SC1000

INSTRUCTION MANUAL

SECTION 1

MOTOR PROTECTION ELECTRONICS, LLC

2464 Vulcan Road
Apopka, Florida 32703

Phone: (407) 299-3825
Website: www.mpelectronics.com

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TABLE OF CONTENTS - SECTION 1

SUPPLEMENTAL MANUAL SECTIONS

The following Supplemental Manual Sections are available in pdf format at: www.mpelectronics.com.

STATION CONTROLLER SC1000

APPLICATIONS

- Simplex, Duplex, or Triplex Liquid Level Control
- Pump Down (Empty a Tank) or Pump Up (Fill a Tank)
- Where Connection to a SCADA System is Required

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STANDARD I / O

- 1 Ethernet Port (ENET1) with Modbus TCP Protocol - For connection to: SCADA System.
- 1 RS232 Port (COM1) with Modbus RTU Protocol - For connection to: SCADA System or to the TSID.
- 1 Analog Input (AIX1), Non-Isolated 4-20mA - Function: Analog Level Input (Pressure Transducer).
- 1 Analog Output (AOX1), Isolated 4-20mA - Function: Copy of Wet Well Level.
- 12 Discrete Inputs (D1 - D12) - May be Assigned to Application Specific Functions.
- 10 Level Probe Inputs (E1 - E10) - For connection to a 10 Electrode Level Probe.
- 5 Relay Outputs (ROX1 - ROX5) - May be Assigned to Application Specific Functions

OPTION

- S-Option: Makes the Analog Input (AIX1) Isolated from Controller Power Supply Ground.

SPECIFICATIONS

- Input Power: 120 VAC ±10%, 13 VA max
- Agency Approvals: UL 508, CAN/CSA
- Dimensions (Width x Height x Depth): 8.50" x 6.90" x 4.09"
- Ambient Operating Temperature: -20°C to +65°C (-4°F to +149°F)
- Color: White with Blue Graphics
- Level Display: 5 Digit, 7 Segment LED, Red
- Level Display Range: 0 - 2310 feet (Decimal Point Position is Selectable)
- Analog Input (AIX1): Non-Isolated (or Insolated with: S-Option) 4-20mA, 100Ω Load, Transient Protected
- Analog Output (AOX1): Isolated 4-20mA, Transient Protected, Maximum Load: 900Ω
- Discrete Inputs (D1 - D12): 24VDC, Transient Protected
- Level Probe Inputs (E1 - E10): ±6V, 60Hz Square Wave ±0.6mA max, Transient Protected
- Relay Outputs (ROX1 - ROX5): 8A @ 120VAC Resistive

ORDERING INFORMATION

Part Number: SC1000 - E X

Analog Level Input AIX1:

Blank = AIX1 is Non-Isolated
S = AIX1 is Isolated

The S-Option makes the Analog Level Input (AIX1) Isolated from the Controller's Power Supply Ground.

TOUCH SCREEN INTERFACE DEVICE - TSID

Description

The Touch Screen Interface Device (TSID) is a optional piece of equipment that is used to perform troubleshooting and customization of the SC1000 for specific applications.

It provides full access to all the setup and status parameters.

It also has screens designed to demo the SCADA capabilities of the SC1000.

Functions

- View or Change all Setup Parameters
- View Status or Change Setup of all I / O
- Test Communication Ports COM1 and ENET1
- Demo all SCADA features

The Touch Screen Interface Device (TSID) consists of a 7 inch Touch Screen panel made by Automation Direct, housed in a durable carrying case with a power cord and interface cables for connection to the Serial Port COM1 and the Ethernet Port ENET1.

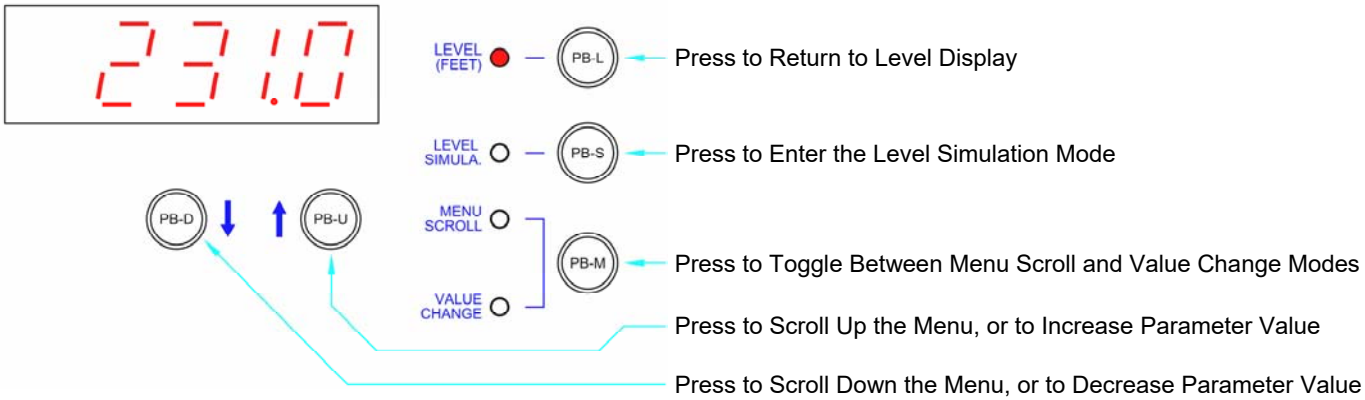
It is programmed as a Modbus Master that continually polls the Controller.

ORDERING INFORMATION

Part Number: **TSID**

For more information on the TSID see Section Z.

SC1000 OPERATOR INTERFACE



Note: To Prevent the Accidental Changing of a Parameter Value, there is a 4 second Delay Before a Parameter Value will Change.

(The PB-D or PB-U Push-Button must be Held Down for the Entire 4 second Delay.)

How to View a Setup Parameter Value

1. Press push-button PB-M until the Menu Scroll Mode indicator comes on.
2. Press push-button PB-D or PB-U as needed to arrive at the Parameter you wish to view.
3. Press push-button PB-M until the Value Change Mode indicator comes on.
4. The current value of the Parameter may then be viewed on the display.

How to Change a Setup Parameter Value

1. Press push-button PB-M until the Menu Scroll Mode indicator comes on.
2. Press push-button PB-D or PB-U as needed to arrive at the Parameter you wish to change.
3. Press push-button PB-M until the Value Change Mode indicator comes on.
4. The current value of the Parameter may then be viewed on the display.
5. Press and hold for 4 seconds, either push-button PB-D or PB-U, to change the Parameter to the desired new value.
6. Press push-button PB-M or PB-L to exit the Value Change Mode.

How to Simulate Levels

1. Press push-button PB-S.
   Note: The Simulation starts from the actual level displayed prior to entering the Level Simulation mode.
2. Press push-button PB-D or PB-U as needed to change the simulated level.
3. To end the level simulation press push-button PB-L.
   Note: If you do not exit the Level Simulation mode, normal operation will resume automatically 60 seconds after the last time the PB-U, PB-D, or PB-S push-buttons were pressed.

SC1000 MENU

User / Operator Info.			SCADA	
Parameter	Default Value	Current Value	Register Address	Description of Parameters and SCADA Notes
Low Level Alarm				
LoAL	2.0 feet		40021	Low Level Alarm — Range: 0.0 - 231.0 feet Notes: 1. This sets the level at which the Low Level Alarm will be activated. 2. To disable the Low Level Alarm see Parameter P.34. 3. The Low Level Alarm operation is delayed for 90 seconds after power is applied. 4. The Low Level Alarm does not act as a redundant pump off. 5. A Float Switch connected to a Discrete Input assigned to either Functions 11 or 13 will also activate the Low Level Alarm. 6. Upon a Low Level Alarm, the contacts of a relay programmed for Function 2 will close.
The "Low Level Alarm" status is available from Modbus Coil 2 (Register 40001 Bit 1).				
Pump On / Off Levels				
1PoFF	3.0 feet		40013	1st Pump Off Level — Range: 0.2 - 231.0 feet
1Pon	6.0 feet		40012	1st Pump On Level — Range: 0.2 - 231.0 feet
2PoFF	4.0 feet		40015	2nd Pump Off Level — Range: 0.2 - 231.0 feet
2Pon	7.0 feet		40014	2nd Pump On Level — Range: 0.2 - 231.0 feet
3PoFF	5.0 feet		40017	3rd Pump Off Level — Range: 0.2 - 231.0 feet
3Pon	8.0 feet		40016	3rd Pump On Level — Range: 0.2 - 231.0 feet
High Level Alarm				
HIAL	10.0 feet		40020	High Level Alarm — Range: 0.5 - 231.0 feet Notes: 1. This sets the level at which the High Level Alarm will be activated. 2. The High Level Alarm operation is delayed for 10 seconds after power is applied. 3. The High Level Alarm does not act as a redundant pump off (for Pump Up). 4. A Float Switch connected to a Discrete Input assigned to Functions 12, 14 or 19 will also activate the High Level Alarm. 5. A Backup Level Probe connected to a Level Probe Input may also activate the High Level Alarm. See Parameters b.01 - b.10. 6. Upon a High Level Alarm, the contacts of a relay programmed for Function 1 will close.
The "High Level Alarm" status is available from Modbus Coil 1 (Register 40001 Bit 0).				

SC1000 MENU

User / Operator Info.			SCADA	
Parameter	Default Value	Current Value	Register Address	Description of Parameters and SCADA Notes
Fault Code				
FLC	-	-	40047	Fault Code
LFC	-	-	40048	Last Fault Code
For a description of the Fault Codes see pages 23 - 25.				
Remote Control Level Input				
rcLn	0	-	40025	Remote Control Level Input Range: 0 - 231.0 feet
For more information about the Remote Control Level Input see Section O.				
Pump Setup				
P.13	3		40113	Number of Pumps Present 1 = 1 Pump 2 = 2 Pumps 3 = 3 Pumps
P.14	3		40114	Maximum Number of Pumps Allowed to Run at the Same Time 1 = 1 Pump 2 = 2 Pumps 3 = 3 Pumps
P.15	3		40115	Maximum Number of Pumps Allowed to Run While On Generator 1 = 1 Pump 2 = 2 Pumps 3 = 3 Pumps Note: Must Connect Transfer Switch Contact to Discrete Input assigned to Function 6.

SC1000 MENU

User / Operator Info.			SCADA	
Parameter	Default Value	Current Value	Register Address	Description of Parameters and SCADA Notes
Pump Alternation Setup				
P.16	1		40116	Alternation Sequence Mode 1 = Standard Alternation: Group 1: Pumps 1 - 3 2 = Pump 1 Always Lead: Group 1: Pump 1, Group 2: Pumps 2 - 3 3 = Pump 3 Always Last: Group 1: Pumps 1 - 2, Group 2: Pump 3 For more information on Alternation Sequences see Section G. Also see: Alternation Sequence Modifier A (Parameter P.17) below.
P.17	0		40117	Alternation Sequence Modifier A 0 = Pump 1 is Allowed To Run With Pumps From Group 2 1 = Pump 1 is Not Allowed To Run With Pumps From Group 2 (Pump 1 is turned off before starting Pumps in Group 2) Note: This applies when Parameter P.16 = 2
P.18	0		40022	Forced Lead Pump Position - Group 1 0 = Normal Alternation X = Pump X as Lead Note: This applies to Group 1 when Parameter P.16 = 1 or 3
P.19	0		40026	Forced Lead Pump Position - Group 2 0 = Normal Alternation X = Pump X as Lead Note: This applies to Group 2 when Parameter P.16 = 2
P.20	0		40120	Time Based Alternation - Group 1 Range: 0 - 65535 minutes 0 = Disabled 60 = 1 hour 480 = 8 hours 1440 = 24 hours Note: Group 1 may be triggered to alternate by using the Internal Time Clock setup using Parameter P.20, or it can also be triggered by an External Time Clock, which may be either a hardware device connected to a Discrete Input setup to perform Function 4, or it may be triggered to alternate by momentarily setting Modbus Coil 136 (Register 40009 Bit 7).
P.21	0		40121	Time Based Alternation - Group 2 Range: 0 - 65535 minutes 0 = Disabled 60 = 1 hour 480 = 8 hours 1440 = 24 hours Note: Group 2 may be triggered to alternate by using the Internal Time Clock setup using Parameter P.21, or it can also be triggered by an External Time Clock, which may be either a hardware device connected to a Discrete Input setup to perform Function 5, or it may be triggered to alternate by momentarily setting Modbus Coil 137 (Register 40009 Bit 8).
For more information about Alternation see Section G.				

