MDC-01 MAXIMUM DEMAND CONTROLLER
SLIDING WINDOW VERSION

Non-domestic electrical power users often have to pay a maximum demand charge in addition to the usual charge for the number of units consumed. This charge is usually based on the highest amount of power used during some period (say 30 mins) during the metering month. The maximum demand charge often represents a large proportion of the total bill and may be based on only one isolated 30 minute episode of high power use. Considerable savings can be realised by monitoring power use and turning off or reducing non-essential loads during such periods of high power use. The MDC-01 is a realistically priced stand alone controller suitable for small to medium consumers wishing to reduce their maximum demand in an economical and simple manner. The unit can also be used for reducing cable and transformer loadings.

How does it work?

A kWhr (or kVAhr) transducer is placed on the consumer's electrical supply which produces a pulse for every 0.1 kWhr (or kVAhr) consumed. The MDC-01 records these pulses adding them to a running total whilst discarding those pulses recorded 15 mins previously. In this manner a record of the average power use over the last 15 mins is obtained in a so called "sliding window". The MDC-01 is also available on request with a 30 or 60 min sliding window.

The controller compares this running average with a set target load value and operates a set of relays if the target appears in danger of being exceeded. The relay contacts are used to switch off non-critical electrical loads and hence hold the overall load to a prescribed limit.

The unit also records the highest value of running average load to date and operates an alarm relay when a new high is recorded. A visual display is provided of the running average which can also display the target value or the recorded maximum on request.

Most demand metering systems work by counting consumption pulses over a fixed period, say, every 30 mins. At the end of the period a reset occurs which returns the register to zero. Such systems, known as block time systems, originally came into favour as they were easy to realise using electromechanical components. The sliding window type of controller can also work on a block time system provided the width of the window is made to correspond to length of the metering period and so automatically ensure that they correspond to each other at the end of the metering period. Maximum demand control systems that simulate the block time method of metering must of necessity be synchronised to the meter's reset times. Often this signal is not available preventing the normal type of block time controller from being employed. An effective compromise is to use a sliding window type such as the MDC-01.

How to set up the MDC-01

A typical set up is shown in the connection diagram below. A connection diagram is also displayed on the front of the actual unit. Although the diagram shows a Carrel & Carrel LP-2.5KW4 kWhr meter, consumption pulses can come from any available device with a rating of 0.1 unit per pulse. Dry contact devices are preferred but the unit will operate on open collector or opto-coupler devices provided terminal 5 is treated as voltage positive with respect to terminal 1. The unit is powered via terminals 23 and 24, with the voltage shown on the side label of the unit. This supply should be on a reliable circuit and should be fused or on a circuit breaker.

The output relays are connected to the load control circuits in whichever safe and reliable manner the user deems desirable. Note that the relay changeover contacts are shown in the de-energised position ie before shedding. Relay 1 is the lowest priority relay and is the first to operate in the event of load shedding being required therefore use it to control loads that are generally unimportant. Relay 2 is the next highest priority and should control loads of slightly higher priority. Relay 3 operates when the target has been exceeded and should be connected to loads of high priority. A small amount of hysteresis is provided in the relay operation to avoid excessive operating. When loads need to be shed in some sort of manner based on timing, delays, cycling or previous history it is recommended that a PLC be used between the relays and the loads. An alarm relay is also provided which operates when the highest internally recorded demand is exceeded thereby giving an indication of when a new maximum demand figure is incurred.

Operating the MDC-01

The front face of the unit has four push buttons, five LED lights and an LCD display. The green LED labelled "Power" indicates that the unit is operating whilst the red LEDs "Alarm", "Shed 3", "Shed 2" and "Shed 1" indicate that the respective relays are operated.

On power up the display shows the target value which was current when the device was last used. This value flashes a number of times before the display changes over to the average power reading which is a continuous display. The initial value of this is set slightly below the target value and will gradually change over the window period to align with the true average as a record builds up. The average power reading is the default display on the LCD and will change as the power use changes.

To view or set the target load value press the button labelled "Target". The target value will be displayed on the LCD and will flash on and off a number of times before returning to the average load reading. Whilst the display is flashing the target may be set by pressing either button "+" or "-". The initial scrolling of the target value will be slow but will speed up if the button is held down. The selection of a reasonable target value will depend on the ability of the system to shed load and the frequency of operation that can be tolerated. Should the user find that the control system is shedding too often and too drastically then they are advised to raise their target until this situation no longer concerns them. To avoid unauthorised tampering with the target settings it is advisable to secure the unit in some sort of secure enclosure.

To view the highest load incurred to date press the button labelled "Max Dmd". The current value of the maximum demand will be displayed on the LCD and will flash on and off a number of times before reverting back to the present average load. Whilst the display is flashing the recorded value of maximum demand can be reset by pressing both buttons labelled "+" and "-" together. The recorded maximum demand value will immediately fall to the current load value.

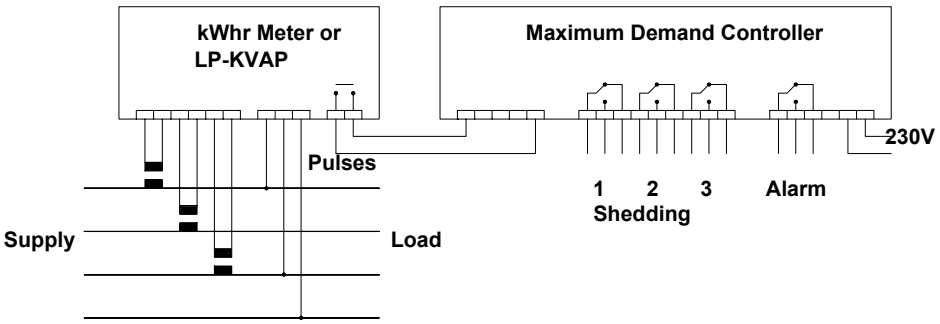
When the recorded maximum demand value is exceeded the alarm relay will operate, the alarm light will come on and the new value will be recorded. To reset the alarm relay press the button labelled "Alarm Res". This is the same button used to view the recorded maximum demand. The alarm relay will reset and the new recorded maximum demand value will be displayed briefly.

If power to the device is lost it will retain the value of the target setting and the recorded maximum demand. On re-powering the device these will be reloaded and the unit will provide a temporary load value which is just sufficient to ensure that if the load is above the target value then the unit will begin shedding load virtually immediately.

TECHNICAL DETAILS

INPUTS	Isolated through opto-coupler
	Dry contact or NPN open collector
	0.1 kWhr (kVAhr) pulses
OUTPUTS	Load control relay contacts, 8A, 250V ac
	Shed level 1: 3% below target setting
	Shed level 2: at target setting
	Shed level 3: 3% above target setting
	Relay hysteresis: 1% of target setting
	Alarm relay contacts, 8A, 250V ac
	Power reading exceeds recorded maximum
WINDOW	15, 30 or 60 minutes
TARGET	0 to 999.9 kW (kVA)
SUPPLY	230V ac or 110V ac or 12V dc or 24V dc

CONNECTION DIAGRAM



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