Quick-start booklet
IP2040/QS, Rev. BA
May 2009

MCU900 Series

Quick-start for MCU901*X-A Control Units

with Mobrey HART® Transmitters

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EMERSON
Process Management

Introduction

What is this Quick-start?

This **Quick-Start** is for anyone who has to install and commission the **MCU901** and **MSP900** ultrasonic system, and does not need in-depth information.

For full installation instructions, you **must** refer to the installation (IM) manuals supplied with the equipment.

What are the MCU901 and MSP900 used for?

The MCU901 and MSP900 are used for level, contents, and flow measurement and control. Suitable applications include wet well level (and pump) control, tank contents measurement, and open channel flow measurement.

The system comprises mains or DC powered **MCU901** control unit, an **MSP900*H** ultrasonic transmitter with a mounting kit, and manuals. The MCU901WX-A is a **wall-mounted** version of the MCU901, and the MCU901PX-A is a **panel-mounted** MCU901.

Figure 1: MCU901W – wall-mounted

Figure 2: MSP900*H

Figure 3: MCU901P – panel-mounted

About the MCU901 Control Unit

The MCU901 unit is a member of the **MCU900 family** of control units. It has:

- Full support for a single MSP900*H ultrasonic transmitter – measuring level by default
- a 4-line LCD display with back light – displays both text and graphical information
- a 6 button keypad
- an LED indicator
- an intuitive menu system – for setting up
- **2** digital inputs (voltage-free contacts) for triggering various activities (e.g. displaying a message)
- **5** relay outputs (e.g. for controlling pumps, indicating alarms, etc.)
- a 4-20mA output

All setting up is achieved from the front panel of the MCU901 control unit.

About the MSP900*H Ultrasonic Transmitter

This is a loop-powered transmitter, factory sealed and fitted with cable ready to install on aqueous applications. The transmitter is pre-configured to measure liquid level in metres and communicates values to the MCU901.

If the level measurement is required to be in feet or inches, navigate the MCU901 menu system to the "Base Units" screen under the MSP900 transmitter's SETUP/SYSTEM menu. Edit the base unit setting to be "Imperial ft" or "Imperial inch". Switch off the power to the MCU901 for five seconds and then switch the power back on. The MCU901 automatically configures itself to the chosen base units of the MSP900 transmitter. For example, the display units will be in feet. Note that this procedure does not lose programmed application information but the MCU901 will re-prompt for the Bottom Reference as described on page 4.

The other manuals

The following manuals are supplied along with this Quick-start manual:

MCU901:
Installation manual (IP2030/IM)
Safety instructions (IP2030/SI)

MSP900*H:
Installation manual (IP2040/IM or IP2047/IM)
Safety instructions (IP2040/SI)

The full operation manual IP2030/OM is available on request from Mobrey Measurement and is on the web at www.mobrey.com.

Installation

IMPORTANT - For hazardous area installations, you must refer to the installation (IM) manuals supplied with the system.

Location of MSP900*H

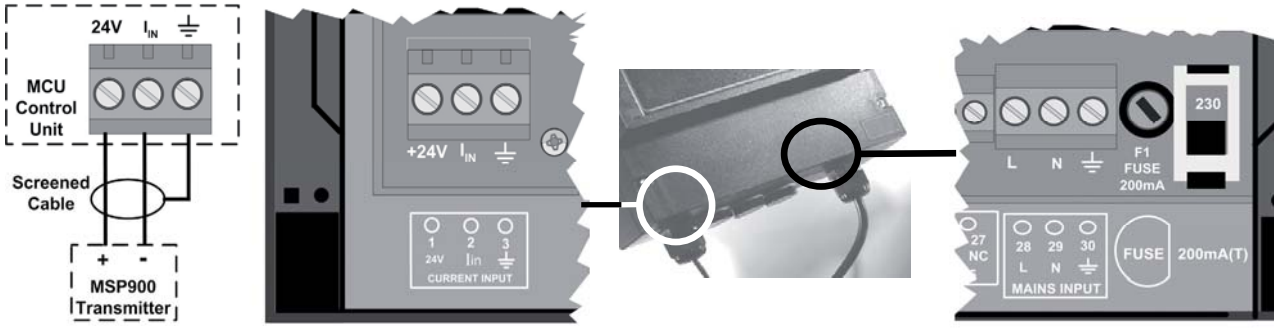
- Install the transmitter above the liquid surface using the bracket provided
- Do **not** mount the MSP900*H on a structure that is subject to vibration, or in a position where damage may be caused by impact or thermal stress
- The equipment is **not** intended for use in areas exposed to dust
- The equipment must **not** be installed directly in any process where the enclosure might be charged by the rapid flow of non-conductive media

Location of MCU901

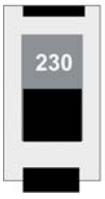
- The MCU901 **must not** be located in a hazardous area. **Do not** mount the MCU901 where it is subject to vibration, or in a position where damage may be caused by impact, thermal stress or liquid ingress
- The **MCU901W** is housed in a tough IP65 enclosure. If mounted outside, it is recommended that the unit be protected from direct heavy rain
- The **MCU901P** is a standard DIN size designed for direct mounting in a control panel. It is designed for panel mounting in a weatherproof environment

Cabling (MCU901W)

1. Cable the MSP900*H to the MCU901 using the gland provided. (Undo 2 screws and lift cover away to reveal terminals).



2. For a mains powered MCU901W:
(**a**) Check the voltage selector switch (230Vac or 115Vac) and adjust if necessary. (See figure inset, right).
(**b**) Cable the power lead to the MCU901 using the gland provided. **Do not apply power yet.**



3. For a 24V DC powered MCU901W:
(**a**) Connect the negative power wire (–ve) to terminal 31, and the positive power wire (+ve) to terminal 32.
(**b**) **Do not apply power yet.**

4. Make connections to relay terminals and current output terminals, if required.

5. Seal unused cable entries with the blanking plugs provided.

6. Replace and secure the terminal cover.

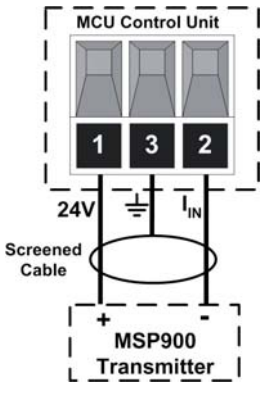
Cabling (MCU901P)

1. Cable the MSP900*H transmitter to terminals **1**, **2** and **3** on the rear panel of the MCU901. (See figure inset, right). Make connections to relay and current output terminals, if required.

2. For a mains powered MCU901P:
(**a**) Check the voltage selector switch (230Vac or 115Vac) and adjust if necessary.
(**b**) Cable the mains power supply to terminals 28 (Live) and 29 (Neutral) on the rear panel of the MCU901. Note that mains Earth is not required. **Do not apply power yet.**

3. For a 24V DC powered MCU901P:
(**a**) Connect the negative power wire (–ve) to terminal 31.
(**b**) Connect and the positive power wire (+ve) to terminal 32. **Do not apply power yet.**

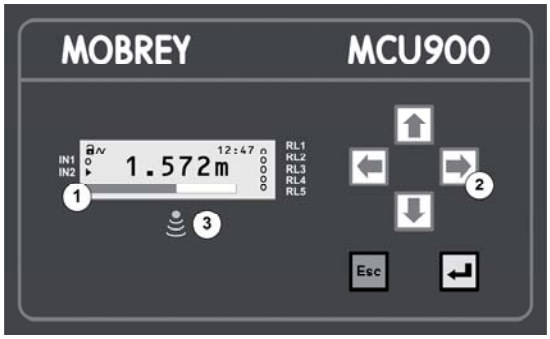
4. Connect terminal 30 to an Intrinsically Safe Earth. **This is essential when the MSP900*H is located in a hazardous area.**



Getting started

After completing the installation of both MCU901 control unit and the MSP900*H transmitter, the next stage is to switch on.

