

process measurement solutions

# Magne-Sonic

## MSC900 Series

### Industrial Transmitter

### Control Unit

Software Version 1.3

**Installation & maintenance**  
**instructions**



MSC900 is the generic name used in this manual for the MSC900 range of control units comprising :-

MSC901  
MSC902  
MSCLOG



# Safety Precautions

The following safety precautions should be observed before using this product or working on the attached cables.

This MSC900 product is intended for use by qualified personnel who recognise shock hazards and are familiar with the safety precautions required to avoid possible injury. Read the operating information carefully before using the product.

The types of product users are:

**Responsible body:** This is the individual or group responsible for the use and maintenance of equipment, and for ensuring that operators are adequately trained.

**Operators** use the product for its intended function. They do not require access to the electrical connections within the control box, and would normally only operate the external keypad and monitor the display.

**Maintenance personnel** perform routine procedures on the product to keep it operating, for example, checking the line voltage or checking electrical connections, replacing mains fuses etc.

**Service personnel** are trained to work on live circuits, and perform safe installations and repairs of products. Only properly trained service personnel may perform installation and service procedures. However, the only serviceable part in MSC900 is the mains cartridge fuse.

Users of this product must be protected from electric shock at all times. Product users must be trained to protect themselves from the risk of electric shock.

MSC900 Control Units are double insulated and do not require a mains earth.

Periodically inspect the connecting cables for possible wear, cracks, or breaks.

The fuse must only be replaced with same type and rating for continued protection against fire hazard.


To clean the instrument, use a damp cloth with a mild, water based cleaner. Clean the exterior of the instrument only. Do not allow liquids to enter or spill on the instrument.

**WARNING** - If this equipment is used in a manner not specified by Solartron Mobrey, the protection provided may be impaired. The MSC900 is regarded as permanently installed equipment and as such a switch or circuit breaker must be included in the installation. This should be in close proximity to the equipment and be marked as its disconnecting device.

Under no circumstances must voltages higher than those stated in this manual be applied.

An Intrinsically Safe earth must be connected for all hazardous area systems.

The installation of the MSC900 and its associated power cables must be such that tank overflow, local flooding or pump failure do not cause these to be submerged or subject to flows of water. Sensors and sensor cabling can be submerged without hazard to equipment operators when correctly connected as described in this manual.

Explanation of symbols: The Intrinsically Safe Earth Symbol is :  = functional (Intrinsically Safe) earth

 = Double insulated

 = Refer to manual

CHECK THAT THE POWER SUPPLY IS SUITABLE BEFORE SWITCHING POWER ON.

Internal adjustments can select mains 115 Volts AC power, which makes the equipment unsuitable for 230V AC supplies. Check this Voltage selection switch is set suitable for the available power supply.

HAZARDOUS AREA SYSTEMS :-

Where the MSC900 is connected to a transmitter located in a hazardous area, additional instructions apply. Refer to page 8 and safety instruction.

The symbol  in the text of this manual refers the reader to 8 and safety instruction leaflet.

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## Appendices

Appendix 1 Introduction to programming the MSC900

### Associated manuals

Quickstart Manual covering use of the MSC900 with a ultrasonic transmitter

Quickstart manual for Differential system

Detailed technical programming and operating manual

Safety Instruction Manual

Quickstart manual for Logging system

### Footnote :-

In this manual the following terms are used which refer to trademarks from other manufacturers:

HART: is the protocol adopted for the MSC900 SMART Communications.

HART is a registered trademark of the HART Communications Foundation and is a mnemonic For Highway Addressable Remote Transducer.

## 1.0 Product Introduction

MSC900 is the generic family name for a range of industrial transmitter control units, providing a wide range of control functions and a visual display of the measured variable. There are two mounting styles available; a tough IP66 Wall mounting control unit for either indoor or outdoor installation, and a Panel mounting control unit designed for direct mounting in a control panel. The controller will accept a 4-20mA signal from a self-powered transmitter or can provide 24V dc power to the transmitter if required.

A HART transmitter, powered from the MSC900, can be connected to the MSC900 and all Universal plus some Common Practice commands will be implemented.

The MSC900 may be connected to a 4-20mA transmitter installed in a hazardous area. However, the mains powered MSC900 is designed for mounting in a non-hazardous (safe) area.

