333512A

Mobile Lubrication Library

Yellow Iron Lubrication System Installation Guidelines

Guidelines for installing an automatic lubrication system on Yellow Iron equipment.

Maximum System Working Pressure: 2750 psi (18.96 MPa, 189.6 bar)

Important Safety Information
Read all warnings and Guidelines in all Graco related component manuals. Save all Guidelines.

Related Graco Component Manuals*	
Manual No.	**Manual Title**
332514	Dyna-Star Pump
332291	G3 Pump
332960	GLC2200 Controller
308953	GL-1 Injectors
307273	Fluid Outlet Filter
312497	MSP Divider Valves
3A3159	Instructions for Installing a Swivel Fitting on the End of a Hose

**Refer to these instruction manuals for additional information related to the installation and operation of system components.*

WARNING

FLUID INJECTION HAZARD

Fluid leaks from incorrectly installed or ruptured components, and/or failure to verify the components are properly installed and tested, can result in serious injury such as fluid spraying in the eyes or on skin and fluid injection, or equipment damage. Installation must be done by a qualified professional or Komatsu certified technician and tested prior to use.

The information contained in this document is only a recommendation for an automatic lubrication system and is not intended to replace the installation and maintenance instructions provided by the original equipment manufacturer.

Table of Contents

Before You Start

The information contained in this document is provided for reference only.

⚠WARNING

Before installing any equipment:

- Familiarize yourself with all warnings and guidelines specific to the machinery.
- Review all warnings provided in the Graco instruction manuals provided with the equipment.
- Be sure all power to the machine is off including, when applicable, disconnecting the main power breaker.
- Follow all grounding procedures.
- All safety and protective equipment must be worn.
- Installation must be completed by trained and qualified personnel.

Installation Notes

Do not use PTFE tape on fitting threads. Liquid pipe sealant is recommended for use in lubrication systems to eliminate the potential for contamination. If you must use PTFE tape, always skip the first two threads on the fitting.

NOTE: *Photographs may include optional equipment.*

Welding and Weld Studs

Welding Guidelines

- Turn off Master Power Switch.
- To ensure the structural integrity of the equipment, weld studs should only be used when already existing routing paths on the equipment are not available. Whenever possible, use the path of factory-installed electrical or hydraulic lines.
- Do not weld to the cab or to areas that would affect the Roll-Over Protection Structures (ROPS), Falling-Object Protective Structures (FOPS), or Operator Protective Guards (OPG).

NOTICE
Welding on or drilling into structures that are certified ROPS, FOPS or OPG, invalidates the certifications.

- Avoid welding near any existing factory weld joints.
- Make sure any welding done is at least 2 inches from any edge, mating surface or existing factory weld.
- Avoid welding near any main pivot point, bearing, or bushing which carries a load or articulates on the machine.
- Avoid welding on any part of the equipment deemed “lifetime reliable”, critical, or noted as non-replaceable.
- Weld only in areas accessible from the outside of the machine. Welding inside the machine can cause further issues should damage occur to OEM equipment due to sparks and slag particulate falling during the welding process.

Graco offers hoses, fittings, guarding, and accessories to ensure proper product selection and to aid in streamlining the installation process. See your ILE Buyers Guide for product information.

- ***Weld studs - used for mounting anchors (FIG. 1), p-clamps (FIG. 2) and metal guarding (FIG. 3).***

  See Welding Guidelines.

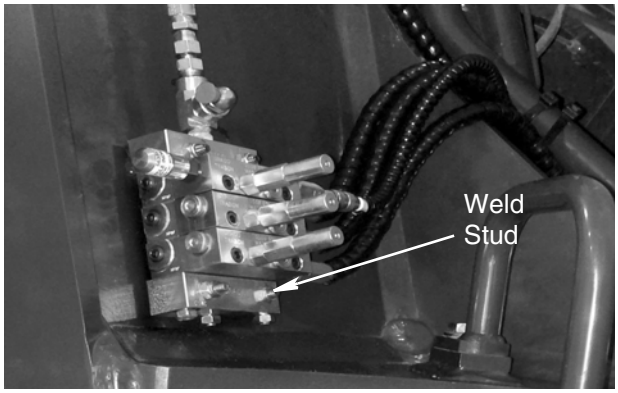

FIG. 1: Weld Stud Anchor

- ***Fitting anchors*** are also commonly used in the routing of hoses to aid in protection, add durability to damage prone areas, and/or to section the lengths of grease hoses should a hose become compromised and need replacing. In the event fitting anchors are the only option, be sure to follow the Welding Guidelines provided on page 3. Anchors can be purchased in different configurations, and can be found in the hose and fittings section of Graco's ILE Buyers Guide.

NOTE: *Photographs may include optional equipment.*

- ***P-clamps*** are used for securing hoses to the machine in areas were other components are not available to attach cable ties. In the event P-clamps are the only option, be sure to follow the Welding Guidelines provided on page 3. Using larger p-clamps to route multiple loomed hoses through one area is a good practice. This will reduce the amount of welding needed which is ideal for all equipment.

FIG. 2: Weld Stud and P-clamp

- ***Graco guarding*** is designed with recessed areas to allow for easy bending or trimming should the area require a smaller piece of guarding.

  When preparing to mount the guarding, using the farthest opposing mounting holes as guides for the first two weld studs eases the installation and aids in proper alignment for the remaining weld studs. See Welding Guidelines provided on page 3.

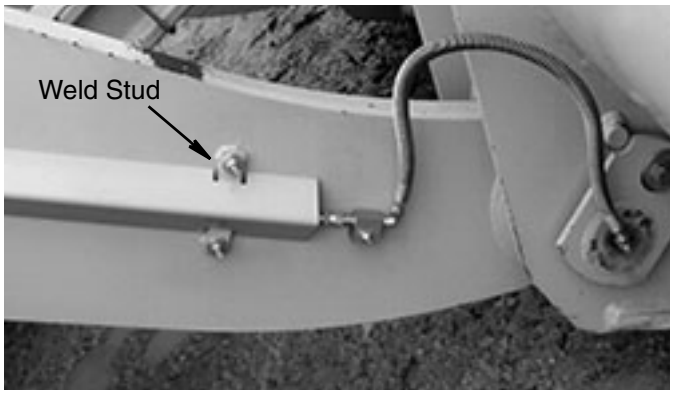

FIG. 3: Weld Stud Metal Guarding

- ***Cable Ties (FIG. 4)*** are used for securing lubricant hoses, electrical accessories, and power cables.

  Although welding in some areas of the machine is required, using cable ties reduces the amount of welding needed which is ideal for all equipment. In many cases, multiple hoses will be routed through a similar area. Because of this, a common practice is to loosely attach several cable ties to existing hydraulic and electrical looms. Routing hoses through these loose cable ties reduces the quantity of cable ties you will have to use, and will group hoses together rather than having multiple strands randomly routed in the machine. Once all hoses are routed, tighten the cable ties until all hoses are secure.

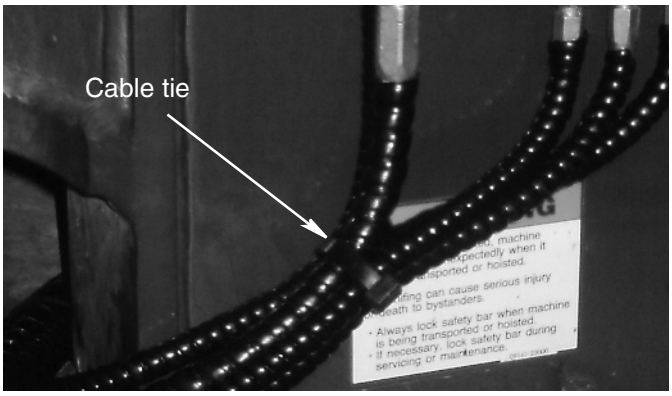

FIG. 4: Cable Tie

- ***Hose loom (FIG. 5)*** provides protection for the hose.

  Hose loom should be installed after the proper hose length has been identified, and before the fittings are installed on the ends of the hose.

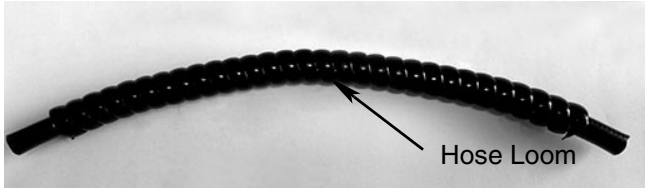

FIG. 5: Hose Loom

NOTE: *Photographs may include optional equipment.*

Hose loom can also be used to band hoses together when multiple hoses are routed through the same area. This keeps the appearance clean, but also adds stability to the hoses.

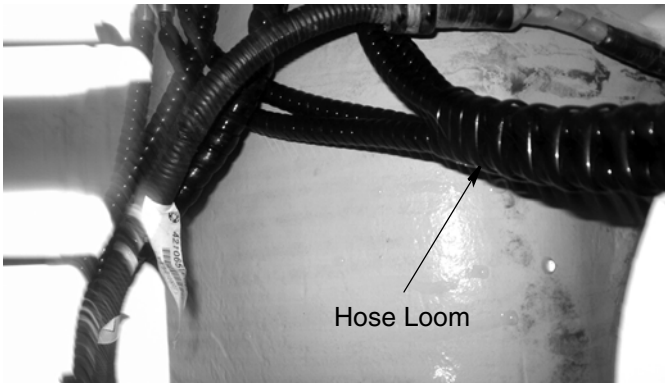

FIG. 6

- ***Steel spiral guard (FIG. 7)*** can be added to the hose in damage prone areas to provide additional protection.

  Steel guarding is available from Graco and is used in areas where excessive damage could occur should the hoses not be properly protected.

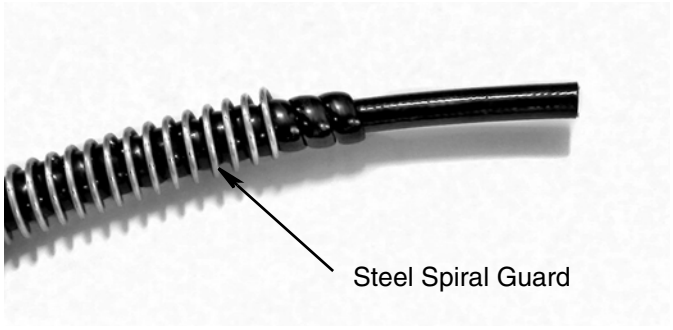

FIG. 7: Steel Spiral Guard

NOTE: *Photographs may include optional equipment.*

Injectors

Most Injector grease systems are installed on larger mining equipment, but are perfectly acceptable to install on general construction equipment as well.

Injector mounting requires either the use of weld studs, or pre-engineered weld mounting bars.

Although welding on mobile equipment is always subject for concern, it is important to understand that factory lubrication installations require the use of welding or drilling on the machine to mount lubrication equipment. See the Welding and Weld Stud section, beginning on page 3.

Pressure Switches

- Pressure switches are required on the system for main line monitoring and to feed performance information back to the pumps controller.
- Pressure switches should be mounted at the end of the line after the farthest injector bank but are routinely mounted next to the pump for simplicity of wiring.
- Pressure switches should be wired back into the pump (with built in controller) or routed to an external controller such as the Graco GLC2200 or GLC4400 (FIG. 8).
- Pressure gages (not required) should always be mounted in an injector system. This allows visual indication that the system is functioning properly and aid in troubleshooting should service be needed.

