Auto-Lube Services
INCORPORATED

Lincoln Quicklub System Installation Manual for:

CAT 966-972M Loaders

Contents:

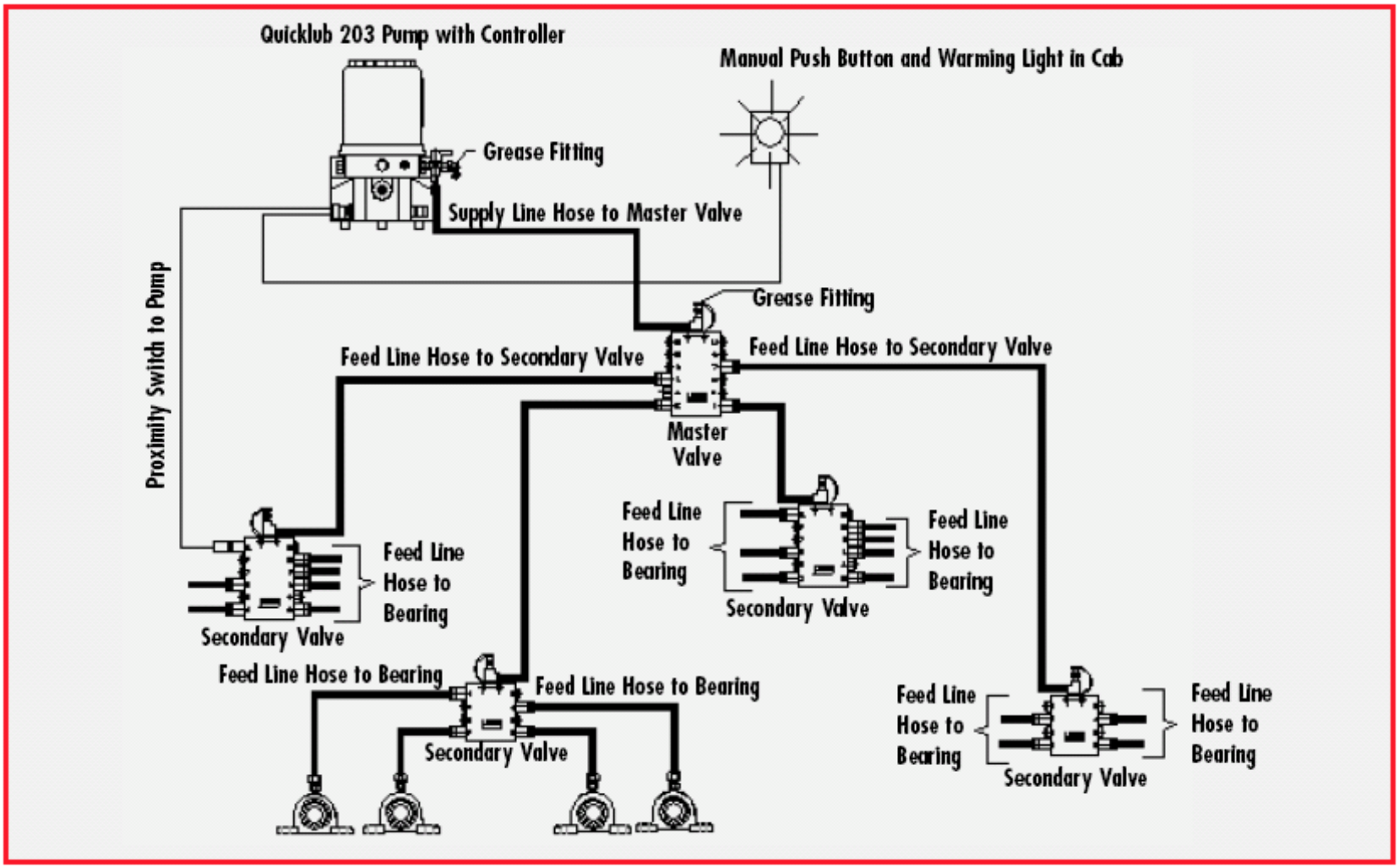
Section I

Introduction

The Lincoln QuickLub System is the industry standard and covers 95% of all mobile equipment lube systems that Auto-Lube Services, Inc. installs. The systems operate the same regardless of the equipment they are installed upon. While the system layout will vary based upon make and model, the basic system operation principle and type of system components will be identical. This section of the guide will cover system operation and an explanation of the components.

As a quick overview, the Lincoln QuickLub system is a 12 or 24-volt electric pump system that operates off of less than 5-amps of DC power. The pump is controlled by an internal timer that has an adjustable off-time. The off-time is the time between "run" cycles. When the off-time elapses, the "run" portion of the cycle commences. This is controlled by the proximity switch. Once the proximity switch sends the appropriate number of cycle counts, the controller "resets" and starts the off-time over again for the next Lube event. The off-time cycle and "run" cycle together comprise a single lube event.

The pump can have 1, 2, 4, 8, and 15-liter reservoirs. For reference, an 8-liter reservoir is just over 2 gallons of grease and should typically last 150-200 hours of machine "run-time' before re-filling is required.



Example of 2-liter Pump

Example of 8-liter Pump

The QuickLub #203 family of pumps is extensive. The #233 data-Logger is a sub-category of the #203 family. They come in 12 or 24 DC, or 120-230 AC variants. Standard pumps come with only timers for on and off operation. Other pumps, like the Data-Logger, have full monitoring and alarm capabilities. Together with a multitude of reservoir options, there is a pump to precisely fit every application.

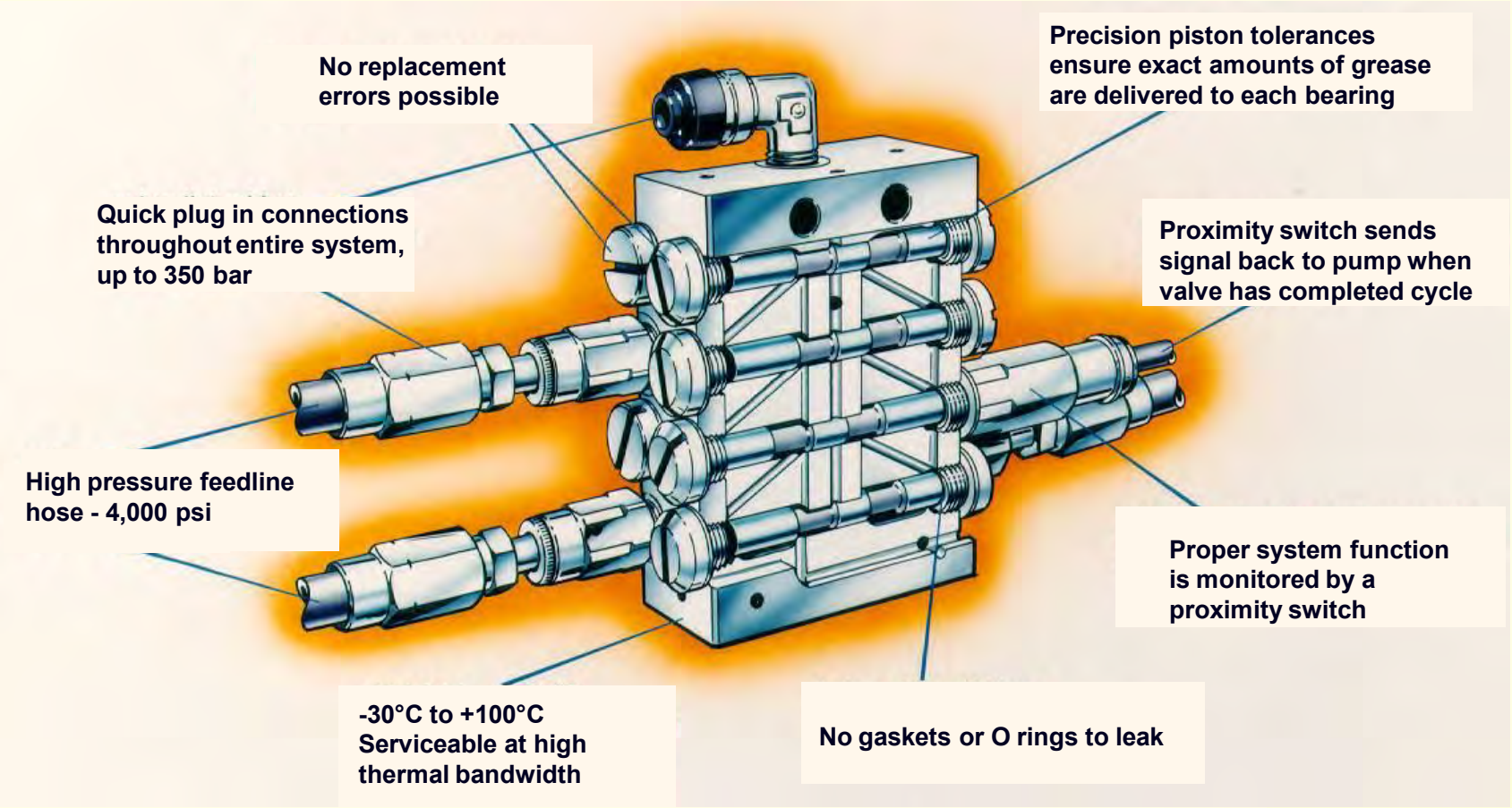
The Lincoln QuickLub (SSV) series valves are progressive metering devices. As the pump dispenses grease, the lubricant flows through the valve in a progressive sequence. As each piston in the valves shifts, it opens up a passage allowing the next piston to shift. This continues in a progressive sequence until all of the pistons in that valve have shifted.

This ensures that each point gets the pre-determined amount of lubricant. It also ensures, through the sequential operation, that each point gets grease one at a time. This allows the system, via the proximity switch, to monitor flow through the system and detect a blockage. One full cycle of the valve is confirmed by one full cycle (in/out) of the cycle indicator pin.

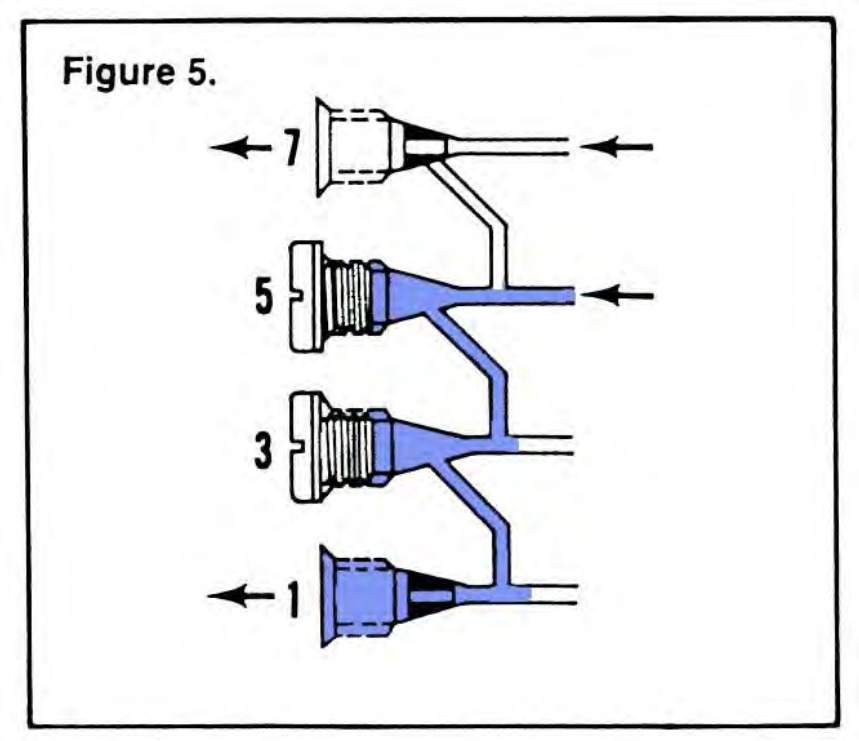
Because the QuickLub valve can be configured for differential proportioning, the system can have different amounts of lubricant dispensed from the primary to the secondary valves. This allows for different proportional amounts of lubricant to certain areas of the machine. As an example, during a normal lube cycle, the system can give 10-20 times as much grease to an impact zone secondary than a non-impact zone valve. This allows more critical lube points to receive more lubricant during the same lube event.

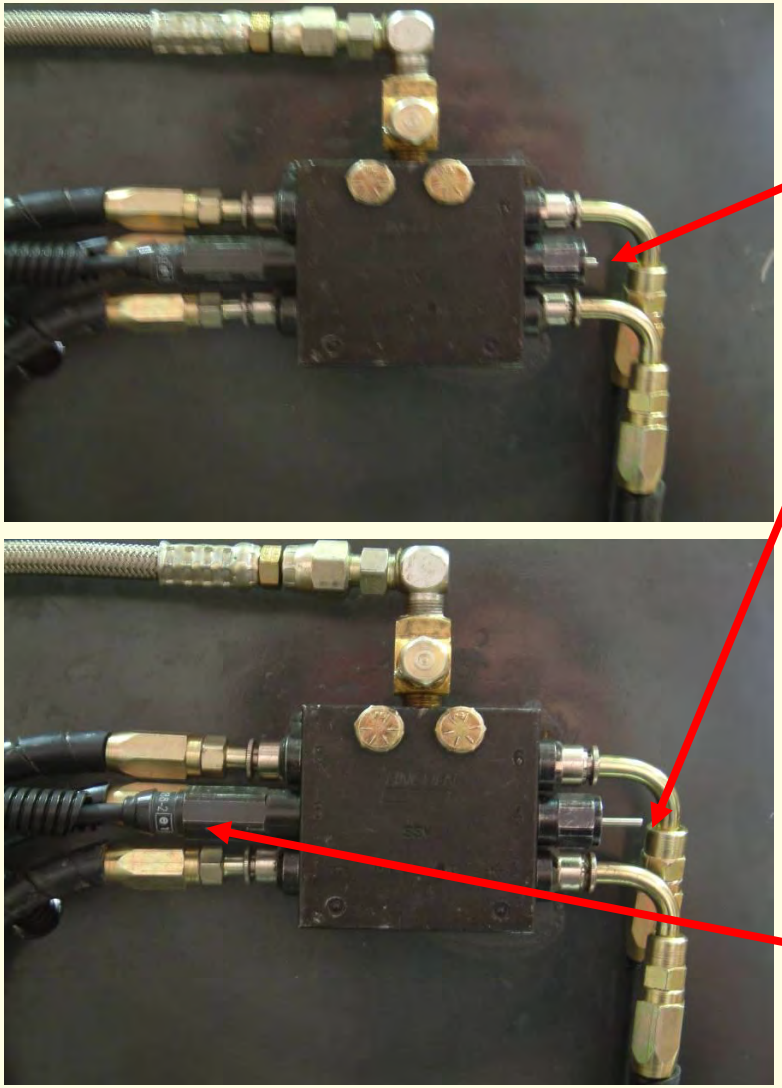
Proportioning within the Lincoln QuickLub system is done through cross-porting. This system uses plugs to divert grease out a given outlet to another outlet. The affect is to double, triple, or even quadruple the amount of lubricant being dispensed to a bearing. Proportioning is an important and critical aspect of the systems.

Quicklub values ensure the right amount grease is delivered to each bearing point according to their requirements



Cross porting (Divider valve)





Cycle indicator stems on each valve show proper operation of valve.

Proximity switch on secondary valve insures that all pins receive grease during each lube event.

Owner Manual
Operating Instructions

LINCOLN

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Description of the QUICKDATA 233 Centralized Lubrication Pump

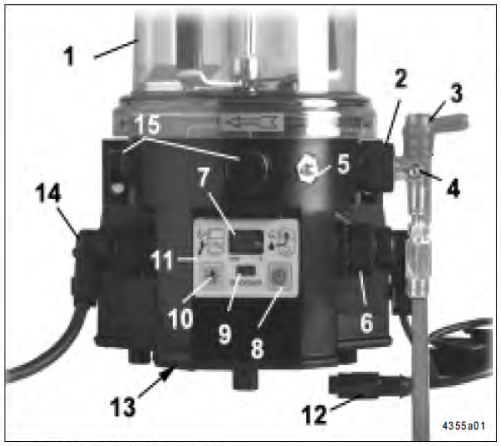

Fig. 2 - Components of pump 233

1 - Reservoir
2 - Pump element
3- Pressure relief valve
4 - Filling nipple, system
Emergency lubrication possible
5 - Filling nipple, pump
6 - Adaptor for piston detector
7 - Display
8 - Momentary-contact switch for indication or setting of pause time
9 - Reading window for data logger
10 - Momentary-contact switch for additional lubrication
11 - Membrane key pad
12 - Piston detector
13 - Control p.c.b. with data logger
14 - Adaptor for power supply External illuminated pushbutton
15 - Closure plug for the use of a pump element

- **The QUICKDATA 233 centralized lubrication pump**

- is a compact multiline pump consisting of the following components:

Housing with integrated motor
Reservoir with stirring paddle and fixed paddle
Data logger (control p.c.b. and readable data memory)
Pump element
Pressure relief valve
Filling device
Electrical connection parts

- can drive up to 3 pump elements with different outputs
- operates according to lubrication cycles (pause and operating times)
- is equipped with a low-level control
- can supply up to 300 lubrication points depending on the line lengths
- is designed for the automatic lubrication of the connected lubrication points
- is designed for the delivery of greases up to NLGI 2 at temperatures from -25°C to +70°C
- can be used with low-temperature greases down to temperatures of -40°C

- During the operating time the pump dispenses lubricant to the connected lube points via one divider valve model SSV...-N and several divider valves model SSV... .

Control and monitoring system „QuickData“

- The control and monitoring system consists of:
- control p.c.b. MDF00 with
- built-on data logger module with IR interface
- membrane key pad with display
- IR interface module RS 232 (COM) for laptops without IR interface
- Software “QuickData“
- monitored divider valve model SSV...-N with integrated piston detector, see fig. 20.

Control p.c.b. MDF 00 with data logger

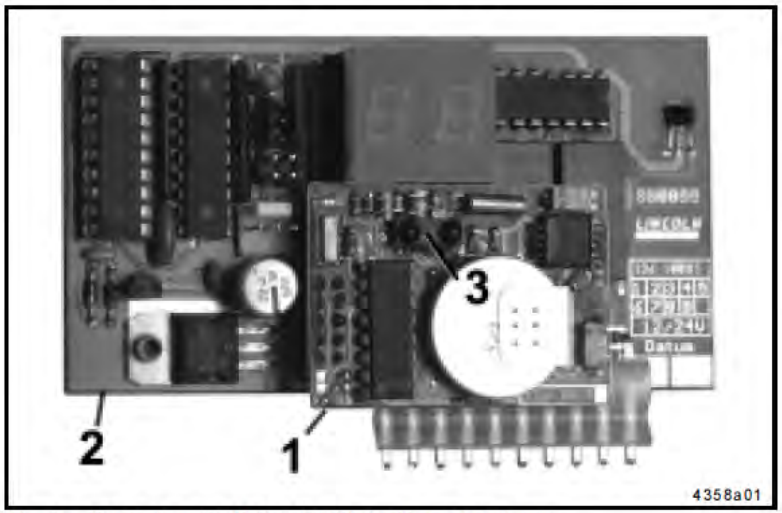

Fig. 3 - Control p.c.b. MDF 00 with built-on data logger

- The control is installed in the housing of the pump behind the membrane key pad as an integrated printed circuit board MDF 00 (2, fig. 3).
- The data logger (1) is fixed onto the printed circuit board.

1 - Data logger
2 - Control p.c.b.
3 - Infrared interface

Membrane key pad

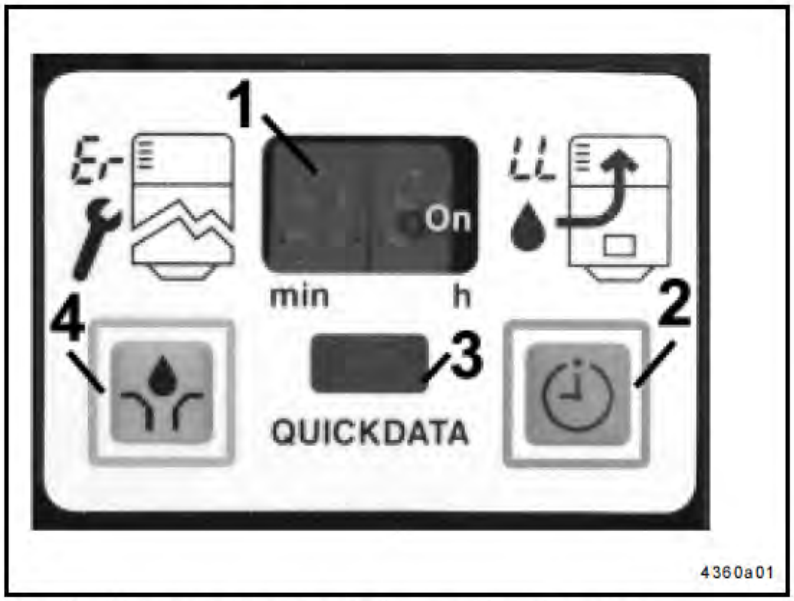

Fig. 22 - Membrane key pad with display and reading window

- The membrane key pad serves for:
- displaying functions, faults, low-level indications and time settings in the display window 1, fig. 22 (display mode)
- setting the pause time (programming mode)
- triggering one or several additional lubrications (operating mode)
- reading of data and events

1 - Display window
2 - Key for acknowledgment of fault indications and setting of time (shift key)
3 - Reading window for „QuickData“ data
4 - Key for triggering an additional lubrication and for setting the time values

Low-Level Control

Low-level control for grease

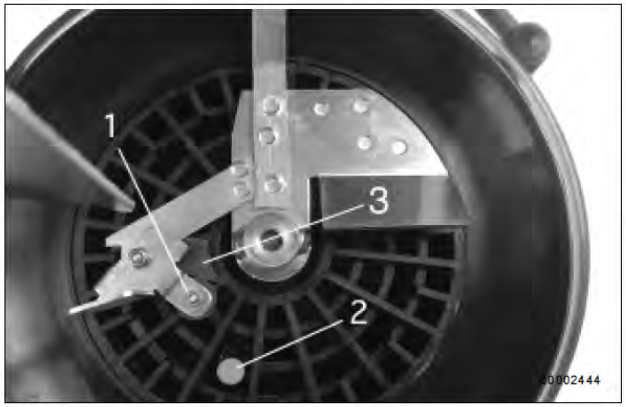

Fig. 33 - Switching parts of the low-level control

1 - Guiding plate with round solenoid
2 - Electromagnetic switch (at stirring paddle)
3 - Control cam

Note: The switching parts listed above are not suitable for liquid grease. In such a case a float magnetic switch must be used (see Low-level control for oil).

