LC-1000 Lube System Controller

DESCRIPTION

The Trabon microprocessor based LC-1000 Controller is a multi-use solid state controller that is dedicated to the operation and monitoring of intermittent operating series and parallel centralized lubrication systems equipped with a cycle or pressure switch for cycle completion feed back.

The LC-1000 monitors and schedules lubrication intervals in either time or stroke/cycle basis in values ranging from 1 to 9999. Pump may be self cycling or single cycle type requiring a pulsed output.

Four units are available for 12 VDC, 24 VDC, 115 VAC, or 230 VAC operation. The LC-1000 is easy to program in the field using four mini push-buttons. The programming requires no special knowledge or training of computer language. During power down or outage, all data is saved in EEPROM (Electrically Erasable Programming Read Only Memory). As power is restored, counting and pump status are restored to values prior to the loss of power.
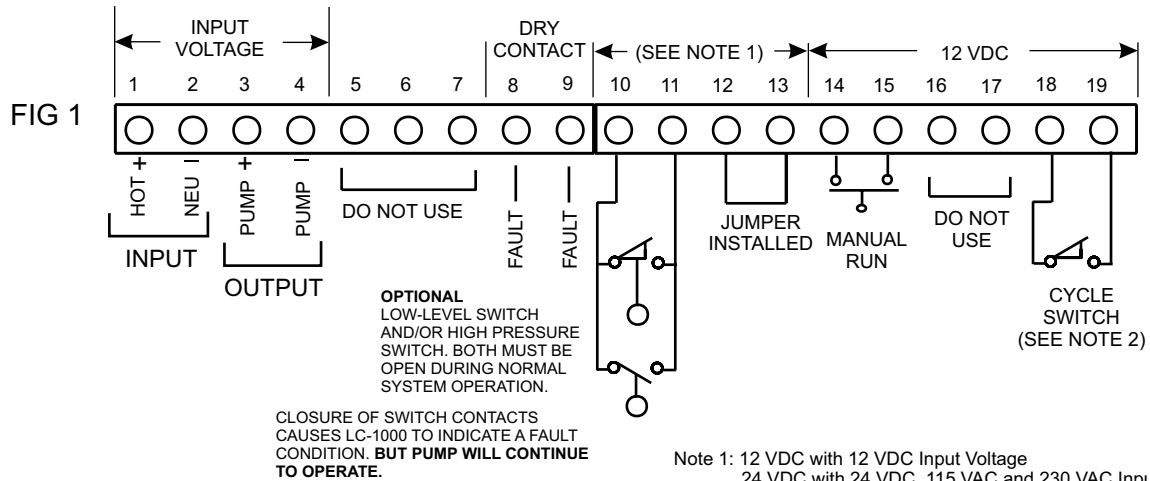
SPECIFICATIONS

Power Supply	115 VAC $\pm$ 10%, 50/60 Hz, 1 ph; 230 VAC $\pm$ 10%, 50/60 Hz, 1 ph; 12 VDC $\pm$ 10%; 24 VDC $\pm$ 10%
Output Loading	
Main Pump Load	12 VDC-230 VAC, 50/60 Hz, 10 amp replay output (external fused by user)
Fault Output Signal	12 VDC-230 VAC, 50/60 Hz, 1 amp resistive max (N.O.) dry isolated contact (external fused by user)
Temperature Range	Do Not Locate Unit in Direct Sunlight
Operating	-4ºF to 122ºF (-20ºC to 50ºC)
Storage	-13ºF to 140ºF (-25ºC to 60ºC)
Enclosure	Plastic with Clear Cover, NEMA 4X, IP 66
Display	Supertwist LDC, Annotated 4 Digit, 4 LED's - PWR (GN), LUBE (YW), FAULT (RD), CYCLE (YW)
Stroke Input	
Max Input Rate	10 Hz (600 cpm)
Nominal 12 Volts	12 VDC version
Nominal 24 Volts	24 VDC, 115 VAC, 230 VAC versions
Other Inputs	
Cycle Switch	12 Volts, dry contact, 2.5 mA max, counts half cycles

Programming Selection	
Output On	1-9999 sec, min, hrs, counts
Output Off	1-9999 sec, min, hrs, counts
Cycle Counter	Half counts (0-99)
Pump	Steady State or Pulsed
Pulse Off Time (Prime)	3 sec fixed
Pulse On Programmable	0-99 sec
Program Entry	4 Mini Push Buttons - Program, Increase, Shift, Enter
EEPROM	Electrically Erasable Programming Read Only Memory

WIRING INFORMATION

Option for units built after February 1, 1999 that are programmed in time mode.

