Logikos Pump Control System

OPERATION & MAINTENANCE MANUAL

1.0 CONTENTS

LOGIKOS PUMP CONTROL SYSTEM		**3 - 29**
1.	Liquid Level	3 - 7
2.	Digital Input	8
3.	Pump Control	9 - 13
4.	Alarms	13 - 15
5.	Running Hours and Servicing	16
6.	PLC Output	16
7.	MODBUS Interface	16 - 23
8.	Programming Menus	23 - 27
9.	Status Displays	28
10.	Power Up Scape Sequences	29
GRINDER CONTROL SYSTEM		**29 - 35**
11.	Grinder	29 - 32
12.	Grinder Maintenance / Troubleshooting	33 - 34

APPENDIX A: Warranty and Service Information

1.1 LIQUID LEVEL SOURCE

This section applies only to the gathering of information regarding the liquid level and not the use or display of the information.

The source of level information comes from one of three sources Multipoint	Nominally 10 conductivity sensors. Levels for alarms and pump start etc can be changed by selecting different inputs from the 10. Advanced setup allows the sensitivity of the inputs to be selected. LEVEL1 is lower in the tank than LEVEL10 whether tank empty or tank fill.
Individual	From 3 to 5 conductivity sensors or float switches connected to level inputs 1 to 5. The functions are given in the table below. Advanced setup allows the sensitivity of the inputs to be selected.
Analogue	A continuously variable signal proportional to the depth. Advanced Setup allows the Offset and Scale to be set. The depth in mm is Depth = Input x Scale + Offset Where Depth is depth of liquid from bottom of tank. Input is the input level scaled to 1 (i.e., 0 at 0V or 4mA and 1 at 10V or 20mA). Scale and Offset are Advanced Setup parameters.
Pressure	This setting is designed to be used in a constant pressure system. The input is a continuously variable signal from a pressure transducer. Advanced Setup allows the Offset and Scale to be set. Separate on and off setpoints can be set for both duty and standby pumps.
3 Level Probe	Designed for 3 conductivity sensors or float switches connected to level inputs 2(Stop),3(Duty) & 5(Standby). Advanced setup allows the sensitivity of the inputs to be selected. A high-level alarm is generated after a programmable delay

Functions in Individual mode.

Tank Empty		**Tank Fill**	
Input	**Function**	**Function**	**Input**
LEVEL5	High Level	High Level	LEVEL5
LEVEL4	Standby Pump Start	Pump Stop	LEVEL2
LEVEL3	Duty Pump Start	Duty Pump Start	LEVEL3
LEVEL2	Pump Stop	Standby Pump Start	LEVEL4
LEVEL1	Low Level	Low Level	LEVEL1

1.2 LIQUID LEVEL INTERPRETATION

1.2.1 Multipoint

In Multipoint mode the user selects a level input to correspond with each of the level functions. An example, may be

Tank Empty		Tank Fill	
Input	Function	Function	Input
LEVEL9	High Level	High Level	LEVEL9
LEVEL7	Standby Pump Start	Pump Stop	LEVEL7
LEVEL5	Duty Pump Start	Duty Pump Start	LEVEL3
LEVEL2	Pump Stop	Standby Pump Start	LEVEL2
LEVEL1	Low Level	Low Level	LEVEL1

1.2.2 Individual & 3 Level Probe

In Individual mode the function is fixed for each level input number. To change a level the user must move the probe.

The sensor input position / functions are different for Individual Probes mode and 3 Level Probe mode:

Function	**Individual Probes**	**3 Level Probe**
High Level	L5	Timed
Standby Pump Start **	L4	L5
Duty Pump Start	L3	L3
Pump Stop	L2	L2
Low Level	L1	N/A

** Note – in a 2 pumps system with maximum pumps set as then Standby level will cause pumps to changeover.

1.2.3 Analogue

In Analogue mode the user specifies depths for each function. An example is given in the table below. If the current is less than approximately 4mA or above approximately 20mA or the calculation would result in a tank less than empty or more than 110% full then a range error is generated. For reliable analogue sensing the unit must be set up so that the conditions will not be reached unless there is a problem. Great care is needed in deciding the calibration of the sensor and selection of the values. A fully empty tank should report a couple of % of depth and be marginally above 4mA (or below 20mA). A full tank should report about 100% and be marginally below 20mA (Or above 4mA).

Tank Empty		Tank Fill	
Input	Function	Function	Input
2400mm	High Level	High Level	2400mm
2000mm	Standby Pump Start	Pump Stop	2000mm
1800mm	Duty Pump Start	Duty Pump Start	800mm
500mm	Pump Stop	Standby Pump Start	500mm
200mm	Low Level	Low Level	200mm

If High Level is enabled in Digital I/O then LEVEL5 input is monitored. If it is found to be wet/conducting then the Level is taken to be the High Level setting. If the analogue reading was less than High level when the LEVEL5 input is wet, then a range error is also generated.

1.2.4 Making the Best of Invalid Inputs

It is possible that one or more switches or conductivity probes may fail due to fat on electrodes or debris etc. The unit has the option to generate an alarm when this occurs but will continue operation according to the scheme described below.

In both Multipoint and Individual mode the tank level is mostly taken to be that of the highest sensor that that it does not have a dry sensor immediately below. The exception is in the case of a high level being present. If a Level sensor that corresponds to a High level is wet and there is a wet sensor below it, then the level will be assumed to be no less than the High level. For this enhancement to be active in Multipoint mode, High Level must be selected in digital I/O.

Multipoint Mode

LEVEL10	Dry	Dry	Dry	Dry	Dry
LEVEL9 (High)	Dry	Dry	Dry	Dry	**Wet**
LEVEL8	Dry	Dry	Dry	Dry	**Dry**
LEVEL7	Dry	Dry	Dry	Dry	**Dry**
LEVEL6	Dry	Dry	Dry	Dry	**Dry**
LEVEL5	Dry	Dry	Dry	Wet	**Wet**
LEVEL4	Dry	Dry	Dry	Dry	**Dry**
LEVEL3	Dry	Dry	**Wet**	**Wet**	**Wet**
LEVEL2	Dry	Wet	**Wet**	**Wet**	**Wet**
LEVEL1	**Wet**	Dry	**Dry**	**Wet**	**Wet**
Level used	1	0	3	3	9
Level Sense Alarm	No	Yes	Yes	Yes	Yes

In Individual mode, above and below is according to the input position in the table below. Only those inputs that are selected are considered used

Tank Empty	Tank Fill
Function	Function
High Level	High Level
Standby Pump Start	Pump Stop
Duty Pump Start	Duty Pump Start
Pump Stop	Standby Pump Start
Low Level	Low Level

1.3 LIQUID LEVEL DISPLAY

The unit has a bar graph consisting of 10 LEDs. These display the liquid level in the tank.

1.3.1 Multipoint

In multipoint mode, each LED corresponds to a probe input and the LED is on if the probe is wet. Notionally each LED corresponds to 10% of the tank.

