

APPENDIX B

LEVELITE OPTICAL LIQUID LEVEL SENSORS

LEVELITE SPECIFICATION SHEET

Teflon Electro Optic Remote Probe Model Number: GLL 110010

PRODUCT HIGHLIGHTS

- Superior Corrosion Resistance
- PFA Teflon Body
- 1/2" NPT Mounting
- Non Contaminating
- Compact Design
- No Moving Parts
- For Use With Universal Controller

DESCRIPTION

The corrosion resistant PFA Teflon body makes this the probe of choice in applications involving contact with extremely destructive acids, bases, and organic solvents. It is well suited for use in semiconductor manufacturing and other operations involving destructive materials, or in systems requiring the highest purity.

SPECIFICATIONS

Overall Length: 2.8" (71.4 mm.)

Weight: 8.3 oz. (235g)

Material: PFA Teflon

Process connection: 1/2" NPT

Conduit connection: 1/2" NPT

Cable type/Length: Belden 8443/ 25 Ft. (7.62m)

Operating temp: -20° F to 200° F (-29° C to 94° C)

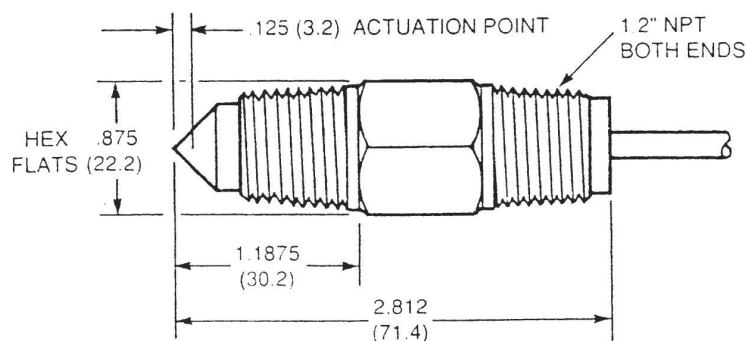
Maximum operating pressure: 100 PSI (7 kg/cm²)

Repeatability: ± 0.020" (0.5mm) in water

Supply voltage: From Universal Controller

Maximum distance from control unit: 250 Ft. (76.2m)

Sensor operation: Optical refraction, modulated infrared with 6800 Å chromatic filter.



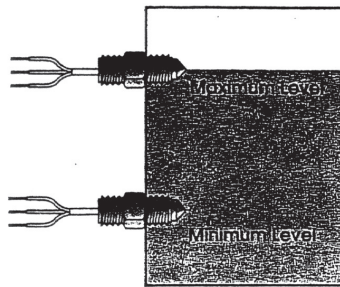
Levelite Optical Liquid Level Systems

LEVELITE

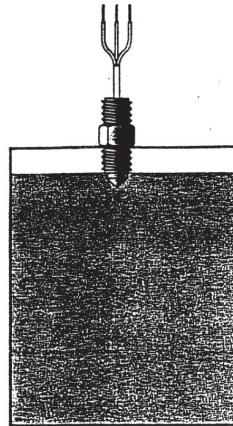
Levelite Sensing Probe Installation

STEP 1 Mounting:

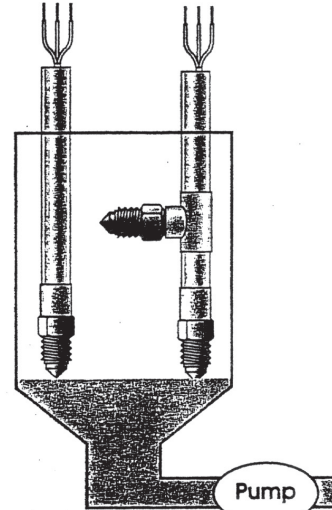
Typical In-Vessel Mounting



Thread directly into side of tank



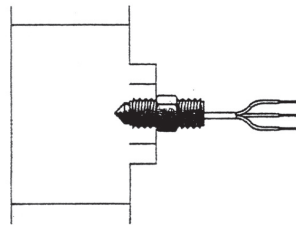
Thread directly into tank top or bottom



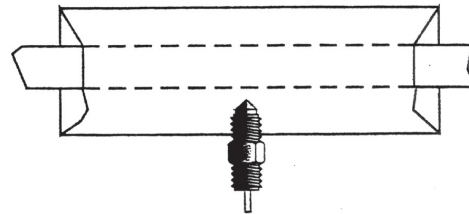
Use 1/2" nominal pipe, coupling, or tee for custom installations

- Mount probes in any attitude
- Do not submerge rear of probes (except GLL110000)
- All probes have 1/2" NPT process and conduit connection with the following exceptions:

Alternate Mounting



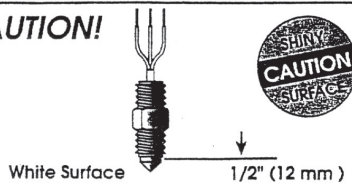
- 1/2" NPT Pipe Tee



- Dual Containment piping

• SEAL THREADS WITH TEFLON SEALANT OR TAPE, DO NOT ALLOW TAPE OR SEALANT TO COVER TIP OF PROBE

CAUTION!



- If mounting tip within 1/2" (12mm) of white or shiny surface, consult factory.

