

## Section 9 Liquid Level Controls

### Liquid Level Controls

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#### Open Board



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# Liquid Level Controls Selection Guide

For detailed product specifications, refer to catalog pages.

### Open PC Board



Monitor and control conductive liquid levels when filling or emptying tanks. Low cost open board design.

### Plug-in Package



Monitor and control conductive liquid levels when filling or emptying tanks. Convenient plug-in packaging.

### Alternating Relays & Duplexors



Provides equal run time for two loads. Automatically changes lead load upon the opening of the control switch input. Industry standard wiring.

Series Page	Open PC Board			Plug-in Package			Alternating Relays & Duplexors			
	LLC1 9.4	LLC2 9.12	LLC8 9.8	LLC4 9.6	LLC5 9.14	LLC6 9.10	ARP_1 9.16	ARP_2 9.16	ARP_3 9.16	
<b>General Features</b>										
Single Probe & Common	•		•	•		•				
Dual Probe & Common		•			•					
DIN Rail Mounting				w/socket	w/socket	w/socket	w/socket	w/socket	w/socket	
Surface Mounting	•	•	•	w/socket	w/socket	w/socket	w/socket	w/socket	w/socket	
Plug-In Socket Required				8 pin	8 pin	11 pin	8 pin	11 pin	8 pin	
Screw Terminals		•		w/socket	w/socket	w/socket	w/socket	w/socket	w/socket	
Quick Connects	•	•	•							
<b>Output Form</b>										
Isolated Output	SPDT	SPDT	SPDT	SPDT	SPDT		SPDT	DPDT		
Non-Isolated Output	SPST					SPDT			DPDT-X	
<b>Sensing Range</b>										
6K ... 20K Ω										
1K or 5K ... 100K Ω		•			•					
1K or 5K ... 250K Ω	•		•	•		•				
250 Ω ... 500K Ω										
Set Point: A=Adjustable; F=Fixed	A or F	A or F	F	A or F	A or F	F				
Trip Delay Fixed	1...60 s		1...60 s	1...60 s		1...60 s				
<b>Probe Voltage</b>										
12 V AC	•	•	•	•	•	•				
20 V AC or 30 V AC										
<b>Logic Type</b>										
Drain/Emptying	•	•		•	•					
Fill	•	•		•	•					
Low Level Cut Off			•			•				
Alternating/Duplexing							•	•	•	
<b>Input Voltage</b>										
24 V AC	•	•	•	•	•	•	•	•	•	
24 ... 240 V AC/DC										
110 ... 130 V AC	•	•	•	•	•	•	•	•	•	
220 ... 240 V AC	•	•	•	•	•	•	•	•	•	
380 ... 415 V AC										
<b>Indicator LED (s)</b>										
Output(s) ON/OFF			•		•	•	Loads A/B	Loads A/B	Loads A/B	
Supply ON/OFF										
<b>Dimensions</b>	in mm	2.75 x 3.5 x ≤2.0 69.9 x 88.9 x ≤50.8	3.0 x 4.0 x 2.0 76.2 x 101.6 x 50.8	2.19 x 2.5 x 1.88 55.6 x 63.5 x 47.8	1.78 x 2.39 x 2.91 (LLC5 D = 3.30) 45.2 x 60.7 x 73.9 (LLC5 D = 83.8)			1.78 x 2.39 x 3.20 45.2 x 60.7 x 81.3		

# Liquid Level Control

## LLC1 Series

### Single Probe



- Single Probe Level Control for Conductive Liquids
- Isolated AC Voltage on the Probes
- Adjustable or Fixed Sensing up to 250KΩ
- Fill or Drain Operation Available
- 24,120, or 230 V AC Models are Available
- 10 A SPDT Isolated & SPST Non-Isolated Contacts

Approvals:

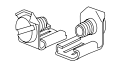
#### Accessories



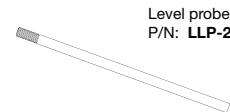
Electrode  
P/N: **PHST-38QTN**



Female quick connect  
P/Ns:  
**P1015-13** (AWG 10/12)  
**P1015-64** (AWG 14/16)  
**P1015-14** (AWG 18/22)



Quick connect to screw adaptor  
P/N: **P1015-18**



Level probe  
P/N: **LLP-24**

See accessory pages for specifications.

#### Description

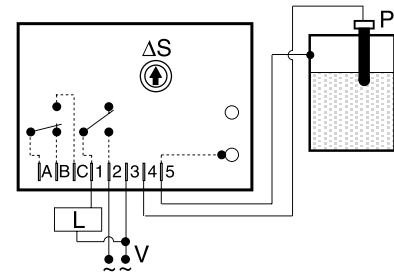
The LLC1 Series is a single probe conductive liquid level control designed for OEM equipment and commercial appliances. This device may be ordered in one of two modes: Fill or Drain. A factory fixed time delay (1-60 s) prevents rapid cycling of the output relay. On adjustable units, the sensitivity adjustment allows accurate level sensing while ignoring foaming agents and floating debris. Transformer isolated 12 V AC is provided at the probe to prevent electrolysis. A trickle current of less than 1 mA determines the presence or absence of liquid between the probe and common. The LLC1 Series printed circuit board is conformal coated to resist moisture and corrosion.

#### Operation

**Drain:** When the liquid level rises and touches the probe, a fixed time delay begins. This time delay prevents rapid cycling of the output relay and its load. At the end of the time delay, the output relay energizes and remains energized until the liquid level falls below the probe. The output relay then de-energizes and remains de-energized until the liquid again touches the probe.

**Fill:** When the liquid level falls below the probe, a fixed time delay begins. This time delay prevents rapid cycling of the output relay and its load. At the end of the time delay, the output relay energizes and remains energized until the liquid level rises and touches the probe. The output relay then de-energizes and remains de-energized until the liquid level again falls below the probe.

#### Connection



Connect common to conductive tank or an additional probe as required. Contacts A, B, & C are isolated.

