



MODELS | ZB20044



# Service Manual

## ZOOM BOOM SERIES TELESCOPIC MATERIAL HANDLER

Part No. 402509AD October 2013

**SKYJACK**



**This manual is based on Serial Numbers:**

ZB 2044 85,800,072 & Below

Please refer to the website - [www.skyjack.com](http://www.skyjack.com) for older Serial Numbers.

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## **SERVICE AND MAINTENANCE**

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The Safety Alert Symbol identifies important safety messages on telehandlers, safety signs in manuals or elsewhere. When you see this symbol, be alert to the possibility of personal injury or death. Follow the instructions in the safety message.



**This Safety Alert Symbol means attention!**

**Become alert! Your safety is involved.**



**DANGER**

**DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.**



**WARNING**

**WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.**



**CAUTION**

**CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.**

**IMPORTANT**

**IMPORTANT indicates a procedure essential for safe operation and which, if not followed, may result in a malfunction or damage to the telehandler.**





**Section 1**  
**SCHEDULED MAINTENANCE**

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## Section 1 - Scheduled Maintenance

## Operator's Responsibility for Maintenance

**SKYJACK** is continuously improving and expanding product features on its equipment, therefore, specifications and dimensions are subject to change without notice.

### Telehandler Definition

A material handler designed primarily as a fork truck with a pivoting telescopic boom which enables it to pick and place loads at distances as well as various lift heights.

### Purpose of Equipment

The SKYJACK telehandlers are designed to lift, handle and transport agricultural or industrial products by means of specific attachments.

### Use of Equipment

The telehandler is a highly maneuverable, mobile work station. Lifting, handling and driving must be on a flat, level, compacted surface. It can be driven over uneven terrain only when the boom is fully lowered.

### Manual Operating

The operating manual is considered a fundamental part of the telehandler. It is a very important way to communicate necessary safety information to users and operators. A complete and legible copy of this manual must be kept in the provided weather-resistant storage compartment on the telehandler at all times.

### Service & Maintenance

The purpost of this is to provide the customer with the servicing and maintenance procedures essential for the promotion of proper machine operation for its intended purpose.

All information in this manual should be read and understood before any attempt is made to service the telehandler. The updated copy of the manuals are found on the company's website: [www.skyjack.com](http://www.skyjack.com).

### Operator

The operator must read and completely understand both this operating manual and the safety panel label located on the telehandler and all other warnings in this manual and on the telehandler. Compare the labels on the telehandler with the labels found within this manual. If any labels are damaged or missing, replace them immediately.

### Service Policy and Warranty


SKYJACK warrants each new ZB series telehandler to be free of defective parts and workmanship for the first 12 months or 2000 hours, whichever occurs first. Any defective part will be replaced or repaired by your local SKYJACK dealer at no charge for parts or labor. Contact SKYJACK Service Department for warranty statement extensions or exclusions.

### Optional Accessories

The SKYJACK telehandler is designed to accept a variety of optional accessories. These are listed under "Attachments Installation and Operation" in [Section 2](#) of the operating manual. Operating instructions for these options (if equipped) are located in [Section 2](#) of the operating manual.

For non-standard components or systems, contact the SKYJACK Service Department at

 : 800 275-9522

 : 630 262-0006

Include the model and serial number for each applicable telehandler.



## Operator's Responsibility for Maintenance

## Section 1 - Scheduled Maintenance

### Scope of this Manual

- a. **This manual applies** to the ANSI/ASME/ITSDF and CSA versions of the ZB20032 & ZB20044 telehandlers.
  - **Equipment identified** with "ANSI" meets the ASME/ANSI B56.6 standard.
  - **Equipment identified** with "CSA" meets the CSA B335-04 standard.
- b. **CSA (Canada)**  
Operators are required to conform to national, territorial/provincial and local health and safety regulations applicable to the operation of this telehandler.
- c. **ANSI (United States)**  
Operators are required by the current ANSI standards to conform to national, territorial/provincial and local health and safety regulations applicable to the operation of this telehandler.



**warning**

**Failure to comply with your required responsibilities in the use and operation of the telehandler could result in death or serious injury!**

### Operator Safety Reminders

A study conducted by St. Paul Travelers showed that most accidents are caused by the failure of the operator to follow simple and fundamental safety rules and precautions.

You, as a careful operator, are the best insurance against an accident. Therefore, proper usage of this telehandler is mandatory. The following pages of this manual should be read and understood completely before operating the telehandler.

Common sense dictates the use of protective clothing when working on or near machinery. Use appropriate safety devices to protect your eyes, ears, hands, feet and body.

Some attachments may not be approved for use with certain telehandler models. Use only approved attachments.

Any modifications from the original design are strictly forbidden without written permission from Skyjack.



## Section 1 - Scheduled Maintenance

## Operator's Responsibility for Maintenance

### Electrocution Hazard

**This telehandler is NOT electrically insulated.** Use extreme caution around high-voltage overhead power lines and maintain a Minimum Safe Approach Distance (MSAD) of 10 feet from source of power. Adhere to all federal/national, state/provincial, or local safety regulations for your own protection.

No part of telehandler or payload should be brought closer to any energized overhead electrical conductor with nominal phase voltage rating as specified below:

| Voltage            | Distance |
|--------------------|----------|
| 750 to 150,000     | 10 feet  |
| 150,000 to 250,000 | 15 feet  |
| 250,000            | 20 feet  |



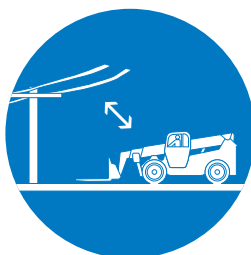
### **DANGER**

**Never approach any power line with any part of telehandler. Use extreme caution; serious injury or death can result with contact from any power line.**

### **IMPORTANT**

**Always assume electrical power sources and overhead lines are energized.**

**DO NOT USE TELEHANDLER AS A GROUND FOR WELDING.  
DO NOT OPERATE TELEHANDLER DURING LIGHTNING OR STORMS.**





## AC

## Operator's Responsibility for Maintenance

## Section 1 - Scheduled Maintenance

## Safety Precautions

Know and understand all safety precautions before going on to the next section.

**WARNING**

**DO NOT** operate this telehandler without proper authorization and training. Failure to avoid this hazard could result in death or serious injury.

**WARNING**

Failure to heed the following safety precautions could result in tip over, falling, crushing, or other hazards leading to death or serious injury.

- **MAKE SURE** all DANGER, WARNING, CAUTION and INSTRUCTIONAL DECALS are in place and can be read. Clean or replace decals as required.
- **KNOW** all national, state/provincial and local rules which apply to your telehandler and jobsite.
- **WEAR** all the protective clothing and personal safety devices issued to you or called for by job conditions.

- **DO NOT** wear loose clothing, dangling neckties, scarves, rings, wristwatches or other jewelry while operating this telehandler.



- **DO NOT** climb on this vehicle for any reason.



- **DO NOT** stand on forks. Failure to heed could result in death or serious injury.



- **DO NOT** use telehandler as a man lift or equip this telehandler with a personnel work platform.



- **DO NOT** use carriage or any other portion of the boom for slinging loads



- **DO NOT** elevate the boom in windy or gusty conditions.



- **DO NOT** drive with boom elevated.



- **DO NOT** operate on surfaces not capable of holding the weight of the telehandler; including the rated load (e.g., covers, drains, and trenches).



- **DO NOT** maneuver a load while moving. This greatly increases the chance of spills and injury.





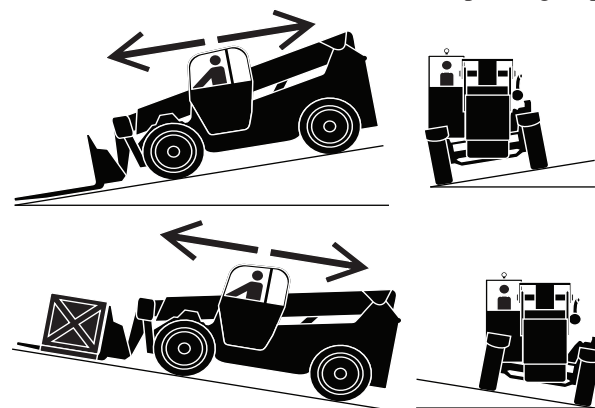
## Section 1 - Scheduled Maintenance

## Operator's Responsibility for Maintenance

## Safety Precautions (Continued)

Know and understand all safety precautions before going on to the next section.

- DO NOT** exceed the maximum safe operating slope.



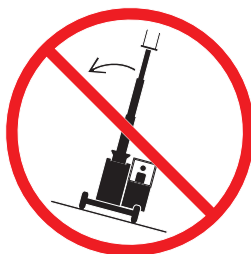
- DO NOT** lower the boom unless the area below is clear of personnel and obstruction.



- DO NOT** elevate the boom while the telehandler is on a truck, forklift or other device or vehicle.



- DO NOT** use frame leveling when boom is elevated. It is recommended that frame leveling be used only when boom is retracted and in the lowered position.



- ENSURE** that there are no personnel or obstructions in the path of travel, including blind spots.



- BE AWARE** of blind spots when operating the telehandler.

- DO NOT** use the frame leveling mechanism to compensate for swinging loads.



- ALWAYS** Keep head, arms, hands, legs and all other body parts inside the operator's cab.



- DO NOT** enter the danger area under or around the boom when forks are off the ground or while engine is running.



- AVOID** jerks and sudden stops.



- AVOID** entanglement with ropes, cords or hoses.





## AC

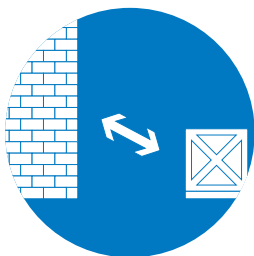
## Operator's Responsibility for Maintenance

## Section 1 - Scheduled Maintenance

## Safety Precautions (Continued)

Know and understand all safety precautions before going on to the next section.

- **BE AWARE** of all obstructions while traveling. Check for clearance before traveling between obstacles.



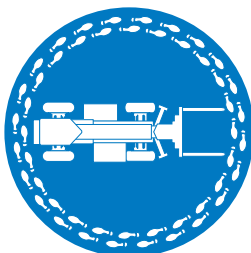
- **USE CAUTION** when boom is fully extended. The further out the boom is extended, the less load telehandler can support.



- **USE CAUTION** when placing loads at high elevations and on downhill slopes.



- **WALK AROUND** the telehandler before operation and check for any visible signs of damage or malfunction.



- **ALWAYS** maintain three points of contact when entering vehicle. Use provided hand-holds and steps only.



- **ALWAYS** wear your seat belt when operating this vehicle.



- **KNOW** the weight of the load you are transporting. Never lift more than the lifting capacity at any given extension or elevation of the boom as listed on the capacity charts.



- **CHECK** for cracks and signs of stress.



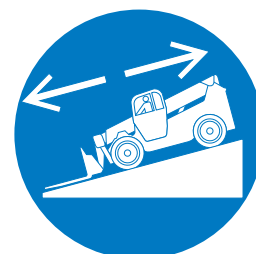
- **TRAVEL SLOWLY** over rough terrain.



- **If operation in areas with holes or dropoffs is absolutely necessary**, ensure that all 4 wheels or outriggers (if equipped) have contact with firm surface. Then level the frame. Once frame is level the boom can be elevated. After elevation, the drive function must not be activated.



- **DRIVE DOWNHILL UNLOADED.** Without a load, the back end is the heaviest part of the telehandler. Driving downhill decreases potential for tipover.







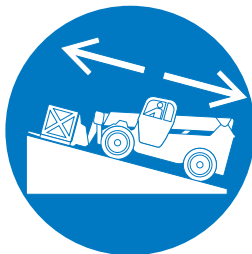
## Section 1 - Scheduled Maintenance

## Operator's Responsibility for Maintenance

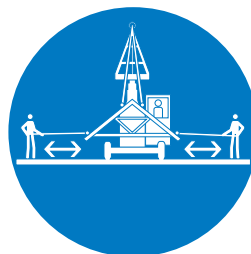
## Safety Precautions (Continued)

Know and understand all safety precautions before going on to the next section.

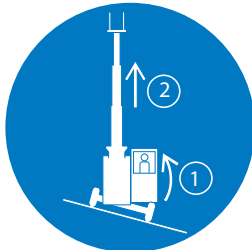
- **DRIVE UPHILL LOAD-ED.** When holding a load, driving uphill decreases potential for load to slip out.



- **TETHER LOADS** that may swing, keeping them close to the ground. Provide ample clearance for personnel to guide the load safely.



- **ALWAYS LEVEL FRAME** before elevating the boom



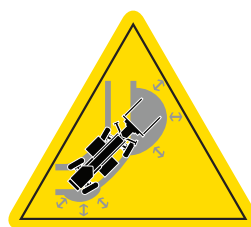
- **SLINGING LOADS** is acceptable only when the load is appropriately attached to a jib boom or the throat of a tilted fork, and the precautions outlined in [Section 1.1](#) are followed.



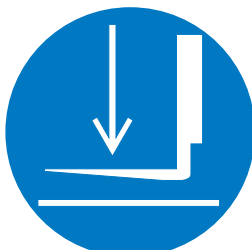
- **WHEN TRANSPORTING LOADS** fully retract the boom, keep the load low to the ground and forks tilted back slightly. This is the most stable position possible for the vehicle.



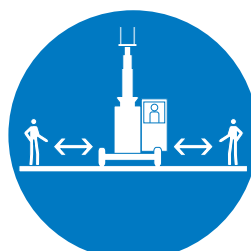
- **BE AWARE** of the telehandler's travel envelope, especially when turning. Keep sufficient clearance at all times between the telehandler and any obstacles or people.



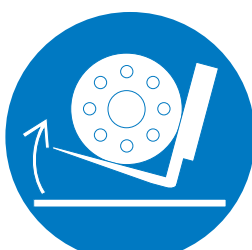
- **KEEP** forks close to the ground when in motion to increase telehandler stability and decrease potential for injury to others. When fully stopped, lower forks completely to the ground.



- **KEEP OTHERS AWAY** at all times during operation.



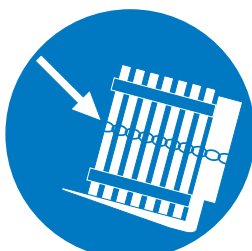
- **TILT** forks backwards slightly when traveling to decrease potential of load slipping off.



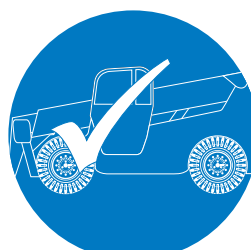
- **CHECK** lights (if equipped) for proper function before operating.



- **SECURE** loose loads with chains or straps to decrease potential of spills or injury to others.



- **ENSURE ALL** tires are in good condition and lug nuts are properly tightened.





## Operator's Responsibility for Maintenance

## Section 1 - Scheduled Maintenance

### Safety Precautions (Continued)

Know and understand the safety precautions before going on to next section.

- **DO NOT** alter or disable safety devices.
- **DO NOT** burn or drill holes in forks. Modifying any part of telehandler or attachment affects its capacity and/or stability.
- **DO NOT** try to start the telehandler by pushing or towing. Such operation may cause severe damage to the transmission - Refer to [Section 2 of the Operating Manual](#).
- **IF DRIVING ON ROADS OPEN TO PUBLIC TRAFFIC** respect the local regulations.
- **THE OPERATOR'S CAB** provides a falling object protection structure (FOPS) and a rollover protection structure (ROPS). **Do not make any modification to this structure.** If damaged, the cab cannot be repaired. It must be replaced.
- **STUNT** driving and horseplay are prohibited.
- **ALWAYS USE FRONT** steering when traveling at high speeds; i.e. on highways or public roads.
- **DO NOT** change steering mode while the telehandler is traveling. Change the steering mode only when telehandler is stopped, and wheels aligned straight ahead.
- **ALWAYS** look in the direction of travel. Reduce speed and be careful especially when traveling in reverse and/or turning. Bring the telehandler to a complete stop before changing the direction of travel.
- **STAY CLEAR** of pinch points and rotating parts on the material handler. Getting caught in a pinch point or a moving part can cause serious injury or death. Before performing any maintenance on telehandler, follow the shutdown procedure in [Section 2.9-9 of the Operating Manual](#).
- **DO NOT** position the telehandler against another object to steady the load.
- **SHUT DOWN** by positioning the telehandler in a safe location. Lower forks to ground, apply the parking brake, move all controls to '**neutral**' and allow engine to run at low idle for 3 to 5 minutes after a full load operation. Stop engine and remove ignition key to prevent unauthorized use. Block tires.



### **WARNING**

**Always engage park brake and shut off engine before leaving the operator's cab.**

**Section 1 - Scheduled Maintenance****Operator's Responsibility for Maintenance****Safety Precautions (Continued)**

Know and understand the safety precautions before going on to next section.

**WARNING**

**Operator should not use any telehandler that:**

- does not appear to be working properly.
- has been damaged or appears to have worn or missing parts.
- has alterations or modifications not approved by the manufacturer.
- has safety devices which have been altered or disabled.
- has been tagged or locked out for non-use or repair.
- bears an unapproved attachment.

**Failure to avoid these hazards could result in death or serious injury.**

**Maintenance and Inspection Schedule**

The actual operating environment of the telehandler governs the use of the maintenance schedule. The inspection points covered in [Table 1.1](#). Maintenance and Inspection Checklist, indicates the areas of the telehandler to be maintained or inspected and at what intervals the maintenance and inspections are to be performed.

**Owner's Annual Inspection Record**

It is the responsibility of the owner to arrange quarterly and annual inspections of the telehandler. Owner's Annual Inspection Record is to be used for recording the date of the inspection, owner's name, and the person responsible for the inspection of the telehandler.

**Replacement Parts**

Use only original replacement parts. Parts such as wheels, etc. with weight and dimensions different from original parts will affect stability of the telehandler and must not be used without manufacturer's consent.

All replacement tires must be of the same size and load rating as originally supplied tires; to maintain safety and stability of telehandler.

Replacement attachments must be equivalent to the originals and be associated with manufacturer approved capacity charts.

Consult SKYJACK's Service Department for optional tires specifications and installation.

**WARNING**

**Any unit that is damaged or not operating properly must be tagged and removed immediately from service until proper repairs are completed.**

**Maintenance and Service Safety Tips**

Maintenance and repair should only be performed by personnel who are trained and qualified to service this telehandler.

All maintenance and service procedures should be performed in a well lighted and well ventilated area.

Anyone operating or servicing this telehandler must read and completely understand all operating instructions and safety hazards in this manual and operating manual.

All tools, supports and lifting equipment to be used must be of proper rated load and in good working order before any service work begins. Work area should be kept clean and free of debris to avoid contaminating components while servicing.

All service personnel must be familiar with employer and governmental regulations that apply to servicing this type of equipment.

Keep sparks and flames away from all flammable or combustible materials.

Properly dispose of all waste material such as lubricants, rags, and old parts according to the relative law provisions obtaining in the country.

Preventive maintenance is the easiest and least expensive type of maintenance.

**Jobsite Inspection**

- Do not use in hazardous locations.
- Perform a thorough jobsite inspection prior to operating the telehandler, to identify potential hazards in your work area.
- Be aware of moving equipment in the area. Take appropriate actions to avoid possible collision.



## Operator's Responsibility for Maintenance

## Section 1 - Scheduled Maintenance

### Hydraulic System & Component Maintenance and Repair

The following points should be kept in mind when working on the hydraulic system or any component:



#### **WARNING**

**Escaping fluid from a hydraulic pressure leak can damage your eyes, penetrate the skin and cause serious injury. Use proper personal protection at all times.**

1. Any structure has limits of strength and durability. To prevent failure of structural parts of hydraulic components, relief valves which limit pressure to safe operating values are included in the hydraulic circuits.
2. Tolerance of working parts in the hydraulic system is very close. Even small amounts of dirt or foreign materials in the system can cause wear or damage to components, as well as general faulty operation of the hydraulic system. Every precaution must be taken to assure absolute cleanliness of the hydraulic oil.
3. Whenever there is a hydraulic system failure which gives reason to believe that there are metal particles or foreign materials in the system, drain and flush the entire system and replace the filter cartridges. A complete change of oil must be performed under these circumstances.
4. All containers and funnels used in handling hydraulic oil must be absolutely clean. Use a funnel when necessary for filling the hydraulic oil reservoir, and fill the reservoir only through the filter opening. The use of cloth to strain the oil should be avoided to prevent lint from getting into the system.
5. When removing any hydraulic component, be sure to cap and tag all hydraulic lines involved. Also, plug the ports of the removed components.

6. All hydraulic components must be disassembled in spotlessly clean surroundings. During disassembly, pay particular attention to the identification of parts to assure proper reassembly. Clean all metal parts in a clean mineral oil solvent. Be sure to thoroughly clean all internal passages. After the parts have been dried thoroughly, lay them on a clean, lint-free surface for inspection.
7. Replace all O-rings and seals when overhauling any component. Lubricate all parts with clean hydraulic oil before reassembly. Use small amounts of petroleum jelly to hold O-rings in place during assembly.
8. Be sure to replace any lost hydraulic oil when completing the installation of the repaired component, and bleed any air from the system when required.
9. All hydraulic connections must be kept tight. A loose connection in a pressure line will permit the oil to leak out or air to be drawn into the system. Air in the system can cause damage to the components and noisy or erratic system operation.

### Maintenance Hints

Three simple maintenance procedures have the greatest effect on the hydraulic system performance, efficiency and life. Yet, the very simplicity of them may be the reason they are so often overlooked. What are they? Simply these:

1. Change filters annually. The filters will need to be changed more often depending on the operating conditions. Dirty, dusty, high moisture environments may cause the hydraulic system to be contaminated more quickly.
2. Maintain a sufficient quantity of clean hydraulic oil of the proper type and viscosity in the hydraulic reservoir.
3. Keep all connections tight.



## Section 1 - Scheduled Maintenance

## Scheduled Maintenance Inspections

### About this Section

This section contains the maintenance and inspection schedule that is to be performed.

References are made to the procedures in Section 5 that outline detailed step-by-step instructions for checks and replacements.

### Service Bulletins

Before performing any scheduled maintenance inspection procedure, refer to service bulletins found in our web site: [www.skyjack.com](http://www.skyjack.com) for updates related to service and maintenance of this telehandler.

### Maintenance and Inspection

Death or injury can result if the telehandler is not kept in good working order. Inspection and maintenance should be performed by competent personnel who are trained and qualified on maintenance of this telehandler.



### WARNING

**Failure to perform each procedure as presented and scheduled may cause death, serious injury or substantial damage.**

### NOTE

Preventive maintenance is the easiest and least expensive type of maintenance.

- Unless otherwise specified, perform each maintenance procedure with the telehandler in the following configuration:
  - Telehandler parked on a flat and level surface
  - Engine is turned off.
- Repair any damaged or malfunction components before operating telehandler.
- Keep records on all inspections.

### Maintenance Instructions

This manual consists of four schedules to be done for maintaining on a telehandler. Inspection schedule frequency is shown below:

### Inspection Schedule

|                        |               |
|------------------------|---------------|
| Daily                  | A             |
| Weekly or 40 hours     | A + B         |
| Quarterly or 250 hours | A + B + C     |
| Annually or 1000 hours | A + B + C + D |

- Make copies of the maintenance and inspection checklist to be used for each inspection.
- Check the schedule on the checklist for the type of inspection to be performed.
- Place a check in the appropriate box after each inspection procedure is completed.
- Use the maintenance and inspection checklist and step-by-step procedures in [Section 5](#) to perform these inspections.
- If any inspection receives a fail, tag and remove the telehandler from service.
- If any telehandler component(s) has been repaired, an inspection must be performed again before removing the tag. Place a check in the repair column.

### Legend

P = Pass  
 F = Fail  
 R = Repaired



## Scheduled Maintenance Inspections

## Section 1 - Scheduled Maintenance



Table 1.1 MAINTENANCE AND INSPECTION CHECKLIST

Serial Number: \_\_\_\_\_

Model: \_\_\_\_\_

Hourmeter Reading: \_\_\_\_\_

Operator's Name (Printed): \_\_\_\_\_

Date: \_\_\_\_\_

Time: \_\_\_\_\_

Operator's Signature: \_\_\_\_\_

Each item shall be inspected using the appropriate section of the Skyjack operating manual.

As each item is inspected, write the appropriate grade in the box.

P - PASS

F - FAIL

R - REPAIRED

## INSPECTION FREQUENCY

☐ DAILY☐ WEEKLY or 40 HOURS☐ QUARTERLY or 250 HOURS☐ ANNUALLY or 1000 HOURS

## Inspection Schedule

|                        |               |
|------------------------|---------------|
| Daily                  | A             |
| Weekly or 40 Hours     | A + B         |
| Quarterly or 250 Hours | A + B + C     |
| Annually or 1000 Hours | A + B + C + D |

| Schedule                                |         | P | F | R |
|---|---------|---|---|---|
| <b>Schedule Maintenance Inspections</b> |         |   |   |   |
| Labels                                  | A       |   |   |   |
| Electrical                              | A       |   |   |   |
| Safety Switches                         | A       |   |   |   |
| Mirrors                                 | A       |   |   |   |
| Hydraulic                               | A       |   |   |   |
| Cylinders                               | A,B,C,D |   |   |   |
| <b>Frame</b>                            |         |   |   |   |
| Wheel/Tire Assembly                     | A       |   |   |   |
| Batteries and Cables                    | A       |   |   |   |
| Engine Air Filter                       | A,B,C   |   |   |   |
| Engine Coolant                          | A       |   |   |   |
| Muffler and Exhaust                     | A       |   |   |   |
| <b>Drive Axles</b>                      |         |   |   |   |
| Hub Oil                                 | C       |   |   |   |
| Change Differential Oil                 | D       |   |   |   |
| Pinion Seal                             | A       |   |   |   |
| Inner and Outer Shaft Seals             | A       |   |   |   |
| Hub Seals                               | A       |   |   |   |
| King Pins                               | C,D     |   |   |   |
| Check Drive Shafts and U-Joints         | C,D     |   |   |   |
| Axle Mounting Pins and Bushings         | C,D     |   |   |   |
| Axle Housing                            | A       |   |   |   |
| Steer Cylinder Assembly                 | A       |   |   |   |
| Steer Linkage                           | A       |   |   |   |
| <b>Engine Compartment</b>               |         |   |   |   |
| Engine Oil                              | A,C     |   |   |   |
| Fuel Leaks                              | A       |   |   |   |
| Hydraulic Pump                          | A       |   |   |   |
| Belts and Hoses                         | A       |   |   |   |
| Fuel Tank                               | A       |   |   |   |
| Change Fuel Filter                      | A,C     |   |   |   |
| Drain Water from Fuel Filter            | C,D     |   |   |   |
| Hydraulic Tank                          | A       |   |   |   |
| Hydraulic Oil                           | A,D     |   |   |   |
| Hydraulic Return Filter                 | A,C     |   |   |   |
| Change Oil Filters                      | A,C     |   |   |   |
| Charging System                         | A       |   |   |   |
| <b>Transmission</b>                     |         |   |   |   |
| Operate and Check Shifting              | A       |   |   |   |
| Check for Leaks                         | A       |   |   |   |
| Check Transmission Disconnect           | A       |   |   |   |

| Schedule   |       | P | F | R |
|--|-------|---|---|---|
| Change Transmission Filter                               | D     |   |   |   |
| <b>Boom</b>  |       |   |   |   |
| Main pins and bushings                                   | C,D   |   |   |   |
| subcarriage pins and bushings                            | C,D   |   |   |   |
| Rollers and Tracks                                       | C,D   |   |   |   |
| Slide Pads   | B,C,D |   |   |   |
| Chain  | A,C   |   |   |   |
| Boom Angle Indicator                                     | A     |   |   |   |
| Proximity Sensor   | A     |   |   |   |
| Lifting Attachment                                       | A     |   |   |   |
| Forks  | A     |   |   |   |
| Fork Bars and Locks                                      | A     |   |   |   |
| <b>Grease Fittings</b>                                   |       |   |   |   |
| Grease Fittings on Frame                                 | B     |   |   |   |
| Grease Fittings on Boom Assembly                         | B     |   |   |   |
| <b>Operator's Cab</b>                                    |       |   |   |   |
| ROPS/FOPS  | A     |   |   |   |
| Seat   | A     |   |   |   |
| Pedals   | A     |   |   |   |
| Manual   | A     |   |   |   |
| Operator's Cab Controls                                  | A     |   |   |   |
| <b>Function Tests</b>                                    |       |   |   |   |
| <b>Operator's Cab Controls</b>                           |       |   |   |   |
| Test Starter Operation                                   | A     |   |   |   |
| Test Horn  | A     |   |   |   |
| Test Reverse Alarm                                       | A     |   |   |   |
| Test Gauges  | A     |   |   |   |
| Test Lights  | A     |   |   |   |
| Test Switches  | A     |   |   |   |
| Test Steering Wheel and Column                           | A     |   |   |   |
| Test Boom and Attachment Functions                       | A     |   |   |   |
| Test Frame Leveling and Level Indicator                  | A     |   |   |   |
| Test Frame Level Lock                                    | A     |   |   |   |
| Test Accelerator Pedal                                   | A     |   |   |   |
| Test Driving and Service Brake Functions                 | A     |   |   |   |
| Test Steering  | A     |   |   |   |
| Test Parking Brake                                       | A     |   |   |   |
| Test Outriggers (if equipped)                            | A     |   |   |   |
| Test Outrigger Control & Boom Extension Interlock System | A     |   |   |   |

202A

A - Perform Visual and Daily Maintenance Inspections &amp; Functions Test. Refer to Section 2.7 of the Operating Manual.

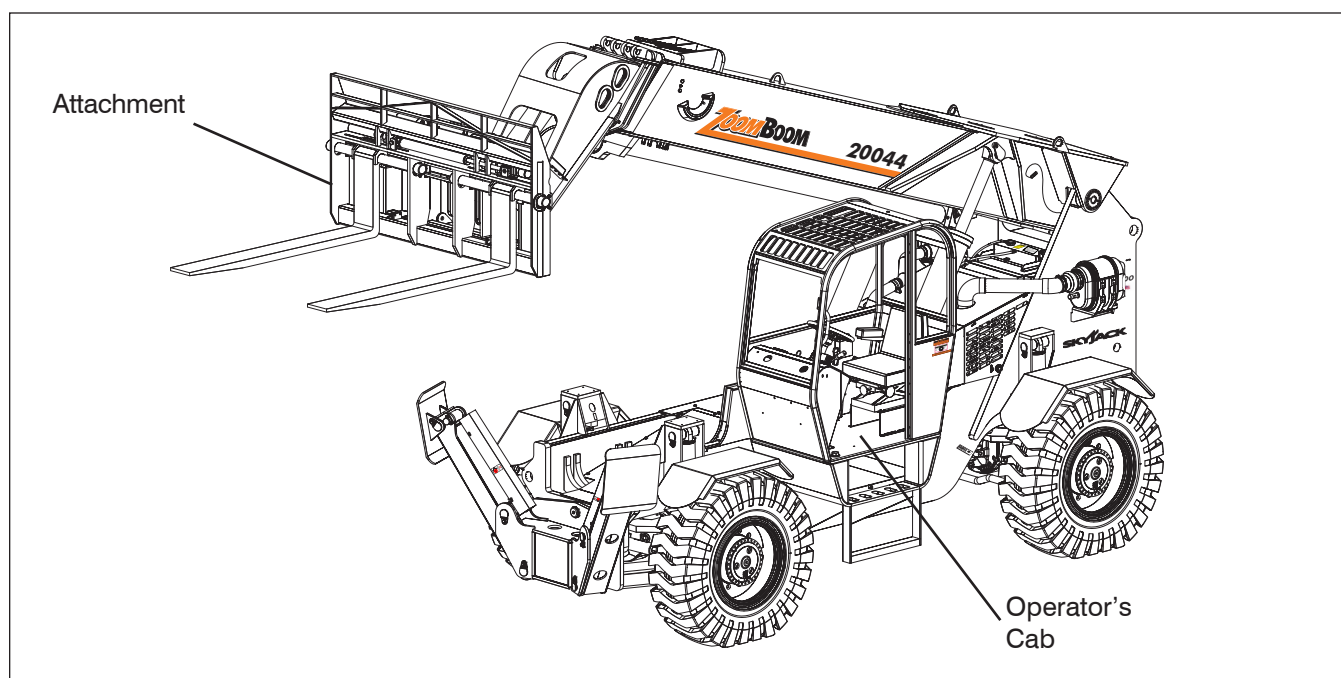
B - Perform Scheduled Maintenance Inspection every week or 40 hrs. Refer to Section 1.0 of this manual.

C - Perform Scheduled Maintenance Inspection every 3 months or 250 hours. Refer to Section 1.0 of this manual.

D - Perform Scheduled Maintenance Inspection every year or 1000 hours. Refer to Section 1.0 of this manual.

**Note:** Make a copy of this page or visit the Skyjack web site: [www.skyjack.com](http://www.skyjack.com) for a printable copy.



**Section 1 - Scheduled Maintenance****Scheduled Maintenance Inspections****1.1 Scheduled Maintenance Inspections**

Before performing the visual and daily maintenance inspections, ensure that the telehandler is parked on a firm level surface.

Begin the visual and daily maintenance inspections by checking each item in sequence for the conditions listed in this section.

**WARNING**

**To avoid injury, do not operate a telehandler until all malfunctions have been corrected.**

**WARNING**

**To avoid possible injury, ensure telehandler power is off during your visual and daily maintenance inspections.**

**NOTE**

While performing visual and daily inspections in different areas, be aware to also inspect all switches, electrical and hydraulic components.

**1.1-1 Labels**

Refer to the labels section in the parts manual and determine that all labels are in place and are legible.

**1.1-2 Electrical**

Maintaining the electrical components is essential to good performance and service life of the telehandler.

- Ensure proper operation of all gauges
- Check charging system Ammeter/Voltmeter
- Inspect the following areas for chafed, corroded and loose wires:
  - boom wiring harnesses
  - frame wiring harnesses
  - cab wiring harnesses

Ensure electrical devices are properly secured with no signs of visible damage. Ensure there are no loose or missing parts.

**1.1-3 Safety Switches**

Ensure safety switches are properly secured with no signs of visible damage.

**1.1-4 Mirrors**

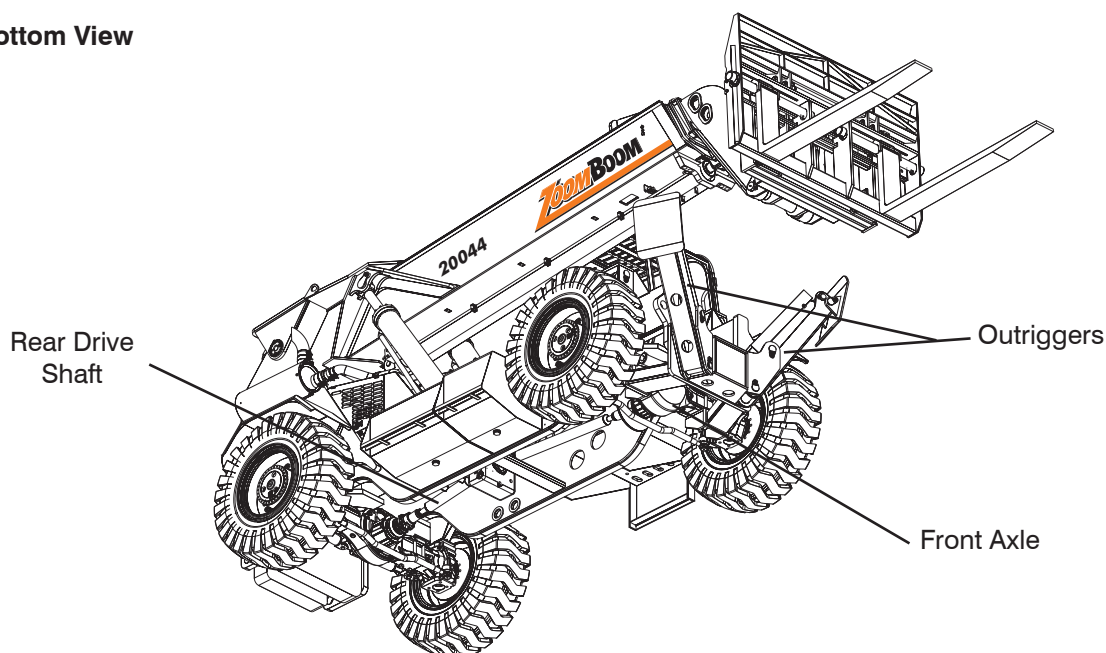
Ensure mirrors are properly secured with no signs of visible damage.



## Scheduled Maintenance Inspections

## Section 1 - Scheduled Maintenance

Bottom View

**1.1-5 Hydraulic**

Maintaining the hydraulic components is essential to good performance and service life of the telehandler. Perform a visual inspection and check for leaks around the following areas:

- hydraulic tank, filter(s), fittings, hoses, pump, and frame surface
- all hydraulic cylinders
- all hydraulic manifolds
- underside of the frame
- ground area under the telehandler

**1.1-6 Cylinders**

- Ensure all cylinders are properly secured and there is no evidence of leakage.
- Grease weekly and check pins and bushings to ensure there is no evidence of damage.

**1.1-7 Frame**

- **Wheel/Tire Assembly**

The telehandler is either equipped with air tires or foam-filled tires. Tire and/or wheel failure could result in a telehandler tipover. Component damage may also result if problems are not discovered and repaired in a timely fashion.

**WARNING**

An over-inflated tire can explode and may cause death or serious injury.

- Check all tire treads and sidewalls for cuts, cracks, punctures and unusual wear.
- Check each wheel for damage and cracked welds.
- Check each lug nut for proper torque to ensure none are loose.

To safeguard maximum stability, achieve optimum telehandler handling and minimize tire wear, it is essential to maintain proper pressure in all air-filled tires.

- Check each tire with an air pressure gauge and add air as needed.
- **Drive Axle**
  - Ensure drive axle is properly secured, there are no loose or missing parts.

**D - Annual Inspection**

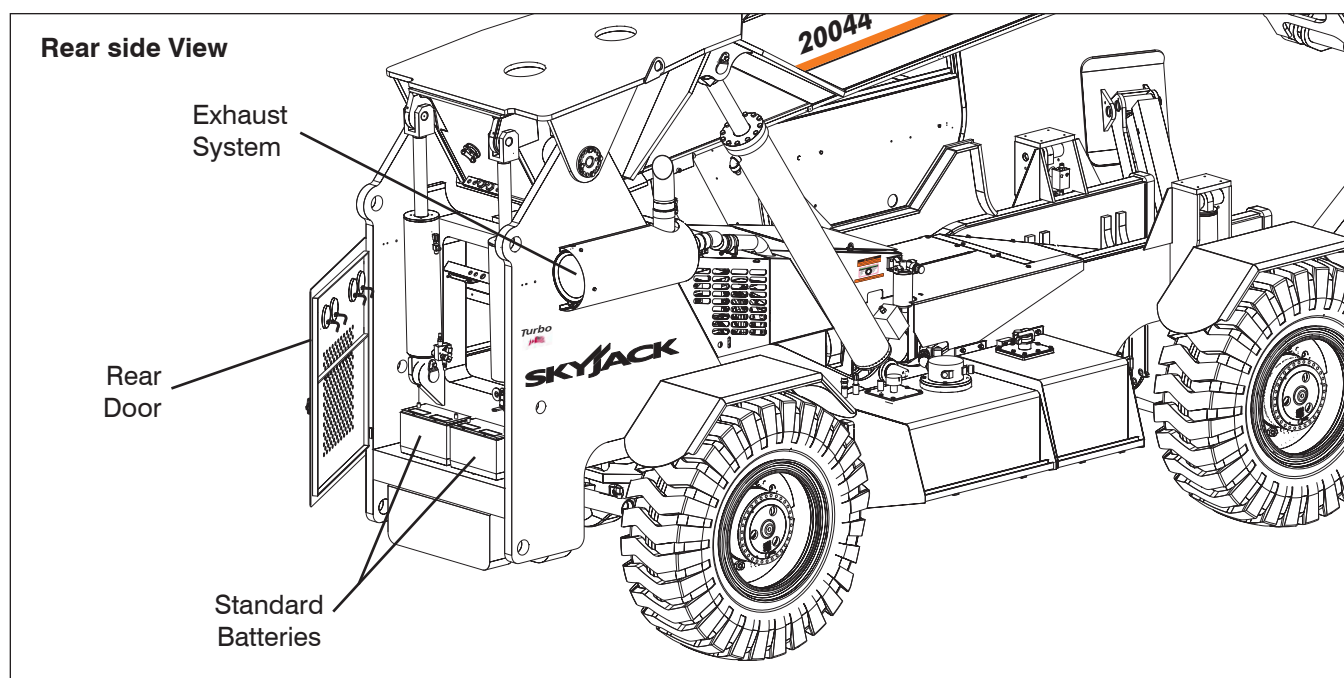
- For differential oil replacement procedure, refer to Section 5.
- **Steer Cylinder Assembly**
  - Ensure steer cylinder assembly is properly secured, there are no loose or missing parts, all fittings and hoses are properly tightened and there is no evidence of hydraulic oil leakage.
- **Steer Linkage**
  - Ensure there are no loose or missing parts, steer linkage studs are locked and there is no visible damage.





## Section 1 - Scheduled Maintenance

## Scheduled Maintenance Inspections



- **Batteries**

Proper battery condition is essential to good engine performance and operational safety. Improper fluid levels or damaged cables and connections can result in engine component damage and hazardous conditions.

**WARNING**

**Explosion hazard. Keep flames and sparks away. Do not smoke near batteries.**

**WARNING**

**Battery acid is extremely corrosive - Wear proper eye and facial protection as well as appropriate protective clothing. If contact occurs, immediately flush with cold water and seek medical attention.**

1. Check batteries case for damage.
2. Clean terminals and cable ends thoroughly with a terminal cleaning tool or wire brush.
3. Ensure all connections are tight.
4. If applicable, check battery fluid level. If plates are not covered by at least 1/2" (13 mm) of solution, add distilled or demineralized water.

5. Replace batteries if damaged or incapable of holding a lasting charge.

**WARNING**

**Use original or manufacturer-approved parts and components for the telehandler.**

- **Engine Air Filter**

- Ensure there are no loose or missing parts and there is no visible damage.
- Ensure air cleaner vaccuator valve (if applicable) is free from dirt or dust by squeezing the valve lips.

**B - Weekly Inspection**

- For engine air filter inspection procedure, refer to [Section 5](#).

**C - Quarterly Inspection**

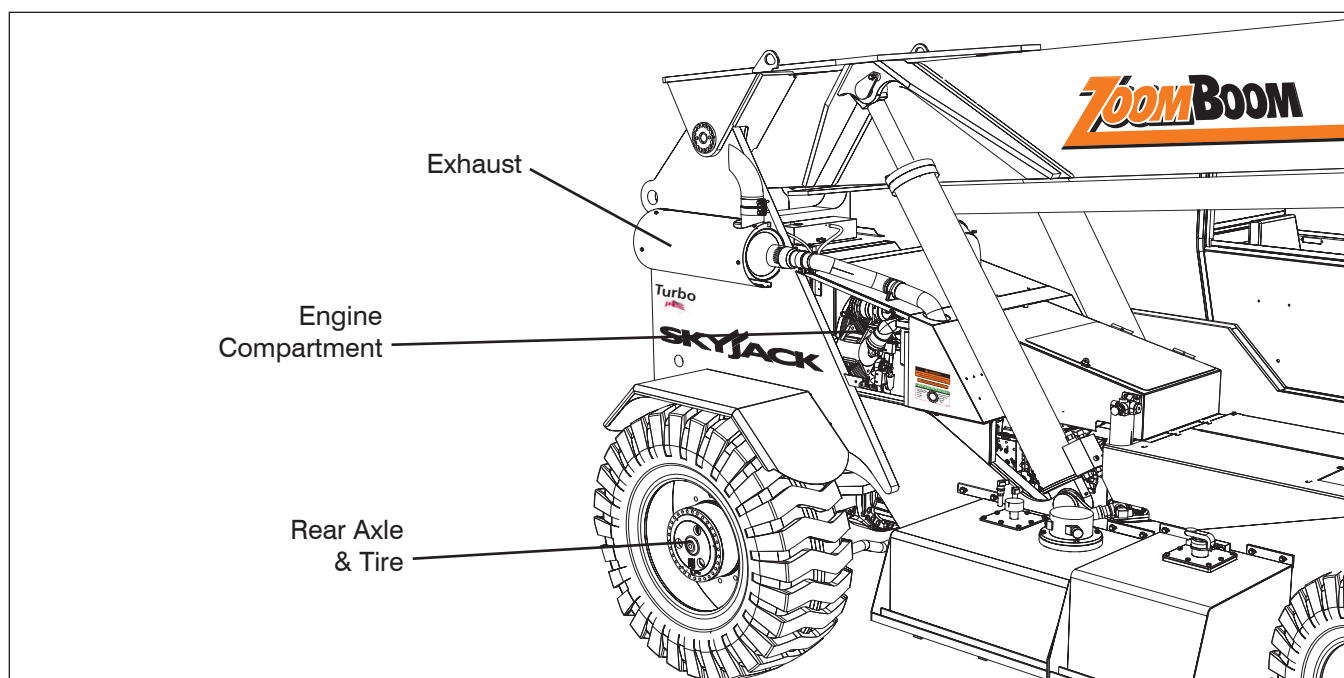
- For engine air filter replacement procedure, refer to [Section 5](#).

- **Engine Coolant**

- The coolant level should be between the minimum and maximum marks. Add coolant as needed. Refer to your engine manual for recommended coolant mixture.

- **Muffler and Exhaust**

- Ensure muffler and exhaust systems are properly secured, with no evidence of damage.

**Scheduled Maintenance Inspections****Section 1 - Scheduled Maintenance****1.1-8 Engine Compartment**

- Ensure compartment cover is secure and in proper working order.
- **Engine Oil Level**
  - Maintaining the engine components is essential to good performance and service life of the telehandler.

**WARNING**

**Beware of hot engine components.**

**Check oil level on dipstick**

- Oil level should be in the “safe” zone. Add oil as needed. Refer to [Table 2.2](#) for recommended oil type.

**C - Quarterly Inspection**

- For engine oil replacement procedure, refer to [Section 5](#)

- **Fuel Leaks**

Failure to detect and correct fuel leaks will result in an unsafe condition. An explosion or fuel fire may cause death or serious injury.

**DANGER**

**Engine fuels are combustible. Inspect the telehandler in an open, well-ventilated area away from heaters, sparks and flames. Always have an approved fire extinguisher within easy reach.**

Perform a visual inspection around the following areas:

- hoses and fittings
- fuel pump
- fuel filter
- fuel tank

- **Fuel Filter**

- Ensure there are no loose or missing parts and there is no visible damage or evidence of leakage.

**C - Quarterly Inspection**

- For fuel filter replacement procedure, refer to [Section 5](#)

- **Hydraulic Pumps**

- Ensure there are no loose or missing parts and there is no visible damage.
- Ensure all bolts are properly tightened.
- Ensure all fittings and hoses are properly tightened and there is no evidence of hydraulic oil leakage.

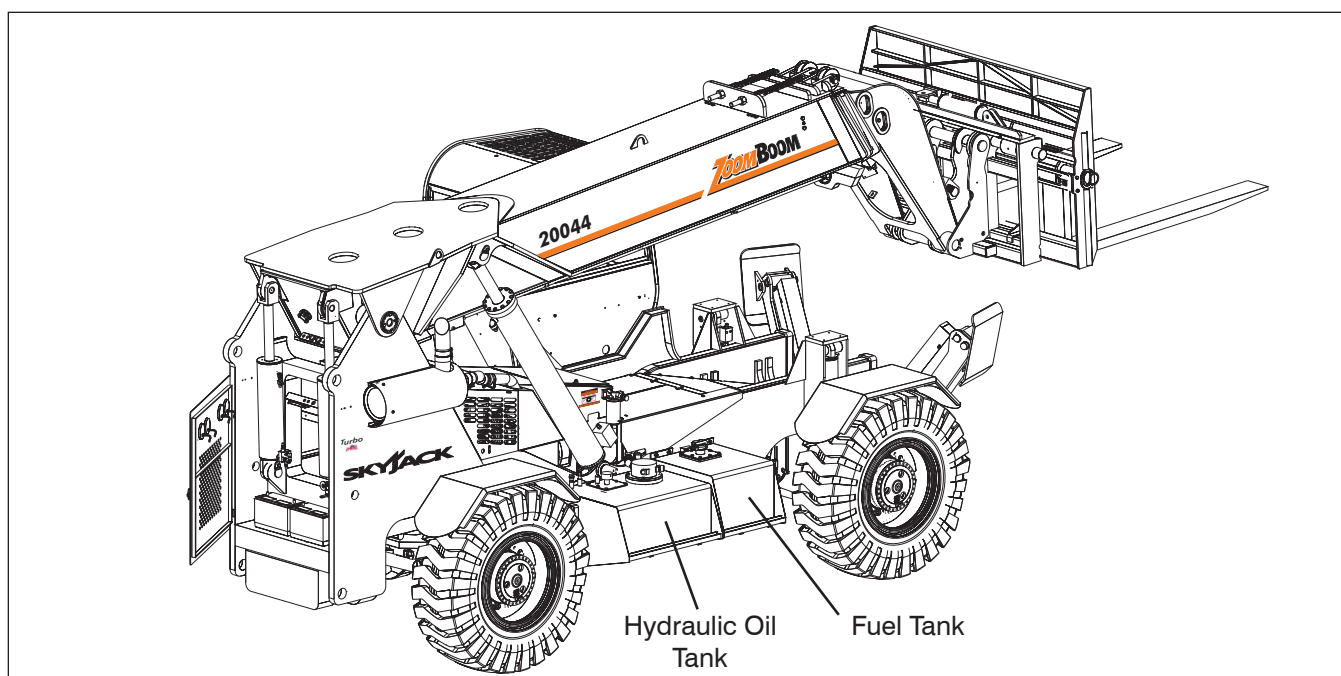
- **Belts**

- Ensure belts are in good working condition and have correct tension. Replace if belts are cracked, frayed, or have chunks of material missing. Refer to service manual for proper replacement procedure.



## Section 1 - Scheduled Maintenance

## Scheduled Maintenance Inspections



- **Fuel Tank**

**IMPORTANT**

**Before using your telehandler ensure there is enough fuel for expected use.**

- Ensure fuel filler cap is secure.
- Ensure tank shows no visible damage and no evidence of fuel leakage.

- **Hydraulic Tank**

- Ensure hydraulic filler cap is secure.
- Ensure tank shows no visible damage and no evidence of hydraulic leakage.

- **Hydraulic Oil**

- Be sure that the boom is in the stowed position, and then visually inspect the sight gauge located on the side of the hydraulic oil tank.
- The hydraulic oil level should be between the minimum and maximum marks on the sight glass. Add oil as needed. Refer to [Table 2.2](#) for recommended oil type.

**D - Annual Inspection**

- For hydraulic oil and filter replacement procedures, refer to [Section 5](#).

- **Hydraulic Return Filter**

- Ensure filter element is secure.
- Ensure there are no signs of leakage or visible damage.

