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Operating Instructions

MultiRanger DS Series

Panel Mounted Tachometers
Ratemeters / Counters / Timers

Document No: 15103 Iss 1.0

Contents

MultiRanger Tachometers

DS48 Specifications

Speed Modes

Speed range	0.001 to 99,999 rpm (12Khz max using input divider)
Accuracy	0.01%
Resolution	±1 digit (0.001 RPM below 100 RPM)
Display update time	0.8 secs or time between input pulses whichever is longer 0.1 secs if output module fitted
Cycle time	0.01 sec to 99,999 secs
Count mode	5 digits with overflow to 8 digits (Auto-ranging)
Accumulated time	0.01 - 99,999 secs
Scaling factor	x or ÷ by 0.001 to 99,999 (Operates on all functions)
Power supply options	1.) Mains 110 - 240V AC + 10% - 15% (ext fuse ceramic 250mA A/S) 2.) DC Version 10 to 36v DC 3.) 24v AC
Sensor supply	12v DC @50ma and 5v DC @ 100ma
Enclosure	DIN 48 x 96 x 115mm (123mm including connectors) Panel cut out 42.5 x 91 .5mm

Factory adjustable parameters (To Order)

Internal scaling factor	x or ÷ by 0.001 to 99,999
Update time	0.1 secs to 60 secs
Under range speed	3 RPM to 0.1 RPM

Output module Specification

0-10v output

Update time	0.1 secs or time between input pulses
Output range	0 - 9.99 Volts
Accuracy	±0.15% of span
Full scale error	±0.15% of span
Resolution	2.5 mv
Zero offset (max)	25 mV
Temperature Coefficient	±30 ppm / °C

0-20ma output

Update time	0.1 secs or time between input pulses
Output range	0 - 20ma
Accuracy	±0.3% of span
Resolution	10 microamps
Zero offset (max)	100 microamps
Max load	500 Ohms
Temperature Coefficient	±100 ppm / °C

4-20ma output

Update time	0.1 secs or time between input pulses
Output range	0 - 20ma
Accuracy	±0.3% of span
Resolution	10 microamps
zero offset (Max)	100 microamps
Max load	500 Ohms

Ranges selectable on analogue output

0-999	0-9.99v	0-20ma	4-20ma	
0-9990	0-9.99v	0-20ma	4-20ma	
0-99900	**0-9.99v**	**0-20ma**	**4-20ma***	***ex-works setting**
0-xxxxx	0-9.99v	0-20ma	4-20ma	customer programmable

Serial Output RS232

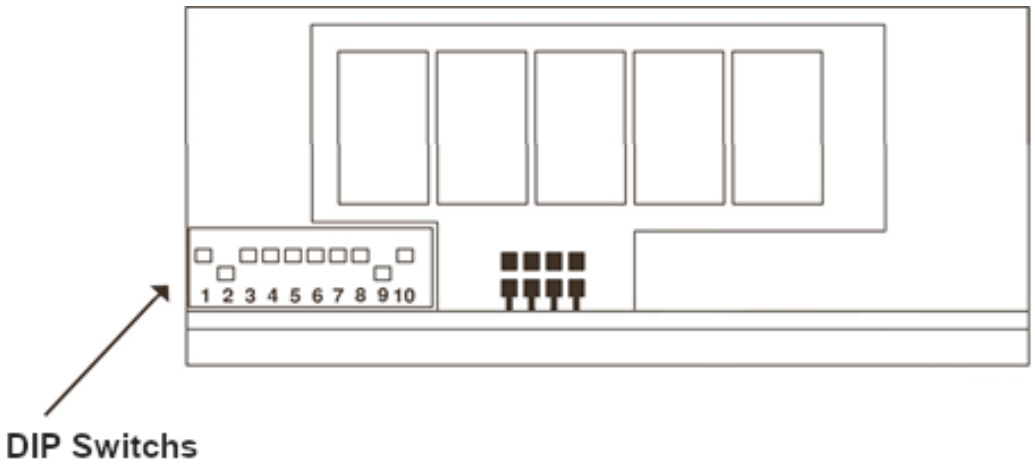
Update time	0.1 secs or time between input pulsesl
Baud Rate	9600
Data Bits	8
Stop bits	1
Parity	None
Output format	Displayed value in ASCII characters MSD first include decimal point
End of line character	Carriage return (13 decimal, 0D hexadecimal)
Connection	RJ11 connectorl