SC1000 MENU

User / Operator Info.			SCADA	
Parameter	Default Value	Current Value	Register Address	Description of Parameters and SCADA Notes
Level Input Select				
P.22	1		40122	Level Input Select 1 = Analog Level Meter - ALM1 2 = Level Probe Meter - LPM1 3 = Float Switch Inputs 4 = Remote Control Level Input Selection 1 - Level Input is from the Analog Level Meter ALM1. With a Pressure Transducer connected to Analog Input AIX1. See Section M. Selection 2 - Level Input is from the Level Probe Meter LPM1. With a 10 Electrode Level Probe Connected to Inputs E1 - E10. See Section L. Selection 3 - Float Switches as the primary Level Input. See Section A. Selection 4 - Remote Control Level Input written through SCADA to Parameter rcLn. See Section O.
Analog Level Meter ALM1 Setup and Calibration				
P.24	23.10 feet		40124	Analog Level Meter ALM1 - Level Input Span Range: 1.00 - 231.00 feet Notes: 1. Parameter P.24 allows the entry of the Transducer's Calibrated Span in feet. 2. A 20mA signal **does not** need to be applied to the Process Input while Setting the Span.
P.25	-		40125	Analog Level Meter ALM1 - Level Input Zero Notes: 1. While viewing Parameter P.25, the UP and Down pushbuttons may be used to make minor adjustments to the Zero Calibration of Analog Level Meter ALM1, so that it reads zero feet of liquid. The liquid level is shown in the display while performing the Zero Calibration. 2. Before attempting to adjust the Level Input Zero, first pull the Submersible Pressure Transducer out of the liquid, or apply a 4.0mA signal to the Level Input, and then Set the Zero.
P.26	240		40126	Analog Level Meter ALM1 - Signal Conditioning Control Range: 1 - 254 100 = Slow 240 = Normal 250 = Fast Note: This parameter controls the signal conditioning of Analog Level Meter ALM1
For Calibration Procedure See page 26.				
Level Probe Meter LPM1 Setup				
P.27	12 in.		40127	Level Probe Electrode Spacing Range: 3 - 24 inches
P.28	100		40128	Level Probe Input Sensitivity Range: 90 - 210 100 = Standard Sensitivity 150 = Extra Sensitive
For Connection Diagrams see pages 31 & 35. For more information about Level Probe Control see Section L.				
Level Display Setup				
P.29	1		40129	Numerical Display Decimal Point Position 0 = No Decimal Point 1 = XXXX.X 2 = XXX.XX 3 = XX.XXX 4 = X.XXXX Note: Parameter P.29 is automatically set to "1" if the Level Input Select is set for the Level Probe Meter LPM1 (Parameter P.22 = 2).
P.30	10 min.		40130	Numerical Display Blanking Delay Range: 10 - 254 minutes Note: To disable the Numerical Display Blanking feature: Set Parameter P.30 = 255.

SC1000 MENU

User / Operator Info.			SCADA	
Parameter	Default Value	Current Value	Register Address	Description of Parameters and SCADA Notes
Control Setup				
P.31	1		40131	Pump Up or Down Mode 1 = Pump Down - Empty a Tank 2 = Pump Up - Fill a Tank Note: When Parameter P.31 is changed new default values will be loaded into the Pump On/Off Level setup parameters.
P.32	10 sec.		40132	Start Up Delay Range: 10 - 100 seconds Note: This is the minimum time, after power up, that the first pump may be called to run.
P.33	5 sec.		40133	Lag Pump Delay Range: 1 - 100 seconds Note: This is the minimum time between the calling of pumps to run. It is also used to delay the turning on of the replacement pump when an operating pump is suddenly disabled, or when a time based alternation of the pumps is performed.
P.34	1		40134	Low Level Alarm Disable 0 = Disable Low Level Alarm 1 = Enable Low Level Alarm Notes: 1. This only disables Low Level Alarms generated from the Analog Level Input, or the Level Probe Input being below the Level Alarm setting on Parameter LoAL, not Low Level Alarms generated from Float Switch inputs assigned Functions 11 or 13. 2. This feature does not operate when the Float Switch Inputs are selected as the primary Level Input Source (Parameter P.22 = 3).
P.35	10 sec.		40135	Pump Re-enable Delay - Pump Cutoff Low-Low Level Range: 1 - 600 sec. Notes: 1. This is only used in the Pump Down Mode (Parameter P.31 = 1). 2. While the Low-Low Level Float Switch is closed no pump operation will be allowed. 3. A Low-Low Level Float Switch must be connected to a Discrete Input assigned to Function 13. 4. The Delay starts timing out when the Discrete Input opens. When the Re-enable Delay expires the Pump Cutoff Low-Low Level feature will no longer prevent pump operation. 5. While the Pump Cutoff Low-Low Level input is closed the Low Level Alarm will be active. The contacts of a relay assigned to the Low Level Alarm (Function 2) will also be close. Also, Fault Code 1041 will be generated.
Activates the “Pump Cutoff Active Low-Low Level”. Status is available from Modbus Coil 131 (Register 40009 Bit 2). Also activates the “Low Level Alarm”. Status is available from Modbus Coil 47 (Register 40003 Bit 14).				
P.36	10 sec.		40136	Pump Re-enable Delay - Pump Cutoff High-High Level Range: 1 - 600 sec. Notes: 1. This is only used in the Pump Up Mode (Parameter P.31 = 2). 2. While the High-High Level Float Switch is closed no pump operation will be allowed. 3. A High-High Level Float Switch must be connected to a Discrete Input assigned to Function 14. 4. The Delay starts timing out when the Discrete Input opens. When the Re-enable Delay expires the Pump Cutoff High-High Level feature will no longer prevent pump operation. 5. While the Pump Cutoff High-High Level input is closed the High Level Alarm will be active. The contacts of a relay assigned to the High Level Alarm (Function 1) will also be close. Also, Fault Code 1042 will be generated.
Activates the “Pump Cutoff Active High-High Level”. Status is available from Modbus Coil 132 (Register 40009 Bit 3). Also activates the “High Level Alarm”. Status is available from Modbus Coil 48 (Register 40003 Bit 15).				

SC1000 MENU

User / Operator Info.			SCADA	
Parameter	Default Value	Current Value	Register Address	Description of Parameters and SCADA Notes
Flush Cycle Setup				
P.71	0		40171	Flush Cycle Mode 0 = Flush Cycle Disabled 1 = Flush Cycle Enabled - Activated by the Internal Time Clock 2 = Flush Cycle Enabled - Activated by an External Time Clock
P.72	1440 min		40172	Delay Between Flush Cycles Range: 1 - 65,535 minutes
P.73	9.5 feet		40173	Flush Cycle Start Level Range: 0.2 - 231.0 feet
P.74	2.5 feet		40174	Flush Cycle Stop Level Range: 0.2 - 231.0 feet
For more information about the Flush Cycle see page 27.				
Flow Calculator Setup				
P.75	0		40175	Flow Calculator Mode 0 = Flow Calculator Disabled - All Flow Data is Reset to Zero 1 = Flow Calculator Enabled - Internal Time Clock 2 = Flow Calculator Enabled - External Time Clock
P.76	1		40176	Display Scaling for Legacy SCADA Registers Range: 1 - 1000 1 = gallons 100 = gallons / 100 10 = gallons / 10 1000 = gallons / 1000 Note: Sets the Display Scaling of SCADA Registers 40081 and 40086 - 40092.
P.77	79.0 Square Feet		40177	Surface Area of Wet Well Range: 2.0 - 2,000.0 Square Feet
P.78	20 Minutes		40178	Delay Before Forcing On Additional Pump(s) Range: 4 - 60 Minutes
P.79	20 Minutes		40179	Latest Inflow Rate Reset Delay Range: 1 - 100 Minutes
For more information about the Flow Calculator see Section K.				

SC1000 MENU

User / Operator Info.			SCADA	
Parameter	Default Value	Current Value	Register Address	Description of Parameters and SCADA Notes

Discrete Input Setup

Discrete Input Function				Discrete Input
F.01	1		40301	Discrete Input - D1
F.02	2		40302	Discrete Input - D2
F.03	3		40303	Discrete Input - D3
F.04	4		40304	Discrete Input - D4
F.05	5		40305	Discrete Input - D5
F.06	6		40306	Discrete Input - D6
F.07	7		40307	Discrete Input - D7
F.08	8		40308	Discrete Input - D8
F.09	9		40309	Discrete Input - D9
F.10	10		40310	Discrete Input - D10
F.11	11		40311	Discrete Input - D11
F.12	12		40312	Discrete Input - D12

Function of Discrete Input: **Connect To:**

0 = Collect Discrete Data for SCADA ..... Telemetry Contact

1 = Pump 1 Disable ..... HOA and Fault Logic
2 = Pump 2 Disable ..... HOA and Fault Logic
3 = Pump 3 Disable ..... HOA and Fault Logic

4 = External Alternation - Group 1 ..... External Time Clock
5 = External Alternation - Group 2 ..... External Time Clock

6 = On Generator ..... Automatic Transfer Switch
7 = All Pump Disable ..... Phase Monitor

8 = Sequence Input 1 ..... Lead Select Switch - 1 as Lead
9 = Sequence Input 2 ..... Lead Select Switch - 2 as Lead
10 = Sequence Input 3 ..... Lead Select Switch - 3 as Lead

Alarm Only

11 = Low Level Alarm Only ..... Float Switch
12 = High Level Alarm Only ..... Float Switch

Pump Cutoff & Alarm

13 = Pump Cutoff - Low-Low Level (Pump Down Mode).... Float Switch
14 = Pump Cutoff - High-High Level (Pump Up Mode) ..... Float Switch

Pump Control & Alarm

15 = Pump Control – Off Level ..... Float Switch
16 = Pump Control – 1st On Level ..... Float Switch
17 = Pump Control – 2nd On Level ..... Float Switch
18 = Pump Control – 3rd On Level ..... Float Switch
19 = Pump Control – High Level (Pump Down Mode).....Float Switch

20 = Start Flush Cycle ..... External Time Clock
21 = Flow Calculator - Start New Day ..... External Time Clock

36 = Telemetry A ..... Logic Contact
37 = Telemetry B ..... Logic Contact
38 = Telemetry C ..... Logic Contact
39 = Telemetry D ..... Logic Contact
40 = Telemetry E ..... Logic Contact
41 = Telemetry F ..... Logic Contact
42 = Telemetry G ..... Logic Contact
43 = Telemetry H ..... Logic Contact
44 = Telemetry J ..... Logic Contact
45 = Telemetry K ..... Logic Contact
46 = Telemetry L ..... Logic Contact
47 = Telemetry M ..... Logic Contact
48 = Telemetry N ..... Logic Contact

Notes:

1. Any Discrete Input may be set for Function “0” when the input is used only to collect data for SCADA and no other Function is desired.
2. The status of the Discrete Inputs is made available to be read by SCADA and is available in the menu from Parameters n.01 - n.12. See page 18.
3. For a detailed description of the Functions see Section A.
4. Pump 1(2,3) Disable logic may be inverted using Parameter F.19.

For Connection Diagram see page 28. For more information about the Discrete Inputs see Section A.

SC1000 MENU

User / Operator Info.			SCADA	
Parameter	Default Value	Current Value	Address	Description of Parameters and SCADA Notes
Discrete Input Setup				
F.19	0		40319	Discrete Input Pump Disable Mode 0 = Disable Pump with Closed Discrete Input 1 = Disable Pump with Open Discrete Input Note: This parameter only applies to Discrete Inputs that are assigned to be Pump Disable Inputs (Discrete Input Functions 1 - 3).
For more information about the Discrete Inputs see Section A.				
Relay Output Setup				

Relay Output Function				Relay Output
F.31	1		40331	Relay Output - ROX1
F.32	2		40332	Relay Output - ROX2
F.33	3		40333	Relay Output - ROX3
F.34	4		40334	Relay Output - ROX4
F.35	5		40335	Relay Output - ROX5

Function of Relay Output:

0 = Remote Control
1 = High Level Alarm
2 = Low Level Alarm
3 = Pump 1 Control
4 = Pump 2 Control
5 = Pump 3 Control

Notes:
1. Output Relays set for Function 0 may be Remotely Controlled through SCADA. See Section B.
2. Output Relay's status may be viewed from Parameters ro.1 - ro.5. See Page 19.

For Connection Diagram see page 28. For more information about the Relay Outputs see Section B.

SC1000 MENU

User / Operator Info.			SCADA	
Parameter	Default Value	Current Value	Register Address	Description of Parameters and SCADA Notes
Remote Control Setup				
E.01	60 sec.		40181	Remote Control Command Canceling Delay - RS232 Port - COM1 Delay Range: 1 - 65535 seconds Set to "0" to disable the Remote Control Command Canceling feature.
E.02	60 sec.		40182	Remote Control Command Canceling Delay - Ethernet Port - ENET1 Delay Range: 1 - 65535 seconds Set to "0" to disable the Remote Control Command Canceling feature.
E.03	0.0 feet		40183	Default Remote Level Range: 0.0 - 231.0 feet
For more information about the Remote Control Setup see Section E.				
RX & TX LED Mode				
E.07	1		40187	RX & TX LED Mode 1 = Show COM1 & ENET1 2 = Show COM1 Only 3 = Show ENET1 Only
RS232 Port COM1 Setup				
E.11	1		40191	Slave Address Range: 1 - 247
E.12	3		40192	Baud Rate 1 = 2400 bps 2 = 4800 bps 3 = 9600 bps 4 = 19200 bps
E.13	0		40193	Parity Mode 0 = No Parity 1 = Odd Parity 2 = Even Parity
E.14	2		40194	Stop Bits 1 = 1 Stop Bit 2 = 2 Stop Bits
Power must be cycled after changing E.11 - E.14. For more information about COM1 see Section E.				