1. Familiarise yourself with the front panel fascia.



Front Panel Fascia of MCU901W

Key to figure:

① 4-line LCD with backlight.
② Keypad with 6 function keys.
③ Status LED – flashes once per second if okay.

2. Switch on the MCU901 by applying the power. Wait for the **primary display** (inset, right) to appear.

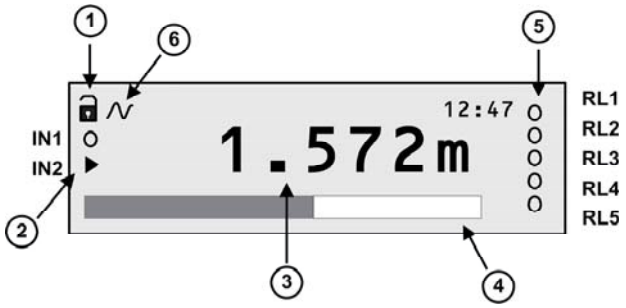
During this time, the MCU901 will read parameters from the MSP900*H transmitter.

If being used for the first time, it will prompt for the **Bottom Reference** of the MSP900*H transmitter and then automatically set-up the 4-20mA output span over this range. **If you do not want to commission the system now, simply switch off the power – the same prompt will then re-appear when switching on the next time.** (If the MSP900*H transmitter has been configured already, this prompt will not appear).

If you are commissioning the system, edit the Bottom Reference with the arrow-keys and then press the yellow key to confirm the value. The Bottom Reference can be changed at a later stage but it is better to get it correct now. When you press the red (**ESC**) key, the MCU901 will continue and the Bottom Reference prompt will re-appear when switching on the next time.

After the start-up is completed, the double-height **PV (Primary Variable) display** appears, indicating the measured depth of the liquid in the tank in metres.

3. Press the yellow (**ENTER**) key to view the **primary display**.

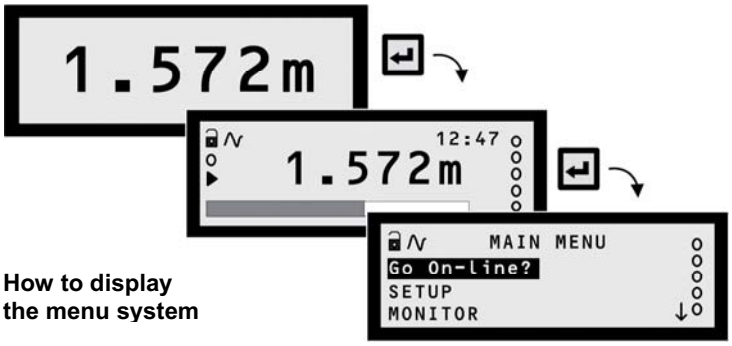


Primary Display

Key to figure:

1. Off-line/on-line status. (Locked padlock = on-line) (See page 14)
2. Digital input status. (o = de-energised, ▸ = energised)
3. Measured variable (P.V.) and units of measurement.
4. Bar graph of 4-20mA output of MCU901.
5. Relay (RL) status. (o = de-energised, ▸ = energised)
6. Digital communication in progress. (Absent if idle)

Note: If a "Find Instrument" screen appears and remains, power off. Check the cabling and then try again. If the problem persists, follow the on-screen prompts until the primary display appears.

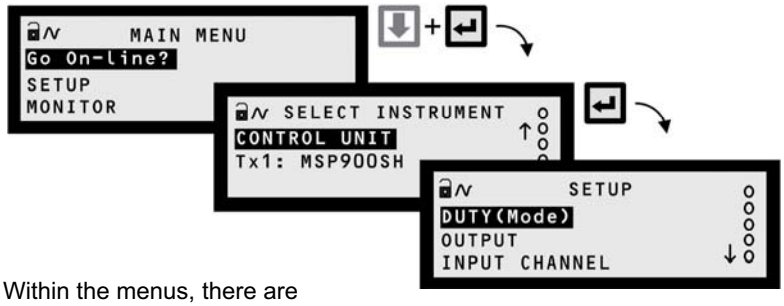


How to display the menu system

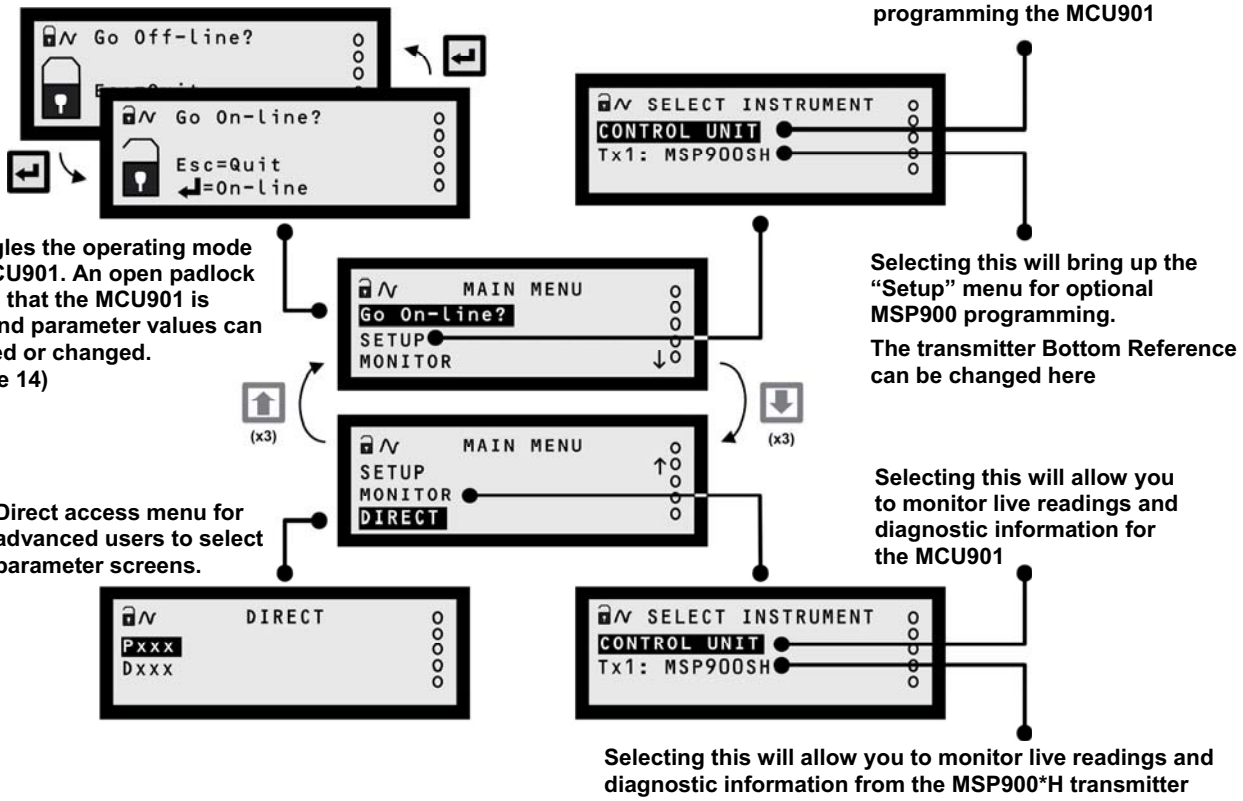
4. Use the yellow (**ENTER**) key to display the top-level of the menu system.

