

## General Operation

The 'LEVEL IN FEET' column show the actual level in the tank. Each LED indicates one quarter of a foot. The level monitor must be calibrated to the transducer in the tank (see Calibration Mode on page 2).

- 1. The 'LEAD', 'LAG 1', 'LAG 2', and 'LAG 3': ON/OFF** columns are used to control the levels in which the respective pumps will turn on and off. This is done by selecting which set point (ON/OFF) is to be changed by pressing the 'SELECT' button for the desired column. The corresponding 'SELECTED' LED below the 'SELECT' button will turn on. Once selected the 'INCREASE' and 'DECREASE' buttons are used to change the set point level. When the desired set point level is reached, a press of the same 'SELECT' button will exit that set point mode, and the corresponding 'SELECTED' LED will turn off. This mode will also be automatically exited if there is no button activity for 45 seconds. If there is a pump connected for the set point columns, the 'ACTIVE' LED will always be on. If the 'ACTIVE' LED is off, then there is no pump connected for that column.

Default set points for columns:

LEAD OFF	1 ¼ FEET
LEAD ON	5 ¾ FEET
LAG 1 OFF	2 ¾ FEET
LAG 1 ON	7 ¼ FEET
LAG 2 OFF	4 ¼ FEET
LAG 2 ON	8 ½ FEET
LAG 3 OFF	5 ¾ FEET
LAG 3 ON	10 FEET
LOW ALARM OFF	4 ¼ FEET
LOW ALARM ON	¾ FEET
HIGH ALARM OFF	7 ¼ FEET
HIGH ALARM ON	11 ½ FEET

- 2. The 'SIMULATE' button:** This button allows the user to simulate most of the functions of the LMS400. The 'INCREASE' and 'DECREASE' buttons are used to raise and lower the 'LEVEL IN FEET' column in place of the transducer feedback signal. When in the simulate mode the 'SELECTED' LED below the simulate button will turn on. When in the simulate mode all pumps will be turned off and any request to turn them on will be

ignored. The simulate mode is exited by pressing the 'SIMULATE' button again. If there is no button activity for five minutes, the LMS400 will exit the simulate mode. When the simulate mode is exited the corresponding LED will turn off and the 'LEVEL IN FEET' columns will return to the actual level coming from the tank transducer.

- 3. The 'SET SEQUENCE' button:** The 'SET SEQUENCE' button is used to control the pump sequencing order. When this button is pressed, the sequencing order is shifted to the right one position. If the lead pump is not present in the new sequence, the sequence will advance until there is a present lead pump.

### A. LED 1 ON

In this sequence pump 1 is the lead pump. Pump 2 is lag 1, pump 3 is lag 2, and pump 4 is lag 3.

### B. LED 2 ON

In this sequence pump 2 is the lead pump. Pump 3 is lag 1, pump 4 is lag 2, and pump 1 is lag 3.

### C. LED 3 ON

In this sequence pump 3 is the lead pump. Pump 4 is lag 1, pump 1 is lag 2, and pump 2 is lag 3.

### D. LED 4 ON

In this sequence pump 4 is the lead pump. Pump 1 is lag 1, pump 2 is lag 2, and pump 3 is lag 3.

- E. AUTO LED AND 1, 2, 3, OR 4 ON:** In this sequence the lead pump sequence is shifted to the right when the following conditions occur:

- All active pumps are in the A (auto) position.
- One or more of the active pumps completes an automatic cycle of turning on and then off again.

4. **The 'ALARM SILENCE' button:** This button will clear the common alarm output. The common alarm will stay off until a new alarm condition occurs. The 'ACTIVE' alarm LED's located above the 'LOW' and 'HIGH' columns will not turn off until the alarm condition changes.
  5. **The 'PUMP 1', 'PUMP 2', 'PUMP 3', 'PUMP 4' buttons:** These buttons change the pump modes and clear pump faults.
    - A. **'H' LED ON**

This is the hand mode. When in the hand mode the pump will turn on until the pump button is pressed again and the pump mode toggles to O (off).
    - B. **'O' LED ON**

This is the off mode. The pump will not become active again until it is put in the H (hand) or A (auto) mode.
    - C. **'A' LED ON**