FIG 1

INPUT VOLTAGE

DRY CONTACT

(SEE NOTE 1)

12 VDC

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |

HOT + | NEU − | PUMP + | PUMP −

DO NOT USE

FAULT | FAULT

JUMPER INSTALLED

MANUAL RUN

DO NOT USE

CYCLE SWITCH (SEE NOTE 2)

INPUT

OUTPUT

OPTIONAL LOW-LEVEL SWITCH AND/OR HIGH PRESSURE SWITCH. BOTH MUST BE OPEN DURING NORMAL SYSTEM OPERATION.

CLOSURE OF SWITCH CONTACTS CAUSES LC-1000 TO INDICATE A FAULT CONDITION. **BUT PUMP WILL CONTINUE TO OPERATE.**

Note 1: 12 VDC with 12 VDC Input Voltage
        24 VDC with 24 VDC, 115 VAC and 230 VAC Input Voltage
Note 2: Piston Distributor or Injector System will use a Pressure Switch.

WIRING INFORMATION

All units programmed in machine count mode, or any units built prior to Februay 1, 1999.
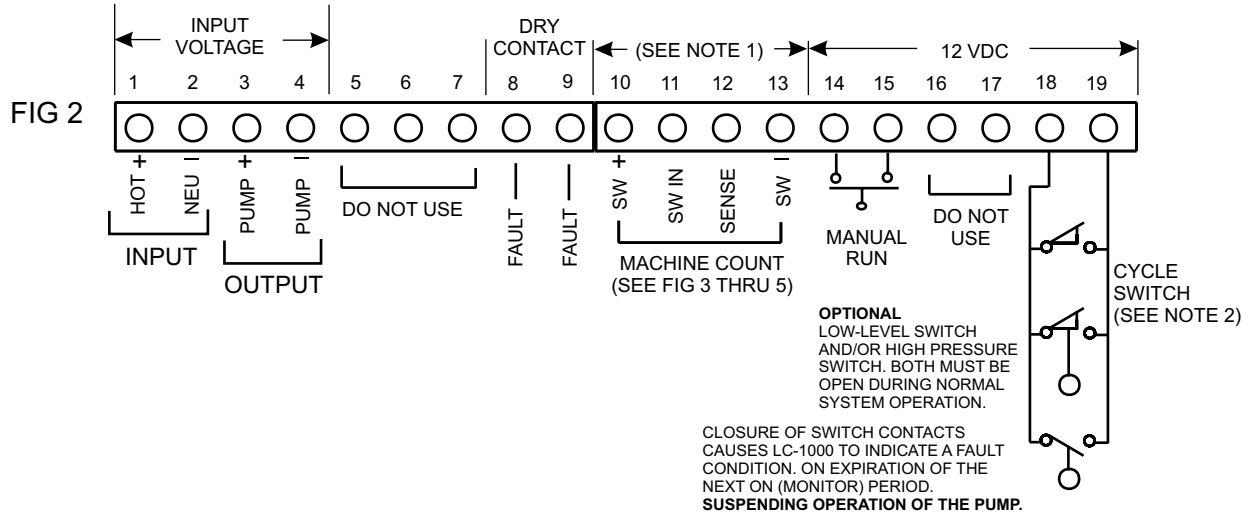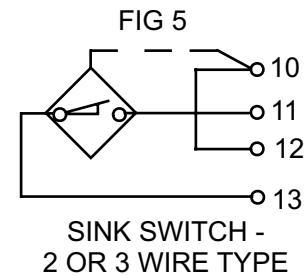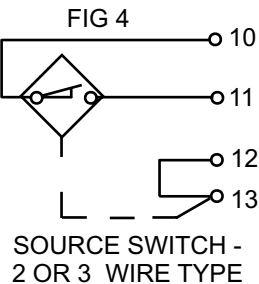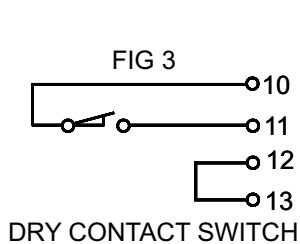Option for units built after February 1, 1999 that are programmed in time mode.

