

MEDACS Universal & Frequency



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1.0 DESCRIPTION

The MEDACS 2XXX series is a range of DIN rail transmitters with a wide range of options available. This manual documents the functionality of the MEDACS 21XX, 22XX, 23XX and 24XX. The units are available with the following output option combinations:

PART No.	INPUT	O/P 1	O/P 2
2122	U	C/O relay	C/O relay
2113	U	Current (4 to 20) mA, (0 to 10)mA, (0 to 20)mA	Twin relay
2133	U	Twin relay	Twin relay
2211	U	Current (4 to 20) mA	Current (4 to 20) mA
2222	U	C/O relay	C/O relay
2233	U	Twin relay	Twin relay
2213	U	Current (4 to 20) mA	Twin relay
2322	F	C/O relay	C/O relay
2313	F	Current (4 to 20) mA, (0 to 10)mA, (0 to 20) mA	Twin relay
2333	F	Twin relay	Twin relay
2411	F	Current (4 to 20) mA	Current (4 to 20) mA
2413	F	Current (4 to 20) mA	Twin relay
2422	F	C/O relay	C/O relay
2433	F	Twin relay	Twin relay

The units' performance is enhanced by the inclusion of Status' own TFML (Transfer Function Module Library). TFML was designed to make the transmitters' signal processing capabilities as flexible as possible. TFML is not documented in detail in this manual. Please contact your supplier for further information.

2.0 UNPACKING

Please inspect the instrument carefully for any signs of shipping damage. The packaging has been designed to provide maximum protection, however we cannot guarantee that mishandling will not have damaged the instrument. In the case of this unlikely event, please contact your supplier immediately and retain the packaging for subsequent inspection.

3.0 SPECIFICATION

EMC Approval	EN61326: 1997
Immunity	Annex A Industrial
Emissions	Class A
Supply	24 V \pm 10 % DC @ 200 mA maximum per unit
Ambient	(-30 to 60) °C

Care must be taken when installing units into an enclosure to ensure that the above ambient range is not exceeded. Power supply units can produce heat and if possible are best mounted in a separate enclosure away from the MEDACS units.

3.1 INPUTS

3.1.1 UNIVERSAL INPUT 21XX AND 22XX ONLY

SENSOR	RANGE
mA	4 to 20, \pm 20, \pm 10
RTD	Pt100, Ni120
T/C	K, J, T, R, S, E, N, L, B
Volts	\pm 0.1, \pm 10, \pm 1, \pm 5, 1 to 5 slidewire

CURRENT INPUT	
Base Accuracy	0.05 % FS \pm 0.05 % of reading
Thermal Drift	0.02 %/°C
Input Impedance	20 Ω
Linearisation	Linear, Square root, Power 3/2, Power 5/2, Custom

Two isolated and regulated 19 V power supply's are available to power the current loops, and are capable of sourcing 25 mA for each channel.

RTD	
Sensor Range	(-200 to 850) °C
Linearisation	BS EN 60751/JISC 1604/Custom
Basic Accuracy	0.1°C \pm 0.05 % of reading
Thermal Drift	Zero
Span	\pm 0.004 Ω /°C
Excitation Current	0.01 % /°C
Lead Resistance Effect	1 mA
Max. Lead Resistance	0.002 °C/ Ω
	50 W/leg

THERMOCOUPLE TYPE	RANGE (°C)
K	-200 to 1370
J	-200 to 1200
T	-210 to 400
R*1	-10 to 1760
S*1	-10 to 1760
E	-200 to 1000
L	-100 to 600
N	-180 to 1300
B*2	-10 to 1650
Custom	-1999 to 9999

Accuracy	\pm 0.04 % FS \pm 0.04 % reading or \pm 0.5 °C, whichever is greater
Linearisation	BS4937/IEC 584-3/Custom
Cold junction error	\pm 0.5 °C
Cold junction tracking	0.05 °C/°C
Cold junction range	(-20 to 70) °C
Thermal drift	Zero
Span	4 μ V/°C
	0.02 % /°C

*NOTES:

1. Accuracy true for (800 to 1760) °C
2. Accuracy true for (400 to 1650) °C

VOLTAGE INPUT

Range	± 100 mV, ± 1 V, ± 5 V, ± 10 V, (1 to 5) V
Accuracy	0.04 % FS ± 0.04 % of reading
Thermal drift	0.02 %/°C
Input impedance	1 MΩ
Linearisation	Linear, Square root, Power 3/2, Power 5/2, Custom
*Slidewire	3 wire Potentiometer inputs can be accommodated between 50 Ω and 10 KΩ

3.1.2 FREQUENCY INPUTS 23XX AND 24XX ONLY

A wide range of input types and frequencies can be accommodated without the need for Switches or Jumpers. Totalise functions are a standard feature on the single channel version and are stored during power down.

Input Types	Namur, Low Voltage (> 10 mV), TTL, Open Collector, PFC
Frequency range	0.1 Hz to 20 kHz.
Accuracy	0.003% FS

DIGITAL INPUTS 21XX AND 23XX ONLY

Single channel units can also accept two external digital inputs which can be TTL, Open Collector, 24 VDC Logic or Potential Free Contacts. Dig 1 is dedicated to a reset/clear function enabled by the configuration software whilst Dig 2 is reserved for use with TFML. Both digitals can be read via the communications and used to signal events.

OUTPUTS

Two output option types are available per channel, relay or current re-transmission. The configuration of these will vary depending upon whether they are fitted on the single or dual channel transmitter.

CURRENT RE-TRANSMISSION OUTPUTS

Output Range	
Single Channel	(0 to 10) mA, (0 to 20) mA, (4 to 20) mA source or sink
Dual Channel	(4 to 20) mA sink
Max. Current Output	< 23 mA
Accuracy	0.07 % or 5 mA, whichever is greater
Max Power Supply	30 V (In SINK mode)
Temperature Stability	5 µA/°C

*NOTE: Maximum source load 750 R

RELAY OUTPUTS

Two relay options are available, either a single changeover or twin independent relays with normally closed contacts.*1

Alarm Action	Off, High, Low, Deviation, Test
Hysteresis	Programmable (0 to 100) %
Delay Time*2	Programmable
Start-up Delay	Programmable

	AC	DC
Max. Switching Voltage	48 V RMS	48 V
Max. Current	1 A @ 48 V	1 A @ 30 V
Max. Power	60 VA	30 W
Contact Resistance	< 100 mΩ	
Operate Time	< 5 ms	
Electrical Life @ Full Load	100 000 operations	
Mechanical Life	10 000 000 operations	

*NOTES:

1. Contacts are normally closed i.e the contact is closed at power off and when operating in an alarm condition. The contact opens in the absence of an alarm condition. The active function can be reversed in software.
2. Alarm must be continuously present for this period in order to be recognised

3.2 GENERAL

Response Time	300 ms
Filter	Programmable or Adaptive
Power Requirements	24 VDC ± 10 % @ 200 mA
Breakdown Isolation	1 kV I/P-O/P-PSU
Ambient Operating Range	(-30 to 60) °C
Ambient Storage	(-50 to 85) °C
Ambient Humidity	(10 to 90) % RH
EMC Emissions	BS EN61326
EMC Immunity	BS EN61326
Display Range	-1999 to 9999