The double-height PV display re-appears automatically if there is no keypad activity for several minutes. In addition, the primary display re-appears when pressing the **ESC** key whilst at the top level of the menu system.

5. Navigation of the menu system is achieved by using the **ARROW** keys, the **ENTER** key, and the **ESC** key. (See figure, right). The **ESC** key will return you to the previous menu level.



6. The **Main Menu** sits above a series of sub-menus. Within the menus, there are also **parameter screens** for programming – setting up for an application, adjusting default settings, etc. – and for **displaying** information.



Selecting this will bring up the "Set-up" menu for programming the MCU901

This toggles the operating mode of the MCU901. An open padlock indicates that the MCU901 is off-line and parameter values can be entered or changed. (See page 14)

Selecting this will bring up the "Setup" menu for optional MSP900 programming.

The transmitter Bottom Reference can be changed here

Direct access menu for advanced users to select parameter screens.

Selecting this will allow you to monitor live readings and diagnostic information for the MCU901

Selecting this will allow you to monitor live readings and diagnostic information from the MSP900*H transmitter

7. Programming the MCU901 unit is **best achieved** through easy-to-follow **Wizards**. They are simply a sequence of on-screen prompts, allowing you to easily set-up an individual function or a large application. There is a **collection of Wizards** for most functions and applications. They are all selected and started through the menu system. **On the pages that follow, examples for several applications show how to use them. Note:** Wizards should not be used for accessing pre-programmed parameters. Some parameter values are reset during Wizard programming.

Wizard Selection

8. Additional features, such as password protection, resetting to factory defaults, etc., can found on pages 14/15.

Application/Duty: Level Measurement

1. With power on and the MSP900*H transmitter giving a 4-20mA signal to the MCU901 unit (see previous pages), you can now program the MCU901 for an application. **This application example is for level measurement.**

Requirements

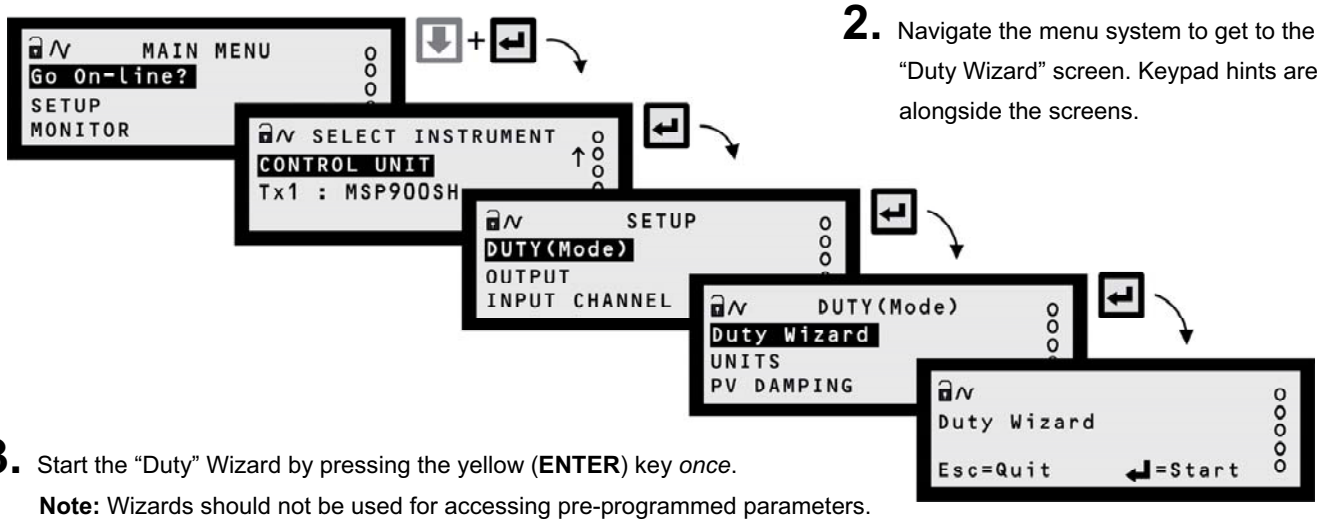
Live level measurement in units of metres over a range of 0 to 11.7 metres.
High level alarm.

Input Data

Tank Shape: Linear (e.g. Square)
Bottom Reference: 12 metres

The MSP900*H transmitter supplies live level measurements in units of *metres*.
(If the level measurement is required to be in *feet* or *inches*, see the note on page 2).

2. Navigate the menu system to get to the "Duty Wizard" screen. Keypad hints are alongside the screens.



3. Start the "Duty" Wizard by pressing the yellow (**ENTER**) key *once*.

Note: Wizards should not be used for accessing pre-programmed parameters. Some parameter values are reset during Wizard programming.

4. Work through the "Duty" Wizard prompts (see next page) until completion; this occurs when the menu system re-appears. Keypad hints, for the illustrated Wizard sequence on the next page, are provided alongside the prompts. If applicable, adapt the example to suit your application.

5. Circled numbers in the illustrated Wizard sequence relate to these notes:

① Select "Level" from the multiple-choice list.

② Program the 4-20mA output span with a level range (e.g. 0 to 11.7 metres)

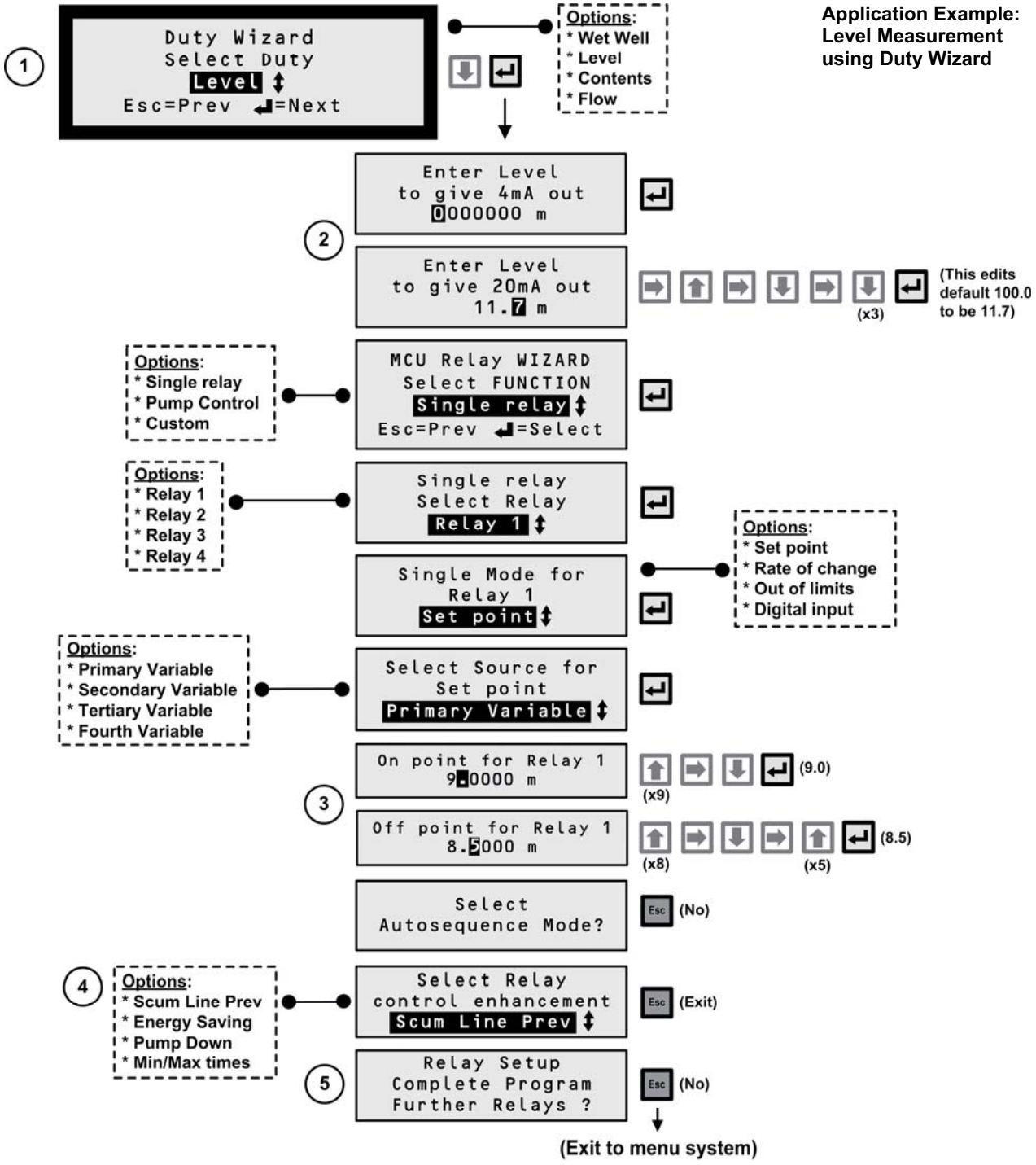
③ Set-up a high level alarm – the relay RL1 is energised whenever the measured level exceeds a pre-set level and de-energises below another pre-set level, as defined at these prompts.

