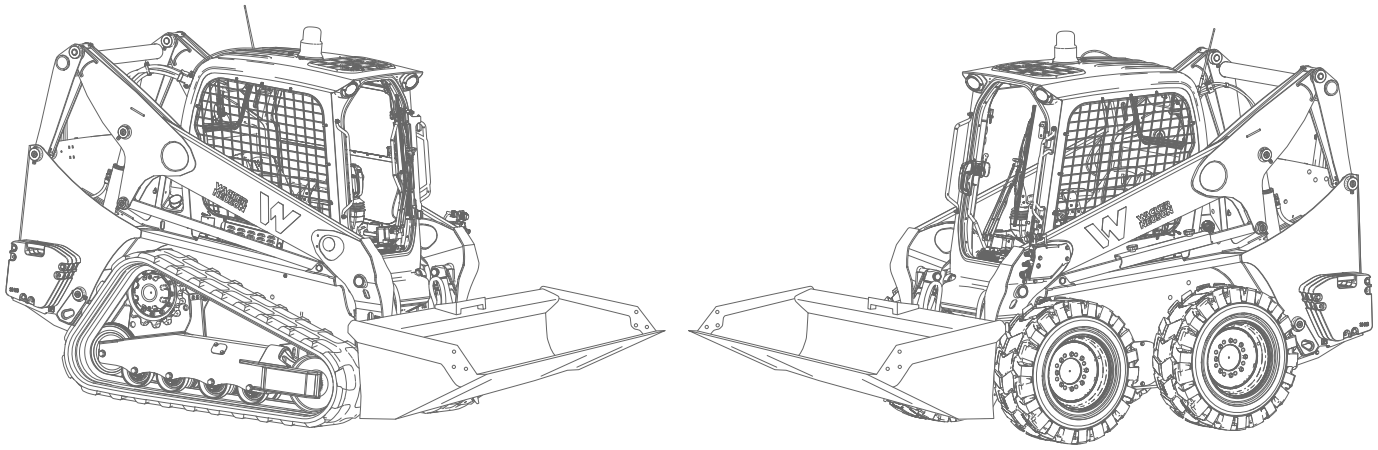
WACKER NEUSON

all it takes!

Medium Frame Skid Steer Loader / Compact Track Loader With Tier 4 Engine Service Manual



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www.wackerneuson.com

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Original instructions

This Manual presents the original instructions. The original language of this Manual is American English.

Foreword

General

This manual provides detailed information and procedures to safely repair and maintain the following: Wacker Neuson Medium Frame Skid Steer Loader (SSL) and Compact Track Loader (CTL).

This manual is intended to introduce and guide the user through the latest factory-approved troubleshooting and repair techniques and practices.

Before you attempt to troubleshoot or make repairs, you must be familiar with the operation of this machine. Refer to the operator's manual for specific information on these topics.

THE INFORMATION CONTAINED IN THIS MANUAL IS BASED ON MACHINES MANUFACTURED UP TO THE TIME OF PUBLICATION. WACKER NEUSON RESERVES THE RIGHT TO CHANGE ANY OF THIS INFORMATION WITHOUT NOTICE.

California Proposition 65 Warning

WARNING

Certain vehicle components contain or emit chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

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How to Use This Manual

This manual is designed to provide multiple ways to locate and access repair information. Read each section in its entirety before beginning a procedure. Proper understanding of machine operation and components is the key to successful diagnostics and repair.
Make use of special information features within this manual in order to be better prepared to perform repairs. Always follow manual procedures and safety guidelines. Never take shortcuts.

Table of Contents

Major machine components or topics of interest are separated into specific chapters. Each manual lists these chapters in a main Table of Contents.

Chapter Table of Contents

Each chapter begins with a detailed Table of Contents related to the specific machine component or system. Use the Chapter Table of Contents to find specific component procedural information.

Index

An alphabetical Index is located at the back of the manual.
Use the Index to fined specific components and related procedures.

Required Tools and Materials

Some procedures will require the use of specific tools and/or materials. These tools and/or materials will be listed for reference prior to beginning a procedure.

Specifications

Near the beginning of each chapter is a specifications list. This listing contains any specifications contained within the chapter.

Quick Reference Specifications

A list of all machine specifications can be found in Chapter 1, Specifications and General Information. This is a list of all specifications from each chapter, combined and listed in one place for easy reference.

Warnings and Cautions

Warning and Caution indicators are located throughout the manual at specific points of interest. These notices are given to prevent personal injury, death, and/or equipment damage. Always heed these notices, and practice common sense when performing any maintenance or repair procedure.

Notes
Special notes are given in order to draw attention to detailed instructions. These notes are intended to give further important information regarding the machine and/or a step in a procedure.

Troubleshooting
Troubleshooting charts are provided in each chapter to aid in the diagnostic process. Use these suggestions to aid in identifying a potential mechanical or machine adjustment problem.

Safety

Introduction

Safety is the most important element of any repair procedure. Knowledge of the procedure to be performed and safe work habits are essential to preventing death, personal injury, or property damage. Use the following statements as a common-sense guide to proper work and tool-use habits.

Preparing for the Job

Preparation is essential to complete a procedure in a safe and efficient manner.

Service Training

- Read and understand the instructions contained in all manuals delivered with the machine.
- Familiarize yourself with the location and proper use of all controls and safety devices.
- Only trained personnel shall troubleshoot or repair problems occurring with the machine. Contact Wacker Neuson for additional training if necessary.
- Visit http://www.wackerneuson.us/en/support-usa/technical-training.html for more information.

Repair Person Qualifications

- Work on the electric system and equipment on the undercarriage and the steering and brake systems may be performed only by skilled individuals who have been specially trained for such work.
- Work on the hydraulic system of the machine must be performed only by a technician with special knowledge and experience in hydraulic equipment.

Personal Protective Equipment (PPE)

Wear the following PPE while servicing or maintaining this machine:

- Close-fitting work clothes that do not hinder movement.
- Safety glasses with side shields.
- Hearing protection.
- Safety-toed footwear.
- In addition, before servicing or maintaining the machine:
  - Tie back long hair.
  - Remove all jewelry (including rings).

Personal Safety Measures

- Follow the specific safety instructions in this manual.
- Block or support the machine parts that may move or fall prior to making repairs.
- Apply special care when working on the fuel system due to increased risk of fire.
- Engine block and muffler system become very hot during operation and require cool-down time after machine is shut off. Avoid contact with hot parts.
- Retainer pins can fly out or splinter when struck with force. Use a brass hammer or a suitable material between the hammer and pin.
- Do not use starting fluid (for example, ether), especially in those cases in which a heater or glow plug (intake air pre-heating) is used at the same time to reduce the risk of explosions.
- Always use specially designed or otherwise safety-oriented ladders and operating platforms to perform overhead assembly work. Never use machine parts or attachments/superstructures as a climbing aid.

Precautions

- Read and understand the service procedures before performing any service on the machine.
- Remain aware of the machine's moving parts. Keep hands, feet, and loose clothing away from the machine's moving parts.
- Reinstall the safety devices and guards after repair and maintenance procedures are complete.

Cleaning

- Ensure the machine is clean and free of debris such as leaves, paper, cartons, etc.
- Ensure all labels are legible.
- Do not clean the machine while it is running.
- Never use gasoline or other types of fuels or flammable solvents to clean the machine. Fumes from fuels and solvents can become explosive.

Preparing Machine for Maintenance

- All attachments must be removed from the machine when servicing requires a raised lift arm. Always secure the lift arm with the safety strut.
- Prior to performing assembly work on the machine, make sure that no movable parts will roll away or start moving.
- Should maintenance with a tilted cab be required, always secure the cab with the cab safety strut.
- Position on firm and level ground.
- Lower hydraulically movable attachments and operating equipment to the ground.
- Apply park brake.
- Stop engine unless maintenance or repair is required with engine running.
- Remove starting key and attach warning tag (Do Not Operate) to machine unless maintenance or repair is required with engine running.
- Empty pressure accumulator (if equipped).
- Secure machine against unintentional movement.
- Should maintenance or repair with the engine running be required:
  - Only work in groups of two.
  - Both persons must be authorized for the operation of the machine.
  - One person must be seated on the seat and maintain visual contact with the other person.
  - Always keep a safe distance from all rotating and moving parts, for example, fan blades, V-belt drives, etc.
- Prior to performing assembly work on the machine, stabilize the area under repair and use proper lifting and support devices.
- If maintenance has to be performed under a raised boom, support boom with safety strut or an approved boom support device on the machine.
- Special care must be taken with the electrical system when cleaning the machine with water/ detergents.
- To avoid the risk of accidents, parts and large assemblies being moved for replacement purposes must be carefully attached and secured to lifting gear. Use only certified lifting gear and suspension systems in a state of good repair with adequate load-bearing capacity.
- Stay clear of suspended loads.
- Have loads fastened and lift operators instructed by experienced persons only. The person giving the instructions to the operator must be within sight or sound of them.
- Disconnect the battery if work needs to be performed on the electrical system.

General Maintenance Notes

- Make sure all tools and service center equipment are capable of performing the tasks prescribed. Do not use malfunctioning or broken tools. Use certified measuring devices that are routinely calibrated for accuracy (for example torque wrench, pressure gauge, or multimeter).
- Recycle scrapped parts and drained fluids according to environmental and hazardous material requirements. To avoid fire and health hazards, dispose of soiled shop towels by approved methods.
- Always retighten any screws, electrical connections, or hose connections that may have been loosened during maintenance and repair.
- Any safety devices removed for setup, maintenance, or repair purposes must be refitted and checked immediately upon completion of the maintenance and repair work.

Machine Modifications

- Do not defeat safety devices.
- Do not modify the machine without the express written approval of Wacker Neuson.
- Do not make any modifications, additions, or conversions to the machine and its superstructures (for example: cab, lift arm, etc.), or the machine's attachments without the approval of Wacker Neuson. Such modifications may affect safety and/or machine performance. This also applies to the installation and adjustment of safety devices, as well as to welding work on load-bearing parts. Use only accessories/attachments that are approved by Wacker Neuson.

Safety Symbols Found In This Manual

Throughout this manual, the following key safety words will be used to alert the reader of potential hazards. Become familiar with these words and their meaning. Take all precautions to avoid the hazards described.

DANGER

Indicates an imminently hazardous situation which, if not avoided, WILL result in death or serious injury.

WARNING

Indicates a potentially hazardous situation which, if not avoided, COULD result in death or serious injury.

CAUTION

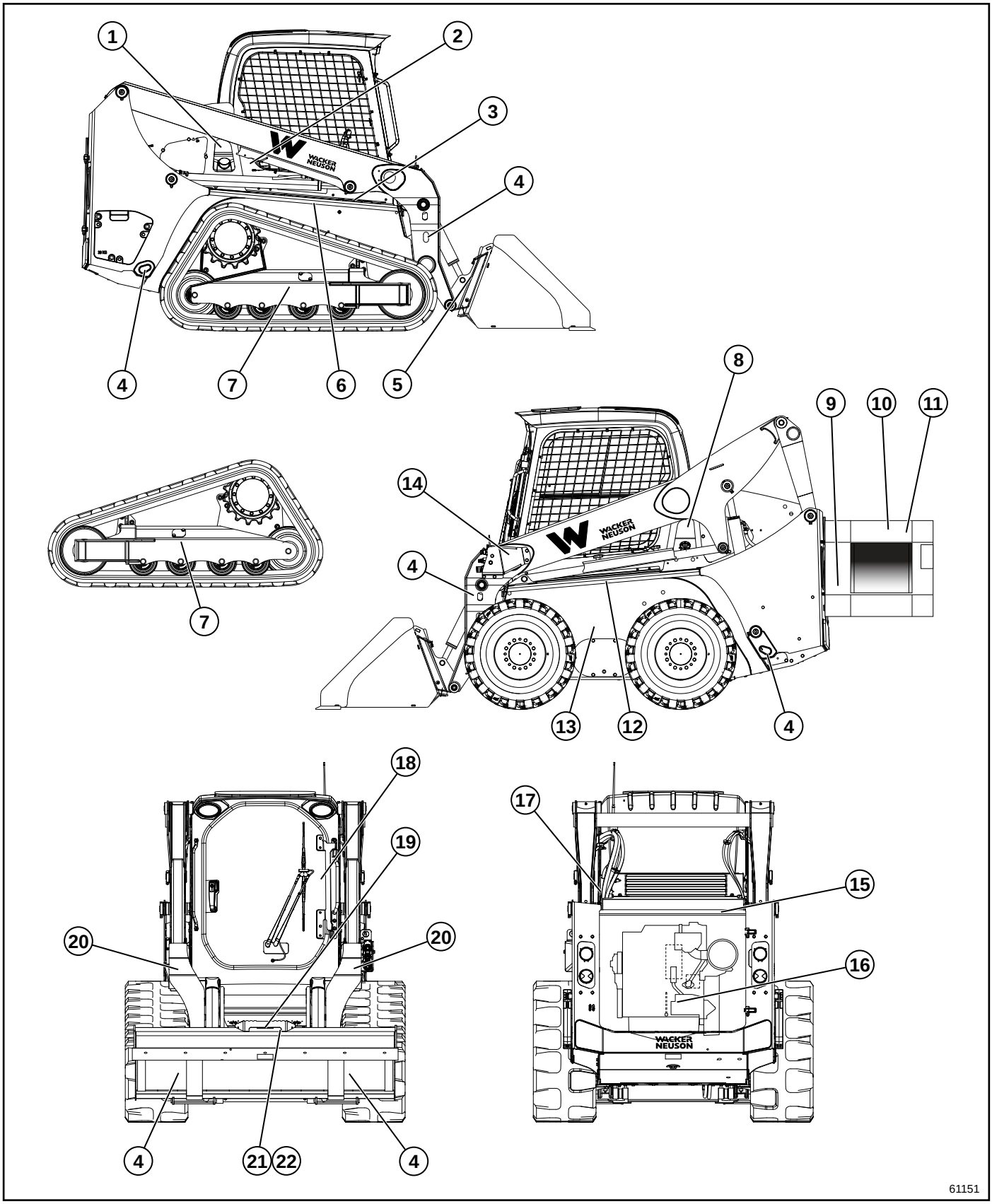
Indicates a potentially hazardous situation which, if not avoided, MAY result in minor or moderate injury and property damage. It may also be used to alert against unsafe practices.

NOTICE

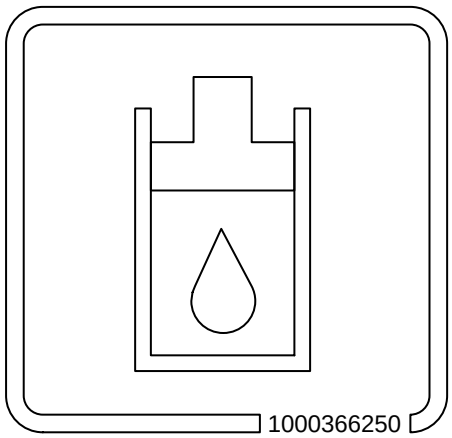
Indicates a potentially hazardous situation which, if not avoided, MAY result in property damage. It may also be use to alert against unsafe practices.

Safety Label Locations

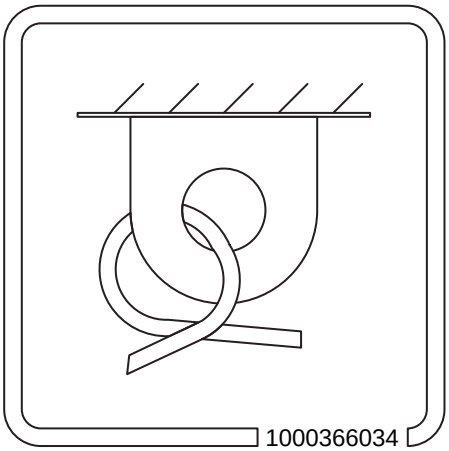
Become familiar with machine safety labels and locations. The following illustrations show safety label locations on the machine.


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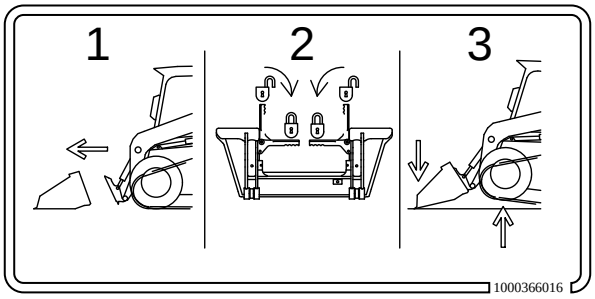
ROPS-ROLLOVER PROTECTIVE STRUCTURE
ISO 3471:2008
FOPS-FALLING OBJECT PROTECTIVE STRUCTURE
ISO 3449:2005 LEVEL 1
CERTIFIED FOR WACKER NEUSON COMPACT LOADER
MODELS UP TO MAXIMUM 6803kg (15000 LBS) G.V.W.



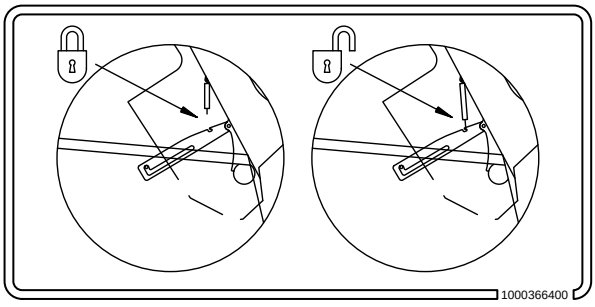
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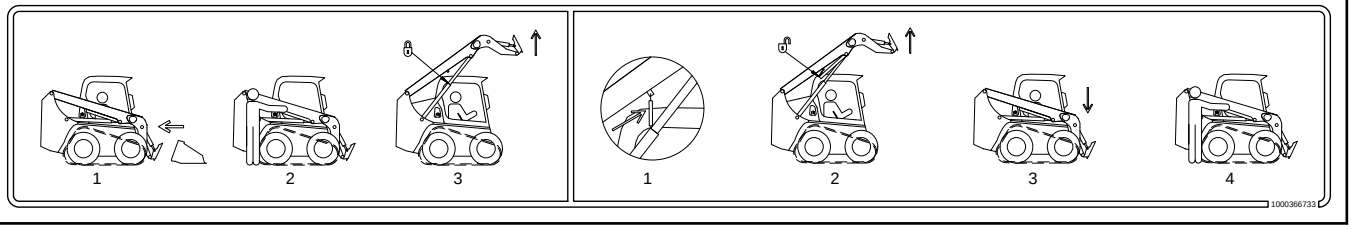
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DANGER
PELIGRO
DANGER
STOP
S≤15mg/kg
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WARNING
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AVERTISSEMENT
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11

⚠ WARNING

Keep door closed except for service.
Keep engine clean of flammable material.
Keep body, loose objects, and clothing away from electrical contacts, moving parts, hot parts, and exhaust.
Do not use loader in spaces with explosive dusts or gases or with flammable material near exhaust.
Leaking fluids under pressure can enter skin and cause serious injury.
For jump start, connect negative cable to loader engine last (never at the battery). After jump start, remove negative connection at the engine first.

⚠ ADVERTENCIA

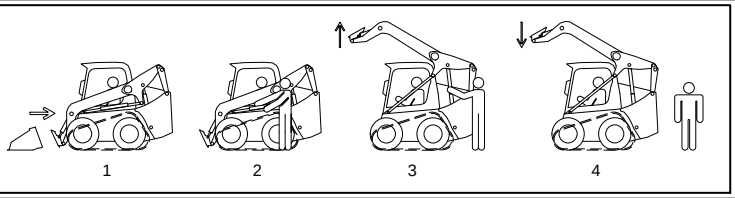
Mantenga la puerta cerrada, excepto durante el mantenimiento.
Mantenga el motor limpio de material inflamable.
Mantenga el cuerpo, objetos sueltos y ropas holgadas alejadas de los contactos eléctricos, piezas en movimiento, piezas calientes y del escape.
No use la cargadora en espacios con polvos o gases explosivos ni con materiales inflamables cerca del escape.
Las fugas de líquidos bajo presión pueden perforar la piel y causar lesiones graves.
Para realizar una carga de batería auxiliar, conecte el cable negativo al motor de la cargadora al último (nunca en la batería). Después del arranque de batería auxiliar, primero quite la conexión negativa en el motor.

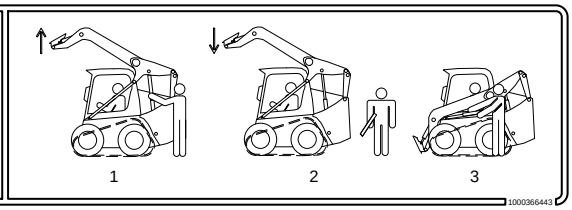
⚠ AVERTISSEMENT

Garder la porte fermée sauf pour l'entretien.
Tenir le moteur à l'écart de tout matériel inflammable.
Tenir le corps, les objets épars, et les vêtements à l'écart des contacts électriques, les pièces mobiles, les pièces chaudes et l'échappement.
Ne pas utiliser la chargeuse dans des endroits avec de la poussière explosive, des gaz, ou avec du matériel inflammable prés de l'échappement.
Les fuites de liquide sous pression peuvent pénétrer la peau et causer des blessures graves.
Pour relancer le démarrage, brancher le câble négatif à la chargeuse en dernier (jamais à la batterie). Après la relance de démarrage, retirer les connexions négatives au moteur en premier.