Analogue input modulel

Full Scale input	9.99v
Accuracy	±0.15% of span
Full scale error	±0.15% of span
Nonlinearity	±0.15% of span
Temperature Coefficient	± 100ppm

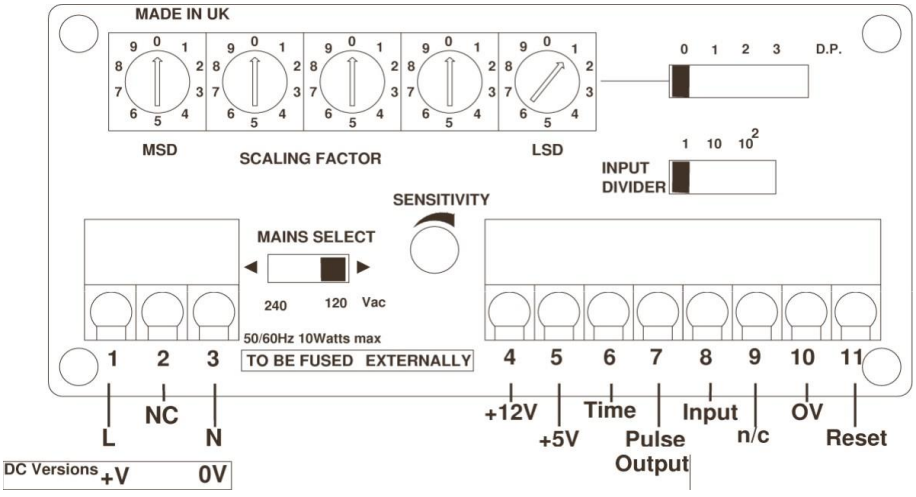
Measuring range and Function select controls

To access these remove the front bezel and display filter



Scaling Factor input divider and voltage selection facilities

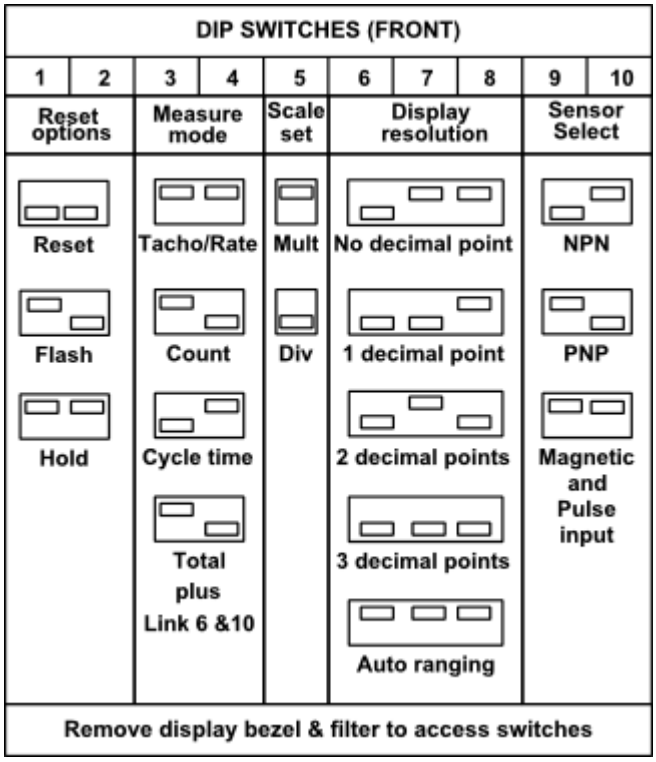
These are located on the rear panel of the instrument