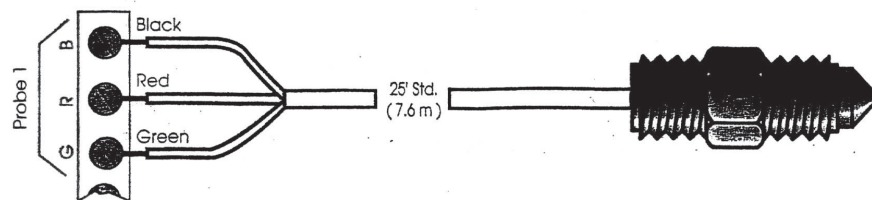
Quartz Tips



- Quartz tips available from 5/8" (16mm) to 10" (254mm)
- Hand tighten seal and then finish last quarter-turn with wrench

STEP 2 Wiring:

Electro Optic Probe Wiring



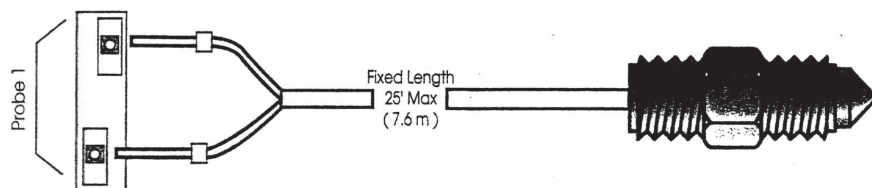
Universal Controller

- 25 ft. (7.6m) cable is supplied with each probe

- All Electro optic probes can be extended to 250 feet (76m) using Belden 8443, 3 conductor 22 gauge (or equivalent)
- Run cable thru conduit, if desired (Do not run with high voltage cables)
- DO NOT APPLY POWER DIRECTLY TO PROBE WIRES

Fiber Optic Probe Connection

P/N GLL110121 thru GLL110132



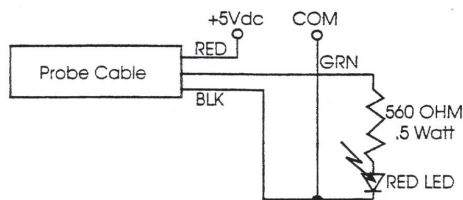
Universal Controller

- Fiber optic cable length not field alterable

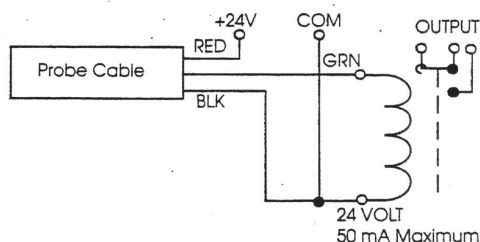
- Plug probe connector(s) into mating connector(s) on Universal Controller
- Orientation of connectors is not important
- Do not bend cable in less than a 1 inch (25.4mm) radius
- Fiber optic cable can be installed with high voltage wiring

Controller Probe Wiring

P/N GLL100240/5Vdc, GLL100250/24Vdc



- Typical wiring for GLL100240/5Vdc



- Typical wiring for GLL100250/24Vdc

- GLL100240/5Vdc, 20 mA maximum - sinking (output low when wet), sourcing (output high when wet)
- GLL100250/12-32 Vdc, 50 mA maximum - sourcing (output high when wet)
- Extend to 1000 feet (300m) using Belden 8443, 3 conductor, 22 gauge (or equivalent)

STEP 3 Calibration and Use:

- No calibration is required at the Levelite probes. Calibration for remote probes is done at the Universal Controller. (Controller probes have a factory set calibration).
- Only Fiber Optic probes should be used in hazardous areas.
- Check probe compatibility including pressure, temperature, and corrosion resistance before using.
- Air bubbles and particles collecting on wet (submerged) probes can cause the probe to appear dry. Readjust Universal Controller sensitivity to compensate.

Venture Measurement, 150 Venture Boulevard, Spartanburg, SC 29306. Phone: (800) 778-9242 or (864) 574-8060. Fax: (864) 574-8063

GLL 180026 Rev. A

Levelite Universal Controller

LEVELITE

Installation & Operation Instructions

GLL 180009 Rev. A

LEVELITE

"Universal Controller"

Operation and Installation Instructions

1.0 INTRODUCTION

The Universal Controller is available in a variety of configurations to match practically any process or power requirement. Automatic pump control, hi or low alarming, spill/leak detection, and pump protection are among the potential uses of this device when coupled with any of the remote Levelite probes. In the fiber-optic configuration, the Universal Controller can be used in hazardous areas where a potential for ignition is present (a suitable enclosure and following of NEC guidelines is required). The total flexibility will provide ease of installation and years of trouble free service.

If you should have any questions after reading this manual, please contact your Levelite Distributor or BINDICATOR, at:

Phone: 1-800-778-9242 • 864-574-8060 • Fax: 864-574-8063

2.0 OPERATION

The U.L. recognized Universal Controller provides all power necessary to operate the remote Levelite probes and in turn processes the optical signal received.

Where refractive probes are used (probes with 90° tip), the optical signal received is very strong when the probe is dry and diminishes or is completely lost when the probe is wet. The Universal Controller utilizes a unique "Calibration Window" consisting of a sensitivity adjustment, sensitivity test point, and probe test point to provide for perfect set-up and to adjust for potential problems, such as: aeration, coatings, or changes in fluid characteristics.