Full reservoir

- The stirring paddle rotates **clockwise** during the operating time.
- Due to the rotating motion of the stirring paddle in the lubricant the pivoting guiding plate with the round solenoid , item 1 fig. 33, is pressed backwards. The solenoid moves towards the center of rotation of the stirring paddle. The electromagnetic switch, item 2, **cannot** be activated.
- Control cam, item 3, guides the round solenoid with the pivoting guiding plate automatically outwards, in the direction of the reservoir wall. After the lubricant has left the control cam, it flows against the guiding plate, thus displacing the solenoid again onto the center of rotation of the stirring paddle.

Reservoir empty

- During the rotating motion of the stirring paddle there is no backpressure from the lubricant. The guiding plate with the round solenoid no longer moves towards the center of rotation of the stirring paddle. After control cam, item 3, has been overtravelled, the solenoid remains in the outer position and overruns the electromagnetic switch 2. The solenoid activates the electromagnetic switch contact-free thus triggering a low-level signal. The operating time is stopped by the piston detector.

Note: The flashing signal „LL“ appears only after the solenoid has activated the electromagnetic switch 6 times contact-free.

Magnetic switch

- The electromagnetic switch is activated contact-free and without wear by the magnetic field of the solenoid fitted to the stirring paddle.

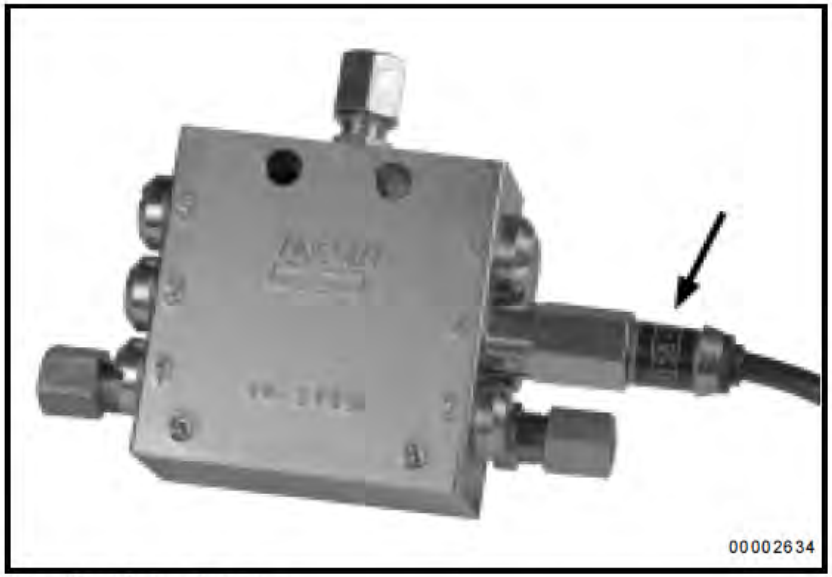

Fig. 20 - Piston detector

Operating time

- A **piston detector** (initiator) which has been installed on a metering device instead of a piston closure plug, monitors and brings the pump **operating time** to a close after all the pistons of this metering device have dispensed their lubricant quantity once.
- The operating time depends on the system's lubricant requirement and on the location of the piston detector (either on the main metering device or on the secondary metering device).

- During the pump operating time a circulating segment appears in the display of the membrane key pad (see Display of the membrane key pad).
- After an interruption of the operating time, e.g. by switching off the power supply, the operating time continues from the point where it had been interrupted.
- When the machine contact or the driving switch is switched off, the pause times which have already elapsed are stored and added up by an **electronic data memory** (EEPROM) until the piston detector stops the operating time.

Section II

Special Tools:

Special Tools:

In addition to the standard hand tools and electric tools possessed and used regularly by each technician, the following tools will be need for this installation. These are tools not regularly stocked on the service trucks and must be placed on the truck prior to leaving the shop for the job site.

Note: Due to the infrequent nature and use of these tools, their proper functionality must be tested and confirmed before leaving for the job.

The necessary Special Tools are:

NO SPECIAL TOOLS REQUIRED FOR THIS INSTALL

Section III

System Layout and Design:

Right Rear Steering Cylinder:	1:1
Left Rear Steering Cylinder:	1:1
Right Front Steering Cylinder:	1:1
Left Front Steering Cylinder:	1:1
Left Lower Lift Cylinder:	1:1
Right Lower Lift Cylinder:	1:1
Center Support Bearing:	1:1
Left Upper Lift Cylinder:	5:1
Right Upper Lift Cylinder:	5:1
Tilt Cylinder:	1:1
Z-link Pivot:	8:1
Z-link Cylinder:	4:1
Z-link/dog-bone:	4:1
Left Lift Arm:	1:1
Right Lift Arm:	1:1
Upper Center Pivot:	6:1
Lower Center Pivot:	6:1
Rear Axle Front Pivot:	12:1
Rear Axle Rear Pivot:	12:1
Left Bucket Pin:	15:1
Right Bucket Pin:	15:1
Dog-Bone/Bucket Link:	8:1

Lubrication Volume Factors

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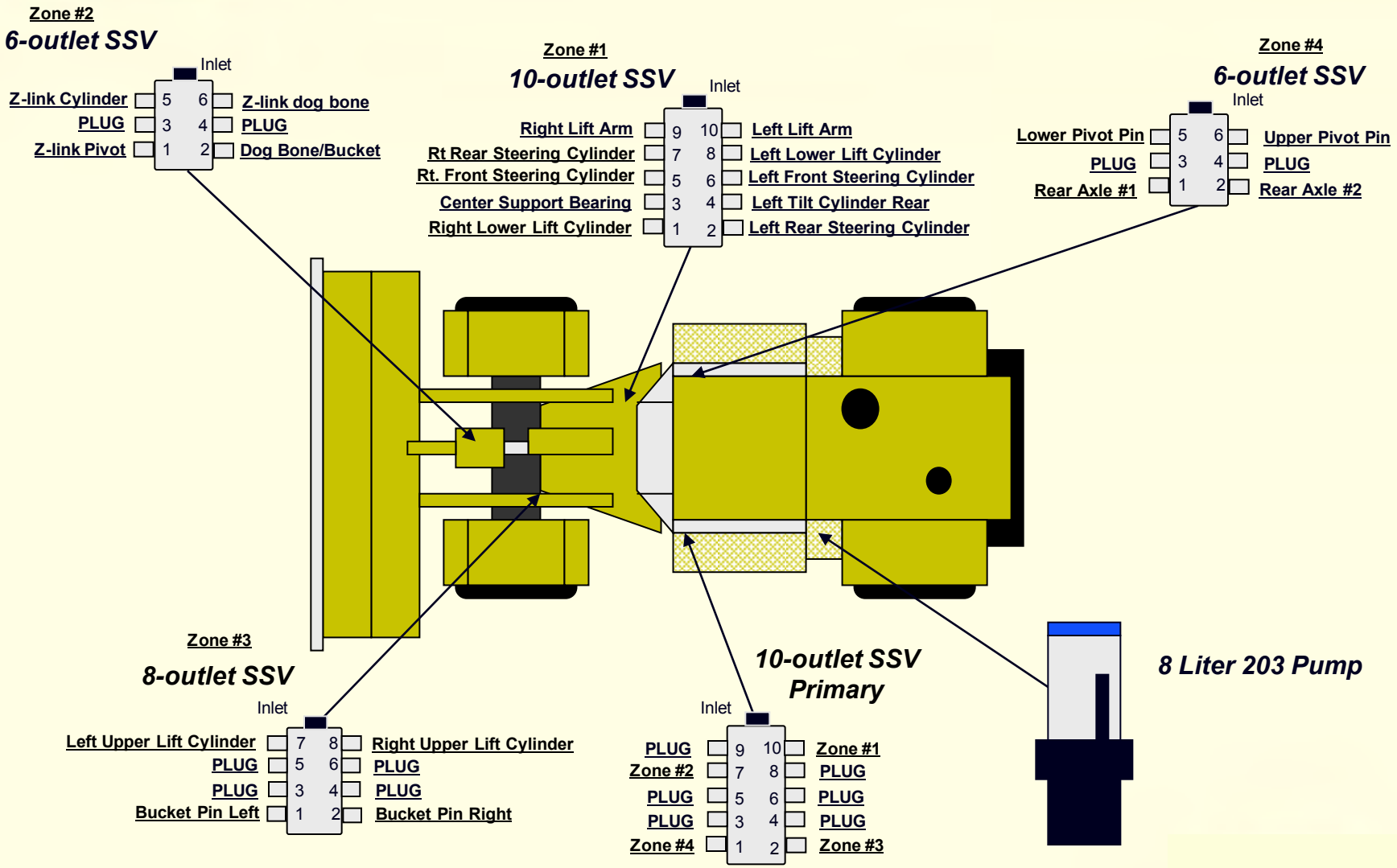


Section IV

Welding Layout:

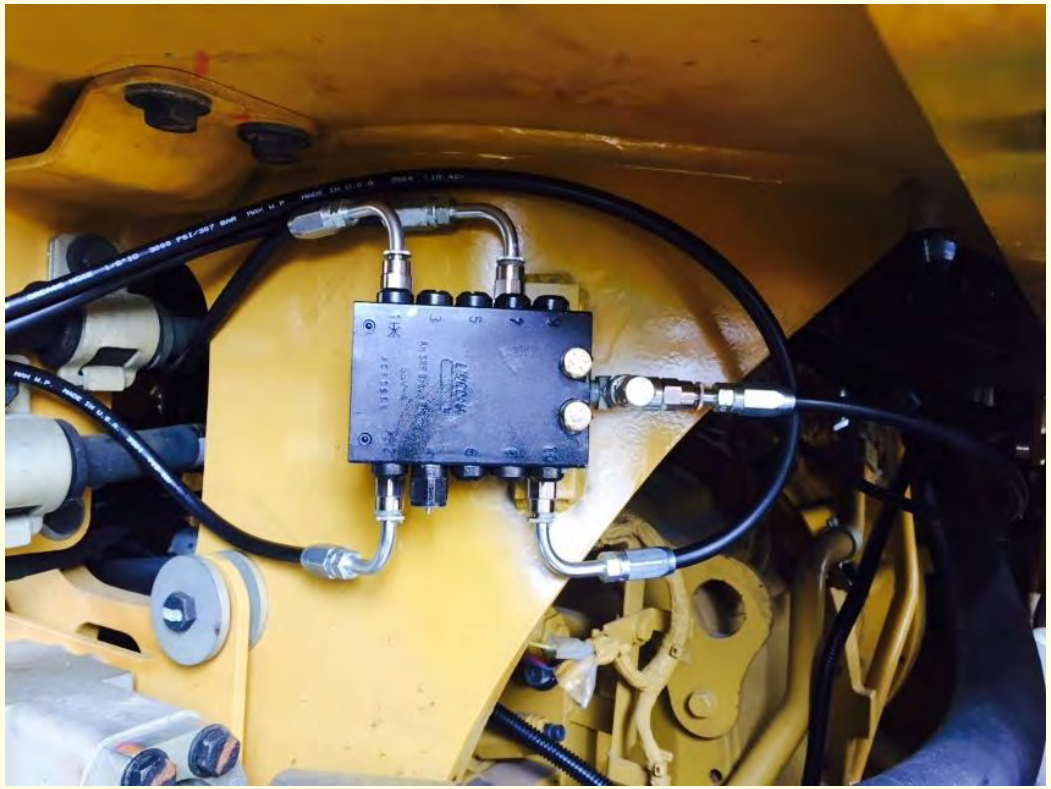
Caution: ***It is vital and imperative that a welding blanket be used at all times when welding on mobile equipment. Welding slag and splatter can permanently damage windshield glass, light lens, cylinder chrome, and plastic panels. Welding can also burn decals and large areas of painted surfaces requiring large-scale touch-up or re-paint.***

Pay close attention to detail!! ***Careless welding practices can cause high and significant damage claims by the customer or dealer.***

ALWAYS disconnect the battery or "Master Switch OFF" before welding!!!

The remote fill block is welded underneath the cab on the left frame member. It is oriented with the ports facing forward, backward, and down.

The primary mounting block is mounted on the transmission frame brace on the left side of the drive-shaft. It is oriented so that the valve faces the ladder. No other studs are required.



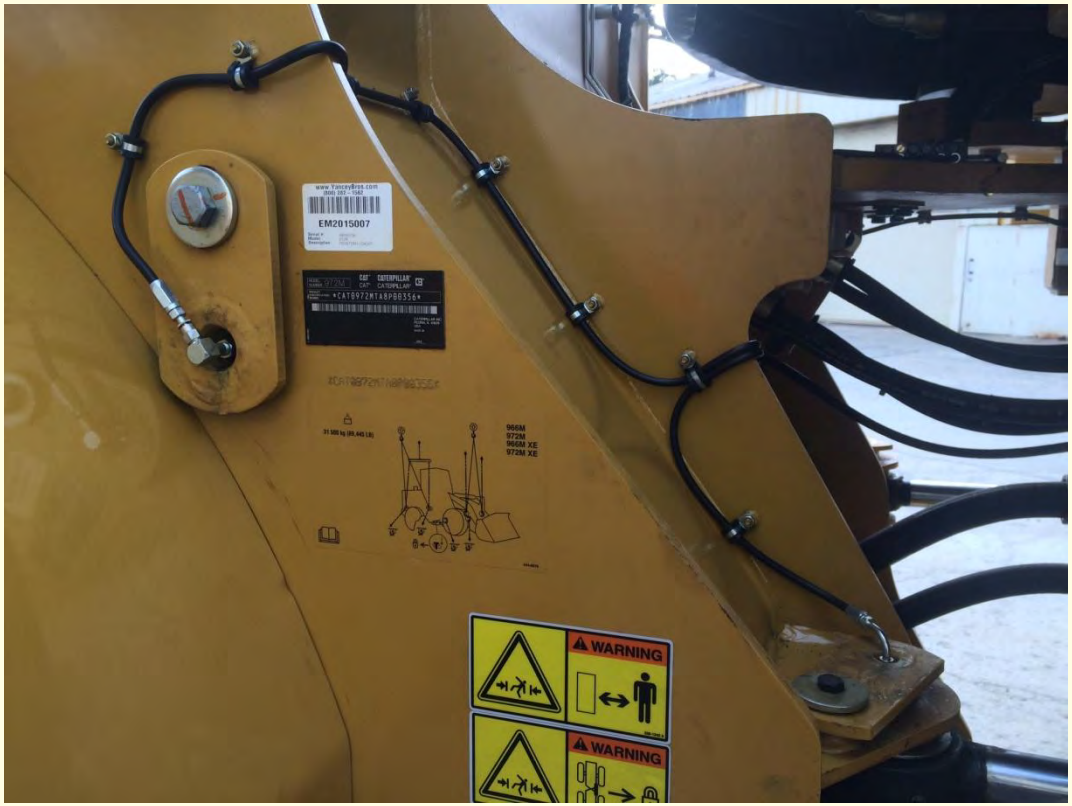
The rear valve mount is welded on the rear frame just forward of the hydraulic tank. It is adjacent to the zerk manifold for the rear axle.

The lower center pin lube line needs three (3) studs on the front box frame. The picture to the left shows the bottom most of those three studs. These are for securing this line so that it does not contact the drive-shaft.

The Center valve (house) mount is welded on the right-hand outside of the box frame just behind the front right tire. There will need to be four (4) studs welded in this area to help route the lube lines and proximity wire.

Right outside view of the front box frame showing the studs necessary for routing the lube lines to the Lift and Steering cylinders

Left side view of the front box frame showing lube line routing to the steering and lift cylinder lube points.



Lift Arm/Bucket Pin secondary valve mount is welded on the left Lift Arm just behind the torque tube. There will be 4-5 studs welded from the shoulder pin to the secondary valve for routing the supply lines. There will also be 3-4 studs securing the lube lines going to the bucket pins and across the torque tube.

The Lift Arm guards are welded “nut down” to create threaded “bosses” that the guard will be bolted to. As the guard is held against the machine, the nuts are tack welded in place. The guard is removed and the welding is completed. There will be 6 nuts per side.

Picture showing the completed Lift Arm guards, Dog-bone guard, and turret rings installed and final painted.

Turret Rings will be welded on the Lift cylinders to protect the lube inlet from damage. One for each side.

The Z-lever secondary mount is welded vertically on the Z-lever casting. The guard will be bolted on after final assembly.

There will be a total of 6 studs welded on the Z-lever to secure the lube lines. Please see photo for detail.

Here is the stud underneath the torque tube for running the supply line between the junction block to the Z-lever secondary.

Detail of the back underside of the torque tube showing the junction block with zerk fitting. This connects the supply line with the Z-lever secondary. There will be 4 studs across the back of the torque tube for routing these lines across.

Left underside view of the torque tube showing routing of left-hand lines to bucket pins and lift cylinder clevis. Note the strategic location of welded studs.

Section V

Pump Mounting and Wiring:

CAT 966M Pump location. Located on left side of machine on deck. The lines and wires are routed below the pump using ¼”-20 hardware as through-bolts on the deck.

CAT 972M Pump location.
Located on right side of machine on deck. The lines and wires are routed below the pump using ¼”-20 hardware as through-bolts on the deck.

Remote Fill Location.
Located on left side of machine below the cab in the center section. The line is routed through the center and beneath the cab. It will come out behind the cab and follow the other line across the deck to the pump.

Electric Connection Diagram

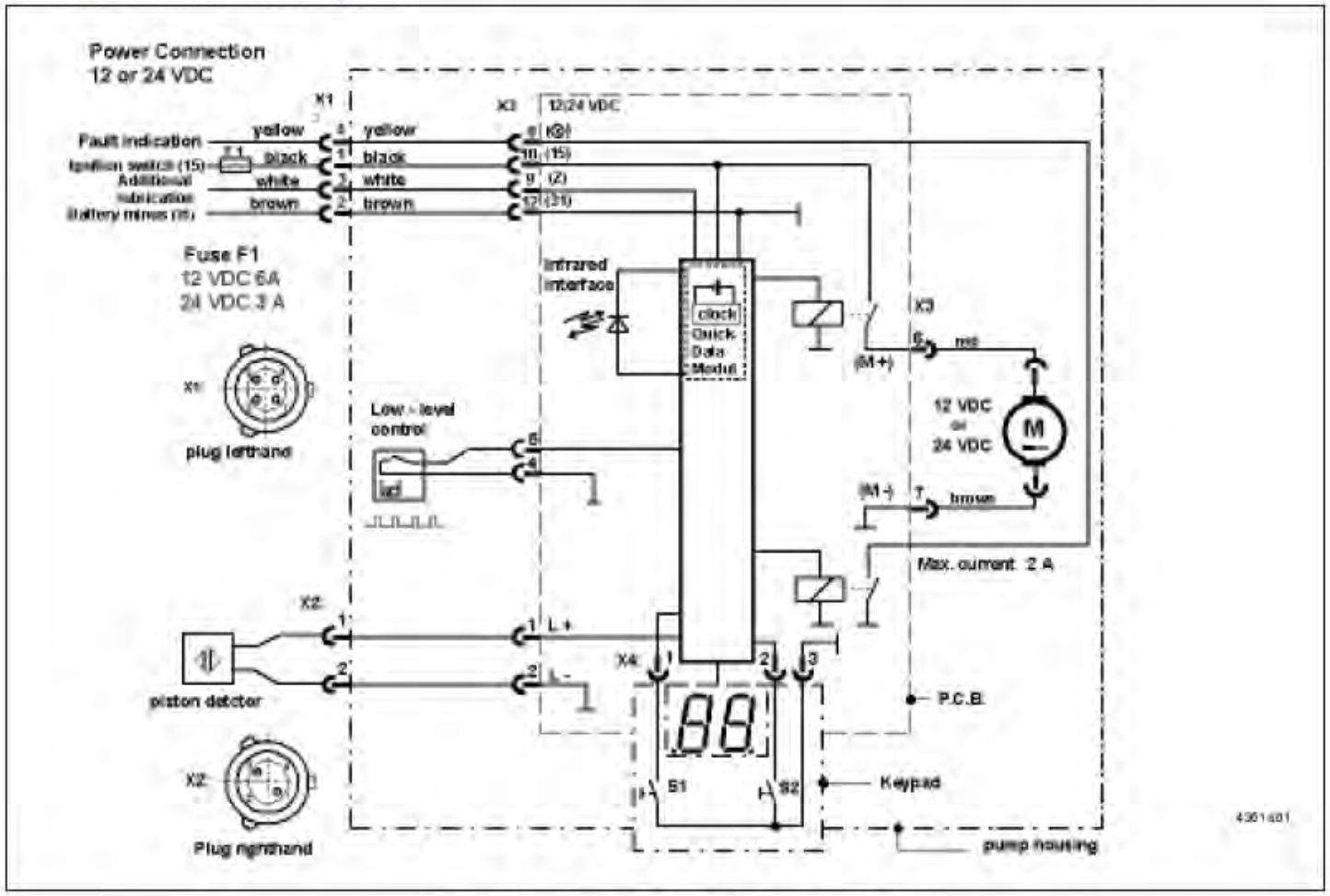
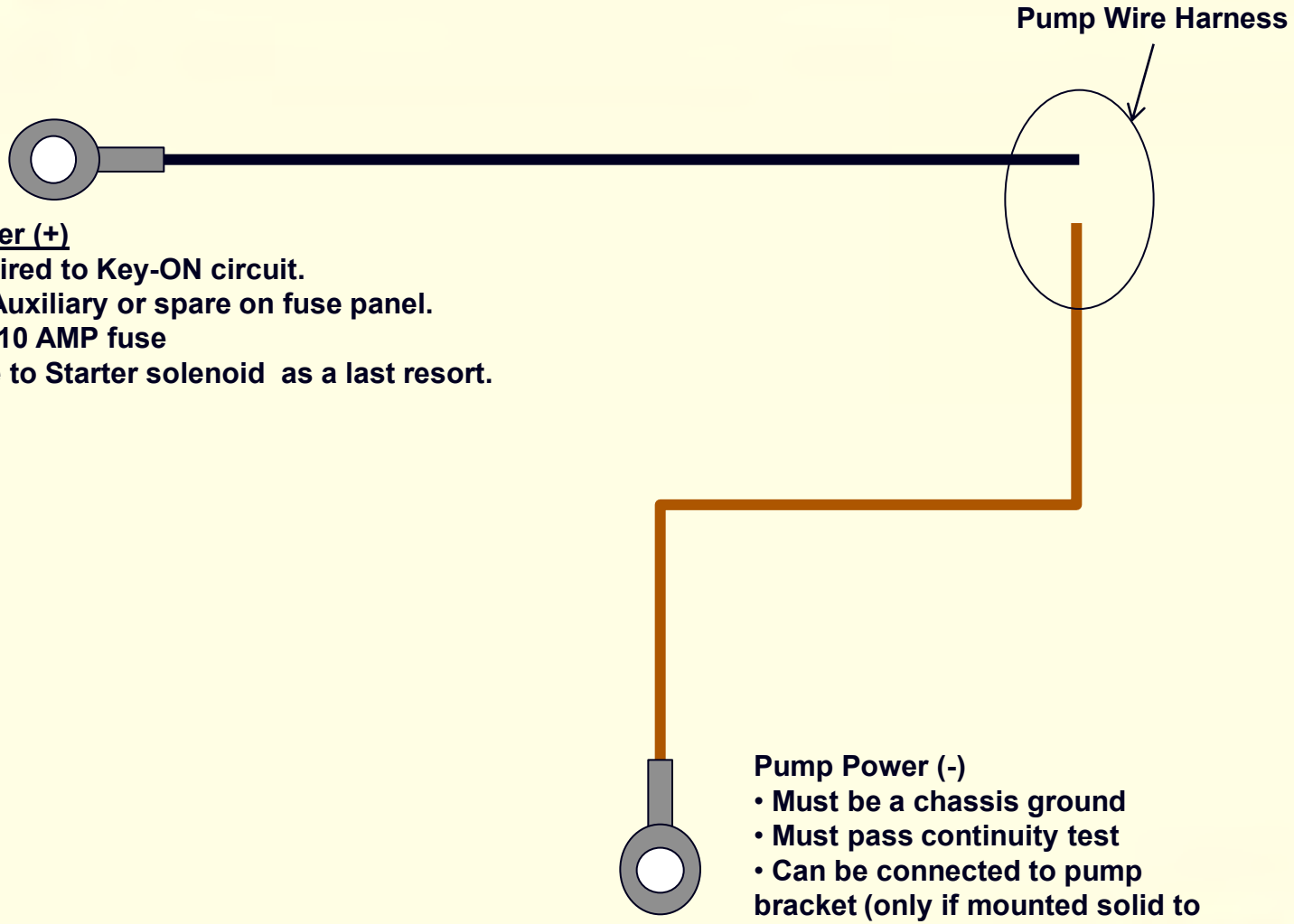


