SMOOTHPULSE PULSATION CONTROL

Version - March 2009
For Software Version V1.00

Part Number - 39-0140

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GOOD PRACTICE: Mains Supply:

- A separate mains supply and earth running directly from the consumer meter is essential.
- Avoid routing the mains cable to the power supply close to other supplies especially those providing intermittent current- motors that are starting and stopping continually or high power heaters with thermostatic control.
- Terminate in a sealed, fused, double pole switched outlet fitted with a 13Amp (Type 1362) fuse or trip. A 3-pin ring main socket is not suitable in parlour conditions. All mains cabling must be contained in a firmly secured durable conduit.

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SmoothPulse Features and Specifications:

- **Input Voltage:** 220 or 240volts AC 50Hz.
- **Output Voltage:** 12 or 24volts selectable.
- **Output Fuses:** 5amp electronic fuses to each channel.
- **Output Connectors:** Terminal block: 4 channels.
- **Pulsation Groups:** Channels 1+3 and channels 2+4.
- **Switched Polarity:** Negative - Common (+) terminal.
- **Channel Indicator:** LED to each channel on the front panel which flashes at the selected frequency. Extinguishes if the channel fails.
- **Solenoid Valves:** 48 maximum at 12volts 0.5Amp to 24 maximum at 24volts 0.5Amp.
- **Invert Function:** Swaps ratio settings to allow either normally open or normally closed solenoid valves to be used. The function is selected from the front panel and does not involve setting links or switches.
- **Frequency Range:** Selectable on the front panel in single steps from 30 to 120 pulses per minute (ppm). The operating frequency is shown on a dedicated display.
- **Pulsation Ratio:** Selectable in 25 steps from 50:50 to 75:25 (On:Off) and 25 steps from 25:75 to 50:50 through the invert facility.
- **Split Ratio:** Available using the Split function which allows the ratios of outputs 1+3 to differ from 2+4. This helps to spread the load on the vacuum by generally avoiding both channel pairs being 'On' simultaneously. The ratio for each output pair is set by the two RATIO keys and is shown on the dedicated display. The Split function is set from the front panel and if it is active the SPLIT indicator will be illuminated.
- **Settings Memory:** The ratio and frequency data is retained in flash memory if the power is removed. If the data is lost, the SmoothPulse will automatically reset when the power is restored and the RESET indicator will illuminate.
- **Reset Defaults:** If setting data is lost the machine will default to:
  - Frequency: 40ppm
  - Ratio: All Outputs 60:40
  - Split Function: Off
  - Invert Function: Off
- **Security:** Access mode prevents accidental or unauthorised data changes.
- **Displays:** Dedicated 7-segment LED displays for frequency and ratio(s).
- **System Status:** Indicator LEDs for RESET, ACCESS, SPLIT (Enabled), INVERT (Enabled).

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f Frequency Display:
Displays the frequency setting in the range 30 to 120 pulses per minute (ppm). The default setting is 40ppm.

f Frequency Button:
Press and hold whilst using the Up/Down buttons to increase or decrease the frequency in Access mode.