User / Operator Info.		Scada	
Parameter	Default Value	Register Address	Parameter Definitions
Ethernet Port ENET1 Setup			
E.101	2	40200	Protocol 2 = Modbus TCP
E.114 - E.111	192 . 168 . 80 . 12 (E.114 . E.113 . E.112 . E.111)	40204-40201	IP Address Range: 0 - 255
E.144 - E.141	255 . 255 . 255 . 0 (E.144 . E.143 . E.142 . E.141)	40226-40223	Subnet Mask Range: 0 - 255
E.154 - E.151	192 . 168 . 80 . 1 (E.154 . E.153 . E.152 . E.151)	40230-40227	Default Gateway Range: 0 - 255
E.161	502	40232	Port Number Range: 1 - 65,535
E.176 - E.171	0 : 80 : 194 : 219 : XXX : XXX (E.176 : E.175 : E.174 : E.173 : E.172 : E.171)	40222-40217	MAC Address
Power must be cycled after changing E.101 - E.171. For more information about ENET1 see Section E.			

SC1000 MENU

User / Operator Info.			SCADA	
Parameter	Default Value	Current Value	Register Address	Description of Parameters and SCADA Notes
Level Probe Backup Setup				
Level Probe Electrode Function			**Electrode Input**	
b.01	0		40251	Electrode - E1
b.02	0		40252	Electrode - E2
b.03	0		40253	Electrode - E3
b.04	0		40254	Electrode - E4
b.05	0		40255	Electrode - E5
b.06	0		40256	Electrode - E6
b.07	0		40257	Electrode - E7
b.08	0		40258	Electrode - E8
b.09	0		40259	Electrode - E9
b.10	0		40260	Electrode - E10

Function of Level Probe Electrodes:

0 = No Function

1 = Backup Pump Control – High Level
2 = Backup Pump Control – 3rd On Level
3 = Backup Pump Control – 2nd On Level
4 = Backup Pump Control – 1st On Level
5 = Backup Pump Control – Off Level

Notes:

1. The Backup Pump Control feature will be disabled when the Level Probe is selected as the primary Level Input (Parameter P.22 = 2).
2. The Backup Pump Control feature will operate in the Pump Down Mode (Parameter P.31 = 1), and will not operate in the Pump Up Mode.
3. When an Electrode Input is not used it should be set for Function 0.
4. Electrode Function 1 will activate the High Level Alarm and will call all available pumps to run until the Off Level Electrode is uncovered.
5. Whenever the Backup Pump Control is active calling one or more pumps to run the Fault indicator will be on and fault code 1049 will be present in Parameter FLC. The status of the Fault is also available through SCADA from Modbus Coil 15 (Register 40001 Bit 14).
6. The status of the Level Probe Inputs is made available to be read by SCADA and is available in the menu from Parameters n.21 - n.30.

For more information about Level Probe Backup see Section N.

SC1000 MENU

User / Operator Info.			SCADA		
Parameter	Default Value	Current Value	Register Address		Description of Parameters and SCADA Notes
Parameter Security Setup					
Parameter Security is for protecting the Setup Parameters from being tampered with remotely through SCADA Communication Ports ENET1 or COM1 and will not hinder an operator from making changes to the Controller's Setup Parameters from the front of the Controller.					
S.01	0		-	**COM1**	Parameter Write Access Mode 0 = Always Unlocked 1 = Requires Security Code Entry 2 = Always Locked
S.02	0		-	**ENET1**	
S.03	10 min.		-	Parameter Write Access Relock Delay	Range: 10 - 480 minutes
SCS1	11	-	-	Security Code Setup - **SCS3 : SCS2 : SCS1**	Range: 2 - 65535
SCS2	12	-	-	Establishes the Numerical Values that will be Accepted as the Security Code.	
SCS3	13	-	-		
For more information about Parameter Security see Section S.					

SC1000 MENU

User / Operator Info.	SCADA	
Parameter	**Coil Address**	**Description of Parameters and SCADA Notes**
Discrete Input Status		
n.01	Coil 545	Discrete Input - D1
n.02	Coil 546	Discrete Input - D2
n.03	Coil 547	Discrete Input - D3
n.04	Coil 548	Discrete Input - D4
n.05	Coil 549	Discrete Input - D5
n.06	Coil 550	Discrete Input - D6
n.07	Coil 551	Discrete Input - D7
n.08	Coil 552	Discrete Input - D8
n.09	Coil 561	Discrete Input - D9
n.10	Coil 562	Discrete Input - D10
n.11	Coil 563	Discrete Input - D11
n.12	Coil 564	Discrete Input - D12
		Discrete Input Status: 0 = Input Open 1 = Input Closed
For more information about the Discrete Inputs see Section A.		
Level Probe Input Status		
n.21	Coil 583	Electrode - E1
n.22	Coil 584	Electrode - E2
n.23	Coil 585	Electrode - E3
n.24	Coil 586	Electrode - E4
n.25	Coil 587	Electrode - E5
n.26	Coil 588	Electrode - E6
n.27	Coil 589	Electrode - E7
n.28	Coil 590	Electrode - E8
n.29	Coil 591	Electrode - E9
n.30	Coil 592	Electrode - E10
		Level Probe Input Status: 0 = Input Open 1 = Input Closed
For more information about the Level Probe Inputs see Section L.		

SC1000 MENU

User / Operator Info.	SCADA	
Parameter	Register Address	Description of Parameters and SCADA Notes
Level Probe Input Analog Test Signal Status		
L.01	41801	Electrode - E1
L.02	41802	Electrode - E2
L.03	41803	Electrode - E3
L.04	41804	Electrode - E4
L.05	41805	Electrode - E5
L.06	41806	Electrode - E6
L.07	41807	Electrode - E7
L.08	41808	Electrode - E8
L.09	41809	Electrode - E9
L.10	41810	Electrode - E10
L.11	41811	Clock Signal for Level Probe Inputs: E1 - E10

Notes:

1. Each of the Discrete Inputs send out a low voltage (+/- 6 V), low current (0.6 mA), AC (60 Hz) square wave as a Test Signal to determine the status of the input, either Open or Closed. The Status of the Test Signals for each of the Discrete Input (as an analog value) may be viewed from Parameters L.01 - L.10.
2. The Controller compares each of the Test Signal analog values with the Level Probe Input Sensitivity set on Parameter P.28.
   The Discrete Input is considered to be:
   Open - When the Test Signal is above the Sensitivity setting.
   Closed - When the Test Signal is below the Sensitivity setting.
3. The status of all the Level Probe Inputs as a discrete value may also be read from Modbus Coils 583 - 592 (Register 40037 Bits 6 - 15).

For more information about the Level Probe Inputs see Section L.

User / Operator Info.	SCADA	
Parameter	Coil Address	Description of Parameters and SCADA Notes
Relay Output Status		
ro.1	Coil 153	Relay Output - ROX1
ro.2	Coil 154	Relay Output - ROX2
ro.3	Coil 155	Relay Output - ROX3
ro.4	Coil 156	Relay Output - ROX4
ro.5	Coil 157	Relay Output - ROX5

Relay Status:

0 = Relay Not Energized
1 = Relay Is Energized

For more information about the Relay Outputs see Section B.

SC1000 MENU

User / Operator Info.	SCADA		
Parameter	Register Address	Description of Parameters and SCADA Notes	
Analog Input Status			
A.100	40061	Analog Input - AIX1	Note: Parameter A.100 is the 12-bit Analog to Digital Converter input value that is conditioned and factory calibrated to the following values: 819 @ 4.0 mA 4095 @ 20 mA
For Procedure to perform a factory level calibration of Analog Input AIX1 see Section X.			
Analog Output Status			
A.200	40066	Analog Output - AOX1	Note: Parameter A.200 is the 12-bit Digital to Analog Converter output control value that is factory calibrated to the following: 819 @ 4.0 mA 4095 @ 20 mA
For Procedure to perform a factory level calibration of Analog Output AOX1 see Section X.			

SC1000 MENU

User / Operator Info.	SCADA	
Parameter	Register Address	Data Description
Controller Data		
d.101	42501	Control Board - Operating Program Revision Number
d.102	42502	Control Board - Startup Status (% Completion)
d.103	42503	Input Board - Operating Program Revision Number
d.104	42504	Input Board - Polling Request Counter
d.105	42505	Input Board - Polling Response Counter
d.109	42509	RS232 Port - COM1 - Polling Request Byte Counter
d.110	42510	RS232 Port - COM1 - Polling Response Byte Counter
d.111	42511	Ethernet Port Board - ENET1 - Operating Program Revision Number
d.112	42512	Ethernet Port Board - ENET1 - Polling Request Byte Counter
d.113	42513	Ethernet Port Board - ENET1 - Polling Response Byte Counter
d.114	42514	+24V #1 Power Supply Voltage (Volts)
d.115	42515	+24V #3 Power Supply Voltage (Volts)

SC1000 MENU

User / Operator Info. Parameter	SCADA Register Address	Data Description
Controller Data - RS232 Port COM1 - Incoming Modbus Request		
d.120	42520	RS232 Port COM1 - Incoming Modbus Request - Byte 0 (Slave Address)
d.121	42521	RS232 Port COM1 - Incoming Modbus Request - Byte 1 (Function Code)
d.122	42522	RS232 Port COM1 - Incoming Modbus Request - Byte 2
d.123	42523	RS232 Port COM1 - Incoming Modbus Request - Byte 3
d.124	42524	RS232 Port COM1 - Incoming Modbus Request - Byte 4
d.125	42525	RS232 Port COM1 - Incoming Modbus Request - Byte 5
d.126	42526	RS232 Port COM1 - Incoming Modbus Request - Byte 6
d.127	42527	RS232 Port COM1 - Incoming Modbus Request - Byte 7
d.128	42528	RS232 Port COM1 - Incoming Modbus Request - Byte 8
d.129	42529	RS232 Port COM1 - Incoming Modbus Request - Byte 9
d.130	42530	RS232 Port COM1 - Incoming Modbus Request - Byte 10
d.131	42531	RS232 Port COM1 - Incoming Modbus Request - CRC Hi & Lo
d.132	42532	RS232 Port COM1 - Incoming Modbus Request - CRC Calculated
Controller Data - Ethernet Port ENET1 - Incoming Modbus Request		
d.140	42540	Ethernet Port ENET1 - Incoming Modbus Request - Byte 0 (Slave Address)
d.141	42541	Ethernet Port ENET1 - Incoming Modbus Request - Byte 1 (Function Code)
d.142	42542	Ethernet Port ENET1 - Incoming Modbus Request - Byte 2
d.143	42543	Ethernet Port ENET1 - Incoming Modbus Request - Byte 3
d.144	42544	Ethernet Port ENET1 - Incoming Modbus Request - Byte 4
d.145	42545	Ethernet Port ENET1 - Incoming Modbus Request - Byte 5
d.146	42546	Ethernet Port ENET1 - Incoming Modbus Request - Byte 6
d.147	42547	Ethernet Port ENET1 - Incoming Modbus Request - Byte 7
d.148	42548	Ethernet Port ENET1 - Incoming Modbus Request - Byte 8
d.149	42549	Ethernet Port ENET1 - Incoming Modbus Request - Byte 9
d.150	42550	Ethernet Port ENET1 - Incoming Modbus Request - Byte 10
d.151	42551	Ethernet Port ENET1 - Incoming Modbus Request - CRC Hi & Lo
d.152	42552	Ethernet Port ENET1 - Incoming Modbus Request - CRC Calculated

SC1000 FAULT CODES

Fault Indication

The Fault indicator on the front of the SC1000 shows when there is something wrong with the system, and that there is a non-zero Fault Code present in Parameter FLC. Please see the Fault Code Table below.

Fault Code

The current Fault Code may be viewed from Parameter FLC.

Last Fault Code

The Last Fault Code may be viewed from Parameter LFC. It is a copy of the last non-zero Fault Code that was present in Parameter FLC.

Parameter	SCADA Register Address	Data Description
FLC	40047	Fault Code — See Fault Code Table below. Note: Parameter FLC automatically returns to zero when the fault clears. (Except for the latching fault codes: 1001 - 1009 & 1051 - 1053.)
LFC	40048	Last Fault Code — See Fault Code Table below. Note: Parameter LFC is a copy of the last fault code that was shown on Parameter FLC.

The Fault Code (FLC) and the Last Fault Code (LFC) may be viewed from Parameters FLC and LFC in the SC1000 menu.

Latching Fault Codes (1001 - 1009 & 1051 - 1053) and the Last Fault Code FLC may be reset by pressing the down push-button while viewing either FLC or LFC. They may also be viewed and reset from the TSID.