Fig. 39 - Connection diagram pump 233 with data logger



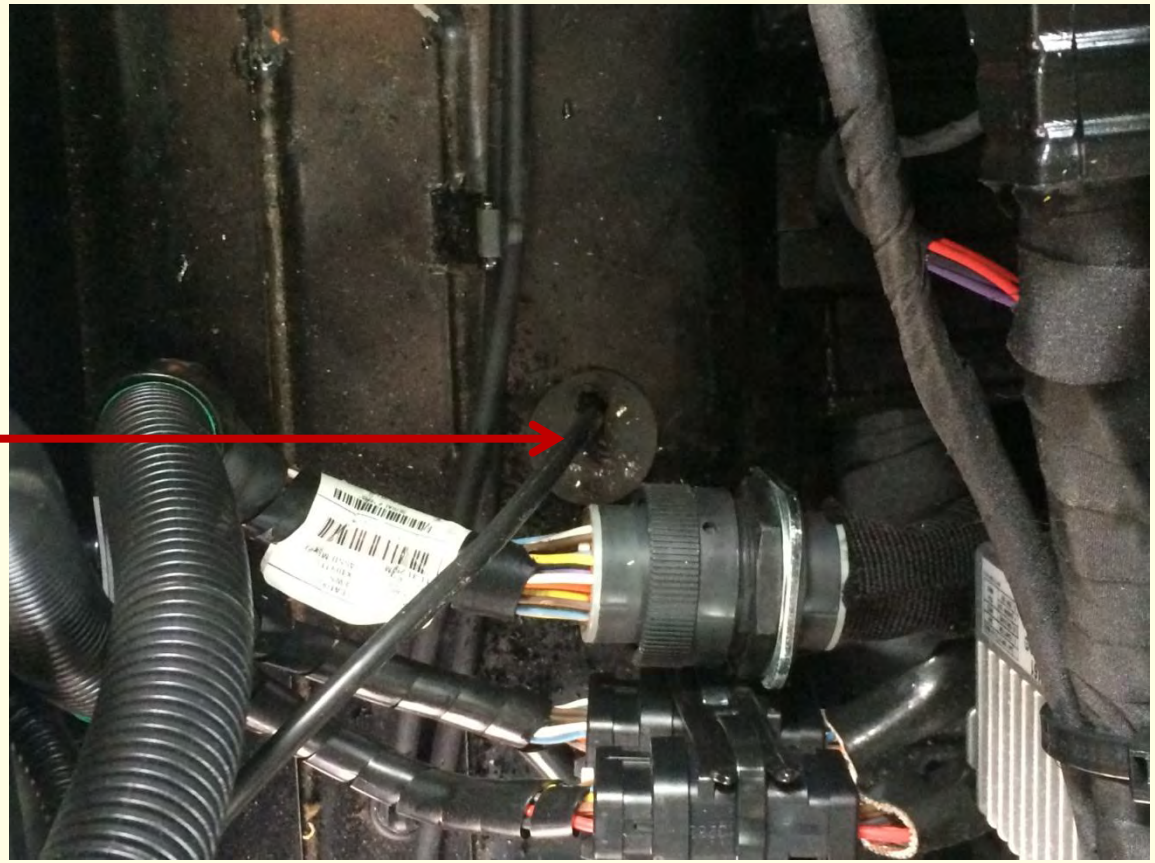
Pump Power (+)

- Always wired to Key-ON circuit.
- Must be Auxiliary or spare on fuse panel.
- Must be 10 AMP fuse
- Only wire to Starter solenoid as a last resort.

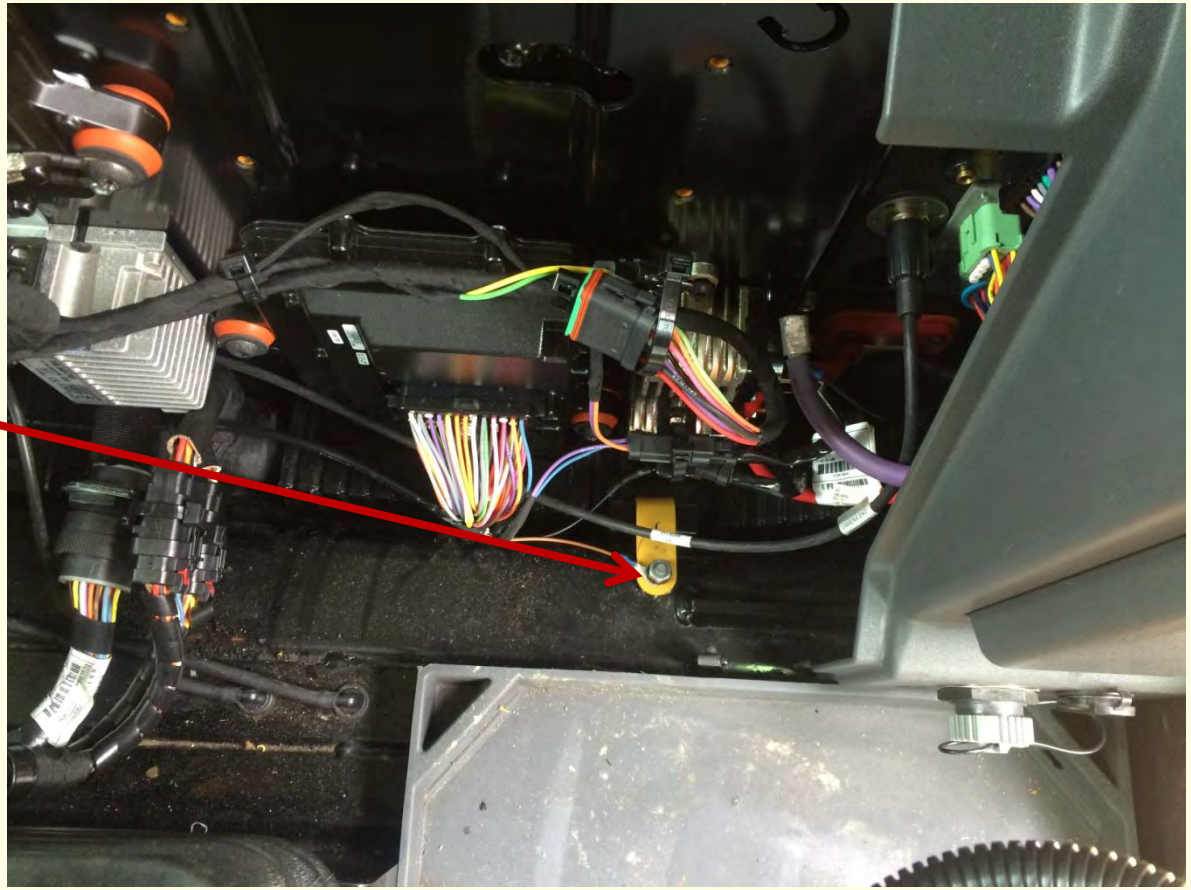
Pump Power (-)

- Must be a chassis ground
- Must pass continuity test
- Can be connected to pump bracket (only if mounted solid to metal surface)

The power cord passes into the cab through an unused grommet located on the cab floor behind the seat. The plastic dash panel behind the seat will need to be removed.



The power cord Ground (-) is made at the yellow tab just to the left of the fuse panel. This is a ground chassis bolt.



The power cord (+) is connected to the “auto-lube” auxilary fuse output. This connection will be made on the back of the fuse panel. It is a 10-1mp circuit. There will be only one wire. Our connection will be spliced in with this. As the electrical fuse panel layout changes periodically, check the fuse panel diagram for the correct fuse.

Section VI

Valve Placement and Configuration:

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Zone #1

10-outlet SSV

Inlet

Right Lift Arm	9	10	Left Lift Arm
Rt Rear Steering Cylinder	7	8	Left Lower Lift Cylinder
Rt. Front Steering Cylinder	5	6	Left Front Steering Cylinder
Center Support Bearing	3	4	Left Tilt Cylinder Rear
Right Lower Lift Cylinder	1	2	Left Rear Steering Cylinder

Zone #4

6-outlet SSV

Inlet

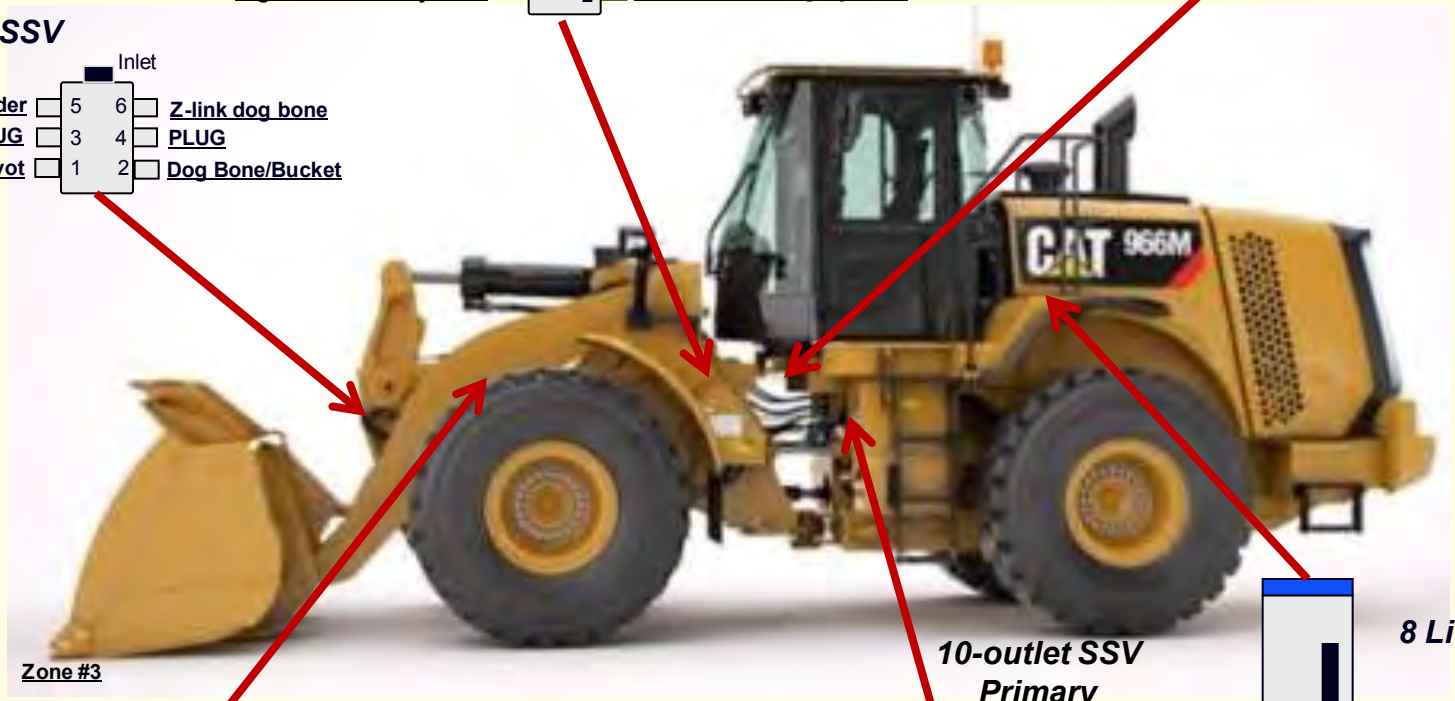
Lower Pivot Pin	5	6	Upper Pivot Pin
PLUG	3	4	PLUG
Rear Axle #1	1	2	Rear Axle #2

Zone #2

6-outlet SSV

Inlet

Z-link Cylinder	5	6	Z-link dog bone
PLUG	3	4	PLUG
Z-link Pivot	1	2	Dog Bone/Bucket



Zone #3

8-outlet SSV

Inlet

Left Upper Lift Cylinder	7	8	Right Upper Lift Cylinder
PLUG	5	6	PLUG
PLUG	3	4	PLUG
Bucket Pin Left	1	2	Bucket Pin Right

10-outlet SSV Primary

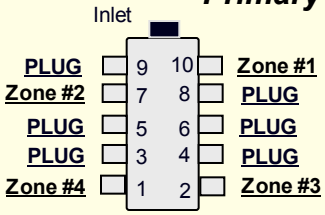
Inlet

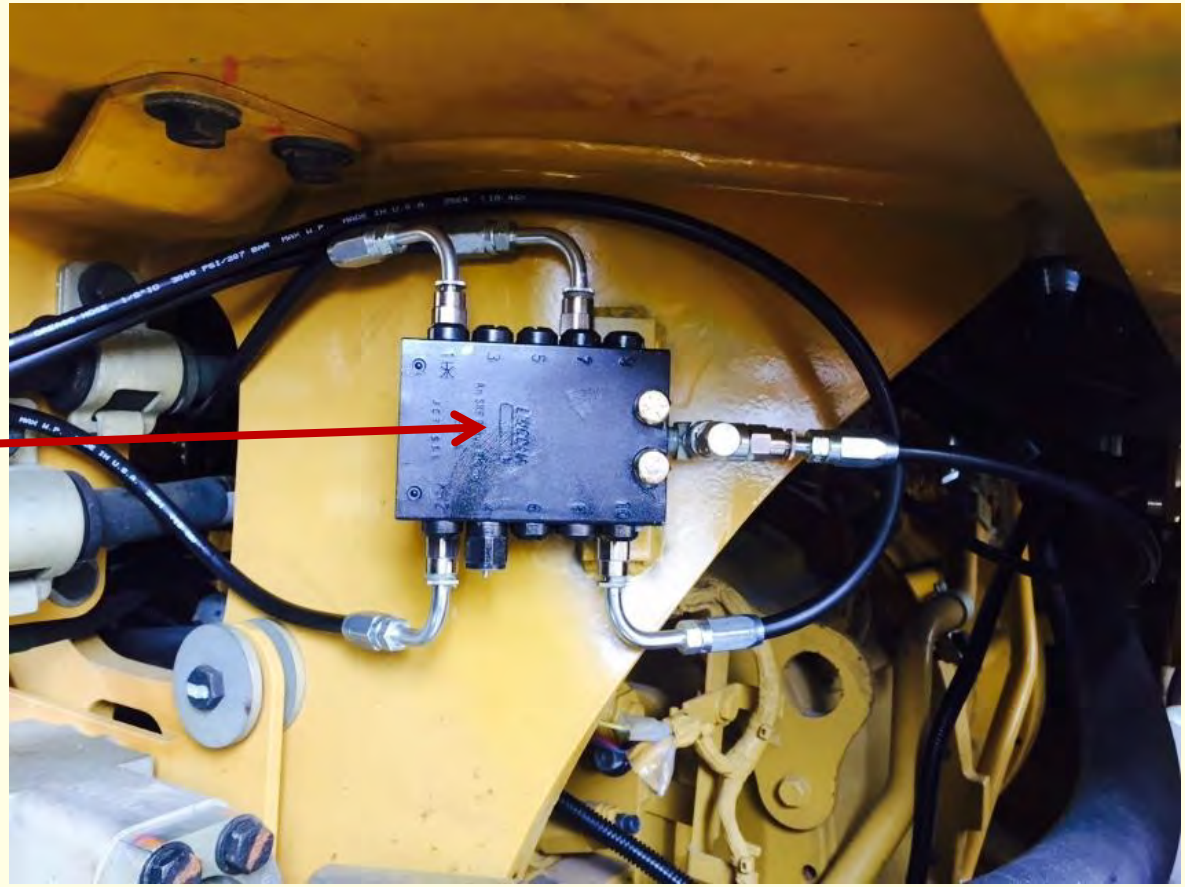
PLUG	9	10	Zone #1
Zone #2	7	8	PLUG
PLUG	5	6	PLUG
PLUG	3	4	PLUG
Zone #4	1	2	Zone #3

8 Liter 203 Pump

Section VI.