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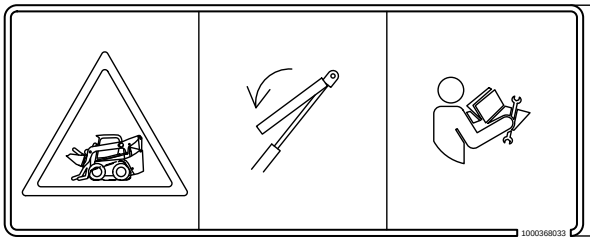
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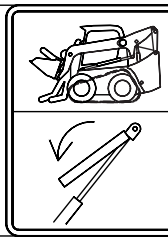


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⚠ DANGER

Disconnecting hydraulic lines can cause the lift arm or attachment to drop. Always use an approved lift arm support when lift arms are in a raised position.

⚠ PELIGRO

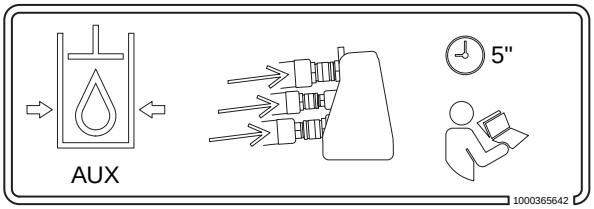
Desconectar las líneas hidráulicas puede hacer que los brazos o accesorio de elevación se caigan. Siempre use un soporte para brazo de elevación aprobado cuando los brazos de elevación estén en posición levantada.

⚠ DANGER

Le débranchement des conduites hydrauliques peut entraîner une chute des bras de levage ou de l'attachement. Toujours utiliser un support de bras de levage approuvé lorsque ceux-ci sont en position levée.

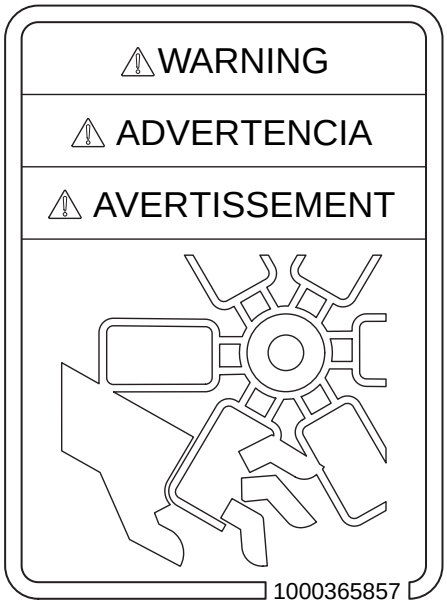
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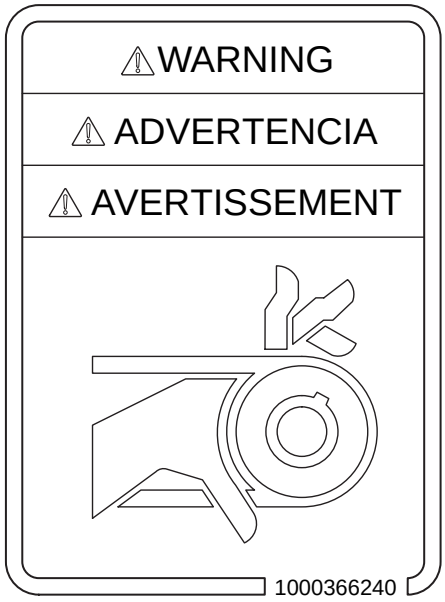


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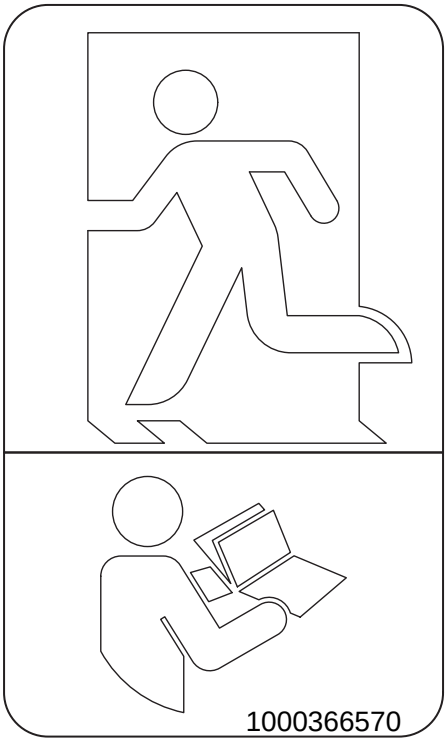
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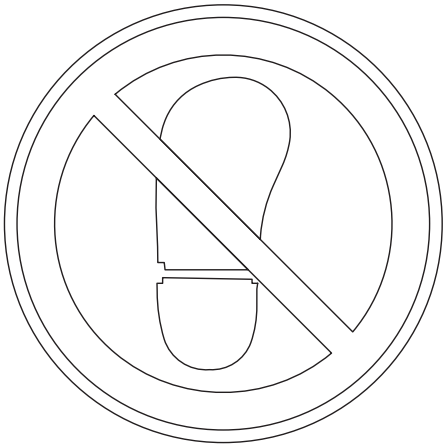
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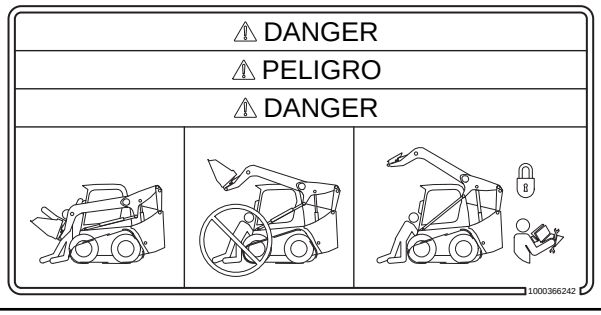

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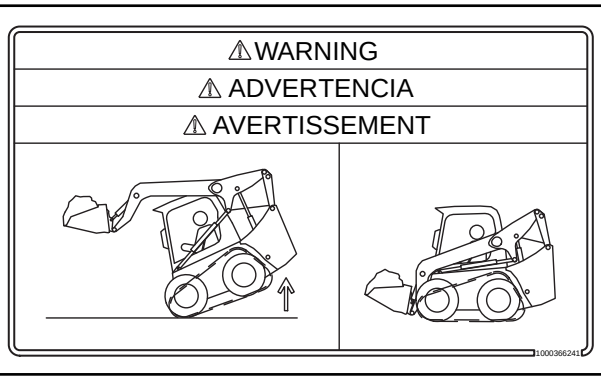


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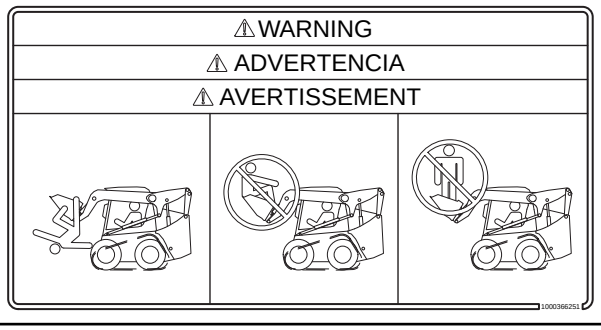
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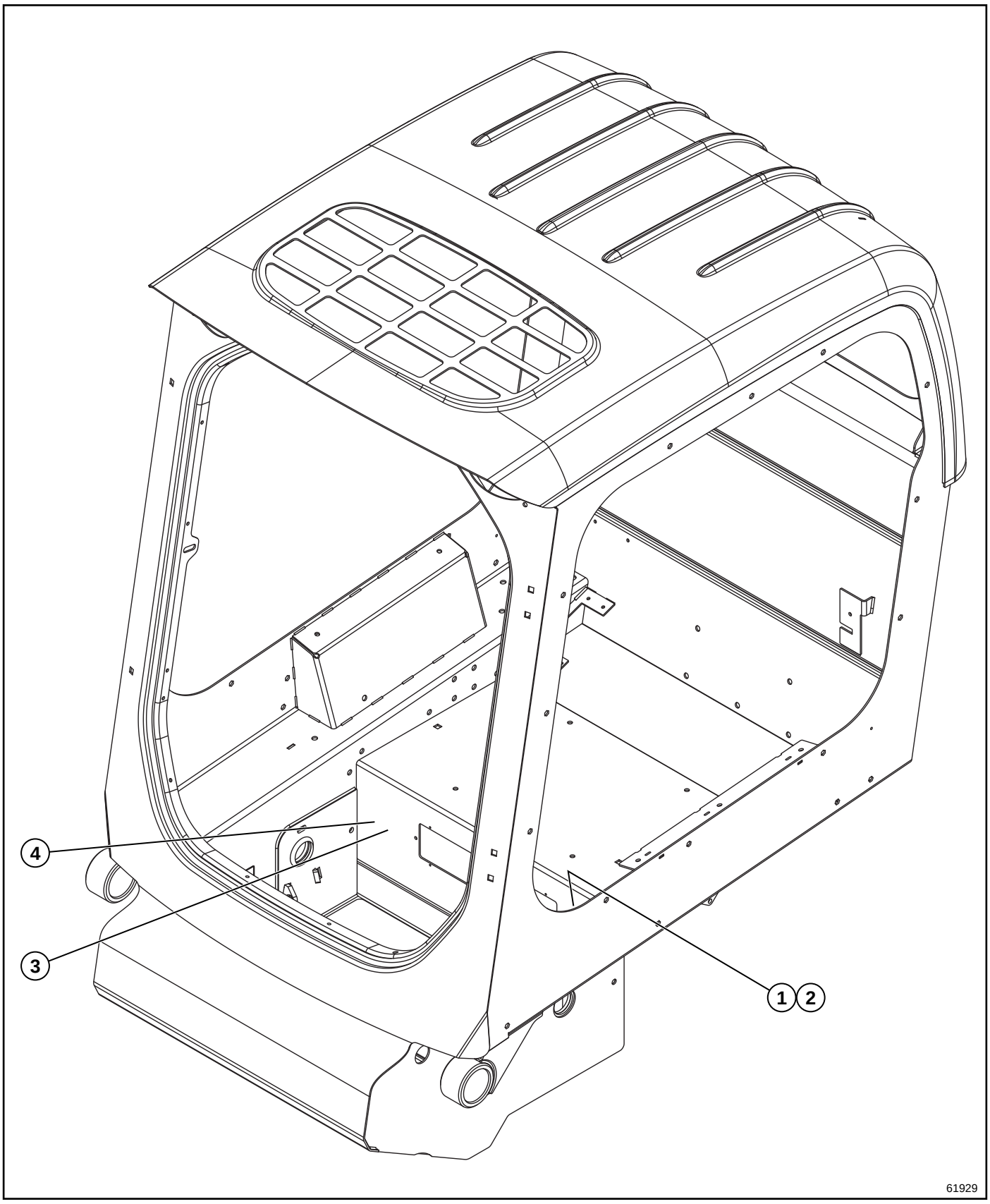


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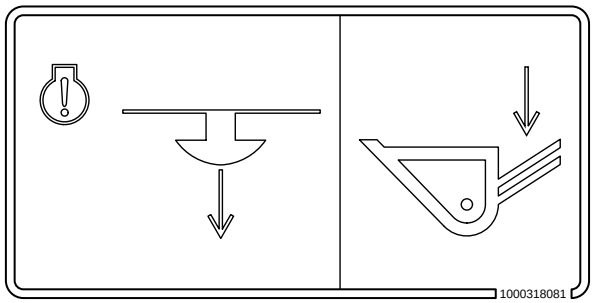


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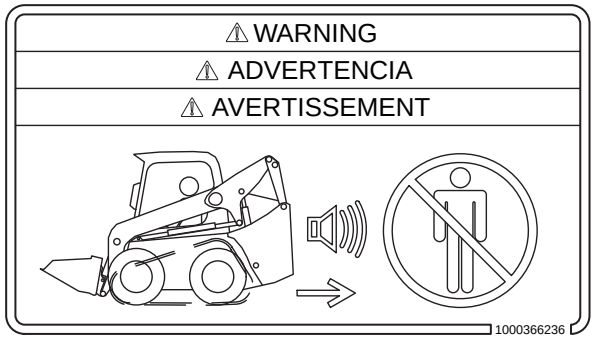



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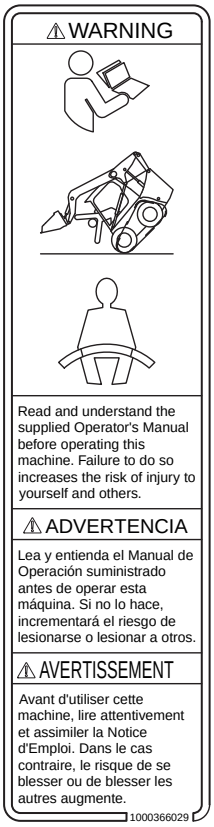
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Safety Label Inspection

Safety labels are critical to the safe operation of the machine. Inspect the machine for any damaged, missing, or unreadable labels. Replace labels as needed before placing the machine back in service.

Keep Work Area Clean

A clean, organized, well-lit work area is important to promote safe working conditions.

- Keep floor clean of debris and clear of parts and tools.
- Clean up any spilled fuel, oil, and/or chemicals immediately.
- Store all air hoses and electrical cords properly when not in use.

Keep Work Area Well Ventilated

WARNING

Never operate the engine without proper ventilation. Exhaust fumes can be fatal if inhaled.

Certain test and adjustment procedures require the engine to be running. Be sure work area is well ventilated. Never run the engine in an enclosed area.

Use Proper Eye and Face Protection

WARNING

Always use approved personal protection equipment. Avoid workplace hazards by wearing properly maintained, approved eye and face protection. Failure to use appropriate protection equipment may result in serious injury or death.

Always wear eye protection while in a shop environment.

- Safety Glasses: Safety glasses offer a minimum level of protection from flying debris.
- Face Shields: Face shields are often used along with safety glasses to offer a higher level of protection when sparks and flying debris are present.
- Vented Goggles: Goggles offer side protection not offered by safety glasses alone.
- Unvented Goggles: Unvented goggles offer protection from chemical splashes and vapors.

Park Machine Safely

WARNING

When performing maintenance other than repairs that require engine to be running, remove starting key and attach warning tag to machine.

WARNING

Always ensure cab is secured with safety strut when raising cab. Failure to secure cab with safety strut may result in death or serious injury.

1. Park the machine on a solid, level surface.
2. Lower hydraulically movable attachments and operating equipment to the ground.
3. Apply park brake.
4. Stop engine, unless maintenance or repair is required with engine running.
5. Secure machine against unintentional movement.
6. Remove starting key and attach **Do Not Operate** warning tag to machine.
7. If maintenance with a tilted cab is required, always secure the cab with the cab safety strut.
8. Empty pressure accumulator (if equipped).

Use Lifting Equipment Safely

WARNING

Always check the lifting capacity and condition of hoists, slings, cables, or chains before use. Using underrated or worn lifting components can result in death or serious injury.

- Always use a lifting device with a lifting capacity greater than the weight of the item being lifted.
- Secure the load to the lifting device using cables, chains, or slings rated to handle the load being lifted. Fasteners being used to connect lifting devices must be strong enough to handle the load. Be sure the mounting point of load is strong enough to handle the load.
- When using a lifting device, always connect the load so it is balanced.
- Always use a lifting device on a hard, level surface.
- Lower the lifting device to the lowest point before moving. Move the load slowly.
- Always support the load as soon as possible. Never leave a load suspended in mid-air.

Support Machine Securely

WARNING

- **Support the machine using properly rated jackstands. Never work under a machine supported only by a jack.**
- **Do not use wood or concrete blocks to support the machine. Failure to properly support the machine may result in death or serious injury.**

Use Compressed Air and Air Tools Safely

WARNING

Always wear approved eye and ear protection while using compressed air. Misuse of compressed air could result in death or serious injury.

- When using air nozzles, air pressure should not exceed 30 psi (206.8 kPa).
- Never direct air nozzles or tools at a person.
- Never point air nozzles directly at skin.
- Compressed air is a useful tool when used in a safe manner.
- Always use eye and ear protection while using compressed air and air tools.
- When using air tools, do not exceed the air pressure rating for the tool.
- When using an impact wrench, always use approved impact sockets. Never use standard sockets on an impact wrench.
- Disconnect the air supply before changing air tool attachments.
- Always properly maintain air tools.

Service Tires Safely

WARNING

An inflated tire contains explosive force. Use care when handling wheels and tires.

- Always wear safety glasses or goggles.
- Use proper lifting methods when working with wheels and tires.
- When working on an inflated tire, never position yourself directly over the work area.
- When dismounting or mounting tires, use a wheel holder or tire machine. Use proper tire mounting tools and equipment. Never use screwdrivers or makeshift tools to force a tire on or off of a wheel.
- Be sure tire irons and mounting tools are free of grease and oil. Grip them firmly.
- Inspect wheel parts for rust, damage, or distortion.
- Never use wheels that are out-of-round, rusted, or cracked.
- Never hammer on wheels with a steel hammer. Use rubber-covered hammers.
- When inflating tires, always use an inflation cage.
- Always stand away from the valve stem.
- Use accurate, tested inflation gauges to set air pressures.

Handle Fuel Safely

WARNING

- **Never remove the fuel cap from the fuel tank or add fuel when the engine is running or while the engine is hot.**
- **Do not smoke when handling fuel. Never fill or drain the fuel tank indoors.**
- **Do not spill fuel. Clean spilled fuel immediately.**
- **Never handle or store fuel containers near an open flame or any device that may create sparks and ignite the fuel or fuel vapors.**
- **Be sure to reinstall and tighten fuel cap securely.**
- **Use an approved container; the spout must fit inside the fuel filler neck. Avoid using cans and funnels to transfer fuel.**

- Store fuel according to local, state, or federal ordinances and recommendations from your fuel supplier.
- Never overfill or allow the tank to become empty.
- Use clean, fresh fuel.
- Do not fill above the fuel filler neck.

Store Volatile and Hazardous Materials Safely

Store volatile materials (for example, gasoline, diesel fuel, oil, etc.) in approved containers that are clearly marked. Containers should be stored in an approved safety cabinet away from possible sources of ignition. Storage areas and cabinets should be well ventilated to prevent the possible build-up of fumes.

Handle Chemical Products Safely

WARNING

Exposure to chemical products could result in serious injury. Handle chemical products with care.

Refer to the chemical manufacturer's Material Safety Data Sheet (MSDS) for information regarding health hazards, safe handling, and emergency response procedures.

Routine service often requires the use of various chemical products, including lubricants and cleaning solutions. Many of these chemicals are flammable and can pose health risks if not handled properly.

- Never mix chemicals. Mixing chemicals can produce toxic or explosive results.
- Follow the manufacture's recommendations for safe usage and handling of the product.
- Various materials may pose a health hazard if used incorrectly. An MSDS contains important information regarding proper handling and health hazards, as well as emergency response procedures. Contact the chemical manufacturer to obtain an MSDS for the chemical product.

Service Hydraulic System Safely

WARNING

The hydraulic system is under pressure, and the oil may be hot.

- **Always allow the machine to cool completely before performing service.**
- **Always relieve pressure in the hydraulic system before performing service.**
- **Always use appropriate safety equipment and clothing to protect exposed skin and eyes from high pressure oil.**
- **Tighten all connections to proper specifications before applying pressure.**
- **Never use bare hands to check for leaks. Oil under pressure can penetrate the skin, and can cause gangrene within a few hours if not properly removed. Use a piece of cardboard to check for leaks.**

Failure to follow appropriate safety precautions may result in death or serious injury.

Always dispose of used hydraulic oil properly. (See "**Dispose of Waste Materials Safely** " on **page 18**.)

Service Cooling System Safely

WARNING

Engine coolant is hot and under pressure! Allow the cooling system to cool completely before performing service. Rotate the filler cap 1/2-turn counterclockwise and allow pressure to vent before removing filler cap. Failure to follow appropriate safety precautions may result in death or serious injury.

WARNING

Contact with anti-freeze can damage your skin. Use gloves when working with anti-freeze. If you come in contact with anti-freeze, wash it off immediately.

Always dispose of used engine coolant properly. (See "**Dispose of Waste Materials Safely** " on **page 18**.)

Service Electrical Components Safely

WARNING

Always disconnect the negative terminal first and positive terminal last. Connect positive terminal first and negative terminal last. Use care when testing live circuits to prevent arcing. Arcing could result in death or serious injury.

- Disconnect the battery negative (–) cable before removing or installing electrical components. Always connect the battery negative (–) cable last.
- Certain test and adjustment procedures must be performed with the battery connected. Use care to prevent arcing when working on live circuits or components. Arcing can cause component damage and could ignite flammable materials.

Dispose of Waste Materials Safely

Routine service can produce waste products such as used oil, coolant, grease, and used batteries. If not handled properly, these materials can pose a threat to the environment. Collect fluids in well-marked, approved storage containers. Some waste fluids can react with certain types of plastics. Make sure the fluid to be stored is compatible with the storage container. Never use food or beverage containers to store waste fluids.

NOTICE

- **Dispose of waste fluids properly at approved local recycling centers. If recycling facilities are not available, contact your local community for the correct disposal procedure for waste fluids.**
- **Dispose of old batteries properly. Battery electrolyte contains sulfuric acid and other hazardous materials. Never place an old battery in the trash. Batteries must be disposed of in a manner consistent with EPA and/or local regulations.**

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Chapter 1

Specifications and General Information

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Commonly Used Terms

Commonly Used Terms

Throughout this manual there are many commonly used terms and phrases. Below is a list of many of these terms and a description of how they are used in this manual.