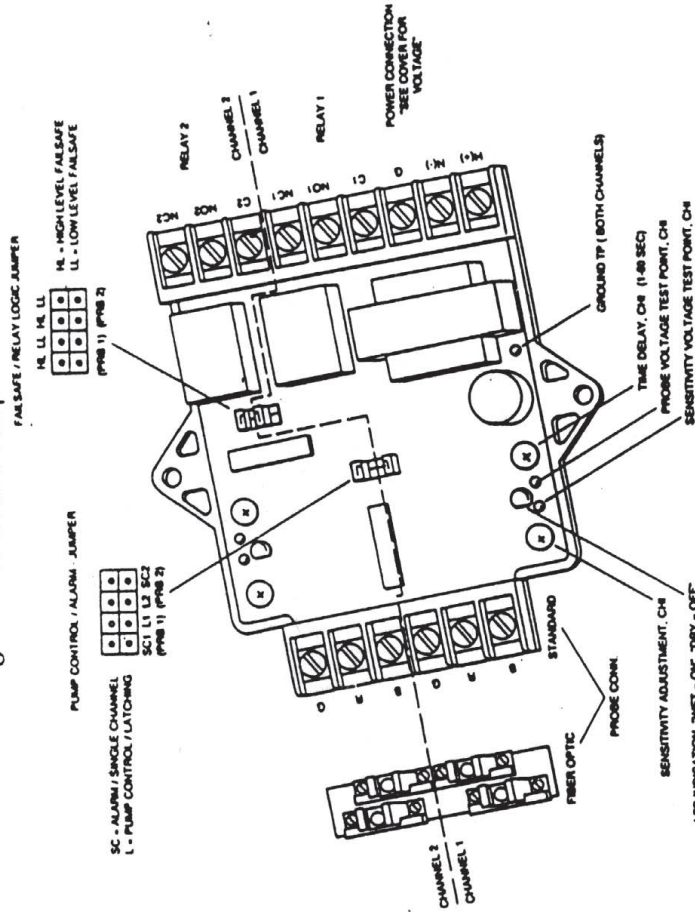
In addition, relay logic for high or low fail-safe and latching for pump control is available via a jumper selection. The Fiber-optic version provides the same adjustability as the standard but utilizes acrylic cable between the controller and the process; eliminating all power at the sensing probe. This allows for noise immunity and the ability to operate in a hazardous area without fear of potential ignition. Bright Red LED indication is also provided to indicate a wet probe condition for each channel.

When operating in the pump control mode, the second (unused) relay can be utilized to indicate abnormal operation based upon normal fill or empty time. This feature is set-up using the unused relay, time delay adjustment and logic jumper. An example can be found in the System Configuration section.

NOTE: Units Must be calibrated to Function Properly, See Page 6

3.0 CONTROL/TEST POINT POSITIONS

Refer to the figure shown for location of controls during calibration and setup.



Notes:

1. Channel 2 Controls/Test Points Not Shown
2. Single Channel Units Only Have Channel 1 Controls
3. DC Powered Units Labeled "DC Power Only"
4. Fiber Optic Unit Identical In Set-up and Operations

4.0 APPLICATION CONSIDERATIONS

In order to insure successful and safe operation of the Universal Controller and the Levelite sensing probes, the following should be noted **before** beginning installation or operation.

- A. Verify that the sensing probe is compatible with the process, including: pressure, temperature, construction, and area classification. **Only fiber-optic type probes are recommended for use in an area where a potential for ignition exists.**
- B. The Universal Controller has exposed power terminals and must be mounted in a suitable enclosure to avoid possible electrical shock or ignition (hazardous areas). Optional Nema 4X or Nema 7/9 enclosures are available.
- C. Do not attempt to operate any Levelite product in a liquid which will permanently cover the sensor with an opaque coating or in a liquid which is white and/or highly reflective without consulting the factory.
- D. Use caution when applying polysulfone probes in DI (de-ionized) water. Some DI water reacts with polysulfone causing poor operation.
- E. Calibrate the unit in process using liquids which are representative of actual. If the liquid can change, calibrate based on all potential liquids which may be exposed to the sensor (see calibration section).
- F. Do not allow the sensor to be frozen into the solution; the controller may always indicate a dry probe condition.
- G. Levelite probes may be mounted in any position; however, vertically mounted probes may not react as quickly to a level change in highly viscous fluids.

Do not connect to any control device or power unit until installation is complete and wiring verified for safe operation.

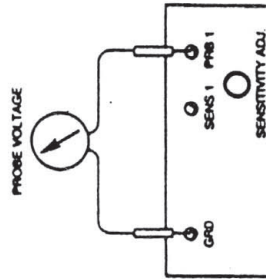


6.0 CALIBRATION

The Universal Controller must be calibrated to the actual process liquid for proper operation. This procedure can be done either before or after complete system configuration is complete. Only power to the input and probe connection is required.

STEP 1 - Read and record WET and DRY Probe Voltage for each channel by connecting DVM as indicated below.

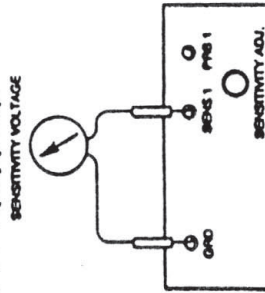
<u>Channel 1</u>		<u>Channel 2</u>	
WET Probe	Volts DC	WET Probe	Volts DC
DRY Probe	Volts DC	DRY Probe	Volts DC



Step 1 - Read And Record Probe Voltage!

Note: If the process liquid can vary in type or clarity. Record the lowest wet and dry values.

STEP 2- Move DVM leads to the points indicated and adjust "Sensitivity" for a voltage halfway between the WET and DRY voltages recorded above. Do this for each channel (if so equipped).



Step 2 - Set Sensitivity Halfway Between Probe Voltages!

Example:

STEP 1 WET Probe = 3.00 volts DC
DRY Probe = 1.00 volts DC

STEP 2 Move DVM leads to "SENS" and "GRD" terminals and set to 2.00 volts (half-way between 1.00 and 3.00) using the "SENSITIVITY" adjustment.