4.0 INSTALLATION

THIS SECTION FOR USE BY COMPETENT PERSONNEL ONLY

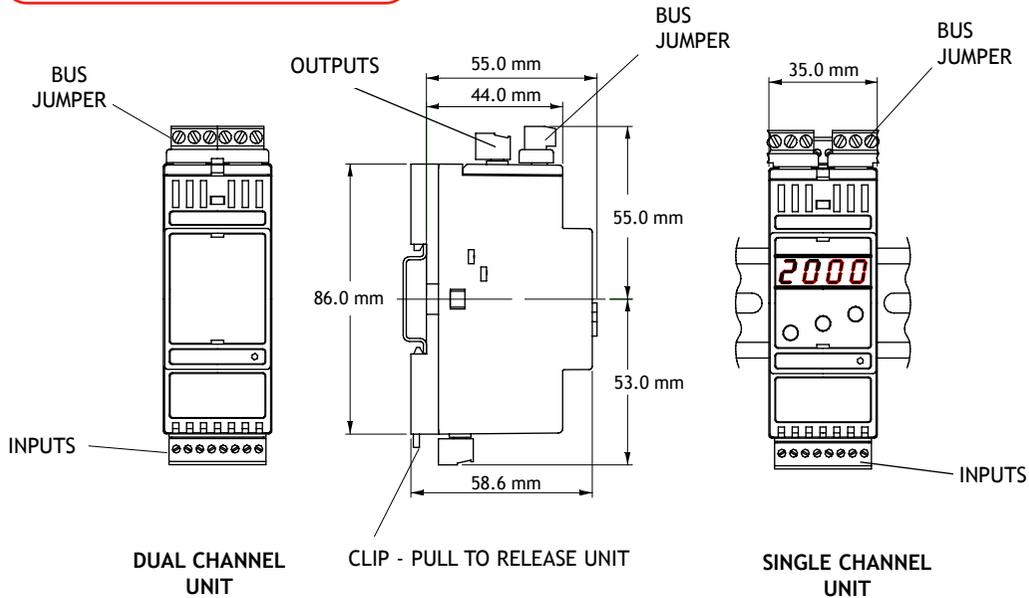
SAFETY INFORMATION

- **WARNING!** THE EQUIPMENT MUST BE INSTALLED BY SUITABLY QUALIFIED PERSONNEL AND MOUNTED IN AN ENCLOSURE PROVIDING PROTECTION TO AT LEAST IP20. THE EQUIPMENT CONTAINS NO USER SERVICEABLE PARTS.

4.1 ISOLATION

The 24 VDC power supply and RS485 comms bus share the same common connections. Isolation is provided between input, output and supply/comms breakdown isolation voltage 500 VAC RMS flash tested to 1 kVDC.

4.2 INSTALLATION DETAIL DIAGRAM

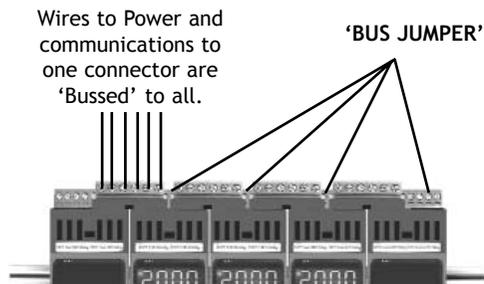


5.0 WIRING

All connections are made to sockets which are removable for ease of maintenance. Installation should be undertaken in accordance with relevant sections of BS6739 - British Standards Code of Practice for "Instrumentation in Process Control Systems: Installation Design and Practice".

5.1 WIRING-UP MULTIPLE UNITS

MEDACS is provided with a unique 'BUS JUMPER' system for quick wiring of COMMS and POWER connections. To use the Bus Jumper, disconnect all power supply/comms connectors and place them so that they connect between the two units. Wiring to one connector then connects to all units.

