# MINIFLEX LR PROGRAMMABLE LEVEL CONTROLLER

## INSTALLATION AND OPERATION MANUAL

## FOR SOFTWARE MINIFLEX LR1.11 and later


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# MINIFLEX LR USER MANUAL - INDEX



***Major changes from previous issue***

***1. ATEX transducers added***
***2. Separate temperature probe deleted***
***3. Fuse F4 uprated to 500mA***
***4. Door security screws added***

# MINIFLEX LR PROGRAMMABLE LEVEL CONTROLLER

## USER MANUAL

## INTRODUCTION

Miniflex LR is a programmable multi-purpose level measurement and flow control instrument. It consists of two elements, a wall mounted transceiver, which has a display and an integral keypad for programming, and a transducer, which must be mounted directly above the surface to be monitored.

Ultrasonic pulses are transmitted by the transducer to the surface of the material to be monitored and are reflected back to the transducer. The time period between transmission and reception of the sound pulses is directly proportional to the distance between the transducer and the material.

Since the speed of sound through air is affected by changes in temperature, a temperature-compensated transducer may be specified to improve accuracy .

Miniflex LR is capable of the following functions:-

a) Distance Measurement (distance from a datum)
b) Level Measurement (height above datum)
c) Volume Measurement
d) Pump Control
e) Open Channel Flow Measurement (O.C.M.)
f) Differential Level Measurement

**WARNING**

**DO NOT OPEN THE TRANSCEIVER TERMINAL COVER WHEN THE POWER IS ON TO THE SUPPLY OR RELAY TERMINALS.**

**IMPORTANT INSTALLATION REQUIREMENTS**

**1: A SWITCH OR CIRCUIT BREAKER SHALL BE INCLUDED IN THE INSTALLATION**

**2: IT SHALL BE IN CLOSE PROXIMITY TO THE EQUIPMENT AND WITHIN EASY REACH OF THE OPERATOR**

**3: IT SHALL BE MARKED AS THE DISCONNECTING DEVICE FOR THE EQUIPMENT**

**4: FOR ATEX INSTALLATIONS REFER TO APPENDIX 3**

# INSTALLATION

## Transceiver

### Enclosure mounting

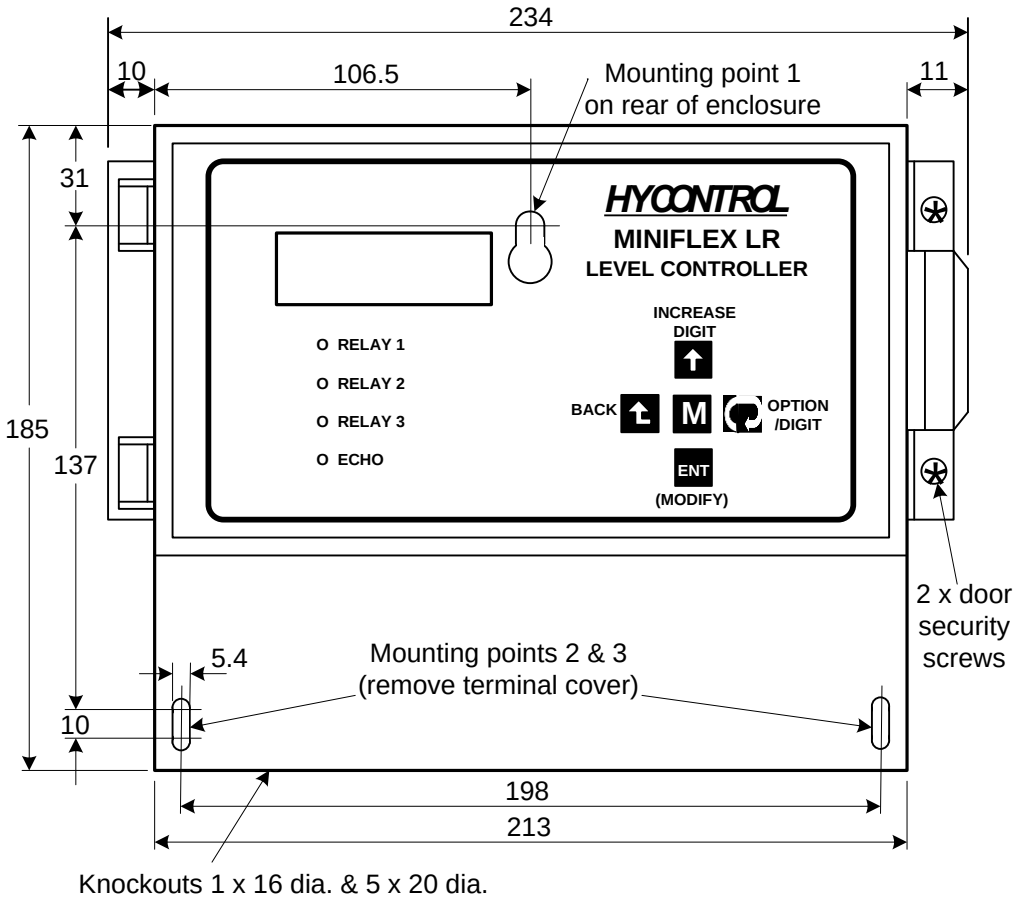
Ensure that the mounting surface is not subject to vibration and is not close to high voltage cables, contactors or drive controls. The unit should not be mounted in a confined space where temperatures may exceed the normal working temperature. If the unit is mounted outside, it must be protected from direct sunlight and severe weather conditions.

Remove the terminal cover, select knockouts in the base of the enclosure and fit cable glands to maintain the IP65 rating. Note that 3x M20 holes are already prepared.

Refer to the drawing below.
For mounting point 1, fix an M4 or M5 flat-head screw in the mounting surface, leaving a 4mm gap to the surface. Remove the terminal cover, hang the transceiver from the screw and secure it with 2x M4 or M5 flat-head screws at mounting points 2 & 3.
Do not use excessive force when tightening the screws and do not distort the enclosure.

Replace the terminal cover unless you now intend to proceed with wiring into the terminals.

***After programming the unit refit the 2 screws to secure the enclosure door***




ALL DIMENSIONS IN MM

***Figure 1: Enclosure dimensional & mounting drawing***

## Electrical and Transducer Connections

The Miniflex LR has two-part screw terminals; the top part can be removed for ease of connection. It can be powered from either an AC or DC supply.

**Power Supply** Remove the terminal cover to expose the terminals shown below.

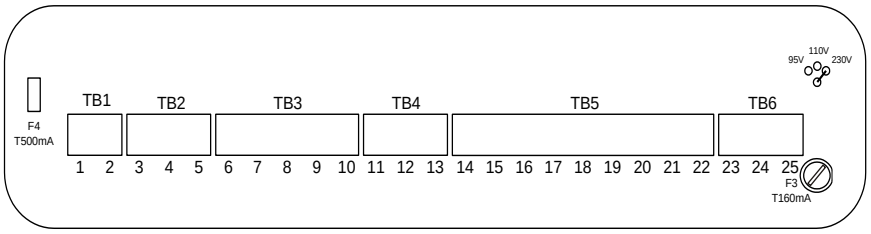



***Figure 2: Terminals as seen in Miniflex LR.***

The wiring instructions are on the inside of the terminal cover as shown below.

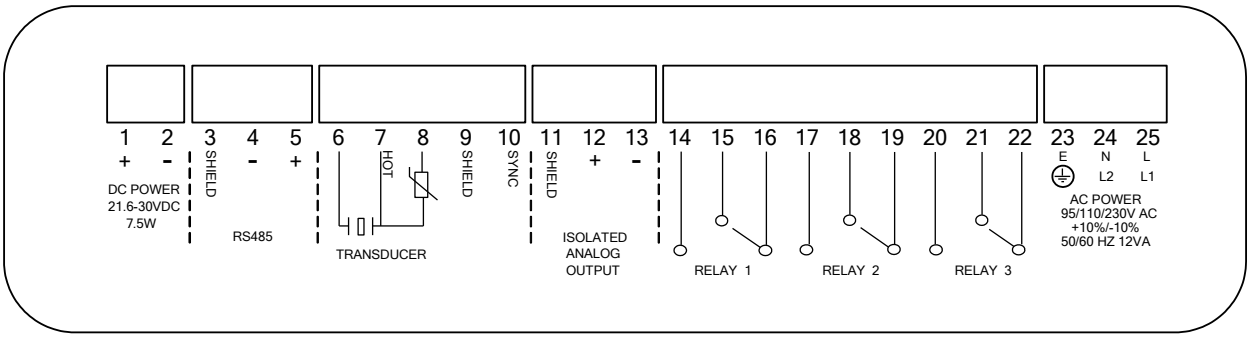



***Figure 3: Wiring diagram label inside Miniflex LR terminal cover***

**AC Supply** The instrument will accept either 95V, 110V or 230VAC ±10%, 50Hz or 60Hz, 12VA. A time lag fuse T160mA is fitted.

Select the voltage required using the jumper link situated just above terminal TB6.

| | | | |
|---|---|---|---|
| Pass mains cable through cable gland and | - Connect:- | Earth | to terminal 23 |
| | | Neutral | to terminal 24 |
| | | Live | to terminal 25 |

**DC Supply** The instrument will accept 21.6 - 30VDC, 7.5W. A time lag fuse T500mA is fitted.

| | | | |
|---|---|---|---|
| | - Connect :- | Positive +ve | to terminal 1 |
| | | Negative -ve | to terminal 2 |

## Relays

**3 SPDT Relays** - rated at 8A/250VAC 8A/30V DC resistive, are connected at terminals 14 to 22, for activating external alarms, contactors, pumps etc..

**Transducer**

| | | |
|---|---|---|
| **Transducers RYVK15, RWVK15,** | | |
| **RYVK15-ATEX & RWVK15-ATEX** - are connected:- | Black | to terminal 6 |
| | Blue | to terminal 7 |
| | Shield | to terminal 9 |

| | | |
|---|---|---|
| **Temperature compensated transducers RYTK15, RWTK15,** | | |
| **RYTK15-ATEX & RWTK15-ATEX** - are connected:- | Shield | to terminal 6 |
| | Blue | to terminal 7 |
| | Black | to terminal 8 |

**Analogue Output**

| | | |
|---|---|---|
| **Analogue** - is connected:- | Shield | to terminal 11 |
| | Positive +ve | to terminal 12 |
| | Negative -ve | to terminal 13 |

**RS485 Output**

| | | |
|---|---|---|
| **RS485** - is connected:- | Shield | to terminal 3 |
| | Negative –ve | to terminal 4 |
| | Positive +ve | to terminal 5 |

**Note: - See Page 8 for transducer extension cables.**

**Note:- When using temperature compensated transducer type RYTK15-ATEX or RWTK15-ATEX, software must be Miniflex LR1.11 or later; see Pr.12.11 on page 34. This software version defaults to operate these types of transducer. If your unit has earlier software, contact Hycontrol for advice.**

**If you are using an older transducer, type RYT15, RYTK15, RWT15 or RWTK15 i.e. without the suffix "ATEX", you must select "12.14.2 Trans R*TK15" at Pr.12.14 (see page 34)**

**This note does not apply to transducers without temperature compensation i.e. RYV15, RYVK15, RYVK15-ATEX, RWV15, RWVK15, RWVK15-ATEX**

## Transducer Mounting

The transducer can be supplied as 'standard' or mounted in a flange. For improved chemical compatibility the transducer is available fully enclosed in PVDF in a standard mounting or with a flange. Figure 4 shows the dimensions:

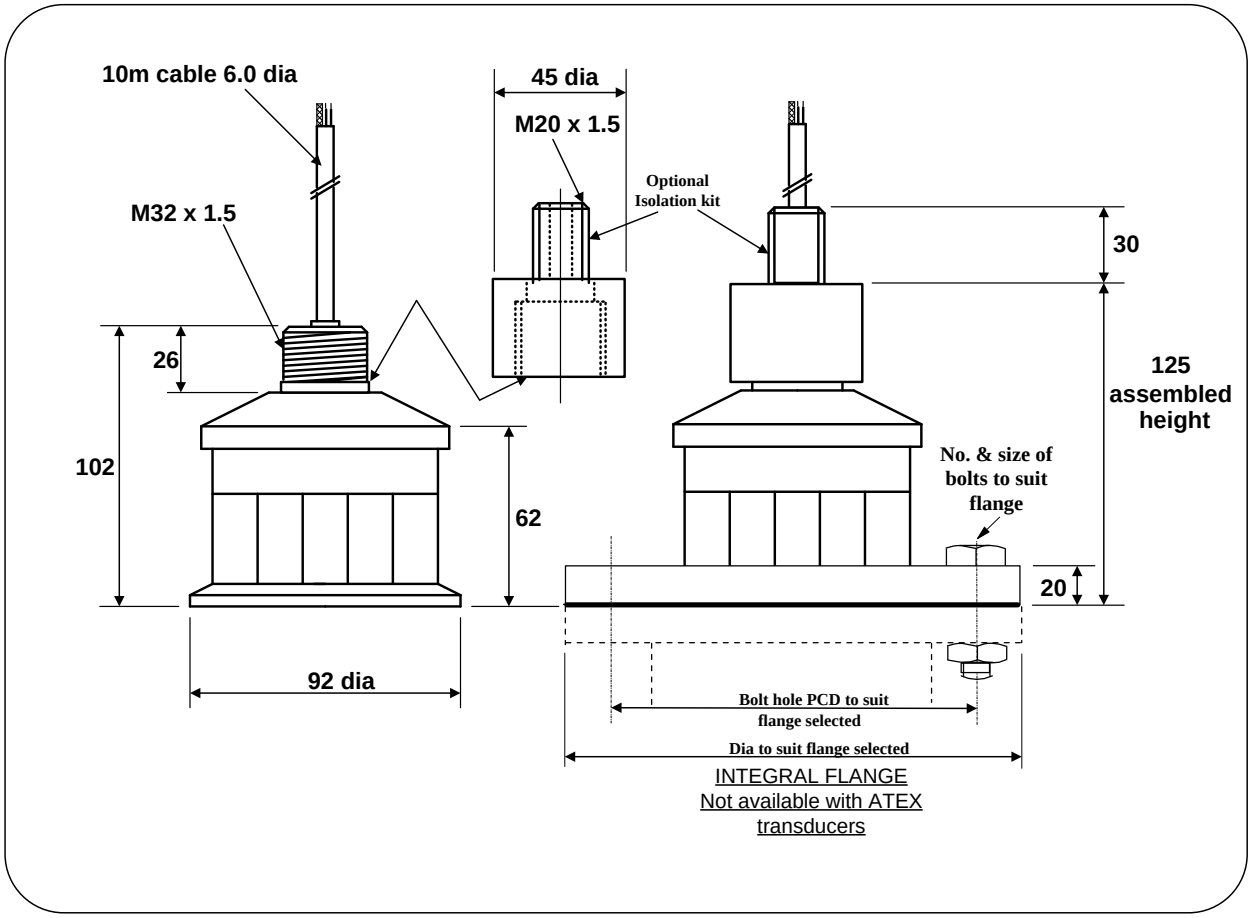



***Figure 4: Transducer dimensions***

An isolation kit is provided with each transducer to minimise any ringing transmitted through the mounting structure.

The transducer must be mounted perpendicular to the monitored surface and, ideally, at least 0.5 metres above it.

The transducer has a 12° inclusive conical beam angle at -3dB and must be mounted with a clear unobstructed sight of the liquid to be measured over the complete measurement range.

The transducer is provided with integral cable which can be extended up to 300 metres using a suitable junction box and RG62AU cable. The temperature compensated transducer requires an additional single core screen extension, or twin-axial cable.
Refer to Page 8 for full details.

**Transducer cables should be separated from power cables by at least 150mm and preferably installed in their own earthed steel conduit.**

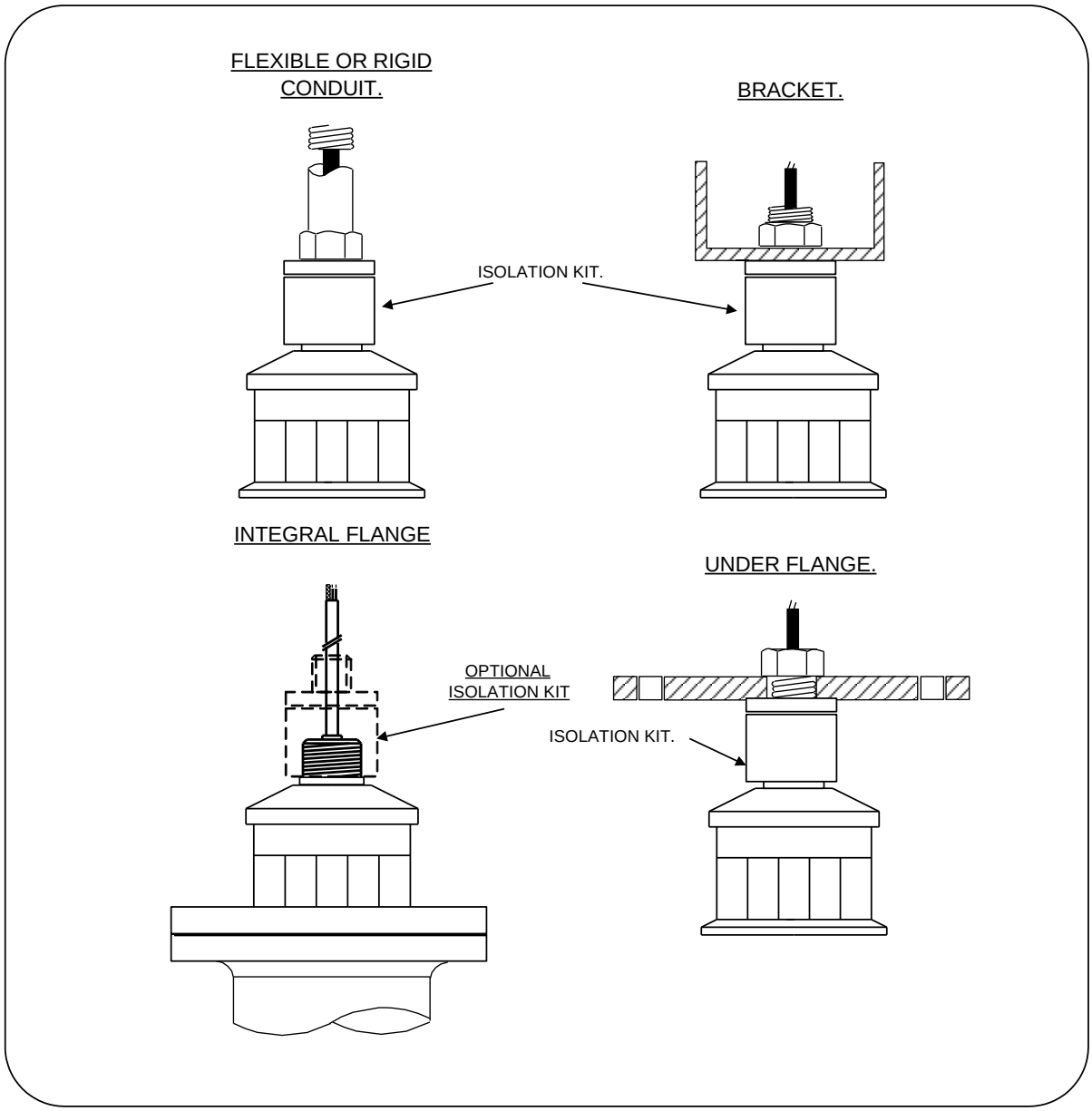



***Figure 5: Alternative mounting arrangements for transducers***

**Do not** mount transducers incorporating temperature compensation in direct sunlight.

**Do not** over-tighten the bolts on flange construction transducers.

**Flange transducers are not pressure rated** and are suitable only for atmospheric pressure.

**ATEX** approved transducers must be mounted and wired in accordance with the appropriate National Standards concerning installation in hazardous environments for Ex mb equipment.

**For differential applications** mount both transducers at the same height above the zero datum point.
**For open channel flow applications** the transducer must be mounted upstream of the flume or weir as detailed in BS3680 (usually 3 or 4 times maximum head).

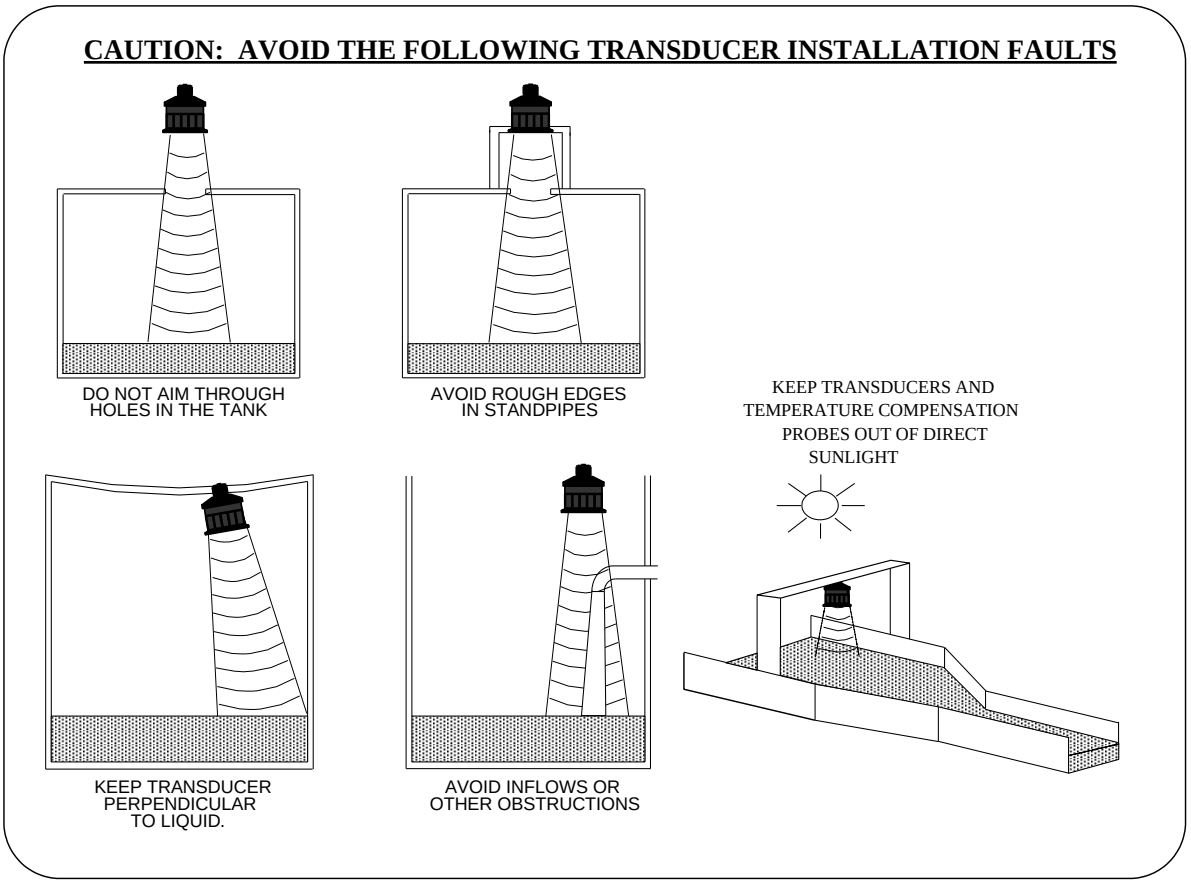



***Figure 6: Transducer installation faults***

## Standpipe Installations

In many applications access to a vessel must be made via a standpipe. However, it is necessary to observe some basic rules when fitting transducers into standpipes.

BLANKING: Parameter 4.0 should always be set at least 150mm longer than the length of the standpipe.

STANDPIPE DIMENSIONS: Should be in accordance with the following table

| Flange size and minimum bore of standpipe | Maximum length of standpipe |
|---|---|
| 3" ( 80mm) | 300mm |
| 4" (100mm) | 300mm |

e.g. Using a 4" flanged transducer would require the standpipe length to be no more than 300mm and Pr.4.0 set at 450mm minimum.

