# AMR 100N RATE TOTALISER

**AlphaDynamic PUMPS**

*We Make The Difference*

**MODEL AMR100N**

*Instruction & Operation manual*

CONTENTS MANUAL

**Introduction**

**1.1 Description of elements**



Gasket    Processor

Facia    Bezel    Body



| Factory supplied batteries : |
|---|
| P/No. 1312007 |

3.6V x 2.4Ah AA
Lithium Thionyl Chloride
non - rechargeable cell

| Suitable batteries also available from : | |
|---|---|
| R S Components<br>Stock No. 596-602 | Farnell Components<br>Order code 206-532 |
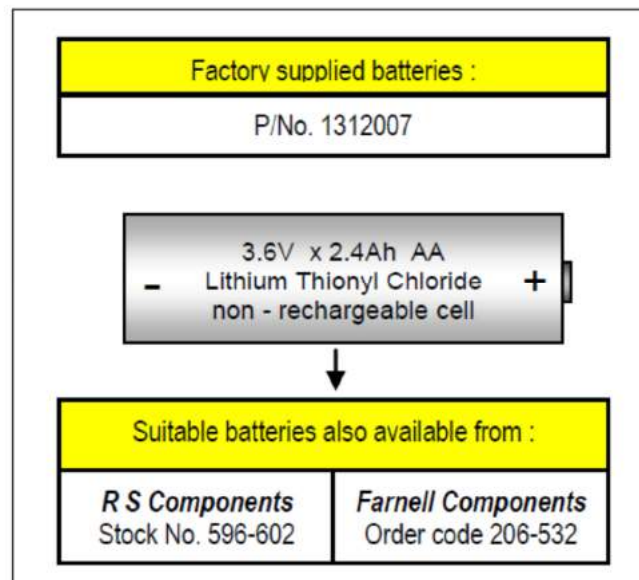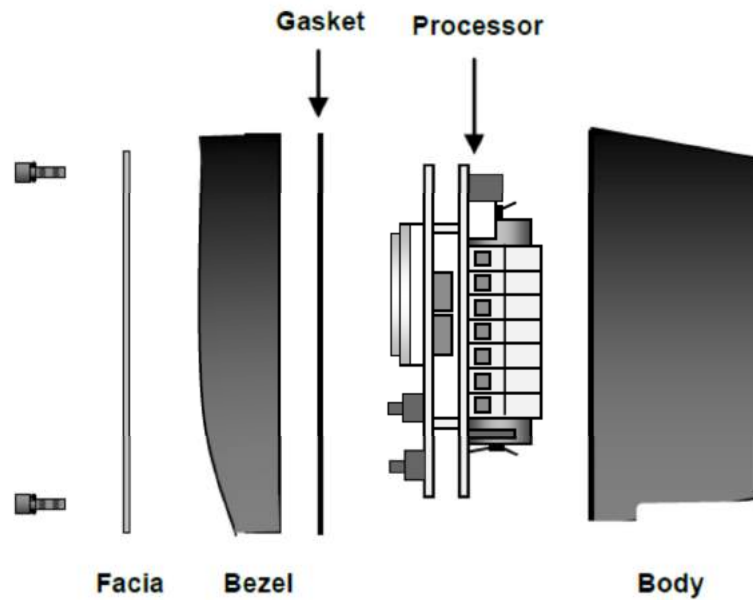
## 1.2 Specifiactions

Display : Large backlit 6 digit numeric display with LCD characters 17mm ( 0.67 ") high, second line of 8 digits x 7mm high totalising plus 5 digits of rate indication. Programmable 0~3 decimal places for all displays.

Signal Input : Universal pulse/frequency input compatible with Reed switch, Hall effect, Namur proximity detectors, voltage, current & Coil *(15mV P-P min).* Max. input frequency 5Khz under external power. Maximum input frequency when not externally powered is 150hz.

Minimum input frequency for rate display is 0.1hz with low frequency cut off feature enabled, totals have no minimum input frequency when low frequency cut off is set to zero.