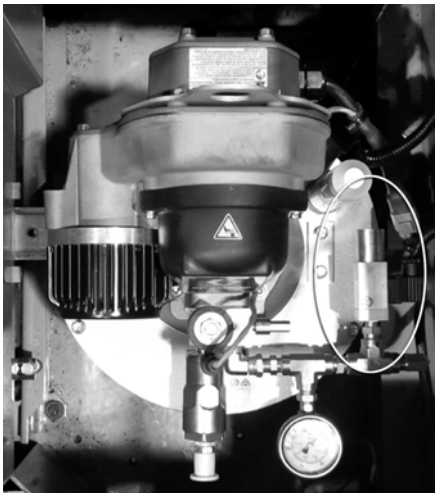

FIG. 8

Injector Mounting

Injector System Typical Installation

NOTE: Not every grease system has multiple banks of injectors. The image shown FIG. 9 is a typical layout of an injector system.

- Follow all torque specifications
- Mount injectors in protected areas on the equipment
- Provide ample clearance around all hoses, electrical connections, and accessories

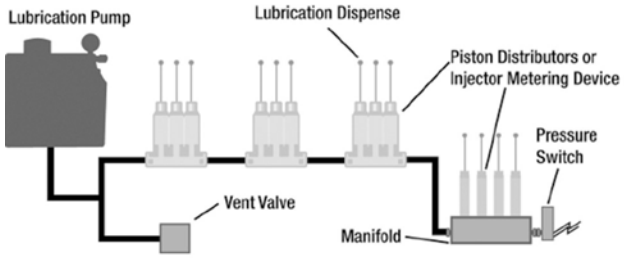

FIG. 9: Injector System Typical Installation

NOTE: *Photographs may include optional equipment.*

Vent Valve

A vent valve is required in an injection system because the grease will have to move in two directions:

> Pressure builds in the system to discharge grease from the injector and then pressure is reduced in the system by sending grease back to the pump reservoir which allows the grease injector to reset for the next lube cycle.

When installing the injectors, it is crucial that the main feed line is sized correctly. Use Table 1 as a quick reference guide for selecting appropriate line sizes for GL1 Injectors at ambient temperature. If the temperature drops, and the grease type remains consistent, you must increase the size of the main line to allow for the injectors to reset adequately.

Table 1

Line Length		
Feet	**Meters**	**Line Size**
<20	<6.09	1/4 inch
20 to 35	6.09 to 10.67	3/8 inch
35 to 50	10.67 to 15.24	1/2 inch
50 to 75	15.24 to 22.86	3/4 inch
75 to 100	22.86 to 30.48	1 inch
100 to 125	30.48 to 38.10	1.25 inch
125 to 150	38.10 to 45.72	1.5 inch

FIG. 10 - FIG. 13 are examples of injectors installed on equipment.

FIG. 10: Wheel Loader

FIG. 11: Excavator

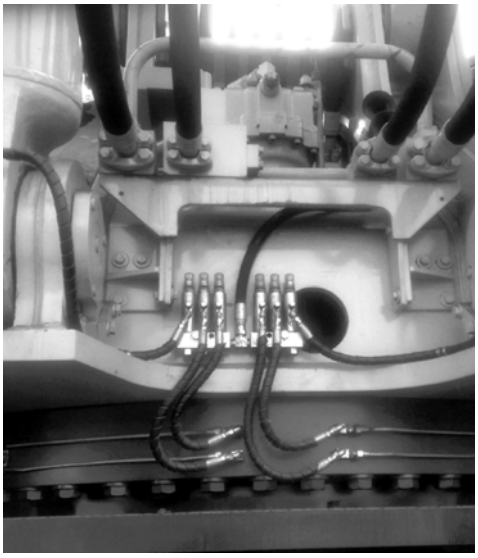

FIG. 12: Excavator

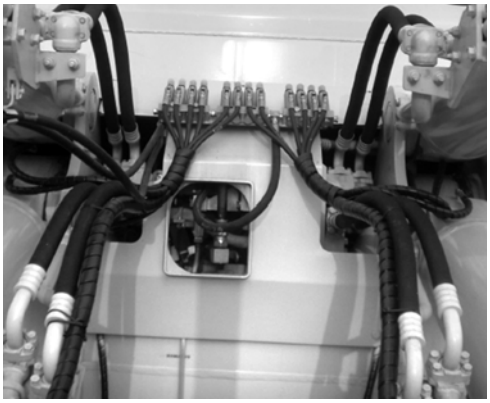

FIG. 13: Bull Dozer

NOTE: *Photographs may include optional equipment.*

Grease Zerks

Injectors come with manual grease zerks. Grease zerks:

- aid in the filling and purging of grease lines,
- help simplify troubleshooting, and
- provide a method of manually greasing the equipment should service be needed on the pump.

NOTICE
All the air must be purged from an injection system for the equipment to function properly. If air is trapped in the injector, manifold, or main feed line, some of the injectors may not discharge grease due to air being compressed in the system.

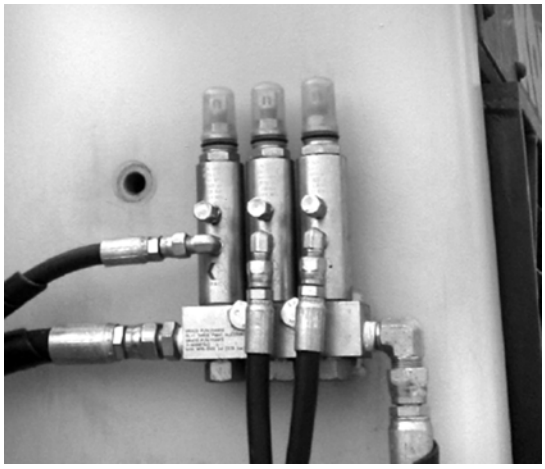

FIG. 14

NOTE: *Photographs may include optional equipment.*

Valve Mounting

NOTE: Valve mounting requires either weld studs or pre-engineered weld mounting bars.

Although welding on mobile equipment is always subject for concern, it is important to understand that factory lubrication installations require the use of welding or drilling on the machine to mount lubrication equipment. See the Welding and Weld Stud section, beginning on page 3.

Master Valve

Most series progressive systems have a master valve that should be mounted in close proximity to the pump/cab of the equipment. This is due to the common use of a proximity or cycle switch to monitor the lubrication system. The proximity switch or cycle switch are electronic devices and need to be tied back into the pump (with built in controller) or routed to an external controller such as the Graco GLC2200 or GLC4400 (FIG. 15).

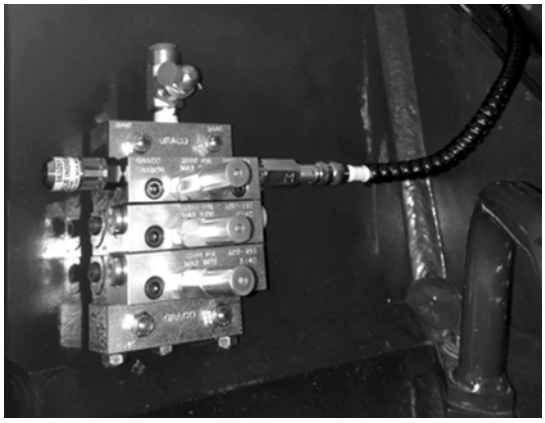

FIG. 15

Series Progressive System Typical Installation

NOTE: Not every grease system has primary and secondary series progressive valves. The image provided in FIG. 16 shows a typical series progressive system.

- Follow all torque specifications
- Mount injectors in protected areas on the equipment
- Provide ample clearance around all hoses, electrical connections, and accessories

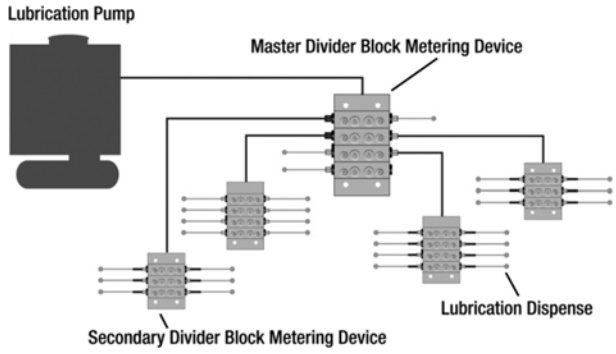

FIG. 16: Series Progressive System Typical Installation

FIG. 17 - FIG. 19 show examples of common placement of series progressive valves on construction equipment.

FIG. 17

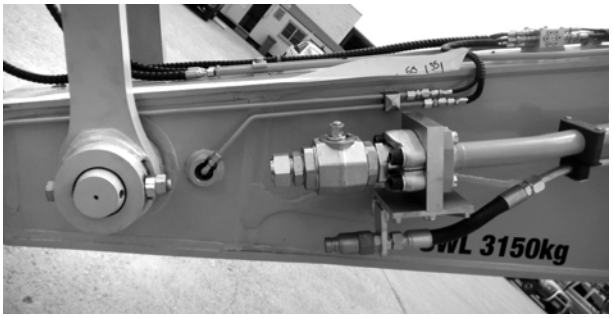

FIG. 18

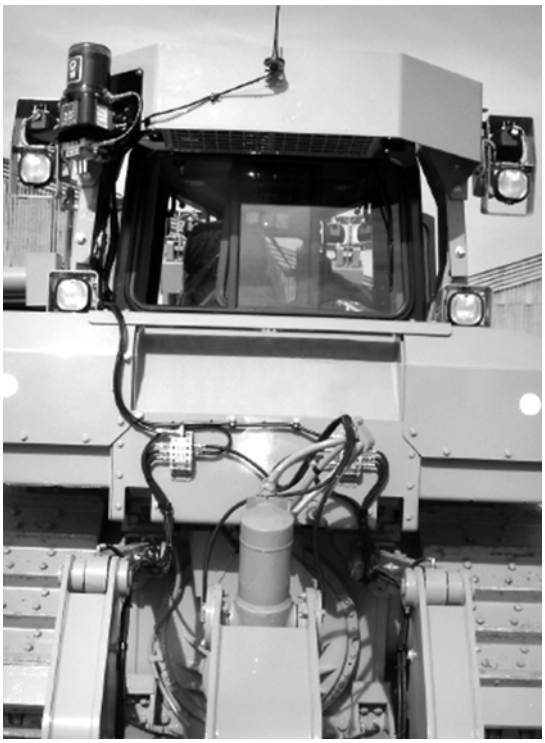

FIG. 19

Grease Zerks (optional)

(Optional) Grease zerks can be installed in each valve manifold.

Grease zerks:

- aid in the filling and purging of grease lines,
- help simplify troubleshooting, and
- provide a method of manually greasing the equipment should service be needed on the pump.

NOTE: *Photographs may include optional equipment.*

Dyna-Star Pump

Pump Installation (FIG. 20 - FIG. 23)

1. Mount the Dyna-Star pump to the equipment.

   NOTE: Never mount the pump directly to the cab.

   - Identify a protected location near the cab to mount the pump. This location should have ample space around the pump to allow for hoses, cables, gages, a relief valve.
   - The most common space to mount a pump is on the deck plate that surrounds the cab. If this location is unacceptable due to durability or space constraints, identify an alternate location around the cab,
   - The deck plate is preferred as it is a non-critical component on the machine and therefore drilling or welding to the deck plate is generally acceptable to most manufacturers.
   - In some cases, a special mounting bracket may be required if the conventional locations are not acceptable for mounting the pump.

FIG. 20: Deck Plate Mounting

FIG. 21: Deck Plate Mounting

FIG. 22: Engine Bay Mounting

FIG. 23: Custom Bracket

2. Route the hoses, power cable, and accessories under the cab or through the body of the machine to protect them from the environment and to aid in wiring into the cab.

