317 and 320
Skid Steer Loader
CT322
Compact Track Loader
Operation and Test

OPERATION & TEST TECHNICAL MANUAL

317, 320 Skid Steer Loader, CT322
Compact Track Loader

TM2151 26MAR19 (ENGLISH)

Worldwide Construction
And Forestry Division
PRINTED IN U.S.A.

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Foreword

This manual is written for an experienced technician. Essential tools required in performing certain service work are identified in this manual and are recommended for use.

Live with safety: Read the safety messages in the introduction of this manual and the cautions presented throughout the text of the manual.

CAUTION:

This is the safety-alert symbol. When you see this symbol on the machine or in this manual, be alert to the potential for personal injury.

Technical manuals are divided in two parts: repair and operation and tests. Repair sections tell how to repair the components. Operation and tests sections help you identify the majority of routine failures quickly.

Information is organized in groups for the various components requiring service instruction. At the beginning of each group are summary listings of all applicable essential tools, service equipment and tools, other materials needed to do the job, service parts kits, specifications, wear tolerances, and torque values.

Technical Manuals are concise guides for specific machines. They are on-the-job guides containing only the vital information needed for diagnosis, analysis, testing, and repair.

Fundamental service information is available from other sources covering basic theory of operation, fundamentals of troubleshooting, general maintenance, and basic type of failures and their causes.

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THANK YOU!

Section 9000 - GENERAL INFORMATION

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Group 01 - Safety

Recognize Safety Information

Safety Alert Symbols

Safety Alert Symbols

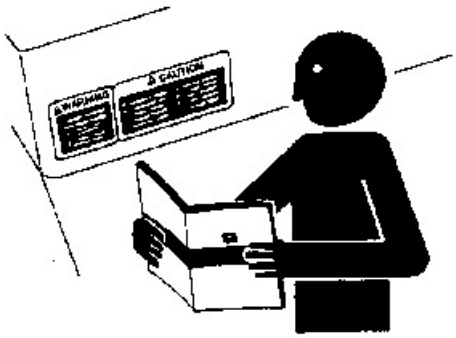
This is the safety alert symbol. When this symbol is noticed on the machine or in this manual, be alert for the potential of personal injury.

Follow the precautions and safe operating practices highlighted by this symbol.

A signal word — DANGER, WARNING, or CAUTION — is used with the safety alert symbol. DANGER identifies the most serious hazards.

On the machine, DANGER signs are red in color, WARNING signs are orange, and CAUTION signs are yellow. DANGER and WARNING signs are located near specific hazards. General precautions are on CAUTION labels.

Follow Safety Instructions



Follow Safety Instructions

Read the safety messages in this manual and on the machine. Follow these warnings and instructions carefully. Review them frequently.

Be sure all operators of this machine understand every safety message. Replace operator's manual and safety labels immediately if missing or damaged.

Operate Only If Qualified

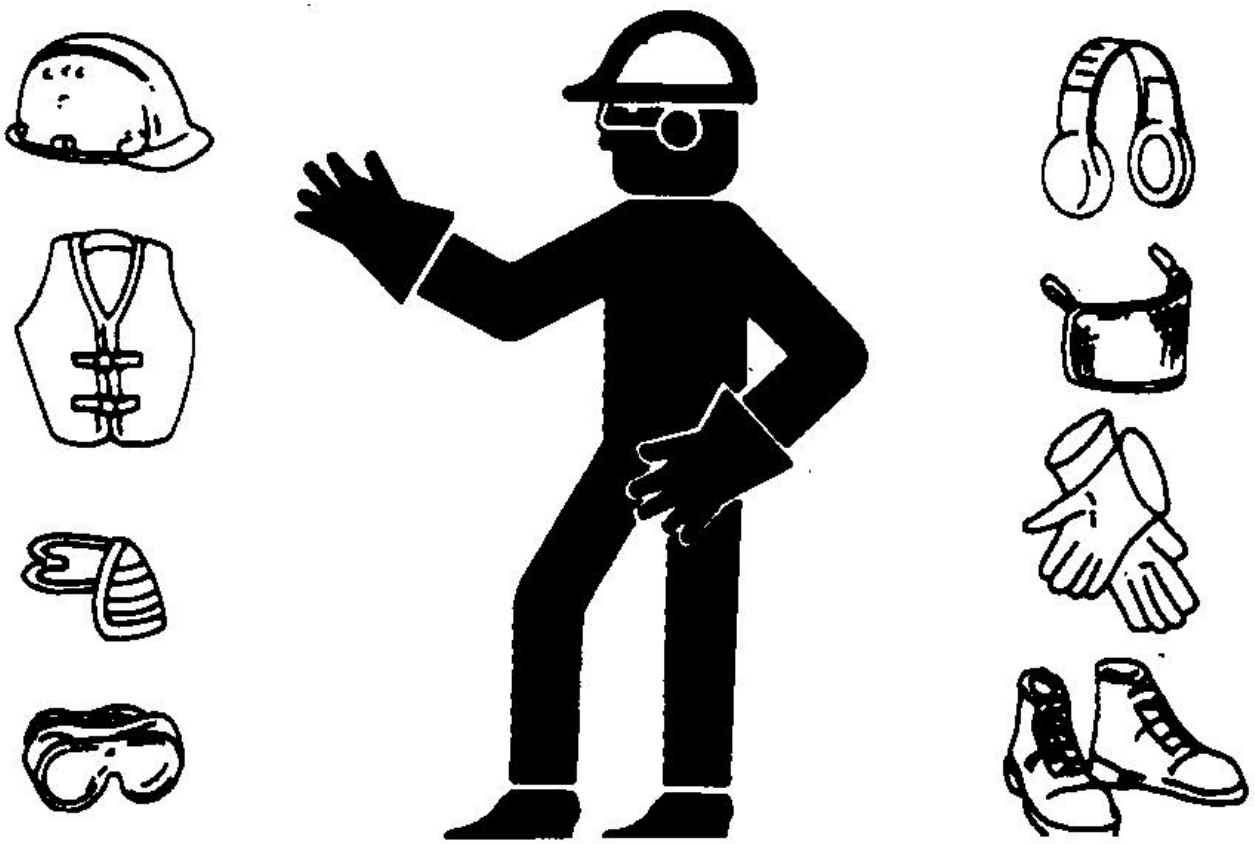
Do not operate this machine unless the operator's manual has been read carefully, and you have been qualified by supervised

training and instruction.

Operator should be familiar with the job site and surroundings before operating. Try all controls and machine functions with the machine in an open area before starting to work.

Know and observe all safety rules that may apply to every work situation and work site.

Wear Protective Equipment



Protective Equipment

Guard against injury from flying pieces of metal or debris; wear goggles or safety glasses.

Wear close fitting clothing and safety equipment appropriate to the job.

Prolonged exposure to loud noise can cause impairment or loss of hearing. Wear suitable hearing protection such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.

Avoid Unauthorized Machine Modifications

Modifications of this machine, or addition of unapproved products or attachments, may affect machine stability or reliability, and may create a hazard for the operator or others near the machine. The installer of any modification which may affect this machine is responsible for establishing that the modification does not adversely affect the machine or its performance. This applies to all aspects of the machine, including electronic controls.

Always contact an authorized dealer before making machine modifications that change the intended use, weight or balance of the machine, or that alter machine controls, performance or reliability.

Inspect Machine

Inspect Machine

Inspect machine carefully each day by walking around it before starting.

Inspect and Clean the Polycarbonate Windows. See Inspect and Clean Polycarbonate Windows. (Section 4-1.)

Keep all guards and shields in good condition and properly installed. Fix damage and replace worn or broken parts immediately. Pay special attention to hydraulic hoses and electrical wiring.

Stay Clear of Moving Parts

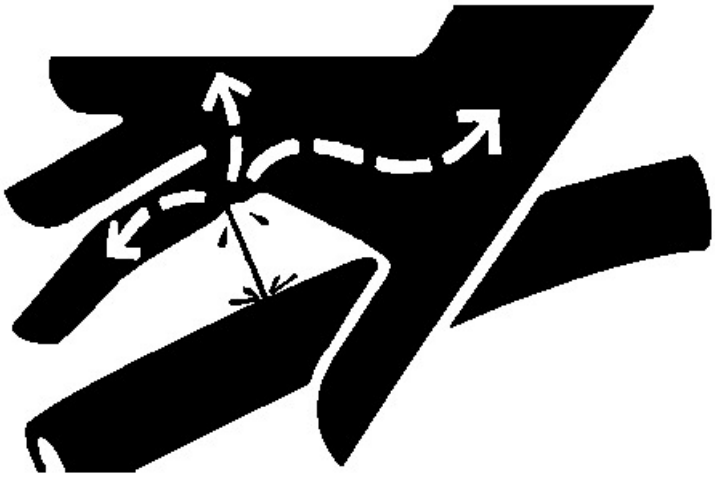
Stay Clear Of Moving Parts

Entanglements in moving parts can cause serious injury.

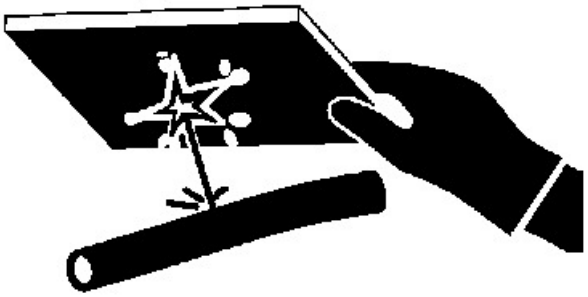
Stop engine before examining, adjusting or maintaining any part of machine with moving parts.

Keep guards and shields in place. Replace any guard or shield that has been removed for access as soon as service or repair is complete.

Avoid High-Pressure Oils



Avoid High Pressure Oils



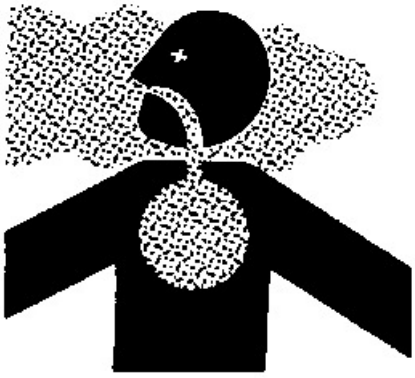
Avoid High-Pressure Oils

This machine uses a high-pressure hydraulic system. Escaping oil under pressure can penetrate the skin causing serious injury.

Never search for leaks with your hands. Protect hands. Use a piece of cardboard to find location of escaping oil. Stop engine and relieve pressure before disconnecting lines or working on hydraulic system.

If hydraulic oil penetrates your skin, see a doctor immediately. Injected oil must be removed surgically within hours or gangrene may result. Contact a knowledgeable medical source or the Deere & Company Medical Department in Moline, Illinois, U.S.A.

Beware of Exhaust Fumes



Beware Of Exhaust Fumes

Prevent asphyxiation. Engine exhaust fumes can cause sickness or death.

If you must operate in an enclosed space, provide adequate ventilation. Use an exhaust pipe extension to remove the exhaust fumes or open doors and windows to bring outside air into the area.

Prevent Fires

Handle Fuel Safely

Clean Machine Regularly

Carry A Fire Extinguisher

Handle Fuel Safely: Store flammable fluids away from fire hazards. Never refuel machine while smoking or when near sparks or flame.

Clean Machine Regularly: Keep trash, debris, grease and oil from accumulating in engine compartment, around fuel lines, hydraulic lines and electrical wiring. Never store oily rags or flammable materials inside a machine compartment.

Maintain Hoses and Wiring: Replace hydraulic hoses immediately if they begin to leak, and clean up any oil spills. Examine electrical wiring and connectors frequently for damage.

Keep A Fire Extinguisher Available: Always keep a multi-purpose fire extinguisher on or near the machine. Know how to use extinguisher properly.

Keep Machine Away From Fire: Maintain a safe distance between sources of fire and the machine so elevated heat, flames or glowing embers never contact any part of the machine, including airborne glowing embers.

Prevent Battery Explosions

Battery Explosions

Battery gas can explode. Keep sparks, lighted matches, and open flame away from the top of battery.

Never check battery charge by placing a metal object across the posts. Use a voltmeter or hydrometer.

Do not charge a frozen battery; it may explode. Warm battery to 16°C (60°F).

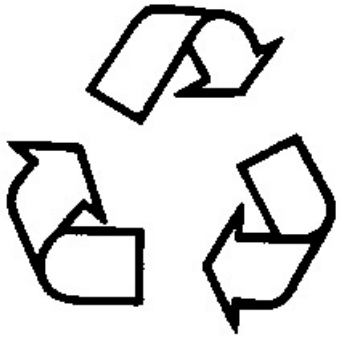
Handle Chemical Products Safely

Handle Chemical Products Safely

Exposure to hazardous chemicals can cause serious injury. Under certain conditions, lubricants, coolants, paints and adhesives used with this machine may be hazardous.

If uncertain about safe handling or use of these chemical products, contact your authorized dealer for a Material Safety Data Sheet (MSDS). The MSDS describes physical and health hazards, safe use procedures, and emergency response techniques for chemical substances. Follow MSDS recommendations to handle chemical products safely.

Dispose of Waste Properly



Dispose Of Waste Properly

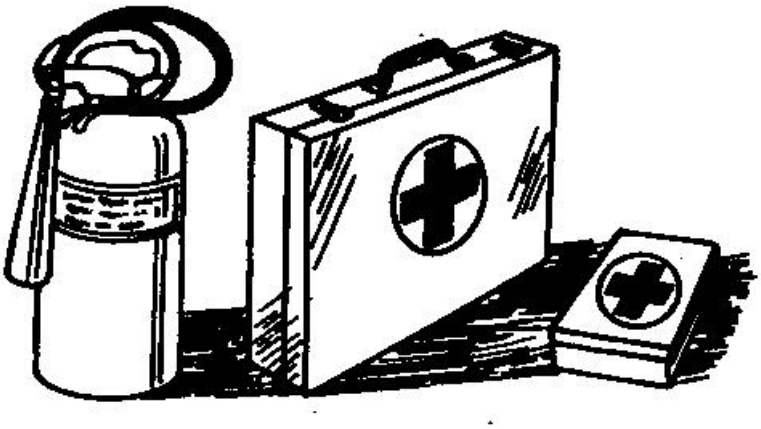
Improper disposal of waste can threaten the environment. Fuel, oils, coolants, filters and batteries used with this machine may be harmful if not disposed of properly.

Never pour waste onto the ground, down a drain, or into any water source.

Air conditioning refrigerants can damage the atmosphere. Government regulations may require using a certified service center to recover and recycle used refrigerants.

If uncertain about the safe disposal of waste, contact your local environmental or recycling center or your authorized dealer for more information.

Prepare for Emergencies



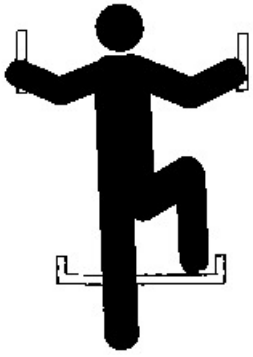
First Aid Kit

Be prepared if an emergency occurs or a fire starts.

Keep a first aid kit and fire extinguisher handy.

Keep emergency numbers for doctors, ambulance service, hospital, and fire department near your telephone.

Use Steps and Handholds Correctly



Use Handholds and Steps

Prevent falls by facing the machine when getting on and off. Maintain 3-point contact with steps and handrails. Never use machine controls as handholds.

Use extra care when mud, snow, or moisture present slippery conditions. Keep steps clean and free of grease or oil. Never jump when exiting machine. Never mount or dismount a moving machine.

Start Only From Operator′s Seat

Operate Only From Operators Seat

Avoid unexpected machine movement. Start engine only while sitting in operator′s seat. Ensure all controls and working tools are in proper position for a parked machine.

Never attempt to start engine from the ground. Do not attempt to start engine by shorting across the starter solenoid terminals.

Use and Maintain Seat Belt

Use and Maintain Seat Belt

Use seat belt when operating machine . Remember to fasten seat belt when loading and unloading from trucks and during other uses.

Examine seat belt frequently. Be sure webbing is not cut or torn. Replace seat belt immediately if any part is damaged or does not function properly.

The complete seat belt assembly should be replaced every 3 years, regardless of appearance.

Prevent Unintended Machine Movement

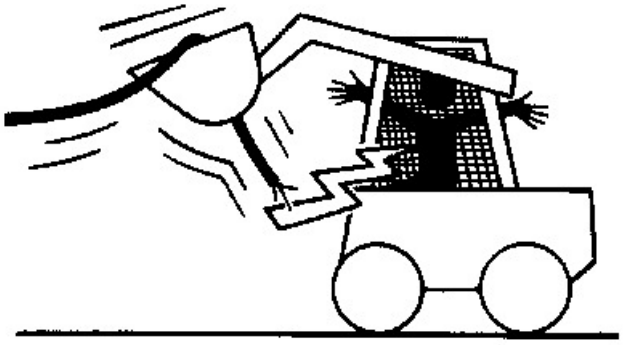
Prevent Unintended Machine Movement

Be careful not to accidentally actuate controls when co-workers are present.

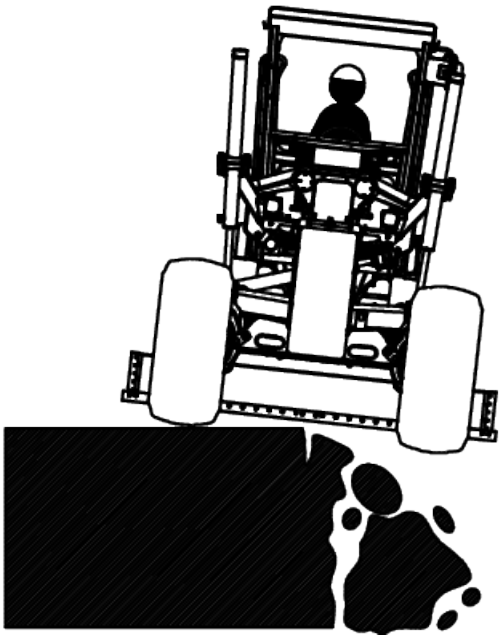
Lower all equipment to the ground during work interruptions. Press park brake to park position “P” to engage park brake before allowing anyone to approach the machine.

Follow these same precautions before standing up, leaving the operator′s seat, or exiting the machine.

Avoid Work Site Hazards



Contact With Gas Line



Operate Only On Solid Footing

Avoid contact with gas lines, buried cables and water lines. Call utility line location services to identify all underground utilities before starting work.

Prepare work site properly. Avoid operating near structures or objects that could fall onto the machine. Clear away debris that could move unexpectedly if run over.

Avoid boom or attachment contact with overhead obstacles or overhead electrical lines. Never move machine closer than 3 m (10 ft) plus twice the line insulator length to overhead wires.

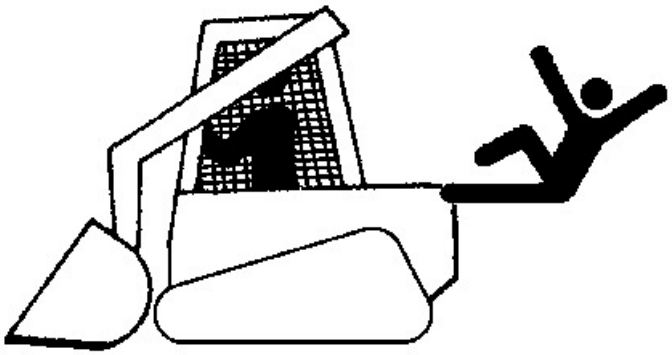
Keep bystanders clear at all times. Use barricades or a signal person to keep vehicles and pedestrians away. Use a signal person if moving machine in congested areas or where visibility is restricted. Always keep signal person in view. Coordinate hand signals before starting machine.

Operate only on solid footing with strength sufficient to support machine. Be especially alert working near embankments or excavations.

Avoid working under over-hanging embankments or stockpiles that could collapse under or on machine.

Reduce machine speed when operating with tool on or near ground when obstacles may be hidden (i.e., during snow removal).

Keep Riders Off Machine



Keep Riders Off Machine

Only allow operator on machine.

Riders are subject to injury. They may fall from machine, be caught between machine parts, or be struck by foreign objects.

Riders may obstruct operator’s view or impair his ability to operate machine safely.

Avoid Backover Accidents

Avoid Backover Accidents

Before moving machine, be sure all persons or vehicles are clear of machine path. Turn around and look directly for best visibility. Keep windows clean.

Be certain reverse warning alarm is working properly (if equipped).

Use a signal person when backing if view is obstructed or when in close quarters. Keep signal person in view at all times. Use prearranged hand signals to communicate.

Avoid Machine Tip Over

Use Seat Belt

Avoid Machine Tip Over

Use seat belt at all times.

Do not jump if the machine tips. You will be unlikely to jump clear and the machine may crush you.

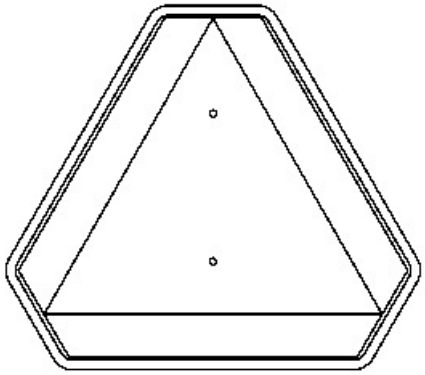
Load and unload from trucks or trailers carefully. Be sure truck is wide enough and on a firm level surface. Use loading ramps and attach them properly to truck bed.

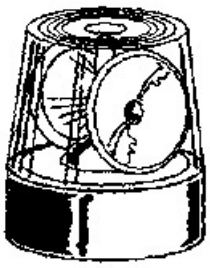
Be careful on slopes. Avoid sharp turns. Balance loads so weight is evenly distributed and load is stable. Carry tools and loads close to the ground to aid visibility and lower center of gravity. Use extra care on wet, soft, rocky, or frozen ground.

Know the capacity of the machine. Do not overload. Be careful with heavy loads. Using oversize buckets or lifting heavy objects reduces machine stability.

Ensure solid footing. Use extra care in soft ground conditions or on structures that may not uniformly support the tracks especially when raising the boom. Do not operate close to banks or open excavations that may cave in and cause machine to tip or fall.

Operating or Traveling On Public Roads





Operating or Traveling On Public Roads

Machines that work near vehicle traffic or travel slower than normal highway speeds must have proper lighting and markings to assure they are visible to other drivers.

Install additional lights, beacons, slow moving vehicle (SMV) emblems, or other devices and use as required to make the machine visible and identify it as a work machine. Check state and local regulations to assure compliance. Keep these devices clean and in working condition.

Add and Operate Attachments Safely

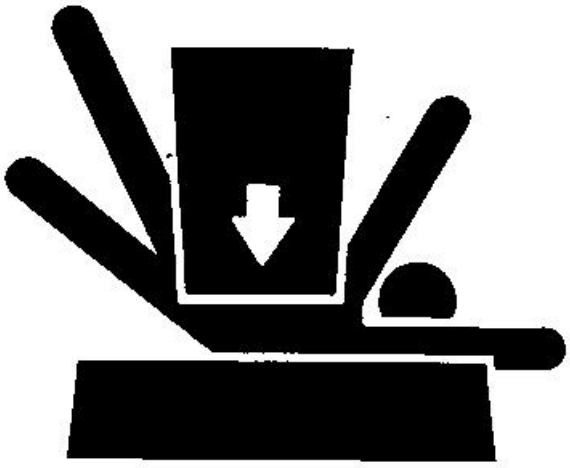
Always verify compatibility of attachments by contacting your authorized dealer. Adding unapproved attachments may affect machine stability or reliability, and may create a hazard for others near the machine.

Ensure that a qualified person is involved in attachment installation. Add guards to machine if operator protection is required or recommended. Verify that all connections are secure and attachment responds properly to controls.

Carefully read attachment manual and follow all instructions and warnings. In an area free of bystanders and obstructions, carefully operate attachment to learn its characteristics and range of motion.

Park And Prepare For Service Safely

Do Not Operate Tag



Support Machine Properly

Warn others of service work. Always park and prepare your machine for service or repair properly.

- Park machine on a level surface and lower equipment to the ground.
- Engage park brake. Stop engine and remove key.
- Attach a “Do Not Operate” tag in an obvious place in the operator’s station.

Securely support machine or attachment before working under it.

- Do not support machine with any hydraulically actuated equipment.
- Do not support machine with cinder blocks or wooden pieces that may crumble or crush.
- Do not support machine with a single jack or other devices that may slip out of place.

Understand service procedures before beginning repairs. Keep service area clean and dry. Use two people whenever the engine must be running for service work.

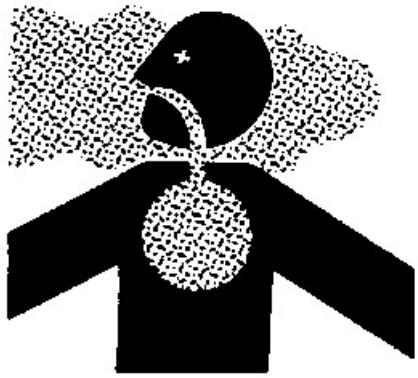
Service Cooling System Safely

Cooling System

Explosive release of fluids from pressurized cooling system can cause serious burns.

Shut off engine. Only remove filler cap when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.

Remove Paint Before Welding or Heating



Toxic Fumes

Hazardous fumes can be generated when paint is heated by welding or using a torch. Dust from sanding or grinding paint can also be hazardous.

Remove paint to at least 76 mm (3 in.) from area to be heated. Wear an approved respirator when sanding or grinding paint. If a solvent or paint stripper is used, wash area with soap and water. Remove solvent or paint stripper containers from work area and allow fumes to disperse at least 15 minutes before welding or heating.

Work outside or in a well-ventilated area. Dispose of waste, paint and solvents properly.

Make Welding Repairs Safely

Avoid Heating Near Pressurized Fluid Lines

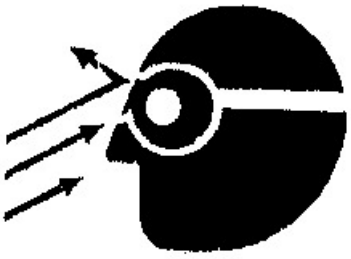
IMPORTANT:

Disable electrical power before welding. Turn off main battery switch or disconnect positive battery cable. Separate harness connectors to engine and vehicle microprocessors.

Avoid welding or heating near pressurized fluid lines. Flammable spray may result and cause severe burns if pressurized lines fail as a result of heating. Do not let heat go beyond work area to nearby pressurized lines.

Remove paint properly. Do not inhale paint dust or fumes. Use a qualified welding technician for structural repairs. Make sure there is good ventilation. Wear eye protection and protective equipment when welding.

Drive Metal Pins Safely



Hardened Metal Parts

Always wear protective goggles or safety glasses and other protective equipment before striking hardened parts. Hammering hardened metal parts such as pins and bucket teeth may dislodge chips at high velocity.

Use a soft hammer or a brass bar between hammer and object to prevent chipping.

Section 9005 - OPERATIONAL CHECKOUT PROCEDURE

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Group 10 - Operational Checkout Procedure

Operational Checkout

Use this procedure to make a quick check of machine operation by doing a walk around inspection and performing specific checks from operator's seat.

Complete visual checks (oil levels, oil condition, external leaks, loose hardware, linkage, wiring, etc.) before performing checkout.

Most checks will require machine systems to be at normal operating temperatures and a level area with adequate space to operate machine. Some checks may require varied surfaces.

No special tools are necessary to perform the checkout.

If no problem is found, go to next check. If problem is indicated, an additional check or repair procedure will be suggested.

Key Switch OFF, Engine OFF Checks

(1) Diagnostic Trouble Code Check

Action:

Always check for diagnostic trouble codes and correct them before performing the operational checkout.

Diagnostic trouble codes are displayed on the Engagement Monitor Unit.

Sit in seat and access diagnostic trouble code menu.

sss:

Are diagnostic trouble codes present?

Result:

YES: Correct all diagnostic trouble codes. See Reading Engagement and Monitor Unit Diagnostic Trouble Codes . (Group 9015-20.)

NO: Proceed with operational checkout.

(2) Monitor and Gauge Circuits Check

Action:

Sit in operator's seat.

sss:

Do gauges move to far right position, then move to the center position, and then display the machine status?

sss:

Do all indicators illuminate and then go out depending on machine status?

sss:

Do all monitor display segments turn on, turn off, display correct machine model setting for 3 seconds, display hour meter for 10 seconds, and then display last selected run display item?

Close cab door if equipped.

sss:

Does cab door indicator go off?

Buckle seat belt.

sss:

Do seat and seat belt indicators go off?

Result:

YES: Go to next check.

NO: Check F2 monitor 15 amp fuse. See Fuse Specifications . (Group 9015-10.)

NO: Check seat, seat belt, or cab door switch. See Engagement and Monitor Unit Data Items for switch diagnostics. (Group 9015-20.)

NO: See System Functional Schematic for further information. (Group 9015-10.)

Key Switch ON, Engine OFF Checks

(1) Monitor and Gauge Circuits Check

Action:

Turn key switch ON.

sss:

Do switches on instrument panel illuminate?

sss:

Does engagement and monitor unit alarm sound?

Result:

YES: Go to next check.

NO: Check F1 key switch and accessory fuse. See Fuse Specifications . (Group 9015-10.) Check F3 accessory 25 amp fuse. See Fuse Specifications . (Group 9015-10.) Check K4 accessory relay. See Relay Test . (Group 9015-20.)

NO: See System Functional Schematic for further information. (Group 9015-10.)

(2) Horn Circuit Check

Action:

Press horn switch on right steering lever.

sss:

Does horn sound?

Result:

YES: Go to next check.

NO: Check F1 key switch and accessory fuse. See Fuse Specifications . (Group 9015-10.) Check F3 accessory 25 amp fuse. See Fuse Specifications . (Group 9015-10.) Check K4 accessory relay. See Relay Test . (Group 9015-20.)

NO: See System Functional Schematic for further information. (Group 9015-10.)

(3) Lights Circuit Check

Action:

Push light switch to middle position.

sss:

Do front work lights and tail lights turn on?

Push light switch to upper position.

sss:

Do front work lights and tail lights stay on and rear work light turn on?

If equipped, push dual flasher switch to the upper position.

sss:

Do the dual flashers turn on?

Result:

YES: Go to next check.

NO: Check F4 lights 20 amp fuse. See Fuse Specifications . (Group 9015-10.)

NO: Check F1 key switch and accessory fuse. See Fuse Specifications . (Group 9015-10.) Check F3 accessory 25 amp fuse. See Fuse Specifications . (Group 9015-10.) Check K4 accessory relay. See Relay Test . (Group 9015-20.)

NO: See System Functional Schematic for further information. (Group 9015-10.)

(4) Windshield Wiper Circuit Check (If Equipped)

Action:

Close cab door.

Push windshield wiper and washer switch to the middle position.

sss:

Does wiper operate?

Result:

YES: Go to next check.

NO: Check F1 key switch and accessory fuse. See Fuse Specifications . (Group 9015-10.) Check F3 accessory 25 amp Fuse. See Fuse Specifications . (Group 9015-10.) Check K4 accessory relay. See Relay Test . (Group 9015-20.)

NO: See System Functional Schematic for further information. (Group 9015-10.)

(5) Windshield Washer Circuit Check (If Equipped)

Action:

Close cab door.

Turn on windshield wiper.

Push and hold windshield wiper and washer switch in the upper position.

> ***IMPORTANT:***
>
> ***Washer motor may be damaged if washer switch is held for more than 20 seconds, or continually operated with no fluid in the washer fluid tank.***

sss:

Does washer operate?

Result:

YES: Go to next check.

NO: Check washer fluid level.

NO: Check washer hose for kinks or obstructions.

NO: Check F1 key switch and accessory fuse. See Fuse Specifications . (Group 9015-10.) Check F3 accessory 25 amp fuse. See Fuse Specifications . (Group 9015-10.) Check K4 accessory relay. See Relay Test . (Group 9015-20.)

NO: See System Functional Schematic for further information. (Group 9015-10.)

Key Switch ON, Engine ON Checks

(1) Engine Start Check

Action:

Position engine speed control lever in slow idle position.

Start engine.

sss:

Does engine speed increase briefly, then return to slow idle?

Result:

YES: Go to next check.

NO: Check slow idle and fast idle engine speeds.Check governor linkage.

(2) Hydraulic Control Enable Check

Action:

Close cab door if equipped.

Run engine at slow idle.

Engage park brake.

Actuate boom and bucket functions.

sss:

Do boom and bucket move?

Result:

NO: Continue check.

YES: Check park brake switch.

YES: Check diagnostic trouble codes and check port lock solenoid valve and port lock spool. See Diagnostic Trouble Codes . (Group 9015-20.) See Solenoid Test . (Group 9015-20.)

YES: Check diagnostic trouble codes and check boom and bucket spool lock solenoids. See Diagnostic Trouble Codes . (Group 9015-20.) See Solenoid Test . (Group 9015-20.)

Action:

Move park brake switch to the run position to enable hydraulics.

Actuate boom and bucket functions.

sss:

Do boom and bucket move?

Result:

YES: Go to next check.

NO: Check park brake switch.

NO: Check diagnostic trouble codes and check port lock solenoid valve and port lock spool. See Diagnostic Trouble Codes . (Group 9015-20.) See Solenoid Test . (Group 9015-20.)

NO: Check diagnostic trouble codes and check boom and bucket spool lock solenoids. See Diagnostic Trouble Codes . (Group 9015-20.) See Solenoid Test . (Group 9015-20.)

(3) Park Brake Check

Action:

Close cab door if equipped.

CAUTION:

Prevent injury from unexpected machine movement. Keep bystanders clear of machine.

Engage park brake.

Gradually move steering levers in the forward direction and then in the reverse direction.

IMPORTANT:

Extreme movement of steering levers may cause engine to stall while trying to overcome park brake.

sss:

Does machine move?

Result:

NO: Continue check.

YES: Check park brake switch. See Park Brake Switch Check . (Group 9015-20.)

YES: Check park brake solenoid valve. See Solenoid Test . (Group 9015-20.)

YES: Check park brake. Perform Park Brake Release Pressure Test . (Group 9026-25.)

Action:

CAUTION:

Prevent injury from unexpected machine movement. Keep bystanders clear of machine.

Move park brake switch to release position to disengage park brake.

Gradually move steering levers in the forward direction and then in the reverse direction.

sss:

Does machine move?

Result:

NO: Continue check.

YES: Check park brake switch. See Park Brake Switch Check . (Group 9015-20.)

YES: Check park brake solenoid valve. See Solenoid Test . (Group 9015-20.)

YES: Check park brake. Perform Park Brake Release Pressure Test . (Group 9026-25.)

(4) Hydraulic Quik-Tatch Check (S.N. —131876) (If Equipped)

Action:

Close cab door if equipped.

Move park brake switch to the run position to enable hydraulics.

Press and hold lower part of hydraulic Quik-Tatch switch to unlock the Quik-Tatch latches.

sss:

Do hydraulic Quik-Tatch latches release attachment?

Press and hold the upper part of hydraulic Quik-Tatch switch to lock the Quik-Tatch latches.

sss:

Do hydraulic Quik-Tatch latches secure attachment?

Result:

YES: Go to next check.

NO: Hydraulic Quik-Tatch operates opposite of function indicated on switch. See Hydraulic Quik-Tatch Does Not Function Properly. (Group 9025-15.)

NO: Hydraulic Quik-Tatch does not unlock or lock latches. See Hydraulic Quik-Tatch Does Not Function Properly. (Group 9025-15.)

(5) Electric Quik-Tatch Check (S.N. 131877—) (If Equipped)

Action:

IMPORTANT:

Damage to Electric Quik-Tatch motor will occur if motor is immersed in liquid. Do Not Immerse in Liquid

Close cab door if equipped.

Press and hold lower part of Quik-Tatch switch to unlock the Quik-Tatch latches.

sss:

Do Quik-Tatch latches release attachment?

Press and hold upper part of Quik-Tatch switch to lock the Quik-Tatch latches.

sss:

Do Quik-Tatch latches secure attachment?

Result:

YES: Go to next check.

NO: Electric Quik-Tatch does not unlock or lock latches. See Electric Quik-Tatch (W28) Component Location . (Group 9015-10.)

(6) Steering Mistracking Check

Action:

CAUTION:

Prevent injury from unexpected machine movement. Keep bystanders clear of machine.

Run engine at fast idle.

Drive machine at full speed forward on a flat and level surface for 30.5 m (100 ft.).

Repeat procedure for reverse direction.

Observe which direction and how much the machine mistracks from a straight line.

sss:

Does machine mistrack more than the width of the machine over 30.5 m (100 ft.) ?

Result:

YES: Steering levers misadjusted. Check steering lever adjustment. See Steering Lever Adjustment—Centering . (Group 9026-25.) Tracking Adjustment—Skid Steer Loader or Tracking Adjustment—Compact Track Loader . (Group 9026-25.)

NO: Go to next check.

(7) Two Speed Check

Action:

CAUTION:

Prevent injury from unexpected machine movement. Keep bystanders clear of machine.

Run engine at slow idle.

Drive machine at full speed forward on a flat and level surface.

Push two speed switch to activate fast speed mode.

Push two speed switch to activate slow speed mode.

sss:

Does machine accelerate then decelerate?

Result:

YES: Go to next check.

NO: Check two speed switch.

NO: Check two speed solenoid valve. See Solenoid Test . (Group 9015-20.)

NO: Hydrostatic system malfunction. See Diagnose Hydrostatic System Malfunctions . (Group 9026-15.)

(8) Back-Up Alarm Check (If Equipped)

Action:

CAUTION:

Prevent injury from unexpected machine movement. Keep bystanders clear of machine.

Run engine at slow idle.

Drive machine in reverse.

sss:

Does back-up alarm sound?

Result:

YES: Go to next check.

NO: Check back-up alarm. See Back-Up Alarm Check . (Group 9015-20.)

NO: Check F1 key switch and accessory fuse. See Fuse Specifications . (Group 9015-10.) Check F3 accessory 25 amp fuse. See Fuse Specifications . (Group 9015-10.) Check K4 accessory relay. See Relay Test . (Group 9015-20.)

NO: See System Functional Schematic for further information. (Group 9015-10.)

(9) Boom Down Drift Check

Action:

→NOTE:

This check may require two people.

→NOTE:

Machine must be equipped with a bucket for this check.

Close cab door if equipped.

Operate hydraulic system until hydraulic oil reaches specification.

Item	Measurement	Specification
Hydraulic Oil	Temperature	43°C 110°F

Actuate boom function to lower boom to ground.

Raise boom half way.

Engage park brake.

Mark and record a distance on the boom cylinder rod from the cylinder barrel.

Disengage park brake.

Allow machine to run at slow idle for 5 minutes.

Engage park brake.

Measure marked distance on boom cylinder rod.

Item	Measurement	Specification
Boom Cylinder	Drift	12.7 mm Maximum
		0.5 in. Maximum

sss:

Does boom drift down more than specification?

Result:

NO: Go to next check.

YES: Continue check.

Action:

Raise boom half way.

Engage park brake.

Turn engine off.

Allow machine to sit for 5 minutes.

Item	Measurement	Specification
Boom Cylinder	Drift	12.7 mm Maximum
		0.5 in. Maximum

sss:

Does boom drift down more than specification?

Result:

YES: Check boom cylinders for leakage. See Cylinder Identification . (CTM120519.)

NO: Check system relief valve. See System Relief Valve Test (S.N. —150522) . See System Relief Valve Test (S.N. 150523—) . (Group 9025-25.)

NO: Check boom up circuit relief valve. See Circuit Relief Valve Test (S.N. —150522) . See Circuit Relief Valve Test (S.N. 150523—) . (Group 9025-25.)

NO: Check boom lift check valve. See Control Valve Disassemble and Assemble (S.N. —150522) . See Control Valve Disassemble and Assemble (S.N. 150523—) . (Group 3160.)

NO: Check control valve for leakage. See Control Valve Disassemble and Assemble (S.N. —150522) . See Control Valve Disassemble and Assemble (S.N. 150523—) . (Group 3160.)

(10) Boom Up Drift Check

Action:

→NOTE:

This check may require two people.

→NOTE:

Machine must be equipped with a bucket for this check.

Close cab door if equipped.

Operate hydraulic system until hydraulic oil reaches specification.

Item	Measurement	Specification
Hydraulic Oil	Temperature	43°C
		110°F

→NOTE:

Bucket may need to be in dump position.

Actuate boom down function to raise front of machine off of the ground.

Engage park brake.

Mark and record a distance on the boom cylinder rod from the cylinder barrel.

Disengage park brake.

Allow machine to run at slow idle for 5 minutes.

Engage park brake.

Measure marked distance on boom cylinder rod.

Item	Measurement	Specification
Boom Circuit	Drift	12.7 mm Maximum
		0.5 in. Maximum

sss:

Does boom drift up more than specification?

Result:

NO: Go to next check.

YES: Continue check.

Action:

Actuate boom down function to raise front of machine off of the ground.

Engage park brake.

Turn engine off.

Allow machine to sit for 5 minutes.

Item	Measurement	Specification
Boom Cylinder	Drift	12.7 mm Maximum
		0.5 in. Maximum

sss:

Does boom drift up more than specification?

Result:

YES: Check boom cylinders for leakage. See Cylinder Identification . (CTM120519.)

NO: Check self-level valve.

NO: Check system relief valve. See System Relief Valve Test (S.N. —150522) . See System Relief Valve Test (S.N. 150523—) . (Group 9025-25.)

NO: Check boom lift check valve. See Control Valve Disassemble and Assemble (S.N. —150522) . See Control Valve Disassemble and Assemble (S.N. 150523—) . (Group 3160.)

NO: Check control valve for leakage. See Control Valve Disassemble and Assemble (S.N. —150522) . See Control Valve Disassemble and Assemble (S.N. 150523—) . (Group 3160.)

(11) Bucket Dump Drift Check

Action:

→NOTE:

This check may require two people.

→NOTE:

Machine must be equipped with a bucket for this check.

Close cab door if equipped.

Operate hydraulic system until hydraulic oil reaches specification.

Item	Measurement	Specification
Hydraulic Oil	Temperature	43°C
		110°F

Raise boom half way.

Fully roll back bucket.

Dump bucket half way.

Engage park brake.

Mark and record a distance on the bucket cylinder rod from the cylinder barrel.

Disengage park brake.

Allow machine to run at slow idle for 5 minutes.

Engage park brake.

Measure marked distance on bucket cylinder rod.

Item	Measurement	Specification
Bucket Circuit	Drift	12.7 mm Maximum
		0.5 in. Maximum

sss:

Does bucket drift down more than specification?

Result:

NO: Go to next check.

YES: Continue check.

Action:

Raise boom half way.

Fully roll back bucket.

Dump bucket half way.

Engage park brake.

Turn engine off.

Allow machine to sit for 5 minutes.

Item	Measurement	Specification
Bucket Cylinder	Drift	12.7 mm Maximum
		0.5 in. Maximum

sss:

Does bucket drift down more than specification?

Result:

YES: Check bucket cylinders for leakage. See Cylinder Identification . (CTM120519.)

NO: Check self-level valve.

NO: Check counterbalance valve. See Counterbalance Valve Test and Adjustment . (Group 9025-25.)

NO: Check system relief valve. See System Relief Valve Test (S.N. —150522) . See System Relief Valve Test (S.N. 150523—) . (Group 9025-25.)

NO: Check bucket rollback circuit relief valve. See Circuit Relief Valve Test (S.N. —150522) . See Circuit Relief Valve Test (S.N. 150523—) . (Group 9025-25.)

NO: Check bucket lift check valve. See Control Valve Disassemble and Assemble (S.N. —150522) . See Control Valve Disassemble and Assemble (S.N. 150523—) . (Group 3160.)

NO: Check control valve for leakage. See Control Valve Disassemble and Assemble (S.N. —150522) . See Control Valve Disassemble and Assemble (S.N. 150523—) . (Group 3160.)

(12) Bucket Rollback Drift Check

Action:

→NOTE:

This check may require two people.

→NOTE:

Machine must be equipped with a bucket for this check.

Close cab door if equipped.

Operate hydraulic system until hydraulic oil reaches specification.

Item	Measurement	Specification
Hydraulic Oil	Temperature	43°C
		110°F

Dump bucket half way.

Actuate boom down function to raise front of machine off of the ground.

Engage park brake.

Mark and record a distance on the bucket cylinder rod from the cylinder barrel.

Disengage park brake.

Allow machine to run at slow idle for 5 minutes.

Engage park brake.

Measure marked distance on bucket cylinder rod.

Item	Measurement	Specification
Bucket Circuit	Drift	12.7 mm Maximum
		0.5 in. Maximum

SSS:

Does bucket drift up more than specification?

Result:

NO: Go to next check.

YES: Continue check.

Action:

Dump bucket half way.

Actuate boom down function to raise front of machine off of the ground.

Engage park brake.

Turn engine off.

Allow machine to sit for 5 minutes.

Item	Measurement	Specification
Bucket Cylinder	Drift	12.7 mm Maximum
		0.5 in. Maximum

SSS:

Does bucket drift up more than specification?

Result:

YES: Check bucket cylinders for leakage. See Cylinder Identification . (CTM120519.)

NO: Check self-level valve.

NO: Check counterbalance valve. See Counterbalance Valve Test and Adjustment . (Group 9025-25.)

NO: Check system relief valve. See System Relief Valve Test (S.N. —150522) . See System Relief Valve Test (S.N. 150523—) . (Group 9025-25.)

NO: Check bucket dump circuit relief valve. See Circuit Relief Valve Test (S.N. —150522) . See Circuit Relief Valve Test (S.N. 150523—) . (Group 9025-25.)

NO: Check bucket lift check valve. See Control Valve Disassemble and Assemble (S.N. —150522) . See Control Valve Disassemble and Assemble (S.N. 150523—) . (Group 3160.)

NO: Check control valve for leakage. See Control Valve Disassemble and Assemble (S.N. —150522) . See Control Valve Disassemble and Assemble (S.N. 150523—) . (Group 3160.)

(13) Auxiliary Hydraulic Override Check

Action:

Close cab door if equipped.

Operate auxiliary hydraulic function.

Unbuckle seat belt and exit machine.

sss:

Does machine shut down?

Return to seat, fasten seat belt and close cab door if equipped.

Restart machine and operate auxiliary hydraulic function.

Press auxiliary hydraulic override switch.

sss:

Does “BYPAS” appear in engagement and monitor unit display?

→NOTE:

Operator must exit machine within 15 seconds of pressing auxiliary hydraulic override switch.

Open cab door and exit machine.

sss:

Does machine continue to operate after operator has exited the machine?

Return to seat, fasten seat belt and close cab door, if equipped.

Disengage auxiliary hydraulics.

sss:

Does engagement and monitor unit exit “BYPAS” mode and return to last run data item?

Result:

YES: Go to next check.

NO: Check auxiliary hydraulic override switch. See Auxiliary Hydraulic Override Switch Check . (Group 9015-20.)

NO: See Engagement and Monitor Unit Circuit Theory of Operation for Auxiliary Hydraulic Override Logic. (Group 9015-15.)

(14) Self-Level Valve Check (If Equipped)

Action:

Close cab door if equipped.

Lower boom to the ground.

Position bottom of bucket on the ground.

Raise boom.

sss:

Does bucket self-level as boom is raised?

Result:

YES: Go to next check.

NO: Check adjustable orifice screw. See Self-Level Valve Operation . (Group 9025-05.)

NO: Check valve removed from self-level valve. See Self-Level Valve Operation . (Group 9025-05.)

(15) Heating and Air Conditioning System Check

Action:

→NOTE:

Engine will need to be at operating temperature for this check.

Run engine at slow idle.

Turn fan speed switch from off to slow, medium and high speeds.

sss:

Does fan speed increase and/or decrease as switch is moved?

Turn fan speed switch to medium speed.

Turn temperature control to hot (red).

sss:

Does warm air come out of air ducts?

Turn temperature control to cold (blue).

sss:

Does cool air come out of air ducts?

Turn on air conditioner.

sss:

Does cold air come out of air duct after a couple of minutes?

Result:

YES: Go to next check.

NO: Blower motor does not operate. Check blower motor 15 amp fuse. See Fuse Specifications . (Group 9015-10.) Check blower motor switch. See Air Conditioner and Heater Blower Motor Switch Check . (Group 9015-20.)

NO: Cab temperature does not change. Check Cab Temperature Control Dial. See Cab Temperature Control Dial Check . (Group 9015-20.) See Diagnose Heater System Malfunctions . (Group 9031-15.)

NO: Air conditioner does not operate. Check Air Conditioner Switch. See Air Conditioner Switch Check . (Group 9015-20.) See Diagnose Air Conditioning System Malfunctions . (Group 9031-15.)

(16) Engine Speed Check

Action:

Set the monitor and engagement unit to display engine RPM.

Run engine at slow idle.

sss:

Does engine run between 1230—1370 RPM?

Run engine at fast idle.

sss:

Does engine run between 2930—3070 RPM?

Result:

YES: Go to next check.

NO: Check engine speed. See Engine Speed Test and Adjustment . (Group 9010-25.)

(17) Cycle Times Check—317

Action:

→NOTE:

Warm hydraulic oil to operating temperature for this check.

Run engine at fast idle.

Record cycle time for each function.

Does machine perform within specification?

Item	Measurement	Specification
Cycle Times		
Boom Raise	Cycle Time	3.0—3.6 sec
Boom Lower	Cycle Time	2.6—3.2 sec
Bucket Rollback	Cycle Time	1.6—2.0 sec
Bucket Dump	Cycle Time	2.3—2.8 sec

Result:

YES: Go to next check.

NO: Check engine speed. Perform Engine Speed Test and Adjustment . (Group 9010-25.) Check hydraulic pump flow. Perform Hydraulic Pump Flow Test . (Group 9025-25.)

(18) Cycle Times Check—320 and CT322

Action:

→NOTE:

Warm hydraulic oil to operating temperature for this check.

Run engine at fast idle.

Record cycle time for each function.

Does machine perform within specification?

Item	Measurement	Specification
Cycle Times		
Boom Raise	Cycle Time	2.7—3.3 sec
Boom Lower	Cycle Time	2.6—3.2 sec
Bucket Rollback	Cycle Time	1.3—1.6 sec
Bucket Dump	Cycle Time	1.9—2.4 sec

Result:

YES: Go to next check.

NO: Check engine speed. Perform Engine Speed Test and Adjustment . (Group 9010-25.) Check hydraulic pump flow. Perform Hydraulic Pump Flow Test . (Group 9025-25.)

Section 9010 - ENGINE

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Group 05 - Theory Of Operation

POWERTECH ™ 2.4 L & 3.0 L (4024 & 5030) John Deere Engines

For more information on John Deere engines and components, see the following Component Technical Manuals.

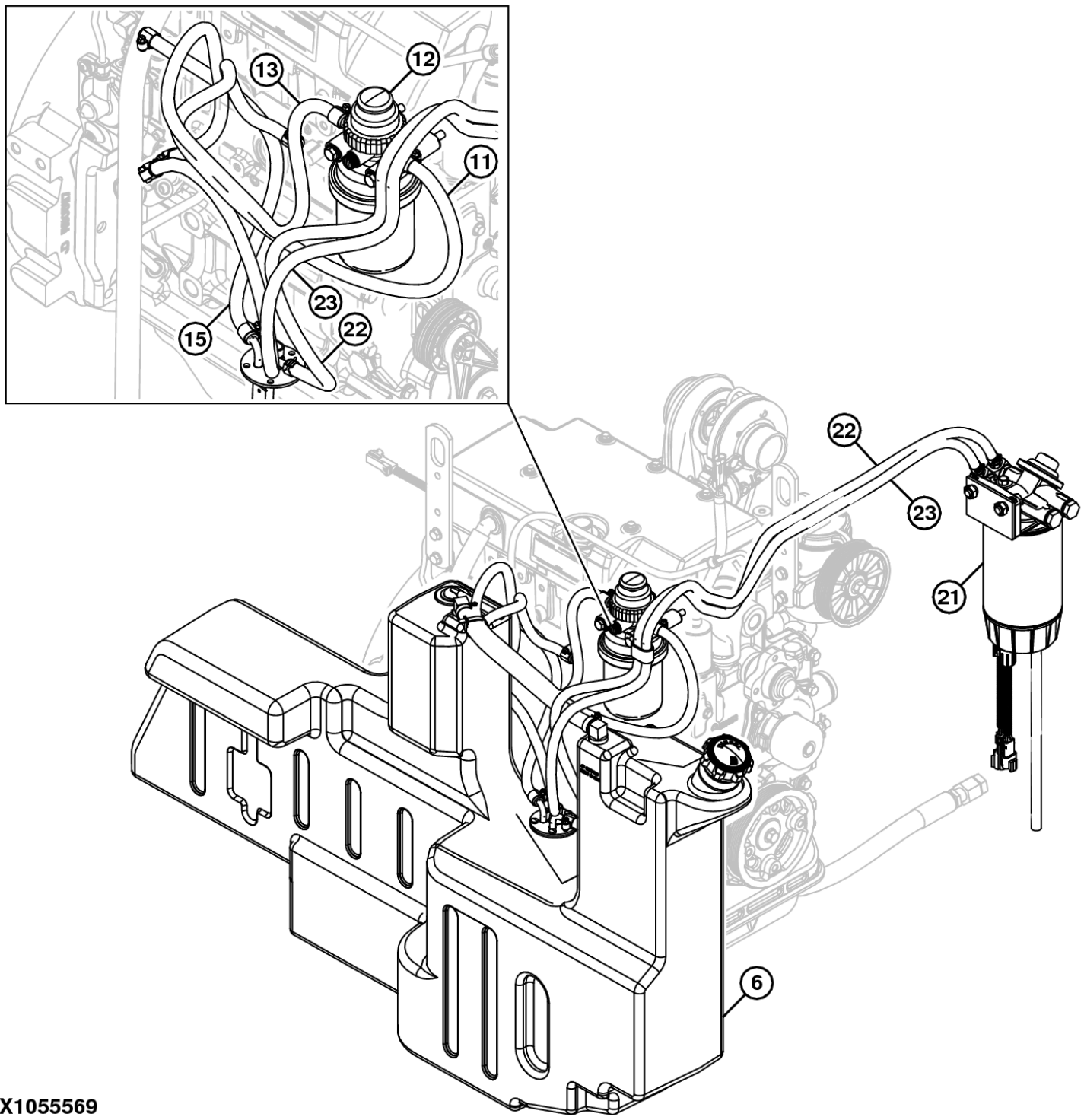
- PowerTech 2.4 L & 3.0 L Diesel Engines (CTM301.)
- Alternators and Starting Motors (CTM77.)

Group 15 - Diagnose Observable Machine Symptoms

2.4 L & 3.0 L Diesel Engine for 317 & 320 Skid Steer Loader and CT322 Compact Track Loader

Symptom	Problem	Solution
Excessive Oil Consumption	Engine Problem	See L1 - Excessive Oil Consumption in Section 4, Group 150 of CTM 301.
Engine Oil Pressure Low	Engine Problem	See L2 - Engine Oil Pressure Low in Section 4, Group 150 of CTM 301.
Engine Oil Pressure High	Engine Problem	See L3 - Engine Oil Pressure High in Section 4, Group 150 of CTM 301.
Engine Coolant Temperature Above Normal	Engine Problem	See C1 - Engine Coolant Temperature Above Normal in Section 4, Group 150 of CTM 301.
Engine Coolant Temperature Below Normal	Engine Problem	See C2 - Engine Coolant Temperature Below Normal in Section 4, Group 150 of CTM 301.
Coolant in Oil or Oil in Coolant	Engine Problem	See C3 - Coolant in Oil or Oil in Coolant in Section 4, Group 150 of CTM 301.
Engine Cranks/Won't Start	Engine Problem	See E1 - Engine Cranks/Won't Start in Section 4, Group 151 of CTM 301.
Engine Misfires/Runs Irregularly	Engine Problem	See E2 - Engine Misfires/Runs Irregularly in Section 4, Group 151 of CTM 301.
Engine Does Not Develop Full Power	Engine Problem	See E3 - Engine Does Not Develop Full Power in Section 4, Group 151 of CTM 301.
Engine Emits Excessive White Exhaust Smoke	Engine Problem	See E4 - Engine Emits Excessive White Exhaust Smoke in Section 4, Group 151 of CTM 301.
Engine Emits Excessive Black or Gray Exhaust Smoke	Engine Problem	See E5 - Engine Emits Excessive Black or Gray Exhaust Smoke in Section 4, Group 151 of CTM 301.
Engine Will Not Crank	Engine Problem	See E6 - Engine Will Not Crank in Section 4, Group 151 of CTM 301.
Engine Idles Poorly	Engine Problem	See E7 - Engine Idles Poorly in Section 4, Group 151 of CTM 301.
Abnormal Engine Noise	Engine Problem	See E8 - Abnormal Engine Noise in Section 4, Group 151 of CTM 301.
Excessive Fuel Consumption	Engine Problem	See F2 - Excessive Fuel Consumption in Section 4, Group 151 of CTM 301.
Fuel in Oil	Engine Problem	See F3 - Fuel in Oil in Section 4, Group 151 of CTM 301.

Engine Fuel System Component Location



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Engine Fuel System Component Location—317 and 320 Shown

LEGEND:

6	Fuel Tank
11	Fuel Transfer Pump-to-Fuel Water Separator Filter Hose
12	Fuel Water Separator Filter
13	Fuel Water Separator Filter-to-Fuel Rack Hose
15	Fuel Rack-to-Fuel Tank Hose
21	Auxiliary Water Separator Fuel Filter—If Equipped
22	Fuel Transfer Pump-to-Auxiliary Water Separator Fuel Filter Hose—If Equipped
23	Auxiliary Water Separator Fuel Filter-to-Fuel Tank Hose—If Equipped

Group 25 - Tests

Engine Speed Test and Adjustment

Specifications

SPECIFICATIONS	
Engine—Slow Idle Speed	1230—1370 rpm
Engine—Fast Idle Speed	2930—3070 rpm

[1] - Park machine on a flat level surface.

[2] - Run machine until engine reaches operating temperature.

[3] - Run machine at slow idle and record engine rpm from engagement and monitor unit display. Check measurement against specification.

Item	Measurement	Specification
Engine—Slow Idle	Speed	1230—1370 rpm

[4] - Repeat procedure for fast idle. Check measurement against specification.

Item	Measurement	Specification
Engine—Fast Idle	Speed	2930—3070 rpm

→NOTE:

Engine will pull down to 2800 rpm under load at fast idle. This is the rated rpm of the machine and is where the machine makes full power.

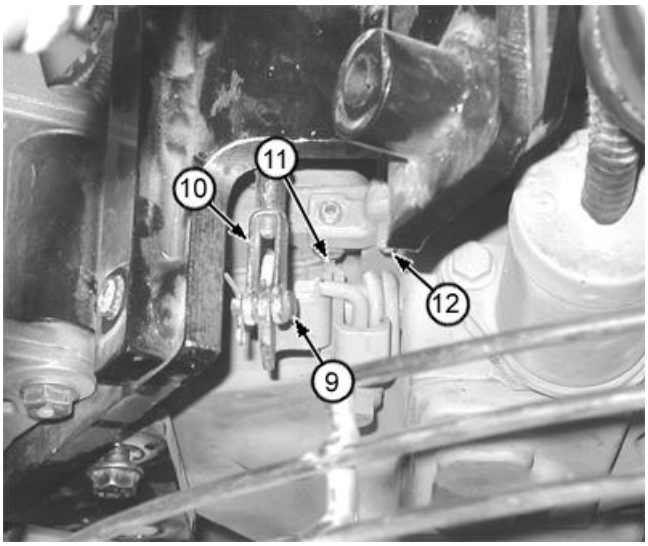
[5] - If engine speed does not meet specification, check adjustment of engine speed control linkage. If engine meets specification, but will not maintain engine speed, tighten engine speed control lever pivot cap screw.

[6] - Raise boom and engage boom lock.

[7] - Raise engine cover and remove side shields.

[8] - Remove air conditioner compressor from bracket (if equipped) and move aside. See Air Conditioner Compressor Remove and Install . (Group 1830.)

[9] -



LEGEND:

9	Pin
10	Clevis
11	Slow Idle Speed Stop Screw
12	Fast Idle Speed Stop Screw

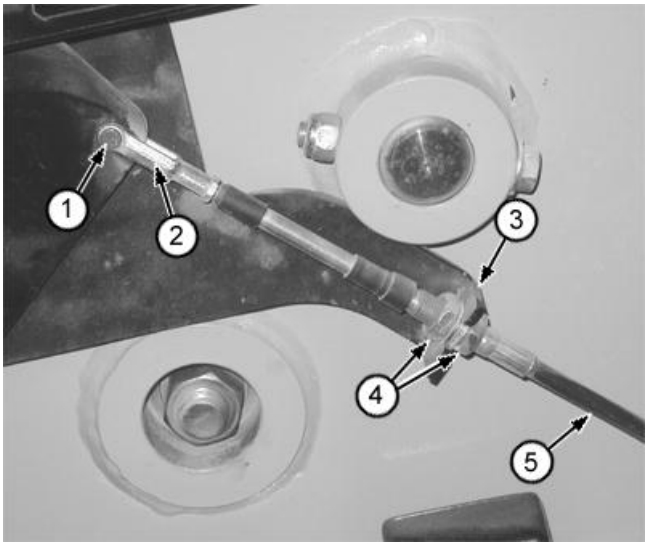
Engine Governor

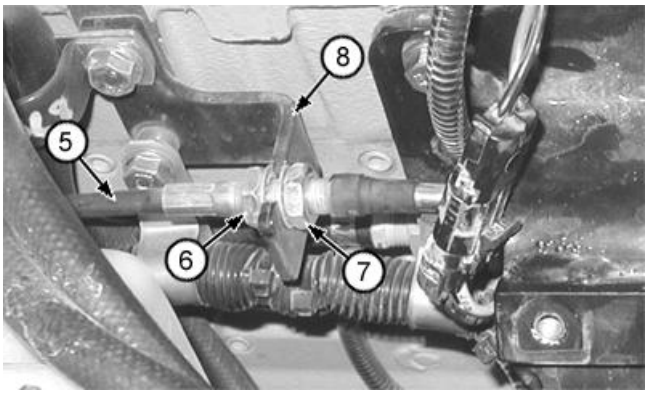
Move engine speed control lever to slow and fast idle. Make sure governor control lever makes contact with both the fast (12) and slow (11) idle speed stop screws. If governor control lever does not make contact with stop screws, adjust engine speed control linkage.

[10] -

IMPORTANT:

DO NOT adjust slow and fast idle speed stop screws. Idle speed stop screws are set at the factory.





LEGEND:

1	Pin
2	Clevis
3	Bracket
4	Nut (2 used)
5	Engine Speed Control Cable
6	Nut
7	Nut
8	Bracket

Engine Speed Control Cable

Loosen nuts (4, 6, and 7) and adjust cable until governor control lever makes contact with the fast (12) and slow (11) idle speed stop screws.

[11] - Verify slow and fast idle speeds on the engagement and monitor unit.

[12] - Install side shields, close engine cover, and lower boom to ground position.

Engine Power Test Using Turbocharger Boost Pressure

Specifications

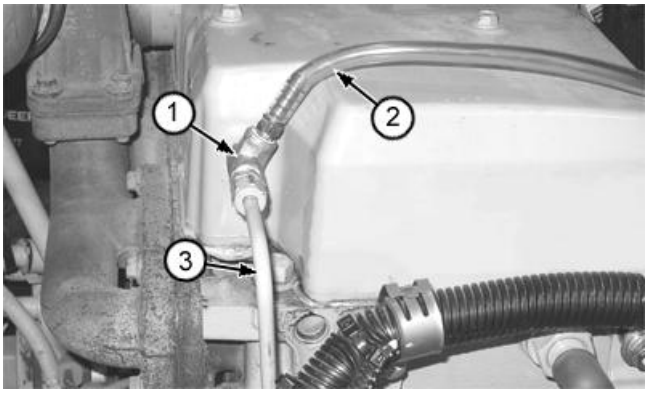
SPECIFICATIONS	
Engine Coolant Temperature	88—94°C
Engine Coolant	190—200°F
Engine—Fast Idle Speed	2930—3070 rpm
Engine—Rated Speed	2800 rpm
317 Turbocharger Boost Pressure	110 kPa at 2800 rpm 1.10 bar at 2800 rpm 16 psi at 2800 rpm
320/CT322 Turbocharger Boost Pressure	121 kPa at 2800 rpm 1.21 bar at 2800 rpm 17 psi at 2800 rpm

This procedure should only be used as a guide to determine engine condition.

[1] - Raise and block machine. For skid steer loader, see Raising and Blocking Machine . (Operator's Manual.) For compact track loader, see Raising and Blocking Machine . (Operator's Manual.)

[2] - Raise cab. For skid steer loader, see Raising Operator's Station . (Operator's Manual.) For compact track loader, see Raising Operator's Station . (Operator's Manual.)

[3] -



LEGEND:
1 Tee Fitting
2 Manifold Pressure Gauge Hose
3 Aneroid Line

Manifold Pressure Test Connection

Remove aneroid line (3) from engine rocker arm cover and install tee fitting (1).

[4] - Connect hose (2) from JDE147 Manifold Pressure Test Kit or KFM10002 Universal Pressure Test Kit to tee fitting. Route the hose and gauge in to cab so that hose is not pinched when cab is lowered.

[5] - Lower cab.

[6] -

IMPORTANT:

Engine must be at operating temperature to develop full power.

Before checking turbo boost pressure, warm up engine to allow the lubricating oil to reach operating temperature.

Item	Measurement	Specification
Engine Coolant	Temperature	88—94°C
		190—200°F

[7] - Run engine at specification and set the engagement and monitor unit to display engine RPM. See Engagement and Monitor Unit Operation . (Group 9015-20.)

Item	Measurement	Specification
Engine—Fast Idle	Speed	2930—3070 rpm

[8] -

IMPORTANT:

Extreme movement of steering levers may cause engine to stall while trying to overcome park brake.

Apply park brake and gradually push steering levers forward. Pull engine down to rated RPM.

Item	Measurement	Specification
Engine—Rated	Speed	2800 rpm

[9] - Repeat procedure three times and record highest pressure reading. Compare results with specification.

Item	Measurement	Specification
317 Turbocharger Boost	Pressure	110 kPa at 2800 rpm
		1.10 bar at 2800 rpm
		16 psi at 2800 rpm
320/CT322 Turbocharger Boost	Pressure	121 kPa at 2800 rpm
		1.21 bar at 2800 rpm
		17 psi at 2800 rpm

→NOTE:

Reduce boost pressure specification by 7% if No. 1 fuel is used.

[10] - Check the following if turbocharger boost pressure is low:

- Incorrect fuel
- Restricted air cleaner element
- Restricted fuel filter element
- Incorrect fast idle adjustment
- Exhaust manifold leaks
- Low compression pressure
- Cam lobe wear (valve clearance)
- Carbon build-up in turbocharger
- Faulty injectors
- Turbocharger compressor or turbine wheel rubbing housing

Section 9015 - ELECTRICAL SYSTEM

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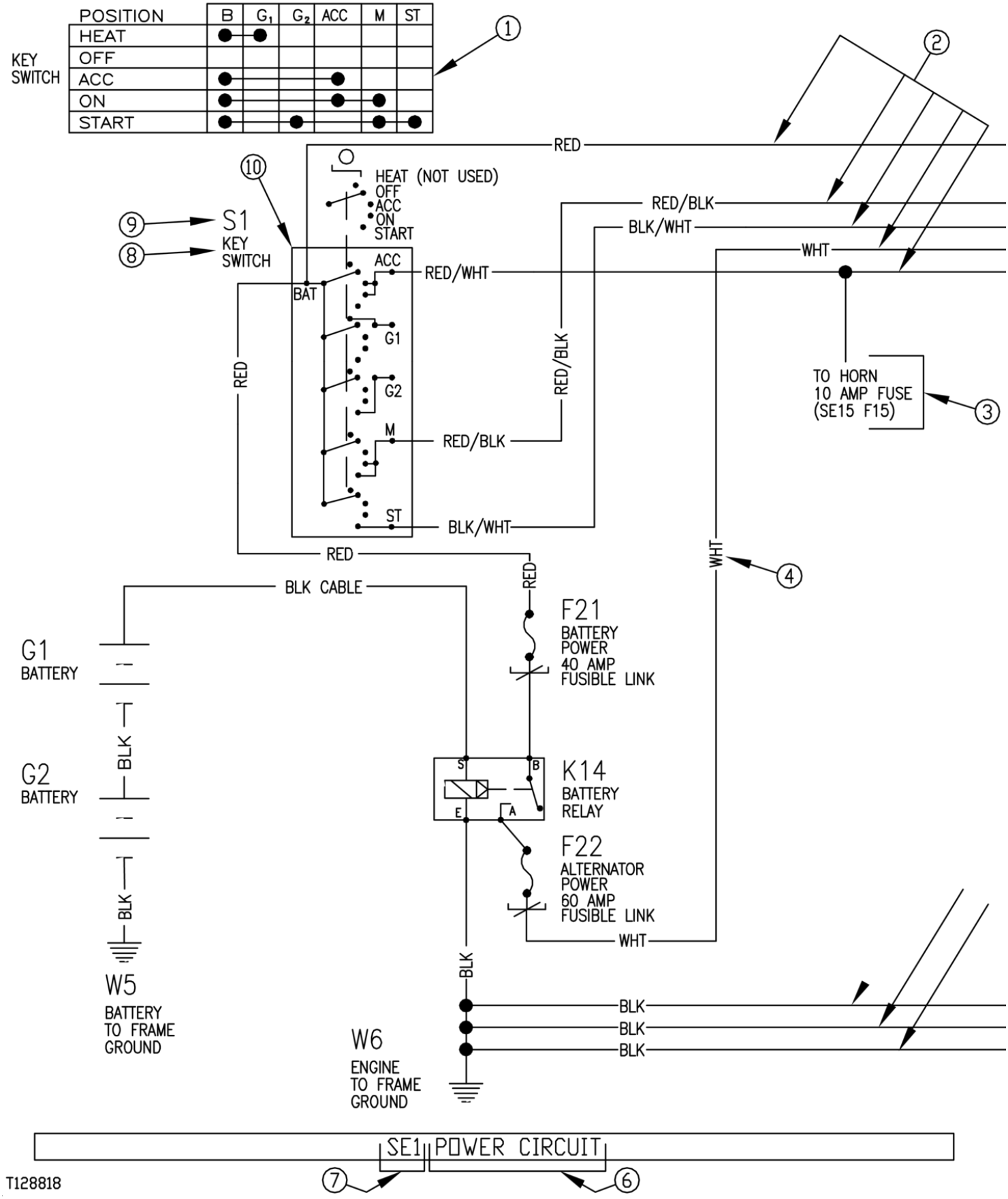
Group 05 - System Information

Electrical Diagram Information

→NOTE:

All System Functional Schematics, Circuit Schematics, and Wiring Diagrams are shown with key switch in the off position.

System Functional Schematic Diagram



System Functional Schematic Example

LEGEND:

1	Continuity Chart
2	Power Wires
3	Routing Location Information
4	Wire Identification
5	Ground Wires
6	Circuit Name

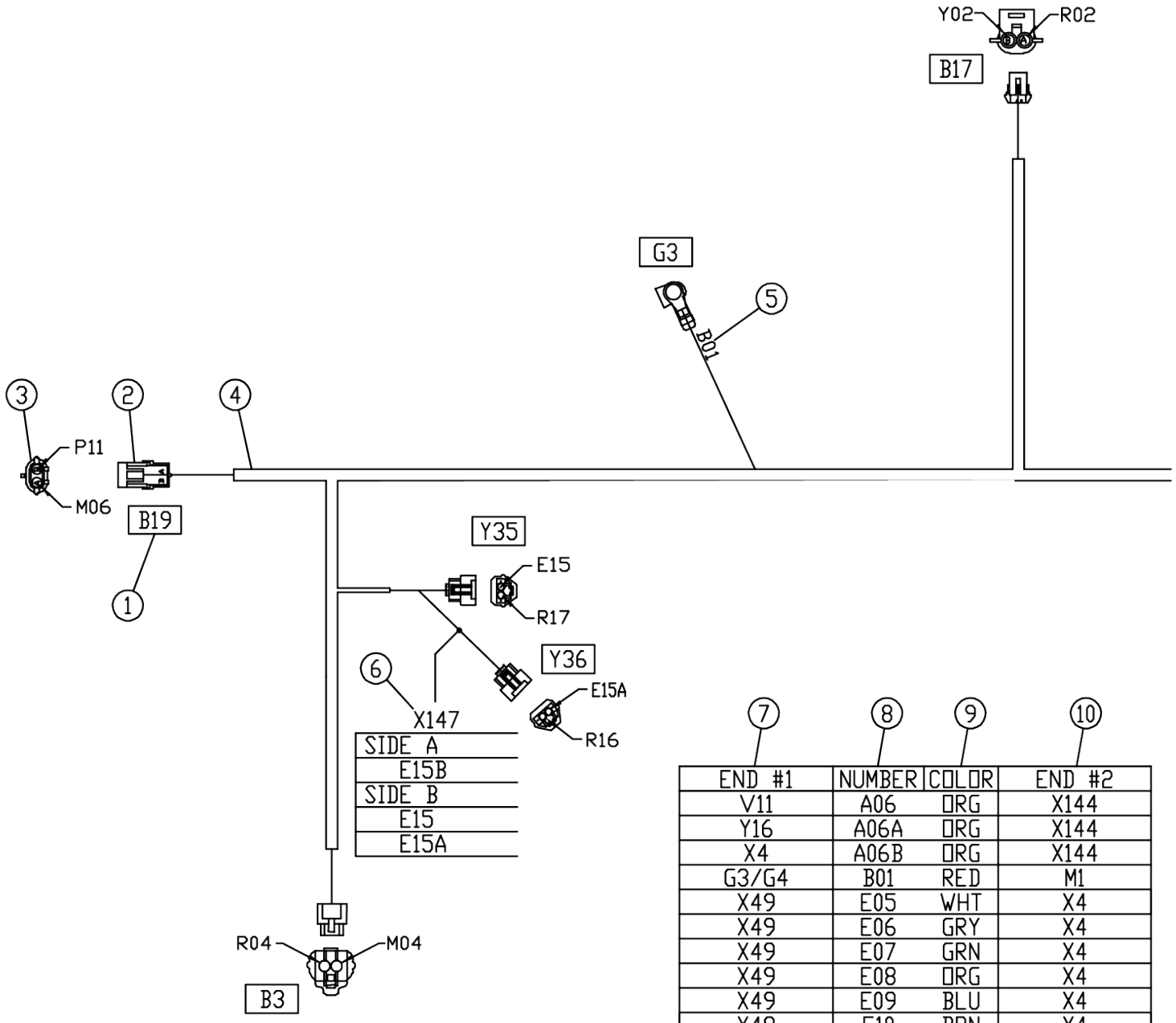
7	Section Number
8	Component Name
9	Component Identification Number
10	Component Schematic Symbol

The System Functional Schematic is made up of sections which contain one or more Subsystem Functional Schematics laid out side by side in a logical sequence of related functions. Each subsystem is a major group of components like starting components or charging components. Each section of the System Functional Schematic is assigned a number (7) and a name (6) that reflects a group of components. The System Functional Schematic is formatted with power supply wires (2) shown across the top of the drawing and ground wires (5) across the bottom. The schematic contains no harness or connector information.

Each electrical component is shown by a schematic symbol (10), the component name (8), and a component identification number (9). A component identification number and name will remain the same throughout the Operation and Test Technical Manual. This will allow for easy cross-referencing of all electrical drawings (Schematics, Wiring Diagrams, and Component Location). A continuity chart (1) is included for each multi-terminal switch.

Routing location information (3) is presented to let the reader know when a wire is connected to a component in another section. TO and FROM statements identify when power is going “To” or coming “From” a component in a different location. The section and component number are given in parenthesis at the bottom of the statement. In the example, power is going TO component F15 Horn Fuse, in section SE15.

Wiring Diagram



7 END #1	8 NUMBER	9 COLOR	10 END #2
V11	A06	ORG	X144
Y16	A06A	ORG	X144
X4	A06B	ORG	X144
G3/G4	B01	RED	M1
X49	E05	WHT	X4
X49	E06	GRY	X4
X49	E07	GRN	X4
X49	E08	ORG	X4
X49	E09	BLU	X4
X49	E10	BRN	X4
X38	E13	WHT	X4
Y35	E15	RED	X147
Y36	E15A	RED	X147
X4	E15B	RED	X147
G3/G4	G03	BLK	W27
W27	G03A	BLK	X148
V11	G03B	BLK	X148
Y16	G03C	BLK	X148
X145	G03D	BLK	W27
X37	H13	GRN	X4
G3/G4	J08	TAN	X4
B4	M03	PUR	X4
B3	M04	PUR	X4
B19	M06	PUR	X4
B23	N02	YEL	X4

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Wiring Diagram Example

LEGEND:

1	Component Identification Number
2	Connector
3	Connector End View
4	Wire Harness
5	Wire Number
6	Wire Splice

7	Wire End #1 Termination Location
8	Wire Number
9	Wire Color
10	Wire End #2 Termination Location

Each harness on the machine is drawn showing connectors, wires, and splices. A “W” component identification number identifies harnesses. (W6, Etc.) The harness is drawn showing spatial arrangement of components and branches.

A component identification or connector number (1) identifies each component. The harness branch (4) is terminated by a top or side view of the connector (2). If more than one wire is supplied to the connector, a harness side connector end view (3) is provided. Each wire number is labeled for the appropriate pin. If only one wire is supplied to the connector, the wire number (5) is indicated.

An “X” component identification number of 100 or higher identifies splices (6). Each splice lists side A wires and side B wires to differentiate the side of the harness that the wires come from.

A wire legend is provided for each harness. A component identification number is listed in the “END #1” column (7) to indicate the termination location of one end of a wire. In the center, the wire number (8) and wire color (9) are listed. A component identification number in the “END #2” column (10) identifies the opposite end of the wire.

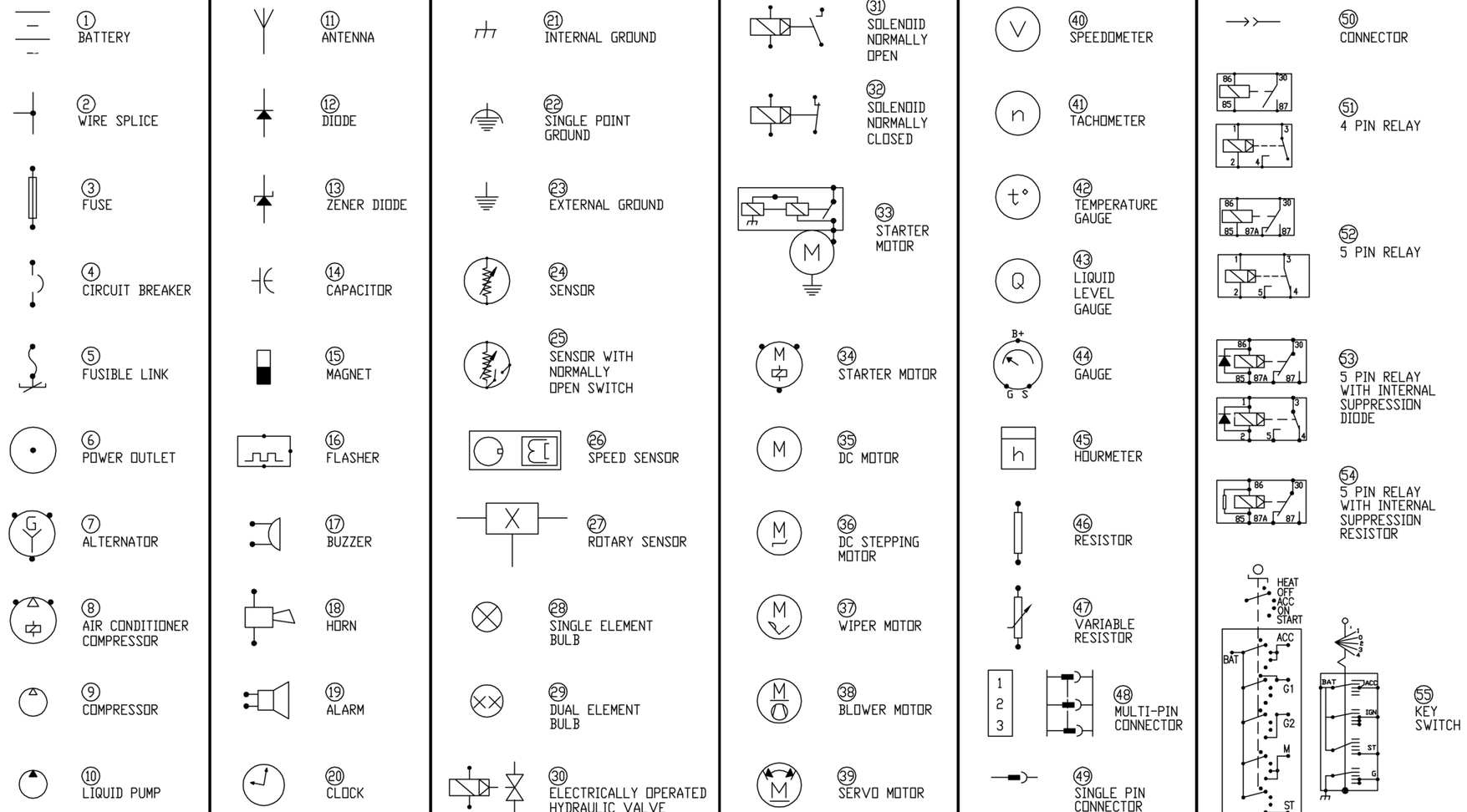
Component Location Diagram

The Component Location Diagram is a pictorial view by harness showing location of all electrical components, connectors, harness main ground locations and harness band and clamp location. Each component will be identified by the same identification letter/number and description used in the System Functional Schematic Diagram.

Connector End View Diagram—If Provided

The Connector End View Diagram is a pictorial end view of the component connectors showing the number of pins in the connector and the wire color and identifier of the wire in every connector. Each component will be identified by the same identification letter/number and description used in the System Functional Schematic Diagram.

Electrical Schematic Symbols



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Electrical Schematic Symbols

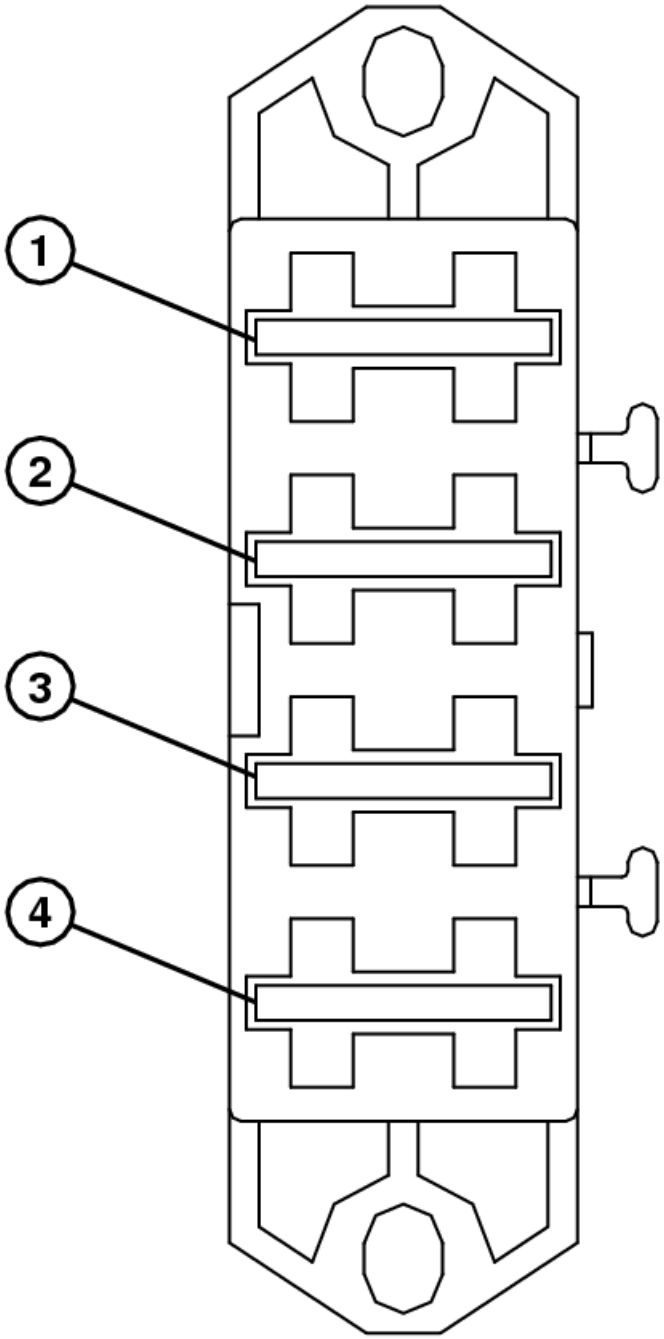
LEGEND:

1	Battery
2	Wire Splice
3	Fuse
4	Circuit Breaker
5	Fusible Link
6	Power Outlet
7	Alternator
8	Air Conditioner Compressor
9	Compressor
10	Liquid Pump
11	Antenna
12	Diode
13	Zener Diode
14	Capacitor
15	Magnet
16	Flasher
17	Buzzer
18	Horn
19	Alarm
20	Clock
21	Internal Ground
22	Single Point Ground
23	External Ground
24	Sensor
25	Sensor with Normally Open Switch
26	Speed Sensor
27	Rotary Sensor
28	Single Element Bulb
29	Dual Element Bulb
30	Electrically Operated hydraulic Valve
31	Solenoid Normally Open
32	Solenoid Normally Closed
33	Starter Motor
34	Starter Motor
35	DC Motor
36	DC Stepping Motor
37	Wiper Motor
38	Blower Motor
39	Servo Motor
40	Speedometer
41	Tachometer
42	Temperature Gauge
43	Liquid Level Gauge
44	Gauge
45	Hour Meter
46	Resistor
47	Variable Resistor
48	Multi-Pin Connector
49	Single Pin Connector
50	Connector
51	4 Pin Relay
52	5 Pin Relay
53	5 Pin Relay With Internal Suppression Diode
54	5 Pin Relay With Internal Suppression Resistor
55	Key Switch
56	Temperature Switch Normally Open
57	Temperature Switch Normally Closed
58	Pressure Switch Normally Open
59	Pressure Switch Normally Closed
60	Liquid Level Switch Normally Open
61	Liquid Level Switch Normally Closed
62	Momentary Switch Normally Open
63	Momentary Switch Normally Closed
64	Toggle Switch Normally Open
65	Toggle Switch Normally Closed
66	2 Way Toggle Switch Normally Open

Group 10 - System Diagrams

Fuse Specifications

The fuses are located behind a panel on the right side of the cab.



Fuse Layout

LEGEND:

1	F1 Key Switch and Accessory 15 Amp Fuse (S.N. —172788)
1	F1 Key Switch and Accessory 20 Amp Fuse (S.N. 172789—)
2	F2 Monitor 15 Amp Fuse
3	F3 Accessory 25 Amp Fuse
4	F4 Lights 20 Amp Fuse

F5 Glow Plug 80 Amp Fuse is located underneath the cab on the engine in the engine harness. See Engine Harness (W1) Component Location for location of F5 Glow Plug 80 Amp Fuse. (Group 9015-10.)

F6 Blower Motor 15 Amp Fuse is located by the blower motor under the air conditioner and heater cover. See Air Conditioner and Heater Harness (W7) Component Location for location of F6 Blower Motor 15 Amp Fuse. (Group 9015-10.)

F12 Electric Quik-Tatch 30 Amp Fuse is located behind a panel on right side of cab. See Electric Quik-Tatch (W28) Component Location . (Group 9015-10.)

F13 Fuel Heater 15 Amp Fuse is located behind a panel on right side of cab. See Water-in-Fuel Sensor Harness (W38) Component Location . (Group 9015-10.)

F15 Helper Fan 25 Amp Fuse is located in Helper Fan Control Harness near the starter. See Helper Fan Control and Tee Harness (W29 and W30) Component Location . (Group 9015-10.)

System Functional Schematic, Wiring Diagram, and Component Location Master Legend

→NOTE:

A1—Radio (SE10)(W1)

- **A1 indicates component identification number.**
- **Radio indicates component name.**
- **SE10 indicates section number of SYSTEM FUNCTIONAL SCHEMATIC where component is located.**
- **W1 indicates HARNESS WIRING DIAGRAM and HARNESS COMPONENT LOCATION drawings where component is located.**

- A2 — Engagement and Monitor Unit (SE4)(W2 or W12)
- B1 — Air Filter Restriction Switch (SE4)(W1)
- B2 — Hydraulic Oil Temperature Sensor (SE4)(W1)
- B3 — Hydraulic Oil Filter Restriction Switch (SE4)(W1)
- B4 — Fuel Level Sensor (SE4)(W1)
- B5 — Engine Coolant Temperature Sensor (SE4)(W1)
- B6 — Engine Oil Pressure Switch (SE4)(W1)
- B9 — Air Conditioner High/Low Pressure Switch (SE11)(W7)
- B10 — Air Conditioner Freeze Control Switch (SE11)(W7)
- B11 — Auxiliary Hydraulic Spool Neutral Switch (SE4)(W3 or W13 , W16 or W17)
- B18 — Water-in-Fuel Sensor—If Equipped (SE12)(W38)
- B19 — Fuel Heater Temperature Switch—If Equipped (SE12)(W38)
- E1 — Left Front Work Light (SE5)(W2 or W12)
- E2 — Right Front Work Light (SE6)(W2 or W12)
- E3 — Left Tail Light (SE6)(W2 or W12)
- E4 — Right Tail Light (SE6)(W2 or W12)
- E5 — Rear Work Light (SE6)(W2 or W12)
- E6 — Left Front Flasher Light (SE8)(W5 or W12)
- E7 — Right Front Flasher Light (SE8)(W5 or W12)
- E8 — Beacon (SE12)(W10 or W37)
- E9 — Dome Light (SE10)(W2)
- E10 — License Plate Light—If Equipped (SE6)(W39)
- E11 — Water-in-Fuel Indicator—If Equipped (SE12)(W37)
- F1 — Key Switch and Accessory 15 Amp Fuse (S.N. —172788) (SE1)(W1)
- F1 — Key Switch and Accessory 20 Amp Fuse (S.N. 172789—) (SE1)(W1)
- F2 — Monitor 15 Amp Fuse (SE1)(W1)
- F3 — Accessory 25 Amp Fuse (SE5)(W1)
- F4 — Lights 20 Amp Fuse (SE5)(W1)
- F5 — Glow Plug 80 Amp Fuse (SE1)(W1)
- F6 — Blower Motor 15 Amp Fuse (SE11)(W7)
- F7 — 12 Volt Auxiliary Power Harness 10 Amp Fuse (W9)
- F8 — 8-Button Controller Harness 10 Amp Fuse (W15)
- F9 — Dome Light and Accessory Power Socket 10 Amp Fuse (SE10)(W2)
- F12 — Electric Quik-Tatch Harness 30 Amp Fuse (S.N. 131877—) (W28)
- F13 — Fuel Heater 15 Amp Fuse (SE12)(W38)
- F15 — Helper Fan 25 Amp Fuse (SE1) (W29)
- G1 — Battery (SE1)
- G2 — Alternator (SE3)(W1)
- G3 — 12 Volt Auxiliary Power Outlet (W9)
- H2 — Back-Up Alarm (SE10)(W4)
- H3 — Horn (SE10)(W6)
- H4 — Engagement and Monitor Unit Warning Alarm (SE4)(W2 or W12)
- K1 — Starter Relay (SE1)(W1)
- K2 — Glow Plug Relay (SE2)(W1)
- K4 — Accessory Relay (SE5)(W1)
- K5 — Dual Flasher Relay (SE8)(W5 or W12)
- K6 — High Flow Relay (SE8)(W12)

- K7 — Air Conditioner Compressor Clutch Relay (SE11)(W7)
- K10 — Auto Shutdown Relay (SE2)(W1)
- K13 — Electric Quik-Tatch Relay (S.N. 131877—) (W28)
- K14 — Electric Quik-Tatch Relay (S.N. 131877—) (W28)
- K15 — Helper Fan Relay (SE10) (W29)
- K16 — Fuel Heater Relay—If Equipped (SE12)(W38)
- M1 — Starter Motor (SE1)(W1)
- M3 — Air Conditioner and Heater Blower Motor (SE11)(W7)
- M4 — Windshield Wiper Motor (SE7)(W8 or W12)
- M5 — Windshield Washer Motor (SE7)(W1)
- M6 — Heater Control Valve Actuator (SE11)(W7)
- M10 — Electric Quik-Tatch Motor (S.N. 131877—) (W28)
- M11 — Helper Fan Motor (SE10) (W29)
- R3 — Cab Temperature Control Dial (SE11)(W12)
- R4 — Blower Motor Resistor Block (SE11)(W7)
- R5 — Glow Plugs (SE2)(W1)
- R10 — Fuel Heater—If Equipped (SE12)(W38)
- S1 — Key Switch (SE1)(W2 or W12)
- S2 — Park Brake Switch (SE1)(W2 or W12)
- S4 — Seat Switch (SE3)(W2 or W12)
- S5 — Seat Belt Switch (SE3)(W2 or W12)
- S6 — Work Lights Switch (SE5)(W2 or W12)
- S7 — Dual Flasher Switch (SE8)(W5 or W12)
- S8 — High Flow Switch (SE8)(W12)
- S9 — Air Conditioner and Heater Blower Motor Switch (SE10)(W12)
- S10 — Left Reverse Switch (SE10)(W4)
- S11 — Right Reverse Switch (SE10)(W4)
- S12 — Windshield Wiper and Washer Switch (SE6)(W8 or W12)
- S13 — Cab Door Switch (SE3)(W2 or W12)
- S14 — Two Speed Switch (SE4)(W13 or W17)
- S17 — Horn Switch (SE10)(W6)
- S19 — Air Conditioner Switch (SE11)(W12)
- S20 — Hydraulic Quik-Tatch Switch (S.N. —131876) (SE9)(W12)
- S21 — Auxiliary Hydraulic Override Switch (SE5)(W2 or W12)
- S22 — Right 12 Volt Power Switch (W9)
- S23 — Left 12 Volt Power Switch (W9)
- S24 — Dome Light Switch (SE10)(W2)
- S26 — Electric Quik-Tatch Switch (S.N. 131877—) W28)
- V5 — Alternator Diode (SE3)(W1)
- V6 — Right 12 Volt Power Switch Diode (W9)
- V7 — Left 12 Volt Power Switch Diode (W9)
- V8 — 8-Button Controller Suppression Diode 1 (W15)
- V9 — 8-Button Controller Suppression Diode 2 (W15)
- V10 — 8-Button Controller Suppression Diode Block (W15)
- W1 — Engine Harness (W1)
- W2 — Cab Harness—Standard (W2)
- W3 — Front Chassis Harness—Standard (W3)
- W4 — Back-Up Alarm Harness (W4)
- W5 — Dual Flasher Harness (W5)
- W6 — Horn Harness (W6)
- W7 — Air Conditioner and Heater Harness (W7)
- W8 — Wiper Harness (W8)
- W9 — 12 Volt Auxiliary Power Harness (W9)
- W10 — Beacon Harness (W10)
- W12 — Cab Harness—Deluxe (W12)
- W13 — Front Chassis Harness—Deluxe (W13)
- W15 — 8-Button Controller Harness (W15)
- W18 — Operator Convenience Package Harness (S.N. —170536) (W18)
- W19 — Operator Convenience Package Harness (W19)
- W20 — Battery to Frame Ground
- W21 — Alternator Ground (W1)

- W22 — Hydraulic Oil Filter Housing Ground (W1)
- W23 — Engine Harness to Frame Ground (W1)
- W24 — Solenoid Ground (W1)
- W25 — Cab Harness Ground (W2 or W12)
- W28 — Electric Quik-Tatch Harness (S.N. 131877—) (W28)
- W29 — Helper Fan Control Harness
- W30 — Helper Fan Tee Harness
- X1 — Cab Harness to Engine Harness 5-Pin Connector (W1 , W2 or W12)
- X2 — Cab Harness to Engine Harness 12-Pin Connector (W1 , W2 or W12)
- X3 — Cab Harness to Engine Harness 12-Pin Connector (W1 , W2 or W12)
- X4 — Cab Harness to Front Chassis Harness 6-Pin Connector (W12 , W13 or W17)
- X5 — Engine Harness to Front Chassis Harness 8-Pin Connector (W1 , W3 or W13 , W16 or W17)
- X6 — Cab Harness to Engagement and Monitor Unit 16-Pin Connector (J1) (W2 or W12)
- X7 — Cab Harness to Engagement and Monitor Unit 14-Pin Connector (J2) (W2 or W12)
- X8 — Cab Harness to Air Conditioner and Heater Harness 3-Pin Connector (W7 , W12)
- X9 — Cab Harness to Air Conditioner and Heater Harness 6-Pin Connector (W7 , W12)
- X10 — Remote Start Box Connector (W1)
- X11 — Engine Harness Accessory Power Connector (W1)
- X12 — Cab Harness Accessory Power Connector (SE12)(W2 or W12)
- X12A — Cab Harness Accessory Power Connector A (SE12)(W5 , W8 , W10 , W37)
- X12B — Cab Harness Accessory Power Connector B (SE12)(W5 , W8 , W10 , W37)
- X15 — 8-Button Controller Harness to Attachment 14-Pin Connector (W15)
- X16 — 8-Button Controller Harness to 8-Button Controller 6-Pin Connector (W15)
- X17 — 8-Button Controller Harness to 8-Button Controller 2-Pin Connector (W15)
- X18 — Cab Switch Connector (SE3)
- X19 — Park Brake Signal Connector (W16 or W17)
- X20 — Operator Convenience Package Power 2-Pin Connector (W2)
- X21 — Dome Light With F9 Fuse 2-Pin Connector (SE10)(W2)
- X22 — 12-Volt Accessory Power Socket (SE10)(W2)
- X30 — Electric Quik-Tatch Motor 2-Pin Connector (S.N. 131877—) (W28)
- X32 — Electric Quik-Tatch 1-Pin Connector (S.N. 131877—) (W28)
- X33 — Electric Quik-Tatch 1-Pin Connector (S.N. 131877—) (W28)
- X34 — Electric Quik-Tatch Power From Battery Connector (S.N. 131877—) (W28)
- X35 — Electric Quik-Tatch Ground to Frame Connector (S.N. 131877—) (W28)
- X36 — Electric Quik-Tatch 4-Pin Connector (S.N. 131877—) (W13 or W17 , W28)
- X37 — Helper Fan Harness to Helper Fan Tee Harness 1-Pin Connector (W29 and W30)
- X38 — Helper Fan Tee Harness to Air Conditioning Harness 1-Pin Connector (W29)
- X39 — Helper Fan Tee Harness to B10 1-Pin Connector (W29)
- X55 — Cab Connector—If Equipped (SE12)(W37 or W38)
- X100 — Splice (W3 or W13 , W16 or W17)
- X101 — Splice (W3 or W13 , W16 or W17)
- X102 — Splice (W13 or W17)
- X103 — Splice (W4)
- X104 — Splice (W4)
- X105 — Splice (W2 or W12)
- X106 — Splice (W2 or W12)
- X107 — Splice (W2 or W12)
- X108 — Splice (W2 or W12)
- X109 — Splice (W2 or W12)
- X110 — Splice (W2 or W12)
- X111 — Splice (W2 or W12)
- X112 — Splice (W12)
- X113 — Splice (W12)
- X114 — Splice (W12)
- X115 — Splice (W12)
- X116 — Splice (W1)
- X117 — Splice (W1)
- X118 — Splice (W1)
- X119 — Splice (W1)
- X120 — Splice (W1)
- X121 — Splice (W1)

- X122 — Splice (W1)
- X123 — Splice (W1)
- X124 — Splice (W1)
- X125 — Splice (W1)
- X126 — Splice (W1)
- X127 — Splice (W6)
- X128 — Splice (W6)
- X129 — Splice (W5)
- X130 — Splice (W8)
- X131 — Splice (W8)
- X132 — Splice (W10)
- X133 — Splice (W10)
- X134 — Splice (W9)
- X135 — Splice (W9)
- X136 — Splice (W9)
- X137 — Splice (W9)
- X138 — Splice (W9)
- X139 — Splice (W15)
- X140 — Splice (W15)
- X141 — Splice (W15)
- X142 — Splice (W15)
- X143 — Splice (W15)
- X144 — Splice (W15)
- X145 — Splice (W15)
- X146 — Splice (W15)
- X147 — Splice (W15)
- X148 — Splice (W1)
- X149 — Splice (SE6 , W2 or W12)
- X240 — G02 BLK Splice (W37)
- X241 — P02 RED Splice (W37)
- X242 — P02 RED Splice (W38)
- X243 — G02 BLK Splice (W38)
- Y1 — Fuel Shut-Off Solenoid (SE2)(W1)
- Y2 — Boom Spool Lock Solenoid (SE3)(W3 or W13 , W16 or W17)
- Y3 — Bucket Spool Lock Solenoid (SE3)(W3 , W13 , W16 , or W17)
- Y4 — Port Lock Solenoid (SE3)(W3 or W13 , W16 or W17)
- Y5 — Park Brake Solenoid (SE3)(W1 , W16 or W17)
- Y6 — Two Speed Solenoid (SE5)(W13 or W17)
- Y7 — High Flow Solenoid (SE8)(W13 or W17)
- Y11 — Hydraulic Quik-Tatch Lock Solenoid (S.N. —131876)(SE9)(W13 or W17)
- Y12 — Hydraulic Quik-Tatch Unlock Solenoid (S.N. —131876)(SE9)(W13 or W17)
- Y13 — Air Conditioner Compressor Clutch (SE11)(W1)

System Functional Schematic and Section Legend

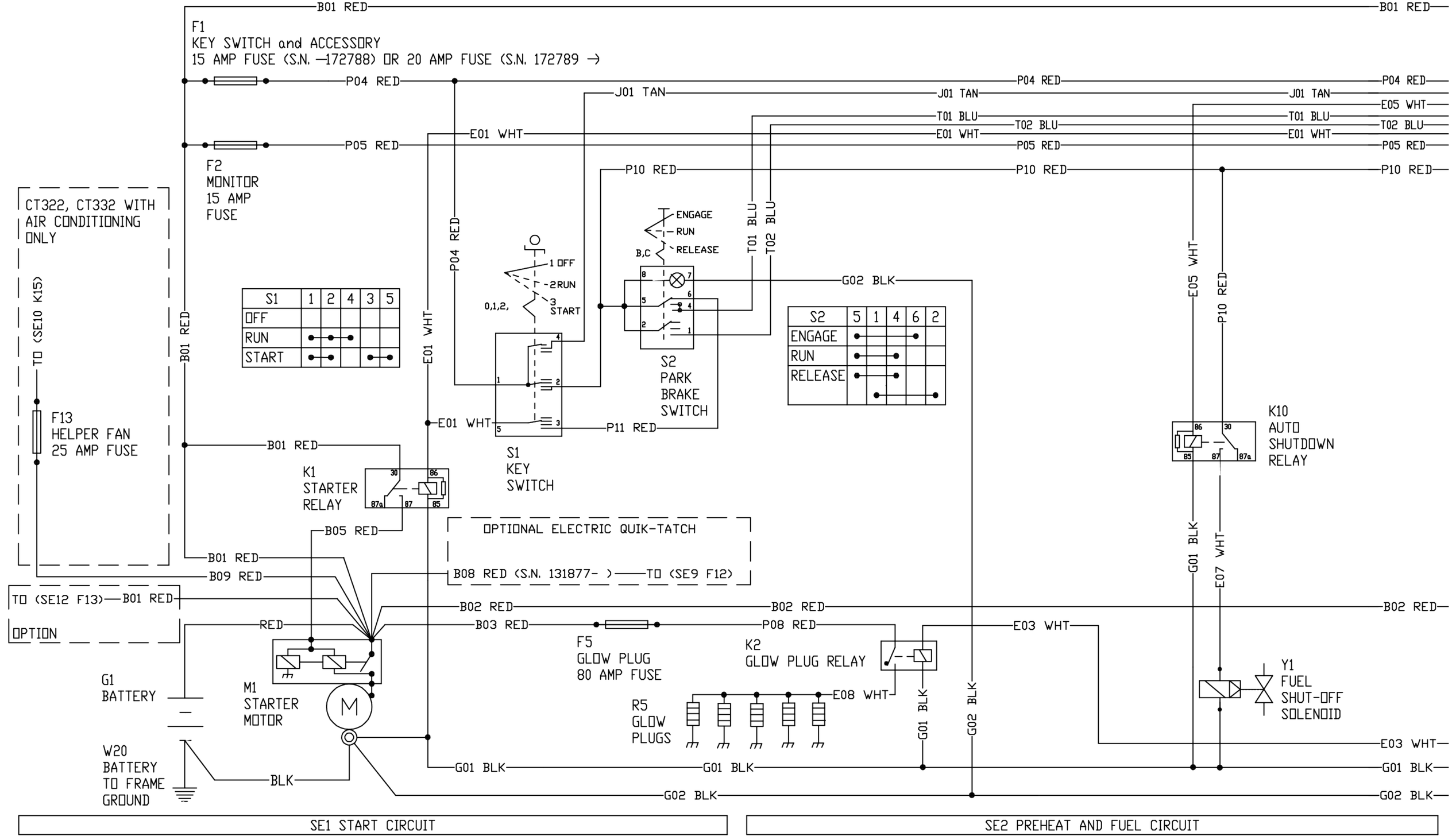
→NOTE:

SE1—Start Circuit

SE1 indicates section number of Functional Schematic where circuit is located.

Start Circuit indicates circuit name.