FIG 2

INPUT VOLTAGE

DRY CONTACT

(SEE NOTE 1)

12 VDC

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |

HOT + | NEU − | PUMP + | PUMP −

DO NOT USE

FAULT | FAULT

SW + | SW IN | SENSE | SW −

MANUAL RUN

DO NOT USE

CYCLE SWITCH (SEE NOTE 2)

INPUT

OUTPUT

MACHINE COUNT (SEE FIG 3 THRU 5)

OPTIONAL LOW-LEVEL SWITCH AND/OR HIGH PRESSURE SWITCH. BOTH MUST BE OPEN DURING NORMAL SYSTEM OPERATION.

CLOSURE OF SWITCH CONTACTS CAUSES LC-1000 TO INDICATE A FAULT CONDITION. ON EXPIRATION OF THE NEXT ON (MONITOR) PERIOD. **SUSPENDING OPERATION OF THE PUMP.**

Figure 3, 4 and 5 refer to machine count input only.

FIG 3

○ 10
○ 11
○ 12
○ 13

DRY CONTACT SWITCH

FIG 4

○ 10
○ 11
○ 12
○ 13

SOURCE SWITCH - 2 OR 3 WIRE TYPE

FIG 5

○ 10
○ 11
○ 12
○ 13

SINK SWITCH - 2 OR 3 WIRE TYPE

DIMENSIONS mm / (Inches)

MANUAL RUN BUTTON
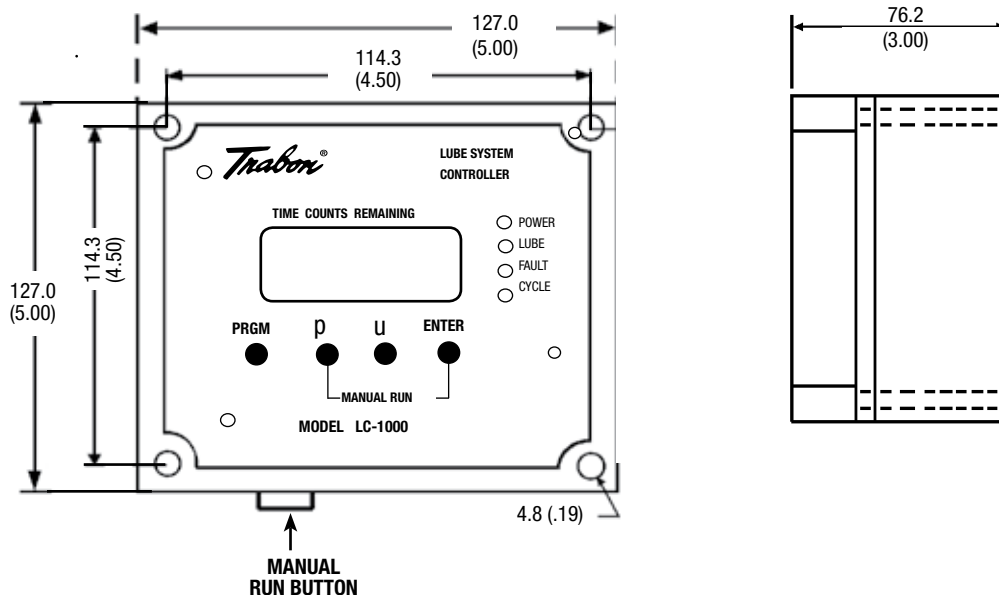
ORDERING INFORMATION		
Description	**Part No.**	**Old Part No.**
LC-1000 Controller (Voltage)		
12 VDC	562876	163-400-050
24 VDC	562877	163-400-051
115 VAC, 50/60 Hz	562878	163-400-052
230 VAC, 50/60 Hz	562879	163-400-053
Replacement Board (Voltage)		
12 VDC	558050	572-144-644
24 VDC	558051	572-144-645
115 VAC, 50/60 Hz	558052	572-144-646
230 VAC, 50/60 Hz	558053	572-144-647

PUSH BUTTONS:

There are four mini push buttons;

PRGM - Initiate Program mode, or alternate between settings for:

ON	(Monitor Time)
OFF	(Pause Time)
CYCLE	(Switch Transitions)
PUMP	(Pulsed On Time)

p - Increase digit

u - Next digit select

ENTER - Enter (save) new setting and advance to next program step.