3. Secure the pump cables and hoses with cable ties to existing hydraulic hoses or electrical looms, or use P-clamps in the event that other fastenings methods do not permit the use of cable ties.

   Cable and hose routing examples are shown in FIG. 24 - FIG. 25.

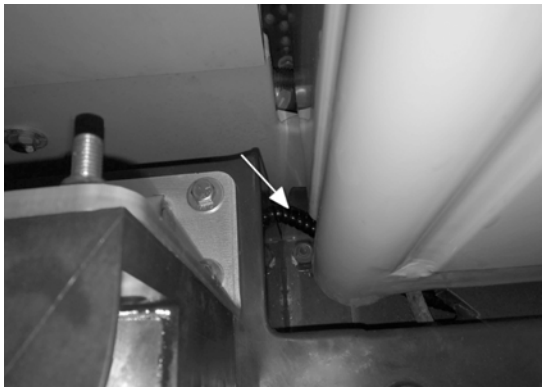

FIG. 24

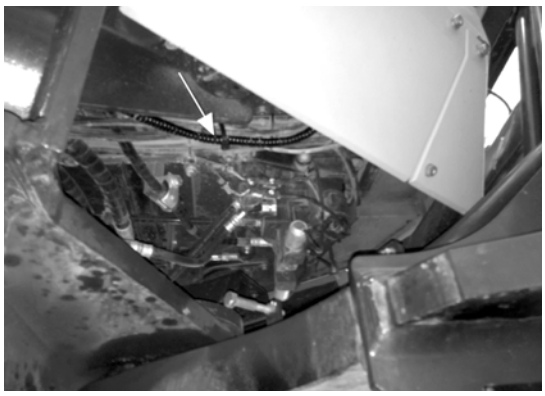

FIG. 25

4. Route the power wire for the pump to the battery box of the equipment (FIG. 26).

   NOTE: An open grommet or isolated entry point should always be the primary choice rather than drilling a hole into the battery box.

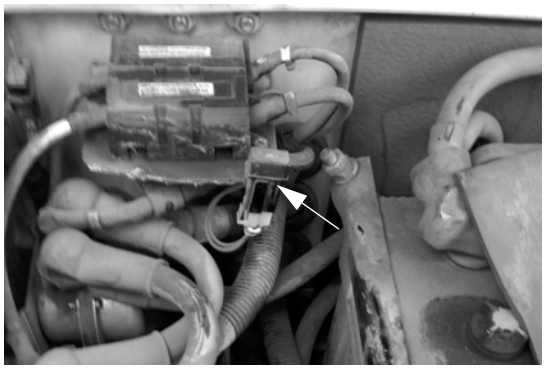

FIG. 26

5. Attach the Dyna-Star power/signal cable to the GLC2200 controller using a terminal strip.

   Mount a 4 section/double pole terminal strip into the battery box (FIG. 27).

FIG. 27

NOTE: *Photographs may include optional equipment.*

6. Cut the pump power/signal cable to length and attach ring crimp connectors to the cable followed by shrink tubing to protect the wires and the connection point (FIG. 28).

FIG. 28

7. Install the power/signal cable leads to the terminal strip (all on one side) (See FIG. 29).

8. Remove the outer jacket from excess power/signal cable and connect a fuse, ring connector and shrink tubing to the red (+) wire. Also attach a ring connector and shrink tubing to the black (-) wire (FIG. 29).

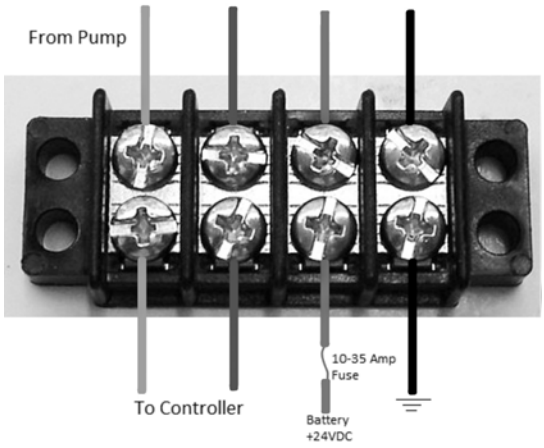

FIG. 29

9. Route a signal cable (not supplied) into the battery box through the same entry point as the power/signal cable lead (installed in Step 5).

   Attach ring connectors and shrink tubing to the newly routed signal cable in the battery box (Step 8). Connect the corresponding signal wires to the opposite side of the pump signal wires on the terminal strip (FIG. 29).

10. Attach the red (+) lead wire with the fuse to the 24V battery supply. Attach the black (-) lead wire to a grounding location inside the battery box (FIG. 29).

11. Locate a rubber grommet in the floor panel of the cab (FIG. 30).

    There is normally one on either side of the cab floor depending on the brand of equipment you have. This rubber grommet allows the entry of the pump signal cable, prox cable/pressure switch cable, or any other components that have to enter the cab.

    Route the new signal cable into the cab utilizing the same entry point as the hoses and cables installed in Step 2.

    Use cable ties to secure the cable to the existing hydraulic hoses or electrical cable under the cab and inside the machine.

NOTICE
Never drill into the machine's cab. Doing so will invalidate the ROPS Certification for the cab.

FIG. 30

NOTE: *Photographs may include optional equipment.*

12. Route the signal cables under the floor mat towards the GLC2200 controller cable (FIG. 31 and FIG. 32).

    NOTE:

    - Use care when routing the cables to avoid areas of abrasion or that could potentially damage the cables.
    - Under certain circumstances, removing the internal cab coverings are needed in order to route the cables.

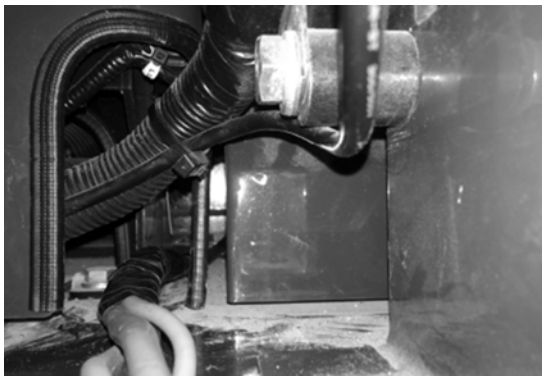

FIG. 31

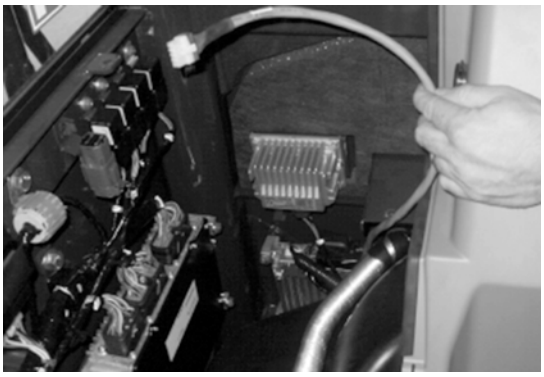

FIG. 32

Wiring Guide for Dyna-Star Pumps with GLC2200 Controller

1. Turn off Master Power Switch.
2. Locate and identify the area in which you will be mounting the GLC2200 controller. This is generally located on the passenger side of the machine near the operator's seat.

   At this time:

   - the pump power cable should be routed into the equipment battery box,
   - a terminal strip should be installed,
   - the cycle/pressure switch cable should be routed into the cab.

If these steps have not been completed, refer to the Dyna-Star Pump installation Guidelines beginning on page 3.

3. Mount the GLC2200 Controller.

   An installation example is shown in FIG. 33.

FIG. 33

NOTE: *Photographs may include optional equipment.*

4. Connect the controller cable to the GLC2200 and route the cable behind a cab cover panel (FIG. 34).

   NOTE: You may need to remove a cab cover panel to route the cable. The cable should be routed towards the cab floor or the fuse panel area (depending upon where your signal and cycle/pressure switch cables are entering the cab).

FIG. 34

5. Trim cables to length. Remove at least 6 inches (152.4 mm) of outer jacket from the GLC2200 power cable, and the prox or pressure switch cable

   NOTE: The amount of outer jacket removed depends on ground wire location.

6. Refer to FIG. 35 and the Wiring Table, page 15.

   a. Remove 1 inch (25.4 mm) of insulation from around the connection wires.

   b. Slip a piece of shrink tubing over each wire, twist wires, and solder the ends together.

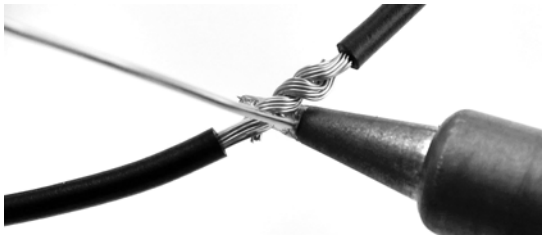

FIG. 35

   c. Slide the shrink tubing over the solder joint and heat tubing until it has closed over both wires (FIG. 36).

   NOTE: Black electrical tape can also be wrapped around the joints for added protection.

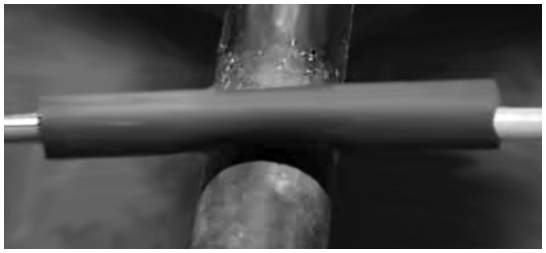

FIG. 36

Wiring Table

GLC 2200 Harness			Prox	Prox w/LED	Pressure Switch	Pump
Color	**Description**	**+/-**	**Color**	**Color**	**Description**	**Color**
Blue	Pump	-		Blue		Blue
Purple	Alarm Output	-				
Brown	Low Level Input	-				
White	Switch Signal	-	Common	Black	Common	
Black	Voltage Input	-				
Orange	Pump Power	+		Brown		Orange
Green	Alarm Output	+				
Yellow	Low Level Input	+				
Gray	Switch Signal	+	N/O Wire		N/O or N/C Wire	
Red	Voltage Input	+				

7. Route the loose GLC2200 power wire under the floor mat or behind the cab paneling and into the fuse panel.

   NOTE: The fuse panel is usually located on the right hand side of the machine, or behind the operator's seat.

8.

   a. Remove at least 6 inches (152.4 mm) of outer jacket from the from the controller power cable.

   b. Remove 1 inch (25.4 mm) of insulation from around the power wire (+).

   c. Remove 1 inch (25.4 mm) of insulation from around the Add-A-Fuse circuit connector.

   d. Slip a piece of shrink tubing over the (+) wire, and solder the two ends together. Slide the shrink tubing over the solder joint and heat tubing until it has closed over both wires.

      NOTE: Black electrical tape can also be wrapped around the joint for added protection.

9. Steps 9a-9c refer to FIG. 37.

   a. Remove about ¼ inch (6.35 mm) of insulation from the end of the controller power wire (-).

   b. Slip a piece of shrink tubing over the (-) wire and install a ring crimp connector.

   c. Slide the shrink tubing over the crimp and heat until closed.

      NOTE: Black electrical tape can also be wrapped around the joint for added protection.

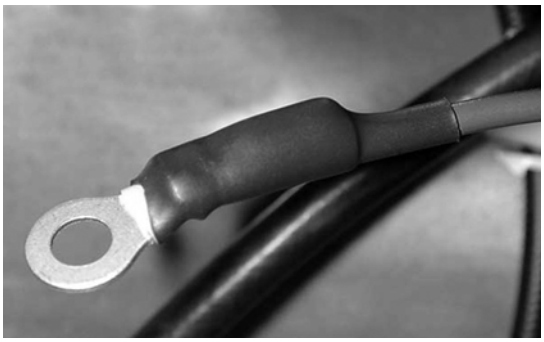

FIG. 37

10. Remove the fuse panel cover and identify either an open auxiliary fuse circuit or identify a non-critical fuse circuit that can be used (FIG. 38).