- **Charge Pressure Oil:** Oil provided from the hydrostatic pump after it has been regulated by a pressure relief valve.
- **Inlet or Drain Oil:** Unpressurized oil either flowing to or from a component.
- **Interlock Circuit:** A safety circuit with a series of switches and relays that allow certain functions to become active after several processes and conditions have been met.
- **Metered Oil:** Oil that is regulated through one or more check or pressure relief valve.
- **Operating Pressure Oil:** Oil provided directly from the hydraulic pump without traveling through the hydrostatic pump where it is regulated by a pressure relief valve.
- **Return Oil:** Pressurized oil that is returned to the hydraulic tank or a component after a function is performed.
- **Switched Power:** Power provided to a circuit from a switching device such a switch or a relay.
- **Unswitched Power:** Power provided to a circuit directly from the battery without going through any switching devices such as a switch or a relay.

Standard Torque Values

Torque Values

1. Always use torque values listed in Table 1-1, Torque Limits - SAE Standard Fasteners and Table 1-2, Torque Values for Lubricated or Plated Metric Thread Fasteners when a maintenance procedure does not provide a specific torque value.
2. Unless otherwise indicated, standard torque tolerance shall be ±10 percent.
3. Torque values listed are based on clean, dry threads.

a. Reduce torque by 25 percent when engine oil is used as a lubricant.

b. Reduce torque by 25 percent if new, plated cap screws are used.

4. If the maintenance procedures do not specify a tightening order, use the following guidelines:

a. Lubricate threads of fasteners as specified in work procedure or Table 2.

b. Tighten fasteners above 30 lb-ft (41 N•m) using torque pattern and tighten to 70 percent of final value.

c. Multiply final value by 0.7 and torque to specifications.

d. Use torque pattern to torque to final value.

e. Tighten circular patterns using **Figure 1-1**, Circular Torque Pattern.

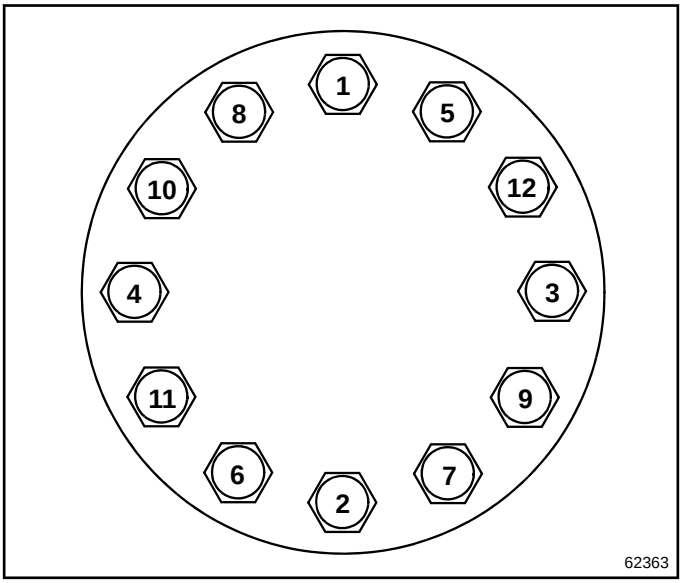


Figure 1-1: Circular Torque Pattern

f. Tighten straight patterns using **Figure 1-2**, Straight Torque Pattern.

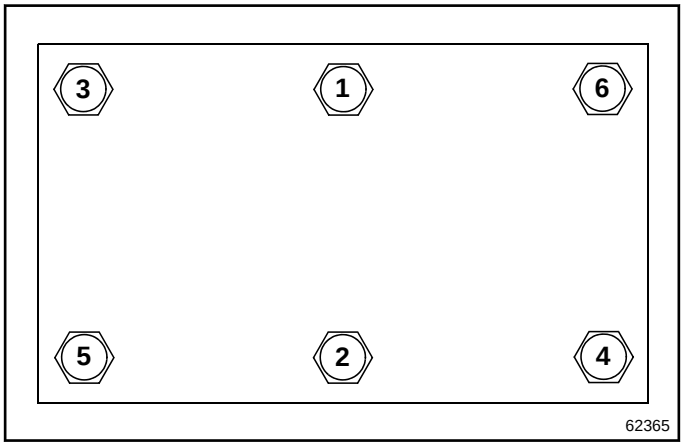


Figure 1-2: Straight Torque Pattern

SAE Standard Fasteners Torque Limits

CAUTION

If replacement cap screws are of a higher grade than originally supplied, use torque specifications for original cap screw. Failure to comply may result in damage to equipment.

Table 1-1. Torque Limits - SAE Standard Fasteners

Cap Screw Head Markings (Manufacturer's Marks May Vary)		TORQUE			
SIZE		SAE GRADE NO. 1 or 2 and General Hardware	SAE GRADE NO. 5	SAE GRADE NO. 6 or 7	SAE GRADE NO. 8
DIA. INCHES	THREADS PER INCH	lb-ft (N•m)	lb-ft (N•m)	lb-ft (N•m)	lb-ft (N•m)
1/4 1/4	20 28	5 (7) 6 (8)	8 (11) 10 (14)	10 (14) 12 (16)	12 (16) 14 (19)
5/16 5/16	18 24	11 (15) 12 (16)	17 (23) 19 (26)	21 (28) 24 (33)	25 (34)
3/8 3/8	16 24	20 (27) 23 (31)	30 (41) 35 (47)	40 (54) 45 (61)	45 (61) 50 (68)
7/16 7/16	14 20	30 (41) 35 (47)	50 (68) 55 (75)	60 (81) 70 (95)	70 (95) 80 (108)
1/2 1/2	13 20	50 (68) 55 (75)	75 (102) 90 (122)	95 (129) 100 (136)	110 (149) 120 (163)
9/16 9/16	12 18	65 (88) 75 (102)	110 (149) 120 (163)	135 (183) 150 (203)	150 (203) 170 (230)
5/8 5/8	11 18	90 (122) 100 (136)	150 (203) 180 (244)	190 (258) 210 (285)	220 (298) 240 (325)
3/4 3/4	10 16	160 (217) 180 (244)	260 (353) 300 (407)	320 (434) 360 (488)	380 (515) 420 (569)
7/8 7/8	9 14	140 (190) 155 (210)	400 (542) 440 (597)	520 (705) 580 (786)	600 (813) 660 (895)
1 1	8 12	220 (298) 240 (325)	580 (786) 640 (868)	800 (1085) 860 (1166)	900 (1220) 1000 (1356)
1-1/8 1-1/8	7 12	300 (407) 340 (461)	800 (1085) 880 (1193)	1120 (1519) 1260 (1708)	1280 (1735) 1440 (1952)
1-1/4 1-1/4	7 12	420 (569) 460 (624)	1120 (1519) 1240 (1681)	1580 (2142) 1760 (2386)	1820 (2468) 2000 (2712)
1-3/8 1-3/8	6 12	560 (759) 640 (868)	1460 (1980) 1680 (2278)	2080 (2820) 2380 (3227)	2380 (3227) 2720 (3688)
1-1/2 1-1/2	6 12	740 (1003) 840 (1139)	1940 (2630) 2200 (2983)	2780 (3769) 3100 (4203)	3160 (4285) 3560 (4827)

Metric Fasteners Torque Limits

Table 1-2. Torque Limits - Torque Values for Lubricated or Plated Metric Thread Fasteners

Cap Screw Head Markings (Manufacturer's Marks May Vary)	Class 8.8* or 9.8+	Class 10.9*	Class 12.9
Thread Diameter-Pitch	Torque: lb-ft (N•m)		
DIA. INCHES	lb-ft (N•m)	lb-ft (N•m)	lb-ft (N•m)
M6 M8 M8 X 1.25	5 (7) 12 (16) 13 (18)	7 (9) 17 (23) 18 (24)	12 (16) 30 (41) 29 (39)
M10 M10 X 1.25	24 (33) 27 (37)	34 (46) 38 (52)	70 (95) 60 (81)
M12 M12 X 1.5	42 (57) 43 (58)	60 (81) 62 (84)	120 (163)
M14 M14 X 1.5	66 (89) 72 (98)	95 (129) 103 (140)	190 (258)
M16 M16 X 1.5	103 (140) 110 (149)	148 (201) 157 (213)	300 (407)
M18 M18 X 1.5	147 (199) 165 (224)	203 (275) 320 (434)	410 (556)
M20 M20 X 1.5	208 (282) 213 (289)	288 (390) 320 (434)	580 (786)
M22 M22 X 1.5	283 (384) 315 (427)	392 (531) 431 (584)	800 (1085)
M24 M24 X 2	360 (488) 392 (531)	498 (675) 542 (735)	1000 (1356)
M27 M27 X 2	527 (715) 569 (771)	729 (988) 788 (1068)	1475 (2000)
M30 M30 X 2	715 (969) 792 (1074)	990 (1342) 1096 (1486)	2000 (2712)
M33	1300 (1763)	1850 (2508)	2150 (2915)
M36	2100 (2847)	3000 (4067)	3500 (4745)

*Coat plated and unplated fasteners with oil before installation.
+Use if bolt or nut is lubricated or plated (zinc-phosphate conversion-coated, cadmium-plated, or waxed).

Using a Torque Wrench Extension

Occasionally an extension, crowfoot, or other adapter is necessary to use with a torque wrench to torque a bolt or line fitting. Adding adapters or extensions will alter the torque on the fastener from what the torque wrench reads. Use the following formula to calculate the correct torque wrench setting to achieve a specific torque value.

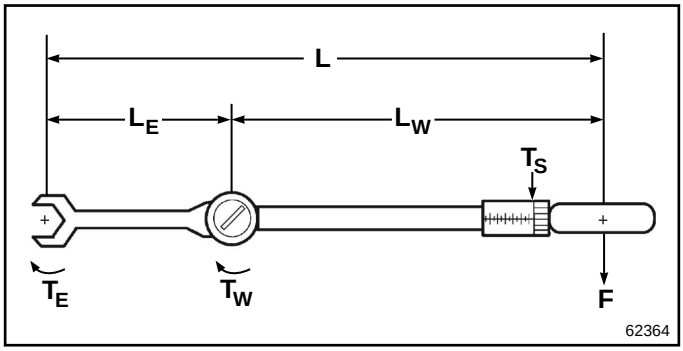


Figure 1-3: Torque Wrench and Extension

F - Force applied by technician

L - Total length through which force is applied to fastener

TW - Torque applied at end of torque wrench

TS = TE (LW / (LW + LE))

TS - Torque wrench setting

TE - Torque specified at fastener

LW - Length of torque wrench

LE - Length of extension

Example: A component requires a specified torque value of 65 lb-ft and a 6 inch extension is required to reach it. What should the torque wrench setting (TS) be to compensate for the extension?

Torque specified at fastener (TE) = 65 lb-ft

Length of torque wrench (LW) = 12 in.

Length of extension (LE) = 6 in.
TS = TE (LW / (LW + LE))
TS = 65 lb-ft (12 in. / (12 in. + 6 in.)
TS = 65 lb-ft (12 in. / (18 in.)
TS = 65 lb-ft (0.666)
TS = 43.33 lb-ft

Track and Tire Maintenance

Track and Tire Maintenance

Recomended Tire Pressure		
Description	**Size**	**Pressure**
Standard Duty	10 x 16.5	75 psi (5.2 bar)
Premium	10 x 16.5	
Severe Duty	10 x 16.5	
Standard Duty	12 x 16.5	80 psi (5.5 bar)
Premium	12 x 16.5	
Severe Duty	12 x 16.5	

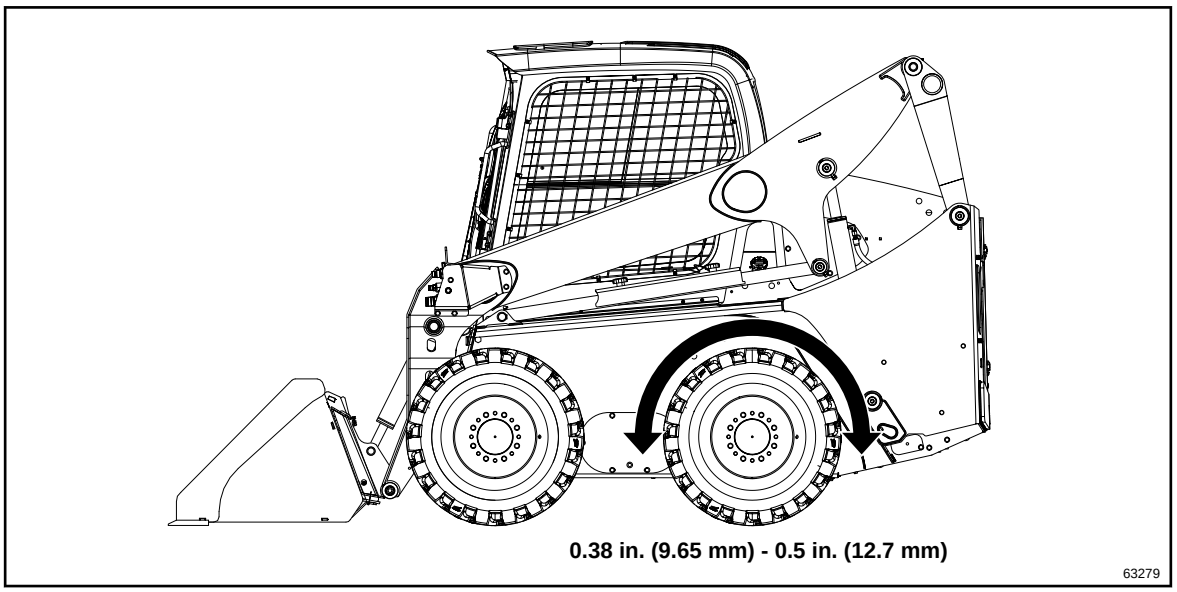


Figure 1-4: Drive Chain Tension

Drive chain tension should be adjusted so that the wheel can rotate 0.38 in. (9.65 mm) - 0.5 in. (12.7 mm) by hand.

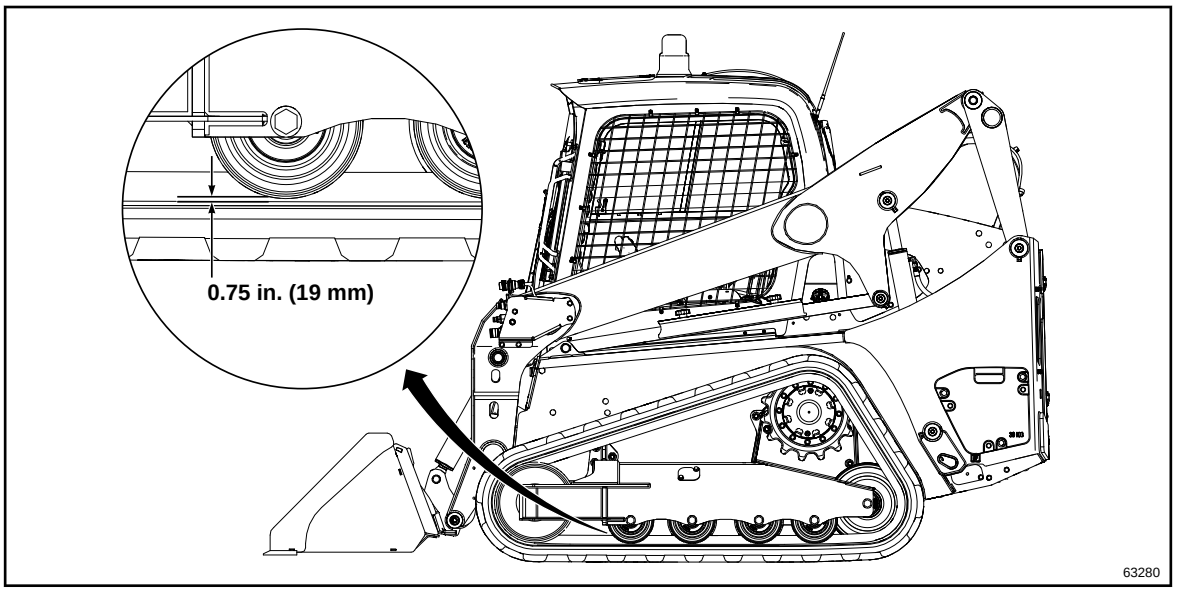


Figure 1-5: Track Tension

Track tension should be set to achieve a 0.75 in. (19 mm) gap between the track and the bottom of the center rollers.

Service Information

Fluids

Description	Specification	Capacity					
		SW16	SW20	SW17	SW21	ST28	ST31
Engine Oil	10W30 API CJ-4	7.9 qt (7.5 L)		10.3 qt (9.8 L)			
Engine Oil	15W40 API CJ-4	7.9 qt (7.5 L)		10.3 qt (9.8 L)			
Engine Oil Full Synthetic	5W40 API CJ-4	7.9 qt (7.5 L)		10.3 qt (9.8 L)			
Hydraulic Oil	ISO 46, Group II Base Stock	31.2 qt (29.5 L)					
Hydraulic Oil Synthetic	ISO 46, Fully Synthetic	31.2 qt (29.5 L)					
Chain Tank Oil	Engine or Hydraulic Oil	12.7 qt (12 L)				N/A	
Engine Coolant	ASTM D6210 Type III-FF 50/50 Long Life	14.5 qt (13.7 L)		15.5 qt (14.7 L)			
Diesel Fuel	#2 Ultra Low Sulfur	30 gallon (114 L)					
Diesel Fuel	#2 Ultra Low Sulfur, Winterized	30 gallon (114 L)					
Diesel Fuel	#1 Ultra Low Sulfur	30 gallon (114 L)					
Air Conditioning Refrigerant	R 134a	1.80 lb (0.82 kg)					
Grease	Lithium #2	As Required					
Dielectric Sealant	Dow Corning 4 or Equivalent	As Required					
RTV Sealant	Oil Resistant RTV Silicon Adhesive	As Required					

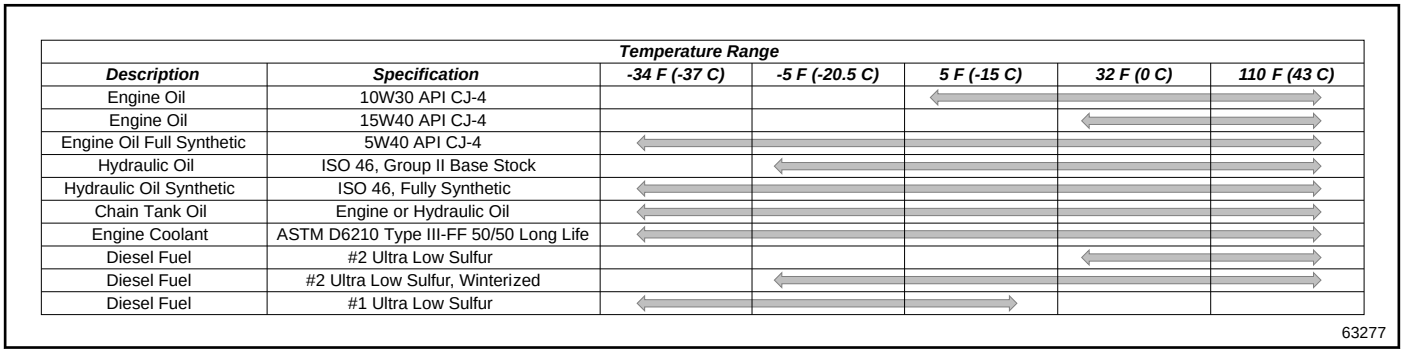


Figure 1-6: Recommendations

Maintenance Kits

Description	Parts in Kit	
SSL/CTL 500 Hour Service Kit	Main Fuel Filter	1000337856
	Oil Filter	5200016387
	Lift Pump Filter	1000370138
	V-Belt Kohler T4 74L	5200016280
	Primary Air Filter	1000370137
	Secondary Air Filter	1000370136
SSL/CTL 1000 Hour Service Kit	Main Fuel Filter	1000337856
	Oil Filter	5200016387
	Lift Pump Filter	1000370138
	V-Belt Kohler T4 74L	5200016280
	Primary Air Filter	1000370137
	Secondary Air Filter	1000370136
	Hydraulic Filter	1000359349

Service Schedule

	Hours												
	50	**500**	**1000**	**1500**	**2000**	**2500**	**3000**	**3500**	**4000**	**4500**	**5000**	**5500**	**6000**
Engine Oil and Filter [1]		X	X	X	X	X	X	X	X	X	X	X	X
Engine Air Filter (or as required by plugged filter indicator)		X	X	X	X	X	X	X	X	X	X	X	X
Hydraulic Filter	X		X		X		X		X		X		X
Hydraulic Oil			X		X		X		X		X		X
Chain Tank Oil			X		X		X		X		X		X
Main Fuel Filter [1]		X	X	X	X	X	X	X	X	X	X	X	X
Lift Pump Filter		X	X	X	X	X	X	X	X	X	X	X	X
Engine Antifreeze			X		X		X		X		X		X
Engine Water Pump Drive Belt[2]		X	X	X	X	X	X	X	X	X	X	X	X
Case Drain Strainer (clean)			X		X		X		X		X		X
Coolant Hoses											X		
Hydraulic Hoses[2]					X				X				X
SSL Drive Chain Tension (Check and adjust as needed)		X	X	X	X	X	X	X	X	X	X	X	X
CTL Track Tension (Check and adjust as needed)	X	X	X	X	X	X	X	X	X	X	X	X	X