PROGRAMMING INSTRUCTIONS

The LC-1000 Controller has icons in the display to indicate if the unit is in a lube ON cycle or OFF cycle and to show the timing mode. They are also used to indicate which counter is being adjusted when programming new parameters. The LCD four digit display is used to show the remaining time left in either an ON or OFF cycle, as indicated by the icons. Timing can be done in seconds, minutes, hours or counts. **A flashing LCD character indicates that the timer is in the Programming mode.**

OPERATION

When power is applied, the green "POWER LED" lights and the LC-1000 counts down alternately from the programmed "OFF/ON" Times/Counts to zero.

In the "ON" (Monitor) mode, the "PUMP LED" lights. The pump is activated and both the "ON" and "RUN" icons are displayed. If the programmed number of cycle switch transitions (1/2 cycles) are received before expiration of the "ON" (Monitor) period, the PUMP OUTPUT, "PUMP" LED, "ON" and "RUN" icons turn off and the "OFF" icon will display. If the programmed number of cycle switch transitions (1/2 cycles) are not received before expiration of the "ON" (Monitor) period, a "FAULT" will be registered. This suspends pump operation, turns off the "PUMP" LED, the "ON" and "RUN" icons, turns on the red "FAULT" LED and closes the fault output contacts.

If a pulsed output to the pump is required, a "PUMP ON" time may be programmed from 0 to 99 seconds. Setting this value to zero will provide a steady state output. "PUMP OFF" is fixed at 3 seconds.

The "RUN" icon will display anytime the pump output is energized. During pulsed pump operation, the "RUN" icon will flash on and off in sequence with the pump. During continuous running, the "RUN" icon will not flash.

The Controller is programmed to retain the Time/Count in memory when power is turned off. This feature prevents excessive lubrication in start/stop applications and retains information for cycle to be completed when power is restored.

CHANGING SETTINGS

From the Timer display mode, pressing the "PRGM" button will allow you to review or change between the set "ON" (Monitor), "OFF", "CYCLE, "PUMP" (Pulsed On Time) and "DISPLAY" modes. When in the programming mode, the icons/digits will blink. When in the display mode, the icons/digits do not blink.

1. To set a new "ON" (Monitor) Time/Count, press the "PRGM" key until the "ON" icon blinks. The current "ON" (Monitor) Time/Count will be displayed.

    a. Press the "ENTER" key. The "ON" (Monitor) Timer/Count digit will blink

    b. Change the value using the "p" key and the "u" key

    c. Press the "ENTER" key to accept the new value. The "SEC/MIN/HR/CNT" icon will blink

    d. Press "ENTER" to accept the time base or the "p" key to scroll through the timing choices

    e. Press "ENTER" to complete the process

    Note: Monitor perior is normally set 2 times the actual time required for the pump to satisfy the system cycle requirements

2. The "OFF" icon will now be blinking

    a. Repeat above process until all "OFF" options have been programmed

    b. Press "ENTER" to accept the new values

3. The "CYCLE" icon will now be blinking

    a. Press "ENTER" and the cycle value (1/2 cycles) will blink

    b. Using the "p" and "u" keys, set the cycle value as follows:

        • Series Progressive: 02 (1 divider cycle), 04 (2 divider cycles), 06 (3 divider cycles), etc.

        • Dual Line: 01 (half cycle), 02 (full cycle)

        • Piston Distributor or Injector: 01

    c. Press "ENTER" to register the new value

4. The "PUMP" icon will now blink

    a. Press "ENTER" again and the pump pulsed "ON" time will blink

    b. Using the "p" and "u" keys, set the value (seconds) as follows:

        • Self-Cycling Pump (Motor Driven or Reciprocating Barrel): 00

        • Single Shot Pump (Piston Distributor or Injector): 00

        • Single Shot Pump (Recycle for Series Progressive): 03 to 10

    c. Press "ENTER" to accept the new values

        Note: In the Recycle mode, PUMP "OFF" time is fixed at 3 seconds. Press "ENTER" to register the new value and return to the "DISPLAY" mode. Scrolling through the modes using the "PRGM" key only will allow the review of the current settings without changing any of the values or timing. It is recommended that programming not be attempted while a lube cycle is in prcess. After making any change in settings, activate a manual run to initiate the change. Programming examples for specific types of systems are shown on pages 5-7.

MANUAL RUN/RESET

A manual-run lubrication cycle may be initiated by pressing the manual run button, located on the left underside of the unit, or by shorting terminals 14 and 15 together, such a with a remote push-button momentary switch. Manual run may also be initiated by pressing "p" and "ENTER" keys together. Manula run is also used to reset the controller and to clear faults.