Battery power : The unit draws about 70µA under battery, life expectancy is generally 3 years. Battery life reduces when rate is more often displayed & there is no external power connected. Rate display defaults to total display 4 minute after pressing the rate key in order to conserve battery power.

Battery condition is continuously monitored internally, the instrument runs on 3.6Vdc, the battery icon illuminates when the battery output falls below 3.1Vdc, at this point the instrument will continue to operate for a short period but the battery should be change as soon as possible, batteries are readily available from all major electronic component suppliers *(see page 4 for details).*

External power : Regulated 8~24Vdc x 50mA minimum. *(reverse polarity protected)*

Memory : All programmed & accumulated data is stored permanently in non-volatile memory.

Pulse output : NPN transistor, scalable, 20hz max. 100mA maximum drive capability.

Physical : A) IP66 aluminium alloy with 0.3% magnesium (6% is maximum for mine sites).
       B) 3 x M16 x 1.5 female conduit entries.
       C) 114mm (4.5") wide x 96mm (3.8") high x 62mm deep (2.5") x 480g (1lb).
       D) Temperature range from -20ºC to +80ºC ( -4ºF to +176ºF).

Configuring : PIN protected data entry.

K-factor range : *( scale factor )* Eg. pulses/litre, gallon, lb etc. Programmable range is 0.001~ 99,999.999 with a floating decimal point during K-factor entry.

Engineering units : Selectable Ltr, gal, m3, kgs, lbs *(total).* /sec, /min, /hr or /day *(rate).*

## 1.3  Overview

The instrument will display Flow Rate, Resettable Total and an Accumulated Total in engineering units as programmed by the user. Simple flow chart programming prompts you through the programming set up greatly reducing the need to refer to the instruction manual. All user program data is retained if the battery is removed.

*Environments*

The instrument is weatherproof to IP66/67 ( Nema 4X ) standards, constructed in ADC12 aluminum alloy with stainless screws & nitrile seal. The instrument suits harsh indoor and outdoor environments & conforms to EMC directive 89/336/EEC Electro Magnetic Compatibility.
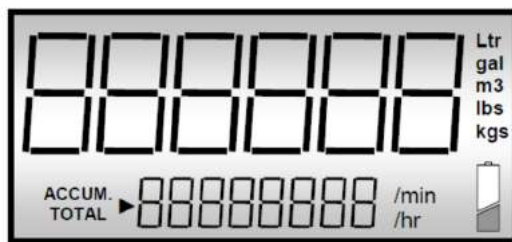
*Features*

PIN Protection, NPN scalable pulse output, Low frequency cut-off, display priority & large backlit digital display *(backlighting enabled under external DC power only)*.

*Installation*

Specifically engineered to be directly mounted on a variety of flow meters, wall or surface mounted, pipe or panel mounted. Various mounting kits are available. The instrument can be self powered or may be powered by an external dc supply or two wire loop powered.

## 1.4  LCD displays

Full LCD display test feature illuminates all display segments and script text displays for 5 seconds when entering the program mode.

**Resettable Total** This large 6 digit display can be programmed for up to 3 decimal places.

**Accumulative Total** The 8 digit display can be programmed for up to 3 decimal places. Reset is only possible when in the program mode which can be PIN protected for security.

**Rate display** Rate is displayed with a flashing time base of either SEC, /min, /hr or day followed by up to 5 digits of rate; these are programmable for up to 3 "floating" decimal places.

Time bases of units /SEC & units /day are displayed to the left of the digital display whilst units /min & /hr are to the right of the rate digits as shown.

**Backlighting** The LCD backlight feature will only work from an external dc power source in the range of 8~24Vdc.

## 2   Operation

### 2.1 Accumulative Total

Accumulative total can be reset in the program mode. The accumulative total is displayed by pressing the ACCUM TOTAL key.

### 2.2 Resettable Total

The resettable total display remains visible at all times & may be reset at any time by pressing the reset button for 2 seconds.