FAULT CODE TABLE

Fault Code	Description of Condition
0	Normal
Level Probe Fault	
1001	Level Probe Fault - Electrodes Covered Out of Sequence - Electrode 1 Covered before Electrode 2
1002	Level Probe Fault - Electrodes Covered Out of Sequence - Electrode 2 Covered before Electrode 3
1003	Level Probe Fault - Electrodes Covered Out of Sequence - Electrode 3 Covered before Electrode 4
1004	Level Probe Fault - Electrodes Covered Out of Sequence - Electrode 4 Covered before Electrode 5
1005	Level Probe Fault - Electrodes Covered Out of Sequence - Electrode 5 Covered before Electrode 6
1006	Level Probe Fault - Electrodes Covered Out of Sequence - Electrode 6 Covered before Electrode 7
1007	Level Probe Fault - Electrodes Covered Out of Sequence - Electrode 7 Covered before Electrode 8
1008	Level Probe Fault - Electrodes Covered Out of Sequence - Electrode 8 Covered before Electrode 9
1009	Level Probe Fault - Electrodes Covered Out of Sequence - Electrode 9 Covered before Electrode 10

SC1000 FAULT CODE TABLE

Fault Code	Description of Condition
0	Normal
Setup Fault	
1011	Setup Fault - Pump On/Off Level Control - 1st Pump Off Level and 1st Pump On Level are too close together (minimum of: 0.5 feet apart), or they are upside down.
1012	Setup Fault - Pump On/Off Level Control - 2nd Pump Off Level and 2nd Pump On Level are too close together (minimum of: 0.5 feet apart), or they are upside down.
1013	Setup Fault - Pump On/Off Level Control - 3rd Pump Off Level and 3rd Pump On Level are too close together (minimum of: 0.5 feet apart), or they are upside down.
1018	Setup Fault - More than one Discrete Input is assigned to the same Function.
Miscellaneous Fault	
1031	All Pump Disable - Discrete Input assigned Function 7 is closed (Typically connected to Phase Monitor).
1037	Communication Lost - While Setup for Remote Control Level Input from SCADA (Parameter P.22 = 4). Note: To clear this Fault SCADA must write a Level Input value to the Remote Control Level Input (Modbus Register 40025).
1041	Pump Cutoff Low-Low Level Active - Discrete Input assigned Function 13 is closed.
1042	Pump Cutoff High-High Level Active - Discrete Input assigned Function 14 is closed.
1049	Level Probe Backup Control Active Calling Pump(s) to Run.
1050	Float Backup Control Active Calling Pump(s) to Run. Note: This Fault is disabled if the Level Input Source is set for Float Switch Inputs (Parameter P.22 = 3).
Float Control Fault	
1051	Float Control Fault - Float Out of Sequence - 1st On Level Float input closed before Off Level Float input.
1052	Float Control Fault - Float Out of Sequence - 2nd On Level Float input closed before 1st On Level Float input.
1053	Float Control Fault - Float Out of Sequence - 3rd On Level Float input closed before 2nd On Level Float input.
Hardware Fault	
1081	Hardware Fault - Reading a Setup Parameter from the EEPROM was not successful.
1082	Hardware Fault - Storing a Setup Parameter to EEPROM was not successful.
Parameter Security Alert Fault	
1201	Parameter Security Alert Fault - Suspicious Activity on SCADA RS232 Serial Port COM1 Detected an Unusually High Number of Entries into the Security Code Entry Parameters: SCE3 : SCE2 : SCE1
1202	Parameter Security Alert Fault - Suspicious Activity on SCADA Ethernet Port ENET1 Detected an Unusually High Number of Entries into the Security Code Entry Parameters: SCE3 : SCE2 : SCE1

SC1000 FAULT CODE TABLE

Fault Code	Description of Condition
0	Normal
Communication Fault - RS232 Serial Port COM1	
2101	The UART detected an Overrun Error reading incoming message.
2102	The UART detected a Parity Error reading the incoming message.
2103	The UART detected a Framing Error or Parity Error reading the incoming message.
2104	Incoming message failed Checksum Test.
2105	Incoming message Length Error. Maximum Allowed: 80 Bytes
2106	Incoming message with Function Code No. 15 - Byte Count Limit Exceeded. Maximum Allowed: 13 Bytes
2107	Incoming message with Function Code No. 15 - Coil Quantity Exceeds what is Allowed by Byte Count.
2108	Incoming message with Function Code No. 16 - Byte Count Limit Exceeded. Maximum Allowed: 70 Bytes
Communication Fault - Ethernet Port ENET1	
3101	The UART detected an Overrun Error reading incoming message.
3102	The UART detected a Parity Error reading the incoming message.
3103	The UART detected a Framing Error or Parity Error reading the incoming message.
3104	Incoming message failed Checksum Test.
3105	Incoming message Length Error. Maximum Allowed: 80 Bytes
3106	Incoming message with Function Code No. 15 - Byte Count Limit Exceeded. Maximum Allowed: 13 Bytes
3107	Incoming message with Function Code No. 15 - Coil Quantity Exceeds what is Allowed by Byte Count.
3108	Incoming message with Function Code No. 16 - Byte Count Limit Exceeded. Maximum Allowed: 70 Bytes

For more information on Fault Codes see Section F.

ANALOG LEVEL INPUT AIX1 – CALIBRATION PROCEDURE

LEVEL INPUT SPAN - Parameter P.24

Parameter P.24 is used to enter the Transducer's Calibrated Span in feet.

Calibration Procedure:

1. A 20mA signal **does not** need to be applied to the Level Input while Setting the Span.
2. Scroll in the menu to Parameter P.24 and press push-button PB-M to view the Parameter's current value.
3. Press and hold down the "UP" or "DOWN" push-buttons as needed to make the display read the Transducer's Calibrated Span.

LEVEL INPUT ZERO - Parameter P.25

Parameter P.25 is used to make small changes to the Level Display Calibration to make the display read zero.

Calibration Procedure:

1. Apply a 4.0mA signal to the Analog Level Input.
   (Alternate Procedure - Raise the pressure transducer up out of the liquid.)
2. Scroll in the menu to Parameter P.25 and press push-button PB-M to view the Level.
3. Press and hold down the "UP" or "DOWN" push-buttons as need to make the display read zero with no negative sign. Note: It is slow to change at first.

Note:

Do not attempt to change the Zero calibration using parameter P.25 without first applying a 4 mA signal to the Analog Level Input, or having a functioning Pressure Transducer (raised above the surface of the liquid) connected to the Level Input.

LEVEL INPUT SPAN in Feet Of Water Versus TRANSDUCER CALIBRATION in PSI

	Transducer Calibration						
	5.0psi @ 20mA	10psi @ 20mA	15psi @ 20mA	30psi @ 20mA	60psi @ 20mA	100psi @ 20mA	
Level Input Span	-	-	-	-	139 feet	231 feet	**P.29 = 0**
	11.5 feet	23.1 feet	34.6 feet	69.3 feet	139.0 feet	231.0 feet	**P.29 = 1**
	11.50 feet	23.10 feet	-	-	-	-	**P.29 = 2**

Notes:

1. Parameter P.29 is used to set the decimal point position.
2. To find the Span Setting for other transducers use the following equation:

   Pressure (psi) x 2.309 = Level (feet of water)

For more information on the Analog Level Input see Section M.

For Factory Level Calibration of AIX1 see Section X.

FLUSH CYCLE

The Flush Cycle is provided to periodically flush the sludge build up from the bottom of the wet well and from the discharge pipe. This is done by periodically maximizing the lift station's discharge flow rate.

Flush Cycle Steps:

1. Upon the start of the Flush Cycle, normal pump operation is suspended (all pumps turned off).
2. It then waits for the level to rise to the "Flush Cycle Start Level" set on Parameter P.73.
3. Upon reaching the "Flush Cycle Start Level" all available pumps are turned on with a delay in between.
4. The pumps stay on until the level reaches the "Flush Cycle Stop Level" set on Parameter P.74.
5. At the "Flush Cycle Stop Level" all pumps are turned off and normal pump control resumes.

Automatically Starting Flush Cycle:

A. Internal Time Delay - Expiration of the "Delay Between Flush Cycles" set on Parameter P.72.
B. External Time Clock - Closure of a Discrete Input that is assigned Function 20.

Manually Starting / Stopping Flush Cycle:

Start - Press & hold the LEVEL push-button until the "LEVEL" indicator starts to flash. To start the cycle through SCADA - Momentarily set Modbus Coil 139 (Register 40009 Bit 10).

Stop - Press & hold the LEVEL push-button until the "LEVEL" indicator stops flashing. To stop the cycle through SCADA - Momentarily set Modbus Coil 140 (Register 40009 Bit 11).

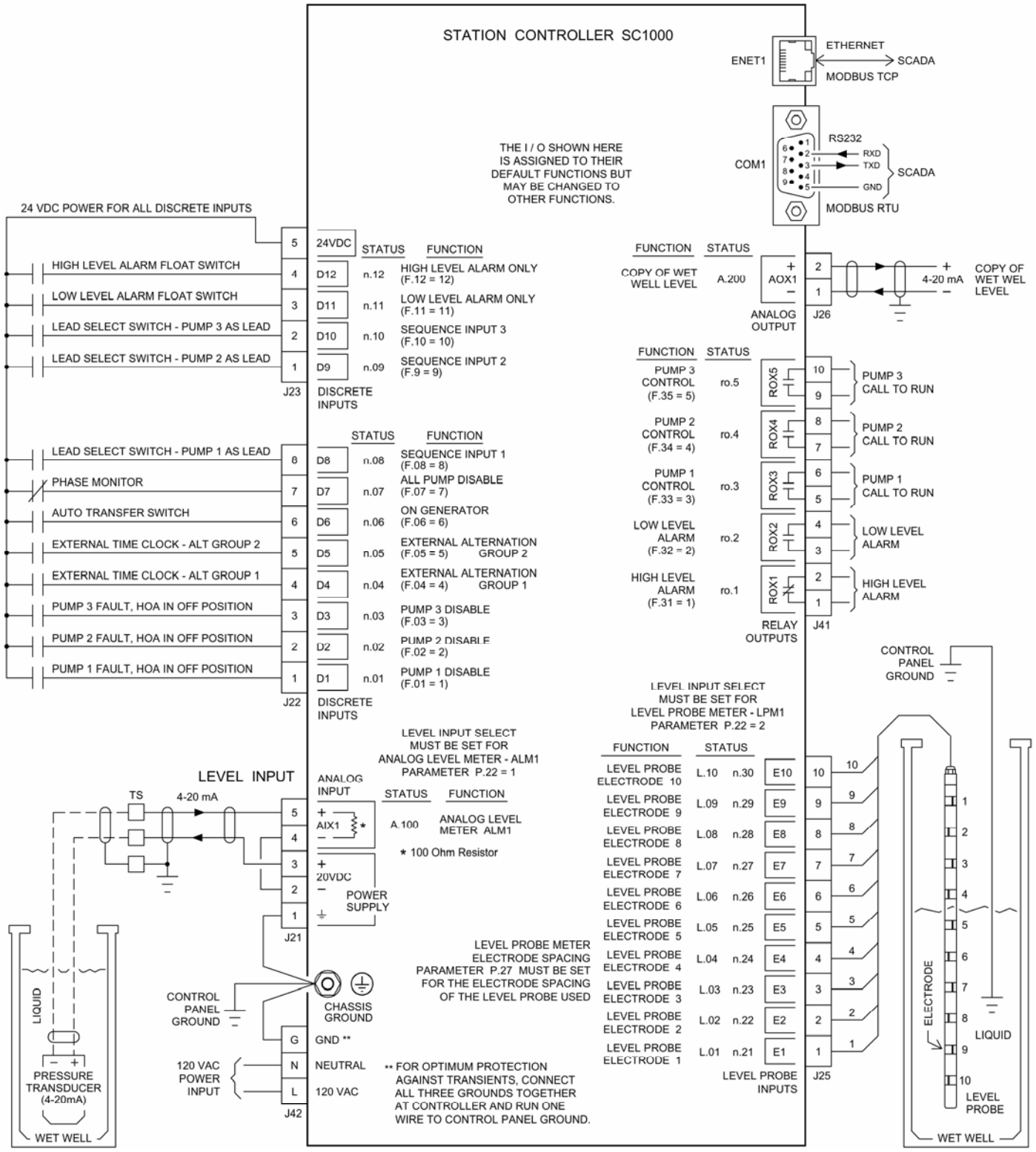
Notes:

1. The Flush Cycle Feature only works in the "Pump Down" mode (Parameter P.31 = 1).
2. The number of pumps called to run by the Flush Cycle logic is always limited by the following:
   A. The setting on Maximum Number of Pumps Allowed to Run At the Same Time (Parameter P.14).
   B. The closing of Discrete Inputs that are assigned as the Pump Disable inputs (Functions 1 - 3).
3. If the Flush Cycle is active, the closing of a Discrete Input assigned as the All Pump Disable input (Function 7), will abort the Flush Cycle.
4. All backup systems and level alarms must be setup so that they do not activate within the Flush Cycle operating range set on Parameters P.73 and P.74.
5. If the Flush Cycle is active, the closing of a Discrete Input assigned as the Pump Cutoff - Low-Low Level input (Function 13), will abort the Flush Cycle. Therefore, the Flush Cycle Stop Level must be set higher than the Low-Low Level Float Switch.