**The inside of the pipe and joint with vessel top must be clean and free of any obstructions, seams or welds.**

## Transducer Cable Extensions

Transducer cables may be extended using junction boxes as shown in Figure 7:

**Note! For ATEX installations refer to BS EN 60079-14 (current issue)**

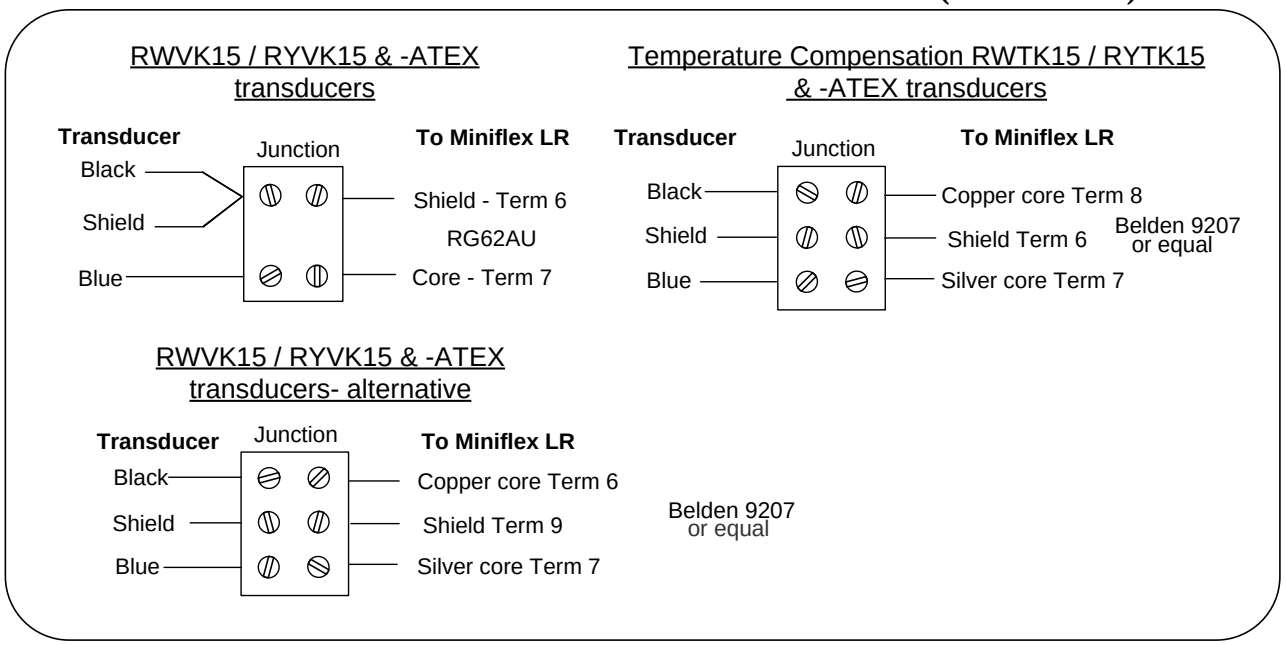



***Figure 7: Transducer cable extension diagram***

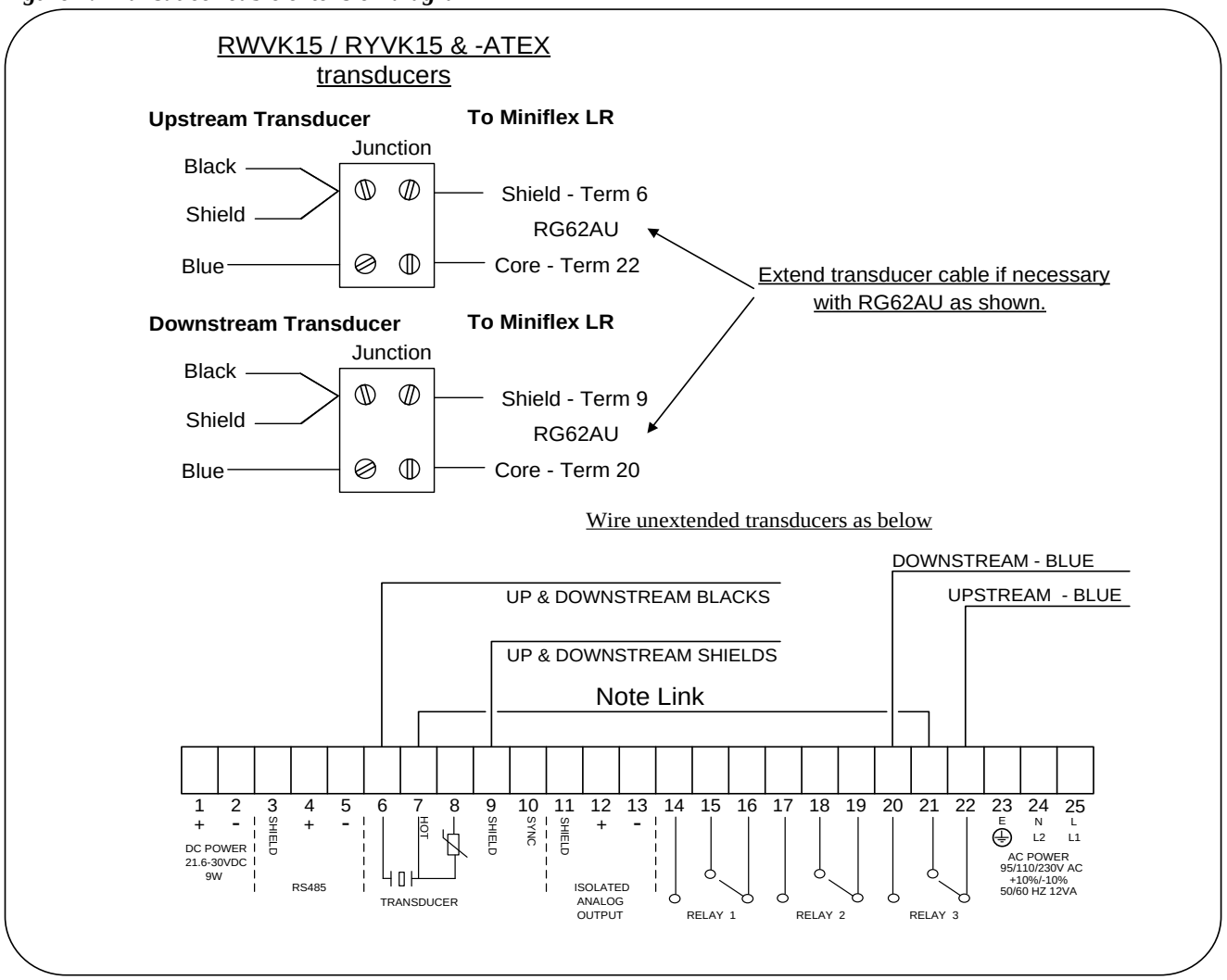



***Figure 8: Transducer wiring for differential mode***

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# QUICK START FOR MINIFLEX LR

The Miniflex LR system requires programming by the operator to obtain the required measurements and control. To create a basic working system, only the application type and parameters 2.0 to 5.0 need be programmed. To become familiar with the use of the system, it is suggested that the following QUICK START guide is used before the instrument is installed.
Refer to the notes on page 4 before starting.

## Quick Start Guide

1. Connect power and transducer cables as defined on the instrument.

| | **dc Power Supply** | | **Temperature compensated Transducer** | | | **ac Power Supply** | | |
|---|---|---|---|---|---|---|---|---|
| Terminal Nos: | [1 ] | [2] | [ 6 ] | [ 7 ] | [8 ] | [ 23 ] | [ 24 ] | [ 25] |
| | +ve | -ve | Shield | Blue | Black | E | N | L |

2. Close the front cover and secure in position before switching on the power. The instrument is supplied factory set to work in distance measurement up to 10 metres from the transducer.

3. Hold the transducer approximately 1.5 metres from a flat surface and switch on.

   After a short period, the display will show the distance (e.g. 1.50) between the transducer and the surface.

   If the transducer is now moved slowly towards the surface, the reading should decrease. This shows that the unit is correctly wired and is operating as expected in response to the reduction in distance.

   If the reading increases as the transducer is moved towards the surface, it indicates that the unit has been previously programmed to read level not distance.

## Principle of Programming

The Miniflex LR has two modes:-

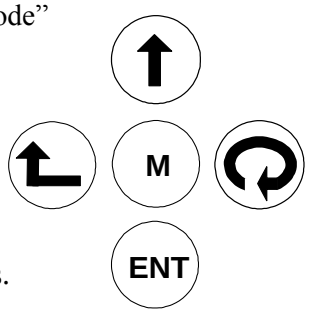
a) RUN (Normal operating)
In the 'RUN' mode, the instrument is monitoring the target, displaying values and setting outputs as programmed by the operator.

b) Program Mode (Programming)
In the 'Program Mode' the operator uses the keypad in conjunction with the display to adjust the settings and to test that the unit is programmed correctly.

## Keypad Definitions

The keypad consists of 5 keys which are used to programme the operation of the transceiver. These keys also have secondary functions enabling the operator to view the results being obtained by the instrument during its normal 'RUN' cycle.

**Primary Key Functions**




**M** = Mode Key - to go from "RUN" to "Program Mode"
- or to go from "Program Mode" to "RUN" Mode

**ENT** = ENTER - to enter a value or option change or start a simulation if parameter 12.5.2 is entered.

↑ = In program mode to increase the selected digits value.

↵ = To move back to the main sections of parameters.

↻ = Scroll through options or move cursor to the right if there is a value.

**Alternative Key Functions**

The 4 peripheral keys have secondary functions which can be viewed without interrupting the instrument's operation. In the normal "RUN" mode:-

Press ↑ = Display will show head and flow values when in OCM mode.

Press ↻ = Display will show the echo distance in metres and "GAIN" with a value from 0.2 to 100, which represents strength of echo. Low numbers mean strong echo.

Press ↵ = Display will show the operating temperature if using a temperature compensated transducer or 20ºC with standard transducer, and the analogue output value in mA.

Press **ENT** = Display will show the number of Alarms and Starts for relay 1, if the button is pressed again whilst displaying the value for relay 1 it will change to relay 2 and if pressed again relay 3.

**NOTE:-** The Miniflex LR comes with pre-programmed applications, which can be simply modified to meet your applications requirements. See SECTION 4 for more details.

**1) To Enter Programme**

Press **M** - Display will show "Program Mode"
Press ↑ immediately - Display will show either Distance Measurement, Level Measurement, Volume Measurement, Pump Control, Open Channel Flow Monitoring or Differential Measurement.

If you wish to change the selected application press ↻ to move through the applications, you will be asked to enter the password.

**2) To Enter the Password**

The first time that you try to change the application, a value or a parameter option, you will be required to enter the password. The default for this is 1000. You use the ↑ and the ↻ to change the digits then **ENT** when you have finished, if you enter the wrong code the display value will be cleared and you will need to try again.

**3) To Accept the Current Selection press ENT**

Continue to press **ENT** - To accept the value or option and move to the next applicable parameter.

**4) To Change the Value of a Number**

Press ↑ - To increase value of flashing digit between 0 and 9. It will then roll over to its minimum and start again.

Press ↻ - To move the cursor right and select the next digit to be changed, then Press ↑ to change its value as above.

Press **ENT** - To enter the new value. The display will then show the next parameter in the list.

**5) To Change a Y or N Option**

Certain parameters have been put into sections to avoid stepping through numerous parameters that you may not need to change initially. Each of the sections will have a Yes or No option.

```
8.0 Edit relays
                No
```

To change the relay settings use the ↑ to change a 'No' to a 'Yes' or to skip that section just press **ENT**.

```
8.0 Edit relays
               Yes
```

When you have made your selection press **ENT** to move to the next parameter.

**6) To Change an Option**

A display which shows a label enclosed in brackets means that this is the currently selected value for this parameter, but it can be changed.

e.g.

```
8.1 Rly1 Options
(Norm–Energised)
```

Press **ENT**
To change value press ↑

```
8.1.1        Relay 1
Norm - Energised
```

Press ↻ to change the option

```
8.1.2        Relay 1
Norm-DeEnergised
```

Press ↻ to change the option again

```
8.1.3        Relay 1
Temp Alarm
```

When you come to the option you want press **ENT** to accept the new selection and move on the next parameter in the list.

**(Shortcut for more familiar users)**
Alternatively if you don't need to make a change to this parameter and its associated settings you can move to the next parameter in the top level by using the ↻ key.

**e.g.** | **8.1 Rly1 Options (Norm-Energised)** | ↻ | **8.2 Rly2 Options (Norm–Energised)** | ↻ | **8.3 Rly3 Options (L.O.E. Alarm)** |

When you come to a parameter you want to adjust press **ENT** and follow step **4)**, **5)** or **6)** depending on whether there is a value to enter, a yes or no option or select an option.

**7) To complete Programming and Return to RUN Mode**

Press **M** - The display will show "Storing Values" and "Data stored to memory", if a value has been changed. Then "Searching for target" and then the measured value in the selected units.

**8) To Reset all Parameters to Factory Default**

Press **M** if not already in program mode - Displays "Program mode".

Press ↑ To display a parameter (it can be any one)

To reset the instrument you need to display the first parameter of any application i.e. Distance Measurement, Level Measurement, Volume Measurement, Pump Control, Open Channel Flow Monitoring or Differential Measurement. If it is not displayed, use the ↰ key to move back through the program to the first parameter.

Then press both ↰ and ↻ simultaneously and when prompted Enter the password. The instrument will reset the parameters, custom tables and totaliser, and reverts back to displaying Distance Measurement.

## Simulation mode

To simulate a program go to parameter **12.5.2 Simulate Yes** then press **ENT**.

Keys

**M** = Exits simulation mode

**ENT** = Direction to decrease displayed value

↑ = Direction to increases displayed value

↰ = Reduce speed by 2 from a maximum of 64x to 1x. The initial speed of 1x is set by the rate of change defined in parameter 6.0.

↻ = Increase speed by 2. From 1x to a maximum of 64x.

# PARAMETER INDEX
# MINIFLEX LR

# PROGRAMMING THE INSTRUMENT

NOTE:- (D = ) factory default entry for that parameter.

## Step 1: - Select application (Pr.1.0)

**Application** (D = Distance Measurement)
This will automatically load the applicable default program which can then be modified to suit your application.
At initial start up display will show one of below listed options: -

| | |
|---|---|
| **Distance Measurement** | (Page 35) |
| **Level Measurement** | (Page 36) |
| **Volume Measurement** | (Page 37) |
| **Pump Control** | (Page 38) |
| **Open Channel Flow Monitoring** | (Pages 39 – 40) |
| **Differential Measurement** | (Pages 41 – 42) |

For more details see Pr.1.0 Application Selection Guide (Page 16)

## Step 2: - Enter Basic Set-up parameters

Complete Basic Set-up section - Page 17

## Step 3: - Dependent on application, go to appropriate section in manual.

For Distance Measurement go to Page 35.
For Level Measurement go to Page 36.
For Volume Measurement go to Page 37.
For Pump Control go to Page 38.
For Open Channel Flow Monitoring go to Pages 39 - 40.
For Differential Measurement go to Pages 41 - 42.

## Step 4: - Set any relay conditions

Relay section go to Pages 24 - 26

## Step 5: - Set any failsafe conditions

Failsafe section go to Page 30

## Step 6: - Set any analogue conditions

Analogue section go to Pages 31 - 32

## Step 7: - Set any miscellaneous conditions

Miscellaneous section go to Pages 33 - 34

## Step 8: - Exit program mode and return to run mode

Go to Section 7 Page 13

# Pr.1.0 APPLICATION SELECTION GUIDE

Miniflex LR can be programmed for Distance measurement, Level measurement, Volume measurement, Pump control, OCM and Differential measurement. Each application selected will allow access to only parameters associated with that application.

## Distance Measurement

Displays a distance measurement; relay set and reset points can be programmed and a relay can be programmed for Loss Of Echo indication. A 4-20mA output proportional to the displayed distance is provided.

## Level Measurement

Displays a level; relay set and reset points can be programmed and a relay can be programmed for Loss Of Echo indication. A 4-20mA output proportional to level is provided.

## Volume Measurement

Displays contents, ullage or both contents and ullage. Choose from a variety of vessel shapes including vertical and horizontal cylinders or a 24-point custom table. Display in Litres, Gallons, Tons, Tonnes, Kg, m3 or %. Provide a 4-20mA output proportional to contents or ullage.

## Pump Control

For pump control applications; can include pump sequencing, duty standby, pump maintenance and pump run on.

## Open Channel Flow Monitoring (O.C.M.)

For flow measurement, using BS3680 flumes and weirs, Parshall flumes, or custom table for non-standard devices. Displays flow rate in litres/sec or gallons/sec and totalises in a variety of units. Provides a pulse output to drive an external totaliser and a 4-20mA output proportional to level or flow.

## Differential Measurement

Uses two transducers switched automatically. The display indicates the difference between two levels and gives a 4-20mA output proportional to the reading. Relay set and reset points can be programmed and a relay can be programmed for Loss Of Echo indication.

## Basic Set-up

**Pr.2.0** **Empty Dist** Empty Distance in Metres

| | Distance | Level | Volume | Pump | OCM | Differential |
|---|---|---|---|---|---|---|
| Default | 10.00 | 6.000 | 6.000 | 6.000 | 1.200 | 2.000 |

The approximate distance from the face of transducer to the furthest point away, usually the bottom of the container or channel. Enter the distance in metres.

Resolution is a function of this parameter.

**Pr.3.0** **Span** Operational Span in Metres

| | Distance | Level | Volume | Pump | OCM | Differential |
|---|---|---|---|---|---|---|
| Default | 10.00 | 5.500 | 5.500 | 5.500 | 0.280 | 0.500 |

The distance between the furthest and nearest points over which measurement is required. Enter the distance in metres.
For OCM, span = maximum head.
For differential applications, the value required is the maximum difference in the levels to be measured.

**Pr.4.0** **Blanking** (D = 0.500 Metres)
Blocking or Blanking Zone.

Minimum distance from transducer face to target, within which no return echoes will be processed. It is important to ensure that the target material does not enter this zone.

Enter in metres.

**DO NOT REDUCE THE FACTORY SET VALUE WITHOUT REFERENCE TO HYCONTROL.**

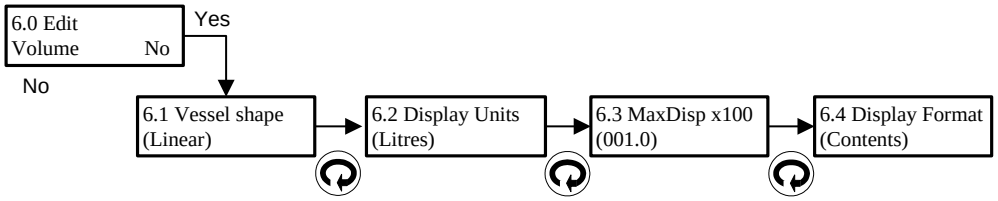
**Pr.5.0** **RateOfChange** Rate Of Change in Metres/Min

| | Distance | Level | Volume | Pump | OCM | Differential |
|---|---|---|---|---|---|---|
| Default | 10.00 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |

This value should be as small as possible but greater than the maximum rate of change of level. **Do not** change this value unless you know that the rate of change is greater than 1.0m/min or that the system continually 'tracks' a level lower than the actual level.
If it is necessary to change the value, enter the new value in m/min; the suggested range is 0.1 to 10.

# Volume Measurement

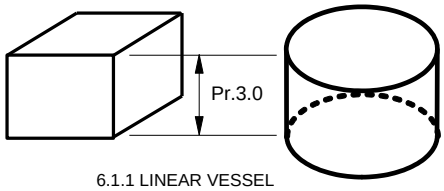
The following main parameters set up a volume measurement application.




## Pr.6.1 Vessel shape (D = Linear)

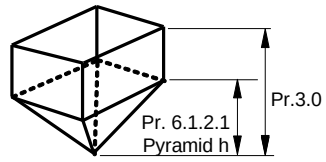
| Options displayed | Description |
|---|---|
| **6.1.1 Linear Vessel** | Linear vessel |
| **6.1.2 Vertical Pyramid Bottom** | Vertical cylindrical tank with pyramid bottom |
| **6.1.3 Vertical Conical Bottom** | Vertical cylindrical tank with conical bottom |
| **6.1.4 Vertical Spherical Bottom** | Vertical cylindrical tank with half spherical bottom |
| **6.1.5 Vertical Dished Bottom** | Vertical with dished bottom |
| **6.1.6 Horizontal Cylind Flat Ends** | Horizontal cylinder with flat ends |
| **6.1.7 Horizontal Cylind Dish Ends** | Horizontal cylinder with dished ends |
| **6.1.8 Custom table – 24point** | 24 point linearisation table – See appendix 1 |

Additional parameters may be required dependent on vessel shape selection.



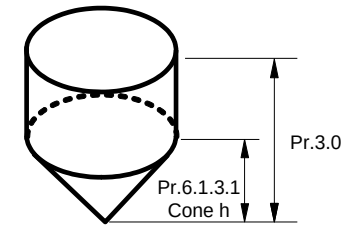

6.1.1 LINEAR VESSEL

**No additional parameters**



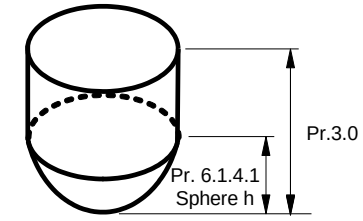

6.1.2 VERTICAL PYRAMID BOTTOM

**Pr 6.1.2.1 Pyramd h** (D = 0.00)
Enter pyramid h in metres.



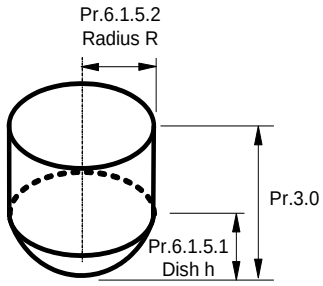

6.1.3 VERTICAL CONICAL BOTTOM

**Pr 6.1.3.1 Cone h** (D = 0.00)
Enter cone h in metres.




6.1.4 VERTICAL SPHERICAL BOTTOM.

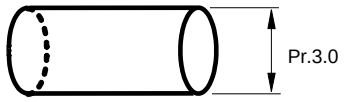
**Pr 6.1.4.1 Sphere h** (D = 0.00)
Enter sphere h in metres.




6.1.5 VERTICAL DISHED BOTTOM.

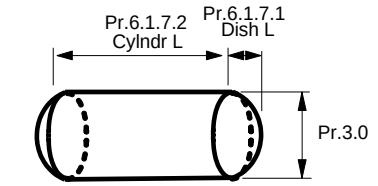
**Pr 6.1.5.1 Dish h** (D = 0.00)
Enter dish h in metres.

**Pr 6.1.5.2 Radius R** (D = 0.00)
Enter radius R in metres.




6.1.6 HORIZONTAL CYLINDER FLAT ENDS.

**No additional parameters**




6.1.7 HORIZONTAL CYLINDER DISHED ENDS.

**Pr 6.1.7.1 Dish L** (D = 0.00)
Enter dish L in metres.

**Pr 6.1.7.2 Cylndr L** (D = 0.00)
Enter cylinder L in metres.

**Pr. 6.2 DisplayUnits** Display Units (D = %)

| Options displayed | Description |
|---|---|
| **6.2.1 Units Litres** | Units label displayed in Litres |
| **6.2.2 Units Gallons** | Units label displayed in Gallons |
| **6.2.3 Units Tons** | Units label displayed in Tons |
| **6.2.4 Units Tonnes** | Units label displayed in Tonnes |
| **6.2.5 Units Kg** | Units label displayed in Kg |
| **6.2.6 Units m3** | Units label displayed in m3 |
| **6.2.7 Units %** | Units label displayed in % |

**Pr. 6.3 MaxDsp x 100** Maximum display x 100 (D = 1.0)

Enter - full scale display ÷ 100
e.g. if 100% = 2000 litres and display required in litres then set Pr. 6.3 to 2000 ÷ 100 = 20.

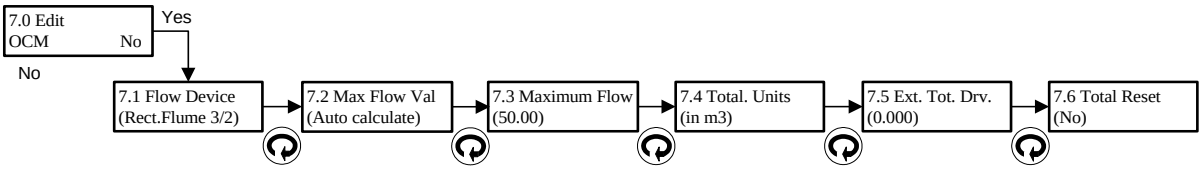
This parameter should not be adjusted in conjunction with **6.2.7 Units %** as it will invalidate the % reading.

**Pr. 6.4 Disp. Format** Display Format (D = Contents)

| Options displayed | Description |
|---|---|
| **6.4.1 Display Contents** | Display contents only |
| **6.4.2 Display Ullage** | Display ullage only |
| **6.4.3 Display Ullage &Contents** | Display both ullage and contents |

# Open Channel Flow Monitoring (O.C.M.)

The following main parameters set up an Open Channel Flow Monitoring application.



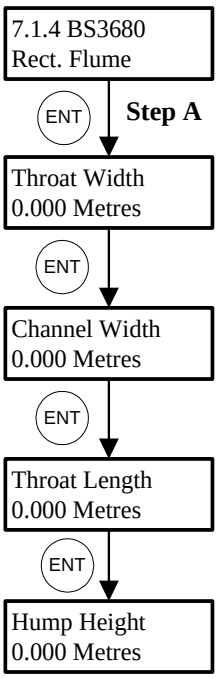

**Pr.7.1 Flow device** (D = Rect. Flume 3/2)

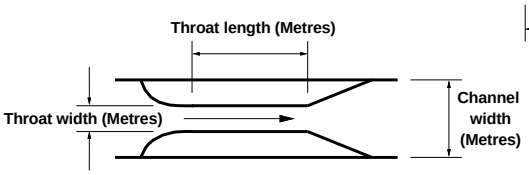
The instrument provides options for three standard ratio-metric flow devices, three BS3680 flow devices, a variety of Parshall flumes or a custom 24-point table. Select the flow device from the following list.

| Options displayed | Description | Action |
|---|---|---|
| **7.1.1 Std. Ratio Rect. Flume 3/2** | Standard Ratio Rectangular flume 3/2 | |
| **7.1.2 Std. Ratio Rect. Weir 3/2** | Standard Ratio Rectangular weir 3/2 | |
| **7.1.3 Std. Ratio V-Notch Weir 5/2** | Standard Ratio V-notch weir 5/2 | |
| **7.1.4 BS3680 Rect. flume** | BS3680 Rectangular flume | * Follow BS3680 set-up at step A |
| **7.1.5 BS3680 Rect. weir** | BS3680 Rectangular weir | * Follow BS3680 set-up at step B |
| **7.1.6 BS3680 V-notch weir** | BS3680 V-notch weir | * Follow BS3680 set-up at step C |
| **7.1.7 Parshall Flumes** | Parshall Flumes | * Follow PARSHALL set-up step D |
| **7.1.8 Custom table** | 24-point linearization table. | Refer to Appendix 1 |

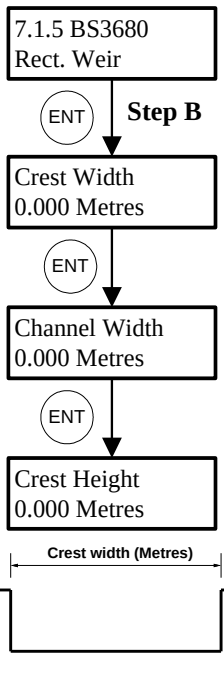
BS3680 set-ups

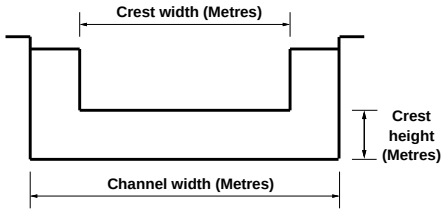
Rectangular flume



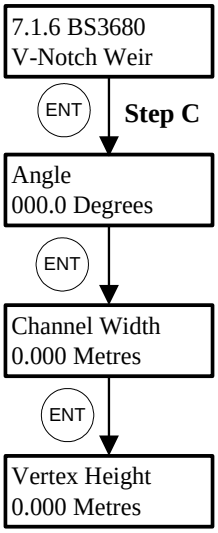



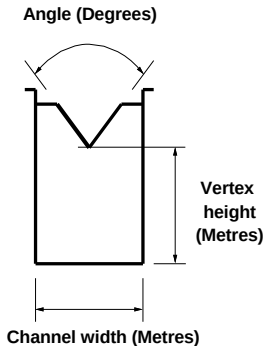

Rectangular weir




V-notch weir



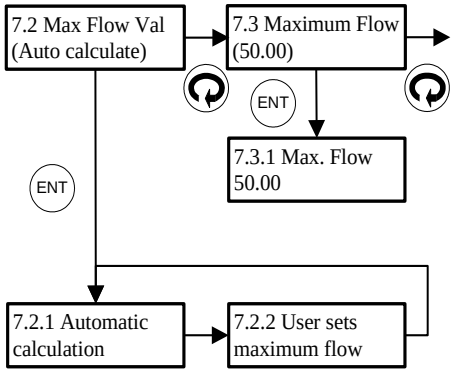



**Step D: -**
Select from one of the following options for a Parshall flume
(See also Appendix 5)

| Options displayed | Description - Parshall flume type |
|---|---|
| **7.1.7.1 Parshall 1,2,3,24 inches** | 1,2,3 or 24 inches |
| **7.1.7.2 Parshall 6 inches** | 6 inches |
| **7.1.7.3 Parshall 9 inches** | 9 inches |
| **7.1.7.4 Parshall 12 inches** | 12 inches |
| **7.1.7.5 Parshall 18 inches** | 18 inches |
| **7.1.7.6 Parshall 36 inches** | 36 inches |
| **7.1.7.7 Parshall 48 inches** | 48 inches |
| **7.1.7.8 Parshall 72 inches** | 72 inches |
| **7.1.7.9 Parshall 96 inches** | 96 inches |
| **7.1.7.10 Parshall 10 – 50 feet** | 10 to 50 feet |

## **Pr. 7.2 Max Flow Val** ** Only applies if 7.1 set to BS3680* Maximum Flow Value (D = Auto calculation)

There are two types of calculation either *Auto calculate*, if you want the instrument to calculate the flow automatically or *Input by User* if you want to enter the flow value manually.




| Options displayed | Description | Action following selection |
|---|---|---|
| **7.2.1 Automatic Calculation** | This option calculates maximum flow based on the entered flume or weir values and the maximum head in metres @ **Pr.3.0 Span.** The calculated flow is stored in litres/sec @ Pr.7.3.1. | Calculates a new flow value based on entered parameters and rewrites this flow in litres/sec then displays this value in Pr.7.3 |
| **7.2.2 User sets maximum flow** | Selecting this option requires you to enter manually the maximum flow corresponding to the maximum head **(Pr.3.0**) using units selected @ 7.4/7.5. Enter maximum flow @ **PR. 7.3.1.** | Displays Pr.7.3.1. does not modify the existing entered value. |

**Pr. 7.3 Maximum Flow** (D = 50.00)

Enter the maximum flow rate in selected units corresponding to maximum head, set at Pr. 3.0

| Text displayed | Description |
|---|---|
| **7.3.1 Max. Flow 50.00** | Maximum Flow |

Note
1. If you are using a BS3680 flume or weir in auto calculate mode the maximum flow will be calculated in l/sec and stored by the instrument, overwriting any previous value.

