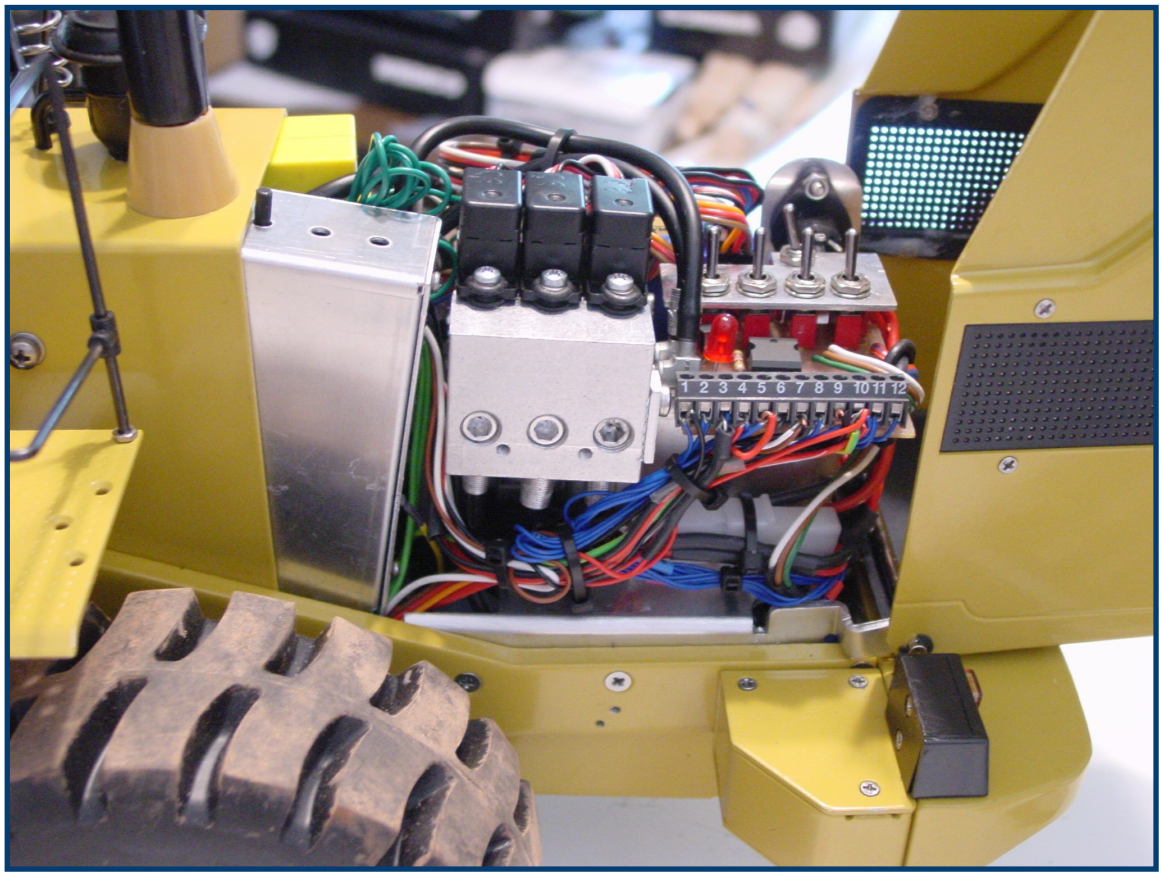
LSC

Lincoln Centromatic Auto Lubrication System

for Caterpillar 966G and 972G



User Manual by Lubrication Specialties Consultants

Lincoln Centromatic Auto Lubrication System for Caterpillar 966G and 972G - 55kg Keg Version with Electric Pump

For help or information call **1-866-988-2640**
Edmonton: **780-707-2406**
British Columbia: **604-729-2456**

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Introduction

The **966G** and **972G** Caterpillar models use an electrically powered grease pump to grease 21 points.

Automatic lubrication systems are an important maintenance factor in machine life, as a single lost boom pin can negate any savings achieved by not installing an automatic lubrication system.

The key advantage provided by automatic lubrication systems is the fact the system provides small measured quantities of lubricant at very frequent intervals. The importance of this factor cannot be overstressed!

By maintaining a constant, steady positive pressure of grease on the pin, and by using a sealed system, the we eliminate the two major factors in premature bearing wear; namely contamination and water induced corrosion.

Even hand greasing a hard working machine every four hours will not prevent the eventual entry of dirt and water into a bearing as the existing grease is forced out by the pin pressure and the cavity formed draws in dirt and water.

The LSC Lincoln based auto lube systems used on these machines is designed to reduce the installation time required and to ensure the system has the professional look and protection of a factory installed system.

To this end, LSC provides custom steel brackets and junction blocks to provide a neat appearance, and, where necessary, shielding for the lines is supplied.

Mounting components are designed to fit existing bolt patterns where necessary and to reduce to a minimum the welding and drilling required.

If an optional low grease level indicator is required, the unit is available at a modest extra cost.

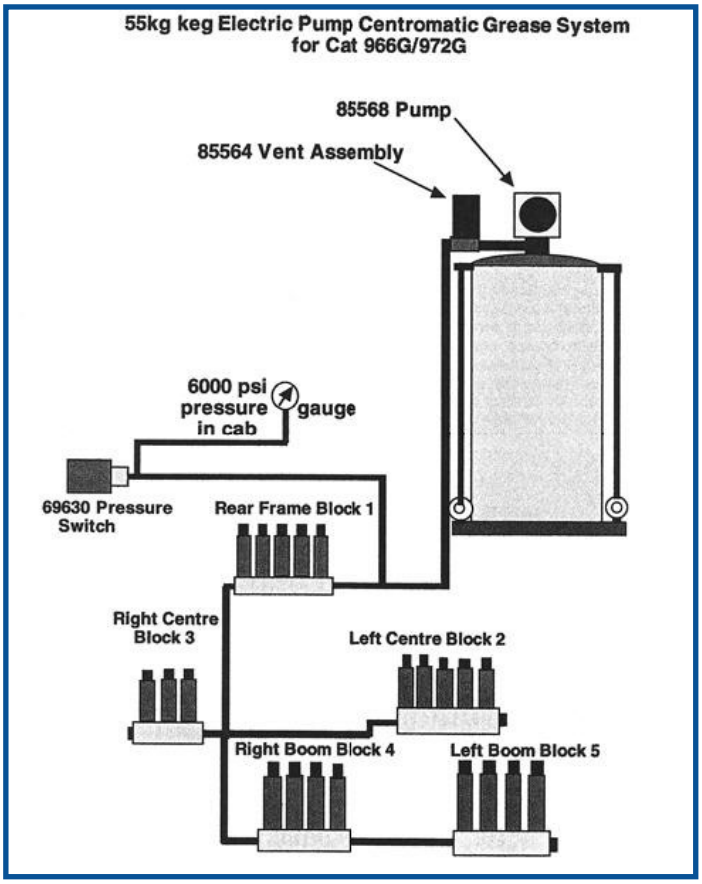


Figure 1: *Lincoln Centromatic Automatic Lubrication System*

Package includes:

- Pre-cut hoses
- Welded hose clamps
- All necessary steel brackets
- Injectors with cover caps
- Pump/vent/drum cover/tie-down assembly
- LSC timer unit suitable for the required power source
- Hydraulic controls
- Grease pressure gauge
- Pressure switch

System Components

The LSC Auto Lube System for the Caterpillar 966G and 972G includes the following components:

- Lincoln 85568 Pump and 85564 Vent
- PT-24-51 Timer
- 69630 Pressure Switch
- SL-1 Injectors.

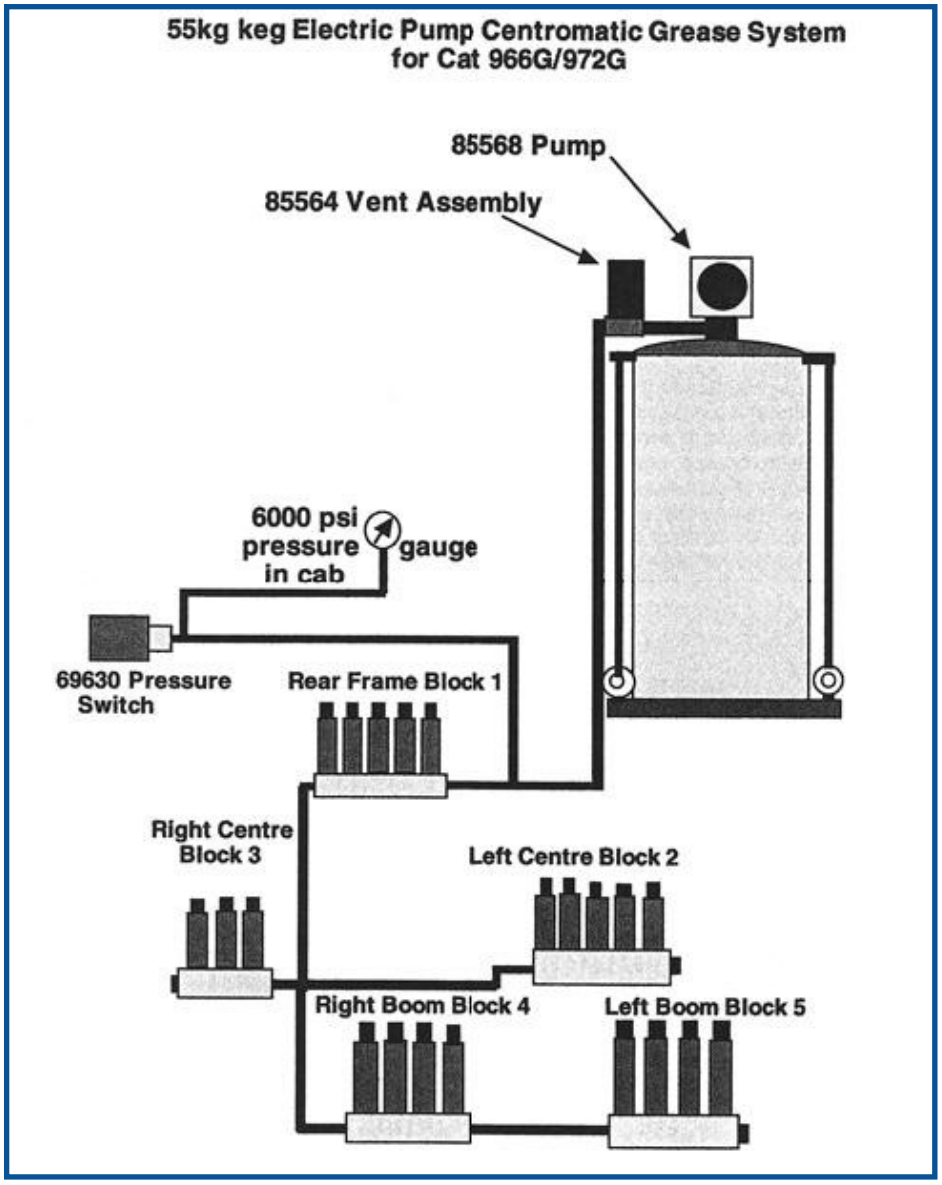


Figure 2: 55kg Keg Electric Pump Grease System

Lincoln 85568 Pump

The Lincoln 85568 Pump operates on machine 24VDC electrical power and draws as much as 15 amps at full load.