This is the auto mode. When in this mode the 'LEAD', 'LAG 1', 'LAG 2', and 'LAG 3' column set points will turn the pump on and off.
- NOTE:** *The LMS400 has an internal on/off/on timer to prevent short cycling the pump and causing damage to the pump. A pump on to off to on transition will not occur until this timer times out. This internal timer is set by the position of dip switch 1. Dip switch 1 is located on the back of the front display panel. When dip switch 1 is off the delay is 10 seconds. When dip switch 1 is on the delay is 30 seconds.*
6. **Faults:** The 'FAULT' LED indicator for each pump will illuminate if a pump fault occurs. A pump fault will occur if one of the following conditions occurs:
    - A. Shortly after the start command ('REQUIRED' LED indicator is on) is given to the pump output, the run feedback signal ('RUN' LED indicator) is not received.
    - B. A run feedback signal ('RUN' LED indicator) is present without a start command ('REQUIRED' LED indicator).

Any fault that occurs while the pump is running will turn off the pump. A pump fault can be cleared by pressing the corresponding 'PUMP' button. If the fault has cleared, the pump will return to the state it was in before the fault occurred. If the fault has not cleared, the fault will recur again shortly. If the fault occurred while the pump was running and the fault is trying to be cleared by pressing the 'PUMP' button, but the fault still exists, the pump will come on for 3 seconds, then fault out again. If a low battery fault occurs, all on/off LED indicator columns will turn off, and the two 'TREND' LED indicators will turn on. The system will then wait for the battery voltage to become valid again. When it does, the system will automatically reset itself. If a low 12-volt power supply fault occurs, all columns will turn off. In this case, the power will have to be cycled to the LMS400 to clear the fault.

7. **Alarms:** If the level in the tank falls below the on set point of the 'LOW' LED column, the low alarm and common alarm outputs will trip, and the 'AUDIBLE ALARM ACTIVE' LED indicator will illuminate. The alarms will stay on until the tank level rises above the off set point. The 'ALARM SILENCE' button will turn off the common alarm output and the 'AUDIBLE ALARM ACTIVE' LED indicator. If the level in the tank rises above the on set point of the 'HIGH' LED column the high alarm and common alarm outputs will trip and the 'AUDIBLE ALARM ACTIVE' LED indicator will illuminate. The alarms will stay on until the level falls below the off set point.
8. **Trend Indication:** If the level is increasing at a rate of  $\frac{1}{4}$  foot every five seconds or faster, the 'INC' LED indicator will illuminate. If the level is dropping  $\frac{1}{4}$  foot every five seconds or faster the 'DEC' LED indicator will illuminate.
9. **Calibration Mode:** Dip switch 3 (DP3), located on the back of the display panel, is used to configure the LMS400 to be in pump up mode or pump down mode. *DP3 should only be toggled with the controller power turned off.* If DP3 is in the OFF position, the LMS400 is in pump down mode (default). If DP 3 is in the ON position the LMS400 is in the pump up mode.

### 10. Procedure for calibration of input signal:

- A. If at power up. Dip Switch 2 (DP2) is in the ON position, calibration will begin. This is the recommended way to do calibration.
- B. If at power up, DP2 is in the OFF position, calibration will be skipped.
- C. If while running after power up, and calibration is not in progress, when DP2 transitions from OFF to ON, calibration will begin.

Once calibration begins, all LEDs for ON/OFF columns will be turned off and then proceed as follows:

- A. Scroll the INC and DEC keys until the LEVEL IN FEET COLUMN is set to the desired minimum level.
- B. Fill the tank to the desired minimum level.
- C. Set the DP2 to the OFF position.
- D. At this time the LEVEL IN FEET column should be set to the desired maximum level using the INC and DEC keys.
- E. The tank should now be filled to the desired maximum level.
- F. Set DP2 to the ON position, then back to the OFF position.
- G. Calibration is completed and the minimum and the maximum readings are stored in E2PROM and are used for scaling transducer feedback.