The unit is now calibrated. Proceed to the TIME DELAY section and/or SYSTEM CONFIGURATION section for complete hook-up and jumper position instructions. The RED LED for each channel should now illuminate on a WET probe.

6.1 Recalibration

Should it become necessary due to changes in process liquid, permanent coating, or aeration, the controller can easily be brought back into calibration by repeating the above calibration procedure. Simply read the probe voltage(s) wet and dry and set the sensitivity at the half-way point.

6.2 Time Delay Adjustment

Each single-turn potentiometer has a range of 1.0 to 60.0 Seconds and can be used to delay relay actuation to compensate for agitation, control a time-based fill or empty cycle or to control the Watchdog failure system. We recommend this adjustment be set at minimum during start-up and calibration.

Potentiometer Position	Time Delay
Full Counterclockwise (CCW)	1.0 Second
Full Clockwise (CW)	60.0 Seconds

7.0 SYSTEM CONFIGURATION

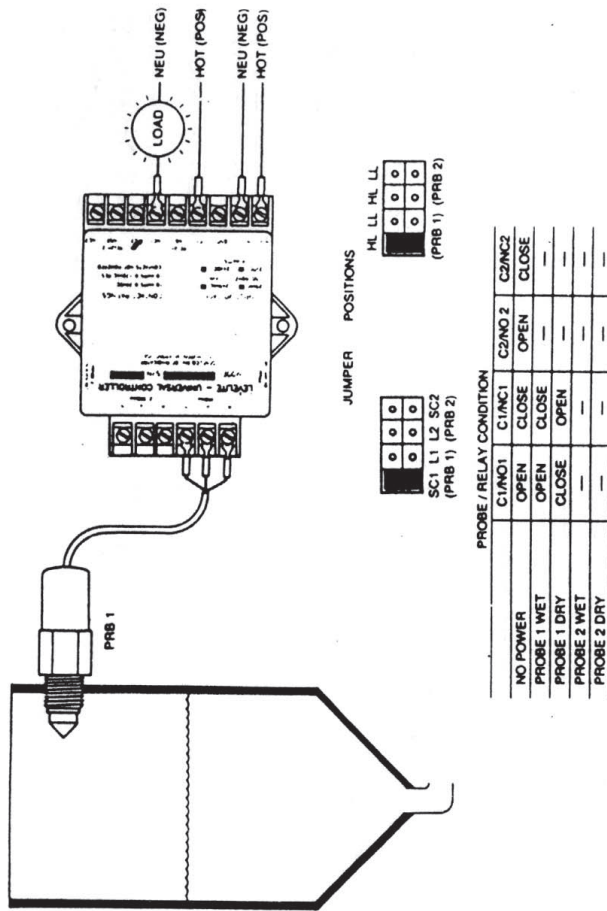
The following examples will provide complete information as to wiring, jumper positions, and probe hook-up. In addition, each example indicates relay condition for a given liquid height. If your particular application is not found, you will probably be able to infer the proper course of action based upon the information given. If not, please call or fax with your requirements.

NOTES:

1. Relays are dry (unpowered) and labeled in their de-energized state.
2. Pump Control- If power is applied while level is between probes, the unit will not begin control sequence until level is at probe (either falling or rising).
3. Fiber-optics - Fiber-optic units will have a slight relay chatter when power is first applied.
4. Probes shown mounted horizontally but may be mounted vertically as well.
5. For true fail-safe action, controller power should be from different circuit than that used for the load.

7.1

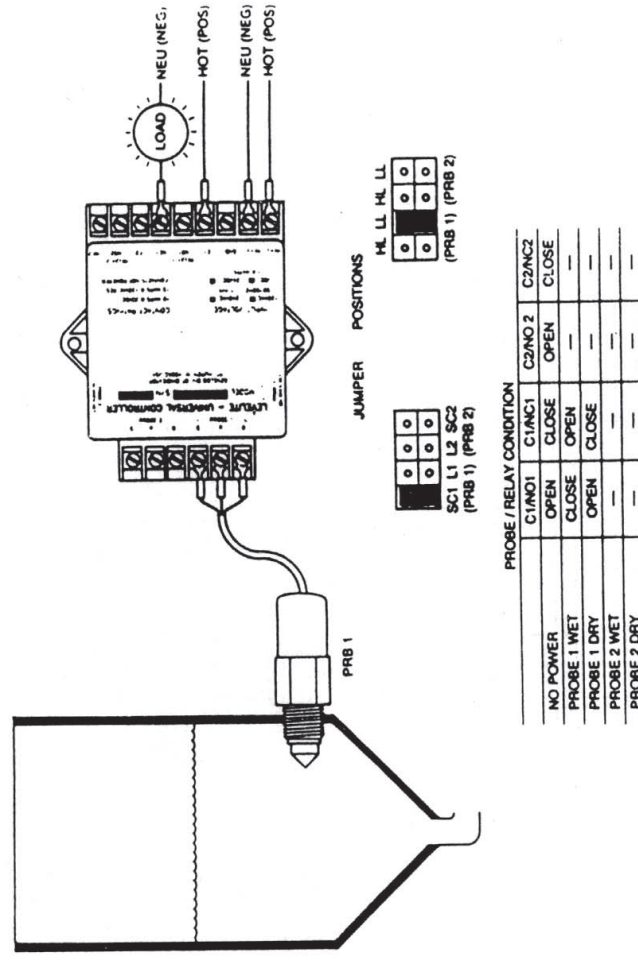
HIGH LEVEL ALARM WITH FAIL-SAFE



Note: Adjust "Time Delay" Accordingly (1 - 60 Seconds).

