



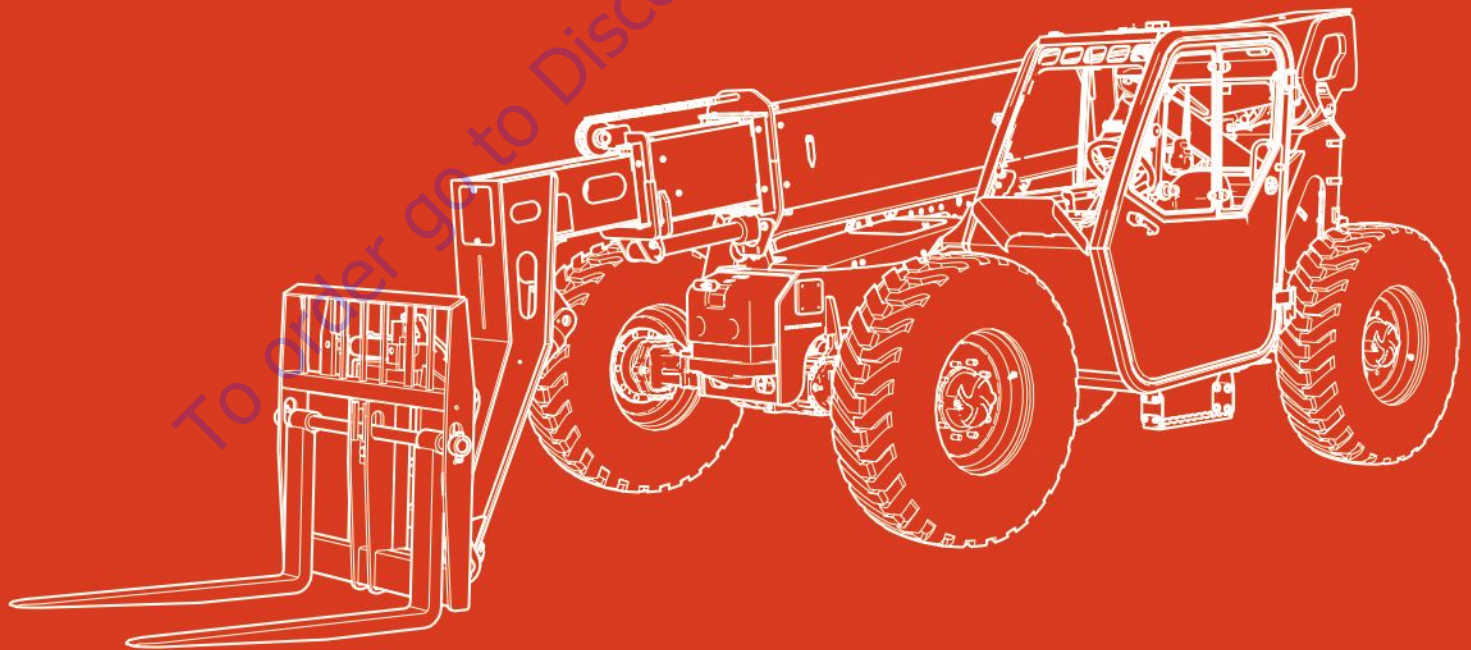
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SKYJACK

SERVICE MANUAL

SJ643 TH, SJ843 TH

TELEHANDLERS



190127AE

January 2021
ANSI

This manual is based on Serial Number(s):

SJ643 TH & SJ843 TH: 87 110 032 & Above

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THIS SAFETY ALERT SYMBOL MEANS ATTENTION!



BECOME ALERT! YOUR SAFETY IS INVOLVED.

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.

 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.

Table of Contents

Table of Contents	5
Section 1 – Scheduled Maintenance	11
1.1 Read and Heed	11
1.1-1 <i>Telehandler Definition</i>	11
1.1-2 <i>Purpose of Equipment</i>	11
1.1-3 <i>Use of Equipment</i>	11
1.1-4 <i>Manual</i>	11
1.1-5 <i>Service Policy and Warranty</i>	11
1.1-6 <i>Operator Safety Reminders, Warnings and Precautions</i>	11
1.2 Maintenance and Inspection Schedule	12
1.2-1 <i>Owner's Annual Inspection Record</i>	12
1.2-2 <i>Replacement Parts</i>	12
1.2-3 <i>Maintenance and Service Safety Tips</i>	12
1.3 Hydraulic System & Component Maintenance and Repair	13
1.3-1 <i>Maintenance Hints</i>	13
1.4 About this Section	14
1.4-1 <i>Service Bulletins</i>	14
1.4-2 <i>Maintenance and Inspection</i>	14
1.4-3 <i>Maintenance Instructions</i>	14
1.5 Scheduled Maintenance Inspections	16
1.5-1 <i>Labels - A</i>	16
1.5-2 <i>Electrical</i>	16
1.5-3 <i>Mirrors - A</i>	16
1.5-4 <i>Hydraulic</i>	16
1.5-5 <i>Cylinders - A</i>	17
1.5-6 <i>Frame</i>	17
1.5-7 <i>Engine Compartment</i>	20
1.5-8 <i>Transmission</i>	21
1.5-9 <i>Boom - A</i>	21
1.5-10 <i>Lifting Attachment - A</i>	21
1.5-11 <i>Grease Fittings - B</i>	22
1.5-12 <i>Operator's Cab</i>	22
1.6 Function Tests	24
Section 2 – Maintenance Tables	25
2.1 Standard and Optional Equipment	26
2.2 Specifications and Features	27
2.3 Tire/Wheel Specifications	28

2.4	Recommended Fluids/Lubrication	29
2.5	Pressure Setting	30
2.6	Standard Hose Numbering System	31
2.7	Torque Specifications for Fasteners (US)	33
2.8	Torque Specifications for Fasteners (Metric)	34
2.9	Torque Specifications for Hydraulic Couplings & Hoses	35
2.10	Air Conditioner Temperature/Pressure Chart	36
Section 3 – System Component Identification and Schematics		37
3.1	Electrical Symbol Chart	38
3.2	Hydraulic Symbol Chart	39
3.3	Electrical Schematic Parts List	40
3.4	Hydraulic Schematic Parts List	43
3.5	Hydraulic Pump and Return Filter Ports Identification	45
3.6	Steering Control Unit Ports Identification	46
3.7	Service Brake Actuator (Brake Pedal) Ports Identification	47
3.8	Auxiliary Block Ports Identification	48
3.9	Joystick Port Identifications	49
3.10	Premium Joystick Port Identifications	50
3.11	Premium Joystick Manifold Port Identifications	51
3.12	Optional Reserve Brake Manifold Port Identification	52
3.13	Major Components Identification and Location	53
3.14	Main Control Valve Port Identification	54
3.15	Enclosed Cab Harness & Wiring Diagram	57
3.16	Glow Plug Harness & Wiring Diagram	58
3.17	Road Lights Harness & Wiring Diagram	59
3.18	Work Lights Harness & Wiring Diagram	60
3.19	Boom Lights Harness & Wiring Diagram	61
3.20	Beacon Light Harness & Wiring Diagram	62
3.21	Elevate Telematics Harness	63
3.22	A/C Harness	64
3.23	Heater & A/C Harness	65
3.24	CVT Vehicle Harness	66
3.25	CVT Transmission Harness	67
3.26	Console Harness and Layout	68
3.27	Console Harness Wiring Diagram	69
3.28	Engine Harness	70
3.29	Engine Harness Wiring Diagram	71
3.30	Chassis Harness	72
3.31	Chassis Harness Wiring Diagram	73
3.32	Electrical Schematic	74
3.33	Electrical Schematic - Premium Joystick	77
3.34	Electrical Schematic for CVT	80

3.35	Electrical Schematic for CVT with Premium Joystick	84
3.36	Hydraulic Schematic	88
3.37	Hydraulic Schematic (Reserve Brake Option)	89
3.38	Hydraulic Schematic - Premium Joystick	90
3.39	Hydraulic Schematic (Reserve Brake) - Premium Joystick	91

Section 4 – Troubleshooting Information 93

4.1	Introduction	93
4.2	Electrical System	94
4.2-1	<i>Engine Will Not Crank</i>	94
4.2-2	<i>Engine Cranks But Will Not Run</i>	95
4.2-3	<i>All Electrical Controls Inoperative</i>	95
4.2-4	<i>Park Brake Will Not Release</i>	96
4.2-5	<i>Transmission Will Not Engage</i>	97
4.2-6	<i>No Forward Drive</i>	97
4.2-7	<i>No Reverse Drive</i>	98
4.2-8	<i>No 1st Speed Range</i>	98
4.2-9	<i>No 2nd Speed Range</i>	98
4.2-10	<i>No Boom Up, Front Steer Mode Only</i>	99
4.2-11	<i>Front Steer Mode Only</i>	99
4.2-12	<i>No 4W (Round) Steer Mode</i>	99
4.2-13	<i>No Crab Steer Mode</i>	100
4.2-14	<i>No Boom Up</i>	100
4.2-15	<i>Frame Will Not Tilt Over 40° With Boom Below 40°</i>	101
4.2-16	<i>No Frame Level</i>	102
4.2-17	<i>Function Does Not Switch</i>	104
4.3	Hydraulic System	106
4.3-1	<i>All Controls inoperative</i>	106
4.3-2	<i>No Boom Functions</i>	106
4.3-3	<i>No Carriage Tilt</i>	108
4.3-4	<i>No Frame Level</i>	109
4.3-5	<i>No Aux. functions</i>	110
4.3-6	<i>Hard or No Steering</i>	110
4.3-7	<i>Park Brake will not Release</i>	111
4.3-8	<i>Park Brake Will Not Engage</i>	111
4.3-9	<i>Service Brake Will Not Engage</i>	111

Section 5 – Procedures 113

5.1	General	113
5.1-1	<i>Safety and Workmanship</i>	113
5.1-2	<i>Engine and Transmission</i>	113
5.2	10 Hour or Daily Routine Maintenance	114
5.2-1	<i>Check Engine Oil Level</i>	114

5.2-2	Check Coolant Level, Radiator and Hoses	114
5.2-3	Check Transmission Fluid Level	115
5.2-4	Check Air Cleaner Restriction and Filter Elements	115
5.2-5	Check Hydraulic Oil Level	116
5.2-6	Drain Fuel/Water Separator	117
5.2-7	Fuel Tank	117
5.2-8	Check Parking Brake	117
5.2-9	Check Tire Pressure and Condition	117
5.2-10	Check Seat Belt and Mounting Hardware	118
5.2-11	Check Windshield Washer Fluid Level and Wiper Condition	118
5.3	50 Hour or Weekly Routine Maintenance	118
5.3-1	Grease Axle Pivot Bearings and King Pins	118
5.3-2	Grease Drive Shaft U-joints and slip joints	119
5.3-3	Check Fork Pins	120
5.3-4	Grease Frame Level Pivot Bushings	120
5.3-5	Grease Boom Pivot and Boom Cylinders	120
5.3-6	Grease Bottom Front & Top Rear Slide Pads	121
5.4	250 Hour or Quarterly Routine Maintenance	122
5.4-1	Check Lug Nut Torque	122
5.4-2	Check Oil Level in Axle Differential Planetary wheel Ends	122
5.4-3	Check Oil level in Axle differentials	123
5.4-4	Replace Engine Oil and Filter	123
5.4-5	Change Engine Fuel filter and Fuel/Water Separator	125
5.4-6	Clean Hydraulic Tank Breather	127
5.4-7	Torque Axle Mounting Bolts	127
5.4-8	Inspect Boom Chains	127
5.4-9	Check Boom Slide Pad Clearances	128
5.4-10	Check Boom Chains Tension	130
5.4-11	Chain Tension Adjustment	131
5.5	1000 Hour or Annual Routine Maintenance	132
5.5-1	Change Hydraulic Oil Filter	132
5.5-2	Change Hydraulic Oil and Clean Hydraulic Tank	133
5.5-3	Change Axle Differential Oil	134
5.5-4	Change Axle Planetary Oil	134
5.5-5	Change Engine Coolant	135
5.5-6	Change Transmission Oil and Filter	137
5.5-7	Change Continuously Variable Transmission (CVT) Oil and Filter	139
5.5-8	Inspect Boom Chains	141
5.6	Non-Routine Maintenance	141
5.6-1	Boom Hoses and Sheaves Replacement	141
5.6-2	Boom Chains Replacement	145
5.6-3	Slide Pads Replacement Procedure	149
5.6-4	Hydraulic Pressure Test Procedure	151

5.6-5	<i>Hydraulic Pump Testing Procedure</i>	154
5.6-6	<i>T12000 Modulation</i>	154
5.6-7	<i>Deutz Fault Codes</i>	158
5.6-8	<i>Starter Replacement Procedure</i>	161
5.6-9	<i>Bleeding Hydraulic Circuits</i>	163
5.7	Electronic Tilt Switch Setup Procedure	164
5.7-1	<i>Tilt Switch Replacement</i>	164
5.7-2	<i>Reprogramming Existing Tilt Switch</i>	165
5.7-3	<i>Test and Verify Tilt Circuit</i>	166
5.8	Park Brake Release	168
5.9	Bearing Installation	169

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Section 1 – Scheduled Maintenance

1.1 Read and Heed

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

1.1-1 Telehandler Definition

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

1.1-2 Purpose of Equipment

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

1.1-3 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 boom is fully lowered.

1.1-4 Manual

Operating Manual: 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 purpose of this manual 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 machine. The updated copy of the manuals are found on the company's website: www.skyjack.com.

1.1-5 Service Policy and Warranty

SKYJACK warrants each new product to be free of defective parts and workmanship for the first 2 years or 3000 hours, whichever occurs first. Any defective part will be replaced or repaired by your local SKYJACK dealer at no charge for parts or labor. In addition, all products have a 5 year structural warranty. Contact the SKYJACK Service Department for warranty statement extensions or exclusions.

1.1-6 Operator Safety Reminders, Warnings and Precautions

Operator safety is SKYJACK's priority. The operator should comply with all applicable safety-related reminders, warnings and precautions found in the Operating Manual. They should be read and understood completely before operating the telehandler.

1.2 Maintenance and Inspection Schedule

The actual operating environment of the work platform 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.

1.2-1 Owner's Annual Inspection Record

It is the responsibility of the owner to arrange quarterly and annual inspections of the telehandler. The 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.

1.2-2 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 immediately tagged and removed from service until proper repairs are completed.

1.2-3 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.

Ensure personnel are clear from under unsupported components/systems that are at risk of movement during maintenance.

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.

Before attempting any repair work, disconnect the main power connectors.

Keep personnel clear of components, systems or unsupported loads that may move unexpectedly during maintenance procedures.

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.

1.3 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. Whenever the hydraulic system is drained, check the magnets in the hydraulic reservoir for metal particles. If metal particles are present, flush the entire system and add a new change of oil. The presence of metal particles also may indicate the possibility of imminent component failure. A very small amount of fine particles is normal.
5. 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.
6. When removing any hydraulic component, be sure to cap and tag all hydraulic lines involved. Also, plug the ports of the removed components.
7. 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.
8. 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.
9. 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.
10. 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.

1.3-1 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. They are 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.

1.4 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.

1.4-1 Service Bulletins

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

1.4-2 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.

1.4-3 Maintenance Instructions

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

Issue or Symptom		
PDI/Frequent	B	Perform PDI prior to each delivery, or Frequent Inspection every 3 months or 150 hours.
Annual	B + C	Perform Scheduled Maintenance Inspections every year.
Additional	*	Perform at time sensitive maintenance intervals.

- 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

Pass	P
Fail	F
Repaired	R
Not applicable	N/A

Table 1.1 Maintenance and Inspection Checklist



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 50 Hours	A + B
Quarterly or 250 Hours	A + B + C
Annually or 1000 Hours	A + B + C + D

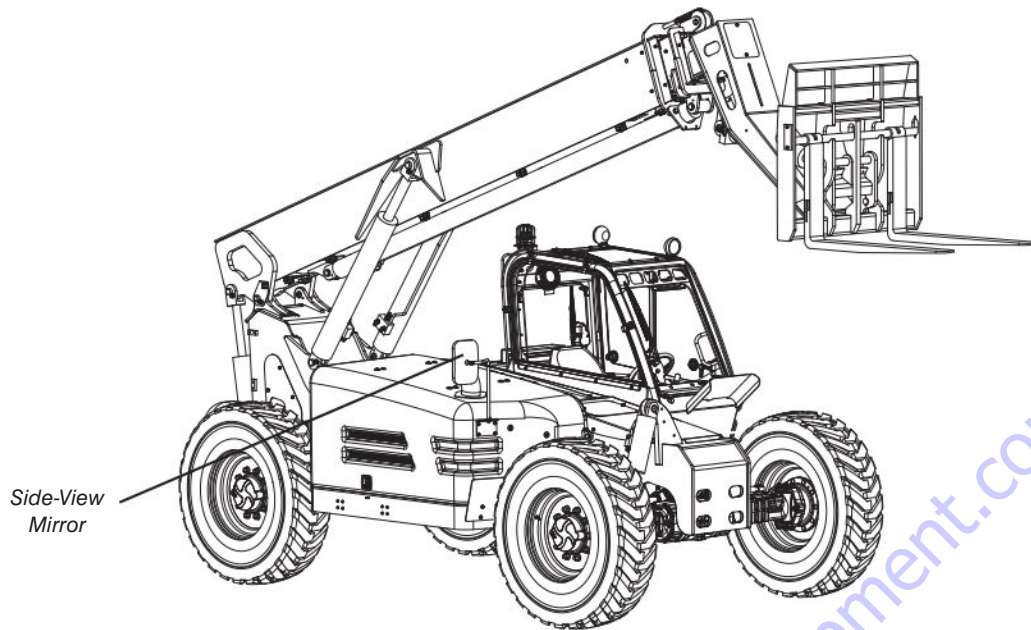
Schedule	P	F	R
Schedule Maintenance Inspections			
Labels	A		
Electrical	A		
Mirrors	A		
Hydraulic	A		
Cylinders	A,B,C,D		
Frame			
Wheel/Tire Assembly	A		
Air-filled Tires	A		
Foam-filled Tires	A		
Battery and Cables	A		
Hydraulic Tank	A		
Hydraulic Oil	A,D		
Engine Intake Air Filter	A,B,C		
Tilt Switch	A,B,C,D		
Drive Axles			
Hub Oil	D		
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		
Engine Compartment			
Engine Oil	A,C		
Engine Coolant Level	A		
Fuel Leaks	A		
Belts and Hoses	A		
Fuel Tank	A		
Change Fuel Filter	A,C		
Drain Fuel/Water Separator	C,D		
Change Oil Filters	A,C		
Charge Accumulators (if equipped)	A		
Transmission			
Operate and Check Shifting	A		
Check for Leaks	A		
Change Transmission Oil	D		
Change Oil Filter	D		
Hydraulic Pump	A		

Schedule	P	F	R
Boom			
Main pins and bushings	C,D		
subcarriage pins and bushings	C,D		
Rollers and Tracks	C,D		
Slide Pads	B,C,D		
Chain(s)	A,C		
Boom Angle Indicator	A		
Proximity Sensors	A		
Lifting Attachment(s)	A		
Forks	A		
Fork Bars and Locks	A		
Quick Attach apron	A		
Grease Fittings			
Grease Fittings on Frame	B		
Grease Fittings on Boom Assembly	B		
Operator's Cab			
Seat	A		
Pedals	A		
Manual	A		
Operator's Cab Controls	A		
Function Tests			
Operator's Cab Controls			
Test Starter Operation	A		
Test Horn	A		
Test Lights (If Equipped)	A		
Test Boom and Attachment Functions	A		
Test Frame Leveling and Level Indicator	A		
Test Frame Leveling and Boom Interlock	A		
Test Accelerator Pedal	A		
Test Reverse Alarm, Driving & Service Brake	A		
Test Steering	A		
Test Positive Shut-off Valve (if equipped)	A		
Test Parking Brake	A		
Test Outriggers (If Equipped)	A		

256C

- A** - Perform Visual and Daily Maintenance Inspections & Functions Test. Refer to [Section 2.8](#) of the Operating Manual.
- B** - Perform Scheduled Maintenance Inspection every week or 40 hrs. Refer to [Section 1](#) of this manual.
- C** - Perform Scheduled Maintenance Inspection every 3 months or 250 hours. Refer to [Section 1](#) of this manual.
- D** - Perform Scheduled Maintenance Inspection every year or 1000 hours. Refer to [Section 1](#) of this manual.

Note: Make a copy of this page or visit the Skyjack web site: www.skyjack.com for a printable copy.



1.5 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.

1.5-1 Labels - **A**

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

1.5-2 Electrical

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

- Ensure proper operation of all gauges.
- Inspect the following areas for chafed, corroded and loose wires:
 - boom wiring harnesses - **A**
 - frame wiring harnesses - **A**
 - cab wiring harnesses - **A**

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

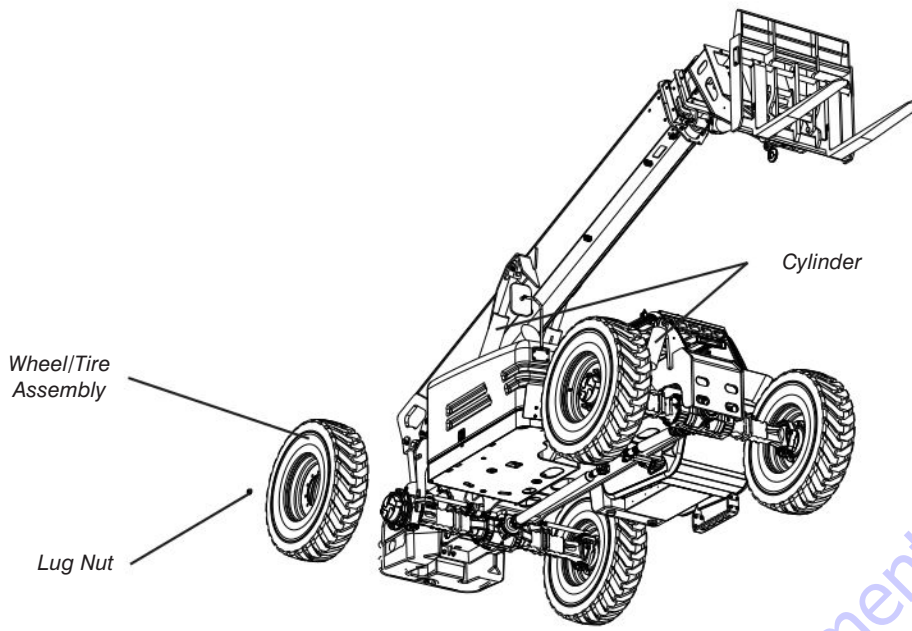
1.5-3 Mirrors - **A**

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

1.5-4 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 - **A**
- all hydraulic manifolds - **A**
- underside of the frame - **A**
- ground area under the telehandler - **A**



1.5-5 Cylinders - A

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.

Refer to section 5.3 for greasing procedure.

1.5-6 Frame

▪ Wheel/Tire Assembly - A

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.

- Check all tire treads and sidewalls for cuts or cracks that expose the cord plies.
- Check for punctures, holes and unusual wear.
- Check each wheel rim for damage and cracked welds.
- Check each lug nut for proper torque to ensure none are loose. Refer to table [2.3 Tire/Wheel Specifications](#).

▲ WARNING

If any tire does not meet the criteria outlined above, remove telehandler from service and replace wheel/tire immediately.

▪ Air-filled Tires - A

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

- Check each tire with an air pressure gauge and add air as needed.

▲ WARNING

An improperly inflated tire may cause death or serious injury.

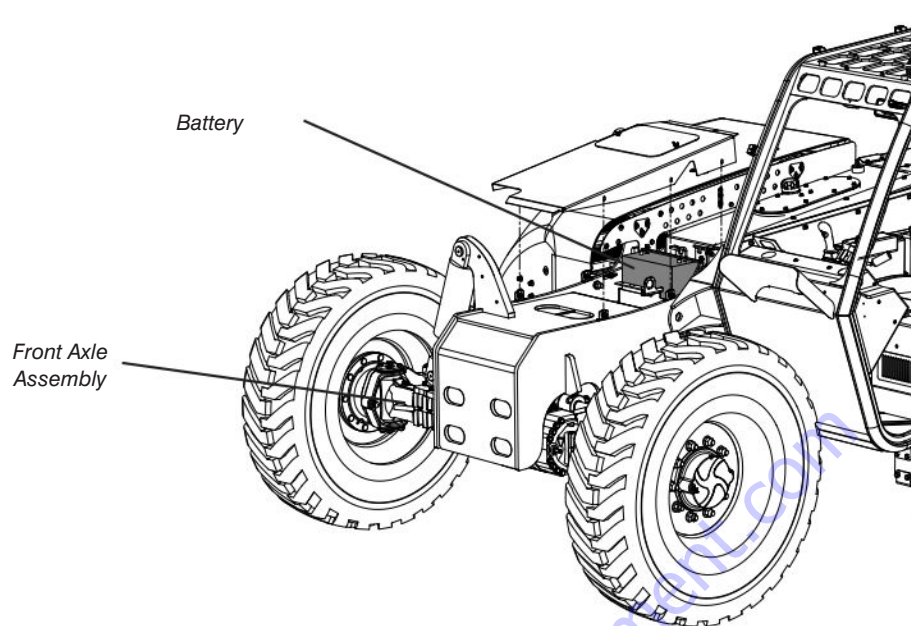
▪ Foam-filled Tires - A

Tire condition can vary significantly depending on telehandler use, job site environment and preventative maintenance measures. Inspect tires periodically and pay extra attention to the following:

- Check for punctures or holes. Ensure they do not exceed 1 inch in diameter.

IMPORTANT

Do not intermix foam-filled and air-filled tires.



▪ **Drive Axles - A**

Ensure drive axles are properly secured, there are no loose or missing parts, all fittings and hoses are properly tightened and there is no evidence of oil leakage.

▪ **Steer Cylinder - A**

Ensure steer cylinders are 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.

▪ **Planetary Wheel Ends - C**

Check the planetary wheel ends oil level and add as required. Ensure there is no evidence of oil leakage.

▪ **Axle Differential - C**

Check the axle differential oil level and add as required. Ensure there is no evidence of oil leakage.

▪ **Battery - A**

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.

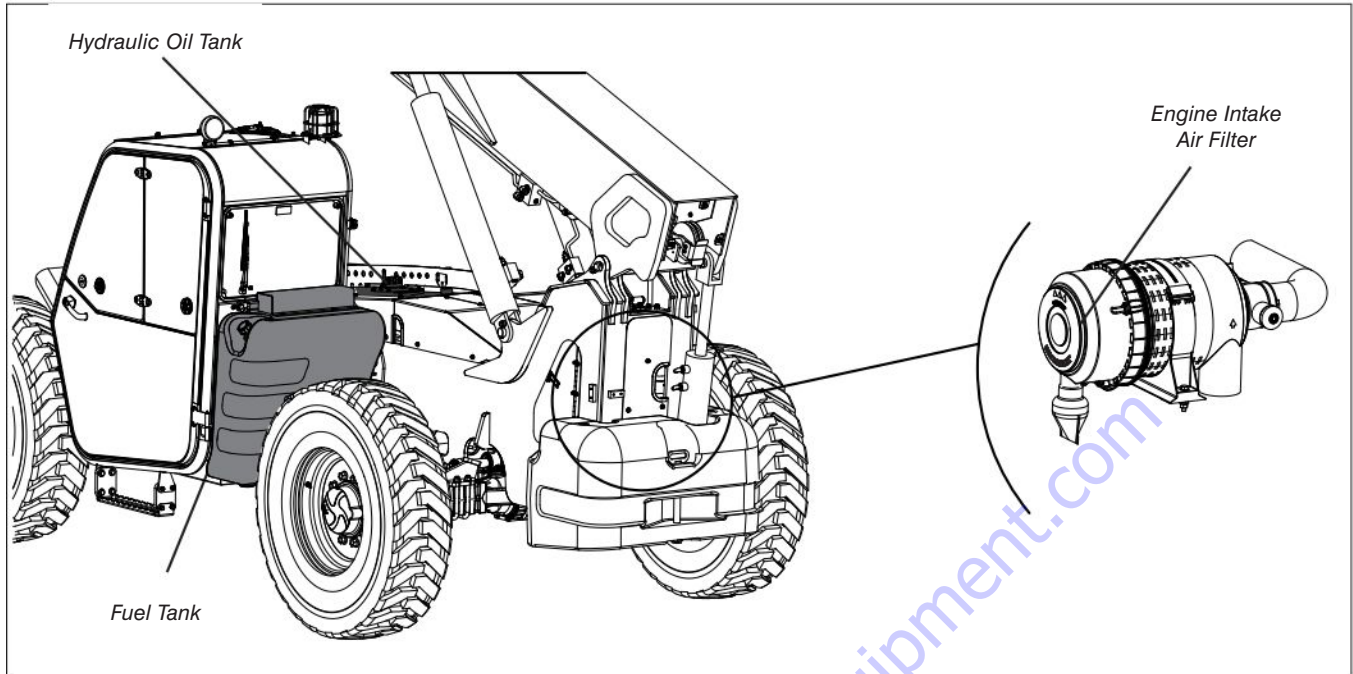
! WARNING


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 battery case for damage.
2. Clean battery terminals and cable ends thoroughly with a terminal cleaning tool or wire brush.
3. Ensure all battery 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 battery if damaged or incapable of holding a lasting charge.

! WARNING

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



- **Engine Intake Air Filter - A**
 - Ensure there are no loose or missing parts and there is no visible damage.
 - Ensure air cleaner vacuator valve is free from dirt or dust by squeezing the valve lips.
 - Check air cleaner service indicator and replace filter element if needed. Refer to section 5.2-4
- **Fuel Tank**  - A

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.
- **Fuel Leaks - A**

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

Perform a visual inspection around the following areas:

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

WARNING

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.

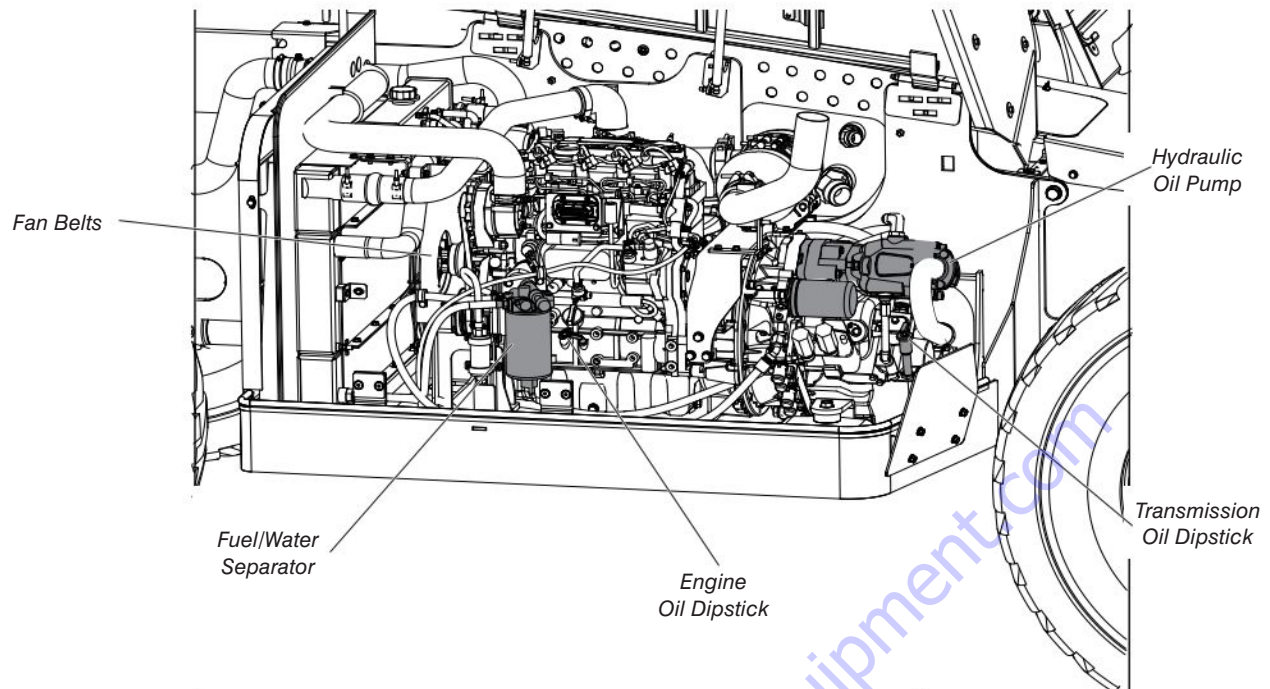
Refer to section 5.4-5 for fuel filter replacement procedure



- **DEF Tank (if equipped) - A**

IMPORTANT

Before using your telehandler ensure there is enough Diesel Exhaust Fluid for expected use.

- Ensure tank cap is secure.
- Ensure DEF tank shows no visible damage and no evidence of leakage.
- **Hydraulic Oil Tank**
 - Ensure hydraulic filler cap is secure.
 - Ensure tank shows no visible damage and no evidence of hydraulic leakage.



- **Hydraulic Oil**  - **A, D**
 - Be sure that the boom is in the lowered and stowed position, and then visually inspect the sight gauge located at the rear of the hydraulic oil tank.
 - Add clean hydraulic oil as required. Refer to section 5.5-2 [Change Hydraulic Oil and Clean Hydraulic Tank](#) for hydraulic oil change.
- **Engine Coolant**  - **A**

WARNING

Pressurized fluid present in radiator. Never open radiator cap when hot. Always open fill cap slowly.

- Check coolant level on radiator.
- Add coolant as required.



Refer to section 5.5-5 for engine coolant change procedure.

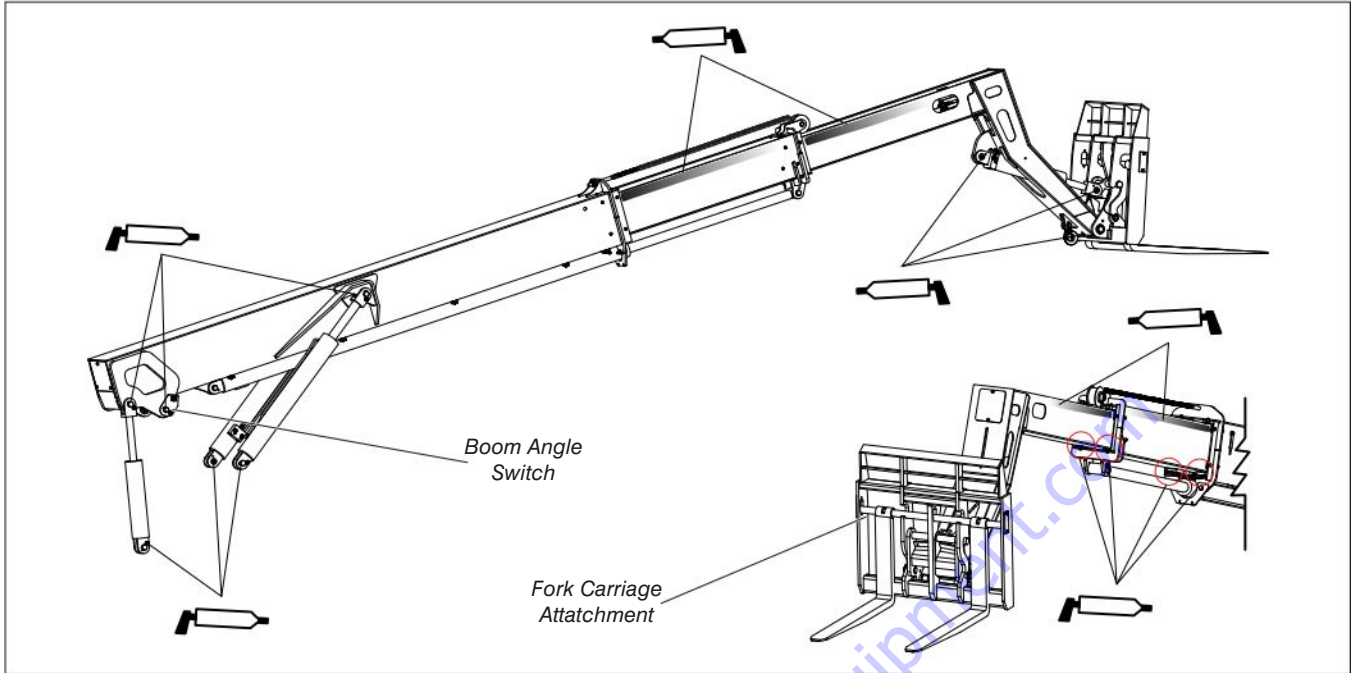
1.5-7 Engine Compartment

Ensure compartment cover is secure and in proper working order.

WARNING

Beware of hot engine components.

- **Engine Oil Level on dipstick**  - **A, C**
 - Maintaining the engine components is essential to good performance and service life of the telehandler.
 - Oil level should be between the “L” low and “H” high marks. Add oil as needed. Refer to table 2.4 [Recommended Fluids/Lubrication](#).
- **Belts** - **A**
 - 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.
- **Hydraulic Pump** - **A**
 - 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.
- **Fuel/Water Separator**  - **C, D**
 - Ensure there are no loose or missing parts and there is no visible damage.
 - Ensure all fittings and hoses are properly tightened and there is no evidence of fuel leaks.



- Drain water by opening water drain plug at bottom of filter. Close tightly after inspection.

Refer to section 5.4-5 for fuel/water separator replacement procedure

1.5-8 Transmission

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

- **Check oil level on dipstick** “” - **D**
- With park brake engaged and transmission shifter in “N” Neutral position, start engine.
- Oil level should be in the ‘safe’ zone. Add oil as needed. Refer to section 5.5-6 for transmission oil change procedure.

1.5-9 Boom - **A**

- 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.

▪ **Boom Angle Switches - A**

- Ensure boom angle switches are properly secured with no signs of visible damage.

▪ **Slide Pads - B, C, D**

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

▪ **Chain - A, C**

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

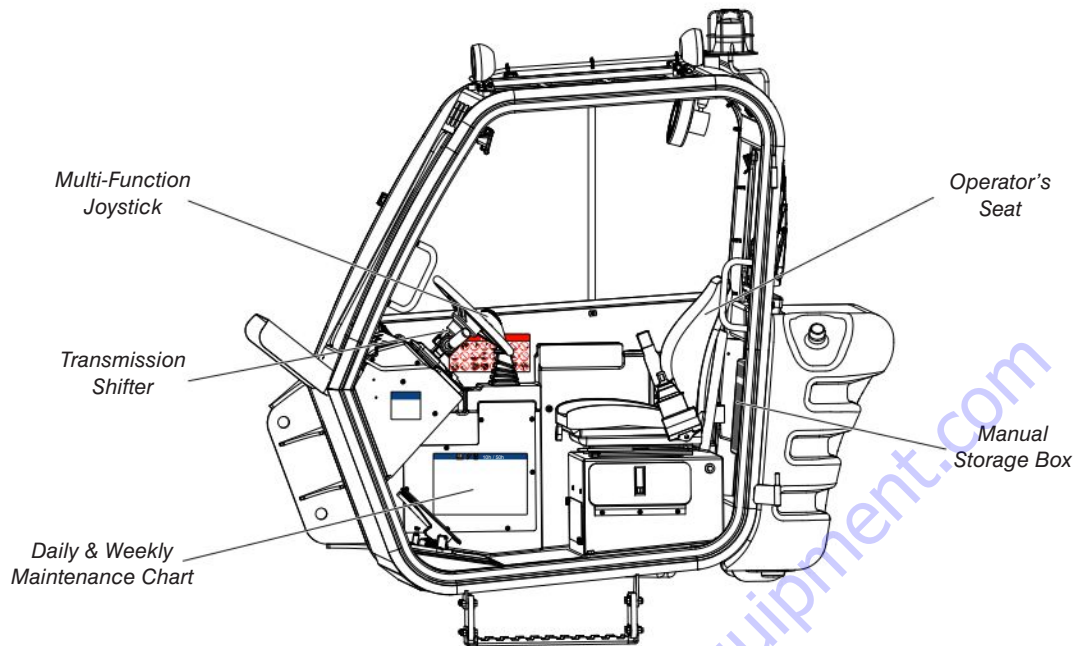
▪ **Boom Angle Indicator - A**

- Ensure all bolts are tight, and there is no visible damage and indicator swings freely.

1.5-10 Lifting Attachment - **A**

- Ensure there are no loose or missing parts and there is no visible damage.
- Ensure attachment is properly positioned and secured. (refer to Section 2.13 for attachments installation and operation).

Operator's Cab



1.5-11 Grease Fittings - B

- 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.

Refer to section 5.2 for greasing procedures.

⚠ WARNING

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

- Greasing intervals are based on average telehandler usage. Use of telehandler may vary significantly and greasing frequency must be adjusted to obtain maximum service life.
- Refer to the Daily and Weekly Maintenance Chart located inside operator's cab for grease points location and service intervals.

1.5-12 Operator's Cab

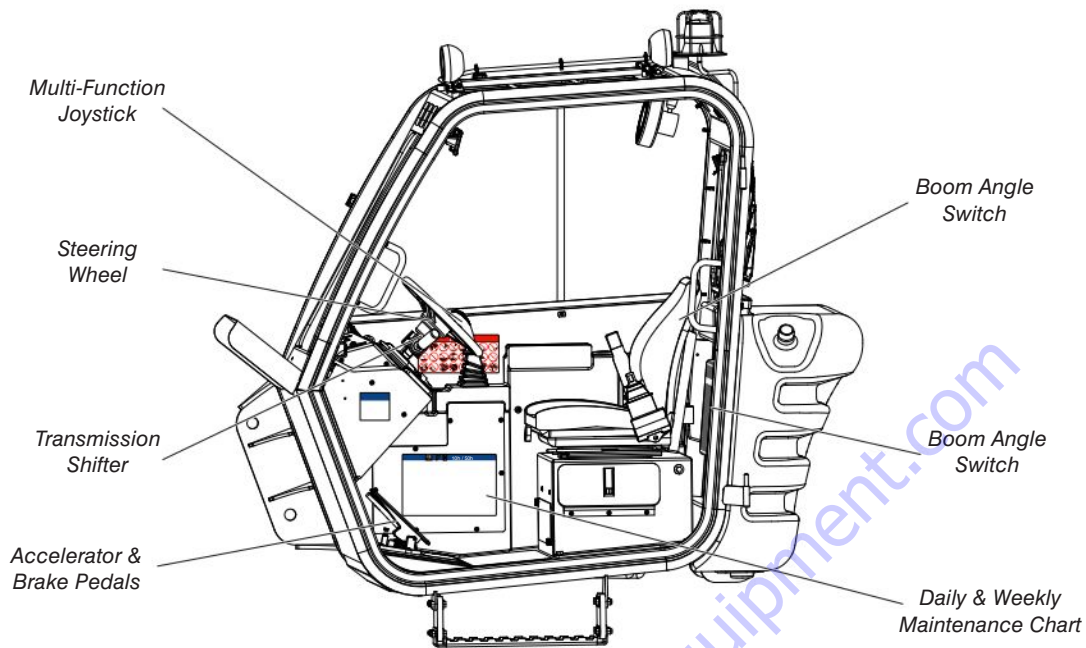
- **Rollover and Falling Object Protective Structure (ROPS/FOPS) - B**
 - Ensure there is no visible damage.

⚠ WARNING

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

- **Seat - A**
 - Ensure seat is properly secured with no sign of visible damage.
 - Ensure seat belt is working properly with no sign of visible damage.
- **Pedals - A**
 - Ensure brake and accelerator pedals are secure, no loose or missing parts, no sign of visible damage and movements are not obstructed.
- **Manual - A**
 - 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



▪ Operator's Cab Controls - A

⚠ 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 position and movements are not obstructed.
- Ensure capacity charts are in place and are legible.

⚠ WARNING

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

1.6 Function Tests

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

IMPORTANT

Never use a malfunctioning aerial platform. If malfunctions are discovered, aerial platform must be tagged and placed out of service. Repairs to aerial platform 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 aerial platform into service.
- Prior to performing function tests, be sure to read and understand the “Start Operation” section of the operating manual.
- For function test that are to be performed, please refer to the operating manual that corresponds to the correct serial number. Found there will be detailed instructions for which tests to perform, as well as how to properly and successfully perform them.



NOTE

All-function motion alarm should sound while operating any boom and drive function

Section 2 – Maintenance Tables

To order go to Discount-Equipment.com

Table 2.1 Standard and Optional Equipment

Models	SJ643 TH	SJ843 TH
Standard Equipment		
48" / 60" / 72" QA 10K Fork Carriages	*	*
Air Filled Tires	*	*
Diesel Engine	*	*
Engine Block Heater	*	*
Four-wheel drive	*	*
Frame Leveling System	*	*
Lifting Hook	*	*
Open Operator's Cab	*	*
Operator horn	*	*
Reverse/Backup Alarm	*	*
Spring-applied Hydraulically Released Parking Brake	*	*
Three-Speed Transmission	*	*
Three-Mode Steering	*	*
Optional Equipment		
1.75 Cu. Yd. Bucket Loader Attachment	*	*
12 ft. Truss Boom	*	*
2 ft. Jib Boom	*	*
48" / 60" / 72" Side-Tilt Fork Carriages	*	*
72" Swing Carriage	*	*
Back-up Sensor/ Back-up Camera and Sensor	*	*
Enclosed Operator's Cab	*	*
Enclosed Operator's Cab with A/C	*	*
Fire Extinguisher	*	*
Flashing Beacon	*	*
Foam Filled Tires	*	*
Fork Positioner	*	*
Four-Wheel Fenders	*	*
Pintle Hitch	*	*
Positive Air Shut-off System	*	*
Premium Multi-function Joystick	*	*
Reserve Brake System	*	*
Road/Work/Boom Lights	*	*
Continuously Variable Transmission	*	*

1460AA

Table 2.2 Specifications and Features

Models		SJ643 TH	SJ843 TH
Standard Engine			
Type	Deutz 2.90 L Tier 4 Final		
Cylinders	4		
Horsepower @ 2600 RPM	74 HP		
Capacity	177 cu in (2900 cm ³)		
Torque @ 1600 RPM	221 lb ft (300 N-m)		
Idle Speed*	1200 – 1250 RPM		
Fuel type	Diesel		
Transmission			
Powershift	Type	Powershift with soft shift	
	Speeds forward	3	
	Speeds reverse	3	
CVT	Type	Continuously Variable Transmission - Two Range Powershift	
	Speeds forward	2	
	Speeds reverse	1	
Travel Speeds			
Powershift	Range 1	3 mph (4.80 km/h)	
	Range 2	6 mph (9.70 km/h)	
	Range 3	16 mph (25 km/h)	
CVT	Range	0 mph (0 km/h) - 15 mph (24 km/h)	
Electrical			
Negative ground	12 Volts		
Alternator	95 Amps		
Battery	90 Amps		
Backup Alarm	107 dBm		
Dimensions			
Wheelbase	128 in (325.12 cm)		
Overall width	102 in (259.08 cm)		
Overall height	95.25 in (241.94 cm)		
Overall length (less forks)	232 in (590 cm)		
Ground clearance	19 in (48.26 cm)		
**Maximum weight without attachment	19,880 lb (9017,42 kg)	21,780 lb (9,879.24 kg)	
Turn radius (inside)	2.7 ft. (82.44 cm)		
Turn radius (outside)	13 ft. (396.24 cm)		
Boom			
Number of sections	3		
Maximum lift height	43 ft 4 in (13.20 m)		
Maximum forward reach	28 ft 7 in (8.71 m)		
Standard Forks	2.25 in x 5 in x 48 in (standard tapered forks)		
Carriage rollback	20°		
Carriage forward tilt	92.5°		

* Engine idle speed is measured with 5% droop when in gear.

** Add 400 lb (181.437 kg) to the maximum weight for machines with CVT

1459AA

Table 2.3 Tire/Wheel Specifications

Models SJ643 TH & SJ843 TH						
	FILL	Size	Pressure	Ply Rating	Wheel Nuts Torque	
PRIMEX G3000	AIR	13.00 X 24 TG G-2	87 psi (600 Kpa)	16	"442 ft.-lb. (600 Nm)"	
	FOAM		-			
GPX Rough Terrain L3 R Grade Rock XT (Hard Surface)	AIR	13.00 X 24 L3 GPX	80 psi (552 Kpa)			
	FOAM		-			
GALAXY GIRAFFE XLW	AIR	13.00 X 24 14 PR	87 psi (600 Kpa)			
	FOAM		-			
SOLIDAIR	-	50.787 X 8.5 X 13.00 X 24	N/A			-
SOLIDBOSS	-	50 X 13.00 X 24	N/A			-
BLACKSTONE	FOAM	13.00 X 24	-	16		

1458AA

⚠ WARNING

Do not use tires other than those specified for this machine. Do not mix different types of tires. Tires other than those specified can adversely affect stability. Failure to operate with matched, approved tires in good condition can result in serious injury or even death. Replace tires with the exact, Skyjack-approved types only.

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 reduces the life of the differentials and reduce overall mobility of telehandler.

Table 2.4 Recommended Fluids/Lubrication

SJ643 TH & SJ843 TH			
Engine			
Fuel Type	Ultra Low Sulfur Diesel (EN 590, ASTM D975)		
Fuel Tank Capacity	35.7 gal (142 L)		
Recommended Oil Type	SAE 15W40 GR.SH, CD CF		
Engine Oil Capacity	9.5 quart (9.0 L)		
Coolant Type (Standard)	COOLANT-ANTIFREEZE 50/50 PREMIX *		
Coolant Type (Cold Weather Option)	COOLANT-ANTIFREEZE 60/40 PREMIX *		
Coolant Tank Capacity	3.7 gal (14 L)		
Transmission			
Powershift	Oil Type	ATF DEXRON 3	
	Capacity	16.9 Quart (16 L)	
CVT	Oil Type	CVT Case: VALVOLINE INVARITORC 205	Dropcase: ATF DEXRON 3
	Capacity	18 L	0.90 L
Axles			
Differential	Mobilube HD		
Front Axle Capacity	8.0 quart (7.5 L)		
Rear Axle Capacity	8.0 quart (7.5 L)		
Planetary Wheel Ends	SAE 80W-90EP		
Capacity	1.3 quart (1.2 L)		
Hydraulic Oil			
Standard Factory Fill	ATF Dexron III		
Type	ATF Dexron III or Equivalent		
Tank Capacity	43.85 gal (166 L)		
Grease Points			
Type	EP2 Grease		

* Refer to manufacturer's manual.

1457AB

 WARNING

Do not mix hydraulic oil of different types or use oils of types other than those originally supplied with this equipment. Doing so can severely damage hydraulic components. A full hydraulic oil system flush must be performed prior to adding a new type of hydraulic oil. Consult Skyjack service department.

Table 2.5 Pressure Setting

Model SJ643 TH, SJ843 TH		
System Component	Test Port	Pressure Valve
Pilot Oil Pressure	GP2	400 psi
Tilt Comp./ Carriage Tilt Port Relief	-	3300 psi
System		
Standby Pressure (Load Sense)	GP1	450 psi
Maximum Pressure	GP1	3000 psi
Steering		
Maximum	RV2	2200 psi
Brakes		
Service Brakes	PS2	900 psi

1684AA



NOTE

All pressures to be checked with engine running at idle unless specified otherwise.

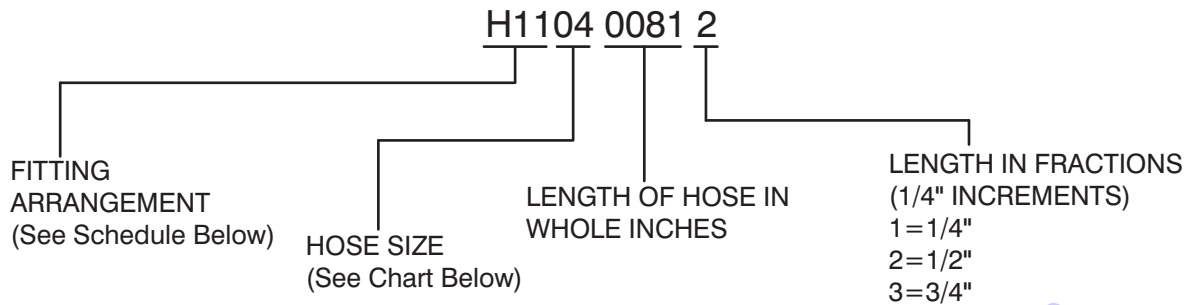


NOTE

Service brake pressure is variable. The value provided above is the maximum nominal value.

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Table 2.6 Standard Hose Numbering System



Using the number above as an example, H1104 0081 2, this hose requires a 37° JIC female swivel fitting on one end, and a medium length 90° JIC female swivel fitting for the other end. The hose must meet or exceed the S.A.E. 100R13 hose specification, and be a total of 81-1/2" long.



NOTE

Hose ends and hose must be from same manufacturer per S.A.E. J1273 Nov. '91, Sections 3.10 and 4.2. Hose ends and hose must be of the same size i.e. #4 size fittings must be used with #4 size hose.

Hose Size Chart

Size	03	04	06	08	10	12	16	20	24	32	40	48	56	64
ID	3/16"	1/4"	3/8"	1/2"	5/8"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	3-1/2"	4"

Fitting Arrangement Schedule

Hose Prefix	Hose End Fitting	Hose End Fitting	S.A.E. Hose Specification
H01	FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R17
H02	FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R13
H03	FEMALE, 37° JIC, SWIVEL	45°, FEMALE, 37° JIC, SWIVEL	100R17
H04	FEMALE, 37° JIC, SWIVEL	45°, FEMALE, 37° JIC, SWIVEL	100R13
H05	FEMALE, 37° JIC, SWIVEL	LONG 90°, FEMALE, 37° JIC, SWIVEL	100R17
H06	FEMALE, 37° JIC, SWIVEL	SHORT 90°, FEMALE, 37° JIC, SWIVEL	100R17
H07	LONG 90°, FEMALE, 37° JIC, SWIVEL	LONG 90°, FEMALE, 37° JIC, SWIVEL	100R17
H08	FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R4
H09	FEMALE, 37° JIC, SWIVEL	45°, FEMALE, 37° JIC, SWIVEL	100R4
H10	FEMALE, 37° JIC, SWIVEL	MALE PIPE THREAD FITTING	100R17
H11	FEMALE, 37° JIC, SWIVEL	MEDIUM 90°, FEMALE, 37° JIC, SWIVEL	100R13
H12	SHORT 90°, FEMALE, 37° JIC, SWIVEL	SHORT 90°, FEMALE, 37° JIC, SWIVEL	100R17
H13	FEMALE, 37° JIC, SWIVEL	REUSABLE MALE PIPE THREAD FITTING	300 PSI
H14	REUSABLE MALE PIPE THREAD FITTING	NO FITTING	300 PSI
H15	REUSABLE FEMALE, 37° JIC, SWIVEL	REUSABLE FEMALE, 37° JIC, SWIVEL	300 PSI
H16	NO FITTING	NO FITTING	100R4
H17	NO FITTING	NO FITTING	300 PSI
H18	REUSABLE, FEMALE, 37° JIC, SWIVEL	NO FITTING	300 PSI
H19	LONG 90°, FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R13
H20	FEMALE, SHORT 37° JIC, SWIVEL	SHORT 90°, FEMALE, 37° JIC, SWIVEL	100R4

Fitting Arrangement Schedule

Hose Prefix	Hose End Fitting	Hose End Fitting	S.A.E. Hose Specification
H21	FEMALE, SHORT 37° JIC, SWIVEL	SHORT 90°, FEMALE, 37° JIC, SWIVEL	100R2AT
H22	FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R2AT
H23	FEMALE, LONG 37° JIC, SWIVEL	LONG 90°, FEMALE, 37° JIC, SWIVEL	100R2AT
H24	FEMALE, SHORT 37° JIC, SWIVEL	SHORT 90°, FEMALE, 37° JIC, SWIVEL	100R13
H25	FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R4
H30	MEDIUM 90°, FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R17
H31	FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R17
H32	SHORT 45°, FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R17
H33	MEDIUM 45°, FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R17
H34	SHORT 90°, FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R17
H35	MEDIUM 90°, FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R17
H36	LONG 90°, FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R17
H37	SHORT 45°, FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R4
H38	SHORT 90°, FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R4
H39	LONG 90°, FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R4
H40	SHORT 90°, FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R16
H43	FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R16
H51	FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R17
H52	SHORT 45°, FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R17
H53	MEDIUM 45°, FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R17
H54	SHORT 90°, FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R17
H55	MEDIUM 90°, FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R17
H56	LONG 90°, FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R17
H57	SHORT 45°, FEMALE, SAE ORFS, SWIVEL	FEMALE, SAE ORFS, SWIVEL	100R13
H58	FEMALE, SAE ORFS, SWIVEL	FEMALE, SAE ORFS, SWIVEL	100R13
H59	MEDIUM 90°, FEMALE, SAE ORFS, SWIVEL	FEMALE, SAE ORFS, SWIVEL	100R13
H60	FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R17
H61	FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R16
H62	SHORT 90°, FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R16
H63	MEDIUM 90°, FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R16
H64	LONG 90°, FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R16
H65	MEDIUM 67°, FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R12
H66	FEMALE, 37° JIC, SWIVEL	NO FITTING	100R4
H67	FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R19
H68	SHORT 45°, FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R19
H69	MEDIUM 90°, FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R19
H70	LONG 90°, FEMALE, 37° JIC, SWIVEL	FEMALE, 37° JIC, SWIVEL	100R19
H71	LONG 90°, FEMALE, SAE ORFS, SWIVEL	FEMALE, SAE ORFS, SWIVEL	100R15

Table 2.7 Torque Specifications for Fasteners (US)

Size	Torque Type	SAE2		SAE 5		SAE 8	
		Dry	Lubed	Dry	Lubed	Dry	Lubed
4-40	(in-lb)	(5)	(4)	(8)	(6)	(12)	(9)
	Nm	0.6	0.5	0.9	0.7	1.4	1.0
4-48	(in-lb)	(6)	(5)	(9)	(7)	(13)	(10)
	Nm	0.7	0.6	1.0	0.8	1.5	1.1
6-32	(in-lb)	(10)	(8)	(16)	(12)	(23)	(17)
	Nm	1.1	0.9	1.8	1.4	2.6	1.9
6-40	(in-lb)	(12)	(9)	(18)	(13)	(25)	(19)
	Nm	1.4	1.0	2.0	1.5	2.8	2.1
8-32	(in-lb)	(19)	(14)	(30)	(22)	(41)	(31)
	Nm	2.1	1.6	3.4	2.5	4.6	3.5
8-36	(in-lb)	(20)	(15)	(31)	(23)	(43)	(32)
	Nm	2.3	1.7	3.5	2.6	4.9	3.6
10-24	(in-lb)	(27)	(21)	(43)	(32)	(60)	(45)
	Nm	3.1	2.4	4.9	3.6	6.8	5.1
10-32	(in-lb)	(31)	(23)	(49)	(36)	(68)	(51)
	Nm	3.5	2.6	5.5	4.1	7.7	5.8
1/4-20	(in-lb) ft-lb	(66)	(50)	8	(75)	12	9
	Nm	7.5	5.6	11	8.5	16	12
1/4-28	(in-lb) ft-lb	(76)	(56)	10	(86)	14	10
	Nm	8.6	6.3	14	9.7	19	14
5/16-18	ft-lb	11	8	17	13	25	18
	Nm	15	11	23	18	34	24
5/16-24	ft-lb	12	9	19	14	25	20
	Nm	16	12	26	19	34	27
3/8-16	ft-lb	20	15	30	23	45	35
	Nm	27	20	41	31	61	47
3/8-24	ft-lb	23	17	35	25	50	35
	Nm	31	23	47	34	68	47
7/16-14	ft-lb	32	24	50	35	70	55
	Nm	43	33	68	47	95	75
7/16-20	ft-lb	36	27	55	40	80	60
	Nm	49	37	75	54	108	81
1/2-13	ft-lb	50	35	75	55	110	80
	Nm	68	47	102	75	149	108
1/2-20	ft-lb	55	40	90	65	120	90
	Nm	75	54	122	88	163	122

Size	Torque Type	SAE2		SAE 5		SAE 8	
		Dry	Lubed	Dry	Lubed	Dry	Lubed
9/16-12	ft-lb	70	55	110	80	150	110
	Nm	95	75	149	108	203	149
9/16-18	ft-lb	80	60	120	90	170	130
	Nm	108	81	163	122	230	176
5/8-11	ft-lb	100	75	150	110	220	170
	Nm	136	102	203	149	298	230
5/8-18	ft-lb	110	85	180	130	240	180
	Nm	149	115	244	176	325	244
3/4-10	ft-lb	175	130	260	200	380	280
	Nm	237	176	353	271	515	380
3/4-16	ft-lb	200	150	300	220	420	320
	Nm	271	203	407	298	569	434
7/8-9	ft-lb	170	125	430	320	600	460
	Nm	230	169	583	434	813	624
7/8-14	ft-lb	180	140	470	360	660	500
	Nm	244	190	637	488	895	678
1-8	ft-lb	250	190	640	480	900	680
	Nm	339	258	868	651	1220	922
1-12	ft-lb	270	210	710	530	1000	740
	Nm	366	285	963	719	1356	1003
1-14	ft-lb	280	210	730	540	1020	760
	Nm	380	285	990	732	1383	1030
1 1/8-7	ft-lb	350	270	800	600	1280	960
	Nm	475	366	1085	813	1735	1302
1 1/8-12	ft-lb	400	300	880	660	1440	1080
	Nm	542	407	1193	895	1952	1464
1 1/4-7	ft-lb	500	380	1120	840	1820	1360
	Nm	678	515	1519	1139	2468	1844
1 1/4-12	ft-lb	550	420	1240	920	2000	1500
	Nm	746	569	1681	1247	2712	2034
1 3/8-6	ft-lb	670	490	1460	1100	2380	1780
	Nm	908	664	1979	1491	3227	2413
1 3/8-12	ft-lb	750	560	1680	1260	2720	2040
	Nm	1017	759	2278	1708	3688	2766
1 1/2-6	ft-lb	870	650	1940	1460	3160	2360
	Nm	1180	881	2630	1979	4284	3200
1 1/2-12	ft-lb	980	730	2200	1640	3560	2660
	Nm	1329	990	2983	2224	4827	3606

NOTE: Lubed includes lubricants such as lubrizing, oil, grease, or uncured Loctite.

