

INSTALLATION, OPERATION AND INSTRUCTION MANUAL

Level-Trac Model LT-300 Control Unit

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Note: This document should be reviewed in its entirety prior to installation of equipment.

1. Operating Principle

The Level-Trac LT-300 system is an electronic alternative to the gage glass, enabling transmission of the water level condition to a remote display and the application of alarm and control functions.

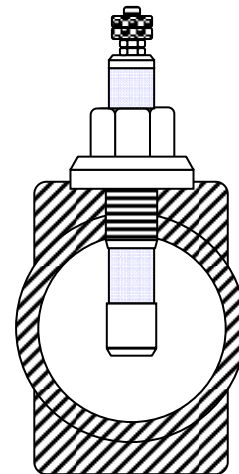
The discrimination between water and steam is based on the significant difference in resistivity between the two states over the saturation range. The sensing element is a Probe with an insulated tip inserted in a probe manifold Figure 1.1. If a voltage is applied to the tip, conduction occurs between the tip and the inside wall of the column. The dimensions are selected to provide a resistance typically less than 100 K Ω when the Probe is immersed in water which results in a resistance greater than 5 M Ω for the steam condition. An electronic discrimination circuit is arranged to sense whether the Probe resistance is less than 100 K Ω representing water or

2. System Configuration

Probes are installed in a probe manifold. A run of high temperature wire connects the probes and the manifold to the control unit. The probe manifold itself serves as a common conductor. The presence of water will complete a circuit between the manifold and the probe tip.

Two printed circuit boards contained in a NEMA 4X (IP65) wall mounted enclosure provide 1 to 4 water/steam discrimination circuits, LED display, relay alarm outputs, and terminals for the connection of a Remote Display Unit.

To avoid galvanic action at the probe and variations in sensing voltage due to changing electrolytic potentials, an alternating voltage source is applied to the probe and the sensing circuit responds only to an alternating waveform. Two low frequency oscillators are provided for the source voltage, one driving the odd numbered channels and the other the even numbered channels. The voltage applied to the probe is less than 6 volts, current limited to 50 μ A and presents no risk to personnel.



Typical Probe Manifold
Cross Section

Figure 1.1

2.1 System Features

Channels: The LT-300 has 4 independent channels that are assigned a Normal State, Steam (Dry) or Water (Wet). Process Fault will be invoked when any channel is not in the assigned Normal State.

Visual Indication: Channels 1 through 4 have dedicated LEDs, Red to indicator Steam (Dry) State, and Green to indicate Water (Wet) State. There are two flashing Yellow LEDs, System Fault and Process Fault.

Dual Power Supplies: The Control Unit is supplied with two switching power supplies to convert 84-264 VAC to the low voltage current that operates the electronics. In the event of failure of one of the power supplies, the other will take over the full load, and System Fault (Yellow Flashing LED) will be invoked. The unit is designed for two independent power sources. If only one source is available, wire jumpers may be used to link the two power supplies.

Relays: Each channel is supplied with a DPDT (2 Form C) Relay for Alarm or Trip. RL1 is designed to be used as a Low Level Trip, and is invoked when both Channels 1 and 2 agree. RL4 is designed to be used as a High Level Trip, and is invoked when both Channels 3 and 4 agree. RL2 and RL3 are designed to be used as alarms and operate with no agreement, and are assigned to Channels 2 and 3. Each relay may be assigned to operate in the Energized or De-energized state with a series of rotary switches. Each relay is also assigned a PCB mounted LED to indicate when the relay is closed.

Time Delay: Time Delay may be independently set at 1, 5 or 10 seconds for each channel. This is normally used to prevent nuisance trips or chattering.

Coincidence / Vertical Mode: The system can be configured for Coincidence or Vertical mode pairings of Channels 1 and 2, Channels 2 and 3, and Channels 3 and 4. Coincidence mode (See Fig. 2.1A) is applicable when two or more probes are mounted at the same level, System Fault will be invoked when the paired channels do not agree. Vertical mode is applicable when two or more probes are mounted at different levels, System Fault will be invoked where Out of Sequence is indicated (Water over Steam, or Steam under Water.)