* Float/contacts: The above can be performed with a "NC" normally closed float or other contact by connecting to probe terminals "G" Green and "B" Black.

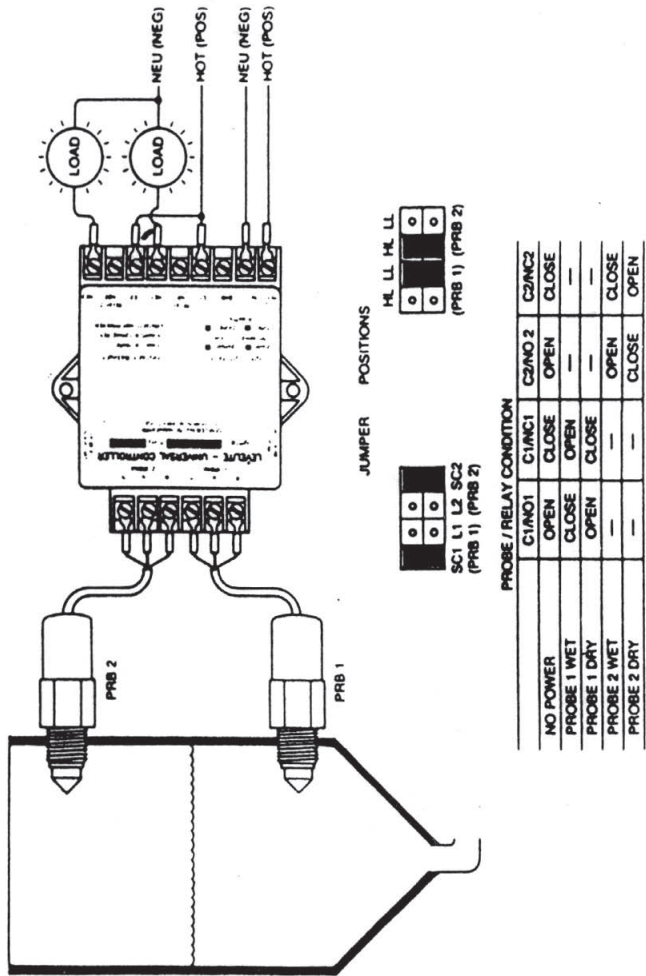
7.2 LOW LEVEL ALARM WITH FAIL-SAFE



Note: Adjust "Time Delay" Accordingly (1 - 60 Seconds)

* Float/contacts: The above can be performed with a "NC" normally closed float or other contact by connecting to probe terminals "G" Green and "B" Black.

7.3 HIGH AND LOW LEVEL ALARM WITH FAIL-SAFE



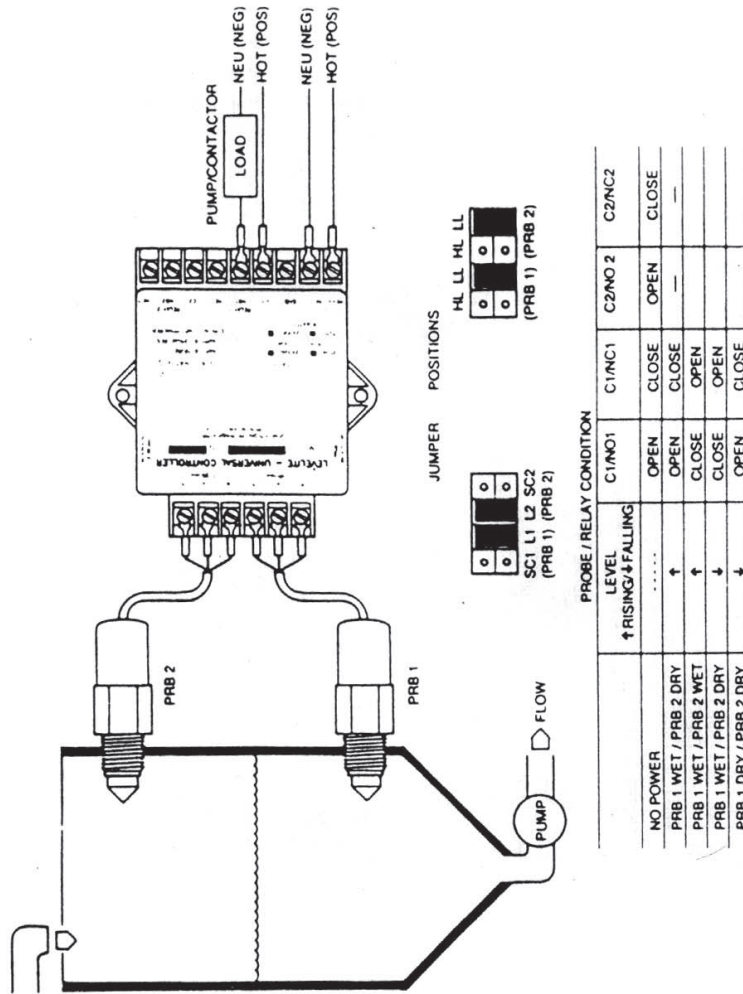
Note : Adjust "Time Delay" Accordingly (1 - 60 Seconds)

* Float/contacts: The above can be performed with a "NC" normally closed float or other contact by connecting to probe terminals "C" Green and "B" Black.