④ Optional overrides e.g. to prevent individual relays from being energised for too little time or too much time.

⑤ Option to set-up further relays.

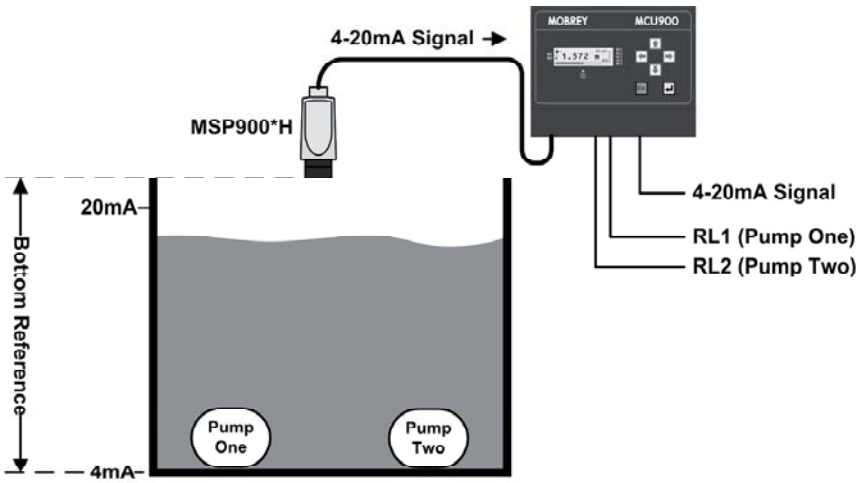
6. Return to the main menu by holding the **ESC** key for a few seconds, releasing it when the main menu appears. Next, go on-line by selecting the "Go on-line" menu option and then pressing the **ENTER** key *once*. Finally, press the **ESC** key repeatedly until the primary display appears. The level measurement will be live on the primary display.

Application Example: Level Measurement using Duty Wizard



Application/Duty: Wet Well (with Pump Control)

1. With power on and the MSP900*H transmitter giving a 4-20mA signal to the MCU901 unit (see previous pages), you can now program the MCU901 for an application. **This application example is for a Wet Well with pump control.**



Requirement

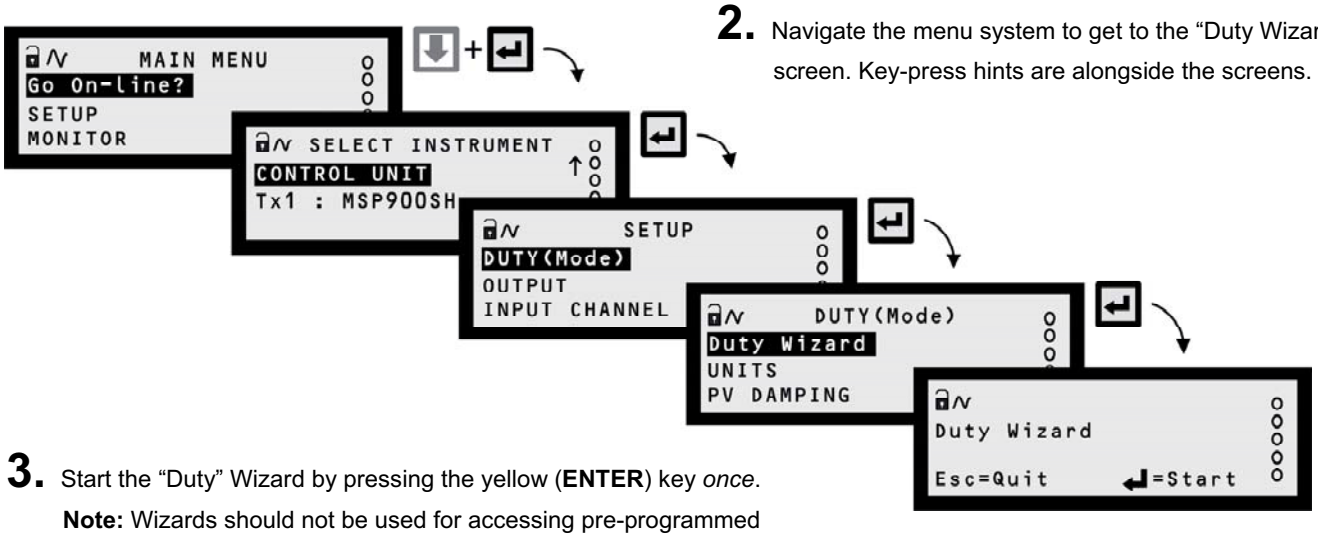
- Live measurement in units of metres.
- Emptying application with **2 pumps**
- RL1 On at 2.0m at and Off at 0.5m
- RL2 On at 3.8m and Off at 3.3m
- Additional relay functions: None

Input Data

- Tank Shape: Square
- Bottom Reference: 5 metres

The MSP900*H transmitter supplies live level measurements in units of *metres*. (If the level measurement is required to be in *feet* or *inches*, see the note on page 2).

2. Navigate the menu system to get to the "Duty Wizard" screen. Key-press hints are alongside the screens.



3. Start the "Duty" Wizard by pressing the yellow (**ENTER**) key *once*.
Note: Wizards should not be used for accessing pre-programmed parameters. Some parameter values are reset during Wizard programming.

4. Work through the "Duty" Wizard prompts until completion; this occurs when the menu system re-appears. Keypad hints, for the illustrated Wizard sequence on the next page, are provided alongside the prompts. If applicable, adapt the example to suit your application.

5. Circled numbers in the illustrated Wizard sequence relate to these notes:

① Select "Wet Well" from the multiple-choice list.