[1]or 12 months if hours are not reached

[2]or 36 months if hours are not reached

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Chapter 2

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Specifications

Test and Adjustment Specifications

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Fuel Level Sender Resistance Between Terminals at Full Position	33 ohms
Fuel Level Sender Resistance Between Terminals at Empty Position	260 ohms
Pressure Transducer Resistance Between Terminals at 77° F (25° C)	990-1010 ohms
Resistance Across Pilot Cut Off Valve at 68° F (20° C)	4.7 ohms
Resistance Across Solenoid Coil-Boom Up Solenoid Coil at 68° F (20° C)	7 ohms
Resistance Across Solenoid Coil-Boom Down Solenoid Coil at 68° F (20° C)	7 ohms
Resistance Across Solenoid Coil-Bucket Up Solenoid Coil at 68° F (20° C)	7 ohms
Resistance Across Solenoid Coil-Bucket Dump Solenoid Coil at 68° F (20° C)	7 ohms
Resistance Across Solenoid Coil-Quick Hitch Solenoid Coil at 68° F (20° C)	7 ohms
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Resistance Across Solenoid Coil-Right Prop Valve Two at 68° F (20° C)	7 ohms

Dielectric Sealant Locations

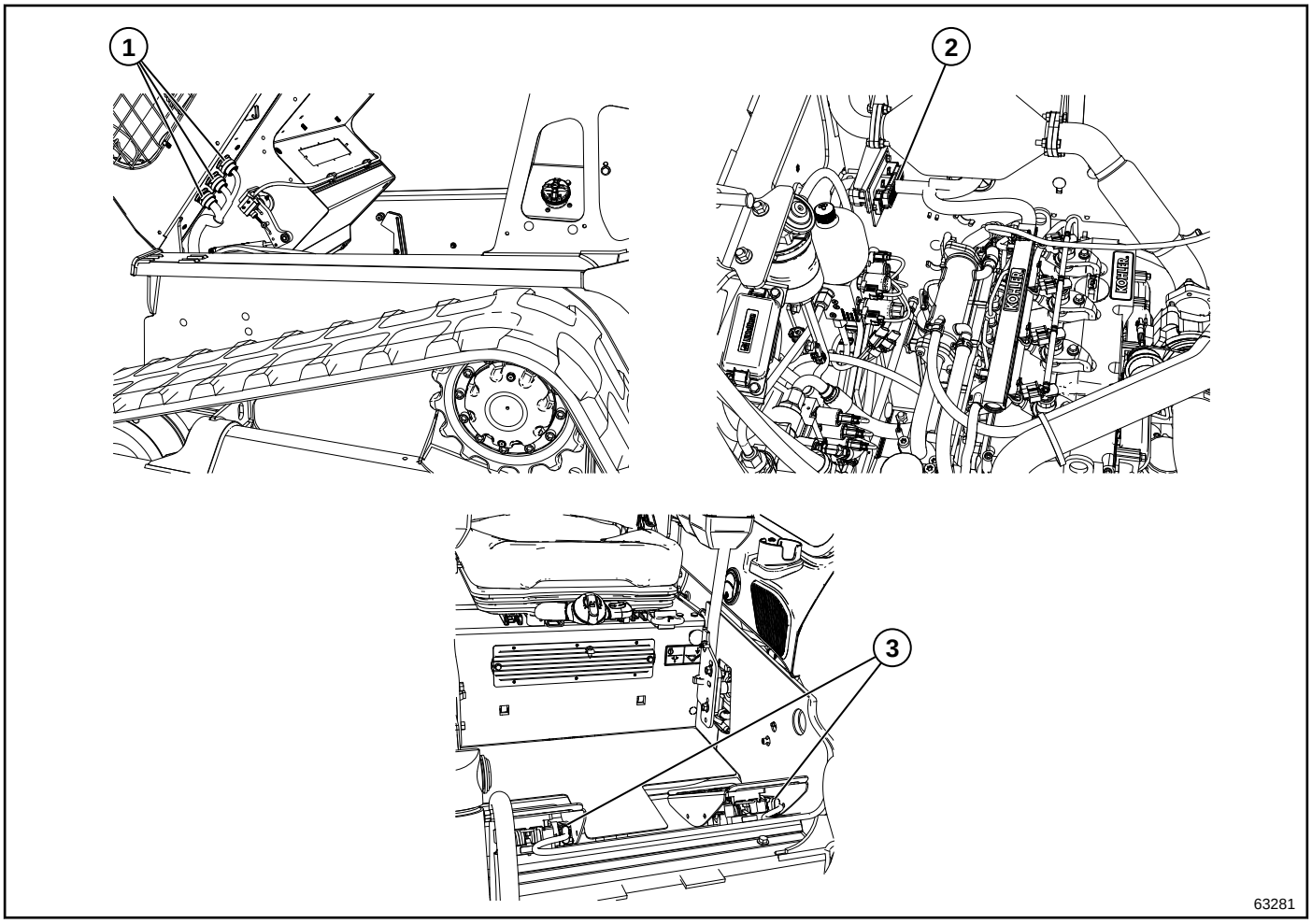


Figure 2-1: Dielectric Sealant Locations

Any time the following wire harness connectors have been disconnected for any reason, an ample amount of dielectric sealant should be applied to the connector ends.

- Cab to main wire harness connector (1)
- Engine to main wire harness connector (2)
- Foot controls wire harness connectors (3)

Commonly Used Terms

Throughout this manual there are many commonly used terms and phrases. Below is a list of many of these terms and a description of how they are used in this manual.

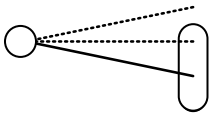
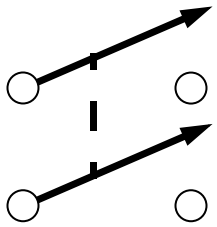
- **Charge Pressure Oil:** Oil provided from the hydrostatic pump after it has been regulated by a pressure relief valve.
- **Inlet or Drain Oil:** Unpressurized oil either flowing to or from a component.
- **Interlock Circuit:** A safety circuit with a series of switches and relays that allow certain functions to become active after several processes and conditions have been met.
- **Metered Oil:** Oil that is regulated through one or more check or pressure relief valve.
- **Operating Pressure Oil:** Oil provided directly from the hydraulic pump without traveling through the hydrostatic pump where it is regulated by a pressure relief valve.
- **Return Oil:** Pressurized oil that is returned to the hydraulic tank or a component after a function is performed.
- **Switched Power:** Power provided to a circuit from a switching device such as a switch or a relay.
- **Unswitched Power:** Power provided to a circuit directly from the battery without going through any switching devices such as a switch or a relay.

Electrical Components Symbols/How to Read Schematic

Electrical Component Symbols

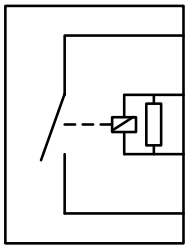
The following symbols are used in the electrical schematics to represent various electrical components.

Switches[1]

 Single Pole, Single Throw (SPST)	 Single Pole, Triple Throw (SPTT)
 Single Pole, Double Throw (SPDT)	
 Double Pole, Single Throw (DPST)	

[1] **The sample switch symbols shown are just a few of the many switch configurations. Switches are designated by the number of "poles" (circuits controlled) and "throws" (actuator positions). Unless otherwise specified, switches are shown in the "Normally Open" (N.O.) position.**

Switching Devices

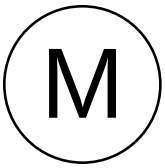
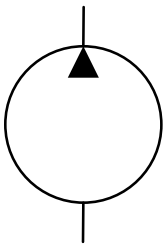
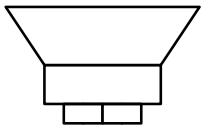
	

Relay	

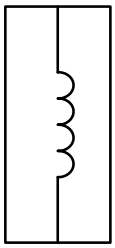
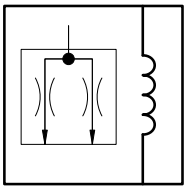
Circuit Protection Devices

 Fuse	

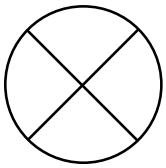
Motors and Generating Devices

 Electric Motor (may also include "AC" or "DC".)	 Pump
 Loudspeaker	

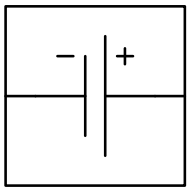
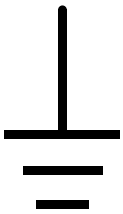
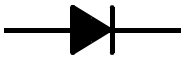
Actuating Devices

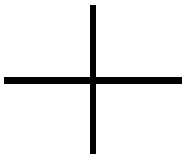
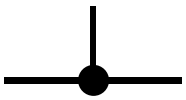
 Solenoid Valve	 Self-Level Valve

Lights

 Single-Element Light	

Miscellaneous Symbols

 Enclosure	 Battery
 Ground (to earth)	 Diode

 Resistor	 Pin and Socket Connector
 Resistor	 Wires (crossing but not connected)
 Variable Resistor	 Wiring Connections
 Coil	

Electrical Schematic Component Identification

Electrical Schematic Component Identification

Electrical components shown in the main schematic are identified with an alpha-numeric callout. All electrical components shown in the electrical schematic are listed below.

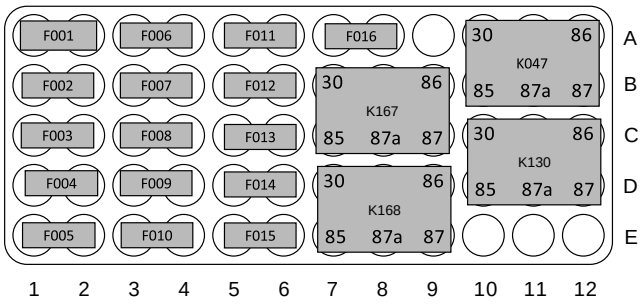
- A001—Radio (See **Figure 2-26**)
- B001—Fuel Level Sensor (See **Figure 2-26**)
- B002—Horn (See **Figure 2-16**)
- B003—Back Up Alarm (See **Figure 2-28**)
- B007—Hydraulic Oil Temperature Sensor (See **Figure 2-18**)
- B011A—RH Lower Speaker (See **Figure 2-26**)
- B011B—LH Lower Speaker (See **Figure 2-26**)
- B012A—RH Rear Speaker (See **Figure 2-26**)
- B012B—LH Rear Speaker (See **Figure 2-26**)
- B116—Boom Foot Pedal Sensor (See **Figure 2-20**)
- B117—Bucket Foot Pedal Sensor (See **Figure 2-20**)
- B118—Left Forward Neutral Reverse Swash Angle Position Sensor (See **Figure 2-15**)
- B119—Right Forward Neutral Reverse Swash Angle Position Sensor (See **Figure 2-15**)
- B121—Pressure Transducer (See **Figure 2-18**)
- C10—Engine (See **Figure 2-6**)
- E004—Left Tail Light (See **Figure 2-10**)
- E002—Right Tail Light (See **Figure 2-10**)
- E009—Right Front Work Light (See **Figure 2-10**)
- E010—Left Front Work Light (See **Figure 2-10**)
- E014—Dome Light (See **Figure 2-10**)
- E029—Left Rear Work Light (See **Figure 2-10**)
- E030—Right Rear Work Light (See **Figure 2-10**)
- E1C1—Engine Wire Harness Connector (See **Figures 2-11** and **2-26**)
- F000—Main Fuse (100-Amp)**Figures 2-8** and **2-13**)
- F001—15A HVAC Fuse (See **Figures 2-7** and **2-30**)
- F002—5A Instrument Display Fuse (See **Figures 2-7**, **2-15**, and **2-26**)
- F003—10A Cab Power Fuse (See **Figures 2-5**, **2-7**, **2-12**, **2-19**, **2-21**, **2-22**, and **2-29**)
- F004—15A Wiper Fuse (See **Figures 2-7** and **2-29**)
- F005—2A Beacon Fuse (See **Figures 2-7** and **2-10**)
- F006—30A (MCU) Fuse (See **Figure 2-7**)
- F007—20A Socket Fuse (See **Figure 2-7**)
- F008—20A Key Switch Fuse (See **Figures 2-6** and **2-7**)
- F009—25A AUX Electric (See **Figures 2-7** and **2-12**)
- F010—20A Lights: Work Lights Switch Fuse (See **Figures 2-7** and **2-10**)
- F011—20A Lights: Front Work Lights Fuse (See **Figures 2-7** and **2-10**)
- F012—15A Joysticks Fuse (See **Figures 2-7**, **2-14**, and **2-27**)
- F013—10A Seat: Heat and Compressor Fuse (See **Figures 2-7** and **2-27**)
- F014—5A Seat: Seat Switch and Belt Switch Fuse (See **Figures 2-7** and **2-27**)
- F015—10A Horn/Dome Light Fuse (See **Figures 2-7**, **2-10**, and **2-16**)
- F016—25A AUX Electric (J) Fuse (See **Figures 2-7** and **2-12**)
- F017—15A Starter Fuse (See **Figures 2-8** and **2-11**)
- F018—20A Engine Fuse (See **Figures 2-8** and **2-11**)
- F019—10A Lift Pump Fuse (See **Figures 2-8** and **2-11**)
- F020—10A DCU Fuse (See **Figures 2-8**, **2-15**, **2-28** and **2-31**)
- F021—20A HVAC Fuse (See **Figures 2-8** and **2-30**)
- F022—5A Engine Fuse (See **Figures 2-8**, **2-11**, and **2-31**)
- F023—5A Engine Fuse (See **Figures 2-8** and **2-11**)
- F024—5A Engine Fuse (See **Figures 2-8** and **2-11**)
- F025—25A AUX Electric (K) Fuse (See **Figures 2-8** and **2-13**)
- F026—15A AUX Pin C Fuse (See **Figure 2-13**)
- F027—15A AUX Pin D Fuse (See **Figure 2-13**)
- F028—15A AUX Pin E Fuse (See **Figure 2-13**)
- F029—15A AUX Pin F Fuse (See **Figure 2-13**)
- F030—15A AUX Pin G Fuse (See **Figure 2-13**)
- F031—15A AUX Pin H Fuse (See **Figure 2-13**)
- G1—Battery (See **Figures 2-8** and **2-13**)
- H028—Beacon Light (See **Figure 2-10**)
- K047—Work Lights Relay (See **Figures 2-7**, **2-9**, and **2-10**)
- K130—Horn Relay (See **Figures 2-7**, **2-9**, and **2-16**)

- K152—Ride Control Relay 01 (See **Figure 2-25**)
- K153—Ride Control Relay 02 (See **Figure 2-25**)
- K155—Starter Motor Relay (See **Figures 2-8** and **2-11**)
- K156—Grid Heater Relay (See **Figures 2-8** and **2-11**)
- K157—Engine Power Relay (See **Figure 2-8** and **2-11**)
- K158—Lift Pump Relay (See **Figures 2-8** and **2-11**)
- K159—Aux Pin C (See **Figures 2-9** and **2-13**)
- K160—Aux Pin D (See **Figures 2-9** and **2-13**)
- K161—Aux Pin E (See **Figures 2-9** and **2-13**)
- K162—Aux Pin F (See **Figures 2-9**and **2-13**)
- K163—Aux Pin G (See **Figures 2-9** and **2-13**)
- K164—Aux Pin H (See **Figures 2-9** and **2-13**)
- K902—Main Power Relay (See **Figures 2-6** and **2-8**)
- M005—Washer Fluid Pump (See **Figure 2-29**)
- M034/M035—HVAC Unit (See **Figure 2-30**)
- R011—Foot Throttle (See **Figure 2-17**)
- R012—Hand Throttle Control (See **Figure 2-17**)
- R049—HVAC Temperature Switch (See **Figure 2-30**)
- S12—Battery Disconnect Switch (See **Figures 2-8** and **2-13**)
- S001—Key Switch (See **Figures 2-6** and **2-11**)
- S005—Hydraulic Oil Filter Switch (See **Figure 2-18**)
- S015—HVAC Blower Fan Switch (See **2-30**)
- S016—Work Lights Switch (See **Figure 2-10**)
- S018—Beacon Switch (See **Figure 2-10**)
- S020—Windshield Wiper Switch (See **Figure 2-29**)
- S032—Self Level Switch (See **Figure 2-22**)
- S040—Quick Coupler Switch (See **Figure 2-21**)
- S051—HVAC Switch (See **Figure 2-30**)
- S065—Park Brake Switch (See **Figure 2-19**)
- S087—Door Switch (See **Figure 2-29**)
- S202—HVAC Dryer (See **Figure 2-30**)
- S203—H/ISO Pattern Selection Switch (See **Figure 2-14**)
- S204—A/B/C Mode Switch (See **Figure 2-12**)
- S205—Auxiliary Electric L and M Switch (See **Figure 2-12**)
- S206—Auxiliary Electric J Switch (See **Figure 2-12**)
- S207—Standard/Highflow Selection Switch (See **Figure 2-23**)
- V001—Diode (See **Figure 2-27**)
- V004—Diode (See **Figure 2-6**)
- V005—Diode (See **Figure 2-11**)
- X009—Left Hand Joystick Grip (See **Figures 2-16** and **2-24**)
- X010—Left Hand Joystick (See **Figures 2-5** and **2-14**)
- X011—Right Hand Joystick Grip (See **Figures 2-16** and **2-23**)
- X012—Right Hand Joystick (See **Figures 2-5** and **2-14**)
- X017—Engine Wire Harness Connector (See **Figure 2-5**)
- X023—Seat Control Unit (SCU) (See **Figure 2-27**)
- XA01—Instrument Display (See **Figures 2-5** and **2-26**)
- XE01—Machine Control Unit (MCU) (See **Figures 2-5**, **2-14**, **2-22**, **2-29**, and **2-31**)
- XE02—Machine Control Unit (MCU) (See **Figure 2-26**)
- XE01/XE02—Machine Control Unit (MCU) (See **Figures 2-11**, **2-12**, **2-16**, **2-17**, **2-18**, **2-19**, **2-20**, **2-21**, **2-23**, **2-24**, **2-25**, and **2-27**)
- XE05/XE06—Danfoss Control Unit (DCU) (See **Figures 2-5** and **2-15**)
- XE06—Danfoss Control Unit (DCU) (See **Figures 2-19** and **2-28**)
- XE90—Telemetry Unit (See **Figures 2-5** and **2-31**)
- XM02—Wiper Motor (See **Figure 2-29**)
- Y003—Two Speed Solenoid (See **Figure 2-24**)
- Y020—Ride Control Base Solenoid (See **Figure 2-25**)
- Y021—Ride Control Rod Solenoid (See **Figure 2-25**)
- Y022—Ride Control Charge Solenoid (See **Figure 2-25**)
- Y025—Quick Coupler Valve (See **Figure 2-21**)
- Y031—HVAC Compressor (See **Figure 2-30**)
- Y043—Park Brake Release Solenoid (See **Figure 2-19**)
- Y156—Pilot Supply Solenoid (See **Figure 2-18**)
- Y157—Boom Up Solenoid (See **Figure 2-18**)
- Y158—Tilt Down Solenoid (See **Figure 2-18**)
- Y159—Auxiliary Forward Flow Solenoid (See **Figure 2-18**)
- Y160—Boom Down Solenoid (See **Figure 2-18**)
- Y161—Tilt Down Solenoid (See **Figure 2-18**)
- Y162—Auxiliary Forward Flow Solenoid (See **Figure 2-18**)
- Y163—Left Drive Reverse Solenoid (See **Figure 2-15**)

- Y164—Left Drive Reverse Solenoid (See **Figure 2-15**)
- Y165—Right Drive Forward Solenoid (See **Figure 2-15**)
- Y166—Right Drive Forward Solenoid (See **Figure 2-15**)
- Y167—High Flow Valve (See **Figure 2-23**)
- Y168—Ride Control Balance Solenoid (See **Figure 2-25**)
- Y169—Self Leveling Valve (See **Figure 2-22**)

Electrical Schematic

See **Figures 2-2** through **2-31**.