P = Probe L = Load V = Voltage  
ΔS = Sensitivity Adjustment

#### Available Models-

LLC14A1AX	LLC14A7AX	LLC14B15AX
LLC14B1AX	LLC14B2F25X	LLC14B60A
•LLC14B60AX	LLC16A25AX	LLC16A3AX
LLC16B60A		

**Don't see what you need? Call us for a minimum quantity and price quote!**

#### Ordering Table

<b>LLC1</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>
<b>Series</b>	<b>Input</b>	<b>Operation</b>	<b>Time Delay</b>	<b>Sense Resistance</b>	<b>Mounting</b>
	-2 - 24 V AC	-A - Drain	Specify fixed delay (1 ... 60) secs. in 1 s increments	-A - Adjustable	Blank - Surface Mount
	-4 - 120 V AC	-B - Fill		-F - Fixed	-X - 0.50 in. nylon standoffs (three)
	-6 - 230 V AC			Specify fixed resistance (1 ... 250) in 1KΩ increments	

**Example P/N: LLC14A7A Fixed - LLC14B1F100X**

# Liquid Level Control

## LLC1 Series

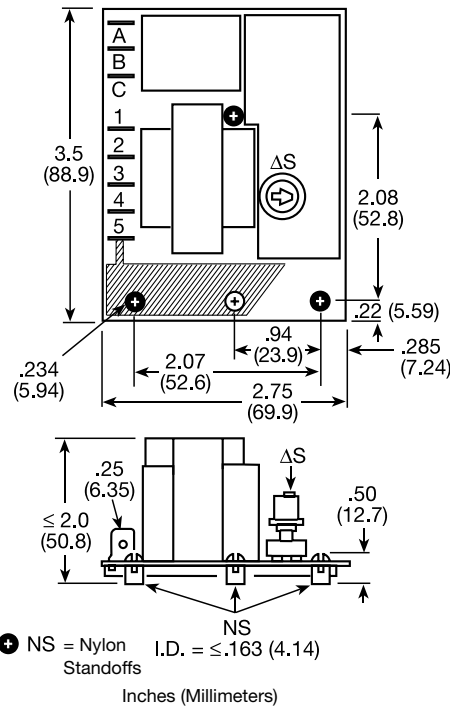
### Single Probe

Liquid level controls

#### Technical Data

<b>Control</b>		
Type		ON/OFF (Single Level) Resistance sensor with built-in time delay to prevent rapid cycling
Sense Voltage		12 V AC at probe terminals
Sense Resistance		Factory fixed or adjustable to 250KΩ
Sense Resistance Tolerance		Adjustable - guaranteed range Factory fixed +/-10%
<b>Input</b>		
Voltage		24, 120, or 230 V AC
Tolerance	24 V AC 120 & 230 V AC	-15% ... +20% -20% ... +10%
Frequency		50 ... 60 Hz
<b>Output</b>		
Type		Electromechanical relay
Form		SPST non-isolated & SPDT isolated contacts
Rating		10 A resistive at 120/240 V AC & 28 V DC; 1/3 hp at 120/240 V AC
Life		Mechanical - 1 x 10 <sup>7</sup> ; Electrical - 1 x 10 <sup>6</sup>
<b>Protection</b>		
Isolation Voltage		≥ 1500 V RMS between input, output, & probe
<b>Mechanical</b>		
Mounting		Surface mount to probe COMMON with two #6 (M3.5 x 0.6) screws or 0.50 inch (12.7 mm) nylon standoffs with three #6 (M3.5 x 0.6) screws (use Terminal 5 for probe COMMON)
Termination		0.25 in. (6.35 mm) male quick connect terminals
Package (Open Board)		3.5 x 2.75 x 2 in. (88.9 x 69.9 x 50.8 mm)
<b>Environmental</b>		
Operating / Storage Temperature		-20°C ... +55°C / -40°C ... +80°C
Protection		Printed circuit board is conformal coated to resist moisture and corrosion
Weight		≅ 8.7 oz (247 g)

#### Mechanical View



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LLC12B01 09.10

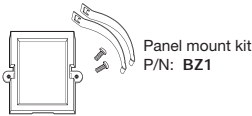
# Liquid Level Control LLC4 Series Single Probe



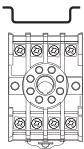
- Single Probe Level Control for Conductive Liquids
- Adjustable or Fixed Sensing up to 250 K $\Omega$
- Fixed Fill or Drain Operation available
- 24, 120, or 230 V AC Models are Available
- Adjustable or Fixed Time Delay Prevents Rapid Cycling
- Isolated AC Voltage on the Probes
- 10 A Resistive SPDT Isolated Contacts

Approvals:

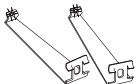
### Accessories



Panel mount kit  
P/N: BZ1



Octal  
8 pin socket  
P/N: NDS-8



Hold down clips  
P/N: PSC8



Electrode  
P/N: PHST-38QTN

Level probe P/N: LLP-24

See accessory pages for specifications.

### Description

The LLC4 combines resistance sensing circuitry with solid state timing to provide single probe level maintenance. On adjustable units, the sensitivity adjustment allows accurate level sensing while ignoring foaming agents and floating debris. Isolated AC voltage is provided at the probe to prevent electrolysis. A trickle current of less than 1 mA determines the presence or absence of conductive liquid between the probe and common. The LLC4 Series can be used with many types of low voltage (resistance changing) transducers to perform other control functions like temperature limit control, photo limit control, condensation sensing, and ice sensing.

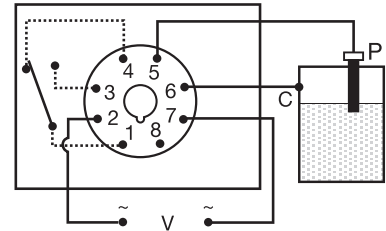
### Operation

**Drain (Pump Down Mode):** When the liquid level rises and touches the probe, the time delay begins. This time delay prevents rapid cycling of the output relay and its load. At the end of the time delay, the output relay and LED energize and remain energized until the liquid level falls below the probe level. The output relay and LED de-energize and remain de-energized until the liquid rises and touches the probe.