② Program the 4-20mA output span with a level range (e.g. 0 to 4.7 metres)

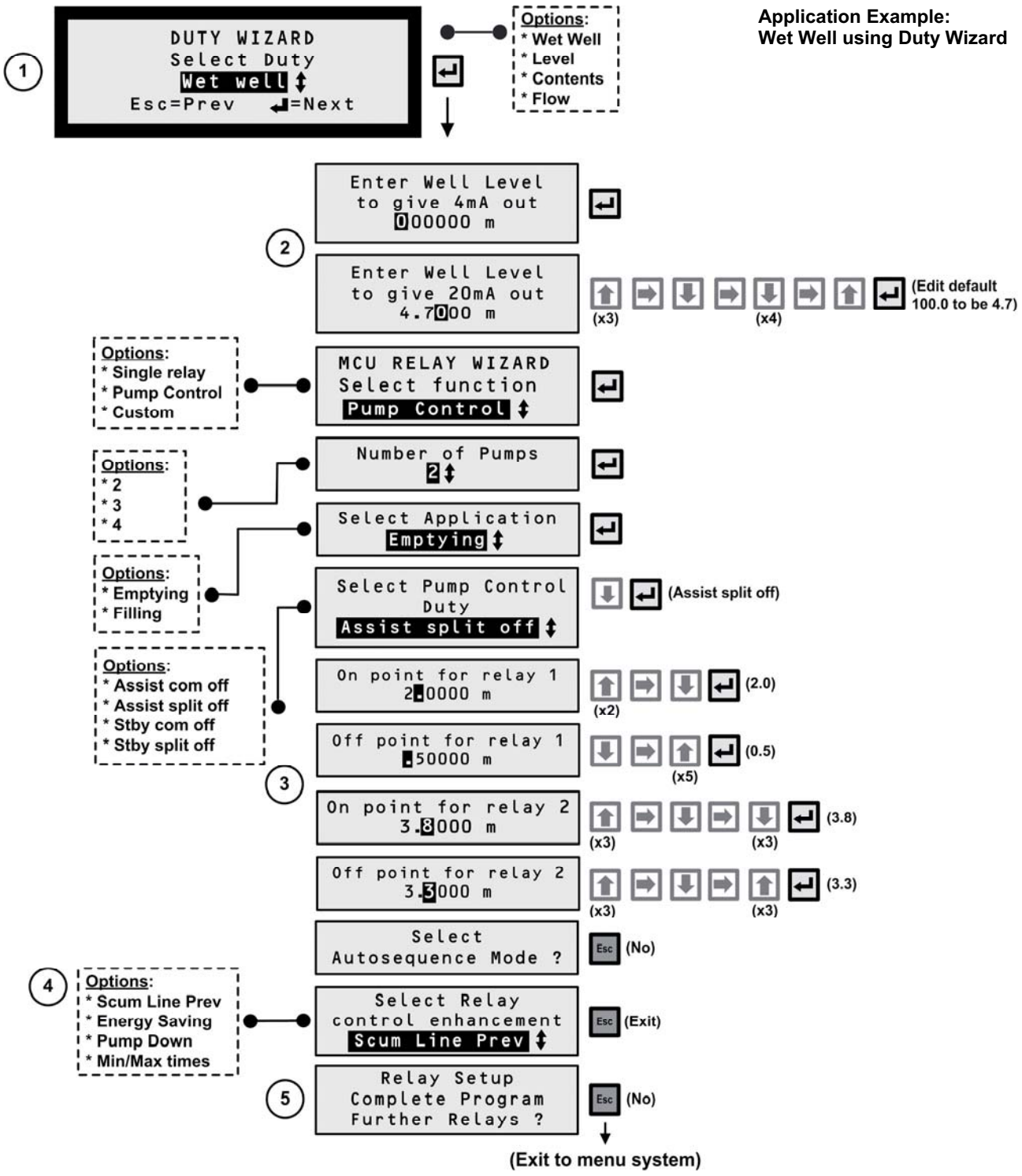
③ Set-up of On and Off points for Relay 1 (Pump 1) and Relay 2 (Pump 2), and type of control (duty assist or standby).

④ Optional overrides e.g. to provide special override functions for nominated pumps such as automatic pump down cycle.

⑤ Option to set-up further relays.

6. Return to the main menu by holding the **ESC** key for a few seconds, releasing it when the main menu appears. Next, go on-line by selecting the "Go on-line" menu option and then pressing the **ENTER** key *once*. Finally, press the **ESC** key repeatedly until the primary display appears. The level measurement will be live on the primary display.

Application Example:
Wet Well using Duty Wizard



Application/Duty: Contents Measurement

1. With power on and the MSP900*H transmitter giving a 4-20mA signal to the MCU901 unit (see previous pages), you can now program the MCU901 for an application. **This application example is for contents measurement.**

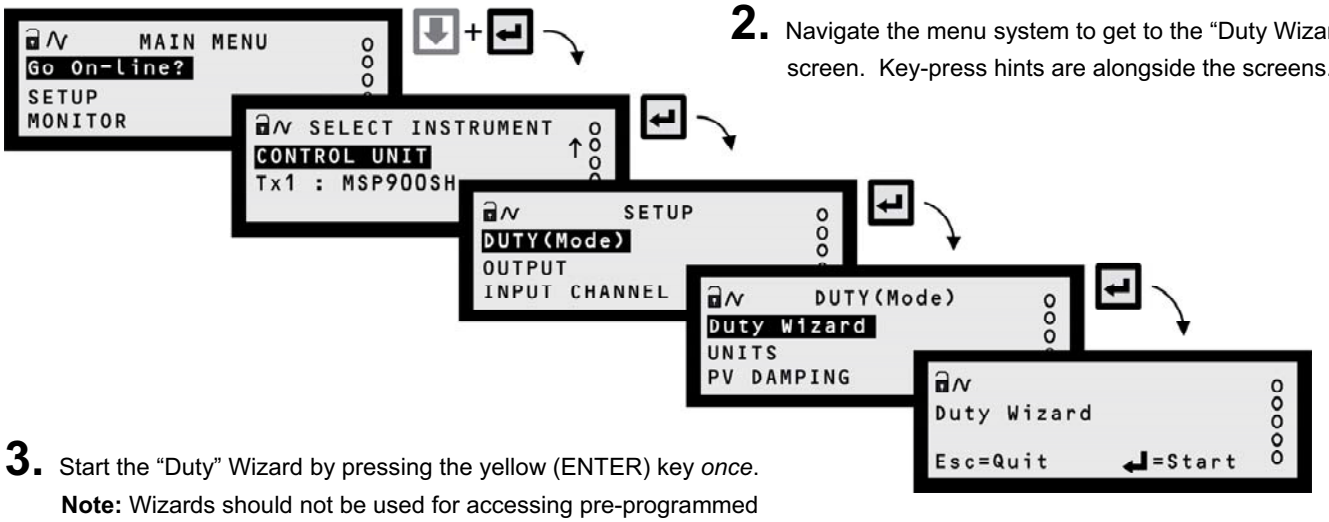
Requirement

Live contents measurement in units of litres.
Low level alarm at 2000 litres.

Input Data

Tank Shape: horizontal cylinder with flat ends.
Tank Diameter: 2.5 metres.
Tank Length: 5 metres.

The MSP900*H transmitter supplies live level measurements in units of *metres*.
(If the level measurement is required to be in *feet* or *inches*, see note on page 2).



2. Navigate the menu system to get to the "Duty Wizard" screen. Key-press hints are alongside the screens.

3. Start the "Duty" Wizard by pressing the yellow (ENTER) key *once*.
Note: Wizards should not be used for accessing pre-programmed parameters. Some parameter values are reset during Wizard programming.

4. Work through the "Duty" Wizard prompts until completion; this occurs when the menu system re-appears. Keypad hints, for the illustrated Wizard sequence on the next page, are provided alongside the prompts. If applicable, adapt the example to suit your application.

5. Circled numbers in the illustrated Wizard sequence relate to these notes:

① Select "Contents" from the multiple-choice list.

② The required tank shape is a pre-programmed shape from the MCU901 library.

③ Maximum contents as calculated by MCU901 unit. It can be edited here if required.