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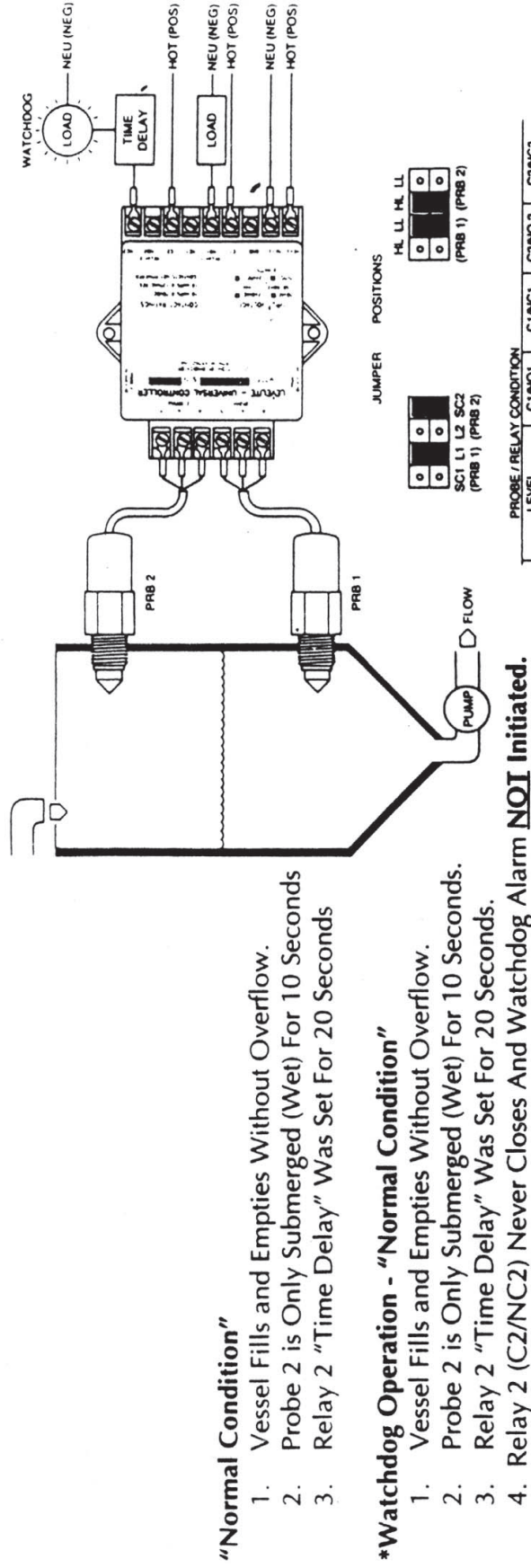
7.5 PUMP DOWN CONTROL WITH FAIL-SAFE OFF



Note: Relay 2 Follows Relay 1 With Both Jumpers In "L" Position. Time Delay Will Effect "Pull In" Time.

* Float/contacts: The above can be performed with a "NC" normally closed float or other contact by connecting to probe terminals "G" Green and "B" Black.

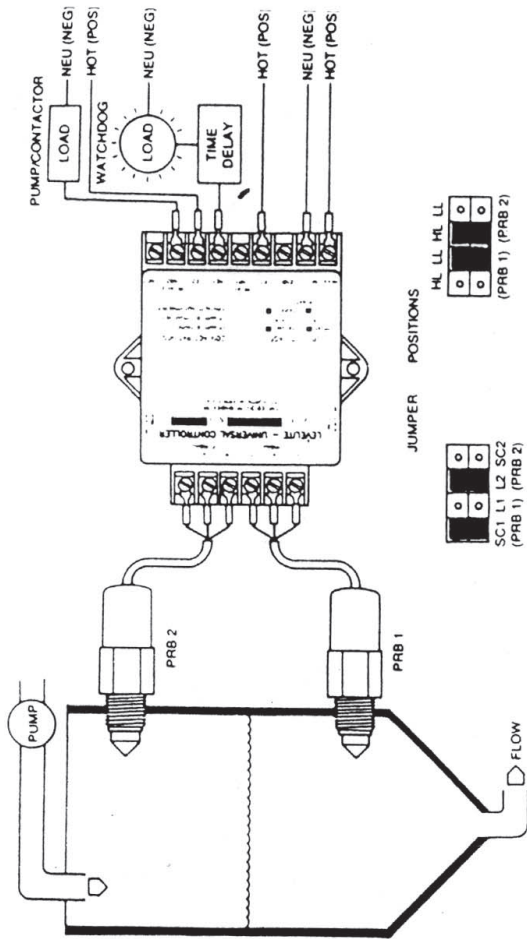
7.6 PUMP DOWN CONTROL WITH OVERFLOW WATCHDOG (FAIL-SAFE OFF)



PROBE / RELAY CONDITION	LEVEL	C1/NO1	C1/NC1	C2/NO2	C2/NC2
NO POWER	↑ RISING / ↓ FALLING	OPEN	CLOSE	OPEN	CLOSE
PRB 1 WET / PRB 2 DRY	↑	OPEN	CLOSE	CLOSE	OPEN
PRB 1 WET / PRB 2 WET	↑	CLOSE	OPEN	"SEE BELOW"	"SEE BELOW"
PRB 1 DRY / PRB 2 DRY	↓	OPEN	CLOSE	CLOSE	OPEN

* Float/contacts: The above can be performed with a "NC" normally closed float or other contact by connecting to probe terminals "G" Green and "B" Black.

7.7. PUMP UP CONTROL WITH PUMP FAILURE WATCHDOG (FAIL-SAFE OFF)



Watchdog Operation - "Normal Condition"

1. Vessel Fills and Empties Normally Without Problem.
2. Probe 1 is Only Dry For 10 Seconds.
3. Relay 1 "Time Delay" Was Set For 20 Second Response.
4. Relay 1 (C1/NC1) Never Closes and Watchdog Alarm **NOI** Initiated.

