allocation after P504 Pump Run Status Time Delay has expired.*

| | | | |
|---|---|---|---|
| **Primary Index** | relay | | |
| **Values** | Format: view only | | |
| | 0 | * | normal operation |
| | 1 | | fault detected |
| **Alters** | • P510 Pump Failed Status on page 83 | | |
| **Altered By** | • P503 Pump Run Status Allocation on page 80 | | |
| **Related** | • P504 Pump Run Status Time Delay on page 81 | | |

## P512 Pump Low Efficiency Fault Status

*Reports pump efficiency status based on efficiency calculations.*

| | | | |
|---|---|---|---|
| **Primary Index** | relay | | |
| **Values** | Format: view only | | |
| | 0 | * | normal operation |
| | 1 | | fault detected |
| **Alters** | • P510 Pump Failed Status on page 83 | | |
| **Altered By** | • P185 Pump Low Efficiency Action on page 40 | | |
| **Related** | • Pump Efficiency (P180 to P186) on page 39 | | |

See Pump Efficiency (P180 to P186) on page 39. The value of P185 Pump Low Efficiency Action determines how these parameters are updated:

| P185 value | Updated Parameters |
|---|---|
| 0 – no action | no action |
| 1 – Alarm | P512 = 1 |
| 2 – Alarm and fail pump | P510 = 1, P512 = 1 |

# P513 Pump Fault “A” Status

*Reports status of P505 Pump Fault “A” Allocation.*

| | | | |
|---|---|---|---|
| **Primary Index** | relay | | |
| **Values** | Format: view only | | |
| | 0 | * | normal operation |
| | 1 | | fault detected |
| **Alters** | • P510 Pump Failed Status on page 83 | | |
| **Altered By** | • P505 Pump Fault “A” Allocation on page 81 | | |
| **Related** | • P275 Scaled Discrete Input Value on page 50 | | |

# P514 Pump Fault “B” Status

*Reports status of P506 Pump Fault “B” Allocation.*

| | | | |
|---|---|---|---|
| **Primary Index** | relay | | |
| **Values** | Format: view only | | |
| | 0 | * | normal operation |
| | 1 | | fault detected |
| **Alters** | • P510 Pump Failed Status on page 83 | | |
| **Altered By** | • P506 Pump Fault “B” Allocation on page 82 | | |
| **Related** | • P275 Scaled Discrete Input Value on page 50 | | |

# P515 Pump Remote Control Status

*Reports status of P501 Pump Remote Control Allocation or remote control bit.*

| | | | |
|---|---|---|---|
| **Primary Index** | relay | | |
| **Values** | 0 | * | pump in local mode, remote disabled |
| | 1 | | pump in remote mode, remote enabled |
| **Altered By** | • P501 Pump Remote Control Allocation on page 79 | | |
| **Related** | • P275 Scaled Discrete Input Value on page 50 | | |

If P501 Pump Remote Control Allocation is used then this parameter reports the result of the discrete input and is view only. If P501 is not used then this parameter reports the value of the remote control bit which is set in communications. See the Communications Reference for details.

## P519 Power Failure Status

*Reports the status of P502 Power Failure Allocation.*

| | | | |
|---|---|---|---|
| **Primary Index** | global | | |
| **Values** | Format: view only | | |
| | 0 | * | power available |
| | 1 | | power failure |
| **Altered By** | • P502 Power Failure Allocation on page 79 | | |
| **Related** | • P275 Scaled Discrete Input Value on page 50<br>• Power Failure Alarm (P111 = 12) | | |

# Pump Control Source (P520 to P524)

These parameters determine where the pump relays are controlled:

| | **Auto** | **Manual** |
|---|---|---|
| **Local** | P521 | P522 |
| **Remote** | P523 | P524 |

## P520 Pump Available

*Indicates whether the pump is available to the pump control routines.*

| | | | |
|---|---|---|---|
| **Primary Index** | relay | | |
| **Values** | Format: view only | | |
| | 0 | | pump not available |
| | 1 | * | pump available |
| **Altered By** | • P510 Pump Failed Status on page 83<br>• P521 Pump in Local Auto on page 86<br>• P522 Pump in Local Manual on page 87<br>• P523 Pump in Remote Auto on page 87<br>• P524 Pump in Remote Manual on page 87 | | |

A pump is not available in *manual* mode or a fault in the discrete inputs.

## P521 Pump in Local Auto

*Control of the indexed pump is through the pump control algorithms.*

| | | | |
|---|---|---|---|
| **Primary Index** | relay | | |
| **Values** | Format: view only | | |
| | 0 | | pump not in local / auto |
| | 1 | * | pump in local / auto |
| **Related** | • P520 Pump Available on page 86<br>• P510 Pump Failed Status on page 83<br>• P522 Pump in Local Manual on page 87<br>• P523 Pump in Remote Auto on page 87<br>• P524 Pump in Remote Manual on page 87 | | |

See the Pump Control section in the User Guide for more information.

# P522 Pump in Local Manual

*Indicates that control of the indexed pump is exclusively from a discrete input.*

| Primary Index | relay | | |
|---|---|---|---|
| Values | Format: view only | | |
| | 0 | * | pump not in local / auto |
| | 1 | | pump in local / manual |
| Related | • P520 Pump Available on page 86<br>• P510 Pump Failed Status on page 83<br>• P521 Pump in Local Auto on page 86<br>• P523 Pump in Remote Auto on page 87<br>• P524 Pump in Remote Manual on page 87 | | |

Usually a three-way (on-off-auto) switch mounted near the EnviroRanger is used to put the unit into Local Manual mode and to control the pump.

# P523 Pump in Remote Auto

*Indicates that control of the indexed pump is from the EnviroRanger pump control algorithms and that remote control is enabled.*

| Primary Index | relay | | |
|---|---|---|---|
| Values | Format: view only | | |
| | 0 | * | pump not in remote / auto |
| | 1 | | pump in remote / auto |
| Related | • P520 Pump Available on page 86<br>• P510 Pump Failed Status on page 83<br>• P521 Pump in Local Auto on page 86<br>• P522 Pump in Local Manual on page 87<br>• P524 Pump in Remote Manual on page 87 | | |

See the Communications Reference for details on the pump controls available through communications.

# P524 Pump in Remote Manual

*Control of the pump is through communications from a remote system.*

| Primary Index | relay | | |
|---|---|---|---|
| Values | 0 | * | pump not in remote / manual |
| | 1 | | pump in remote / manual |
| Related | • P520 Pump Available on page 86<br>• P510 Pump Failed Status on page 83<br>• P521 Pump in Local Auto on page 86<br>• P522 Pump in Local Manual on page 87<br>• P524 Pump in Remote Manual on page 87 | | |

See the Communications Reference for more information

# OCM (P600 to P621)

If the EnviroRanger is used to monitor open channel flow, alter the following parameters as required and run a calibration as described in P621.

**Note:**
See Open Channel Monitoring (OCM) in the EnviroRanger User Guide for application examples involving common weirs and flumes.



The EnviroRanger measures "head" as referenced to Empty (P006) or OCM Zero Offset (P605), when Operation is set for "OCM" (P001 = 6). Flowrate, based on head (at the "point of measure" specified by the Primary Measuring Device fabricator) is also calculated and displayed on the LCD.

Some Primary Measuring Devices require a longer Range Extension (P801) to avoid entering the LOE failure state if the water level falls below the zero point of the Primary Measuring Device. See P801 Range Extension on page 121 for more information.

## P600 Primary Measuring Device

*The type of primary measuring device (PMD) used.*

| Primary Index | Single | | | Dual |
|---|---|---|---|---|
| | global | | | transducer |
| Values | 0 | * | off (no calculation) | |
| | 1 | | Exponential (see P601) | |
| | 2 | | Palmer-Bowlus Flume (see P602) | |
| | 3 | | H-Flume (see P602) | |
| | 4 | | Universal Linear Flow Calculation (see P610, P611) | |
| | 5 | | Universal Curved Flow Calculation (see P610, P611) | |
| | 6 | | BS-3680/ISO 4359 Rectangular Flume (see P602) | |
| | 7 | | BS-3680/ISO 1438/1 Thin Plate V-Notch Weir (see P602) | |
| Alters | • P601 Flow Exponent on page 89<br>• P602 Primary Measuring Device Dimensions on page 90<br>• P608 Flowrate Units on page 93 | | | |
| Altered By | • P001 Operation on page 7 | | | |
| Related | • P603 Maximum Head on page 90<br>• P604 Maximum Flow on page 91<br>• P605 Zero Head on page 91<br>• P610 Head Breakpoints on page 93<br>• P611 Breakpoint on page 94 | | | |

The EnviroRanger is pre-programmed for common PMD flow calculations. If your PMD is not listed, select the appropriate Universal Flow Calculation.

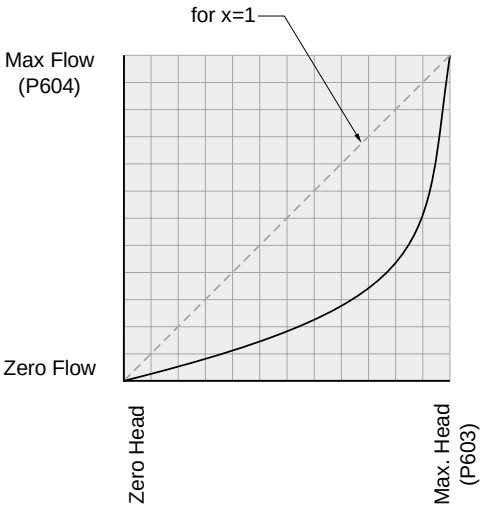
Associated parameters Max Head (P603), Max Flow (P604), and Min Head (P605) may be scroll accessed. If Operation is not set for "OCM" (P001 = 6), this value is preset to 0. If Operation is set for "OCM", it is preset to 1.

# P601 Flow Exponent

*The Exponent for the flow calculation formula.*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: -999 to 9999 | |
| | Preset: 1.55 | |
| Altered By | • P600 Primary Measuring Device on page 88 | |
| Related | • P603 Maximum Head on page 90<br>• P604 Maximum Flow on page 91<br>• P605 Zero Head on page 91 | |

Use this parameter if the Primary Measuring Device (P600) is set to 1 (exponential). It creates an exponential curve with end points set by Max Head (P603) and Zero Head (P604) and with the curve based on the specified exponent.




**A Word on Exponents**

The exponential equation is:

$$Q=KH^{P601}$$

Where:
- Q = flow
- K = internal constant
- H = head

Use the exponent specified by the PMD manufacturer, if available, or the sample value given below.

### Example Exponents

| PMD Type | Exponent (sample only) |
|---|---|
| Suppressed Rectangular Weir | 1.50 |
| Cipolletti Weir | 1.50 |
| Venturi Flume | 1.50 |
| Parshall Flume | 1.22 to 1.607 |
| Leopold Lagco | 1.547 |
| V-Notch Weir | 2.50 |

# P602 Primary Measuring Device Dimensions

*The dimensions of the Primary Measuring Device (PMD).*

| Primary Index | Single | Dual |
|---|---|---|
| | dimension | Transducer and dimension |
| Index Values for Supported PMDs | **ISO 1438/1** | |
| | 1 Notch Angle | |
| | 2 Discharge Coefficient | |
| | **ISO 4359** | |
| | 1 Approach width | |
| | 2 Throat width | |
| | 3 Hump Height | |
| | 4 Throat Length | |
| | 5 Velocity coefficient | |
| | 6 Discharge coefficient | |
| | **Palmer Bowlus** | |
| | 1 Flume width | |
| | **H Flume** | |
| | 1 Flume height | |
| Altered By | • P600 Primary Measuring Device on page 88 | |

Use this parameter if the Primary Measuring Device is directly supported (P600=2,3,6,7). The dimensions required for each PMD vary. See the examples in the User Guide for full descriptions of the required values.