### 2.3 Rate display

The second line display toggles between Rate & Accumulative Total as the appropriate keys are pressed. The instrument will default out of the rate mode after 4 minutes when under battery power, this is to conserve the battery as the unit draws more current when it needs to calculate rate. Under external power the instrument will remain on Rate or Accumulative Total as they are selected.

When rate is displayed the leading three alpha characters on the left of the display "flash" the time base for rate **eg**. rate /SEC. rate /dAy. & rate /min. or rate /hr to the left of the rate digits. Decimal points float to provide good resolution & rangeability.



Ltr / SEC
( litres / second )

**SEC  14.30**

Ltr
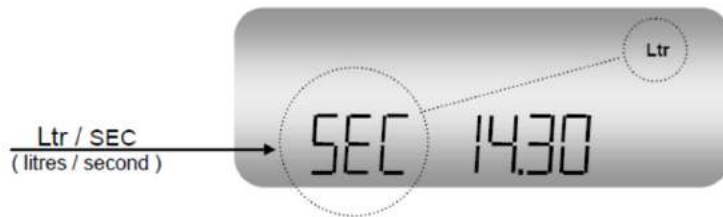
The minimum input frequency for rate display is 0.25hz reducing to 0.1hz If the low frequency cut-off is set to 0.1Hz *( see clause 4.7 ).* Rate may be displayed on the large digits on the top display *( see clause 4.8 ).*

### 2.4 Keypad function matrix

| KEY | FUNCTION IN OPERATING MODE | FUNCTION IN PROGRAM MODE |
|---|---|---|
| ACCUM TOTAL | Displays Accumulative Total when pressed. | No function |
| ▲ | No function | Increments the selected digit each time that it is pressed. |
| RESET | Resets the resettable total (hold for 2 sec.) | 1) Resets the accumulative total to zero. 2) Back steps the program during programming. |
| PROGRAM ENTER | 1) Pressing the Prog. & Reset keys for 5 seconds enters you into the program mode. 2) Displays model & software revision No. | Each press steps you through each level of the program. |
| RATE ▶ | Displays flow rate when pressed | Selects the digit to be set, the selected digit will be "flashing" indicating that it can be incremented. |

# 3 Installation

## 3.1 *Flowmeter connections-* unpowered sensors

**DIP switch functions :**

| Flow Input | | |
|---|---|---|
| | O N | 3 2 1 |

Switch 3 : ON engages 820Ω pull down resister
Switch 2 : ON engages 1 meg Ω pull up resister
Switch 1 : ON engages 0.01µf capacitor to suppress reed switch bounce

### 1. Reed switch

DIP switch 1 & 2 are <u>on</u>

| + | Flow sensor supply ( 12V ) |
|---|---|
| 3 | Flow input |
| 4 | Flow input ( coil only ) |
| 5 | − 0V ( ground ) |
| 6 | + 8~24Vdc ( supply in ) |
| 7 | Scaled pulse output ( NPN ) |

Ground screen at -0V (5)

### 2. Voltage Pulse

All DIP switches are <u>off</u>

1.1 ~ 30 Vdc

| + | Flow sensor supply ( 12V ) |
|---|---|
| 3 | Flow input |
| 4 | Flow input ( coil only ) |
| 5 | − 0V ( ground ) |
| 6 | + 8~24Vdc ( supply in ) |
| 7 | Scaled pulse output ( NPN ) |