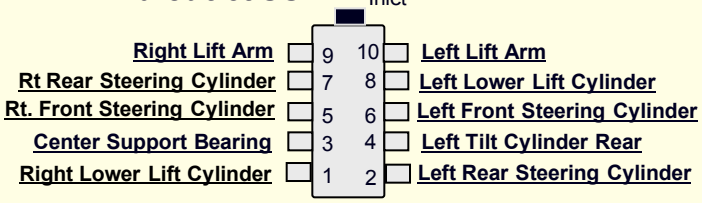
10-outlet SSV Primary





Zone #1

10-outlet SSV

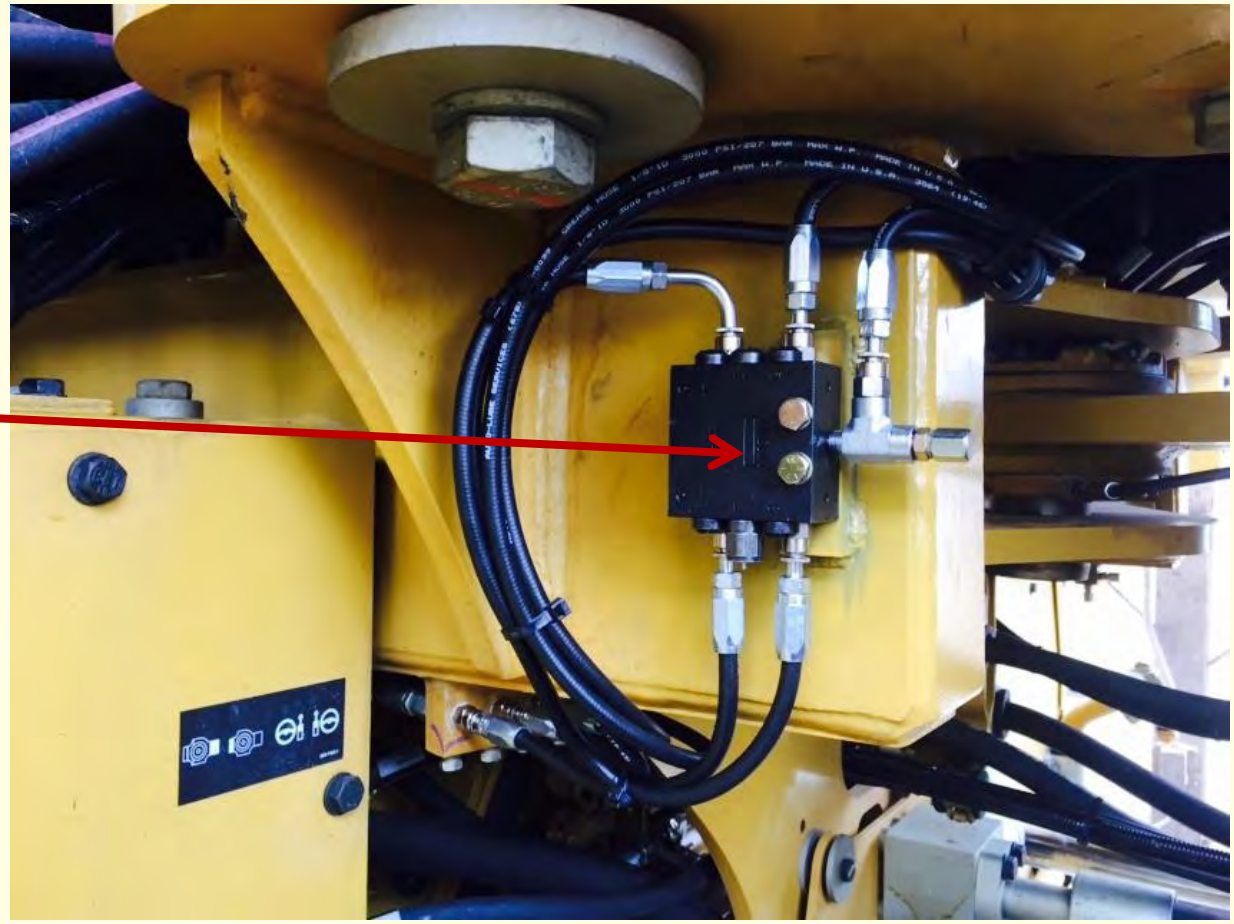


Zone #4

6-outlet SSV

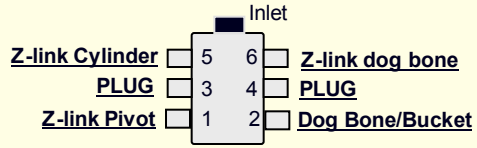
Inlet

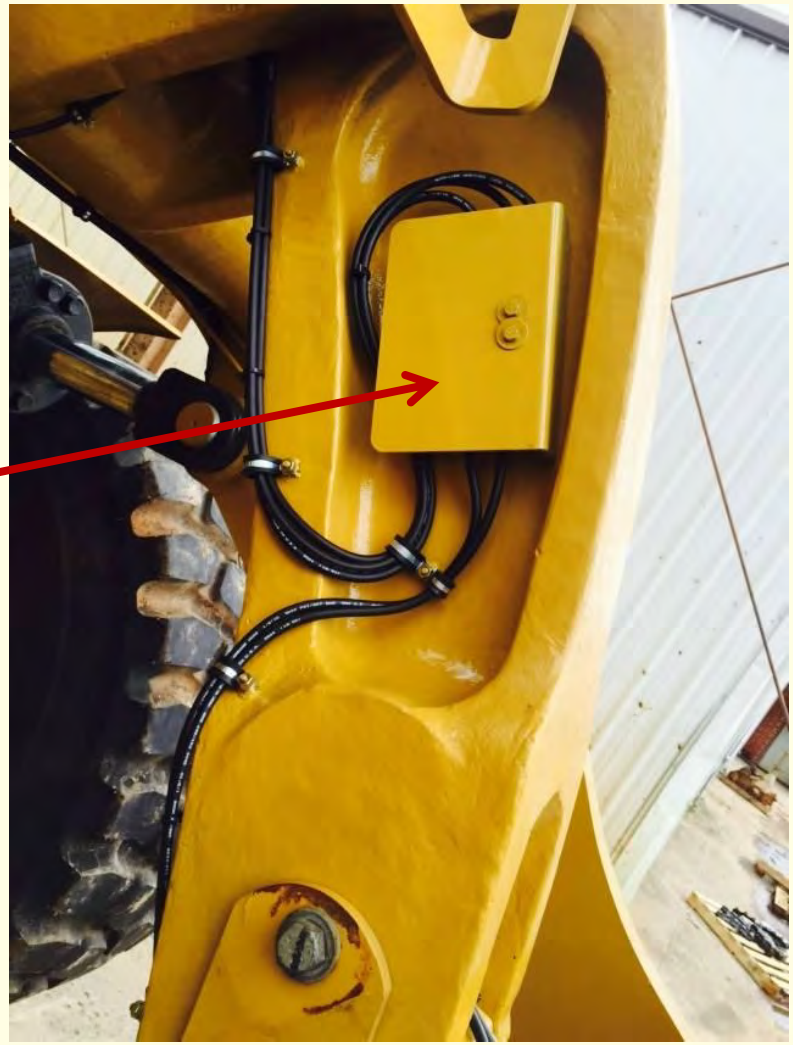
Lower Pivot Pin	5	6	**Upper Pivot Pin**
PLUG	3	4	**PLUG**
Rear Axle #1	1	2	**Rear Axle #2**



Zone #2

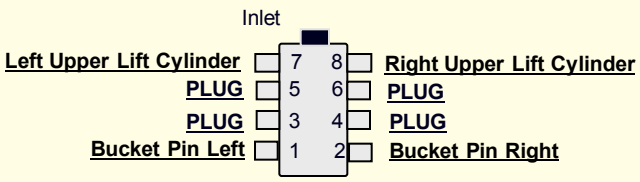
6-outlet SSV

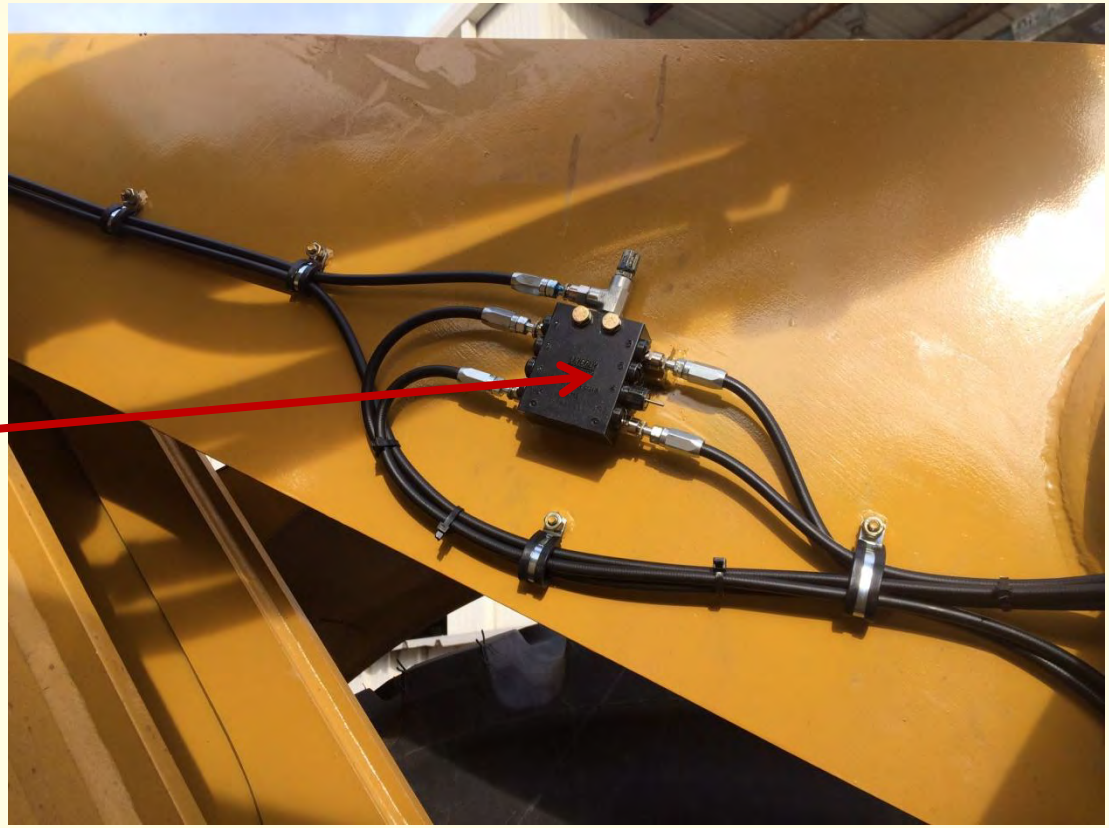




Zone #3

8-outlet SSV





Section VII

Line Routing:

Line routing is critical to a successful installation. It serves two main purposes. First, the proper routing of lube lines ensures the proper connection of all lines within the system in an aesthetic and visually pleasing manner. This also helps with servicing and trouble-shooting as a cleanly routed line is easy to diagnose and repair/replace.

Secondly, and possibly more important, proper routing is a form of guarding. A line that is properly routed out of the path of possible damage is, by virtue, protected or guarded. This becomes very critical on all makes and models of machines for the lube lines that are run in the "impact zone" of the machine. The machine was designed and built without any thought given to the addition of a lubrication system after-market. Routing helps to compensate for this.

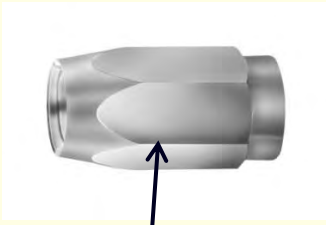
The pathway of the lube line, the number and style of clamps, the size of the lube line bundle are all critical in ensuring the lubrication system remains undamaged and functional. The aesthetic side of routing brings further value in making the lubrication system appear to be "part of the machine".

Caution: ***Improperly routed lines are a leading cause of internal warranties and customer call-backs. These arise form lines that are too long, too short, not clamped adequately, routed in an incorrect location, too much slack at an articulation joint, etc…***

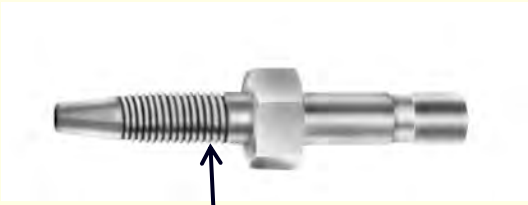
Pay close attention to detail!! ***Sometimes as little as an inch in placement can make the difference between a lube line lasting or being damaged prematurely.***

Assembly of Lincoln QuickLinc Hose Stud Fittings

Black Par-Flex (Lincoln)
#252717 hose
5/16” O.D. x 1/8” I.D.

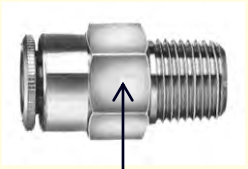


Lincoln
#272427
Hose nut



Lincoln
#272401
Hose stud

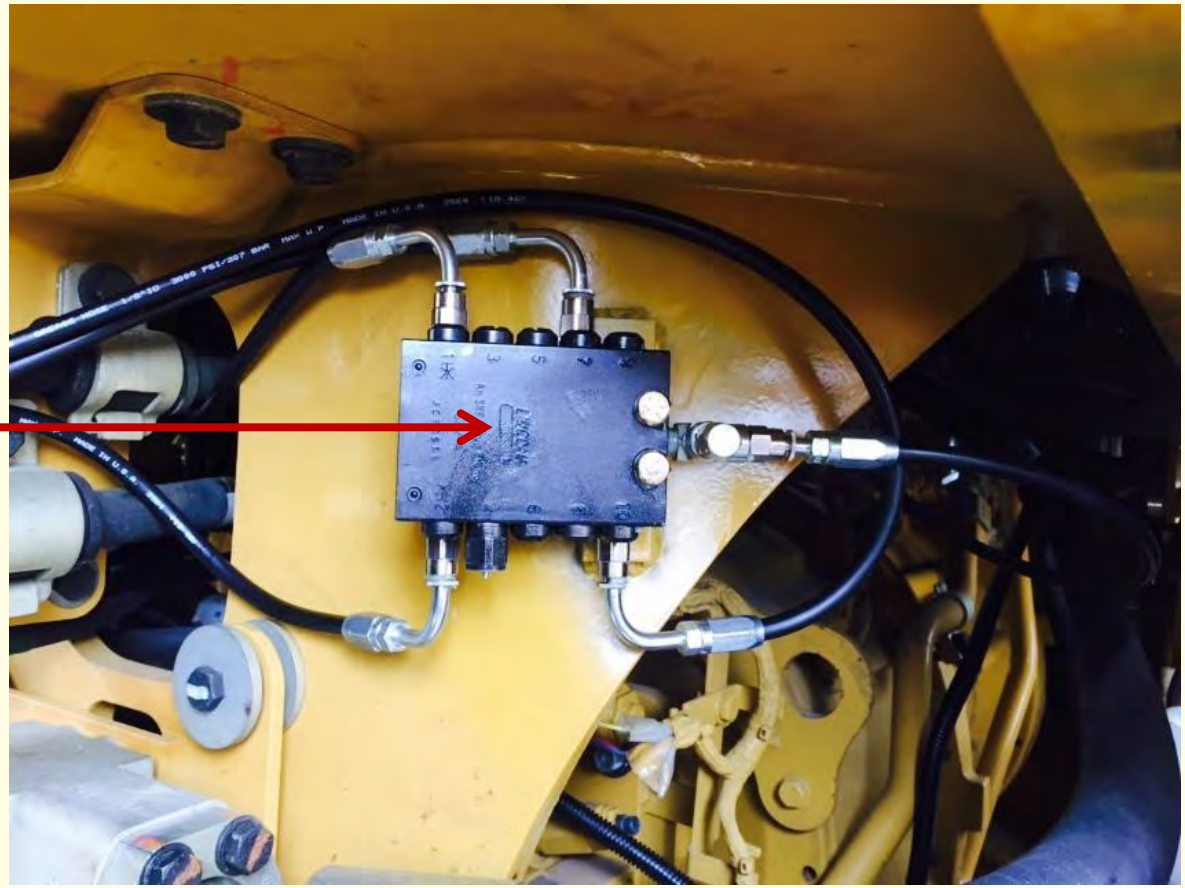
Lincoln
#243699
Swivel Inlet



Lincoln
#244047
Inlet

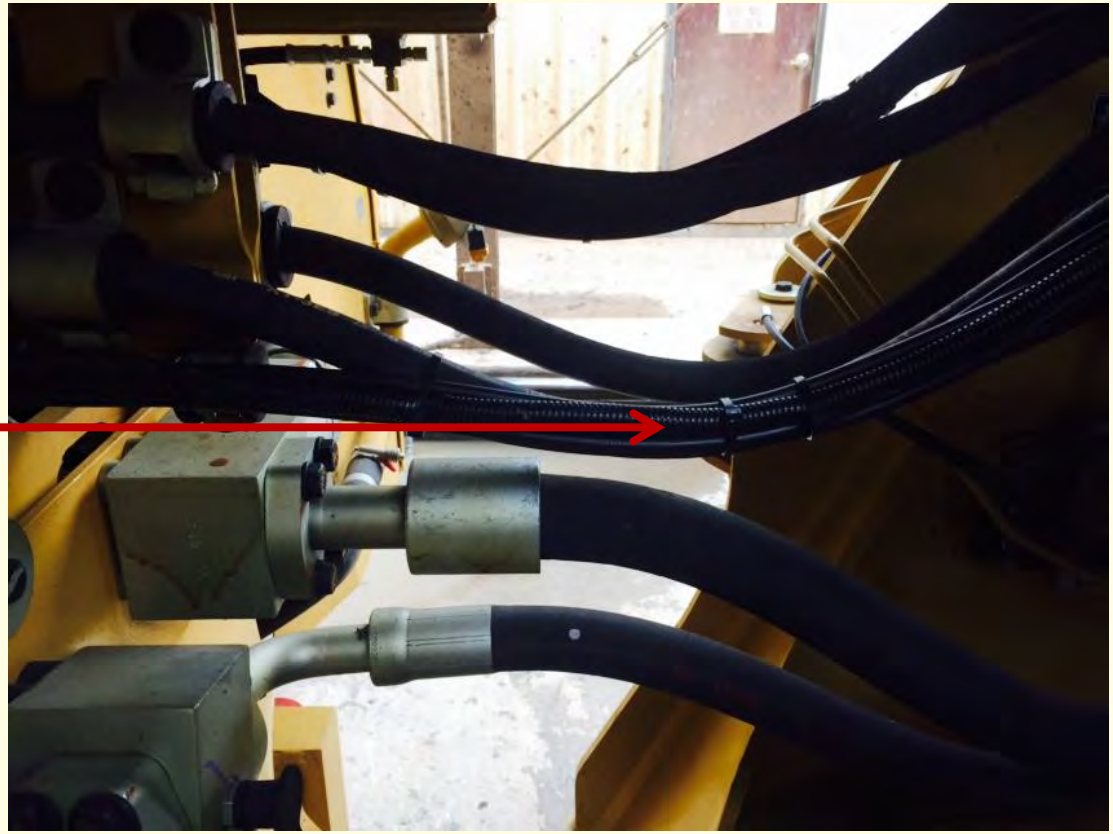
Detail of the supply lines at the primary.

These lines connect to Zone #1, #2, #3, and #4 secondary valves. All outputs will be hose stud 90 fittings. The incoming supply line from the pump routes through the deck along with the remote fill line. All other lines bend around and head into the center section.



Detail of the lube lines and proximity switch wire passing through the center section.

This bundle will include the proximity switch wire, supply lines for Zones #1, #2, and #3, Lube lines for the upper and lower center pins, and rear steering cylinder points

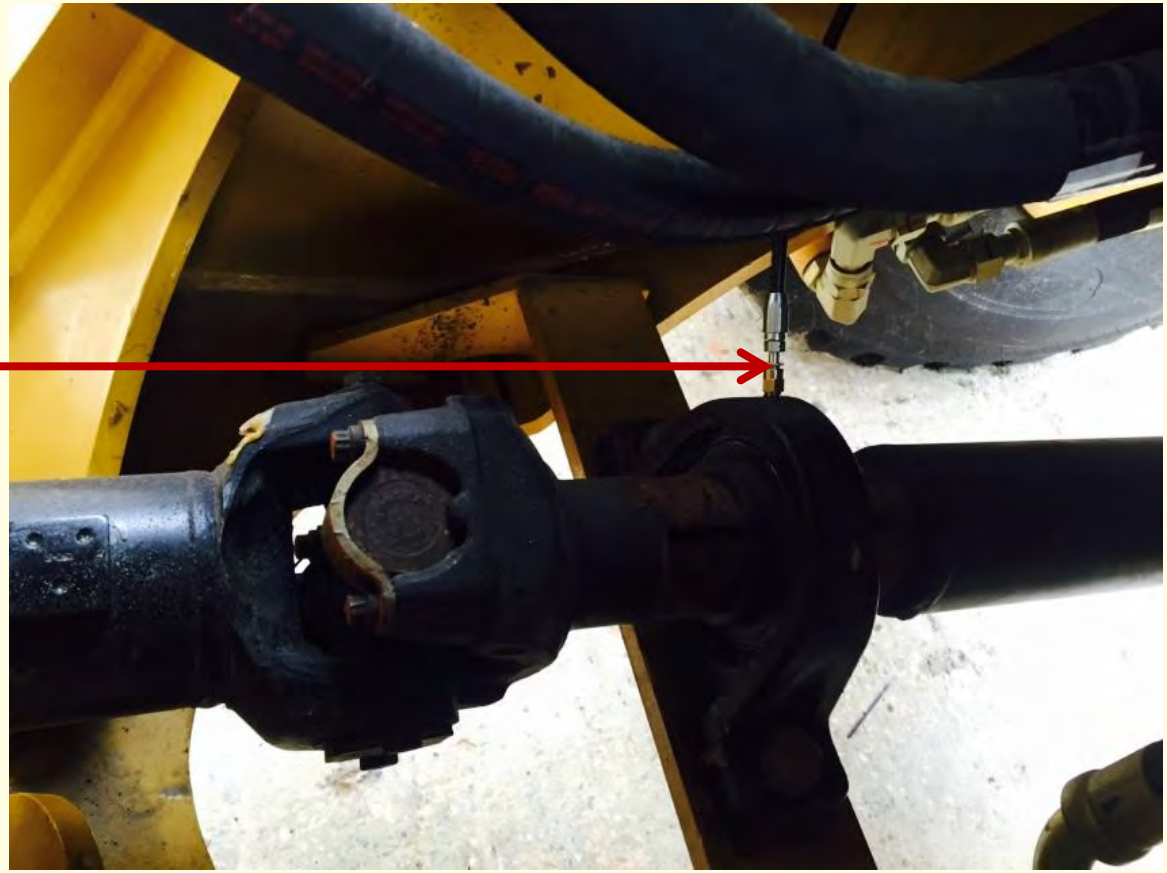


Detail of the lube lines and proximity switch wire on the center section valve.

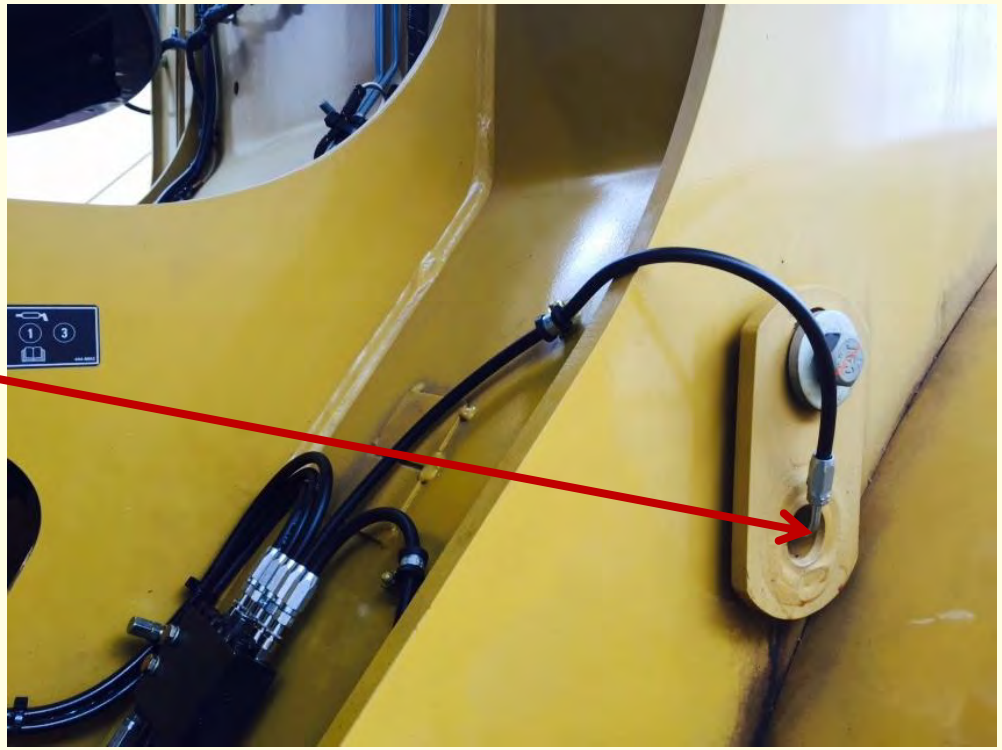
The two rear steering cylinder points will be coming off of the bottom of this valve and will pass through the bundle to the rear chassis.

Detail of the lube line going to the Center Support Shaft Bearing.