- SE1—Start Circuit
- SE2—Preheat and Fuel Circuit
- SE3—Charging and Interlock Circuit
- SE4—Engagement and Monitor Unit Circuit
- SE5—Auxiliary Hydraulic Override Circuit
- SE6—Windshield Wiper, Washer, and Lights Circuit
- SE7—Windshield wiper and Washer Circuit
- SE8—Dual Flasher and High Flow Circuit
- SE9—Quik-Tatch and Back-Up Circuit
- SE10—Dome Light, 12-Volt Accessory Power Socket and Horn Circuit
- SE11—Air Conditioner Circuit
- SE12—Water-in-Fuel (WIF), Fuel Heater, and Beacon Circuit



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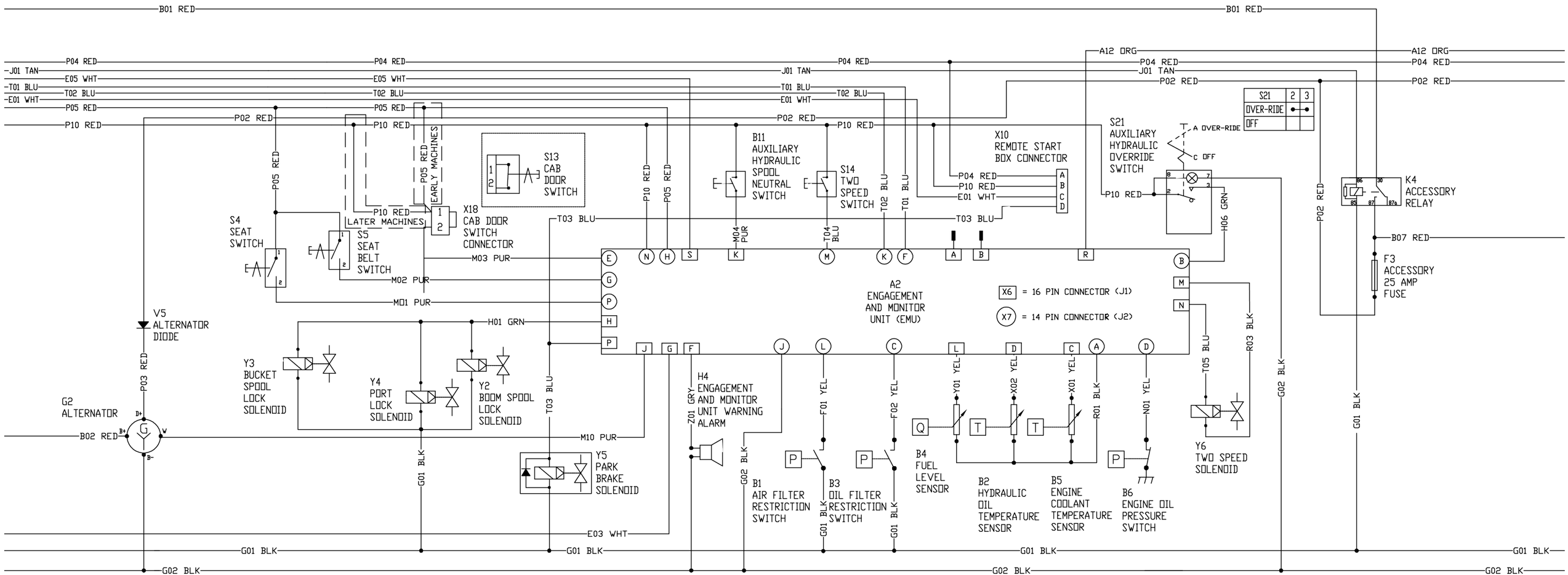
SYSTEM FUNCTIONAL SCHEMATIC (1 OF 5)

System Functional Schematic (SE1 and SE2) (1 of 5)

LEGEND:

F1	Key Switch and Accessory 15 Amp Fuse (S.N. —172788)
F1	Key Switch and Accessory 20 Amp Fuse (S.N. 172789—)
F2	Monitor 15 Amp Fuse
F5	Glow Plug 80 Amp Fuse
F13	Water-in-Fuel Sensor 15 Amp Fuse
G1	Battery
K1	Starter Relay
K2	Glow Plug Relay
K10	Auto Shutdown Relay
M1	Starter Motor
R5	Glow Plugs
S1	Key Switch
S2	Park Brake Switch
W20	Battery to Frame Ground
Y1	Fuel Shut-Off Solenoid



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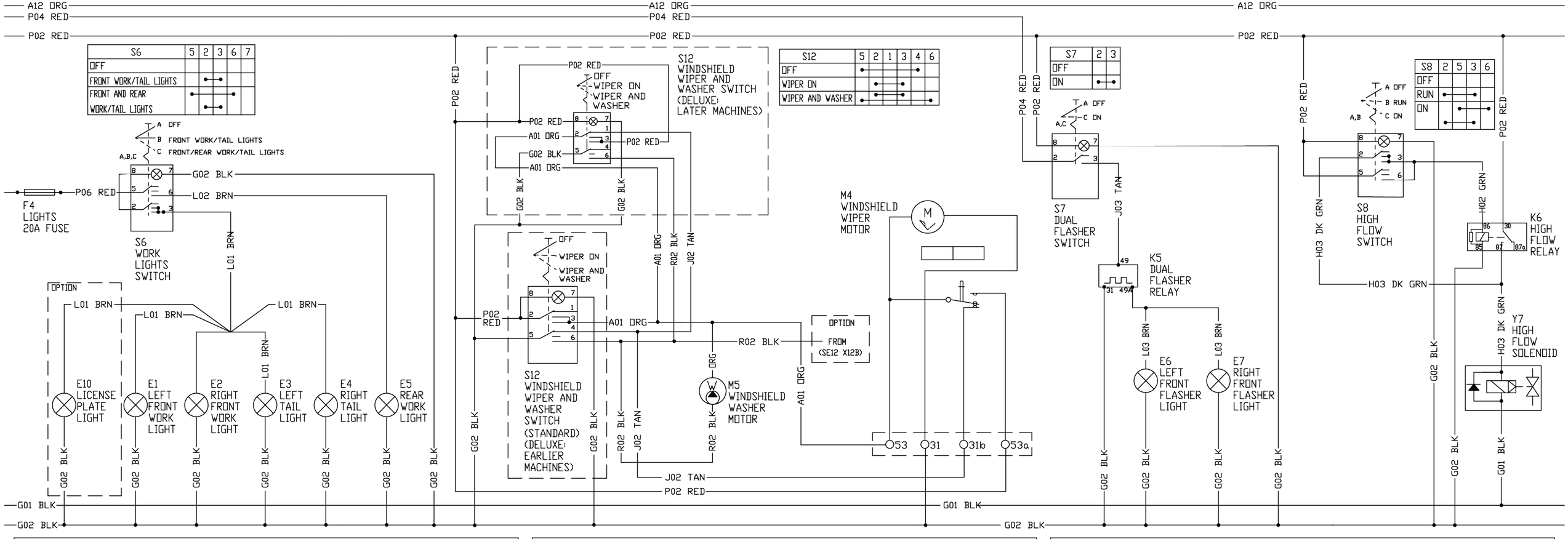
SYSTEM FUNCTIONAL SCHEMATIC (2 OF 5)

System Functional Schematic (SE3, SE4 and SE5) (2 of 5)

LEGEND:

A2	Engagement and Monitor Unit
B1	Air Filter Restriction Switch
B2	Hydraulic Oil Temperature Sensor
B3	Hydraulic Oil Filter Restriction Switch
B4	Fuel Level Sensor
B5	Engine Coolant Temperature Sensor
B6	Engine Oil Pressure Switch
B11	Auxiliary Hydraulic Spool Neutral Switch
F3	Accessory 25 Amp Fuse
G2	Alternator
H4	Engagement and Monitor Unit Warning Alarm
K4	Accessory Relay
S4	Seat Switch
S5	Seat Belt Switch
S13	Cab Door Switch
S14	Two Speed Switch
S21	Auxiliary Hydraulic Override Switch
V5	Alternator Diode
X6	Cab Harness to Engagement and Monitor Unit 16-Pin Connector (J1)
X7	Cab Harness to Engagement and Monitor Unit 14-Pin Connector (J2)
X10	Remote Start Box Connector
X18	Cab Door Switch Connector
Y2	Boom Spool Lock Solenoid
Y3	Bucket Spool Lock Solenoid
Y4	Port Lock Solenoid
Y5	Park Brake Solenoid
Y6	Two Speed Solenoid



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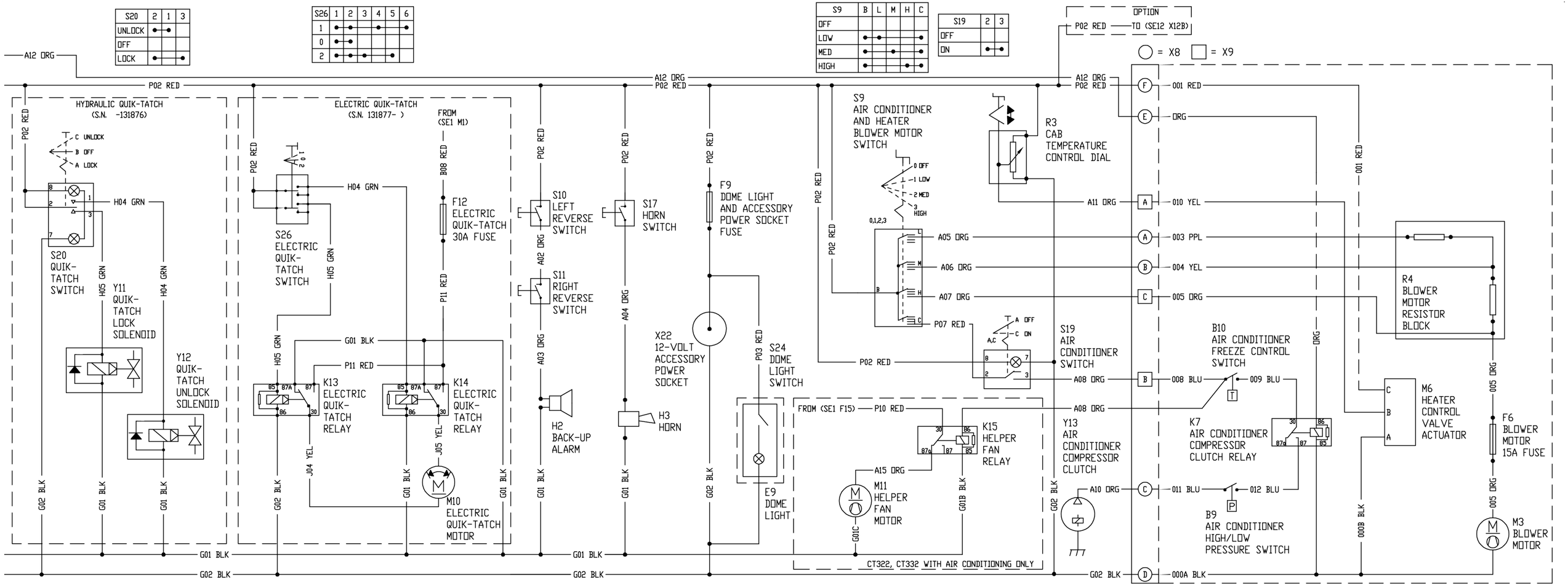
SYSTEM FUNCTIONAL SCHEMATIC (3 OF 5)

System Functional Schematic (SE6, SE7 and SE8) (3 of 5)

LEGEND:

E1	Left Front Work Light
E2	Right Front Work Light
E3	Left Tail Light
E4	Right Tail Light
E5	Rear Work Light
E6	Left Front Flasher Light
E7	Right Front Flasher Light
E10	License Plate Light—If Equipped
F4	Lights 20 Amp Fuse
K5	Dual Flasher Relay
K6	High Flow Relay
M4	Windshield Wiper Motor
M5	Windshield Washer Motor
S6	Work Lights Switch
S7	Dual Flasher Switch
S8	High Flow Switch
S12	Windshield Wiper and Washer Switch
Y7	High Flow Solenoid



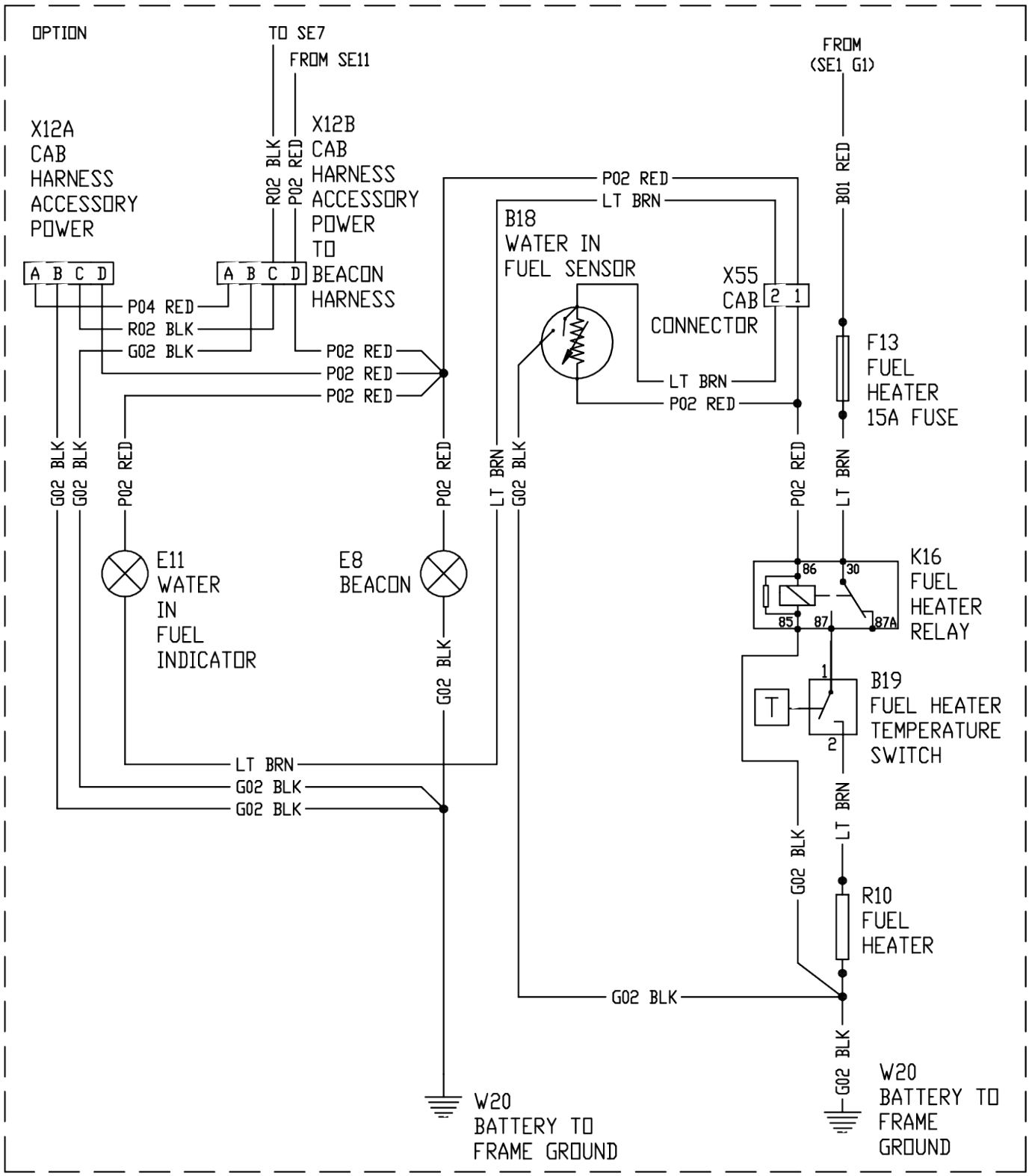
TX1073850

SYSTEM FUNCTIONAL SCHEMATIC (4 OF 5)

System Functional Schematic (SE9, SE10 and SE11) (4 of 5)

LEGEND:

B9	Air Conditioner High/Low Pressure Switch
B10	Air Conditioner Freeze Control Switch
E9	Dome Light
F6	Blower Motor 15 Amp Fuse
F9	Dome Light and Accessory Power Socket 10 Amp Fuse
F12	Electric Quik-Tatch Harness 30 Amp Fuse (S.N. 131877—)
H2	Back-Up Alarm
H3	Horn
K7	Air Conditioner Compressor Clutch Relay
K13	Electric Quik-Tatch Relay (S.N. 131877—)
K14	Electric Quik-Tatch Relay (S.N. 131877—)
K15	Helper Fan Relay
M3	Air Conditioner and Heater Blower Motor
M6	Heater Control Valve Actuator
M10	Electric Quik-Tatch Motor (S.N. 131877—)
M11	Helper Fan Motor
R3	Cab Temperature Control Dial
R4	Blower Motor Resistor Block
S9	Air Conditioner and Heater Blower Motor Switch
S10	Left Reverse Switch
S11	Right Reverse Switch
S17	Horn Switch
S19	Air Conditioner Switch
S20	Hydraulic Quik-Tatch Switch (S.N. —131876)
S24	Dome Light Switch
S26	Electric Quik-Tatch Switch (S.N. 131877—) W28)
X8	Cab Harness to Air Conditioner and Heater Harness 3-Pin Connector
X9	Cab Harness to Air Conditioner and Heater Harness 6-Pin Connector
X22	12-Volt Accessory Power Socket
Y11	Hydraulic Quik-Tatch Lock Solenoid (S.N. —131876)
Y12	Hydraulic Quik-Tatch Unlock Solenoid (S.N. —131876)
Y13	Air Conditioner Compressor Clutch



SE12 WATER-IN-FUEL (WIF), FUEL HEATER, AND BEACON CIRCUIT
TX1073868 SYSTEM FUNCTIONAL SCHEMATIC (5 OF 5)

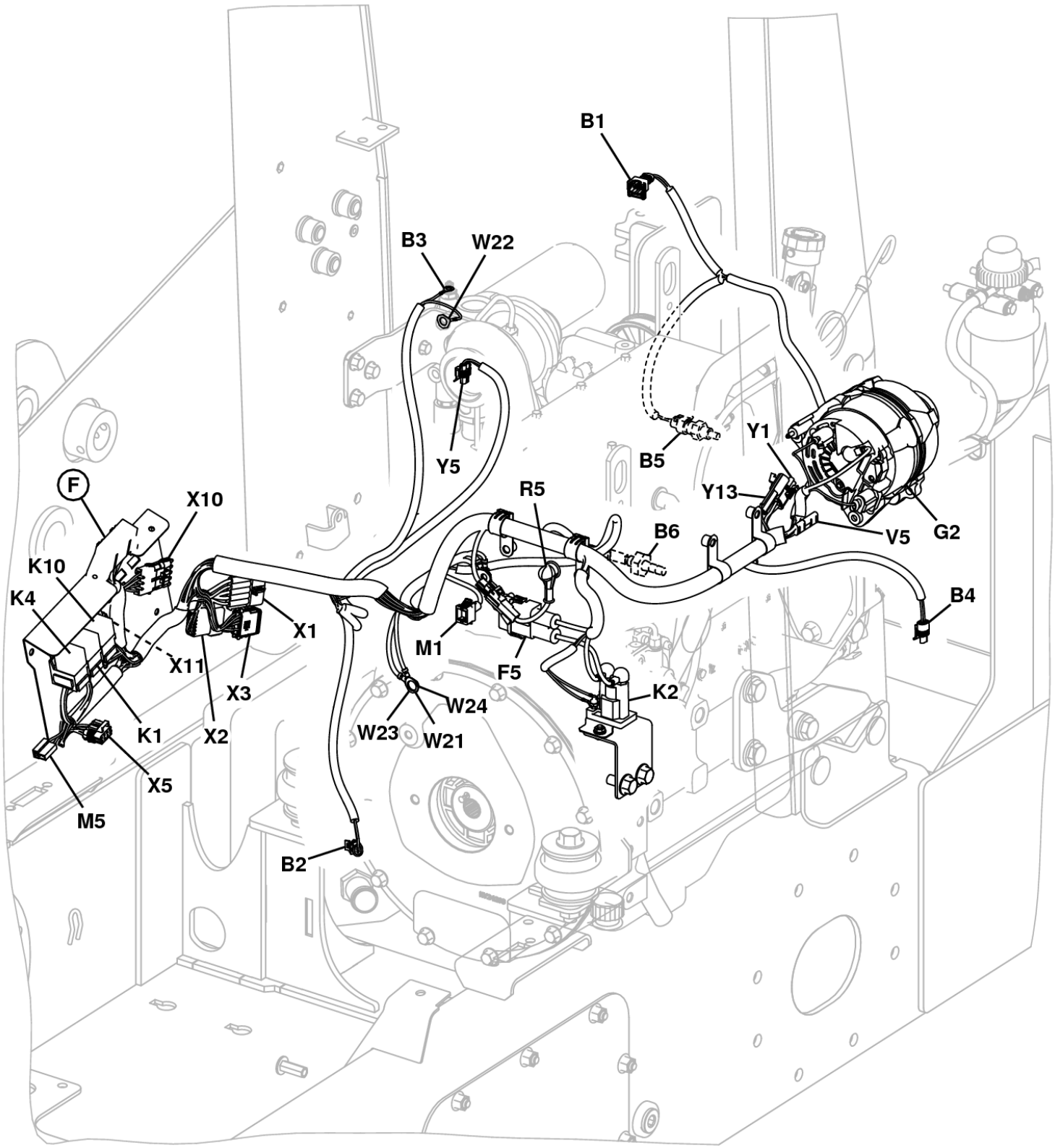
System Functional Schematic (SE12) (5 of 5)

LEGEND:

B18	Water-in-Fuel Sensor—If Equipped
B19	Fuel Heater Temperature Switch—If Equipped
E8	Beacon
E11	Water-in-Fuel Indicator—If Equipped
F13	Fuel Heater 15 Amp Fuse
K16	Fuel Heater Relay—If Equipped

R10	Fuel Heater—If Equipped
W20	Battery to Frame Ground
X12A	Cab Harness Accessory Power Connector A
X12B	Cab Harness Accessory Power Connector B
X55	Cab Connector—If Equipped

Engine Harness (W1) Component Location



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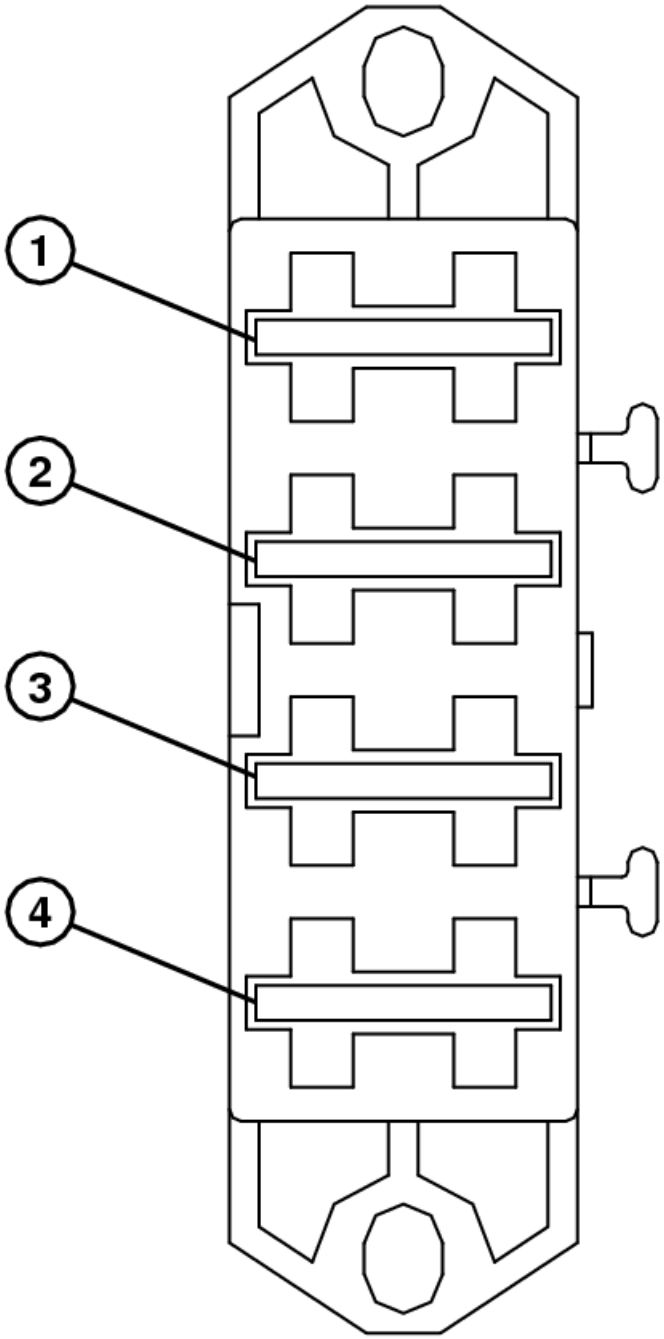
Engine Harness (W1) Component Location

LEGEND:

B1	Air Filter Restriction Switch
B2	Hydraulic Oil Temperature Sensor
B3	Hydraulic Oil Filter Restriction Switch
B4	Fuel Level Sensor

B5	Engine Coolant Temperature Sensor
B6	Engine Oil Pressure Switch
F	Fuse Block (See Detail F)
F5	Glow Plug 80 Amp Fuse
G2	Alternator
K1	Starter Relay
K2	Glow Plug Relay
K4	Accessory Relay
K10	Auto Shutdown Relay
M1	Starter Motor
M5	Windshield Washer Motor
R5	Glow Plugs
V5	Alternator Diode
W21	Alternator Ground
W22	Hydraulic Oil Filter Housing Ground
W23	Engine Harness to Frame Ground
W24	Solenoid Ground
X1	Cab Harness to Engine Harness 5-Pin Connector
X2	Cab Harness to Engine Harness 12-Pin Connector
X3	Cab Harness to Engine Harness 12-Pin Connector
X5	Engine Harness to Front Chassis Harness 8-Pin Connector
X10	Remote Start Box Connector
X11	Engine Harness Accessory Power Connector
Y1	Fuel Shut-Off Solenoid
Y5	Park Brake Solenoid
Y13	Air Conditioner Compressor Clutch

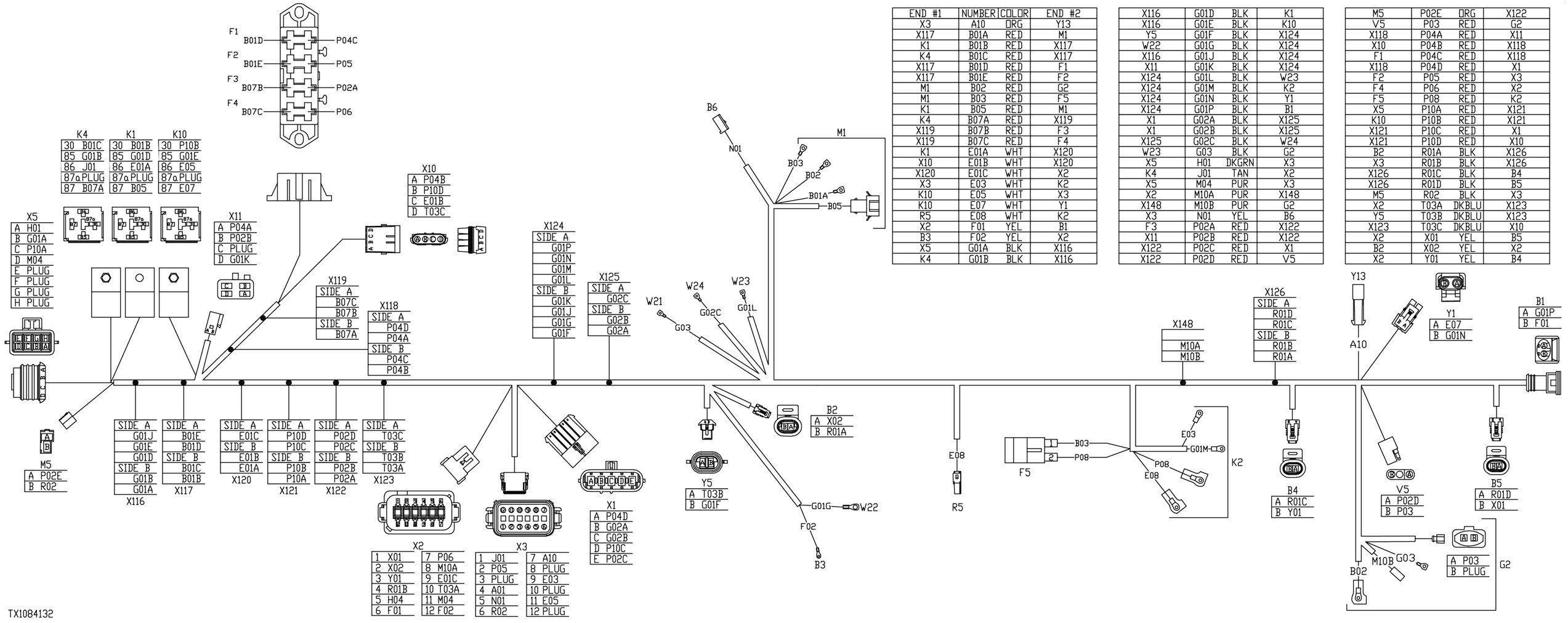


Detail F—Fuse Block Layout

LEGEND:

1 F1 Key Switch and Accessory 15 Amp Fuse (S.N. —172788)
1 F1 Key Switch and Accessory 20 Amp Fuse (S.N. 172789—)
2 F2 Monitor 15 Amp Fuse
3 F3 Accessory 25 Amp Fuse
4 F4 Lights 20 Amp Fuse

Engine Harness (W1) Wiring Diagram



END #1	NUMBER	COLOR	END #2
X3	A10	ORG	Y13
X117	B01A	RED	M1
K1	B01B	RED	X117
K4	B01C	RED	X117
X117	B01D	RED	F1
X117	B01E	RED	F2
M1	B02	RED	G2
M1	B03	RED	F5
K1	B05	RED	M1
K4	B07A	RED	X119
X119	B07B	RED	F3
X119	B07C	RED	F4
K1	E01A	WHT	X120
X10	E01B	WHT	X120
X120	E01C	WHT	X2
X3	E03	WHT	K2
K10	E05	WHT	X3
K10	E07	WHT	Y1
R5	E08	WHT	K2
X2	F01	YEL	B1
B3	F02	YEL	X2
X5	G01A	BLK	X116
K4	G01B	BLK	X116

X116	G01D	BLK	K1
X116	G01E	BLK	K10
Y5	G01F	BLK	X124
W22	G01G	BLK	X124
X116	G01J	BLK	X124
X11	G01K	BLK	X124
X124	G01L	BLK	W23
X124	G01M	BLK	K2
X124	G01N	BLK	Y1
X124	G01P	BLK	B1
X1	G02A	BLK	X125
X1	G02B	BLK	X125
X125	G02C	BLK	W24
W23	G03	BLK	G2
X5	H01	DKGRN	X3
K4	J01	TAN	X2
X5	M04	PUR	X3
X2	M10A	PUR	X148
X148	M10B	PUR	G2
X3	N01	YEL	B6
F3	P02A	RED	X122
X11	P02B	RED	X122
X122	P02C	RED	X1
X122	P02D	RED	V5

M5	P02E	ORG	X122
V5	P03	RED	G2
X118	P04A	RED	X11
X10	P04B	RED	X118
F1	P04C	RED	X118
X118	P04D	RED	X1
F2	P05	RED	X3
F4	P06	RED	X2
F5	P08	RED	K2
X5	P10A	RED	X121
K10	P10B	RED	X121
X121	P10C	RED	X1
X121	P10D	RED	X10
B2	R01A	BLK	X126
X3	R01B	BLK	X126
X126	R01C	BLK	B4
X126	R01D	BLK	B5
M5	R02	BLK	X3
X2	T03A	DKBLU	X123
Y5	T03B	DKBLU	X123
X123	T03C	DKBLU	X10
X2	X01	YEL	B5
B2	X02	YEL	X2
X2	Y01	YEL	B4

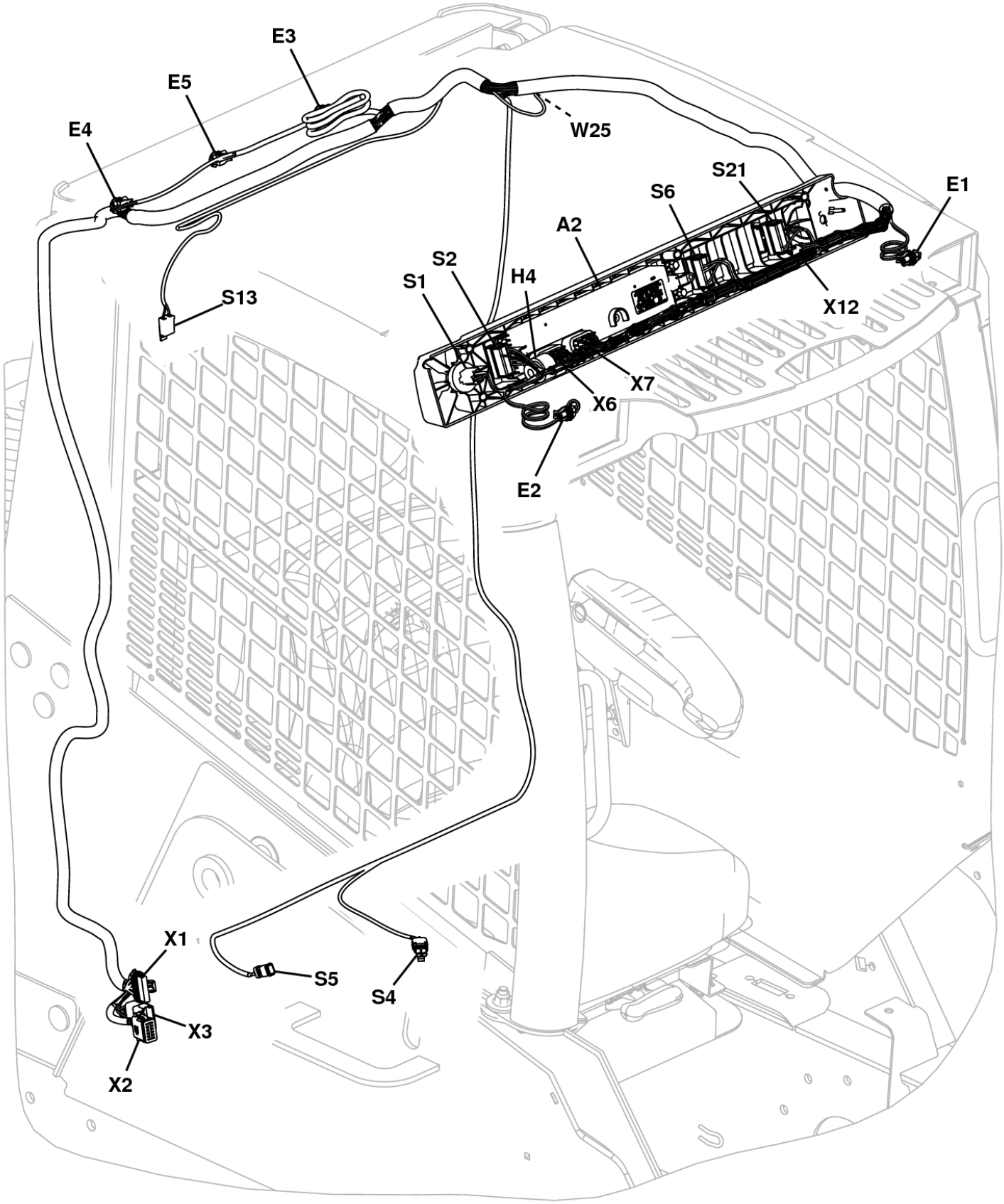
TX1084132

Engine Harness (W1) Wiring Diagram

LEGEND:

B1	Air Filter Restriction Switch
B2	Hydraulic Oil Temperature Sensor
B3	Hydraulic Oil Filter Restriction Switch
B4	Fuel Level Sensor
B5	Engine Coolant Temperature Sensor
B6	Engine Oil Pressure Switch
F	Fuse Block
F5	Glow Plug 80 Amp Fuse
G2	Alternator
K1	Starter Relay
K2	Glow Plug Relay
K4	Accessory Relay
K10	Auto Shutdown Relay
M1	Starter Motor
M5	Windshield Washer Motor
R5	Glow Plugs
V5	Alternator Diode
W21	Alternator Ground
W22	Hydraulic Oil Filter Housing Ground
W23	Engine Harness-to-Frame Ground
W24	Solenoid Ground
X1	Cab Harness-to-Engine Harness 5-Pin Connector
X2	Cab Harness-to-Engine Harness 12-Pin Connector
X3	Cab Harness-to-Engine Harness 12-Pin Connector
X5	Engine Harness-to-Front Chassis Harness 8-Pin Connector
X10	Remote Start Box Connector
X11	Engine Harness Accessory Power Connector
X116	Splice
X117	Splice
X118	Splice
X119	Splice
X120	Splice
X121	Splice
X122	Splice
X123	Splice
X124	Splice
X125	Splice
X126	Splice
X148	Splice
Y1	Fuel Shutoff Solenoid
Y5	Park Brake Solenoid
Y13	Air Conditioner Compressor Clutch

Cab Harness—Standard (W2) Component Location



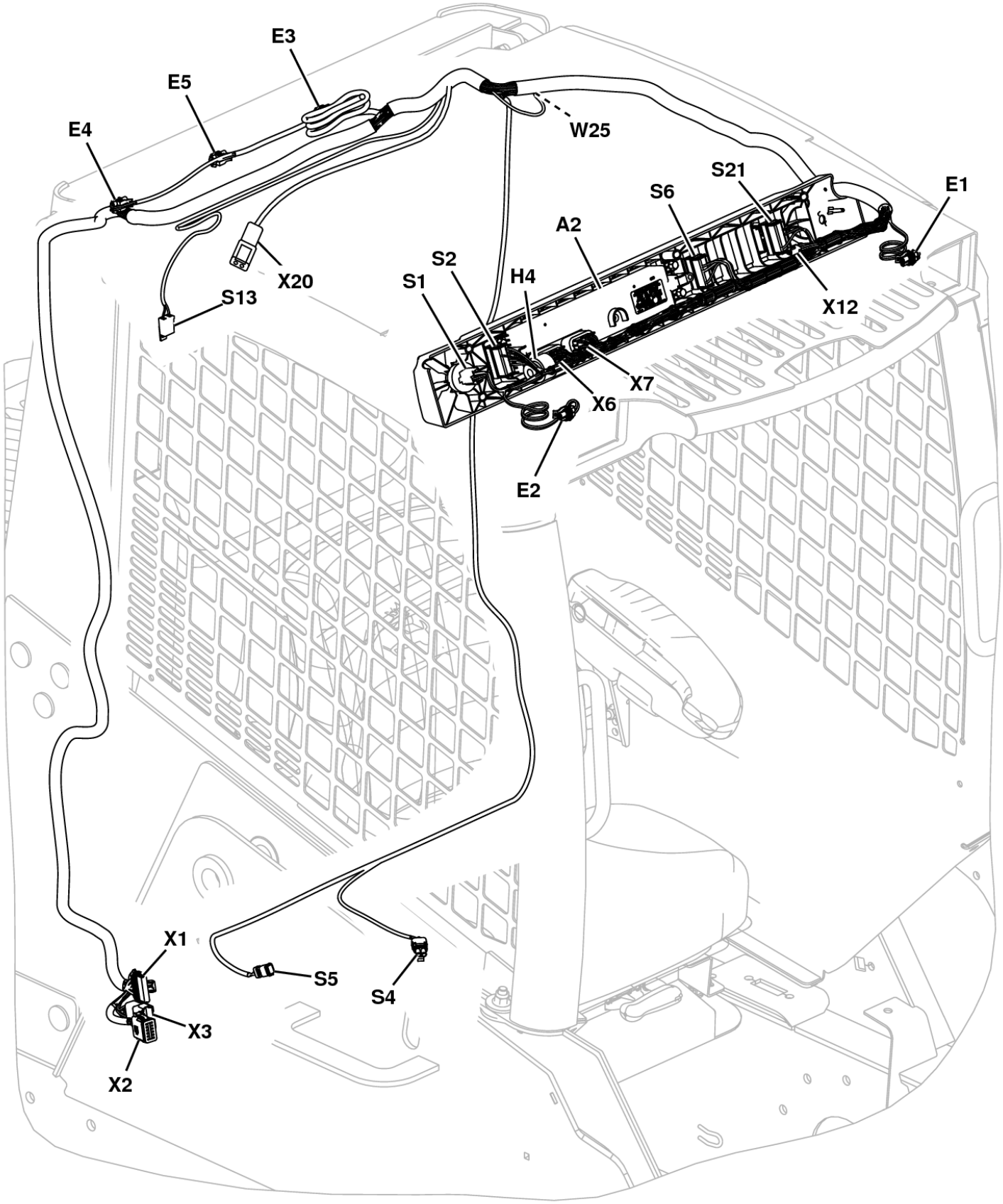
T197464

Cab Harness—Standard (W2) Component Location (S.N. —170536)

LEGEND:

A2	Engagement and Monitor Unit
E1	Left Front Work Light
E2	Right Front Work Light
E3	Left Tail Light

E4	Right Tail Light
E5	Rear Work Light
H4	Engagement and Monitor Unit Warning Alarm
S1	Key Switch
S2	Park Brake Switch
S4	Seat Switch
S5	Seat Belt Switch
S6	Work Lights Switch
S13	Cab Door Switch
S21	Auxiliary Hydraulic Override Switch
W25	Cab Harness Ground
X1	Cab Harness to Engine Harness 5-Pin Connector
X2	Cab Harness to Engine Harness 12-Pin Connector
X3	Cab Harness to Engine Harness 12-Pin Connector
X6	Cab Harness to Engagement and Monitor Unit 16-Pin Connector (J1)
X7	Cab Harness to Engagement and Monitor Unit 14-Pin Connector (J2)
X12	Cab Harness Accessory Power Connector



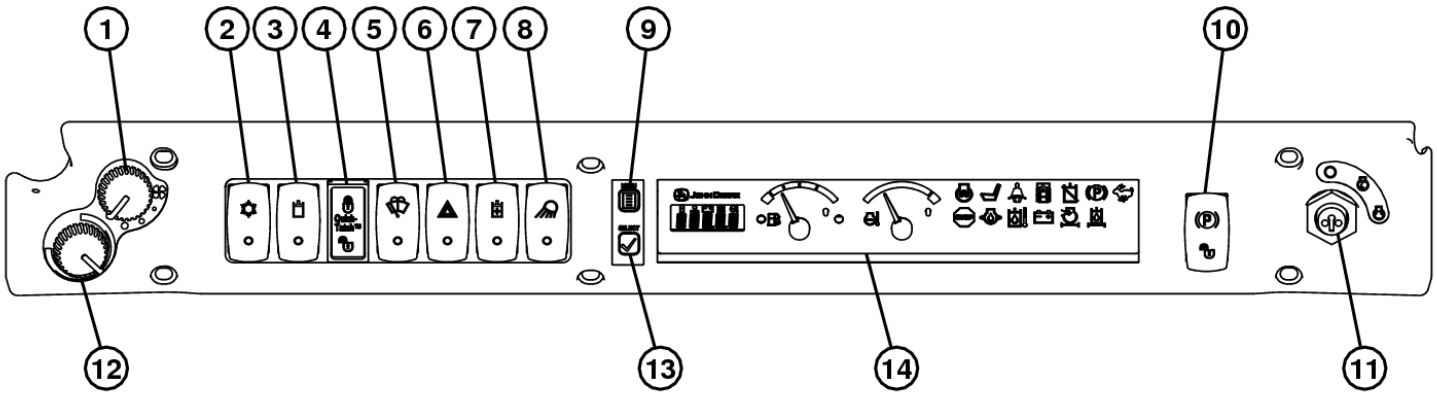
TX1056881

Cab Harness—Standard (W2) Component Location (S.N. 170537—)

LEGEND:

A2	Engagement and Monitor Unit
E1	Left Front Work Light
E2	Right Front Work Light
E3	Left Tail Light
E4	Right Tail Light
E5	Rear Work Light

H4	Engagement and Monitor Unit Warning Alarm
S1	Key Switch
S2	Park Brake Switch
S4	Seat Switch
S5	Seat Belt Switch
S6	Work Lights Switch
S13	Cab Door Switch
S21	Auxiliary Hydraulic Override Switch
W25	Cab Harness Ground
X1	Cab Harness to Engine Harness 5-Pin Connector
X2	Cab Harness to Engine Harness 12-Pin Connector
X3	Cab Harness to Engine Harness 12-Pin Connector
X6	Cab Harness to Engagement and Monitor Unit 16-Pin Connector (J1)
X7	Cab Harness to Engagement and Monitor Unit 14-Pin Connector (J2)
X12	Cab Harness Accessory Power Connector
X20	Operator Convenience Package Power 2-Pin Connector

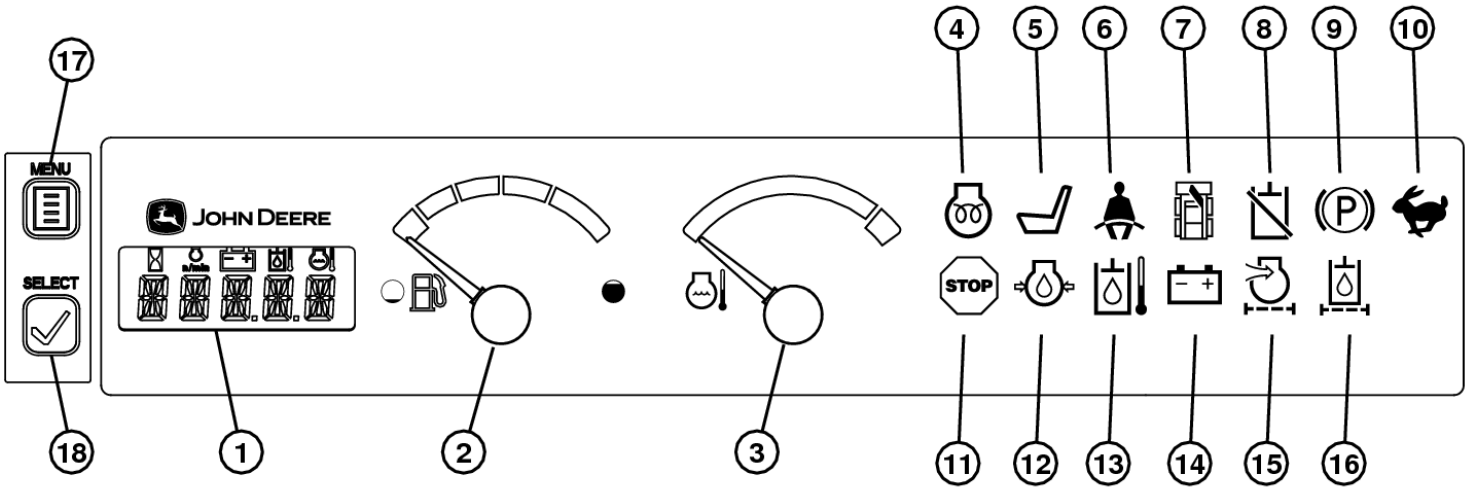


T197805

Instrument Panel

LEGEND:

1	Air Conditioner and Heater Blower Motor Switch (S9)
2	Air Conditioner Switch (S19)
3	Auxiliary Hydraulic Override Switch (S21)
4	Hydraulic Quik-Tatch Switch (S.N. —131876) (S20), Electric Quik-Tatch Switch (S.N. 131877—) (S26)
5	Windshield Wiper and Washer Switch (S12)
6	Dual Flasher Switch (K5)
7	High Flow Switch (S8)
8	Work Lights Switch (S6)
9	MENU Button
10	Park Brake Switch (S2)
11	Key Switch (S1)
12	Cab Temperature Control Dial (R3)
13	SELECT Button
14	Engagement and Monitor Unit (A2)



T197653

Engagement and Monitor Unit

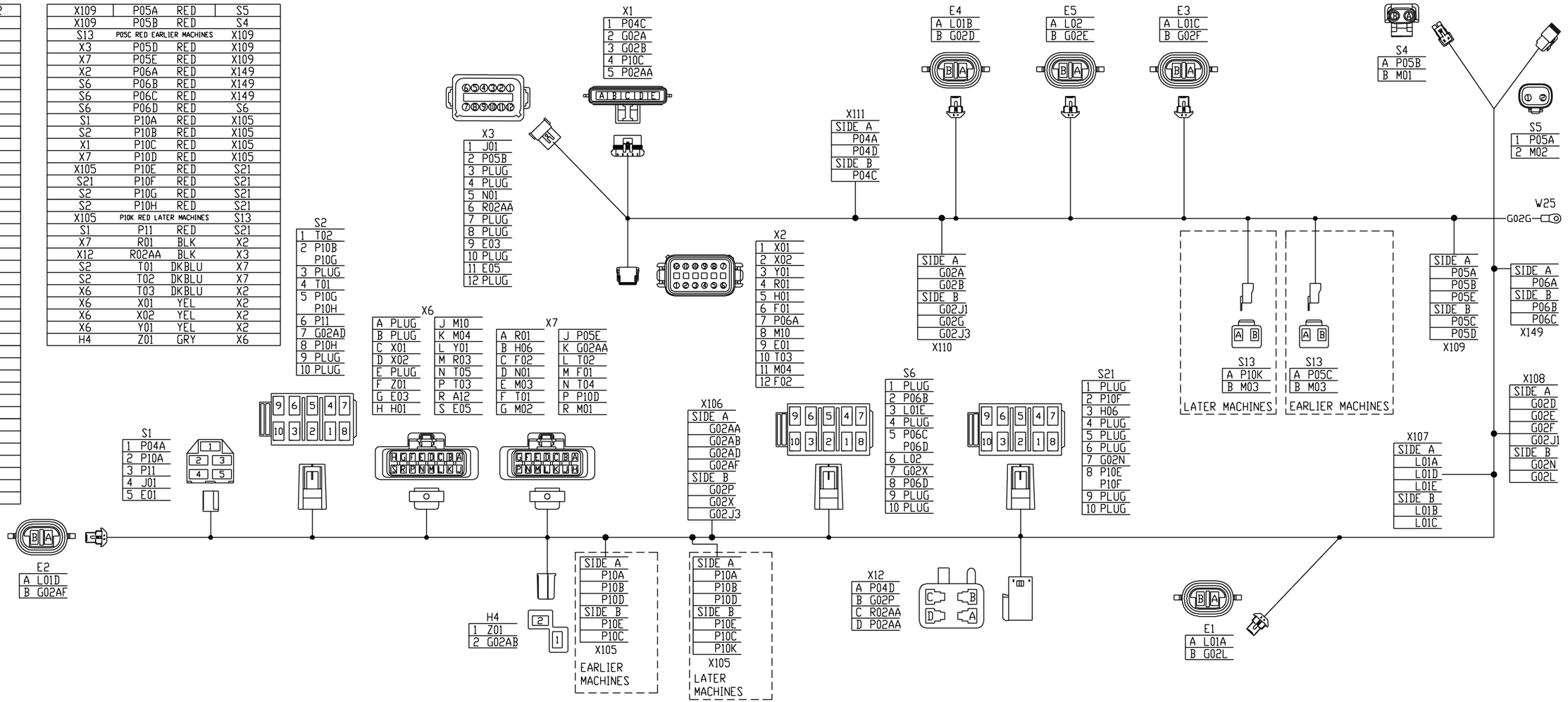
LEGEND:

1	Engagement and Monitor Unit Display
2	Fuel Gauge
3	Engine Coolant Temperature Gauge
4	Glow Plug Indicator
5	Seat Switch Indicator
6	Seat Belt Switch Indicator
7	Cab Door Switch Indicator
8	Hydraulics OFF Indicator
9	Park Brake Indicator
10	High Speed Indicator
11	STOP Indicator
12	Low Engine Oil Pressure Indicator
13	Hydraulic Oil Temperature Indicator
14	Low Alternator or Battery Voltage Indicator
15	Engine Air Filter Restriction Indicator
16	Hydraulic Oil Filter Restriction Indicator
17	MENU Button
18	SELECT Button

Cab Harness—Standard (W2) Wiring Diagram

END #1	NUMBER	COLOR	END #2
S1	E01	WHT	X2
X6	E03	WHT	X3
X6	E05	WHT	X3
X7	F01	YEL	X2
X7	F02	YEL	X2
X1	G02A	BLK	X110
X1	G02B	BLK	X110
E4	G02D	BLK	X108
E5	G02E	BLK	X108
E3	G02F	BLK	X108
X110	G02G	BLK	W25
X110	G02J1	BLK	X108
X110	G02J2	BLK	X106
X108	G02L	BLK	E1
X108	G02N	BLK	S21
X106	G02P	BLK	X12
X106	G02X	BLK	S6
X7	G02AA	BLK	X106
H4	G02AB	BLK	X106
S2	G02AD	BLK	X106
E2	G02AF	BLK	X106
X6	H01	DKGRN	X2
X7	H06	DKGRN	S21
S1	J01	TAN	X3
E1	L01A	BRN	X107
E4	L01B	BRN	X107
E3	L01C	BRN	X107
E2	L01D	BRN	X107
S6	L01E	BRN	X107
S6	L02	BRN	E5
X7	M01	PUR	S4
X7	M02	PUR	S5
X7	M03	PUR	S13
X2	M04	PUR	X6
X6	M10	PUR	X2
X7	N01	YEL	X3
X12	P02AA	RED	X1
S1	P04A	RED	X111
X1	P04C	RED	X111
X1	P04D	RED	X111

X109	P05A	RED	S5
X109	P05B	RED	S4
S13	P05C RED EARLIER MACHINES		X109
X3	P05D	RED	X109
X7	P05E	RED	X109
X2	P06A	RED	X149
S6	P06B	RED	X149
S6	P06C	RED	X149
S6	P06D	RED	S6
S1	P10A	RED	X105
S2	P10B	RED	X105
X1	P10C	RED	X105
X7	P10D	RED	X105
X105	P10E	RED	S21
S21	P10F	RED	S21
S2	P10G	RED	S21
S2	P10H	RED	S21
X105	P10K RED LATER MACHINES		S13
S1	P11	RED	S21
X7	R01	BLK	X2
X12	R02AA	BLK	X3
S2	T01	DKBLU	X7
S2	T02	DKBLU	X7
X6	T03	DKBLU	X2
X6	X01	YEL	X2
X6	X02	YEL	X2
X6	Y01	YEL	X2
H4	Z01	GRY	X6



TX1058140

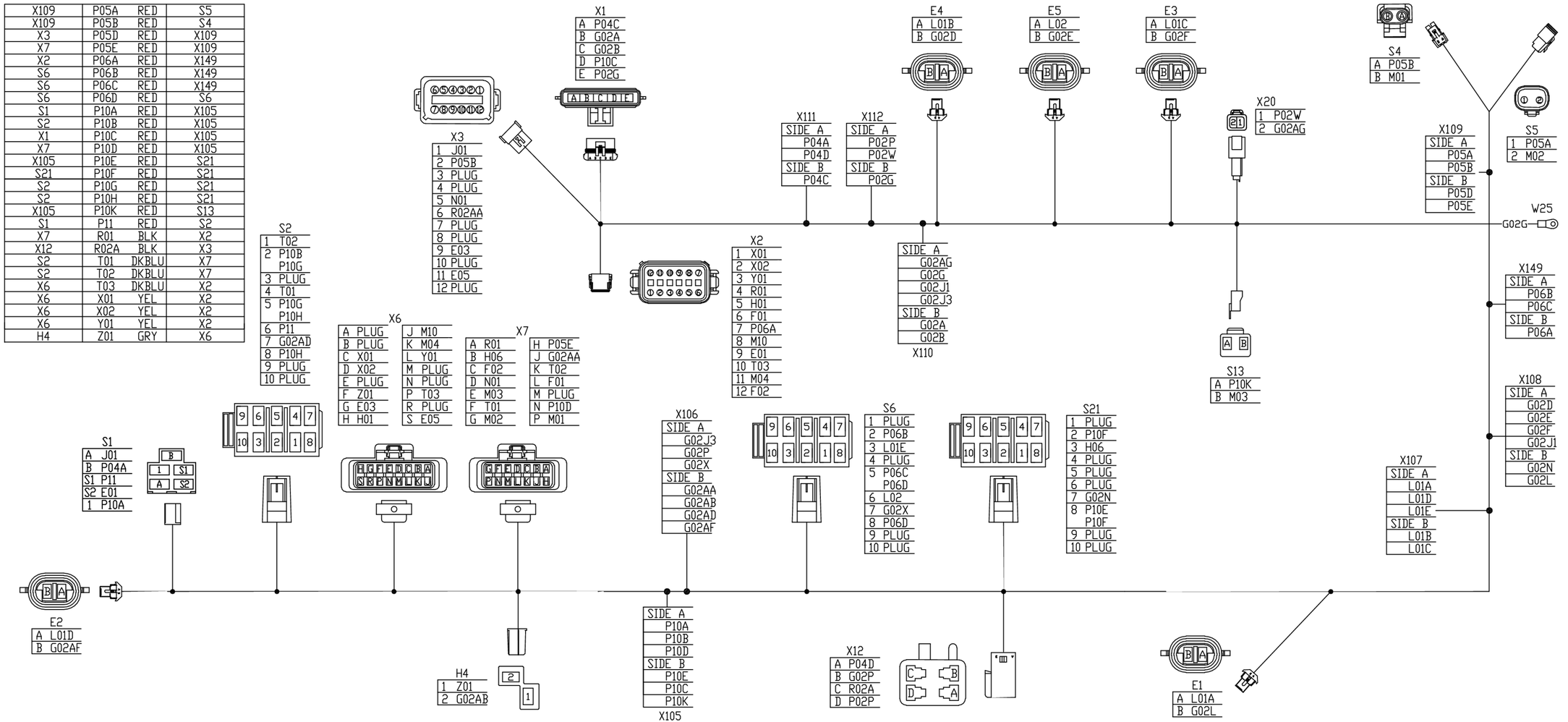
Cab Harness—Standard (W2) Wiring Diagram (S.N. —170536)

LEGEND:

E1	Left Front Work Light
E2	Right Front Work Light
E3	Left Tail Light
E4	Right Tail Light
E5	Rear Work Light
H4	Engagement and Monitor Unit Warning Alarm
S1	Key Switch
S2	Park Brake Switch
S4	Seat Switch
S5	Seat Belt Switch
S6	Work Lights Switch
S13	Cab Door Switch
S21	Auxiliary Hydraulic Override Switch
W25	Cab Harness Ground
X1	Cab Harness to Engine Harness 5-Pin Connector
X2	Cab Harness to Engine Harness 12-Pin Connector
X3	Cab Harness to Engine Harness 12-Pin Connector
X6	Cab Harness to Engagement and Monitor Unit 16-Pin Connector (J1)
X7	Cab Harness to Engagement and Monitor Unit 14-Pin Connector (J2)
X12	Cab Harness Accessory Power Connector
X105	Splice
X106	Splice
X107	Splice
X108	Splice
X109	Splice
X110	Splice
X111	Splice
X149	Splice

END #1	NUMBER	COLOR	END #2
S1	E01	WHT	X2
X6	E03	WHT	X3
X6	E05	WHT	X3
X7	F01	YEL	X2
X7	F02	YEL	X2
X1	G02A	BLK	X110
X1	G02B	BLK	X110
E4	G02D	BLK	X108
E5	G02E	BLK	X108
E3	G02F	BLK	X108
X110	G02G	BLK	W25
X110	G02J1	BLK	X108
X110	G02J2	BLK	X106
X110	G02J3	BLK	X106
X108	G02L	BLK	E1
X108	G02N	BLK	S21
X106	G02P	BLK	X12
X106	G02X	BLK	S6
X7	G02AA	BLK	X106
H4	G02AB	BLK	X106
S2	G02AD	BLK	X106
E2	G02AF	BLK	X106
X110	G02AG	BLK	X20
X6	H01	DKGRN	X2
X7	H06	DKGRN	S21
S1	J01	TAN	X3
E1	L01A	BRN	X107
E4	L01B	BRN	X107
E3	L01C	BRN	X107
E2	L01D	BRN	X107
S6	L01E	BRN	X107
S6	L02	BRN	E5
X7	M01	PUR	S4
X7	M02	PUR	S5
X7	M03	PUR	S13
X2	M04	PUR	X6
X6	M10	PUR	X2
X7	N01	YEL	X3
X12	P02AA	RED	X1
X1	P02G	RED	X112
X112	P02P	RED	X12
X112	P02W	RED	X20
S1	P04A	RED	X111
X1	P04C	RED	X111
X1	P04D	RED	X111

X109	P05A	RED	S5
X109	P05B	RED	S4
X3	P05D	RED	X109
X7	P05E	RED	X109
X2	P06A	RED	X149
S6	P06B	RED	X149
S6	P06C	RED	X149
S6	P06D	RED	S6
S1	P10A	RED	X105
S2	P10B	RED	X105
X1	P10C	RED	X105
X7	P10D	RED	X105
X105	P10E	RED	S21
S21	P10F	RED	S21
S2	P10G	RED	S21
S2	P10H	RED	S21
X105	P10K	RED	S13
S1	P11	RED	S2
X7	R01	BLK	X2
X12	R02A	BLK	X3
S2	T01	DKBLU	X7
S2	T02	DKBLU	X7
X6	T03	DKBLU	X2
X6	X01	YEL	X2
X6	X02	YEL	X2
X6	Y01	YEL	X2
H4	Z01	GRY	X6



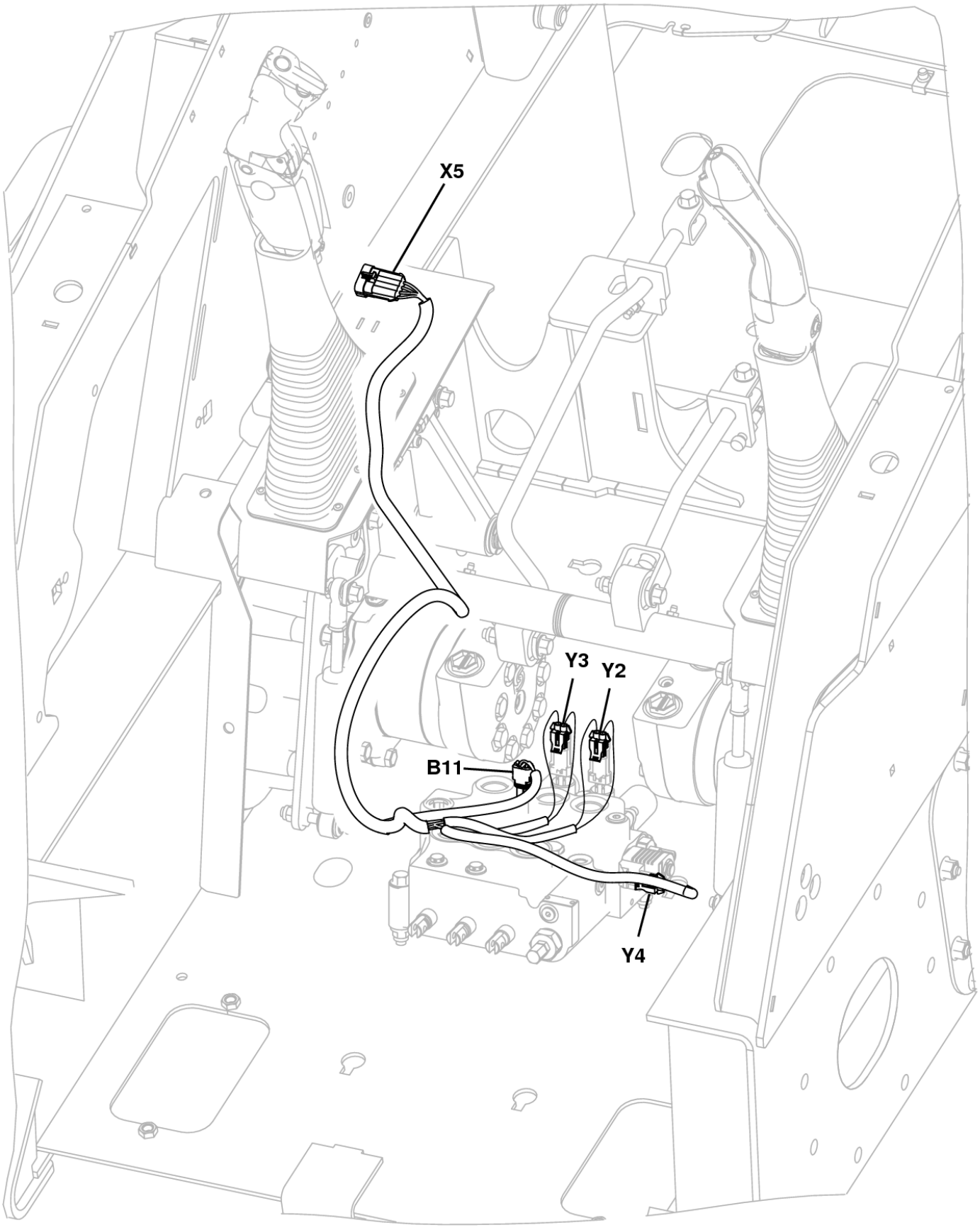
TX1056883

Cab Harness—Standard (W2) Wiring Diagram (S.N. 170537—)

LEGEND:

E1	Left Front Work Light
E2	Right Front Work Light
E3	Left Tail Light
E4	Right Tail Light
E5	Rear Work Light
H4	Engagement and Monitor Unit Warning Alarm
S1	Key Switch
S2	Park Brake Switch
S4	Seat Switch
S5	Seat Belt Switch
S6	Work Lights Switch
S13	Cab Door Switch
S21	Auxiliary Hydraulic Override Switch
W25	Cab Harness Ground
X1	Cab Harness to Engine Harness 5-Pin Connector
X2	Cab Harness to Engine Harness 12-Pin Connector
X3	Cab Harness to Engine Harness 12-Pin Connector
X6	Cab Harness to Engagement and Monitor Unit 16-Pin Connector (J1)
X7	Cab Harness to Engagement and Monitor Unit 14-Pin Connector (J2)
X12	Cab Harness Accessory Power Connector
X20	Operators Convenience Package Power 2-Pin Connector
X105	Splice
X106	Splice
X107	Splice
X108	Splice
X109	Splice
X110	Splice
X111	Splice
X112	Splice
X149	Splice

Front Chassis Harness—Standard (W3) Component Location



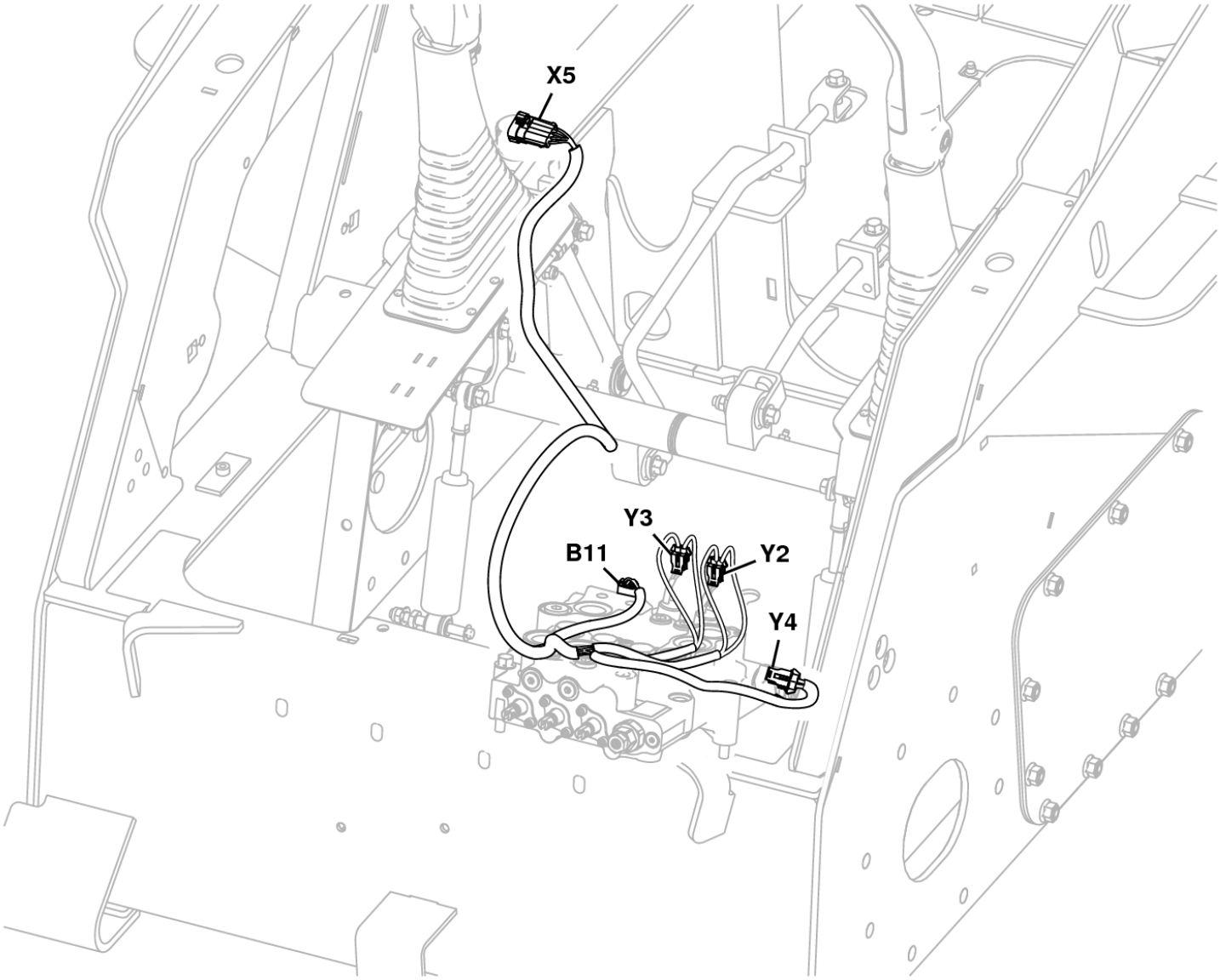
T197466

Front Chassis Harness—Standard (W3) Component Location (S.N. —150522)

LEGEND:

B11	Auxiliary Hydraulic Spool Neutral Switch
X5	Engine Harness to Front Chassis Harness 8-Pin Connector
Y2	Boom Spool Lock Solenoid
Y3	Bucket Spool Lock Solenoid

Y4 Port Lock Solenoid



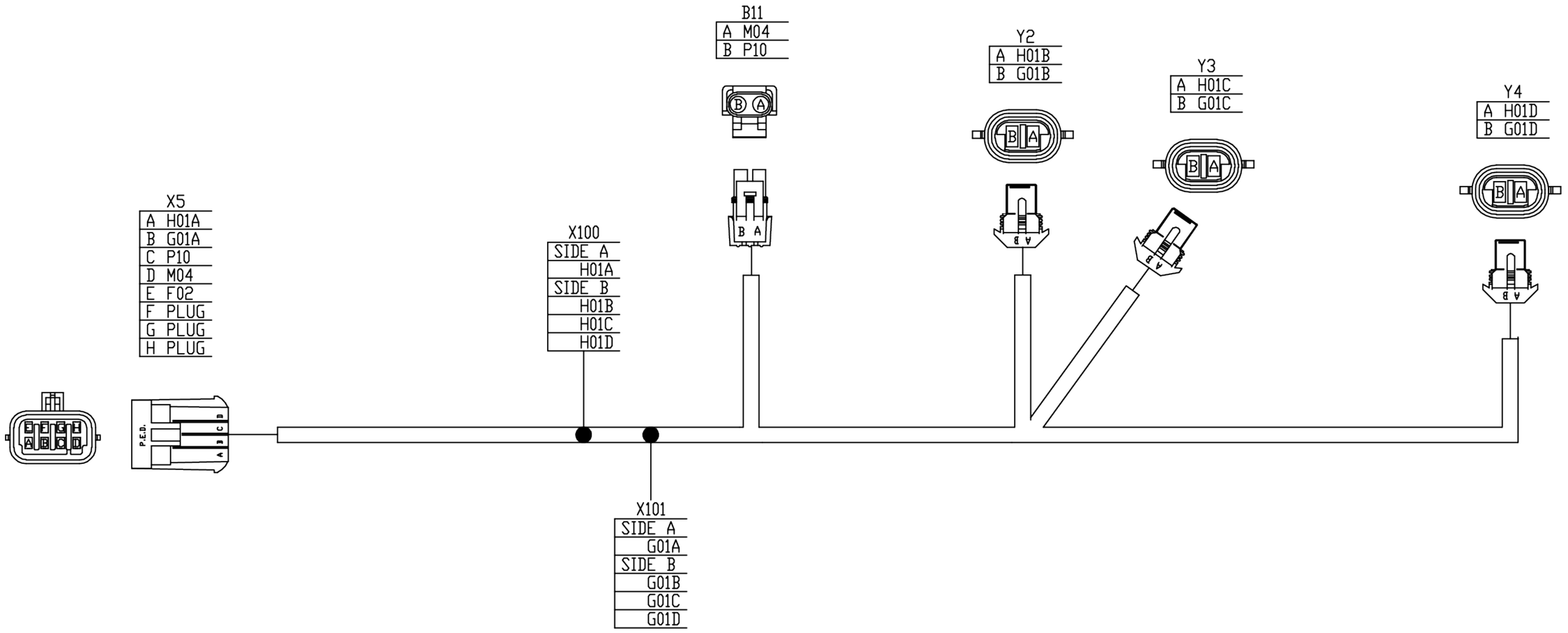
TX1026105

Front Chassis Harness—Standard (W3) Component Location (S.N. 150523—)

LEGEND:

B11	Auxiliary Hydraulic Spool Neutral Switch
X5	Engine Harness to Front Chassis Harness 8-Pin Connector
Y2	Boom Spool Lock Solenoid
Y3	Bucket Spool Lock Solenoid
Y4	Port Lock Solenoid

Front Chassis Harness—Standard (W3) Wiring Diagram



END #1	NUMBER	COLOR	END #2
X5	G01A	BLK	X100
X100	G01B	BLK	Y2
X100	G01C	BLK	Y3
X100	G01D	BLK	Y4
X5	H01A	GRN	X101
X101	H01B	GRN	Y2
X101	H01C	GRN	Y3
X101	H01D	GRN	Y4
X5	M04	PUR	B11
X5	P10	RED	B11

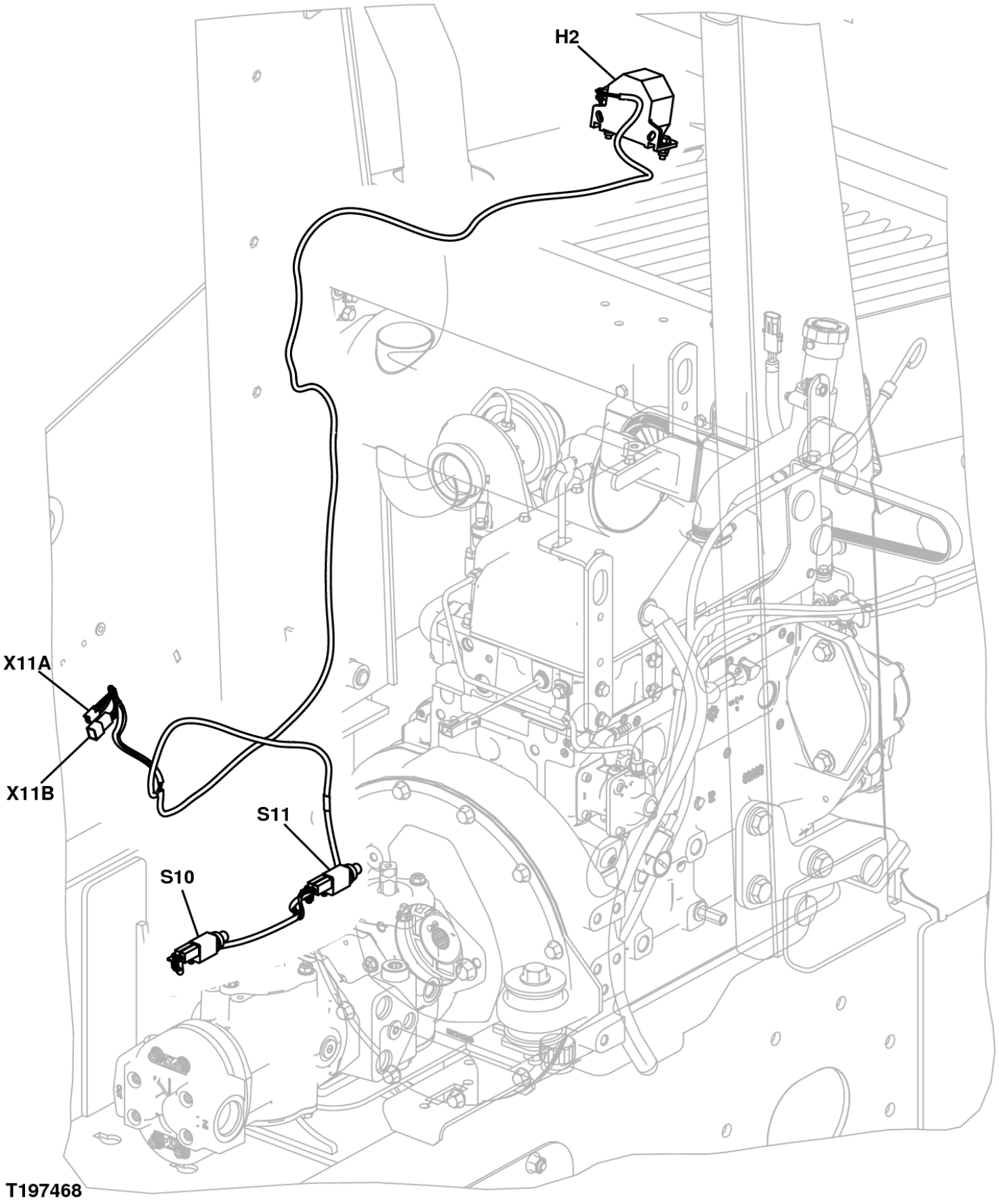
T197465

Front Chassis Harness—Standard (W3) Wiring Diagram

LEGEND:

B11	Auxiliary Hydraulic Spool Neutral Switch
X5	Engine Harness to Front Chassis Harness 8-Pin Connector
X100	Splice
X101	Splice
Y2	Boom Spool Lock Solenoid
Y3	Bucket Spool Lock Solenoid
Y4	Port Lock Solenoid

Back-Up Alarm Harness (W4) Component Location

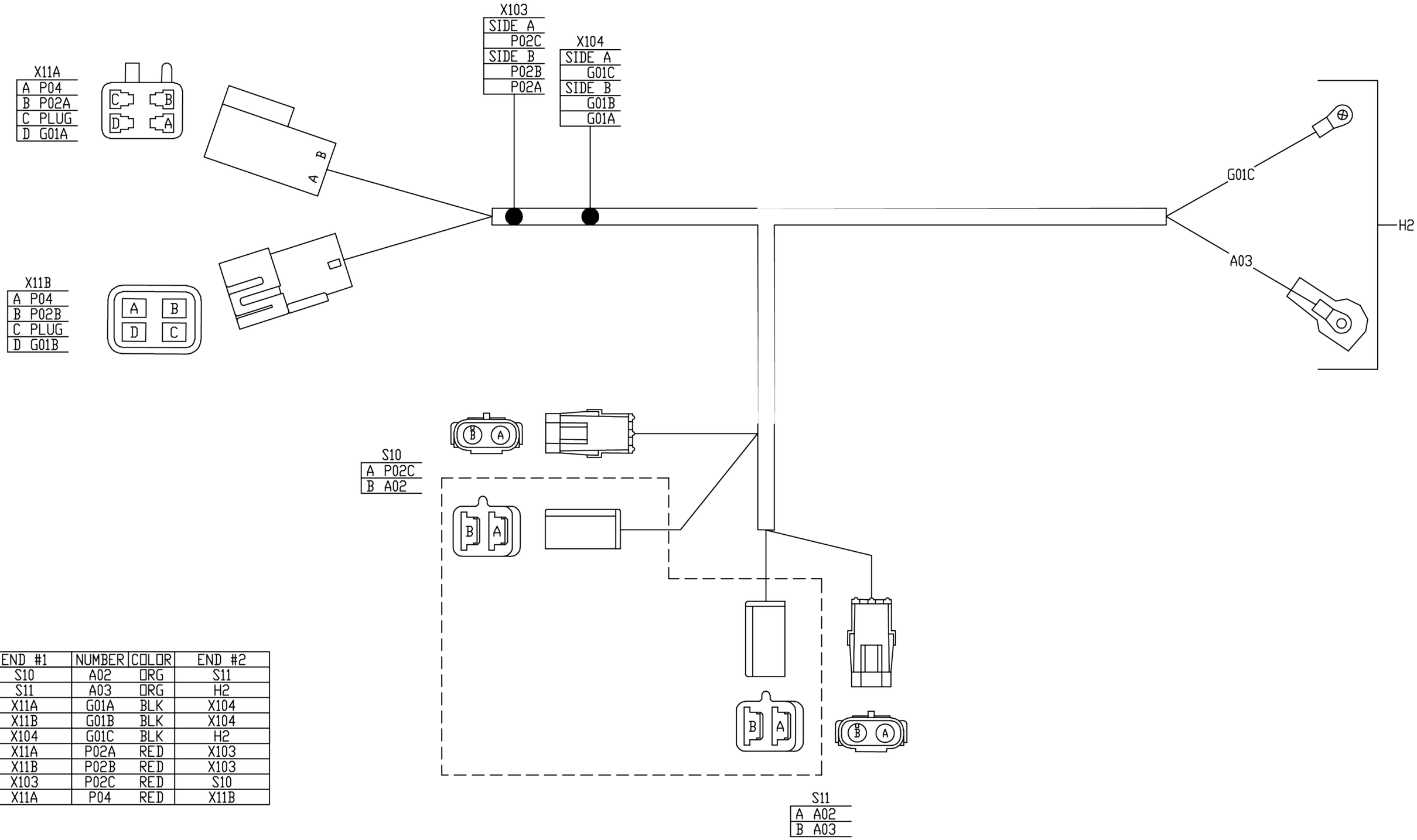


Back-Up Alarm Harness (W4) Component Location

LEGEND:

H2	Back-Up Alarm
S10	Left Reverse Switch
S11	Right Reverse Switch
X11	Engine Harness Accessory Power Connector

Back-Up Alarm Harness (W4) Wiring Diagram



END #1	NUMBER	COLOR	END #2
S10	A02	ORG	S11
S11	A03	ORG	H2
X11A	G01A	BLK	X104
X11B	G01B	BLK	X104
X104	G01C	BLK	H2
X11A	P02A	RED	X103
X11B	P02B	RED	X103
X103	P02C	RED	S10
X11A	P04	RED	X11B

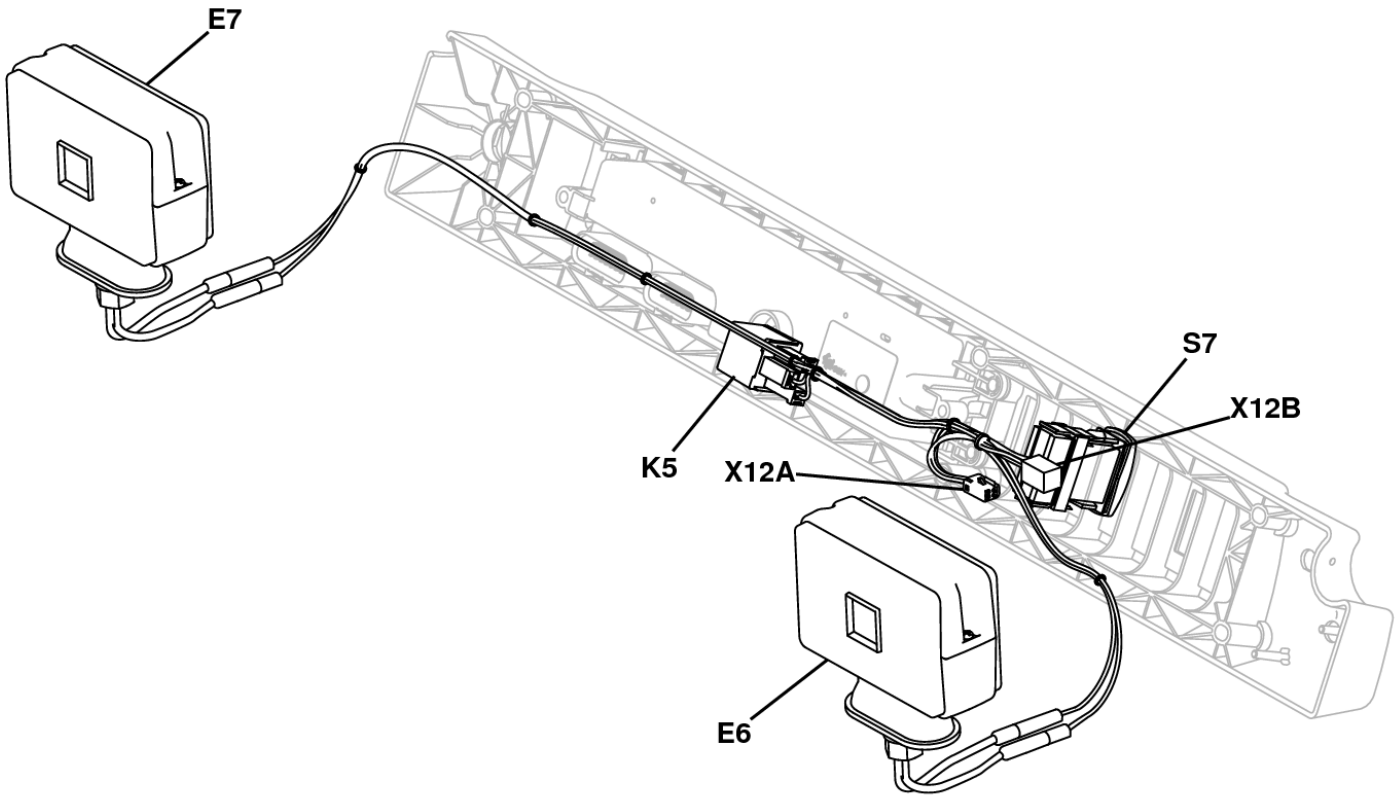
TX1186105

Back-Up Alarm Harness (W4) Wiring Diagram

LEGEND:

H2	Back-Up Alarm
S10	Left Reverse Switch
S11	Right Reverse Switch
X11A	Engine Harness Accessory Power Connector
X11B	Engine Harness Accessory Power to Back-Up Alarm Harness Connector
X103	Splice
X104	Splice

Dual Flasher Harness (W5) Component Location



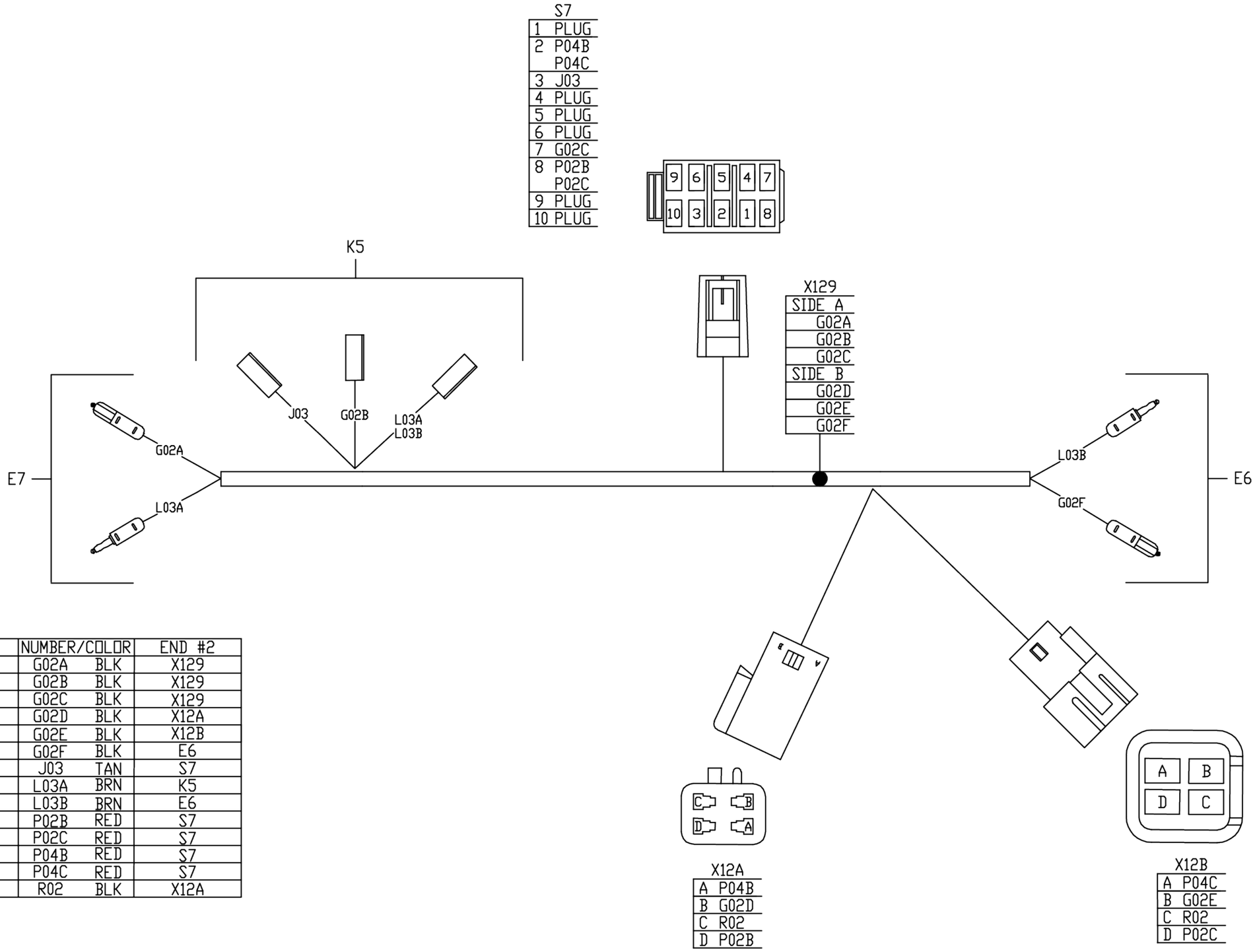
T197470

Dual Flasher Harness (W5) Component Location

LEGEND:

E6	Left Front Flasher Light
E7	Right Front Flasher Light
K5	Dual Flasher Relay
S7	Dual Flasher Switch
X12	Cab Harness Accessory Power Connector

Dual Flasher Harness (W5) Wiring Diagram



END #1	NUMBER/COLOR	END #2
E7	G02A BLK	X129
K5	G02B BLK	X129
S7	G02C BLK	X129
X129	G02D BLK	X12A
X129	G02E BLK	X12B
X129	G02F BLK	E6
K5	J03 TAN	S7
E7	L03A BRN	K5
K5	L03B BRN	E6
X12A	P02B RED	S7
X12B	P02C RED	S7
X12A	P04B RED	S7
X12B	P04C RED	S7
X12B	R02 BLK	X12A

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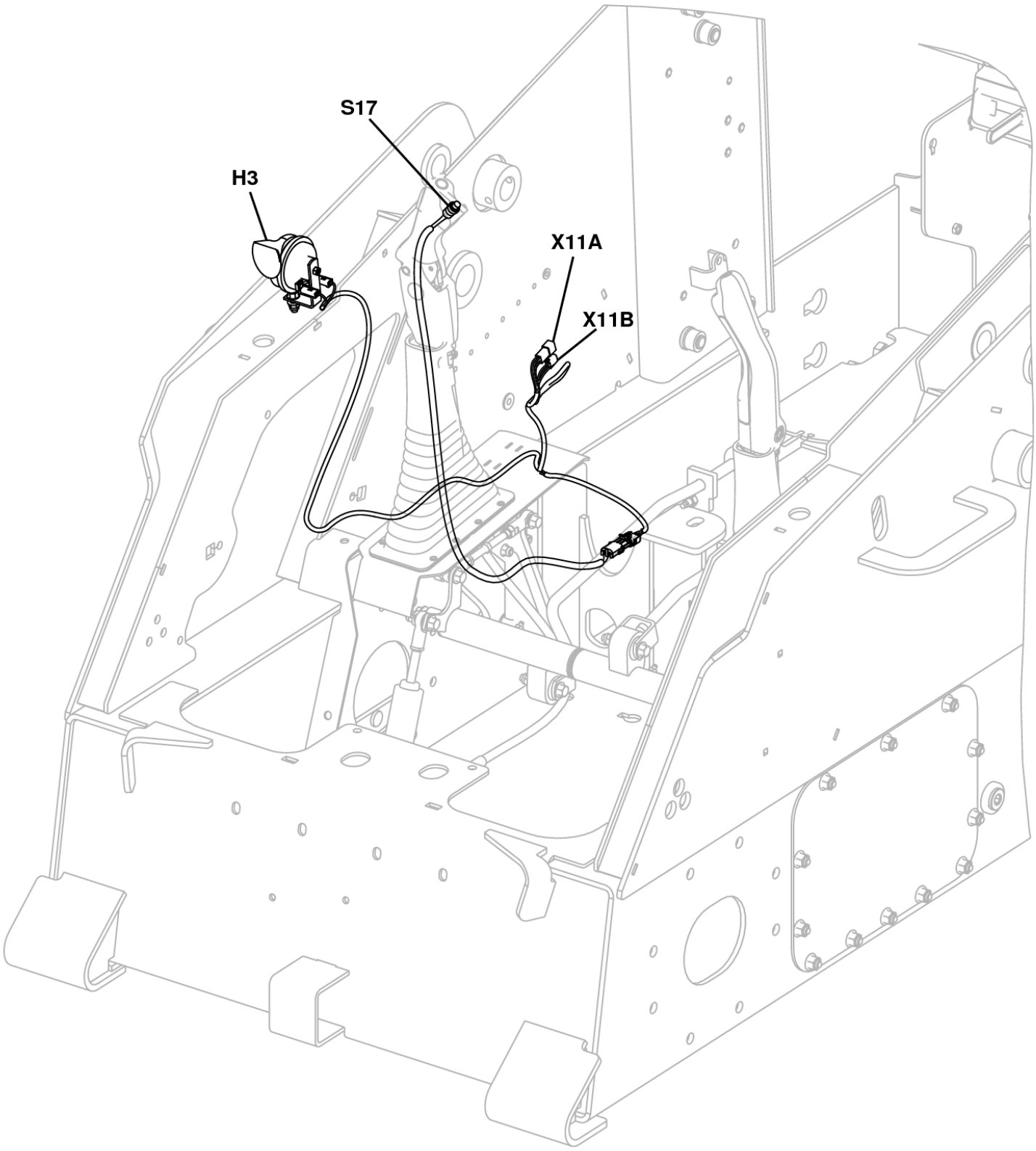
Dual Flasher Harness (W5) Wiring Diagram

LEGEND:

E6	Left Front Flasher Light
E7	Right Front Flasher Light
K5	Dual Flasher Relay
S7	Dual Flasher Switch
X12A	Cab Harness Accessory Power Connector
X12B	Cab Harness Accessory Power to Dual Flasher Harness Connector
X129	Splice

Horn Harness (W6) Component Location



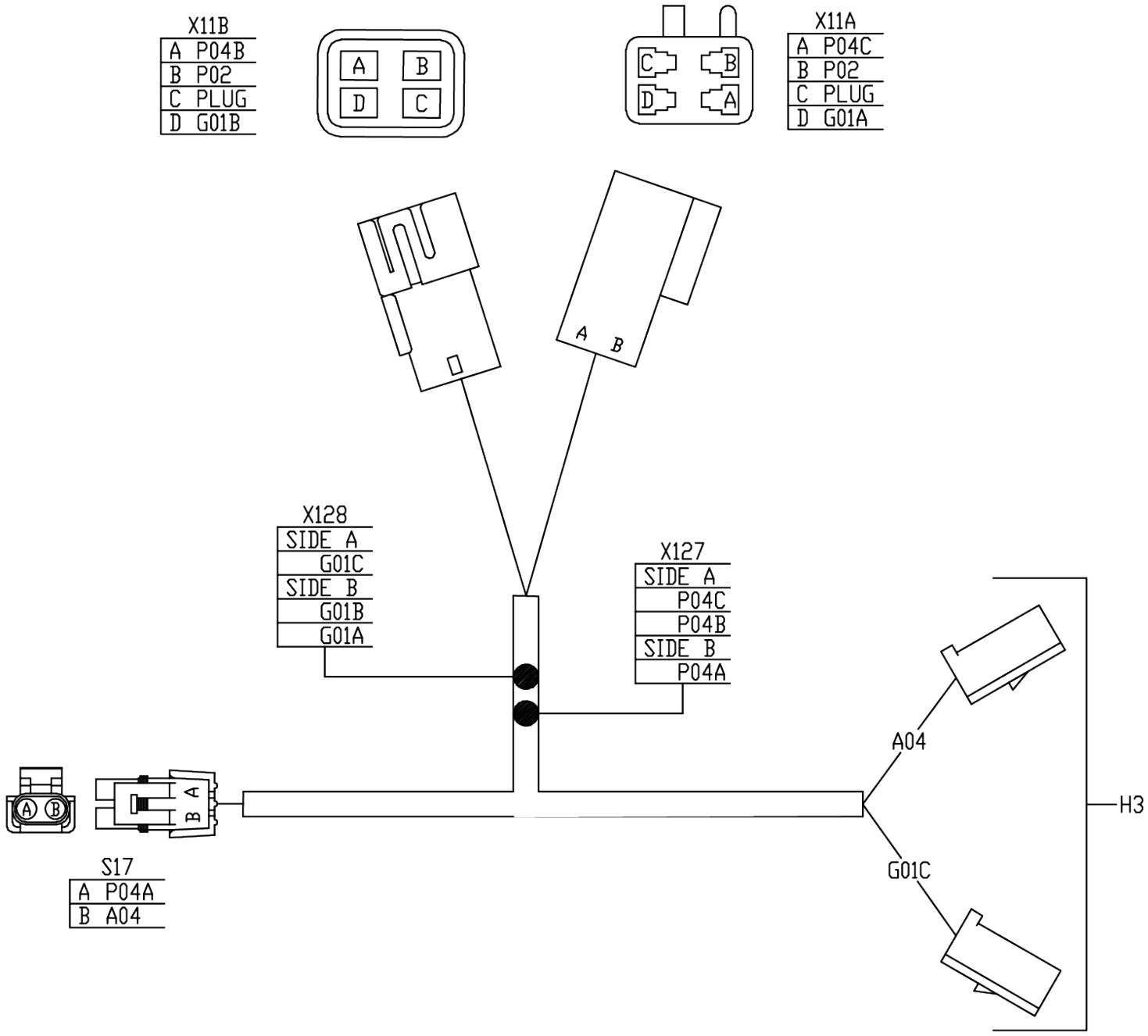
T197472

Horn Harness (W6) Component Location

LEGEND:

H3	Horn
S17	Horn Switch
X11	Engine Harness Accessory Power Connector

Horn Harness (W6) Wiring Diagram



END #1	NUMBER	COLOR	END #2
S17	A04	ORG	H3
X11A	G01A	BLK	X128
X11B	G01B	BLK	X128
X128	G01C	BLK	H3
X11B	P02	RED	X11A
S17	P04A	RED	X127
X127	P04B	RED	X11B
X127	P04C	RED	X11A

T197471

Horn Harness (W6) Wiring Diagram

LEGEND:

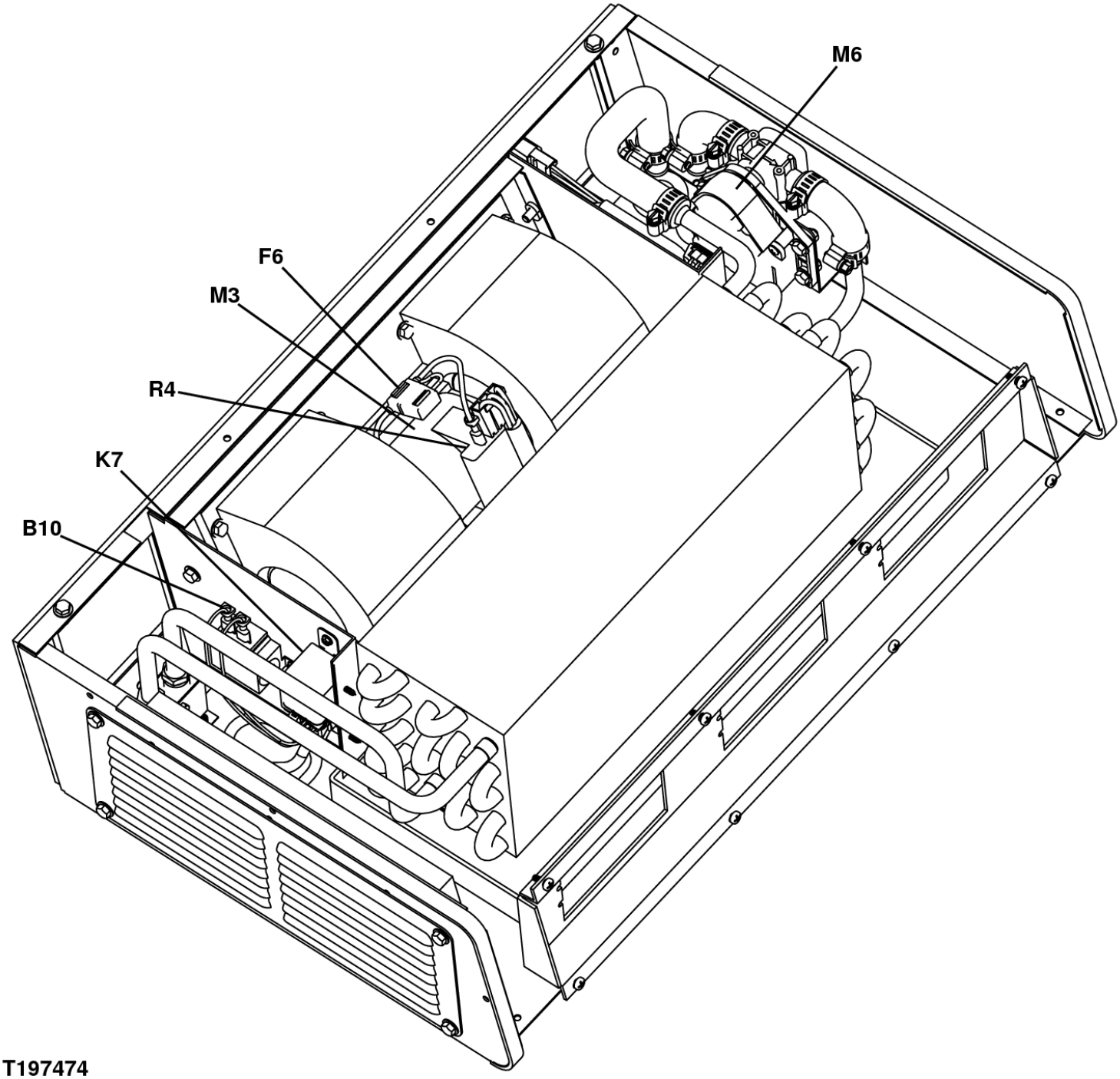
H3	Horn
S17	Horn Switch
X11A	Engine Harness Accessory Power Connector
X11B	Engine Harness Accessory Power to Horn Harness Connector

X127	Splice
X128	Splice

Air Conditioner and Heater Harness (W7) Component Location

→NOTE:

Heater-only machines similar.



T197474

Air Conditioner and Heater Harness (W7) Component Location

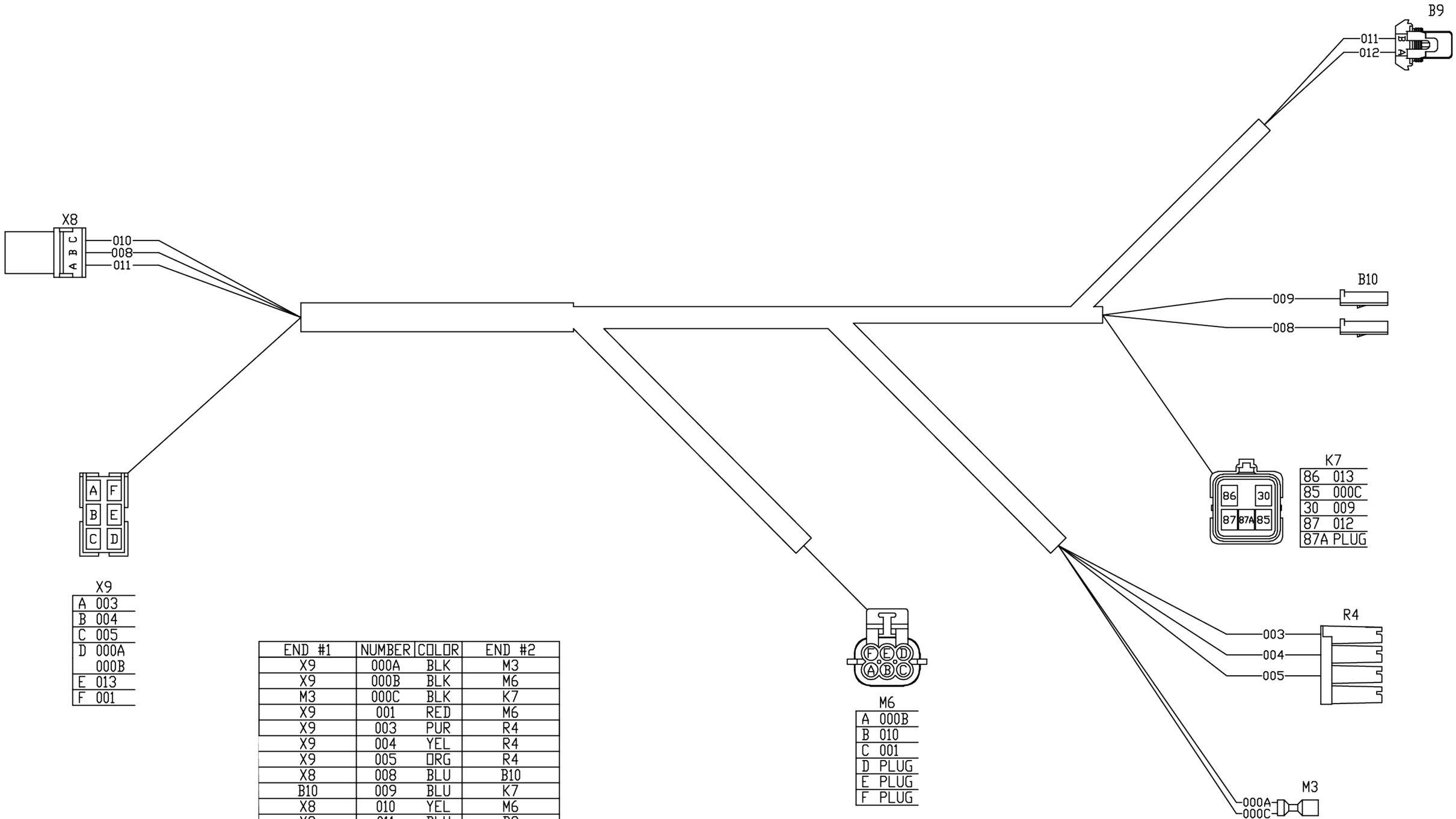
LEGEND:

B10	Air Conditioner Freeze Control Switch
F6	Blower Motor 15 Amp Fuse
K7	Air Conditioner Compressor Clutch Relay
M3	Air Conditioner and Heater Blower Motor
M6	Heater Control Valve Actuator
R4	Blower Motor Resistor Block

Air Conditioner and Heater Harness (W7) Wiring Diagram

→NOTE:

Heater-only machines similar.



END #1	NUMBER	COLOR	END #2
X9	000A	BLK	M3
X9	000B	BLK	M6
M3	000C	BLK	K7
X9	001	RED	M6
X9	003	PUR	R4
X9	004	YEL	R4
X9	005	ORG	R4
X8	008	BLU	B10
B10	009	BLU	K7
X8	010	YEL	M6
X8	011	BLU	B9
B9	012	BLU	K7
X9	013	ORG	K7

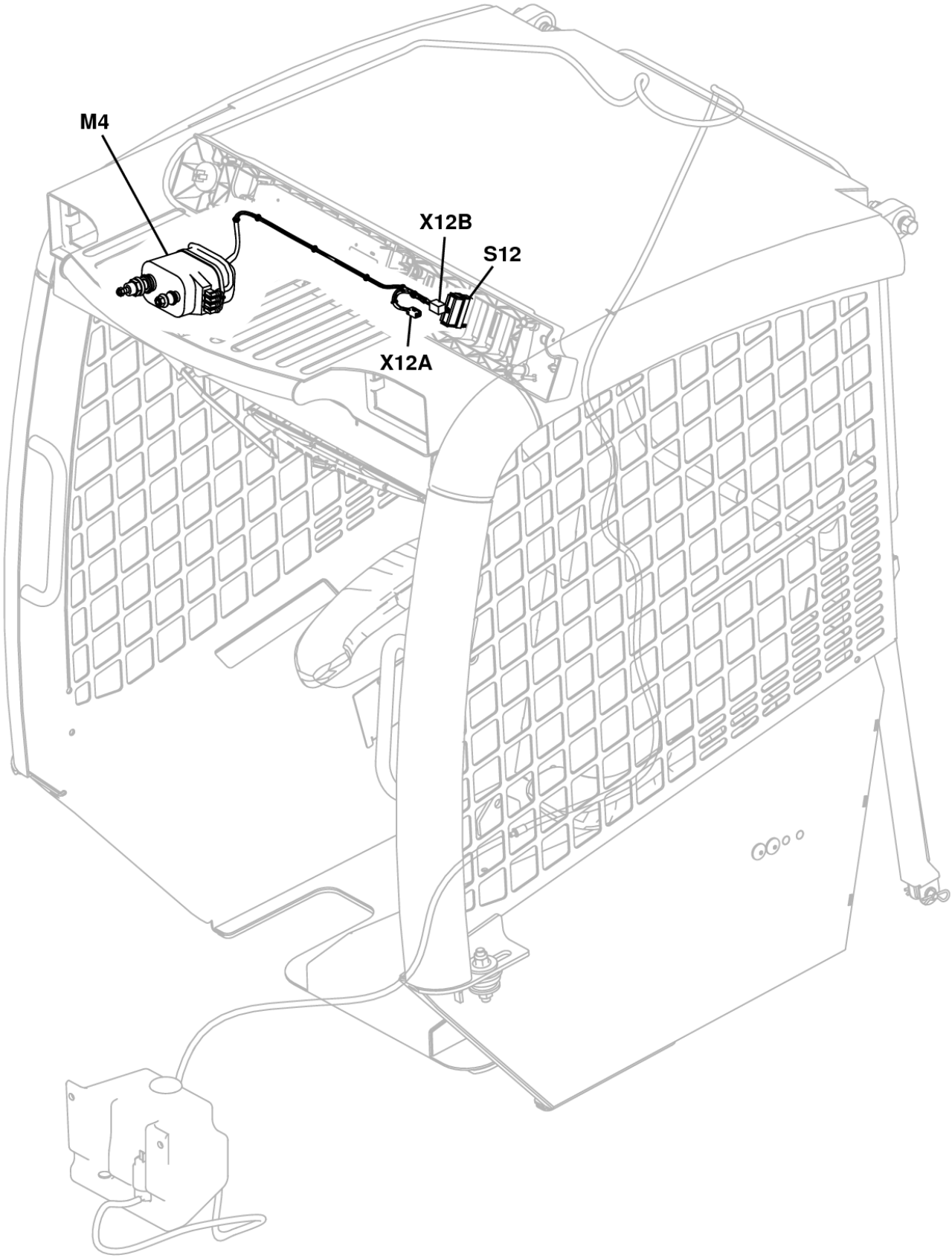
T197473

Air Conditioner and Heater Harness (W7) Wiring Diagram

LEGEND:

B9	Air Conditioner High/Low Pressure Switch
B10	Air Conditioner Freeze Control Switch
K7	Air Conditioner Compressor Clutch Relay
M3	Air Conditioner and Heater Blower Motor
M6	Heater Control Valve Actuator
R4	Blower Motor Resistor Block
X8	Cab Harness to Air Conditioner and Heater Harness 3-Pin Connector
X9	Cab Harness to Air Conditioner and Heater Harness 6-Pin Connector

Wiper Harness (W8) Component Location



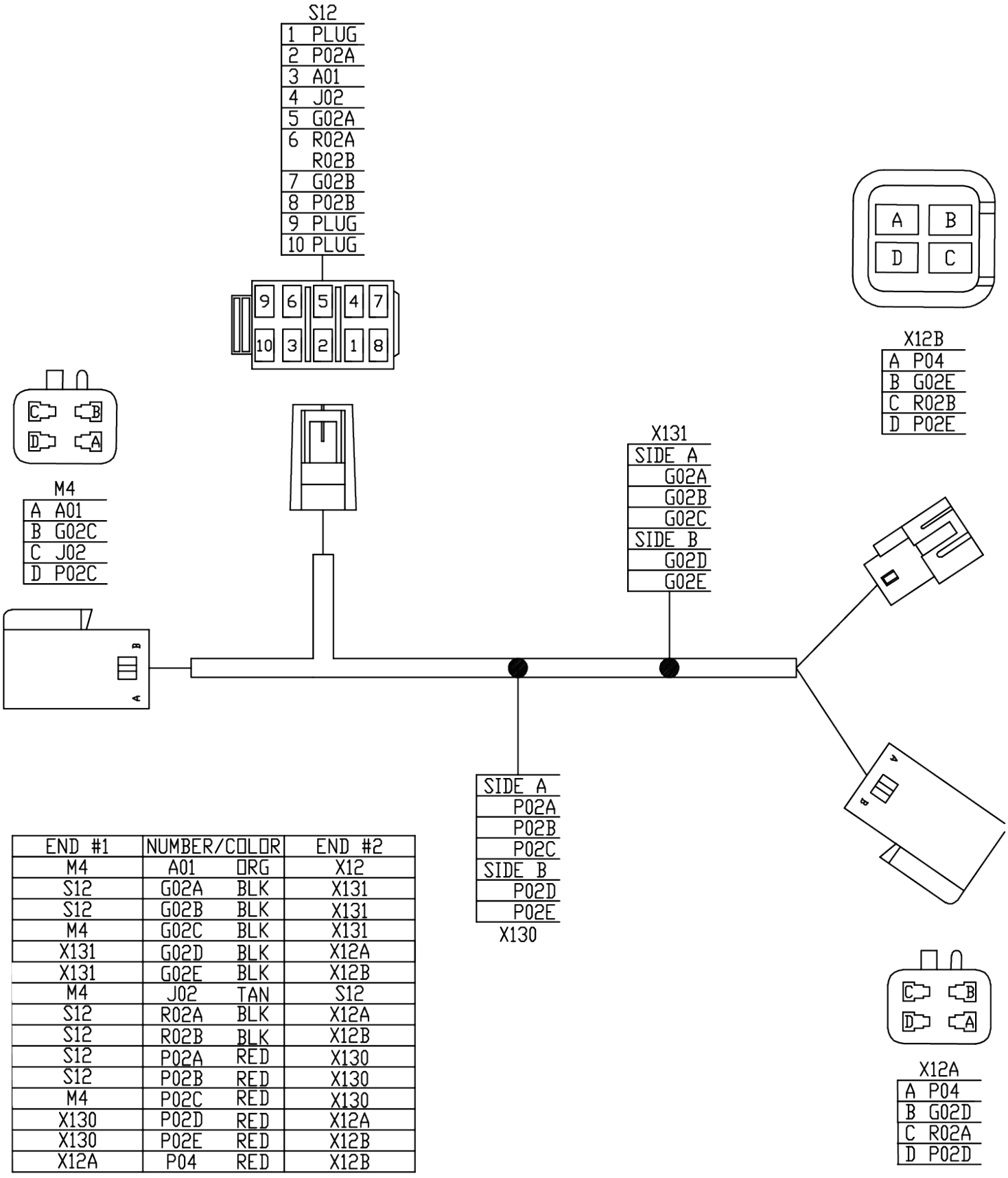
T197476

Wiper Harness (W8) Component Location

LEGEND:

M4	Windshield Wiper Motor
S12	Windshield Wiper and Washer Switch
X12	Cab Harness Accessory Power Connector

Wiper Harness (W8) Wiring Diagram



END #1	NUMBER/COLOR		END #2
M4	A01	ORG	X12
S12	G02A	BLK	X131
S12	G02B	BLK	X131
M4	G02C	BLK	X131
X131	G02D	BLK	X12A
X131	G02E	BLK	X12B
M4	J02	TAN	S12
S12	R02A	BLK	X12A
S12	R02B	BLK	X12B
S12	P02A	RED	X130
S12	P02B	RED	X130
M4	P02C	RED	X130
X130	P02D	RED	X12A
X130	P02E	RED	X12B
X12A	P04	RED	X12B

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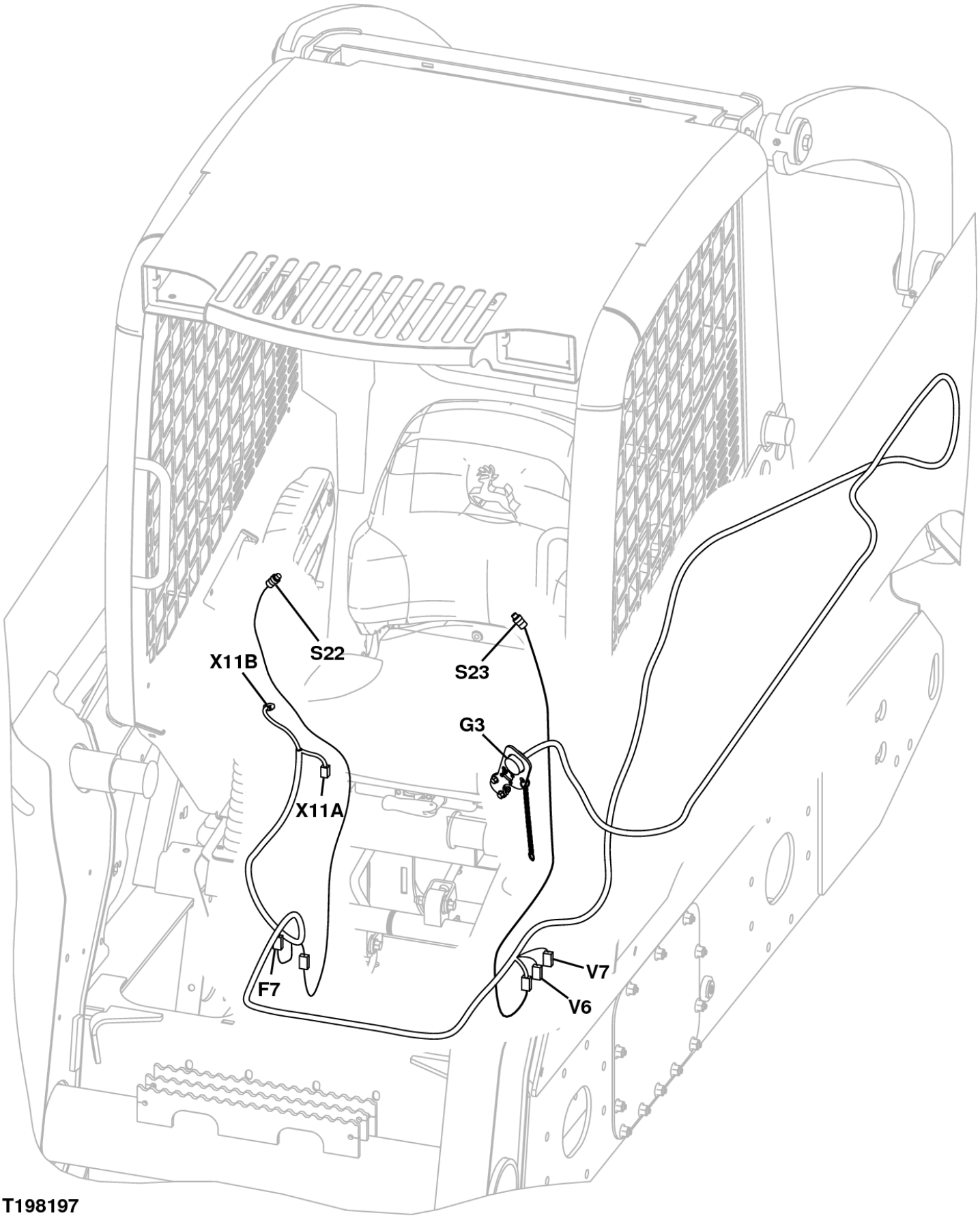
Wiper Harness (W8) Wiring Diagram

LEGEND:

M4	Windshield Wiper Motor
S12	Windshield Wiper and Washer Switch
X12A	Cab Harness Accessory Power Connector
X12B	Cab Harness Accessory Power to Wiper Harness Connector

X130	Splice
X131	Splice

12 Volt Auxiliary Power Harness (W9) Component Location



T198197

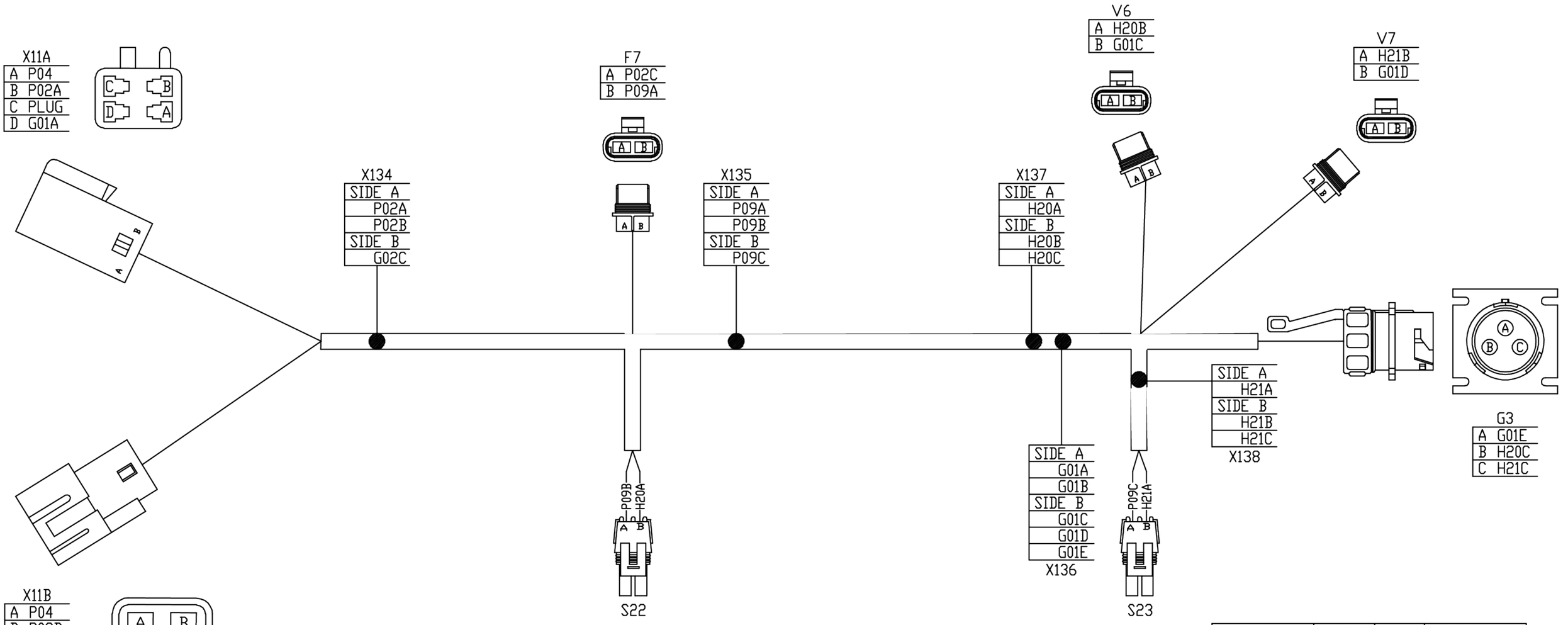
12 Volt Auxiliary Power Harness (W9) Component Location

LEGEND:

F7	12 Volt Auxiliary Power Harness 10 Amp Fuse
G3	12 Volt Auxiliary Power Harness Outlet
S22	Right 12 Volt Power Switch
S23	Left 12 Volt Power Switch

V6	Right 12 Volt Power Switch Diode
V7	Left 12 Volt Power Switch Diode
X11	Engine Harness Accessory Power Connector

12 Volt Auxiliary Power Harness (W9) Wiring Diagram



END #1	NUMBER	COLOR	END #2
X11A	G01A	BLK	X136
X11B	G01B	BLK	X136
X136	G01C	BLK	V6
X136	G01D	BLK	V7
X136	G01E	BLK	G3
S22	H20A	DKGRN	X137
X137	H20B	DKGRN	V6
X137	H20C	DKGRN	G3
S23	H21A	DKGRN	X138
X138	H21B	DKGRN	V7
X138	H21C	DKGRN	G3
X11A	P02A	RED	X134
X11B	P02B	RED	X134
X134	P02C	RED	F7
X11A	P04	RED	X11B
F7	P09A	RED	X135
S22	P09B	RED	X135
X135	P09C	RED	S23

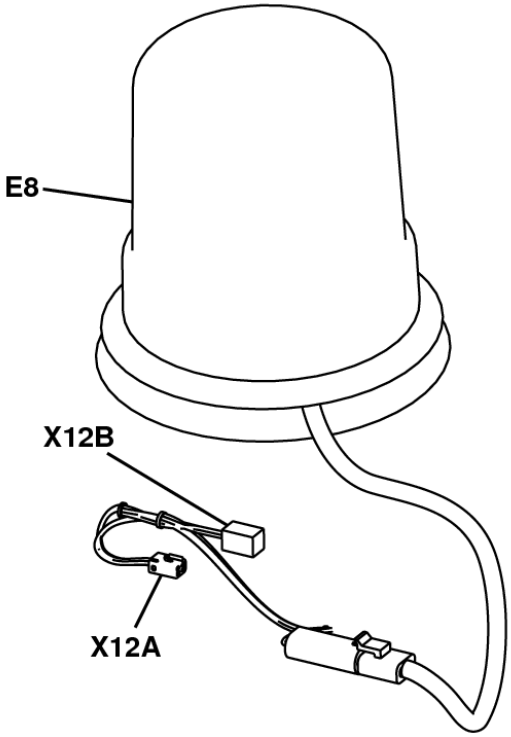
TX1030392

12 Volt Auxiliary Power Harness (W9) Wiring Diagram

LEGEND:

F7	12 Volt Auxiliary Power Harness 10 Amp Fuse
G3	12 Volt Auxiliary Power Harness Outlet
S22	Right 12 Volt Power Switch
S23	Left 12 Volt Power Switch
V6	Right 12 Volt Power Switch Diode
V7	Left 12 Volt Power Switch Diode
X11A	Engine Harness Accessory Power Connector
X11B	Engine Harness Accessory Power to 12 Volt Auxiliary Power Harness Connector
X134	Splice
X135	Splice
X136	Splice
X137	Splice
X138	Splice

Beacon Harness (W10) Component Location



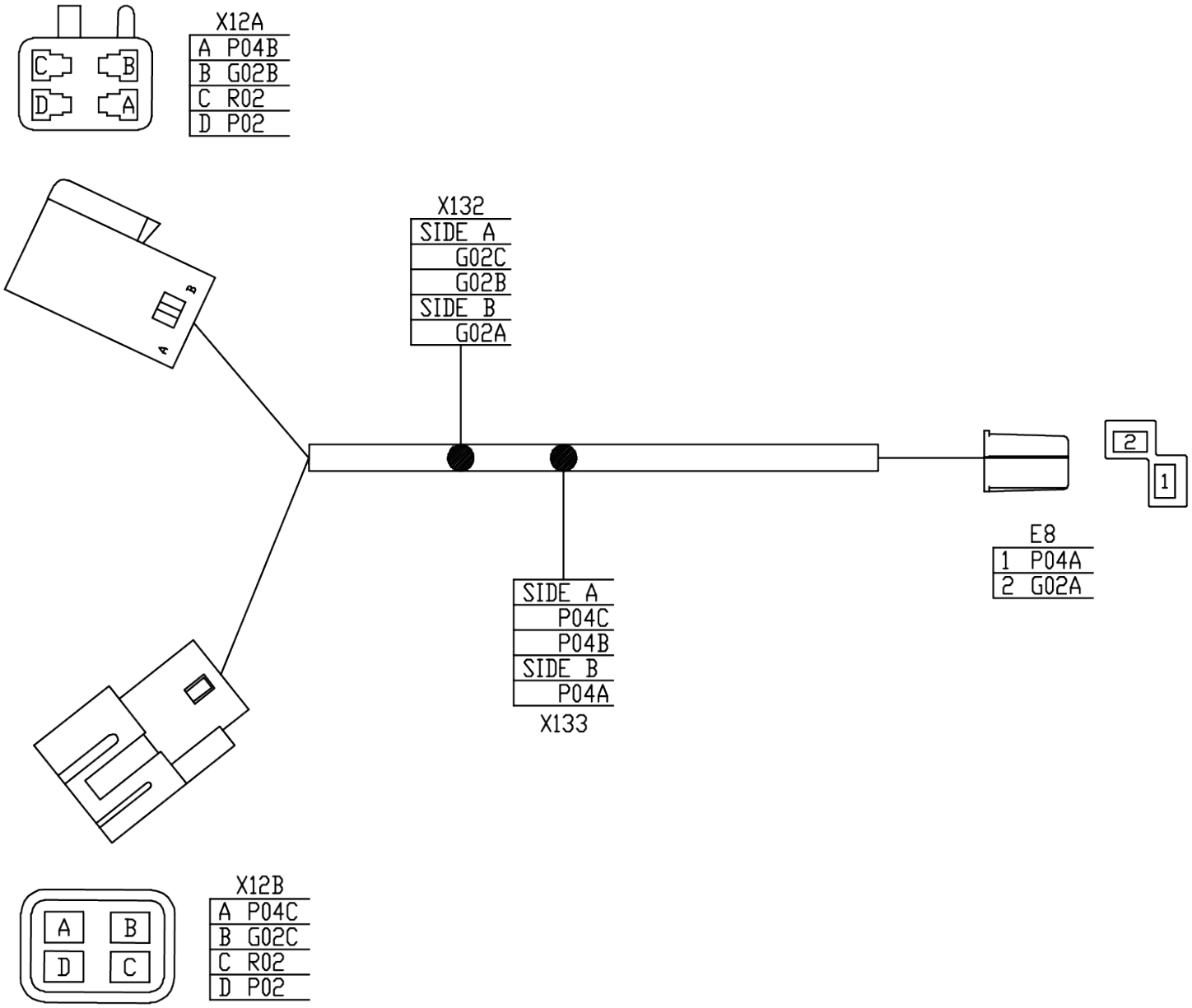
T198199

Beacon Harness (W10) Component Location

LEGEND:

E8	Beacon
X12	Cab Harness Accessory Power Connector

Beacon Harness (W10) Wiring Diagram



END #1	NUMBER	COLOR	END #2
X132	G02A	BLK	E8
X12A	G02B	BLK	X132
X12B	G02C	BLK	X132
X12A	P02	RED	X12B
X133	P04A	RED	E8
X12A	P04B	RED	X133
X12B	P04C	RED	X133
X12A	R02	BLK	X12B

T198180

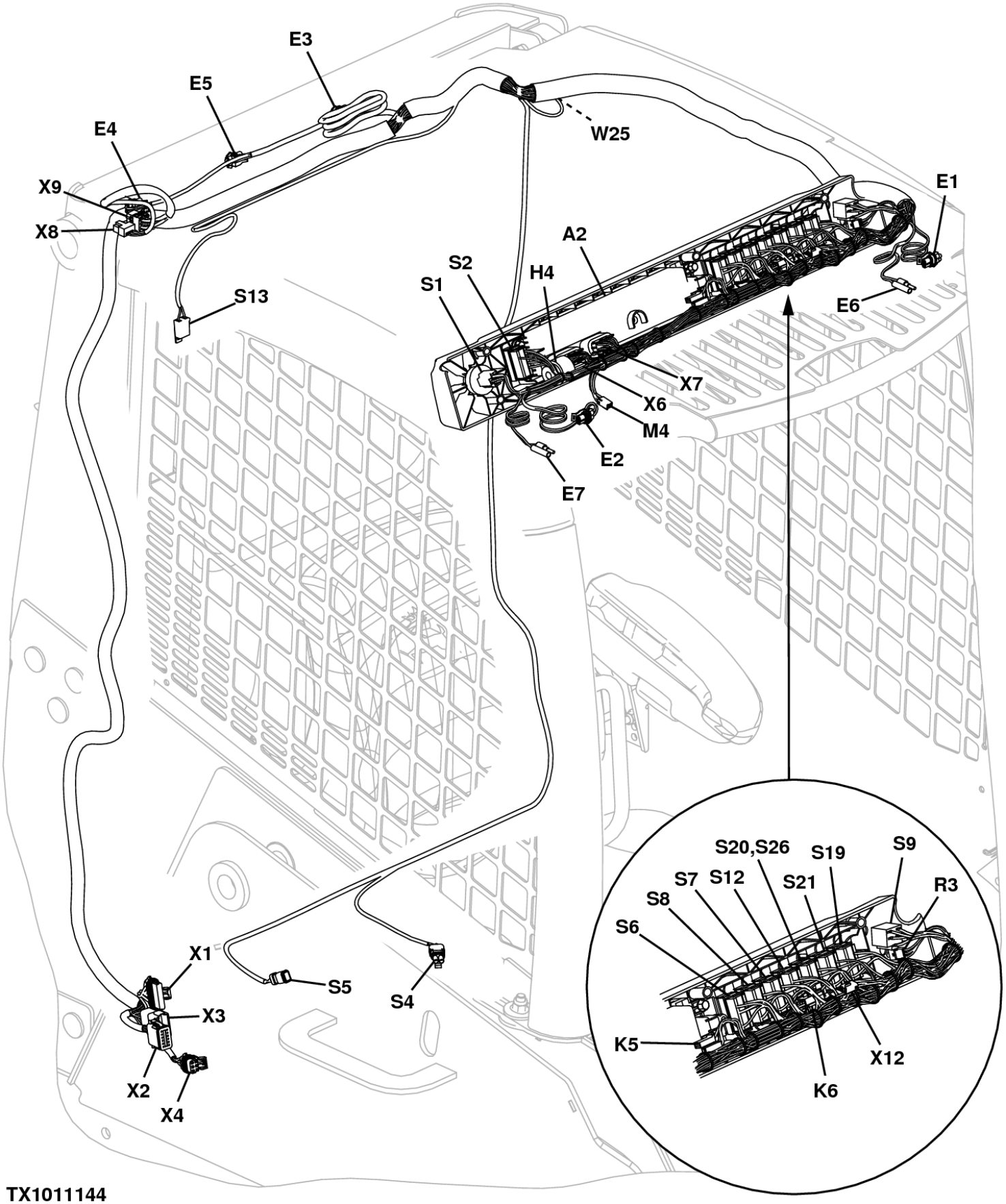
Beacon Harness (W10) Wiring Diagram

LEGEND:

E8	Beacon
X12A	Cab Harness Accessory Power Connector
X12B	Cab Harness Accessory Power to Beacon Harness Connector
X132	Splice

X133	Splice

Cab Harness—Deluxe (W12) Component Location



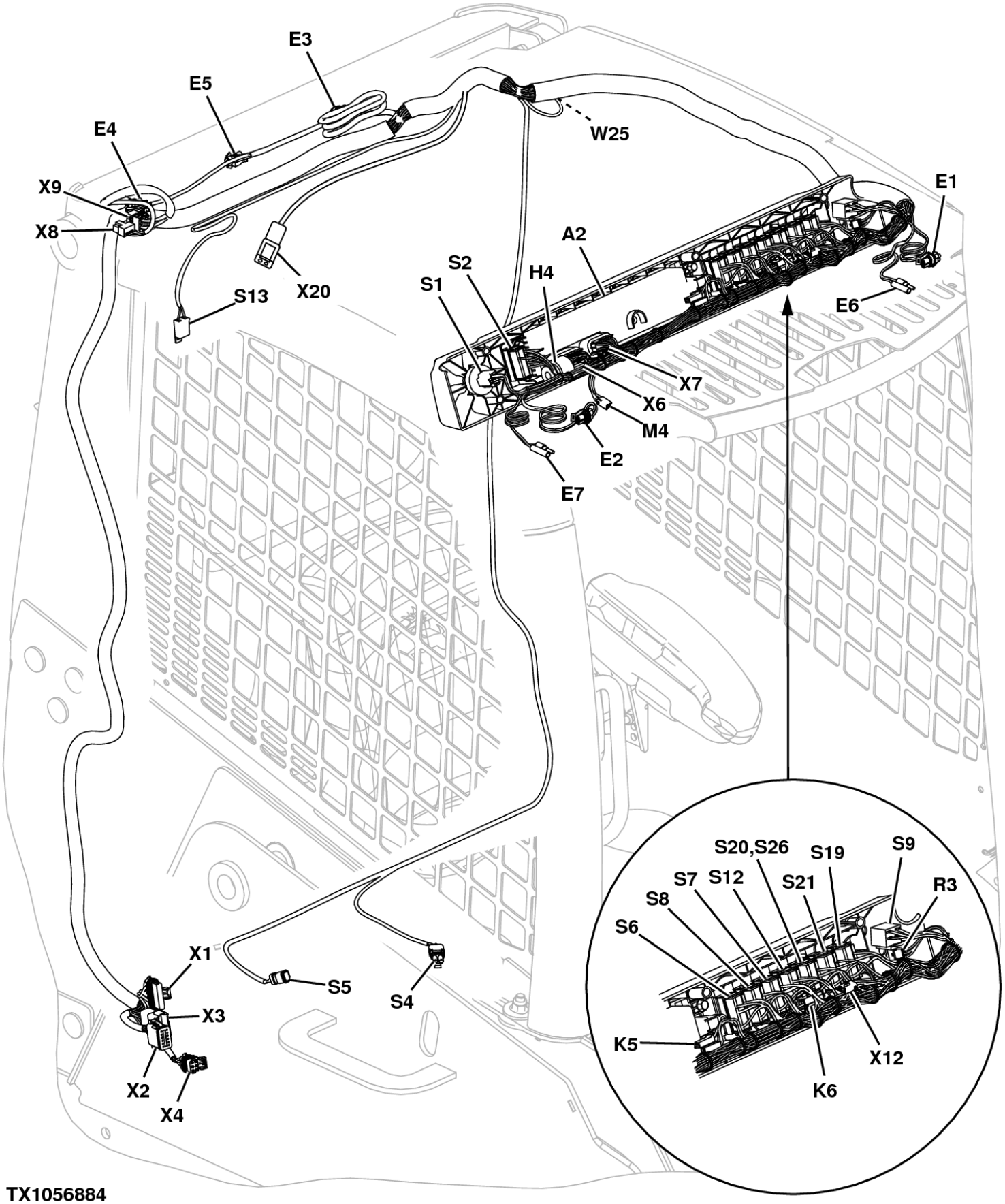
TX1011144

Cab Harness—Deluxe (W12) Component Location (S.N. —170536)

LEGEND:

A2	Engagement and Monitor Unit
E1	Left Front Work Light
E2	Right Front Work Light
E3	Left Tail Light

E4	Right Tail Light
E5	Rear Work Light
E6	Left Front Flasher Light
E7	Right Front Flasher Light
H4	Engagement and Monitor Unit Warning Alarm
K5	Dual Flasher Relay
K6	High-Flow Relay
M4	Windshield Wiper Motor
R3	Cab Temperature Control Dial
S1	Key Switch
S2	Park Brake Switch
S4	Seat Switch
S5	Seat Belt Switch
S6	Work Lights Switch
S7	Dual Flasher Switch
S8	High Flow Switch
S9	Air Conditioner and Heater Blower Motor Switch
S12	Windshield Wiper and Washer Switch
S13	Cab Door Switch
S19	Air Conditioning Switch
S20	Quik-Tatch Switch
S21	Auxiliary Hydraulic Override Switch
W25	Cab Harness Ground
X1	Cab Harness to Engine Harness 5-Pin Connector
X2	Cab Harness to Engine Harness 12-Pin Connector
X3	Cab Harness to Engine Harness 12-Pin Connector
X4	Cab Harness to Front Chassis Harness 6-Pin Connector
X6	Cab Harness to Engagement and Monitor Unit 16-Pin Connector (J1)
X7	Cab Harness to Engagement and Monitor Unit 14-Pin Connector (J2)
X8	Cab Harness to Air Conditioner and Heater Harness 3-Pin Connector
X9	Cab Harness to Air Conditioner and Heater Harness 6-Pin Connector
X12	Cab Harness Accessory Power Connector



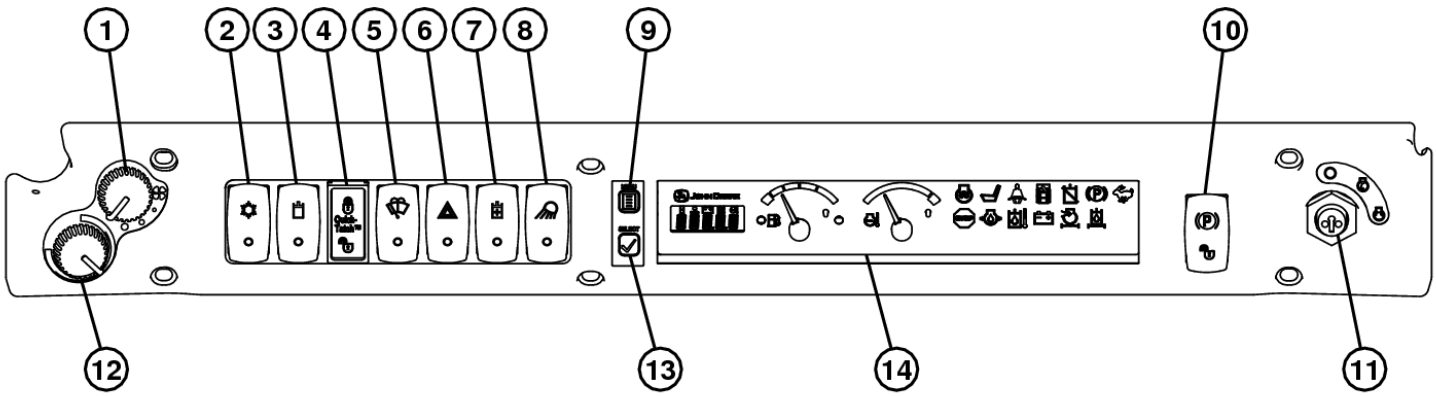
TX1056884

Cab Harness—Deluxe (W12) Component Location (S.N. 170537—)

LEGEND:

A2	Engagement and Monitor Unit
E1	Left Front Work Light
E2	Right Front Work Light
E3	Left Tail Light
E4	Right Tail Light
E5	Rear Work Light

E6	Left Front Flasher Light
E7	Right Front Flasher Light
H4	Engagement and Monitor Unit Warning Alarm
K5	Dual Flasher Relay
K6	High-Flow Relay
M4	Windshield Wiper Motor
R3	Cab Temperature Control Dial
S1	Key Switch
S2	Park Brake Switch
S4	Seat Switch
S5	Seat Belt Switch
S6	Work Lights Switch
S7	Dual Flasher Switch
S8	High Flow Switch
S9	Air Conditioner and Heater Blower Motor Switch
S12	Windshield Wiper and Washer Switch
S13	Cab Door Switch
S19	Air Conditioning Switch
S20	Quik-Tatch Switch
S21	Auxiliary Hydraulic Override Switch
W25	Cab Harness Ground
X1	Cab Harness to Engine Harness 5-Pin Connector
X2	Cab Harness to Engine Harness 12-Pin Connector
X3	Cab Harness to Engine Harness 12-Pin Connector
X4	Cab Harness to Front Chassis Harness 6-Pin Connector
X6	Cab Harness to Engagement and Monitor Unit 16-Pin Connector (J1)
X7	Cab Harness to Engagement and Monitor Unit 14-Pin Connector (J2)
X8	Cab Harness to Air Conditioner and Heater Harness 3-Pin Connector
X9	Cab Harness to Air Conditioner and Heater Harness 6-Pin Connector
X12	Cab Harness Accessory Power Connector
X20	Operators Convenience Package Power 2-Pin Connector



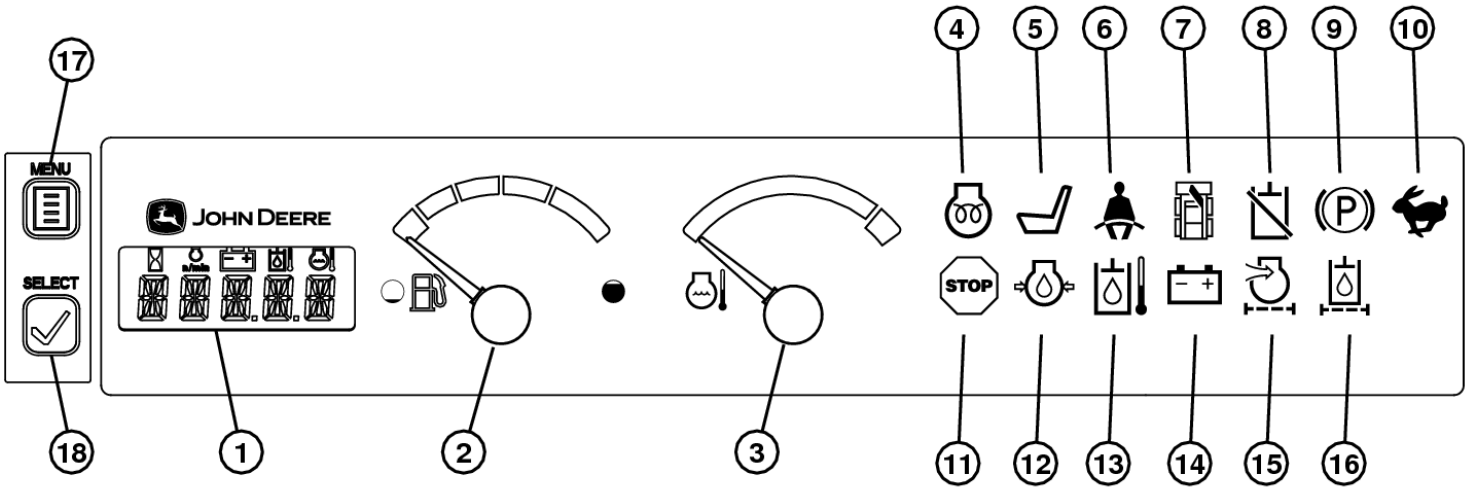
T197805

Instrument Panel

LEGEND:

1	Air Conditioner and Heater Blower Motor Switch
2	Air Conditioner Switch
3	Auxiliary Hydraulic Override Switch
4	Quik-Tatch Switch
5	Windshield Wiper and Washer Switch
6	Dual Flasher Switch
7	High Flow Switch
8	Work Lights Switch
9	MENU Button
10	Park Brake Switch
11	Key Switch

12 Cab Temperature Control Dial
13 SELECT Button
14 Engagement and Monitor Unit



T197653

Engagement and Monitor Unit

LEGEND:

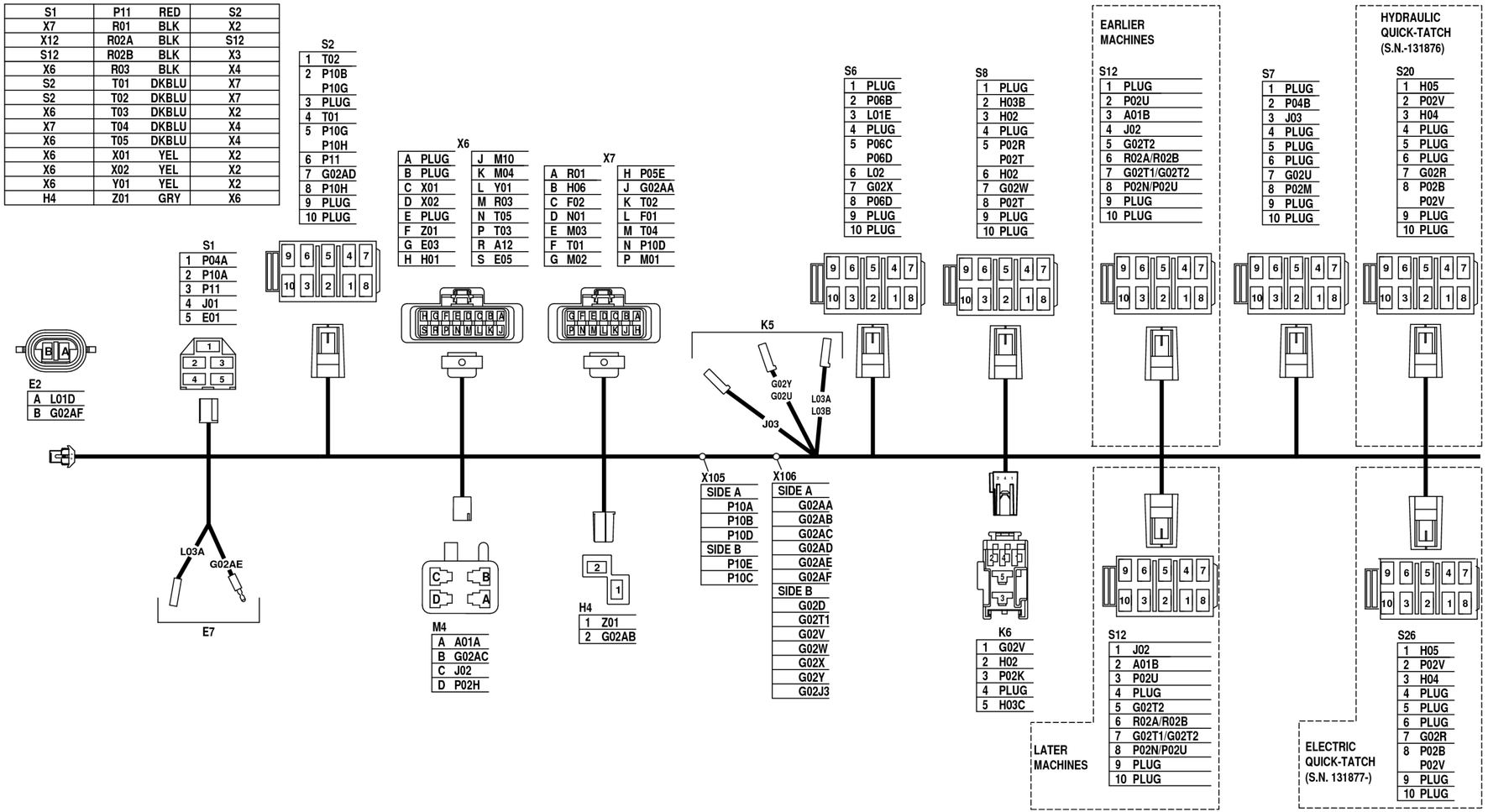
1 Engagement and Monitor Unit Display
2 Fuel Gauge
3 Engine Coolant Temperature Gauge
4 Glow Plug Indicator
5 Seat Switch Indicator
6 Seat Belt Switch Indicator
7 Cab Door Switch Indicator
8 Hydraulics OFF Indicator
9 Park Brake Indicator
10 High Speed Indicator
11 STOP Indicator
12 Low Engine Oil Pressure Indicator
13 Hydraulic Oil Temperature Indicator
14 Low Alternator or Battery Voltage Indicator
15 Engine Air Filter Restriction Indicator
16 Hydraulic Oil Filter Restriction Indicator
17 MENU Button
18 SELECT Button

Cab Harness—Deluxe (W12) Wiring Diagram

END #1	NUMBER	COLOR	END #2
M4	A01A	ORG	X113
S12	A01B	ORG	X113
X3	A01C	ORG	X113
S9	A05	ORG	X9
S9	A06	ORG	X9
S9	A07	ORG	X9
S19	A08	ORG	X8
X8	A10	ORG	X3
R3	A11	ORG	X8
X6	A12	ORG	X9
S1	E01	WHT	X2
X6	E03	WHT	X3
X6	E05	WHT	X3
X7	F01	YEL	X2
X7	F02	YEL	X2
X1	G02A	BLK	X110
X1	G02B	BLK	X110
X9	G02C	BLK	X110
E4	G02D	BLK	X108
E5	G02E	BLK	X108
E3	G02F	BLK	X108
X110	G02G	BLK	W25
X108	G02H	BLK	R3
X110	G02J1	BLK	X108
X110	G02J3	BLK	X106
X108	G02K	BLK	E6
X108	G02L	BLK	E1
X108	G02M	BLK	S19
X108	G02N	BLK	S21
X106	G02P	BLK	X12
X108	G02R	BLK	S20/S26
X106	G02T1	BLK	S12
S12	G02T2	BLK	S12
X106	G02U	BLK	S7
X106	G02V	BLK	K6
X106	G02W	BLK	S8
X106	G02X	BLK	S6
X106	G02Y	BLK	K5
X7	G02AA	BLK	X106
H4	G02AB	BLK	X106
M4	G02AC	BLK	X106
S2	G02AD	BLK	X106
E7	G02AE	BLK	X106
E2	G02AF	BLK	X106
X6	H01	DKGRN	X2
K6	H02	DKGRN	S8
X4	H03A	DKGRN	X114
S8	H03B	DKGRN	X114
K6	H03C	DKGRN	X114
S20/S26	H04	DKGRN	X4
S20/S26	H05	DKGRN	X4
X7	H06	DKGRN	S21
S1	J01	TAN	X3

S12	J02	TAN	M4
K5	J03	TAN	S7
E1	L01A	BRN	X107
E4	L01B	BRN	X107
E3	L01C	BRN	X107
E2	L01D	BRN	X107
S6	L01E	BRN	X107
S6	L02	BRN	E5
K5	L03A	BRN	E7
K5	L03B	BRN	E6
X7	M01	PUR	S4
X7	M02	PUR	S5
X7	M03	PUR	S13
X2	M04	PUR	X6
X6	M10	PUR	X2
X7	N01	YEL	X3
X112	P02A	RED	S19
X112	P02B	RED	S20/S26
X115	P02D	RED	R3
X115	P02E	RED	S9
X9	P02F	RED	X112
X1	P02G	RED	X112
X115	P02H	RED	M4
X112	P02J1	RED	X115
K6	P02K	RED	X115
S7	P02M	RED	X115
S12	P02N	RED	X112
X12	P02P	RED	X115
S8	P02R	RED	X115
S8	P02T	RED	S8
S12	P02U	RED	S12
S20/S26	P02V	RED	S20/S26
S1	P04A	RED	X111
S7	P04B	RED	X111
X1	P04C	RED	X111
X1	P04D	RED	X111
X109	P05A	RED	S5
X109	P05B	RED	S4
S13	P05C RED EARLIER MACHINES		X109
X3	P05D	RED	X109
X7	P05E	RED	X109
X2	P06A	RED	X149
S6	P06B	RED	X149
S6	P06C	RED	X149
S6	P06D	RED	S6
S19	P07	RED	S9
S1	P10A	RED	X105
S2	P10B	RED	X105
X1	P10C	RED	X105
X7	P10D	RED	X105
X105	P10E	RED	S21
S21	P10F	RED	S21
S2	P10G	RED	S2
S2	P10H	RED	S2
X105	P10K RED LATER MACHINES		S13

S1	P11	RED	S2
X7	R01	BLK	X2
X12	R02A	BLK	S12
S12	R02B	BLK	X3
X6	R03	BLK	X4
S2	T01	DKBLU	X7
S2	T02	DKBLU	X7
X6	T03	DKBLU	X2
X7	T04	DKBLU	X4
X6	T05	DKBLU	X4
X6	X01	YEL	X2
X6	X02	YEL	X2
X6	Y01	YEL	X2
H4	Z01	GRY	X6

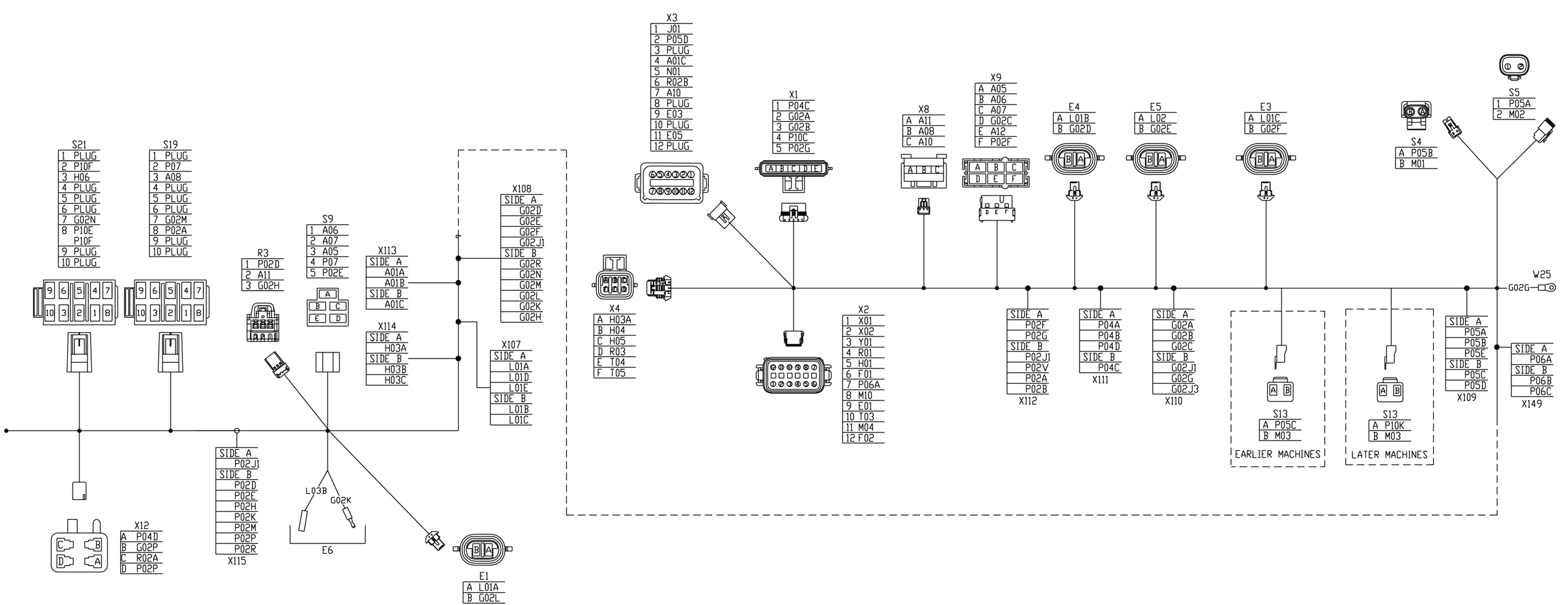


TX1087178

Cab Harness—Deluxe (W12) Wiring Diagram (1 of 2) (S.N. —170536)

LEGEND:

E2	Right Front Work Light
E7	Right Front Flasher Light
H4	Engagement and Monitor Unit Warning Alarm
K5	Dual Flasher Relay
K6	High-Flow Relay
M4	Windshield Wiper Motor
S1	Key Switch
S2	Park Brake Switch
S6	Work Lights Switch
S7	Dual Flasher Switch
S8	High Flow Switch
S12	Windshield Wiper and Washer Switch
S20	Hydraulic Quik-Tatch Switch (S.N. —131897)
S26	Electric Quik-Tatch Switch (S.N. 131898—)
X6	Cab Harness to Engagement and Monitor Unit 16-Pin Connector (J1)
X7	Cab Harness to Engagement and Monitor Unit 14-Pin Connector (J2)
X105	Splice
X106	Splice



Cab Harness—Deluxe (W12) Wiring Diagram (2 of 2) (S.N. —170536)

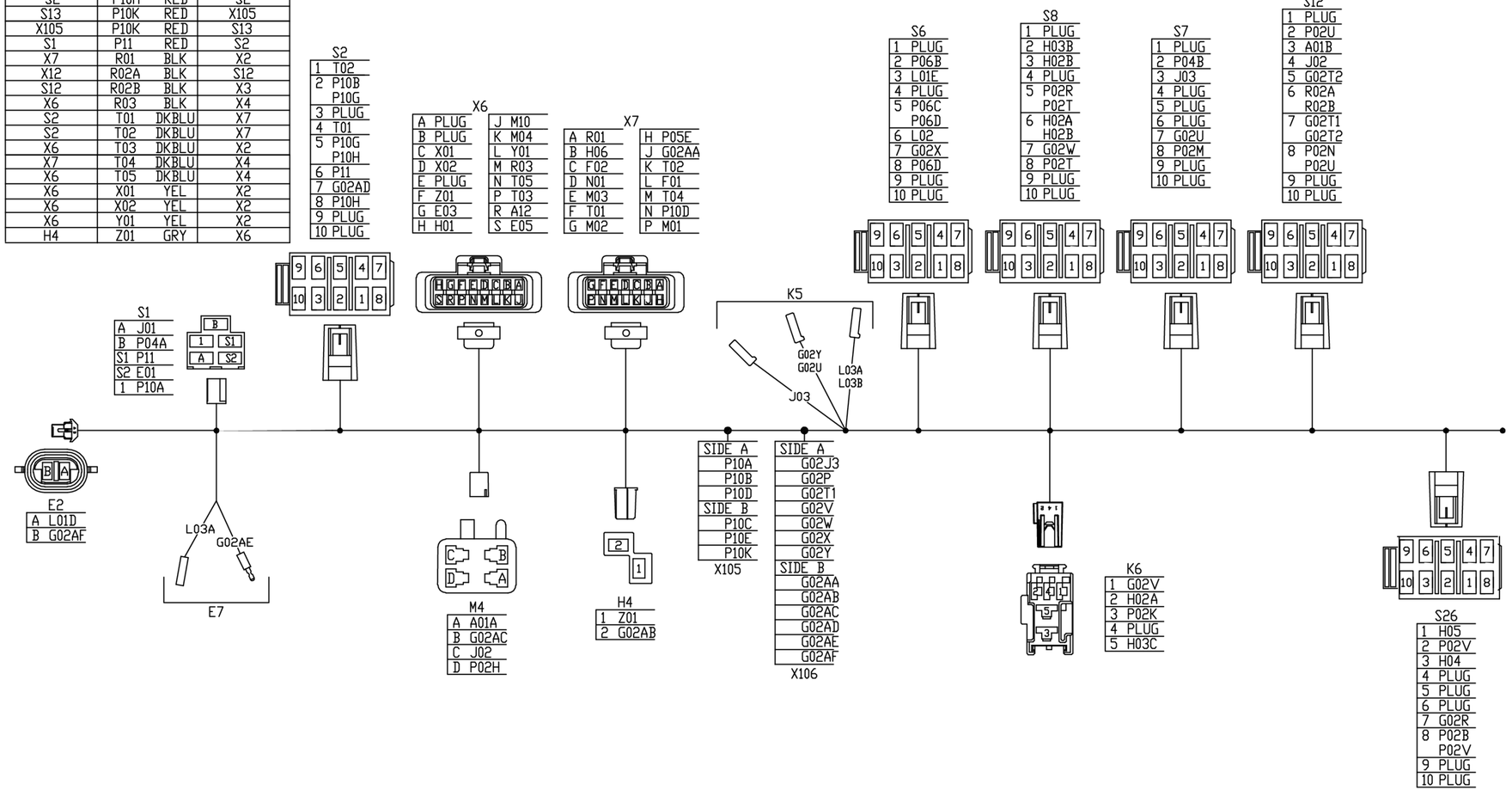
LEGEND:

E1	Left Front Work Light
E3	Left Tail Light
E4	Right Tail Light
E5	Rear Work Light
E6	Left Front Flasher Light
R3	Cab Temperature Control Dial
S4	Seat Switch
S5	Seat Belt Switch
S9	Air Conditioner and Heater Blower Motor Switch
S13	Cab Door Switch
S19	Air Conditioning Switch
S21	Auxiliary Hydraulic Override Switch
W25	Cab Harness Ground
X1	Cab Harness to Engine Harness 5-Pin Connector
X2	Cab Harness to Engine Harness 12-Pin Connector
X3	Cab Harness to Engine Harness 12-Pin Connector
X4	Cab Harness to Front Chassis Harness 6-Pin Connector
X8	Cab Harness to Air Conditioner and Heater Harness 3-Pin Connector
X9	Cab Harness to Air Conditioner and Heater Harness 6-Pin Connector
X12	Cab Harness Accessory Power Connector
X107	Splice
X108	Splice
X109	Splice
X110	Splice
X111	Splice
X112	Splice
X113	Splice
X114	Splice
X115	Splice
X149	Splice

END #1	NUMBER	COLOR	END #2
M4	A01A	ORG	X113
S12	A01B	ORG	X113
X3	A01C	ORG	X113
S9	A05	ORG	X9
S9	A06	ORG	X9
S9	A07	ORG	X9
S19	A08	ORG	X8
X8	A10	ORG	X3
R3	A11	ORG	X8
X6	A12	ORG	X9
S1	E01	WHT	X2
X6	E03	WHT	X3
X6	E05	WHT	X3
X7	F01	YEL	X2
X7	F02	YEL	X2
X1	G02A	BLK	X110
X1	G02B	BLK	X110
X9	G02C	BLK	X110
E4	G02D	BLK	X108
E5	G02E	BLK	X108
E3	G02F	BLK	X108
X110	G02G	BLK	W25
X108	G02H	BLK	R3
X110	G02J1	BLK	X108
X110	G02J3	BLK	X106
X108	G02K	BLK	E6
X108	G02L	BLK	E1
X108	G02M	BLK	S19
X108	G02N	BLK	S21
X106	G02P	BLK	X12
X108	G02R	BLK	S26
X106	G02T1	BLK	S12
S12	G02T2	BLK	S12
X106	G02U	BLK	S7
X106	G02V	BLK	K6
X106	G02W	BLK	S8
X106	G02X	BLK	S6
X106	G02Y	BLK	K5
X7	G02AA	BLK	X106
H4	G02AB	BLK	X106
M4	G02AC	BLK	X106
S2	G02AD	BLK	X106
E7	G02AE	BLK	X106
E2	G02AF	BLK	X106
X110	G02AG	BLK	X20
X6	H01	DKGRN	X2
K6	H02	DKGRN	S8
K6	H02A	DKGRN	S8
S8	H02B	DKGRN	S8
X4	H03A	DKGRN	X114
S8	H03B	DKGRN	X114
K6	H03C	DKGRN	X114
S26	H04	DKGRN	X4

S20/S26	H05	DKGRN	X4
X7	H06	DKGRN	S21
S1	J01	TAN	X3
S12	J02	TAN	M4
K5	J03	TAN	S7
E1	L01A	BRN	X107
E4	L01B	BRN	X107
E3	L01C	BRN	X107
E2	L01D	BRN	X107
S6	L01E	BRN	X107
S6	L02	BRN	E5
K5	L03A	BRN	E7
K5	L03B	BRN	E6
X7	M01	PUR	S4
X7	M02	PUR	S5
X7	M03	PUR	S13
X2	M04	PUR	X6
X6	M10	PUR	X2
X7	N01	YEL	X3
X112	P02A	RED	S19
X112	P02B	RED	S26
X115	P02D	RED	R3
X115	P02E	RED	S9
X9	P02F	RED	X112
X1	P02G	RED	X112
X115	P02H	RED	M4
X112	P02J1	RED	X115
K6	P02K	RED	X115
S7	P02M	RED	X115
S12	P02N	RED	X112
X12	P02P	RED	X115
S8	P02R	RED	X115
S8	P02T	RED	S8
S12	P02U	RED	S12
S26	P02V	RED	S26
X112	P02W	RED	X20
S1	P04A	RED	X111
S7	P04B	RED	X111
X1	P04C	RED	X111
X12	P04D	RED	X111
X109	P05A	RED	S5
X109	P05B	RED	S4
X3	P05D	RED	X109
X7	P05E	RED	X109
X2	P06A	RED	X149
S6	P06B	RED	X149
S6	P06C	RED	X149
S6	P06D	RED	S6
S19	P07	RED	S9
S1	P10A	RED	X105
S2	P10B	RED	X105
X1	P10C	RED	X105
X7	P10D	RED	X105
X105	P10E	RED	S21

S21	P10F	RED	S21
S2	P10G	RED	S2
S2	P10H	RED	S2
S13	P10K	RED	X105
X105	P10K	RED	S13
S1	P11	RED	S2
X7	R01	BLK	X2
X12	R02A	BLK	S12
S12	R02B	BLK	X3
X6	R03	BLK	X4
S2	T01	DKBLU	X7
S2	T02	DKBLU	X7
X6	T03	DKBLU	X2
X7	T04	DKBLU	X4
X6	T05	DKBLU	X4
X6	X01	YEL	X2
X6	X02	YEL	X2
X6	Y01	YEL	X2
H4	Z01	GRY	X6

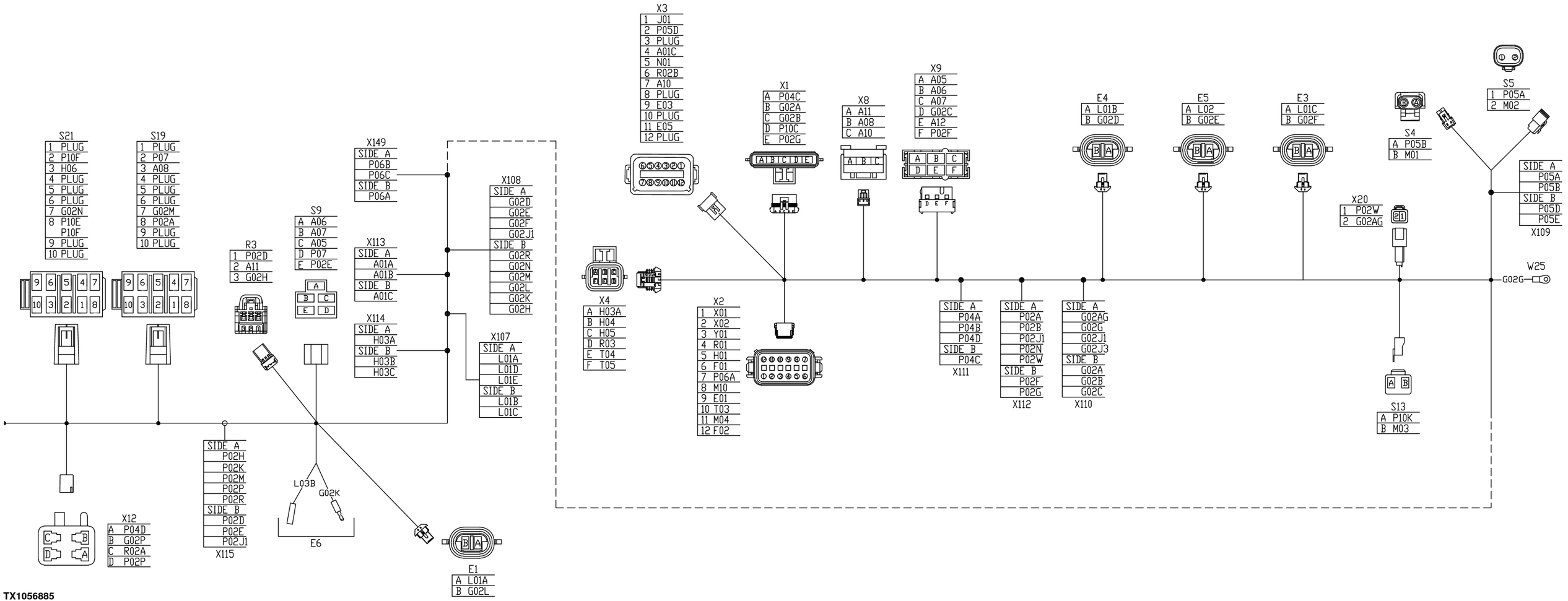


TX1056886

Cab Harness—Deluxe (W12) Wiring Diagram (1 of 2) (S.N. 170537—)

LEGEND:

E2	Right Front Work Light
E7	Right Front Flasher Light
H4	Engagement and Monitor Unit Warning Alarm
K5	Dual Flasher Relay
K6	High-Flow Relay
M4	Windshield Wiper Motor
S1	Key Switch
S2	Park Brake Switch
S6	Work Lights Switch
S7	Dual Flasher Switch
S8	High Flow Switch
S12	Windshield Wiper and Washer Switch
S26	Electric Quik-Tatch Switch
X6	Cab Harness to Engagement and Monitor Unit 16-Pin Connector (J1)
X7	Cab Harness to Engagement and Monitor Unit 14-Pin Connector (J2)
X105	Splice
X106	Splice



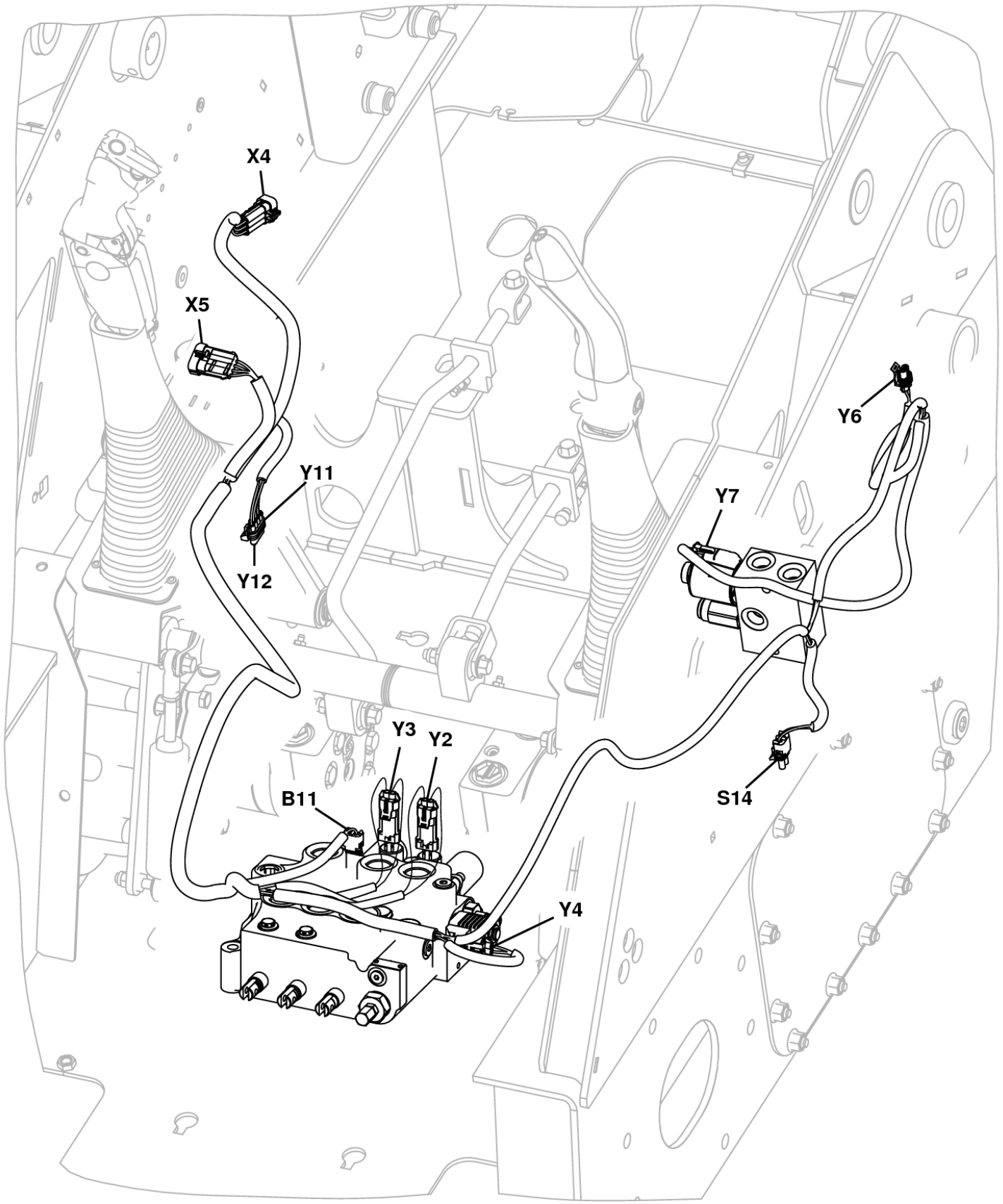
TX1056885

Cab Harness—Deluxe (W12) Wiring Diagram (2 of 2) (S.N. 170537—)

LEGEND:

E1	Left Front Work Light
E3	Left Tail Light
E4	Right Tail Light
E5	Rear Work Light
E6	Left Front Flasher Light
R3	Cab Temperature Control Dial
S4	Seat Switch
S5	Seat Belt Switch
S9	Air Conditioner and Heater Blower Motor Switch
S13	Cab Door Switch
S19	Air Conditioning Switch
S21	Auxiliary Hydraulic Override Switch
W25	Cab Harness Ground
X1	Cab Harness to Engine Harness 5-Pin Connector
X2	Cab Harness to Engine Harness 12-Pin Connector
X3	Cab Harness to Engine Harness 12-Pin Connector
X4	Cab Harness to Front Chassis Harness 6-Pin Connector
X8	Cab Harness to Air Conditioner and Heater Harness 3-Pin Connector
X9	Cab Harness to Air Conditioner and Heater Harness 6-Pin Connector
X12	Cab Harness Accessory Power Connector
X20	Operator Convenience Package Power 2-Pin Connector
X107	Splice
X108	Splice
X109	Splice
X110	Splice
X111	Splice
X112	Splice
X113	Splice
X114	Splice
X115	Splice
X149	Splice

Front Chassis Harness—Deluxe (W13) Component Location



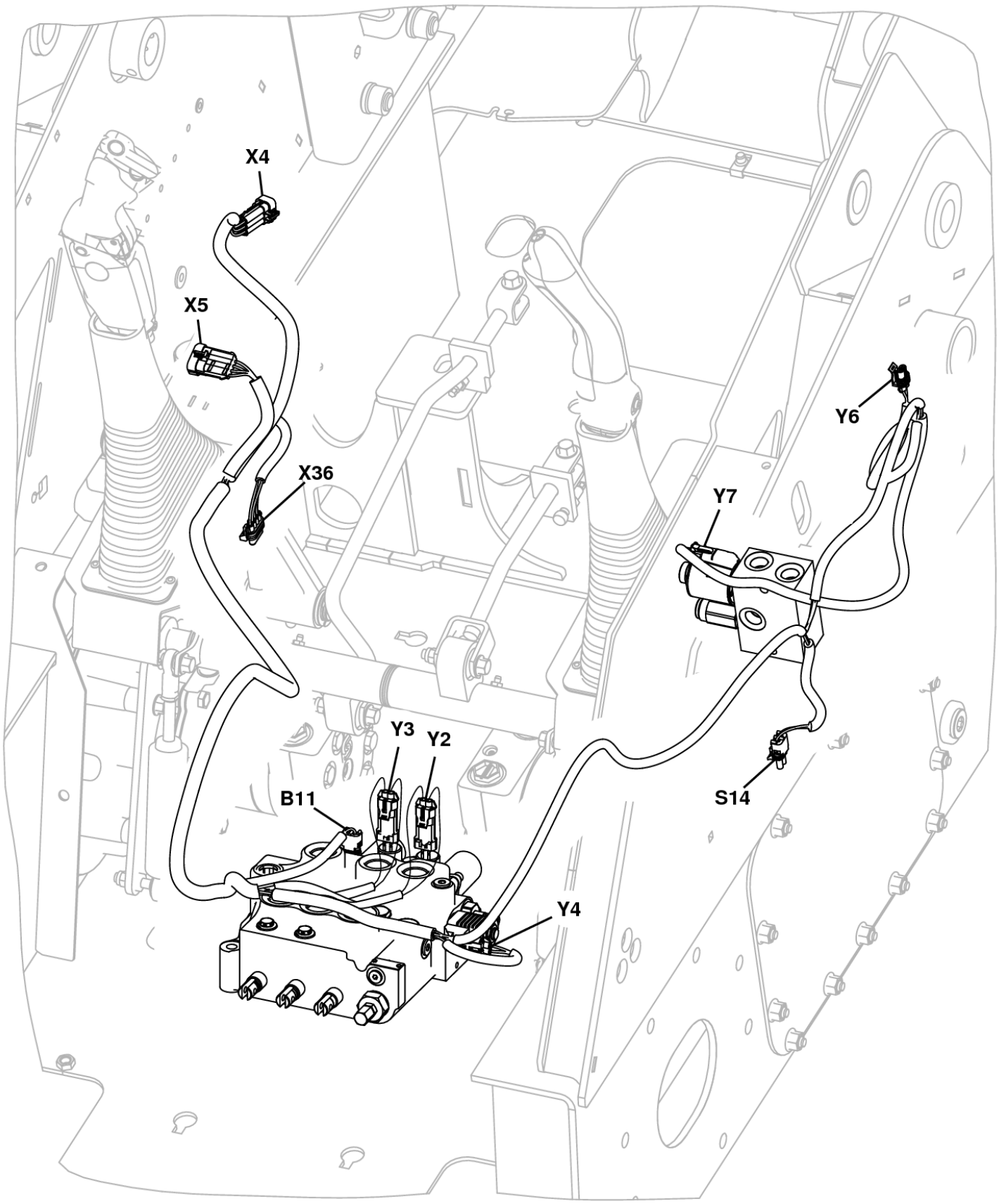
T197480

Front Chassis Harness—Deluxe (W13) Component Location (S.N. —131876)

LEGEND:

B11	Auxiliary Hydraulic Spool Neutral Switch
S14	Two Speed Switch
X4	Cab Harness to Front Chassis Harness 6-Pin Connector
X5	Engine Harness to Front Chassis Harness 8-Pin Connector

Y2	Boom Spool Lock Solenoid
Y3	Bucket Spool Lock Solenoid
Y4	Port Lock Solenoid
Y6	Two Speed Solenoid
Y7	High Flow Solenoid
Y11	Quik-Tatch Lock Solenoid
Y12	Quik-Tatch Unlock Solenoid

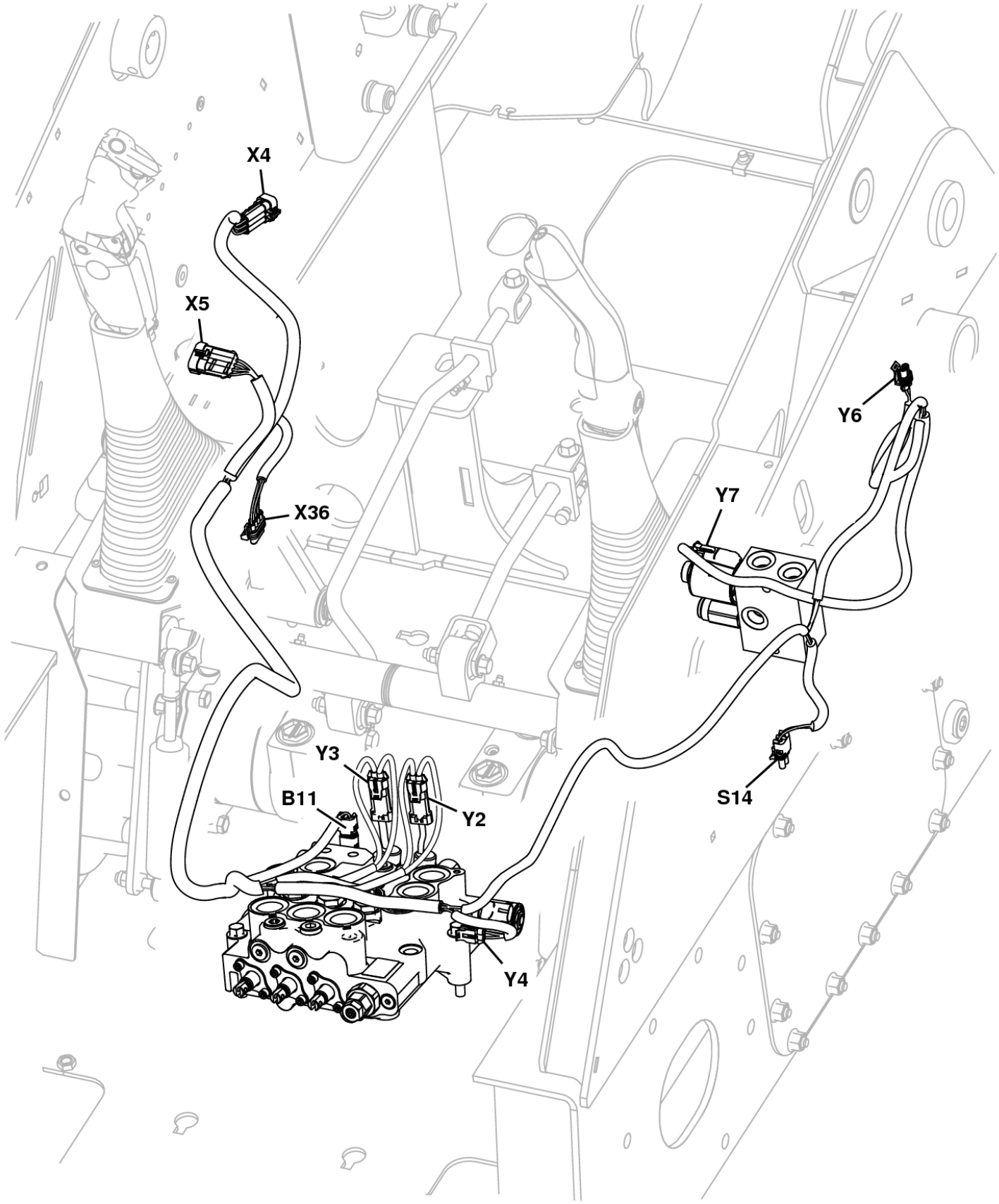


TX1024067

Front Chassis Harness—Deluxe (W13) Component Location (S.N. 131877—150522)

LEGEND:

B11	Auxiliary Hydraulic Spool Neutral Switch
S14	Two Speed Switch
X4	Cab Harness to Front Chassis Harness 6-Pin Connector
X5	Engine Harness to Front Chassis Harness 8-Pin Connector
X36	Electric Quik-Tatch 4-Pin Connector
Y2	Boom Spool Lock Solenoid
Y3	Bucket Spool Lock Solenoid
Y4	Port Lock Solenoid
Y6	Two Speed Solenoid
Y7	High Flow Solenoid



TX1024102

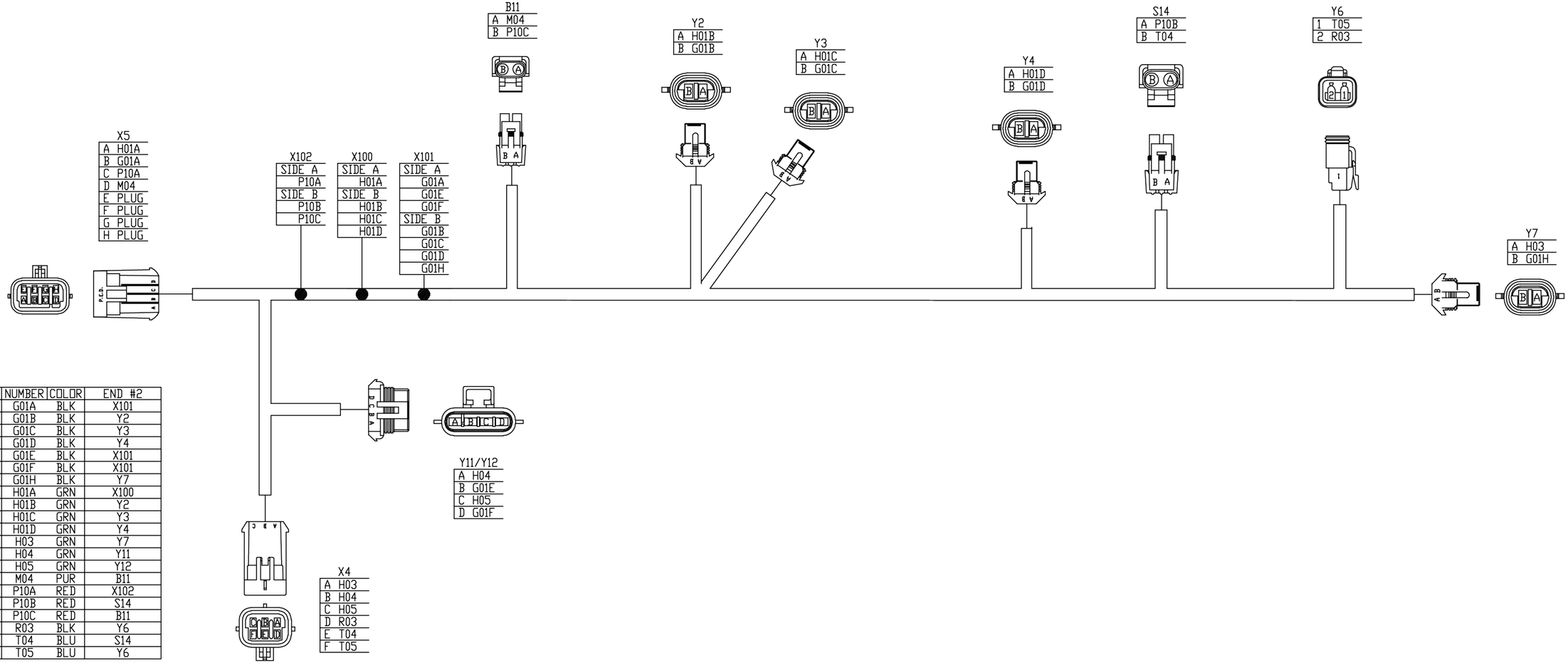
Front Chassis Harness—Deluxe (W13) Component Location (S.N. 150523—)

LEGEND:

B11	Auxiliary Hydraulic Spool Neutral Switch
S14	Two Speed Switch
X4	Cab Harness to Front Chassis Harness 6-Pin Connector
X5	Engine Harness to Front Chassis Harness 8-Pin Connector
X36	Electric Quik-Tatch 4-Pin Connector
Y2	Boom Spool Lock Solenoid

Y3	Bucket Spool Lock Solenoid
Y4	Port Lock Solenoid
Y6	Two Speed Solenoid
Y7	High Flow Solenoid

Front Chassis Harness—Deluxe (W13) Wiring Diagram



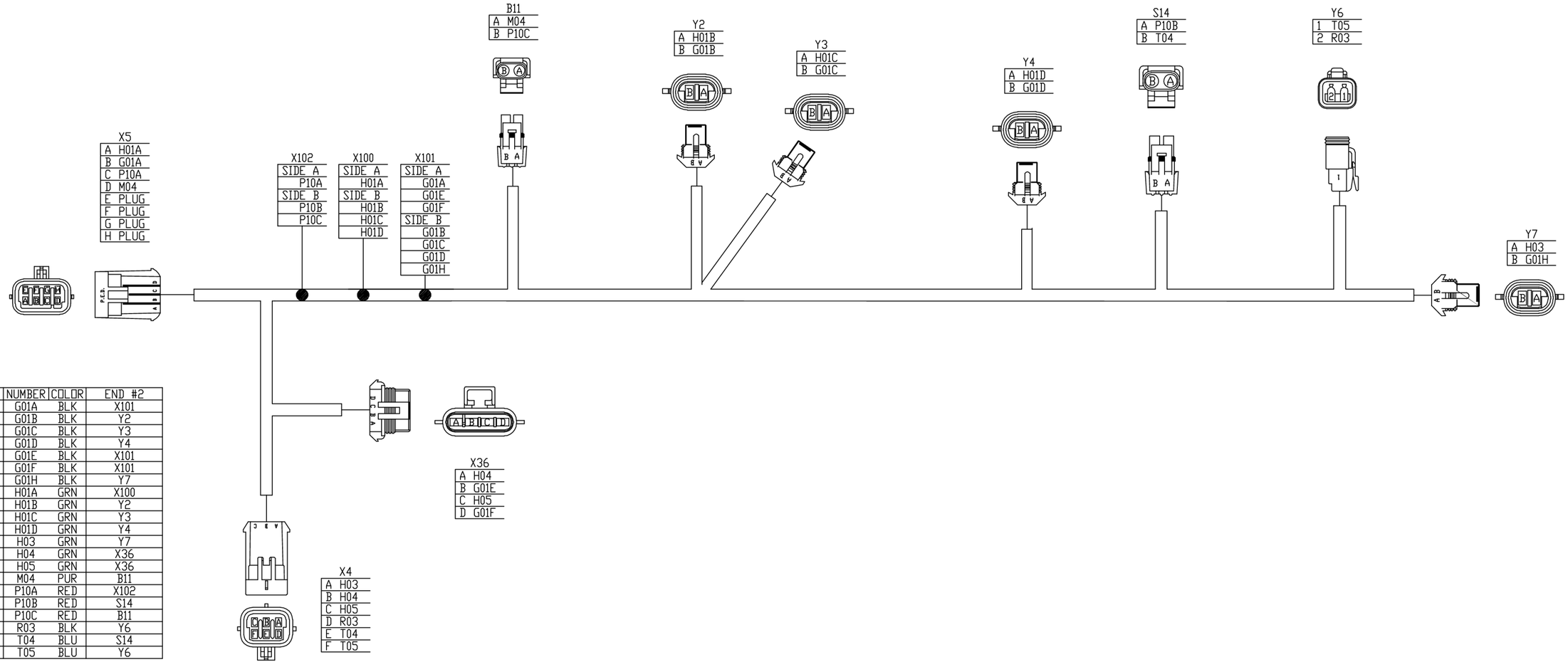
END #1	NUMBER	COLOR	END #2
X5	G01A	BLK	X101
X101	G01B	BLK	Y2
X101	G01C	BLK	Y3
X101	G01D	BLK	Y4
Y12	G01E	BLK	X101
Y11	G01F	BLK	X101
X101	G01H	BLK	Y7
X5	H01A	GRN	X100
X100	H01B	GRN	Y2
X100	H01C	GRN	Y3
X100	H01D	GRN	Y4
X4	H03	GRN	Y7
X4	H04	GRN	Y11
X4	H05	GRN	Y12
X5	M04	PUR	B11
X5	P10A	RED	X102
X102	P10B	RED	S14
X102	P10C	RED	B11
X4	R03	BLK	Y6
X4	T04	BLU	S14
X4	T05	BLU	Y6

T197479

Front Chassis Harness—Deluxe (W13) Wiring Diagram (S.N. —131876)

LEGEND:

B11	Auxiliary Hydraulic Spool Neutral Switch
S14	Two Speed Switch
X4	Cab Harness to Front Chassis Harness 6-Pin Connector
X5	Engine Harness to Front Chassis Harness 8-Pin Connector
X100	Splice
X101	Splice
X102	Splice
Y2	Boom Spool Lock Solenoid
Y3	Bucket Spool Lock Solenoid
Y4	Port Lock Solenoid
Y6	Two Speed Solenoid
Y7	High Flow Solenoid
Y11	Hydraulic Quik-Tatch Lock Solenoid
Y12	Hydraulic Quik-Tatch Unlock Solenoid



END #1	NUMBER	COLOR	END #2
X5	G01A	BLK	X101
X101	G01B	BLK	Y2
X101	G01C	BLK	Y3
X101	G01D	BLK	Y4
X36	G01E	BLK	X101
X36	G01F	BLK	X101
X101	G01H	BLK	Y7
X5	H01A	GRN	X100
X100	H01B	GRN	Y2
X100	H01C	GRN	Y3
X100	H01D	GRN	Y4
X4	H03	GRN	Y7
X4	H04	GRN	X36
X4	H05	GRN	X36
X5	M04	PUR	B11
X5	P10A	RED	X102
X102	P10B	RED	S14
X102	P10C	RED	B11
X4	R03	BLK	Y6
X4	T04	BLU	S14
X4	T05	BLU	Y6

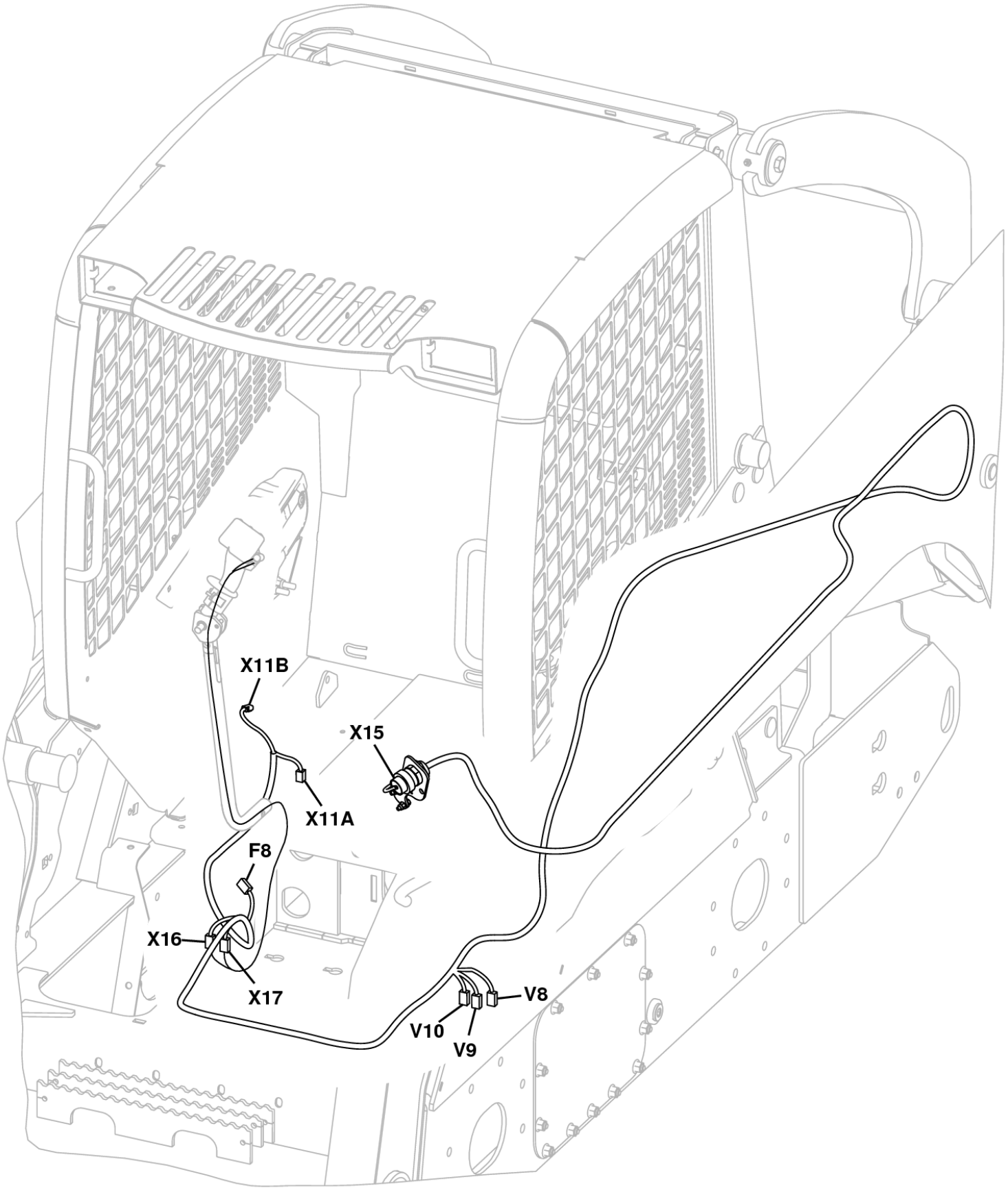
TX1024053

Front Chassis Harness—Deluxe (W13) Wiring Diagram (S.N. 131877—)

LEGEND:

B11	Auxiliary Hydraulic Spool Neutral Switch
S14	Two Speed Switch
X4	Cab Harness to Front Chassis Harness 6-Pin Connector
X5	Engine Harness to Front Chassis Harness 8-Pin Connector
X36	Electric Quik-Tatch 4-Pin Connector
X100	Splice
X101	Splice
X102	Splice
Y2	Boom Spool Lock Solenoid
Y3	Bucket Spool Lock Solenoid
Y4	Port Lock Solenoid
Y6	Two Speed Solenoid
Y7	High Flow Solenoid

8-Button Controller Harness (W15) Component Location



T198200

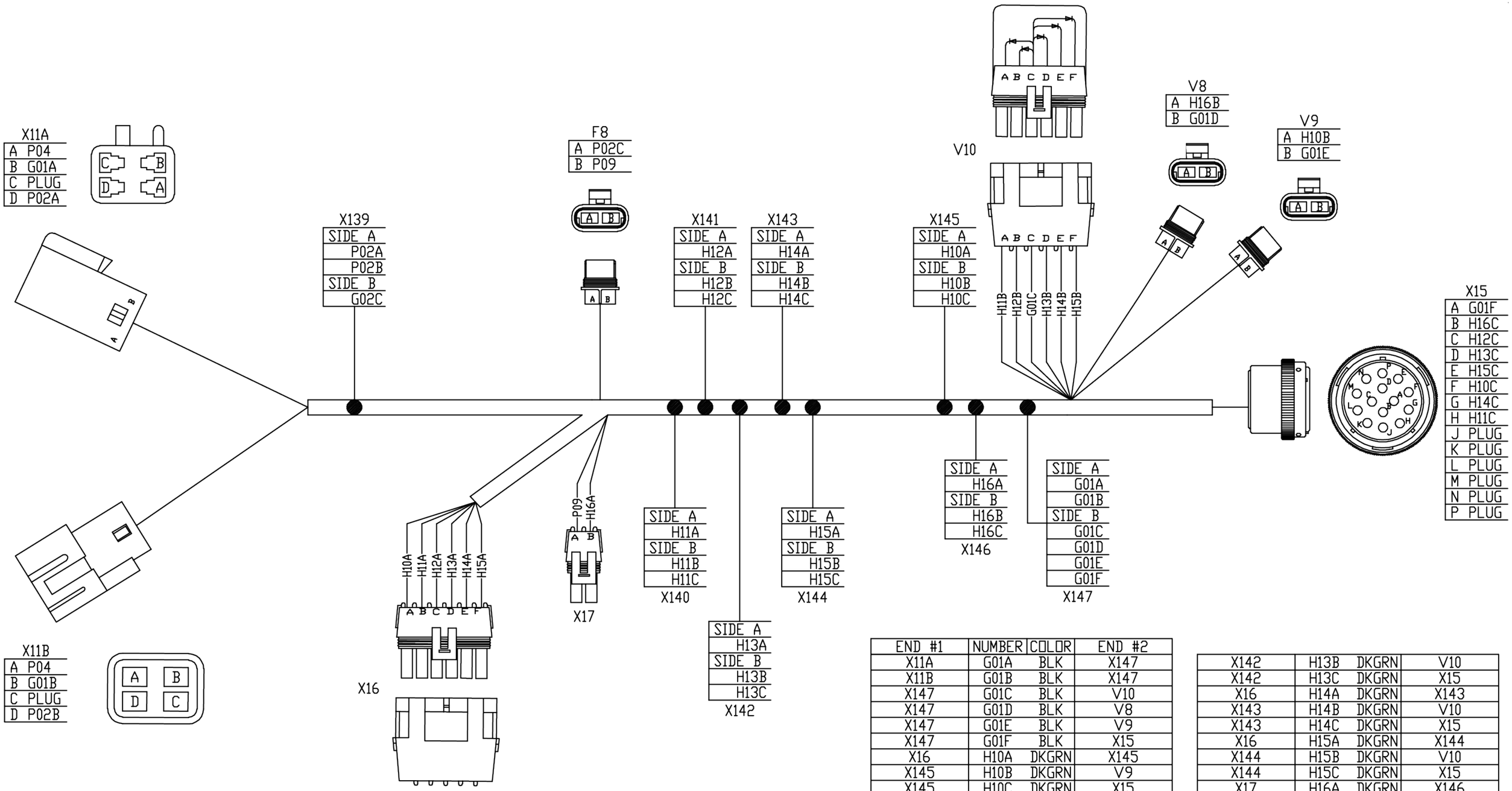
8-Button Controller Harness (W15) Component Location

LEGEND:

F8	8-Button Controller Harness 10 Amp Fuse
V8	8-Button Controller Suppression Diode 1
V9	8-Button Controller Suppression Diode 2
V10	8-Button Controller Suppression Diode Block

X11	Engine Harness Accessory Power Connector
X15	8-Button Controller Harness to Attachment 14-Pin Connector
X16	8-Button Controller Harness to 8-Button Controller 6-Pin Connector
X17	8-Button Controller Harness to 8-Button Controller 2-Pin Connector

8-Button Controller Harness (W15) Wiring Diagram



END #1	NUMBER	COLOR	END #2
X11A	G01A	BLK	X147
X11B	G01B	BLK	X147
X147	G01C	BLK	V10
X147	G01D	BLK	V8
X147	G01E	BLK	V9
X147	G01F	BLK	X15
X16	H10A	DKGRN	X145
X145	H10B	DKGRN	V9
X145	H10C	DKGRN	X15
X16	H11A	DKGRN	X140
X140	H11B	DKGRN	V10
X140	H11C	DKGRN	X15
X16	H12A	DKGRN	X141
X141	H12B	DKGRN	V10
X141	H12C	DKGRN	X15
X16	H13A	DKGRN	X142
X142	H13B	DKGRN	V10
X142	H13C	DKGRN	X15
X16	H14A	DKGRN	X143
X143	H14B	DKGRN	V10
X143	H14C	DKGRN	X15
X16	H15A	DKGRN	X144
X144	H15B	DKGRN	V10
X144	H15C	DKGRN	X15
X17	H16A	DKGRN	X146
X146	H16B	DKGRN	V8
X146	H16C	DKGRN	X15
X11A	P02A	RED	X139
X11B	P02B	RED	X139
X139	P02C	RED	F8
X11A	P04	RED	X11B
X11B	P09	RED	X17

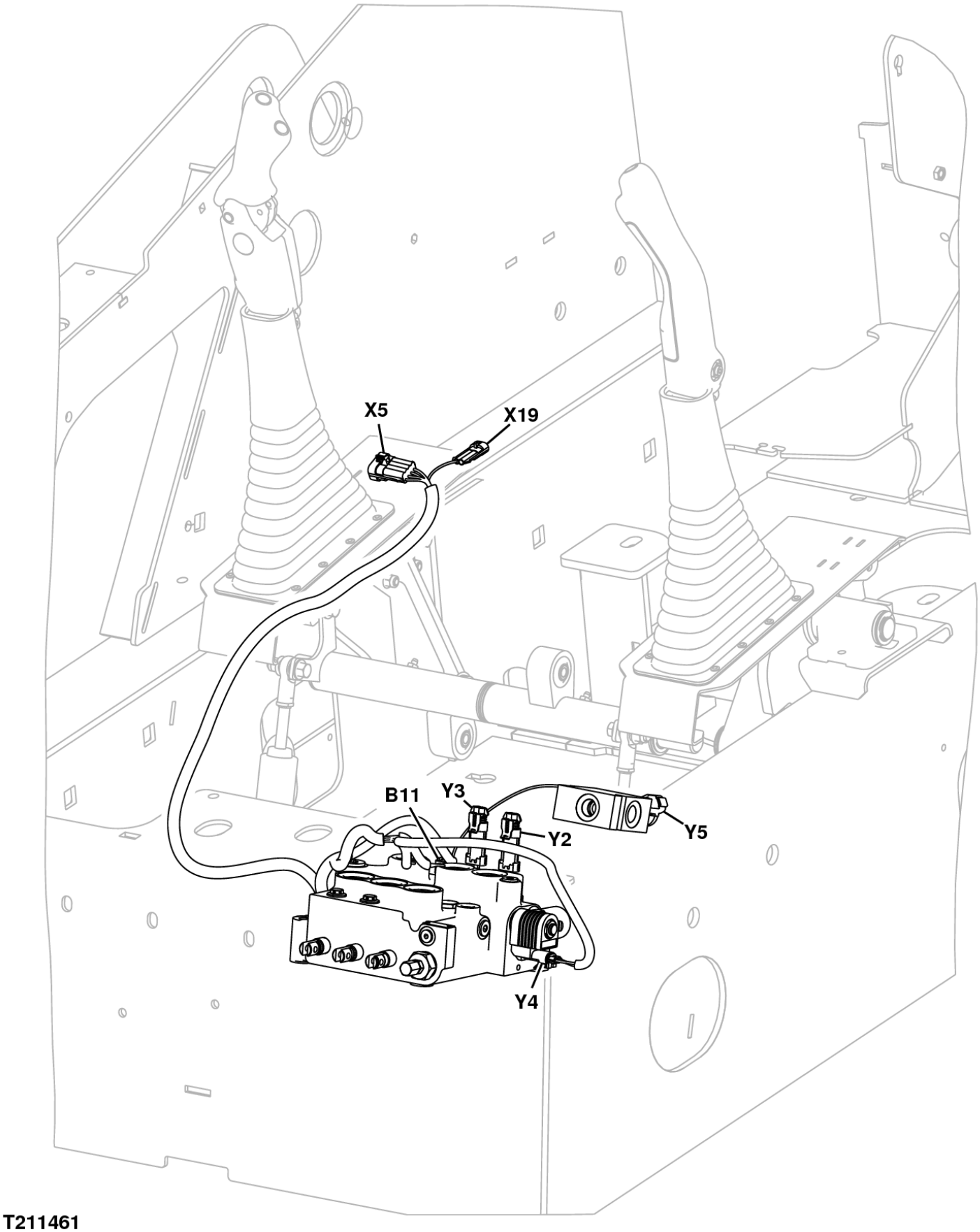
T198201

8-Button Controller Harness (W15) Wiring Diagram

LEGEND:

F8	8-Button Controller Harness 10 Amp Fuse
V8	8-Button Controller Suppression Diode 1
V9	8-Button Controller Suppression Diode 2
V10	8-Button Controller Suppression Diode Block
X11A	Engine Harness Accessory Power Connector
X11B	Engine Harness Accessory Power to 8-Button Controller Harness Connector
X15	8-Button Controller Harness to Attachment 14-Pin Connector
X16	8-Button Controller Harness to 8-Button Controller 6-Pin Connector
X17	8-Button Controller Harness to 8-Button Controller 2-Pin Connector
X139	Splice
X140	Splice
X141	Splice
X142	Splice
X143	Splice
X144	Splice
X145	Splice
X146	Splice
X147	Splice

CTL Front Chassis Harness—Standard (W16) Component Location



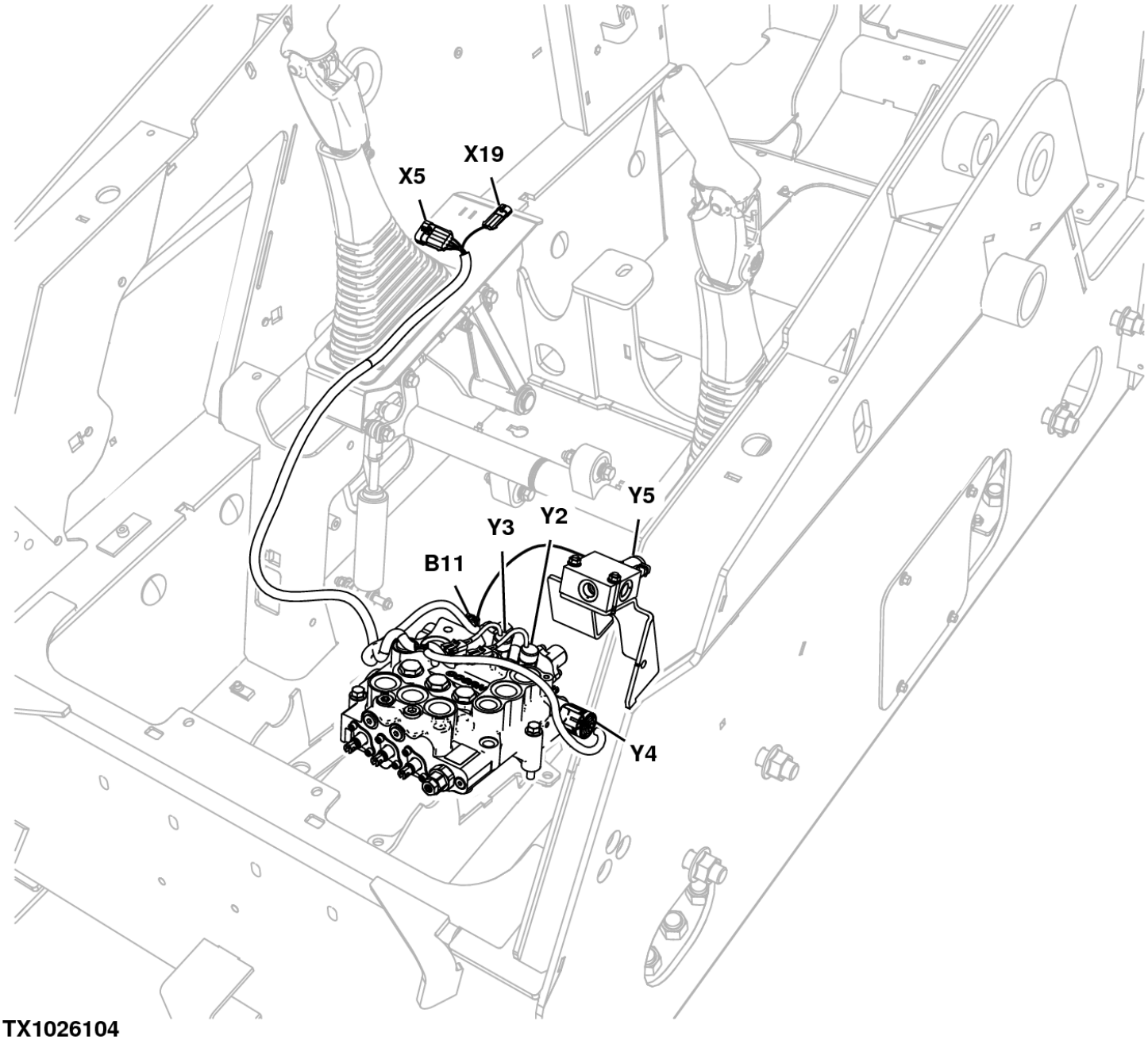
T211461

CTL Front Chassis Harness—Standard (W16) Component Location (S.N. —150522)

LEGEND:

B11	Auxiliary Hydraulic Spool Neutral Switch
X5	Engine Harness to Front Chassis Harness 8-Pin Connector
X19	Park Brake Signal Connector
Y2	Boom Spool Lock Solenoid

Y3	Bucket Spool Lock Solenoid
Y4	Port Lock Solenoid
Y5	Park Brake Solenoid



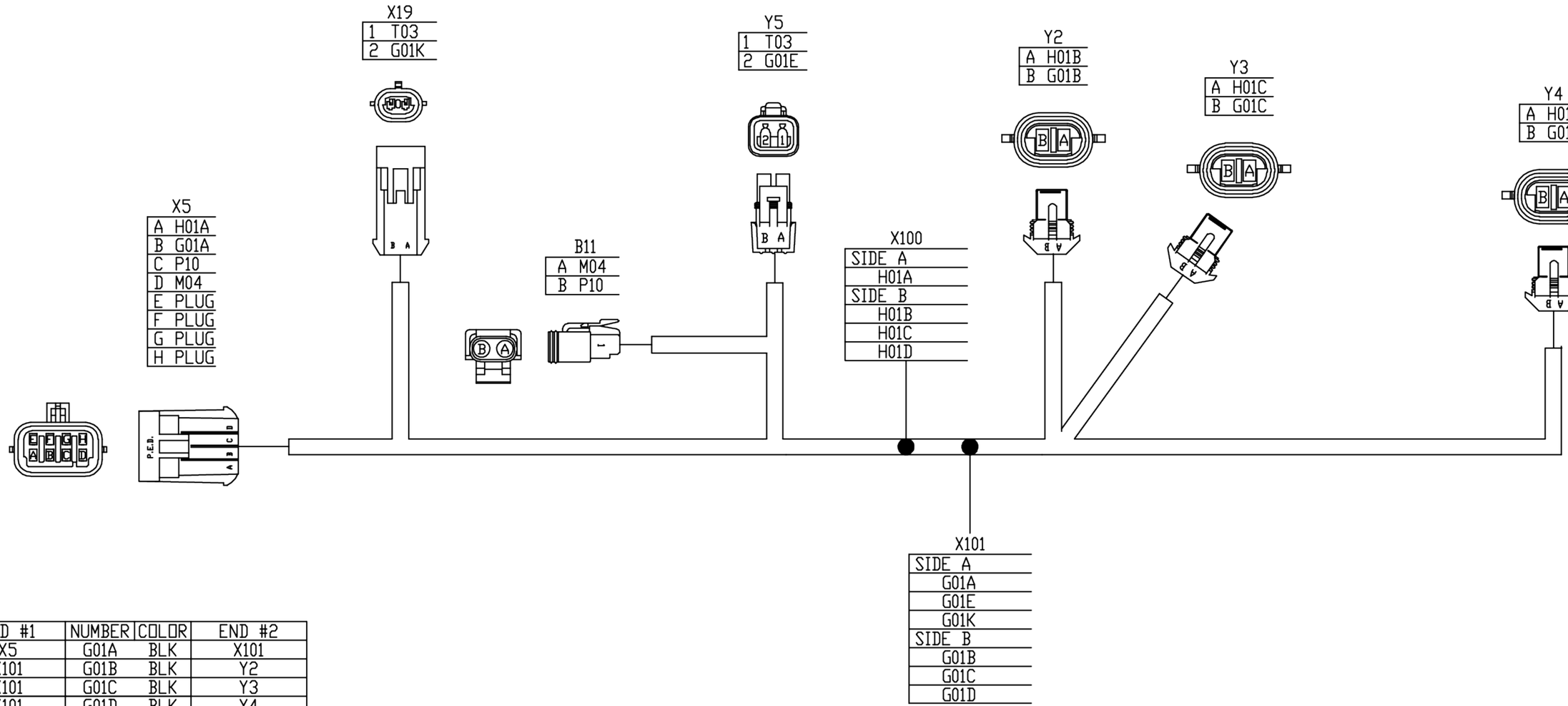
TX1026104

CTL Front Chassis Harness—Standard (W16) Component Location (S.N. 150523—)

LEGEND:

B11	Auxiliary Hydraulic Spool Neutral Switch
X5	Engine Harness to Front Chassis Harness 8-Pin Connector
X19	Park Brake Signal Connector
Y2	Boom Spool Lock Solenoid
Y3	Bucket Spool Lock Solenoid
Y4	Port Lock Solenoid
Y5	Park Brake Solenoid

CTL Front Chassis Harness—Standard (W16) Wiring Diagram



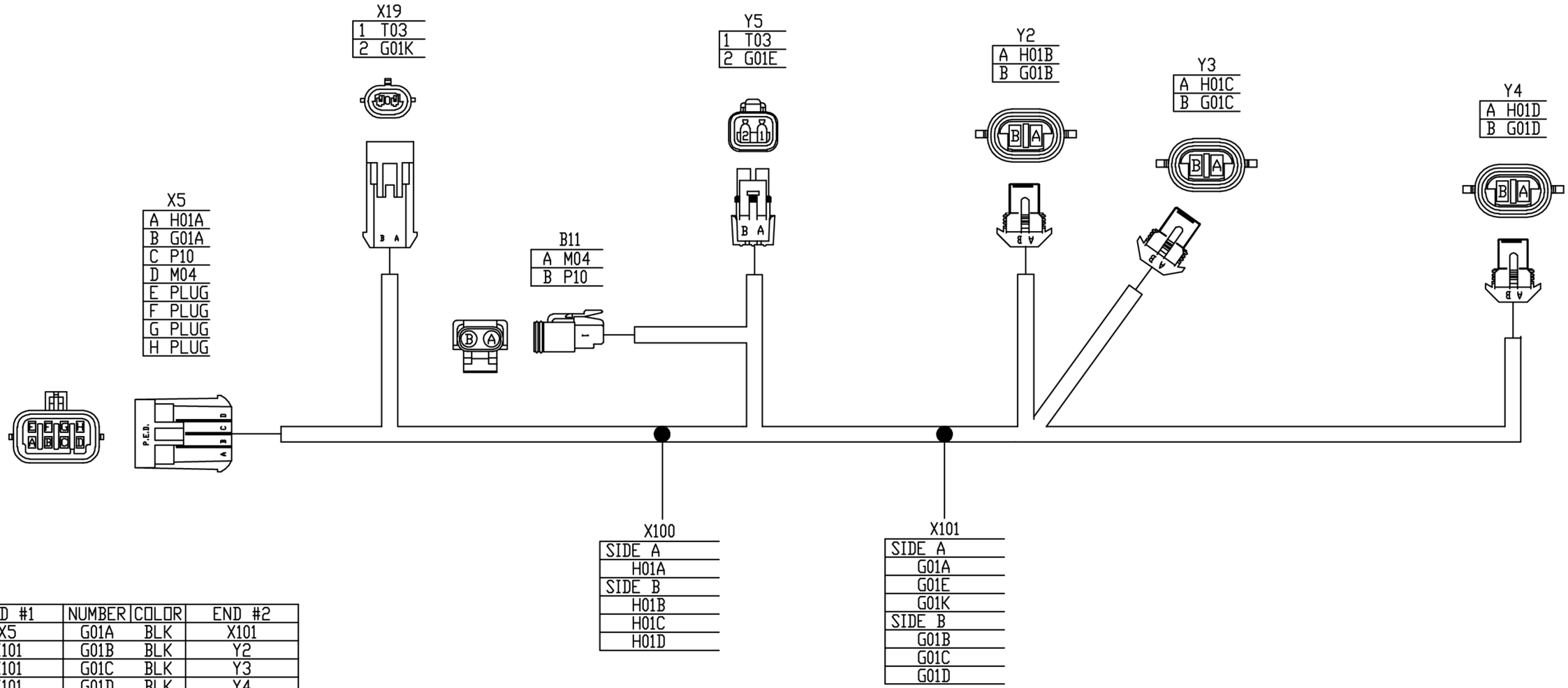
END #1	NUMBER	COLOR	END #2
X5	G01A	BLK	X101
X101	G01B	BLK	Y2
X101	G01C	BLK	Y3
X101	G01D	BLK	Y4
Y5	G01E	BLK	X101
X19	G01K	BLK	X101
X5	H01A	GRN	X100
X100	H01B	GRN	Y2
X100	H01C	GRN	Y3
X100	H01D	GRN	Y4
X5	M04	PUR	B11
X5	P10	RED	B11
X19	T03	BLU	Y5

T211426

CTL Front Chassis Harness—Standard (W16) Wiring Diagram (S.N. —150522)

LEGEND:

B11	Auxiliary Hydraulic Spool Neutral Switch
X5	Engine Harness to Front Chassis Harness 8-Pin Connector
X19	Park Brake Signal Connector
X100	Splice
X101	Splice
Y2	Boom Spool Lock Solenoid
Y3	Bucket Spool Lock Solenoid
Y4	Port Lock Solenoid
Y5	Park Brake Solenoid



END #1	NUMBER	COLOR	END #2
X5	G01A	BLK	X101
X101	G01B	BLK	Y2
X101	G01C	BLK	Y3
X101	G01D	BLK	Y4
Y5	G01E	BLK	X101
X19	G01K	BLK	X101
X5	H01A	GRN	X100
X100	H01B	GRN	Y2
X100	H01C	GRN	Y3
X100	H01D	GRN	Y4
X5	M04	PUR	B11
X5	P10	RED	B11
X19	T03	BLU	Y5

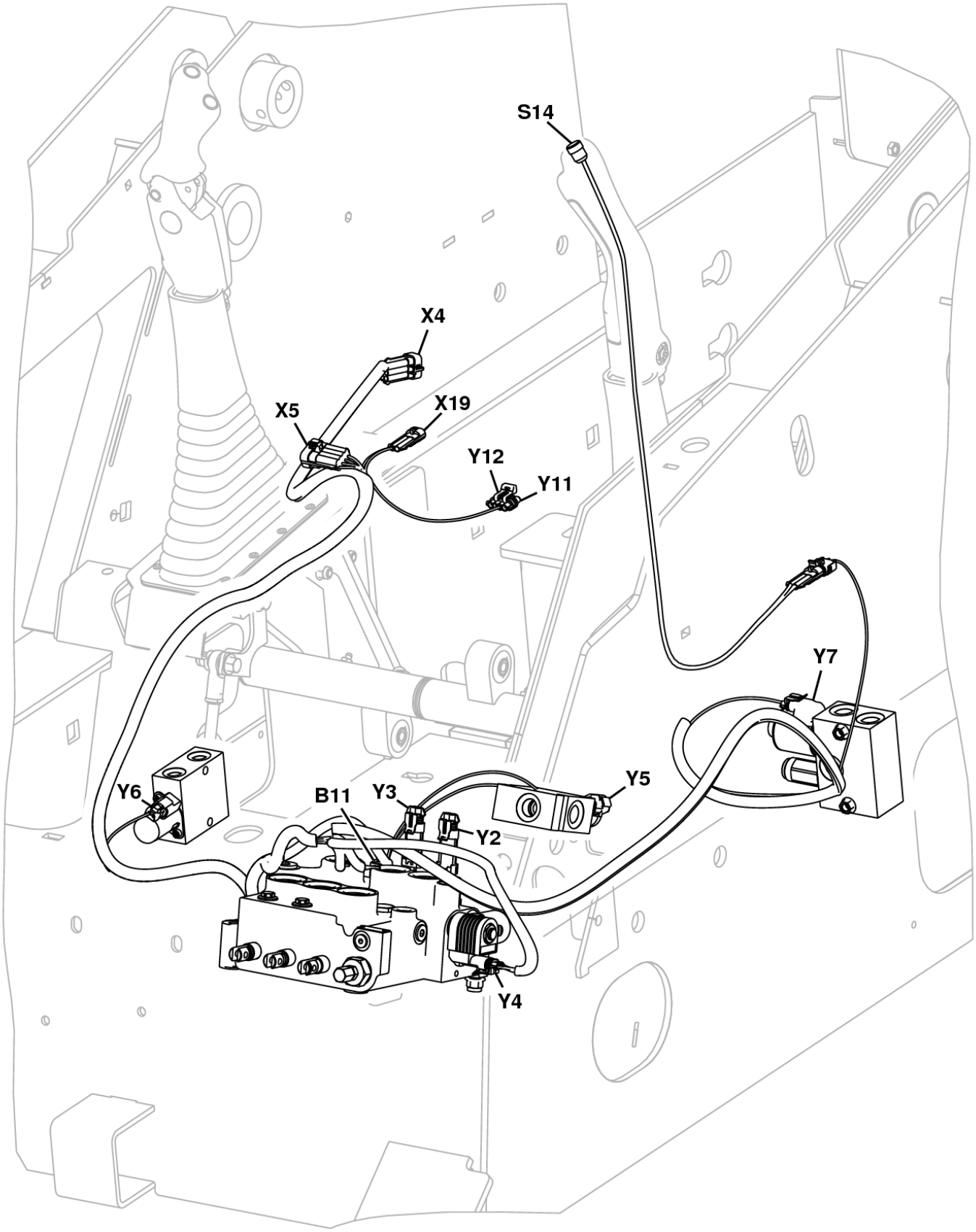
TX1024054

CTL Front Chassis Harness—Standard (W16) Wiring Diagram (S.N. 150523—)

LEGEND:

B11	Auxiliary Hydraulic Spool Neutral Switch
X5	Engine Harness to Front Chassis Harness 8-Pin Connector
X19	Park Brake Signal Connector
X100	Splice
X101	Splice
Y2	Boom Spool Lock Solenoid
Y3	Bucket Spool Lock Solenoid
Y4	Port Lock Solenoid
Y5	Park Brake Solenoid

CTL Front Chassis Harness—Deluxe (W17) Component Location



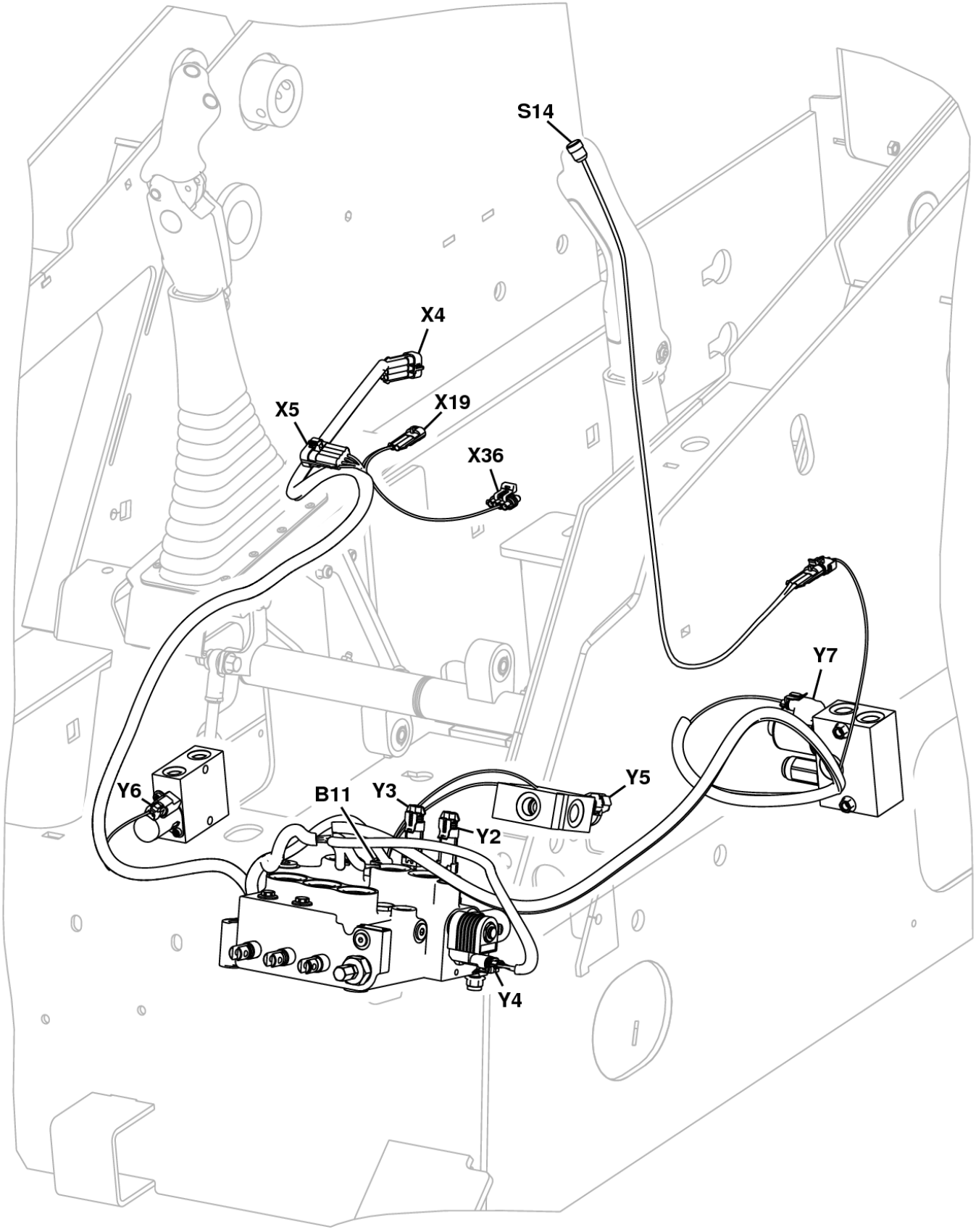
T211460

CTL Front Chassis Harness—Deluxe (W17) Component Location (S.N. —131876)

LEGEND:

B11	Auxiliary Hydraulic Spool Neutral Switch
S14	Two Speed Switch
X4	Cab Harness to Front Chassis Harness 6-Pin Connector
X5	Engine Harness to Font Chassis Harness 8-Pin Connector

X19	Park Brake Signal Connector
Y2	Boom Spool Lock Solenoid
Y3	Bucket Spool Lock Solenoid
Y4	Port Lock Solenoid
Y5	Park Brake Solenoid
Y6	Two Speed Solenoid
Y7	High Flow Solenoid
Y11	Hydraulic Quik-Tatch Lock Solenoid
Y12	Hydraulic Quik-Tatch Unlock Solenoid

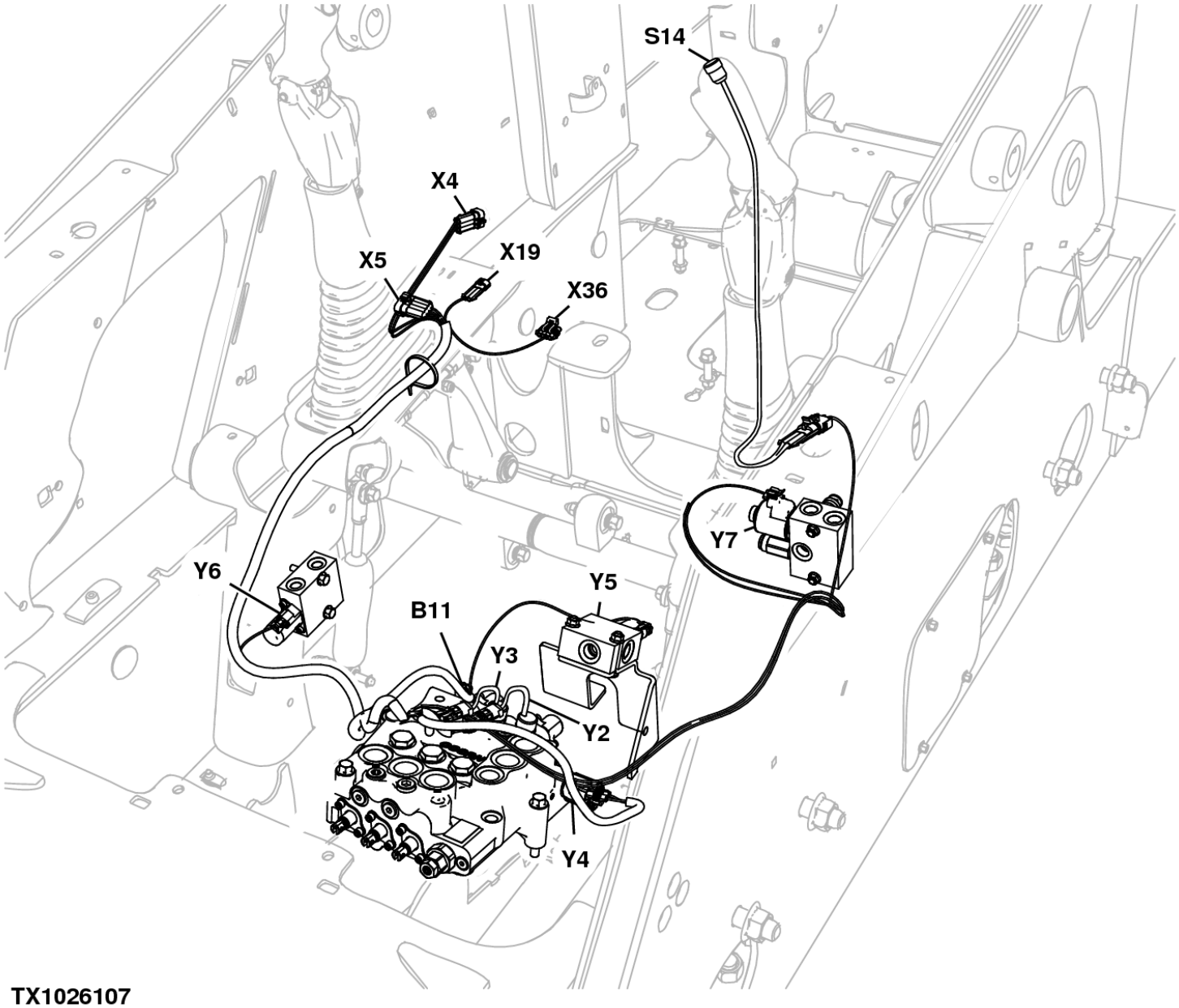


TX1024068

CTL Front Chassis Harness—Deluxe (W17) Component Location (S.N. 131877—150522)

LEGEND:

B11	Auxiliary Hydraulic Spool Neutral Switch
S14	Two Speed Switch
X4	Cab Harness to Front Chassis Harness 6-Pin Connector
X5	Engine Harness to Font Chassis Harness 8-Pin Connector
X19	Park Brake Signal Connector
X36	Electric Quik-Tatch 4-Pin Connector
Y2	Boom Spool Lock Solenoid
Y3	Bucket Spool Lock Solenoid
Y4	Port Lock Solenoid
Y5	Park Brake Solenoid
Y6	Two Speed Solenoid
Y7	High Flow Solenoid



TX1026107

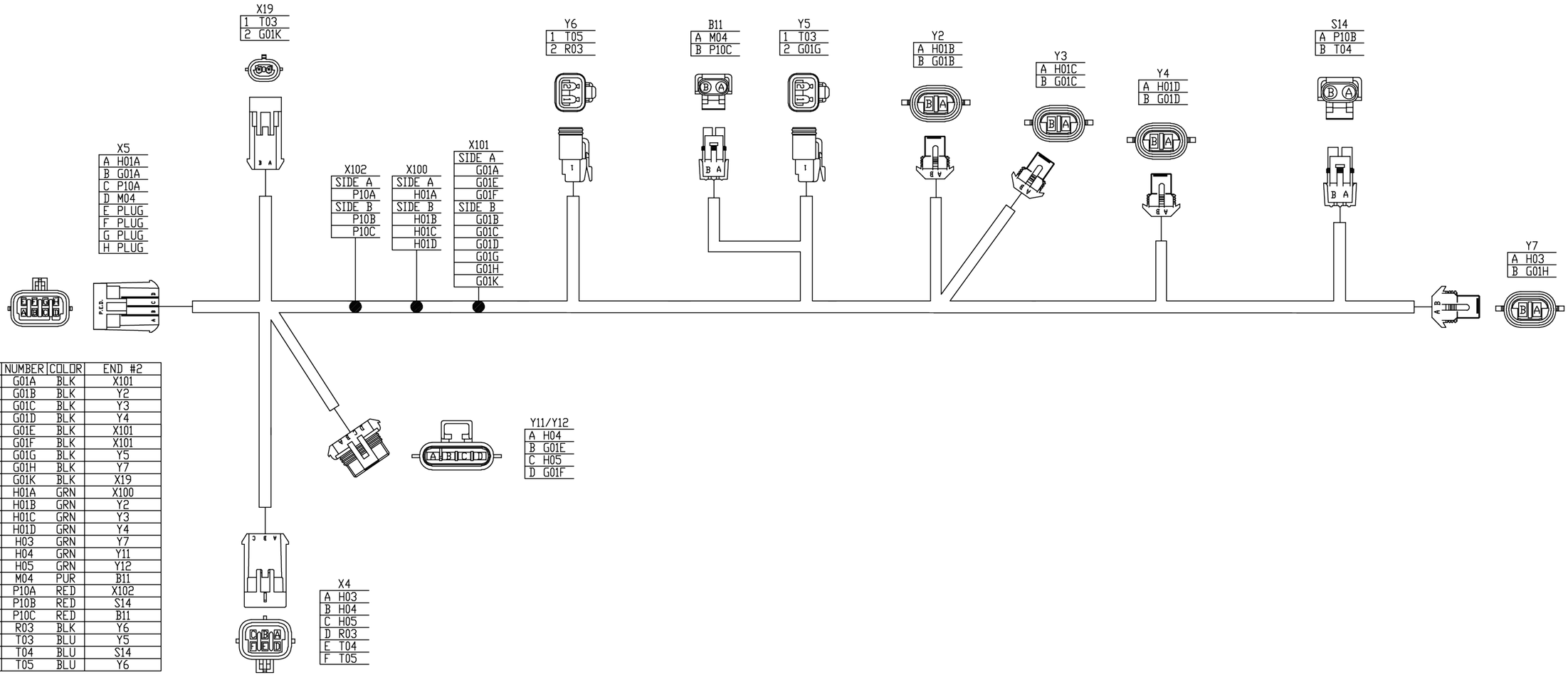
CTL Front Chassis Harness—Deluxe (W17) Component Location (S.N. 150523—)

LEGEND:

B11	Auxiliary Hydraulic Spool Neutral Switch
S14	Two Speed Switch
X4	Cab Harness to Front Chassis Harness 6-Pin Connector
X5	Engine Harness to Font Chassis Harness 8-Pin Connector
X19	Park Brake Signal Connector
X36	Electric Quik-Tatch 4-Pin Connector
Y2	Boom Spool Lock Solenoid
Y3	Bucket Spool Lock Solenoid

Y4	Port Lock Solenoid
Y5	Park Brake Solenoid
Y6	Two Speed Solenoid
Y7	High Flow Solenoid

CTL Front Chassis Harness—Deluxe (W17) Wiring Diagram



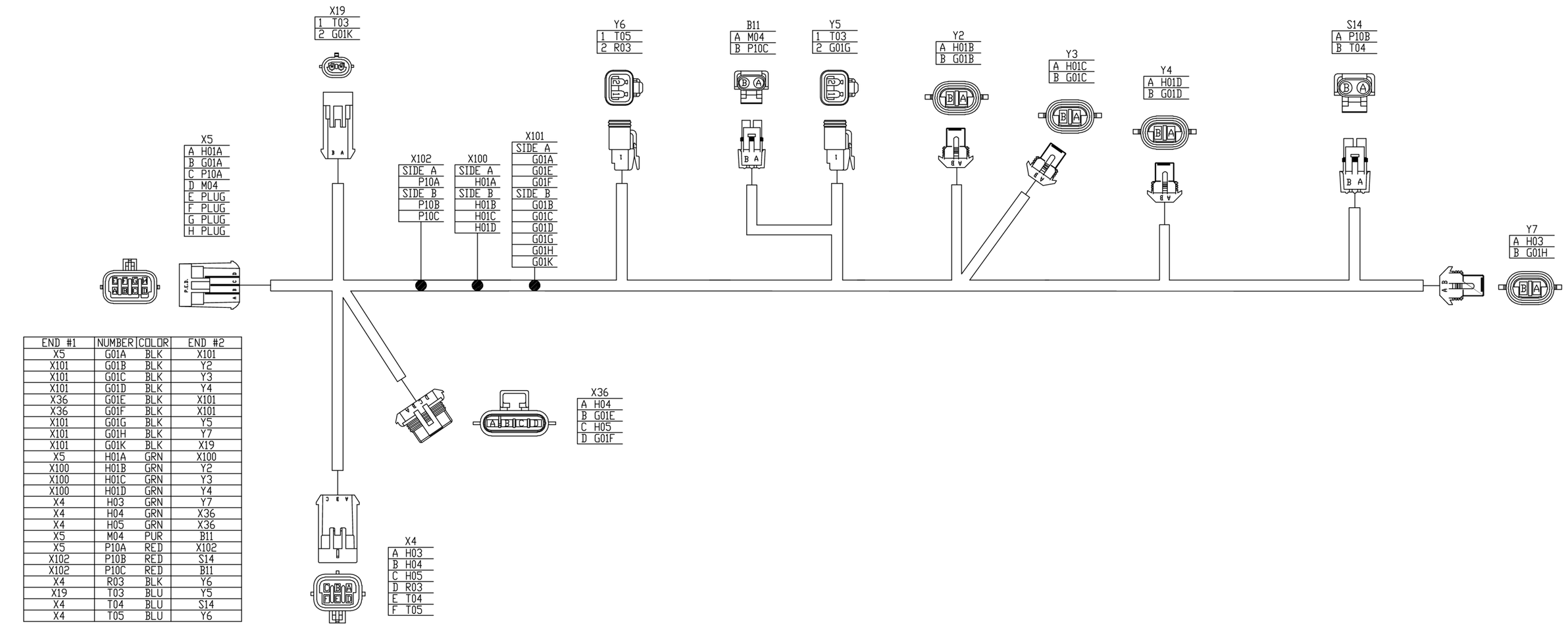
END #1	NUMBER	COLOR	END #2
X5	G01A	BLK	X101
X101	G01B	BLK	Y2
X101	G01C	BLK	Y3
X101	G01D	BLK	Y4
Y12	G01E	BLK	X101
Y11	G01F	BLK	X101
X101	G01G	BLK	Y5
X101	G01H	BLK	Y7
X101	G01K	BLK	X19
X5	H01A	GRN	X100
X100	H01B	GRN	Y2
X100	H01C	GRN	Y3
X100	H01D	GRN	Y4
X4	H03	GRN	Y7
X4	H04	GRN	Y11
X4	H05	GRN	Y12
X5	M04	PUR	B11
X5	P10A	RED	X102
X102	P10B	RED	S14
X102	P10C	RED	B11
X4	R03	BLK	Y6
X19	T03	BLU	Y5
X4	T04	BLU	S14
X4	T05	BLU	Y6

T211441

CTL Front Chassis Harness—Deluxe (W17) Wiring Diagram (S.N. —131876)

LEGEND:

B11	Auxiliary Hydraulic Spool Neutral Switch
S14	Two Speed Switch
X4	Cab Harness to Front Chassis Harness 6-Pin Connector
X5	Engine Harness to Front Chassis Harness 8-Pin Connector
X19	Park Brake Signal Connector
X100	Splice
X101	Splice
X102	Splice
Y2	Boom Spool Lock Solenoid
Y3	Bucket Spool Lock Solenoid
Y4	Port Lock Solenoid
Y5	Park Brake Solenoid
Y6	Two Speed Solenoid
Y7	High Flow Solenoid
Y11	Hydraulic Quik-Tatch Lock Solenoid
Y12	Hydraulic Quik-Tatch Unlock Solenoid



END #1	NUMBER	COLOR	END #2
X5	G01A	BLK	X101
X101	G01B	BLK	Y2
X101	G01C	BLK	Y3
X101	G01D	BLK	Y4
X36	G01E	BLK	X101
X36	G01F	BLK	X101
X101	G01G	BLK	Y5
X101	G01H	BLK	Y7
X101	G01K	BLK	X19
X5	H01A	GRN	X100
X100	H01B	GRN	Y2
X100	H01C	GRN	Y3
X100	H01D	GRN	Y4
X4	H03	GRN	Y7
X4	H04	GRN	X36
X4	H05	GRN	X36
X5	M04	PUR	B11
X5	P10A	RED	X102
X102	P10B	RED	S14
X102	P10C	RED	B11
X4	R03	BLK	Y6
X19	T03	BLU	Y5
X4	T04	BLU	S14
X4	T05	BLU	Y6

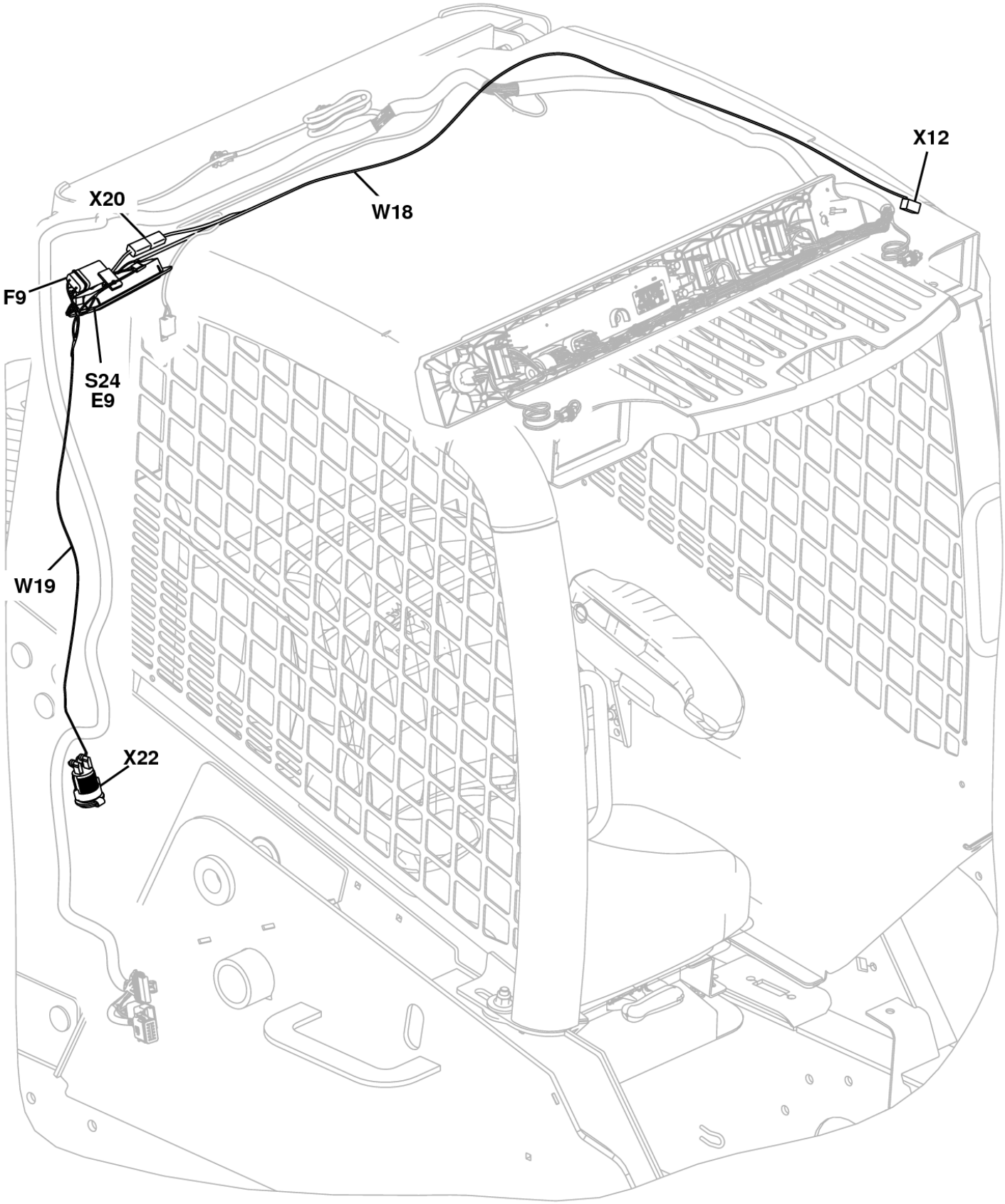
TX1024055

CTL Front Chassis Harness—Deluxe (W17) Wiring Diagram (S.N. 131877—)

LEGEND:

B11	Auxiliary Hydraulic Spool Neutral Switch
S14	Two Speed Switch
X4	Cab Harness to Front Chassis Harness 6-Pin Connector
X5	Engine Harness to Front Chassis Harness 8-Pin Connector
X19	Park Brake Signal Connector
X36	Electric Quik-Tatch 4-Pin Connector
X100	Splice
X101	Splice
X102	Splice
Y2	Boom Spool Lock Solenoid
Y3	Bucket Spool Lock Solenoid
Y4	Port Lock Solenoid
Y5	Park Brake Solenoid
Y6	Two Speed Solenoid
Y7	High Flow Solenoid

Operator Convenience Package Harnesses (W18 and W19) Component Location



TX1058021

Operator Convenience Package Harnesses (W18 and W19) Component Location

LEGEND:

E9	Dome Light
F9	Dome Light and Accessory Power Socket 10 Amp Fuse

S24	Dome Light Switch
W18	Operator Convenience Package Harness (S.N. —170536)
W19	Operator Convenience Package Harness
X12	Cab Harness Accessory Power Connector
X20	Operator Convenience Package Power 2-Pin Connector
X22	12-Volt Accessory Power Socket

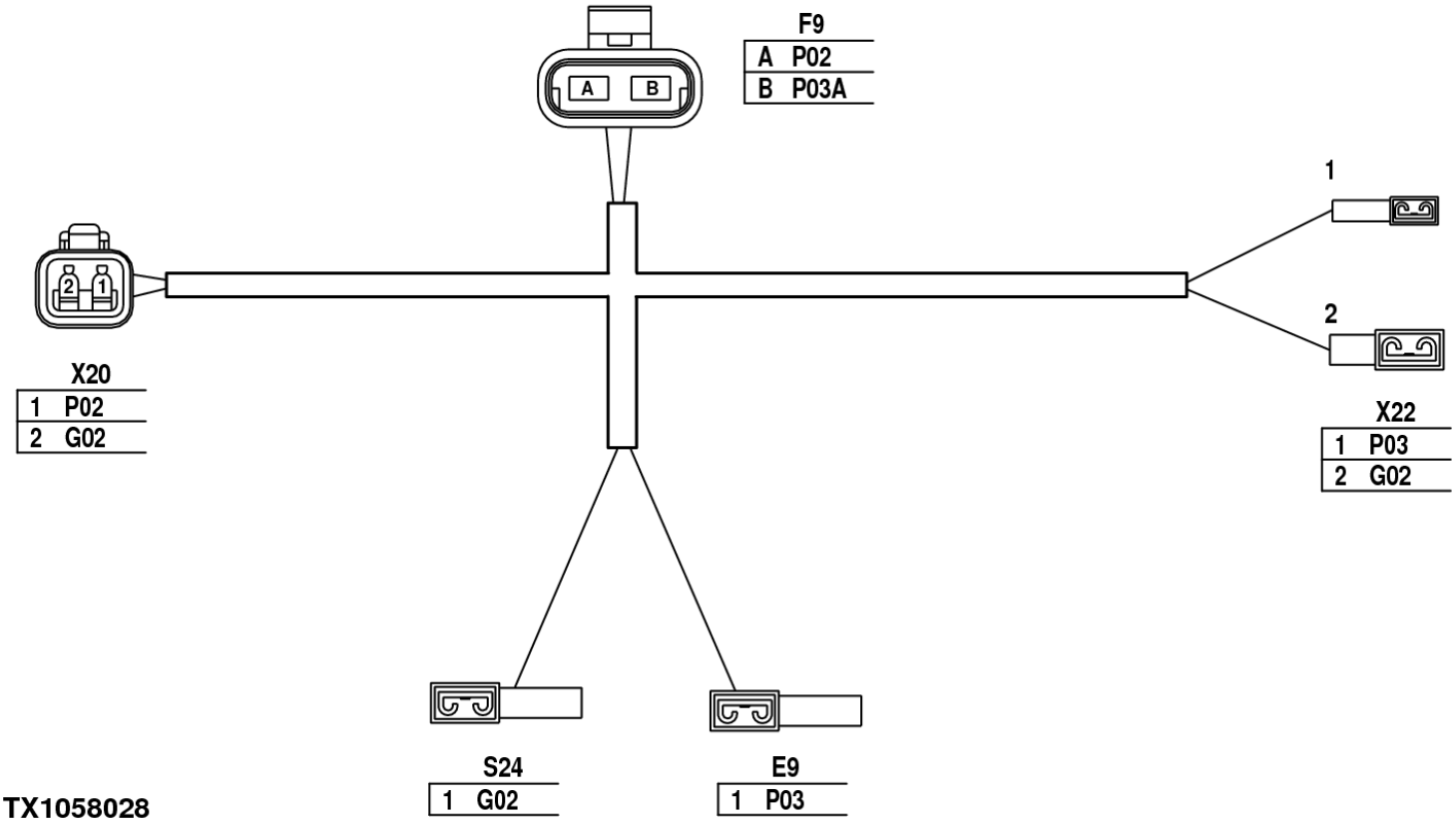
Operator Convenience Package Harnesses (W18 and W19) Wiring Diagram

TX1058026

Operator Convenience Package Harness (W18) Wiring Diagram (S.N. —170536)

LEGEND:

X12	Cab Harness Accessory Power Connector
X20	Operator Convenience Package Power 2-Pin Connector



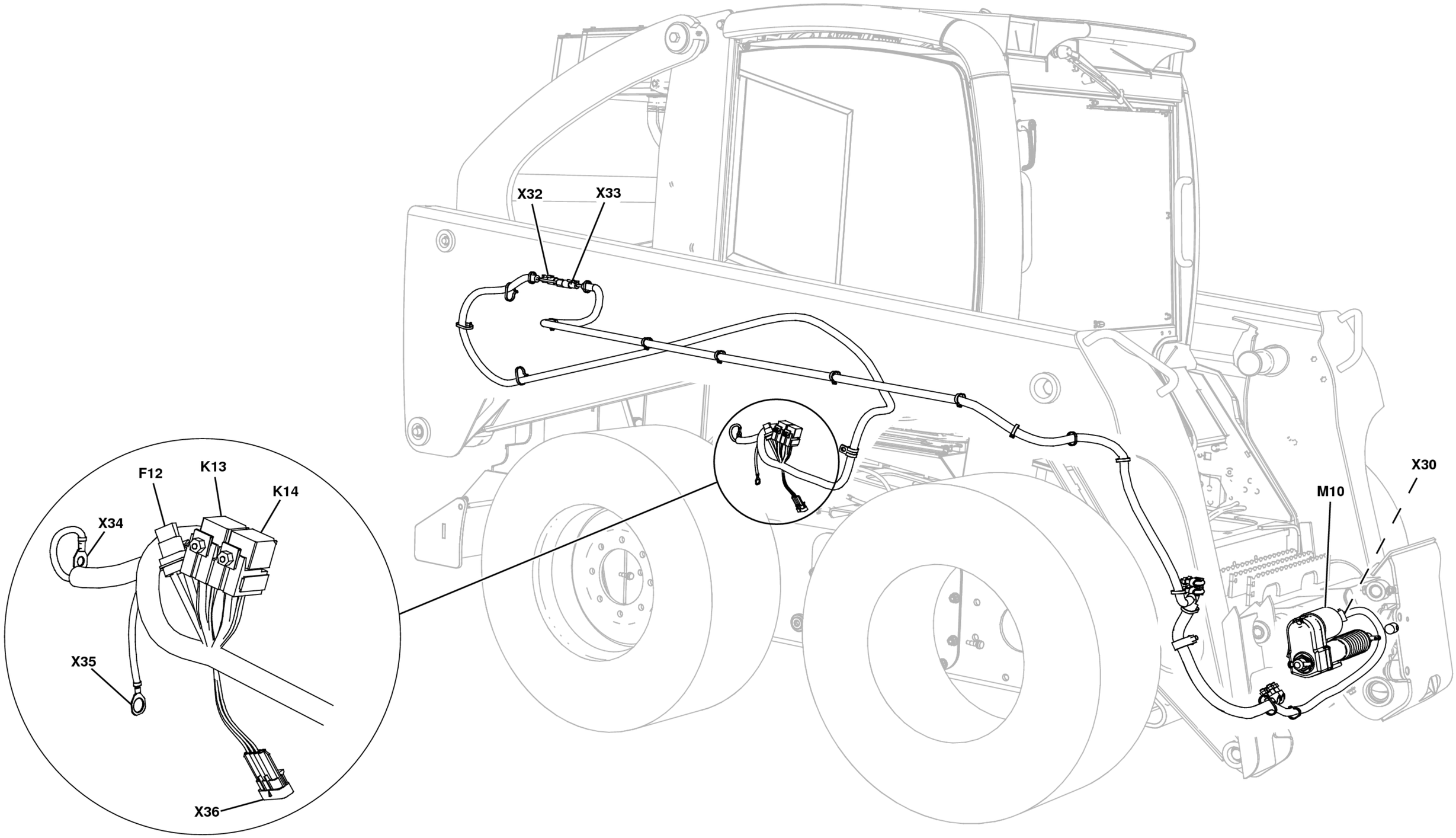
TX1058028

Operator Convenience Package Harness (W19) Wiring Diagram

LEGEND:

E9	Dome Light
F9	Dome Light and Accessory Power Socket 10 Amp Fuse
S24	Dome Light Switch
X20	Operator Convenience Package Power 2-Pin Connector
X22	12-Volt Accessory Power Socket

Electric Quik-Tatch (W28) Component Location (S.N. 131877—)



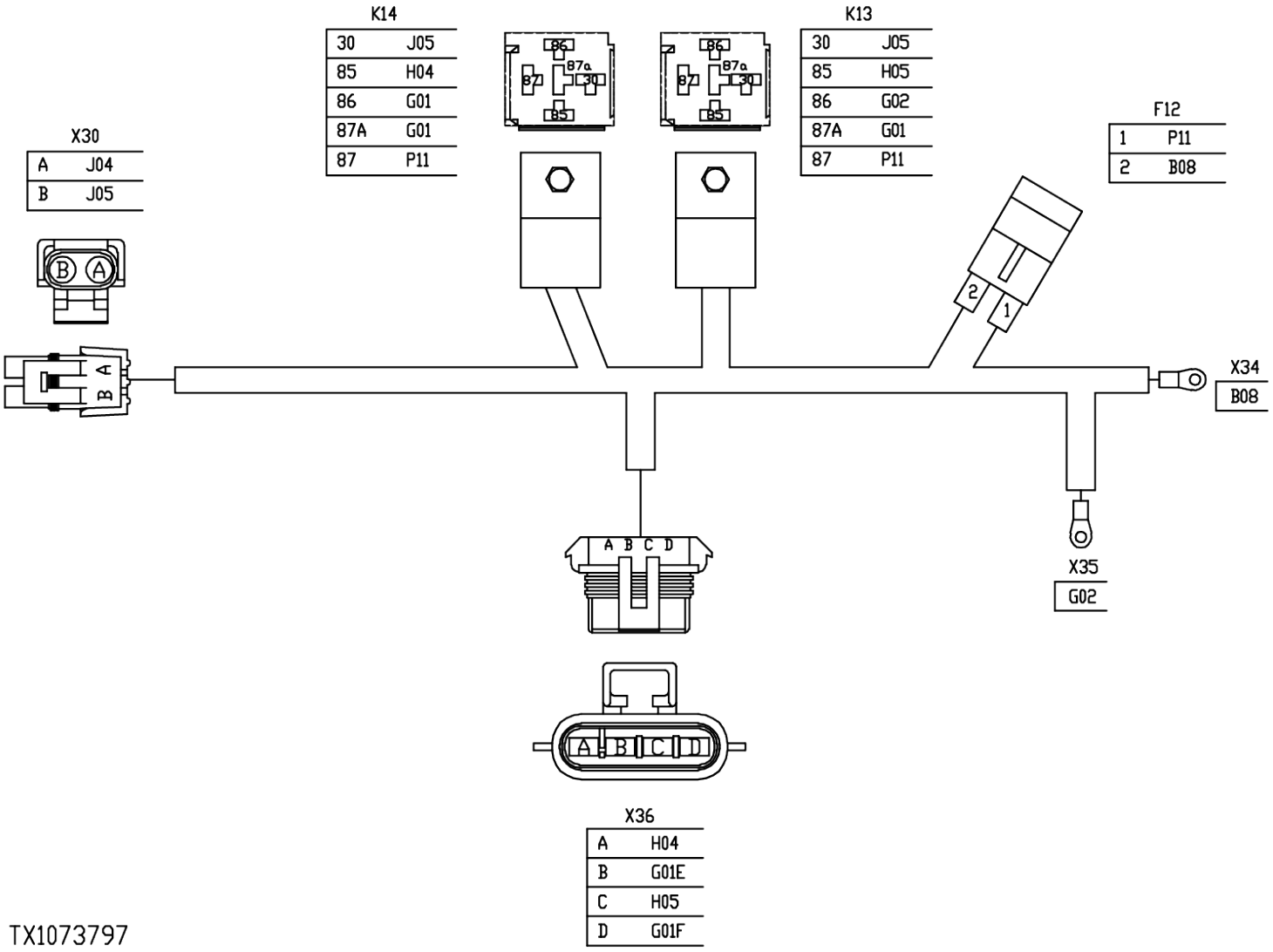
TX1009210

W28 Component Location

LEGEND:

F12	Electric Quik-Tatch Harness 30 Amp Fuse
K13	Electric Quik Tatch Relay
K14	Electric Quik-Tatch Relay
M10	Electric Quik-Tatch Motor
X30	Electric Quik-Tatch Motor 2-Pin Connector
X32	Electric Quik-Tatch 1-Pin Connector
X33	Electric Quik-Tatch 1-Pin Connector
X34	Electric Quik-Tatch Power From Battery Connector
X35	Electric Quik-Tatch Ground to Frame Connector
X36	Electric Quik-Tatch 4-Pin Connector

Electric Quik-Tatch (W28) Wiring Diagram (S.N. 131877—)

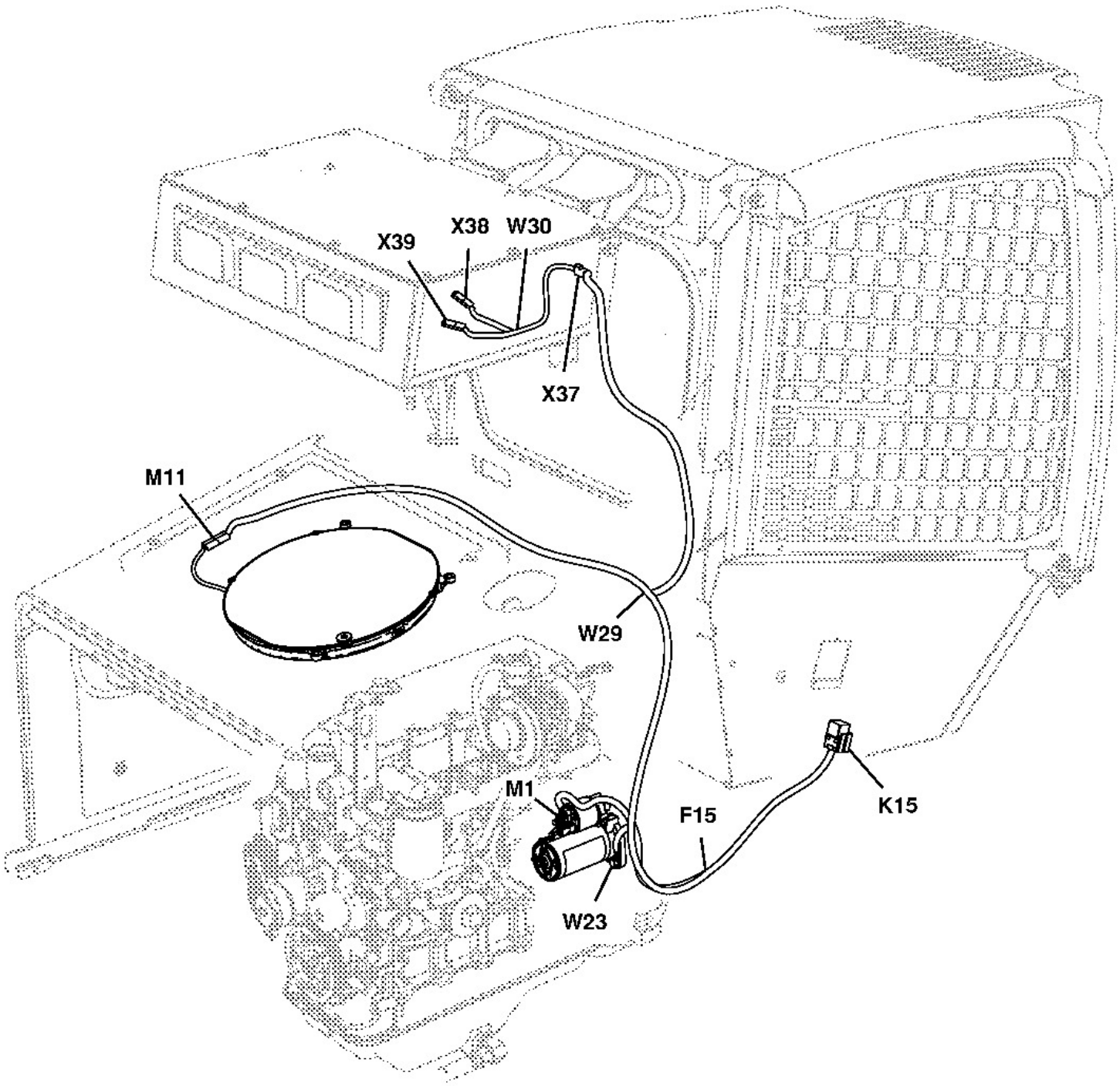


Electric Quik-Tatch ™ (W28) Wiring Diagram

LEGEND:

F12	Electric Quik-Tatch 30 Amp Fuse
K13	Electric Quik-Tatch Relay
K14	Electric Quik-Tatch Relay
X30	Electric Quik-Tatch Motor 2-Pin Connector
X34	Electric Quik-Tatch Power From Battery Connector
X35	Electric Quik-Tatch Ground to Frame Connector
X36	Electric Quik-Tatch 4-Pin Connector

Helper Fan Control and Tee Harness (W29 and W30) Component Location



TX1010653

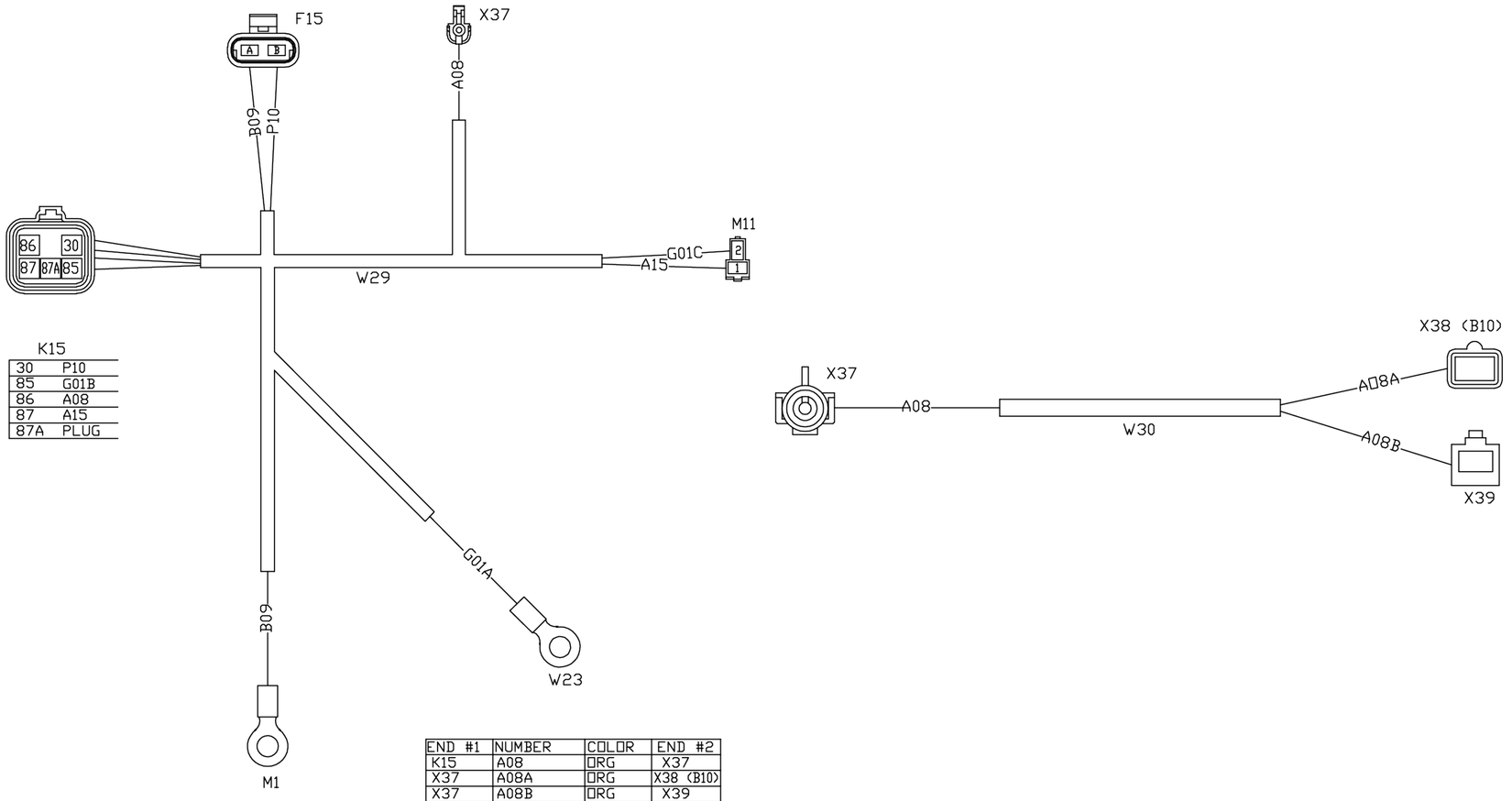
Helper Fan Control and Tee Harness (W29 and W30) Component Location

LEGEND:

F15	Helper Fan Fuse (25 Amp)
K15	Helper Fan Relay

M1	Starter Motor
M11	Helper Fan Motor
W29	Helper Fan Control Harness
W30	Helper Fan Tee Harness
X37	Helper Fan Control Harness - to - Helper Fan Tee Harness Connector
X38	Helper Fan Control Harness - to - Air Conditioning Harness
X39	Helper Fan Control Harness - to - B10

Helper Fan Control and Tee Harness (W29 and W30) Wiring Diagram



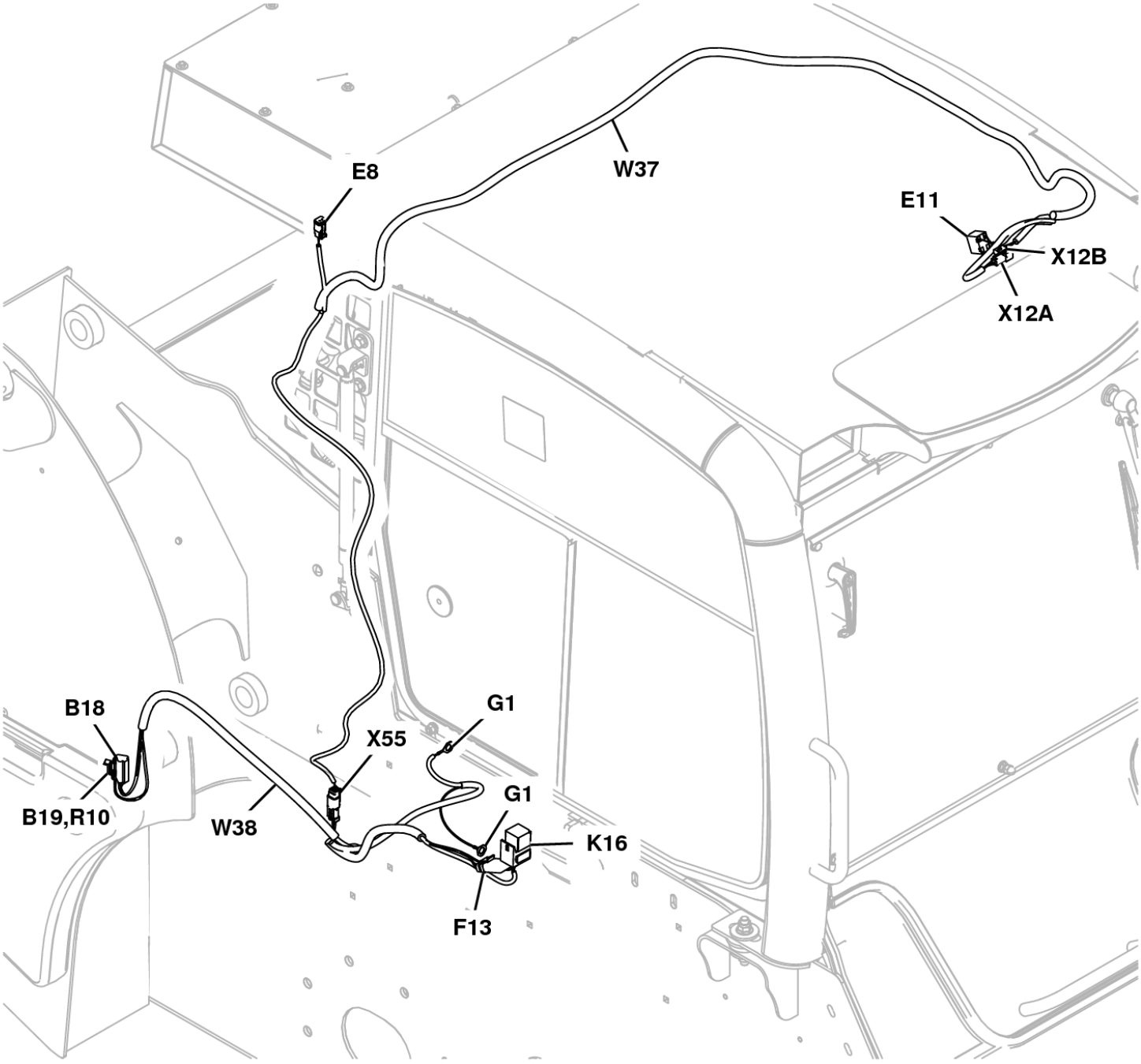
END #1	NUMBER	COLOR	END #2
K15	A08	ORG	X37
X37	A08A	ORG	X38 (B10)
X37	A08B	ORG	X39
K15	A15	ORG	M11
M1	B09	RED	F13
K15,M11	G01A	BLK	W23
K15	G01B	BLK	W23
W23	G01C	BLK	M11
F15	P10	RED	K15

Helper Fan Control and Tee Harness (W29 and W30) Wiring Diagram

LEGEND:

F15	Helper Fan Fuse (25 Amp)
K15	Helper Fan Relay
M1	Starter Motor
M11	Helper Fan Motor
W29	Helper Fan Control Harness
W30	Helper Fan Tee Harness
X37	Helper Fan Control Harness - to - Helper Fan Tee Harness Connector
X38	Helper Fan Control Harness - to - Air Conditioning Harness
X39	Helper Fan Control Harness - to - B10

Water-in-Fuel Indicator Harness (W37) and Water-in-Fuel Sensor Harness (W38) Component Location—If Equipped



TX1055108

Water-in-Fuel Indicator Harness (W37) and Water-in-Fuel Sensor Harness (W38) Component Location

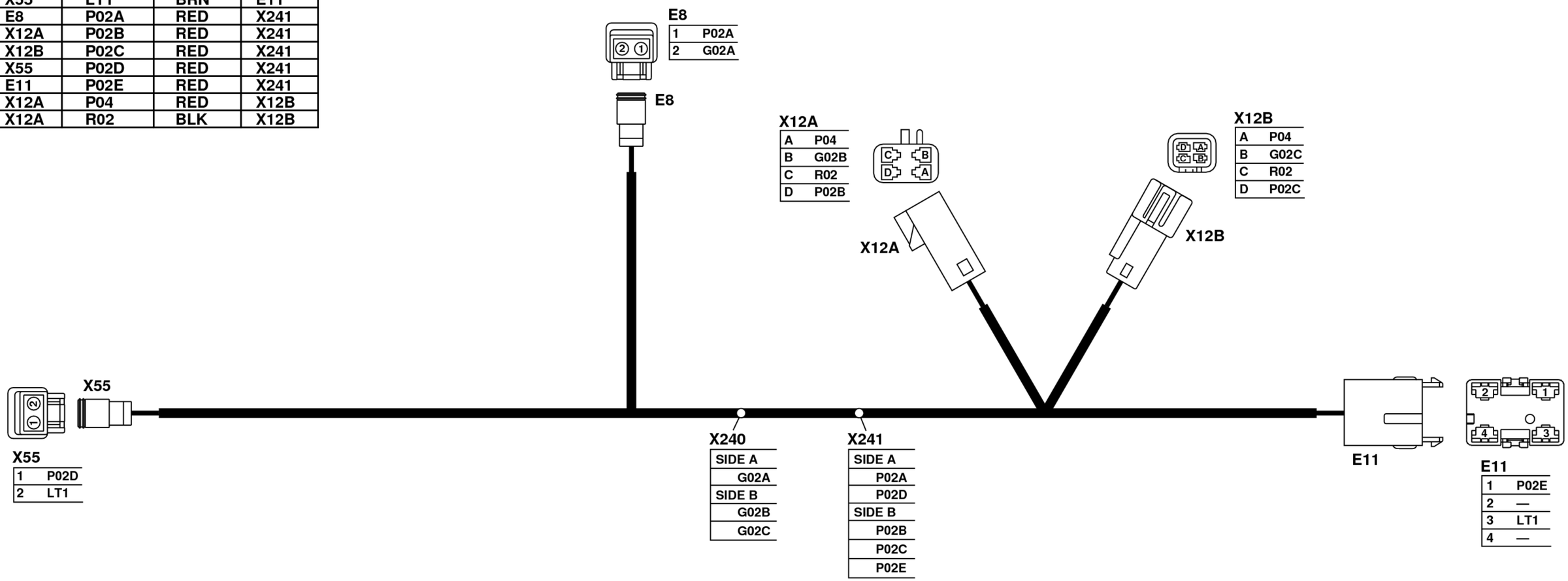
LEGEND:

B18	Water-in-Fuel Sensor 3-Pin Connector
B19	Fuel Heater Temperature Switch
E8	Beacon 2-Pin Connector
E11	Water-in-Fuel Indicator 4-Pin Connector
F13	Fuel Heater 15 Amp Fuse
G1	Battery
K16	Fuel Heater Relay 4-Pin Connector
R10	Fuel Heater 2-Pin Connector
W37	Water-in-Fuel Indicator Harness
W38	Water-in-Fuel Sensor Harness
X12A	Cab Harness Accessory Power 4-Pin Connector
X12B	Cab Harness Accessory Power to Beacon Harness 4-Pin Connector

X55 Cab Harness 2-Pin Connector

Water-in-Fuel Indicator Harness (W37) Wiring Diagram—If Equipped

END #1	NUMBER	COLOR	END #2
E8	G02A	BLK	X240
X12A	G02B	BLK	X240
X12B	G02C	BLK	X240
X55	LT1	BRN	E11
E8	P02A	RED	X241
X12A	P02B	RED	X241
X12B	P02C	RED	X241
X55	P02D	RED	X241
E11	P02E	RED	X241
X12A	P04	RED	X12B
X12A	R02	BLK	X12B



TX1054727

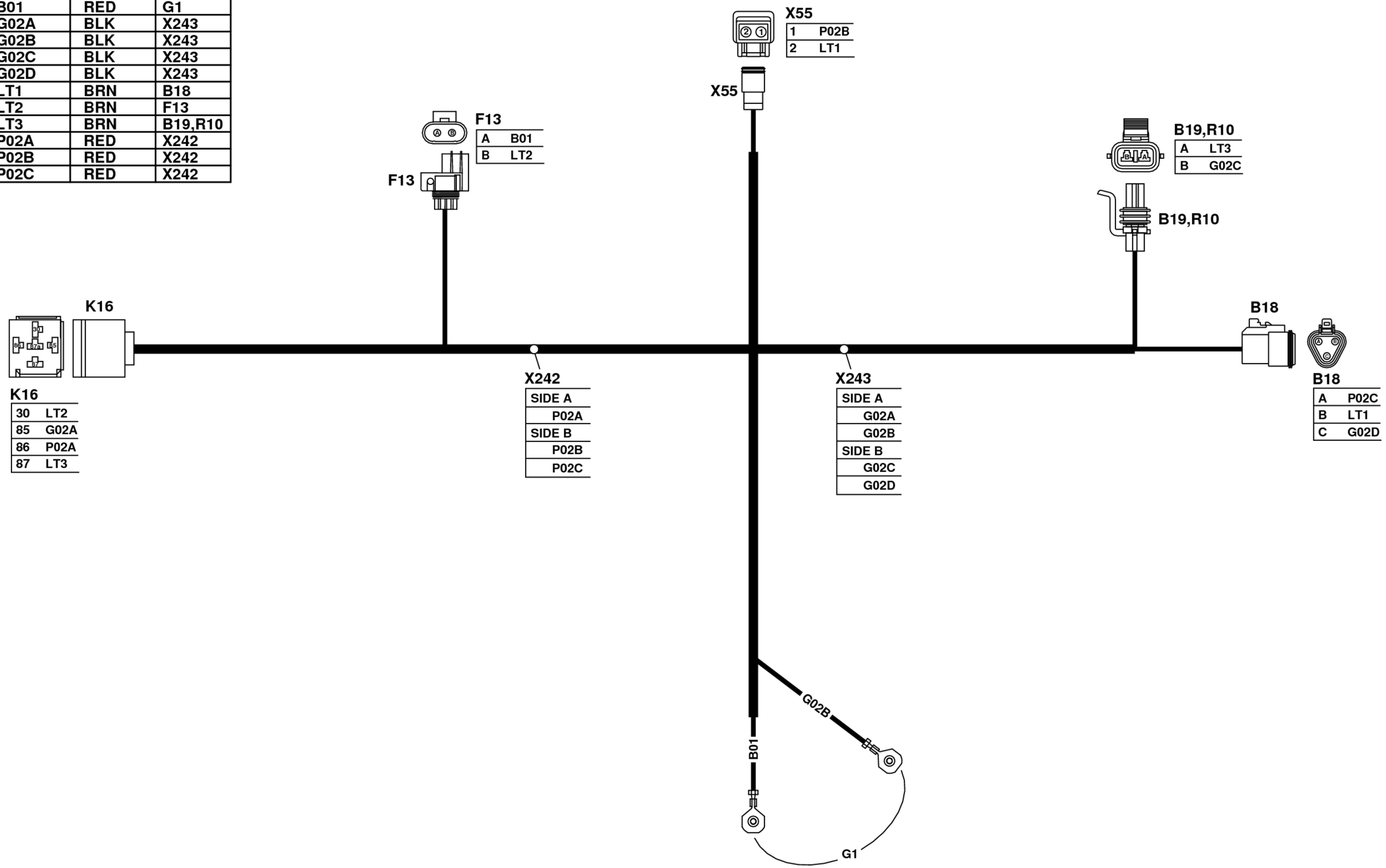
Water-in-Fuel Indicator Harness (W37) Wiring Diagram

LEGEND:

E8	Beacon 2-Pin Connector
E11	Water-in-Fuel Indicator 4-Pin Connector
X12A	Cab Harness Accessory Power 4-Pin Connector
X12B	Cab Harness Accessory Power to Beacon Harness 4-Pin Connector
X55	Cab Harness 2-Pin Connector
X240	G02 BLK Splice
X241	P02 RED Splice

Water-in-Fuel Sensor Harness (W38) Wiring Diagram—If Equipped

END #1	NUMBER	COLOR	END #2
F13	B01	RED	G1
K16	G02A	BLK	X243
G1	G02B	BLK	X243
B19,R10	G02C	BLK	X243
B18	G02D	BLK	X243
X55	LT1	BRN	B18
K16	LT2	BRN	F13
K16	LT3	BRN	B19,R10
K16	P02A	RED	X242
X55	P02B	RED	X242
B18	P02C	RED	X242



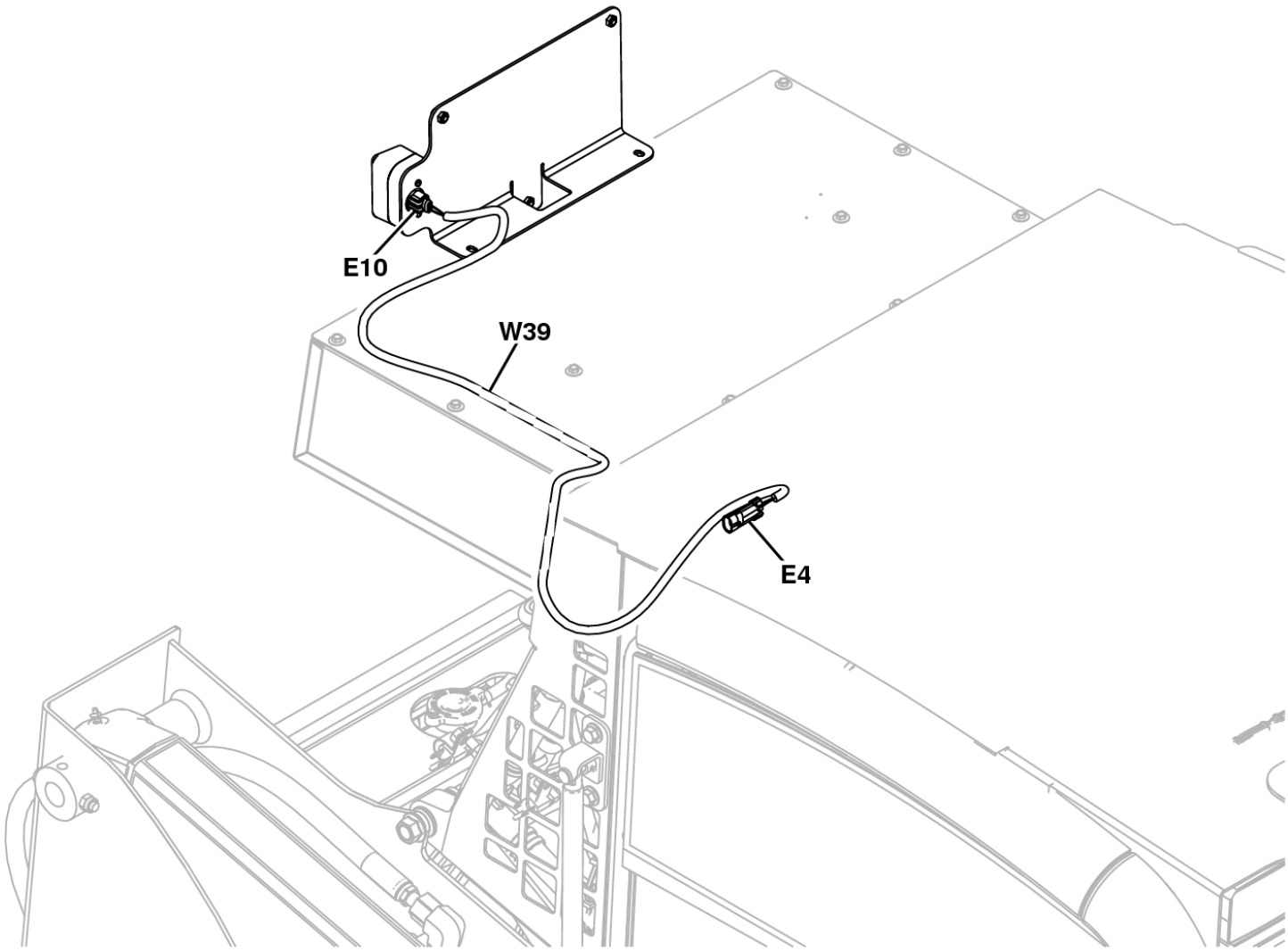
TX1054756

Water-in-Fuel Sensor Harness (W38) Wiring Diagram

LEGEND:

B18	Water-in-Fuel Sensor 3-Pin Connector
F13	Fuel Heater 15 Amp Fuse
G1	Battery
K16	Fuel Heater Relay
R10	Fuel Heater 2-Pin Connector
X55	Cab Harness 2-Pin Connector
X242	P02 RED Splice
X243	G02 BLK Splice

License Plate Light Harness (W39) Component Location—If Equipped



TX1054716

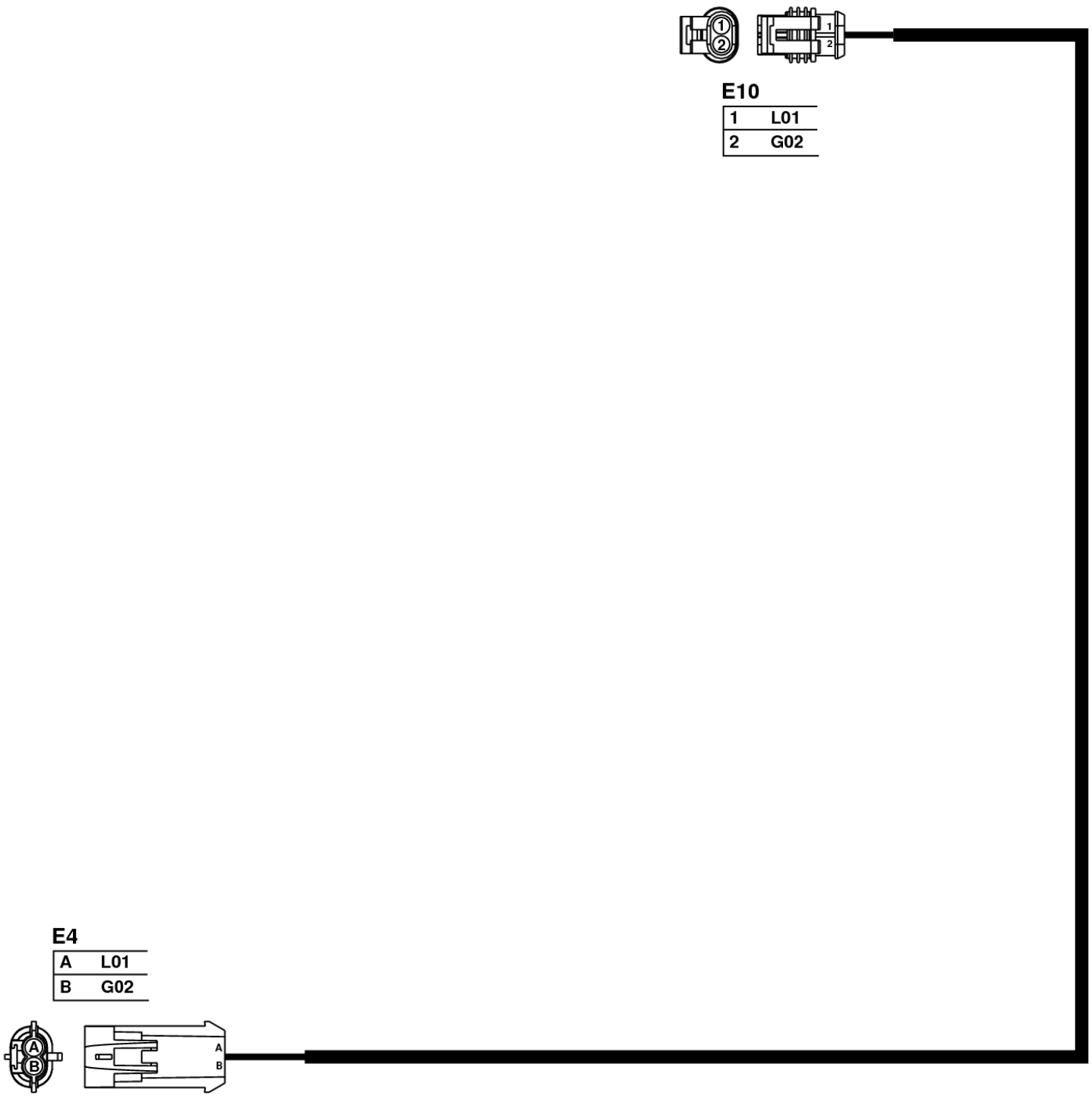
License Plate Light Harness Component Location

LEGEND:

E4	Right Tail Light 2-Pin Connector
E10	License Plate Light 2-Pin Connector
W39	License Plate Light Harness

License Plate Light Harness (W39) Wiring Diagram—If Equipped

END #1	NUMBER	COLOR	END #2
E4	L01	BRN	E10
E4	G02	BLK	E10



TX1054676

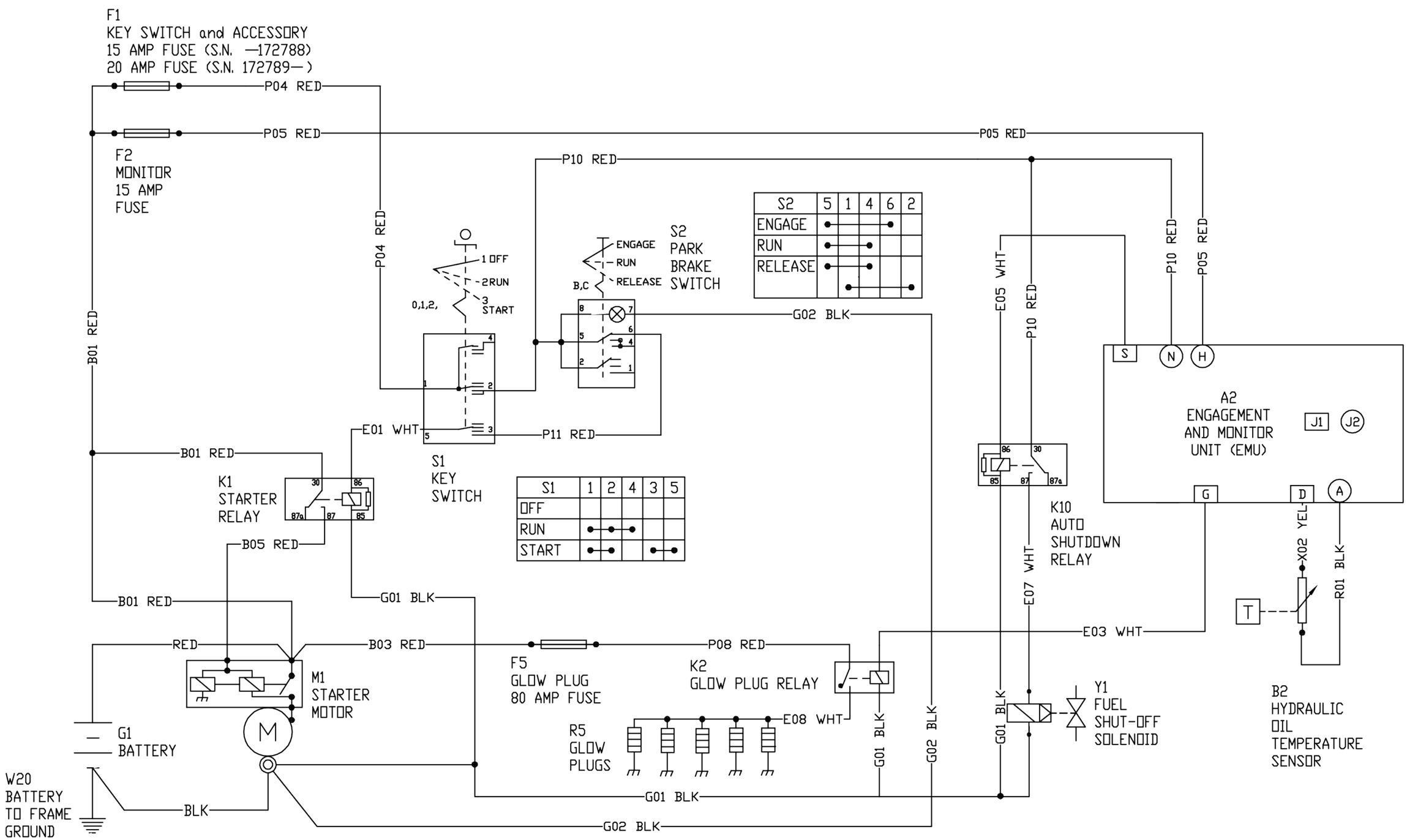
License Plate Light Harness (W39) Wiring Diagram

LEGEND:

E4	Right Tail Light 2-Pin Connector
E10	License Plate Light 2-Pin Connector

Group 15 - Sub-System Diagnostics

Starting Circuit Theory of Operation



TX1073882

Start Circuit Schematic

LEGEND:

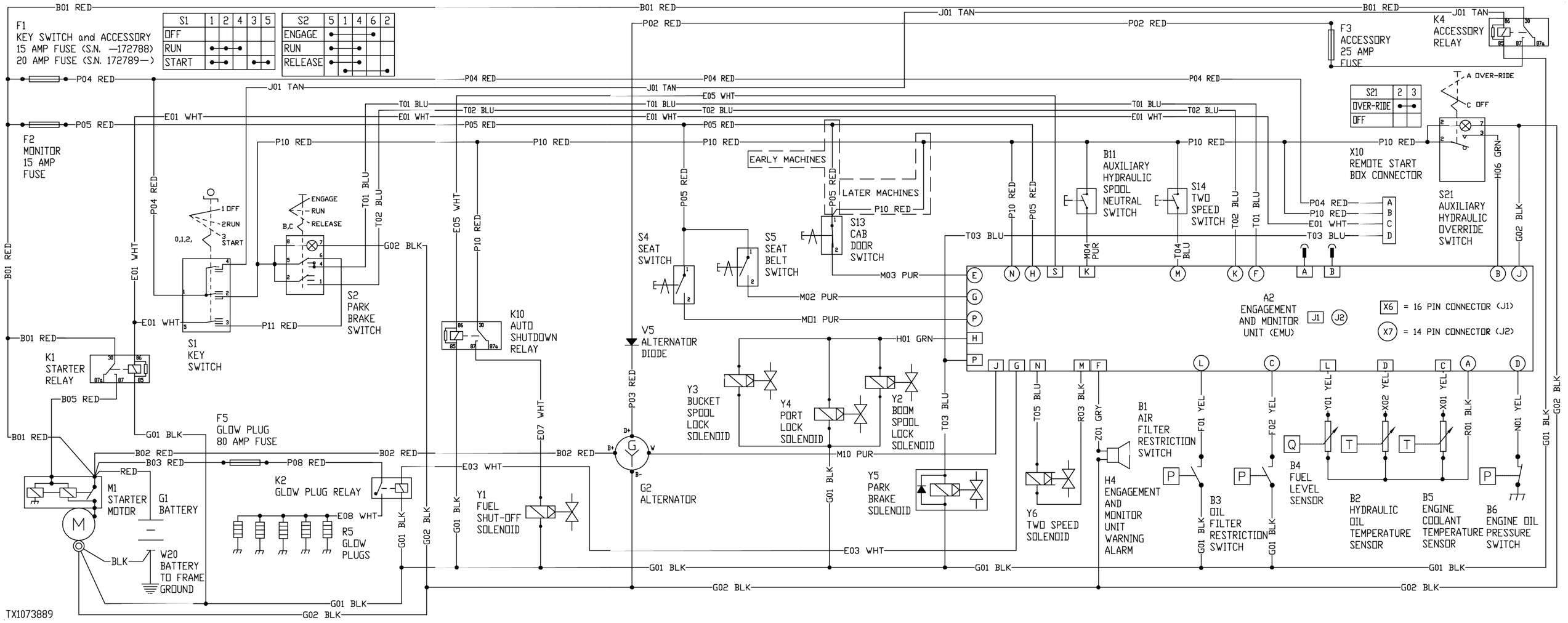
A2	Engagement and Monitor Unit (EMU)
B2	Hydraulic Oil Temperature Sensor
F1	Key Switch and Accessory 15 Amp Fuse (S.N. —172788)
F1	Key Switch and Accessory 20 Amp Fuse (S.N. 172789—)
F2	Monitor 15 Amp Fuse
F5	Glow Plug 80 Amp Fuse
G1	Battery
K1	Starter Relay
K2	Glow Plug Relay
K10	Auto Shutdown Relay
M1	Starter Motor
R5	Glow Plugs
S1	Key Switch
S2	Park Brake Switch
Y1	Fuel Shut-Off Solenoid

When the key switch (S1) is put in the START position, power flows from the battery (G1) through fuse (F1) to key switch terminal 1 and out through key switch terminal 2 to park brake switch (S2). The park brake switch must be in the engaged position for power to continue out through park brake switch terminal 6 and back to key switch terminal 3. Power then flows from key switch terminal 3 to key switch terminal 5 and out to start relay (K1) energizing it. Energized start relay (K1) allows power to flow from the battery to the starter solenoid, activating it and the starter motor.

When the key switch is in the ON or START position, the Engagement and Monitor Unit (A2) activates the Auto Shutdown Relay (K10), sending power to the Fuel Shut-Off Solenoid (Y1). The fuel shut-off solenoid must be energized for the engine to start.

If the hydraulic oil temperature is less than 15° C (60° F), the engagement and monitor unit will energize the glow plug relay (K2) allowing power to flow from the battery, through glow plug fuse (F5) and glow plug relay (K2) to the glow plugs. Glow plugs will be activated for up to 20 seconds or until engine RPM is greater than 600 RPM. After the engine reaches 600 RPM or greater, the engagement and monitor unit will keep the glow plugs energized for an additional 20 seconds. When the glow plug relay is energized, the “Wait” indicator will illuminate on the instrument panel. Glow plug activation is determined by the hydraulic oil temperature sensor to avoid premature deactivation of glow plugs when an engine block heater is used.

Engagement and Monitor Unit Circuit Theory of Operation



Engagement and Monitor Unit Circuit Schematic

LEGEND:

A2	Engagement and Monitor Unit (EMU)
B1	Air Filter Restriction Switch
B2	Hydraulic Oil Temperature Sensor
B3	Hydraulic Oil Filter Restriction Switch
B4	Fuel Level Sensor
B5	Engine Coolant Temperature Sensor
B6	Engine Oil Pressure Switch
B11	Auxiliary Hydraulic Spool Neutral Switch
F1	Key Switch and Accessory 15 Amp Fuse (S.N. —172788)
F1	Key Switch and Accessory 20 Amp Fuse (S.N. 172789—)
F2	Monitor 15 Amp Fuse
F3	Accessory 25 Amp Fuse
F5	Glow Plug 80 Amp Fuse
G1	Battery
G2	Alternator
H4	Engagement and Monitor Unit Warning Alarm
K1	Starter Relay
K2	Glow Plug Relay
K4	Accessory Relay
K10	Auto Shutdown Relay
M1	Starter Motor
R5	Glow Plugs
S1	Key Switch
S2	Park Brake Switch
S4	Seat Switch
S5	Seat Belt Switch
S13	Cab Door Switch
S14	Two Speed Switch
S21	Auxiliary Hydraulic Override Switch
V5	Alternator Diode
W20	Battery to Frame Ground
X6	Cab Harness to Engagement and Monitor Unit 16-Pin Connector (J1)
X7	Cab Harness to Engagement and Monitor Unit 14-Pin Connector (J2)
X10	Remote Start Box Connector
Y1	Fuel Shut-Off Solenoid
Y2	Boom Spool Lock Solenoid
Y3	Bucket Spool Lock Solenoid
Y4	Port Lock Solenoid
Y5	Park Brake Solenoid
Y6	Two Speed Solenoid

The engagement and monitor unit uses information from the machine sensors to display information to the operator and to shutdown the machine under abnormal conditions. The engagement and monitor unit also uses operator input from switches and sensors to control certain machine functions.

Air Filter Restriction Switch (B1)

The air filter restriction switch is a normally open switch that will close when a restriction is detected. When the switch closes, it grounds terminal L (J2) on the engagement and monitor unit. This illuminates the air filter restriction indicator on the instrument panel. See Electrical Component Specifications for component specifications. (Group 9015-20.)

Hydraulic Oil Temperature Sensor (B2)

The hydraulic oil temperature sensor is a variable resistance temperature sensor. The resistance is sensed at terminal D (J1) of the engagement and monitor unit. Information from this sensor is used to display hydraulic oil temperature to the operator, warn the operator when the hydraulic oil temperature is too high, determine if the glow plugs are to be energized, and to auto shutdown the machine when hydraulic oil temperature reaches a predetermined temperature. For more information on auto shutdown, see below. For more information on sensor, see Electrical Component Specifications . (Group 9015-20.)

Hydraulic Oil Filter Restriction Switch (B3)

The hydraulic oil filter restriction switch is a normally open switch that will close when the pressure differential across the hydraulic oil filter is greater than specification. When the switch closes, it grounds terminal C (J2) of the engagement and monitor unit. If the temperature of the hydraulic oil is above 38°C (100° F), after a 60 second delay, the hydraulic oil filter restriction indicator illuminates on the instrument panel.

Fuel Level Sensor (B4)

The fuel level sensor is a variable resistance fuel level sensor. The resistance is sensed at terminal L (J1) of the engagement

and monitor unit. Information from this sensor is used to display the fuel level to the operator and to warn the operator when the fuel level is low. When fuel is low, the operator will be warned by a series of three warnings. The first and second warnings consist of a message on the engagement and monitor unit display and three beeps of the engagement and monitor unit warning alarm. The third warning starts immediately after the second warning and consists of a message on the engagement and monitor unit display and a single beep of the engagement and monitor unit warning alarm every 60 seconds. The message displayed on the engagement and monitor unit display is an alternation of “LOW” and “FUEL” until the “SELECT” or “MENU” buttons are pushed. For more information on sensor, see Electrical Component Specifications . (Group 9015-20.)

Coolant Temperature Sensor (B5)

The coolant temperature sensor is a variable resistance temperature sensor. The resistance is sensed at terminal C (J1) of the engagement and monitor unit. Information from this sensor is used to display engine coolant temperature to the operator, warn the operator when coolant temperature is above normal, and auto shutdown the machine when the coolant temperature reaches critical levels. For more information on auto shutdown, see below. For more information on sensor, see Electrical Component Specifications . (Group 9015-20.)

Engine Oil Pressure Switch (B6)

The engine oil pressure switch is a normally closed switch held open by the oil pressure in the engine. When the oil pressure drops below specification, the switch grounds terminal D (J2) on the engagement and monitor unit. If oil pressure is low for one second or more the low oil pressure indicator illuminates on the instrument panel. Information from this switch is used to inform the engagement and monitor unit that the engine is running, warn the operator if engine oil pressure is low, determine if the glow plugs are to be energized, and auto shutdown the machine when low oil pressure is detected. For more information on auto shutdown, see below. For more information on switch, see Electrical Component Specifications . (Group 9015-20.)

Alternator (G2)

The alternator provides a signal from the W terminal to the engagement and monitor unit terminal J (J1) that the engine is running. When the engagement and monitor unit receives the signal that the engine is running, it starts the hour meter. This signal is also used to calculate the engine RPM which can be displayed on the engagement and monitor unit display. The engine RPM information is also used to determine if the glow plugs are to be energized.

Interlock Logic

The seat switch (S4) followed by the seat belt switch (S5) and cab door switch (S13) must be connected to system voltage for the engagement and monitor unit to allow the “Run” input and “Release” input to enable the hydraulic functions and release the park brake.

When the “Run” input at pin F (J2) is connected to system voltage from the park brake switch (S2), the engagement and monitor unit outputs power to the boom spool lock (Y2), bucket spool lock (Y3), and port lock (Y4) solenoids. This enables the hydraulics of the machine, but does not release the park brake.

When the “Release” input at pin K (J2) is momentarily connected to system voltage from the park brake switch (S2), the engagement and monitor unit outputs power to the park brake solenoid (Y5) to release the park brake.

If the seat switch drops power to the engagement and monitor unit for more than one second after either the hydraulic or park brake output have been enabled, these outputs are turned off. This disables the hydraulics and engages the park brake. The one second delay is to prevent the hydraulics from disengaging and the park brake from engaging if the operator bounces in the seat while driving over rough terrain.

If the seat belt or cab door switch momentarily drops power to the engagement and monitor unit after either the hydraulic or park brake outputs have been enabled, the outputs are turned off. This disables the hydraulics and engages the park brake.

Once power has been lost from the seat or seat belt switch to the engagement and monitor unit, power must be reestablished from the seat switch first and then the seat belt switch. This sequence must be followed for the engagement and monitor unit to allow the “Run” and “Release” input to enable hydraulic functions and release the park brake.

The park brake output from the engagement and monitor unit must always be off when the engine is not running.

Engine Status

The engagement and monitor unit determines that the engine is running if the engine RPM, which is measured using the alternator (G2), is greater than 600 RPM or the engine oil pressure switch (B6) is open for more than one second. The engine is determined to be off when the engine RPM is less than 200 RPM and the engine oil pressure switch is closed for more than one second.

Shut Down Logic

Auto shutdown is prevented in the first 30 seconds the engine is running to provide “limp home” capabilities for the machine.

If the engine coolant temperature rises above specification, the stop indicator will illuminate, the engine coolant temperature gauge needle will be in the red portion of the gauge, the engagement and monitor unit display will automatically display engine coolant temperature, and the engagement and monitor unit warning alarm will sound. If engine coolant temperature rises even further, the engagement and monitor unit will deactivate the auto shutdown relay (K10), removing power to the fuel shut-off solenoid (Y1). This will shut the machine down.

If the low oil pressure warning or engine coolant temperature warning has been on for more than 5 seconds, the engagement and monitor unit will deactivate the auto shutdown relay (K10), removing power to the fuel shut-off solenoid (Y1). This shuts the machine down.

If the hydraulic oil temperature rises above specification, the stop indicator will illuminate and the engagement and monitor unit warning alarm will sound. If the hydraulic oil temperature warning has been active for more than 5 minutes, the engagement and monitor unit will deactivate the auto shutdown relay (K10), removing power to the fuel shut-off solenoid (Y1). This shuts the machine down.

If the auxiliary hydraulic spool neutral switch (B11) is open (auxiliary hydraulics active) and the seat or seat belt switch become open, the engagement and monitor unit will deactivate the auto shutdown relay (K10), removing power to the fuel shut-off solenoid (Y1). This shuts the machine down. For more information on auxiliary spool neutral switch and auxiliary hydraulic override switch, see below.

One second after shutdown is complete, the auto shutdown relay and fuel shut-off solenoid are re-energized. If the seat, seat belt and auxiliary hydraulic spool neutral switch (B11) remain closed, the auto shutdown relay and fuel shut-off solenoid will remain activated. If the seat, seat belt or auxiliary hydraulic spool neutral switch are open after shutdown is complete, the auto shutdown relay and fuel shut-off solenoid are deactivated.

Auxiliary Hydraulic Override Switch Logic

The auxiliary hydraulic override switch (S21) allows the operator to utilize the auxiliary hydraulics after exiting the machine. Under normal conditions, the machine will auto shutdown if the operator exits the machine (seat belt switch becomes open) and the auxiliary spool neutral switch is open (auxiliary spool activated).

If the auxiliary hydraulic override switch is pressed, system voltage is momentarily applied to the engagement and monitor unit pin B (J2), activating the bypass mode.

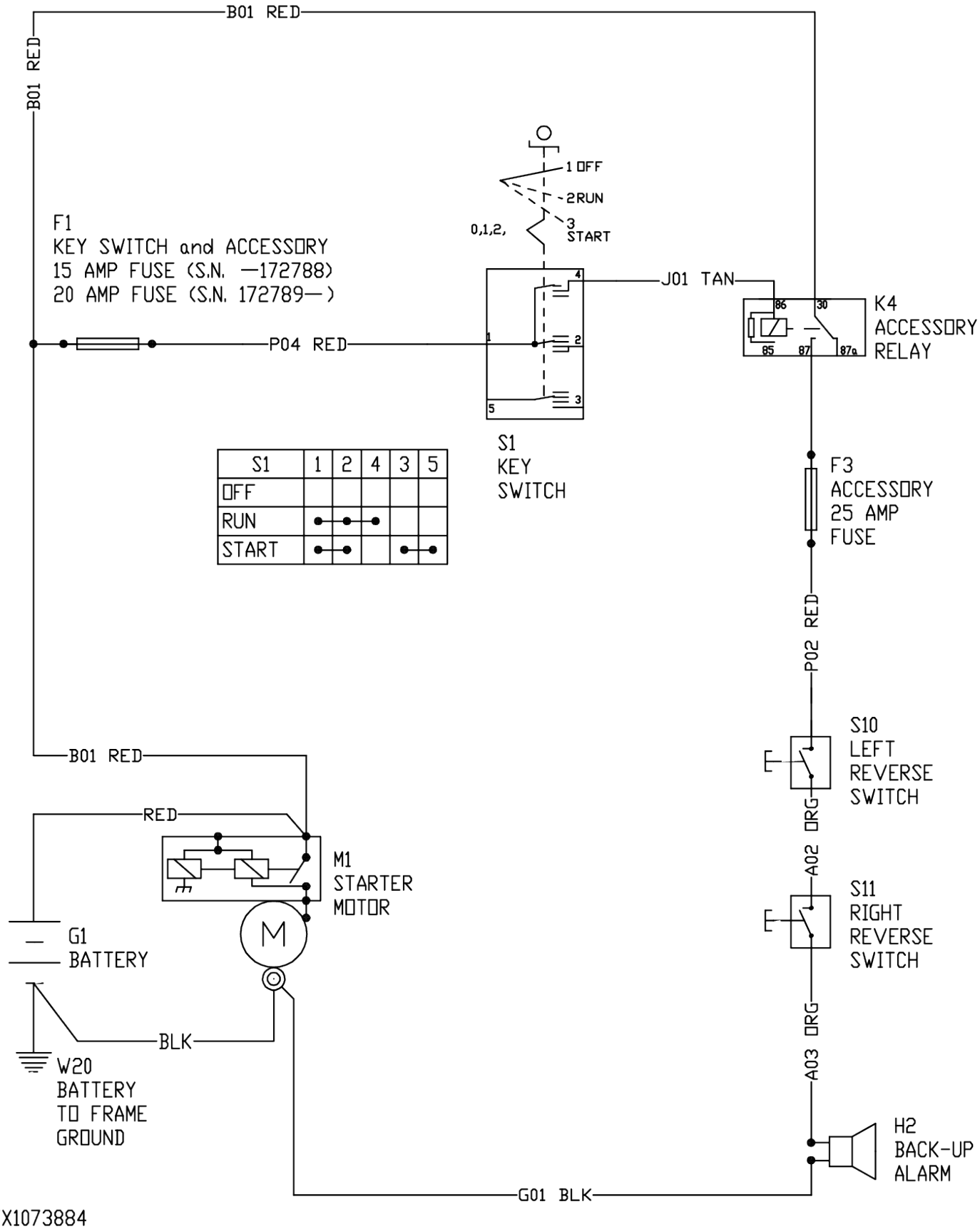
If the auxiliary hydraulic neutral switch is open (auxiliary active) and the auxiliary hydraulic override switch is pressed, the engagement and monitor unit will enter bypass mode and “BYPAS” will display on the monitor display. After “BYPAS” appears on the monitor display, the operator can exit the machine (seat belt switch open) for up to 15 seconds. If the operator exits the machine within the 15 seconds, auto shutdown will be prevented. If the operator does not exit the machine within 15 seconds, the engagement and monitor unit will exit the bypass mode and auto shutdown will return to normal operation.

The engagement and monitor unit will remain in bypass mode until the seat and seat belt interlock logic is performed. See Interlock Logic.

Air Conditioner Compressor Cutout

When engine coolant temperature or hydraulic oil temperature are 103°C (217°F) or greater, the engagement and monitor unit will disable the air conditioner compressor clutch relay (K7). This stops the air conditioner compressor from operating and “ACoFF” will appear in the engagement and monitor unit display. This will reduce the load on the engine and allow for cooler air to be drawn through the engine coolant radiator and hydraulic oil cooler. When the engine coolant temperature or hydraulic oil temperature drop below 100.6°C (213°F), the engagement and monitor unit will enable the air conditioner compressor clutch relay allowing the air conditioner compressor to operate.

Back-Up Alarm Circuit Theory of Operation



Back-Up Alarm Circuit Schematic

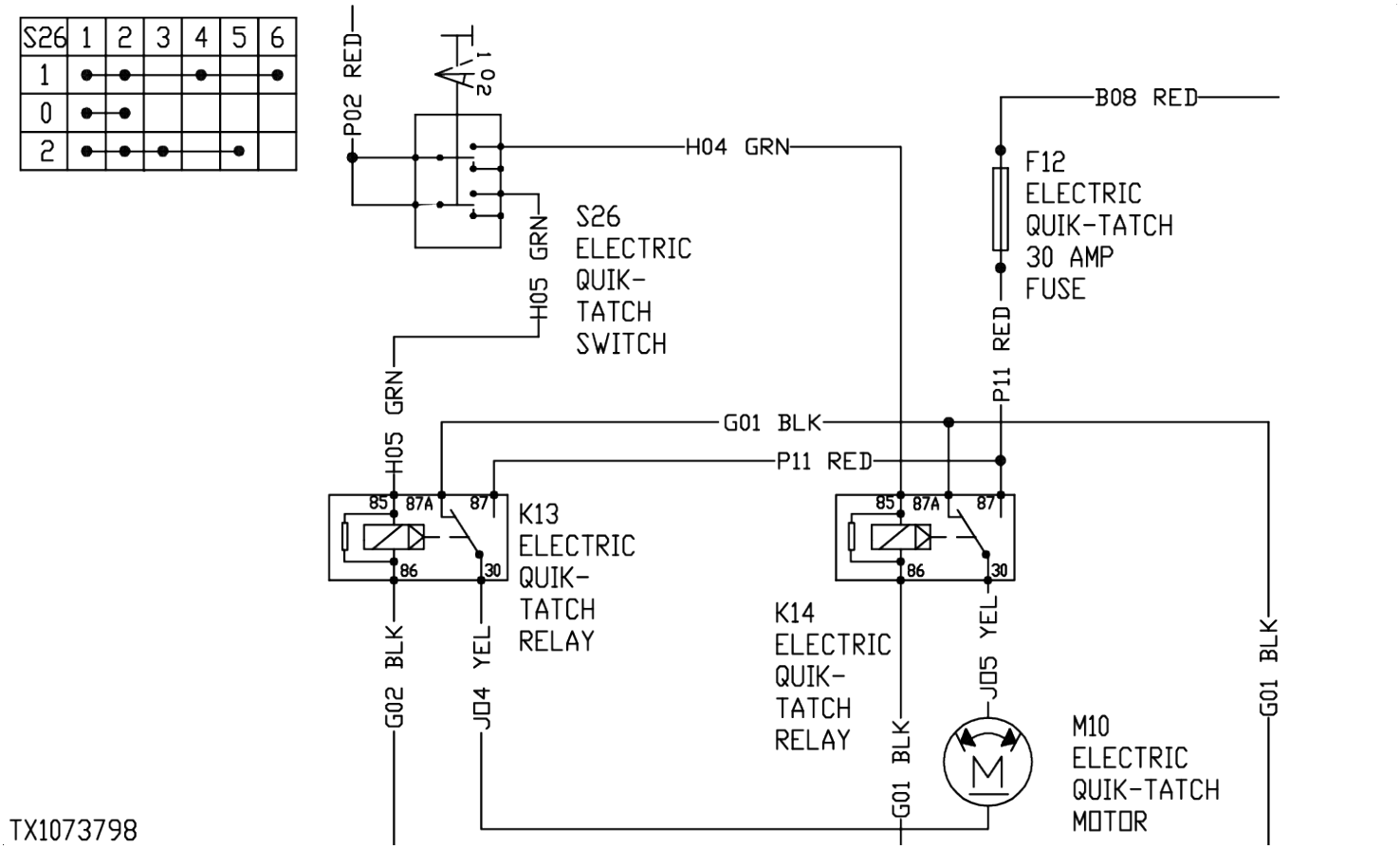
LEGEND:

F1	Key Switch and Accessory 15 Amp Fuse (S.N. —172788)
F1	Key Switch and Accessory 20 Amp Fuse (S.N. 172789—)
F3	Accessory 25 Amp Fuse
G1	Battery

H2	Back-Up Alarm
K4	Accessory Relay
M1	Starter Motor
S1	Key Switch
S10	Left Reverse Switch
S11	Right Reverse Switch
W20	Battery to Frame Ground

When both steering levers are moved in the reverse direction, left reverse switch (S10) and right reverse switch (S11) are closed. This applies power to the back-up alarm (H2), providing an audible warning to bystanders.

Electric Quik-Tatch Theory of Operation (S.N. 131877—)



Electric Quik-Tatch ™ Schematic

LEGEND:

F12	Electric Quik-Tatch 30 Amp Fuse
K13	Electric Quik-Tatch Relay
K14	Electric Quik-Tatch Relay
M10	Electric Quik-Tatch Motor
S26	Electric Quik-Tatch Switch

IMPORTANT:

Damage to Electric Quik-Tatch motor will occur if motor is immersed in liquid. Do Not Immerse in Liquid

→NOTE:

Electric Quik-Tatch is optional equipment.

When the operator presses the Quik-Tatch switch, current is directed by the switch to flow through either the lock, or unlock relay which activates the electric motor on the Quik-Tatch cylinder. Each end of the cylinder is attached to one of the Quik-Tatch latches and takes the place of the standard manual levers. The cylinder will extend or retract, depending on whether the operator is latching or unlatching the attachment.

Group 20 - References

Engagement and Monitor Unit Operation

The engagement and monitor unit can be used to display vital operating information, hours, diagnostic trouble codes, diagnostics and to configure units of measure. It can also be used to lock the machine using an anti-theft security system. When the engagement and monitor unit powers up, the display initially shows the machine model setting for 3 seconds, and then will show the hour meter for 10 seconds before it defaults to Run Data Items. If the anti-theft system is enabled on the machine, the lock status appears after the machine model setting has been shown. Refer to Anti-Theft Security System in this section for more information. The “MENU” button is used to scroll through the menus or to return to the Run Data Items when in a sub-menu. The “SELECT” button is used to scroll through the Run Data Items or to select a menu item.

Run Data Items

The Run Data Items are the default display when the engagement and monitor unit is powered up. The Run Data Items may also be displayed by cycling through the menu items by pressing the “MENU” button, or by pressing “MENU” at any time while in a sub-menu. Pressing “SELECT” while viewing a Run Data Item will scroll through all the Run Data Items.

- Hours
- Engine RPM
- Volts
- Hydraulic Temperature
- Engine Temperature

If “CHECK CODES” appears in the engagement and monitor unit display, press “SELECT” to return to the Run Data Items. “CHECK CODES” will appear for any hydraulic, park brake or auto shutdown diagnostic trouble codes. Once “CHECK CODES” appears in the display, it will become part of the list of Run Data Items. Once the diagnostic trouble code is cleared, the “CHECK CODES” will no longer be part of the Run Data Item list. If possible, move machine to a safe location before checking the diagnostic trouble codes. See Reading Engagement and Monitor Unit Diagnostic Trouble Codes . (Group 9015-20.) See Diagnostic Trouble Codes . (Group 9015-20.)

Job Menu

The Job Menu is an hour meter that can be reset. To reset the Job hour meter, press and hold the “SELECT” button for 5 seconds.

Code Menu

The Code Menu displays any diagnostic trouble codes that may be present in the machine. The Code Menu displays both machine and engine diagnostic trouble codes. For more information, see Reading Engagement and Monitor Unit Diagnostic Trouble Codes and see Diagnostic Trouble Codes . (Group 9015-20.)

Diagnostic Menu

The Diag Menu displays diagnostic information from various switches on the machine. For more information, see Engagement and Monitor Unit Data Items . (Group 9015-20.)

Configuration Menu

The Confg Menu is used to change how the information in the engagement and monitor unit is displayed. Press “MENU” to scroll through the available features to configure. To change the configuration of a feature, press and hold the “SELECT” button for 5 seconds.

Machine Model Setting

The engagement and monitor unit uses a machine model setting to set fuel gauge calibration and two speed shift modulation for specific machine models. The machine model number displays for 3 seconds when the engagement and monitor unit powers on.

The correct machine model number must be verified and set in the engagement and monitor unit anytime a replacement unit has been installed. See Engagement and Monitor Unit Initial Configuration . (Group 9015-20.)

Anti-Theft Security System

The optionally-enabled anti-theft security system within the engagement and monitor unit provides a basic level of machine theft protection. When the anti-theft security system is enabled, the machine can be unlocked and locked with the use of either a 3-digit or 5-digit security code (depending on how the system is configured). This security code, along with the machine key switch, is necessary to start and run the engine. When locked, the anti-theft security system prevents the engine from starting by disabling the fuel shut-off solenoid (Y1).

There are three levels of security within the anti-theft security system: Operator, Owner and Master. The Operator level of

security provides three different security codes that can be used by machine operators. The Owner level of security is designed for the owner or equipment manager. This security level is primarily to be used as a safeguard in the event an Operator code is forgotten or unknown and the owner wishes to change or replace that security code.

After entering a valid Owner security code, the owner can:

- Lock and unlock the machine
- Change the Owner security code.
- Change/reset an Operator security code.
- Enable/disable the auto lock feature.

The Master level of security is the highest security level and is used to enable or disable the anti-theft security system. A Master security code can be obtained for a machine by an owner by contacting their John Deere Dealer. The dealer will need the current engine hour meter reading and the machine′s serial number to generate a new Master security code.

All security codes are three digit numbers that are entered using the “MENU” and “SELECT” buttons on the engagement and monitor unit. Unlock or lock prompts appear on the engagement and monitor unit display at machine power up or power down, respectively. If the anti-theft security system is not enabled on the machine, no prompts will appear.

Auto Lock Feature

The auto lock feature, when enabled, automatically locks the machine one hour after the operator leaves the seat if the machine had been left unlocked when turning key switch to OFF position.

See Anti-Theft Security System Operation .

Anti-Theft Security System Operation—If Equipped

IMPORTANT:

When providing Operator security codes to machine users, owners should not provide operators with the default codes. Instead, owners should first change the default Operator security codes to other values before providing codes to machine users. Refer to Changing an Operator or Owner Security Code in this section for more information.

→NOTE:

On a locked machine, engine can be started but will shut down after 3 seconds.

Unlocking the Machine (Operator)

[1] - Sit in the operator′s seat to power up the engagement and monitor unit.

[2] - Turn key switch to ON position.

[3] - “LOCKA” appears on the engagement and monitor unit display.

[4] - Press “SELECT” to unlock machine using an Operator security code (LOCKA).

[5] - At the “0 - -” prompt, enter the appropriate security code:

a. Press “MENU” to change the number displayed in the active (blinking) field.
b. Press “SELECT” to accept the number displayed in the active field and shift the active field to the next digit to the right.

→NOTE:

Pressing “SELECT” to accept the last digit (third digit or fifth digit depending on system configuration) will process the entered security code. If the code is incorrect, an error message appears on the engagement and monitor unit display.

The anti-theft security system allows three attempts to enter a valid security code before requiring the key switch to be turned OFF and ON to restart the process.

[6] - If a correct security code was entered, “UNLKD” appears for 3 seconds on the engagement and monitor unit display before returning to Run Data Items.

Unlocking the Machine (Owner)

[1] - Sit in the operator′s seat to power up the engagement and monitor unit.

[2] - Turn key switch to ON position.

[3] - “LOCKA” appears on the engagement and monitor unit display.

[4] - Press “MENU” and then “SELECT” to unlock the machine using the Owner security code (“LOCKB”).

[5] - At the “0 - -” prompt, enter the appropriate security code:

a. Press “MENU” to change the number displayed in the active (blinking) field.
b. Press “SELECT” to accept the number displayed in the active field and shift the active field to the next digit to the right.

→NOTE:

Pressing “SELECT” to accept the last digit (third digit or fifth digit depending on system configuration) will process the entered security code. If the code is incorrect, an error message appears on the engagement and monitor unit display.

The anti-theft security system allows three attempts to enter a valid security code before requiring the key switch to be turned OFF and ON to restart the process.

[6] - If a correct security code was entered, “UNLKD” appears for 3 seconds on the engagement and monitor unit display before returning to Run Data Items.

Locking the Machine

[1] - Turn key switch to the OFF position.

[2] - Press “SELECT” at the “LOCK?” prompt.

[3] - The anti-theft system locks the machine and “LOCKD” appears for 3 seconds on the engagement and monitor unit before returning to the Run Data Items.

[4] - Exit the operator´s seat to power down the engagement and monitor unit.

→NOTE:

On a locked machine, engine can be started but will shut down after 3 seconds.

Enable or Disable the Auto Lock Feature

When using the auto lock feature, a machine left unlocked when the key switch is turned to OFF position will switch to locked one hour after the operator has left the seat.

Complete the following procedure to enable or disable the auto lock feature. The machine must have been unlocked using the Owner security code in order to enable or disable this feature.

[1] -

→NOTE:

The machine must be locked first (if not already locked) before it can be unlocked with the Owner security code.

Unlock the machine using the Owner security code.

[2] - Press “MENU” until “CONFG” appears on the engagement and monitor unit display.

[3] - Press “SELECT” to enter the “CONFG” menu.

[4] - Press “MENU” until “AUTOL” appears on the display.

[5] - Press and hold “SELECT” for five seconds to enable or disable the auto lock feature, depending on the previous setting.

[6] - Press “MENU” when finished to return to the Run Data Items.

Changing an Operator or Owner Security Code

The following rules apply when changing security codes:

- An Operator security code (LCKA1, LCKA2, LCKA3) can only be changed if that security code was used to unlock the anti-theft security system.
- An Operator security code can only be reset to the default value if the Owner security code was used to unlock the anti-theft security system.
- Duplicate Operator security codes are not allowed.
- The Owner security code (LOCKB) can only be changed if that code was used to unlock the anti-theft security system.
- The anti-theft security system resets all Operator security codes and the Owner security code to their default values when the Master security code is used to enable the system.

[1] -

→NOTE:

The machine must be locked first (if not already locked) before it can be unlocked.

Unlock the machine using an Operator security code (if changing Operator security codes) or the Owner security code (if changing the Owner security code).

[2] - Turn key switch to OFF position.

[3] - At the “LOCK?” prompt, press “MENU” until “LOCKA” (for changing Operator security codes) or “LOCKB” (for changing Owner security code) appears.

[4] - Press “SELECT”.

[5] - At the “- - -” prompt, enter the new security code:

a. Press “MENU” to change the number displayed in the active (blinking) field.
b. Press “SELECT” to accept the number displayed in the active field and shift the active field to the next digit to the right.

→NOTE:
Pressing “SELECT” to accept the last digit (third digit or fifth digit depending on system configuration) will process the new security code. The previous security code will no longer be valid.

→NOTE:
If a dash (“-”) is selected for all three or five digits, the security code will not be changed.

[6] - The anti-theft security system locks the machine using the new security code.

Resetting Operator Security Codes

[1] -

→NOTE:
The machine must be locked first (if not already locked) before it can be unlocked with the Owner security code.

Unlock the machine using the Owner security code.

[2] - Turn the key switch to the “OFF” position to display the “LOCK?” prompt.

[3] - Press “MENU” until the appropriate Operator security code appears: “LCKA1”, “LCKA2”, “LCKA3”.

[4] - Press “SELECT”.

[5] - Press “SELECT” at the “RST?” prompt to reset the Operator security code back to the default.

The default Operator security code (“000”, “999”, or “998” for 3-digit security codes; “00000”, “00999”, or “00998” for 5-digit security codes) appears for 3 seconds before the engagement and monitor unit returns to Run Data Items.

[6] - Repeat steps 3—5 to reset additional Operator security codes.

Changing Security Code Length

The length of security code (3-digit or 5-digit) to use with the anti-theft security system can only be changed if the security system is currently enabled on the machine.

[1] -

→NOTE:
The machine must be locked first (if not already locked) before it can be unlocked with the Owner security code.

Unlock the machine using the Owner security code.

[2] - Press “MENU” until “CONFG” appears on the engagement and monitor unit display.

[3] - Press “SELECT” to enter the “CONFG” menu.

[4] - Press “MENU” until “ATS 3” or “ATS 5” appears on the display, depending on the current machine setting. The default setting is “ATS 3” (3-digit security codes).

[5] - Press and hold “SELECT” for five seconds to change the security code length.

[6] - Press “MENU” when finished to return to the Run Data Items.

Enable or Disable the Anti-Theft System

Complete the following procedure to enable or disable the anti-theft security system.

[1] - Press “MENU” on the engagement and monitor unit until “ATS” appears in the display.

→NOTE:

If “ATS” does not display in the menu list, turn key switch to ON position then press and hold “MENU” for five seconds until the engagement and monitor unit beeps. Repeat Step 1.

[2] - Press “SELECT”.

[3] -

→NOTE:

A Master security code can be obtained from John Deere using DealerNet. The current engine hour meter reading and the machine′s serial number are needed to obtain a Master security code.

At the “0 - -” prompt, enter the correct Master security code. If the system is configured for five-digit security codes, the first two digits are automatically entered as “0 0” by the engagement and monitor unit.

a. Press “MENU” to change the number displayed in the active (blinking) field.

b. Press “SELECT” to accept the number displayed in the active field and shift the active field to the next digit to the right.

→NOTE:

Pressing “SELECT” to accept the last digit (third digit or fifth digit depending on system configuration) will process the entered security code. If the code is incorrect, an error message appears on the engagement and monitor unit display.

The anti-theft security system allows three attempts to enter a valid security code before requiring the key switch to be turned OFF and ON to restart the process.

[4] - The engagement and monitor unit enables or disables the anti-theft security system depending upon the previous setting:

- If the anti-theft security system had been disabled, “ATS ACTIV” appears on the display and the anti-theft system is enabled. The system sets the system to UNLOCK and resets the Owner and three Operator security codes to their defaults. If configured for 3-digits, “111”, “000”, “999”, and “998”, respectively. If configured for 5-digits, “00111”, “00000”, “00999”, and “00998”, respectively. The auto-lock feature will be set to the default (OFF) value. Refer to Enable or Disable the Auto Lock Feature in this section for more information.
- If the anti-theft security system had been enabled, “ATS NOT ACTIV” appears on the display and the anti-theft system is disabled.

Engagement and Monitor Unit Data Items

Run Data Items

The Run Data Items are the default display when the engagement and monitor unit is powered up. The Run Data Items may also be displayed by cycling through the menu items by pressing the “MENU” button, or by pressing “MENU” at any time while in a sub-menu. Pressing “Select” while viewing a Run Data Item will scroll through all the Run Data Items.

- Hours
- Engine rpm
- Volts
- Hydraulic Temperature
- Engine Temperature

Air Conditioner Compressor Shutdown

“ACoFF” will appear in the engagement and monitor unit display. When engine coolant temperature or hydraulic oil temperature are 103°C (217°F) or greater, the engagement and monitor unit will disable the air conditioner compressor clutch relay (K7). This stops the air conditioner compressor from operating. This will reduce the load on the engine and allow for cooler air to be drawn through the engine coolant radiator and hydraulic oil cooler. When the engine coolant temperature or hydraulic oil temperature drop below 100.6°C (213°F), the engagement and monitor unit will enable the air conditioner compressor clutch relay allowing the air conditioner compressor to operate.

Diagnostic Display Items

The Diagnostic Display Items are available under the “DIAG” menu in the engagement and monitor unit.

[1] - Press “MENU” until “DIAG” appears on the engagement and monitor unit display.

[2] - When “DIAG” appears, press “SELECT” to enter the sub-menu.

[3] - The Diagnostic Display Items are shown in three parts, a two part signal name and then the value of the signal. Pressing “SELECT” again will scroll through the Diagnostic Display Items.

[4] - Pressing “MENU” while viewing a Diagnostic Display Item will return the display to the last Run Display item.

Diagnostic Display Items

Signal	Signal Identification 1	Signal Identification 2	Value	Description
1	PARK	RUN	ON/OFF	When park brake switch is in the “RUN” position, signal value will be “ON”
2	PARK	REL	ON/OFF	When park brake switch is held in “RELEASE” position, signal value will be “ON”
3	SEAT	SW	ON/OFF	When operator is in seat, signal value will be “ON”
4	SEAT	BELT	ON/OFF	When seat belt is fastened, signal value will be “ON”
5	DOOR	LATCH	ON/OFF	When cab door is fully closed, signal value will be “ON”
6	2-SPD	SW	ON/OFF	When two speed switch is pressed and held, signal value will be “ON”
7	OVER	RIDE	ON/OFF	When auxiliary hydraulic override switch is held in “ON” position, signal value will be “ON”
8	VALVE	SPOOL	ON/OFF	When auxiliary hydraulics are activated, signal value will be “OFF”

Reading Engagement and Monitor Unit Diagnostic Trouble Codes

The diagnostic trouble codes can only be viewed from the engagement and monitor unit. The engagement and monitor unit displays both engine and machine diagnostic trouble codes. To access the diagnostic trouble codes:

[1] - Press “MENU” on the engagement and monitor unit until “CODES” appears in the engagement and monitor unit display.

[2] - Press “SELECT” to enter the “CODES” menu.

[3] - Pressing “SELECT” again will scroll through the diagnostic trouble codes if any are present in the machine.

[4] - If no diagnostic trouble codes are present, or when the end of the diagnostic trouble code list is reached, “END” will appear in the engagement and monitor unit display.

[5] - Press and hold “SELECT” again and “WAIT” will display on the engagement and monitor unit. Release the “SELECT” button in less than 5 seconds to scroll back through the diagnostic trouble code list, or hold “SELECT” for 5 seconds while “WAIT” is displayed to clear the stored diagnostic trouble codes. After the diagnostic trouble codes are cleared, “CLEAR” will

momentarily display and then “END” will appear on the engagement and monitor unit display.

Diagnostic Trouble Codes

Symptom	Problem	Solution
F9D0	**Coolant Temperature Sensor Input at 0 Volts.** Coolant temperature sensor signal at engagement and monitor unit less than 0.27 volts, coolant temperature gauge at left most position, and “ERROR” appears in engagement and monitor unit display.	Check harness. See Engine Harness (W1) Wiring Diagram . (Group 9015-10.)
F9D5	**Coolant Temperature Sensor Input at 5 Volts.** Coolant temperature sensor signal at engagement and monitor unit is 4.96 volts or greater, coolant temperature gauge at left most position, and “ERROR” appears in engagement and monitor unit display.	Check harness. See Engine Harness (W1) Wiring Diagram . (Group 9015-10.) Check coolant temperature sensor. See Temperature Sensor Test . (Group 9015-10.)
F965	**Fuel Level Sensor Input at 5 Volts.** Fuel level sensor signal at engagement and monitor unit is 4.81 volts or greater, fuel gauge at left most position, and “ERROR” appears in engagement and monitor unit display.	Check harness. See Engine Harness (W1) Wiring Diagram . (Group 9015-10.) Check fuel level sensor. See Electrical Component Specifications . (Group 9015-20.)
F974	**Alternator Voltage Out of Range High.** System voltage is greater than 16 volts.	Check alternator output. See Alternator Test . (Group 9015-20.)
F980	**Hydraulic Oil Temperature Sensor Input at 0 Volts.** Hydraulic oil temperature sensor signal at engagement and monitor unit is less than 0.27 volts and “ERROR” appears in engagement and monitor unit display.	Check harness. See Engine Harness (W1) Wiring Diagram . (Group 9015-10.)
F985	**Hydraulic Oil Temperature Sensor Input at 5 Volts.** Hydraulic oil temperature sensor signal at engagement and monitor unit is 4.96 volts or greater and “ERROR” appears in engagement and monitor unit display.	Check harness. See Engine Harness (W1) Wiring Diagram . (Group 9015-10.) Check coolant temperature sensor. See Temperature Sensor Test . (Group 9015-10.)
F9P8	**Park Brake Output Open or Shorted to Power.** “CHECK CODES” appears in engagement and monitor unit display.	**→NOTE:** **Diagnostic Trouble Code F9P8 can be caused by the use of the remote start box. If the remote start box has been used, clear the code and operate machine. Recheck codes to verify code has been cleared.** **If park brake output open, park brake is engaged at all times. Check park brake solenoid. See Solenoid Test . (Group 9015-20.)** **Check harness. See Engine Harness (W1) Wiring Diagram . (Group 9015-10.)**
		If park brake output shorted to power, park brake is disengaged at all times. Check harness. See Engine Harness (W1) Wiring Diagram . (Group 9015-10.)
F9P9	**Park brake output shorted to ground.** Park brake is engaged at all times and “CHECK CODES” appears in engagement and monitor unit display.	Check park brake solenoid. See Solenoid Test . (Group 9015-20.) Check harness. See Engine Harness (W1) Wiring Diagram . (Group 9015-10.)
F9H8	**Hydraulic Output Open or hydraulic output shorted to power.** “CHECK CODES” appears in engagement and monitor unit display.	If hydraulic output is open, boom and/or bucket will not operate. Check boom spool lock, bucket spool lock and port lock solenoid. See Solenoid Test . (Group 9015-20.) Check front chassis wire harness.
		If hydraulic output is shorted to power, boom and/or bucket are enabled at all times. Check front chassis wire harness.
F9H9	**Hydraulic output shorted to ground.** Boom and bucket will not operate and “CHECK CODES” appears in engagement and monitor unit display.	Check boom spool lock, bucket spool lock and port lock solenoid. See Solenoid Test . (Group 9015-20.) Check front chassis wire harness.
F9J8	**Glow plug relay output open or shorted to power.**	If glow plug relay output is open, glow plugs will not operate. Check relay. See Glow Plug Relay Check . (Group 9015-20.) Check harness. See Engine Harness (W1) Wiring Diagram . (Group 9015-10.)
		If glow plug relay output is shorted to power, glow plugs will operate at all times. Check relay. See Glow Plug Relay Check . (Group 9015-20.) Check harness. See Engine Harness (W1) Wiring Diagram . (Group 9015-10.)
F9J9	**Glow plug relay output shorted to ground.** Glow plugs do not operate	Check relay. See Glow Plug Relay Check . (Group 9015-20.) Check harness. See Engine Harness (W1) Wiring Diagram . (Group 9015-10.)
F9K8	**Auto shutdown relay output open or shorted to power.** “CHECK CODES” appears in engagement and monitor unit display.	If auto shutdown relay output is open, engine will shut down or crank and not start. Check relay. See Relay Test . (Group 9015-20.) Check harness. See Engine Harness (W1) Wiring Diagram . (Group 9015-10.)
		If auto shutdown relay output is shorted to power, auto shutdown protection is disabled. Check relay. See Relay Test . (Group 9015-20.) Check harness. See Engine Harness (W1) Wiring Diagram . (Group 9015-10.)
F9K9	**Auto shutdown relay output shorted to ground.** Engine shuts down, cranks but will not start and “CHECK CODES” appears in engagement and monitor unit display.	Check relay. See Relay Test . (Group 9015-20.) Check harness. See Engine Harness (W1) Wiring Diagram . (Group 9015-10.)
F9M9	**Engagement and monitor unit warning alarm output shorted to ground.** Alarm will not operate.	Check harness. See Cab Harness—Standard (W2) Wiring Diagram or see Cab Harness—Deluxe (W12) Wiring Diagram . (Group 9015-10.)

Diagnostic Trouble Codes Quick Reference

Engagement and Monitor Unit Diagnostic Trouble Codes

Code	Description
F9D0	Coolant Temperature Sensor Input Low
F9D5	Coolant Temperature Sensor Input High
F965	Fuel Level Sensor Input High
F974	Alternator Voltage Out of Range High
F980	Hydraulic Oil Temperature Sensor Input Low
F985	Hydraulic Oil Temperature Sensor Input High
F9P8	Park Brake Output Open or Shorted to Power
F9P9	Park Brake Output Shorted to Ground
F9H8	Hydraulic Output Open or Shorted to Power
F9H9	Hydraulic Output Shorted to Ground
F9J8	Glow Plug Relay Output Open or Shorted to Power
F9J9	Glow Plug Relay Output Shorted to Ground
F9K8	Auto Shutdown Relay Output Open or Shorted to Power
F9K9	Auto Shutdown Relay Output Shorted to Ground
F9M9	Engagement and Monitor Unit Warning Alarm Output Shorted to Ground.

Electrical Component Specifications

Item	Measurement	Specification
Engine Sensors		
Air Filter Restriction Switch (B1)	Vacuum	64 mbar
		4.8 cm of Mercury
		25.7 in of Water
Fuel Level Sensor (B4)	Resistance	Empty tank 10 Ohms
		Half full tank 100 Ohms
		Full tank 180 Ohms
	First low fuel warning at	15 Ohms
	Second and third low fuel warning at	10 Ohms
Engine Coolant Temperature Sensor (B5)	Normal Operating Range	85°C—110°C
		185°F—230°F
	Full Operating Range	-40°C—+125°C
		-40°F—+257°F
	STOP Indicator turns On at	105°C
		221°F
	Engine Shutdown at	107°C or greater
		225°F or greater
	Voltage	4.732—4.762 Volts at 0°C
		4.378—4.407 Volts at 20°C
		1.315—1.344 Volts at 100°C
		4.732—4.762 Volts at 32°F
		4.378—4.407 Volts at 68°F
		1.315—1.344 Volts at 212°F
	Resistance	8800—10 000 Ohms at 0°C
		3300—3700 Ohms at 20°C
		172—183 Ohms at 100°C
		8800—10 000 Ohms at 32°F
		3300—3700 Ohms at 68°F
		172—183 Ohms at 212°F
Engine Oil Pressure Switch (B6) (Normally Closed)	Pressure	40—75 kPa
		0.4—0.75 bar
		5.8—10.8 psi
Hydraulic Sensors		
Hydraulic Oil Temperature Sensor (B2)	Normal Operating Range	85°C—110°C
		185°F—230°F
	Full Operating Range	-40°C—+125°C
		-40°F—+257°F
	STOP indicator turns On when	105°C or greater for 5 sec.
		220°F or greater for 5 sec.
	Engine shutdown when	STOP indicator On for 5 min.
	Voltage	4.732—4.762 Volts at 0°C
		4.378—4.407 Volts at 20°C
		1.315—1.344 Volts at 100°C
		4.732—4.762 Volts at 32°F
		4.378—4.407 Volts at 68°F
		1.315—1.344 Volts at 212°F
	Resistance	8800—10 000 Ohms at 0°C
		3300—3700 Ohms at 20°C
		172—183 Ohms at 100°C
		8800—10 000 Ohms at 32°F

Item	Measurement	Specification
		3300—3700 Ohms at 68°F
		172—183 Ohms at 212°F
Hydraulic Oil Filter Restriction Switch (B3)	Pressure differential	248—303 kPa
		2.5—3.0 bar
		36—44 psi
Air Conditioning System Sensors		
Air Conditioner High/Low Pressure Switch (B9)	Closing Pressure—Low Side	160—260 kPa
		1.6—2.6 bar
		23—37 psi
	Opening Pressure—Low Side	140—230 kPa
		1.4—2.3 bar
		20—33 psi
	Opening Pressure—High Side	2600—2900 kPa
		26.0—29.0 bar
		380—420 psi
	Closing Pressure—High Side	1380—2070 kPa
		13.8—20.7 bar
		200—300 psi
Air Conditioner Freeze Control Switch (B10)	Temperature—Increasing	-1.9—+0.8°C
		28.5—33.5°F
	Temperature—Decreasing	2.8—5.6°C
		37—42°F
Solenoids		
Park Brake Solenoid (Y5)	Resistance	7—10.5 Ohms
Boom Spool Lock Solenoid (Y2)	Resistance	14.8—18.2 Ohms
Bucket Spool Lock Solenoid (Y3)	Resistance	14.8—18.2 Ohms
Port Lock Solenoid (Y4)	Resistance	8.2—9.0 Ohms
Quik-Tatch Lock and Unlock Solenoid (Y11 and Y12)	Resistance	6.8—8.3 Ohms
High Flow Solenoid (Y7)	Resistance	5.7—10.6 Ohms
Two Speed Solenoid (Y6) (Compact Track Loader Only)	Resistance	7—10.5 Ohms

Fuse Test

Some symptoms may indicate an expensive component failure, when in fact a fuse has failed. Machine functions can be performed without test equipment to determine if fuses have failed. If certain circuits or components operate, fuses are considered to be ok.

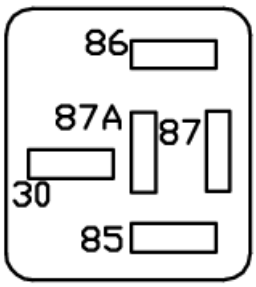
For fuse locations, see Fuse Specifications . (Group 9015-10.)

Fuse Test

Fuse	Test	Results of Fuse Failure
F1—Key Switch and Accessory 15 Amp (S.N. —172788) F1—Key Switch and Accessory 20 Amp (S.N. 172789—)	Turn key On. Does park brake and auxiliary hydraulic override switch illuminate? If switches illuminate, fuse is ok.	Engine will not crank.
F2—Monitor 15 Amp	Sit in seat. If instrument panel lights and gauges indicate machine status, fuse is ok.	Instrument panel will not work. Engine will crank, but will not start.
F3—Accessory 25 Amp	Does air conditioning, windshield wiper and washer, dual flasher, Hydraulic Quik-Tatch (S.N. - 131897), or high flow switch illuminate? If switch(es) illuminate, fuse is ok.	Windshield wiper and washer, high flow, Quik-Tatch, back-up alarm, and heater blower motor will not operate.
F4—Lights 20 Amp	Turn key switch ON. Turn work lights on. If lights turn on, fuse is ok.	Front and rear work lights and tail lights will not operate.
F5—Glow Plug 80 Amp	Test fuse with multimeter.	Glow plugs will not operate.
F6—Blower Motor 15 Amp	Turn key switch ON. Turn blower motor switch to high speed. If blower motor operates, fuse is ok.	Air conditioner and heater blower motor will not operate.

Relay Test

[1] -



Relay Test

Connect multimeter to terminals 85 and 86.

Multimeter

Measure resistance in relay test.

About 63.5—79.5 ohms must be measured. If not, relay has failed.

[2] - Connect multimeter to terminals 30 and 87a.

Less than 0.7 ohms must be measured. If not, relay has failed.

[3] - Connect multimeter to terminals 30 and 87, and then 87 and 87a.

Multimeter must read open in both connections. If not, relay has failed.

[4] - Apply 12 volts to terminal 86 and ground terminal 85.

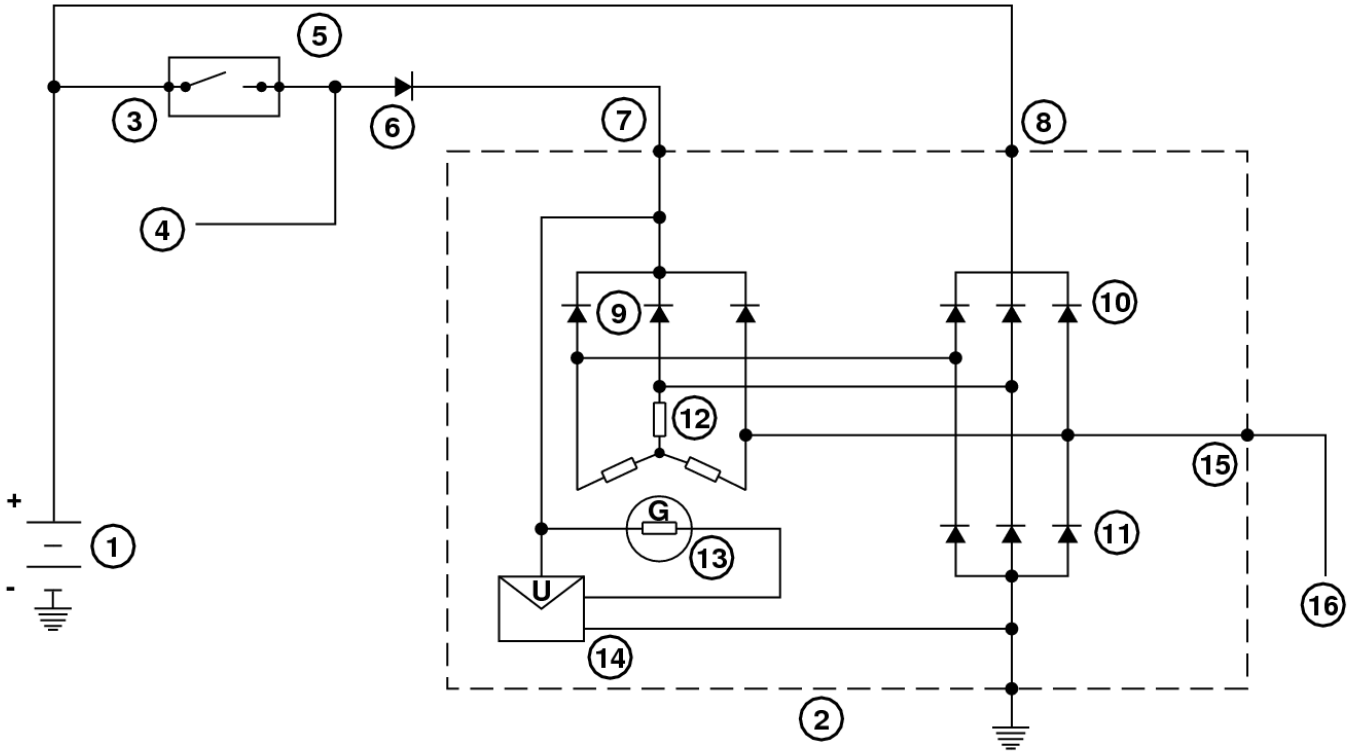
[5] - Connect multimeter to terminals 30 and 87.

Less than 0.7 ohms must be measured. If not, relay has failed.

[6] - Connect multimeter to terminals 30 and 87a, and then 87 and 87a.

Multimeter must read open in both connections. If not, relay has failed.

Alternator Test



TX1045884

Common Alternator Circuit

LEGEND:

1	Battery
2	Alternator
3	Key Switch
4	To Accessories
5	ACC
6	Alternator Excitation Diode
7	Excitation Terminal (marked D+)
8	B+
9	Exciter Diodes
10	Positive Diodes
11	Negative Diodes
12	Stator
13	Excitation Winding (field)
14	Regulator
15	AC Terminal (marked W)
16	To Display Module (indicator lamp)

[1] - 12 V System — With engine running at slow idle, check **DC** voltage between terminal **D+** and ground. Voltage should be **13.5 VDC** or greater

[Note: For 12 V systems with maintenance free batteries, D+ and B+ voltage should be 14.1 VDC or greater.]

.

[2] - With engine running at fast idle, check **DC** voltage between terminal **B+** and ground. Voltage should be **13.5 VDC** or greater

[Note: For 12 V systems with maintenance free batteries, D+ and B+ voltage should be 14.1 VDC or greater.]

.

[3] - If voltage from previous steps is below 13.5 VDC

[Note: For 12 V systems with maintenance free batteries, D+ and B+ voltage should be 14.1 VDC or greater.]

, check excitation by placing a jumper wire between terminals **D+** and **B+** with the engine running. If output at terminals **B+** and **D+** rise to **13.5 VDC** or greater, check for an open diode, wiring problem or blown fuse in the alternator excitation circuit (wire to D+ terminal).

[4] - With engine running, check **AC** voltage between terminal **W** (if equipped) and ground. Voltage should be **6—7 VAC** .

[5] - Repeat above steps with lights on to load the alternator.

[6] - If alternator does not produce specified voltage after testing, check for worn out brushes in the regulator/brush assembly. Replace brush/regulator assembly if necessary. Test and repair if possible. If alternator still malfunctions, replace it. If alternator tests OK, check indicator light circuit.

[1] - 24 V System — With engine running at slow idle, check **DC** voltage between terminal **D+** and ground. Voltage should be **27.5 VDC** or greater

[Note: For 24 V systems with maintenance free batteries, D+ and B+ voltage should be 28.2 VDC or greater.]

.

[2] - With engine running at slow idle, check **DC** voltage between terminal **B+** and ground. Voltage should be **27.5 VDC** or greater

[Note: For 24 V systems with maintenance free batteries, D+ and B+ voltage should be 28.2 VDC or greater.]

.

[3] - If voltage from previous steps is below 27.5 VDC

[Note: For 24 V systems with maintenance free batteries, D+ and B+ voltage should be 28.2 VDC or greater.]

, check excitation by placing a jumper wire between terminals **D+** and **B+** with the engine running. If output at terminals **B+** and **D+** rise to **27.5 VDC** or greater, check for an open diode, wiring problem, or blown fuse in the alternator excitation circuit (wire to D+ terminal).

[4] - With engine running, check **AC** voltage between terminal **W** (if equipped) and ground. Voltage should be **12—14 VAC** .

[5] - Repeat above steps with lights on to load the alternator.

[6] - If alternator does not produce specified voltage after testing, check for worn out brushes in the regulator/brush assembly. Replace brush/regulator assembly if necessary. Make specific test and repair procedures. If alternator still malfunctions, replace it. If alternator tests OK, check indicator light circuit.

Solenoid Test

Solenoid Observable Symptom Check

(1) Park Brake Solenoid (Y5)

Action:

Start machine and release park brake.

Push steering levers forward.

Does machine move?

Result:

YES: Park brake solenoid is ok.

NO: Continue check.

Action:

Disconnect park brake solenoid from harness.

Connect power to purple wire and ground to black wire of park brake solenoid.

→NOTE:

Park brake solenoid makes a light click. Click may not be audible in noisy conditions.

→NOTE:

When component is disconnected from harness, a diagnostic trouble code may appear. Check and clear codes after test is performed.

Does solenoid click?

Result:

YES: Solenoid is ok.

NO: Continue check.

Action:

Disconnect park brake solenoid from harness.

→NOTE:

When component is disconnected from harness, a diagnostic trouble code may appear. Check and clear codes after test is performed.

Measure resistance across terminals of park brake solenoid.

Does solenoid resistance meet specification? See Electrical Component Specifications . (Group 9015-20.)

Result:

YES: Solenoid is ok.

NO: Solenoid has failed. Replace.

(2) Port Lock Solenoid (Y4)

Action:

Start machine and release hydraulics.

Operate the boom and bucket functions.

Do pedals move and hydraulic functions operate?

Result:

YES: Port lock solenoid is ok.

NO: Pedals or hand controls move but hydraulic functions do not operate, continue check.

NO: Pedals or hand controls do not move and hydraulic functions do not operate, check Boom Spool Lock Solenoid and Bucket Spool Lock Solenoid.

Action:

Disconnect port lock solenoid from harness.

Connect power and ground to port lock solenoid.

→NOTE:

Port lock solenoid makes a light click. Click may not be audible in noisy conditions.

→NOTE:

When component is disconnected from harness, a diagnostic trouble code may appear. Check and clear codes after test is performed.

Does solenoid click?

Result:

YES: Solenoid is ok.

NO: Continue check.

Action:

Disconnect port lock solenoid from harness.

→NOTE:

When component is disconnected from harness, a diagnostic trouble code may appear. Check and clear codes after test is performed.

Measure resistance across terminals of port lock solenoid.

Does solenoid resistance meet specification? See Electrical Component Specifications . (Group 9015-20.)

Result:

YES: Solenoid is ok.

NO: Solenoid has failed. Replace.

(3) Boom Spool Lock and Bucket Spool Lock Solenoid (Y2 & Y3)

Action:

Start machine and release hydraulics.

Operate the boom and bucket functions.

Do the pedals move and hydraulic functions operate?

Result:

YES: Boom spool lock and bucket spool lock solenoids are ok.

NO: Pedals or hand controls move but hydraulics do not operate, check Port Lock Solenoid.

NO: Pedals or hand controls do not move and hydraulics do not operate, continue check.

Action:

Disconnect boom spool lock or bucket spool solenoid from harness.

→NOTE:

When component is disconnected from harness, a diagnostic trouble code may appear. Check and clear codes after test is performed.

Connect power and ground to boom spool lock or bucket spool lock solenoid.

Does solenoid click?

Result:

YES: Solenoid is ok.

NO: Continue check.

Action:

Disconnect boom spool lock or bucket spool lock solenoid from harness.

→NOTE:

When component is disconnected from harness, a diagnostic trouble code may appear. Check and clear codes after test is performed.

Measure resistance across the terminals of boom spool lock or bucket spool lock solenoid.

Does solenoid resistance meet specification? See Electrical Component Specifications . (Group 9015-20.)

Result:

YES: Solenoid is ok.

NO: Solenoid has failed. Replace.

(4) Quik-Tatch Solenoid (Y11 & Y12)

Action:

Start machine.

Operate Quik-Tatch lock and unlock function.

Do functions operate?

Result:

YES: Solenoid is ok.

NO: Continue check.

Action:

If one function works, but not the other, physically swap solenoid coils.

Does opposite function work after swapping solenoid coils?

If neither function works, continue check.

Result:

YES: Continue check.

NO: Solenoid is ok.

Action:

Disconnect solenoid from harness.

Measure resistance across terminals of Quik-Tatch solenoid.

Does Quik-Tatch solenoid resistance meet specification? See Electrical Component Specifications . (Group 9015-20.)

Result:

YES: Solenoid is ok.

NO: Solenoid has failed. Replace.

(5) High Flow Solenoid Check (Y7)

Action:

→NOTE:

Machine must be connected to a high flow attachment to perform this check.

Turn on high flow option and operate attachment.

Does attachment operate?

Result:

YES: Solenoid is ok.

NO: Continue check.

Action:

Disconnect solenoid from harness.

Connect power to the dark green wire side of the connector and ground the black wire side of the connector of the high flow solenoid.

→NOTE:

High flow solenoid makes a light click. Click may not be audible in noisy conditions.

Does solenoid click?

Result:

YES: Solenoid is ok.

NO: Continue check.

Action:

Disconnect high flow solenoid from harness.

Measure resistance across solenoid terminals.

Does solenoid resistance meet specification? See Electrical Component Specifications . (Group 9015-20.)

Result:

YES: Solenoid is ok.

NO: Solenoid has failed. Replace.

(6) Two Speed Solenoid Check (Y6) (Compact Track Loader Only)

Action:

Drive machine and press two speed switch to activate two speed.

Does machine speed up?

Press two speed switch again while driving to deactivate two speed.

Dose machine slow down?

Result:

YES: Two speed solenoid is ok.

NO: Continue check.

Action:

Disconnect solenoid from harness. Apply power and ground to solenoid.

Does solenoid click?

Result:

YES: Two speed solenoid is ok.

NO: Continue check.

Action:

Disconnect two speed solenoid from harness.

Measure resistance across solenoid terminals.

Does solenoid resistance meet specification? See Electrical Component Specifications . (Group 9015-20.)

Result:

YES: Solenoid is ok.

NO: Solenoid has failed. Replace.

Temperature Sensor Test

[1] - To check a temperature sensor using a multimeter, remove temperature sensor from the machine.

Multimeter

Measure resistance on electrical component.

[2] - Measure resistance as indicated. Resistance may vary from one sensor to another. See Electrical Component Specifications for sensor resistance values. (Group 9015-20.)

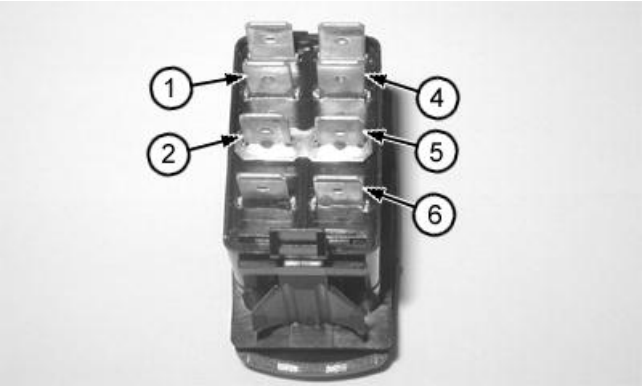
[3] - For location of temperature sensors, see System Functional Schematic, Wiring Diagram, and Component Location Master Legend . (Group 9015-10.)

Electrical Component Checks

Electrical Component Checks

(1) Park Brake Switch Check

Action:



LEGEND:

1	Pin 1
2	Pin 2
4	Pin 4
5	Pin 5
6	Pin 6

Park Brake Switch

Remove switch from harness. Use multimeter to check for continuity.

Pins 5 and 6 in the Engaged position.

Pins 4 and 5 in the Run position.

Pins 2 and 5 in the Release position.

Pins 1 and 5 in the Release position.

Is continuity measured?

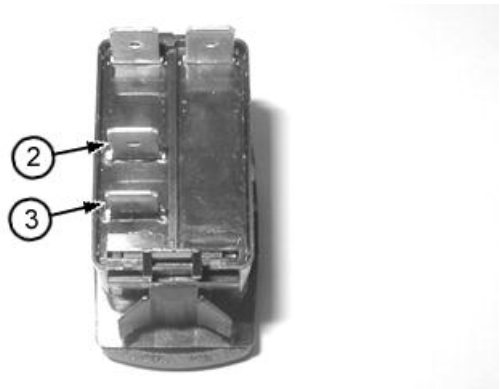
Result:

YES: Switch is ok.

NO: Switch has failed. Replace.

(2) Auxiliary Hydraulic Override Switch Check

Action:



LEGEND:

2	Pin 2
3	Pin 3

Auxiliary Hydraulic Override Switch

Remove switch from harness. Use multimeter to check for continuity.

Pins 2 and 3 in the On position.

Is continuity measured?

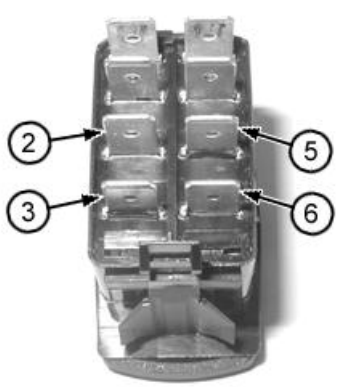
Result:

YES: Switch is ok.

NO: Switch has failed. Replace.

(3) Work Lights Switch Check

Action:



LEGEND:

2	Pin 2
3	Pin 3
5	Pin 5
6	Pin 6

Work Lights Switch

Remove switch from harness. Use multimeter to check for continuity.

Pins 2 and 3 in the Front Work Lights and Tail Lights position.

Pins 2 and 3 in the Front and Rear Work Lights and Tail Lights position.

Pins 5 and 6 in the Front and Rear Work Lights and Tail Lights position.

Is continuity measured?

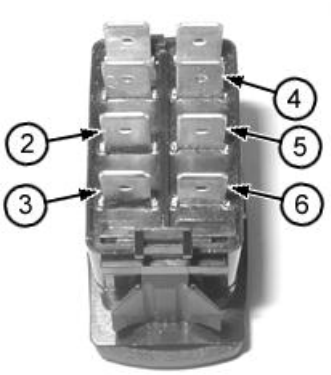
Result:

YES: Switch is ok.

NO: Switch has failed. Replace.

(4) Windshield Wiper and Washer Switch Check

Action:



LEGEND:

2	Pin 2
3	Pin 3
4	Pin 4
5	Pin 5
6	Pin 6

Windshield Wiper and Washer Switch

Remove switch from harness. Use multimeter to check for continuity.

Pins 4 and 5 in the Off position.

Pins 2 and 3 in the On position.

Pins 2 and 3 in the Wash position.

Pins 5 and 6 in the Wash position.

Is continuity measured?

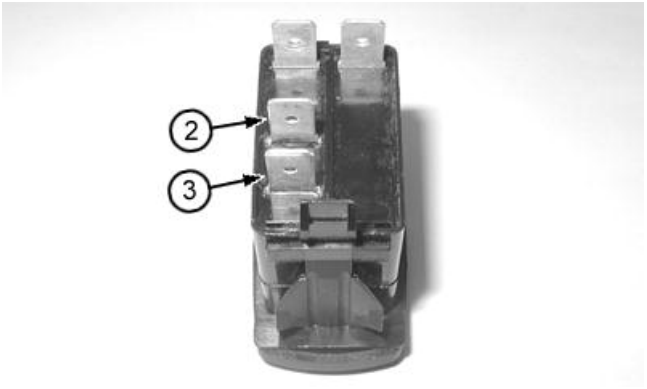
Result:

YES: Switch is ok.

NO: Switch has failed. Replace.

(5) Dual Flasher Switch Check

Action:



LEGEND:

2	Pin 2
3	Pin 3

Dual Flasher Switch

Remove switch from harness. Use multimeter to check for continuity.

Pins 2 and 3 in the On position.

Is continuity measured?

Result:

YES: Switch is ok.

NO: Switch has failed. Replace.

(6) High Flow Switch Check

Action:

LEGEND:

2	Pin 2
3	Pin 3
5	Pin 5
6	Pin 6

High Flow Switch

Remove switch from harness. Use multimeter to check for continuity.

Pins 2 and 3 in the Run position.

Pins 2 and 3 in the On position.

Pins 5 and 6 in the On position.

Is continuity measured?

Result:

YES: Switch is ok.

NO: Switch has failed. Replace.

(7) Quik-Tatch Switch Check
Hydraulic (S.N. —131897)
Electric (S.N. 131898—)

Action:

LEGEND:

1	Pin 1
2	Pin 2
3	Pin 3

Quik-Tatch Switch

Remove switch from harness. Use multimeter to check for continuity.

Pins 2 and 3 in the Lock position.

Pins 1 and 2 in the Unlock position.

Is continuity measured?

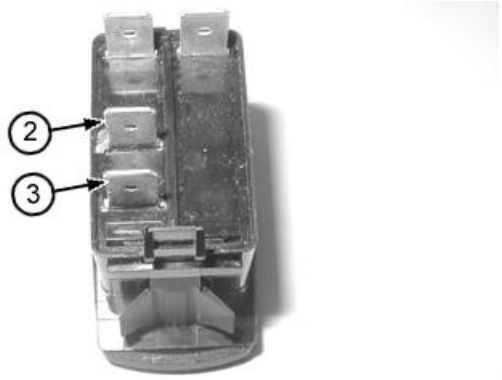
Result:

YES: Switch is ok.

NO: Switch has failed. Replace.

(8) Air Conditioner Switch Check

Action:



LEGEND:

2	Pin 2
3	Pin 3

Air Conditioner Switch

Remove switch from harness. Use multimeter to check for continuity.

Pins 2 and 3 in the On position.

Is continuity measured?

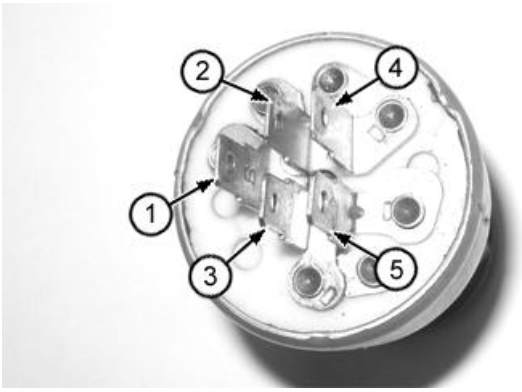
Result:

YES: Switch is ok.

NO: Switch has failed. Replace

(9) Key Switch Check

Action:



LEGEND:

1	Pin 1
2	Pin 2
3	Pin 3
4	Pin 4
5	Pin 5

Key Switch

Remove switch from harness. Use multimeter to check for continuity.

Pins 1 and 4 in the run position.

Pins 1 and 2 in the run position.

Pins 1 and 2 in the start position.

Pins 3 and 5 in the start position.

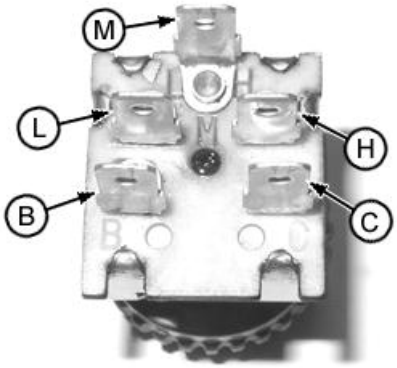
Result:

YES: Switch is ok.

NO: Switch has failed. Replace.

(10) Air Conditioner and Heater Blower Motor Switch Check

Action:



LEGEND:

B	Pin B
C	Pin C
H	Pin H
L	Pin L
M	Pin M

Air Conditioner and Heater Blower Motor Switch

Remove switch from harness. Use multimeter to check for continuity.

Pins B and L in low speed.

Pins B and C in low speed.

Pins B and M in medium speed.

Pins B and C in medium speed.

Pins B and H in high speed.

Pins B and C in high speed.

Is continuity measured?

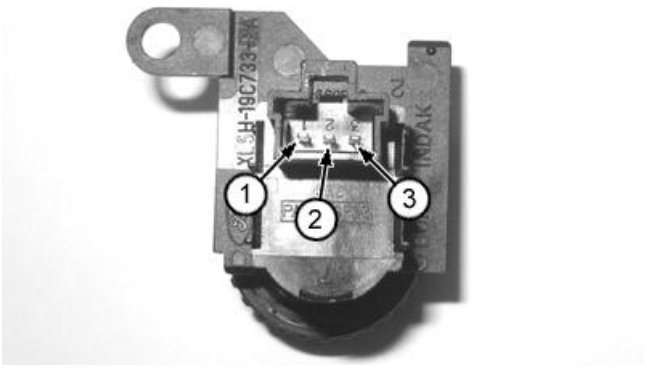
Result:

YES: Switch is ok.

NO: Switch has failed. Replace.

(11) Cab Temperature Control Dial Check

Action:



LEGEND:

1	Pin 1
2	Pin 2
3	Pin 3

Cab Temperature Control Dial

Remove switch from harness. Use multimeter to check for resistance.

210 Ω on pins 1 and 2 at maximum cooling.

5.1 kΩ on pins 2 and 3 at maximum cooling.

5.1 kΩ on pins 1 and 2 at maximum heating.

210 Ω on pins 2 and 3 at maximum heating.

5.1 kΩ on pins 1 and 3 regardless of dial position.

Does temperature control dial meet specification?