Note: voltage selector switch not fitted on DC versions

Set up procedures

Function select DIP switches (See diagram on previous page for the location of these switches)



Sensors and Signal inputs

NPN/PNP Proximity sensors

Connect the sensor +ve wire to +12v (Terminal 4), 0v wire to 0v (Terminal 10), sensor output to input (Terminal 8), Configure the unit to the appropriate sensor type using the front panel DIP switches 9 & 10 as shown above.

Magnetic sensors

Connect the sensor between 0v (Terminal 10) and input (Terminal 8), configure the unit to magnetic input using the front panel DIP switches 9 & 10 as shown above.

Namur 2-wire sensors

Connect the sensor 0v wire to 0v (Terminal 10) and the signal wire to proximity input (Terminal 8), configure the unit to NPN input using the front panel DIP switches 9 & 10 as shown above.

Pulse inputs (2−30v DC)

Connect the +ve to input (Terminal 8) and 0v to 0v (Terminal 10), configure the unit to magnetic input using the front panel DIP switches 9 & 10 as shown above.

Encoders

Connect the +ve supply to 5v (Terminal 5) or 12v (Terminal 4) as required, output signal to input (Terminal 8) and 0v to 0v (Terminal 10), configure the unit to magnetic input using the front panel DIP switches 9 & 10 as shown above.

AC signal sources (2−30v Peak)

Connect and configure as for magnetic sensors

Sensitivity Control

This sets the level above which the input needs to reach in order for the signal to be recognised, the noise rejection of the instrument also increases as this level is increased.

Measurement mode selection

RPM

Set the front panel DIP switches 3 & 4 to Tacho/rate, the unit will then display the speed of the input pulses in RPM.

Count

Set the front panel DIP switches 3 & 4 to count and set the display resolution to auto-ranging (See display resolution below), the unit will now display a running total of the input pulses received since the power was applied or since the last reset, when the count value exceeds 99,999 counts, the unit will auto-range and count in 10's. The decimal point will move to indicate the position of the thousands i.e. it can be read as the comma that separates thousands from the hundreds e.g. 264.12 = a count of 264,120), if the count again exceeds 999.99 it will again auto-range and count in 100's. The maximum count is 99,999,999.

Accumulated time / Count duration

If during a count session "time" (Rear Terminal 6) is connected to 0v (Terminal 10) the unit will display the time elapsed since the count began, on removing this connection the count will again be displayed.

Cycle Time/ Time interval

Set the front DIP switches 3 & 4 to cycle time and the display resolution to auto-ranging, the unit will now display the time between successive input pulses to a maximum resolution of 0.01 seconds, if the time exceeds 99.990 seconds the unit will auto-range and continue to display the time up to 999.99 seconds, it will again auto-range and display time up to 9999.9 seconds but to a resolution of 0.1 seconds, at times greater than 9,999.9 seconds the unit will again auto-range enabling a maximum count value of 99,999 seconds to a resolution of 1 second, when used in conjunction with the scaling factor this mode can be used to display long process times but with a fast update (See **Process Time** page 6)

Display resolution (rpm modes only)

The resolution of the display can be set to either a fixed resolution of 0, 1 ,2 or 3 decimal places or to be fully auto-ranging in which case the maximum number of decimal places possible at the current speed will be displayed, to select auto range mode set DIP switch 6 to on, in this case switches 7 & 8 will have no effect, to select a fixed number of decimal places set DIP switch 6 to off and select the number of decimal places required as per the above diagram. N**ote**: when in fixed resolution mode, if a resolution is chosen that is too great to fit the whole value in the 5-digit display, the higher digits will be lost but the overall measurement resolution is not changed so the least significant digits will not be displayed to the full accuracy of the unit.