# P603 Maximum Head

*The level value associated with Maximum Flow, in Units (P005).*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: -999 to 9999 | |
| | Preset: Span (P007) value | |
| Altered By | • P005 Units on page 10<br>• P600 Primary Measuring Device on page 88 | |
| Related | • P604 Maximum Flow on page 91<br>• P605 Zero Head on page 91 | |

This represents the highest head level supported by the PMD and works in conjunction with Maximum Flow (P604) to define the highest point in the exponential curve. Use it when the Primary Measuring Device (PMD) requires a maximum head and flow reference point. This would include Exponential, Palmer Bowlus Flume, H Flume, and Universal breakpoints.

# P604 Maximum Flow

*The maximum flowrate associated with Maximum Head (P603).*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: -999 to 9999 | |
| | Preset: 1000 | |
| Alters | • P316 Overflow Event Volume on page 55 | |
| Altered By | • P600 Primary Measuring Device on page 88 | |
| Related | • P603 Maximum Head on page 90<br>• P606 Time Units on page 92<br>• P925 Flow Measurement on page 140 | |

This represents the flow at the highest head level supported by the PMD. and works in conjunction with Maximum Head (P603) to define the highest point in the exponential curve. Use it when the Primary Measuring Device (PMD) requires a maximum head and flow reference point. This would include Exponential, Palmer Bowlus Flume, H Flume, and Universal breakpoints.

Also use this parameter with Time Units (P606) to define the flowrate units. The limitation of four digits is for the LCD only, and the flowrate value is available with greater precision through communications.

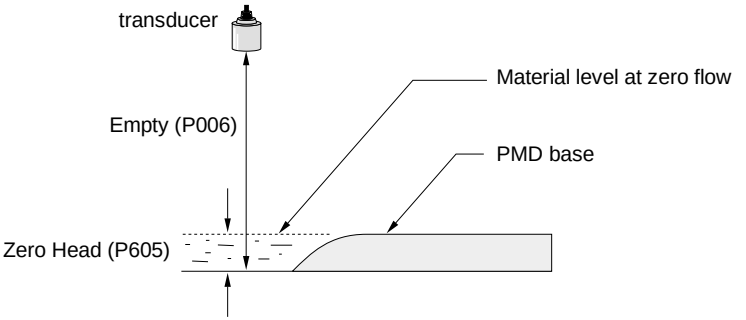
e.g. If flowrate is to be displayed in millions of gallons / day, and the maximum flowrate is 376,500,000 gallons / day, enter “376.5” for Maximum Flow (P604) and “4” for Time Units (P606).

# P605 Zero Head

*The distance above Empty (P006) in Units (P005) representing zero head (and zero flow).*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: -999 to 9999 | |
| | Preset: 0.000 | |
| Altered By | • P005 Units on page 10<br>• P007 Span on page 11 | |
| Related | • P006 Empty on page 10<br>• P801 Range Extension on page 121<br>• P926 Head Measurement on page 140 | |

This feature can be used for most weirs and some flumes (e.g. Palmer Bowlus) where the zero reference is at a higher elevation than the channel bottom.






## P606 Time Units

*Determines the units used to display current flow and logging flow values.*

| Primary Index | Single | | | Dual |
|---|---|---|---|---|
| | global | | | transducer |
| Values | 1 | | seconds | |
| | 2 | | minutes | |
| | 3 | | hours | |
| | 4 | * | days | |
| Alters | • P316 Overflow Event Volume on page 55 | | | |
| Altered By | • P608 Flowrate Units on page 93 | | | |

This is used when the Primary Measuring Device is “Ratiometric” (P608=0).

e.g. If flowrate is to be displayed in millions of gallons / day, and the maximum flowrate is 376,500,000 gallons / day, enter “376.5” for Maximum Flow (P604) and “4” for Time Units (P606).

## P607 Flowrate Decimal

*The maximum number of decimal places to be displayed.*

| Primary Index | Single | | | Dual |
|---|---|---|---|---|
| | global | | | transducer |
| Values | 0 | | no digits after the decimal point | |
| | 1 | | 1 digit after the decimal point | |
| | 2 | | 2 digits after the decimal point | |
| | 3 | | 3 digits after the decimal point | |
| Altered By | • P060 Decimal Position on page 16 | | | |

In the Run mode, the number of decimal places displayed is automatically adjusted (if necessary) to prevent the number of Flowrate digits from exceeding display capabilities.

The max. number of "head" decimal places is controlled by Decimal Position (P060).

# P608 Flowrate Units

*The volume units used to display total flow.*

Use this parameter only if the primary measuring device (PMD) supports absolute calculations (P600=6, 7). Leave it at “0” for all other P600 values.

| Primary Index | Single | | Dual |
|---|---|---|---|
| | global | | transducer |
| Values | **Ratiometric (P600=all)** | | |
| | 0 | * | Ratiometric calculation (units defined by P604) |
| | **Absolute (P600=6,7 only)** | | |
| | 1 | | litres / second |
| | 2 | | cubic metres / hour |
| | 3 | | cubic metres / day |
| | 4 | | cubic feet / second |
| | 5 | | gallons / minute – Imperial |
| | 6 | | million gallons / day – Imperial |
| | 7 | | gallons / minute – U.S. |
| | 8 | | million gallons / day – U.S. |
| Alters | • P316 Overflow Event Volume on page 55<br>• P606 Time Units on page 92 | | |
| Altered By | • P600 Primary Measuring Device on page 88 | | |
| Related | • P608 Flowrate Units on page 93 | | |

For absolute PMDs (P600=6,7) volume units can be specified using this parameter. If needed, absolute PMDs can still use ratiometric (P608=0) to accommodate other units.

# P610 Head Breakpoints

*The head breakpoints for which flowrate is known.*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Secondary Index | Breakpoint | |
| Values | Range: 0.000 to 9999 | |
| Related | • P611 Breakpoint Flowrates on page 94 | |

The values in the Span for which flowrates are known. See Universal Calculation Support in the User Guide for how to specify universal flows.

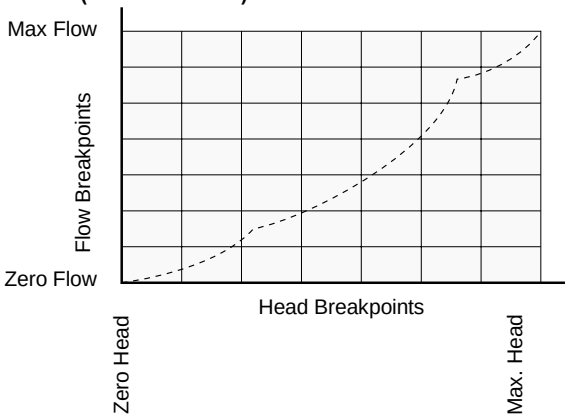
# P611 Breakpoint Flowrates

*The flowrate corresponding to each Head Breakpoint entered.*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| **Secondary Index** | Breakpoint | |
| **Values** | Range: 0.000 to 9999 | |
| **Related** | • P610 Head Breakpoints on page 93 | |

These are the flowrates for the related breakpoints. See Universal Calculation Support in the User Guide for how to specify universal flows.

**Head vs. Flowrate (P610 and P611)**




# P620 Low Flow Cutoff

*Eliminates totalizer activity for flows at or below the cutoff value.*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| **Values** | Range: 0.000 to 9999 | |
| | Preset = 5.000 (units) or % of P603 Maximum Head | |
| **Altered By** | • P005 Units on page 10. | |
| **Related** | • P603 Maximum Head on page 90 | |

Use this to enter the minimum head in units (P005) or as a percent of span.

## P621 Auto Zero Head

*Calibrates Zero Head (P605) based on actual head measurements.*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| **Values** | Range: -999 to 9999 | |
| **Related** | • P006 Empty on page 10<br>• P062 Offset Reading on page 17<br>• P605 Zero Head on page 91<br>• P664 Temperature on page 104 | |

Use this parameter when the reported head is consistently high or low by a fixed amount.

**Before using this feature, verify the following parameters are correct:**

- Empty (P006)
- Temperature (P664)
- Offset Reading (P062=0)
- Zero Head Offset (P605)

**Procedure, with "head" steady ...**

1. Press [⇩] to display the calculated head
2. Repeat step 1 at least 5 times to verify repeatability
3. Measure the "actual" head (e.g. with a tape measure or solid rule)
4. Enter the "actual" head value
   The deviation between the entered Empty (P006) value and the calibrated Empty value, is stored in Offset Correction (P652). Alternatively, the Empty parameter (P006) can be corrected directly.

# Pumped Volume Totalizer (P622 to P623)

If the 8 digit totalizer display, or a remote totalizer contact closure is desired, alter the following parameters.

## P622 Inflow / Discharge Adjust

*The method used to calculate the volume pumped, for "pumped total" Operation (P001 = 7).*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| **Values** | **1 = inflow * / pump cycle**<br>When the pump is off, the EnviroRanger estimates the volume of inflow by recording the rate at which the liquid level changes. When the pump is operating, the estimated inflow volume is added to the pumped volume total. When the pump stops, the pumped volume of the previous pump cycle is added to the total volume pumped in the totalizer. | |
| | **2 = inflow * ignored**<br>Inflow is assumed to be 0 while pumps are running. | |

| | |
|---|---|
| | **3 = inflow * / rate (preset)**<br>Volume pumped is adjusted for inflow. Inflow rate is estimated by assuming that the rate calculated (P708) just prior to the start of the pump cycle remained constant during the pump cycle. Inflow rate is averaged using rate filter (P704), rate update time (P705) and rate update distance (P706) to control how the average rate is calculated. |
| **Related** | • P001 Operation on page 7<br>• P704 Rate Filter on page 106<br>• P705 Rate Update Time on page 106<br>• P706 Rate Update Distance on page 107<br>• P708 Volume Rate Display on page 107 |



* or discharge

## P623 Pump Total Method

*This parameter determines the method used for updating the pumped volume totalizer.*

| **Primary Index** | **Single** | **Dual** |
|---|---|---|
| | global | transducer |
| **Values** | **1 = Volume readings at Start and End**<br>Volume pumped is calculated from the volume readings at the start and end of the pump cycle. The result is compensated for estimated inflow which is added to the total volume change while pumps are running. Inflow rate is estimated as selected by the inflow / discharge adjust (P622). | |
| | **2 = Pump Capacity and Running Time (preset)**<br>Volume pumped is calculated from the Pump Capacity (P182) for each pump, and the running time of each pump. Pump Capacity is recalculated on each pump cycle, based on the rate of change of level or volume before and after each pump starts. Accuracy of the totalizer when using this selection is entirely dependent on the accuracy of the rate calculation so the user must ensure that appropriate settings are entered for Pump Capacity Time (P181) and Pump Start Delay (P132). | |
| **Related** | • P132 Pump Start Delay on page 28<br>• P181 Pump Capacity Time on page 39<br>• P182 Pump Measured Capacity on page 39<br>• P622 Inflow / Discharge Adjust on page 95 | |

# Totalizer (P630 to P645)

## P630 LCD Totalized Multiplier

*Use this feature if the LCD Total increments by too large (or too small) an amount.*

| Primary Index | Single | | Dual |
|---|---|---|---|
| | global | | transducer |
| Values | -3 | .001 | |
| | -2 | .01 | |
| | -1 | .1 | |
| | 0 * | 1 | |
| | 1 | 10 | |
| | 2 | 100 | |
| | 3 | 1000 | |
| | 4 | 10,000 | |
| | 5 | 100,000 | |
| | 6 | 1,000,000 | |
| | 7 | 10,000,000 | |
| Related | • LCD Totalizer (P322 and P323) on page 56 | | |

Enter the factor (powers of 10 only) by which actual volume is divided, prior to display on the LCD. Use a value such that the eight-digit totalizer doesn't roll over between readings.

e.g. for an LCD Total display in 1000's of volume units, enter 3.