**1.1-9 Transmission**

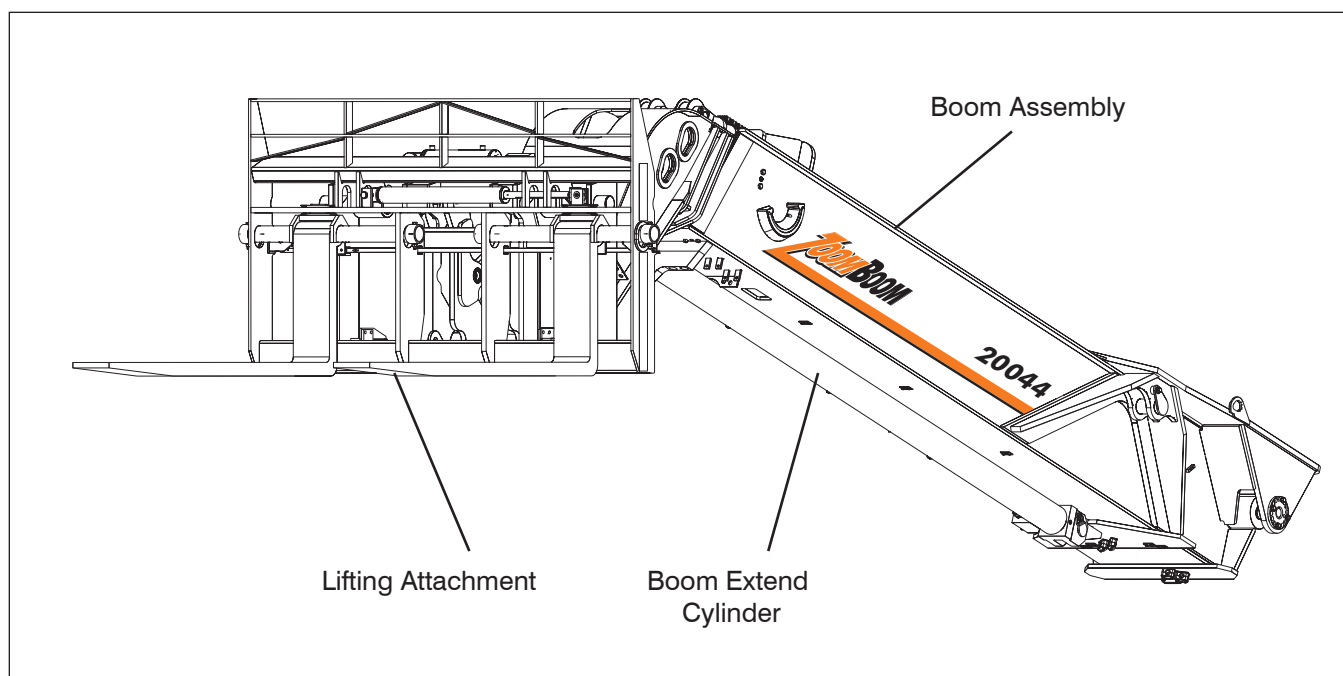
- Ensure transmission shifter is working properly and there is no evidence of damage.

- **Check oil level on dipstick**

- Oil level should be in the "safe" zone. Add oil as needed. Refer to [Table 2.2](#) for recommended oil type.

**D - Annual Inspection**

- For hydraulic oil and filter replacement procedures, refer to [Section 5](#).

**Scheduled Maintenance Inspections****Section 1 - Scheduled Maintenance****1.1-10 Boom**

- Ensure there are no loose or missing parts and there is no visible damage.
- Ensure all bolts and pins are properly tightened.
- Ensure there are no visible cracks in welds or structure and there are no signs of deformation.
- Ensure all hoses are properly tightened and there is no evidence of hydraulic leakage.

- **Slide Pads**

- Ensure all bolts are tight, there is no visible damage to the slide pads and that no parts are missing.

- **Chain**

- Ensure there are no loose or missing parts and there is no visible damage

**C - Quarterly Inspection**

- Check chain tension and adjust as required (refer to [Section 5](#)).

- **Boom Angle Indicator**

- Ensure all bolts are tight, and there is no visible damage

**1.1-11 Lifting Attachment**

- Ensure there are no loose or missing parts and there is no visible damage.
- Ensure attachment is properly positioned and secured. (refer to [Section 2.14](#) of the operating manual for attachments)

**1.1-12 Grease Points**

Maintaining properly greased components is essential for good performance and service life of the telehandler. If components are improperly greased, it could result in component damage.

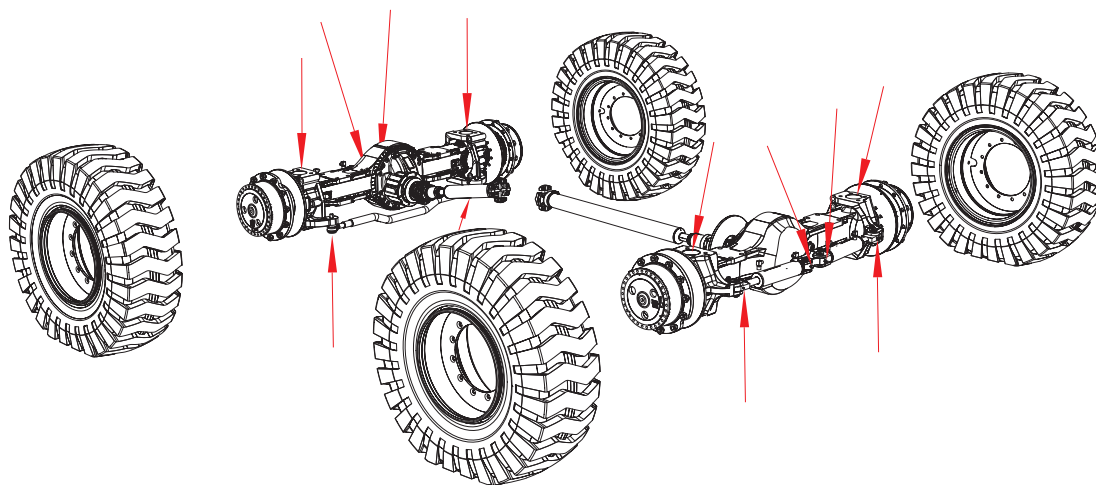
**WARNING**

**Ensure that there are no personnel or obstructions in maintenance area.**

Greasing intervals are based on telehandler usage of 40 hours. Use of telehandler may vary significantly and greasing frequency must be adjusted to obtain maximum service life.

**B - Weekly Inspection**

- For greasing procedure, refer to [Section 5](#).

**Section 1 - Scheduled Maintenance****Scheduled Maintenance Inspections****Axle Grease Points****Grease Points on Frame**

1. Ensure telehandler is on a firm level surface and is in stowed position.
2. Locate grease fittings (refer to label inside operator's cab) and pump grease in the following:
  - king pins
  - axle lock cylinder (top and bottom)
  - lift cylinder (top and bottom, both sides)
  - frame level cylinders (top and bottom)
  - outrigger pins
  - slave cylinders (top and bottom)
3. Using a creeper, slide under the frame to locate grease fittings and pump grease in the following:
  - axle pivot bearings (front and rear)
  - drive shaft U-joint (front and rear)
  - slip joint on drive shaft (front and rear)

**Grease Points on Boom Assembly**

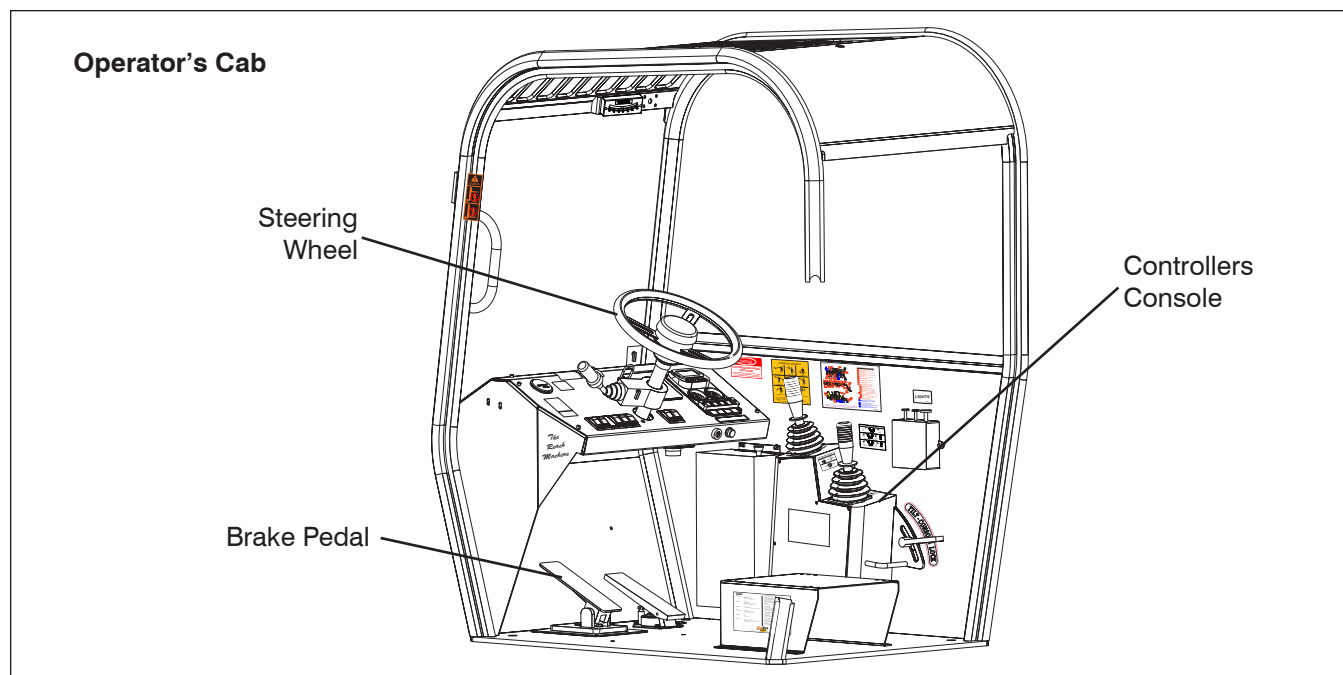
1. Ensure telehandler is on a firm level surface and is in stowed position.
2. Locate grease fittings (refer to label inside operator's cab) and pump grease in the following:
  - main boom pivot bearing pins
  - retract chain rollers
  - hose rollers
  - extension chains and rollers
  - slide pads
  - attachment tilt cylinders (top and bottom)
  - attachment pivot bearings





## Scheduled Maintenance Inspections

## Section 1 - Scheduled Maintenance



### 1.1-13 Operator's Cab

- **Rollover and Falling Object Protective Structure (ROPS/FOPS)**
  - Ensure there is no visible damage.



#### **WARNING**

**Do not modify, drill or alter the operator's cab in any way.**

- **Seat**
  - Ensure seat is properly secured with no sign of visible damage.
  - Ensure seat belt is working properly with no sign of visible damage.
- **Pedals**
  - Ensure brake and accelerator pedals are secure, no loose or missing parts, no sign of visible damage and movements are not obstructed.
- **Manual**
  - Check to be sure manual storage box is present and in good condition.
  - Ensure a copy of operating manual, and other important documentation are enclosed in manual storage box.
  - Ensure manual is legible and in good condition.

- Always return manual to the manual storage box after use.

- **Operator's Cab Controls**



#### **WARNING**

**Ensure that you maintain three points of contact to mount/dismount the cab.**

Use the steps of telehandler to access operator's cab.

- Ensure door and windows (if equipped) are secure and in proper working order.
- Ensure steering wheel is secured with no sign of visible damage.
- Ensure all switches and controls are properly secured with no sign of visible damage.
- Ensure all switches and controls are returned to their neutral positions and movements are not obstructed.
- Ensure capacity charts are in place and are legible.



#### **DANGER**

**Do not operate the telehandler if capacity charts are missing or not legible.**



## Section 1 - Scheduled Maintenance

## AC Scheduled Maintenance Inspections

### 1.1-14 Slinging Loads



#### **CAUTION**

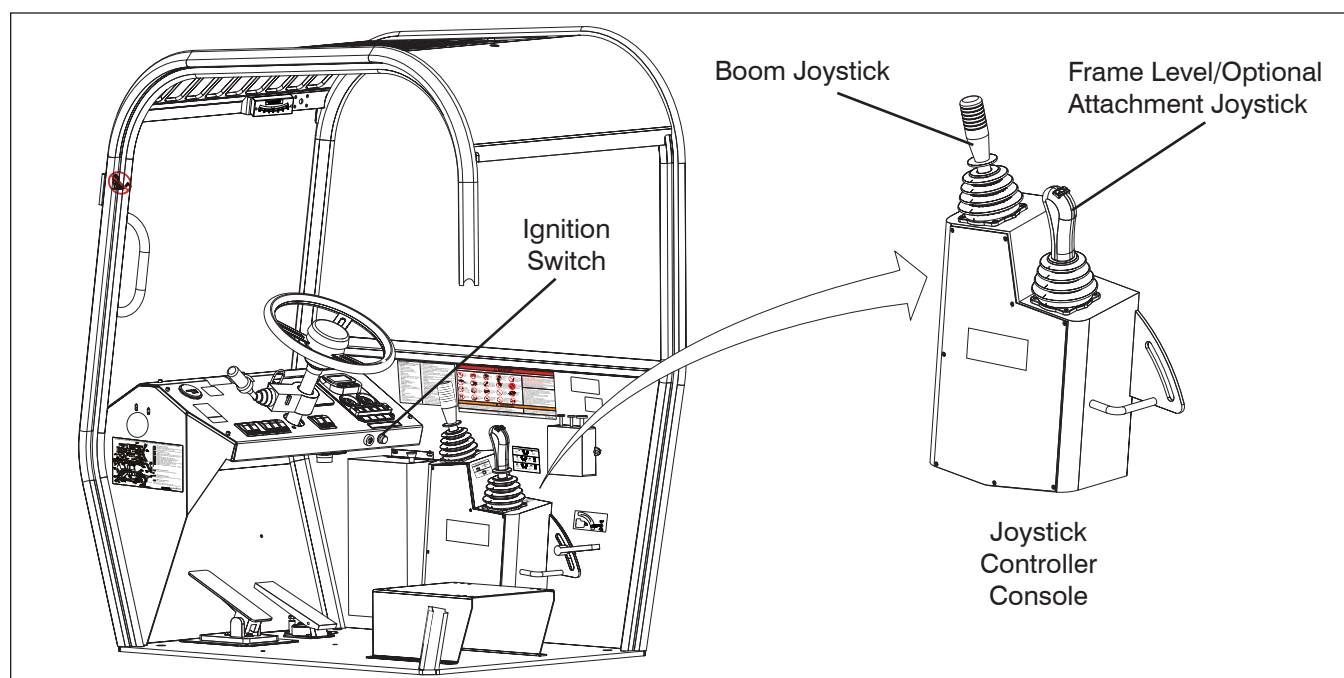
**Sling loads from appropriate attachment  
to the jib boom or a tilted fork ONLY.**

1. Slinging of loads must only be performed following a complete risk assessment by a qualified person regarding the rigging and guiding of any such load.
2. The rated capacity of the unit and attachment at the sling position must not be exceeded. The sling must be in good repair and restrained from movement at all times.



## Function Tests

## Section 1 - Scheduled Maintenance



### 1.2 Function Tests

Function tests are designed to discover any malfunctions before telehandler is put into service. The operator must understand and follow step-by-step instructions to test all telehandler functions.

#### **IMPORTANT**

**Never use a malfunctioning telehandler. If malfunctions are discovered, telehandler must be tagged and placed out of service. Repairs to telehandler may only be made by a qualified service technician.**

After repairs are completed, operator must perform a pre-operation inspection and a series of function tests again before putting telehandler into service.

Prior to performing function tests, be sure to read and understand [Section 2.9](#) of the operating manual - Start Operation.



#### **WARNING**

**Ensure that there are no personnel or obstructions in test area and that there is sufficient room to test all telehandler functions.**

### 1.2--1 Operator's Cab Controls



#### **WARNING**

**Ensure that you maintain three points of contact to mount/dismount the cab.**

#### • Test Starter Operation

1. Enter cab and close door (if equipped).



#### **WARNING**

**The seat belt must be worn at all times.**

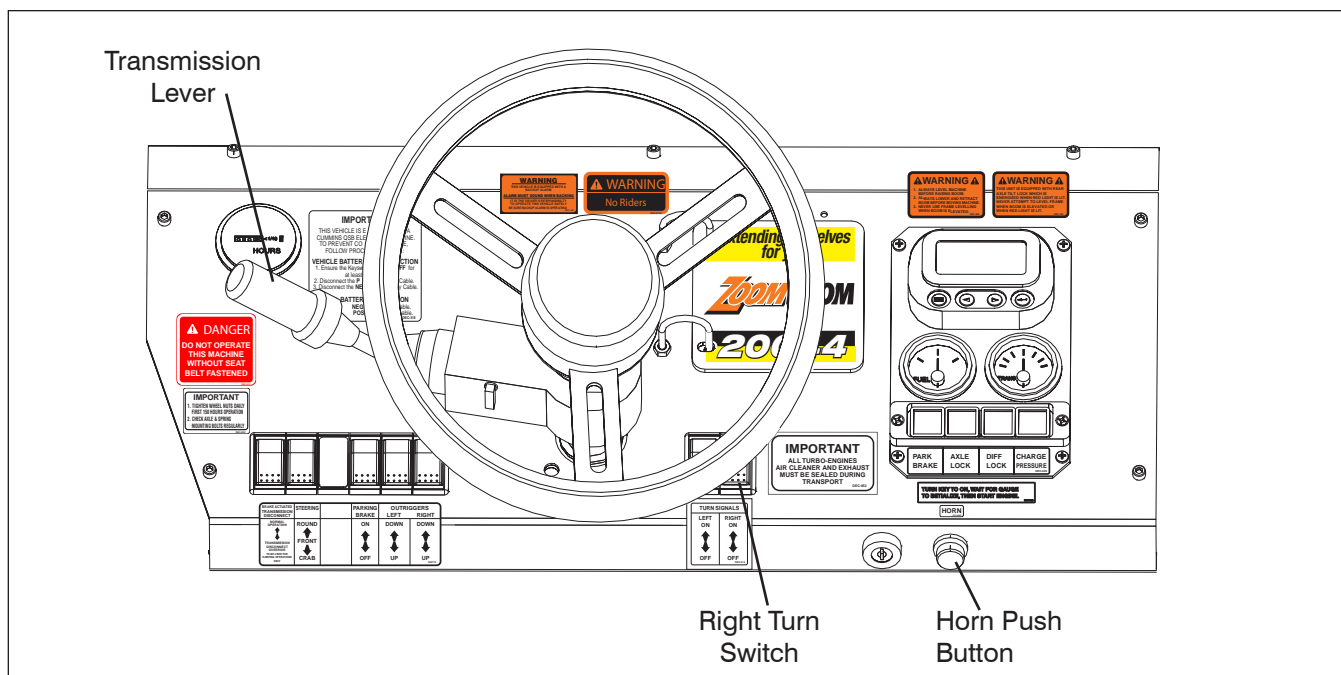
2. Sit in the driver's seat and fasten seat belt.
3. Using a spotter, adjust the mirrors.
4. Ensure parking brake is engaged.
5. Adjust the boom controller console.





## Section 1 - Scheduled Maintenance

## Function Tests



6. Insert key into ignition switch and select "I" on position. The red and amber lights at the top of electronic dash display will illuminate. Once red and amber lights are no longer displayed, and the electronic gauges are visible on the display panel; turn the key to start position.
7. Allow engine to idle for 30 seconds until low brake pressure light is off.

#### • Test Horn

1. Push "📢" horn push-button.  
**Result:** Horn should sound.

**WARNING**

If the warning indicator lights illuminate when engine is running, immediately shut down the telehandler and have it serviced.

#### • Test Reverse Alarm

1. Ensure parking brake switch is on.
2. Depress service brake pedal and shift the transmission lever backward.  
**Result:** The reverse alarm should sound and reverse light (if equipped) should turn on.

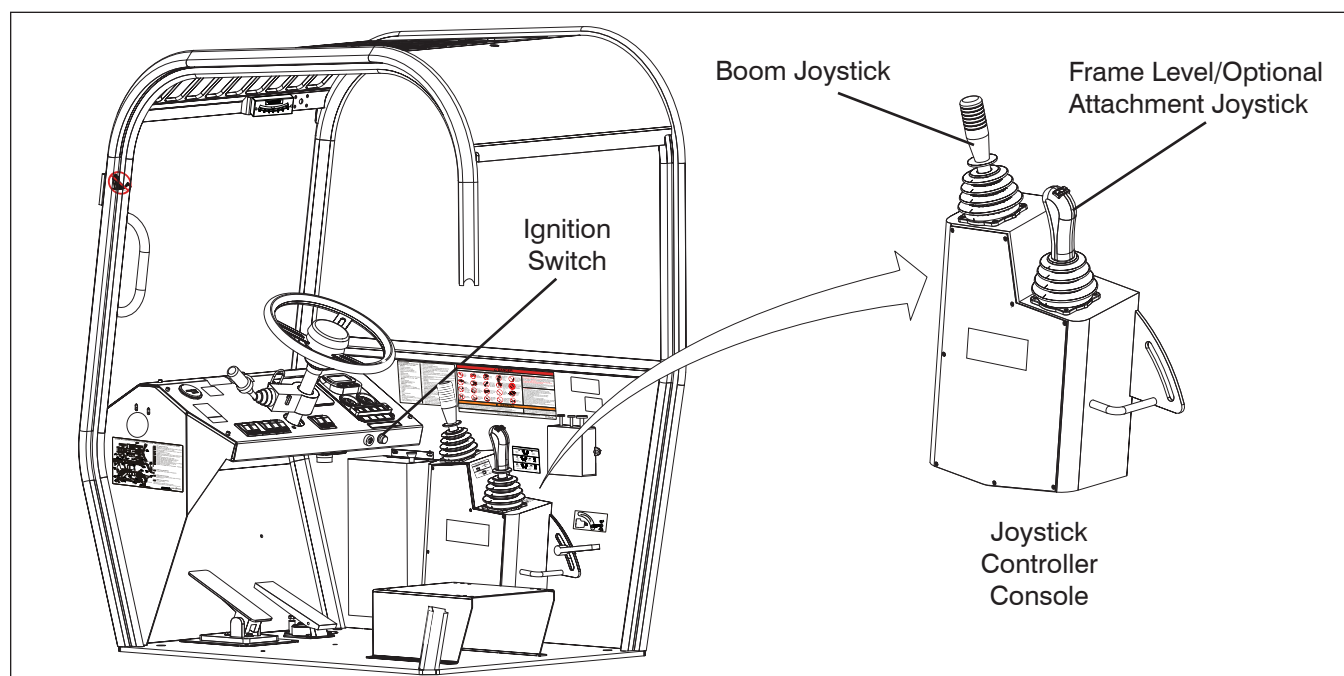
#### • Test Lights (if equipped)

1. Use a spotter to check if all the lights are working well. The spotter should maintain a safe distance from telehandler.
2. Turn parking brake switch to off position.  
**Result:** Rear brake lights should turn off.
3. Depress service brake pedal.  
**Result:** Rear brake lights should turn on.
4. Select head/tail light (if equipped) switch to on position.  
**Result:** Head/tail lights should turn on.
5. Turn parking brake switch to on position.
6. Select left turn signal (if equipped) rocker switch to on position.  
**Result:** The indicator light and left signal lights should flash.
7. Select right turn signal (if equipped) rocker switch to on position.  
**Result:** The indicator light and right signal lights should flash.



## Function Tests

## Section 1 - Scheduled Maintenance



### • Test Boom and Attachment Functions



#### **WARNING**

**Ensure that there are no personnel or obstructions in test area and that there is sufficient room to test all telehandler functions.**

1. Ensure the parking brake indicator light is on.
2. Raise the boom by pulling the boom/attachment joystick backward.  
**Result:** Boom should raise and boom angle indicator should be functioning.
3. Extend the boom by moving the boom/attachment joystick to the right.  
**Result:** Boom should extend and boom extension indicators are visible.

4. Tilt attachment forward by pressing and holding the thumb button while moving joystick forward.  
**Result:** Attachment should tilt forward.
5. Tilt attachment backward by pressing and holding the thumb button while moving joystick backward.  
**Result:** Attachment should tilt backward.
6. Retract the boom by moving the boom/attachment joystick to the left.  
**Result:** Boom should retract.
7. Lower the boom by moving the boom/attachment joystick forward.  
**Result:** Boom should lower.
8. Raise the boom until attachment is 2 feet above the ground.

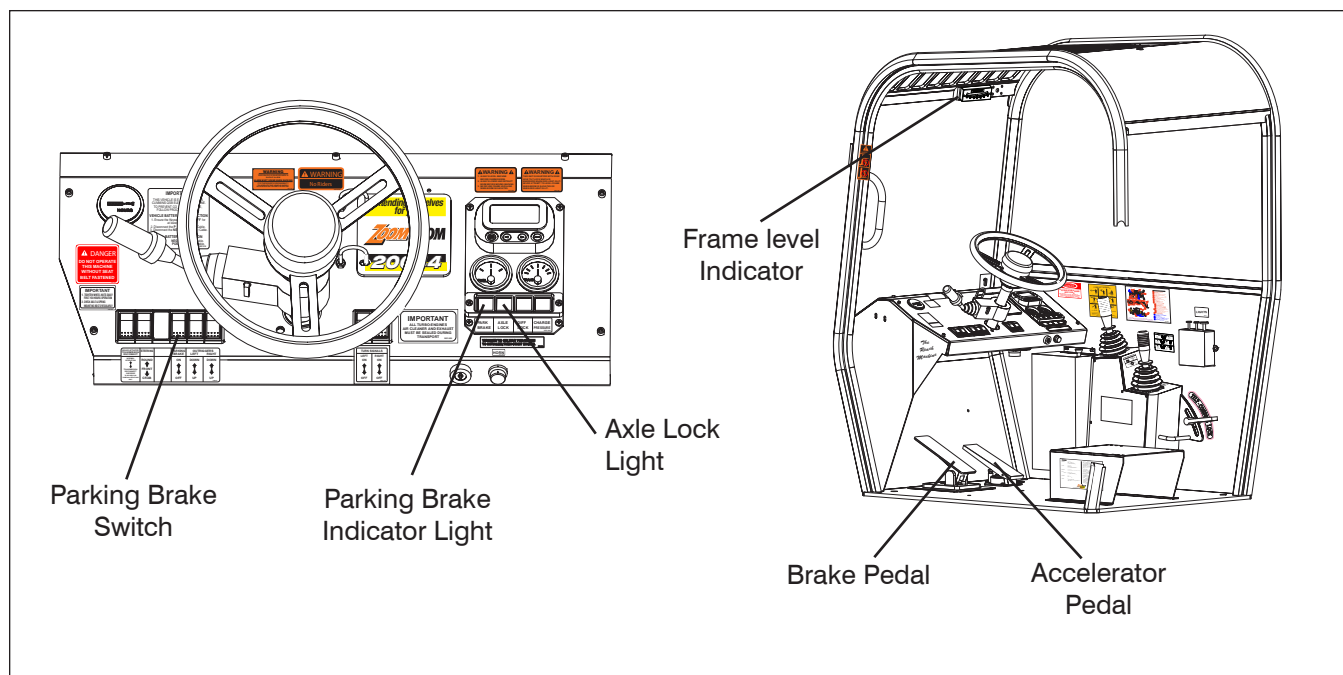
#### **IMPORTANT**

Test all attachment functions if telehandler is equipped with optional attachments. Refer to [Section 2.14](#) in the operating manual for optional attachments operation.



## Section 1 - Scheduled Maintenance

## Function Tests



- **Test Frame Leveling and Level Indicator**

1. Ensure parking brake switch is on.
2. Tilt frame to the right by moving frame level joystick to the right.  
**Result:** Frame should tilt to the right.
3. Tilt frame to the left by moving frame level joystick to the left.  
**Result:** Frame should tilt to the left.
4. Use the frame level indicator to ensure frame is level.

- **Test Rear Axle Lock**

1. Ensure parking brake switch is on.
2. Raise boom above 45° - boom angle and attempt leveling the frame to the right or to the left.  
**Result:** Rear axle lock light should illuminate and frame should not tilt to right or left.
3. Lower the boom until attachment is 2 feet above the ground.

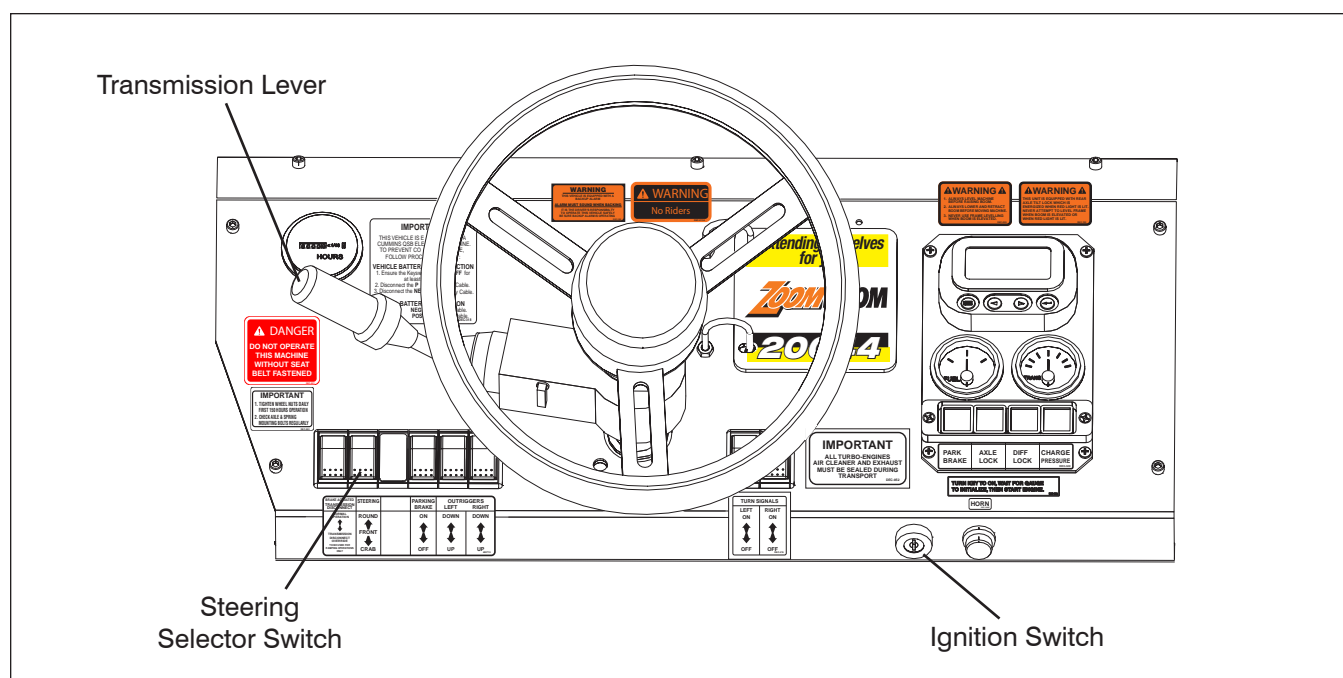
- **Test Accelerator Pedal**

1. Ensure parking brake switch is on.
2. Depress accelerator pedal slowly.  
**Result:** The engine RPM should increase.
3. Release the accelerator pedal.  
**Result:** The engine RPM should decrease.



## Function Tests

## Section 1 - Scheduled Maintenance



- **Test Driving & Service Brake Functions**

1. Ensure path of intended motion is clear.
2. Ensure all four wheels are aligned straight ahead.
3. Depress service brake pedal.
4. Release parking brake.  
**Result:** Parking brake indicator light should turn off.
5. Shift transmission lever forward and release the service brake pedal slowly.  
**Result:** Telehandler should move forward.
6. Depress service brake pedal slowly.  
**Result:** Telehandler should stop.
7. Shift transmission lever backward and release the service brake pedal slowly.  
**Result:** Telehandler should move backward.
8. Depress service brake pedal slowly.  
**Result:** Telehandler should stop.
9. Return transmission lever to neutral position and engage parking brake.

- **Test Steering**

**CAUTION**

Before changing steering modes, bring all four wheels into alignment (i.e., in the straight-ahead position).

**WARNING**

Before driving on public roads and highways check the alignment of the wheels and drive with **FRONT** steering only.

**WARNING**

Do not change steer mode while telehandler is traveling.

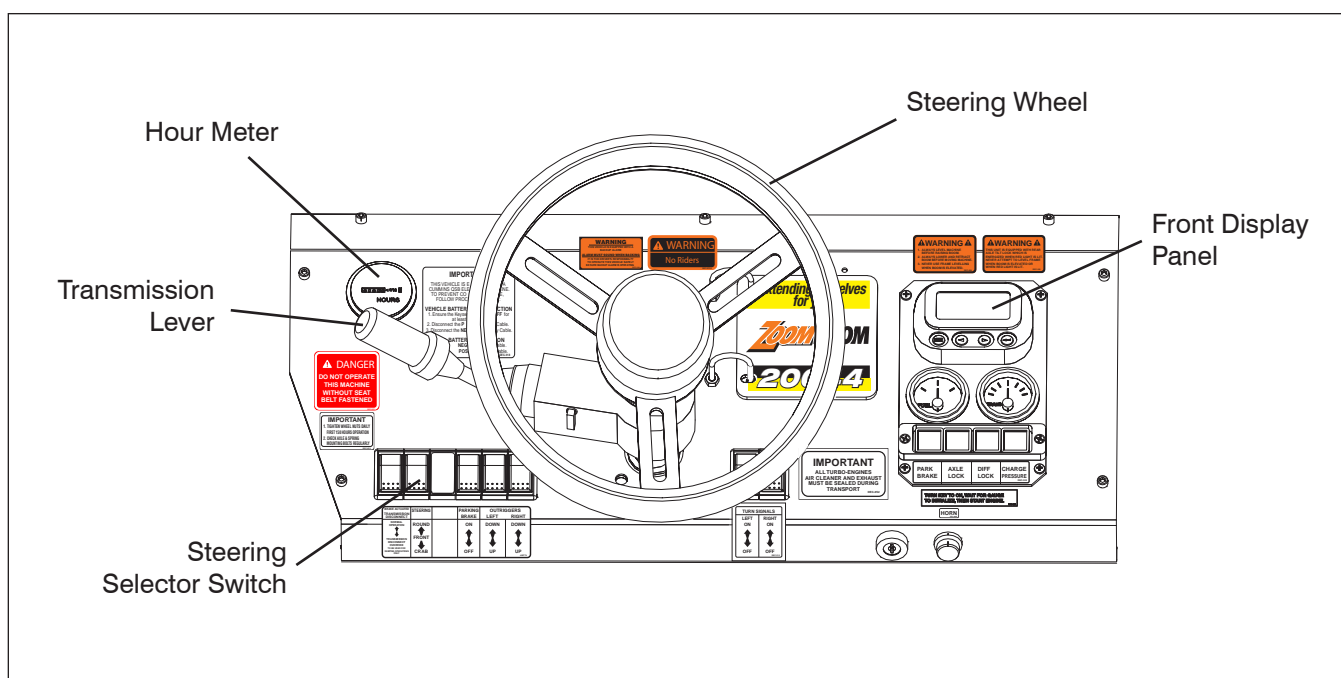
**NOTE**

Avoid steering the wheels while telehandler is stationary.



## Section 1 - Scheduled Maintenance

## Function Tests



## Round Steer

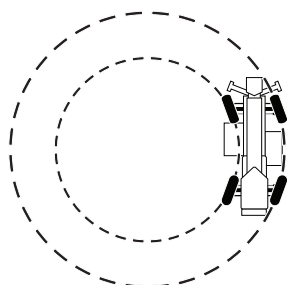



Figure 2-2 Round Steering

1. Ensure path of intended motion is clear.
2. Ensure all four wheels are aligned straight ahead.
3. Select parking brake switch to off position and depress service brake pedal.
4. Select rocker switch to forward “” position for round steering.
5. Turn the steering wheel to the left or right and drive forward.

**Result:** Telehandler should move in the chosen direction, producing a turning circle, with front wheels pointing in the opposite direction to the rear wheels.

6. Steer the telehandler straight ahead until all four wheels are aligned.

7. Depress service brake pedal until the telehandler stops.

## Front Steer

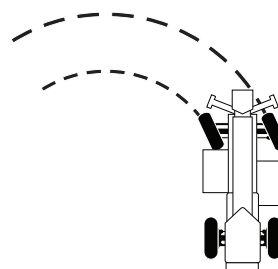



Figure 2-3 Front Steering

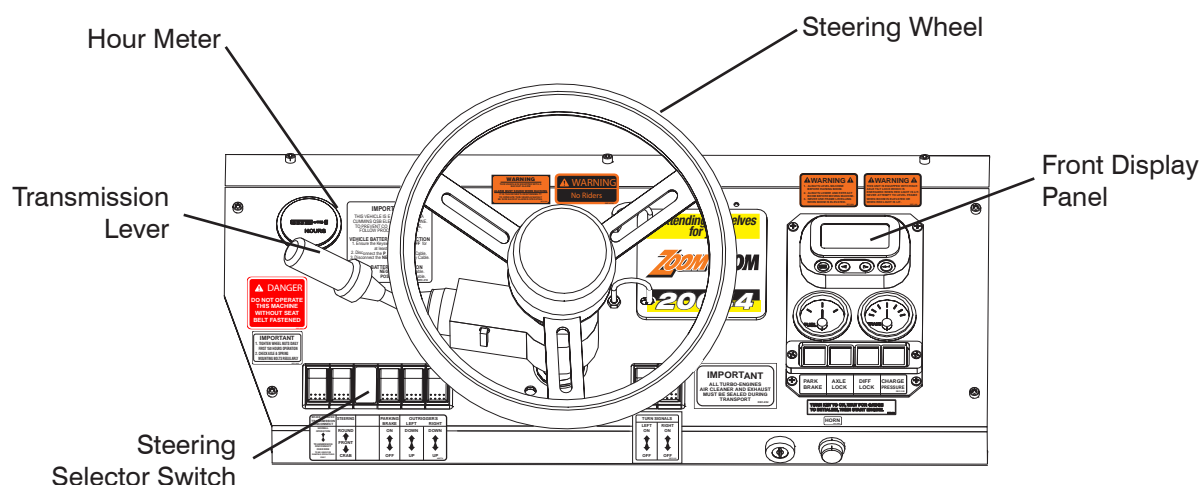
8. Select rocker switch to middle “” position for front steering.
9. Turn the steering wheel to the left or right and drive forward.

**Result:** Only front wheels of the telehandler should turn in the chosen direction.



## Function Tests

## Section 1 - Scheduled Maintenance



10. Steer the telehandler straight ahead until all four wheels are aligned.

11. Depress service brake pedal until the telehandler stops.

13. Turn the steering wheel to the left or right and drive forward.

**Result:** Telehandler should move in the chosen direction with both front and rear wheels in the same direction.

### Crab Steer

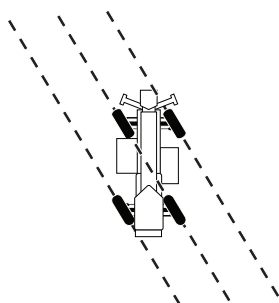



Figure 2-4 Crab Steering

14. Steer the telehandler straight ahead until all four wheels are aligned.

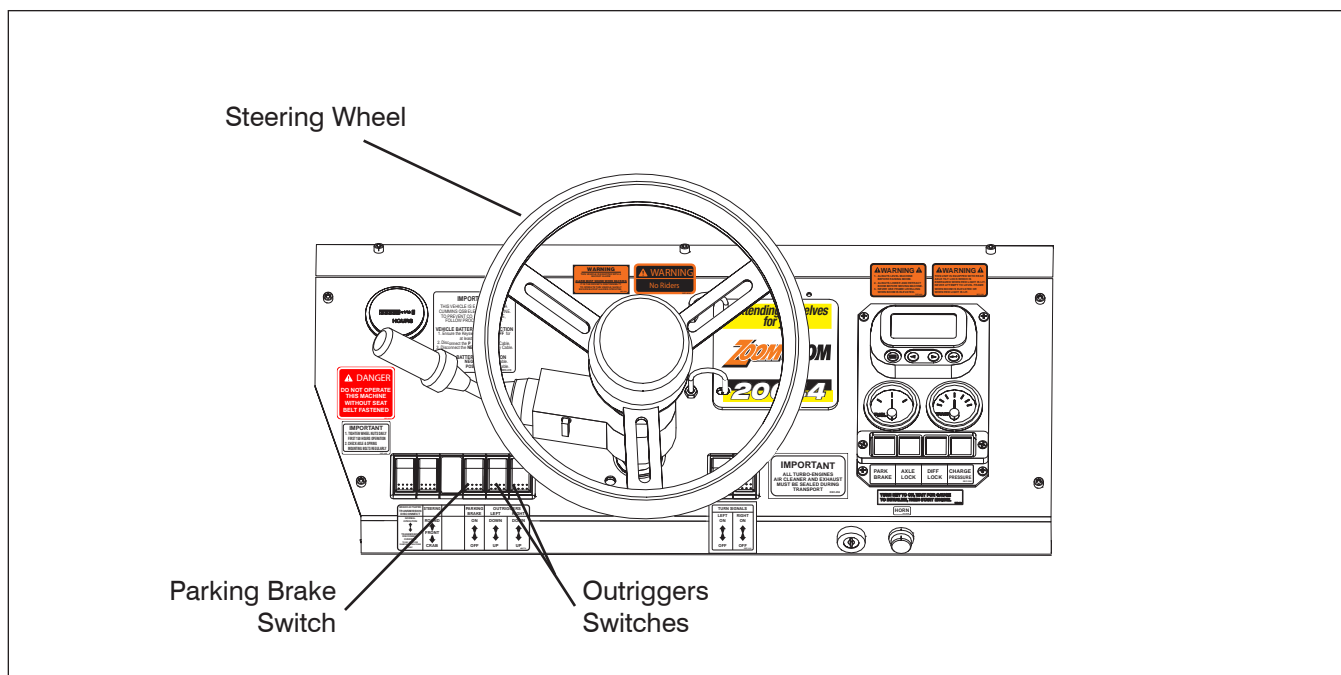
15. Depress service brake pedal until the telehandler stops.

12. Select rocker switch to backward “” position for crab steering.



## Section 1 - Scheduled Maintenance

## Function Tests



## • Test Parking Brake

**CAUTION**

Refer to Section 2.9-3 for instructions on how to drive on a slope.



1. Ensure path of intended motion is clear.
2. Ensure parking brake switch is off.
3. Drive the telehandler on a slope.
4. Depress service brake pedal slowly until telehandler stops.
5. Select parking brake rocker switch to on position and release service brake pedal.

**Result:** Parking brake indicator light should turn on and telehandler should not roll

## • Test Outriggers (If Equipped)

**WARNING**

Ensure that there are no personnel or obstructions in test area and that there is sufficient room to test all telehandler functions.

1. Ensure parking brake switch is on.
2. Lower outriggers by depressing and holding rocker switch forward “” continuously.
3. Raise outriggers by depressing and holding rocker switch backward “” continuously until outriggers are fully raised.

**Result:** Outriggers should lower.

**Result:** Outriggers should raise up.







**Section 2**  
**MAINTENANCE TABLES AND DIAGRAMS**

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## Service and Maintenance

## Section 2 - Maintenance Tables and Diagrams

Table 2.1 Telehandler Specifications and Features

| MODEL  | ZB20032                                   | ZB20044                                   |
|--|---|---|
| Engine                                       |   |   |
| Type   | Cummins QSB4.5C160T3                      |   |
| Max RPM                                      | 2500 rpm                                  |   |
| Horsepower @ 2300 RPM                        | 168 HP                                    |   |
| Horsepower @ 2500 RPM                        | 163 HP                                    |   |
| Fuel type                                    | Diesel                                    |   |
| Transmission                                 |   |   |
| Type   | DANA T32000                               |   |
| Speeds forward                               | 3   |   |
| Speeds Reverse                               | 3   |   |
| Top Speed                                    | 20.5 mph (33 km/h)                        |   |
| Gear Ratios                                  |   |   |
| 1st Gear                                     | 4.64 : 1                                  |   |
| 2nd Gear                                     | 2.23 : 1                                  |   |
| 3rd Gear                                     | 0.82 : 1                                  |   |
| Electrical                                   |   |   |
| System voltage                               | 12 volts negative ground                  |   |
| Standard Batteries                           |   |   |
| Type   | HP-31E                                    |   |
| Quantity                                     | 2   |   |
| Cranking amperes @ 0°F (-17°C)               | 725 A                                     |   |
| Total cranking amps @ 0°F (-17°C)            | 1450 A                                    |   |
| Cranking amperes @ 32°F (0°C)                | 1100 A                                    |   |
| Reserve capacity                             | 180 minutes                               |   |
| Dimensions                                   |   |   |
| Overall length (less forks)                  | 243 in (617 cm)                           |   |
| Overall width                                | 102 in (259 cm)                           |   |
| Overall Height                               | 108 in (274 cm)                           |   |
| Curb weight (standard machine with open cab) | 41,500 lbs. (18,370 kg)                   | 45,000 lbs. (20,000 kg)                   |
| Maximum capacity                             | 20,000 lbs. (9,071 kg)                    |   |
| Wheelbase                                    | 138 in (350 cm)                           |   |
| Round steer turning Radius (inside)          | 220 in (559 cm)                           |   |
| Boom   |   |   |
| Number of sections                           | 2   | 3   |
| Maximum lift height                          | 32 ft. 4 in (985 cm)                      | 44 ft. 10 in (1366 cm)                    |
| Maximum forward reach                        | 16 ft 6 in (502 cm)                       | 27 ft 5 in (835 cm)                       |
| Standard Forks                               | 2¾ x 6 x 60 in<br>(6.9 x 15.2 x 152.4 cm) | 2¾ x 6 x 60 in<br>(6.9 x 15.2 x 152.4 cm) |
| Carriage rollback                            | 19°                                       | 19°                                       |
| Carriage forward tilt                        | 80°                                       | 80°                                       |
| Operating Times                              |   |   |
| Boom extend (at max. boom angle)             | 13 seconds                                |   |
| Boom retract (at max. boom angle)            | 9.5 seconds                               |   |
| Boom raise*                                  | 19 seconds                                |   |
| Boom lower*                                  | 20 seconds                                |   |
| Carriage roll forward                        | 12 seconds                                |   |
| Carriage roll back                           | 12 seconds                                |   |
| Frame level right (stop to stop) **          | 15 - 20 seconds                           |   |
| Frame level left (stop to stop) **           | 15 - 20 seconds                           |   |

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\* Measured with boom fully retracted.

\*\* Under no circumstances should the frame level cycle take less than 15 seconds to complete in either direction.



## Section 2 - Maintenance Tables and Diagrams

## Service and Maintenance

Table 2.2 Recommended Fluids/Lubrication

| MODEL         |                      | ZB20032                               | ZB20044 |
|---------------|----------------------|---------------------------------------|---------|
| Engine        | Fuel Type            | Diesel                                |         |
|               | Fuel Tank Capacity   | 49 gal (185 L)                        |         |
|               | Recommended Oil Type | 15W40 CC/SF                           |         |
|               | Coolant Type         | 60/40 Ethylene glycol/distilled water |         |
| Transmission  | Type                 | ATF Dexron III                        |         |
|               | Capacity             | 6.3 gal (24 L)                        |         |
| Axles         | Differential         | SAE 80W-90 GL-5                       |         |
|               | Planetary Wheel Ends |                                       |         |
| Hydraulic Oil | Type                 | Anti-wear ISO Gr. 32                  |         |
|               | Tank Capacity        | 55 gal (208 L)                        |         |
| Grease        | Boom Slide Bearings  | Sunaplex 992 E.P. 2                   |         |
|               | General Greasing     | Multi Purpose E.P.                    |         |

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Table 2.3 Axles Torque Specifications

| Size of Bolt |            | Type of Bolt                   |                     |                                |                     |                                |                     |
|--------------|------------|--------------------------------|---------------------|--------------------------------|---------------------|--------------------------------|---------------------|
|              |            | 8.8                            |                     | 10.9                           |                     | 12.9                           |                     |
|              |            | Normali<br>Loctite 242<br>(Nm) | Loctite 270<br>(Nm) | Normali<br>Loctite 242<br>(Nm) | Loctite 270<br>(Nm) | Normali<br>Loctite 242<br>(Nm) | Loctite 270<br>(Nm) |
| Course Pitch | M6 x 1     | 9.5-10.5                       | 10.5-11.5           | 14.3-15.7                      | 15.2-16.8           | 16.2-17.8                      | 18.1-20.0           |
|              | M8 x 1.25  | 23.8-26.2                      | 25.6-28.4           | 34.2-37.8                      | 36.7-40.5           | 39.0-43.0                      | 43.7-48.3           |
|              | M10 x 1.5  | 48-53                          | 52-58               | 68-75                          | 73-81               | 80-88                          | 88-97               |
|              | M12 x 1.75 | 82-91                          | 90-100              | 116-128                        | 126-139             | 139-153                        | 152-168             |
|              | M14 x 2    | 129-143                        | 143-158             | 182-202                        | 200-221             | 221-244                        | 238-263             |
|              | M16 x 2    | 200-221                        | 219-242             | 283-312                        | 309-341             | 337-373                        | 371-410             |
|              | M18 x 2.5  | 276-305                        | 299-331             | 390-431                        | 428-473             | 466-515                        | 509-562             |
|              | M20 x 2.5  | 390-431                        | 428-473             | 553-611                        | 603-667             | 660-730                        | 722-798             |
|              | M22 x 2.5  | 523-578                        | 575-635             | 746-824                        | 817-903             | 893-987                        | 974-1076            |
|              | M24 x 3    | 675-746                        | 732-809             | 950-1050                       | 1040-1150           | 1140-1260                      | 1240-1370           |
|              | M27 x 3    | 998-1103                       | 1088-1202           | 1411-1559                      | 1539-1701           | 1710-1890                      | 1838-2032           |
|              | M30 x 3.5  | 1378-1523                      | 1473-1628           | 1914-2115                      | 2085-2305           | 2280-2520                      | 2494-2757           |
| Fine Pitch   | M8 x 1     | 25.7-28.3                      | 27.5-30.5           | 36.2-39.8                      | 40.0-44.0           | 42.8-47.2                      | 47.5-52.5           |
|              | M10 x 1.25 | 49.4-54.6                      | 55.2-61.0           | 71.5-78.5                      | 78.0-86.0           | 86.0-94.0                      | 93.0-103.0          |
|              | M12 x 1.25 | 90-100                         | 98-109              | 128-142                        | 139-154             | 152-168                        | 166-184             |
|              | M12 x 1.5  | 86-95                          | 94-104              | 120-132                        | 133-147             | 143-158                        | 159-175             |
|              | M14 x 1.5  | 143-158                        | 157-173             | 200-222                        | 219-242             | 238-263                        | 261-289             |
|              | M16 x 1.5  | 214-236                        | 233-257             | 302-334                        | 333-368             | 361-399                        | 394-436             |
|              | M18 x 1.5  | 312-345                        | 342-378             | 442-489                        | 485-536             | 527-583                        | 580-641             |
|              | M20 x 1.5  | 437-483                        | 475-525             | 613-677                        | 674-745             | 736-814                        | 808-893             |
|              | M22 x 1.5  | 581-642                        | 637-704             | 822-908                        | 903-998             | 998-1103                       | 1078-1191           |
|              | M24 x 2    | 741-819                        | 808-893             | 1045-1155                      | 1140-1260           | 1235-1365                      | 1363-1507           |
|              | M27 x 2    | 1083-1197                      | 1178-1302           | 1520-1680                      | 1672-1848           | 1834-2027                      | 2000-2210           |
|              | M30 x 2    | 1511-1670                      | 1648-1822           | 2138-2363                      | 2332-2577           | 2565-2835                      | 2788-3082           |

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**Note:** 1 Nm = 0.7376 ft-lb**Screw-locking, Sealing and Lubricating Materials****Loctite 242**

- Anaerobic product apt to prevent the loosening of screws, nuts and plugs. Used for medium-strength locking. Before using it, completely remove any lubricant by using the specific activator.