**Pr.7.4 Flow Units** (D = in Litres)

| Option displayed | Description |
|---|---|
| **7.4.1 Flow Units in Litres** | Flow Units in Litres |
| **7.4.2 Flow Units in m3** | Flow Units in m3 |
| **7.4.3 Flow Units in Gallons** | Flow Units in Gallons |

Select from one of the above options: -

**Pr.7.5 Flow Timebase** (D = in units per second)

| Option displayed | Description |
|---|---|
| **7.5.1 in units per second** | Flow timebase in units per second |
| **7.5.2 in units per minute** | Flow timebase in units per minute |
| **7.5.3 in units per hour** | Flow timebase in units per hour |
| **7.5.4 in units per day** | Flow timebase in units per day |

Select from one of the above options: -

**Pr.7.6 Total. Units** Totaliser Units (D = m3)

| Option displayed | Description |
|---|---|
| *Metric measurement* | |
| **7.6.1 Totalise In Litres** | Totalise flow in Litres |
| **7.6.2 Totalise In m3** | Totalise flow in m3 |
| **7.6.3 Totalise In 1000 m3** | Totalise flow in 1000 m3 |
| *Imperial measurement* | |
| **7.6.4 Totalise In Gallons** | Totalise flow in Gallons |
| **7.6.5 Totalise In 1000Gals (kG)** | Totalise flow in 1000 Gallons |
| **7.6.6 Totalise In Million Gallons** | Totalise flow in Million Gallons |

Select from one of the above options: -

**Note:** You cannot mix metric and imperial units at PR. 7.4 / Pr. 7.6

**Pr.7.7 Ext. Tot. Drv.** External Totaliser Drive (D = 0.000)

If **8.3 Rly 3 option** (Page 26) is set to "**Totaliser Out.**" (**8.3.6**), then enter the amount, which each relay trip is to represent.

| Text displayed | Description |
|---|---|
| **7.7.1 Tot. Dri.** | On every multiple of this parameter output a pulse to drive an external totaliser. |

e.g.
**7.7.1 Tot. Dri. = 0.000**
External Totaliser Drive is disabled.

**7.7.1 Tot. Dri. = 1.000**
If "Totalise in Litres" selected at 7.6 then relay output is tripped every litre
If "Totalise in m3" selected at 7.6 then relay output is tripped every cubic metre (m3)
If "Totalise in 1000m3" selected at 7.6 then relay output is tripped every 1000 cubic metres (1000m3)

**7.7.1 Tot. Dri. = 1000**
If "Totalise in Litres" entered at 7.6 then relay output is tripped every cubic metre (m3)

After making entries in Pr.7.7.1, go to Pr.7.8 to clear and initiate totaliser.

**Pr.7.8 Total. Reset** Relay Hours/Starts Totaliser Reset (D = No)

| Option displayed | Description |
|---|---|
| **7.8.1 Totaliser Reset No** | No effect on totaliser |
| **7.8.2 Totaliser Reset Yes** | Resets the totaliser to 0 |

To clear the totalisers select the following:
**7.8.2 Totaliser Reset Yes**

The following messages “Totaliser reset” then “Totaliser stored” appear on the screen.

Note
1. Pr. 7.8 will never display (Yes) even after the totaliser is reset.

# Relays

The 3 relays can be assigned to various functions depending on the application, as shown below:

Hysteresis is fully adjustable, so for most functions it is necessary to enter both "set" and "reset" values.

The relay state under normal operating conditions is defined as:-

Normally energised. De-energise when "set" value is reached.

Normally de-energised. Energise when "set" value is reached.

"Failsafe" functions are detailed in Pr.10.1 – 10.5.

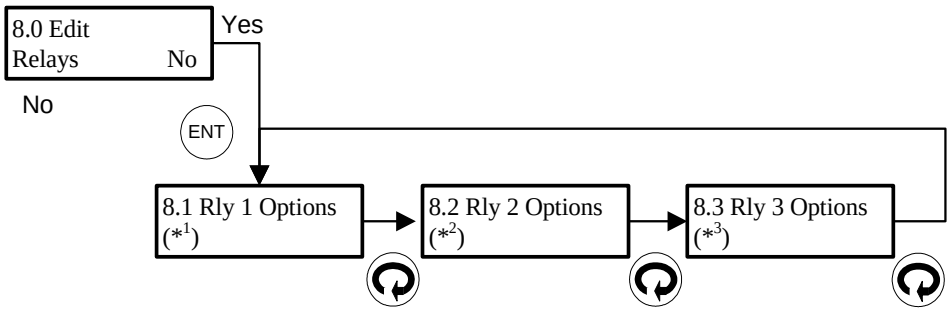
The relays can be programmed to give both high and low alarm or control levels.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| e.g. | High alarm | Set: | 2.0m | Low Alarm | Reset: | 0.5m |
| | | Reset | 1.8m | | Set | 0.2m |

The system will automatically configure itself as high or low alarm depending on which of the set and reset entries has the higher value.

Note that in distance measurement mode set by Pr 1.0, the highest value is furthest from the transducer.

The relays are controlled using parameter section 8.0 as follows: -




*1 See Pr.8.1 Relay 1 Options default table below
*2 See Pr.8.2 Relay 2 Options default table on Page 25
*3 See Pr.8.3 Relay 3 Options default table on Page 25

**Pr.8.1 Rly1 Options** Relay 1 Options

The default setting for Rly1 Options is dependent on the application as shown in the following table: -

| | Distance | Level | Volume | Pump | OCM | Differential |
|---|---|---|---|---|---|---|
| Default R | Off | Norm-Energised | Norm-Energised | Norm-DeEnerg | Flow Alarm | Diff Control |

Relay 1 options in *Distance*, *Level*, *Volume*, *Pump* and *OCM* mode: -

| Options displayed | Description |
|---|---|
| **8.1.1 Relay 1 Norm-Energised** | Relay 1 Normally Energised |
| **8.1.2 Relay 1 Norm-DeEnergised** | Relay 1 Normally De-Energised |
| **8.1.3 Relay 1 Temp Alarm *5** | Relay 1 Temperature alarm (Normally Energised) |
| **8.1.4 Relay 1 L.O.E. Alarm** | Relay 1 L.O.E. Alarm (Normally Energised) |
| **8.1.5 Relay 1 Off** | Relay 1 Off |
| **8.1.6 Relay 1 Flow Alarm *4** | Relay 1 Flow Alarm (Normally Energised) |

Options 8.1.1, 8.1.2, 8.1.3 and 8.1.6 require relay set and reset points to be entered in the units indicated on the display, except volume where they are set in percent.

Relay 1 options in *Differential* mode: -

| Options displayed | Description |
|---|---|
| **8.1.1 Relay 1 Differ. Alarm** | Relay 1 Differential Alarm (Normally Energised) |
| **8.1.2 Relay 1 Differ. Control** | Relay 1 Differential Control (Normally De-Energised) |
| **8.1.3 Relay 1 Temp Alarm *5** | Relay 1 Temperature alarm (Normally Energised) |
| **8.1.4 Relay 1 L.O.E. Alarm** | Relay 1 L.O.E. Alarm (Normally Energised) |
| **8.1.5 Relay 1 Off** | Relay 1 Off |
| **8.1.6 Relay 1 Downstream Alarm** | Relay 1 Downstream Alarm (Normally Energised) |
| **8.1.7 Relay 1 Upstream Alarm** | Relay 1 Upstream Alarm (Normally Energised) |
| **8.1.8 Relay 1 Alarm on Up/Down** | Relay 1 Alarm on both Upstream and Downstream (Normally Energised) |

Options 8.1.1, 8.1.2, 8.1.3, 8.1.6, 8.1.7 & 8.1.8 require relay set and reset points to be entered in the units indicated on the display.

## **Pr.8.2** **Rly2 Options** Relay 2 Options

The default setting for Rly2 Options is dependent on the application as shown in the following table: -

| | **Distance** | **Level** | **Volume** | **Pump** | **OCM** | **Differential** |
|---|---|---|---|---|---|---|
| Default | Off | Norm-Energised | Norm-Energised | Norm-DeEnerg | L.O.E. | Upstream Alarm |

Relay 2 options in *Distance*, *Level*, *Volume*, *Pump* and *OCM* mode: -

| Options displayed | Description |
|---|---|
| **8.2.1 Relay 2 Norm-Energised** | Relay 2 Normally Energised |
| **8.2.2 Relay 2 Norm-DeEnergised** | Relay 2 Normally De-Energised |
| **8.2.3 Relay 2 Temp Alarm *5** | Relay 2 Temperature alarm (Normally Energised) |
| **8.2.4 Relay 2 L.O.E. Alarm** | Relay 2 L.O.E. Alarm (Normally Energised) |
| **8.2.5 Relay 2 Off** | Relay 2 Off |
| **8.2.6 Relay 2 Flow Alarm *4** | Relay 2 Flow Alarm (Normally Energised) |

Options 8.2.1, 8.2.2, 8.2.3 and 8.2.6 require relay set and reset points to be entered in the units indicated on the display, except volume where they are set in percent.

***4** Option only available in OCM mode
***5** Requires t/comp transducer

Relay 2 options in *Differential* mode: -

| Options displayed | Description |
|---|---|
| **8.2.1 Relay 2 Differ. Alarm** | Relay 2 Differential Alarm (Normally Energised) |
| **8.2.2 Relay 2 Differ. Control** | Relay 2 Differential Control (Normally De-Energised) |
| **8.2.3 Relay 2 Temp Alarm *5** | Relay 2 Temperature alarm (Normally Energised) |
| **8.2.4 Relay 2 L.O.E. Alarm** | Relay 2 L.O.E. Alarm (Normally Energised) |
| **8.2.5 Relay 2 Off** | Relay 2 Off |
| **8.2.6 Relay 2 Downstream Alarm** | Relay 2 Downstream Alarm (Normally Energised) |
| **8.2.7 Relay 2 Upstream Alarm** | Relay 2 Upstream Alarm (Normally Energised) |
| **8.2.8 Relay 2 Alarm on Up/Down** | Relay 2 Alarm on both Upstream and Downstream (Normally Energised) |

Options 8.2.1, 8.2.2, 8.2.3, 8.2.6, 8.2.7 & 8.2.8 require relay set and reset points to be entered in the units indicated on the display.

## **Pr.8.3** **Rly3 Options** Relay 3 Options

The default setting for Rly3 Options is dependent on the application as shown in the following table: -

| | **Distance** | **Level** | **Volume** | **Pump** | **OCM** | **Differential** |
|---|---|---|---|---|---|---|
| Default | L.O.E. | L.O.E. | L.O.E. | L.O.E. | Totaliser Output | N/A |

Relay 3 options: -

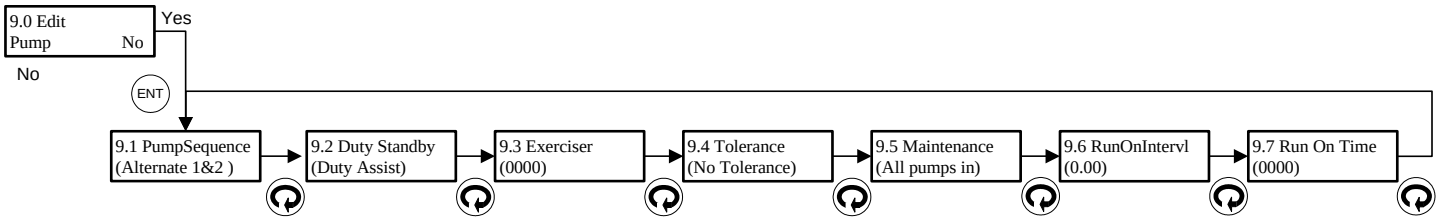
| Options displayed | Description |
|---|---|
| **8.3.1 Relay 3 Norm-Energised** | Relay 3 Normally Energised |
| **8.3.2 Relay 3 Norm-DeEnergised** | Relay 3 Normally De-Energised |
| **8.3.3 Relay 3 Temp Alarm *5** | Relay 3 Temperature alarm (Normally Energised) |
| **8.3.4 Relay 3 L.O.E. Alarm** | Relay 3 Loss Of Echo Alarm (Normally Energised) |
| **8.3.5 Relay 3 Off** | Relay 3 Off |
| **8.3.6 Relay 3 Totaliser Output *4** | Relay 3 Output pulse to external totaliser (Normally De-Energised) |

***4** Option only available in OCM mode
***5** Requires t/comp transducer

Options 8.3.1, 8.3.2 and 8.3.3 require relay set and reset points to be entered in the units indicated on the display, except volume where they are set in percent.

# Pump Control

The following main parameters set up a Pump Control application.




**Pr.9.1 PumpSequence** Pump Sequence (D = Alternate pumps1&2)

In order to even out the wear of pumps it is possible to alternate the sequence in which pumps are used.

Select the sequence from the following list.

| Options displayed | Description |
|---|---|
| **9.1.1 Off** | Sequence by set points (i.e. no alternation). |
| **9.1.2 Alternate pumps 1 & 2** | Alternate Relay 1 and Relay 2 (1-2 / 2-1 etc.) |
| **9.1.3 Alternate pumps 1,2 & 3** | Alternate Relay 1, Relay 2 and Relay 3 (1,2,3 / 2,3,1 / 3,1,2 etc.) |

**NOTE: When using Pr.9.1 with Pr.9.2 set to 9.2.2 or 9.2.3: -**

1. **All switch-off points should be set at the same level**
2. **Do not include alarm function relays in duty/standby routines.**

**Pr. 9.2 Duty Standby** (D = Duty Assist)

Duty assist is where pumps are switched on by set point, and kept on to assist earlier pumps. Duty standby is where only one of the pumps specified for duty can be on at a time, i.e. when the set point for the second pump is reached and it switches on, the first pump will switch off.

Select the duty sequence from the following list.

| Options displayed | Description |
|---|---|
| **9.2.1 Duty Assist** | Duty/assist operation |
| **9.2.2 Duty Standby 1 & 2** | Duty/standby on pumps 1 and 2 |
| **9.2.3 Duty Standby 1,2 & 3** | Duty/standby on pumps 1, 2 and 3 |

The turn-off points for the pumps can all be the same, or they can be different depending on the chosen "Set" and "Reset" values for each relay – unless using alternating sequence at Pr.9.1.

**Pr.9.3 Exerciser** (D = 0001)

To use this facility, first select alternating duty options 9.1.2 or 9.1.3 in Pr.9.1, depending on the number of pumps installed.
Enter the number of starts assigned to Pump 1 before the sequence switches to allow the other pumps to be exercised in turn.

**Pr.9.4 Tolerance** (D = No Tolerance)

In applications where a greasy topped liquid is being pumped, problems may occur due to build-up of grease at the levels where pumping starts. It is usually necessary for this to be cleared manually. To avoid this, varying the "turn on" point for the pumps by ± 10% of the set point value causes the build-up to occur over a larger area, significantly reducing the maintenance problem.

Select the tolerance setting from the following list.

| Options displayed | Description |
|---|---|
| **9.4.1 No Tolerance** | No tolerance applied to pumps |
| **9.4.2 Tolerance On** | Tolerance applied to all pumps |

**NOTE:** The programmed pump "reset" points must be outside the 10% tolerance zone and outside the blanking distance Pr.4.0.

**Pr.9.5 Maintenance** (D = All pumps in)

The removal of one pump for maintenance can necessitate a great deal of readjustment to ensure correct control. Pr.9.5 simplifies this by allowing one pump to be removed without affecting the control levels. Pumps are re-assigned downwards so that the highest level is not used, therefore, normal control levels are maintained for lower level settings.

Select the pump maintenance sequence from the following list.

| Options displayed | Description |
|---|---|
| **9.5.1 All pumps in** | All pumps in |
| **9.5.2 Drop out pump 1** | Drop out pump 1 |
| **9.5.3 Drop out pump 2** | Drop out pump 2 |
| **9.5.4 Drop out pump 3** | Drop out pump 3 |

**NOTE:**

a. The system assumes that the lower numbered pumps turn on first.

b. CAUTION - A PUMP NOT INCLUDED IN AN ALTERNATING SEQUENCE BUT PROGRAMMED INTO THE FIXED PART OF THE SEQUENCE WILL BE SUBSTITUTED INTO THE ALTERNATING SEQUENCE TO REPLACE A PUMP DROPPED OUT.

c. This feature should not be used if the relays are being used for a mixture of pump control and alarm functions.

**Pr.9.6 RunOnIntervl** Pump Run-on Interval (D = 0.00)

When submersible pumps are used, it may be necessary to pump down occasionally to clear the sludge from the bottom of the well. This feature is controlled by Pr.9.6 and Pr.9.7. Once in every interval defined by Pr.9.6, the pump will run-on for the time period defined by Pr.9.7.

Enter the time interval in hours between each run-on cycle.

**Pr.9.7 Pump Run-on Time** (D = 0)

Enter the pump running time in seconds. Maximum 120 seconds.

Only one run-on cycle occurs per interval as set by Pr.9.6.

**NOTE:**

a. Caution is required when choosing a value for pump run-on time, as extended pump run-on can lead to cavitation, causing air locks or pump damage.

b. As overflow can occur, **do not** use pump run-on for pump up operation, set Pr.9.6 and Pr.9.7 to zero.

c. Care should be taken if pump sequence and pump run-on are defined together, as pump run-on will be assigned to the last pump to turn off, which could be any of those in the sequence.

Note!
If turn-off points are all the same, run-on will be by the last pump to turn on.

If 2 or 3 pumps have the same turn-on points, there will be a delay of 3-5 seconds between each pump turn-on; the alternating sequence be maintained.

## Failsafe

On loss of power all relays will de-energise.
For other fault conditions e.g. damaged transducer, the failsafe relay state (after time delay selected at Pr.10.4), is selectable:-

**Pr.10.1 Relay 1** Relay 1 Failsafe

| | Distance | Level | Volume | Pump | OCM | Differential |
|---|---|---|---|---|---|---|
| Default | Hold State | Hold State | Hold State | De-Energise | Hold State | Hold State |

| Options displayed | Description |
|---|---|
| **10.1.1 Relay 1 Energise** | Relay 1 energises when in fail condition |
| **10.1.2 Relay 1 De-Energise** | Relay 1 de-energises when in fail condition |
| **10.1.3 Relay 1 Hold State** | Relay 1 holds state when in fail condition |

**Pr.10.2 Relay 2** Relay 2 Failsafe

| | Distance | Level | Volume | Pump | OCM | Differential |
|---|---|---|---|---|---|---|
| Default | Hold State | Hold State | Hold State | De-Energise | Hold State | Hold State |

| Options displayed | Description |
|---|---|
| **10.2.1 Relay 2 Energise** | Relay 2 energises when in fail condition |
| **10.2.2 Relay 2 De-Energise** | Relay 2 de-energises when in fail condition |
| **10.2.3 Relay 2 Hold State** | Relay 2 holds state when in fail condition |

**Pr.10.3 Relay 3** Relay 3 Failsafe (D = Hold State)

| Options displayed | |
|---|---|
| **10.3.1 Relay 3 Energise** | Relay 3 energises when in fail condition |
| **10.3.2 Relay 3 De-Energise** | Relay 3 de-energises when in fail condition |
| **10.3.3 Relay 3 Hold State** | Relay 3 holds state when in fail condition |

NOTE: Relay designated LOSS-OF-ECHO will always de-energise on failsafe.
Relay 3 Failsafe is not applicable in differential or OCM mode.

**Pr.10.4 Fail Time** Failsafe time delay

| | Distance | Level | Volume | Pump | OCM | Differential |
|---|---|---|---|---|---|---|
| Default | 600 | 600 | 600 | 30 | 30 | 600 |

Enter time delay value (in seconds) before unit goes to selected failsafe positions. Minimum value is 30 seconds. Maximum Value is 9999 seconds.

**Pr.10.5 mA Fail** Analogue and Display Failsafe (Pump D = High)
(Other applications D = Hold)

| Options displayed | Description |
|---|---|
| **10.5.1 Analogue Low** | Set analogue output low |
| **10.5.2 Analogue High** | Set analogue output high |
| **10.5.3 Analogue Hold** | Analogue output holds its value |

# Analogue

**Pr.11.1 Analog. O/P** Analogue Output (D = 4-20mA)

| Options displayed | Description |
|---|---|
| **11.1.1 Output 4-20mA** | related to span (Pr.3.0) or Pr.11.4.2 |
| **11.1.2 Output 20-4mA** | |
| **11.1.3 Output 0-20mA** | |
| **11.1.4 Output 20-0mA** | |
| **11.1.5 4-20mA Overrange** | will over-range 0-24mA if normal span (Pr.3.0) is exceeded |
| **11.1.6 0-20mA Overrange** | |

The output represents different variables depending on the application mode selected at Pr.1.0.

Limits are defined by Pr.3.0

| Pr. 1 Application | Output Proportional To |
|---|---|
| Distance Measurement | Target distance |
| Level Measurement | Level |
| Volume Measurement | Volume |
| Pump Control | Level |
| Open Channel Meter (OCM) | a) If 11.2.1 Output relative to Flow<br>b) If 11.2.2 Output relative to Head |
| Differential Level Measurement (DLD) | Differential level. (The unit can differentiate between positive and negative differentials. (See Pr.11.2) |

NOTE: Refer to Pr.11.3 for the mA output test.

**Pr.11.2 Analog. Val** Analogue value options (Only available in differential level measurement and OCM).

In differential mode (D = Upstream Level)

| Options displayed | Description |
|---|---|
| **11.2.1 Output differential of levels** - | Pr.3.0 represents maximum differential in levels |
| **11.2.2 Output upstream level** - | Pr.3.0 represents the difference between upstream empty distance Pr.2.0 and maximum upstream level |
| **11.2.3 Output downstream level** - | Pr.3.0 represents the difference between downstream empty distance Pr.2.0 and maximum downstream level |

In OCM mode (D = Relative to flow)

| Options displayed | Description |
|---|---|
| **11.2.1 Output relative to Flow** | Output proportional to calculated flow |
| **11.2.2 Output relative to Head** | Output proportional to measured head (depth of liquid) |

**Pr.11.3 Test mA** (D = 4mA)

This parameter outputs a mA value selected by the user. A value of 4, 8, 12 , 16 or 20mA can be outputted and measured at terminals 12 & 13, to test the external circuitry. Display 11.3.* then press ENT to show 'Analogue Testing *mA'

| Options displayed | Description |
|---|---|
| **11.3.1 Analogue set output 4mA** | Sets the analogue output to 4mA |
| **11.3.2 Analogue set output 8mA** | Sets the analogue output to 8mA |
| **11.3.3 Analogue set output 12mA** | Sets the analogue output to 12mA |
| **11.3.4 Analogue set output 16mA** | Sets the analogue output to 16mA |
| **11.3.5 Analogue set output 20mA** | Sets the analogue output to 20mA |
| **11.3.6 End analogue test** | Exits analogue test |

**Pr.11.4 Analogue Scale**

**11.4.1 Analogue Datum** (D = 0.000)
If an analogue output is required with a zero different from the measurement zero (Pr.2.0) then an offset defined as a percentage of the measurement span/flow/volume etc., can be entered here.

**11.4.2 Analogue Span** (D = 100.0)
If an analogue output is required with a span different to that defined for the measurement (Pr.3.0) then an alternative value defined as a percentage of the measurement span/flow/volume etc., can be entered here. A value of zero is ignored.

## Miscellaneous

**Pr.12.1 Offset** (D = 0.00)

Both negative and positive values can be input. This value must be entered in metres.

This parameter has two uses:
1. It can be used to correct minor reading errors on the display

2. It can be used to prevent loss-of-echo when the target can go further away from the transducer than the desired span.

e.g. a) When a channel floor is lower than the zero point of a "V" notch weir.
b) To set an elevated zero level in a vessel, which is not normally completely emptied.

Add the extra depth to Pr.2.0 and enter minus the extra depth at Pr.12.1 in metres.

**Pr.12.2 Passcode** Security Code Store

A new security code can be entered at this parameter, but after entry it is scrambled. Refer to Hycontrol if you forget your security code, and quote the number displayed.