    NOTE: Non-critical fuse circuit include: horn, radio, parking lights, etc)

    - Fuse circuit must be 24V for 24V pumps, or 12V for 12V pumps.
    - Fuse circuit must also be a switched circuit (when machine power is off, circuit is off)
    - If you are unsure, use a volt-meter, or multi-tester to identify a switched circuit.

FIG. 38

NOTE: *Photographs may include optional equipment.*

11. Insert the Add-A-Fuse into an open Auxiliary circuit or remove a non-critical fuse and place the Add-A-Fuse into the fuse slot (FIG. 39).

FIG. 39

12. Place the removed fuse into the lower socket of the Add-A-Fuse and insert a 5Amp fuse into the upper socket with the lead wire. This wire is attached to the main power wire for the pump (FIG. 40).

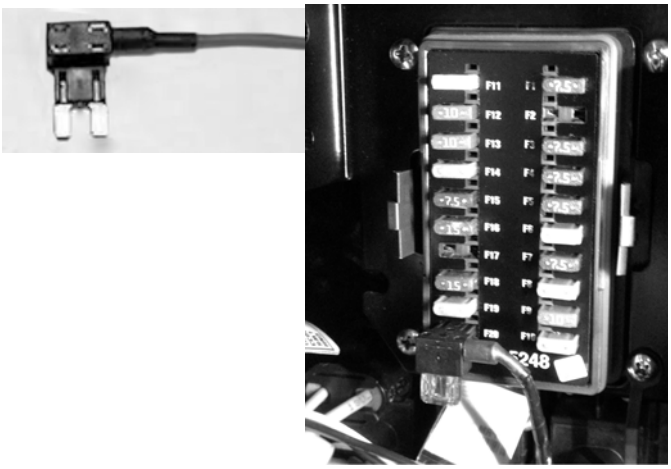

FIG. 40

13. Route the wire through an opening in the back of the fuse panel. Leave excess wire in the fuse panel to allow for routing of the wires, and to allow easy removal of the fuse panel cover (FIG. 41).

FIG. 41

14. Locate a grounding point in the fuse panel (FIG. 42).

    - The best place to ground is directly to the chassis.
    - Certain equipment will have metal supports for the relays in the panel. This is an ideal mounting location for the ground wire.
    - Paint must be removed from a painted surface before ground wire is installed.

    a. Remove a bolt and insert it through the ring connector on the (-) wire.

    b. Re-install the bolt until firmly tightened.

    The ground wire has now been installed.

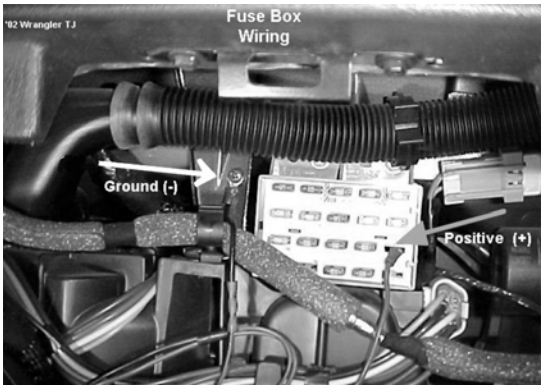

FIG. 42

NOTE: *Photographs may include optional equipment.*

15. Re-install the fuse panel cover. Check for any snag points in the wiring. If there are any excess wires from the power cable, cut them back and wrap the wires with electrical tape. Coil any excess wire and secure with a zip tie (FIG. 43).

FIG. 43

16. Close the fuse panel cover and access panels. Restore power to the machine. Check your wiring to verify power is successfully applied to your pump, controller, and that power is being sent to the existing auxiliary equipment if equipped.

17. If everything is working correctly, turn off main power breaker, reinstall any panels that may have been removed, and document the installation for future reference (FIG. 44).

FIG. 44

NOTE: *Photographs may include optional equipment.*

G3 Pump

Pump Installation (FIG. 45, - FIG. 48)

1. Mount the G3 pump to the equipment.

   NOTE: Never mount the pump directly to the cab.

   - Identify a protected location near the cab to mount the pump. This location should have ample space around the pump to allow for hoses, cables, gages, and a relief valve.
   - The most common space to mount a pump is on the deck plate that surrounds the cab. If this location is unacceptable due to durability or space constraints, identify an alternate location around the cab,
   - Mounting to the deck plate (FIG. 45 and FIG. 46) is preferred as it is a non-critical component on the machine and therefore drilling or welding to the deck plate is generally acceptable by most manufactures.
   - In some cases, a special mounting bracket may be required if the conventional locations are not acceptable for mounting the pump.

FIG. 45: Deck Plate Mounting

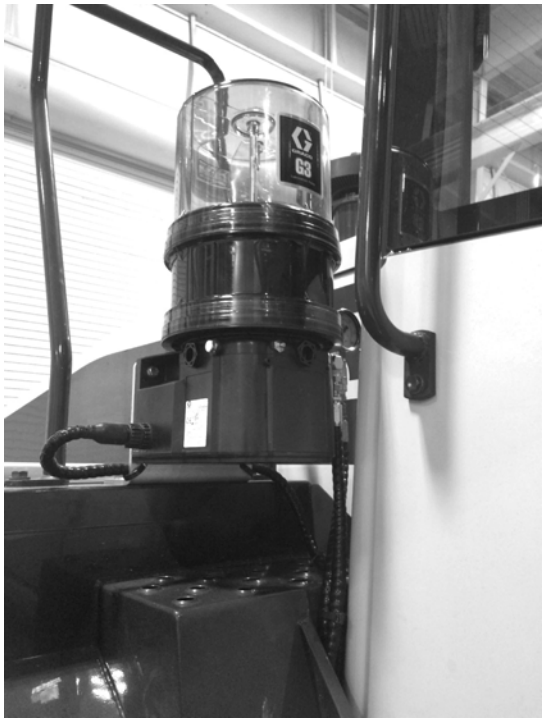

FIG. 46: Deck Plate Mounting

FIG. 47: Engine Bay Mounting

FIG. 48: Cab Hand Rails

2. Route the hoses, power cable, and accessories under the cab or through the body of the machine to protect them from the environment and to aid in wiring into the cab (FIG. 49 and FIG. 50).

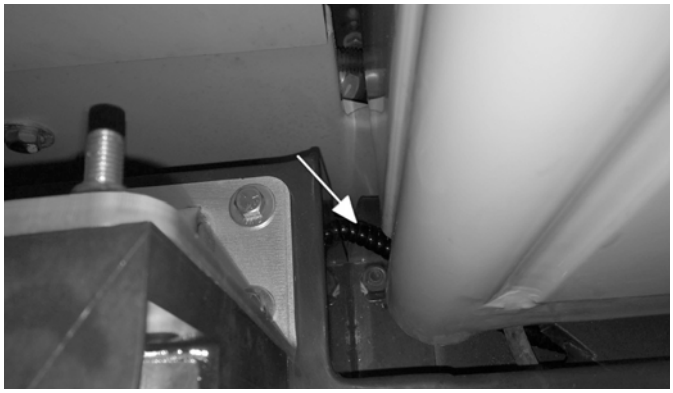

FIG. 49

FIG. 50

3. Locate a rubber grommet in the floor panel of the cab (FIG. 51).

   There is normally one on either side of the cab floor depending on the brand of equipment you have. This rubber grommet allows the entry of the pump signal cable, prox cable/pressure switch cable, or any other components that have to enter the cab.

NOTICE
Never drill into the machines' cab. Doing so will invalidate the ROPS Certification for the cab.

FIG. 51

4. Route the power cable under the floor mat and through the most protected opening into the fuse panel as shown in FIG. 52 and FIG. 53.

   If your pump uses a remote manual run button with a 5 wire CPC cable, route the power cable to the location of the remote manual run button (See Wiring Guide for G3 Pump with Internal Controller and Remote Run Button, page 24).

   If your pump uses a GLC2200 controller, route the pump power cable into the cab, but do not route the cable into the fuse panel at this time (See Wiring Guide for G3 Pumps with External Controller, page 29).

   NOTE: Under certain circumstances, removing the internal cab coverings are needed in order to route the cable to the fuse panel.

NOTE: *Photographs may include optional equipment.*

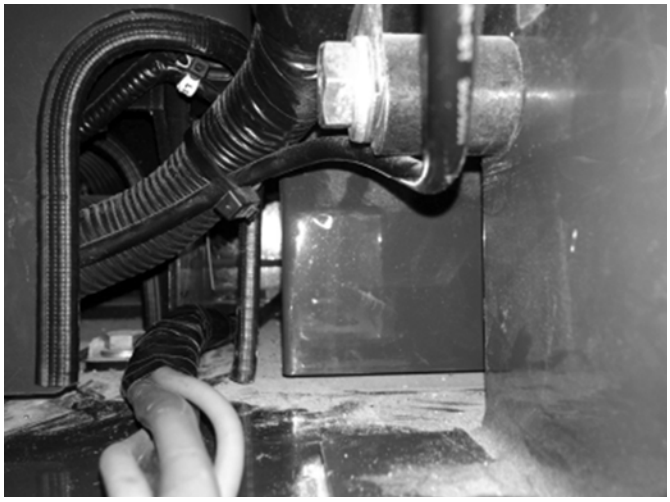

FIG. 52

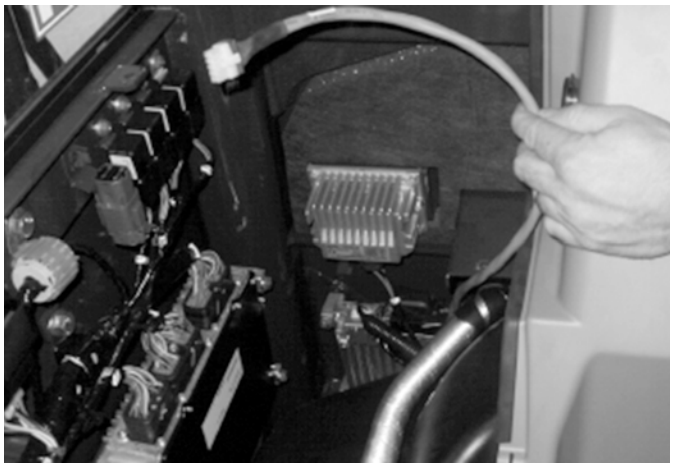

FIG. 53

Wiring Guidelines

There are three pump control options available. Each requires a different series of steps to correctly wire the G3 pump. Refer to the following list to ensure you use the correct Guidelines for your pump and controller.

- Wiring Guide for G3 Pumps with Internal Controller, page 21.
- Wiring Guide for G3 Pumps with Internal Controller and Manual Run Button, page 24.
- Wiring Guide for G3 Pumps with External Controller, page 29.

Wiring Guide for G3 Pumps with Internal Controller

1. Locate and identify the main fuse panel on the piece of equipment the lube system is being installed on. (FIG. 54). The fuse panel is generally located on the right-hand side of the machine or behind the operator's seat.

   At this time the pump power cable should be routed to the fuse panel. If this step has not been completed, refer to the G3 Pump Installation section, page 19.

FIG. 54

2. Remove at least 6 inches (152.4 mm) of the outer jacket from the G3 pump power wire (+).

   NOTE: The amount of outer jacket removed depends on ground wire location.