**Loctite 270**

- Anaerobic product apt to prevent the loosening of screws, nuts and plugs. Used for medium-strength locking. Before using it, completely remove any lubricant by using the specific activator. To remove parts, it may be necessary to heat them at 80 °C approx.





Table 2.4 Tire Specifications

| Standard Tires    |                 |
|-------------------|-----------------|
| Tire Size         | 17.50 - 25      |
| Pressure          | 90 psi          |
| Tire Ply Rating   | 16 PR           |
| Wheel Nuts Torque | 450 - 500 ft.lb |

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**WARNING**

Intermixing tires of different types or using tires of types other than those originally supplied with this equipment can adversely affect stability. Therefore, replace tires only with the exact original Skyjack-approved type. Failure to operate with matched approved tires in good condition may result in death or serious injury.

**IMPORTANT**

For proper function of each axle differential, all four wheels must have same tire size installed at all times. Failure to comply with this requirement will reduce the life of the differentials and reduce overall mobility of telehandler.



## Service and Maintenance

## Section 2 - Maintenance Tables and Diagrams

Table 2.5 Pressure Settings

| Model ZB20044                  |                                  |          |          |
|--------------------------------|----------------------------------|----------|----------|
| Maximum Pump Pressure          | P1                               |          | 3150 psi |
|                                | P2                               |          | 3200 psi |
| Stand-by Pump Pressure         | P1                               |          | 500 psi  |
|                                | P2                               |          | 550 psi  |
| Lift                           | Maximum pump pressure controlled |          | 3200 psi |
|                                |                                  |          | 3200 psi |
| Extension                      | Maximum pump pressure controlled |          | 3200 psi |
|                                |                                  |          | 3200 psi |
| Carriage Tilt Cylinder         | Port Relief                      | Rod End  | 3100 psi |
|                                |                                  | Base End | 1500 psi |
|                                | Crossover Relief                 | Rod End  | 3400 psi |
|                                |                                  | Base End | 1800 psi |
| Frame Level Cylinder           | Port Relief                      | Rod End  | 1500 psi |
|                                |                                  | Base End | 1500 psi |
| Auxiliary Hydraulics           | Port Relief                      | Rod End  | 2000 psi |
|                                |                                  | Base End | 2000 psi |
| Outrigger                      | Port Relief                      | Rod End  | 2500 psi |
|                                |                                  | Base End | 2500 psi |
| Pressure Reducing Valve        | Pilot Pressure                   |          | 325 psi  |
| Priority Valve Pressure Relief | Steering Pressure                |          | 2800 psi |

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**Note:** all pressure settings to be checked at idle



## Section 3

### SYSTEM COMPONENT IDENTIFICATION AND SCHEMATICS

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



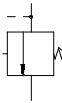








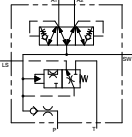



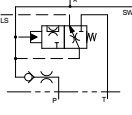



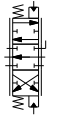



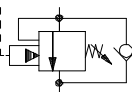









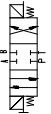
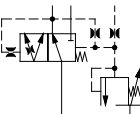
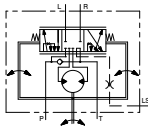

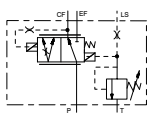




## Section 3 - System Component Identification and Schematics

## Service and Maintenance

## 3.1 Hydraulic Symbol Chart



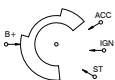





































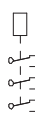


|   |   |   |  |   |  |   |   |
|---|---|---|--|---|--|---|---|
|    | LINE CROSSING                               |    | HAND PUMP  |    | ACCUMULATOR,<br>GAS CHARGED                              |    | SINGLE ACTING<br>CYLINDER                         |
|    | LINE JOINED                                 |    | RELIEF VALVE   |    | PRESSURE<br>SWITCH                                       |    | DOUBLE ACTING<br>CYLINDER                         |
|    | HYDRAULIC<br>TANK                           |    | PRESSURE<br>REDUCING<br>VALVE                              |    | SHUTTLE VALVE  |    | DOUBLE ACTING<br>DOUBLE<br>RODDED<br>CYLINDER     |
|    | HYDRAULIC<br>FILTER WITH<br>BYPASS          |    | FIXED ORIFICE  |    | CHARGE VALVE<br>DUAL                                     |    | SPRING APPLIED<br>HYDRAULIC<br>RELEASED<br>BRAKE  |
|    | ELECTRIC<br>MOTOR                           |    | ADJUSTABLE<br>FLOW CONTROL                                 |    | CHARGE VALVE<br>SINGLE                                   |    | BRAKE<br>CYLINDER                                 |
|  | ENGINE                                      |  | CHECK VALVE  |  | THREE POSITION<br>SIX WAY<br>OPEN CENTER<br>CLOSED PORT  |  | TWO POSITION<br>TWO WAY<br>NORMALLY<br>OPEN VALVE |
|  | FIXED<br>DISPLACEMENT<br>PUMP               |  | OIL COOLER   |  | COUNTER<br>BALANCE VALVE                                 |  | MAIN LINES Solid                                  |
|  | VARIABLE<br>DISPLACEMENT<br>PUMP            |  | TWO POSITION<br>THREE WAY VALVE                            |  | VALVE COIL   |  | PILOT LINES Dashed                                |
|  | VARIABLE<br>DISPLACEMENT<br>HYDRAULIC MOTOR |  | TWO POSITION<br>TWO WAY<br>NORMALLY<br>CLOSED VALVE        |  | THREE POSITION<br>FOUR WAY<br>CLOSED CENTER<br>OPEN PORT |   |   |
|  | BI DIRECTIONAL<br>HYDRAULIC<br>MOTOR        |  | THREE POSITION<br>FOUR WAY<br>CLOSED CENTER<br>CLOSED PORT |  | DYNAMIC SIGNAL<br>PRIORITY VALVE                         |   |   |
|  | ORBITAL<br>STEERING<br>MOTOR                |  | PRESSURE<br>TRANSDUCER                                     |  | STATIC SIGNAL<br>PRIORITY VALVE                          |   |   |
|   |   |   |  |   |  |   |   |



## Service and Maintenance

## Section 3 - System Component Identification and Schematics

## 3.2 Electrical Symbol Chart

|  |   |  |   |
|--|---|--|---|
|  CIRCUITS CROSSING<br>NO CONNECTION     |  HOURMETER                               |  KEY SWITCH                             |  LIMIT SWITCH<br>N.O.                |
|  CIRCUITS<br>CONNECTED                  |  LIGHT                                   |  FOOT SWITCH                            |  LIMIT SWITCH<br>N.O. HELD<br>CLOSED |
|  BATTERY                                |  HYDRAULIC<br>VALVE COIL                 |  TOGGLE SWITCH                          |  LIMIT SWITCH<br>N.C.                |
|  GROUND                                 |  PROPORTIONAL<br>HYDRAULIC<br>VALVE COIL |  PUSH BUTTON                            |  LIMIT SWITCH<br>N.C. HELD OPEN      |
|  FUSE                                   |  ELECTRIC<br>MOTOR                       |  ROTARY SWITCH                          |  SILICON<br>CONTROLLED<br>RECTIFIER  |
|  CIRCUIT<br>BREAKER                   |  HORN                                  |  LIMIT SWITCH                         |  PROXIMITY<br>SWITCH               |
|  VOLT METER                           |  EMERGENCY<br>STOP BUTTON              |  CAM OPERATED<br>LIMIT SWITCH         |  PNP<br>TRANSISTOR                 |
|  CAPACITOR                            |  RESISTOR                              |  TILT SWITCH                          |  NPN<br>TRANSISTOR                 |
|  POTENTIOMETER                        |  LEVEL SENSOR                          |  SINGLE POLE<br>SINGLE THROW<br>RELAY |  PRESSURE<br>VACUUM<br>SWITCH      |
|  SINGLE POLE<br>DOUBLE THROW<br>RELAY |  DOUBLE POLE<br>SINGLE THROW<br>RELAY  |  DOUBLE POLE<br>DOUBLE THROW<br>RELAY |  TEMPERATURE<br>SWITCH             |
|  TRIPLE POLE<br>DOUBLE THROW<br>RELAY |  DIODE                                 |  RHEOSTAT                             |   |
|  |   |  |   |



## Section 3 - System Component Identification and Schematics

## Service and Maintenance

## 3.3 Harnesses Color Codes

| FUNCTION                                  | WIRE COLOR |
|---|------------|
| GROUND                                    | BLK        |
| FROM ALTERNATOR B+ TO STARTER MOTOR       | RED        |
| FROM ACC ON KEY SWITCH TO BREAKER BUS BAR | RED        |
| IGNITION                                  | YEL        |
| OIL TEMPERATURE (TRANSMISSION)            | BRN/RED    |
| STARTER SOLENOID                          | GRN        |
| HORN                                      | PNK        |
| FUEL GAUGE                                | GRY        |
| BRAKE PRESSURE WARNING LIGHT              | BLU        |
|   |            |
| <b>STEERING</b>                           |            |
| FROM BREAKER TO STEERING SWITCH           | GRN/YEL    |
| ROUND STEER                               | GRN/BLK    |
| CRAB STEER                                | GRN/WHT    |
|   |            |
| <b>PARK BRAKE</b>                         |            |
| FROM BREAKER TO PARK BRAKE SOLENOID       | LT BLU/RED |
| FROM SWITCH TO PARK BRAKE SOLENOID        | LT BLU     |
| FROM SWITCH TO PARK BRAKE LIGHT           |            |
| FROM SWITCH TO DECLUTCH RELAY             | LT BLU/BLK |
| FROM SWITCH TO PARK BRAKE OFF             | LT BLU/BLK |
|   |            |
| <b>TRANSMISSION</b>                       |            |
| FORWARD SOLENOID                          | RED        |
| REVERSE SOLENOID                          | WHT        |
| 1 <sup>st</sup> SOLENOID                  | BRN        |
| 2 <sup>nd</sup> SOLENOID                  | BLK        |
|   |            |
| DIVERTER VALVE                            | TAN        |
|   |            |
| ALTERNATOR EXCITER                        | PUR        |

| FUNCTION   | WIRE COLOR  |
|--|-------------|
| <b>DASH POWER</b>  |             |
| TO HOUR METER  | BLU/YEL     |
| TO HORN  | BLU/WHT     |
| TO INSTRUMENT CLUSTER (exclude PV100)                            | BLU/RED     |
|  |             |
| <b>DIFFERENTIAL LOCK</b>   |             |
| FROM BREAKER TO TO DIFF. LOCK SWITCH                             | LT GRN      |
| FROM SWITCH TO DIFF. LOCK SOLENOID                               |             |
| FROM DIFF. LOCK SWITCH TO INSTRUMENT CLUSTER                     | LT GRN/RED  |
|  |             |
| <b>FRAME LEVEL/AXLE LOCK</b>                                     |             |
| FROM BREAKER TO AXLE LOCK RELAY                                  | YEL/BLK     |
| AXLE LOCK LIGHT  | YEL/BLU     |
|  |             |
| <b>OUTRIGGERS</b>  |             |
| FROM BREAKER TO BOX  | WHT         |
| FROM BOX TO OUTRIGGER SWITCHES                                   | WHT/BLU     |
| FROM 400425 BOX TO DUMP VALVE                                    | WHT/GRY     |
| LEFT UP  | WHT/BLK     |
| LEFT DOWN  | WHT/BLK/RED |
| RIGHT UP   | WHT/RED     |
| RIGHT DOWN   | WHT/RED/GRN |
| FROM 401392 HARNESS TO LIFT CYLINDER PRESS OR PROXIMITY SWITCHES | WHT/ORG     |
|  |             |
| <b>OPTIONAL LIGHTS</b>   |             |
| HEADLIGHTS   | ORG/GRN     |
| HEADLIGHTS AND TAILLIGHTS  | ORG/BLK/WHT |
| BRAKE LIGHTS   | ORG/RED     |
| SIGNAL LIGHTS  | ORG         |
| LEFT FRONT & LEFT REAR   | ORG/BLK     |
| RIGHT FRONT & RIGHT REAR   | ORG/BLU     |

225A

This table is to be used as a wire function/color reference for all electrical drawings and schematics.





## Section 3 - System Component Identification and Schematics

## Service and Maintenance

## 3.4 Hydraulic Schematic Parts List

| Index No. | Skyjack Part No.                 | Qty. | Description  |
|-----------|----------------------------------|------|--|
| ACC1      | 400947                           | 1    | ACCUMULATOR, Joystick                                      |
| ACC2      | 400947                           | 1    | ACCUMULATOR, Brake Charge                                  |
| ACC3      | 400947                           | 1    | ACCUMULATOR, Brake Charge                                  |
| ACC4      | 400947                           | 1    | ACCUMULATOR, Rear axle lock                                |
| C1        | 9-180                            | 1    | CYLINDER, Front steer (LH) (Part of axle assembly)         |
| C2        | 9-180                            | 1    | CYLINDER, Front steer (RH) (Part of axle assembly)         |
| C3        | 9-180                            | 1    | CYLINDER, Rear steer (RH) (Part of axle assembly)          |
| C4        | 9-180                            | 1    | CYLINDER, Rear steer (LH) (Part of axle assembly)          |
| C5        | 401061                           | 1    | CYLINDER, Boom lift  |
| C6        | 401061                           | 1    | CYLINDER, Boom lift  |
| C7        | 9-163                            | 1    | CYLINDER, Boom extension                                   |
| C8        | 9-158                            | 1    | CYLINDER, Slave  |
| C9        | 9-158                            | 1    | CYLINDER, Slave  |
| C10       | 9-158                            | 1    | CYLINDER, Carriage Tilt                                    |
| C11       | 9-158                            | 1    | CYLINDER, Carriage Tilt                                    |
| C12       | 9-161                            | 1    | CYLINDER, Frame Level (Right)                              |
| C13       | 9-161                            | 1    | CYLINDER, Frame Level (Left)                               |
| C14       | 9-155                            | 1    | CYLINDER, Rear axle lock                                   |
| C15       | 9-160                            | 1    | CYLINDER, Left outrigger                                   |
| C16       | 9-160                            | 1    | CYLINDER, Right outrigger                                  |
| C17       | -                                | 1    | CYLINDER, Parking Brake (Part of front axle only)          |
| C18       | 9-101                            | 1    | CYLINDER, Carriage shift (Optional)                        |
| C19       | 401401                           | 1    | CYLINDER, Fork shift (Optional fork/side shift carriage)   |
| C20       | 401401                           | 1    | CYLINDER, Fork shift (Optional fork/side shift carriage)   |
| C21       | -                                | 1    | CYLINDER, Clamp (Optional rotating pipe & pole grapppler)  |
| C22       | -                                | 1    | CYLINDER, Clamp (Optional rotating pipe & pole grapppler)  |
| C23       | -                                | 1    | CYLINDER, Rotate (Optional rotating pipe & pole grapppler) |
| C24       | -                                | 1    | CYLINDER, Clamp (Optional 2 stage pipe & pole grapppler)   |
| C25       | -                                | 1    | CYLINDER, Clamp (Optional 2 stage pipe & pole grapppler)   |
| CB1       | CAGALHN-<br>CBGALHN-<br>YVSNB120 | 1    | VALVE, Counterbalance (Lift cylinder)                      |
| CB2       | CAGALHN-<br>CBGALHN-<br>YVSNB120 | 1    | VALVE, Counterbalance (Lift cylinder)                      |
| CB3       | CAGALHN-<br>CBGALHN-<br>YVSNB120 | 1    | VALVE, Counterbalance (Boom extension cylinder)            |
| CB4       | CX434_A                          | 1    | VALVE, Counterbalance (Carriage tilt cylinder)             |
| CB5       | CBCH-LJN-YY                      | 1    | VALVE, Counterbalance (Right, Frame level cylinder)        |
| CB6       | CBCH-LJN-YY                      | 1    | VALVE, Counterbalance (Left, Frame level cylinder)         |
| CB7       | CBCH-LJN-YY                      | 1    | VALVE, Counterbalance (Right outrigger)                    |
| CB8       | CBCH-LJN-YY                      | 1    | VALVE, Counterbalance (Left outrigger)                     |
| CRV1      | 133603                           | 1    | VALVE, Crossover relief                                    |
| CV1       | 3C14-12T-65                      | 1    | VALVE, Check   |
| CV2       | 3C14-12T-65                      | 1    | VALVE, Check   |
| F1        | 149177                           | 1    | FILTER, Return line  |
|           |                                  |      | Parts list continued on following page.                    |



## Service and Maintenance

## Section 3 - System Component Identification and Schematics

## 3.4 Hydraulic Schematic Parts List (Continued)

| Index No.                                       | Skyjack Part No. | Qty. | Description                            |
|---|------------------|------|--|
| <b>Parts list continued from previous page.</b> |                  |      |  |
| JS1   | 401473           | 1    | JOYSTICK, Rear                         |
| JS2   | 401349           | 1    | JOYSTICK, Front                        |
| MB1   | WA10-175-1       | 1    | MANIFOLD, Return                       |
| OSM1  | 21-1085-002      | 1    | MOTOR, Drive Steering                  |
| P1 thru   | 78493-RAJ        | 1    | PUMP, Hydraulic gear (Front)           |
| P2  | 78493-RAJ        | 1    | PUMP, Hydraulic gear (Rear)            |
| PRV1  | RD10A            |      |  |
|   | 0S1B_J11         | 1    | VALVE, Pressure reduce                 |
| PRT1  | 402902           | 1    | VALVE, Priority                        |
| PS1   | DNB-150-K        | 1    | SWITCH, Pressure                       |
| PS2   | 20-580-038       | 1    | SWITCH, Pressure                       |
| PS3   | 20-580-038       | 1    | SWITCH, Pressure                       |
| PS4   | 20-580-038       | 1    | SWITCH, Pressure                       |
| RV1   | -                | 1    | VALVE, Relief (Part of priority valve) |
| RV2 thru  |                  |      |  |
| RV11  | -                | 1    | VALVE, Relief (Part of main valve)     |
| QD1 thru  |                  |      |  |
| QD2   | FD45-1040-02     | AR   | QUICK DISCONNECT                       |
| QD3 thru  |                  |      |  |
| QD4   | FD45-1040-02     | 1    | QUICK DISCONNECT                       |
| QD5 thru  |                  |      |  |
| QD10  | 2071-4-4         | 1    | QUICK DISCONNECT                       |
| STR1  | FST212-1SA       | 1    | SUCTION STRAINER                       |
| STR2  | FST212-1SA       | 1    | SUCTION STRAINER                       |
| SV1   | VFC-NC-14        | 1    | VALVE, Shuttle                         |
| SV2   | VFC-NC-14        | 1    | VALVE, Shuttle                         |
| SV3   | VFC-NC-14        | 1    | VALVE, Shuttle                         |
| TP1 thru  | FD45-1002        | 5    | TEST PORT                              |
| TP6   | -02-02           |      |  |
| V1  | DSG-3C60-01-     |      |  |
|   | D1-2090          | 1    | VALVE, Steering function               |
| V2  | DFE5_6H18        |      |  |
|   | ES-Y202          | 1    | VALVE, Diverter                        |
| V3  | 06-463-100       | 1    | VALVE, Charge                          |
| <b>Parts list continued on following page.</b>  |                  |      |  |





AB

## Section 3 - System Component Identification and Schematics

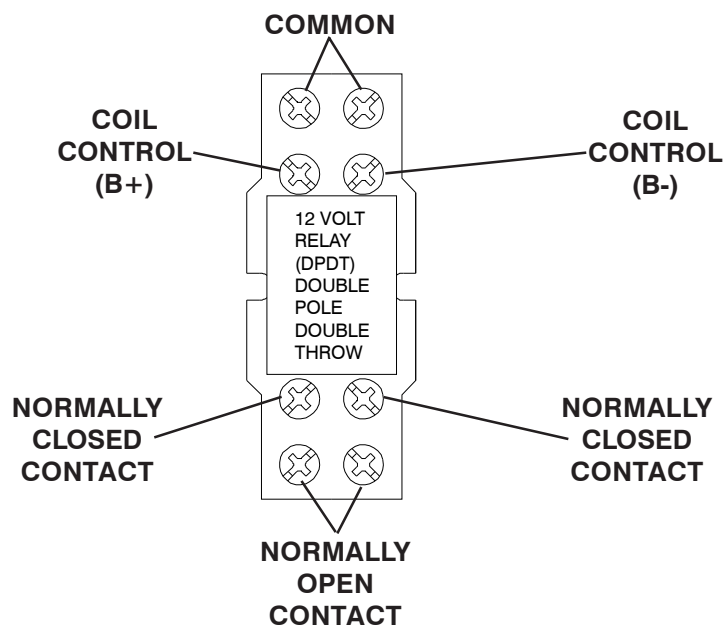
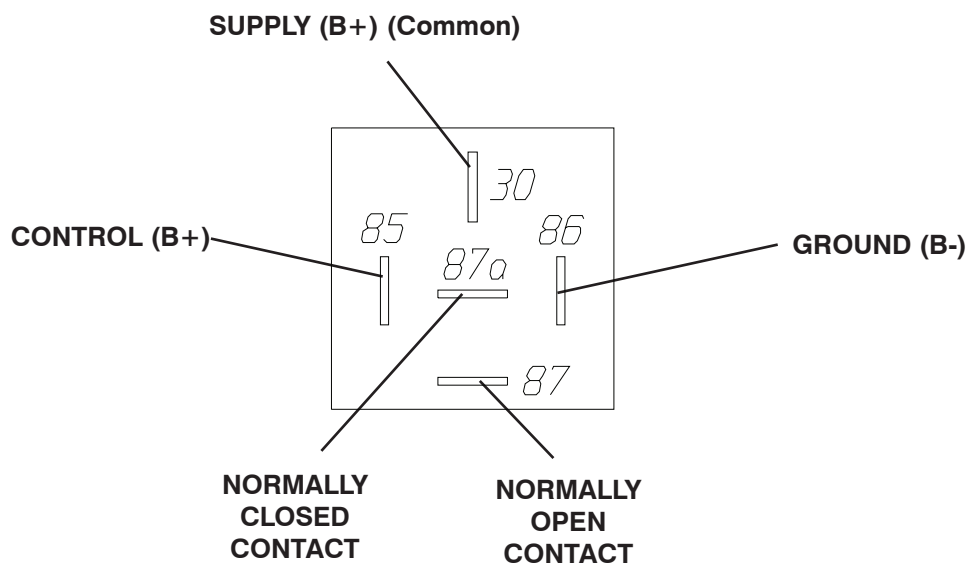
## Service and Maintenance

## 3.4 Hydraulic Schematic Parts List (Continued)

| Index No.                                       | Skyjack Part No. | Qty. | Description              |
|---|------------------|------|--------------------------|
| <b>Parts list continued from previous page.</b> |                  |      |                          |
| V4  | 403338           | 1    | VALVE, Dual brake pedal  |
| V5  | DSG-3C4-N01-     |      |                          |
|   | D1-2090          | 1    | VALVE, Park brake        |
| V6  | DFE5_6H18        |      |                          |
|   | ES-Y202          | 1    | VALVE, Diverter          |
| V7 thru   |                  |      |                          |
| V10   | 9S002904A        | 4    | VALVE, Dump, Frame level |
| V11 thru  |                  |      |                          |
| V14   | 9S000469A        | 1    | VALVE, Axle lock         |



### 3.5 Electrical Component Parts List





## Section 3 - System Component Identification and Schematics

## Service and Maintenance

## 3.5 Electrical Component Parts List (Continued)

| Index No.      | Skyjack Part No.       | Qty. | Description  |
|----------------|------------------------|------|--|
| CB1            | 30055-6                | 1    | CIRCUIT BREAKER, Self resetting (6 A), Diverter valve            |
| CB3            | 30055-6                | 1    | CIRCUIT BREAKER, Self resetting (6 A), Outtrigger                |
| CB4            | 661-10                 | 1    | CIRCUIT BREAKER, Self resetting (10 A), Transmission shifter     |
| CB5            | 661-10                 | 1    | CIRCUIT BREAKER, Self resetting (10 A), Dash power               |
| CB6            | 661-10                 | 1    | CIRCUIT BREAKER, Self resetting (10 A), Parking brake            |
| CB7            | 661-20                 | 1    | CIRCUIT BREAKER, Self resetting (20 A), Signal lights            |
| CB8            | 30055-6                | 1    | CIRCUIT BREAKER, Self resetting (6 A), Alternator                |
| CB9            | 661-20                 | 1    | CIRCUIT BREAKER, Self resetting (20 A), Axle lock/Frame leveling |
| CB10           | 30055-6                | 1    | CIRCUIT BREAKER, Self resetting (6 A), Steering                  |
| CB11           | 661-10                 | 1    | CIRCUIT BREAKER, Self resetting (10 A), Auxiliary hydraulic      |
| CB15           | 661-20                 | 1    | CIRCUIT BREAKER, Self resetting (20 A), Light power              |
| CB16           | 661-20                 | 1    | CIRCUIT BREAKER, Self resetting (20 A), Heater power             |
| CB17           | 661-20                 | 1    | CIRCUIT BREAKER, Self resetting (20 A), Wiper power              |
| CB18           | 661-20                 | 1    | CIRCUIT BREAKER, Self resetting (20 A), Boom light power         |
| CB21           | 661-20                 | 1    | CIRCUIT BREAKER, Self resetting (20 A), Aux light power          |
| CB23           | 661-30                 | 1    | CIRCUIT BREAKER, Self resetting (30 A)                           |
| CB220          | 661-50                 | 2    | CIRCUIT BREAKER, Self resetting (50 A)                           |
| DXX            | 102921                 | AR   | DIODE  |
| F1             | ATC5                   | 1    | FUSE, 5 Amp  |
| F2             | ATC5                   | 1    | FUSE, 5 Amp  |
| F64            | AGC4A                  | 1    | FUSE, 4 Amp  |
| F66            | AGC4A                  | 1    | FUSE, 4 Amp  |
| F70            | AGC4A                  | 1    | FUSE, 4 Amp  |
| F100 thru F104 | ATC5                   | 1    | FUSE, 5 Amp  |
| F201           | -                      | 1    | FUSE, 5 Amp  |
| F279           | -                      | 1    | FUSE, 30 Amp   |
| F300           | 0298125                | 1    | FUSE, 125 Amp  |
| H1             | 19-1040                | 1    | HORN, 12 Volt,   |
| K1             | 0332-019-110           | 1    | RELAY, Transmission disconnect, 10 Amp, 12V,                     |
| K13 , K14      | CCP012D                | 2    | RELAY, Power module  |
| K15            | 0-1432772-1            | 1    | RELAY, (SPST-NO, 40A, 12 VDC)                                    |
| K16            | 0332-019-110           | 1    | RELAY, Enclosed cab power module                                 |
| K20            | 0332-019-110           | 1    | RELAY, 12V, Shifter (Neutral Safety)                             |
| K124           | 4210835                | 1    | SOLENOID, Steering "A"   |
| K125           | 4210835                | 1    | SOLENOID, Steering "B"   |
| K127           | -                      | 1    | COIL, Upper, part of parking brake valve V6                      |
| K128           | -                      | 1    | COIL, Lower, part of parking brake valve V6                      |
| K134           | V.813-12VDC-SD10-11-16 | 1    | COIL, Right lower  |
| K135           | V.813-12VDC-SD10-11-16 | 1    | COIL, Right lower  |
| K140 thru K143 | CCP012D                | 4    | COIL, Frame leveling   |
| K210 thru K213 | CCP012D                | 1    | COIL, Axle lock  |
| K220           | -                      | 1    | SOLENOID, Starter  |
| K221           | LY2                    | 1    | RELAY, DPDT  |

Parts list continued on following page.



## Service and Maintenance

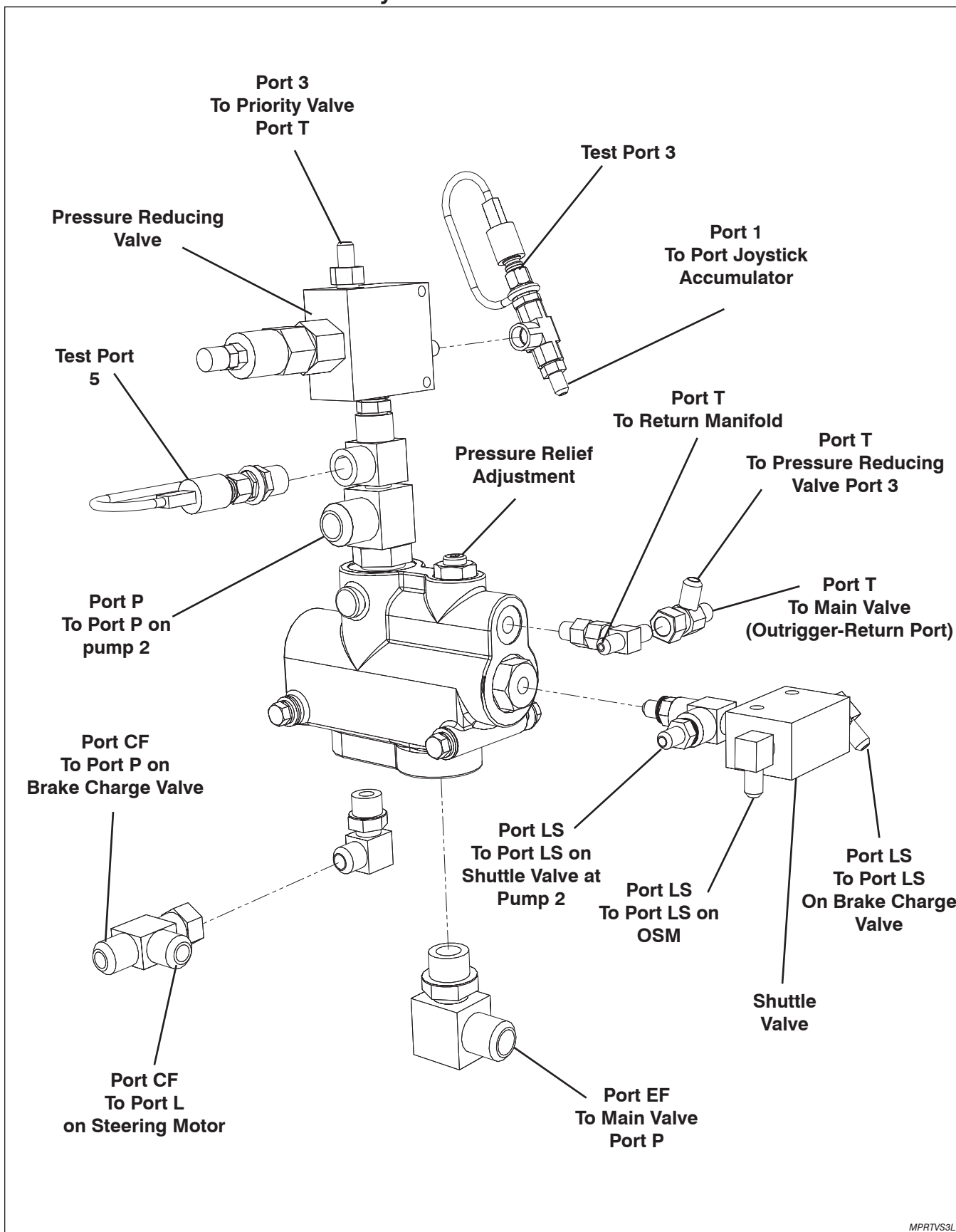
## Section 3 - System Component Identification and Schematics

## 3.5 Electrical Component Parts List (Continued)

| Index No.                               | Skyjack Part No. | Qty. | Description                                  |
|---|------------------|------|--|
| Parts list continued from previous page |                  |      |  |
| K222                                    | DFE5/6H18ES-Y202 | 1    | COIL, Diverter valve                         |
| K267                                    | 4210835          | 1    | SOLENOID, First, Transmission                |
| K268                                    | 4210835          | 1    | SOLENOID, Second, Transmission               |
| K269                                    | 4210835          | 1    | SOLENOID, Forward, Transmission              |
| K270                                    | 4210835          | 1    | SOLENOID, Reverse, Transmission              |
| K380                                    | -                | 1    | COIL, 3-way diverter valve                   |
| K381                                    | -                | 1    | COIL, 3-way diverter valve                   |
| M                                       | 892032           | 1    | HEATER, <b>Optional</b>                      |
| M1                                      | 85099            | 1    | HOUR METER                                   |
| M2                                      | 457-CE           | 1    | GAUGE, S-W Fuel level                        |
| M3                                      | 467-JL           | 1    | GAUGE, 140-320 Transmission oil temperature  |
| PS1                                     | 24-725           | 1    | BATTERY (12 V, 725CCA)                       |
| PS2                                     | 24-725           | 1    | BATTERY (12V, 725 CCA))                      |
| R208                                    | 391D             | 1    | FUEL SENDER                                  |
| R223                                    | 334J             | 1    | TEMPERATURE SENDER                           |
| SW1                                     | 956-3126         | 1    | SWITCH, Ignition                             |
| SW2                                     | 19-1040          | 1    | SWITCH, Horn                                 |
| SW3                                     | 58031-01         | 1    | SWITCH, Rocker (transmission disconnect)     |
| SW4                                     | 58031-02         | 1    | SWITCH, Rocker SPCO (steering mode selector) |
| SW6                                     | 58031-03         | 1    | SWITCH, Rocker SPDT (park brake)             |
| SW7                                     | 58031-08         | 1    | SWITCH, Rocker momentary (Left outrigger)    |
| SW8                                     | 58031-08         | 1    | SWITCH, Rocker momentary (Right outrigger)   |
| SW9                                     | 58031-01         | 1    | SWITCH, Rocker (Left turn signal)            |
| SW10                                    | 58031-01         | 1    | SWITCH, Rocker (Right turn signal)           |
| SW15                                    | 660-135          | 1    | SWITCH, (Push-pull, 75A) lights              |
| SW18                                    | 660-135          | 1    | SWITCH, Boom lights                          |
| SW19                                    | 660-135          | 1    | SWITCH, Aux lights                           |
| SW62                                    | 193362           | 1    | LIGHT, Interior (dome)                       |
| SW64                                    | P190130          | 1    | MOTOR, Top wiper                             |
| SW66                                    | P190130          | 1    | MOTOR, Front wiper                           |
| SW68                                    | 193876           | 1    | FAN, Ventilation                             |
| SW69                                    | 1151             | 1    | SWITCH, Heater fan                           |
| SW70                                    | P190130          | 1    | MOTOR, Rear wiper                            |
| SW114                                   | DNB-070-22B-NPT  | 1    | SWITCH, Park brake pressure                  |
| SW122                                   | DNB-150-22B-NPT  | 1    | SWITCH, Pressure (Brake charge)              |
| SW125                                   | DNB-070-22B-NPT  | 1    | SWITCH, Pressure (Reverse Alarm)             |
| SW150                                   | 32-580-002       | 1    | SWITCH, Brake light pressure                 |
| SW305                                   | 402742           | 1    | SWITCH, Battery Disconnect <b>Optional</b>   |
| SW360                                   | A1002            | 1    | SWITCH, Mercury, Boom angle                  |

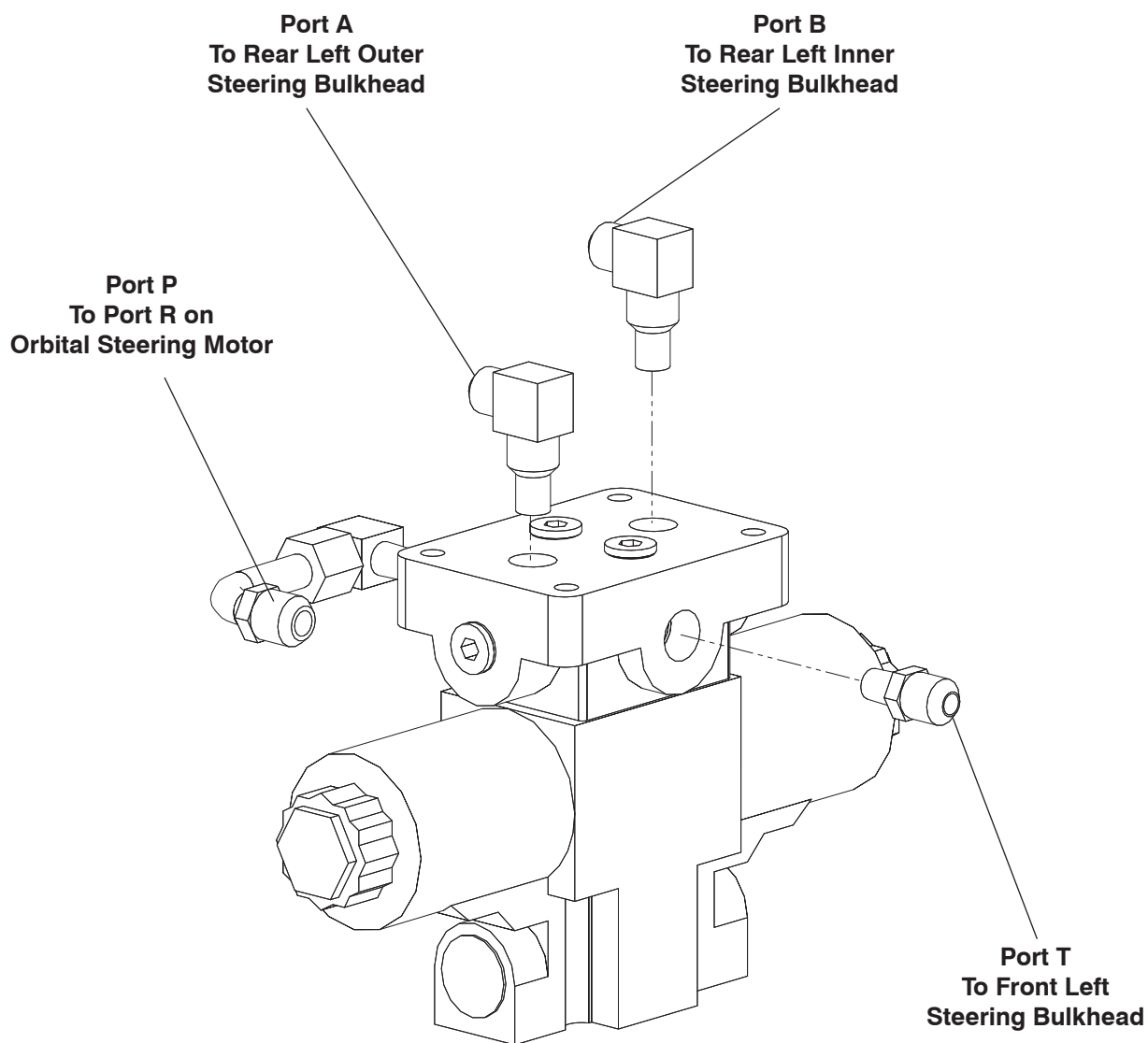


### 3.6 Priority Valve and Port Identifications





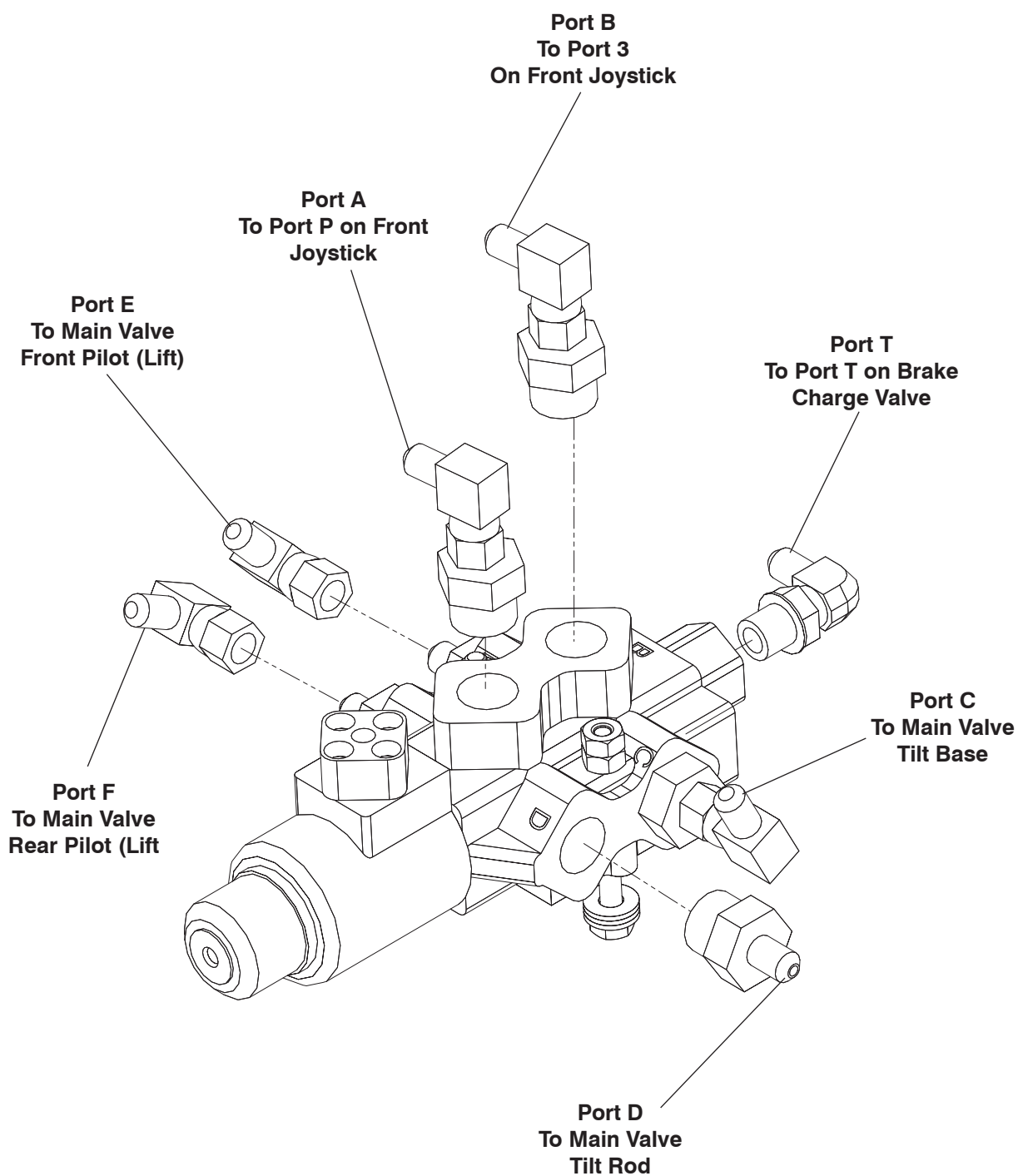
### 3.7 Steering Valve and Port Identifications



MSTRVS3L



### 3.8 Diverter Valve and Port Identifications

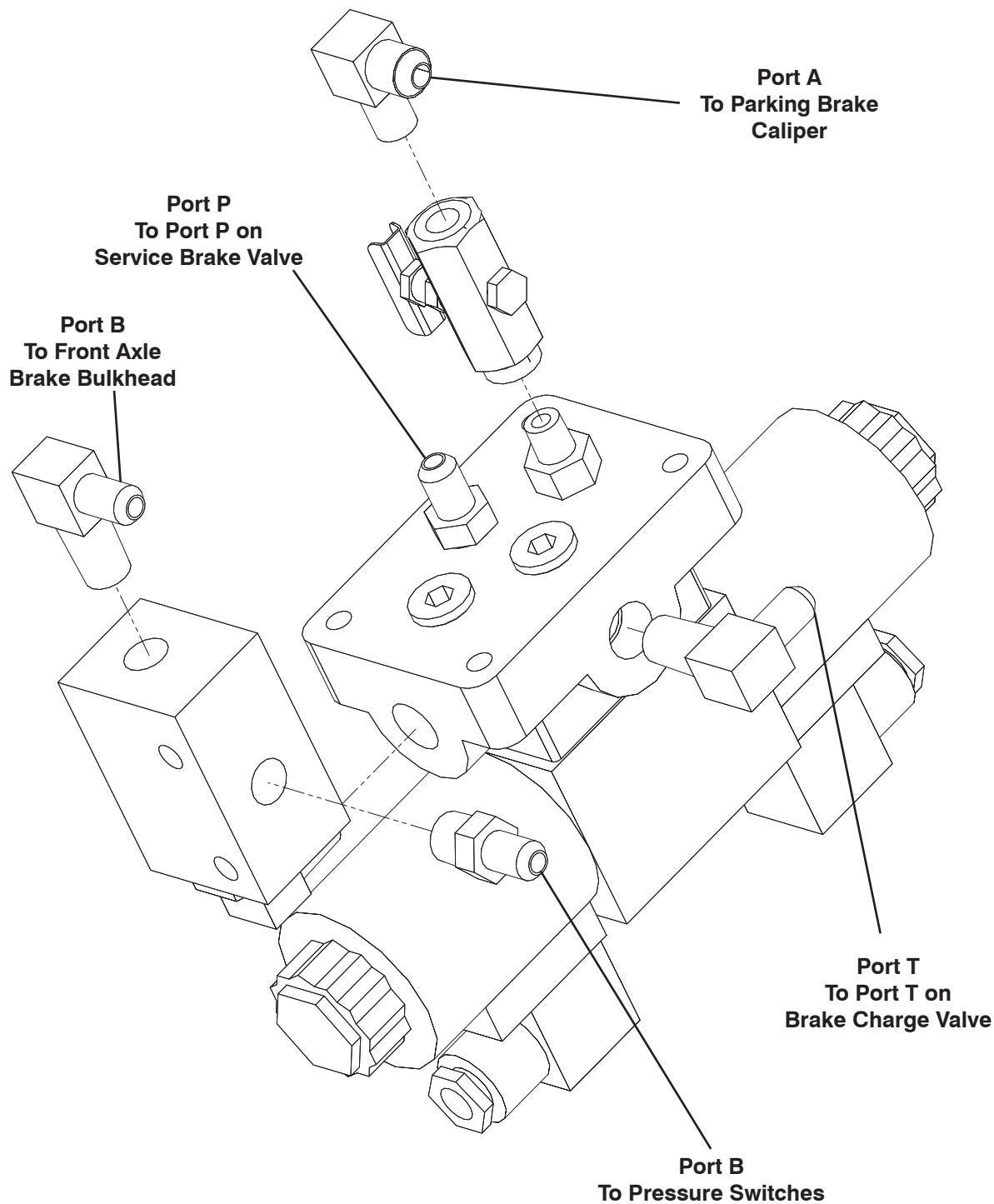


MDVRTVS3L





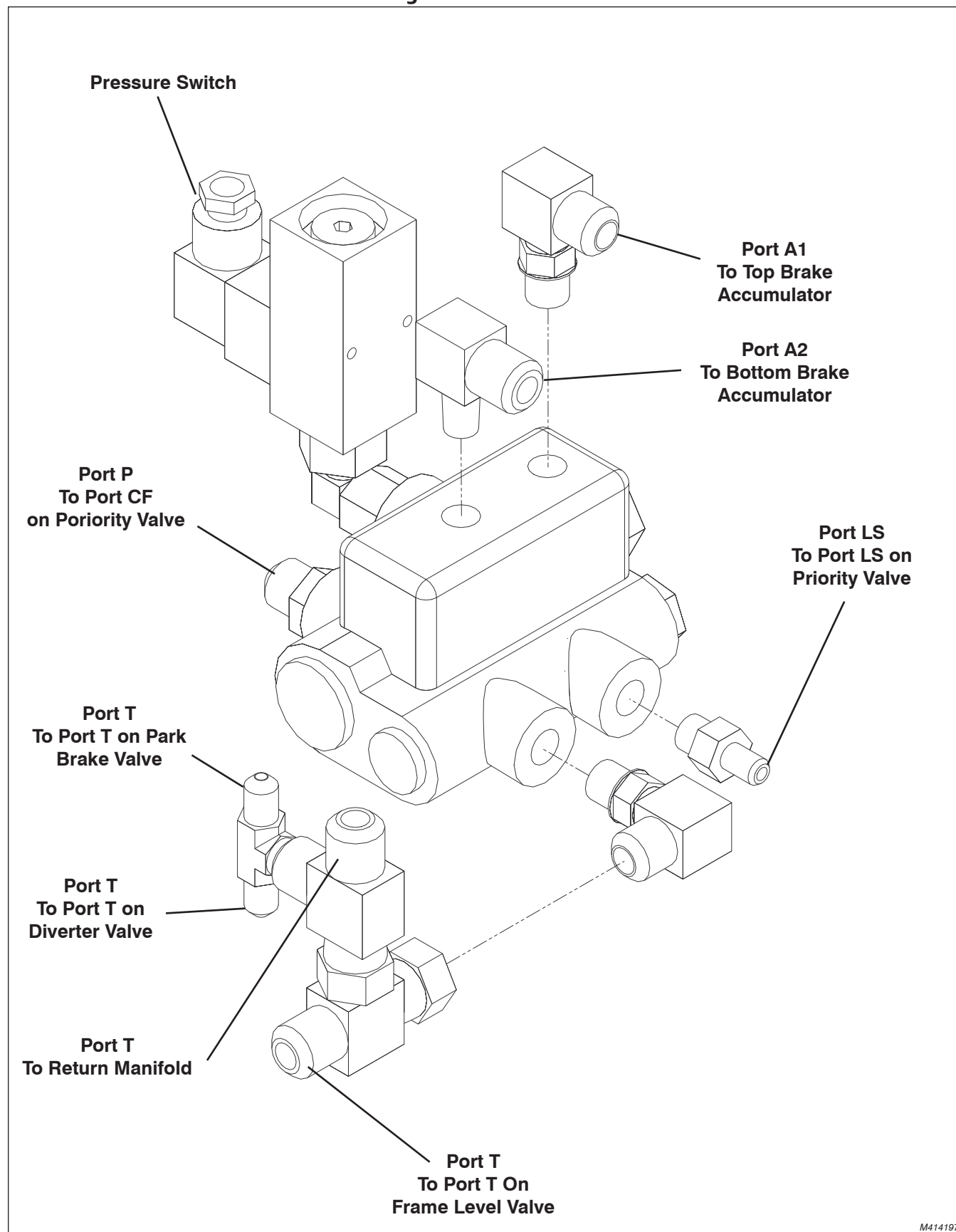
### 3.9 Parking Brake Valve and Port Identifications