1.3.2 Individual

In individual mode, each input is assigned a notional percentage of tank height for the purposes of display. Each LED on the bar graph represents 10%. The notional percentages are

Tank Empty		Tank Fill	
Level	Function	Function	Input
80 to 100%	High Level	High Level	100%
60 to 70%	Standby Pump Start	Pump Stop	90%
40 to 50%	Duty Pump Start	Duty Pump Start	60 to 70%
30%	Pump Stop	Standby Pump Start	40 to 50%
10%	Low Level	Low Level	10 to 30%

In Tank Empty mode, when Standby pump start is not used, the High level input represents 60 to 100%. When Low level is not used Pump Stop input represents 10 to 30%.

In Tank Fill mode, when High Level is not present, Pump stop represents 90 and 100%. When Standby pump start is not present, Low level represents 10 to 50%

1.3.3 Analogue

In Analogue mode the LEDs come on at the points shown in the table.

Depth	Number of LEDs
up to 5%	none
5 to 15%	1
15 to 25%	2
25 to 35%	3
35 to 45%	4
45 to 55%	5
55 to 65%	6
65 to 75%	7
75 to 85%	8
85 to 95%	9
95% and above	10

The percentage is of the total tank depth not of the input signal range. For this reason the tank depth is required as part of the level setup.

1.3.4 Constant Pressure

The level is set as proportion of pressure between the high and low alarm level set points.

1.3.5 Individual & 3 Level Probe

In individual mode, each input is assigned a notional percentage of tank height for the purposes of display. Each LED on the bar graph represents 10%. The notional percentages are

Tank Empty		Tank Fill	
Level	Function	Function	Input
100%	High Level (Timed)	High Level	N/A
75%	Standby Pump Start	Pump Stop	75%
50%	Duty Pump Start	Duty Pump Start	50%
30%	Pump Stop	Standby Pump Start	30%
N/A	Low Level	Low Level (Timed)	0%

2 DIGITAL INPUTS

The Advanced Programming mode allows the operator to determine how various inputs are interpreted. For most digital inputs the operator can select if an input is active when the connected contact is closed (active low), when the connected contact is open (active high) or not used at all.

The inputs that may be configured for each pump are

Thermal	Motor Over temperature input
Overload	Overload on motor input
Pressure	Pressure input
No Flow	No Flow input
Seal	The seal leaking (Conductivity sensing. Selectable 3K, 20k, 50k, 100k and Active when wet).

The phase detects inputs may be configured as being used or not being used. In single phase systems this must be selected to deactive.

High level and Low level inputs may be selected as being present or not. Low level is always active dry and high level is always active wet.

3 PUMP CONTROL

3.1 NAMES AND PARAMETERS

The control algorithm for pump operation has the following controlling switch parameters which are stored in EEROM and can be changed in Advanced Programming mode.

TankEmpty	If true the objective of the algorithm is to keep the tank level low (empty)
TankFill	Not TankEmpty
OnePump	If true there is only one pump in the system
DualPump	If true two pumps may operate concurrently

The control algorithms described below uses the following terminology for inputs, output and internal states.

The two physical pumps are Pump1 and Pump2. At power up Pump1 is the Duty Pump and Pump2 is the Standby Pump.

Under Pump is true when the High Level is wet and Tank Empty. Under pump is true when Low Level is dry and Tank Fill.

Level Stop is true if the stop level is dry and the mode is Tank Empty. Level stop is true if the stop level is wet and the mode is Tank Fill.

Level Duty is true if the duty pump start level is wet and the mode is Tank Empty. Level Duty is true if the duty pump start level is dry and the mode Tank Fill.

Level Standby is true if the Standby pump start level is wet and the mode is Tank Empty. Level Standby is true if the Standby pump start level is dry and the mode Tank Fill.

3.2 THE HIGH LEVEL CONTROL ALGORITHM

This control algorithm determines which pumps should be on and off to perform the overall function of the controller. Turning pumps off when there is a fault and manual pump control is discussed in The Low Level Control Algorithm and Manual Control.

The following control algorithm is used in One Pump systems.

If LevelStop
    If Pump1 is in Auto mode Pump1 is switched off
    If Pump2 is in Auto mode Pump2 is switched off
    Swapped is reset
Each time Level stop is newly reached the Duty Pump is toggled
If LevelDuty
    If Pump1 is Duty Pump
        If Pump1 is not bypassed and not faulted then Pump1 is turned on.
        If Pump1 is faulted or bypassed Duty Pump is swapped.
    If Pump2 is Duty Pump

If Pump2 is not bypassed and not faulted then Pump2 is turned on.
If Pump2 is faulted or bypassed Duty Pump is swapped.
IF NO PUMPS ARE UNFAULTED AND UNBYPASSED A NO PUMP ALARM IS CREATED

If LevelStandby and DualPump
If Pump1 is not bypassed and not faulted then Pump1 is turned on.
If Pump2 is not bypassed and not faulted then Pump2 is turned on.
If UnderPump and not DualPump mode and not Swapped and both pumps are in auto then
Swapped is set
DutyPump is swapped
Both pumps are turned off (the new duty pump is turned on elsewhere)

3.3 THE LOW LEVEL CONTROL ALGORITHM

When manual control or the High Level Control Algorithm requires a pump to be on then the following must be met before it is turned on.

- There must be no pre-existing fault of the pump.
- The pump must not be in manual override.
- The current state of the fault inputs must all be OK – this includes the power supply being OK if selected. The flow input is special in that it checked continuously after Flow Delay time since the pump was last turned on. If the Fault inputs are not OK a fault is recorded for the pump.
- The Pump Restart Delay must have elapsed since the last time this pump was started. This does not generate a fault, only delay the starting of the pump. When a pump is started in this section a start is recorded in the history.

Pump faults are cleared in the following way

- Removing and Re applying power clears pump faults for both pumps Pressing the pump button clears the pump for which the button is associated Pressing Alarm Reset clears pump faults for both pumps.

3.4 MANUAL CONTROL

When the pump is in AUTO mode and the pump button is short pressed the pump switches to manual OFF.

When in manual off mode and the button is short pressed the pump reverts back to AUTO mode.

A long press of the pump button will cause the pump to enter MANUAL on.

In Manual override the pump will stay on until the HIGH level is reached.

Auto is available if the pump is not currently faulted.

Manual OFF is always available, and the pump will remain in Manual OFF indefinitely, even if power is removed and restored.

MANUAL On is available when all of the following are met

- The pump has no current fault. (pressing the pump button clears any previous faults)
- Not level stop
- In systems that are not OnePump and not DualPump and the other pump is not on

If a fault occurs or HIGH level occurs during MANUAL on the pump is moved to Manual OFF.

A short press during MANUAL On reverts to manual OFF.

If the pump is in MANUAL on and pump is running then the MANUAL LED is slow pulsing otherwise if the pump is not running then the LED is constant on.

If the power is removed and reapplied during any manual mode the pump will be in Bypass when power is restored.

