SM96 & SM97 PUMP CONTROLLER

INSTALLATION & MAINTENANCE GUIDE

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Manufactured in Australia by Alian Electronics Pty Ltd
408 Old Sale Rd. Drouin West 3818 Ph. (03) 5625 2545

www.alianelectronics.com.au

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PUMP CONTROLLER – GENERAL DESCRIPTION

TYPICAL APPLICATIONS

The SM96 & SM97 pump controller forms a vital part of a domestic sewage distribution system. Each householder or client within the system has an in-ground sewage collection tank fitted, with an integral submersible pump. The tank allows for the collection and liquefaction of raw sewage in the immediate vicinity of the clients premises. When a predetermined level of waste has accumulated in the tank it is pumped into sewage lines. This system allows for these lines to be of a much smaller cross section than is needed for conventional gravity fed sewage collection networks. As this system maintains positive pressure in the lines, it makes sewage concentration viable in areas where the natural water table is close to the land surface, or in rocky, difficult terrain.

The function of this pump controller is to provide power to the pump when tank levels have risen to a defined threshold, and to halt the pump when tank levels have fallen to another, lower threshold. It must perform this function so that it will call for human intervention should the pump or input sensors behave in a way that do not meet normal operating parameters. The controller must do this in a way that is safe for both the client and the maintenance staff.

The power source for the pump controller must be a dedicated circuit, cabled directly from the customers power distribution switchboard.

The advanced microprocessor design within the pump controller allows statistical information to be collected by regional management staff or maintenance staff. Management staff can use the information accumulated in each controller to ascertain usage patterns and flow rate trends over an extended period. Maintenance staff can use the logged information to diagnose customer difficulties and faults by reading an extensive profile of the last 24 hours of pump activity.

Because of the perspex safety barrier within the enclosure, non–electrically qualified staff can gain access to the pump enclosure to isolate the power, jog the pump motor or download data log information with a non-contact infrared link.
(only qualified electricians are permitted to remove the perspex safety barrier.)

SM96 AND SM97 UNITS – MAIN DIFFERENCES

The two units in the range are the SM96 and the SM97. The SM96 is designed for single pumps working on 240VAC single phase only. The SM97 is similar except that it supports *dual* pump operation. Should one pump fail, then the controller will attempt to continue with the alternate pump. The SM97 is also available in a Three-Phase supply version for 3 phase pumps.

CONTROL SYSTEM ENCLOSURE

The enclosure is an industrial grade polyester moulded fibreglass unit with stainless steel hinges, access latches and wall mounting brackets. The door latches support the use of small padlocks to ensure that access is restricted to authorised staff. When the enclosure has been opened, an internal perspex barrier protects operators from all exposed terminals and electrical devices. This permits operators to check pump and controller integrity without the presence of qualified electrical personnel.
(The actual maintenance work may still require the presence of qualified electrical staff.)

The enclosure has a high water proofing integrity. It will support cable entry from the top, bottom side or rear. Clearance has been provided around the edges of the pcb backplane to allow cable gland nuts to be inserted.
(Installing staff must use cable glands and seals of suitable integrity to maintain the water proofing integrity of the enclosure.)

SAFETY INFORMATION

- This equipment must be installed and maintained by a licensed electrician
- Do not install this equipment if the enclosure or any internal components appear damaged.
- Power cabling and circuit breaker rating at the power distribution panel must be rated to support 240VAC at 20Amps.
- Power should not be extended to the SM96 control unit until all cabling is in place and correctly terminated.
- The IP (Ingress Protection) rating of the control unit enclosure will be diminished if conduit seals to the enclosure are not of a high standard. Suitable cable glands and seals must be used on all conduits.
- Before drilling holes behind the control unit for mounting purposes or cable access, ensure that no active 240VAC cables in the wall cavity will be damaged by drill bits or mounting screws.
- Access beyond the perspex safety barrier within the SM96 enclosure is limited to qualified electrical personnel.
- Do not open the access door to the control unit enclosure during inclement weather or where water spray is present.
- Do not operate this equipment until all outgoing cables to pumps and sensors are correctly terminated and sealed against the ingress of moisture.