## P633 LCD Totalized Decimal Position

*Enter the maximum number of decimal places to be displayed.*

| Primary Index | Single | | Dual |
|---|---|---|---|
| | global | | transducer |
| Values | 0 | no digits after the decimal point | |
| | 1 | 1 digit after the decimal point | |
| | 2 | 2 digits after the decimal point | |
| | 3 | 3 digits after the decimal point | |
| Related | • LCD Totalizer (P322 and P323) on page 56 | | |

In the RUN mode, the number of decimal places displayed is not automatically adjusted. When the LCD Total value is so large as to exceed display capabilities, the total "rolls over" to "0" and continues incrementing.

## P640 Remote Totalized Multiplier

*Use this feature if the remote totalizer (device connected to the relay set for "totalizer operation" Relay Function, P111 = 40), updates too slowly or rapidly.*

| Primary Index | Single | | Dual |
|---|---|---|---|
| | global | | transducer |
| Values | -3 | | .001 |
| | -2 | | .01 |
| | -1 | | .1 |
| | 0 | * | 1 |
| | 1 | | 10 |
| | 2 | | 100 |
| | 3 | | 1000 |
| | 4 | | 10,000 |
| | 5 | | 100,000 |
| | 6 | | 1,000,000 |
| | 7 | | 10,000,000 |
| Related | • P001 Operation on page 7<br>• P111 Relay Control Function on page 21<br>• P114 Relay "Duration" Setpoint on page 23<br>• P115 Relay "Interval" Setpoint on page 23<br>• P645 Relay Duration on page 99 | | |

This parameter is relevant only if Operation is set to OCM or Pumped Volume (P001 = 6 or 7).

The relays on the EnviroRanger have a maximum frequency of 2.5 Hz.

Enter the factor (powers of 10 only) by which actual volume is divided, prior to Remote Totalizer count increment.

e.g. for a Remote Totalizer update by 1000's of volume units, enter 3.

## P641 Flow Sampler Mantissa

*Use this feature in conjunction with Flow Sampler Exponent (P642) to establish the number of flow units required to increment the Flow Sampler (device connected to the EnviroRanger relay set for the "flow sampler operation" Relay Function, P111 = 41).*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: 0.001 to 9999 | |
| | Preset = 1.000 | |
| Related | • P001 Operation on page 7<br>• P111 Relay Control Function on page 21<br>• OCM (P600 to P621) on page 88<br>• P642 Flow Sampler Exponent on page 99 | |

This parameter is relevant only if Operation is set to OCM (P001 = 6).

**Enter the mantissa (Y) for the exponent (Z) in the formula...**

*Flow Sampler Increment = Y x $10^{Z}$ Flow units.*

e.g. To count once every 4310 (4.31 x $10^{3}$) flow units, set P641 to 4.31 and P642 to 3.

## P642 Flow Sampler Exponent

*Use this feature in conjunction with Flow Sampler Mantissa (P641) to establish the number of flow units required to increment the Flow Sampler (device connected to the EnviroRanger relay set for the "flow sampler operation" Relay Function, P111 = 41).*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: -3 to +7 (integers only) | |
| | Preset = 0 | |
| Related | • P001 Operation on page 7<br>• P111 Relay Control Function on page 21<br>• OCM (P600 to P621) on page 88<br>• P641 Flow Sampler Mantissa on page 98 | |

This parameter is relevant only if Operation is set to OCM (P001 = 6).

**Enter the exponent (Z) for the mantissa (Y) in the formula:**

*Flow Sampler Increment = Y x $10^{Z}$ Flow units.*

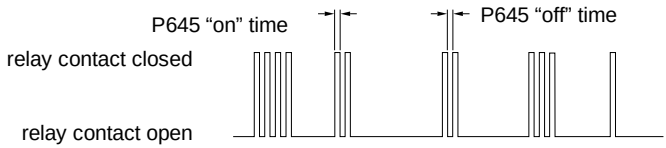
## P645 Relay Duration

*Use this feature (if desired) to adjust the minimum contact closure duration of a relay set as a totalizer, flow sampler, time [control], or aeration (P111 = 40, 41, 60 or 62)*

| Primary Index | global |
|---|---|
| Values | Range: 0.1 to 1024 |
| | Preset = 0.2 (sec) |
| Related | • P111 Relay Control Function on page 21 |

Enter the minimum contact closure duration (in seconds) required by the device connected.

For the flow sampler function this value is used for both the “on” time of the relay and the “off” time between contacts.



# Range Calibration (P650 to P654)

**There are two types of calibration possible:**

**Offset:** Adjusts the measurements by a fixed amount.

**Sound Velocity:** Adjusts the speed of sound and changes the measurement calculations.

Do Offset calibration at any steady level unless a Sound Velocity calibration is also done. If both calibrations are done then do Offset at a known high level and Sound Velocity at a known low level.



## P650 Offset Calibration

*Calibrates Empty (P006) if the reported level is consistently high or low by a fixed amount.*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: -999 to 9999 | |
| Related | • P006 Empty on page 10<br>• P062 Offset Reading on page 17<br>• P605 Zero Head on page 91<br>• P652 Offset Correction on page 101<br>• P664 Temperature on page 104 | |

**Before using this feature, verify the following parameters are correct:**

- Empty (P006)
- Temperature (P664)
- Offset Reading (P062)
- Zero Head Offset (P605)

**With the level steady…**

1. Press [⇩] to display the calculated reading
2. Repeat step 1 at least 5 times to verify repeatability
3. Measure the actual reading (e.g. with a tape measure)
4. Enter the actual value
   The deviation between the entered Empty (P006) value and the calibrated "Empty" value, is stored in Offset Correction (P652).

## P651 Sound Velocity Calibration

*Changes the speed of sound constant.*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: -999 to 9999 | |
| Related | • P653 Velocity on page 101<br>• P654 Velocity at 20°C on page 102 | |

**Use this feature if:**

- The acoustic beam atmosphere is other than "air"
- The acoustic beam atmosphere temperature is unknown
- The Reading accuracy is acceptable at higher material levels only
  For best results do this calibration with the level at a known value near empty.

**With the level steady at some low value...**

1. Allow sufficient time for the vapour concentration to stabilize
2. Press [↓] to display the calculated reading
3. Repeat step 2 at least 5 times to verify repeatability
4. Measure the actual reading (e.g. with a tape measure)
5. Enter the actual value
   (Velocity parameters P653 and P654 are adjusted accordingly).

Repeat this procedure if the atmosphere type, concentration, or temperature varies from that present when the last sound velocity calibration was performed.

**Note:**
In gasses other than air the temperature variation may not correspond with the speed of sound variation. In these cases turn off the temperature sensor and use a fixed temperature.



## P652 Offset Correction

*The value altered when an Offset Calibration is performed.*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: -999 to 999.0 | |
| Related | • P650 Offset Calibration on page 100 | |

Alternatively, if the amount of Offset Correction required is known, enter the amount to be added to the Reading before display.

## P653 Velocity

*The value adjusted based on the "Sound Velocity at 20 °C (P654) vs. Temperature (P664) characteristics of air".*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: 50.01 to 2001 m/s (164.1 to 6563 ft/s) | |
| Related | • P651 Sound Velocity Calibration on page 100<br>• P654 Velocity at 20°C on page 102 | |

Alternatively, enter the current sound velocity (if known), or perform a Sound Velocity Calibration (P651). The units used are m/s if P005 = 1, 2, or 3 (ft/s if P005 = 4 or 5).

## P654 Velocity at 20°C

*This value is used to automatically calculate Sound Velocity (P653).*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: 50.01 to 2001 m/s (164.1 to 6563 ft/s) | |
| Related | • P005 Units on page 10<br>• P651 Sound Velocity Calibration on page 100<br>• P653 Velocity on page 101 | |

After performing a Sound Velocity Calibration, check this value to verify the acoustic beam atmosphere is "air" (344.1 m/s or 1129 ft/s).

Alternatively, if the acoustic beam atmosphere sound velocity at 20°C (68 °F) is known, and the sound velocity vs. temperature characteristics are similar to that of "air", enter the sound velocity.

The units used are m/s if P005 = 1, 2, or 3 (or ft/s if P005 = 4 or 5).

# Temperature Compensation (P660 to P664)

## P660 Temp Source

*Source of the temperature reading used to adjust the speed of sound.*

| Primary Index | transducer | | |
|---|---|---|---|
| Values | 1 | * | AUTO |
| | 2 | | Temp Fixed |
| | 3 | | Ultrasonic/Temperature Transducer |
| | 4 | | TS-3 Temperature Sensor |
| | 5 | | Average (TS-3 and transducer) |
| Alters | • P664 Temperature on page 104 | | |
| Related | • P651 Sound Velocity Calibration on page 100<br>• P653 Velocity on page 101<br>• P654 Velocity at 20°C on page 102<br>• P661 Temp Fixed on page 103 | | |

The EnviroRanger uses the TS-3 temperature sensor assigned to the transducer unless one is not connected, in which case the ultrasonic/temperature transducer is used. If the transducer does not have an internal temperature sensor, the Temp Fixed (P661) value is used.

If the acoustic beam atmosphere temperature varies with distance from the transducer, connect a TS-3 Temperature Sensor and ultrasonic / temperature transducers, and select "average".

In gasses other than air the temperature variation may not correspond with the speed of sound variation. In these cases turn off the temperature sensor and use a fixed temperature.

## P661 Temp Fixed

*Use this feature if a temperature sensing device is not used.*

| | |
|---|---|
| **Primary Index** | transducer |
| **Values** | Range: -199 to 199 (preset = 20 °C) |
| **Related** | • P651 Sound Velocity Calibration on page 100<br>• P653 Velocity on page 101<br>• P654 Velocity at 20°C on page 102<br>• P660 Temp Source on page 102 |

Enter the temperature (in °C) of the atmosphere within the transducer acoustic beam. If the temperature varies with distance from the transducer, enter the average temperature.

## P663 Temperature Transducer Allocation

*This feature may only be used for "differential" or "average" Operation (P001 = 4 or 5).*

| | | | |
|---|---|---|---|
| **Primary Index** | transducer | | |
| **Values** | 1 | * | Transducer # 1 |
| | 2 | | Transducer # 2 |
| | 1:2 | | Transducer # 1 and 2 average |
| **Related** | • P651 Sound Velocity Calibration on page 100<br>• P653 Velocity on page 101<br>• P654 Velocity at 20°C on page 102 | | |

As preset, the temperature measurements of Ultrasonic / Temperature Transducer # 1 and 2 are allocated to Point Number 1 and 2 respectively.

Use this feature if the temperature measurement from both transducers should be identical, but one is located close to a radiant heat source. Allocate the temperature measurement of the other transducer to both transducer Point Numbers. Enter the Transducer Number whose temperature measurement will be used for the distance calculation of the Point Number displayed. When both transducers are allocated to a Point Number, the temperature measurements from each are averaged.

## P664 Temperature

*View the transducer temperature in °C.*

| | |
|---|---|
| **Primary Index** | transducer |
| **Values** | Range: -50 to 150 (view only) |
| **Altered By** | • P660 Temp Source on page 102 |
| **Related** | • P651 Sound Velocity Calibration on page 100<br>• P653 Velocity on page 101<br>• P654 Velocity at 20°C on page 102<br>• P661 Temp Fixed on page 103 |

This value is displayed when 6 is pressed in RUN mode (see the *About the EnviroRanger* section in the User Guide).

If Temp Source (P660) is set to any value other than Fixed Temp, the value displayed is the temperature measured. If Temp Source is set to Fixed Temp, the P661 value is displayed.

# Rate (P700 to P708)

These parameters determine how material level changes are reported.