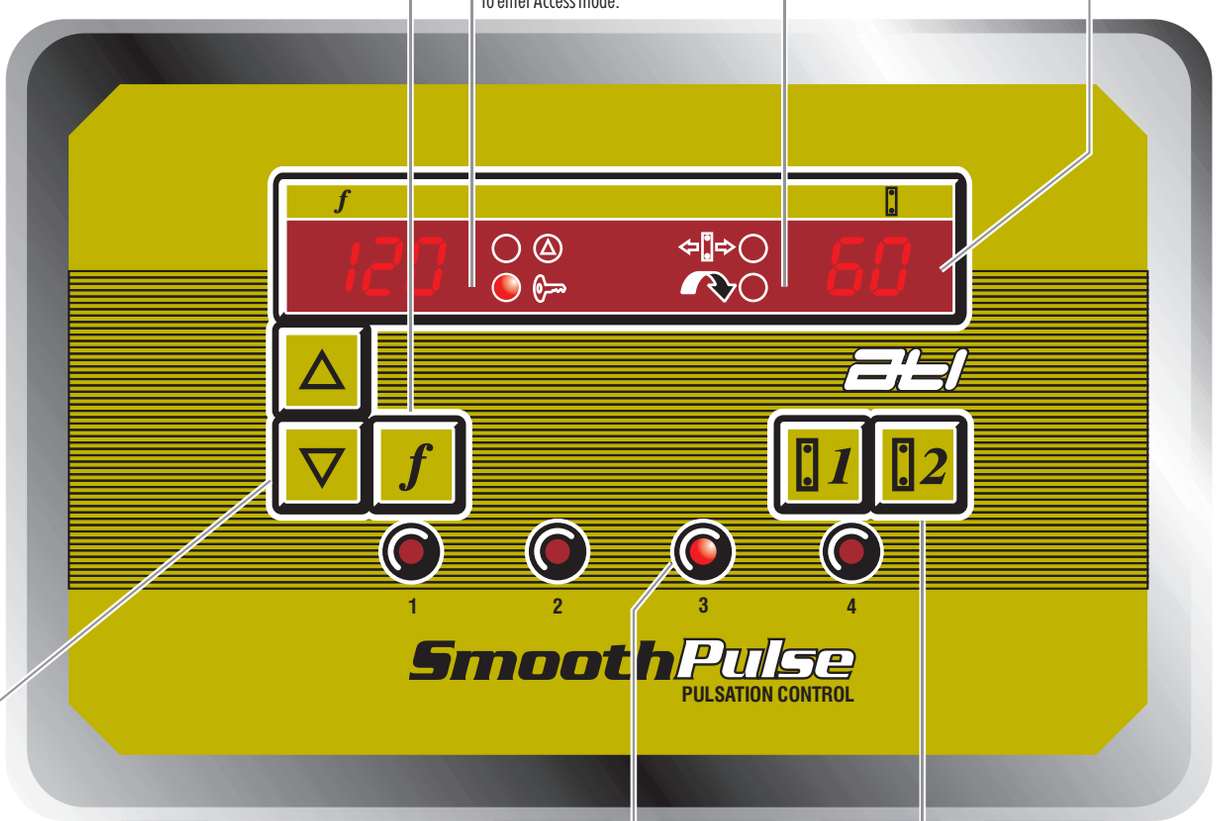
Reset Indicator:
Illuminates if programmed data is lost, and the control has reverted to its defaults.

Access Mode Indicator:
Illuminates during ACCESS mode whilst the machine parameters are being entered.
Hold Ratio 1,2 and frequency to enter Access mode.

Split Indicator:
Illuminates when different ratios have been selected for channel pairs 1 + 3 and 2 + 4.

Invert Indicator:
Illuminates when the On and OFF periods within a cycle have been swapped.
Used for normally ON solenoid valves.

Ratio Display:
Displays the ON period of a cycle as a percentage of the complete cycle.
For example, if the display shows 60, the appropriate channel will be ON for 60% of the cycle and OFF for 40%.



Mains cable entry gland

Channel Indicators:
Illuminate when channel is on

Access for Solenoid Valve cables
Use 2.5csa.

Note: Access mode will time out and exit after 4 seconds of no key presses.

Up and Down Buttons:
Used to increase or decrease the frequency and ratio settings; holding the down and pressing up will toggle the control into invert mode.

Ratio Select Buttons:
Used in conjunction with the Up/Down buttons, Ratio 1 selects channels 1 and 3, whilst Ratio 2 selects channels 2 and 4.