# LMS400

Level Management System

# OPERATION MANUAL

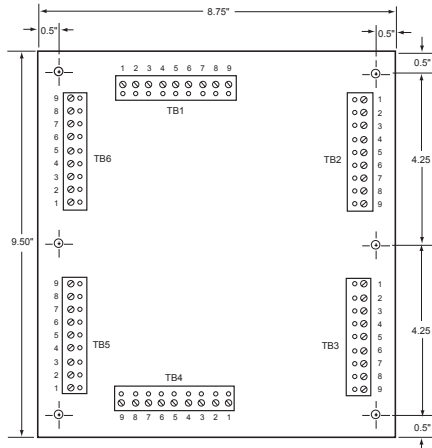
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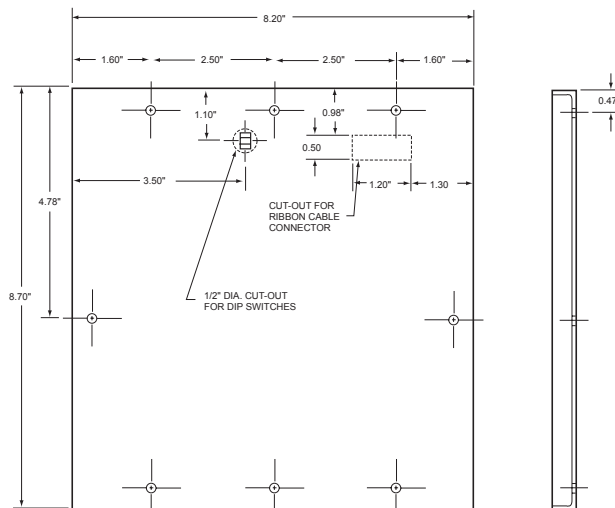
Document No.: LMS-OM-01

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## 11. Terminal Block Legend:



Power Supply Board (Front View)



Power Supply Board (Front View)

### TB1

- 1 Alarm switch 1
- 2 Alarm switch 2
- 3 Alarm output 1
- 4 Alarm output 2
- 5 +13.8VDC to battery
- 6 Common to battery 7
- 24 VAC common 8
- 24 VAC input
- 9 Transducer power

### TB4

- 1 Pump 3 start feedback
- bypass
- 2 Pump 3 start feedback
- bypass
- 3 Pump 4 run feedback
- 4 Pump 4 start 1
- 5 Pump 4 start 2
- 6 Pump 4 start feedback
- bypass
- 7 Pump 4 start feedback
- bypass
- 8 Pump 1 failure no
- 9 Pump 1 failure common

### TB2

- 1 Signal feedback
- 2 Common
- 3 Ground
- 4 120 VAC common
- 5 120 VAC input
- 6 Pump 1 run feedback
- 7 Pump 1, start 1
- 8 Pump 1, start 2
- 9 Pump 1 start feedback
- bypass

### TB5

- 1 Pump 1 failure nc
- 2 Pump 2 failure no
- 3 Pump 2 failure common
- 4 Pump 2 failure nc
- 5 Pump 3 failure no
- 6 Pump 3 failure common
- 7 Pump 3 failure nc
- 8 Pump 4 failure no
- 9 Pump 4 failure common

### TB3

- 1 Pump 1 start feedback
- bypass
- 2 Pump 2 run feedback
- 3 Pump 2, start 1
- 4 Pump 2, start 2
- 5 Pump 2 start feedback
- bypass
- 6 Pump 2 start feedback
- bypass
- 7 Pump 3 run feedback
- bypass
- 8 Pump 3, start 1
- 9 Pump 3, start 2

### TB6

- 1 Pump 4 failure nc
- 2 High alarm no
- 3 High alarm common
- 4 High alarm nc
- 5 Low alarm no
- 6 Low alarm common
- 7 Low alarm mc
- 8 Control power
- 9 Control power common