62472

Figure 2-2: Cab Power Distribution Module (PDM)

CAB PDM- FUSE/RELAY TABLE			
FUSE ID	**DESCRIPTION**	**SOURCE**	**RATING (AMP)**
F001	HVAC	SWITCHED	15
F002	DISPLAY	SWITCHED	5
F003	CAB POWER	SWITCHED	10
F004	WIPER	SWITCHED	15
F005	BEACON	SWITCHED	2
F006	MACHINE CONTROL UNIT (MCU)	UNSWITCHED	30
F007	SOCKET	SWITCHED	20
F008	KEY SWITCH	UNSWITCHED	20
F009	AUX ELECTRIC (L and M)	SWITCHED	25
F010	LIGHTS: WORK LIGHT SWITCH	SWITCHED	20
F011	LIGHTS: WORK LIGHTS	SWITCHED	20
F012	JOYSTICKS	SWITCHED	15
F013	SEAT: HEAT and COMPRESSOR	SWITCHED	10
F014	SEAT: SEAT SWITCH and SEAT BELT SWITCH	UNSWITCHED	5
F015	HORN / DOME LIGHT	UNSWITCHED	10
F016	AUX ELECTRIC (J)	SWITCHED	25
K047	WORK LIGHTS RELAY	SWITCHED	35

K130	HORN RELAY	UNSWITCHED	35
K167	ECU POWER LATCH TRIGGER RELAY	SWITCHED	35
K168	ECU POWER LATCH RESET RELAY	SWITCHED	35

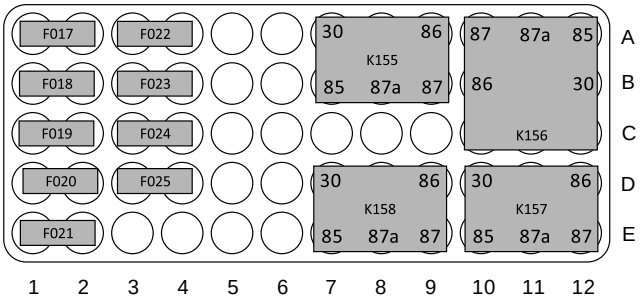
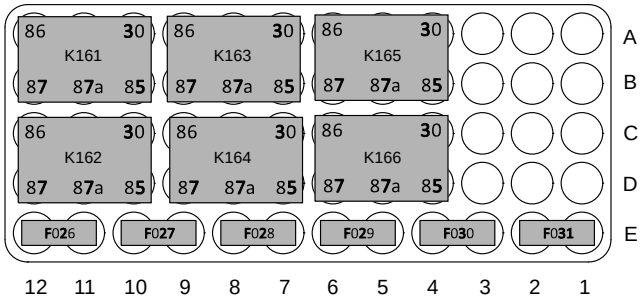


Figure 2-3: Chassis PDM

CHASSIS PDM - FUSE/RELAY TABLE			
FUSE ID	**DESCRIPTION**	**SOURCE**	**RATING (AMP)**
F017	STARTER	UNSWITCHED	15
F018	ENGINE	UNSWITCHED	20
F019	LIFT PUMP	SWITCHED	10
F020	DANFOSS CONTROL UNIT (DCU)	SWITCHED	10
F021	HEATING VENTELATION and AIR CONDITIONING (HVAC)	SWITCHED	20
F022	ENGINE	UNSWITCHED	5
F023	ENGINE	UNSWITCHED	5
F024	ENGINE	SWITCHED	5
F025	AUX ELECTRIC (K)	SWITCHED	25
K155	STARTER	SWITCHED	35
K156	GRID HEATER	SWITCHED	50
K157	ENGINE POWER	UNSWITCHED	35
K158	LIFT PUMP	SWITCHED	35



65071

Figure 2-4: Auxiliary Electric PDM

AUXILIARY ELECTRIC PDM - FUSE/RELAY TABLE			
FUSE ID	**DESCRIPTION**	**SOURCE**	**RATING (AMP)**
F026	AUX PIN C	SWITCHED	15
F027	AUX PIN D	SWITCHED	15
F028	AUX PIN E	SWITCHED	15
F029	AUX PIN F	SWITCHED	15
F030	AUX PIN G	SWITCHED	15
F031	AUX PIN H	SWITCHED	15
K161	AUX PIN C	SWITCHED	35
K162	AUX PIN D	SWITCHED	35
K163	AUX PIN E	SWITCHED	35
K164	AUX PIN F	SWITCHED	35
K165	AUX PIN G	SWITCHED	35
K166	AUX PIN H	SWITCHED	35