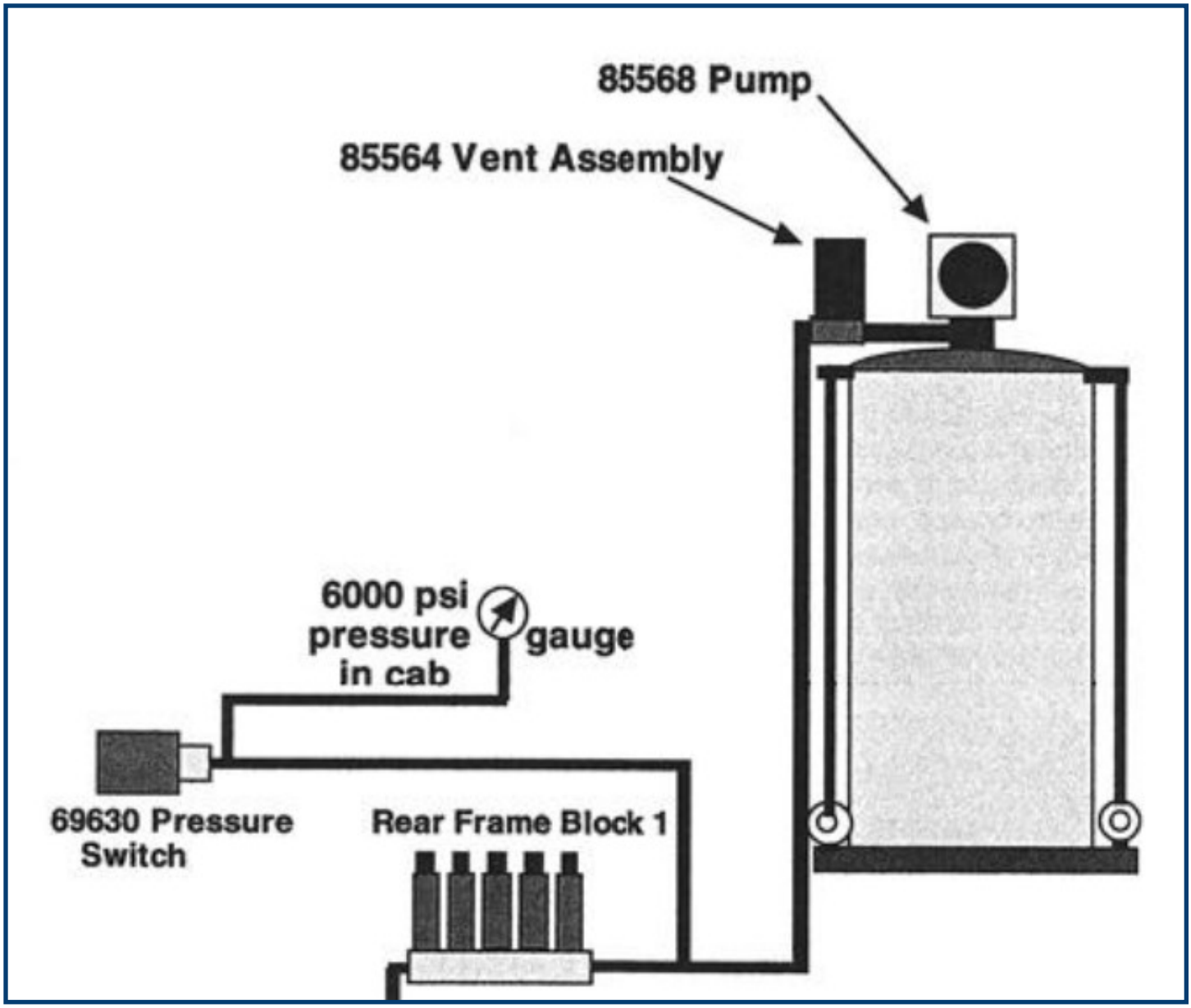


Figure 3: Lincoln 85568 Pump on Centromatic Auto Lubrication System

Lincoln 85564 Vent Assembly

The Lincoln 85564 Vent Assembly is specifically designed to be used with the Lincoln 85568 Pump and 84616 Drum Cover.

The vent consists of a two-way normally open solenoid wired in parallel with the electric pump motor.

The vent closes as grease is pumped into the system, and once pressure is reached and the system is deactivated, allows the excess pressurized grease to be returned to the grease barrel. This allows the injectors to reset.

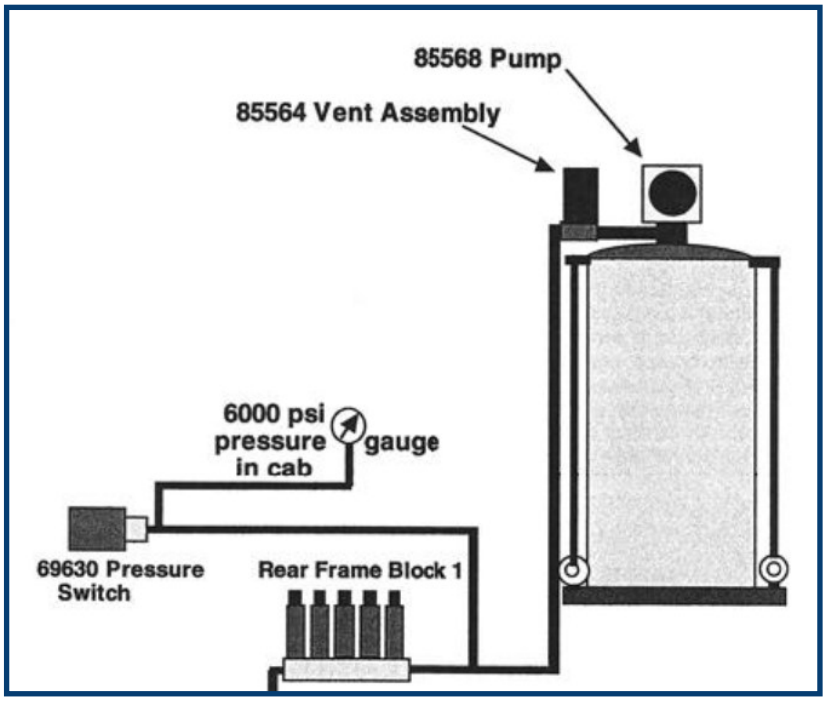


Figure 4: Schematic of Lincoln 85564 Vent Assembly on Lincoln Centromatic Auto Lubrication System

Warning:

The vent has a 2500 PSI safety unloader 272722 included to prevent over-pressuring the system or damaging the pump.

This safety must never be removed except for replacement!

Lincoln 84616M Drum Cover and Tie Down Assembly

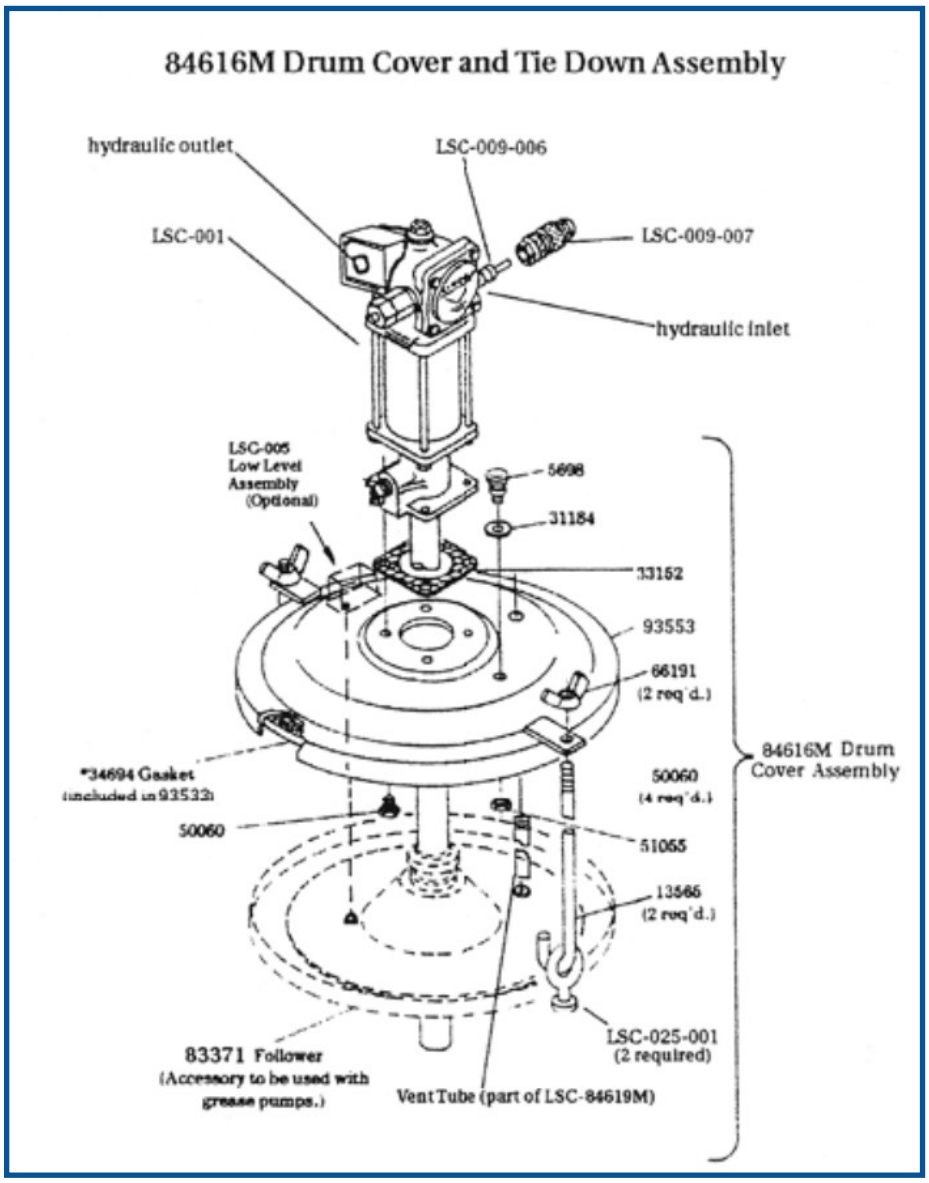


Figure 5: Schematic of Lincoln 84616M Drum Cover and Tie Down Assembly

The Lincoln 84616M Drum Cover and Tie Down Assembly provided is modified to be used with the supplied deck plate.

The kit comes with the deck plate and spacers for the tie rods assemblies. The assembly is designed for use in rough terrain.

LSC PT-24-51 Timer

The LSC PT-24-51 Timer represents the latest step forward in timer technology. The timer is identical to the PT-24-5 except for the inclusion of an internal 15 amp relay to allow the timer to operate the Lincoln Electric Pumps.

Figure 6: Main display of the LSC PT-24-51 Timer

The timer is a completely solid state programmable mini computer capable of monitoring numerous functions in the system.

The PT-24-51 Timer is extremely easy to operate, with precise and accurate timing and control.

The timer is rugged and designed with heavy field use in mind.

The case is waterproof and all components were selected for extreme durability under the most adverse conditions.

Timer features

Lubrication Cycle

The time between cycles is controlled by the internal clock B03 (Pump Off). The adjustable range is from 0 seconds to 99.99 hours, and the timer is easy to adjust. The yellow light on the exterior of the timer indicates an active lubrication cycle.

Alarm Timer

The length of time for which the pump is allowed to run before an alarm is triggered is controlled by timer B07 (Alarm Timer). If the system does not build adequate pressure before the Dwell Timer B07 times out, the red alarm light will come on and the alarm buzzer will sound. The system can be reset by pushing the reset button. If the alarm again comes on in the next one or two cycles after an initial reset, the system should be checked for malfunction. Setting ranges are the same as for B03. The factory set is 3 minutes, and we recommend that this not be changed without consulting us.

Power Light

The green power light indicates that the timer is functional and is receiving power.

Pump On Light

The yellow Pump On Light comes on when the solenoid is activated. The light remains on until the cycle is completed or until the alarm is triggered.

Low Level Warning Light

The Low Level Warning Light is for use with the optional LSC-005 low level assembly.