3. Refer to FIG. 55 and the Wiring Table, page 15.

a. Remove at least 6 inches (152.4 mm) of insulation from the from the controller power cable.

b. Remove 1 inch (25.4 mm) of insulation from around the power wire (+).

c. Remove 1 inch (25.4 mm) of insulation from around the Add-A-Fuse circuit connector.

d. Slip a piece of shrink tubing over the (+) wire, twist the wires and solder the two ends together (FIG. 55).

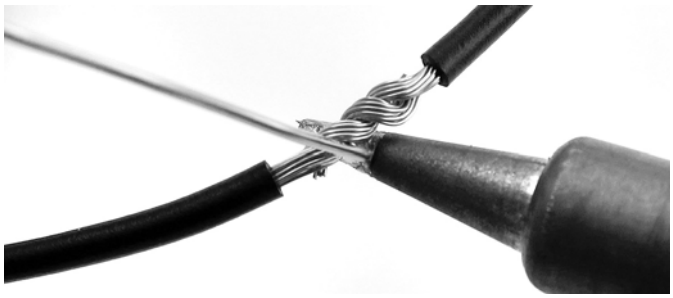

FIG. 55

e. Slide the shrink tubing over the solder joint and heat tubing until it has closed over both wires.

NOTE: Black electrical tape can also be wrapped around the joints for added protection.

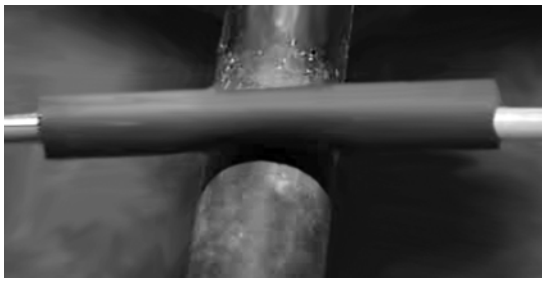

FIG. 56

4. Steps 4a-4c refer to FIG. 57.

a. Remove about ¼ inch (6.35 mm) of insulation from the end of the G3 pump power wire (-).

b. Slip a piece of shrink tubing over the (-) wire and install a ring crimp connector.

c. Slide the shrink tubing over the crimp and heat until closed.

NOTE: Black electrical tape can also be wrapped around the joint for added protection.

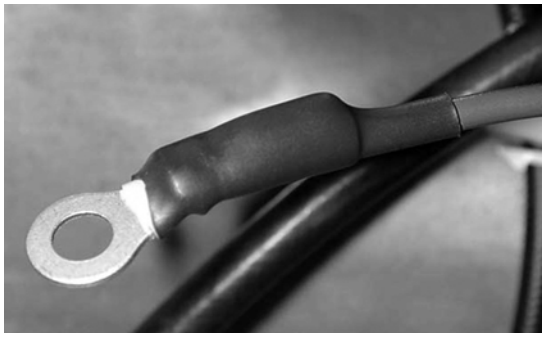

FIG. 57

5. Remove the fuse panel cover and identify either an open auxiliary fuse circuit or identify a non-critical fuse circuit that can be used (FIG. 58).

NOTE: Non-critical fuse circuit include: horn, radio, parking lights, etc)

- Fuse circuit must be 24V for 24V pumps, or 12V for 12V pumps.
- Fuse circuit must also be a switched circuit (when machine power is off, circuit is off)
- If you are unsure, use a volt-meter, or multi-tester to identify a switched circuit.

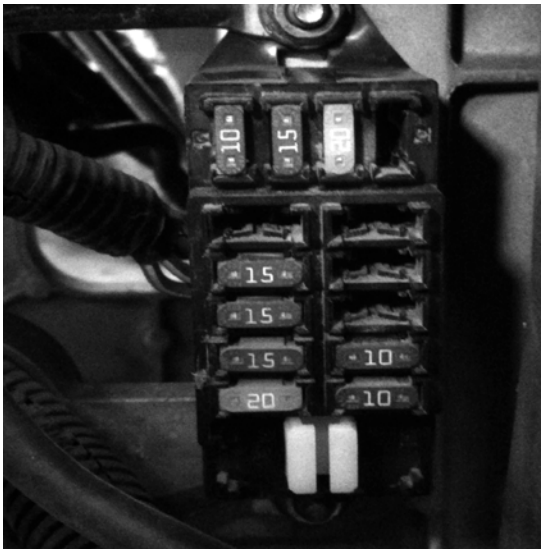

FIG. 58

6. Insert the Add-A-Fuse into an open Auxiliary circuit or remove a non-critical fuse and place the Add-A-Fuse into the fuse slot (FIG. 59).

NOTE: *Photographs may include optional equipment.*

FIG. 59

7. Place the removed fuse into the lower socket of the Add-A-Fuse and insert a 5Amp fuse into the upper socket with the lead wire. This wire is attached to the main power wire for the G3 pump (FIG. 60).

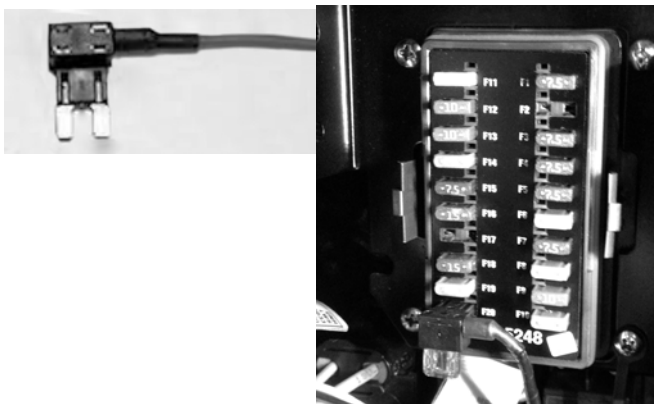

FIG. 60

8. Route the wire through an opening in the back of the fuse panel. Leave excess wire in the fuse panel to allow for routing the wires, and to allow easy removal of the fuse panel cover (FIG. 61).

FIG. 61

9. Locate a grounding point in the fuse panel (FIG. 62).
   - The best place to ground is directly to the chassis.
   - Certain equipment will have metal supports for the relays in the panel. This is an ideal mounting location for the ground wire.
   - Paint must be removed from a painted surface before ground wire is installed.

   a. Remove a bolt and insert it through the ring connector on the (-) wire.

   b. Re-install the bolt until firmly tightened.

   The ground wire has now been installed.

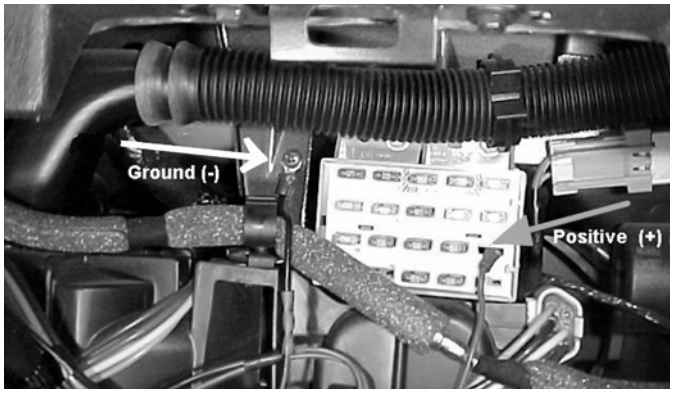

FIG. 62

10. Re-install the fuse panel cover. Check for any snag points in the wiring. If there are any excess wires from the power cable, cut them back and wrap the wires with electrical tape. Coil any excess wire and secure with a zip tie (FIG. 63).

FIG. 63

11. Close the fuse panel cover and access panels. Restore power to the machine. Check your wiring to verify power is successfully applied to your pump, controller, and that power is being sent to the existing auxiliary equipment if equipped.

NOTE: *Photographs may include optional equipment.*

12. If everything is working correctly, turn off main power breaker and document the installation for future reference (FIG. 64).

FIG. 64

Wiring Guide for G3 Pumps with Internal Controller and Remote Run Button

1. Locate and identify the area in which you will be mounting the remote manual run button. This is generally located on the passenger side of the machine near the operator's seat (FIG. 65).

   At this time the pump power cable should be routed into the cab and to the remote manual run button location. If this step has not been completed, refer to the G3 Pump Installation section, page 19.

FIG. 65

2. Remove the panel that you will be mounting the manual run button into. Make sure your location has enough space around and under the button to allow for extra wire connection, and to verify there will be no interference with other equipment controls.

3. Use a step drill bit to drill a 3/4 (19.05 mm) diameter hole in the location for the manual run button (FIG. 66).

FIG. 66

NOTE: *Photographs may include optional equipment.*

4. Install the remote manual run button (b) into the panel (c), and secure with the supplied jam nut (a) (FIG. 67).

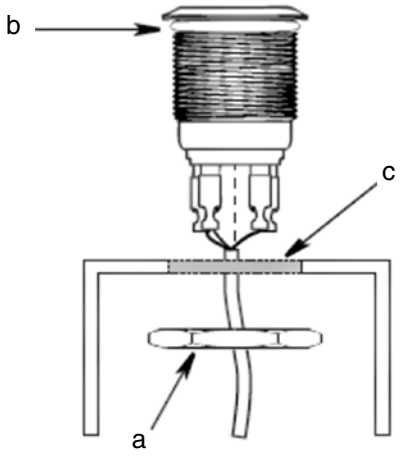

FIG. 67

5. Cut the excess G3 power cable to the proper length for wiring to the manual run button.

   NOTE: Do not discard the extra cabling as it will be used to send power to the remote manual run button.

6. Remove at least 6 inches (152.4 mm) of outer jacket from the G3 pump power cable (+) that was cut to length in Step 5.

   NOTE: The amount of outer jacket removed will depend on the ground wire location.

7. On the G3 pump power wire remove approximately 1 inch (25.4 mm) of insulation from around:

   - G3 power (+) wire.
   - G3 power (-_ wire.
   - The white illumination wire.
   - The orange manual run wire
   - The excess cable that was cut to length from the G3 power wire (+) in Step 5 (page 25).
   - The excess cable that was cut to length from the G3 power wire (-) in Step 5 (page 25).

8. Solder the white illumination wire and orange manual run wire to the manual run button cable connected to the pump (FIG. 68).

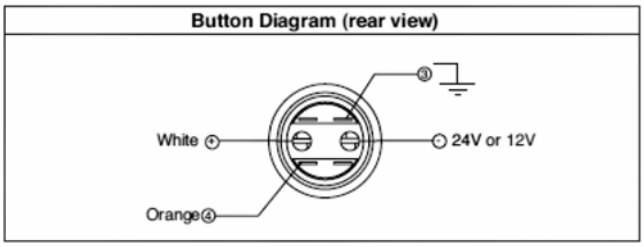

FIG. 68

9. Solder the G3 pump (+) and the excess (+) wire to the 24V/12V terminal on the manual run button. Solder the G3 pump (-) and the excess (-) wire to the other end of the white illumination wire and orange manual run wire to the manual run button in the grounding location (FIG. 68).

   NOTE: Due to excessive machine vibration solder wires to the manual run button.

10. Route the excess power wire (now soldered to the pump power and manual run button) under the cab floor mat (Step 4, page 20) or behind the cab paneling and into the fuse panel to finish the wiring process.

11. Remove at least 6 inches (152.4 mm) of outer jacket from the excess power cable to allow for wiring into the fuse panel.

    NOTE: The amount of outer jacket removed depends on ground wire location.

12. On the G3 pump power wire;

    a. Remove 1 inch (25.4 mm) of insulation from around the G3 power wire (+),

    b. Remove 1 inch (25.4 mm) of insulation from the Add-A-Fuse circuit connector.

    c. Slip a piece of shrink tubing over the (+) wire, twist the wires and solder the two ends together (FIG. 69).