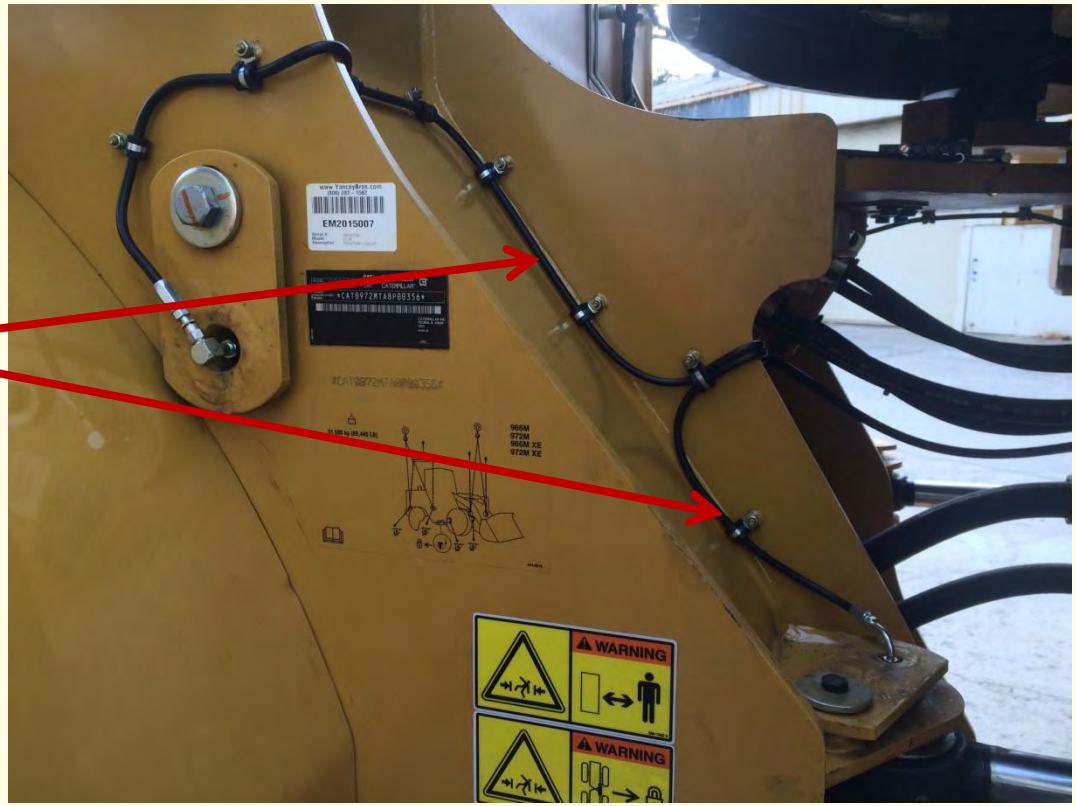
NOTE: **This should be connected only if it is not part of the parking Brake assembly**



Detail of the lube line going to the Lift cylinder on the right side of the machine. A hose stud 90 and #10181 extension will be necessary for both sides.

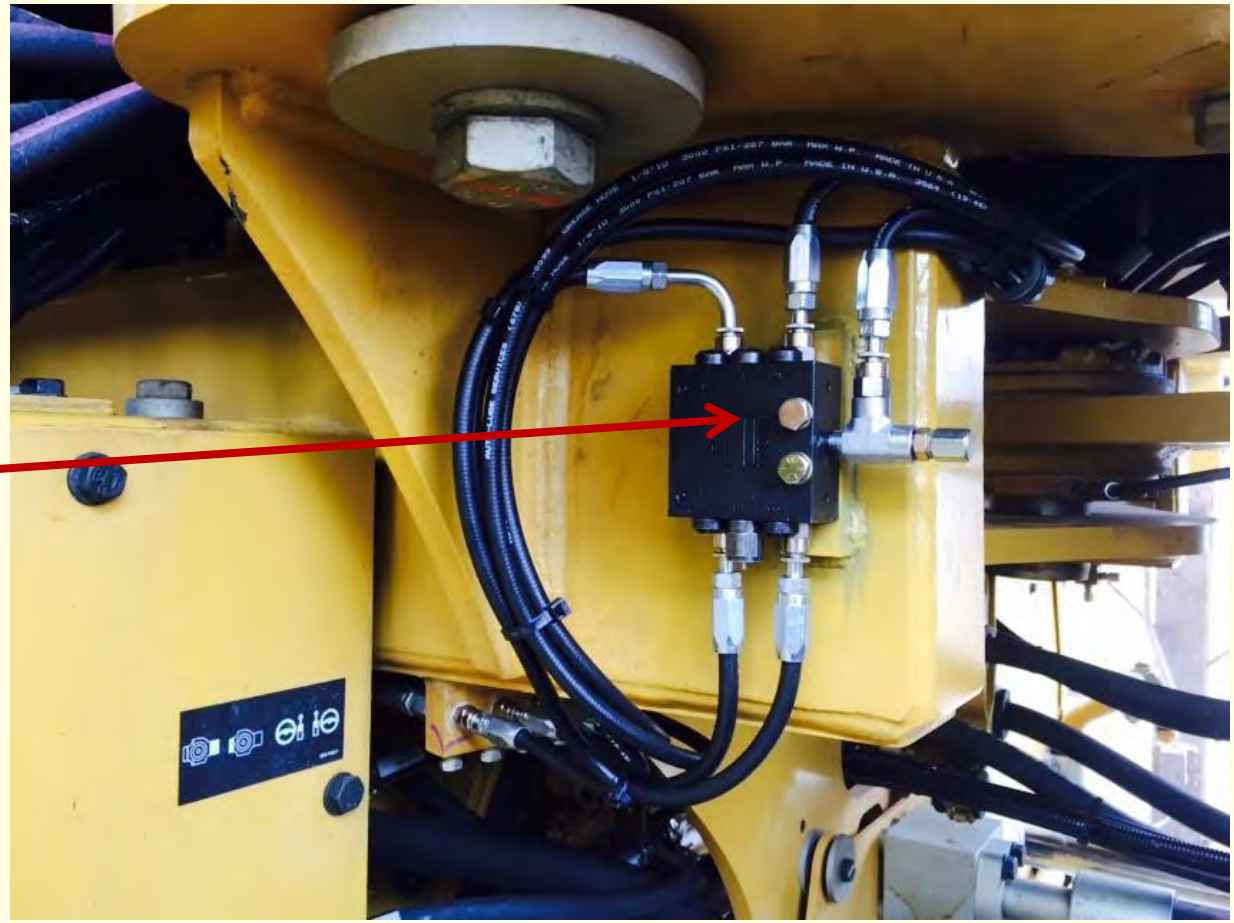


Detail of the lube lines to the lift and steering cylinders on the left side of the machine.

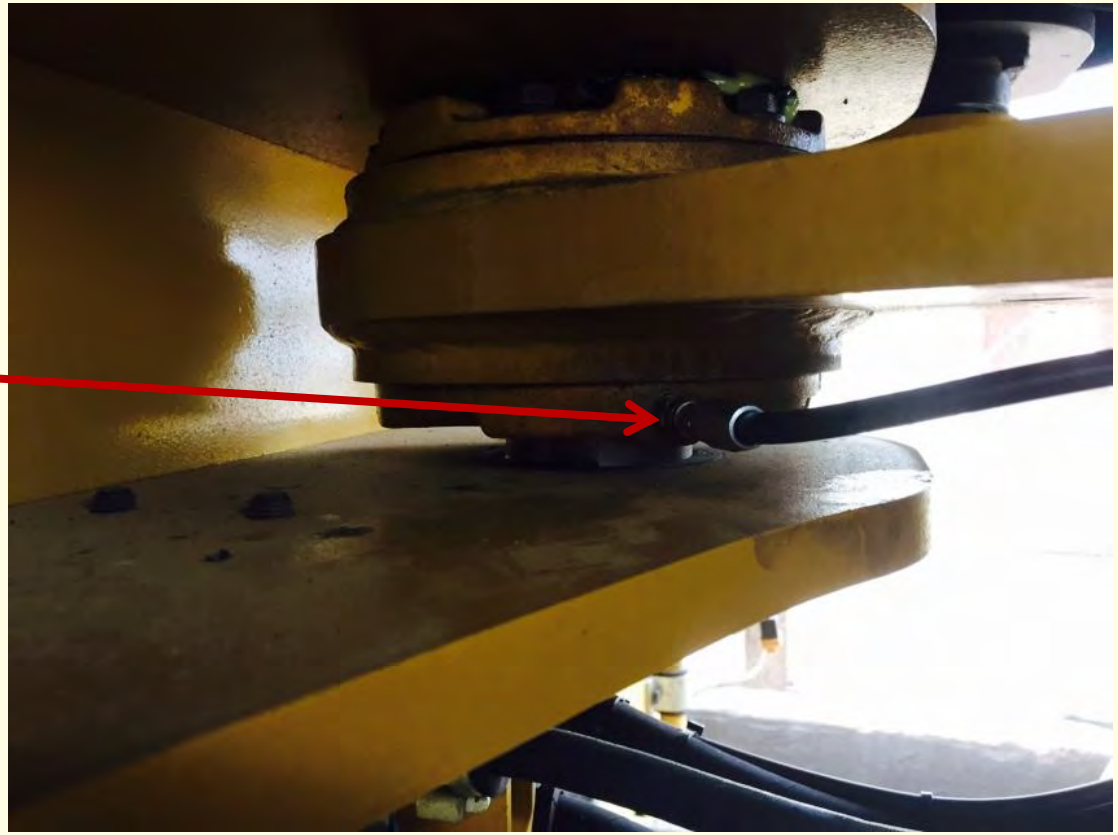


Detail of the rear secondary valve. The manual lube manifold will connect the two points from this valve to the rear axle lube points. The rear steering points are connected to the center section valve with the proximity switch.

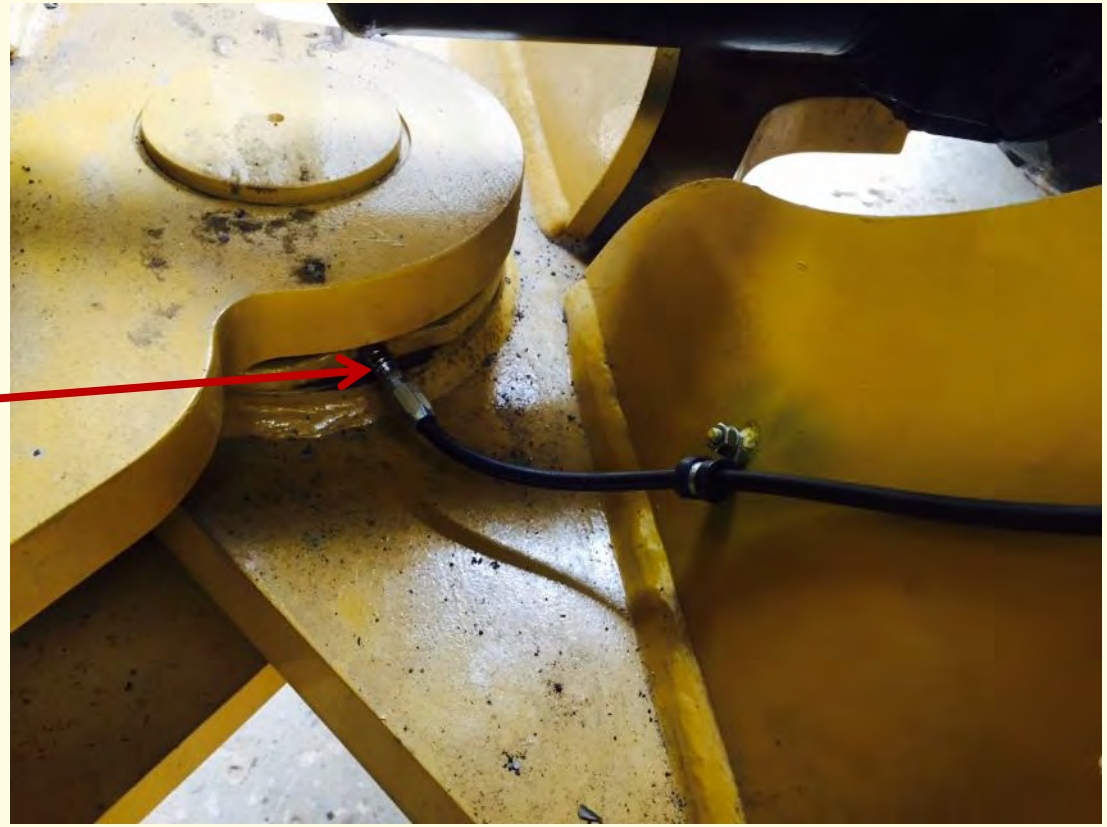
The two single outlets will connect through the center section to the upper and lower center pins.



Detail of the lube line going to the upper center pin. Sometimes this may be ¼”-28 or 1/8”-NPT. Use adapter if necessary. Zip-ties will hold this line in place on the front chassis.

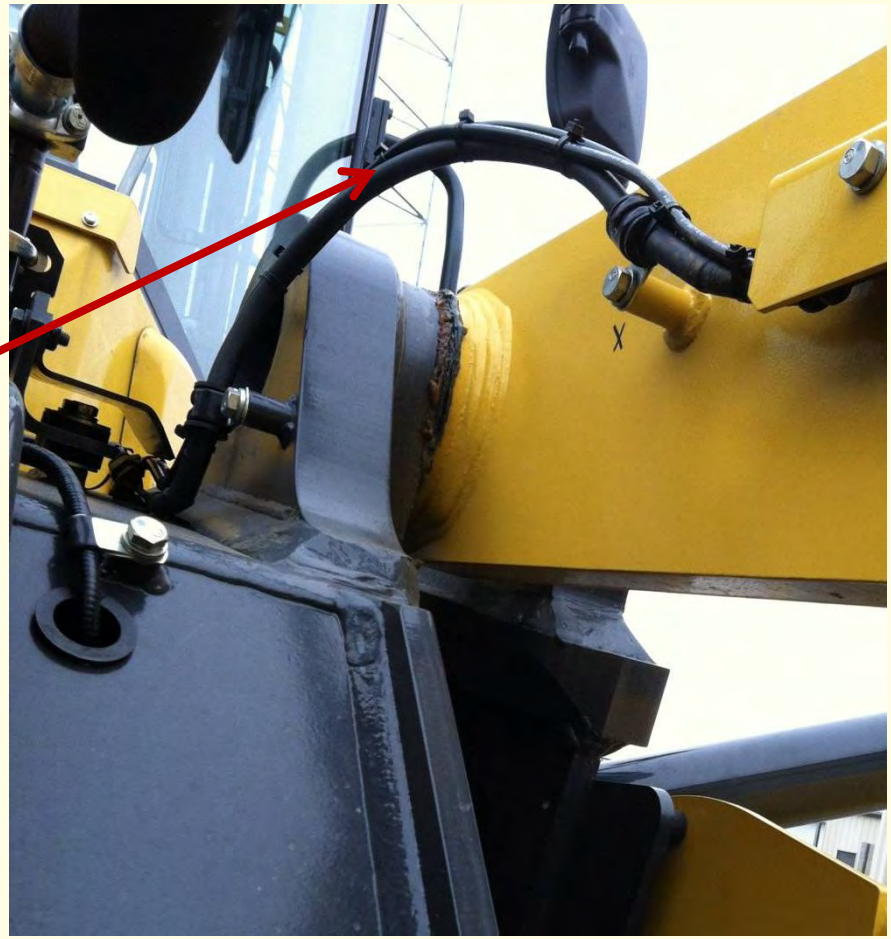


Detail of the lube line going to the lower center pin. Sometimes this may be ¼”-28 or 1/8”-NPT. Use adapter if necessary. Use the welded studs to secure this line up to the other lines going through the center section.



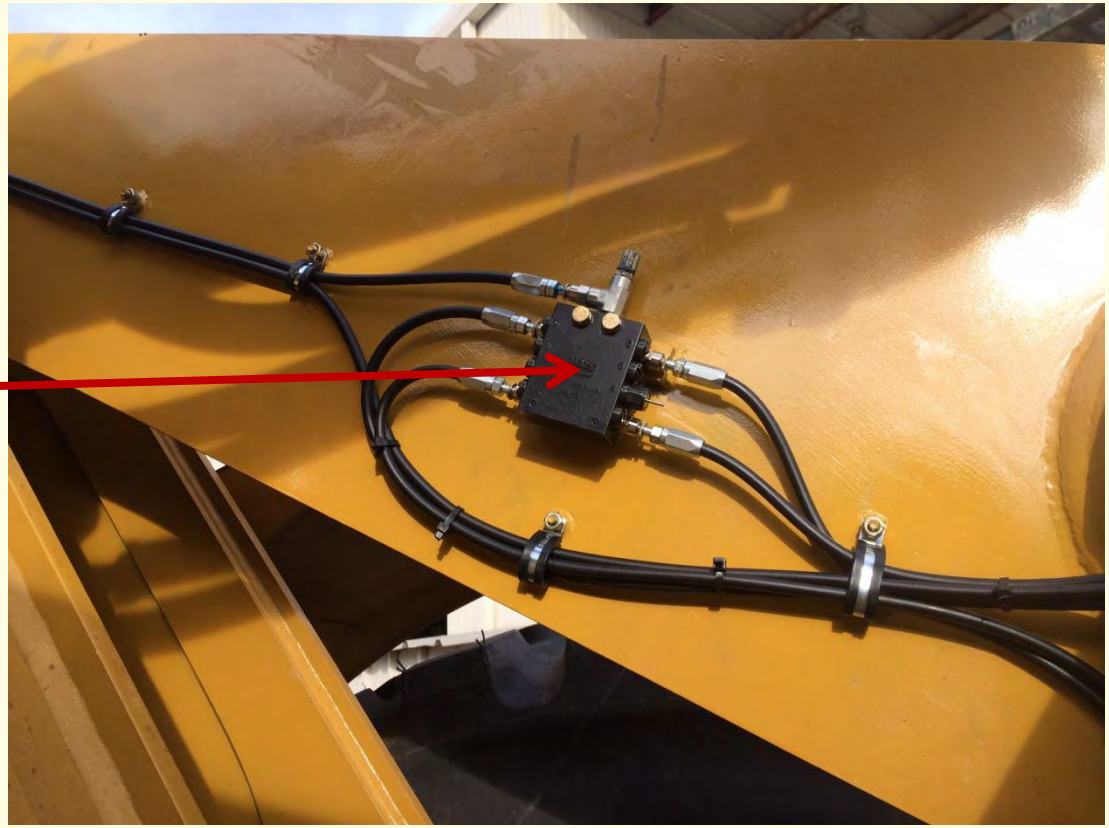
Detail of the supply lines for Zone #2 and #3 coming from the front chassis over to the left Lift Arm.

While this is not a CAT machine, it shows how little this loop needs to be. With the bucket on the ground, this loop needs only 2-3 inches of extra length. The line will "grow" as the Lift arms rise.



Detail of the lube lines at the Lift Arm secondary valve.

Here, the supply line for the Z-lever valve runs with the feed-lines towards the torque tube.



Detail of the lube lines from the Lift Arm secondary valve.

Here, the feed-lines for the Lift cylinder clevis and right bucket pin emerge from above the lift cylinder clevis and run to the lift cylinder point and then down the guard to the bucket pin.

Detail of the lube line at the Lift cylinder clevis. This is identical on both sides.

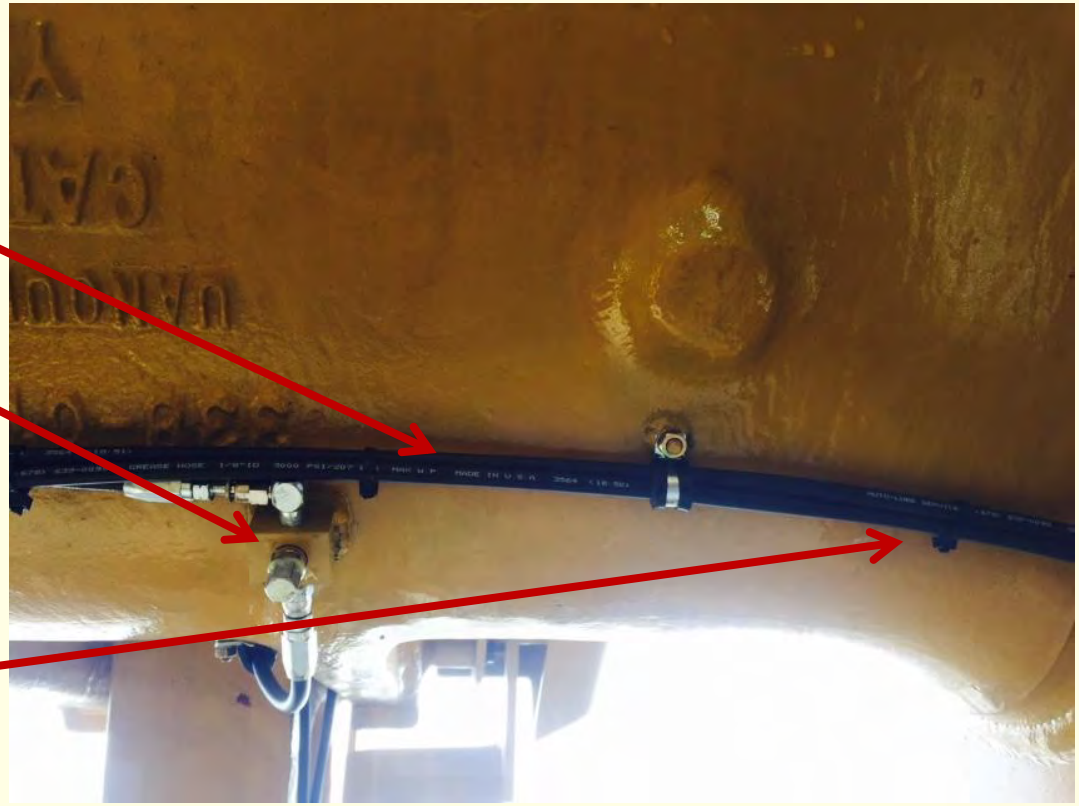
These are the feed-lines on the left lift cylinder routing from inside the lift arms to the outside.

Note the lines for the right side as they began their route across the underside of the torque tube.

Detail of the lube lines as they cross the underside of the torque tube.

Note the junction block and supply line being routed forward for the Z-lever secondary valve.