3.5 CONSTANT PRESSURE CONTROL

Constant pressure control is set by setting the level source to "PRESSURE" mode. (Mode=4), in the ADVANCED MENUs.

The level input is sensed at the analog input to which is connected to a pressure transducer.

This may be as either (a) Constant Current input (4-20mA) or (b) Constant voltage 0-10VDc.

Note – the link on the D1237 module are used to select the input transducer type.

The analog input is sampled at a 32msec rate and then digital filtering is applied (Time Constant 256msec).

The LOAD DEFAULTS MENU allows selection for 1 or 2 pumps in constant pressure control mode.

The defaults are set for a 10BAR, 4-20mA pressure transducer.

The sensor span and offset parameters can be adjusted to suit the sensor.

One or two pump operation can be selected in the CONFIGURATION MENUS.

With two pump operation the selected duty pump alternates with each restart after BOTH pumps are off.

The duty and standby on and off setpoints can be individually set for each pump.

This is accessed through the USER MENUs

This means that can have the duty pump on as pressure reduces down to low setpoint, or can have the standby continue down to low setpoint, with duty pump stopping first.

Duty and Standby pump control work as in tank fill (low pressure==pumps on, high pressure==pumps off) according to 5.2 and 5.3 above.

High and low alarm threshold can also be set.

These operate to generate alarms according to normal pump operation.

The maximum duty and pump restart period may be used as for normal pump operation.

Pump re-start period is timed from the last pump startup and can be used to prevent pump damage due to constant short-cycling of the pump.

Each pump has a separate pump-restart timer.

The LED level indicator bar operation shows the pressure level as proportion of pressure between the high and low alarm level set points.

ALARMS generally operate according to Section 6.

MANUAL override is not possible.

On power up a 200 second delay is applied for to the low pressure cutout to allow time for pressure to build up. A 10 second delay is also applied to low pressure cutout during normal operation to allow for short transient drops in pressure.

3.6 PUMP LEDs

The Auto pump LED

is on steady when the pump is in Auto mode and not running

is flashing when the pump is in Auto mode and is running

The Bypass, LED

Is on when the pump is in Bypass (manual off).

The Manual LED

Is on steady when the pump is on but subject to faults and Level Stop

Flashes when the pump is on because it is manual override and will not stop because of faults or Level Stop.

3.7 MAXIMUM OFF TIME

In advanced setup a maximum off time can be set. The level is such that it is between stop and duty and no pump is on for more that the maximum off time then the unit will function as if though a momentary input on the duty level was received. Setting maximum off time to 0 disables this feature.

3.8 MAXIMUM DUTY

In advanced setups Maximum Duty time can be set. Maximum duty time is used to prevent the bearings from burning out. Operation is explained from the perspective of tank empty - If start is dry and stop is wet for more than the maximum duty time a pump stop is created. No alarm or warning is generated. This effectively ends an Excess Run period because no pump is running. Setting this parameter to 0 disables the feature.

3.9 PUMPS TIMEOUT IN MANUAL MODE

This parameter sets the maximum time (0 to 3600 Second) that each of the pumps will remain in Manual Mode. In any case the pumps are switched off when level reaches the Stop Level.

3.10 EXTERNAL INPUT

The external digital input function has a number of flexible options which can be set in the Digital I/O menu.
The external input can be set to Pause or External Fault.
When set to operate as a Pause function, this will override the main pump controls and system will continue to operate in same state at time it was paused.
There is an option to allow the high level alarm to override the pause.

When set to External fault, one of 7 external fault descriptions can be set. This will appear in the alarm description on the LCD display.
An external fault condition can also be set cause 1 of 4 external functions to be activated, e.g. Alarm only, Pumps OFF, Pump Start or Pump Off and Alarm.

3.11 AUX OUTPUT

The AUX relay output can be set to 1 of 5 functions.

(1) Well Wash – output to operate a separate well washing pump
(2) PLC – basic PLC output to interconnect with other PLC equipment
(3) High Level – operates when the high level is set
(4) Mixer – output to operate a mixer funciton
(5) Link to AUXIN – operates when AUX input is active.

4. ALARMS

4.1 ALARM SOURCES

The Alarm Sources are

Alarm Name	Cause
Level Sense	The unit has an invalid state on the level sensing inputs (such as a wet point above a dry point and it has existed for over a minute)
No Pumps	Control algorithm needs a pump to be running but none is available due to fault or manual bypass
Low Level	If the low level point is dry this alarm is generated (must be enabled under Digital I/O section to become active)
High Level	If the high level point is wet this alarm is generated (must be enabled under Digital I/O section to become active)
Power	Power had a phase fail or a under pumping condition was detected soon after power up – which is most often caused when recovering from a power failure. This feature must be enabled under Digital I/O section to become
Service	The run time on a pump exceeds the next service setting
External Fault	External (AUX) input is active. This alarm has 3 programmable functions – Alarm Only, Pumps OFF & Pump Start
Excess Run	A pump run time has exceeded the set limit without reaching stop. Strictly speaking, this alarm is exists only momentarily at the time when either pump has been required for the Excess Run Time. So if the alarm is reset while a
For Each Pump	
Seal Probe	If the seal input is wet
Thermal	If the over temperature input is active
Overload	If the overload input is active.
Pressure	If the pressure input is active.

No Flow	If the No Flow input is active and the pump has been running for more than Flow Delay time.

4.2 ALARM TYPES

An Alarm can be one of 4 types. These are

ALARM TYPE	DISPLAY	FAULT LED ACTIVATED	NON-CRITICAL FAULT RELAY ACTIVED	CRITICAL FAULT RELAY ACTIVATED	ALARM RELAY AND SOUNDER ACTIVATED
DISPLAY ONLY	YES	YES	NO	NO	NO
LOCAL	YES	YES	YES	NO	YES
NON-CRITICAL	YES	YES	YES	NO	NO
CRITICAL & LOCAL	YES	YES	NO	YES	YES

This means that an alarm is never off. At the least it will show on the display, the fault LED and the non-critical relay.

4.3 RESETTING AND MUTING ALARMS

Pressing the Mute button will cause the external sounder to be deactivated until a new alarm occurs.

Pressing the Alarm Reset button will do the same as pressing the Mute button plus also cause all new alarms that are no longer present to be moved to previous alarms and then cleared. Only those alarms that are no longer present will be cleared. For this reason it is best to use the Mute button to silence the alarm response. Alarm Reset also clears any motor faults.

There is an option to auto mute alarms after a certain period of time. This time is in advanced setup. If set to 0 there is not auto mute.

4.4 AUTO RESETTING ALARMS

4.4.1 The method of auto resetting alarms

Some alarms are cleared when a satisfactory recovery state has been identified. When cleared, they are moved from "new" to "previous" and the sounder and alarm outputs are deactivated. Auto resetting alarms will only auto reset if they will clear all of the currently active alarms. So for example, if a Level sensing alarm occurred that led to a high level fault and the Level sensing alarm rectified itself the Level Sensing alarm is not cleared until the high level alarm is also rectified (pumping down to stop).