Ground screen at -0V (5)
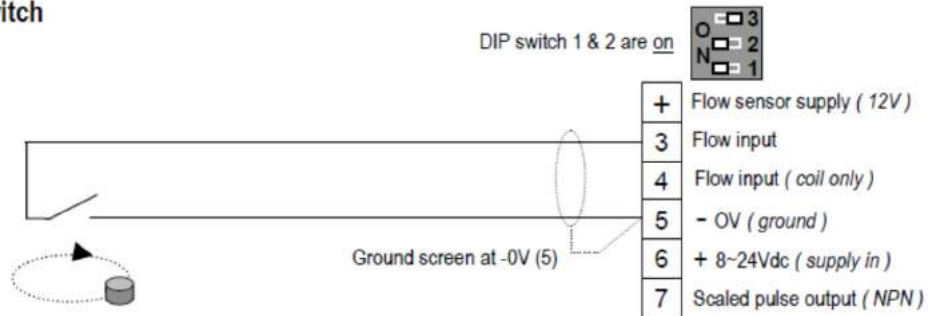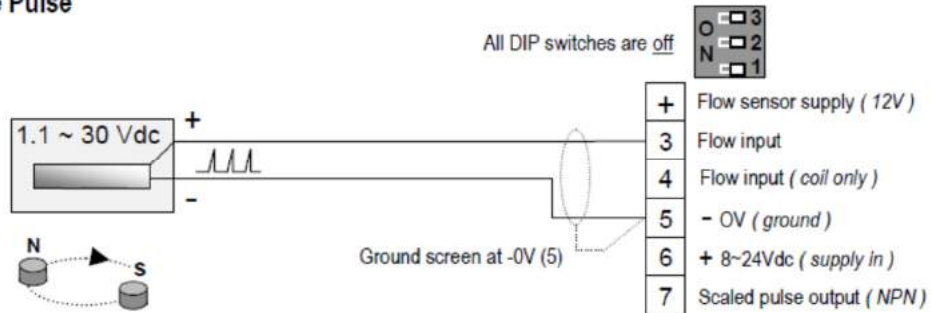
### 3. Coil   ( Turbine & paddle style flowmeters – minimum 15mV p-p )

All DIP switches off  (set switch 1 <u>on</u> if unit is effected by line noise).

use twisted pairs

| + | Flow sensor supply ( 12V ) |
|---|---|
| 3 | Flow input |
| 4 | Flow input ( coil only ) |
| 5 | − 0V ( ground ) |
| 6 | + 8~24Vdc ( supply in ) |
| 7 | Scaled pulse output ( NPN ) |

Ground screen at -0V (5)
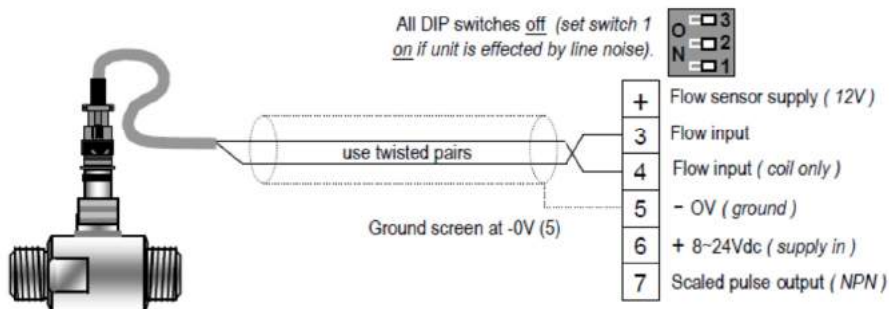
## 4. Hall effect  *( 12Vdc open collector )*

DIP switch 2 *(pull up)* is <u>on</u>

Ground screen at -0V (5)