Control functionality is provided by the 5 SPCO voltage free contact relays in the MSC900. There is also an isolated 4-20mA signal out.

For applications where the functionality of the MSC900 is linked to other external events, 2 digital input ports are provided to accept contact closure signals.

The MSC900 is simply programmed using the 6 key membrane keypad on the front of the unit. Menu structured programming is employed, with the display assisting the user with dynamic help text.

### 1.1. Control Unit Functions

Using either a standard 4-20mA input or a digital HART input from a transmitter, the MSC900 control unit will provide the following functions :

- Calculation and display of the MSC900 Primary Variable (PV).

The user can choose this to be the reading coming from the transmitter, which may be a depth or distance measurement from a HART ultrasonic transmitter or may be a mA reading from a pressure transmitter, or some other value calculated by the MSC900 based on the transmitter input, which could be a level, distance, contents or flow reading. A totaliser function is also included.

The MSC900 is factory programmed with a set of standard volumetric and flow equations to convert a level signal to contents or flow, and also has a 21 point user programmed look-up table for non-standard applications.

MSC902 units calculate the difference, sum or product of 2 separate 4-20mA inputs.

MSCLOG units have a 4800 event on board logging capability.

- 4-20mA signal out from the MSC900 control unit.

The MSC900 current output is usually proportional to the displayed PV, and is displayed in bargraph form on the display (0-100%).

- Relay control functions.

There are 5 freely assignable relays. Relay 5 is a fault relay by default, which may be assigned to control duty if required. The other 4 relays are available for the user to programme to operate at chosen values of the displayed PV, or other calculated values.

The MSC900 is factory programmed with a selection of popular pump control routines for wet well and sump control, along with energy saving over-rides.

- Voltage free (digital) contact input

Up to two voltage free contact closure inputs may be connected, allowing external over-ride of control unit functions if desired.

- Programming a transmitter from the MSC900 control unit

As the MSC900 will communicate digitally with any HART compatible transmitter powered by the MSC900, it is possible to programme a HART transmitter using the MSC900 keypad.

Full communication with Magne-Sonic HART ultrasonic transmitters, allowing access to all transmitter parameters is supported, whilst Universal and some Common Practice commands of other HART transmitters is possible in accordance with HART protocol.



































## A2.1 Understanding the input to the MCU900 and what is shown on the display.

The MCU900 may be used with either a 4-20mA transmitter or a digital HART transmitter.

### A2.1.1 Using a transmitter with a standard 4-20mA output.

Any transmitter with a 4-20mA output may be connected to the MCU900.

Exactly what this 4-20mA represents is a function of the transmitter. The transmitter can not be re-ranged by the MCU900.

For example, if a level transmitter designed to give a 4-20mA output over 5m is installed in a 3m deep tank, the input to the MCU900 is going to be 4-13.6mA.

When a standard 4-20mA transmitter is connected, the MCU900 will recognise the input and the PV shown on the main display will be in % of current input, where 4mA is 0% and 20mA is 100%.

Note, in the example above, the maximum current that the MCU900 will see will be 13.6mA, so the PV on the display will only ever show 60% maximum.

It is possible to scale this input in the MCU900 and give a 4-20mA output from the MCU900.

### A2.1.2 Using a HART compatible transmitter

Any HART compatible transmitter can be connected to the MCU900.

The MCU900 will recognise a HART transmitter and automatically start digital communications. The PV shown on the display will be extracted directly from the transmitter, along with the associated measurement units.

You will notice a small “~” icon next to the padlock in the upper left corner of the display which shows digital communications are in operation.

### A2.1.3 Using the MCU902

The MCU902 accepts inputs from two HART transmitters arranged in multi-drop mode.

Transmitters **MUST BE** HART compatible to be used with the MCU902. See Section 3.4.1.

## A2.2 Using Solartron Mobrey Wizard assisted programming

With a transmitter connected and operating, you should now tell the MCU900 what duty it is to perform – Wet well pump control, Level measurement, Contents measurement or Flow measurement.

- Press enter and navigate to the Duty Wizard selection screen “SETUP / MCU900 CONTROL UNIT / DUTY (mode) / Duty Wizard.
- Press enter to start the duty wizard and select the duty for the MCU900
- Enter data as requested by the MCU900, which will automatically set up the input scaling and current output of the MCU900.