Reset Options

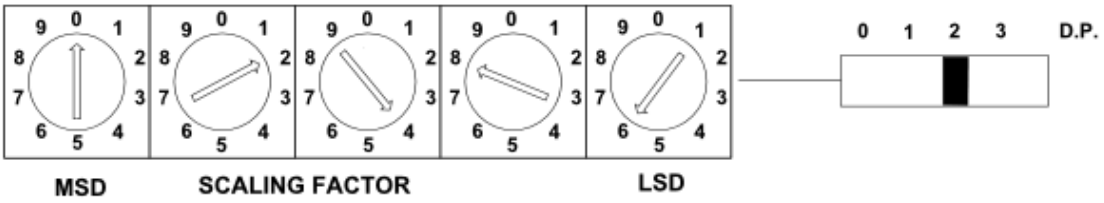
These two DIP switches determine the operation of the unit in under-range and over- range conditions, the alternatives are:-

1. **Reset to zero if no pulses have been received for 20 seconds** (i.e. if the input speed is less than 3 rpm) DIP switch 1 should be set to on, if this is set, then it overrides the action of DIP switch 2.
2. **Continue to measure below 3 RPM**. DIP switches 1 & 2 off, in this case the unit will continue to measure speeds down to 0.001 rpm. **Note:** in this mode if the apparatus being measured stops, then the unit will never go to zero but will continue to display the last reading.
3. **Flash Display on under-range conditions**. DIP switch 2 on, in this case the display will flash when an input pulse has not been received for 20 seconds, the display holds the last reading until another pulse is received, it will also flash the display if the displayed value is greater than 99,999 or if displaying a fixed number of decimal places the value is large than can be displayed with those number of decimal places.

Scaling Factor

This function can be applied to all measurement modes and is set using the 5 rotary BCD switches labelled scaling factor on the rear panel and the upper rear slide switch, the scaling factor can be either a multiplication factor or a division factor.

To set the Scaling factor first determine whether the value should be divided or multiplied by the factor and set the Front DIP switch 5 accordingly, enter the scaling factor including any decimal places required into the 5 scaling factor switches, if the factor contains decimal places then set the rear upper slide switch to the number of decimal places required, e.g. for a scaling factor of 24.86 set the switches as shown.



The scaling factor resolution and the display resolution are completely independent of each other however the measurement resolution cannot be increased by the scaling factor e.g. it the unit is in count mode and the scaling factor is set to multiply by 43 the for each count input the display will increment in steps of 43. The scaling function is purely a mathematical calculation on the measured value and hence has no adverse effect on update time etc.

Input pulse divide

This is the lower slide switch on the rear panel. It enables the input pulse rate to be divided by 1, 10, 100, This can be used to measure pulse rates higher than the normal maximum input rate of 99,999rpm up to a maximum of 12Khz (5v square wave 1:1 mark space ratio). It can also be used at slower speeds to average or smooth erratic readings, if the divided input period is greater than 0.8 seconds then the update time will become the input period thus, enabling the update and hence the averaging effect to be increased.

Note: when the reset options (See above) are enabled these refer to the pulse rate after the input divider.

Pulse Output

A 5v TTL compatible output is available on Terminal 7, this output is at the same rate as the incoming pulse rate no scaling is applied to it, it can be used to drive addition instruments that require a 5v pulse input, the maximum loading on this signal is 1KΩ pull up to 5v or 100kΩ pulldown to 0v.

Reset

A reset capability is available via Terminal 11 on the rear panel, the unit can be reset momentarily connecting this terminal to 0v (Terminal 10), when the reset is connected to 0v the unit will stop and the display will continue to display the last reading, When 0v is removed from the reset, the unit is only then reset internally with the measurement starting again from zero.