Sample LC-1000 Program for Series Progressive,

31 Point Series Progressive System

DESCRIPTION

- System Lube Volume: 6.0 cu in (99 cc) per hour

- AL-50 Pump Used: .24 cu in per stroke (3.9 cc)

- Master Divider Volume per Cycle: .15 cu in (2.4 cc)

- Cycle Interval 15 Minute (1/4 hour) Used

- Volume per Lube Cycle: 6.0 cu in/4 = 1.5 cu in/15 min.

- Master Divider Cycles/Lube Cycle: 1.5 cu in/.15 cu in = 10 cycles

- Cycle Switch Transitions (2 transitions/cycle) x 10 = 20

- Pump Strokes per Lube Cycle: 1.5 cu in/.24 cu in = 6.3 (use 7)

- Monitor Time: 7 Strokes x 6 seconds/stroke (3 second "ON", 3 second "OFF") = 42 second x 2 (safety factor) = 84 seconds.
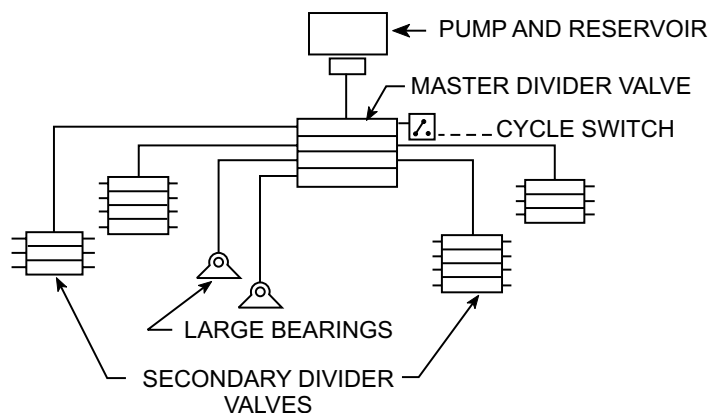
PROGRAMMING

1. Initiate Programming Mode

    a. Press "PRGM" - "ON" icon blinks

2. "ON" (Monitor Period)

    a. Press "ENTER" - "ON TIME/COUNT" blinks

    b. Use "p" and "u" keys to set "ON" (Monitor Time) to 0084

    c. Press "ENTER" to accept value, "SEC/MIN/HR/CNT" blinks

    d. Use "p" key to scroll through choices, select "SEC"

    e. Press "ENTER" to accept choice, "OFF" icon blinks

3. "OFF" (Pause Time)

    a. Press "ENTER" - "OFF TIME/COUNT" blinks

    b. Use "p" and "u" keys to set "OFF TIME" to 0015

    c. Press "ENTER" to accept value, "SEC/MIN/HR/CNT" blinks

    d. Use "p" key to scroll through choices, select "MIN"

    e. Press "ENTER" to accpet choice, "CYCLE" icon blinks

4. "CYCLE" (Cycle Switch Transitions)

    a. Press "Enter", "CYCLE" blinks

    b. Use "p" and "u" keys to select 20 (20 cycle switch transitions = 10 divider cycles)

    c. Press "ENTER" to accept value, "PUMP" icon blinks

5. "PUMP ON" (Pump Duty-Pulsed/Non-Pulsed)

    a. Press "ENTER" - "PUMP" (pulsed on time) blinks

    b. Use "p" and "u" keys to set "ON TIME" to 0.03 (3 sec pulsed output)

    c. Press "ENTER" to accept value, LCD returns to "DISPLAY" mode

    NOTE: If an electrical motor driven pump of self cycling barrel pump is used, enter "00" in Step 5b for non-pulsed output.

Programming is now complete. To verify lube sequence, initiate a manual lube cycle by pressing "MANUAL RUN" button.

Sample LC-1000 Program for Piston Distributor or Injector Systems

### 31 Point Piston Distributor System

DESCRIPTION

- System Lube Volume: 99 cc (6.0 cu in) per hour

- EO-3 Motor Driven Pump: 140 cc/min (8.5 cu in)

- Total Piston Distributor Displacement: 4.62 cc/cycle (.28 cu in)

- Cycle Interval: 99 cc / 4.62 cc = 21.4 cycles/hr

- 60 min/21.4 cyc = 2.8 min (168 sec) per cycle

- Cycle Switch (Pressure Switch) Transitions: (1 transition/cycle) x 1 = 1

- Pump Run Time: 4.62cc/140cc = .033min (1.98 second)

- Monitor Time: 1.98 sec x 2 (safety factor) = 3.96 seconds

Note: Due to the very short calculated pump run time, use a 20 second monitor time.