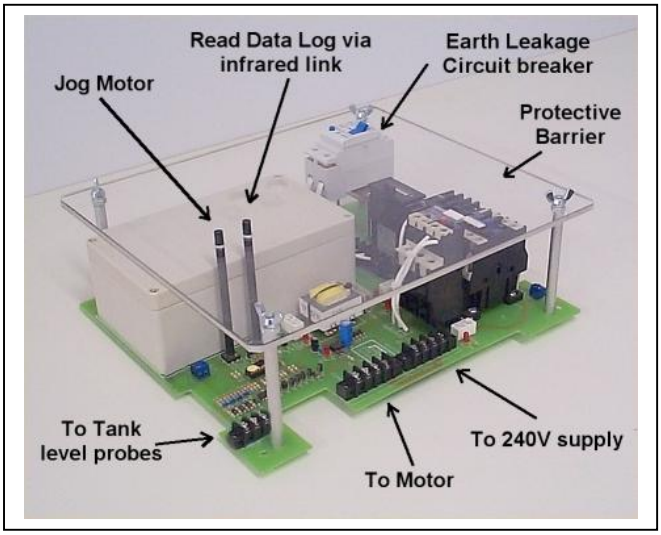
SM96 PUMP CONTROL UNIT- FEATURES

The SM96 unit features an advanced microprocessor controller bonded to the backplane within the enclosure. Heavy contactors and current overload devices support single phase 240VAC pumps with Start/Run motor windings and an average load current of up to 15 Amps. An integral Residual Current Device (RCD) ensures protection against earth leakage faults.

Where the pump motor requires a separate high current starter circuit, an approved 'Starter Module' may be fitted to the SM96 backplane. (shown below)

A perspex barrier behind the cabinet door separates all internal wiring from the user console. This allows routine pump maintenance to be carried out without the presence of electrical staff. (Installation and maintenance of all electrical components still requires the presence of a qualified electrical contractor.)

The cabinet is an extremely tough moulded polyester composition, with stainless steel hinge and latches and foam door seals. Stainless Steel door latches will accept padlocks . The cabinet is intended to be wall mounted with brackets provided and cable access may be effected from top, bottom, side or rear.



OTHER FEATURES

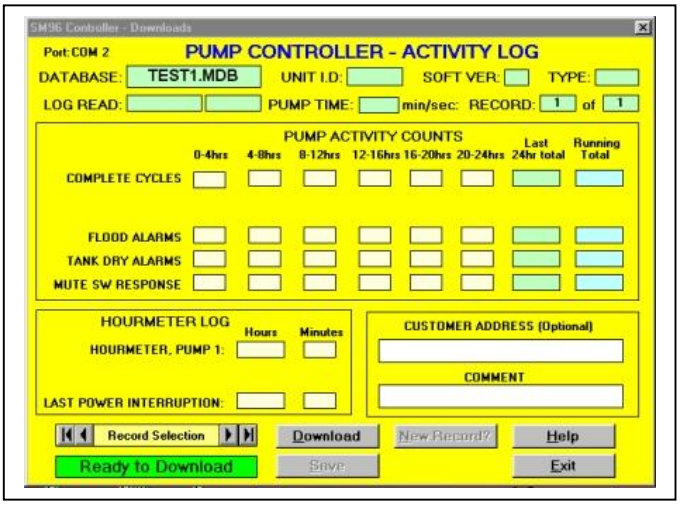
Should tank levels become too high or too low, audible and visual alarms will be triggered for the duration of the fault. A single or double flash will indicate the fault type. The audible alarm may be suppressed for 6 hours by briefly pressing an 'Alarm 'Mute button on the underside of the cabinet. Motor operation is inhibited with 'Tank Low' alarms.

A third alarm condition will indicate the accidental reversal of the 'High' and 'Low' probes by installation staff.

A 'Motor Jog' button inside the cabinet will force the pump to operate for a brief period.
(This feature is inhibited if tank levels are low)

An electromechanical hour-meter (resettable) indicates total pump activity.