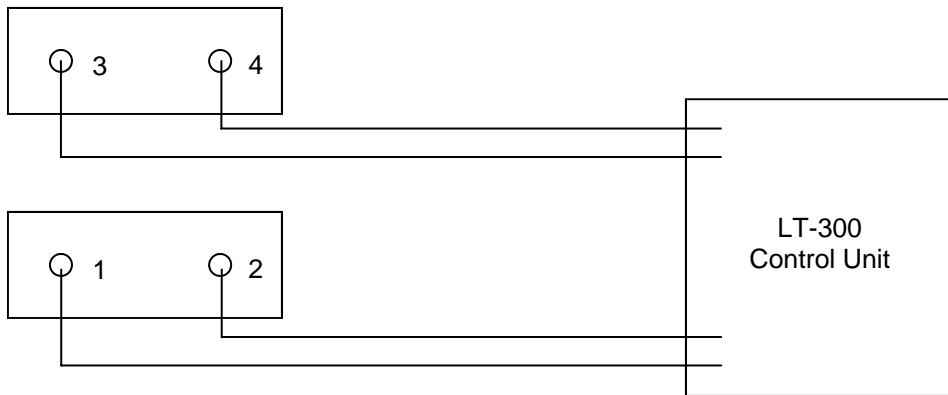


Fig. 2.1A Typical Coincident Configuration

Probes 1 and 2 at the same level indicating Low Water,
 Probes 3 and 4 at the same level indicating High Level.
 System Fault will be invoked where paired channels disagree.

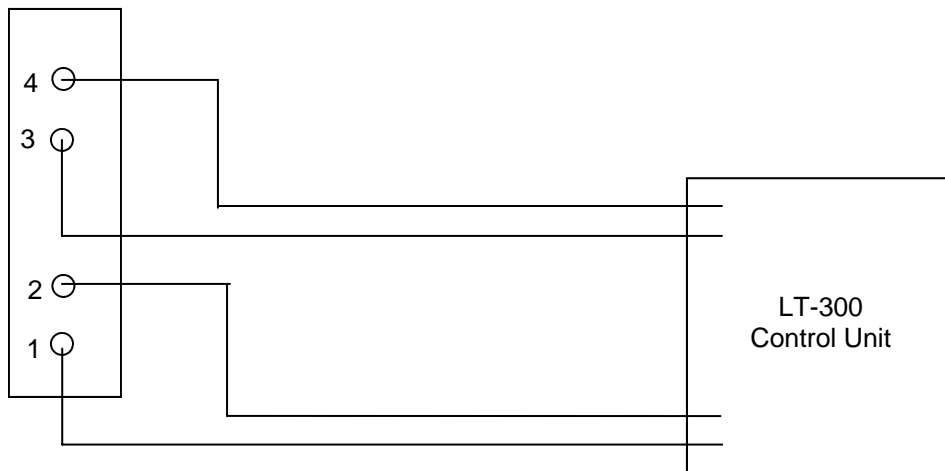


Fig. 2.1B Typical Vertical Configuration

System Fault will be invoked with Out of Sequence logic, in the event of indication of Steam under Water, or Water over Steam.

System Fault: System Fault will be invoked in three scenarios, which will also trip RL5.

- 1) Failure of a Power Supply.
- 2) Coincident or Vertical Logic fault.
- 3) Probe Cable Fault.

Process Fault: Process Fault will be invoked when a Channel is not in its pre-selected Normal State.

Test Switches: There is a slide switch, which activates the 6 Green/Red pushbutton switches located along the bottom of the Discriminator PCB. When in the "On" position, all relays are held in place and the pushbutton switches are activated. Depressing a switch will simulate either Water (Wet) or Steam (Dry) regardless of the actual input from the probes. CAUTION: When the slide switch is "ON", the Trip and Alarm Relays will not change state. Always return the switch to the "OFF" position during normal operation.

Commissioning:

Program Check List:

1. Set Normal Probe State: This is done by making solder jumps alongside TB1 and TB2 on the Discriminator PCB. There are two pads sets of pad for each probe, labeled A1, B1, A2, B2, A3, B3, A4, and B4. If a probe is expected to be normally Steam (Dry) no jumps are to be made. If a probe is expected to be normally Water (Wet) make both the A and B jumps for that probe.

2. Sensitivity Setting: This is done by making solder jumps for each channel of the clusters labeled "SENS". These are located slightly left of center on the upper half of the Discriminator PCB. Jump is made to >2S as default. A subsequent jump to >1S increases sensitivity, a jump to >0.5S maximizes sensitivity.

3. Normal Channel State: This is done by making solder jumps labeled "NORM SERV" for each channel. The pads are located done the center of the upper half of the Discriminator PCB. Jump Center to S for channels normally Steam (Dry), or Center to W for channels normally in Water (Wet.)

4. Coincident or Vertical Mode: This is done with solder pad pairing of Channels 3 and 2, Channels 2 and 1, and/or Channels 3/4. These pads are located to the right of the 26 pin ribbon cable socket on the Discriminator PCB.

5. Time Delay: This is done with solder pad clusters for each channel labeled "DELAY" These pads are located left of center on the lower half of the Discriminator PCB.