PROGRAMMING

1. **I**nitiate Programming Mode

    a. Press "PRGM" Key – "ON" Icon blinks

2. "ON" (Monitor Period)

    a. Press "ENTER" Key – ON TIME/COUNT blinks

    b. Use p Key and u Key to set Monitor ("ON") Time to 0020

    c. Press "ENTER" Key to accept value; "SEC/MIN/HR/CNT" blinks

    d. Use p Key to scroll through choices; select "SEC"

    e. Press "ENTER" Key to accept choice; "OFF" Icon blinks

3. "OFF" (Pause Time)

    a. Press "ENTER" Key – OFF TIME/COUNT blinks

    b. Use p Key and u Key to set "OFF TIME" to 0168

    c. Press "ENTER" Key to accept value; "SEC/MIN/HR/CNT" blinks

    d. Use p Key to scroll through choices; select "SEC"

    e. Press "ENTER" Key to accept choice; "CYCLE" Icon blinks

4. "CYCLE" (Pressure Switch Transitions)

    a. Press "ENTER" Key; CYCLE blinks

    b. Use p Key and u Key to select 01 (1 pressure switch transition = 1 system cycle)

    c. Press "ENTER" Key to accept value; "PUMP" Icon blinks

5. "PUMP ON" (Pump Duty-Pulsed/Non-Pulsed)

    a. Press "ENTER" Key; "PUMP" (pulsed on time) blinks

    b. Use p Key and u Key to set "ON TIME" TO 00 (non-pulsed output)

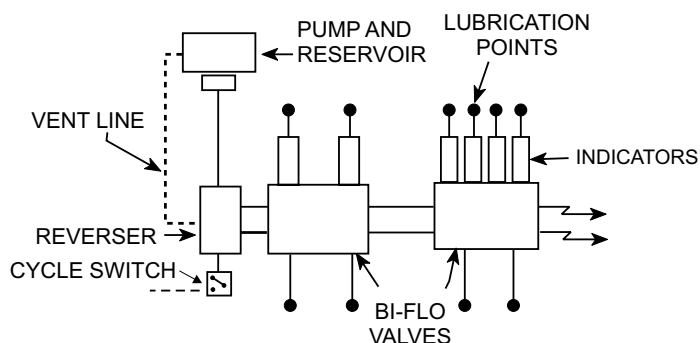   c. Press "ENTER" Key to accept value; LCD returns to "DISPLAY" mode
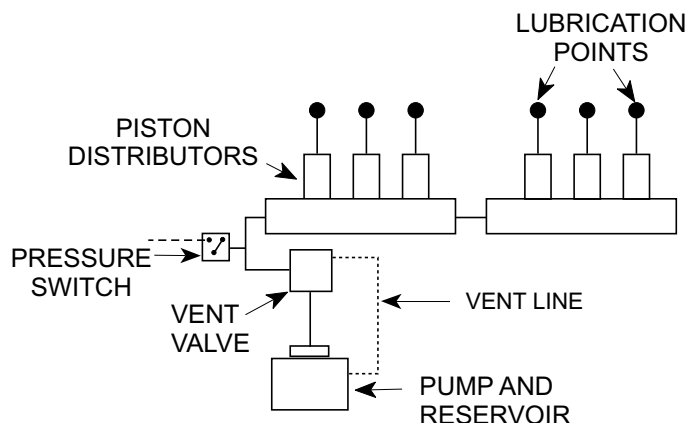
Programming is now complete. To verify lube sequence, initiate a manual lube cycle by pressing "Manual Run" button.

Sample LC-1000 Program for Bi-Flo (Dual Line) Systems

31 Point Bi-Flo (Dual Line) System

DESCRIPTION

- System Lube Volume: 6.0 cu in (99 cc) per hour

- Bi-Flo Motor Driven Pump Used: 8.6 cu in (141 cc) per minute.
  Note 1: Requires a Motor Starter
  Note 2: Requires a hydraulic reverser with cycle switch.

- Cycle Interval 15 Minute (1/4 hour) Used

- Volume per Lube Cycle: 6.0 cu in/4 = 1.5 cu in/15 minute.