1374AA

Table 2.8 Torque Specifications for Fasteners (Metric)

Size	Torque Type	SAE2		SAE 5		SAE 8	
		Dry	Lubed	Dry	Lubed	Dry	Lubed
M5 x 0.80	(in-lb)	(54)	(41)	(78)	(59)	(12)	(9)
	Nm	6.1	4.6	8.8	6.7	1.4	1.0
M6 x 1.00	(in-lb)	(92)	(69)	(133)	(99)	(13)	(10)
	Nm	10.4	7.8	15	11.2	1.5	1.1
M7 x 1.00	(in-lb)	(156)	(116)	(222)	(167)	(23)	(17)
	Nm	17.6	13.1	25.1	18.9	2.6	1.9
M8 x 1.25	(in-lb)	(225)	(169)	(333)	(242)	(25)	(19)
	Nm	25.4	19.1	37.6	27.3	2.8	2.1
M10 x 1.50	ft-lb	37	28	53	40	(41)	(31)
	Nm	50	38	72	54	4.6	3.5
M12 x 1.75	ft-lb	65	49	93	69	(43)	(32)
	Nm	88	66	126	94	4.9	3.6
M14 x 2.00	ft-lb	104	78	148	111	(60)	(45)
	Nm	141	106	201	150	6.8	5.1
M16 x 2.00	ft-lb	161	121	230	172	(68)	(51)
	Nm	218	164	312	233	7.7	5.8
M18 x 2.50	ft-lb	222	167	318	238	12	9
	Nm	301	226	431	323	16	12
M20 x 2.50	ft-lb	314	235	449	337	14	10
	Nm	426	319	609	457	19	14
M22 x 2.50	ft-lb	428	321	613	460	25	18
	Nm	580	435	831	624	34	24
M24 x 3.00	ft-lb	543	407	776	582	25	20
	Nm	736	552	1052	789	34	27
M27 x 3.00	ft-lb	796	597	1139	854	45	35
	Nm	1079	809	1544	1158	61	47
M30 x 3.50	ft-lb	1079	809	1543	1158	50	35
	Nm	1463	1097	2092	1570	68	47
M33 x 3.50	ft-lb	1468	1101	2101	1576	70	55
	Nm	1990	1493	2849	2137	95	75
M36 x 4.00	ft-lb	1886	1415	2699	2024	80	60
	Nm	2557	1918	3659	2744	108	81

NOTE: Lubed includes lubricants such as lubrizing, oil, grease, or uncured Loctite.

1375AA

Table 2.9 Torque Specifications for Hydraulic Couplings & Hoses

Hydraulic Coupling Torque Chart O-Ring Port Connectors				
SAE Size	Steel Ports		Non-ferrous Ports	
	ft-lb	Nm	ft-lb	Nm
4	14-16	20-22	9-10	12-13
6	24-26	33-35	15-16	20-21
8	50-60	68-78	30-36	41-47
10	72-80	98-110	43-48	60-66
12	125-135	170-183	75-81	102-110
16	200-220	270-300	120-132	162-180
20	210-280	285-380	126-168	171-228
24	270-360	370-490	162-216	222-294
32	-	-	-	-

Hose End Torque Chart for JIC									
Size		Steel				Brass			
Dash	Frac.	ft-lb		Nm		ft-lb		Nm	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
-4	1/4"	10	11	13	15	5	6	6.75	9
-6	3/8"	17	19	23	26	12	15	17	20
-8	1/2"	34	38	47	52	20	24	27.66	33
-10	5/8"	50	56	69	76	34	40	46.33	55
-12	3/4"	70	78	96	106	53	60	72.33	82
-16	1"	94	104	127	141	74	82	100.5	111
-20	1 1/4"	124	138	169	188	75	83	101.5	113
-24	1 1/2"	156	173	212	235	79	87	107	118
-32	2"	219	243	296	329	158	175	214	237

Hose End Torque Chart for Flat-Face O-Ring Seal (Steel)					
Size		Torque Specification			
Dash	Frac.	ft-lb		Nm	
		Min.	Max.	Min.	Max.
-4	1/4"	10	12	14	16
-6	3/8"	18	20	24	27
-8	1/2"	32	40	43	54
-10	5/8"	46	56	60	75
-12	3/4"	65	80	90	110
-14	1"	65	80	90	110
-16	1 1/4"	92	105	125	240
-20	1 1/2"	125	140	170	190
-24	2"	150	180	200	245

1276AA

2.10 Air Conditioner Temperature/Pressure Chart

R-134a Temperature/Pressure Chart		
Ambient Temperature °F (°C)	Low Pressure Gauge	High Pressure Gauge
65 °F (18 °C)	25-35 psi (172-241 kPa)	135-155 psi (931-1069 kPa)
70 °F (21 °C)	35-40 psi (241-276 kPa)	145-160 psi (1000-1103 kPa)
75 °F (24 °C)	35-45 psi (241-310 kPa)	150-170 psi (1034-1172 kPa)
80 °F (27 °C)	40-50 psi (276-345 kPa)	175-210 psi (1207-1448 kPa)
85 °F (29 °C)	45-55 psi (310-379 kPa)	225-250 psi (1551-1724 kPa)
90 °F (32 °C)	45-55 psi (310-379 kPa)	250-270 psi (1724-1862 kPa)
95 °F (35 °C)	50-55 psi (345-379 kPa)	275-300 psi (1896-2068 kPa)
100 °F (38 °C)	50-55 psi (345-379 kPa)	315-325 psi (2172-2241 kPa)
105 °F (41 °C)	50-55 psi (345-379 kPa)	330-335 psi (2275-2310 kPa)
110 °F (43 °C)	50-55 psi (345-379 kPa)	340-345 psi (2344-2379 kPa)

Interpreting Pressure Readings		
Low Pressure Gauge	High Pressure Gauge	Action Required
In Range	In Range	A/C working properly
Low	Low	Add refrigerant
Low	High	Need service, possibly blockage of the expansion valve or orifice tube
High	Low	Need service, possibly faulty compressor
High	High	System overcharged.*

*It is illegal to vent R-134a refrigerant into the atmosphere.

Section 3 – System Component Identification and Schematics

To order go to Discount-Equipment.com

Table 3.1 Electrical Symbol Chart







































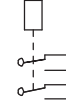


















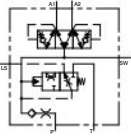



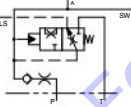







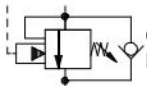









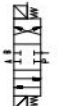

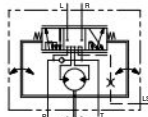

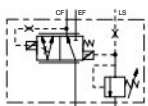
 CIRCUITS CROSSING NO CONNECTION	 HOURMETER	 KEY SWITCH	 LIMIT SWITCH N.O.
 CIRCUITS CONNECTED	 LIGHT	 FOOT SWITCH	 LIMIT SWITCH N.O. HELD CLOSED
 BATTERY	 HYDRAULIC VALVE COIL	 TOGGLE SWITCH	 LIMIT SWITCH N.C.
 GROUND	 PROPORTIONAL HYDRAULIC VALVE COIL	 PUSH BUTTON	 LIMIT SWITCH N.C. HELD OPEN
 FUSE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

Table 3.2 Hydraulic Symbol Chart

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

3.3 Electrical Schematic Parts List

Index No.	Skyjack Part No.	Qty.	Description
60CR	9-921734	1	RELAY, Power Relay
11CR	9-165029	1	RELAY, Glow Plug
56ACR	9-156200	1	RELAY, Fuel Pump
403ACR	9-931298	1	RELAY, Positive Air Shutoff
19CR	9-931298	1	RELAY, Boom Up
222CR	9-931298	1	RELAY, Frame Level Enable
224CR	9-931298	1	RELAY, Carriage Tilt Enable
5JCR	9-931298	1	RELAY, Brake Lamp
77CR	9-931298	1	RELAY, Engine Running
212CR	9-931298	1	RELAY, Boom Angle
65CR	9-931298	1	RELAY, Frame Level Disable
28CR	9-931298	1	RELAY, Boom Raise Disable
28LCR	9-931298	1	RELAY, Frame Left Enable
28RCR	9-931298	1	RELAY, Frame Right Enable
05CR	9-931298	1	RELAY, Park Brake Release
255CR	9-931298	1	RELAY, Rear Wiper
258CR	9-931298	1	RELAY, Front Wiper
258ACR	9-931298	1	RELAY, Top Wiper
250ACR	9-931298	1	RELAY, Left Turn Signal
251ACR	9-931298	1	RELAY, Right Turn Signal
F1	9-156203	1	FUSE, Ignition/ Power (10A)
F2	9-156203	1	FUSE, Transmission/Back-up Alar/ Park Brake (10A)
F3	9-156203	1	FUSE, Steer Select/Gauge/Transmission Temp (10A)
F4	9-156203	1	FUSE, Frame/Carriage Enable (10A)
F5	9-156203	1	FUSE, Rear Axle Lock (10A)
F6	9-156202	1	FUSE, Auxilliary Hydraulics (5A)
F7	9-156203	1	FUSE, Horn/Beacon Option (10A)
F8	9-156204	1	FUSE, Power port (15A)
F9	9-156202	1	FUSE, Rear wiper (5A)
F10	9-156203	1	FUSE, Outriggers (10A)
F11	9-156203	1	FUSE, Work lights (10A)
F12	9-156204	1	FUSE, Road lights (15A)
F13	9-156202	1	FUSE, Turn/Hazard/Brake lights (5A)
F14	9-156203	1	FUSE, Boom lights (10A)
F15	9-156203	1	FUSE, Front & Top Wiper (10A)
F16	-	-	Not used.
F17	9-156202	1	FUSE, Fan/Interior Light (5A)
F18	9-156164	1	FUSE, Blower motor (30A)
F19	9-156203	1	FUSE, Frame Level Interlock (10A)
F20	9-156203	1	FUSE, Heater Valve & A/C (10A)
F21	-	-	Not used.
F22	-	-	Not used.
F23	-	-	Not used.
F24	-	-	Not used.
F25	9-156164	1	FUSE, ECM (30A)

Index No.	Skyjack Part No.	Qty.	Description
F26	9-121504	1	FUSE, Fuel Pump (20A)
F27	9-165031	1	FUSE, Glow Plug (100A)
-	9-163021	2	RESISTOR, 120 Ohm 1/2 watt axial lead
-	9-164855	1	RESISTOR, 1000 Ohm 1/2 watt axial lead
SW1	9-926721	1	SWITCH, Ignition
SW2	9-191454	1	SWITCH, Park brake
SW3	-	-	Not used.
SW4	9-191457	1	SWITCH, Steer mode
SW5	9-196995	1	SWITCH, Frame level (Joystick)
SW6	9-405339	1	SWITCH, Horn switch (Button)
SW7	9-196995	1	SWITCH, Carriage Tilt (Joystick)
SW8	9-191680	1	SWITCH, Fan
SW9	9-191455	1	SWITCH, positive shutoff
SW10	9-191455	1	SWITCH, boom lights
SW11	9-191457	1	SWITCH, work lights
SW12	9-191457	1	SWITCH, turn signal
SW13	9-191658	1	SWITCH, Interior light
SW14	9-191459	1	SWITCH, rear washer/wiper
SW15	9-197031	1	SWITCH, Auxiliary Extend
SW16	9-197031	1	SWITCH, Auxiliary Retract
SW17	-	1	SWITCH,Blower
SW18	9-191491	1	SWITCH, A/C
SW19	9-191457	1	SWITCH, Road lights
SW20	-	-	Not used.
SW21	N/A	1	SWITCH, LH outrigger
SW22	N/A	1	SWITCH, RH Outrigger
SW23	9-191455	1	SWITCH, Hazard lights
SW24	9-191459	1	SWITCH, Washer/wiper front/top
D05J	9-102921	1	DIODE, Console harness
D26B	9-102921	1	DIODE, Console harness
D60	9-102921	1	DIODE, Console harness
D60-1	9-102921	1	DIODE, Consolo Harness
D252	9-102921	1	DIODE, Console harness
D252-1	9-102921	1	DIODE, Console harness
D252A-1	9-102921	1	DIODE, Console harness
D252A-2	9-102921	1	DIODE, Console harness
D221	9-102921	1	DIODE, Chassis Harness
D15	9-102921	1	DIODE, Engine Harness
D15A	9-102921	1	DIODE, Console harness
D16	9-102921	1	DIODE, Console harness
D250	9-102921	1	DIODE, Road light Harness
D251	9-102921	1	DIODE, Road light Harness
-	9-190547	2	SENSOR, Inductive proxi 15 mm
-	9-166700	2	SENSOR, Pressure
2H-19A	9-159821	1	COIL, #8
2H-57	-	1	COIL, #8
2H-221	-	1	COIL, #8

Index No.	Skyjack Part No.	Qty.	Description
2H-28	-	1	COIL, #8
2H-28A	-	1	COIL, #8
4H-223	-	1	COIL, #8
4H-223-1	-	1	COIL, #8
4H-47	-	1	COIL, #8
4H-47-1	-	1	COIL, #8
3H-26	9-168057	1	COIL, #10
4H-217	-	1	COIL, #10
4H-218	-	1	COIL, #10

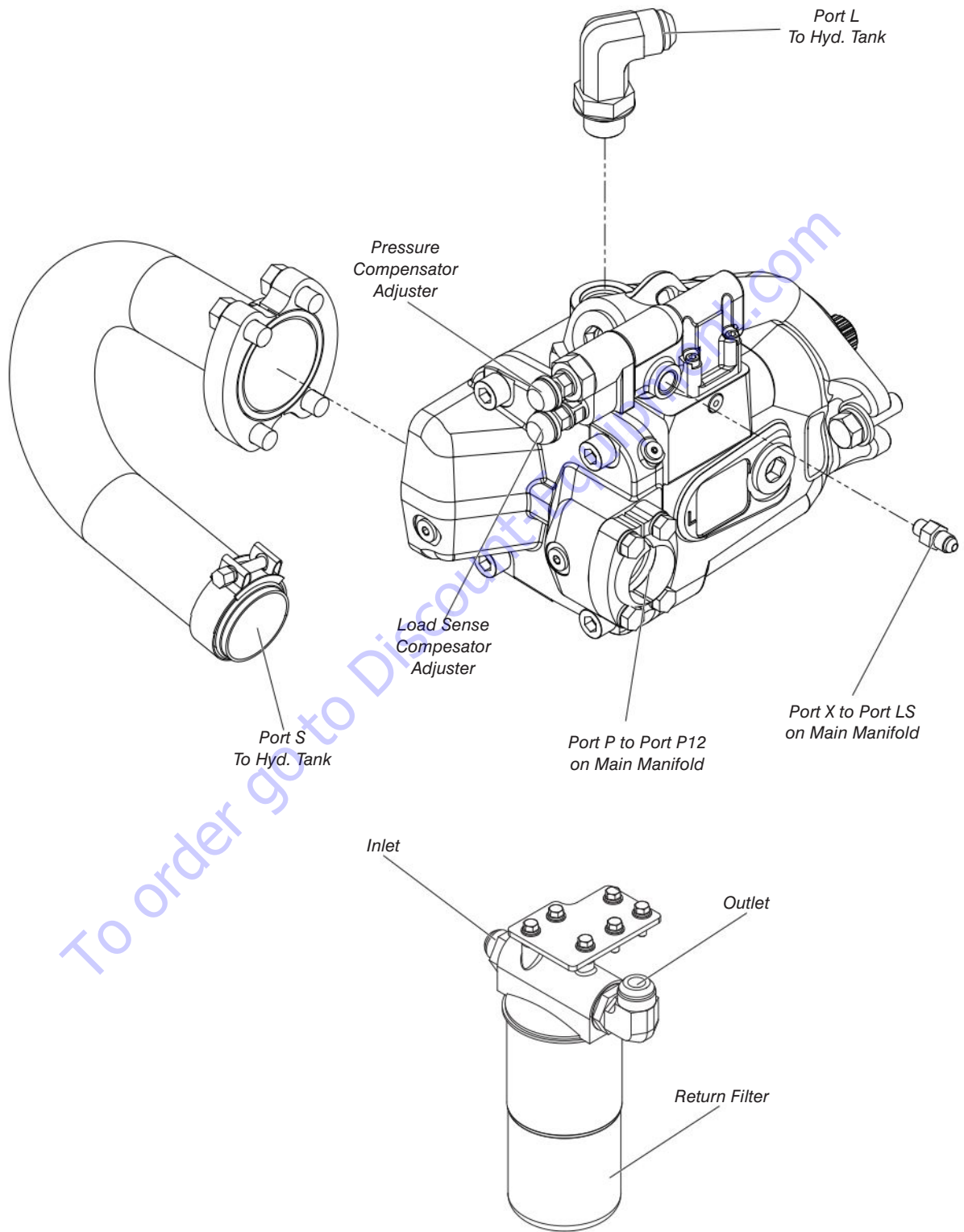
To order go to Discount-Equipment.com

3.4 Hydraulic Schematic Parts List

Index No.	Skyjack Part No.	Qty.	Description
ACC1	9-400947	1	ACCUMULATOR, Diaphragm (if equipped)
ACC2	9-400947	1	ACCUMULATOR, Diaphragm (if equipped)
C1	9-190027	1	CYLINDER, Front steer
C2	9-190028	1	CYLINDER, Rear steer
C3	9-190039	1	CYLINDER, Lift 130B
C4	9-190039	1	CYLINDER, Lift 130B
C5	9-190045	1	CYLINDER, Extend 115B
C6	9-190040	1	CYLINDER, Tilt/Compensation 120B
C7	9-190043	1	CYLINDER, Fork tilt 120B
C9	9-191831	1	CYLINDER, Frame level 115B
CB1	9-191811	1	VALVE, Counterbalance - 4060 PSI
CB2	9-191812	1	VALVE, Counterbalance - 1800 PSI
CB3	9-191813	1	VALVE, Counterbalance - 4000 PSI
CB4	9-191814	1	VALVE, Counterbalance - 4000 PSI
CB5	9-191815	1	VALVE, Counterbalance - 6000 PSI
CB6	9-191816	1	VALVE, Counterbalance - 3700 PSI
CB7	9-191816	1	VALVE, Counterbalance - 3700 PSI
CV11	9-191805	1	VALVE, Check
CV12	9-191805	1	VALVE, Check
CV13	9-191806	1	VALVE, Check disc
CV1	9-166066	1	VALVE, Check
CV2	9-166066	1	VALVE, Check
CV3	9-166066	1	VALVE, Check
CV4	9-166066	1	VALVE, Check
CV5	9-166066	1	VALVE, Check
CV6	9-166066	1	VALVE, Check
CV7	9-166066	1	VALVE, Check
CV8	9-166066	1	VALVE, Check
CV9	9-166066	1	VALVE, Check
CV10	9-166066	1	VALVE, Check
EC1	9-191799	1	PRESSURE COMPENSATOR, Priority-On-Demand
F1	9-157907	1	FILTER ELEMENT, Hydraulic spin-on
F2	9-191484	1	FILLER BREATHER, VR 1PSI
JS1	9-190356	1	JOYSTICK, HYDRAULIC
MB1	9-169032	1	MANIFOLD, VR6/843
MB2	9-169033	1	MANIFOLD, Auxiliary
MB3	9-190357	1	MANIFOLD, Reserve brake (if equipped)
OR1	9-191807	1	ORIFICE PLUG
OR2	9-191808	1	ORIFICE PLUG
OR3	9-191809	1	ORIFICE PLUG
OR4	9-199033	1	ORIFICE PLUG
OR5	9-199034	1	ORIFICE PLUG
OR6	9-199035	1	ORIFICE PLUG
OR7	9-199032	1	ORIFICE DISC
OSM1	9-406450	1	MOTOR, Steering wheel
P1	9-190264	1	PUMP, Hydraulic VR6/843
PR1	9-191798	1	VALVE, Pressure reducing/relieving

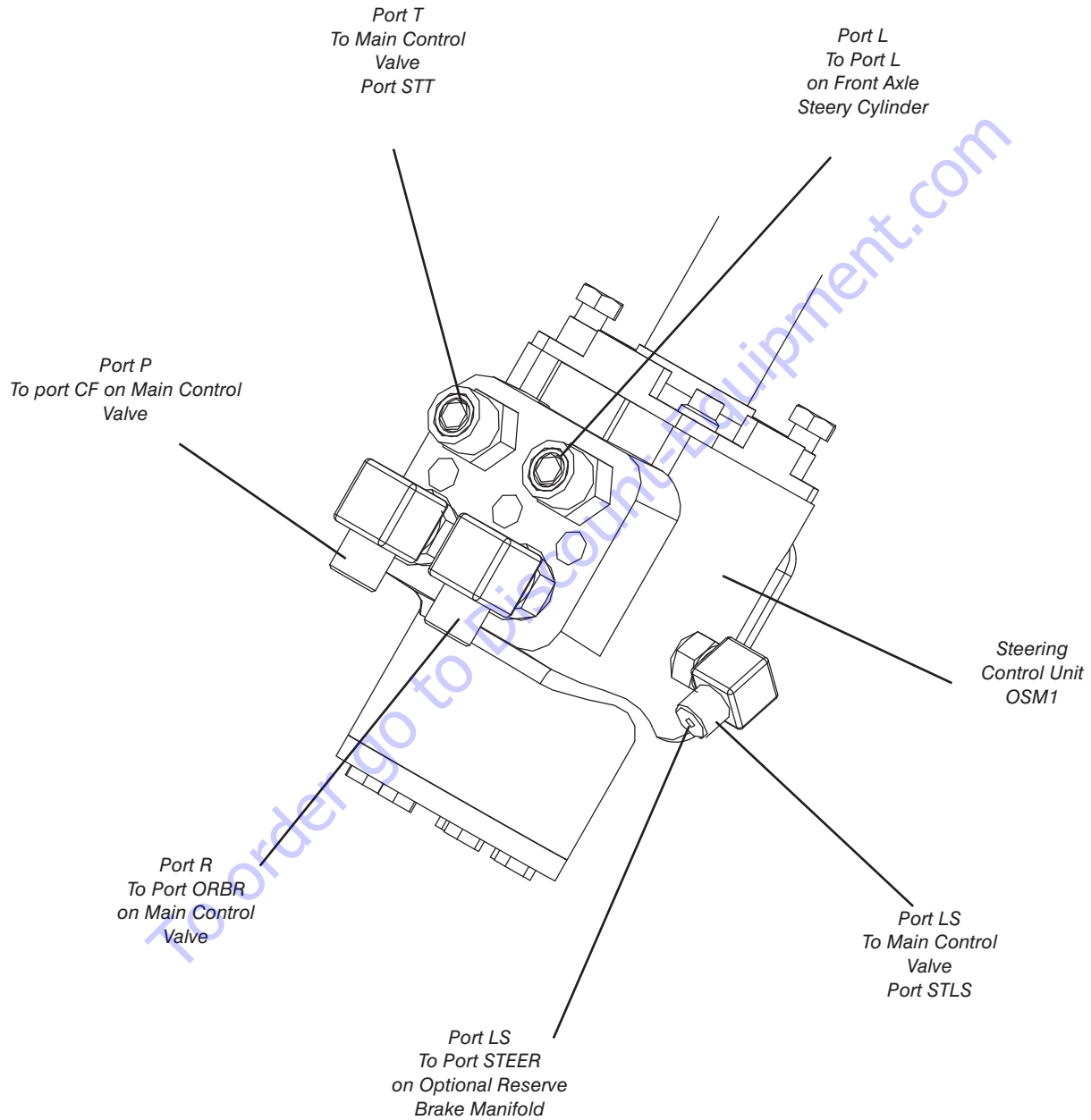
Index No.	Skyjack Part No.	Qty.	Description
PS1	9-191810	1	SWITCH, Pressure 450 PSI
PS2	9-927724	1	SWITCH, Brake light pressure
RV1	9-191802	1	VALVE, Relief
RV2	9-191803	1	VALVE, Relief
RV3	9-221887	1	VALVE, Relief anti-cavitation
RV4	9-191804	1	VALVE, Relief anti-cavitation
SV1	9-197301	1	VALVE, Shuttle
SW	9-197304	1	SWITCH, Pressure 1500 PSI
V1	9-191794	1	VALVE, Proportional-pilot operated
V2	9-191793	1	VALVE, Proportional-pilot operated
V3	9-191794	1	VALVE, Proportional-pilot operated
V4	9-191793	1	VALVE, Proportional-pilot operated
V5	9-191795	1	VALVE, Solenoid 4W3P
V6	9-191796	1	VALVE, Solenoid 4W2P
V7	9-191796	1	VALVE, Solenoid 4W2P
V8	9-191796	1	VALVE, Solenoid 4W2P
V9	9-191796	1	VALVE, Solenoid 4W2P
V10	9-171796	1	VALVE, Solenoid cartridge SV38-38
V11	9-102626	1	VALVE, Solenoid cartridge spool
V12	9-926370	1	VALVE, Brake (Brake Pedal)
V13	9-191801	1	VALVE, Piloted 2W N.O.
V14	9-191797	1	VALVE, Solenoid 5W3P
V15	9-166038	1	VALVE, Solenoid cartridge
V16	9-102626	1	VALVE, Solenoid cartridge
V17	9-102626	1	VALVE, Solenoid cartridge
V18	9-197302	1	VALVE, Pressure unloading
V19	9-197303	1	VALVE, Low flow 2 way, normally closed