User / Operator Info.			SCADA	
Parameter	Default Value	Current Value	Register Address	Description of Parameters and SCADA Notes
Flush Cycle Setup				
P.71	0		40171	Flush Cycle Mode 0 = Flush Cycle Disabled 1 = Flush Cycle Enabled - Activated by the Internal Time Clock 2 = Flush Cycle Enabled - Activated by an External Time Clock
P.72	1440 min		40172	Delay Between Flush Cycles Range: 1 - 65,535 minutes
P.73	9.5 feet		40173	Flush Cycle Start Level Range: 0.2 - 231.0 feet
P.74	2.5 feet		40174	Flush Cycle Stop Level Range: 0.2 - 231.0 feet

For more information on the Flush Cycle see Section J.

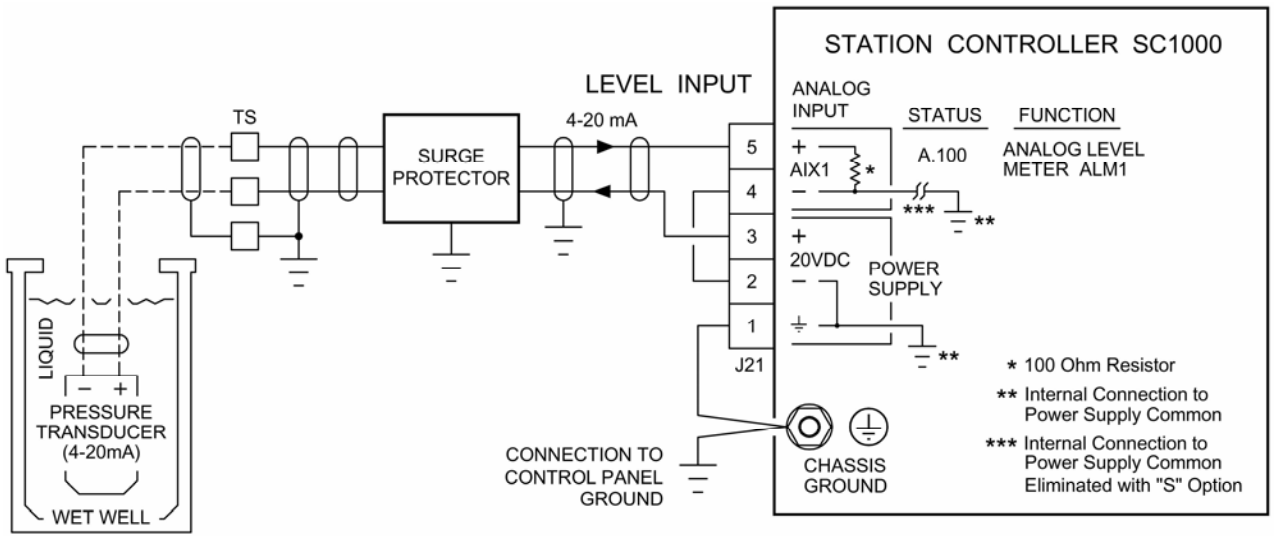
CONNECTON DIAGRAM - STANDARD FEATURES



For more information on I/O see Sections A, B, E, L, M & N.

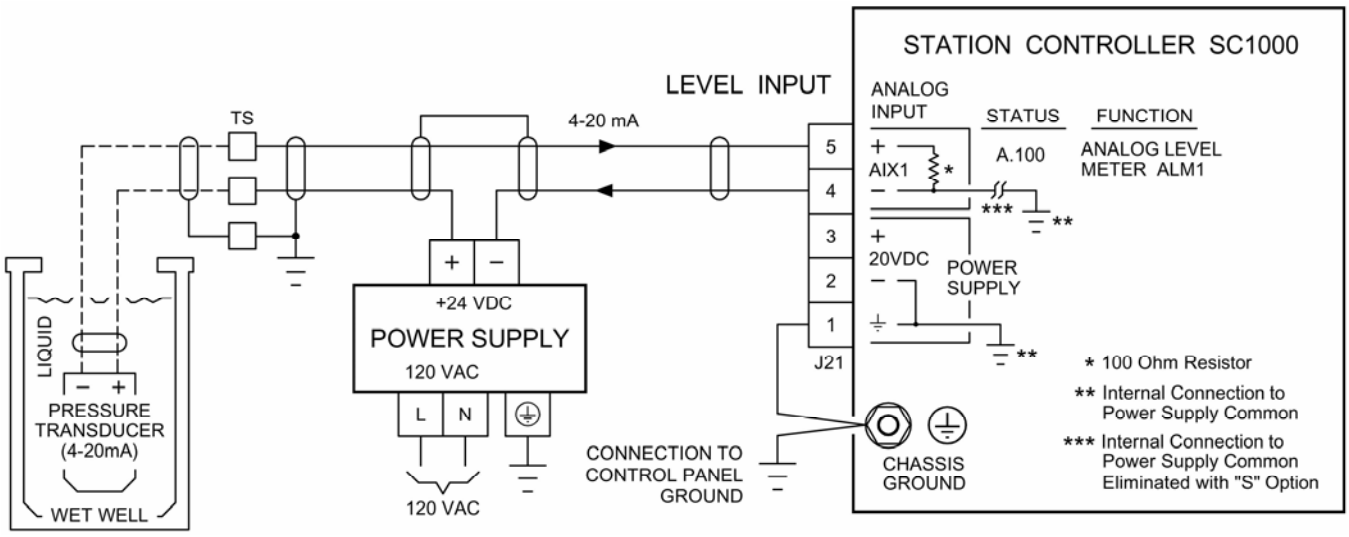
ANALOG LEVEL INPUT EXAMPLES

Example Using the 20 VDC Power Supply on the SC1000



Analog Input AIX1 in this example does not need to be Isolated, so the Controller does not need the “S” Option.

Example Using an External 24 VDC Power Supply

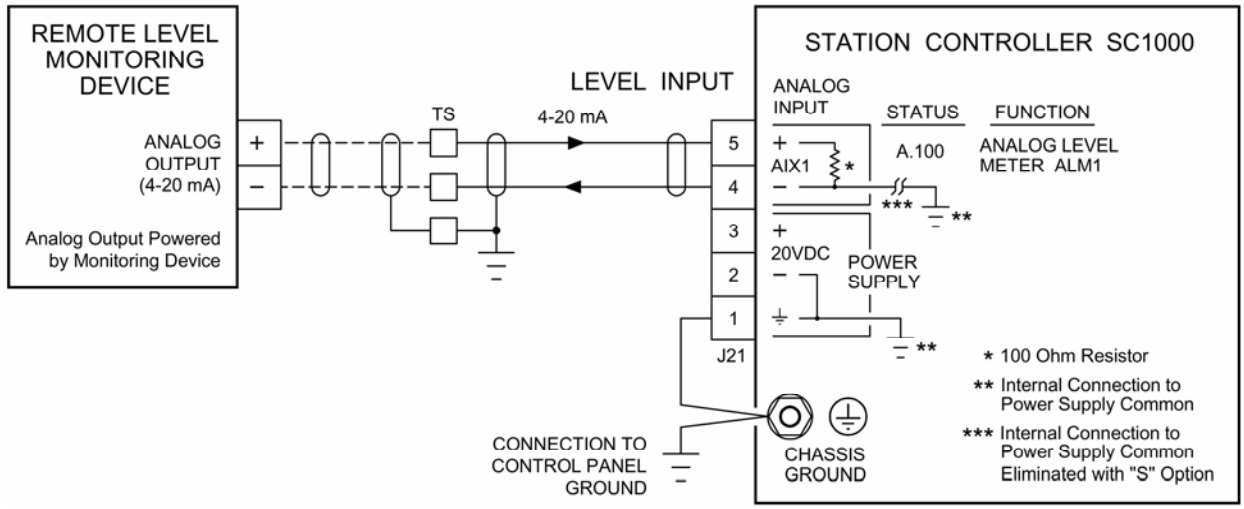


Analog Input AIX1 in this example does not need to be Isolated, so the Controller does not need the “S” Option.

For more information on the Analog Level Input see Section M.

ANALOG LEVEL INPUT EXAMPLES

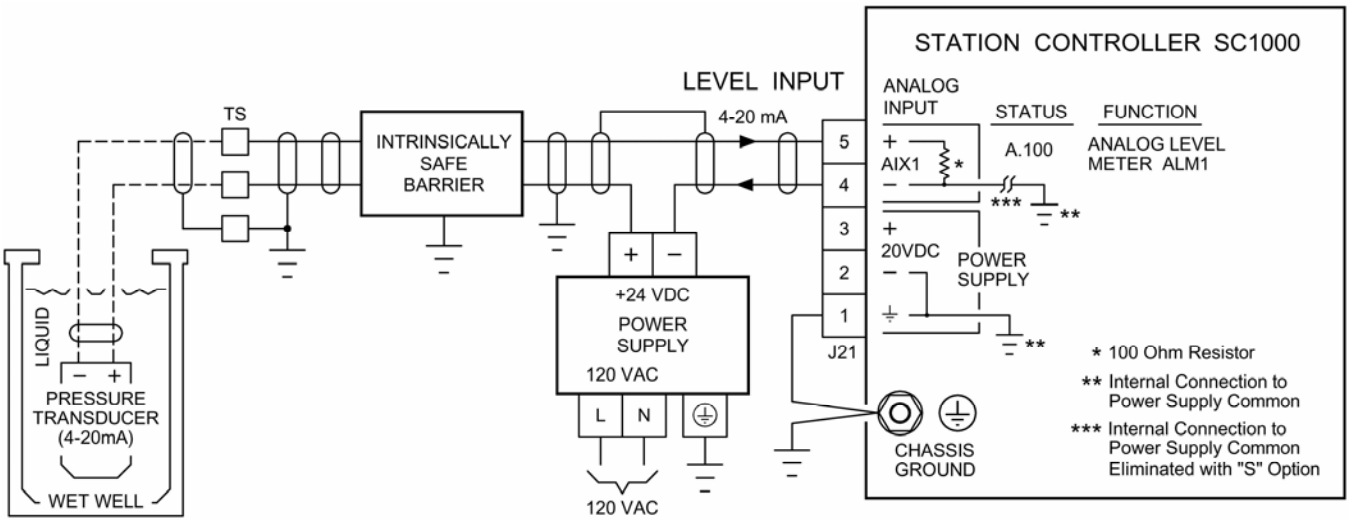
Example of where the Analog Signal is Powered by a Remote Device



The 4-20 mA signal in this example **must be Isolated from ground**. This is required to ensure that the Remote Device's Control Panel ground is not connected to the Local Control Panel's ground through the 4-20 mA signal wiring. When this is the case it greatly affects the signal's integrity.

The **Controller should be ordered with the "S" Option**, unless it is known that the Analog Output from the Remote Device is Isolated from ground. The Level Input signal must be Isolated from ground at one end or the other or at both ends.