- Cycle Switch Transitions (2 transitions/cycle) x 1 = 2

- Pump Run Time per Lube Cycle: 1.5 cu in/ 8.6 cu in = .17 min (10.4 second)

- Monitor Time: 10.4 sec x 2 (safety factor) = 20.8 second (use 21 second).

PROGRAMMING

1. Initiate Programming Mode

   a. Press "PRGM" Key – "ON" Icon blinks

2. "ON" (Monitor Period)

   a. Press "ENTER" Key – ON TIME/COUNT blinks

   b. Use p Key and u Key to set Monitor ("ON") Time to 0021

   c. Press "ENTER" Key to accept value; "SEC/MIN/HR/CNT" blinks

   d. Use p Key to scroll through choices; select "SEC"

   e. Press "ENTER" Key to accept choice; "OFF" Icon blinks

3. "OFF" (Pause Time)

   a. Press "ENTER" Key – OFF TIME/COUNT blinks

   b. Use p Key and u Key to set "OFF TIME" to 0015

   c. Press "ENTER" Key to accept value; "SEC/MIN/HR/CNT" blinks

   d. Use p Key to scroll through choices; select "MIN"

   e. Press "ENTER" Key to accept choice; "CYCLE" Icon blinks

4. "CYCLE" (Cycle Switch Transitions)

   a. Press "ENTER" Key; CYCLE (switch transitions) blinks

   b. Use p Key and u Key to select 02 (02 cycle switch transitions = 1 System cycle)

   c. Press "ENTER" Key to accept value; "PUMP" Icon blinks

5. "PUMP ON" (Pump Duty-Pulsed/Non-Pulsed)

   a. Press "ENTER" Key "PUMP" (pulsed on time) blinks

   b. Use p Key and u Key to set "ON TIME" TO 00 (Non-pulsed output)

   c. Press "ENTER" Key to accept value; LCD returns to "DISPLAY" mode

Programming is now complete. To verify lube sequence, initiate a manual lube cycle by pressing "MANUAL RUN" button.

NOTE 1: If half cycle Bi-Flo (Dual Line) operation is desired, select 01 (one switch transition) in step 4b.

NOTE 2: If a single cycle pump is used in conjunction with a Bi-Flo Reverser, enter "03" in Step 5b for pulsed pump output (3 second "ON", 3 second "OFF").

Your Program Record

Company: _____   By: _____

Machine Identification: _____   Date: _____

System Type: Bi-Flo ____ Piston Distributor ____ Series ____ Other: _____

On (Monitor) Value: Time/Count _____ Seconds ___ Minutes ____Hours ___ Counts _____

Off Value: Time/Count _____ Seconds _____ Minutes _____ Hours ____ Counts _____

Cycle Value (Switch Transitions): _____

Pump On (Pulsed/Non Pulsed): _____ (00 is Non-Pulsed)

TROUBLESHOOTING

Symptom	Cause	Remedy
Blank Display, No LEDs	No Power	Check Wiring & Fuse-Repair as Required
	Bad Circuit Board	Replace Circuit Board
No Display or Black Display, but System Operates	Temperature too High or too Low	Move Controller to Location that is within Temperature Limits
	Bad Display	Replace Circuit Board
Program Will Not Run	Programming Error or Bad Circuit Board	Review Instructions & Examples-Reprogram/ Replace Circuit Board as Required
	In Programming Mode	Exit by Pressing PRGM
Can't Change Program	Programming Error or Bad Circuit Board	Review Instructions & Examples-Reprogram/ Replace Circuit Board as Required
	Power Off Before Programming Completed	Complete the Programming Process Before Removing Power
Fault Light On	No Cycle Input	Check Cycle Switch & Wiring-Repair as Required
	Level Sw. or HP Sw. Closed (If Used)	Check Reservoir Level and Operating Pressure-Refill/Repair as Required
	System Blockage	Correct Blockage (see Bul 30101)
	No Pump Flow or Low Flow	Check Reservoir Level & Pump Output-Refill/Repair as Required
	Main Line Leaks	Check & Repair as Required
	Plugged Filter/Strainer	Clean or Repair as Required
	Monitor Time too Short	Increase Monitor Time
Failure to Indicate a Fault	Cycle Count Set to 00	Set Cycle Count to Desired Number of Half-Cycles.
	Programmed Machine Count Mode, and Wire According to Fig. 1	Program On and Off in Time Mode, or Wire per Fig. 2.