MPRKBRKVS3L



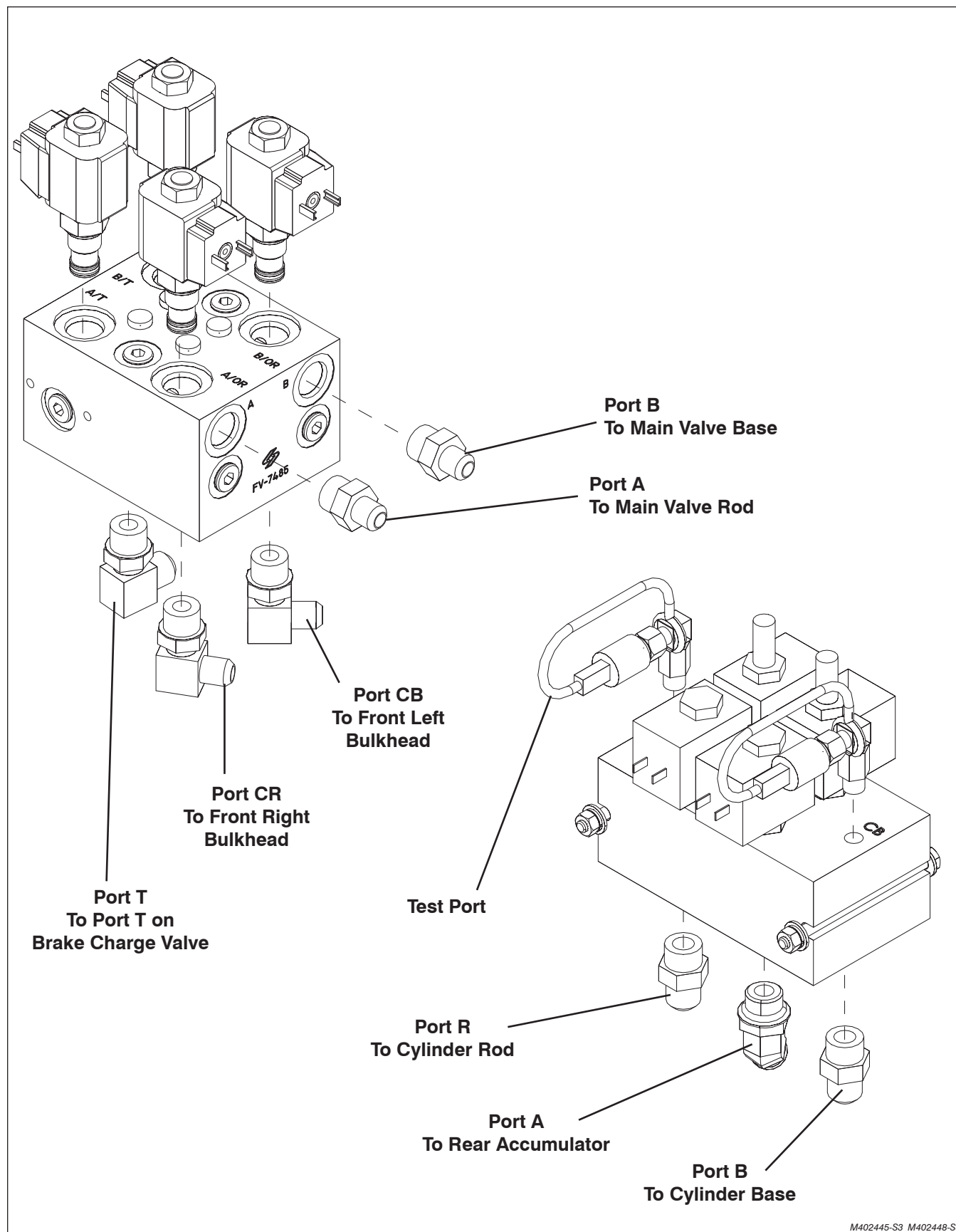
3.10 Brake Charge Valve and Port Identifications



M414197



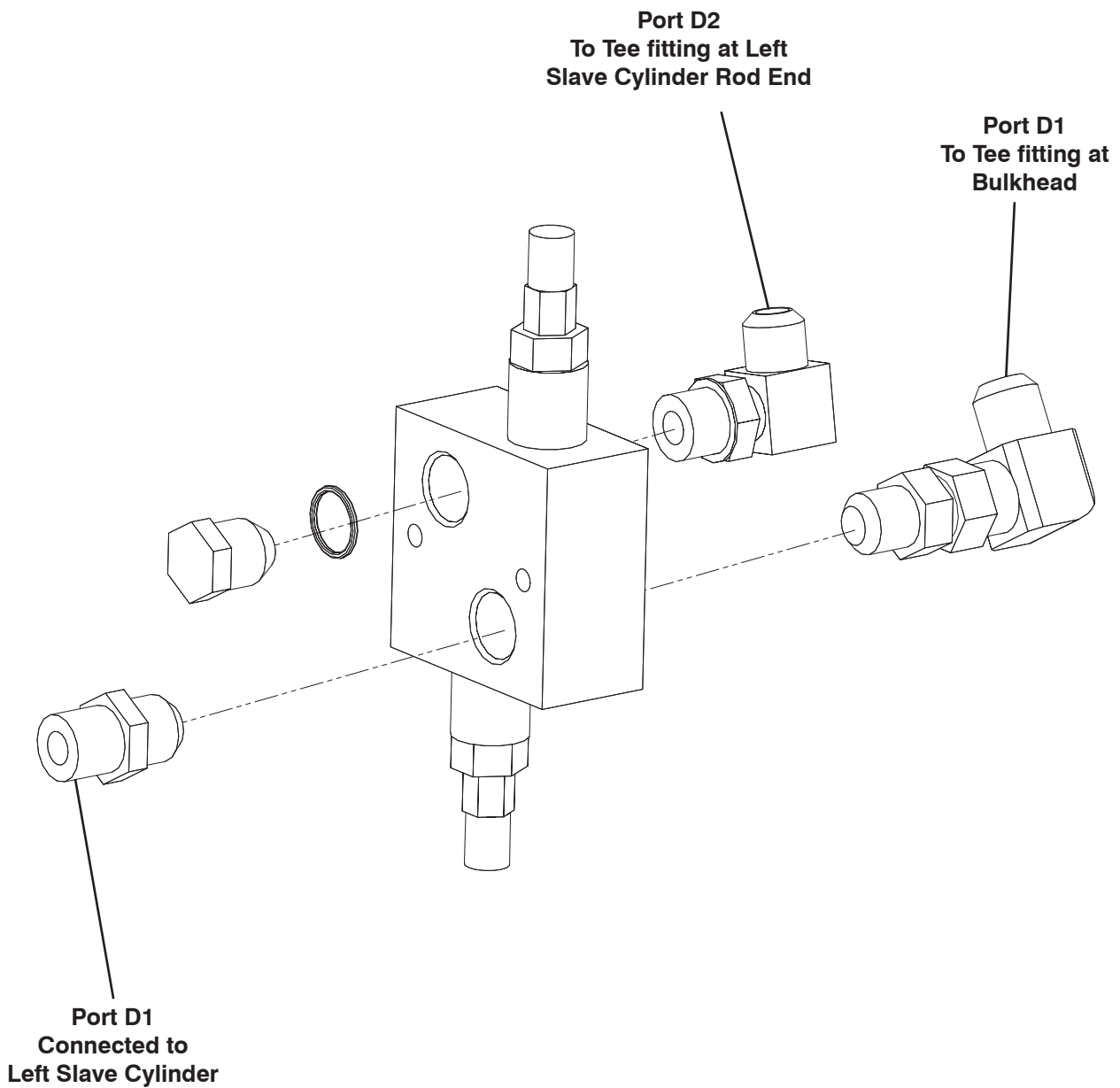
### 3.11 Frame Level and Axle Lock Valves and Port Identifications



M402445-S3\_M402448-S3



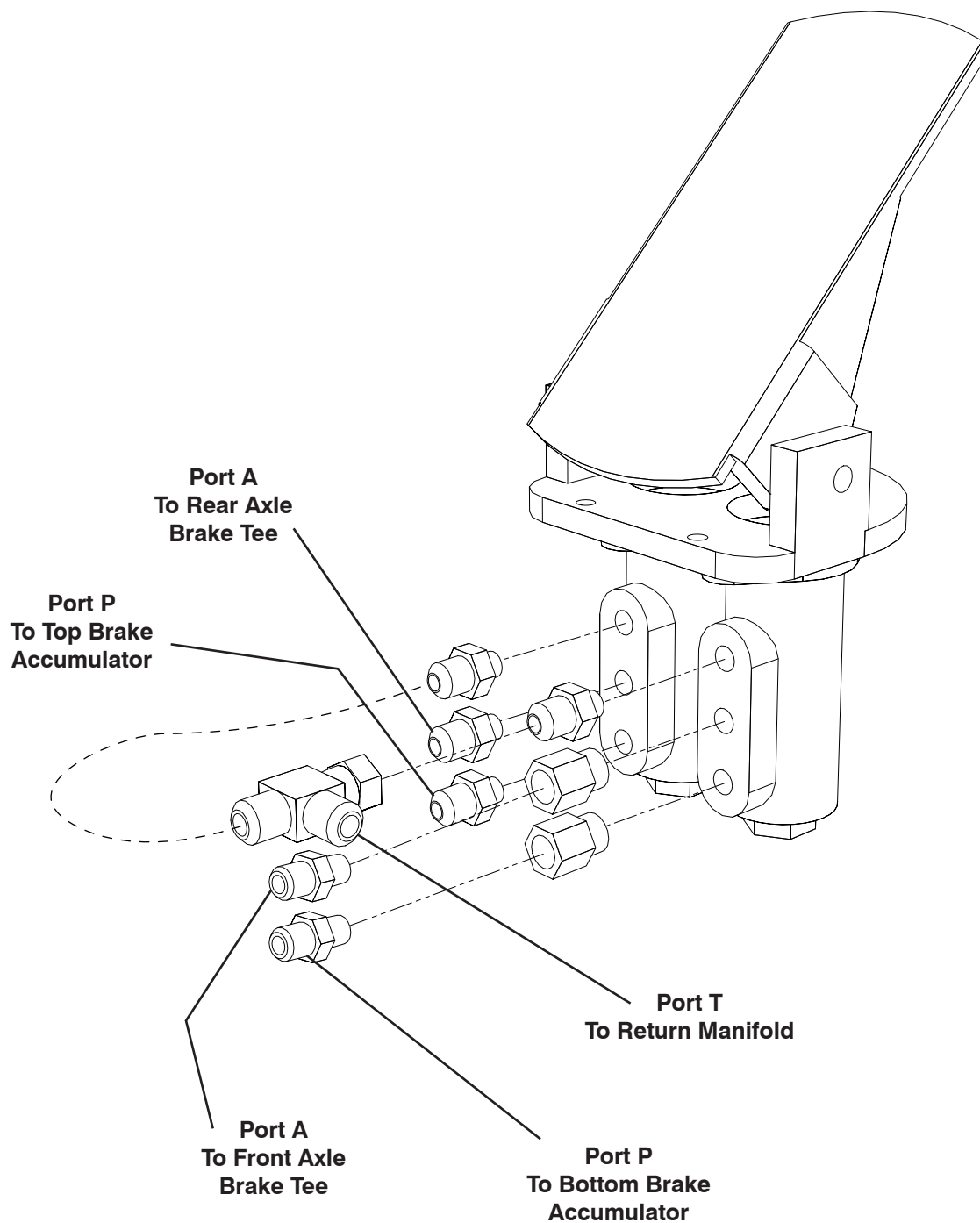
### 3.12 Cross-Over Relief Valve and Port Identifications



M402447-S3



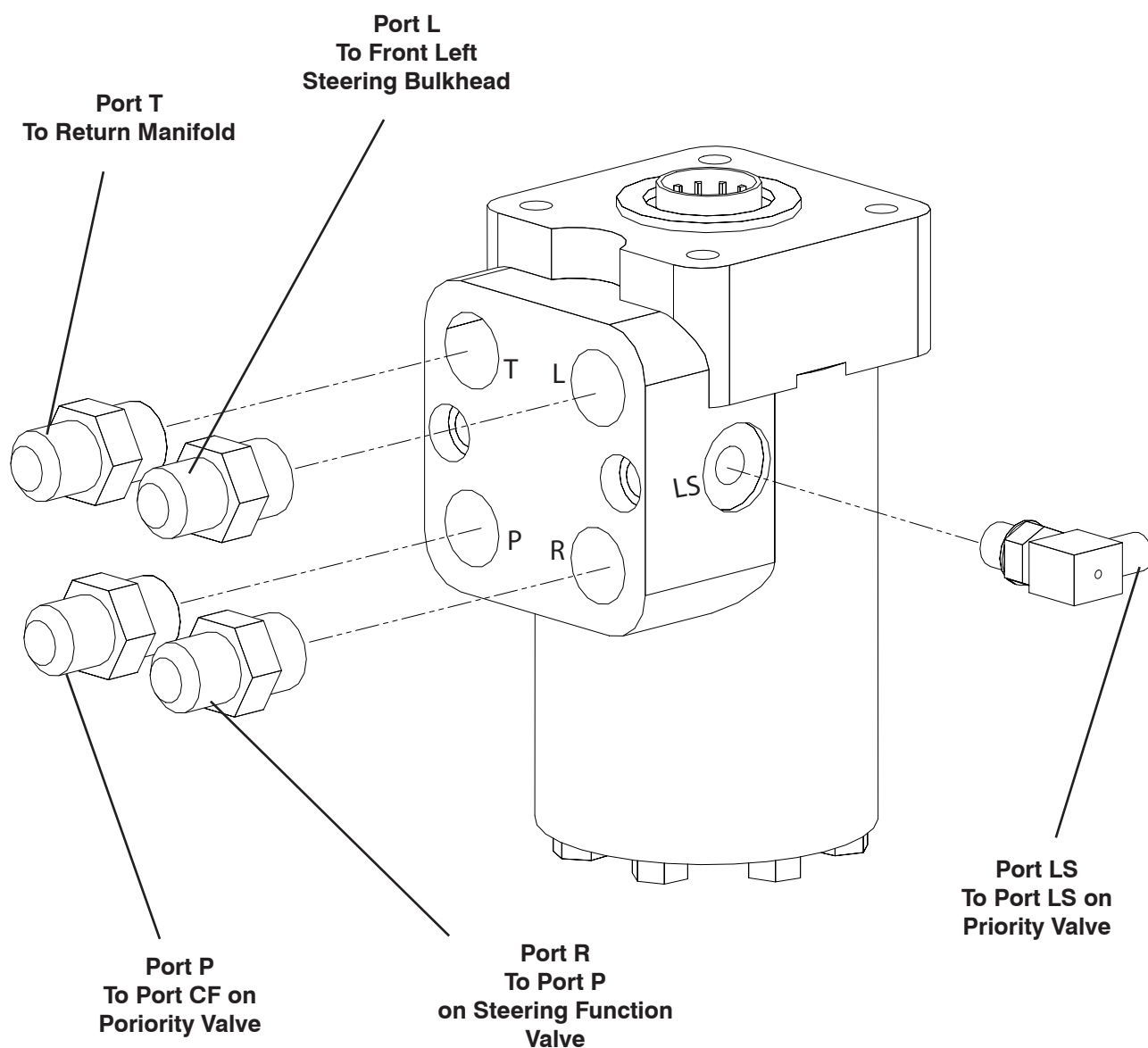
### 3.13 Dual Charge Brake Pedal and Port Identifications



M06-462-364-E-L



### 3.14 Orbital Steering Motor and Port Identifications



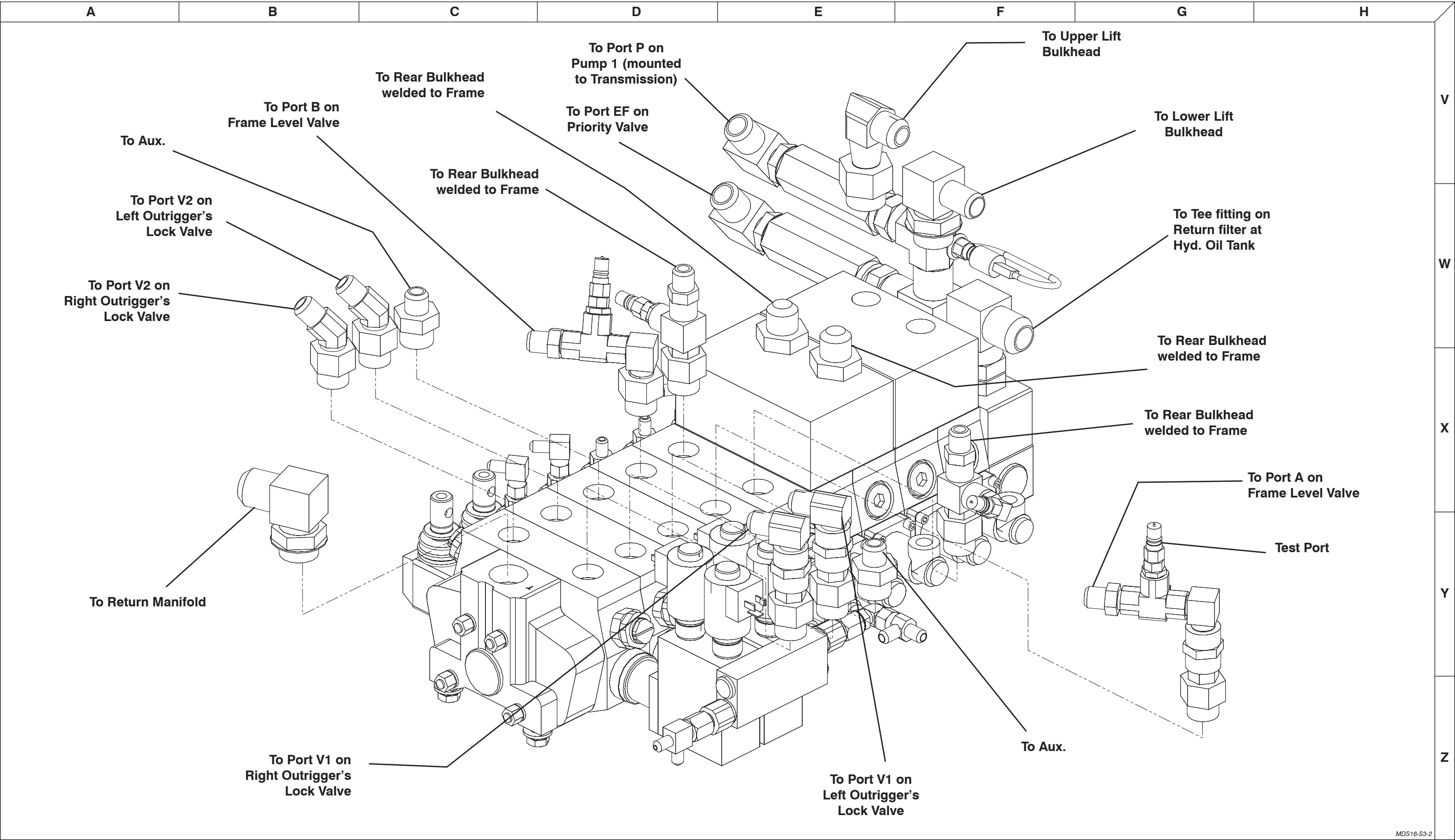
M213-1085-E-1





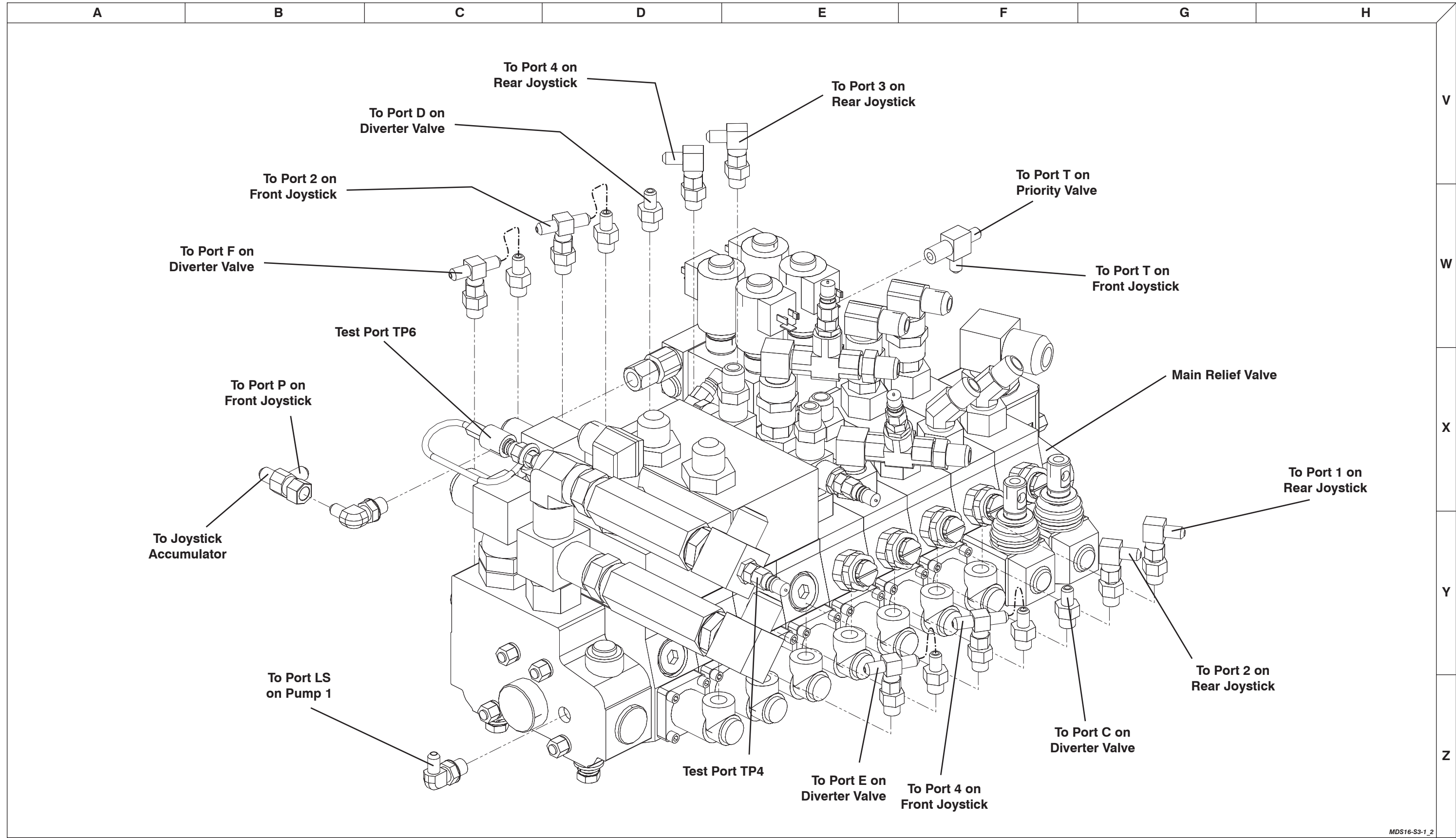


3.15a Main Valve and Main Ports Identifications





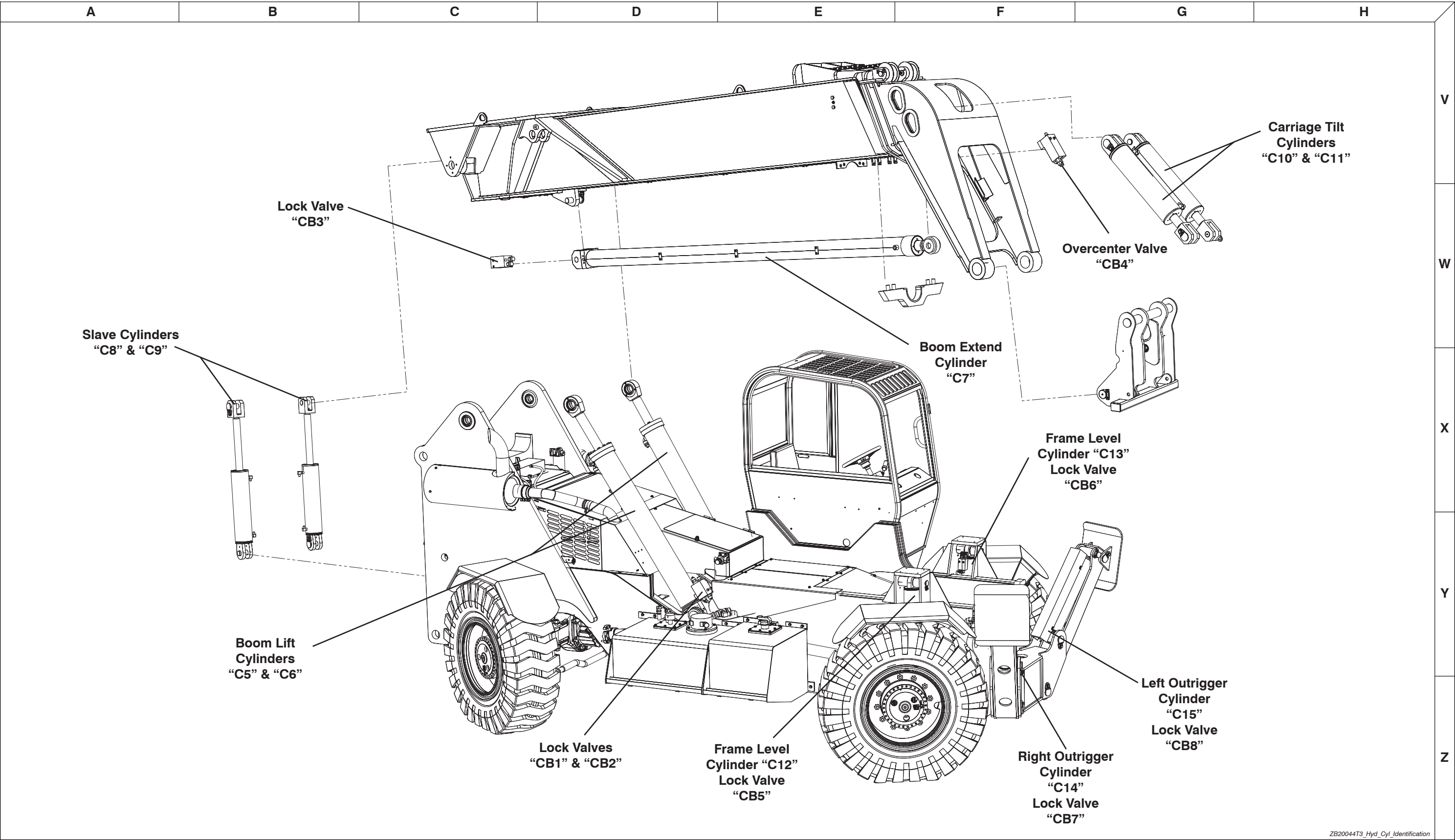
3.15b Main Valve and Pilot Ports Identifications



MDS16-S3-1\_2



3.16 Hydraulic Cylinders Identification

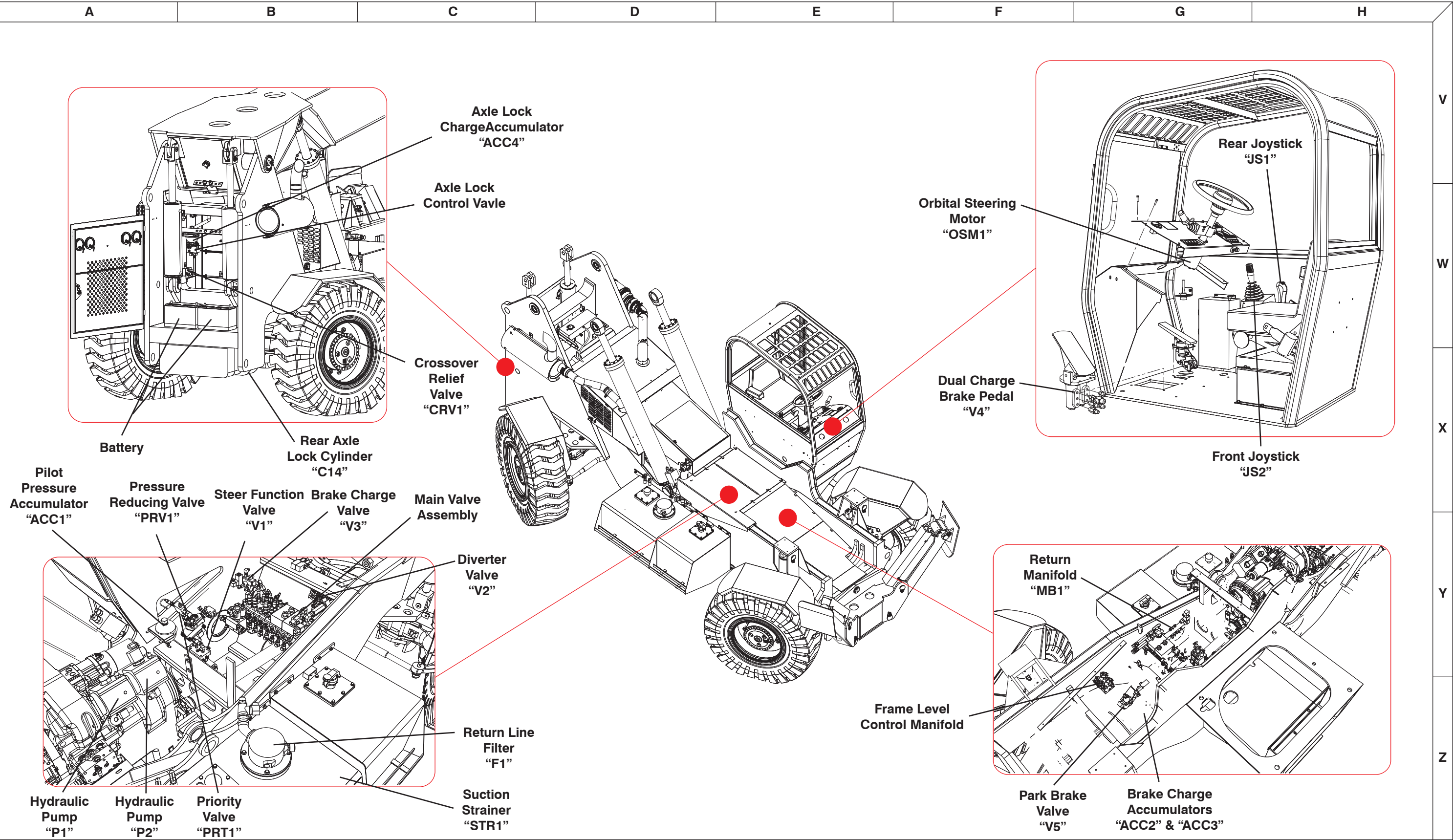


ZB20044T3\_Hyd\_Cyl\_Identification

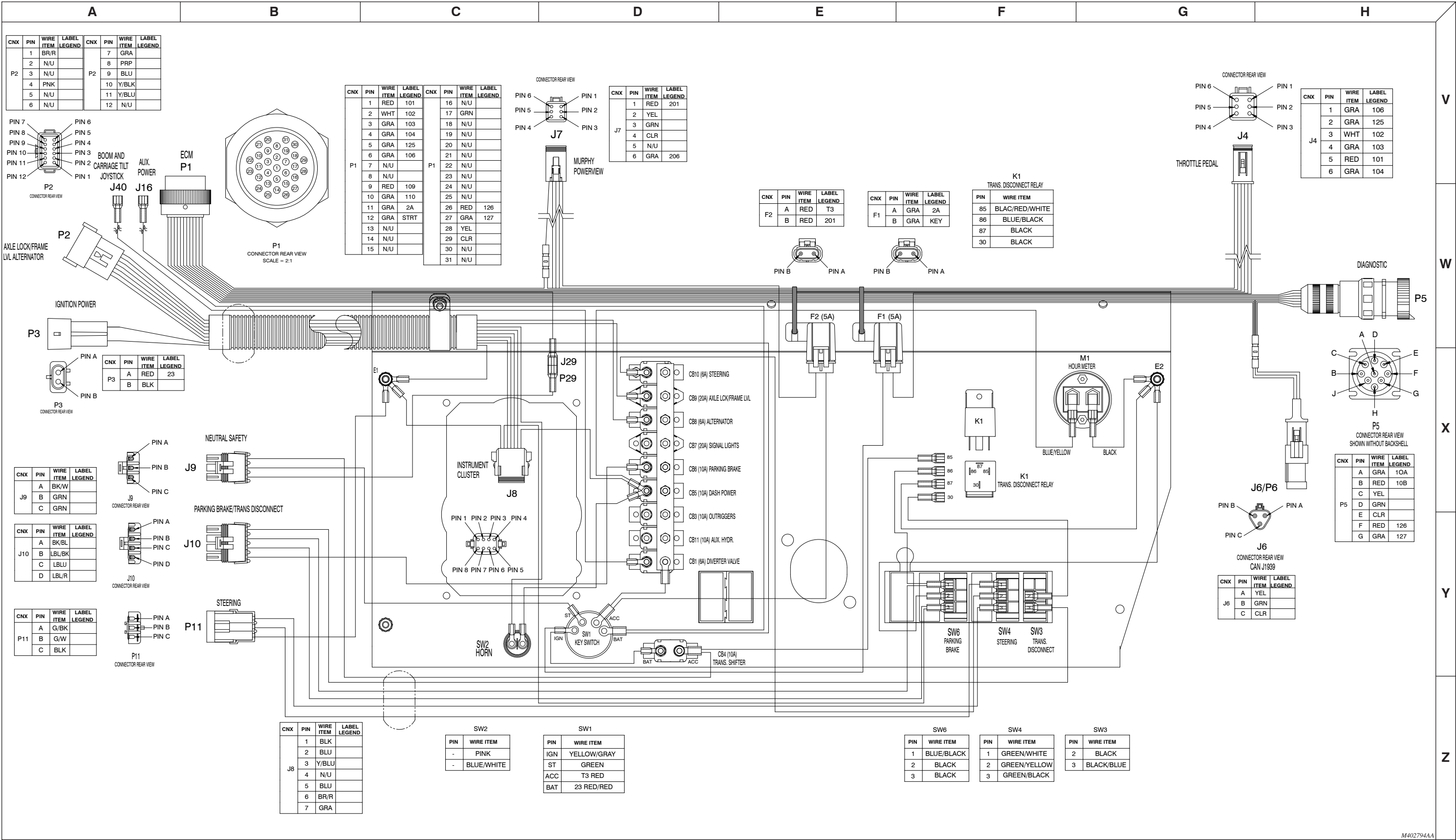




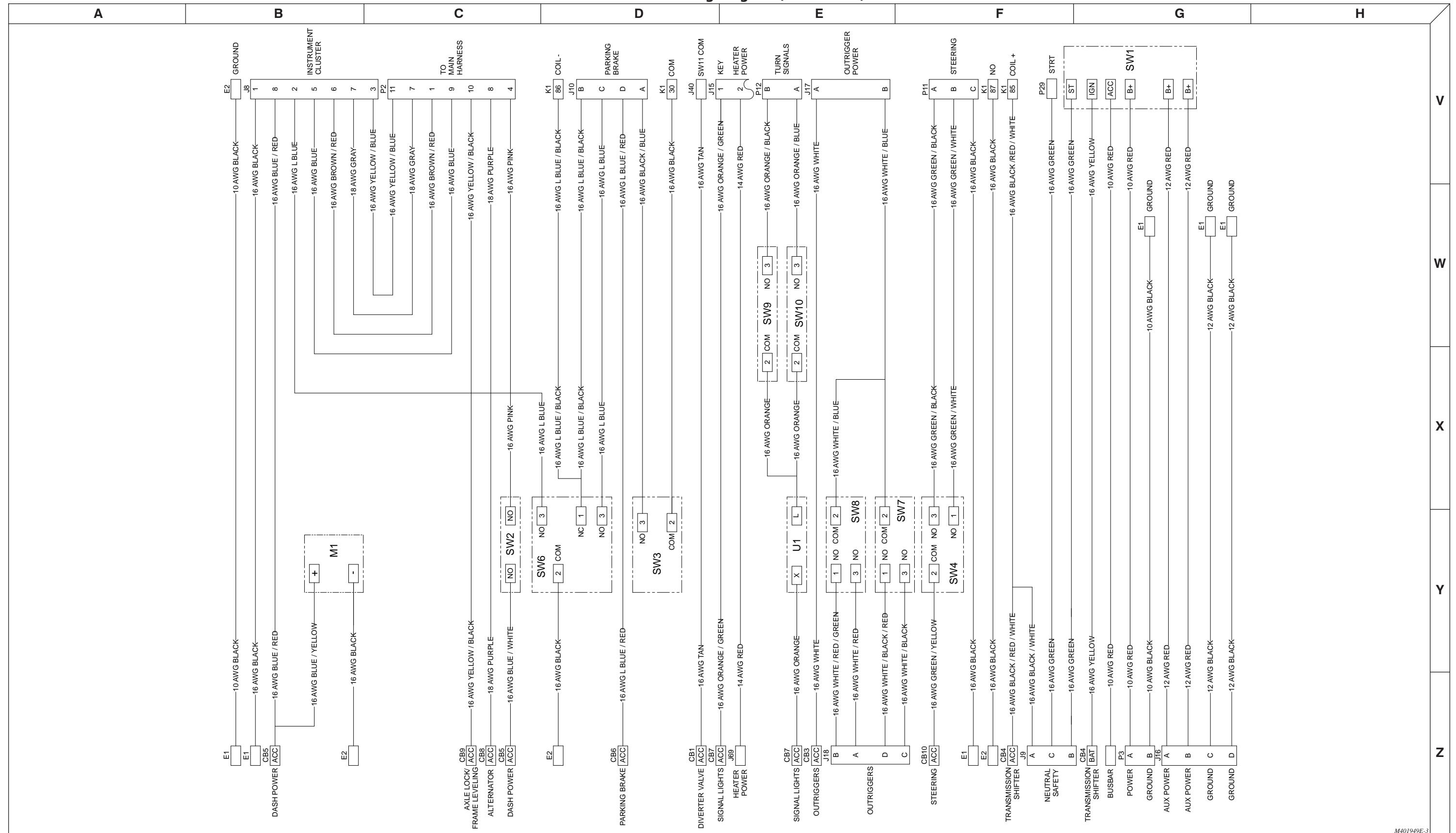
3.17 Hydraulic Manifolds Location



3.18a Instrument Panel Wiring Diagram (Base Model) - Part 1 of 2

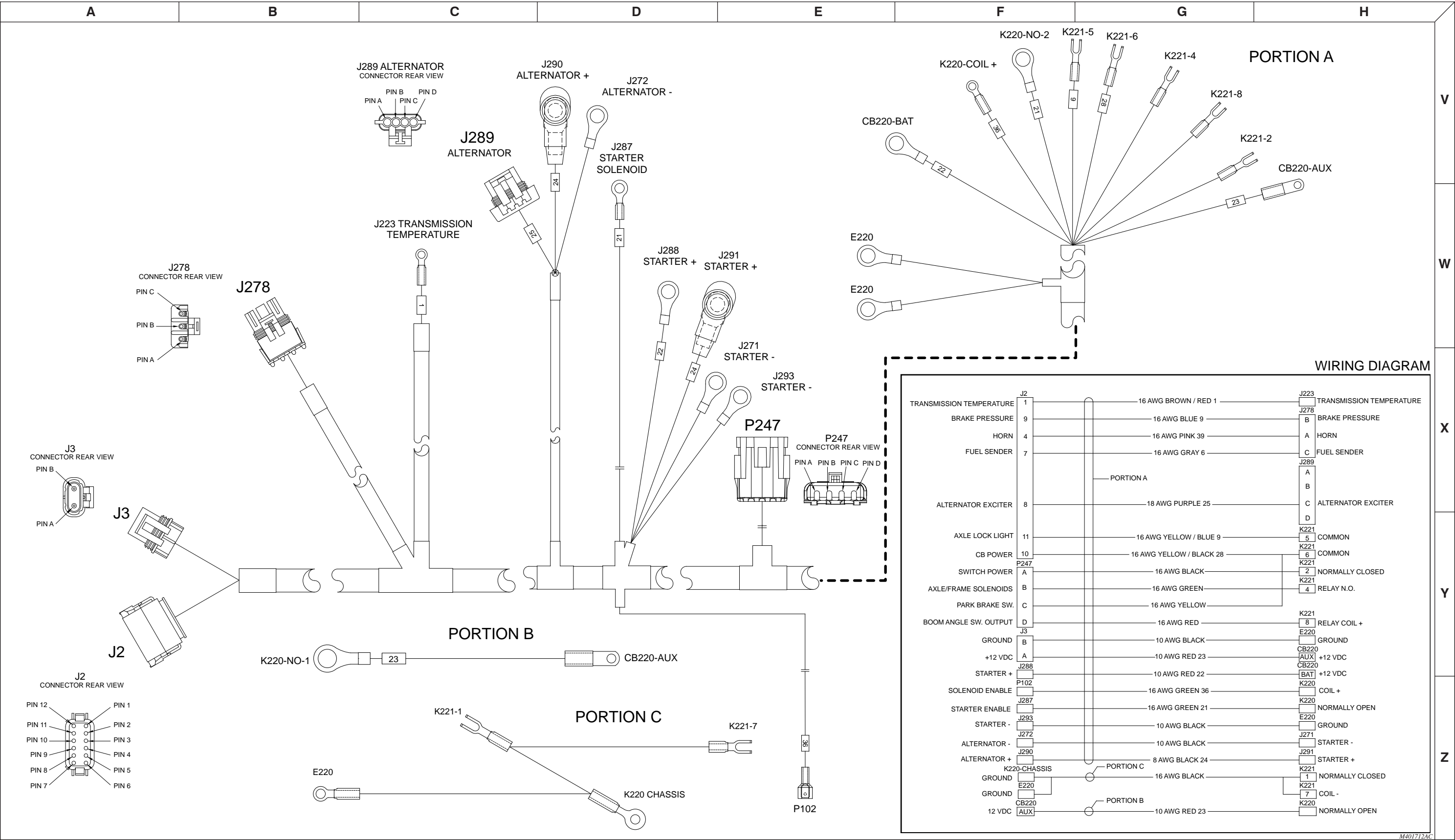


### 3.18b Instrument Panel Wiring Diagram (Base Model) - Part 2 of 2





3.19 Main Wiring Harness





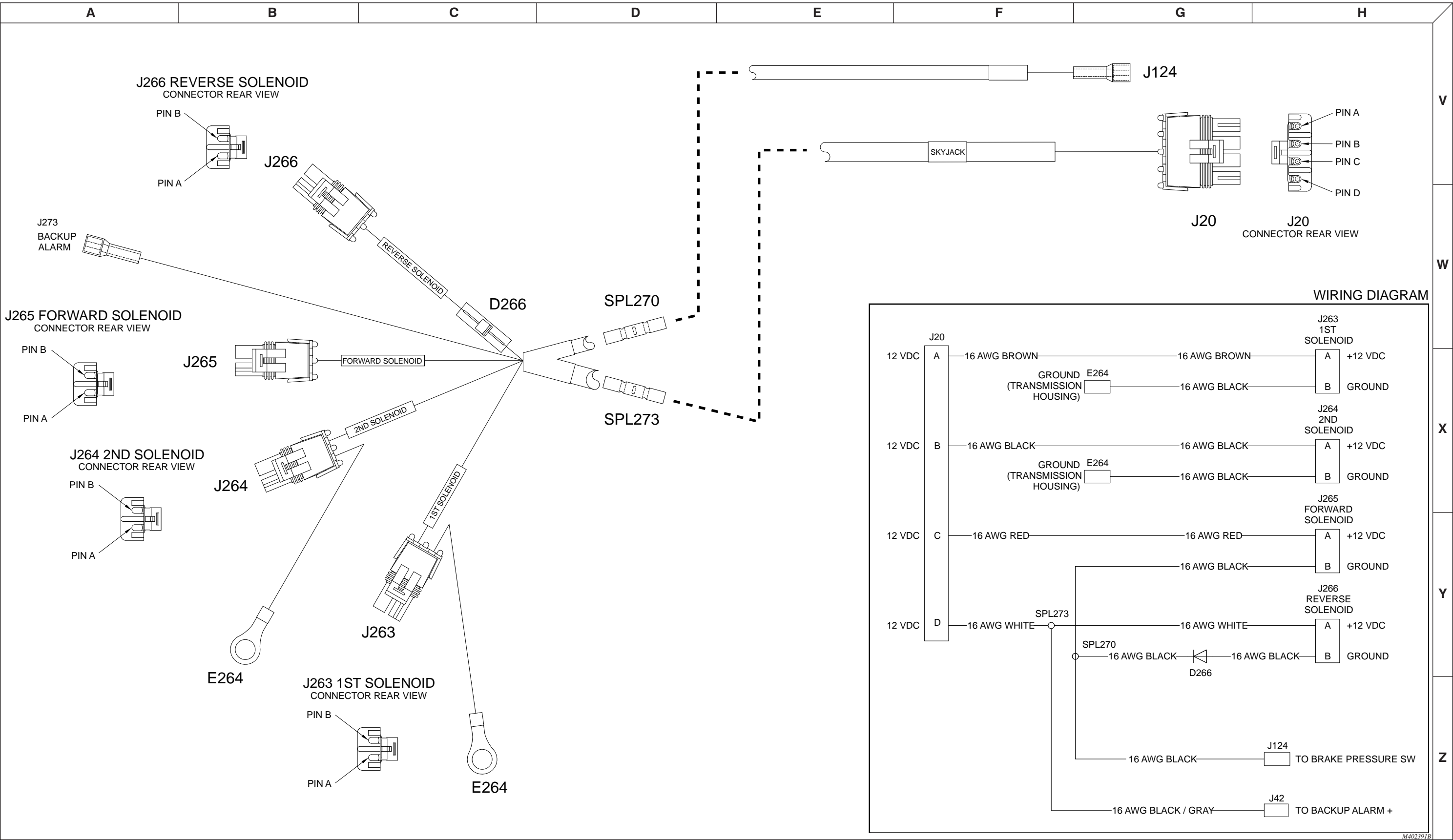
### 3.20 Engine Harness (QSB4.5 Tier 3)