Watchdog Operation - "Abnormal Condition"

1. Vessel Falls Below Low Probe (Probe 1).
2. Pump Does NOT Start (Pump Contactor Failure).
3. Probe 1 is Dry For Over 10 Seconds (Time Delay Setting).
4. Relay 1 (C1/NC1) Closes Indicating An Abnormal Condition ("Watchdog").

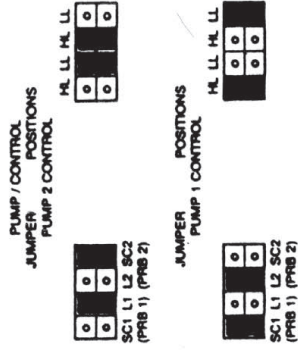
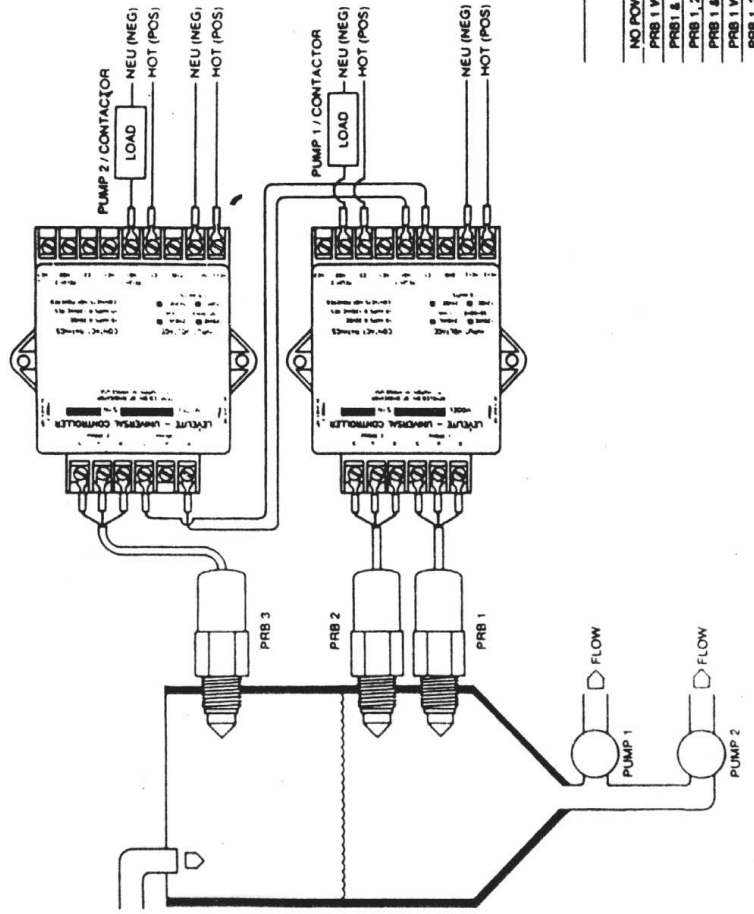
Note: Time delay in Watchdog Control is internal time delay if under 60 seconds. If over 60 seconds, an external delay can be used.

* Float/contacts: The above can be performed with a "NC" normally closed float or other contact by connecting to probe terminals "C" Green and "B" Black.

PROBE / RELAY CONDITION	JUMPER POSITIONS	
	SC1 L1 L2 SC2 (PRB 1) (PRB 2)	HL LL HL LL (PRB 1) (PRB 2)
NO POWER		
PRB 1 WET / PRB 2 DRY		
PRB 1 WET / PRB 2 WET		
PRB 1 WET / PRB 2 DRY		
PRB 1 DRY / PRB 2 DRY		

LEVEL	C1/NO1	C1/NC1	C2/NO2	C2/NC2
↑ RISING / ↓ FALLING				
↑	OPEN	CLOSE	OPEN	CLOSE
↓	CLOSE	OPEN	CLOSE	OPEN
↓	CLOSE	OPEN	OPEN	CLOSE
↓	CLOSE	OPEN	CLOSE	OPEN
↓	"SEE BELOW"	"SEE BELOW"	CLOSE	OPEN

7.8 PUMP DOWN WITH 2 PUMPS (LEAD/LAG) - FAIL-SAFE OFF



	LEVEL ↑ RISING / ↓ FALLING	PUMP 1 C2/NO 2	PUMP 2 C1/NO 1
NO POWER	-----	OPEN	OPEN
PRB 1 WET / PRB 2 & 3 DRY	↑	OPEN	OPEN
PRB 1 & 2 WET / PRB 3 DRY	↑	CLOSE	OPEN
PRB 1, 2 & 3 WET	↑	CLOSE	CLOSE
PRB 1 & 2 WET / PRB 3 DRY	↓	CLOSE	CLOSE
PRB 1 WET / PRB 2 & 3 DRY	↓	CLOSE	CLOSE
PRB 1, 2 & 3 DRY	↓	OPEN	OPEN

* Float/contacts: The above can be performed with a "NC" normally closed float or other contact by connecting to probe terminals "G" Green and "B" Black.

8.0 TROUBLESHOOTING

Before consulting the following, please review the "Calibration" and "System Configuration" sections. Verify that "Time Delay" is not causing problem.