Example using an Intrinsically Safe Barrier



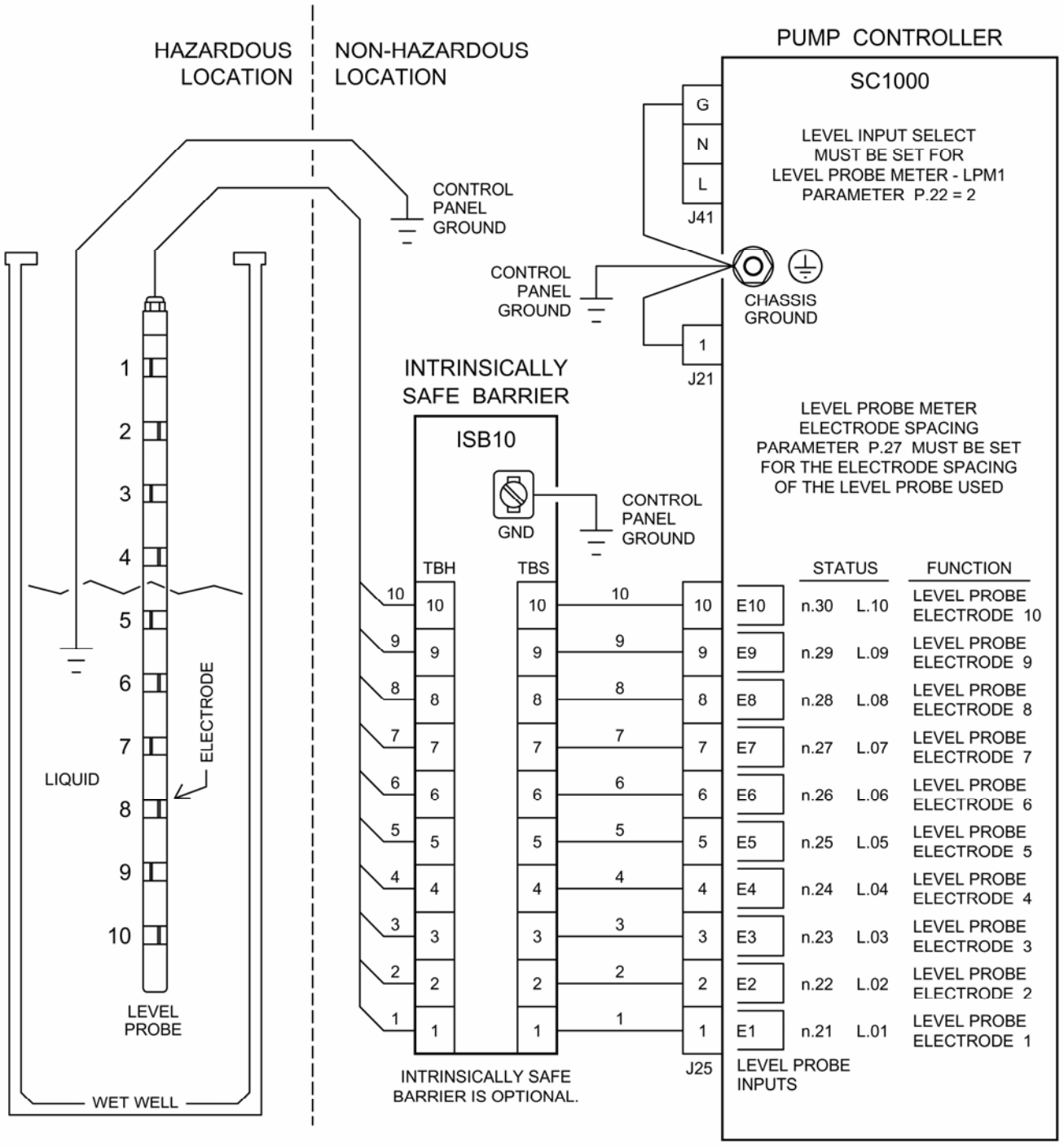
An external +24 VDC Power Supply is required when using an Intrinsically Safe Barrier.

Some Intrinsically Safe Barriers (due to how they are made internally and how they are connected in the circuit) may lose part of the analog signal to ground through their internal circuits. When this is the case it greatly affects the analog signal's integrity. In some cases having the "S" Option (where AIX1 is Isolated from the Controller's ground) may correct the problem.

For correctly made Intrinsically Safe Barriers that are connected correctly it is not necessary for the Analog Input AIX1 to be Isolated, so the Controller does not need the "S" Option.

For more information on the Analog Level Input see Section M.

LEVEL PROBE CONNECTION EXAMPLE



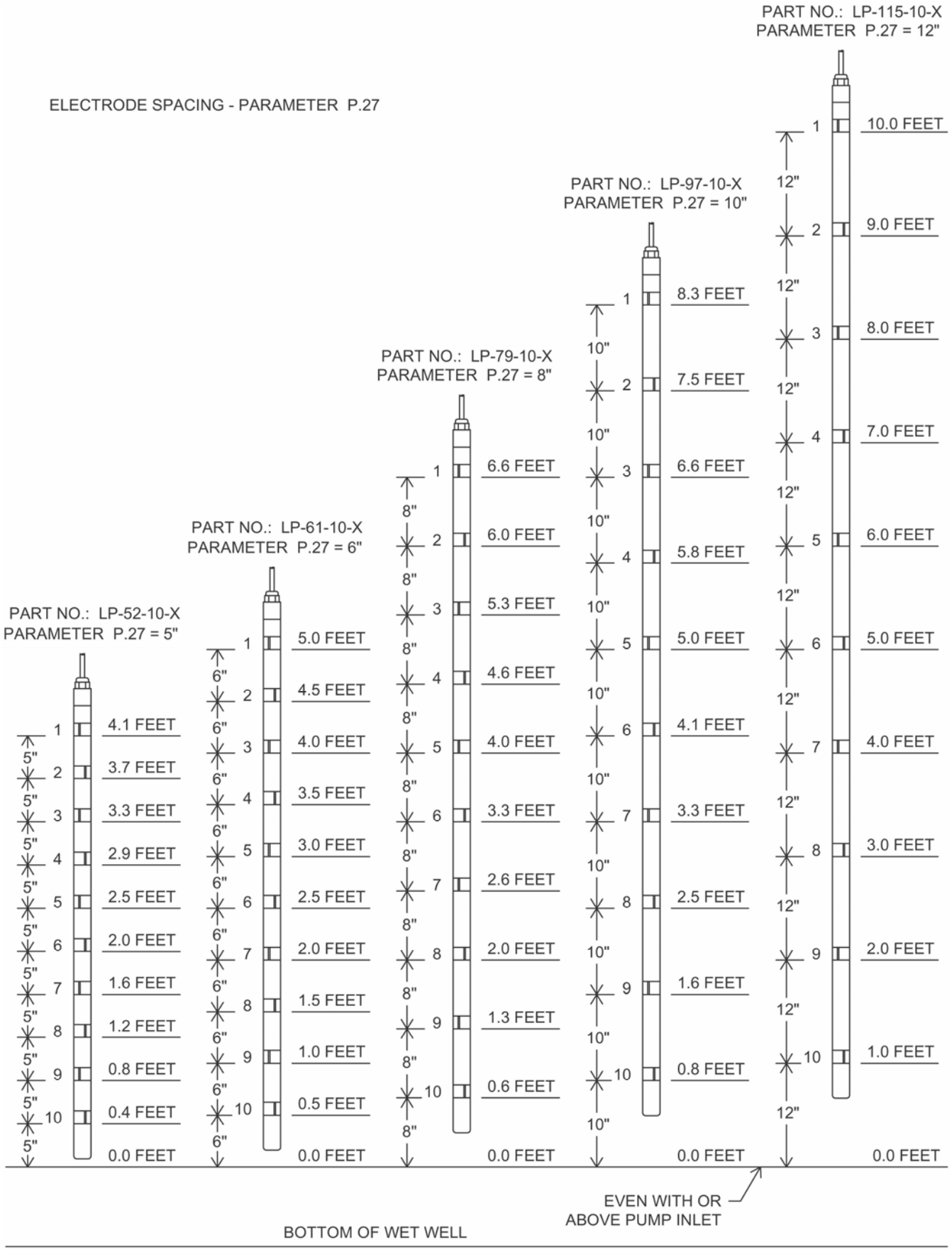
Note:

The liquid in the wet well must be grounded to the control panel ground.

Where a submersible pump is present the grounded housing of the pump is sufficient to ground the water to the control panel.

For more information on Level Probe Control see Section L.

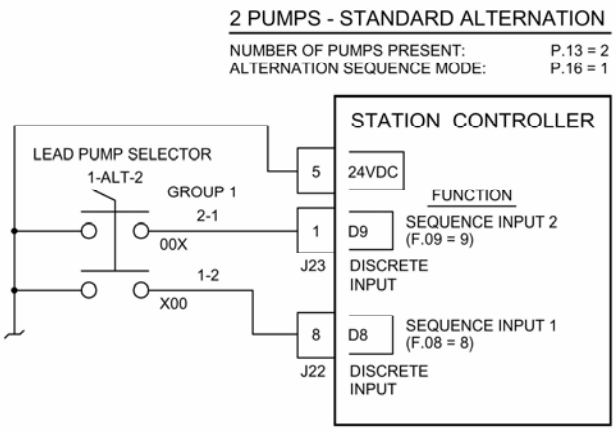
LEVEL PROBE ELECTRODE SPACING

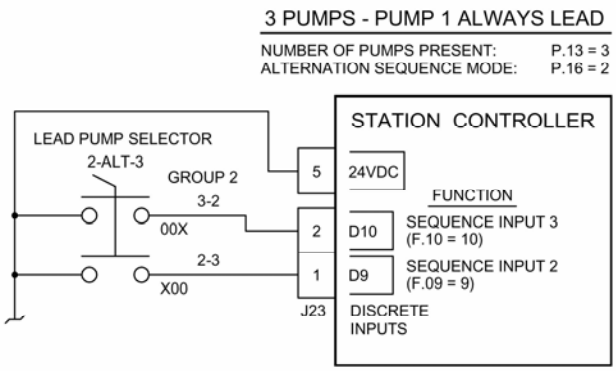


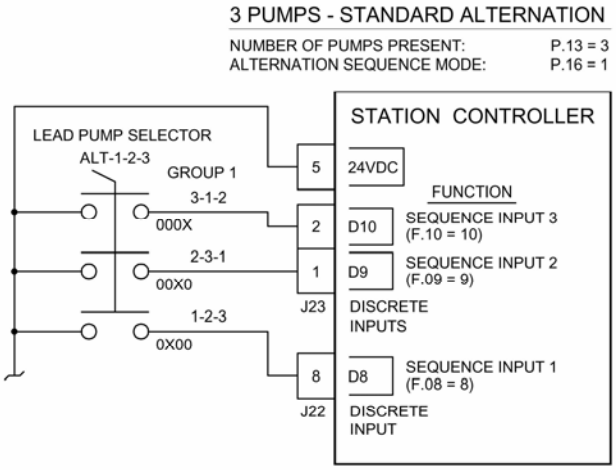
For more information on Level Probe Control see Section L.

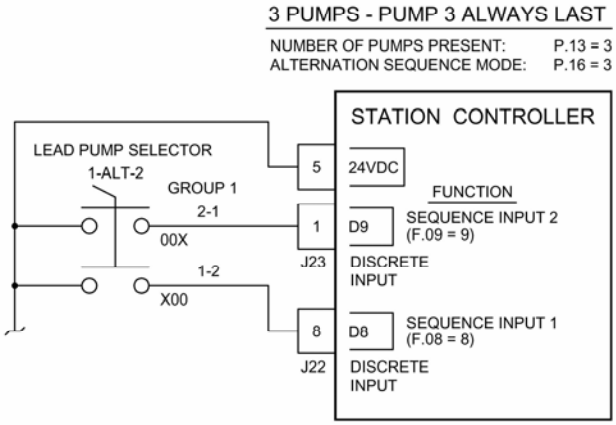
PUMP ALTERNATION - LEAD PUMP SELECT SWITCH EXAMPLES