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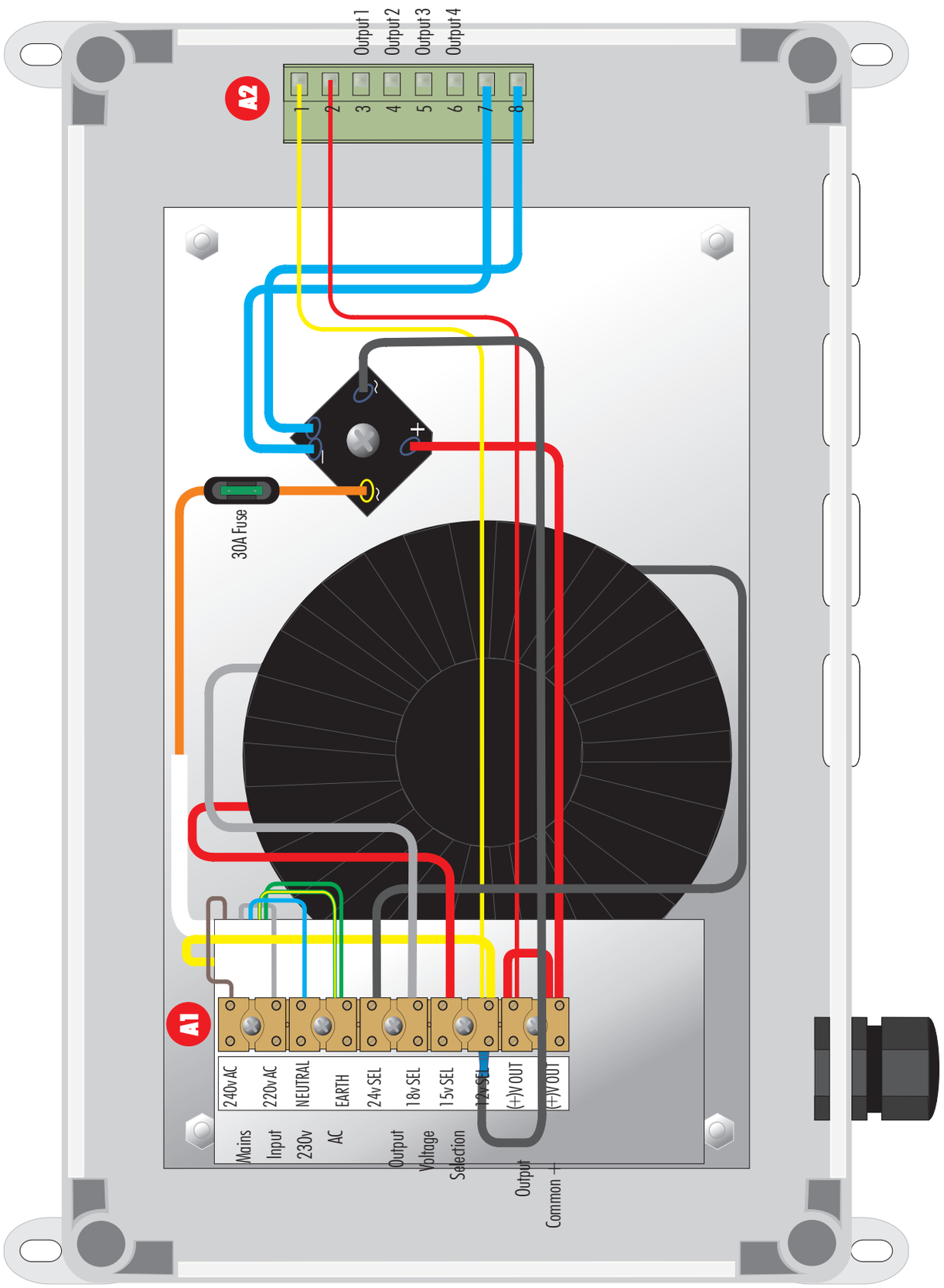
Smooth Pulse Internal Wiring



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Siting and Wiring the SmoothPulse:

The SmoothPulse unit should be sited to allow easy access and minimal cable runs to the solenoid valves. The common (+) supply should be taken from either of the 2 connector block terminals and looped to all of the solenoids. Use 2.5csa red cable.

The appropriate (-) switched supply is taken from the 8-way plug-in (see below) to each solenoid valve depending upon the parlour configuration. Use 2.5csa black cable.

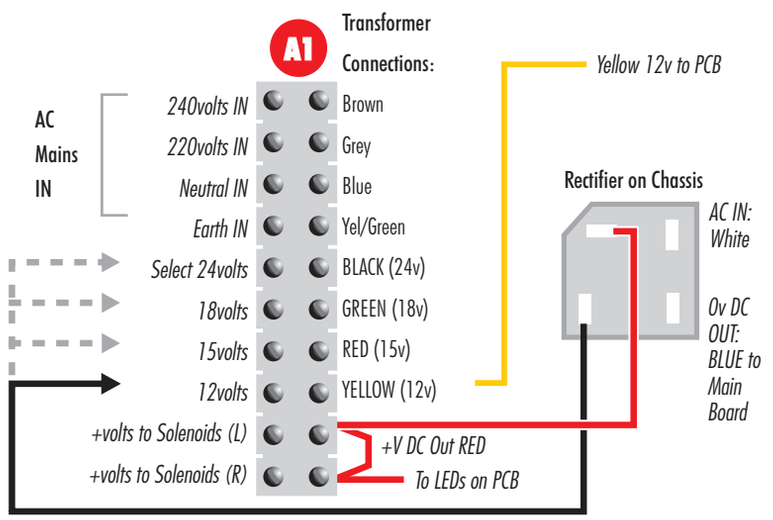
The SmoothPulse requires a 240 or 220volt 50Hz AC supply from a switched, fused outlet, not a 13amp plug and socket. Use a 5Amp fuse.