4.4.2 The individual Auto Resetting alarms

- In tank empty mode if the stop point is wet any low level alarm will be cleared automatically.
- In tank fill mode if the stop point is dry any high level alarm will be cleared automatically.
- In tank empty mode if the duty pump start point is dry any high level alarm will be cleared automatically

if the Level Alarm Auto Reset option is selected.

- In tank fill mode if the duty pump start point is wet any low level alarm will be cleared automatically if the Level Alarm Auto Reset option is selected.
- If a level sense error disappears its alarm will be cleared automatically
- If a no pump error disappears its alarm will be cleared automatically.

4.5 POWER UP WITH HIGH LEVEL ALARM PRESENT

Software versions prior to Version 4.0 would also set the Power Alarm when powered up with the High Level alarm present.
This has been removed in Versions 4.0 and later.

4.6 HIGH LEVEL ALARM PAUSE OVERIDE

Version 4.1 includes an option in Digital I/O settings to allow a high-level alarm to override the system Pause function.
If the 'Overrides Pause' option is enabled and if the high-level alarm becomes active then the pumps are started.
The pumps will run until the high level alarm condition is cleared (e.g. tank level drops below the high level threshold)

5 RUNNING HOURS AND SERVICING

The unit accrues counts of certain events and operating times of the pumps. These counts may be cleared in the Advanced Programming menu. The menu allows for each count to be cleared separately.

The unit allows for a next service to be scheduled for each pump. The hours to next service are displayed in the status display and an alarm may be set for pumps that have exceeded their service interval.

5.1 PUMP RUNNING HOURS

The unit accrues the minutes for which each pump is running. At the end of each minute the value is updated in non-volatile memory. Power failures cause the partly accrued minute to be lost. When pump run time is displayed, it is displayed as hours and minutes. The maximum pump run time accrued of 32000 hours.

5.2 PUMP STARTS

Every time a pump is started the pumps start count in non-volatile memory is updated. Manual Override starts are not counted.

6 PLC OUTPUT

The unit can be set to transmit a serial data stream giving the liquid level. See PLC_OUT.PDF.

The output is produced every 3 minutes if enabled in advanced programming.

Well wash, High Level output and PLC output are mutually exclusive as they share the same electrical connections.

7 MODBUS INTERFACE

The unit provides a basic Modbus interface.
The following features are available.
DATA CONNECTION

- Asynchronous
- CMOS Logic Level (0 – 5V) (See **Note below)
- Speed - 9600 Bps Fixed
- Data Bits - 8
- Parity – Even
- Stop Bits – 1

MODBUS ADDRESS

- Default Address = 5
- Configured via front Panel Menus
- Note – The Modbus feature is disabled by default and must be enabled via the front panel menus

MODBUS COMMANDS:

- 3 - Read Holding Registers
- 6 – Write Single Register
- 8 – Diagnostics Command
- 16 – Write Multiple Registers

7.1 NOTES ON SERIAL PORT INTERFACING

This interface is compatible with many RS232 Driver ICs but is operating with a reduced noise margin and reduced output drive impedance.

As a general rule cable distance should be limited to <2metres and cables kept at least 100mm distance from other high voltage or high current cables.
Shielding should be considered if these limits are compromised.

Connected devices should have an isolated signal reference otherwise grounding noise could cause problems.

The interface has limited protection against high voltage or current surge.

This interface should be pre-tested and verified in the actual working environment.

7.2 MODBUS REGISTER DESCRIPTIONS:

Notes for reading these tables:-

Generally the registers are 16bit integer number representation, with the following exceptions.
(1) Split as 2x 8 bit numbers – shown as Byte0 & Byte1
(2) Combined – where 2x 16 bit registers are combined to form a 32 bit number
These are shown as "Register Name- A" and "Register Name – B"
(3) Bitmapped – where the bit locations are shown as B0, B1, B2 , etc

The R/W field shows if the register is Read Only (R), or Read & Write (R/W)

7.2.1 Stored Parameters

REGISTER NUMBER	DESCRIPTION	R/W
0	User Pin	R/W
1	Modbus Address	R/W
2	ID Low	R/W
3	ID High	R/W
4	Level Source	R/W
5	Level Sensitivity	R/W
6	Level Offset	R/W
7	Level Scale	R/W
8	Level Maximum Depth	R/W
9	Well wash Period	R/W
10	Auto Mute Delay	R/W
11	Maximum Off Time	R/W
12	Well wash Cycles	R/W
13	Main Control Flags (Bitmapped) B0 – Tank Empty B1 – One Pump B2 – Dual Pump B3 - Flash Alarm B4 – PLC Output B5 – Model (0=Non Plus, 1=Plus) B6 – Seal Lockout B7 – Underpump Auto Reset B8-15 - Spare	R/W
14	Main Control Flags 2 (Bitmapped) B0, B1, B2 – External Function B3 – High Level Out B4– Pause Enabled B5,6,7 - External Fault Type B8 – Mixer Out B8 – 15 - Spare	R/W
15	Digital Active Flags 1 (Bitmapped) B0 – No Flow 1 B1 – No Flow 2 B2 – Pressure 1 B3 – Pressure 2 B4 – Overload 1 B5 – Overload 2	R/W

	B6 – Thermal 1 B7 – Thermal 2 D8-15 - Spare	
16	Digital Active Flags 2 (Bitmapped) B0 – Seal 1 B1 – Seal 2 B2 - Phase B3,4 – High Level B5 – Low Level B6-15 - Spare	R/W
17	Digital Polarity Flags (Bitmapped) B0 – No Flow 1 B1 – No Flow 2 B2 – Pressure 1 B3 – Pressure 2 B4 – Overload 1 B5 – Overload 2 B6 – Thermal 1 B7 – Thermal 2	R/W
18	Main Control Flags 3 (Bitmapped) B0– Main Control – Modbus Enabled B1 - High_overides_pause B2-15 - Spare	R/W
19	Alarm Critical Flags A B0 – Thermal 1 B1 – Thermal 2 B2 – Overload 1 B3 – Overload 2 B4 – Pressure 1 B5 – Pressure 2 B6 – No Flow 1 B7 – No Flow 2 B8 – Seal 1 B9 – Seal 2 B10 – Level Sense B11 – Low Level B12 – Hi Level B13 - Power B14 – No Pumps B15 - Service	R/W
20	Alarm Critical Flags B B0 – Excess Run B1 – Aux B2-15 - Spare	R/W
21	Alarm Enable Flags A B0 – Thermal 1 B1 – Thermal 2 B2 – Overload 1 B3 – Overload 2 B4 – Pressure 1 B5 – Pressure 2 B6 – No Flow 1 B7 – No Flow 2 B8 – Seal 1 B9 – Seal 2	R/W