**Pr.12.3 NoOfDecimal** Number of decimal places (D = 2 dec points)

The number of decimal places required for displaying when in normal operation.

| Options displayed | Description |
|---|---|
| **12.3.1 Display No decimal point** | Display value with no decimal point |
| **12.3.2 Display 1 Decimal Point** | Display value with 1 decimal point |
| **12.3.3 Display 2 Decimal Points** | Display value with 2 decimal points |
| **12.3.4 Display 3 Decimal Points** | Display value with 3 decimal points |

**Pr.12.4 Relay tot.** Relay totaliser (D = Off)

| Options displayed | Description |
|---|---|
| **12.4.1 Relay totaliser off** | Disables relay totaliser function |
| **12.4.2 Relay totaliser on** | Enable relay totaliser function |

**Pr.12.5 Simulation** (D = No)

| Options displayed | Description |
|---|---|
| **12.5.1 Simulation No** | Don't simulate program |
| **12.5.2 Simulation Yes** | Start simulation |

The value displayed will depend on the application set in Pr.1.0.
Select **12.5.2 Simulation Yes** to simulate the operation of the instrument as set up between Blanking (Pr.4.0) and Empty distance (Pr.2.0).

| Application type | | Display value relative to |
|---|---|---|
| Level Measurement | - | LEVEL |
| Distance measurement | - | DISTANCE |
| Differential level measurement | - | NO SIMULATION AVAILABLE |
| Open Channel Measurement | - | LEVEL / FLOW |
| Pump Control | - | LEVEL |
| Volume | - | LEVEL |

It will set all LEDs/relays and the current output as programmed. Therefore, care must be taken if the instrument is wired into other instruments or controls. The displayed value, on which all relays are operated, is that which is set by the operator.

The initial speed of the simulation is that set into Rate of Change (Pr.5.0) this can be increased by a factor of 2 by pressing the '↻' key and the key can be pressed 6 times (x64). To reduce the speed press the '↵' key, the speed cannot be reduced below that defined by Rate of Change.

The direction of the simulation can be changed by using the '↑' and '**ENT**' keys, which one has to be pressed depends on the set up. Press '**M**' twice to end.

**Pr.12.6 Station ID** (D = 1)

For polled data transfer, the unit must have a station number assigned to it in the range of 1 – 31, which must be unique to the unit.

| Text displayed | Description |
|---|---|
| **12.6.1 StationID 01** | Unique identification number for instrument |

**Pr.12.7 Sync Instrs** Synchronise instruments (D = Master)

Options displayed
**12.7.1 Sync Master**
**12.7.2 Sync Slave**

This parameter is used in conjunction with Pr12.6 Station ID for synchronising two or more instruments when they are in close proximity. See Appendix 6 for details, Pg 64.

**Pr.12.8 Check Search** (D = Off)

| Options displayed | Description |
|---|---|
| **12.8.1 Check Search Off** | Check search not used |
| **12.8.2 Check Search On** | Check search included |

Check search should be used where fill rates can sometimes be greater than that entered at Pr.5.0, or if the transducer is liable to be submerged.

**Pr.12.9 Maximum gain** (D = 100.0)

The maximum gain will be displayed in % and will be linear. It defines the level of gain (power) available to the instrument when searching for a valid echo.

**Pr.12.10 Serial Number** (Viewable only)

This parameter displays the serial number of the Miniflex LR unit.

**Pr.12.11 Revision Number** (Viewable only)

Displays the Revision number of the software, e.g. LR 1.11.

**Pr.12.12 Echo Velocity** (D = 344.1 i.e. speed of sound in air at 20°C)

If operating through any medium other than air enter the velocity of sound through that medium in metres per second.

**Pr.12.13 Gain Control** (D = Fixed for OCM, D = Variable for All other applications)

| Options displayed | Description |
|---|---|
| **12.12.1 Gain control variable** | Variable gain selection |
| **12.13.2 Gain control fixed** | Fixed gain selection |

When in OCM select variable gain if instrument locks on to a protruding object, which is closer to the transducer than the actual target.

**Pr.12.14 Transducer (**D = 12.14.1 Trans R*TK15-ATEX)

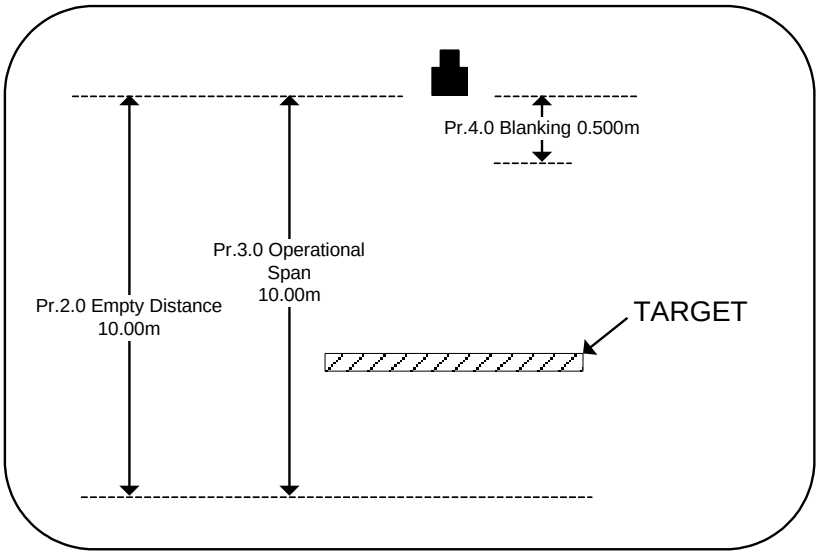
| Options displayed | Description |
|---|---|
| **12.14.1 Trans R*TK15-ATEX** | ATEX certified transducer |
| **12.14.2 Trans R*TK15** | Non-ATEX certified transducer |

# MINIFLEX LR DEFAULT PROGRAMS

For each application type in the Miniflex LR there is a default program, which is automatically loaded on first selecting a new application at Pr.1.0. Resetting the instrument (Page 13) will load the factory default program for a typical distance measurement application. The default settings for all 6 application types are detailed on the following pages.

## DISTANCE – Distance Measurement Mode Default Program

Changing the application to Distance Measurement or resetting the instrument, loads this distance measurement default program into memory.




This default program is created to do the following:-

To measure and display the distance between the face of the transducer and the target in metres.
Maximum distance of 10.00m.
Rate of change of 10.0 metre/min.
No alarms.
4-20mA output proportional to distance.

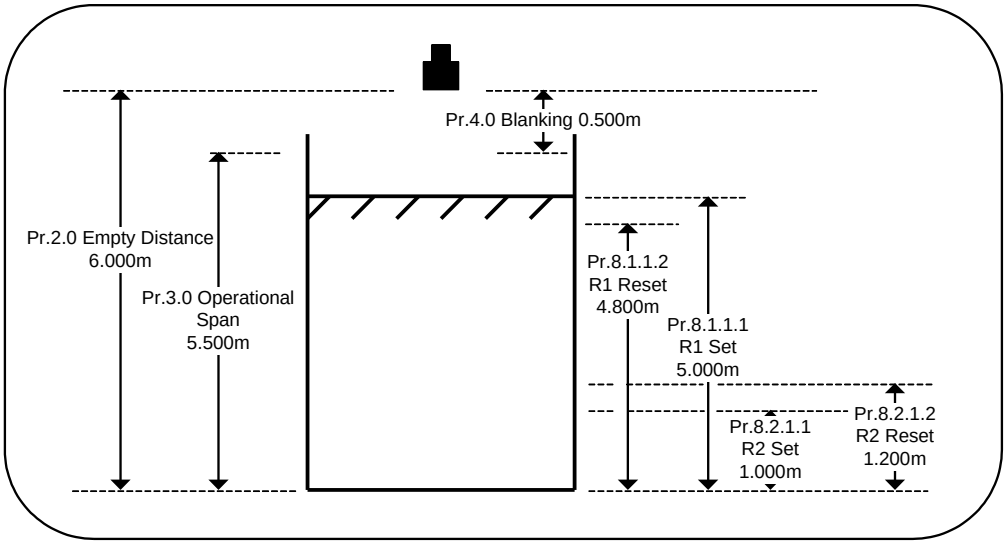
This program can be easily modified to suit the required application. You should delete from this program any unwanted entries (e.g. 8.3.4 Relay 3 L.O.E.).

| **Parameter number** | **Default Setting** | **Description** |
|---|---|---|
| 2.0 Empty Distance | = 10.00 | Maximum measurable distance from transducer. |
| 3.0 Operational Span | = 10.00 | The span, based on zero level. |
| 4.0 Blanking | = 0.500 | Blanking zone into which target should not rise. |
| 5.0 RateOfChange | = 10.00 | The maximum rate of change of target distance in metres/minute. |
| 8.1 Rly1 Options | = 8.1.5 Relay 1 Off | Relay 1 Off |
| 8.2 Rly2 Options | = 8.2.5 Relay 2 Off | Relay 2 Off |
| 8.3 Rly3 Options | = 8.3.4 Relay 3 L.O.E. | Relay 3 (L.O.E. Alarm – de-energises relay) |
| 10.4 Fail Time | = 600 | Failsafe time in seconds |
| 10.5 mA Fail | = 10.5.3 Analogue Hold | Analogue output holds on failsafe. |
| 11.1 Analog O/P | = 11.1.1 Output 4–20mA | 4-20mA output fixed to span (Pr.3.0) |
| 12.14 Transducer | = 12.14.1 Trans R*TK15-ATEX | Relevant only for temperature compensation |

To simulate the program go to *12.5.2 yes* then press ENT again.

## LEVEL – Level Measurement Mode Default Program

Changing the application to Level measurement loads this default program into memory.




This default program is created to do the following:-

To measure and display the level of liquid in metres.
Maximum level 5.5m.
Fill rate 1.0 metre/min.
Alarm if level exceeds 5.0 metres or goes below 1m.
4-20mA output proportional to level.

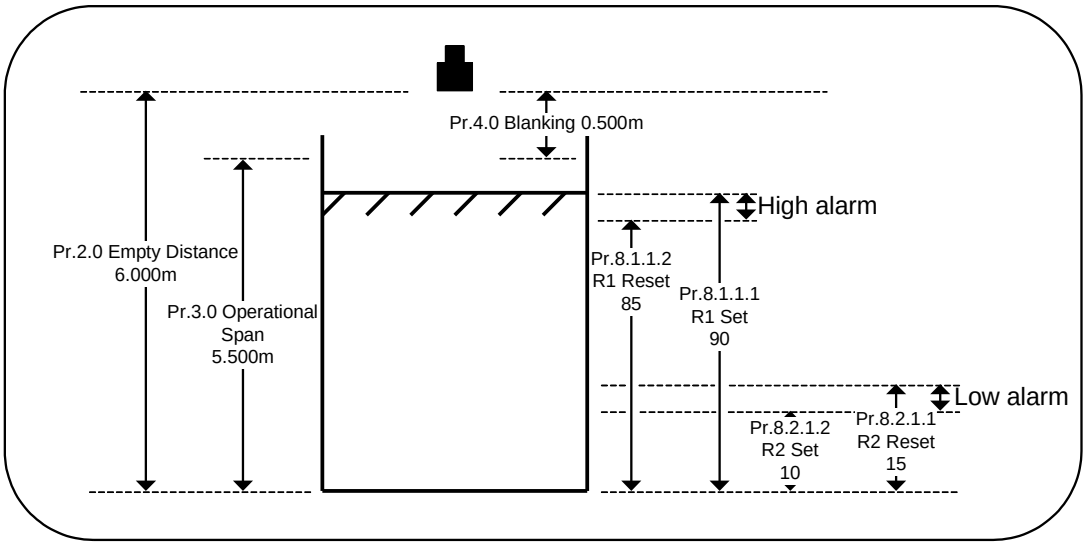
This program can be easily modified to suit the required application. You should delete from the program any unwanted entries (e.g. Relay 2 settings).

| **Parameter number** | **Default Setting** | **Description** |
|---|---|---|
| 2.0 Empty Distance | = 6.000 | Distance from transducer to zero level. |
| 3.0 Operational Span | = 5.500 | The span, based on zero level. |
| 4.0 Blanking | = 0.500 | Blanking zone into which level should not rise. |
| 5.0 RateOfChange | = 1.000 | The maximum rate of change of liquid level in metres/minute. |
| 8.1 Rly1 Options | = 8.1.1 Relay 1 Norm-Energised | Relay 1 to alarm on level (normally energised) |
| 8.1.1.1 Relay 1 Set | = 5.0 | Relay 1 to de-energise at 5.0 metres to indicate high alarm. |
| 8.1.1.2 Relay 1 Reset | = 4.8 | Relay 1 to re-energise at 4.8 metres to clear the high alarm. |
| 8.2 Rly2 Options | = 8.2.1 Relay 2 Norm-Energised | Relay 2 to alarm on level (normally energised) |
| 8.2.1.1 Relay 2 Set | = 1.0 | Relay 2 to de-energise at 1.0 metre to indicate low alarm. |
| 8.2.1.2 Relay 2 Reset | = 1.2 | Relay 2 to re-energise at 1.2 metres to clear the low alarm. |
| 8.3 Rly3 Options | = 8.3.4 Relay 3 L.O.E. | Alarm Relay 3 (L.O.E. Alarm – de-energises relay) |
| 10.1 Relay 1 | = 10.1.3 Relay 1 Hold State | Hold alarm indication (relay 1) on failsafe. |
| 10.2 Relay 2 | = 10.2.3 Relay 2 Hold State | Hold alarm indication (relay 2) on failsafe. |
| 10.4 Fail Time | = 600 | Failsafe time in seconds |
| 10.5 mA Fail | = 10.5.3 Analogue Hold | Analogue output holds on failsafe. |
| 11.1 Analog O/P | = 11.1.1 Output 4–20mA | 4-20mA output fixed to span (Pr.3.0). |
| 12.14 Transducer | = 12.14.1 Trans R*TK15-ATEX | Relevant only for temperature compensation |

To simulate the program go to *12.5.2 yes* then press ENT again.

## VOLUME - Contents Measurement with Volumetric Conversion Default Program

Changing the application to volume measurement loads this default program into memory.




This default program is created to do the following:-

To measure the level in a flat bottomed tank. Dimensions as shown.
Output/display in m³.
Analogue output to be 4-20mA proportional to volume in tank.
High alarm at 90% volume.
Low alarm at 10% volume.

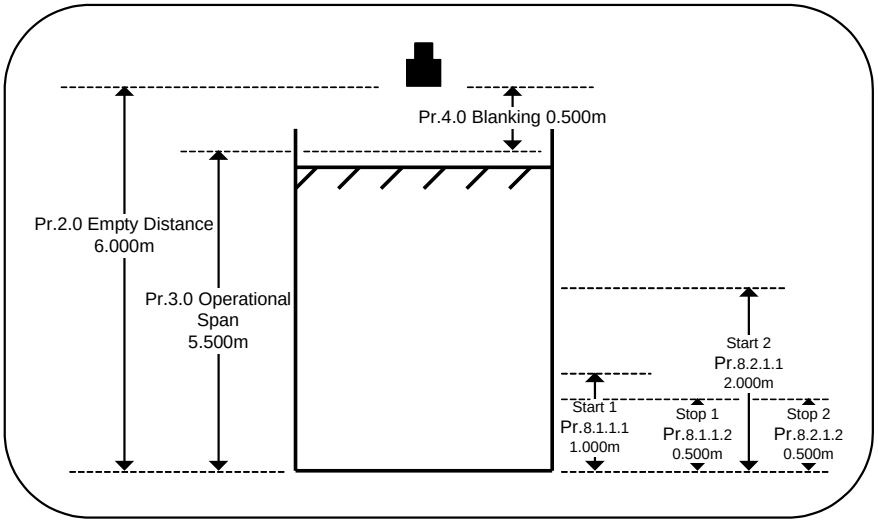
This program can be easily modified to suit the required application. You should delete from this program any unwanted entries (e.g. Relay 3 L.O.E.).

| **Parameter number** | | **Default Setting** | **Description** |
|---|---|---|---|
| 2.0 Empty Distance | = | 6.000 | Distance from transducer to zero level. |
| 3.0 Operational Span | = | 5.500 | The span, based on zero level. |
| 4.0 Blanking | = | 0.500 | Blanking zone into which level should not rise. |
| 5.0 RateOfChange | = | 1.000 | The maximum rate of change of liquid level in metres/minute. |
| 6.1 Vessel Shape | = | 6.1.1 Linear Vessel | Define vessel as linear vessel |
| 6.2 Display Units | = | 6.2.7 Units % | Display in % |
| 8.1 Rly1 Options | = | 8.1.1 Relay 1 Norm-Energised | Relay 1 to alarm on volume (normally energised) |
| 8.1.1.1 Relay 1 Set | = | 90 | Relay 1 to de-energise at 90% to indicate high alarm. |
| 8.1.1.2 Relay 1 Reset | = | 85 | Relay 1 to re-energise at 85% to clear the high alarm. |
| 8.2 Rly2 Options | = | 8.2.1 Relay 2 Norm-Energised | Relay 2 to alarm on volume (normally energised) |
| 8.2.1.1 Relay 2 Set | = | 10 | Relay 2 to de-energise at 10% to indicate low alarm. |
| 8.2.1.2 Relay 2 Reset | = | 15 | Relay 2 to re-energise at 15% to clear the low alarm. |
| 8.3 Rly3 Options | = | 8.3.4 Relay 3 L.O.E. Alarm | Relay 3 (L.O.E. Alarm) |
| 12.14 Transducer | = | 12.14.1 Trans R*TK15-ATEX | Relevant only for temperature compensation |

To simulate the program go to *12.5.2 yes* then press ENT again.

## Pump Control Default Program

Changing the application to Pump Control loads this default program into memory.




This default program is created to do the following:

2 pump control, pump down in a wet-well, duty-assist operation.
Alternate pump duty to reduce wear.
4-20mA to remote indicator.
Loss-of-Echo indication to telemetry.
Display actual level in metres.

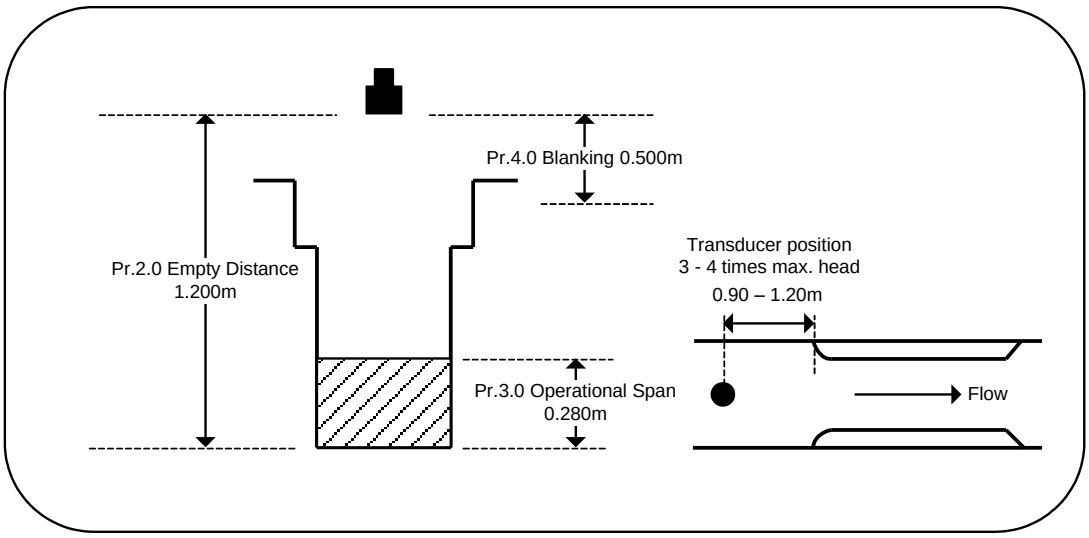
This program can be easily modified to suit the required application. You should delete from this program any unwanted entries (e.g. 9.2.1 Duty assist).

| **Parameter number** | | **Default Setting** | **Description** |
|---|---|---|---|
| 2.0 Empty Distance | = | 6.000 | Distance from transducer to zero level. |
| 3.0 Operational Span | = | 5.500 | The span, over which measurement is required. |
| 4.0 Blanking | = | 0.500 | Blanking zone into which level should not rise. |
| 5.0 RateOfChange | = | 1.000 | The maximum rate of change of liquid level in metres/minute. |
| 8.1 Rly1 Options | = | 8.1.2 Relay 1 Norm-DeEnergised | Relay 1 control on level (normally de-energised) |
| 8.1.1.1 Relay 1 Set | = | 1.0 | Relay 1 energises at 1.0m to turn pump 1 on. |
| 8.1.1.2 Relay 1 Reset | = | 0.5 | Relay 1 de-energises at 0.5m to turn pump off. |
| 8.2 Rly2 Options | = | 8.2.2 Relay 2 Norm-DeEnergised | Relay 2 to control on level (normally de-energised) |
| 8.2.1.1 Relay 2 Set | = | 2.0 | Relay 2 energises at 2m to turn pump 2 on. |
| 8.2.1.2 Relay 2 Reset | = | 0.5 | Relay 2 de-energises at 0.5m to turn pump 2 off. |
| 8.3 Rly3 Options | = | 8.3.4 Relay 3 L.O.E. Alarm | Relay 3 (L.O.E. Alarm – de-energises relay) |
| 9.1 Pump Sequence | = | 9.1.2 Alternate pumps 1 & 2 | Alternate pumps 1 & 2 |
| 9.2 Duty Standby | = | 9.2.1 Duty Assist | Duty assist operation. |
| 10.1 Relay 1 | = | 10.1.2 Relay 1 De-Energise | Pump 1 de-energise on failsafe. |
| 10.2 Relay 2 | = | 10.2.2 Relay 2 De-Energise | Pump 2 de-energise on failsafe. |
| 10.4 Fail Time | = | 30 | Failsafe time in seconds |
| 10.5 mA Fail | = | 10.5.2 Analogue High | Analogue output goes high on failsafe. |
| 11.1 Analog O/P | = | 11.1.1 Output 4–20mA | 4-20mA output fixed to span (Pr.4). |
| 12.14 Transducer | = | 12.14.1 Trans R*TK15-ATEX | Relevant only for temperature compensation |

To simulate the program go to *12.5.2 yes* then press ENT again.

## OpenChannel Flowmeter Default Program

Changing the application to Open Channel Flow Monitoring loads this default program into memory.




This default program is created to do the following:-

Standard Ratio Rectangular flume, with a maximum flow of 50 litres per second at head 28cm.
Loss-of-Echo indication to telemetry system.
4-20mA output proportional to flow.
Totalise flow and provide pulsed output to external totaliser every 1000 litres.
Display flow reading.

This program can be easily modified to suit the required application. You should delete from this program any unwanted entries (e.g. Relay 1 settings).

| **Parameter number** | | **Default Setting** | **Description** |
|---|---|---|---|
| 2.0 Empty Distance | = | 1.200 | Distance from transducer to bottom of channel. |
| 3.0 Operational Span | = | 0.280 | Level at which maximum flow rate value is defined. |
| 4.0 Blanking | = | 0.500 | Blanking zone into which level will not rise. It is suggested that this is above the top of the channel to allow the system to continue reading up to that level. |
| 5.0 RateOf Change | = | 1.000 | Rate of change of level 1m/min. |
| 7.1 Flow device | = | 7.1.1 Std. Ratio Rect. Flume 3/2 | To define that a rectangular flume is being used (Not BS3680). |
| 7.3 Maximum Flow | = | 50 | Defines the maximum flow is 50 litres per second. |
| 7.6 Totaliser Units | = | 7.6.2 Totalise In m3 | To avoid totaliser overflow, totalise in cubic metres |
| 7.7 Ext.Tot.Drv | = | 7.7.1 = 1.000 | External totaliser in cubic metres |
| 8.1 Rly1 Options | = | 8.1.6 Flow alarm | Relay 1 to alarm on flow (normally energised) |

| | | | |
|---|---|---|---|
| 8.1.1.1 Relay 1 Set | = | 45 | Relay 1 to de-energise at 45 litres per second to indicate flow alarm. |
| 8.1.1.2 Relay 1 Reset | = | 40 | Relay 1 to re-energise at 40 litres per second to clear the flow alarm. |
| 8.2 Rly2 Options | = | 8.2.4 Relay 2 L.O.E. Alarm | Relay 2 (L.O.E. Alarm) |
| 8.3 Rly3 Options | = | 8.3.6 Relay 3 Totaliser Output | Relay 3 used to trigger external totaliser |
| | | | |
| 10.1 Relay 1 | = | 10.1.2 Relay 1 De-Energise | De-energise (relay 1) on failsafe. |
| 10.2 Relay 2 | = | 10.2.2 Relay 2 De-Energise | De-energise (relay 2) on failsafe. |
| 10.4 Fail Time | = | 30 | Failsafe time in seconds |
| 10.5 mA Fail | = | 10.5.3 Analogue Hold | Analogue output holds on failsafe. |
| | | | |
| 11.1 Analog. O/P | = | 11.1.1 Output 4–20mA | Output over 4-20mA |
| 11.2 Analog. Val | = | 11.2.1 Output relative to flow | 4-20mA output is proportional to flow |
| 12.14 Transducer | = | 12.14.1 Trans R*TK15-ATEX | Relevant only for temperature compensation |

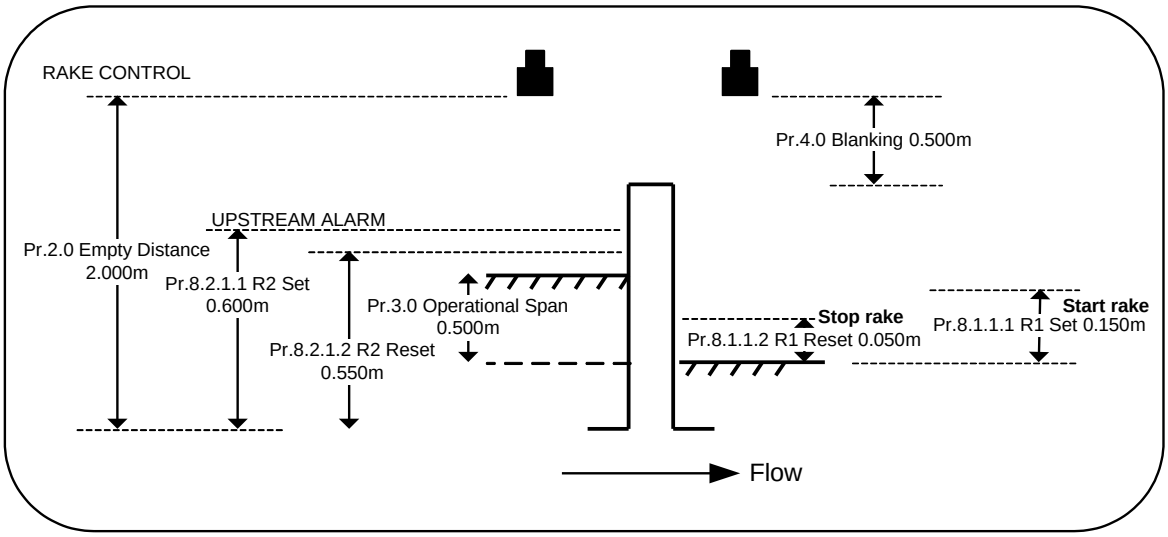
To simulate the program go to *12.5.2 yes* then press ENT again.
(NOTE:- Simulates the level / flow).

