

DUAL PUMP CONTROLLERS

Advanced Pump Protection

Almost without exception, an overload and or thermostat fault is the result of a condition that requires operator intervention. Thermostats and many overloads reset automatically, which results in the pump being subjected to either repeated 'overheating' or 'over current' conditions. In most instances, such faults go undetected until finally, pump failure results. The MATElec pump controller allows for three such faults in succession only, before locking the pump out.

Thermostat Fault Lockout

If manual pump mode is selected, the current sensing circuit will immediately detect if a pump has stopped running due to an overload or thermal cut out and a fault will be flagged. If no current is drawn for 4 seconds, duty will automatically alternate to the standby pump. If three faults are flagged on a pump, in succession, the controller will lock the pump out, preventing it from running until the fault is manually reset. Faults logged against a pump, are automatically cleared if the pump performs a normal duty cycle.

'Ragged' Pump Detection

If a pump's suction or discharge becomes partially blocked and it is still maintaining a small flow, this condition would normally go undetected. The controller, by way of the microcontroller is able to identify such conditions. If a pump takes more than 30 minutes to perform a pump 'start to stop' cycle, the controller will automatically alternate duty to the other pump and log a fault against the pump in question. If faults are logged against the pump in three successive cycles, the controller will lock the pump out, preventing it from running until the fault is manually reset. Faults logged against a pump, are automatically cleared if the pump performs a normal duty cycle. This is an excellent feature which prevents nuisance call outs, typical of a temporary blockage.

Multi-Fault Indication

The controller features multi-fault indication by way of three LEDs situated in the keypad. One LED is dedicated to 'High Level' which works in conjunction with the strobe. The other two LEDs are dedicated to one of the two pumps each. These two LEDs indicate the type of fault, by way of varying flashing characteristics.

On Steady:

High level has occurred whilst this pump was the duty pump, during three successive cycles.

Flashing Slowly:

A pump overload or thermal 'cut out' has occurred during three successive cycles.

Flashing Fast:

The pump has run continuously for 30 minutes during three successive cycles.

Balanced 'Pump Run' Time

By simply selecting 'Advanced Mode' on the controller, 'actual' run time is continually monitored. Once 60 minutes of run time has been accumulated, duty will alternate to the standby pump. Selection of this mode does not inhibit any of the fault induced switching features. Monitoring of actual run time in this way, means that the pump run hours will remain balanced - there is no need for extra timers or operator selected duty pump change over.

'Automatic Pump' Alternation

Innovative current sensing technology is employed by the controller to enable alternation (between duty and standby) for automatic pumps (pumps that have inbuilt switches). By simply selecting 'Automatic Pump Mode', the pumps are able to utilise their internal switches to start and stop, whilst the controller provides the alternation. This means the controller is suited to a large variety of applications including pumps which are switched by a pressure or flow / float switch.

Smart Alarm

The numerous alarm conditions that are detected will activate both audible and visual alarms. In the event of the alarm not being muted, the siren will be automatically silence after 5 minutes while the strobe will continue to flash. The controller will then enter 'chirp' mode which means a brief 'chirp' is sounded every 5 minutes as a reminder to the operator that an alarm condition exists. This is an excellent feature in built up areas or in the event of strobe failure.

Power Failure - Memory

In the event of a power failure, all settings, alarms, logged faults, pump cycles etc are stored in the memory of the micro controller, which is not reliant on battery power to be maintained. Once power is restored, the controller will resume operation, as at the time of the power failure.

Remote Status Indication

The controller features a two wire data output, which sends status information to an indoor indicator unit (available as an optional extra) up to 150m away. Conditions displayed on the remote indicator include 'power on', 'high level', 'pump 1 fault' and 'pump 2 fault'. The indoor indicator is mounted on an attractive wall plate which incorporates the four indicator lights, plus the buzzer and mute button.

Building Management System - BMS Module

The same two wire output, used to provide data for the Remote Status Indicator, can be utilized to provide a coded signal to a BMS Module (available as an optional extra). The BMS module micro controller decodes the signal and provides four voltage free relay outputs for interfacing with a computer or other monitoring equipment. The module operates on 9 - 12V ac/dc and is supplied complete with power pack. The module also includes four LEDs to indicate 'switched' relay status.