| Hall effect | | |
|---|---|---|
| 12Vdc supply | | + Flow sensor supply ( 12V ) |
| + Signal out ⊓_⊓ | | 3 Flow input |
| - 0V ground | | 4 Flow input ( coil only ) |
| | | 5 − OV ( ground ) |
| Reg. Vdc | | 6 + 8~24Vdc ( supply in ) |
| | | 7 Scaled pulse output ( NPN ) |
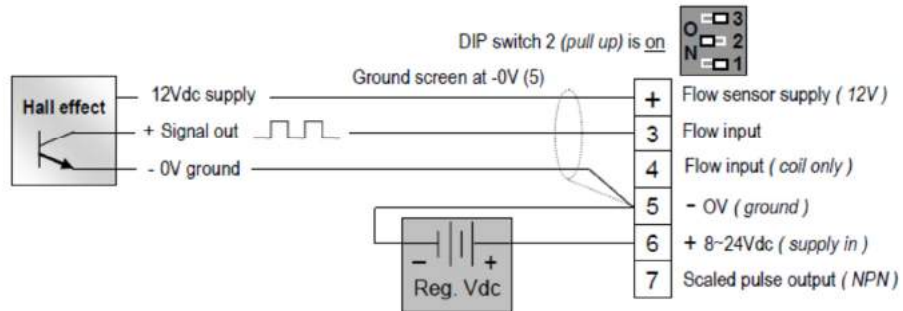
## 5. Namur  *( inductive proximity switch )*

DIP switch 3 *(pull down)* is <u>on</u>

Ground screen at -0V (5)

| NAMUR Inductive Proximity | | |
|---|---|---|
| + | | + Flow sensor supply ( 12V ) |
| − | | 3 Flow input |
| | | 4 Flow input ( coil only ) |
| | | 5 − OV ( ground ) |
| Reg. Vdc | | 6 + 8~24Vdc ( supply in ) |
| | | 7 Scaled pulse output ( NPN ) |

**NOTE :** Limit supply to 8.5Vdc for NAMUR proximities, regulate input voltage at terminals 5 & 6 until flow sensor supply voltage is 8.5V.
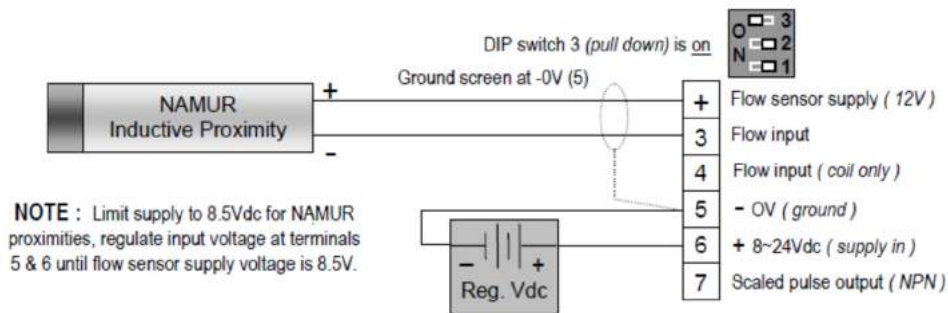
## 6. Current modulated pulse  *( 4mA & 20mA pulse amplitude )*

All DIP switches <u>off</u>

Ground screen at -0V (5)

| Coil with pre-amp current modulated | A + | |
|---|---|---|
| | B − | |
| | | + Flow sensor supply ( 12V ) |
| | | 3 Flow input |
| | | 4 Flow input ( coil only ) |
| | | 5 − OV ( ground ) |
| | | 6 + 8~24Vdc ( supply in ) |
| Reg. Vdc | | 7 Scaled pulse output ( NPN ) |

NOTE : position a 100Ω, ¼W Resistor across terminals 3 & 5
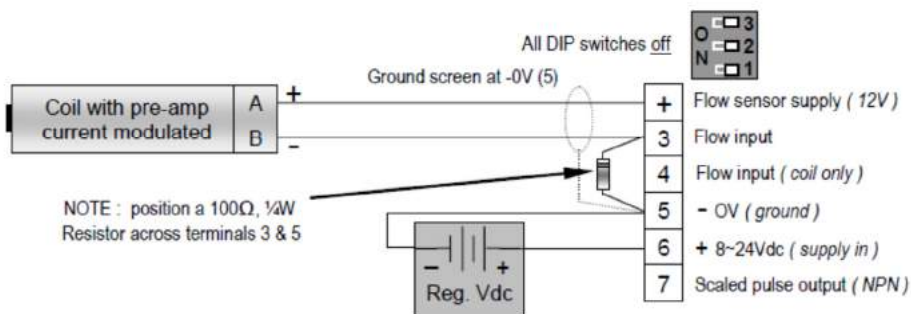
## 3.2 Wiring connections