**Fill (Pump Up Mode):** When the liquid level falls below the probe, the time delay begins. This time delay prevents rapid cycling of the output relay and its load. At the end of the time delay, the output relay and LED energize and remain energized until the liquid level rises and touches the probe. The output relay and LED then de-energize and remain de-energized until the liquid level again falls below the probe level.

**Adjusting Sensitivity:** On adjustable units increase the sensitivity setting to sense (control) less conductive liquids. For example: pure water exhibits low conductivity, requiring a higher sensitivity setting.

### Connection



Relay contacts are isolated. Dashed lines are internal connections.

Connect common to conductive tank. Additional probe is necessary for non-conductive or insulated tanks.

P = Probe C = Probe Common V = Voltage

### Available Models-

- |              |             |           |
|--------------|-------------|-----------|
| •LLC42A10A   | LLC42A1A    | LLC42B15A |
| LLC42B5A     | •LLC44A10A  | LLC44A15A |
| •LLC44A1A    | LLC44A1F1   | •LLC44A2A |
| LLC44A30A    | LLC44A30F10 | LLC44A4A  |
| •LLC44A5A    | •LLC44A60A  | LLC44B10A |
| •LLC44B1A    | LLC44B20A   | LLC44B2A  |
| •LLC44B30A   | LLC44B4A    | •LLC44B5A |
| •LLC44B5F100 |             |           |

Don't see what you need? Call us for a minimum quantity and price quote!

### Ordering Table

<b>LLC4</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>
Series	Input	Operation	Time Delay (Seconds)	Sense Resistance
	-2 - 24 V AC	-A - Drain	-Specify fixed delay	-A - Adjustable (1...250k)
	-4 - 120 V AC	-B - Fill	(1 ... 60) secs. in	-F - Fixed
	-6 - 230 V AC		1 s increments	Specify fixed resistance (1 ... 250) in 1K $\Omega$ increments

### Example P/N:

- LLC44B5A - 120VAC, fill operation, time delay fixed - 5 s, adjustable sensitivity
- LLC46A10A - 230VAC, drain operation, time delay fixed - 10 s, adjustable sensitivity
- LLC42S5F50 - 24VAC, drain operation, time delay fixed - 5 s, sensitivity fixed at 50k ohms

# Liquid Level Control

## LLC4 Series

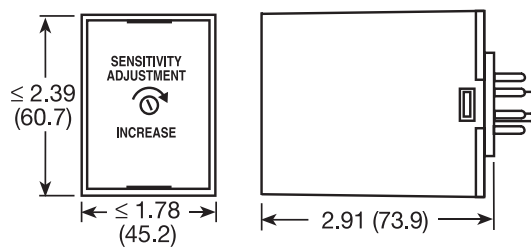
### Single Probe

Liquid level controls

#### Technical Data

<b>Control</b> Type Sensing Voltage Sensing Resistance Sensing Resistance Tolerance	ON/OFF (Single Level) Resistance sensor with built-in time delay to prevent rapid cycling Low voltage AC between probe and common. Isolated from Input and Output. Factory fixed or adjustable to 250K $\Omega$ Adjustable - guaranteed range Factory fixed +/-10% or 500 ohms whichever is greater
<b>Time Delay</b> Range	Adjustable 1...60 s or fixed 1...60 s in 1 s increments (see Ordering Table)
<b>Input</b> Voltage Tolerance Frequency	24, 120, or 230 V AC -15% ... +20% -20% ... +10% 50 ... 60 Hz
<b>Output</b> Type Form Rating (at 40°C)	Isolated relay contacts Single pole double throw SPDT 4 A resistive at 240 V AC; 1/4 hp at 125 V AC
<b>Protection</b> Surge Isolation Voltage	IEEE C62.41-1991 Level A $\geq 1500$ V RMS between input, output, & probe
<b>Mechanical</b> Mounting Termination Package	Accessory octal socket (NDS-8 or equivalent) required 8 Pin plug-in 2.91 x 2.39 x 1.78 in. (73.9 x 60.7 x 45.2 mm)
<b>Environmental</b> Operating Temperature Storage Temperature Weight	-20°C ... +60°C -40°C ... +80°C $\cong 6$ oz (170 g)

#### Mechanical View



Inches (Millimeters)

9

# Low Level Cutoff LLC8 Series Liquid Level Control



- Designed for Low Level Cutoff Protection
- Energized on Wet Probe
- Fixed Time Delay of 1 ... 60 s
- Fixed Sense Resistance of 5K ... 250K  $\Omega$
- 24, 120, or 230 V AC Input Voltages Available
- Isolated 10 A, SPDT Relay Contacts

Approvals:

### Accessories



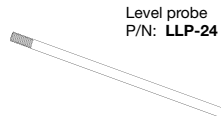
Electrode  
P/N: **PHST-38QTN**



Female quick connect  
P/Ns:  
**P1015-13** (AWG 10/12)  
**P1015-64** (AWG 14/16)  
**P1015-14** (AWG 18/22)



Quick connect to screw adaptor  
P/N: **P1015-18**



Level probe  
P/N: **LLP-24**

See accessory pages for specifications.

### Description

The LLC8 Series is a low cost single probe conductive liquid level control designed for low liquid level cutoff protection. It offers a factory fixed time delay of 1 to 60 s and is available for input voltages of 24, 120, or 230 V AC. LED indicator illuminates whenever the LLC8's isolated 10 A SPDT output relay is energized. Sense resistance is fixed from 5K to 250K  $\Omega$ . Available with manual/automatic reset or a special manual reset with a power outage feature that auto resets the unit when power is restored and the water level is acceptable. 24 and 120 V AC units are UL recognized as limit switches under UL353 (230 V AC units are UL 508) and CSA certified under Standard 14.

### Operation

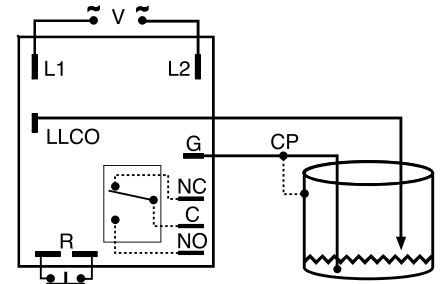
#### Automatic Reset (Reset switch not connected):

When liquid rises to low level cutoff probe, output relay and LED indicator energize. When liquid falls below low level cutoff probe, output relay and LED indicator de-energize after a fixed time delay.