Process time

Long process times such as those of baking ovens can be measured and controlled with a fast update time by using the time interval mode in conjunction with the scaling factor, this can be achieved by monitoring the speed of the conveyors drive motor, these pulses can be reduced in frequency by using the input divider until the measured value is of sufficient resolution, The displayed value can then be scaled so that the display indicates the actual process time, using this method it is possible to measure process times of long durations (Several minutes or even hours) and yet have an update of only a few seconds.

Output Modules

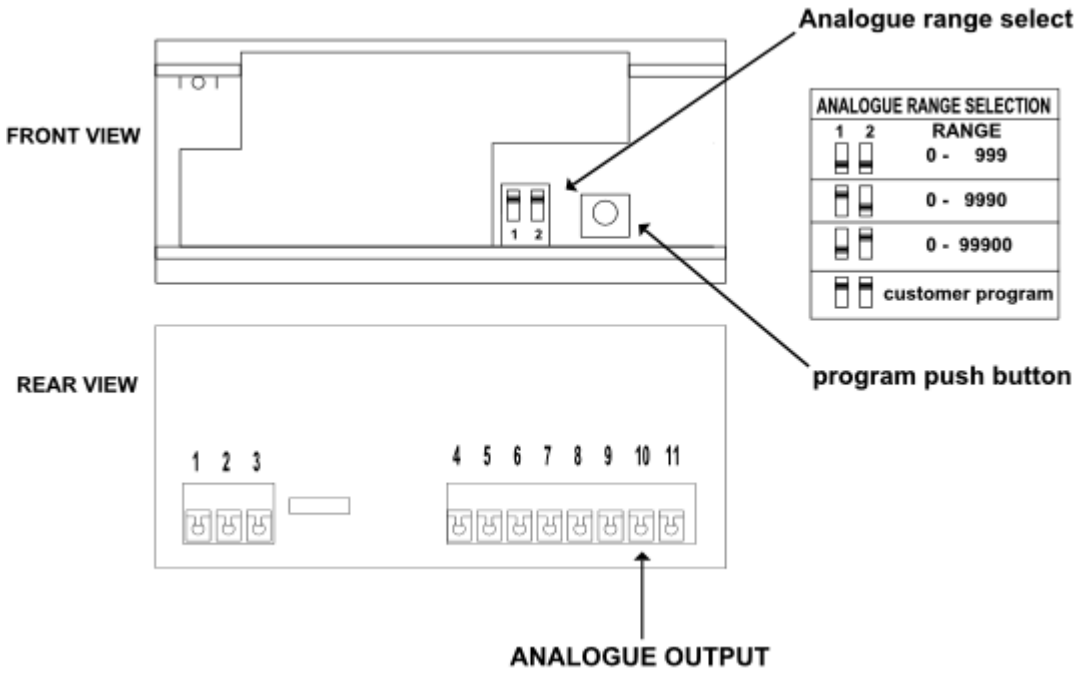
Analogue

These are optional factory fitted modules that enable the measured value to be output in various preselected formats for further processing, recording or to be used for control purposes. The voltage and current outputs are available on rear Terminal 9, the current / voltage outputs have three fixed ranges and one customer programmable mode, in the fixed ranges the maximum output voltage / current corresponds to 999 in either the left hand three digits of the display, the middle three digits or the right hand three digits. In each case the other digits in the display have no effect on the output, the output is updated at the same rate as the display and between updates the output remains constant.

If one of these is fitted, then the Display update time is set at 0.1 seconds.

Serial
The RS232 output is via Terminal 10 (Terminal 6 if other Analog output modules are fitted), this output continually transmits as ASCII characters value in the display. Only one of the voltage / current types may be fitted at once, the RS232 out may be fitted in conjunction with one of these or on its own.

Set up of analogue output module



Preset Ranges
Select the speed range to be measured (0-999, 0-9990, 0-99,900) using the analogue range selection switches found behind the front panel as shown in the above diagram.