A full electronic 'Data Logging' system is standard with each controller. It records pump cycles, hours of operation, alarm conditions both as running totals and within 4 hour blocks over the last 24 hours. A counter also indicates the number of hours since the last power interruption.
Data is extracted from the unit by bringing a standard PC with a special terminal program near the controller. When the 'Send Data' button is pressed, the entire data log contents are sent to the PC by an infrared signal broadcast through the protective perspex barrier. The log data is stored in a special memory which requires no backup battery.



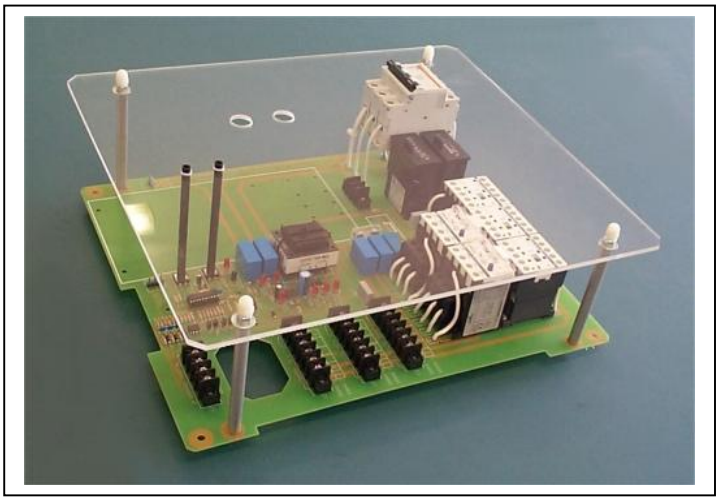
The retrieved information may be saved within the PC in a simple 'Microsoft Access' format for later analysis. (The infrared receiver probe and software package are available as separate product, 'SM96 TERM', which also supports the SM97 Dual Pump version of the controller .)

SM97 PUMP CONTROL UNIT- FEATURES

The SM97 unit features an advanced microprocessor controller bonded to the backplane within the enclosure. Heavy contactors and current overload devices are available in two configurations. The single phase unit supports two single phase 240VAC pumps with Start/Run motor windings and an average load current of up to 15 Amps. The Three phase unit is fitted with a three phase circuit breaker and motor overload units of a suitably reduced trip current.

A perspex barrier behind the cabinet door separates all internal wiring from the user console. This allows routine pump maintenance to be carried out without the presence of electrical staff. (Installation and maintenance of all electrical components still requires the presence of a qualified electrical contractor.)

The cabinet is an extremely tough moulded polyester composition, with stainless steel hinge and latches and foam door seals. Stainless Steel door latches will accept padlocks . The cabinet is intended to be wall mounted with brackets provided and cable access may be effected from top, bottom, side or rear.



OTHER FEATURES

Should tank levels become too high or too low, audible and visual alarms will be triggered for the duration of the fault. A single or double flash will indicate the fault type. The audible alarm may be suppressed for 6 hours by briefly pressing an ‘Alarm ‘Mute button on the underside of the cabinet. Motor operation is inhibited with ‘Tank Low’ alarms.

A third alarm condition will indicate the accidental reversal of the ‘High’ and ‘Low’ probes by installation staff.

A ‘Motor Jog’ button inside the cabinet will force the pump to operate for a brief period.
(This feature is inhibited if tank levels are low)

Two electromechanical hour-meters (resettable) indicates total pump activity.

The SM97 data log feature is supported by the standard SM96 TERM program. When the program detects a download from the Dual-pump SM97, it automatically configures the screen to reveal the extra fields of information related to the additional pump.

Under normal usage the SM97 will alternate between the two pumps (designated P1 and P2) so that even wear will occur. Should a pump cycle commence and the MID probe fails to achieve a ‘dry’ state within two minutes, the controller will assume that the pump is defective and will attempt a restart with the alternate pump. Should the alternate pump also fail, no further retries will be attempted. If the MID probe has failed and the system is using the HIGH probe as a trigger to start pump cycles, then the auto-changeover-on-fail facility will still apply.