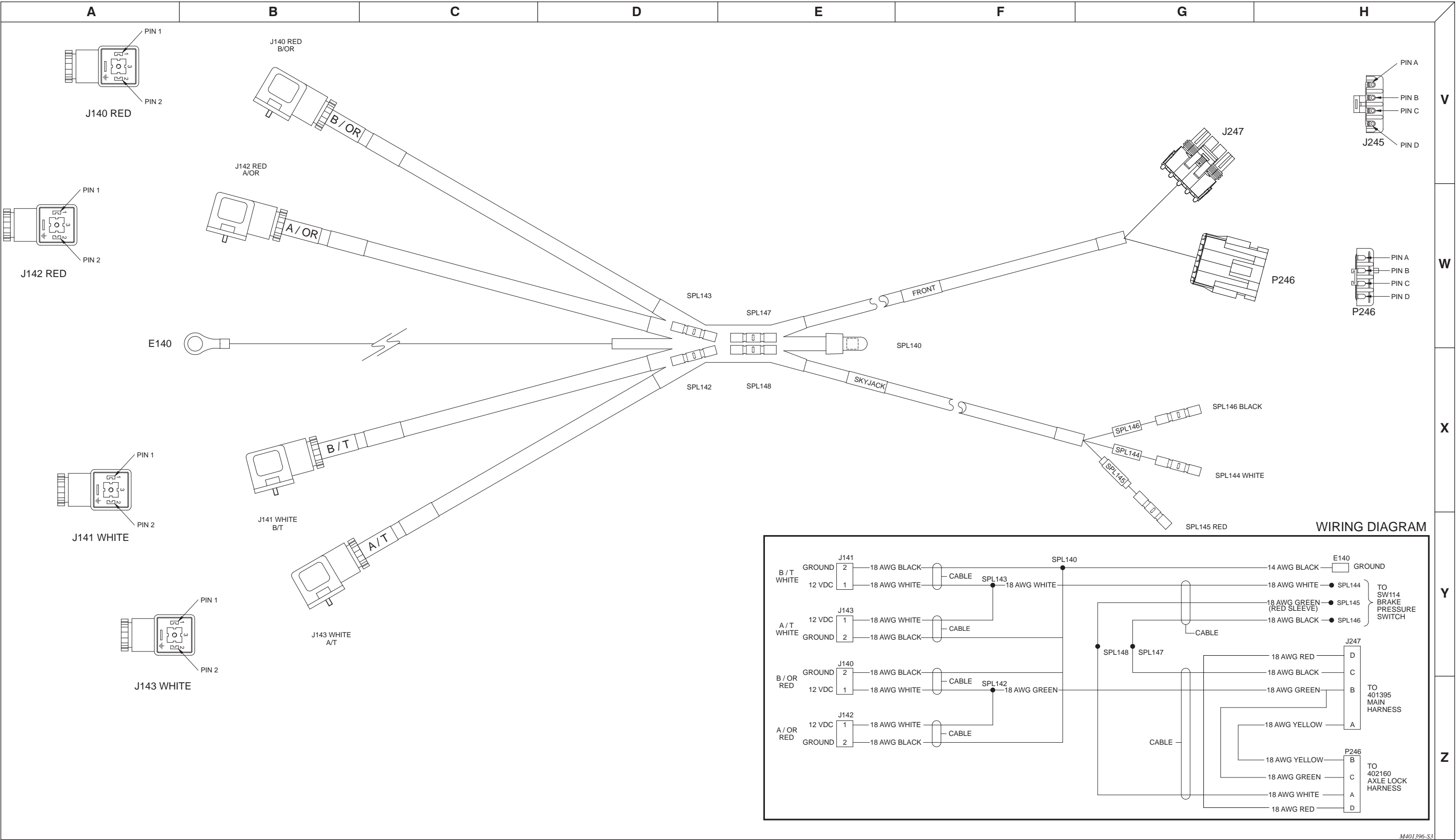


3.21 Transmission T32000 Harness



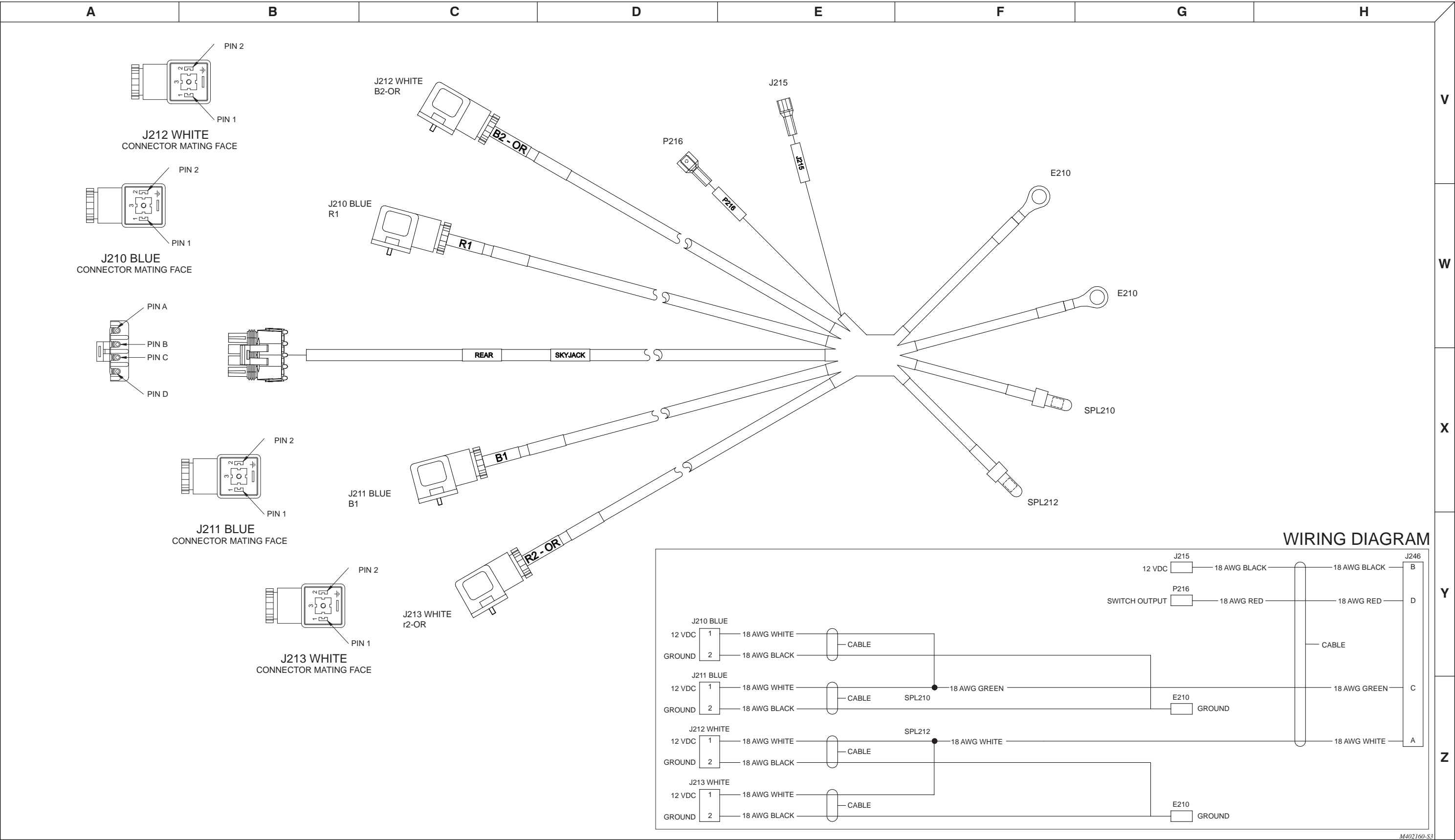


3.22 Frame Level Harness



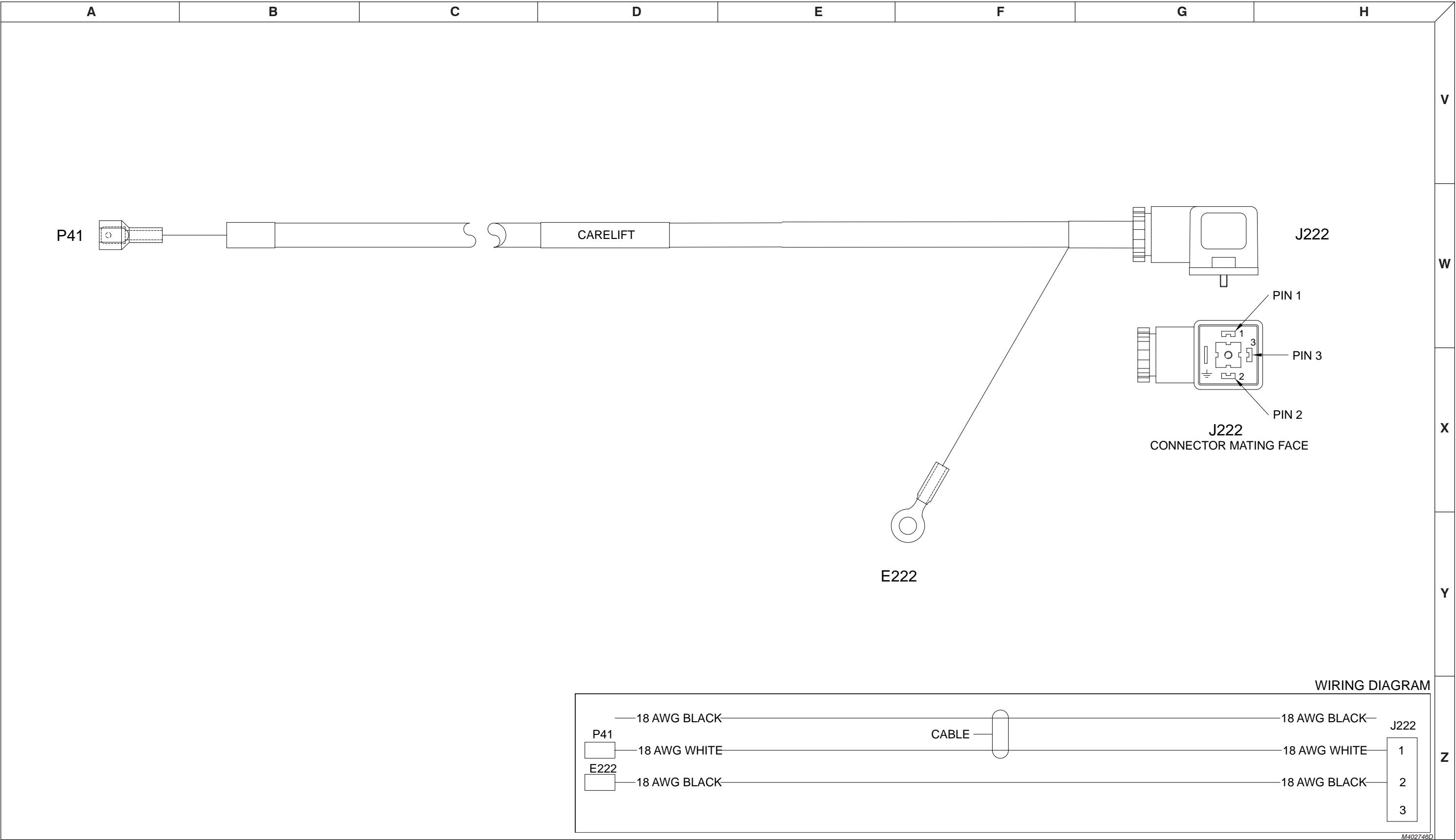


3.23 Axle Lock Harness



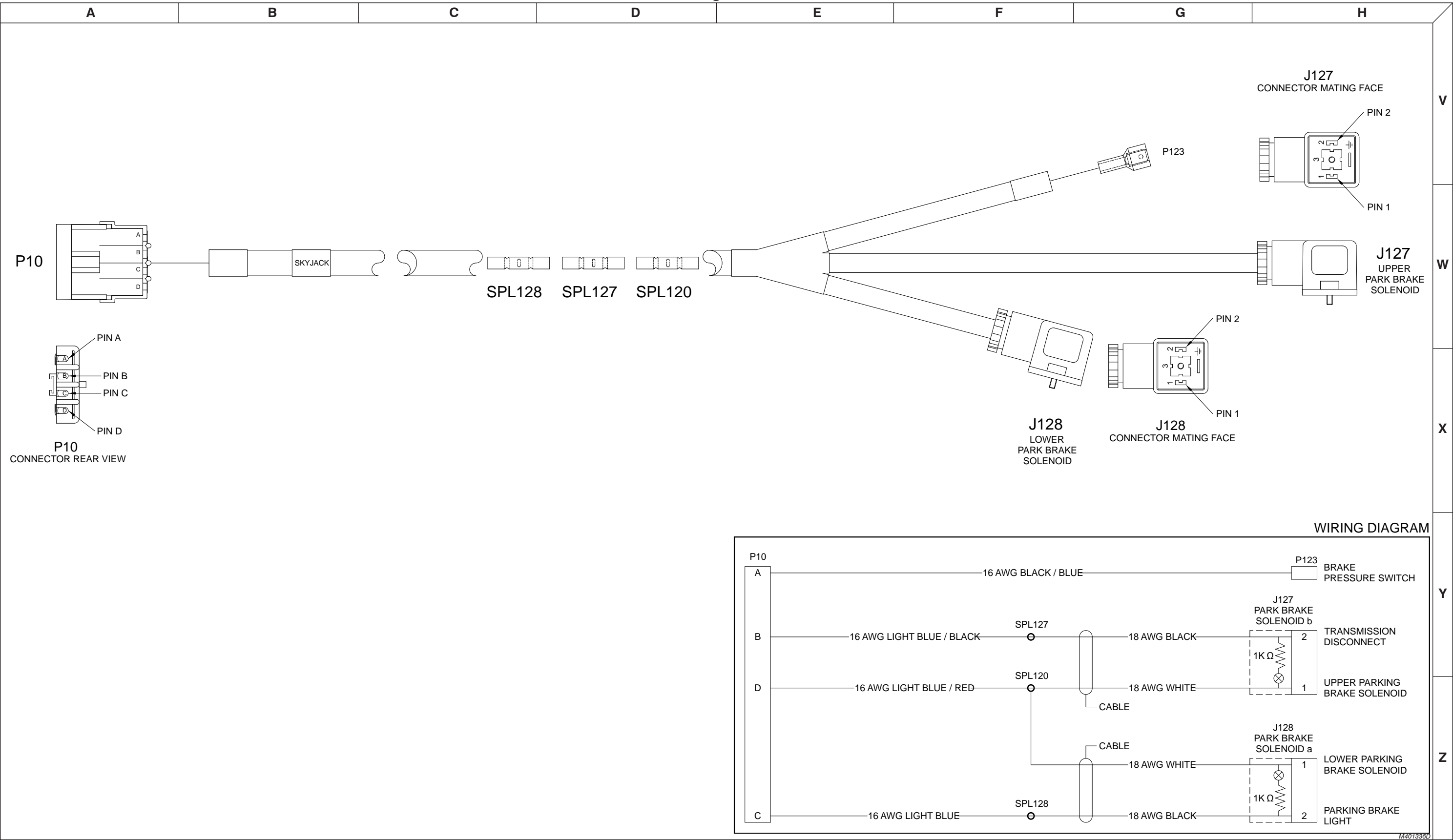


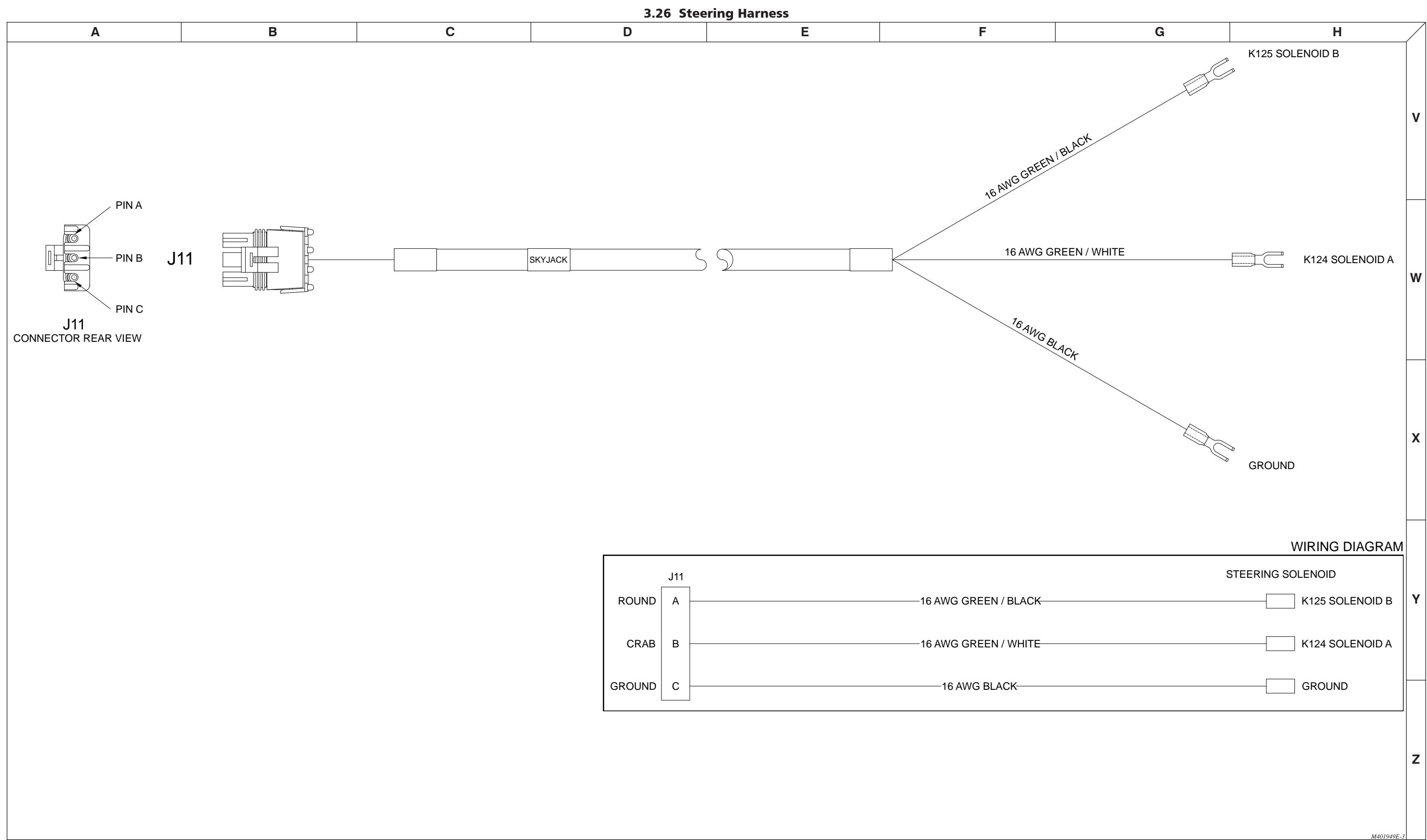
3.24 Diverter Valve Harness, 2-Way





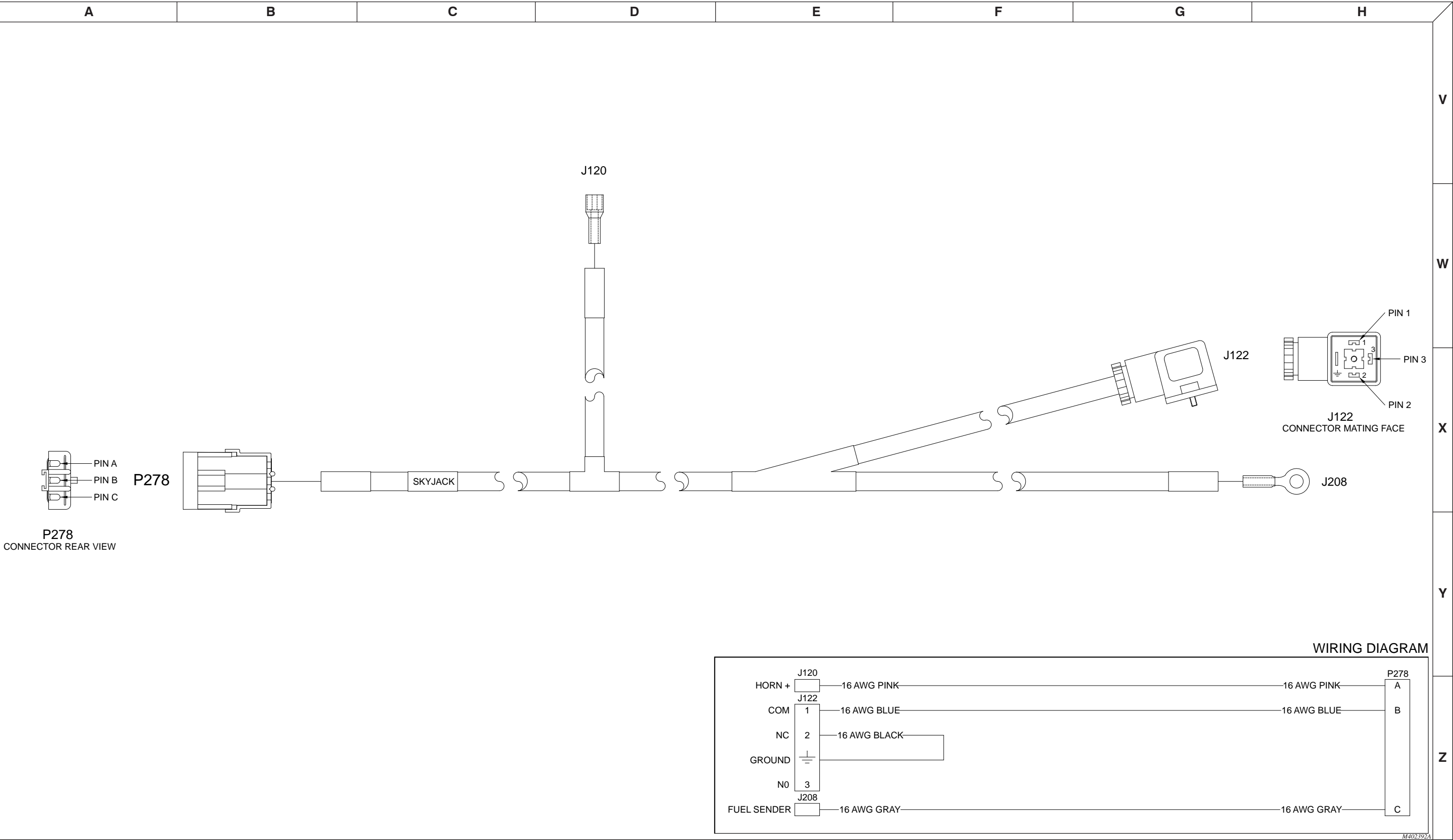
3.25 Parking Brake Harness





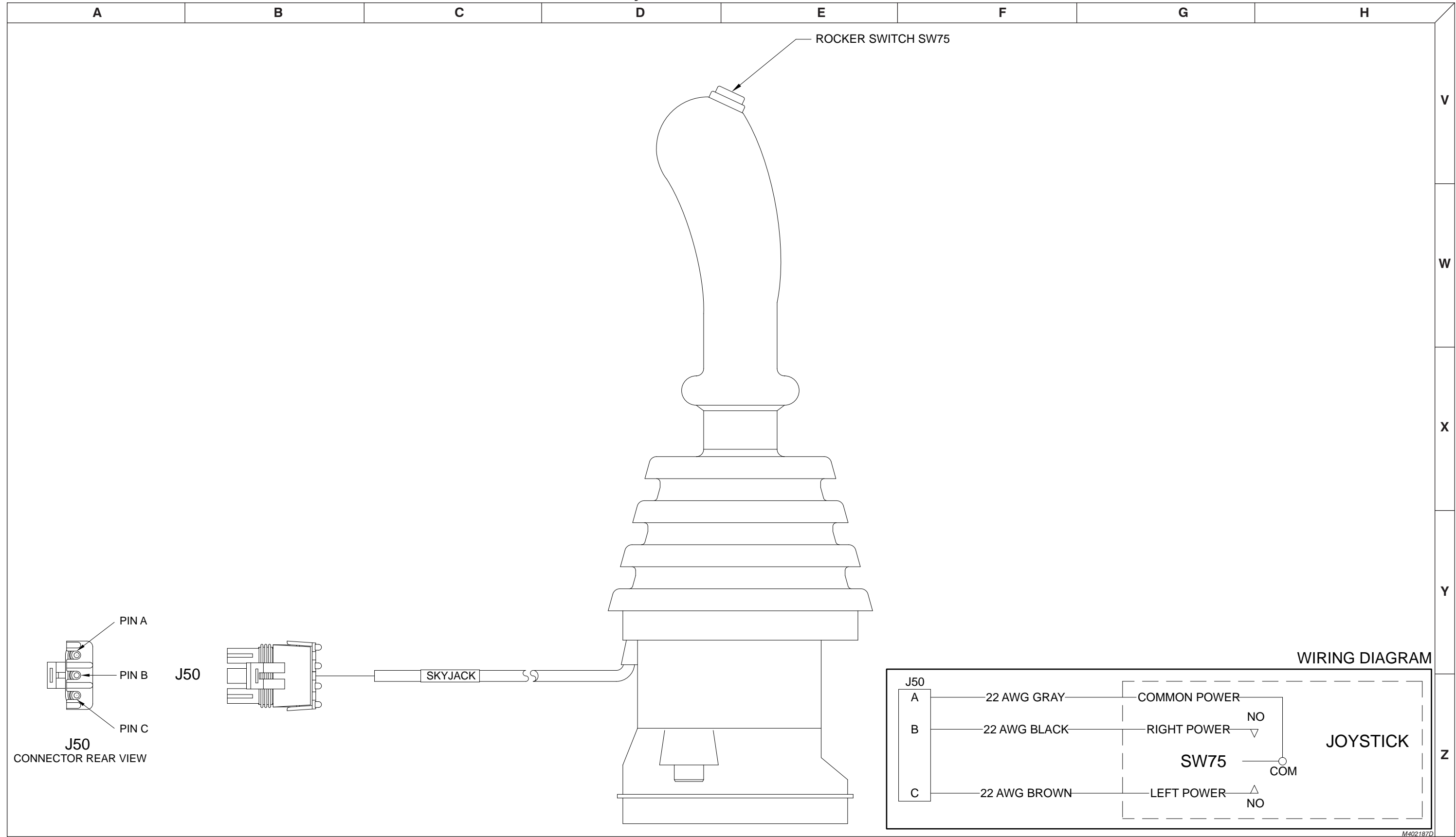


3.27 Horn, Fuel & Brake Pressure Switch Harness





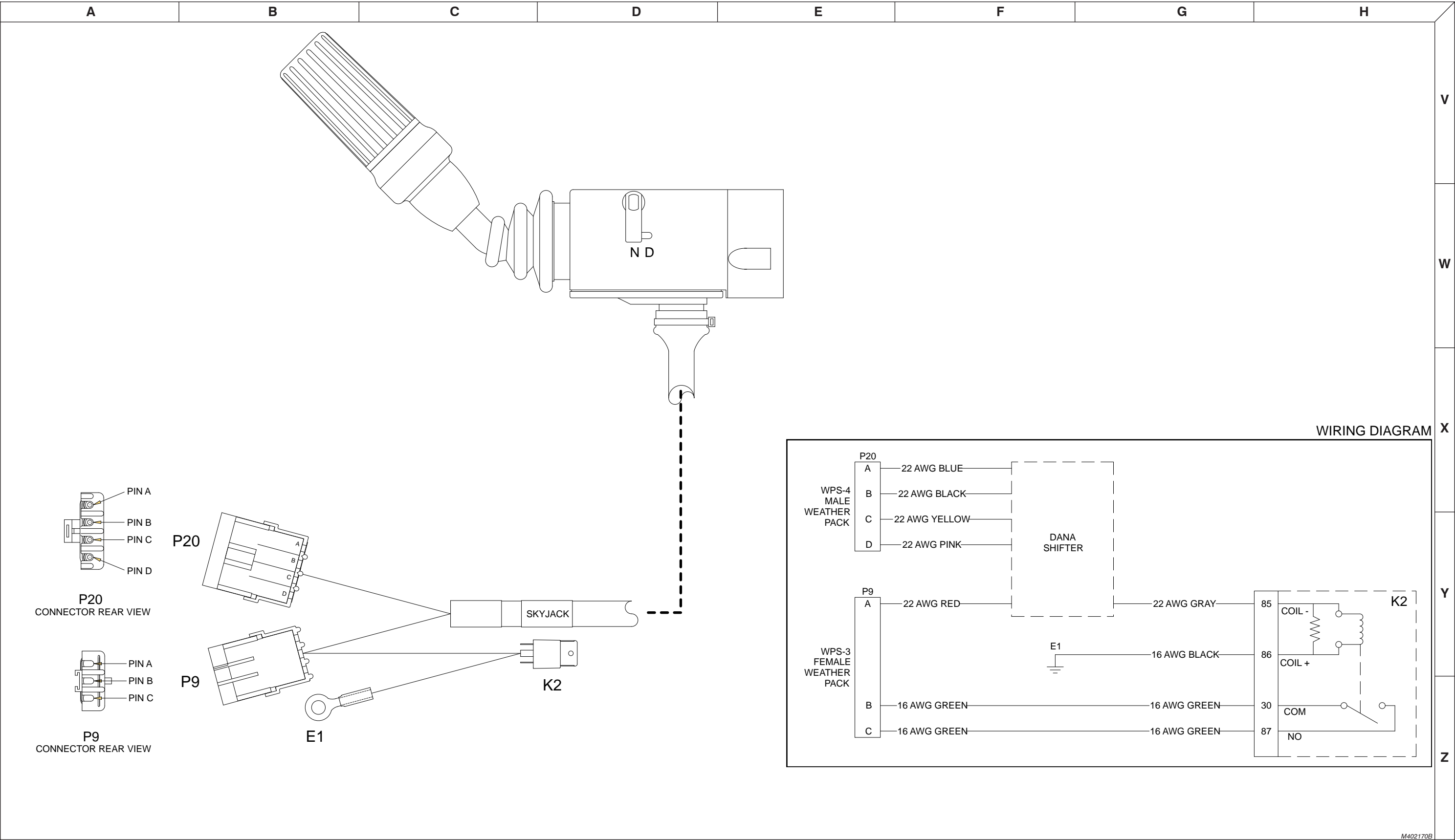
3.28 Joystick with Horizontal Rocker Switch