COMMON OPERATING INSTRUCTIONS

Operation Manual

The FPC-300 Series controls two pumps in a pump well type application. It is designed to work with or without a working level float switch/switches, as the pumps' integrated switches (on automatic or pressure pumps) can be used as working level sensors. The FPC-300 also has provision for a high level float switch with both audible and visual alarms. A current sensing circuit discerns the operation of the pumps and, together with the high level float switch, is used to identify various pump fault conditions.

Operation Modes

The FPC-300 has four different operation options, which are selected using the Mode switch on the main PCB (to the left of the High Level input terminal). The following is a table of the mode switch settings, which are also explained in more detail in later sections of this manual.

Mode switch 1	
OFF Standard mode:	Pump duty alternates each time a pump operates.
ON Advanced mode:	Pump duty alternates after the pump has run for a total time of 60 minutes.
Mode switch 2	
OFF Manual Pumps:	A single working level float is wired into the system and is used to operate the pumps.
ON Automatic Pumps:	No working level float is used – instead 'automatic' pumps with integral switches are required. The working level input will be ignored.

Table 1: Mode switch settings and descriptions

Auto / Off / Manual Pushbutton Switches

On the front panel keypad each pump output has a corresponding set of auto/off/man pushbuttons. The Auto and Man switches each have an adjacent LED to indicate that the unit is operating in the corresponding mode.

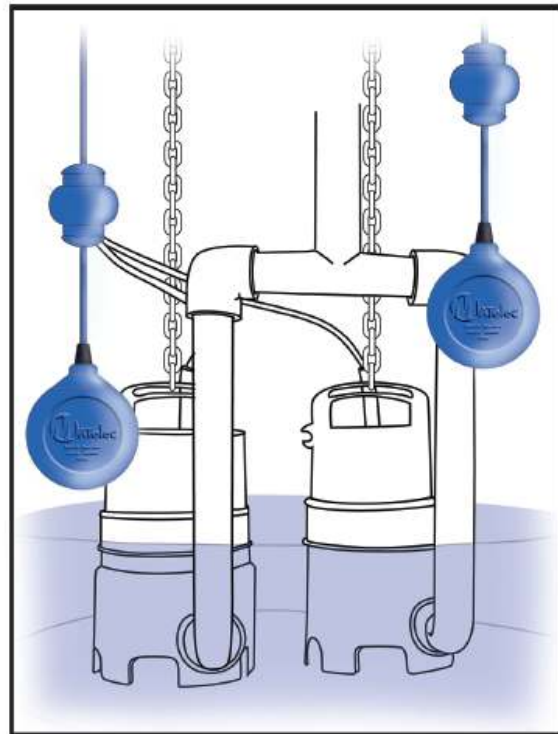
Pressing the auto switch for a pump will allow it to operate normally under working levels and high level conditions. Note that if only one pump is set to auto then no alternating can occur.

Setting a pump to "off" will leave that pump output permanently off, effectively isolating the pump output. Note: a high level condition cannot override a pump that is set to off.

Setting a pump to 'manual' will run the pump continuously, regardless of level status, for a maximum of 5 minutes. Once 5 minutes is up, the pump/s will revert to auto mode.

Operation

The following operation summary is only valid for when the pumps are set to auto mode. 'Duty pump' refers to the pump that is currently selected in alternating mode.



Working Level

If manual pumps are selected then the working level inputs (High & Low) must be active for the pumps to switch on. If automatic pumps are selected then the working level input will be ignored and the pumps' integrated switches will act as the working level sensors. The high level input will always override the working level input.

High Level

Upon activation of the high level input, both pumps will be activated, regardless of the working level input state. If the high level condition does not subside within 2 minutes then the high level alarm will activate, regardless of the pumps' auto/off/man settings.

If, upon activation of the high level, the duty pump is not running (drawing current) then a fault will be flagged with that pump and the pump fault alarm will activate.

If a high level is triggered 3 times whilst the same pump is the duty pump then it will have a fault flagged and the corresponding pump fault alarm will activate.

Pump Fault Lockout

If a pump has been flagged with a fault condition it will become locked out and duty will always switch to the other pump. The lockout will take effect until the pump fault is reset. If both pumps are locked out then no pump will be able to run whilst set to auto mode.

Blocked Pump Detection

If either pump runs continuously for more than 30 minutes then the pump duty will alternate. This prevents a blocked pump from running continuously if it is unable to clear the water level and also provides continuous "run time" protection limiting it to 30 minutes. If this occurs 3 consecutive times then a fault will be flagged and that pump will be locked out. The count is reset whenever the pump alternates normally or the FPC-300 is reset.