Note that an unwanted auto-changeover may take place where a pump cycle has commenced and a large volume of water is still entering the tank faster than the level can be pumped down. If the MID probe stays wet for more than 2 minutes in a cycle, then an auto-changeover will occur.

Where unusual tank sizes and probe positions are being used, both the SM96 and the SM97 support a special ‘Learn’ mode where the pumping times may be varied to suit the different tanks.

UNPACKING AND ASSEMBLING THE UNIT

OPENING THE CARTON

The SM96 control unit comes packaged within a cardboard carton with protective cardboard packing in each corner. Care must be taken when initially opening the carton by knife so that the blade does not penetrate too far and mark the front of the enclosure.

WALL MOUNTING BRACKETS

Within the enclosure is a plastic bag containing four small stainless steel brackets and screws. These are used to fasten the enclosure to a wall. Store these in a secure location until they are ready for use.

ALARM LAMP MOUNTING

The alarm lamp on top of the pump enclosure is vulnerable to impact damage during transport and handling. For this reason It is packed separately within the enclosure. The installing electrician must remove the lamp from its transit position in the interior of the enclosure and mount it on top of the top using the two screws and rubber seal provided. The cable stub attached to the lamp must pass through the top of the enclosure and press onto the terminal strip labelled ‘Alarm Lamp'.

ENCLOSURE MOUNTING PROCEDURE

WALL MOUNTING

Using the four stainless steel mounting bracket and screws provided, attach the four brackets to the rear of the enclosure. The enclosure may then be mounted to the wall through the brackets using a fixing device appropriate for the wall material. Stainless steel self tapping screws are suitable for weatherboards or fibrous cement sheeting. Brick and concrete walls will require nylon wall plugs or similar.

The enclosure must be mounted at a height and location suitable for access by the installer and maintenance staff. This means that the underside of the enclosure should be between 1.2 and 1.5 metres from the ground, with 1.3 metres being optimal. It should also be a minimum of 0.5 metres from the nearest corner of a building to minimise the hazard potential for passing foot traffic. Some thought should also be given to visibility so that alarm conditions may be observed by the client.

Where there is no convenient access to the wall of a building, the enclosure may be post mounted. A metal frame with at least two galvanised steel supports into the ground, will provide a suitable alternative to wall mounting. When post mounting is used consideration must be given to the proximity of vehicular traffic to prevent vehicles from striking the enclosure.

IMPORTANT!

When drilling holes In the enclosure for conduit & cable entry care must be taken to ensure that the circuit board is not damaged in the process. Some hole saws may extend into the enclosure at the point where drilling breakthrough occurs and damage the circuit board or its components.