6. Alarm/Trip Relays: These are programmed by a rotary switch. Fully Clockwise (CW) closes the switch, fully Counter Clockwise (CCW) fully opens it. Switch Assignments are:

Relay	Function	Energized	De-Energized
RL1	Trip	SW0 = 1 SW1 = 0 SW2 = 1	SW0 = 0 SW1 = 1 SW2 = 0
RL2	Alarm	SW10 = 1 SW11 = 0	SW10 = 0 SW11 = 1
RL3	Alarm	SW8 = 1 SW9 = 0	SW8 = 0 SW9 = 1
RL4	Trip	SW3 = 1 SW4 = 0 SW5 = 1	SW0 = 1 SW1 = 0 SW2 = 1
RL6	Holds RL1, RL2, RL3, and RL4 position when Test Switch is operated.	SW6 and SW7. These should always remain open in normal operation.	

6 LT-300 Electronic Unit Specification

Enclosure:

Wall mounted glass-fiber reinforced polyester, IP65/NEMA4X protection for location in harsh environments.

Inputs:

Discrimination between water and steam for 4 channels numbered in ascending order.

Discrimination threshold may be selected for minimum conductivity of 0.5 micro Siemens/cm, 1 micro Siemens/cm or 2 micro Siemens/cm.

Display:

Two vertical columns of 10 mm (0.4") square LED's provided on the front of the enclosure. One row of Green LED's represents water and the second row of Red represents steam. Two Yellow flashing LED signals System Fault or Process Fault Condition.

Supply Requirements

84 to 264 VAC @ 15VA, 48 - 63 Hz

Temperature Rating:-

Ambient: -10° C to +65° C, Storage : -50° C to 100° C

Relays:

DPDT, Form C for Each Probe

8 Amps @ 250 VAC

0.55 Amps @ 220 VDC

Response Time: 0.5 milliseconds

Remote Display: Eight terminals are provided for direct connection to a Remote Display Unit. Remote Display Unit Option. The LTI-300 unit duplicates the display on the front of the main unit and is intended for control room location.

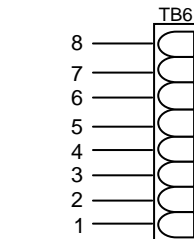
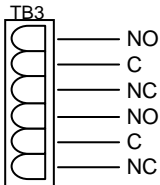
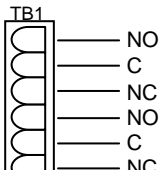
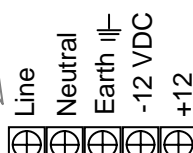
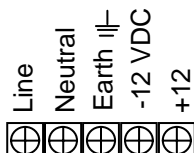
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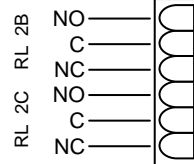
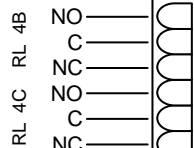
P/N 1-504-02-959
Power Supply

Incoming Power Supply (88-264 VAC, 50/60 Hz, 0.8 A max.) is wired directly to this Switching Power Supply. If only one input power source is available, jump Line to Line, Neutral to Neutral and Earth to Earth.

P/N 1-504-02-959
Power Supply



This terminal block is for Remote Level Indicator, if used.



This is for Ind.

Dimensions: inches (mm)
Not to Scale

Customer	
Cust. Ref.	
Fact. Ref.	
Project	
Drawn By:	MRB
Checked:	JAB

LT-300 Power Supply/Relay PCB	
User Connections and Solder Pad Jumps	
Drawing No.: D330-40-02, Rev. 0	Date: 2/8/2010
Glass-Trac Steam-Trac Level-Trac Magne-Trac	

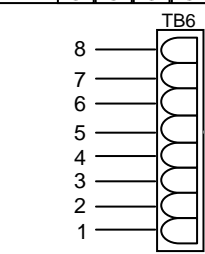
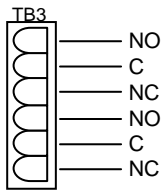
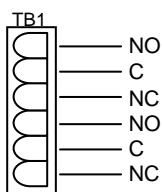
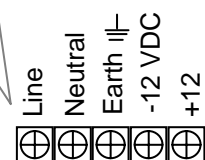
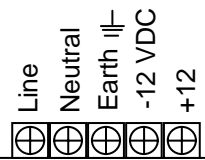
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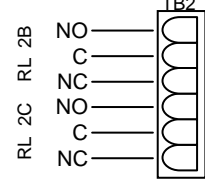
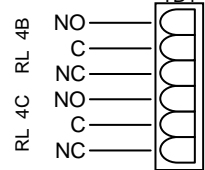
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