④ Program the 4-20mA output span with a content range (e.g. 0 to 24543 litres)

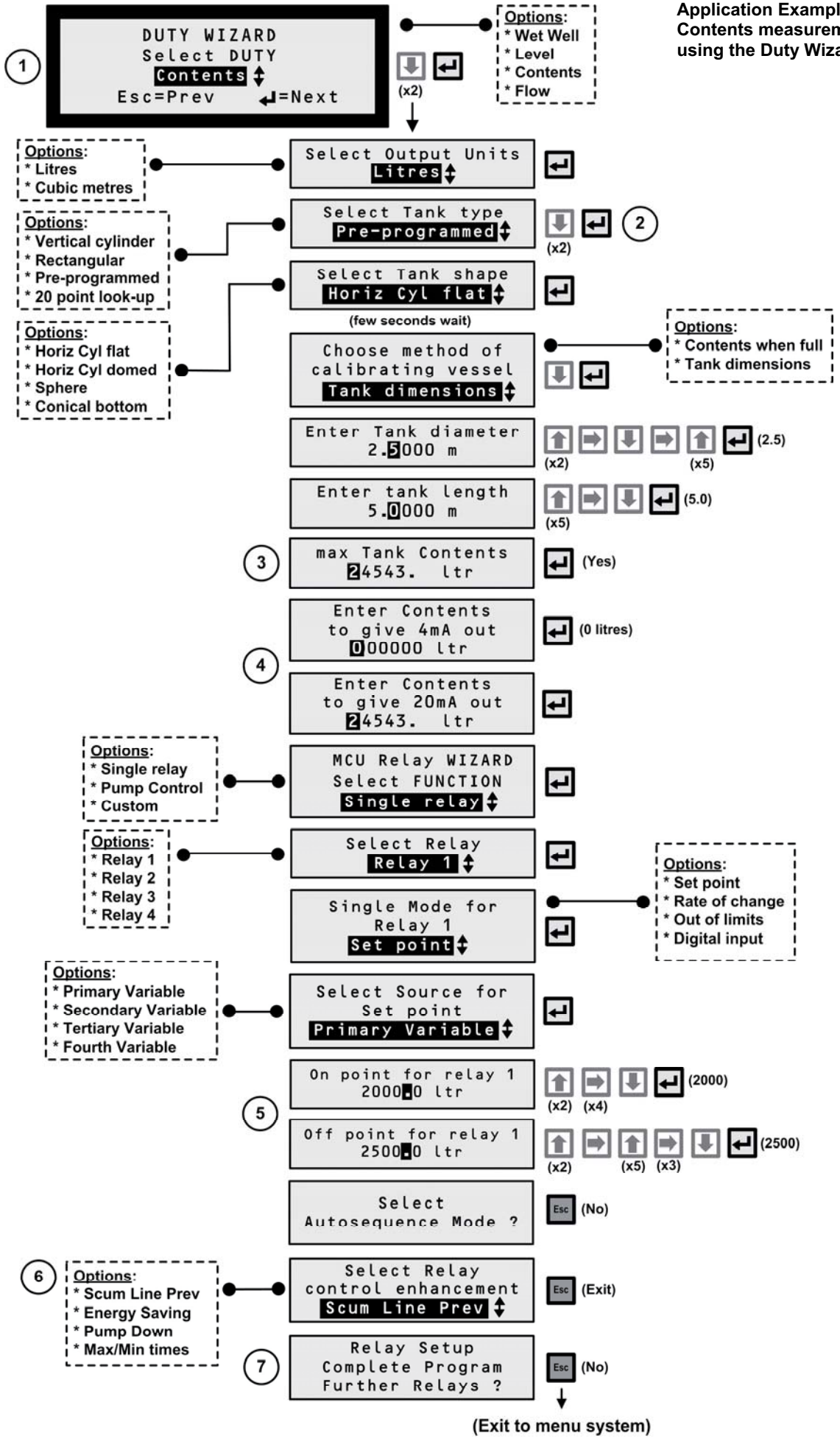
⑤ Set-up a low level alarm – the relay RL1 is energised whenever the measured level falls below a pre-set level and de-energises on rising above another pre-set level, as defined at these prompts.

⑥ Optional overrides e.g. to prevent individual relays from being energised for too little time or too much time.

⑦ Option to set-up further relays.

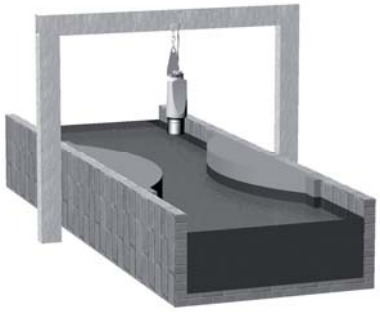
6. Return to the main menu by holding the **ESC** key for a few seconds, releasing it when the main menu appears. Next, go on-line by selecting the "Go on-line" menu option and then pressing the **ENTER** key *once*. Finally, press the **ESC** key repeatedly until the primary display appears. The content measurement will be live on the primary display.

Application Example: Contents measurement using the Duty Wizard



Application/Duty: Flow Measurement

1. With power on and the MSP900*H transmitter giving a 4-20mA signal to the MCU901 unit (see previous pages), you can now program the MCU901 for an application. **This application example is for flow measurements.**



Requirement

Live flow measurements in units of cubic metres per second.
Totalised flow in cubic metres per second.

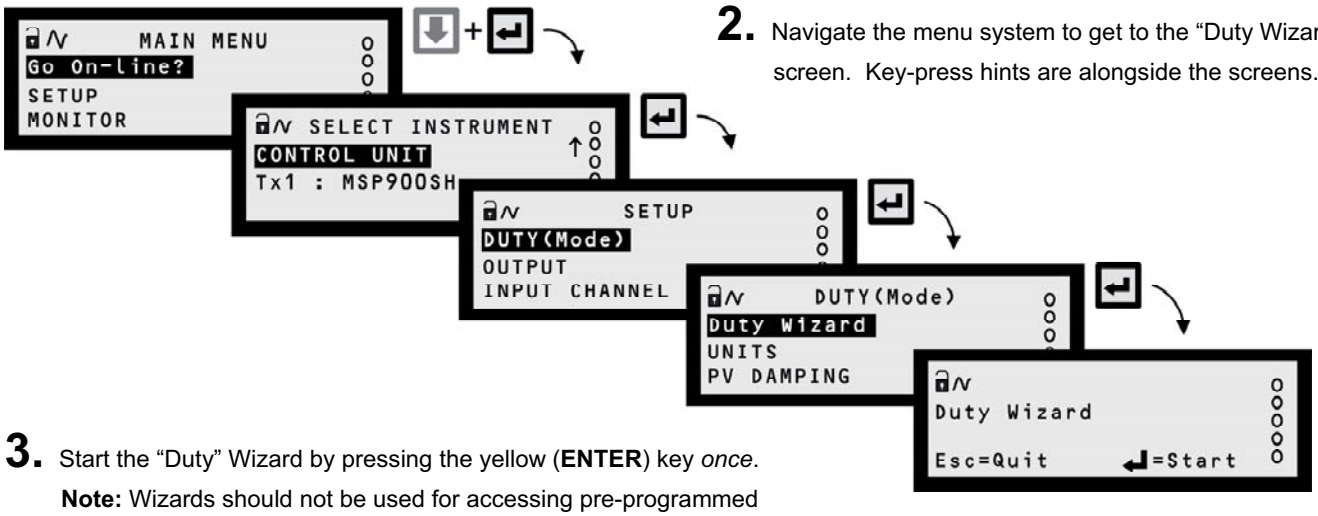
Input Data

Channel Shape: Flume
Depth at maximum flow rate: 1 metre
Maximum flow rate: 1 cubic metre per second

The MSP900*H transmitter supplies live level measurements in units of *metres*. (If the level measurement is required to be in *feet* or *inches*, see note on page 2).