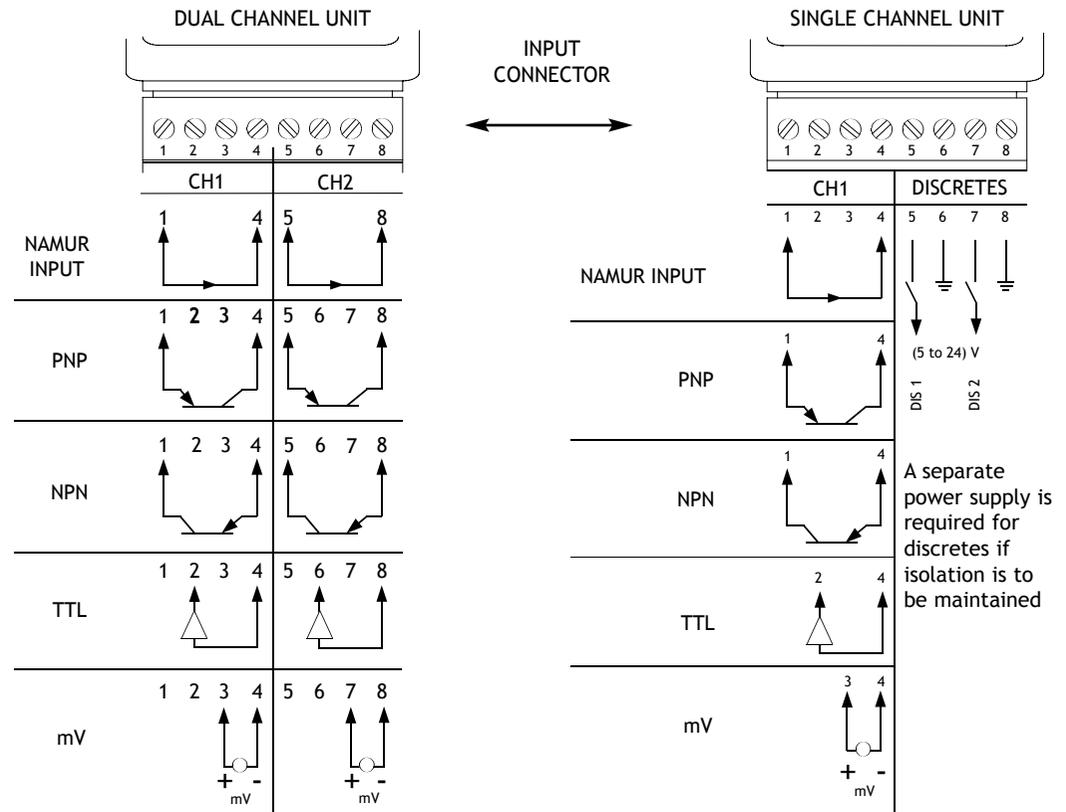


5.2 POWER/COMMS CONNECTIONS

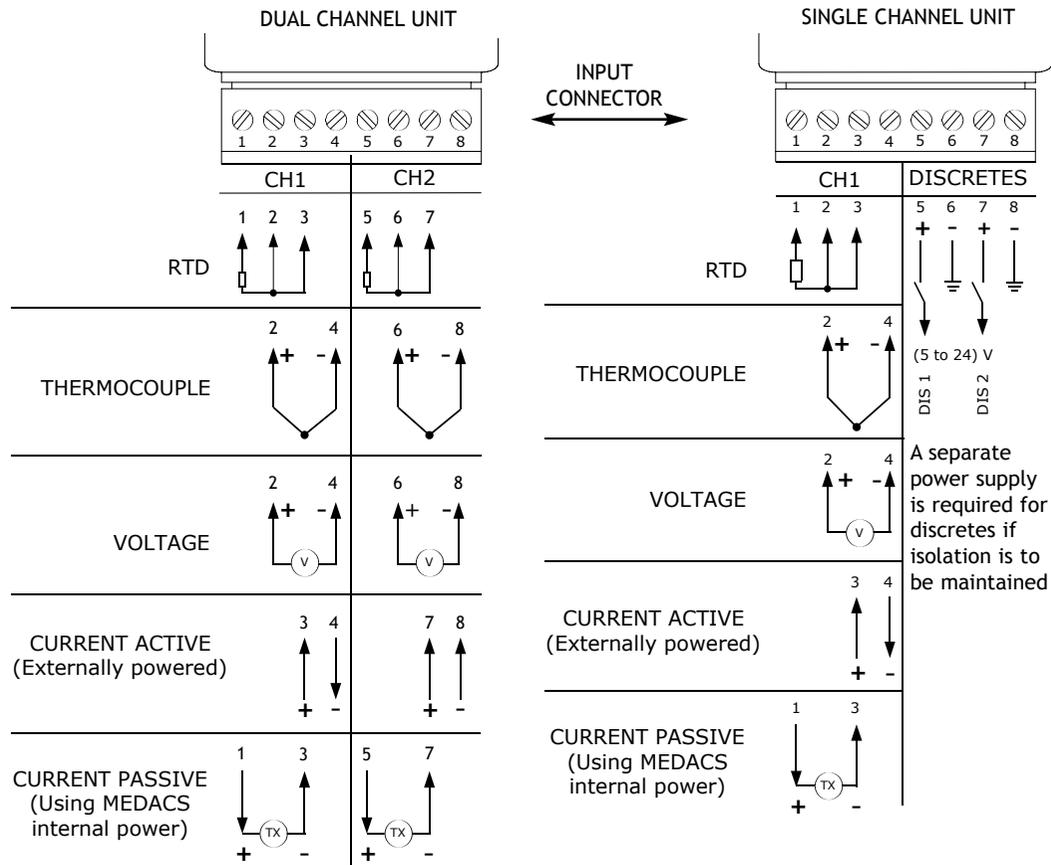
Ensure that the power supply is correct for the application. Over voltage could damage the instrument. Ensure that the exposed section of the wire is fully inserted and that no loose strands are exposed.

6.0 INPUT / OUTPUT CONNECTIONS

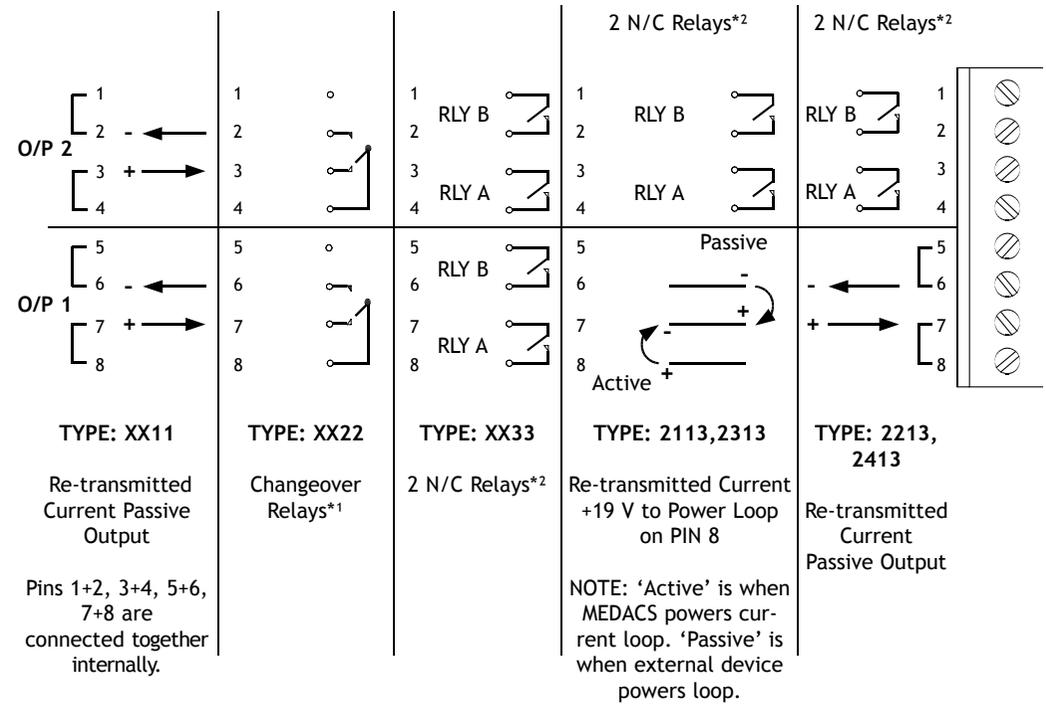
6.1.1 FREQUENCY INPUT CONNECTIONS WIRING DIAGRAM



6.1.2 UNIVERSAL INPUT CONNECTIONS WIRING DIAGRAM



6.2 OUTPUT CONNECTIONS WIRING DIAGRAM



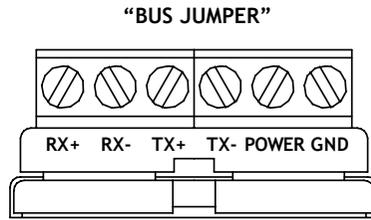
*1 Changeover relays

ALARM STATE / SETTING	IN ALARM	NOT IN ALARM
NINV	8 and 7/4 and 3	8 and 6/4 and 2
INV	8 and 6/4 and 2	8 and 7/4 and 3
Power Off	8 and 7/4 and 3	8 and 7/4 and 3

*2 Normally closed relays

ALARM STATE / SETTING	IN ALARM	NOT IN ALARM
NINV	Relay Closed	Relay Open
INV	Relay Open	Relay Closed
Power Off	Relay Closed	Relay Closed

6.3 POWER SUPPLY/COMMS WIRING DIAGRAM



7.0 PROGRAMMING THE INSTRUMENT

The unit is a microprocessor based instrument enabling it to satisfy a variety of applications. For single channel units, a display/keypad allows local menu programming from the front panel. For single or dual channel units, programming is available via a PC using the RS485 Modbus communications utility.

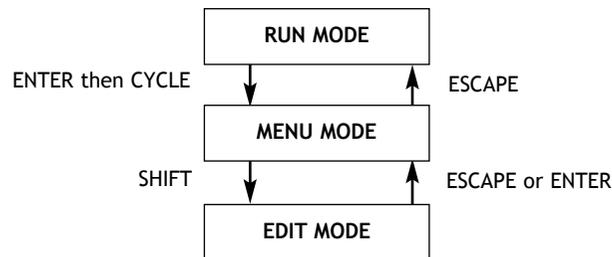
7.1 MENU PROGRAMMING

OPERATING MODES

The MEDACS has 3 operating modes. These are:

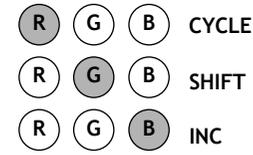
- **RUN MODE** - Process Variable (PV) is displayed.
- **MENU MODE** - Enables navigation around menu structure.
- **EDIT MODE** - Enables menu parameters to be edited.

Run mode is the principal mode of operation. The other two modes are accessed as shown in the diagram below.

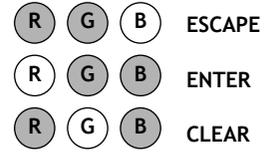


7.2 KEY PRESS DEFINITIONS

Each key pressed individually produces the following menu action (shaded circle signifies key pressed):



Keys pressed simultaneously produce the following menu actions (shaded circle signifies key pressed):



Each MEDACS unit has 3 keys (RED, GREEN and BLUE) to enable menu programming.