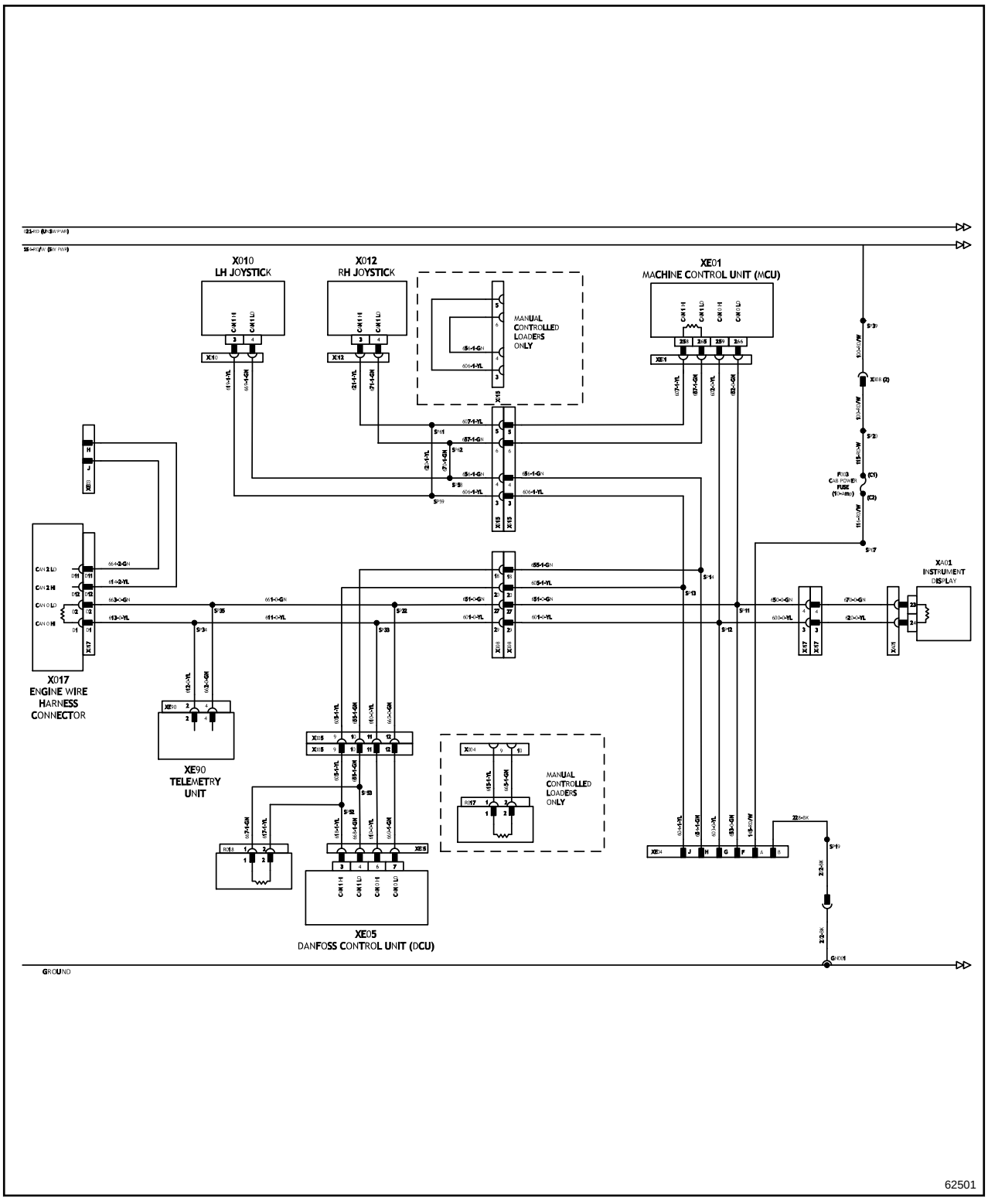


Figure 2-5: Controller Area Network (CAN) Networks and Diagnostic Port

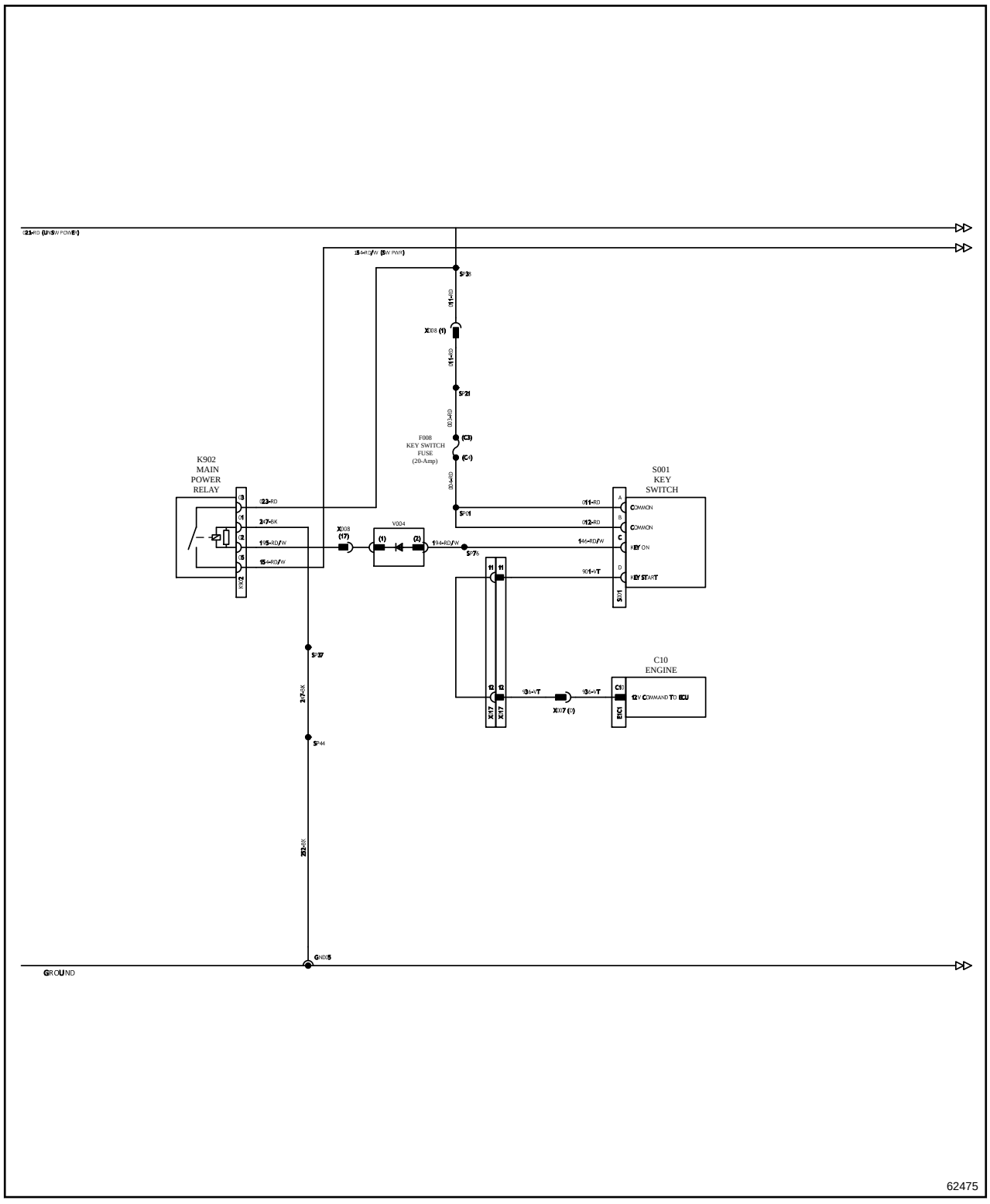


Figure 2-6: Key Switch

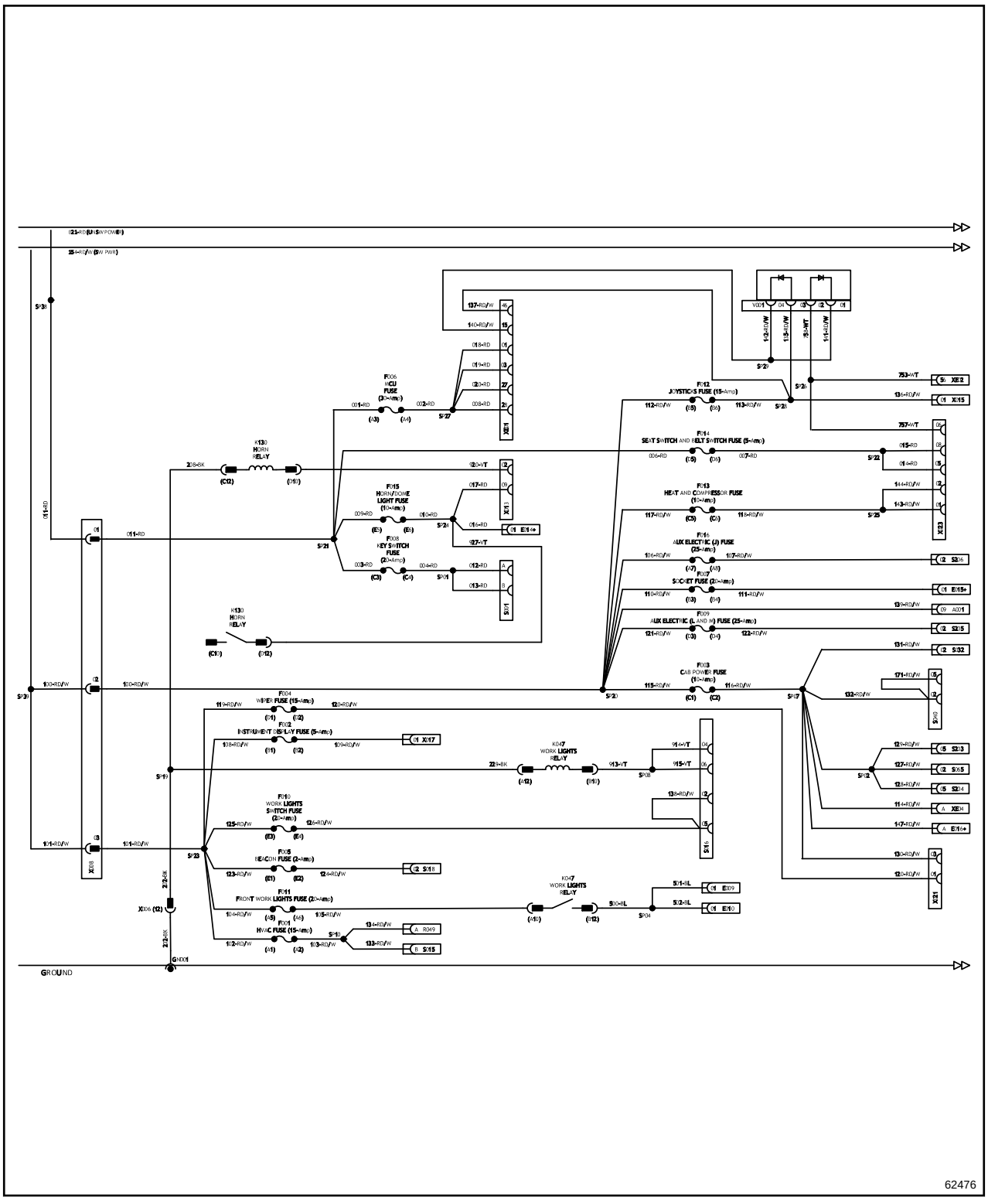


Figure 2-7: Power Distribution - Cabin

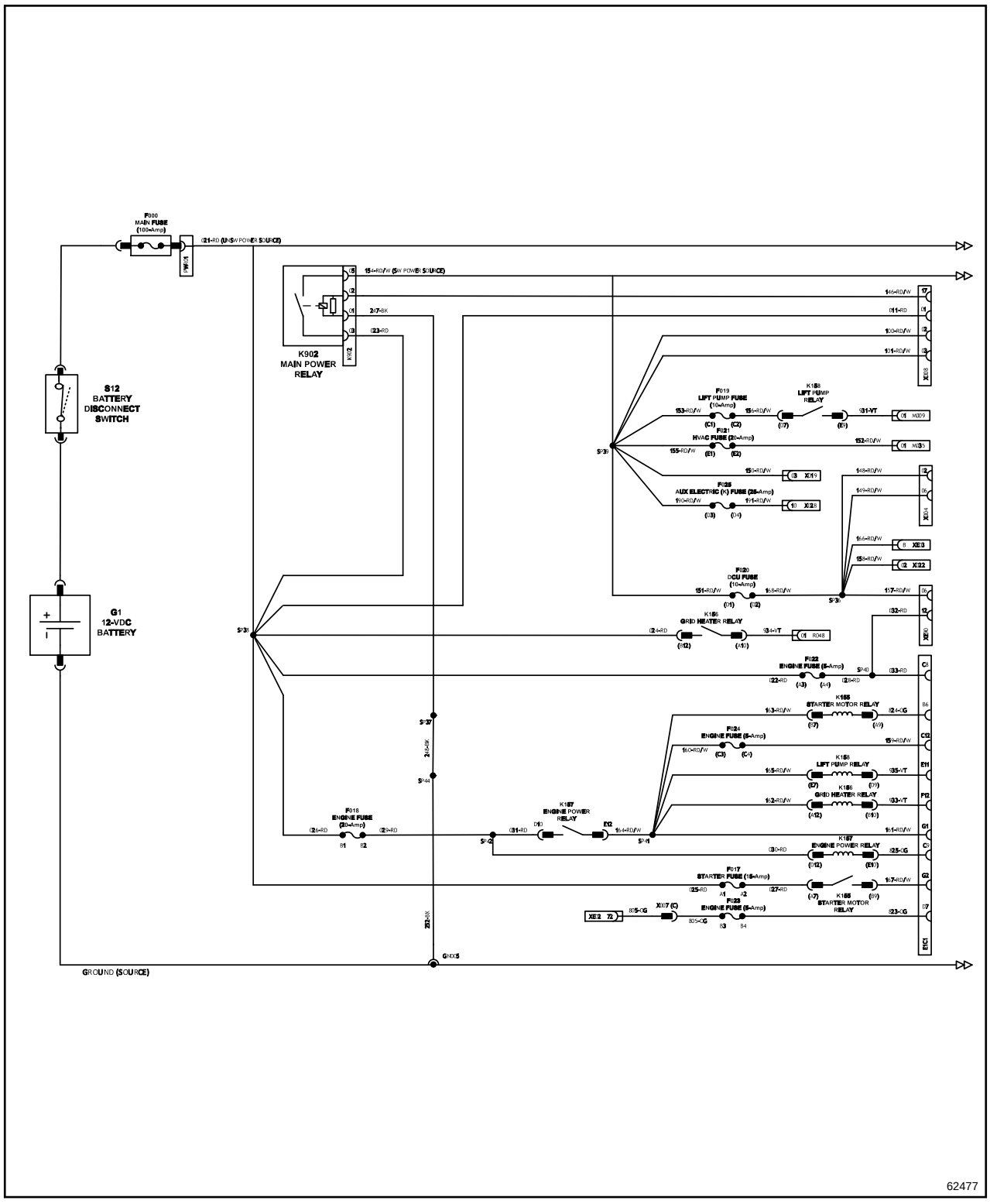


Figure 2-8: Power Distribution - Chassis

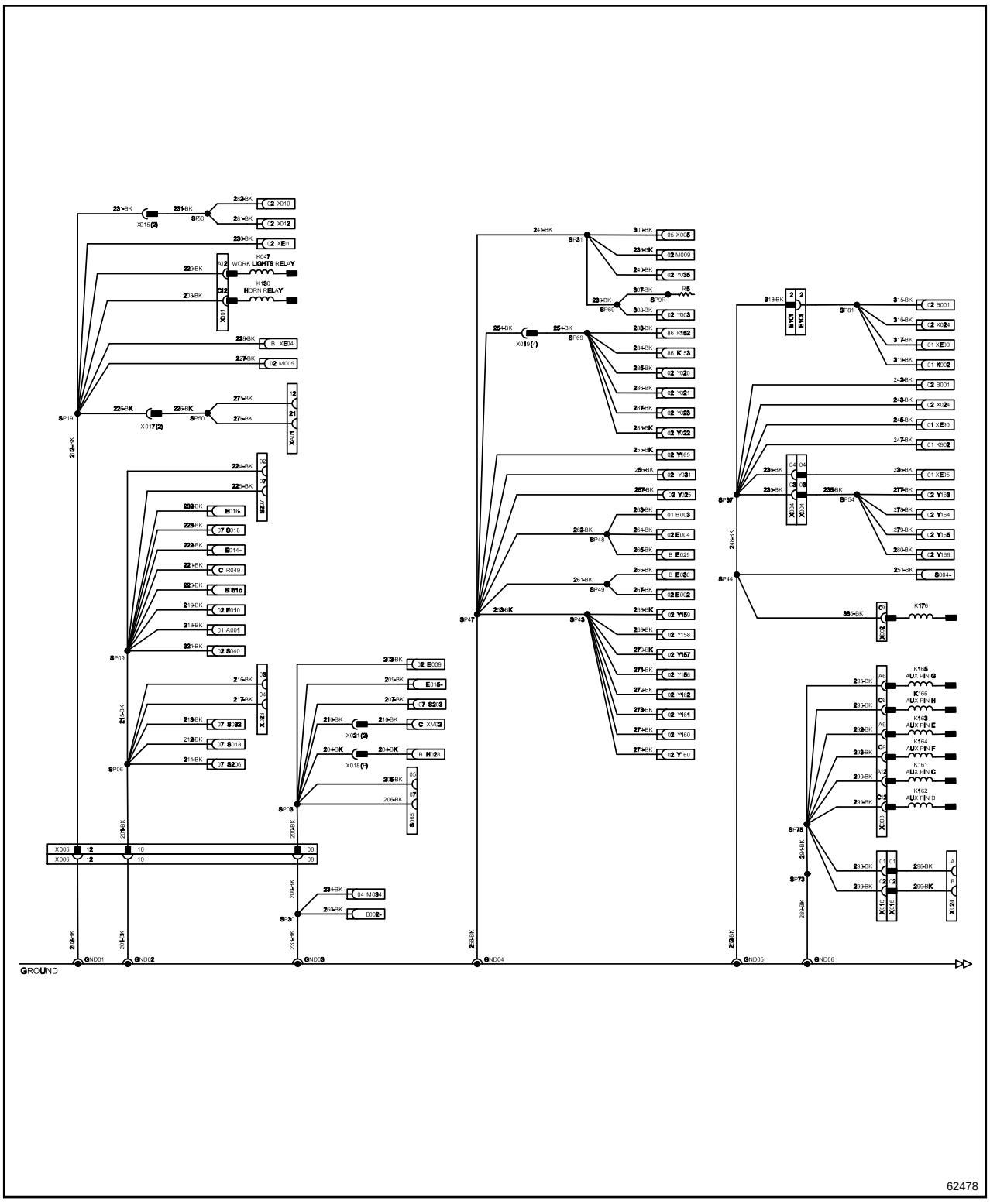


Figure 2-9: Grounds

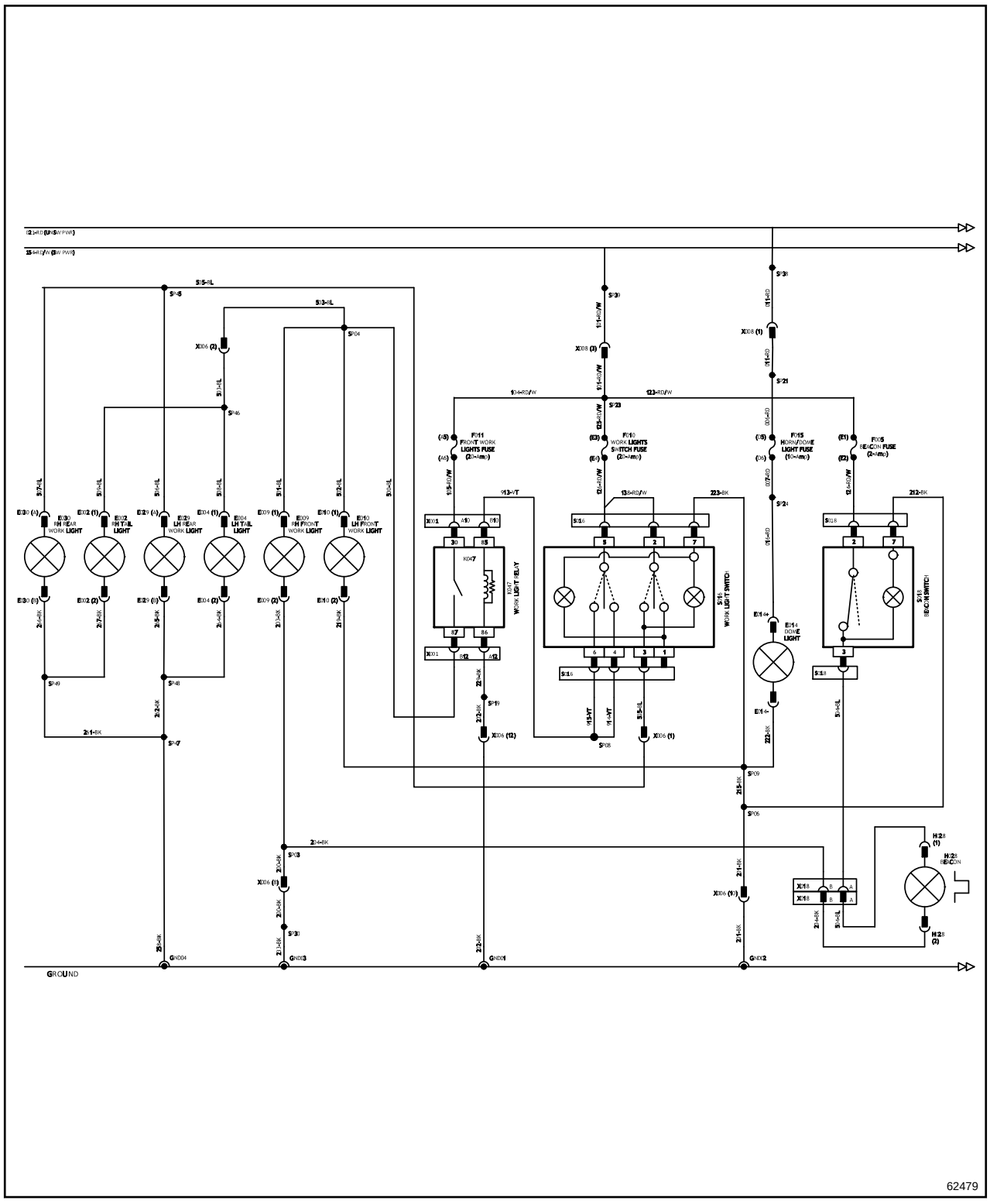


Figure 2-10: Lighting

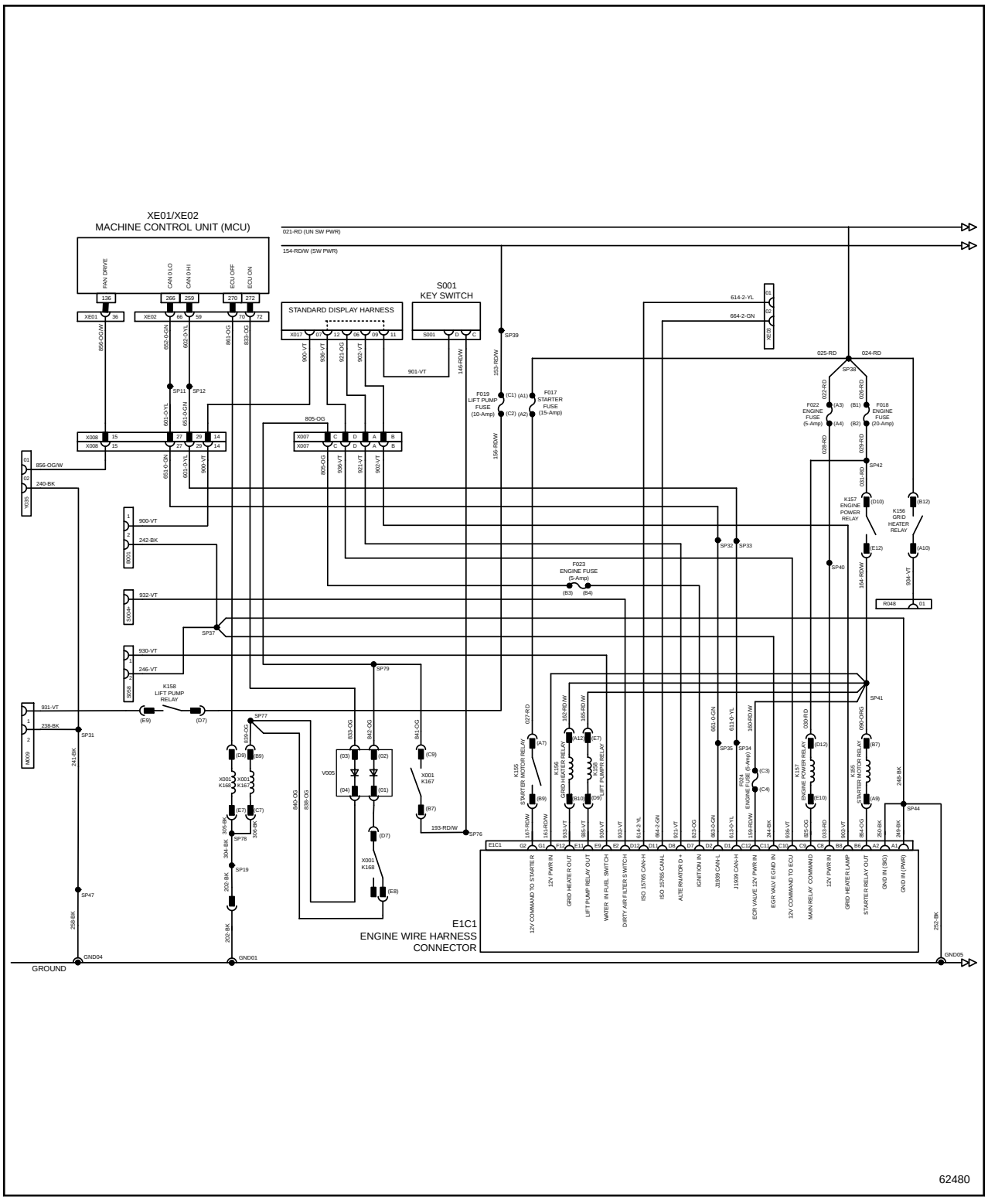


Figure 2-11: Engine Management

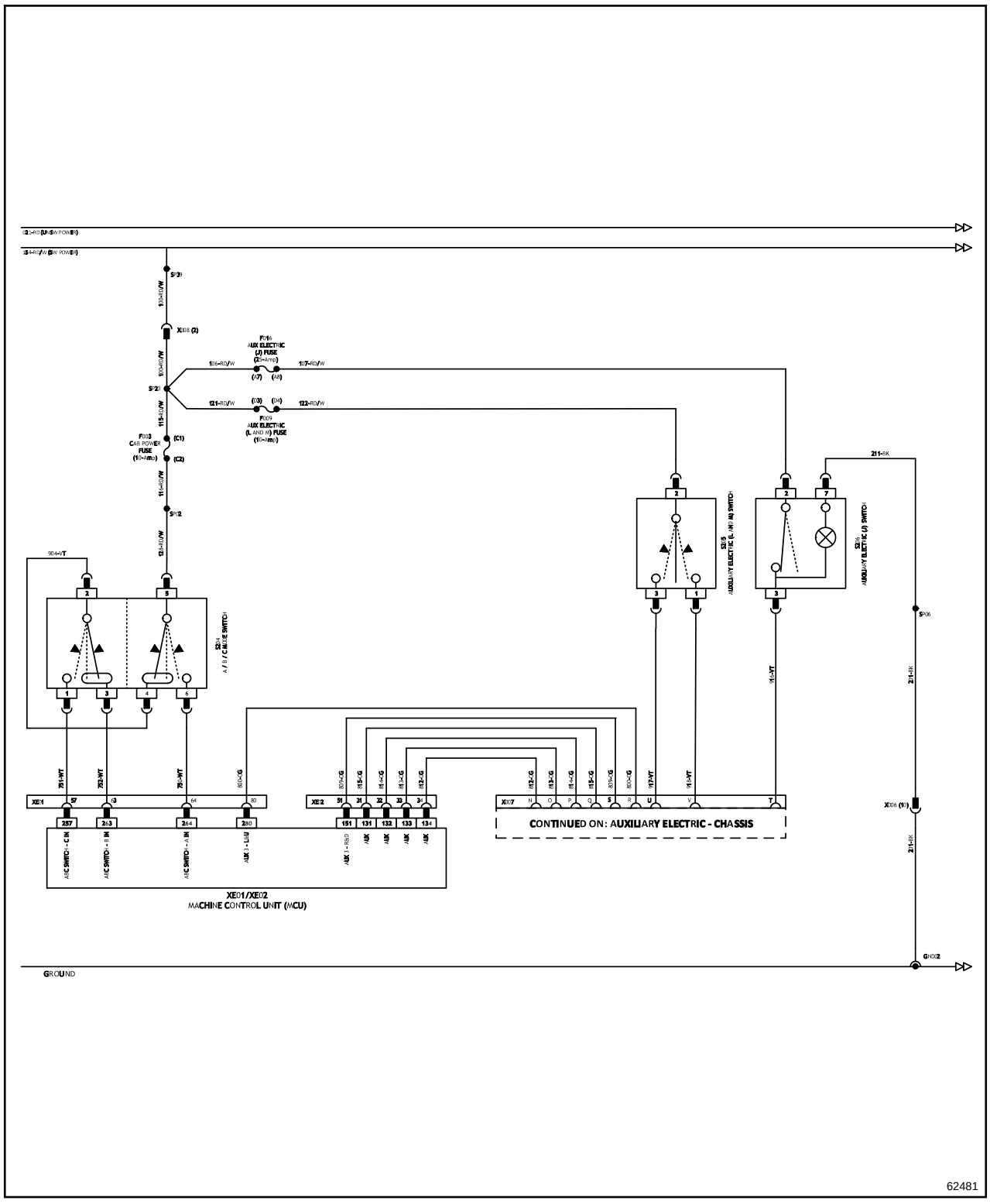