The lines on the far right are the feed-lines going to the right side lift cylinder clevis and right bucket pin.



Detail of the supply line as it crosses from the underside of the torque tube to the Z-lever.

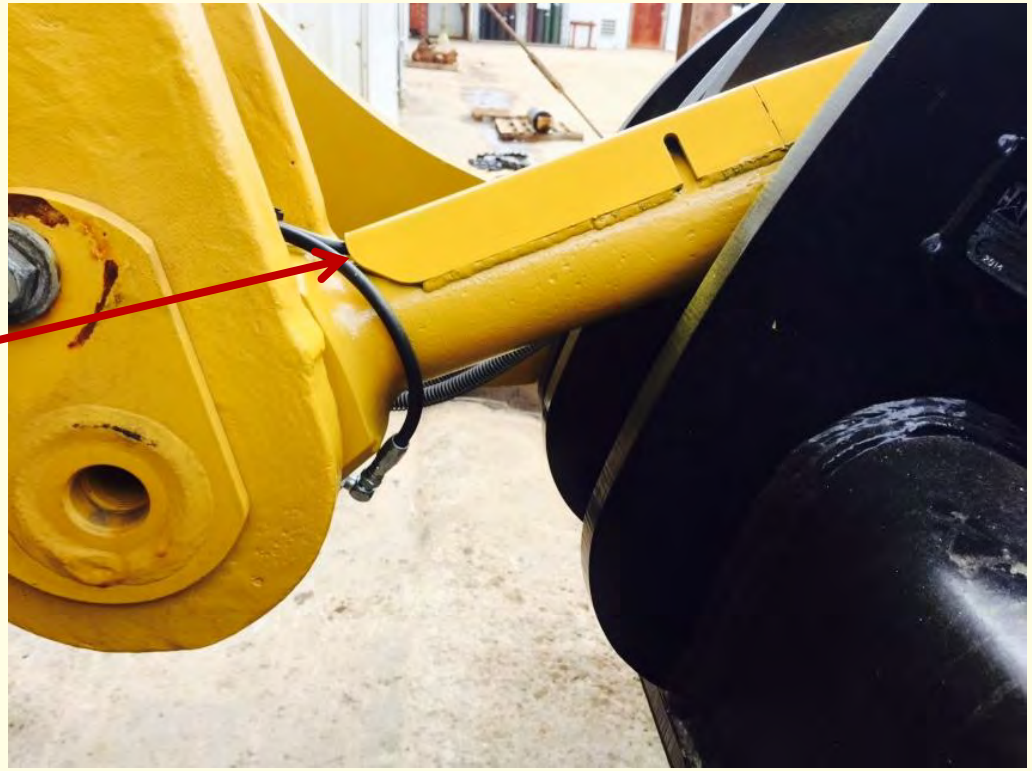
Note the clamp location and the very small amount of loop necessary for this articulation joint.

Detail of the lube lines at the Z-lever secondary. There are four (4) feed-lines and one supply line in this area.

Note the clean routing and the guard placement.

Detail of the lube lines on the Z-lever going to the Dog-bone.

It is essential that both of the dog-bone feed-lines come off of the back of the Z-lever and curl to the top of the dog-bone. The rear fitting will loop directly into the rear inlet. The front lube line will follow the same route and emerge at the top of the dog-bone and then pass through the guard to the front inlet.



Section VIII

Guarding:

Each and every lubrication system has specific needs for protection that require some sort of consideration be made for the security of the lube valves, lines, and fittings. Due to the nature of how the equipment is being used and the environment that it will be working in presents many challenges regarding protecting the critical system components. These challenges may require guarding that is either standard or custom fabricated. This section will cover the standard guarding used on this make and model to address the most common guarding considerations.

These considerations may include:

- Wet digging (water, mud, corrosion, etc…)
- Rocky digging (physical damage, abuse, etc…)
- Clearing (lines being torn off by branches)
- Burn piles (melted or damaged lines and valves)
- Dusty environments (fine dust that enters bearings quickly)

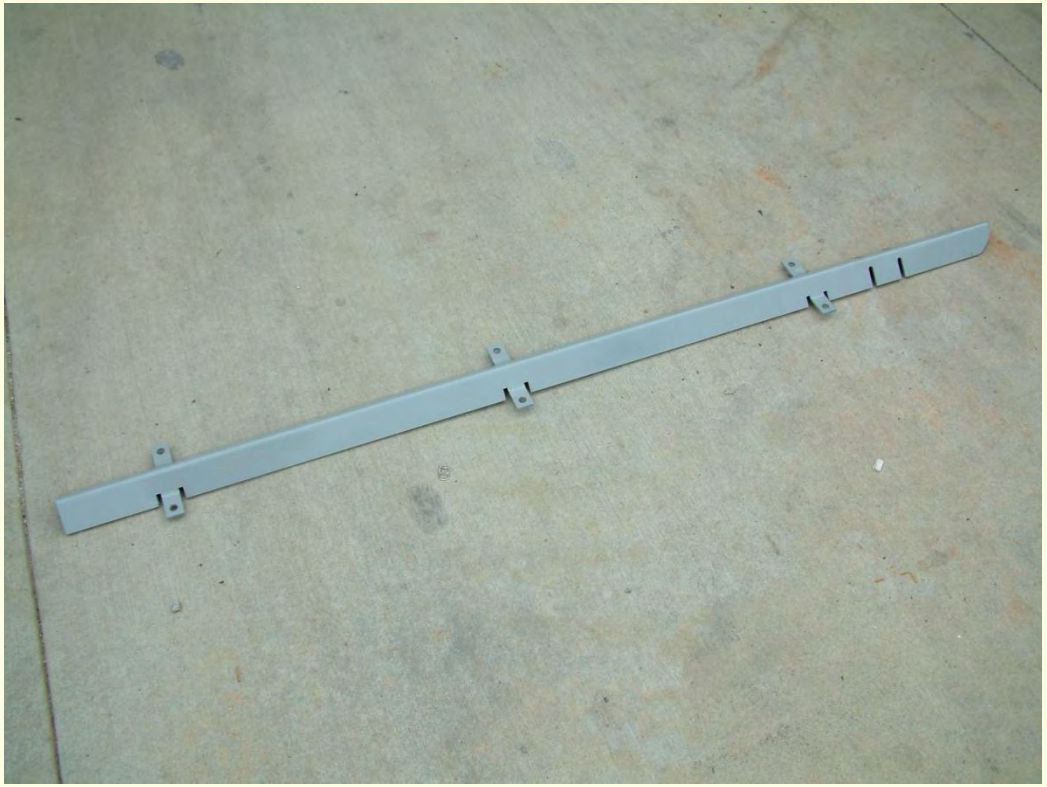
Caution: ***Improper or insufficient guarding are leading causes of internal warranties and customer call-backs. These arise from lube lines being broken prematurely due directly to guards not adequately covering the lube lines. At times, the guard can actually cause the lube line breakage due to interference with the lube line during articulation of the machine. Pay close attention to detail!!***

Caution: ***It is vital and imperative that a welding blanket be used at all times when welding on mobile equipment. Welding slag and splatter can permanently damage windshield glass, light lens, cylinder chrome, and plastic panels. Welding can also burn decals and large areas of painted surfaces requiring large-scale touch-up or re-paint.***

Pay close attention to detail!! ***Careless welding practices can cause high and significant damage claims by the customer or dealer.***

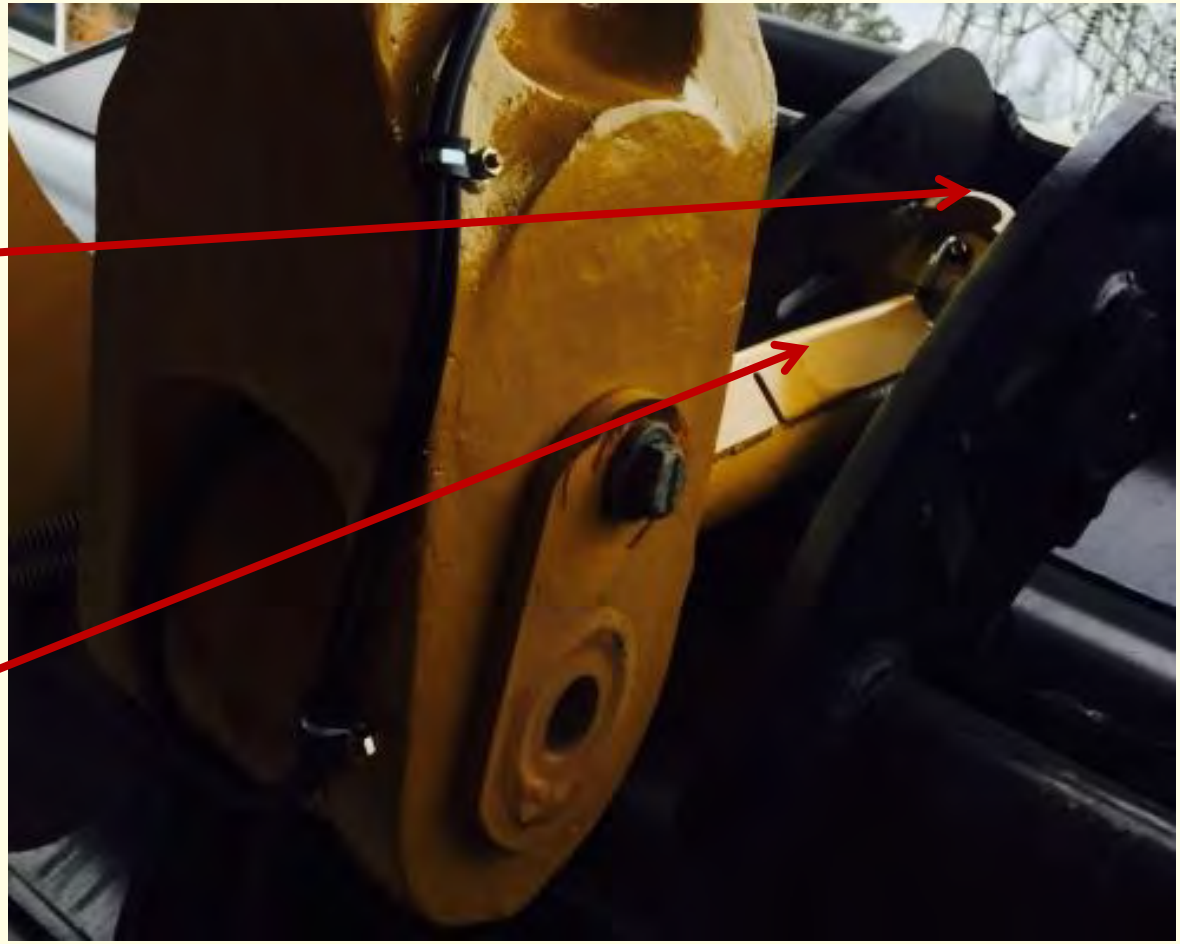
ALWAYS disconnect the battery or "Master Switch OFF" before welding!!!

Standard 60” guards will be used. They will be cut back to the first set of bolt tabs. This will leave the segmented potion of the guard for use as a guard on the dog-bones. (See further pictures)



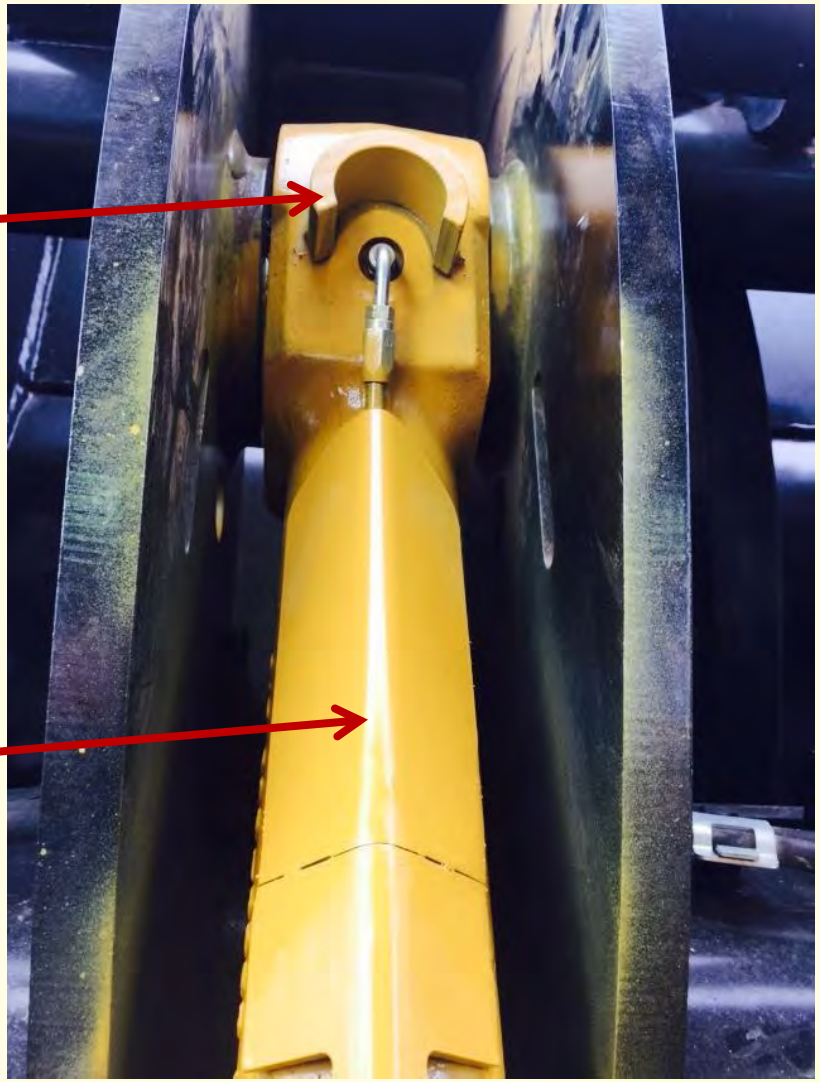
Turret Ring guard welded to the end of the Dog-bone.

Segmented ends of 60” guards are welded together to create a Dog-bone guard. Approximately 18” in length. This is welded directly to the top of the dog-bone.

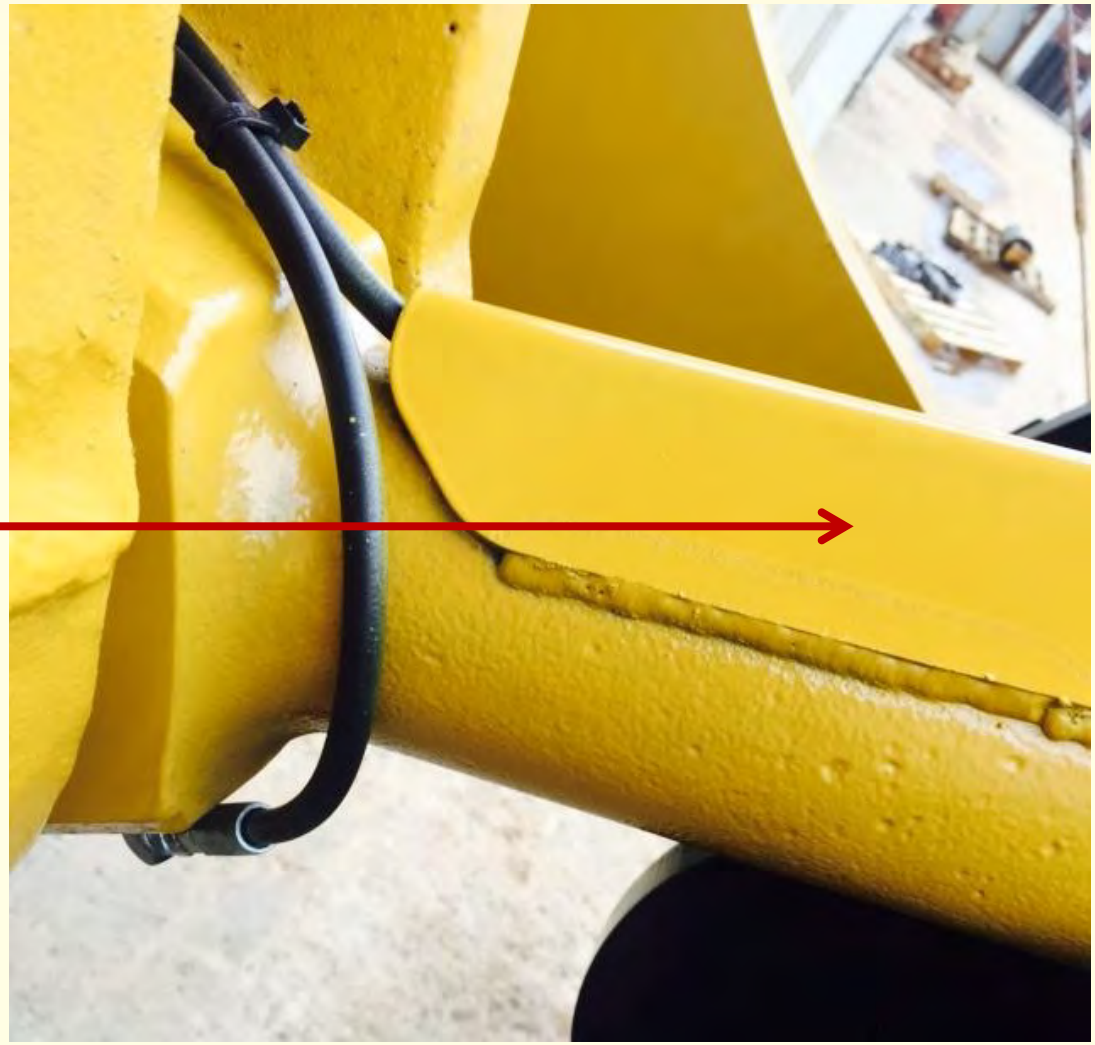


Turret Ring will be welded on the bucket end of the dog-bone to protect the lube inlet from damage. Only one required.

Segmented ends of 60” guards are welded together to create a Dog-bone guard. Approximately 18” in length. This is welded directly to the top of the dog-bone.



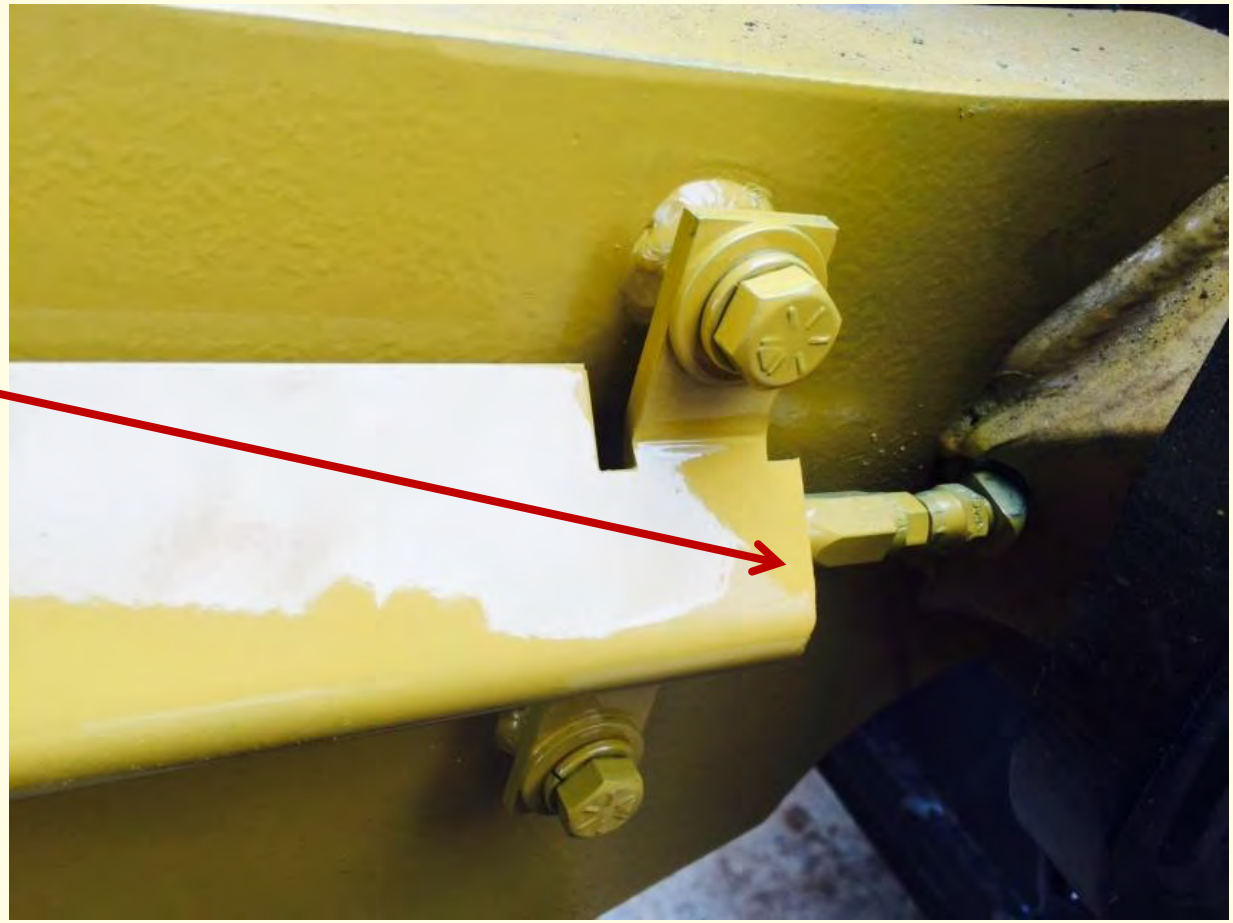
Segmented ends of 60” guards are welded together to create a Dog-bone guard.