**Manual Reset (Reset switch connected):** When the liquid level falls below low level probe, the output relay and LED de-energize after a fixed time delay. When the liquid level rises to low level probe, the output relay and LED indicator remain de-energized until the N.C. manual reset switch is opened; then they energize immediately.

**Power Outage Manual Reset (Reset switch connected):** A power outage causes the output relay and LED indicator to de-energize. Upon restoration of power, if the liquid is touching the low level probe, the output relay and LED indicator will re-energize. If the liquid level is below the low level probe, the output relay and LED indicator remain de-energized until the N.C. reset switch is opened.

### Connection



Relay contacts are isolated. Dashed lines are internal connections.

Connect common to conductive tank. Additional probe is necessary for non-conductive or insulated tanks.

V = Voltage LLCO = Low Level Probe  
G or CP = Ground or Common (Reference) Probe  
R = Optional NC Reset Switch (not included)  
NO = Normally Open NC = Normally Closed  
C = Common or Transfer Contact

### Available Models-

LLC824F10P	LLC825F5M	LLC8425F5M
LLC843F10M	LLC843F10P	LLC843F26P
LLC845F25P	LLC8610F12M	

**Don't see what you need? Call us for a minimum quantity and price quote!**

### Ordering Table

<b>LLC8 Series</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>
<b>Input</b>	<b>2</b> - 24 V AC	<b>4</b> - 120 V AC	<b>6</b> - 230 V AC	<b>F</b> - Fixed
<b>Time Delay (Fixed)</b>	Specify Fixed Delay In Seconds [1 ... 60] In 1 s Increments			<b>M</b> - Manual/Automatic Reset
<b>Sense Resistance</b>	Specify Fixed Resistance In Kilohms [5 ... 250] in 1K increments			<b>P</b> - Power Outage Manual Reset

**Example P/N: LLC8410F25M, LLC8620F100P**

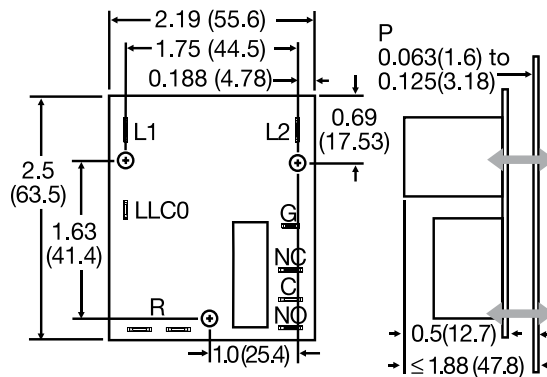
# Low Level Cutoff LLC8 Series Liquid Level Control

Liquid level  
controls

## Technical Data

<b>Control</b>		
Type		Resistance sensing for conductive liquids with time delay
Sense Voltage		12 V AC nominal at probe terminals
Sense Resistance		5K ... 250K $\Omega$ fixed
Sense Resistance Tolerance		+/-10%
<b>Time Delay</b>		
Tolerance		+/-20%
Repeat Accuracy		+/-10%
Time Delay vs. Temperature & Voltage		+/-10%
Power Outage Reset Delay		$\leq 1$ s
<b>Input</b>		
Voltage		24, 120, or 230 V AC
Tolerance	24 V AC	-15% ... +20%
	120 or 230 V AC	-20% ... +10%
Frequency		50 ... 60 Hz
<b>Output</b>		
Type		Electromechanical relay
Form		Isolated single pole double throw (SPDT)
Rating		10 A resistive at 120/240 V AC; 1/4 hp at 125 V AC; 1/2 hp at 250 V AC
<b>Protection</b>		
Surge		IEEE C62.41-1991 Level A
Isolation Voltage		$\geq 2500$ V RMS input to output terminals
<b>Mechanical</b>		
Mounting		0.5 in. (12.7 mm) x .187 (4.76 mm) dia. nylon standoffs (3)
Termination	Electrical	0.25 in. (6.35 mm) male quick connect terminals
	Reset Switch & Probe(s)	0.187 x 0.03 in. (4.75 x 0.76 mm) male quick connect terminals
<b>Environmental</b>		
Operating Temperature		-40°C ... +60°C
Storage Temperature		-40°C ... +80°C
Coating		Printed circuit board is conformal coated to resist moisture & corrosion
Humidity		95% relative, non-condensing
Weight		$\cong 5$ oz (141.7 g)

## Mechanical View



Inches (Millimeters)

P = User supplied mounting panel thickness

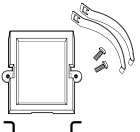
# Low Level Cutoff LLC6 Series Liquid Level Control



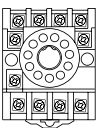
- Designed for Low Level Cutoff Protection
- Energized on Wet Probe
- Fixed Time Delay of 1 ... 60 s
- Sense Resistance of 5K ... 250K  $\Omega$
- 24, 120, or 230 V AC Input Voltage Available
- 10 A, SPDT Relay Contacts

Approvals:

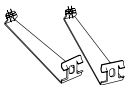
### Accessories



Panel mount kit  
P/N: **BZ1**



11-pin socket  
P/N: **NDS-11**



Hold down clips  
P/N: **PSC11**



Electrode  
P/N: **PHST-38QTN**

Level probe  
P/N: **LLP-24**



See accessory pages for specifications.

### Description

The LLC6 Series is a plug-in single probe conductive liquid level control designed for low liquid level cutoff protection. It offers a factory fixed time delay of 1 to 60 s and is available in input voltages of 24, 120, or 230 V AC. LED indicator illuminates whenever the LLC6's 10 A SPDT output relay is energized. Available with automatic/manual reset or a special manual reset with power outage feature, which auto resets the unit when power is restored and the water level is acceptable. 24 V AC and 120 V AC units are recognized as limit switches under UL353 (230 V AC units are UL508) and CSA certified under Standard 14.