## P700 Max Fill Rate

*Adjusts the EnviroRanger response to increases in the actual material level (or advance to a higher Failsafe Material Level, P071).*

| **Primary Index** | **Single** | **Dual** |
|---|---|---|
| | global | transducer |
| **Values** | Range: 0.000 to 9999 | |
| **Altered by** | • P003 Maximum Process Speed on page 8 | |
| **Related** | • P005 Units on page 10<br>• P007 Span on page 11<br>• P071 Failsafe Material Level on page 18 | |

Enter a value slightly greater than the maximum vessel filling rate. This value, in Units (P005) or % of Span (P007) per minute, is automatically altered when Maximum Process Speed (P003) is altered. Any fill rate above this value will trigger any alarms set to “rate”.

| P003 Value | Meters / Minute |
|---|---|
| 1 | 0.1 |
| 2 | 1 |
| 3 | 10 |

# P701 Max Empty Rate

*Adjusts the EnviroRanger response to decreases in the actual material level (or advance to a lower Failsafe Material Level, P071).*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: 0.000 to 9999 | |
| Altered by | • P003 Maximum Process Speed on page 8 | |
| Related | • P005 Units on page 10<br>• P007 Span on page 11<br>• P071 Failsafe Material Level on page 18 | |

Enter a value slightly greater than the maximum vessel emptying rate. This value, in Units (P005) or % of Span (P007) per minute, is automatically altered when Maximum Process Speed (P003) is altered. Any empty rate above this value will trigger any alarms set to "rate".

| P003 Value | Meters / Minute |
|---|---|
| 1 | 0.1 |
| 2 | 1 |
| 3 | 10 |

# P702 Filling Indicator

*The fill rate required to activate the LCD Filling indicator (↑).*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: -999 to 9999 | |
| Altered by | • P003 Maximum Process Speed on page 8 | |
| Related | • P005 Units on page 10<br>• P007 Span on page 11<br>• P700 Max Fill Rate on page 104 | |

This value (in Units (P005) or % of Span (P007) per minute) is automatically set to 1/10 of the Max Fill Rate (P700).

# P703 Emptying Indicator

*The empty rate required to activate the LCD Emptying indicator (↓).*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: -999 to 9999 | |
| Altered by | • P003 Maximum Process Speed on page 8 | |
| Related | • P005 Units on page 10<br>• P007 Span on page 11<br>• P701 Max Empty Rate on page 105 | |

This value (in Units (P005) or % of Span (P007) per minute) is automatically set to 1/10 of the Max Empty Rate (P701) .

## P704 Rate Filter

*Damps Rate Value (P707) fluctuations.*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | 0 rate display not required | |
| | **Filtered Output** | |
| | 1 continuously filtered and updated | |
| | **Interval Output** | |
| | 2 1 minute or 50 mm (2 in) | |
| | 3 5 minutes or 100 mm (3.9 in) | |
| | 4 10 minutes or 300 mm (11.8 in) | |
| | 5 10 minutes or 1000 mm (39.4 in) | |
| Alters | • P707 Rate Value on page 107 | |
| Altered by | • P003 Maximum Process Speed on page 8 | |
| Related | • P705 Rate Update Time on page 106P706 Rate Update Distance on page 107 | |

Enter the time or distance interval over which the Rate Value is to be calculated before the display updates.

This is automatically altered along with Maximum Process Speed (P003) is. See the description of the Maximum Process Speed in the User's Guide.

This value automatically alters the Rate Update Time (P705) and / or Rate Update Distance (P706). Alternatively, these parameter values may be altered independently.

## P705 Rate Update Time

*The time period (in seconds) over which the material level rate of change is averaged before Rate Value update.*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: 0.000 to 9999 | |
| Related | • P707 Rate Value on page 107 | |

# P706 Rate Update Distance

*The material level change (in metres) to initiate a Rate Value update.*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| **Values** | Range: 0.000 to 9999 | |
| **Related** | • P707 Rate Value on page 107 | |

# P707 Rate Value

*The rate of material level change (in Units (P005) or % of Span (P007) per minute).*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| **Values** | Range: -999 to 9999 (view only) | |
| **Altered By** | • P704 Rate Filter on page 106 | |
| **Related** | • P005 Units on page 10<br>• P007 Span on page 11 | |

A negative rate indicates the vessel is emptying.

This is the value displayed when 7 is pressed in the run mode as described in the EnviroRanger User's Guide.

# P708 Volume Rate Display

*The rate of change of volume in "percent of maximum volume" per minute.*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| **Values** | Range: -999 to 9999 (view only) | |
| **Related** | • P622 Inflow / Discharge Adjust on page 95<br>• P623 Pump Total Method on page 96 | |

This value is used internally to calculate inflow in pumped volume applications (P622=3 and P623=1). Press ▲% to toggle between percent and volume.

# Measurement Verification (P710 to P713)

## P710 Fuzz Filter

*Use this to stabilize the reported level, due to level fluctuations (such as a rippling or splashing liquid surface), within the Echo Lock Window (P713).*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: 0 to 100 (0 = off) | |
| Altered by | • P003 Maximum Process Speed on page 8 | |
| Related | • P007 Span on page 11<br>• P713 Echo Lock Window on page 109 | |

This value (in % of Span, P007) is automatically altered when Maximum Process Speed (P003) is altered. The higher the value entered, the greater the fluctuation stabilized.

## P711 Echo Lock

*Use this feature to select the measurement verification process.*

| Primary Index | Single | | Dual |
|---|---|---|---|
| | global | | transducer |
| Values | 0 | | off |
| | 1 | | maximum verification |
| | 2 | * | material agitator |
| | 3 | | total lock |
| Related | • P700 Max Fill Rate on page 104<br>• P701 Max Empty Rate on page 105<br>• P712 Echo Lock Sampling on page 109<br>• P713 Echo Lock Window on page 109<br>• P820 Algorithm127 | | |

If a material agitator (mixer) is used in the vessel monitored, set Echo Lock for "maximum verification" or "material agitator", to avoid agitator blade detection. Ensure the agitator is always "on" while the EnviroRanger is monitoring the vessel, to avoid stationary blade detection.

When set for "max verification or material agitator", a new measurement outside of the Echo Lock Window (P713), must meet the sampling criterion (P712).

For "total lock", Echo Lock Window (P713) is preset to zero "0". The EnviroRanger continuously searches for the best echo according to the algorithm chosen (P820). If the selected echo is within the window, the window is then centered about the echo. If not, the window widens with each successive shot until the selected echo is within the window. The window then returns to its normal width.

When Echo Lock is "off", the EnviroRanger responds immediately to a new measurement as restricted by the Max Fill / Empty Rate (P700 / P701), however measurement reliability is affected.

## P712 Echo Lock Sampling

*The sampling criterion sets the number of consecutive echoes appearing above or below the echo currently locked onto, that must occur before the measurements are validated as the new reading (for Echo Lock P711 values: 1 or 2).*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: 1:1 to 99:99 | |
| | Format: x:y | |
| | x = the number of “above” echoes | |
| | y = the number of “below” echoes | |
| Related | • P711 Echo Lock on page 108 | |

| P711 value | P712 preset value |
|---|---|
| 1, max verification | 5:5 |
| 2, material agitator | 5:2 |

e.g.: P711 = 2, material agitator P712 = 5:2

This means that a new reading will not be validated unless 5 consecutive measurements higher or 2 consecutive measurements lower than the current reading occurs.

Resetting P711 returns P712 to the respective preset values.

## P713 Echo Lock Window

*Adjusts the size of the Echo Lock Window.*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: 0.000 to 9999 | |
| | Preset: 0.000 | |
| Altered by | • P003 Maximum Process Speed on page 8 | |
| Related | • P005 Units on page 10<br>• P711 Echo Lock on page 108 | |

The Echo Lock Window is a “distance window” (units P005) centred on the echo and used to derive the Reading. When a new measurement is in the window, it is re-centred and the new Reading calculated. Otherwise, the new measurement is verified by Echo Lock (P711) before the reading is updated.

When “0” is entered the window is automatically calculated after each measurement. For slower P003 Maximum Process Speed values the window is narrow, for faster P003 values the window becomes wider.

# Transducer Scanning (P726 to P728)

## P726 Level System Sync

*Enables the System Sync on the terminal block.*

| Primary Index | global | | |
|---|---|---|---|
| Values | 0 | | not required |
| | 1 | * | synchronize level monitors |

Use this if another level measurement system is mounted nearby, and they are wired together on the Sync terminal. (See the Installation Guide)

## P727 Scan Delay

*The delay, in seconds, between measurements from transducer points.*

| Primary Index | global |
|---|---|
| Values | Range: 0.000 to 9999 |
| | Preset: 5.0 |
| Altered by | • P003 Maximum Process Speed on page 8 |
| Related | • P001 Operation on page 7 |

This feature may only be used for "differential" or "average" Operation (P001 = 4 or 5), to adjust the delay before the next point is scanned. Enter the amount of delay in seconds. This value is automatically altered when Maximum Process Speed (P003) is altered.

## P728 Shot Delay

*The delay, in seconds, between transducer shots.*

| Primary Index | transducer |
|---|---|
| Values | Range: 0.1 to 4.0 |
| | Preset: 0.5 |

Use this if transient acoustic noise within the vessel is causing measurement difficulties due to echoes from one shot being received on the next. If more than one ultrasonic unit is installed for redundancy, this value should be 0.

## P729 Scan Time

*View the elapsed time (in seconds) since the point displayed was last scanned.*

| Primary Index | level point |
|---|---|
| Values | Range: 0.000 to 9999 (view only) |
| Related | • P001 Operation on page 7 |

This may be viewed as an Auxiliary Reading in the RUN mode, and is useful when "differential" or "average" (P001 = 4 or 5) is selected.



# Display (P730 to P739)

## P730 Auxiliary Reading

*Use this feature to display operator selected Auxiliary Readings temporarily or indefinitely (as desired).*

| Primary Index | global |
|---|---|
| Values | Range: 000 to 999 |
| | Display: “OFF”, “HOLd” |

Select "OFF" to display Auxiliary Readings temporarily. Select "HOLd" to display Auxiliary Readings until another Auxiliary Reading is selected or programming mode is entered. See the Hand Programmer section in the User Guide for Run mode auxiliary readings.

**To select the Auxiliary Reading operation desired...**

1. Press [%] to display the Auxiliary Function symbol.
2. Press [▲] or [▼] to access the "OFF" or "HOLd" option desired.
3. Press [↵]

If desired, enter the Parameter Number to default in the Auxiliary Reading display. That value will show in the auxiliary reading area by default. Other values are available but will reset to the parameter defined here.

## P731 Auxiliary Reading Key

*Enter the Parameter Number whose value is to be displayed in the Auxiliary Reading field when...*

| Primary Index | global |
|---|---|
| Values | Range: 000 to 999 |
| | Preset: Material Reading, P921 |

[Pxxx] is pressed in the RUN mode. See the Hand Programmer section in the Users Guide for run mode auxiliary readings.

## P732 Display Delay

*Adjusts the Point Number display scroll speed.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: 0.5 to 10 |
| | Preset: 1.5 seconds |
| **Related** | • P001 Operation on page 7<br>• P737 Primary Reading on page 113 |

Use this feature when "differential" or "average" (P001 = 4 or 5) is selected, to adjust the delay before the display advances to the next Point Number. Display scrolling is independent from transducer scanning.

## P733 Scroll Access

*Use this feature to select the parameter scroll access option desired.*

| | | | | |
|---|---|---|---|---|
| **Primary Index** | global | | | |
| **Values** | 0 | | off | to scroll to all parameters (P001 to P999) |
| | 1 | * | smart | for Quick Start, altered, and tagged parameters |
| | 2 | | tagged | to scroll to operator tagged parameters only |

Press [▲%] [7] to tag / untag any accessed parameter. ↕ is displayed to indicate the parameter accessed is tagged.