Pump Overload / Thermal Cutout Detection

If manual pumps are selected then the current sensing circuit will be used to detect if a pump has stopped running due to an overload or thermal cutout. If the pump stops drawing current for 4 seconds then the duty will immediately alternate. If this occurs 3 times then a fault with that pump will be flagged and the pump will be locked out. The count is reset whenever the pump alternates normally or the FPC-300 is reset.

Standard Mode

With manual pumps selected, then when the working level float switch is activated, the first pump will turn on. Once the working level float deactivates then the first pump will turn off.

The next time the working level float is activated duty will alternate and pump 2 will switch on until the float deactivates again, at which point duty will alternate back to the first pump.

With automatic pumps selected the working level input is ignored and the pump 1 output is switched on initially. When the pump's integrated switch activates, the pump will run until the switch turns off again. At this point the current sensor circuit detects that pump 1 has operated and switches the pump 1 output off.

The pump 2 output is then switched on and the same process occurs, with duty going back to pump 1 once pump 2 has operated.



Advanced Mode

In advanced mode the FPC-300 attempts to maintain a similar accumulated running time on each pump, so that wear on the pumps is distributed evenly. To do this, each pump has to have run for an accumulated time of 60 minutes before duty will alternate to the other pump. This timing is overridden upon a high level, when both pumps switch on.

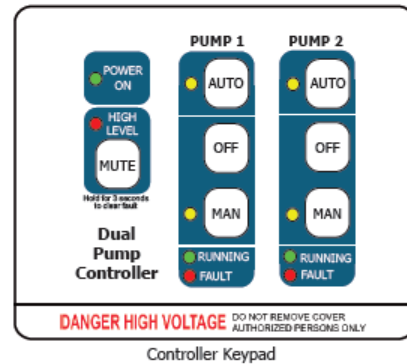
The FPC-300 keeps a count to the second of how long the pump has actually been running (using the current sensor circuit). Once the 60 minute run time has elapsed the count is reset and duty switches to the other pump. The duty pump selection and accumulated time will reset to pump 1 and 0 seconds respectively whenever mode switch 1 is set to off (standard mode). Upon a high level condition the current pump selection and accumulated time will be saved so that when the high level subsides the FPC-300 will resume operation from where it was interrupted.

Alarm

Whenever a high level or pump fault alarm is triggered, the FPC-300 will activate the strobe and siren outputs. Pressing the mute button on the front keypad will stop the siren from sounding but the strobe output will remain energized until the alarm is reset.

If the siren sounds for 5 minutes without being muted then it will revert to chirp mode. At this point the siren will turn off and once every 5 minutes will give a short 'chirp' to indicate that an alarm is still present.

The alarm can be reset at any time by holding the mute button down for 3 seconds until the fault indicators turn off. The siren will chirp to indicate that the unit has been reset. Resetting also clears the high level pump fault counters (30 minute continual run and thermal/overload cutout).



Pump Enabled Indicators

Each pump output has a corresponding Pump Enabled indicator that will light when the pump output has been activated. When the current sensor detects that the pump is running it will flash the Pump Enabled indicator.

Pump Fault Indicators

Each pump output also has a corresponding Pump Fault indicator that will behave differently depending on the fault, as shown in the following table:

LED Status	Fault description
Off	No fault
On steady	A high level has occurred 3 times whilst this pump was selected as the duty pump
Flashing slowly	A pump overload/thermal cutout has occurred 3 times for this pump
Flashing fast	This pump has run continuously for 30 minutes 3 times in a row

Table 2: Pump fault LED behaviour

If the fault indicator is not off then that pump will currently be locked out. The indicator (and pump lockout) will stay activated until the alarm is reset (by holding the mute button down for 3 seconds).

High Level Indicator

Upon triggering of a high level alarm, the High Level indicator will light. This indicator will also stay lit until the alarm is reset.

Power Loss

Upon power loss the FPC-300 saves most current settings into EEPROM memory. Settings saved include currently activated pump and its accumulated time, high level and any pump fault alarms. Once power resumes the FPC-300 will load the saved settings and continue operation from where it left off.

Auxiliary Remote Output

The FPC-300 has provision for various auxiliary and remote status indicators. The standard remote alarm indicator uses a 2-wire connection to a remote wall plate unit that displays the current power and alarm status of the unit. Other auxiliary options available include a relay output board for Building Management network systems and a wireless link for use in conjunction with the remote alarm indicator unit.