	B10 – Level Sense B11 – Low Level B12 – Hi Level B13 - Power B14 – No Pumps B15 - Service	
22	Alarm Enable Flags B B0 – Excess Run B1 – Aux B1 – Aux B2-15 – Spare	R/W
23	Excess Run Period	R/W
24	High Level Alarm Delay	R/W
25	Maximum Duty	R/W
26	High Level Alarm Time	R/W
27	Pump Flow Period	R/W
28	Restart Period	R/W
29	High Setpoint	R/W
30	Standby Setpoint	R/W
31	Duty Setpoint	R/W
32	Stop Setpoint	R/W
33	Low Setpoint	R/W
34	High Setpoint (mm)	R/W
35	Standby Setpoint (mm)	R/W
36	Duty Setpoint (mm)	R/W
37	Stop Setpoint (mm)	R/W
38	Low Setpoint (mm)	R/W
39	Next Service 1	R/W
40	Next Service 2	R/W
41	Pressure Duty Setpoint	R/W
42	Pressure Duty Off Setpoint	R/W
43	Pressure Standby Setpoint	R/W
44	Pressure Standby Off Setpoint	R/W
45	Pressure High Setpoint	R/W
46	Pressure Low Setpoint	R/W
47	Pressure Sensor Zero	R/W
48	Pressure Sensor Span	R/W
49	Pump Run on Time (Secs)	R/W
50	Manual_Max_Time (Hrs)	R/W
51	Seal Threshold	R/W

7.2.2 History Records

NUMBER	DESCRIPTION	R/W
100	Alarm Current -A	R
101	Alarm Current -B	R
102	Alarm Previous 1 -A	R
103	Alarm Previous 1 -B	R
104	Alarm Previous 2 -A	R
105	Alarm Previous 2 -B	R
106	Alarm Previous 3 -A	R
107	Alarm Previous 3 -B	R

108	Alarm Previous 4 -A	R
109	Alarm Previous 4 -B	R
110	Alarm Previous 5 -A	R
111	Alarm Previous 5 -B	R
112	Alarm Previous 6 -A	R
113	Alarm Previous 6 -B	R
114	Alarm Previous 7 -A	R
115	Alarm Previous 7 -B	R
116	Alarm Previous 8 -A	R
117	Alarm Previous 8 -B	R
118	Alarm Previous 9 -A	R
119	Alarm Previous 9 -B	R
120	Pump Starts 1	R
121	Pump Starts 2	R
122	Pump Hours 1	R
123	Pump Hours 2	R
124	Byte0 - Pump Mins 1 Byte1 - Pump Mins 2	R
125	Pump Manual B0 – Pump 1 B1 – Pump 2	R

7.2.3 Diagnostics

REGISTER NUMBER	DESCRIPTION	R/W
150	Software Version	R
151	max_off_time_count1	R
152	max_off_time_count2	R
153	Pump 1 Restart Timer	R
154	Pump 2 Restart Timer	R
155	Pump Max Duty Timer	R
156	Power Hours	R
157	Power Minutes	R
158	Pump Run on Timer	R

7.2.4 System Status

REGISTER NUMBER	DESCRIPTION	R/W
200	Pump Flags – A B0 – One Wanted B1 – Dual Wanted B2 - Swapped B3 - Duty B4 – Fault 1 B5 – Fault 2 B6 – Available 1 B7 – Available 2 B8 – Manual Override 1 B9 – Manual Override 2 B10 – No Flow 1 B11 – No Flow 2	R

	B12 – Required 1 B13 – Required 2 B14 – Power Fault B15 – Level Stop One-shot	
201	Pump Flags – B B0 – Max Off Time Timeout B1 – Pump 1 On B2 – Pump 2 On	R
202	Level Flags –A B0 – Calibration Fault B1 – Missed Sensor Fault B2 – Range Fault B3 – Seal 1 B4 – Seal 2 B5 – Seal Normalised 1 B6 – Seal Normalised 2 B7 – High Wet B8 – Standby Wet B9 – Duty Wet B10 – Stop Wet B11 – Low Wet B12 B13 B14	R
203	Level Flags – B (Not Allocated)	R
204	Level - Current	R
205	Level – Analog Raw	R
206	Level – Pressure	R
207	Alarms Present – A (Refer bitmapped fields Register 19)	R
208	Alarms Present – B (Refer bitmapped fields Register 20)	R
209	u14_normalised.byte	R
210	u14_data.byte	R
212	u19_data.byte	R

7.3 UPDATING PARAMETER REGISTERS

Updating of the stored parameter registers can be done via the Modbus interface.

Note – This should be done with caution as changes to registers will affect the operation of the system. If this is done remotely then it will not be possible to observe the actual operational state of the system.

Changes to Registers 13 or 0 could stop the Modbus interface from functioning.

Only Registers 0 to 31 can be changed.
These are stored in EEROM and are re-loaded if the system is reset after power failure.

The values displayed via the Modbus interface are accessed through holding registers.
These holding registers are updated with a system reset.
Holding registers can be written to but do not affect the system operation nor are they saved unless the save holding register procedure is completed.

7.3.1 Save Holding Registers

To save the Holding (Parameter) Registers to EEROM memory the following sequence must be followed.

(1) Write to all the holding registers (0-31) required to be changed
(2) Write value '197' to register 254 and send using a single set register command (6)
(3) [Optional – readback of register 254 returns '197' if primed, otherwise '0']
(4) Write value '55' to register 255 and send with a single set register command (6)

This will copy the holding registers into the stored EEPROM memory and then cause the system to initiate a 'warm' restart.

The system will then re-start using the updated settings restored from EEROM memory.

8 PROGRAMMING MENUS

The unit has two levels of programming Menus. These are a PIN protected Advanced Menu and a User Menu.

8.1 INITIAL COMMISSIONING

When a unit is new, or has been changed between Plus and Non-Plus, it is important that Load Defaults and Reset Totals – All are selected before editing the Config menu. Without doing this operation may be incorrect and erratic. This only needs to be done once for a unit. The unit should be set up in the following order

ADVANCED
- Config
  - Master
  - Digital I/O
  - Levels
  - Alarms
  - Modbus
- Reset Totals
- Load Defaults
- Exit
- (Change Pin)

User
- Change Levels
- Auto Mute
- Service
  - Edit
    - Pump 1 next service
    - Pump 2 next service
    - Save Changes
    - Abandon
- [Well Wash]

Edit
Wash Cycles

Wash/Mix Time(s)

Exit

8.2 ACCESS TO ADVANCED MENU

The advanced menu is entered by holding Mute and Up and Down button down together. A person identification number (PIN) is asked for. The number 107 will always allow access and a second user PIN also allows access. If the user PIN is entered, then the ability to change the user PIN is withheld.
On exiting the advanced menu, the unit restarts.

8.3 ADVANCED MENU STRUCTURE

The Advanced Menu has the following structure. Items in square brackets are available on Plus units only.