Alarm Buzzer

If either the cycle failure alarm or the low level alarm is activated, the alarm light will come on and the alarm buzzer will sound for 3 seconds. The alarm light will remain on until the problem is corrected. After 5 minutes, the buzzer will sound again for 3 seconds. This will continue until the problem is corrected. The buzzer off time and duration are programmable and controlled by two internal timers.

- **Timer B18 (Buzzer Off)** controls the alarm off time.
- **Timer B19 (Buzzer On)** controls the duration of the buzzer.

The system was designed to alert the operator to a malfunction without causing undue stress due to a constant buzzer when the timer is in fault mode.

Timer cycle sequence

1. Machine startup. The timer's green power light comes on.

2. The Cycle Timer Pump On "times out", activating the solenoid. The Dwell Timer Alarm is now activated and counting down the time to alarm. The timer's yellow light comes on.

3. Once the pressure has been built up and the pressure switch opens, the timer resets itself. The yellow light goes out, indicating that the system has reset itself and is ready to begin another cycle.

Figure 7: Main display of the LSC PT-24-51 Timer

Note: If the pressure switch fails to activate before the Dwell Timer times out, the red alarm light will come on with the alarm buzzer, indicating that the timer has timed out and the system has not reset.

The Low Level Light and buzzer indicate the reservoir needs to be refilled.

Resetting the Time Settings on the Internal Timers

To adjust time cycles:

1. Remove the box cover, exposing the PLC.

2. If the screen reads PT-24-51, press the down arrow to show the flashing date/time screen. Then press ESC. This will take you from the run mode to the menu.

3. Scroll down until the arrow indicator points to SET PARAMETERS.

4. Press OK.

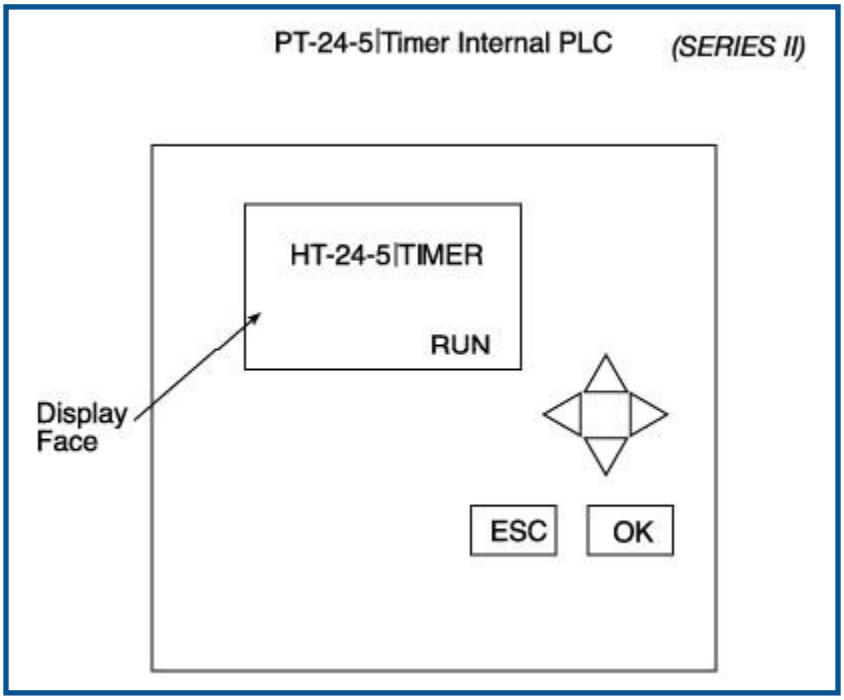


Figure 7: Control panel of the LSC PT-24-51 Timer

5. You will now see Timer B03 indicated. Press OK. A blinking cursor will appear behind the left digit. To move the cursor to the right, press the right hand arrow. To move left, press the left hand arrow. To change the digit with the blinking cursor, press the down arrow to reduce the digit, and the up arrow to increase the digit.

6. Once you have set the time required, press OK.

7. If you do not wish to change any other timers, press the ESC button twice, once to return to SET PARAMETERS, once to return to RUN.

8. To program other timers, press the down arrow to scroll down to Timer B07. To change B07, follow step 5 above. Once B07 is reset, press OK.

9. Press the down arrow to scroll down to Timer B18. Repeat step 5 and 6 if desired.

10. Press down arrow to scroll down to B19. Repeat step 5 and 6 if desired.

11. Press the ESC button twice to return to RUN.

LSC 69630 Pressure Switch

The 69630 Pressure Switch is incorporated into the system for two purposes:

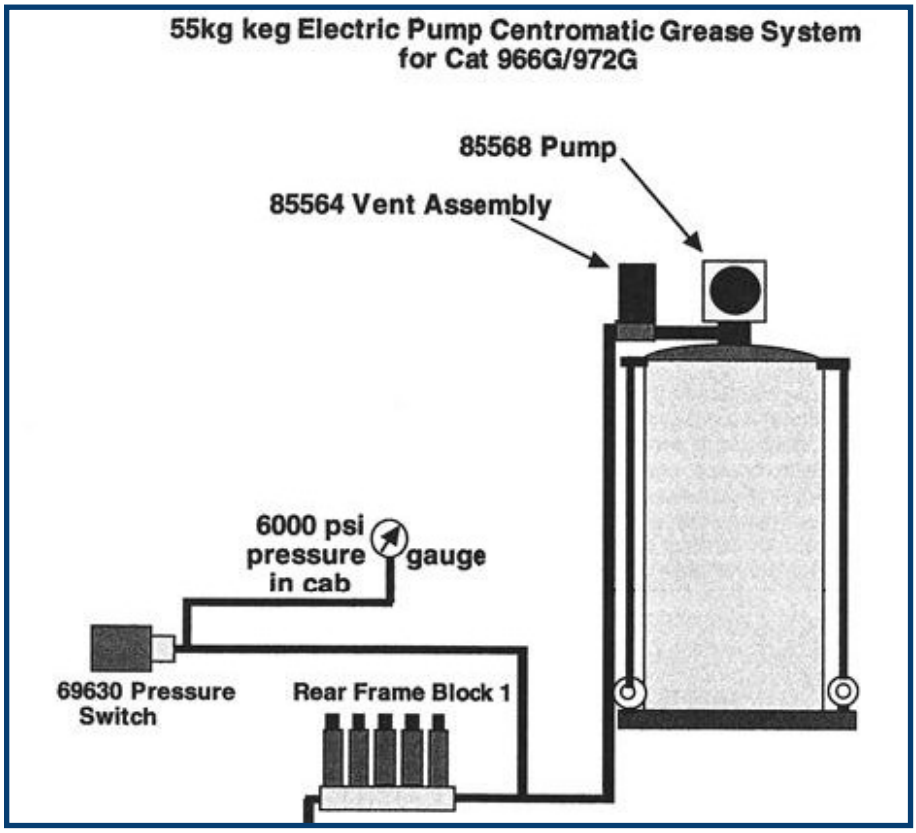


Figure 8: Close-up of 69630 Pressure Switch on Auto Lubrication System

- To act as a control to deactivate and reset the system once the desired pressure has been reached.
- To act as a safety in the event of system malfunction, preventing the pump from over pressurizing the system and causing damage or personnel injury. The pressure switch is wired to ensure that if the switch fails, the system will indicate the system has failed but will not over pressurize.

Warning:

The switch is factory set for 2300 PSI. Under no circumstances should the switch be adjusted below 2000 PSI. Low settings will not allow the injectors to charge properly, leading to a system failure that will be undetectable by the alarm timer. In

Lincoln SLV-1 Injectors

The system may use either:

- **Lincoln SL-1 injectors**
- **SLV-1 injectors**

The Lincoln SLV-1 injectors represent a great stride forward in injector technology, allowing the injectors to vent faster and more securely.

The injectors do not use springs. Instead, they operate purely on the hydraulic action of the grease in the in-

The most noticeable difference between the SLV-1 injectors and the older SL-1 injectors is the fact the SLV-1 injectors appear to operate backwards. The pins are down when the injector is at rest and move up as the injector is charged, exactly the opposite of SL-1 injectors.

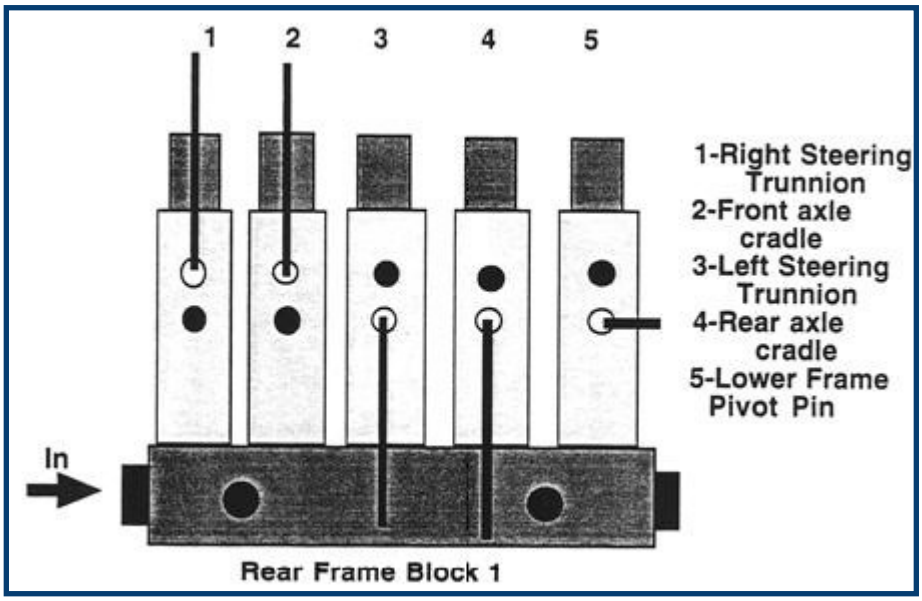


Figure 9: SL-1 Injectors on Rear Frame Block 1

Injector Points

The Caterpillar 966G and 972G utilize SLV-1 injectors to provide grease to 21 points. The injector groups and points covered are:

Group 1

One group of three injectors (85770-5) located in the centre of the rear frame. These injectors cover the following points:

1. Right steering cylinder trunnion

2. Rear axle cradle

3. Left axle cradle

4. Left steering cylinder trunnion

5. Lower frame hinge

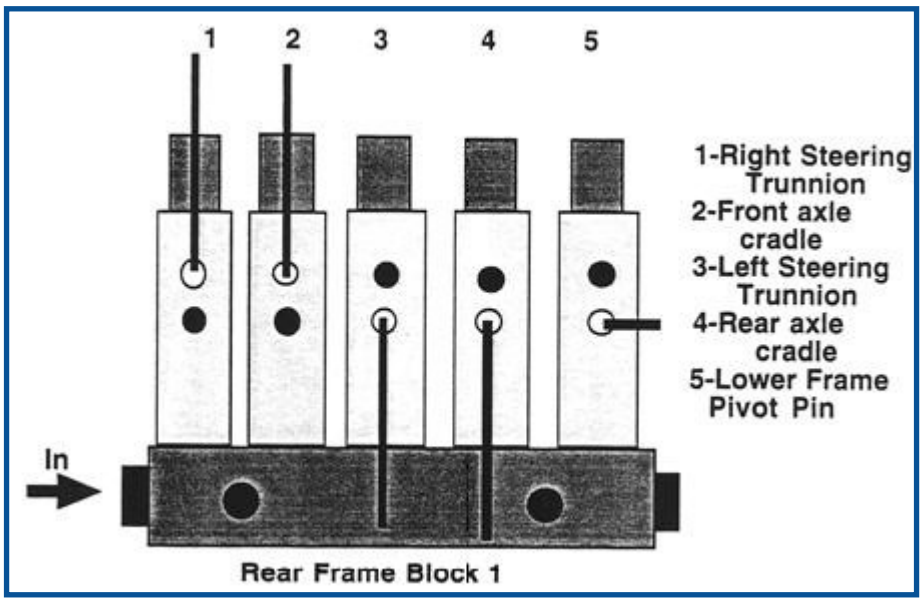


Figure 10: SL-1 Injectors on Rear Frame Block 1 (Group 1)