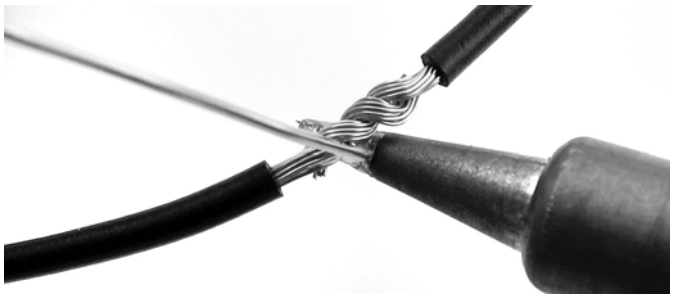

FIG. 69

d. Slide the shrink tubing over the solder joint and heat tubing until it has closed over both wires (FIG. 70).

NOTE: Black electrical tape can also be wrapped around the joints for added protection

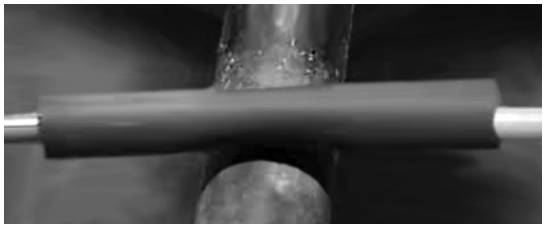

FIG. 70

13. Steps 13a-13c refer to FIG. 71.

a. Remove about ¼ inch (6.35 mm) of insulation from the end of the G3 pump power wire (-).

b. Slip a piece of shrink tubing over the (-) wire and install a ring crimp connector.

c. Slide the shrink tubing over the crimp and heat until closed.

NOTE: Black electrical tape can also be wrapped around the joint for added protection.

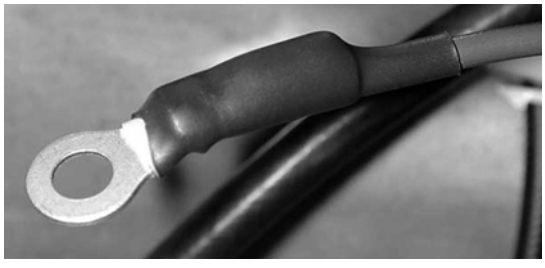

FIG. 71

14. Remove the fuse panel cover and identify either an open auxiliary fuse circuit or identify a non-critical fuse circuit that can be used (FIG. 72).

NOTE: Non-critical fuse circuit include: horn, radio, parking lights, etc)

- Fuse circuit must be 24V for 24V pumps, or 12V for 12V pumps.
- Fuse circuit must also be a switched circuit (when machine power is off, circuit is off)
- If you are unsure, use a volt-meter, or multi-tester to identify a switched circuit.

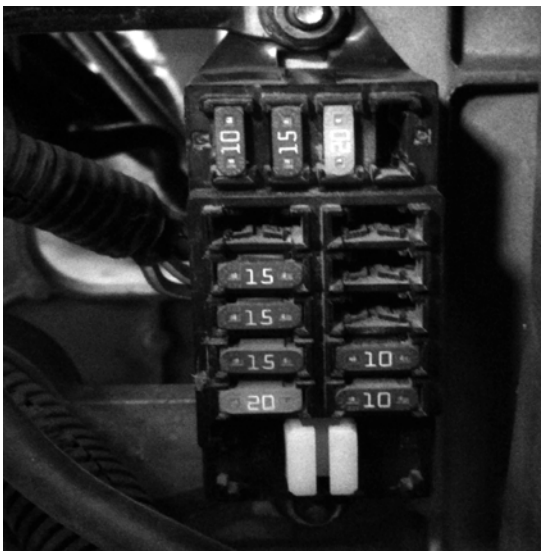

FIG. 72

15. Insert the Add-A-Fuse into an open Auxiliary circuit or remove a non-critical fuse and place the Add-A-Fuse into the fuse slot (FIG. 73).

FIG. 73

NOTE: *Photographs may include optional equipment.*

16. Place the removed fuse into the lower socket of the Add-A-Fuse and insert a 5Amp fuse into the upper socket with the lead wire. This wire is attached to the main power wire for the G3 pump (FIG. 74).

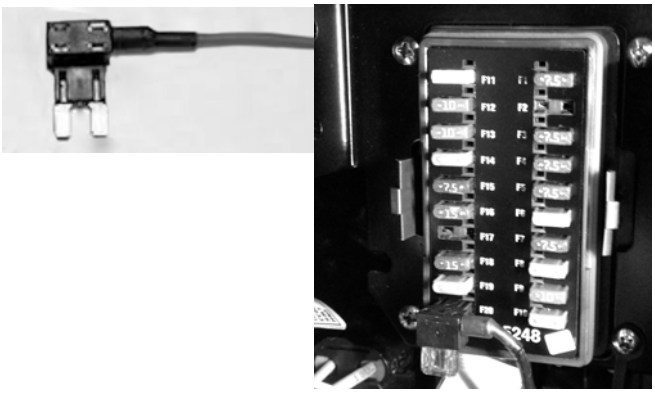

FIG. 74

17. Route the wire through an opening in the back of the fuse panel. Leave excess wire in the fuse panel to allow for routing of the wires, and to allow easy removal of the fuse panel cover (FIG. 75).

FIG. 75

NOTE: *Photographs may include optional equipment.*

18. Locate a grounding point in the fuse panel (FIG. 76).
    - The best place to ground is directly to the chassis.
    - Certain equipment will have metal supports for the relays in the panel. This is an ideal mounting location for the ground wire.

    a. Remove a bolt and insert it through the ring connector on the (-) wire.

    b. Re-install the bolt until firmly tightened.

    The ground wire has now been installed.

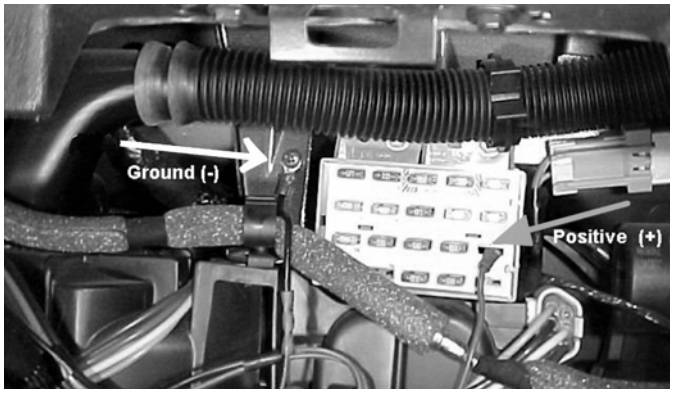

FIG. 76

19. Re-install the fuse panel cover. Check for any snag points in the wiring. If there are any excess wires from the power cable, cut them back and wrap the wires with electrical tape. Coil any excess wire and secure with a zip tie (FIG. 77).

FIG. 77

20. Close the fuse panel cover and access panels. Restore power to the machine. Check your wiring to verify power is successfully applied to your pump, controller, and that power is being sent to the existing auxiliary equipment if equipped.

21. Verify that the remote manual run button has been wired in correctly by pushing the button in the middle to activate the pump.

22. If everything is working correctly, turn off main power breaker and document the installation for future reference (FIG. 78).

FIG. 78

NOTE: *Photographs may include optional equipment.*

Wiring Guide for G3 Pumps with External Controller

1. Identify the mounting location for the GLC2200 controller on the equipment. This is generally located on the passenger side of the machine near the operator's seat.

   At this time the pump power cable should be routed into the cab. If this step has not been completed, refer to the G3 Pump Installation section, page 19.

2. Using the supplied mounting hardware, install the GLC2200 controller to the mounting location identified in Step 1 (FIG. 79).

FIG. 79

3. Connect the controller cable to the GLC2200. Route the cable behind a cab cover panel (FIG. 80).

   NOTE: You may need to remove a cab cover panel to route the cable. The cable should be routed toward the G3 power cable near the cab floor.

FIG. 80

4. Trim all cables to length. Remove at least 6 inches (152.4 mm) of outer jacket from:

   - The G3 pump power cable
   - The GLC2200 power cable
   - The Prox or pressure switch cable

   NOTE: The amount of outer jacket removed depends on ground wire location.

5. Refer to FIG. 81 and FIG. 82 and Wiring Table, page 30.

   a. Remove 1 inch (25.4 mm) of insulation from around the connection wires.

   b. Slip a piece of shrink tubing over each wire, twist wires and solder the two ends together.

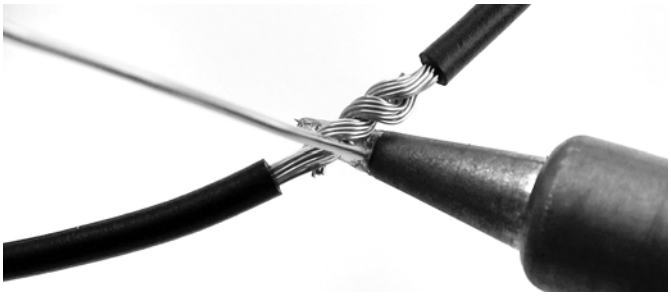

FIG. 81

c. Slide the shrink tubing over the solder joint and heat tubing until it has closed over both wires (FIG. 82).

NOTE: Black electrical tape can also be wrapped around the joints for added protection.

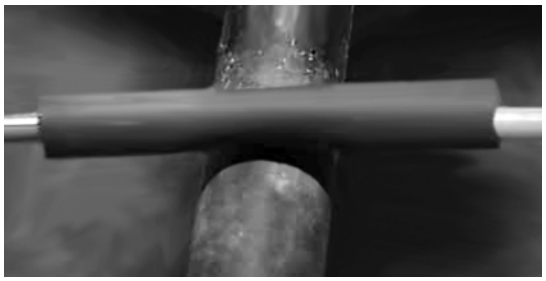

FIG. 82

d. Slide the shrink tubing over the solder joint and heat tubing until it has closed over both wires.

NOTE: Black electrical tape can also be wrapped around the joints for added protection.

Wiring Table

GLC 2200 Harness			Prox	Prox w/LED	Pressure Switch	Pump w/CPC5	Pump w/M12
Color	**Description**	**+/-**	**Color**	**Color**	**Description**	**Color**	**Color**
Blue	Pump	-		Blue		Black	Black
Purple	Alarm Output	-					
Brown	Low Level Input	-				Orange	Black/M12
White	Switch Signal	-	Common	Black	Common		
Black	Voltage Input	-					
Orange	Pump Power	+		Brown		Red	Red
Green	Alarm Output	+					
Yellow	Low Level Input	+				White	Blue/M12
Gray	Switch Signal	+	N/O Wire		N/O or N/C Wire		
Red	Voltage Input	+					

6. Locate the loose power wire routed under the cab floor mat (Step 4, page 20) or behind the cab paneling and into the fuse panel (Step 3, page 29) to finish the wiring process.

7. Remove at least 6 inches (152.4 mm) of outer jacket from the G3 pump power cable.

   NOTE: The amount of outer jacket removed depends on ground wire location.

8. On the G3 pump power wire;
   a. Remove 1 inch (25.4 mm) of insulation from around the G3 power wire (+),
   b. Remove 1 inch (25.4 mm) of insulation from the Add-A-Fuse circuit connector.
   c. Slip a piece of shrink tubing over the (+) wire. Solder the two ends together.
   d. Slide the shrink tubing over the solder join and heat the tubing until it has closed over both wires.

   NOTE: Black electrical tape can also be wrapped around the joint for added protection.