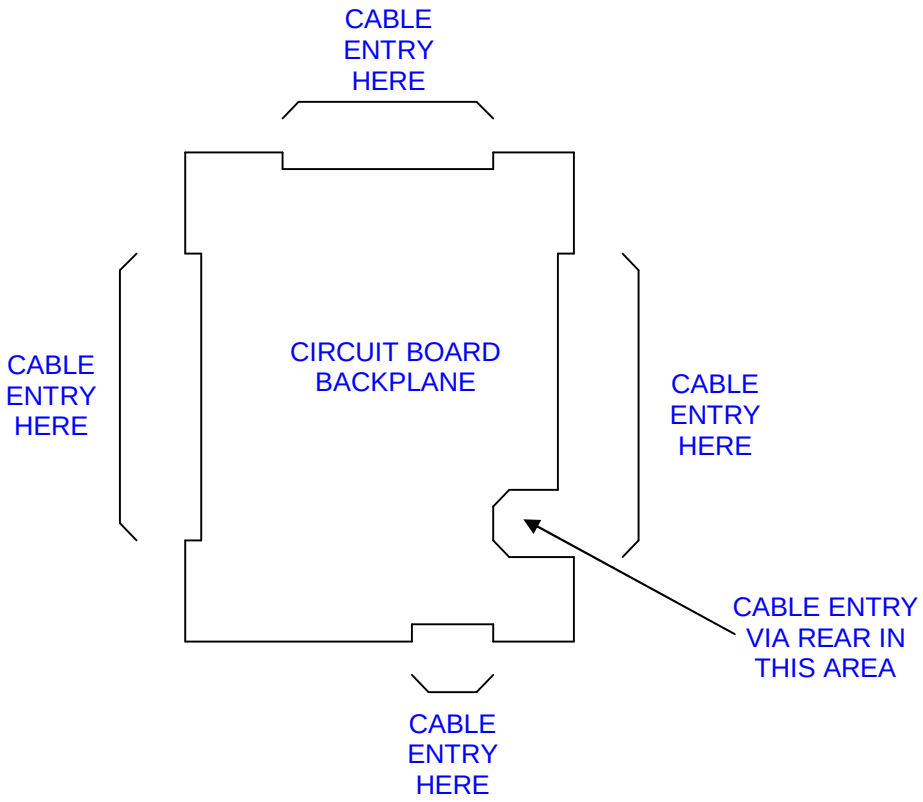
It is possible to unscrew and remove the pcb backplane from the enclosure during the drilling process and re-mount it after the conduits and cables are in place. If this is done then care must be taken to ensure that the Alarm Lamp, Alarm Buzzer and Mute Switch connectors are removed and replaced from the corresponding PCB terminals. The four screws that hold the circuit board to the rear of the enclosure are best removed and replaced with a magnetised screwdriver as fingertip access is limited. An alternative is to place a small amount of ‘Blue Tack’

gum or similar, on the end of the screwdriver to hold the screw while reinserting it through the circuit board.

CABLE/CONDUIT ENTRY

The SM96/SM97 Pump Control Unit is normally wall mounted on the exterior of a building. External connections from the electrical supply, level sensors and pump motor are normally cabled to the unit on the outside of the wall in suitably rated conduits and connect to the enclosure via cable glands. Alternately, cable entry may be achieved by through the rear of the enclosure in the designated cable entry position.

A rebate in the circuit board backplane has been provided to allow the nuts to be fitted to cable glands. A cut-out area on the lower right of the backplane allows for cable entry through the rear of the enclosure. Refer to the figure below to determine the optimal cable/conduit entry points.



ELECTRICAL CONNECTIONS

There are three electrical connections that must be made to the SM96 Pump Control unit. There is the 240VAC supply cable, the Pump Motor cable and a sensor cable to the tank level switches. The SM97 has an additional Pump Motor cable.

The 240VAC Supply cable must be suitably rated for fixed power installations. For most installations 2.5sq mm conductors are sufficient, but cable runs greater than 40 metres may need to be upgraded to 4 sq. mm cable. The cable should be run directly from the power distribution cabinet and not from the nearest available electrical outlet. An isolation circuit breaker rated at 20Amps should be fitted to the power distribution board to protect the wiring to the Pump controller.

The 240VAC supply cable terminates within the Pump Controller enclosure at the screw terminal strip labelled **240V Supply.** The Active Neutral and Earth conductors must be securely

fastened to the corresponding terminals at this point. The integrity of the earth connection should be tested before applying power to the Pump Control unit.

The cable feeding the pump unit should support four conductors. Where cable runs to the pump are greater than 40 metres, 4 sq. mm cable should be used. The four conductors are Active (Start winding), Active (Run winding), Neutral and Earth.

The pump power cable terminates within the Pump Controller enclosure at the screw terminal strip labelled **To Motor.** The Start, Run, Neutral and Earth conductors must be securely fastened to the corresponding terminals at this point. The integrity of the earth connection should be tested before applying power to the Pump unit.

The cable that connects the water level probes to the Pump Control unit requires four conductors. Level Low probe, Level Mid probe, Level High probe and a 'common' conductor. The electrical potential in this cable is classified as 'Extra Low Voltage' and is typically less than 5V D.C. Here the conductor size is not critical, but the cable sheath must be suitably robust for harsh outdoor environments. The sensors function by measuring electrical conductivity through the effluent between the three sensor probes and a common probe.