7.3 ENTERING MENU MODE

On power up, the unit will take a few seconds to configure itself. Run mode will then automatically be entered. Menu mode is accessed from run mode by pressing ENTER followed quickly by CYCLE. The user will then be able to move around the root menu.

NAVIGATING AROUND THE MENU

The user can navigate around the root menu (or any submenu) by pressing CYCLE. Menu navigation wraps around at the end of the menu list. The items displayed in the menu can either be submenus, parameter lists or numbers.

ENTERING A SUBMENU

Pressing SHIFT enters the submenu or enables parameter list/number editing, depending on where the menu structure is currently being pointed. If the menu navigation is pointing at a submenu, the subsequent submenu can then be cycled around by pressing CYCLE.

7.4 EDITING A PARAMETER LIST

A parameter is selected from a list of options. The parameter option list can be cycled through by pressing INC. The user will be able to distinguish between a menu cycle action, and a parameter list cycle action by having the following 2 dynamic display styles:

ACTION	DISPLAY STYLE
Menu cycle	Display changes on cycle press, no flash
Parameter list cycle	Display flashes

EDITING A NUMBER

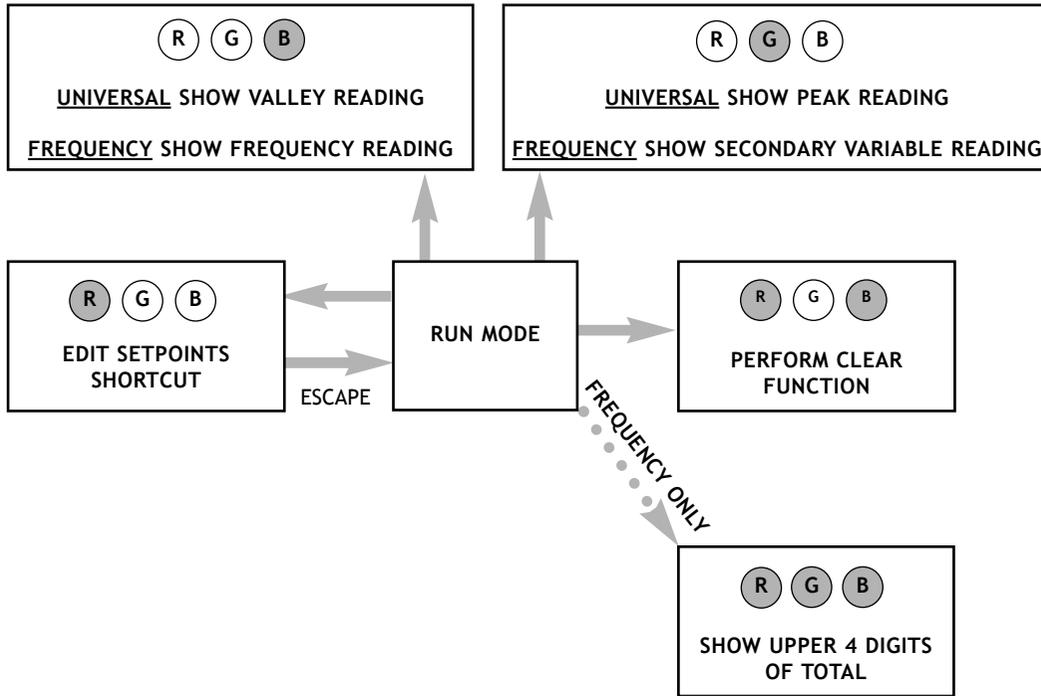
A number is edited by incrementing each digit in turn. The user will know which digit is currently selected for incrementing by the flashing digit. Pressing INC will increment the digit. On overflow, the digit will wrap around to '-', '-1' or '0', whichever is applicable. Pressing SHIFT will shift the currently selected digit right one place. If the number is a whole number, pressing SHIFT when the right most digit is selected will wrap the selection around to the left most digit, and the process starts again.

If the number has a decimal point (DP), pressing SHIFT when the right most digit is selected will select the decimal point position as the editable parameter. In this case, pressing INC will shift the DP position one place to the right. If the current DP position is the right most, the DP will wrap around to the first DP position. Pressing SHIFT will select the left most digit as the editable parameter, and the process starts again.

While the display is flashing, the number/option on the display has not been saved to memory. When the desired number is in view, pressing ENTER will save it to memory. The display will stop flashing for 1 s to confirm the saved number, before returning to the previous submenu. Waiting for 60 s without a key press, or pressing ESCAPE will return the user to the previous submenu, without saving the number.

8.0 OPERATION

8.1 RUN MODE OPTIONS



RUN MODE

This is the normal run time mode where the PV is displayed to the chosen resolution.

To enter MENU mode from RUN mode, the user should press ENTER followed by CYCLE.

ENTER =

CYCLE =

EDIT SETPOINTS SHORTCUT

If enabled (ENbL submenu), and if relay output card is fitted, this menu gives access to the relevant alarm setpoints, 1A, 1B, 2A and 2B.

PERFORM CLEAR FUNCTION

If enabled, pressing CLEAR will:

1. Clear the stored Peak/Valley readings
2. Clear any latched alarms

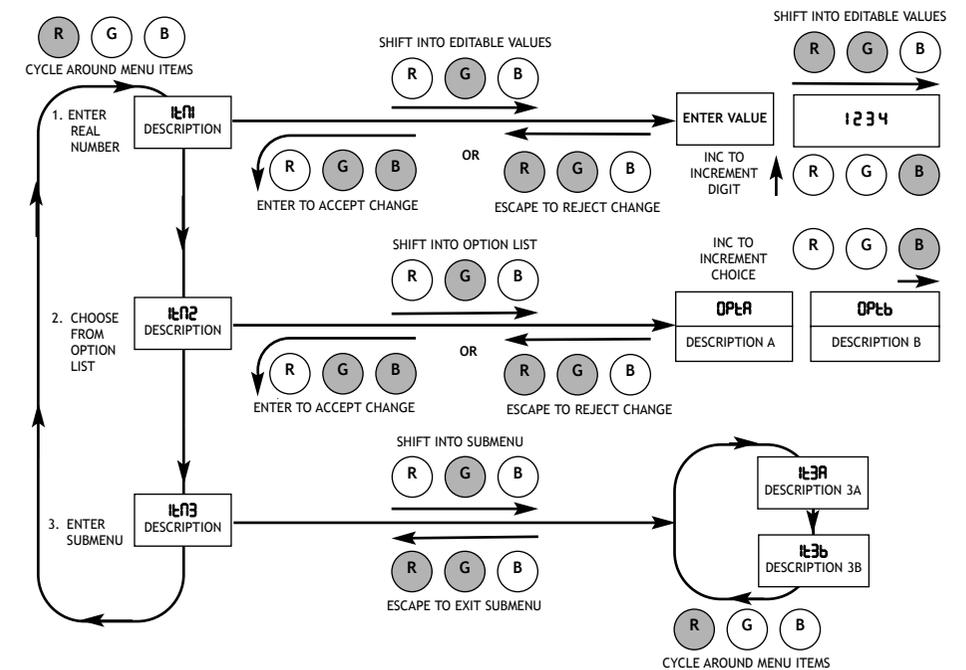
9.0 GENERAL MENU NAVIGATION

The diagram overleaf details how to move around the menu structure and enter data and shows:

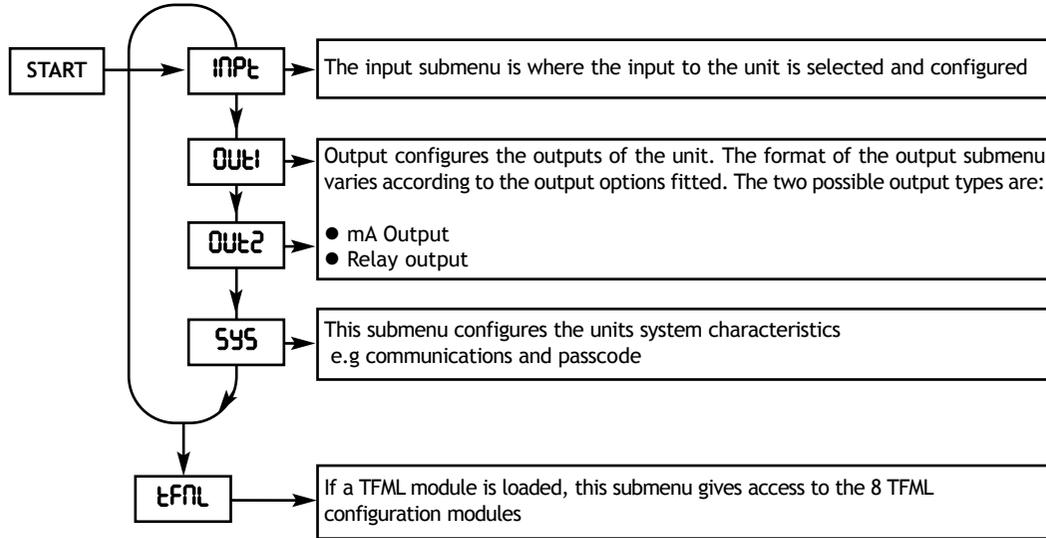
1. How to enter a real number
2. How to choose an option from a list
3. How to enter and navigate around a submenu

Using these three procedures the user can enter all applicable data to configure the unit to suit the application. The options displayed in the menu depend on whether the short menu or full menu option are enabled. (This can be selected in the SY5 submenu).

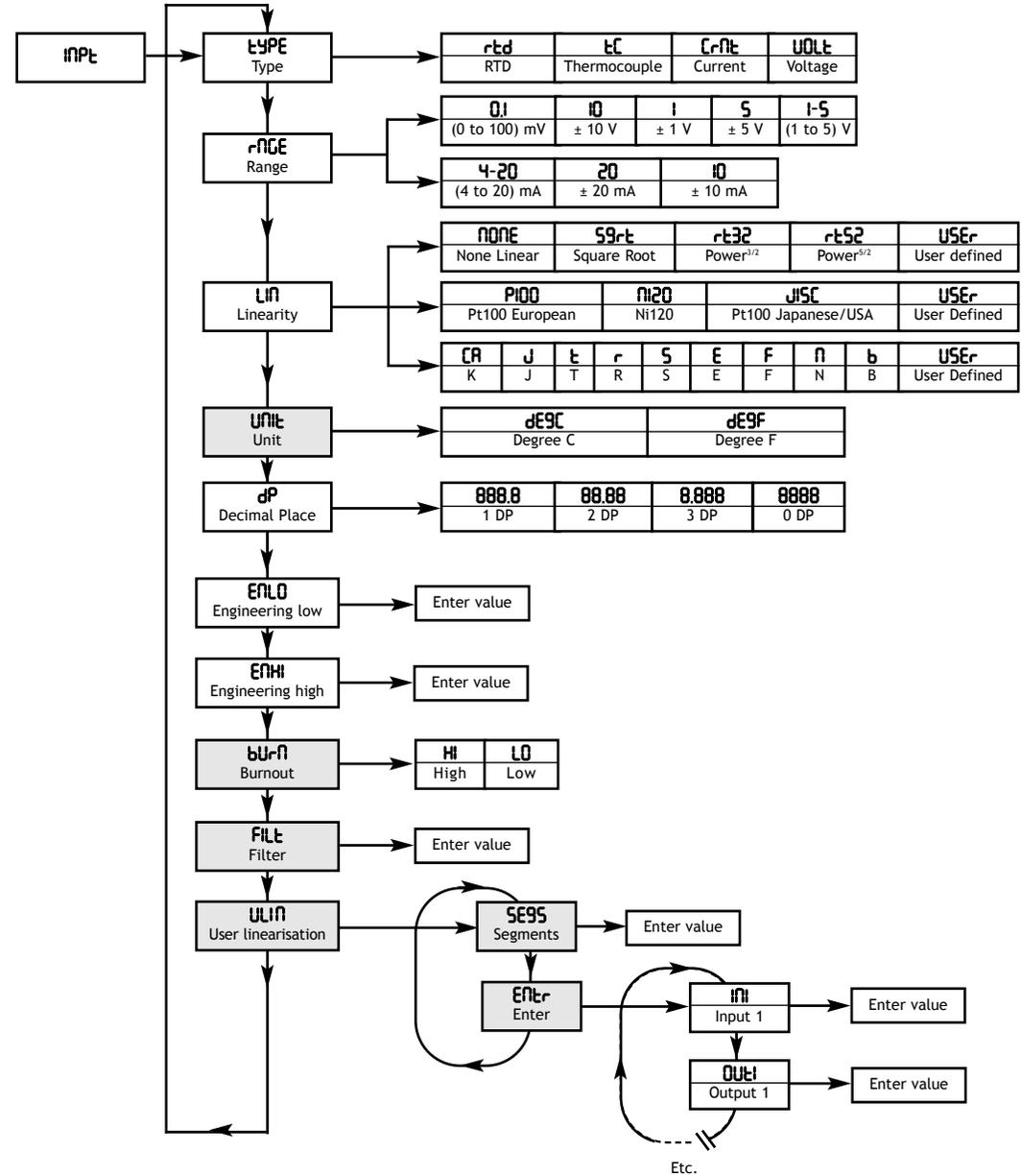
9.1 GENERAL MENU STRUCTURE



9.2 MENU MAP



10.0 UNIVERSAL INPUT MENU STRUCTURE 21XX AND 22XX ONLY



NOTE: that shaded menu entries are only available if FULL menu type is chosen.

10.1 UNIVERSAL INPUT MENU FUNCTION BLOCKS 21XX AND 22XX ONLY

TYPE

Select input type.

RANGE

Select input range. (Only displayed if voltage or current input type selected).

LINEARITY

Choose linearity type.

UNIT

Only available if TC/RTD input selected.

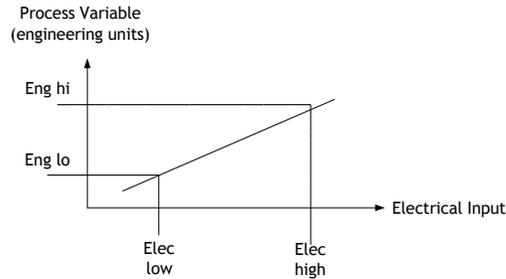
DECIMAL POINT

The number of decimal places shown on the display can be selected using this option.