12, 15, 18 or 24volt solenoid valves either normally open or normally closed may be used. The solenoid output voltage is selected by connecting the 'flying' secondary tap (Black wire) to the appropriate terminal on the connector block. See opposite. The control is shipped with 12volt solenoid valves selected.

A negative supply wire (blue) and two control supply wires (red + yellow) are pre-fitted to the plug-in connector. Ensure that the plug-in is firmly located in the socket on the circuit board.

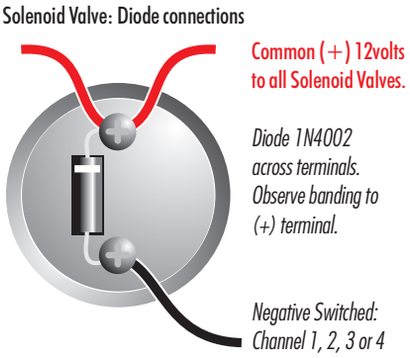
The solenoid valves / pulsators should be wired into the pre-fitted plug-in connector using suitable cabling. It is good practice to fit anti back-EMF diodes (1N4002) to all solenoid valves / pulsators to prevent interference.

Connector Block: Mains Input, Solenoid Valve Operating Voltage Select and (+) Common Output.

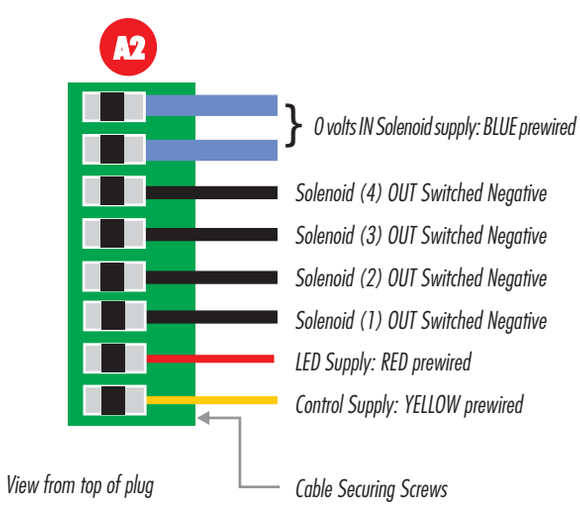


Secondary Tap: Black: Fit to appropriate Select connector: 12, 15, 18 or 24volt

Solenoid Valve: Diode connections



Circuit Board Plug In Connector: Check orientation before fitting to Control Board



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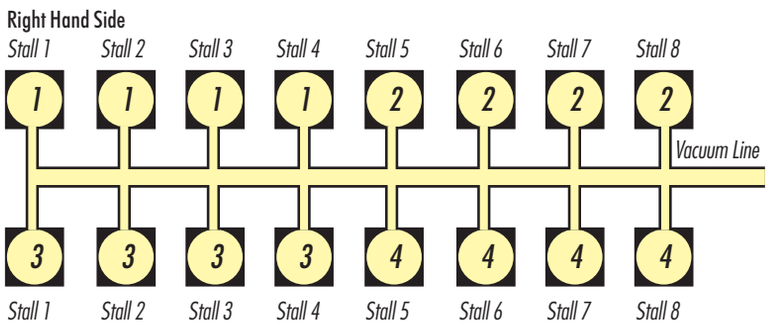
Pulsation Configurations

4/1 Configuration

The illustration right shows a 16/16 parlour with the SmoothPulse in 4/1 configuration.

The parlour is divided into 4 quadrants each of four stalls with one SmoothPulse channel driving each quadrant. There is only one solenoid valve to each stall, so all four teat cups on a cluster are pulsed together.