Where Float switches are available in lieu of conductivity probes, as may be the case where an existing installation is being upgraded to use the SM96 Controller, they may be connected to the three sensor inputs with respect to the common. The Float Switch contacts would need to be **Open Circuit** when dry and **Closed Circuit** when submersed.

The Water Level Probe cable terminates within the Pump Controller enclosure at the screw terminal strip labelled **Level Sensors.** The Low, Mid High and Common conductors must be securely fastened to the corresponding terminals at this point.

NOTE: Should the **Level Low** and **Level High** probes or wires be transposed in error, this will be detected as a fault condition by the controller when the tank first fills with water & effluent. The Alarm Lamp and buzzer will produce a triple flash/buzz every four seconds whenever the Level High probe is submersed while the Level Low probe remains dry.

GENERAL OPERATION

When power is first applied to the panel the Alarm buzzer will sound for one second. This is a part of a normal start up sequence. Note that immediately following this start up sequence the controller will attempt to monitor the level probes and respond accordingly. If no probes are connected a **Level Low** alarm will be triggered.

Also note that an internal counter/timer is reset whenever the mains power is interrupted so that the internal Data Log facility will be aware of how many hours/days have transpired since the unit was last powered up.

ALARMS

There are three alarms that can be generated by the Alarm Lamp and Alarm Buzzer. A five second delay is built into the response time of all probes to prevent false triggering by splashes of water and electrical transients.

1. A slow flash (one burst every four seconds) indicates that the water levels in the tank are low. Specifically this means that the **Level Low** probe has no conductivity path to the **Common** probe. This is also the case where no probes are connected to the controller. During a **Level Low** alarm condition the motor is halted and inhibited from any operation.

2. A Double Flash (two bursts every four seconds) indicates that the water levels in the tank are too high. Specifically this means that both the **Level Low** *and* **Level High** probes both have a conductivity path to the Common probe.

In this state the controller forces the pump **on** until the level high condition ceases. It would indicate that (A.) The pump has failed to operate and the tank is at risk of an overflow.
(B.) The Mid Level probe is defective. (C.) The tank has is filling at a rate greater than the normal pumping rate and the tank levels have slowly risen.

3. A Triple flash (three bursts every four seconds) indicates that the **Level High** and **Level Low** probes are probably transposed during wiring. This means that the controller has sensed that the Level Low probe is dry while the Level High probe is submerged. This is an unusual state and would not normally occur after installation unless the Low probe is defective and the water levels in the tank are high.

   Pressing the **Alarm Mute** button on the underside of the enclosure will force the **Alarm Buzzer OFF** for the next six hours. The **Alarm Lamp** is unaffected by this button.

MOTOR JOG

The button protruding from the protective safety barrier labelled **Jog Motor** is a test function for motor integrity. To avoid accidental operation of the Jog feature, this button will need to be pressed for a full second before the controller will respond.

When pressed, the **START** contactor will engage for two seconds, and the **RUN** contactor will engage for 20 seconds. Note that this function is disabled if the Level Low probe has not detected the presence of water within the tank. This is to ensure that the pump motor will not be damaged by operating while not submersed.

HOUR METER (ELECTROMECHANICAL)

An electromechanical Hour meter (optional) on the circuit board counts the hours of operation of the pump since the last time it was reset. The counter may be reset by pressing the button on the front of the counter. (a small cable tie may be placed through a hole in this button to prevent unwarranted resets of the pump timer.) Its principle function is to provide an indication of the work performed by the pump.

Note that the internal data log feature also counts hours/minutes of pump operation, but this information may only be retrieved with the use of a PC Laptop running the SM96 TERM software package and infrared probe.