ENGINEERING HIGH/LOW

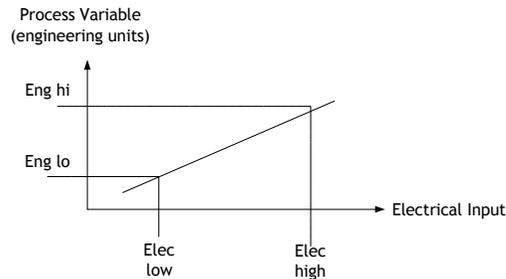
If current input type is selected, the electrical high/low input values are set as follows:

RANGE	ELECTRIC LO	ELECTRIC HI
(4 to 20) mA	4 mA	20 mA
± 20 mA	0 mA	20 mA
± 10 mA	0 mA	10 mA



If voltage input type is selected, the electrical high/low input values are set as follows:

RANGE	ELECTRICAL LOW	ELECTRICAL HIGH
± 0.1 V	0 V	0.1 V
± 10 V	0 V	10 V
± 1 V	0 V	1 V
± 5V	0 V	3 V
(1 to 5) V	1 V	5 V



BURNOUT

If TC/RTD input selected. Defines whether, in the event of a sensor burnout, the output current goes high (21.5 mA) or low (3.6 mA).

FILTER

There are 3 types of filter available:

1. Set value to 0.1 to turn filter off.
2. Set value to a filter factor of greater than 0.3 to apply a fixed filter with time constant (TC) equal to the value entered in seconds.
3. Set value to 0.0 to apply an adaptive filter where the TC adapts to the dynamic behaviour of the input signal.

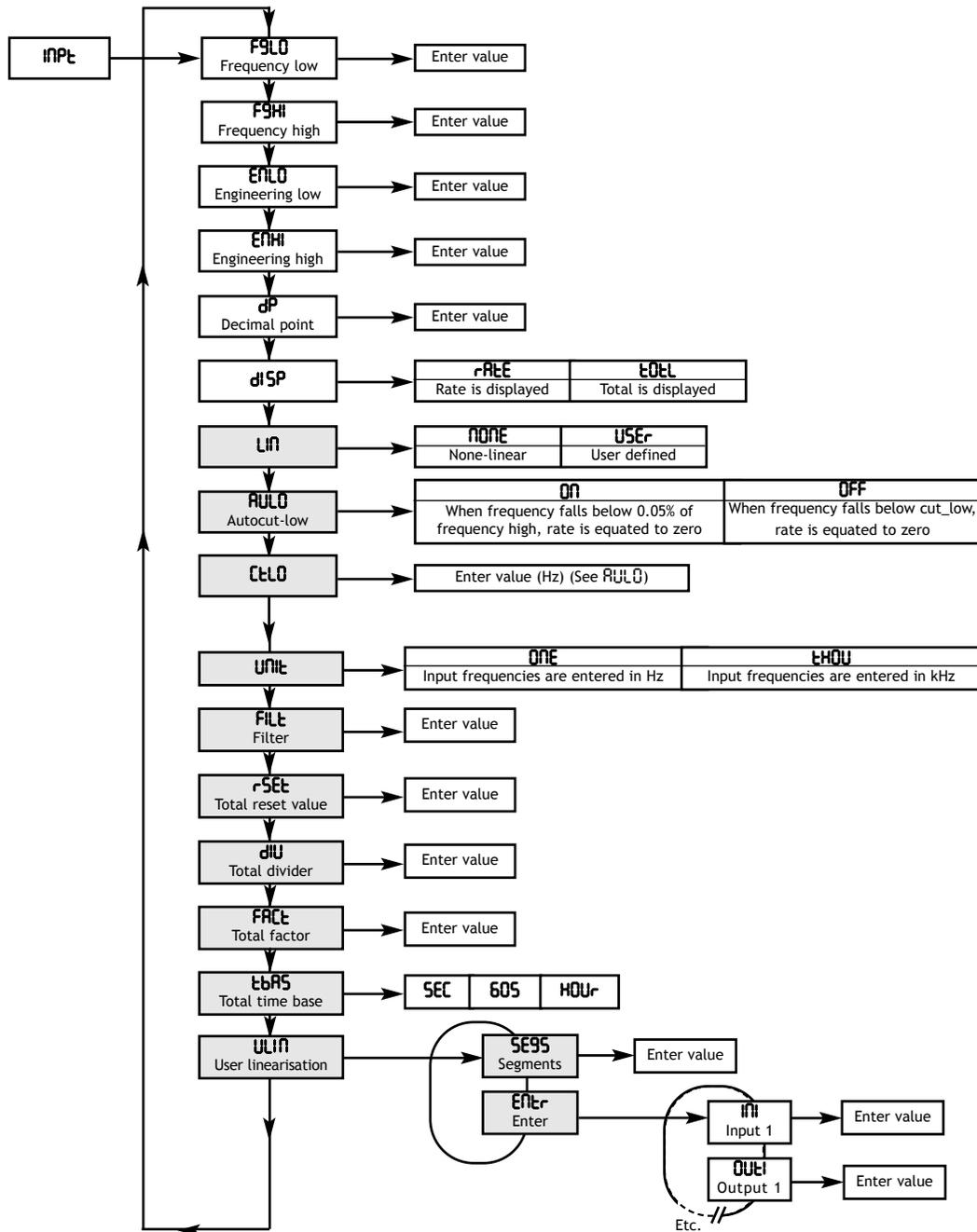
USER LINEARISATION

When user linearisation is selected, linear interpolation data can be entered.

Segments - This submenu gives the number of interpolated segments = between 1 and 59

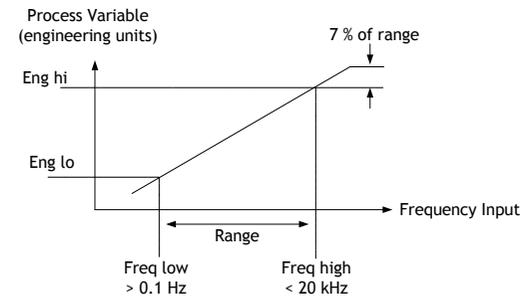
The submenu also contains prompts for the X (in) and Y (out) co-ordinates. The X values are the electrical input values. The Y values are corresponding engineering values.

10.2 FREQUENCY INPUT MENU STRUCTURE 23XX AND 24XX ONLY



NOTE: that shaded menu entries  are only available if FULL menu type is chosen.

10.3 FREQUENCY INPUT SUBMENU BLOCKS 23XX AND 24XX ONLY



FREQUENCY LOW / HIGH
In Hz.

ENGINEERING LOW / HIGH
In engineering units.

DECIMAL POINT
The number of decimal places shown on the display can be selected using this option.

DISPLAY VARIABLE
Rate or total is displayed.

LINEARISATION
The input type selected will determine the linearisation options available.

AUTOCUT LOW
When frequency falls below 0.05 % of frequency high rate is equated to zero. And when frequency falls below cut_low, rate is equated to zero.

CUT-LOW
Only displayed if AULO is turned off.

FREQUENCY UNIT

FILTER
There are 3 types of filter available:

1. Set value to 0.1 to turn filter off
2. Set value to filter factor 0.5 greater than 0.3 to apply filter with time constant (TC) equal to the value entered in seconds.
3. Set Lo 0.06 apply adaptive filter where the (TC) adapts to the dynamic behaviour of the input signal.

TOTAL RESET VALUE
When total is reset it will revert to this value.

TOTAL DIVIDER / TOTAL FACTOR / TOTAL TIME BASE

Factor, divider and tbase are used to scale the amount by which the total is incremented every second. While pulses are sensed, the total added every second is:

$$\frac{\text{rate.factor}}{\text{tbase.divider}} \quad \text{Where tbase} = (1, 60 \text{ or } 3600) \text{ s}$$

Note that even though this increment is indirectly based on rate, if no pulses are served, no increment occurs. Similarly, if pulses are very infrequent (e.g 1 pulse per day), they will be counted accordingly.