Group 2

One group of five injectors (85770-5) located on the left inside centre portion of the front frame. These injectors cover the following points:

1. Left hand boom / frame bushing

2. Tilt cylinder trunnion

3. Upper frame pivot bearing

4. Left hand steering cylinder rod eye

5. Left lift cylinder trunnion

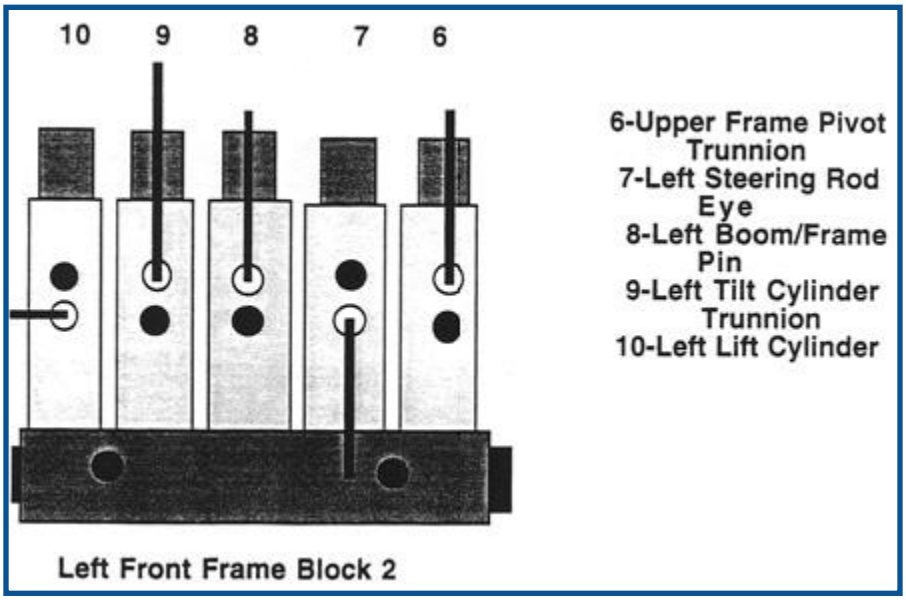


Figure 11: SL-1 Injectors on Left Front Frame Block 2 (Group 2)

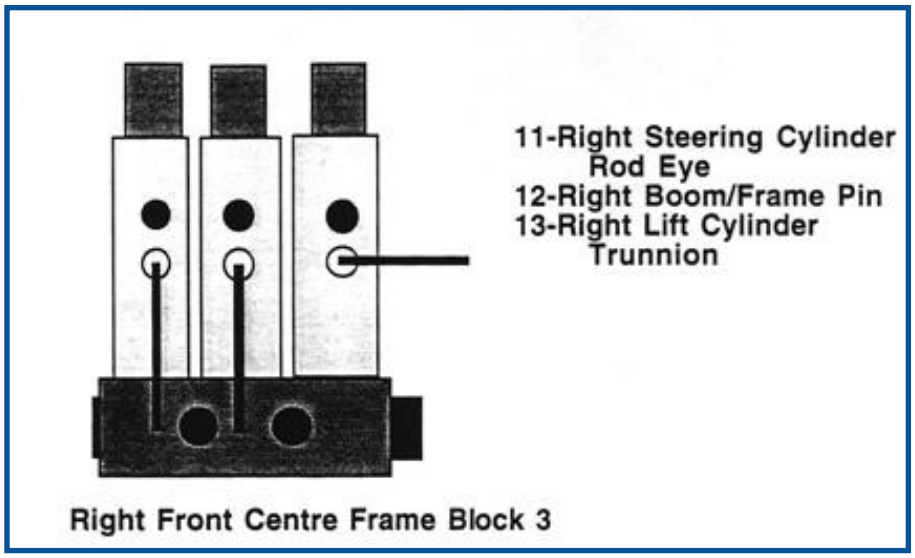


Figure 12: SL-1 Injectors on Right Front Centre Frame Block 3 (Group 3)

Group 3

One group of three injectors (85770-3) located on the right inside centre portion of the front frame. These injectors cover the following points:

1. Right boom / frame bushing

2. Right steering cylinder rod eye

3. Right lift cylinder trunnion

Group 4

Group of four injectors (85770-4) located on the left hand inside boom. These injectors cover the following points:

1. Bell crank pin

2. Front tilt arm / bucket pin

3. Left lift rod eye

4. Left boom / bucket pin

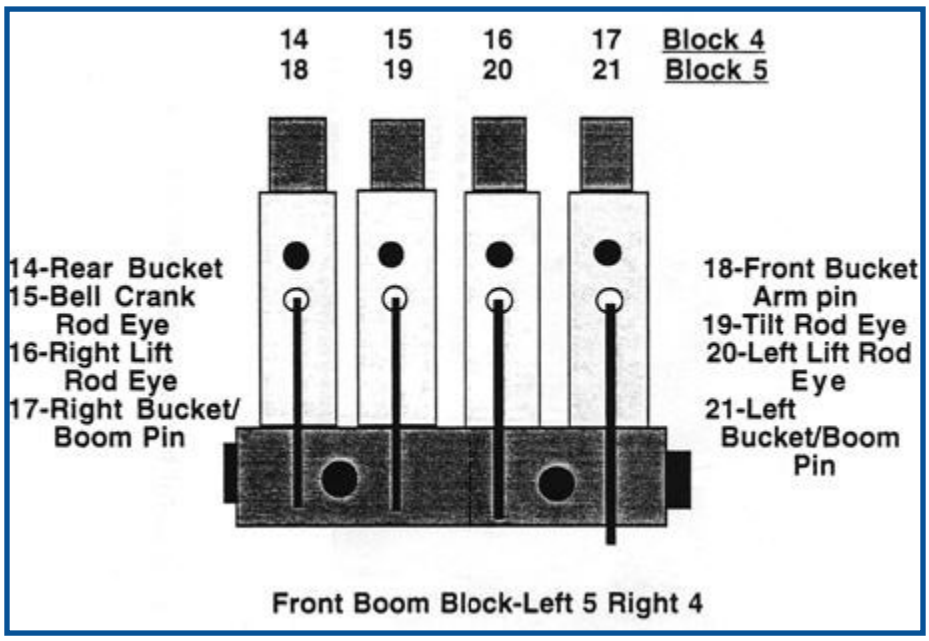


Figure 13: SL-1 Injectors on Front Boom Block Right (Group 4)

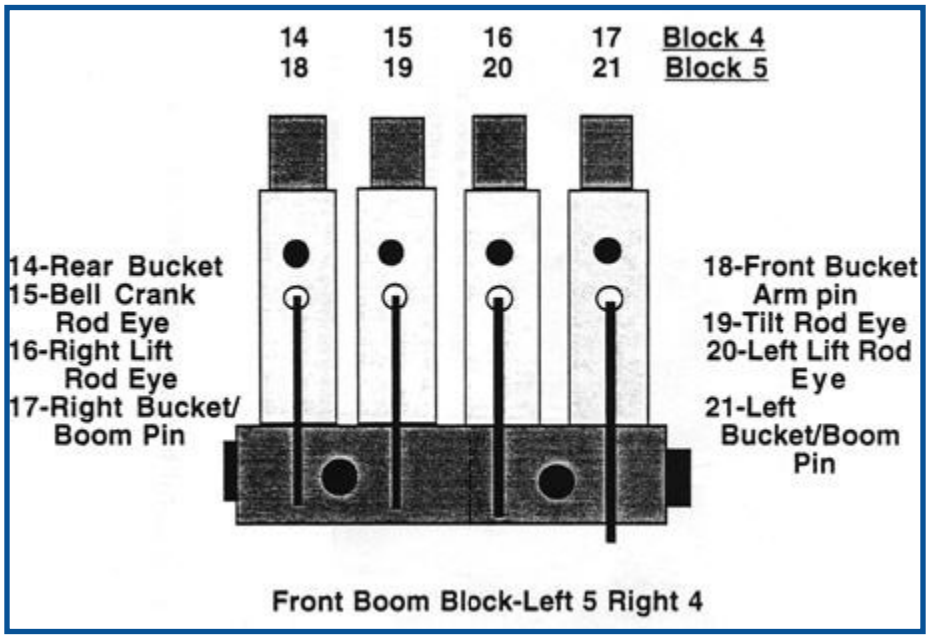


Figure 14: SL-1 Injectors on Front Boom Block Left (Group 5)

Group 5

Group of four injectors (85770-4) located on the right inside boom. These injectors cover the following points:

1. Tilt rod eye

2. Rear tilt arm / bucket pin

3. Right lift rod eye

4. Right boom / bucket pin

Operating the System

How It Works

The electrically operated auto lubrication system used on the Caterpillar 966G and 972G provides an independent power source for the grease pump on machines not equipped with an air source, or where the customer would prefer to use electric power.

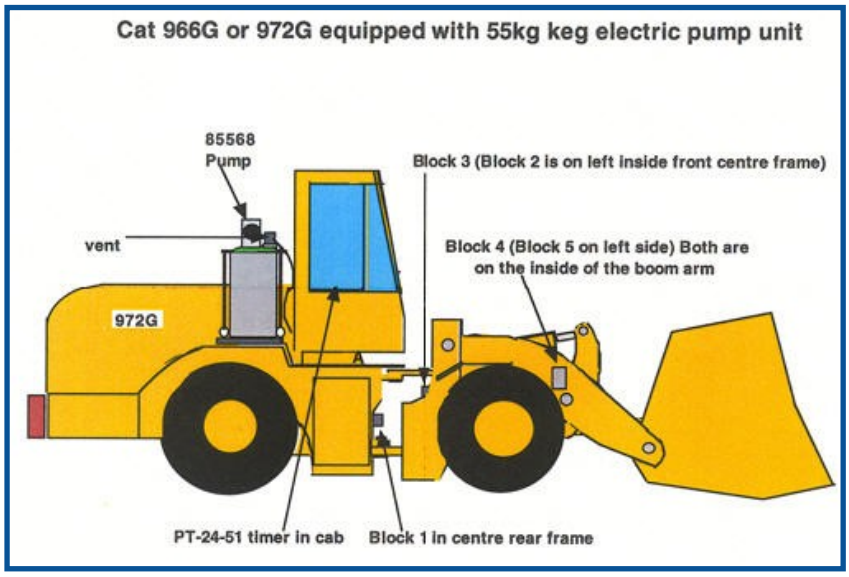


Figure 15: Placement of key components of the lubrication system

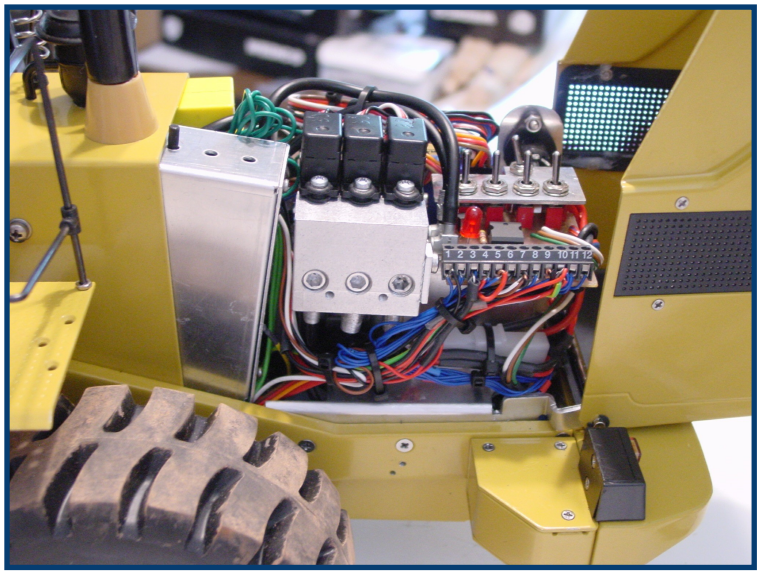


Figure 16: Appearance of lubrication system after installation

The electrically operated system offers many advantages, including no dependence on machine hydraulic systems with the related potential for hydraulic problems due to cold weather or contamination.