**External DC powering** ( *required for powered flow sensors, display backlighting or pulse outputs* ).
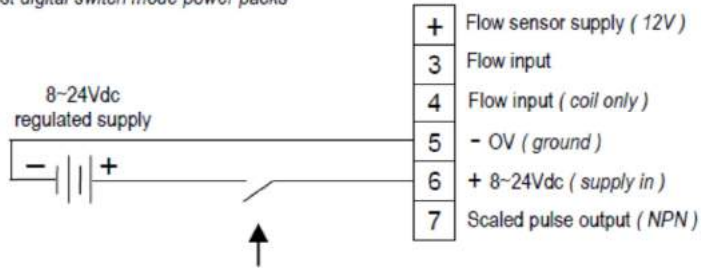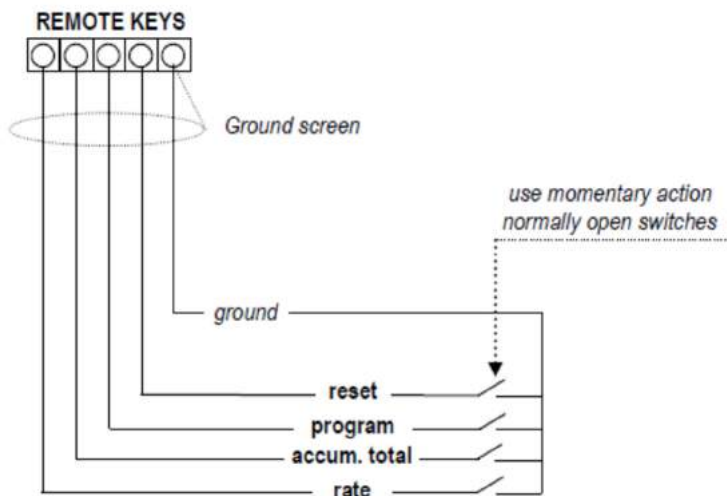
**CAUTION :**
*Avoid using low cost digital switch mode power packs*

| | |
|---|---|
| **+** | Flow sensor supply ( *12V* ) |
| **3** | Flow input |
| **4** | Flow input ( *coil only* ) |
| **5** | − OV ( *ground* ) |
| **6** | + 8~24Vdc ( *supply in* ) |
| **7** | Scaled pulse output ( *NPN* ) |

8~24Vdc
regulated supply

**Note :** Powering the instrument from an external DC source will cause the
backlighting feature to turn on, if this is not desirable at all times then install
a power isolation switch in series with the DC power source as shown.

**Remote switches**

The small 5 position terminal strip provides connections for any or all of the touch key functions, these require remote switches having a normally open momentary action. All remote switch wiring is to be screen & grounded.

**REMOTE KEYS**

Ground screen

*use momentary action
normally open switches*

ground

reset

program

accum. total

rate

**Wiring requirements** : Use multi-core screened twisted pair instrument cable ( 0.25 – 0.5mm2 ) for electrical connection between the instrument and any remote flow meter or receiving instrument. The screen needs to be earthed to the signal ground of the receiving instrument only to protect the transmitted signal from mutual inductive interference.

Instrument cabling should not be run in a common conduit or parallel with power and high inductive load carrying cables, power surges & power line frequencies may induce erroneous noise transients onto the signal. Run instrument cables in a separate conduit or with other instrument cables.

**Pulse Output** *(for this feature the instrument must be externally powered as per page 12 )*

The scaled pulse output is in the form of an NPN *(current sinking)* style pulse capable of switching up to 100mA. Current sinking derives its name from the fact that it "sinks current from a load". When activated the current flows from the load into the output at terminal 7.