USER LINEARISATION

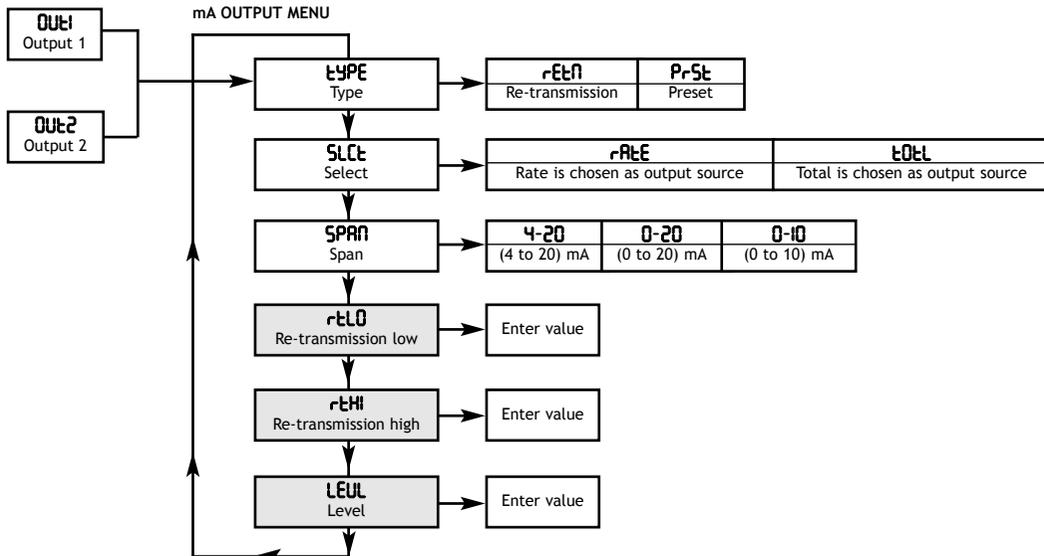
When user linearisation is selected, linear interpolation data can be entered.

Segments - This submenu gives the number of interpolated segments = between 1 and 59

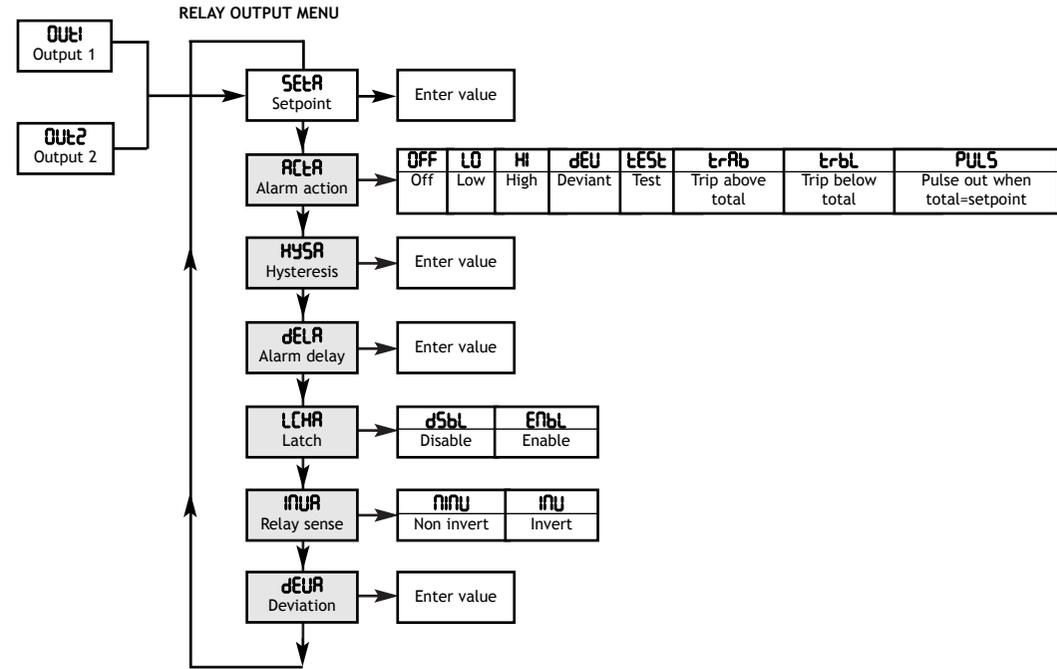
This submenu also contains prompts for the X (in) and Y (out) co-ordinates. The X values are the frequency input values. The Y values are corresponding engineering values.

11.0 OUTPUT MENU STRUCTURE

NOTE: Output 1 and Output 2 can be either mA or Relay outputs.



NOTE: that shaded menu entries are only available if FULL menu type is chosen.



NOTE: that shaded menu entries are only available if FULL menu type is chosen.

11.1 OUTPUT MENU FUNCTION BLOCKS

If PRSE is chosen, the output current can be edited in LEVEL. Otherwise, the re-transmitted current is derived linearly from the process variable, using rLLO and rLHI.

11.2 RTX OUTPUT MENU

TYPE

Re-transmission or preset.

SELECT

Rate or total can be chosen as output source.

SPAN

On dual channel units (MEDACS 22XX and 24XX) only (4 to 20) mA span is available.

RE-TRANSMISSION LOW/HIGH

Enter value in engineering units.

LEVEL

Enter value in

11.3 RELAY OUTPUT MENU

For a changeover relay, there is only one alarm (A). For a twin relay, there are two alarms (A & B), so the previous relay output menu will be duplicated for alarm B.

SETPOINT

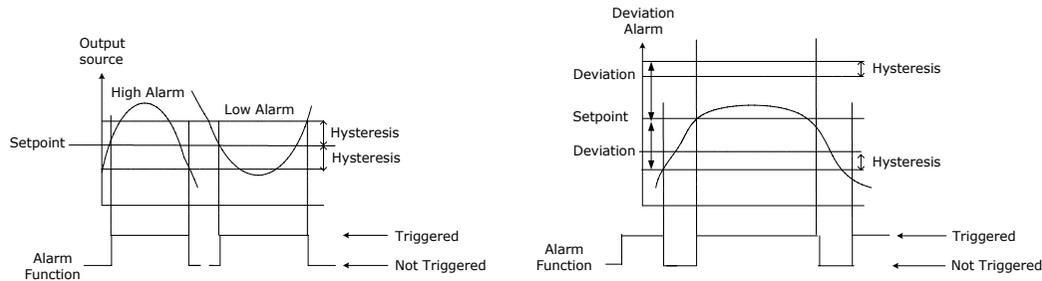
The setpoint value defines the engineering value associated with an alarm.

ALARM ACTION

ALARM ACTION	ALARM BEHAVIOUR
OFF (Off)	Always off
LO (Low)	Alarm triggers when PV < setpoint
HI (High)	Alarm triggers when PV > setpoint
dEU (Deviation)	Alarm triggers when PV moves out of deviation band
tESE (Test)	Alarm on

HYSTERESIS

The hysteresis value is the difference between the points at which the alarm triggers and releases, expressed in the relevant engineering unit.



ALARM DELAY

The alarm will not trigger until the PV has been in the alarm region for more than the selected number of seconds.

LATCH

When latch is enabled, any alarm will remain triggered until it is manually cleared.