NORMAL PUMP CYCLE OPERATION

Under normal conditions, **Level Low** probe is always submerged, and the **Level High** probe is always dry. Whenever the **Mid Level** probe is submerged, the pump will be activated. It will remain activated until the **Mid Level** probe becomes dry again and has remained dry for ‘XX’ seconds. (where ‘XX’ is a time delay in seconds consistent with the capacity of the tank) Typically, this means that when the **Mid Level** probe is pumped dry, the pump will continue to operate until the level is just a little above the **Level Low** probe. This would take 2-4 minutes for most installations. Note that the ‘XX’ time delay is adjustable by implementing a tank ‘Learn’ mode. (detailed next page) Where a portable PC is available with a working copy of the SM96 TERM software, the actual pump time can be read from the display, along with the number of complete pump cycles and other alarm information.

STORING A USER-SELECTABLE PUMP DELAY TIME

Both the SM96 and SM97 have a pump delay time preset in the factory. This is the time that the pump will operate after the MID level probe has first gone dry. The time delay should be such that the pump will take the tank level down to a short distance before the normally immersed LOW probe is exposed.

If during a normal pump cycle, the LOW probe *is* exposed, this could be because the MID probe was set too low in the tank, or the LOW probe was not set deep enough in the tank, or even that the tank capacity is too small for the standard time delay.

Another problem may occur where a bigger than normal tank is used, the standard pumping time may not be *long enough* to fully utilise the tank capacity.

Either way, the standard pumping time should be overridden with a customised pumping time. This is a learning process where the controller performs an extended pump cycle and learns the optimum time value for the current pump, tank and probe positions.

Follow these steps to set a new pump delay period.

1. Setup the LOW, MID, and HIGH probes to the desired positions within the tank.

2. Slowly fill the tank with water until the MID probe JUST GETS WET, then turn off the water. A standard pump cycle should automatically commence and the level should begin to fall.

3. Within **ten seconds** of the pump cycle commencing, **press and hold** the MOTOR JOG button (on the controller panel) for **six consecutive seconds**. When the Alarm Lamp comes on with a continuous glow, remove your finger from the button, the LEARN mode has just been activated.

4. There is nothing more for the operator to do. The pump will continue until the LOW probe is eventually exposed. The pump will halt and the slow flash LEVEL LOW alarm will be activated. The alarm may now be stopped by letting a little water back into the tank until the LOW probe is covered again.

What just happened is that the controller measured the pumping time from when the MID probe went dry until the LOW probe went dry (rounded to the nearest ten second period). The unit then subtracted 20 seconds of pumping time from this period and stored this new value into the permanent memory of the controller. It will use this new pumping time thereafter.

The new pump time can be tested by letting more water into the tank and commencing a normal cycle. If all is well, the pump should stop with the level a short distance from activating the LEVEL LOW probe. If a portable PC is available, a standard download sequence with the SM96TERM software package will show on the screen exactly what the revised pumping time has become.

Should the result be unsatisfactory, the LEARN mode may be engaged several times until the desired pump delay is achieved.

TEST PROCEDURE

To check for correct operation of the pump controller, power is applied and the unit must successfully manage a normal pump cycle. In addition, the Level Low and Level High alarm conditions must be simulated to confirm the integrity of all probes.

Note that with all level measurements, the SM96/SM97 control unit will wait for five seconds of stable conditions before responding to changes.

The starting position for these tests assumes that the pump motor is installed and the three probes are in position in the tank. The **Level Low** probe is to be submerged with some fresh water. The **Level Mid** and **Level High** probes are to be exposed (dry).