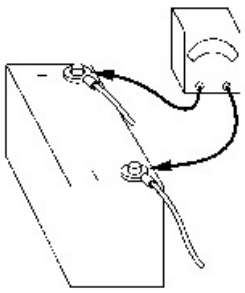
Result:

YES: Switch is ok.

NO: Switch has failed. Replace.

(12) Battery Voltage Check

Action:



T123529

Battery Voltage Check

Measure battery voltage by connecting a multimeter to negative (-) terminal grounded to frame and positive (+) terminal connected to machine harness.

Is 12—14 volts measured?

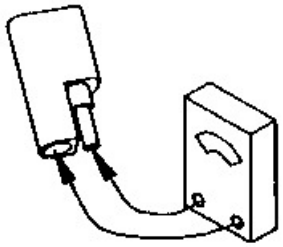
Result:

YES: Battery is ok.

NO: Battery is undercharged. Charge battery.

(13) Diode Check

Action:



Diode Check

Remove diode from connector.

Test diode using diode test function of multimeter.

Multimeter

To test diode.

Does multimeter beep?

Reverse multimeter probes.

Does multimeter beep?

Result:

YES: If multimeter beeps in both checks, diode has failed in a shorted mode. Replace diode.

NO: If multimeter does not beep in either check, diode has failed in an open mode. Replace diode.

NO: If multimeter beeps in one check and not the other, diode is ok.

(14) Back-Up Alarm Check

Action:

LEGEND:

1	Back-Up Alarm
2	Terminal (+)
3	Terminal (-)

Back-Up Alarm

Connect jumper wire between terminal (2) and battery positive (+) terminal and connect terminal (3) to ground (-).

Does back-up alarm sound?

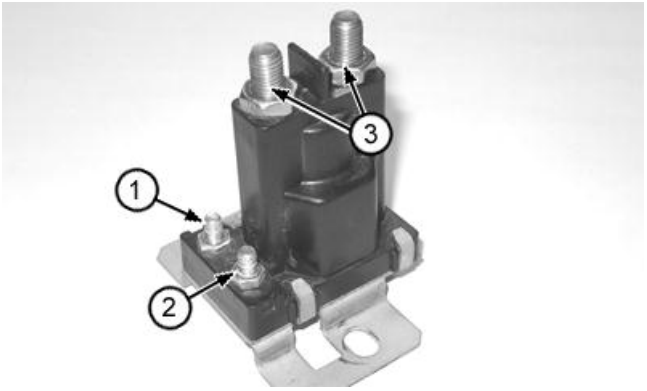
Result:

YES: Back-up alarm is ok.

NO: Back-up alarm has failed. Replace. See Back-Up Alarm Remove and Install. (Group 9015-20.)

(15) Glow Plug Relay Check

Action:



Glow Plug Relay

LEGEND:

1	Coil Terminal
2	Coil Terminal
3	Contact Terminal

CAUTION:

Avoid shock or electrical burn from open harness wires. Cover open harness connections or remove glow plug fuse from harness.

Disconnect harness from glow plug relay.

Connect multimeter to coil terminals (1 and 2) and measure resistance.

Is 23—29 ohms measured?

Connect multimeter to contact terminals to measure continuity.

Apply power (+) to coil terminal (1) and ground coil terminal (2).

Does relay click and is continuity measured across contact terminals?

Result:

YES: Glow plug relay is ok.

NO: Glow plug relay has failed. Replace.

Battery Remove and Install

[1] - Park machine on a flat level surface.

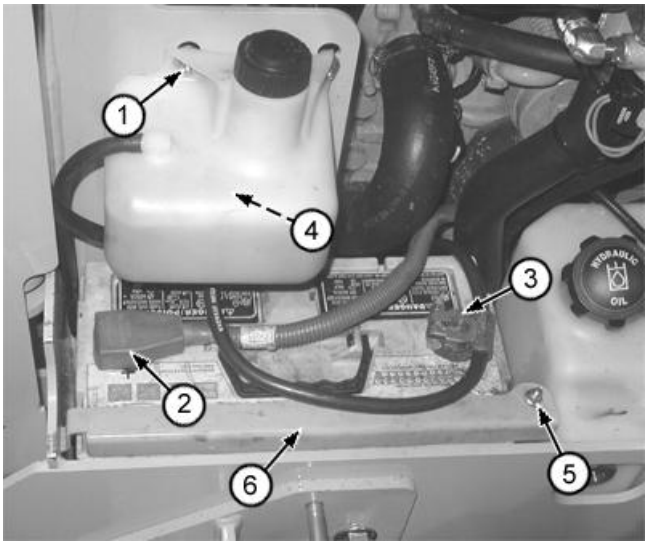
[2] - Raise boom and engage boom lock.

[3] - Lift engine cover and remove side shield.

[4] -

→NOTE:

Radiator overflow tank cap screws do not need to be completely removed to move overflow tank aside.



LEGEND:

1 Radiator Overflow Tank Cap Screw (2 used)
2 Positive Battery Cable
3 Negative Battery Cable
4 Frame Ground
5 Nut
6 Battery Retaining Bracket

Battery Remove and Install

Loosen radiator overflow tank mounting cap screws and move overflow tank aside.

[5] - Remove battery negative (-) cable (3), frame ground (4) and positive (+) cable (2).

[6] - Remove nut (5) and battery retaining bracket (6).

[7] - Replace battery as necessary.

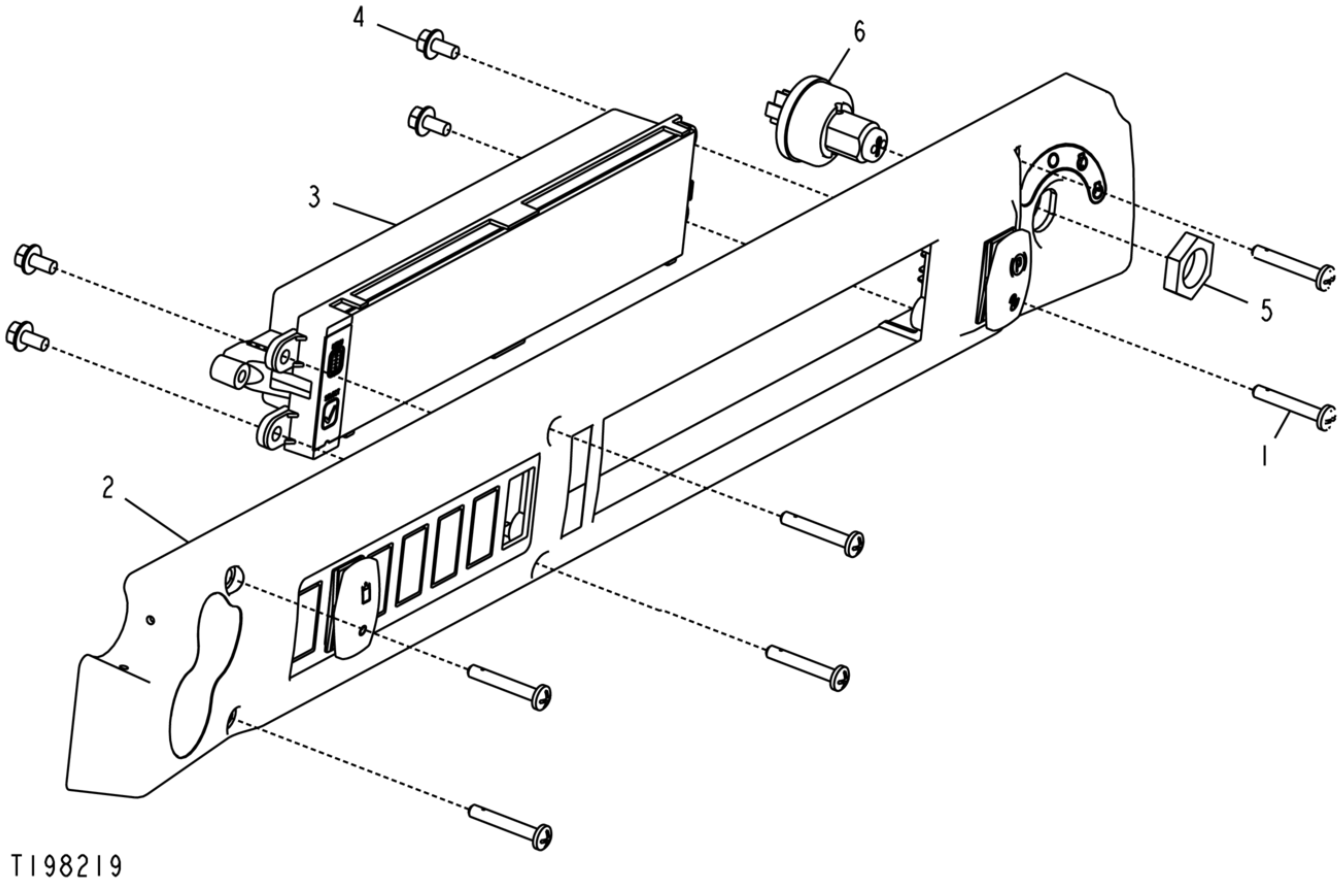
[8] - Install battery retaining bracket, nut, and cables.

[9] - Install radiator overflow tank, side shields, and lower engine cover.

[10] - Remove boom locks and lower boom.

Instrument Panel, Engagement and Monitor Unit, and Key Switch Remove and Install

[1] -



Instrument Panel, Engagement and Monitor Unit, and Key Switch

LEGEND:

1	Screw (6 used)
2	Instrument Panel
3	Engagement and Monitor Unit
4	Cap Screw (4 used)
5	Nut
6	Key Switch

Remove screws (1) from instrument panel (2).

[2] - Remove cap screws (4) from engagement and monitor unit (3).

[3] - Remove engagement and monitor unit (3).

[4] - Remove nut (5) and key switch (6).

[5] - Replace parts as necessary.

[6] - Install key switch (6) and nut (5).

[7] -

IMPORTANT:

If you are installing a replacement engagement and monitor unit, you must complete an initial configuration once the unit has been installed. See Engagement and Monitor Unit Initial Configuration . (Group 9015-20.)

Install engagement and monitor unit (3) and cap screws (4).

Item	Measurement	Specification
Engagement and Monitor Unit Cap Screw	Torque	6.8 N˙m

Item	Measurement	Specification
		60 lb-in.

[8] - Install instrument panel (2) and screws (1).

Engagement and Monitor Unit Initial Configuration

Complete the following procedure to set the appropriate machine model in the engagement and monitor unit.

[1] - Sit in operator's seat to power up the engagement and monitor unit.

[2] - At the "ATS?" prompt, press "SELECT".

If "ATS?" prompt does not appear, proceed to Step 5.

[3] - Press "MENU" to display "YES" or "NO" to enable or disable the anti-theft security system.

[4] - Press "SELECT" to enable or disable the anti-theft security system.

[5] - The current machine model setting, hour meter, then Run Data Items appear on the engagement and monitor unit display.

[6] - Turn key to ON position.

[7] - Press and hold "MENU" for five seconds until the engagement and monitor unit beeps.

[8] - Press "MENU" until "MODEL" appears in the display.

[9] - Press "SELECT" to enter the "MODEL" menu.

[10] - Press "MENU" until the appropriate machine model number appears in the engagement and monitor unit display.

[11] - Press "SELECT" to set the machine model number.

The engagement and monitor unit beeps after setting the machine model number.

[12] -

→NOTE:

Key switch must be turned to OFF position or model selection will NOT be saved.

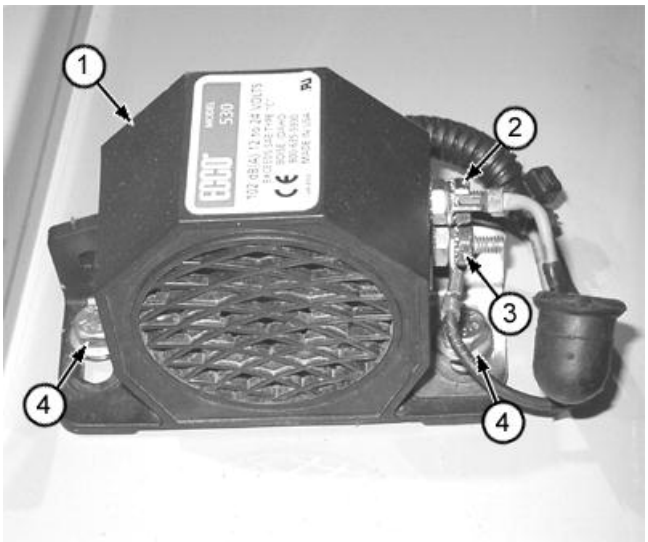
Turn key switch to OFF position.

[13] - Exit operator's seat to power down the engagement and monitor unit.

The correct machine model number setting will display the next time the engagement and monitor unit powers up.

Back-Up Alarm Remove and Install

[1] -



LEGEND:

1	Back-Up Alarm
2	Nut and Wire
3	Nut and Wire
4	Cap Screw (2 used)

Back-Up Alarm Remove and Install

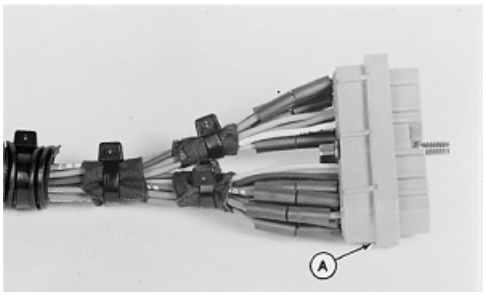
Remove nut and wire (2 and 3).

[2] - Remove cap screws (4) and back-up alarm (1).

[3] - Install back-up alarm (1) and cap screws (4).

[4] - Install nut and wire (2 and 3).

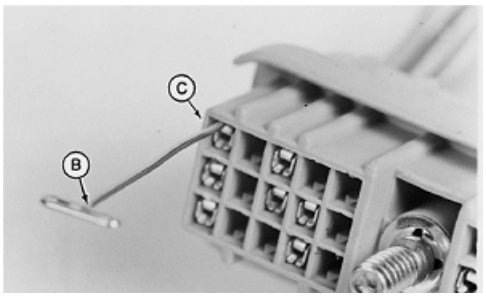
Replace (Pull Type) Metri-Pack™ Connectors



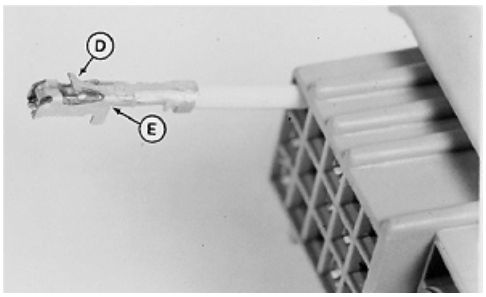
LEGEND:

A	Connector
B	“T” Pin
C	Body Socket
D	Locking Tab
E	Push Terminal

Connector



Socket



Terminals

Disconnect the Metri-Pack

[Metri-Pack is a trademark of Packard Electric]

connector (A). Remove tie bands and tape.

Insert a “T” pin (B) 6.4 mm (1/4 in.) into connector body socket (C).

→NOTE:

Use JDG777

[Included in JT07195A Electrical Repair Kit]

Terminal Extraction Tool or “T” pin to remove terminals.

Angle “T” pin so pin tip slides close to the plastic socket edge pushing terminal locking tab (D) inward.

Remove “T” pin and push terminal (E) out of socket.

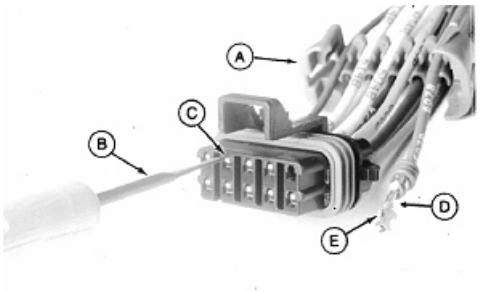
Remove terminal, cut strip and crimp wire through connector.

Check to make sure locking tab on new terminal is in outward position, then pull on wire until terminal locks in connector body socket.

→NOTE:

Terminal will seat only one way. If terminal does not pull into the connector body socket, check to make sure terminal is aligned correctly.

Replace (Push Type) Metri-Pack™ Connectors



LEGEND:

A	Connector Lock
B	Extraction Tool JDG777
C	Connector Body Socket
D	Terminal
E	Locking Tab

Push Type Connector

Disconnect the Metri-Pack

[Metri-Pack is a trademark of Packard Electric]
connector. Remove the tie bands and tape.

Remove the connector lock (A), and mark wire colors for identification.

Identify wire color locations with connector terminal letters.

Insert JDG776 or JDG777

[Included in JT07195A Electrical Repair Kit]
Terminal Extraction Tool (B) into connector body socket (C) pushing the terminal locking tab inward.

→NOTE:

Use JDG776 Extraction Tool with 56, 280 and 630 series METRI-PACK terminals. Use JDG777 Extraction Tool with 150 series METRI-PACK terminals.

Remove extraction tool and pull terminal (D) out of the socket.

Replace terminal. Make sure locking tab (E) on the new terminal is in the outward position.

Push terminal into connector body socket until terminal locks.

Replace WEATHER PACK ™ Connector

Terminal Contact

IMPORTANT:

Identify wire color locations with connector terminal letters.

[1] - Open connector body.

[2] - Insert JDG364 Extraction Tool over terminal contact in connector body.

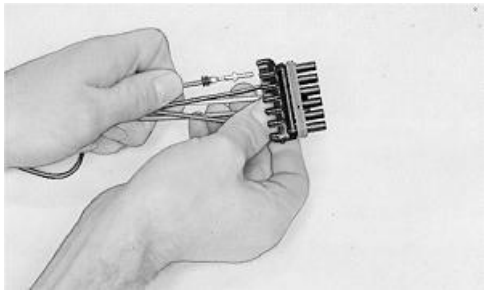
[3] - Hold extractor tool fully seated and pull wire from connector body.

→NOTE:

If terminal cannot be removed, insert wire or nail through extractor tool handle and push terminal contact from connector.

[4] -

IMPORTANT:



Connector Body

Carefully spread contact lances to assure good seating on connector body.

→NOTE:

Connector bodies are "keyed" for proper contact mating. Be sure contacts are in proper alignment.

Push contact into new connector body until fully seated.

[5] - Pull on wire slightly to be certain contact is locked in place.

[6] - Transfer remaining wires to correct terminal in new connector.

[7] - Close connector body.

Install WEATHER PACK ™ Contact

Correct Size Cable

Strip Insulation

→NOTE:

Cable seals are color coded for three sizes of wire:

- **Green - 18 to 20 gauge wire**
- **Gray - 14 to 16 gauge wire**
- **Blue - 10 to 12 gauge wire**

[1] - Slip correct size cable seal on wire.

[2] - Strip insulation from wire to expose 6 mm (1/4 in.) and align cable seal with edge of insulation.

[3] -

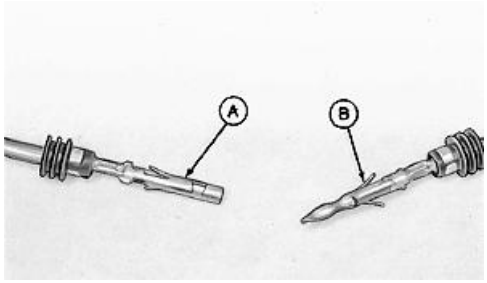
→NOTE:

Contacts have numbered identification for two sizes of wire: a) #15 for 14 to 16 gauge wire b) #19 for 18 to 20 gauge wire

Put proper size contact on wire and crimp in place with a "W" type crimp, using JDG783 Terminal Applicator.

[4] -

IMPORTANT:



Contact Installation

Proper contact installation for "sleeve" (A) and "pin" (B) is shown.

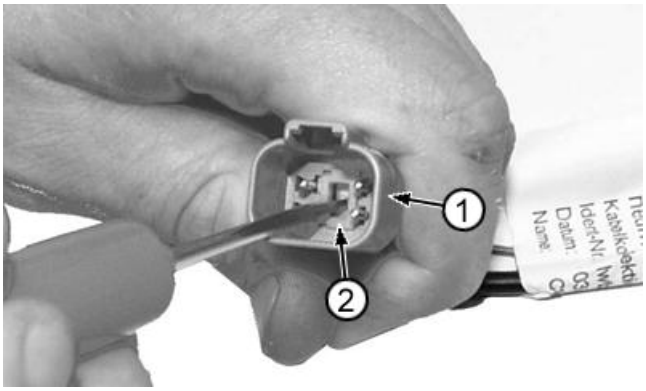
Secure cable seal to contact as shown, using JDG783 Terminal Applicator.

Replace DEUTSCH ™ Rectangular or Triangular Connectors

[1] -

→NOTE:

Connector shown is the female half or a 4-pin square connector. Other similar styles of Deutsch connectors can be serviced using the same procedure.



LEGEND:

1	Connector
2	Locking Wedge

Removing Locking Wedge

Pull connector (1) apart. Inspect and clean connector seal and contacts.

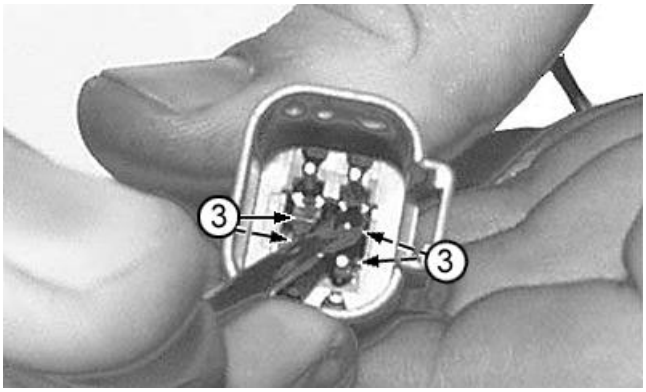
[2] - Remove locking wedge (2) from connector using hook on JDG1383 service tool.

DEUTSCH ™ Connector Service Tool

JDG1383

Remove secondary contact lock.

[3] -



LEGEND:

3 Primary Locking Latches

Releasing Primary Latch

Removing Wire

Release primary locking latch (3) next to the pin to be removed using screwdriver on JDG1383 service tool.

[4] - Gently pull wire out from back of connector.

[5] - Replace connector contact as necessary.

[6] - Install wire terminal back into connector until it clicks into place.

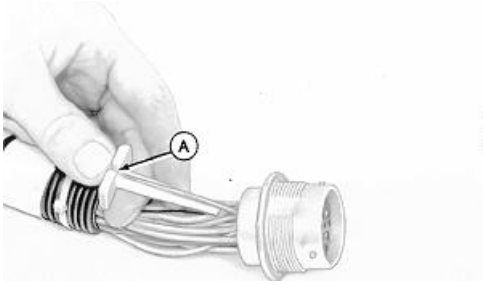
[7] -

→NOTE:

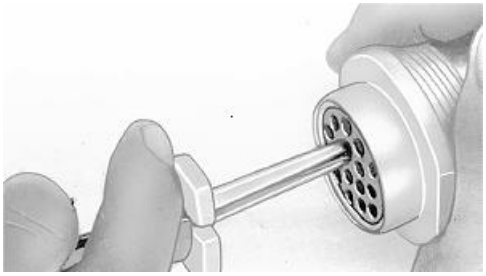
Locking wedge in 2-pin connector is not symmetrical. Position latch shoulder next to terminals.

Install locking wedge until it snaps into place.

Replace DEUTSCH ™ Connectors



Extractor Tool



Slide Extractor Tool

[1] - Select correct size extractor tool for size of wire to be removed:

- JDG361 Extractor Tool for 12 to 14 gauge wire.
- JDG362 Extractor Tool for 16 to 18 gauge wire.
- JDG363 Extractor Tool for 20 gauge wire.

[2] - Start correct size extractor tool over wire at handle (A).

[3] - Slide extractor tool rearward along wire until tool tip snaps onto wire.

[4] -

IMPORTANT:

Do NOT twist tool when inserting in connector.

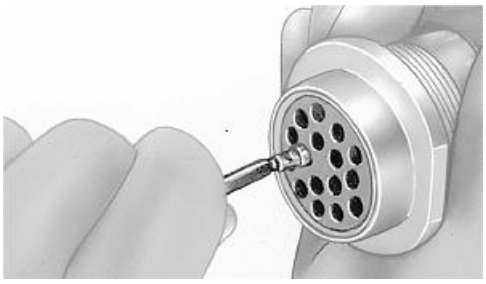
Slide extractor tool along wire into connector body until it is positioned over terminal contact.

[5] - Pull wire out of connector body, using extractor tool.

[6] -

IMPORTANT:

Install contact in proper location using correct size grommet.



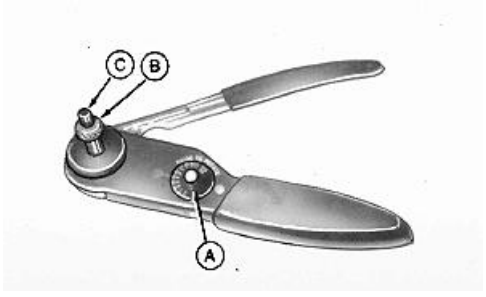
Push Contact

Push contact straight into connector body until positive stop is felt.

[7] - Pull on wire slightly to be certain contact is locked in place.

[8] - Transfer remaining wires to correct terminal in new connector.

Install DEUTSCH ™ Contact



Crimper

[1] - Strip 6 mm (1/4 in.) insulation from wire.

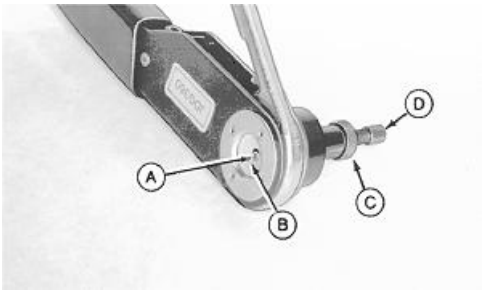
[2] - Adjust selector (A) on JDG360 Crimper for correct wire size.

[3] - Loosen lock nut (B) and turn adjusting screw (C) in until it stops.

[4] -

IMPORTANT:

Select proper size contact "sleeve" or "pin" to fit connector body.



Adjusting Screw

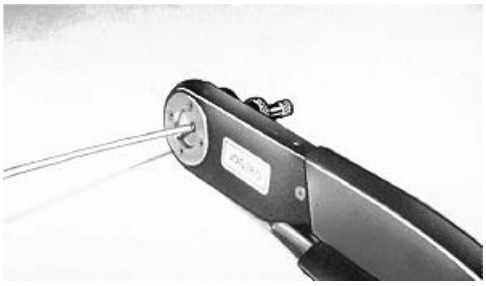
Insert contact (A) and turn adjusting screw (D) until contact is flush with cover (B).

[5] - Tighten lock nut (C).

[6] -

IMPORTANT:

Contact must remain centered between indentors while crimping.



Crimp

Insert wire in contact and crimp until handle touches stop.

[7] - Release handle and remove contact.

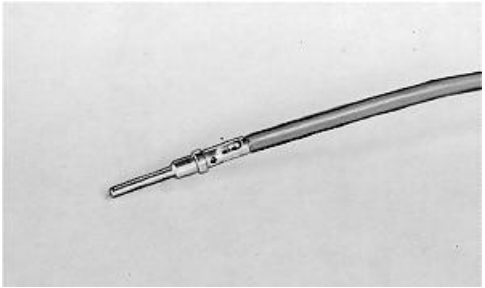
[8] -

IMPORTANT:

If all wire strands are not crimped into contact, cut off wire at contact and repeat contact installation procedures.

→NOTE:

Readjust crimping tool for each crimping procedure.



Inspect Contact

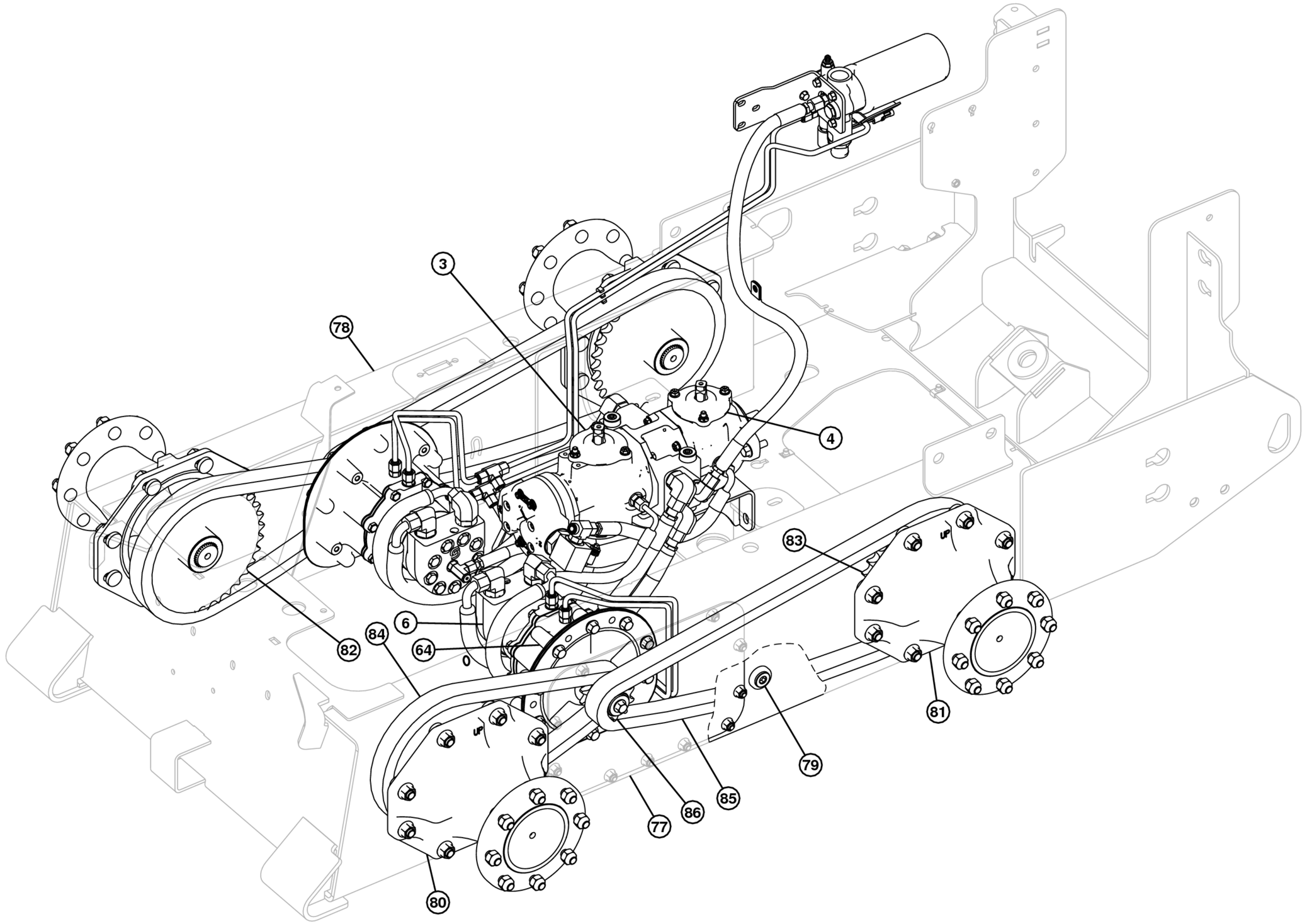
Inspect contact to be certain all wires are in crimped barrel.

Section 9020 - POWER TRAIN

Table of contents

Group 05 - Theory Of Operation

Power Train System Operation—Skid Steer Loader



T197254

Power Train System Component Location—Skid Steer Loader

LEGEND:

3	Left Hydrostatic Pump
4	Right Hydrostatic Pump
6	Hydrostatic Motor
64	Park Brake
77	Left Chain Case
78	Right Chain Case
79	Fill Plug
80	Front Axle Housing
81	Rear Axle Housing
82	Front Axle Sprocket
83	Rear Axle Sprocket
84	Front Drive Chain
85	Rear Drive Chain
86	Drive Sprocket

The skid steer loader power train transmits power from the hydrostatic motor to the drive chains in the chain case. The drive chains turn large sprockets splined to the drive axles. The hydrostatic motor is mounted on the park brake assembly and is splined to the park brake driveshaft. The left and right power trains are separate units. The drive system is the same for forward and reverse; the drive motor is reversed through the hydrostatic system.

Chain Case Operation

The chain case is a structural component of the machine side frame member. It is sealed from the other components of the machine and the environment. The left and right chain cases are identical. The chain case contains the hydrostatic motor drive sprocket, front and rear axle drive chains, and sprockets. Each chain case houses an oil bath lubrication system with an oil level/fill plug and drain plug. All service to the components in the chain case may be accomplished through a removable access plate. See Power Train System Operation for component location. (Group 9020-05.)

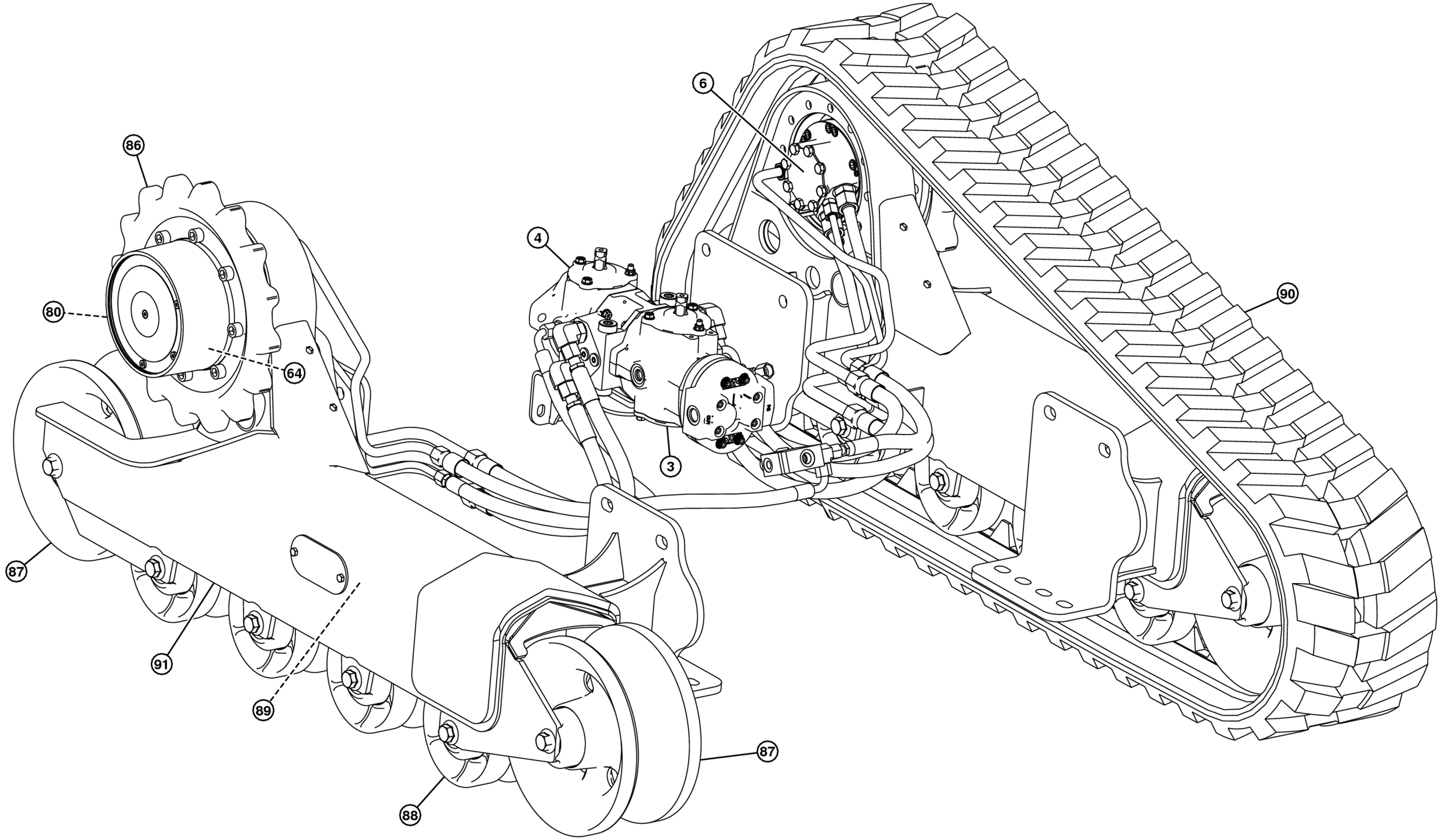
Drive Chain Operation

The machine uses four endless drive chains, one for each drive axle, running in an oil bath inside the chain case. The drive chain is driven by a double sprocket driveshaft from the hydrostatic motor. Each chain then drives a large sprocket splined to the axle shaft. The sprocket is allowed to slide freely on the splines of the axle shaft. The chain can be tightened by sliding the front and rear axle housings on slotted holes. There are no chain tensioners or idler springs to adjust. See Power Train System Operation for component location. (Group 9020-05.)

Drive Axle Operation

The drive axle is attached to the chain case on eight studs. The axle housing slides fore and aft to provide tension to the drive chains inside the chain case. The splined axle shaft extends into the chain case where it is driven by a large sprocket. The sprocket is allowed to slide freely on the splines of the axle shaft. The axle housing contains two tapered roller bearings in replaceable races. The axle bearings are lubricated by the oil bath in the chain case. See Power Train System Operation for component location. (Group 9020-05.)

Power Train System Operation—Compact Track Loader



T210308

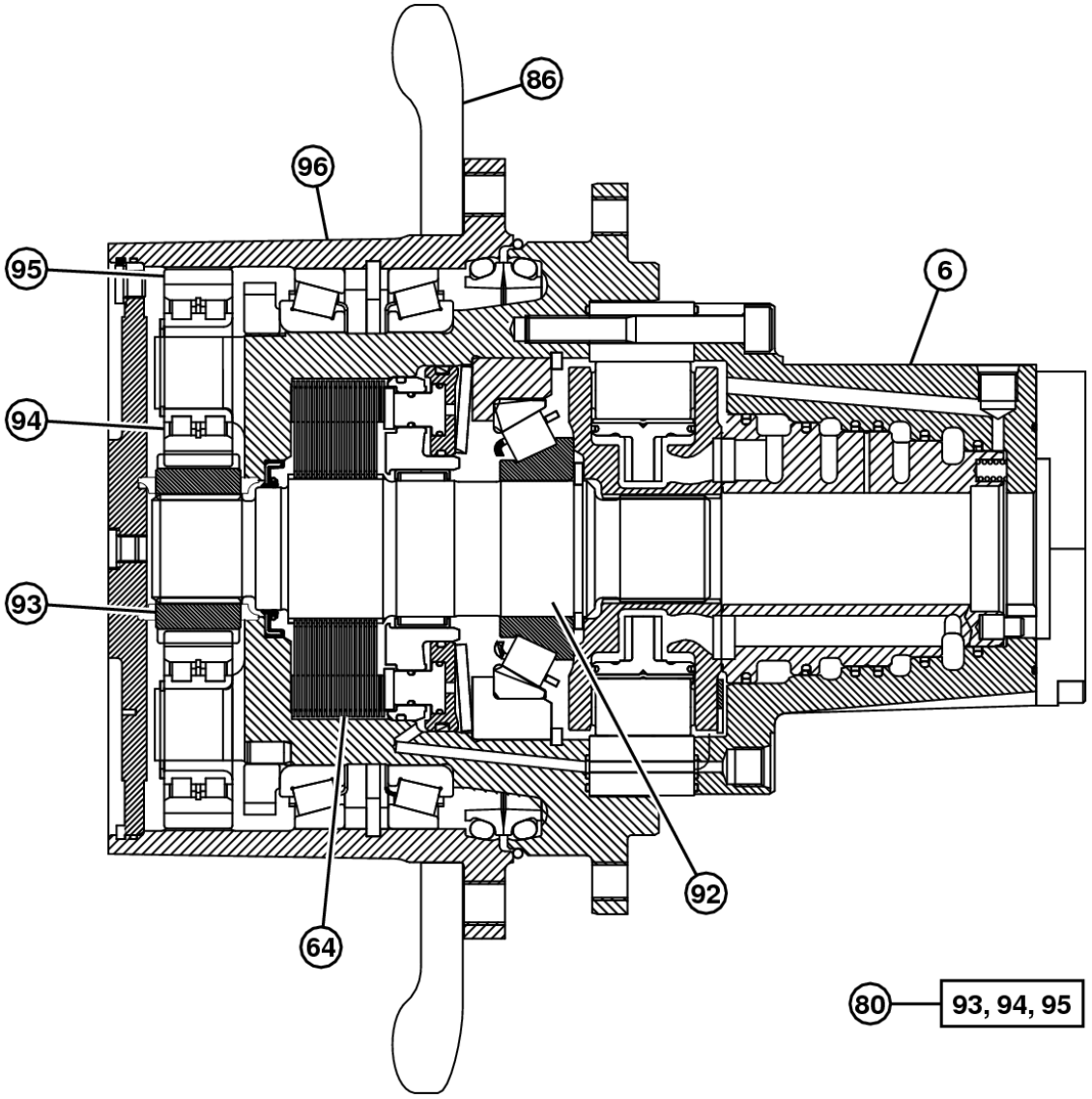
Power Train System Component Location—Compact Track Loader

LEGEND:

3	Left Hydrostatic Pump
4	Right Hydrostatic Pump
6	Hydrostatic Motor
64	Park Brake (2 used)
80	Hydrostatic Motor Gearbox (2 used)
86	Drive Sprocket (2 used)
87	Idler (2 per side)
88	Roller (4 per side)
89	Track Adjuster and Recoil Spring Assembly (2 used)
90	Track (2 used)
91	Undercarriage Frame

The compact track loader power train transmits power from the hydrostatic motor through the hydrostatic motor gearbox to the drive sprocket and tracks. The hydrostatic motor is mounted on the park brake assembly, which is attached to the undercarriage support on the outside of the machine frame. The motor is splined to the park brake drive shaft. The drive shaft is also splined to the hydrostatic motor gearbox, which reduces shaft speed and increases torque transmitted to the drive sprocket and tracks. The left and right power trains are separate units. The drive system is the same for forward and reverse; the drive motor is reversed through the hydrostatic system.

Hydrostatic Motor Gearbox Operation



T211770

Hydrostatic Motor Gearbox Component Location (two speed motor shown)

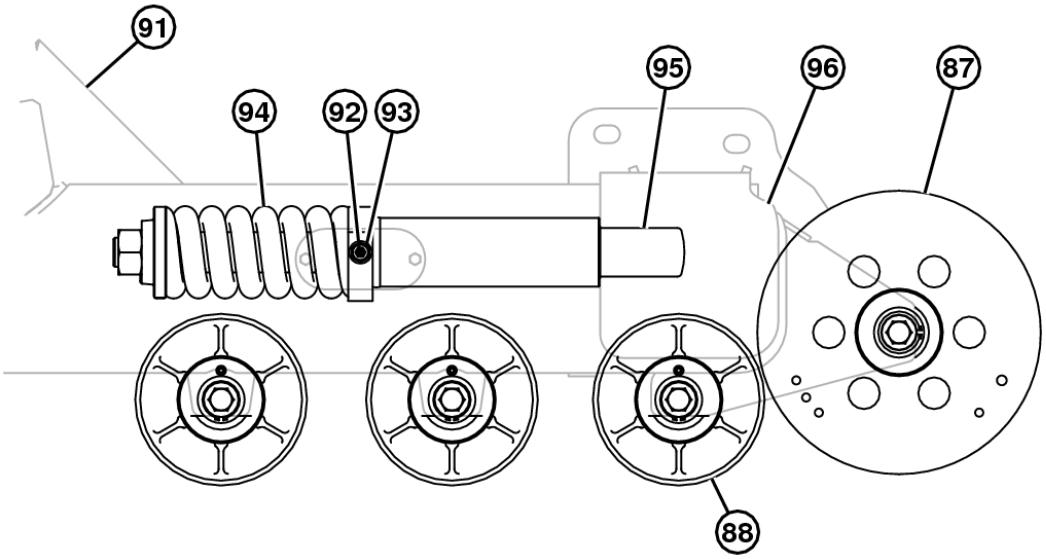
LEGEND:

6	Hydrostatic Motor
64	Park Brake
80	Hydrostatic Motor Gearbox
86	Drive Sprocket
92	Park Brake Drive Shaft
93	Sun Gear
94	Planet Gear (4 used)
95	Ring Gear
96	Housing Drum

The hydrostatic motor gearbox (80) is a single reduction planetary drive. The function of the motor gearbox is to convert fast rotary speed and low torque from the hydrostatic motor to a slow rotary speed and high torque to rotate the drive sprocket (86).

Rotary motion is transferred from the park brake drive shaft (92) to the drive sprocket by a single planetary gear set that meshes with the ring gear (95). As the park brake drive shaft turns, the splined sun gear (93) turns against the planet gears (94). Because the planet gear carrier is fixed to the park brake housing and does not rotate, the rotation of the planet gears is transferred to and turns the ring gear. The ring gear, drum (96) and drive sprocket all turn as a unit driving the track to move the machine.

Track Adjuster and Recoil Spring Operation



T210309

Track Adjuster and Recoil Spring Component Location

LEGEND:

87	Idler
88	Roller
91	Undercarriage Frame
92	Grease Fitting
93	Adjuster Valve
94	Recoil Spring
95	Piston
96	Yoke

The track adjuster and recoil spring assembly is supported by the undercarriage frame (91). Shock loads on the front idler (87) and first track roller (88) are absorbed by the recoil spring (94).

To tighten the track, pump grease into fitting (92) to force the piston (95) out. As it presses against the yoke (96), the track becomes tighter. Loosen adjuster valve (93), NOT the grease fitting (92) to release grease to loosen the track. Grease will escape through a small passage that is concealed by the adjuster valve. See Check and Adjust Track Sag for more information. (Group 9020-25.)

Group 15 - Diagnostic Information

Diagnose Power Train Component Malfunctions—Skid Steer Loader

→NOTE:

Diagnose malfunction charts are arranged from most probable and simplest to verify, to least likely and most difficult to verify.

Symptom	Problem	Solution
Oil Leak From Power Train Component	Oil leak from chain case	Inspect O-ring at chain case drain plug.
		Inspect and/or replace sealant on chain case access plate. See Chain Case Access Plate Remove and Install . (Group 0250.)
		Inspect O-ring at chain case fill plug.
		Inspect O-ring on axle housing.
		Inspect axle oil seal.
	Oil leak from axle or axle housing	Inspect O-ring on axle housing.
		Inspect axle oil seal.
Component Wear	Excessive axle play	Inspect axle bearings.
Component Noise	Drive chain noise	Check chain case oil level. See Check Chain Case Oil Level . (Operator's Manual.)
		Check drive chain and sprockets.
		Check drive chain tension. See Drive Chain Tension Check and Adjustment . (Group 9020-25.)
	Grinding noise	Check chain case oil level. See Check Chain Case Oil Level . (Operator's Manual.)
		Check drive chain and sprockets.
		Check drive chain tension. See Drive Chain Tension Check and Adjustment . (Group 9020-25.)
		Inspect axle housing. See Axle Housing Remove and Install . (Group 0201.)
Power Not Transferred To Wheels	One drive wheel not powered	Check drive chain and sprockets.
		Inspect axle housing. See Axle Housing Remove and Install . (Group 0201.)
	Both wheels on one side not powered	Check drive chain and sprockets.
		Inspect axle housing. See Axle Housing Remove and Install . (Group 0201.)

Diagnose Power Train Component Malfunctions—Compact Track Loader

→NOTE:

Diagnose malfunction charts are arranged from most probable and simplest to verify, to least likely and most difficult to verify

Symptom	Problem	Solution
Loose Track	Incorrect track tension adjustment	Perform Check and Adjust Track Sag . (Group 9020-25.)
	Grease leaking from track adjuster seals, grease fitting, or valve	See Track Adjuster Cylinder Disassemble and Assemble . (Group 0130.)
Tight Track	Material packing in sprocket	Material filling drive sprocket teeth can cause sprocket tooth to track impact. Perform Check and Adjust Track Sag . (Group 9020-25.)
	Track sag less than specification	Perform Check and Adjust Track Sag . (Group 9020-25.)
Frequent Track Sag Adjustment Required	Grease leaking from track adjuster seals, grease fitting, or valve	See Track Adjuster Cylinder Disassemble and Assemble . (Group 0130.)
Excessive Oil Leakage From Idlers And Rollers	Loose plug, worn or damaged O-ring, or metal faced seal	See Front or Rear Idler Disassemble and Assemble . (Group 0130.)
		See Track Roller Disassemble and Assemble . (Group 0130.)
“Popping” Of Track	High propel loads in reverse	High propel loads in reverse can cause the recoil spring to retract allowing sprocket to slip in track.
	Material packed in sprocket	Material filling drive sprocket teeth can cause sprocket tooth to track impact. Perform Check and Adjust Track Sag . (Group 9020-25.)
Individual Undercarriage Component Wear	Some wear is normal.	Inspect components to determine if they should be replaced. See Track System Repair . (Group 0130.)

Group 25 - Tests

Drive Chain Tension Check and Adjustment

[1] -

Check Wheel Play

Park machine on flat level surface.

[2] - Lower boom and bucket, engage park brake and turn engine off.

[3] - Raise and block skid steer loader. See Raising and Blocking Machine . (Operator's Manual.)

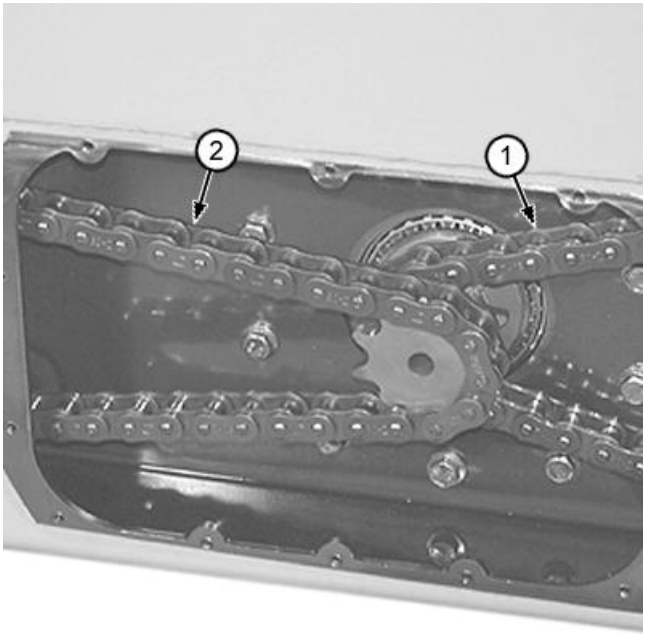
[4] - Check chain tension by rotating each wheel by hand forward and rearward. If wheel play is not within specification, adjust chain tension.

Item	Measurement	Specification
Chain Tension	Play	6.35 mm at tire tread
		0.25 in. at tire tread

[5] - As necessary, drain chain case oil.

[6] - Remove chain case access plate. See Chain Case Access Plate Remove and Install . (Group 0250.)

[7] -



LEGEND:

1	Front Drive Chain
2	Rear Drive Chain

Chain Case

Loosen axle housing mounting nuts.

[8] - Adjust drive chain as necessary. After adjustment, drive chain should have free play movement up and down.

Item	Measurement	Specification
Drive Chain	Play	5 mm up and down
		0.197 in. up and down

To loosen drive chain:

- Push rear axle housing forward.
- Push front axle housing rearward.

To tighten drive chain:

- Push rear axle housing rearward.
- Push front axle housing forward.

[9] - Tighten axle housing nuts.

Item	Measurement	Specification
Axle Housing Nut	Torque	305 N˙m
		225 lb-ft

[10] - Install chain case access plate. See Chain Case Access Plate Remove and Install . (Group 0250.)

[11] - Fill chain case with oil. See Check Chain Case Oil Level . (Operator′s Manual.)

Check and Adjust Track Sag

Specifications

SPECIFICATIONS	
Track Sag	13—25 mm (0.5—1.0 in.)

Service Equipment and Tools

SERVICE EQUIPMENT AND TOOLS
Grease Gun

Other Material

OTHER MATERIAL
Multi-Purpose Grease

[1] -

→NOTE:

Track sag can also be checked and adjusted by safely blocking the machine in the air, such as when performing track component repair or replacement. see Raising and Blocking Machine . (Operator's Manual.)

IMPORTANT:

Test can only be performed safely and accurately by using a bucket to raise machine to proper height. DO NOT use a broken or worn out bucket when checking or adjusting track sag.

Put bucket attachment on machine. Visually check pin engagement with Quik-Tatch to ensure locking.

[2] - Park machine on a hard, flat level surface.

[3] - Lower boom completely until it rests on stops.

[4] - Dump bucket to raise front end of tracks 8 inches (20.3 cm).

[5] - Apply the park brake. The Park Brake switch activates the park brake and spool locks for the boom and bucket.

[6] - Turn the key switch to the OFF position. Remove the key from the ignition and keep it with you.

[7] -

CAUTION:

Prevent injury due to unexpected machine movement during servicing. Be alert to possible machine movement caused by hydraulic leakage. If the hydraulics drift then the machine should be blocked into the air to check track sag.

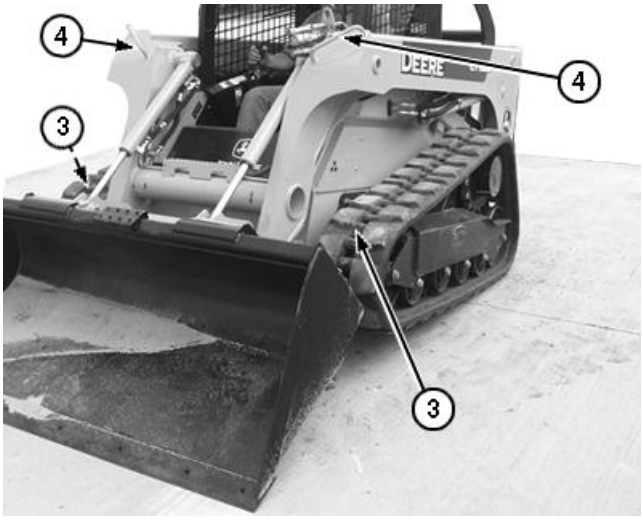
From the seat, verify the machine is stable and the front end is still raised.

[8] -

CAUTION:

Avoid possible injury from falls or slips. Use care when entering and exiting machine with front end raised. Maintain three point contact. DO NOT use bucket as foothold when machine is in raised position.

Exit machine using handholds (4) and top of track (3) for assistance.



LEGEND:

3	Step Points
4	Handholds

Exit and Entry Points

[9] -

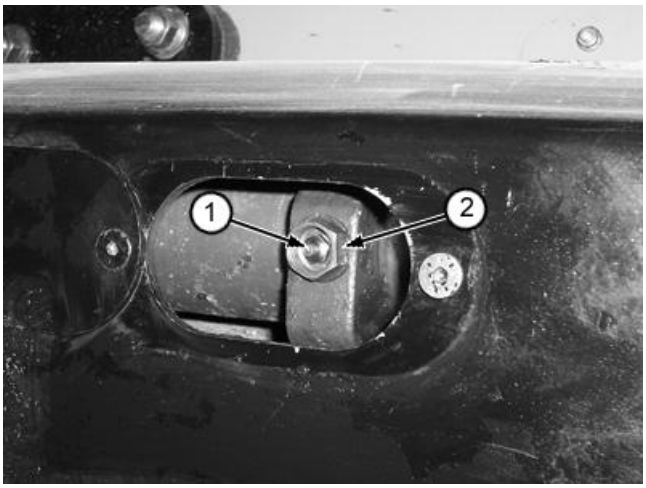
IMPORTANT:

If gravel or mud is packed between sprocket and track, it must be removed before adjusting track.

Measure track sag from bottom of third roller from rear of machine to top of track. The bottom of the rollers should not be touching the track.

Item	Measurement	Specification
Track	Sag	13—25 mm
		0.5—1.0 in.

[10] -



LEGEND:

1	Grease Fitting
2	Adjuster Valve

CTL Track Adjuster

If track sag is not within specification, remove track adjuster cover plate on track frame.

[11] -

CAUTION:

High pressure grease is in track adjuster cylinder. Do not loosen track adjuster valve (2) quickly or too much. Never loosen grease fitting (1) to release grease.

IMPORTANT:

Prevent possible damage to track components. Do not use the grease fitting on track adjuster cylinder for lubrication. Use grease fitting only for track sag adjustment.

To decrease track sag, add grease to track adjuster cylinder through grease fitting (1).

To increase track sag, loosen track adjuster valve (2) 1—2 turns to release grease from track adjuster cylinder.

Tighten track adjuster valve when track sag is correct.

Item	Measurement	Specification
Track	Sag	13—25 mm 0.5—1.0 in.

Grease Gun

Used for decreasing track sag.

Number	Name	Use
	Multi-Purpose Grease	Used for decreasing track sag.

[12] - Install track adjuster cover plate on track frame.

[13] - Repeat procedure for other track.

[14] -

CAUTION:

Avoid possible injury from falls or slips. Use care when entering and exiting machine with front end raised. Maintain three point contact. DO NOT use bucket as foothold when machine is in raised position.

Re-enter machine using top of track (3) and handholds (4) on machine for assistance.

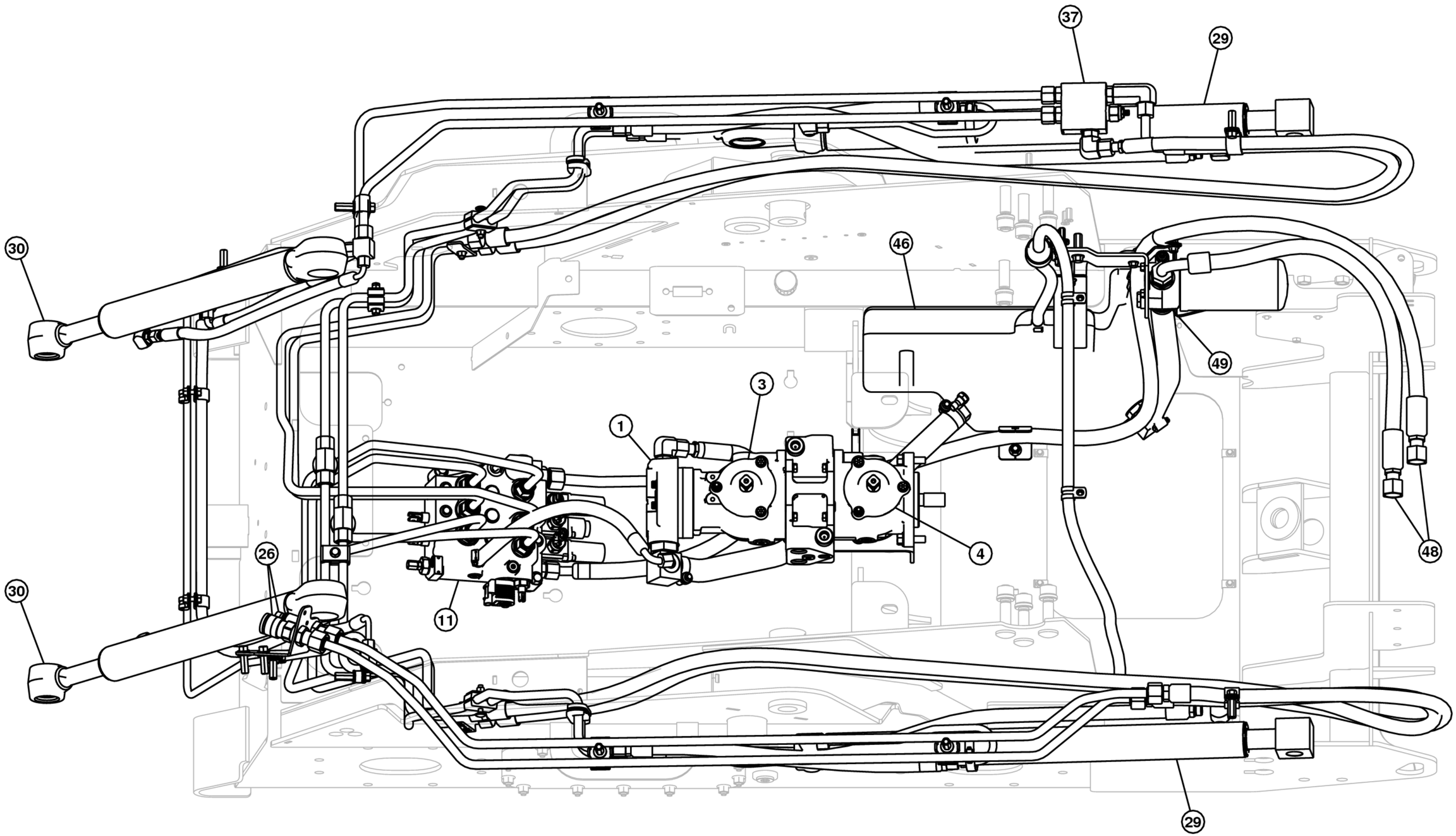
[15] - Start machine and rollback bucket to lower front end.

Section 9025 - HYDRAULIC SYSTEM

Table of contents

Group 05 - Theory Of Operation

Hydraulic System Operation

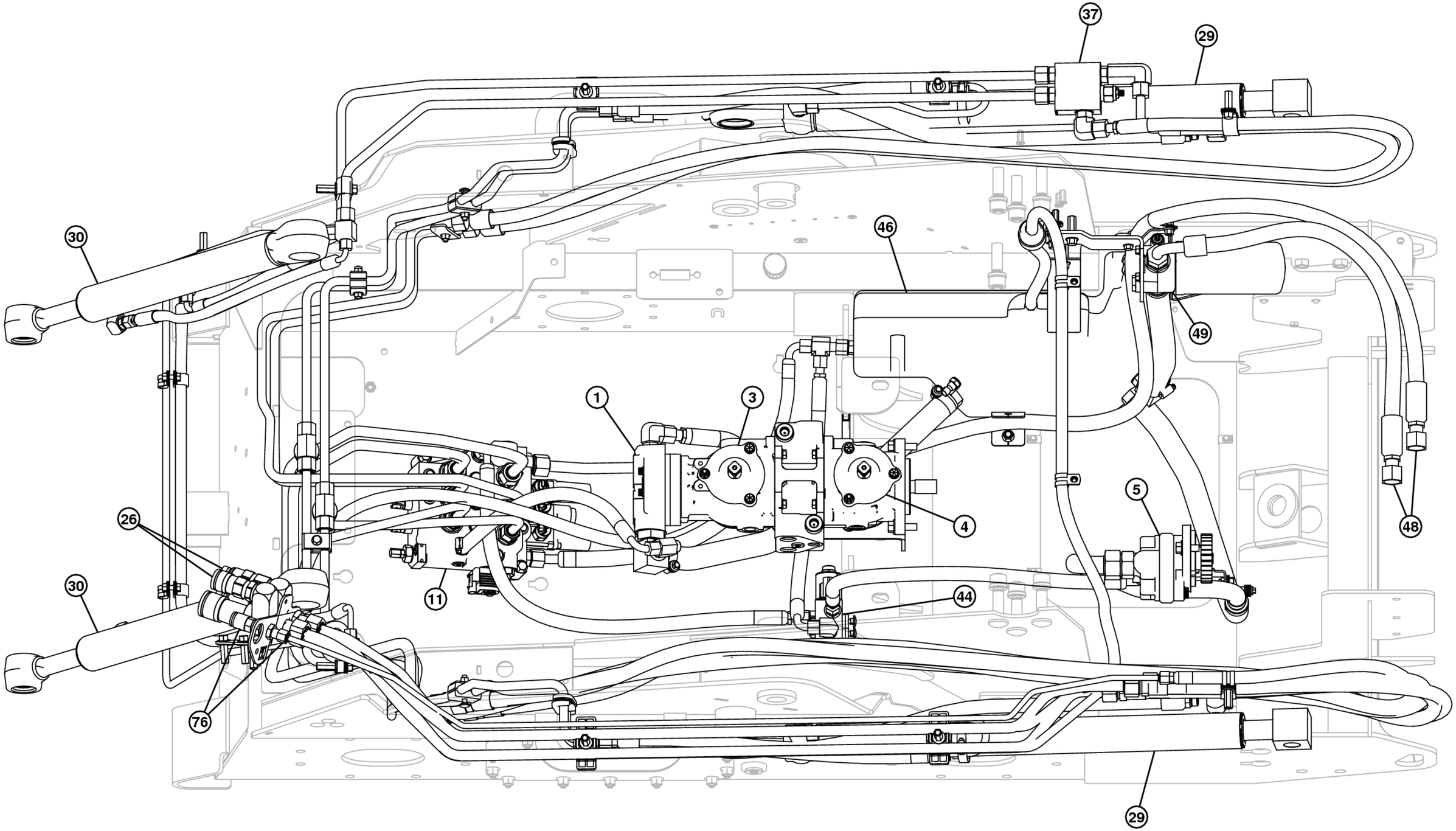


T197419

Hydraulic System Component Location—Skid Steer Loader (S.N. —150522)

LEGEND:

1	Hydraulic Pump
3	Left Hydrostatic Pump
4	Right Hydrostatic Pump
11	Control Valve
26	Auxiliary Coupler (2 used)
29	Boom Cylinder (2 used)
30	Bucket Cylinder (2 used)
37	Counterbalance Valve
46	Hydraulic Oil Tank
48	To Hydraulic Oil Cooler
49	Hydraulic Oil Filter and Park Brake Solenoid Valve Manifold

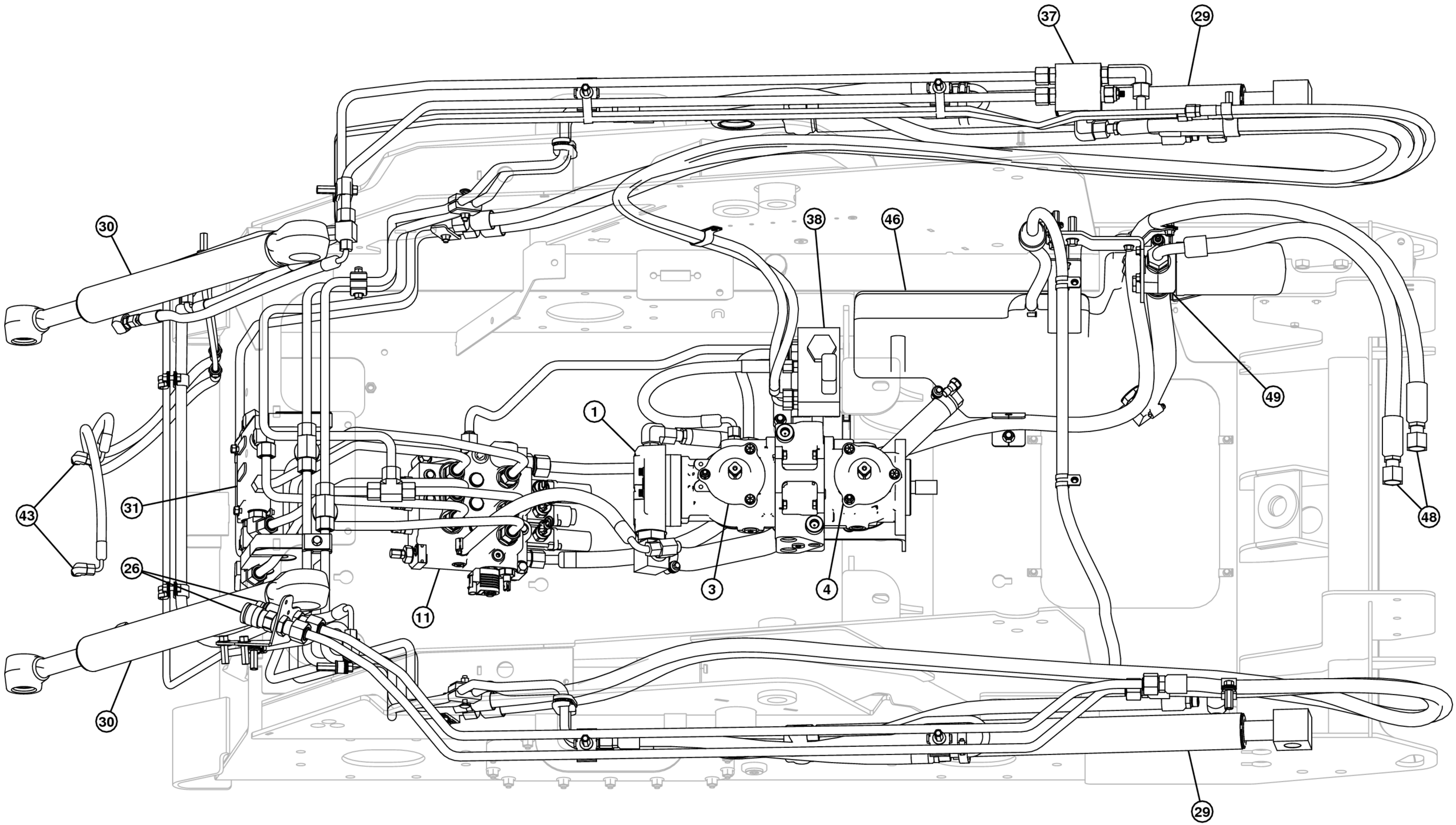


T197420

Hydraulic System Component Location—High Flow Hydraulics Option—Skid Steer Loader (S.N. —150522)

LEGEND:

1	Hydraulic Pump
3	Left Hydrostatic Pump
4	Right Hydrostatic Pump
5	High Flow Hydraulic Pump
11	Control Valve
26	Auxiliary Coupler (2 used)
29	Boom Cylinder (2 used)
30	Bucket Cylinder (2 used)
37	Counterbalance Valve
44	High Flow Solenoid Valve
46	Hydraulic Oil Tank
48	To Hydraulic Oil Cooler
49	Hydraulic Oil Filter and Park Brake Solenoid Valve Manifold
76	High Flow Auxiliary Coupler (2 used)

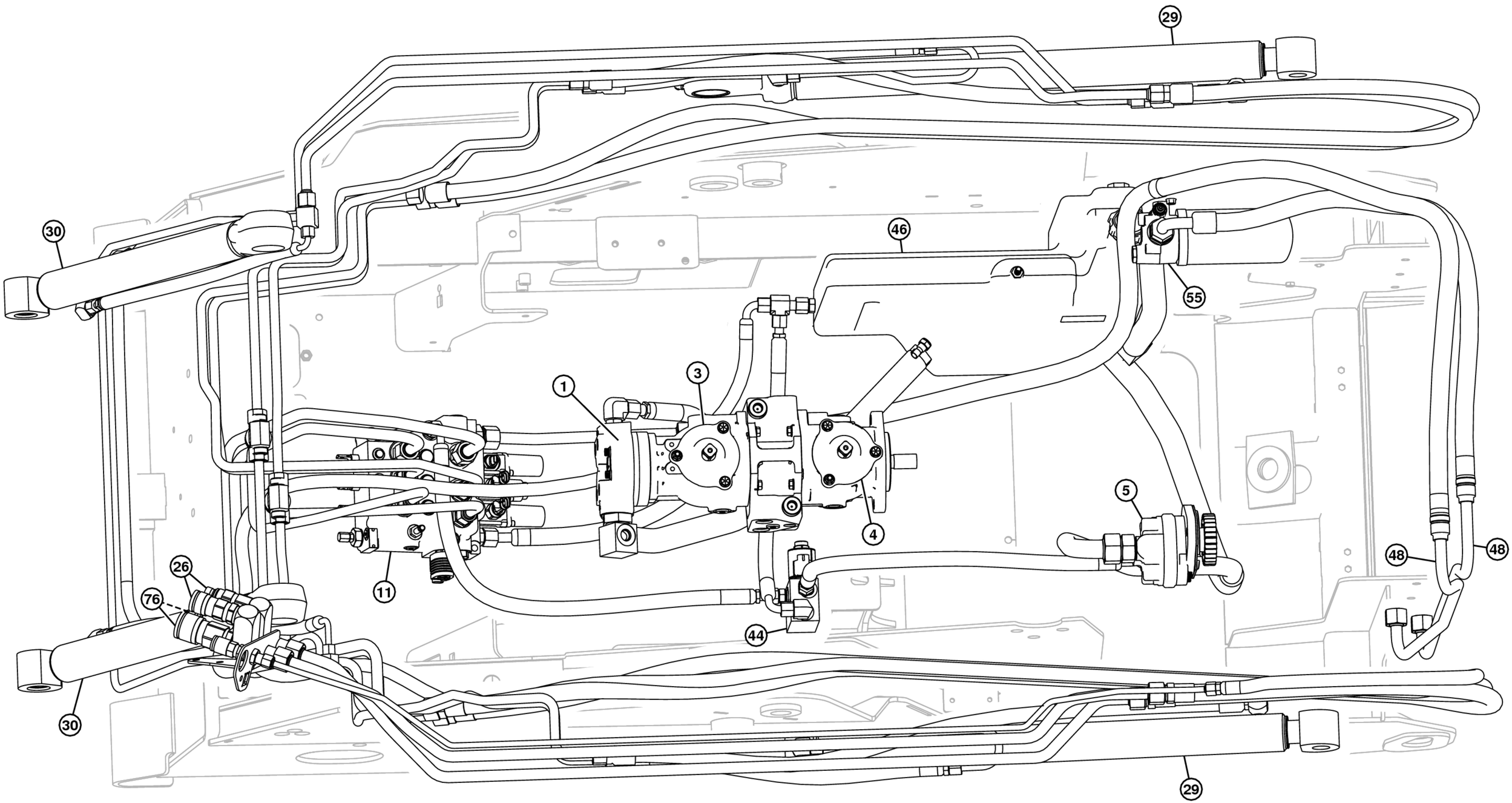


T197421

Hydraulic System Component Location—Self-Level and Hydraulic Quik-Tatch Options—Skid Steer Loader (S.N. —150522)

LEGEND:

1	Hydraulic Pump
3	Left Hydrostatic Pump
4	Right Hydrostatic Pump
11	Control Valve
26	Auxiliary Coupler (2 used)
29	Boom Cylinder (2 used)
30	Bucket Cylinder (2 used)
31	Self-Level Valve
37	Counterbalance Valve
38	Quik-Tatch Solenoid Valve
43	To Quik-Tatch Cylinder
46	Hydraulic Oil Tank
48	To Hydraulic Oil Cooler
49	Hydraulic Oil Filter and Park Brake Solenoid Valve Manifold

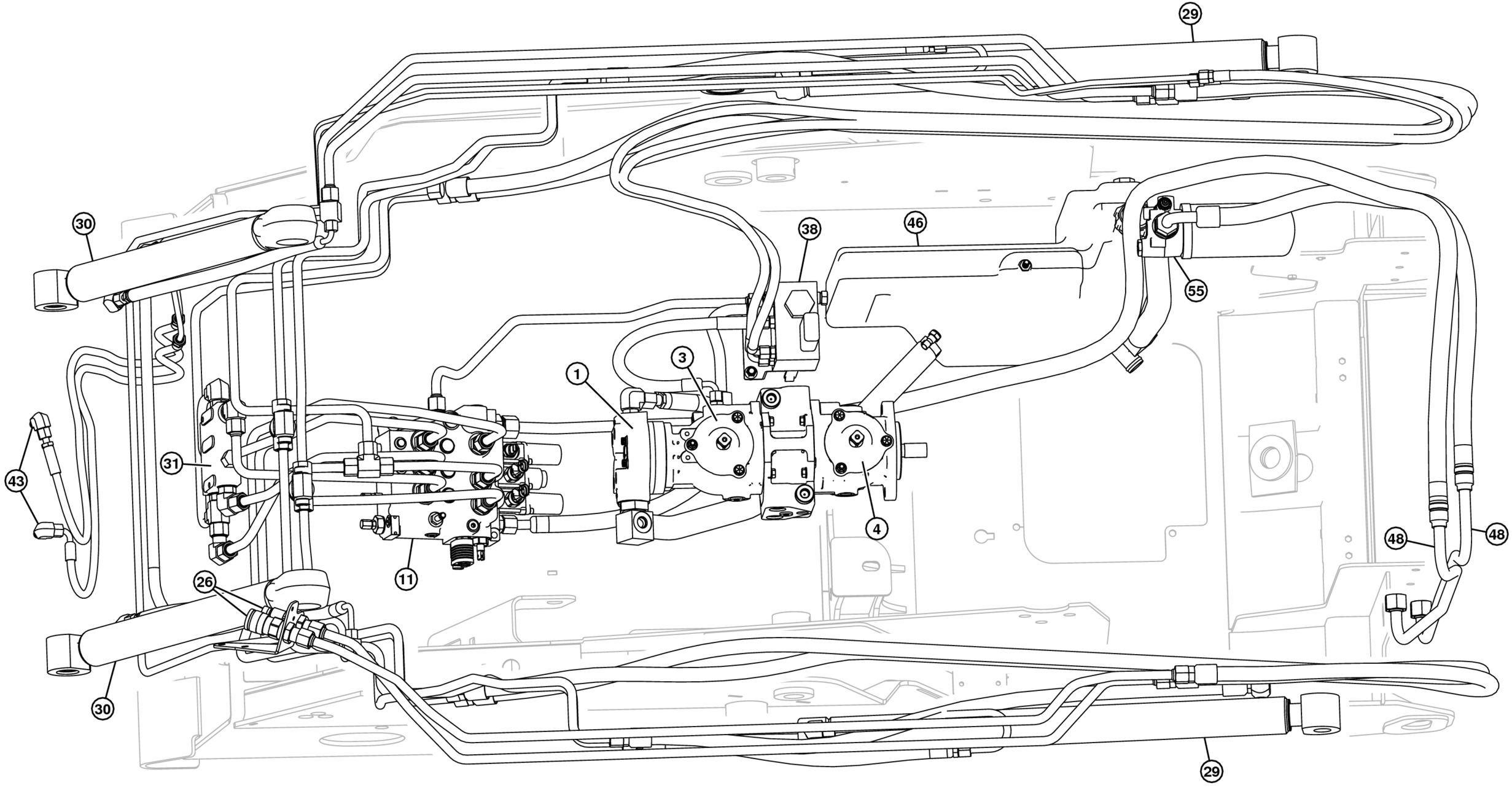


T209885

Hydraulic System Component Location—High Flow Hydraulics Option—Compact Track Loader (S.N. —150522)

LEGEND:

1	Hydraulic Pump
3	Left Hydrostatic Pump
4	Right Hydrostatic Pump
5	High Flow Hydraulic Pump—High Flow Option Only
11	Control Valve
26	Auxiliary Coupler (2 used)
29	Boom Cylinder (2 used)
30	Bucket Cylinder (2 used)
44	High Flow Solenoid Valve—High Flow Option Only
46	Hydraulic Oil Tank
48	To Hydraulic Oil Cooler
55	Hydraulic Oil Filter Manifold
76	High Flow Auxiliary Coupler—High Flow Option Only (2 used)

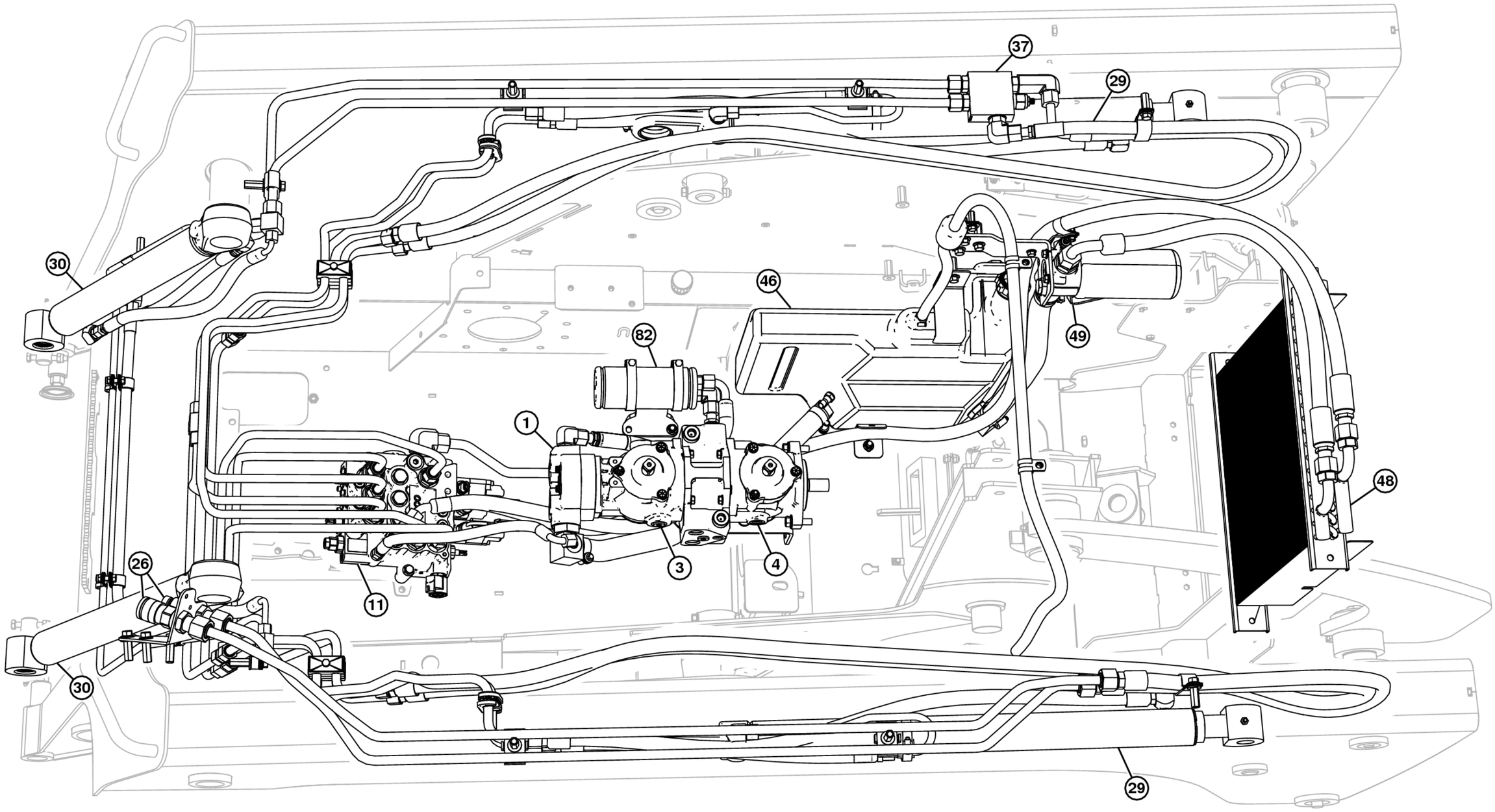


T210008

Hydraulic System Component Location—Self-Level and Hydraulic Quik-Tatch Options—Compact Track Loader (S.N. —150522)

LEGEND:

1	Hydraulic Pump
3	Left Hydrostatic Pump
4	Right Hydrostatic Pump
11	Control Valve
26	Auxiliary Coupler (2 used)
29	Boom Cylinder (2 used)
30	Bucket Cylinder (2 used)
31	Self-Level Valve
38	Quik-Tatch Solenoid Valve
43	To Quik-Tatch Cylinder
46	Hydraulic Oil Tank
48	To Hydraulic Oil Cooler
55	Hydraulic Oil Filter Manifold

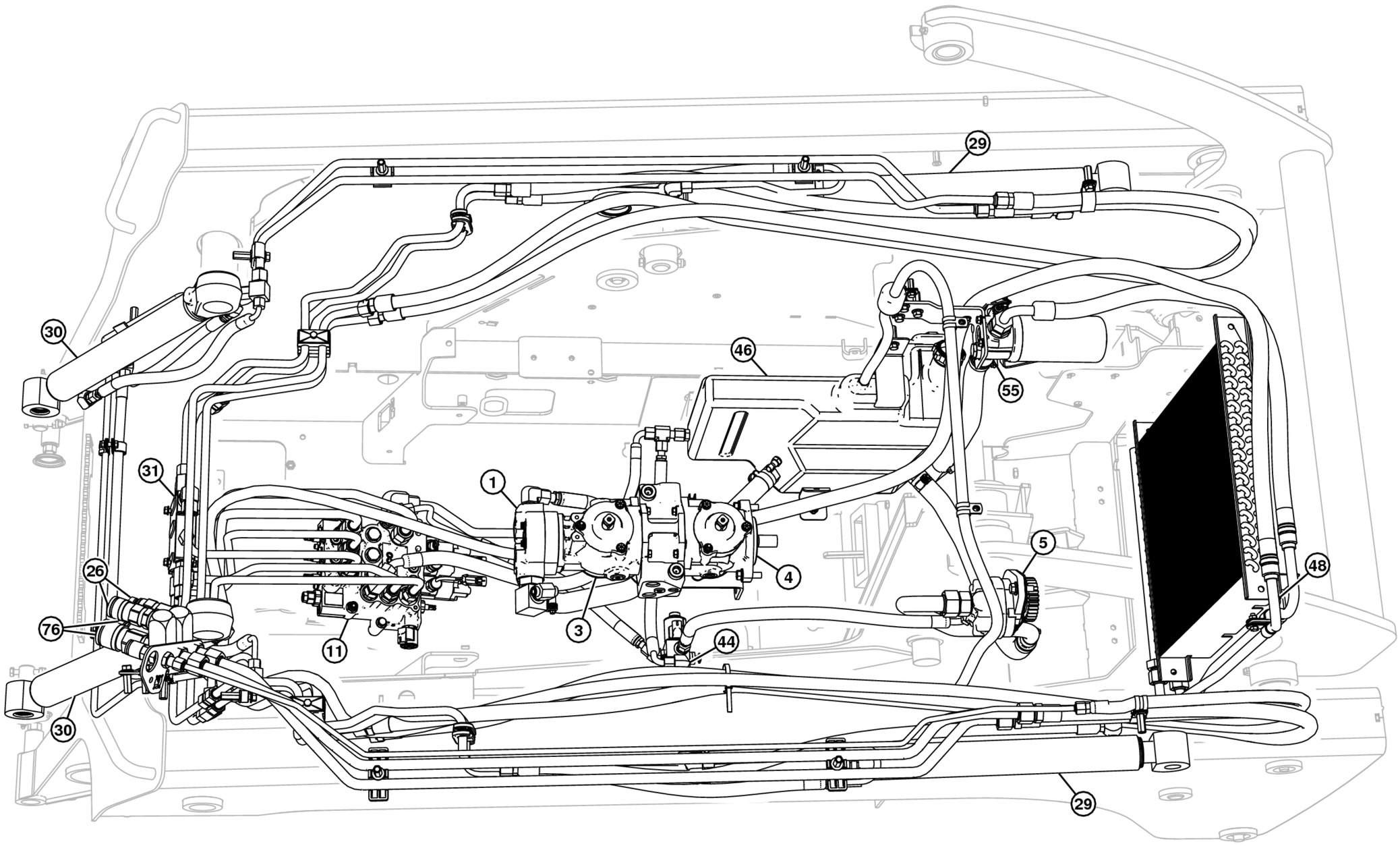


TX1024178

Hydraulic System Component Location—Skid Steer Loader (S.N. 150523—)

LEGEND:

1	Hydraulic Pump
3	Left Hydrostatic Pump
4	Right Hydrostatic Pump
11	Control Valve
26	Auxiliary Coupler (2 used)
29	Boom Cylinder (2 used)
30	Bucket Cylinder (2 used)
37	Counterbalance Valve
46	Hydraulic Oil Tank
48	Hydraulic Oil Cooler
49	Hydraulic Oil Filter and Park Brake Solenoid Valve Manifold
82	Attenuator—If Equipped



TX1024179

Hydraulic System Component Location—Self-Level and High Flow Hydraulics Options—Compact Track Loader (S.N. 150523—)

LEGEND:

1	Hydraulic Pump
3	Left Hydrostatic Pump
4	Right Hydrostatic Pump
5	High Flow Hydraulic Pump—High Flow Option Only
11	Control Valve
26	Auxiliary Coupler (2 used)
29	Boom Cylinder (2 used)
30	Bucket Cylinder (2 used)
31	Self-Level Valve
44	High Flow Solenoid Valve—High Flow Option Only
46	Hydraulic Oil Tank
48	Hydraulic Oil Cooler
55	Hydraulic Oil Filter Manifold
76	High Flow Auxiliary Coupler—High Flow Option Only (2 used)

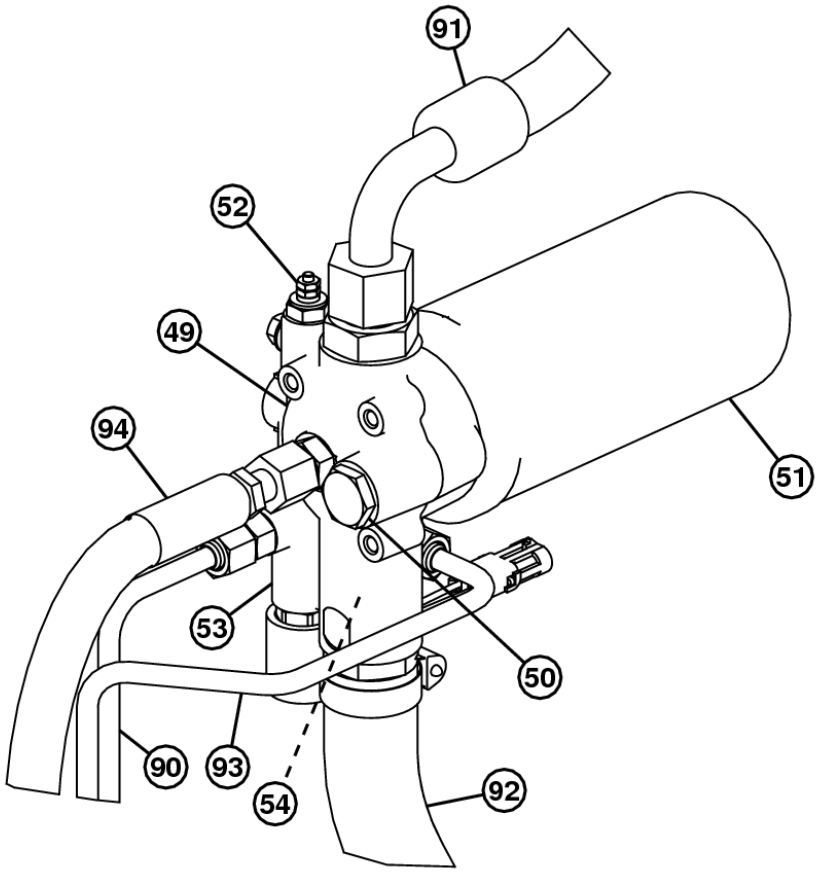
The hydraulic system provides fluid power to charge the hydrostatic system and to operate the boom and bucket cylinders and auxiliary hydraulic attachments.

The hydraulic system is an open-center system. In an open-center system, the first valve spool takes priority over the next valve spool downstream in the circuit. The hydraulic pump provides a continuous flow of hydraulic oil through a main circuit that connects to the controlling valves. If the valves are not operated, hydraulic oil flow passes through the open-center passage of each valve spool, hydraulic oil cooler, hydraulic oil filter and returns to the hydraulic oil tank. The hydraulic pump also provides a continuous flow of charge oil to the hydrostatic pumps.

For more information:

- See Hydraulic System Schematic—Skid Steer Loader (S.N. —150522) . (Group 9025-05.)
- See Hydraulic System Schematic—Skid Steer Loader (S.N. 150523—) . (Group 9025-05.)
- See Hydraulic System Schematic—Single Speed—Compact Track Loader (S.N. —150522) . (Group 9025-05.)
- See Hydraulic System Schematic—Single Speed—Compact Track Loader (S.N. 150523—) . (Group 9025-05.)
- See Hydraulic System Schematic—Two Speed—Compact Track Loader (S.N. —150522) . (Group 9025-05.)
- See Hydraulic System Schematic—Two Speed—Compact Track Loader (S.N. 150523—) . (Group 9025-05.)

Hydraulic Oil Filter and Park Brake Solenoid Valve Manifold Operation—Skid Steer Loader

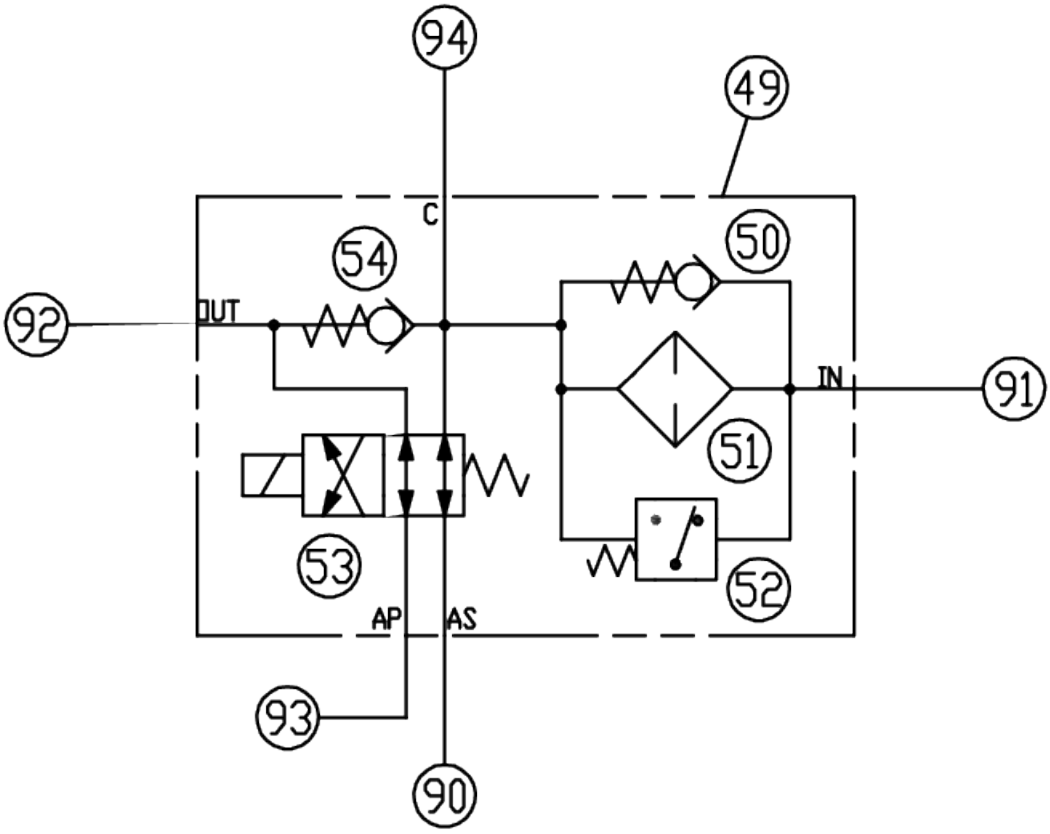


T197450

Hydraulic Oil Filter and Park Brake Solenoid Valve Manifold Component Location

LEGEND:

49	Hydraulic Oil Filter and Park Brake Solenoid Valve Manifold
50	Hydraulic Oil Filter Bypass Valve
51	Hydraulic Oil Filter
52	Hydraulic Oil Filter Restriction Switch
53	Park Brake Solenoid Valve
54	Charge Pressure Relief Valve
90	To Park Brake (piston side)
91	From Hydraulic Oil Cooler
92	To Hydraulic Oil Tank
93	To Park Brake (spring side)
94	To Hydrostatic Pumps



Hydraulic Oil Filter and Park Brake Solenoid Valve Manifold Schematic

LEGEND:

49	Hydraulic Oil Filter and Park Brake Solenoid Valve Manifold
50	Hydraulic Oil Filter Bypass Valve
51	Hydraulic Oil Filter
52	Hydraulic Oil Filter Restriction Switch
53	Park Brake Solenoid Valve
54	Charge Pressure Relief Valve
90	To Park Brake (piston side)
91	From Hydraulic Oil Cooler
92	To Hydraulic Oil Tank
93	To Park Brake (spring side)
94	To Hydrostatic Pumps

The hydraulic oil filter and park brake solenoid valve manifold (49) contains the hydraulic oil filter (51), hydraulic oil filter restriction switch (52), hydraulic oil filter bypass valve (50), charge pressure relief valve (54) and park brake solenoid valve (53).

Hydraulic oil from the hydraulic oil cooler (91) flows to the hydraulic oil filter and charge pressure relief valve before entering the hydraulic oil tank (92). The hydraulic oil filter is a canister-type, screw-on filter.

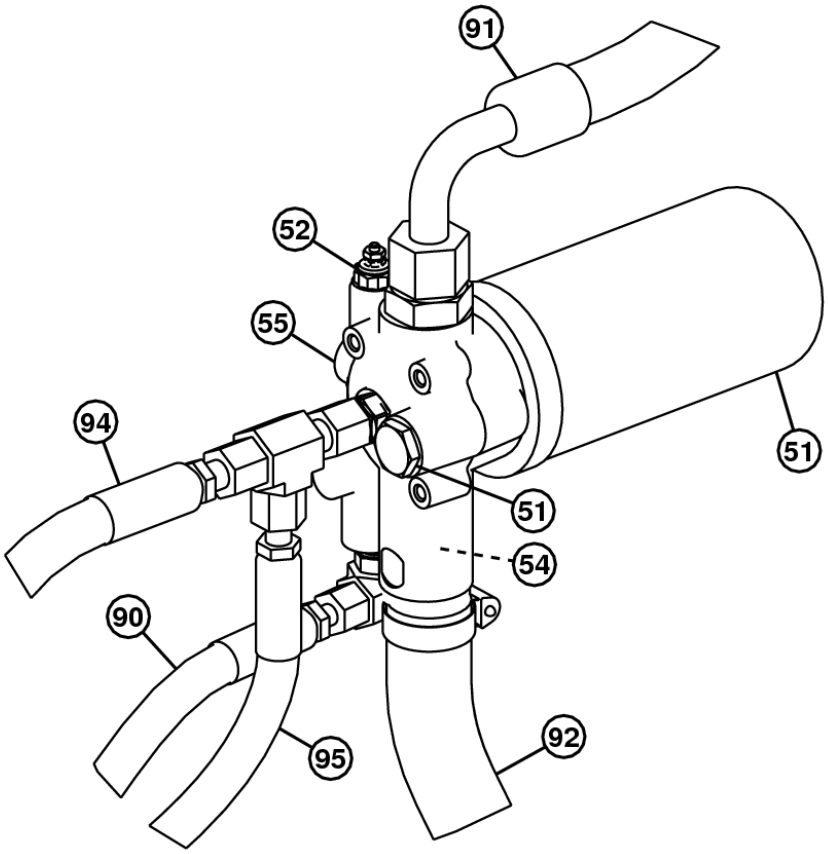
If the pressure differential at the hydraulic oil filter rises above a specified value, the hydraulic oil filter restriction switch sends a signal to the engagement and monitor unit to indicate a plugged hydraulic oil filter. See Engagement and Monitor Unit Circuit Theory of Operation for Hydraulic Oil Filter Restriction Switch (B3). (Group 9015-15.)

As the pressure differential at the hydraulic oil filter continues to rise above the specified value, the hydraulic oil filter bypass valve opens, allowing unfiltered hydraulic oil to flow to the hydrostatic pumps and park brakes (94, 90 and 93.)

The charge pressure relief valve maintains charge pressure and is not adjustable. It is located in the outlet port of the manifold.

The park brake solenoid valve controls park brake actuation by sending charge pressure oil to the park brake. See Park Brake System Operation . (Group 9026-05.)

Hydraulic Oil Filter Manifold Operation—Compact Track Loader

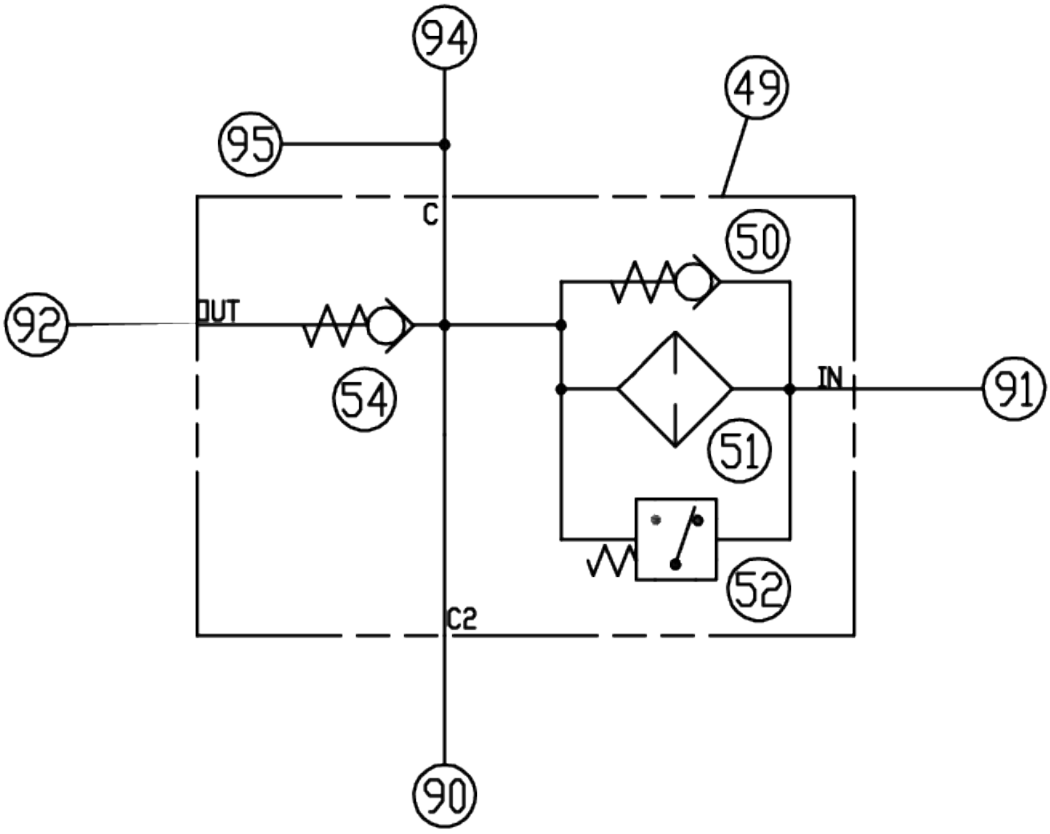


T209887

Hydraulic Oil Filter Manifold Component Location—Two Speed—Compact Track Loader

LEGEND:

50	Hydraulic Oil Filter Bypass Valve
51	Hydraulic Oil Filter
52	Hydraulic Oil Filter Restriction Switch
54	Charge Pressure Relief Valve
55	Hydraulic Oil Filter Manifold
90	To Park Brake Solenoid Valve Manifold
91	From Hydraulic Oil Cooler
92	To Hydraulic Oil Tank
94	To Hydrostatic Pumps
95	To Two Speed Proportional Solenoid Valve (Two Speed Machines Only)



Hydraulic Oil Filter Manifold Schematic—Compact Track Loader

LEGEND:

50	Hydraulic Oil Filter Bypass Valve
51	Hydraulic Oil Filter
52	Hydraulic Oil Filter Restriction Switch
54	Charge Pressure Relief Valve
55	Hydraulic Oil Filter Manifold
90	To Park Brake Solenoid Valve Manifold
91	From Hydraulic Oil Cooler
92	To Hydraulic Oil Tank
94	To Hydrostatic Pumps
95	To Two Speed Proportional Solenoid Valve (Two Speed Machines Only)

The hydraulic oil filter manifold (55) contains the hydraulic oil filter (51), hydraulic oil filter restriction switch (52), hydraulic oil filter bypass valve (50) and charge pressure relief valve (54).

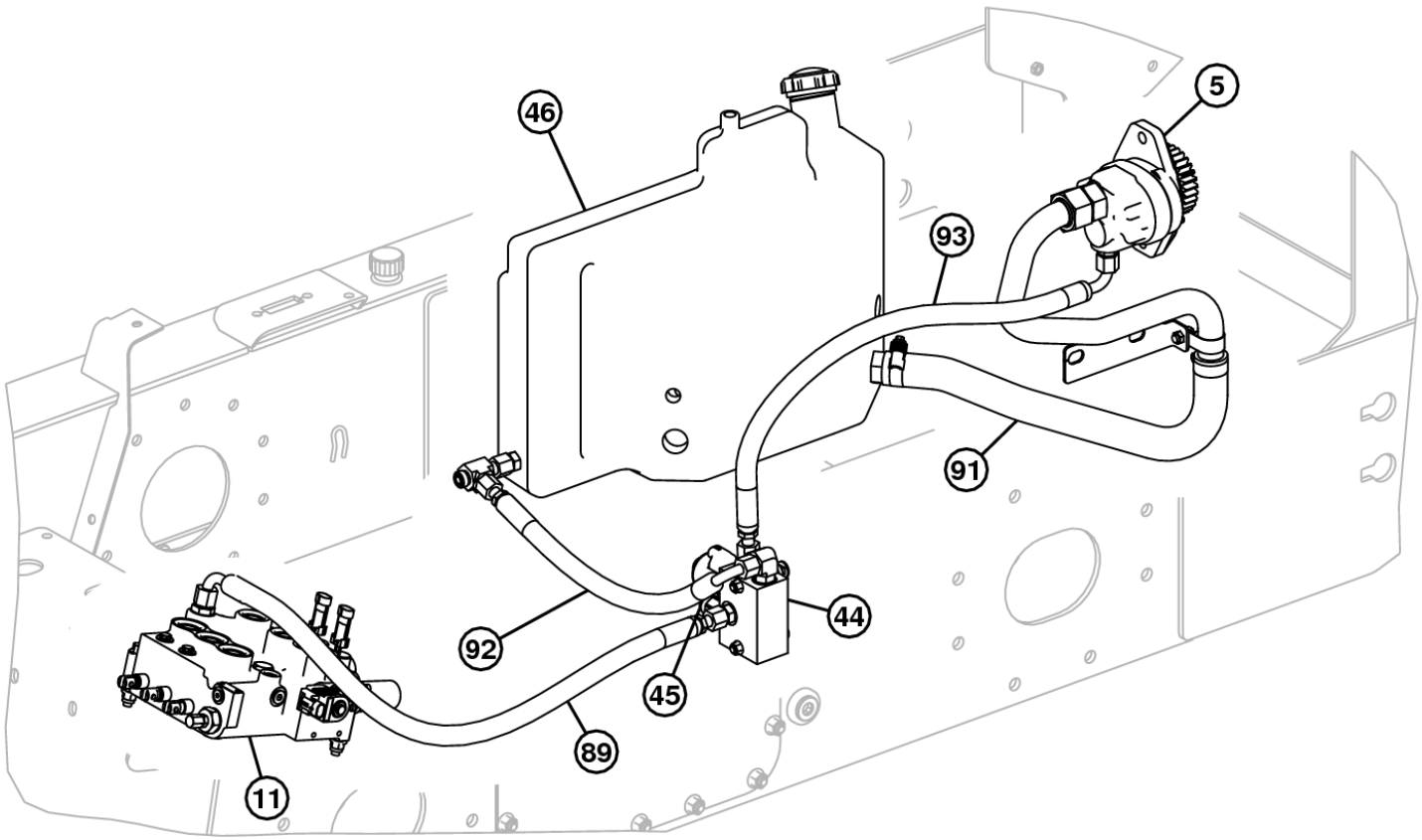
Hydraulic oil from the hydraulic oil cooler (91) flows to the hydraulic oil filter and charge pressure relief valve before entering the hydraulic oil tank (92). The hydraulic oil filter is a canister-type, screw-on filter.

If the pressure differential at the hydraulic oil filter rises above a specified value, the hydraulic oil filter restriction switch sends a signal to the engagement and monitor unit to indicate a plugged hydraulic oil filter. See Engagement and Monitor Unit Circuit Theory of Operation for Hydraulic Oil Filter Restriction Switch (B3). (Group 9015-15.)

As the pressure differential at the hydraulic oil filter continues to rise above the specified value, the hydraulic oil filter bypass valve opens, allowing unfiltered hydraulic oil to flow to the hydrostatic pumps, park brake solenoid valve manifold and two speed proportional solenoid valve (on two speed machines) (94, 90 and 95.)

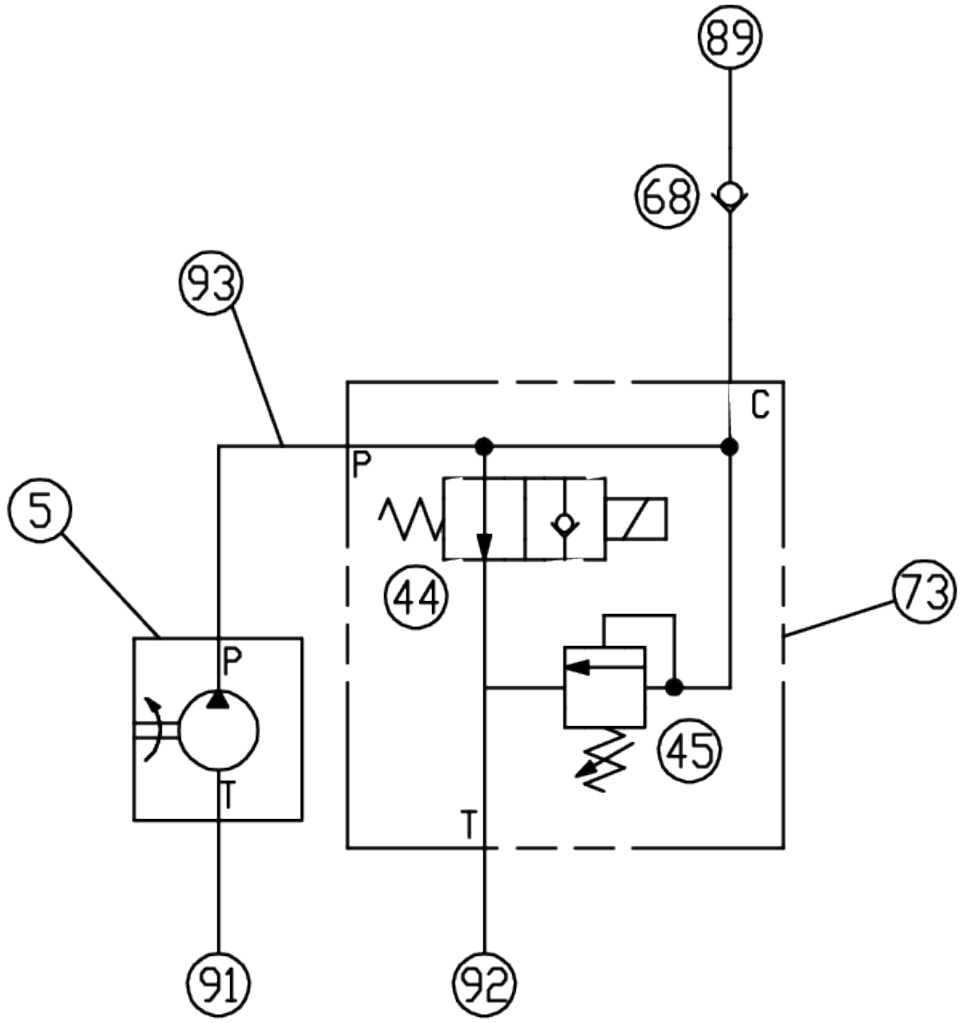
The charge pressure relief valve maintains charge pressure and is not adjustable. It is located in the outlet port of the manifold.

High Flow Hydraulic Pump Operation



T197547

High Flow Hydraulic Pump Component Location



High Flow Hydraulic Pump Schematic

LEGEND:

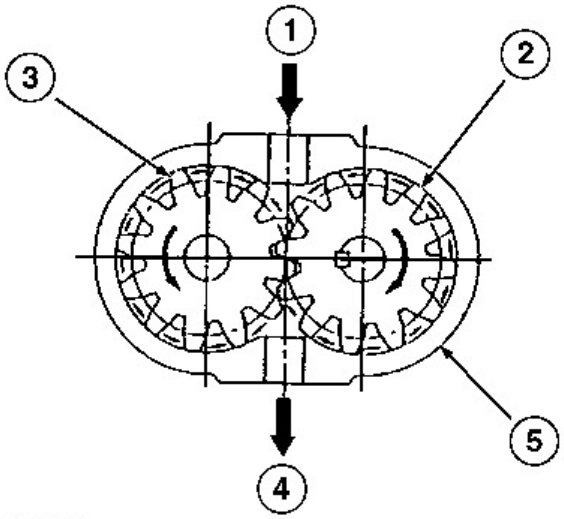
5	High Flow Hydraulic Pump
11	Control Valve
44	High Flow Solenoid Valve
45	High Flow Relief Valve
46	Hydraulic Oil Tank
68	Check Valve
73	High Flow Valve
89	To Auxiliary Valve Spool
91	From Hydraulic Oil Tank
92	To Hydraulic Oil Tank
93	To High Flow Solenoid Valve

→NOTE:

High flow hydraulic pump is optional equipment.

High flow hydraulic pump is not available with hydraulic Quik-Tatch ™ option.

The high flow hydraulic pump (5) is for attachments that require a high hydraulic oil flow rate to operate. It is located on the side of the engine and driven by the engine auxiliary drive gear. The high flow hydraulic pump draws oil from the hydraulic oil tank (46) and supplies a constant flow of oil to the high flow solenoid valve (44). The high flow relief valve (45) is an adjustable relief valve. It maintains a set pressure in the high flow hydraulic circuit.



TX1071201

LEGEND:

1	Suction Port
2	Drive Gear
3	Driven Gear
4	Delivery Port
5	Housing

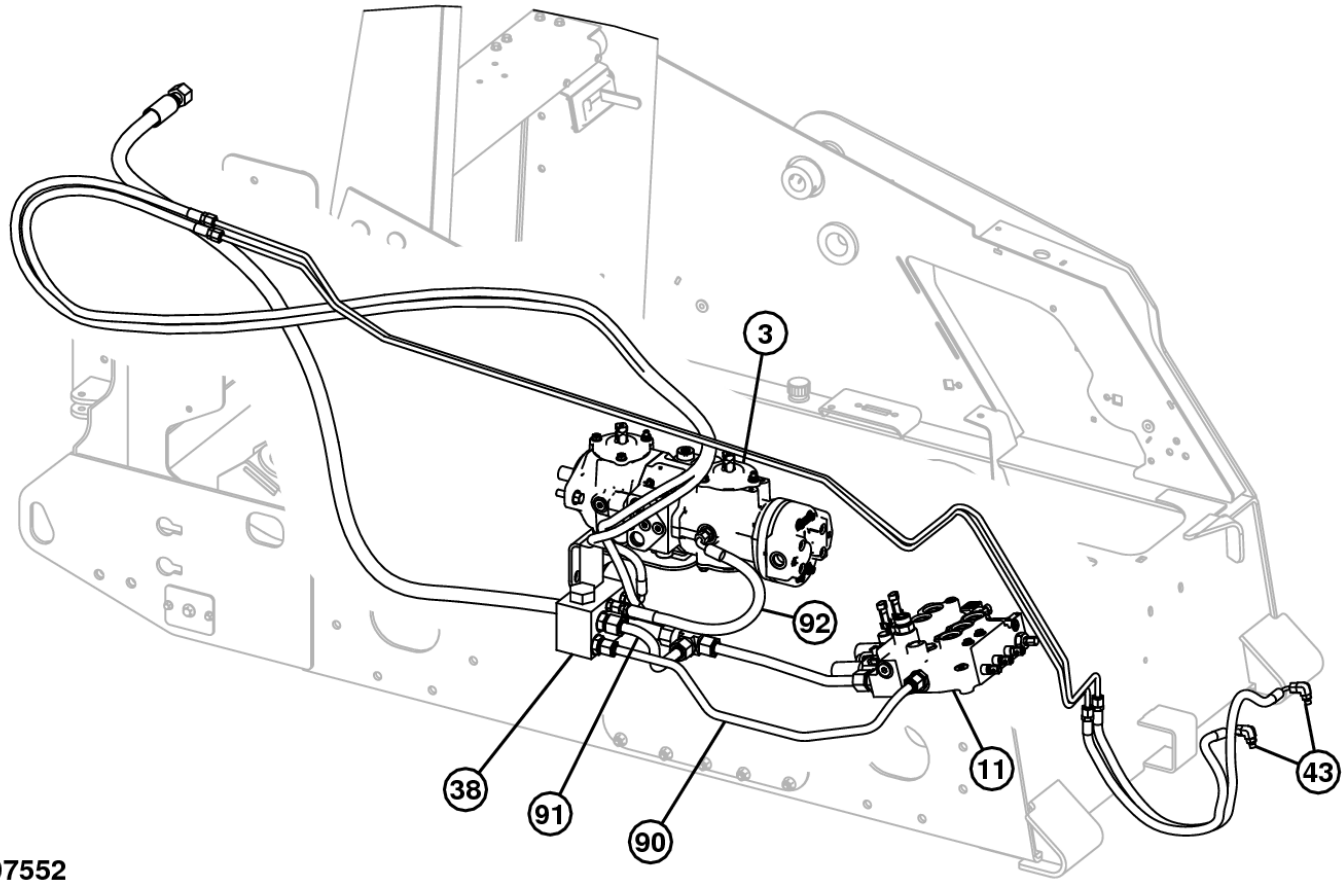
High Flow Pump

The high flow pump is a fixed displacement, external gear pump. An external gear pump has two gears in mesh, closely fitted inside a housing (5). A drive shaft drives one gear (drive gear) (2), which in turn drives the other gear (driven gear) (3).

As the gears rotate and come out of mesh, oil enters the suction port (1) and fills the cavity between the gear teeth. Oil is carried in the tooth cavity to the delivery port (4). As the gears come into mesh again oil is forced out of the delivery port and sent through the system.

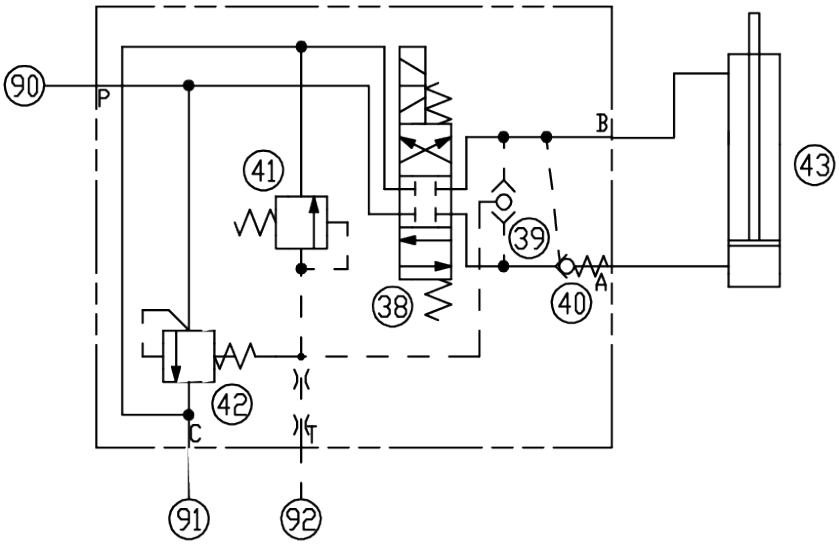
When the high flow switch is in the off position, the high flow hydraulic pump will pump oil through the high flow solenoid valve and back to the hydraulic oil tank. To enable high flow hydraulics, the high flow switch must be momentarily held in the on position. When released, the high flow switch will return to the run position. This energizes the high flow solenoid valve and oil is routed to the control valve (11) and through the auxiliary valve spool to the attachment. With the high flow switch in the run position, high flow hydraulics will be enabled until the high flow switch is turned to the off position. The machine will automatically return to standard flow hydraulics when the engine is shut off.

Hydraulic Quik-Tatch Operation (S.N. —131876)



T197552

Hydraulic Quik-Tatch Component Location



T194516

Hydraulic Quik-Tatch Schematic

LEGEND:

3	Left Hydrostatic Pump
11	Control Valve
38	Solenoid Valve
39	Shuttle Valve
40	Check Valve
41	Circuit Relief Valve
42	Diverter Valve
43	Cylinder

90	From Control Valve
91	To Hydraulic Oil Tank
92	To Left Hydrostatic Pump

→NOTE:

Hydraulic Quik-Tatch is optional equipment.