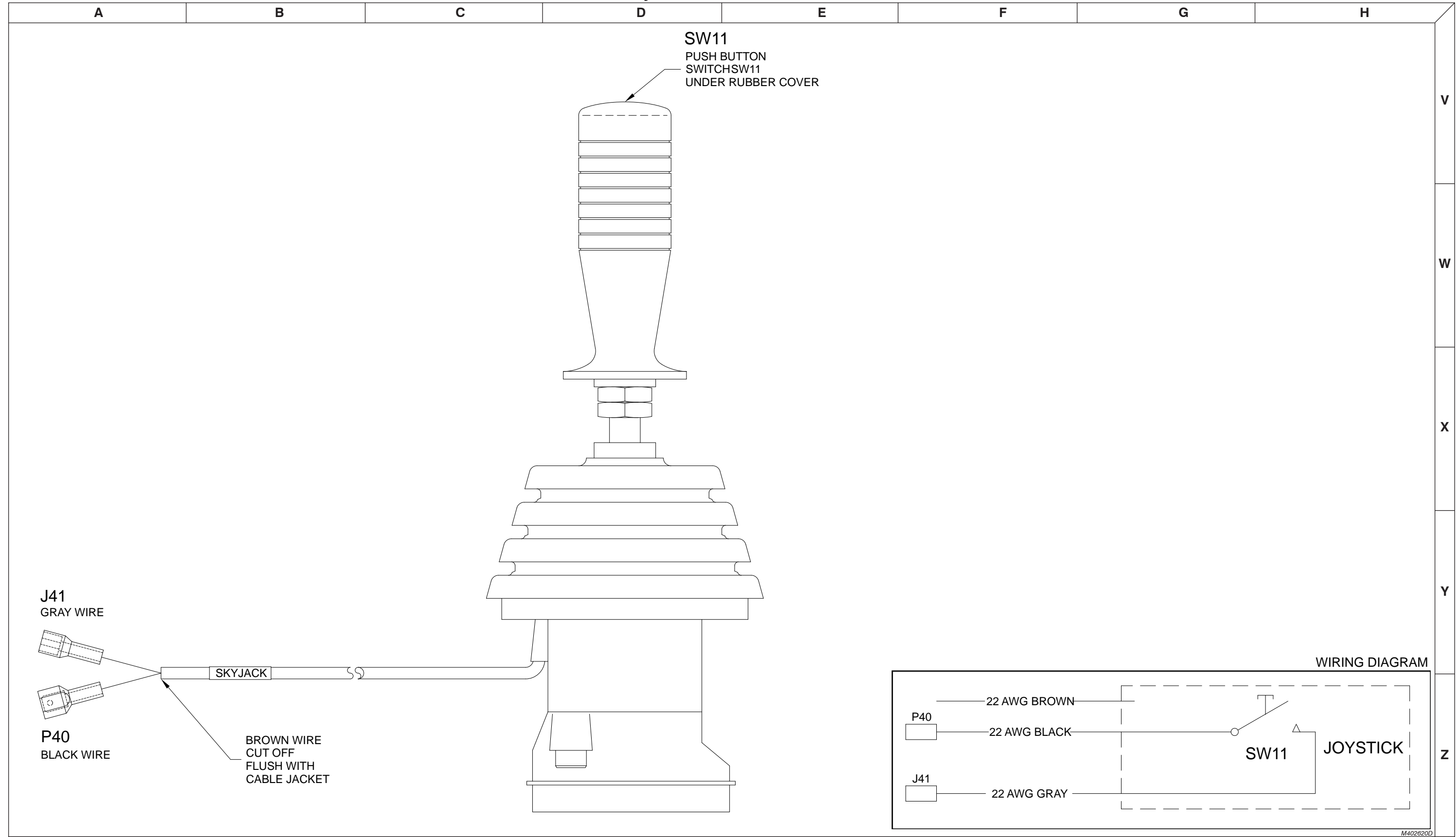


3.29 Three-Speed Shifter





3.30 Joystick, Two-Axis with Microswitch

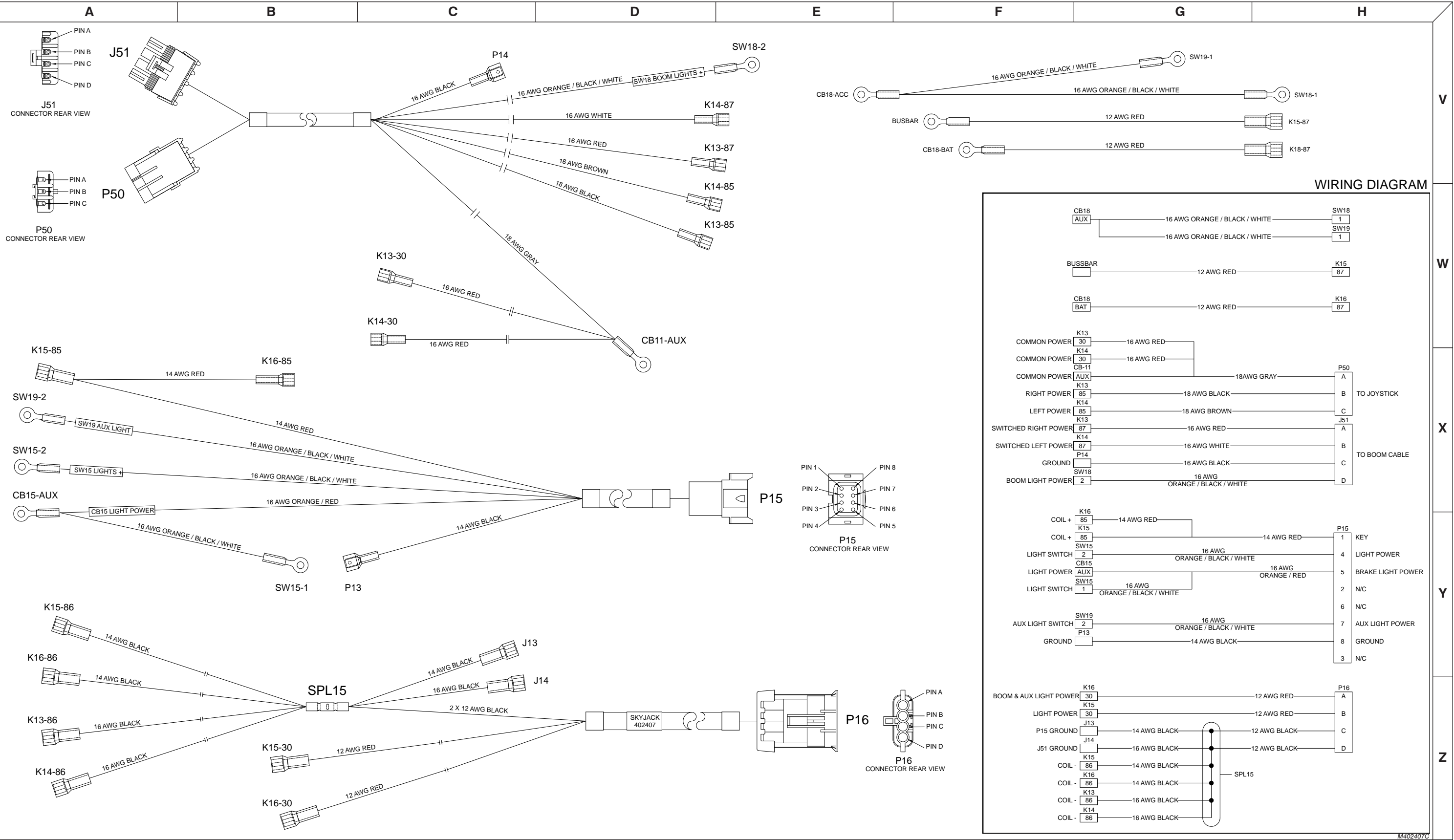


### 3.31 Power Module - Enclosed Cab Harnesses



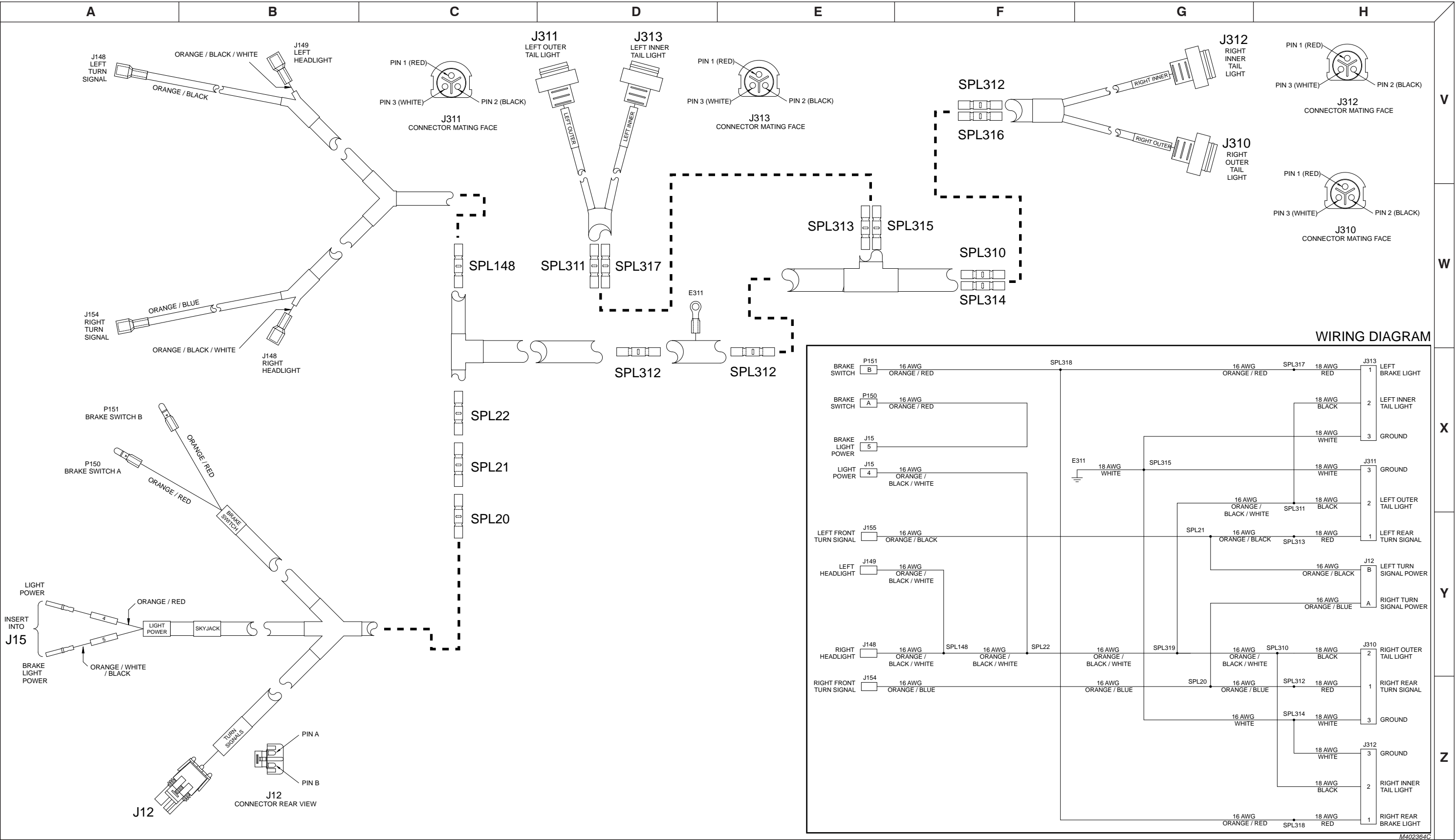


3.32 Power Module - Open Cab Harnesses



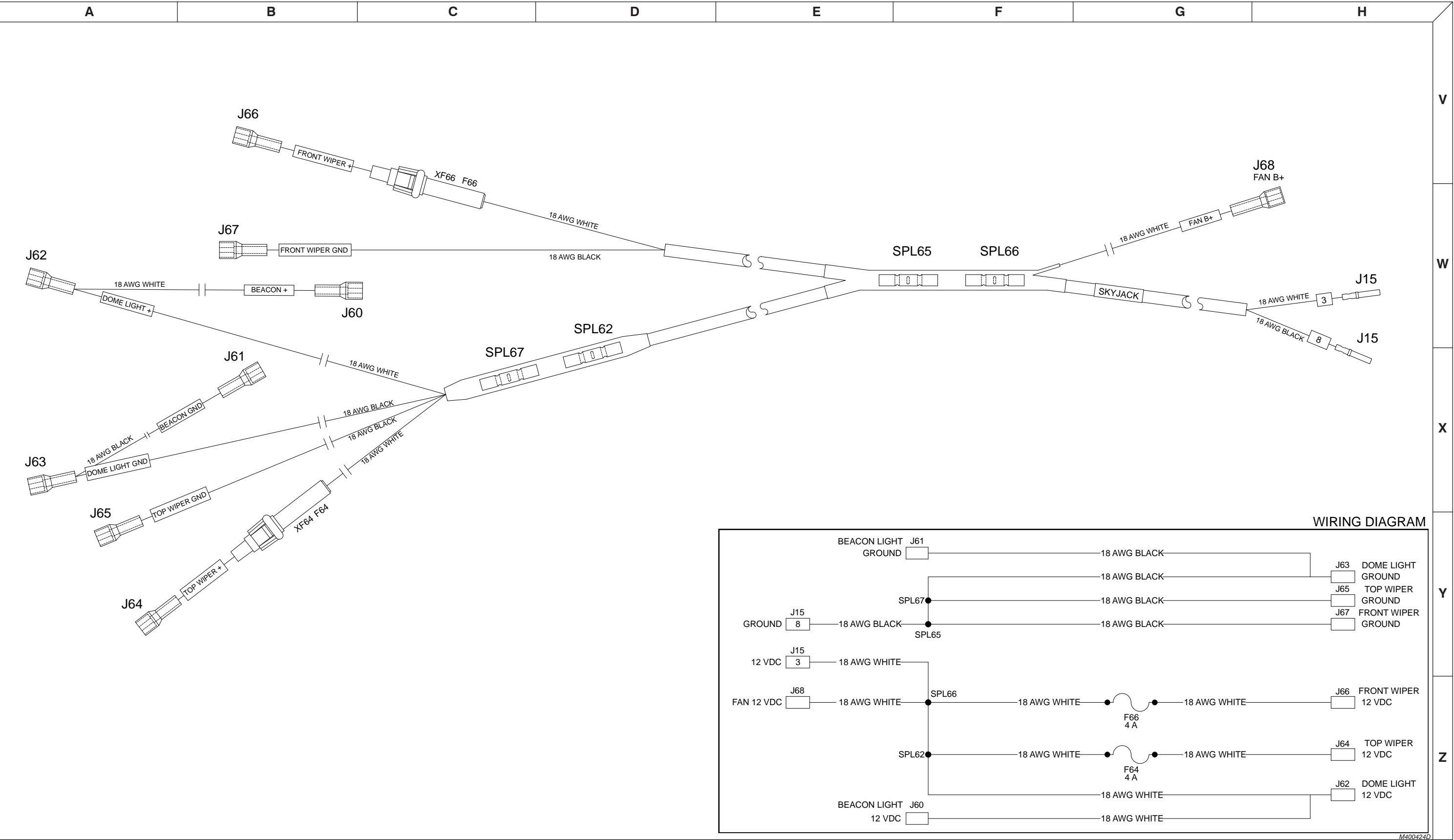


3.33 Lighting Harness



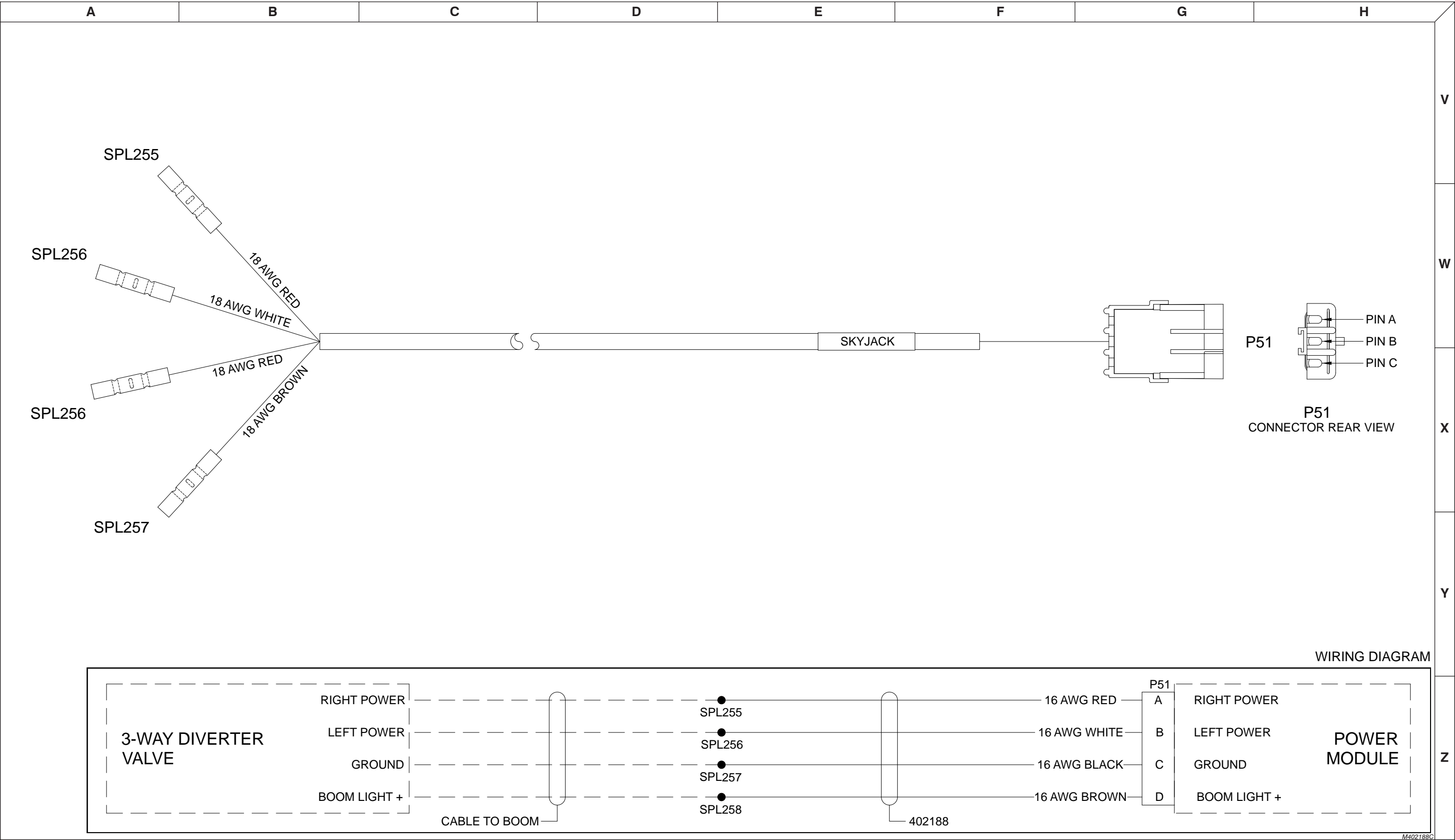


3.34 Wiper Harness



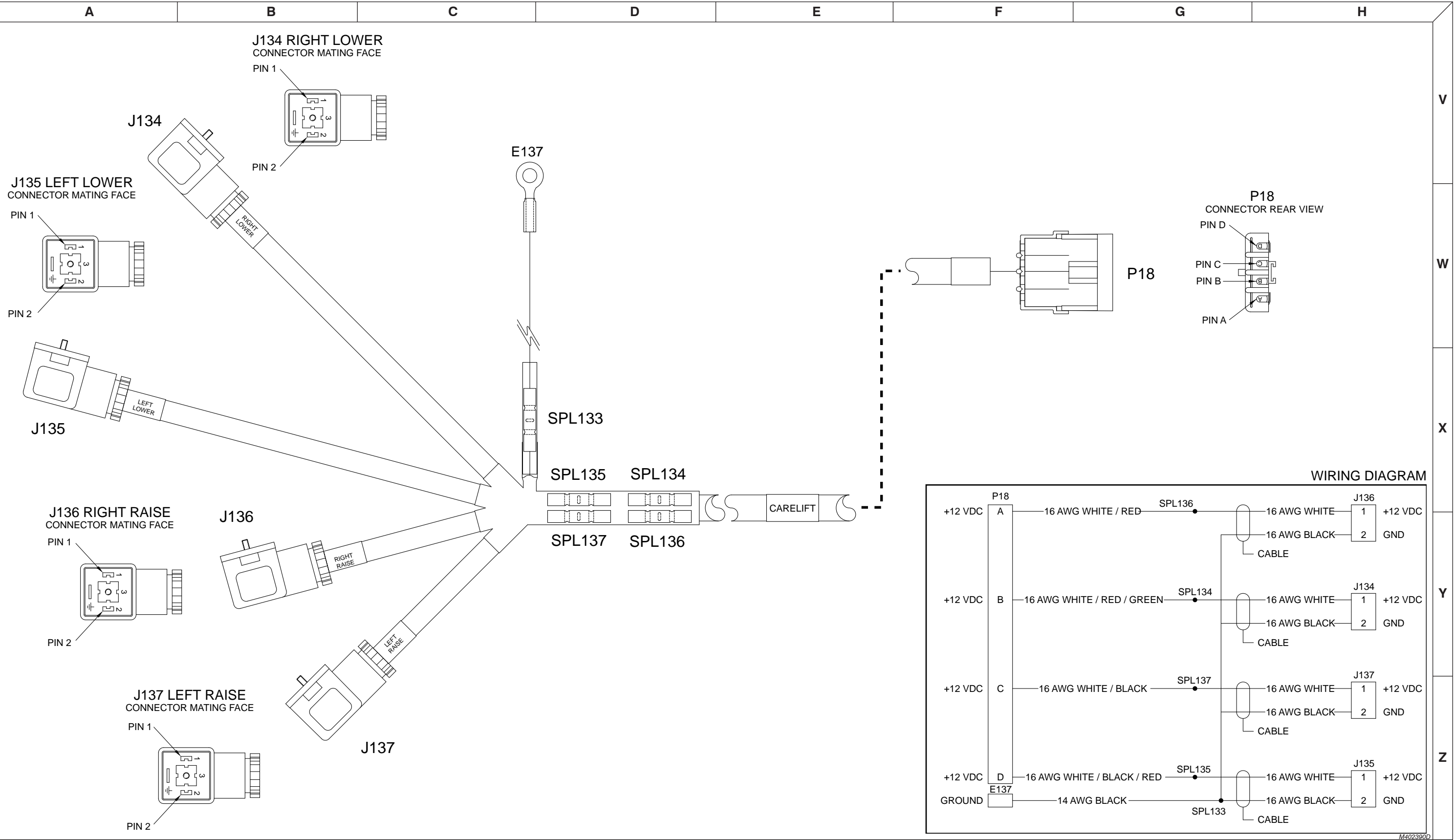


3.35 Grapppler Harness



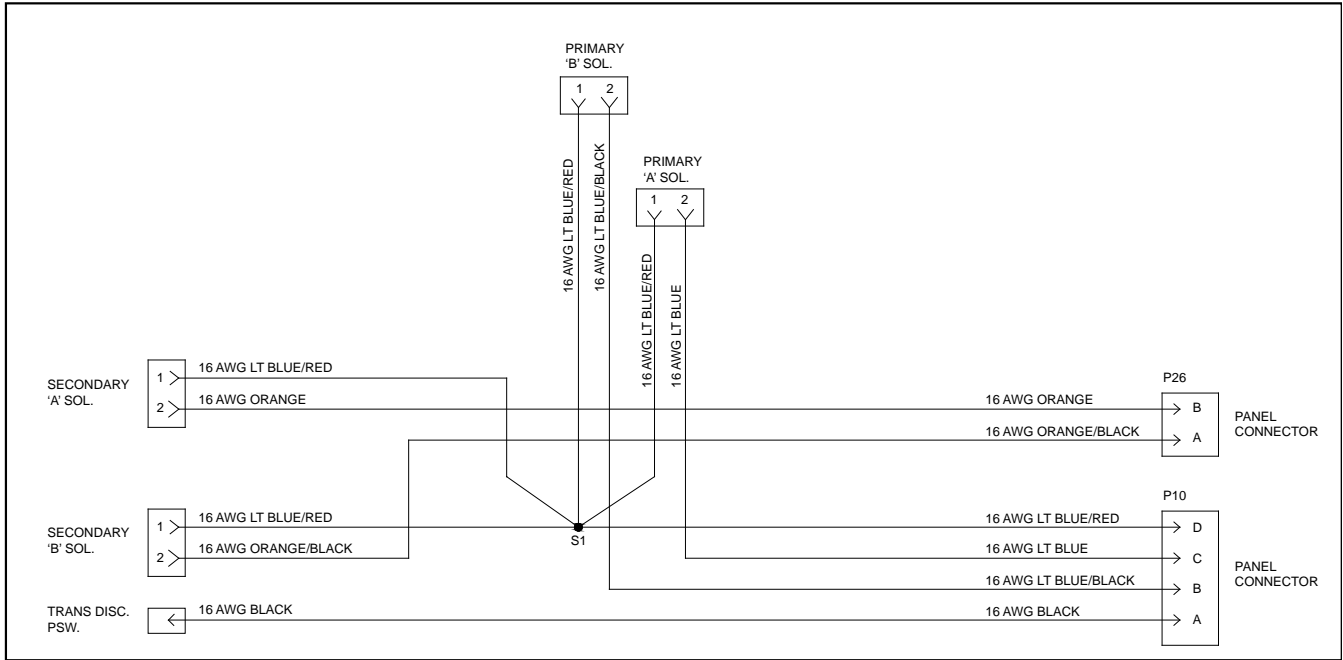


3.36 Outrigger Raise/Lower Harness



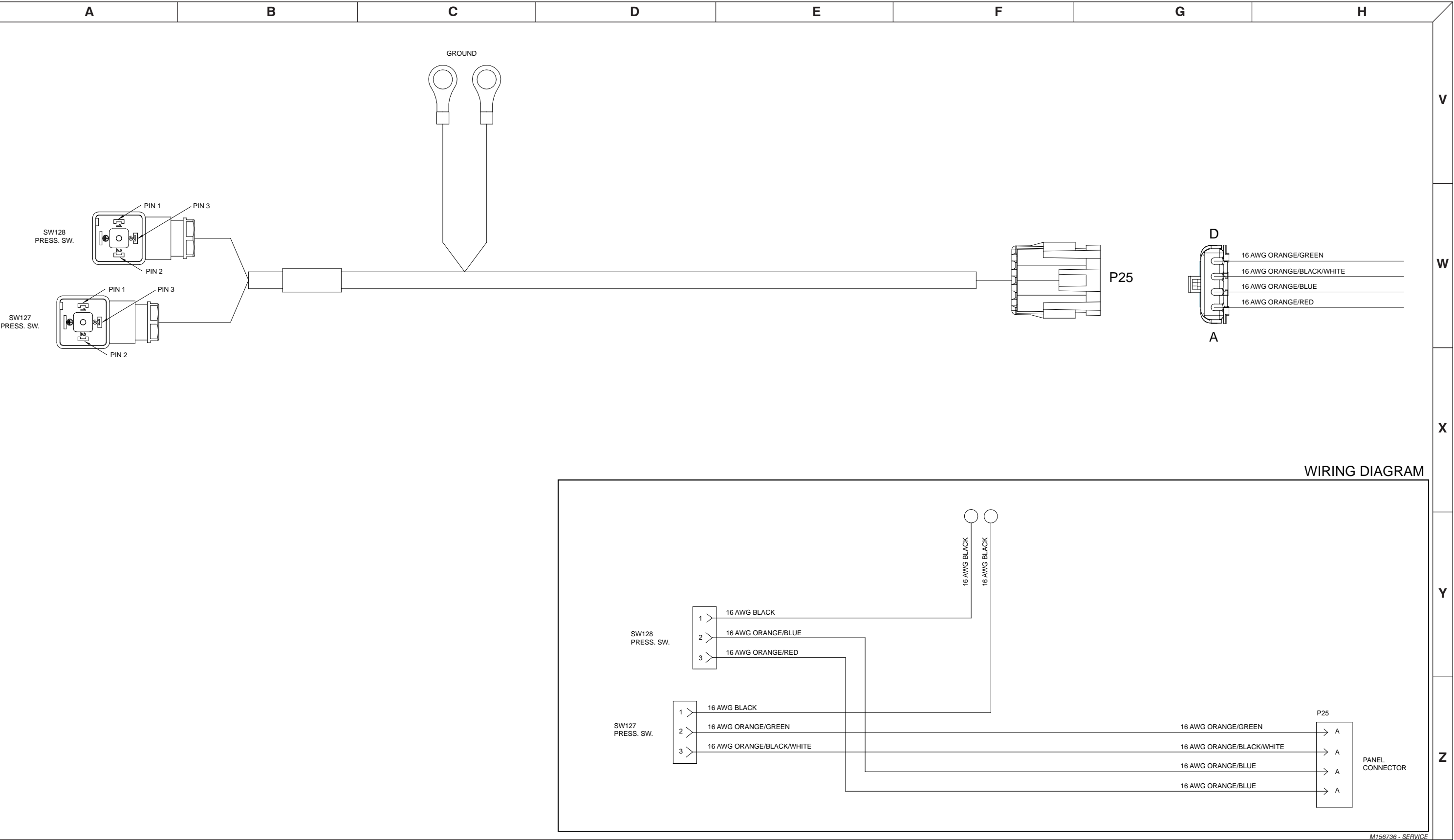


### 3.37 Mine Spec. - Brakes Harness



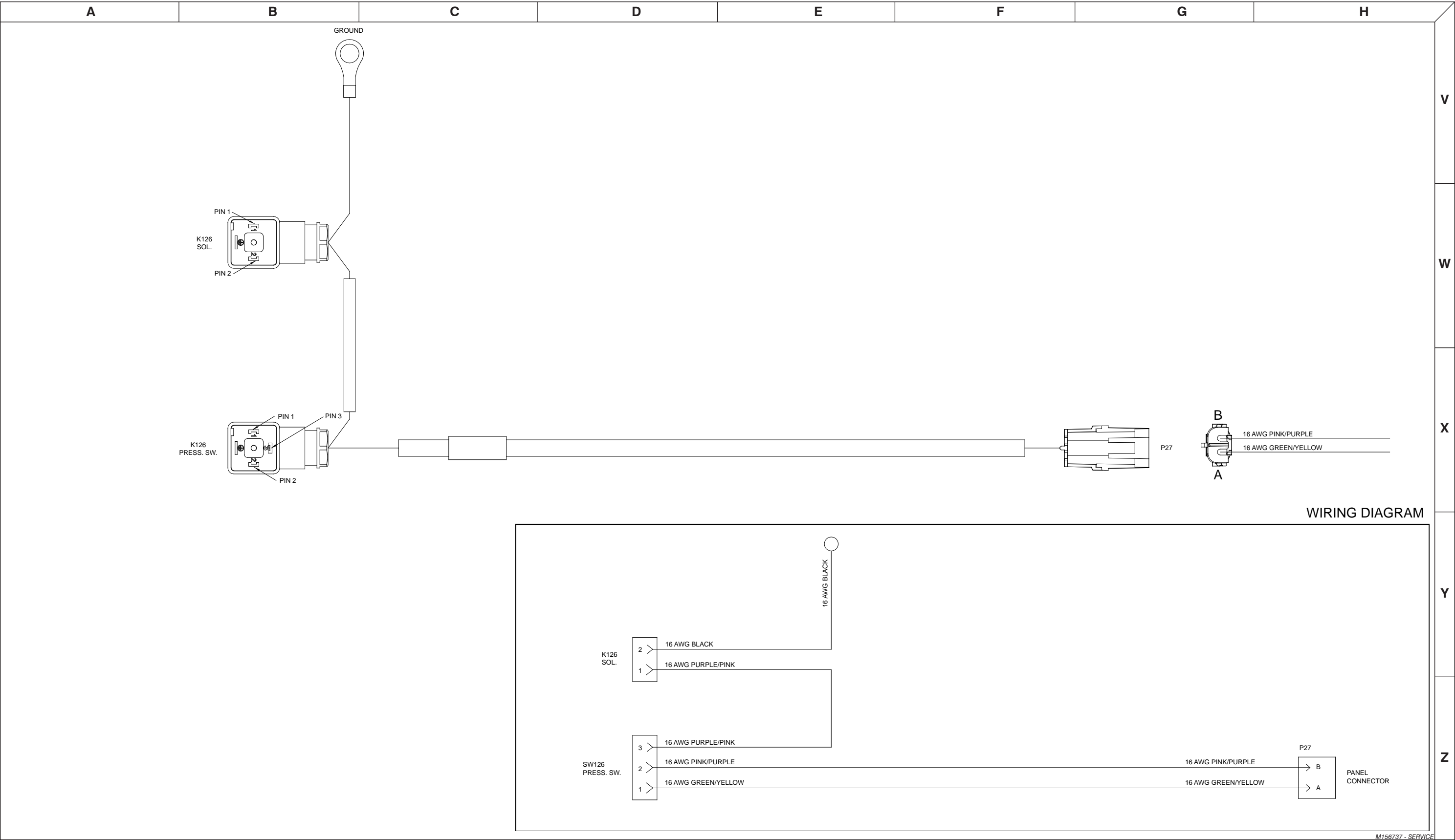


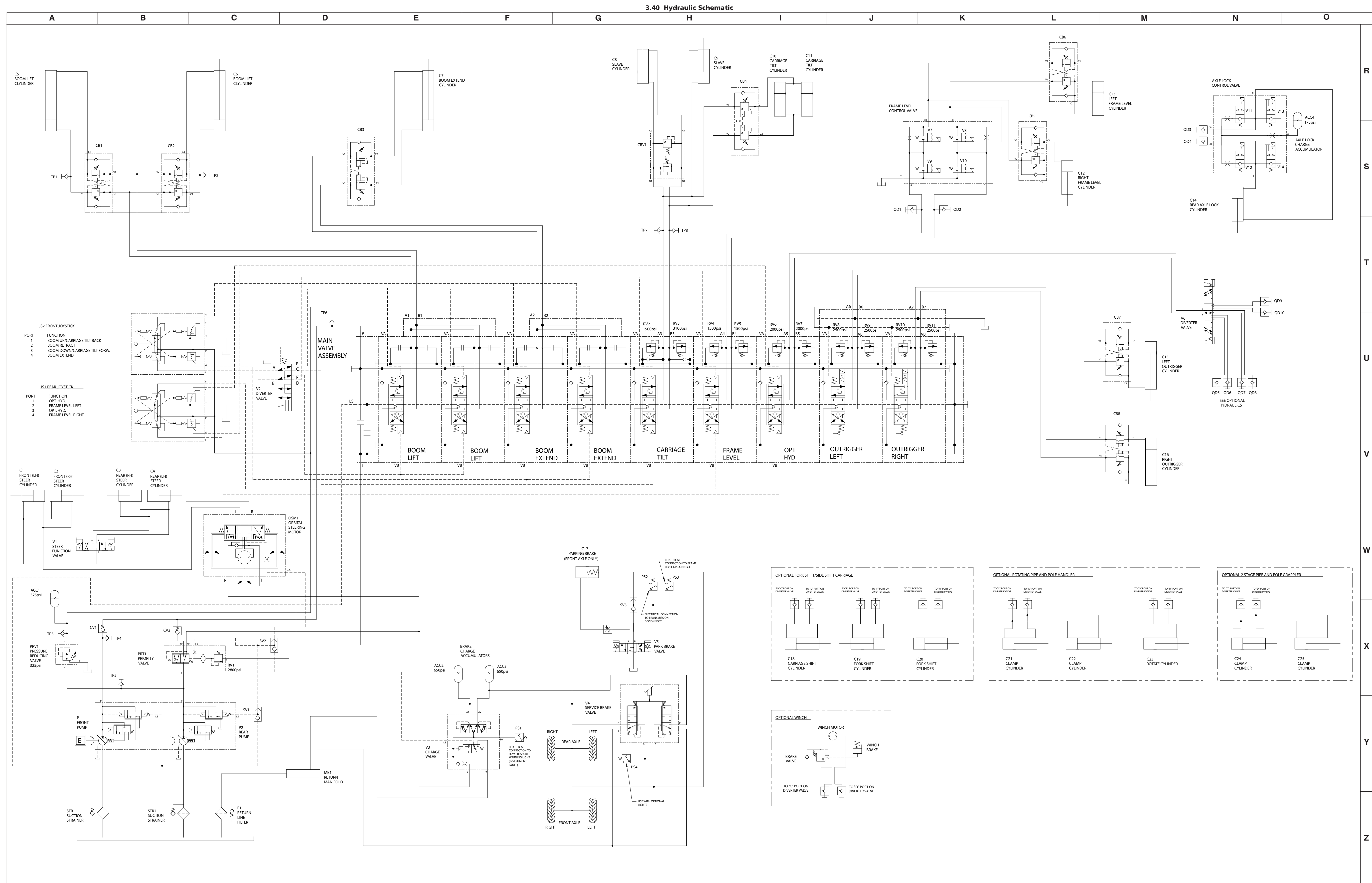
3.38 Mine Spec. - Pressure Switches Harness



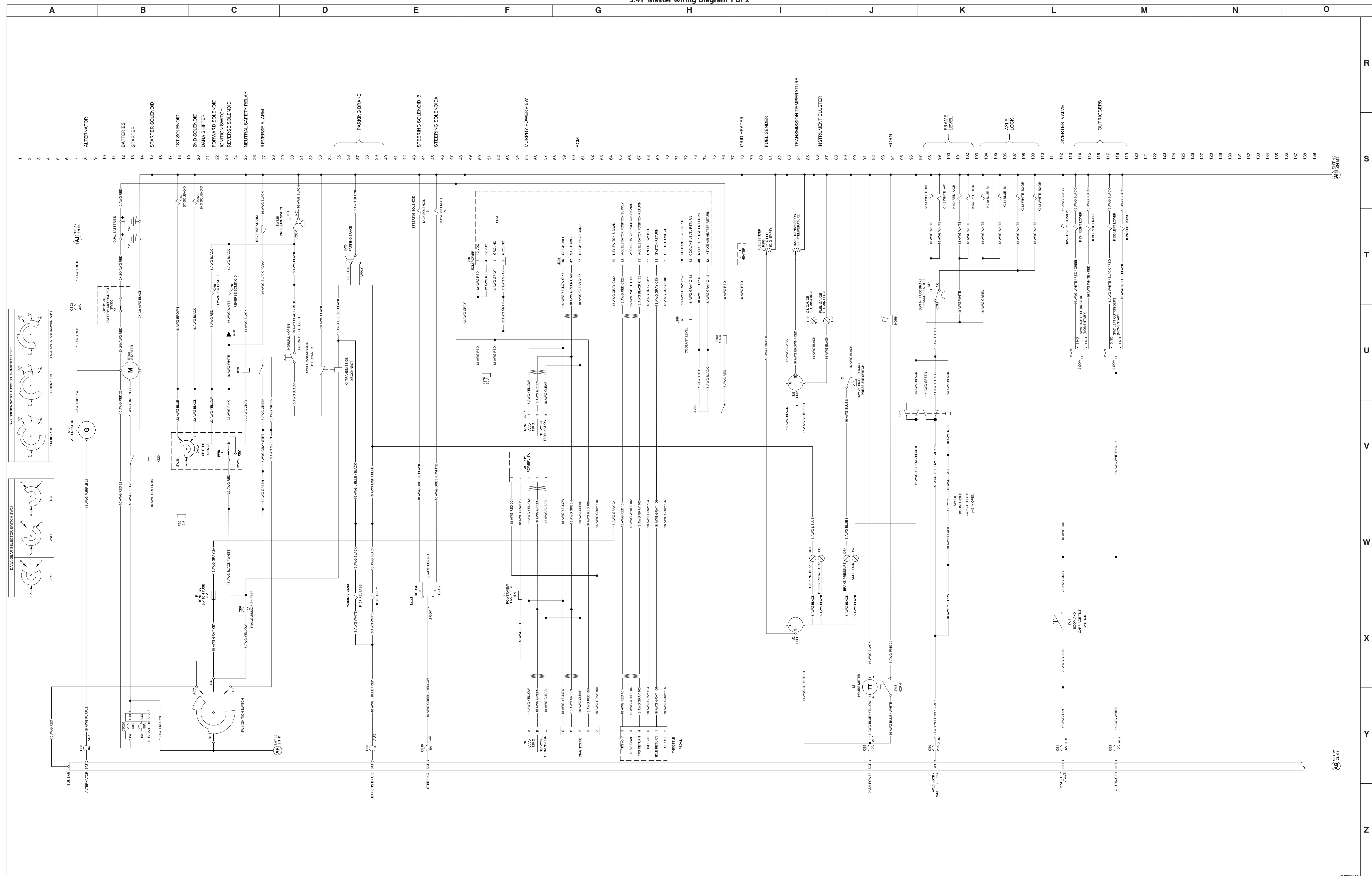


3.39 Mine Spec. - Steering Accumulator Harness





### 3.41 Master Wiring Diagram 1 of 2



**Telehandler Series**  
**Model ZB20044**  
**402509**

**NOTE:** To determine the correct hydraulic/electrical schematic that resembles your telehandler, refer to the “Table Of Contents” found at the beginning of this section.







## Section 4 TROUBLESHOOTING INFORMATION

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## Section 4 - Troubleshooting Information

## Service and Maintenance

### Introduction

The following pages contain the necessary troubleshooting information for locating and correcting electrical and hydraulic malfunctions that may arise. Careful and accurate analysis of the systems listed, will localize the problem more quickly than any other method.

Prior to performing any troubleshooting procedure, observe the following recommendations:

1. Isolate the major component in which the trouble occurs
2. Isolate whether the problem is electrical or hydraulic
3. Isolate and correct the specific problem

### **NOTE**

**If a specific problem is not listed, or after performing all necessary steps a problem can not be resolved; consult SKYJACK's service department.**

The content of this section is divided into "probable cause" and "remedy." The information preceded by a number represents the "probable cause." The following line, noted by a dash represents the "remedy" to the "probable cause" directly above it. See example below for clarification.

1. Probable Cause
  - [Remedy](#)



## Electrical System

### 4.1-1 All Controls Inoperative (No Crank)

1. Battery cable(s) loose or disconnected.
  - [Tighten or connect battery cable\(s\).](#)
2. Battery discharged.
  - [Charge battery.](#)
3. Loose or broken wire #22 from starter to circuit breaker CB220.
  - [Check continuity. Replace if defective.](#)
4. Circuit breaker CB220 tripped or defective.
  - [Check for defective wiring. Replace if defective.](#)
5. Loose or broken wire #23 from circuit breaker CB220 to starter solenoid K220.
  - [Check continuity. Replace if defective](#)
6. Loose or broken wire #23 from circuit breaker CB220 to Ignition switch SW1.
  - [Check continuity. Replace if defective.](#)
7. Defective ignition switch SW1.
  - [Replace if defective.](#)
8. Loose or broken green wire from ignition switch SW1 to 3pin connector J9 (pin B).
  - [Check continuity. Replace if defective.](#)
9. Loose or broken green wire from 3pin connector P9 (pin B) to neutral safety relay K20 (pin30).
  - [Check continuity. Replace if defective.](#)
10. Loose or broken green wire from neutral safety relay K20 (pin 87) to 3pin connector P9 (pin C).
  - [Check continuity. Replace if defective.](#)
11. Loose or broken yellow wire from ignition switch SW1 to transmission shifter circuit breaker CB4.
  - [Check continuity. Replace if defective.](#)
12. Circuit breaker CB4 tripped or defective.
  - [Check for defective wiring. Replace if defective.](#)
13. Loose or broken black/white wire from CB4 to 3pin connector J9 (pin A).
  - [Check continuity. Replace if defective.](#)
14. Loose or broken red wire from 3pin connector P9 (pin A) to transmission shifter.
  - [Check continuity. Replace if defective.](#)
15. Defective shifter.
  - [Check shifter. Replace if defective.](#)
16. Loose or broken grey wire from shifter to neutral start relay K20 (pin 85).
  - [Check continuity. Replace if defective.](#)
17. Loose or broken black wire relay K20 (pin 86) to ground E1.
  - [Check continuity. Replace if defective.](#)
18. Defective neutral start relay K20.
  - [Replace if defective.](#)
19. Loose or broken green wire from 3pin connector J9 (pin C) to single wire connector P29.
  - [Check continuity. Replace if defective.](#)
20. Loose or broken grey wire from single pin connector P29 to 32pin connector P1 (pin12).
  - [Check continuity. Replace if defective.](#)
21. Loose or broken grey wire from 32pin connector J1 (pin12) to fuse F201.
  - [Check continuity. Replace if defective.](#)
22. Defective fuse F201.
  - [Replace fuse.](#)
23. Loose or broken red wire from fuse F201 to single pin connector J102.
  - [Check continuity. Replace if defective.](#)
24. Loose or broken green wire #36 from single pin connector P102 to starter solenoid K220.
  - [Check continuity. Replace if defective.](#)
25. Loose or broken black wire from starter solenoid K220 to ground.

**Electrical System (Continued)**

- Check continuity. Replace if defective.
- 26. Loose or broken green wire #21 from starter solenoid K220 to starter motor B200.
  - Check continuity. Replace if defective.
- 27. Defective starter B200.
  - Replace if defective.

**4.1-2 Engine Cranks but will not start.**

1. Loose or broken ECM battery cable from J204 to fuse F279.
  - Check continuity. Replace if defective.
2. Defective fuse F279.
  - Check for defective wiring, Replace Fuse.
3. Loose or broken red wire from fuse F297 Connector J296 (pin 3 and 4).
  - Check continuity. Replace if defective.
4. Loose or broken ECM ground from J296 (pin 1 and 2) to ground E204.
  - Check continuity. Replace if defective.
5. Loose or broken grey wire "key" from ignition switch SW1 to ignition switch fuse F1.
  - Check continuity. Replace if defective.
6. Defective fuse F1.
  - Check for defective wiring, Replace fuse.
7. Loose or broken grey wire 2A from fuse F1 to 32 pin connector P1 (Pin 11).
  - Check continuity. Replace if defective.
8. Loose or broken grey wire from J1 (pin 11) to Connector J295 (Pin 39).
  - Check continuity. Replace if defective.

**NOTE**

For other engine related problems, consult engine manufacturer's manual.

**4.1-3 Can Bus Failure, no data/display on Murphy Powerview.**

1. Loose or broken red wire T3 from ignition switch SW1 to fuse F2.
  - Check continuity. Replace if defective.
2. Defective fuse F2.
  - Check for defective wiring, Replace Fuse.
3. Loose or defective red wire 201 from fuse F2 to Connector J7 (pin 1) @ Murphy powerview.
  - Check continuity. Replace if defective.
4. Loose or defective grey wire 206/110 from connector J7 pin (pin 6) to connector P1 (pin 10).
  - Check continuity. Replace if defective.
5. Loose or defective grey wire from connector J1 (pin 10) to ground E204.
  - Check continuity. Replace if defective.
6. Loose or defective green wire from connector J7 (pin3) to connector P1 (pin 17).
  - Check continuity. Replace if defective.
7. Loose or defective green wire from connector J1 (pin 17) to connector J295 (pin 47).
  - Check continuity. Replace if defective.
8. Loose or defective yellow wire from connector J7 (pin 2) to connector P1 (pin 28).
  - Check continuity. Replace if defective.
9. Loose or defective yellow wire from connector J1 (pin 28) to connector J295 (pin 46).
  - Check continuity. Replace if defective.
10. Open or defective resistors R6 and R297.
  - Replace resistors.



## Electrical System (Continued)

11. Defective Murphy Powerview.
  - [Replace Murphy Powerview.](#)

### NOTE

For other engine related problems, consult engine manufacturer's manual.

#### 4.1-4 No Throttle.

1. Loose or broken red wire 101 from throttle pedal connector J4 (pin 5) to connector P1 (pin 1)
  - [Check continuity. Replace if defective.](#)
2. Loose or broken red wire 129 from J1 (pin 1) to ECM connector B (pin 29)
  - [Check continuity. Replace if defective.](#)
3. Loose or broken grey wire 103 from throttle pedal connector J4 (pin 4) to connector P1 (pin 3)
  - [Check continuity. Replace if defective.](#)
4. Loose or broken black wire from J1 (pin 3) to ECM connector J295 (pin 23)
  - [Check continuity. Replace if defective.](#)
5. Loose or broken white wire 102 from throttle pedal connector J4 (pin 3) to connector P1 (pin 2).
  - [Check continuity. Replace if defective.](#)
6. Loose or broken white wire 130 from J1 (pin 2) to ECM connector J294 (pin 9)
  - [Check continuity. Replace if defective.](#)
7. Defective throttle pedal
  - [Replace throttle pedal.](#)

### NOTE

For other engine related problems, consult engine manufacturer's manual.

#### 4.1-5 No Drive (park brake releases)

1. Loose or defective black wire from J269 (pin 2) and J270 (pin2) to single wire connector P124.
  - [Check continuity. Replace if defective.](#)
2. Loose or broken red wire from connector J124 to brake pressure switch SW125.
  - [Check continuity. Replace if defective.](#)
3. Defective pressure switch SW125.
  - [Replace pressure switch.](#)
4. Loose or broken black wire from brake pressure switch SW125 to ground E125.
  - [Check continuity. Replace if defective.](#)
5. Defective Shifter.
  - [Replace shifter.](#)

#### 4.1-6 No Forward Drive.

1. Loose or broken red wire from connector J20 (pin C) to connector J269 (pin 1)
  - [Check continuity. Replace if defective.](#)
2. Defective forward solenoid K269.
  - [Replace solenoid](#)
3. Loose or broken black wire from solenoid connector J269 (pin 2) to ground.
  - [Check continuity. Replace if defective.](#)
4. Defective shifter.
  - [Replace shifter](#)



## Section 4 - Troubleshooting Information

## Service and Maintenance

### Electrical System (Continued)

#### 4.1-7 No reverse drive

1. Loose or broken white wire from connector J20 (pin D) to diode D266.
  - [Check continuity. Replace if defective.](#)
2. Open or defective diode D266.
  - [Replace Diode.](#)
3. Loose or broken white wire from diode D266 to connector J270 (pin1).
  - [Check continuity. Replace if defective.](#)
4. Defective reverse solenoid K270.
  - [Replace solenoid](#)
5. Loose or broken black wire from solenoid connector J270 (pin B) to ground.
  - [Check continuity. Replace if defective.](#)
6. Defective shifter.
  - [Replace shifter](#)

#### 4.1-8 3rd speed range only.

1. Loose or broken black wire from connector J20 (pin B) to connector J268 (pin 1).
  - [Check continuity. Replace if defective.](#)
2. Defective 2nd solenoid K268.
  - [Replace solenoid.](#)
3. Loose or broken wire from connector J268 (pin B) to connector P264 (pin 2).
  - [Check continuity. Replace if defective.](#)
4. Loose or broken black wire from connector J264 (pin 2) to ground E267.
  - [Check continuity. Replace if defective.](#)
5. Defective shifter.
  - [Replace shifter.](#)

#### 4.1-9 No 1st speed range.

1. Loose or broken brown wire from connector J20 (pin A) to connector J263 (pin 1)
  - [Check continuity. Replace if defective.](#)
2. Loose or broken brown wire from connector P263 (pin 1) to 1st solenoid connector J267 (pin A).
  - [Check continuity. Replace if defective.](#)
3. Defective 1st solenoid K267.
  - [Replace solenoid](#)
4. Loose or broken black wire from solenoid connector J267 (pin B) to connector P263 (pin 2).
  - [Check continuity. Replace if defective.](#)
5. Loose or broken black wire from connector J263 (pin 2) to ground E267.
  - [Check continuity. Replace if defective.](#)
6. Defective shifter.
  - [Replace shifter.](#)

#### 4.1-10 No Drive (park brake does not release)

1. Loose or broken red wire from ignition switch SW1 to Accessory Circuit breaker buss bar.
  - [Check continuity. Replace if defective.](#)
2. Tripped or defective circuit breaker CB6.
  - [Check for defective wiring, Replace circuit breaker.](#)
3. Loose or broken light blue/red wire from circuit breaker CB6 to connector J10 (pin D).
  - [Check continuity. Replace if defective.](#)
4. Loose or broken light blue/red wire from connector P10 (pin D) to Hirschman connectors J127 and J128(pins 1).
  - [Check continuity. Replace if defective.](#)



## Electrical System (Continued)

5. Defective park brake release coil K127.
  - [Replace Coil.](#)
6. Loose or broken light blue/black wire from Hirschman connector J127 (pin 2) to connector P10 (pin B).
  - [Check continuity. Replace if defective.](#)
7. Loose or broken light blue/black wire from connector J 10 (pin B) to park brake switch SW6.
  - [Check continuity. Replace if defective.](#)
8. Defective park brake switch SW6.
  - [Replace switch.](#)
9. Loose or broken black wire from park brake switch SW6 to ground E2.
  - [Check continuity. Replace if defective.](#)

### 4.1-11 Alternator not charging

1. Loose or broken red wire from ignition switch SW1 to Accessory Circuit breaker buss bar.
  - [Check continuity. Replace if defective.](#)
2. Tripped or defective circuit breaker CB8.
  - [Check for defective wiring, Replace circuit breaker.](#)
3. Loose or broken purple wire #25 from circuit breaker CB8 to Connector P2 (pin8).
  - [Check continuity. Replace if defective.](#)
4. Loose or broken purple wire #25 from connector J2 (pin 8) to single wire connector J220.
  - [Check continuity. Replace if defective.](#)
5. Loose or broken purple wire #25 from Connector P220 to alternator connector J289 (pin C).
  - [Check continuity. Replace if defective.](#)
6. Loose or broken red wire #24 from alternator "BAT" terminal to starter.
  - [Check continuity. Replace if defective.](#)
7. Defective alternator.
  - [Replace alternator.](#)

### 4.1-12 Front steer mode only

1. Loose or broken red wire from ignition switch SW1 to Accessory Circuit breaker buss bar.
  - [Check continuity. Replace if defective.](#)
2. Tripped or defective circuit breaker CB10.
  - [Check for defective wiring, Replace circuit breaker.](#)
3. Loose or broken green/yellow wire from circuit breaker CB10 to Steer switch SW4.
  - [Check continuity. Replace if defective.](#)
4. Defective steer switch SW4.
  - [Replace switch](#)
5. Loose or broken black wire from steering solenoid A & B coils K124 and K125 to connector J11 (pin C).
  - [Check continuity. Replace if defective.](#)
6. Loose or broken black wire form connector P11 (pin C) to ground E1.
  - [Check continuity. Replace if defective.](#)

### 4.1-13 No round steer mode

1. Defective steer switch SW4.
  - [Replace switch.](#)
2. Loose or broken green/black wire from steer switch to connector P11 (pin A).
  - [Check continuity. Replace if defective.](#)
3. Loose or broken green/black wire from connector J11 (pin A) to steering solenoid B coil K125.
  - [Check continuity. Replace if defective.](#)
4. Defective steering solenoid K125.
  - [Replace solenoid.](#)



## Section 4 - Troubleshooting Information

## Service and Maintenance

### Electrical System (Continued)

#### 4.1-14 No crab steer mode

1. Defective steer switch SW4.
  - [Replace switch.](#)
2. Loose or broken green/white wire from steer switch to connector P11 (pin B).
  - [Check continuity. Replace if defective.](#)
3. Loose or broken green/white wire from connector J11 (pin B) to steering solenoid A coil K124.
  - [Check continuity. Replace if defective.](#)
4. Defective steering solenoid K124.
  - [Replace solenoid.](#)

#### 4.1-15 No carriage tilt function

1. Loose or broken red wire from ignition switch SW1 to Accessory Circuit breaker buss bar.
  - [Check continuity. Replace if defective.](#)
2. Tripped or defective circuit breaker CB1.
  - [Check for defective wiring, Replace circuit breaker.](#)
3. Loose or broken tan wire from circuit breaker CB1 to connector J40.
  - [Check continuity. Replace if defective.](#)
4. Defective carriage tilt switch SW11.
  - [Replace switch.](#)
5. Loose or broken white wire from connector P41 to Hirschman connector J222 at pilot diverter valve K222.
  - [Check continuity. Replace if defective.](#)
6. Defective diverter valve K22.
  - [Replace diverter valve.](#)
7. Loose or broken black wire from pilot diverter valve K222 Hirschman connector J222 to ground E222.
  - [Check continuity. Replace if defective.](#)

#### 4.1-16 No outrigger function

1. Tripped or defective circuit breaker CB3.
  - [Check for defective wiring, Replace circuit breaker.](#)
2. Loose or broken white wire from circuit breaker CB3 to connector J17 (pin A).
  - [Check continuity. Replace if defective.](#)
3. Loose or broken white jumper wire on connector J17 (pin A to pin B).
  - [Check continuity. Replace if defective.](#)
4. Loose or broken white/blue wire from connector J 17 (pin B) to common on outrigger switches SW7 and SW8
  - [Check continuity. Replace if defective.](#)
5. Loose or broken black wire from splice S137 to Ground E137 .
  - [Check continuity. Replace if defective.](#)

#### 4.1-17 No right outrigger lower function

1. Defective right outrigger switch SW8.
  - [Replace switch.](#)
2. Loose or broken white/red/green wire from right outrigger switch to connector J18 (pin B).
  - [Check continuity. Replace if defective.](#)
3. Loose or broken white/red/green wire from connector P18 (pin B) to right lower solenoid connector J134 (pin 1)
  - [Check continuity. Replace if defective.](#)
4. Defective right lower solenoid K134.
  - [Replace solenoid.](#)
5. Loose or broken black wire from right lower solenoid connector J134 (pin 2) to ground E137.





## Electrical System (Continued)

- Check continuity. Replace if defective.

### 4.1-18 No right outrigger raise function

1. Defective right outrigger switch SW8.
  - Replace switch.
2. Loose or broken white/red wire from right outrigger switch to connector J18 (pin A).
  - Check continuity. Replace if defective.
3. Loose or broken white/red/green wire from connector P18 (pin A) to right raise solenoid connector J136 (pin 1)
  - Check continuity. Replace if defective.
4. Defective right raise solenoid K136.
  - Replace solenoid.
5. Loose or broken black wire from right raise solenoid connector J136 (pin 2) to ground E137.
  - Check continuity. Replace if defective.

### 4.1-19 No left outrigger lower function

1. Defective left outrigger switch SW7.
  - Replace switch.
2. Loose or broken white/black/red wire from left outrigger switch to connector J18 (pin D).
  - Check continuity. Replace if defective.
3. Loose or broken white/black/red wire from connector P18 (pin D) to left lower solenoid connector J135 (pin 1)
  - Check continuity. Replace if defective.
4. Defective left lower solenoid K135.
  - Replace solenoid.
5. Loose or broken black wire from left lower solenoid connector J135 (pin 2) to ground E137.
  - Check continuity. Replace if defective.

### 4.1-20 No left outrigger raise function

1. Defective left outrigger switch SW7.
  - Replace switch.
2. Loose or broken white/black wire from left outrigger switch to connector J18 (pin C).
  - Check continuity. Replace if defective.
3. Loose or broken white/black wire from connector P18 (pin C) to left raise solenoid connector J137 (pin 1)
  - Check continuity. Replace if defective.
4. Defective left raise solenoid K137.
  - Replace solenoid.
5. Loose or broken black wire from left raise solenoid connector J137 (pin 2) to ground E137.
  - Check continuity. Replace if defective.

### 4.1-21 Rear axle locked, Front frame level in slow mode, brakes do not lock axle out, Axle lock light on, all boom angles.

1. Loose or broken red wire from ignition switch SW1 to Accessory Circuit breaker buss bar.
  - Check continuity. Replace if defective.
2. Tripped or defective circuit breaker CB9.
  - Check for defective wiring, Replace circuit breaker.
3. Loose or defective yellow/black wire from circuit breaker CB9 to connector P2 (pin 10).
  - Check continuity. Replace if defective.
4. Loose or defective yellow/black wire #28 from connector J2 (pin 10) to relay K221 (pin 6).
  - Check continuity. Replace if defective.





## Section 4 - Troubleshooting Information

## Service and Maintenance

### Electrical System (Continued)

#### **4.1-22 Rear axle and front frame level in slow mode, brake application locks out both axles, axle lock light on, all boom angles.**

1. Loose or broken yellow wire from relay K221 (pin 6) to connector P247 (pin A).
  - [Check continuity. Replace if defective.](#)
2. Loose or broken black wire from connector J247 (pin A) to single wire connector J215.
  - [Check continuity. Replace if defective.](#)
3. Loose or broken wire from connector P215 to mercury switch SW300.
  - [Check continuity. Replace if defective.](#)
4. Defective mercury switch SW360.
  - [Replace if defective.](#)
5. Loose or broken wire from mercury switch SW300 to single wire connector J216.
  - [Check continuity. Replace if defective.](#)
6. Loose or broken white wire from connector P216 to splice SPL210.
  - [Check continuity. Replace if defective.](#)

#### **4.1-23 Rear axle locked and front frame level operates normally, brake application locks out frame level, axle lock light on, all boom angles.**

1. Loose or broken green wire from connector P247 (pin B) to relay K221 (pin 8).
  - [Check continuity. Replace if defective.](#)
2. Defective relay K221.
  - [Replace if defective.](#)
3. Loose or broken black wire from relay K221 (pin 7) to ground E221.
  - [Check continuity. Replace if defective.](#)

#### **4.1-24 Rear axle locked, front frame level operates normally, axle lock light off, below 45 degrees.**

1. Loose or broken white wires from splice SPL210 to solenoids K210 and K211.
  - [Check continuity. Replace if defective.](#)
2. Defective solenoid K210 or K211.
  - [Replace if defective.](#)
3. Defective black wire from solenoids K210 and K211 to ground E210.
  - [Check continuity. Replace if defective.](#)

#### **4.1-25 Rear axle lock works normally, front frame level in slow mode, axle lock, light off, below 45 degrees.**

1. Loose or defective green wire from connector J247 (pin B) to solenoids K140 and K142 (pin 1).
  - [Check continuity. Replace if defective.](#)
2. Defective solenoid K140 or K142.
  - [Replace if defective.](#)
3. Loose or defective black wire from solenoids K140 and K142 (pin 2) to ground E140.
  - [Check continuity. Replace if defective.](#)



## Electrical System (Continued)

### 4.1-26 Front frame level does not lock out with brake application above 45 degrees.

1. Lose or defective black wire from relay K221 (pin2) to connector P247 (pin C).
  - [Check continuity. Replace if defective.](#)
2. Loose or defective black wire from connector J247 (pin C) to brake pressure switch SW114 connector (pin 1).
  - [Check continuity. Replace if defective.](#)
3. Brake pressure switch SW114 out of adjustment or defective.
  - [Adjust switch. Replace if defective.](#)
4. Loose or broken white wire from to brake pressure switch SW114 connector (pin 3) to frame level dump solenoids K141 and K143 (pin 1).
  - [Check continuity. Replace if defective.](#)
5. Defective solenoids K141 or K143.
  - [Check continuity. Replace if defective.](#)
6. Loose or defective green wire from solenoids K141 and K143 (pin 2) to ground E113.
  - [Check continuity. Replace if defective.](#)

### NOTE

If only one relay is bad and one is OK, you will have steer in one direction only.



## Section 4 - Troubleshooting Information

## Service and Maintenance

### Hydraulic System

#### 4.2-1 All controls inoperative

1. Worn or defective pump shaft or coupling.
  - [Check pump shaft and coupling. Replace if defective.](#)
2. No PTO rotation.
  - [Repair transmission, or flex plate.](#)
3. Hydraulic oil level low.
  - [Check oil level. Fill to proper level.](#)
4. System pump P2 is out of adjustment or is defective.
  - [Refer to section 5 for pump set up procedure. Repair or replace if defective.](#)

#### 4.2-2 All Boom Functions Inoperative.

1. Stuck or defective pressure reducing valve PRV1.
  - [Set valve to specifications. Check o-rings and clean valve. Repair or replace valve as required.](#)
2. Stuck or defective priority valve PRT1 .
  - [Clean valve. Check operation of valve. Repair or replace valve as required.](#)

#### 4.2-3 No Boom Raise

1. Stuck or defective joystick JS2.
  - [Clean valve. Check operation of valve. Repair or replace valve as required.](#)
2. Stuck or defective carriage tilt diverter valve V2.
  - [Clean valve. Check operation of valve. Repair or replace valve as required.](#)
3. Stuck or defective lift valve sections.
  - [Clean valve. Check operation of valve. Repair or replace valve as required.](#)
4. Stuck or defective lift counterbalance valves CB1, CB2.
  - [Clean valve. Check o-rings on valve. Repair or replace valve as required.](#)
5. Defective lift cylinder C5 and/or C6.
  - [Check seals on cylinder. Replace as necessary. Replace cylinder if defective.](#)

#### 4.2-4 No Boom Lower

1. Stuck or defective joystick JS2.
  - [Clean valve. Check operation of valve. Repair or replace valve as required.](#)
2. Stuck or defective carriage tilt diverter valve V2.
  - [Clean valve. Check operation of valve. Repair or replace valve as required.](#)
3. Stuck or defective lift valve sections.
  - [Clean valve. Check operation of valve. Repair or replace valve as required.](#)
4. Stuck or defective lift counterbalance valves CB1, CB2.
  - [Clean valve. Check o-rings on valve. Repair or replace valve as required.](#)
5. Defective lift cylinder C5 and/or C6.
  - [Check seals on cylinder. Replace as necessary. Replace cylinder if defective.](#)

#### 4.2-5 No Boom Extend

1. Stuck or defective joystick JS2.
  - [Clean valve. Check operation of valve. Repair or replace valve as required.](#)
2. Stuck or defective extension valve sections.
  - [Clean valve. Check operation of valve. Repair or replace valve as required.](#)
3. Stuck or defective extension counterbalance valve CB3.
  - [Clean valve. Check o-rings on valve. Repair or replace valve as required.](#)
4. Defective extension cylinder C7.
  - [Check seals on cylinder. Replace as necessary. Replace cylinder if defective.](#)

#### 4.2-6 No Boom Retract

**Hydraulic System (Continued)**

1. Stuck or defective joystick JS2.
  - Clean valve. Check operation of valve. Repair or replace valve as required.
2. Stuck or defective extension valve section.
  - Clean valve. Check operation of valve. Repair or replace valve as required.
3. Stuck or defective extension counterbalance valve CB3.
  - Clean valve. Check o-rings on valve. Repair or replace valve as required.
4. Defective extension cylinder C7.
  - Check seals on cylinder. Replace as necessary. Replace cylinder if defective.

**4.2-7 No Carriage Tilt Back**

1. Stuck or defective joystick JS2.
  - Clean valve. Check operation of valve. Repair or replace valve as required.
2. Stuck or defective carriage tilt diverter valve V2.
  - Clean valve. Check operation of valve. Repair or replace valve as required.
3. Stuck or defective carriage tilt valve section.
  - Clean valve. Check operation of valve. Repair or replace valve as required.
4. Stuck or defective port relief valve RV3.
  - Set valve to specifications. Check o-rings and clean valve. Repair or replace valve as required.
5. Stuck or defective carriage tilt counterbalance valve CB4.
  - Clean valve. Check o-rings on valve. Repair or replace valve as required.
6. Defective carriage slave cylinder C8 and/or C9.
  - Check seals on cylinder. Replace as necessary. Replace cylinder if defective.
7. Defective carriage tilt cylinder C10 and/or C11.
  - Check seals on cylinder. Replace as necessary. Replace cylinder if defective.
8. Stuck or defective Crossover relief valve CRV1.
  - Set valve to specifications. Check o-rings and clean valve. Repair or replace valve as required.

**4.2-8 No Carriage Tilt Forward**

1. Stuck or defective joystick JS2.
  - Clean valve. Check operation of valve. Repair or replace valve as required.
2. Stuck or defective carriage tilt diverter valve V2.
  - Clean valve. Check operation of valve. Repair or replace valve as required.
3. Stuck or defective carriage tilt valve section.
  - Clean valve. Check operation of valve. Repair or replace valve as required.
4. Stuck or defective port relief valve RV2.
  - Set valve to specifications. Check o-rings and clean valve. Repair or replace valve as required.
5. Stuck or defective carriage tilt counterbalance valve CB4.
  - Clean valve. Check o-rings on valve. Repair or replace valve as required.
6. Defective carriage slave cylinder C8 and/or C9.
  - Check seals on cylinder. Replace as necessary. Replace cylinder if defective.
7. Defective carriage tilt cylinder C10 and/or C11.
  - Check seals on cylinder. Replace as necessary. Replace cylinder if defective.
8. Stuck or defective Crossover relief valve CRV1.
  - Set valve to specifications. Check o-rings and clean valve. Repair or replace valve as required.

**4.2-9 No Frame Level Right.**

1. Stuck or defective joystick JS1.
  - Clean valve. Check operation of valve. Repair or replace valve as required.
2. Stuck or defective frame level valve section.
  - Clean valve. Check operation of valve. Repair or replace valve as required.



## Section 4 - Troubleshooting Information

## Service and Maintenance

### Hydraulic System (Continued)

3. Stuck or defective port relief valve RV4.
  - [Set valve to specifications. Check o-rings and clean valve. Repair or replace valve as required.](#)
4. Stuck or defective frame level counterbalance valve CB5 and/or CB6.
  - [Clean valve. Check o-rings on valve. Repair or replace valve as required.](#)
5. Stuck or defective frame level dump valve V9.
  - [Clean valve. Check o-rings on valve. Repair or replace valve as required.](#)
6. Defective frame level cylinder C12 and/or C13.
  - [Check seals on cylinder. Replace as necessary. Replace cylinder if defective.](#)

#### 4.2-10 No Frame Level Left.

1. Stuck or defective joystick JS1.
  - [Clean valve. Check operation of valve. Repair or replace valve as required.](#)
2. Stuck or defective frame level valve section.
  - [Clean valve. Check operation of valve. Repair or replace valve as required.](#)
3. Stuck or defective port relief valve RV5.
  - [Set valve to specifications. Check o-rings and clean valve. Repair or replace valve as required.](#)
4. Closed or obstructed flow control valve FC1.
  - [Clean valve. Check operation of valve. Adjust, repair or replace valve as required.](#)
5. Stuck or defective frame level counterbalance valve CB4 and/or CB6.
  - [Clean valve. Check o-rings on valve. Repair or replace valve as required.](#)
6. Stuck or defective frame level dump valve V10.
  - [Clean valve. Check o-rings on valve. Repair or replace valve as required.](#)
7. Defective frame level cylinder C11 and/or C12.
  - [Check seals on cylinder. Replace as necessary. Replace cylinder if defective.](#)

#### 4.2-11 No Auxiliary/Optional Hydraulic Control

1. Stuck or defective joystick JS1.
  - [Clean valve. Check operation of valve. Repair or replace valve as required.](#)
2. Stuck or defective Auxiliary valve section.
  - [Clean valve. Check operation of valve. Repair or replace valve as required.](#)
3. Stuck or defective port relief valve RV7 and/or RV8.
  - [Set valve to specifications. Check o-rings and clean valve. Repair or replace valve as required.](#)
4. Closed or obstructed flow control valve FC3 and/or FC4.
  - [Clean valve. Check operation of valve. Adjust, repair or replace valve as required.](#)
5. Stuck or defective Auxiliary counterbalance valve.
  - [Clean valve. Check o-rings on valve. Repair or replace valve as required.](#)
6. Stuck or defective Diverter valve V6.
  - [Clean valve. Check operation of valve. Repair or replace valve as required.](#)
7. Defective Auxiliary cylinder(s).
  - [Check seals on cylinder. Replace as necessary. Replace cylinder if defective.](#)



## Hydraulic System (Continued)

### 4.2-12 No Right Outrigger Lower

1. Stuck or defective right lower pilot valve.
  - [Clean valve. Check operation of valve. Repair or replace valve as required.](#)
2. Stuck or defective right outrigger valve section.
  - [Clean valve. Check operation of valve. Repair or replace valve as required.](#)
3. Stuck or defective port relief valve RV10.
  - [Clean valve. Check operation of valve. Adjust, repair or replace valve as required.](#)
4. Stuck or defective right outrigger counterbalance valve CB8.
  - [Set valve to specifications. Check o-rings and clean valve. Repair or replace valve as required.](#)
5. Defective right outrigger cylinder C16.
  - [Check seals on cylinder. Replace as necessary. Replace cylinder if defective.](#)

### 4.2-13 No Right Outrigger Raise

1. Stuck or defective right raise pilot valve.
  - [Clean valve. Check operation of valve. Repair or replace valve as required.](#)
2. Stuck or defective right outrigger valve section.
  - [Clean valve. Check operation of valve. Repair or replace valve as required.](#)
3. Stuck or defective port relief valve RV11.
  - [Set valve to specifications. Check o-rings and clean valve. Repair or replace valve as required.](#)
4. Stuck or defective right outrigger counterbalance valve CB8.
  - [Clean valve. Check o-rings on valve. Repair or replace valve as required.](#)
5. Defective right outrigger cylinder C16.
  - [Check seals on cylinder. Replace as necessary. Replace cylinder if defective.](#)

### 4.2-14 No Left Outrigger Lower

1. Stuck or defective left lower pilot valve.
  - [Clean valve. Check operation of valve. Repair or replace valve as required.](#)
2. Stuck or defective left outrigger valve section.
  - [Clean valve. Check operation of valve. Repair or replace valve as required.](#)
3. Stuck or defective port relief valve RV8.
  - [Set valve to specifications. Check o-rings and clean valve. Repair or replace valve as required.](#)
4. Stuck or defective left outrigger counterbalance valve CB7.
  - [Clean valve. Check o-rings on valve. Repair or replace valve as required.](#)
5. Defective left outrigger cylinder C15.
  - [Check seals on cylinder. Replace as necessary. Replace cylinder if defective.](#)

### 4.2-15 No Left Outrigger Raise

1. Stuck or defective left raise pilot valve.
  - [Clean valve. Check operation of valve. Repair or replace valve as required.](#)
2. Stuck or defective left outrigger valve section.
  - [Clean valve. Check operation of valve. Repair or replace valve as required.](#)
3. Stuck or defective port relief valve RV9.
  - [Set valve to specifications. Check o-rings and clean valve. Repair or replace valve as required.](#)
4. Stuck or defective left outrigger counterbalance valve CB7.
  - [Clean valve. Check o-rings on valve. Repair or replace valve as required.](#)
5. Defective left outrigger cylinder C15.
  - [Check seals on cylinder. Replace as necessary. Replace cylinder if defective.](#)

### 4.2-16 Brake System Charging Constantly or Too Frequently.

1. Stuck or defective priority valve PRT1.



## Section 4 - Troubleshooting Information

## Service and Maintenance

### Hydraulic System (Continued)

- Set valve to specifications. Check o-rings and clean valve. Repair or replace valve as required.
- 2. Stuck or defective brake charge valve V3.
  - Set valve to specifications. Check o-rings and clean valve. Repair or replace valve as required.
- 3. Defective accumulators ACC2 and/or ACC3.
  - Charge with nitrogen to specification. Replace if defective.
- 4. Stuck or defective service brake valve V5.
  - Remove from system, check brake charge cycle time. Replace if defective.

#### 4.2-17 Hard or No Steering

1. Stuck or defective priority valve PRT1.
  - Set valve to specifications. Check o-rings and clean valve. Repair or replace valve as required.
2. Stuck or defective steering motor OSM1.
  - Check o-rings and clean valve. Repair or replace valve as required.
3. Defective steer cylinder C1 and/or C2, C3, C4.
  - Check seals on cylinder. Replace as necessary. Replace cylinder if defective.

#### 4.2-18 Wheels go out of Synch. When in 4 wheel steer mode

1. Stuck or defective steer function valve V1.
  - Clean valve. Check operation of valve. Repair or replace valve as required.
2. Defective steer cylinder C1 and/or C2, C3, C4.
  - Check seals on cylinder. Replace as necessary. Replace cylinder if defective.

#### 4.2-19 Park Brake will not Release

1. Stuck or defective park brake valve V5.
  - Clean valve. Check o-rings on valve. Repair or replace valve as required.
2. Bypassing or defective parking brake C17.
  - Check seals, replace as necessary. Replace if defective.

#### 4.2-20 Park Brake will not Engage

1. Defective park brake C17.
  - Repair or replace as necessary.
2. Park brake valve V5 stuck in shifted position.
  - Check valve. Replace if defective.
3. Park brake out of adjustment.
  - See section 5 for park brake adjustment procedure.







## Section 5 PROCEDURES

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**Section 5 - Procedures****Service and Maintenance****General**

The following information is provided to assist you in the use and application of servicing and maintenance procedures contained in this chapter.

**Safety and Workmanship**

Your safety, and that of others, is the first consideration when engaging in the maintenance of equipment. Always be conscious of weight. Never attempt to move heavy parts without the aid of a mechanical device. Do not allow heavy objects to rest in an unstable position. When raising a portion of the equipment, ensure that adequate support is provided.

**Engine and Transmission****5.1-1 Engine and Components**

The engine used on the ZB200XX Zoom Boom models is a Cummins QSB4.5C160T3.

Engine service information can be found in the Cummins Engine Manuals. It should be noted that engine warranty service work is to be directed to and administered by your nearest authorized Cummins dealer/distributor. Skyjack cannot enter into any warranty service work requirements.