STEP	ACTION	RESULT
1	Apply power to the panel. • circuit breaker in distribution board ON • Earth leakage breaker in enclosure ON • Reset the Electromechanical hour meter (if fitted)	• Alarm buzzer beeps for one second. • The **+5V** led lamp should be **ON** • All other lamps should be **OFF**
2	Press the **TEST** button on the Earth Leakage circuit breaker	• Circuit breaker should release • **+5V** lamp should be extinguished.
3	Restore the Earth Leakage breaker to the ON position.	• Alarm buzzer beeps for one second. • The **+5V** led lamp should be **ON** • All other lamps should be **OFF**
4	Wait 5 seconds for probe settling time	Both contactors should remain **OFF.** If a motor start sequence commences it means that the Level Low probe is not submerged or the wiring to the probes is open.
5	Test the **Jog Motor** feature: Press the **Jog Motor** button for one second.	Both contactors should operate, the **Start** (left hand) contactor should release after two seconds. The pump should continue to operate for **20 seconds** then halt.
6	Expose the **Level Low** probe to the air. (This may be done by removing some water from the tank or simulated by lifting the probe assembly out of the water briefly.)	A **Level Low** alarm condition should be generated. (slow flash every 4 seconds)
7	Restore the **Level Low** probe to below the water line in the tank.	The **Level Low** alarm should cease.
8	Add water to the tank until **the Level Mid** probe is submerged,	• Both contactors should operate, the **Start** (left hand) contactor should release after two seconds. The pump should now be reducing the water level. • When the **Level Mid** probe is exposed, the motor should continue for 4½ to 5 min, then halt. (time may vary with pump capacity and tank size) When the pump stops, the tank level should be approx 50mm *above* the **Level Low** probe. (if the Level Low probe becomes exposed, tripping an alarm, then probe spacing is incorrect, or tank/pump size does not match pump times in present software version.

9	Assuming Step 7 was successful, briefly disconnect the wire that comes from the Level Mid probe and add water until the Level High probe is submerged. (this will simulate a Level Mid probe failure)	• A **Level High** alarm should commence. • The pump should operate until **the Level High** probe is exposed once more • The **Level High** alarm should then cease.
10	Test the **Send Data** button: Press the **Send Data** button for one second	• The buzzer should sound and **the Send Data** LED lamp should go on for One Second. (a copy of the internal data log has just been sent via the infrared LED next to the Send Data LED lamp.)
11	Check the electromechanical hour meter (if fitted)	The meter should have moved beyond 0.0 hours with pump activity during tests
12	Test the Alarm Mute feature: Activate a Level Low alarm by briefly disconnecting the Level Low probe, or by lifting the probe out of the water	When the alarm lamp flashes and the alarm buzzer sounds, press the Alarm Mute switch. The buzzer should stop sounding while the lamp continues to flash. The alarm will remain muted until 6 hours have passed or until 240V mains have been interrupted.
	TESTS COMPLETE	

ADDITIONAL TESTS FOR SM97 DUAL PUMP SYSTEM

STEP	ACTION	RESULT
1	Test the Alternating of pumps feature: Activate a pump cycle by adding water until the MID probe is submerged.	Observe which pump contactor is presently active for this cycle.
2	Commence a *second* pump cycle by adding water until the MID probe is submerged once more.	The alternate contactor should now be active.
3	Temporarily isolate the first pump to operate. (by unplugging the pump) Then perform another start sequence by adding water until the MID probe is submerged.	The pump should attempt to operate. After 2 minutes it should give up the attempt, then restart with the alternate pump.
4	Restore the pump connection, TESTS COMPLETE.	

SPECIFICATIONS

	SM96	SM97
Cabinet Height/Width/Depth	360 x 310 x 160mm	450 x 405 x 220mm
Cabinet weight	7.5 Kg	8.2.5KG
Supply Voltage	240VAC, 50Hz	240VAC, 50HZ or 415VAC 3 phase + Neutral
Supply Current	16A	Single phase:16A Three phase: 8A
Earth Leakage trip	30ma	N/A
Pump Current	13A average load current	Single phase : 13A Three Phase: 5A

EMC (C-tick) compliance	N12656
Electrical Safety compliance	CS03057V (AS3100)

WARANTY INFORMATION

A warranty period of 12 months applies to the pump control system from the date of installation. This warranty becomes void where: (A) The unit has been damaged by excessive and unreasonable impacts, or (B) Water damage has resulted from an ingress of water caused a poor cable seal (fitted by an installer), or (C) Water damage has resulted by exposure to weather where a door has not been fully closed, or (D) The controller has been used for an application other than that specified in the installation document.

The warranty implies that a repair or replacement will be given when the defective unit is returned to the supplier. The warranty does not cover delivery and handling charges, compensation for time lost, damage caused by incorrect wiring during installation, or damage to other plant and equipment at the installation site.