→NOTE:

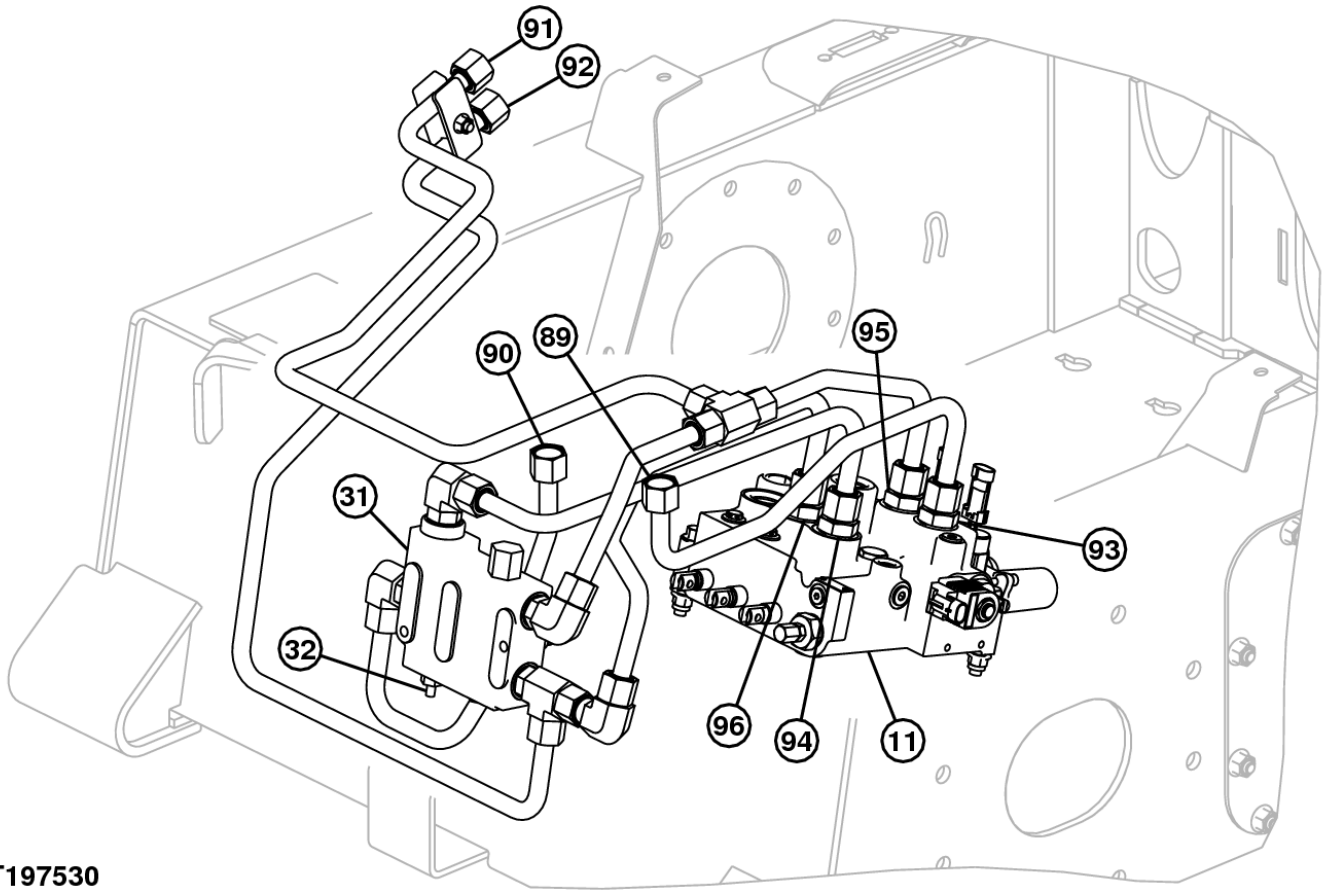
Hydraulic Quik-Tatch is not available with high flow hydraulic pump option.

Hydraulic Quik-Tatch allows the operator to change attachments without having to leave the cab.

When the operator presses the Quik-Tatch switch, the spool in the solenoid valve (38) is shifted, allowing hydraulic oil to flow to the cylinder (43). Each end of the cylinder is attached to one of the Quik-Tatch latches and takes the place of the standard manual levers. The cylinder will extend or retract, depending on whether the operator is latching or unlatching the attachment. Check valve (40) prevents oil from escaping from the cylinder to ensure positive engagement of Quik-Tatch latches.

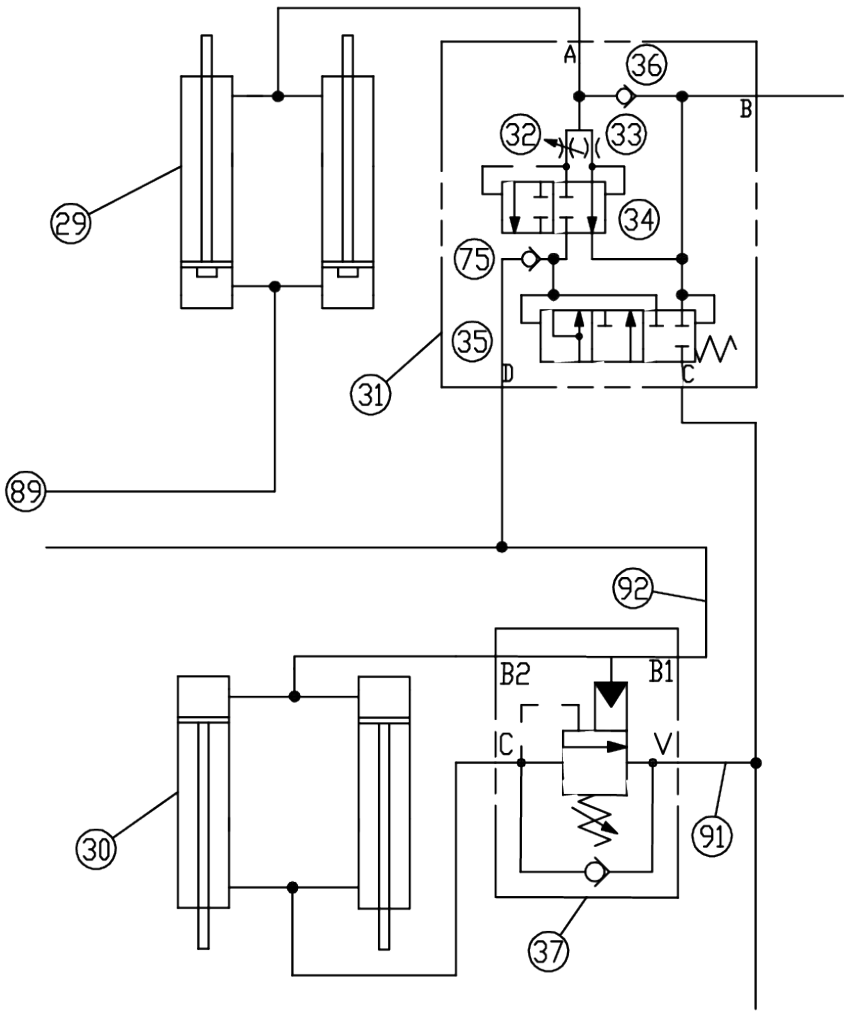
As resistance in the circuit increases, shuttle valve (39) directs oil to the circuit relief valve (41), which allows oil to flow to the hydraulic oil tank. Diverter valve (42) allows hydraulic oil to flow to the hydraulic oil tank when the Quik-Tatch circuit is in neutral.

Self-Level Valve Operation



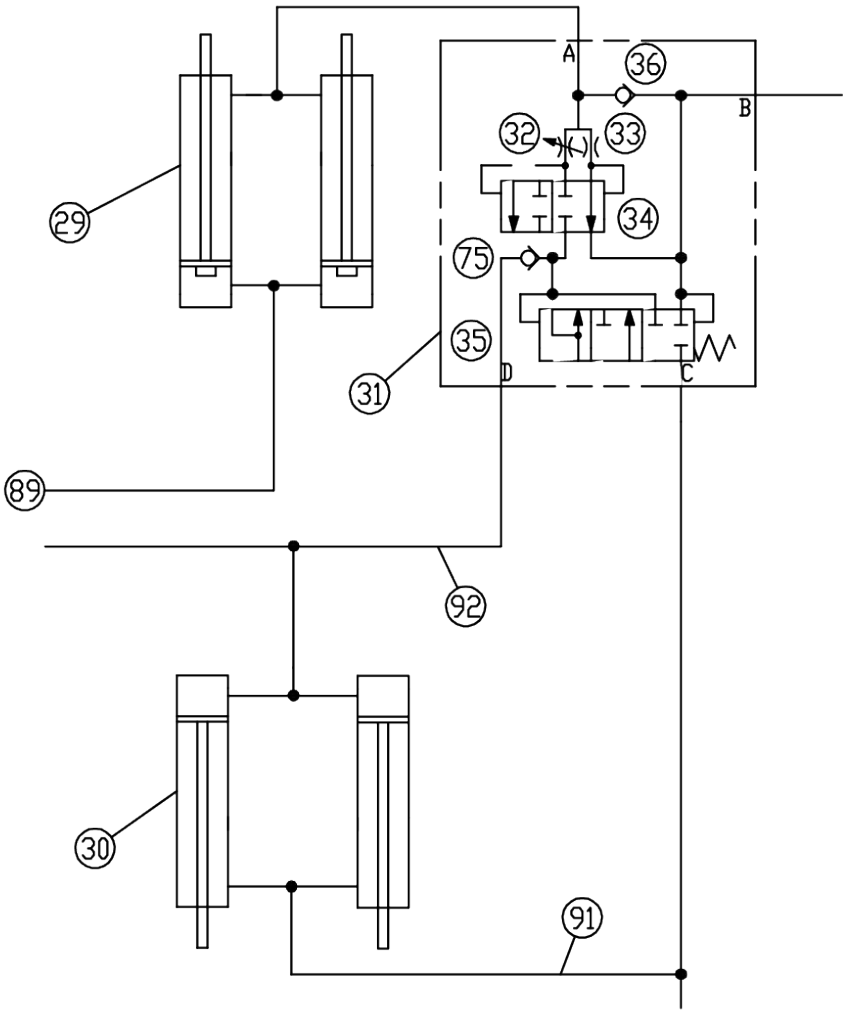
T197530

Self-Level Valve Component Location (S.N. —150522 shown)



T212657

Self-Level Valve Schematic—Skid Steer Loader



T210004

Self-Level Valve Schematic—Compact Track Loader

LEGEND:

11	Control Valve
29	Boom Cylinder (2 used)
30	Bucket Cylinder (2 used)
31	Self-Level Valve
32	Adjustable Orifice
33	Orifice
34	Flow Divider Valve
35	Unloader Valve
36	Check Valve
37	Counterbalance Valve
75	Check Valve
89	To Boom Cylinders (boom up)
90	To Boom Cylinders (boom down)
91	To Bucket Cylinders (bucket rollback)
92	To Bucket Cylinders (bucket dump)
93	Boom Up
94	Boom Down
95	Bucket Rollback
96	Bucket Dump

→NOTE:

Self-level valve is optional equipment.

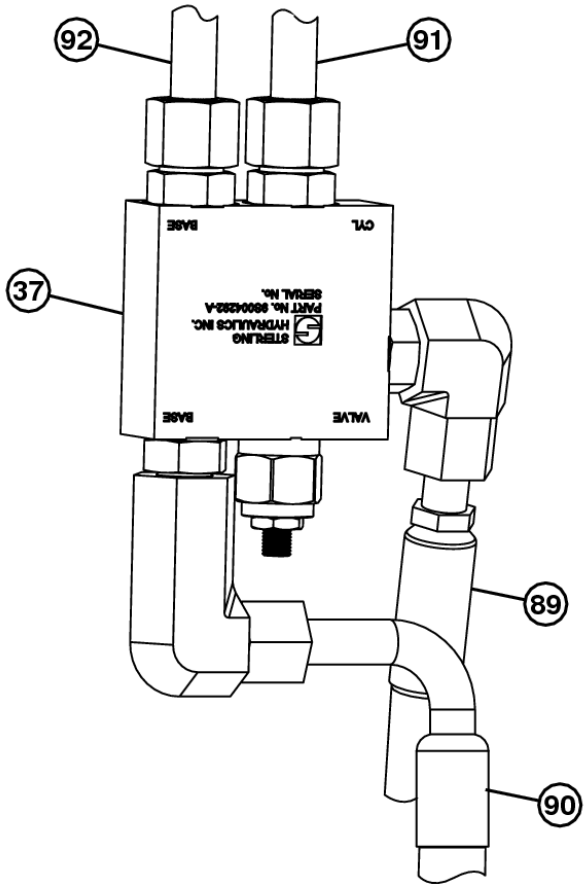
The self-level valve automatically levels attachments as the boom is raised by routing hydraulic oil from the rod end of the boom cylinders to the head end of the bucket cylinders.

As the boom cylinders (29) extend, oil from the rod end is directed through a adjustable orifice (32) and a fixed orifice (33) at the flow divider valve (34). The proportion of the oil flow is determined by the size of the adjustable orifice. Oil from the adjustable orifice flows to the head end of the bucket cylinders (30) and the remainder of the oil goes through the fixed orifice to the hydraulic oil tank. The adjustable orifice is screw adjustable. Turning the screw in completely turns off the self-level feature. Removal of check valve (36) will disable the self-level feature and allow boom float to function.

Resistance to movement of the bucket cylinders creates a pressure high enough to shift the unloader valve (35). As the bucket cylinders extend, oil from the rod end flows past the unloader valve to the hydraulic oil tank. The unloader valve prevents the bucket cylinders from dumping during the self-leveling cycle. The self-level feature does not operate when the boom is lowered.

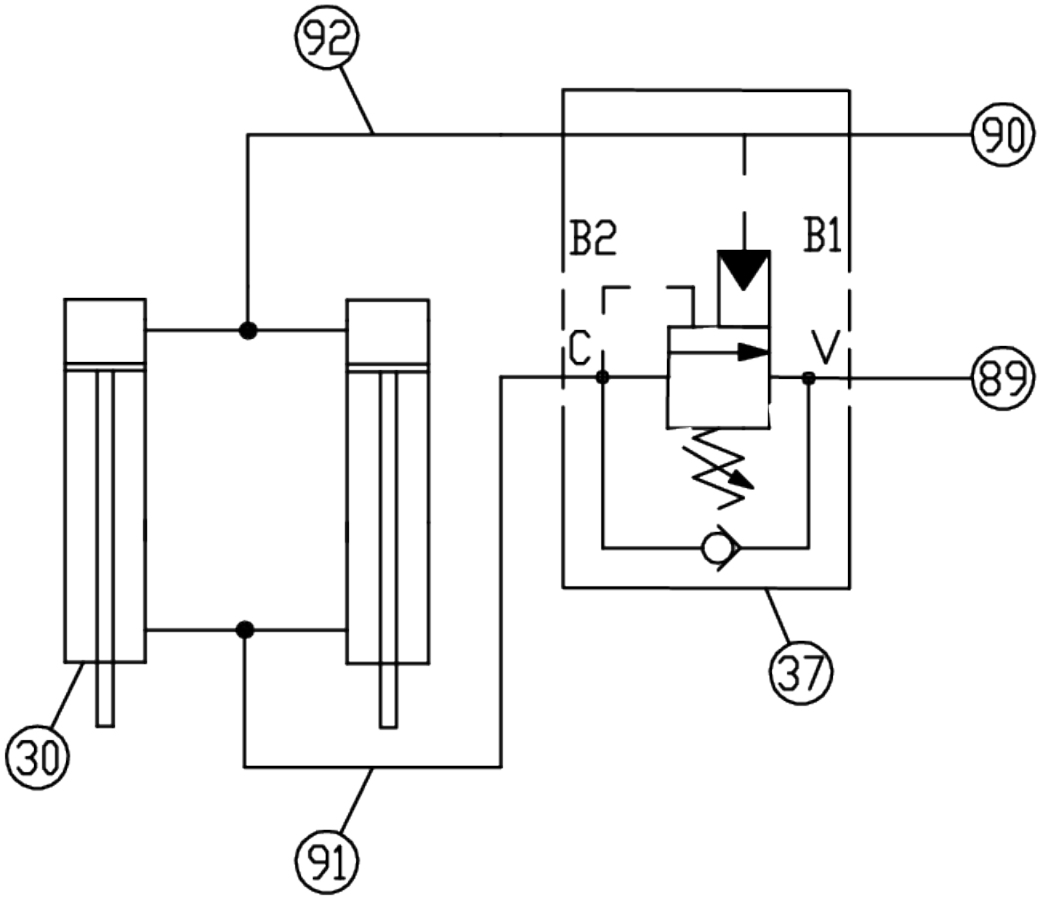
When the bucket cylinders are fully extended while the boom is being raised, the unloader valve shifts blocking oil flow to the head end of the bucket cylinders. Oil is routed to the hydraulic oil tank to allow the boom to raise.

Counterbalance Valve Operation—Skid Steer Loader



T197547

Counterbalance Valve Component Location



Counterbalance Valve Schematic

LEGEND:

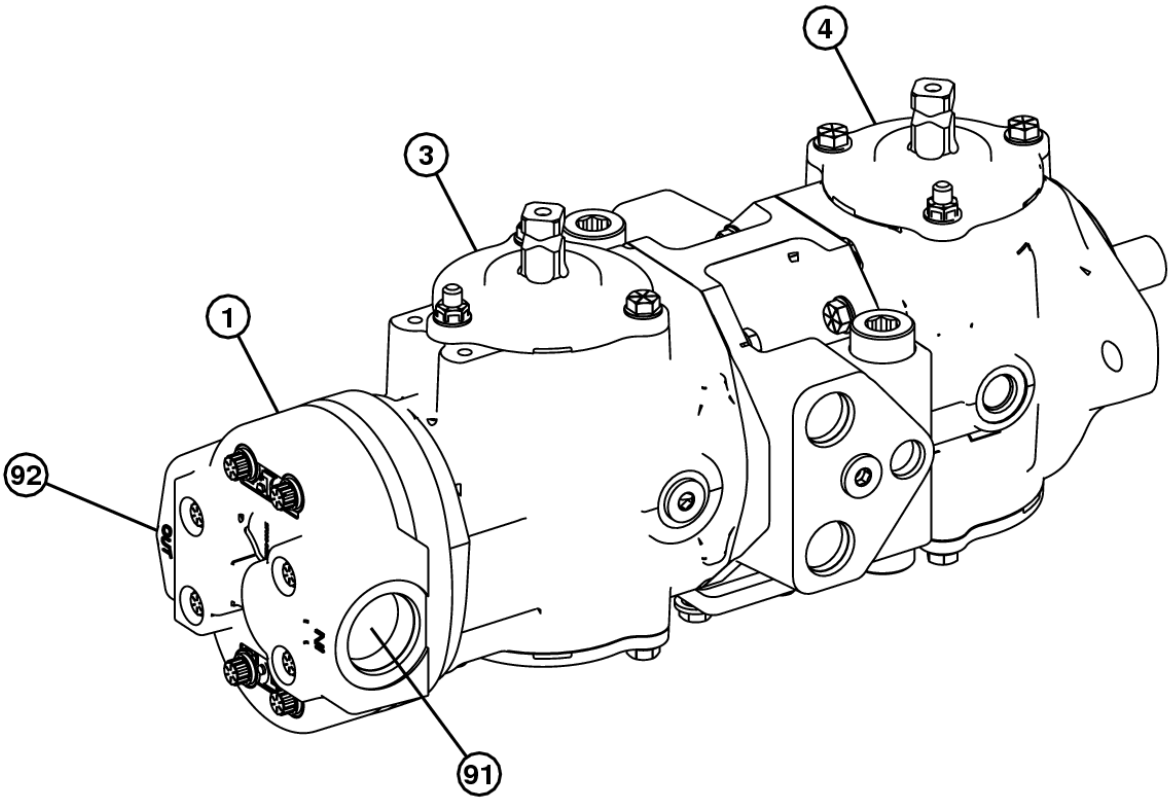
30	Bucket Cylinder (2 used)
37	Counterbalance Valve
89	From Control Valve (bucket rollback)
90	From Control Valve (bucket dump)
91	To Bucket Cylinders (bucket rollback)
92	To Bucket Cylinders (bucket dump)

The counterbalance valve is located near the right rear of the boom frame and is connected to the bucket hydraulic lines. It controls oil flow during bucket dump operation while maintaining pressure in the bucket dump circuit and preventing the loss of charge pressure elsewhere in the system.

When the bucket valve spool is moved to the bucket dump position, hydraulic oil going to the head end of the bucket cylinders (30) assists rod end pressure to open the counterbalance valve (37), opening a path for return oil from the rod end of the bucket cylinders.

When the bucket valve spool is moved to the bucket rollback position, oil to the rod end of the bucket cylinders bypasses the counterbalance valve spool through a check valve. Return oil from the head end of the bucket cylinders passes through the counterbalance valve and back to the control valve.

Hydraulic Pump Operation



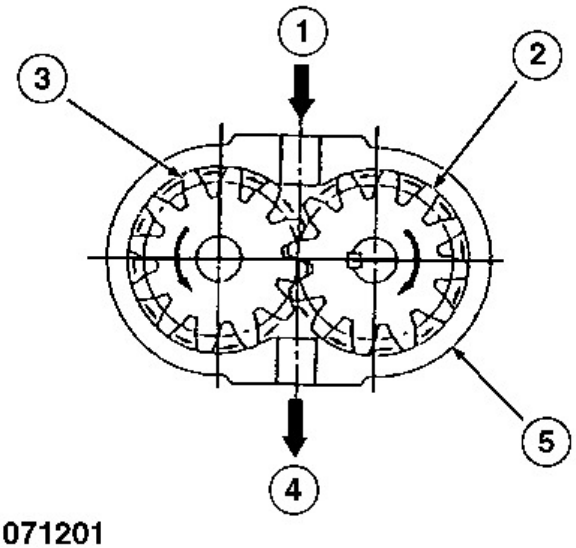
T197598

Hydraulic Pump Component Location

LEGEND:

1	Hydraulic Pump
3	Left Hydrostatic Pump
4	Right Hydrostatic Pump
91	From Hydraulic Oil Tank
92	To Control Valve

The hydraulic pump (1) is a fixed displacement, external gear pump. The pump is mounted and driven off the end of the left hydrostatic pump (3). The pump draws hydraulic oil from the hydraulic oil tank (91) and supplies a constant flow of oil to the control valve (92). It also supplies charge oil to the hydrostatic pumps.



LEGEND:

1	Suction Port
2	Drive Gear
3	Driven Gear
4	Delivery Port
5	Housing

TX1071201

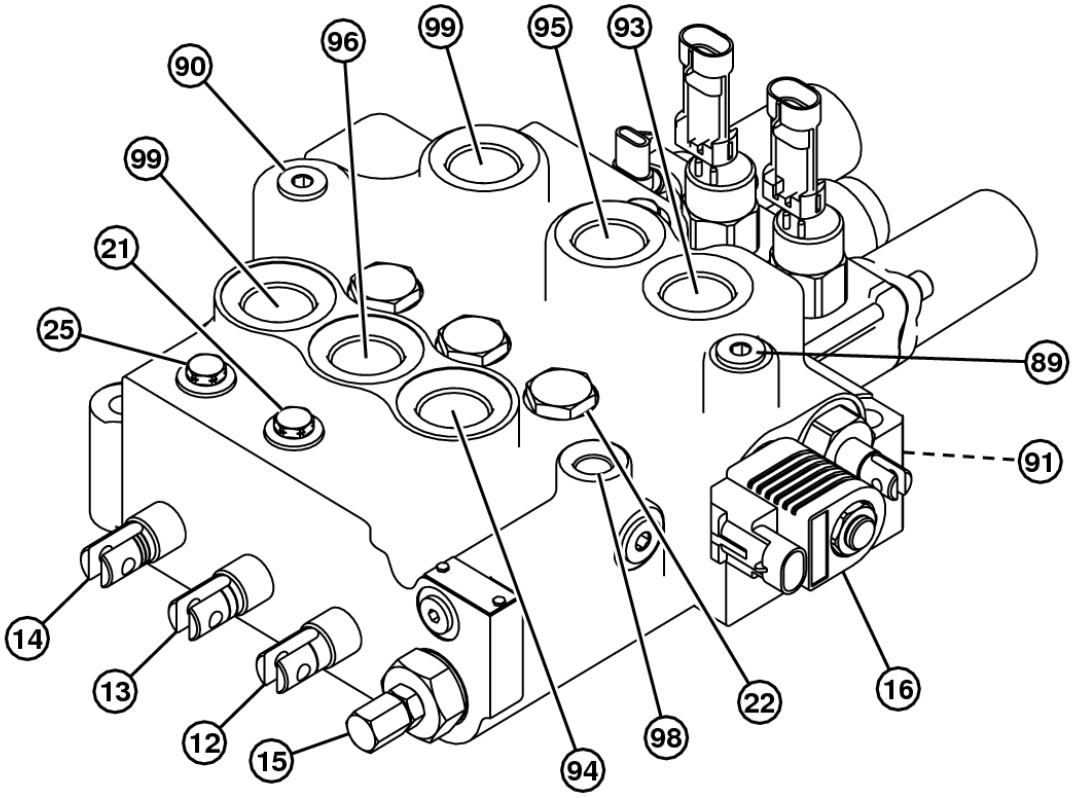
Hydraulic Pump

The hydraulic pump is a fixed displacement, external gear pump. An external gear pump has two gears in mesh, closely fitted

inside a housing (5). A drive shaft drives one gear (drive gear) (2), which in turn drives the other gear (driven gear) (3).

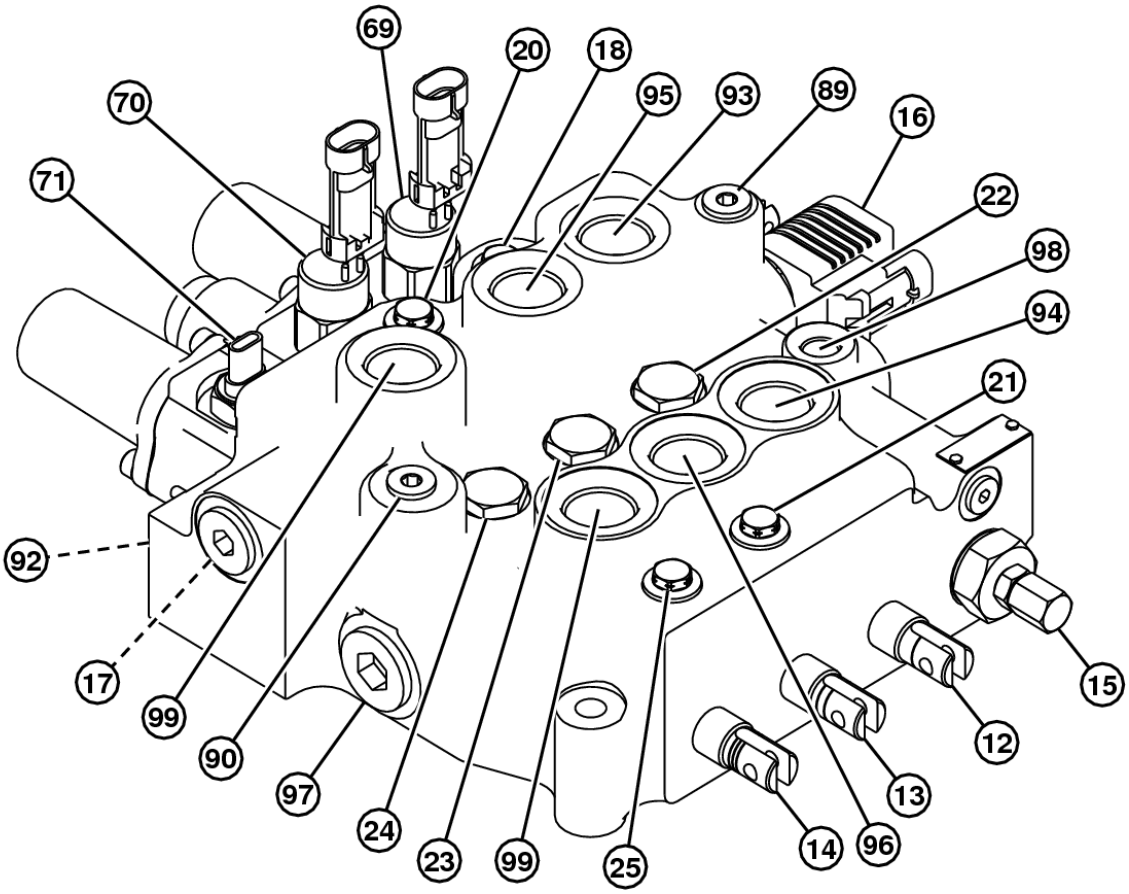
As the gears rotate and come out of mesh, oil enters the suction port (1) and fills the cavity between the gear teeth. Oil is carried in the tooth cavity to the delivery port (4). As the gears come into mesh again oil is forced out of the delivery port and sent through the system.

Control Valve Operation (S.N. —150522)



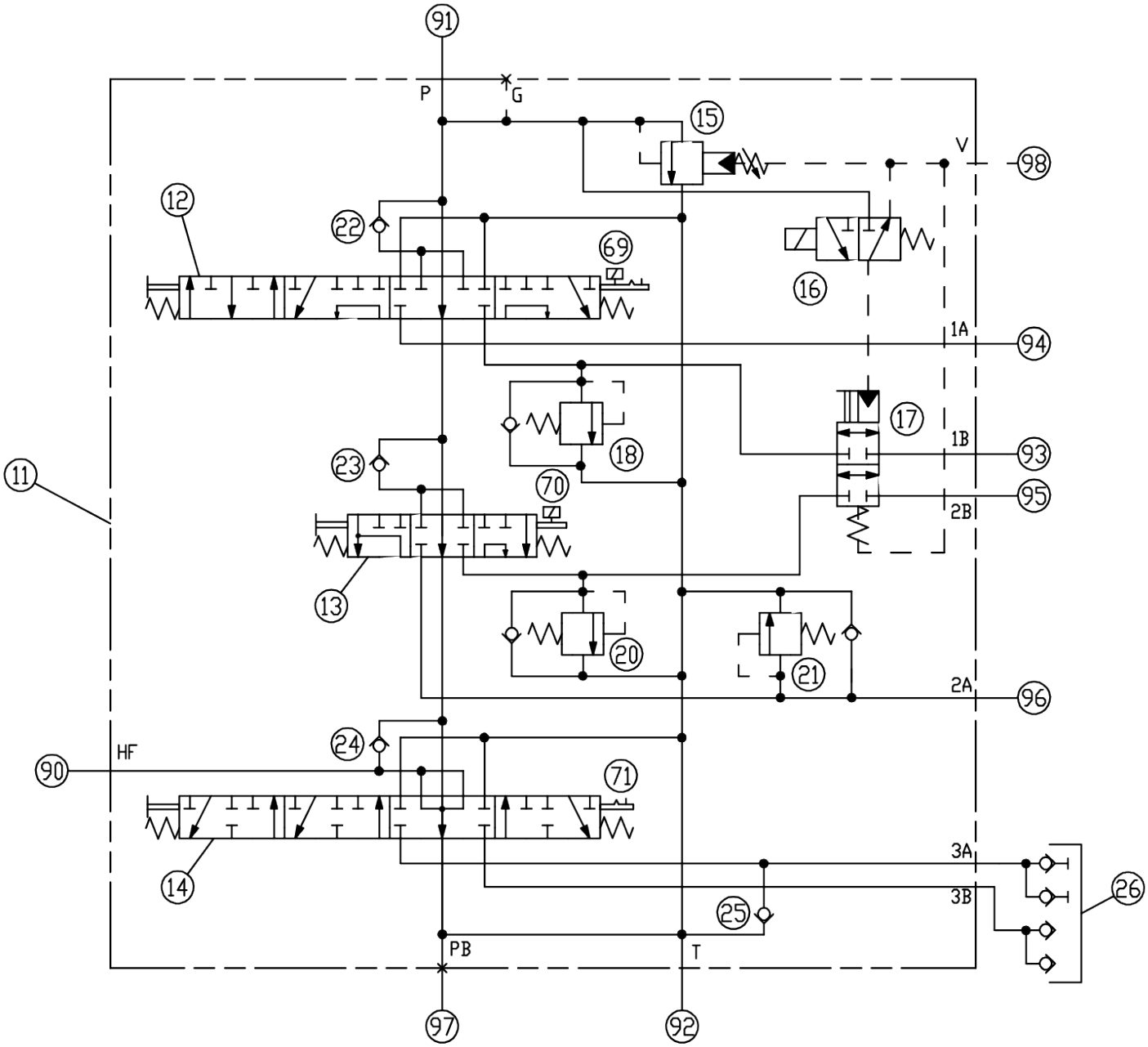
T197612

Control Valve Component Location (S.N. —150522)



T197613

Control Valve Component Location (S.N. —150522)



T194627

Control Valve Schematic (S.N. —150522)

LEGEND:

11	Control Valve
12	Boom Spool
13	Bucket Spool
14	Auxiliary Spool
15	System Relief Valve
16	Port Lock Solenoid Valve
17	Port Lock Spool
18	Boom Up Circuit Relief and Anticavitation Valve
20	Bucket Rollback Circuit Relief and Anticavitation Valve
21	Bucket Dump Circuit Relief and Anticavitation Valve
22	Boom Lift Check Valve
23	Bucket Lift Check Valve
24	Auxiliary Lift Check Valve
25	Anticavitation Valve
26	Auxiliary Coupler
69	Boom Spool Lock Solenoid

70	Bucket Spool Lock Solenoid
71	Auxiliary Hydraulic Spool Neutral Switch
89	Not Used
90	From High Flow Hydraulic Pump
91	From Hydraulic Pump
92	To Hydraulic Oil Tank
93	Boom Up Port
94	Boom Down Port
95	Bucket Rollback Port
96	Bucket Dump Port
97	To Hydraulic Quik-Tatch
98	To Hydraulic Oil Tank
99	Auxiliary Port

The control valve (11) integrates three valve spools and pressure relief valves for the individual circuits and the entire system into one housing.

Boom Cylinder Circuit

The first spool in the series, and therefore first priority, controls the boom cylinder circuit. When the boom spool (12) is actuated, the open-center port is blocked and oil is directed to the appropriate side of the boom cylinders (94). Return oil from the cylinders flows through the control valve to the hydraulic oil cooler, hydraulic oil filter and hydraulic oil tank (92). The boom up circuit relief and anticavitation valve (18) protects the circuit from excessive pressure when the boom spool is in neutral and also prevents cavitation. The boom lift check valve (22) prevents unwanted movement in the circuit.

A boom spool lock solenoid (69) is mounted to the boom spool as a safety device. The boom spool lock solenoid controls a mechanical lockout pin on the boom spool. When the lockout pin is engaged, the boom spool will not move, thus preventing hydraulic oil flow to the boom circuit. When the boom spool lock solenoid is energized, the lockout pin is disengaged allowing boom spool movement and hydraulic oil flow to the boom circuit. See Engagement and Monitor Unit Circuit Theory of Operation for Interlock Logic. (Group 9015-15.)

Bucket Cylinder Circuit

The second spool in the series controls the bucket cylinder circuit. When the bucket spool (13) is actuated, the open-center port is blocked and oil is directed to the appropriate side of the bucket cylinders (96). Return oil from the cylinders flows through the control valve to the hydraulic oil cooler, hydraulic oil filter and hydraulic oil tank (92). The bucket rollback and bucket dump circuit relief and anticavitation valves (20 and 21) protect the circuit from excessive pressure when the bucket spool is in neutral and prevent cavitation. The bucket lift check valve (23) prevents unwanted movement in the circuit.

A bucket spool lock solenoid (70) is mounted to the boom spool as a safety device. The bucket spool lock solenoid controls a mechanical lockout pin on the bucket spool. When the lockout pin is engaged, the bucket spool will not move, thus preventing hydraulic oil flow to the bucket circuit. When the bucket spool lock solenoid is energized, the lockout pin is disengaged allowing bucket spool movement and hydraulic oil flow to the bucket circuit. See Engagement and Monitor Unit Circuit Theory of Operation for Interlock Logic. (Group 9015-15.)

Auxiliary Hydraulic Circuit

The third spool in the series provides hydraulic oil to operate optional auxiliary hydraulic attachments. When the auxiliary spool (14) is actuated, the open-center port is blocked and oil is directed to the appropriate side of the attachment circuit through the auxiliary couplers (26). Return oil from the attachment flows through the control valve to the hydraulic oil cooler, hydraulic oil filter and hydraulic oil tank (92).

The auxiliary lift check valve (24) prevents unwanted movement in the circuit. Anticavitation valve (25) prevents cavitation when operating optional attachments. The auxiliary spool is equipped with an auxiliary hydraulic spool neutral switch (71). The auxiliary hydraulic spool neutral switch works in conjunction with the auxiliary hydraulic override switch to allow the operator to utilize the auxiliary hydraulics after exiting the machine. See Engagement and Monitor Unit Circuit Theory of Operation for Auxiliary Hydraulic Override Switch Logic. (Group 9015-15.)

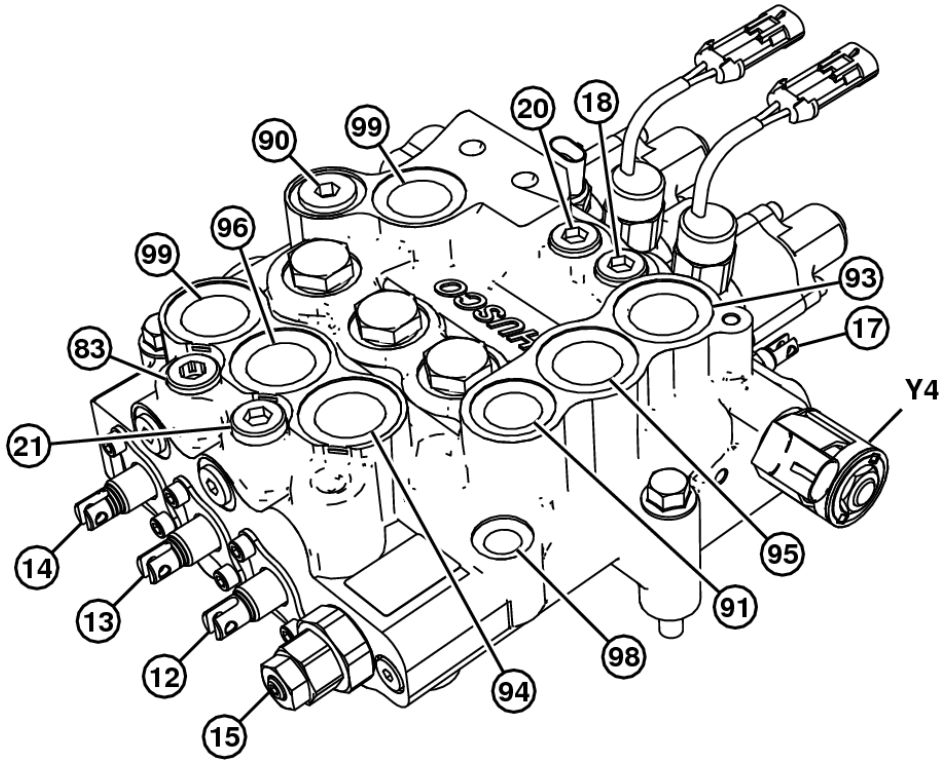
System Relief Valve

The system relief valve (15) protects the hydraulic system and hydraulic pump from excessive pressure. The system relief valve is not adjustable.

Port Lock Solenoid Valve and Port Lock Spool

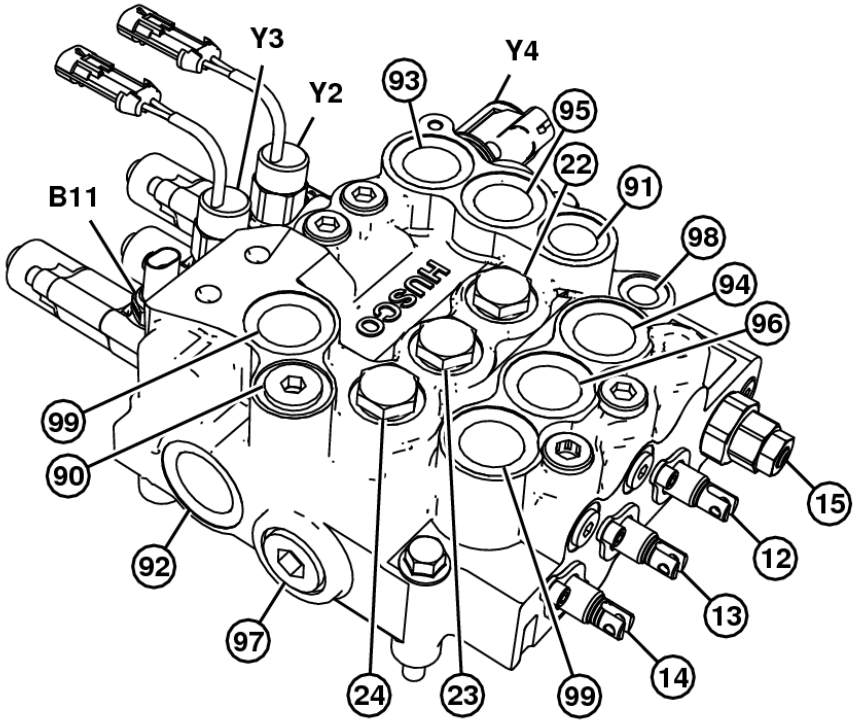
A port lock solenoid valve (16) and port lock spool (17) are incorporated into the control valve as safety devices. When the port lock solenoid valve is de-energized, spring pressure shifts the port lock spool and prevents oil flow to the boom and bucket spools. When the port lock solenoid is energized, oil pressure overcomes spring pressure and the port lock spool shifts to allow oil flow to the boom and bucket spools. See Engagement and Monitor Unit Circuit Theory of Operation for Interlock Logic. (Group 9015-15.)

Control Valve Operation (S.N. 150523—)



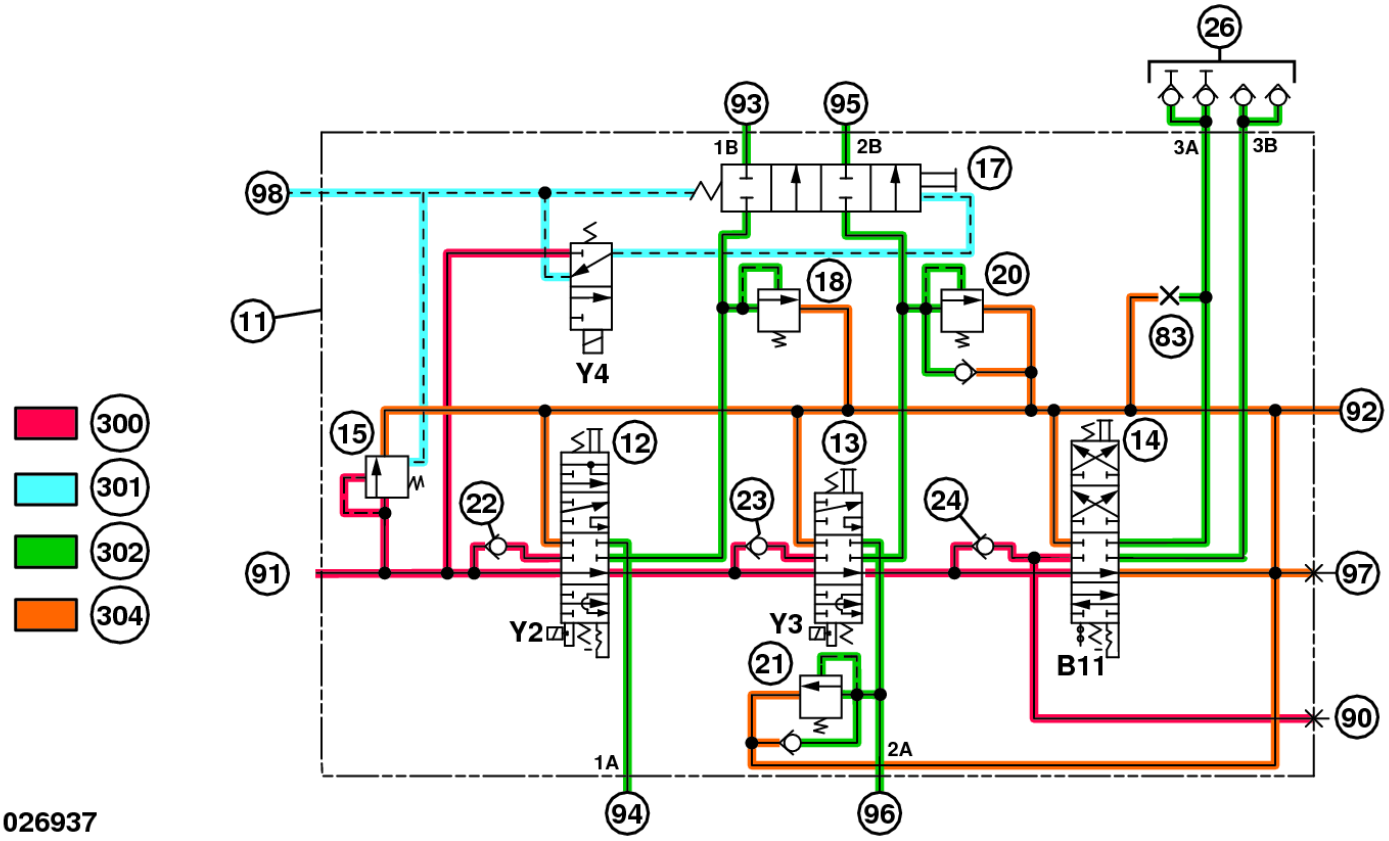
TX1026957

Control Valve Component Location (S.N. 150523—)



TX1023906

Control Valve Component Location (S.N. 150523—)



Control Valve Schematic (S.N. 150523—)

LEGEND:

11	Control Valve
12	Boom Spool
13	Bucket Spool
14	Auxiliary Spool
15	System Relief Valve
17	Port Lock Spool
18	Boom Up Circuit Relief Valve
20	Bucket Rollback Circuit Relief and Anticavitation Valve
21	Bucket Dump Circuit Relief and Anticavitation Valve
22	Boom Lift Check Valve
23	Bucket Lift Check Valve
24	Auxiliary Lift Check Valve
26	Auxiliary Coupler
83	Plug
90	From High Flow Hydraulic Pump
91	From Hydraulic Pump
92	To Hydraulic Oil Tank
93	Boom Up Port
94	Boom Down Port
95	Bucket Rollback Port
96	Bucket Dump Port
97	Power Beyond Port—If Equipped
98	To Hydraulic Oil Tank
99	Auxiliary Port
300	High Pressure Oil
301	Return Oil
302	Trapped Oil
304	Charge Pressure Oil
B11	Auxiliary Hydraulic Spool Neutral Switch
Y2	Boom Spool Lock Solenoid
Y3	Bucket Spool Lock Solenoid
Y4	Port Lock Solenoid Valve

The control valve (11) integrates three valve spools and pressure relief valves for the individual circuits and the entire system into one housing.

Boom Cylinder Circuit

The first spool in the series, and therefore first priority, controls the boom cylinder circuit. When the boom spool (12) is actuated, the open-center port is blocked and oil is directed to the appropriate side of the boom cylinders (94). Return oil from the cylinders flows through the control valve to the hydraulic oil cooler, hydraulic oil filter and hydraulic oil tank (92). The boom up circuit relief valve (18) protects the circuit from excessive pressure when the boom spool is in neutral. The boom lift check valve (22) prevents unwanted movement in the circuit.

A boom spool lock solenoid (Y2) is mounted to the boom spool as a safety device. The boom spool lock solenoid controls a mechanical lockout pin on the boom spool. When the lockout pin is engaged, the boom spool will not move, thus preventing hydraulic oil flow to the boom circuit. When the boom spool lock solenoid is energized, the lockout pin is disengaged allowing boom spool movement and hydraulic oil flow to the boom circuit. See Engagement and Monitor Unit Circuit Theory of Operation for Interlock Logic. (Group 9015-15.)

Bucket Cylinder Circuit

The second spool in the series controls the bucket cylinder circuit. When the bucket spool (13) is actuated, the open-center port is blocked and oil is directed to the appropriate side of the bucket cylinders (96). Return oil from the cylinders flows through the control valve to the hydraulic oil cooler, hydraulic oil filter and hydraulic oil tank (92). The bucket rollback and bucket dump circuit relief and anticavitation valves (20 and 21) protect the circuit from excessive pressure when the bucket spool is in neutral and prevent cavitation. The bucket lift check valve (23) prevents unwanted movement in the circuit.

A bucket spool lock solenoid (Y3) is mounted to the boom spool as a safety device. The bucket spool lock solenoid controls a mechanical lockout pin on the bucket spool. When the lockout pin is engaged, the bucket spool will not move, thus preventing hydraulic oil flow to the bucket circuit. When the bucket spool lock solenoid is energized, the lockout pin is disengaged allowing bucket spool movement and hydraulic oil flow to the bucket circuit. See Engagement and Monitor Unit Circuit Theory of Operation for Interlock Logic. (Group 9015-15.)

Auxiliary Hydraulic Circuit

The third spool in the series provides hydraulic oil to operate optional auxiliary hydraulic attachments. When the auxiliary spool (14) is actuated, the open-center port is blocked and oil is directed to the appropriate side of the attachment circuit through the auxiliary couplers (26). Return oil from the attachment flows through the control valve to the hydraulic oil cooler, hydraulic oil filter and hydraulic oil tank (92).

The auxiliary lift check valve (24) prevents unwanted movement in the circuit. The auxiliary spool is equipped with an auxiliary hydraulic spool neutral switch (B11). The auxiliary hydraulic spool neutral switch works in conjunction with the auxiliary hydraulic override switch to allow the operator to utilize the auxiliary hydraulics after exiting the machine. See Engagement and Monitor Unit Circuit Theory of Operation for Auxiliary Hydraulic Override Switch Logic. (Group 9015-15.)

System Relief Valve

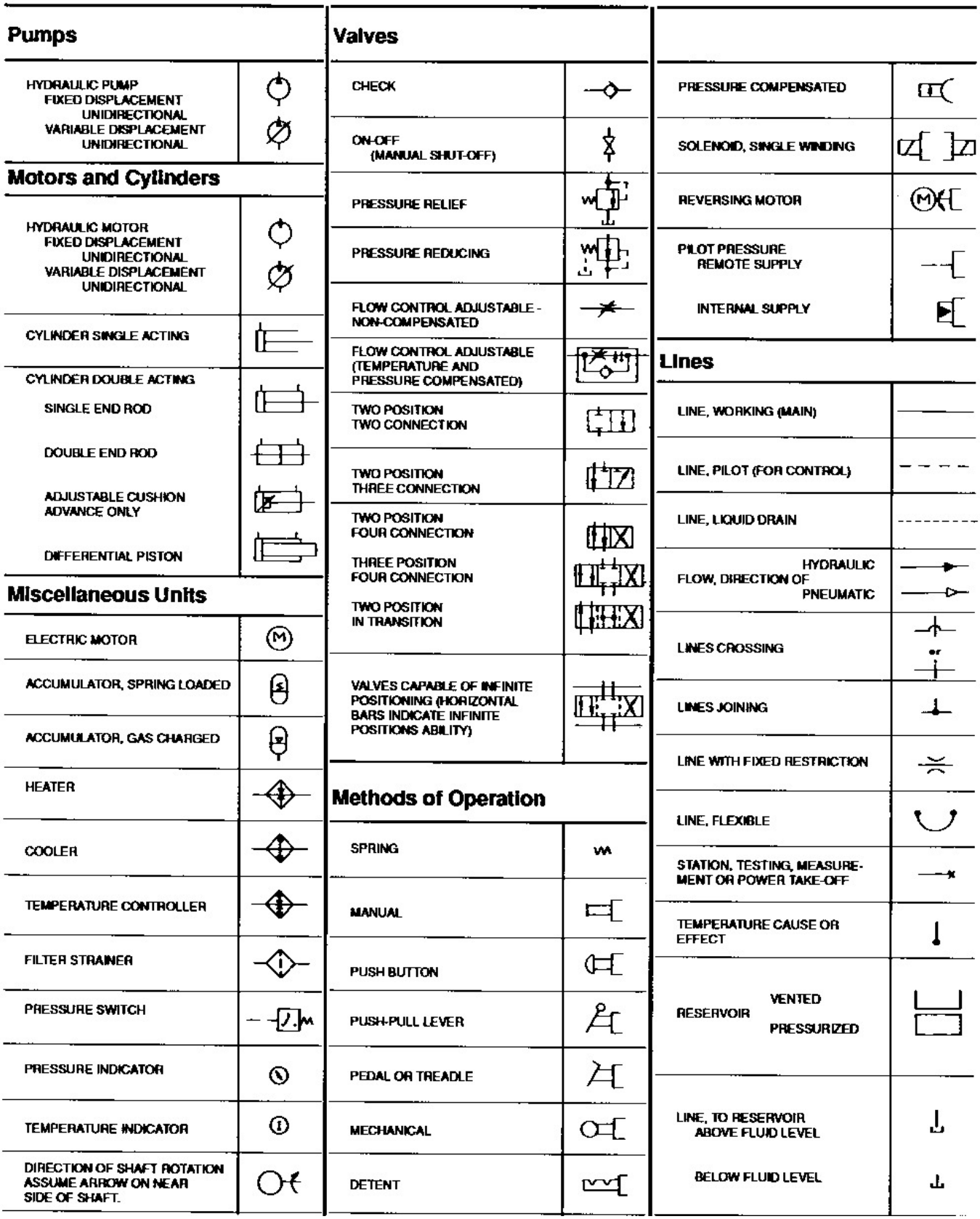
The system relief valve (15) protects the hydraulic system and hydraulic pump from excessive pressure. The system relief valve is not adjustable.

Port Lock Solenoid Valve and Port Lock Spool

A port lock solenoid valve (Y4) and port lock spool (17) are incorporated into the control valve as safety devices. When the port lock solenoid valve is de-energized, spring pressure shifts the port lock spool and prevents oil flow to the boom and bucket spools. When the port lock solenoid is energized, oil pressure overcomes spring pressure and the port lock spool shifts to allow oil flow to the boom and bucket spools. See Engagement and Monitor Unit Circuit Theory of Operation for Interlock Logic. (Group 9015-15.)

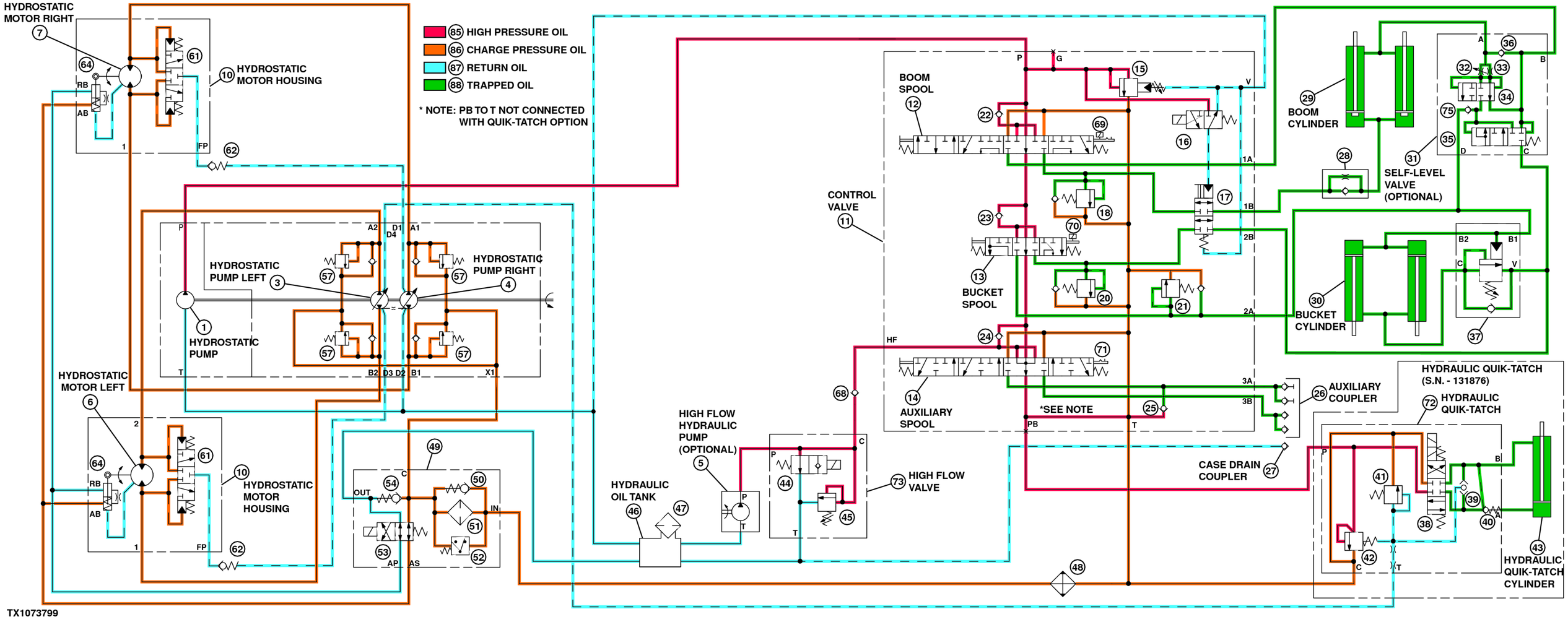
Hydraulic System Circuit Symbols

These are ISO and ANSI standard hydraulic symbols for use in reading circuit diagrams.



Hydraulic System Circuit Symbols

Hydraulic System Schematic—Skid Steer Loader (S.N. —150522)

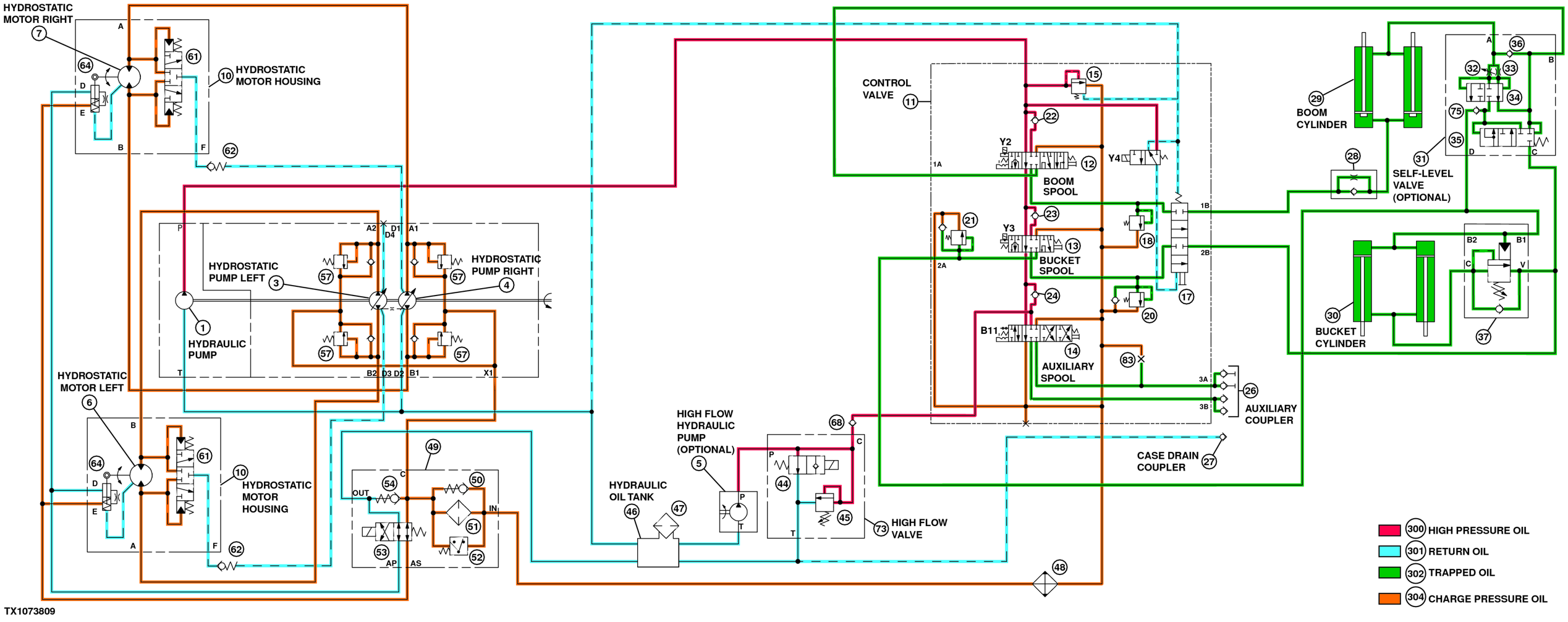


Hydraulic System Schematic—Skid Steer Loader (S.N. —150522)

LEGEND:

1	Hydraulic Pump
3	Hydrostatic Pump Left
4	Hydrostatic Pump Right
5	High Flow Hydraulic Pump (optional)
6	Hydrostatic Motor Left
7	Hydrostatic Motor Right
10	Hydrostatic Motor Housing
11	Control Valve
12	Boom Spool
13	Bucket Spool
14	Auxiliary Spool
15	System Relief Valve
16	Port Lock Solenoid Valve
17	Port Lock Spool
18	Boom Up Circuit Relief and Anticavitation Valve
20	Bucket Rollback Circuit Relief and Anticavitation Valve
21	Bucket Dump Circuit Relief and Anticavitation Valve
22	Boom Lift Check Valve
23	Bucket Lift Check Valve
24	Auxiliary Lift Check Valve
25	Anti-Cavitation Valve
26	Auxiliary Coupler
27	Case Drain Coupler
28	Flow Rate Orifice and Check Valve
29	Boom Cylinder (2 used)
30	Bucket Cylinder (2 used)
31	Self-Level Valve (optional)
32	Adjustable Orifice
33	Orifice
34	Flow Divider Valve
35	Unloader Valve
36	Check Valve
37	Counterbalance Valve
38	Hydraulic Quik-Tatch Solenoid Valve (S.N. —131876)
39	Hydraulic Quik-Tatch Shuttle Valve (S.N. —131876)
40	Hydraulic Quik-Tatch Check Valve (S.N. —131876)
41	Hydraulic Quik-Tatch Circuit Relief Valve (S.N. —131876)
42	Hydraulic Quik-Tatch Diverter Valve (S.N. —131876)
43	Hydraulic Quik-Tatch Cylinder (S.N. —131876)
44	High Flow Solenoid Valve
45	High Flow Relief Valve
46	Hydraulic Oil Tank
47	Hydraulic Oil Tank Breather
48	Hydraulic Oil Cooler
49	Hydraulic Oil Filter and Park Brake Solenoid Valve Manifold
50	Hydraulic Oil Filter Bypass Valve
51	Hydraulic Oil Filter
52	Hydraulic Oil Filter Restriction Switch
53	Park Brake Solenoid Valve
54	Charge Pressure Relief Valve
57	Hydrostatic Pump Make-Up Check Valve (4 used)
61	Hydrostatic Motor Shuttle Valve (2 used)
62	Hydrostatic Motor Relief Valve (2 used)
64	Park Brake (2 used)
68	Check Valve
69	Boom Spool Lock Solenoid
70	Bucket Spool Lock Solenoid
71	Auxiliary Hydraulic Spool Neutral Switch
72	Hydraulic Quik-Tatch (S.N. —131876) (optional)
73	High Flow Valve (optional)
75	Check Valve
85	High Pressure Oil
86	Charge Pressure Oil
87	Return Oil
88	Trapped Oil

Hydraulic System Schematic—Skid Steer Loader (S.N. 150523—)

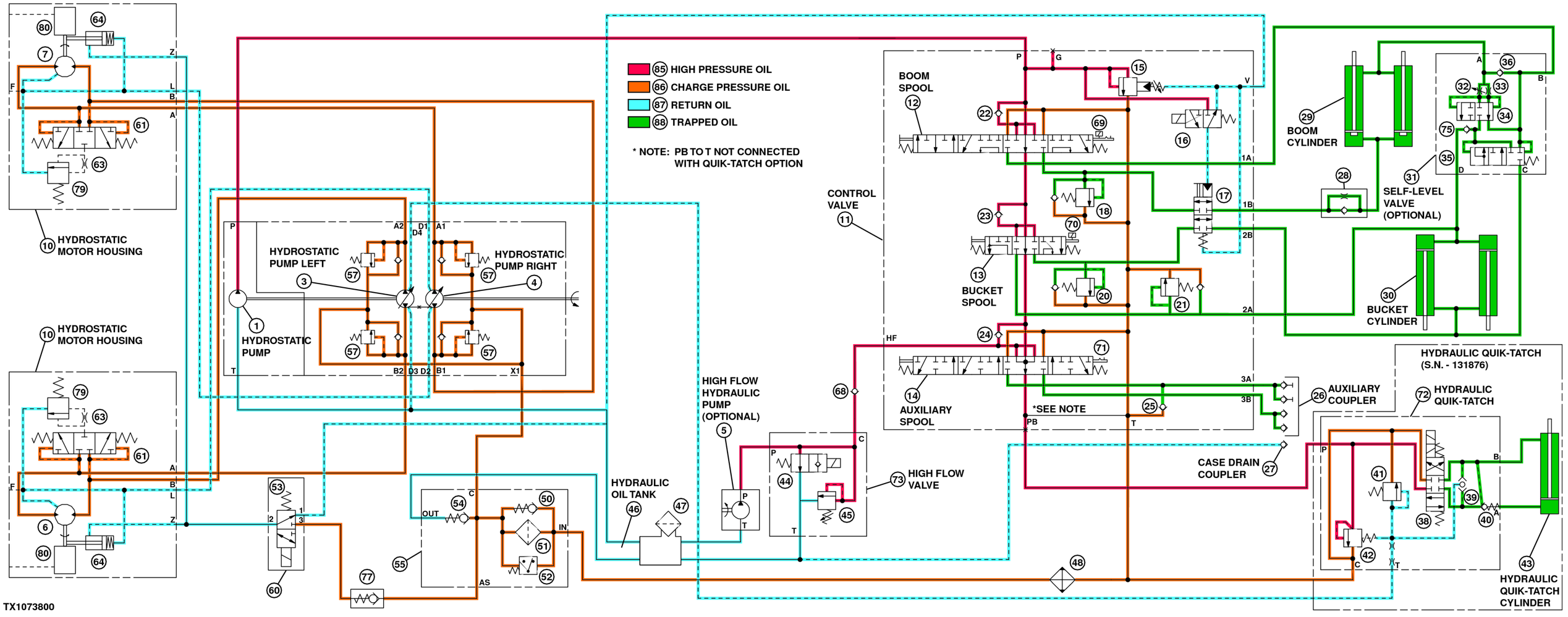


Hydraulic System Schematic—Skid Steer Loader (S.N. 150523—)

LEGEND:

1	Hydraulic Pump
3	Hydrostatic Pump Left
4	Hydrostatic Pump Right
5	High Flow Hydraulic Pump (optional)
6	Hydrostatic Motor Left
7	Hydrostatic Motor Right
10	Hydrostatic Motor Housing
11	Control Valve
12	Boom Spool
13	Bucket Spool
14	Auxiliary Spool
15	System Relief Valve
17	Port Lock Spool
18	Boom Up Circuit Relief Valve
20	Bucket Rollback Circuit Relief and Anticavitation Valve
21	Bucket Dump Circuit Relief and Anticavitation Valve
22	Boom Lift Check Valve
23	Bucket Lift Check Valve
24	Auxiliary Lift Check Valve
26	Auxiliary Coupler
27	Case Drain Coupler
28	Flow Rate Orifice and Check Valve
29	Boom Cylinder (2 used)
30	Bucket Cylinder (2 used)
31	Self-Level Valve (optional)
32	Adjustable Orifice
33	Orifice
34	Flow Divider Valve
35	Unloader Valve
36	Check Valve
37	Counterbalance Valve
44	High Flow Solenoid Valve
45	High Flow Relief Valve
46	Hydraulic Oil Tank
47	Hydraulic Oil Tank Breather
48	Hydraulic Oil Cooler
49	Hydraulic Oil Filter and Park Brake Solenoid Valve Manifold
50	Hydraulic Oil Filter Bypass Valve
51	Hydraulic Oil Filter
52	Hydraulic Oil Filter Restriction Switch
53	Park Brake Solenoid Valve
54	Charge Pressure Relief Valve
57	Hydrostatic Pump Make-Up Check Valve (4 used)
61	Hydrostatic Motor Shuttle Valve (2 used)
62	Hydrostatic Motor Relief Valve (2 used)
64	Park Brake (2 used)
68	Check Valve
73	High Flow Valve (optional)
75	Check Valve
83	Plug
300	High Pressure Oil
301	Return Oil
302	Trapped Oil
304	Charge Pressure Oil
B11	Auxiliary Hydraulic Spool Neutral Switch
Y2	Boom Spool Lock Solenoid
Y3	Bucket Spool Lock Solenoid
Y4	Port Lock Solenoid Valve

Hydraulic System Schematic—Single Speed—Compact Track Loader (S.N. —150522)



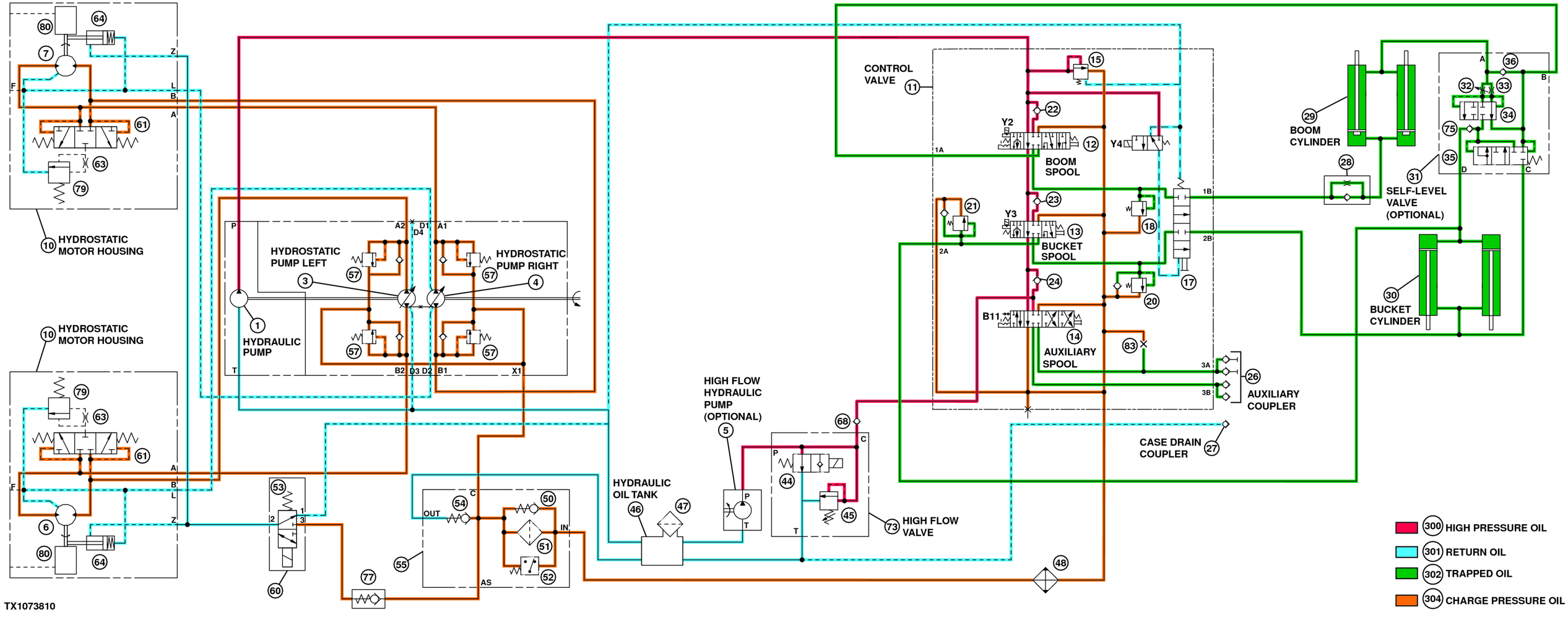
Hydraulic System Schematic—Single Speed—Compact Track Loader (S.N. —150522)

LEGEND:

1	Hydraulic Pump
3	Hydrostatic Pump Left
4	Hydrostatic Pump Right
5	High Flow Hydraulic Pump (optional)
6	Hydrostatic Motor Left
7	Hydrostatic Motor Right
10	Hydrostatic Motor Housing
11	Control Valve
12	Boom Spool
13	Bucket Spool
14	Auxiliary Spool
15	System Relief Valve
16	Port Lock Solenoid Valve
17	Port Lock Spool
18	Boom Up Circuit Relief and Anticavitation Valve
20	Bucket Rollback Circuit Relief and Anticavitation Valve
21	Bucket Dump Circuit Relief and Anticavitation Valve
22	Boom Lift Check Valve
23	Bucket Lift Check Valve
24	Auxiliary Lift Check Valve
25	Anti-Cavitation Valve
26	Auxiliary Coupler
27	Case Drain Coupler
28	Flow Rate Orifice and Check Valve
29	Boom Cylinder (2 used)
30	Bucket Cylinder (2 used)
31	Self-Level Valve (optional)
32	Adjustable Orifice
33	Orifice
34	Flow Divider Valve
35	Unloader Valve
36	Check Valve
38	Hydraulic Quik-Tatch Solenoid Valve (S.N. —131876)
39	Hydraulic Quik-Tatch Shuttle Valve (S.N. —131876)
40	Hydraulic Quik-Tatch Check Valve (S.N. —131876)
41	Hydraulic Quik-Tatch Circuit Relief Valve(S.N. —131876)
42	Hydraulic Quik-Tatch Diverter Valve (S.N. —131876)
43	Hydraulic Quik-Tatch Cylinder (S.N. —131876)
44	High Flow Solenoid Valve
45	High Flow Relief Valve
46	Hydraulic Oil Tank
47	Hydraulic Oil Tank Breather
48	Hydraulic Oil Cooler
50	Hydraulic Oil Filter Bypass Valve
51	Hydraulic Oil Filter
52	Hydraulic Oil Filter Restriction Switch
53	Park Brake Solenoid Valve
54	Charge Pressure Relief Valve
55	Hydraulic Oil Filter Manifold
57	Hydrostatic Pump Make-Up Check Valve (4 used)
60	Park Brake Solenoid Valve Manifold
61	Hydrostatic Motor Shuttle Valve (2 used)
63	Orifice (2 used)
64	Park Brake (2 used)
68	Check Valve
69	Boom Spool Lock Solenoid
70	Bucket Spool Lock Solenoid
71	Auxiliary Hydraulic Spool Neutral Switch
72	Hydraulic Quik-Tatch (S.N. —131876) (optional)
73	High Flow Valve (optional)
75	Check Valve
77	Brake Check Valve
79	Flushing Relief Valve (2 used)
80	Hydrostatic Motor Gearbox (2 used)
85	High Pressure Oil
86	Charge Pressure Oil

87 Return Oil
88 Trapped Oil

Hydraulic System Schematic—Single Speed—Compact Track Loader (S.N. 150523—)



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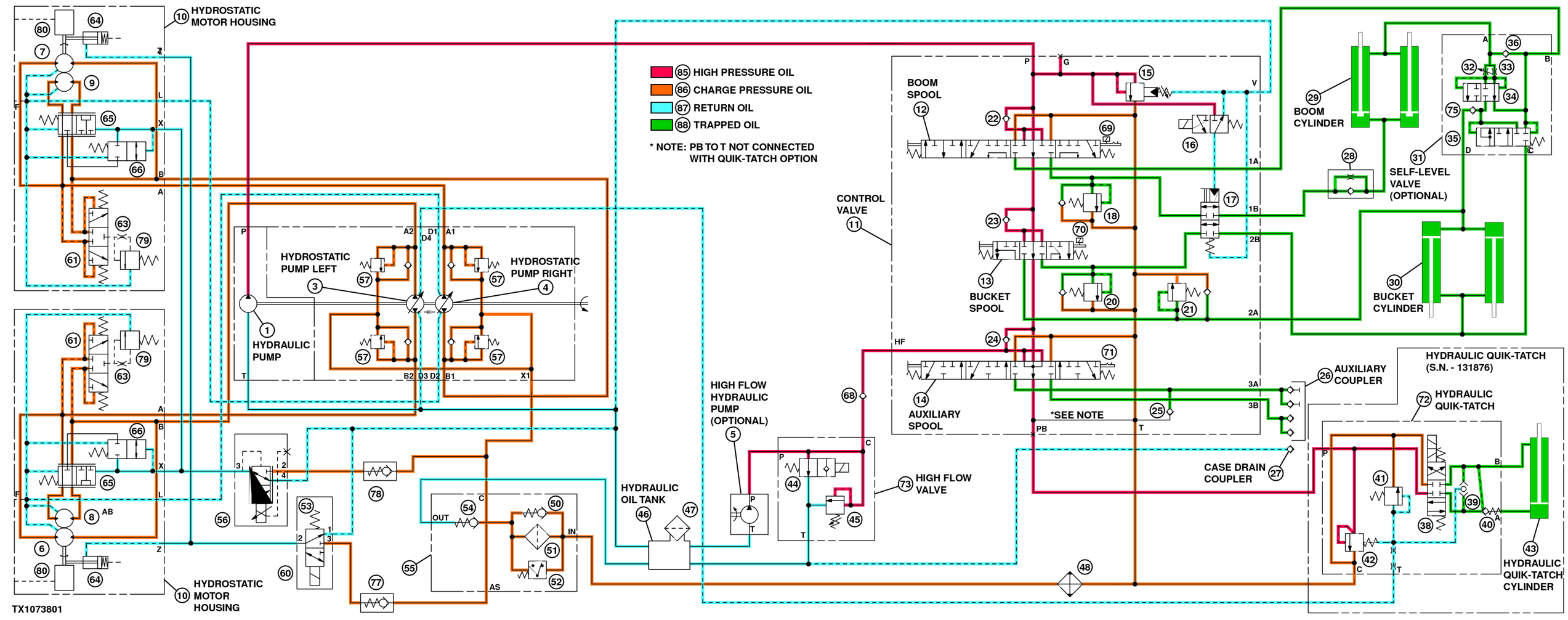
Hydraulic System Schematic—Single Speed—Compact Track Loader (S.N. 150523—)

LEGEND:

1	Hydraulic Pump
3	Hydrostatic Pump Left
4	Hydrostatic Pump Right
5	High Flow Hydraulic Pump (optional)
6	Hydrostatic Motor Left
7	Hydrostatic Motor Right
10	Hydrostatic Motor Housing
11	Control Valve
12	Boom Spool
13	Bucket Spool
14	Auxiliary Spool
15	System Relief Valve
17	Port Lock Spool
18	Boom Up Circuit Relief Valve
20	Bucket Rollback Circuit Relief and Anticavitation Valve
21	Bucket Dump Circuit Relief and Anticavitation Valve
22	Boom Lift Check Valve
23	Bucket Lift Check Valve
24	Auxiliary Lift Check Valve
26	Auxiliary Coupler
27	Case Drain Coupler
28	Flow Rate Orifice and Check Valve
29	Boom Cylinder (2 used)
30	Bucket Cylinder (2 used)
31	Self-Level Valve (optional)
32	Adjustable Orifice
33	Orifice
34	Flow Divider Valve
35	Unloader Valve
36	Check Valve
44	High Flow Solenoid Valve
45	High Flow Relief Valve
46	Hydraulic Oil Tank
47	Hydraulic Oil Tank Breather
48	Hydraulic Oil Cooler
50	Hydraulic Oil Filter Bypass Valve
51	Hydraulic Oil Filter
52	Hydraulic Oil Filter Restriction Switch
53	Park Brake Solenoid Valve
54	Charge Pressure Relief Valve
55	Hydraulic Oil Filter Manifold
57	Hydrostatic Pump Make-Up Check Valve (4 used)
60	Park Brake Solenoid Valve Manifold
61	Hydrostatic Motor Shuttle Valve (2 used)
63	Orifice (2 used)
64	Park Brake (2 used)
68	Check Valve
73	High Flow Valve (optional)
75	Check Valve
77	Brake Check Valve
79	Flushing Relief Valve (2 used)
80	Hydrostatic Motor Gearbox (2 used)
83	Plug
300	High Pressure Oil
301	Return Oil
302	Trapped Oil
304	Charge Pressure Oil
B11	Auxiliary Hydraulic Spool Neutral Switch
Y2	Boom Spool Lock Solenoid
Y3	Bucket Spool Lock Solenoid
Y4	Port Lock Solenoid Valve

Hydraulic System Schematic—Two Speed—Compact Track Loader (S.N. —150522)



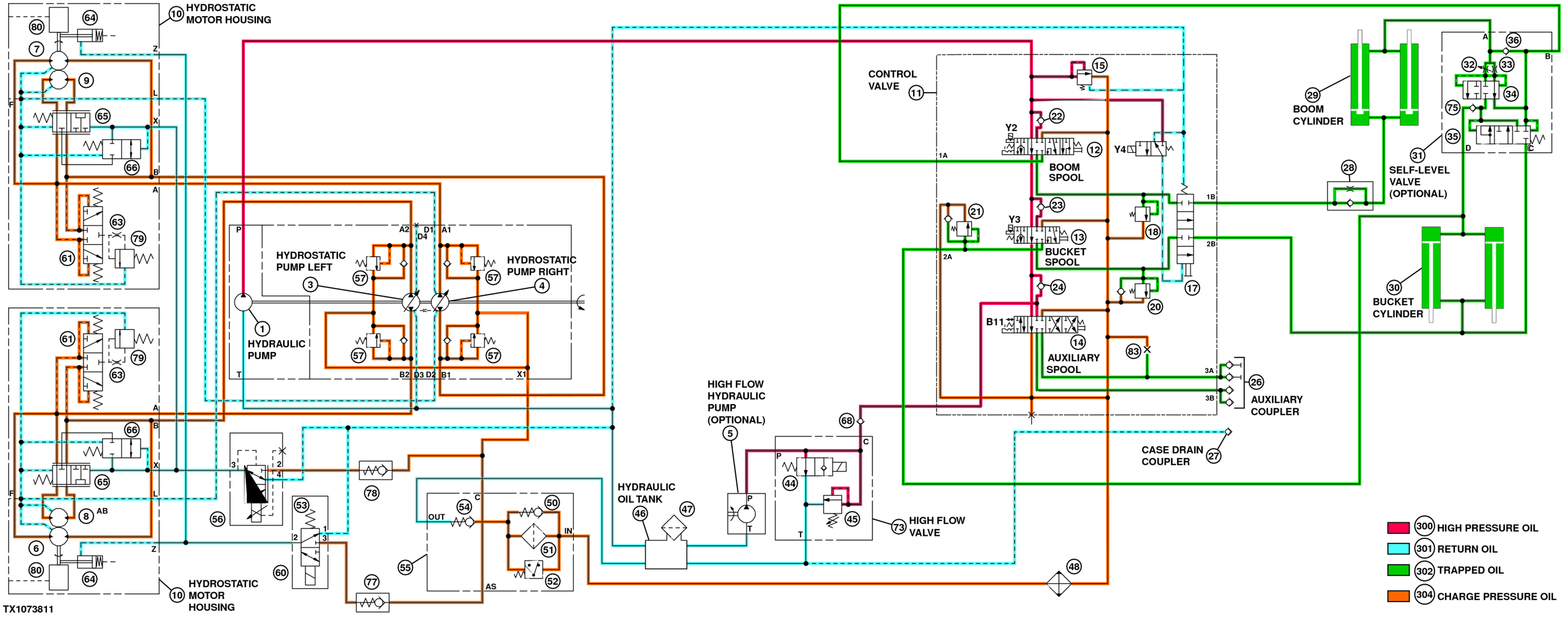
Hydraulic System Schematic—Two Speed—Compact Track Loader (S.N. —150522)

LEGEND:

1	Hydraulic Pump
3	Hydrostatic Pump Left
4	Hydrostatic Pump Right
5	High Flow Hydraulic Pump (optional)
6	Hydrostatic Motor Left—Single Speed
7	Hydrostatic Motor Right—Single Speed
8	Hydrostatic Motor Left—Two Speed
9	Hydrostatic Motor Right—Two Speed
10	Hydrostatic Motor Housing
11	Control Valve
12	Boom Spool
13	Bucket Spool
14	Auxiliary Spool
15	System Relief Valve
16	Port Lock Solenoid Valve
17	Port Lock Spool
18	Boom Up Circuit Relief and Anticavitation Valve
20	Bucket Rollback Circuit Relief and Anticavitation Valve
21	Bucket Dump Circuit Relief and Anticavitation Valve
22	Boom Lift Check Valve
23	Bucket Lift Check Valve
24	Auxiliary Lift Check Valve
25	Anti-Cavitation Valve
26	Auxiliary Coupler
27	Case Drain Coupler
28	Flow Rate Orifice and Check Valve
29	Boom Cylinder (2 used)
30	Bucket Cylinder (2 used)
31	Self-Level Valve (optional)
32	Adjustable Orifice
33	Orifice
34	Flow Divider Valve
35	Unloader Valve
36	Check Valve
38	Hydraulic Quik-Tatch Solenoid Valve (S.N. —131876)
39	Hydraulic Quik-Tatch Shuttle Valve (S.N. —131876)
40	Hydraulic Quik-Tatch Check Valve (S.N. —131876)
41	Hydraulic Quik-Tatch Circuit Relief Valve (S.N. —131876)
42	Hydraulic Quik-Tatch Diverter Valve (S.N. —131876)
43	Hydraulic Quik-Tatch Cylinder (S.N. —131876)
44	High Flow Solenoid Valve
45	High Flow Relief Valve
46	Hydraulic Oil Tank
47	Hydraulic Oil Tank Breather
48	Hydraulic Oil Cooler
50	Hydraulic Oil Filter Bypass Valve
51	Hydraulic Oil Filter
52	Hydraulic Oil Filter Restriction Switch
53	Park Brake Solenoid Valve
54	Charge Pressure Relief Valve
55	Hydraulic Oil Filter Manifold
56	Two Speed Proportional Solenoid Valve (optional)
57	Hydrostatic Pump Make-Up Check Valve (4 used)
60	Park Brake Solenoid Valve Manifold
61	Hydrostatic Motor Shuttle Valve (2 used)
63	Orifice (2 used)
64	Park Brake (2 used)
65	Speed Shift Spool (2 used)
66	Speed Selector Valve (2 used)
68	Check Valve
69	Boom Spool Lock Solenoid
70	Bucket Spool Lock Solenoid
71	Auxiliary Hydraulic Spool Neutral Switch
72	Hydraulic Quik-Tatch (S.N. —131876) (optional)
73	High Flow Valve (optional)
75	Check Valve

77 Brake Check Valve
78 Two Speed Check Valve
79 Flushing Relief Valve (2 used)
80 Hydrostatic Motor Gearbox (2 used)
85 High Pressure Oil
86 Charge Pressure Oil
87 Return Oil
88 Trapped Oil

Hydraulic System Schematic—Two Speed—Compact Track Loader (S.N. 150523—)



Hydraulic System Schematic—Two Speed—Compact Track Loader (S.N. 150523—)

LEGEND:

1	Hydraulic Pump
3	Hydrostatic Pump Left
4	Hydrostatic Pump Right
5	High Flow Hydraulic Pump (optional)
6	Hydrostatic Motor Left—Single Speed
7	Hydrostatic Motor Right—Single Speed
8	Hydrostatic Motor Left—Two Speed
9	Hydrostatic Motor Right—Two Speed
10	Hydrostatic Motor Housing
11	Control Valve
12	Boom Spool
13	Bucket Spool
14	Auxiliary Spool
15	System Relief Valve
17	Port Lock Spool
18	Boom Up Circuit Relief Valve
20	Bucket Rollback Circuit Relief and Anticavitation Valve
21	Bucket Dump Circuit Relief and Anticavitation Valve
22	Boom Lift Check Valve
23	Bucket Lift Check Valve
24	Auxiliary Lift Check Valve
26	Auxiliary Coupler
27	Case Drain Coupler
28	Flow Rate Orifice and Check Valve
29	Boom Cylinder (2 used)
30	Bucket Cylinder (2 used)
31	Self-Level Valve (optional)
32	Adjustable Orifice
33	Orifice
34	Flow Divider Valve
35	Unloader Valve
36	Check Valve
44	High Flow Solenoid Valve
45	High Flow Relief Valve
46	Hydraulic Oil Tank
47	Hydraulic Oil Tank Breather
48	Hydraulic Oil Cooler
50	Hydraulic Oil Filter Bypass Valve
51	Hydraulic Oil Filter
52	Hydraulic Oil Filter Restriction Switch
53	Park Brake Solenoid Valve
54	Charge Pressure Relief Valve
55	Hydraulic Oil Filter Manifold
56	Two Speed Proportional Solenoid Valve (optional)
57	Hydrostatic Pump Make-Up Check Valve (4 used)
60	Park Brake Solenoid Valve Manifold
61	Hydrostatic Motor Shuttle Valve (2 used)
63	Orifice (2 used)
64	Park Brake (2 used)
65	Speed Shift Spool (2 used)
66	Speed Selector Valve (2 used)
68	Check Valve
73	High Flow Valve (optional)
75	Check Valve
77	Brake Check Valve
78	Two Speed Check Valve
79	Flushing Relief Valve (2 used)
80	Hydrostatic Motor Gearbox (2 used)
83	Plug
300	High Pressure Oil
301	Return Oil
302	Trapped Oil
304	Charge Pressure Oil
B11	Auxiliary Hydraulic Spool Neutral Switch
Y2	Boom Spool Lock Solenoid
Y3	Bucket Spool Lock Solenoid

Y4	Port Lock Solenoid Valve

Group 15 - Diagnostic Information

Diagnose Hydraulic System Malfunctions

→NOTE:

Diagnose malfunction charts are arranged from most probable and simplest to verify, to least likely and most difficult to verify.

Symptom	Problem	Solution
No Hydraulic Functions	Interlock logic sequence not performed correctly	See Engagement and Monitor Unit Circuit Theory of Operation for Interlock Logic. (Group 9015-15.)
	Low hydraulic oil level	Check hydraulic oil tank level. For skid steer loader, see Check Hydraulic Tank Oil Level. (Operator's Manual.) For compact track loader, see Check Hydraulic Tank Oil Level. (Operator's Manual.)
	Hydraulic pump drive failure	Check dampener drive. See Hub Coupler Remove and Install. (Group 0325.)
Boom Will Not Raise	Low hydraulic oil level	Check hydraulic oil tank level. For skid steer loader, see Check Hydraulic Tank Oil Level. (Operator's Manual.) For compact track loader, see Check Hydraulic Tank Oil Level. (Operator's Manual.)
	Hydraulic pump worn or damaged	Check hydraulic pump flow. See Hydraulic Pump Flow Test. (Group 9025-25.)
	Control valve linkage or spool binding or damage	Inspect control valve and linkage.
	Control valve not functioning properly	Inspect control valve. See Control Valve Disassemble and Assemble (S.N. —150522). See Control Valve Disassemble and Assemble (S.N. 150523—). (Group 3160.)
	Bent or damaged cylinder rods	Check cylinders for bent or damaged rods.
	Stuck pivot pins	Check pivot pins for proper operation.
	Cylinder leakage	Check cylinder for leakage. See Cylinder Identification. (CTM120519.)
	Low system pressure	Check system relief valve pressure setting. See System Relief Valve Test (S.N. —150522). See System Relief Valve Test (S.N. 150523—). (Group 9025-25.)
	Boom or bucket spool lock solenoid malfunctioning	Check boom or bucket spool lock solenoid. See Solenoid Test. (Group 9015-20.)
	Bucket overloaded	Reduce bucket load.
Boom Will Not Lower	Control valve linkage or spool binding or damage	Inspect control valve and linkage.
	Control valve not functioning properly	Inspect control valve. See Control Valve Disassemble and Assemble (S.N. —150522). See Control Valve Disassemble and Assemble (S.N. 150523—). (Group 3160.)
	Bent or damaged cylinder rods	Check cylinders for bent or damaged rods.
	Stuck pivot pins	Check pivot pins for proper operation.
	Boom or bucket spool lock solenoid malfunctioning	Check boom or spool lock solenoid. See Solenoid Test. (Group 9015-20.)
Bucket Will Not Dump	Low hydraulic oil level	Check hydraulic oil tank level. For skid steer loader, see Check Hydraulic Tank Oil Level. (Operator's Manual.) For compact track loader, see Check Hydraulic Tank Oil Level. (Operator's Manual.)
	Hydraulic pump worn or damaged	Check hydraulic pump flow. See Hydraulic Pump Flow Test. (Group 9025-25.)
	Control valve linkage or spool binding or damage	Inspect control valve and linkage.
	Control valve not functioning properly	Inspect control valve.
	Bent or damaged cylinder rods	Check cylinders for bent or damaged rods.
	Stuck pivot pins	Check pivot pins for proper operation.
	Cylinder leakage	Check cylinder for leakage. See Cylinder Identification. (CTM120519.)
	Boom or bucket spool lock solenoid malfunctioning	Check boom or spool lock solenoid. See Solenoid Test. (Group 9015-20.)
	Malfunctioning counterbalance valve (Skid steer loader)	Inspect counterbalance valve.
Bucket Will Not Roll Back	Low hydraulic oil level	Check hydraulic oil tank level. For skid steer loader, see Check Hydraulic Tank Oil Level. (Operator's Manual.) For compact track loader, see Check Hydraulic Tank Oil Level. (Operator's Manual.)
	Hydraulic pump worn or damaged	Check hydraulic pump flow. See Hydraulic Pump Flow Test. (Group 9025-25.)
	Control valve linkage or spool binding or damage	Inspect control valve and linkage.
	Control valve not functioning properly	Inspect control valve. See Control Valve Disassemble and Assemble (S.N. —150522). See Control Valve Disassemble and Assemble (S.N. 150523—). (Group 3160.)
	Bent or damaged cylinder rods	Check cylinders for bent or damaged rods.

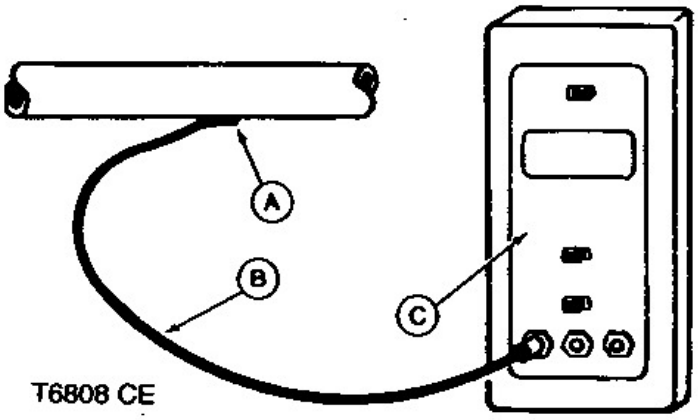
	Stuck pivot pins	Check pivot pins for proper operation.
	Cylinder leakage	Check cylinder for leakage. See Cylinder Identification . (CTM120519.)
	Low system pressure	Check system relief valve pressure setting. See System Relief Valve Test (S.N. —150522) . See System Relief Valve Test (S.N. 150523—) . (Group 9025-25.)
	Boom or bucket spool lock solenoid malfunctioning	Check boom or spool lock solenoid. See Solenoid Test . (Group 9015-20.)
	Bucket overloaded	Reduce bucket load.
	Malfunctioning counterbalance valve (Skid steer loader)	Inspect counterbalance valve.
Bucket Will Not Self-Level When Boom Is Raised	Adjustable orifice screw is turned in completely	Turn self-level screw out to set desired self-level rate. See Self-Level Valve Operation . (Group 9025-05.)
	Check valve removed from self-level valve	See Self-Level Valve Operation . (Group 9025-05.)
Bucket Dumps During Self-Leveling Cycle	Unloader valve malfunctioning	Check self-level valve.
Boom Drifts Down	System relief valve	Check system relief valve. See System Relief Valve Test (S.N. —150522) . See System Relief Valve Test (S.N. 150523—) . (Group 9025-25.)
	Boom up circuit relief valve	Check boom up circuit relief valve. See Circuit Relief Valve Test (S.N. —150522) . See Circuit Relief Valve Test (S.N. 150523—) . (Group 9025-25.)
	Boom lift check valve	Check boom lift check valve. See Control Valve Disassemble and Assemble (S.N. —150522) . See Control Valve Disassemble and Assemble (S.N. 150523—) . (Group 3160.)
	Control valve linkage or spool binding or damage	Inspect control valve and linkage.
	Control valve not functioning properly	Check control valve for leakage. See Control Valve Disassemble and Assemble (S.N. —150522) . See Control Valve Disassemble and Assemble (S.N. 150523—) . (Group 3160.)
	Boom cylinder leakage or bent or damaged cylinder rod	Check boom cylinders for leakage or bent or damaged cylinder rods. See Cylinder Identification . (CTM120519.)
Boom Drifts Up	Self-level valve	Check self-level valve.
	System relief valve	Check system relief valve. See System Relief Valve Test (S.N. —150522) . See System Relief Valve Test (S.N. 150523—) . (Group 9025-25.)
	Boom lift check valve	Check boom lift check valve. See Control Valve Disassemble and Assemble (S.N. —150522) . See Control Valve Disassemble and Assemble (S.N. 150523—) . (Group 3160.)
	Control valve linkage or spool binding or damage	Inspect control valve and linkage.
	Control valve not functioning properly	Check control valve for leakage. See Control Valve Disassemble and Assemble (S.N. —150522) . See Control Valve Disassemble and Assemble (S.N. 150523—) . (Group 3160.)
	Boom cylinder leakage or bent or damaged cylinder rod	Check boom cylinders for leakage or bent or damaged cylinder rods. See Cylinder Identification . (CTM120519.)
Bucket Drifts Down	Self-level valve	Check self-level valve.
	Counterbalance valve (Skid steer loader)	Check counterbalance valve. See Counterbalance Valve Test and Adjustment—Skid Steer Loader . (Group 9025-25.)
	System relief valve	Check system relief valve. See System Relief Valve Test (S.N. —150522) . See System Relief Valve Test (S.N. 150523—) . (Group 9025-25.)
	Bucket rollback circuit relief valve	Check bucket rollback circuit relief valve. See Circuit Relief Valve Test (S.N. —150522) . See Circuit Relief Valve Test (S.N. 150523—) . (Group 9025-25.)
	Bucket lift check valve	Check bucket lift check valve. See Control Valve Disassemble and Assemble (S.N. —150522) . See Control Valve Disassemble and Assemble (S.N. 150523—) . (Group 3160.)
	Control valve linkage or spool binding or damage	Inspect control valve and linkage.
	Control valve not functioning properly	Check control valve for leakage. See Control Valve Disassemble and Assemble (S.N. —150522) . See Control Valve Disassemble and Assemble (S.N. 150523—) . (Group 3160.)
	Bucket cylinder leakage or bent or damaged cylinder rod	Check bucket cylinders for leakage or bent or damaged cylinder rods. See Cylinder Identification . (CTM120519.)
Bucket Drifts Up	Self-level valve	Check self-level valve.
	Counterbalance valve (Skid steer loader)	Check counterbalance valve. See Counterbalance Valve Test and Adjustment—Skid Steer Loader . (Group 9025-25.)
	System relief valve	Check system relief valve. See System Relief Valve Test (S.N. —150522) . See System Relief Valve Test (S.N. 150523—) . (Group 9025-25.)
	Bucket dump circuit relief valve	Check bucket dump circuit relief valve. See Circuit Relief Valve Test (S.N. —150522) . See Circuit Relief Valve Test (S.N. 150523—) . (Group 9025-25.)

	Bucket lift check valve	Check bucket lift check valve. See Control Valve Disassemble and Assemble (S.N. —150522) . See Control Valve Disassemble and Assemble (S.N. 150523—) . (Group 3160.)
	Control valve linkage or spool binding or damage	Inspect control valve and linkage.
	Control valve not functioning properly	Check control valve for leakage. See Control Valve Disassemble and Assemble (S.N. —150522) . See Control Valve Disassemble and Assemble (S.N. 150523—) . (Group 3160.)
	Bucket cylinder leakage or bent or damaged cylinder rod	Check bucket cylinders for leakage or bent or damaged cylinder rods. See Cylinder Identification . (CTM120519.)
Hydraulic Quik-Tatch Does Not Function Properly	Hydraulic Quik-Tatch operates opposite of function indicated on switch	Swap hydraulic Quik-Tatch solenoids. See Hydraulic Quik-Tatch Operation . (Group 9025-05.)
	Hydraulic Quik-Tatch does not unlock or lock latches	Check hydraulic Quik-Tatch solenoids. See Solenoid Test . (Group 9015-20.)
	Hydraulic Quik-Tatch latches not staying latched	Hydraulic Quik-Tatch solenoid valve or cylinder plumbed incorrectly. Check hydraulic Quik-Tatch plumbing. See Hydraulic Quik-Tatch Operation . (Group 9025-05.) If plumbing was corrected, hydraulic Quik-Tatch may operate opposite of function indicated on switch. Swap hydraulic Quik-Tatch solenoids.
Hydraulic Functions Slow Or No Power	Low hydraulic oil level	Check hydraulic oil tank level. For skid steer loader, see Check Hydraulic Tank Oil Level . (Operator´s Manual.) For compact track loader, see Check Hydraulic Tank Oil Level . (Operator´s Manual.)
	Hydraulic pump worn or damaged	Check hydraulic pump flow. See Hydraulic Pump Flow Test . (Group 9025-25.)
	High flow hydraulic pump worn or damaged	Check high flow hydraulic pump flow. See High Flow Hydraulic Pump Flow Test . (Group 9025-25.)
	Control valve linkage or spool binding or damage	Inspect control valve and linkage.
	Control valve not functioning properly	Inspect control valve. See Control Valve Disassemble and Assemble (S.N. —150522) . See Control Valve Disassemble and Assemble (S.N. 150523—) . (Group 3160.)
	Bent or damaged cylinder rods	Check cylinders for bent or damaged rods.
	Stuck pivot pins	Check pivot pins for proper operation.
	Cylinder leakage	Check cylinder for leakage. See Cylinder Identification . (CTM120519.)
	Low system pressure	Check system relief valve pressure setting. See System Relief Valve Test (S.N. —150522) . See System Relief Valve Test (S.N. 150523—) . (Group 9025-25.)
	Air in cylinders	Check hydraulic oil tank level. For skid steer loader, see Check Hydraulic Tank Oil Level . (Operator´s Manual.) For compact track loader, see Check Hydraulic Tank Oil Level . (Operator´s Manual.) Operate hydraulic functions to bleed hydraulic system.
	Boom or bucket spool lock solenoid malfunctioning	Check boom or spool lock solenoid. See Solenoid Test . (Group 9015-20.)
	Bucket overloaded	Reduce bucket load.
	High system pressure	Check system relief valve pressure setting. See System Relief Valve Test (S.N. —150522) . See System Relief Valve Test (S.N. 150523—) . (Group 9025-25.)
Hydraulic Functions “Jerky” Or “Spongy”	Low hydraulic oil level	Check hydraulic oil tank level. For skid steer loader, see Check Hydraulic Tank Oil Level . (Operator´s Manual.) For compact track loader, see Check Hydraulic Tank Oil Level . (Operator´s Manual.)
	Hydraulic pump worn or damaged	Check hydraulic pump flow. See Hydraulic Pump Flow Test . (Group 9025-25.)
	High flow hydraulic pump worn or damaged	Check high flow hydraulic pump flow. See High Flow Hydraulic Pump Flow Test . (Group 9025-25.)
	Control valve linkage or spool binding or damage	Inspect control valve and linkage.
	Control valve not functioning properly	Inspect control valve. See Control Valve Disassemble and Assemble (S.N. —150522) . See Control Valve Disassemble and Assemble (S.N. 150523—) . (Group 3160.)
	Bent or damaged cylinder rods	Check cylinders for bent or damaged rods.
	Stuck pivot pins	Check pivot pins for proper operation.
	Cylinder leakage	Check cylinder for leakage. See Cylinder Identification . (CTM120519.)
	Low system pressure	Check system relief valve pressure setting. See System Relief Valve Test (S.N. —150522) . See System Relief Valve Test (S.N. 150523—) . (Group 9025-25.)
	Air in cylinders	Check hydraulic oil tank level. For skid steer loader, see Check Hydraulic Tank Oil Level . (Operator´s Manual.) For compact track loader, see Check Hydraulic Tank Oil Level . (Operator´s Manual.) Operate hydraulic functions to bleed hydraulic system.
	Hydrostatic pump leaking or damaged	Inspect hydrostatic pump. See Hydrostatic Pump Flow Test . (Group 9026-25.)
Hydraulic System Noise	Low hydraulic oil level	Check hydraulic oil tank level. For skid steer loader, see Check Hydraulic Tank Oil Level . (Operator´s Manual.) For compact track loader, see Check Hydraulic Tank Oil Level . (Operator´s Manual.)
	Hydraulic pump worn or damaged	Check hydraulic pump flow. See Hydraulic Pump Flow Test . (Group 9025-25.)

	High flow hydraulic pump worn or damaged	Check high flow hydraulic pump flow. See High Flow Hydraulic Pump Flow Test . (Group 9025-25.)
	Control valve linkage or spool binding or damage	Inspect control valve and linkage.
	Control valve not functioning properly	Inspect control valve. See Control Valve Disassemble and Assemble (S.N. —150522) . See Control Valve Disassemble and Assemble (S.N. 150523—) . (Group 3160.)
	Air in cylinders	Check hydraulic oil tank level. For skid steer loader, see Check Hydraulic Tank Oil Level . (Operator´s Manual.) For compact track loader, see Check Hydraulic Tank Oil Level . (Operator´s Manual.) Operate hydraulic functions to bleed hydraulic system.
	Bucket overloaded	Reduce bucket load.
	High system pressure	Check system relief valve pressure setting. See System Relief Valve Test (S.N. —150522) . See System Relief Valve Test (S.N. 150523—) . (Group 9025-25.)
	Hydrostatic pump leaking or damaged	Inspect hydrostatic pump. See Hydrostatic Pump Flow Test . (Group 9026-25.)
Pedals Will Not Move	Control valve linkage or spool binding or damage	Inspect control valve and linkage.
	Boom or bucket spool lock solenoid not energized	Check boom or bucket spool lock solenoid. See Solenoid Test . (Group 9015-20.)
Hydraulic Oil Overheats	Low hydraulic oil level	Check hydraulic oil tank level. For skid steer loader, see Check Hydraulic Tank Oil Level . (Operator´s Manual.) For compact track loader, see Check Hydraulic Tank Oil Level . (Operator´s Manual.)
	Hydraulic oil cooler restricted	Check hydraulic oil cooler for restriction.
	Hydraulic pump worn or damaged	Check hydraulic pump flow. See Hydraulic Pump Flow Test . (Group 9025-25.)
	High flow hydraulic pump worn or damaged	Check high flow hydraulic pump flow. See High Flow Hydraulic Pump Flow Test . (Group 9025-25.)
	Control valve linkage or spool binding or damage	Inspect control valve and linkage.
	Control valve not functioning properly	Inspect control valve. See Control Valve Disassemble and Assemble (S.N. —150522) . See Control Valve Disassemble and Assemble (S.N. 150523—) . (Group 3160.)
	Bent or damaged cylinder rods	Check cylinders for bent or damaged rods.
	Stuck pivot pins	Check pivot pins for proper operation.
	Cylinder leakage	Check cylinder for leakage. See Cylinder Identification . (CTM120519.)
	Bucket overloaded	Reduce bucket load.
	High system pressure	Check system relief valve pressure setting. See System Relief Valve Test (S.N. —150522) . See System Relief Valve Test (S.N. 150523—) . (Group 9025-25.)

Group 25 - Tests

JT05800 Digital Thermometer Installation



LEGEND:

A	Temperature Probe
B	Cable
C	JT05800 Digital Thermometer

JT05800 Digital Thermometer

Service Equipment and Tools

SERVICE EQUIPMENT AND TOOLS
JT05800 Digital Thermometer

[1] - Fasten temperature probe (A) to a bare metal hydraulic line using a tie band.

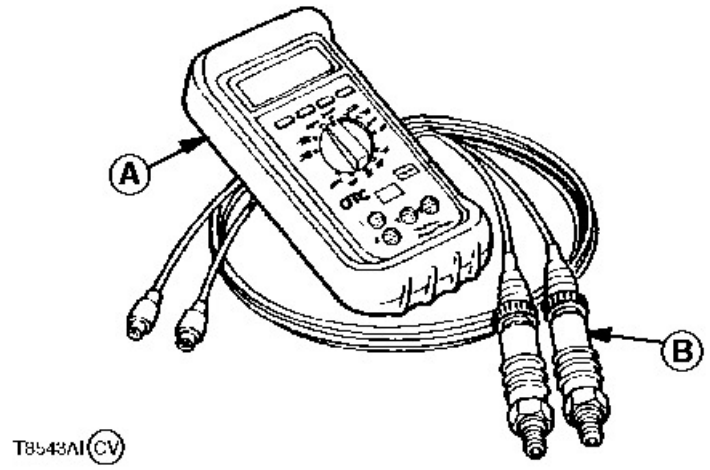
Digital Thermometer

JT05800

To measure the temperature of hydraulic oil.

[2] - Wrap temperature probe and line with a shop towel.

JT02156A Digital Pressure/Temperature Analyzer Installation



JT02156A Digital Pressure/Temperature Analyzer

LEGEND:

A	Digital Pressure/Temperature Analyzer
B	3 400 kPa (35 bar) (500 psi) Transducer 34 000 kPa (350 bar) (5000 psi) Transducer 70 000 kPa (700 bar) (10,000 psi Transducer

Service Equipment and Tools

SERVICE EQUIPMENT AND TOOLS
JT02156A Digital Pressure/Temperature Analyzer
JT02158 Digital Pressure/Temperature Analyzer
JT02159 20 ft Cable with Couplers
JT02161 500 psi Transducer
JT02162 5000 psi Transducer
JT05969 Thermo-Coupler
312883 Carry Case
JT02160 10,000 psi Transducer (Optional, Order Separately)

Use the digital pressure/temperature analyzer (A), and transducers (B) in place of analog gauges and a separate temperature reader.

Digital Pressure/Temperature Analyzer

JT02156A

Kit contains the analyzer, cable, two transducers, thermo-coupler, and a carry case.

Digital Pressure/Temperature Analyzer

JT02158

To display digital readings for temperature and single, multiple or differential hydraulic oil pressure. Also reads vacuum when used with 500 psi transducer.

20 ft Cable with Couplers

JT02159

To connect tranducers to digital pressure/temperature analyzer.

500 psi Transducer

JT02161

To measure hydraulic oil pressure and vacuum.

5000 psi Transducer

JT02162

To measure hydraulic oil pressure.

Thermo-Coupler

JT05969

To measure hydraulic oil temperature.

Carry Case

312883

Storage for analyzer and components.

10,000 psi Transducer (Optional, Order Separately)

JT02160

To measure hydraulic oil pressure.

Transducers are temperature sensitive. Allow transducer to warm to system temperature. After transducer is warmed and no pressure applied, push sensor zero button for one second to set the true zero point.

When using for different pressures, turn selector to OFF for two seconds and then to the pressure range. Readings are inaccurate if proper range for transducer is not used.

Remote Start Box Installation

The remote start box allows the engine to be started with the cab raised and in the locked position.

[1] - Park machine on a flat level surface.

[2] - Raise boom and engage boom lock.

[3] - Engage park brake.

[4] - Turn engine off.

[5] -

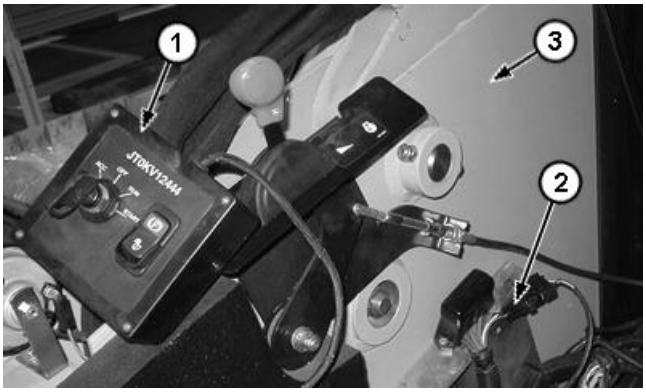
CAUTION:

Avoid possible injury from moving tires/tracks when using remote start box. Keep tire/track area clear of bystanders. Do not use remote start box without raising and blocking machine. Machine may override brake and move quickly.

Raise and block machine. For skid steer loader, see Raising and Blocking Machine . (Operator's Manual.) For compact track loader, see Raising and Blocking Machine . (Operator's Manual.)

[6] - Raise cab. For skid steer loader, see Raising Operator's Station . (Operator's Manual.) For compact track loader, see Raising Operator's Station . (Operator's Manual.)

[7] -



LEGEND:

1	Remote Start Box
2	Electrical Connector
3	Right Frame

Remote Start Box Connection

Connect JT0KV12444 Remote Start Box (1) to electrical connector (2) inside right frame (3).

[8] -

CAUTION:

Prevent personal injury, do not operate boom and bucket functions when using remote start box. Boom and bucket hydraulics are enabled when engine is running and park brake switch is disengaged by the remote start box.

Use remote start box to:

- Start and stop engine with cab raised and in locked position.
- To engage and disengage park brake with cab raised and in locked position.

[9] - Remove remote start box.

[10] -

→NOTE:

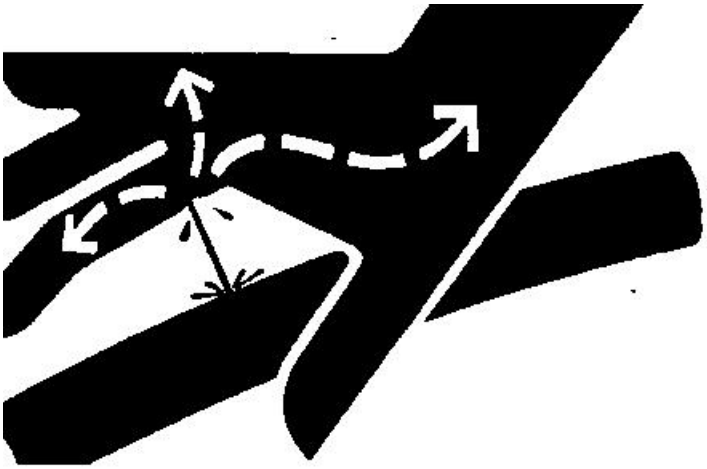
Using the remote start box may cause diagnostic trouble code F9P8 to be stored in the engagement and monitor unit. After the remote start box is used, clear the code and operate the machine. Recheck codes to verify code has been cleared. See Reading Engagement and Monitor Unit Diagnostic Trouble Codes . (Group 9015-20.)

Lower cab. For skid steer loader, see Raising Operator′s Station . (Operator′s Manual.) For compact track loader, see Raising Operator′s Station . (Operator′s Manual.)

[11] - Raise machine and remove blocks from under machine and lower to ground. For skid steer loader, see Raising and Blocking Machine . (Operator′s Manual.) For compact track loader, see Raising and Blocking Machine . (Operator′s Manual.)

Hydraulic System Pressure Release

CAUTION:



Escaping Fluid

Escaping fluid under pressure can penetrate the skin causing serious injury. Avoid the hazard by relieving pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure. Search for leaks with a piece of cardboard. Protect hands and body from high pressure fluids.

If an accident occurs, see a doctor immediately. Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result. Doctors unfamiliar with this type of injury should reference a knowledgeable medical source. Such information is available from Deere & Company Medical Department in Moline, Illinois, U.S.A.

→NOTE:

This procedure can also be used to lower the boom mechanically. For skid steer loader, see Boom Release . (Operator′s Manual.) For compact track loader, see Boom Release . (Operator′s Manual.)

This procedure is to relieve trapped hydraulic system pressure prior to performing hydraulic system repairs or tests.

[1] - Sit in seat. Close cab door if equipped.

[2] - Fasten seat belt.

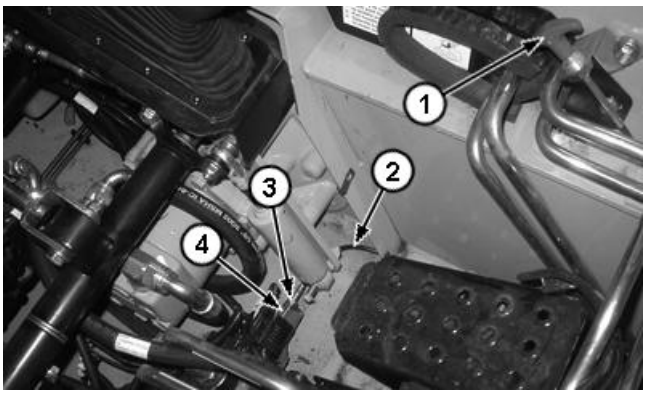
[3] - Turn key switch to run position but do not start engine.

[4] - Move park brake switch to run position.

[5] -

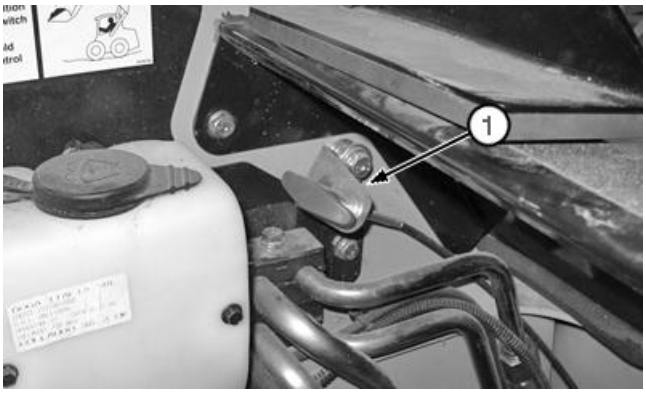
CAUTION:

To prevent crushing injury, only perform hydraulic system pressure release with boom down or boom up with boom lock engaged. To lower boom after machine is stalled, see Boom Release in the skid steer loader Operator′s Manual, or see Boom Release in the compact track loader Operator′s Manual.



LEGEND:
1 Pressure Release Cable Handle
2 Pressure Release Cable
3 Cable Adjusting Nuts
4 Cable Mounting Bracket

Pressure Release Cable Handle (S.N. —150522)



Pressure Release Cable Handle (S.N. 150523—)

Pull and hold hydraulic pressure release cable handle (1) located under toe kick panel on left side.

[6] - Operate boom and bucket controls while pulling release cable handle (1).

[7] - Release cable handle.

[8] - Engage park brake and turn key switch to off.

Hydraulic System Pressure Release Cable Adjustment

→NOTE:

The hydraulic system pressure release cable provides a means to mechanically shift the port lock spool when the engine is stopped or if there is no hydraulic pressure to shift the port lock spool.

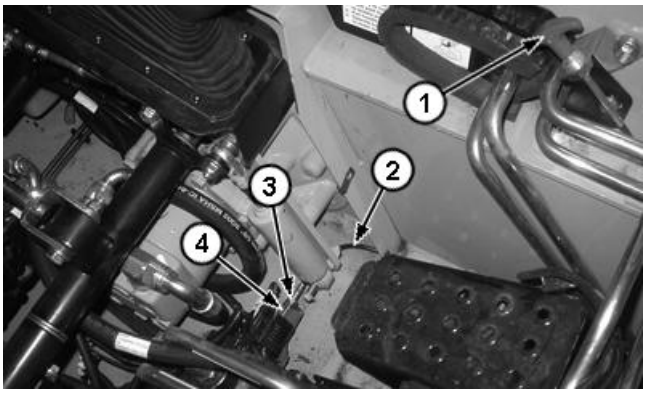
[1] - Park machine on flat level surface.

[2] - Raise boom and engage boom lock.

[3] - Raise cab. For skid steer loader, see Raising Operator's Station . (Operator's Manual.) For compact track loader, see Raising Operator's Station . (Operator's Manual.)

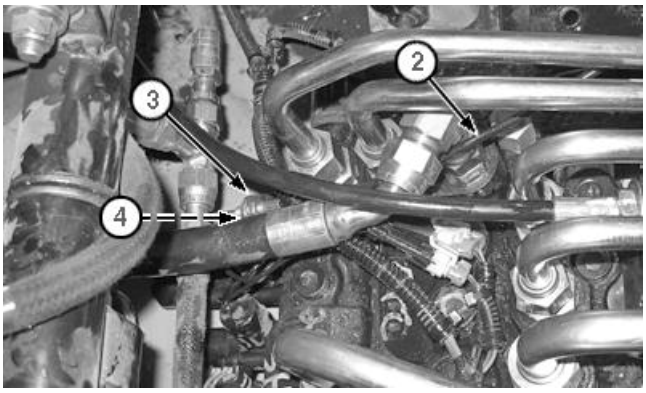
[4] - Locate pressure release cable bracket (4) at control valve.