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
"Wet" LED Never Illuminates	No Power Dry Sensor Not Calibrated Properly	Check Power Normal Condition Calibrate Unit
	Reflective Surface in Front of probe	Recalibrate
	Large number of air bubbles	Recalibrate
"Wet" LED Always On	Not Calibrated Probe Not Connected	Calibrate Unit Check Probe Wires
"Wet" LED Flashes	Improper Calibration Intermittent Bubbles On Probe	Check "Sensitivity" Setting & Calibrate Decrease Sensitivity To Eliminate Effect
No Output	No Power To Relay	Power Common Of Relay (Dry Contacts)
Output Wrong	Pump/Alarm Jumper	See "System Configuration" (SC = Alarming) (L = Pump/Valve Control)
	FAIL-SAFE / Logic Jumper In Wrong Position	See "System Configuration" (HL = High Fail-safe) (LL = Low Fail-safe)

8.0 TROUBLESHOOTING--Continued...

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
"Wet" LED Changes But Output Does Not	Open Relay Contact	Check Contacts With Ohmmeter
	Fail-safe Jumper Missing Unit Miswired	See "System Configuration" And Check Wiring

8.1 QUICK FUNCTIONAL TEST

Electro Optic Units

Sensor is dry - To simulate "Wet" sensor, lift (disconnect) green probe wire. "Wet" LED will illuminate (relay may also change state).

Sensor is wet - To simulate "Dry" sensor, use a jumper wire between black and green probe wires. "Wet" LED will turn off (relay may also change state).

Fiber Optic Units

Sensor is dry - To simulate "Wet" sensor, disconnect one of the fiber-optic Amp connectors. "Wet" LED will illuminate (relay may also change state).

Sensor is wet - To simulate "Dry" sensor, disconnect both Amp connectors (For channel in question) and hold a white card 1 to 2 inches above LED and photodetector. "Wet" LED will turn off (relay may also change state).

9.0 SPECIFICATIONS

Control Capability: 1 Channel: Single Alarm

2 Channel: Dual Alarm, Single Alarm, Automatic Fill Or Empty (with or without "Watchdog" Alarming)

Weight : 10.3oz. (292g)

Power: 120 VAC AND 240 VAC Units, 50/60 Hz; 1.4 VA; 12 VDC AND 24 VDC Units -25% To +10%, 1.8 Watts On All Ranges; 100 VAC and 200 VAC , 50/60 Hz, 1.4VA

Probe Input: Standard Electrical; Fiber Optic; Normally Closed Switch, Float

Output: SPDT Relay, 10 AMPS Resistive @ 120 VAC, 28 VDC; 1/3 Hp. @ 120 VAC (Dry Contacts, 1 relay per channel)

Time Delay: 1.0 Sec. to 60 Sec. Adjustable - Both Directions

Fail-safe: Selectable High/Low

Control Action: Selectable, Pump Logic Or Level Switch.

Calibration: Field Adjustable Sensitivity With Probe Status and Sensitivity Test Points

Probe Status: Super Bright LED, Each Channel Wet

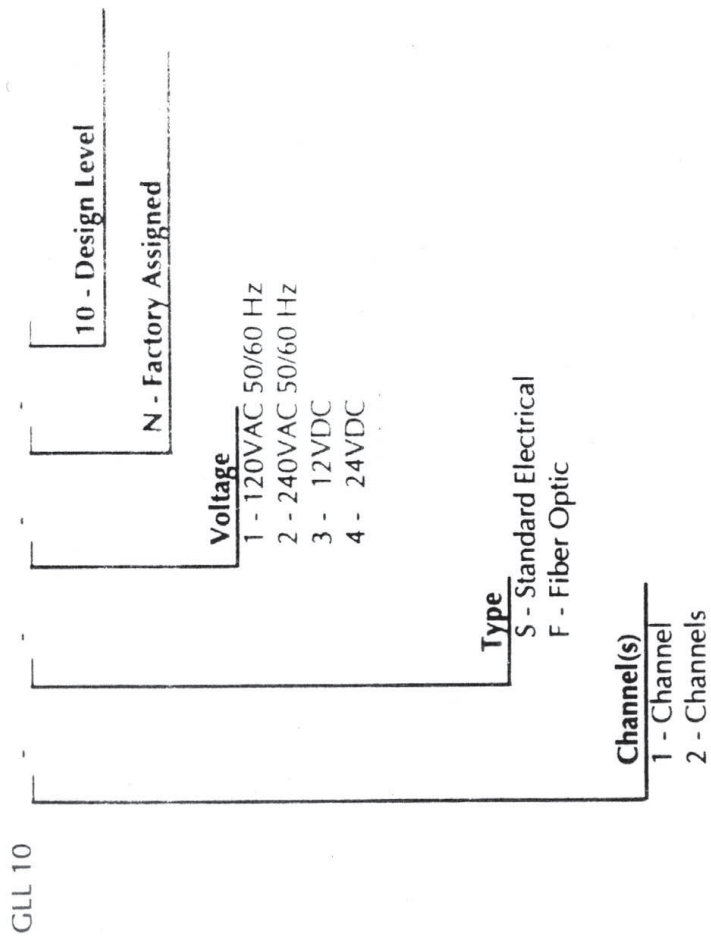
Temp. Limits: -40° F. to +158° F (-40° C To +70° C); 5% to 95% Relative Humidity

Terminations: Standard Unit - Terminal Block 12-18 AWG; Fiber Optic - Quick Disconnect, AMP

Approvals: UL Recognized, File E95139 (N)

Enclosure: 4.6" x 4.3" x 1.8" (460cm. x 430cm. x 180cm.) with clear Lexan cover

10.0 ORDERING INFORMATION



Venture Measurement, 150 Venture Boulevard, Spartanburg, SC 29306, **Phone:** (800) 778-9242 or (864) 574-8060, **Fax:** (864) 574-8063

GLL 180006 - Rev. A