The electrically operated system produces up to 24 cubic inches of grease per minute depending on temperature and back pressure. The system can develop up to 5000 PSI, although the relief is set for 2500 PSI.

Important Warning:

Please note that the drive shaft steady bearing is not lubricated automatically.

This point must be lubricated manually as per Caterpillar maintenance recommendations.

Over-greasing can cause parking brake failure.

On earlier models, the bearing was lubricated automatically.

If the machine has automatic lubrication, remove the hose to the bearing lubrication block in the middle frame, install the grease fitting in the block, and cap off the injector.

Figure 17: Caterpillar 966G (left) and 972G (right) in action

To Setup the Auto Lubrication System

1. The PT-24-51 timer reaches the preset cycle time and activates the 85568 pump.

2. The 85568 pump pumps the grease up to pressure and charges the injectors. When all the injectors are charged, the grease pressure builds until the line pressure reaches the pressure set on the 69630 pressure switch.

Warning:
The switch is factory set for 2300 PSI. Do not adjust!

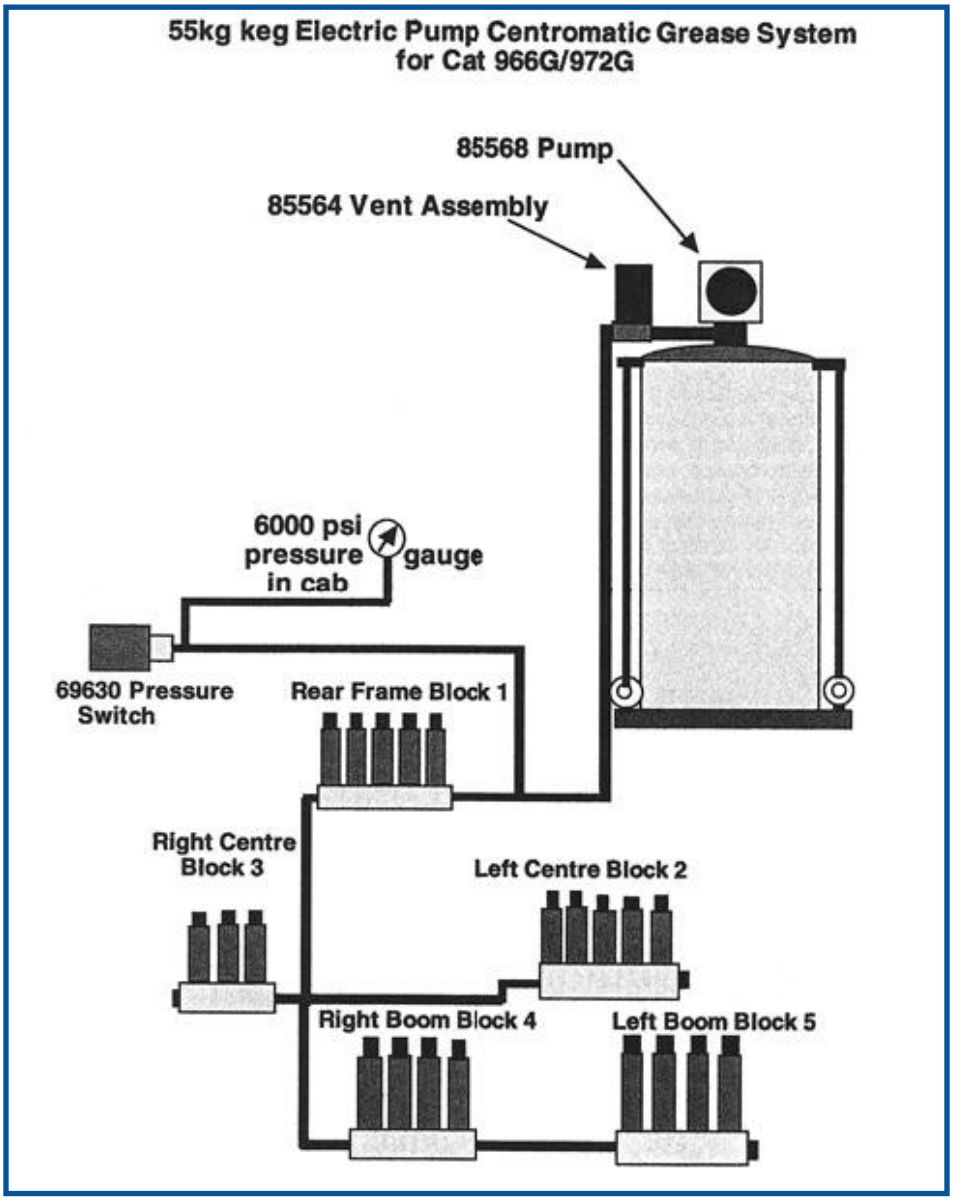


Figure 18: Schematic for Lincoln Centromatic Auto Lubrication System

3. The pressure switch opens and sends a signal to the timer. The timer resets and remains inactive until the next cycle begins.

4. The injector spring is compressed and the grease in the injector discharge chamber is forced out to the bearing point.

Note: The system also has a secondary or alarm timer that is activated when the pump starts up. This timer "counts down" from activation until the pressure switch deactivates the system. If the specified pressure is not reached before the secondary timer times out, an alarm will be activated to warn the operator of system malfunction. *(See the section on the PT-24-51 timer.)*

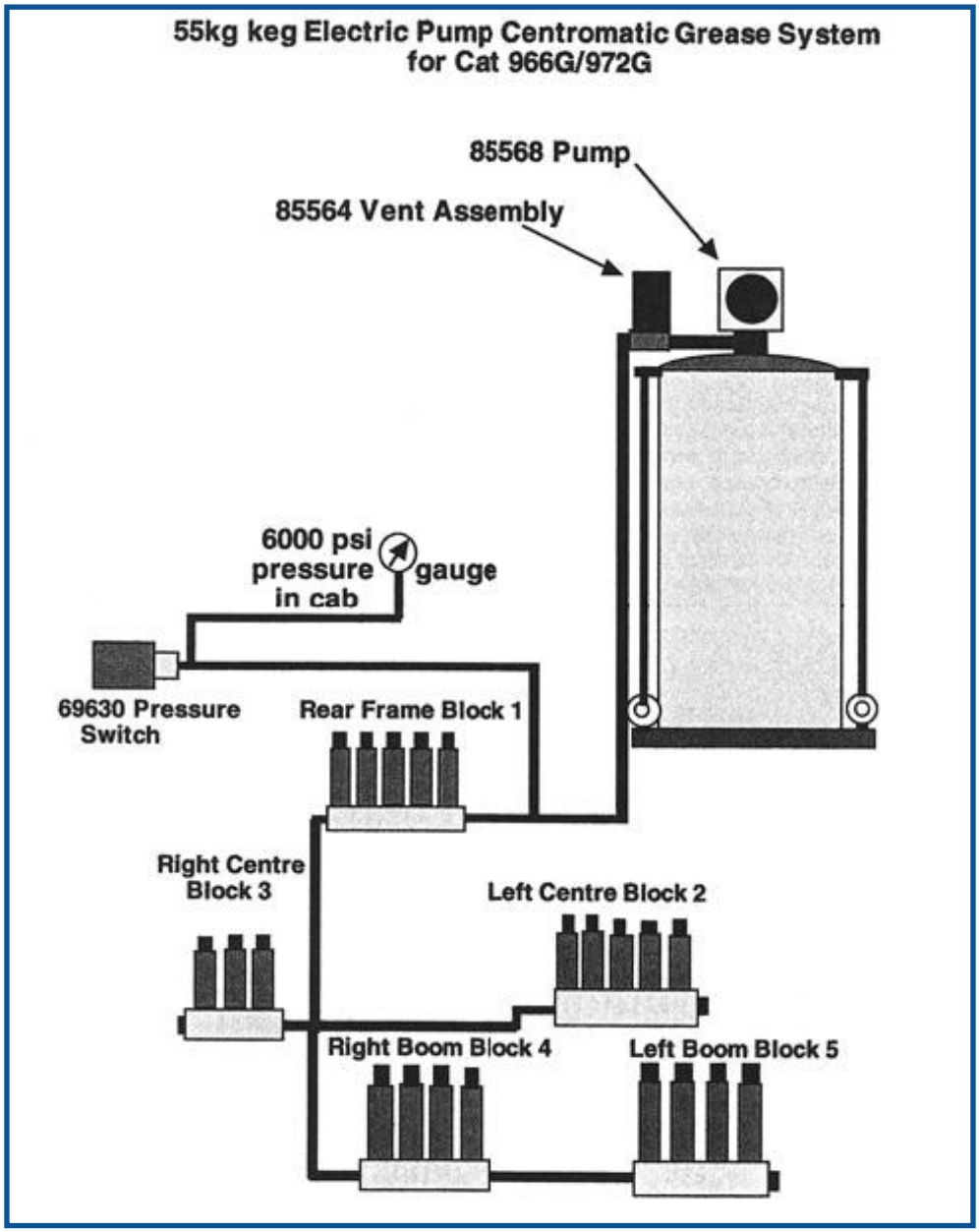


Figure 18: Schematic for Lincoln Centromatic Auto Lubrication System

5. When the set pressure is reached, the system shuts off power to the pump motor and the vent. At this point the excess grease pressure in the system is bled back through the vent into the drum.

6. Once the grease pressure has returned to below 200 PSI, the injector spring expands, sending the grease in the injector measuring chamber into the discharge chamber. (See injector operation.) At this point the system is ready to begin the next

Note: In the event the system alarm is activated or the system does not reach a grease pressure of 2000 to 2500 PSI on the grease gauge in the cab before the timer times out, the operator should report the problem to maintenance.