3.5 Hydraulic Pump and Return Filter Ports Identification



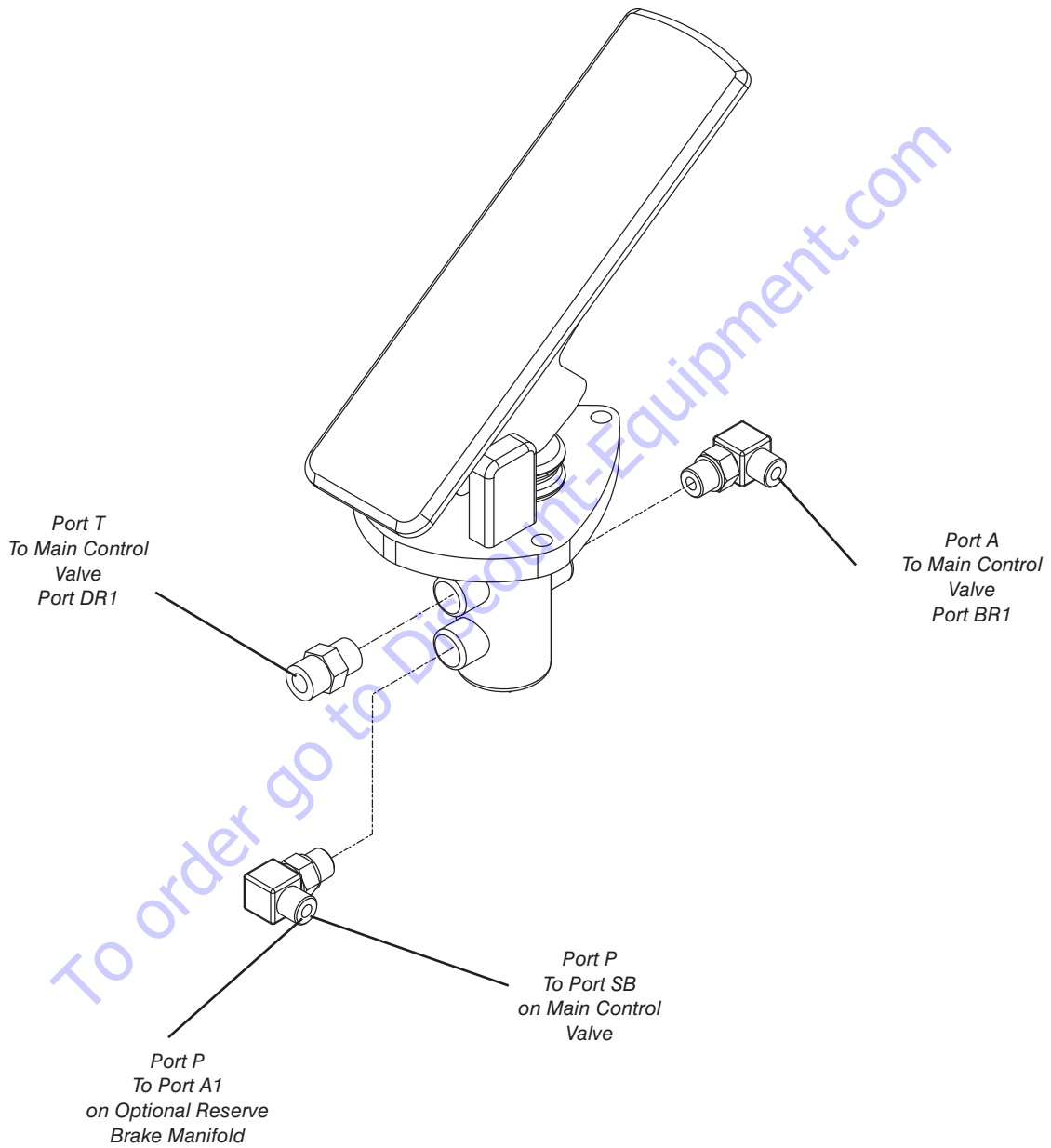
M190807-1, M191415AA-S1

3.6 Steering Control Unit Ports Identification



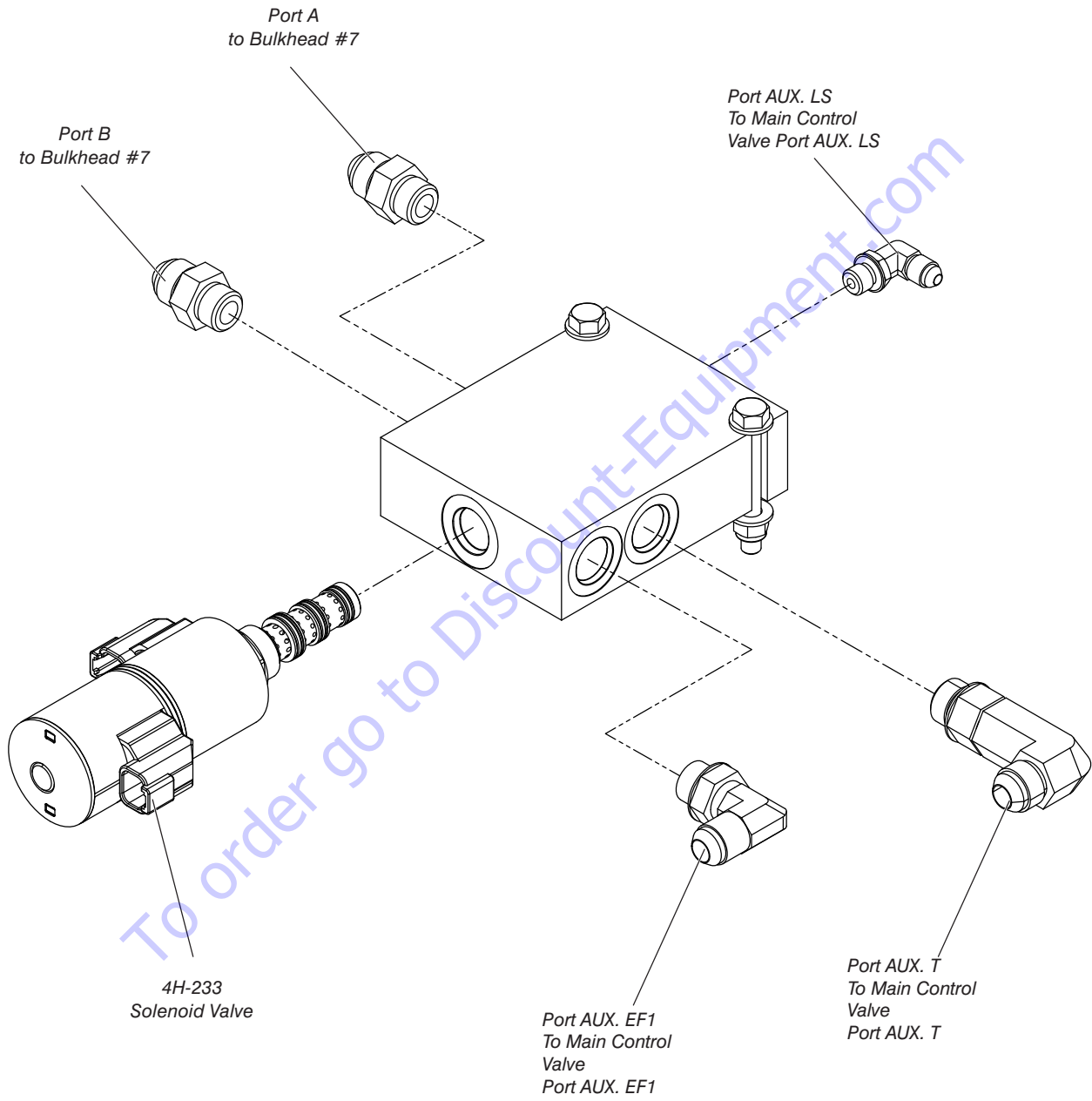
Steering Control Unit

3.7 Service Brake Actuator (Brake Pedal) Ports Identification



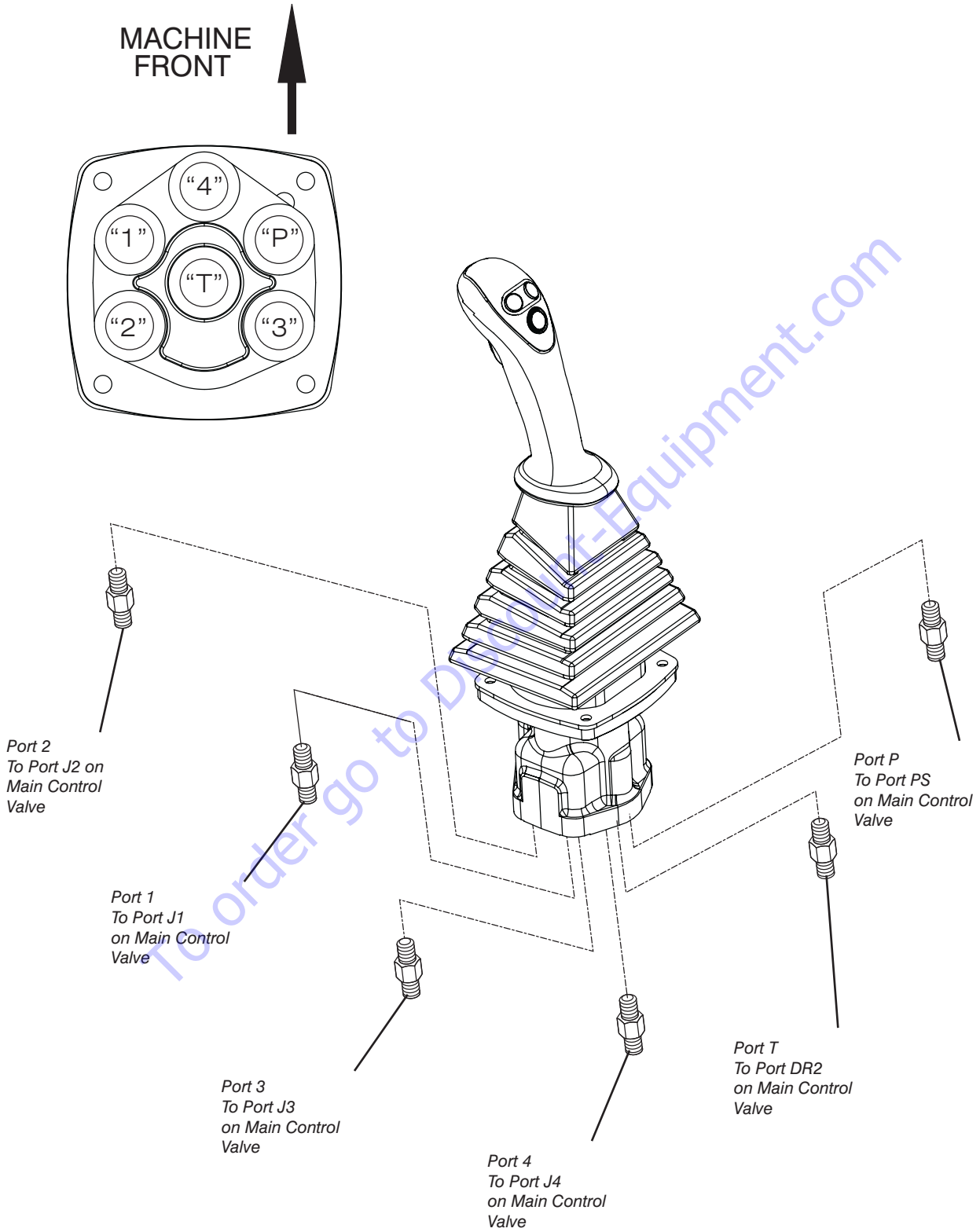
Brake Pedal

3.8 Auxiliary Block Ports Identification



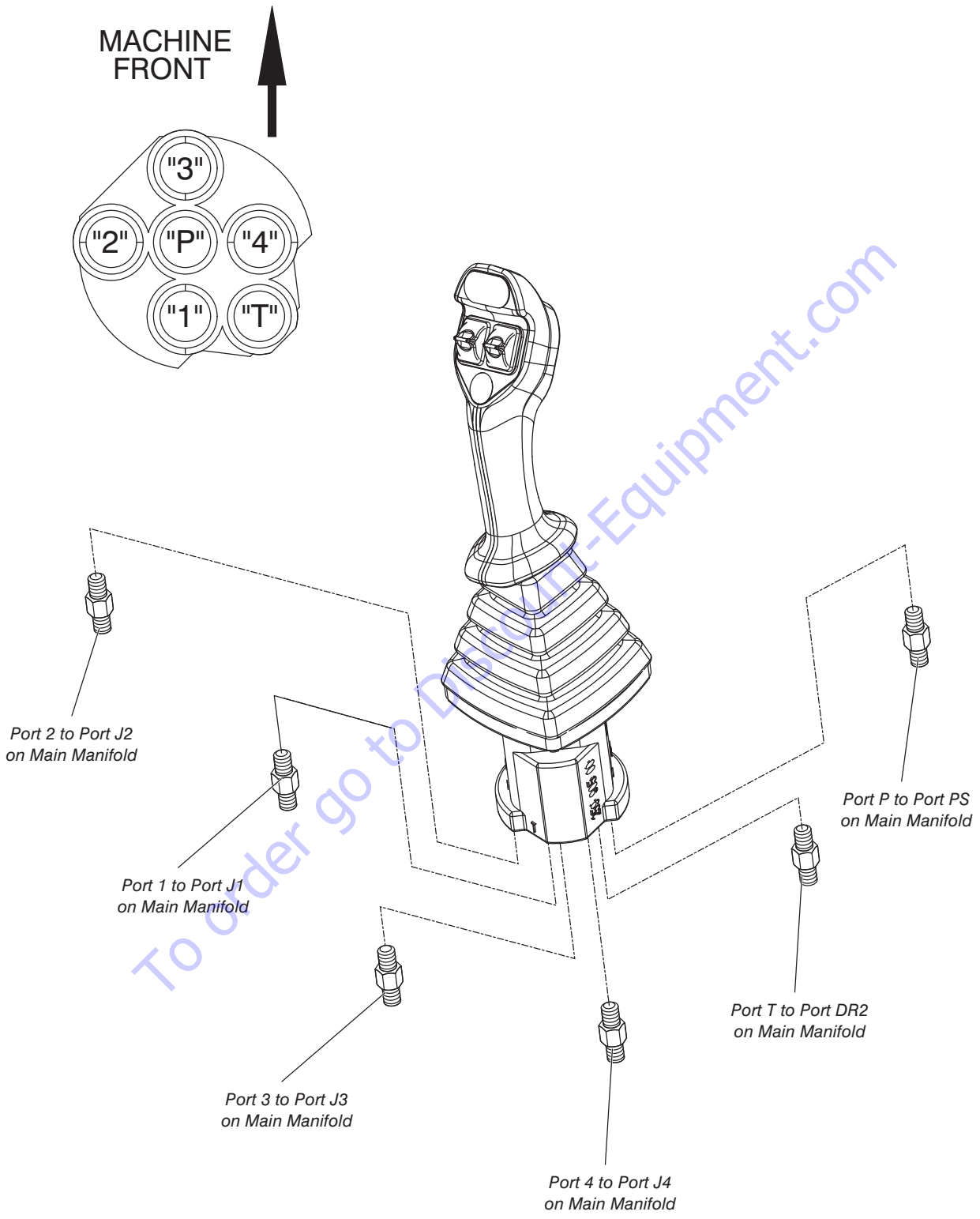
M190791AB-S1

3.9 Joystick Port Identifications



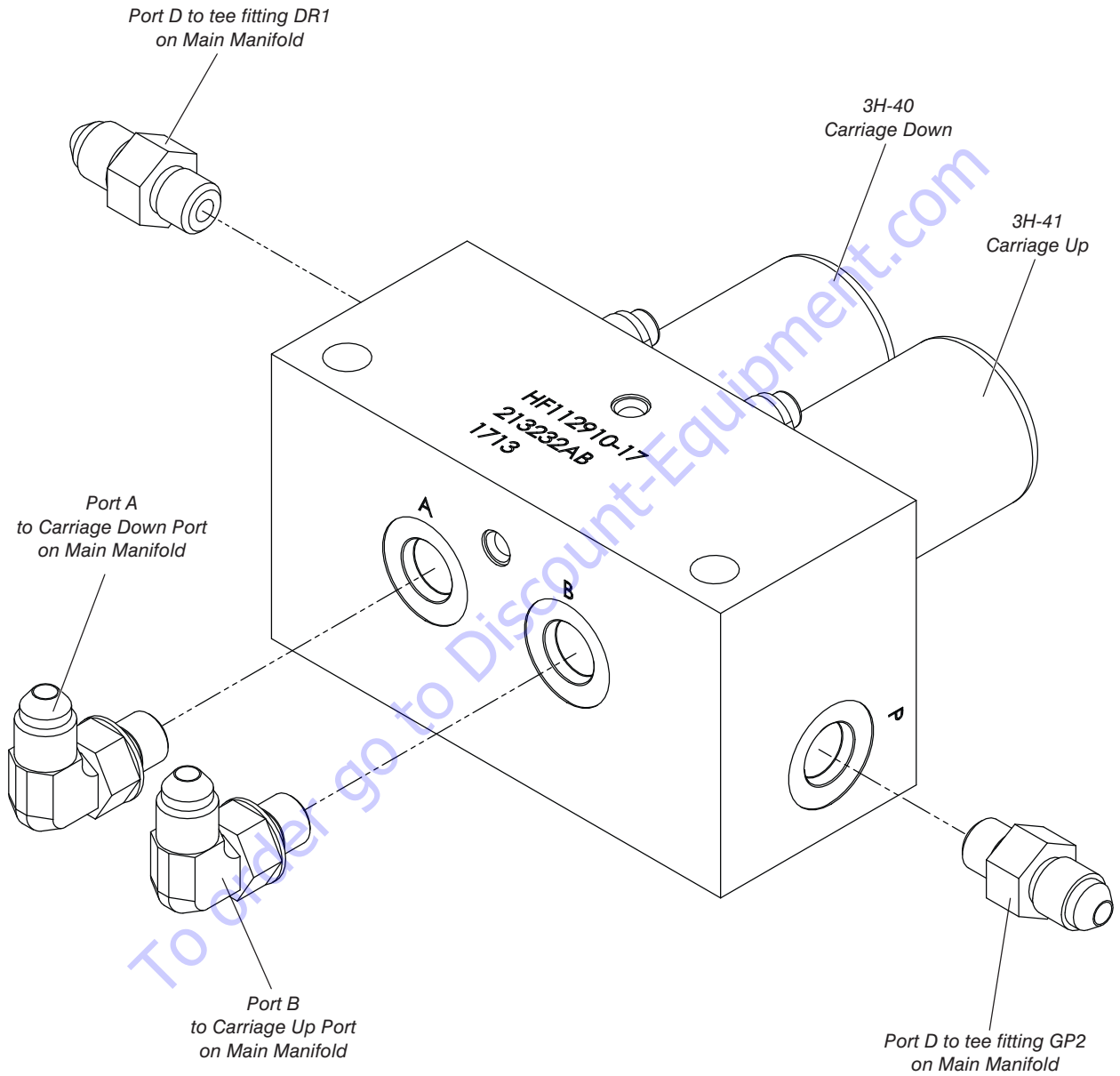
M190356-1

3.10 Premium Joystick Port Identifications



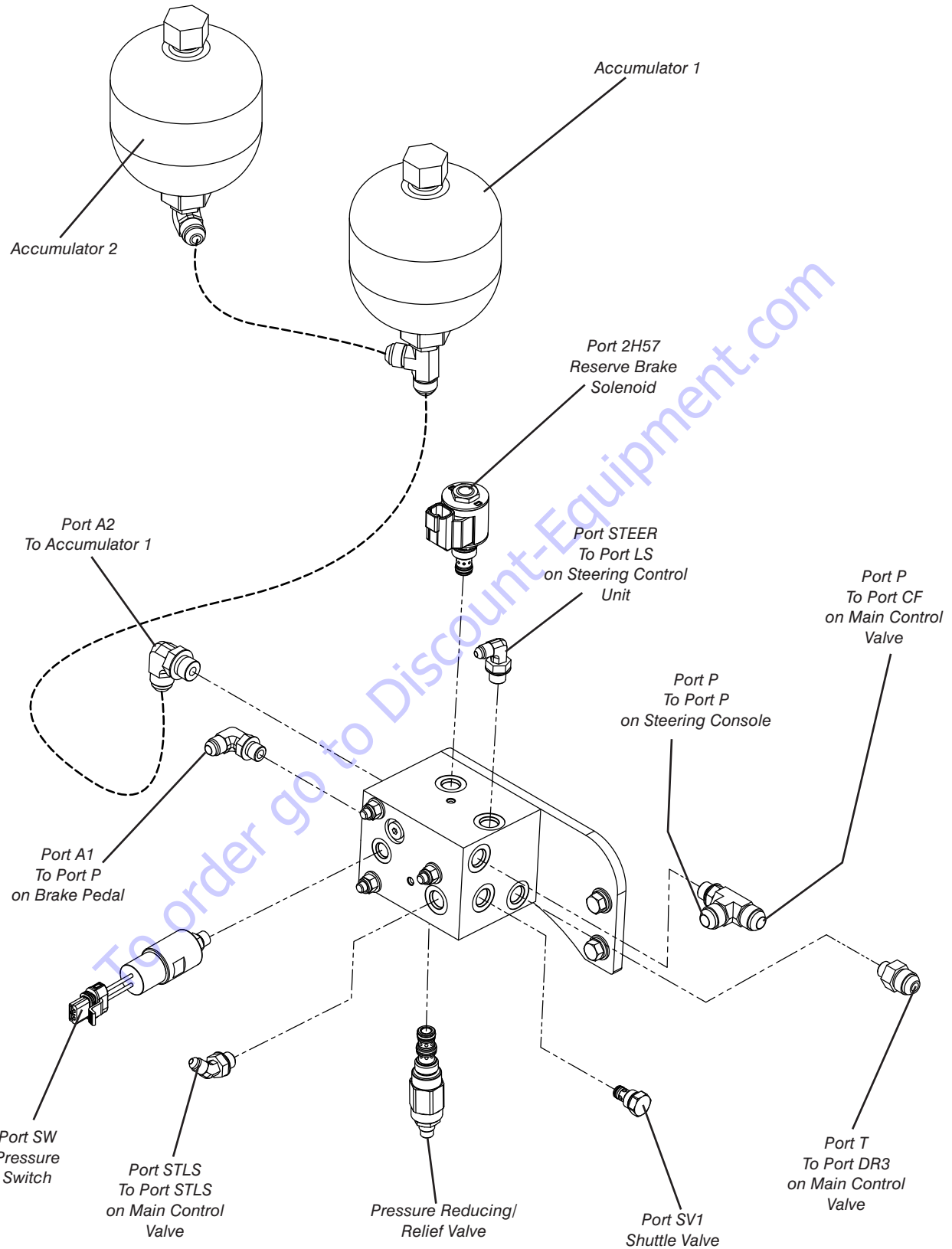
M1344040201_JS

3.11 Premium Joystick Manifold Port Identifications



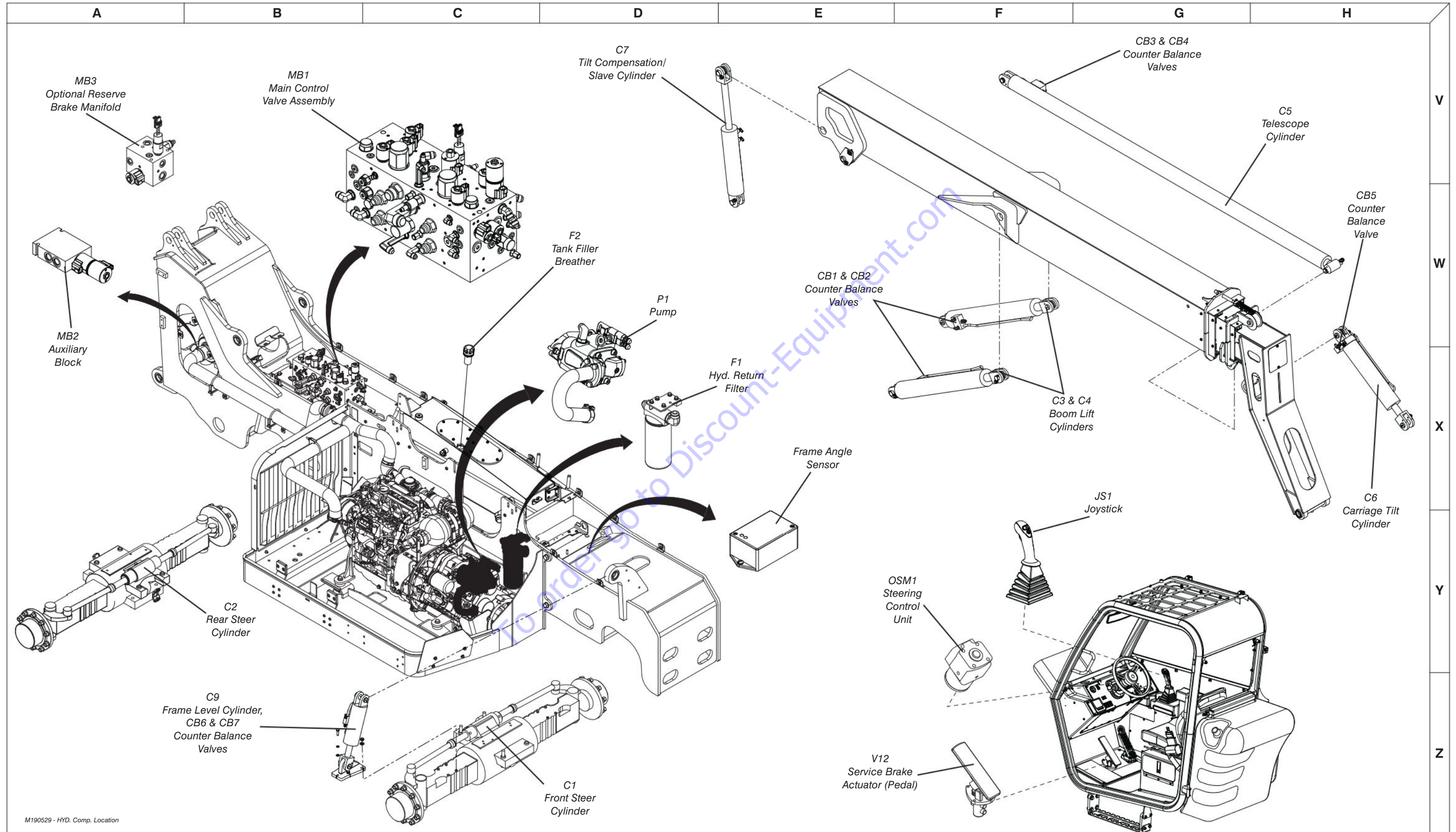
213749AA-SM

3.12 Optional Reserve Brake Manifold Port Identification



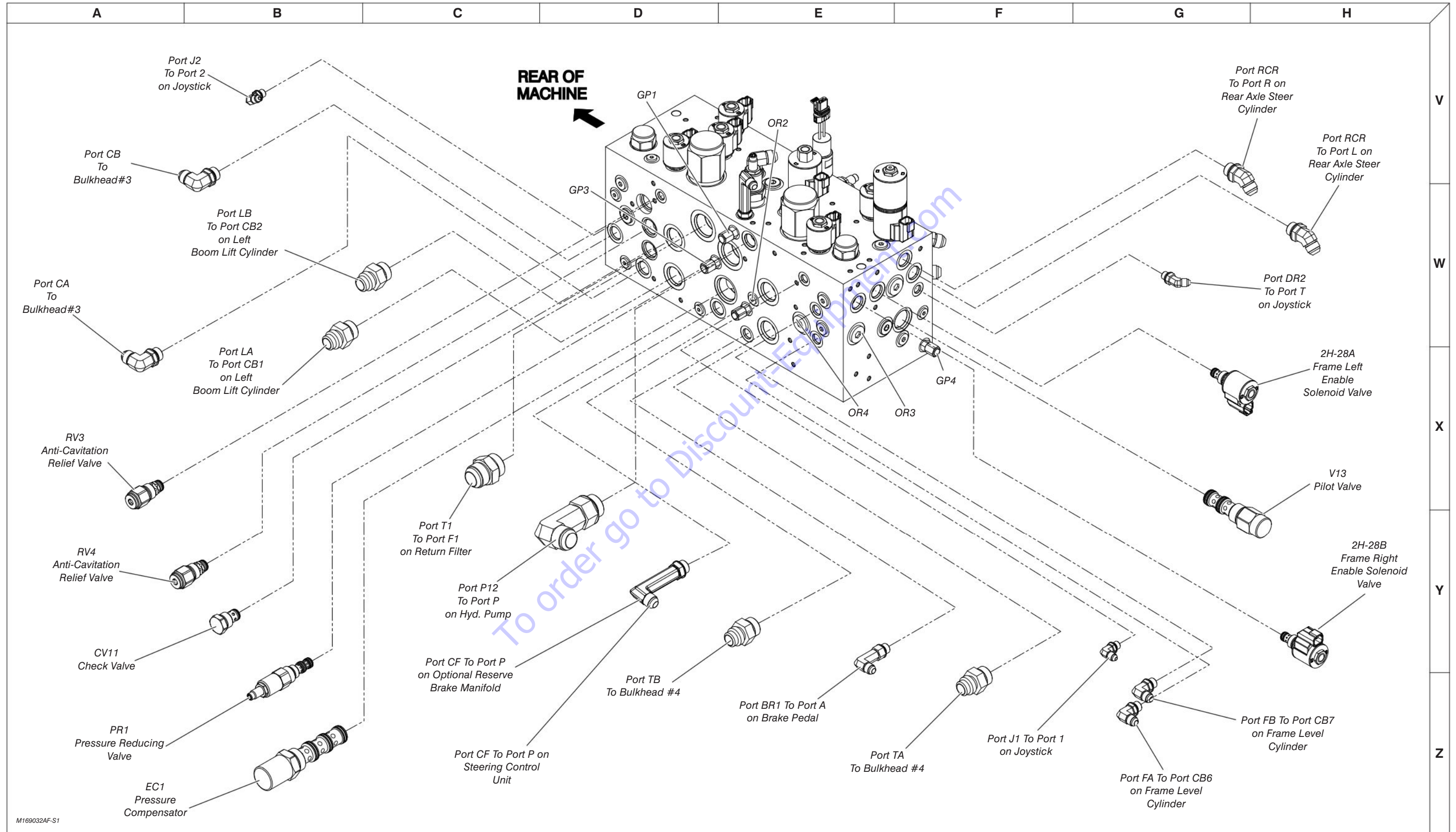
M190115AC-S1

3.13 Major Components Identification and Location



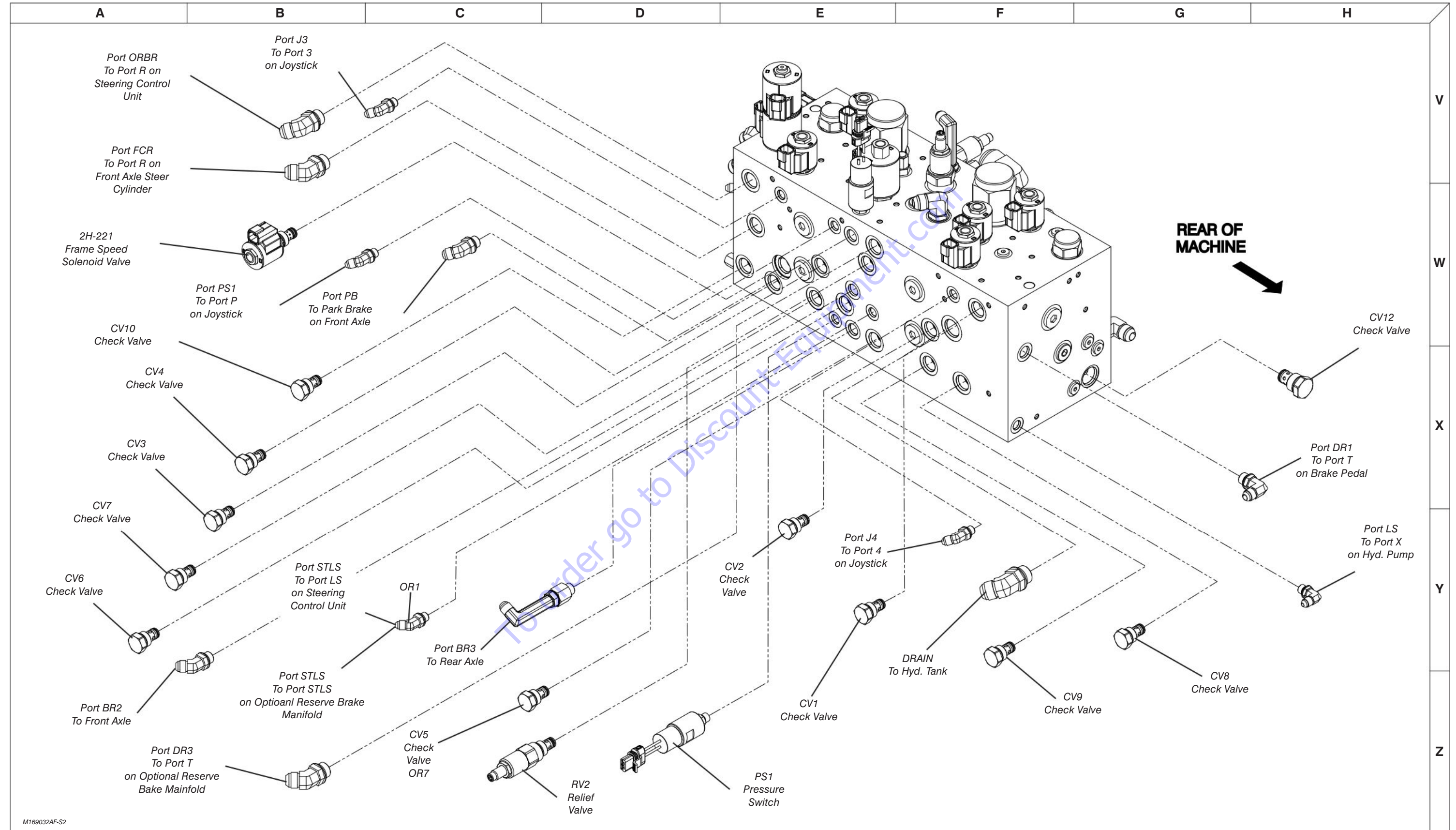
M190529 - HYD. Comp. Location

3.14 Main Control Valve Port Identification

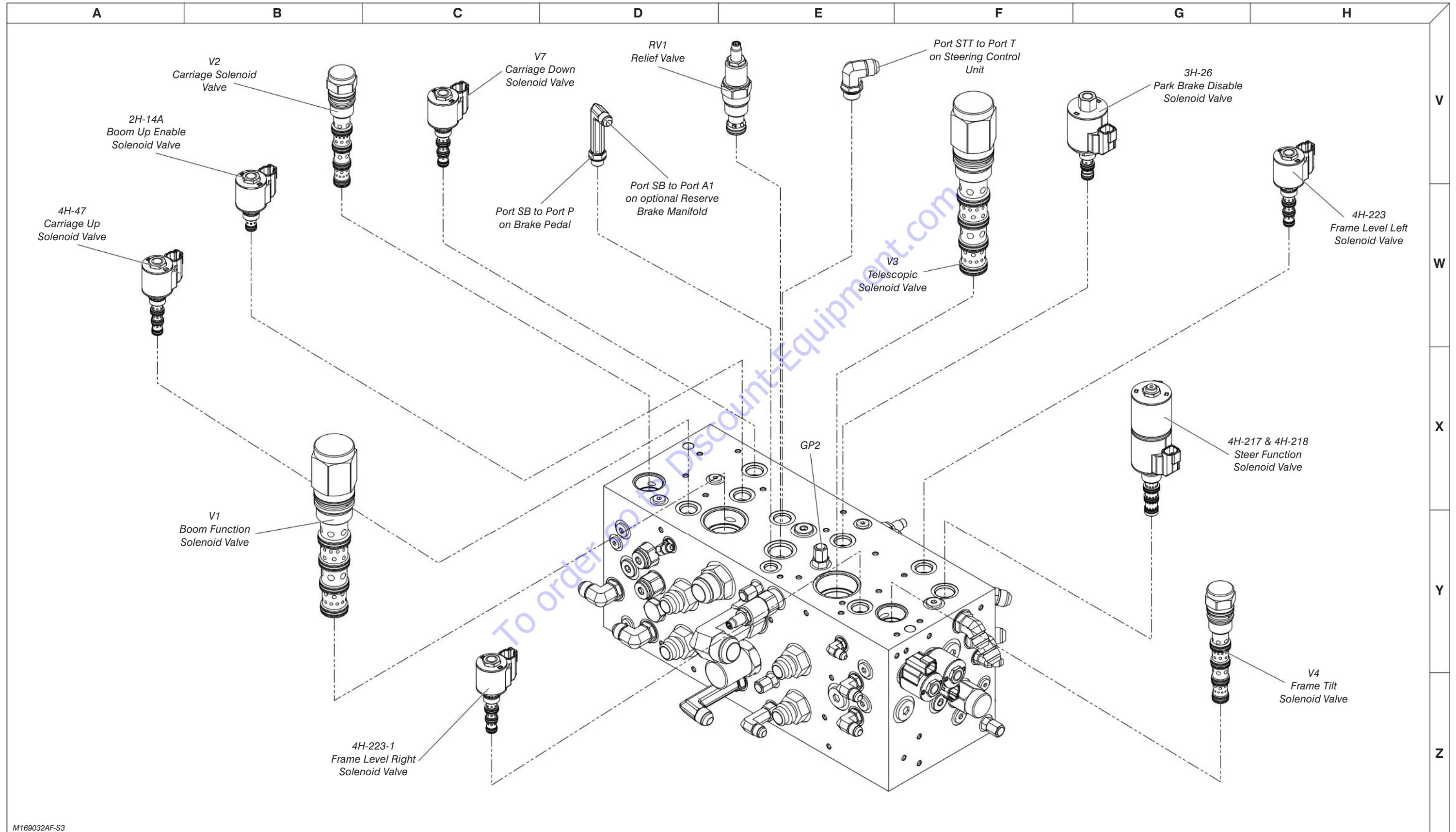


M169032AF-S1

3.14 Main Control Valve Port Identification

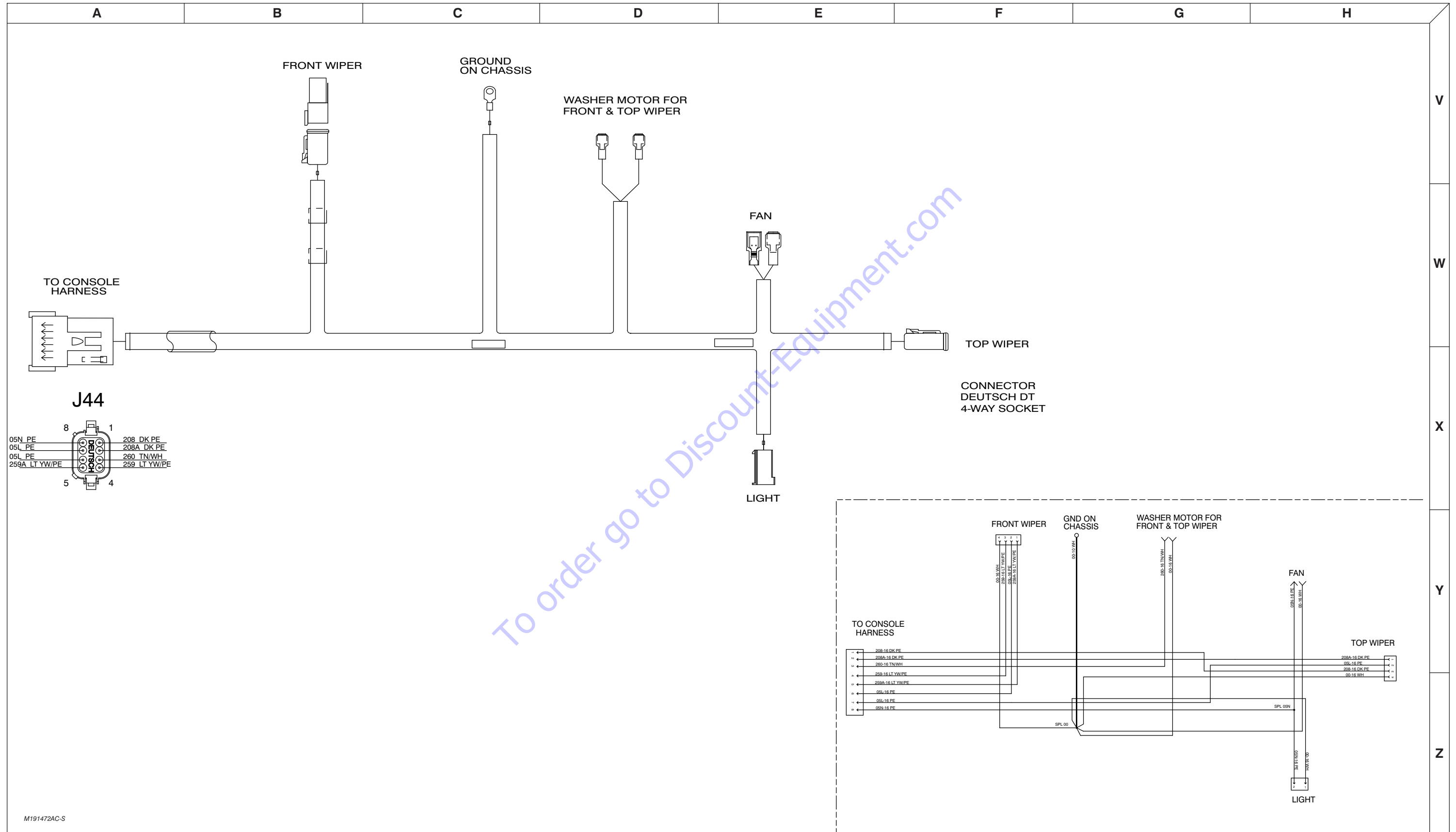


3.14 Main Control Valve Port Identification



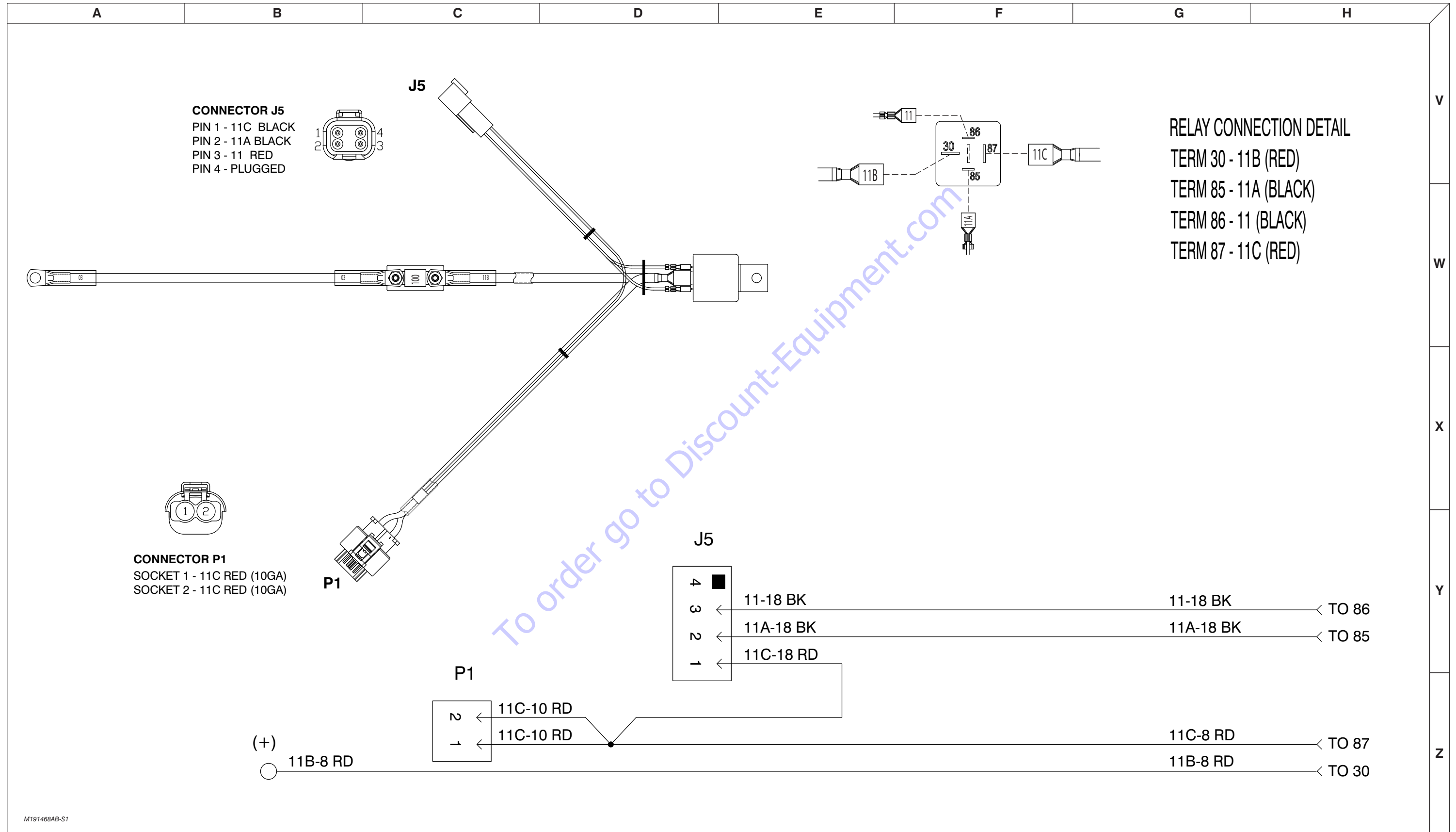
M169032AF-S3

3.15 Enclosed Cab Harness & Wiring Diagram



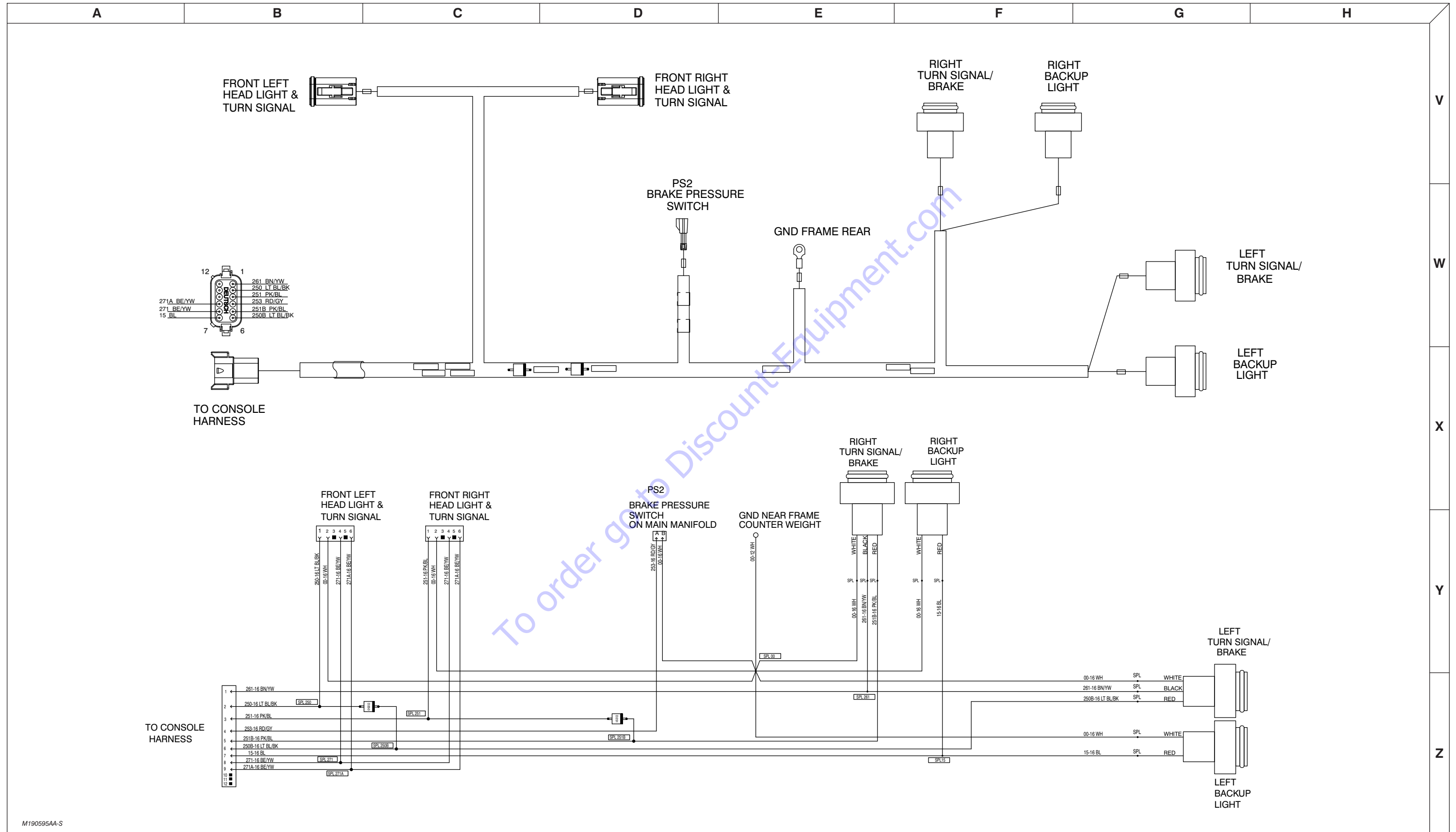
M191472AC-S

3.16 Glow Plug Harness & Wiring Diagram



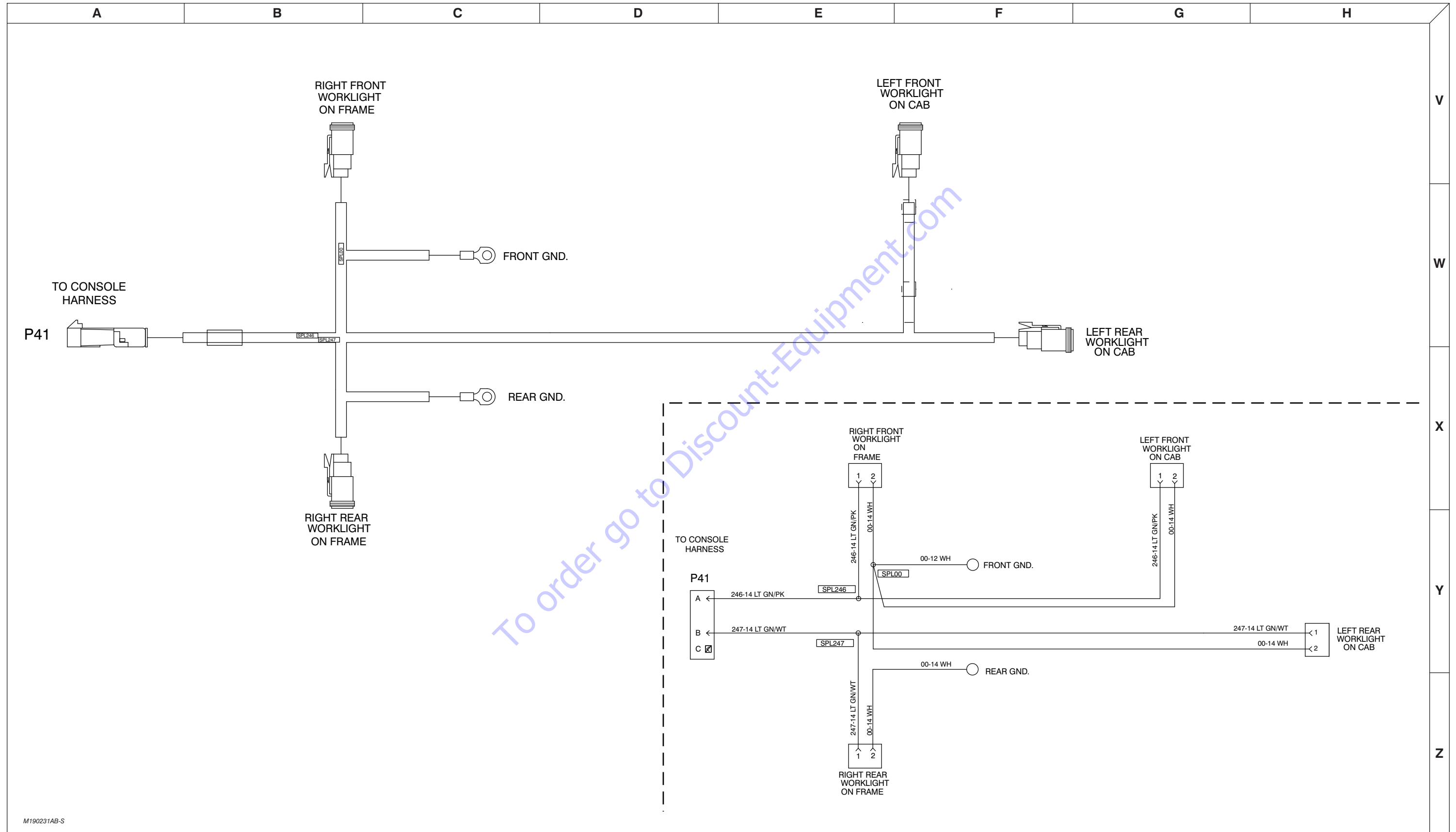
M191468AB-S1

3.17 Road Lights Harness & Wiring Diagram



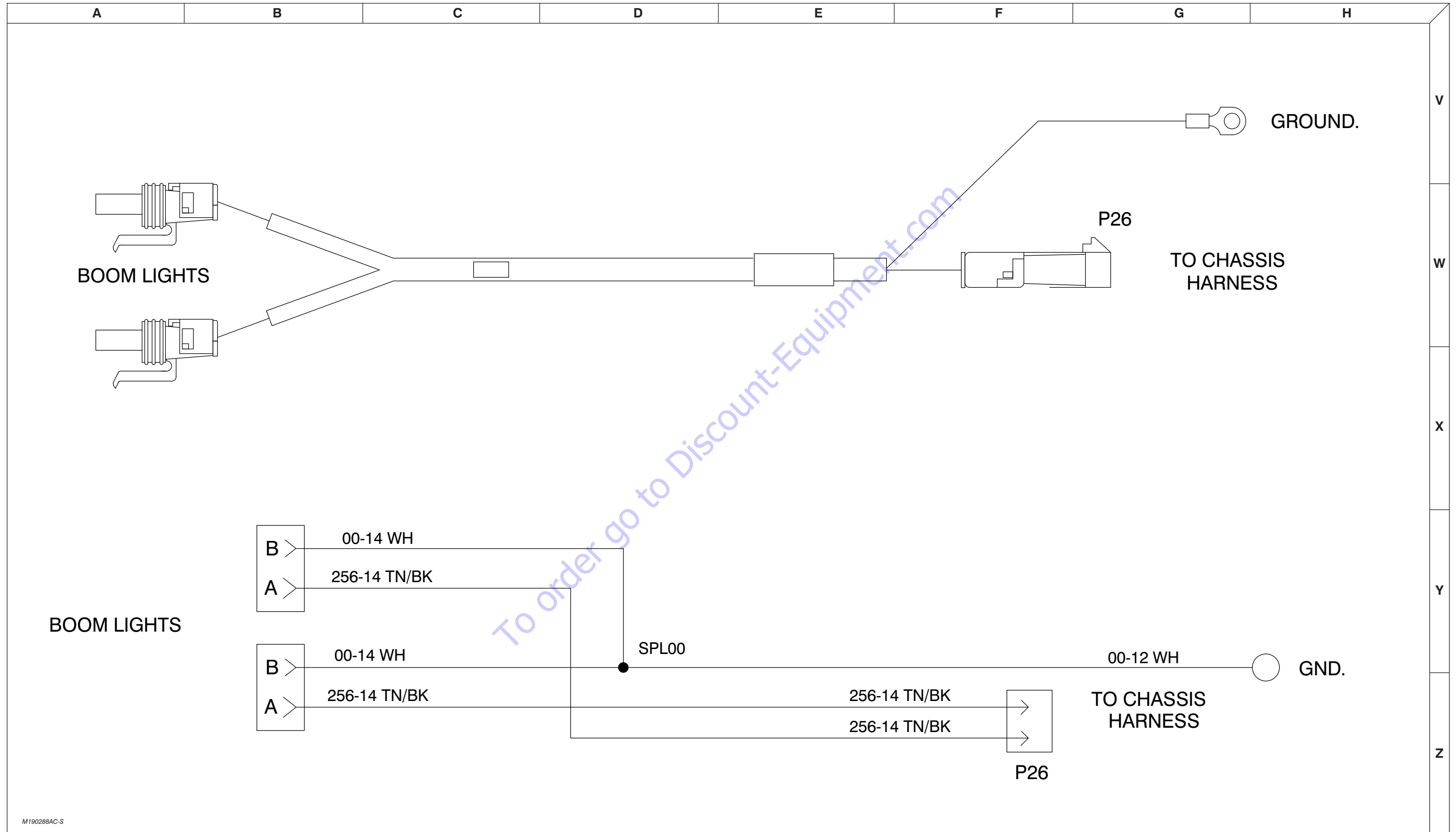
M190595AA-S

3.18 Work Lights Harness & Wiring Diagram



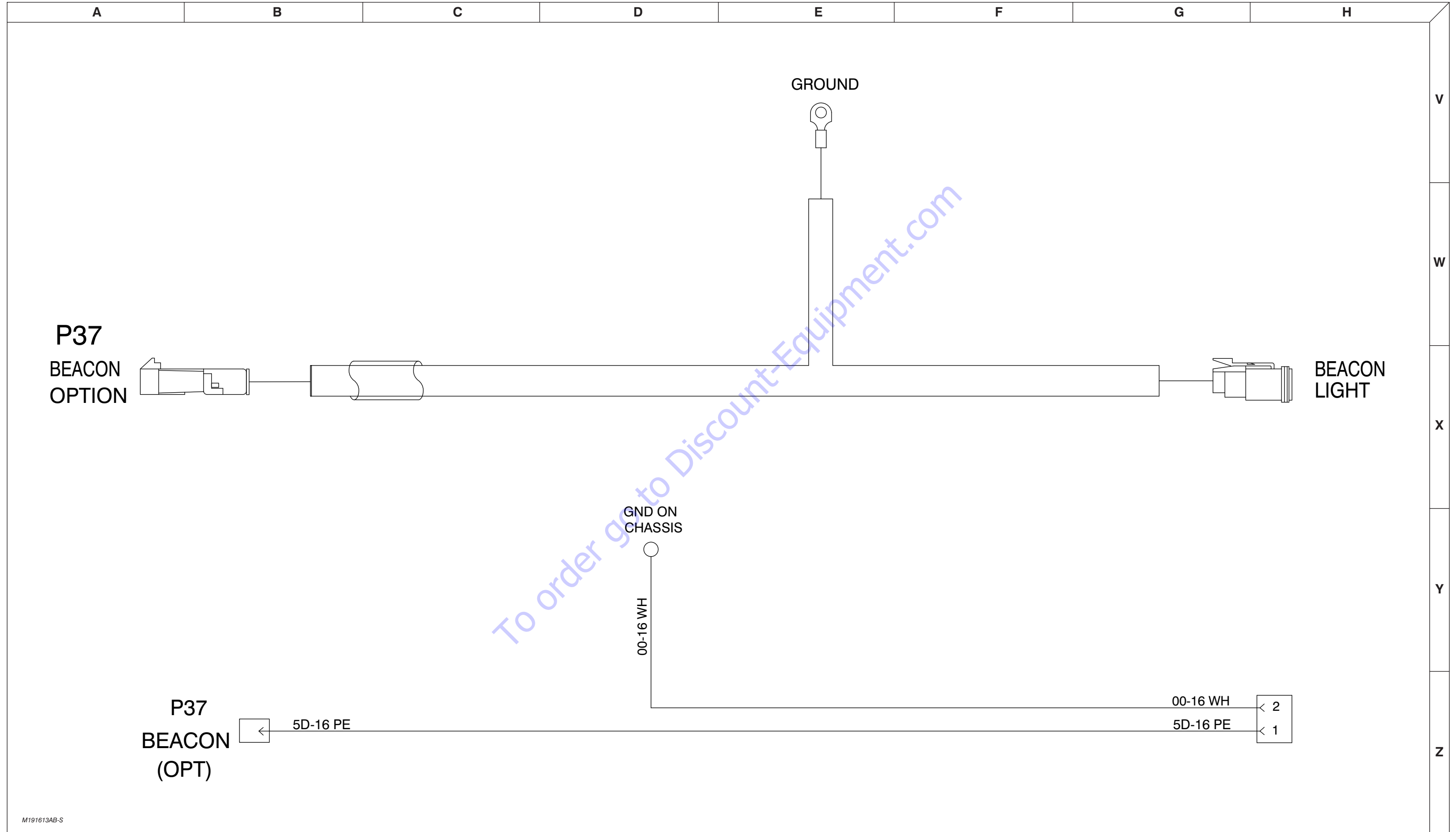
M190231AB-S

3.19 Boom Lights Harness & Wiring Diagram



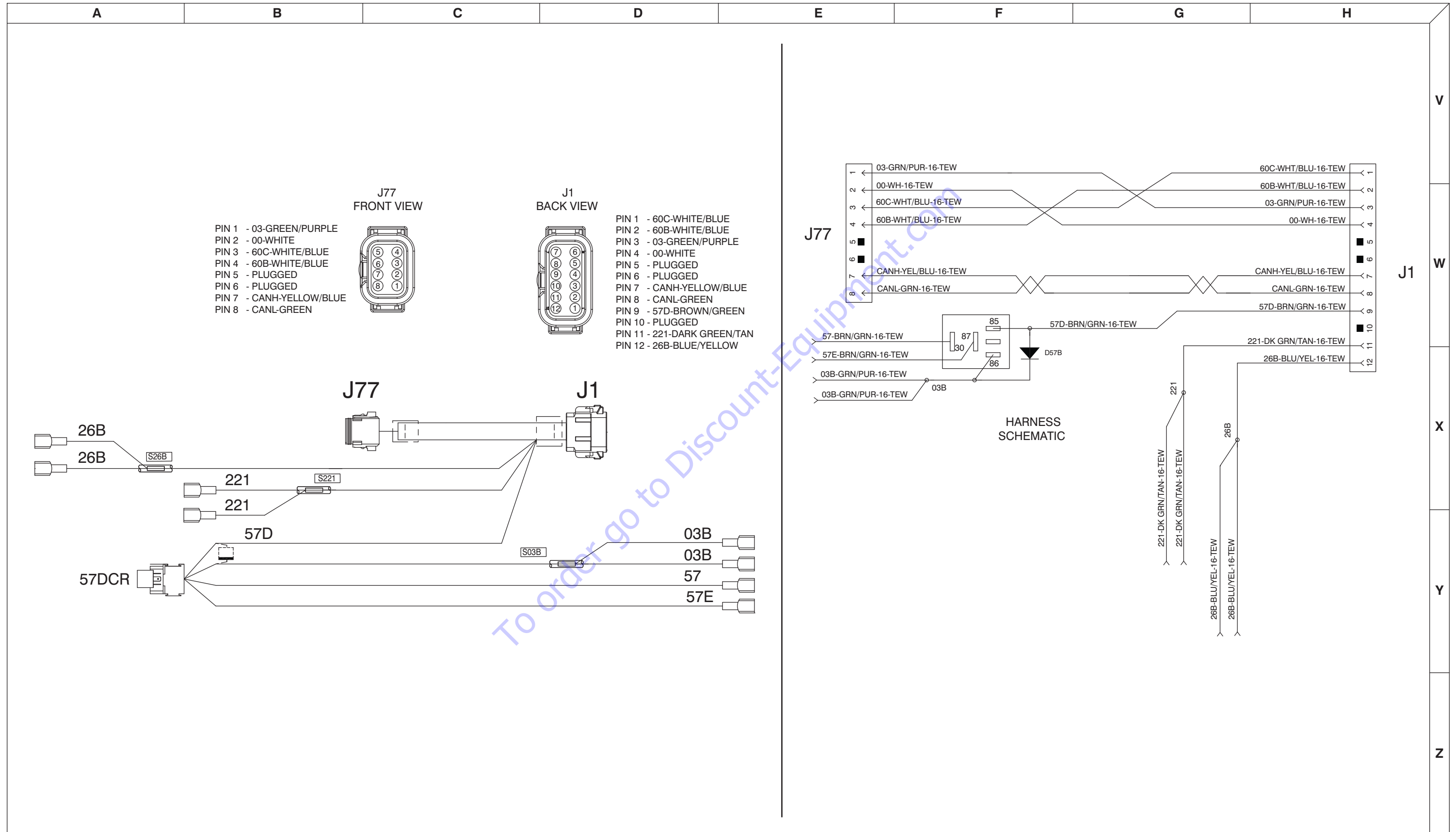
M190288AC-S

3.20 Beacon Light Harness & Wiring Diagram

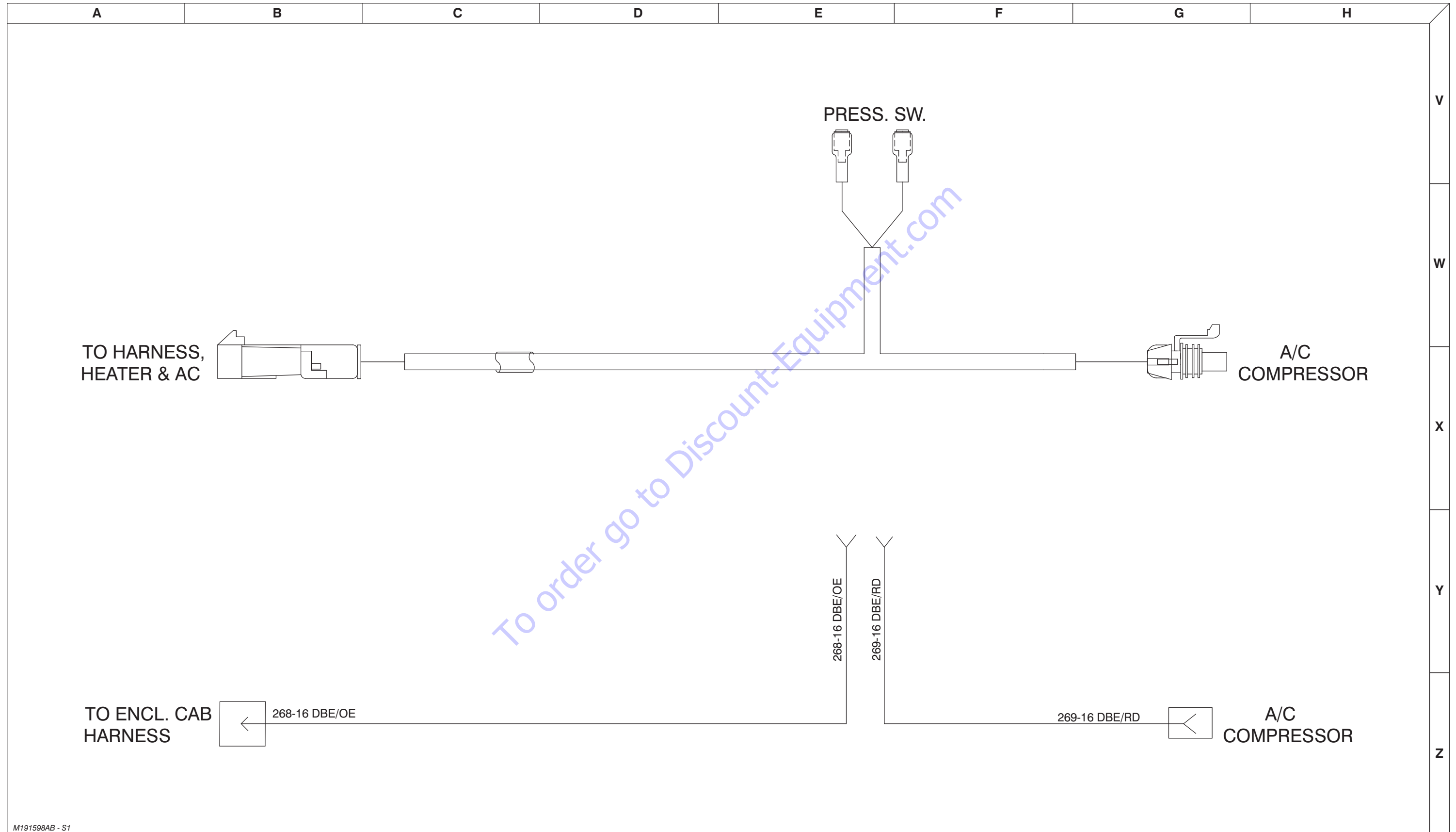


M191613AB-S

3.21 Elevate Telematics Harness

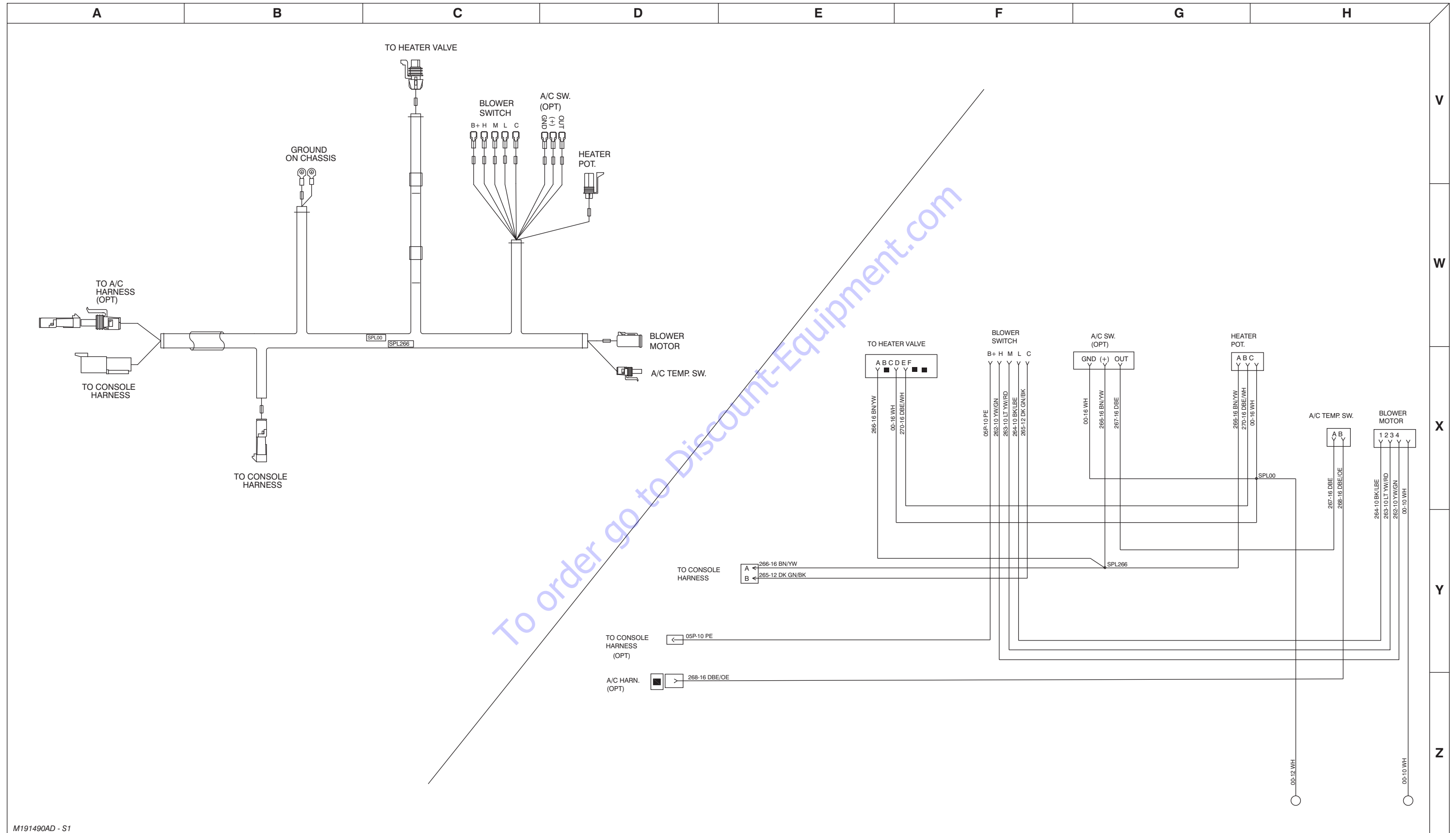


3.22 A/C Harness



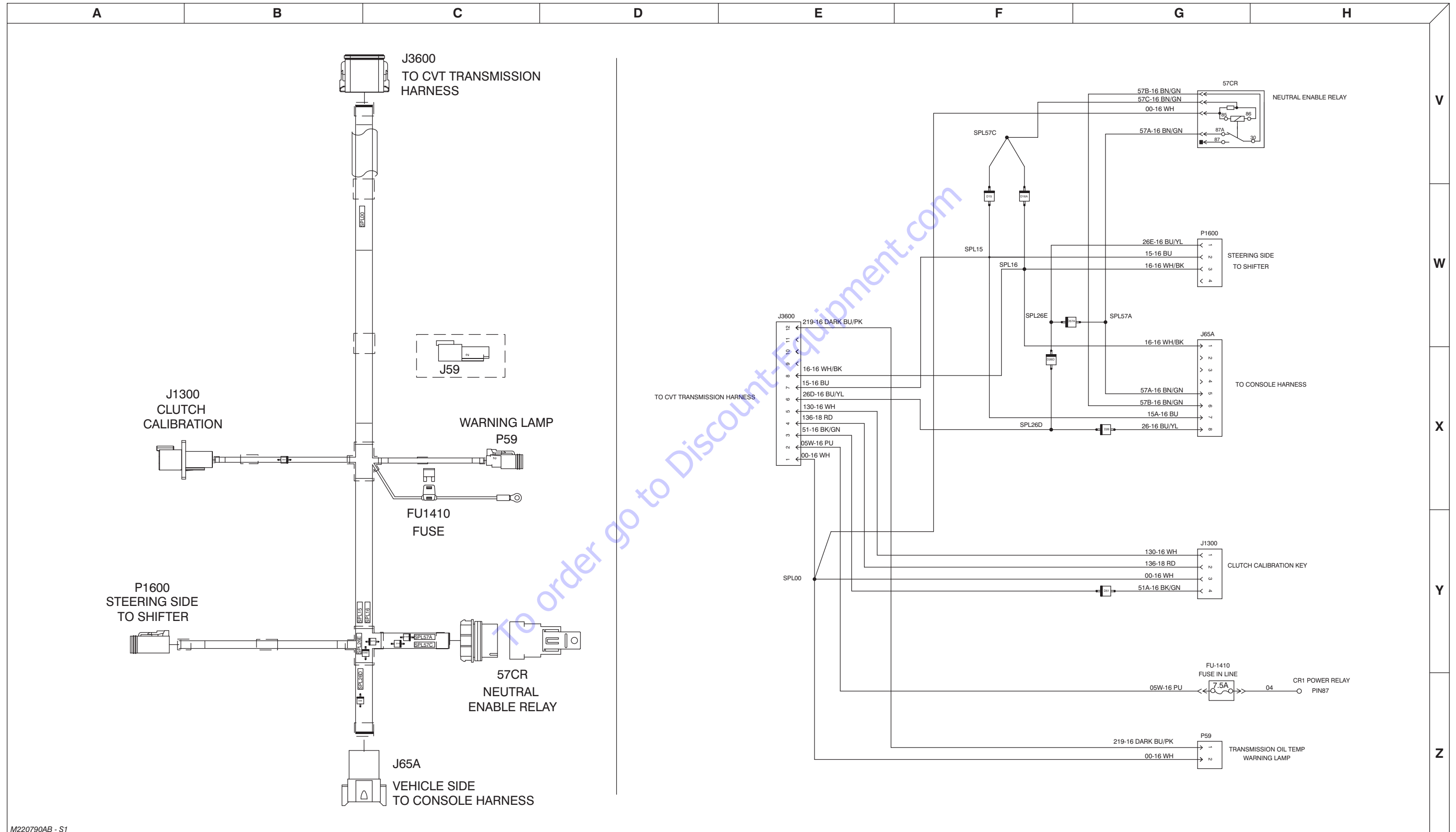
M191598AB - S1

3.23 Heater & A/C Harness



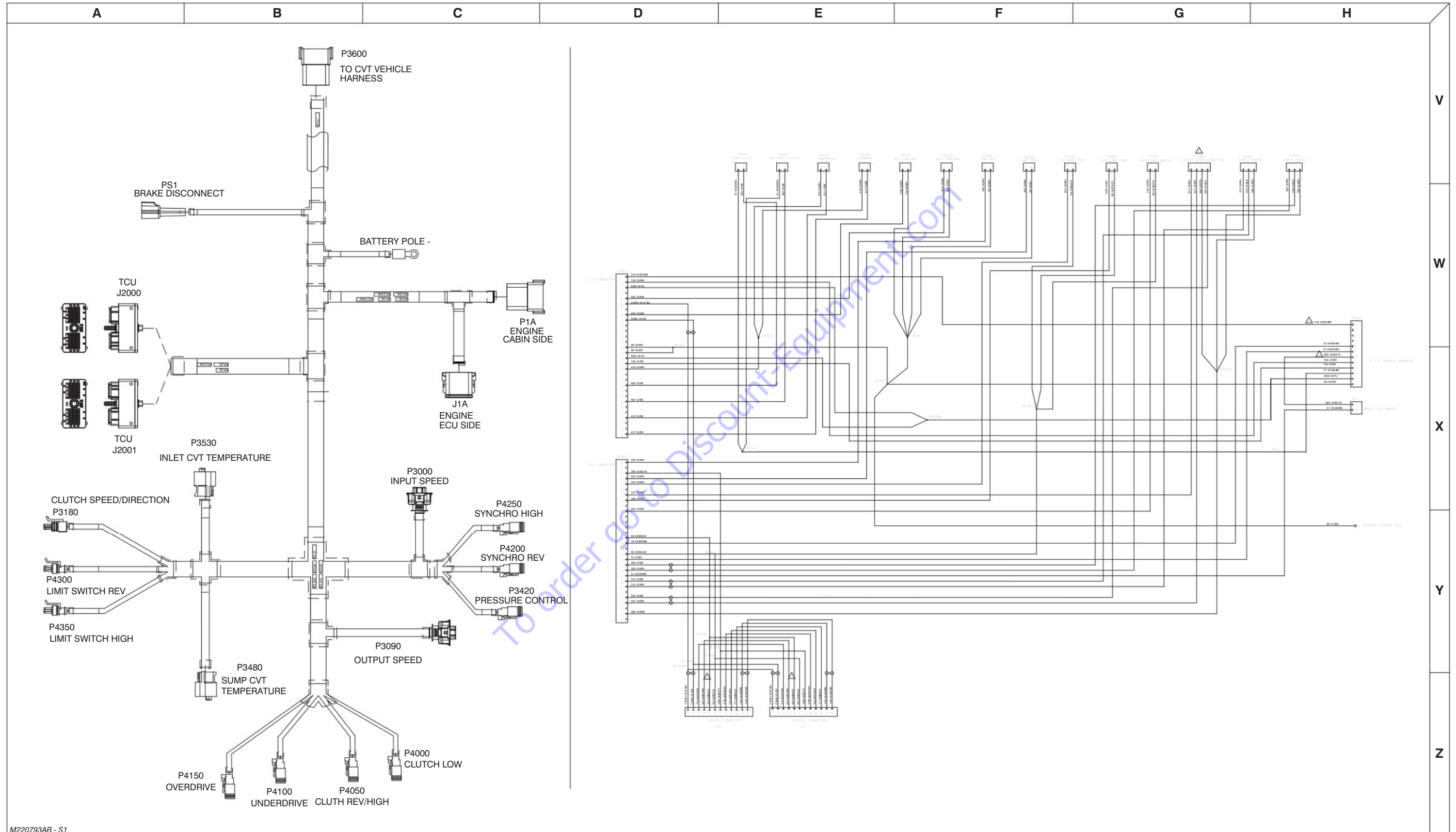
M191490AD - S1

3.24 CVT Vehicle Harness



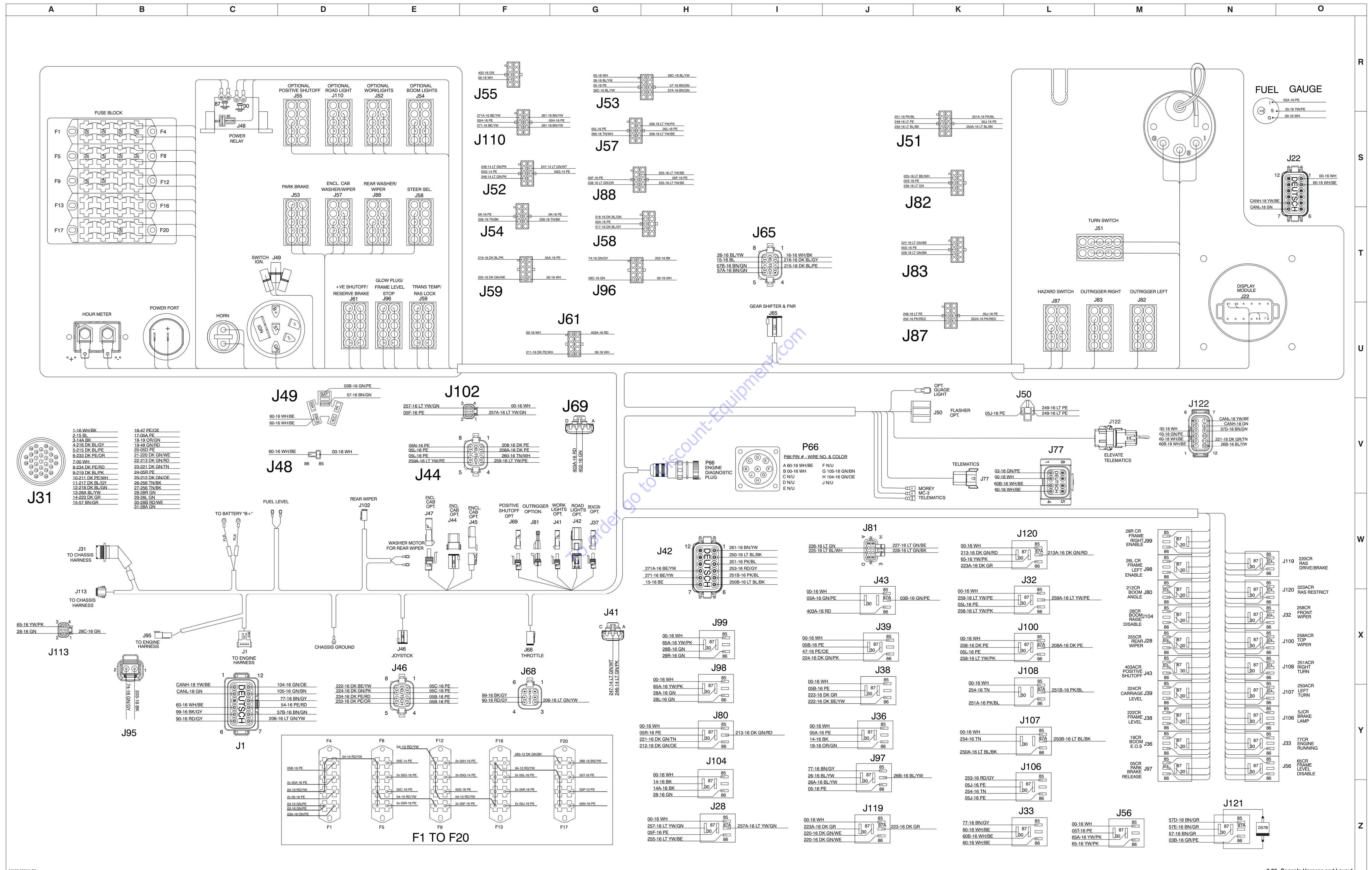
M220790AB - S1

3.25 CVT Transmission Harness



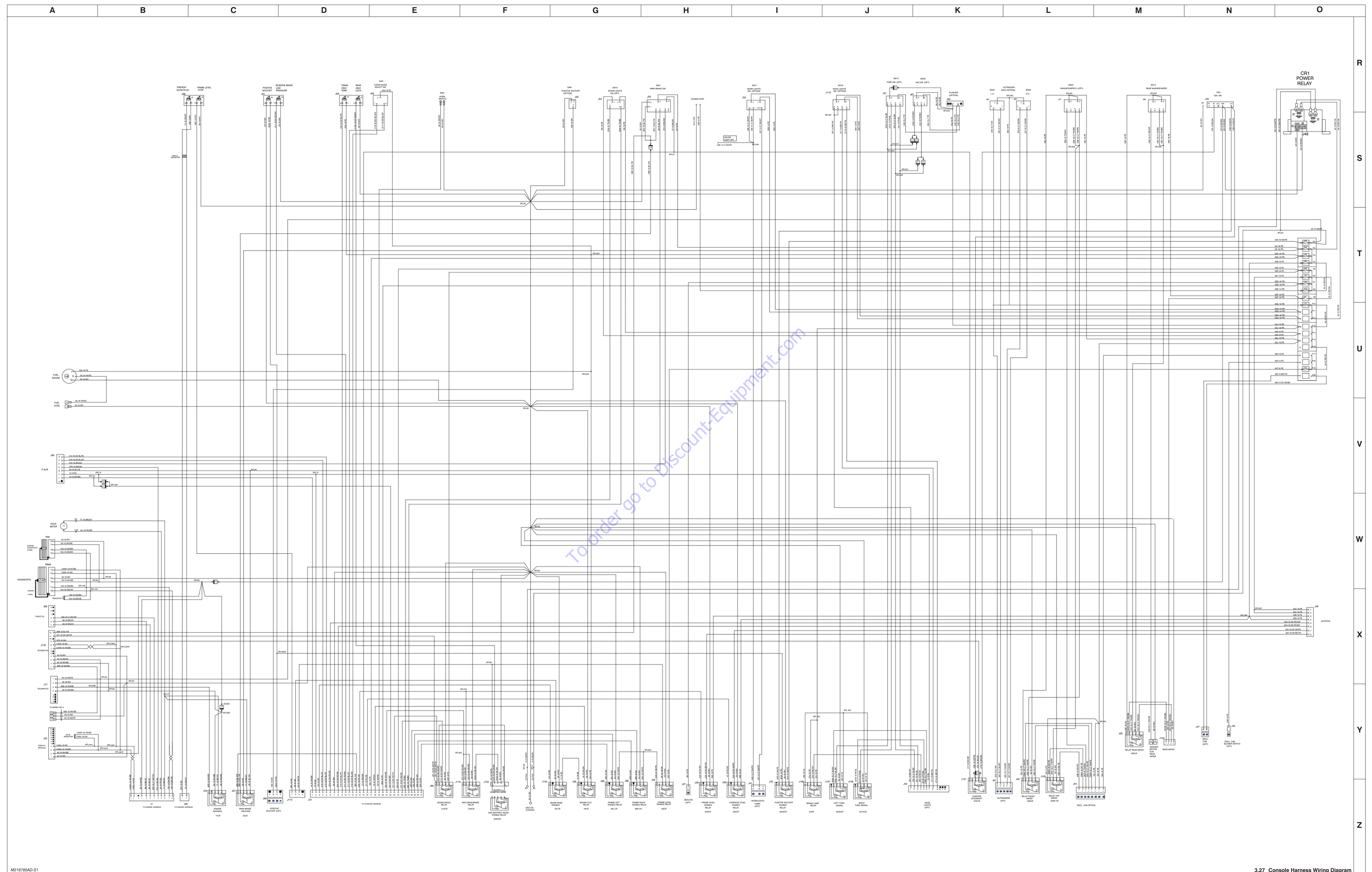
M220793AB - S1

3.26 Console Harness and Layout



M199476AA-S2

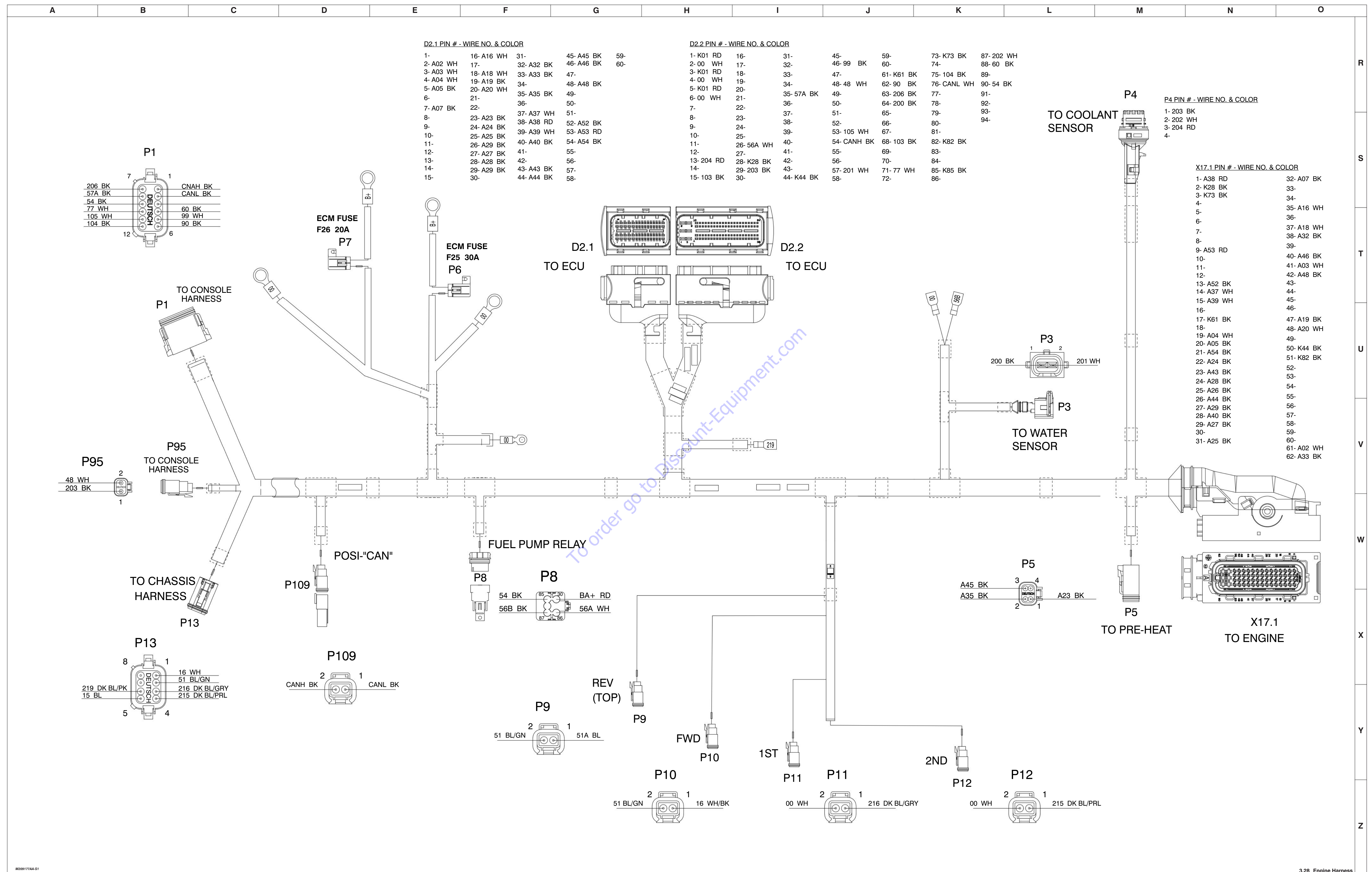
3.27 Console Harness Wiring Diagram



M2167854D-S1

3.27 Console Harness Wiring Diagram

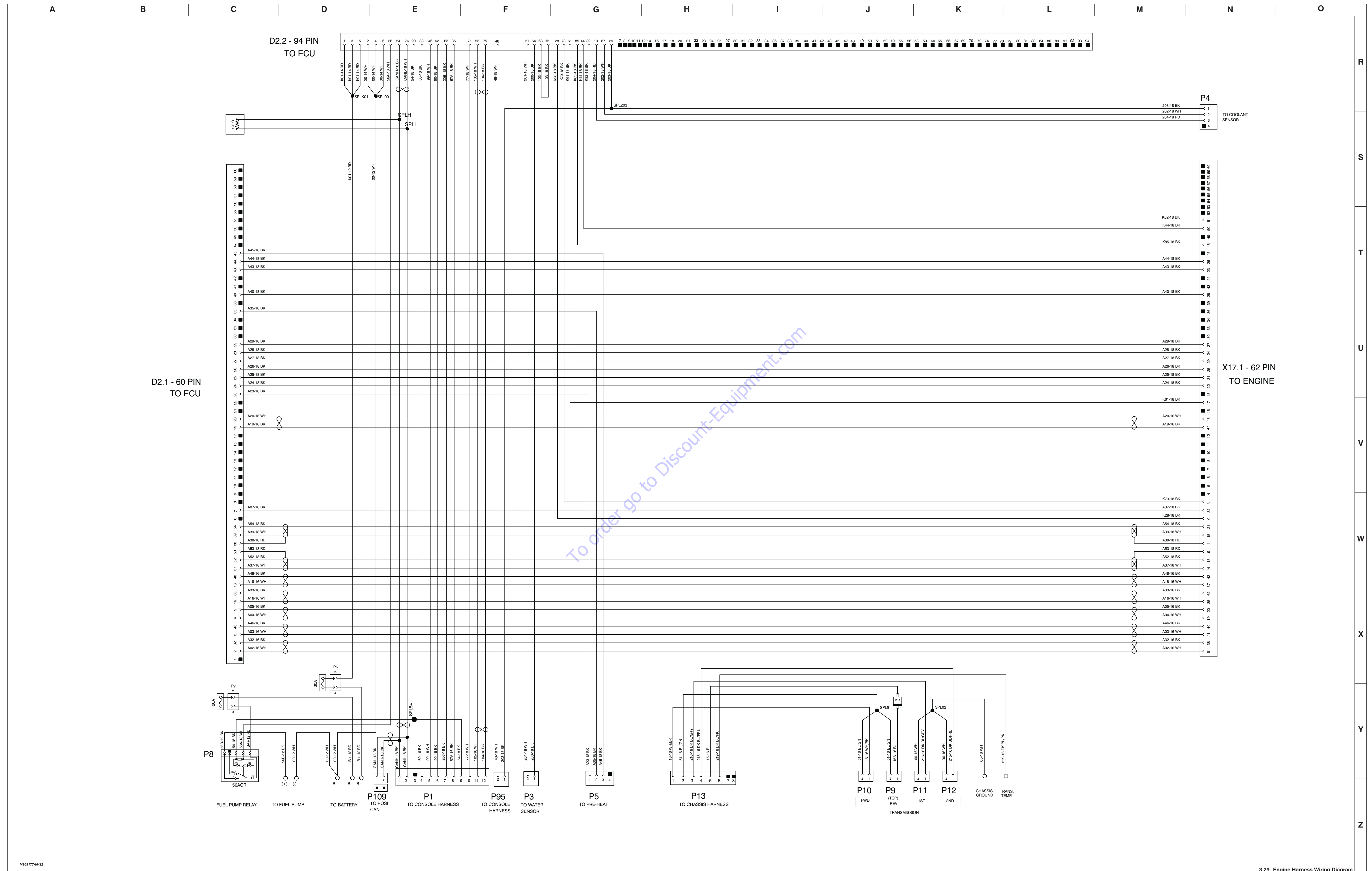
3.28 Engine Harness



M209177AA-51

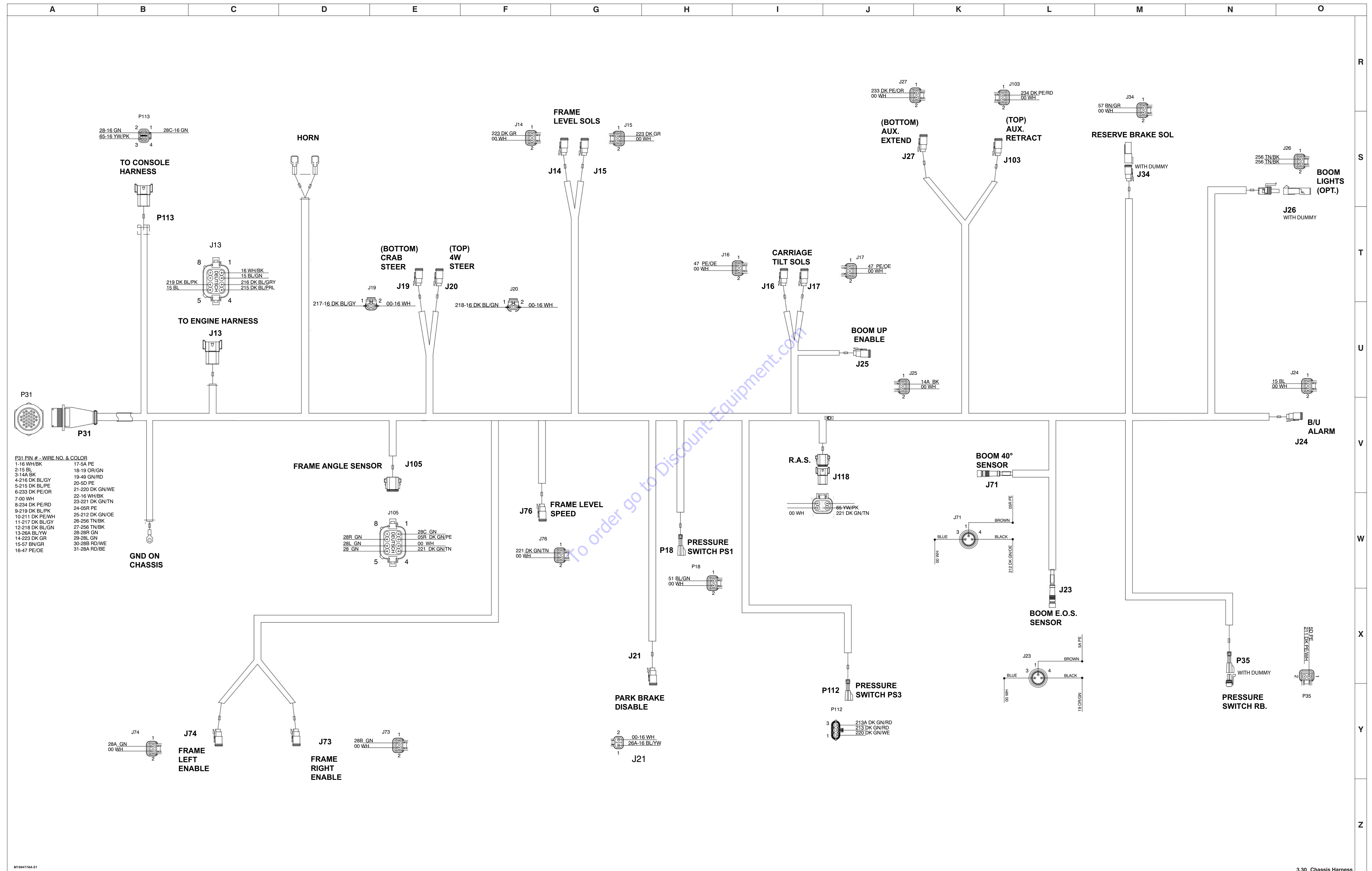
3.28 Engine Harness

3.29 Engine Harness Wiring Diagram



M209177AA-52

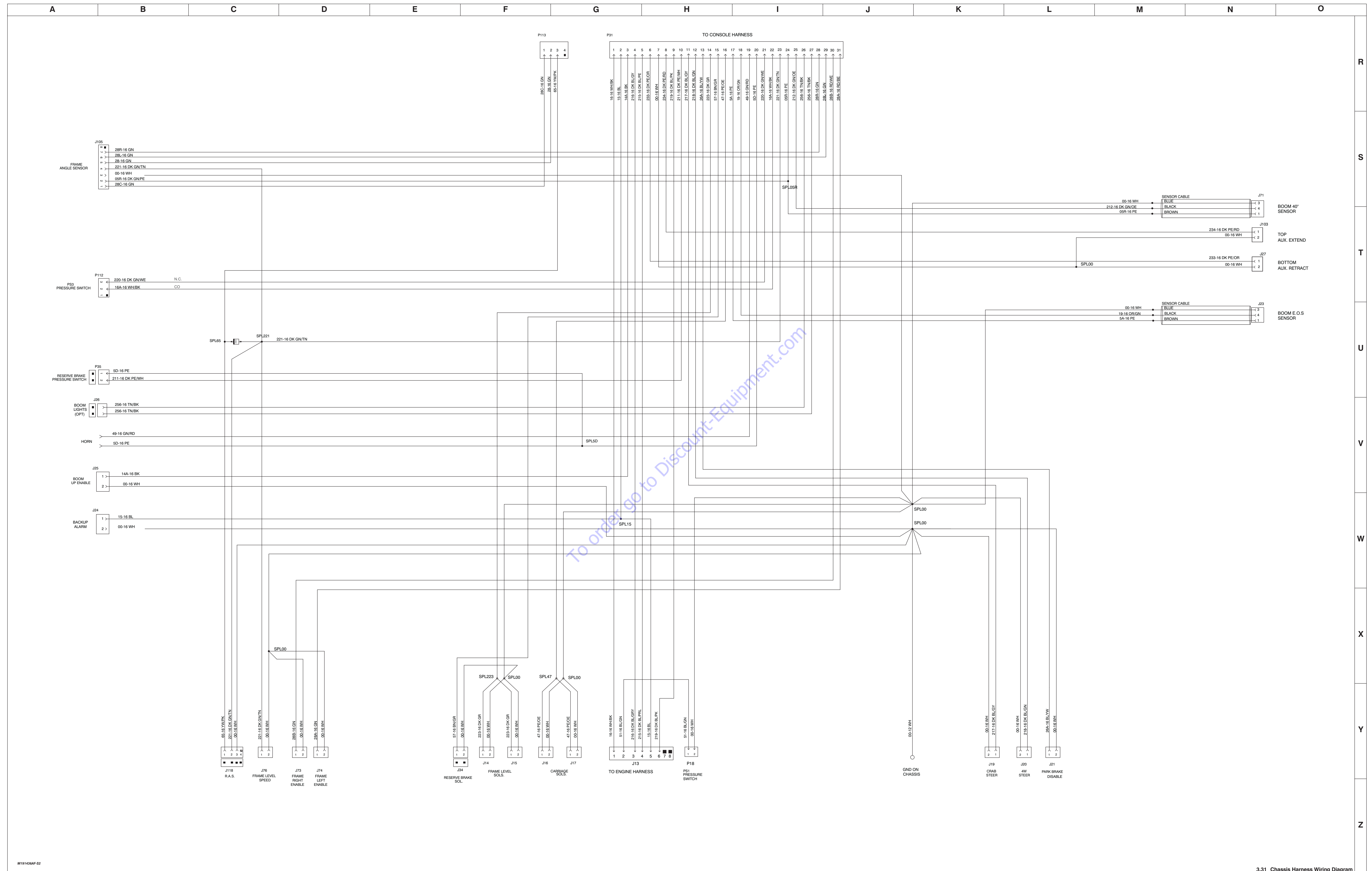
3.30 Chassis Harness



M19947AA-51

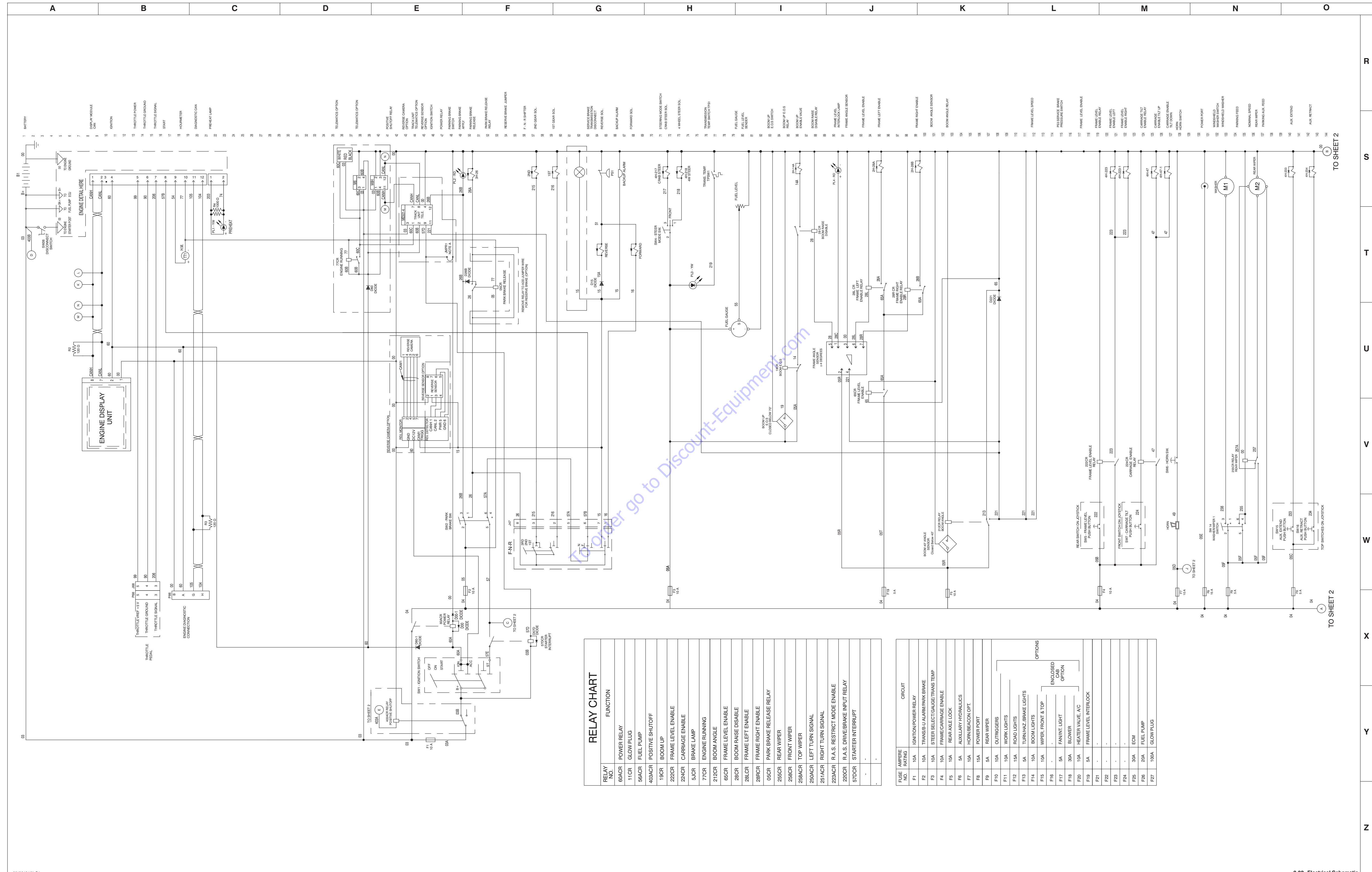
3.30 Chassis Harness

3.31 Chassis Harness Wiring Diagram



M191436AF-52

3.32 Electrical Schematic



RELAY CHART

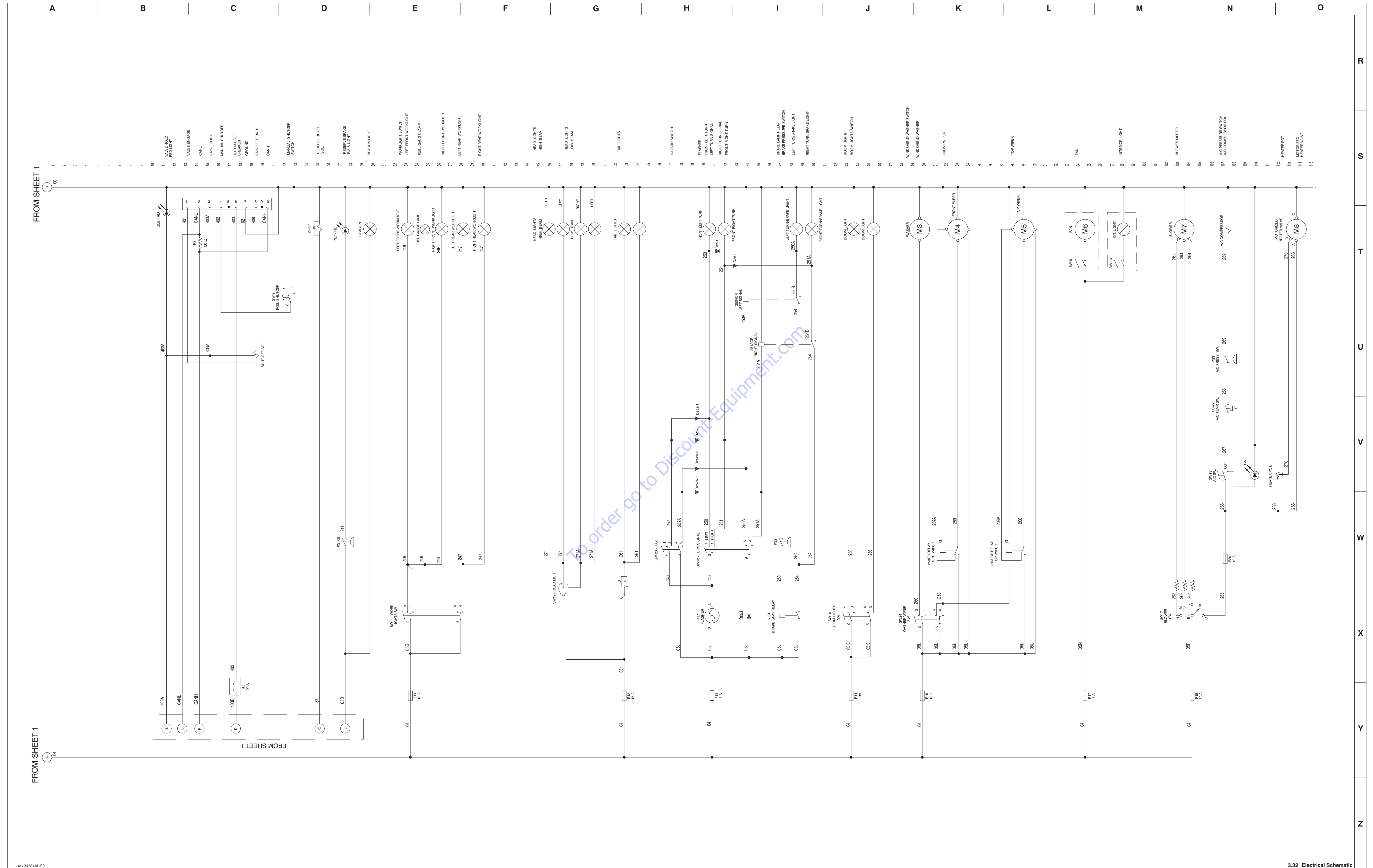
RELAY NO.	FUNCTION
60ACR	POWER RELAY
11CR	GLOW PLUG
56ACR	FUEL PUMP
403ACR	POSITIVE SHUTOFF
19CR	BOOM UP
222CR	FRAME LEVEL ENABLE
51CR	CARRIAGE ENABLE
77CR	ENGINE RUNNING
212CR	BOOM ANGLE
65CR	FRAME LEVEL ENABLE
28CR	BOOM RAISE DISABLE
28LCR	FRAME LEFT ENABLE
28RCR	FRAME RIGHT ENABLE
05CR	PARK BRAKE RELEASE RELAY
255CR	REAR WIPER
256CR	FRONT WIPER
258ACR	TOP WIPER
250ACR	LEFT TURN SIGNAL
251ACR	RIGHT TURN SIGNAL
223ACR	R.A.S. RESTRICT MODE ENABLE
220CR	R.A.S. DRIVE/BRAKE INPUT RELAY
57DCR	STARTER INTERRUPT

FUSE AMPERE NO. RATING	CIRCUIT
F1	IGNITION/POWER RELAY
F2	TRANS-BLU ALARM/PARK BRAKE
F3	10A STEER SELECT/GAUGE/TRANS TEMP
F4	10A FRAME/CARRIAGE ENABLE
F5	10A REAR AXLE LOCK
F6	5A AUXILIARY HYDRAULICS
F7	10A HORN/BEACON OPT.
F8	15A POWER PORT
F9	5A REAR WIPER
F10	10A OUTRIGGERS
F11	10A WORK LIGHTS
F12	15A ROAD LIGHTS
F13	5A TURN/HAZ/BRAKE LIGHTS