At the end of any duty wizard you will automatically be offered further wizards which are appropriate to you chosen application. For example, the “MCU Relay WIZARD”, which allows you to set up relay control or alarm points as required, or the “TOTALISER WIZARD” relevant to open channel flow measurement and totalisation.

Further details of Solartron Mobrey Wizards are given in the system Quickstart manual IP2040/QS and the technical manual IP2030/OM available on request or from the website.

## A2.3 Useful programming information

The following information is given to assist users in programming other popular functions of the MCU900.

### A2.3.1 Password protection

The MCU900 may be protected from unauthorised programming by setting a PIN number.

Follow the path “SETUP / MCU CONTROL UNIT / SYSTEM / SETTINGS / PIN” and enter a 4 digit PIN.

### A2.3.2 Configure the display

The MCU900 display may be customised to show a variety of data. The display is sectioned into 3 horizontal zones, Upper, Middle and Lower.

Follow the path “SETUP / MCU CONTROL UNIT / OUTPUT / DISPLAY” and select which part of the display you wish to customise. You may then select from a list of data which may be displayed there.

### A2.3.3 Set up a digital input

Two voltage free contact inputs may be connected to the MCU900 and be programmed to cause certain actions should they activate.

Follow the path “SETUP / MCU CONTROL UNIT / DIGITAL INPUT / Digital Input 1 “ and you can then customise the input to suit your requirements.

### A2.3.4 Commissioning aids

The MCU900 has several useful commissioning aids on-board.

Follow the path “SETUP / MCU CONTROL UNIT / SYSTEM / TEST “ and you can choose to autcycle the MCU900 over the full range of the current input without changing the transmitter input or level in a tank, trim input and output currents or use the MCU to drive a set output current into the loop.

### A2.3.5 Re-setting default values

If the MCU900 is not operating as you would expect or you are unsure of some of the data you have programmed in, you can re-set the MCU900 to it's factory default condition. This action causes default values to be loaded into all of the MCU900 parameter locations. Note, all previously entered data will be overwritten or lost.

Follow the path “SETUP / MCU CONTROL UNIT / SYSTEM / DEFAULTS” and follow the instruction to load defaults.

### A2.3.6 Direct parameter access

Proficient users who become familiar with the parameter numbers of the MCU900 can access parameters directly by parameter number.

Follow the path “DIRECT” and select either Pxxx or Dxxx. “D” type parameters are diagnostic parameters and are read only.

Once a parameter number is entered and displayed, the user can use the up and down keys to scroll through the full parameter list.

### A2.3.7. Programming menus

The following pages detail the menu structure of the MCU control unit.