## P735 Backlight

*Controls the LCD backlighting.*

| | | | |
|---|---|---|---|
| **Primary Index** | global | | |
| **Values** | 0 | | off |
| | 1 | * | on |
| | 2 | | keypad activated |

The backlight can be forced on or off, or controlled by a programmer, in which case it will turn off 30 seconds after the last key is pressed.

## P736 Date Format

*The order of days and months in date readings in run mode.*

| | | | |
|---|---|---|---|
| **Primary Index** | global | | |
| **Values** | 0 | * | DD:MM |
| | 1 | | MM:DD |

This parameter determines the order of days and months of dates shown in Run mode. It does not affect the way dates are set in Program mode.

## P737 Primary Reading

*The reading shown on the primary reading display when in run mode.*

| Primary Index | global | | |
|---|---|---|---|
| Values | Range: 0 to 3 | | |
| | 1 | * | default reading (P920) based on operation (P001) |
| | 2 | | LCD totalizer (P322, P323) |
| | 3 | | automatically toggle between 1 and 2 |
| Related | • LCD Totalizer (P322 and P323) on page 56<br>• P732 Display Delay on page 112<br>• P920 Reading Measurement on page 138 | | |

When this value indicates “toggle” then both readings (default and totalizer) are shown in the time specified in display delay (P732).

## P738 Access Code

*Enter an Access Codes to enable Optional Features.*

| Primary Index | global |
|---|---|
| Values | Range: up to 999 999 999 |
| Related | • Enabling Optional Features (P343 to P348) on page 62 |

## P739 Time Zone

*The offset from GMT (Greenwich Mean Time) of local time.*

| Primary Index | global |
|---|---|
| Values | Range: -999 to 9999 |
| | Preset: 0.0 |

This parameter does not affect any timed events because all times are local. It can be accessed by a remote computer for synchronization purposes. While this parameter will accept the values shown above, valid values are –12.00 to +12.00.

# SmartLinx Reserved (750 to 769)

These parameters are reserved for optional SmartLinx communications cards and vary by card. Refer to the SmartLinx documentation to determine if any of them are used.

# Communications (P770 to P782)

The EnviroRanger communication ports are configured by a series of parameters that are indexed by port. See the Communications Reference manual for a complete description communications set-up.

Communication parameters are indexed to these communication ports, unless otherwise noted:

| Port | Description |
|---|---|
| 1 | RS-232 port (RJ-11 modular telephone) |
| 2 | RS-232 port on terminal block |
| 3 | RS 485 port on optional Auxiliary Input / Output Card |



## P770 Port Protocol

*The communications protocol used between the EnviroRanger and other devices.*

| Primary Index | communications port | | |
|---|---|---|---|
| Values | 0 | * | Communications port disabled (preset for port 3) |
| | 1 | * | Milltronics "Dolphin" protocol (preset for port 1) |
| | 2 | | Modbus ASCII slave serial protocol |
| | 3 | * | Modbus RTU slave serial protocol (preset for port 2) |
| | 4 | | ModBus ASCII master |
| | 5 | | ModBus RTU master |
| Related | • Report by Exception (P470 to P472) on page 72 | | |

The EnviroRanger supports Milltronics' proprietary "Dolphin" data format (go to www.milltronics.com for more information). plus the internationally recognized Modbus standard in both ASCII and RTU formats. Other protocols are available with optional SmartLinx cards.

**Report by Exception**
If a modem is installed, P770 (Port Protocol) defines protocol for incoming calls. If a slave is currently connected, and a master needs to make an outgoing call, the slave will not be preempted. If the EnviroRanger is the master, it will hang up after exceptions are sent.

## P771 Network Address

*The unique identifier of the EnviroRanger on the network.*

| Primary Index | communications port |
|---|---|
| Values | Range: 0 to 9999 |
| | Preset: 1 |
| Related | • Report by Exception (P470 to P472) on page 72 |

For devices connected with the Milltronics protocol this parameter is ignored. For devices connected with a serial Modbus slave protocol, this parameter is a number from 1-247. The network administrator must ensure that all devices on the network have unique addresses. Do not use the value “0” for Modbus communications as this is the broadcast address and is inappropriate for a slave device.

## P772 Baud Rate

*The communication rate with the master device.*

| **Primary Index** | communications port | | |
|---|---|---|---|
| **Values** | 4.8 | | 4800 baud |
| | 9.6 | | 9600 baud (preset and only option for port 3) |
| | 19.2 | * | 19,200 baud (preset for port 2) |
| | 115.2 | * | 115,200 baud (preset for port 1) |
| **Related** | • Report by Exception (P470 to P472) on page 72 | | |

This specifies the rate of communication in Kbaud. Any value may be entered but only the values shown below are supported. The baud rate should reflect the speed of the connected hardware and protocol used.

## P773 Parity

*The serial port parity.*

| **Primary Index** | communications port | | |
|---|---|---|---|
| **Values** | 0 | * | No Parity (only option for port 3) |
| | 1 | | Odd Parity |
| | 2 | | Even Parity |
| | 3 | | Mark Parity (=1) |
| | 4 | | Space Parity (=0) |
| **Related** | • Report by Exception (P470 to P472) on page 72 | | |

Ensure that the communications parameters are identical between the EnviroRanger and all connected devices. For example many modems default to N-8-1 which is No parity, 8 data bits, and 1 stop bit.

## P774 Data Bits

*The number of data bits per character.*

| **Primary Index** | communications port | |
|---|---|---|
| **Values** | Range: 5 to 8 | |
| | Preset: 8 (only option for port 3) | |
| | 8 | Modbus RTU |
| | 7 or 8 | Modbus ASCII |
| | 7 or 8 | Dolphin Plus |
| **Related** | • Report by Exception (P470 to P472) on page 72 | |

## P775 Stop Bits

*The number of bits between the data bits.*

| | | | |
|---|---|---|---|
| **Primary Index** | communications port | | |
| **Values** | Range: 1 or 2 | | |
| | Preset: 1 (only option for port 3) | | |
| **Related** | • Report by Exception (P470 to P472) on page 72 | | |

## P776 Port Flow Control

*The flow control used on the serial port.*

| | | | |
|---|---|---|---|
| **Primary Index** | communications port | | |
| **Values** | 0 | * | No flow control |
| | 1 | | RTS/CTS (Hardware flow control) |
| **Related** | • Report by Exception (P470 to P472) on page 72 | | |

The EnviroRanger supports hardware flow control (RTS/CTS) for port 2 only, and does not apply to either ports 1 or 3. If your connected device requires this control then select it. Otherwise, select no flow control.

## P777 Key up Delay

*The delay between asserting RTS and transmitting the first data bit.*

| | |
|---|---|
| **Primary Index** | communications port |
| **Values** | Range: 0-3000 milliseconds |
| | Preset: 0 |
| **Related** | • Report by Exception (P470 to P472) on page 72 |

This delay is built into the protocol for older radio modems that do not buffer data and require “key up” time. Consult your modem documentation.

## P778 Modem Available

*Sets the EnviroRanger to use an external modem on the RS-232 port.*

| | | | |
|---|---|---|---|
| **Primary Index** | communications port | | |
| **Values** | 0 | * | No modem connected |
| | 1 | | Answer only |
| | 2 | | Dial only |
| | 3 | | Answer / dial |
| **Related** | • Report by Exception (P470 to P472) on page 72 | | |

**Note:**
For Report by Exception to send reports, either 2 or 3 must be selected.

# P779 Modem Inactivity Timeout

*Sets the time that the unit will keep the modem connected with no activity*

| | | | |
|---|---|---|---|
| **Primary Index** | communications port | | |
| **Values** | Range: 0-9999 seconds | | |
| | 0 | * | No timeout |
| **Related** | • Report by Exception (P470 to P472) on page 72<br>• P778 Modem Available on page 116<br>• P779 Modem Inactivity Timeout on page 117 | | |

To use this parameter, ensure that P778 (Modem Available)=1. Ensure that the value is low enough to avoid unnecessary delays when an unexpected disconnect occurs but long enough to avoid timeout while you are still legitimately connected. This parameter value is ignored by the Modbus Master Drivers, as they automatically disconnect when done.

**Hanging Up**

- If the line is idle and the P779 Modem Inactivity Timeout expires, then the modem is directed to hang up the line. Ensure that P779 is set longer than the standard polling time of the connected master device. 0 disables the inactivity timer.

# P782 Parameter Index Location

*Determines where index information is stored for the parameter access area.*

| | | | |
|---|---|---|---|
| **Primary Index** | global | | |
| **Values** | 0 | * | Global |
| | 1 | | Parameter-Specific |
| **Altered By** | • P770 Port Protocol on page 114 | | |
| **Related** | • Report by Exception (P470 to P472) on page 72 | | |

**Global (0)**
The primary and secondary index values are global (they affect all of the parameter access area at once) and stored in:

- primary index – R43,999
- secondary index – R43998

**Parameter-Specific (1)**
The primary and secondary index values are encoded into the format words found between R46,000 and R46,999. Each format work corresponds with the R44,000-series number in the parameter access map. For example, the format register R46,111 corresponds to the parameter P111 and the value is stored in R44,111. If the Modbus protocol (P770 = 2 or 3) is not used this parameter is ignored.

# Dialler Parameters (P783 to P789)

These parameters define 8 phone numbers to be contacted in the event of an exception as defined by the Report by Exception System (see page 72).

## P783 Dialling Protocol

*The phone dialling protocol used on outgoing connections.*

| Primary Index | phone number | | |
|---|---|---|---|
| Values | 0 | * | Communications port disabled |
| | 2 | | Modbus ASCII slave serial protocol |
| | 3 | | Modbus RTU slave serial protocol |
| | 4 | | ModBus ASCII master |
| | 5 | | ModBus RTU master |
| Related | • Report by Exception (P470 to P472) on page 72 | | |

## P784 Phone number enable

*The phone dialling specifications*

| Primary Index | phone number | | |
|---|---|---|---|
| Values | 0 | | disabled |
| | 1 | | tone |
| | 2 | | pulsed |
| Related | • Report by Exception (P470 to P472) on page 72 | | |

## P785 Phone number

*The phone number that the EnviroRanger will dial to report an exception.*

| Primary Index | phone number |
|---|---|
| Values | Format: 1 to 16 digits |
| Related | • Report by Exception (P470 to P472) on page 72 |

To enter a pause in the dialling sequence, press the "P..." key. This will show as a 'P' on the LCD. The display can only show four numbers at a time, so press "%" to scroll the number to the right.

## P786 Number of tries per number

*The number of tries that the System tries to reach a given phone number*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: 0 to 9999 |
| **Related** | • Report by Exception (P470 to P472) on page 72<br>• P787 Number of cycles on page 119<br>• P788 Delay between tries on page 119<br>• P789 Timeout delay on page 119 |

If the first number cannot be reached after the desired number of tries, the EnviroRanger will proceed to the next phone number in the list.



## P787 Number of cycles

*The number of times the System cycles through all the phone numbers.*

| | | |
|---|---|---|
| **Primary Index** | global | |
| **Values** | Range: 0 to 9999 | |
| | 0 | Non-stop |
| **Related** | • Report by Exception (P470 to P472) on page 72<br>• P786 Number of tries per number on page 119 | |

## P788 Delay between tries

*The number of seconds between each retry.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: 0 to 9999 |
| **Related** | • Report by Exception (P470 to P472) on page 72<br>• P786 Number of tries per number on page 119 |

This delay defined is used between dialling attempt as defined by P786. (Number of Tries per Number). It does not define the delay between each cycle through the phone list as defined by P787 (Number of Tries per Cycle).

## P789 Timeout delay

*The number of seconds before timing out on connect attempts.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: 1 to 9999 |
| | Default: 30 seconds |
| **Related** | • P786 Number of tries per number on page 119 |

After the timeout delay has expired, the unit will use the same phone number to reconnect until reaching the value in P786 (Number of tries per number).