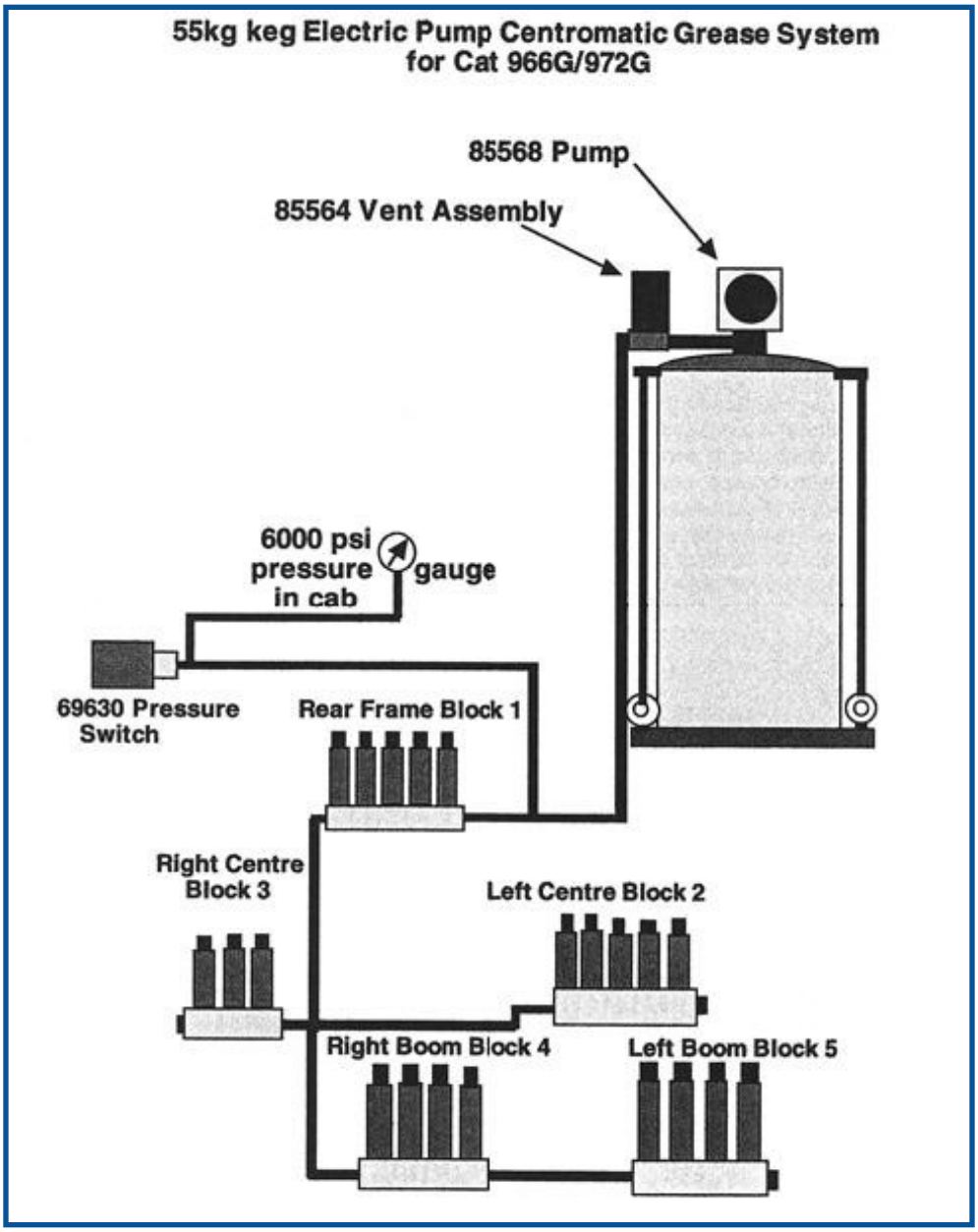


Figure 18: Schematic for Lincoln Centromatic Auto Lubrication System

Warning:

It is vitally important all above steps are completed before the next cycle, as failure to reset the injectors will result in no grease being supplied to the bearings.

Initial Injector Settings: First Time Setup

Because there is an enormous variation in grease requirements depending on the work the machine is doing, the following method is recommended to initially set the injectors.

1. Determine which points require the most grease. These are most likely the bucket pins. Turn the injector adjustment out until the pin at rest (system not activated) is just missing the stop on the injector (about 8 or 9 threads showing).

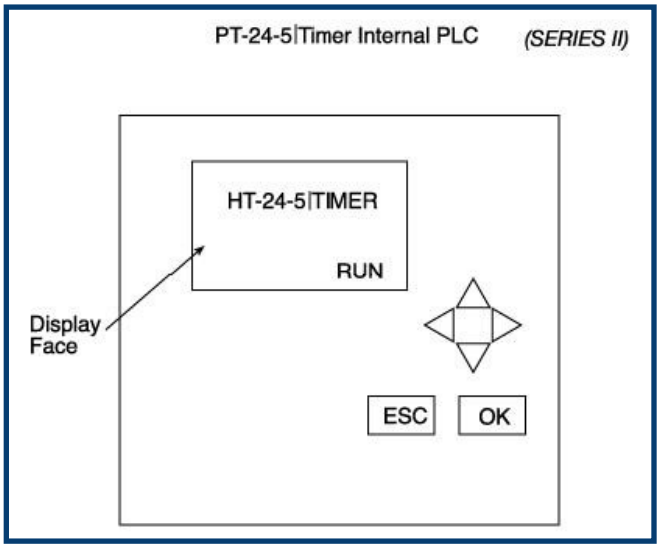


Figure 19: Internal display for PT-24-5 Timer

2. The initial timer setting is 25 minutes. During the first several days after the system is installed, check the pins frequently to ensure they are receiving adequate grease. There should always be fresh grease showing at the pin/bushing juncture. If some pins appear dry, decrease the time cycle to 20 minutes or less and re-evaluate. If all pins are over-greasing, increase the cycle time to 30 minutes and re-evaluate. Once the settings seem satisfactory, monitor the system for several days.

3. After these points have stabilized and are receiving amounts satisfactory grease, then **turn the injector adjustments down on pins that require less grease.** Once all pins are receiving adequate grease, the system is set.

Note: As pins wear or operating conditions change, the injectors may have to be readjusted. If this is the case, repeat the procedure above to readjust the system.

Troubleshooting

Common Issues

System Will Not Cycle Initially

With the machine running, check that the timer power light is on.

If the power light is not on, open the panel and check the microprocessor. If the microprocessor is active, press ESC to go into the menu. If the menu shows a START option, scroll down to START and press OK. This will restart the program.

The usual cause of this problem is low voltage supply to the microprocessor, which prevents the microprocessor from shutting down properly.

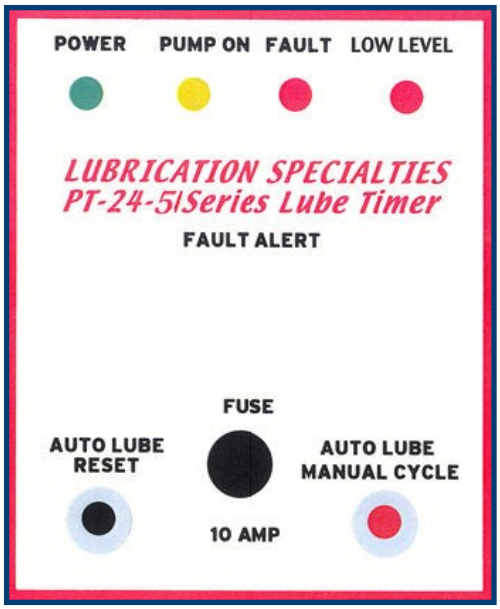


Figure 20: Main display of PT-24-5 Timer

Check the machine voltage for the following problems:

1. If the microprocessor is not active, check the fuse.

2. If the fuse is OK, check to see if there is power to the power side of the fuse.

3. If there is no power, check power wire for continuity.

4. If there is no power, repair the wiring.

5. If there is power, check ground wire for continuity.

6. If the ground wire is OK, check the internal wiring to see if there are any loose connections between the fuse and the microprocessor and check the output from the reset to the microprocessor.

7. If there is power to the reset switch but no power from the switch to the microprocessor, then the switch must be replaced. Replace or repair as necessary.

8. If all wiring is OK but there is no power at the logo, replace logo.

Checking Input/Output Figures

To get to the input/output figures:

1. With the PT-24-51 script showing on the logo face, **press the down arrow** until you come to the time setting. Press the right arrow to show inputs (I). To show outputs (Q) press the right arrow once more.

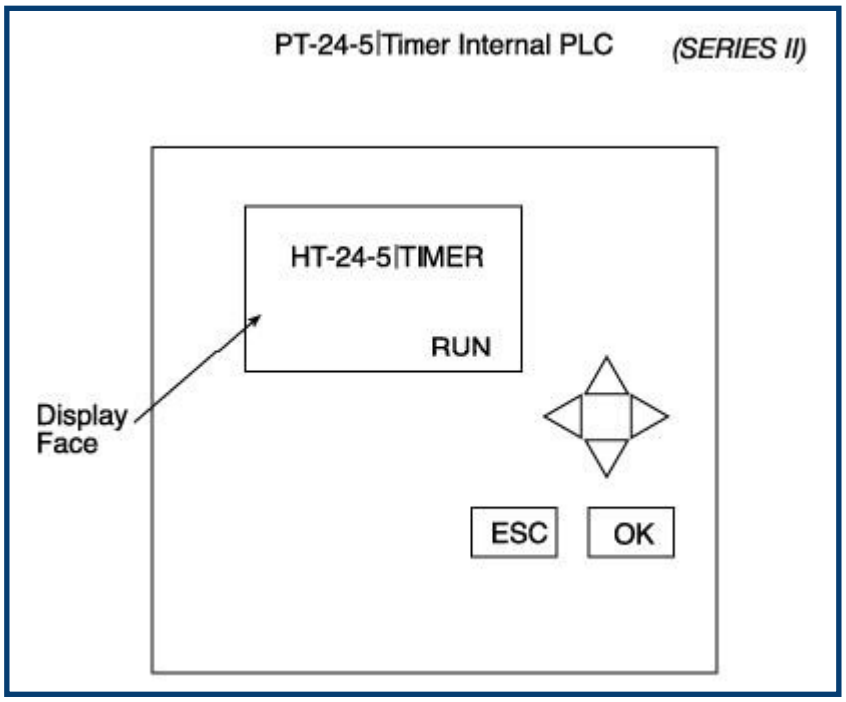


Figure 21: Internal display for PT-24-5 Timer

2. Input I1 should always be shaded when the system is active. If I1 is not shaded check the pressure switch. See Step 3-a.

3. If the system does not cycle manually, **check that output Q1 is shaded when the manual button is pushed.** If Q1 is not shaded, check the solenoid wiring for continuity.

4. Check to see hydraulic pressure is 120 to 170 PSI. If too low adjust. If OK, manually depress spool in hydraulic directional valve. If pump cycles when spool is shifted, go to Step 1-e. If pump does not cycle go to Step 2.

Figure 18: Schematic for Lincoln Centromatic Auto Lubrication System

5. Go into SET PARAMETERS on the timer. Check that Alarm clock is running, and the setting is correct. If setting not correct, correct setting. If the Alarm clock (B03) is not running, change the PLC

Pump Cycles but Pressure Does Not Build Up or Failure Alarm is Tripped

1. Press the reset button. If an alarm sounds on the next cycle, check the Alarm sub-timer (B07). If the timer is set for less than 3 minutes, reset for 3 minutes and retest. If the system fails again, go to Step 3.

2. Check inputs. Input L1 should be shaded after the reset is pushed. If L1 is not shaded, check that the pressure switch is operational and the switch wiring is OK. Replace if necessary.

3. Check the electric vent to ensure that the vent solenoid is receiving power (red LED in solenoid DIN connector should be on) and that the vent is closing. Check by loosening line from the vent to the vent tube return.

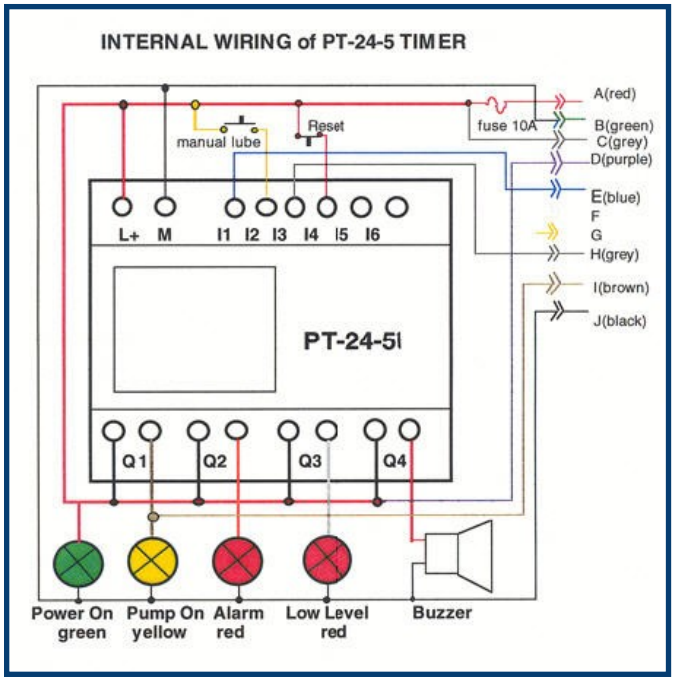


Figure 22: Schematic of internal wiring for PT-24-5 Timer

4. Check the manual grease gauge in cab to see how high pressure builds. If pressure builds slowly and erratically to less than 1800 PSI, go to Step 6. If pressure builds to 2000 -2500 PSI check pressure switch. If the setting is 2400-2600 PSI check for electrical fault in switch or wiring.