F14	10A BOOM LIGHTS
F15	10A WIPER FRONT & TOP
F16	-
F17	5A FAN/INT LIGHT
F18	30A BLOWER
F20	10A HEATER VALVE A/C
F19	5A FRAME LEVEL INTERLOCK
F21	-
F22	-
F23	-
F24	-
F25	30A ECM
F26	20A FUEL PUMP
F27	10A GLOW PLUG

OPTIONS
ENCLOSED CAB OPTION

M190121AL-S7

3.32 Electrical Schematic

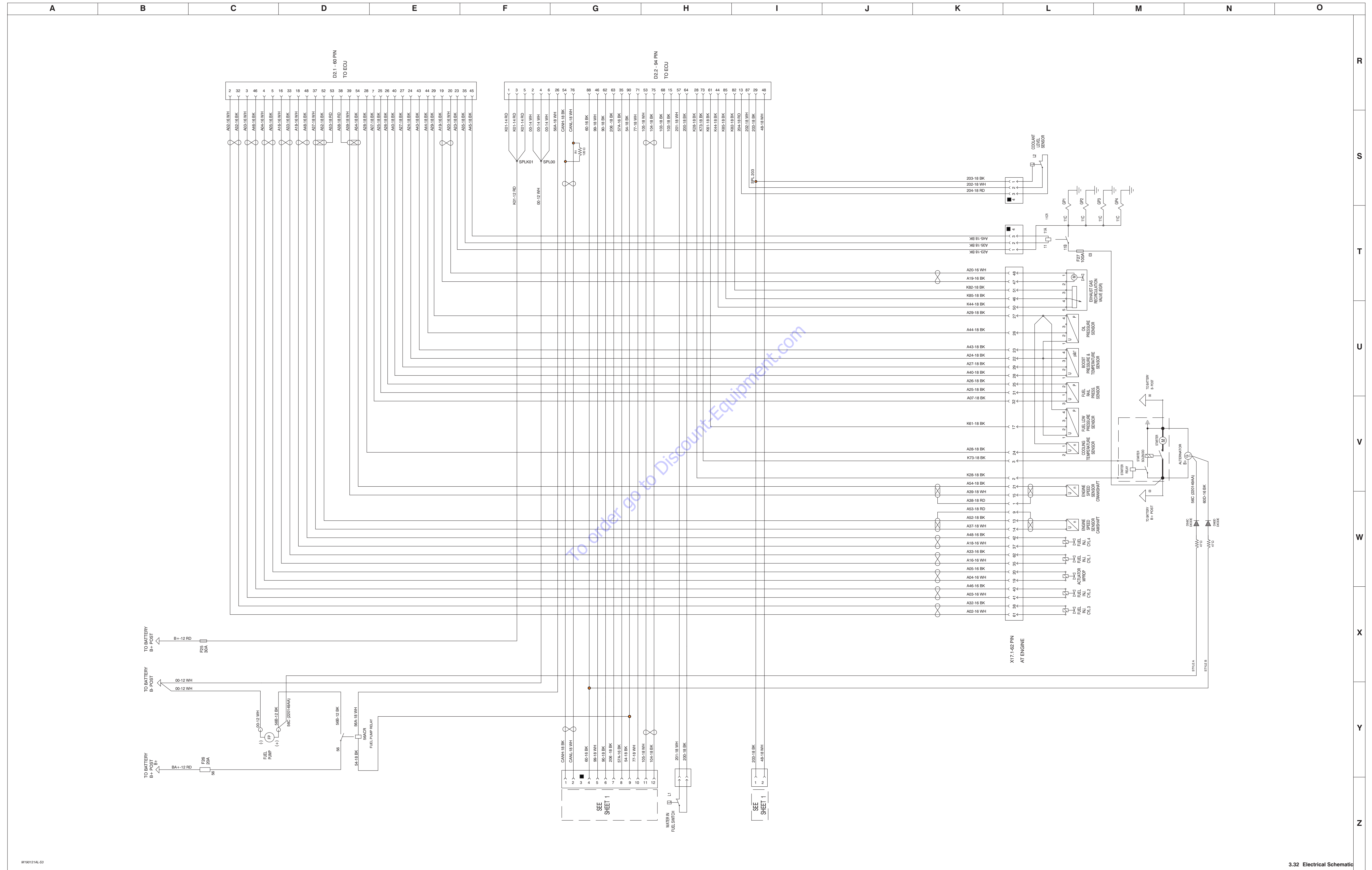


FROM SHEET 1

FROM SHEET 1

FROM SHEET 1

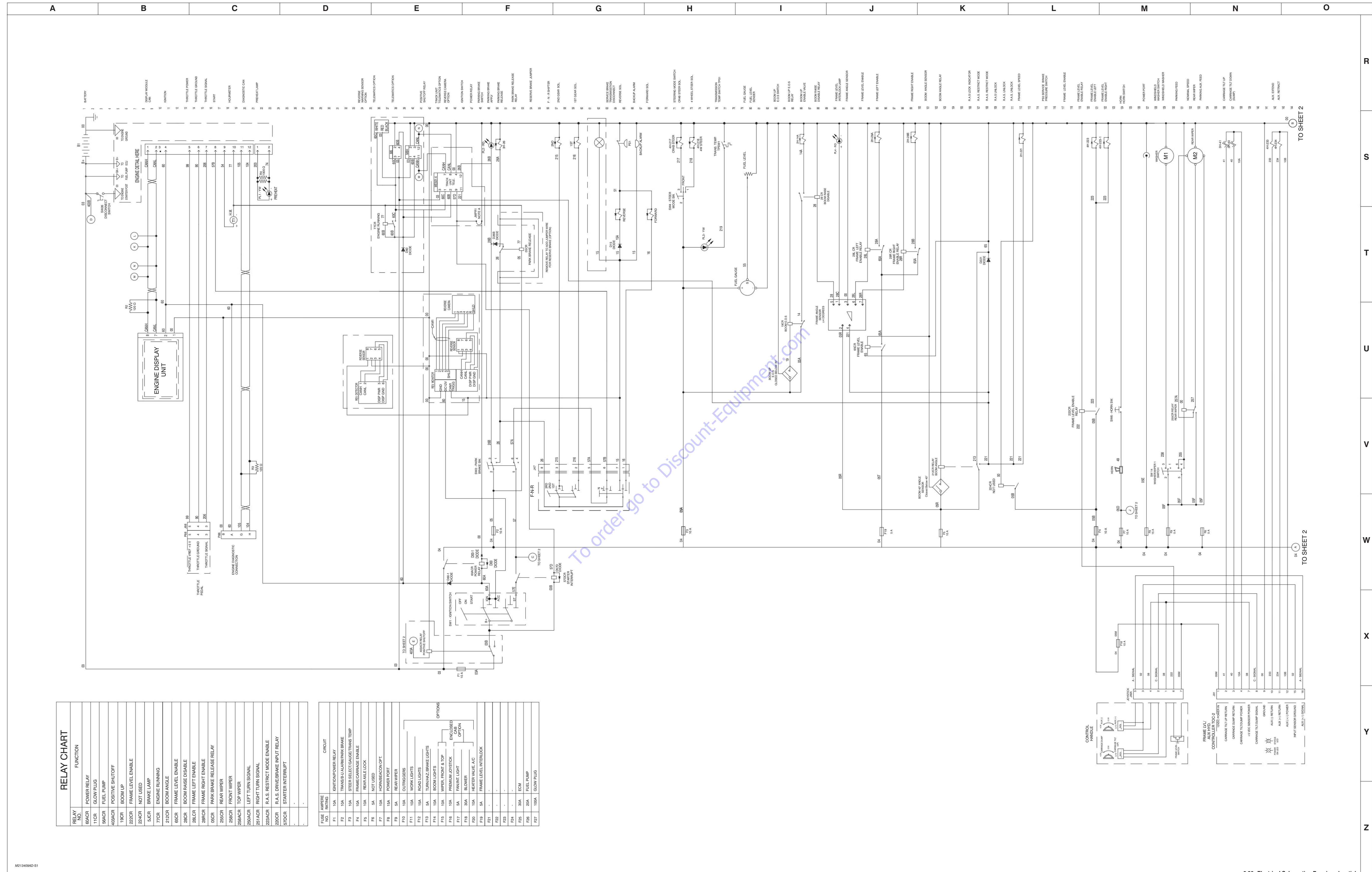
3.32 Electrical Schematic



M190121AL/S3

3.32 Electrical Schematic

3.33 Electrical Schematic - Premium Joystick



RELAY CHART

RELAY NO.	FUNCTION
6ACR	POWER RELAY
11CR	GLOW PLUG
5ACR	FUEL PUMP
40ACR	POSITIVE SHUTOFF
10CR	BOOM UP
22CR	FRAME LEVEL ENABLE
24CR	NOT USED
5CR	BRAKE LAMP
7CR	ENGINE RUNNING
21CR	BOOM ANGLE
6CR	FRAME LEVEL ENABLE
26CR	BOOM RAISE DISABLE
28CR	FRAME LEFT ENABLE
29CR	FRAME RIGHT ENABLE
06CR	PARK BRAKE RELEASE RELAY
25CR	REAR WIPER
28CR	FRONT WIPER
29ACR	TOP WIPER
29ACR	LEFT TURN SIGNAL
28ACR	RIGHT TURN SIGNAL
22ACR	R.A.S. RESTRICT MODE ENABLE
20CR	R.A.S. DRIVE/BRAKE INPUT RELAY
27CR	STARTER INTERRUPT
-	-
-	-

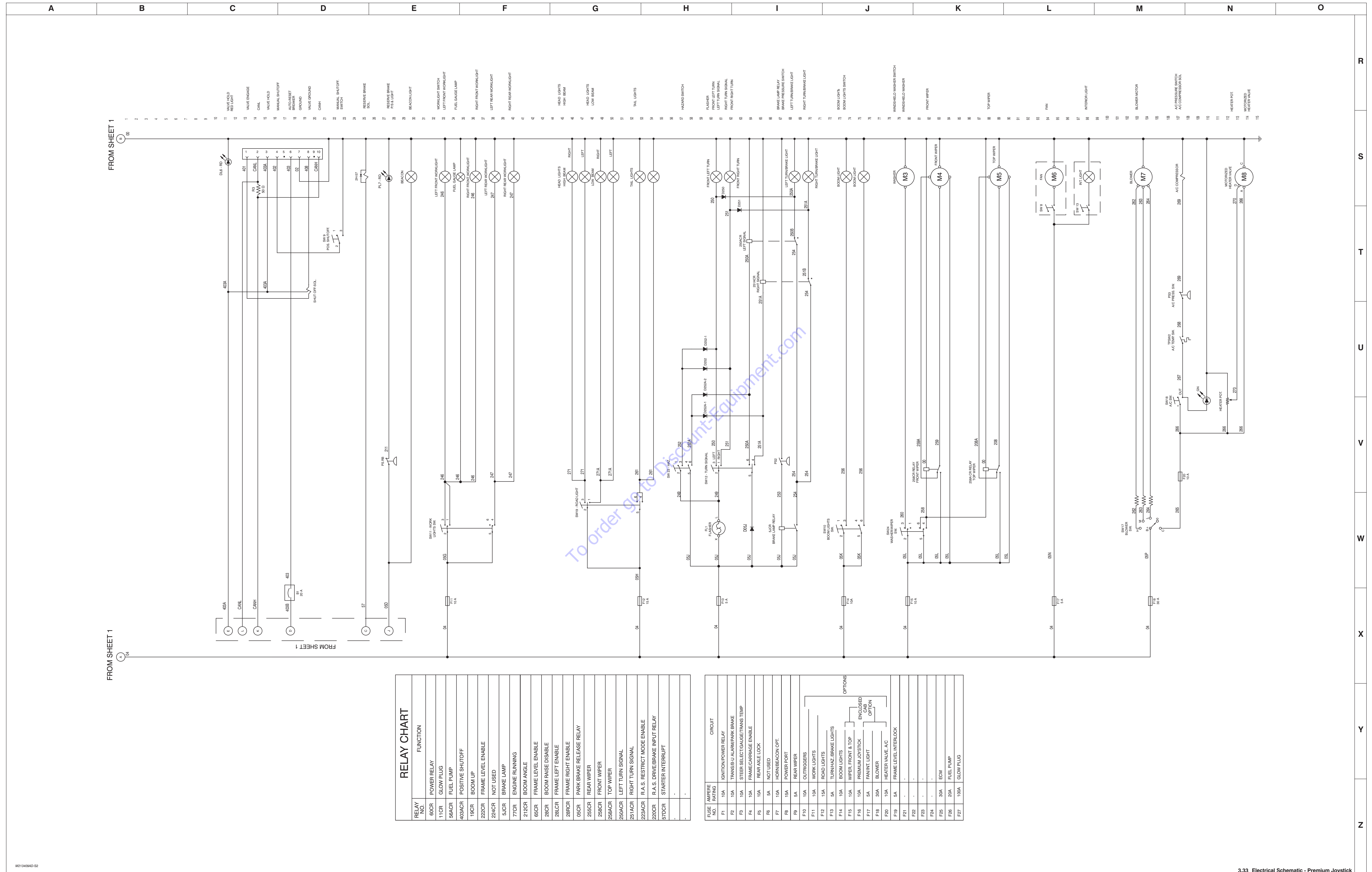
FUSE AMPERE RATING	CIRCUIT
F1	IGNITION POWER RELAY
F2	IGNITION POWER RELAY
F3	IGNITION POWER RELAY
F4	IGNITION POWER RELAY
F5	IGNITION POWER RELAY
F6	IGNITION POWER RELAY
F7	IGNITION POWER RELAY
F8	IGNITION POWER RELAY
F9	IGNITION POWER RELAY
F10	IGNITION POWER RELAY
F11	IGNITION POWER RELAY
F12	IGNITION POWER RELAY
F13	IGNITION POWER RELAY
F14	IGNITION POWER RELAY
F15	IGNITION POWER RELAY
F16	IGNITION POWER RELAY
F17	IGNITION POWER RELAY
F18	IGNITION POWER RELAY
F19	IGNITION POWER RELAY
F20	IGNITION POWER RELAY
F21	IGNITION POWER RELAY
F22	IGNITION POWER RELAY
F23	IGNITION POWER RELAY
F24	IGNITION POWER RELAY
F25	IGNITION POWER RELAY
F26	IGNITION POWER RELAY
F27	IGNITION POWER RELAY

OPTIONS

- OPTIONAL PARKING BRAKE
- STEER SELECT/ENGINE/TRANS TEMP
- FRAME CORPSE ENABLE
- REAR WIPER LOCK
- NOT USED
- POWER LOCK
- REAR WIPER
- OUTDRAGERS
- WORK LIGHTS
- TURN/HAZ BRAKE LIGHTS
- BOOM LIGHTS
- WIPER FRONT & TOP
- PREMIUM JOYSTICK
- FAN/LIGHT
- BLOWER
- HEATER VALVE A.C.
- FRAME LEVEL INTERLOCK

ENCLOSURE OPTION

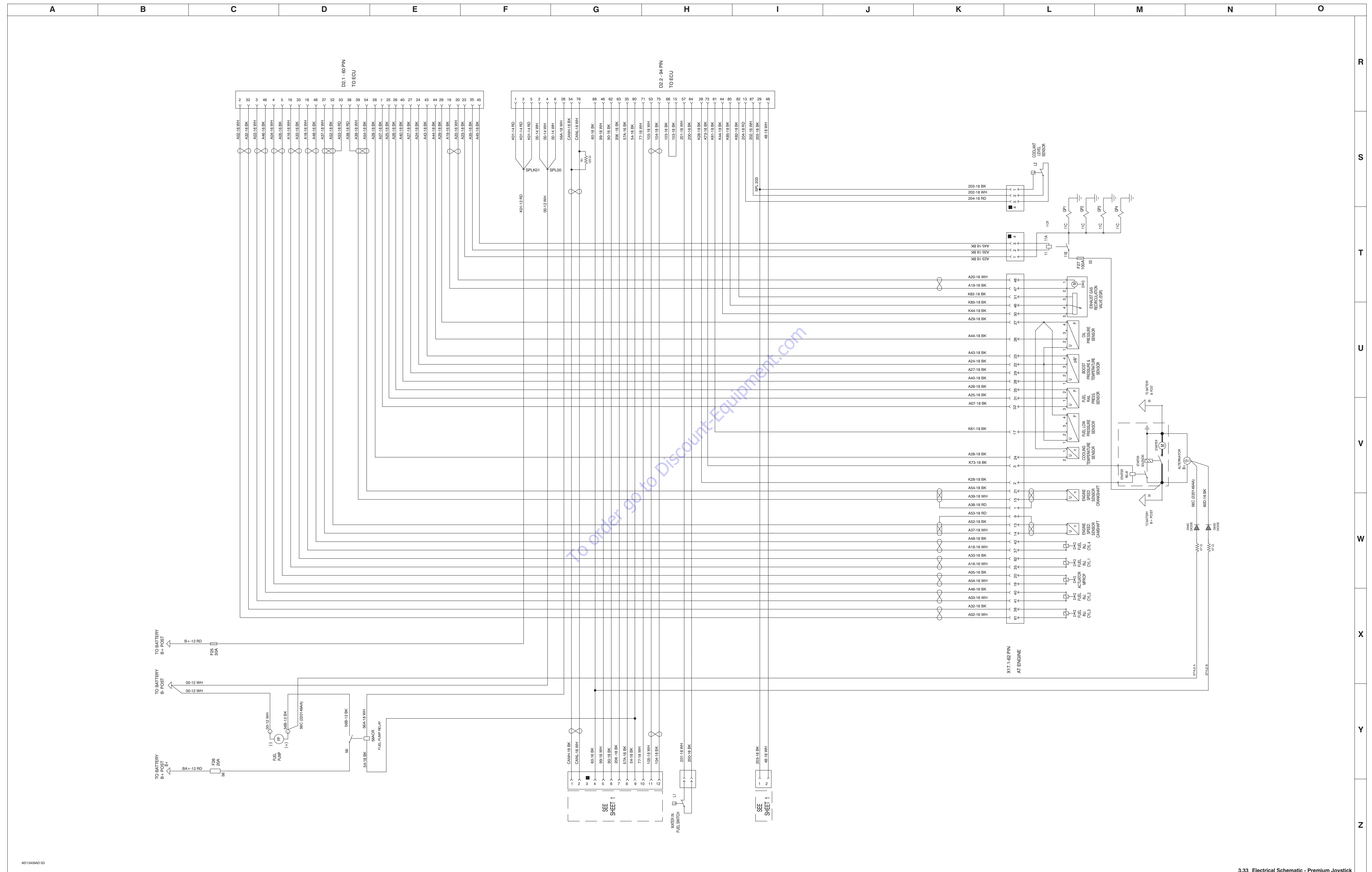
- OPTIONAL



RELAY NO.	FUNCTION
60CR	POWER RELAY
11CR	GLOW PLUG
56ACR	FUEL PUMP
40ACR	POSITIVE SHUTOFF
19CR	BOOM UP
222CR	FRAME LEVEL ENABLE
224CR	NOT USED
5JCR	BRAKE LAMP
77CR	ENGINE RUNNING
212CR	BOOM ANGLE
65CR	FRAME LEVEL ENABLE
28CR	BOOM RAISE DISABLE
28LCR	FRAME LEFT ENABLE
28RCR	FRAME RIGHT ENABLE
05CR	PARK BRAKE RELEASE RELAY
255CR	REAR WIPER
256CR	FRONT WIPER
258ACR	TOP WIPER
250ACR	LEFT TURN SIGNAL
251ACR	RIGHT TURN SIGNAL
223ACR	R.A.S. RESTRICT MODE ENABLE
220CR	R.A.S. DRIVE/BRAKE INPUT RELAY
57DCR	STARTER INTERRUPT

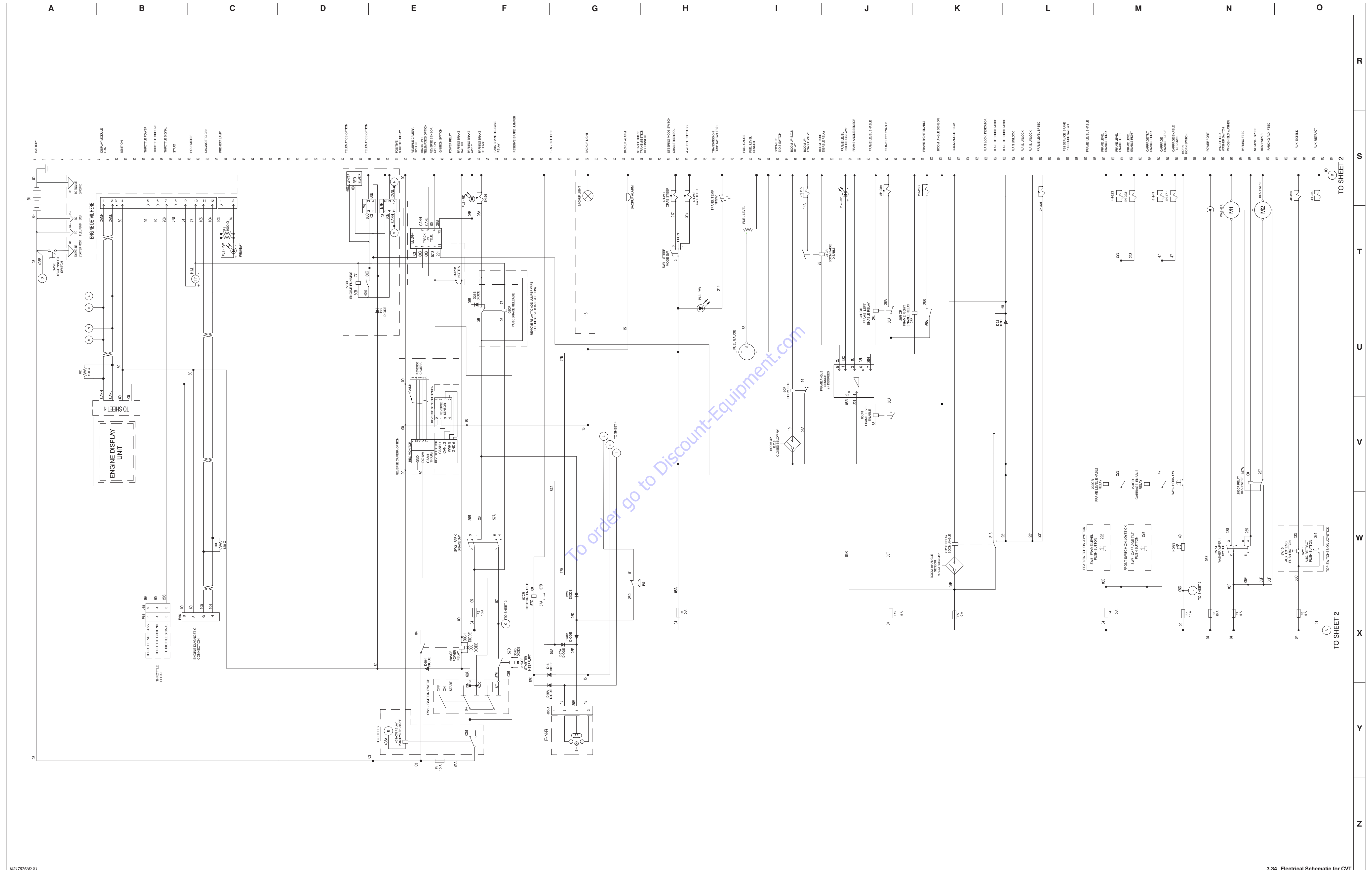
FUSE NO.	AMPERE RATING	CIRCUIT
F1	10A	IGNITION/POWER RELAY
F2	10A	TRANSUB-U/ALUMINUM/PARK BRAKE
F3	10A	STEER SELECT/GAUGE/TRANS TEMP
F4	10A	FRAME/CARRIAGE ENABLE
F5	10A	REAR AXLE LOCK
F6	5A	NOT USED
F7	10A	HORN/BEACON OPT.
F8	5A	POWER PORT
F9	5A	REAR WIPER
F10	10A	OUTRIGGERS
F11	10A	WORK LIGHTS
F12	15A	ROAD LIGHTS
F13	5A	TURN/HAZ/BRAKE LIGHTS
F14	10A	BOOM LIGHTS
F15	10A	WIPER, FRONT & TOP
F16	10A	PREMIUM JOYSTICK
F17	5A	FANNING LIGHT
F18	30A	BLOWER
F19	10A	HEATER VALVE, A.C.
F20	10A	HEATER VALVE, A.C.
F21	5A	FRAME LEVEL INTERLOCK
F22	-	-
F23	-	-
F24	-	-
F25	30A	ECM
F26	20A	FUEL PUMP
F27	100A	GLOW PLUG

3.33 Electrical Schematic - Premium Joystick



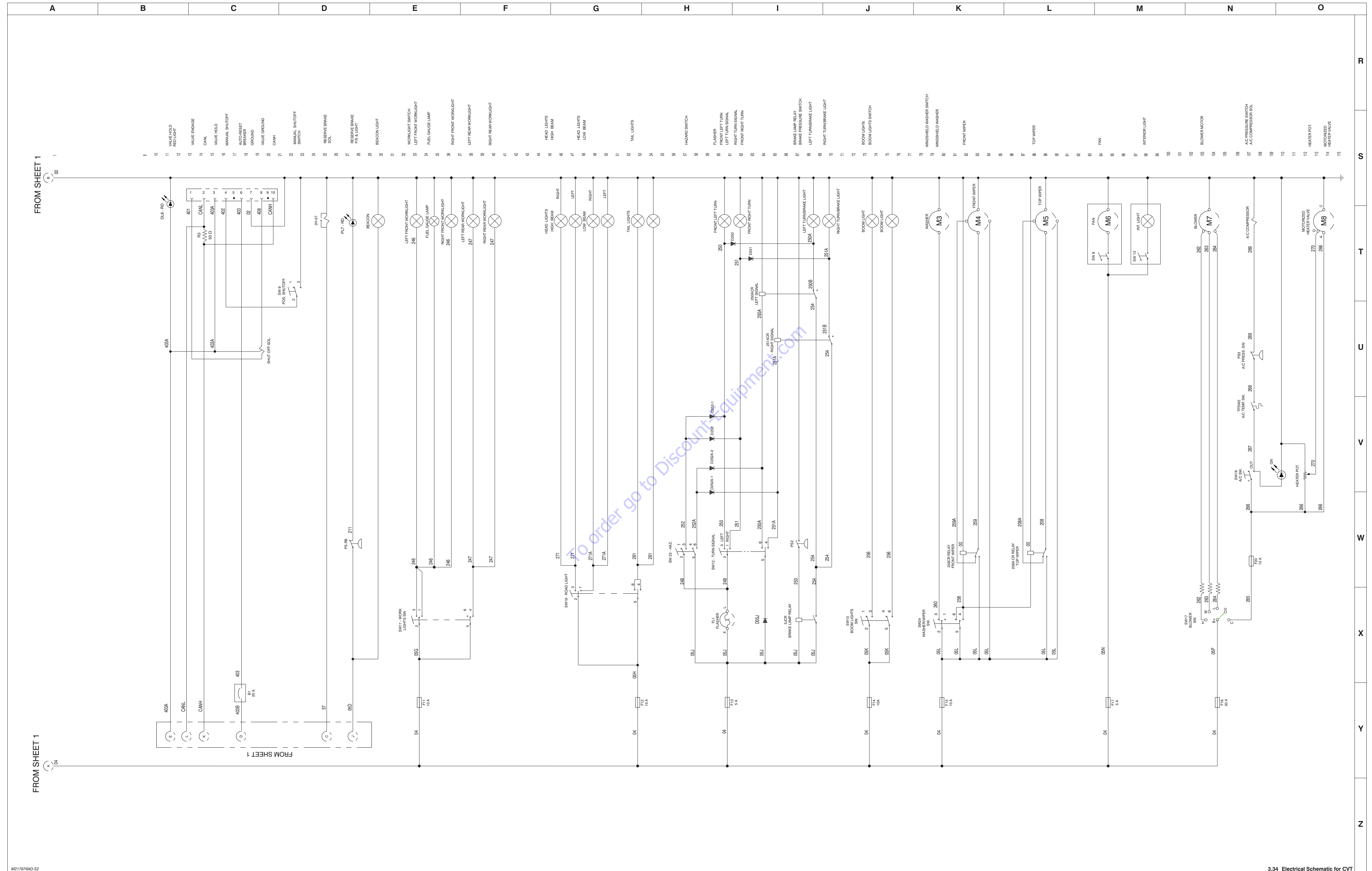
M213408AD-S3

3.34 Electrical Schematic for CVT



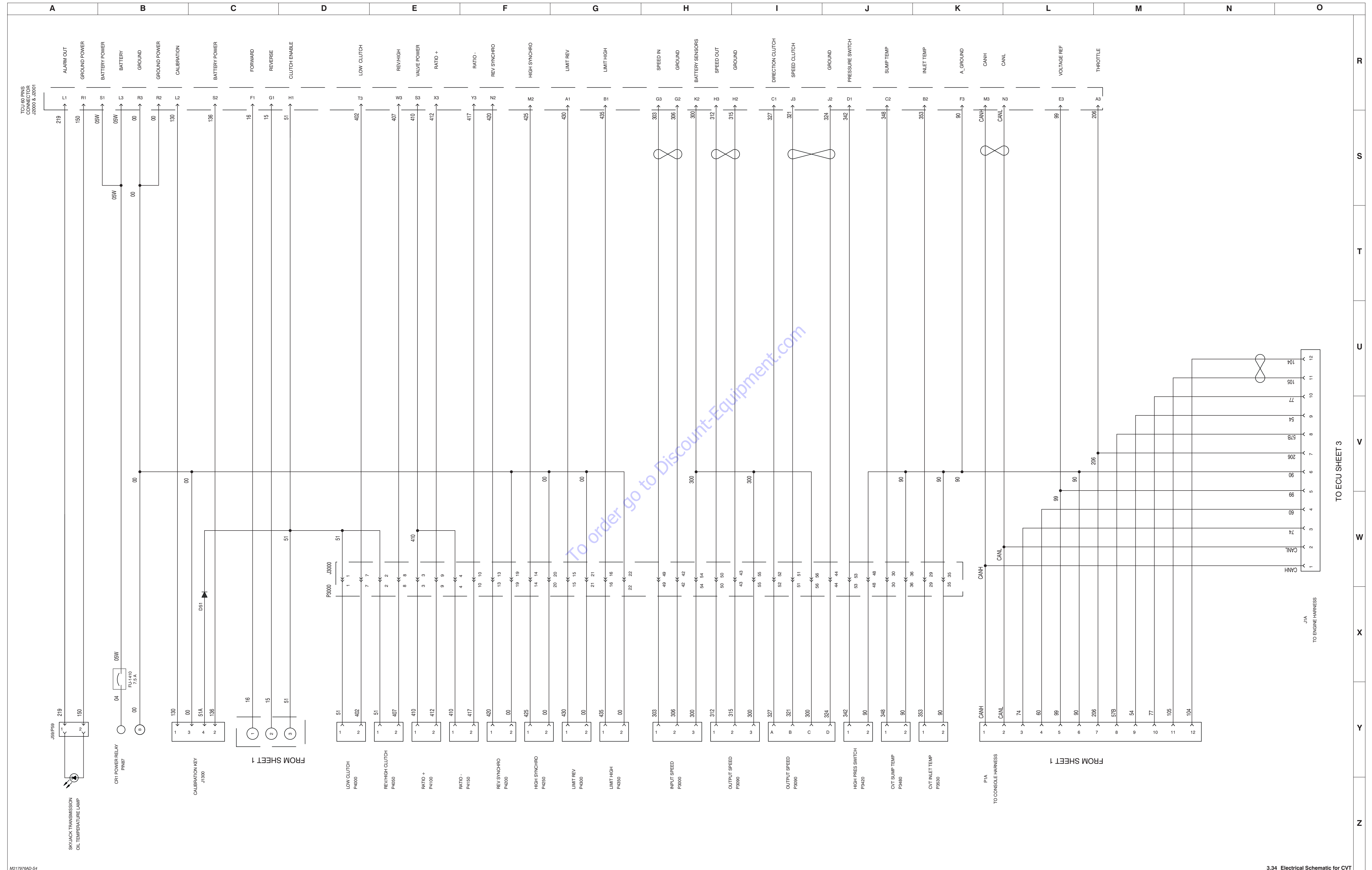
M217976AD-S1

3.34 Electrical Schematic for CVT



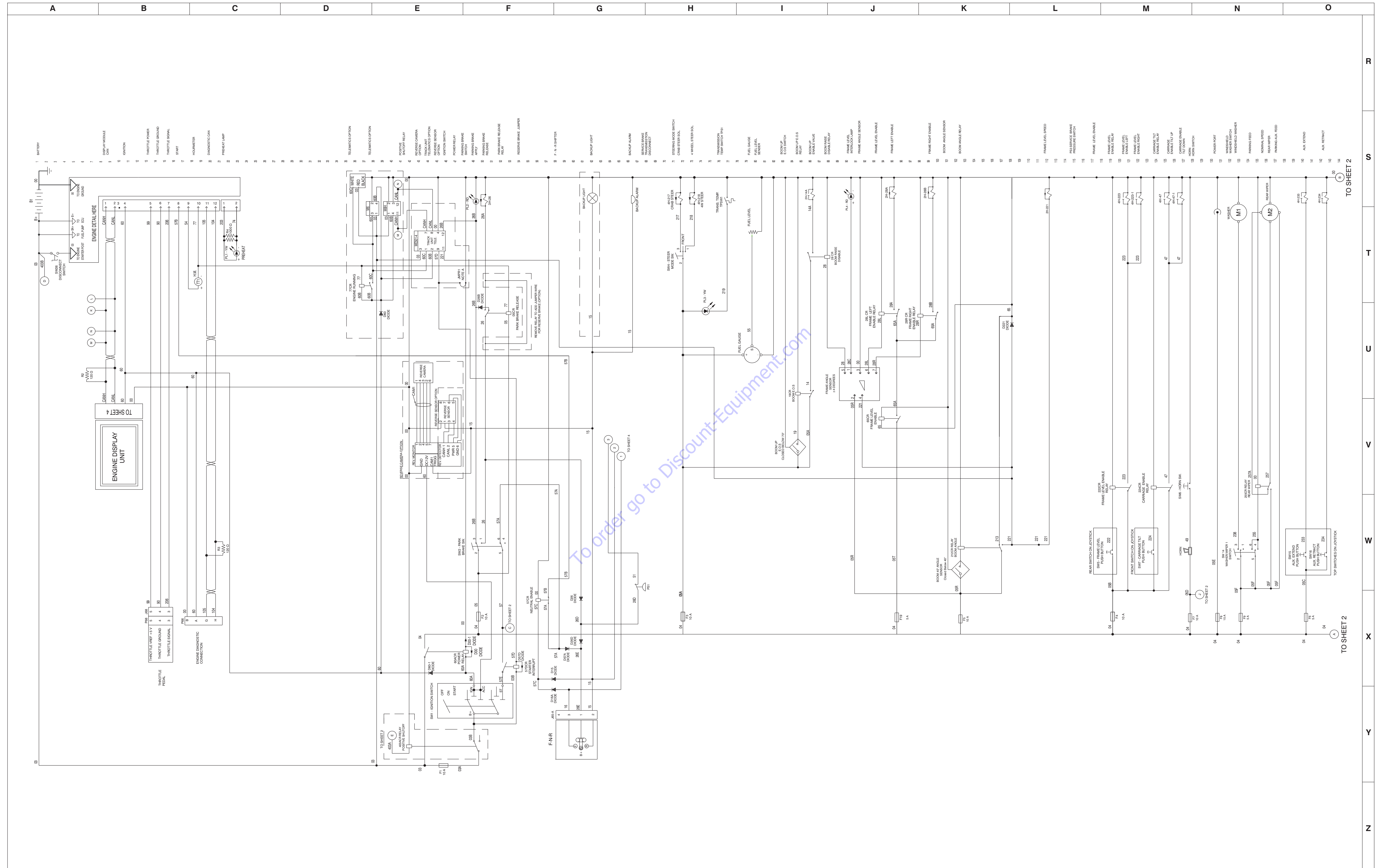
M217976AD-S2

3.34 Electrical Schematic for CVT



M217076AD-S4

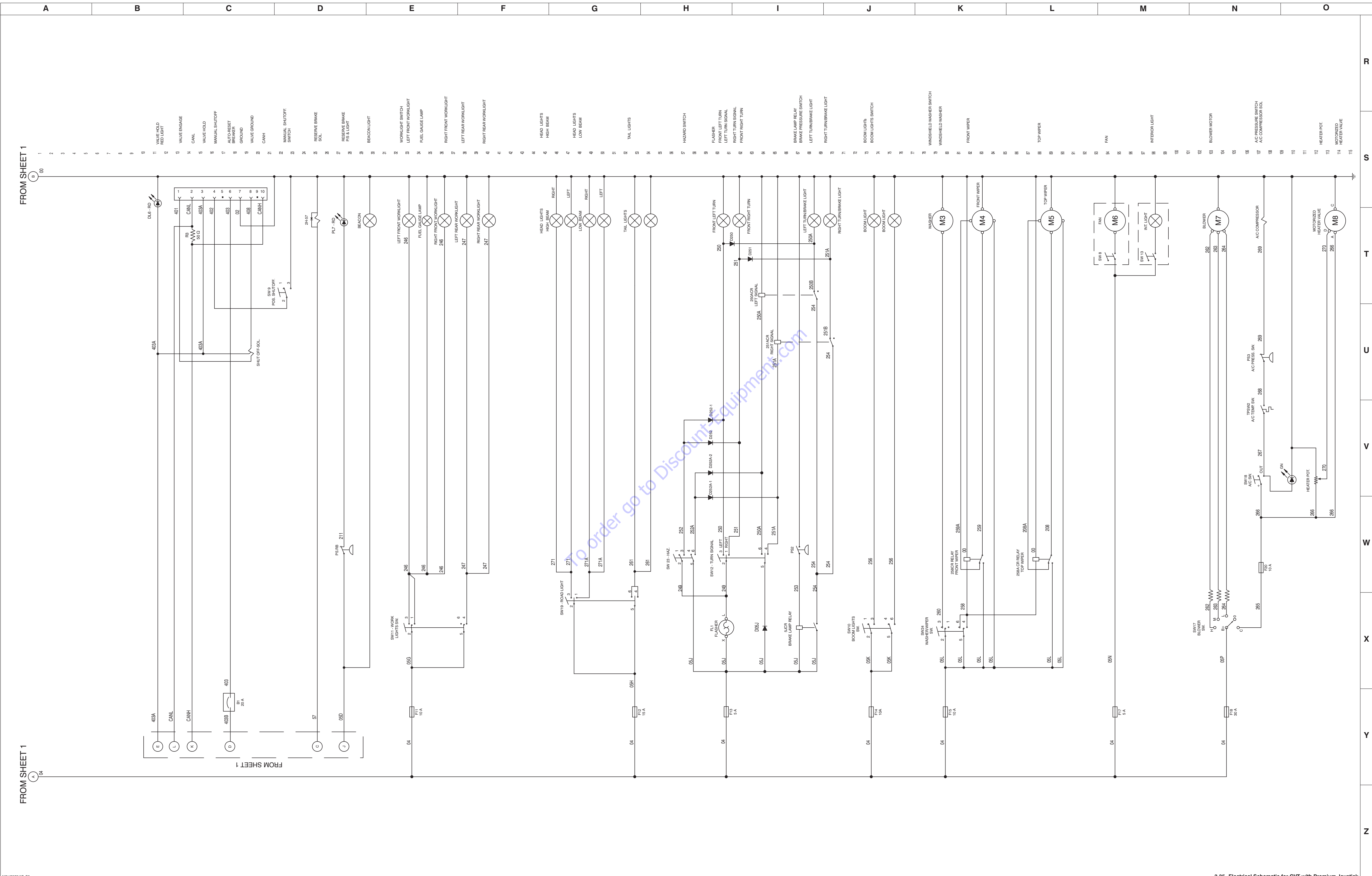
3.35 Electrical Schematic for CVT with Premium Joystick