[5] -



LEGEND:
1 Pressure Release Cable Handle
2 Pressure Release Cable
3 Cable Adjusting Nut (2 used)
4 Cable Mounting Bracket

Pressure Release Cable Handle (S.N. —150522)



Pressure Release Cable Handle (S.N. 150523—)

Loosen both cable adjusting nuts (3) at cable mounting bracket (4).

[6] - Push cable handle (1) in completely.

[7] - Adjust cable adjusting nuts so there is no play in the cable (2). Tighten adjusting nuts (3).

[8] - Lower cab. For skid steer loader, see Raising Operator′s Station . (Operator′s Manual.) For compact track loader, see Raising Operator′s Station . (Operator′s Manual.)

[9] - Lower boom.

Port Lock Solenoid Valve and Port Lock Spool Test

This test is to ensure that the port lock solenoid valve and port lock spool are functioning properly.

→NOTE:

For more information on the Interlock Logic, see Engagement and Monitor Unit Circuit Theory of Operation . (Group 9015-15.)

[1] - Sit in seat. Close cab door if equipped.

[2] - Fasten seat belt.

[3] - Start engine.

[4] - Disengage park brake.

[5] -

→NOTE:

If boom and bucket controls will not move, perform Boom and Bucket Spool Lock Solenoid Test . (Group 9015-20.)

Operate boom and bucket controls. The boom and bucket should move freely.

[6] - Disconnect seat belt. Boom and bucket should lock as soon as seat belt is disconnected.

[7] - If function is not correct, check the port lock solenoid electrical circuit. See Solenoid Test . (Group 9015-20.)

[8] - If port lock solenoid electrical circuit is ok, see Control Valve Disassemble and Assemble (S.N. —150522) or see Control Valve Disassemble and Assemble (S.N. 150523—) . (Group 3160.)

Boom and Bucket Spool Lock Solenoid Test

This test is to ensure that the boom and bucket spool lock solenoids are functioning properly.

→NOTE:

For more information on the Interlock Logic, see Engagement and Monitor Unit Circuit Theory of Operation . (Group 9015-15.)

[1] - Sit in seat. Close cab door if equipped.

[2] - Fasten seat belt.

[3] - Turn key switch to run position but do not start engine.

[4] - Move park brake switch to run position.

[5] - Move boom and bucket controls. Controls should move freely.

[6] - Return controls to their neutral position and disconnect seat belt. The boom and bucket controls should lock as soon as the seat belt is disconnected.

[7] - If function is not correct, check the boom and bucket spool lock solenoid electrical circuit. See Solenoid Test . (Group 9015-20.)

[8] - If boom and bucket spool lock solenoid electrical circuit is good, see Control Valve Disassemble and Assemble (S.N. —150522) or see Control Valve Disassemble and Assemble (S.N. 150523—) . (Group 3160.)

System Relief Valve Test (S.N. —150522)

Specifications

SPECIFICATIONS	
Hydraulic Oil Temperature (minimum)	43°C 110°F
Fast Idle Engine Speed	2930—3070 rpm
System Relief Pressure	23 800 kPa 238 bar 3450 psi

Service Equipment and Tools

SERVICE EQUIPMENT AND TOOLS
JT02158 Digital Pressure and Temperature Analyzer
JT02162 34 000 kPa (350 bar) (5000 psi) Transducer
Auxiliary Quick Coupler (female)
Adapter Fittings (as needed)
Diagnostic Quick Coupler

This test is to ensure that the system relief valve is working properly to protect the hydraulic system from excessive pressures.

[1] - Remove front attachment and park machine on flat, level surface.

[2] -

CAUTION:

To avoid injury from escaping fluid under pressure, stop engine and relieve the pressure in the system before disconnecting or connecting hydraulic or other lines. Tighten all connections before applying pressure.

Stop engine and relieve hydraulic pressure. See Hydraulic System Pressure Release . (Group 9025-25.)

[3] - Connect auxiliary quick coupler, adapter fittings (as needed), and diagnostic quick coupler to male auxiliary port.

Digital Pressure and Temperature Analyzer

JT02158

To display digital readings for temperature and single, multiple, or differential hydraulic oil pressure. Also reads vacuum when used with 500 psi transducer.

34 000 kPa (350 bar) (5000 psi) Transducer

JT02162

To measure hydraulic oil pressure.

Auxiliary Quick Coupler (female)

Used to attach transducer to auxiliary port.

Adapter Fittings (as needed)

Used to attach transducer to auxiliary port.

Diagnostic Quick Coupler

Used to attach transducer to auxiliary port.

[4] -

→NOTE:

Male auxiliary hydraulic connector is pressure port.

Connect JT02158 Digital Pressure Analyzer with JT02162 35 000 kPa (350 bar) (5000 psi) Transducer to diagnostic quick

coupler.

[5] - Operate hydraulic system until hydraulic oil temperature is above specification.

Item	Measurement	Specification
Hydraulic Oil	Temperature (minimum)	43°C 110°F

[6] - If equipped, ensure that high flow hydraulics are not activated.

[7] - Set engine speed to fast idle.

Item	Measurement	Specification
Fast Idle	Engine Speed	2930—3070 rpm

[8] - Operate auxiliary function to supply hydraulic flow to the male auxiliary port.

Pressure in auxiliary circuit will open system relief valve. Record pressure reading when system relief valve opens.

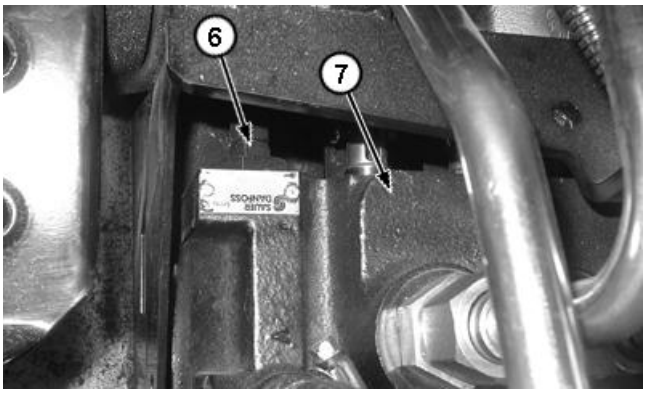
[9] - Compare system relief valve pressure reading to specification..

Item	Measurement	Specification
System Relief	Pressure	23 800 kPa 238 bar 3450 psi

[10] -

→NOTE:

System relief valve is located in the control valve and is not adjustable.



LEGEND:
6 System Relief Valve
7 Control Valve

System Relief Valve

If pressure is not within specification, replace system relief valve (6) located on left front of control valve (7). See Control Valve Disassemble and Assemble (S.N. —150522) . (Group 3160.)

System Relief Valve Test (S.N. 150523—)

Specifications

SPECIFICATIONS	
Hydraulic Oil Temperature (minimum)	43°C 110°F
Fast Idle Engine Speed	2930—3070 rpm
System Relief Valve Pressure	23 800—24 500 kPa 238—245 bar 3450—3550 psi

Service Equipment and Tools

SERVICE EQUIPMENT AND TOOLS
JT02158 Digital Pressure and Temperature Analyzer
JT02162 34 000 kPa (350 bar) (5000 psi) Transducer
Auxiliary Quick Coupler (female)
Adapter Fittings (as needed)
Diagnostic Quick Coupler

This test is to ensure that the system relief valve is working properly to protect the hydraulic system from excessive pressures.

[1] - Remove front attachment and park machine on flat, level surface

[2] -

CAUTION:

To avoid injury from escaping fluid under pressure, stop engine and relieve the pressure in the system before disconnecting or connecting hydraulic or other lines. Tighten all connections before applying pressure.

Stop engine and relieve hydraulic pressure. See Hydraulic System Pressure Release. (Group 9025-25.)

[3] - Connect auxiliary quick coupler, adapter fittings (as needed), and diagnostic quick coupler to male auxiliary port.

Digital Pressure and Temperature Analyzer

JT02158

To display digital readings for temperature and single, multiple, or differential hydraulic oil pressure. Also reads vacuum when used with 500 psi transducer.

34 000 kPa (350 bar) (5000 psi) Transducer

JT02162

To measure hydraulic oil pressure.

Auxiliary Quick Coupler (female)

Used to attach transducer to auxiliary port.

Adapter Fittings (as needed)

Used to attach transducer to auxiliary port.

Diagnostic Quick Coupler

Used to attach transducer to auxiliary port.

[4] -

→NOTE:

Male auxiliary hydraulic connector is pressure port.

Connect JT02158 Digital Pressure Analyzer with JT02162 35 000 kPa (350 bar) (5000 psi) Transducer to diagnostic quick

coupler.

[5] - Operate hydraulic system until hydraulic oil temperature is above specification.

Item	Measurement	Specification
Hydraulic Oil	Temperature (minimum)	43°C 110°F

[6] - If equipped, ensure that high flow hydraulics are not activated.

[7] - Set engine speed to fast idle.

Item	Measurement	Specification
Fast Idle	Engine Speed	2930—3070 rpm

[8] - Operate auxiliary function to supply hydraulic flow to the male auxiliary port.

Pressure in auxiliary circuit will open system relief valve. Record pressure reading when system relief valve opens.

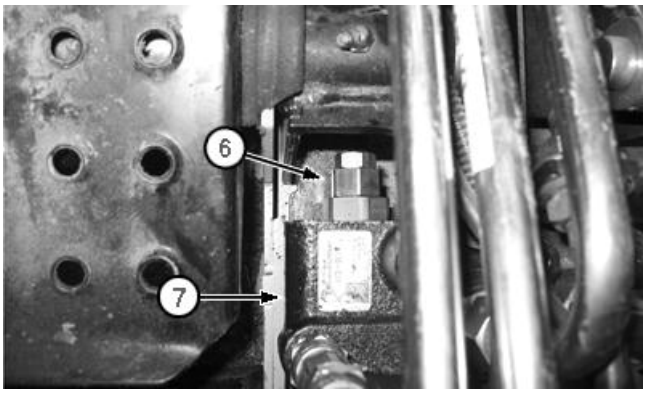
[9] - Compare system relief valve pressure reading to specification.

Item	Measurement	Specification
System Relief Valve	Pressure	23 800—24 500 kPa 238—245 bar 3450—3550 psi

[10] -

→NOTE:

System relief valve is located in the control valve and is not adjustable.



LEGEND:
6 System Relief Valve
7 Control Valve

System Relief Valve

If pressure is not within specification, replace system relief valve (6) located on left front of control valve (7). See Control Valve Disassemble and Assemble (S.N. 150523—) . (Group 3160.)

Charge Pressure Relief Valve Test

Specifications

SPECIFICATIONS	
Hydraulic Oil Temperature	43°C 110°F
Fast Idle Engine Speed	2930—3070 rpm
Charge Pressure Relief Valve Pressure	1900 kPa 19 bar 275 psi

This test is performed to ensure that there is sufficient oil pressure to charge the hydrostatic system and supply oil to the hydraulic system.

[1] - Operate hydraulic system until hydraulic oil reaches specification.

Item	Measurement	Specification
Hydraulic Oil	Temperature	43°C 110°F

[2] - Park machine on flat level surface.

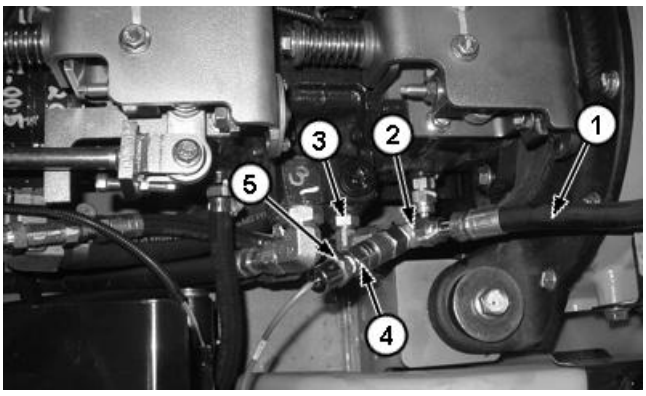
[3] - Raise boom and engage boom lock.

[4] - Stop engine and relieve hydraulic pressure. See Hydraulic System Pressure Release . (Group 9025-25.)

[5] - Raise and block machine. For skid steer loader, see Raising and Blocking Machine . (Operator's Manual.) For compact track loader, see Raising and Blocking Machine . (Operator's Manual.)

[6] - Raise cab. For skid steer loader, see Raising Operator's Station . (Operator's Manual.) For compact track loader, see Raising Operator's Station . (Operator's Manual.)

[7] -



LEGEND:
1 Charge Flow Line
2 Tee Fitting
3 Charge Flow Outlet Fitting
4 Quick Coupler
5 Pressure Gauge Coupler

Charge Pressure Relief Test Location

Remove charge flow line (1) from left side of hydrostatic pump center manifold.

[8] - Connect tee (2) fitting to charge flow outlet fitting (3) and attach charge flow line (1) to opposite end of tee fitting (2).

[9] - Connect pressure gauge coupler (5) to quick coupler (4) located on tee fitting (2).

[10] -

CAUTION:

Prevent possible injury from moving tires/tracks when using remote start box. Keep tire/track area clear of bystanders. Do not use remote start box without raising and blocking machine.

Install remote start box. See Remote Start Box Installation . (Group 9025-25.)

[11] - Use remote start box to start engine.

[12] - Set engine speed to fast idle.

Item	Measurement	Specification
Fast Idle	Engine Speed	2930—3070 rpm

[13] - Measure and record pressure readings.

[14] - If charge pressure does not meet specification, check pump flow. See Hydraulic Pump Flow Test . (Group 9025-25.)

Item	Measurement	Specification
Charge Pressure Relief Valve	Pressure	1900 kPa 19 bar 275 psi

[15] -

→NOTE:

The charge pressure relief valve is a non serviceable part of the hydraulic oil filter and park brake solenoid valve manifold.

If hydraulic pump flow meets specification, replace the hydraulic oil filter and park brake housing manifold.

Circuit Relief Valve Test (S.N. —150522)

Specifications

SPECIFICATIONS	
Boom Up Circuit Relief Valve Pressure	24 000—26 300 kPa 240—263 bar 3,480—3,810 psi
Bucket Dump Circuit Relief Valve Pressure	24 000—26 300 kPa 240—263 bar 3,480—3,810 psi
Bucket Rollback Circuit Relief Valve Pressure	30 000—33 000 kPa 300—330 bar 4,350—4,785 psi

Service Equipment and Tools

SERVICE EQUIPMENT AND TOOLS
JT07192 Electric/Hydraulic Pump

This test is performed to check boom and bucket circuit relief valves.

[1] - Park machine on flat level surface.

[2] - Raise boom and engage boom lock.

[3] -

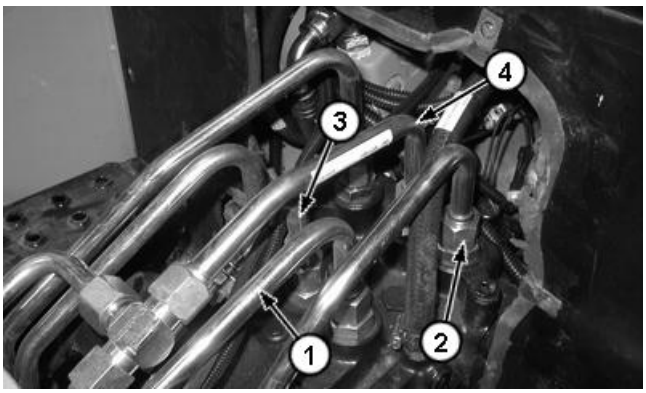
CAUTION:

High pressure can remain in the boom and bucket hydraulic circuits indefinitely. Prevent injury from escaping hydraulic oil under pressure, relieve the pressure in the system before removing hydraulic lines.

Release hydraulic pressure. See Hydraulic System Pressure Release . (Group 9025-25.)

[4] - Remove cover plate to gain access to the hydraulic control valve.

[5] -



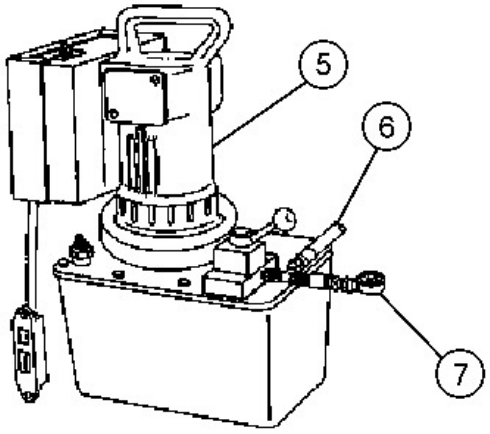
LEGEND:

1	Boom Down Line
2	Boom Up Line
3	Bucket Dump Line
4	Bucket Rollback Line

Hydraulic Control Valve

Remove boom up line (2) between control valve and tee and set aside. Cap tee fitting.

[6] -



LEGEND:

5 Electric/Hydraulic Pump
6 Electric/Hydraulic Pump Hose
7 Gauge

Electric/Hydraulic Pump

Connect electric/hydraulic pump JT07192 hose (6) with gauge (7) to boom up port (2).

Electric/Hydraulic Pump

JT07192

This tool is used to pressurize work ports in the control valve.

[7] - Pull and hold the hydraulic pressure release cable handle.

[8] - Start electric/hydraulic pump to pressurize the port. Take reading when pressure on gauge (7) begins to decrease. The point at which pressure begins to decrease is the opening pressure of the boom up circuit relief valve.

[9] - Repeat procedure for the bucket circuits.

Item	Measurement	Specification
Boom Up Circuit Relief Valve	Pressure	24 000—26 300 kPa
		240—263 bar
		3,480—3,810 psi
Bucket Dump Circuit Relief Valve	Pressure	24 000—26 300 kPa
		240—263 bar
		3,480—3,810 psi
Bucket Rollback Circuit Relief Valve	Pressure	30 000—33 000 kPa
		300—330 bar
		4,350—4,785 psi

[10] -

→NOTE:

Relief valves are factory set and not adjustable.

If pressure is not within specification, replace circuit relief valve.

Circuit Relief Valve Test (S.N. 150523—)

Specifications

SPECIFICATIONS	
Boom Up Circuit Relief Valve Pressure	20 400—25 000 kPa 204—250 bar 2954—3625 psi
Bucket Dump Circuit Relief Valve Pressure	20 400—25 000 kPa 204—250 bar 2954—3625 psi
Bucket Rollback Circuit Relief Valve Pressure	24 600—30 000 kPa 246—300 bar 3574—4355 psi

Service Equipment and Tools

SERVICE EQUIPMENT AND TOOLS
JT07192 Electric/Hydraulic Pump
JT02156A Digital Pressure/Temperature Analyzer

This test is performed to check the boom and bucket circuit relief valves.

Boom Up Circuit Relief Test

[1] - Park machine on flat level surface.

[2] - Lower boom and bucket to the normal ground position.

[3] - Shut off engine.

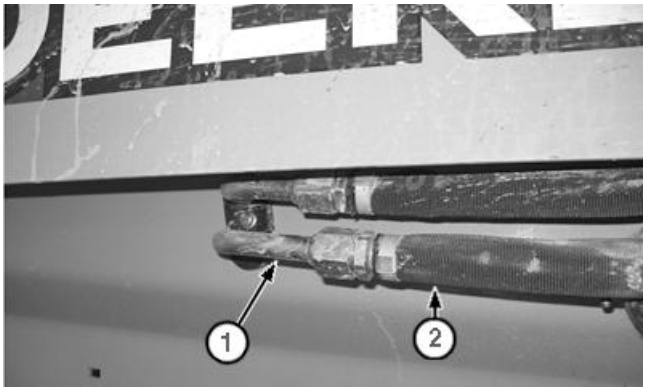
[4] -

CAUTION:

High pressure can remain in the boom and bucket hydraulic circuits indefinitely. Prevent injury from escaping hydraulic oil under pressure, relieve the pressure in the system before removing hydraulic lines.

Release hydraulic pressure. See Hydraulic System Pressure Release . (Group 9025-25.)

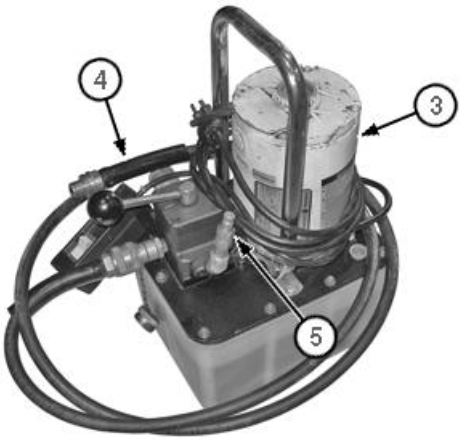
[5] -



Left Boom Cylinder Connections (CT322 shown)

LEGEND:

1 Left Boom Cylinder Line (piston end)
2 Left Boom Cylinder Hose (piston end)
3 JT07192 Electric/Hydraulic Pump
4 Pump Hose
5 Quick Coupler (for attaching JT02156A Digital Pressure/Temperature Analyzer)



JT07192 Electric/Hydraulic Pump

Disconnect hydraulic hose (2) to left boom cylinder piston end at frame.

[6] - Connect hose (4) from JT07192 Electric/Hydraulic Pump (3) to line from control valve (1). Cap hose from hydraulic cylinder.

Electric/Hydraulic Pump

JT07192

This tool is used to pressurize work ports in the control valve.

[7] - Disconnect hydraulic hose to right boom cylinder piston end at frame. Cap and plug line and hose.

[8] - Connect JT02156A Digital Pressure/Temperature Analyzer with 34 000 kPa (350 bar) (5000 psi) Transducer to JT07192 Electric/Hydraulic Pump. See JT02156A Digital Pressure/Temperature Analyzer Installation . (Group 9025-05.)

Digital Pressure/Temperature Analyzer

JT02156A

This tool is used to measure circuit relief pressures.

[9] - Pull and hold the hydraulic pressure release cable handle.

[10] - Start electric/hydraulic pump to pressurize the port. Take reading when pressure begins to decrease. The point at which pressure begins to decrease is the opening pressure of the circuit relief valve. Record results.

Item	Measurement	Specification
Boom Up Circuit Relief Valve	Pressure	20 400—25 000 kPa 204—250 bar 2954—3625 psi

[11] -

→NOTE:

Relief valves are factory set and are not adjustable.

If pressure is not within specification, replace corresponding circuit relief valve. See Control Valve Disassemble and Assemble (S.N. 150523—) . (Group 3160.)

Bucket Dump Circuit Relief Test

[1] - Park machine on flat level surface.

[2] - Lower boom and bucket to the normal ground position.

[3] - Shut off engine.

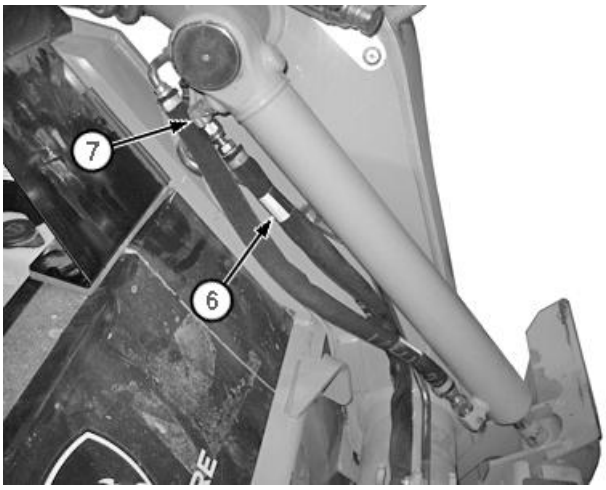
[4] -

CAUTION:

High pressure can remain in the boom and bucket hydraulic circuits indefinitely. Prevent injury from escaping hydraulic oil under pressure, relieve the pressure in the system before removing hydraulic lines.

Release hydraulic pressure. See Hydraulic System Pressure Release . (Group 9025-25.)

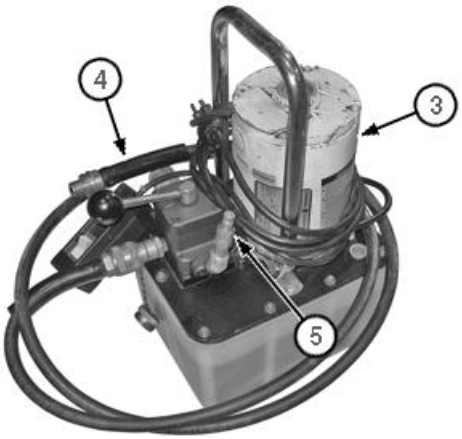
[5] -



Left Bucket Cylinder

LEGEND:

3	JT07192 Electric/Hydraulic Pump
4	Pump Hose
5	Quick Coupler (for attaching JT02156A Digital Pressure/Temperature Analyzer)
6	Left Bucket Cylinder Hose (piston end)
7	Left Bucket Cylinder Fitting (piston end)



JT07192 Electric/Hydraulic Pump

Disconnect hydraulic hose (6) to left bucket cylinder piston end.

[6] - Connect hose (4) from JT07192 Electric/Hydraulic Pump to line from control valve. Cap fitting (7) on hydraulic cylinder.

Electric/Hydraulic Pump

JT07192

This tool is used to pressurize work ports in the control valve.

[7] - Disconnect hydraulic hose to right bucket cylinder piston end. Cap and plug hose and fitting on hydraulic cylinder.

[8] - Connect JT02156A Digital Pressure/Temperature Analyzer with 34 000 kPa (350 bar) (5000 psi) Transducer to JT07192 Electric/Hydraulic Pump. See JT02156A Digital Pressure/Temperature Analyzer Installation . (Group 9025-05.)

Digital Pressure/Temperature Analyzer

JT02156A

This tool is used to measure circuit relief pressures.

[9] - Pull and hold the hydraulic pressure release cable handle.

[10] - Start electric/hydraulic pump to pressurize the port. Take reading when pressure begins to decrease. The point at which pressure begins to decrease is the opening pressure of the circuit relief valve. Record results.

Item	Measurement	Specification
Bucket Dump Circuit Relief Valve	Pressure	20 400—25 000 kPa 204—250 bar 2954—3625 psi

[11] -

→NOTE:

Relief valves are factory set and are not adjustable.

If pressure is not within specification, replace corresponding circuit relief valve. See Control Valve Disassemble and Assemble (S.N. 150523—) . (Group 3160.)

Bucket Rollback Circuit Relief Test—Skid Steer Loader

[1] - Park machine on flat level surface.

[2] - Lower boom and bucket to the normal ground position.

[3] - Shut off engine.

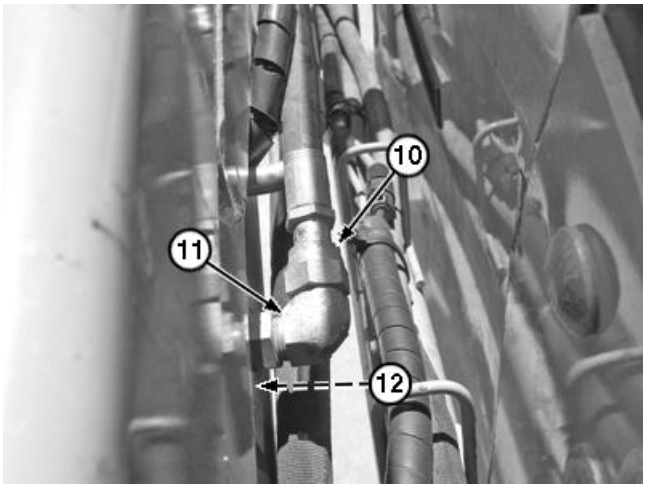
[4] -

CAUTION:

High pressure can remain in the boom and bucket hydraulic circuits indefinitely. Prevent injury from escaping hydraulic oil under pressure, relieve the pressure in the system before removing hydraulic lines.

Release hydraulic pressure. See Hydraulic System Pressure Release . (Group 9025-25.)

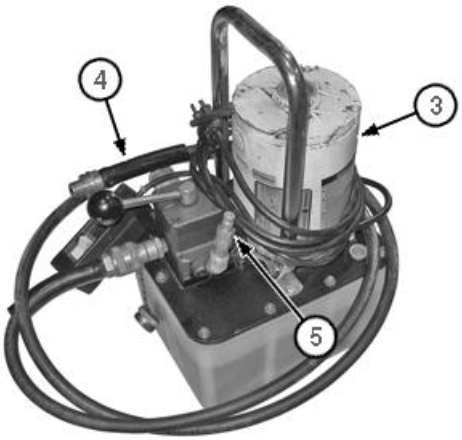
[5] -



Counterbalance Valve

LEGEND:

3 JT07192 Electric/Hydraulic Pump
4 Pump Hose
5 Quick Coupler (for attaching JT02156A Digital Pressure/Temperature Analyzer)
10 Hose to Control Valve
11 Counterbalance Valve Fitting
12 Counterbalance Valve



JT07192 Electric/Hydraulic Pump

Disconnect hydraulic hose (10) to counterbalance valve (12).

[6] - Connect hose (4) from JT07192 Electric/Hydraulic Pump to hydraulic hose. Cap fitting (11) on counterbalance valve.

Electric/Hydraulic Pump

JT07192

This tool is used to pressurize work ports in the control valve.

[7] - Connect JT02156A Digital Pressure/Temperature Analyzer with 34 000 kPa (350 bar) (5000 psi) Transducer to JT07192 Electric/Hydraulic Pump. See JT02156A Digital Pressure/Temperature Analyzer Installation . (Group 9025-05.)

Digital Pressure/Temperature Analyzer

JT02156A

This tool is used to measure circuit relief pressures.

[8] - Pull and hold the hydraulic pressure release cable handle.

[9] - Start electric/hydraulic pump to pressurize the port. Take reading when pressure begins to decrease. The point at which pressure begins to decrease is the opening pressure of the circuit relief valve. Record results.

Item	Measurement	Specification
Bucket Rollback Circuit Relief Valve	Pressure	24 600—30 000 kPa 246—300 bar 3574—4355 psi

[10] -

→NOTE:

Relief valves are factory set and are not adjustable.

If pressure is not within specification, replace corresponding circuit relief valve. See Control Valve Disassemble and Assemble (S.N. 150523—) . (Group 3160.)

Bucket Rollback Circuit Relief Test—Compact Track Loader

[1] - Park machine on flat level surface.

[2] - Lower boom and bucket to the normal ground position.

[3] - Shut off engine.

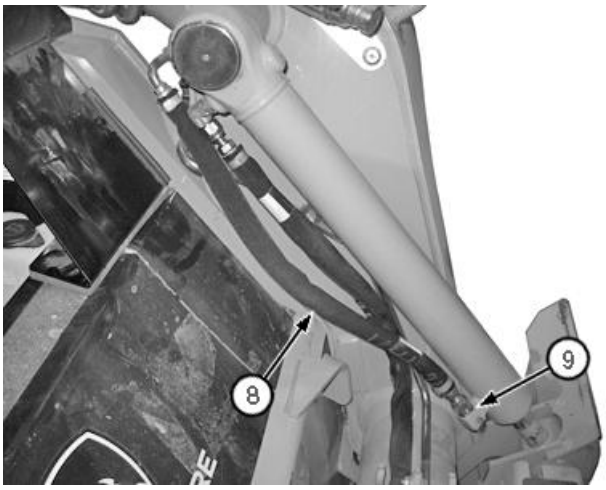
[4] -

CAUTION:

High pressure can remain in the boom and bucket hydraulic circuits indefinitely. Prevent injury from escaping hydraulic oil under pressure, relieve the pressure in the system before removing hydraulic lines.

Release hydraulic pressure. See Hydraulic System Pressure Release . (Group 9025-25.)

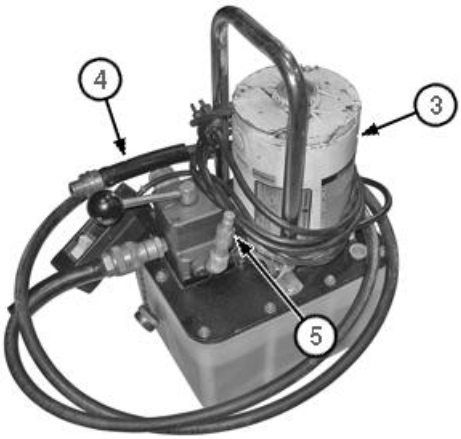
[5] -



Left Bucket Cylinder

LEGEND:

3	JT07192 Electric/Hydraulic Pump
4	Pump Hose
5	Quick Coupler (for attaching JT02156A Digital Pressure/Temperature Analyzer)
8	Left Bucket Cylinder Hose (rod end)
9	Left Bucket Cylinder Fitting (rod end)



JT07192 Electric/Hydraulic Pump

Disconnect hydraulic hose (8) to left bucket cylinder rod end.

[6] - Connect hose (4) from JT07192 Electric/Hydraulic Pump to hydraulic hose. Cap fitting (9) on hydraulic cylinder.

Electric/Hydraulic Pump

JT07192

This tool is used to pressurize work ports in the control valve.

[7] - Disconnect hydraulic hose to right bucket cylinder rod end. Cap and plug hose and fitting on hydraulic cylinder.

[8] - Connect JT02156A Digital Pressure/Temperature Analyzer with 34 000 kPa (350 bar) (5000 psi) Transducer to JT07192 Electric/Hydraulic Pump. See JT02156A Digital Pressure/Temperature Analyzer Installation . (Group 9025-05.)

Digital Pressure/Temperature Analyzer

JT02156A

This tool is used to measure circuit relief pressures.

[9] - Pull and hold the hydraulic pressure release cable handle.

[10] - Start electric/hydraulic pump to pressurize the port. Take reading when pressure begins to decrease. The point at which pressure begins to decrease is the opening pressure of the circuit relief valve. Record results.

Item	Measurement	Specification
Bucket Rollback Circuit Relief Valve	Pressure	24 600—30 000 kPa 246—300 bar 3574—4355 psi

[11] -

→NOTE:

Relief valves are factory set and are not adjustable.

If pressure is not within specification, replace corresponding circuit relief valve. See Control Valve Disassemble and Assemble (S.N. 150523—) . (Group 3160.)

Counterbalance Valve Test and Adjustment—Skid Steer Loader

Specifications

SPECIFICATIONS	
Counterbalance Valve Pressure	12 100 kPa 121 bar 1,750 psi
Slow Idle Engine Speed	1230—1370 rpm
Bucket Cylinder	
Bucket Cylinder Rod End Pressure	6 895—8 274 kPa 69—83 bar 1000—1200 psi
Bucket Cylinder Head End Pressure	4 826—6 205 kPa 48—62 bar 700—900 psi

Service Equipment and Tools

SERVICE EQUIPMENT AND TOOLS
JT07192 Electric/Hydraulic Pump
JT02156A Digital Pressure/Temperature Analyzer
JT02162 5000 psi Transducer

This test is performed to check counterbalance valve.

[1] -

→NOTE:

Front attachment must be removed from Quik-Tatch coupler to perform this test.

Park machine on flat level surface.

[2] - Lower boom to the ground.

[3] -

CAUTION:

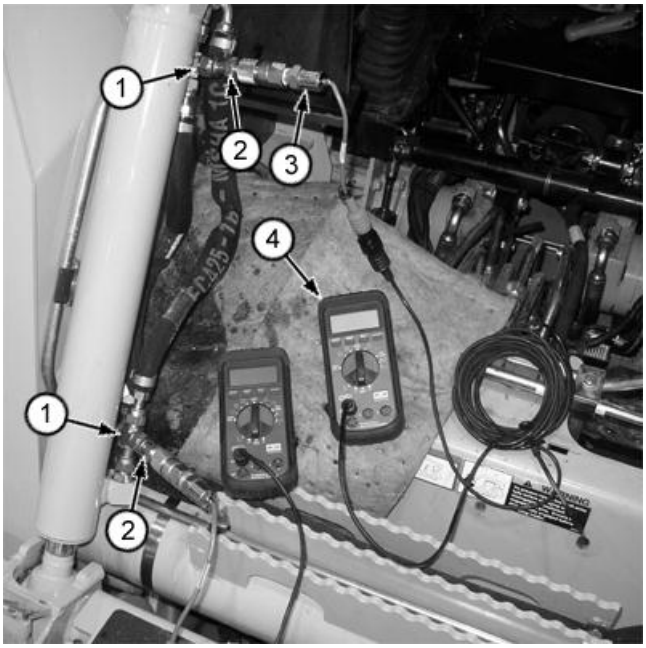
To avoid injury from escaping fluid under pressure, stop engine and relieve the pressure in the system before disconnecting or connecting hydraulic or other lines. Tighten all connections before applying pressure.

Relieve hydraulic system pressure. See Hydraulic System Pressure Release. (Group 9025-25.)

[4] -

IMPORTANT:

Cap and plug openings and hose ends to prevent contamination of hydraulic system.



LEGEND:

1 Tee Fitting (2 used)
2 Quick Coupler (2 used)
3 Transducer (2 shown)
4 Digital Pressure/Temperature Analyzer (2 shown)

Counterbalance Valve Test

Disconnect hydraulic lines from a bucket cylinder.

[5] - Install tee fitting (1) in each port of bucket cylinder and connect hydraulic lines.

[6] - Install quick coupler (2) in each tee fitting.

[7] - Install transducer (3) to each quick coupler and connect digital pressure/temperature analyzer (4).

Digital Pressure/Temperature Analyzer

JT02156A

To display digital readings for temperature and single, multiple or differential hydraulic oil pressure. Also reads vacuum when used with 500 psi transducer.

5000 psi Transducer

JT02162

To measure hydraulic oil pressure.

[8] - Run machine at specification. Fully actuate bucket dump function.

Item	Measurement	Specification
Slow Idle	Engine Speed	1230—1370 rpm

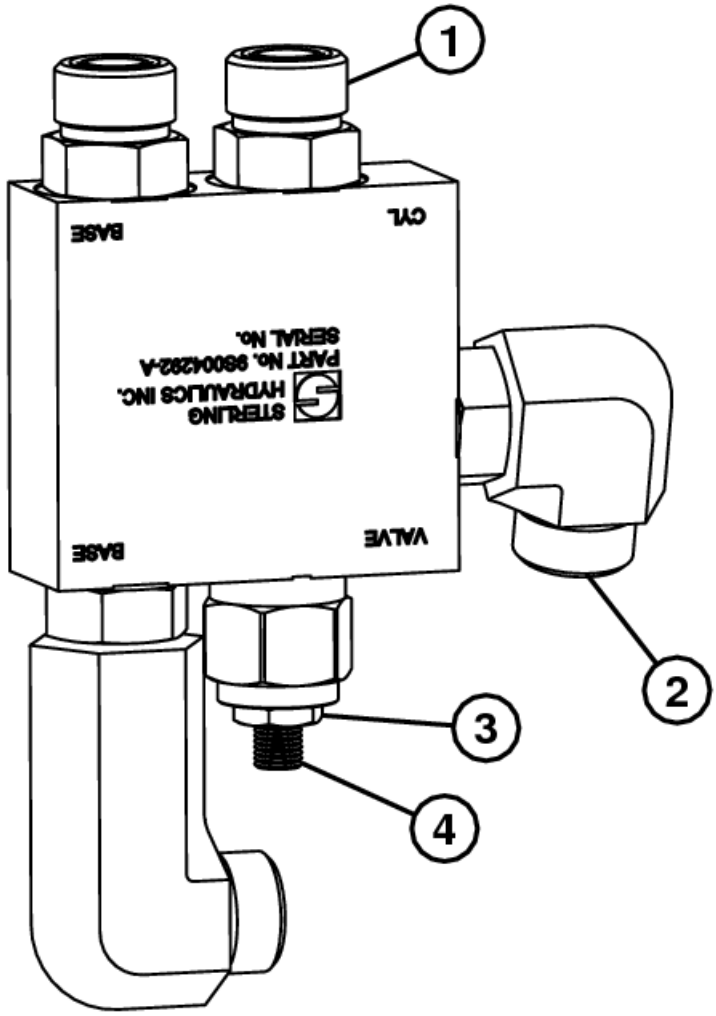
[9] - Measure and record pressure reading from rod and head ends of bucket cylinder.

Item	Measurement	Specification
Bucket Cylinder		
Bucket Cylinder Rod End	Pressure	6 895—8 274 kPa 69—83 bar 1000—1200 psi
Bucket Cylinder Head End	Pressure	4 826—6 205 kPa 48—62 bar 700—900 psi

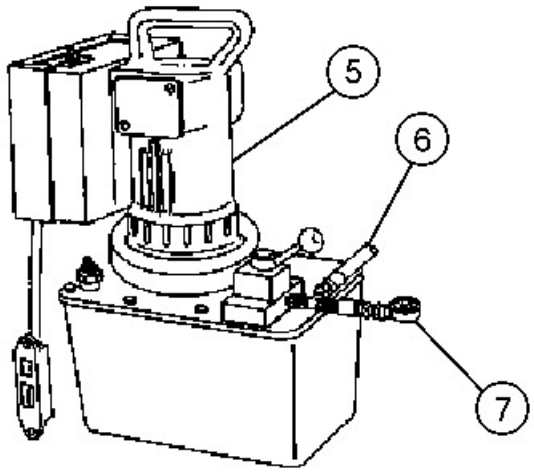
If machine does not meet specifications, continue procedure.

[10] - Remove counterbalance valve. See Counterbalance Valve Remove and Install—Skid Steer Loader. (Group 3160.)

[11] -



Counterbalance Valve



Electric/Hydraulic Pump

LEGEND:

1	Pressure Port
2	Drain Port
3	Nut
4	Screw
5	Electric/Hydraulic Pump
6	Electric/Hydraulic Pump Hose
7	Gauge

Connect electric/hydraulic pump JT07192 hose (6) with gauge (7) to port (1).

Electric/Hydraulic Pump

JT07192

This tool is used to pressurize work ports in the control valve.

[12] - Connect drain hose to port (2) and place in suitable container.

[13] - Start electric/hydraulic pump to pressurize port (1). Take reading when pressure on gauge (7) begins to decrease. The point at which pressure begins to decrease is the opening pressure of the counterbalance valve.

[14] - As necessary, adjust counterbalance valve to specification.

Item	Measurement	Specification
Counterbalance Valve	Pressure	12 100 kPa 121 bar 1,750 psi

- Loosen nut (3).
- Turn screw (4) clockwise to increase pressure.
- Turn screw counterclockwise to decrease pressure.
- Tighten nut.

[15] - Install counterbalance valve. See Counterbalance Valve Remove and Install—Skid Steer Loader . (Group 3160.)

Hydraulic Pump Flow Test

Specifications

SPECIFICATIONS	
Hydraulic Oil Temperature	43°C 110°F
Fast Idle Engine Speed	2930—3070 rpm
Testing Pressure	13 800 kPa 138 bar 2,000 psi
317 Pump Flow	
New, Typical Flow Rate	64.3 L/min 17.0 gpm
Used, Minimum Flow Rate	53.0 L/min 14.0 gpm
New, Typical Flow Rate with High Flow	102.2 L/min 27.0 gpm
Used, Minimum Flow Rate with High Flow	83.7 L/min 22.1 gpm
320 Pump Flow	
New, Typical Flow Rate	71.9 L/min 19.0 gpm
Used, Minimum Flow Rate	58.7 L/min 15.5 gpm
New, Typical Flow Rate with High Flow	117.3 L/min 31.0 gpm
Used, Minimum Flow Rate with High Flow	96.1 L/min 25.4 gpm
CT322 Pump Flow	
New, Typical Flow Rate	71.9 L/min 19.0 gpm
Used, Minimum Flow Rate	58.7 L/min 15.5 gpm
New, Typical Flow Rate with High Flow	109.8 L/min 29.0 gpm
Used, Minimum Flow Rate with High Flow	90.1 L/min 23.8 gpm

→NOTE:

The hydraulic pump provides a continuous flow of charge oil to the hydrostatic pumps.

This test is performed to ensure the hydraulic pump is delivering sufficient oil flow to operate the hydraulic system properly.

[1] - Operate hydraulic system until hydraulic oil reaches specification.

Item	Measurement	Specification
Hydraulic Oil	Temperature	43°C 110°F

[2] - Lower boom and bucket to normal ground position. Stop engine and relieve hydraulic pressure. See Hydraulic System Pressure Release . (Group 9025-25.)

[3] - Raise and block machine. For skid steer loader, see Raising and Blocking Machine . (Operator′s Manual.) For compact track loader, see Raising and Blocking Machine . (Operator′s Manual.)

[4] -

→NOTE:

Male auxiliary hydraulic connector is pressure port.

Connect In-Line Hydraulic Tester to auxiliary connectors on boom.

[5] - Set engine speed to fast idle.

Item	Measurement	Specification
Fast Idle	Engine Speed	2930—3070 rpm

[6] - Adjust the flow meter loading valve to obtain specified test pressures.

Item	Measurement	Specification
Hydraulic Pump	Testing Pressure	13 800 kPa
		138 bar
		2,000 psi

[7] - Read and record pump flow.

Item	Measurement	Specification
317 Pump Flow		
New, Typical	Flow Rate	64.3 L/min
		17.0 gpm
Used, Minimum	Flow Rate	53.0 L/min
		14.0 gpm
New, Typical with High Flow	Flow Rate	102.2 L/min
		27.0 gpm
Used, Minimum with High Flow	Flow Rate	83.7 L/min
		22.1 gpm
320 Pump Flow		
New, Typical	Flow Rate	71.9 L/min
		19.0 gpm
Used, Minimum	Flow Rate	58.7 L/min
		15.5 gpm
New, Typical with High Flow	Flow Rate	117.3 L/min
		31.0 gpm
Used, Minimum with High Flow	Flow Rate	96.1 L/min
		25.4 gpm
CT322 Pump Flow		
New, Typical	Flow Rate	71.9 L/min
		19.0 gpm
Used, Minimum	Flow Rate	58.7 L/min
		15.5 gpm
New, Typical with High Flow	Flow Rate	109.8 L/min
		29.0 gpm
Used, Minimum with High Flow	Flow Rate	90.1 L/min
		23.8 gpm

[8] - If flow does not meet specifications:

- Check auxiliary hydraulic control valve spool travel
- Control handle adjustment
- Pedal pivot and linkage to ensure mechanical systems are operating properly

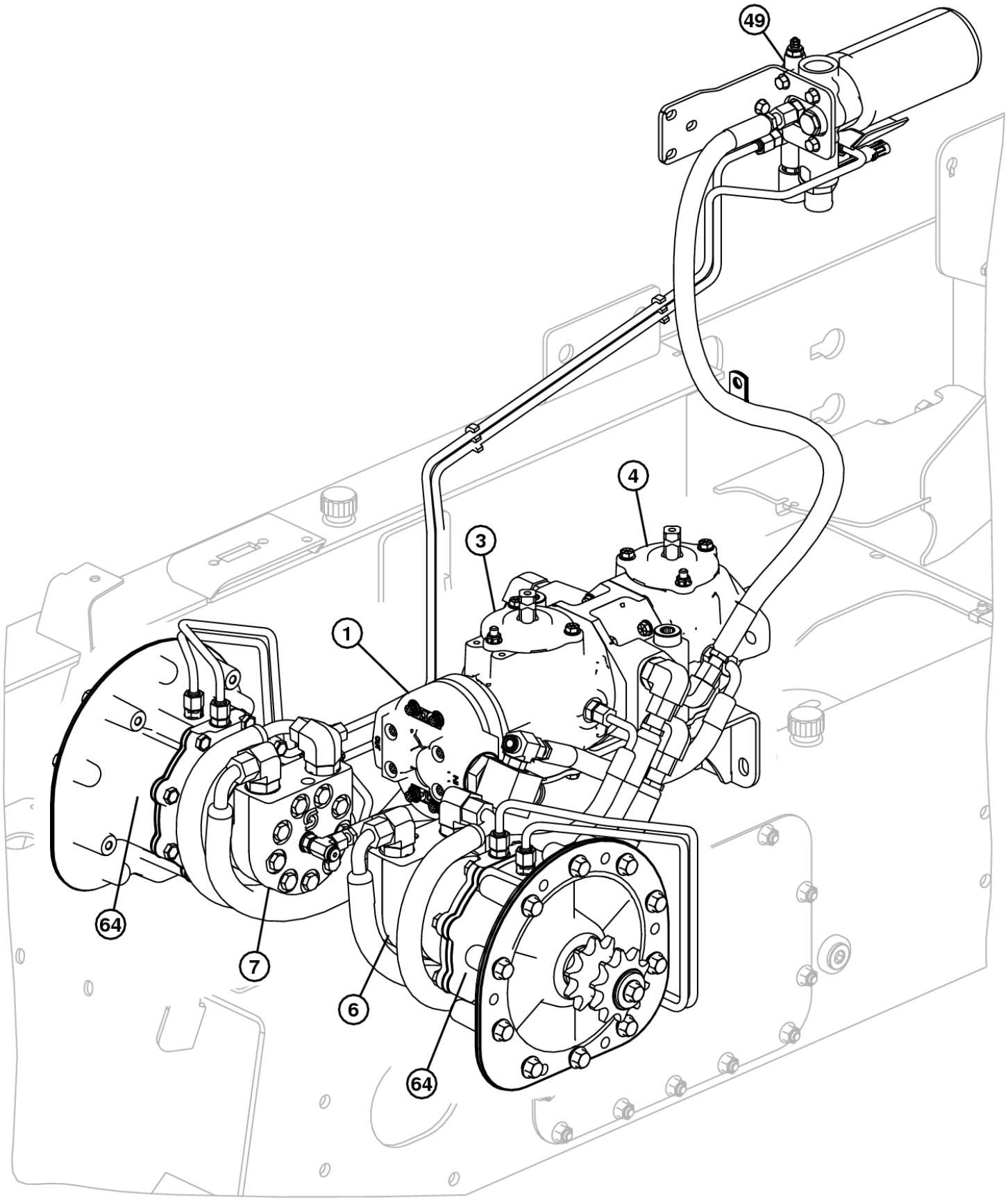
[9] - If flow is low, verify proper engine speed at fast idle see Engine Speed Test and Adjustment. (Group 9010.) If engine speed is ok, repair or replace hydraulic pump. See Hydraulic Pump Remove and Install. (Group 3160.)

Section 9026 - HYDROSTATIC SYSTEM

Table of contents

Group 05 - Theory Of Operation

Hydrostatic System Operation



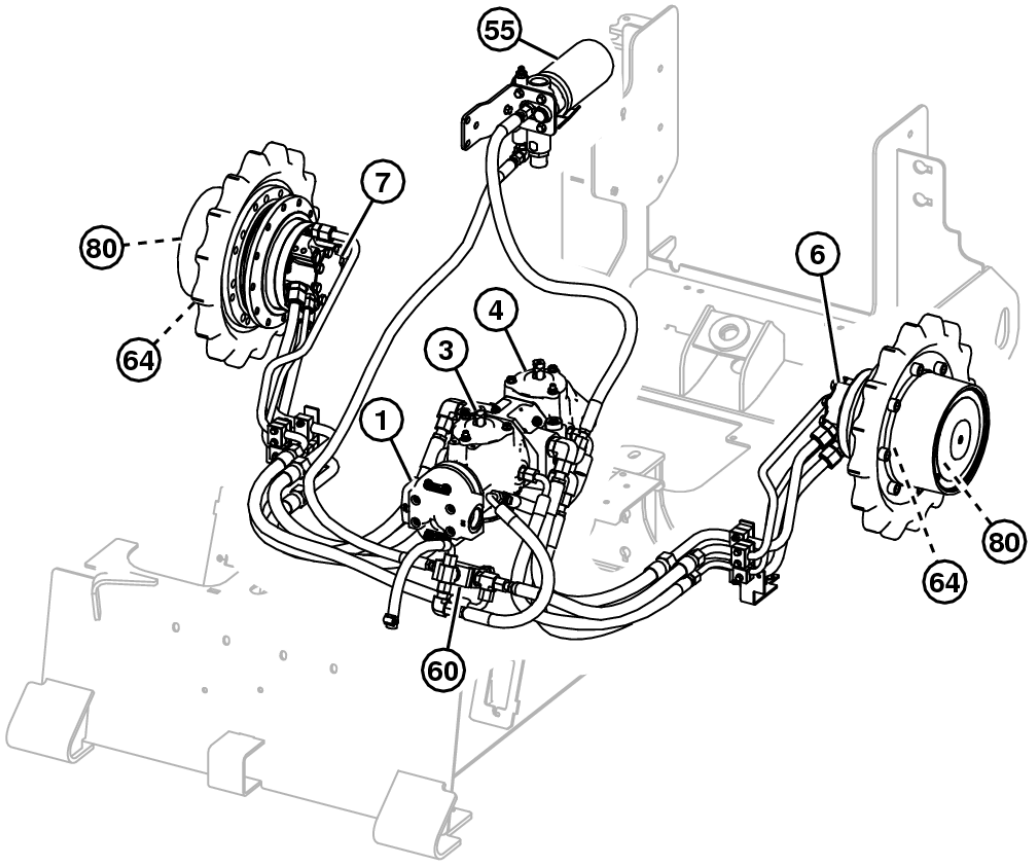
T197382

Hydrostatic System Component Location—Skid Steer Loader

LEGEND:

1	Hydraulic Pump
3	Left Hydrostatic Pump

4 Right Hydrostatic Pump
6 Left Hydrostatic Motor
7 Right Hydrostatic Motor
49 Hydraulic Oil Filter and Park Brake Solenoid Valve Manifold
64 Park Brake (2 used)

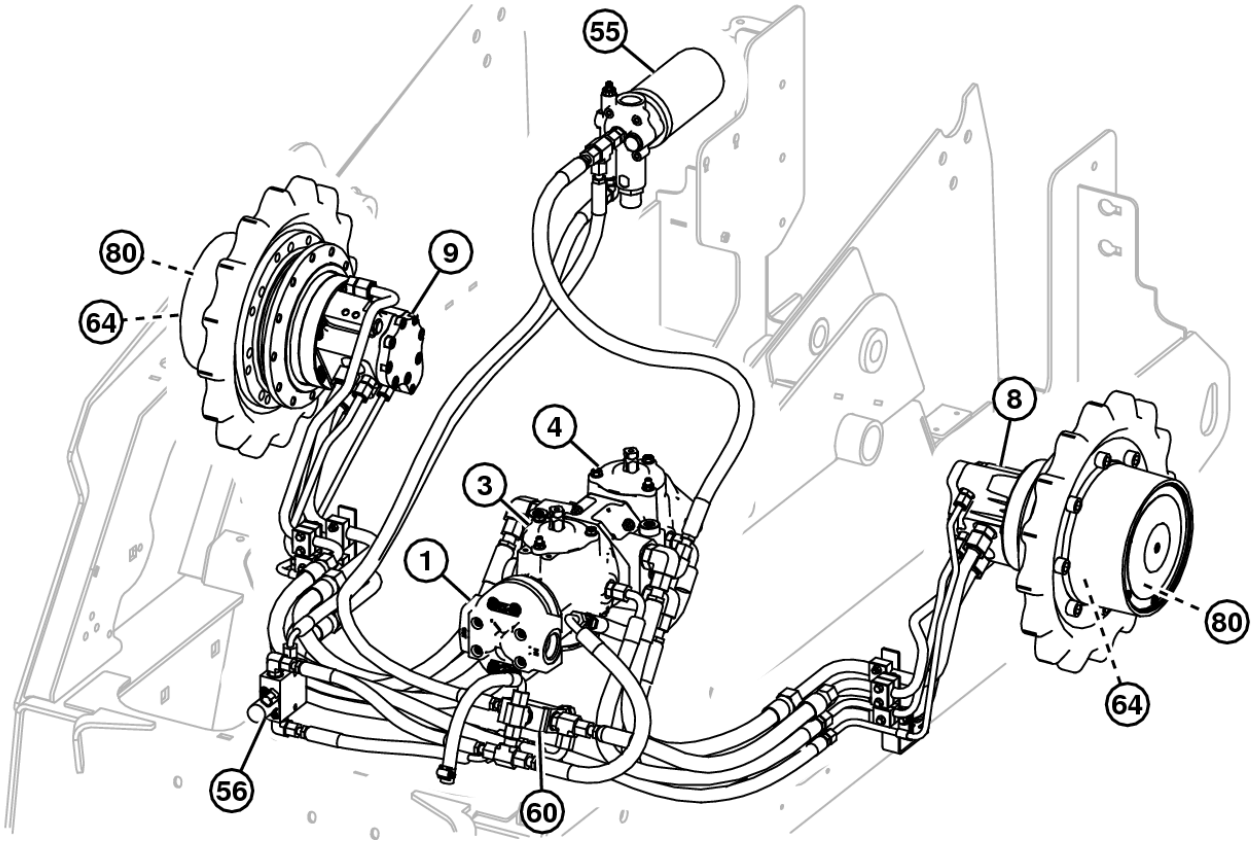


T209971

Hydrostatic System Component Location—Single Speed—Compact Track Loader

LEGEND:

1 Hydraulic Pump
3 Left Hydrostatic Pump
4 Right Hydrostatic Pump
6 Left Hydrostatic Motor
7 Right Hydrostatic Motor
55 Hydraulic Oil Filter Manifold
60 Park Brake Manifold
64 Park Brake (2 used)
80 Hydrostatic Motor Gearbox (2 used)



T209970

Hydrostatic System Component Location—Two Speed—Compact Track Loader

LEGEND:

1	Hydraulic Pump
3	Left Hydrostatic Pump
4	Right Hydrostatic Pump
8	Left Hydrostatic Motor
9	Right Hydrostatic Motor
55	Hydraulic Oil Filter Manifold
56	Two Speed Proportional Solenoid Valve
60	Park Brake Solenoid Valve Manifold
64	Park Brake (2 used)
80	Hydrostatic Motor Gearbox (2 used)

The hydrostatic system provides a means to transfer power from the engine to the hydrostatic motors to drive the wheels on skid steer loaders or the tracks on compact track loaders. It also provides infinitely variable speed and steering.

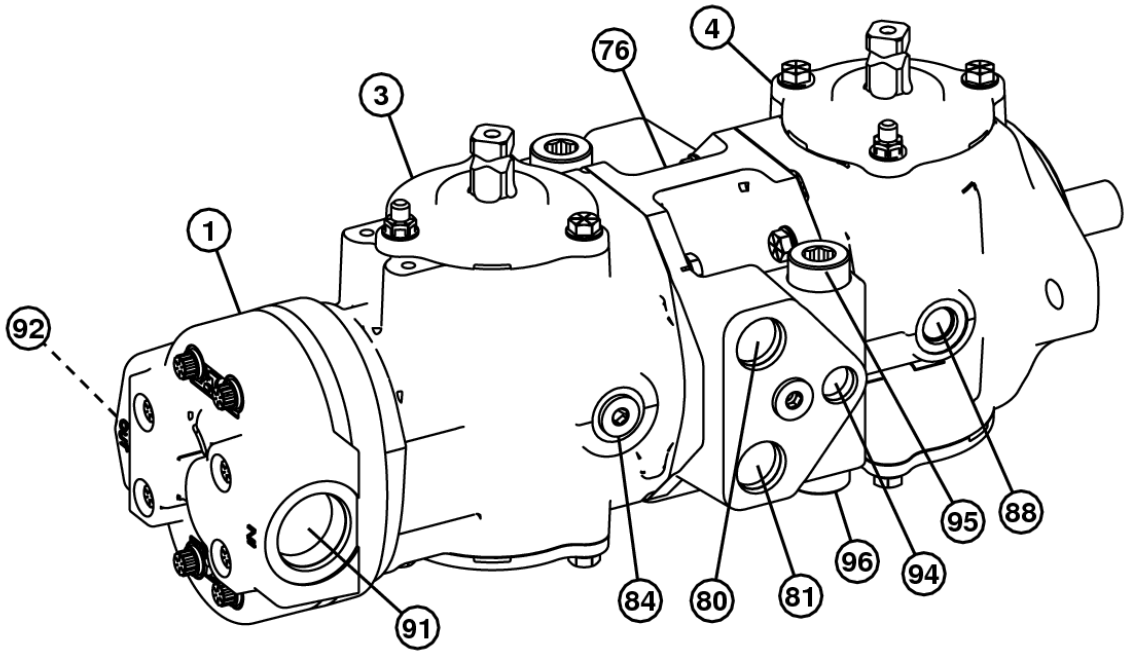
The hydrostatic pumps provide oil to the hydrostatic motors through hydrostatic lines and fittings. Oil in the hydrostatic system circulates in a closed loop circuit. Oil leaves the hydrostatic pumps and flows to the hydrostatic motors and returns to the hydrostatic pumps. Flushing passages in the hydrostatic motors allow oil to circulate within the closed loop circuit to aid in cooling of the hydrostatic system components. The hydraulic pump provides a continuous flow of charge oil to the hydrostatic pumps.

Steering is controlled by two steering levers located in the cab. The steering levers control direction (forward and reverse) and speed (oil flow) of the machine by pivoting the swash plates in the hydrostatic pumps.

For more information:

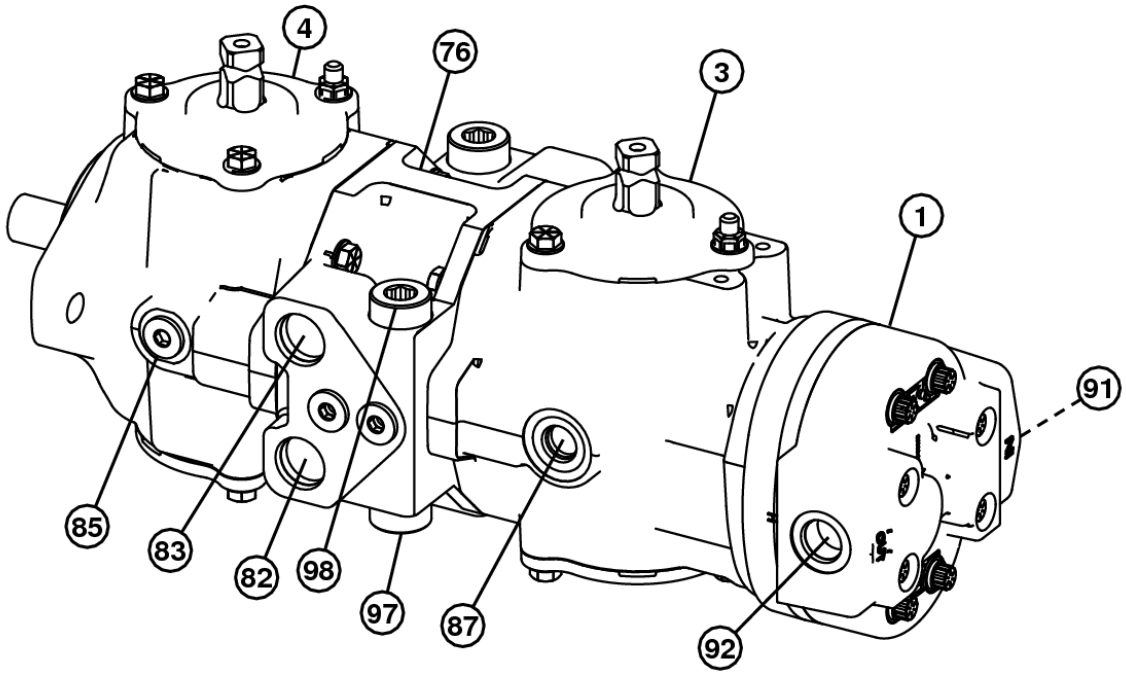
- See Hydraulic System Schematic—Skid Steer Loader (S.N. —150522) . (Group 9025-05.)
- See Hydraulic System Schematic—Skid Steer Loader (S.N. 150523—) . (Group 9025-05.)
- See Hydraulic System Schematic—Single Speed—Compact Track Loader (S.N. —150522) . (Group 9025-05.)
- See Hydraulic System Schematic—Single Speed—Compact Track Loader (S.N. 150523—) . (Group 9025-05.)
- See Hydraulic System Schematic—Two Speed—Compact Track Loader (S.N. —150522) . (Group 9025-05.)
- See Hydraulic System Schematic—Two Speed—Compact Track Loader (S.N. 150523—) . (Group 9025-05.)

Hydrostatic Pump Operation



T197649

Hydrostatic Pump Component Location—Skid Steer Loader



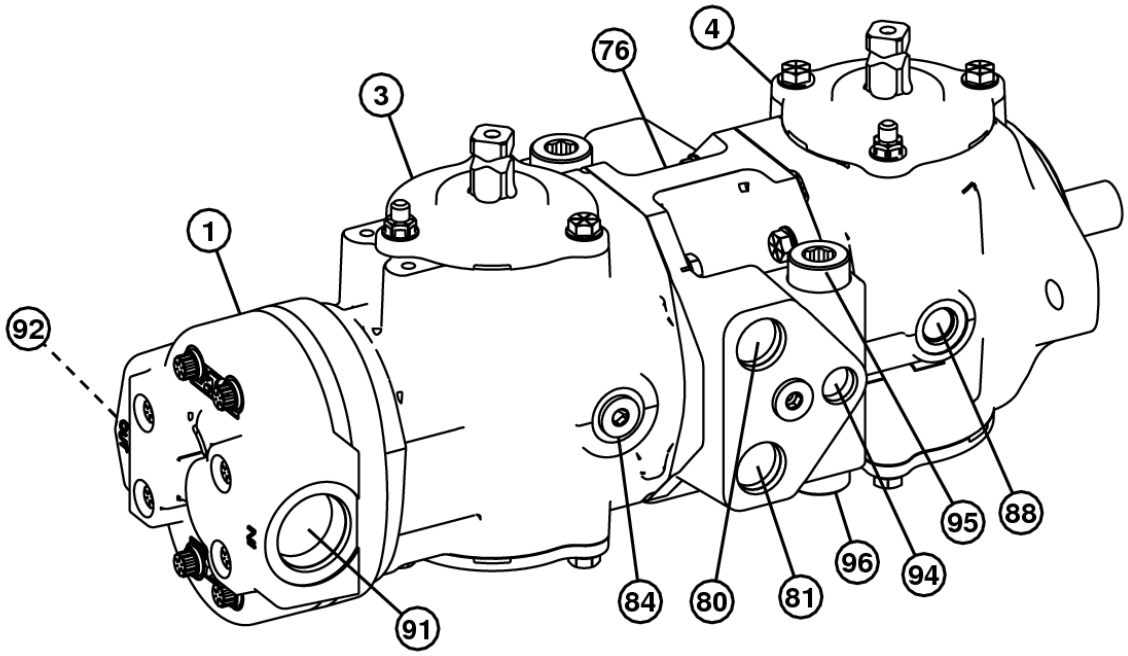
T197650

Hydrostatic Pump Component Location—Skid Steer Loader

LEGEND:

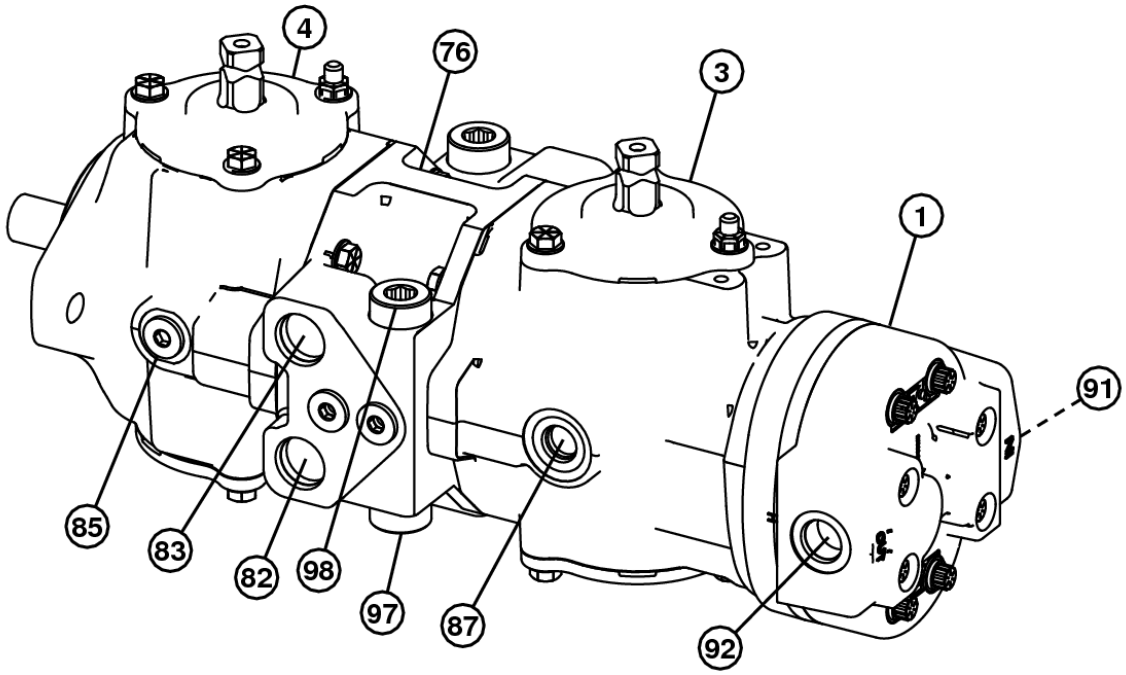
1	Hydraulic Pump
3	Left Hydrostatic Pump
4	Right Hydrostatic Pump
76	Hydrostatic Pump Manifold
80	To Left Hydrostatic Motor Forward Port
81	To Left Hydrostatic Motor Reverse Port
82	To Right Hydrostatic Motor Forward Port
83	To Right Hydrostatic Motor Reverse Port
84	To Left Hydrostatic Motor Flushing Port
85	To Right Hydrostatic Motor Flushing Port
87	To Hydraulic Quik-Tatch Solenoid Valve (if equipped)
88	To Hydraulic Oil Tank
91	From Hydraulic Oil Tank
92	To Control Valve
94	From Hydraulic Oil Filter and Park Brake Solenoid Valve Manifold
95	Right Reverse Pressure Relief Valve

96 Right Forward Pressure Relief Valve
97 Left Reverse Pressure Relief Valve
98 Left Forward Pressure Relief Valve



T197649

Hydrostatic Pump Component Location—Compact Track Loader



T197650

Hydrostatic Pump Component Location—Compact Track Loader

LEGEND:

1 Hydraulic Pump
3 Left Hydrostatic Pump
4 Right Hydrostatic Pump
76 Hydrostatic Pump Manifold
80 To Left Hydrostatic Motor Forward Port
81 To Left Hydrostatic Motor Reverse Port
82 To Right Hydrostatic Motor Forward Port
83 To Right Hydrostatic Motor Reverse Port
84 To Left Hydrostatic Motor Drain Port
85 To Right Hydrostatic Motor Drain Port
87 To Hydraulic Quik-Tatch Solenoid Valve (if equipped)
88 To Hydraulic Oil Tank
91 From Hydraulic Oil Tank
92 To Control Valve
94 From Hydraulic Oil Filter Manifold

95 Right Reverse Pressure Relief Valve
96 Right Forward Pressure Relief Valve
97 Left Reverse Pressure Relief Valve
98 Left Forward Pressure Relief Valve

The hydrostatic pumps (3 and 4) are tandem mounted, manually variable displacement, axial piston pumps. They are connected by a manifold (76) and are mounted as an assembly to the flywheel housing. Power is transferred directly from the engine to the hydrostatic pump assembly by a hub coupling splined on the hydrostatic pump shaft. The hydrostatic pumps provide oil to the hydrostatic motors through hydrostatic lines and fittings. See Hydrostatic Motor Operation , Hydrostatic Motor Operation—Single Speed—Compact Track Loader , or Hydrostatic Motor Operation—Two Speed—Compact Track Loader for additional line connection information. (Group 9026-05.)

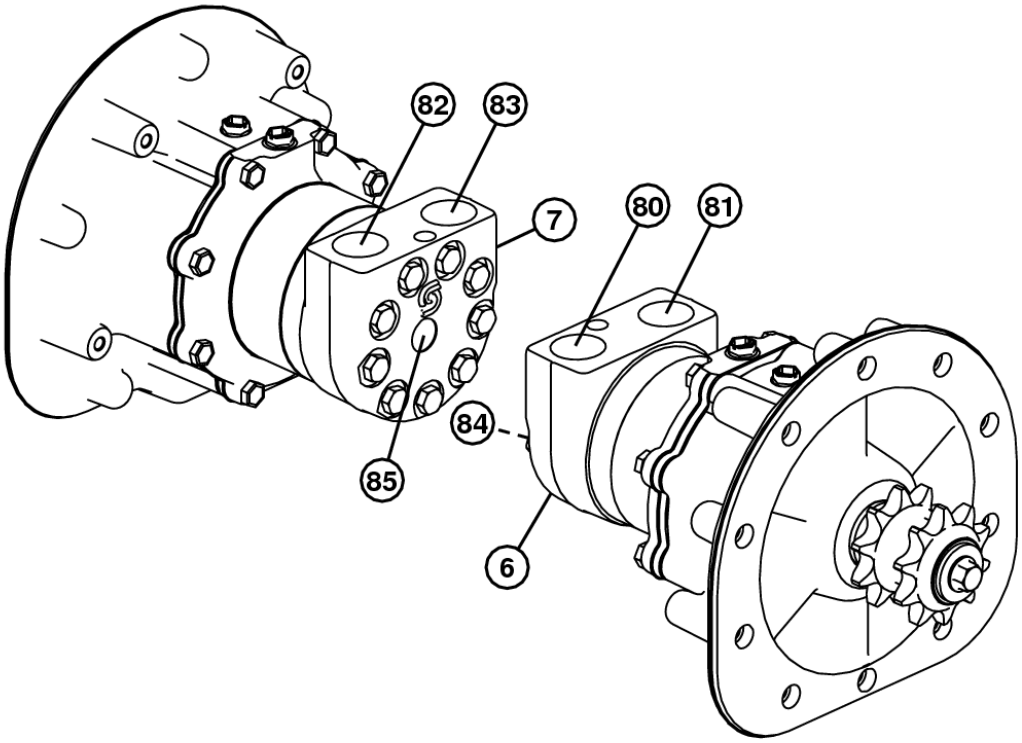
Oil flow is controlled by changing the angle of the swash plate. The position from the center of the swash plate controls the distance the pistons travel inside the piston bore of the rotating assembly. The direction the swash plate is pivoted from center determines the direction of oil flow (forward or reverse). The amount of angle the swash plate is deflected determines how much oil will be displaced (speed). See Steering Control Operation . (Group 9026-05.)

Each hydrostatic pump is equipped with two pressure relief valves (95—98). The pressure relief valves work in unison with each other. As a pressure relief valve shifts to relieve excessive pressure, the other pressure relief valve acts as a check valve, allowing oil to flow to the inlet side of the hydrostatic pump.

For more information:

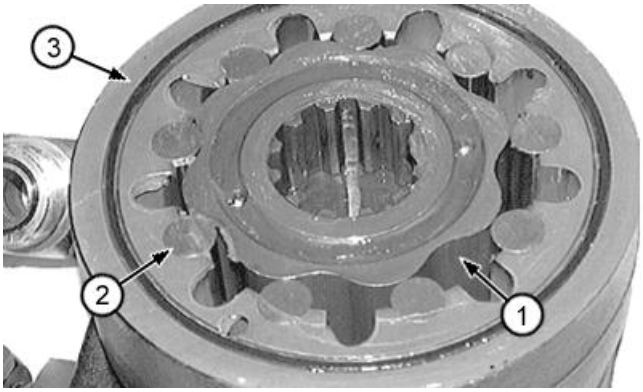
- See Hydraulic System Schematic—Skid Steer Loader (S.N. —150522) . (Group 9025-05.)
- See Hydraulic System Schematic—Skid Steer Loader (S.N. 150523—) . (Group 9025-05.)
- See Hydraulic System Schematic—Single Speed—Compact Track Loader (S.N. —150522) . (Group 9025-05.)
- See Hydraulic System Schematic—Single Speed—Compact Track Loader (S.N. 150523—) . (Group 9025-05.)
- See Hydraulic System Schematic—Two Speed—Compact Track Loader (S.N. —150522) . (Group 9025-05.)
- See Hydraulic System Schematic—Two Speed—Compact Track Loader (S.N. 150523—) . (Group 9025-05.)

Hydrostatic Motor Operation—Skid Steer Loader



T197652

Hydrostatic Motor Component Location—Skid Steer Loader



Geroller Motor

LEGEND:

1	Splined Rotor
2	Roller (9 used)
3	Rotor Ring
6	Left Hydrostatic Motor
7	Right Hydrostatic Motor
80	Forward Port
81	Reverse Port
82	Forward Port
83	Reverse Port
84	Flushing Port
85	Flushing Port

The hydrostatic motor is a geroller motor. There are two hydrostatic motors on each machine. They are mounted on the brake assemblies located on the left and right chain cases. The motor driveshaft drives a sprocket and chain system which transfers power to the wheels. The right hand motor drives the right wheels; the left hand motor drives the left wheels. See Hydrostatic Pump Operation for additional line connection information. (Group 9026-05.)

A geroller motor consists of a splined rotor (1), rollers (2) and rotor ring (3). The rotor is located eccentric to the rollers and rotor ring. The rotor has one less lobe than the rollers so that one lobe will always be in full engagement with the rollers at any one time. This allows the rotor lobes to slide over the rollers creating a seal to prevent pressure oil from returning to the inlet side of the motor.

During operation, pressurized oil enters the inlet side of the motor and acts against the rotor. The rotor and rotor ring are forced to rotate in the same direction. This rotation is transferred to a driveshaft. As the lobes part at the inlet area, hydraulic oil is drawn in to fill the void. Oil in the lobe cavity is forced to the outlet side. As the lobes mesh at the outlet area, oil is forced out of the motor. The hydrostatic motor is equipped with a flushing port to allow oil to circulate within the closed loop circuit to aid in cooling of the hydrostatic system components.

Hydrostatic Motor Operation—Single Speed—Compact Track Loader

T209891

Hydrostatic Motor Component Location—Single Speed—Compact Track Loader

LEGEND:

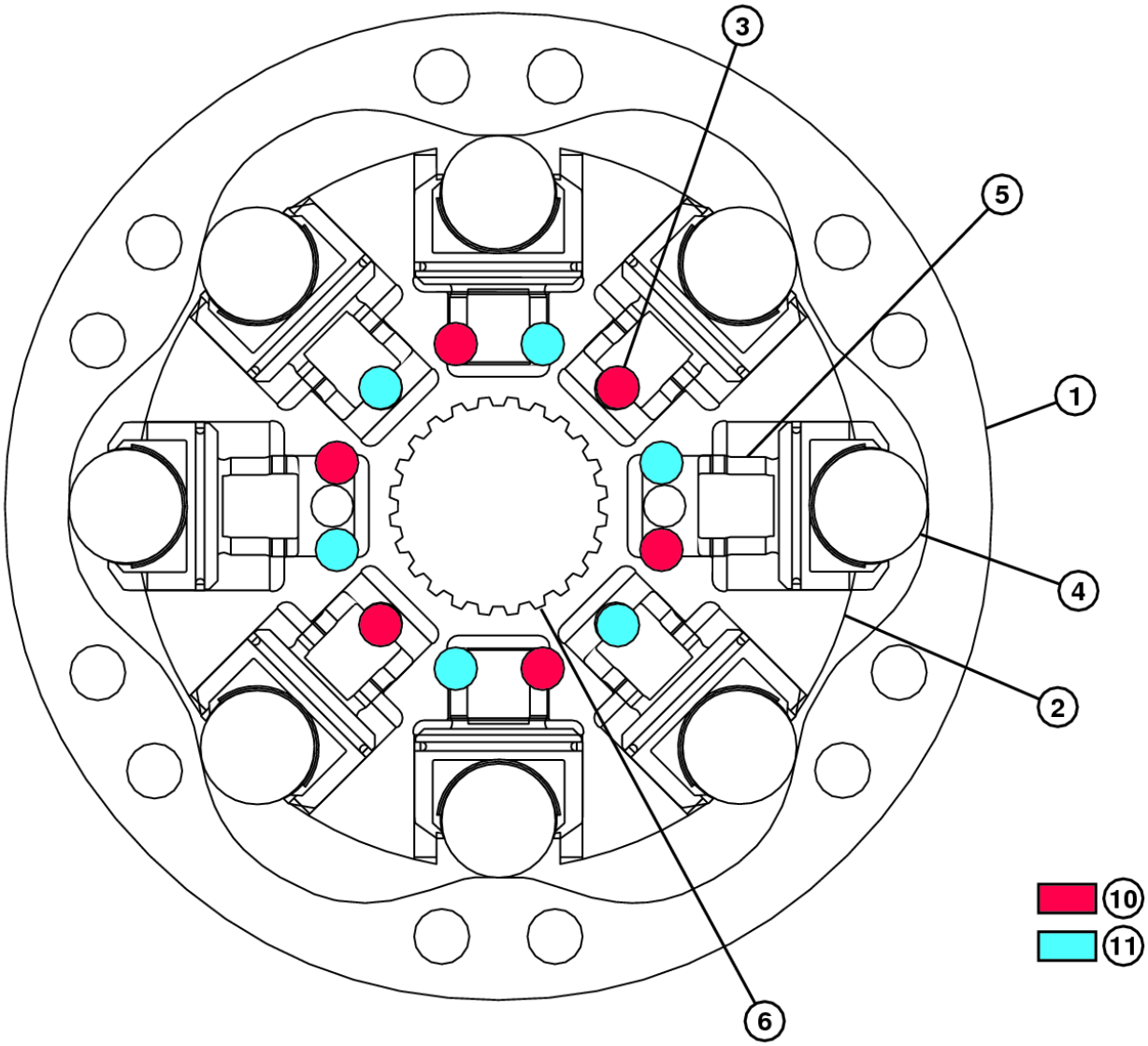
6	Left Hydrostatic Motor
7	Right Hydrostatic Motor
80	Left Forward Port
81	Left Reverse Port
82	Right Forward Port
83	Right Reverse Port
84	Left Drain Port
85	Right Drain Port
86	Left Brake Release Port
87	Right Brake Release Port

The single speed hydrostatic motor used on the compact track loader is a radial piston motor and planetary gearbox drive combination with an integral spring applied/hydraulic released park brake. There are two hydrostatic motors on each machine, mounted outside of the machine frame on either side. Each motor is connected to a park brake assembly bolted to the track undercarriage. Power from the motor is transmitted through the hydrostatic motor gearbox to the sprocket that powers the track. The right hand motor drives the right track; the left hand motor drives the left track. For additional line connection information, see Hydrostatic Pump Operation . (Group 9026-05.)

A radial piston motor consists of a cam (1), a carrier (2) with pistons (5), piston followers (4) and a manifold (3). The cam is attached to the motor housing and the carrier to the output shaft (6). Pressurized oil (10) is routed to the manifold. The oil is then fed through passages in the carrier to the piston bores. Each passage in the manifold is timed to one cam ramp.

The power stroke is developed when pressurized oil flows through the manifold and carrier oil passages, forcing the pistons outward. As the piston follower is forced against the cam ramp, the carrier and shaft are forced to turn. Return oil (11) is routed from the piston bores, through the carrier passages and into the manifold return passages. The oil manifold is spring loaded against the piston carrier with a thin film of oil separating them.

When the motor is engaged, some pistons are in power stroke, some pistons are in return stroke and some pistons are in transition between oil passages. As one group of pistons ends its power stroke, another group has begun. This overlapping of strokes provides smooth power (torque) to the driveshaft, gearbox and tracks.



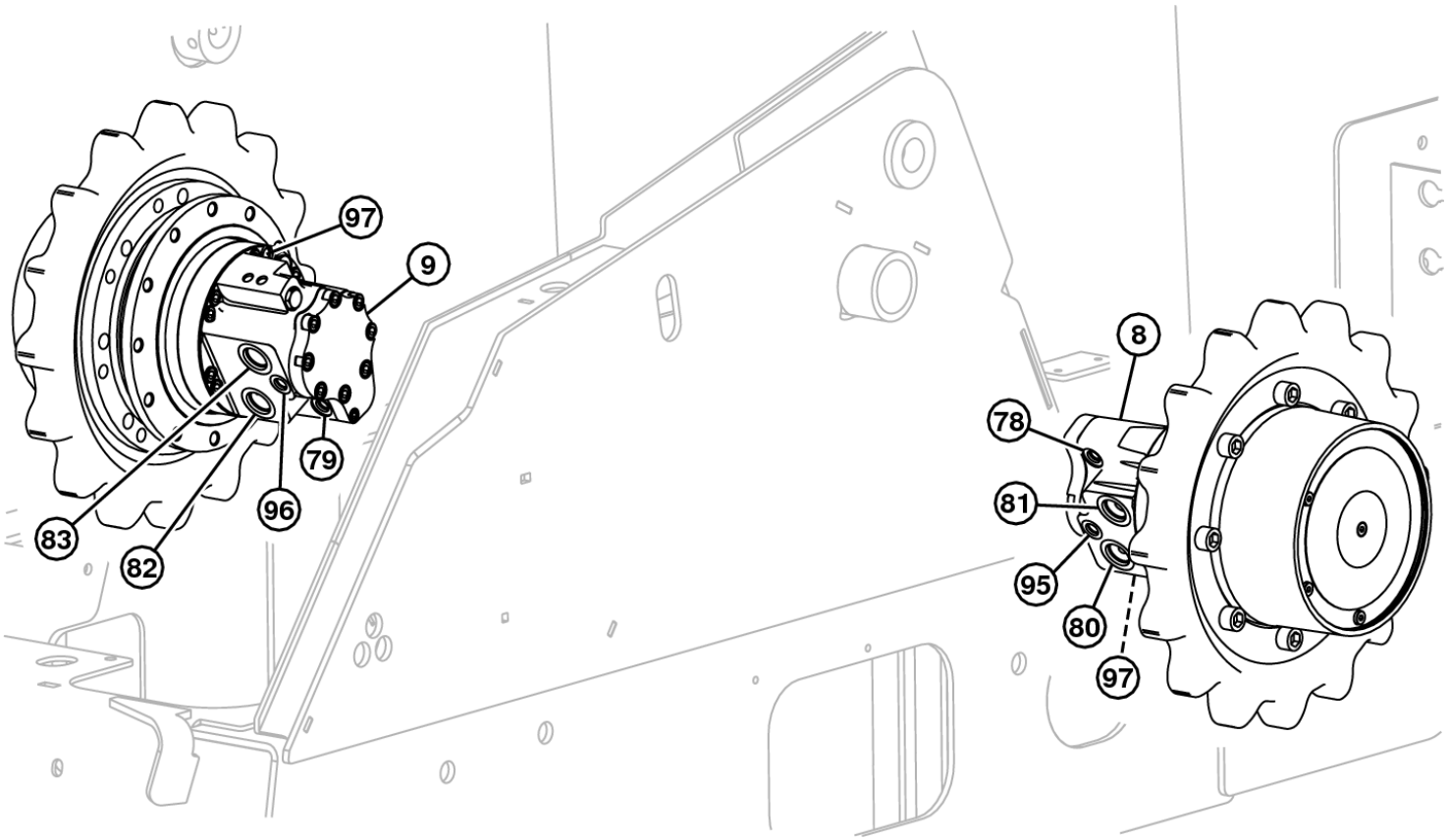
T210820

Single Speed Operation

LEGEND:

1	Cam
2	Carrier
3	Manifold
4	Piston Follower
5	Piston
6	Output Shaft
10	Pressure Oil
11	Return Oil

Hydrostatic Motor Operation—Two Speed—Compact Track Loader



T209893

Hydrostatic Motor Component Location—Two Speed—Compact Track Loader

LEGEND:

8	Left Hydrostatic Motor
9	Right Hydrostatic Motor
78	From Two Speed Proportional Solenoid Valve
79	From Two Speed Proportional Solenoid Valve
80	Left Forward Port
81	Left Reverse Port
82	Right Forward Port
83	Right Reverse Port
95	Left Drain Port
96	Right Drain Port
97	Park Brake Release Line

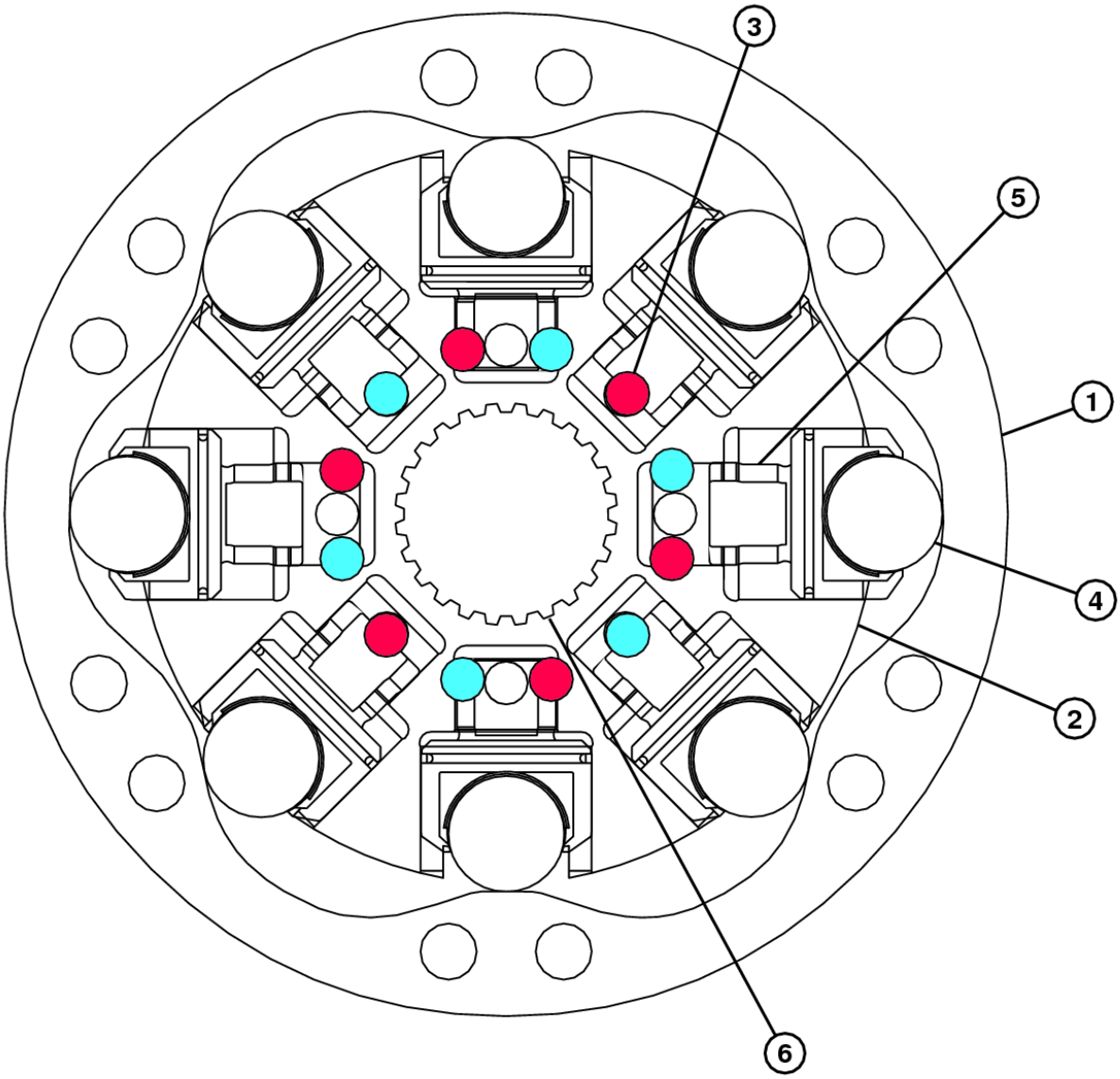
The two speed hydrostatic motor used on the compact track loader is a radial piston motor and planetary gearbox drive combination with an integral spring applied/hydraulic released park brake. There are two hydrostatic motors on each machine, mounted outside of the machine frame on either side. Each motor is connected to a park brake assembly bolted to the track undercarriage. Power from the motor is transmitted through the hydrostatic motor gearbox to the drive sprocket that powers the track. The right hand motor drives the right track; the left hand motor drives the left track. For additional line connection information, see Hydrostatic Pump Operation . (Group 9026-05.)

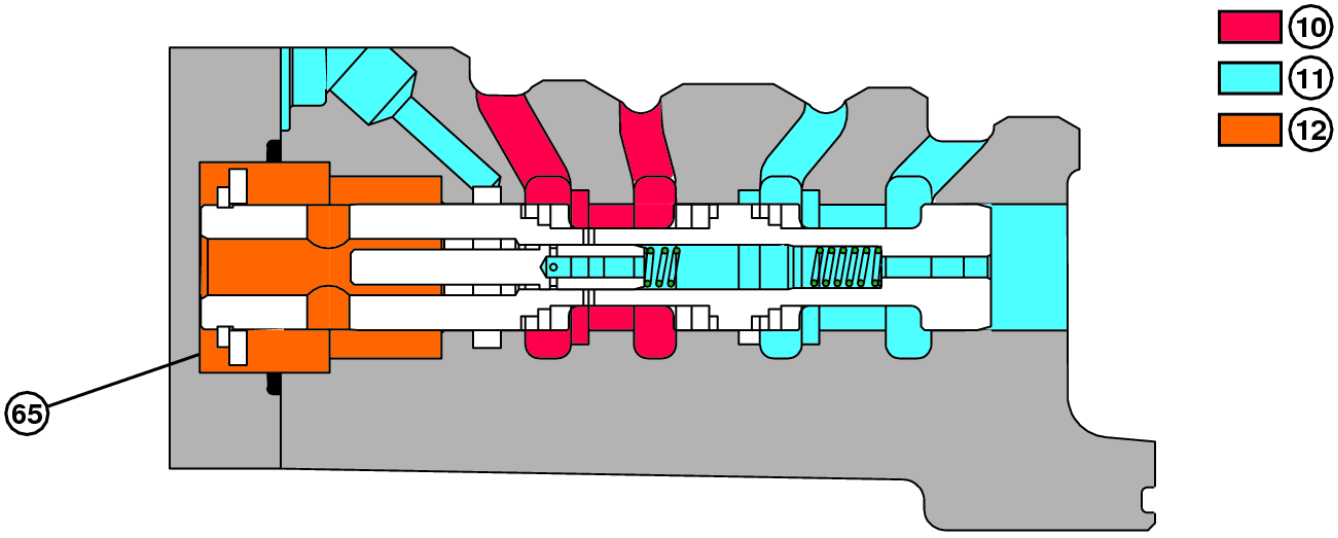
A radial piston motor consists of a cam (1), a carrier (2) with pistons (5), piston followers (4) and a manifold (3). The cam is attached to the motor housing and the carrier to the output shaft (6). Pressurized oil (10) is routed to the manifold. It is then fed through passages in the carrier to the piston bores. Each passage in the manifold is timed to one cam ramp.

The power stroke is developed when pressurized oil flows through the manifold and carrier oil passages, forcing the pistons outward. As the piston follower is forced against the cam ramp, the carrier and shaft are forced to turn. Return oil (11) is routed from the piston bores, through the carrier passages and into the manifold return passages. The oil manifold is spring loaded against the piston carrier with a thin film of oil separating them.

When the motor is engaged, some pistons are in power stroke, some pistons are in return stroke and some pistons are in transition between oil passages. As one group of pistons ends its power stroke, another group has begun. This overlapping of strokes provides smooth power (torque) to the driveshaft, gearbox and tracks.

When shifting between speeds, the speed shift spool (65) allows for smooth shifting by reducing shock on the hydrostatic system.





T198446

Slow Speed Operation

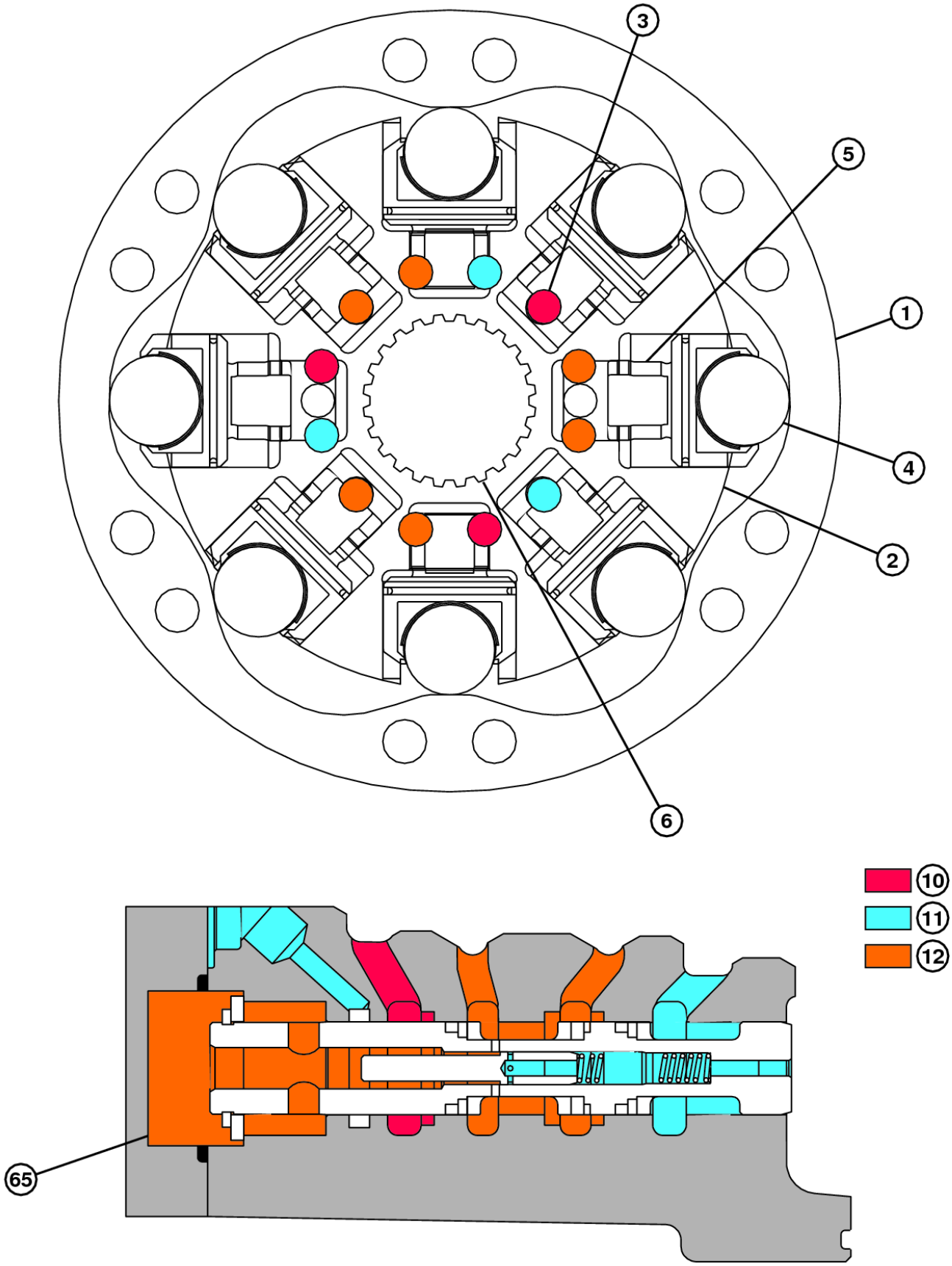
LEGEND:

1	Cam
2	Carrier
3	Manifold
4	Piston Follower
5	Piston
6	Output Shaft

10	Pressure Oil
11	Return Oil
12	Charge Pressure Oil
65	Speed Shift Spool

Slow Speed Operation

During slow speed operation, the hydrostatic pumps supply pressure oil (10) to each of the piston bores of the hydrostatic motors. The machine will operate in a slow speed, high torque mode.



T198447

Fast Speed Operation

LEGEND:

1	Cam
2	Carrier
3	Manifold
4	Piston Follower
5	Piston
6	Driveshaft
10	Pressure Oil
11	Return Oil
12	Charge Pressure Oil
65	Speed Shift Spool

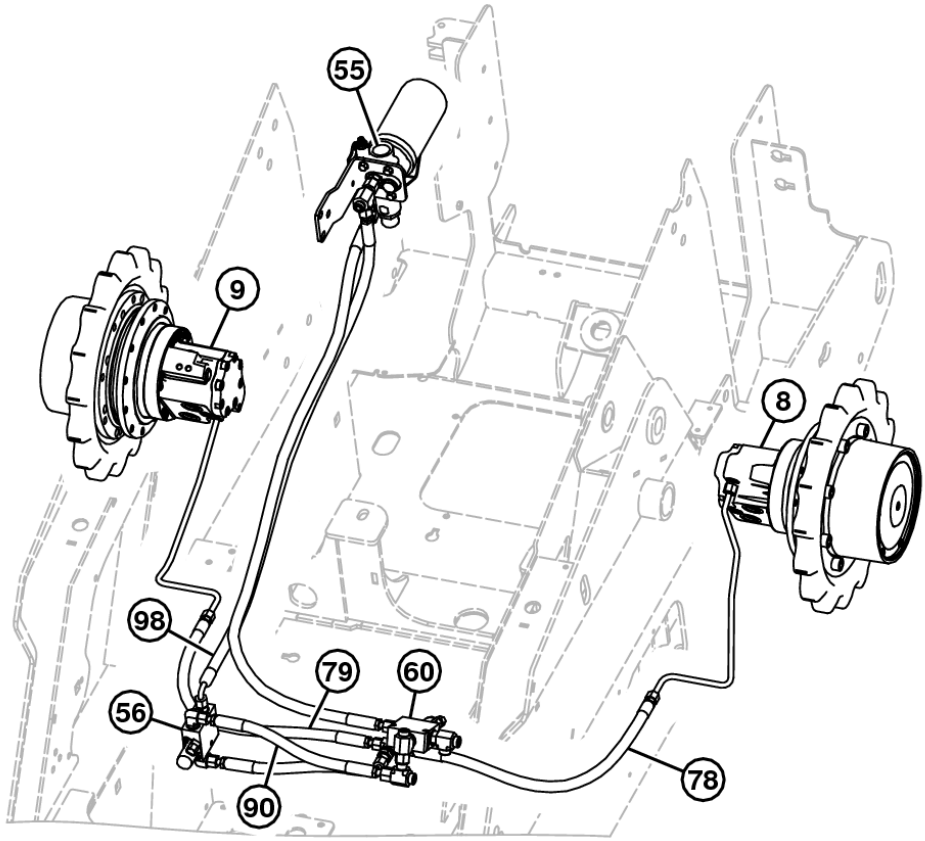
Fast Speed Operation

When the two speed switch is pressed, the two speed proportional solenoid valve shifts allowing charge pressure oil (12) to flow to the hydrostatic motors. Charge pressure oil shifts the speed shift spool (65) and speed selector valve. Charge pressure oil is then routed to half of the piston bores. The pistons in these bores are held out against the can and prevent supply pressure from entering. Supply pressure oil enters the remaining piston bores. The same volume of supply pressure oil is routed through the motor but with fewer power strokes. This causes the machine to operate in a high speed, low torque mode.

See Two Speed Proportional Solenoid Valve Operation—Compact Track Loader . (Group 9026-05.)

See Hydraulic System Schematic—Two Speed—Compact Track Loader (S.N. —150522) . See Hydraulic System Schematic—Two Speed—Compact Track Loader (S.N. 150523—) . (Group 9025-05.)

Two Speed Proportional Solenoid Valve Operation—Compact Track Loader



T209974

Two Speed Proportional Solenoid Valve Component Location—Compact Track Loader

LEGEND:

8	Left Hydrostatic Motor
9	Right Hydrostatic Motor
55	Hydraulic Oil Filter Manifold
56	Two Speed Proportional Solenoid Valve
60	Park Brake Solenoid Valve Manifold
78	To Left Hydrostatic Motor
79	To Right Hydrostatic Motor
90	Return Line
98	Charge Pressure Line

The two speed proportional solenoid valve (56) controls the two speed drive option. The valve is electronically controlled by the two speed switch mounted on the left steering lever.

When the two speed proportional solenoid valve is not energized, the solenoid valve prevents charge oil from flowing to the hydrostatic motors (8 and 9). The machine will operate in a slow speed, high torque mode.

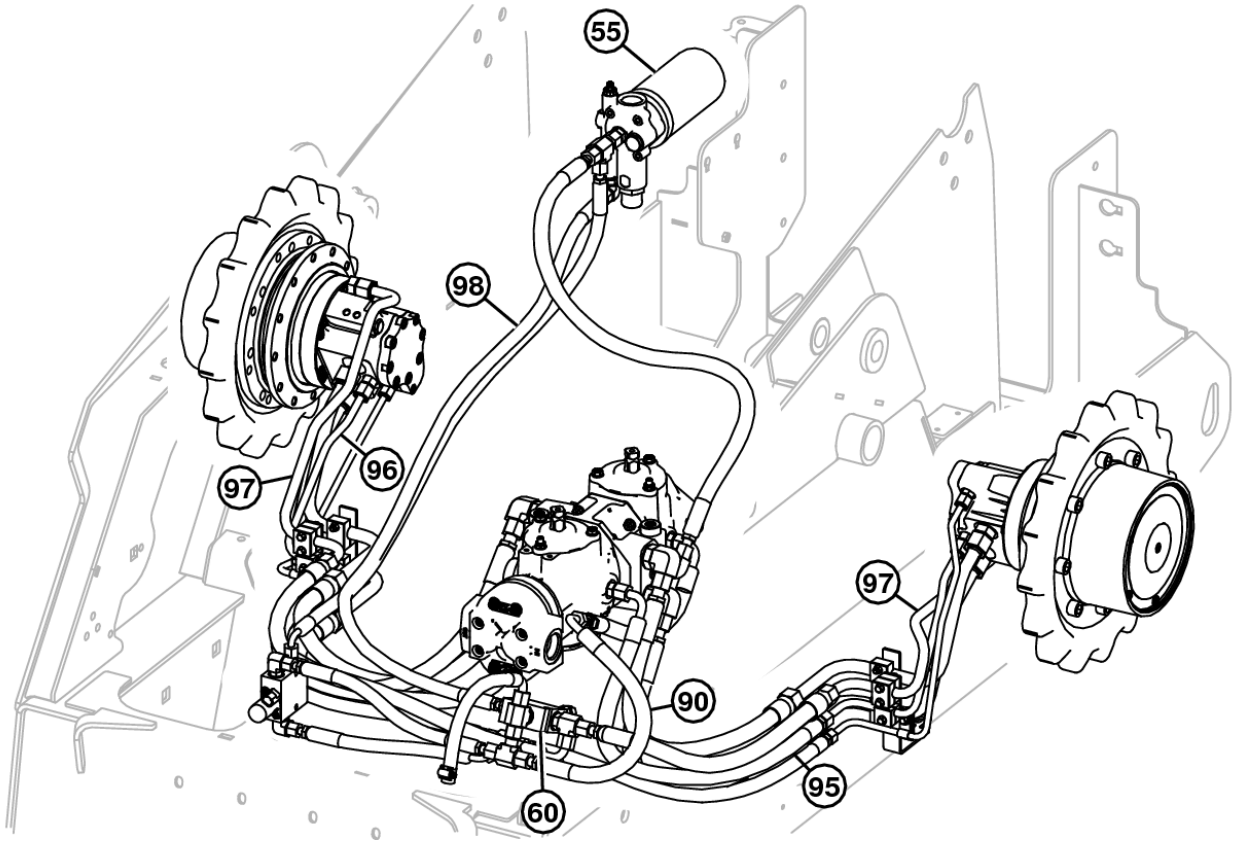
When the two speed proportional solenoid valve is energized, the solenoid valve shifts and allows charge oil to flow to the speed shift spool and speed selector valve in the hydrostatic motors. The machine will operate in a high speed, low torque mode.

If the machine is shut off while in the high speed, low torque mode, the solenoid valve will be de-energized. The machine will operate in a slow speed, high torque mode when restarted.

See Hydrostatic Motor Operation—Two Speed—Compact Track Loader . (Group 9026-05.)

See Hydraulic System Schematic—Two Speed—Compact Track Loader (S.N. —150522) . See Hydraulic System Schematic—Two Speed—Compact Track Loader (S.N. 150523—) . (Group 9025-05.)

Park Brake Solenoid Valve Manifold Operation—Compact Track Loader



T209978

Park Brake Solenoid Valve Manifold Component Location—Compact Track Loader (Two Speed Shown)

LEGEND:

55	Hydraulic Oil Filter Manifold
60	Park Brake Valve Manifold
90	Return Line
95	Left Hydrostatic Motor Drain
96	Right Hydrostatic Motor Drain
97	Park Brake Release Line
98	Charge Pressure Line

The park brake solenoid valve manifold (60) contains the park brake solenoid valve. The park brake solenoid valve controls park brake actuation by sending charge pressure to the park brake. See Park Brake System Operation . (Group 9026-05.)

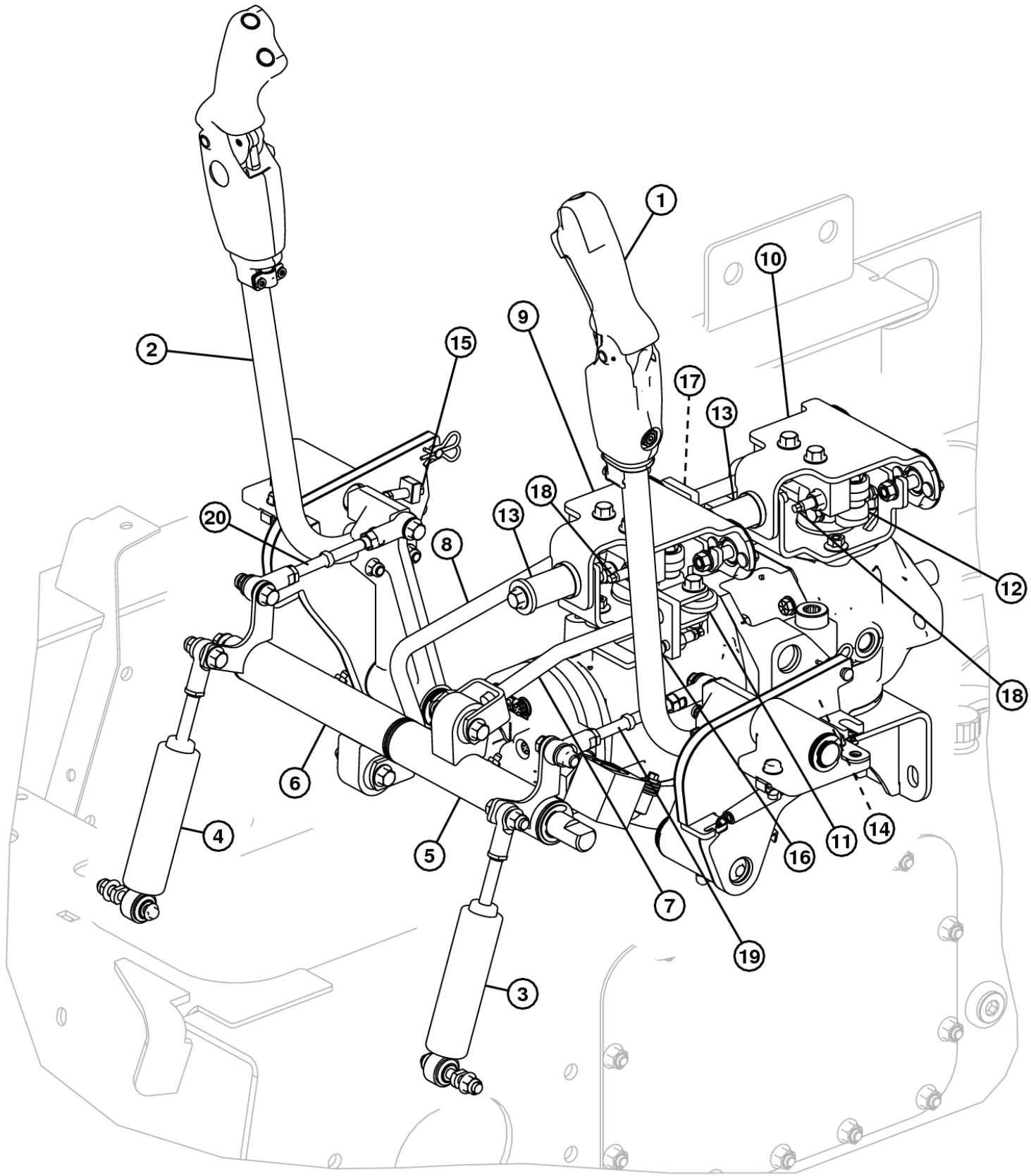
Park Brake System Operation

The park brake system is electrically controlled, spring applied and hydraulically released. The machine has a left and a right park brake assembly located between the hydrostatic motor and the drive axles. See Hydrostatic System Operation . (Group 9026-05.)

When the park brake switch is in the engaged position, the park brake solenoid valve prevents charge pressure oil to flow to the brake disk and spacer plate side of the brake piston. The park brake is applied by an internal spring that pushes the brake piston against the brake disks and spacer plates. Brake disks are splined to the brake housing. Spacer plates are splined to the driveshaft. When the brake disks and spacer plates are forced together, the driveshaft is prevented from rotating. On the skid steer loader, hydraulic pressure on the spring side of the brake piston assists with the engagement of the park brake when the engine is running.

When the park brake switch is in the disengaged position, the park brake solenoid valve allows charge pressure oil to flow to the brake disk and spacer plate side of the brake piston. The charge pressure oil overcomes the internal spring force, forcing the brake piston away from the brake disks and spacer plates. This disengages the park brake and allows the driveshaft to rotate. For more information, See Hydrostatic Motor Operation . (Group 9026-05.) See Hydraulic Oil Filter and Park Brake Solenoid Valve Manifold Operation—Skid Steer Loader . (Group 9025-05.) See Park Brake Solenoid Valve Manifold Operation—Compact Track Loader . (Group 9026-05.)

Steering Control Operation



T197395

Steering System Component Location

LEGEND:

1	Left Steering Lever
2	Right Steering Lever
3	Left Dampener
4	Right Dampener

5	Left Bellcrank
6	Right Bellcrank
7	Left Control Rod
8	Right Control Rod
9	Left Centering Plate
10	Right Centering Plate
11	Left Control Lever
12	Right Control Lever
13	Spring
14	Left Reverse Stop Adjustment Screw
15	Right Reverse Stop Adjustment Screw
16	Left Forward Stop Adjustment Screw
17	Right Forward Stop Adjustment Screw
18	Centering Screw
19	Left Steering Lever Link Rod
20	Right Steering Lever Link Rod

The steering control system provides a means of controlling the direction and speed of the machine by controlling the angle of the swash plates in the hydrostatic pumps. The angle and orientation of the swash plates control oil flow and direction the hydrostatic system. See Hydrostatic Pump Operation . (Group 9026-05.)

The steering control system consists of two steering levers mounted on either side of the operator, centering assemblies mounted on the hydrostatic pumps and a series of dampeners, bellcranks and control linkages.

The steering levers (1 and 2) connect to the hydrostatic pump control levers (11 and 12) using a series of control linkages (7 and 8) and bellcranks (5 and 6). Operating the levers moves the corresponding control linkages, bellcrank and hydrostatic pump control lever. The hydrostatic pump control lever then pushes against a spring-loaded centering plate.

Two spring-loaded centering plates (9 and 10), one on each hydrostatic pump, are used. The centering plates force the swash plates and steering levers to the neutral position whenever the steering levers are released. Each centering plate has a pair of adjustment screws (14—17) that contact the hydrostatic pump control lever. The adjustment screws provide a means of adjusting neutral position and to adjust creep.

A dampener (3 and 4) is attached to the bellcrank of each steering lever. The dampeners absorb hydrostatic pulses and torque feedback into the steering levers. They also provide some resistance to movement of the steering levers.

Moving the left steering lever forward rotates the swash plate inside the left hydrostatic pump in proportion to the movement of the steering lever. This causes the left hydrostatic pump to displace hydraulic oil at a rate relative to the position of the swash plate. The hydraulic oil flow from the left hydrostatic pump causes the left hydrostatic motor to operate. This causes the left wheels to rotate in the forward direction and at a speed relative to the position of the left steering lever. Moving the left steering lever to the rear causes the left wheels to rotate in the reverse direction and at a speed relative to the position of the left steering lever.

Operation of the right steering lever is the same as the left except it controls the swash plate in the right hydrostatic pump, which controls the right wheels.

For machine equipped with hand and foot controls, the right steering lever incorporates a wrist-actuated handle to operate auxiliary hydraulics.

For machine equipped with hand control only, the left and right steering levers incorporate wrist-actuated handles to operate the boom and bucket functions.

Group 15 - Diagnostic Information

Diagnose Hydrostatic System Malfunctions

→NOTE:

Diagnose malfunction charts are arranged from most probable and simplest to verify, to least likely and most difficult to verify.

Symptom	Problem	Solution
Machine Will Not Move In Either Direction	Low hydraulic oil level	Check hydraulic oil tank level. For skid steer loader, see Check Hydraulic Tank Oil Level . (Operator's Manual.) For compact track loader, see Check Hydraulic Tank Oil Level . (Operator's Manual.)
	Cold hydraulic oil	Operate hydraulic system to warm hydraulic oil.
	Hydrostatic pump not operating	Check dampener drive. See Hub Coupler Remove and Install . (Group 0325.)
	Low charge pressure	Perform Hydraulic Pump Flow Test . (Group 9025-25.)
	Air in hydraulic system	Check hydraulic oil tank level. For skid steer loader, see Check Hydraulic Tank Oil Level . (Operator's Manual.) For compact track loader, see Check Hydraulic Tank Oil Level . (Operator's Manual.) Operate hydraulic functions to bleed hydraulic system.
	Low hydrostatic pump pressure	Perform Hydrostatic Pump Flow Test . (Group 9026-25.)
	Hydrostatic pump or hydrostatic motor worn or damaged	Perform Hydrostatic Pump Disassemble . (Group 0360.) Perform Hydrostatic Motor and Park Brake Disassemble and Assemble—Skid Steer Loader . Perform Hydrostatic Motor, Park Brake and Gearbox Disassemble—Single Speed Compact Track Loader , or perform Hydrostatic Motor, Park Brake and Gearbox Disassemble—Two Speed Compact Track Loader . (Group 0360.)
	Park brake engaged or dragging	Check park brake. See Park Brake Release Pressure Test . (Group 9026-25.)
	Steering control linkage loose or broken	Check control linkage and bellcrank.
Hydrostatic Pump Or Hydrostatic Motor Noise	Low hydraulic oil level	Check hydraulic oil tank level. For skid steer loader, see Check Hydraulic Tank Oil Level . (Operator's Manual.) For compact track loader, see Check Hydraulic Tank Oil Level . (Operator's Manual.)
	Air in hydraulic system	Check hydraulic oil tank level. For skid steer loader, see Check Hydraulic Tank Oil Level . (Operator's Manual.) For compact track loader, see Check Hydraulic Tank Oil Level . (Operator's Manual.) Operate hydraulic functions to bleed hydraulic system.
	Hydrostatic pump or hydrostatic motor worn or damaged	Perform Hydrostatic Pump Disassemble . (Group 0360.) Perform Hydrostatic Motor and Park Brake Disassemble and Assemble—Skid Steer Loader . Perform Hydrostatic Motor, Park Brake and Gearbox Disassemble—Single Speed Compact Track Loader , or perform Hydrostatic Motor, Park Brake and Gearbox Disassemble—Two Speed Compact Track Loader . (Group 0360.)
	Park brake engaged or dragging	Check park brake. See Park Brake Release Pressure Test . (Group 9026-25.)
	Hydrostatic pump linkage not centered in neutral for one or both hydrostatic pumps	Check steering lever adjustment. See Steering Lever Adjustment—Centering , and see Tracking Adjustment—Skid Steer Loader , or see Tracking Adjustment—Compact Track Loader . (Group 9026-25.)
	Hydrostatic pump valve plate installed incorrectly	Perform Hydrostatic Pump Disassemble . (Group 0360.)
Slow Response To Changes In Speed	Cold hydraulic oil	Operate hydraulic system to warm hydraulic oil.
	Low hydrostatic pump pressure	Perform Hydrostatic Pump Flow Test . (Group 9026-25.)
	Hydrostatic pump or hydrostatic motor worn or damaged	Perform Hydrostatic Pump Disassemble . (Group 0360.) Perform Hydrostatic Motor and Park Brake Disassemble and Assemble—Skid Steer Loader . Perform Hydrostatic Motor, Park Brake and Gearbox Disassemble—Single Speed Compact Track Loader , or perform Hydrostatic Motor, Park Brake and Gearbox Disassemble—Two Speed Compact Track Loader . (Group 0360.)
	Park brake engaged or dragging	Check park brake. See Park Brake Release Pressure Test . (Group 9026-25.)
	Hydrostatic pump linkage not centered in neutral for one or both hydrostatic pumps	Check steering lever adjustment. See Steering Lever Adjustment—Centering , and see Tracking Adjustment—Skid Steer Loader , or see Tracking Adjustment—Compact Track Loader . (Group 9026-25.)
	Steering control linkage loose or broken	Check control linkage and bellcrank.
Low Power	Low hydraulic oil level	Check hydraulic oil tank level. For skid steer loader, see Check Hydraulic Tank Oil Level . (Operator's Manual.) For compact track loader, see Check Hydraulic Tank Oil Level . (Operator's Manual.)
	Cold hydraulic oil	Operate hydraulic system to warm hydraulic oil.
	Air in hydraulic system	Check hydraulic oil tank level. For skid steer loader, see Check Hydraulic Tank Oil Level . (Operator's Manual.) For compact track loader, see Check Hydraulic Tank Oil Level . (Operator's Manual.) Operate hydraulic functions to bleed hydraulic system.
	Low hydrostatic pump pressure	Perform Hydrostatic Pump Flow Test . (Group 9026-25.)