Function Menu Option	Sub-menu Level 1	Sub-menu Level 2	Sub-menu Level 3	Par No.	Parameter Name	Units	Default			
Cancel Password					Cancel Password	-	-			
Go Offline ?					Go Online/Offline ?	-	-			
SETUP	INPUT CHANNEL			P111	Channel 1 Input Source	-	Tx1 : PV			
				P321	Current Input 1 Damping	sec	5			
				P112	Channel 1 Input Offset	-	0			
				P113	Channel 1 Profile	-	Scaled			
				P114	Channel 1 Input Scale Factor	-	1			
				P115	Channel 1 Non-Linear Data	-	0			
				P116	Channel 1 Post Scale	-	1			
				P117	Channel 1 Low Cut-off	as P201	AUTO			
			DUTY(Mode)				Duty Wizard	-	0	
				UNITS		P200	PV Units	-	%	
						P201	SV Units	-	%	
					P202	TV Units	-	%		
					P203	FV Units	-	°C		
			PV DAMPING			P210	Output PV Damping	s	0	
						P240	Description	-	MCU CONTROL	
						P241	Message	-	MESSAGE	
						P242	Tag Number - Control Unit	-	MSP2000	
		CUSTOM			P250	Start On	-	None		
					P251	Stop On	-	None		
					P252	Stop If	-	None		
					P253	Start Time	hh.mm	07:00		
					P254	Interval	hh.mm	01:00		
					P255	Start Time #2	hh.mm	00:00		
					P256	Interval #2	hh.mm	00:00		
					P257	Max Retries	-	10		
			OVERRIDES			P270	Auto Sequence Enable	-	Off	
						P271	Auto Sequence Qualifier	-	0	
					P272	Pump-down Relay	-	0		
					P273	Pump-down Interval	hh.mm	00:00		
					P274	Pump-down Duration	hh.mm	00:00		
					P275	Energy Saving Start Time	hh.mm	00:00		
					P276	Energy Saving Relay Select	-	0		
					P277	Scum Line Prevention variance	-	0		
					P278	Scum Line Prevention relay	-	0		
		DIGITAL INPUT		DIGITAL INPUT 1		P340	Digital Input 1 Action	-	Free	
						P341	Digital Input 1 Delay	mmm:ss	000:00	
					P342	Digital Input 1 On State	-	Closed		
			DIGITAL INPUT 2		P345	Digital Input 2 Action	-	Free		
					P346	Digital Input 2 Delay	mmm:ss	000:00		
		OUTPUT	CURRENT OUTPUT		P400	Lower range value	as P200	0		
					P401	Upper range value	as P200	100		
					P402	Alarm action	-	3.6mA		
			RELAY				Relay Wizard	-	0	
								Reset RL Params	-	
				RELAY 1			P410	Relay 1 Mode	-	None
							P411	Relay 1 PV ON Point	as P200	0
							P412	Relay 1 PV OFF Point	as P200	0
							P413	Relay 1 Minimum ON Time	mmm:ss	000:00
							P414	Relay 1 Maximum ON Time	mmm:ss	000:00
						P415	Relay 1 Minimum OFF Time	mmm:ss	000:00	
	RELAY 2					P420	Relay 2 Mode	-	None	
						P421	Relay 2 PV ON Point	as P200	0	
						P422	Relay 2 PV OFF Point	as P200	0	
						P423	Relay 2 Minimum ON Time	mmm:ss	000:00	
						P424	Relay 2 Maximum ON Time	mmm:ss	000:00	
	RELAY 3					P425	Relay 2 Minimum OFF Time	mmm:ss	000:00	
						P430	Relay 3 Mode	-	None	
						P431	Relay 3 PV ON Point	as P200	0	
						P432	Relay 3 PV OFF Point	as P200	0	
						P433	Relay 3 Minimum ON Time	mmm:ss	000:00	
	RELAY 4					P434	Relay 3 Maximum ON Time	mmm:ss	000:00	
						P435	Relay 3 Minimum OFF Time	mmm:ss	000:00	
						P440	Relay 4 Mode	-	None	
						P441	Relay 4 PV ON Point	as P200	0	
						P442	Relay 4 PV OFF Point	as P200	0	
	RELAY 5					P443	Relay 4 Minimum ON Time	mmm:ss	000:00	
						P444	Relay 4 Maximum ON Time	mmm:ss	000:00	
						P445	Relay 4 Minimum OFF Time	mmm:ss	000:00	
				P450	Relay 5 Mode	-	Fault			
				P451	Relay 5 PV ON Point	as P200	0			
	ALARM			P452	Relay 5 PV OFF Point	as P200	0			
				P453	Relay 5 Minimum ON Time	mmm:ss	000:00			
				P454	Relay 5 Maximum ON Time	mmm:ss	000:00			
				P455	Relay 5 Minimum OFF Time	mmm:ss	000:00			
				P490	Rising level alarm delay	mmm:ss	000:00			
				P491	Relay operations	-	0			
				P492	Relay operations relay select	-	Disabled			
				P493	Relay runtime	hh.mm	00:00			
				P494	Relay runtime relay select	-	Disabled			
			P495	Pump efficiency limit	-	0				
			P496	Pump Efficiency relay select	-	0				
			P497	No activity delay	hh.mm	00:00				
			P498	No activity relay	-	0				