Output Data

The MCU901 will be calculating the flow rate.



2. Navigate the menu system to get to the "Duty Wizard" screen. Key-press hints are alongside the screens.

3. Start the "Duty" Wizard by pressing the yellow (**ENTER**) key *once*.
Note: Wizards should not be used for accessing pre-programmed parameters. Some parameter values are reset during Wizard programming.

4. Work through the "Duty" Wizard prompts until completion; this occurs when the menu system re-appears. Keypad hints, for the illustrated Wizard sequence on the next page, are provided alongside the prompts. If applicable, adapt the example to suit your application.

5. Circled numbers in the illustrated Wizard sequence relate to these notes:

① Select "Flow" from the multiple-choice list.

② Enter the maximum rate of flow.

③ Enter the height for the maximum flow in the Flume.

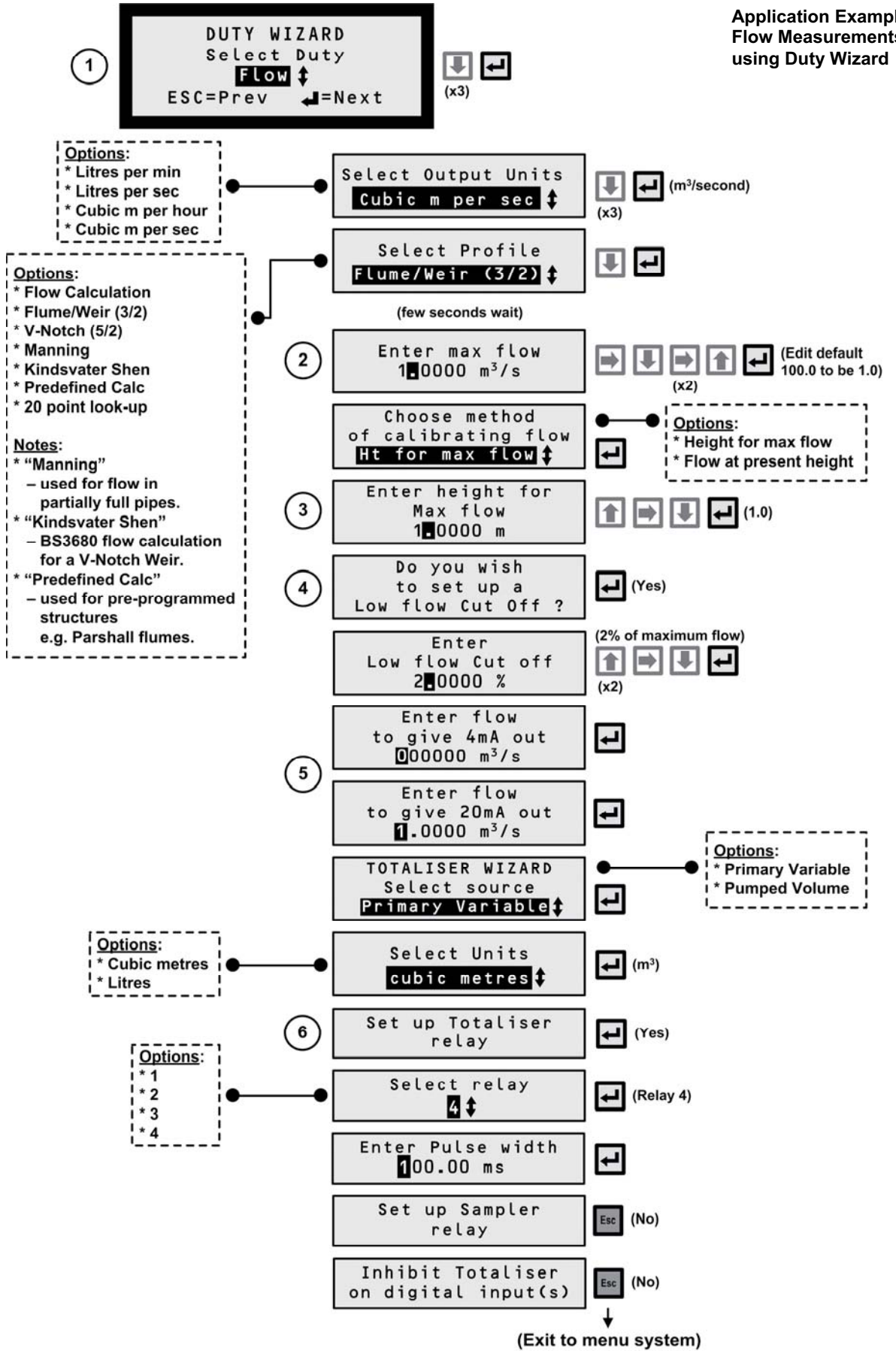
④ Option of registering flow as 0 m^3/s on the MCU901 while the measured flow rate is below a programmed cut off.

⑤ Program the 4-20mA output span with a flow rate range (e.g. 0 m^3/s to 1 m^3/s)

⑥ Option to set-up a relay to output (100ms) pulses representing the totalised flow.

6. Return to the main menu by holding the **ESC** key for a few seconds, releasing it when the main menu appears. Next, go on-line by selecting the "Go on-line" menu option and then pressing the **ENTER** key *once*. Finally, press the **ESC** key repeatedly until the primary display appears. The flow measurement will be live on the primary display.

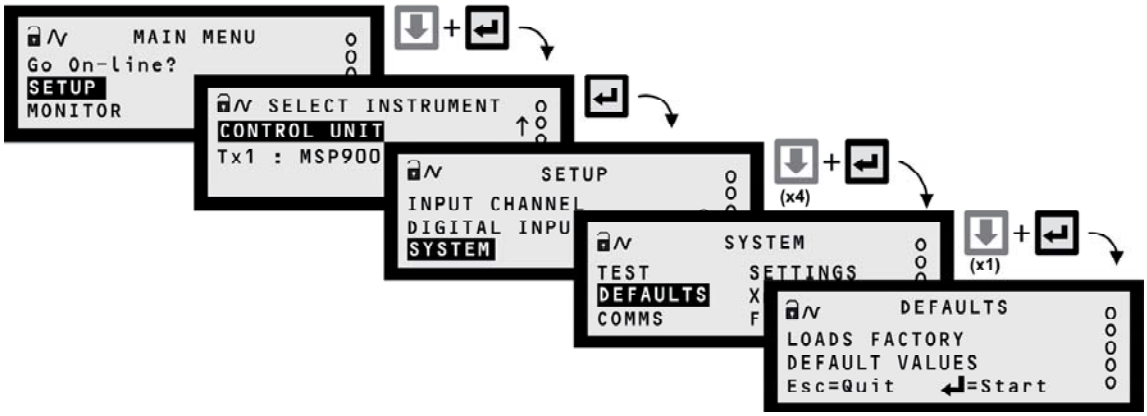
Application Example:
Flow Measurements
using Duty Wizard



Other Features

Restoring factory defaults (Erases all user entered data)

To re-set the MCU901 unit back to the factory defaults, navigate to the "Load Defaults" screen and press the **ENTER** key *twice*.