Figure 2-12: Auxiliary Electric - Cab

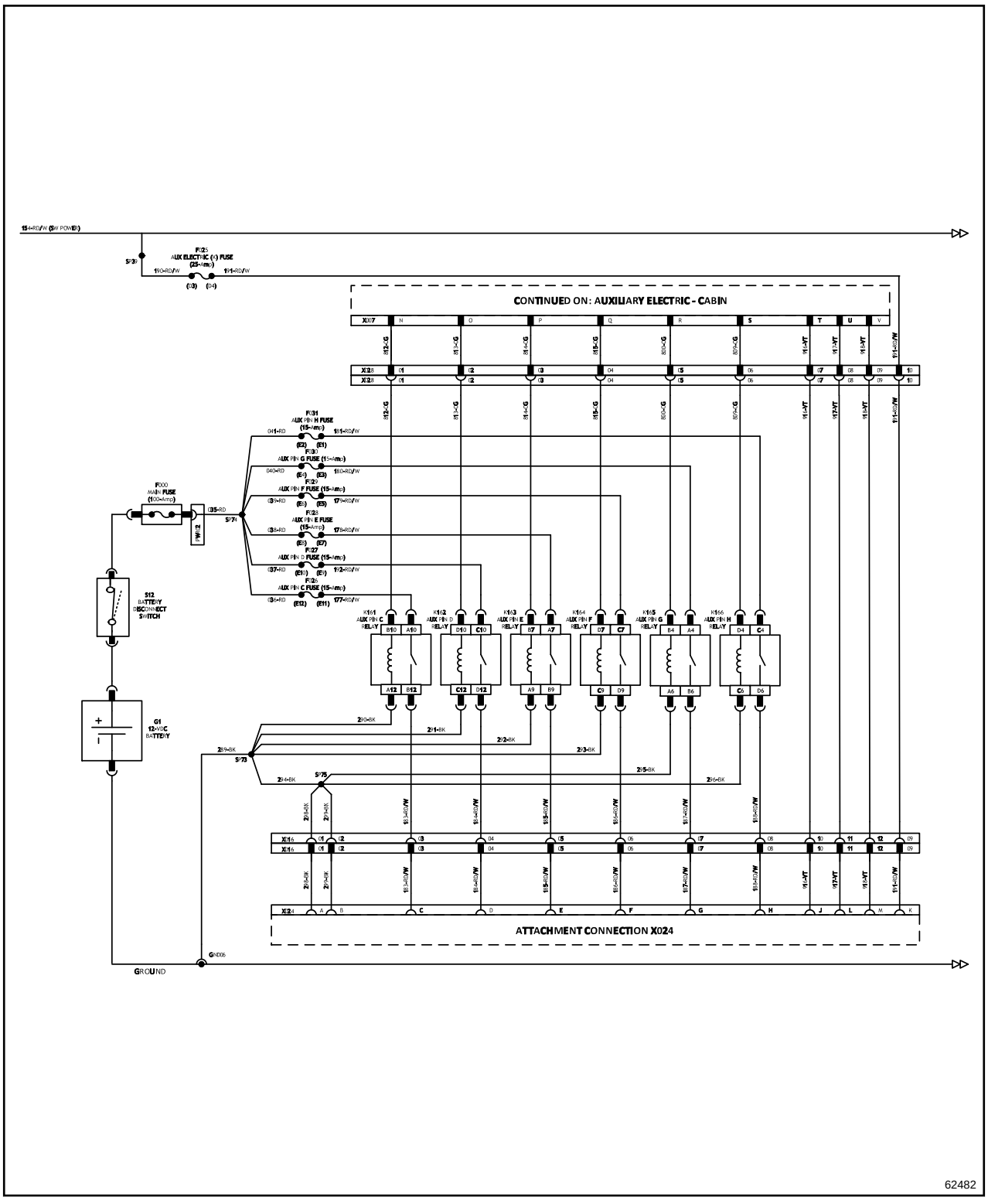


Figure 2-13: Auxiliary Electric - Chassis

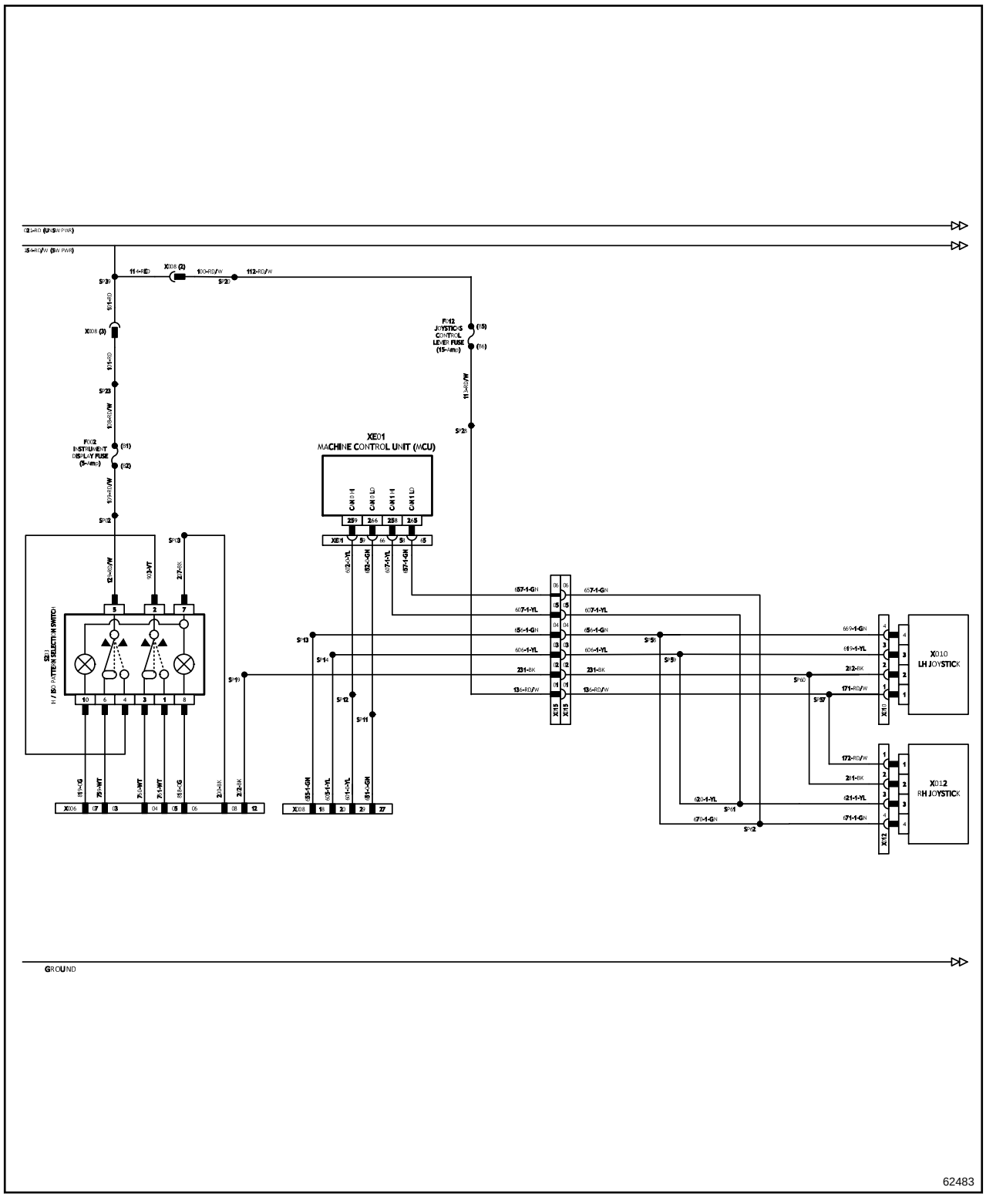


Figure 2-14: Electronic Controls

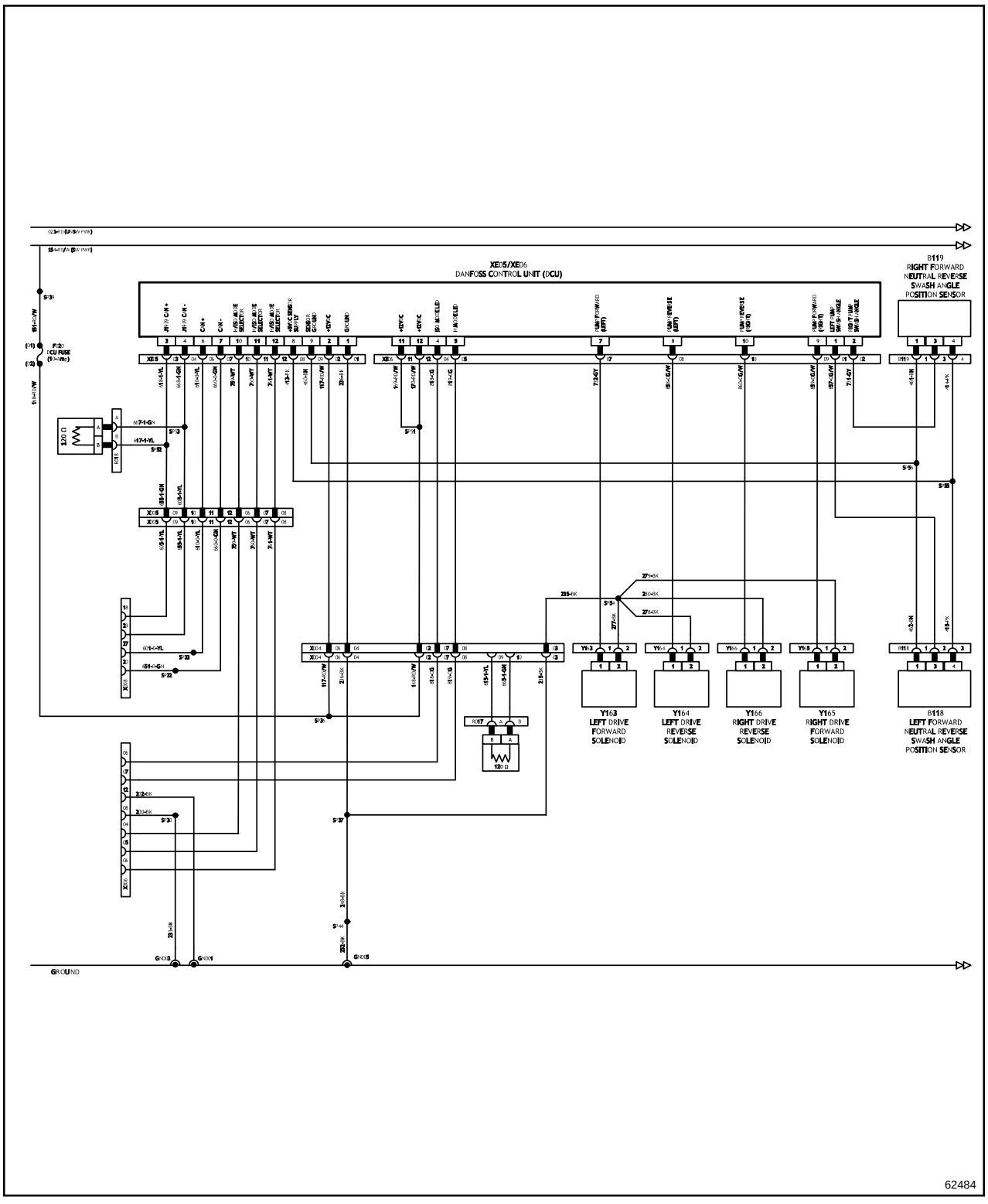


Figure 2-15: Electronic Drive Controls

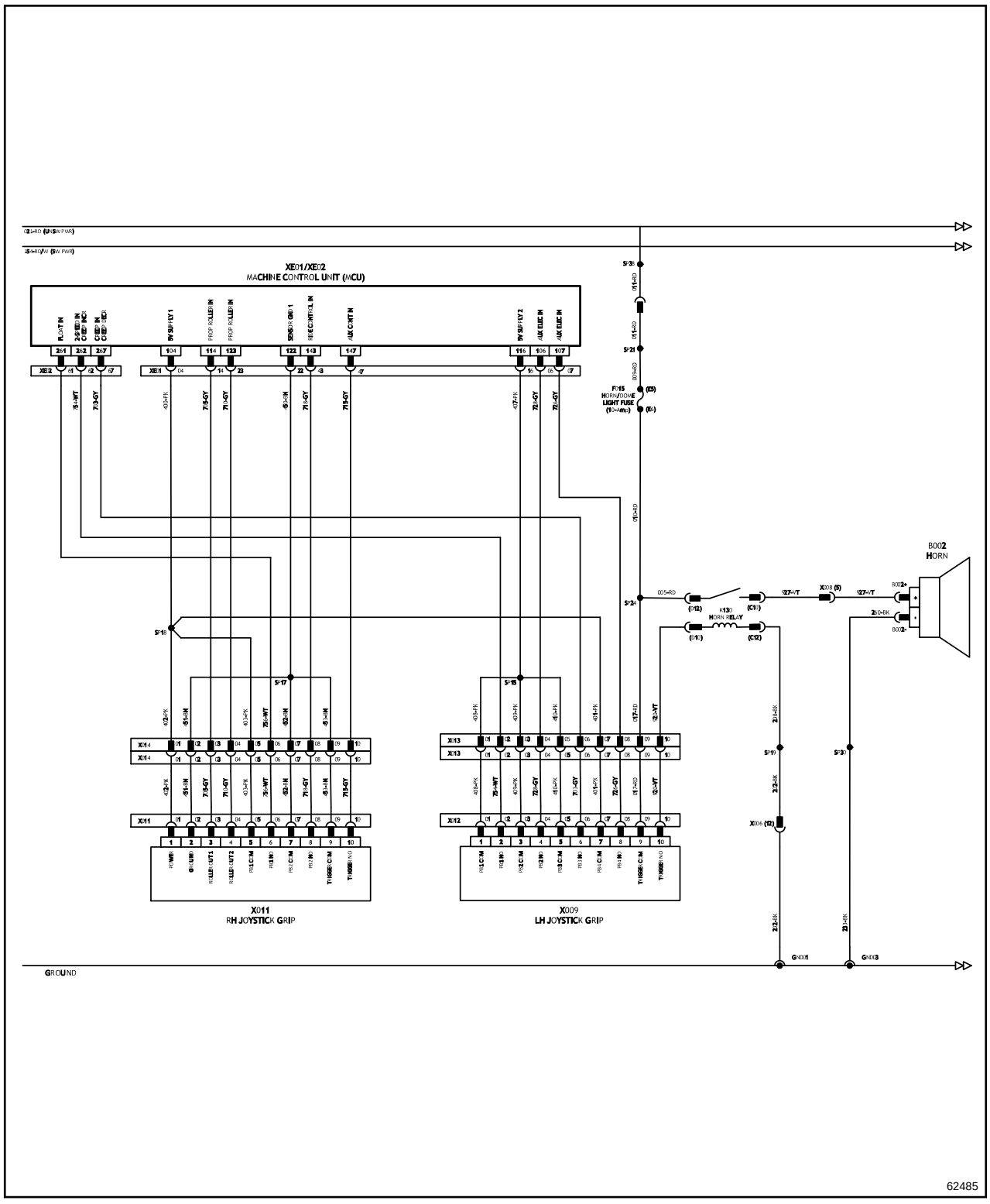


Figure 2-16: Joystick Grip Controls

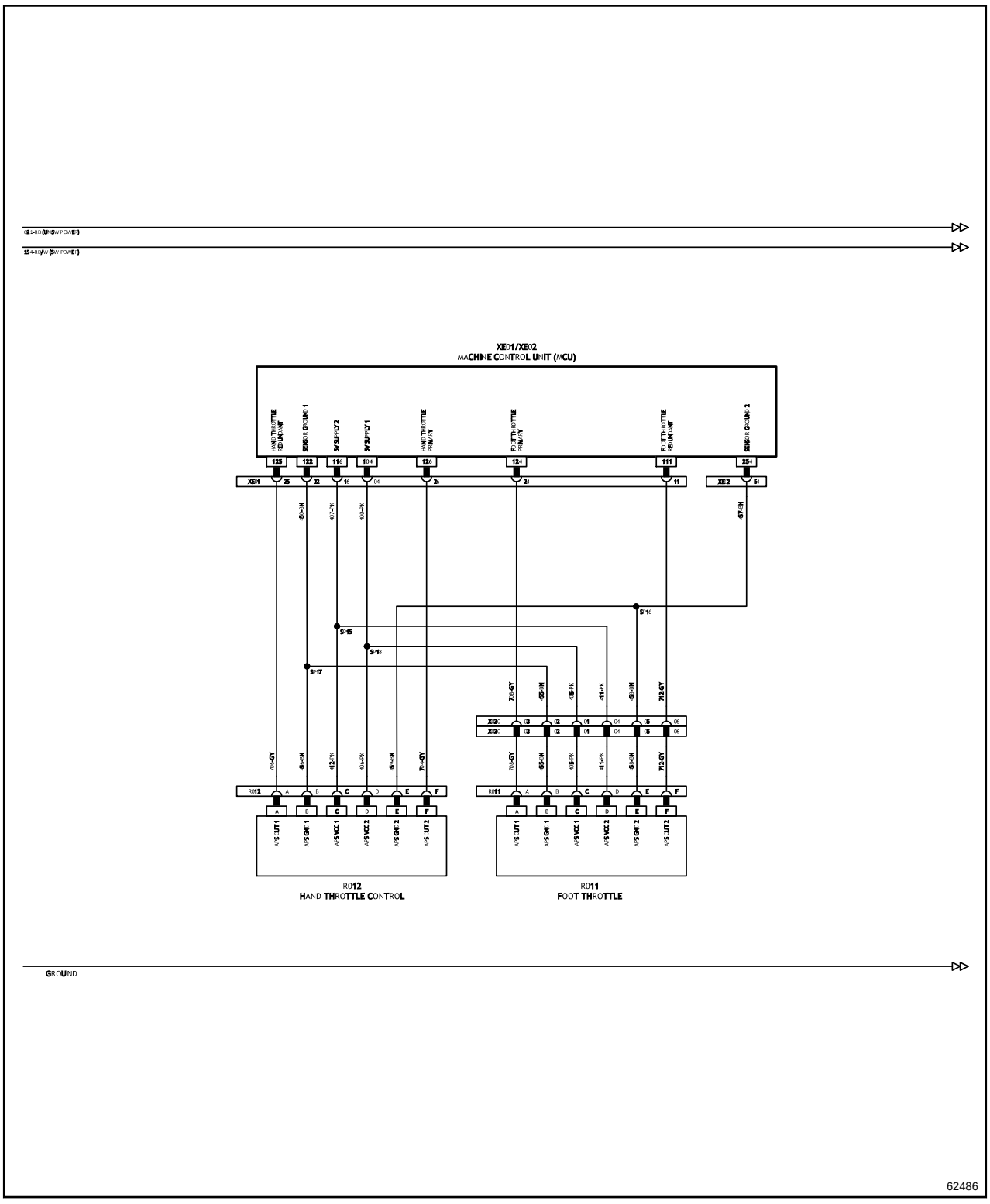


Figure 2-17: Throttles

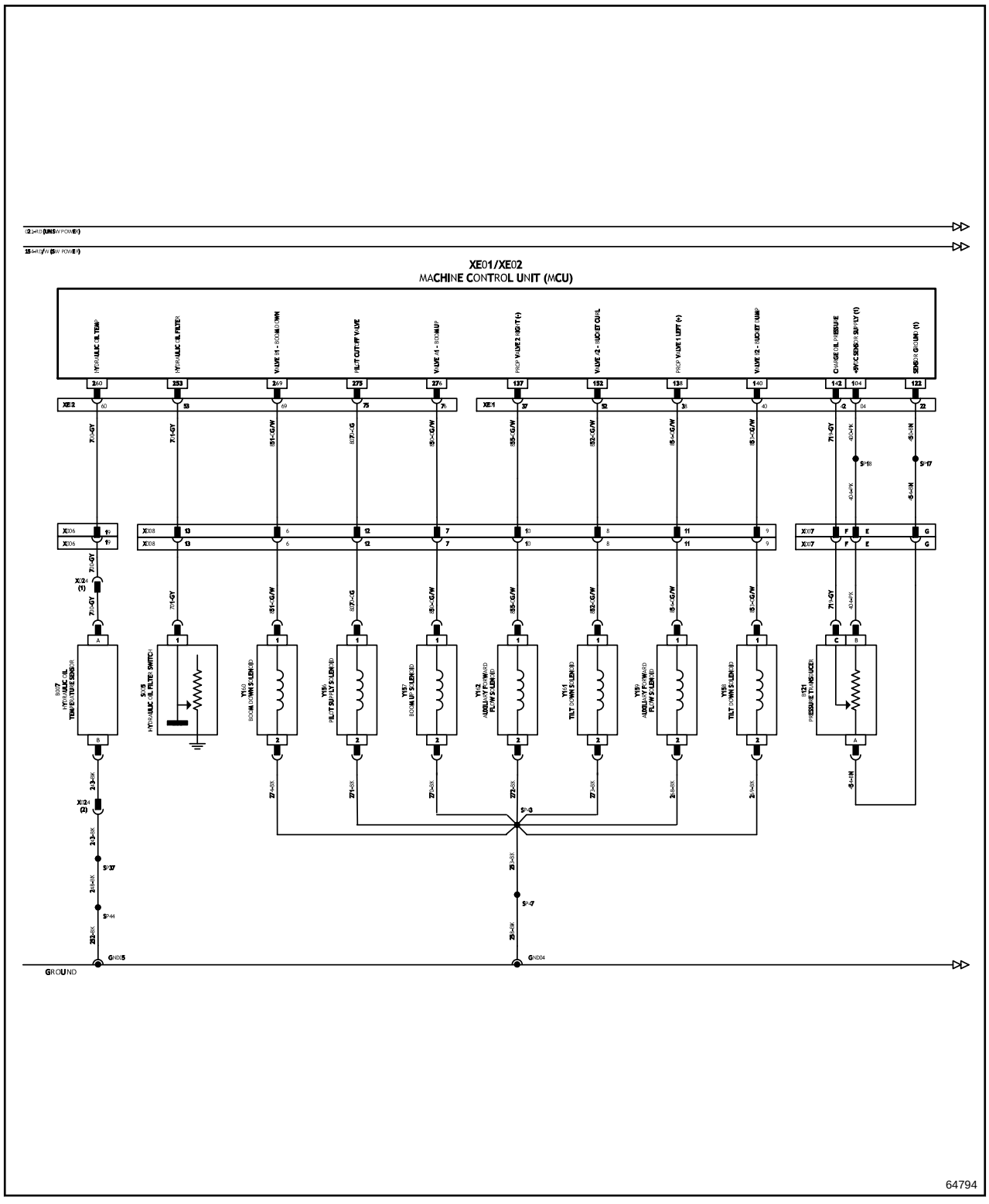


Figure 2-18: Hydraulics - Main

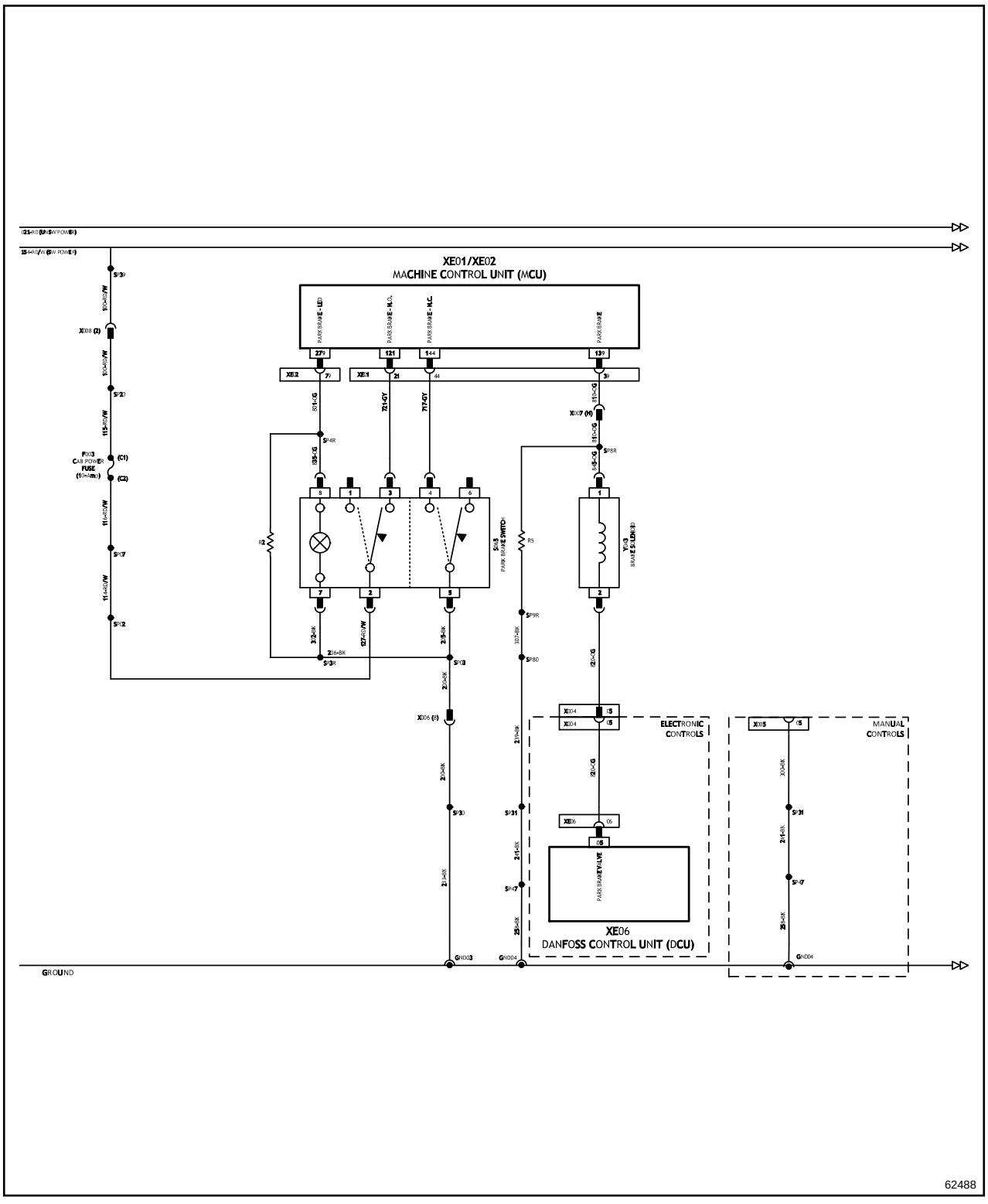


Figure 2-19: Hydraulics - Park Brake