5. Check all supply lines and injectors for leaks. If there is a leak, tighten or replace the fitting or hose end. If the injector is leaking, replace it.

6. If all lines are OK, confirm that the pump is putting out grease. If pump is not putting out grease, bleed the pump using bleeder relief on the outlet until grease starts to flow.

7. If no grease flows, the pump may be faulty. If grease flows, close the bleeder and retest the system. If pressure still does not build up, check the vent return line while the system is running. If grease is coming out of the return line, the vent is faulty.

System Cycles but Grease Pressure Will Not Fall Below 200 PSI After System Returns to Rest

Check the type of grease used. Grease should be number 1 in all weather except for cold winter weather where 0 or Arctic grease should be used.

Check the manufacturer's recommendations. If the grease grade is OK, when the system is at rest, loosen the hydraulic in feed to vent.

If there is oil pressure, replace or repair the directional valve. If there is no oil pressure, cycle the system with the vent line to grease container loosened and check if grease is venting.

If grease is not venting, repair or replace vent valve. If grease is venting, check for obstructions in the vent line.

System Cycles Properly but Points are Not Receiving Adequate Grease

If no points are receiving adequate grease, check the injector pins for cycling and injector settings. If injectors appear to be cycling and the settings are open, remove end plugs from injector blocks and cycle system.

If there is no grease, check for a blocked supply line and replace the plugs. If grease is coming out, reset the timer for shorter time to provide more grease.

If individual points are not receiving adequate grease, check for a broken or blocked line to bearing points.

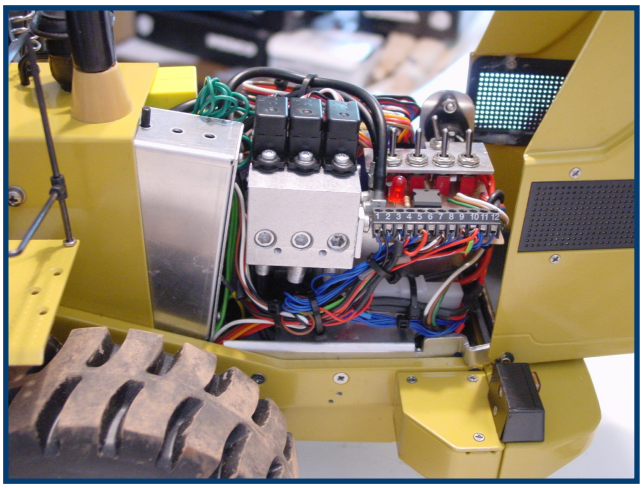


Figure 23: Appearance of lubrication system after installation

If the lines appear OK, cycle the system and check the individual injectors for operation. If the indictor pins do not function properly on individual injectors, replace or repair injectors.

If lines appear to be cycling OK, check grease output by removing 90941 cover caps and cycling injectors. If output OK, increase output to bearing points from individual injectors.

If no grease comes out, replace or repair injectors.

System is Over-Greasing

If the system over-greases all points, reset timer for a longer cycle interval.

If the system over-greases individual points, reset individual injectors for lower grease output per cycle.

If an excessive amount of grease (more than .08 cu. in. or approximately enough to cover a thumb nail with1/8" coating) comes out, replace or repair the injectors.

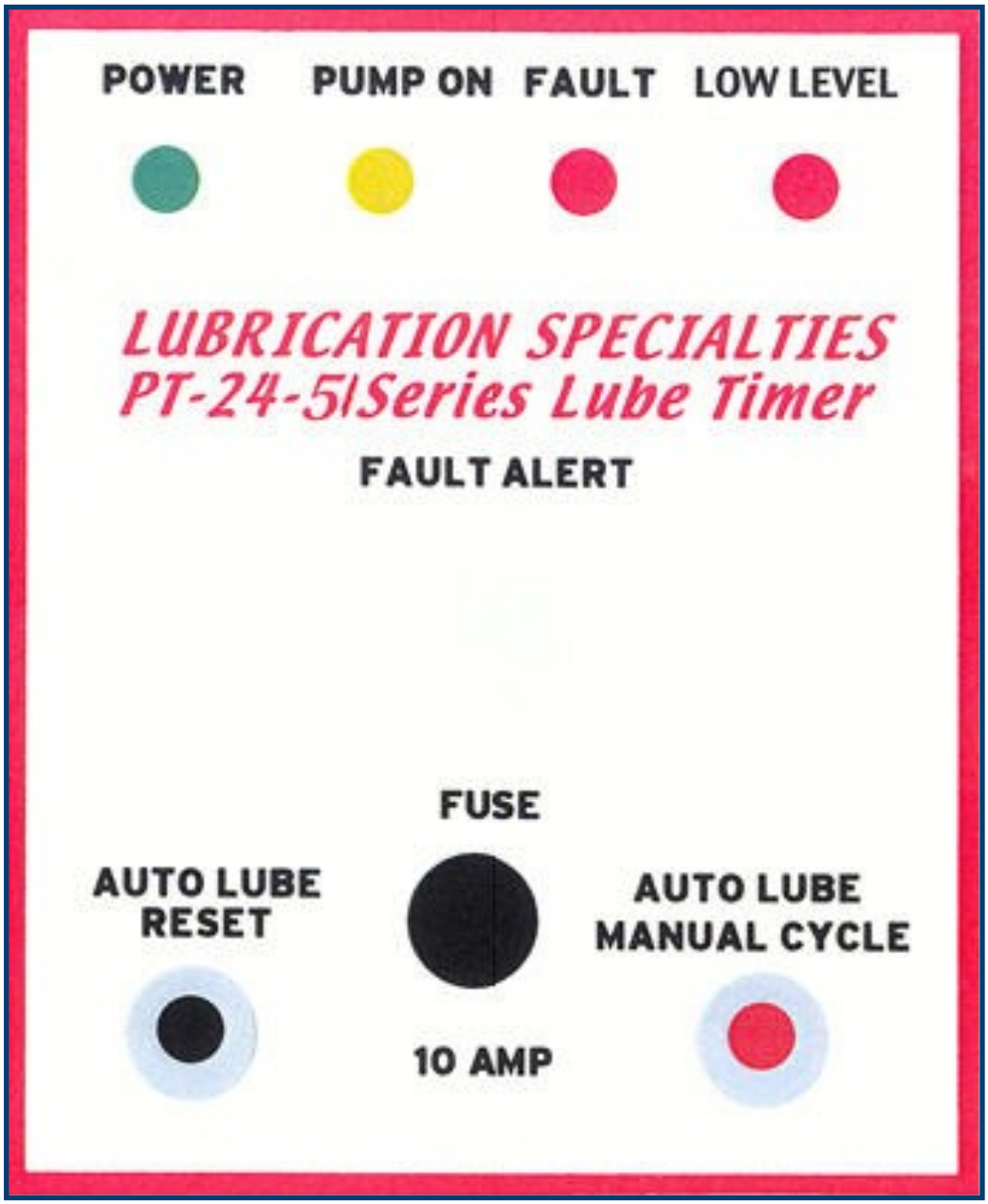


Figure 24: Main display of the LSC PT-24-51 Timer

Pump Does Not Cycle or Cycles Slowly

If the pump is not cycling, **check the pump wiring.**

Repair or replace as necessary.

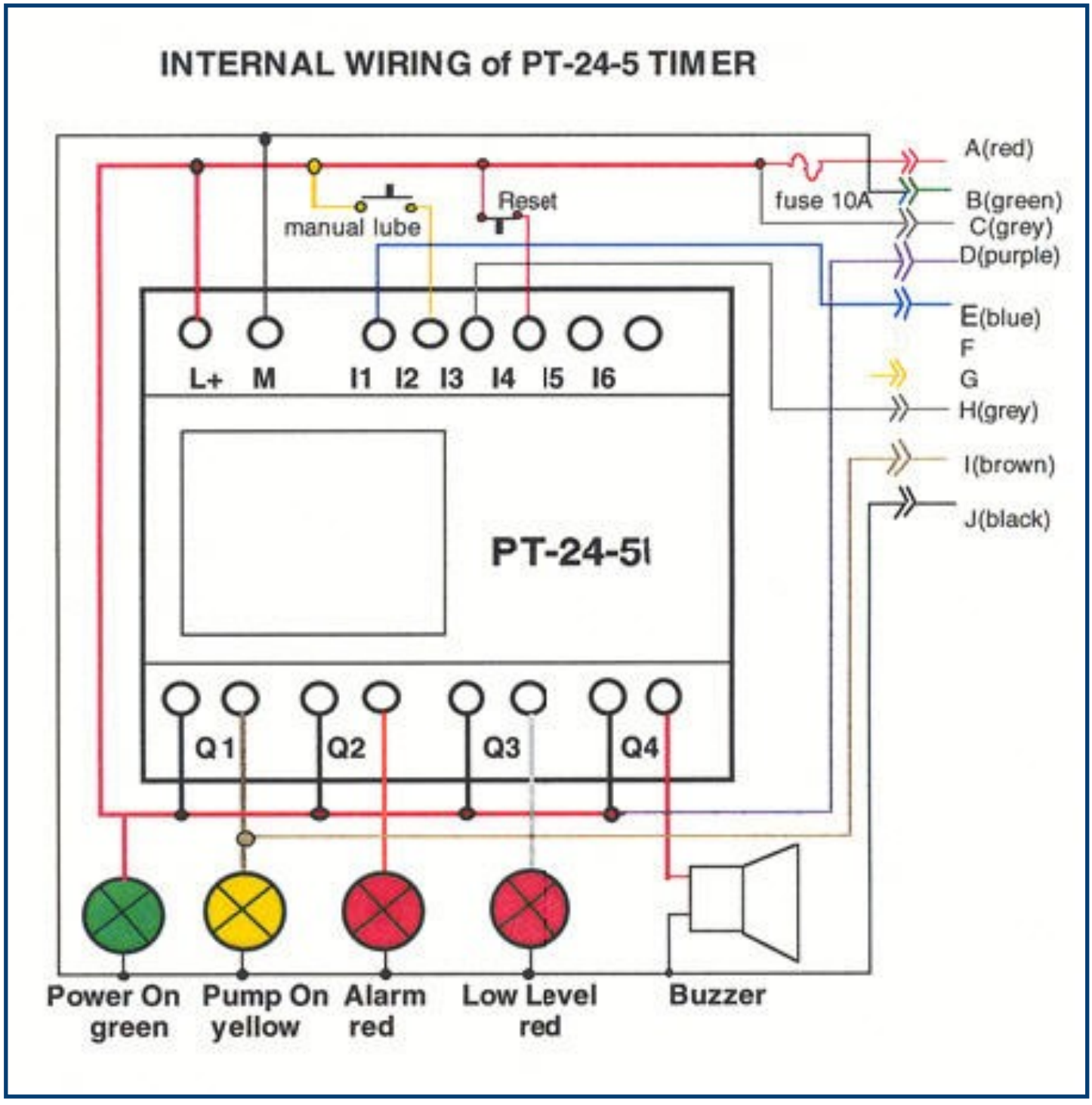
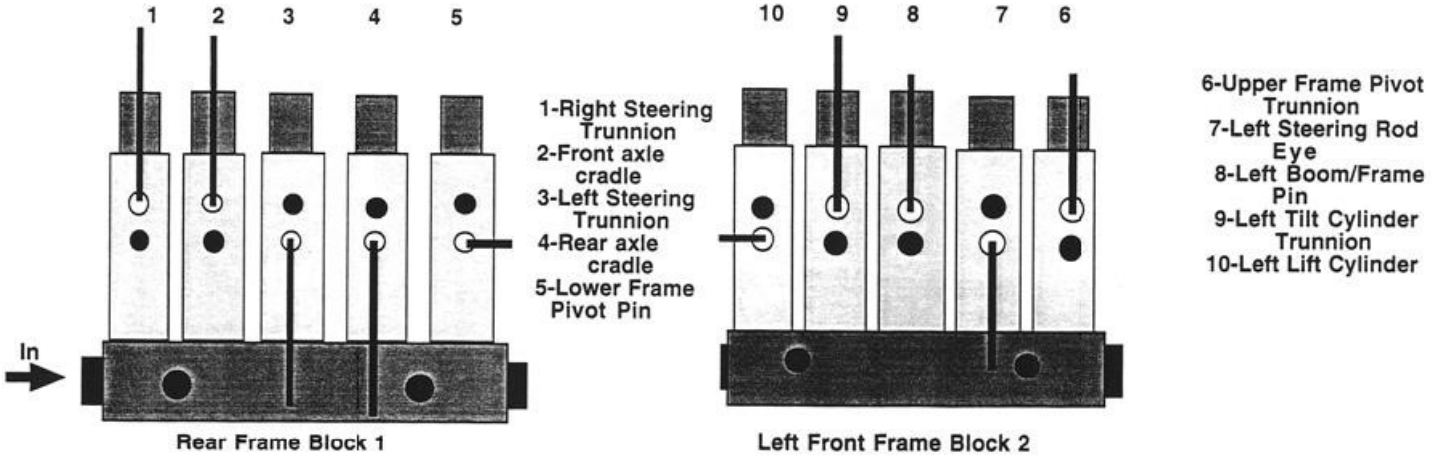