A2.3.7.1 Menu structure and parameter list for the MCU901/MCULOG

	TOTALISER		Totaliser Wizard	-	0		
			P530 Totaliser Factor	-	0		
			P531 Totaliser Units	-	None		
			P534 Totaliser Pulse width	ms	100		
			P535 Sampler Factor	-	0		
	ALARM		P540 PV Out of Limits	-	None		
			P541 Current Output Saturated	-	None		
			P542 Logging Memory Filling	-	None		
			P543 Digital Input 1 Active	-	None		
			P544 Maximum number of retries	-	None		
			P545 Current Input Saturated	-	None		
			P547 Rising level	-	None		
			RELAY		P548 Relay operations	-	None
					P549 Relay runtime	-	None
					P550 Pump efficiency	-	None
	FAULT		P551 No activity	-	None		
			P560 System Fault Alarm	-	Both		
			P561 Control Unit Temperature over Limits	-	None		
	DISPLAY		P562 Transmitter Fault	-	Both		
			P570 Display Select 1 (upper)	-	P731-Time		
			P571 Display Select 2 (mid)	-	D800-PV		
			P572 Display Select 3 (lower)	-	Bargraph		
			P573 Decimal places	-	3		
			P575 Backlight On/Off	-	On		
	LOGGING		Logging Wizard	-	0		
		P590 Logging interval	min	0			
		P591 Fast logging select mode	as P200	0 (=Off)			
		P592 Do/Do not overwrite old data	-	On			
		P593 Low Memory Alarm Threshold	%	0			
SYSTEM	TEST	AUTO-CYCLE	Self Test	-	-		
		DISPLAY	Display Test	-	-		
		CURRENT INPUT	4mA input adjust	-	-		
			20mA input adjust	-	-		
		CURRENT OUTPUT	P700 4mA output adjust	-	-		
	P701 20mA output adjust		-	-			
	P702 Set Current		mA	0			
	DEFAULTS		DEFAULTS	-	-		
	COMMS		P710 Comms Address	-	0		
			P711 Interface Type	-	Log download		
			P712 Baud Rate	-	9600		
			P713 No. of Start Bits	-	1		
			P714 No. of Data Bits	-	8		
			P715 Parity of Data	-	Even		
			P716 No. of Stop Bits	-	1		
	SETTINGS		P730 Date	-	01/01/00		
			P731 Time	-	-		
			P734 Date format	-	dd/mm/yy		
			P735 Keypad Sound On/Off	-	On		
			P737 Language	-	English		
			P740 Personal Identification Code	-	0000		
			Xmtr Wizard	-	0		
	FIXED		D750 Model Code	-	MCU902WX-A		
			D751 Serial Number - Control Unit	-	000000		
			D752 Hardware Revision	-	8		
D753 Software Version			-	12			
HART			D760 Manufacturer's Code	-	Sol. Mobrey		
			D761 Unique ID	-	000000		
			D762 Universal Command Revision	-	5		
			D763 Transmitter Spec. Command Rev.	-	1		
			D764 Preamble Bytes	-	5		
			D765 Flags	-	1		

MONITOR	READINGS	ANSWERS		D800	Primary Variable	as P200	-		
				D801	Secondary Variable	as P201	-		
				D802	Tertiary Variable	as P202	-		
				D803	Fourth Variable	as P203	-		
				D804	Ullage	as P200	-		
				D805	% Current Output	%	-		
				D806	Current output	mA	-		
				D809	Rate of Change	PV/min	-		
				RELAY	RELAY OPERATIONS	D811	Relay 1 Operations	-	0
						D812	Relay 2 Operations	-	0
						D813	Relay 3 Operations	-	0
						D814	Relay 4 Operations	-	0
						D815	Relay 5 Operations	-	0
					RELAY RUN TIME	D820	Relay Status	-	-
						D821	Relay 1 Run-Time	hh:mm	-
		D822	Relay 2 Run-Time			hh:mm	-		
		D823	Relay 3 Run-Time			hh:mm	-		
		D824	Relay 4 Run-Time			hh:mm	-		
		D825	Relay 5 Run-Time			hh:mm	-		
		D828	Totaliser 1 Value			P531	-		
		D830	Alarm report			-	None		
		D831	Fault report			-	None		
		DIAGNOSTICS	D835			Digital input status	-	-	
			D840	Current input	mA	-			
			D842	Current input %	%	-			
			D844	Temperature of Control Unit	°C	-			
			D845	Time to next Pump Down	hh:mm	-			
			D846	Logging Memory Free	%	-			
			D848	Date of Last Change	dmy	--/--			
			D849	Date of 1st Power-On	dmy	--/--			
			CHANNELS	D851	Channel 1 output	P201	-		
				PUMP EFFICIENCY	D861	Pump efficiency RL1	%	-	
					D862	Pump efficiency RL2	%	-	
	D863				Pump efficiency RL3	%	-		
	D864				Pump efficiency RL4	%	-		
	DIRECT		Pxxx		-	-	-		
			Dxxx		-	-	-		