*To clear and initiate the totaliser before returning to run mode set 7.8 Total. Reset = 7.8.2 Totaliser Reset Yes*

## Differential Level Measurement Program

Changing the application to Differential Level Measurement Control loads this default program into memory. In this mode, the transceiver drives two transducers to measure the difference in levels by subtracting the downstream level from the upstream level. Please see connection diagram Figure 7 for transducer wiring (Page 8).

The upstream transducer should be chosen to give a positive differential value.




This default program is created to do the following:-

Start rake when differential reaches 0.15m.
Stop rake when differential falls to 0.05m.
Maximum differential 0.50m.
Alarm if level on upstream side exceeds 0.60m.
4-20mA output proportional to differential.
On Loss-of-Echo energise alarm and switch rake on.

This program can be easily modified to suit the required application. You should delete from this program any unwanted entries (e.g. Relay 2 settings).

| **Parameter number** | | **Default Setting** | **Description** |
|---|---|---|---|
| 2.0 Empty Distance | = | 2.000 | The distance from bottom of channel to transducers in metres. |
| 3.0 Operational Span | = | 0.500 | The maximum differential span. |
| 4.0 Blanking | = | 0.500 | Blanking zone. |
| 5.0 RateOfChange | = | 1.000 | The maximum rate of change of level in metres/minute. |
| 8.1 Rly1 Options | = | 8.1.2 Relay 1 Differ. Control | Relay 1 designated for differential control. |
| 8.1.1.1 Relay 1 Set | = | 0.15 | Relay 1 energises at differential 0.15m to start rake. |
| 8.1.1.2 Relay 1 Reset | = | 0.05 | Relay 1 de-energises at differential 0.05m to stop rake. |
| 8.2 Rly2 Options | = | 8.2.7 Relay 2 Upstream Alarm | Relay 2 to alarm on an upstream level. |
| 8.2.1.1 Relay 2 Set | = | 0.60 | Relay 2 de-energises at 0.60m high alarm. |
| 8.2.1.2 Relay 2 Reset | = | 0.55 | Relay 2 energises at 0.55m to clear high alarm. |
| 10.1 Relay 1 | = | 10.1.1 Relay 1 Energise | Switch rake on in failsafe. |
| 10.2 Relay 2 | = | 10.2.2 Relay 2 De-Energise | Alarm level indication on failsafe. |

| | | | |
|---|---|---|---|
| 10.4 Fail Time | = | 600 | Failsafe time in seconds |
| 10.5 mA Fail | = | 10.5.3 Analogue Hold | Analogue output holds on failsafe. |
| 11.1 Analog O/P | = | 11.1.1 Output 4–20mA | 4-20mA output fixed to span (Pr.3.0). |
| 11.2 Analog.Val | = | 11.2.1 Differential | Proportional to the differential |
| 12.4 Relay tot. | = | 12.4.2 Relay totaliser On | This counts the number of times the rake is turned on, and how many hours it has been energised. |
| 12.14 Transducer | = | 12.14.1 Trans R*TK15-ATEX | Relevant only for temperature compensation |

**NOTE:-** It is not possible to simulate any differential mode applications.

## COMMISSIONING FAULT FINDING

**WARNING! FAULT FINDING SHOULD BE UNDERTAKEN ONLY BY SUITABLY TRAINED PERSONNEL.**

## Basic Hardware

**A) The display is blank or frozen, the leds are unlit and the neon does not fire:-**

1. Ensure that power is being supplied to the board, and that it is correctly wired. Refer to figure 3, on Page 3.

2. Check fuses F3 (ac) and F4 (dc)

3. Check that the supply voltage is within specified levels (See Section 1 Page 3). A large voltage drop can cause the unit to lock and show last distance or level reading.

**B) The fuse blows continuously:-**

1. Power down and fit a new fuse – refer to Page 3
   Remove all connection blocks except AC power TB6 or DC power TB1.
   If fuse does not blow on power up insert each terminal block until fault reappears.
   Check wiring of this terminal block.

2. Check that the power supply is within specified limits -refer to Page 3.

3. Check the enclosure for metal debris which may be under the lower PCB.

**C) The system powers up, but displays garbage:-**

1. Power down then check that an EPROM is fitted at U2 and that it is firmly in place.

**D) The display is blank:-**

1. Power down then check that a jumper link is fitted on 3 pin link LK1 at the side of the display on the top PCB going between the centre pin and pin W.

**E) The display appears faded or too dark:-**

1. Adjust contrast pot P1.

## F) The display shows 'LOSS OF ECHO':-

1. Check the transducer wiring and connections to the instrument. Note that different connections are used if a temperature compensated transducer is connected. See Figure 3, Page 3, and Page 4.

   If the transducer cable has been extended as per Page 8, disconnect and remove the transducer and connect it direct to the Miniflex LR. If the unit now operates, recheck the extension cable connections and routing, avoiding power cables. Re-install the transducer checking that its aim is perpendicular to the target surface.

2. Check whether the neon light on the bottom PCB nearest terminal 1 is flashing. If it is proceed to number 3, if it is not then:-

   a: Disconnect the transducer: If the neon now lights then there is a short circuit in the cabling.
   b: If the neon does not light the transmission fuse may have blown. Check F1 T80mA fuse on the bottom PCB.
   c: If the unit still shows 'LOSS OF ECHO' check that you can hear the transducer "clicking" when close to the ear.
   d: If the transducer does not click proceed to 5.

3. Is there a target within the empty distance specified in Pr.2.0? This is particularly important if temperature variations are experienced and no compensation is applied.

4. Is the vessel empty with a conical, parabolic, sloping or spherical bottom? This commonly causes loss of echo if the transducer cannot be mounted over the centre of the vessel. When the vessel becomes empty the pulse from the transducer hits the sloping sides of the bottom section and the signal is not reflected back to the transducer. Under this condition the display will indicate 'LOSS OF ECHO' but the failsafe designation will operate until product returns and the system will automatically recover and track level. If the transducer cannot be mounted centrally, the problem may be overcome by the installation of a target plate.

5. Connect a known good transducer to the instrument and check the operation. If the known transducer gives a good signal check the instrument's gain by pressing the '↻' key. The number displayed ranges from 0.1 – 100, the lower the number the greater the signal strength.

   If the gain figure is 50 - 100 check the surface level for foam or other materials which may float in and out of the beam and cause poor echoes.

**G) The keypad fails to respond:-**

1. Check for correct alignment of connection from keypad to main board.

2. Check that key press sequence is valid; refer to Page 11.

3. Power down unit and wait 5 seconds. Power up and immediately press 'M'. This should result in 'Program Mode' being displayed. It is now advisable to reset to your original default program, Page 15.

**H) Analogue output is unstable:-**

1. Connect a test meter in series with your external wiring.
   Can the fault be seen on the test meter? If YES, then use Pr.11.3 to set a stable value into the current loop.
   If the output is still unstable disconnect external wiring and connect a meter across terminals 12 and 13 and repeat Pr.11.3 test.
   If the output is now stable check wiring and meters

**I) Analogue has no output:-**

1. Check programme value at Pr.11.1

2. Insert a test meter in series with the output. Under Pr.11.3 select a fixed output. If still no output, connect a test meter directly across terminals 12 and 13, repeat test under Pr.11.3. If no value is read at terminals 12 to 13 contact Hycontrol.

**J) Analogue output is less than 20 at maximum display reading:-**

1. The load attached to the output may be too high. To check this disconnect all the external wiring and see if it now reads 20. The output is capable of driving 20mA into 750 Ohms.

**K) Analogue output does not correspond to application:-**

1. Check that the correct options (Pr.11.1, 11.2 and 11.4 ) have been selected.

2. Check that the correct span (Pr.3.0) has been input, this is the value over which the analogue will be spanned unless a separate entry has been made at Pr.11.4.1 and 11.4.2.

**L) Reading on display and outputs stay high:-**

* This is usually caused by return echoes from close-in obstructions.

1. Check for obstructions. If the transducer is mounted on a standpipe, check for rough edges at the connection with the vessel, refer to figure 6 Page 7.

2. If there are no close-in obstructions ensure that the isolation kit is fitted on the transducer and that the transducer is mounted correctly. The isolation kit should enable the transducer to move slightly, it should not be solid. (Not applicable to flanged transducers.)

3. Check the entry at Pr.4.0, Blanking distance, and return it to 0.5m if reduced from factory setting

4. May be caused by rate of change, Pr.5.0 being too small.

**M) Reading is lower than expected:-**

1. Check that Pr.2.0 and Pr.3.0 are correct for the application

2. It can be caused when the level rises into the blanking zone. The system can then lock on to a multiple echo, and may continue tracking the multiple when the level decreases. Using check search Pr.12.8 should rectify this situation, but preventing the level entering the blanking zone is the preferred solution.

3. It can also be caused by the level moving at a much faster rate than is allowed for by the defined rate of change (Pr.5.0). To solve the problem the rate of change value should be increased to more closely match the real rate.

**N) Reading changes in steps:-**

* This is usually caused by the rate of change value (Pr.5.0) being too small to keep up with the process.

1. To rectify, increase the value of Pr.5.0 to match the rate of change of level.

**O) The display is inaccurate:-**

1. The empty distance (Pr.3.0) of the vessel may be incorrectly set.

2. The dimensions of the vessel or flume may be incorrect, as may the values of maximum flow, volume or mass conversion.

3. The system may require temperature compensation.

4. The application may include vapours that significantly change the speed of sound.

**P) Temperature compensation error:-**

1. The position of the transducer is important to prevent heating by sunlight and convection currents. Also the transducer should be in a free-air vented position if possible to prevent hot-spots.

**NOTE**: The transducer sensor compensates only for temperature variance, it is not expected to accurately measure the actual temperature.

**Q) Temperature reads 20ºC all the time:-**

1. Check the transducer wiring and connections to the instrument. Note that different connections are used if a temperature compensated transducer is connected. See Figure 3, Page 3, and Page 4.
   Also check transducer selection at Pr.12.14, Page 34

2. Check fuse F2 T80mA.

**R) The boards hums loudly:-**

* Usually vibration from the transformer.

1. Check the mounting screws for tightness.

**S) Relays not switching:-**

1. Check the programmed relay designations and settings at Pr.8.1 - Pr.8.3
   Functions can be tested under simulation using Pr.12.5 (Not differential).

2. Check contact continuity at the terminals 14 - 22.

**WARNING: It is recommended that all external controls, alarms etc. are disconnected before performing the above tests.**

# LINEARISATION
# VESSELS OR FLUMES

This feature allows volume conversion to be applied to irregular shaped vessels and flow measurements to be made on open channels, providing that level/volume/flow relationships are known.

The system allows the entry of a volume or flow profile with up to 24 points of level or head to be entered into memory, that is then used to produce the required flow or volume values when in 'RUN' mode.

Before proceeding it is useful to write down a table of the point numbers and 'Level / Head in Metres' with the corresponding '%Volume / % Flow' values, to facilitate programming.

## VOLUME

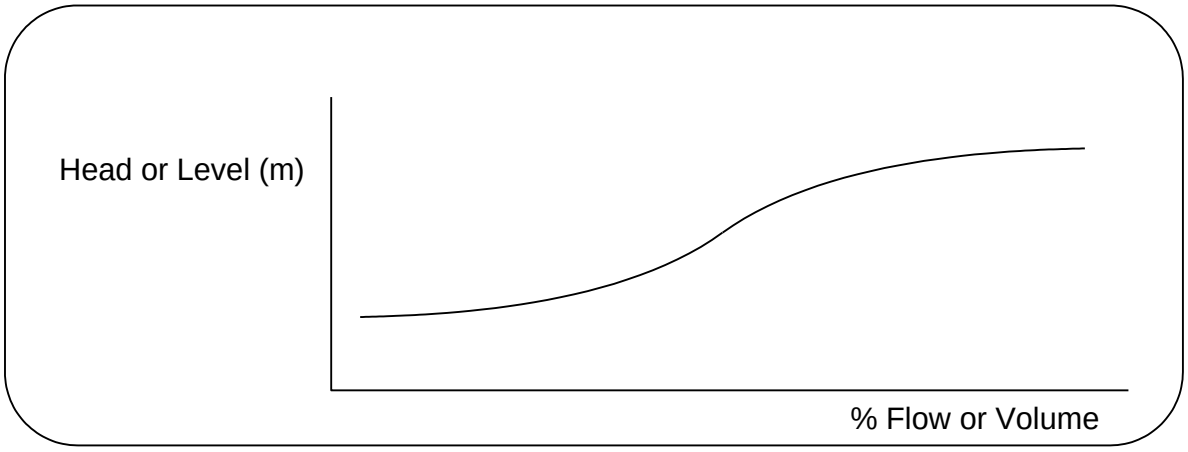
The custom volume table is selected in Pr.6.1.8, Page 18. The profile is level in metres, against percentage of the total volume. See example on page 52.

## FLOW

The custom flow table is selected in Pr.7.1.8, Page 20. The profile is stored as head in metres, against percentage of the total flow. See example on page 50.

## PROCEDURE

The procedure uses a 24 point curve to map the profile, but all 24 points do not have to be used.




The profile data are input into Pr.6.1.8 for volume and Pr.7.1.8 for flow. The values can be displayed and changed as required.

## Custom table - Keyboard controls

↑ - Used to increase digit and change value.

↵ - Moves to previous entered value if available.

↻ - Move to next digit.

**ENT** - Enters a new value and moves to next entry if available.

**M** - Exit custom table key, asks for confirmation of storing table before returning the operator to normal program.

## Custom table - Inputting Values

When inputting a value for the first time or after a reset the initial value will be displayed as _ . _ _ _ or _ _ _ . _.

Selecting either the '↑'or '↻' will display 0.000 allowing you then to enter the head or level in metres. The decimal position is fixed and cannot be changed.

For volume, both Level (Metres) and Volume (%) figures should be entered up to the required number of points you wish to map.

For flow, both Head (Metres) and Flow (%) figures should be entered up to the required number of points you wish to map.

After entering each value, press the **ENT** key to accept the value and display the next point to be entered.

To finish entering the data points press the **M** key.

**PARAMETER RESET: CLEARS ALL METRES VALUES TO _._ _ _**
Head / Level (Metres)
The decimal position is fixed at 3 decimal places
The allowable range of level / head values is 0.000 – 9.999m

**PARAMETER RESET: CLEARS ALL % VALUES** TO _ _ _._
Flow / Volume (%)
The decimal position is fixed at 1 decimal place.
The allowable range of % values is 0-250%.

Any unused data values **must** be cleared to _ _ _ _

**NOTE:** 1. The standard keypad time-outs are suspended, to allow sufficient time to enter the data.
2. We recommend that the required values are written in tabular form, as shown, before programming commences.

**Example: Flow – Special Flume Mapping**

Use default flow example on Page 39, but substitute a special 'U' throat flume with maximum flow 50 litres/second at 30 cm/head.

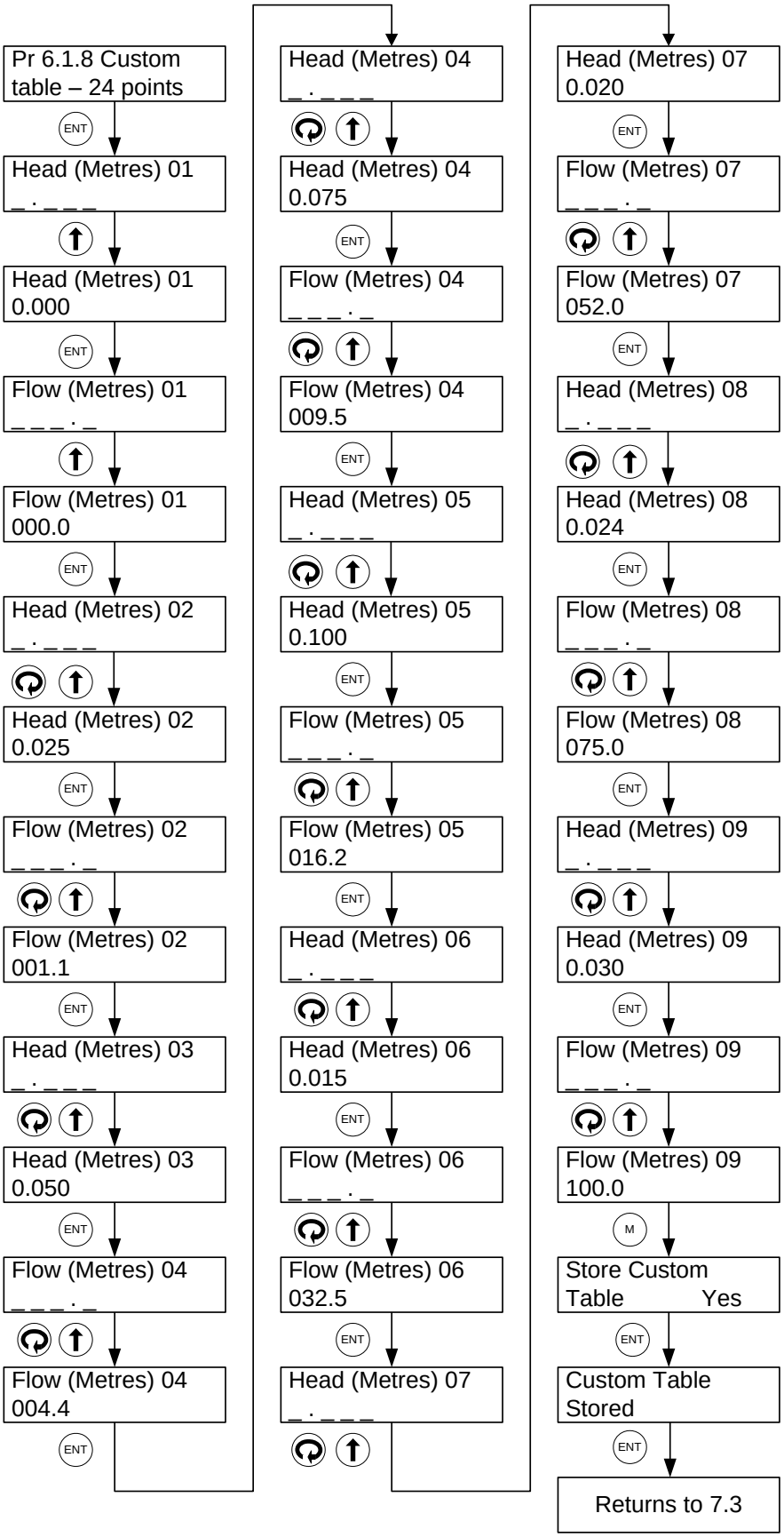
First, create the following table from the relationship of head and flow, which must be given for the special flume.

| Point | Head (m) | Flow litres/sec | % Flow |
|---|---|---|---|
| 1 | 0.000 | 0.0 | 000.0 |
| 2 | 0.025 | 0.6 | 001.1 |
| 3 | 0.050 | 2.2 | 004.4 |
| 4 | 0.075 | 4.8 | 009.5 |
| 5 | 0.100 | 8.1 | 016.2 |
| 6 | 0.150 | 16.3 | 032.5 |
| 7 | 0.200 | 26.0 | 052.0 |
| 8 | 0.250 | 37.5 | 075.0 |
| 9 | 0.300 | 50.0 | 100.0 |
| 10 | _ . _ _ _ | Not used | _ _ _ . _ |
| 11 | _ . _ _ _ | Not used | _ _ _ . _ |
| 12 | _ . _ _ _ | Not used | _ _ _ . _ |
| ⇕ | | | |
| 21 | _ . _ _ _ | Not used | _ _ _ . _ |
| 22 | _ . _ _ _ | Not used | _ _ _ . _ |
| 23 | _ . _ _ _ | Not used | _ _ _ . _ |
| 24 | _ . _ _ _ | Not used | _ _ _ . _ |

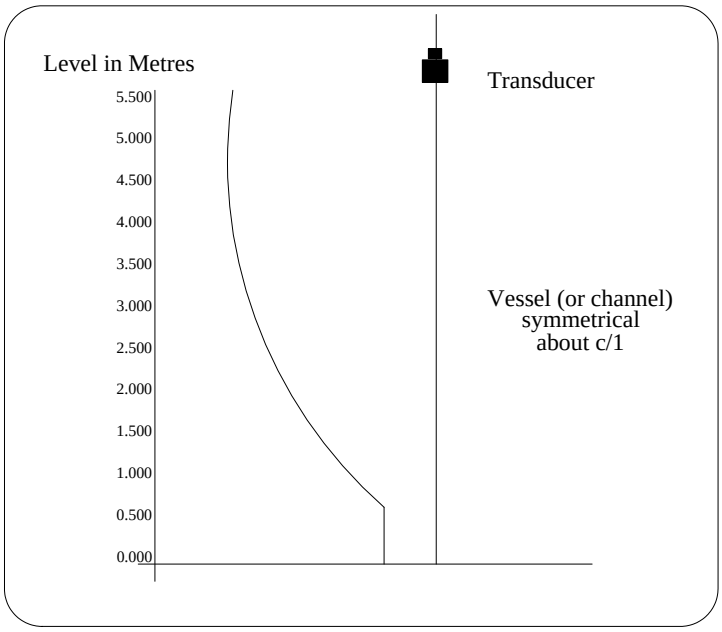
**NOTE:** Points 10 to 24 not used - leave at factory default value.

Now continue programming the instrument as follows:

Flowchart to program the example custom flow table into the instrument.



## Example: Vessel Mapping




## Required values

Use the custom table to create a volume profile for a non- standard tank with a capacity of 8500 litres. Each of the points is entered as a Level in metres against % Volume.

| Point | Level (m) | Volume in Units | % Volume |
|---|---|---|---|
| 1 | 0.000 | 0 | 000.0 |
| 2 | 0.500 | 0 | 000.0 |
| 3 | 1.000 | 612 | 007.2 |
| 4 | 1.500 | 1368.5 | 016.1 |
| 5 | 2.000 | 2320.5 | 027.3 |
| 6 | 2.500 | 3187.5 | 037.5 |
| 7 | 3.000 | 4122.5 | 048.5 |
| 8 | 3.500 | 5057.5 | 059.5 |
| 9 | 4.000 | 5992.5 | 070.5 |
| 10 | 4.500 | 6800.0 | 080.0 |
| 11 | 5.000 | 7607.5 | 089.5 |
| 12 | 5.500 | 8500.0 | 100.0 |
| 13 | _ . _ _ _ | Not used | _ _ _ . _ |
| 14 | _ . _ _ _ | Not used | _ _ _ . _ |
| ⇕ | | | |
| 23 | _ . _ _ _ | Not used | _ _ _ . _ |
| 24 | _ . _ _ _ | Not used | _ _ _ . _ |

**NOTE:** Points 13 to 24 not used - leave at factory default value.

Leave **Pr.6.2 DisplayUnits** at the default setting of **Litres** to display the readings in litres and change **Pr.6.3 MaxDsp x 100 = 85.0** to scale the 0 – 100% volume value 0 to 8500 litres.

# SPECIFICATION

## Transceiver

| | | |
|---|---|---|
| Enclosure | : | IP65, NEMA 4X, IK08 / IK07 polycarbonate, hinged lid. |
| Dimensions | : | 185H X 213W X 119.5D (mm). |
| Weight | : | 1.55Kg |
| Power Supply | : | 95/110/230VAC ± 10%. 50/60Hz, 12VA,<br>24V DC + 25% - 10%, 9W. Separate terminals. |
| Fuse Rating | : | F3 T160mA for AC supply<br>F4 T500mA for 24V DC supply<br>F1 & F2 T80mA. |
| Range | : | Up to 10 metres. |
| Accuracy of Change in Level | : | ± 0.25% of measured distance from the transducer at constant temperature of 20ºC, |
| Ambient Temperature | : | -20ºC to + 70ºC. |
| Resolution | : | 2mm or 0.1% of range, whichever is the greater. |
| Analogue Output | : | 4-20mA into 750 Ohms. 16 bit. Short circuit protected and opto-isolated on AC powered units. Not opto-isolated on 24V DC units. |
| Relay Outputs | : | 3 multi-function SPDT relays rated 8A/250VAC/30V DC resistive, with gold contacts. |
| Indication | : | Integral display, 2lines x 16digit Backlit LCD.<br>3 red LEDs to indicate relay status. |
| Interface | : | 5 key integral keypad with security code. |
| Failsafe | : | High, Low, Hold |
| Damping | : | Fully adjustable |
| Blanking | : | Fully adjustable |

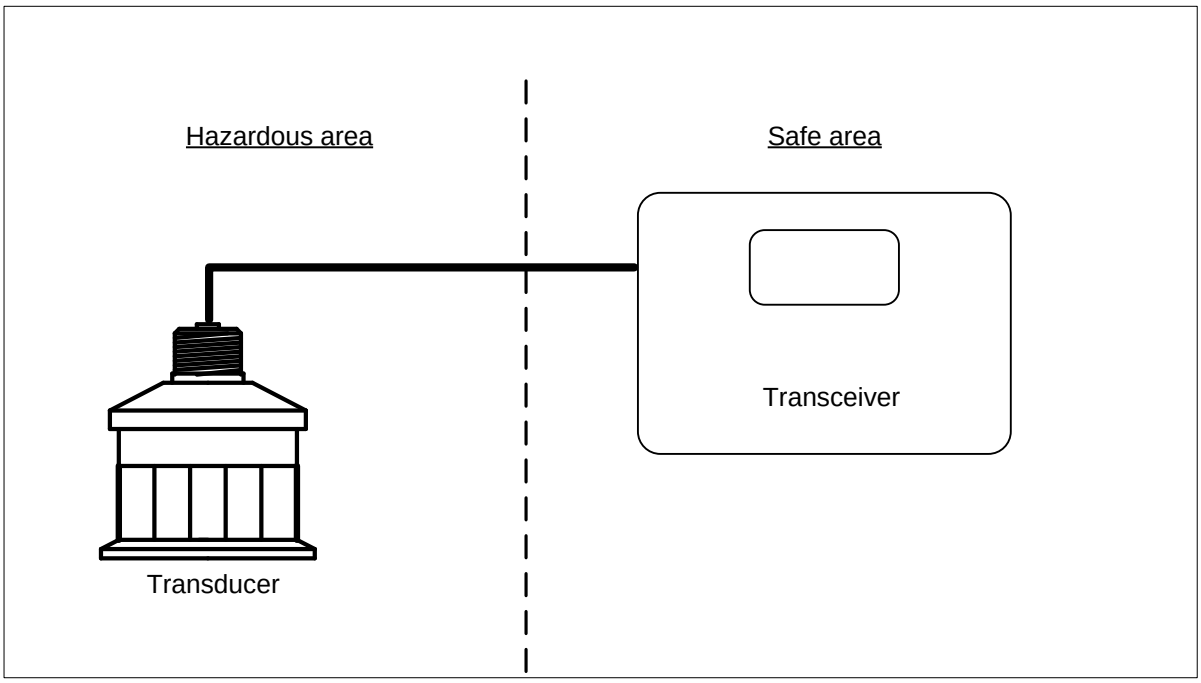
## Transducer

| | | | | | |
|---|---|---|---|---|---|
| Type | : | RYVK15 | RYTK15 | RWVK15 | RWTK15 |
| Temperature Compensation | : | No | Yes | No | Yes |
| Frequency (in KHz) | : | 41.5 kHz | 41.5 kHz | 41.5 kHz | 41.5 kHz |
| Beam Angle at 3dB | : | 12 degrees @ -3dB | 12 degrees @ -3dB | 12 degrees @ -3dB | 12 degrees @ -3dB |
| Body Material | : | PVDF | PVDF | PVDF | PVDF |
| Face Material | : | Glass reinforced epoxy | Glass reinforced epoxy | PVDF | PVDF |
| Process Temperature | : | -40ºC to + 90ºC | -40ºC to + 90ºC | -40ºC to + 90ºC | -40ºC to + 90ºC |
| Protection | : | IP68 | IP68 | IP68 | IP68 |
| Weight (Kg) | : | 1.5 | 1.5 | 1.5 | 1.5 |
| Hazardous area approval | | None | None | None | None |

* Refer to pages 54 & 55 for ATEX transducers & installations.