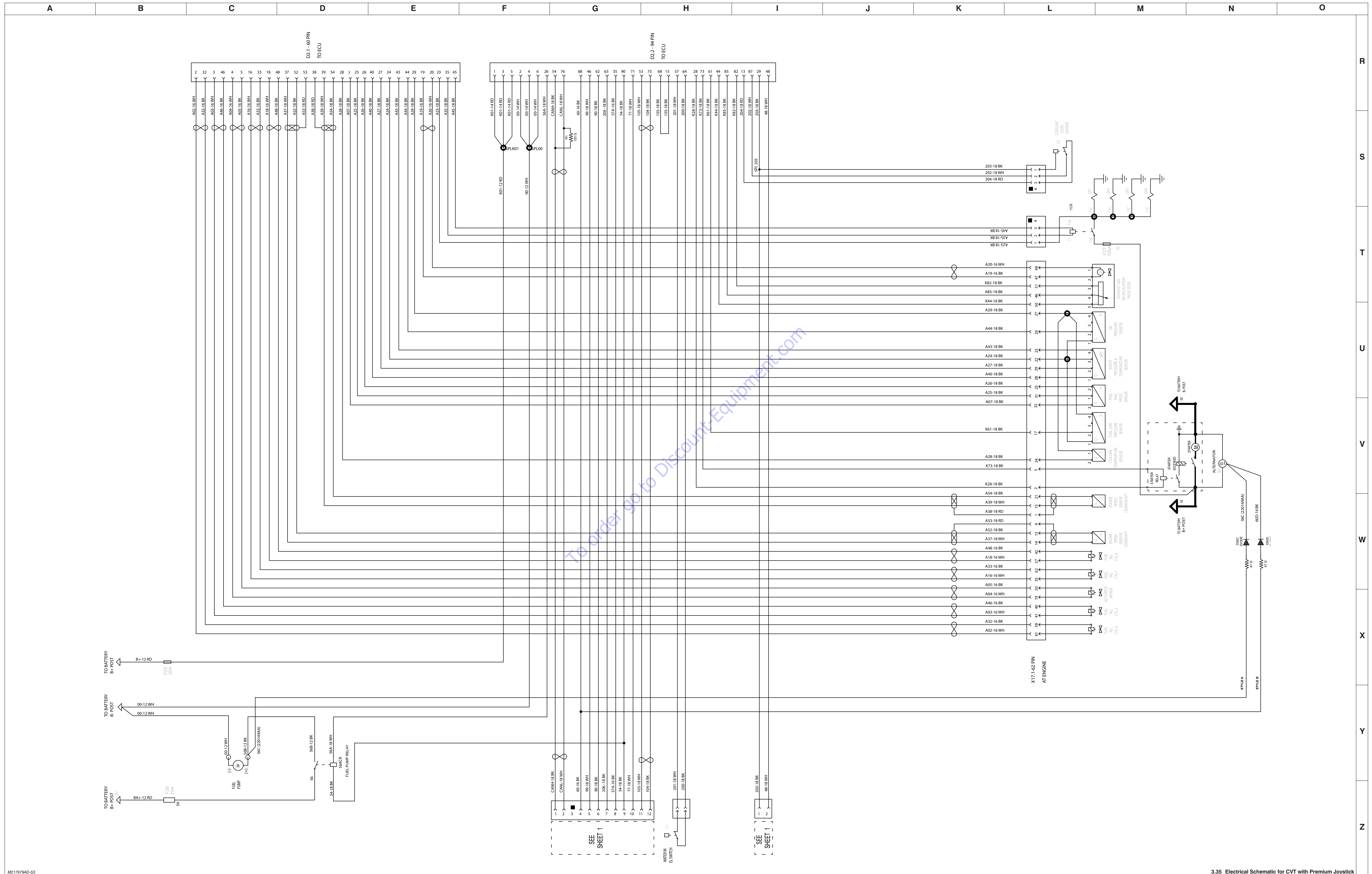
M217979AD-S1

3.35 Electrical Schematic for CVT with Premium Joystick

3.35 Electrical Schematic for CVT with Premium Joystick



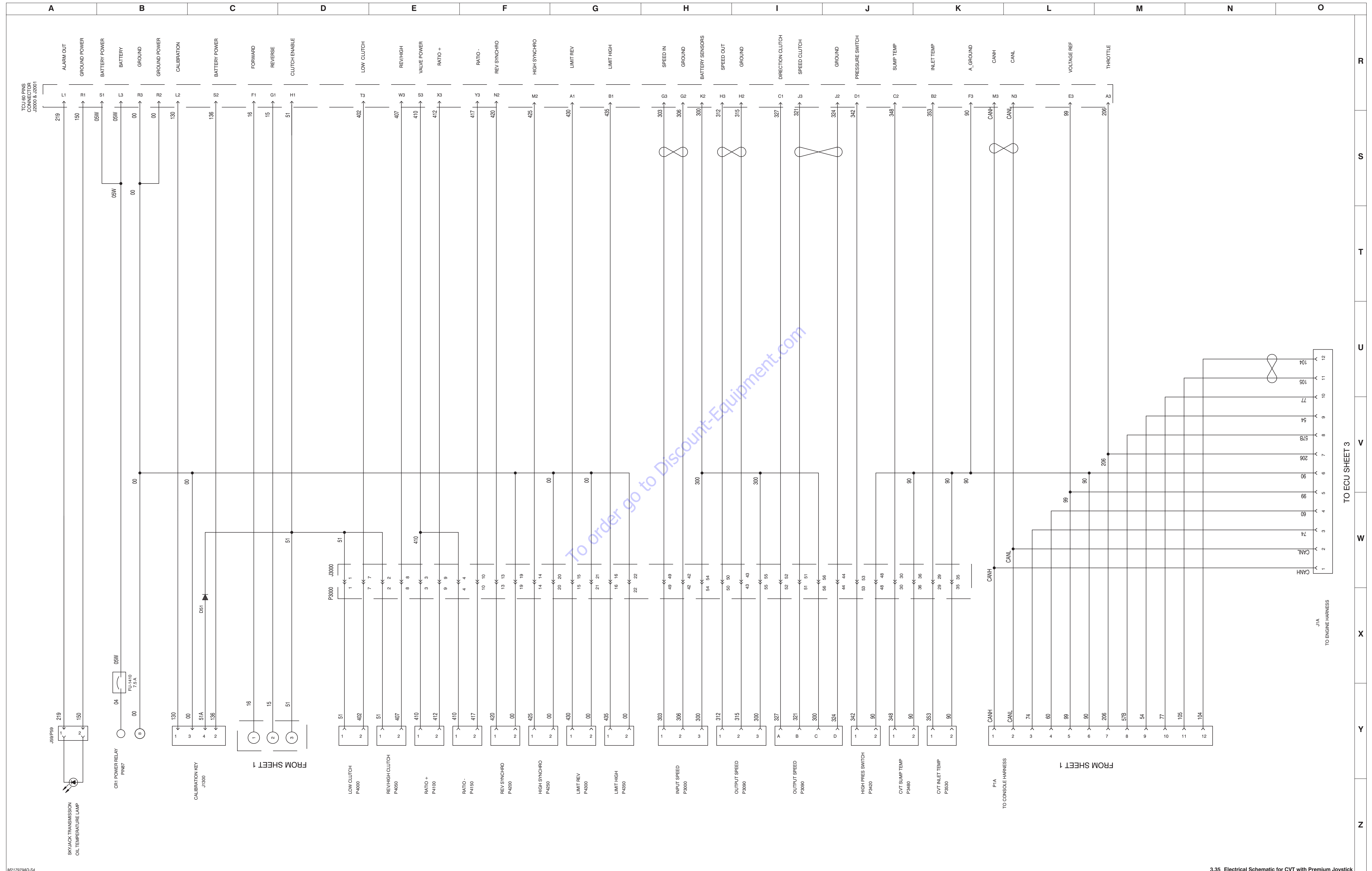
3.35 Electrical Schematic for CVT with Premium Joystick



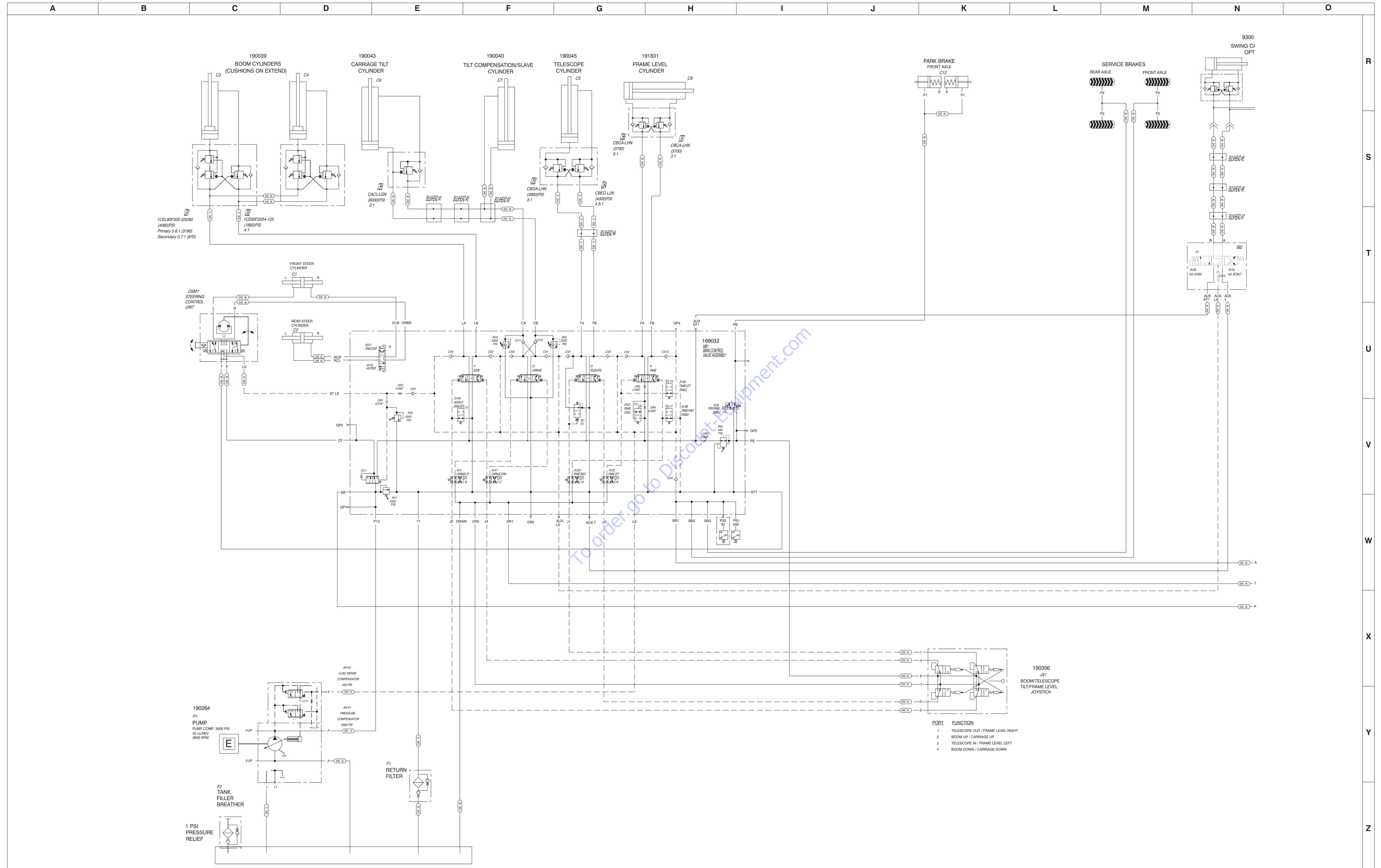
M217979AD-S3

3.35 Electrical Schematic for CVT with Premium Joystick

3.35 Electrical Schematic for CVT with Premium Joystick



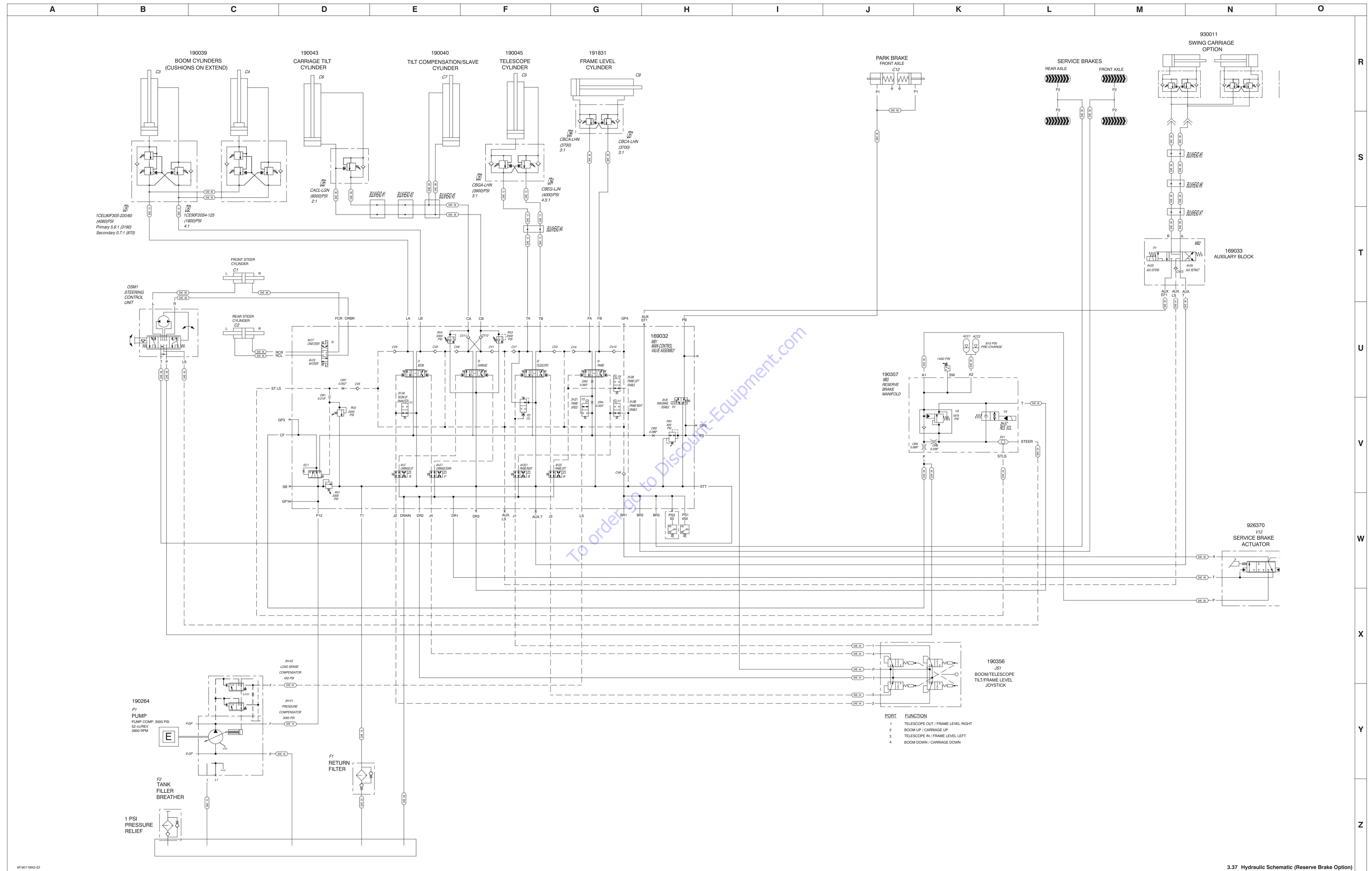
3.36 Hydraulic Schematic



M1901184G-S1

3.36 Hydraulic Schematic

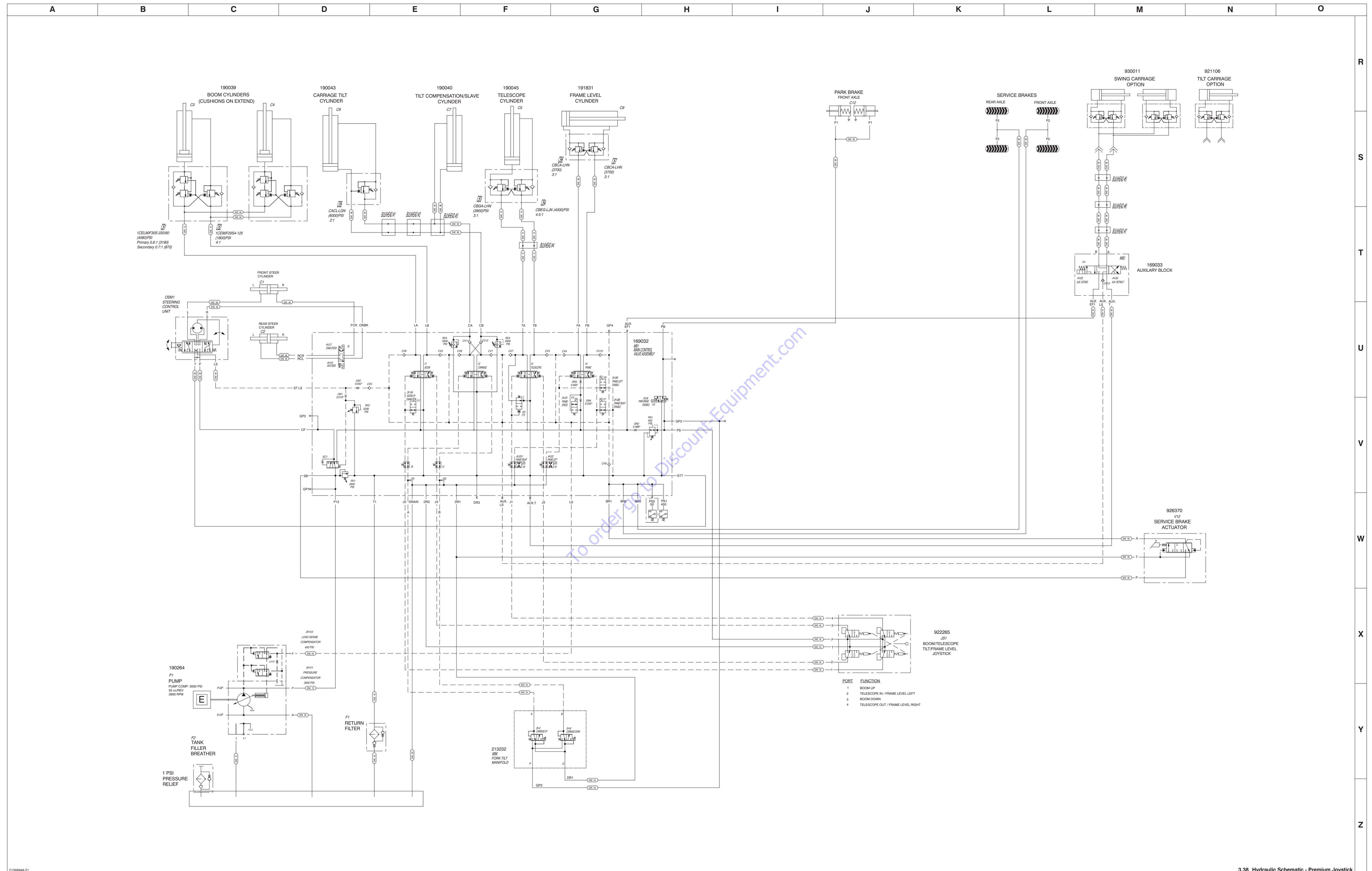
3.37 Hydraulic Schematic (Reserve Brake Option)



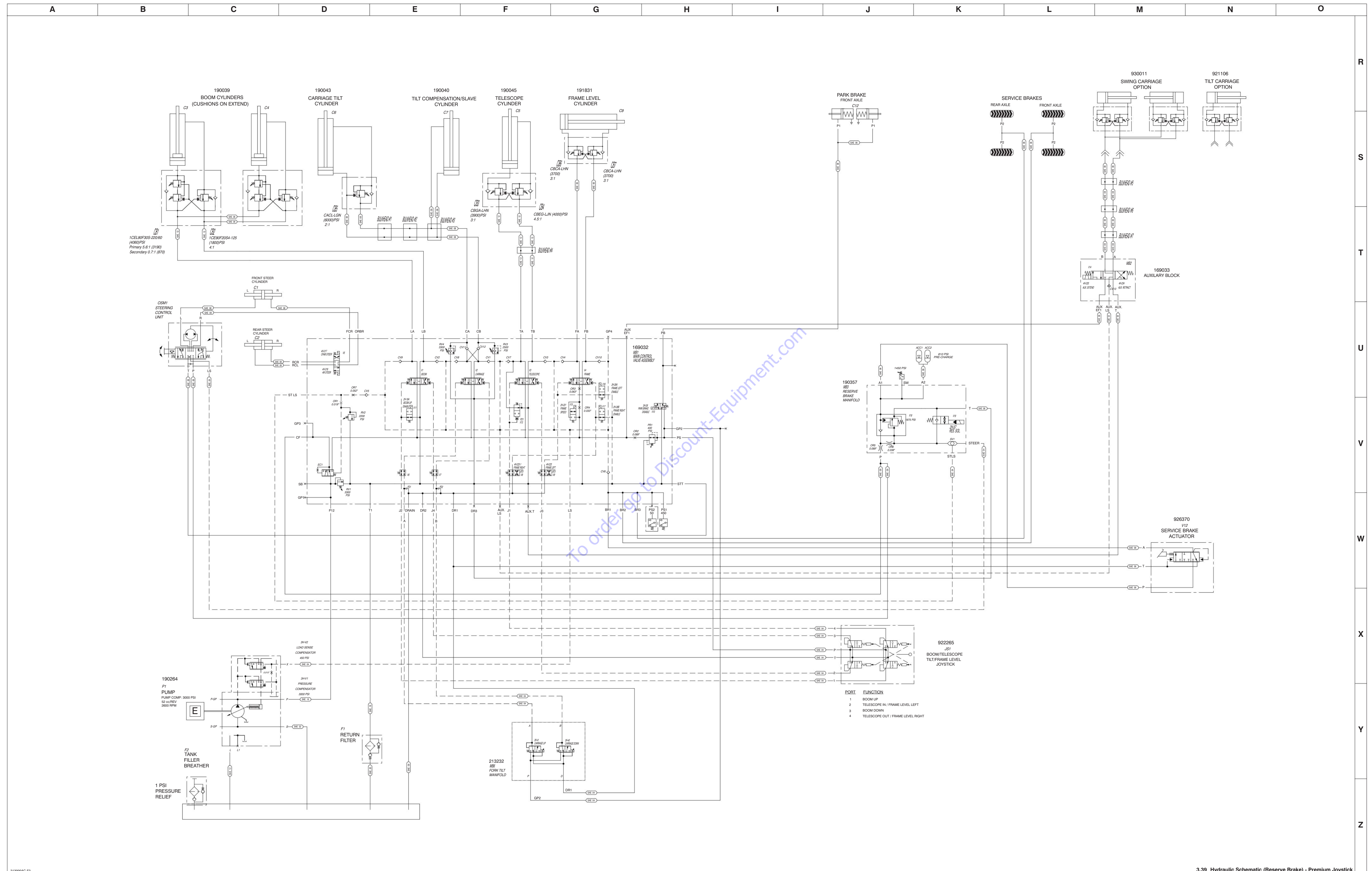
M190119A0-02

3.37 Hydraulic Schematic (Reserve Brake Option)

3.38 Hydraulic Schematic - Premium Joystick



3.39 Hydraulic Schematic (Reserve Brake) - Premium Joystick



212896AC-S2

To order go to Discount-Equipment.com

Section 4 – Troubleshooting Information

4.1 Introduction

The following pages contain a table of Troubleshooting for locating and correcting most service trouble which can develop. Careful and accurate analysis of the systems listed in the table of Troubleshooting will localize the trouble more quickly than any other method. This manual cannot cover all possible troubles and deficiencies that may occur. If a specific trouble is not listed, isolate the major component in which the trouble occurs, isolate whether the problem is electrical or hydraulic, and then isolate and correct the specific problem.

The content of this section is separated into “probable cause” and “remedy.” The information in the left-hand column, preceded by a number, represents the “probable cause.” The information in the right-hand column, in bold text, represents the “remedy” to the “probable cause” directly beside it. See the example below for clarification.

1. Probable cause

Remedy

4.2 Electrical System

4.2-1 Engine Will Not Crank



NOTE

Park brake switch must be on and transmission lever must be in neutral

1. Battery cables loose/disconnected	Tighten or connect battery cables
2. Battery Discharged or Defective	Charge battery or replace if defective
3. Loose or broken wire #54 from 94 pin ECU connector (D2.2), pin90 to relay 56ACR	Check continuity. Replace if defective.
4. Loose or broken wire #03 to fuse F26.	Check continuity. Replace if defective.
5. Fuse F26 open	Check for defective wiring. Replace fuse
6. Loose or broken wire #56 from F26 to relay 56ACR.	Check continuity. Replace if defective.
7. Loose or broken wire #56A from relay 56ACR to 94 pin ECU connector, pin 26.	Check continuity. Replace if defective.
8. Loose or broken wire #56B from relay 56ACR to fuel pump.	Check continuity. Replace if defective.
9. Defective relay 56ACR.	Check continuity through contacts of relay. Replace if defective.
10. Loose or broken ground wire #00 from fuel pump to battery B-.	Check continuity. Replace if defective.
11. Defective Fuel Pump	Replace if defective
12. Loose or broken B+ wire from battery B+ to ECU fuse F25	Check continuity. Replace if defective.
13. ECU 30A fuse F25 open	Check for defective wiring. Replace/repair if defective. Replace fuse.
14. Loose or broken wire #K01 from ECU fuse F25 to 94 pin ECU connector 3 places pins 1, 3, and 5.	Check continuity. Replace if defective.
15. Loose or broken ground wire #00 from battery B- to 94 pin ECU connector 3 places pins 2, 4, and 6.	Check continuity. Replace if defective.
16. Loose or broken 03 wire from B+ to fuse F1	Check continuity. Replace if defective.
17. fuse F1 open	Check for defective wiring. Replace/repair if defective. Replace fuse.
18. Loose or broken 03A wire from fuse F1 to ignition switch SW1	Check continuity. Replace if defective.

19. Defective ignition switch SW1.	Check for voltage at ST terminal (wire 57) while in start position. Replace if defective.
20. Loose or broken 57 wire from ignition switch SW1 to park brake switch SW2, pin 5	Check continuity. Replace if defective.
21. Defective park brake switch SW2.	Check for voltage at pin 6 of switch SW2 (wire 57A) while in start position. Replace if defective.
22. Loose or broken 57A wire from park brake switch SW2, pin 6 to transmission shift lever pin 5	Check continuity. Replace if defective.
23. Defective transmission shift lever	Check for voltage at shift lever pin 5 while in start position. Replace if defective
24. Loose or broken 57B wire from transmission shift lever pin 6 to engine harness connector (J1) pin 8	Check continuity. Replace if defective.
25. Loose or broken 57B wire from engine harness connector (P1) pin 8 to 94 pin ECU connector (D2.2) pin 35	Check continuity. Replace if defective.

4.2-2 Engine Cranks But Will Not Run

1. Engine pre-heat circuit inoperative.	Refer to Engine manufacturer's manual to diagnose
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NOTE

For other engine related problems, consult engine manufacturers' manual.

4.2-3 All Electrical Controls Inoperative

With following conditions:

- Park brake will not release, all other dash switches and lights inoperative, joystick electrical switches inoperative, etc.

1. Defective ignition switch SW1.	Check for voltage at IGN terminal (wire 60) while in run position. Replace if defective
2. Loose or broken wire 60 from ignition switch SW1 to power relay 60CR	Check continuity. Replace if defective.
3. Loose or broken wire 03 from B+ to power relay 60CR	Check continuity. Replace if defective
4. Loose or broken wire 00 from power relay 60CR to ground	Check continuity. Replace if defective

- | | |
|--|---|
| 5. Defective relay 60CR. | Check for voltage at NO contacts of relay (wire 04) with ignition switch SW1 in run position. Replace if defective |
| 6. Loose or broken wire 04 from power relay 60CR to fuse block | Check continuity. Replace if defective |

4.2-4 Park Brake Will Not Release

With following conditions:

- Transmission remains in neutral regardless of shift lever position

- | | |
|--|--|
| 1. Fuse F2 open | Check for defective wiring. Replace fuse |
| 2. Loose or broken 05 wire from fuse F2 to park brake switch SW2 pin 2 | Check continuity. Replace if defective |
| 3. Defective park brake switch SW2 | Check for voltage at pin 1 (wire 26) of park brake switch SW2 with switch in the off position. Replace if defective |

With following conditions:

- Transmission will engage

- | | |
|--|---|
| 1. Loose or broken wire 26 from park brake switch SW2 pin 1 to park brake release relay 05CR pin 30. | Check continuity. Replace if defective |
| 2. Loose or broken 05 wire from fuse F2 to park brake release relay 05CR pin 85 | Check continuity. Replace if defective |
| 3. Loose or broken 77 wire from park brake release relay 05CR pin 86 to engine harness connector J1 pin 10. | Check continuity. Replace if defective |
| 4. Loose or broken 77 wire engine harness connector P1 pin 10 to 94 pin ECU connector D2.2 pin 71 | Check continuity. Replace if defective |
| 5. Defective relay 05CR. | Check continuity through contacts of relay (pin 30 to 87 with coil energized). Replace if defective. |
| 6. Loose or broken 26A wire from park brake release relay 05CR pin 87 to chassis harness connector J31 pin 13. | Check continuity. Replace if defective |
| 7. Loose or broken 26A wire from harness connector P31 pin 13 to park brake solenoid 3H-26A. | Check continuity. Replace if defective |

8. Loose or broken 00 wire from park brake solenoid to ground. **Check continuity. Replace if defective**

9. Defective brake valve coil 3H-26. **Check continuity and resistance through coil. Replace if defective.**

4.2-5 Transmission Will Not Engage

With following conditions:

- Park brake will release

1. Loose or broken wire 26 from park brake switch SW2 pin 1 to Transmission shift lever pin 8 **Check continuity. Replace if defective**

2. Loose or broken wire 51 from forward and reverse solenoids to chassis harness connector P13 pin 2. **Check continuity. Replace if defective.**

3. Loose or broken wire 51 from connector J13 pin 2 to brake pressure switch PS1 connector P18 pin 1. **Check continuity. Replace if defective.**

4. Loose or broken 00 wire from brake pressure switch PS1 connector P18 pin 2 to ground. **Check continuity. Replace if defective.**

5. Defective pressure switch PS1 **Check that switch is closed normally and opens with 450 PSI. Replace if Defective**

6. Defective transmission shifter. **Replace if defective.**

4.2-6 No Forward Drive.

1. Loose or broken wire 16 from shifter connector J47 pin 1 to chassis harness 31 pin connector J31 pin 1 **Check continuity. Replace if defective.**

2. Loose or broken wire 16 from 31 pin connector P31 pin 1 to engine harness connector J13 pin 1. **Check continuity. Replace if defective.**

3. Loose or broken wire 16 from connector P13 pin 1 to forward solenoid. **Check continuity. Replace if defective.**

4. Loose or broken wire 51 from forward solenoid to chassis harness P13 pin 2. **Check continuity. Replace if defective.**

5. Defective forward solenoid. **Replace solenoid.**

6. Defective transmission shifter. **Replace shifter**

4.2-7 No Reverse Drive

1. Loose or broken wire 15 from shifter connector J47 pin 7 to chassis harness 31 pin connector J31 pin 2	Check continuity. Replace if defective.
2. Loose or broken wire 15 from 31 pin connector P31 pin 2 to engine harness connector J13 pin 5.	Check continuity. Replace if defective.
3. Loose or broken wire 15 from connector P13 pin 5 to reverse diode D15.	Check continuity. Replace if defective.
4. Loose or broken wire 15A from reverse diode to reverse solenoid Connector P9 pin 1.	Check continuity. Replace if defective.
5. Defective reverse diode D15.	Check for continuity with positive lead on connector P13 pin 5 and negative lead on reverse solenoid connector P9 pin 1. Replace if defective.
6. Loose or broken wire 51 from reverse solenoid connector P9 pin 2 to chassis harness P13 pin 2.	Check continuity. Replace if defective.
7. Defective reverse solenoid.	Replace solenoid.
8. Defective transmission shifter.	Replace shifter

4.2-8 No 1st Speed Range

1. Loose or broken wire 216 from shifter connector J47 pin 2 to chassis harness 31 pin connector J31 pin 4	Check continuity. Replace if defective.
2. Loose or broken wire 216 from 31 pin connector P31 pin 3 to engine harness connector J13 pin 4.	Check continuity. Replace if defective.
3. Loose or broken wire 216 from connector P13 pin 3 to 1st solenoid connector P11 pin 1.	Check continuity. Replace if defective.
4. Loose or broken wire 00 from 1st solenoid connector P11 pin 2 to ground.	Check continuity. Replace if defective.
5. Defective 1st solenoid.	Replace solenoid.
6. Defective transmission shifter.	Replace shifter

4.2-9 No 2nd Speed Range

1. Loose or broken wire 215 from shifter connector J47 pin 3 to chassis harness 31 pin connector J31 pin 5	Check continuity. Replace if defective.
--	--

- | | |
|--|--|
| 2. Loose or broken wire 215 from 31 pin connector P31 pin 5 to engine harness connector J13 pin 4. | Check continuity. Replace if defective. |
| 3. Loose or broken wire 216 from connector P13 pin 4 to 2nd solenoid connector P12 pin 1. | Check continuity. Replace if defective. |
| 4. Loose or broken wire 00 from 1st solenoid connector P12 pin 2 to ground. | Check continuity. Replace if defective. |
| 5. Defective 2nd solenoid. | Replace solenoid. |
| 6. Defective transmission shifter. | Replace shifter |

4.2-10 No Boom Up, Front Steer Mode Only.

- | | |
|---|---|
| 1. Fuse F3 open | Check for defective wiring. Replace fuse |
| 2. Loose or broken 05A wire from fuse F3 to 31 pin Chassis harness connector J31 pin 17, boom up end of stroke relay 19CR pin 30, and steer mode select switch SW3 pin 2. | Check continuity. Replace if defective. |

4.2-11 Front Steer Mode Only

- | | |
|---|--|
| 1. Loose or broken 05A wire from fuse F3 to steer mode select switch SW3 pin 2. | Check continuity. Replace if defective. |
| 2. Defective Steer mode switch SW3 | Replace if Defective |

4.2-12 No 4W (Round) Steer Mode

- | | |
|---|--|
| 1. Defective Steer mode switch SW3 | Replace if Defective |
| 2. Loose or broken wire 218 from SW3 pin 3 to 31 pin chassis harness connector J31 pin 12 | Check continuity. Replace if defective. |
| 3. Loose or broken wire 218 from connector P31 pin 12 to 4W solenoid connector J20 pin 1 | Check continuity. Replace if defective. |
| 4. Loose or broken 00 wire from 4W solenoid connector J20 pin 2 to ground. | Check continuity. Replace if defective. |
| 5. Defective 4W solenoid | Replace if Defective |

4.2-13 No Crab Steer Mode

1. Defective Steer mode switch SW3	Replace if Defective
2. Loose or broken wire 217 from SW3 pin 1 to 31 pin chassis harness connector J31 pin 11	Check continuity. Replace if defective.
3. Loose or broken wire 217 from connector P31 pin 11 to Crab Steer solenoid connector J19 pin 1	Check continuity. Replace if defective.
4. Loose or broken 00 wire from Crab Steer solenoid connector J19 pin 2 to ground.	Check continuity. Replace if defective.
5. Defective Crab Steer solenoid	Replace if Defective

4.2-14 No Boom Up

With following conditions:

- Frame Level Operates Normally

1. Loose or broken 05A wire from fuse F3 to 31 pin Chassis harness connector J31 pin 17, and/or boom up end of stroke relay 19CR pin 30.	Check continuity. Replace if defective.
2. Loose or broken 05A wire from connector P31 pin 17 to Boom End Of Stroke proximity switch connector J23 pin 1	Check continuity. Replace if defective.
3. Loose or broken 00 wire from Boom E.O.S. proximity switch connector J23 pin 3 to ground	Check continuity. Replace if defective.
4. Boom E.O.S. proximity switch misadjusted or defective.	Check adjustment (set to 70°) , replace if defective
5. Loose or broken 19 wire from Boom E.O.S. proximity switch connector J23 pin 2 to connector P31 pin 18	Check continuity. Replace if defective.
6. Loose or broken 19 wire from connector P31 pin 18 to Boom E.O.S. relay 19CR pin 86	Check continuity. Replace if defective.
7. Loose or broken 00 wire from Boom E.O.S. relay 19CR pin 85 to ground	Check continuity. Replace if defective.
8. Defective relay 19CR.	Check continuity through contacts of relay (pin 30 to 87 with coil energized). Replace if defective.
9. Loose or broken 14 wire from Boom E.O.S. relay 19CR pin 87 to boom up enable relay 28CR pin 30.	Check continuity. Replace if defective.
10. Loose or broken 14 wire from connector P31 pin 18 to boom up enable relay 28CR pin 30.	Check continuity. Replace if defective.
11. Frame angle sensor defective.	With boom below 40° and frame level check for voltage on wire 28 (pin 5). Replace if defective

12. Loose or broken wire 28 from frame angle sensor pin 5 to 4 pin connector P113 pin 2.	Check continuity. Replace if defective
13. Loose or broken wire 28 from 4 pin connector J113 pin 2 to boom up enable relay 28CR pin 86	Check continuity. Replace if defective
14. Loose or broken wire 00 from boom up enable relay 28CR pin 85 to ground	Check continuity. Replace if defective
15. Defective relay 28CR.	Check continuity through contacts of relay (pin 30 to 87 with coil energized). Replace if defective.
16. Loose or broken wire 14A from 28CR relay to 31 pin chassis harness connector J31 pin 3	Check continuity. Replace if defective
17. Loose or broken wire 14A from connector P31 pin 3 to boom up enable solenoid 2H-14A connector J25 pin 1.	Check continuity. Replace if defective
18. Loose or broken 00 wire from boom up enable solenoid 2H-14A connector J25 pin 2 to ground	Check continuity. Replace if defective
19. Defective boom up enable solenoid 2H-14A	Replace if defective.
With following conditions:	
<ul style="list-style-type: none"> ▪ No Frame Level 	
1. Fuse F5 open	Check for defective wiring. Replace fuse
2. Loose or broken 05R wire from fuse F5 to 31 pin Chassis harness connector J31 pin 24	Check continuity. Replace if defective.
3. Loose or broken 05R wire from connector P31 pin 24 to frame angle sensor connector J105 pin 2	Check continuity. Replace if defective.
4. Loose or broken 00 wire from frame angle sensor connector J105 pin 3 to ground.	Check continuity. Replace if defective.
5. Frame angle sensor defective.	With boom below 40° and frame level check for voltage on wires 28 (pin 5), 28R (pin 7), and 28L (pin 6). Replace if defective.

4.2-15 Frame Will Not Tilt Over 40° With Boom Below 40°

1. Loose or broken 05R wire from connector P31 pin 24 to boom 40° angle proximity switch connector J71 pin 1	Check continuity. Replace if defective
2. Loose or broken 00 wire from boom 40° angle proximity switch connector J71 pin 3 to ground.	Check continuity. Replace if defective.
3. Boom 40° angle proximity switch misadjusted or defective.	Check adjustment (set to 40°) , replace if defective

4. Loose or broken 212 wire from boom 40° angle proximity switch connector J71 pin 2 to 31 pin Console harness connector P31 pin 25	Check continuity. Replace if defective
5. Loose or broken 212 wire from connector J31 pin 25 to boom angle relay 212CR pin 86.	Check continuity. Replace if defective
6. Loose or broken 00 wire from con boom angle relay 212CR pin 85 to ground.	Check continuity. Replace if defective
7. Defective relay 212CR.	Check continuity through contacts of relay (pin 30 to 87 with coil energized). Replace if defective.
8. Loose or broken wire 221 from 31 pin connector P31 pin 23 to frame angle sensor connector J105 pin 4	Check continuity. Replace if defective
9. Frame angle sensor defective.	Replace if defective

4.2-16 No Frame Level

1. Fuse F19 open	Check for defective wiring. Replace fuse
2. Loose or broken 05T wire from F19 to frame level enable relay 65CR pin 30	Check continuity. Replace if defective
3. Loose or broken 05R wire from F5 fuse to boom angle relay 212CR pin 30	Check continuity. Replace if defective
4. Loose or broken wire 65 from chassis harness splice 65 (D213B & D221 to wire 65 junction) to 4 pin connector P113 pin 3	Check continuity between unused RAS unlock connector J75 pin 1 and 4 pin connector P113 pin 3. Replace if defective
5. Loose or broken wire 65 from 4 pin connector J113 pin 3 to frame level enable relay 65CR pin 86	Check continuity. Replace if defective
6. Loose or broken 00 wire 65 from frame level enable relay 65CR pin 85 to ground	Check continuity. Replace if defective
7. Defective relay 65CR.	Check continuity through contacts of relay (pin 30 to 87 with coil energized). Replace if defective.
8. Loose or defective wire 65A from 65CR relay pin 87 to 28RCR and 28LCR relays pins 30.	Check continuity. Replace if defective

With following conditions:

- Boom Angle Below 40°
- Works Above 40°

1. Defective relay 212CR.	Check continuity through contacts of relay (pin 30 to 87 with coil energized). Replace if defective
2. Loose or broken wire 221 from 221CR pin 87 to 31 pin connector J31 pin23	Check continuity. Replace if defective
3. Loose or broken wire 221 from 31 pin connector P31 pin23 to diode D221	Check continuity. Replace if defective
4. Defective diode D221	Check for continuity with positive lead on p31 pin 23 and negative lead on P113 pin 3 Replace if defective

With following conditions:

- Boom Angle Above 40°
- Works Below 40°

1. Defective relay 212CR.	Check continuity through contacts of relay (pin 30 to 87a with coil de-energized). Replace if defective
2. Loose or broken wire 213 from 221CR pin 87a to 223ACR socket pin 30	Check continuity. Replace if defective
3. Loose or broken Jumper 213 from pin 30 to pin 87 of 223ACR socket	Check continuity. Replace if defective
4. Loose or broken wire 65 from 223ACR socket pin 87 through splice SPL65 to 65CR relay pin 86	Check continuity. Replace if defective

With following conditions:

- No Frame Level Left

1. Loose or broken wire 65A from relay 65CR pin87 to relay 28LCR pin 30	Check continuity. Replace if defective
2. Frame angle sensor defective.	With boom below 40° and frame level check for voltage on wire 28L (pin 6). Replace if defective
3. Loose or broken wire 28L to connector P31 pin 29	Check continuity. Replace if defective
4. Loose or broken wire 28L from connector J31 pin 29 to relay 28LCR pin 86	Check continuity. Replace if defective
5. Loose or broken wire 00 from 28LCR pin 85	Check continuity. Replace if defective

6. Relay 28LCR defective	Check continuity through contacts of relay (pin 30 to 87a with coil de-energized). Replace if defective
7. Loose or broken wire 28A from 28LCR pin 87 to J31 connector pin 31	Check continuity. Replace if defective
8. Loose or broken wire 28A from P31 connector pin 31 to frame level left enable solenoid J74 pin 1	Check continuity. Replace if defective
9. Loose or broken wire 00 from frame level left enable solenoid J74 pin 2 to ground	Check continuity. Replace if defective
10. Defective frame level left solenoid 2H-28A	Replace if defective

With following conditions:

- No Frame Level Right

11. Loose or broken wire 65A from relay 65CR pin 87 to relay 28RCR pin 30	Check continuity. Replace if defective
12. Frame angle sensor defective.	With boom below 40° and frame level check for voltage on wire 28R (pin 6). Replace if defective
13. Loose or broken wire 28R to connector P31 pin 28	Check continuity. Replace if defective
14. Loose or broken wire 28R from connector J31 pin 28 to relay 28LCR pin 86	Check continuity. Replace if defective
15. Loose or broken wire 00 from 28RCR pin 85	Check continuity. Replace if defective
16. Relay 28RCR defective	Check continuity through contacts of relay (pin 30 to 87a with coil de-energized). Replace if defective
17. Loose or broken wire 28B from 28RCR pin 87 to J31 connector pin 31	Check continuity. Replace if defective
18. Loose or broken wire 28B from P31 connector pin 30 to frame level left enable solenoid J73 pin 1	Check continuity. Replace if defective
19. Loose or broken wire 00 from frame level left enable solenoid J73 pin 2 to ground	Check continuity. Replace if defective
20. Defective frame level right solenoid 2H-28B	Replace if defective

4.2-17 Function Does Not Switch**With following conditions:**

- From Telescope In/Out To Frame Level Left/Right With Frame Level Switch SW5 Depressed or from Boom Raise To Carriage Tilt Up With Carriage Tilt Switch SW6 Depressed

1. Fuse F4 open	Check for defective wiring. Replace fuse
2. Loose or broken wire 05B to joystick connector J46 pin 3 & 4 and/or Carriage tilt relay 224CR pin 86 and frame level enable relay 222CR pin 86	Check for defective wiring. Replace fuse

With following conditions:

- From Telescope In/Out To Frame Level Left/Right With Frame Level Switch SW5 Depressed

1. Loose or broken wire 05B to joystick connector J46 pin 3 and/or frame level enable relay 222CR pin 86	Check for defective wiring. Replace fuse
2. Loose or broken wire 222 from connector J46 pin8 to relay 222CR pin 86	Check continuity. Replace if defective
3. Loose or broken wire 00 from 222CR to ground	Check continuity. Replace if defective
4. Relay 222CR defective	Check continuity through contacts of relay (pin 30 to 87a with coil de-energized). Replace if defective
5. Loose or broken wire 223 from 223CR relay pin 87 to frame level left and/or right solenoids 223 and/or 223-1	Check continuity. Replace if defective
6. Loose or broken wire 00 from frame level left and/or right solenoids 223 and/or 223-1 to ground	Check continuity. Replace if defective
7. Frame Level left enable solenoid 4H-223 and/or frame level right enable solenoid 4H-223-1 defective.	Replace if defective.

With following conditions:

- From Boom Raise/Lower To Carriage Tilt Up/Down With Carriage Tilt Switch SW6 Depressed

1. Loose or broken wire 05B to joystick connector J46 pin 4 and/or frame level enable relay 224CR pin 86	Check for defective wiring. Replace fuse
2. Loose or broken wire 224 from connector J46 pin7 to relay 224CR pin 86	Check continuity. Replace if defective
3. Loose or broken wire 00 from 224CR to ground	Check continuity. Replace if defective
4. Relay 224CR defective	Check continuity through contacts of relay (pin 30 to 87a with coil de-energized). Replace if defective
5. Loose or broken wire 47 from 224CR relay pin 87 to carriage tilt enable up and/or down solenoids 4-H47 and/or 4-H47-1	Check continuity. Replace if defective
6. Loose or broken wire 00 from carriage tilt enable up and/or down solenoids 4-H-47 and/or 4-H47-1	Check continuity. Replace if defective
7. Carriage tilt up enable solenoid 4H-47 and/or carriage tilt down enable solenoid 4H-47-1 defective.	Replace if defective.

4.3 Hydraulic System

4.3-1 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 P1 is out of adjustment or is defective.	Refer to section 5 for pump set up/test procedure. Repair or replace if defective
5. RV1 misadjusted or defective	Adjust pressure, replace if defective

4.3-2 No Boom Functions

With following conditions:

- All Boom Functions Inoperative.

1. EC1 defective	Replace if defective
2. Orifice OR2 plugged	Remove and inspect, clean or replace as required.
3. PR1 pressure reducing valve misadjusted or defective	Adjust pressure, replace if defective

With following conditions:

- No Boom Raise

1. Stuck or defective joystick JS1	Clean valve. Check operation of valve. Repair or replace valve as required.
2. Boom up enable valve 2H-19A stuck or defective.	Clean valve. Check operation of valve. Repair or replace valve as required.
3. Stuck or defective lift valve V1.	Clean valve. Check operation of valve. Repair or replace valve as required.
4. LS check valve CV9 blocked or defective	Clean valve. Check operation of valve. Repair or replace valve as required
5. Stuck or defective lift counterbalance valves CB1, CB1-1.	Clean valve. Check O-rings on valve. Repair or replace valve as required.
6. Stuck or defective lift counterbalance valves CB2, CB2-1.	Clean valves. Check O-rings on valve. Repair or replace valve as required.
7. Defective lift cylinder C3 and/or C4.	Check seals on cylinder. Replace as necessary. Replace cylinder if defective

With following conditions:

- No Boom Lower

1. Stuck or defective joystick JS1	Clean valve. Check operation of valve. Repair or replace valve as required.
2. Stuck or defective lift valve V1.	Clean valve. Check operation of valve. Repair or replace valve as required.
3. LS check valve CV2 blocked or defective	Clean valve. Check operation of valve. Repair or replace valve as required
4. Stuck or defective lift counterbalance valves CB2, CB2-1.	Clean valve. Check O-rings on valve. Repair or replace valve as required.
5. Stuck or defective lift counterbalance valves CB1, CB1-1.	Clean valves. Check O-rings on valve. Repair or replace valve as required.
6. Defective lift cylinder C3 and/or C4.	Check seals on cylinder. Replace as necessary. Replace cylinder if defective

With following conditions:

- No Telescope Out

1. Stuck or defective joystick JS1	Clean valve. Check operation of valve. Repair or replace valve as required.
2. PD1 V13 stuck or defective.	Clean valve. Check operation of valve. Repair or replace valve as required.
3. Stuck or defective lift valve V3.	Clean valve. Check operation of valve. Repair or replace valve as required.
4. LS check valve CV7 blocked or defective	Clean valve. Check operation of valve. Repair or replace valve as required
5. Stuck or defective lift counterbalance valves CB3	Clean valve. Check O-rings on valve. Repair or replace valve as required.
6. Stuck or defective lift counterbalance valves CB4	Clean valves. Check O-rings on valve. Repair or replace valve as required.
7. Defective telescope cylinder C5	Check seals on cylinder. Replace as necessary. Replace cylinder if defective

With following conditions:

- No Telescope Retract

1. Stuck or defective joystick JS1	Clean valve. Check operation of valve. Repair or replace valve as required.
2. Stuck or defective telescope valve V3.	Clean valve. Check operation of valve. Repair or replace valve as required.
3. LS check valve CV3 blocked or defective	Clean valve. Check operation of valve. Repair or replace valve as required

4. Stuck or defective lift counterbalance valves CB4	Clean valve. Check O-rings on valve. Repair or replace valve as required.
5. Stuck or defective lift counterbalance valves CB3	Clean valves. Check O-rings on valve. Repair or replace valve as required.
6. Defective telescope cylinder C5.	Check seals on cylinder. Replace as necessary. Replace cylinder if defective

4.3-3 No Carriage Tilt

With following conditions:

- No Carriage Tilt Up

1. Stuck or defective joystick JS1	Clean valve. Check operation of valve. Repair or replace valve as required.
2. 4H-47 stuck or defective.	Clean valve. Check operation of valve. Repair or replace valve as required.
3. Stuck or defective carriage tilt valve V2.	Clean valve. Check operation of valve. Repair or replace valve as required.
4. LS check valve CV8 blocked or defective	Clean valve. Check operation of valve. Repair or replace valve as required
5. Pilot operated check valve CV11 and or CV12 blocked or defective	Clean valve. Check operation of valve. Repair or replace valve as required
6. RV4 misadjusted or defective	Adjust pressure, replace if defective
7. Stuck or defective lift counterbalance valves CB5	Clean valve. Check O-rings on valve. Repair or replace valve as required.
8. Defective carriage tilt cylinder C6	Check seals on cylinder. Replace as necessary. Replace cylinder if defective
9. Defective tilt compensation cylinder C7	Check seals on cylinder. Replace as necessary. Replace cylinder if defective

With following conditions:

- No carriage Tilt Down

1. Stuck or defective joystick JS1	Clean valve. Check operation of valve. Repair or replace valve as required.
2. 4H-47-1 stuck or defective.	Clean valve. Check operation of valve. Repair or replace valve as required.
3. Stuck or defective carriage tilt valve V2.	Clean valve. Check operation of valve. Repair or replace valve as required.
4. LS check valve CV1 blocked or defective	Clean valve. Check operation of valve. Repair or replace valve as required
5. Pilot operated check valve CV11 and or CV12 blocked or defective	Clean valve. Check operation of valve. Repair or replace valve as required

6. RV3 misadjusted or defective	Adjust pressure, replace if defective
7. Stuck or defective lift counterbalance valves CB5	Clean valve. Check O-rings on valve. Repair or replace valve as required.
8. Defective carriage tilt cylinder C6	Check seals on cylinder. Replace as necessary. Replace cylinder if defective
9. Defective tilt compensation cylinder C7	Check seals on cylinder. Replace as necessary. Replace cylinder if defective

4.3-4 No Frame Level

With following conditions:

- No Frame Level Right

1. Stuck or defective joystick JS1	Clean valve. Check operation of valve. Repair or replace valve as required.
2. 4H-223-1 stuck or defective.	Clean valve. Check operation of valve. Repair or replace valve as required.
3. Frame right enable valve 2H-28 stuck or defective.	Clean valve. Check operation of valve. Repair or replace valve as required
4. Orifice OR3 and/or OR4 plugged	Remove and inspect, clean or replace as required
5. Stuck or defective frame level valve V4.	Clean valve. Check operation of valve. Repair or replace valve as required.
6. LS check valve CV10 blocked or defective	Clean valve. Check operation of valve. Repair or replace valve as required
7. Stuck or defective frame level counterbalance valve CB7	Clean valve. Check O-rings on valve. Repair or replace valve as required.
8. Stuck or defective frame level counterbalance valve CB6	Clean valve. Check O-rings on valve. Repair or replace valve as required.
9. Defective frame level cylinder C9	Check seals on cylinder. Replace as necessary. Replace cylinder if defective

With following conditions:

- No Frame Level Left

1. Stuck or defective joystick JS1	Clean valve. Check operation of valve. Repair or replace valve as required.
2. 4H-223 stuck or defective.	Clean valve. Check operation of valve. Repair or replace valve as required.
3. Frame right enable valve 2H-28A stuck or defective.	Clean valve. Check operation of valve. Repair or replace valve as required
4. Orifice OR3 and/or OR4 plugged	Remove and inspect, clean or replace as required

5. Stuck or defective frame level valve V4.	Clean valve. Check operation of valve. Repair or replace valve as required.
6. LS check valve CV4 blocked or defective	Clean valve. Check operation of valve. Repair or replace valve as required
7. Stuck or defective frame level counterbalance valve CB6	Clean valve. Check O-rings on valve. Repair or replace valve as required.
8. Stuck or defective frame level counterbalance valve CB7	Clean valve. Check O-rings on valve. Repair or replace valve as required.
9. Defective frame level cylinder C9	Check seals on cylinder. Replace as necessary. Replace cylinder if defective

4.3-5 No Aux. functions

1. 4H-233/4H-234 stuck or defective.	Clean valve. Check operation of valve. Repair or replace valve as required
2. Stuck or defective Auxiliary counterbalance valve (if equipped)	Clean valve. Check O-rings on valve. Repair or replace valve as required
3. Defective Auxiliary/Optional cylinder(s).	Check seals on cylinder. Replace as necessary. Replace cylinder if defective.
4. LS check valve CV13 blocked or defective.	Clean valve. Check operation of valve. Repair or replace valve as required

4.3-6 Hard or No Steering

1. Stuck or defective EC1 valve	Clean valve. Check operation of 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.	Check seals on cylinder. Replace as necessary. Replace cylinder if defective.
4. LS check valve CV5 blocked or defective.	Clean valve. Check operation of valve. Repair or replace valve as required
5. Orifice OR1 plugged	Remove and inspect, clean or replace as required
6. Relief valve RV2 valve misadjusted or defective	Adjust pressure, replace if defective
7. Orifice OR7 plugged	Remove and inspect, clean or replace as required

4.3-7 Park Brake will not Release

1. Stuck or defective park brake valve 3H-26	Clean valve. Check O-rings on valve. Repair or replace valve as required
2. Bypassing or defective parking brake seals in axle.	Check seals, replace as necessary. Replace if defective

4.3-8 Park Brake Will Not Engage

3. Defective park brake C11.	Repair or replace as necessary.
4. Park brake valve SV3 stuck in shifted position.	Check valve. Replace if defective.

4.3-9 Service Brake Will Not Engage

1. Service brake actuator stuck or defective	Clean valve. Check operation of valve. Repair or replace valve as required
2. Load sense check valve CV6 blocked or defective	Clean valve. Check operation of valve. Repair or replace valve as required
3. Bypassing or defective brake seals in axle.	Check seals, replace as necessary. Replace if defective

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Section 5 – Procedures

5.1 General

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

5.1-1 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.

5.1-2 Engine and Transmission

The engine used on the SJ643 TH & SJ843 TH telehandler models is a Deutz TCD 2.9L Tier 4 Final.

Engine service information can be found in the Deutz Engine Manuals. It should be noted that engine warranty service work is to be directed to and administered by your nearest authorized Deutz dealer/distributor.

Skyjack cannot enter into any warranty service work requirements.

The basic Deutz 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:

- Electronic Data Display Module
- Starter
- Alternator
- Injectors
- Fuel Pump
- Fuel Solenoid
- Water Pump

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

5.2 10 Hour or Daily Routine Maintenance

Perform maintenance inspections for the items described in this section on a daily basis or at the start of each work shift.

5.2-1 Check Engine Oil Level

1. Park telehandler on a firm level surface with boom fully retracted and lowered.
2. Shut off engine then release latch and lift engine cover to open.
3. Wait approximately 15 minutes after engine has been shut off.
4. Pull out dipstick and wipe it off with a clean, dry, lint-free cloth; then place it back in the hole until it stops.

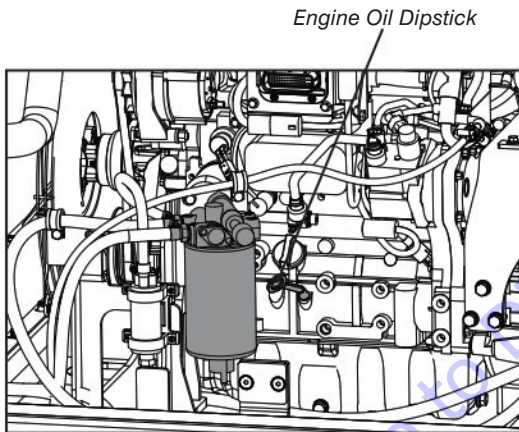


Figure 01 Engine Oil Dipstick

5. Pull the dipstick out again and check the oil level on the dipstick. The oil level must be between the “Full” and “Low” marks.
6. If oil level is below the “Low” mark, refer to [5.4-4 Replace Engine Oil and Filter](#) for engine oil and filter replacement procedure.

5.2-2 Check Coolant Level, Radiator and Hoses

WARNING

Pressurized fluid present in radiator. Never open radiator cap when hot.

NOTE

Do not intermix different brands of coolant. If the existing coolant cannot be identified, drain and flush the remaining coolant and refill with new coolant. Refer to [5.5-5 Change Engine Coolant](#) for instructions on changing engine coolant.

1. Remove radiator cap.
2. Fill radiator completely through the radiator neck, until coolant is visible. See figure below.

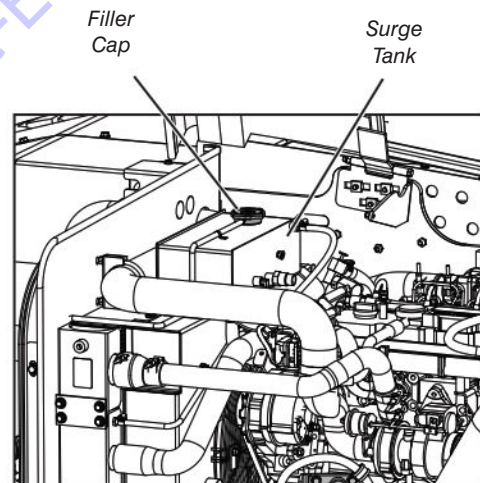


Figure 02 Surge Tank Location

3. Run the engine for 25 minutes without radiator cap to achieve operating temperature. Shut down the engine.
4. Check coolant level in the radiator. Refill until coolant is visible.
5. Install radiator cap.