A2.3.7.2 Menu structure and paramter list for the MCU902

Function Menu Option	Sub-menu Level 1	Sub-menu Level 2	Sub-menu Level 3	Par No.	Parameter Name	Units	Default		
Cancel Password					Cancel Password	-	-		
Go Offline ?					Go Online/Offline ?	-	-		
SETUP	PV CALCULATION	CHANNEL 1		P111	Channel 1 Input Source	-	Tx1 : PV		
				P112	Channel 1 Input Offset	-	0		
				P113	Channel 1 Profile	-	Scaled		
				P114	Channel 1 Input Scale Factor	-	1		
				P115	Channel 1 Non-Linear Data	-	0		
				P116	Channel 1 Post Scale NLP	-	1		
				P117	Channel 1 Low Cut-off	as P201	AUTO		
			CHANNEL 2		P121	Channel 2 Input Source	-	Tx2 : PV	
				P122	Channel 2 Input Offset	-	0		
				P123	Channel 2 Profile	-	Scaled		
				P124	Channel 2 Input Scale Factor	-	1		
				P125	Channel 2 Non-Linear Data	-	0		
				P126	Channel 2 Post Scale NLP	-	1		
				P127	Channel 2 Low Cut-off	as P202	AUTO		
			>		P150	Output Mapping	-	Ch1	
			>		P151	MCU Fourth Variable Source	-	Tx1 : FV	
			>		P321	Current Input 1 Damping	sec	5	
	DUTY(Mode)	>				Duty Wizard	-	0	
		UNITS			P200	PV Units	-	%	
						P201	SV Units	-	%
						P202	TV Units	-	%
						P203	FV Units	-	°C
		PV DAMPING			P210	Output PV Damping	s	0	
		>			P240	Description	-	MCU CONTROL	
		>			P241	Message	-	MESSAGE	
		>			P242	Tag Number - Control Unit	-	MSP2000	
		CUSTOM				P250	Start On	-	None
						P251	Stop On	-	None
						P252	Stop If	-	None
						P253	Start Time	hh.mm	07:00
					P254	Interval	hh.mm	01:00	
					P255	Start Time #2	hh.mm	00:00	
					P256	Interval #2	hh.mm	00:00	
					P257	Max Retries	-	10	
	OVERRIDES					P270	Auto Sequence Enable	-	Off
						P271	Auto Sequence Qualifier	-	0
					P272	Pump-down Relay	-	0	
					P273	Pump-down Interval	hh.mm	00:00	
					P274	Pump-down Duration	hh.mm	00:00	
					P275	Energy Saving Start Time	hh.mm	00:00	
					P276	Energy Saving Relay Select	-	0	
					P277	Scum Line Prevention variance	-	0	
					P278	Scum Line Prevention relay	-	0	
		DIGITAL INPUT	DIGITAL INPUT 1			P340	Digital Input 1 Action	-	Free
						P341	Digital Input 1 Delay	mmm:ss	000:00
					P342	Digital Input 1 On State	-	Closed	
	DIGITAL INPUT 2				P345	Digital Input 2 Action	-	Free	
					P346	Digital Input 2 Delay	mmm:ss	000:00	
					P347	Digital Input 2 On State	-	Closed	
	OUTPUT	CURRENT OUTPUT			P400	Lower range value	as P200	0	
				P401	Upper range value	as P200	100		
				P402	Alarm action	-	3.6mA		
RELAY						Relay Wizard	-	0	
						Reset RL Params	-		
		RELAY 1			P410	Relay 1 Mode	-	None	
						P411	Relay 1 PV ON Point	as P200	0
						P412	Relay 1 PV OFF Point	as P200	0
						P413	Relay 1 Minimum ON Time	mmm:ss	000:00
						P414	Relay 1 Maximum ON Time	mmm:ss	000:00
						P415	Relay 1 Minimum OFF Time	mmm:ss	000:00
		RELAY 2				P420	Relay 2 Mode	-	None
						P421	Relay 2 PV ON Point	as P200	0
						P422	Relay 2 PV OFF Point	as P200	0
						P423	Relay 2 Minimum ON Time	mmm:ss	000:00
						P424	Relay 2 Maximum ON Time	mmm:ss	000:00
						P425	Relay 2 Minimum OFF Time	mmm:ss	000:00
		RELAY 3				P430	Relay 3 Mode	-	None
						P431	Relay 3 PV ON Point	as P200	0
						P432	Relay 3 PV OFF Point	as P200	0
					P433	Relay 3 Minimum ON Time	mmm:ss	000:00	
					P434	Relay 3 Maximum ON Time	mmm:ss	000:00	
					P435	Relay 3 Minimum OFF Time	mmm:ss	000:00	
RELAY 4				P440	Relay 4 Mode	-	None		
				P441	Relay 4 PV ON Point	as P200	0		
				P442	Relay 4 PV OFF Point	as P200	0		
				P443	Relay 4 Minimum ON Time	mmm:ss	000:00		
				P444	Relay 4 Maximum ON Time	mmm:ss	000:00		
				P445	Relay 4 Minimum OFF Time	mmm:ss	000:00		