The pulse width *(pulse duration)* of the output pulse is 30 milliseconds, this will support up to 20hz output frequency so be sure that the preferred output scaling does not exceed this limit, for example if the output pulse is set to 1 pulse/litre then at 400L/min the output frequency would be 6.66hz, this would be well inside the maximum of 20hz.
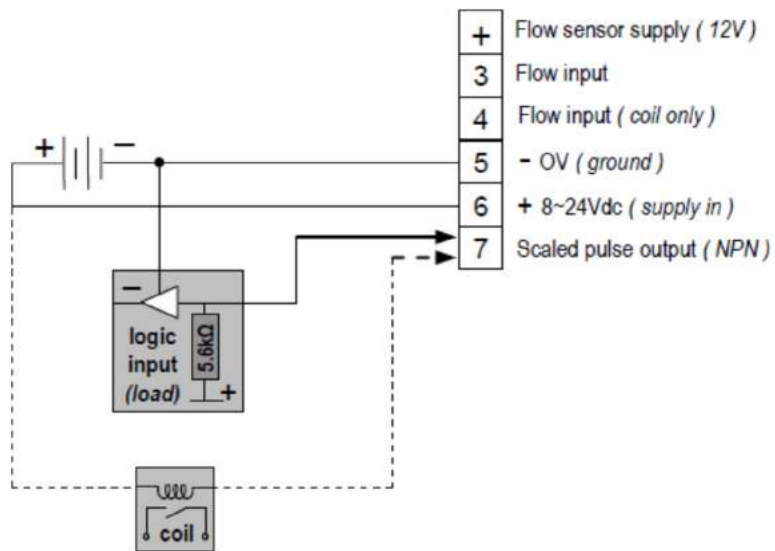


*Driving a logic input* The output voltage pulse is typically the internal voltage of the load. The load would normally have an internal pull up resistor on its input as shown.

*Driving a coil - - - - - - -* The coil load is obtained by dividing the coil voltage by coil impedance ( Ω ), is expressed in amps & is not to exceed 0.1A. The coil voltage is connected across & must match the instrument supply voltage & the pulse output.

## 4　Program Parameters

 **Note:** *The instrument defaults out of the program mode if no programming entries are made after 4 minutes.*

### 4.1 PIN No. Program Protection

Any user defined PIN number other than 0000 will engage the program protection feature, failure to input the correct PIN number will deny the ability to change any of the program parameters but will allow the user to step through and view the existing program parameters.

Only one PIN number may be set but this can be changed at any time after gaining access through PIN entry. A second back up PIN number is installed at the factory should the programmed PIN be lost or forgotten. *( refer bottom of page 16 for the back up PIN No. )*

### 4.2 Resetting Accumulated Total

Resetting the accumulated total can only be done in the program mode.

### 4.3 Engineering Units

Select from available Engineering units to right of the display *(refer clause 1.4)*, for other engineering units set display to show no engineering units & program a suitable K-factor.

### 4.4 K-factor (scale factor)

Enter K-factor at S-Fact, up to 5 whole numbers & 3 decimal numbers can be entered using the arrowed keys.

### 4.5 Rate response

Adjustable response *(rate dampening)* is available to smooth out fluctuating flow input signals in order to provide a stable rate display. The response number (ranged 001~999) represents the number of pulse intervals (duration between each pulse) that the processor averages and displays the rate as calculated.

As a general rule it would be best to apply a response number which is a multiple of the number of pulses a meter produces for each cycle of its primary measuring element, for example a rotating element may produce 4 pulses per revolution so 004, 008, 012 or 016 would be ideal response settings whereas a turbine meters with high resolution pulse outputs would require response settings like 050, 100, 200 or in some cases involving high frequency pulse outputs eg. 500hz, the response number would be set to say 999.

### 4.6.1 Low frequency cut-off

The low frequency cut-off is most commonly set to 0.0Hz *(disabled)* other than to:

1) To display rate for input frequencies below 0.25hz, for example setting the cut-off at 0.1Hz the rate will continue to display for input frequencies as low as 0.1Hz *(one pulse every 10 seconds)*, such conditions often apply to flowmeters with low frequency pulse outputs.