### Operation

#### Automatic Reset

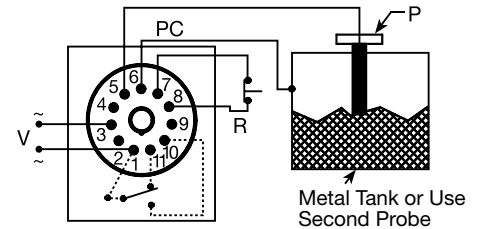
**(Reset terminals not connected):**

When liquid rises to the low level cutoff probe, the output relay and the LED indicator energize. When the liquid falls below low level cutoff probe, the output relay and the LED indicator de-energize after a fixed time delay.

**Manual Reset (Reset switch connected):** When the liquid level falls below the low level probe, the output relay and LED de-energize after a fixed time delay. When the liquid level rises to the low level probe, the output relay and LED indicator remain de-energized until the manual reset switch is opened; then they energize immediately.

**Power Outage Manual Reset (Reset switch connected):** A power outage causes the output relay and LED indicator to de-energize. Upon restoration of power, if the liquid level is above the low level probe, the output relay and LED indicator will re-energize. If the liquid level is below the low level probe, the output relay and LED indicator remain de-energized until the Normally Closed (NC) reset switch is opened.

### Connection



Dashed lines are internal connections.

Connect common to conductive tank. Additional probe is necessary for non-conductive or insulated tanks.

PC = Probe Common P = Probe V = Voltage R = Optional NC Reset Switch

### Available Models-

LLC6610F5P

**Don't see what you need? Call us for a minimum quantity and price quote!**

### Ordering Table

LLC6 Series	X Input	X Time Delay (Fixed)	X Sense Resistance	X Reset
	2 - 24 V AC	Specify Fixed Delay In Seconds [1 ... 60]	F - Fixed Resistance In Kilohms [5 ... 250]	M - Manual/Automatic Reset
	4 - 120 V AC	In 1 s Increments		P - Power Outage Manual Reset
	6 - 230 V AC			

Example P/N: **LLC6410F25M, LLC6640F100P**

# Low Level Cutoff

## LLC6 Series

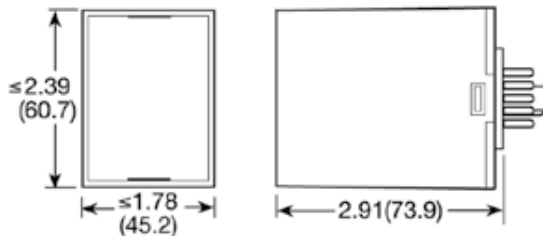
### Liquid Level Control

Liquid level  
controls

#### Technical Data

<b>Control</b>		
Type		ON/OFF (Single Level) Resistance sensor with built-in time delay to prevent rapid cycling
Sense Voltage		12 V AC nominal at probe terminals
Sense Resistance		5K ... 250K $\Omega$ factory fixed
Sense Resistance Tolerance		Fixed +/-10%
<b>Time Delay</b>		
Range		1 ... 60 s in 1 s increments
Tolerance		+/-20%
Repeat Accuracy		+/-10%
Time Delay vs. Temperature & Voltage		+/-10%
Power Outage Reset Delay		$\leq$ 1 s
<b>Input</b>		
Voltage		24, 120, or 230 V AC
Tolerance	24 V AC	+20% ... -15%
	120 or 230 V AC	+10% ... -20%
Frequency		50 ... 60 Hz
<b>Output</b>		
Type		Electromechanical relay
Form		Non-isolated (SPDT) contacts
Rating		10 A resistive at 240 V AC; 1/4 hp at 125 V AC; 1/2 hp at 250 V AC
<b>Protection</b>		
Surge		IEEE C62.41-1991 Level A
Isolation Voltage		$\geq$ 2500 V RMS between input & output terminals
<b>Mechanical</b>		
Mounting		Plug-in socket
Termination		11 Pin relay type
Package		2.91 x 2.39 x 1.78 in. (73.9 x 60.7 x 45.2 mm)
<b>Environmental</b>		
Operating Temperature		-40°C ... +60°C
Storage Temperature		-40°C ... +80°C
Humidity		95% relative, non-condensing
Weight		$\cong$ 7.3 oz (207 g)

#### Mechanical View



Inches (Millimeters)

# Liquid Level Control

## LLC2 Series

### Dual Probe



- Dual Probe Level Control for Conductive Liquids
- Isolated AC Voltage on the Probes
- Adjustable or Fixed Sensing up to 100K $\Omega$
- Terminal Block or Quick Connect Terminals
- Fill or Drain Operation Available
- 24, 120, or 230 V AC Models are Available
- 10 A SPDT Isolated Contacts

Approvals:

#### Accessories



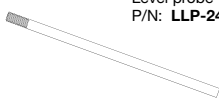
Electrode  
P/N: PHST-38QTN



Female quick connect  
P/Ns:  
P1015-13 (AWG 10/12)  
P1015-64 (AWG 14/16)  
P1015-14 (AWG 18/22)



Quick connect to screw adaptor  
P/N: P1015-18



Level probe  
P/N: LLP-24

See accessory pages for specifications.

#### Description

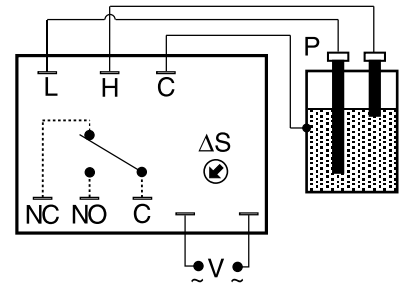
The LLC2 Series is a dual probe conductive liquid level control designed for OEM equipment and commercial appliance applications. Models are available for fill or drain operation. Transformer isolated 12 V AC is provided at the probes to prevent electrolysis. A trickle current of less than 1 mA determines the presence or absence of liquid between the probes and common. On adjustable units, the sensitivity adjustment allows accurate level sensing while ignoring foaming agents and floating debris. The LLC2 Series printed circuit board is conformal coated to resist moisture and corrosion.