Range	DAI	DA2	DA3
0-999	0-9.99v	0-20ma	4-20ma
0-9990	0-9.99v	0-20ma	4-20ma
0-99900	0-9.99v	0-20ma	4-20ma**ex-works setting

Customer program mode
Apply power to the instrument, select customer program on the analogue range selection DIP switches, enter the maximum speed that the full scale analogue output will correspond to, via the 5 rotary BCD switches on the back panel any decimal place required can be set using thel upper slide switch (See **scaling factor** page 5).

Press the program push button once, the selected value will be shown in the display. Press the program button again. The unit is now programmed, set the rear BCD switches to the scaling factor required (If no scaling is required set to 00001)

Note: the accumulated time mode is not available on units fitted with an analogue and RS232 output.

Speed trip module

This versatile Set point alarm is available with one or two independently presettable levels, which may be configured to trip on either under or over speed, the relays may be set to either energised or de-energised in either case, an inhibit timer for start up on under speed applications is incorporatedl as is a motion stopped detector, as well as speed measurements the unit will also work with all other measurement modes of the tachometer. i.e. count, cycle time and accumulated time.

Specification

Output Relay(s)	Single pole changeover 2A non-inductive @240v AC or 30v DC.
Reponse Time	Immediate when the displayed value changes to a value greater than the set value.
Trip Resolution	Equal to resolution of displayed value.
Trip Modes	Output relays may be individually set to energise when the input speed is under or over the set speed.
Start-up Inhibit Delay	Adjustable 1-9 Secs or customer defined via external contact closure.
Under Speed Time Out	Detects motion stopped within 3 seconds if activated.
Number of Channels	Single or Dual.
Enclosure	96 x 96 x 136 mm.

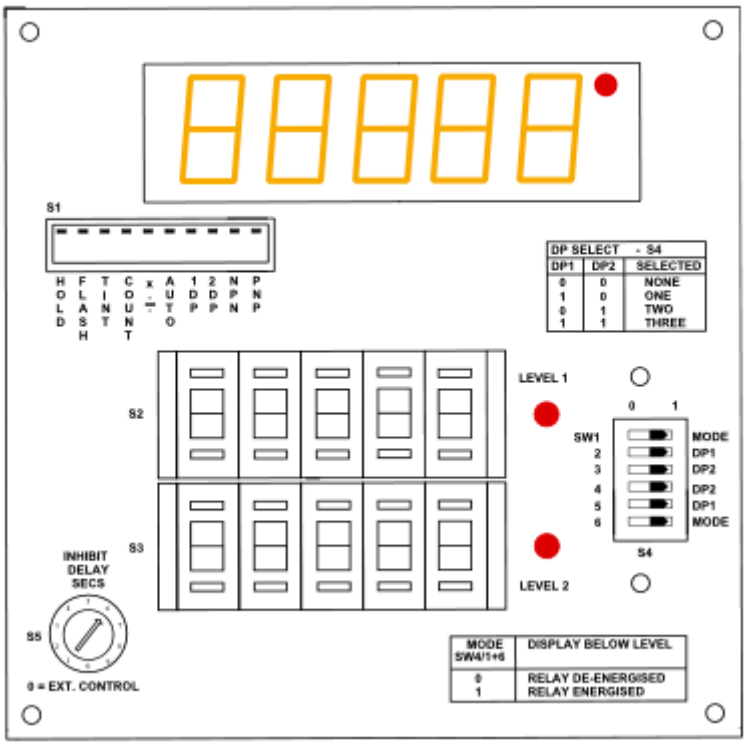
Terminations

Level 1 Relay	12	- Normally closed
	13	- Common
	14	- Normally open
Level 2 Relay	15	- Normally closed
	16	- Common
	17	- Normally open
Time Out	18	- External control
Inhibit	19	- External control
Common	20	- Common 0 volts for external control