	Hydrostatic pump valve plate installed incorrectly	Perform Hydrostatic Pump Disassemble . (Group 0360.)
Wheels/Tracks Powered On One Side, Not The Other	Low hydrostatic pump pressure	Perform Hydrostatic Pump Flow Test . (Group 9026-25.)
	Hydrostatic pump or hydrostatic motor worn or damaged	Perform Hydrostatic Pump Disassemble . (Group 0360.) Perform Hydrostatic Motor and Park Brake Disassemble and Assemble—Skid Steer Loader . Perform Hydrostatic Motor, Park Brake and Gearbox Disassemble—Single Speed Compact Track Loader , or perform Hydrostatic Motor, Park Brake and Gearbox Disassemble—Two Speed Compact Track Loader . (Group 0360.)
	Park brake engaged or dragging	Check park brake. See Park Brake Release Pressure Test . (Group 9026-25.)
	Broken drive chains (skid steer loader only)	Check drive chains. See Chain Case Access Plate Remove and Install . (Group 0250.)
	Steering control linkage loose or broken	Check control linkage and bellcrank.
Machine Will Not Shift Into Or Out Of High Speed (Compact Track Loader Only)	Two speed proportional solenoid valve does not operate	See Solenoid Test . (Group 9015-20.)
	Valves in hydrostatic motor not shifting	See Hydrostatic Motor, Park Brake and Gearbox Disassemble—Two Speed Compact Track Loader . (Group 0360.)

Diagnose Steering System Malfunctions

→NOTE:

Diagnose malfunction charts are arranged from most probable and simplest to verify, to least likely and most difficult to verify.

Symptom	Problem	Solution
Machine Creeps With Steering Levers In Neutral	Centering plates improperly adjusted	Adjust centering plates. See Steering Lever Adjustment—Centering , and see Tracking Adjustment—Skid Steer Loader , or see Tracking Adjustment—Compact Track Loader . (Group 9026-25.)
	Bad pivot bearings on steering levers	Inspect and/or replace pivot bearings. See Steering Lever Remove and Install . (Group 0315.)
	Bent control rods	Repair or replace control rods. See Steering Cross Shaft Assembly Remove and Install . (Group 0315.)
	Broken steering dampener	Repair or replace steering dampener. See Steering Dampener Remove and Install . (Group 0315.)
Hydrostatic System Noise While In Neutral	Centering plates improperly adjusted	Adjust centering plates. See Steering Lever Adjustment—Centering , and see Tracking Adjustment—Skid Steer Loader , or see Tracking Adjustment—Compact Track Loader . (Group 9026-25.)
	Broken steering dampener	Repair or replace steering dampener. See Steering Dampener Remove and Install . (Group 0315.)
Steering Levers Hard To Move	Centering plates improperly adjusted	Adjust centering plates. See Steering Lever Adjustment—Centering , and see Tracking Adjustment—Skid Steer Loader , or see Tracking Adjustment—Compact Track Loader . (Group 9026-25.)
	Bad pivot bearings on steering levers	Inspect and/or replace pivot bearings. See Steering Lever Remove and Install . (Group 0315.)
	Bent control rods	Repair or replace control rods. See Steering Cross Shaft Assembly Remove and Install . (Group 0315.)
	Damaged link rod ends	Repair or replace link rod ends. See Steering Lever Remove and Install . (Group 0315.)
Steering Levers Feel Loose Or “Sloppy”	Centering plates improperly adjusted	Adjust centering plates. See Steering Lever Adjustment—Centering , and see Tracking Adjustment—Skid Steer Loader , or see Tracking Adjustment—Compact Track Loader . (Group 9026-25.)
	Bad pivot bearings on steering levers	Inspect and/or replace pivot bearings. See Steering Lever Remove and Install . (Group 0315.)
	Damaged link rod ends	Repair or replace link rod ends. See Steering Lever Remove and Install . (Group 0315.)
	Worn control rod bushing	Replace control rod bushing. See Steering Cross Shaft Assembly Remove and Install . (Group 0315.)
	Broken steering dampener	Repair or replace steering dampener. See Steering Dampener Remove and Install . (Group 0315.)
	Cab not secured	Secure cab. For skid steer loader, see Raising Operator′s Station . (Operator′s Manual.) For compact track loader, see Raising Operator′s Station . (Operator′s Manual.)
Machine Tracks To One Side With Steering Levers In Full Forward Or Reverse Position	Bad pivot bearings on steering levers	Inspect and/or replace pivot bearings. See Steering Lever Remove and Install . (Group 0315.)
	Bent control rods	Repair or replace control rods. See Steering Cross Shaft Assembly Remove and Install . (Group 0315.)
	Worn control rod bushing	Replace control rod bushing. See Steering Cross Shaft Assembly Remove and Install . (Group 0315.)
	Broken steering dampener	Repair or replace steering dampener. See Steering Dampener Remove and Install . (Group 0315.)
	Steering lever misadjusted	Adjust steering lever. See Steering Lever Adjustment—Centering , and see Tracking Adjustment—Skid Steer Loader , or see Tracking Adjustment—Compact Track Loader . (Group 9026-25.)
Steering Levers Pulse Or Vibrate Excessively	Damaged link rod ends	Repair or replace link rod ends. See Steering Lever Remove and Install . (Group 0315.)
	Worn control rod bushing	Replace control rod bushing. See Steering Cross Shaft Assembly Remove and Install . (Group 0315.)
	Broken steering dampener	Repair or replace steering dampener. See Steering Dampener Remove and Install . (Group 0315.)
	Cab not secured	Secure cab. For skid steer loader, see Raising Operator′s Station . (Operator′s Manual.) For compact track loader, see Raising Operator′s Station . (Operator′s Manual.)

Diagnose Park Brake System Malfunctions—Compact Track Loader

→NOTE:

Diagnose malfunction charts are arranged from most probable and simplest to verify, to least likely and most difficult to verify.

Symptom	Problem	Solution
Park Brake Does Not Release	Electrical	Sit in the seat. Does the seat switch indicator go OFF?
		If NOT off, check operation of the seat switch using the diagnostics menu in the EMU. See Engagement and Monitor Unit Data Items . (Group 9015-20.)
		Buckle the seat belt. Does the seat belt switch indicator go OFF?
		If no, check operation of the seat belt switch using the diagnostics menu in the EMU. See Engagement and Monitor Unit Data Items . (Group 9015-20.)
		Is the door switch indicator OFF? If yes, the operator presence circuit is satisfied. If no, check operation of the door switch using the diagnostics menu in the EMU. See Engagement and Monitor Unit Data Items . (Group 9015-20.) **→NOTE:** **If a door is not installed, the EMU still needs a closed on circuit. If no door installed use jumper connector to take place of door switch.**
		Check park brake solenoid valve electrical function. See Solenoid Test . (Group 9015-20.) If solenoid test is good, check wiring and connections between the EMU and the park brake solenoid.
	Hydraulic	**→NOTE:** **A minimum of 1400 kPa (14 bar) (200 psi) must be available to fully release the park brake.** **Check charge pressure. See Charge Pressure Relief Valve Test . (Group 9025-25.) If charge pressure is still low, replace charge pump.**
		With park brake released, check brake release pressure at park brake release valve by teeing into the brake release pressure line and measuring pressure. See Park Brake Release Pressure Test . (Group 9026-25.)
		IMPORTANT: ***Avoid damage to park brake seals. Do not pressurize park brake beyond test specification.*** ***Check park brake ability to hold pressure. Install a hand pump to manually pressurize the park brake to 2070 kPa (20.7 bar) (300 psi). The park brake should hold test pressure for at least 5 minutes. If brake does not hold pressure, pump up the brakes individually to see which one has the internal leakage.***
	Mechanical	Inspect park brake lining or disk. See Hydrostatic Motor, Park Brake and Gearbox Disassemble—Single Speed Compact Track Loader or see Hydrostatic Motor, Park Brake and Gearbox Disassemble—Two Speed Compact Track Loader . (Group 0360.)
Park Brake Drags	Hydraulic	**→NOTE:** **A minimum pressure of 1400 kPa (14 bar) (200 psi) must be available to fully release the park brake.** **Check charge pressure. See Charge Pressure Relief Valve Test . (Group 9025-25.) If charge pressure is still low, replace charge pump.**
		With park brake released, check brake release pressure at park brake release valve by teeing into the brake release pressure line and measuring pressure. See Park Brake Release Pressure Test . (Group 9026-25.)
		IMPORTANT: ***Avoid damage to park brake seals. Do not pressurize park brake beyond test specification.*** ***Check park brake ability to hold pressure. Install a hand pump to manually pressurize the park brake to 2070 kPa (20.7 bar) (300 psi). The park brake should hold test pressure for at least 5 minutes. If brake does not hold pressure, pump up the brakes individually to see which one has the internal leakage.***
	Mechanical	Inspect park brake lining or disk. See Hydrostatic Motor, Park Brake and Gearbox Disassemble—Single Speed Compact Track Loader or see Hydrostatic Motor, Park Brake and Gearbox Disassemble—Two Speed Compact Track Loader . (Group 0360.)
Park Brake Does Not Hold	Electrical	**→NOTE:** **Make sure that when the switch is ON, the park brake is ON.** **Check function of park brake switch and circuit using the diagnostics menu in the EMU. See Engagement and Monitor Unit Data Items . (Group 9015-20.)**
		Check electrical function of solenoid valve. See Solenoid Test . (Group 9015-20.)
	Hydraulic	**→NOTE:** **Valve should be de-energized when park brake is ON.** **Check charge pressure at park brake release valve by teeing into line and measuring pressure. Pressure should be zero with machine running and park brake ON. If charge pressure is present, replace the valve.**
	Mechanical	Inspect park brake lining or disk. See Hydrostatic Motor, Park Brake and Gearbox Disassemble—Single Speed Compact Track Loader , or see Hydrostatic Motor, Park Brake and Gearbox Disassemble—Two Speed Compact Track Loader . (Group 0360.)

Diagnose Park Brake System Malfunctions—Skid Steer Loader

→NOTE:

Diagnose malfunction charts are arranged from most probable and simplest to verify, to least likely and most difficult to verify.

Symptom	Problem	Solution
Park Brake Does Not Release	Electrical	Sit in the seat. Does the seat switch indicator go OFF?
		If NOT off, check operation of the seat switch using the diagnostics menu in the EMU. See Engagement and Monitor Unit Data Items . (Group 9015-20.)
		Buckle the seat belt. Does the seat belt switch indicator go OFF?
		If no, check operation of the seat belt switch using the diagnostics menu in the EMU. See Engagement and Monitor Unit Data Items . (Group 9015-20.)
		Is the door switch indicator OFF? If yes, the operator presence circuit is satisfied. If no, check operation of the door switch using the diagnostics menu in the EMU. See Engagement and Monitor Unit Data Items . (Group 9015-20.) **→NOTE:** **If a door is not installed, the EMU still needs a closed on circuit. If no door installed use jumper connector to take place of door switch.**
		Check park brake solenoid valve electrical function. See Solenoid Test . (Group 9015-20.) If solenoid test is good, check wiring and connections between the EMU and the park brake solenoid.
	Hydraulic	**→NOTE:** **A minimum of 1400 kPa (14 bar) (200 psi) must be available to fully release the park brake.** **Check charge pressure. See Charge Pressure Relief Valve Test . (Group 9025-25.) If charge pressure is still low, replace charge pump.**
		With park brake released, check brake release pressure at park brake release valve by teeing into the brake release pressure line and measuring pressure. See Park Brake Release Pressure Test . (Group 9026-25.)
	Mechanical	Inspect park brake lining or disk. See Hydrostatic Motor and Park Brake Disassemble and Assemble—Skid Steer Loader . (Group 0360.)
Park Brake Drags	Hydraulic	**→NOTE:** **A minimum of 1400 kPa (14 bar) (200 psi) must be available to fully release the park brake.** **Check charge pressure. See Charge Pressure Relief Valve Test . (Group 9025-25.) If charge pressure is still low, replace charge pump.**
		With park brake released, check brake release pressure at park brake release valve by teeing into the brake release pressure line and measuring pressure. See Park Brake Release Pressure Test . (Group 9026-25.)
	Mechanical	Inspect park brake lining or disk. See Hydrostatic Motor and Park Brake Disassemble and Assemble—Skid Steer Loader . (Group 0360.)
Park Brake Does Not Hold	Electrical	**→NOTE:** **Make sure that when the switch is ON, the park brake is ON.** **Check function of park brake switch and circuit using the diagnostics menu in the EMU. See Engagement and Monitor Unit Data Items . (Group 9015-20.)**
		Check electrical function of solenoid valve. See Solenoid Test . (Group 9015-20.)
	Hydraulic	**→NOTE:** **Valve should be de-energized when park brake is ON.** **Check charge pressure at park brake release valve by teeing into line and measuring pressure. Pressure should be zero with machine running and park brake ON. If charge pressure is present, replace the valve.**
	Mechanical	Inspect park brake lining or disk. See Hydrostatic Motor and Park Brake Disassemble and Assemble—Skid Steer Loader . (Group 0360.)

Group 25 - Tests

Hydrostatic Pump System Pressure Relief Test

Specifications

SPECIFICATIONS	
Hydrostatic Pump Pressure Relief Valves Pressure	33 095—35 507 kPa 331—355 bar 4800—5150 psi

Service Equipment and Tools

SERVICE EQUIPMENT AND TOOLS
JT03362 Gauge (0—10,000 psi)

This test ensures that the hydrostatic pump pressure relief valves are operating properly.

→NOTE:

Ensure that the hydraulic fluid in the hydraulic oil tank is at the full mark. Insufficient hydraulic fluid could cause the system to run dry and damage pumps and motors.

[1] - Park machine on flat level surface.

[2] - Raise and block machine. For skid steer loader, see Raising and Blocking Machine . (Operator's Manual.) For compact track loader, see Raising and Blocking Machine . (Operator's Manual.)

[3] - Raise boom and engage boom lock.

[4] - Raise cab. For skid steer loader, see Raising Operator's Station . (Operator's Manual.) For compact track loader, see Raising Operator's Station . (Operator's Manual.)

[5] -

CAUTION:

Prevent possible injury from moving tires/tracks when using remote start box. Keep tire/track area clear of bystanders. Do not use remote start box without raising and blocking machine.

Install remote start box. See Remote Start Box Installation . (Group 9025-25.)

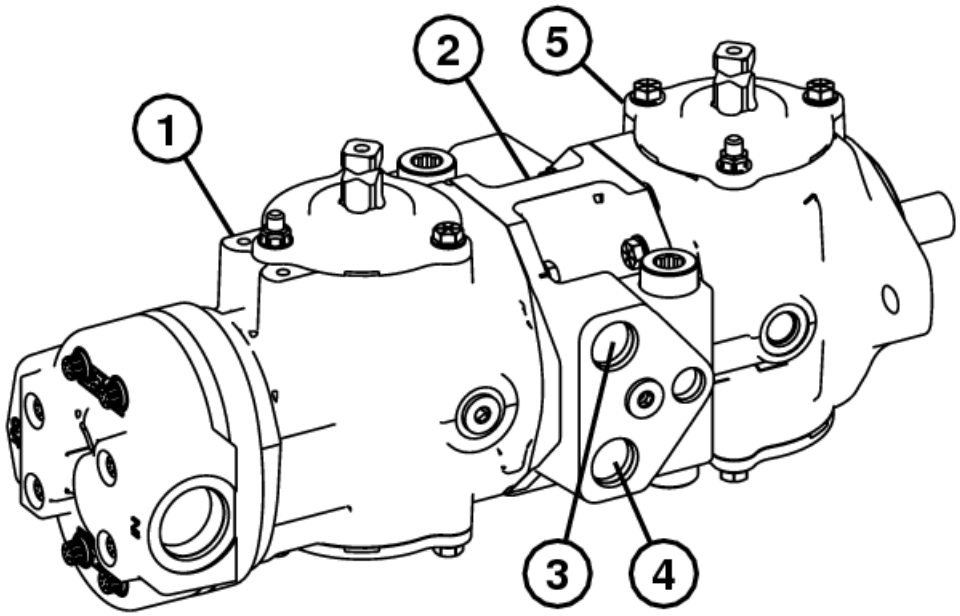
[6] - Install M8 x 30 cap screws in tab at the rear of both yokes of steering control arms to secure steering assembly during test procedure.

[7] - Relieve hydraulic pressure. See Hydraulic System Pressure Release . (Group 9025-25.)

[8] -

CAUTION:

Prevent injury from escaping hydraulic oil under pressure. Relieve pressure in the system before removing hydraulic lines.



Hydrostatic Pump Assembly

LEGEND:

1	Left Hydrostatic Pump
2	Hydrostatic Pump Center Manifold
3	Left Forward Port
4	Left Reverse Port
5	Right Hydrostatic Motor

Install tee fitting into the hydrostatic pump center manifold (2) left forward port (3) to be tested.

[9] - Connect test hose, fittings and gauge JT03362 to tee fitting.

Gauge (0—10,000 psi)

JT03362

Used To Measure Hydrostatic Pump System Pressure Relief Test.

[10] - Engage park brake.

[11] - Slowly move corresponding steering lever (left) in appropriate direction (forward) to test left forward relief valve.

[12] - Record gauge reading.

[13] - Repeat procedure for all four relief valves as necessary.

Item	Measurement	Specification
Hydrostatic Pump Pressure Relief Valves	Pressure	33 095—35 507 kPa 331—355 bar 4800—5150 psi

[14] - If pressure is not within specifications, replace the corresponding relief valve.

[15] - Remove M8 x 30 cap screws from both yokes of steering levers securing steering levers in an upright position.

[16] - Remove remote start box.

[17] - Lower cab. For skid steer loader, see Raising Operator′s Station . (Operator′s Manual.) For compact track loader, see Raising Operator′s Station . (Operator′s Manual.)

[18] - Raise machine and remove blocking. For skid steer loader, see Raising and Blocking Machine . (Operator′s Manual.) For compact track loader, see Raising and Blocking Machine . (Operator′s Manual.)

[19] - Start machine and lower boom.

Hydrostatic Pump Case Drain Test

Specifications

SPECIFICATIONS	
Hydraulic Oil Temperature	43°C 110°F
Hydrostatic Pump Case Drain—10 Seconds Maximum Volume	0.95 L 2 pt

This test ensures that the hydrostatic pump is not bypassing excessive hydraulic oil.

[1] -

→NOTE:

Ensure hydraulic oil tank is at the full mark. Insufficient hydraulic fluid could damage pumps and motors

Operate hydraulic system until hydraulic oil reaches specification.

Item	Measurement	Specification
Hydraulic Oil	Temperature	43°C 110°F

[2] - Park machine on flat level surface.

[3] - Raise and block machine. For skid steer loader, see Raising and Blocking Machine . (Operator′s Manual.) For compact track loader, see Raising and Blocking Machine . (Operator′s Manual.)

[4] - Raise boom and engage boom lock.

[5] - Stop engine. Turn key to on position and operate all hydraulic controls to relieve hydraulic pressure.

[6] - Raise cab. For skid steer loader, see Raising Operator′s Station . (Operator′s Manual.) For compact track loader, see Raising Operator′s Station . (Operator′s Manual.)

[7] -

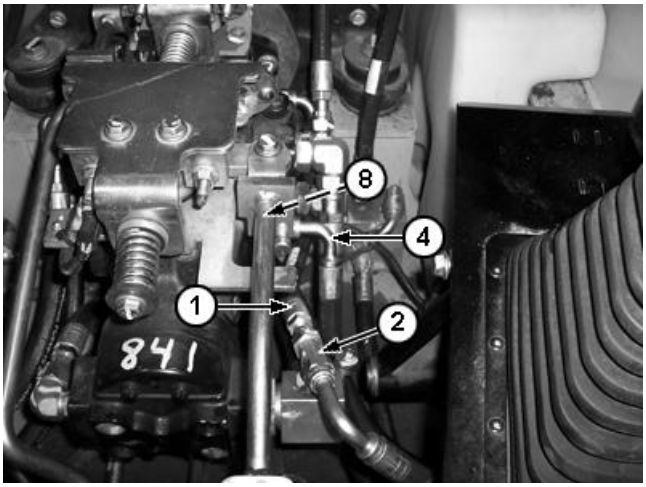
CAUTION:

Prevent possible injury from moving tires/tracks when using remote start box. Keep tire/track area clear of bystanders. Do not use remote start box without raising and blocking machine.

Install remote start box. See Remote Start Box Installation . (Group 9025-25.)

[8] - Install M8 x 30 cap screws in tab at the rear of both yokes of steering control arms to secure steering assembly during test procedure.

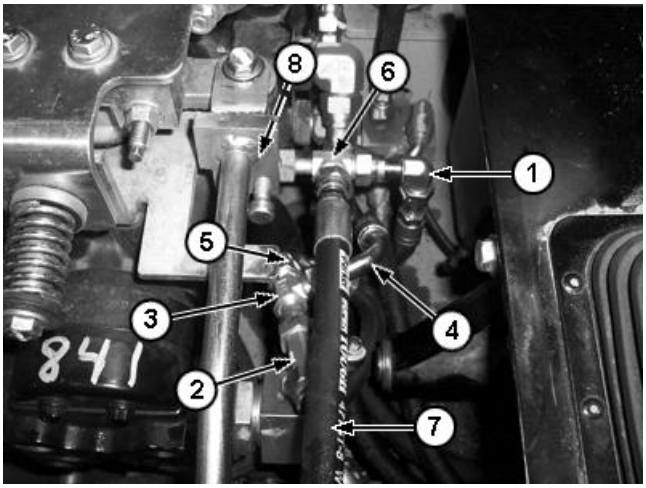
[9] -



LEGEND:

1 Right Hydrostatic Pump Drain Hose
2 Original Tee Fitting
3 Swivel Run Tee Fitting (38H5105)
4 Left Hydrostatic Motor Drain Hose
5 Right Hydrostatic Motor Drain Hose
6 Swivel Run Tee Fitting (38H5105)
7 Test Hose
8 Left Hydrostatic Pump Drain Port

Hydrostatic Pump Drain Lines



Hydrostatic Pump Case Drain Test Setup

Disconnect right hydrostatic pump drain hose (1) from tee fitting (2) at left side of hydraulic pump.

[10] - Connect a swivel run tee fitting (3) to original tee fitting (2).

[11] - Disconnect left hydrostatic motor drain hose (4) from left hydrostatic pump.

[12] - Connect left hydrostatic motor drain hose to new tee fitting (3).

[13] - Disconnect right hydrostatic motor drain hose (5) from port at right side of rear hydrostatic pump.

[14] - Connect right hydrostatic motor drain hose (5) to swivel run tee fitting (3).

[15] - Install cap assembly in right hydrostatic motor drain port on the right side of rear hydrostatic pump.

[16] - Connect a run tee (6) to left hydrostatic pump drain port (8).

[17] - Connect right hydrostatic pump drain hose (1) to run tee (6).

[18] - Install a 9.5 mm (3/8 in.) test hose (7) to the tee (6) and run test hose to a calibrated container.

[19] - Start engine and disengage park brake.

[20] -

IMPORTANT:

Move only the corresponding steering lever of pump being tested. If both steering levers are moved during the test, an inaccurate reading will result.

Move left steering lever slowly forward or backward until fluid flows from end of test hose.

[21] -

→NOTE:

Ensure accurate readings by keeping container above hydraulic oil tank full line.

Transfer test hose from container to graduated beaker.

[22] -

IMPORTANT:

Complete this test within 20 seconds to avoid overheating hydraulic oil.

Capture fluid for a 10-second period of time. Return hose to container.

Item	Measurement	Specification	
Hydrostatic Pump Case Drain—10 Seconds		Maximum Volume	0.95 L
		2 pt	

[23] - If volume exceeds maximum specification, repair or replace pump. See Hydrostatic Pump Remove and Install . (Group

0360.)

[24] - Repeat procedure for the right hydrostatic pump by operating right steering lever.

[25] - Remove M8 x 30 cap screws from both yokes of steering levers securing steering levers in an upright position.

[26] - Remove remote start box.

[27] - Lower cab. For skid steer loader, see Raising Operator′s Station . (Operator′s Manual.) For compact track loader, see Raising Operator′s Station . (Operator′s Manual.)

[28] - Raise machine and remove blocking. For skid steer loader, see Raising and Blocking Machine . (Operator′s Manual.) For compact track loader, see Raising and Blocking Machine . (Operator′s Manual.)

[29] - Start machine and lower boom.

Wheel Speed Test—Skid Steer Loader

Specifications

SPECIFICATIONS	
Hydraulic Oil Temperature	43°C 110°F
Fast Idle Engine Speed	2930—3070 rpm
Model 317	
Forward Wheel Speed at Fast Idle	72—77 rpm
Reverse Wheel Speed at Fast Idle	72—77 rpm
Model 320	
Forward Wheel Speed at Fast Idle	67—72 rpm
Reverse Wheel Speed at Fast Idle	67—72 rpm

Service Equipment and Tools

SERVICE EQUIPMENT AND TOOLS
JT05719 Hand Held Digital Tachometer

This test is an initial test to verify hydrostatic system is operating normally.

[1] - Operate hydraulic system until hydraulic oil reaches specification.

Item	Measurement	Specification
Hydraulic Oil	Temperature	43°C 110°F

[2] - Park machine on flat level surface.

[3] - Raise and block skid steer loader. See Raising and Blocking Machine . (Operator's Manual.)

[4] - Raise boom and engage boom lock.

[5] - Raise cab. See Raising Operator's Station . (Operator's Manual.)

[6] - Install M8 x 30 cap screws in tab at the rear of both yokes of steering levers to secure steering levers in an upright position.

[7] -

CAUTION:

Avoid possible injury from moving tires when using remote start box. Keep tire area clear of bystanders. Do not use remote start box without raising and blocking skid steer loader. Skid steer loader may override brake and move quickly.

Install remote start box. See Remote Start Box Installation . (Group 9025-25.)

[8] - Apply reflective tape to one wheel on each side of the machine.

Hand Held Digital Tachometer

JT05719

Used to measure wheel/track rpm.

[9] - Increase engine rpm to fast idle. Verify rpm is correct.

Item	Measurement	Specification
Fast Idle	Engine Speed	2930—3070 rpm

[10] - With hydrostatic control (steering) lever moved fully to forward position, measure and record rotations in one minute of corresponding wheel that has the reflective tape.

[11] -

IMPORTANT:

Left and right sides must be within 1 rpm to provide proper steering control.

Move hydrostatic control lever fully rearward. Measure and record rotations in one minute of same wheel.

Item	Measurement	Specification
Model 317		
Forward Wheel Rotations	Speed	72—77 rpm
Reverse Wheel Rotations	Speed	72—77 rpm
Model 320		
Forward Wheel Rotations	Speed	67—72 rpm
Reverse Wheel Rotations	Speed	67—72 rpm

[12] - Repeat procedure for the opposite side.

[13] - Stop engine.

[14] - If wheel speed varies more than 1 rpm from side to side, perform tracking adjustment. See Tracking Adjustment—Skid Steer Loader . (Group 9026-25.)

[15] - If wheel rotations are significantly outside of the listed ranges:

- Inspect brakes for dragging.
- Perform charge pressure relief valve test. See Charge Pressure Relief Valve Test . (Group 9025-25.)
- Perform hydrostatic pump case drain test. See Hydrostatic Pump Case Drain Test . (Group 9026-25.)
- Perform hydrostatic pump flow test. See Hydrostatic Pump Flow Test . (Group 9026-25.)
- Repair hydrostatic motor. See Hydrostatic Motor and Park Brake Disassemble and Assemble—Skid Steer Loader . (Group 0360.)

[16] - Remove M8 x 30 cap screws from both yokes of steering levers securing steering levers in an upright position.

[17] - Remove remote start box.

[18] - Lower cab. See Raising Operator′s Station . (Operator′s Manual.)

[19] - Raise skid steer loader and remove blocking. See Raising and Blocking Machine . (Operator′s Manual.)

[20] - Start skid steer loader and lower boom.

Track Speed Test—Compact Track Loader

Specifications

SPECIFICATIONS	
Hydraulic Oil Temperature	43°C 110°F
Fast Idle Engine Speed	2930—3070 rpm
CT322—Single Speed	
Gearbox Housing Forward Rotations	115—121 rpm
Gearbox Housing Reverse Rotations	115—121 rpm
CT322—Two Speed Low	
Gearbox Housing Forward Rotations	105—110 rpm
Gearbox Housing Reverse Rotations	105—110 rpm
CT322—Two Speed High	
Gearbox Housing Forward Rotations	169—175 rpm
Gearbox Housing Reverse Rotations	169—175 rpm

Service Equipment and Tools

SERVICE EQUIPMENT AND TOOLS
JT05719 Hand Held Digital Tachometer

This test is an initial test to verify hydrostatic system is operating normally.

[1] - Operate hydraulic system until hydraulic oil reaches specification.

Item	Measurement	Specification
Hydraulic Oil	Temperature	43°C 110°F

[2] - Park machine on flat level surface.

[3] - Raise and block compact track loader. See Raising and Blocking Machine . (Operator's Manual.)

[4] - Raise boom and engage boom lock.

[5] - Raise cab. See Raising Operator's Station . (Operator's Manual.)

[6] - Install M8 x 30 cap screws in tab at the rear of both yokes of steering levers to secure steering levers in an upright position.

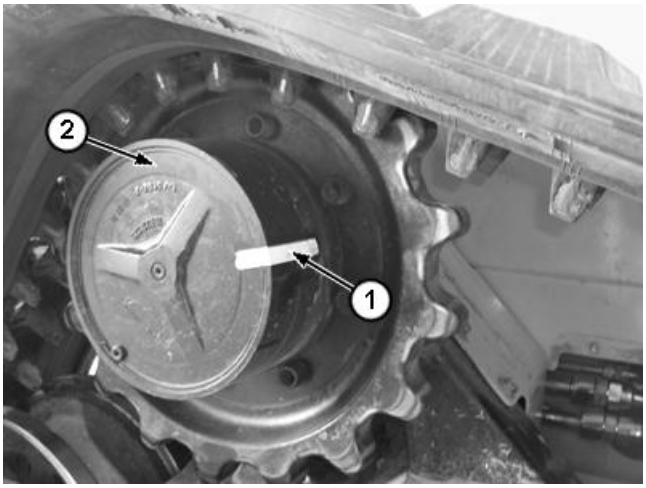
[7] -

CAUTION:

Avoid possible injury from moving tracks when using remote start box. Keep track area clear of bystanders. Do not use remote start box without raising and blocking compact track loader. Compact track loader may override brake and move quickly.

Install remote start box. See Remote Start Box Installation . (Group 9025-25.)

[8] -



LEGEND:

1	Reflective Tape
2	Motor Gearbox Housing

Hydrostatic Motor Gearbox Housing

Apply reflective tape to hydrostatic motor gearbox housing on each side of the machine.

Hand Held Digital Tachometer

JT05719

Used to measure wheel/track rpm.

[9] - Increase engine rpm to fast idle. Verify rpm is correct.

Item	Measurement	Specification
Fast Idle	Engine Speed	2930—3070 rpm

[10] - With hydrostatic control (steering) lever moved fully to forward position, measure and record hydrostatic motor gearbox housing rotations in one minute.

[11] -

IMPORTANT:

Left and right sides must be within 1 rpm to provide proper steering control.

Move hydrostatic control lever fully rearward. Measure and record gearbox housing rotations in one minute.

Item	Measurement	Specification
CT322—Single Speed		
Gearbox Housing Forward Rotations	Speed	115—121 rpm
Gearbox Housing Reverse Rotations	Speed	115—121 rpm
CT322—Two Speed Low		
Gearbox Housing Forward Rotations	Speed	105—110 rpm
Gearbox Housing Reverse Rotations	Speed	105—110 rpm
CT322—Two Speed High		
Gearbox Housing Forward Rotations	Speed	169—175 rpm
Gearbox Housing Reverse Rotations	Speed	169—175 rpm

[12] - Repeat procedure for the opposite side.

[13] - Stop engine.

[14] - If gearbox housing speed varies more than 1 rpm from side to side, perform tracking adjustment. See Tracking Adjustment—Compact Track Loader . (Group 9026-25.)

[15] - If gearbox housing rotations are significantly outside of the listed ranges:

- Inspect brakes for dragging.
- Perform charge pressure relief valve test. See Charge Pressure Relief Valve Test . (Group 9025-25.)
- Perform hydrostatic pump case drain test. See Hydrostatic Pump Case Drain Test . (Group 9026-25.)
- Perform hydrostatic pump flow test. See Hydrostatic Pump Flow Test . (Group 9026-25.)
- Repair hydrostatic motor. See Hydrostatic Motor, Park Brake and Gearbox Disassemble—Single Speed Compact Track

Loader , or see Hydrostatic Motor, Park Brake and Gearbox Disassemble—Two Speed Compact Track Loader . (Group 0360.)

[16] - Remove M8 x 30 cap screws from both yokes of steering levers securing steering levers in an upright position.

[17] - Remove remote start box.

[18] - Lower cab. See Raising Operator′s Station . (Operator′s Manual.)

[19] - Raise compact track loader and remove blocking. See Raising and Blocking Machine . (Operator′s Manual.)

[20] - Start compact track loader and lower boom.

Hydrostatic Pump Flow Test

Specifications

SPECIFICATIONS	
Hydraulic Oil Temperature	43°C 110°F
Fast Idle Engine Speed	2930—3070 rpm
Testing Pressure	13 790 kPa 137.9 bar 2000 psi
317 Skid Steer Loader	
New, Typical Hydrostatic Pump Flow Rate—Approximate	75.7 L/min 20.0 gpm
Used, Minimum Hydrostatic Pump Flow Rate—Approximate	60.6 L/min 16.0 gpm
320 Skid Steer Loader	
New, Typical Hydrostatic Pump Flow Rate—Approximate	94.6 L/min 25.0 gpm
Used, Minimum Hydrostatic Pump Flow Rate—Approximate	75.7 L/min 20.0 gpm
CT322 Compact Track Loader	
New, Typical Hydrostatic Pump Flow Rate—Approximate	76.0 L/min 20.1 gpm
Used, Minimum Hydrostatic Pump Flow Rate—Approximate	60.6 L/min 16.0 gpm

This test is to ensure the hydrostatic pumps are delivering sufficient oil flow to the hydrostatic motors.

[1] - Operate hydraulic system until hydraulic oil reaches specification.

Item	Measurement	Specification
Hydraulic Oil	Temperature	43°C 110°F

[2] - Park machine on flat level surface.

[3] - Raise and block machine. For skid steer loader, see Raising and Blocking Machine. (Operator's Manual.) For compact track loader, see Raising and Blocking Machine. (Operator's Manual.)

[4] - Raise boom and engage boom lock.

[5] -

CAUTION:

Prevent injury from escaping hydraulic oil under pressure. Relieve pressure in the system before removing hydraulic lines.

Stop engine and relieve hydraulic pressure. See Hydraulic System Pressure Release. (Group 9025-25.)

[6] - Raise cab. For skid steer loader, see Raising Operator's Station. (Operator's Manual.) For compact track loader, see Raising Operator's Station. (Operator's Manual.)

[7] -

CAUTION:

Prevent possible injury from moving tires/tracks when using remote start box. Keep tire/track area clear of bystanders. Do not use remote start box without raising and blocking machine.

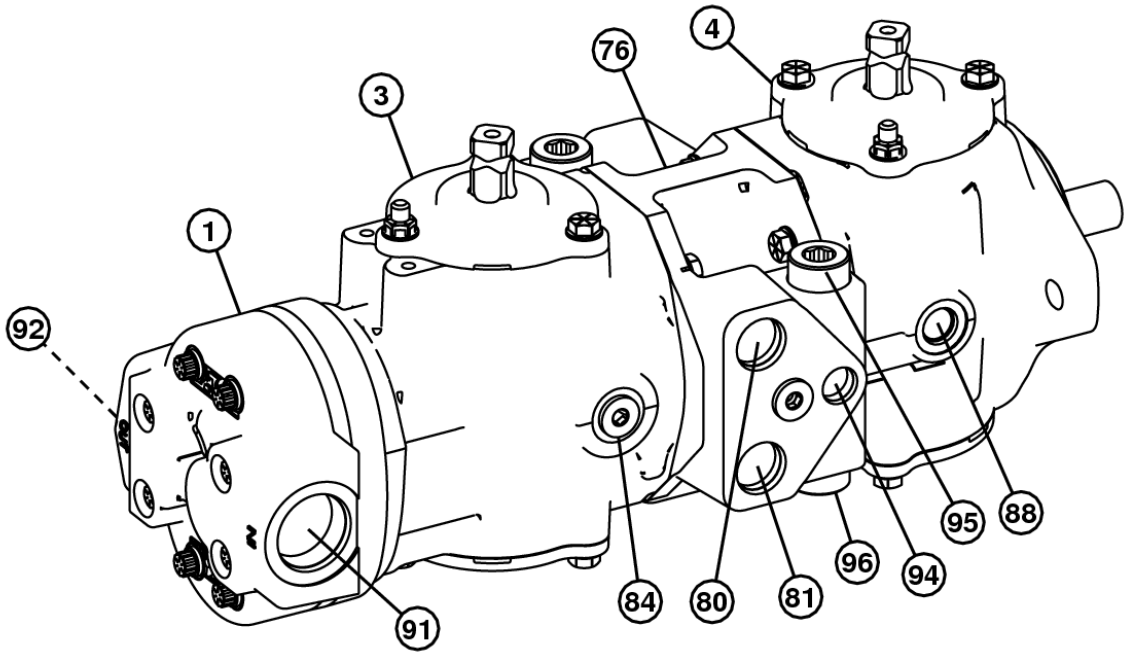
Install remote start box. See Remote Start Box Installation. (Group 9025-25.)

[8] -

→NOTE:

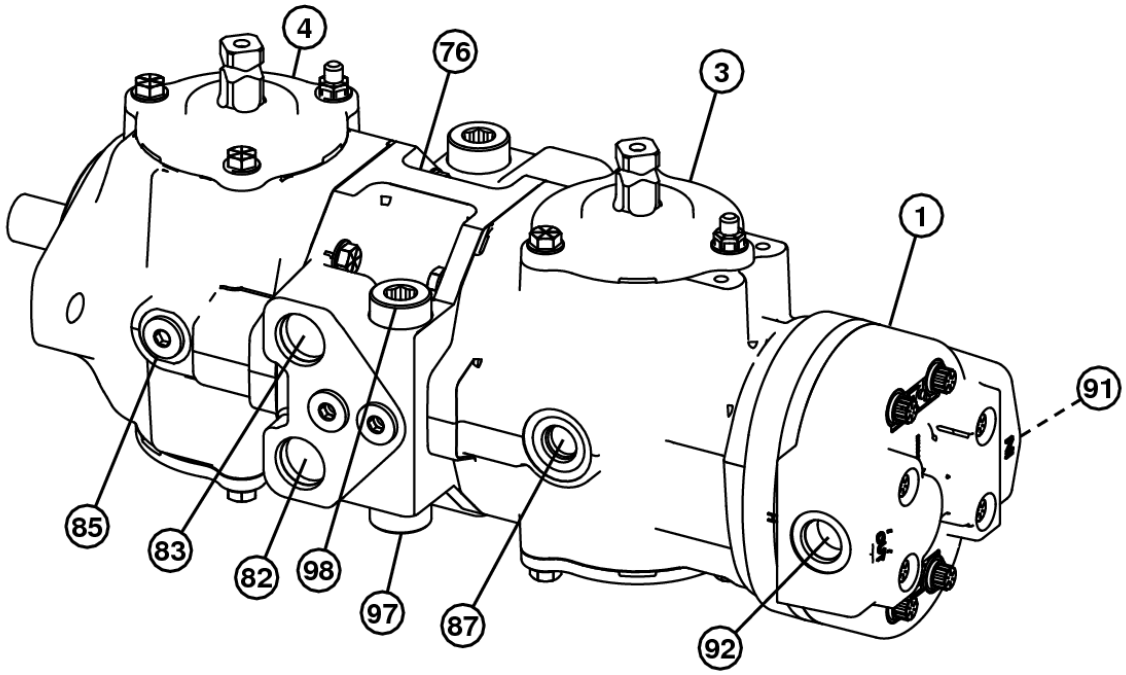
Ensure hydraulic oil tank is at the full mark. Insufficient hydraulic fluid could damage pumps and motors

Install cap screws in both steering control arms to secure them in the upright position.



T197649

Hydrostatic Pump Component Location—Skid Steer Loader



T197650

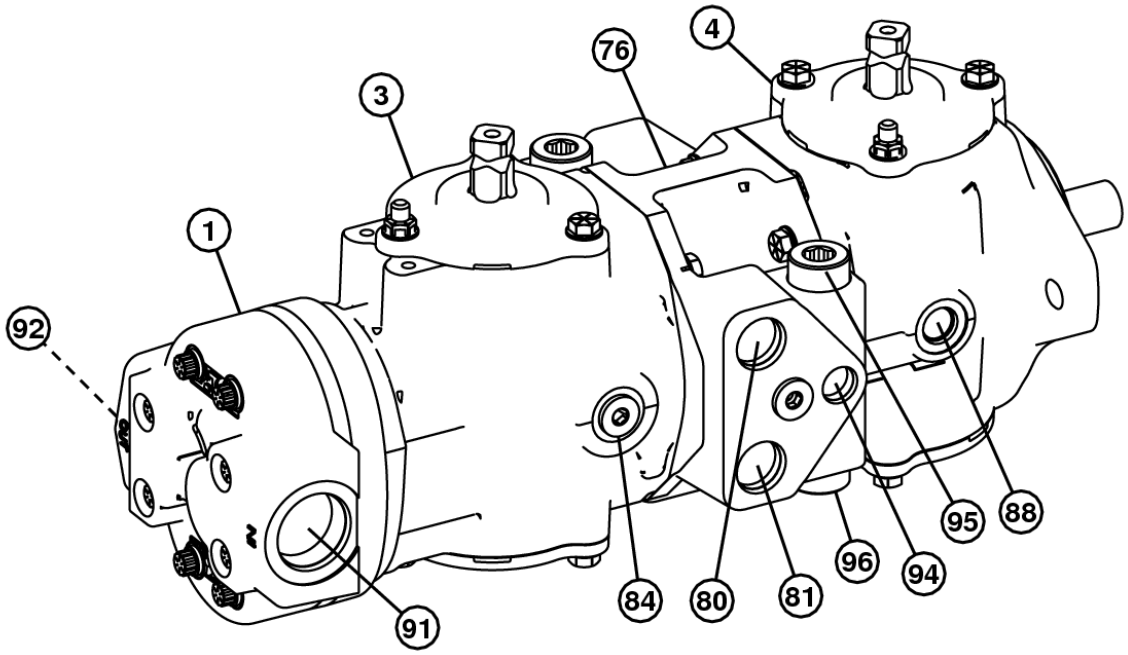
Hydrostatic Pump Component Location—Skid Steer Loader

LEGEND:

1	Hydraulic Pump
3	Left Hydrostatic Pump
4	Right Hydrostatic Pump
76	Hydrostatic Pump Manifold
80	To Left Hydrostatic Motor Forward Port
81	To Left Hydrostatic Motor Reverse Port
82	To Right Hydrostatic Motor Forward Port
83	To Right Hydrostatic Motor Reverse Port
84	To Left Hydrostatic Motor Flushing Port
85	To Right Hydrostatic Motor Flushing Port
87	To Hydraulic Quik-Tatch Solenoid Valve (if equipped)

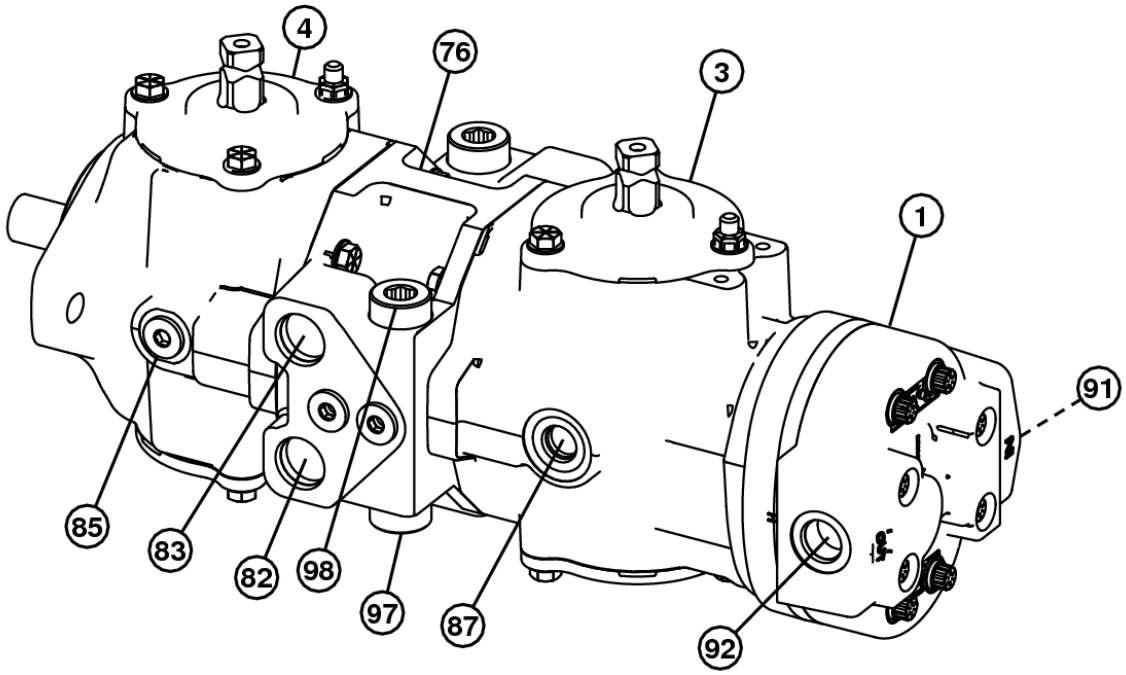
88 To Hydraulic Oil Tank
91 From Hydraulic Oil Tank
92 To Control Valve

[9] -



T197649

Hydrostatic Pump Component Location—Compact Track Loader



T197650

Hydrostatic Pump Component Location—Compact Track Loader

LEGEND:

1 Hydraulic Pump
3 Left Hydrostatic Pump
4 Right Hydrostatic Pump
76 Hydrostatic Pump Manifold
80 To Left Hydrostatic Motor Forward Port
81 To Left Hydrostatic Motor Reverse Port
82 To Right Hydrostatic Motor Forward Port
83 To Right Hydrostatic Motor Reverse Port
84 To Left Hydrostatic Motor Drain Port
85 To Right Hydrostatic Motor Drain Port
87 To Hydraulic Quik-Tatch Solenoid Valve (if equipped)
88 To Hydraulic Oil Tank
91 From Hydraulic Oil Tank

92 To Control Valve

Identify correct port on hydrostatic pump manifold (76) to determine which pump will be tested.

[10] - Attach hydraulic flow meter in line to left hydrostatic motor forward port (80). Turn load valve all the way open.

[11] - Run at fast idle and push left steering lever all the way forward.

Item	Measurement	Specification
Fast Idle	Engine Speed	2930—3070 rpm

[12] - Slowly turn load valve in to increase pressure to specification.

Item	Measurement	Specification
Hydrostatic Pump	Testing Pressure	13 790 kPa 137.9 bar 2000 psi

[13] - Read and record pump flow.

Item	Measurement	Specification
317 Skid Steer Loader		
New, Typical Hydrostatic Pump	Flow Rate	75.7 L/min—Approximate 20.0 gpm—Approximate
Used, Minimum Hydrostatic Pump	Flow Rate	60.6 L/min—Approximate 16.0 gpm—Approximate
320 Skid Steer Loader		
New, Typical Hydrostatic Pump	Flow Rate	94.6 L/min—Approximate 25.0 gpm—Approximate
Used, Minimum Hydrostatic Pump	Flow Rate	75.7 L/min—Approximate 20.0 gpm—Approximate
CT322 Compact Track Loader		
New, Typical Hydrostatic Pump	Flow Rate	76.0 L/min—Approximate 20.1 gpm—Approximate
Used, Minimum Hydrostatic Pump	Flow Rate	60.6 L/min—Approximate 16.0 gpm—Approximate

[14] - Repeat procedure for right pump using right forward port (82) or right reverse port (83).

[15] - If flow is low:

- Verify engine speed at fast idle. See Engine Speed Test and Adjustment . (Group 9010.)
- Verify proper steering lever travel. See Steering Lever Adjustment—Centering . (Group 9026-25.)
- Inspect steering linkage for wear and loose parts.
- Repair or replace hydrostatic pump. See Hydrostatic Pump Remove and Install . (Group 0360.)

Centering Plate Adjustment—Skid Steer Loader

Specifications

SPECIFICATIONS	
Centering Plate Spring Bolt Assembly Torque	67 N·m 50 lb-ft
Centering Plate to Centering Bracket Gap	3.2—6.4 mm 1/8—1/4 in.
Control Lever Cap Screw Torque	40 N·m 30 lb-ft

This adjustment is to prevent the machine from creeping when control levers are in neutral.

[1] - Park machine on flat, level surface.

[2] - Raise and block skid steer loader. See Raising and Blocking Machine . (Operator's Manual.)

[3] - Raise boom and engage boom lock.

[4] - Raise cab. See Raising Operator's Station . (Operator's Manual.)

[5] - Install M8 x 30 cap screws in tab at the rear of both yokes of steering levers to secure steering levers in an upright position.

[6] - Check pivot points of all the steering linkage for wear and damage. Repair linkage components prior to performing these adjustments.

[7] -

CAUTION:

Prevent possible injury from moving tires when using remote start box. Keep tire area clear of bystanders. Do not use remote start box without raising and blocking skid steer loader.

Install remote start box. See Remote Start Box Installation . (Group 9025-25.)

[8] - Disconnect steering control rods from pump control levers.

[9] - Check that the spring bolt assemblies are tightened to specification.

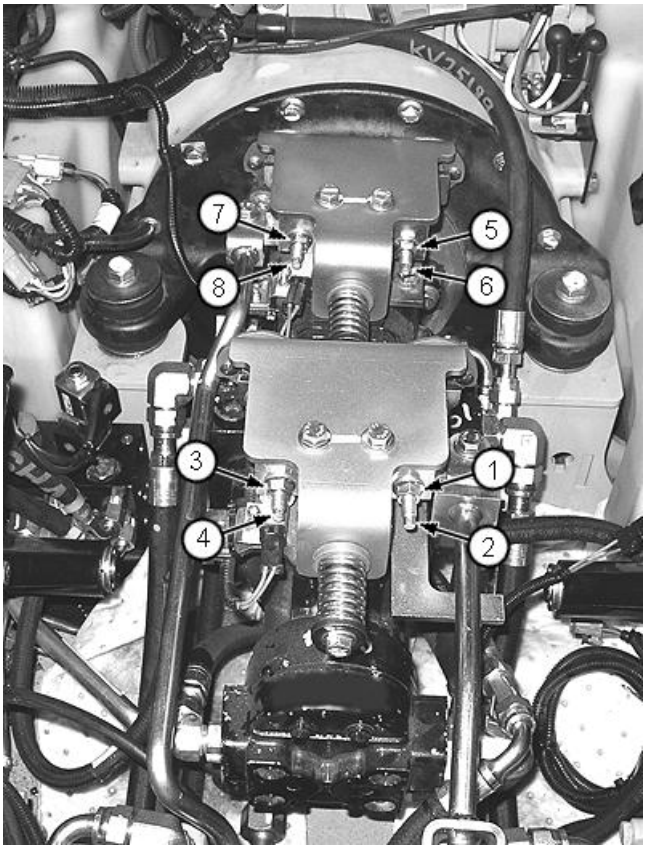
Item	Measurement	Specification
Centering Plate Spring Bolt Assembly	Torque	67 N·m
		50 lb-ft

[10] - Verify that the gaps between the centering plates and the centering brackets are within specification.

Item	Measurement	Specification
Centering Plate to Centering Bracket	Gap	3.2—6.4 mm
		1/8—1/4 in.

[11] - Start and operate engine at fast idle. Disengage parking brake. Wheels must not rotate.

[12] -



LEGEND:

1 Left Wheels Centering Screw Locknut (forward rotation)
2 Left Wheels Centering Screw (forward rotation)
3 Left Wheels Centering Screw Locknut (reverse rotation)
4 Left Wheels Centering Screw (reverse rotation)
5 Right Wheels Centering Screw Locknut (forward rotation)
6 Right Wheels Centering Screw (forward rotation)
7 Right Wheels Centering Screw Locknut (reverse rotation)
8 Right Wheels Centering Screw Locknut (reverse rotation)

Centering Plate Adjustment

If left wheels rotate, adjust front centering plate screws as follows:

- If left wheels rotate in forward direction of travel, loosen locknut (1) and turn centering screw (2) in (clockwise) until the left wheels start to rotate in reverse direction of travel. Slowly turn the centering screw (2) out (counterclockwise) until the wheels stop rotating. Tighten locknut (1).
- If left wheels rotate in reverse direction of travel, loosen locknut (3) and turn centering screw (4) in (clockwise) until the left wheels start to rotate in forward direction of travel. Slowly turn the centering screw (4) out (counterclockwise) until the wheels stop rotating. Tighten locknut (3).

[13] - If right wheels rotate, adjust rear centering plate screws as follows:

- If right wheels rotate in forward direction of travel, loosen locknut (5) and turn centering screw (6) in (clockwise) until the right wheels start to rotate in reverse direction of travel. Slowly turn the centering screw (6) out (counterclockwise) until the wheels stop rotating. Tighten locknut (5).
- If right wheels rotate in reverse direction of travel, loosen locknut (7) and turn centering screw (8) in (clockwise) until the right wheels start to rotate in forward direction of travel. Slowly turn the centering screw out (counterclockwise) until the wheels stop rotating. Tighten locknut (7).

[14] - Verify that there is no gap between all four centering screws and all four bearings. Adjust as necessary being careful not to change the neutral position of the pump control lever.

[15] -

→NOTE:

The machine will not center consistently with a gap less than 3.2 mm (1/8 in.). Steering effort will be increased with a gap greater than 6.4 mm (1/4 in.).

Verify that the gaps between the centering plates and the centering brackets are within specification. If gaps are not with specification, adjust all centering screws equally until specification is obtained, then repeat procedure.

Item	Measurement	Specification
Centering Plate to Centering Bracket	Gap	3.2—6.4 mm 1/8—1/4 in.

[16] - Connect control rods to pump control levers. Tighten cap screws to specification.

Item	Measurement	Specification
Control Lever Cap Screw	Torque	40 N·m 30 lb-ft

[17] - Test left wheel adjustment:

- Move left steering lever to full forward and release handle. The steering lever must return to neutral position and the left wheels must stop rotating.
- Move left steering lever to the full reverse position and release handle. The steering lever must return to neutral position and the left wheels must stop rotating.
- If the left wheels do not stop rotating, adjust the left wheel centering screws (2 and 4) so that both screws contact the bearings when in the neutral position, then repeat procedure.

[18] - Test right wheel adjustment by repeating step using the right steering lever. Adjust the right wheel centering screws (6 and 8) so that both screws contact the bearings when in the neutral position, then repeat procedure.

[19] - Center left and right steering lever. See Steering Lever Adjustment—Centering . (Group 9026-25.)

[20] - Adjust steering lever stops. See Tracking Adjustment—Skid Steer Loader . (Group 9026-25.)

[21] - Remove M8 x 30 cap screws from both yokes of steering levers securing steering levers in an upright position.

[22] - Remove remote start box.

[23] - Lower cab. See Raising Operator′s Station . (Operator′s Manual.)

[24] - Raise skid steer loader and remove blocking. See Raising and Blocking Machine . (Operator′s Manual.)

[25] - Start skid steer loader and lower boom.

Centering Plate Adjustment—Compact Track Loader

Specifications

SPECIFICATIONS	
Centering Plate Spring Bolt Assembly Torque	67 N·m 50 lb-ft
Centering Plate to Centering Bracket Gap	3.2—6.4 mm 1/8—1/4 in.
Control Lever Cap Screw Torque	40 N·m 30 lb-ft

This adjustment is to prevent the machine from creeping when control levers are in neutral.

[1] - Park machine on flat, level surface.

[2] - Raise and block compact track loader. See Raising and Blocking Machine . (Operator's Manual.)

[3] - Raise boom and engage boom lock.

[4] - Raise cab. See Raising Operator's Station . (Operator's Manual.)

[5] - Install M8 x 30 cap screws in tab at the rear of both yokes of steering levers to secure steering levers in an upright position.

[6] - Check pivot points of all the steering linkage for wear and damage. Repair linkage components prior to performing these adjustments.

[7] -

CAUTION:

Prevent possible injury from moving tracks when using remote start box. Keep track area clear of bystanders. Do not use remote start box without raising and blocking compact track loader.

Install remote start box. See Remote Start Box Installation . (Group 9025-25.)

[8] - Disconnect steering control rods from pump control levers.

[9] - Check that the spring bolt assemblies are tightened to specification.

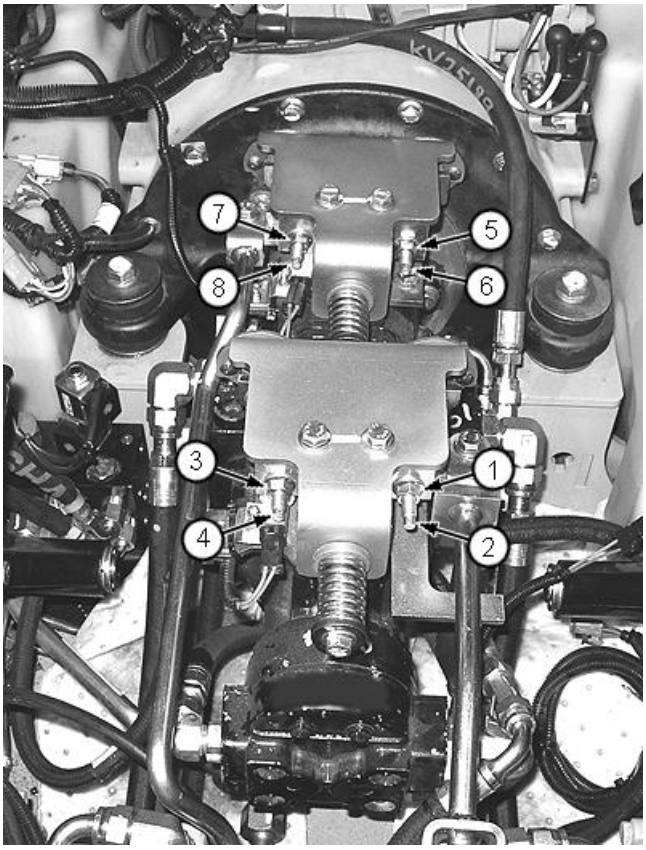
Item	Measurement	Specification
Centering Plate Spring Bolt Assembly	Torque	67 N·m
		50 lb-ft

[10] - Verify that the gaps between the centering plates and the centering brackets are within specification.

Item	Measurement	Specification
Centering Plate to Centering Bracket	Gap	3.2—6.4 mm
		1/8—1/4 in.

[11] - Start and operate engine at fast idle. Disengage parking brake. Tracks must not rotate.

[12] -



LEGEND:

1 Left Track Centering Screw Locknut (forward rotation)
2 Left Track Centering Screw (forward rotation)
3 Left Track Centering Screw Locknut (reverse rotation)
4 Left Track Centering Screw (reverse rotation)
5 Right Track Centering Screw Locknut (forward rotation)
6 Right Track Centering Screw (forward rotation)
7 Right Track Centering Screw Locknut (reverse rotation)
8 Right Track Centering Screw Locknut (reverse rotation)

Centering Plate Adjustment

If left track rotates, adjust front centering plate screws as follows:

- If left track rotates in forward direction of travel, loosen locknut (1) and turn centering screw (2) in (clockwise) until the left track starts to rotate in reverse direction of travel. Slowly turn the centering screw (2) out (counterclockwise) until the track stops rotating. Tighten locknut (1).
- If left track rotates in reverse direction of travel, loosen locknut (3) and turn centering screw (4) in (clockwise) until the left track starts to rotate in forward direction of travel. Slowly turn the centering screw (4) out (counterclockwise) until the track stops rotating. Tighten locknut (3).

[13] - If right track rotates, adjust rear centering plate screws as follows:

- If right track rotates in forward direction of travel, loosen locknut (5) and turn centering screw (6) in (clockwise) until the right track starts to rotate in reverse direction of travel. Slowly turn the centering screw (6) out (counterclockwise) until the track stops rotating. Tighten locknut (5).
- If right track rotates in reverse direction of travel, loosen locknut (7) and turn centering screw (8) in (clockwise) until the right track starts to rotate in forward direction of travel. Slowly turn the centering screw out (counterclockwise) until the track stops rotating. Tighten locknut (7).

[14] - Verify that there is no gap between all four centering screws and all four bearings. Adjust as necessary being careful not to change the neutral position of the pump control lever.

[15] -

→NOTE:

The machine will not center consistently with a gap less than 3.2 mm (1/8 in.). Steering effort will be increased with a gap greater than 6.4 mm (1/4 in.).

Verify that the gaps between the centering plates and the centering brackets are within specification. If gaps are not with specification, adjust all centering screws equally until specification is obtained, then repeat procedure.

Item	Measurement	Specification
Centering Plate to Centering Bracket	Gap	3.2—6.4 mm 1/8—1/4 in.

[16] - Connect control rods to pump control levers. Tighten cap screws to specification.

Item	Measurement	Specification
Control Lever Cap Screw	Torque	40 N·m 30 lb-ft

[17] - Test left track adjustment:

- Move left steering lever to full forward and release handle. The steering lever must return to neutral position and the left track must stop rotating.
- Move left steering lever to the full reverse position and release handle. The steering lever must return to neutral position and the left track must stop rotating.
- If the left track does not stop rotating, adjust the left track centering screws (2 and 4) so that both screws contact the bearings when in the neutral position, then repeat procedure.

[18] - Test right track adjustment by repeating step using the right steering lever. Adjust the right track centering screws (6 and 8) so that both screws contact the bearings when in the neutral position, then repeat procedure.

[19] - Center left and right steering lever. See Steering Lever Adjustment—Centering . (Group 9026-25.)

[20] - Adjust steering lever stops. See Tracking Adjustment—Compact Track Loader . (Group 9026-25.)

[21] - Remove M8 x 30 cap screws from both yokes of steering levers securing steering levers in an upright position.

[22] - Remove remote start box.

[23] - Lower cab. See Raising Operator′s Station . (Operator′s Manual.)

[24] - Raise compact track loader and remove blocking. See Raising and Blocking Machine . (Operator′s Manual.)

[25] - Start compact track loader and lower boom.

Steering Lever Adjustment—Centering

IMPORTANT:

Centering plates must be properly adjusted to perform steering lever centering adjustment.

This adjustment centers the Steering levers.

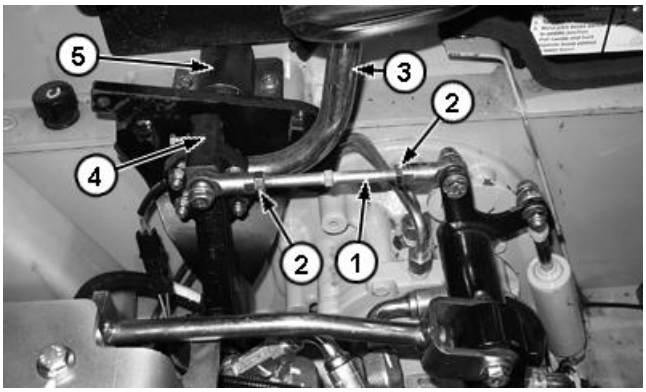
[1] - Park machine on flat level surface.

[2] - Raise boom and engage boom lock.

[3] - Raise cab. For skid steer loader, see Raising Operator's Station . (Operator's Manual.) For compact track loader, see Raising Operator's Station . (Operator's Manual.)

[4] - Install M8 x 30 cap screws in tab at the rear of both yokes of steering levers to secure steering levers in an upright position.

[5] -



LEGEND:

1	Left Link Rod
2	Lock Nut
3	Left Steering Lever
4	Left Lever Casting
5	Left Link Rod Pivot Bearing

Steering lever Adjustment—Centering

Loosen both lock nuts (2) on link rod (1) on left Steering lever (3).

[6] - Adjust left link rod to align lever casting (4) with pivot bearing (5).

[7] - Tighten both lock nuts (2) on link rod (1).

[8] - Repeat procedure for right Steering lever.

[9] -

IMPORTANT:

The Steering lever stops must be adjusted properly to prevent damage to the linkage and hydrostatic components.

Adjust Steering lever stops. See Tracking Adjustment—Skid Steer Loader , or see Tracking Adjustment—Compact Track Loader . (Group 9026-25.)

[10] - Remove cap screws from each steering lever yoke.

[11] - Lower cab. For skid steer loader, see Raising Operator's Station . (Operator's Manual.) For compact track loader, see Raising Operator's Station . (Operator's Manual.)

[12] - Start machine and lower boom.

Tracking Adjustment—Skid Steer Loader

IMPORTANT:

If steering system adjustments have been made for any reason, the steering lever stops must be adjusted. The steering lever stops must be adjusted properly to prevent damage to the linkage and hydrostatic components.

This adjustment ensures machine tracks straight and to protect hydrostatic pumps from damage.

[1] - Park machine on flat level surface.

[2] - Raise and block skid steer loader. See Raising and Blocking Machine . (Operator's Manual.)

[3] - Raise boom and engage boom lock.

[4] - Raise cab. See Raising Operator's Station . (Operator's Manual.)

[5] -

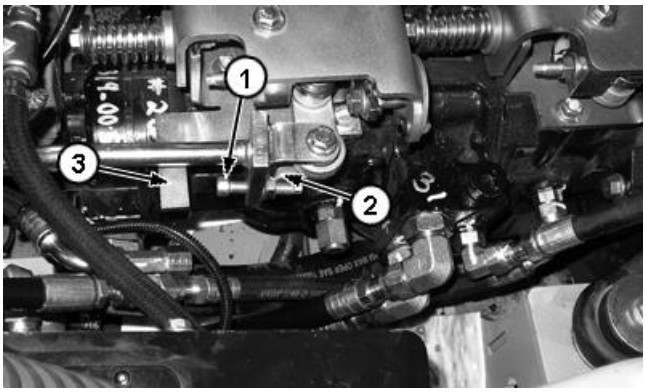
CAUTION:

Prevent possible injury from moving tires when using remote start box. Keep tire area clear of bystanders. Do not use remote start box without raising and blocking skid steer loader.

Install remote start box. See Remote Start Box Installation . (Group 9025-25.)

[6] - Install M8 x 30 cap screws in tab at the rear of both yokes of steering levers to secure steering assembly during adjustment procedure.

[7] -



LEGEND:

1	Left Forward Stop Screw
2	Left Forward Stop Screw Lock Nut
3	Left Forward Stop

Forward Stop Screw

Loosen lock nut (2) on the left steering lever forward stop screw (1).

[8] - Turn stop screws (1) in (clockwise).

[9] -

→NOTE:

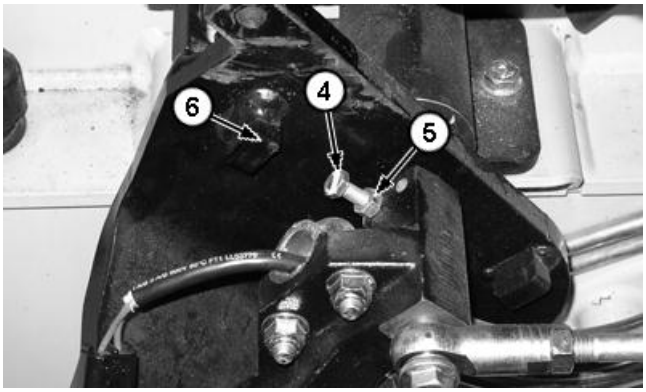
The steering lever stop screw act as the primary stop just before the mechanism inside the hydrostatic pump stops movement of the pump control lever.

Move and hold left steering lever at the full forward position.

[10] - Turn forward stop screw out (counterclockwise) until it just contacts the forward stop (3), then turn stop screw (1) an additional 1/8 turn.

[11] - Hold forward stop screw (1) and tighten lock nut (2).

[12] -



LEGEND:
4 Left Reverse Stop Screw
5 Left Reverse Stop Screw Lock Nut
6 Left Reverse Stop

Steering Lever Reverse Stop

Loosen lock nut (5) on the left steering lever left reverse stop screw (4).

[13] - Move and hold left steering lever at the full reverse position.

[14] - Turn left reverse stop screw (4) out (counterclockwise) until it just contacts the left reverse stop (6), then turn stop screw an additional 1/8 turn.

[15] - Hold reverse stop screw (4) and tighten lock nut (5).

[16] - Allow steering lever to go to neutral position.

[17] - Repeat steps procedure for right side.

[18] - Start and operate engine at fast idle.

[19] - Holding steering lever in the full forward position, measure and record the full forward wheel speed (revolutions per minute) of the left wheel using JT05719 Photo Tachometer. Repeat procedure for the right side.

- Left and right wheel speed should be within one revolution per minute of each other.
- If left and right wheels are not within one revolution per minute of each other, adjust the faster wheel to equal the slower wheel speed by turning the stop screw out (counterclockwise).

[20] - Tighten lock nuts on the steering lever stop screws.

[21] -

→NOTE:

Due to variations such as tire size, tracking must be verified by driving the skid steer loader. If mistracking is more than the width of the machine within 30.5 m (100 ft) of travel, readjustment of the stop screws is required.

Repeat procedure with the left and right steering levers at full reverse position.

[22] - Remove M8 x 30 cap screws from both yokes of steering levers securing steering levers in an upright position.

[23] - Remove remote start.

[24] - Lower cab. See Raising Operator's Station . (Operator's Manual.)

[25] - Raise skid steer loader and remove blocking. See Raising and Blocking Machine . (Operator's Manual.)

[26] - Start skid steer loader and lower boom.

Tracking Adjustment—Compact Track Loader

IMPORTANT:

If steering system adjustments have been made for any reason, the steering lever stops must be adjusted. The steering lever stops must be adjusted properly to prevent damage to the linkage and hydrostatic components.

This adjustment ensures machine tracks straight and to protect hydrostatic pumps from damage.

[1] - Park machine on flat level surface.

[2] - Raise and block compact track loader. See Raising and Blocking Machine . (Operator's Manual.)

[3] - Raise boom and engage boom lock.

[4] - Raise cab. See Raising Operator's Station . (Operator's Manual.)

[5] -

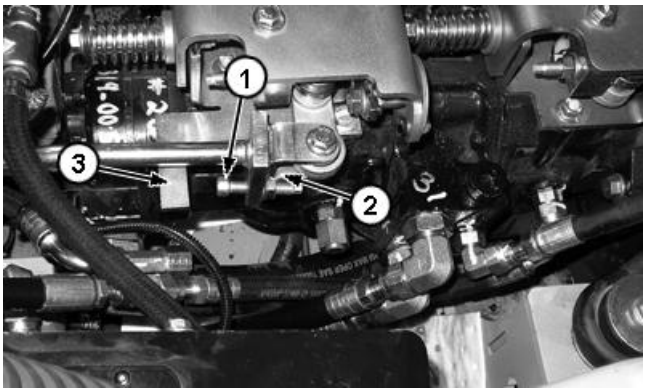
CAUTION:

Prevent possible injury from moving tracks when using remote start box. Keep track area clear of bystanders. Do not use remote start box without raising and blocking compact track loader.

Install remote start box. See Remote Start Box Installation . (Group 9025-25.)

[6] - Install M8 x 30 cap screws in tab at the rear of both yokes of steering levers to secure steering assembly during adjustment procedure.

[7] -



LEGEND:

1	Left Forward Stop Screw
2	Left Forward Stop Screw Lock Nut
3	Left Forward Stop

Forward Stop Screw

Loosen lock nut (2) on the left steering lever forward stop screw (1).

[8] - Turn stop screws (1) in (clockwise).

[9] -

→NOTE:

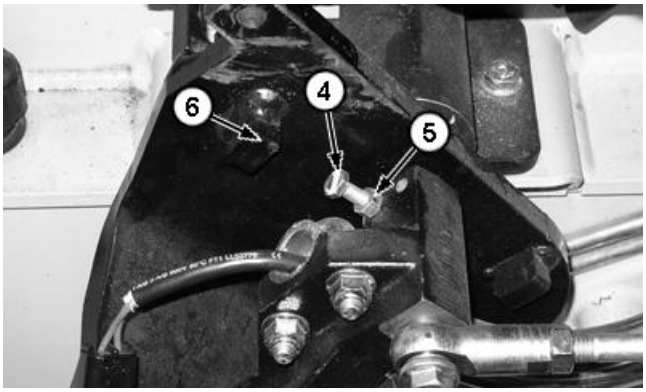
The steering lever stop screw act as the primary stop just before the mechanism inside the hydrostatic pump stops movement of the pump control lever.

Move and hold left steering lever at the full forward position.

[10] - Turn forward stop screw out (counterclockwise) until it just contacts the forward stop (3), then turn stop screw (1) an additional 1/8 turn.

[11] - Hold forward stop screw (1) and tighten lock nut (2).

[12] -



LEGEND:
4 Left Reverse Stop Screw
5 Left Reverse Stop Screw Lock Nut
6 Left Reverse Stop

Steering Lever Reverse Stop

Loosen lock nut (5) on the left steering lever left reverse stop screw (4).

[13] - Move and hold left steering lever at the full reverse position.

[14] - Turn left reverse stop screw (4) out (counterclockwise) until it just contacts the left reverse stop (6), then turn stop screw an additional 1/8 turn.

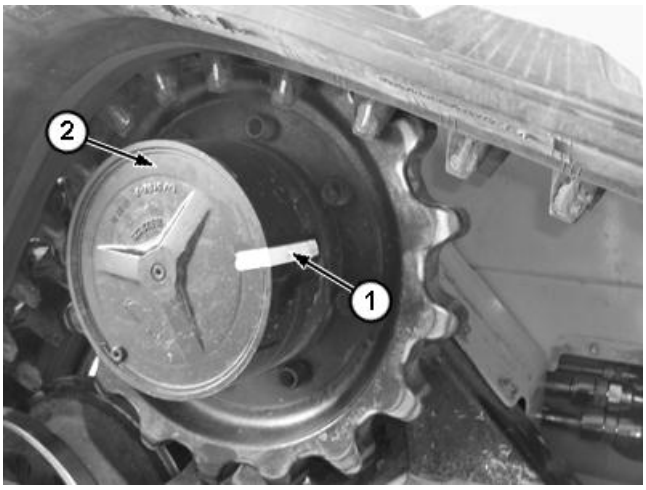
[15] - Hold reverse stop screw (4) and tighten lock nut (5).

[16] - Allow steering lever to go to neutral position.

[17] - Repeat steps procedure for right side.

[18] - Start and operate engine at fast idle.

[19] -



LEGEND:
1 Reflective Tape
2 Motor Gearbox Housing

Hydrostatic Motor Gearbox Housing

Holding steering lever in the full forward position, measure and record the full forward track speed (revolutions per minute) of the left track using JT05719 Photo Tachometer. Repeat procedure for the right side.

- Left and right track speed should be within one revolution per minute of each other.
- If left and right tracks are not within one revolution per minute of each other, adjust the faster track to equal the slower track speed by turning the stop screw out (counterclockwise).

[20] - Tighten lock nuts on the steering lever stop screws.

[21] -

→NOTE:

Tracking must be verified by driving the compact track loader. If mistracking is more than the width of the machine within 30.5 m (100 ft) of travel, readjustment of the stop screws is required.

Repeat procedure with the left and right steering levers at full reverse position.

[22] - Remove M8 x 30 cap screws from both yokes of steering levers securing steering levers in an upright position.

[23] - Remove remote start.

[24] - Lower cab. See Raising Operator′s Station . (Operator′s Manual.)

[25] - Raise compact track loader and remove blocking. See Raising and Blocking Machine . (Operator′s Manual.)

[26] - Start compact track loader and lower boom.

Auxiliary Hydraulic Control Handle Adjustment

Specifications

SPECIFICATIONS	
Auxiliary Cable Lock Nut Torque	27 N·m 20 lb-ft

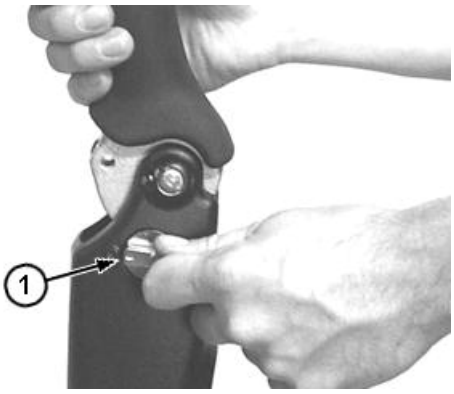
This procedure ensures that the auxiliary control handle is centered, giving equal hydraulic oil flow in all positions.

[1] - Park machine on flat level surface.

[2] - Raise and block machine. For skid steer loader, see Raising and Blocking Machine . (Operator's Manual.) For compact track loader, see Raising and Blocking Machine . (Operator's Manual.)

[3] - Remove cover plates to access the control valve.

[4] -

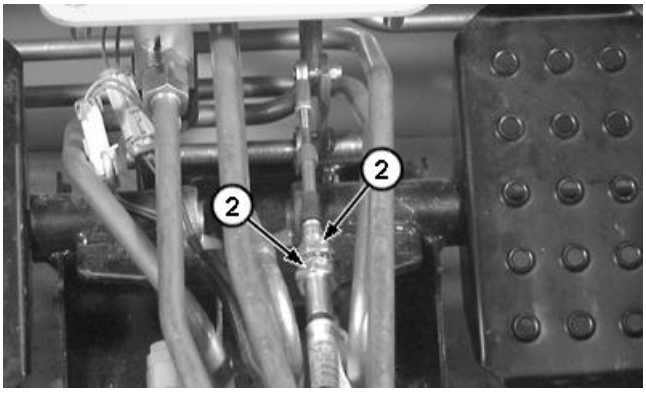


LEGEND:
1 Locking Mechanism

Auxiliary Hydraulic Handle Lock

Lock handle in the middle (neutral) position by turning locking mechanism to the left.

[5] -



LEGEND:
2 Cable Lock Nuts

Auxiliary Hydraulic Cable Adjustment

Loosen both auxiliary cable lock nuts (2).

[6] - Center spool in control valve.

[7] - Tighten both auxiliary cable lock nuts finger tight against cable saddle, then tighten to specification.

Item	Measurement	Specification
Auxiliary Cable Lock Nut	Torque	27 N·m 240 lb-in.

Hydraulic Control Handle Adjustment—Hands Only Machine

This procedure ensures that the control handles are centered, giving equal hydraulic oil flow in all positions.

[1] - Park machine on flat level surface.

[2] - Raise cab. For skid steer loader, see Raising Operator's Station . (Operator's Manual.) For compact track loader, see Raising Operator's Station . (Operator's Manual.)

[3] - Raise boom and engage boom lock.

[4] - Remove cover plates to access the control valve.

[5] -

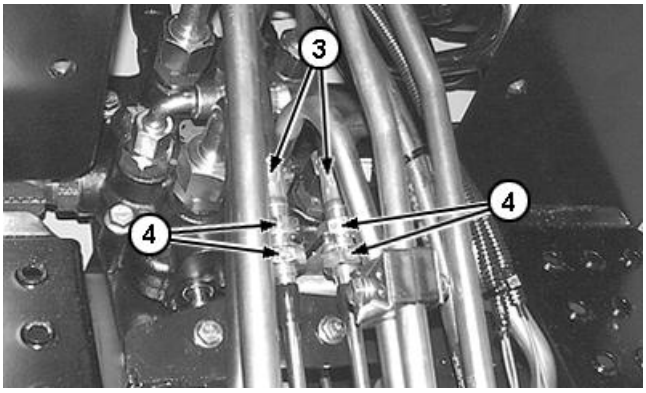
LEGEND:
1 Right Hydraulic Hand Control
2 Left Hydraulic Hand Control

Hydraulic Hand Controls

Move each handle all the way down and all the way up. Ensure boom spool locks into float detent.

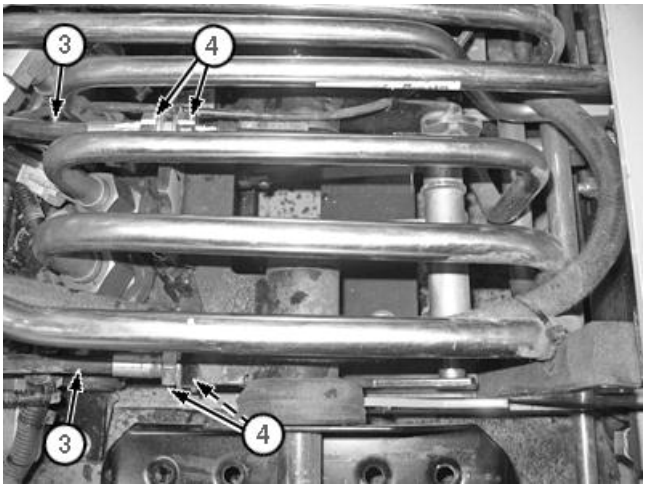
[6] - Confirm that when the handles are returned to neutral position, they are in the center of the operating range.

[7] -



LEGEND:
3 Control Cable
4 Control Cable Lock Nut

Control Cables and Lock Nuts (S.N. —150522)



Control Cables and Lock Nuts (S.N. 150523—)

If adjustment is needed, locate cable (3) on control valve, loosen both cable lock nuts.

[8] - Adjust nuts (4) until handle is centered.

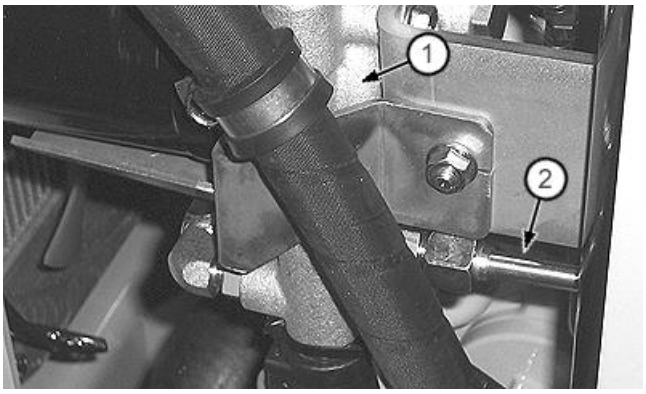
[9] - Tighten both cable lock nuts (4) finger tight against cable saddle, then tighten to specification.

Item	Measurement	Specification
Hand Control Auxiliary Cable Lock Nut	Torque	27 N·m
		240 lb-in.

Park Brake Release Pressure Test

Specifications

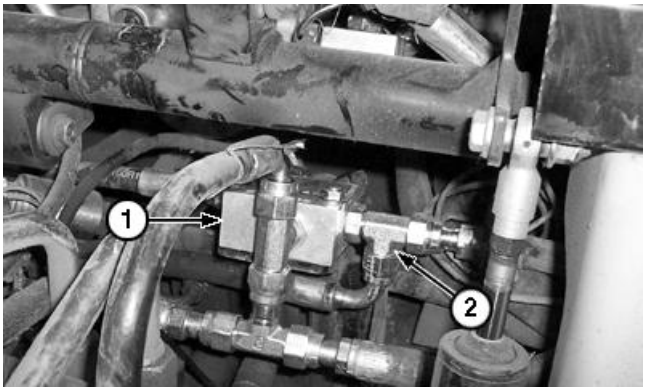
SPECIFICATIONS	
Hydraulic Oil Temperature	43°C 110°F
Brake Release Pressure	1724—2068 kPa 17.2—20.7 bar 250—300 psi



Hydraulic Oil Filter and Park Brake Solenoid Valve Manifold—Skid Steer Loader

LEGEND:

1 Solenoid Valve Manifold
2 Brake Release Line



Park Brake Solenoid Valve Manifold—Compact Track Loader

This procedure tests the park brake release hydraulic pressure. Brakes are applied by internal spring and released with charge pressure when park brake switch is off and the engine is running.

[1] - Operate hydraulic system until hydraulic oil reaches specification.

Item	Measurement	Specification
Hydraulic Oil	Temperature	43°C 110°F

[2] - Park machine on flat level surface.

[3] - Turn engine off.

[4] -

CAUTION:

Avoid possible injury from moving tires/tracks when using remote start box. Keep tire/track area clear of bystanders. Do not use remote start box without raising and blocking machine. Machine may override brake and move quickly.

Raise and block machine. For skid steer loader, see Raising and Blocking Machine . (Operator's Manual.) For compact track loader, see Raising and Blocking Machine . (Operator's Manual.)

[5] - Raise boom and engage boom lock.

[6] - Raise cab. For skid steer loader, see Raising Operator's Station . (Operator's Manual.) For compact track loader, see Raising Operator's Station . (Operator's Manual.)

[7] - Install M8 x 30 cap screws in tab at the rear of both yokes of steering control arms to secure steering assembly during adjustment procedure.

[8] -

CAUTION:

Prevent possible injury from moving tires/tracks when using remote start box. Keep tire/track area clear of bystanders. Do not use remote start box without raising and blocking machine.

Install remote start box. See Remote Start Box Installation . (Group 9025-25.)

[9] -

CAUTION:

High pressure can remain in the boom and bucket hydraulic circuits indefinitely. Prevent injury from escaping hydraulic oil under pressure, relieve the pressure in the system before removing hydraulic lines.

Release hydraulic pressure. See Hydraulic System Pressure Release . (Group 9025-25.)

[10] - Disconnect brake release line (2) on hydraulic oil filter and park brake valve solenoid manifold (1).

[11] - Install tee and pressure gauge in line with brake release line and manifold.

[12] - Start engine and run at fast idle, switch park brake to run position. Read pressure gauge.

Item	Measurement	Specification
Brake Release	Pressure	1724—2068 kPa 17.2—20.7 bar 250—300 psi

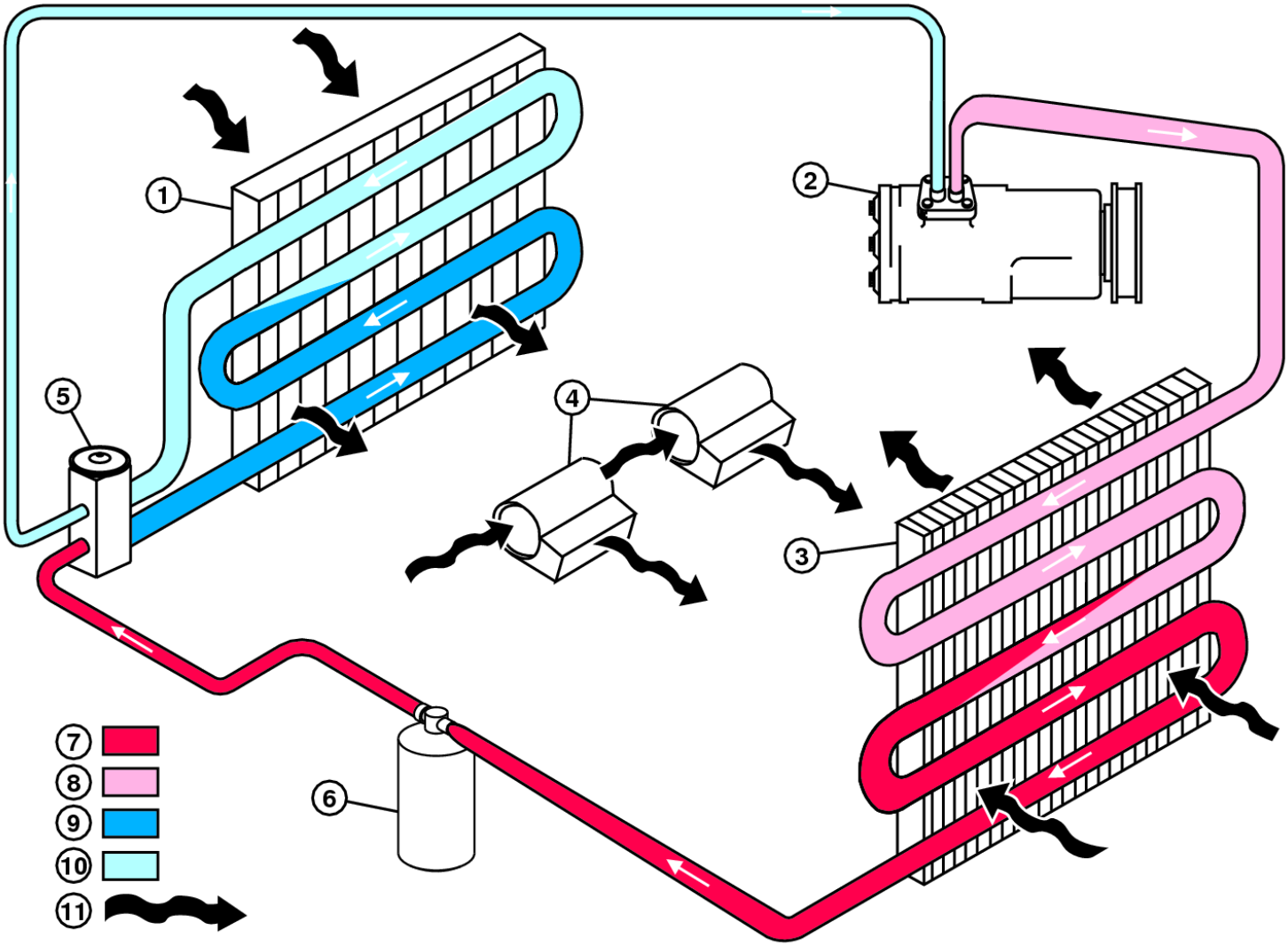
[13] - If pressure reading is within specifications, move right steering lever forward and observe that right wheels move freely, indicating brakes are fully released. Repeat procedure for left side. See Wheel Speed Test—Skid Steer Loader or see Track Speed Test—Compact Track Loader . (Group 9026-25.)

Section 9031 - HEATING AND AIR CONDITIONING

Table of contents

Group 05 - Theory Of Operation

Air Conditioning System Cycle Of Operation



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Refrigerant System Cycle Of Operation

LEGEND:

1	Evaporator
2	Compressor
3	Condenser
4	Circulation Fan Motor
5	Expansion Valve
6	Receiver-Dryer
7	High Pressure Liquid
8	High Pressure Gas
9	Low Pressure Liquid
10	Low Pressure Gas
11	Air Flow

The compressor is belt driven and engaged by an electro-magnetic clutch. The air conditioning circuit automatically controls compressor engagement or disengagement when system is in operation.

Compressor draws low pressure gas from evaporator and compresses it into high pressure gas. This causes temperature of refrigerant to rise higher than that of outside air.

High pressure gas leaves compressor and flows through condenser where heat is removed and transferred to outside air being drawn through condenser core by engine fan. Cooling refrigerant causes it to condense and refrigerant leaves condenser as high pressure liquid.

High pressure liquid flows into receiver-dryer where moisture and contaminants (acid, solids, etc.) are removed. Receiver-dryer contains a color moisture indicator. (Blue) indicates no moisture is present. (Pink) indicates moisture is present. Should moisture be combined with refrigerant, hydrofluoric and hydrochloric acids are formed. These acids are very corrosive to metal

surfaces and leakage will eventually develop. Receiver-dryer also stores refrigerant allowing a longer period of time before additional refrigerant is needed. Refrigerant hoses allow a small amount of refrigerant to migrate through their walls.

Refrigerant flows from receiver-dryer through expansion valve to evaporator. Expansion valve senses refrigerant temperature and pressure to modulate refrigerant flow. Expansion valve changes refrigerant to low pressure liquid entering evaporator. Actual cooling and drying of cab air takes place at evaporator. Heat absorbed by evaporator and transferred to refrigerant causes refrigerant to vaporize into low pressure gas. Low pressure gas is drawn from evaporator by compressor and cycle is repeated.

A freeze control switch senses temperature of evaporator coil through a capillary tube. This prevents the evaporator from becoming cold enough to freeze moisture that condenses on evaporator coil. Condensed moisture is drained away through drain tubes connected to drain pan under evaporator.

System pressure is monitored by the high and low pressure switch, located at the receiver-dryer. See Air Conditioner and Heater Component Location . (Group 9031-15.) for location of A/C components. If pressure becomes too high or too low the switch opens and stops compressor, interrupting the cycle.

Group 15 - Diagnostic Information

Diagnose Air Conditioning System Malfunctions

→NOTE:

Perform Visual Inspection of Components (Group 9031-25.) check prior to diagnostics and tests. These conditions my affect diagnostic and test results.

Symptom	Problem	Solution
Air Conditioning System Does Not Operate	Accessory 25 amp fuse (F3)	Replace Fuse. See Fuse Specifications . (Group 9015-10.)
	Blower motor 15 amp fuse (F6)	Replace fuse. See Fuse Specifications . (Group 9015-10.)
	Air conditioning switch (S19)	Check switch. See Air Conditioner Switch Check . (Group 9015-20.)
	Accessory relay (K4)	Test relay. See Relay Test . (Group 9015-20.)
	Air conditioner and heater blower motor switch (S9)	Check switch. See Air Conditioner and Heater Blower Motor Switch Check . (Group 9015-20.)
	Air conditioner and heater blower motor (M3)	Check blower motor. See Air Conditioner and Heater Component Location . (Group 9031-15.)
	Cab temperature control dial	Check control dial. See Cab Temperature Control Dial Check . (Group 9015-20.)
	Blower motor resistor block	Check blower motor resistor block.
	Air conditioner compressor clutch relay (K7)	Test relay. See Relay Test . (Group 9015-20.)
	Air conditioning freeze control switch (B10)	Test switch. See Air Conditioner Freeze Control Switch Test . (Group 9031-25.)
	Air conditioning high/low pressure switch (B9)	Test switch. See Air Conditioner High/Low Pressure Switch Test . (Group 9031-25.)
	Air conditioning compressor clutch (Y13)	Test clutch. See Air Conditioner Compressor Clutch Test . (Group 9031-25.)
Air Conditioner Does Not Cool Interior of Cab	Fresh air filter restricted	Replace fresh air filter. For skid steer loader, see Cleaning and Replacing Air Conditioner and Heater/Defroster Air Filter . (Operator's Manual.) For compact track loader, see Cleaning and Replacing Air Conditioner and Heater/Defroster Air Filter . (Operator's Manual.)
	Condenser fins restricted with debris	Clean condenser fins. See Air Conditioner and Heater Component Location . (Group 9031-15.)
	Refrigerant hose kinked, pinched, or collapsed	Re-route or re-index hoses. Replace collapsed hoses. See Air Conditioner and Heater Component Location . (Group 9031-15.)
	Heater or evaporator fins restricted with dirt or dust	Clean heater or evaporator fins. See Air Conditioner and Heater Component Location . (Group 9031-15.)
	Air conditioner and heater blower motor failed or operating too slow	Check air conditioner and heater blower motor. See Air Conditioner and Heater Component Location . (Group 9031-15.)
	Air conditioning compressor clutch slipping or failed	Inspect compressor clutch. See Air Conditioner Compressor Clutch Test . (Group 9031-25.)
	Warm outside air leaking into cab	Inspect, repair, or replace door and window seals.
	Heater valve remaining open	Inspect, repair or replace heater control valve actuator.
	System refrigerant (R134A) charge low	Perform Refrigerant Leak Test , and perform R134a Air Conditioning System Test . (Group 9031-25.)
	Evaporator fins frosting or freezing	Freeze control switch not positioned correctly in evaporator core. Reposition in evaporator core.
Air Conditioner Runs Constantly, Too Cold	Freeze control switch not positioned in evaporator properly	Reposition freeze control switch in evaporator core.
Interior Windows Continue to Fog	Air conditioning system off	Push A/C switch to turn air conditioning on.
	Fresh air filter restricted	Clean or replace filter. For skid steer loader, see Cleaning and Replacing Air Conditioner and Heater/Defroster Air Filter . (Operator's Manual.) For compact track loader, see Cleaning and Replacing Air Conditioner and Heater/Defroster Air Filter . (Operator's Manual.)

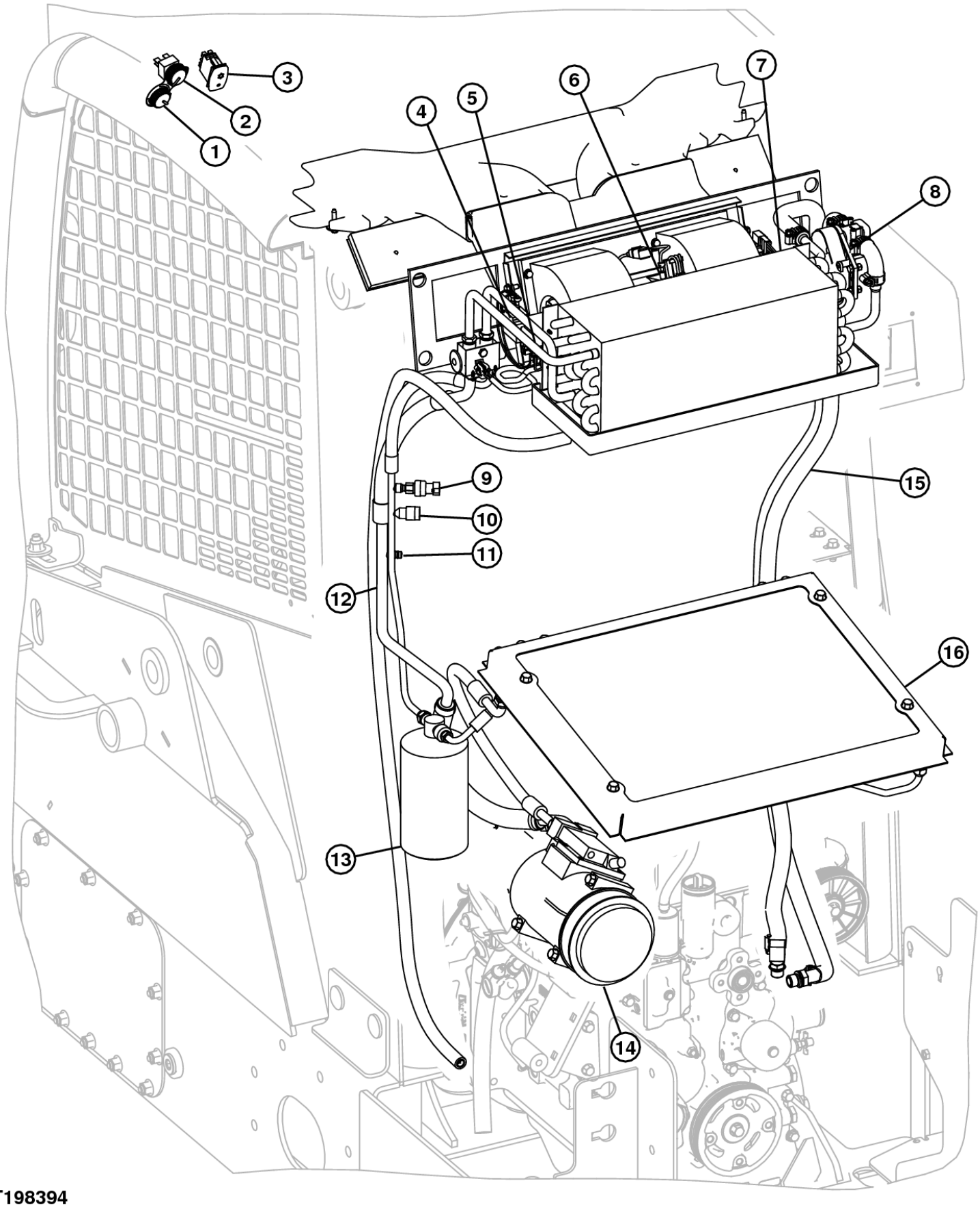
Diagnose Heater System Malfunctions

→NOTE:

Perform Visual Inspection of Components (Group 9031-25.) check prior to diagnostics and tests. These conditions my affect diagnostic and test results.

Symptom	Problem	Solution
Heater System Does Not Operate	Accessory 25 amp fuse (F3)	Replace Fuse. See Fuse Specifications . (Group 9015-10.)
	Blower motor 15 amp fuse (F6)	Replace fuse. See Fuse Specifications . (Group 9015-10.)
	Air conditioner and heater blower motor switch (S9)	Check switch. See Air Conditioner and Heater Blower Motor Switch Check . (Group 9015-20.)
	Air conditioner and heater blower motor (M3)	Check blower motor. See Air Conditioner and Heater Component Location . (Group 9031-15.)
	Cab temperature control dial	Check control dial. See Cab Temperature Control Dial Check . (Group 9015-20.)
	Blower motor resistor block	Check blower motor resistor block.
Heater Does Not Warm Interior of Cab	Fresh air filter restricted	Replace fresh air filter. For skid steer loader, see Cleaning and Replacing Air Conditioner and Heater/Defroster Air Filter . (Operator's Manual.) For compact track loader, see Cleaning and Replacing Air Conditioner and Heater/Defroster Air Filter . (Operator's Manual.)
	Heater hose pinched, kinked, or collapsed	Re-route or re-index hoses. Replace collapsed hoses.
	Heater or evaporator fins restricted with dirt or dust	Clean heater or evaporator fins. See Air Conditioner and Heater Component Location . (Group 9031-15.)
	Air conditioner and heater blower motor failed or operating too slow	Check air conditioner and heater blower motor. See Air Conditioner and Heater Component Location . (Group 9031-15.)
	Heater valve remaining closed	Inspect, repair or replace heater control valve actuator.
Interior Windows Continue to Fog	Fresh air filter restricted	Replace fresh air filter. For skid steer loader, see Cleaning and Replacing Air Conditioner and Heater/Defroster Air Filter . (Operator's Manual.) For compact track loader, see Cleaning and Replacing Air Conditioner and Heater/Defroster Air Filter . (Operator's Manual.)
	Air conditioning system OFF	Turn on air conditioning system.

Air Conditioner and Heater Component Location



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Air Conditioner and Heater Component Location

LEGEND:

1	Cab Temperature Control Dial
2	Air Conditioner and Heater Blower Motor Switch
3	Air Conditioner Switch
4	Air Conditioner Freeze Control Switch

5	Air Conditioner Compressor Clutch Relay
6	Air Conditioner and Heater Blower Motor
7	Evaporator and Heater Core
8	Hot Water Valve
9	High/Low Pressure Switch
10	High Pressure Service Port
11	Low Pressure Service Port
12	Refrigerant Lines
13	Receiver/Dryer
14	Air Conditioner Compressor
15	Hot Water Lines
16	Condenser

→NOTE:

Air conditioner and heater unit shown. Heater only units similar.

Group 25 - Tests

Refrigerant Cautions and Proper Handling

CAUTION:

DO NOT allow liquid refrigerant to contact eyes or skin. Liquid refrigerant will freeze eyes or skin on contact. Wear goggles, gloves and protective clothing.

If liquid refrigerant contacts eyes or skin, DO NOT rub the area. Splash large amounts of COOL water on affected area. Go to a physician or hospital immediately for treatment.

DO NOT allow refrigerant to contact open flames or very hot surfaces such as electric welding arc, electric heating element and lighted smoking materials.

DO NOT heat refrigerant over 52°C (125°F) in a closed container. Heated refrigerant will develop high pressure which can burst the container.

Keep refrigerant containers away from heat sources. Store refrigerant in a cool place.

DO NOT handle damp refrigerant container with your bare hands. Skin may freeze to container. Wear gloves.

If skin freezes to container, pour COOL water over container to free the skin. Go to a physician or hospital immediately for treatment.

IMPORTANT:

To meet government standards relating to the use of refrigerants, R134a is used in the air conditioning system. Because it does not contain chlorine, R134a is not detrimental to the ozone in the atmosphere. However, it is illegal to discharge any refrigerant into the atmosphere. It must be recovered using the appropriate recovery stations.

Use correct refrigerant recovery, recycling and charging stations. Never mix refrigerants, hoses, fittings, components or refrigerant oils.

Use only John Deere approved R134a refrigerant products. Mixing of products not compatible will cause system damage and contaminate recovery, recycling and charging station equipment. Care must be taken to identify and use equipment, refrigerant oil and refrigerant designed only for R134a refrigerant systems. Refrigerant should be tested for type and purity before recovery, recycling or charging of system. JT02167A refrigerant test instrument should be used before any testing or repair to system is performed.

Prism Pro Refrigerant Identification Instrument

JT02167A

To safely identify type and check purity of refrigerant prior to recovery, recycling and recharging of A/C systems.

Air Conditioner and Heater Operational Checks

→NOTE:

Perform Visual Inspection of Components (Group 9031-25.) check prior to diagnostics and tests. These conditions my affect diagnostic and test results.

Visual Inspection Of Components

(1) Lines and Hoses Check

Action:

Inspect all lines and hoses.

sss:

Are all lines and hoses straight and in good condition, NOT kinked, worn from rubbing, or “weather checked”?

sss:

Are hose and line connections clean and NOT showing signs of leakage, such as dirt, oil, or refrigerant dye?

sss:

Are all hose and line clamps in place and tight, with cushions or rubber inserts in place to prevent crushing or scuffing hoses or lines?

Result:

YES: Go to next check.

NO: Reposition hoses and lines as necessary. Replace, adjust, and tighten clamps as necessary. Note any hoses or lines that will require replacement.

(2) Air Conditioner Compressor Check

Action:

Inspect Compressor.

sss:

Is belt properly tensioned on pulley?

sss:

Is belt in good condition, NOT frayed, worn, or glazed?

sss:

Is belt tensioner in good condition, NOT worn or damaged?

sss:

Is compressor pulley in good condition, and properly aligned with belt drive pulley on engine?

sss:

Are compressor mounting brackets in good condition, and is mounting hardware properly tightened?

sss:

Are electrical connections to compressor clean and tight? Is wiring in good condition?

Result:

YES: Go to next check.

NO: Note any components that will require repair or replacement.

(3) Condenser Check

Action:

Inspect condenser core.

sss:

Is core free of dirt and debris?

sss:

Is core NOT showing signs of leakage, such as dirt, oil, or refrigerant dye?

sss:

Are fins of core straight, NOT bent or damaged?

Result:

YES: Go to next check.

NO: Clean and straighten fins if necessary. Note any components that will require repair or replacement.

(4) Engine Fan Check

Action:

Inspect engine fan.

sss:

Are fan blades in good condition, NOT worn, bent, broken, or missing?

sss:

Is fan securely installed?

Result:

YES: Go to next check.

NO: Note any components that will require repair or replacement.

(5) Heater/Evaporator Core Check

Action:

Inspect heater/evaporator core.

sss:

Is core free of dirt and debris?

sss:

Is core NOT showing signs of leakage, such as dirt, oil, or refrigerant dye?

sss:

Are fins of core straight, NOT bent or damaged?

sss:

Is condensation drain tube attached and in good condition, NOT kinked, damaged, or clogged?

Result:

YES: Go to next check.

NO: Clean and straighten fins if necessary. Note any components that will require repair or replacement.

(6) Freeze Control Switch Capillary Tube Check

Action:

Inspect freeze control switch capillary tube.

sss:

Is capillary tube straight, NOT kinked or broken?

sss:

Is capillary tube properly positioned and securely inserted in evaporator core?

Result:

YES: Go to next check.

NO: If capillary tube is kinked or broken, replace freeze control switch.

NO: If capillary tube is improperly positioned, test freeze control switch. See Air Conditioner Freeze Control Switch Test . (Group 9031-25.)

(7) Cab Air Filter Check

Action:

Inspect cab air filter.

sss:

Is filter clean and free of debris?

Result:

YES: Go to next check.

NO: Replace cab air filter.

(8) Cab Door and Windows Check

Action:

Open and close cab door and windows. Inspect seals.

sss:

Are seals present, properly installed, and in good condition?

sss:

Do door and windows contact seals evenly?

Result:

YES: Check complete.

NO: Adjust door and windows if necessary. Replace components as necessary.

Refrigerant Leak Test

→NOTE:

When refrigerant leaks from a system, a small amount of oil is carried out with it.

Some refrigerant manufacturers add dye to refrigerant to aid in leak detection.

[1] - Inspect all lines, fittings, and components for oily or dusty spots and for traces of refrigerant dye.

[2] - Spray a soap and water solution on refrigerant lines and components to cause bubbles to form at source of leak.

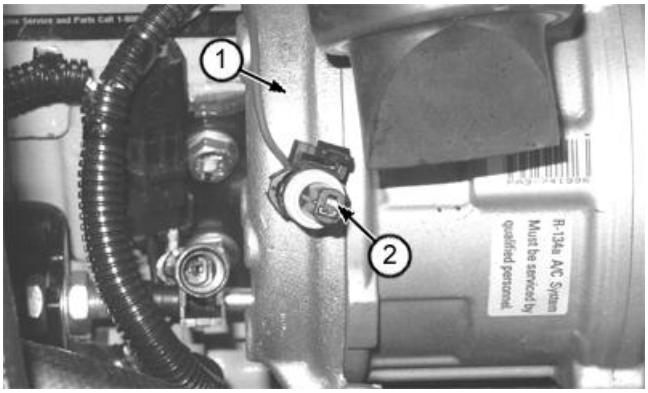
[3] - If a leak detector is used, move leak detector probe under hoses and around connections at specified rate.

Item	Measurement	Specification
Refrigerant Leak Detector Probe	Speed	25 mm per second
		1 in. per second

Air Conditioner Compressor Clutch Test

[1] - Disconnect clutch solenoid wire connector.

[2] -



LEGEND:
1 Air Conditioner Compressor
2 Air Conditioner Compressor Clutch Wire Connector

Air Conditioner Compressor Clutch Test

Connect battery voltage to engage compressor clutch. Connect positive (+) terminal to clutch wire connector (2). Connect negative (-) terminal to compressor housing.

[3] - Air conditioner compressor clutch solenoid should “click” and engage.

[4] - If air conditioner compressor clutch does not “click” or engage, replace compressor. See Air Conditioner Compressor Remove and Install . (Group 1830.)

[5] - If air conditioner compressor clutch “clicks” and engages, check wiring harness and air conditioner high/low pressure switch. See Air Conditioner and Heater Harness (W7) Wiring Diagram (Group 9015-10.) and see Air Conditioner High/Low Pressure Switch Test . (Group 9031-25.)

Air Conditioner High/Low Pressure Switch Test

High/Low Pressure Switch Low Side Test

[1] -

→NOTE:

When system pressure is below 140—240 kPa (1.4—2.4 bar) (20—35 psi) the switch contacts open to stop compressor operation.

Remove pressure switch from high pressure line.

[2] - Install a jumper wire across harness connector.

[3] - Connect pressure switch to JT02051 gauge set center hose using JT02148 straight connector (M10 x 1.25 M x 1/2-16 M ACME).

[4] - Connect low side hose to low pressure service port.

[5] - Close both valves of gauge set and remove hose from high side.

[6] - Connect a test harness to switch terminals and use a multimeter to check opening and closing of switch contacts.

[7] - With engine OFF, slowly open low side valve. Meter will indicate continuity when contacts close.

→NOTE:

If a greater pressure is required to close contacts, connect gauge set hose to high side quick coupler on high pressure line and start engine.

[8] - Disconnect quick coupler from pressure source and slowly open high side valve to bleed pressure from switch.

Item	Measurement	Specification
Air Conditioner High/Low Pressure Switch (Low Side)	Closing Pressure	160—260 kPa
		1.6—2.6 bar
		23—37 psi
	Opening Pressure	140—230 kPa
		1.4—2.3 bar
		20—33 psi

[9] - Install air conditioner high/low pressure switch to high pressure line.

Item	Measurement	Specification
Air Conditioner High/Low Pressure Switch	Torque	36 N˙m
		26 lb-ft

High/Low Pressure Switch High Side Test

[1] -

→NOTE:

When system pressure is above 2600—2900 kPa (26—29 bar) (380—420 psi) the high side of the pressure switch opens to stop compressor operation.

Remove air conditioner high/low pressure switch from high pressure line.

[2] - Install a jumper wire across harness terminals.

[3] - Connect pressure switch to JT02051 gauge set center hose using JT02148 straight connector (M10 x 1.25 M x 1/2-16 M ACME).

[4] - Connect a test harness to switch terminals and use a multimeter to check opening and closing of switch contacts.

[5] - Connect high side hose of gauge set to high pressure service port.

[6] - Close low side valve and open high side valve.

[7] - Completely cover condenser with cardboard or plastic film.

[8] -

IMPORTANT:

DO NOT let pressure exceed 2900 kPa (29 bar) (425 psi).

With engine at 2000 rpm and compressor operating, turn cab temperature control dial to maximum heat to decrease running time.

[9] - Observe high pressure gauge for pressure point at which switch contacts open.

[10] - After switch opens, stop engine and note pressure at which switch contacts close.

[11] - Remove cardboard or plastic film from condenser.

Item	Measurement	Specification
Air Conditioner High/Low Pressure Switch (High Side)	Opening Pressure	2600—2900 kPa
		26.0—29.0 bar
		380—420 psi
	Closing Pressure	1380—2070 kPa
		13.8—20.7 bar
		200—300 psi

[12] - Install air conditioner high/low pressure switch to high pressure line.

Item	Measurement	Specification
Air Conditioner High/Low Pressure Switch	Torque	36 N˙·m
		26 lb-ft

Air Conditioner Freeze Control Switch Test

[1] - Remove freeze control switch from machine.

[2] - Warm freeze control switch to room temperature.

[3] - Connect terminals to multimeter and measure continuity between terminals.

[4] - If multimeter does not measure continuity, replace air conditioner freeze control switch.

[5] - Put air conditioner freeze control switch in freezer and cool to specification.

Item	Measurement	Specification
Freeze Control Switch—Test Set-Up Temperature	Temperature	1—3°C maximum
		34—37.5°F maximum

[6] - Connect terminals to multimeter and measure continuity between terminals.

[7] - If continuity is measured between terminals when switch is below freezing, replace air conditioner freeze control switch.

[8] - Place air conditioner freeze control switch capillary tube into a glass of warm water. Continue to check continuity as capillary tube warms.

[9] - If air conditioner freeze control switch does not close as capillary tube is warmed, replace switch.

Item	Measurement	Specification
Freeze Control Switch—Closing Temperature	Temperature—Increasing	-1.9—+0.8°C
		28.5—33.5°F

[10] - Put capillary tube into a glass of ice water. Continue to check continuity as capillary tube cools.

[11] - If freeze control switch does not open as capillary tube is cooled, replace switch.

Item	Measurement	Specification
Freeze Control Switch—Opening Temperature	Temperature—Decreasing	2.8—5.6°C
		37—42°F

R134a Air Conditioning System Test

[1] -

IMPORTANT:

Use correct refrigerant recovery, recycling, and charging stations. DO NOT mix refrigerant, hoses, fitting, components or refrigerant oils.

Park machine on flat, level surface. Lower boom to ground, engage park brake, and stop engine.

[2] -

→NOTE:

Air conditioning system test should be performed with engine compartment side access panels installed, and compartment top and rear access doors closed.

Clean the engine compartment top and rear access doors, and fins of hydraulic oil cooler, radiator, condenser, and evaporator to ensure proper air flow.

[3] - Inspect the cab air filter. Replace if necessary.

[4] - Follow refrigerant cautions and proper handling procedures. See Refrigerant Cautions and Proper Handling . (Group 9031-25.)

[5] - Identify refrigerant type using JT02167A Prism Pro Refrigerant Identification Instrument.

Prism Pro Refrigerant Identification Instrument

JT02167A

Identify type of refrigerant used in air conditioning system prior to recovery, recycling, and charging.

→NOTE:

Follow manufacturer´s instructions when operating refrigerant recovery, recycling, and charging station.

[6] - Connect refrigerant recovery, recycling, and charging station. See R134a Refrigerant Recovery/Recycling, and Charging Station Installation Procedure . (Group 1830.)

[7] - Open both low and high pressure valves on refrigerant recovery, recycling, and charging station.

[8] - Start engine and run at specification.

Item	Measurement	Specification
Engine Speed	Speed	2800 rpm

[9] - Turn on air conditioner.

[10] - Turn the temperature control dial to maximum cooling position (blue).

[11] - Turn air conditioner and heater blower switch to high speed.

[12] - Open cab doors and windows.

[13] - Run system for at least five minutes.

[14] - Measure and record air temperatures at cab air filter inlet and at air ducts in cab. Compare to specifications.

Air Conditioner Air Inlet and Outlet Temperatures

Ambient Temperature	Maximum Expected Air Temperature at Ducts in Cab
16°C 60°F	7°C 45°F
21°C 70°F	7°C 45°F
27°C 80°F	10°C 50°F

32°C 90°F	13°C 55°F
38°C 100°F	16°C 60°F
43°C 110°F	18°C 65°F

[15] - Observe low-side and high-side pressure on gauges. Compare to specifications.

Low-Side and High-Side Pressure Readings

Ambient Air Temperature	Low-Side Pressure	High-Side Pressure
16°C 60°F	0-138 kPa 0-1.39 bar 0-20 psi	689-1206 kPa 6.89-12.06 bar 100-175 psi
21°C 70°F	0-138 kPa 0-1.39 bar 0-20 psi	862-1379 kPa 8.62-13.79 bar 125-200 psi
27°C 80°F	0-138 kPa 0-1.39 bar 0-20 psi	1034-1551 kPa 10.34-15.51 bar 150-225 psi
32°C 90°F	69-138 kPa 0.69-1.38 bar 10-20 psi	862-1896 kPa 8.62-18.96 bar 200-275 psi
38°C 100°F	69-138 kPa 0.69-1.38 bar 10-20 psi	1724-2241 kPa 17.24-22.41 bar 250-325 psi
43°C 110°F	69-172 kPa 0.69-1.72 bar 10-25 psi	1896-2413 kPa 18.96-24.13 bar 275-350 psi

[16] - If measurements do not meet specifications, diagnose malfunction. See Operating Pressure Diagnostic Chart . (Group 9031-25.)

Operating Pressure Diagnostic Chart

Pressure Diagnostic Chart

Condition	Low Side kPa (bar) (psi)	High Side kPa (bar) (psi)	Sight Glass	Suction Line	Receiver-Dryer	Liquid Line	Discharge Line	Discharge Air
Lack of Refrigerant	Very Low	Very Low	Clear	Slightly Cool	Slightly Warm	Slightly Warm	Slightly Warm	Warm
Loss of Refrigerant	Low	Low	Bubbles	Cool	Warm to hot	Warm	Warm to Hot	Slightly Cool
High Side Restriction	Low	Low	Clear	Cool	Cool, Sweating or Frosting	Cool, Sweating or Frosting	Hot to Point of Restriction	Slightly Cool
Expansion Valve Closed	Low	Low	Clear	Cold, Sweating or Frosting Heavily at Valve Outlet	Warm	Warm	Hot	Slightly Cool
Loose Belt or Compressor Failure	High	Low	Clear	Cool	Warm	Warm	Warm	Slightly Cool
Condenser Malfunction	High	High	Clear to Occasional Bubbles	Slightly cool to Warm	Hot	Hot	Hot	Warm
Refrigerant Contaminated and Air in System	High	High	Bubbles	Warm to Hot	Warm	Warm	Hot	Warm
Expansion Valve Open	High	High	Clear	Cold, Sweating or Frosting Heavily	Warm	Warm	Hot	Slightly Cool
Plugged Condenser, Overcharge of refrigerant	Normal	High	Clear	Cool	Warm	Warm	Hot	Slightly Cool
Moisture in System	Normal (May Drop)	Normal (May Drop)	Clear	Cool	Warm	Warm	Hot	Cool to Warm
Heater Valve Stuck Open	Normal	Normal	Clear	Cool	Warm	Warm	Hot	Warm
Lack of Refrigerant and Air in System	Normal (No Drop)	Normal	Occasional Bubbles	Warm to Hot	Warm	Warm	Warm	Slightly Cool