NOTE: *Photographs may include optional equipment.*

9. Refer to FIG. 83:

   a. Remove about ¼ inch (6.35 mm) of insulation from the end of the G3 pump power wire (-).

   b. Slip a piece of shrink tubing over the (-) wire and install a ring crimp connector.

   c. Slide the shrink tubing over the crimp and heat until closed.

      NOTE: Black electrical tape can also be wrapped around the joint for added protection.

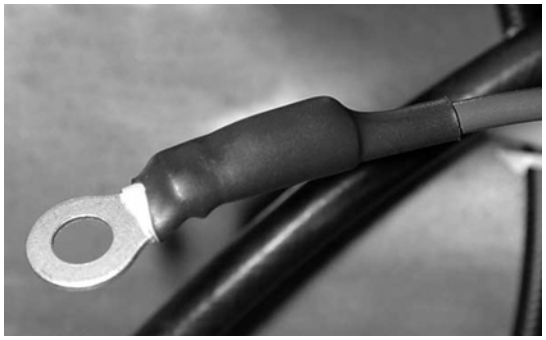

FIG. 83

10. Remove the fuse panel cover and identify either an open auxiliary fuse circuit or identify a non-critical fuse circuit that can be used (FIG. 84).

    NOTE: Non-critical fuse circuit include: horn, radio, parking lights, etc)

    - Fuse circuit must be 24V for 24V pumps, or 12V for 12V pumps.
    - Fuse circuit must also be a switched circuit (when machine power is off, circuit is off)
    - If you are unsure, use a volt-meter, or multi-tester to identify a switched circuit.

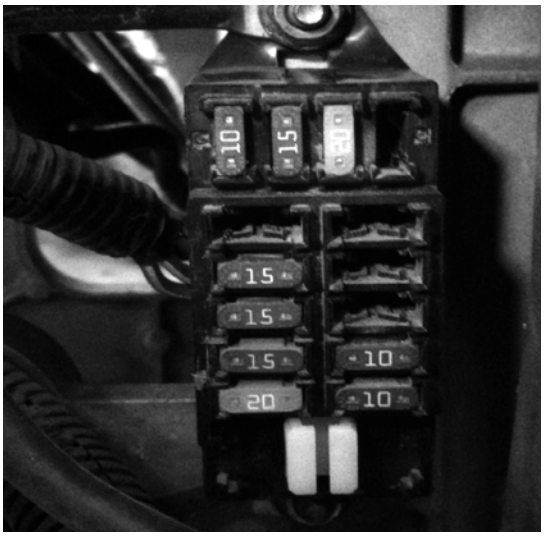

FIG. 84

11. Insert the Add-A-Fuse into an open Auxiliary circuit or remove a non-critical fuse and place the Add-A-Fuse into the fuse slot (FIG. 85).

FIG. 85

12. Place the removed fuse into the lower socket of the Add-A-Fuse and insert a 5Amp fuse into the upper socket with the lead wire. This wire is attached to the main power wire for the G3 pump (FIG. 86).

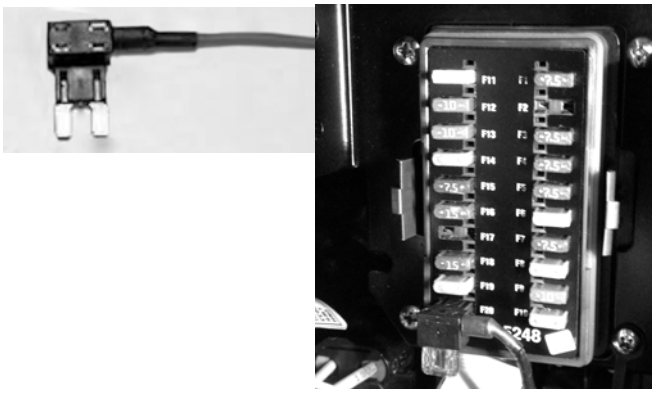

FIG. 86

13. Route the wire through an opening in the back of the fuse panel. Leave excess wire in the fuse panel to allow for routing of the wires, and to allow easy removal of the fuse panel cover (FIG. 87).

FIG. 87

14. See FIG. 88. Locate a grounding point in the fuse panel.

    - The best place to ground is directly to the chassis.
    - Certain equipment will have metal supports for the relays in the panel. This is an ideal mounting location for the ground wire.

    a. Remove a bolt and insert it through the ring connector on the (-) wire.

    b. Re-install the bolt until firmly tightened.

    The ground wire has now been installed.

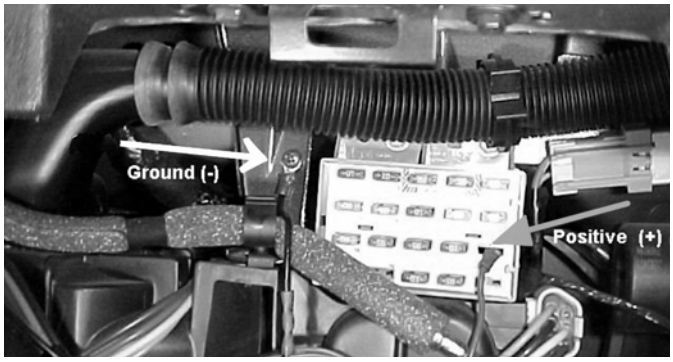

FIG. 88

15. Re-install the fuse panel cover. Check for any snag points in the wiring. If there are any excess wires from the power cable, cut them back and wrap the wires with electrical tape. Coil any excess wire and secure with a zip tie (FIG. 89).

FIG. 89

16. Close the fuse panel cover and access panels. Restore power to the machine. Check your wiring to verify power is successfully applied to your pump, controller, and that power is being sent to the existing auxiliary equipment if equipped.

17. If everything is working correctly, turn off main power breaker and document the installation for future reference (FIG. 90).

FIG. 90

NOTE: *Photographs may include optional equipment.*

Hose Routing Guidelines

NOTE: Hose Routing requires either the use of weld studs, or pre-engineered weld mounting bars.

Although welding on mobile equipment is always subject for concern, it is important to understand that factory lubrication installations require the use of welding or drilling on the machine to mount lubrication equipment. See the Welding and Weld Stud section, beginning on page 3.

Hose Routing

- Identify the internal and external pivot points to ensure proper hose lengths are applied.

  If hoses are too short, they will bind and eventually break.

  If hoses are too long, they can easily get snagged on external debris, or pinched in the machine and break.

- The hoses must fit the machine. Use existing hydraulic and electrical routing from the OEM. This will ensure the lines are protected and routing is relatively similar to the OEM equipment.

- Hoses should not be hanging or dangling from the machine. Hoses should be routed neatly and kept close to the frame of the machine. This will provide added protection from debris and reduce the chance of hoses being snagged from the equipment terrain.

- Care must be taken to ensure hoses are installed to move with the machine. To make the lube system part of the machine consideration must be given to the many pivot, oscillation, extension and pinch point areas of a equipment. Before cutting and securing hoses, have a qualified technician move the various parts of the machine to ensure proper routing is achieved.

- Look for access points. Utilize grommets, supports, or cutouts in equipment's frame. Routing hoses through these areas keeps the hoses inside the machine and provides protection. It will also provide a cleaner, more professional looking installation.

- Keep hoses secured, wrapped, and guarded to reduce the chance of failure in the field. When mounting hoses, identify if there are any added steps that should be taken to ensure the hoses have been protected properly. Sometimes adding extra hose loom to band hoses together or adding steel spiral guard can make a very big difference in performance.

- FIG. 91 - FIG. 95 show examples of hose routings.

FIG. 91

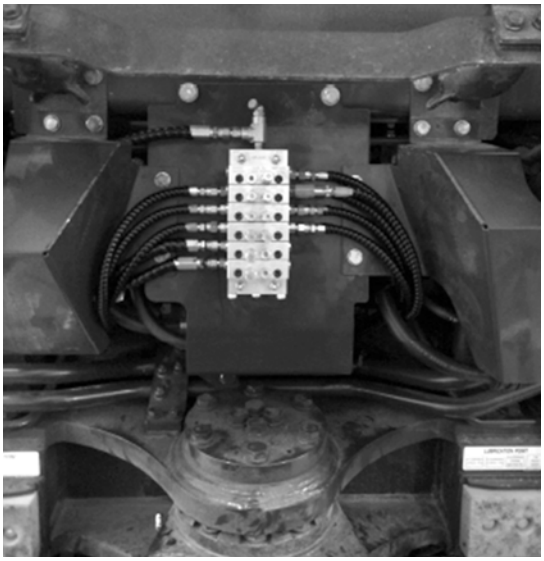

FIG. 92

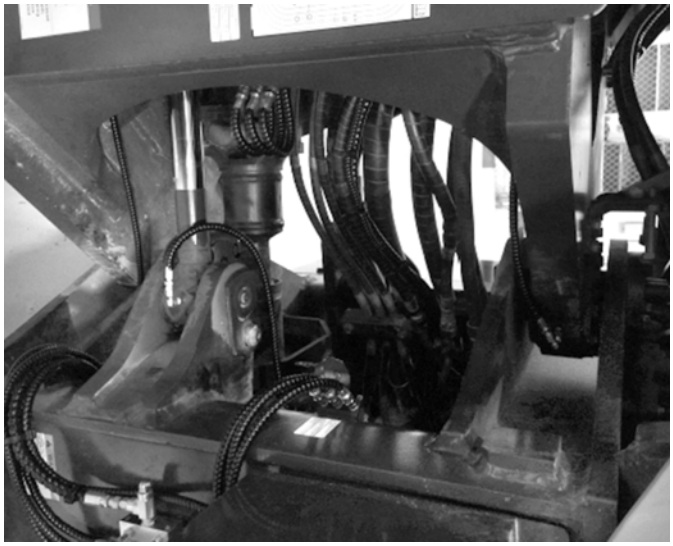

FIG. 93

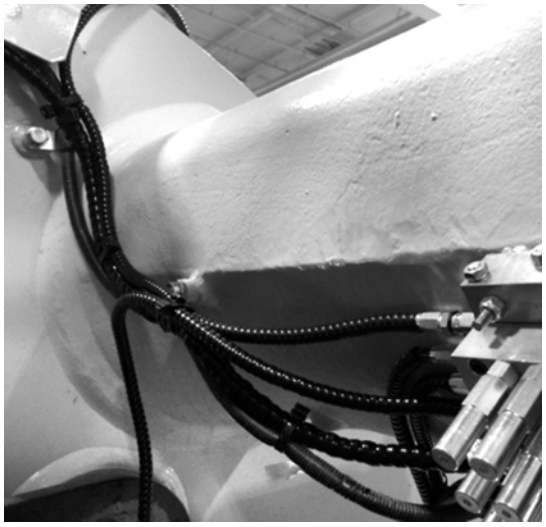

FIG. 94

FIG. 95

NOTE: *Photographs may include optional equipment.*

Hose Assembly Instructions

1. Wrap or slide spiral wrap (sw) over the end of the cut-to-length hose (h) until the entire length of the hose is encased in the spiral wrap.

2. Trim the spiral wrap (sw), leaving approximately 1 inch (25.4 mm) of the hose end unwrapped (FIG. 96).

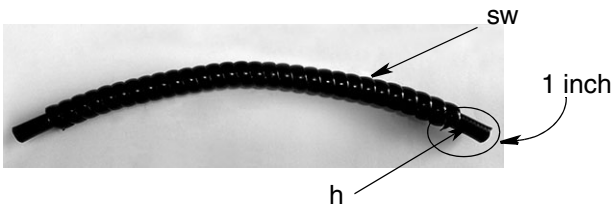

FIG. 96

3. Some hoses require additional protection and should also be wrapped with a hose spring guard.

   a. Slide the hose spring guard (sg) over the end of the spiral wrapped hose. Feed the hose assembly into the hose spring guard until the entire length of the hose is encased in the hose spring guard.

   b. Trim the hose spring guard (sg) so it is long enough to cover hose assembly.