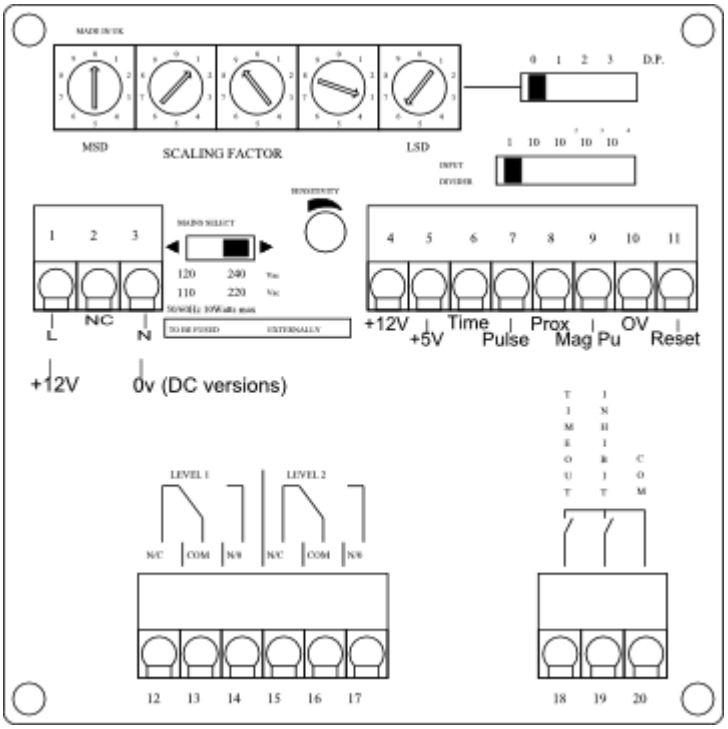
For information on configuring the measurement / display portion of this unit refer to the DS481 instructions on page 1.

Front Controls

Located behind front panel



Rear Panel



Preset level setting Procedure

Enter the required value on the thumbwheel switches including any decimal places (e.g If the unit is required to trip at 231.32 RPM enter 23132).

Select the number of decimal places required using the dip switches S4 (SW1 & 2 refer to level 1 setting, SW4 & 5 refer to Level 2 settings).

Decimal Places	DP1	DP2
None	0	0
One	1	0
Two	0	1
Three	1	1

E.G for the value 321.32 set the switchs to:-

Note: Always set the resolution of the thumbwheel setting to be the same as that of the Display, (The unit will still work if these do not match but there will be a loss of resolution).

Relay Mode

(S4 DIP switches SW1 / SW4) These switches determine whether the output relay is energised or de-energised when the display is above or below the set point.

Count Model

If the display unit is set to count mode then the unit will act as a predetermined counter, the unit will trip as soon as the displayed count exceeds the selected value. **Note:** There is no provision for auto resetting, the unit will continue counting after the set value has been reached.

Reset

A reset capability is available via Terminal 11 on the rear panel, the unit can be reset by momentarily connecting this Terminal to 0v (Terminal 8), when the reset is connected to 0v the unit will stop, the display will continue to display the last reading and the relays will remain in the same state, when 0v is removed from the reset. The Unit is only then reset internally with the measurement starting again from zero.

Inhibit Control

This is normally used when the unit is being used to detect under speed, it allows the unit being monitored to reach operating speed without triggering an under speed alarm.

Internal Control: This is set using the rotary switch S5 on the front panel, this can be set to select start up inhibit times from 1 to 9 seconds in 1 second incremente

External Control: To activate this mode S5 must be set to zero, the unit will then wait for a momentary contact closure across Terminals 19 & 20. **Note: Unless external control is required, do not set S5 to zero**.

Time Out / Motion Stopped

Normally the unit will not recognise that the input pulses have stopped until the Display drops to zero, this in turn depends on the reset options chosen for the display unit (With the normal 3 RPM limit, this would be 20 seconds). In order to rapidly detect that a machine has stopped (e.g. in cases of mechanical failure) the unit can be set to time out after 3 seconds by connecting Timeout (Terminal 18) to Common (Terminal 20).

MultiRanger Numbering System