5.2-3 Check Transmission Fluid Level

1. Park telehandler on a firm level surface, move transmission gear selector to Neutral and apply park brakes.
2. Release latch and lift engine cover to access engine compartment.
3. Start engine and allow the transmission to reach normal operating temperature.
4. Pull out dipstick and wipe with a clean, dry, lint-free cloth. Fully insert dipstick back into the tube and then pull it out and check the oil level.

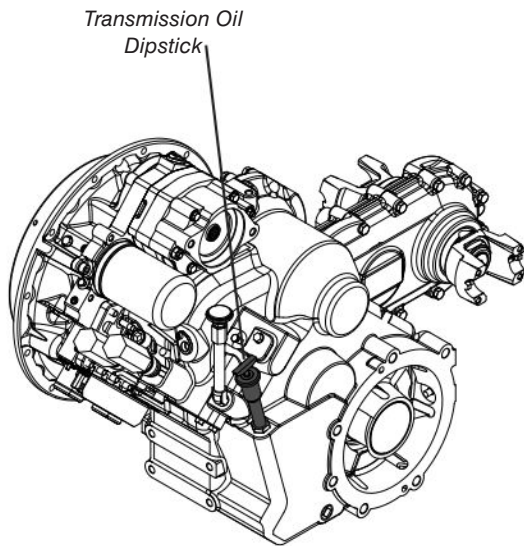


Figure 03 Transmission Oil Dipstick

5. The oil level should be between the “Full” and “Low” marks.
6. If transmission oil level is low, refer to [5.5-6 Change Transmission Oil and Filter](#) for transmission oil and filter replacement.

5.2-4 Check Air Cleaner Restriction and Filter Elements

Air Cleaner
Location

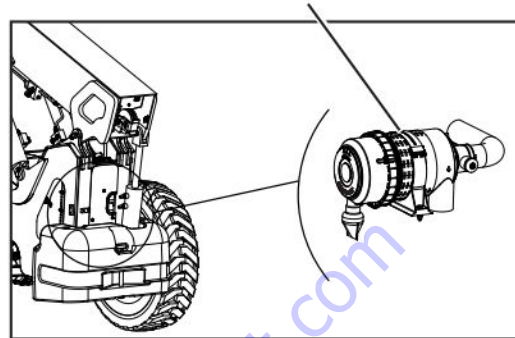


Figure 04 Air Cleaner Location

1. Service the air cleaner when a red band appears on the service indicator. After servicing, press the indicator to reset it.
2. Check the air cleaner vaccuator valve to see that it is clean and that the rubber is not cracked. Squeeze the valve lips and remove any dirt or dust. It should expel dust and dirt continuously when the engine is running. See figure below.

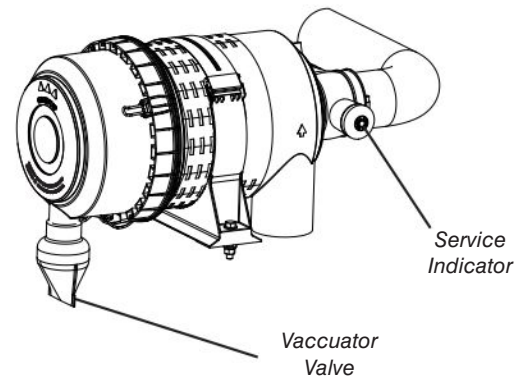


Figure 05 Air Cleaner Vaccuator Valve

NOTE

SJ643 TH & SJ843 TH telehandlers are equipped with a two-stage air filter system; which consists of a primary filter element & a secondary safety element. Inspect the condition of both the primary and safety elements.

IMPORTANT

The primary element can be replaced or cleaned. The secondary element cannot be cleaned and must be replaced only.

NOTE

For maximum engine protection, replace the secondary element after every third cleaning of the primary element or annually.

1. Undo latches and pull cover outward to remove.

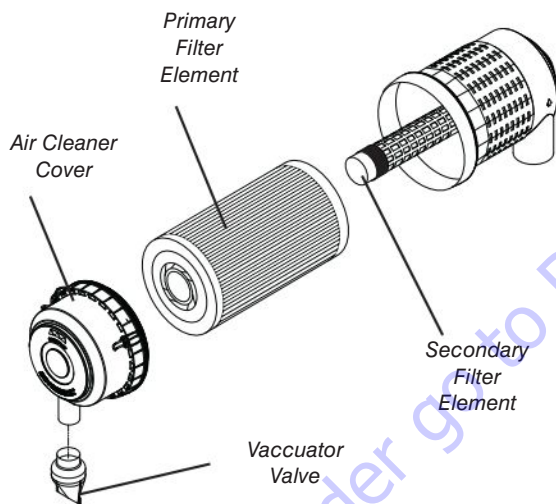


Figure 06 Engine Air Cleaner

2. Remove the primary air cleaner element. Clean or replace as required.
3. With the Secondary element in place, clean inside the housing and the cover with a damp cloth.

CAUTION

Never use compressed air on an air filter. Paper elements should not be “washed”.

NOTE

Secondary or safety element should not be removed unless it is being replaced.

Replace the secondary element if:

- Examination reveals tears or perforations in the safety element.
- The primary element has been replaced three times or the element has been in service one year.

5.2-5 Check Hydraulic Oil Level

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 at rear of tank to check that the hydraulic fluid is between MAX and MIN.

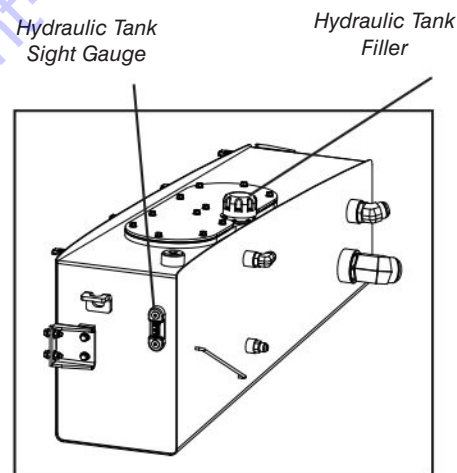


Figure 07 Hydraulic Oil Tank Sight Gauge

1. Check hydraulic Oil Tank Sight Gauge.
2. Add clean hydraulic oil through the tank filler as required. Refer to [2.4 Recommended Fluids/Lubrication](#) for hydraulic oil specifications.

5.2-6 Drain Fuel/Water Separator

⚠ WARNING

Diesel fuel is flammable and may cause death or serious injury. Shut down engine and do not smoke while draining fuel/water separator.

1. Ensure engine is shut down & telehandler is parked on a firm level surface.
2. Prepare a container for draining the fuel/water separator and place it under the separator.
3. Open drain reservoir and allow approximately one cup of fuel and any collected sediment to drain into the container. Refer to the Figure below.

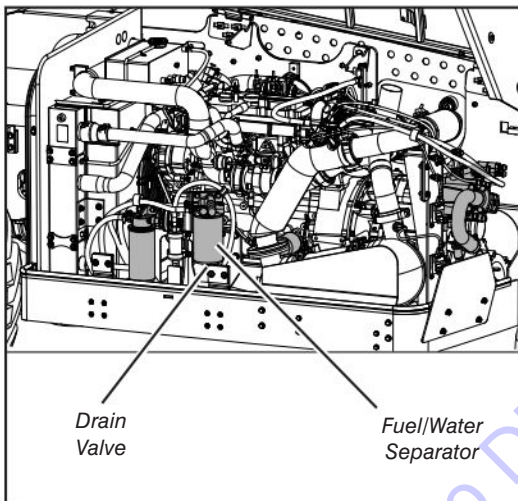


Figure 08 Fuel/Water Separator

4. Close the drain then dispose of the collected liquid in an environmentally safe manner.



NOTE

Refer to your local/national environmental regulations on how to dispose of used fuels and other dangerous liquids.

5.2-7 Fuel Tank

⚠ WARNING

Do not allow fuel tank to become completely empty. If tank is allowed to empty completely, the entire fuel system will require bleeding.

1. Check fuel gauge inside operator's cab.
2. Ensure fuel is at an appropriate level before the start of each work shift.
3. Add diesel fuel as required.



NOTE

Refer to Operating Manual for refueling procedure.

5.2-8 Check Parking Brake

1. Check the park brake operation daily or every 10 hours of service.



NOTE

Refer to "Park Brake Test Procedure" in Section 2 of Operating Manual.

5.2-9 Check Tire Pressure and Condition

1. Check the tire pressure when cold and inflate to the recommended pressure. Refer to Operating Manual for tires and tire pressure specifications.

⚠ WARNING

Do not over-inflate. Tire may explode causing death or severe injury.

2. Remove wheel from telehandler to fill the tire whenever pressure is below 80% of the recommended pressure.
3. Place tire in a cage and inflate using a clip-on chuck and a remote tire pressure gauge.

- If tire must be removed for repairs, remove the air pressure from the tire before removing the wheel from the telehandler.

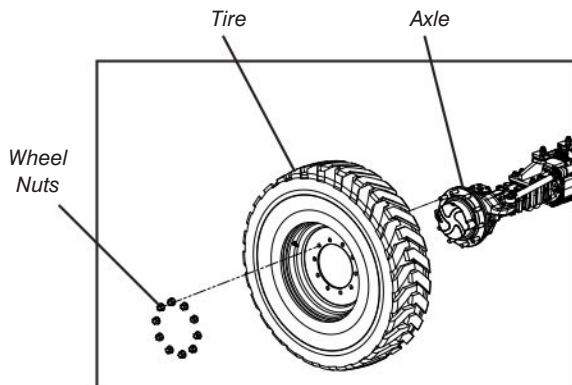


Figure 09 Telehandler Wheel

- Check tire tread for damage. Check for bent or damaged rims and loose or missing hardware.
- Tighten and torque wheel nuts.

5.2-10 Check Seat Belt and Mounting Hardware

- Check seat belt for wear or damage. Check that mounting hardware is tight.
- Inspect the belt hardware and fabric. Replace if hardware is damaged, frayed or loose stitching is found.



Figure 10 Seat Assembly



NOTE

Replace seat belt assemblies every three (3) years, regardless of appearance. Seat belt strength degrades over time and use due to exposure to weather conditions.

5.2-11 Check Windshield Washer Fluid Level and Wiper Condition

- Check fluid level in washer bottle. Add as required.
- Check the condition of the windshield wiper and replace if necessary.

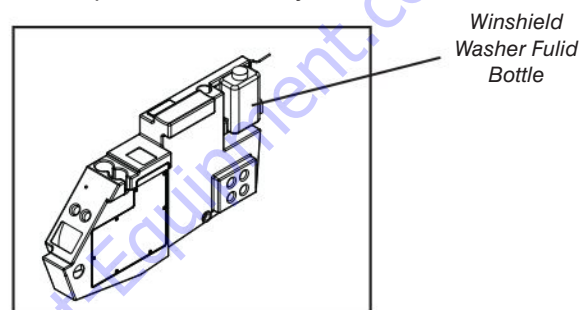


Figure 11 Windshield Washer Fluid.

5.3 50 Hour or Weekly Routine Maintenance

5.3-1 Grease Axle Pivot Bearings and King Pins

Each axle has two integral pivot assemblies which attach the axle to the frame. Each of the four pivot assemblies requires independent lubrication.

▪ **Axle Pivot Bearings**

There are remote grease fittings for pivot bearing lubrication. The front axle grease fittings are located on the right front frame rail next to the frame level cylinder. See Figure below.

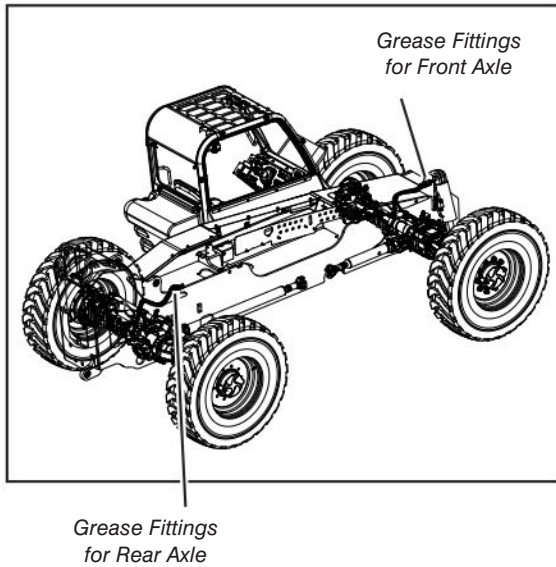


Figure 12 Front Axle Pivot Bearing Grease Fittings

The rear axle remote grease fittings are located beside the right boom lift cylinder. See figure above.

1. Wipe dirt and grease from each remote grease fitting.
2. Remove cap and apply 4 shots of grease to each fitting.

▪ **Axle King Pins**

Each axle has two king pins. Each king pin has an upper and a lower grease fitting (total of 4 king pins on each axle). Follow the steps below to lubricate the king pins.

1. Wipe each fitting clean.
2. Apply 4 shots of grease to each fitting. See figure below.

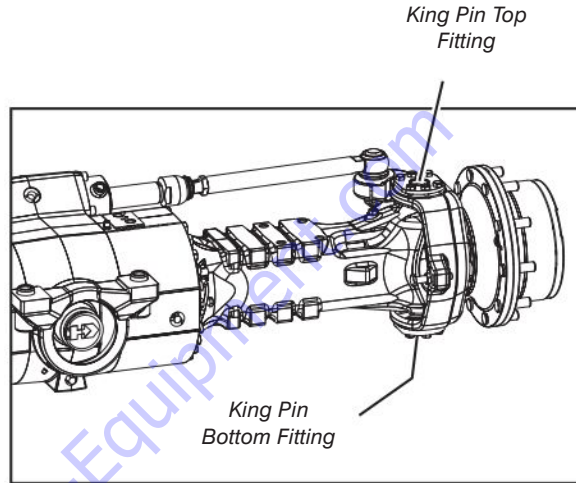


Figure 13 Axle King Pins

5.3-2 Grease Drive Shaft U-joints and slip joints

1. Wipe each fitting clean.
2. Apply 4 shots of grease to each fitting. See figure below.

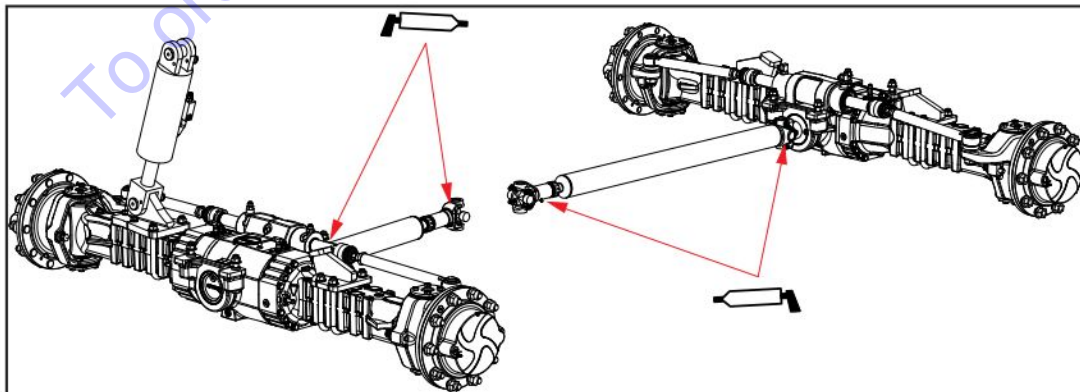


Figure 14 Drive Shaft Grease Points

5.3-3 Check Fork Pins

1. Check the condition of the fork pin.
2. Inspect for cracks and other deformations.
3. Replace if required.

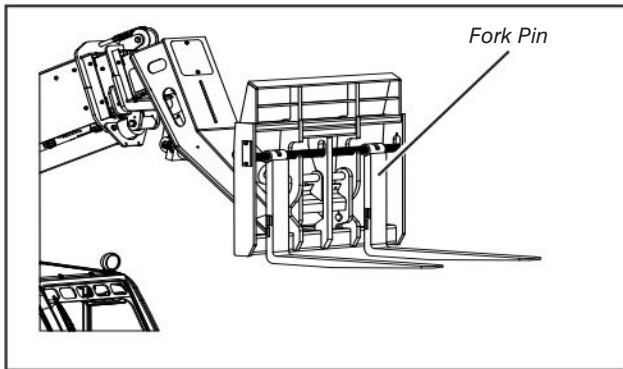


Figure 15 Fork Pin

5.3-4 Grease Frame Level Pivot Bushings

1. Apply grease to the grease fittings at each end of the frame level cylinder. See figure below.

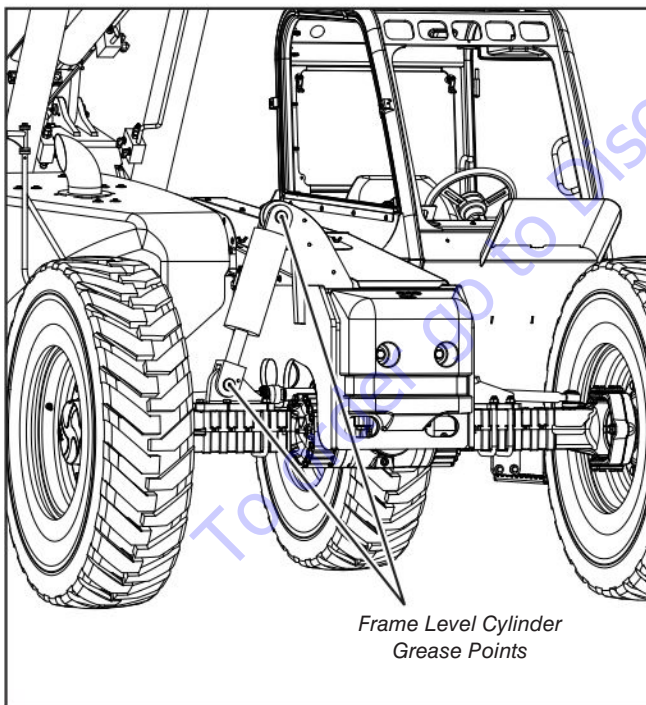


Figure 16 Stabilizer Grease Points

Figure 17 Rear Axle Lock Cylinder Grease Points

5.3-5 Grease Boom Pivot and Boom Cylinders

1. Apply grease to the following grease points on boom pivot and boom cylinders.

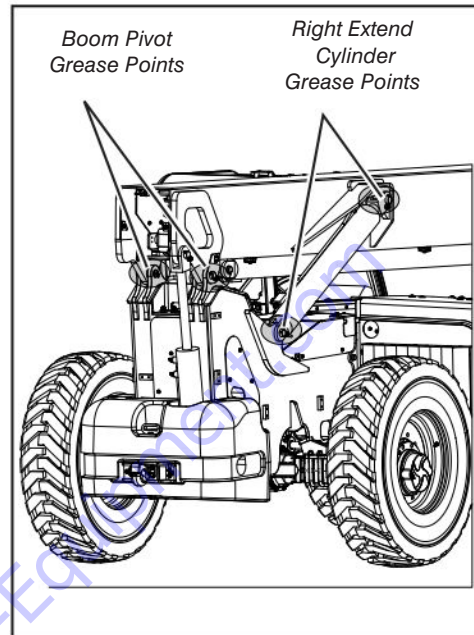


Figure 18 Boom Grease Points

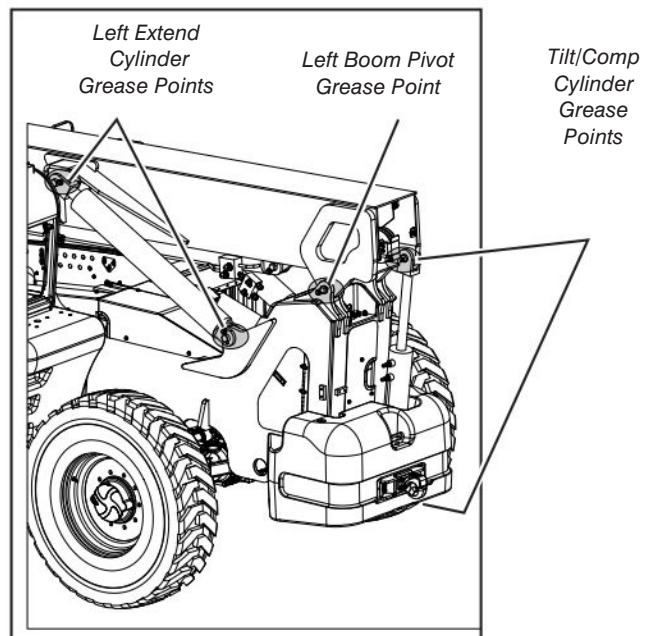


Figure 19 Boom Grease Points

5.3-6 Grease Bottom Front & Top Rear Slide Pads

1. Ensure telehandler is parked on a firm level surface.
2. Move transmission lever to neutral and engage park brake.
3. Fully extend the boom to gain access to front bottom slide pads.
4. Shut down the engine and dismount from cab.
5. With boom fully extended, smear grease along the path of front bottom slide pads. See figures below.

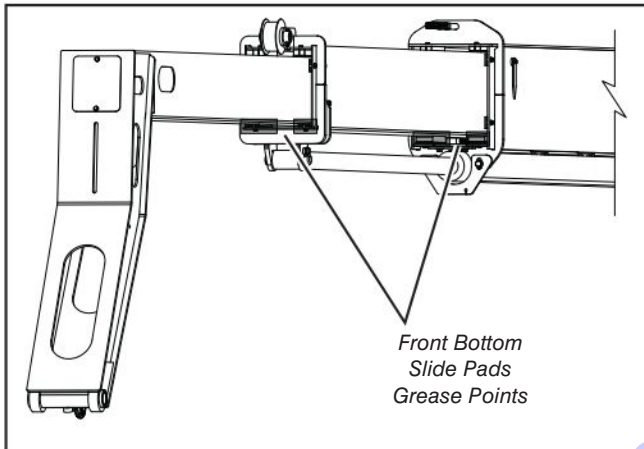


Figure 20 Front Bottom Slide Pads

6. Fully retract the boom then fully extend it a few times to ensure the path of slide pads is covered with grease for maximum protection.
7. With boom fully retracted, remove boom rear cover door to gain access to top rear slide pads.

8. Smear grease along the path of rear top slide pads. See figure below.

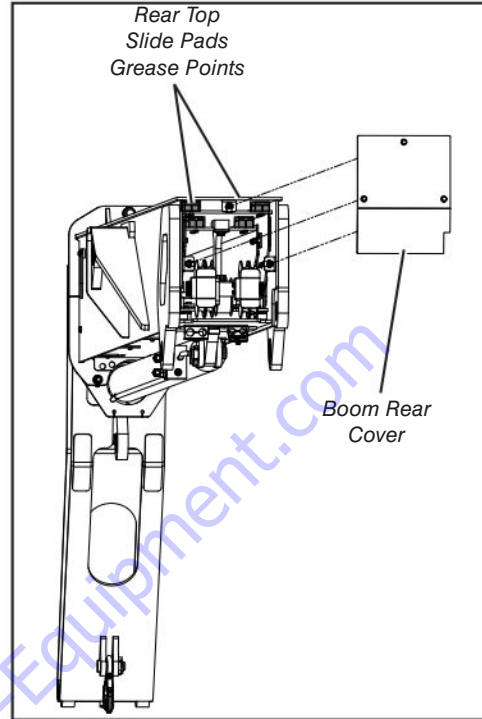


Figure 21 Front Bottom Slide Pads

9. Shut down the engine and remove key.

5.4 250 Hour or Quarterly Routine Maintenance

5.4-1 Check Lug Nut Torque

1. Ensure wheel nuts are tight on all wheels.
2. Tighten wheel nuts to a torque of 442 lb. ft. (599 N.m) using the cross pattern shown in figure below.

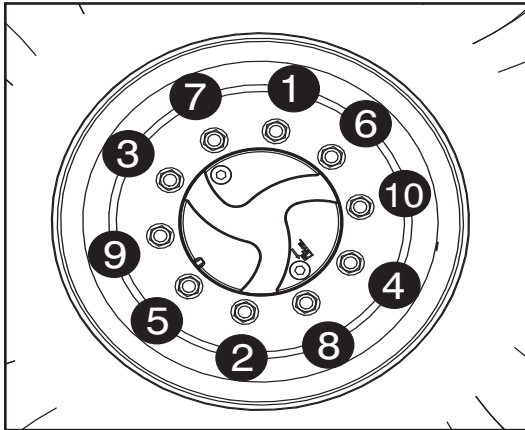


Figure 22 Wheel Nuts Torque Procedure

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.

5.4-2 Check Oil Level in Axle Differential Planetary wheel Ends

WARNING

Hot oil or components can burn. Oil must be at normal operating temperature when draining. Avoid contact with hot oil or components.

NOTE

Each axle has two independent planetary assemblies that require gear oil lubricant.

1. Park telehandler on a firm level surface with the fill plug in the vertical position as shown in figure below.

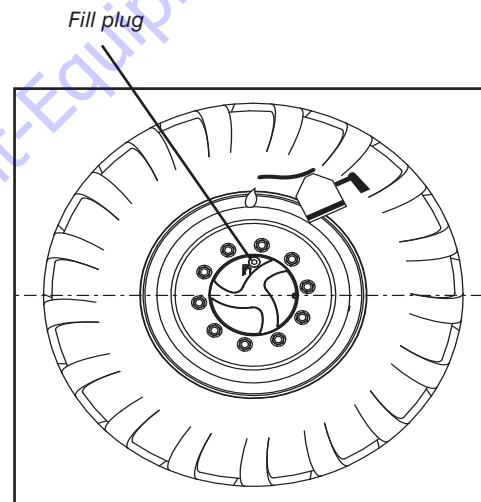


Figure 23 Planetary Wheel Plug

2. Apply park brake and shut off engine and allow telehandler to sit for a minimum of two minutes.
3. Wipe the fill plug clean and remove.
4. Check oil level at the bottom of the fill hole. If required, add oil.

NOTE

Refer to [2.4 Recommended Fluids/Lubrication](#) in this manual for oil type and capacity.

5. Re-install plug and repeat steps above for the three (3) remaining planetary wheel ends.

5.4-3 Check Oil level in Axle differentials



NOTE

Each axle assembly requires gear lubricant independent of the planetary assemblies.

1. Ensure telehandler is parked on a firm level surface.
2. Apply park brake and turn off engine, then allow it to sit for a minimum of two minutes.
3. Wipe Level/Fill plug clean and remove. See figure below.

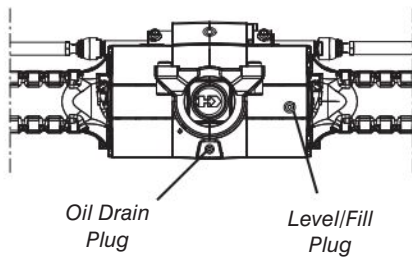


Figure 24 Axle Plugs

4. Check oil level at the bottom of the fill hole. Add oil as needed.



NOTE

Refer to [2.4 Recommended Fluids/Lubrication](#) in this manual for oil type and capacity.

5. Re-install plug and repeat steps above for the other axle.

5.4-4 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

Shut off engine and allow it to cool down prior to performing this procedure.

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 parked on a firm level surface.
2. Apply park brake and remove key from ignition switch.
3. Allow engine to cool down.
4. Unlatch engine cover and lift it to gain access to engine compartment.
5. Place a container capable of holding approximately 7 quarts (7.4 litres) under engine oil drain plug.

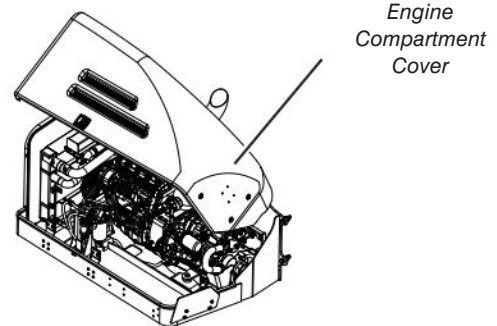


Figure 25 Engine Cover

- Remove oil drain plug and allow all engine oil to drain into container. See figure below.

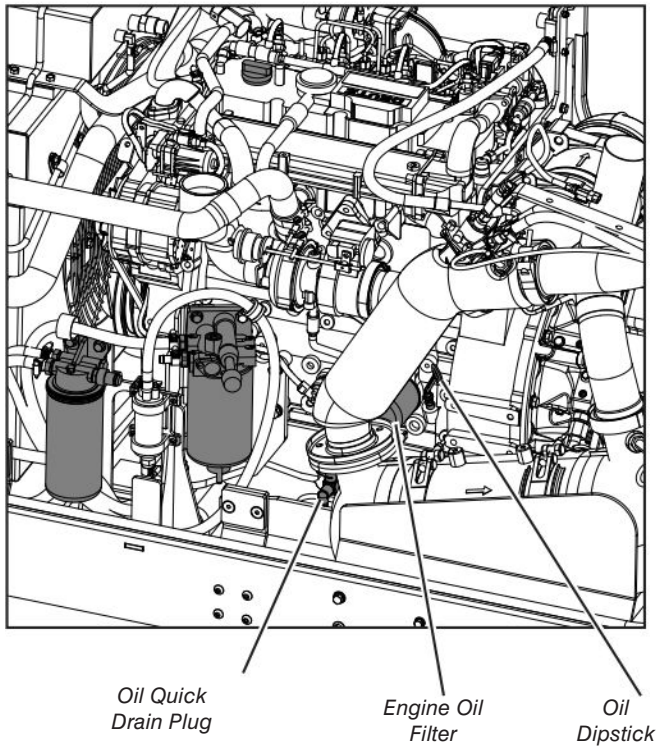


Figure 26 Engine Oil Draining

- Install oil drain plug with a new seal ring and tighten firmly.
- Remove oil filter and catch any escaping oil.

Engine Oil Filter

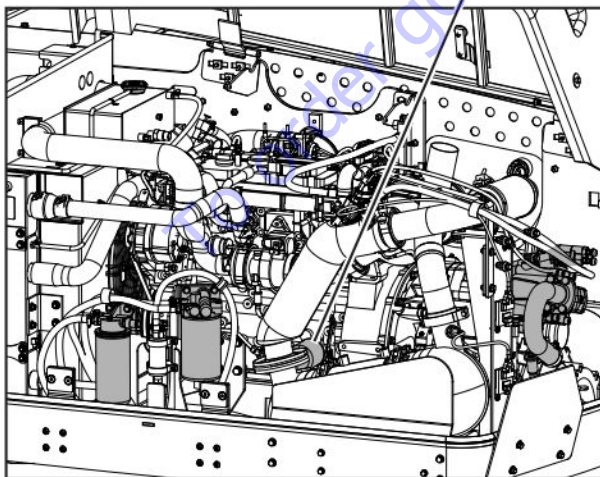


Figure 27 Engine Oil Filter Location

- Clean inside the filter head.
- Apply a thin layer of engine oil to the new oil filter gasket.
- Screw on new filter by hand until the gasket is touching then tighten to a torque of 7-9 ft.-lb. (10-12 Nm).
- Clean up any oil that may have spilled during this procedure.
- Refill engine with new oil through the fill area. Refer to [2.4 Recommended Fluids/Lubrication](#).

Engine Oil
Fill Cap

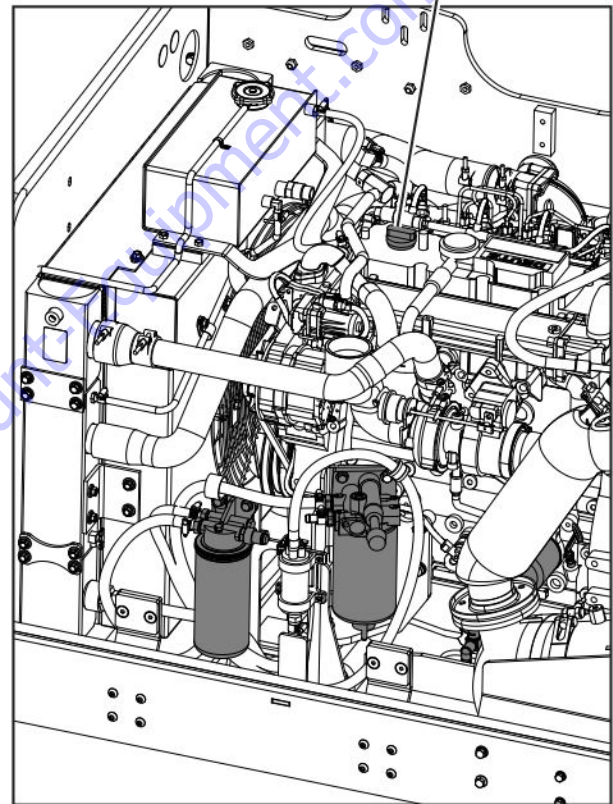


Figure 28 Engine Oil Fill Cap

14. Start engine and allow it to run for 30 seconds then stop the engine.
15. Check for oil leakage.
16. Check engine oil level on dipstick and add oil if needed.

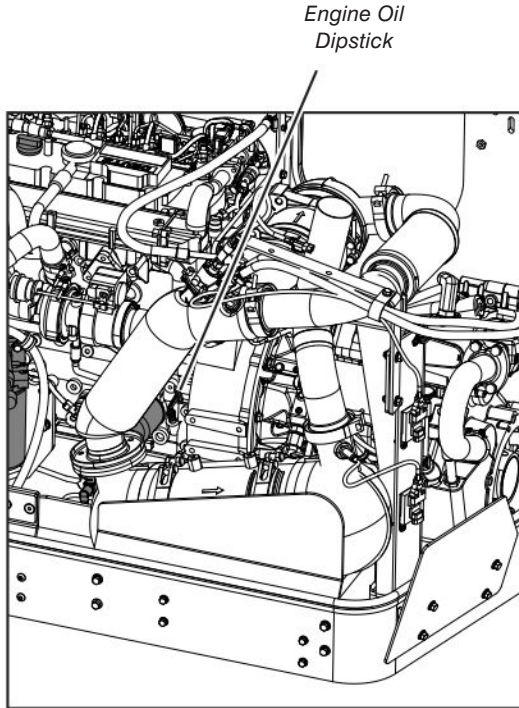


Figure 29 Engine Oil Dipstick Location

17. Close the engine compartment cover then latch to secure in place.

 **NOTE**

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

5.4-5 Change Engine Fuel filter and Fuel/Water Separator

The engine has both a fuel filter and a fuel/water separator to filter water, rust particles, dust and other particles from the fuel. See figure below.

WARNING

The fuel pump high-pressure fuel lines and fuel rail contain very high pressure fuel. Never loosen any fittings while the engine is running. Personal injury and property damage can result.

1. Ensure telehandler is on firm level surface.
2. Apply parking brake, shut down the engine and remove key from ignition switch.
3. Unlatch engine compartment cover and lift it up.
4. Clean area around fuel filter and fuel/water separator.
5. Place a container under filter and separator to collect any escaping fuel when removing them.
6. Disconnect the water level sensor harness from fuel/water separator.
7. Unscrew the drain plug assembly from bottom of water separator.
8. Unscrew used fuel filter and separator. Discard used filter and separator and any captured spilled fuel.

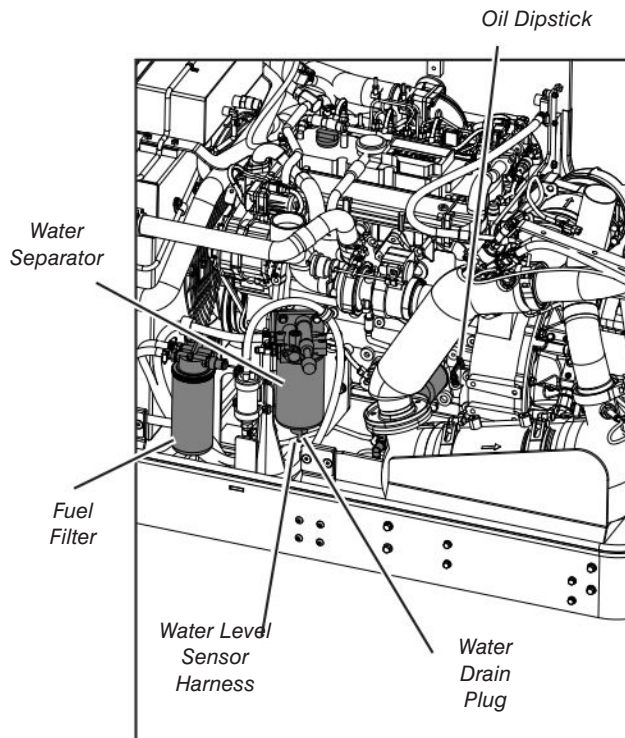


Figure 30 Fuel Filter & Water Separator



NOTE

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

9. Clean the sealing surface of the new filter cartridge and opposite side of filter head. If necessary, replace O-ring on the filter head.
10. Lubricate O-ring seal and the sealing surface slightly with fuel.
11. Install replacement filter and separator as specified by manufacturer. Most filters have instructions printed on the side. Torque to 13 ft.-lb. (17-18 Nm)
12. Mount the drain plug on bottom of water separator. Torque to 1 ft.-lb. (1.6 ± 0.3 Nm)
13. Check area around filter and separator for any leaks.
14. Connect water level sensor harness to fuel/water separator.

15. Prime fuel system after fuel filters have been reinstalled as follows: Refer to figure below.

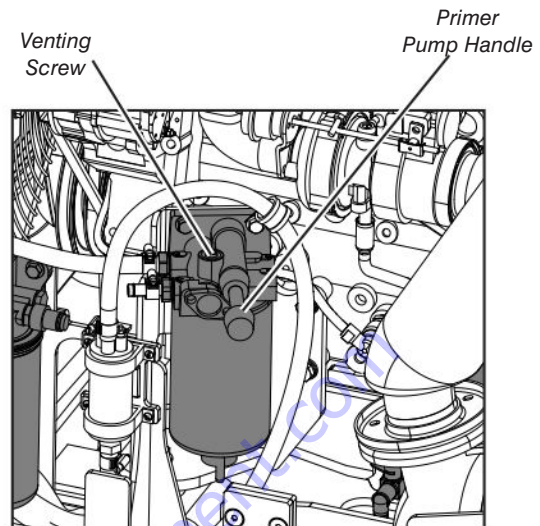


Figure 31 Priming the Fuel System

WARNING

Do not attempt to start the engine while the fuel system is venting to ensure no error messages are generated.

- Loosen venting screw.
 - Turn the primer pump handle counter clockwise (CCW) to release.
 - Pump the handle in and out until pressure builds in the fuel system (handle will gradually become firm and fuel will come out of venting plug).
 - Retighten venting screw and primer handle.
16. Check area for any leaks.
 17. Close engine cover back and latch it in place.

5.4-6 Clean Hydraulic Tank Breather

1. Clean area around hydraulic breather. Do not allow dirt to enter the hydraulic tank.

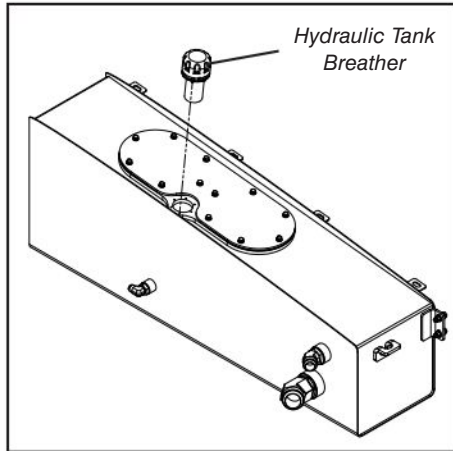


Figure 32 Hydraulic Tank Breather

2. Remove the breather and clean with solvent. Blow dry with compressed air.
3. Install the cleaned breather on the tank.

5.4-7 Torque Axle Mounting Bolts

The axles are secured to the frame by an axle pivot assembly on each side of the axle. The pivot assemblies are bolted to the machine frame with axle mounting bolts. See figure below.

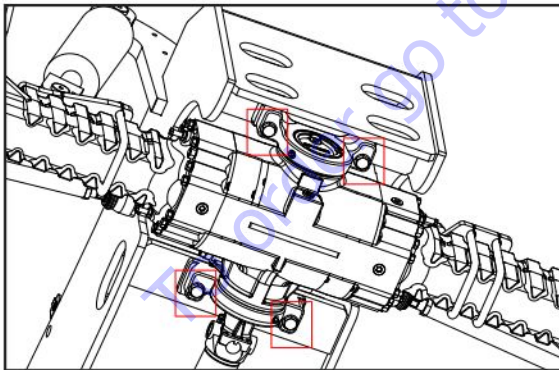


Figure 33 Axle Mounting Bolts

1. Torque front axle mounting bolts to 320 ft·lb. (434 N·m.).
2. Torque rear axle mounting bolts to 320 ft·lb (434 N·m.).

5.4-8 Inspect Boom Chains

⚠ WARNING

Do not enter the danger area under or around the boom when forks are off the ground or while engine is running.

⚠ WARNING

Before making any repairs, use blocks and chains on the boom sections and forks to ensure that they cannot move. Make sure the moveable parts are attached to non-moveable parts.

1. Park telehandler on a firm level surface.
2. Apply parking brake then fully retract and lower the boom.
3. Shut down engine and remove key from ignition switch.
4. Remove cover on rear of boom structure.

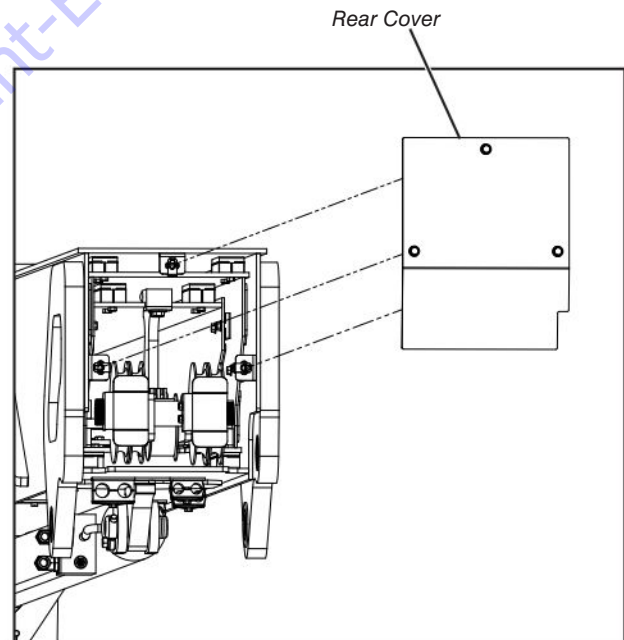
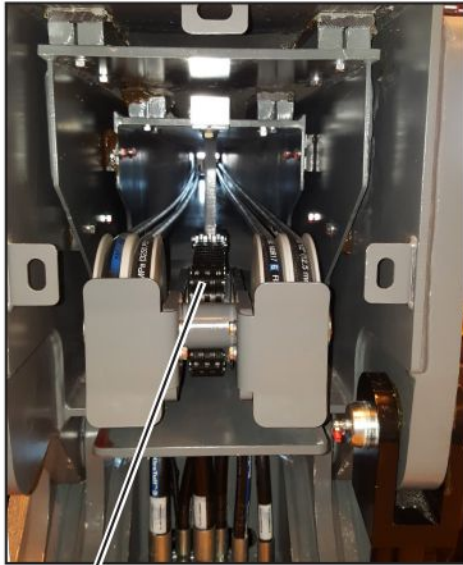


Figure 34 Boom Cover Removal

5. Inspect the retract chain(s) inside the rear of the boom.

**NOTE**

The chains should appear well lubricated, with no signs of wear or rust.

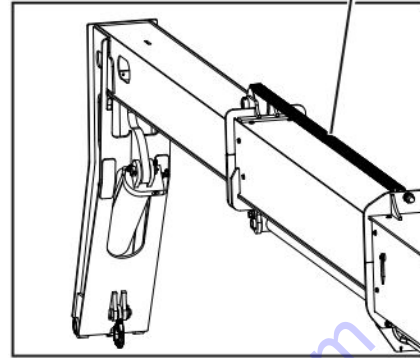


Retract Chain

Figure 35 Retract Chain

6. If chain appears dry, rusty, or worn, the chains must be removed for a complete inspection and lubrication. Refer to [5.6-2 Boom Chains Replacement](#) for boom chains replacement procedure.
7. When the chains are well lubricated, reinstall the cover.
8. Start the engine and fully extend the boom.
9. Shut down engine and remove key from ignition switch.
10. Inspect the extend chain(s). See figures below.

Extend Chain

**Figure 36** Boom Extend Chain**NOTE**

The chain(s) should appear well lubricated, with no signs of wear or rust.

11. If chain appears dry, rusty, or worn, the chains must be removed for a complete inspection and lubrication. Refer to [5.6-2 Boom Chains Replacement](#) for boom chains replacement procedure.

5.4-9 Check Boom Slide Pad Clearances

Slide pads support the boom components as the boom is extended and retracted. The slide pads must maintain clearance between the contact surface of the pad and the adjacent sliding surface. This clearance ranges between 0.031 – 0.062 in. (0.79 – 1.58 mm) TOTAL for both sides of the boom. When clearances exceed this amount, shims need to be added or the pads must be replaced.

The slide pads are chamfered on the corner of the wear surface. This serves as a wear indicator. When the chamfer is no longer visible, replace the pads. Additional wear will allow interference with inserts in the pads. Refer to [5.6-3 Slide Pads Replacement Procedure](#) for slide pads replacement procedure.

Lubrication of the pads require application of grease on the boom surfaces which come in contact with the pads.

1. Park telehandler on a firm level surface.

2. Extend the boom and rest the forks on a level surface.
3. Apply park brake then shutdown the engine and remove key from ignition switch.
4. Measure the clearance between the bottom surfaces of the boom and slide pads at each section. Clearance should not exceed 0.08 in. (2 mm).

Bottom Slide Pads Clearance

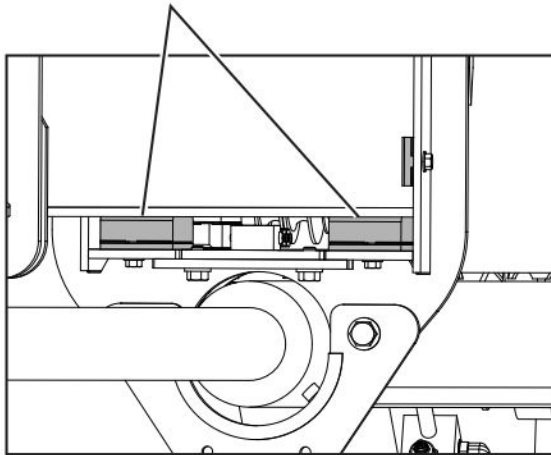


Figure 37 Bottom Slide pads

5. When clearances exceed this amount, add shims or replace the pads.
6. Start the engine and raise the boom off the level surface ensuring there is no upward force applied to the boom.
7. With park brake applied, shut down engine and remove key from ignition switch.
8. Measure the clearance between each side slide pad & the boom at each section as follows:
 - Place a bar against the side of the boom section and pry the section sideways as far as possible.
 - Measure the clearance between the side of the boom and the upper and lower slide pads. Clearance should not exceed 0.08 in. (2 mm).
 - Repeat procedure for inner boom section(s).

Side Slide Pads

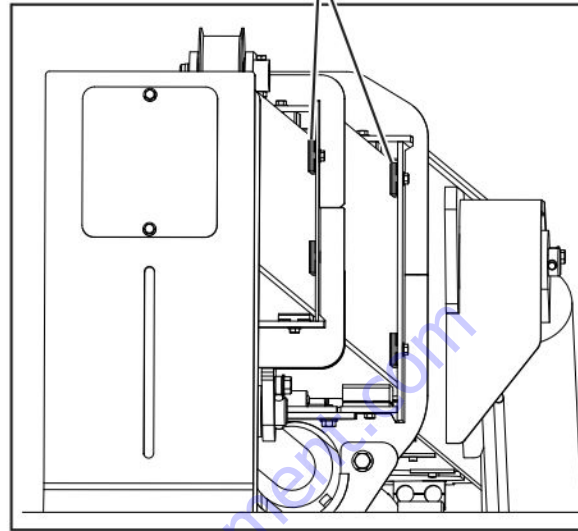


Figure 38 Side Slide Pads Clearance

9. Remove boom cover so that rear of the boom sections is visible.
10. Start the engine and fully retract the boom so that upper and side slide pads on each boom section are visible. See figure below.

Side Slide Pad Upper Slide Pads Side Slide Pad

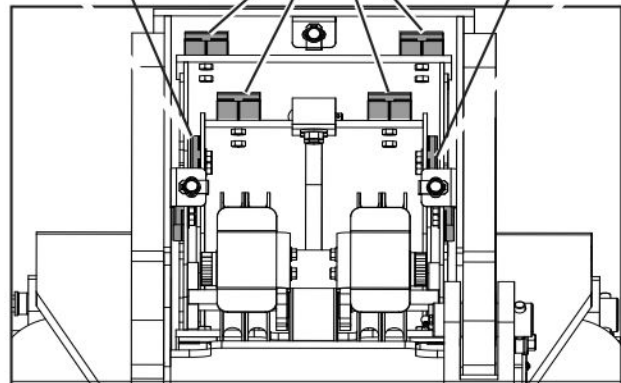


Figure 39 Rear Upper and Side Slide Pads

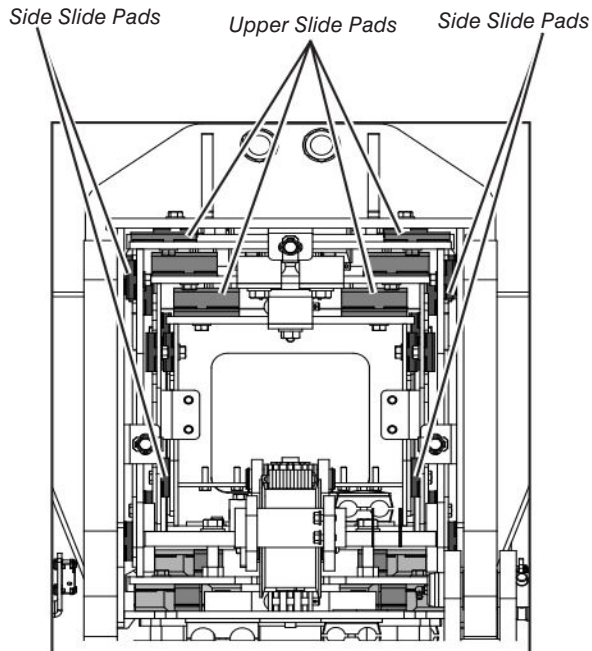


Figure 40 Rear Upper and Side Slide Pads

11. Lower the boom until the forks are resting on the ground and an upward force is being applied to the boom sections.
12. Shut off the engine and remove key.
13. Measure the slide shoe clearance at the top of each boom section. Clearance should range not exceed 0.025 in. (0.63 mm).
14. Start the machine and raise the boom high enough to lift the forks off the ground.
15. Shut off the engine.
16. Measure the side slide pads clearance using the same procedure as outlined in step 8 for the side slide pads at the front of the boom.
17. If clearances are within 0.08 in. (2 mm), install the rear boom cover.

 **NOTE**

If any of the clearances are greater than 0.08 in. (2 mm), shim adjustment or replacement of the slide pads may be required.

5.4-10 Check Boom Chains Tension

Proper adjustment of the chains at this interval minimizes the risk of chain failure which could cause extensive damage to other boom components and

require extensive labor hours to repair.

 **NOTE**

If the chains make noise such as banging on the interior boom parts, or the chain slack identified below is more than the maximum acceptable value, adjustment is necessary.

1. Park telehandler on firm level ground and apply parking brake.
2. Fully extend the boom making sure the extend chain on top of boom assembly is visible.
3. As you retract the boom slowly, watch for sagging parts or loose links. See figure below.

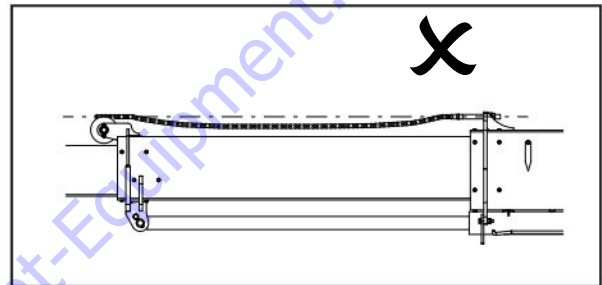


Figure 41 Extend Chain Slack

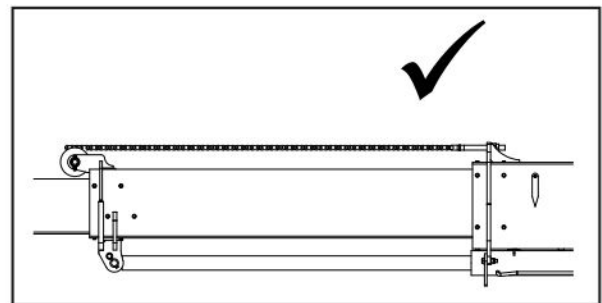


Figure 42 Extend Chain

**NOTE**

Chain slack should not exceed 1 inch. See Figure below.

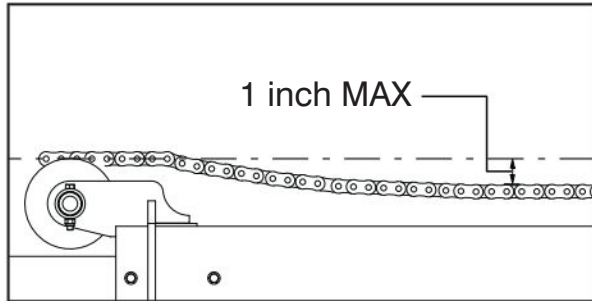


Figure 43 Chain Maximum Slack

**IMPORTANT**

If the slack is more than 1.00 in., an adjustment is required. Refer to [5.4-11 Chain Tension Adjustment](#) for chain tension adjustment procedure.

5.4-11 Chain Tension Adjustment

The boom chains should be adjusted when the following conditions occur:

- Every 250 hours
- When the chains are making noise (i.e. banging on interior boom parts)

**WARNING**

Before performing chain adjustment, complete the steps outlined in [5.4-10 Check Boom Chains Tension](#).

1. Partially extend the boom.
2. Using a 1-1/4" wrench, loosen jam nut at the chain anchor.

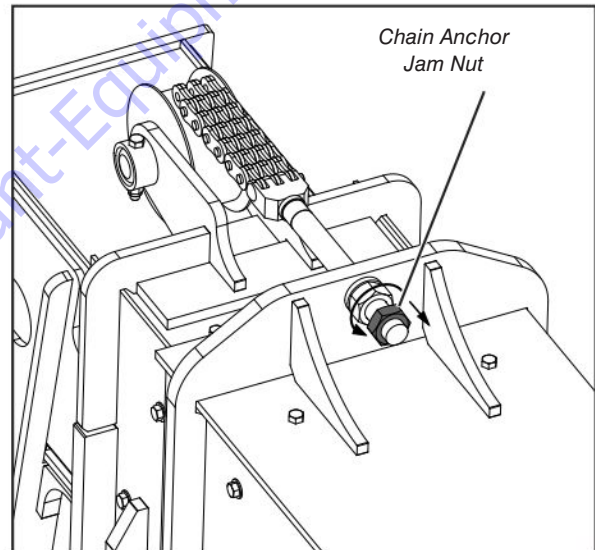


Figure 44 Extend Chain Jam Nut

- Using a 1-1/4" wrench, tighten hex nut to achieve the desired chain tension .

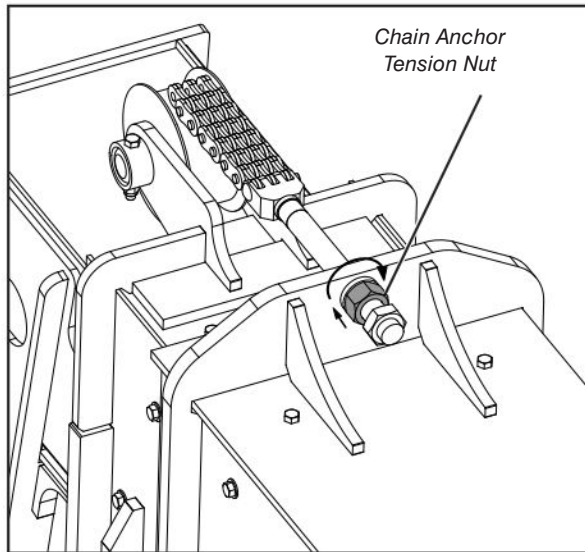


Figure 45 Chain Anchor Tension Nut

- After reaching the satisfactory tension on the chain, tighten jam nut back in place and torque to 80 ft.-lb.

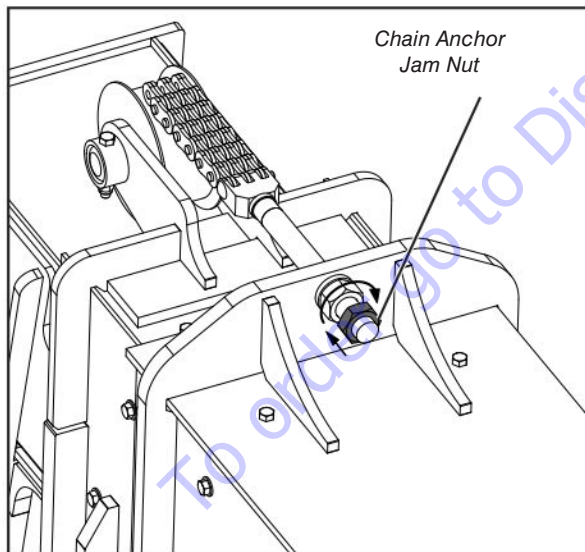


Figure 46 Chain Anchor Jam Nut

5.5 1000 Hour or Annual Routine Maintenance

5.5-1 Change Hydraulic Oil Filter

- Ensure telehandler is on a firm level surface, apply the park brake and shut down the engine.
- Unlatch engine compartment cover and lift up to gain access to Hydraulic Oil Filter.
- Place suitable container under filter to catch any spilled oil.
- Unscrew and discard old filter. Be sure all traces of the old filter gasket are removed from the filter head.

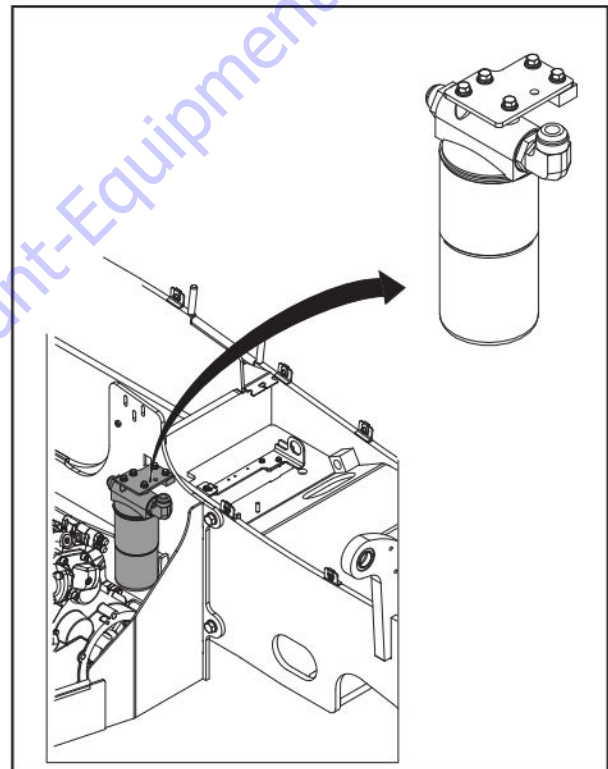


Figure 47 Hydraulic Oil Filter Location



NOTE

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

5. Apply a light coating of clean oil to the gasket on the new filter.
6. Install the new filter and turn until the gasket contacts the filter head.
7. Tighten an additional 1/2 to 3/4 turn by hand to compress the gasket.

5.5-2 Change Hydraulic Oil and Clean Hydraulic Tank

NOTE

Dirt in the hydraulic system will lead to premature component failure. A clean, contaminant-free system is extremely important to the telehandler's proper function. Take extra care when working around or on the hydraulic system to ensure its complete cleanliness.