The basic Cummins engine warranty covers the entire engine from the fan to the fly wheel including all internal parts as well as the following list of parts supplied with the engine as original:

1. Starter
2. Alternator
3. Injectors
4. Fuel Pump
5. Fuel Solenoid
6. Water Pump

The air cleaner and exhaust system are not part of the engine package, and are covered later in this manual.

The cooling system including radiator and hoses are also not part of the engine package and are covered later in this manual.

**5.1-2 Fault Codes for Quantum Engines**

| HHP Quantum 45/60/78 Fault Severity Levels |                         |  |
|--|-------------------------|--|
| Fault Severity Level                       | Fault Severity Function | Action to be taken by operator   |
| Red  | Stop                    | Stop Engine Now - Damage imminent  |
| Yellow                                     | Warning                 | Warning - Engine may continue to run, but must be repaired the same day. |
| No Lamp                                    | Maintenance             | Maintenance - Repair at next PM  |
| No Lamp                                    | None - Information only | None - No lamp action  |



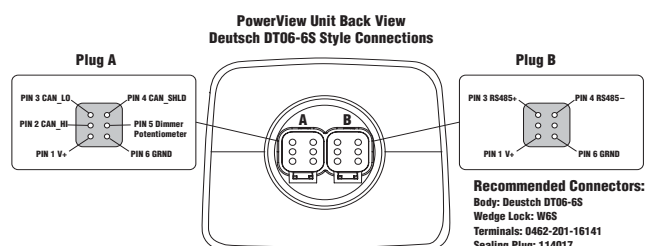
## Service and Maintenance

## Section 5 - Procedures

## 5.1-3 PowerView General Information

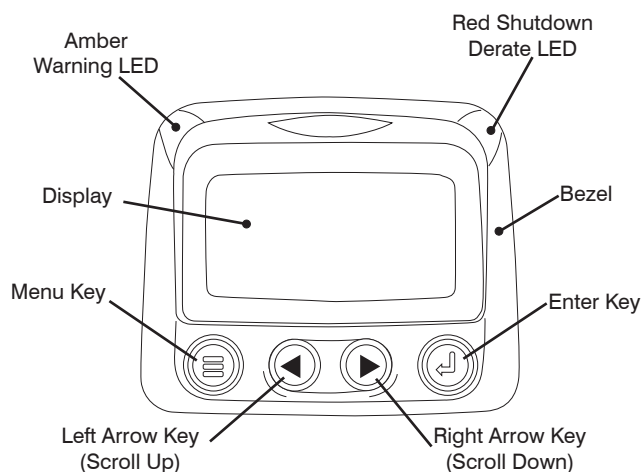
**WARNING**

- Before beginning installation of this Murphy product
- Disconnect all electrical power to the machine
- Make sure the machine cannot operate during installation
- Follow all safety warnings of the manufacturer
- Read and follow all installation instructions

**Display Parameters**

The following are some of the engine and transmission parameters displayed by the PowerView in English or Metric units as well as in Spanish, French, or German (when applicable, consult engine or transmission manufacturer for SAE J1939 supported parameters):

- Engine RPM
- Engine Hours
- Machine Hours
- System Voltage
- % Engine Load at the current RPM
- Coolant Temperature
- Oil Pressure
- Fuel Economy
- Throttle Position
- Engine Manifold Air Temperature
- Current Fuel Consumption
- Active Service Codes
- Stored Service Codes (when supported)
- Set Units for Display (English or Metric)

**Faceplate Features****Keypad Functions**

The keypad on the PowerView is a capacitive touch sensing system. There are no mechanical switches to wear or stick, and the technology has been time proven in many applications. It operates in extreme temperatures, with gloves, through ice, snow, mud, grease, etc., and it allows complete sealing of the front of the PowerView. The 'key is touched' feedback is provided by flashing the screen. The keys on the keypad perform the following functions:

**Menu Key** - The Menu Key is touched to either enter or exit the menu screens.

**Left Arrow** - The Left Arrow Key is touched to scroll through the screen either moving the parameter selection toward the left or upward.

**Right Arrow** - The Right Arrow Key is touched to scroll through the screen either moving the parameter selection toward the right or downward.

**Enter Key** - The Enter Key (also known as Enter Button) is touched to select the parameter that is highlighted on the screen.



## Section 5 - Procedures

## Service and Maintenance

**PowerView Menus (First Time Start Up)**

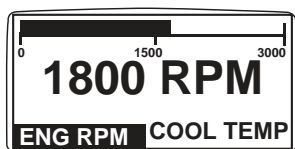
1. When power is first applied to the PowerView, the "Logo" is displayed.



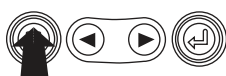
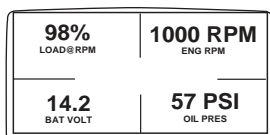
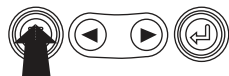
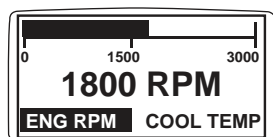
2. The "Wait to Start" message will be displayed for engines with a pre-startup sequence. Once the "Wait to Start" message is no longer displayed the operator may start the engine. Note: Displays only when SAE J1939 message is supported by engine manufacturer.



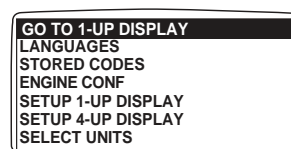
3. Once the engine has started the single engine parameter is displayed.

**Main Menu Navigation**

1. Starting at the single or four engine parameter display, touch "Menu".



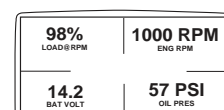
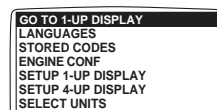
2. The first seven items of the "Main Menu" will be displayed. Touching the "Arrow Buttons" will scroll through the menu selection.



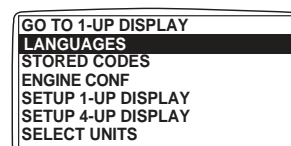
3. Touching the right arrow button will scroll down to reveal the last items of "Main Menu" screen highlighting the next item down.



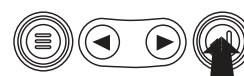
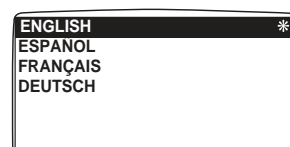
4. Touch the "Arrows" to scroll to the desired menu item or touch "Menu" to exit the Main menu and return to the engine parameter display.

**Selecting a Language**

1. Starting at the main menu display use the "Arrows" to scroll to the "Language" menu and once highlighted touch the "Enter" button.



2. The language choices will be displayed. Use the "Arrow" buttons to scroll through the selections and touch "Enter" to make a selection.

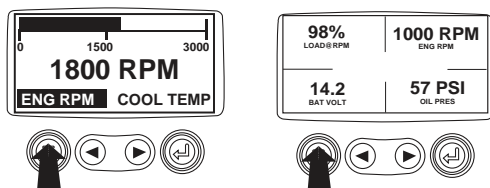


**Service and Maintenance****Section 5 - Procedures**

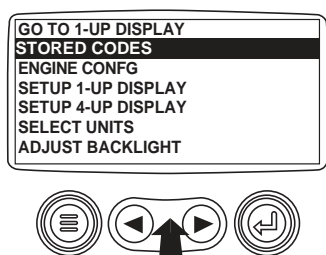
- Now that you have selected the language, touch the “Menu” button to return to the main menu display.

**Stored Fault Codes**

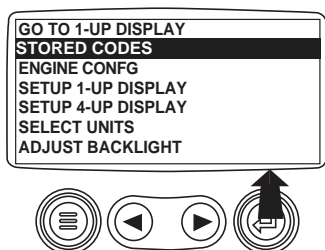
- Starting at the main menu display use the “Arrows” to scroll to the “Language” menu and once highlighted touch the “Enter” button.



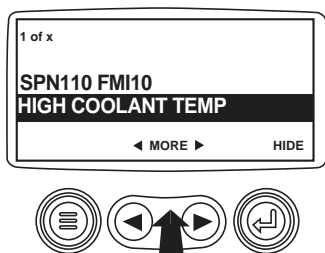
- The main menu will pop up on the display. Use the “Arrow Buttons” to scroll through the menu until the Stored Fault Codes is highlighted.



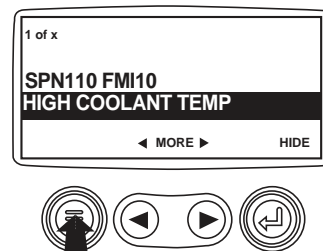
- Once the “Stored Fault Codes” menu item has been highlighted touch the “Enter Button” to view the “Stored Fault Codes” (when applicable, consult engine or transmission manufacturer for SAE J1939 supported parameters).



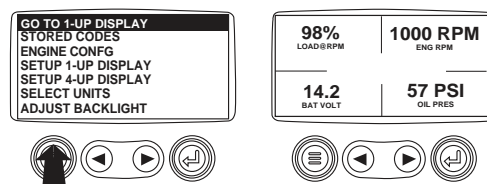
- If the word “MORE” appears above the “Arrow Buttons” there are more stored fault codes that may be viewed. Use the “Arrow Buttons” to scroll to the next Stored Diagnostic Code.



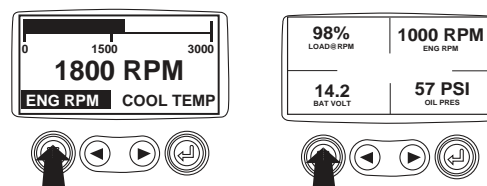
- Touch the “Menu Button” to return to the main menu.



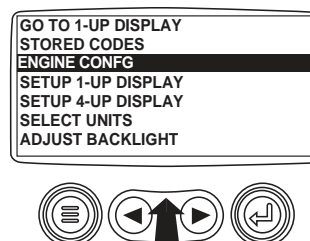
- Touch the “Menu Button” to exit the Main menu and return to the engine parameter display.

**Engine Configuration Data**

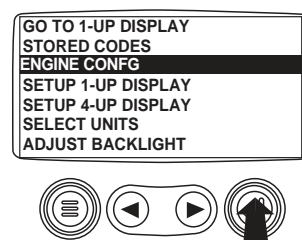
- Starting at the single or four engine parameter display touch the “Menu Button”.



- The main menu will pop up on the display. Use the “Arrow Buttons” to scroll through the menu until the “Engine Configuration” is highlighted.



- Once the “Engine Configuration” menu item has been highlighted touch the “Enter Button” to view the engine configuration data.





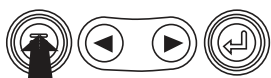
## Section 5 - Procedures

## Service and Maintenance

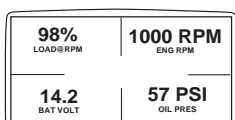
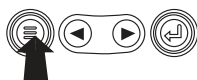
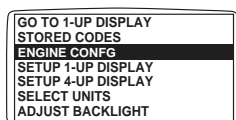
- Use the "Arrow Buttons" to scroll through the engine configuration data.



- Touch the "Menu Button" to return to the main menu.



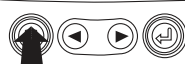
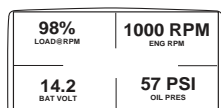
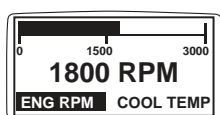
- Touch the "Menu Button" to exit the Main menu and return to the engine parameter display.



## Faults and Warnings

### Auxiliary Gage Fault

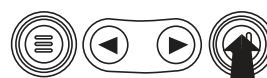
- During normal operation the single or four parameter screen will be displayed.



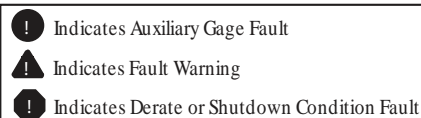
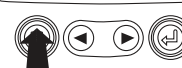
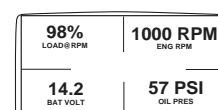
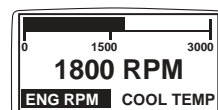
- The PVA Series of auxiliary gages can be attached to the PowerView. These auxiliary gages communicate with the Modbus master PowerView via a daisy-chained RS-485 port. If at any time during system initialization or normal operation an auxiliary gage should fail, the single or four parameter screen will be replaced with the "MLink Gage Fault" message.



- To acknowledge and "Hide" the fault and return to the single or four parameter display, touch the "Enter Button"



- The display will return to the single or four parameter screen.



- Touching the "Enter Button" will re-display the hidden fault. Touching the "Enter Button" once again will hide the fault and return the screen to the single or four parameter display.

**NOTE**

The fault can only be cleared by correcting the cause of the fault condition.



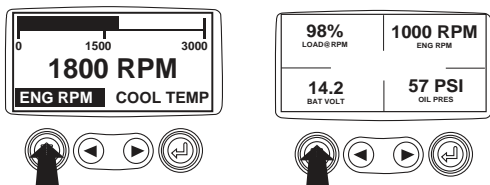


## Service and Maintenance

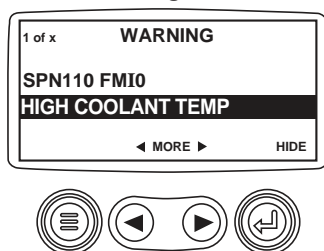
## Section 5 - Procedures

## Active Fault Codes

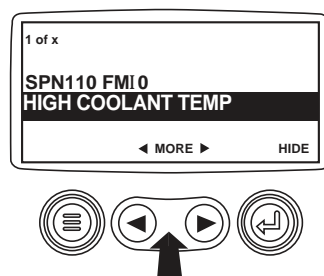
1. During normal operation the single or four parameter screen will be displayed.



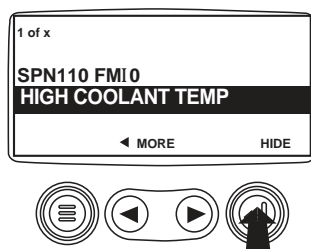
2. When the PowerView receives a fault code from an engine control unit the single or four parameter screen will be replaced with the "Active Fault Codes" message.



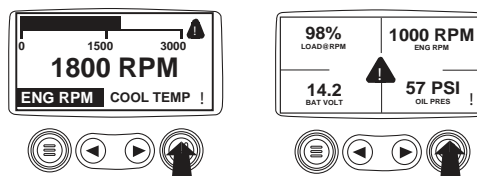
3. If the word "MORE" appears above the "Arrow Buttons" there are more active fault codes that may be viewed. Use the "Arrow Buttons" to scroll to the next "Active Fault Code"



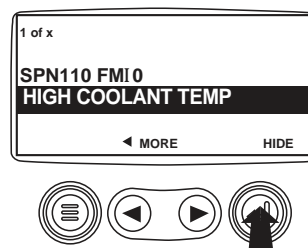
4. To acknowledge and "Hide" the fault and return to the single or four parameter display touch the "Enter Button".



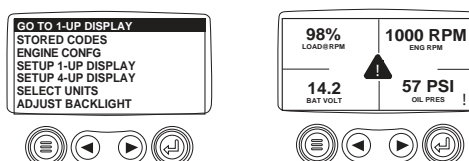
5. The display will return to the single or four parameter display, but the display will contain the "Active Fault" warning icon. Touching the "Enter Button" will re-display the hidden fault.



6. Touching the "Enter Button" once again will hide the fault and return the screen to the single or four parameter display.

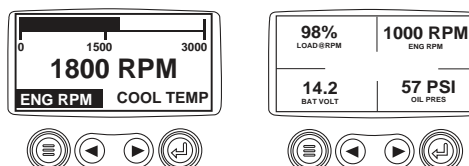


7. The Single or Four parameter screen will display the fault icon until the fault condition is corrected. NOTE: Ignoring active fault codes could result in severe engine damage.



## Shutdown Codes

1. During normal operation the single or four parameter screen will be displayed.



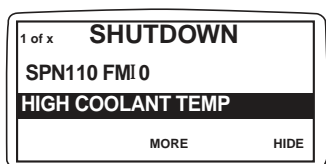
2. When the PowerView receives a severe fault code from an engine control unit the single or four parameter screen will be replaced with the "Shutdown!" message.



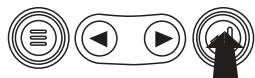
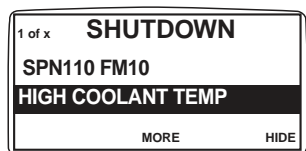


## Section 5 - Procedures

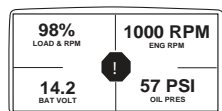
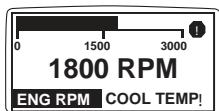
## Service and Maintenance



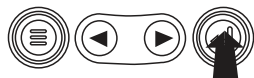
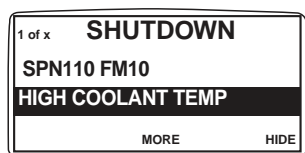
- To acknowledge and "Hide" the fault and return to the single or four parameter display touch the "Enter Button".



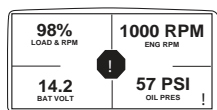
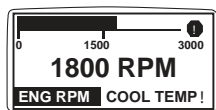
- The display will return to the single or four parameter display, but the display will contain the "Shut Down" icon. Touching the "Enter Button" will re-display the hidden fault.



- Touching the "Enter Button" once again will hide the fault and return the screen to the single or four parameter display.

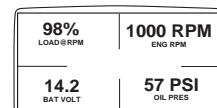
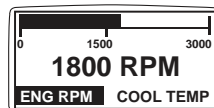


- The Single or Four parameter screen will display the fault icon until the fault condition is corrected.  
NOTE: Ignoring active fault codes could result in severe engine damage.

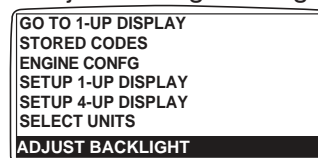


## Back Light Adjustment

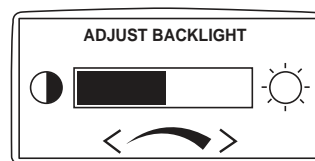
- Starting at the single or four engine parameter display touch the "Menu Button".



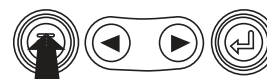
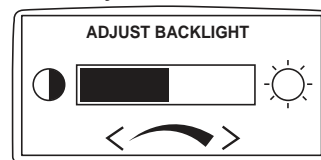
- The main menu will pop up on the display. Use the "Arrow Buttons" to scroll through the menu until the "Adjust Backlight" is highlighted.



- Once the "Adjust Backlight" menu item has been highlighted touch the "Enter Button" to activate the "Adjust Backlight" function.



- Use the "Arrow Buttons" to select the desired backlight intensity.

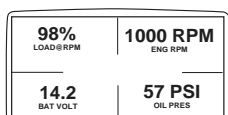
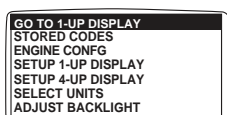


- Touch the "Menu Button" to return to the main menu.

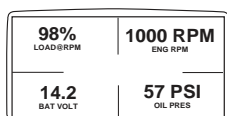
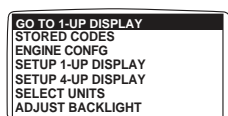


## Service and Maintenance

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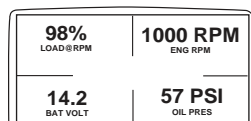
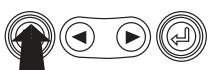
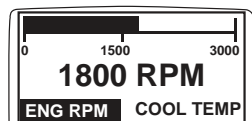


6. Touch the "Menu Button" to exit the Main menu and return to the engine parameter display.

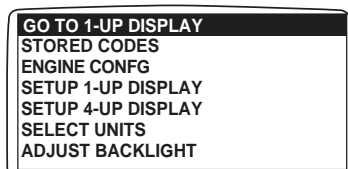


## Contrast Adjustment

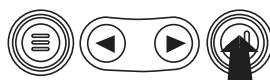
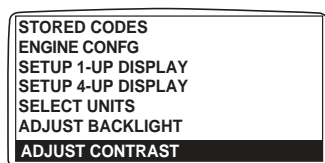
1. Starting at the single or four engine parameter display, touch the Menu Button".



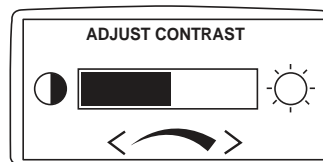
2. The main menu will pop up on the display. Use the "Arrow Buttons" to scroll through the menu until "Adjust Contrast" is highlighted.



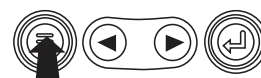
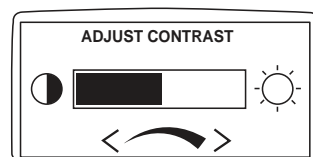
3. Once the "Adjust Contrast" menu item has been highlighted touch the "Enter Button" to activate the "Adjust Contrast" function.



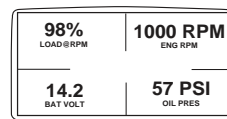
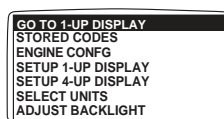
4. Use the "Arrow Buttons" to select the desired contrast intensity.



5. Touch the "Menu Button" to return to the main menu.

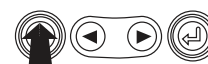
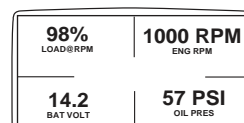
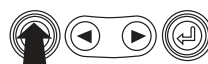
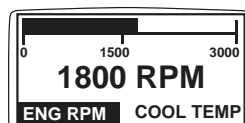


6. Touch the "Menu Button" to exit the Main menu and return to the engine parameter display.

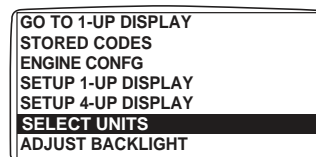


## Select Units

1. Starting at the single or four engine parameter display touch the "Menu Button".



2. The main menu will pop up on the display. Use the arrow buttons to scroll through the menu until the "Select Units" is highlighted.

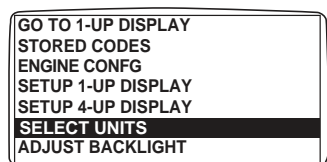




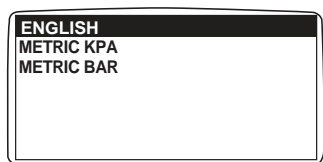
## Section 5 - Procedures

## Service and Maintenance

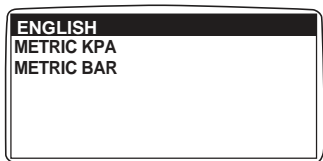
- Once the "Select Units" menu item has been highlighted touch the "Enter Button" to access the "Select Units" function.



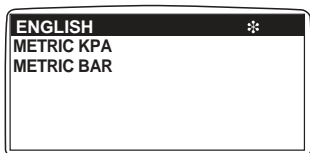
- Use the arrows to highlight the desired units. "English" for Imperial units i.e. PSI, °F or Metric kPa, Metric Bar for IS units i.e. kPa, Bar, °C.



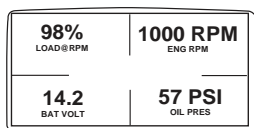
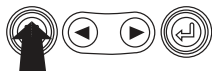
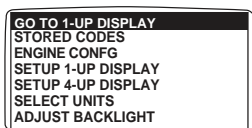
- Touch the "Enter Button" to select the highlighted units.



- Touch the "Menu Button" to return to the "Main Menu".

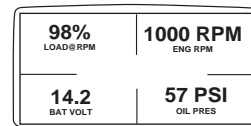
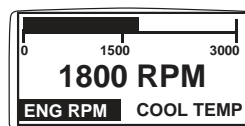


- Touch the "Menu Button" to exit the Main menu and return to the engine parameter display.

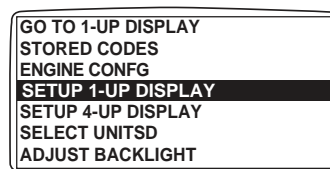


## Setup 1-Up Display

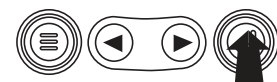
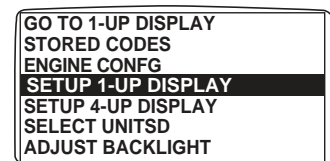
- Starting at the single engine parameter display, touch the "Menu Button".



- The main menu will pop up on the display. Use the "Arrow Buttons" to scroll through the menu until the "Setup 1-up Display" is highlighted.



- Once the "Setup 1-up Display" menu item has been highlighted touch the "Enter Button" to access the "setup 1-up display" function.



- Three options are available for modification of the 1-Up display.

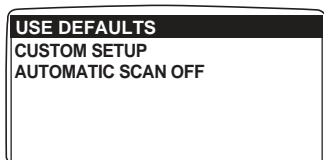
- Use Defaults – This option contains a set of engine parameters: Engine Hours, Engine RPM, System Voltage, Battery Voltage, % Engine Load at Current RPM, Coolant Temperature, Oil Pressure.
- Custom Setup – This option allows for the modification of what parameter, the number of parameters, and the order in which the parameters are being displayed.
- Automatic Scan – Selecting the scan function will cause the 1-Up Display to scroll through the selected set of parameters one at a time, momentarily pausing at each.



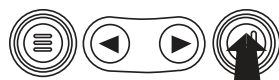
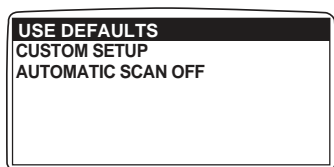
## Service and Maintenance

## Section 5 - Procedures

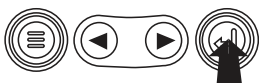
5. **Use Defaults** - To select "Use Defaults" use the arrow buttons to scroll to and highlight "Use Defaults" in the menu display.



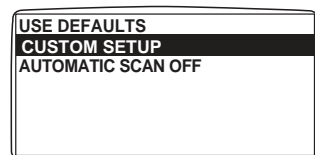
6. Touch the "Enter Button" to activate the "Use Defaults" function.



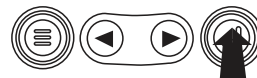
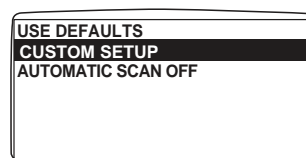
7. A message indicating the "Single Engine" parameter display parameters are reset to the factory defaults will be displayed, then the display will return to the "Custom Setup" menu.



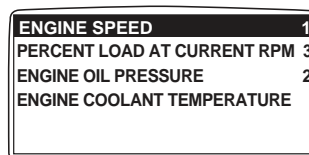
8. **Custom Setup** - To perform a custom setup of the 1-Up Display, use the arrow buttons to scroll to and highlight "Custom Setup" on the display.



9. Touching the "Enter Button" will display a list of engine parameters.



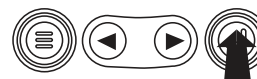
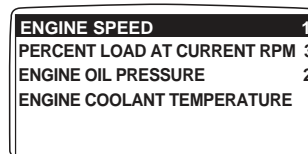
10. Use the "Arrow Buttons" to scroll to and highlight a selected parameter (parameter with a # symbol to right of it).



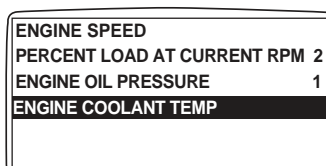
This number indicates the order of display for the parameters and that the parameter is selected for display.



11. Touch the "Enter Button" to deselect the selected parameter removing it from the list of parameters being displayed on the 1-up display.



12. Use the "Arrow Buttons" to scroll and highlight the desired parameter that has not been selected for display.



Note that the numbers now indicate the new order of display for the parameters.

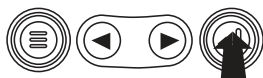
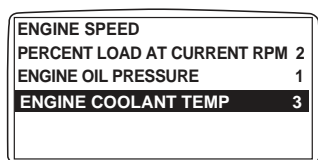


13. Touch the "Enter button" to select the highlighted parameter for inclusion in the Single Engine Parameter Display.

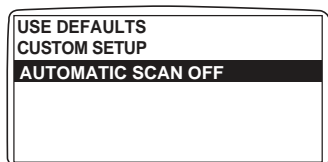


## Section 5 - Procedures

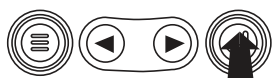
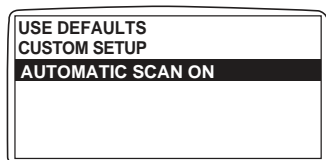
## Service and Maintenance



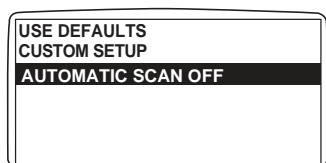
14. Continue to scroll and select additional parameters for the custom 1-Up Display. Touch the "Menu button" at any time to return to the "Custom Setup" menu.
15. **Automatic Scan** - Selecting the scan function will cause the 1-Up Display to scroll through the selected set of parameters one at a time. Use the "Arrow Buttons" to scroll to the "Automatic Scan" function.



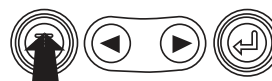
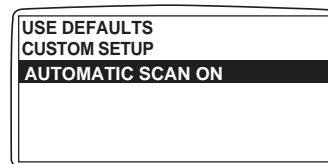
16. Touching the "Enter Button" toggles the "Automatic Scan" function on.



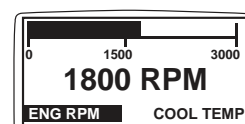
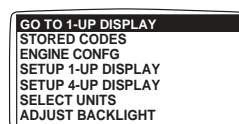
17. Touching the "Enter Button" again toggles the "Automatic Scan" function off.



18. Once the "Use Defaults", "Custom Setup" and "Automatic Scan" functions have been set touch the "Menu Button" to return to the main menu.

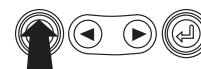
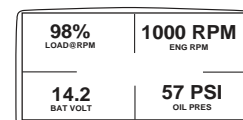
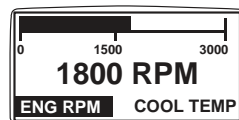


19. Touch the "Menu Button" to exit the Main menu and return to the engine parameter display.

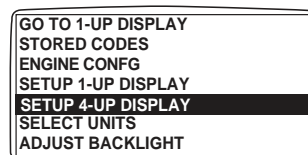


## Setup 4-Up Display

1. From the single or four engine parameter display touch the "Menu Button".



2. The main menu will pop up on the display. Use the "Arrow Buttons" to scroll through the menu until the "Setup 4-Up Display" is highlighted.

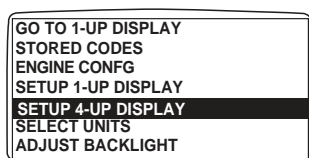


3. Once the "Setup 4-Up Display" menu item has been highlighted touch the "Enter Button" to activate the "Setup 4-Up Display" menu.

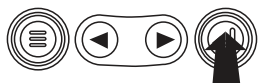
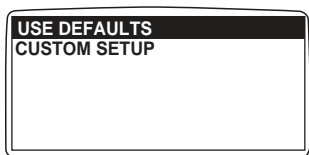


## Service and Maintenance

## Section 5 - Procedures



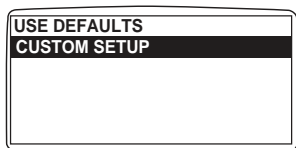
4. Touch the "Enter Button" to activate the "Use Defaults" function. This action will reset the unit to the factory default.



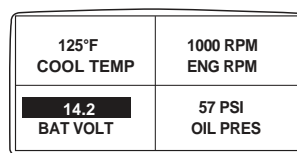
5. The "Use Defaults" screen will be displayed during the resetting period then will automatically return to the "Setup 4-Up Display" menu.



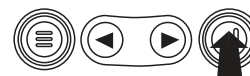
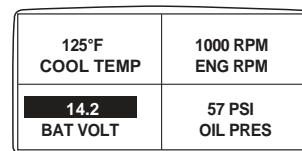
6. Select the "4-Up Custom Setup" from the "4-Up Setup" menu.



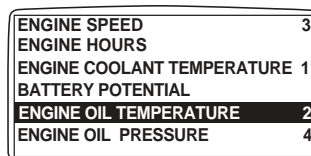
7. The quadrant with the backlit parameter value is the current selected parameter. Use the "Arrow Buttons" to highlight the parameter value in the quadrant you wish to place a new parameter.



8. Touch the "Enter Button" and a list of parameters will appear.



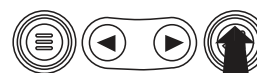
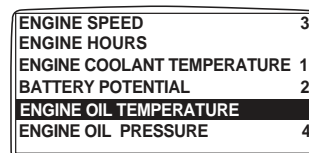
9. The parameter that is highlighted is the selected parameter for the screen. Use the "Arrow Buttons" to highlight the new parameter to be placed in the quadrant selected in the previous screen.



The number to the right of the parameter indicates the quadrant in which it is displayed.  
 1. = Upper Left Quadrant  
 2. = Lower Left Quadrant  
 3. = Upper Right Quadrant  
 4. = Lower Right Quadrant



10. Touch the "Enter Button" to change the selected parameter in the quadrant to the new parameter.



11. Use the "Menu Button" to return to the "4-UP Custom Setup" screen.



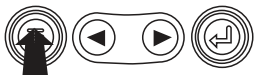


## Section 5 - Procedures

## Service and Maintenance

|                            |   |
|----------------------------|---|
| ENGINE SPEED               | 3 |
| ENGINE HOURS               |   |
| ENGINE COOLANT TEMPERATURE | 1 |
| BATTERY POTENTIAL          |   |
| ENGINE OIL TEMPERATURE     | 2 |
| ENGINE OIL PRESSURE        | 4 |

Note the number to the right of the selected parameter indicating that the parameter is now assigned to that display location.



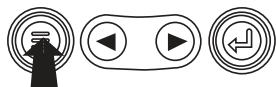
- The parameter in the selected quadrant has changed to the parameter selected in the previous screen.

|                    |                     |
|--------------------|---------------------|
| 125°F<br>COOL TEMP | 1000 RPM<br>ENG RPM |
| 143°F<br>OIL TEMP  | 57 PSI<br>OIL PRES  |



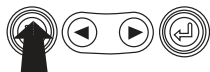
- Repeat the parameter selection process until all spaces are filled.
- Touch the "Menu Button" to return to the main menu.

|                    |                     |
|--------------------|---------------------|
| 125°F<br>COOL TEMP | 1000 RPM<br>ENG RPM |
| 143°F<br>OIL TEMP  | 57 PSI<br>OIL PRES  |



- Touch the "Menu Button" to exit the Main menu and return to the engine parameter display.

|                    |
|--------------------|
| GO TO 1-UP DISPLAY |
| STORED CODES       |
| ENGINE CONFG       |
| SETUP 1-UP DISPLAY |
| SETUP 4-UP DISPLAY |
| SELECT UNITS       |
| ADJUST BACKLIGHT   |

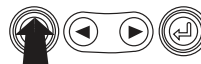
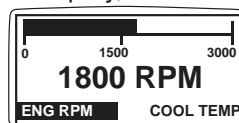


|                   |                     |
|-------------------|---------------------|
| 125%<br>COOL TEMP | 1000 RPM<br>ENG RPM |
| 143°F<br>OIL TEMP | 57 PSI<br>OIL PRES  |

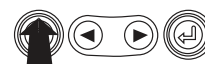


## Utilities (Information and Troubleshooting)

- Starting at the single or four engine parameter display, touch the "Menu button".



|                   |                     |
|-------------------|---------------------|
| 125%<br>COOL TEMP | 1000 RPM<br>ENG RPM |
| 143°F<br>OIL TEMP | 57 PSI<br>OIL PRES  |



- The main menu will be displayed. Use the "Arrow buttons" to scroll through the menu until the "Utilities" is highlighted.

|                    |
|--------------------|
| STORED CODES       |
| ENGINE CONFG       |
| SETUP 1-UP DISPLAY |
| SETUP 4-UP DISPLAY |
| SELECT UNITS       |
| ADJUST BACKLIGHT   |
| UTILITIES          |



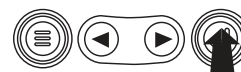
- Once the "Utilities" menu item has been highlighted, touch the "Enter Button" to activate the "Utilities" functions.

|                    |
|--------------------|
| STORED CODES       |
| ENGINE CONFG       |
| SETUP 1-UP DISPLAY |
| SETUP 4-UP DISPLAY |
| SELECT UNITS       |
| ADJUST BACKLIGHT   |
| UTILITIES          |



- Touch "Select" to enter the "Gage Data" display. When "Gage Data" is selected the PowerView will communicate with the analog gages at a fixed rate of 38.4 Kilo Baud, 8 data bits, no parity check, 1 stop bits, half duplex.

|                  |
|------------------|
| GAGE DATA        |
| REMOVE ALL GAGES |
| SOFTWARE VERSION |
| MODBUS SETUP     |
| FAULT CONVERSION |
| DEMO MODE ON     |

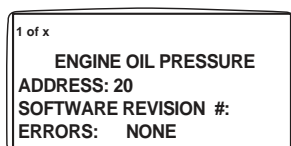


- Use the "Arrow buttons" to scroll through the items or touch "Menu" to return to the "Utilities" menu.

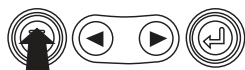
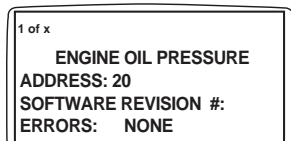


## Service and Maintenance

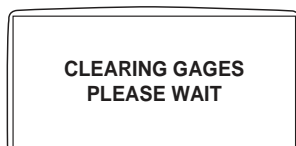
## Section 5 - Procedures



6. Touch "Menu Button" to return to the "Utilities" menu.



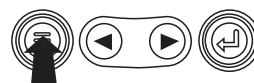
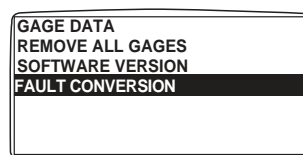
7. Use the "Arrows" to highlight "Remove All Gages". Touch "Select" to clear gage data from memory. It takes a moment to clear all gages.



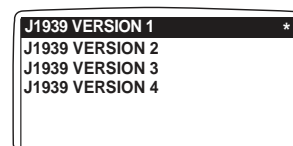
8. When the gage data has cleared, the display automatically returns to the "Utilities" menu. Scroll to "Software Version". Touch "Select" to view the software version currently in the PowerView.



9. Touch "Menu" to return to "Utilities". Highlight "Fault Conversion" using the "Arrows". Touch "Select" to enter the Fault conversion menu.



10. Use the "Arrows" to scroll and highlight the version then touch "Select" and an asterisks appears to the right of the selection.

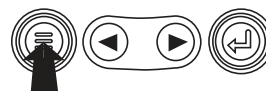
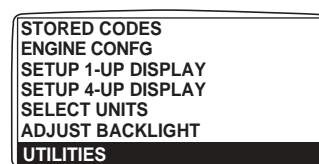
**NOTE**

There are four (4) different methods for converting fault codes.

The PowerView always looks for J1939 Version 4 and can be set to use one of the 3 other J1939 versions. Most engine ECU's use Version 4, therefore in most cases adjustment of this menu option will not be required.

Upon receiving an unrecognizable fault, change to a different J1939 Version. If the fault SPN does not change when the version is changed, the ECU generating the fault is using Fault Conversion method 4. If the SPN number does change but is still unrecognizable, try changing to another J1939 Version not yet used and continue to check the SPN number.

11. Touch the "Menu" button to return to "Utilities" menu. Touch the "Menu" button again to return to the "Main" menu.





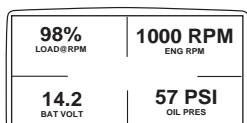
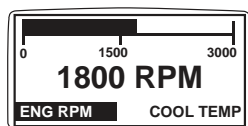


## Section 5 - Procedures

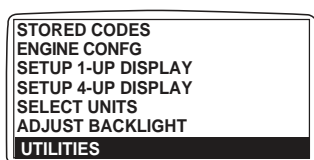
## Service and Maintenance

## MODBUS Setup

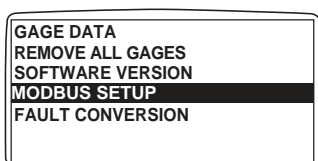
- Starting at the single or four engine parameter display, touch the "Menu button".



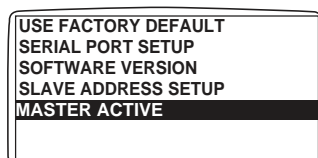
- The main menu will be displayed. Use the "Arrow buttons" to scroll through the menu until the "Utilities" is highlighted, then touch "Enter".



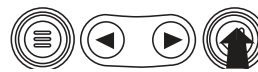
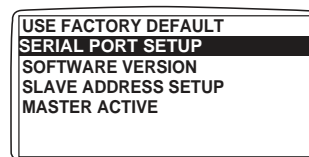
- Once in the "Utilities" menu use the "Arrows" to scroll through the menu until the "Modbus Setup" menu is highlighted, then touch "Enter".



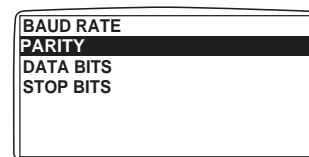
- Use the "Arrows" to scroll down to and highlight either the "Slave Active or Master Active" modes. Touch the "Enter" button to toggle between master and slave.



- Use the "Arrows" to scroll to the "Serial Port" menu to highlight it, then touch "Enter".



- Use the "Arrow" button to scroll to each selection to configure the MODBUS values for your application.





## Error Messages

| PowerView Error Messages |     |   |
|--------------------------|-----|---|
| SPN                      | FMI | Description   |
| 28                       | 3   | % ACCEL POS3 VOLT ABOVE NORM OR SHORT HIGH            |
| 28                       | 4   | % ACCEL POS3 VOLT BELOW NORM OR SHORT LOW             |
| 29                       | 3   | % ACCEL POS2 VOLT ABOVE NORM OR SHORT HIGH            |
| 29                       | 4   | % ACCEL POS2 VOLT BELOW NORM OR SHORT LOW             |
| 91                       | 3   | ACCEL PEDAL POS VOLT ABOVE NORM OR SHORT HIGH         |
| 91                       | 4   | ACCEL PEDAL POS VOLT BELOW NORMAL OR SHORT LOW        |
| 91                       | 9   | ACCEL PEDAL POS A VALID THROTTLE MSG NOT RCVD         |
| 91                       | 14  | ACCEL PEDAL POS THROTTLE SIG VOLT OUT OF RANGE        |
| 94                       | 1   | FUEL DELIVERY PRESSURE VERY LOW                       |
| 94                       | 3   | FUEL RAIL PRESSURE VOLTAGE OUT OF RANGE HIGH          |
| 94                       | 4   | FUEL RAIL PRESSURE VOLTAGE OUT OF RANGE LOW           |
| 94                       | 10  | FUEL DELIVERY PRESSURE DROPPING TO FAST               |
| 94                       | 13  | FUEL DELIVERY PRESSURE OUT OF CALIBRATION             |
| 94                       | 16  | FUEL DELIVERY PRESSURE HIGH                           |
| 94                       | 17  | NO RAIL FUEL PRESSURE                                 |
| 94                       | 18  | FUEL DELIVERY PRESSURE LOW                            |
| 97                       | 0   | WATER IN FUEL DETECTED                                |
| 97                       | 3   | WATER IN FUEL INDICATOR VOLTAGE OUT OF RANGE HIGH     |
| 97                       | 4   | WATER IN FUEL INDICATOR VOLTAGE OUT OF RANGE LOW      |
| 97                       | 16  | WATER IN FUEL DETECTED                                |
| 97                       | 31  | WATER IN FUEL DETECTED                                |
| 100                      | 1   | ENGINE OIL PRESSURE LOW                               |
| 100                      | 3   | ENGINE OIL PRESS VOLT ABOVE NORM OR SHORT HIGH SOURCE |
| 100                      | 4   | ENGINE OIL PRESS VOLT BELOW NORM OR SHORT LOW SOURCE  |
| 100                      | 16  | ENGINE OIL PRESSURE READING INCORRECT                 |
| 100                      | 18  | ENGINE OIL PRESS LOW                                  |
| 105                      | 0   | INTAKE MAN1 AIR TEMP HIGH                             |
| 105                      | 3   | INTAKE MAN1 TEMP VOLT ABOVE NORM OR SHORT HIGH SOURCE |
| 105                      | 4   | INTAKE MAN1 TEMP VOLT BELOW NORM OR SHORT LOW SOURCE  |
| 105                      | 16  | INTAKE MAN1 AIR TEMP HIGH                             |
| 107                      | 0   | AIR FILT DIFF PRESS PLUGGED AIR FILTER DETECTED       |
| 107                      | 31  | AIR FILT DIFF PRESS PLUGGED AIR FILTER DETECTED       |
| 110                      | 0   | ENG COOL TEMP HIGH                                    |
| 110                      | 3   | ENG COOL TEMP VOLT ABOVE NORM OR SHORT HIGH SOURCE    |
| 110                      | 4   | ENG COOL TEMP VOLT BELOW NORM OR SHORT LOW SOURCE     |
| 110                      | 15  | ENG COOL TEMP HIGH                                    |
| 110                      | 16  | ENG COOL TEMP HIGH                                    |
| 111                      | 1   | LOW COOLANT LEVEL                                     |
| 158                      | 2   | KEYSWITCH INTERMITTENT                                |
| 158                      | 17  | KEYSWITCH CIRCUIT PROBLEM                             |
| 174                      | 0   | FUEL TEMP HIGH  |

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## Section 5 - Procedures

## Service and Maintenance

## Error Messages - Continued

| PowerView Error Messages - continued |     |   |
|--------------------------------------|-----|---|
| SPN                                  | FMI | Description                                     |
| 190                                  | 0   | ENGINE OVERSPEED                                |
| 190                                  | 2   | ENG SPD DATA ERRATIC, INTERMITTENT OR INCORRECT |
| 190                                  | 3   | ENG SPD VOLT ABOVE NORMAL OR SHORT HIGH         |
| 190                                  | 4   | ENG SPD VOLT BELOW NORMAL OR SHORT LOW          |
| 190                                  | 5   | ENG SPD CIRCUIT IS OPEN                         |
| 190                                  | 16  | ENGINE OVERSPEED                                |
| 611                                  | 3   | INJ WIRING SHORTED TO BATTERY                   |
| 611                                  | 4   | INJ WIRING SHORTED TO GROUND                    |
| 620                                  | 3   | SENSOR VOLT1 (+5VDC) ABOVE NORMAL OR SHORT HIGH |
| 620                                  | 4   | SENSOR VOLT1 (+5VDC) BELOW NORMAL OR SHORT LOW  |
| 627                                  | 1   | POWER SUPPLY LOW VOLT TO INJECTORS              |
| 627                                  | 4   | POWER SUPPLY INTERRUPTION                       |
| 629                                  | 13  | REPROGRAM CONTROLLER ECU PROBLEM                |
| 629                                  | 19  | ECU NOT RECEIVING MSG FROM PUMP                 |
| 632                                  | 2   | FUEL SHUTOFF VALVE ERR DETECTED                 |
| 632                                  | 5   | FUEL SHUTOFF VALVE NON-FUNCTIONAL               |
| 632                                  | 11  | FUEL SHUTOFF VALVE SOLENOID CKT OPEN OR SHORTED |
| 636                                  | 2   | ENG POS SENSOR TIMING SIGNAL ERROR              |
| 636                                  | 8   | ENG POS SENSOR TIMING SIGNAL ERROR              |
| 636                                  | 10  | ENG POS SENSOR TIMING SIGNAL ERROR              |
| 637                                  | 2   | TIMING (CRANK) SENSOR TIMING SIGNAL ERROR       |
| 637                                  | 7   | TIMING (CRANK) SENSOR TIMING SIGNAL ERROR       |
| 637                                  | 8   | TIMING (CRANK) SENSOR TIMING SIGNAL ERROR       |
| 637                                  | 10  | TIMING (CRANK) SENSOR TIMING SIGNAL ERROR       |
| 639                                  | 13  | CAN BUS FAILURE                                 |
| 651                                  | 5   | INJ CYLINDER1 CURRENT LESS THAN EXPECTED        |
| 651                                  | 6   | INJ CYLINDER1 CURRENT INCREASE TOO RAPIDLY      |
| 651                                  | 7   | INJ CYLINDER1 FUEL FLOW LOWER THAN EXPECTED     |
| 652                                  | 5   | INJ CYLINDER2 CURRENT LESS THAN EXPECTED        |
| 652                                  | 6   | INJ CYLINDER2 CURRENT INCREASES TOO RAPIDLY     |
| 652                                  | 7   | INJ CYLINDER2 FUEL FLOW LOWER THAN EXPECTED     |
| 653                                  | 5   | INJ CYLINDER3 CURRENT LESS THAN EXPECTED        |
| 653                                  | 6   | INJ CYLINDER3 CURRENT INCREASES TOO RAPIDLY     |
| 653                                  | 7   | INJ CYLINDER3 FUEL FLOW LOWER THEN EXPECTED     |
| 654                                  | 5   | INJ CYLINDER4 CURRENT LESS THAN EXPECTED        |
| 654                                  | 6   | INJ CYLINDER4 CURRENT INCREASES TOO RAPIDLY     |
| 654                                  | 7   | INJ CYLINDER4 FUEL FLOW LOWER THAN EXPECTED     |
| 655                                  | 5   | INJ CYLINDER5 CURRENT LESS THAN EXPECTED        |
| 655                                  | 6   | INJ CYLINDER5 CURRENT INCREASES TOO RAPIDLY     |
| 655                                  | 7   | INJ CYLINDER5 FUEL FLOW LOWER THAN EXPECTED     |
| 656                                  | 5   | INJ CYLINDER6 CURRENT LESS THAN EXPECTED        |
| 656                                  | 6   | INJ CYLINDER6 CURRENT INCREASES TOO RAPIDLY     |
| 656                                  | 7   | INJ CYLINDER6 FUEL FLOW LOWER THAN EXPECTED     |
| 676                                  | 3   | GLOW PLUG RELAY STUCK ON                        |
| 676                                  | 5   | GLOW PLUG RELAY WILL NOT TURN ON                |
| 729                                  | 3   | INLET AIR HEATER DRIVER1 STUCK ON               |
| 729                                  | 5   | INLET AIR HEATER DRIVER1 WILL NOT TURN ON       |

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## Service and Maintenance

## Section 5 - Procedures

## Error Messages - Continued

| PowerView Error Messages - continued |     |   |
|--------------------------------------|-----|---|
| SPN                                  | FMI | Description   |
| 833                                  | 2   | RACK POSITION SENSOR ERROR                          |
| 833                                  | 3   | RACK POSITION SENSOR VOLT ABOVE NORMAL              |
| 833                                  | 4   | RACK POSITION SENSOR VOLT BELOW NORMAL              |
| 834                                  | 2   | RACK ACTUATOR ERROR BLEED AIR IN FUEL SYSTEM        |
| 834                                  | 3   | RACK ACTUATOR CKT VOLT ABOVE NORMAL                 |
| 834                                  | 5   | RACK ACTUATOR CKT OPEN                              |
| 834                                  | 6   | RACK ACTUATOR CKT GROUNDED                          |
| 834                                  | 7   | RACK ACTUATOR POSITION ERROR                        |
| 970                                  | 2   | EXT AUX ENG SHUTDOWN SWITCH INTERMITTENT            |
| 970                                  | 11  | EXT ENG PROTECTION SHUTDOWN ACTIVE                  |
| 970                                  | 31  | EXT AUX ENG SHUTDOWN SWITCH ACTIVE                  |
| 971                                  | 31  | ENG DERATE SWITCH ACTIVATED                         |
| 1041                                 | 2   | START SIGNAL MISSING                                |
| 1041                                 | 3   | START SIGNAL ALWAYS ACTIVE                          |
| 1076                                 | 0   | FUEL INJ PUMP CONT VALVE ERROR                      |
| 1076                                 | 1   | FUEL INJ PUMP CONT VALVE ERROR                      |
| 1076                                 | 2   | FUEL INJ PUMP CONT VALVE ERROR                      |
| 1076                                 | 3   | FUEL INJ PUMP CONT VALVE ERROR                      |
| 1076                                 | 5   | FUEL INJ PUMP CONT VALVE ERROR                      |
| 1076                                 | 6   | FUEL INJ PUMP CONT VALVE ERROR                      |
| 1076                                 | 7   | FUEL INJ PUMP CONT VALVE ERROR                      |
| 1076                                 | 10  | FUEL INJ PUMP CONT VALVE ERROR                      |
| 1076                                 | 13  | FUEL INJ PUMP CONT VALVE ERROR                      |
| 1077                                 | 7   | FUEL INJ PUMP ERROR                                 |
| 1077                                 | 11  | FUEL INJ PUMP CONT VP44 INPUT VOLT OUT OF RANGE     |
| 1077                                 | 12  | FUEL INJ PUMP CONT VP44 SELF TEST ERROR             |
| 1077                                 | 19  | FUEL INJ PUMP CONT VP44 DETECTED CAN BUS FAILURE    |
| 1077                                 | 31  | FUEL INJ PUMP CONT POWER DERATED                    |
| 1078                                 | 7   | FUEL INJ PUMP SPD/POS SENSOR ERROR                  |
| 1078                                 | 11  | FUEL INJ PUMP SPD/POS SENSOR ERROR                  |
| 1078                                 | 31  | FUEL INJ PUMP SPD/POS VP44 UNABLE TO ACHIEVE TIMING |
| 1079                                 | 3   | SENSOR VOLT1 (+5VDC) ABOVE NORM OR SHORT HIGH       |
| 1079                                 | 4   | SENSOR VOLT1 (+5VDC) BELOW NORM OR SHORT LOW        |
| 1080                                 | 3   | SENSOR VOLT2 (+5VDC) ABOVE NORM OR SHORT HIGH       |
| 1080                                 | 4   | SENSOR VOLT2 (+5VDC) BELOW NORM OR SHORT LOW        |
| 1109                                 | 31  | ENG PROT SYSTEM APPROACHING SHUTDOWN                |
| 1110                                 | 31  | ENG PROT SYSTEM SHUT ENG DOWN                       |
| 1347                                 | 5   | FUEL PUMP ASSY 1 CKT OPEN SHORTED GROUND OR OVLOAD  |
| 1347                                 | 7   | FUEL PUMP ASSY 1 RAIL PRESSURE CONT MISMATCH        |
| 1347                                 | 10  | FUEL PUMP ASSY 1 LOW FUEL FLOW                      |
| 1348                                 | 5   | FUEL PUMP ASSY 2 CKT OPEN SHORTED GROUND OR OVLOAD  |
| 1348                                 | 10  | FUEL PUMP ASSY 2 LOW FUEL FLOW                      |
| 1485                                 | 2   | ECU MAIN RELAY PUMP POWER RELAY FAULT               |
| 1569                                 | 31  | ENG PROT TORQ FUEL DERATE LIMIT CONDITION EXIST     |
| 2000                                 | 6   | FUEL INJECTION PUMP CONT VALVE ERROR                |
| 2000                                 | 13  | SECURITY VIOLATION PROPER CONT NOT INSTALLED        |

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**Section 5 - Procedures****Service and Maintenance****5.1-4 Replace Engine Oil and Filter**

Maintaining the engine components is essential to good performance and service life of the telehandler.