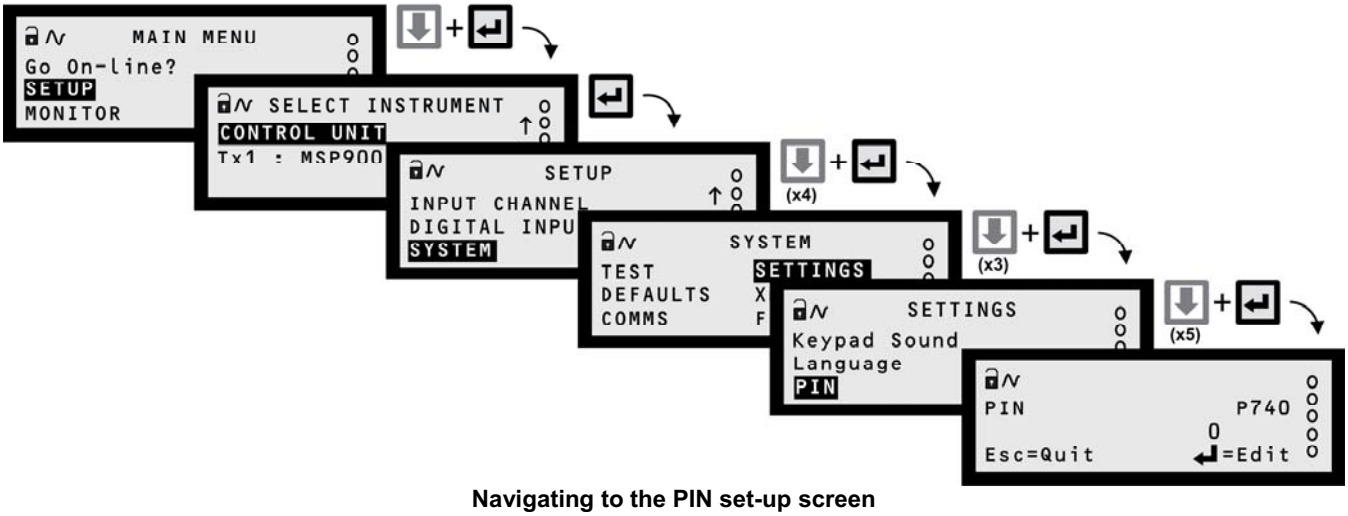
Navigating to the LOAD DEFAULTS Screen

PIN Security

Personal Identification Number (PIN) security prevents unauthorised people from programming the MCU901 control unit. Typically, this is set-up when all the other programming has been completed. As with Bankcards, there is one PIN number.

The factory default is for PIN security to be inactive. To activate, navigate the menu system to the **PIN** screen and edit a **4-digit** personal identification number (PIN) that you want. The PIN is edited with the arrow keys and confirmed with the **ENTER** key; the 4-digit PIN will then be replaced by **"- - - -"** to indicate that PIN security is active. (By default, PIN is a 0 if inactive).

Once PIN security is activated, a prompt for the PIN will appear when needed for an activity, such as starting a Wizard. If correctly entered, no further PIN requests are made **unless** the "Cancel Password" option is selected from the MAIN MENU screen. This menu option appears only after correctly entering the PIN; the option disappears when selected, therefore making the MCU901 secure and prompt for the PIN when needed.



Navigating to the PIN set-up screen

Modes of operation

There are two operating modes for the MCU901. They are **on-line** and **off-line**.

An open padlock icon indicates the MCU901 is presently in the **off-line** mode. In this mode, the unit can be programmed providing that you know the security PIN (if set-up). Additionally, the 4-20mA output and all relays are frozen.

A closed padlock icon indicates that the MCU901 is presently in the **on-line** mode. In this mode, most of the unit **cannot be programmed**. However, you will be prompted to go off-line if you attempt to program whilst in this mode and providing that you know the security PIN (if set-up). Additionally, the 4-20mA output and all relays are **not frozen**.

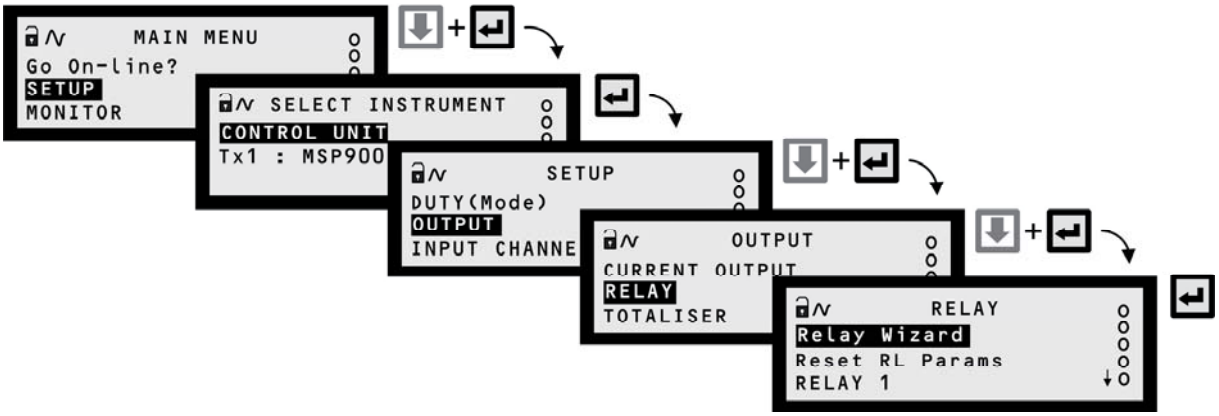
Relays

Relay outputs 1 to 4 are normally On Point/Off Point relays which may be used to start/stop pumps or open/close valves at different levels. They normally energise at one level and de-energise at a different level.

Alternatively, they may be programmed as out-of-limits alarms such that they are energised between defined points and will de-energise outside the defined limits. They may also be programmed to perform a variety of auto-sequences and auxiliary functions, such as pump-down operations, pump rotations to equalise wear, and desludge/cleaning.

Relay output 5 is normally a fail safe fault relay but may be re-allocated to another duty.

Relays can be set-up easily using the **Relay Wizard**, accessible by navigating to the RELAYS menu screen.



Navigating to the RELAY Screen

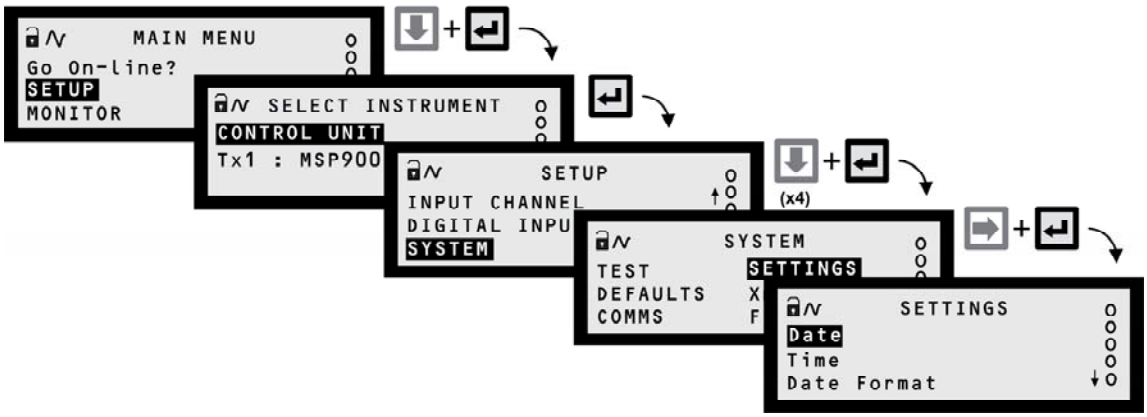
Relay (RL) Status

The relay status icons on the primary display have the following meanings:

▸	= energised	Relay is presently energised.
0	= de-energised	Relay is presently de-energised.
A	= Alarm	All active alarms can be viewed by parameter D831.
S	= Sampler	Relay is allocated to sampling duty.
T	= Totalising	Relay is allocated to totalising duty.

Comfort (System) Settings

The SETTINGS menu allows adjusting of the time and date, switching off the keyboard sound and changing language.



Navigating to the SETTINGS Menu

MCU900 Series

Quick-start booklet
IP2040/QS, Rev. BA
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CE

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