1. Park telehandler on a firm level surface.
2. Fully retract and lower the boom to the stowed position.
3. Apply parking brake and shutdown the engine.
4. Place a container under the hydraulic oil tank capable of holding approximately 45 gallons (170 Litres).
5. Remove hydraulic tank drain plug from under hydraulic oil tank and allow all hydraulic oil to drain into container.

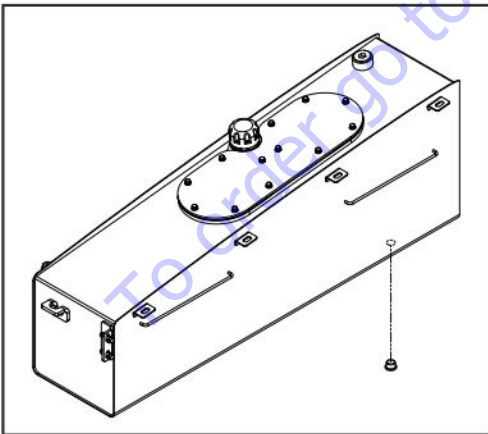


Figure 48 Hydraulic Tank Drain Plug

NOTE

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

6. Remove tank filler breather and set aside.
7. Remove 12 screws holding the access cover plate from top of tank using a 5/16" wrench.
8. Remove rubber gaskets under access cover plate and set aside.

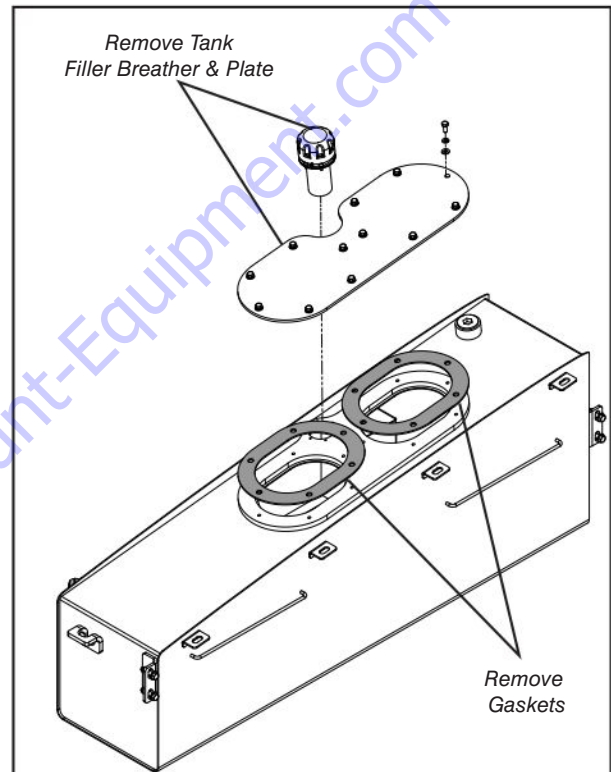


Figure 49 Tank Hose Removal

9. Clean the tank with a lint-free cloth or a similar shop rag ensuring all dirt and dust particles are removed.

NOTE

Follow shop practice standards for flushing and cleaning of hydraulic oil tank.

10. Install drain plug back into tank. Replace O-ring seal if needed.

**NOTE**

Refer to [2.4 Recommended Fluids/Lubrication](#) for hydraulic oil specifications and tank capacity.

11. Refill the hydraulic tank with new oil from unopened container.
12. Check for leakage.
13. Install cover plate and tank filler breather.
14. Clean up any oil that may have spilled during this procedure.
15. Check hydraulic oil level. (They hydraulic oil level should be at or slightly above the top mark on the sight gage)
16. Start engine and work hydraulic functions.
17. Check hydraulic oil level again through the sight gauge. Add additional oil as required.

5.5-3 Change Axle Differential Oil

Each axle assembly requires gear lubricant independent of the planetary assemblies.

WARNING

Hot oil or components can burn. Oil must be at normal operating temperature when draining. Avoid contact with hot oil or components. Do not allow oil to drain into the ground.

1. Ensure that the axle differential oil is at normal operating temperature.
2. Park the machine on a firm level surface, apply parking brake, shut off the machine, and allow it to sit for two minutes.
3. Place a container capable of holding approximately 10 quarts (9.5 litres) under axle drain plugs.

4. Clean the areas around the three (3) drain plugs and level/fill plug, and remove the level/fill plug.

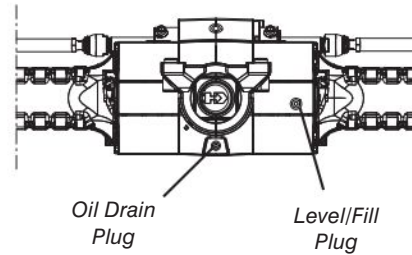


Figure 50 Axle Plugs

5. Remove all three (3) drain plugs and drain the oil from the differential. Dispose of used oil in accordance with local regulations.

**NOTE**

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

6. Wipe off the magnetic drain plugs with a clean rag and install them in the axle.
7. Slowly fill the axle with 7 quarts (6.6 liters) of gear oil until oil begins to overflow from the level/fill hole. Refer to [2.4 Recommended Fluids/Lubrication](#) for axle differential oil specifications.
8. Clean and replace the level fill plug.
9. Repeat procedure for the second axle

5.5-4 Change Axle Planetary Oil

Each axle assembly requires planetary gear lubricant independent of the differential assemblies.

1. Ensure that the axle planetary oil is at operating temperature.
2. Park the telehandler on a firm level surface with the level/fill/drain plug at the 6 o'clock position.
3. Shut down the engine, apply parking brake, and allow it to sit for a minimum of two minutes.

- Clean the area around the plug and remove it, then drain the axle oil into a container.



Figure 51 Draining Planetary Gear Oil

NOTE

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

- Wipe off the magnetic drain plug with a clean rag and install it in the planetary.
- Reposition the plug to the 3 o'clock or 9 o'clock position then remove plug again.
- Slowly fill the planetary with 1 quart (0.95 liters) of gear oil until oil begins to overflow from the level/fill hole. Refer to [2.4 Recommended Fluids/Lubrication](#) for oil specifications.

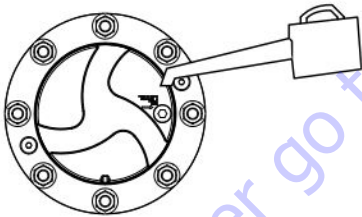


Figure 52 Filling Planetary Gear Oil

- Clean the level/fill plug and install it in the planetary.
- Repeat procedure for the remaining three planetaries.

5.5-5 Change Engine Coolant

WARNING

Always shut off the engine and allow it to cool down before removing the radiator cap. Steam or fluid escaping from the radiator may cause severe injury. Remove cap slowly to relieve pressure. Avoid contact with steam or escaping fluid.

NOTE

Machines with an enclosed cab have a heater unit that needs to be flushed separately.

NOTE

Place the heat select switch in the full hot position if equipped.

- Open the radiator cap to ensure proper draining.

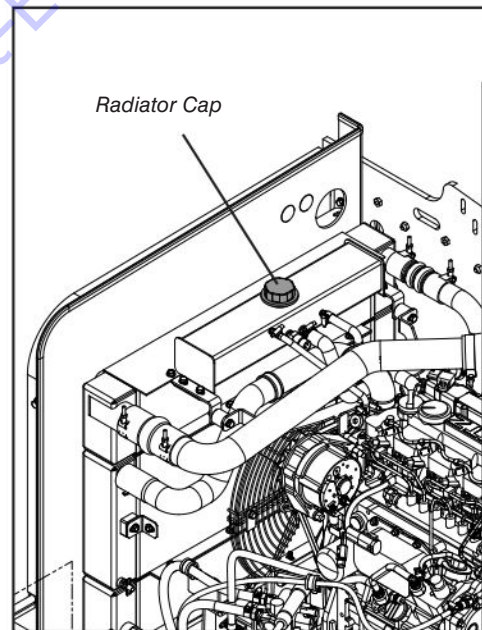


Figure 53 Radiator Cap

- Place a container capable of holding 5 gallons (17 liters) under the radiator drain plug.
- Open the drain plug and allow radiator and coolant bottle to drain.

NOTE

Refer to your local/national regulations on how to dispose of used coolant fluid.

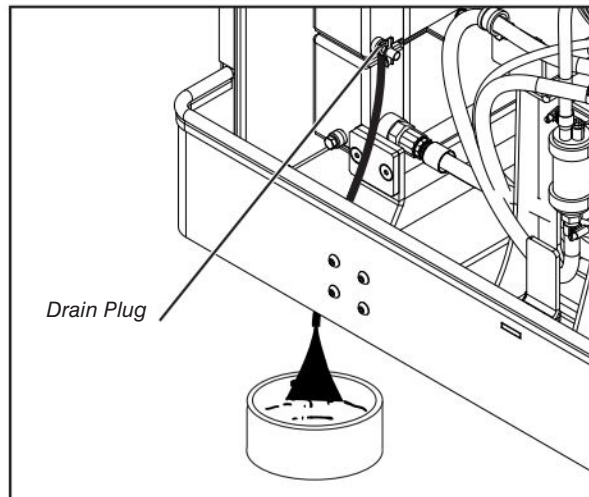


Figure 54 Radiator Draining

4. Close the drain plug.

NOTE

For machines without an enclosed cab continue from step 10.

5. Close manual heater valve located near the radiator cap/surge tank then disconnect the heater hose connected to it.
6. Locate the motorized heater valve and disconnect the heater hose going to the heater unit.

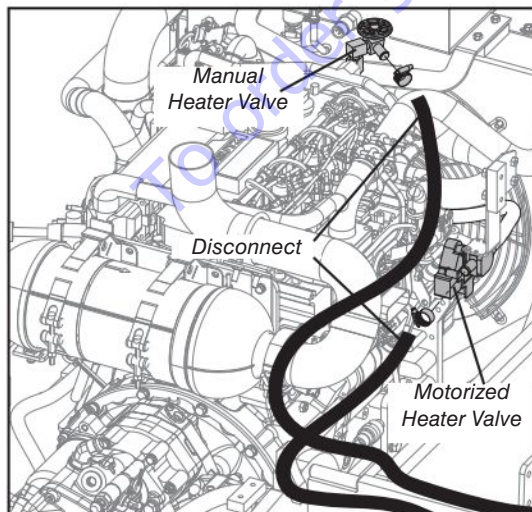


Figure 55 Hoses Disconnection

7. Run distilled water/clean tap water into the heater system through the manual valve hose until clean water comes out of the heater valve hose.

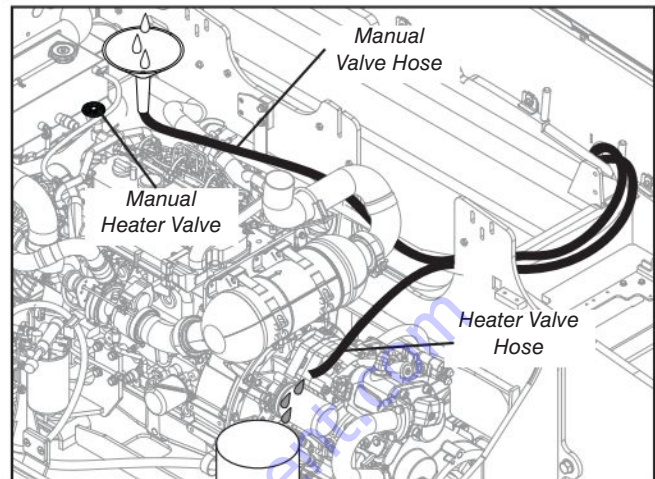


Figure 56 Heater Unit Flushing

8. Reinstall the heater hose into the manual heater valve. Keep valve closed.
9. Place a section of a 5/8" hose with a plugged end on the motorized heater valve as shown.

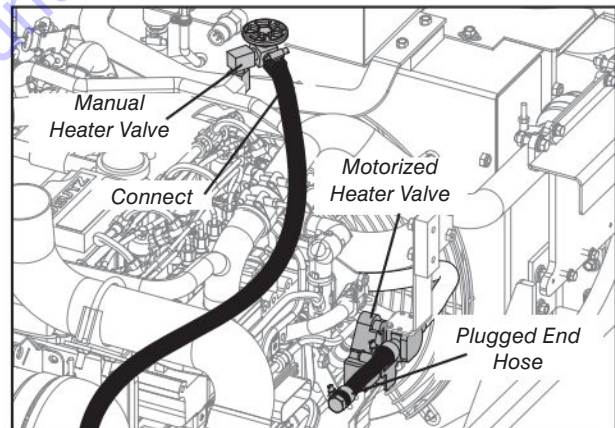


Figure 57 Plugged Hose Installation

10. Fill the cooling system with distilled water through the radiator neck until water is visible.
11. Run the engine until the module display indicates 75° to 80° without radiator cap. Check for leaks. Shut down the engine.
12. Place a container capable of holding 5 gallons (17 liters) under the radiator drain plug.

13. Let the engine cool down and open the radiator drain plug and allow radiator and coolant bottle to drain.

 **NOTE**

If heater is equipped, remove the plugged hose at the motorized heater valve for proper draining. Must be reinstalled if another flush is needed.

14. Close the drain plug.

 **NOTE**

Refer to your local/national regulations on how to dispose of used coolant fluid.

15. Repeat steps 10 to 14 until clean water came out of the system.
16. After cleaning and flushing operations are completed refill the radiator using a mixture of antifreeze and distilled water (2.4 Recommended Fluids/Lubrication). Refer to engine manufacturer's manual.

 **NOTE**

If heater is equipped remove the plugged hose at the motorized heater valve and install the heater hose. Open manual heater valve.

17. Fill radiator completely through the radiator neck, until coolant is visible. See figure below.

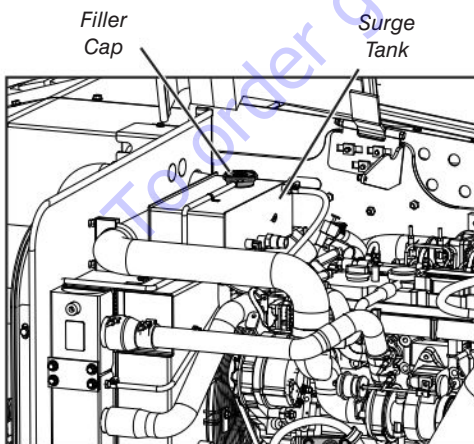


Figure 58 Surge Tank Location

18. Run the engine until the module display indicates 85° to 90° without radiator cap. Shut down the engine.
19. Check coolant level and coolant strength in the radiator. Adjust mixture as required. Refill until coolant is visible.
20. Tighten radiator cap, start the engine, and check for leaks.

5.5-6 Change Transmission Oil and Filter

1. Allow engine to run until the transmission oil temperature reaches operating temperature.
2. Park telehandler on a firm level surface, apply park brake and shut down the engine.
3. Place a container with a capacity of at least 15 quarts (14 liters) under the transmission drain point.

 **WARNING**

Hot oil or components can burn. Oil must be at normal operating temperature when draining. Avoid contact with hot oil or components. Do not allow oil to drain into the ground.

4. Remove drain plugs A and B to drain transmission oil.

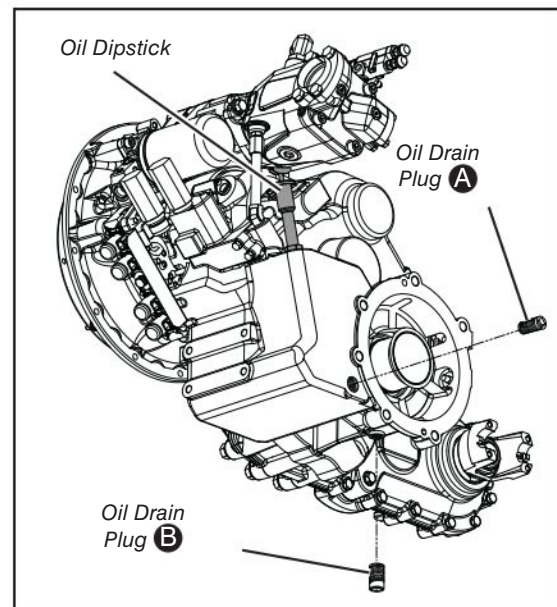


Figure 59 Transmission Oil Drain Plugs

5. Place a suitable container with enough capacity under drop box to catch drained oil.
6. Remove the drop box drain plug and drain the oil.

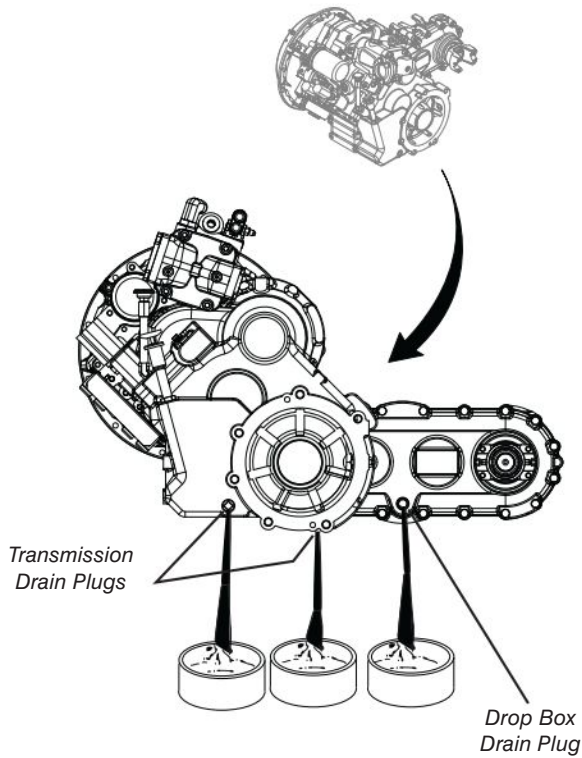


Figure 60 Drop Box Drain Plug



NOTE

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

7. Install all 3 fittings on transmission and drop box after draining all oil.
8. Remove drop box fill plug and fill transmission drop box with fresh clean transmission.

9. Check oil level on sight gauge. See figure below.

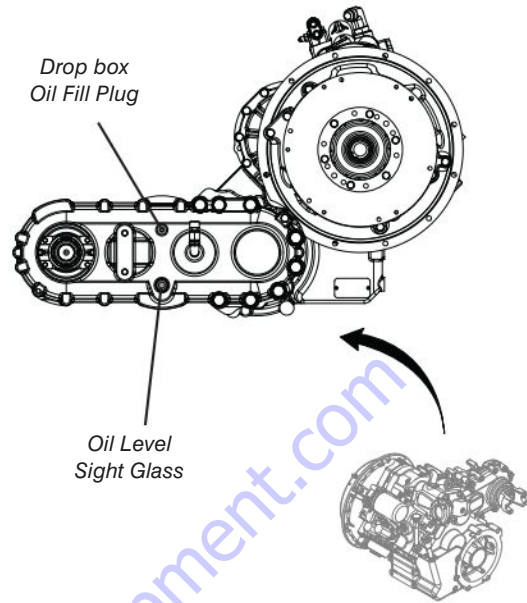


Figure 61 Transmission Oil Filter Removal

10. Clean the area around the transmission filter.
11. Remove the used filter and discard in accordance with local guidelines.

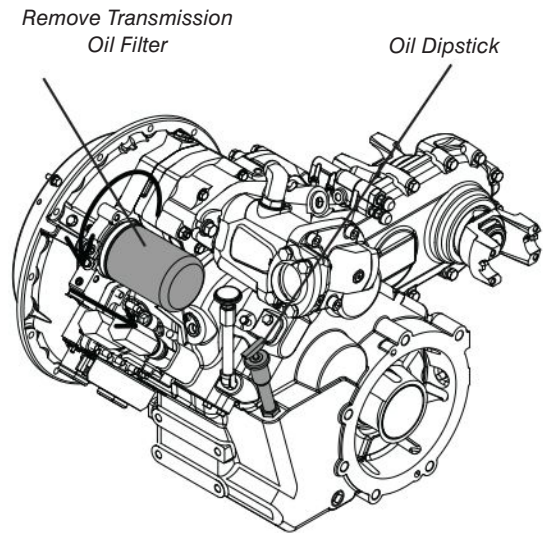


Figure 62 Transmission Oil Filter Removal



NOTE

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

12. Apply a light coating of oil to the new filter gasket and install it on the transmission.
13. Hand tighten the new filter until it touches the base then tighten an additional 1/2 to 3/4 turn.
14. Remove the dipstick and fill the transmission with 14.2 quarts (13.5 liters) of fresh clean transmission oil through the dipstick tube. Refer to 2.4 Recommended Fluids/Lubrication for transmission oil specifications.
15. Install the dipstick and screw on tightly.
16. Start engine and allow it to run until the transmission oil is at normal operating temperature.
17. Move the Direction Control Lever to 'Neutral', and shut down engine.
18. Remove the transmission oil dipstick then check the transmission oil level. Add as required.

5.5-7 Change Continuously Variable Transmission (CVT) Oil and Filter

1. Allow engine to run until the transmission oil temperature reaches operating temperature.
2. Park telehandler on a firm level surface, apply park brake and shut down the engine.
3. Place a container with a capacity of at least 15 quarts (14 liters) under the transmission drain point.

⚠ WARNING

Hot oil or components can burn. Oil must be at normal operating temperature when draining. Avoid contact with hot oil or components. Do not allow oil to drain into the ground.

4. Remove the transmission drain plug to drain transmission oil.

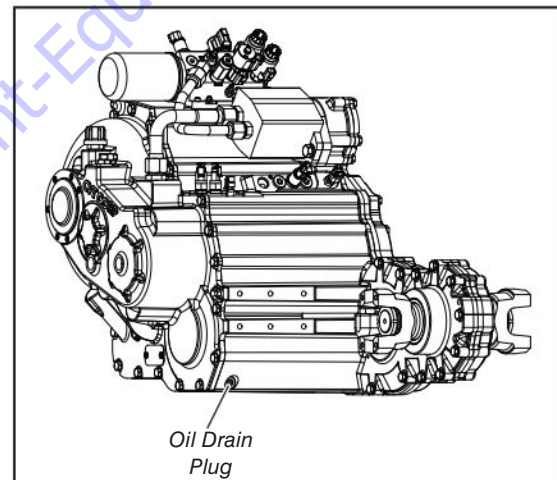


Figure 63 Transmission Oil Drain Plugs

5. Place a suitable container with enough capacity under drop box to catch drained oil.
6. Remove the drop box drain plug and drain the oil.

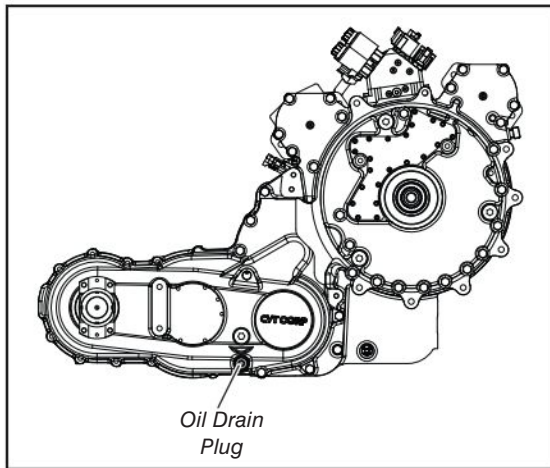


Figure 64 Drop Box Drain Plug



NOTE

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

7. Install the plugs on the transmission and the drop box after draining all the oil.
8. Remove drop box fill plug and fill transmission drop box with clean transmission oil until it starts to come out of the fill plug hole.

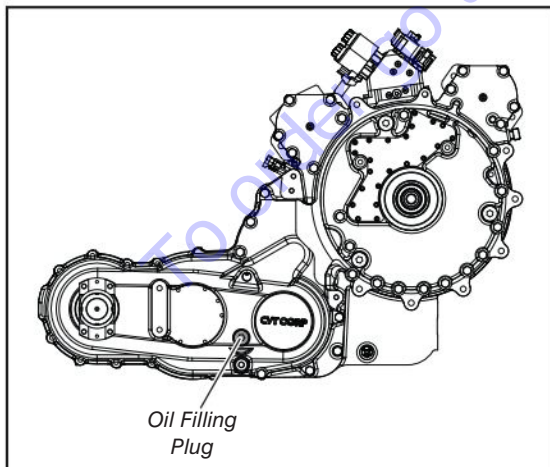


Figure 65 Transmission Oil Filter Removal

9. Clean the area around the transmission filter.
10. Remove the used filter and discard in accordance with local guidelines.

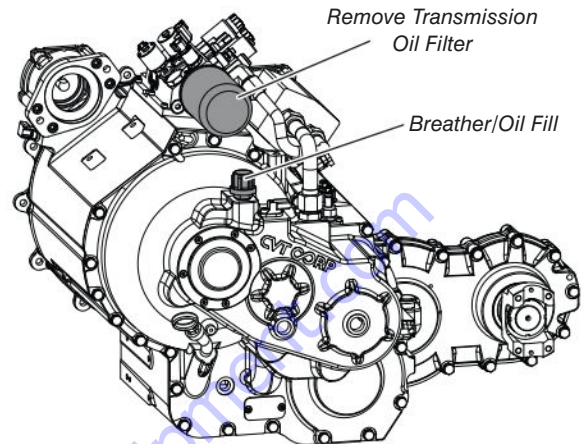


Figure 66 Transmission Oil Filter Removal



NOTE

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

11. Apply a light coating of oil to the new filter gasket and install it on the transmission.
12. Hand tighten the new filter until it touches the base then tighten an additional 1/2 to 3/4 turn.
13. Remove the dipstick and fill the transmission with ~19 quarts (~18 liters) of clean Valvoline I-205 traction transmission oil through the Breather/Oil fill port. Refer to Table 2.3 for transmission oil specifications.
14. Install the dipstick and screw on tightly.
15. Start engine and allow it to run until the transmission oil is at normal operating temperature.
16. Move the Direction Control Lever to 'Neutral', and shut down engine.
17. Remove the transmission oil dipstick then check the transmission oil level. Add as required.

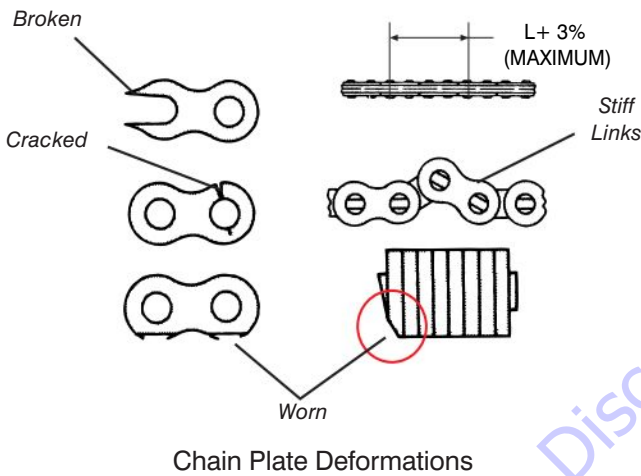
5.5-8 Inspect Boom Chains



NOTE

Refer to 5.6-2 *Boom Chains Replacement* for chain replacement procedure.

1. Inspect the chains annually for the following items, replace the chains as necessary:
 - worn, cracked or broken plates
 - wear of plate and pin head
 - stiff links or enlarged plate holes
 - worn or rusted connecting pins



2. Measure chain elongation. Measurement should be MAXIMUM of new chain length plus 3%.
3. If chain replacement is not necessary; clean the chain in solvent, and dry using low pressure compressed air.
4. Prior to installation, soak the chain in a pan of SAE 40 engine oil or chain and cable lubricant for a MINIMUM of 8 hours to ensure correct lubrication of the pins and links.

5.6 Non-Routine Maintenance

5.6-1 Boom Hoses and Sheaves Replacement

Remove Hose Sheaves

1. Park telehandler on a firm level surface, apply park brake.
2. Fully retract and lower the boom then shutdown engine and remove key from ignition switch.
3. Remove the rear boom cover.



NOTE

Right side sheaves are for Fork Tilt hoses. Left side sheaves are for Auxiliary Functions hoses.

4. Remove the 2 bolts holding each sheave guard bracket to the finger weldment.

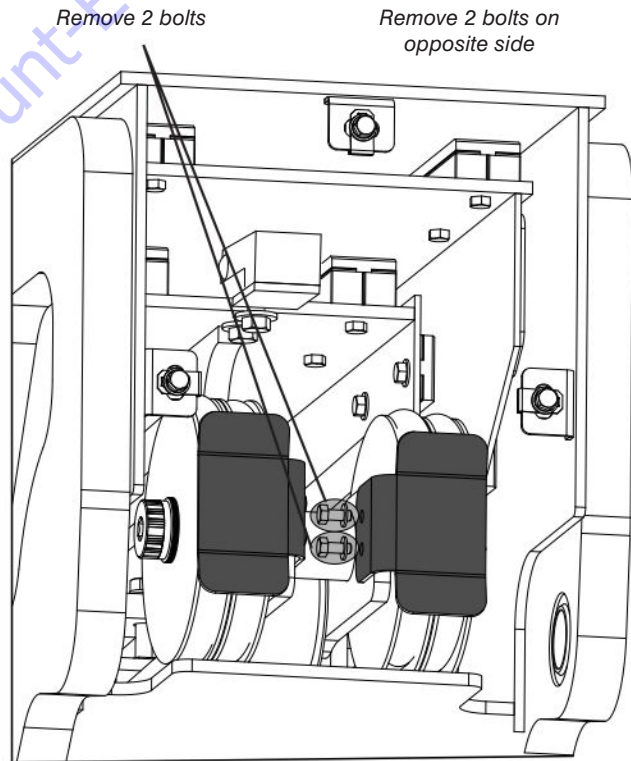


Figure 67 Sheave Guards Removal.

- Remove 2 bolts on opposite sheave guards as shown in figure below.

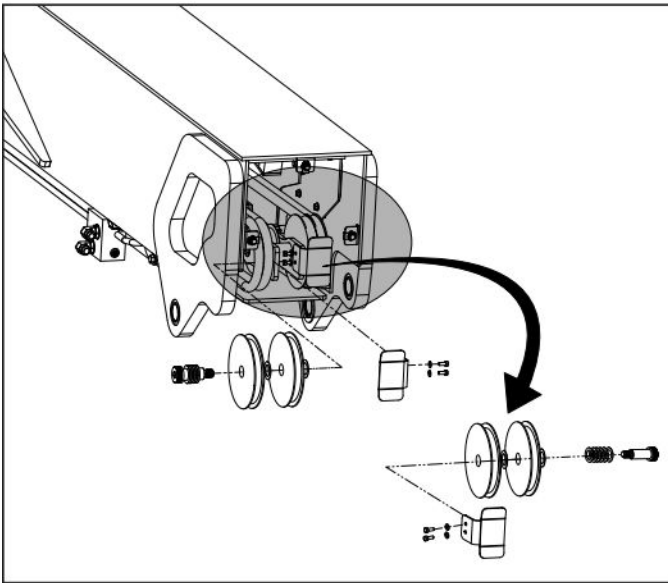


Figure 68 Boom Hose Sheaves

- Using a allen key or pipe-wrench remove shoulder screw holding the rollers in place.
- Slowly remove hose sheaves (rollers) and keep thrust washers intact in the same order.

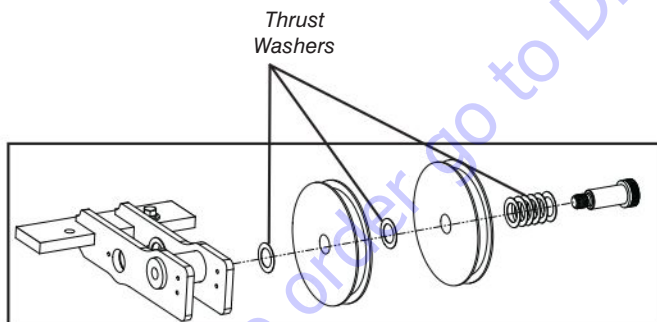


Figure 69 Thrust Washers on Hose Sheaves

Remove Boom Hoses

- Start engine and extend the boom approximately 3 feet to gain access to side access hole on fly boom section.



Figure 70 Boom Side Access Hole

- Shutdown engine and remove key from ignition switch.
- Disconnect hoses at the rear of bulkhead as shown below.

Disconnect hoses

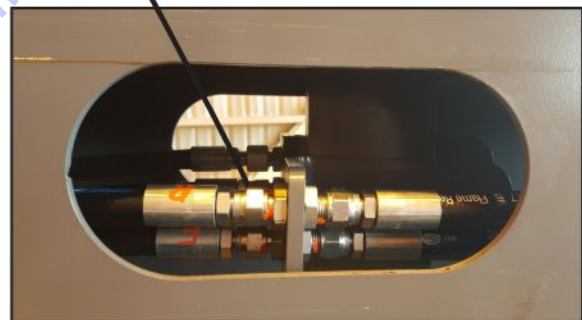


Figure 71 Fork Tilt Hoses Removal

- Cap/plug all open lines and fittings.
- Remove the hoses at the rear of bulkhead fittings on the other side of the boom.
- Cap/plug all open lines and fittings.
- Start the engine and fully retract the boom.
- Shutdown engine and remove key from ignition switch.
- Remove end of Fork Tilt hoses at front bulkheads on main boom assembly.

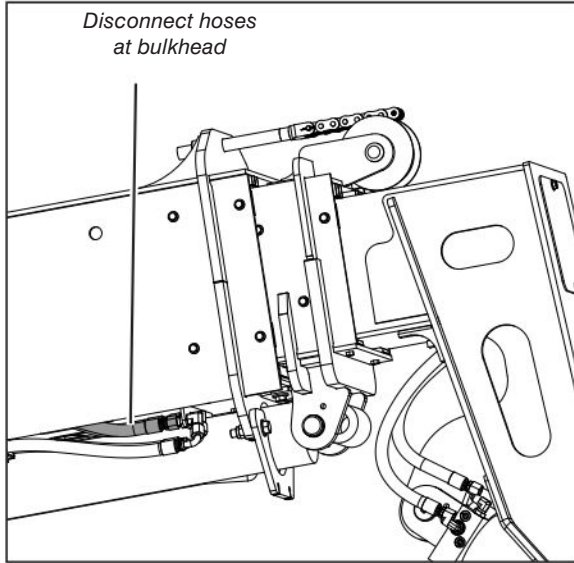


Figure 72 Fork Tilt Hoses Removal at Bulkhead

10. Cap/plug all open lines and fittings.
11. Remove other end of Auxilliary Hydraulics hoses at front bulkheads on main boom assembly.

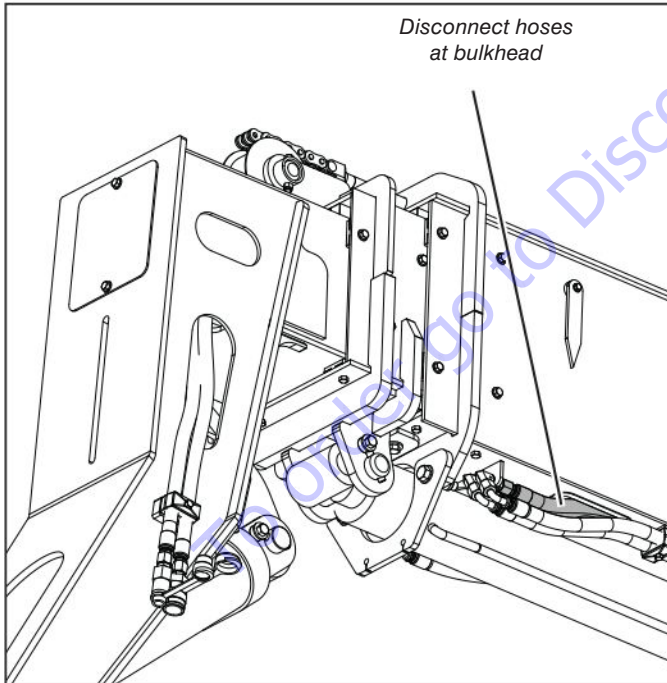


Figure 73 Aux. Hydraulics Hoses Removal at Bulkhead

12. Cap/plug all open lines and fittings.
13. With rear access cover plate removed, pull the hoses out of boom assembly and thoroughly inspect all hoses. Replace hoses if needed.

Inspect Boom Hydraulic Hoses

1. Inspect hoses for damage such as cuts, blisters and/or soft spots along their length. Inspect hoses for damage at the fittings. Inspect the pulleys for face and edge damage. Replace damaged parts as required.
2. Ensure that all wire ties or tags used to mark the long hose during removal are transferred to the new long hose prior to beginning the assembly process. Ensure to wire tie/tag both ends of the hose.

Install Hose Sheaves

1. With rear access cover plate removed, install right-side hose sheaves as shown in the figure below.
2. Ensure thrust washers are set in place.

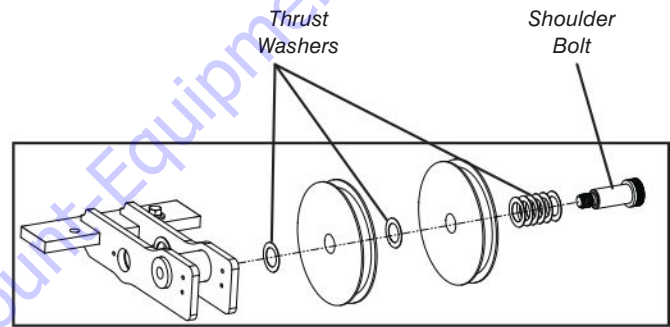


Figure 74 Thrust Washers on Hose Sheaves

3. Using a allen key or pipe-wrench tighten shoulder screw to hold the rollers in place.
4. Repeat Steps 1 to 3 for the left-side hose sheaves.
5. Install sheave guard bracket to the finger weldment using 2 bolts as shown in the figure.

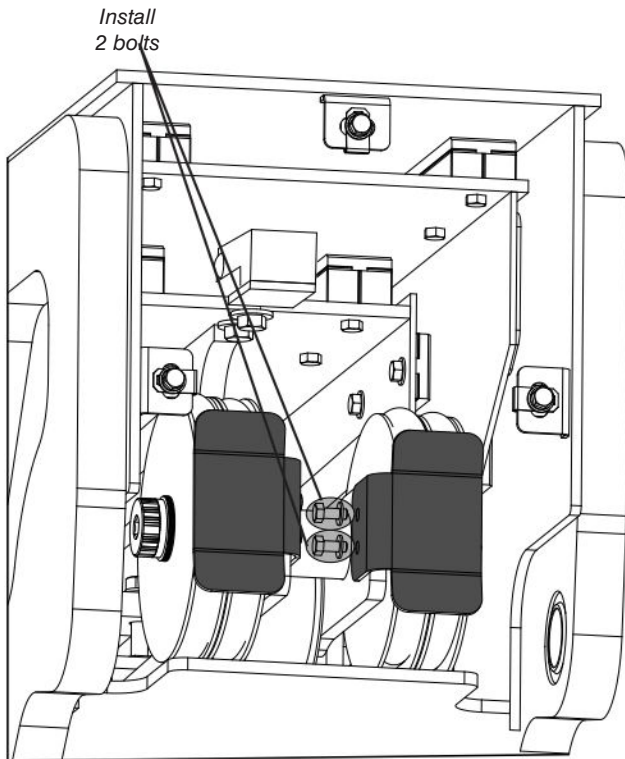


Figure 75 Sheave Guards Removal.

6. Repeat step 5 for the opposite side sheave guard bracket.

Install Boom Hydraulic Hoses

1. With rear access cover plate removed, insert right side hoses & left side hoses and rest half-way on the rollers.
2. Connect auxilliary hoses (cab side) to bulkhead under front of boom assembly as shown in figure below.
3. Connect carriage tilt hoses (tank side) to bulkhead as shown in figure below.
4. Fully loosen off the extend chain anchor jam nut and tension nut.

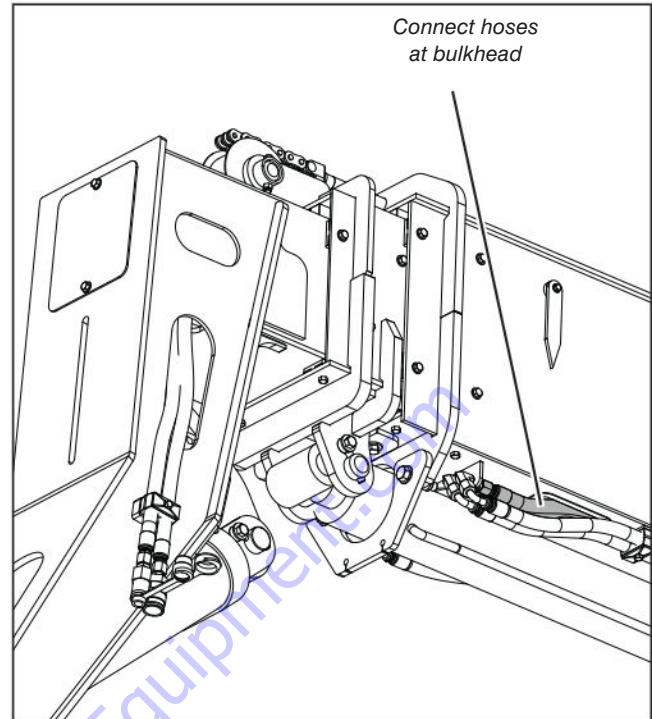


Figure 76 Auxilliary Hydraulics Hoses Connection at Bulkhead

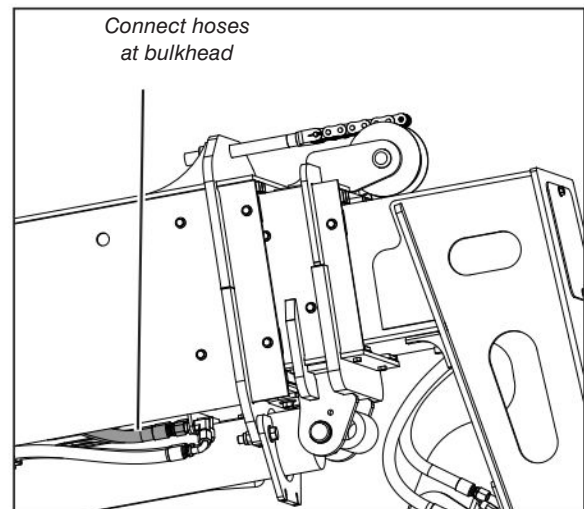


Figure 77 Fork Tilt Hoses Connection at Bulkhead

5. Start engine and extend the boom approximately 3 feet to gain access to side access hole on fly boom section.

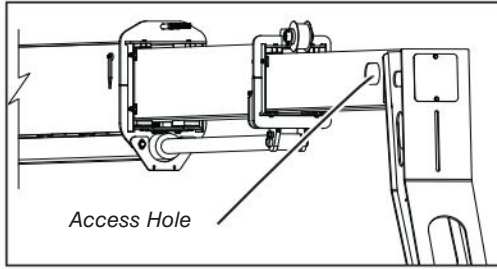


Figure 78 Boom Side Access Hole

6. Shutdown engine and remove key from ignition switch.
7. Connect hoses at the rear of bulkhead as shown below.

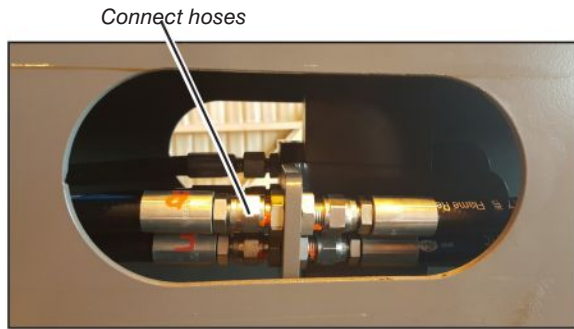


Figure 79 Fork Tilt Hoses Connection

8. Connect the hoses at the rear of bulkhead fittings on the other side of the boom.
9. Start the engine and fully retract the boom.
10. Re-tighten extend chain. Refer to section 5.4-11.
11. Shutdown engine and remove key from ignition switch.
12. Install auxiliary attachment, start engine and check for proper operation of the attachment. Repair as required.
13. Check hydraulic oil level and top-up as required.

5.6-2 Boom Chains Replacement

Remove Extend Chain

1. Partially extend the boom.
2. Using a 1-1/4" wrench, remove jam nut at the chain anchor as shown below.

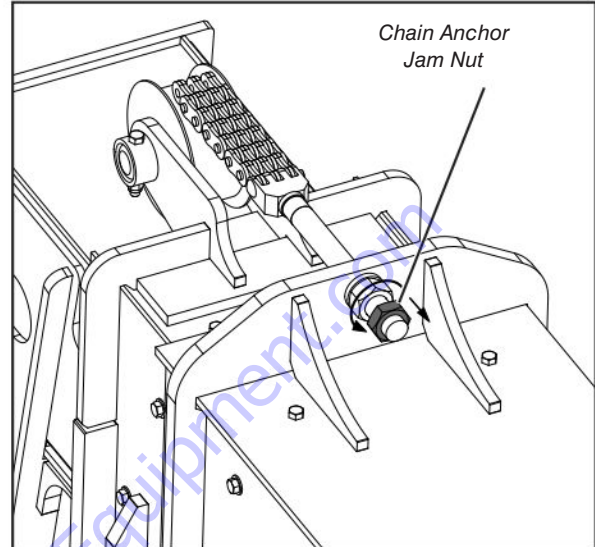


Figure 80 Extend Chain Jam Nut

3. Using a 1-1/4" wrench, Remove hex nut as shown below.
4. Remove and discard washer.

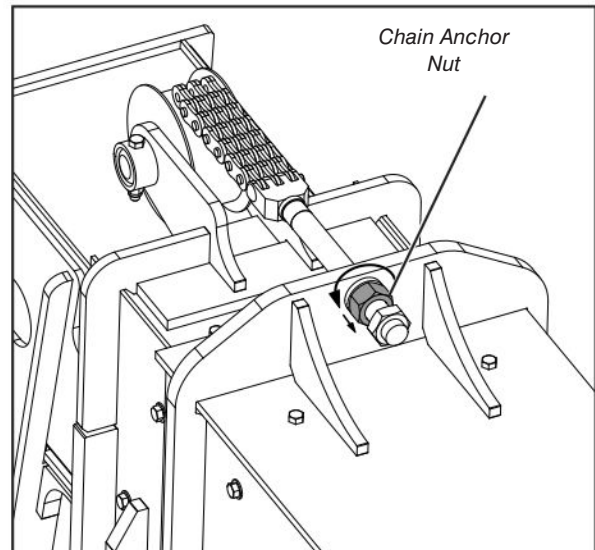


Figure 81 Chain Anchor Nut & Washer Removal

5. Slide chain anchor through hole on main boom then lay chain with anchor on top of boom as shown.

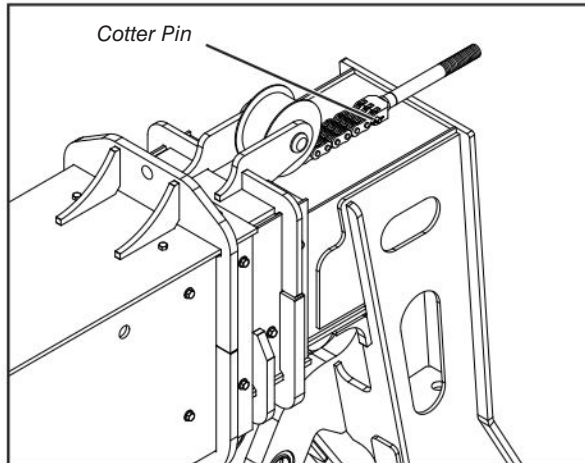


Figure 82 Chain Removal

6. Remove cotter pin and anchor pin then disconnect chain from anchor.
7. Remove rear access cover plate then remove the rear anchor mount on 3rd boom section.

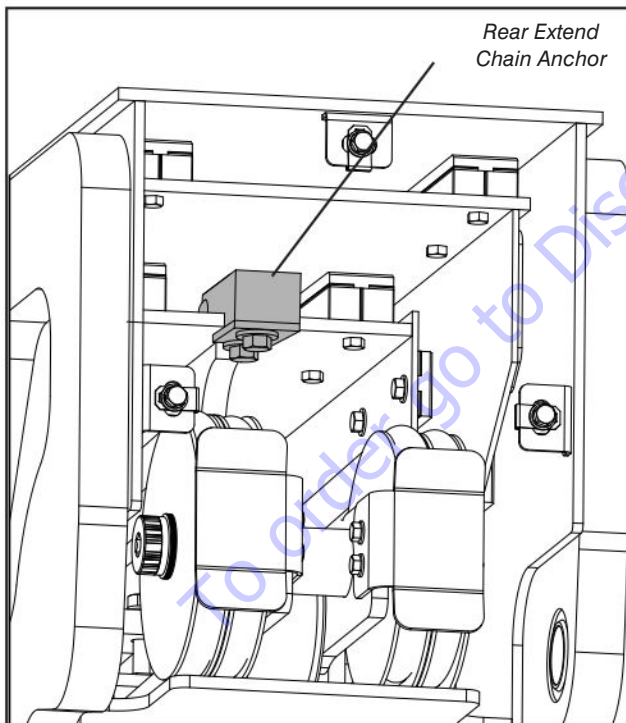


Figure 83 Rear Extend Chain Anchor.

8. Remove cotter pin and anchor pin then disconnect chain from anchor.
9. Pull out chain completely from boom and thoroughly inspect.

 **NOTE**

Refer to section [5.5-8 Inspect Boom Chains](#) for detailed procedure on how to inspect boom chains.

Install Extend Chain

1. At the front of the boom, link the new extend chain to the end of the old extend chain using a link pin and new cotter pin.
2. From the rear of the boom, pull the old extend chain through the boom until the link to the new chain is visible.

 **NOTE**

Leave a about 2 ft. of slack to loop around chain sheave on 2nd boom and connect to it to the chain anchor as shown.

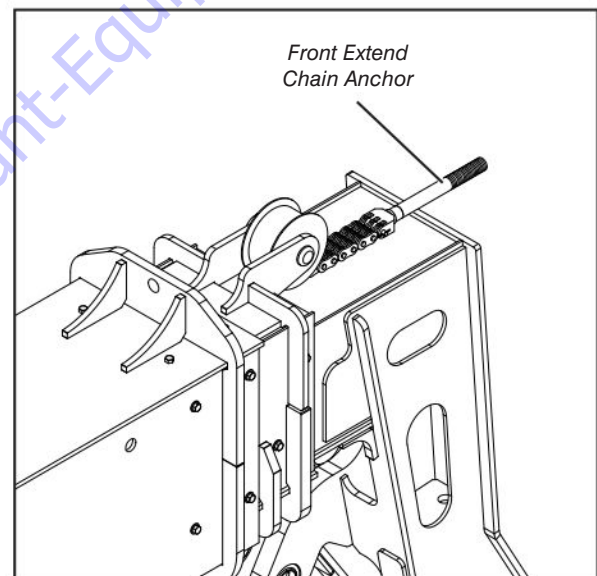


Figure 84 Front Extend Chain Anchor

3. Remove the cotter pin and link pin that secures the old extend chain to the new extend chain. Remove and discard the old extend chain. Discard the cotter pin.
4. From the rear of the boom, secure the chain to the anchor by installing the link pin and a new cotter pin

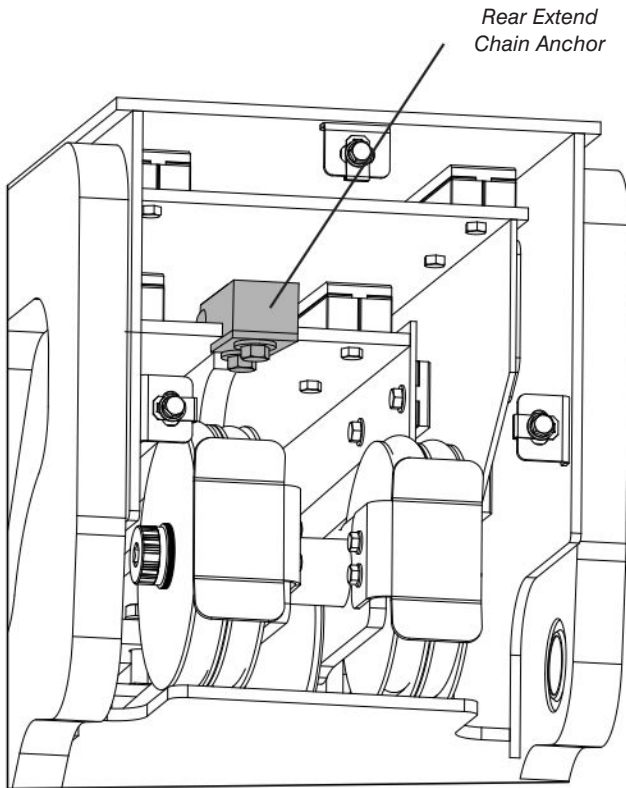


Figure 85 Rear Extend Chain Anchor.

5. Install the rear anchor mount to the top of the 3rd boom section and/or fourth boom section for SJ1056 TH with 1/2" bolts and washers.
6. Torque bolts to 80 lb.-ft. using a 3/4" socket.



NOTE

Ensure the chain anchor remains square to the 3rd boom top plate.

7. On front of boom, apply SKF Antifret grease to threaded end of chain anchor then feed it through the mounting hole.

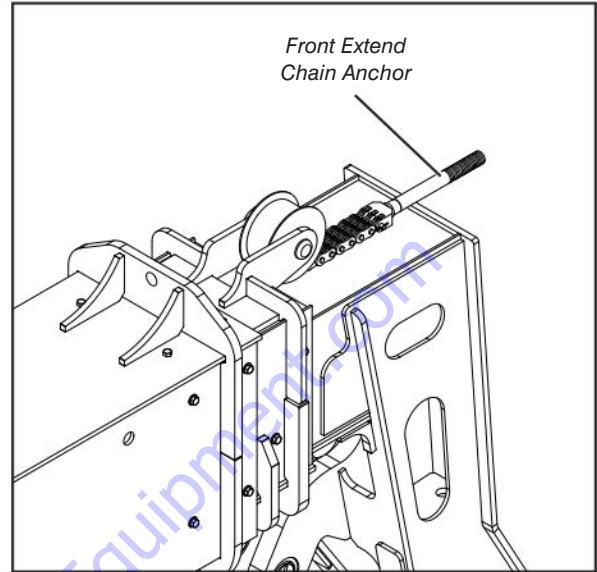


Figure 86 Front Extend Chain Anchor

8. Install new washer then insert nut and tighten to 80 lb.-ft. of torque.
9. After reaching the satisfactory tension on the chain, tighten jam nut in place and torque to 80 ft.-lb.

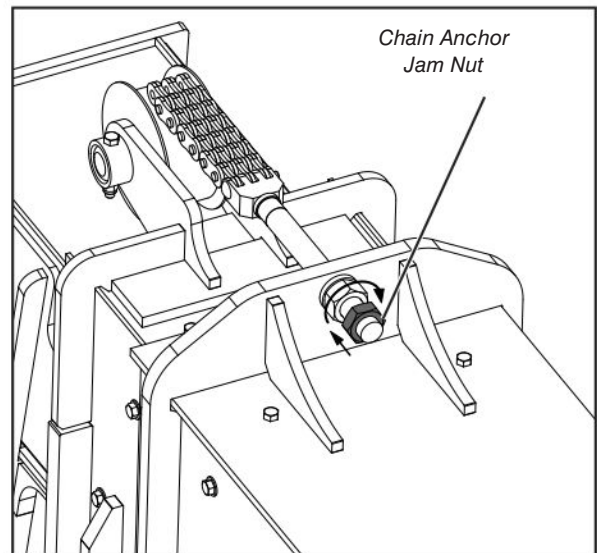


Figure 87 Chain Anchor Jam Nut

10. Start the engine and operate extend/retract function through several cycles to assure proper operation. Repair as required.
11. To adjust boom chain tension. Refer to [5.4-11 Chain Tension Adjustment](#) for Chain Tension adjustment procedure.

Remove Retract Chain

1. With boom fully lowered and retracted, remove rear access cover plate.
2. Using snap ring pliers, remove the 2 snap rings from both sides of anchor pin on 3rd boom section.
3. Remove chain with anchor from rear of boom and set aside.

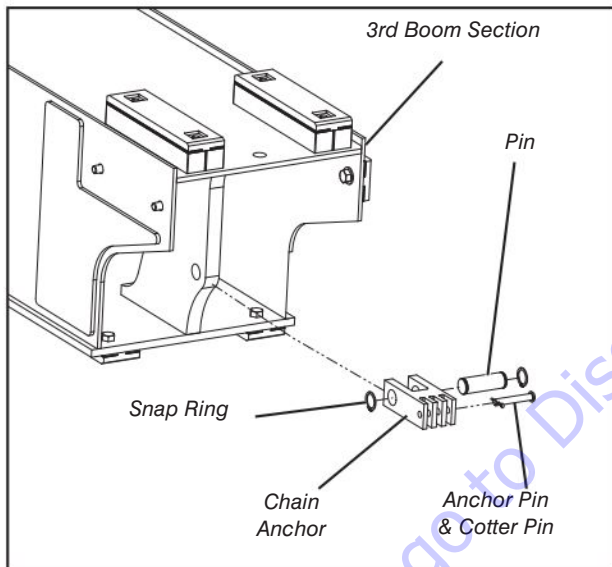


Figure 88 Rear Retract Chain Anchor

4. On front of boom assembly, remove 2 bolts from retract anchor weldment.

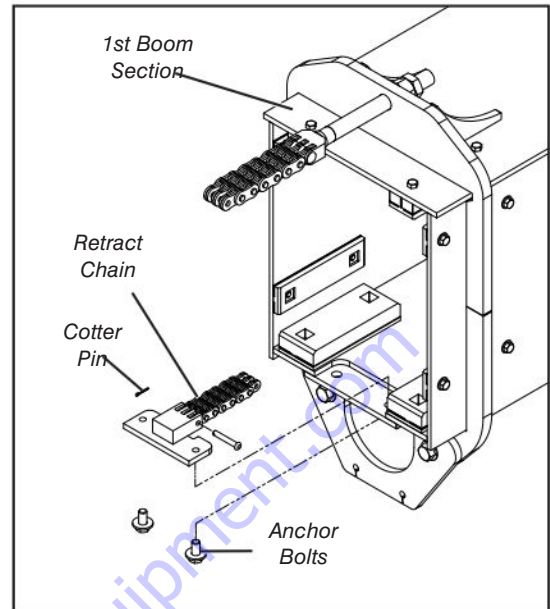


Figure 89 Front Retract Chain Anchor

5. Pull retract chain from front of boom and thoroughly inspect.



NOTE

Refer to [5.5-8 Inspect Boom Chains](#) for detailed procedure on how to inspect boom chains.

Install Retract Chain

1. Working at the rear of the boom, attach the new retract chain to the old retract chain by installing the link pin and a new cotter pin.
2. From the front of the boom, pull the old retract chain from the front of the boom until the new retract chain is exposed long enough to attach to the chain anchor.
3. Remove the cotter pin and link pin that attached the old chain to the new chain. Discard the cotter pin and old chain.
4. Position the chain anchor to the retract chain and secure by installing the link pin and a new cotter pin.

5. Position the chain anchor to its mounting location at the underside of the outer boom section and secure by installing scerwing 2 anchor bolts.
6. Torque the bolts to 80 lb.-ft.
7. Start the engine and operate extend/retract function through several cycles to assure proper operation. Repair as required.
8. Adjust boom chain tension. Refer to [5.4-11 Chain Tension Adjustment](#) for Chain Tension adjustment procedure.

5.6-3 Slide Pads Replacement Procedure

Slide pads are designed to protect the structural integrity of the boom sections. In addition, slide pads partially carry the weight of the boom sections and will wear out over time and based on daily operation. Ensure to check slide pads quarterly. Refer to [5.4-9 Check Boom Slide Pad Clearances](#) for slide pads inspection procedure.



NOTE

The wear pads located at the rear-top and bottom-front of the boom sections wear faster than the other wear pads. The basic procedure for removing wear pads is the same regardless of their location in the boom assembly.

▲ IMPORTANT

Pay attention to high-load slide pads (Front-Lower & Rear-Upper of boom) as most of the weight is exerted on them.