#### Operation

**Drain:** When the liquid level rises and touches the high probe, the output relay energizes and remains energized until the liquid level falls below the low probe. The output relay then de-energizes and remains de-energized until the liquid again touches the high probe.

**Fill:** When the liquid level falls below the low probe, the output relay energizes and remains energized until the liquid level rises and touches the high probe. The output relay then de-energizes and remains de-energized until the liquid level again falls below the low probe.

#### Connection



Connect common to conductive tank. Additional probe is necessary for non-conductive or insulated tanks.

V = Voltage L = Low Probe H = High Probe  
C = Probe Common  $\Delta$ S = Sensitivity Adjustment  
NC = Normally Closed NO = Normally Open

#### Available Models-

LLC24A1AC  
LLC24A2F50N  
LLC24B2F50N

LLC24A1AN  
LLC24B1AC  
LLC26A1F25C

LLC24A2AN  
LLC24B2AN

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#### Ordering Table

LLC2 Series	X Input	X Operation	X Termination	X Sense Resistance	X Mounting Dimension
	-2 - 24 V AC	-A - Drain	-1 - 0.25 Quick Connect	-A - Adjustable to 100K $\Omega$	-N
	-4 - 120 V AC	-B - Fill	-2 - Terminal Block	-F - Fixed	-C
	-6 - 230 V AC			Specify fixed resistance (1 ... 100) in 1K $\Omega$ increments	

Example P/N: LLC26B1AN Fixed - LLC26B1F100N

# Liquid Level Control

## LLC2 Series

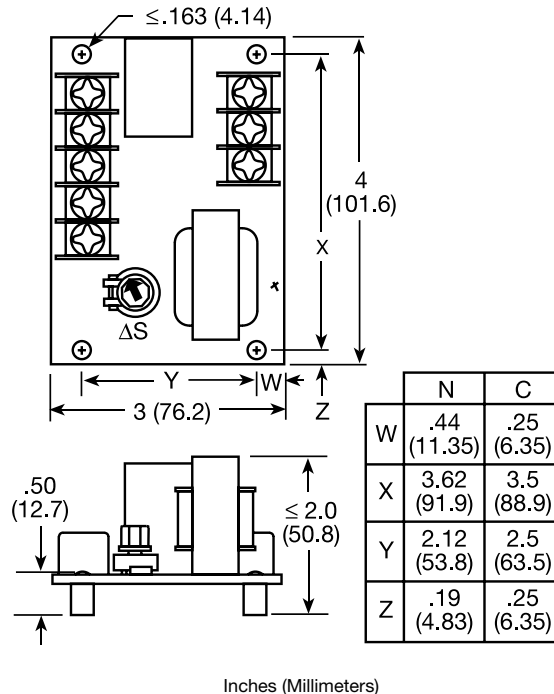
### Dual Probe

Liquid level controls

#### Technical Data

<b>Control</b> Type Sense Voltage Sense Resistance Sense Resistance Tolerance	Resistance sensing for high and low level detection of conductive liquids 12 V AC at probe terminals Factory fixed or adjustable to 100K $\Omega$ Adjustable - guaranteed range Factory fixed +/-10%
<b>Input</b> Voltage Tolerance Frequency	24, 120, or 230 V AC -15% ... +20% -20% ... +10% 50 ... 60 Hz
<b>Output</b> Type Form Rating Life	Electromechanical relay Isolated single pole double throw (SPDT) 10 A resistive at 120/240 V AC & 28 V DC; 1/3 hp at 120/240 V AC Mechanical - 1 x 10 <sup>5</sup> ; Electrical - 1 x 10 <sup>5</sup>
<b>Protection</b> Isolation Voltage	$\geq 1500$ V RMS between input, output, & probe
<b>Mechanical</b> Mounting Termination	Surface mount with two or four #6 (M3.5 x 0.6) screws 0.25 in. (6.35 mm) duplex male quick connect terminals Terminal blocks for up to #14 AWG (2.5 mm <sup>2</sup> ) wire 4 x 3 x 2 in. (101.6 x 76.2 x 50.8 mm)
Package (Open Board)	
<b>Environmental</b> Operating Temperature Storage Temperature Protection Weight	-20°C ... +55°C -40°C ... +80°C Printed circuit board is conformal coated to resist moisture and corrosion $\cong 9$ oz (255 g)

#### Mechanical View



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# Liquid Level Control

## LLC5 Series

### Dual Probe



- Dual Probe Level Control for Conductive Liquids
- Onboard Knob or Fixed Sensing up to 100KΩ
- Fill or Drain Operation Available
- Select Standard or Diagnostic LED Operation
- Diagnostic LED Operation Reduces Adjustment & Troubleshooting Time
- 24, 120, or 230 V AC Models are Available
- 10 A SPDT Isolated Contacts



Approvals:

#### Accessories

- Panel mount kit  
P/N: **BZ1**
- Octal 8 pin socket  
P/N: **NDS-8**
- Hold down clips  
P/N: **PSC8**
- Electrode  
P/N: **PHST-38QNT**

Level probe  
P/N: **LLP-24**

See accessory pages for specifications.