Figure 25: Schematic of internal wiring for PT-24-5 Timer

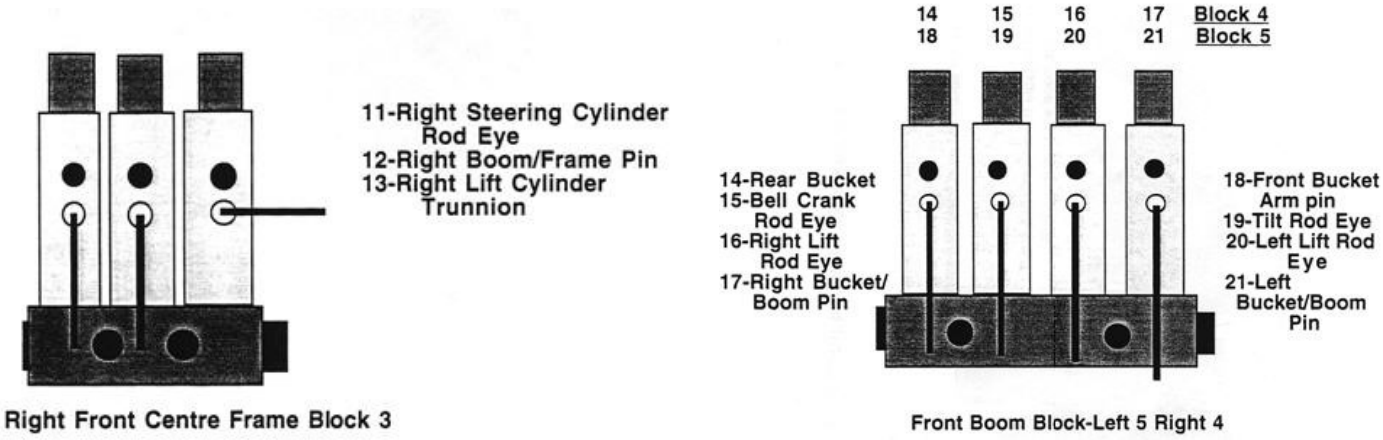
Appendix

System Schematics

Injector Blocks 1 and 2

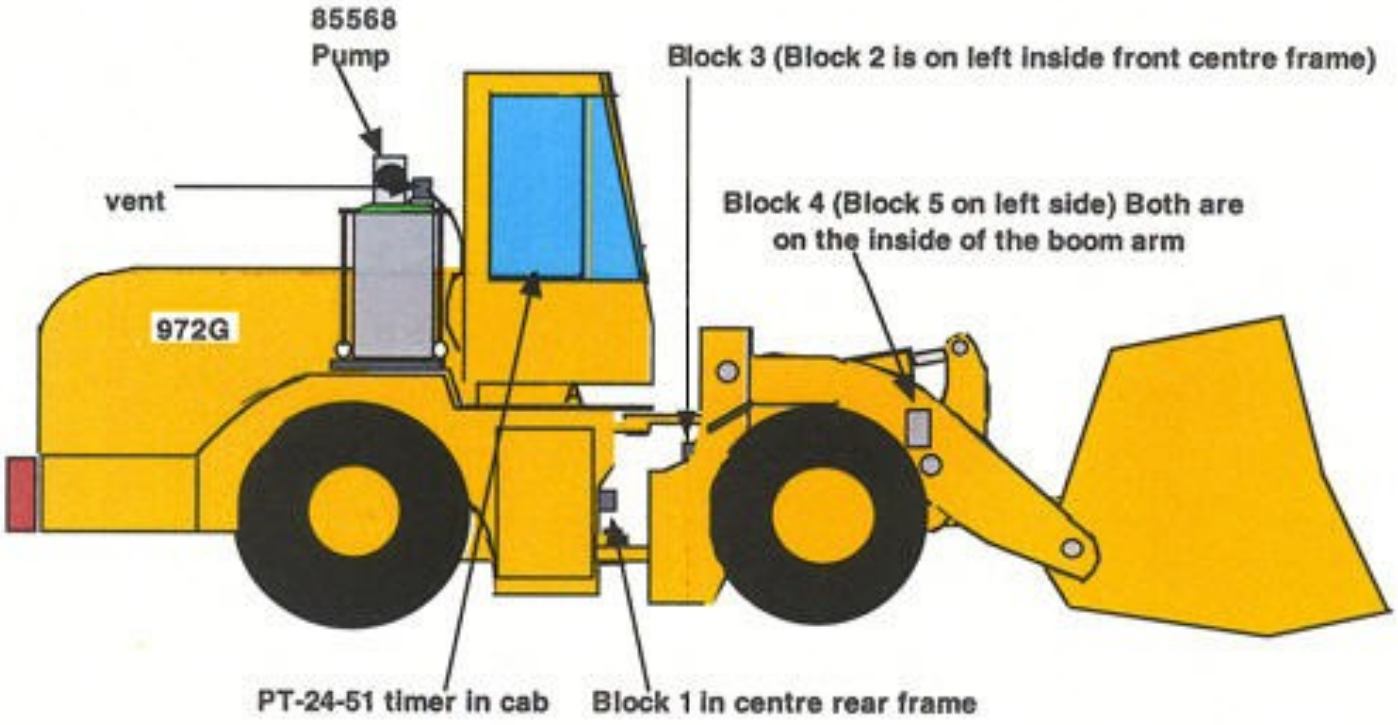


Injector Blocks 3, 4, and 5

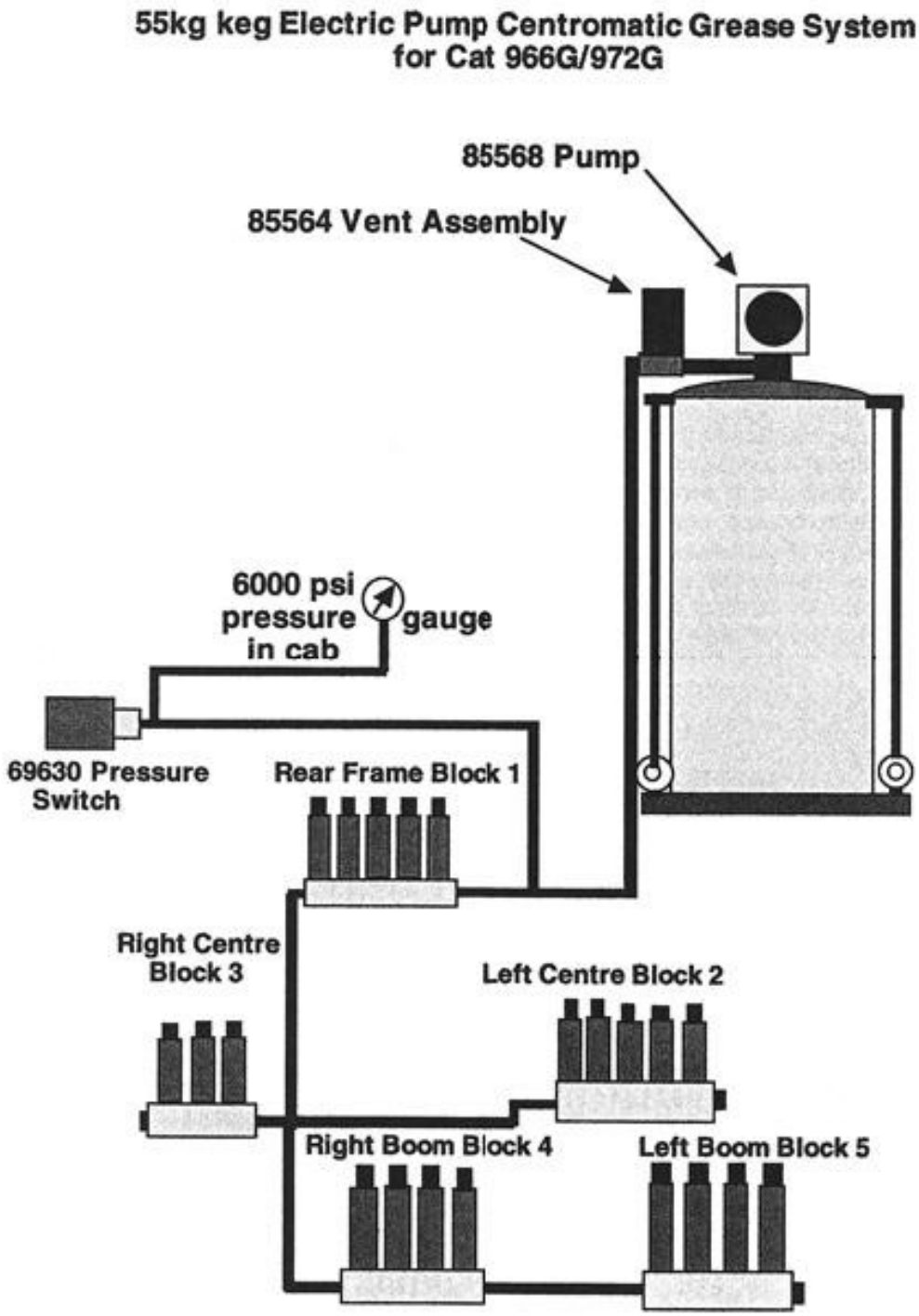


Machine

Cat 966G or 972G equipped with 55kg keg electric pump unit



Grease System Schematic



For help or information call **1-866-988-2640**

Edmonton: **780-707-2406**

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