# Specifications & Installation Instructions for ATEX Transducers in Hazardous Areas

## Applies to models:- RY*K15-ATEX & RW*K15-ATEX




The installation must be in accordance with the applicable codes of practice and harmonized standards for Ex mb (encapsulated) equipment.

The transducer must be driven only by one of the above listed transceivers.

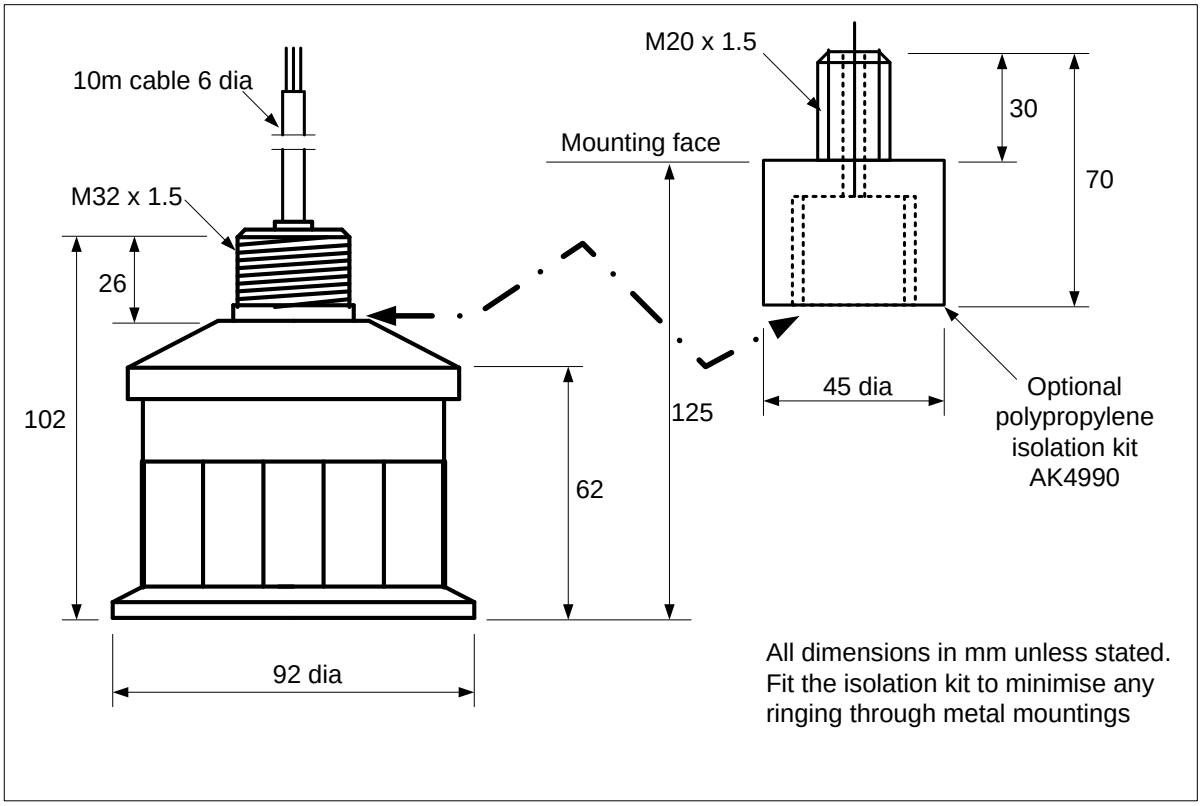
The transceiver must always be installed in a safe area.

User repairs are not permitted; in case of faults return the unit to Hycontrol.

Periodically clean the radiating face only with clean water, and inspect the body and wiring for damage.

To avoid electrostatic hazard the equipment shall not be installed in a location where external conditions are conducive to the build-up of electrostatic charge on the non-metallic enclosure. The equipment shall be cleaned only with a damp cloth.

# Specifications & Installation Instructions for ATEX Transducers in Hazardous Areas




| Specifications | |
|---|---|
| Type; | RYVK15-ATEX<br>RYTK15-ATEX (T/comp) |
| Frequency: | 41.5 kHz |
| Beam angle: | 14º @ -3dB |
| Body material: | PVDF |
| Face material: | Glass reinforced epoxy |
| Temp. range: | -40ºC to +60ºC |
| Range: | Up to 10 metres |

| Typical marking | |
|---|---|
| Manufacturer: | Hycontrol Ltd. |
| CE marking / Notified body: | CE 0038 |
| Group / category; | Ⓔx II 2 G<br>Ex mb IIC T6 Gb |
| EC certification: | Sira 14ATEX5083X |
| Type: | RYVK15-ATEX<br>RYTK15-ATEX |
| Tamb: | -40ºC to +60ºC |
| Protection: | IP68 |
| S/No: | xxxxxxxxxxxxxxx |
| Mfg. year: | xxxx |

| Specifications | |
|---|---|
| Type; | RWVK15-ATEX<br>RWTK15-ATEX (T/comp) |
| Frequency: | 41.5 kHz |
| Beam angle: | 14º @ -3dB |
| Body material: | PVDF |
| Face material: | PVDF |
| Temp. range: | -40ºC to +60ºC |
| Range: | Up to 10 metres |

| Typical marking | |
|---|---|
| Manufacturer: | Hycontrol Ltd. |
| CE marking / Notified body: | CE 0038 |
| Group / category; | Ⓔx II 2 GD<br>Ex mb IIC T6 Gb<br>Ex mb IIIC T85ºC Db |
| EC certification: | Sira 14ATEX5083X |
| Type: | RWVK15-ATEX<br>RWTK15-ATEX |
| Tamb: | -40ºC to +60ºC |
| Protection: | IP68 |
| S/No: | xxxxxxxxxxxxxxx |
| Mfg. year: | xxxx |

| DISTANCE APPLICATION PARAMETERS | | | | |
|---|---|---|---|---|
| **Pr** | **Description** | **Factory Default** | **User** | **Service** |
| **Application** | | | | |
| 1.0 | Basic Application | Distance | | |
| **Basic Set-up** | | | | |
| 2.0 | Empty Distance | 10.00 | | |
| 3.0 | Operational Span | 10.00 | | |
| 4.0 | Blanking | 0.500 | | |
| 5.0 | RateOfChange | 10.00 | | |
| **Relays** | | | | |
| 8.1 | Rly1 Options | Off | | |
| 8.1.1.1 | R1 Set | NOT APPLICABLE | | |
| 8.1.1.2 | R1 Reset | NOT APPLICABLE | | |
| 8.2 | Rly2 Options | Off | | |
| 8.2.1.1 | R2 Set | NOT APPLICABLE | | |
| 8.2.1.2 | R2 Reset | NOT APPLICABLE | | |
| 8.3 | Rly3 Options | L.O.E. Alarm | | |
| 8.3.1.1 | R3 Set | NOT APPLICABLE | | |
| 8.3.1.2 | R3 Reset | NOT APPLICABLE | | |
| **Failsafe** | | | | |
| 10.1 | Relay 1 | NOT APPLICABLE | | |
| 10.2 | Relay 2 | NOT APPLICABLE | | |
| 10.3 | Relay 3 | De-Energise | | |
| 10.4 | Fail Time | 600 | | |
| 10.5 | mA Fail | Hold | | |
| **Analogue** | | | | |
| 11.1 | Analogue O/P | Output 4-20mA | | |
| 11.2 | Analogue Value | NOT APPLICABLE | | |
| 11.3 | Test mA | 4mA | | |
| 11.4 | Analogue Scale | NO VALUE REQUIRED | | |
| 11.4.1 | Datum (%) | 0.0 | | |
| 11.4.2 | Span (%) | 100.0 | | |
| **Miscellaneous** | | | | |
| 12.1 | Offset | 0.000 | | |
| 12.2 | Passcode | 36.67 | | |
| 12.3 | NoOfDecimal | 2 Dec Points | | |
| 12.4 | Relay tot. | Off | | |
| 12.5 | Simulation | No | | |
| 12.6 | Station ID | 1 | | |
| 12.7 | Sync Instrs | Master | | |
| 12.8 | Check Search | Off | | |
| 12.9 | Maximum gain | 100.0 | | |
| 12.10 | Serial Number Store | Serial Number | | |
| 12.11 | Rev. Number Store | Revision Number | | |
| 12.12 | Echo Velocity | 344.1 | | |
| 12.13 | Gain Control | Variable | | |
| 12.14 | Transducer | R*TK15-ATEX | | |

NOT APPLICABLE – Parameter is not required for the selected option but may need to be set if the option is change

NO VALUE REQUIRED – This parameter is just a heading and leads to another parameter.

| LEVEL APPLICATION PARAMETERS | | | | |
|---|---|---|---|---|
| **Pr** | **Description** | **Factory Default** | **User** | **Service** |
| **Application** | | | | |
| 1.0 | Basic Application | Level | | |
| **Basic Set-up** | | | | |
| 2.0 | Empty Distance | 6.000 | | |
| 3.0 | Operational Span | 5.500 | | |
| 4.0 | Blanking | 0.500 | | |
| 5.0 | RateOfChange | 1.000 | | |
| **Relays** | | | | |
| 8.1 | Rly1 Options | Norm-Energised | | |
| 8.1.1.1 | R1 Set | 5.000 | | |
| 8.1.1.2 | R1 Reset | 4.800 | | |
| 8.2 | Rly2 Options | Norm-Energised | | |
| 8.2.1.1 | R2 Set | 1.000 | | |
| 8.2.1.2 | R2 Reset | 1.200 | | |
| 8.3 | Rly3 Options | L.O.E. Alarm | | |
| 8.3.1.1 | R3 Set | NOT APPLICABLE | | |
| 8.3.1.2 | R3 Reset | NOT APPLICABLE | | |
| **Failsafe** | | | | |
| 10.1 | Relay 1 | Hold State | | |
| 10.2 | Relay 2 | Hold State | | |
| 10.3 | Relay 3 | De-Energise | | |
| 10.4 | Fail Time | 600 | | |
| 10.5 | mA Fail | Hold | | |
| **Analogue** | | | | |
| 11.1 | Analogue O/P | Output 4-20mA | | |
| 11.2 | Analogue Value | NOT APPLICABLE | | |
| 11.3 | Test mA | 4mA | | |
| 11.4 | Analogue Scale | NO VALUE REQUIRED | | |
| 11.4.1 | Datum (%) | 0.0 | | |
| 11.4.2 | Span (%) | 100.0 | | |
| **Miscellaneous** | | | | |
| 12.1 | Offset | 0.000 | | |
| 12.2 | Passcode | 36.67 | | |
| 12.3 | NoOfDecimal | 2 Dec Points | | |
| 12.4 | Relay tot. | Off | | |
| 12.5 | Simulation | No | | |
| 12.6 | Station ID | 1 | | |
| 12.7 | Sync Instrs | Master | | |
| 12.8 | Check Search | Off | | |
| 12.9 | Maximum gain | 100.0 | | |
| 12.10 | Serial Number Store | Serial Number | | |
| 12.11 | Rev. Number Store | Revision Number | | |
| 12.12 | Echo Velocity | 344.1 | | |
| 12.13 | Gain Control | Variable | | |
| 12.14 | Transducer | R*TK15-ATEX | | |

NOT APPLICABLE – Parameter is not required for the selected option but may need to be set if the option is changed.
NO VALUE REQUIRED – This parameter is just a heading and leads to another parameter.

| VOLUME APPLICATION PARAMETERS | | | | |
|---|---|---|---|---|
| **Pr** | **Description** | **Factory Default** | **User** | **Service** |
| **Application** | | | | |
| 1.0 | Basic Application | Level | | |
| **Basic Set-up** | | | | |
| 2.0 | Empty Distance | 6.000 | | |
| 3.0 | Operational Span | 5.500 | | |
| 4.0 | Blanking | 0.500 | | |
| 5.0 | RateOfChange | 1.000 | | |
| **Volume Conversion** | | | | |
| 6.1 | Vessel Shape | Linear | | |
| | h Metres | NOT APPLICABLE | | |
| | R Metres | NOT APPLICABLE | | |
| | Dish L Metres | NOT APPLICABLE | | |
| | Cylindr L Metres | NOT APPLICABLE | | |
| 6.2 | Display Units | % | | |
| 6.3 | MaxDisp *100 | 001.0 | | |
| 6.4 | Disp. Format | Contents | | |
| **Relays** | | | | |
| 8.1 | Rly1 Options | Norm-Energised | | |
| 8.1.1.1 | R1 Set | 90.00% | | |
| 8.1.1.2 | R1 Reset | 85.00% | | |
| 8.2 | Rly2 Options | Norm-Energised | | |
| 8.2.1.1 | R2 Set | 10.00% | | |
| 8.2.1.2 | R2 Reset | 15.00% | | |
| 8.3 | Rly3 Options | L.O.E. Alarm | | |
| 8.3.1.1 | R3 Set | NOT APPLICABLE | | |
| 8.3.1.2 | R3 Reset | NOT APPLICABLE | | |
| **Failsafe** | | | | |
| 10.1 | Relay 1 | Hold State | | |
| 10.2 | Relay 2 | Hold State | | |
| 10.3 | Relay 3 | Hold State | | |
| 10.4 | Fail Time | 600 | | |
| 10.5 | mA Fail | Hold | | |
| **Analogue** | | | | |
| 11.1 | Analogue O/P | Output 4-20mA | | |
| 11.2 | Analogue Value | NOT APPLICABLE | | |
| 11.3 | Test mA | 4mA | | |
| 11.4 | Analogue Scale | NO VALUE REQUIRED | | |
| 11.4.1 | Datum (%) | 0.0 | | |
| 11.4.2 | Span (%) | 100.0 | | |
| **Miscellaneous** | | | | |
| 12.1 | Offset | 0.000 | | |
| 12.2 | Passcode | 36.67 | | |
| 12.3 | NoOfDecimal | 2 Dec Points | | |
| 12.4 | Relay tot. | Off | | |
| 12.5 | Simulation | No | | |
| 12.6 | Station ID | 1 | | |
| 12.7 | Sync Instrs | Master | | |
| 12.8 | Check Search | Off | | |
| 12.9 | Maximum gain | 100.0 | | |
| 12.10 | Serial Number Store | Serial Number | | |
| 12.11 | Rev. Number Store | Revision Number | | |
| 12.12 | Echo Velocity | 344.1 | | |
| 12.13 | Gain Control | Variable | | |
| 12.14 | Transducer | R*TK15-ATEX | | |

NOT APPLICABLE – Parameter is not required for the selected option but may need to be set if the option is changed.

NO VALUE REQUIRED – This parameter is just a heading and leads to another parameter.

| PUMP CONTROL APPLICATION PARAMETERS | | | | |
|---|---|---|---|---|
| **Pr** | **Description** | **Factory Default** | **User** | **Service** |
| **Application** | | | | |
| 1.0 | Basic Application | Pump Control | | |
| **Basic Set-up** | | | | |
| 2.0 | Empty Distance | 6.000 | | |
| 3.0 | Operational Span | 5.500 | | |
| 4.0 | Blanking | 0.500 | | |
| 5.0 | RateOfChange | 1.000 | | |
| **Relays** | | | | |
| 8.1 | Rly1 Options | Norm-DeEnergised | | |
| 8.1.1.1 | R1 Set | 1.000 | | |
| 8.1.1.2 | R1 Reset | 0.500 | | |
| 8.2 | Rly2 Options | Norm-DeEnergised | | |
| 8.2.1.1 | R2 Set | 2.000 | | |
| 8.2.1.2 | R2 Reset | 0.500 | | |
| 8.3 | Rly3 Options | L.O.E. Alarm | | |
| 8.3.1.1 | R3 Set | NOT APPLICABLE | | |
| 8.3.1.2 | R3 Reset | NOT APPLICABLE | | |
| **Pump Controls** | | | | |
| 9.1 | PumpSequence | Alternate 1&2 | | |
| 9.2 | Duty Standby | Duty Assist | | |
| 9.3 | Exerciser | 0001 | | |
| 9.4 | Tolerance | No Tolerance | | |
| 9.5 | Maintenance | All pumps in | | |
| 9.6 | RunOnIntervl | 0.000 | | |
| 9.7 | Run On Time | 0000 | | |
| **Failsafe** | | | | |
| 10.1 | Relay 1 | De-Energise | | |
| 10.2 | Relay 2 | De-Energise | | |
| 10.3 | Relay 3 | De-Energise | | |
| 10.4 | Fail Time | 30 | | |
| 10.5 | mA Fail | High | | |
| **Analogue** | | | | |
| 11.1 | Analogue O/P | Output 4-20mA | | |
| 11.2 | Analogue Value | NOT APPLICABLE | | |
| 11.3 | Test mA | 4mA | | |
| 11.4 | Analogue Scale | NO VALUE REQUIRED | | |
| 11.4.1 | Datum (%) | 0.0 | | |
| 11.4.2 | Span (%) | 100.0 | | |
| **Miscellaneous** | | | | |
| 12.1 | Offset | 0.000 | | |
| 12.2 | Passcode | 36.67 | | |
| 12.3 | NoOfDecimal | 2 Dec Points | | |
| 12.4 | Relay tot. | Off | | |
| 12.5 | Simulation | No | | |
| 12.6 | Station ID | 1 | | |
| 12.7 | Sync Instrs | Master | | |
| 12.8 | Check Search | Off | | |
| 12.9 | Maximum gain | 100.0 | | |
| 12.10 | Serial Number Store | Serial Number | | |
| 12.11 | Rev. Number Store | Revision Number | | |
| 12.12 | Echo Velocity | 344.1 | | |
| 12.13 | Gain Control | Variable | | |
| 12.14 | Transducer | R*TK15-ATEX | | |

NOT APPLICABLE – Parameter is not required for the selected option but may need to be set if the option is changed.

NO VALUE REQUIRED – This parameter is just a heading and leads to another parameter.

| OCM APPLICATION PARAMETERS | | | | |
|---|---|---|---|---|
| Pr | Description | Factory Default | User | Service |
| **Application** | | | | |
| 1.0 | Basic Application | Open Channel Flow Monitoring | | |
| **Basic Set-up** | | | | |
| 2.0 | Empty Distance | 1.200 | | |
| 3.0 | Operational Span | 0.280 | | |
| 4.0 | Blanking | 0.500 | | |
| 5.0 | RateOfChange | 1.000 | | |
| **Open Channel Flow** | | | | |
| 7.1 | Flow Device | Rect.Flume 3/2 | | |
| If Flow device is a BS3680 rectangular flume / weir or V-Notch weir enter details in boxes below | | | | |

| BS3680 Rect. Flume | | FD | User | Serv |
|---|---|---|---|---|
| | Throat Width (m) | N/A | | |
| | Channel Width (m) | N/A | | |
| | Throat Length (m) | N/A | | |
| | Hump Height (m) | N/A | | |

| BS3680 Rect. Weir | | FD | User | Serv |
|---|---|---|---|---|
| | Crest Width (m) | N/A | | |
| | Channel Width (m) | N/A | | |
| | Crest Height (m) | N/A | | |

| BS3680 V-Notch Weir | | FD | User | Serv |
|---|---|---|---|---|
| | Angle (Degrees) | N/A | | |
| | Channel Width (m) | N/A | | |
| | Vertex Height (m) | N/A | | |

| | | | | |
|---|---|---|---|---|
| 7.2 | Max Flow Val | *Only used in BS3680 | | |
| 7.3 | Maximum Flow | 50.00 | | |
| 7.4 | Flow Units | in Litres | | |
| 7.5 | Flow Timebase | in Seconds | | |
| 7.6 | Total. Units | in m3 | | |
| 7.7 | Ext. Tot. Drv. | 0.000 | | |
| 7.8 | Total. Reset | No | | |
| **Relays** | | | | |
| 8.1 | Rly1 Options | Flow Alarm | | |
| 8.1.1.1 | R1 Set | 45.00 | | |
| 8.1.1.2 | R1 Reset | 40.00 | | |
| 8.2 | Rly2 Options | L.O.E. Alarm | | |
| 8.2.1.1 | R2 Set | NOT APPLICABLE | | |
| 8.2.1.2 | R2 Reset | NOT APPLICABLE | | |
| 8.3 | Rly3 Options | Totaliser Output | | |
| 8.3.1.1 | R3 Set | NOT APPLICABLE | | |
| 8.3.1.2 | R3 Reset | NOT APPLICABLE | | |
| **Failsafe** | | | | |
| 10.1 | Relay 1 | De-Energise | | |
| 10.2 | Relay 2 | De-Energise | | |
| 10.3 | Relay 3 | NOT APPLICABLE | | |
| 10.4 | Fail Time | 30 | | |
| 10.5 | mA Fail | Hold | | |
| **Analogue** | | | | |
| 11.1 | Analogue O/P | Output 4-20mA | | |
| 11.2 | Analogue Value | Relative to flow | | |
| 11.3 | Test mA | 4mA | | |
| 11.4 | Analogue Scale | NO VALUE REQUIRED | | |
| 11.4.1 | Datum (%) | 0.0 | | |
| 11.4.2 | Span (%) | 100.0 | | |

Cont'd…

| **Miscellaneous** | | | | |
|---|---|---|---|---|
| 12.1 | Offset | 0.000 | | |
| 12.2 | Passcode | 36.67 | | |
| 12.3 | NoOfDecimal | 2 Dec Points | | |
| 12.4 | Relay tot. | Off | | |
| 12.5 | Simulation | No | | |
| 12.6 | Station ID | 1 | | |
| 12.7 | Sync Instrs | Master | | |
| 12.8 | Check Search | Off | | |
| 12.9 | Maximum gain | 100.0 | | |
| 12.10 | Serial Number Store | Serial Number | | |
| 12.11 | Rev. Number Store | Revision Number | | |
| 12.12 | Echo Velocity | 344.1 | | |
| 12.13 | Gain Control | Variable | | |
| 12.14 | Transducer | R*TK15-ATEX | | |

NOT APPLICABLE – Parameter is not required for the selected option but may need to be set if the option is changed.

NO VALUE REQUIRED – This parameter is just a heading and leads to another parameter.

| DIFFERENTIAL LEVEL APPLICATION PARAMETERS | | | | |
|---|---|---|---|---|
| **Pr** | **Description** | **Factory Default** | **User** | **Service** |
| **Application** | | | | |
| 1.0 | Basic Application | Differential Measurement | | |
| **Basic Set-up** | | | | |
| 2.0 | Empty Distance | 2.000 | | |
| 3.0 | Operational Span | 0.500 | | |
| 4.0 | Blanking | 0.500 | | |
| 5.0 | RateOfChange | 1.000 | | |
| **Relays** | | | | |
| 8.1 | Rly1 Options | Diff. Control | | |
| 8.1.1.1 | R1 Set | 0.150 | | |
| 8.1.1.2 | R1 Reset | 0.050 | | |
| 8.2 | Rly2 Options | Upstream Alarm | | |
| 8.2.1.1 | R2 Set | 0.600 | | |
| 8.2.1.2 | R2 Reset | 0.550 | | |
| 8.3 | Rly3 Options | NOT AVAILABLE *Used to switch between transducers* | | |
| **Failsafe** | | | | |
| 10.1 | Relay 1 | Energise | | |
| 10.2 | Relay 2 | De-Energise | | |
| 10.3 | Relay 3 | NOT AVAILABLE | | |
| 10.4 | Fail Time | 600 | | |
| 10.5 | mA Fail | Hold | | |
| **Analogue** | | | | |
| 11.1 | Analogue O/P | Output 4-20mA | | |
| 11.2 | Analog. Value | Differential | | |
| 11.3 | Test mA | 4mA | | |
| 11.4 | Analogue Scale | NO VALUE REQUIRED | | |
| 11.4.1 | Datum (%) | 0.0 | | |
| 11.4.2 | Span (%) | 100.0 | | |
| **Miscellaneous** | | | | |
| 12.1 | Offset | 0.000 | | |
| 12.2 | Passcode | 36.67 | | |
| 12.3 | NoOfDecimal | 2 Dec Points | | |
| 12.4 | Relay tot. | On | | |
| 12.5 | Simulation | No | | |
| 12.6 | Station ID | 1 | | |
| 12.7 | Sync Instrs | Master | | |
| 12.8 | Check Search | Off | | |
| 12.9 | Maximum gain | 100.0 | | |
| 12.10 | Serial Number Store | Serial Number | | |
| 12.11 | Rev. Number Store | Revision Number | | |
| 12.12 | Echo Velocity | 344.1 | | |
| 12.13 | Gain Control | Variable | | |
| 12.14 | Transducer | R*TK15-ATEX | | |

NOT APPLICABLE – Parameter is not required for the selected option but may need to be set if the option is changed.
NOT AVAILABLE – Parameter does not apply to this application type.
NO VALUE REQUIRED – This parameter is just a heading and leads to another parameter.

# PARSHALL FLUMES

The OCM flow exponent (Pr.7.1) has been expanded to include 10 Parshall flume profiles. The data for the selected flume are loaded into the flume mapping system (Appendix 1) from tables held in memory.