Periodic replacement of the engine oil and filter is essential to good engine performance.

**NOTE**

Perform this operation after warming the engine to normal operating temperature.

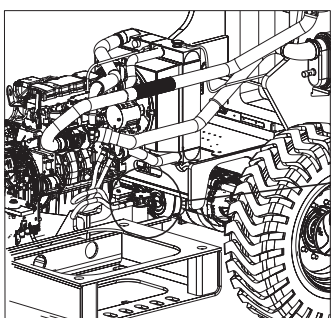
**CAUTION**

**Beware of hot engine components. Contact with hot engine components may cause severe burns.**

**CAUTION**

**When draining hot oil, there is a risk of scalding. Do not let used oil run into the soil, rather collect it in a container. Dispose of this in accordance with environmental regulations.**

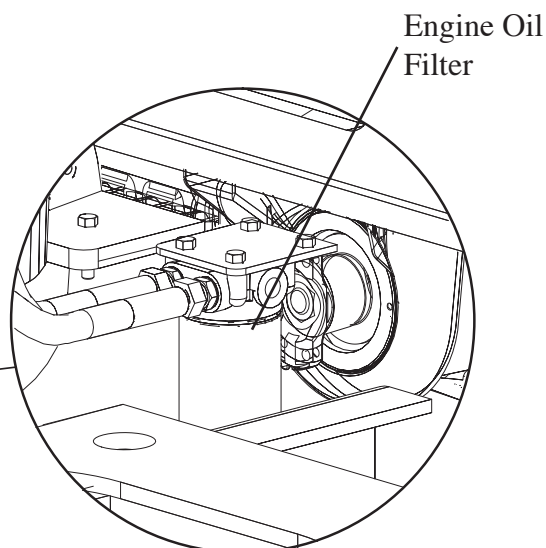
1. Ensure telehandler is on a firm level surface.
2. Allow engine to warm up.
3. Locate engine side door behind operator's cab.
4. Remove locking pins and lift up engine side doors so that engine components are accessible.
5. Place suitable container under engine.
6. Remove oil drain plug and allow all engine oil to drain into container.
7. Install oil drain plug with new seal ring and tighten firmly.



8. Remove oil filter and catch any escaping oil.
9. Clean inside the filter head.
10. Add clean engine oil to oil filter.
11. Apply a thin layer of engine oil to the new oil filter gasket.
12. Install filter and tighten it by hand.
13. Clean up any oil that may have spilled during this procedure.
14. Refill engine with new oil as per specifications (refer to [Table 2.2](#)).
15. Start engine and allow it to run for 30 seconds then stop the engine.
16. Check for oil leakage.
17. Check engine oil level on dipstick and add oil if needed.
18. Close engine side doors and reinstall locking pins.

**NOTE**

Refer to your national/local regulations on how to dispose of used filter and oil.



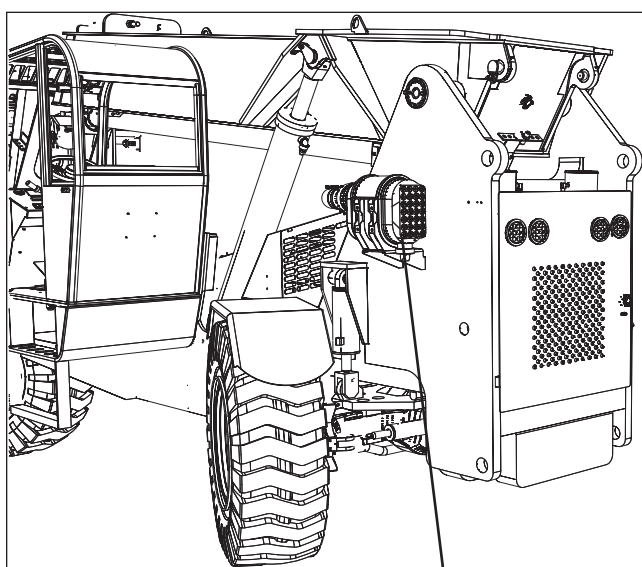
**Service and Maintenance****Section 5 - Procedures****5.1-5 Check Engine Air Filter**

Check the air cleaner vaccuator valve if applicable. Squeeze the valve lips and remove any dirt or dust. It should expel dust and dirt continuously when the engine is running.

Inspect the condition of both the primary and safety elements and replace if required.

**WARNING**

**Do not remove the inner safety filter unless it is damaged or dirty.**

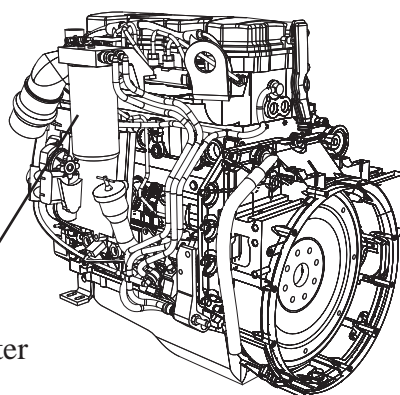


Air Filter

**5.1-6 Replace Fuel Filter**

1. Ensure telehandler is on a firm level surface.
2. Remove locking pins on engine side doors and lift them up so that engine components are accessible.
3. Use the filter drain valve to drain fuel out of the filter for approximately 5 seconds.
4. Disconnect the water-in-fuel sensor from the wiring harness
5. Remove fuel filter and catch any escaping fuel.
6. Clean any dirt from filter carrier sealing surface.

7. Apply a thin layer of oil or diesel fuel to rubber gasket of new fuel filter.



Fuel Filter

8. Install fuel filter and tighten it by hand.
9. Connect the water-in-fuel sensor to the wiring harness.
10. Bleed the fuel lines by loosening the bleed screws.
11. Operate the hand lever until the fuel flowing from the fitting is free of air.
12. Tighten the bleed screws.
13. Clean up any fuel that may have spilled during this procedure.
14. Close engine side door and reinstall locking pins.

**NOTE**

Refer to your national/local regulations on how to dispose of used filter and oil.

**5.1-7 Check Fan Drive Belt**

Remove the drive belt and check that the automatic tensioner turns freely:

- With no play on bearing.
- Spring in tensioner hasn't become weak or broken.

**Section 5 - Procedures****Service and Maintenance****Transmission****5.1-8 Check Transmission Filter Breather**

The transmission and dipstick are accessed underneath the two transmission cover plates at the transmission mount.

Clean the transmission breather and surrounding area.

12. Add oil as needed to fill up to the required level.
13. Install transmission cover plates and tighten bolts.

**NOTE**

Refer to your national/local regulations on how to dispose of used filter and oil.

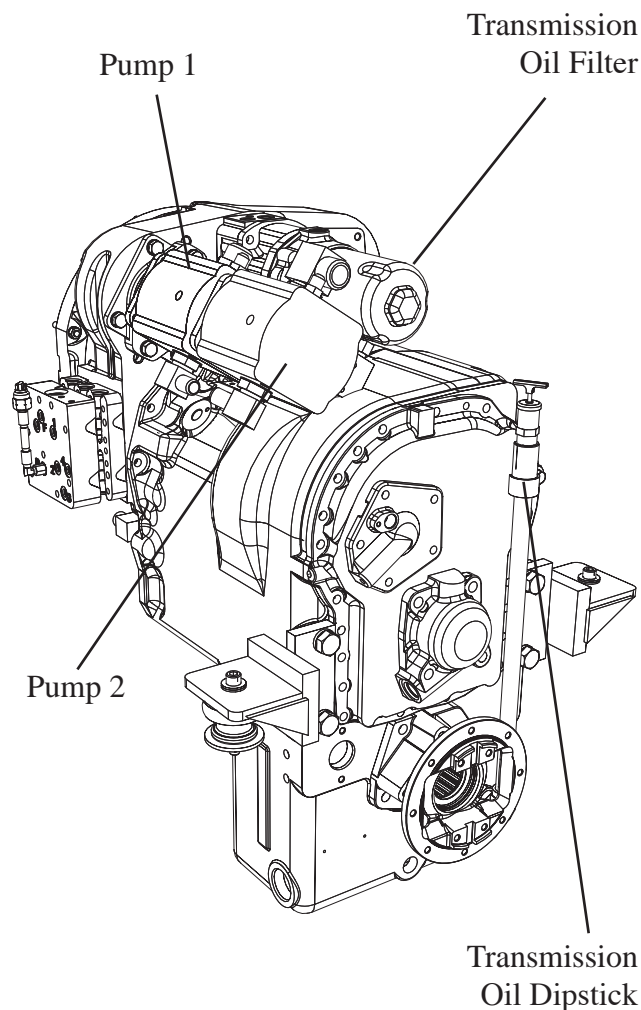
**5.1-9 Change Transmission Fluid and Filter****WARNING**

Ensure the following:

- Telehandler is parked on level ground.
- Engine is turned off.
- Parking brake on
- Wheels are blocked

Raise the boom high enough to allow access and lock out the ignition switch.

1. Remove bolts from two transmission cover plates.
2. Remove transmission cover plates so that Transmission components are accessible.
3. Place a suitable container under transmission.
4. Remove the transmission drain plug and drain the oil.
5. Remove the sump screen and clean with varsol and compressed air.
6. Replace the sump screen gasket.
7. Install the sump screen and replace the oil drain plug
8. Replace the Transmission oil filter.
9. Refill the transmission with the correct fluid and check the level on the dipstick "Full". (refer to [Table 2.2](#))
10. Check for oil leakage
11. Start the engine and check oil level with the engine running.

***T32000 Transmission***





## Service and Maintenance

## Section 5 - Procedures

## Hydraulic System

## 5.2-1 Check Hydraulic Oil

Maintaining the hydraulic components and hydraulic oil at the proper level are essential to good performance and service life of the telehandler.

The telehandler must be on level ground and all cylinders retracted when checking oil level.

Refer to oil sight gauge on side of tank to check that the hydraulic fluid is within 4 inches below the top of the tank.

## 5.2-2 Change Hydraulic Tank Filter

**NOTE**

The filter does not need to be changed unless the service indicator is showing at the top of the filter. If the indicator is past the 3.4 green mark, change the filter. Should the indicator not be showing at 250 hours, check the unit. Check the service indicator daily. Change the return filter when the filter gauge indicates a dirty element.

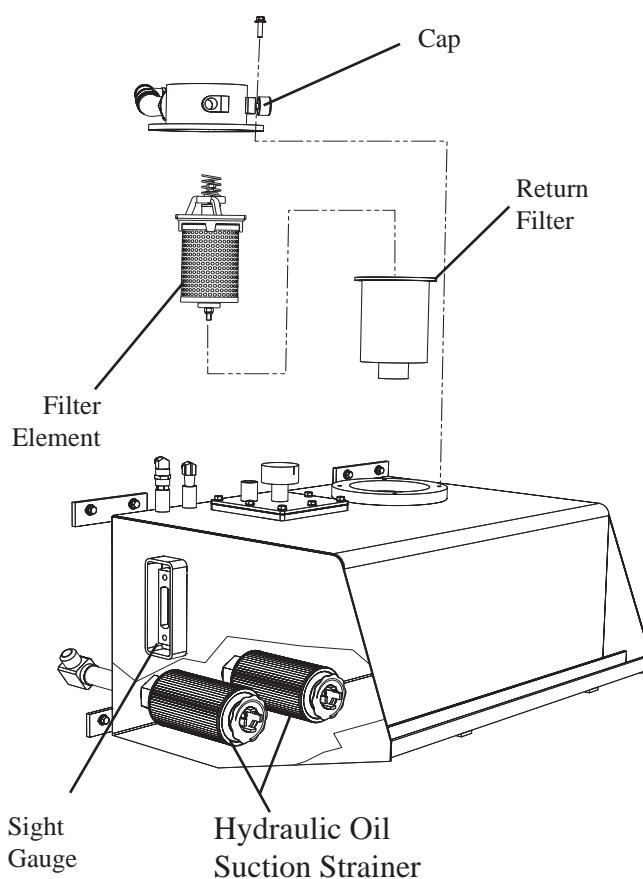
1. Ensure telehandler is on a firm level surface, is in stowed position and engine is off.
2. Place suitable container under the hydraulic tank filter.
3. Remove oil filter and catch any escaping oil.
4. Clean inside the filter head.
5. Apply a thin layer of clean hydraulic oil to the new oil filter gasket.
6. Install filter and tighten firmly.
7. Clean up any oil that may have spilled during this procedure.
8. Start engine.
9. Check for leakage.

**NOTE**

Refer to your national/local regulations on how to dispose of used filter and oil.

## 5.2-3 Change Hydraulic Oil

1. Ensure telehandler is on a firm level surface and is in stowed position.
2. Allow hydraulic oil to warm up.
3. Turn off the engine.
4. Place suitable container under the hydraulic tank.
5. Remove oil drain plug and allow all hydraulic oil to drain into container.
6. Install oil drain plug with new seal ring and tighten firmly.
7. Refill hydraulic tank with new oil as per specifications. (refer to [Table 2.2](#) of this manual)
8. Check for leakage.
9. Clean up any oil that may have spilled during this procedure.
10. Check hydraulic oil level. (The hydraulic oil level should be at or slightly above the top mark on the sight gauge)



*Hydraulic Oil Tank*



**Section 5 - Procedures****Service and Maintenance****NOTE**

Refer to your national/local regulations on how to dispose of used filter and oil.

**NOTE**

Samples of hydraulic oil should be drawn from the reservoir and tested annually. These samples should be taken when the oil is warmed through normal operation of the system. The sample should be analyzed by a qualified lubrication specialist to determine if it is suitable for continued use. Oil change intervals will depend on the care used in keeping the oil clean, and the operating conditions. Dirt and/or moisture contamination will dictate that the oil should be changed more often. Under normal use and operating conditions, the hydraulic oil should be changed every two years. Refer to [Table 1.1](#) of this manual.

**5.2-4 Bleeding Hydraulic Circuits****NOTE**

Whenever a hydraulic system is opened up, it is necessary to bleed or purge the air from the circuit that was opened.

**Bleed Carriage Tilt Circuit**

1. Tilt carriage to full forward position.
2. Raise boom fully while extending boom to keep carriage ahead of the front tires.
3. Tilt carriage to full backward position.
4. Lower and retract boom fully.
5. Tilt carriage forward as much as possible and raise boom to facilitate tilting carriage fully forward.
6. Repeat steps 1 through 5, five times
7. Check for air in the system by leveling forks and raising and lowering the boom several times while watching the forks to see if they stay level. If the forks do not stay level repeat above steps and re-check.

**Bleed Boom Extend/Retract Circuit**

- Fully extend and retract boom several times with boom level.

**Bleed Boom Raise/Lower Circuit**

- Fully raise and lower the boom several times. Ensure carriage remains ahead of the front tires.

**Bleed Frame Level Circuit**

- Tilt telehandler fully side to side several times with boom in a low position.

**Bleed Auxiliary/Optional Circuits**

- Operate function fully in both directions several times.

**Bleed Outriggers Circuit**

- Fully lower and raise outriggers several times.

**Bleed Brake Circuit**

1. With engine running depress and hold brake pedal. The hydraulic pump will constantly supply fluid; there is no need to pump the brake pedal.
2. Locate bleeder fittings on top of brake calipers at each wheel.
3. Starting with the fitting furthest from the pedal and working your way to the closest, slightly open each bleeder and close when hydraulic oil comes out clear.
4. Slowly loosen hose fitting at pressure switch shuttle valve on left frame rail. Tighten when fluid comes out clear.



## Service and Maintenance

## Section 5 - Procedures

### Pressure Adjustment Procedures

#### NOTE

- All pressure adjustments are to be made at idle with telehandler on a level surface, park brake applied, and wheels chocked.
- Procedures require two persons; one to operate functions and another to check and adjust pressures.

#### 5.3-1 Piston Pump Pressure

1. Park the machine on a firm level surface, apply the park brake and chock the wheels.
2. Raise and support the boom so the lifting attachment is at least 7 ft. up.
3. Install a pressure gauge (4000 psi minimum) to test ports TP4 and TP5.
4. Remove and plug load sense lines at both pumps.
5. With engine running check pressure reading; 500 psi for P1 (TP4), 550 psi for P2 (TP5).
6. Adjust as required at front adjuster by loosening jam nut and turning center screw clockwise to increase pressure and counter clockwise to decrease pressure.
7. When correct pressure is obtained, tighten jam nut.
8. Shut engine off and re-install load sense lines at both pumps.
9. With engine running hold the extend function in the retract position and check pressure reading; 3150 psi for P1 (TP4), 3200 psi for P2 (TP5).
10. Adjust as required at rear adjuster by loosening jam nut and turning center screw clockwise to increase pressure and counter-clockwise to decrease pressure.
11. When correct pressure is obtained, tighten jam nut.

#### 5.3-2 Port Relief Pressure

1. Locate the main hydraulic valve mounted between the main frame rails, in the center of the frame.
2. Connect a pressure gauge (4000 psi minimum) to the test port TP6 located on the fitting at the P port of the main control valve.
3. Dead-end the desired function and note pressure reading on gauge.
4. Compare gauge reading to pressure settings chart (refer to [Table 2.5](#)) and adjust as necessary at the corresponding port relief valve. Adjust by loosening jam nut and turning center screw clockwise to increase pressure or counter-clockwise to decrease pressure. When correct pressure is achieved tighten jam nut and re-check pressure.

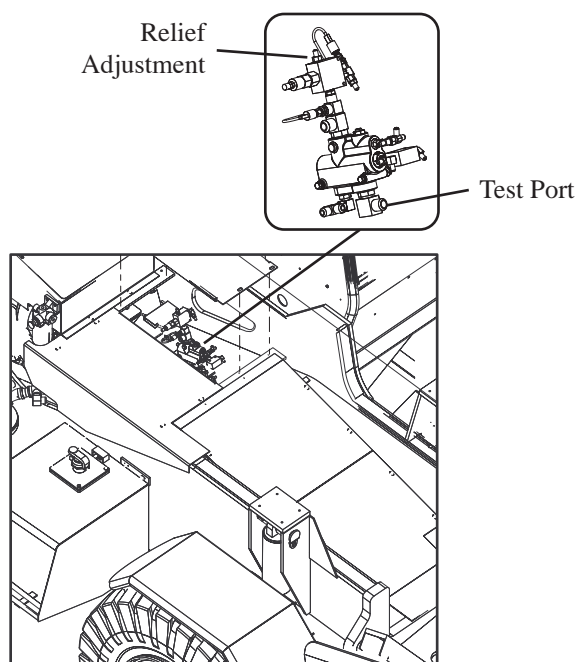


## Section 5 - Procedures

## Service and Maintenance

### 5.3-3 Priority Valve Relief Pressure

1. Locate the priority valve PRT1.
2. Connect a pressure gauge (3000 psi minimum) to test port TP5.
3. Turn the steering wheel to full lock position and note pressure reading on gauge.
4. Compare gauge reading to pressure settings chart (refer to [Table 2.5](#)) and adjust as necessary by loosening jam nut and turning center screw clockwise to increase pressure, or counter-clockwise to decrease pressure.
5. Repeat steps 3 and 4 until correct pressure is achieved. Tighten jam nut and re-check pressure.



*Priority Valve Pressure Adjustment*

### 5.3-4 Pilot Pressure

1. Locate the pressure reducing valve PRV1.
2. Connect a pressure gauge (500 psi minimum) to test port TP6 at the pressure reducing valve by removing acorn nut and brass sealing washer, loosening jam nut and turning center screw clockwise to increase pressure, or counter-clockwise to decrease pressure. When correct pressure is obtained, tighten jam nut and install acorn nut with brass sealing washer.

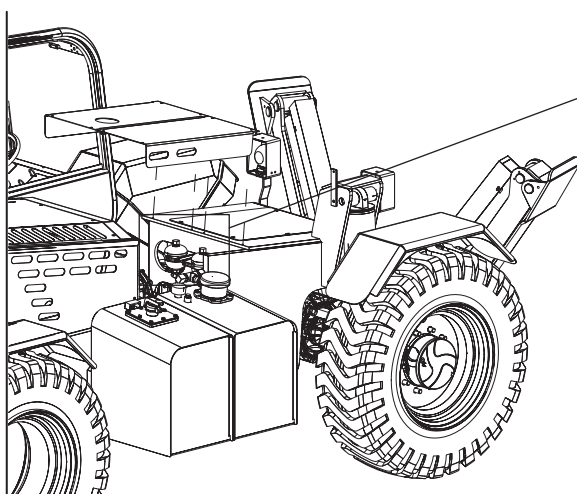


### 5.3-5 Check Brake Accumulators

1. Actuate brake pedal until very little pedal resistance is felt.
2. Start engine, brake pressure light on the dash should come on. The engine should have a slight labouring sound. After idling for 30 seconds, the light should go out and there should be a noticeable difference in engine sound when it stops labouring. Accumulators should now be charged and the brake pressure light on the dash should now be off.
3. Depress the brake pedal 2 to 3 times and you should hear the engine again begin to labour for 10 to 15 seconds. The brake charge cycle should occur somewhere in the range between 30 seconds to 5 minutes and more often when brakes or pilot operated functions are used.
4. Turn off engine.
5. Turn ignition key to on position only (do not restart engine).
6. Depress brake pedal and release, repeating the process.

#### NOTE

- Keep count of the number of times the pedal is depressed.
- After 5 to 6 depressions, the brake pressure light should come on.
- It may take over 20 depressions to completely discharge accumulators



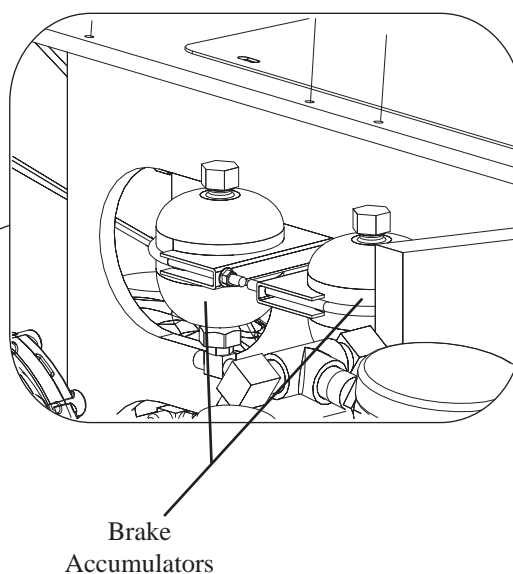
### 5.3-6 Charging Brake Accumulators



#### WARNING

**Never try to check accumulators with a tire gauge type tester as it will cause a loss of nitrogen gas; which is very cold when discharged.**

1. Ensure engine is turned off and depress brake pedal 10 to 12 times to empty accumulators of any oil pressure.
2. Attach proper gauge and nitrogen charge kit.
3. Charge accumulators to 650 psi.



**Section 5 - Procedures****Service and Maintenance****5.3-7 Charging Rear Axle Lock System****DANGER**

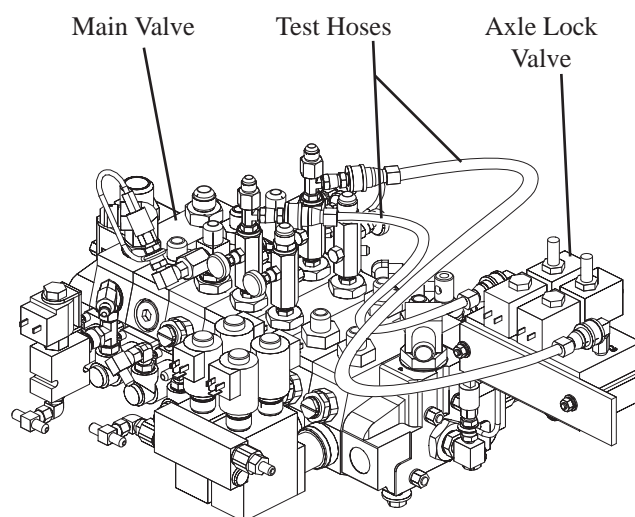
- Frame leveling should not be attempted when boom is elevated.
- Boom should be in travel position (24" off the ground).
- Very unstable conditions will result if frame leveling is attempted when rear axle is in the lock position.

**NOTE**

The accumulator is pre-charged with nitrogen gas to 175 psi.

1. Connect the ends of 2 test hoses supplied with telehandler to the quick disconnect ports at the main valve (Frame level section) and the other ends to the rear axle lock valve ports. (See picture below).
2. Remove the ground cable or the limit switch cable connections
3. Actuate the frame level control valve to tilt the frame from side to side while holding the valve open at end of each cycle for several seconds to fully pressurize the system. This will help eliminate any air in the system.
4. Repeat step 3 four times.
5. Tilt the frame fully to the right.
6. Two of the solenoids in the rear solenoid-mounting block have manual unlocking capabilities. These are unlocked by pulling up on the knob and turning 90° so the point sits on top of the "V" stem. This position allows free flow through the lock valve for charging and will also equalize the pressure between the rod and the base ends of the axle lock cylinder.
7. Relieve the pressure on the axle lock valve by moving the rear joystick controller from left to right 4 to 5 times.
8. Remove the quick disconnect hoses at both ends and leave in frame.
9. The two manual solenoid overrides should now be returned to their closed position.

10. Check system for proper operation by attempting to level frame to the left until the left wheel starts to lift off the ground. Level frame fully to the right.
11. Attach ground cable or limit switch cable connections.
12. Cycle frame level from left to right. (Rear axle cylinder should stroke fully in both directions).



***Charging Rear Axle  
Lock System***

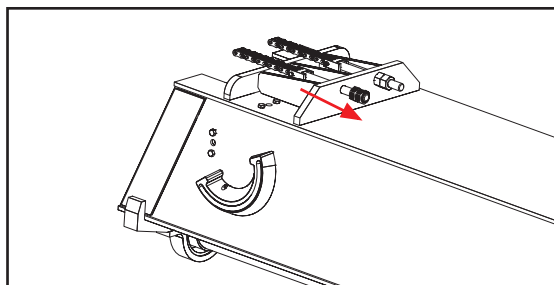
**Service and Maintenance****Section 5 - Procedures****Boom****5.4-1 Boom Hose Replacement****IMPORTANT**

**If there is evidence of a fluid leak in the boom sections, check first to make sure there are no loose hydraulic fittings before attempting to change the hoses in the boom.**

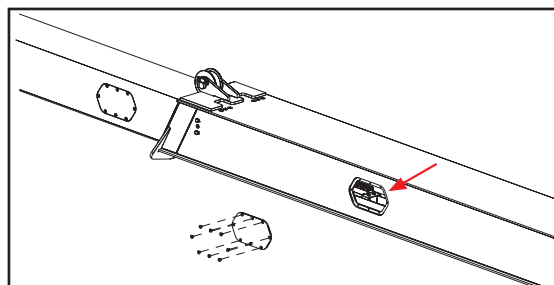
**NOTE**

The hydraulic hoses inside the boom (carriage tilt, optional hydraulics) are stretched over the roller to prevent sagging and premature wear. Use only the size, spec. and length of hose as specified in the parts manual.

1. Loosen chain adjusting nut to end of adjuster.

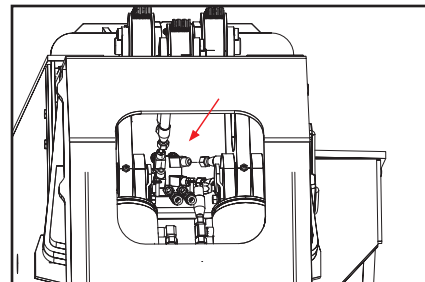


2. Extend boom just enough to allow removal of side access plates on secondary section. Then retract slightly to put slack in extend chains



3. With side access plate off, tie a rope around tensioning bracket, loosen hydraulic fittings of hose to be replaced and remove bolts holding bracket to boom.

4. Remove hose from bulkhead on main boom section (bottom of boom) and attach new hose to old hose with a short union.
5. Remove hose from bulkhead on tension bracket and pull hose through front of boom taking care not to pull too far and lose hose inside bottom of boom. It may be necessary to either temporarily remove roller or raise primary section at the rear to get the fittings around the roller.

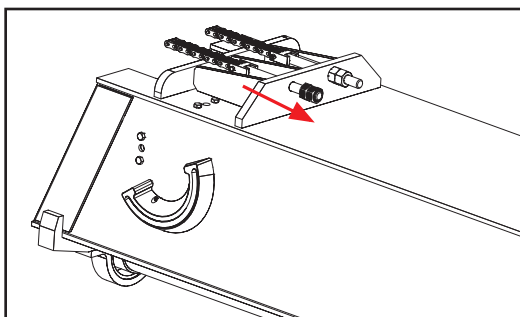


6. Attach new hose at both ends and leave loose.
7. Pull rope attached to tension bracket and bolt bracket to boom.
8. Extend and retract boom several times.
9. Tighten hose fittings 38-42 ft. lb (52-58 Nm) taking care not to twist hose.
10. Install access plate, tension chain, and bleed hydraulic circuit (refer to [Section 5.2-4](#) of this manual).

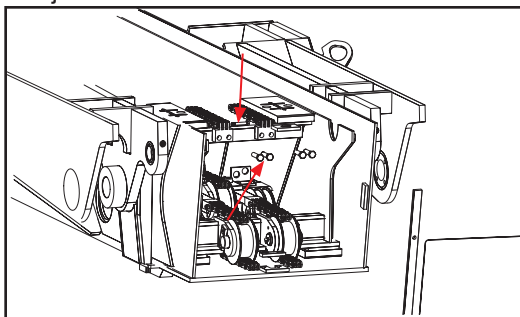


**Section 5 - Procedures****Service and Maintenance****5.4-2 Boom Chain Replacement and Adjustment****Extend Chain**

1. With boom level loosen extend chain adjustment nut until nut is at the end of the adjuster.



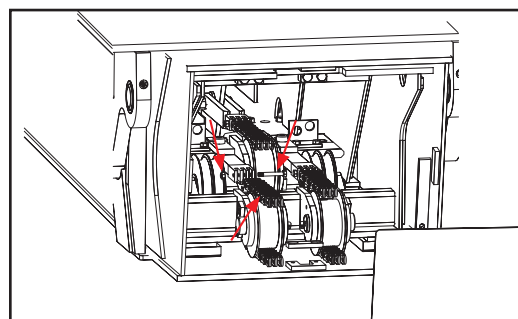
2. Extend boom 8".
3. Retract boom just enough to put slack in extend chain.
4. Remove access door at rear of boom and remove center bracket.
5. Remove two bolts holding extend chain anchor to primary boom section.
6. Remove bolt that attaches extend chain to adjuster.



7. Attach new chain to existing chain and pull through.
8. Pull the rest of the chain through and disconnect old chain from new.
9. Remove chain anchor from old chain and install on new chain with new 5/16" grade 8 bolt and lock nut.
10. Attach chain anchor to primary boom section with 2 new grade 8 bolts.

**Retract Chain**

1. With boom level and retracted remove retract chain anchor nut through access hole at rear bottom sides of boom.
2. With adjustment nut loose extend boom slightly and secure secondary from moving out.
3. Remove retract chain anchor bolt at rear where anchor attaches to secondary boom.



4. Extend boom enough to allow removal of retract chain anchor from main boom section.
5. Remove rear anchor from chain and attach new chain to existing chain and anchor to new chain.
6. Remove retract chain anchor from main boom section at front of boom and pull through
7. Disconnect old chain from new chain and attach anchor from old chain onto new chain
8. Bolt front anchor to main boom section
9. Attach chain anchor to secondary section at rear of boom. It may be necessary to retract boom and manually, via ratchet strap, retract secondary section



## Service and Maintenance

## Section 5 - Procedures

### Chain Adjustment

1. Fully extend boom when level
2. Retract boom a few inches and tighten adjustment nut on top of main boom until there is no droop in chain
3. Repeat above step until there is 1/2" droop while retracting boom from full extension

### 5.4-3 Check Slide Pads

1. With telehandler parked on a level surface and park brake applied remove access door at rear of boom.
2. Measure slide pad thickness (top and bottom of each boom section) inside rear of boom.
3. Raise boom slightly and extend boom approximately 6' (2M). Measure slide pad thickness (top, bottom and sides of each boom section) at front end of boom.
4. Replace any pads that are less than 3/4" (19mm) thick.
5. Shim all slide pads as required. (more than 1/8" or 3mm gap)

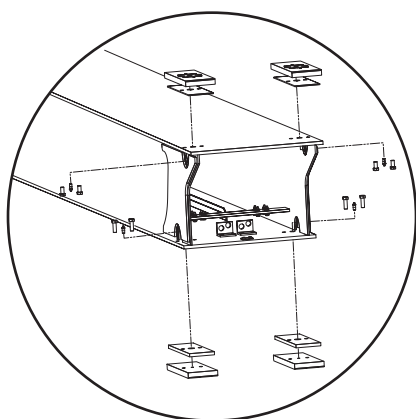
3. Add shims as required to obtain 0-1/16" (0-1.5mm) clearance with no drag.
4. Apply Loctite® 609 to bolts and torque to 100 ft.lb. Re-torque after 10min. and within 15min. of initial torque.
5. Raise boom slightly and extend boom approximately 6 ft. (2M).
6. Use steps 2 through 4 for slide pads at the front of boom. To remove side front slide pads pry boom section away from slide pad and place a support/hook under pad then remove bolts and pads.

### NOTE

Always maintain squareness between the booms outer and inner tube.

### 5.4-4 Replacing and Shimming Slide Pads

1. With machine parked on a level surface and park brake applied remove access door at rear of boom.
2. Remove grease fittings and bolts of slide pads to be shimmed/replaced. (Do not use heat)





**Section 5 - Procedures****Service and Maintenance****Axles****5.5-1 Change Oil in Axles**

1. Ensure telehandler is on a firm level surface and is in stowed position.
2. Turn off engine.
3. Place suitable container under the axle
4. Remove fill plug.
5. Remove drain plug to allow oil to drain into container.
6. Reinstall all drain plugs.
7. Remove check plug.
8. Refill axle with new oil as per specifications. (refer to [Table 2.2](#))

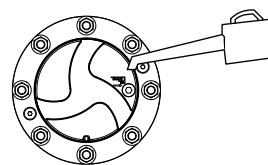
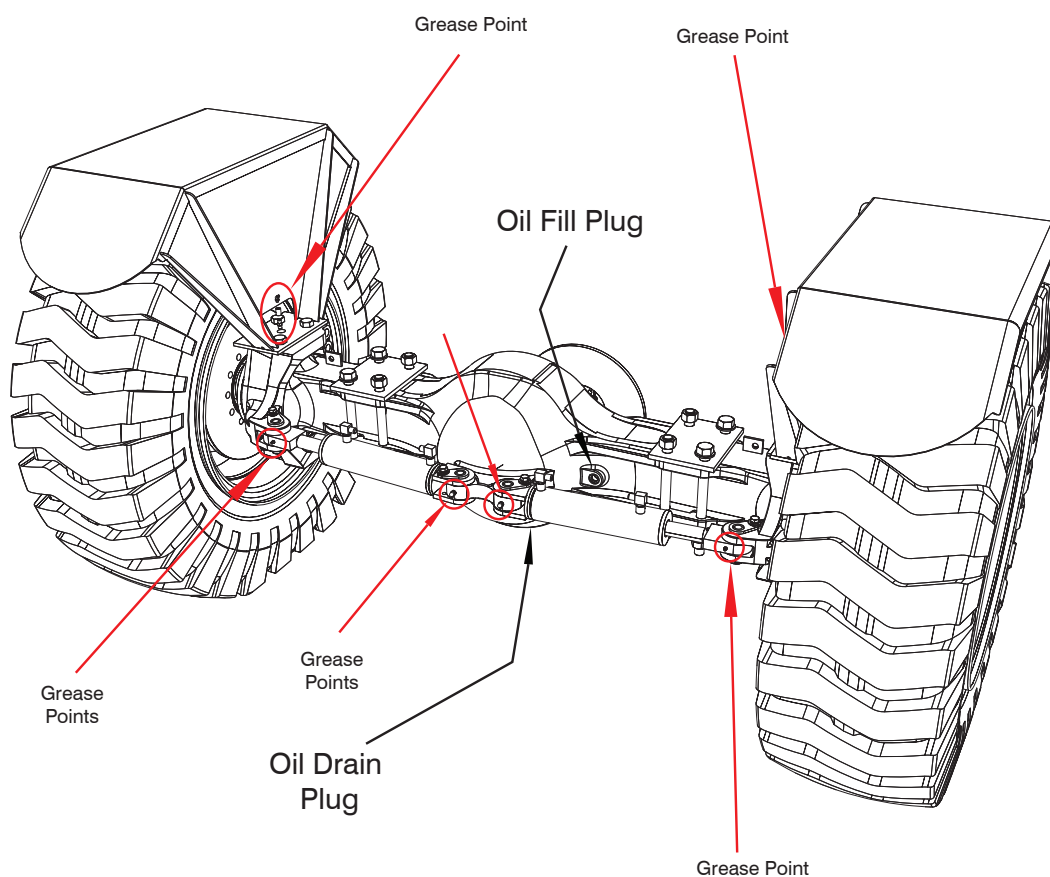
**NOTE**

Axle is filled when oil is leaking from the check port.

9. Reinstall both fill and check plugs.

**5.5-2 Check Oil Level in Torque Hub**

1. Drive the telehandler to rotate the hub until the plug is located at 90 degrees.
2. Remove the plug and check the oil level. The oil level should be even with the bottom of the plug hole. Add oil if needed. (refer to [Table 2.2](#) for oil specifications)

**Drive Torque Hub****Front or Rear Axle**



## Grease Points

### NOTE

Brush-on dry lubricant may be applied in the field where greasing is undesirable. This may be the case in extremely sandy conditions, where abrasive particles can become entrapped in the grease. (refer to [Table 2.2](#) for recommended grease and fluid types and greasing intervals).

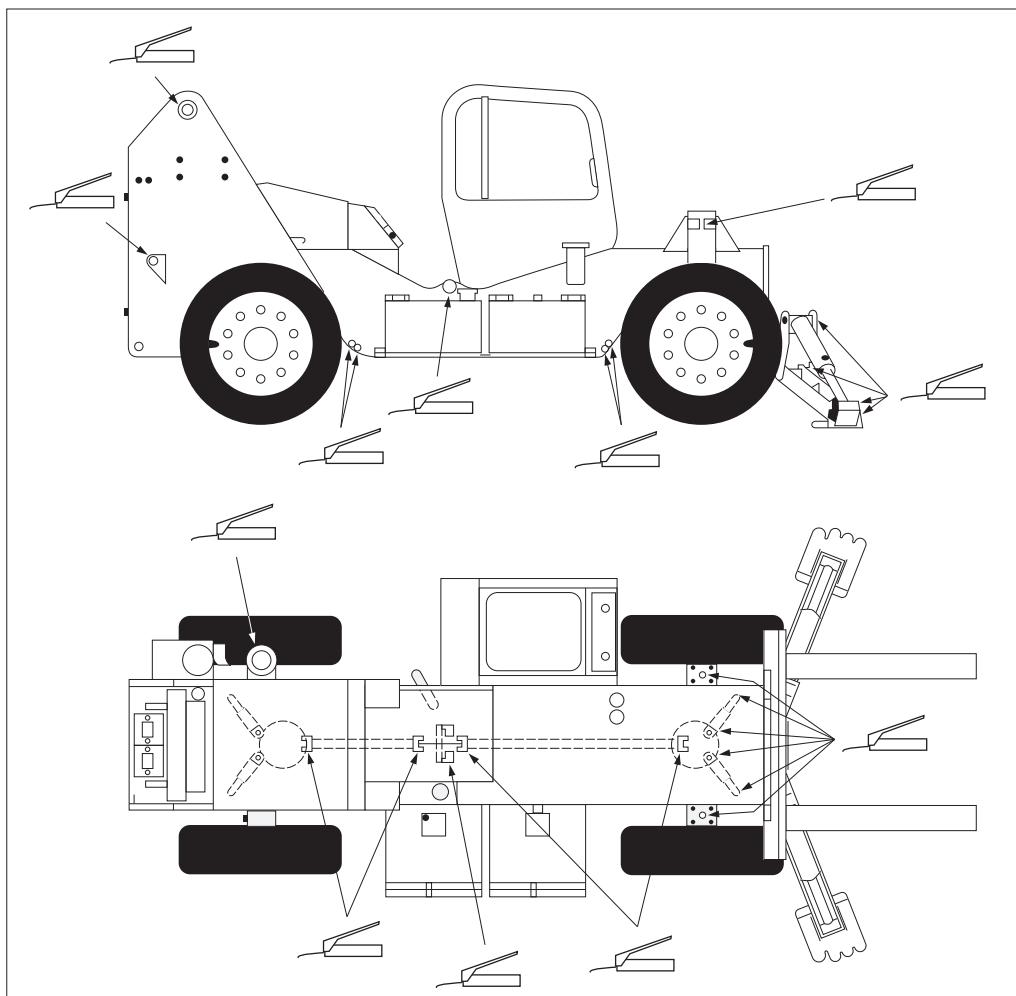
### 5.6-1 Frame Grease Points

Add grease to the following components. Ensure grease reaches the bearing internals.

- Brake pedal pivot pin
- Lift cylinders
- Axle lock cylinder
- Frame level cylinder
- Slave cylinders
- Outtrigger pins

### NOTE

When greasing cylinders, pump grease into grease fittings located on both the base end and the rod end of the cylinder.



*Frame Grease Points*



## Section 5 - Procedures

## Service and Maintenance

### 5.6-2 Boom Grease Points

#### NOTE

Grease should be applied if any of the following occur:

- Pulsating or erratic boom operation, especially on retract.
- Appreciable loading of the hydraulic system also while retracting the boom in the horizontal position, or
- Noticeable wear of the high-load flange surfaces of the boom

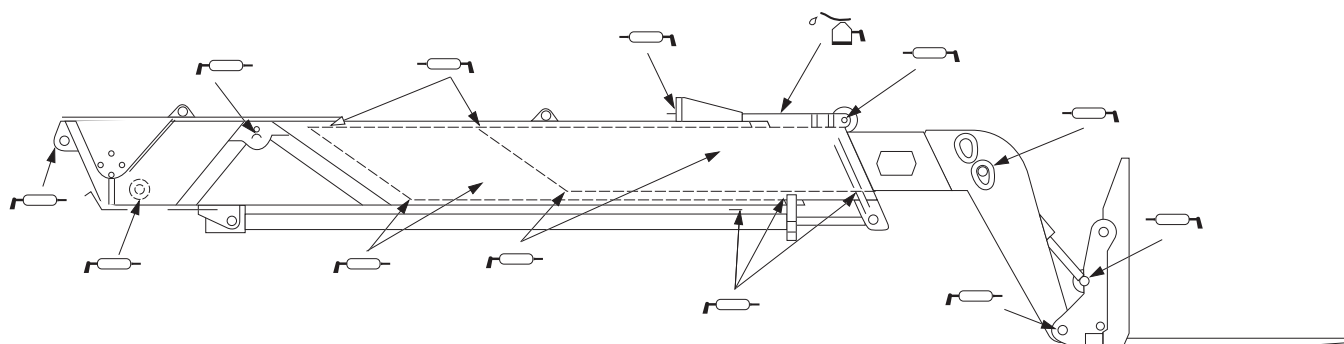
Add grease to the following components. Ensure grease reaches the bearing internals.

- Main boom pivot bearings
- Carriage tilt cylinders
- Carriage pivot bearings
- Extension chain rollers
- High load slide pads \*
- Retract chain roller
- Hose rollers
- Oil extension chain

Extend boom and rest it on the ground. Wipe the exposed portion of the extension chain with oil.

\* Lubricate the rear top pads (4 places) on the primary and secondary booms through the door at the rear of the boom while the boom is fully retracted.

Lubricate the front bottom pads (4 places) on the main and primary booms while the boom is also fully retracted.



*Boom Grease Points*

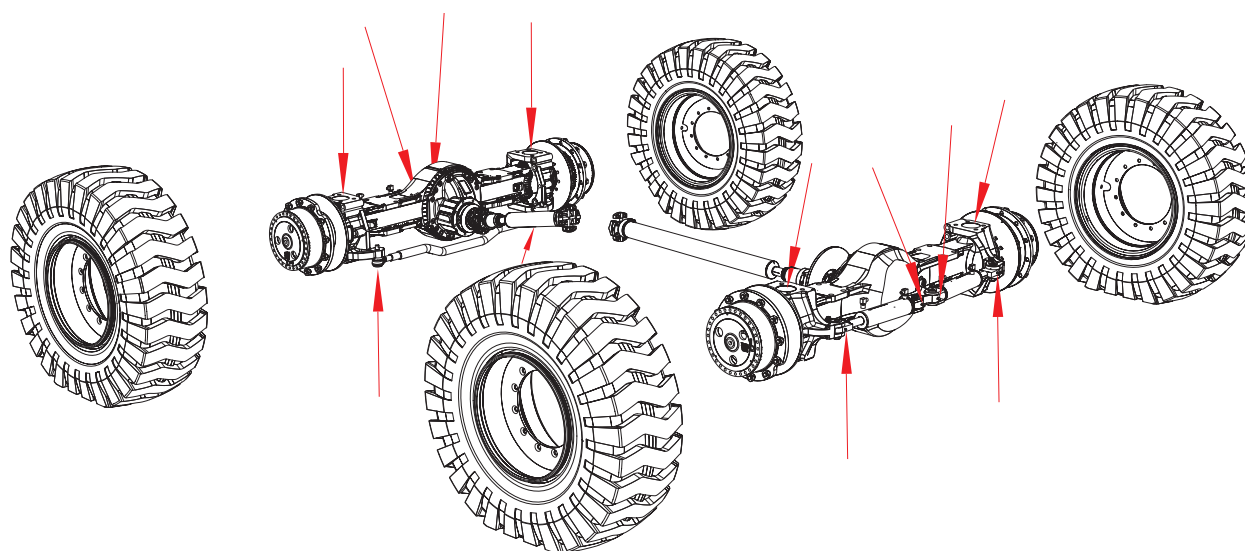


### 5.6-3 Drive Axle Grease Points

1. Ensure telehandler is on a firm level surface and is in stowed position.
2. Open axle cover plate and locate grease fitting. (See diagram below)
3. Pump grease into the grease fittings.

### 5.6-4 Drive Shaft Grease Points

1. Locate the grease fittings on the drive shaft and pump grease. (See diagram below)



*Axles & Drive Shafts Grease Points*



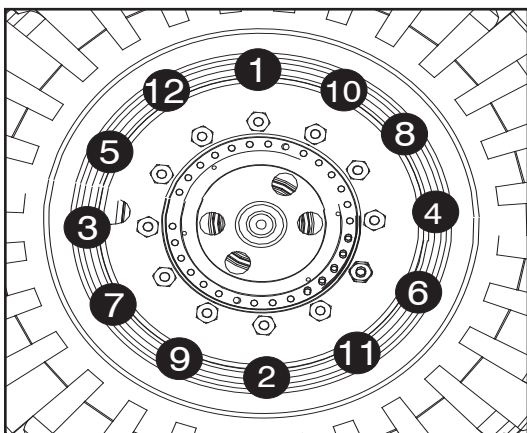
## Section 5 - Procedures

## Service and Maintenance

### Tires

#### 5.7-1 Check Lug Nut Torque

1. Tighten wheel nuts to an initial torque reading of 50-100 ft-lbs, dry, in the sequence shown below.



2. Re-tighten wheel nuts to a torque of 450-500 ft-lbs, dry, in the sequence shown above.
3. When the wheels are removed and reinstalled, check the nuts after eight (8) hours of operation.
4. If nuts are tight after the eight hour check, the interval for checking with a torque wrench can be extended to 250 hours.









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