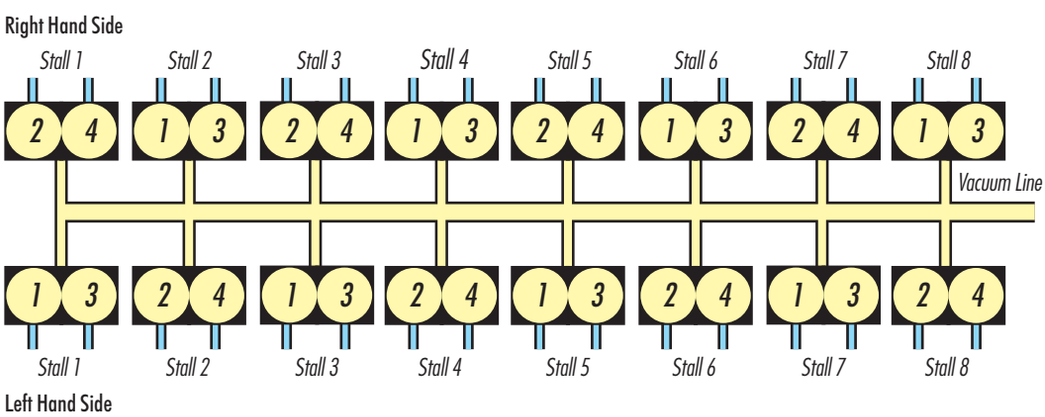


The numbers in circles represent the SmoothPulse channels.

2/2 Configuration

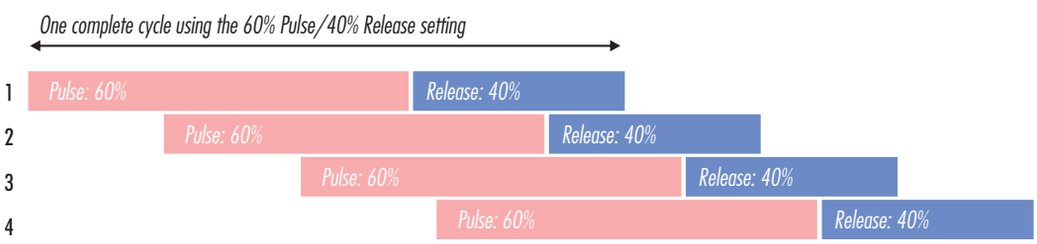
A 16/16 parlour with SmoothPulse 2/2 configuration is illustrated below. Every stall has two solenoid valves fitted, one for each pair of teat cups on the cluster.

The teat cup pairs may be arranged either diagonally or front-to-back and because they are connected to different SmoothPulse channels, will pulse alternately.



The Pulsation Cycle

Diagram showing the timing relationship between the 4 channels during a cycle start and finish.



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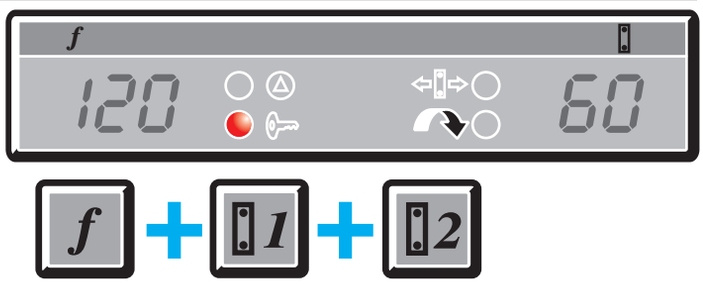
Operating the SmoothPulse

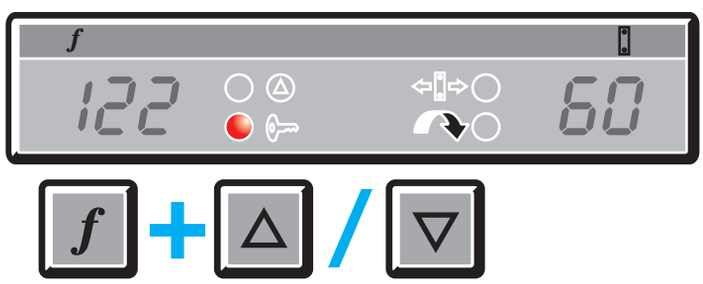
Entering Access Mode:

The frequency is measured in pulses per minute (ppm) and can be set in the range 30 to 120ppm in single steps. Before the frequency can be changed, the unit must be in Access mode. With the power on, Press and Hold Ratio 1, 2 and f until access light is on . The unit is now in Access mode.