#### Description

The LLC5 provides dual probe conductive liquid level control in a convenient octal plug-in package. Models are available for fixed fill or drain operation. Isolated, pulsed DC voltage on the probes prevents electrolytic plating. Less than 1 mA of current is used to sense the presence of conductive liquid between the probes and common. On adjustable units, the sensitivity adjustment eliminates false tripping caused by floating debris and foaming agents. New diagnostic LED option speeds setup and trip point adjustment by displaying when the unit senses conduction between the probes and common. This new LED operation can also decrease system troubleshooting time by displaying the relay status and probe conduction. (see the table below)

#### Operation

**Drain (Pump Down Mode):** When the liquid level rises and touches the high level probe, the output relay and LED energize and remain energized until the liquid level falls below the low level probe. The output relay and LED de-energize and remain de-energized until the liquid rises and touches the high level probe. (Description covers standard LED operation, see the table below)

**Fill (Pump Up Mode):** When the liquid level falls below the low level probe, the output relay and LED energize and remain energized until the liquid level rises and touches the high level probe. The output relay and LED de-energize and remain de-energized until the liquid level again falls below the low level probe. (Description covers standard LED operation, see the table below)

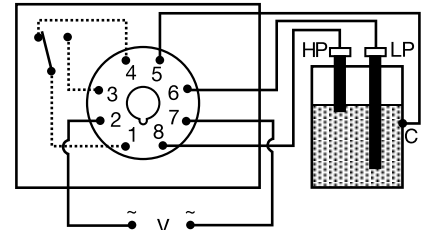
**Adjusting Sensitivity:** On adjustable units increase the sensitivity setting to sense (control) less conductive liquids. For example: pure water exhibits low conductivity, requiring a higher sensitivity setting.

Conducting occurs when the liquid is in contact with the common probe and a level sensing probe. The LLC5 uses an isolated, low voltage DC current to sense conduction.

Not Conducting occurs when the liquid is only touching the common probe. See diagnostic LED operation chart.

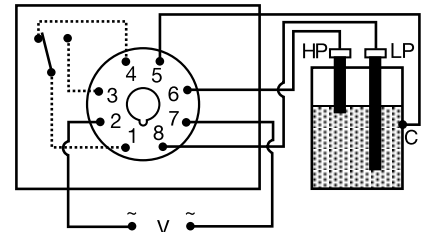
See the Gen II interactive operation diagram with standard LED operation at [www.ssac.com](http://www.ssac.com)

#### Standard Connection



#### Reverse Probe Connection

Example P/N LLC54AASD for this connection diagram



Relay contacts are isolated. Dashed lines are internal connections.

Connect probe common to conductive tank. Additional probe is necessary for non-conductive or insulated tanks.

HP = High Level Probe LP = Low Level Probe  
C = Probe Common V = Voltage

#### LED Operation with Diagnostics

Indicating Operation	Type	Time Diagram	Standard Operation	With Diagnostics (D-Suffix)
Relay Energized & Conducting	Blinks OFF			■
Relay Energized & Not Conducting	ON steady		■	■
Relay De-energized & Conducting	Flashing			■
Power Applied & Relay De-energized Not Conducting	Double Blink			■

#### Available Models-

- LLC52AA
- LLC54AAS
- LLC56AA
- LLC52BA
- LLC54BA
- LLC54AA
- LLC54BAS

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#### Ordering Table

LLC5 Series	X Input	X Operation	X Sense Resistance	X Connection	X LED Operation
	-2 - 24 V AC	-A - Drain	-A - Adjustable	-Blank - Standard (#6 Low, #8 High)	-Blank - Standard LED Operation
	-4 - 120 V AC	-B - Fill	-F - Fixed	-S - Reverse (#8 Low, #6 High)	-D - LED Operation with Diagnostics
	-6 - 230 V AC		Specify fixed resistance (1...100) in 1KΩ increments		

# Liquid Level Control

## LLC5 Series

### Dual Probe

Liquid level controls

#### Technical Data

<b>Control</b> Type Sensing Voltage Sensing Resistance Sensing Resistance Tolerance	Resistance sensing for high & low level detection of conductive liquids Low voltage pulsed DC between probes and common. Isolated from the Input and Output. Factory fixed or adjustable to 100 K $\Omega$ Adjustable - Low end: 1 K $\Omega$ +/- 500 $\Omega$ ; High end: 100 K $\Omega$ +25% - 0% Factory fixed +/-10% or 500 ohms whichever is greater Debounce time delay < 1 second
Response Time	24, 120, or 230 V AC -15% ... +20% -20% ... +10% 50 ... 60 Hz
<b>Input</b> Voltage Tolerance	24 V AC -15% ... +20% -20% ... +10%
Frequency	50 ... 60 Hz
<b>Output</b> Type Form Rating	Isolated relay contacts Single pole double throw SPDT 10 A resistive at 125 V AC general purpose 5 A resistive at 230 V AC & 28 V DC general purpose 1/4 hp at 125 V AC
Max. Switching Voltage Life (Operations)	250 V AC Mechanical - 1 x 10 <sup>7</sup> ; Electrical - 1 x 10 <sup>5</sup>
<b>Protection</b> Isolation Voltage Surge	$\geq$ 1500 V RMS between input, output, & probe IEEE C62.41-1991 Level A
<b>Mechanical</b> Mounting Termination	Accessory octal socket (NDS-8 or equivalent) required 8 Pin Octal plug-in
<b>Environmental</b> Operating Temperature (Surrounding air) Storage Temperature Weight	-25°C ... +60°C -40°C ... +80°C $\cong$ 6 oz (170 g)

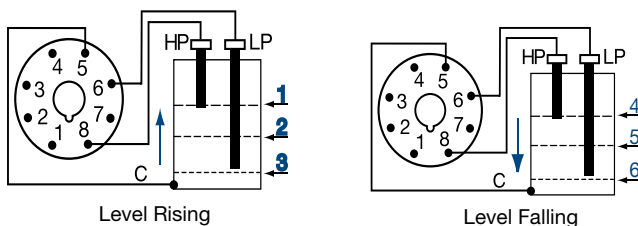
#### Diagnostic LED Operation - LLC5

LED Operation & Description		Operation or Mode	Level Diagram	Level of Liquid
Double Blink	Relay De-energized & Not Conducting	Drain	6	Low liquid level, not touching low probe, end of drain cycle
		Fill	N/A	N/A
Flashing	Relay De-energized & Conducting	Drain	2	Liquid touching low probe and level rising
		Fill	1	High liquid level, touching both probes, end of fill cycle
ON Steady	Relay Energized & Not Conducting	Drain	N/A	N/A
		Fill	3	Low liquid level, not touching low probe, beginning fill cycle
Blinks OFF	Relay Energized & Conducting	Drain	4, 5	Liquid touching one or both probes during drain cycle
		Fill	2	Liquid touching low probe during fill cycle