Maximum head is entered in Pr.3.0 and the associated maximum flow in Pr.7.3. If one of the values is known, the other can be found in the flume tables or by calculation from :

$$Q = KH^n \text{ GPM},$$

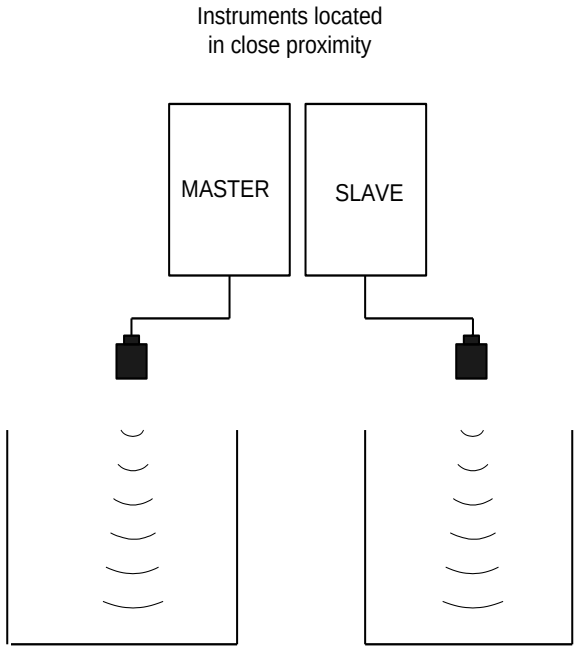
where H = Inches, Q = US GPM and K = Constant for flume size
(for imperial gallon multiply K factor by 0.8).

| Flume Size - Inches | K Factor for US GPM |
|---|---|
| 1 | 3.22 |
| 2 | 6.45 |
| 3 | 9.46 |
| 6 | 18.20 |
| 9 | 30.80 |
| 12 | 40.90 |
| 18 | 58.90 |
| 24 | 76.30 |
| 36 | 110.00 |
| 48 | 142.00 |
| 72 | 204.70 |
| 96 | 256.60 |

| Flume Size - Feet | K Factor for US GPM |
|---|---|
| 10 | 331.60 |
| 12 | 393.70 |
| 15 | 486.90 |
| 20 | 642.10 |
| 30 | 797.40 |
| 40 | 1263.00 |
| 50 | 1574.00 |

## WIRING DIAGRAM FOR SYNCHRONISATION OF INSTRUMENTS

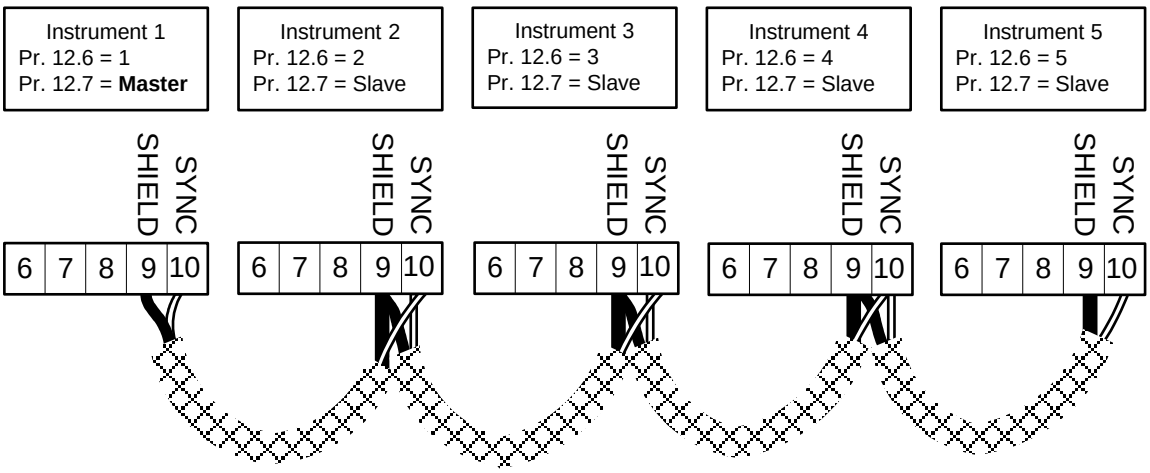
If two or more instruments are situated close together or the transducers beam profile overlaps there is a possibility they can interfere with each other.



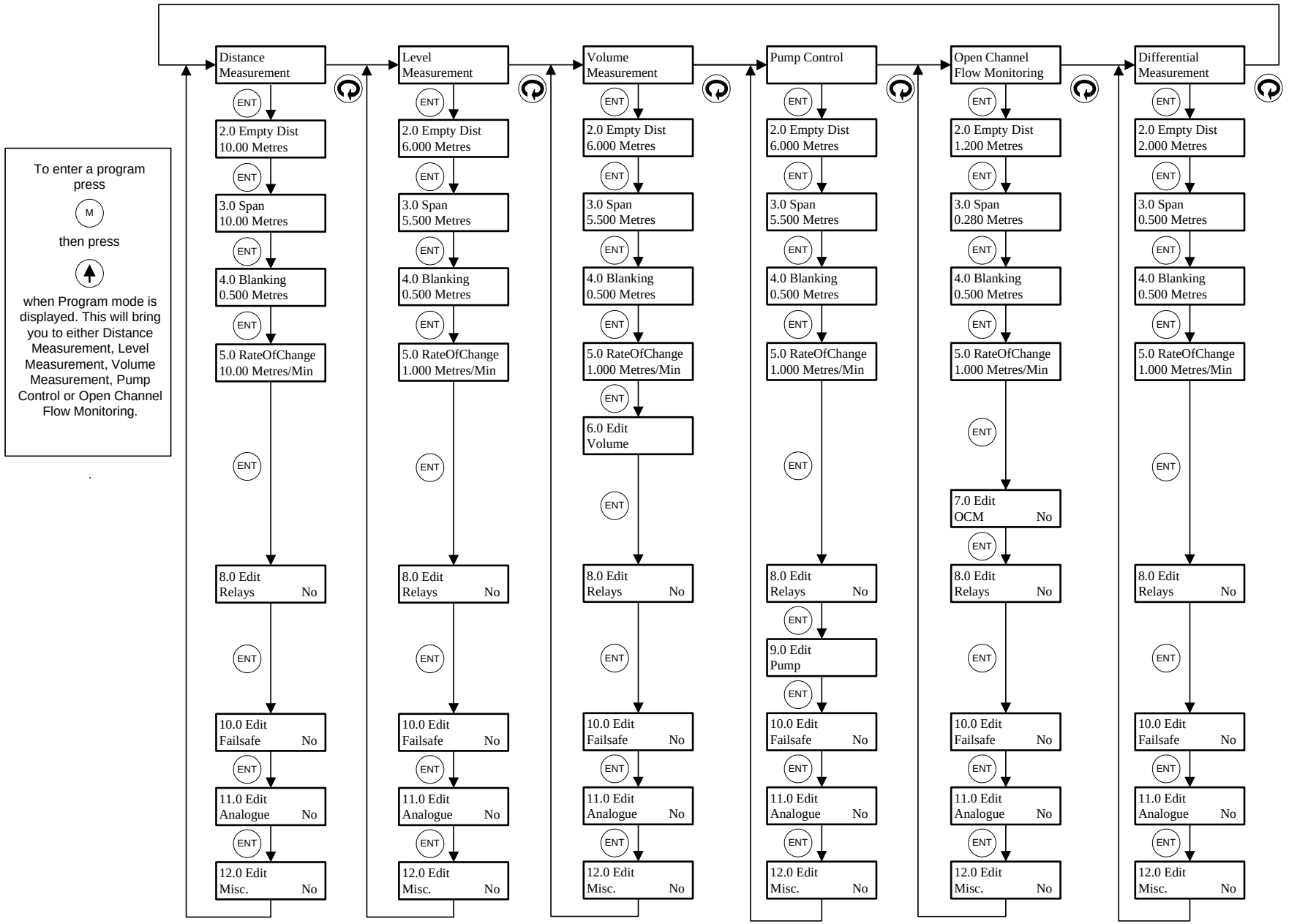

*Potential problem application with two instruments located close together.*

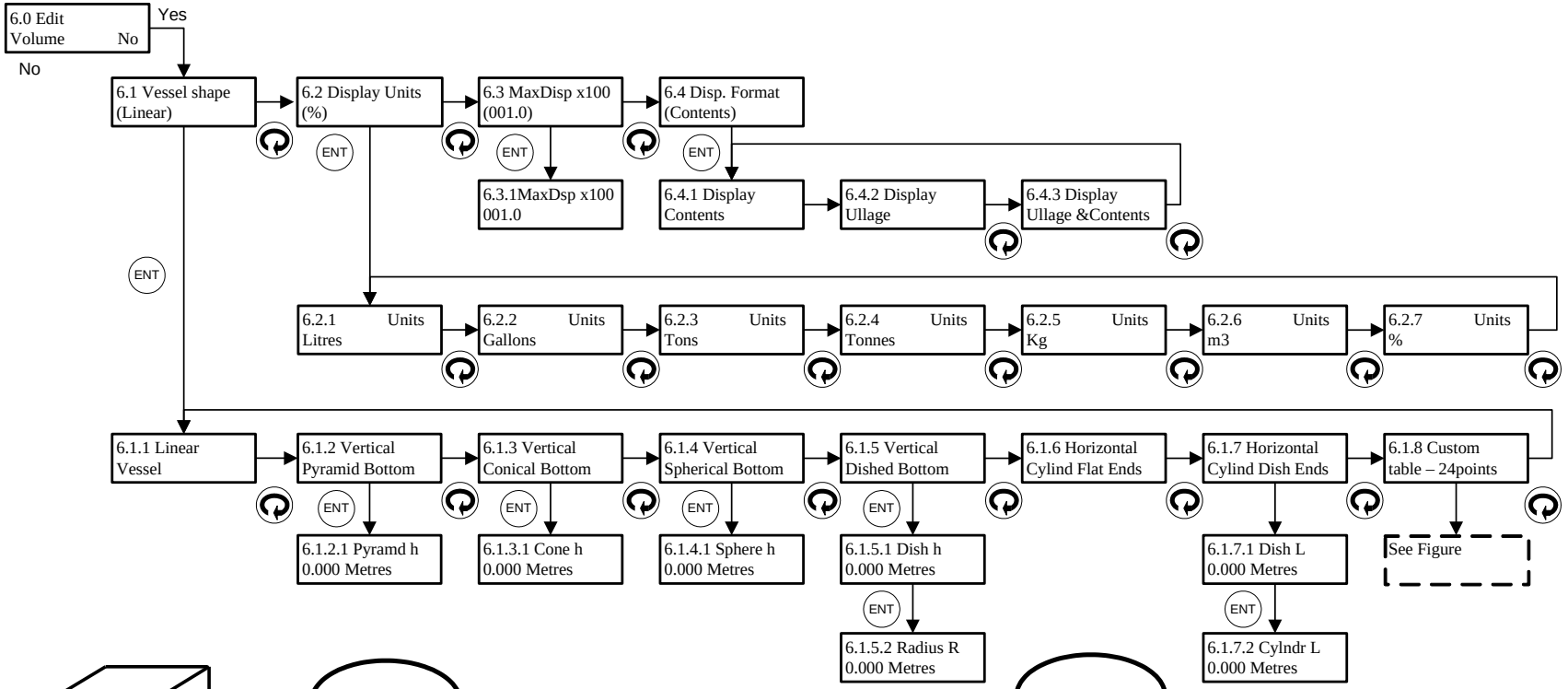
To solve this problem, connect the sync and shield terminals of each of the units in close proximity to each other as shown below.

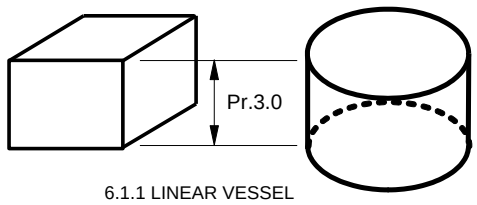
To program one instrument as master give it the ID number 1 (Pr 12.6 = 1) then set each of the attached instruments as slaves (Pr. 12.7 = Slave) with consecutive ID numbers, up to a maximum of 5.



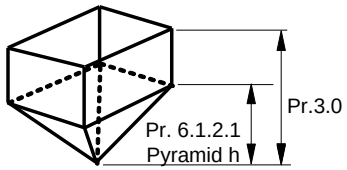

*Connection diagram for up to 5 instruments*


To enter a program press
M
then press
when Program mode is displayed. This will bring you to either Distance Measurement, Level Measurement, Volume Measurement, Pump Control or Open Channel Flow Monitoring.
Distance Measurement
2.0 Empty Dist 10.00 Metres
3.0 Span 10.00 Metres
4.0 Blanking 0.500 Metres
5.0 RateOfChange 10.00 Metres/Min
8.0 Edit Relays No
10.0 Edit Failsafe No
11.0 Edit Analogue No
12.0 Edit Misc. No
Level Measurement
2.0 Empty Dist 6.000 Metres
3.0 Span 5.500 Metres
4.0 Blanking 0.500 Metres
5.0 RateOfChange 1.000 Metres/Min
8.0 Edit Relays No
10.0 Edit Failsafe No
11.0 Edit Analogue No
12.0 Edit Misc. No
Volume Measurement
2.0 Empty Dist 6.000 Metres
3.0 Span 5.500 Metres
4.0 Blanking 0.500 Metres
5.0 RateOfChange 1.000 Metres/Min
6.0 Edit Volume
8.0 Edit Relays No
10.0 Edit Failsafe No
11.0 Edit Analogue No
12.0 Edit Misc. No
Pump Control
2.0 Empty Dist 6.000 Metres
3.0 Span 5.500 Metres
4.0 Blanking 0.500 Metres
5.0 RateOfChange 1.000 Metres/Min
8.0 Edit Relays No
9.0 Edit Pump
10.0 Edit Failsafe No
11.0 Edit Analogue No
12.0 Edit Misc. No
Open Channel Flow Monitoring
2.0 Empty Dist 1.200 Metres
3.0 Span 0.280 Metres
4.0 Blanking 0.500 Metres
5.0 RateOfChange 1.000 Metres/Min
7.0 Edit OCM No
8.0 Edit Relays No
10.0 Edit Failsafe No
11.0 Edit Analogue No
12.0 Edit Misc. No
Differential Measurement
2.0 Empty Dist 2.000 Metres
3.0 Span 0.500 Metres
4.0 Blanking 0.500 Metres
5.0 RateOfChange 1.000 Metres/Min
8.0 Edit Relays No
10.0 Edit Failsafe No
11.0 Edit Analogue No
12.0 Edit Misc. No
ENT