2) Inhibit the integration & registration of "apparent flow" which at times may be encountered on mobile installations where the movement of the vehicle or dead heading a pulsating pump may cause spurious flow signals which are not attributed to actual flow.

3) Inhibit the integration & registration of flow at input frequencies below what is considered the minimum accurate flow rate of the primary flow element *(flowmeter)*.

**Caution:** If the low frequency cut-off is set to any value other than 0.0Hz then the integration
of rate and total will cease at frequencies on or below the set frequency value.

### 4.6.2 Scalable pulse output

Pulse scaling ( terminal 15 ) is set as the number of litres / gallons etc. per output pulse *Eg.* 0.1 litres/pulse, 10 litres/pulse, 100 gallons/pulse. Range is 0.1~9999.9 Eng.unit/pulse.

### 4.7 Display priority

The large digits at the top of the display can be programmed to show either flow rate or resettable total. When flow rate is selected at the top display the rate key can be used to cycle between rate, reset total & accumulate total, in this mode the instrument will default from rate to reset & accumulative totals after 1 minute, external power must be applied if required to display rate at top display continuously.

# 5. Programming

*5.1*



**HoLd**
5  4  3  2  1

hold Program then Reset keys
for 5 secs to enter program mode

press Program key to
show software issue

RATE

PROGRAM ENTER

ACCUM TOTAL

**ProG**
*AccESSED*

if PIN protected

RESET

press Prog. key
to step through
program levels

PROG

* * * *
*Pin no.*

press and hold for
2 sec. to cause reset

* * * *
*nu Pin*

if incorrect
PIN No. is entered

**rESEt**
*ACCUM TOTAL ▶ XXXXXXXX*

**Error**
*rEAdonLY*

**Ltr gal m3 lbs kgs** *(none)*
*Eng Unit*

Read only

**S - FACt**
**00000.001 ~ 99999.999**

**S-factor** *(K- factor)* is the number of pulses / unit volume
or unit mass *eg:* 20.465 pulses / litre, gallon, kg etc.

Set decimals

0   0.0   0.00   0.000
*dEC t0t (total)*

0   0.0   0.00   0.000
*dEC ACC (accum. tot)*

RESET  press RESET to step backward
through program levels at any time

0   0.0   0.00   0.000
*dEC rAtE*

**rAtE**
*PEr SEC, /min, /hr, dAy.*

**001 ~ 999**
*rESP0nSE*

**Response to change in rate** *(see rate response 4.6)*

**0.0 ~ 50**
*CUt OFF*

**Low frequency cut-off** is generally set to 0.0Hz *(disabled)* for most
applications other than those described at clause 4.7.1.

**PuLSE**
*Out 0001.0*

**The scalable pulse output** is set as the number of litres,
gallons etc per output pulse, see clause 4.7.2.

**T0tAL    rAtE**
*tOP diSP (display)*

**Assign resettable total or rate** to the large LCD
**top display** *(see display priority 4.8)*

**End**

## 5.2 Program detail record

*Pencil your program details here*

| | | | | |
|---|---|---|---|---|
| User selected PIN No. | | | | |
| Engineering units | | | | |
| K-factor *(scale factor)* | K = | | | |
| Decimal for reset Total | ☐ 0 | ☐ 0.0 | ☐ 0.00 | ☐ 0.000 |
| Decimal for Accum. total | ☐ 0 | ☐ 0.0 | ☐ 0.00 | ☐ 0.000 |
| Decimal for Rate | ☐ 0 | ☐ 0.0 | ☐ 0.00 | ☐ 0.000 |
| Time base for Rate | Units / ☐ Sec | ☐ Min | ☐ Hr | ☐ Day |
| Rate response | | | | |
| Low frequency cut-off | Hertz = | | | |
| Scaled pulse output | 1 pulse = | | | |
| Top display set as | ☐ Resettable total | | | ☐ Rate |

# Notes