		RELAY 5	P450	Relay 5 Mode	-	Fault
			P451	Relay 5 PV ON Point	as P200	0
			P452	Relay 5 PV OFF Point	as P200	0
			P453	Relay 5 Minimum ON Time	mmm:ss	000:00
			P454	Relay 5 Maximum ON Time	mmm:ss	000:00
			P455	Relay 5 Minimum OFF Time	mmm:ss	000:00
		ALARM	P490	Rising level alarm delay	mmm:ss	000:00
			P491	Relay operations	-	0
			P492	Relay operations relay select	-	Disabled
			P493	Relay runtime	hh:mm	00:00
			P494	Relay runtime relay select	-	Disabled
			P495	Pump efficiency limit	-	0
			P496	Pump Efficiency relay select	-	0
			P497	No activity delay	hh:mm	00:00
			P498	No activity relay	-	0
		TOTALISER		Totaliser Wizard	-	0
			P530	Totaliser 1 Factor	-	0
			P531	Totaliser 1 Units	-	None
			P532	Totaliser 2 Factor	-	0
			P533	Totaliser 2 Units	-	None
			P536	Totaliser 2 Source	-	None
			P534	Totaliser Pulse width	ms	100
			P535	Sampler Factor	-	0
		ALARM	P490	Rising level alarm delay	mmm:ss	000:00
			P491	Relay operations	-	0
			P492	Relay operations relay select	-	Disabled
			P493	Relay runtime	hh:mm	00:00
			P494	Relay runtime relay select	-	Disabled
			P495	Pump efficiency limit	-	0
			P496	Pump Efficiency relay select	-	0
			P497	No activity delay	hh:mm	00:00
			P498	No activity relay	-	0
		TOTALISER		Totaliser Wizard	-	0
			P530	Totaliser 1 Factor	-	0
			P531	Totaliser 1 Units	-	None
			P532	Totaliser 2 Factor	-	0
			P533	Totaliser 2 Units	-	None
			P536	Totaliser 2 Source	-	None
			P534	Totaliser Pulse width	ms	100
			P535	Sampler Factor	-	0
		ALARM	P540	PV Out of Limits	-	None
			P541	Current Output Saturated	-	None
			P542	Logging Memory Filling	-	None
			P543	Digital Input 1 Active	-	None
			P544	Maximum number of retries	-	None
			P545	Current Input Saturated	-	None
			P547	Rising level	-	None
		RELAY	P548	Relay operations	-	None
			P549	Relay runtime	-	None
			P550	Pump efficiency	-	None
			P551	No activity	-	None
		FAULT	P560	System Fault Alarm	-	Both
		FAULT	P561	Control Unit Temperature over Limits	-	None
		FAULT	P562	Transmitter Fault	-	Both
		DISPLAY	P570	Display Select 1 (upper)	-	P731-Time
		DISPLAY	P571	Display Select 2 (mid)	-	D800-PV
		DISPLAY	P572	Display Select 3 (lower)	-	Bargraph
		DISPLAY	P573	Decimal places	-	3
		DISPLAY	P575	Backlight On/Off	-	On
		LOGGING		Logging Wizard	-	0
			P590	Logging interval	min	0
			P591	Fast logging select mode	as P200	0
			P592	Do/Do not overwrite old data	-	On
			P593	Low Memory Alarm Threshold	%	0
		SYSTEM		Self Test	-	-
		TEST		Display Test	-	-
		TEST		4mA input adjust	-	-
		TEST		20mA input adjust	-	-
		TEST		4mA output adjust	-	-
		TEST		20mA output adjust	-	-
		TEST		Set Current	mA	0
		DEFAULTS		DEFAULTS	-	-
		COMMS		Comms Address	-	0
		COMMS		Interface Type	-	Log download
		COMMS		Baud Rate	-	9600
		COMMS		No. of Start Bits	-	1
		COMMS		No. of Data Bits	-	8
		COMMS		Parity of Data	-	Even
		COMMS		No. of Stop Bits	-	1