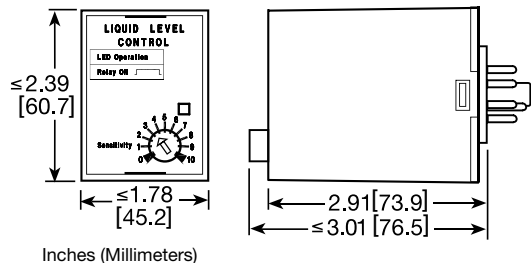
9

See the LLC5 Gen II details at [www.ssac.com](http://www.ssac.com)

#### Level Diagrams



#### Mechanical View



LLC52B03 09.10

# Alternating Relay ARP Series Motor Duplexor



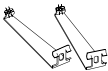
- Provides Equal Run Time for Two Motors
- Alternating or Electrically Locked Operation
- Low Profile Selection Switch
- 10 A Relay Contacts
- LED Status Indication
- Industry Standard Base Connection

Approvals:

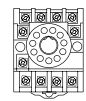
### Accessories



Panel mount kit  
P/N: **BZ1**



Hold down clips  
P/Ns: **PSC8 (NDS-8)**  
**PSC11 (NDS-11)**



11 pin socket  
P/N: **NDS-11**



Octal 8 pin socket  
P/N: **NDS-8**

DIN rail P/Ns:  
**C103PM (Al)**

See accessory pages for specifications.

### Description

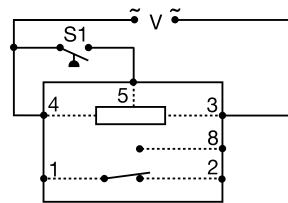
The ARP Series is used in systems where equal run time for two motors is desirable. The selector switch allows selection of alternation or either load for continuous operation. LED's indicate the status of the output relay. This versatile series may be front panel mounted (BZ1 accessory required) or 35 mm DIN rail mounted with an accessory socket.

### Operation

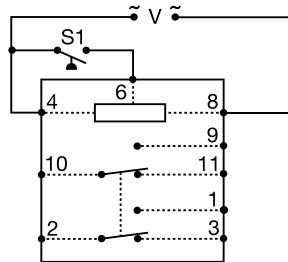
**Alternating:** When the rotary switch is in the "alternate" position, alternating operation of Load A and Load B occurs upon the opening of the control switch S1. To terminate alternating operation and cause only the selected load to operate, rotate the switch to position "A" to lock Load A or position "B" to lock Load B. The LEDs indicate the status of the internal relay and which load is selected to operate.

**Note:** Input voltage must be applied at all times for proper alternation. The use of a solid state control switch for S1 may not initiate alternation correctly. S1 voltage must be from the same supply as the unit's input voltage (see connection diagrams). Loss of input voltage resets the unit; Load A becomes the lead load for the next operation.

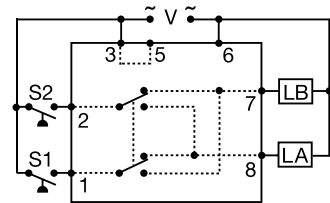
### Connection



1. SPDT 8 Pin



2. DPDT 11 Pin



3. DPDT 8 Pin Cross Wired

Relay contacts in above are isolated.

Dashed lines are internal connections.

V = Voltage LA = Load A LB = Load B  
S1 = Primary Control Switch S2 = Lag Load Switch

**Duplexing (Cross Wired):** Duplexing models operate the same as alternating relays and when both the Control (S1) and Lag Load (S2) Switches are closed, Load A and Load B energize simultaneously.

The DPDT 8-pin, cross wired option, allows extra system load capacity through simultaneous operation of both motors when needed. Relay contacts are not isolated.

### Available Models-

- |          |          |          |
|----------|----------|----------|
| • ARP22  | • ARP23S | • ARP41  |
| • ARP41S | • ARP42  | • ARP42S |
| • ARP43  | • ARP43S | ARP62S   |
| • ARP63S |          |          |

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### Ordering Table

<b>ARP Series</b>	<b>X</b> Input -2 - 24 V AC -4 - 120 V AC -6 - 230 V AC	<b>X</b> Output Form -1 - SPDT, 8 Pin -2 - DPDT, 11 Pin -3 - DPDT, 8 Pin Cross Wired	<b>X</b> Switch Option -S - Rotary Switch Blank - No Switch
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**Example P/N: ARP41S, ARP63**

# Alternating Relay

## ARP Series

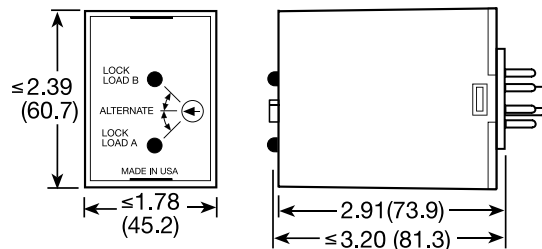
### Motor Duplexor

Liquid level controls

#### Technical Data

<b>Input</b>		
Voltage		24, 120, or 230 V AC
Tolerance	24 V AC	-15% ... +20%
	120 & 230 V AC	-20% ... +10%
Line Frequency		50 ... 60 Hz
<b>Output</b>		
Type		Electromechanical relay
Form		SPDT, or DPDT, or cross wired DPDT
Rating		10 A resistive at 120/240 V AC & 28 V DC; 1/3 hp at 120/240 V AC
Maximum Voltage		250 V AC
Life		Mechanical -- $1 \times 10^7$ Electrical -- $1 \times 10^6$
<b>Protection</b>		
Isolation Voltage		$\geq 1500$ V RMS input to output
<b>Mechanical</b>		
Mounting		Plug-in socket
Package		3.2 x 2.39 x 1.78 in. (81.3 x 60.7 x 45.2 mm)
Termination		8 Pin octal or 11 Pin magnal
<b>Environmental</b>		
Operating Temperature		-20°C ... +60°C
Storage Temperature		-30°C ... +85°C
Weight		$\cong 5.6$ oz (159 g)

#### Mechanical View



Inches (Millimeters)

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