Advanced Menu
- Config
  - Master - Master Menu
    - Edit
      - Tank Mode (Empty or Fill)
      - Pumps Connected (1 or 2)
      - Pump Mode (Dual or Single)
      - Pump Restart Delay
      - Maximum pump off time
      - Maximum duty time
      - Pump RunOn Time
      - Manual Maximum Time
      - AUX Output
        - Wellwash
        - PLC
        - High Level
        - Mixer
        - Link to AUXIN
      - ID Number Low
      - ID Number High
      - Visual Alarm (Steady or Flashing)
      - Auto Mute
      - Seal Fault (Alarm only or Alarm and Lockout)
      - Seal Threshold (3k, 20k, 50k, 100k)
      - Level Alarm (manual or auto reset)
    - Save Changes
    - Abandon
  - Digital IO - Digital I/O Menu
    - Edit
      - Power Check (Yes or No)
      - External Input
        - Pause
          - High Alarm
            - No Overide
            - Overides Pause
        - External Fault

- External
- Mixer
- Monitor System
- Extra High Level
- Extra Low Level
- External Level
- Treatment System
- External Function
  - Alarm Only
  - Pumps OFF
  - Pump Start

High Level
- Off
- Level
- Time

Low Level (Used or Not Used)

Setup Pump
- 1 (Pump 1)
  - Thermal
    - Not Used
    - Normally Open
    - Normally Closed
  - Overload
    - Not Used
    - Normally Open
    - Normally Closed
  - [Pressure]
    - [Not Used]
    - [Normally Open]
    - [Normally Closed]
  - [No Flow]
    - [Not Used]
    - [Normally Open]
    - [Normally Closed]
  - Seal
    - Not Used
    - Used
- 2 (Pump 2)
  - Thermal
    - Not Used
    - Normally Open
    - Normally Closed
  - Overload
    - Not Used
    - Normally Open
    - Normally Closed
  - [Pressure]
    - [Not Used]
    - [Normally Open]
    - [Normally Closed]
  - [No Flow]
    - [Not Used]
    - [Normally Open]

[Normally Closed]
Seal
Not Used
Used
Exit

Save Changes
Abandon
Level – Level Source Setup
Edit
Level Source ([Multipoint], Individual [or Analogue], Pressure Sensor)
Multipoint (use 10 sensor probe) (Mode = 1)
Sensitivity (3K,20K,50K)
Individual (uses 3 to 5 probe inputs) (Mode =2)
Sensitivity (3K,20K,50K)
Analogue In (use proportional signal) (Mode = 3)
Sensitivity (3K,20K,50K)
Zero Signal Tank Level
Span 0 to Max input
Maximum Tank Depth
Pressure Sensor (Mode = 4)
Sensor Zero
Sensor Span
3 Level Probe (uses 3 sensor probe) Mode =5)
Sensitivity (3K,20K,50K)
Save Changes
Abandon
Alarms
Edit

Thermal (Local,Critical& Local,Non Critical, Display Only)
Overload (Local,Critical& Local,Non Critical, Display Only)
[Pressure (Local,Critical& Local,Non Critical, Display Only)]
[No Flow (Local,Critical& Local,Non Critical, Display Only)]
Seal (Local,Critical& Local,Non Critical, Display Only)
Sensor Fault (Local,Critical& Local,Non Critical, Display Only)
Low Level (Local,Critical& Local,Non Critical, Display Only)
High Level (Local,Critical& Local,Non Critical, Display Only)
Power Fault (Local,Critical& Local,Non Critical, Display Only)
Both Pumps (Local,Critical& Local,Non Critical, Display Only)
Service (Local,Critical& Local,Non Critical, Display Only)
External Fault (Local,Critical& Local,Non Critical, Display Only)
Excess Run
Excess Run - Minutes
High Level Timer – Seconds
High Alarm Delay - Seconds
[Flow Delay]
Save Changes
Abandon
MODBUS – Setup Modbus
Edit
Modbus Enabled (Yes / No)
Modbus Address (1 to 127)
Save Changes
Abandon
Exit
Reset Totals

Pump 1
Pump 2
All

Service
Edit
Pump 1 next service
Pump 2 next service
Save Changes
Abandon
Abandon
Load Defaults
Pumps (single or dual)
System Type (Sewage, Stormwater, Helical, Tank Fill)
Load Defaults (Yes or No)
(Change PIN)
Exit (Returns to normal operation)

8.4 USER MENUS

Some items may be changed without having a PIN number. The items that may be changed are the low, stop, duty start, standby start, and high level points. The user may also change the Auto Mute time, Pump 1 and Pumps 2 next service, and Well Washing parameters. To enter the user programming menu, hold the escape key down until the user menu appears on the screen. On exiting the user menu system is reset.

User
Change Levels
[If Individual sensor mode] Move switches to change levels
Level Menu [Multi_sensor, Analog, Pressure_sensor]
High Setpoint
Standby Setpoint
Duty Setpoint
[Standby Off Set] (Pressure Sensor Mode)
[Duty Off Set] (Pressure Sensor Mode)
[Stop Setpoint] (Multi_sensor and analog mode)
Low Setpoint
Auto Mute
Auto Mute Seconds
Service
Edit
Pump 1 next service
Pump 2 next service
Save Changes
Abandon
[Well Wash]
Edit
Wash Cycles
Wash/Mix Time(s)
Exit

8.5 MODEL TYPE

The unit may display that it is either a Plus or not a Plus model. If a pin number of 114 is entered when entering the advanced menus, then the user will be prompted to select the model type. The model type effects both the configuration menu options offered and the defaults loaded. For this reason, it is critical that Load Defaults is performed after the model is selected.

9 STATUS DISPLAYS

In normal run mode the unit displays status screens. The status screens are, in order Level	Shows Current Level as percentage or depth and also the highest wet functional input. (ie When low, stop and duty are wet just Duty is displayed) Any level reading fault is shown.
Pump 1 Status	Shows the pump number followed by status (run/off/auto). Any faults for the pump are shown.
Pump 1 Records	Shows the Counts for the pump. The first number is pump starts (Sts), the second line is hours and minutes.
Pump 2 Status	Shows the pump number followed by status (run/off/auto). Any faults for the pump are shown.
Pump 2 Records	Shows the Counts for the pump. The first number is pump starts (Sts), the second line is hours and minutes.
Power Status	Indicates if any phases have failed
Service	Displays number of ours until service required for each pump.
Alarms Previous	Displays what were new alarms prior to the alarms being cleared.
Alarms Present	Displays the currently active alarm sources. Even alarms that are not enabled for announcement are shown.
Alarms New	Displays all the alarms that have occurred since the last alarm clear operation. Even alarms that are not enabled for announcement are shown.
Info (Default screen)	Displays Model, ID and software version.
Pause Status	Only available if paused.

10 POWER UP ESCAPE SEQUENCES

By powering the unit up while certain buttons are pushed the unit can be put into special modes.