# SmartLinx Hardware Testing (P790 – P792)

These parameters are used to test and debug a SmartLinx card.

## P790 Hardware Error

*The results of ongoing hardware tests in the communications circuitry.*

| | | | |
|---|---|---|---|
| **Primary Index** | global | | |
| **Values** | PASS | * | no errors |
| | FAIL | | faulty SmartLinx module or EnviroRanger |
| | ERR1 | | unknown protocol, upgrade software |
| **Related** | • P791 Bus Error on page 120<br>• P792 Bus Error Count on page 120 | | |

If a test does not meet PASS requirements, communication halts and tests repeated until PASS requirements are met. Communication then resumes.

## P791 Bus Error

*Indicates if an error condition is occurring on the bus.*

| | | | |
|---|---|---|---|
| **Primary Index** | global | | |
| **Values** | 0 | * | no error |
| | ∅ | | error code, refer to the SmartLinx module documentation for explanation of the code |
| **Related** | • P790 Hardware Error on page 120<br>• P792 Bus Error Count on page 120 | | |

## P792 Bus Error Count

*A count that increments by 1 each time a bus error (P752) is reported.*

| | |
|---|---|
| **Primary Index** | global |
| **Values** | Range: 0 to 9999 |
| | Preset: 0 |
| **Related** | • P790 Hardware Error on page 120<br>• P791 Bus Error on page 120 |

# Echo Processing (P800 to P807)

## P800 Near Blanking

*The space close to the transducer face which cannot be measured*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: 0.000 to 9999 | |
| | Preset 0.300m (Most transducers)<br>0.450m (XCT-8, XCT-12) | |
| Related | • P006 Empty on page 10<br>• P007 Span on page 11<br>• P833 TVT Start Min on page 131 | |

Use this feature if the surface is reported to be near the transducer face but is in fact much further away. Extend this value when changing transducer location, mounting, or aiming. cannot correct measurement problems. Ensure that Span (P007) < Empty(P006) – Near Blanking (P800)

**Measurement difficulties can be caused by:**

- Vessel obstruction partly blocking the transducer acoustic beam
- Transducer standpipe mount is too narrow for its length or not cut at 30 to 45°
- Transducer mounting which is resonant at the transducer frequency (ringing)

## P801 Range Extension

*Allows the material level to fall below the Empty setting without reporting LOE.*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: 0.000 to 9999 | |
| | Preset: 20% of Span (P007) | |
| Related | • P005 Units on page 10<br>• P006 Empty on page 10<br>• P007 Span on page 11<br>• P004 Transducer on page 9 | |

This feature is useful in OCM applications where the Empty level is set to the bottom of the weir, and above the bottom of the channel, and should be used if the surface monitored can fall past the Empty (P006) level in normal operation. The value is added to Empty (P006) and can be greater than the range of the transducer. If the surface monitored can extend beyond Empty (P006), increase Range Extension (in Units (P005) or % of Span) such that Empty plus Range Extension is greater than the transducer face to furthest surface to be monitored distance. This is often the case with OCM when using weirs and some flumes.

## P802 Submergence Transducer

*Used when the transducer is expected to be submerged on occasion.*

| Primary Index | Single | | Dual |
|---|---|---|---|
| | global | | transducer |
| Values | 0 | * | off |
| | 1 | | submergence transducer |
| Related | • P006 Empty on page 10<br>• P071 Failsafe Material Level on page 18<br>• Relays on page 19 | | |

When a transducer is submerged, the submergence shield in traps an air pocket that creates a special echo. The EnviroRanger recognizes the echo and advances the reading to the highest level and operates displays and outputs accordingly. This feature is particularly useful when power is returned while the transducer is submerged.

## P803 Shot / Pulse Mode

*Determines what type of ultrasonic shots are fired.*

| Primary Index | Single | | Dual |
|---|---|---|---|
| | global | | transducer |
| Values | 1 | | short |
| | 2 | * | short and long |
| Related | • P006 Empty on page 10<br>• P805 Echo Confidence on page 123<br>• P804 Confidence Threshold on page 122<br>• P852 Short Shot Range on page 135 | | |

Use this feature to increase EnviroRanger response when the monitored surface is close to the transducer face. Select "short and long" to have short and long acoustic shots fired for each measurement, regardless of the transducer to surface distance. Select "short" to have only short shots fired if the Echo Confidence (P805) produced by a short shot exceeds the short Confidence Threshold (P804) and the monitored surface is always within the Short Shot Range (P852).

## P804 Confidence Threshold

*Determines which echoes are evaluated by software.*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: 0 to 99:0 to 99 | |
| | Preset: 10:5 | |
| Related | • P805 Echo Confidence on page 123 | |

Use this feature when an incorrect material level is reported. The short and long shot Confidence Thresholds are preset to 10 and 5 respectively. When Echo Confidence (P805) exceeds the Confidence Threshold, the echo is evaluated by Sonic Intelligence™. Values are entered as two numbers separated by a decimal point. The first number is the short shot confidence and the second number is the long shot confidence.

**Note:**
The decimal point "." it is replaced with a colon ":" on the display.



## P805 Echo Confidence

*Displays the echo confidence of the measurement echo from the last shot.*

| | |
|---|---|
| **Primary Index** | transducer |
| **Values** | Format: x:y (view only) |
| | x = short (0 to 99) |
| | y = long (0 to 99) |
| **Related** | • P804 Confidence Threshold on page 122<br>• P830 TVT Type on page 130 |

Use this feature to monitor the effect of transducer aiming, location, and mechanical transducer / mounting isolation.

Both short and long shot Echo Confidence is displayed. (To display this value in the auxiliary display while the unit is running, press 8 for 4 seconds).

| Display | Description |
|---|---|
| "x:--" | short shot confidence value, (long shot not used). |
| "--:y" | long shot confidence value, (short shot not used). |
| "x:y" | short and long shot confidence values (both used). |
| "E" | transducer cable is open or short circuited. |
| "--:--" | no shots were processed for Sonic Intelligence™ evaluation. |

## P806 Echo Strength

*Displays the strength (in dB above 1 uV RMS) of the echo which was selected as the measurement echo.*

| | |
|---|---|
| **Primary Index** | transducer |
| **Values** | Format: 0 to 9 (view only) |

## P807 Noise

*Displays the average and peak ambient noise (in dB above 1 uV RMS) being processed.*

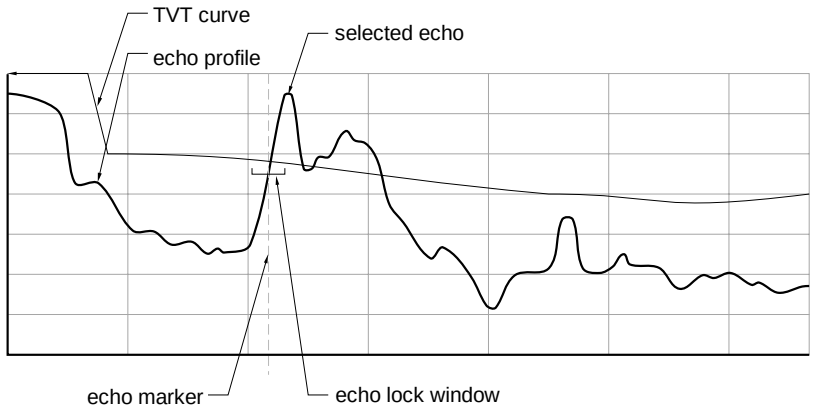
| Primary Index | transducer |
|---|---|
| Values | Format: x:y (view only) |
| | x = average (-99 to 99) |
| | y = peak (-99 to 99) |

The noise level is a combination of transient acoustic noise and electrical noise (induced into the transducer cable or receiving circuitry). See Noise Problems in the Troubleshooting Section in the EnviroRanger User Guide.

# Advanced Echo Processing (P810 to P825)

The following parameters are for authorized Milltronics Service personnel or Technicians familiar with Milltronics echo processing techniques.

**Anatomy of an Echo Profile**
The relevant parts of an echo profile are listed here. These are visible in either Dolphin Plus or an oscilloscope.




## P810 Scope Displays

*Captures echo profiles for display on an oscilloscope.*

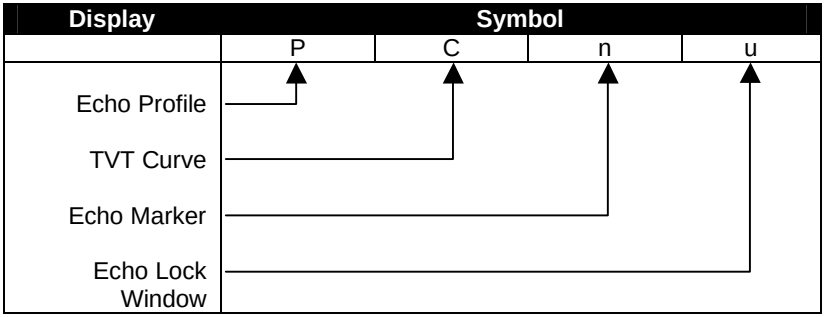
| Primary Index | transducer |
|---|---|
| Values | Display: P, C, n, u, _ |
| | Preset: _ _ _ _ (display is off) |
| Related | • P832 TVT Shaper Adjust on page 130 |

Use this feature to monitor the effects of Echo Processing changes.

Connect an oscilloscope to Display Board TP1, TP2, and TP3.

Sweep = 10 us / div. to 1 ms / div. (x 100 for real time)
Amplitude = 1 V / div.
Trigger = external

**Any combination of the following Scope Displays are available.**




**There are two methods of selecting the Scope Displays:**

**Scrolling**

1. Press [%] to display the Auxiliary Function symbol.
2. Press [▲] or [▼] to access the desired Reading display symbols.
3. Press [↵] with the desired display symbols displayed.

**1/0 Values**

Alternatively, a 4 digit binary value may be entered, where a “0” turns the associated signal display “off”, and a “1” turns the display “on”.

e.g. 1110 = PCn_ = Echo Profile, TVT Curve, and Echo Marker displays on, Echo Lock Window display off.

See Echo Processing in the User Guide for more information.

Use the Scope Displays after pressing [⏚] (Program mode) to observe the result of parameter alterations. (Take several measurements to verify repeatability and overcome Echo Lock (P711) restrictions).

## P815 Echo Time Filtered

*The time (in ms) from the transmission of the pulse, to when it is processed.*

| | |
|---|---|
| **Primary Index** | transducer |
| **Values** | Range: 0.0 to 9999 (view only) |
| **Related** | • P816 Echo Time Raw on page 126 |

## P816 Echo Time Raw

*The time (in ms) from the transmit pulse to the echo processed.*

| | |
|---|---|
| **Primary Index** | transducer |
| **Values** | Range: 0.0 to 9999 (view only) |
| **Related** | • P815 Echo Time Filtered on page 125 |

# Profile Pointer (P817 to P825)

When one of these parameters are accessed, the display changes to a Profile Pointer display. The Profile Pointer may be moved to a number of points on the Echo Profile, to gain information relevant to the parameter.

To move the Profile Pointer to a specific point, enter the desired value and it will move to the nearest acceptable Echo Profile point. Alternatively, to scroll the Profile Pointer along the Echo Profile:

1. Press [▲%] to display the Auxiliary Function symbol.
2. Press [P___] or [Pxxx] to move the Profile Pointer to the left or right respectively. When the Profile Pointer Parameters are exited and the RUN mode is entered, the display automatically changes back to the Echo Lock Window.