# LMS400

Level Management System

# OPERATION MANUAL

Dated: 9/11/02

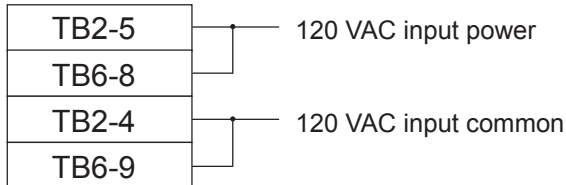
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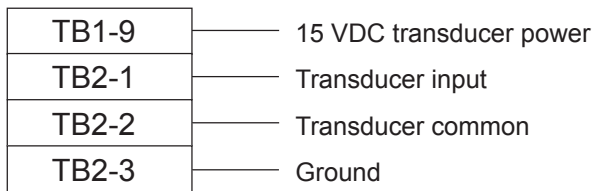
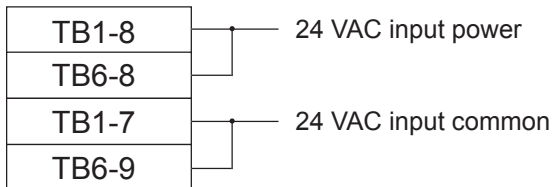
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## 12. Terminal block wiring key:

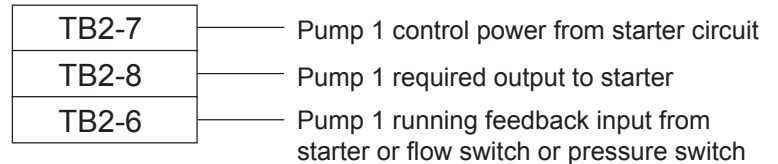
For 120 VAC Power



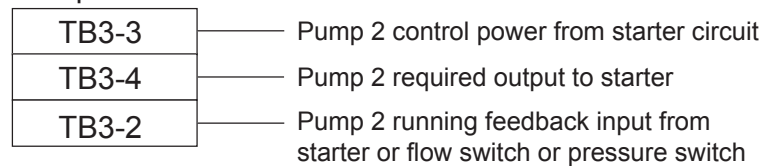
For 24 VAC Power



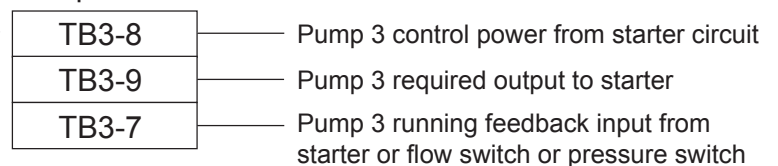
Pump 1



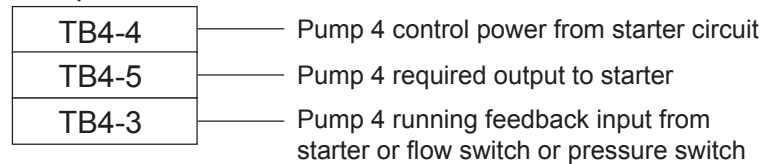
Pump 2



Pump 3

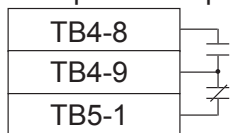


Pump 4

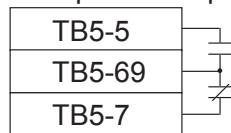


## 13. All Dry Contacts (10 Amps at 120 VAC):

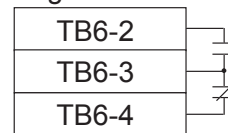
Pump 1 fail output



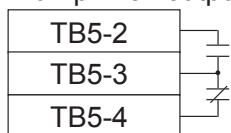
Pump 3 fail output



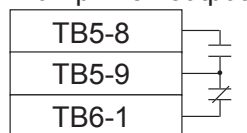
High level alarm output



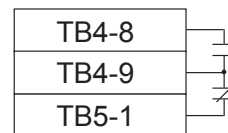
Pump 2 fail output



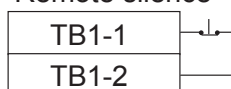
Pump 4 fail output



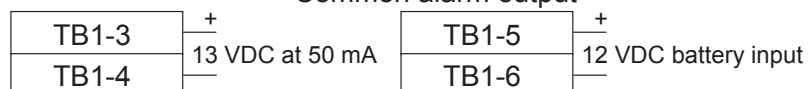
Low level alarm output



Remote silence\*



Common alarm output



\*Normally closed, jumper if not used.