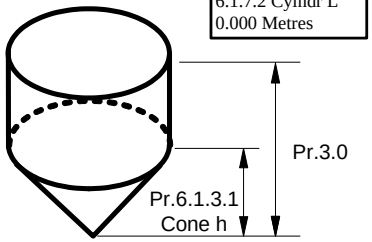


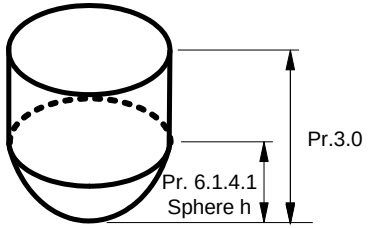

6.1.1 LINEAR VESSEL



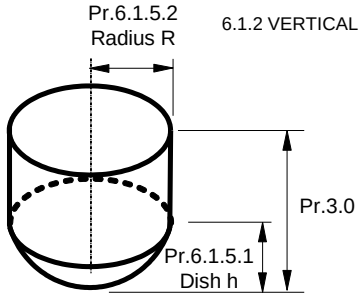

6.1.2 VERTICAL PYRAMID BOTTOM



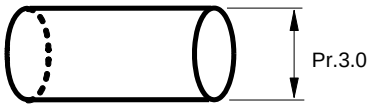

6.1.3 VERTICAL CONICAL BOTTOM



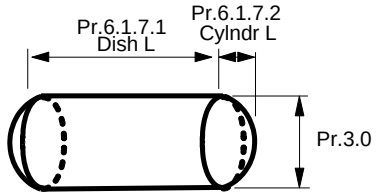

6.1.4 VERTICAL SPHERICAL BOTTOM.



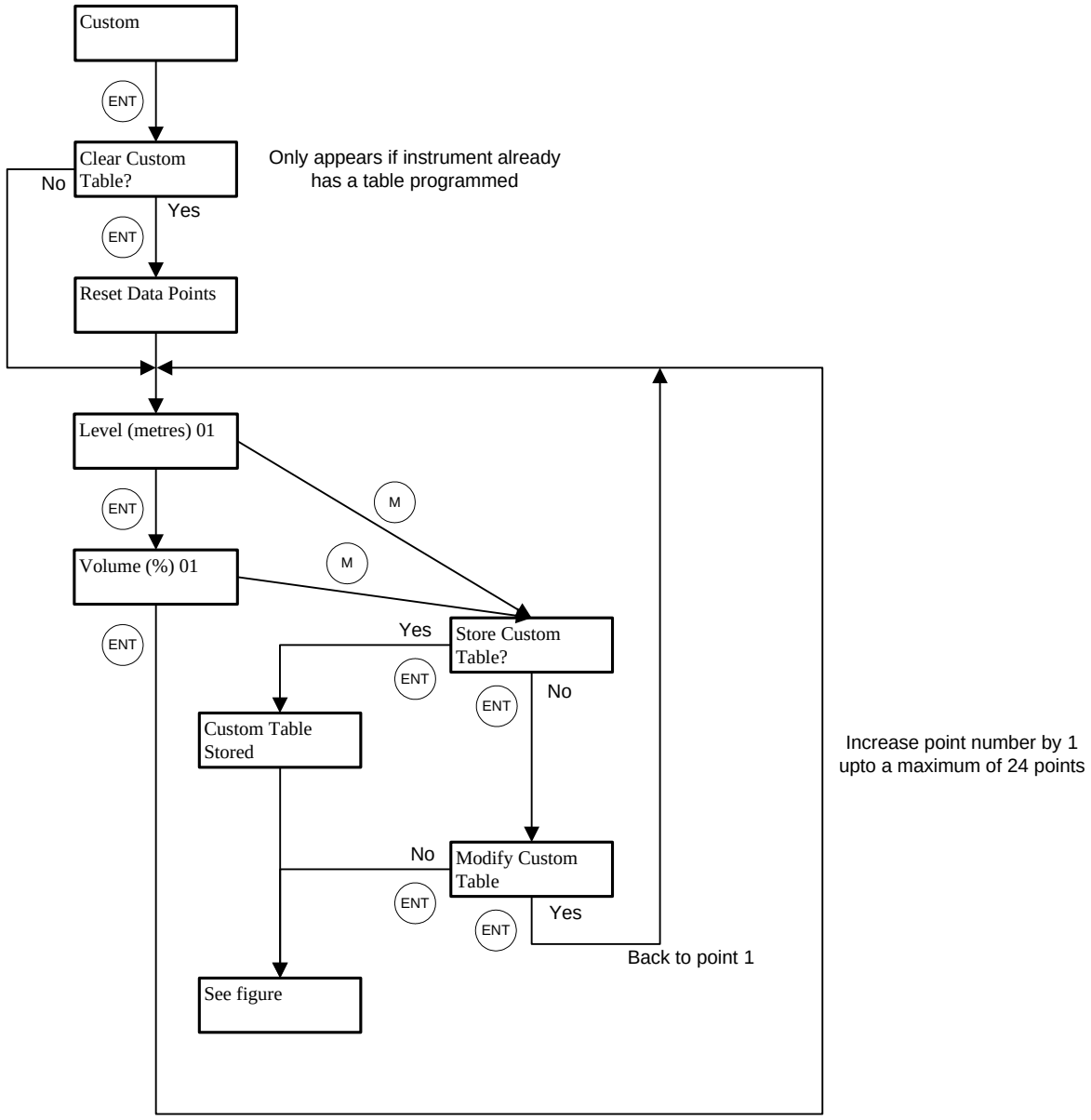

6.1.5 VERTICAL DISHED BOTTOM.

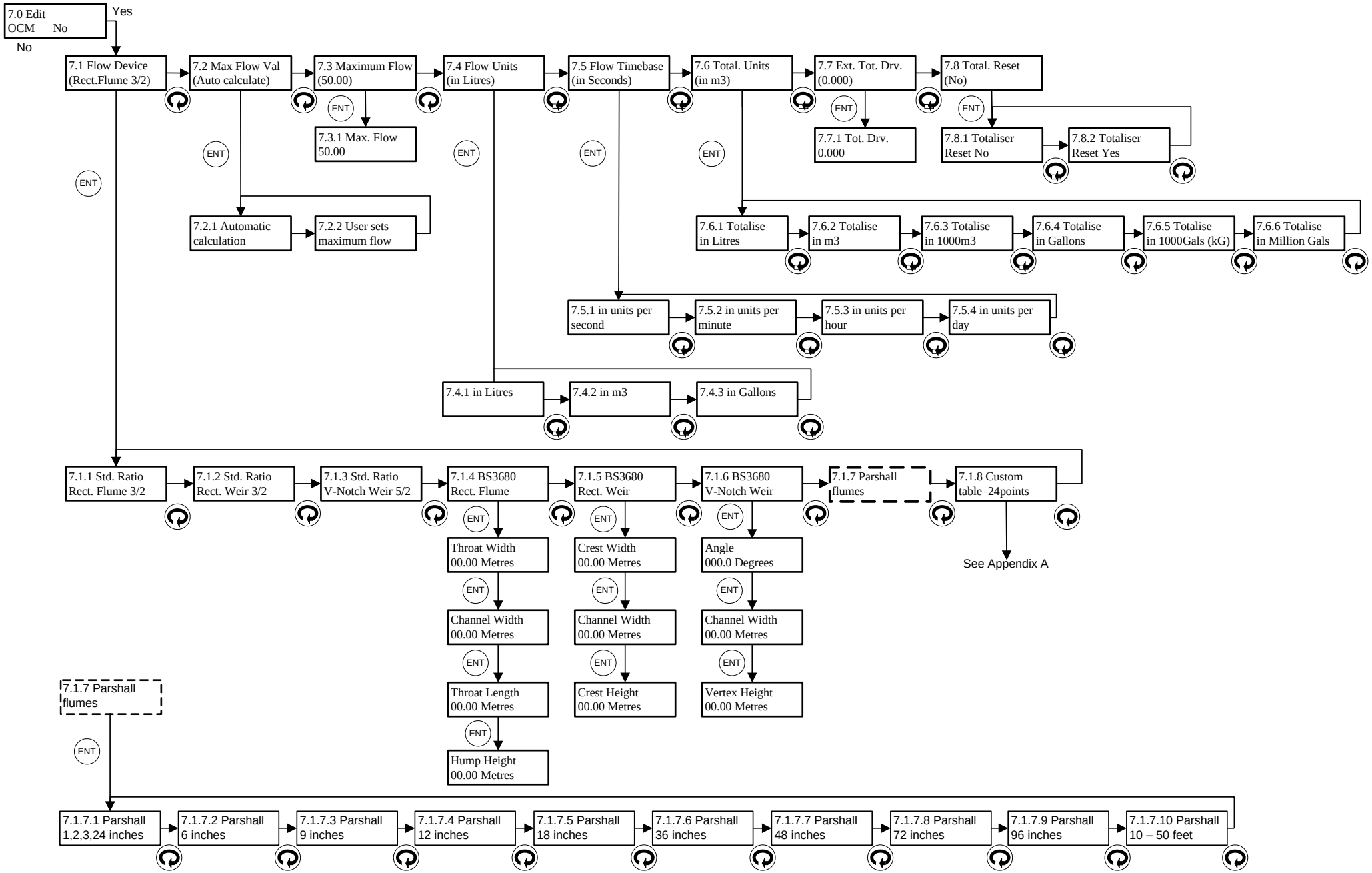


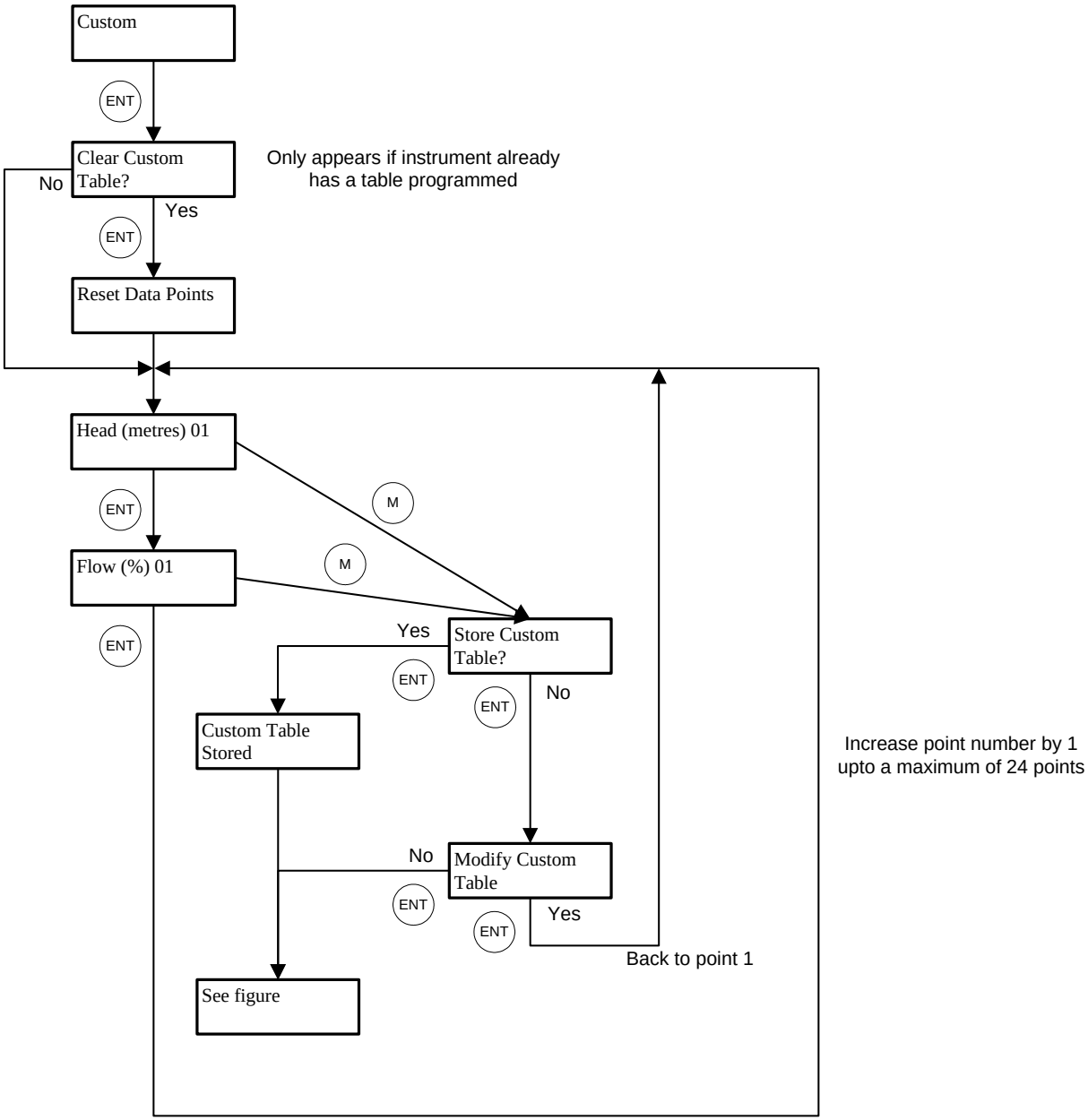

6.1.6 HORIZONTAL CYLINDER FLAT ENDS.

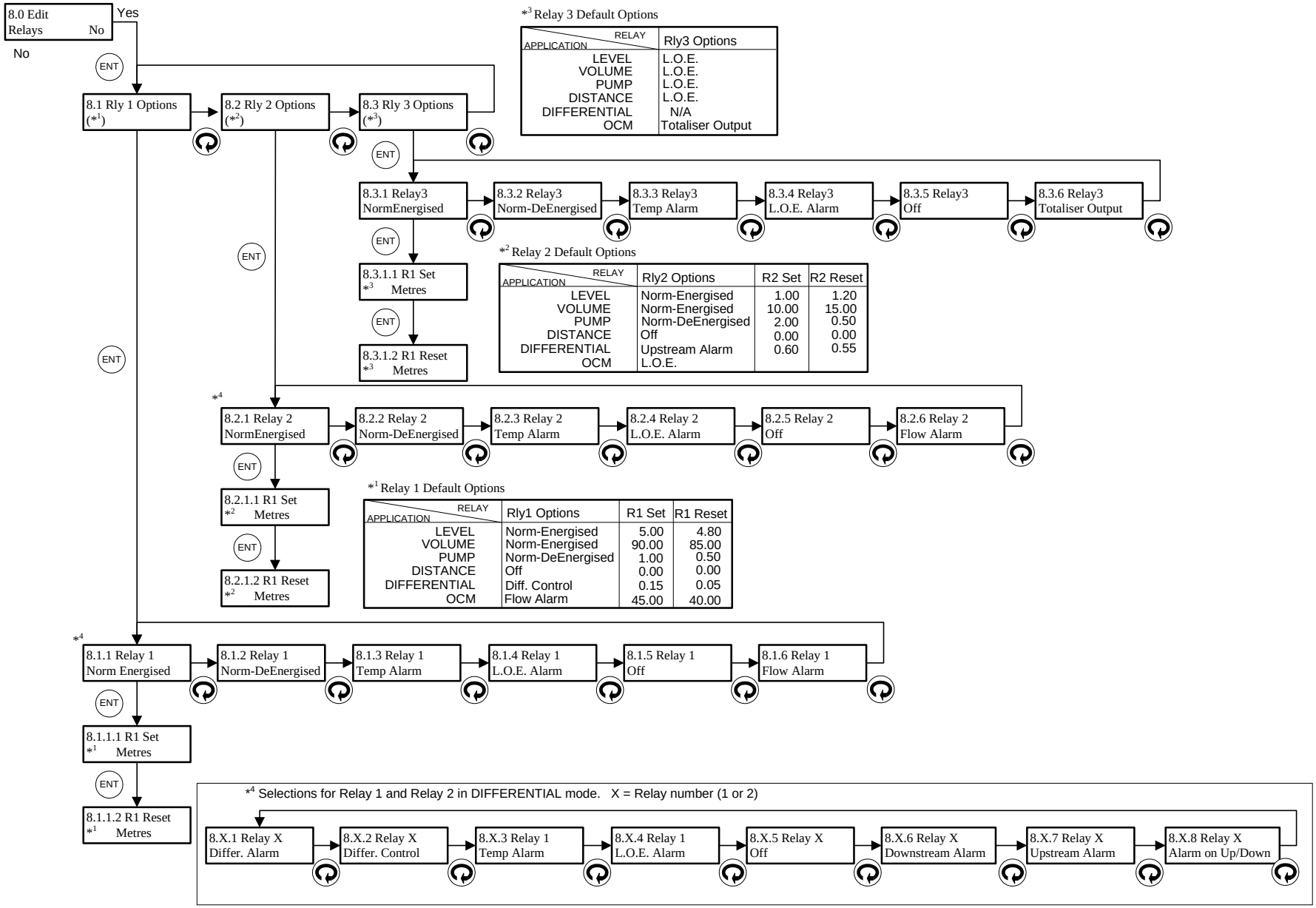



6.1.7 HORIZONTAL CYLINDER DISH ENDS.


Custom
ENT
Clear Custom Table?
No
Yes
Only appears if instrument already has a table programmed
ENT
Reset Data Points
Level (metres) 01
ENT
M
Volume (%) 01
M
ENT
Yes
Store Custom Table?
ENT
No
ENT
Custom Table Stored
No
Modify Custom Table
ENT
Yes
ENT
Back to point 1
See figure
Increase point number by 1 upto a maximum of 24 points


7.0 Edit OCM No
Yes
No
7.1 Flow Device (Rect.Flume 3/2)
7.2 Max Flow Val (Auto calculate)
7.3 Maximum Flow (50.00)
7.4 Flow Units (in Litres)
7.5 Flow Timebase (in Seconds)
7.6 Total. Units (in m3)
7.7 Ext. Tot. Drv. (0.000)
7.8 Total. Reset (No)
ENT
7.3.1 Max. Flow 50.00
7.7.1 Tot. Drv. 0.000
7.8.1 Totaliser Reset No
7.8.2 Totaliser Reset Yes
7.2.1 Automatic calculation
7.2.2 User sets maximum flow
7.6.1 Totalise in Litres
7.6.2 Totalise in m3
7.6.3 Totalise in 1000m3
7.6.4 Totalise in Gallons
7.6.5 Totalise in 1000Gals (kG)
7.6.6 Totalise in Million Gals
7.5.1 in units per second
7.5.2 in units per minute
7.5.3 in units per hour
7.5.4 in units per day
7.4.1 in Litres
7.4.2 in m3
7.4.3 in Gallons
7.1.1 Std. Ratio Rect. Flume 3/2
7.1.2 Std. Ratio Rect. Weir 3/2
7.1.3 Std. Ratio V-Notch Weir 5/2
7.1.4 BS3680 Rect. Flume
7.1.5 BS3680 Rect. Weir
7.1.6 BS3680 V-Notch Weir
7.1.7 Parshall flumes
7.1.8 Custom table–24points
See Appendix A
Throat Width 00.00 Metres
Crest Width 00.00 Metres
Angle 000.0 Degrees
Channel Width 00.00 Metres
Throat Length 00.00 Metres
Crest Height 00.00 Metres
Vertex Height 00.00 Metres
Hump Height 00.00 Metres
7.1.7.1 Parshall 1,2,3,24 inches
7.1.7.2 Parshall 6 inches
7.1.7.3 Parshall 9 inches
7.1.7.4 Parshall 12 inches
7.1.7.5 Parshall 18 inches
7.1.7.6 Parshall 36 inches
7.1.7.7 Parshall 48 inches
7.1.7.8 Parshall 72 inches
7.1.7.9 Parshall 96 inches
7.1.7.10 Parshall 10 – 50 feet


Custom
ENT
Clear Custom Table?
No
Yes
Only appears if instrument already has a table programmed
ENT
Reset Data Points
Head (metres) 01
ENT
M
Flow (%) 01
M
ENT
Yes
Store Custom Table?
ENT
No
ENT
Custom Table Stored
No
Modify Custom Table
ENT
Yes
ENT
Back to point 1
See figure
Increase point number by 1 upto a maximum of 24 points




*3 Relay 3 Default Options

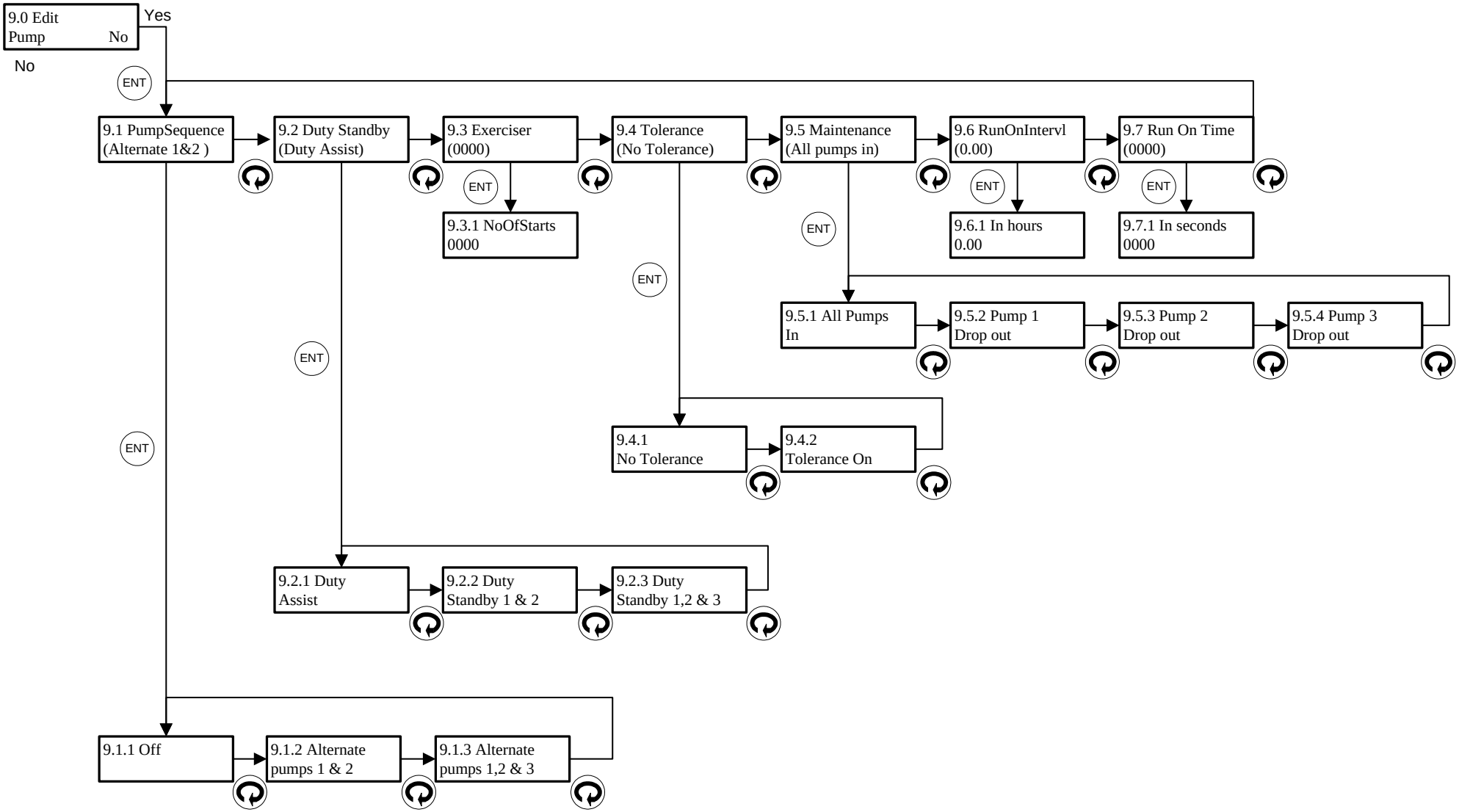
| APPLICATION \ RELAY | Rly3 Options |
|---|---|
| LEVEL | L.O.E. |
| VOLUME | L.O.E. |
| PUMP | L.O.E. |
| DISTANCE | L.O.E. |
| DIFFERENTIAL | N/A |
| OCM | Totaliser Output |

*2 Relay 2 Default Options

| APPLICATION \ RELAY | Rly2 Options | R2 Set | R2 Reset |
|---|---|---|---|
| LEVEL | Norm-Energised | 1.00 | 1.20 |
| VOLUME | Norm-Energised | 10.00 | 15.00 |
| PUMP | Norm-DeEnergised | 2.00 | 0.50 |
| DISTANCE | Off | 0.00 | 0.00 |
| DIFFERENTIAL | Upstream Alarm | 0.60 | 0.55 |
| OCM | L.O.E. | | |

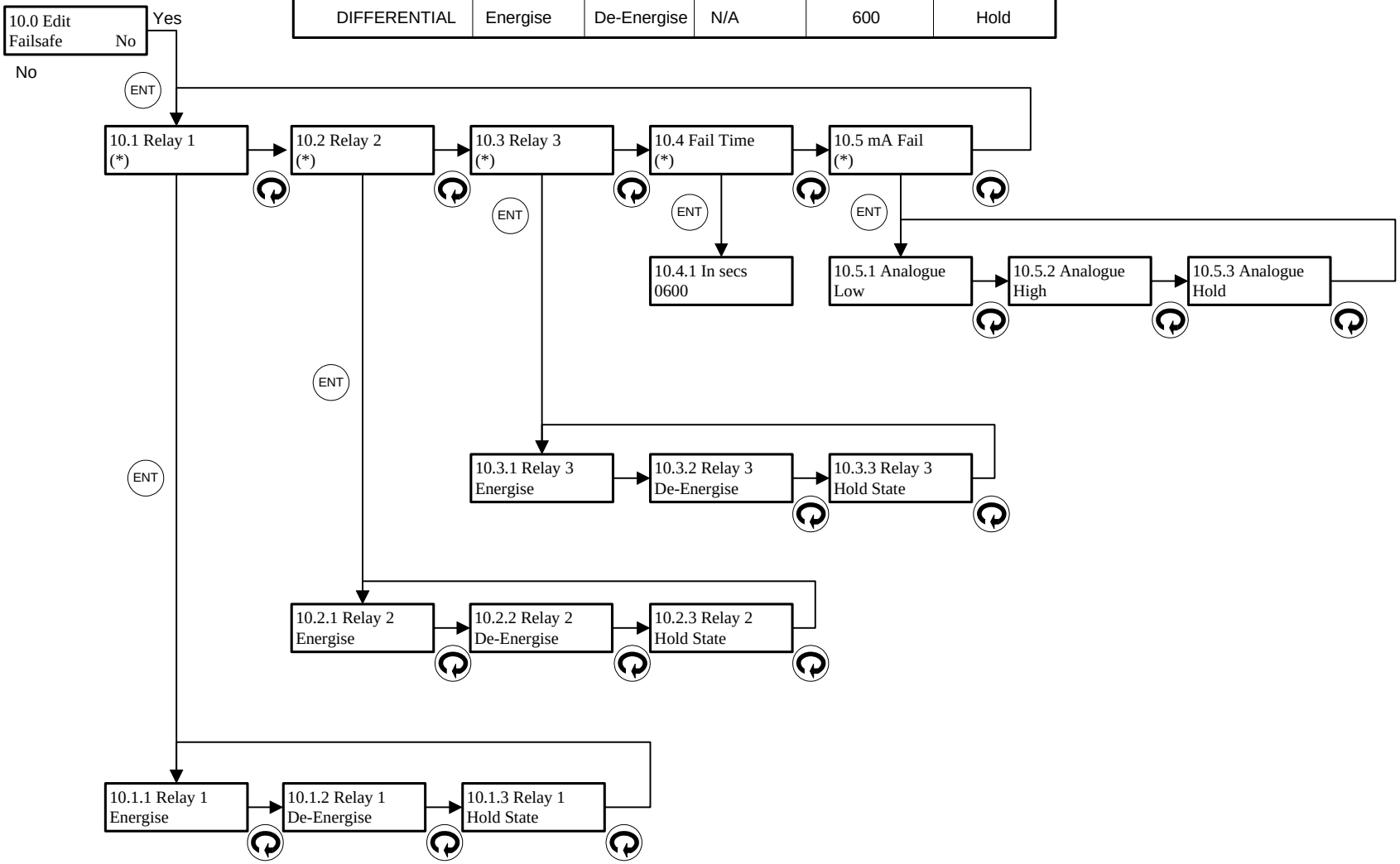
*1 Relay 1 Default Options

| APPLICATION \ RELAY | Rly1 Options | R1 Set | R1 Reset |
|---|---|---|---|
| LEVEL | Norm-Energised | 5.00 | 4.80 |
| VOLUME | Norm-Energised | 90.00 | 85.00 |
| PUMP | Norm-DeEnergised | 1.00 | 0.50 |
| DISTANCE | Off | 0.00 | 0.00 |
| DIFFERENTIAL | Diff. Control | 0.15 | 0.05 |
| OCM | Flow Alarm | 45.00 | 40.00 |

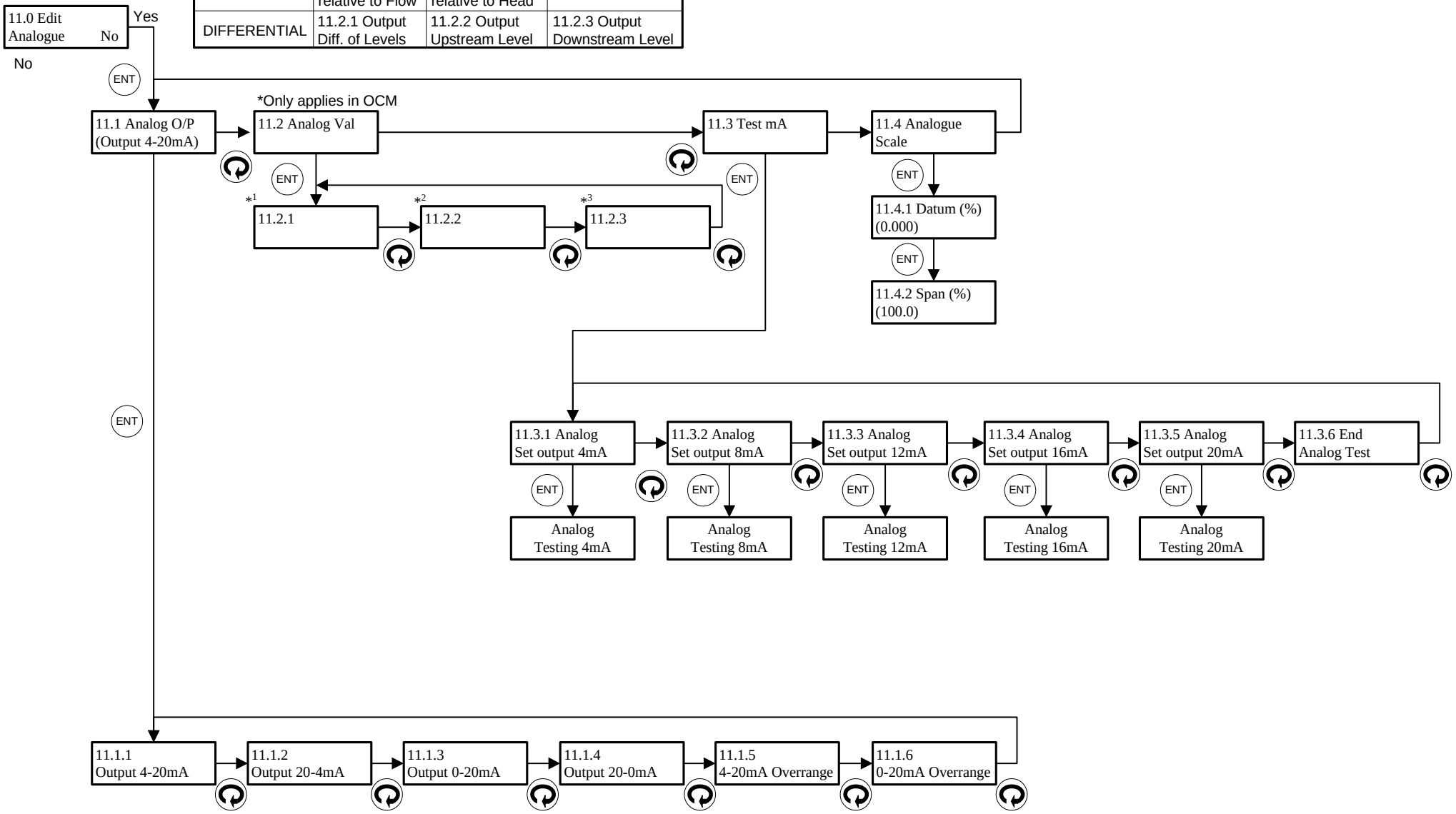

9.0 Edit Pump No
Yes
No
ENT
9.1 PumpSequence (Alternate 1&2 )
9.2 Duty Standby (Duty Assist)
9.3 Exerciser (0000)
9.4 Tolerance (No Tolerance)
9.5 Maintenance (All pumps in)
9.6 RunOnIntervl (0.00)
9.7 Run On Time (0000)
9.3.1 NoOfStarts 0000
9.6.1 In hours 0.00
9.7.1 In seconds 0000
9.5.1 All Pumps In
9.5.2 Pump 1 Drop out
9.5.3 Pump 2 Drop out
9.5.4 Pump 3 Drop out
9.4.1 No Tolerance
9.4.2 Tolerance On
9.2.1 Duty Assist
9.2.2 Duty Standby 1 & 2
9.2.3 Duty Standby 1,2 & 3
9.1.1 Off
9.1.2 Alternate pumps 1 & 2
9.1.3 Alternate pumps 1,2 & 3

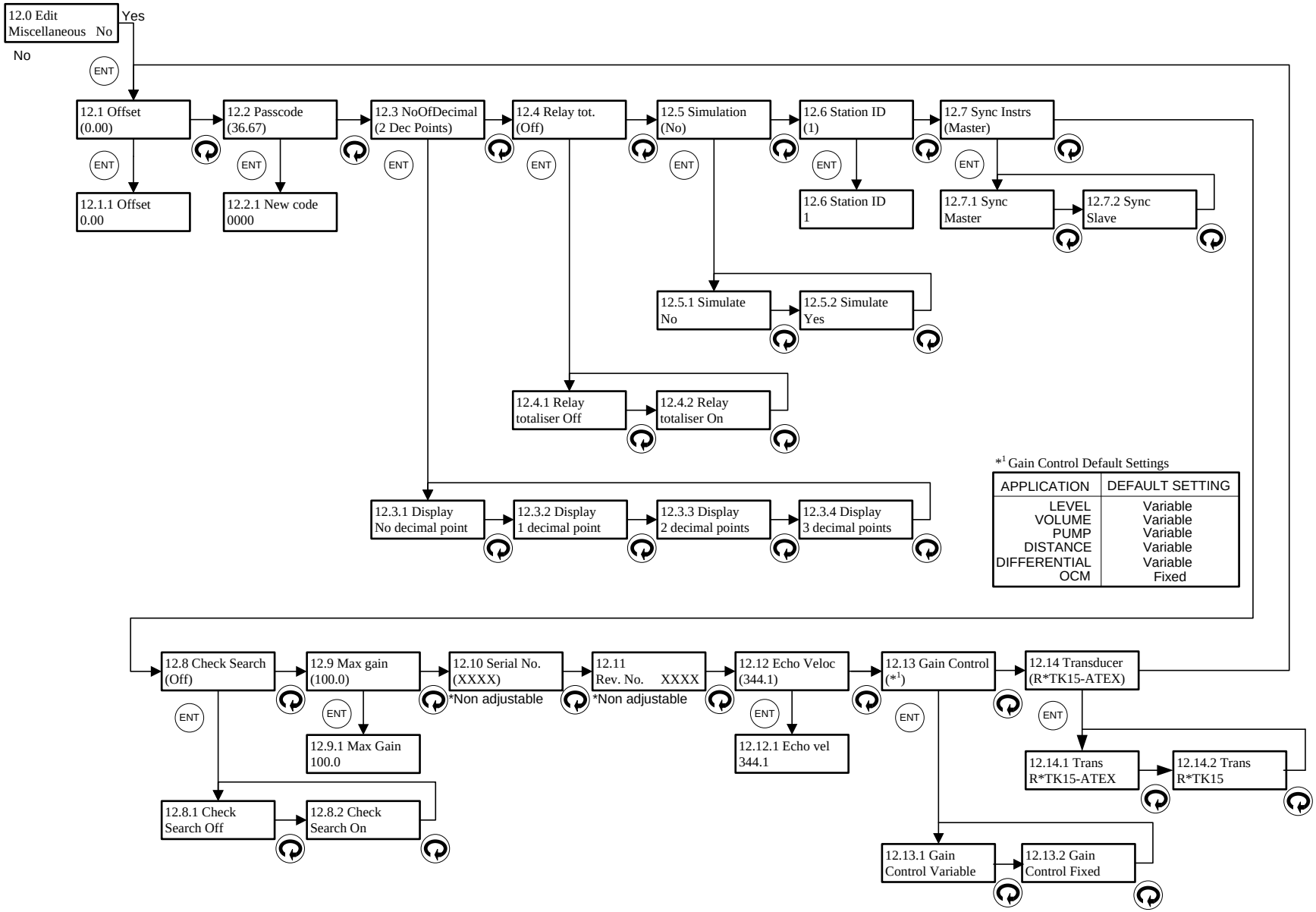
Relay failsafe – default status for different applications

| | *10.1 Relay 1 | *10.2 Relay 2 | *10.3 Relay 3 | *10.4 Fail Time | *10.5 mA Fail |
|---|---|---|---|---|---|
| LEVEL / VOLUME / DISTANCE | Hold State | Hold State | Hold State | 600 | Hold |
| PUMP | De-Energise | De-energise | De-energise | 30 | High |
| OCM | De-Energise | De-energise | De-energise | 30 | Hold |
| DIFFERENTIAL | Energise | De-Energise | N/A | 600 | Hold |



| APPLICATION | *1 11.2.1 | *2 11.2.2 | *3 11.2.3 |
|---|---|---|---|
| OCM | 11.2.1 Output relative to Flow | 11.2.2 Output relative to Head | |
| DIFFERENTIAL | 11.2.1 Output Diff. of Levels | 11.2.2 Output Upstream Level | 11.2.3 Output Downstream Level |




12.0 Edit Miscellaneous No
Yes
No
ENT
12.1 Offset (0.00)
12.1.1 Offset 0.00
12.2 Passcode (36.67)
12.2.1 New code 0000
12.3 NoOfDecimal (2 Dec Points)
12.3.1 Display No decimal point
12.3.2 Display 1 decimal point
12.3.3 Display 2 decimal points
12.3.4 Display 3 decimal points
12.4 Relay tot. (Off)
12.4.1 Relay totaliser Off
12.4.2 Relay totaliser On
12.5 Simulation (No)
12.5.1 Simulate No
12.5.2 Simulate Yes
12.6 Station ID (1)
12.6 Station ID 1
12.7 Sync Instrs (Master)
12.7.1 Sync Master
12.7.2 Sync Slave
*[1] Gain Control Default Settings
APPLICATION | DEFAULT SETTING
LEVEL Variable
VOLUME Variable
PUMP Variable
DISTANCE Variable
DIFFERENTIAL Variable
OCM Fixed
12.8 Check Search (Off)
12.8.1 Check Search Off
12.8.2 Check Search On
12.9 Max gain (100.0)
12.9.1 Max Gain 100.0
12.10 Serial No. (XXXX)
*Non adjustable
12.11 Rev. No. XXXX
*Non adjustable
12.12 Echo Veloc (344.1)
12.12.1 Echo vel 344.1
12.13 Gain Control (*[1])
12.13.1 Gain Control Variable
12.13.2 Gain Control Fixed
12.14 Transducer (R*TK15-ATEX)
12.14.1 Trans R*TK15-ATEX
12.14.2 Trans R*TK15