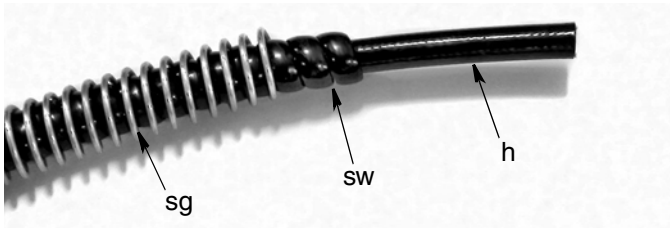

FIG. 97

The hose in the kit is provided in bulk and the fittings are field installable; a crimper is not required.

4. Refer to instruction manual 3A3159 for hose fitting assembly instructions.

NOTICE

Do not over tighten the fittings during final assembly. After the two fittings are securely connected, stop tightening the fittings. Over-tightening can damage the fittings and a new hose assembly will need to be made.

If the ferrule sleeve is difficult to install, check the hose for proper lubrication. Reapply lubricant as needed. Installation without proper lubrication can cause damage to the core tube.

5. Repeat Steps 1-4 for all hose assemblies.

NOTE: *Photographs may include optional equipment.*

Filling and Purging

- An automatic lubrication system must be free of air in order to generate enough pressure to cycle grease through the valves or injectors.
- Take care to ensure dirt and/or debris do not get on the grease fitting or introduced into the system.

Dyna-Star Pump

Filling

1. Fill the Dyna-Star pump through the supplied filling port.
2. Remove the inspection plug on the top of the reservoir to identify when the reservoir is full of grease.
3. Reinstall the inspection plug after the reservoir is full.

Purging

Use the Dyna-Star pump to purge the main feed lines throughout the machine.

1. Make sure the lubrication hoses and plumbing are securely connected to all injector manifolds.
2. Loosen the end plug of each last bank of injectors on a branch line. This will allow air to escape as grease fills the main line. After grease begins to purge from the loosened plug, tighten the plug securely.
3. Continue to bleed the air from each branch of injector manifolds until all air in the main line has been purged.
4. After all air has been purged from the main line and all fittings are secure, purge the grease lines from the injectors to the lubrication point.
5. At the bearing point, loosen the grease hose from the injector to allow grease to purge from the lube line.
6. Remove the cap from the supplied grease zerk on the injector and connect a pneumatically powered grease gun to the grease zerk and fill the line with grease.
7. After grease purges from the end of the hose, reattach the grease line to the lube point.
8. Reinstall the grease zerk cap, and continue the process until all grease lines have been purged.

NOTE: *Photographs may include optional equipment.*

G3 Pump

Filling and Purging

1. Connect a pneumatically powered grease gun to the grease zerk (a) on the G3 pump.

2. Fill the G3 pump reservoir with grease to the “MAX” line mark (b) on the front of the reservoir (FIG. 98).

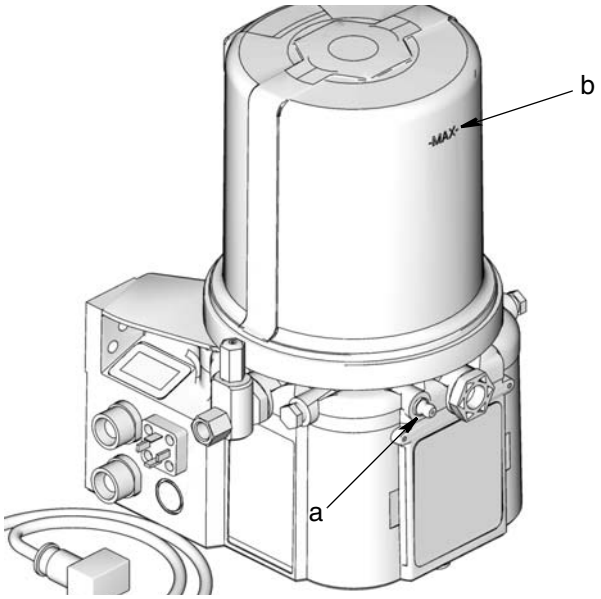

FIG. 98

3. Connect a pneumatically powered grease gun to the grease zerk (c) on the master valve to the pump (FIG. 99). Have a colleague stand next to the pump to identify when the main feed line from the pump is full and the air is purged from the line. Wrench tighten the fitting on the G3 pump, securely.

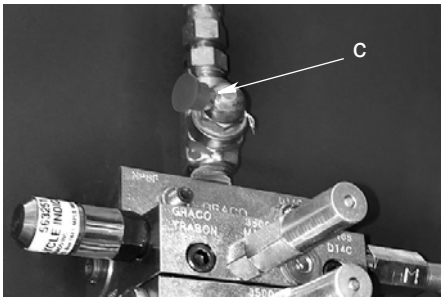

FIG. 99

4. Continue to fill the master valve and the grease lines to the secondary valves (FIG. 99). Have a colleague identify when the lines are filled and air is purged from the lines. Wrench tighten the inlet hose fittings on the secondary valves, securely.

   NOTE: Use a waste container to capture excess grease from the feed lines.

5. Connect a pneumatically powered grease gun to the grease zerk (d) on the secondary valve to fill the secondary valves and their grease lines (FIG. 100). Have a colleague stand next to the grease lines from the secondary valves to the bearing points to identify when the lines are filled and air is purged from the lines. Wrench tighten the secondary lines to the bearing points, securely.

   NOTE: Use a waste container to capture excess grease from the secondary lines.

FIG. 100

Testing

Before testing the system:

- be sure the pump reservoir is filled,
- all supply lines are connected securely,
- verify all bearing point fittings and hose connections are tight,
- valves and grease lines are filled with grease and purged of air.

1. Turn on the battery disconnect to the machine and key on power in the cab to the “Acc” position.
2. Verify the pump and the GLC2200 Controller have power.
3. Press the Manual Run button on the GLC2200 Controller or G3 pump to run the lube system through several lube events.

4. While the pump is running, walk around the machine and inspect all pump, valve hose fittings and bearing point connections to verify there are no leaks in the system.

WARNING

SKIN INJECTION HAZARD

High-pressure fluid from dispensing device, hose leaks, or ruptured components will pierce skin. This may look like just a cut, but it is a serious injury that can result in amputation. Get immediate surgical treatment.

- Do not put your hand over the fluid outlet.
- Do not stop or deflect leaks with your hand, body, glove, or rag.
- Follow the **Pressure Relief Procedure** included in your pump instruction manual when you stop dispensing and before cleaning, checking, or servicing equipment.
- Tighten all fluid connections before operating the equipment.
- Check hoses and couplings daily. Replace worn or damaged parts immediately.

5. If any of the fittings or connections are leaking, tighten fittings and/or make adjustments as needed.
6. Put the machine into service and manually run the lubrication system.
   - Articulate all working sections of the machine to ensure there is sufficient hose length supplied to all lubrication points.
   - Inspect all pump, injector, valve hose fittings and bearing point connections to verify there are no leaks, the hoses are secure and that all points are receiving grease.
7. If any of the fittings or connections are leaking, tighten fittings and/or make adjustments as needed.

Routine Service and Equipment Maintenance

Every time you complete the vehicle inspection checklist, walk around the machine to inspect all pump, injector, valve hose fittings and bearing point connections to verify there are no leaks in the system. This will ensure any damage to hoses or fittings is identified and repaired properly.

NOTE: *Photographs may include optional equipment.*

Troubleshooting

NOTE:

- For more Troubleshooting tips, refer to the specific Graco equipment instruction manuals included with your system or available at www.graco.com.
- If the problem is not attributed to the Graco Lubrication System, consult the Komatsu Operations and Maintenance manual or your Komatsu dealer.

Problem	Cause	Solution
GLC2200 Controller or G3 pump does not turn on	No power to the machine	Check that the battery disconnect is ON and the keyed power is in the “Acc” position.
	GLC2200 Controller not wired correctly	Check to ensure the controller and/or pump have been wired correctly by reviewing the GLC2200 Wiring Table on page 15.
GLC2200 Controller or G3 pump is in alarm mode; will not operate correctly	Fault is not cleared on controller	For 3 seconds, hold down the fault clear button (located on the left side of the controller). Controller fault should clear and begin OFF TIME countdown. See GLC2200 Controller or G3 Pump instruction manual.
GLC2200 Controller goes into fault mode and displays ER:LL	Pump reservoir is empty	Refill pump reservoir. After filling, press and hold the fault clear button on the GLC2200 controller for 3 seconds. See GLC2200 Controller instruction manual.
GLC2200 audible alarm is sounding during machine operation	Machine requires service	To silence the alarm, press the fault clear button on the GLC2200 Controller for one second. Release button. The alarm will silence, but the system will remain in alarm mode until the machine is serviced.

Problem	Cause	Solution
GLC2200 Controller is in fault mode and displays ER:Cy or ER:Pr	The lubrication system failed to complete a lube event in the allowed run time.	Verify the GLC2200 Controller is programmed correctly. In colder temperatures, it may be necessary to exceed the pump run time to complete the lube event
		If the first solution does not correct the problem, run a manual cycle and check the pump relief valve for discharged grease. If grease has discharged from the relief valve, a bearing may have stopped taking grease, a grease line may be compromised, or a valve may be clogged.
	MSP master valve reset indicator pin is protruding. Hose is damaged	Inspect MSP master valve to find reset indicator with a protruding pin. Follow the corresponding hose to the secondary valve. Replace hose.
	MSP master valve reset indicator pin is protruding. Valve is not accepting grease and blocked. Injector pins are not moving when pump runs.	If the hose is not compromised, inspect the corresponding secondary valve for a pin protruding from the secondary valve. Use a grease gun to verify the valve is accepting grease. If the valve is blocked, replace valve. Repeat as needed for all MSP valves. Inspect for leaks in the system to verify that pressure is being generated. If there is pressure in the system, but the indicator pins fail to move, verify that the vent valve is functioning. If there is no pressure in the system, verify the pump is running during the lube event. If there pump is running but pressure is not being generated, there is a leak in the system, or air has been introduced in the main feed lines. Correct and retest.
GLC2200 or G3 pump will not allow programmed time	Hours, minutes or seconds field not set correctly on GLC2200 Controller or G3 pump	Refer the GLC2200 Controller or G3 Pump instruction manual.

NOTE: *Photographs may include optional equipment.*

Problem	Cause	Solution
MSP valves fail to accept grease	MSP valve not torqued to required specification or overtightened	Check MSP valve torque. Tighten if not torqued to required specification. If overtightened, adjust valve assembly and retest.
Bearings not receiving enough grease	GLC2200 Controller of G3 Pump OFF TIME set too long.	Reset the GLC2200 Controller or G3 Pump OFF TIME to a shorter amount of time. This will engage a lube event more frequently and increase the amount of grease the bearings receive in a day.
G3 Pump does not build or hold pressure	Broken hose or air in feed lines	Inspect hoses for damage. Repair or replace as needed. If hoses are not damaged, re-purge main lines to remove any unwanted air from the system.

For additional information about these Graco products; including Warnings, Troubleshooting, and Technical Data refer to the Graco instruction manuals included with the equipment or visit the Graco website at www.graco.com to download the latest versions of Graco instruction manuals.

NOTE: *Photographs may include optional equipment.*