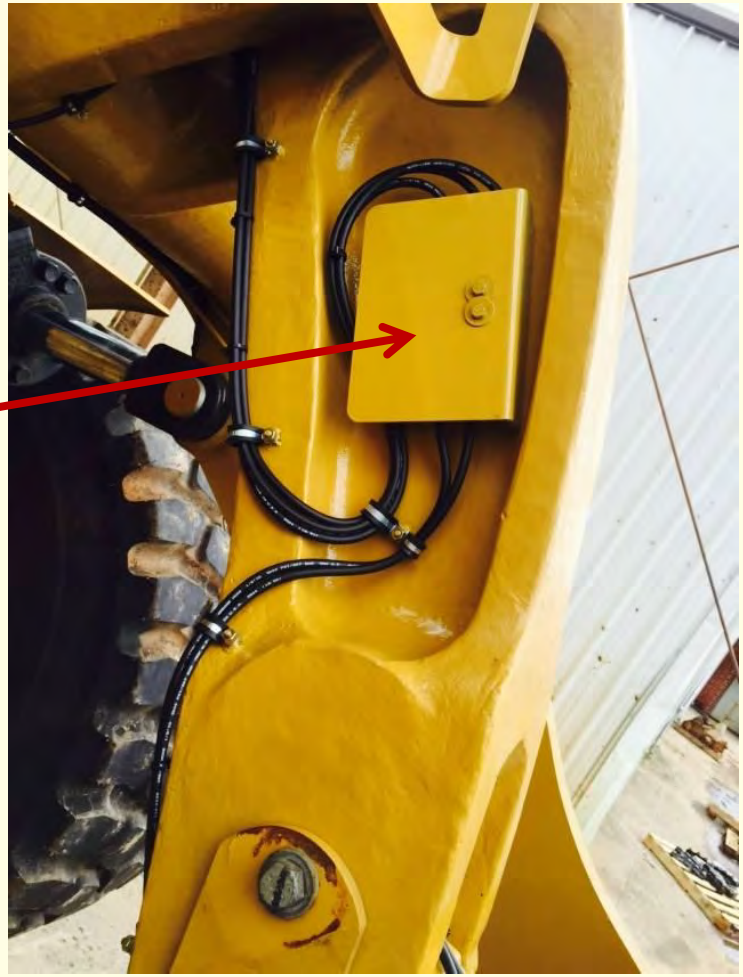
Completed guarding package showing Lift arm Guards and Dog-bone guard installed and painted

Right side of machine showing Boom Arm guard made from cutting a standard 60” guard. The nuts are welded to the machine as “bosses”. The bolts then attach the guard to the machine

The cut 60” guard will entirely cover the lube line up to the fitting. This will be left exposed for ease of service.



The Z-lever valve is welded to the inset of the bottom of the Z-Lever. It is protected from damage by the valve guard shown in this photo. This guard is assembled onto the valve and then final painted.



Turret Rings will be welded on the Lift cylinders to protect the lube inlet from damage. One for each side.

Section IX

Purging and Testing:

Once the lubrication system has been properly installed, it must be completely purged of air and contaminants with the proper lubricant. This process pre-fills all of the lines and valves in preparation for proper functioning of the lube system. It is also the procedure for finding and diagnosing problems that may exist with the system, its components, or the installation. This is one of the most critical steps in a proper and successful installation.

At this point, the purging must be done using a specific procedure. Any deviation from the procedure may result in a misdiagnosed problem or unsuccessful installation. The following steps must be done in order and to the full degree of completion.

Caution: ***Purging large amounts of air through a divider valve may cause the divider valve to quit working properly. The air can cause the valves to cycle very rapidly and cycle them out of sequence. Once out of sequence, the valve can only be repaired by disassembly and proper cycling with lubricant.***

Caution: ***The use of unauthorized or incorrect lubricants can cause the lubrication system not to function properly. Lubricants with NLGI ratings over #2 (#1 in cold weather) are too thick and will result in poor pumping performance and resulting "ER" message faults. Lubricants with Moly above 3% or total solid content above 5% will "clog" the system over time causing the pump and valves to seize during operation resulting in numerous faults. This may further result in the warranty being voided.***

Step-by-Step Purging Process:

1. Ensure that the system is completely assembled and all lines are terminated
2. Clean the grease gun before connecting to clear nozzle of contaminants
3. Disconnect the supply line from the pump; back purge supply line from primary valve.
4. Re-connect after purging
5. Disconnect all secondary supply lines from secondary valves. Purge supply lines from primary valve. Re-connect after purging.
6. Purge each secondary zone one at a time ensuring that the indicator pin moves freely
7. Once each valve (zone) is purged, wipe away any excess grease or mess.
8. After all valves and lines have been purged, walk around machine to inspect for leaks
9. Inspect the pressure relief for signs of over-pressure.
10. If any blockages or problems exist; refer to the Trouble-shooting section of this guide
11. Once the system has been successfully purged, the pump may be energized
12. Programming of the pump is handled in the “programming” section of this guide.
13. Initiate a manual lube event at the pump
14. Walk around the machine and inspect for proper functioning of the lube system while also verifying indicator pins cycling and the lack of any leaks
15. Once the system has been cycled “manually” for 6-8 cycles, the system must be run in “auto” mode.
16. Set the off-time timer to the minimum time setting (4 minutes). Allow the system to count down, cycle, and successfully reset.
17. Refer to the Trouble-shooting section of this guide for any problems
18. This successfully concludes the purging and testing part of the installation

Notice: Test the Machine!!

In order to successfully complete the installation, you must thoroughly test the machine. This means articulating the machine in every direction in order to find any instances where a line, guard, or component may be impacted, damaged, or removed. Once the line or component is damaged, it must be replaced, re-installed, and tested again. It is imperative to anticipate and slowly test areas where interference may be possible.

To best test the machine, first identify the areas where interference might be possible. Then, articulate the machine slowly and watch for impact or potential damage. Once this has been eliminated, inspect the machine again for any other areas where damage might have been undetected.

Section X

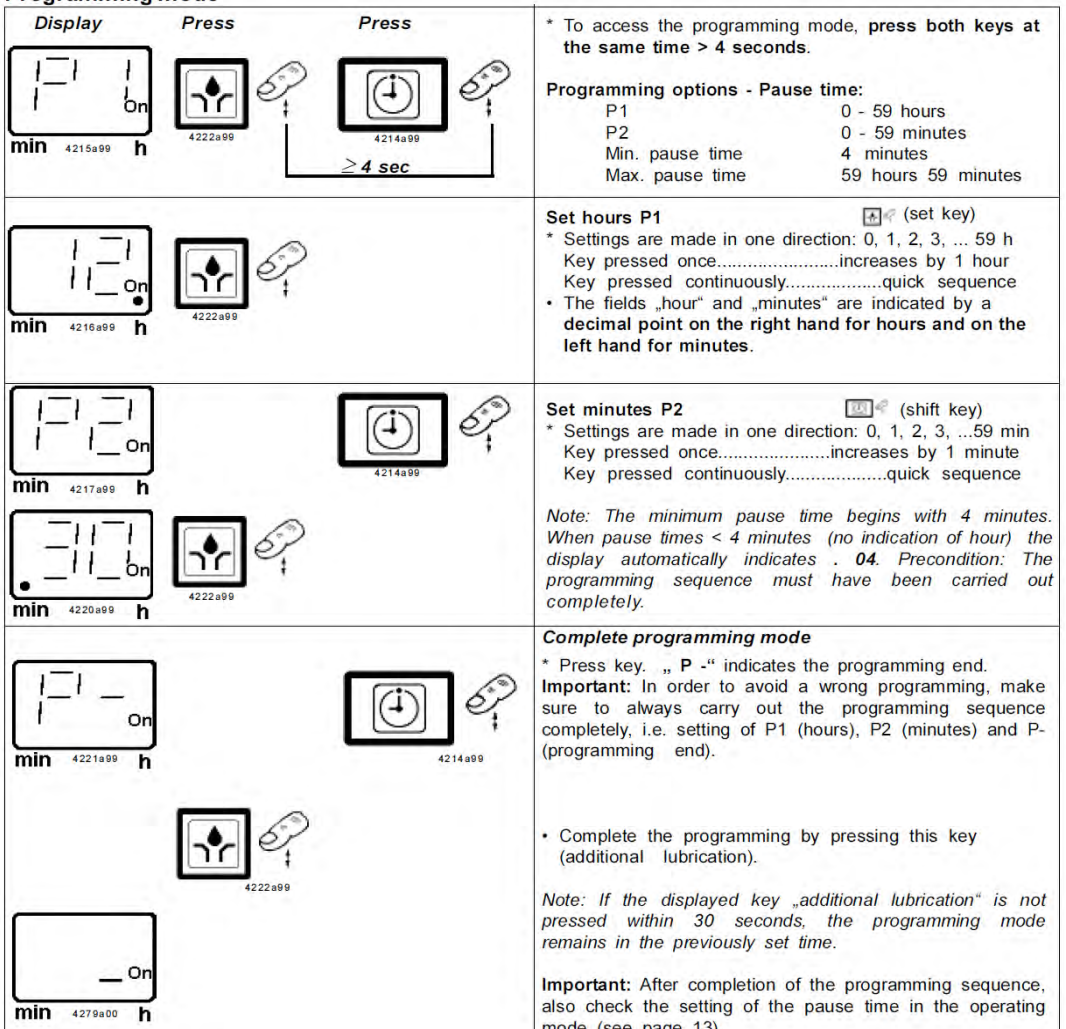
Programming:

The Lincoln Data-Logger #233 pump is a very simple unit to program. The pump uses the controller for off-time settings. The proximity switch (cycle switch) is used to set the “run” duration or portion of the lube event. The program allows you to adjust the off-time timer settings in minutes and hours, the number of cycles from the proximity switch before resetting the pump, and the style of fault contact closure desired.

Note: To fully understand the functioning of the lubrication system, refer to the system introduction covered in Section I of this Guide.

The next few pages of the guide give a detailed explanation of the programming function and sequence for the Lincoln #233 pump controller. For a quick reference or review of the proper programming for this make and model, refer to the last page of the section. Here, the quick reference guide will instruct you on the proper program that should be entered for this specific make and model.

Programming mode



* To access the programming mode, **press both keys at the same time > 4 seconds**.

Programming options - Pause time:

P1	0 - 59 hours
P2	0 - 59 minutes
Min. pause time	4 minutes
Max. pause time	59 hours 59 minutes

Set hours P1 (set key)

* Settings are made in one direction: 0, 1, 2, 3, ... 59 h
Key pressed once.....increases by 1 hour
Key pressed continuously.....quick sequence

• The fields „hour" and „minutes" are indicated by a **decimal point on the right hand for hours and on the left hand for minutes**.

Set minutes P2 (shift key)

* Settings are made in one direction: 0, 1, 2, 3, ...59 min
Key pressed once.....increases by 1 minute
Key pressed continuously.....quick sequence

*Note: The minimum pause time begins with 4 minutes. When pause times < 4 minutes (no indication of hour) the display automatically indicates . **04**. Precondition: The programming sequence must have been carried out completely.*

Complete programming mode

* Press key. „ **P -**" indicates the programming end.
Important: In order to avoid a wrong programming, make sure to always carry out the programming sequence completely, i.e. setting of P1 (hours), P2 (minutes) and P- (programming end).

• Complete the programming by pressing this key (additional lubrication).

Note: If the displayed key „additional lubrication" is not pressed within 30 seconds, the programming mode remains in the previously set time.

Important: After completion of the programming sequence, also check the setting of the pause time in the operating mode (see page 13).

Fig. 36 - Membrane key pad in programming mode

Display window of the membrane key pad

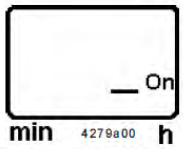


Fig. 23 - Green segment, pause time, voltage applied

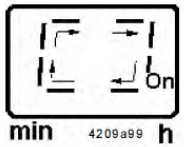


Fig. 24 - Green circulating illuminated segment, operating time

Fig. 25 - Key for triggering an additional lubrication

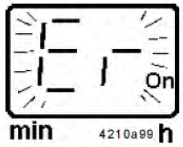


Fig. 26 - Display of a fault signal

- As soon as voltage is applied (On), the lower right-hand segment in the display window flashes (pause time runs).
- If the power supply is interrupted during the pause time, after switching it on again, the pause time continues at the point of interruption.

- During the operating time of the pump, a circulating illuminated segment appears in the display window of the membrane key pad.

- If the power supply is interrupted during the operating time, after switching it on again, the operating time continues at the point of interruption.

- ***Additional lubrication***

- is triggered via the key of fig. 25. Press key for more than 2 seconds.
- can be triggered at any time provided that voltage is applied.

Note: If a malfunction is present (flashing display), first acknowledge the malfunction, then trigger an additional lubrication (see fig. 28).

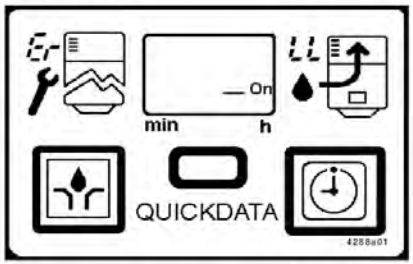
- If a fault signal (malfunction) is present, it will be cancelled whenever the system is operating properly.

Monitoring time/ malfunction

- If there is no feedback from the piston detector (initiator) within **30 minutes** (monitoring time) from completion of the pause time or from triggering an additional lubrication, the pump switches off immediately. The fault signal * **Er** * (error) is displayed as a flashing light in the display of the membrane key pad.

- **If a malfunction is present, the pump does not switch on automatically any longer.**

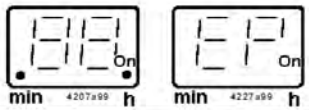
Display mode



- As soon as voltage is applied to pump P 233, the control is automatically in the **display mode.** The **right segment** on the display is illuminated (On).
- Normally, the display is dark. Only the functions (segment, circulating segment display) or malfunctions (" Er ", or " LL ") appear illuminated in the display.

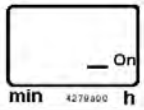
- **Display mode**

- Here the user receives information on functions and malfunctions of pump P 233.



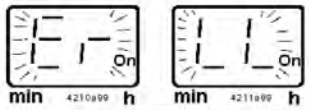
- A test display is made when the voltage is applied, all segments are illuminated for 2 seconds.

*Note: If * EP * is displayed after the display test, this indicates that keys of the membrane key pad are defective.*



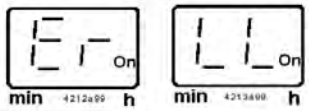
- The right-hand segment (On/h) indicates the available voltage supply during the pause time. As soon as another message is displayed, the segment turns off.

- The operating time is displayed as a circulating segment.



- **Er** * is displayed as a flashing indication for a malfunction.
- * **LL*** is displayed as a flashing indication for a low level.

- The flashing display is changed into a continuous light by pressing this key **(acknowledging)**.
To **acknowledge,** press the key only briefly (less than 2 seconds).



- Signals which have been acknowledged but have not yet been remedied, flash again after the pump has been switched off and on again.

Fig. 34 - Membrane key pad in display mode

Operating mode

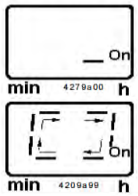
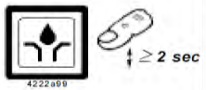
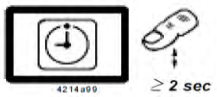
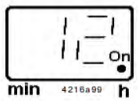
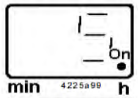
Display	Press	
		**Important:** The operating mode is accesible only during the pause time and cannot be operated during the running time (pump operating time). • Precondition: When the voltage supply is applied, the segment (On/h) is lit. **Operating option: Trigger an additional lube cycle** * Press this key. The pause time already elapsed is reset. The operating time starts. A circulating segment is visible on the display during the whole operating time.
		**Operating option: Read information on how to set the pause time and remaining pause time.** * Press this key. *Note: The following display sequence is shown **twice** and is cancelled after 60 seconds. The change of display occurs every two seconds. Example:* ***PP = 12h 30min*** ***rP = 5 h 10 min*** „ **PP** “ (set pause time) **12 .** (hours)
	*after 2 sec.*	**. 30** (minutes)
	*after 2 sec.*	„ **rP** “ (remaining pause time)
	*after 2 sec.*	**5 .** (hours)
	*after 2 sec.*	**. 10** (minutes)
	*after 60 sec.*	occurs after second sequence

Fig. 35 - Membrane key pad in operating mode

Programming Quick Reference Sheet

1. Press and Hold red & green buttons until “P1” appears
2. “P1” is “hours” of Off-time. ***Set value at “0”***
3. Press green button to change value, or red button to move to next page
4. “P2” is “minutes” of Off-time. ***Set value at “ “***
5. “P3” is the # of cycles per lube event. ***Set value at “1”***
6. “P4” is the switching of the alarm contact. ***Set value to “NO” for normally open***
7. At the “P-” symbol, press ***green*** button to save program and enter “run” mode.
8. Press and hold ***green*** button for 4 seconds to initiate a manual lube cycle and diagnostic test

Note: The system alarm time, the time the pump will run waiting for the programmed number of cycles switch counts to be satisfied, is fixed at 30 minutes at the factory. After 30 minutes without the pre-determined number of cycle counts, the system will go into “ER” fault. This cannot be changed within the program.

Section XI

Trouble-Shooting:

The QuickLub system, like any machine, can and will have issues and malfunctions. These malfunctions are detected by the system during its normal diagnostic checks. These checks occur during the normal operations of the system. Any condition that causes a break in the normal operation of the system will result in a fault condition occurring. During a fault , the system will suspend normal operation until the fault is remedied and the fault is cleared.

While in fault, the system can be run manually using the “green” pushbutton on the keypad to initiate a manual lube event. This can be done for any fault at any time. However, if the fault cause is not remedied, the fault condition will return during the operating cycle. The system will not run automatically until this condition is remedied.

Discovering the cause of the fault can be rather difficult depending upon what type of fault exists. Certain faults cannot be fixed in the field and require the pump be sent in for rebuild. In the case of a low-level or “LL” fault, the solution is intuitive and can be easily fixed. As it usually is caused by lack of grease in the reservoir, refilling the reservoir and acknowledging the fault is the remedy.

An “ER” fault, on the other hand, is a much more complex situation that can have a multitude of causes. If the correct cause is not identified, the system will continue to perform inadequately. For the purposes of this manual, we will focus mostly on the “ER” fault.

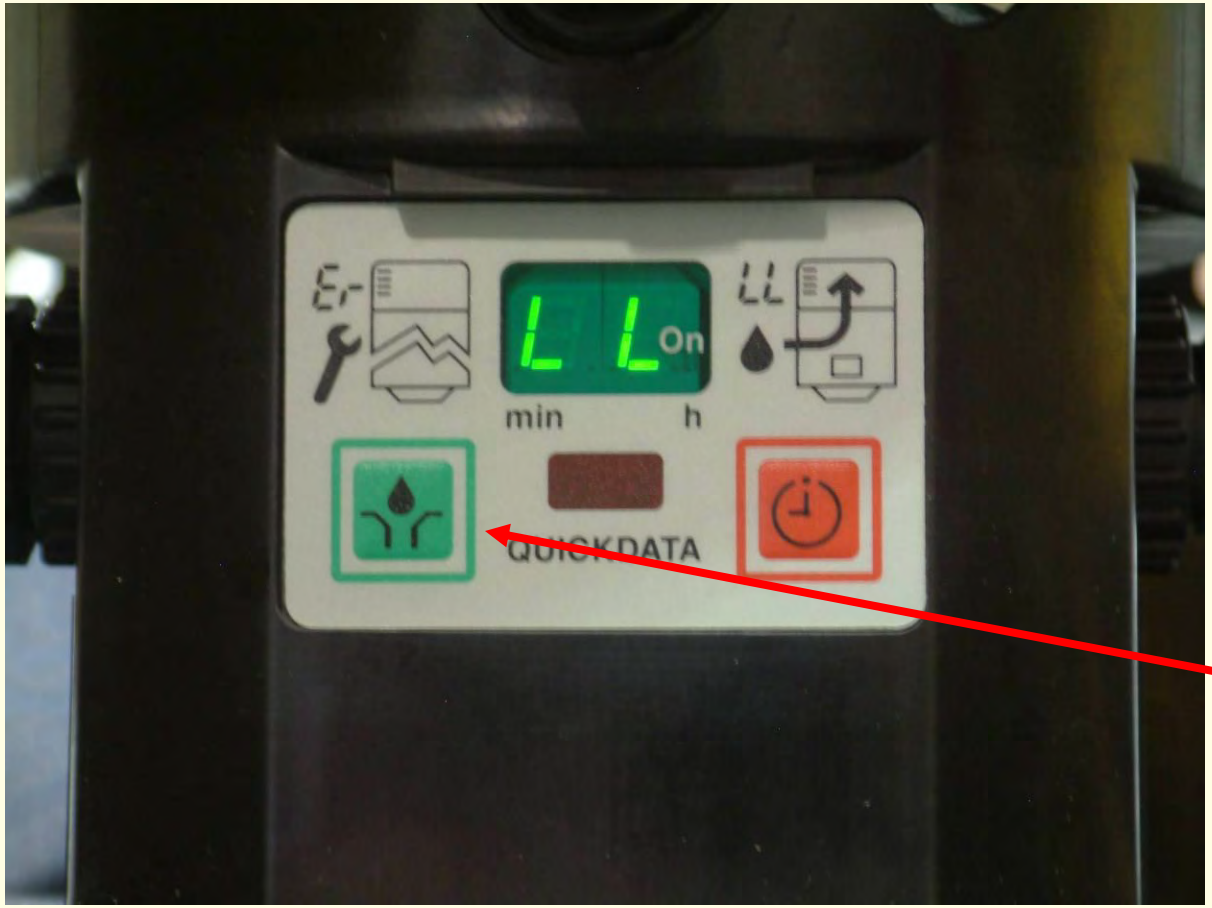
Typical error messages that will be shown on the Lincoln #233 Data-Logger pump display. These will be the fault indications during a lube system error or malfunction

Data logger (data memory)

- Malfunctions (start, end, duration) in the centralized lubrication system, faults in the elapse of the operating time, low-level indications (start, end, duration), number of connections and disconnections of the power supply, automatically triggered lube cycles, manually triggered lube cycles, operating data and customer-related data can be read and analyzed via laptop, see below diagnostic software „QuickData".