		SETTINGS		P730	Date	-	01/01/00
		SETTINGS		P731	Time	-	-
		SETTINGS		P734	Date format	-	dd/mm/vy
		SETTINGS		P735	Keypad Sound On/Off	-	On
		SETTINGS		P737	Language	-	English
		SETTINGS		P740	Personal Identification Code	-	0000
		>			Xmtr Wizard	-	0
		FIXED		D750	Model Code	-	MCU902WX-A
		FIXED		D751	Serial Number - Control Unit	-	000000
		FIXED		D752	Hardware Revision	-	8
		FIXED		D753	Software Version	-	12
		FIXED	HART	D760	Manufacturer's Code	-	Sol. Mobrey
		FIXED	HART	D761	Unique ID	-	000000
		FIXED	HART	D762	Universal Command Revision	-	5
		FIXED	HART	D763	Transmitter Spec. Command Rev.	-	1
		FIXED	HART	D764	Preamble Bytes	-	5
		FIXED	HART	D765	Flags	-	1
MONITOR	READINGS	ANSWERS		D800	Primary Variable	as P200	-
		ANSWERS		D801	Secondary Variable	as P201	-
		ANSWERS		D802	Tertiary Variable	as P202	-
		ANSWERS		D803	Fourth Variable	as P203	-
		ANSWERS		D804	Ullage	as P200	-
		ANSWERS		D805	% Current Output	%	-
		ANSWERS		D806	Current output	mA	-
		>		D809	Rate of Change	PV/min	-
		RELAY	RELAY OPERATIONS	D811	Relay 1 Operations	-	0
		RELAY	RELAY OPERATIONS	D812	Relay 2 Operations	-	0
		RELAY	RELAY OPERATIONS	D813	Relay 3 Operations	-	0
		RELAY	RELAY OPERATIONS	D814	Relay 4 Operations	-	0
		RELAY	RELAY OPERATIONS	D815	Relay 5 Operations	-	0
		RELAY	>	D820	Relay Status	-	-
		RELAY	RELAY RUN TIME	D821	Relay 1 Run-Time	hh:mm	-
		RELAY	RELAY RUN TIME	D822	Relay 2 Run-Time	hh:mm	-
		RELAY	RELAY RUN TIME	D823	Relay 3 Run-Time	hh:mm	-
		RELAY	RELAY RUN TIME	D824	Relay 4 Run-Time	hh:mm	-
		RELAY	RELAY RUN TIME	D825	Relay 5 Run-Time	hh:mm	-
		>		D828	Totaliser 1 Value	P531	-
		>		D829	Totaliser 2 Value	P533	-
		>		D830	Alarm report	-	None
		>		D831	Fault report	-	None
	DIAGNOSTICS			D835	Digital input status	-	-
				D840	Current input	mA	-
				D842	Current input %	%	-
				D844	Temperature of Control Unit	°C	-
				D845	Time to next Pump Down	hh:mm	-
				D846	Logging Memory Free	%	-
				D848	Date of Last Change	dmy	--/--
				D849	Date of 1st Power-On	dmy	--/--
		CHANNELS		D851	Channel 1 output	P201	-
				D852	Channel 2 output	P202	-
		PUMP EFFICIENCY		D861	Pump efficiency RL1	%	-
				D862	Pump efficiency RL2	%	-
				D863	Pump efficiency RL3	%	-
				D864	Pump efficiency RL4	%	-
DIRECT	Pxxx				-	-	-
	Dxxx				-	-	-

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