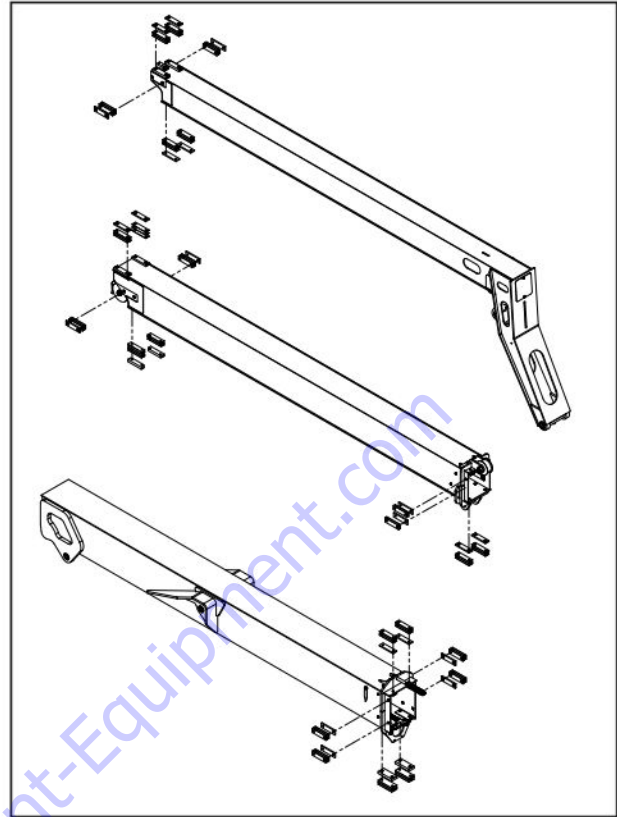


Figure 90 Slide Pad Locations

Remove Wear Pads

1. Fully retract the boom.
2. Remove the rear cover from the outer boom.
3. Remove screw, wear pad, shims, and spacer from the boom. For ease of installation, keep all parts that were removed together as an assembly.

For the rear sides of the 2nd and 3rd boom:

4. Before removing the screws from the wear pads, use a pry bar under the shims of the side wear pads. The bar prevents the shims from falling when the screws are removed.
5. Remove the screws, shims, and wear pads while holding the bar under the shim. For easier installation, keep all parts removed together as an assembly.

For the top of the 2nd and 3rd boom:

6. The weight of the boom must be removed from the rear wear pads to allow removal. Use the boom control lever to lower the boom until the carriage is on the floor or surface. This action changes the load forces on the boom sections so that there is clearance between the wear pads and the outer boom.
7. Remove the screws, shims, and wear pads. For easier installation, keep all parts removed together as an assembly.

Install Wear Pads**NOTE**

To keep the boom section centered, make sure that the number of shims on the top wear pads are approximately equal to the number on the bottom wear pads. The number of shims on each side of the boom must also be approximately equal.

**NOTE**

Shims are 0.015, 0.030, and 0.060 inch thick. Add or subtract shims as required to obtain a clearance on the side between the middle and outer boom sections of 0.59" maximum. When the correct clearance is achieved, remove the screws and apply red thread locking compound to the threads of both the screws and wear pads.

1. Clean installation area to remove any residual grease. Ensure threads are free of grease, dirt.
2. With the carriage lowered to the floor, install the top wear pads on the 2nd boom. Install the top wear pad assemblies consisting of the wear pad, shims and spacer, securing the assemblies by installing screws on the front of the 2nd boom.
3. Apply loctite 271 red and tighten the screws to 37 ft-lb.
4. Start the engine and use the joystick to raise the carriage from the floor.
5. Install the bottom wear pad assemblies consisting of the wear pad, shims and spacer, securing the assemblies by installing screws on the 2nd boom.
6. Apply loctite 271 red and tighten the screws to 37 ft-lb.

For installation of the side wear pads:**NOTE**

Use a pry bar to hold the wear pads and shims in position.

7. Clean installation area to remove any residual grease. Ensure threads are free of grease, dirt.
8. Install the side wear pad assemblies consisting of the wear pad, shims and spacer, securing the assemblies by installing screws on the sides of the 2nd boom.
9. Apply loctite 271 red and tighten the screws to 37 ft-lb. Ensure there is approximately an equal number of shims under each wear pad.
10. Lubricate all wear pads with MPG-EP2 grease.
11. Extend and retract the boom and check for smooth operation.
12. Install the rear cover on the outer boom.

5.6-4 Hydraulic Pressure Test Procedure

IMPORTANT

All checks and adjustments are to be made with the engine running at low idle, the transmission shifter in Neutral and the parking brake applied.

CAUTION

The addition of a hydraulic accumulator on this system causes residual pressure to be present AFTER the engine has been turned OFF. Prior to opening any hydraulic fitting in this system, move the joystick several times in each direction to relieve this residual pressure. Failure to do so may result in personal injury.

System Pressure

System Pressure Check:

1. Release residual pressure by moving the joystick several times in each direction.
2. Install a 5,000 psi gauge at port GP1 of Main Control Valve.

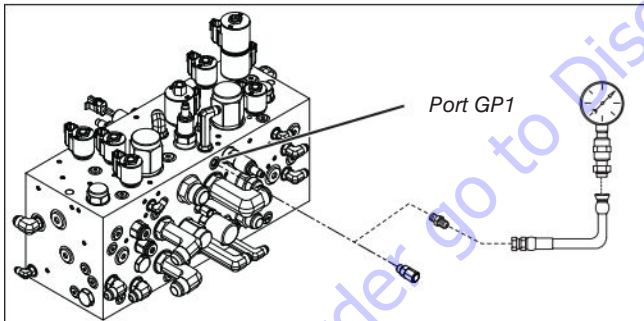


Figure 91 System Pressure Adjustment

3. With engine running at low idle, dead-head the boom retract function. Indicated system pressure should be 3000 psi.
4. If reading is different than what is mentioned above, adjustment is required.

System Pressure Adjustment:

1. Loosen the lock nut on the maximum steering pressure reducing valve at port RV1 on the Main Control Valve.

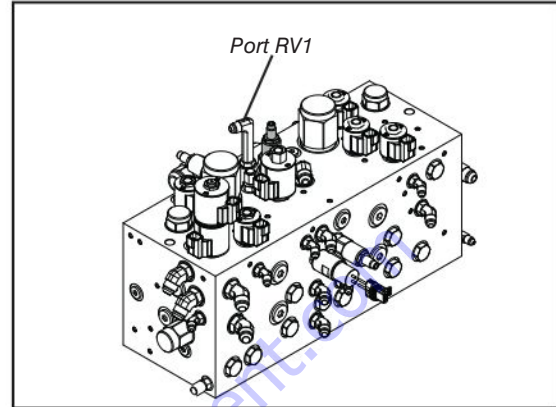


Figure 92 Maximum Steering Pressure Adjustment

2. With engine running at low idle, turn the adjustment screw clockwise (CW) to increase the pressure reading and counter-clockwise (CCW) to reduce the pressure reading until desired reading is achieved.
3. Tighten the lock nut on the valve RV1 and re-check the reading to ensure that the correct pressure is maintained.

Steering Pressure

Steering Pressure Check:

1. Release residual pressure by moving the joystick several times in each direction
2. Install a 5,000 psi gauge into port GP3 at the front of the main control valve as shown in figure below.

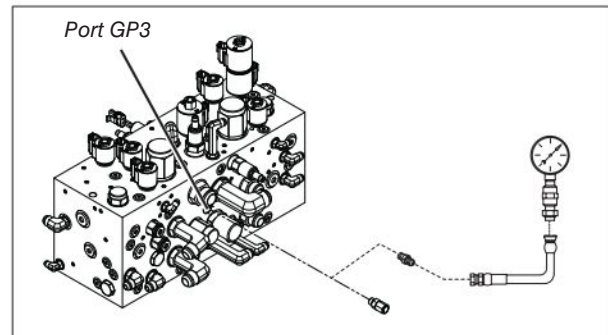


Figure 93 Maximum Steering Pressure

3. With engine running at low idle and steering dead-headed in either direction, read the pressure indicated on the gauge. The correct pressure should be 2,200 psi.
4. If reading is other than 2,200 psi, adjustment is required.

▪ **Steering Pressure Adjustment:**

1. Loosen the lock nut on the maximum steering pressure reducing valve at port RV2 on the Main Control Valve.

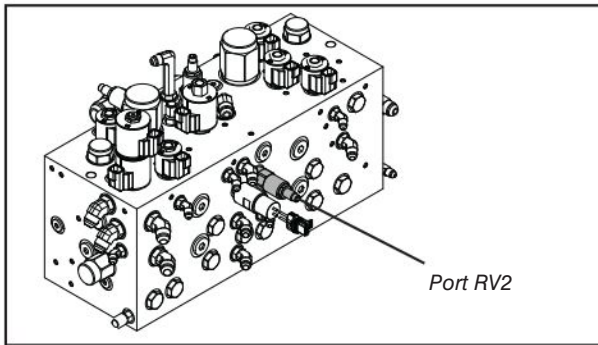


Figure 94 Maximum Steering Pressure Adjustment

2. With engine running at low idle and the steering dead-headed to one side, turn the adjustment screw clockwise (CW) to increase the pressure reading and counter-clockwise (CCW) to reduce the pressure reading until a reading of 2,200 psi is achieved.
3. Tighten the lock nut on the valve RV2 and re-check the reading to ensure that the correct pressure is maintained.

Service Brake Pressure

▪ **Service Brake Pressure Check:**

1. Release residual pressure by moving the joystick several times in each direction.
2. Remove plug and install a 1,000 psi gauge into the PS2 port on the main control valve.

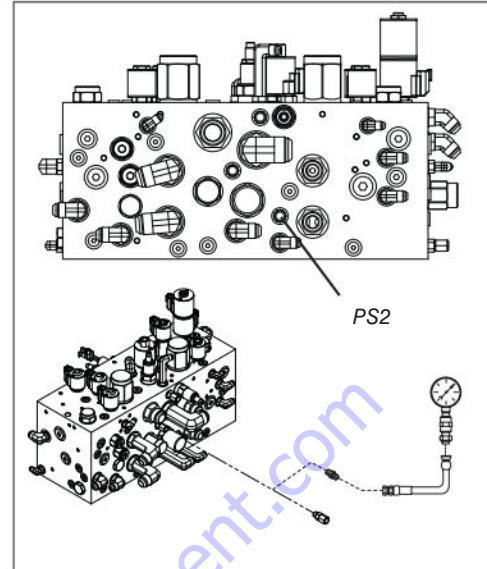


Figure 95 Service Brake Pressure

3. With engine running at low idle, depress brake pedal fully. Pressure should increase proportionally to 900 psi MAX.
4. If maximum pressure is less than 900 psi, brake valve must be replaced.

 **NOTE**

The pressure setting value is the nominal maximum value.

IMPORTANT

There is no adjustment. Replace the brake valve at the service brake pedal.

Pilot Pressure

▪ Pilot Pressure Check:

1. Release residual pressure by moving the joystick several times in each direction.
2. Install a 1,000 psi gauge into the tee fitting at port GP2 of the hydraulic function manifold.
3. With engine running at low idle and NO hydraulic function engaged, pressure should be 400 psi.

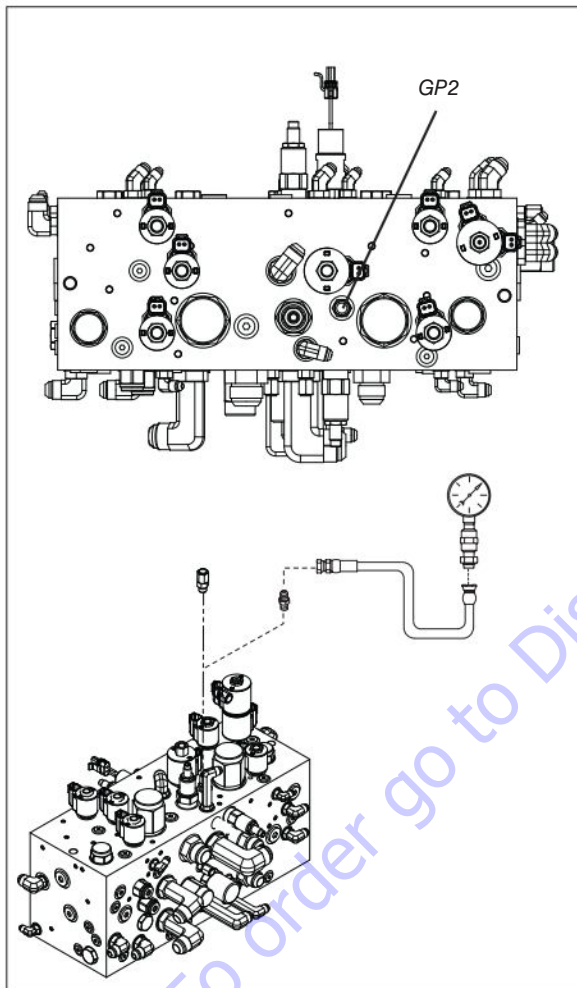


Figure 96 Pilot Pressure Check

▪ Pilot Pressure Adjustment:

1. Loosen the lock nut on the pressure reducing valve at port PR1 on the Main Control Valve.

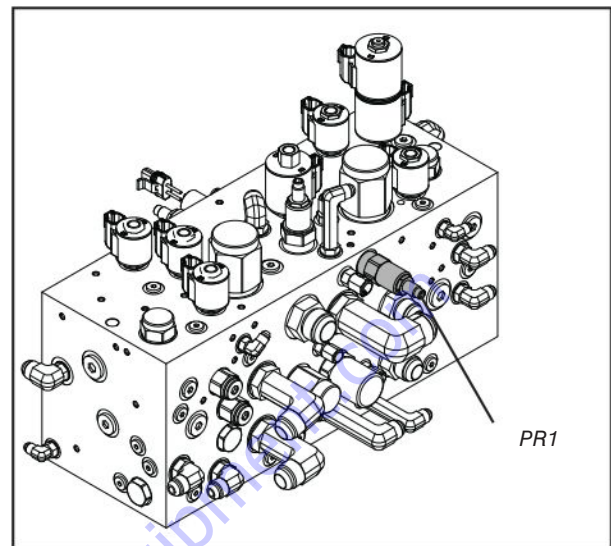


Figure 97 Pilot Pressure Adjustment

2. With engine running at low idle, turn the adjustment screw clockwise (CW) to increase the pressure reading and counter-clockwise (CCW) to reduce the pressure reading until a reading of 400 psi is achieved.
3. Tighten the lock nut on valve PR1 and re-check the reading to ensure that the correct pressure is maintained.

5.6-5 Hydraulic Pump Testing Procedure

If the hydraulic pump is suspected to be bad, the following test will quickly determine if the hydraulic pump requires replacement.

1. Release residual pressure by moving the joystick several times in each direction
2. Remove LS hose on the main manifold and cap the fitting on the manifold.
3. Install a 5,000 psi gauge with a tee fitting on the GP1 port of the main manifold.
4. Install the LS hose to the tee fitting on the GP1.

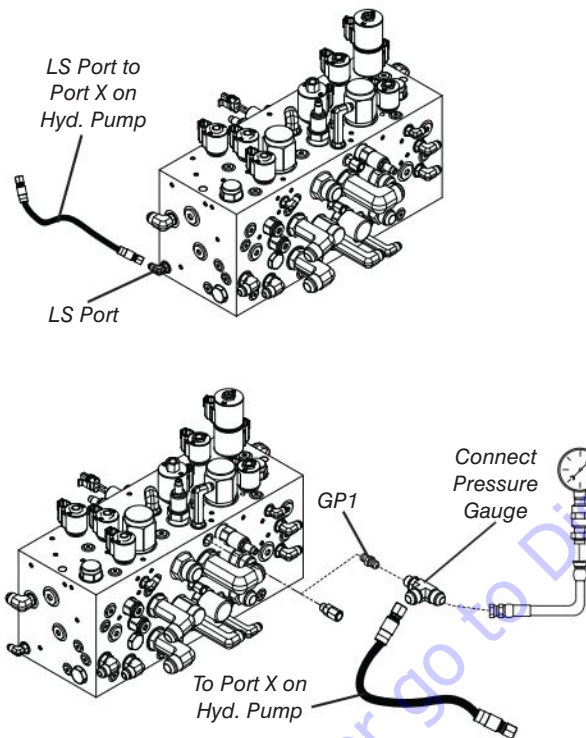


Figure 98 Pump Pressure Adjustment

5. Start the engine and check the gauge. Maximum system pressure should immediately be present (3,000 psi).
6. If the pressure reading is different than the required pressure, use the pressure adjustment screw on the pump to adjust the pressure to the proper level.
7. If the required pressure cannot be set, the pump must be replaced.

5.6-6 T12000 Modulation

1. Remove modulator valve housing as shown in figure below.

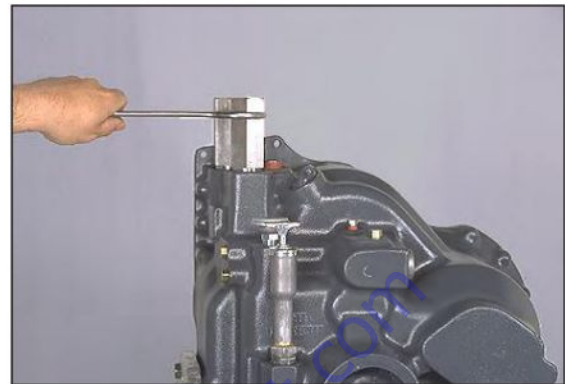


Figure 99 Remove Modulator Valve Housing

2. Remove inner, middle and outer springs, valve stop pin and accumulator spool and regulator spool and sleeve assembly as shown in figure below.



Figure 100 Remove Modulator Valve Components

NOTE

Some units will have two cross pins the same length. Some units will have two pins of different lengths. The longest pin goes in the bottom hole.

3. Remove cross pin from sleeve as shown in figure below.

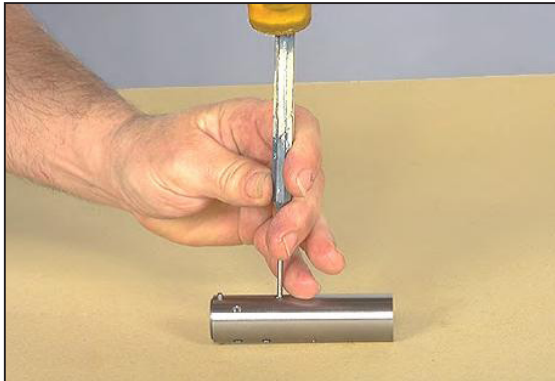


Figure 101 Remove Cross Pin

4. Remove regulator spool, spring, retainer spring and spacer spring from housing sleeve as shown in figure below.



Figure 102 Remove Components from Housing Sleeve

5. Install spring spacer in spring retainer as shown in figure below.



Figure 103 Install Spring Spacer

6. Install spring in spring retainer as shown in figure below.



Figure 104 Install Spring in Retainer

7. Check orifice in regulator spool to be free and clear of any foreign material as shown in figure below.



Figure 105 Verify Orifice is Clear of Debris

8. Install spring retainer, spring and regulator valve in sleeve against inner cross pin as shown in figure below.



Figure 106 Install Component in Sleeve

9. Compress regulator spool and spring in sleeve far enough to install cross pin as shown in figure below.



Figure 107 Compress Components in Sleeve

10. Install cross pin as show in figure below.



Figure 108 Install Cross Pin

11. From opposite end, position accumulator spool in sleeve as shown in figure below.



Figure 109 Position Accumulator Coil

12. Install outer accumulator spring as shown in figure below.



Figure 110 Install Outer Accumulator Spring

13. Install middle spring as shown in figure below.

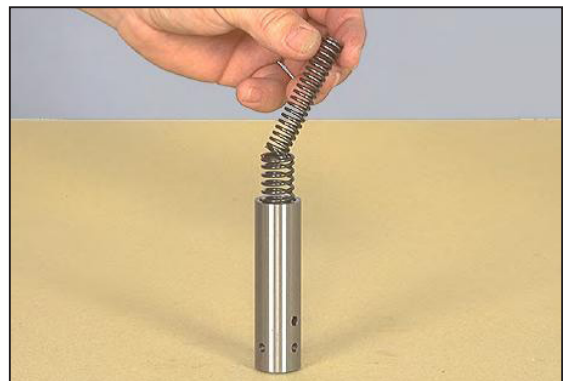


Figure 111 Install Middle Spring

14. Install inner spring as shown in figure below.

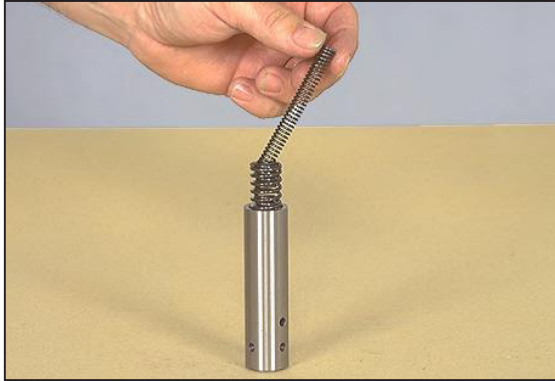


Figure 112 Install Inner Spring

15. Install stop pin in inner spring as shown in figure below.



Figure 113 Install Stop Pin

16. Position a new O-ring on lower end of the modulation valve sleeve and spring assembly as shown in figure below.



Figure 114 Install O-ring

17. Install O-ring on other valve sleeve.
18. Install valve or valves in transmission case as shown in figure below.



Figure 115 Install Valve(s)

19. Position a new O-ring on modulator valve housing as shown in figure below.

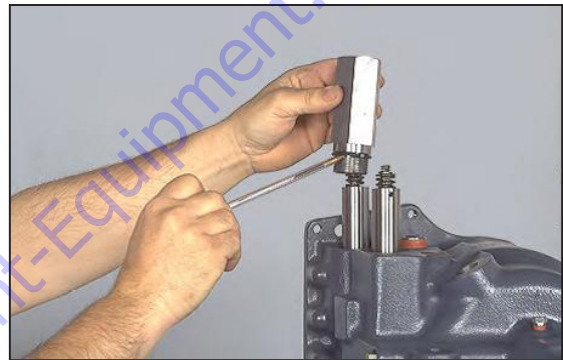


Figure 116 Install Valve(s)

20. Install housing over sleeve and spring assembly and tighten to 60-65 LBF-FT [81-88 N.m] as shown in figure below.

5.6-7 Deutz Fault Codes

The Deutz Display recognizes error messages that are sent from the engine via the data link. If a new error message is received, the Deutz Display will begin to beep, and a flashing pop-up window will open with the latest error messages and details.

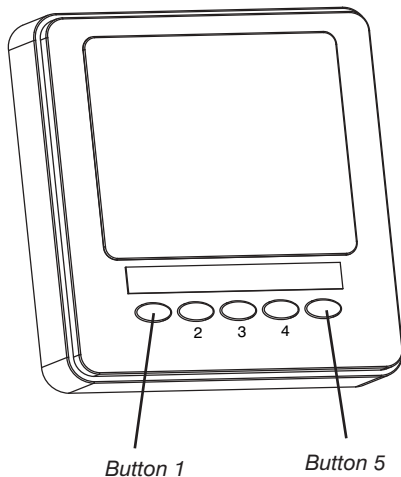


Figure 117 Engine Data Display Module

If a new error message is received, the DEUTZ display will beep and a flashing popup window will open with the latest error messages and details.

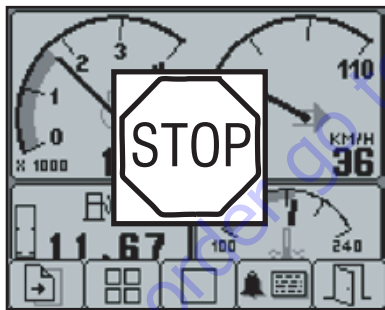


Figure 118 Error Message Popup

The error list is displayed by pressing any button. The errors already viewed appear in black text on a grey background. New messages that have not been read yet appear as emphasized grey text on a black background. The alarm last received is automatically displayed the first time the error list is called up.

If the list is longer than the screen section, you can browse through the list using buttons 1 and 2.



Figure 119 Error Message

The display cannot be quit until all alarms have been acknowledged by pressing button 3. The error list display can be activated at any time by pressing button 4.

The following pages contain information regarding the Deutz Fault Codes; including the SPN code, FMI code, description of the fault code, as well as the recommended action to take.

J1939		Description	Recommended Action
SPN	FMI		
898	9	Timeout Error of CAN-Receive	Check CAN Bus wiring (Bus scheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range, check actuator.
520	9	Timeout Error of CAN-Receive	Check CAN Bus wiring (Bus scheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range, check actuator.
105	11	Charge air temperature sensor: the voltage of sensor measured by ECU is out of the target range	Check wiring, CAC-sensor not working, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it.
523613	0, 1, or 2	Rail pressure: the fuel pressure in rail calculated by ECU is either below or above the target range which is dependant on the engine speed	Check for leakage. Check fuel level in tank and low pressure system. Check fuel-primary pressure. Check backflow pressure check sensor. Check pressure relief valve. Check metering unit. Check Injector function (metering unit, injector). If necessary replace components as required.
523165	3, 4, 5, or 12	Fuel metering unit: the ECU detects no load, or the current drain measured by ECU is above the target range, (Open, Short to B+, Short to B-)	Check wiring, if necessary check FCU, check fuel metering unit and if necessary replace it, check connection cable and if necessary repair or replace it
107	0, 3	Air filter differential pressure: the pressure difference of the intake air between the filter inlet and outlet calculated by ECU is above the target range	Check airfilter and if necessary clean or renew it, check wiring, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it
1237	2	Override switch: the ECU receives a permanent signal	Check wiring, if sensor is not working, check switch and if necessary replace it, check connection cable and if necessary repair or replace it
523470	2, 7, 11, 12, or 14	Rail pressure: Pressure Relief Valve (PRV) error.	Check error memory for other additional errors and eliminate them first. Check working voltage and if necessary correct it, check PRV opening counter and if necessary replace it, check rail-pressure sensor and if necessary replace it, check FCU and if necessary replace it, check rail pressure relief valve and if necessary replace it.
157	3, or 4	Rail pressure sensor: the voltage of sensor measured by ECU is out of the target range or shorted to B+ or B-.	Check wiring, check rail pressure sensor and if necessary replace it, check connection cable and if necessary repair or replace it
523350	4	Injector cylinder bank 1: the current drop measured by ECU is above the target range	Check wiring, check injectors and if necessary replace them, check connection cable and if necessary repair or replace it
523352	4	Injector cylinder bank 2: the current drop measured by ECU is above the target range	Check wiring, check injectors and if necessary replace them, check connection cable and if necessary repair or replace it
523354	12	Internal hardware monitoring: the ECU detects an error of its injector high current output	If error is not removable, change ECU
651	3, or 5	Injector cyl. 1: interruption of electrical connection or the current drop measured by ECU is above the target range	Check wiring and counter plugs, check injector and if necessary replace them, check connection cable and if necessary repair or replace it.
652	3, or 5	Injector cyl 3. : interruption of electrical connection or the current drop measured by ECU is above the target range	Check wiring, check injector and if necessary replace them, check connection cable and if necessary repair or replace it.
653	3, or 5	Injector cyl. 4: interruption of electrical connection or the current drop measured by ECU is above the target range	Check wiring, check injector and if necessary replace them, check connection cable and if necessary repair or replace it.
654	3, or 5	Injector cyl. 2: interruption of electrical connection or the current drop measured by ECU is above the target range	Check wiring, check injector and if necessary replace them, check connection cable and if necessary repair or replace it.
190	8, 12, or 14	Camshaft or Crankshaft speed sensor: out of range, signal disrupted, missing signal, or erratic signal	Check wiring of camshaft/crankshaft sensor, check camshaft/crankshaft sensor and if necessary replace it, check connection cable and if necessary repair or replace it
190	2	ECU measures a deviation between camshaft and crankshaft angle	Check increment wheel position, clean and adjust if necessary, check sensor position, reflash dataset
190	0, 11, or 14	Engine speed: the engine speed calculated by ECU is above the target range	check powertrain settings regarding overspeed
94	1, 3, or 4	Low fuel pressure sensor: the voltage of sensor measured by ECU is out of the target range	Check wiring, if sensor not working, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it. Check low fuel pressure system (fuel feed pump, relay, fuse, wiring, sensor) and if necessary repair or replace it
102	1, 2, 3, or 4	Charge air pressure sensor: the measured voltage of sensor by ECU is out of the target range, either too high or too low.	Check wiring, if charge air pressure/temperature sensor is not working, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it. Check waste gate system if necessary replace TC, check CAC if all channels are clean, check charge air piping if necessary clean or replace it.
100	3, 4	Oil pressure sensor: the voltage of sensor measured by ECU is out of the target range, either too high or too low.	Check sensor and if necessary replace it, check connection cable and if necessary repair or replace it
110	0, 1, 3, or 4	Coolant temperature sensor: the voltage of the sensor measured by ECU is out of the target range; either high or low.	Check wiring, sensor defect, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it

307A-1

J1939		Description	Recommended Action
SPN	FMI		
91	3, 4, or 11	Sensor error accelerator pedal	Check wiring, check accelator pedal sensor and if necessary replace it, check connection cable and if necessary repair or replace it
97	3, 4, or 12	Fuel filter water level sensor: the voltage of sensor measured by ECU is out of the target range high or low.	Drain water out from pre-filter. Check wiring, if sensor is not working, check sensor and if necessary replace it, check connection cable and if necessary repair or replace it
100	0, or 1	Oil pressure is either above or below the target range	Check oil level, check engine for oil leakage, measure oil pressure external to evaluate sensor value, clean suction pipe inlet mesh in oilsump
110	0	Coolant temperature: the coolant temperature calculated by ECU is above the target range.	Clean radiator, check fan drive, check coolant level, check cooling system in general, check thermostat function.
105	0	Charge air temperature downstream calculated by ECU is above the target range	Check CAC system and clean it. Check fan functionality. Check cooling performance with temperature measurement.
111	1	Coolant level: the coolant level calculated by ECU is underneath the allowed minimum	Check coolant level, inspect cooling system for leakage and if necessary repair it, check sensor and wiring
523009	9, or 10	Rail pressure relief valve: is open more frequently, or longer than what the technical specification allows	Change rail pressure relief valve
639, 1231, or 1235	14	CAN bus 0, 1, or 2: the ECU is not allowed to send messages, because the status "BusOff" is detected	Check wiring of CAN bus and if necessary repair it, check connection cable and if necessary repair or replace it, check resistance in CAN lines (60 Ohm)
630	12	Access error: the ECU finds an error during the access to its EEPROM memory or works with an alternative value	ECU not programmed, EEPROM is defective, ECU is defective: reprogram ECU and if necessary replace it
1079, 1080, or 523601	13	Sensor supply voltage monitor error (ECU), Error in sensor voltage.	Check wiring of external components, check working voltage and if necessary correct it, check connection cable and if necessary repair or replace it, if error is not removable, change ECU
168	0, 1, 2, 3, or 4	Battery voltage: the voltage measured by ECU is out of the target range; either too high, too low, or erratic.	Check alternator, contact resistance, safety fuses, too high load in energy system, check battery and connections, check cables and if necessary clean, repair or replace component as required.
1109	2	Engine Shut Off demand has been ignored by the user	Warranty relevant, Additional error must be set
677	3, 4, 5, or 12	Starter relay; short circuit to B+ or B-, Open circuit, or powerstage over temperature	Check wiring and start relay and if necessary replace it, check connection cable and if necessary repair or replace it
523550	12	Start information to Starter (T50-switch) erratic, on too long.	Check wiring, if sensor not working, check start switch and if necessary replace it, check connection cable and if necessary repair or replace it
523612	3, 4, 12, or 14	ECU reported internal software error	Check error memory for other errors. Check wiring, check connected sensors and actuators. Re-flash the ECU. If error is still active replace ECU.
523698	11	Shut off request from supervisory monitoring function, Engine Shut Off due to supervisory function	Warranty relevant, Additional error must be set
5763	0, 1, 3, 4, 5, 6, 7, or 11	Actuator error EGR-Valve: signal out of range	Check wiring and repair or replace if necessary, check actuator/EGR and if necessary replace it
523982	0, 1	Powerstage diagnosis disabled; low or high battery voltage	Check wiring, check alternator, check cables and repair or replace if necessary
523906	3, 4, 5, or 12	ECU detects open load on the electric fuel feed pump output, too high temperature in powerstage of fuel pump circuit, or short to B+ or B-	Check wiring of the fuel feed pump circuit including relay, if necessary repair or replace wiring
524057	2	Electric fuel pump; fuel pressure build up error	Check low fuel pressure system (fuel feed pump, relay, fuse, wiring, sensor) and if necessary repair or replace it
524108	9	Missing CAN message of EGR throttle valve	Check CAN Bus wiring (Bus scheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range, check actuator
524109	9	Missing CAN message of EGR throttle valve	Check CAN Bus wiring (Bus scheduling, polarity, short circuit, power interrupt), test protocol of receiver, check CAN functional range, check actuator

307A-2

5.6-8 Starter Replacement Procedure

1. Turn main power disconnect to the “O” off position (of equipped) then disconnect battery terminals negative, then positive.
2. Locate starter at the left side of the engine between the engine and the frame.

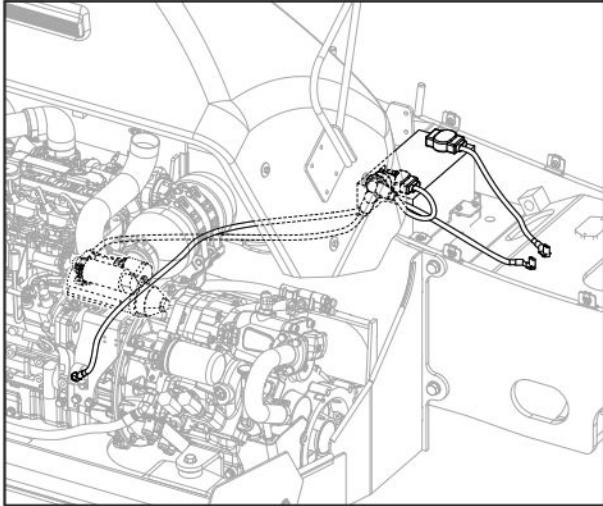


Figure 120

▲ WARNING

A second person to assist will be required to complete this procedure.

3. Locate the upper and lower bolts securing the starter motor unit. Using a 13 mm socket remove upper bolt then remove the lower bolt.

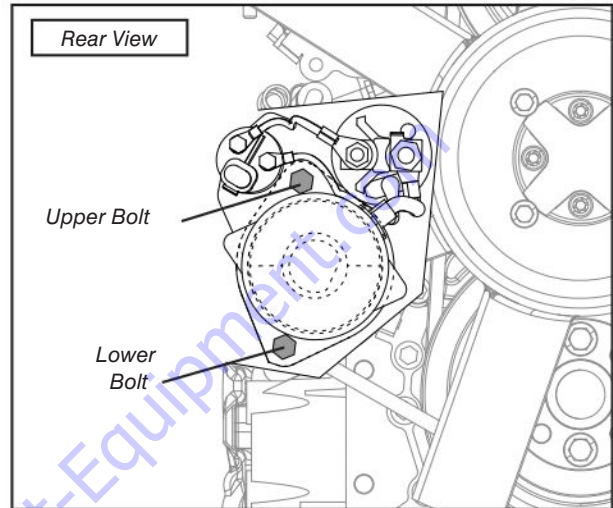


Figure 121 Bolts Location.

4. Remove the existing starter from the side of the engine.

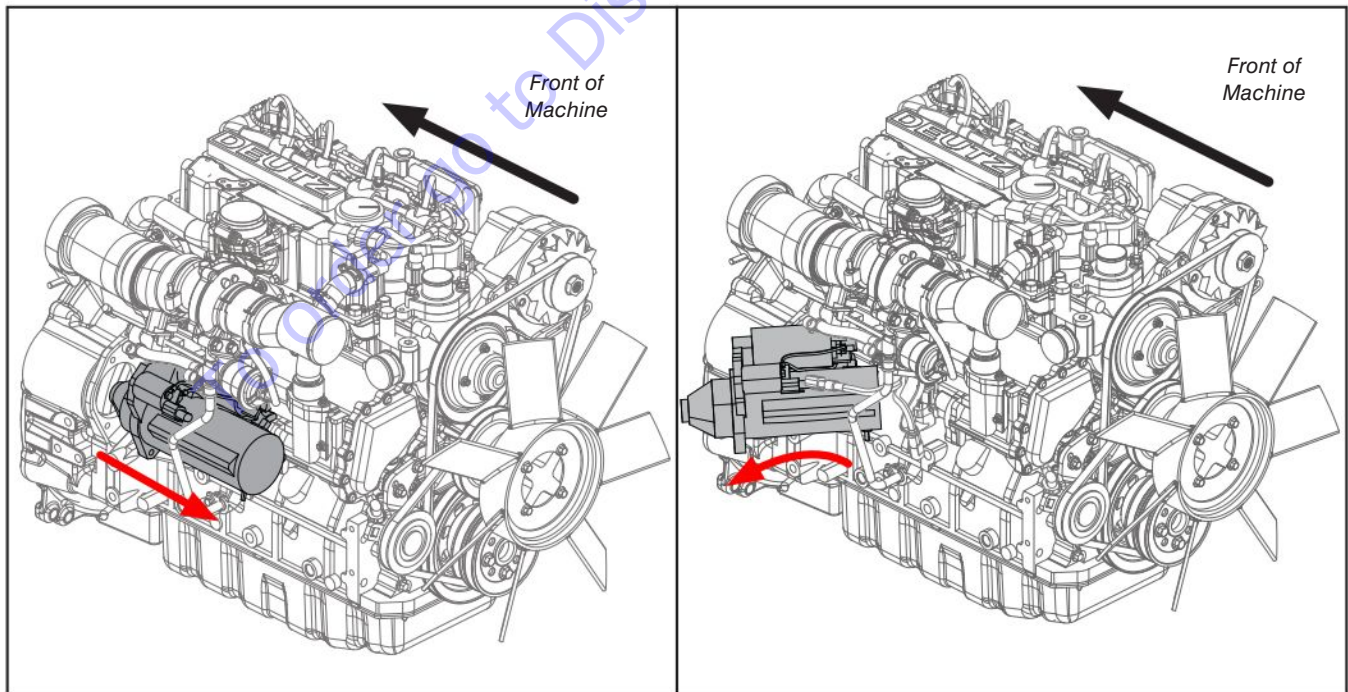


Figure 122 Starter Removal.

5. Position the starter so the pinion is facing down.
6. Remove the nut and retaining washer securing the harnesses with a 17 mm socket 24" long extension, and then disconnect the harnesses from the starter.

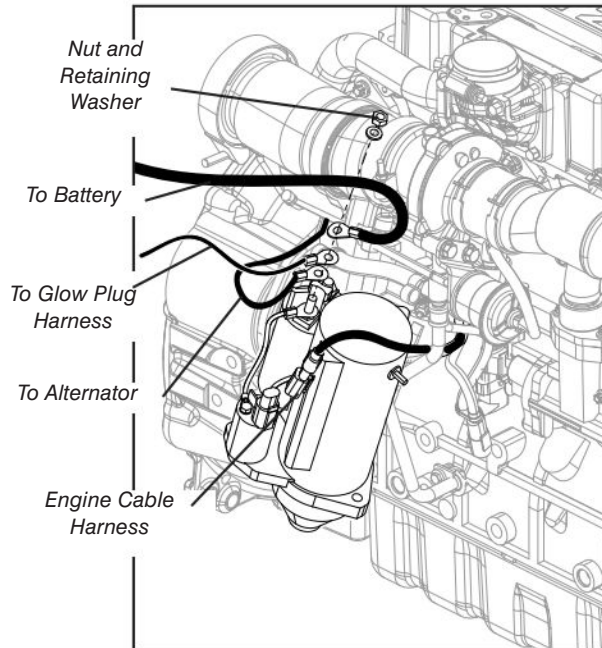


Figure 123 Harnesses Removal.

7. Discard defective/existing starter.
8. Connect all harnesses to the new starter stud and secure them with the nut and washer (do not tighten the nut).

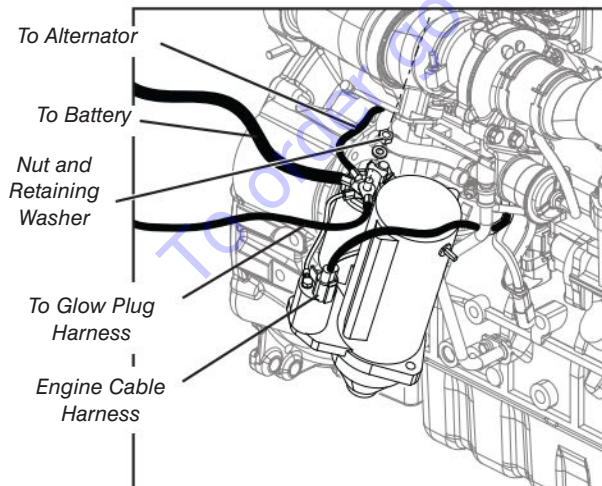


Figure 124 Harnesses Installation.

9. Place starter on the engine flywheel/connection housing.

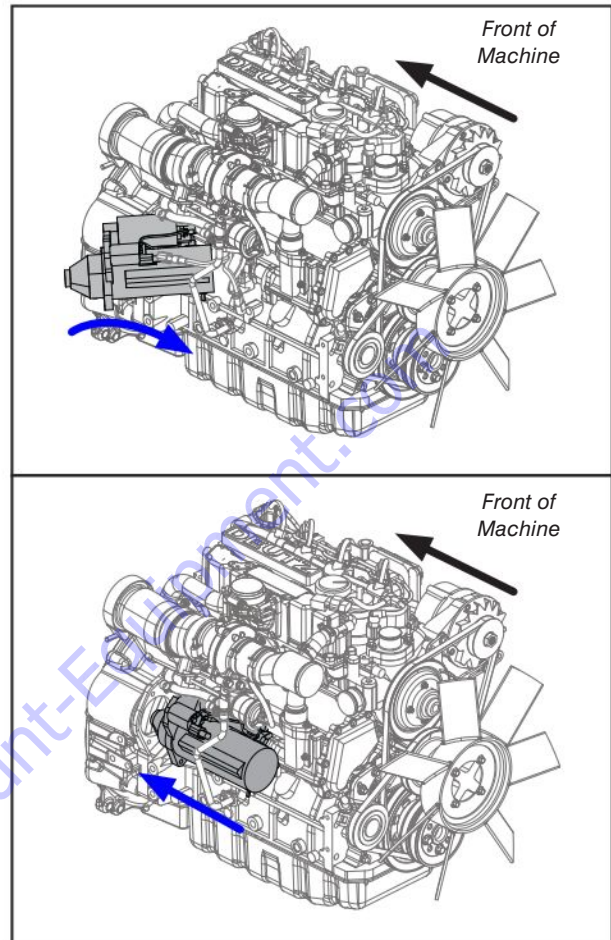


Figure 125 Starter Installation.

10. Secure starter to the engine with the upper and lower bolts.
11. Tighten nut securing the harnesses.
12. Connect battery.
13. Perform a full function test as outlined in Section 'Function Tests' of the operating manual.

5.6-9 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.
 1. Upper and Lower Guide Brackets
 2. Cable Tracks
 3. Carrier Assembly
 4. Side Access Holes

5.7 Electronic Tilt Switch Setup Procedure

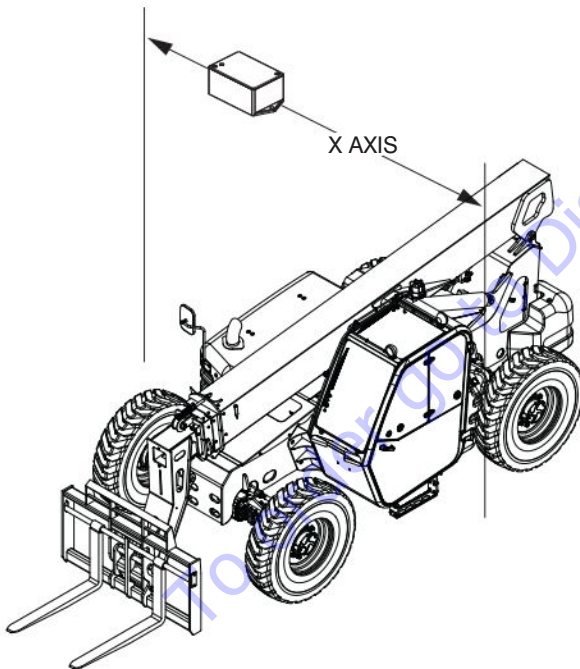
The electronic tilt sensor measures telehandler tilt from side to side. It also monitors the boom proximity switch, and drives the digital outputs whenever the system is powered.

NOTE

Tilt is always measured relative to the programmed zero point.

The following information is supplied for replacement or reprogramming of the electronic tilt switch. Also included are test and verification instructions. Follow the appropriate procedures below.

5.7-1 Tilt Switch Replacement



1. Ensure telehandler is parked on a firm level surface.

IMPORTANT

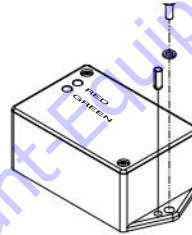
Ensure frame level indicator is at 0°.

2. Apply park brake and move transmission shifter to neutral.
3. Fully retract and lower the boom just enough to gain access to tilt sensor.
4. Chock or block wheels to prevent the telehandler from rolling forward or backward.
5. Shut down the engine and remove key from ignition switch.
6. Remove access cover plate to gain access to tilt sensor.
7. Disconnect tilt switch harness from connector.

NOTE

Ensure part number of old and new tilt switch are the same.

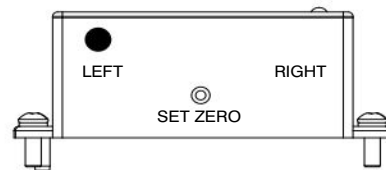
8. Remove old tilt switch from mount.



9. Install new switch to mount and connect switch plug to connector.
10. Turn ignition switch to "I" ON position.
11. Verify switch is powered. (Red or green LEDs are illuminated and blinking).

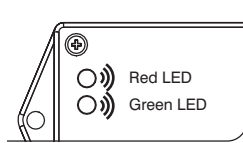


12. Program the sensor zero point.
 1. Press and release the set zero button 3 times. Observe LED flash codes as shown below.

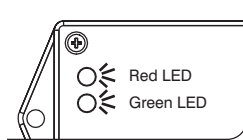


2. Only the red LED will blink for 4 seconds.

3. Both LEDs will flash for 1 second.
Results: The switch is learning the new zero position.



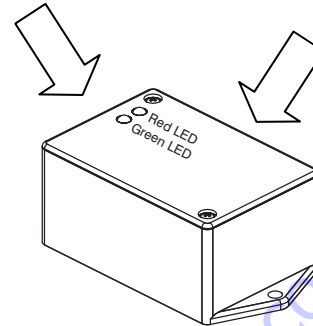
4. Both LEDs will turn on solid for 1 - 2 seconds.
Results: The new zero position has been learned.



13. Turn ignition switch to “O” off position.
14. Remove chock or wheel blocks.
15. Proceed to Test and Verify Tilt Circuit.

5.7-2 Reprogramming Existing Tilt Switch

Light Indicators Set up button is located on this face next to harness



1. Ensure telehandler is parked on a firm level surface.

IMPORTANT

Use a digital level to ensure frame is level.

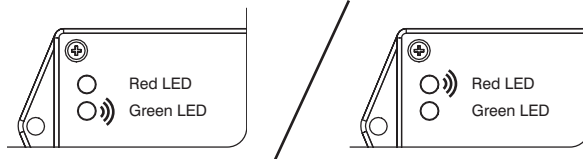
2. Apply park brake and move transmission shifter to neutral.
3. Fully lower and retract the boom.
4. Chock or block wheels to prevent the telehandler from rolling forward or backward.
5. Shut down the engine and turn ignition switch to “I” ON position.



NOTE

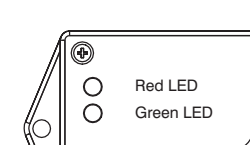
The tilt circuit is only powered when controls are powered up.

6. Verify switch is powered. (Red or green LEDs are illuminated and blinking).

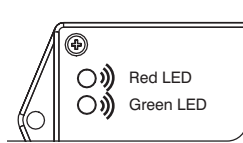


7. Reprogram the Tilt Switch

1. Press and hold the set zero button for 3 seconds.
Results: Both LEDs will be OFF.



2. Red and green LEDs will flash alternately.

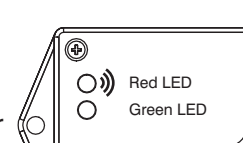


IMPORTANT

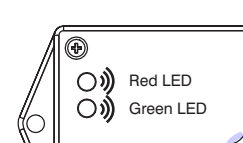
Step 3 must be completed within a 5 second period or the switch will automatically exit program mode and return to normal operation using previously stored data.

3. Press and release set zero button 3 times.
4. If 5 second period has expired prior completion, repeat Step “a”, “b” and “c”.

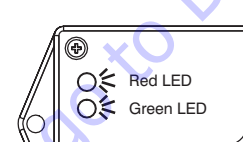
5. Observe program delay / stabilization time. (Only the red LED will blink for 4 seconds)



6. Both LEDs will flash alternately for 1 second. **Results:** The switch learning the new zero position.



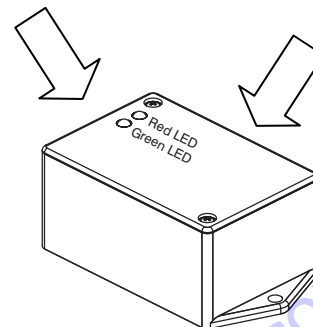
7. Both LEDs will turn on solid for 1 -2 seconds. **Results:** The new zero position has been learned.



8. Turn ignition switch to “O” off position and remove key from ignition switch.
9. Remove chocks or wheel blocks.
10. Proceed to Test and Verify Tilt Circuit/Boom Interlock.

5.7-3 Test and Verify Tilt Circuit

Light Indicators Set up button is located on this face next to harness



Operations of Tilt Switch

The following describes the LED's and what they indicate.

Green LED	Red LED	Meaning
ON	OFF	Tilt is within the specified angle limits.
ON	BLINKING	Transitioning from un-tilted to tilted state.
OFF	ON	Tilt is outside of the specified angle limits.
BLINKING	ON	Transitioning from tilted to un-tilted state.
ON	ON	Output fault detected.





NOTE

Observe program delay / stabilization time.

Tilt Circuit Test

Refer to Section 2 - Function Tests of the operating manual to Test Frame Leveling and Boom Interlock.

Logic Truth Table

INPUT		Boom Proxy Switch (Wire 221) (Pin 4)	OUTPUTS			Lamp (Wire 28C) (Pin 1)
Frame Level >4° Left	Frame Level >4° Right		Frame Level Right (Wire 28R) (Pin 7)	Frame Level Left (Wire 28L) (Pin 6)	Boom UP Enable (Wire 28) (Pin 5)	
0	0	0	1	1	1	0
0	0	1	1	1	1	0
0	1	0	1	0	0	1
0	1	1	1	1	1	0
1	0	0	0	1	0	1
1	0	1	1	1	1	0
1	1	0	0	0	0	FLASH
1	1	1	0	0	0	FLASH
		0 = Switch Open 1 = Switch Closed to 12V	0 = Output Open 1 = output 12V	0 = Output Open 1 = output 12V	0 = Output Open 1 = output 12V	0 = Output Open 1 = output 12V

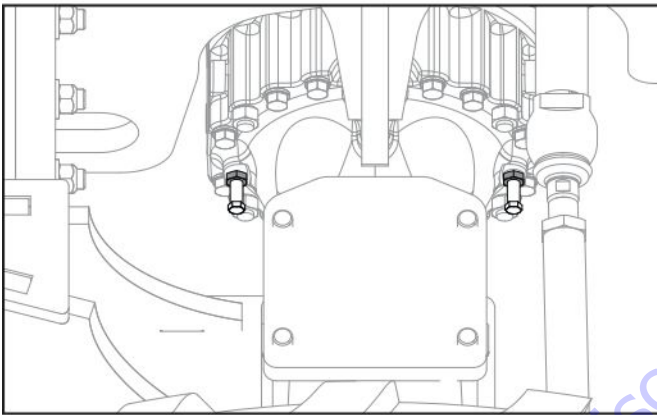
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5.8 Park Brake Release

WARNING

Always chock the wheels of the disabled machine to prevent accidental movement when the park brake is released. This is especially important if machine failure occurs on an incline.

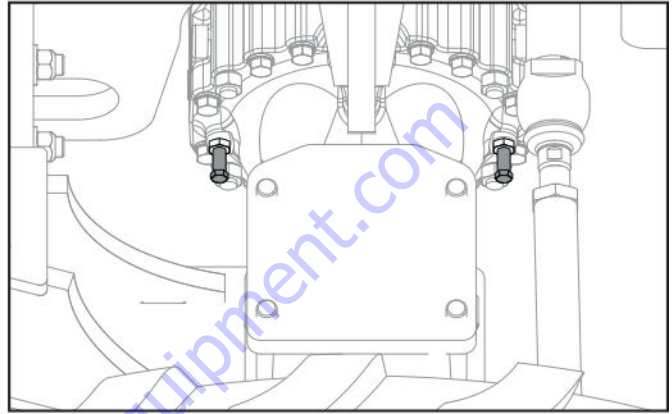
1. Turn off engine and remove key from ignition switch.
2. Chock or block telehandler wheels.
3. Loosen the lock nuts on each side of the axle housing.



4. Tighten the screws on both sides of the axle housing on an alternate sequence by 1/4 turn at a time until the park brake releases.

CAUTION

Tighten maximum by one turn.



5. Repeat steps 3 and 4 on right side of front axle.

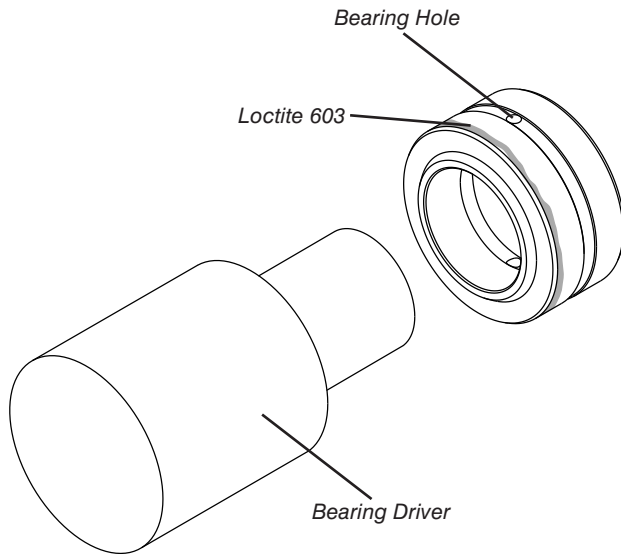
WARNING

Before removing the chocks of the wheels ensure there is no personnel on or close to the machine.

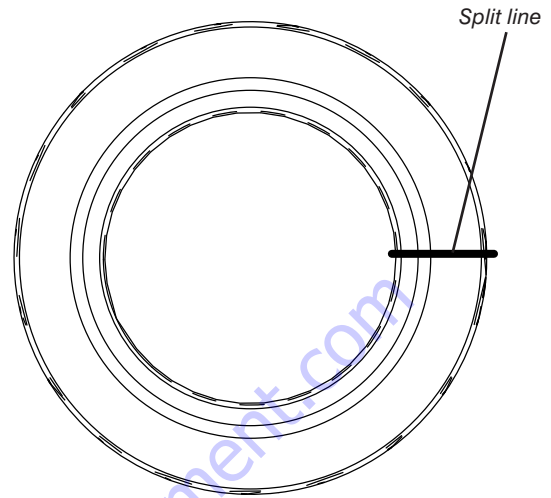
6. Remove the chocks from the wheels to move the machine.
7. Ensure to engage the park brake after the machine has been moved to the desired location.
8. To engage the park brake, back out the two set screws on both the left and right sides of the front axle housing and tighten all four locknuts.

5.9 Bearing Installation

1. Apply Loctite 603 around the outer edge of the outer bearing race. Be careful not to apply any Loctite to the inner bearing ring.
2. If applicable, apply grease to the holes on the outer race of the bearing to prevent Loctite from entering the holes.



3. Identify the split line in the outer race of the bearing. Refer to [Figure 126](#) to install the bearing in the correct orientation.



4. To install the bearings, use a bearing driver or a press that fully contacts the outer race of the bearing.
5. If applicable, apply grease to the inner ring of the bearing.

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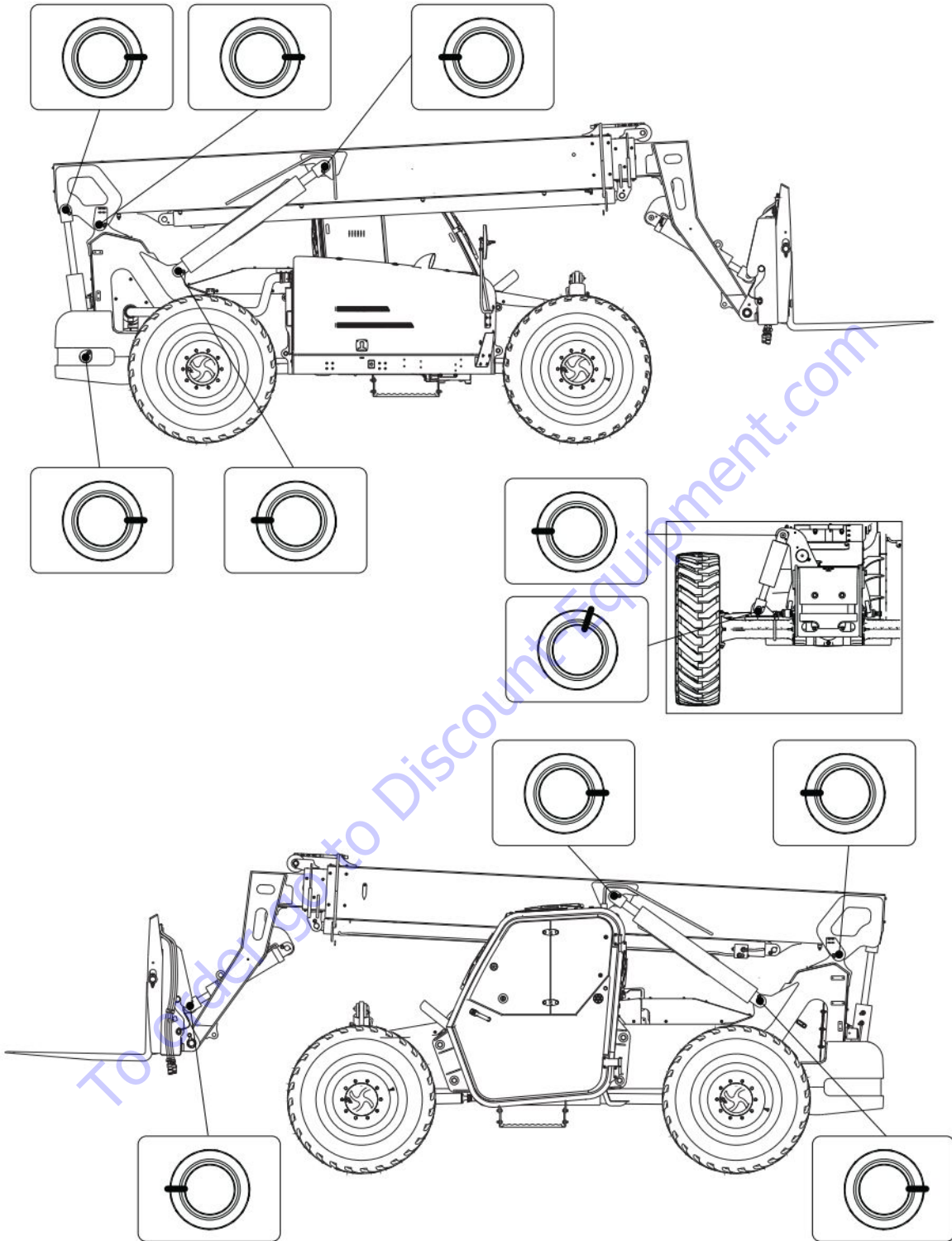


Figure 126 Bearing Orientation

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