## P817 Profile Pointer Time

*The time (in ms) from the transmit pulse to the Profile Pointer.*

| | | |
|---|---|---|
| **Primary Index** | **Single** | **Dual** |
| | global | transducer |
| **Values** | Range: 0.000 to 9999 (view only) | |
| **Related** | • P818 Profile Pointer Distance on page 127<br>• P819 Profile Pointer Amplitude on page 127<br>• P820 Algorithm on page 127<br>• P821 Spike Filter on page 128<br>• P822 Narrow Echo Filter on page 128<br>• P823 Reform Echo on page 129<br>• P825 Echo Marker Trigger on page 129 | |

## P818 Profile Pointer Distance

*The distance between the transducer face and the Profile Pointer.*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| **Values** | Range: 0.000 to 9999 (view only) | |
| **Related** | • P817 Profile Pointer Time on page 126<br>• P819 Profile Pointer Amplitude on page 127<br>• P820 Algorithm on page 127<br>• P821 Spike Filter on page 128<br>• P822 Narrow Echo Filter on page 128<br>• P823 Reform Echo on page 129<br>• P825 Echo Marker Trigger on page 129 | |



## P819 Profile Pointer Amplitude

*The amplitude (in dB above 1 uV) of the Echo Profile at the Pointer position.*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| **Values** | Range: 00 to 99 (view only) | |
| **Related** | • P817 Profile Pointer Time on page 126<br>• P818 Profile Pointer Distance on page 127<br>• P820 Algorithm on page 127<br>• P821 Spike Filter on page 128<br>• P822 Narrow Echo Filter on page 128<br>• P823 Reform Echo on page 129<br>• P825 Echo Marker Trigger on page 129 | |

## P820 Algorithm

*Chooses the algorithm to generate the measured value from the profile.*

| Primary Index | Single | | | Dual |
|---|---|---|---|---|
| | global | | | transducer |
| **Values** | 1 | | ALF = flat Area, Largest, and First average | |
| | 2 | | A = flat Area only | |
| | 3 | | L = flat Largest only | |
| | 4 | | F = flat First only | |
| | 5 | | AL = flat Area and Largest average | |
| | 6 | | AF = flat Area and First average | |
| | 7 | | LF = flat Largest and First average | |
| | 8 | * | bLF = smooth Largest or First | |
| | 9 | | bL = smooth Largest only | |
| | 10 | | bF = smooth First only | |

| | |
|---|---|
| **Related** | • P805 Echo Confidence on page 123<br>• P817 Profile Pointer Time on page 126<br>• P818 Profile Pointer Distance on page 127<br>• P819 Profile Pointer Amplitude on page 127<br>• P821 Spike Filter on page 128<br>• P822 Narrow Echo Filter on page 128<br>• P823 Reform Echo on page 129<br>• P825 Echo Marker Trigger on page 129 |

Use this to select the algorithm(s) the Sonic Intelligence™ echo selection is based on. Use P805 Echo Confidence (page 123) to determine which algorithm gives the highest confidence under all level conditions. If the wrong echo is processed, observe the echo processing displays and select an alternate algorithm, either by entering the numeric value desired, or as below:

1. Press [▲%] to display the Auxiliary Function symbol.
2. Press [▲] or [▼] to access the desired Reading display symbols.
3. Press [↵] with the desired algorithm is displayed.

## P821 Spike Filter

*Dampens spikes in the echo profile to reduce false readings.*

| **Primary Index** | **Single** | | **Dual** |
|---|---|---|---|
| | global | | transducer |
| **Values** | 0 | | off |
| | 1 | * | on |
| **Related** | • P817 Profile Pointer Time on page 126<br>• P818 Profile Pointer Distance on page 127<br>• P819 Profile Pointer Amplitude on page 127<br>• P820 Algorithm on page 127<br>• P822 Narrow Echo Filter on page 128<br>• P823 Reform Echo on page 129<br>• P825 Echo Marker Trigger on page 129 | | |

Use P821 if interference spikes are on the long shot Echo Profile display.

## P822 Narrow Echo Filter

*Filters out echoes of a specific width.*

| **Primary Index** | **Single** | **Dual** |
|---|---|---|
| | global | transducer |
| **Values** | 0 = off (preset) | |
| | greater = wider | |
| **Related** | • P817 Profile Pointer Time on page 126<br>• P818 Profile Pointer Distance on page 127<br>• P819 Profile Pointer Amplitude on page 127<br>• P820 Algorithm on page 127<br>• P821 Spike Filter on page 128<br>• P823 Reform Echo on page 129<br>• P825 Echo Marker Trigger on page 129 | |

Use this for transducer acoustic beam interference (e.g. ladder rungs). Enter the width of false echoes (in ms), to be removed from the long shot Echo Profile. When a value is keyed in, the nearest acceptable value is entered.

## P823 Reform Echo

*Smoothes jagged peaks in the echo profile.*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | 0 = off (preset) | |
| | greater = wider | |
| Related | • P002 Material on page 8<br>• P817 Profile Pointer Time on page 126<br>• P818 Profile Pointer Distance on page 127<br>• P819 Profile Pointer Amplitude on page 127<br>• P820 Algorithm on page 127<br>• P821 Spike Filter on page 128<br>• P822 Narrow Echo Filter on page 128<br>• P825 Echo Marker Trigger on page 129 | |

Use this feature, when monitoring solids (P002 = 2), if the reported level fluctuates slightly, though the monitored surface is still. Enter the amount (in ms) of long shot Echo Profile smoothing required. When a value is keyed in, the nearest acceptable value is entered.

## P825 Echo Marker Trigger

*The point on the primary echo on which the measured value is based.*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: 5 to 95% | |
| | Preset: 50% | |
| Related | • P817 Profile Pointer Time on page 126<br>• P818 Profile Pointer Distance on page 127<br>• P819 Profile Pointer Amplitude on page 127<br>• P820 Algorithm on page 127<br>• P821 Spike Filter on page 128<br>• P822 Narrow Echo Filter on page 128<br>• P823 Reform Echo on page 129 | |

Use this feature if the reported material level fluctuates slightly, due to a variable rise in the leading edge of the true echo on the Echo Profile.

Enter the value (in percent of echo height) to ensure the Echo Lock Window intersects the Echo Profile at the sharpest rising portion of the Echo Profile representing the true echo. This value is preset to 50%.

# Advanced TVT Adjustment (P830 to P835)

The following parameters are for authorized Milltronics Service personnel or Technicians familiar with Milltronics echo processing techniques.

## P830 TVT Type

*Selects the TVT Curve used.*

| Primary Index | Single | | Dual |
|---|---|---|---|
| | global | | transducer |
| Values | 1 | | TVT Short Curved |
| | 2 | | TVT Short Flat |
| | 3 | | TVT Long Flat |
| | 4 | | TVT Long Smooth Front |
| | 5 | | TVT Long Smooth |
| | 6 | | TVT Slopes |
| Altered By | • P002 Material on page 8 | | |
| Related | • P805 Echo Confidence on page 123<br>• P835 TVT Slope Min132 | | |

Select the TVT type which gives the highest confidence (P805) under all level conditions. Use this parameter with caution, and do not use "TVT Slopes" with the "bF" or "bLF" Algorithm (P820).

## P831 TVT Shaper

*Turns the TVT Shaper "on" or "off".*

| Primary Index | Single | | Dual |
|---|---|---|---|
| | global | | transducer |
| Values | 0 | * | off |
| | 1 | | on |
| Related | • P832 TVT Shaper Adjust on page 130 | | |

Turn the TVT Shaper "on" before using P832, and afterwards. turn the TVT Shaper "on" and "off" while monitoring the effect to pick up the true echo.

## P832 TVT Shaper Adjust

*Allows manual adjustment of the TVT curve.*

| Primary Index | Single | Dual |
|---|---|---|
| | breakpoint | transducer and breakpoint |
| Values | Range: -50 to 50 | |
| | Preset: 0 | |
| Related | • P810 Scope Displays on page 124<br>• P831 TVT Shaper on page 130 | |

Use this feature to bias the shape of the TVT curve to avoid crossing false echoes from fixed objects.

Adjustment to this parameter is best done while viewing the echo profile with Dolphin Plus. Refer to the Dolphin Plus online help for details. If Dolphin Plus is not available, then an oscilloscope can be used. When using an oscilloscope, the Echo Lock Window display becomes the TVT Curve Pointer. See P810 Scope Displays on page 124 for more information.

The TVT curve is divided into 40 breakpoints, accessible by enabling the point number as the breakpoint index field. Each breakpoint is normalized to a value of 0, as displayed in the parameter value field. By changing the breakpoint value, up or down, the intensity of the bias applied to that breakpoint of the curve is respectively changed. By changing the value of adjacent breakpoints, the effective bias to the shaper can be broadened to suit the desired correction. In the case of multiple false echoes, shaping can be applied along different points of the curve. Shaping should be applied sparingly in order to avoid missing the true echo.

**To change a breakpoint:**

1. Confirm that P831, TVT shaper, is `on'.
2. Go to P832
3. Press [⇔] twice to highlight the index value
4. Press [▲] or [▼] to scroll through the 40 points (or type in the desired point)
5. Enter the value from –50 to 50
6. Press [↵]

## P833 TVT Start Min

*Use this feature to adjust the TVT Curve height to ignore false echoes (or pick up true echoes) near the start of the Echo Profile.*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: −30 to 225 | |
| | Preset: 50 | |
| Related | • P800 Near Blanking on page 121<br>• P834 TVT Start Duration on page 132 | |

Enter the minimum TVT Curve start point (in dB above 1 uV RMS).

This feature should only be used if increased Near Blanking (P800) would extend farther than desired into the measurement range.

## P834 TVT Start Duration

*Use this feature in conjunction with TVT Start Min (P833) to ignore false echoes (or pick up true echoes) near the start of the Echo Profile.*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: 0 to 9999 | |
| | Preset: 30 | |
| Related | • P833 TVT Start Min on page 131<br>• P835 TVT Slope Min132 | |

Enter the time (in ms) for the TVT Curve to decrease from the TVT Start Min (P833) point to the TVT Curve baseline.

## P835 TVT Slope Min

*Enter the minimum slope (in dB/s) for the middle of the TVT Curve.*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: 0 to 9999 | |
| | Preset: 200 | |
| Related | • P830 TVT Type on page 130<br>• P834 TVT Start Duration on page 132 | |

Use this feature to adjust the slope declination, and use it in conjunction with TVT Start Duration (when a long flat TVT Type is selected) to ensure the TVT Curve remains above the false echoes in the middle of the Echo Profile. Alternatively, if TVT Type is set for "TVT Slopes" (P830 = 6), preset is 2000.

# Advanced Shot Adjustment (P840 to P852)

These parameters are for Milltronics service personnel only.

## P840 Short Shot Number

*The number of short shots to be fired (and results averaged) per transmit pulse.*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: 0 to 100 | |
| | Preset: 1 | |
| Related | • P841 Long Shot Number on page 133<br>• P842 Short Shot Frequency on page 133<br>• P844 Short Shot Width on page 134<br>• P850 Short Shot Bias on page 134<br>• P851 Short Shot Floor on page 135<br>• P852 Short Shot Range on page 135 | |

# P841 Long Shot Number

*Enter the number of long shots to be fired (and results averaged) per transmit pulse.*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: 0 to 200 | |
| | Preset: 5 | |
| Altered By | • P003 Maximum Process Speed on page 8 | |
| Related | • P840 Short Shot Number on page 132<br>• P843 Long Shot Frequency on page 133<br>• P845 Long Shot Width on page 134 | |

This value is automatically altered by Maximum Process Speed (P003).

# P842 Short Shot Frequency

*Adjust the short shot transmit pulse frequency (in kHz).*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: 10.00 to 60.00 | |
| Altered By | • P004 Transducer on page 9 | |
| Related | • P840 Short Shot Number on page 132<br>• P844 Short Shot Width on page 134<br>• P850 Short Shot Bias on page 134<br>• P851 Short Shot Floor on page 135<br>• P852 Short Shot Range on page 135 | |

This feature is automatically altered when Transducer (P004) is altered.