Connection Diagrams



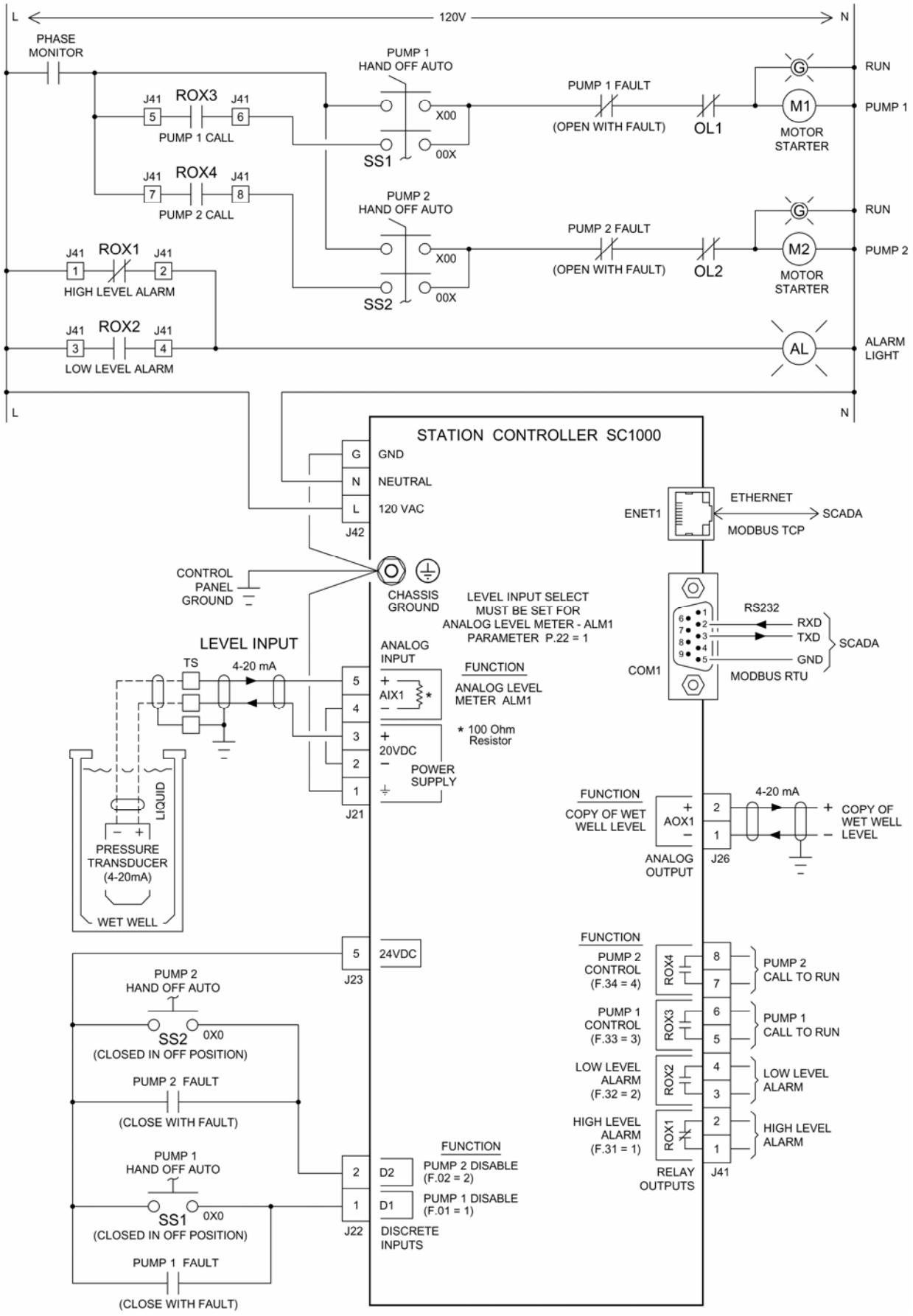






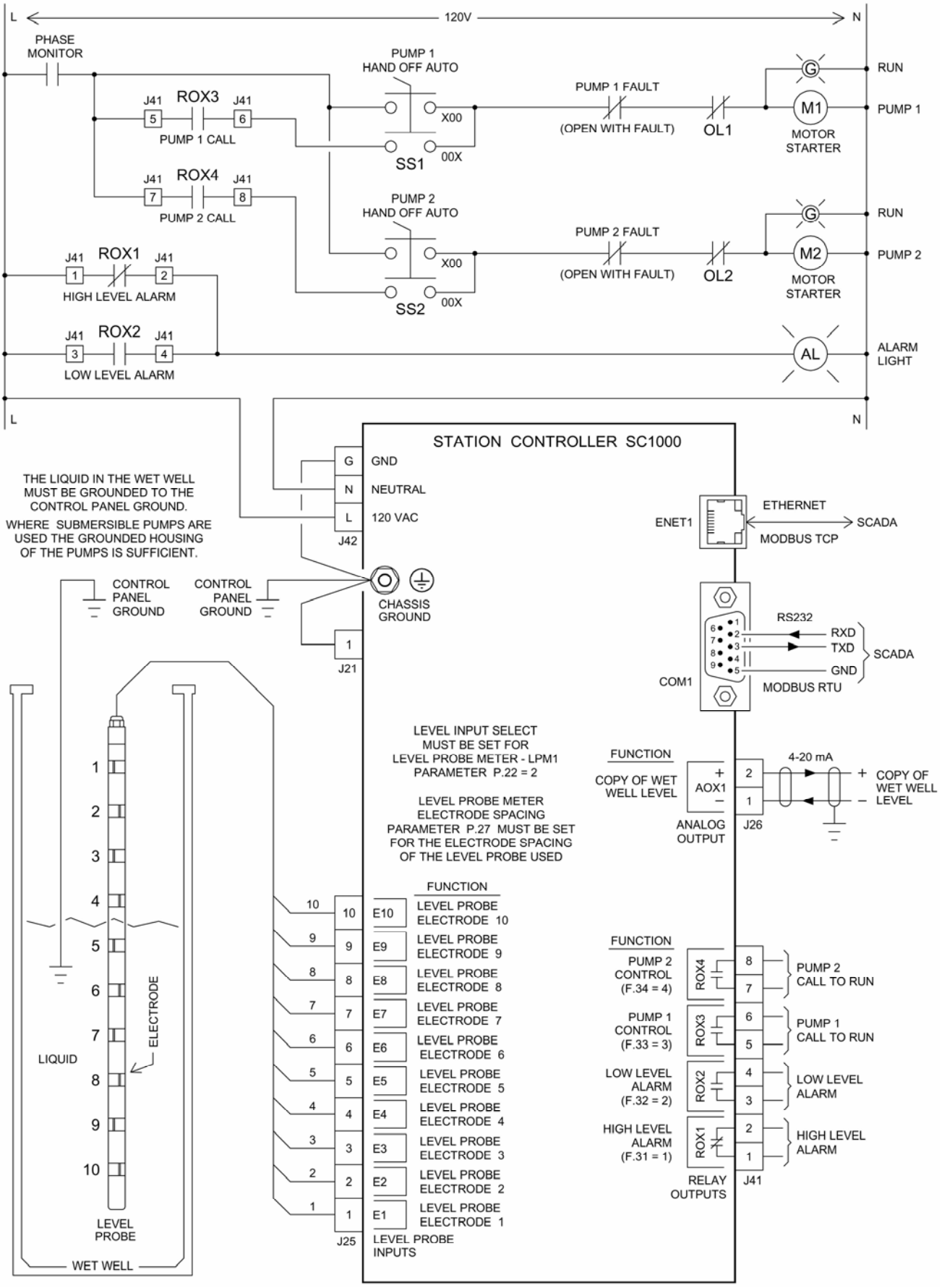
For more information on Alternation see Section G.

LEVEL CONTROL EXAMPLE - ANALOG LEVEL INPUT



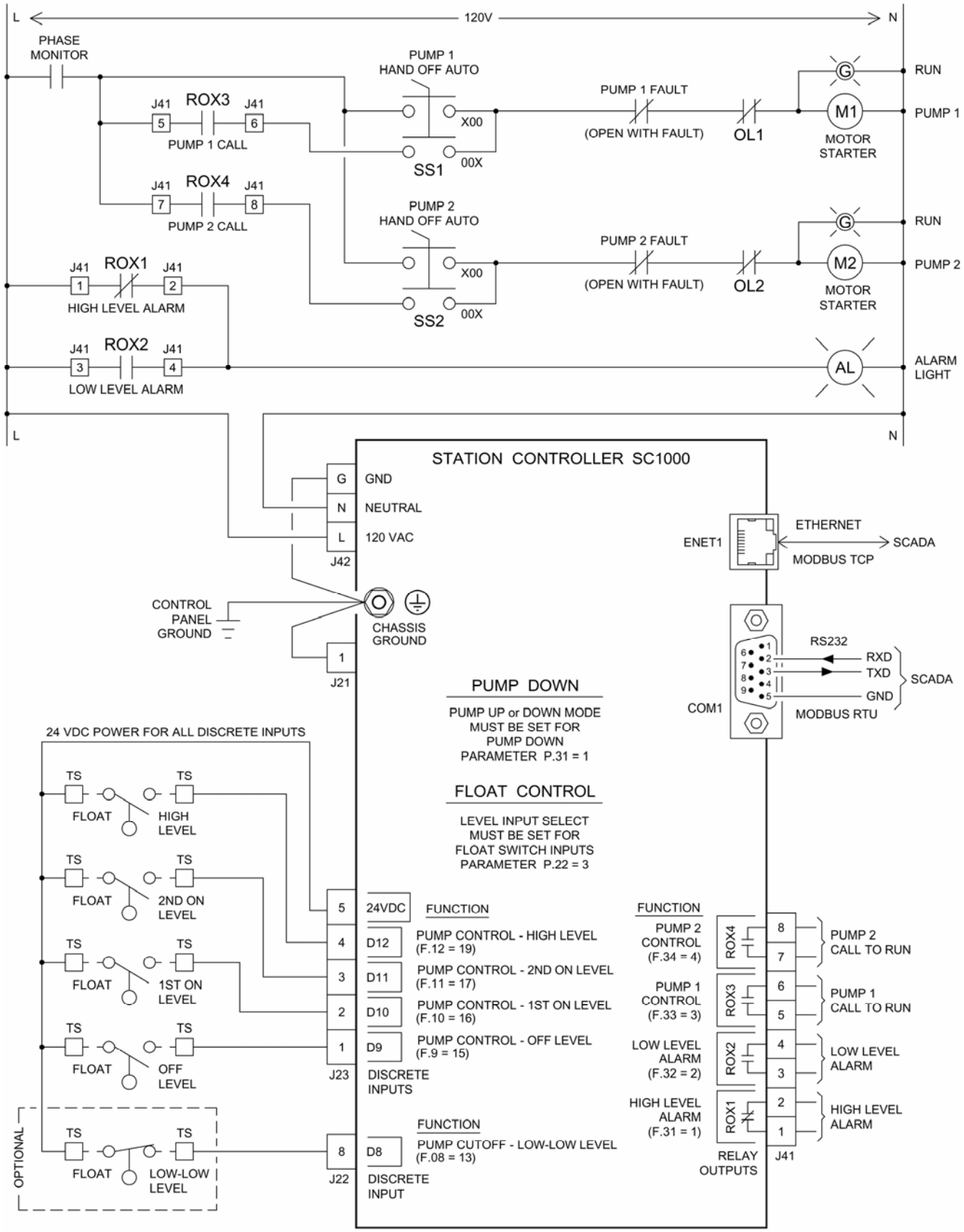
For more information on the Analog Level Input see Section M.

LEVEL CONTROL EXAMPLE - LEVEL PROBE INPUT



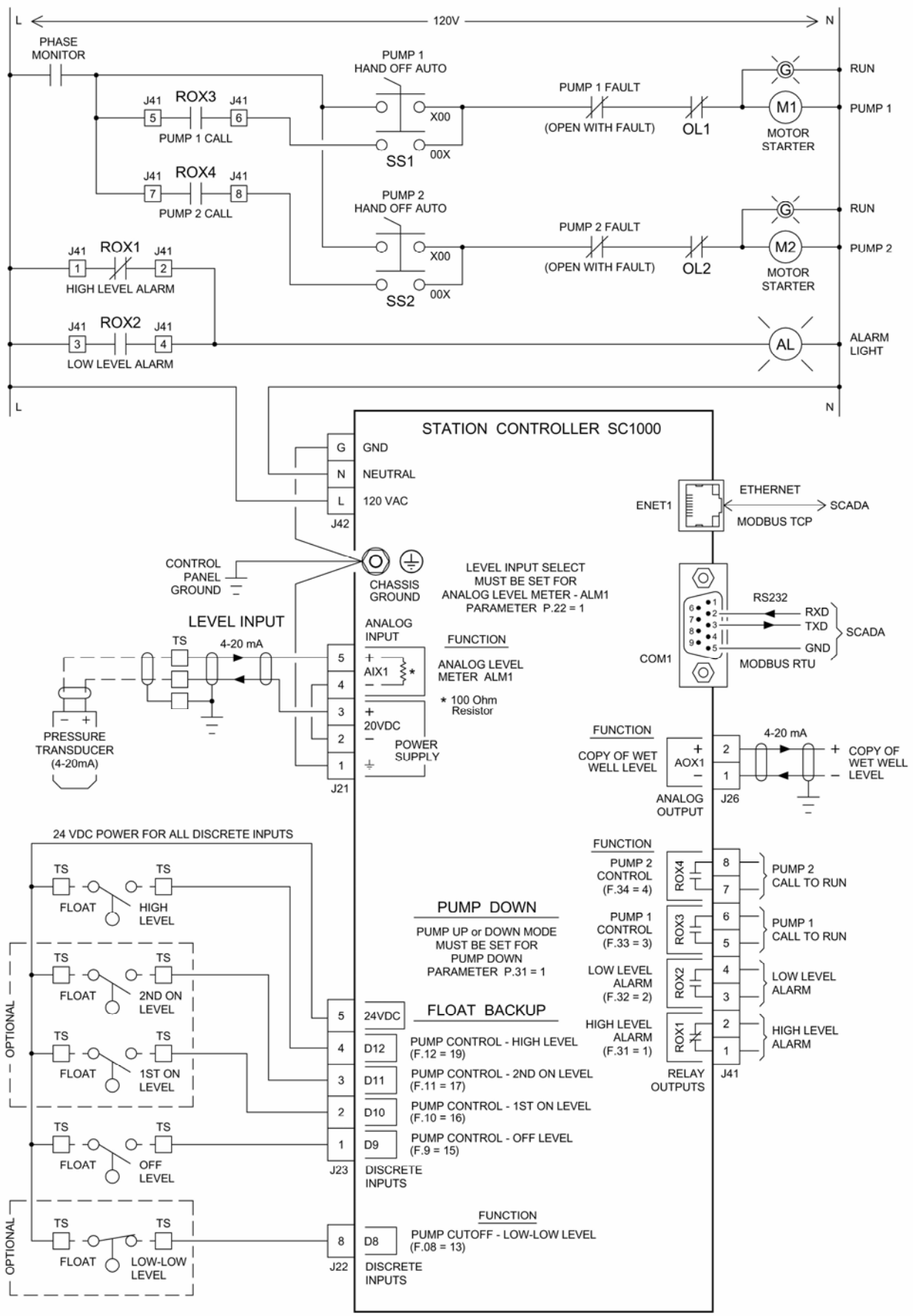
For more information on the Level Probe Input see Section L.