- Functions, processes, settings, faults or malfunctions of the pump and the system are indicated on the membrane key pad as follows, also see below: Adjustment and Operation of the Control:

Pump 233:	**Membrane key pad:**	**System:**	**Membrane key pad:**
Failure in the power supply	No indication	Lubrication point or divider valve blocked	Er
Power supply ON	Right segment illuminated	Leakage in the main line from the pump to the monitored divider valve	Er
Failure in the membrane key pad	EP	Air entrapments in the grease	Er
Operating time elapses	Circulating segment	Failure in one lube cycle (depending on the installation of the monitored divider valve).	Er
Pump element does not dispense	Er		
Reservoir empty *Note: The fault indication „LL" appears whenever the solenoid fixed to the stir-ring paddle has passed the proximity switch six times . Appearing „LL" on the display, the lubrication cycle is being completed fully. Afterwards, the control does not switch the pump on automatically any longer.*	LL		
Pause time Residual pause time	PP rP		



“LL” flashing in display indicates low level in grease reservoir.

Corrective Action:
Refill reservoir, push and hold green button on pump for 4 seconds to clear the fault.

E R flashes in display when the pump fails to receive the correct number of cycle counts from the proximity switch within the 30 minute alarm time. This may be caused by one of the following:

- **Plugged lube line**
- **Bearing not taking grease**
- **Faulty Pump**
- **Faulty Proximity Switch**
- **Leaks**
- **Trash in the Valve(s)**
- **Bad pump element**
- **Air in the system**
- **Air in the reservoir**
- **Incorrectly installed hose fitting**
- **Faulty pressure relief**

Corrective Action:

- Cycle each valve at grease fitting to find blocked line and repair blockage.
- If all valves cycle properly, check output of pump element, if insufficient replace element.
- Check proximity switch wire and proximity switch operation. The indicator light on the proximity switch is a visual cue to its proper functioning

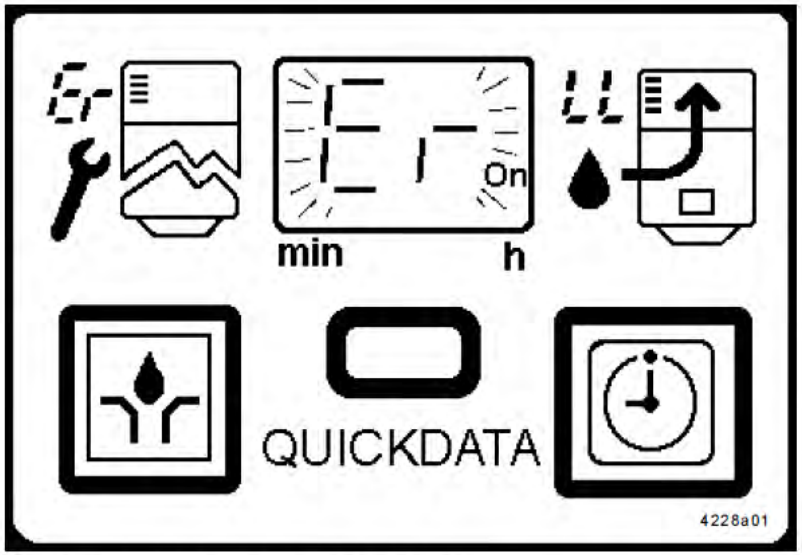


Fig. 27 - Membrane key pad with fault signal

- In this case, switch on the pump by pressing the key for additional lubrication (fig. 25). Acknowledge the malfunction before doing so.
- When a malfunction is present, it can only be cancelled by triggering an additional lubrication and after a proper lubrication cycle has been executed.
- If the fault is still present after an additional lube cycle has been triggered, the fault signal * **ER** * is again displayed in the display of the membrane key pad.
- The monitoring time starts at the same time as the operating time. It is a fixed time of 30 minutes.
- If the voltage supply is interrupted during the monitoring phase (operating time), the monitoring time starts from the beginning after the pump has been switched on again.

Acknowledging the malfunction

- On pressing the key (fig. 28), the flashing display * **Er** * changes into a continuous light.
- An external signal lamp switches off.

Note: The pump will never clear its own faults. It will not resume normal operation until the fault is cleared. The pump must be run through a "manual" cycle in order for it to run its diagnostic check and "clear" the fault.

Fig. 28 - Acknowledging a flashing fault signal „Er"

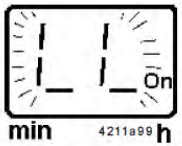


Fig. 29 - Display of a low-level indication

Fig. 30 - Acknowledging a flashing fault signal „LL"

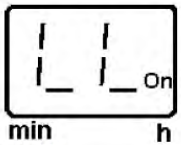


Fig. 31 - Acknowledged fault signal „LL"

Low-level indication

- When the reservoir is empty the display on the membrane key pad shows the flashing fault signal *LL *.
- The function of the low-level control is described on page 17.
- In the case of a low-level indication the pump does not switch off immediately. The current lube cycle is completed. Upon expiration of the pause time, the pump cannot be started automatically again. The flashing indication * LL* appears on the display of the membrane key pad (fig. 29).
- * Before filling the reservoir, press the key, fig. 30, to acknowledge the low-level indication.
- * Fill pump and trigger additional lubrication. As soon as the additional lube cycle has been triggered, the „ LL " display is cancelled. The automatic lube cycle resumes.

Acknowleding the low-level indication

- By pressing the key (fig. 30) the flashing light * LL * is changed into a continuous light (fig. 31).
- An external signal lamp switches off.

Malfunction/ low-level indication

- If both indications occur at the same time, then both displays * Er * and * LL* will flash alternately.

Monitoring relay (on the control p.c.b.)

- The monitoring relay signalizes a low-level indication or a malfunction. In both cases, the monitoring relay will pick up. Via a minus potential contact, a signal lamp can be used as external fault indication which has to be switched against plus. Whenever the fault indication is acknowledged, the flashing indication switches to a continuous indication.

Note: If the fault has not been put in order properly, after switching the pump off and on, an acknowledged fault/ low-level indication will appear as a flashing indication in the display window again.

Pressure relief functioning. Typically, the pressure relief is preset at the factory at around 3,800psi. However, the relief can be adjusted in the field by removing the rubber cap and adjusting the socket head screw underneath to increase the pressure threshold.

Pressure Relief Valve

Fig. 14 - Pressure relief valve

Pressure relief valve without grease return

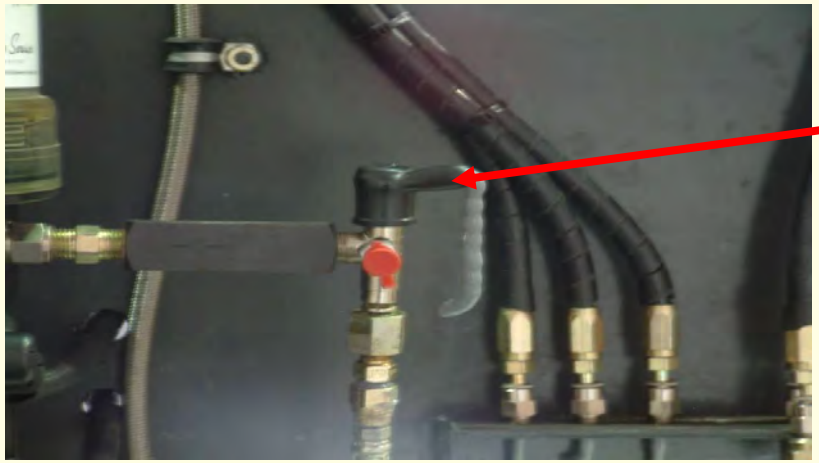
Important! Each pump element must be secured with a pressure relief valve.

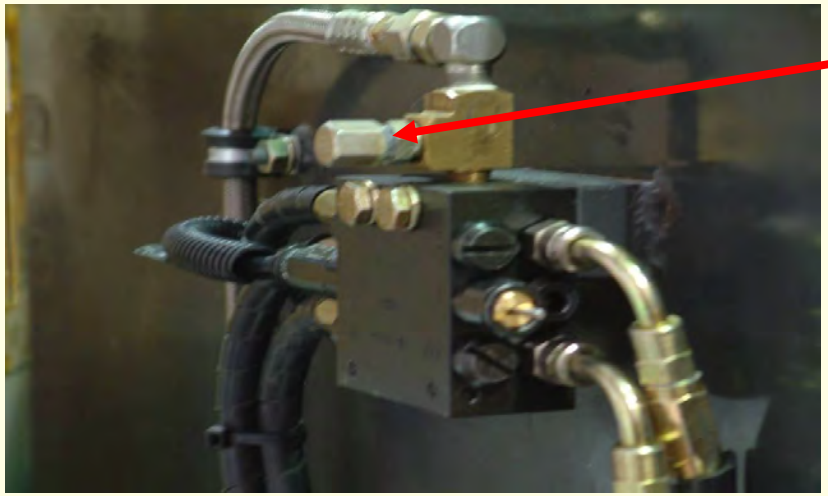
- The pressure relief valve
  - limits the pressure build-up in the system
  - opens when the respective overpressure is reached.
  - must be selected according to the requirements of the lubrication system (see different opening pressures: 200, 270, 350 bar).
- If lubricant is leaking at the pressure relief valve, this indicates a malfunction in the centralized lubrication system or the lubrication point.

Note: There may arise a longer time delay between a malfunction (blockage) and the consequential fault indication (lubricant leakage; monitory: flashing display of „Er" on the membrane key pad).

The duration of the delay depends on the type of line, the line lengths, the type of lubricant, the ambient temperature and other influences.

- Despite the existing failure monitory, carry out a visual control as well as a function control in regular intervals.





Grease coming from pressure relief indicates a blockage in the system. This can be due to several factors, including a faulty pressure relief.

Corrective Action:

Manually cycle valves at grease fitting to find location of blockage.

Repair blockage or re-adjust/replace pressure relief. Manually cycle again to check.

Monitoring time

Note: Only one lubrication cycle can be monitored.

- A fixed **monitoring time** of a maximum of 30 minutes runs in parallel to the operating time.

Note: Normally, the monitoring time ends at the same time as the operating time.

- If there is **no switching off signal** from the piston detector (fig. 20) to the printed circuit board within 30 minutes **a fault signal** will occur (see Display of the membrane key pad).
- An external **signal lamp** flashes **continuously** in case of a fault.

Note: this is the only reason for the "ER" message. While there are a multitude of causes for this condition. The pump generates the "ER" fault simply because it did not receive the cycle signal from the proximity switch within this 30 minute monitoring or alarm time.

Trouble-Shooting the "ER" Fault:

While the meaning of the "ER" fault is very simple. The causes can be very complex and misleading. This, oftentimes, leads to it being misdiagnosed resulting in a return trip and/or an unresolved fault condition. This fault condition continues to confuse and complicate trouble-shooting measures on both new and old installations.

The purpose of this section is to describe the "ONE" correct method of trouble-shooting this fault condition. The goal here being to quickly identify the correct cause through a process of elimination. This process will identify the cause by eliminating possible culprits one at a time. As this process proceeds, the cause will become obvious to even the relatively untrained mechanic.

Taking this process out of order or proceeding only partially **WILL** result in an improperly diagnosed fault cause and an unresolved fault condition. You **MUST** follow these steps through to the cause. There are no short-cuts.

In most cases, the "ER" fault, while a system fault, is created by something wrong with the machine or a lubricant problem. Stay patient, by generating the fault, the system is doing its job. Through the process, the system will tell you and lead you to the problem. ***Patience is Key!!!***

Trouble-Shooting the "ER" Fault: A Step-by-Step Guide

Step 1: Look at the pressure relief. Is Grease coming out? If yes, go to **Step 9.** If no, go to **Step 2**

Step 2: If no grease is at pressure relief, disconnect main grease line at pressure relief and manually cycle the pump. If no grease check the reservoir for air and proceed to **Step 3.** If there is grease coming out, proceed to **Step 4**

Step 3: If reservoir is full with appropriate grease, verify that the pump is running. If not, check check ground and voltage to pump. Next, remove and inspect pump element. Replace the pump element if necessary. Reconnect and run system

Step 4: If grease is being pumped out, check the pressure with a pressure gauge. Another method is to hold your finger over the output of the pump element. If you "feel" the grease being dispensed but "sucked" back in, the element is bad. Replace the element, reconnect the system, and test.

Step 5: If the element tests fine, the problem is not a blockage. That would cause the relief to discharge. Verify, at this point, that the system is physically cycling. The problem surrounds the pump receiving the signal from the proximity switch. Verify, at the pump, that the proximity wire is firmly connected. Next, trace the proximity wire to the switch. Inspect for frays, breaks, or cuts. Repair as necessary.

Step 6: If wire is fine, run the system manually and inspect the proximity switch indicator light. The light will turn on and off as the valve cycles. If the valve cycles, but the switch light does not, replace the proximity switch. If the light does cycle with the valve, the problem may then either be the PCB board in the pump or the proximity switch.

Trouble-Shooting the "ER" Fault: A Step-by-Step Guide

Step 7: First, remove the proximity switch from the valve. Cycle the pump manually. Use an Allen key to actuate the proximity switch. As you slowly insert the Allen key, verify that the light turns on and off. If the pump shuts off, the problem is not the pump or the switch, but the valve. IMPORTANT – the proximity switch must not be installed in the outlets furthest from the valve inlet. This will short stroke the switch and cause a fault. Otherwise, make sure that the switch is installed correctly in the valve. Change the valve as needed.

Step 8: If the pump does not shut off, the problem is on the PCB board. Replace the PCB board in the pump. Test the system.

Step 9: Grease coming out of the pressure relief indicates a system restriction. Cycle each secondary valve with a grease gun. Do not do this with a pneumatic gun as you will not be able to "feel" the resistance in each line. Do not try to cycle the primary valve as grease will only come out of the pressure relief confirming what you already know. As you test each valve, you will encounter one valve that either does not cycle, or cycles with a great amount of resistance. Remember – the pressure relief is set at 3,800 psi. Anything over that pressure will cause it to discharge.

Step 10: Now that you have identified the blocked or "slow" valve, you have to determine the cause. Inspect all of the outlet lines from that valve. Look for the one that is under back-pressure. It will be extended and will not "wiggle" in the outlet coupling.

Step 11: Once you have identified the line with the restriction, disconnect it from the bearing. Cycle the system again. If OK, the bearing is the issue. If not, go to **Step 12.**

Trouble-Shooting the "ER" Fault: A Step-by-Step Guide

Step 12: If the line is still blocked, reconnect the line to the bearing. Disconnect the same line at the valve and cycle again. If OK, the line is the problem. Repair or replace as necessary. Test the system

Step 13: If the blockage remains, disconnect all lube lines from the valve. Manually cycle the valve. If still blocked, the problem is the valve. Replace valve and test.

Step 14: If the valve was the culprit, the cause may still not be known. Inspect the lube valve Look for signs of contamination. If yes, inspect all other valves and purge system again to clear contaminants. Also, check the reservoir for contamination.

Step 15: If no contamination is evident, inspect the valve for incorrect fittings. An incorrect inlet installed in a valve outlet can cause a bypass that can "fool" a proximity switch. If yes to incorrect fittings, check all other valves in the system.

Step 16: If in the course of the trouble-shooting, no blockage or restriction was found then, and only then, should the pressure relief be the suspected cause. Re-adjust or replace as necessary.

Note: there is only one reason for the "ER" message. While there are a multitude of causes for this condition. The pump generates the "ER" fault simply because it did not receive the cycle signal from the proximity switch within the 30 minute monitoring or alarm time.

Trouble-Shooting the "ER" Fault: A Step-by-Step Guide

Important!!

"ER" faults can be caused by a multitude of reasons. Sometimes, phantom faults can occur on cold mornings or evenings when the grease viscosity increases with dropping temperatures. This causes the system pressure to increase above the setting on the pressure relief. Other times, a fault may occur in winter due to the grease being too high a viscosity. It is always recommended that the customer switch from NLGI #2 to NLGI#1 during winter months.

Important!!

"ER" faults can be caused by contamination. Removing a reservoir lid for filling or using improper filling techniques can allow contamination to enter the system. The use of greases with MOLY contents higher than 3% or solid contents higher than 5% can cause blockages as these concentrations react with the system the same as contaminants. The result will be an "ER" fault due to contamination

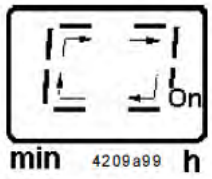
Contamination Control: Proper Reservoir Filling

- Always fill the reservoir from the included fill port.
- Always clean the nozzle before filling the reservoir
- Always completely fill the reservoir until grease comes out the over-flow tube
- Never half or partially fill the reservoir
- Never allow the reservoir to run out of grease
- Always maintain high level in the reservoir. Fill the reservoir often.
- Never remove the reservoir to fill it
- Never fill the reservoir with grease combined from two or more “empty” drums
- Never pump air into the reservoir.
- If possible, try to cycle the pump at least once while filling to mix the grease
- Never combine one or more different types of grease in the reservoir
- Never make a “top fill” port on a lidless reservoir.

Further Trouble-shooting Considerations and Hints

Troubleshooting

Pump 233



- The circulating segment in the display of the membrane key pad indicates that the pump operates properly.

• **Fault: Pump motor does not run; stirring paddle does not turn**	
• **Cause:**	• **Remedy:**
• Power supply interrupted. Segment display for On/h is not lit.	* Check the voltage supply to the pump/ fuses. If necessary, eliminate the fault or replace the fuses. * Check the feed line from the fuses to the plug of the pump and then to the printed circuit board.
• Power supply from printed circuit board to motor interrupted. Electric motor defective.	* Trigger an additional lube cycle. Check voltage supply from the p.c.b. to the motor, if necessary replace motor.
• Printed circuit board defective. • Key on membrane key pad defective.	* Replace p.c.b. * *EP* display is lit. Replace housing and membrane key pad.

• **Fault: Pump does not deliver lubricant**	
• **Cause:**	• **Remedy:**
• Reservoir empty. * **LL** * display on the membrane key pad is flashing. • Pump does not deliver lubricant and ***Er** * display on the membrane key pad is flashing.	* Fill up the reservoir with clean grease. Let the pump run (trigger additional lube cycle) until the lubricant shows at all lube points. *NOTE: Dependent on the ambient temperature and/ or type of lubricant. the pump element needs a longer run time to reach the full output capacity. Therefore, trigger several additional lube cycles.*
• Air pockets in the lubricant.	* Trigger several additional lube cycles. Lubricant must be dispensed without air bubbles (towards the lube point).
• Improper lubricant has been used. • Suction hole of pump element clogged.	* Change lubricant. Consider table of lubricants. * Remove pump element. Check suction hole for foreign particles. If there are any, remove them.
• Pump piston is worn.	* Replace pump element.
• Check valve in pump element defective or clogged.	* Replace pump element.
• **Pump motor does not stop dispensing (30 minutes monitoring time)**	
• **Cause:**	• **Remedy:**
• Piston detector (initiator) defective.	* Remove main line towards the monitored divider valve.
• Blockage in the system	* Unscrew and check piston detector by introducing a **iron pin** into the borehole of the detector, **maintain it there for more than 2 seconds and pull out again.** If then the pump switches off, a blockage may exist; if the pump does not switch off, check cable connections towards the pump. If necessary, replace piston detector with connecting plug.
• Cable connections from the piston detector towards the pump interrupted. • Printed circuit board defective.	* Check cable connections towards pump. If necessary, replace piston detector with connecting plug. * Exchange printed circuit board.

Replace the pump element

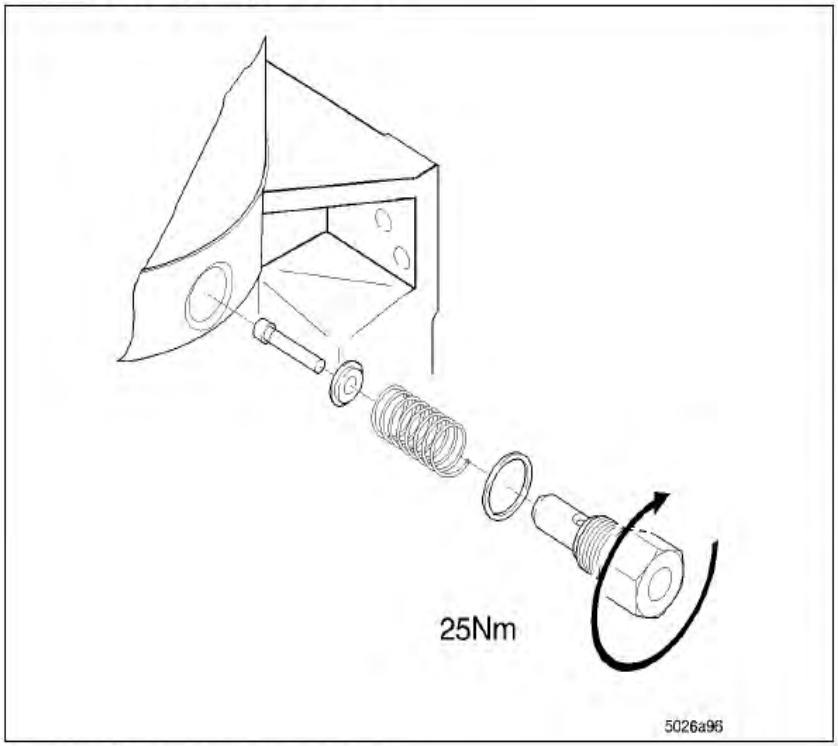


Fig. 38 - Replacing the pump element

* Remove the pressure relief valve from the pump element.
* Unscrew the pump element. Take care that the piston, the pull-back spring and the washer are not left lying in the grease, otherwise the reservoir must be disassembled in order to remove these pieces.

Important: Do not leave the piston, spring and washer in the housing because they may block the motor.

* Install a new pump element and a new sealing ring. Make sure that only **one** sealing ring is installed below the pump element.

Note: Pump element with adjustable lubricant output must be set to the corresponding output.

Note: The pump element should be replaced only after verifying that it is indeed bad. A pressure gauge or a timer can assist with this diagnosis. Be aware that low pressure can be an indication of valve bypass or a leak as well. Also note that a long cycle time can be caused by leaks, improper lubricant, and cold temperatures. **Do the proper trouble-shooting!!**

Section XII

Additional Information:

When mounting a pump behind the cab of any machine, leave enough room for the operator to break the glass and escape from the cab in the event of an emergency.

The back glass on all Operator cabs are Escape Hatches for the purposes of an Emergency Exit!

Contacts:

Auto-Lube Services, Inc.
4148 Pecan Street
P.O. Box 639
Loganville, GA 30052
Ph: (678) 639-0099
www.autolubeservicesinc.com