# P843 Long Shot Frequency

*Adjust the long shot transmit pulse frequency (in kHz).*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: 10.00 to 60.00 | |
| Altered By | • P004 Transducer on page 9 | |
| Related | • P841 Long Shot Number on page 133<br>• P842 Short Shot Frequency on page 133<br>• P843 Long Shot Frequency on page 133<br>• P845 Long Shot Width on page 134 | |

This feature is automatically altered when Transducer (P004) is altered.

## P844 Short Shot Width

*Adjust the width (in ms) of the short shot transmit pulse.*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: 0.000 to 5.000 | |
| Altered By | • P004 Transducer on page 9 | |
| Related | • P840 Short Shot Number on page 132<br>• P842 Short Shot Frequency on page 133<br>• P845 Long Shot Width on page 134<br>• P850 Short Shot Bias on page 134<br>• P851 Short Shot Floor on page 135<br>• P852 Short Shot Range on page 135 | |

This feature is automatically altered when Transducer (P004) is altered.

## P845 Long Shot Width

*Adjust the width (in ms) of the long shot transmit pulse.*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: 0.000 to 5.000 | |
| Altered By | • P004 Transducer on page 9 | |
| Related | • P841 Long Shot Number on page 133<br>• P844 Short Shot Width on page 134<br>• P843 Long Shot Frequency on page 133 | |

This feature is automatically altered when Transducer (P004) is altered.

## P850 Short Shot Bias

*Use this feature to slant the echo evaluation in favour of the short shot echo when both short and long shots are evaluated (see Shot Mode, P803).*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: 0 to 100 | |
| | Preset: 20 | |
| Related | • P803 Shot / Pulse Mode on page 122.<br>• P840 Short Shot Number on page 132<br>• P842 Short Shot Frequency on page 133<br>• P844 Short Shot Width on page 134<br>• P851 Short Shot Floor on page 135<br>• P852 Short Shot Range on page 135 | |

## P851 Short Shot Floor

*Enter the minimum echo strength (in dB above 1 uV), derived from a short shot, to be considered for evaluation.*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: 0 to 100 | |
| | Preset: 50 | |
| Related | • P840 Short Shot Number on page 132<br>• P842 Short Shot Frequency on page 133<br>• P844 Short Shot Width on page 134<br>• P850 Short Shot Bias on page 134<br>• P852 Short Shot Range on page 135 | |

## P852 Short Shot Range

*Enter the maximum distance in Units (P005) to be measured using short shot echoes.*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: 0.000 to 9999 | |
| Altered By | • P004 Transducer on page 9 | |
| Related | • P840 Short Shot Number on page 132<br>• P842 Short Shot Frequency on page 133<br>• P844 Short Shot Width on page 134<br>• P850 Short Shot Bias on page 134<br>• P851 Short Shot Floor on page 135 | |

This feature is automatically altered when Transducer (P004) is altered.

# Test (P900 to P913)

Test Parameters are intended for use by Milltronics Service personnel.

## P900 Software Revision #

*View the EPROM Rev. #.*

| Primary Index | global |
|---|---|
| Values | Range: 00.00 to 99.99 (view only) |

## P901 Memory

*Press ↵ to activate the EnviroRanger memory test.*

| Primary Index | global | | |
|---|---|---|---|
| Values | Display: view only | | |
| | PASS | | (memory test successful) |
| | F1 | | RAM |
| | F2 | | NOVRAM |
| | F3 | | FLASH data |
| | F4 | | FLASH code |

## P902 Watchdog

*Press ↵ to put the CPU into an infinite loop to test the watchdog timer.*

On successful completion (10 seconds) the RUN mode is entered and the EnviroRanger is reset. Programming is kept and the unit responds as if there had been a power failure.

## P903 Display

*Press ↵ to activate the display test.*

All LCD segments and symbols are temporarily displayed.

## P904 Keypad

*Press each keypad key in the following sequence:*


As each key is pressed, the associated keypad number is displayed. On successful test completion, "PASS" is displayed. "FAIL" is displayed if a key is pressed out of sequence or the programmer keypad malfunctions.

## P905 Transmit Pulse

*This feature may be used to monitor the transmit pulse with an oscilloscope connected to the transducer terminals.*

| Primary Index | Single | Dual |
|---|---|---|
| | global | transducer |
| Values | Range: 10.00 to 60.00 (view only) | |
| Altered By | • P004 Transducer on page 9 | |

Press ↵ to supply repeated transmit pulses, at the frequency entered, to the transducer and / or view the transducer operating frequency (automatically altered by (P004) Transducer) for the Point Number displayed.

## P906 Rear RS-232 Port

*Press ↵ to test the RS-232 port on the terminal block.*

An external device must be connected to the RS-232 port for this test. On successful completion, "PASS" is displayed, otherwise it is "FAIL".

## P907 Infrared Interface

*Press ↵ to activate the programmer interface (two way infrared communications) test.*

On successful test completion, "PASS" is displayed, otherwise it is "FAIL".

## P909 Front RS-232 Port

*Press ↵ to test the RS-232 port on the front of the unit.*

An external device must be connected to the RS-232 port for this test. On successful completion, "PASS" is displayed, otherwise it is "FAIL".

## P911 mA Output Value

*Access this parameter to display the current value of the mA output.*

| | |
|---|---|
| **Primary Index** | mA output |
| **Values** | Range: 0.00 to 25.00 |
| **Related** | • P200 mA Output Range on page 41<br>• P201 mA Output Function on page 41 |

Additionally, this feature may be used to enter a desired value. The mA output immediately assumes the value entered regardless of any restrictions programmed.

## P912 Transducer Temperature

*Use this feature to display the temperature in °C (as monitored by the connected transducer).*

| | |
|---|---|
| **Primary Index** | transducer |
| **Values** | Range: -50 to 150 |

"Err" is displayed if the transducer is not equipped with an internal temperature sensor.

## P913 Sensor Temperature

*Access this parameter to display the temperature in °C (as monitored by the TS-3).*

| Primary Index | mA input |
|---|---|
| Values | Range: -50 to 150 |

"OPEn" is displayed if a TS-3 is not connected.



## P914 mA Input

Use this feature to display the mA input value (in mA).

| Primary Index | mA input |
|---|---|
| Values | Range: 0.000 to 24.00 |

# Measurement (P920 to P927)

All of these parameters are available in Run mode and used to verify programming. See Readings in Run Mode in the User Guide.

The range and values shown for each of these parameters depends on the Operation (P001) chosen. The readings for each operation are listed below.

**To Access in Run Mode**

1. Ensure the device is in run mode
2. Press P...
   The Auxiliary Reading field becomes underscores P_ _ _
3. Type the parameter number
   The field changes to the value of the specified parameter
   These parameters are also available in simulation mode. See the Testing the Configuration section of the EnviroRanger User's Guide for instructions on how to control the simulation direction and rate.

## P920 Reading Measurement

*Corresponds to the final reading after all programming is applied.*

| Primary Index | level point |
|---|---|
| Values | Range: -999 to 9999 |

In general this means that: P920 = Reading x P060 + P061

**Reading Measurements by Operation**

| P001 | P050 = 0 | P050 ≠ 0 |
|---|---|---|
| 0 – Off | - - - - | - - - - |
| 1 – Level | P921 | P924 |
| 2 – Space | P922 | 100% - P924 |
| 3 – Distance | P927 | P927 |
| 4 – Difference | P921 (indexed) | P921 (indexed) |
| 5 – Average | P921 (indexed) | P921 (indexed) |
| 6 – OCM | P925 | P925 |
| 7 – Pump Totalizer | P925 | P925 |



## P921 Material Measurement

*The distance in Units (P005) or % of Span (P007), between Empty (P006) and the monitored surface.*

| | |
|---|---|
| **Primary Index** | level point |
| **Values** | Range: -999 to 9999 |
| **Related** | • P005 Units on page 10<br>• P006 Empty on page 10<br>• P007 Span on page 11 |

## P922 Space Measurement

*The distance between the monitored surface and Span (P007).*

| | |
|---|---|
| **Primary Index** | transducer |
| **Values** | Range: 0.000 to 9999 |
| **Related** | • P007 Span on page 11 |

## P923 Distance Measurement

*The distance between the monitored surface and the transducer face.*

| | |
|---|---|
| **Primary Index** | transducer |
| **Values** | Range: 0.000 to 9999 |

## P924 Volume Measurement

*The calculated vessel capacity in Max Volume (P051) or % of Max Volume.*

| | | |
|---|---|---|
| **Primary Index** | **Standard Mode** | **Dual Point Mode** |
| | global | transducer |
| **Values** | Range: 0.000 to 9999 | |
| **Related** | • P051 Maximum Volume on page 14 | |

## P925 Flow Measurement

*The calculated flowrate in Max Flow (P604) units or % of Max Flow.*

| Primary Index | Standard Mode | Dual Point Mode |
|---|---|---|
| | global | transducer |
| Values | Range: 0.000 to 9999 | |
| Related | • P604 Maximum Flow on page 91 | |



## P926 Head Measurement

*Corresponds to Head (the distance from Zero Head (P605) to the monitored surface) in Units (P005) or % of Span (P007).*

| Primary Index | Standard Mode | Dual Point Mode |
|---|---|---|
| | global | transducer |
| Values | Range: -999 to 9999 | |
| Related | • P005 Units on page 10<br>• P007 Span on page 11<br>• P605 Zero Head on page 91 | |

## P927 Distance Measurement

*The distance between the surface and the transducer face.*

| Primary Index | transducer |
|---|---|
| Values | Range: 0.000 to 9999 in units or % of Empty |
| Related | • P005 Units on page 10<br>• P006 Empty on page 10 |

Use P923 unless the distance information is required in percent.

# Master Reset (P999)

*This feature resets all parameters to original values.*

| Primary Index | Standard Mode | Dual Point Mode |
|---|---|---|
| | global | transducer |
| Values | Range: 0.000 to 9999 | |

Use this feature prior to initial programming if arbitrary Parameter Values were used during a "bench test", or after upgrading the software. Following a Master Reset, complete reprogramming is required.

To perform a Master Reset, access P999 and press [c] [↵]. “C.ALL" is shown until the reset is complete.

# Appendix

## Index types

| Name | Description | # of indexes |
|---|---|---|
| Global | This parameter applies to the entire unit | n/a |
| View only | This parameter can not be set, only viewed | n/a |
| Breakpoint | Indexed by breakpoint | 10 or 32 |
| CSO Log | Indexed by CSO log entry | 20 |
| Dimension | Indexed by PMD dimension | up to 7 |
| Discrete Input[3] | Indexed by discrete input | 8 or 16 |
| Data Logging | Indexed by Data Logging | 10 |
| Echo Profile | Indexed by stored echo profile | 10 |
| Trigger | Indexed by Trigger | 32 |
| Level Point[4] | Indexed by level point | 1, 2 or 3 |
| mA input[1] | Indexed by mA input | 1, 3 or 5 |
| mA output[1] | Indexed by mA output | 0, 2 or 4 |
| Comm. Port | Indexed by communications port | 2 |
| Phone Number | Indexed by phone number | 8 |
| Relay | Indexed by relay | 5 |
| Report Generation | Indexed by report | 32 |
| Transducer[5] | Indexed by transducer | 1 or 2 |



[3] The number of indexes depends on the option card installed.

[4] The three level points are: transducer 1, transducer 2, and the calculated point which can be difference (P001=4) or average (P001=5).
Single Point Mode (standard) has one level point unless its operation (P001) is set for difference (P001=4) or average (P005=5). In those cases it has three level points (transducer 1, transducer 2, and the calculated point).

[5] The number of indexes available in Single Point Mode (standard) is typically 1, but can be expanded to 2 if Operation (P001) is set for DPD (P001=4) or DPA (P001=5).
In Dual Point Mode (optional), the number of available indexes is always 2.

# Index

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