LEVEL CONTROL EXAMPLE - FLOAT CONTROL - PUMP DOWN



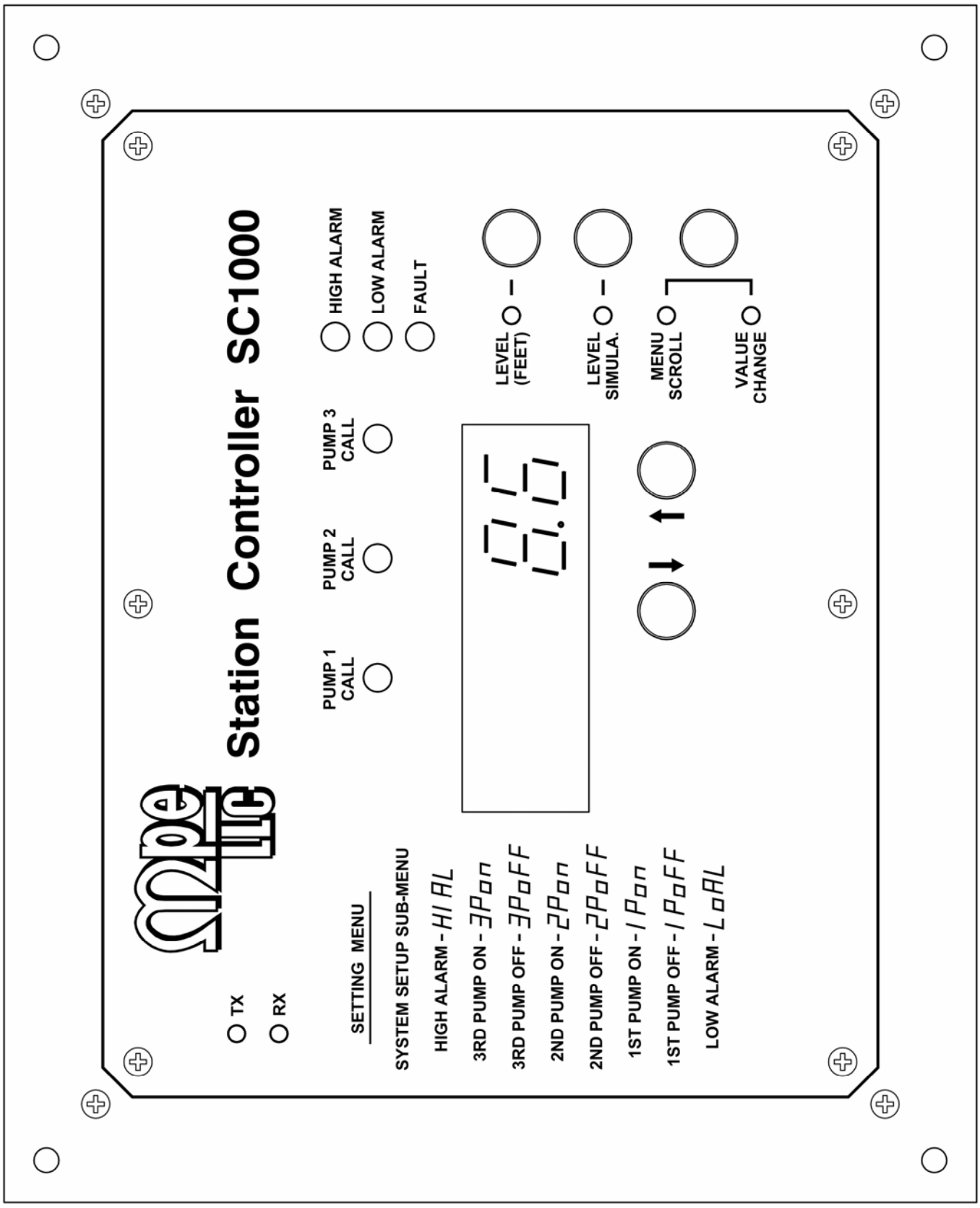
For more information on Float Control see Section I.

LEVEL CONTROL EXAMPLE - FLOAT BACKUP - PUMP DOWN

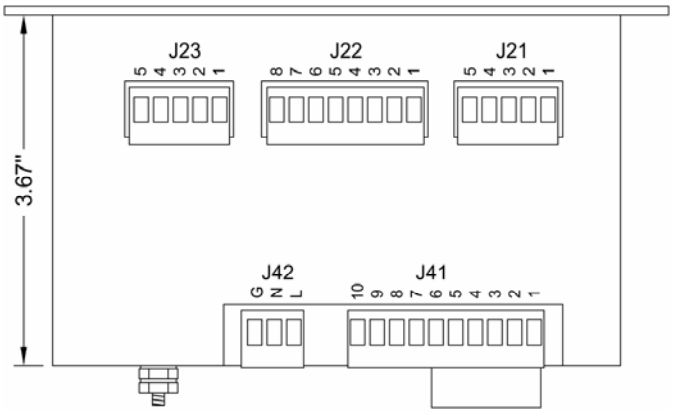


For more information on Float Backup see Section I.

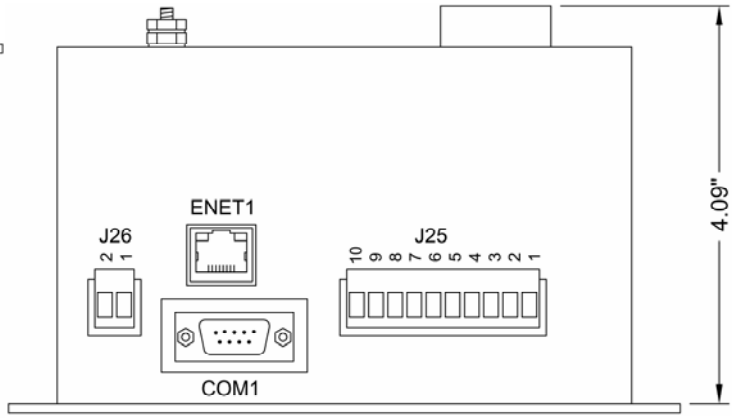
OPERATOR INTERFACE



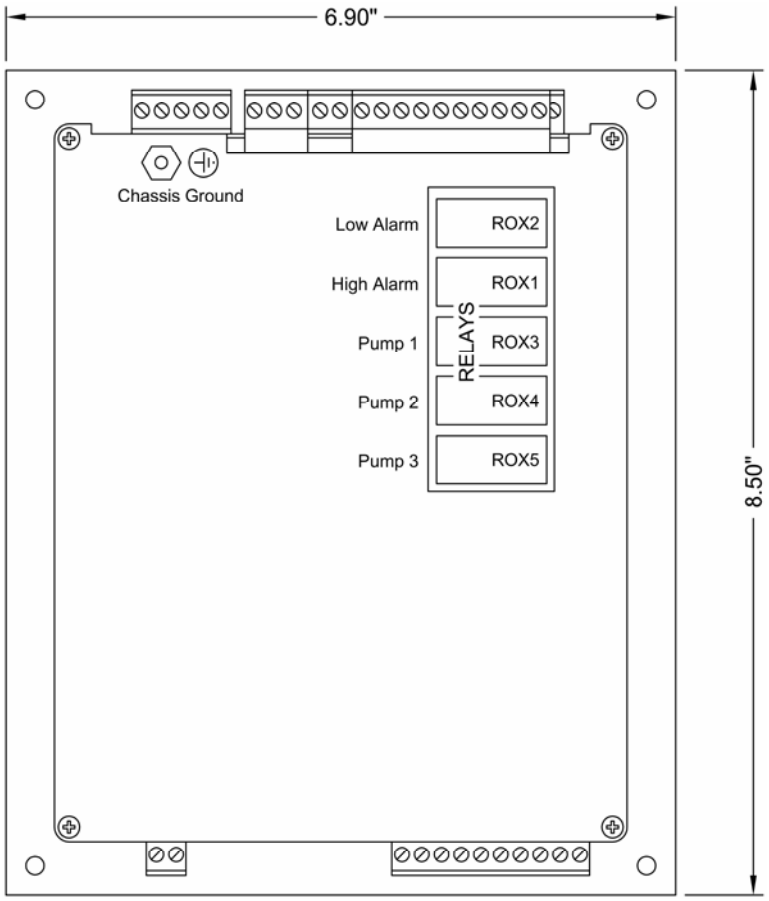
ENCLOSURE MECHANICAL LAYOUT



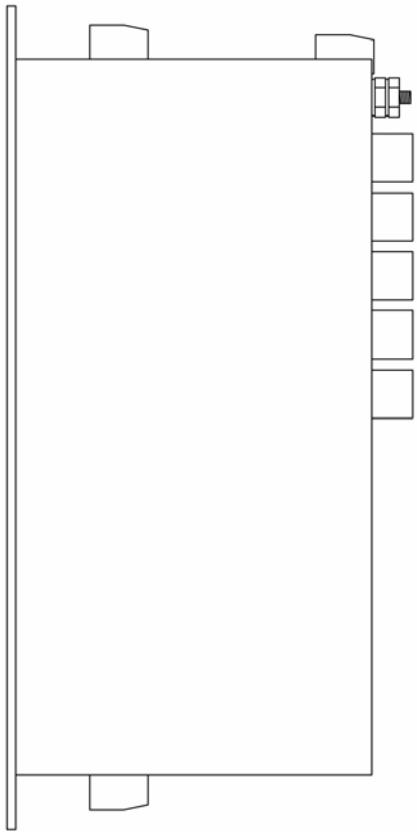
Left Side



Right Side

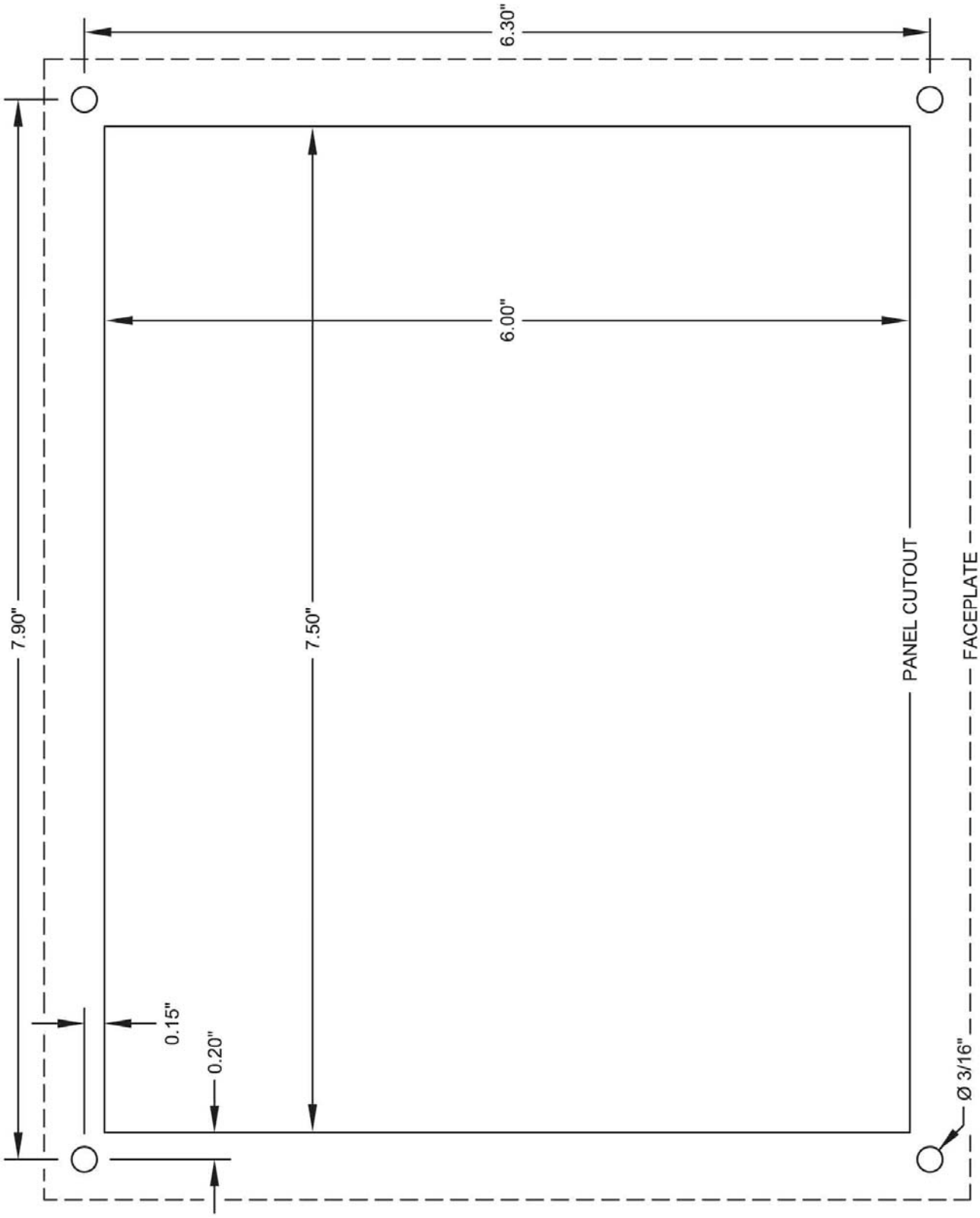


Rear View



Top View

PANEL CUTOUT



Not Printed to Scale. **Do Not Use as a Template.**