RELAY SENSE

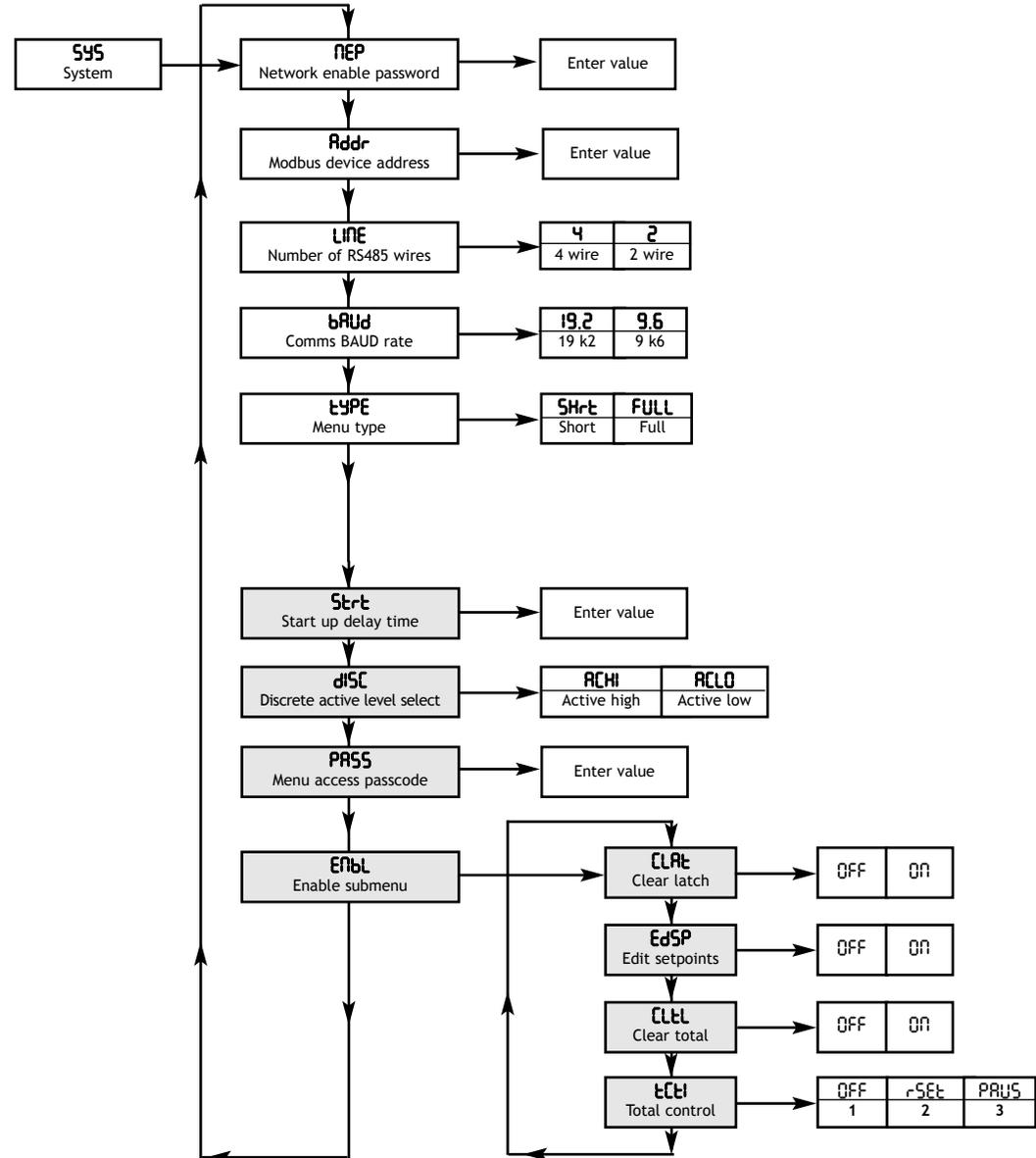
DEVIATION

If dEU action is chosen, this value determines the amount by which the PV may change before the alarm is triggered.

12. SYSTEM MENU

The system menu allows the communications to and from the device to be configured and also various functions to be enabled from the run mode. The passcode can also be changed from within this menu.

12.1 SYSTEM MENU STRUCTURE



NOTE: that shaded menu entries are only available if FULL menu type is chosen.

12.2 SYSTEM MENU FUNCTION BLOCKS

NETWORK ENABLE PASSWORD

Each MEDACS unit has a correct **NEP** (Network Enable Password) associated with it. When the correct **NEP** is set this menu item becomes inaccessible, and the user is able to set a non-zero device address.

DEVICE ADDRESS

When the correct **NEP** is set, the device address can be set to any value between 0 and 247, thus enabling multi-drop comms.

LINE

Defines 4 (full duplex) or 2 (half duplex) wire communications mode.

BAUD RATE

Defines comms baud rate, displayed in kbps.

TYPE

When **SHR** type is chosen, access to greyed out menu items is restricted. To allow access to these items, choose **FULL** menu type.

START UP DELAY TIME

MEDACS outputs will not be asserted until SDT (Start up Delay Time), measured in seconds has expired. MEDACS enforces the condition:
 $5 \leq SDT \leq 3600$

DISCRETE ACTIVE LEVEL SELECT

The function of the discrete input **DISC** is to mimic that of a CLEAR button press. This submenu item selects whether the clear function is executed when the discrete is high (24 V) **ACH** or low (0 V) **ACLO**.

MENU ACCESS PASSCODE

When accessing the menus from RUN mode, the user is prompted for his passcode. If it is zero (default), there is no prompt, and password function is disabled.

ENABLE SUBMENU

When set to **ON**, latched alarms can be cleared by pressing CLEAR or asserting discrete.

CLEAR LATCH

When set to **ON**, latched alarms can be cleared by pressing CLEAR or asserting discrete.

EDIT SETPOINTS

When set to **ON**, the EDIT SETPOINTS submenu can be accessed directly from RUN mode.

CLEAR TOTAL

When set to **ON**, the total is reset by clear button press.

TOTAL CONTROL

1. Total is unaffected by discrete 1
2. Total is reset when discrete 1 is asserted
3. Total is paused when discrete 1 is asserted

13.0 SERIAL COMMUNICATIONS

Each MEDACS unit has a RS485 serial communications port. The unit is supplied configured for single-drop communications for remote configuration by a PC using M-Config. The unit can be upgraded to multi-drop mode by the entry of a network enable password which is obtainable from your supplier.

The communications port can be configured for 4 or 2 wire operation. 4 wire mode supports full duplex communication as the receive/transmit signal lines use separate wires. 2 wire mode is more efficient to connect but the receive and transmit data share the same wires and therefore only half duplex communication is supported. In 2-wire mode, the RX +/- terminals are used.

A MEDACS slave device responds to a Modbus Master request in approximately 10ms. In 4 wire mode, this poses no problem but in 2 wire mode the Master output buffer needs to be disabled in time to prevent a data clash. This direction control problem can be overcome by using an intelligent RS232/485 converter, such as the MED2921, which automatically sets the data direction as well as converting the RS485 to RS232 for direct connection to a PC. Please contact your supplier for full details on all Modbus registers etc. or visit our web site www.status.co.uk

14.0 ENABLING MULTI-DROP COMMS.

All units can be programmed on a 1:1 basis from a PC running M-Config. To use in multi-drop mode you need the network enable password. In order to set the device address to anything other than device '0', contact your supplier with the unique ID of the device to obtain the code. The unlock code is then entered from the system menu, or for dual channel units, via M-Config.

ALSO AVAILABLE:

- Smart In Head Temperature Transmitters
- DIN Rail Mounted Temperature Transmitters
- Panel & Field Temperature Indicators
- Temperature Probes
- Trip Amplifiers
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