These are

Mute and Up and Down (Anytime)	Advanced setup Menu.
Fault and Mute and Up	Hardware diagnostic test. Used by Manufacturer to verify operation. Please note that this mode may allow damage to attached equipment as there are no interlock and so forth. It is intended to leave this code in place.
Fault and Mute	Diagnostic Only. Corrupts the setup data to simulate loss of configuration information. It is intended that this feature will be removed after testing.
Fault and Mute and Pump 1	Diagnostic Only. Corrupts the first copy of the records data to simulate loss of one copy of records data. Unit should work OK. It is intended that this feature will be removed after testing.
Fault and Mute and Pump 2	Diagnostic Only. Corrupts the first copy of the records data to simulate loss of one copy of records data. Unit should work OK. It is intended that this feature will be removed after testing.
Fault and Mute and Pump1 and Pump 2	Diagnostic Only. Corrupts the first copy of the records data to simulate loss of one copy of records data. Unit should clear all records. It is intended that this feature will be removed after testing.

Items in grey may not be implemented depending on release status of the software.

11 GRINDER

11.1 GRINDER CONTROL

11.1.1 Normal Sequence

At startup, power applied to the motor controller is routed to the grinder motor initiating grinder cutter rotation. The motor controller programmable logic controller (PLC) provides monitoring and logic control. The motor controller provides power to the grinder until a stop command is issued by the PLC when one of the following conditions occurs:

- Main input power is removed from the motor controller.
- The motor controller front panel grinder control switch is set to OFF removing power from the grinder motor.
- A grinder jammed failure that cannot be cleared by the automatic reversal sequence when an object becomes lodged in the grinder cutting chamber.
- A motor overload condition is detected by the controller and cannot be cleared by the automatic reversal sequence when an object becomes lodged in the grinder cutting chamber. The overload results in removing power from the grinder motor. The overload must be cleared, and the controller logic reset by the grinder control switch before the grinder can be restarted.

11.1.2 Reversal Sequence

The motor controller initiates a grinder reversal sequence when the grinder cutter stacks can no longer rotate. The motor controller PLC sends a reversal command to close the motor reverse contactor temporarily changing the phasing of the three-phase power to the motor. Grinder reverse rotation starts and run for 2 seconds. After the 2 secs reverse run of the grinder pump, the system will pause for 1 seconds before the forward run command is given. This is to give the motor time to slow down. The PLC removes power from the motor reverse relay and the grinder cutters return to normal forward rotation. the grinder pump will run if forward and if the current sensor input 4 is still ON, the grinder pump will reverse its run again. A counter is used to count the repeated cycle of forward and reverse run and when the cycle is repeated for the 3rd time a grinder failed alarm will be set. The cause of the grinder jam must be cleared, and the motor controller must be reset before the grinder can be restarted.

11.2.3 Remote Contacts

Grinder Pump remote mode is very similar to local mode operation, it just requires a remote start signal.

11.2 OPERATING CONTROLS AND INDICATORS

The following paragraphs describe the Grinder controller controls and indicators.

11.2.1 Control Switch

DO NOT REMOVE POWER FROM THE CONTROLLER ENCLOSURE. DO NOT USE ANY START/STOP PUSHBUTTON AS A POWER DISCONNECT. SERVICE ALLIED PUMPS CONTROLLER AND CONNECT DEVICES ONLY WHEN POWER TO THE CONTROLLER HAS BEEN TURNED OFF. LOCKED OUT AND TAGGED.

The motor controller has a front panel mounted grinder control three (3) position selector switch. The grinder control switch allows the operator to control the application of power to the grinder motor or to place the grinder in REMOTE mode for control by a remote operator. The ON position applies power to the grinder motor. The OFF position removes power from the grinder motor. In the event of a grinder failure, OFF resets the motor controller grinder control circuits and failure indicator(s). The REMOTE position provides remote mode starting and stopping and requires user installed connections to the motor controller REMOTE input terminals.

11.2.2 Indicators

Refer to TABLE 11-1 for a listing of the indicators on the motor controller front panel. Verify the operation of any remotely located indicators as the grinder is cycled through the startup in Paragraph 11.3.1.

TABLE 11-1 MOTOR CONTROLLER INDICATORS

INDICATOR	OPERATION
GRINDER JAMMED	Red indicator that lights to indicate the grinder cutter stack can no longer rotate freely. The indicator stays lit until the fault condition is corrected and the control switch is set to OFF.
GRINDER MOTOR FAULT	Red indicator that lights to indicate a sustained grinder motor supply power condition has occurred and/or the grinder motor overheated, opening the thermostat. Indicator remains lit until the fault condition is corrected and the control switch is set to OFF.

INDICATOR	OPERATION
GRINDER RUNNING	Green indicator that operates along with the grinder control switch and the user installed Remote Control switch to indicate grinder run status. ON mode - Lights when the grinder control switch is set to ON. Power is applied to the grinder motor and grinder rotation starts. Goes out when the grinder control switch is set to OFF. Power is removed from the grinder motor and grinder rotation stops. REMOTE mode - Lights when the grinder control switch is set to REMOTE, and the user installed Remote contact is closed. Power is applied to the grinder motor and grinder rotation starts. Goes out when the grinder control switch is set to OFF or the Remote contact is opened. Power is removed from the grinder motor and grinder rotation stops. Remains lit during grinder reversal sequence(s). Goes out when a stop command is sent to the motor controller.

11.3 SYSTEM OPERATION

The following paragraphs describe the operation of the grinder controller. Refer to section 12 for troubleshooting guide.

11.3.1 Startup

Perform the following procedure to start the grinder.

1. Verify the grinder control switch is in the OFF position. Apply power to the motor controller.
2. Momentarily set the grinder control switch from OFF to ON and then back to OFF.
3. Verify RUN indicator lights when the grinder control switch is set to ON and goes out when the control switch is set to OFF.
4. Set the grinder control switch from OFF to ON. Verify grinder cutters are rotating towards each other in the direction of flow.
5. Set the grinder control switch to ON. Check the grinder for excessive noise and/or vibration.
6. Set the grinder control switch to OFF.
7. Complete any required startup logs and forms. The grinder is considered operational.

11.3.2 Grinder Stop

Rotate the grinder control switch to OFF or set the REMOTE control switch to STOP to power off the grinder. The motor controller **RUN** indicator goes out and grinder cutter rotation stops.

11.3.3 Remote Operation

Remote operation is enabled by setting the grinder control switch to REMOTE position allowing the grinder to be controlled by a remote operator.
The motor controller cannot be reset by the remote operator if a grinder failure occurs in REMOTE mode. The grinder must be reset at the motor controller per Paragraph 11.3.4.

11.3.4 System Reset

The motor controller grinder control switch resets the motor controller logic. If a fail/overload condition occurs, the motor controller cannot accept a new command until the fail/overload condition is corrected, and the grinder controller is reset. Reset the system per the following procedure

1. Set the grinder control switch to OFF. Verify the **GRINDER MOTOR FAULT** indicator goes out, the **RUN** indicator remains off.
2. Open, lock out, and tag power to the motor controller.
3. Correct the fail/overload condition.
4. Restore main power to the motor controller. Set grinder control switch to ON to start the grinder.
5. Verify the grinder is operating normally. If the grinder is operating properly, remote operation can be resumed by setting the grinder control switch to REMOTE.