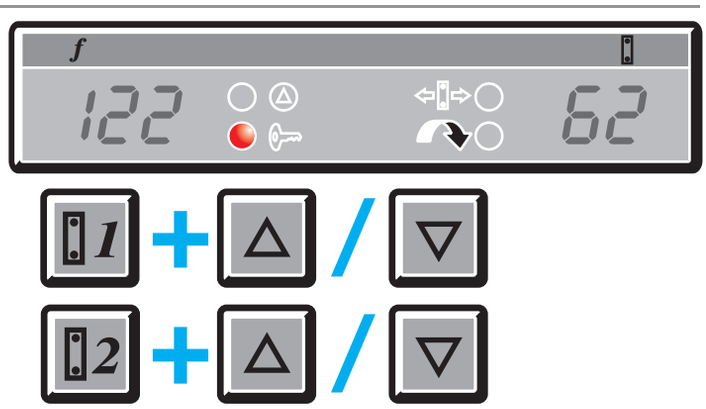
Changing the Frequency:

With Access Mode enabled, press the FREQ button together with either the UP or DOWN button depending upon whether an increase or decrease in frequency is required. The FREQUENCY display shows the frequency selected. The unit will resume pulsing at the new frequency.



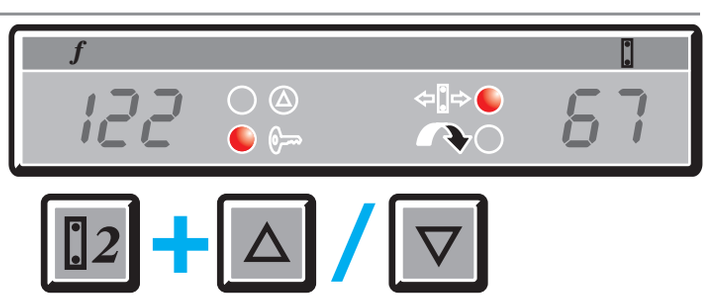
Changing the Ratios:

The ratio represents the percentage of the pulse length that the solenoid valve is energised. So, for example, a ratio of 60 displayed means that the solenoid valve will be on for 60% of the pulse duration and 40% off. The unit must be in the Access Mode to make changes to the ratio. To change the setting for channels 1 and 3, press and hold the RATIO 1 button and, at the same time press either the UP or DOWN button for an increase or decrease in the value. Channels 2 and 4 are altered in the same way but by pressing the RATIO 2 button instead. The new setting is displayed in the RATIO window. Ratios may be changed in single steps from 50% to 75%.



The Split Function:

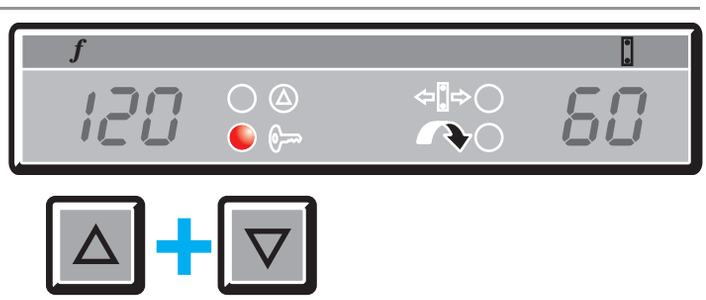
It is often desirable to have different ratios for channels 1+3 and 2+4 since the variable pulsing spreads the load on the vacuum line. If the ratios are different, the SPLIT indicator will illuminate as a warning. However, if it is necessary to set all channels to the same ratio, put the unit into Access Mode and examine the settings by pressing first the RATIO 1 button and then the RATIO 2 button. Choose whichever ratio is suitable by pressing the RATIO button for the setting NOT required together with either the UP or DOWN button until the SPLIT indicator is extinguished. All channels will now have the same ratio setting.



The Invert Function:

To save power, some solenoid valves are designed to be normally ON, which means that they are open and will pass a vacuum when unenergised; when power is applied to them they block the vacuum line. The SmoothPulse can accommodate these new valves by swapping the ratio values. So, for a conventional setting of say 60% on and 40% off, for normally on valves these are swapped to become 60% off and 40% on but for the duration of the 60% off time the valve will still be passing the vacuum because it is normally open or on.

To invert the ratios, put the smooth pulse into Access Mode and press down then up. The INVERT indicator will now illuminate.



Operating the SmoothPulse Continued

Reset:

If the mains power is turned off or interrupted, the flash memory will retain the settings. The reset LED will only show if the memory has been lost.