12 GRINDER MAINTENANCE / TROUBLESHOOTING

12.1 MAINTENANCE

Perform the following procedure for motor controller maintenance tasks. Review all safety instructions before performing maintenance tasks. Refer to TABLE 12-1 for summary and schedule of the maintenance tasks.

TABLE 12-1 MAINTENANCE REQUIREMENTS

Maintenance Operation	Frequency
Enclosure door fit	weekly
Moisture Inspection	3 months
Dust Inspection	3 months
Enclosure Seal Inspection	3 months
Tasks require fifteen (15) minutes minimum/ thirty (30) minutes maximum. Maintenance tasks are based on personnel experienced in same or similar equipment and familiar with the basic operation, safety, emergency procedures, general plant safety, and use of plant tools/ maintenance equipment. Recommended intervals based on normal operation usage and should be adjusted by the individual user based on equipment usage and the operational environment. More frequent inspections are encouraged if the motor controller is operating in a harsh unprotected environment.	

1 Inspect and verify a tight motor controller door- to-enclosure fit during operation. Continue to Step 2 if performing all scheduled tasks.

2 Verify main power to the motor controller is secured before opening the motor controller enclosure. Inspect the inside of the motor controller for moisture and signs of water leakage. If excessive moisture is found, use desiccant capsules to correct the problem. Inspect the motor controller seals and cable/ conduit entries and replace the seals as necessary if water or other contaminants are found inside the motor controller.

3 Inspect the motor controller interior for excessive dust. Check the enclosure seals if

4 dust accumulation is found. Correct any problems found. Vacuum all dust from the motor controller enclosure, do not use forced air to remove (blow out) dust and dirt from the motor controller.

5 Inspect and verify that all conduit connections are sealed. Refer to the motor controller drawing for electrical, functional, and component location information.

12.2 TROUBLESHOOTING

TABLE 12-2 is a troubleshooting guide for the grinder motor controller. Review all safety instructions prior to troubleshooting. Refer to the motor controller drawing for input voltage, component locations and wiring information. Refer to the grinder manual for grinder troubleshooting.

Troubleshooting involves opening the motor controller enclosure to check voltages, components, and PLC indicators while main input power is being applied.

TABLE 12-2 MOTOR CONTROLLER TROUBLESHOOTING

Potential Problem	Possible Solutions
Grinder does not start,	Verify that components are not burnt or damaged.
	Verify control voltage fuses are good.
	Verify proper line voltage at terminals.
	Verify the motor controller circuit breaker is closed, operating properly.
	Verify motor controller grinder control switch is in REMOTE position if starting from a Remote Stop/Start switch. Reset the control switch if necessary.
	ON Operation - Verify the grinder control switch is set to ON and PLC input indicator ON MODE is lit. Check grinder control switch and switch connections if indicator not lit.
	REMOTE Operation - Verify the grinder control switch is set to REMOTE and PLC input indicator REMOTE MODE is lit. Check the grinder control switch and switch connections if indicator not lit.
	Verify PLC input indicator GRINDER OVERLOAD is not lit. Check for a grinder overload condition if indicator is lit. Correct any overload condition, reset the motor controller and continue operation.
	Verify PLC output indicator FORWARD RELAY is lit. Check motor forward starter contactor if indicator not lit.
Grinder does not Reverse	Verify PLC input indicator CT INPUT lights momentarily when grinder is jammed. Check current (Grinder Jam) sensor (CT) if indicator does not light.
	Verify PLC output REVERSE RELAY lights for approximately two (2) second and then goes out when the grinder is jammed. Check grinder motor reverse contactor and contactor connections if indicator does not light.

A

APPENDIX A
Warranty and Service Information

WARRANTY

Warranty is limited to replacement or repair, at Manufacturer's discretion, of any parts or equipment without removal and reinstallation cost for a period of twelve months from date of invoice, provided such part of equipment that is deemed by the respective manufacturer to be faulty. Any work done on site to inspect or remedy faults that are subsequently not accepted as being under warranty by the manufacturer, or are caused by misuse, fair wear or operating procedures, will be charged as parts and labour and travelling time rates applicable at the time.

Warranty does not cover equipment that is not being tested and maintained to AS1851.

Warranty does not cover pump systems that are not monitored on a continuous basis. Part of monitoring requirement is a suitable management plan to attend to alarm and running signals immediately.

Warranty does not cover damage resulted from ingress of water into the engine via the exhaust system or other means.

Australian Standards AS2941-2013 preludes the use of shutdown protection devices that shut down equipment in the case for malfunctions. Consequently any damage results from equipment continuing to operate whilst an abnormal condition is present is expressly excluded from manufacturer's warranty.

If buyer requires our services in respect of site inspection or service outside of what is covered by Manufacturer's warranties, then Buyer should enter into a separate agreement with ALLIED PUMPS in respect to the same. In the event of no such separate agreement, all operation, calibrating, cleaning and maintenance of plant is the responsibility of the buyer.

ALLIED PUMPS have not acted as a consultant or charged design fees on this project, and are in no way responsible for, nor guarantee any particular level or performance of equipment supplied unless such guarantee is specially given in writing.

Under no circumstances is ALLIED PUMPS liable for any direct or consequential loss or damage to persons or properties of any nature due to any cause whatsoever.

Application of warrantied is conditional on ALLIED PUMPS having received in case the total contact price. Furthermore, ALLIED PUMPS reserves the right to withdraw any code compliance. Australian Standard compliance or selection compliance, should the contract not be paid in full.

SCHEDULE SERVICE INFORMATION REQUEST

Allied Pumps recommends regular scheduled servicing for all systems & packages to ensure acceptable service life and reduce the potential for emergency service requirement.

ROUTINE SERVICING

This equipment must be serviced on a regular basis in accordance with the manufacturer's requirements. Failure to do so may void warranty.

As a minimum, this equipment must be serviced on a six monthly basis. More arduous applications will require more regular servicing. Schedule service is in addition to any statutory/standards requirements which should be addressed independently as applicable.

Service should be carried out by experienced service technicians and we recommend this is done by Allied Pumps or an Authorised Dedicated Service Team.

◯ Yes, please send more information on your preventative maintenance program for the following, including a quotation to service our system.

APPLICATION AND WARRANTY REGISTRATION – Please complete the following:

Company Name: _____ **Contact Name:** _____

Site Address: _____

Postal Address: _____

Phone: _____ **Fax:** _____

Email: _____ **Mobile:** _____

System: _____

Model No.: _____ **Serial No.:** _____

If you have other systems on-site that you wish to have maintained to our high standards please fill in as many details as you can below.

Application: _____ **Approx. Age:** _____

Make: _____ **Model:** _____

Location: _____

Comment: _____

Please fax back to: 08 9356 5255 or
Email to: service@alliedpumps.com.au

C-D/105

PERTH
2 Modal Crescent (Cnr Baile Rd.), Canning Vale, WA 6155
PO Box 1468, Canning Vale DC, WA 6970
T: +61 (0) 8 9350 1000
E: service@alliedpumps.com.au

alliedpumps.com.au