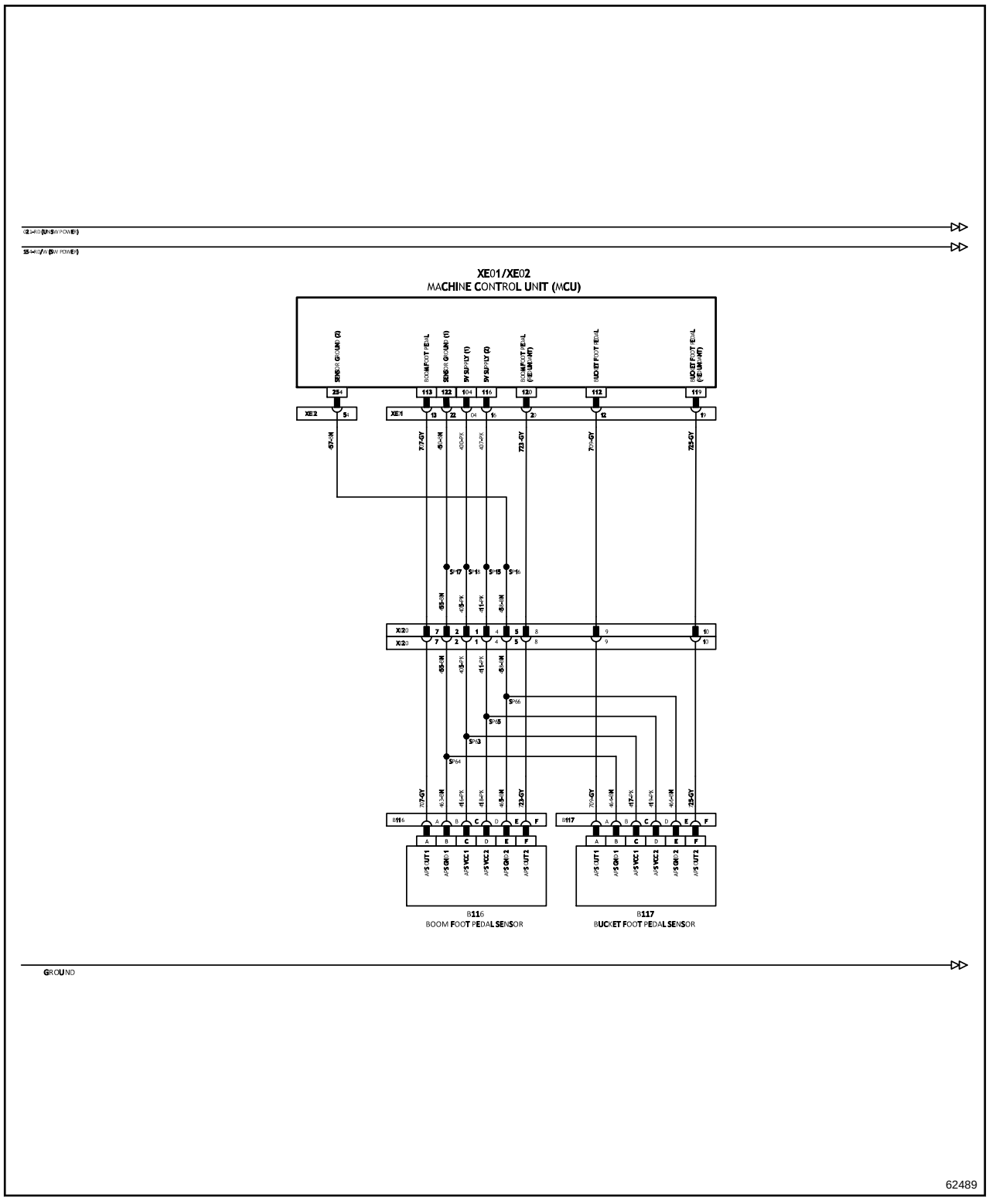


Figure 2-20: Hydraulics - Manual Foot Controls

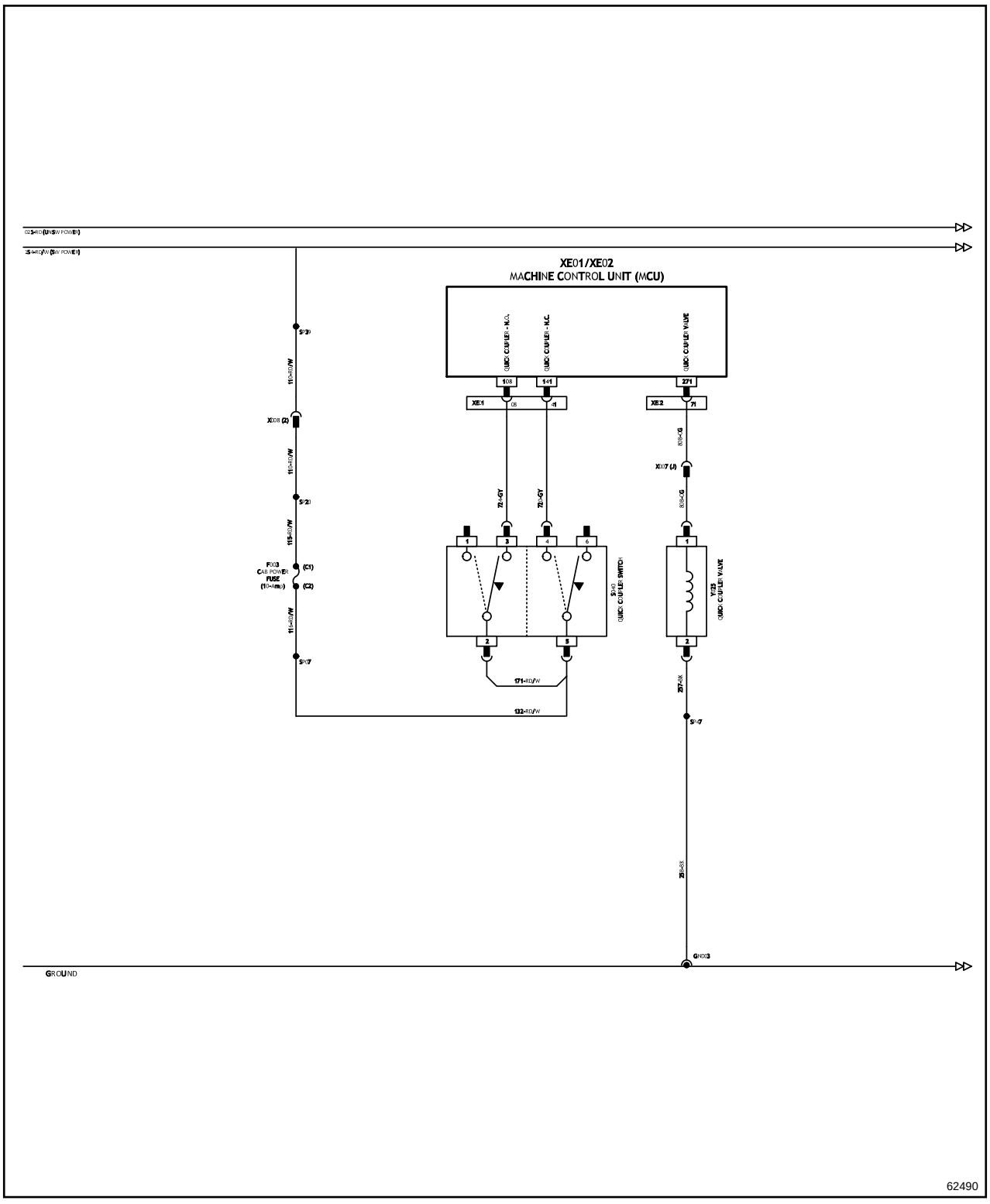


Figure 2-21: Hydraulics - Quick Coupler

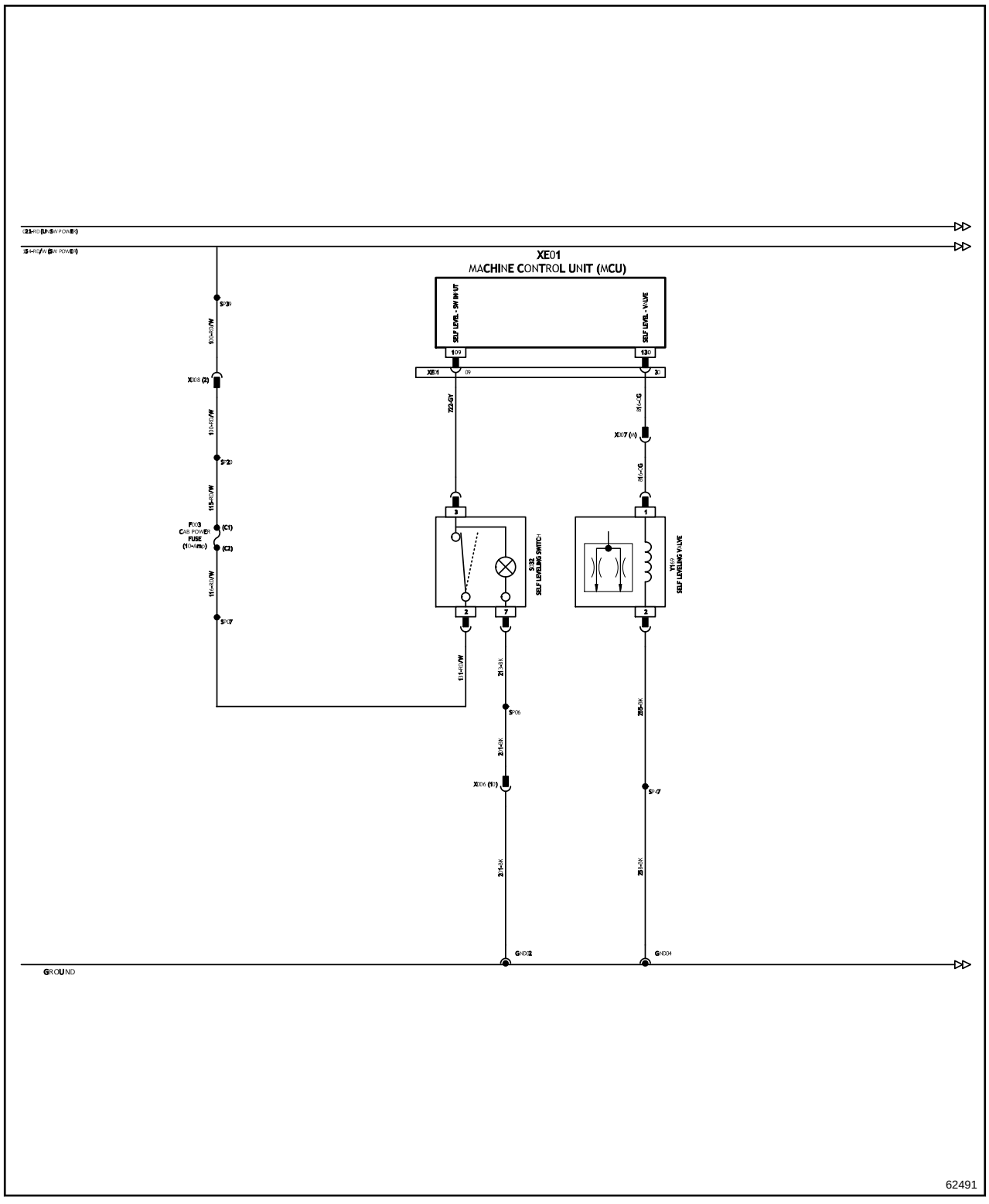


Figure 2-22: Hydraulics - Self Leveling

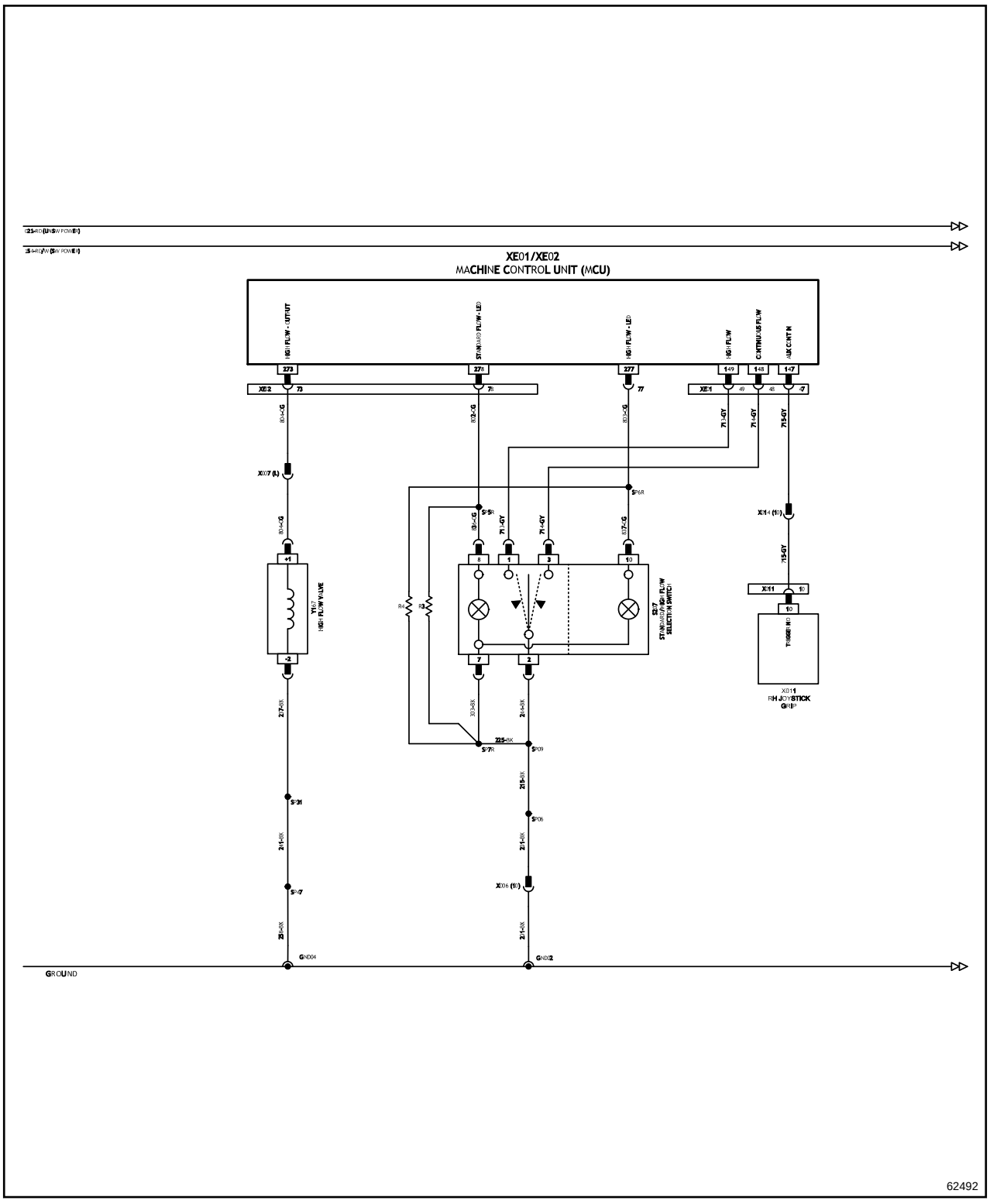


Figure 2-23: Hydraulics - Standard/High Flow

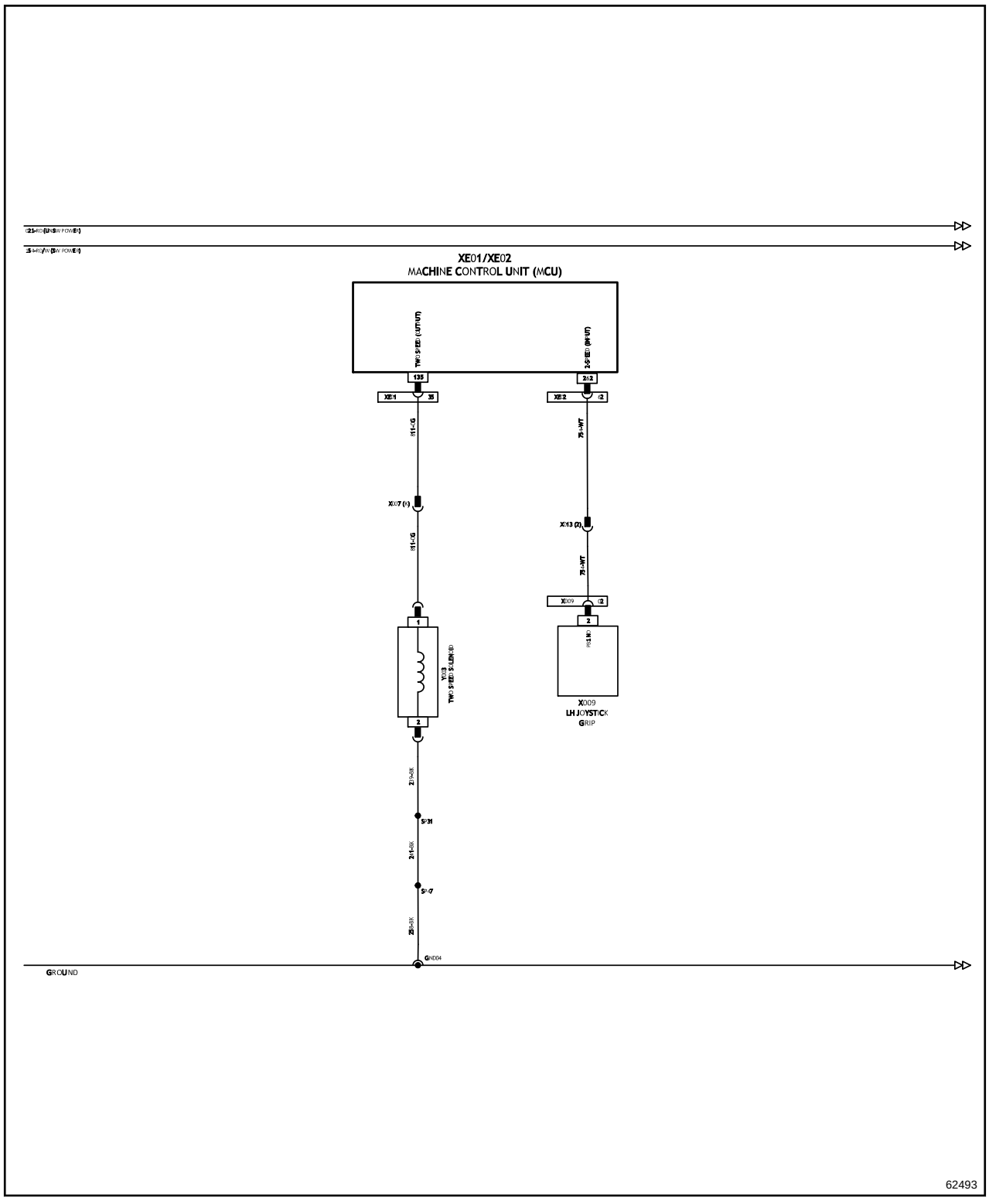


Figure 2-24: Hydraulics - Two Speed

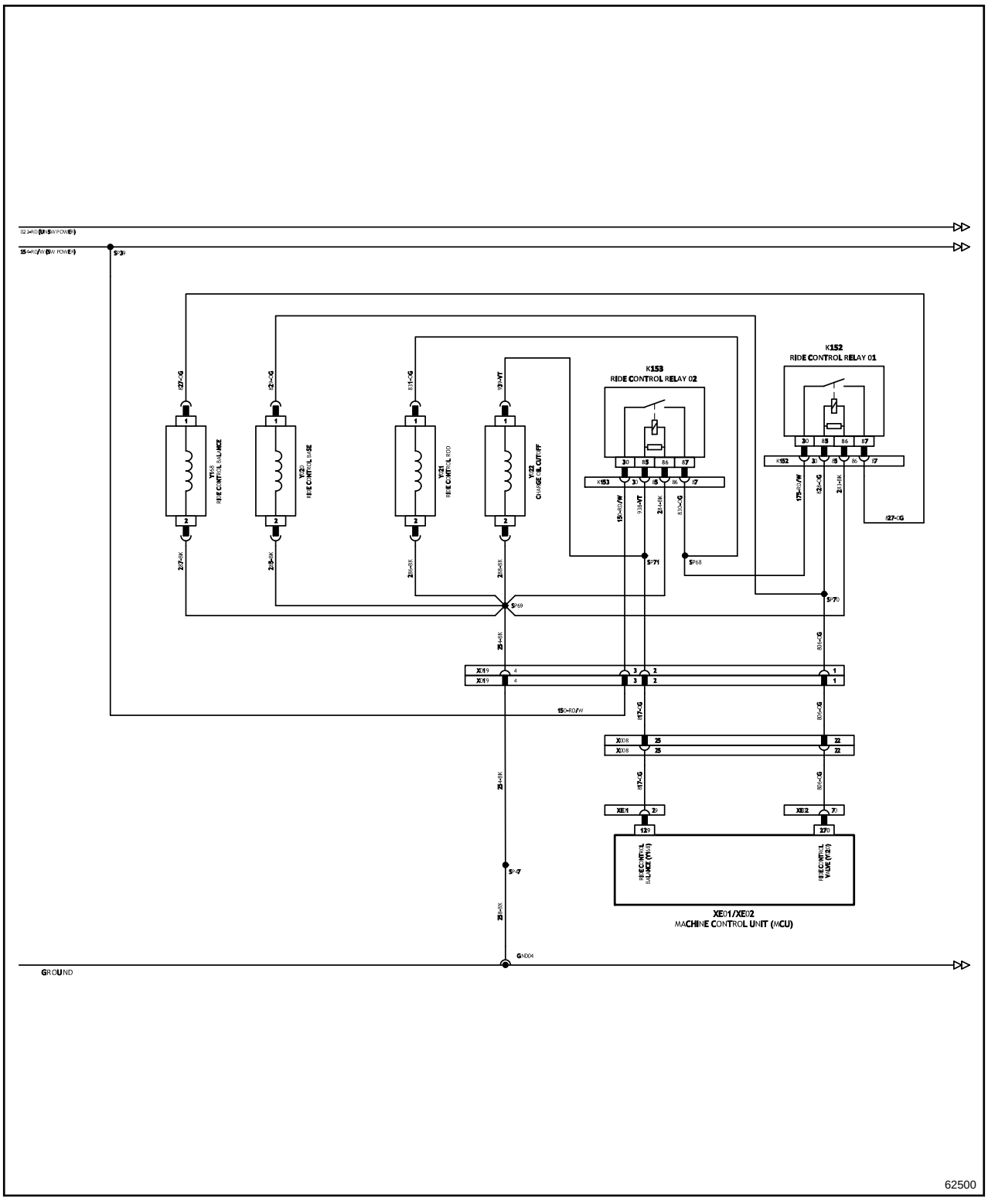


Figure 2-25: Hydraulics - Ride Control

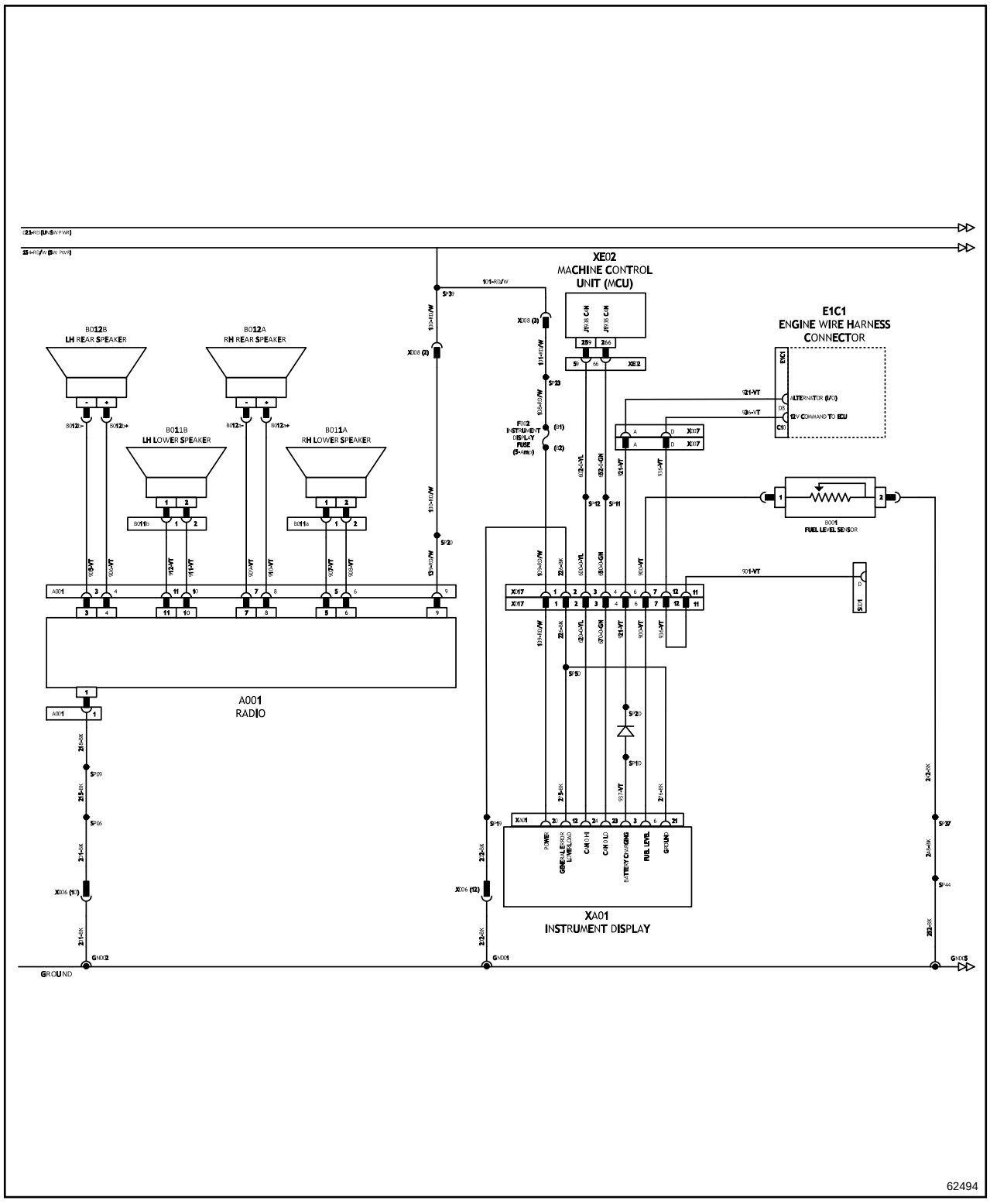


Figure 2-26: Radio and Display

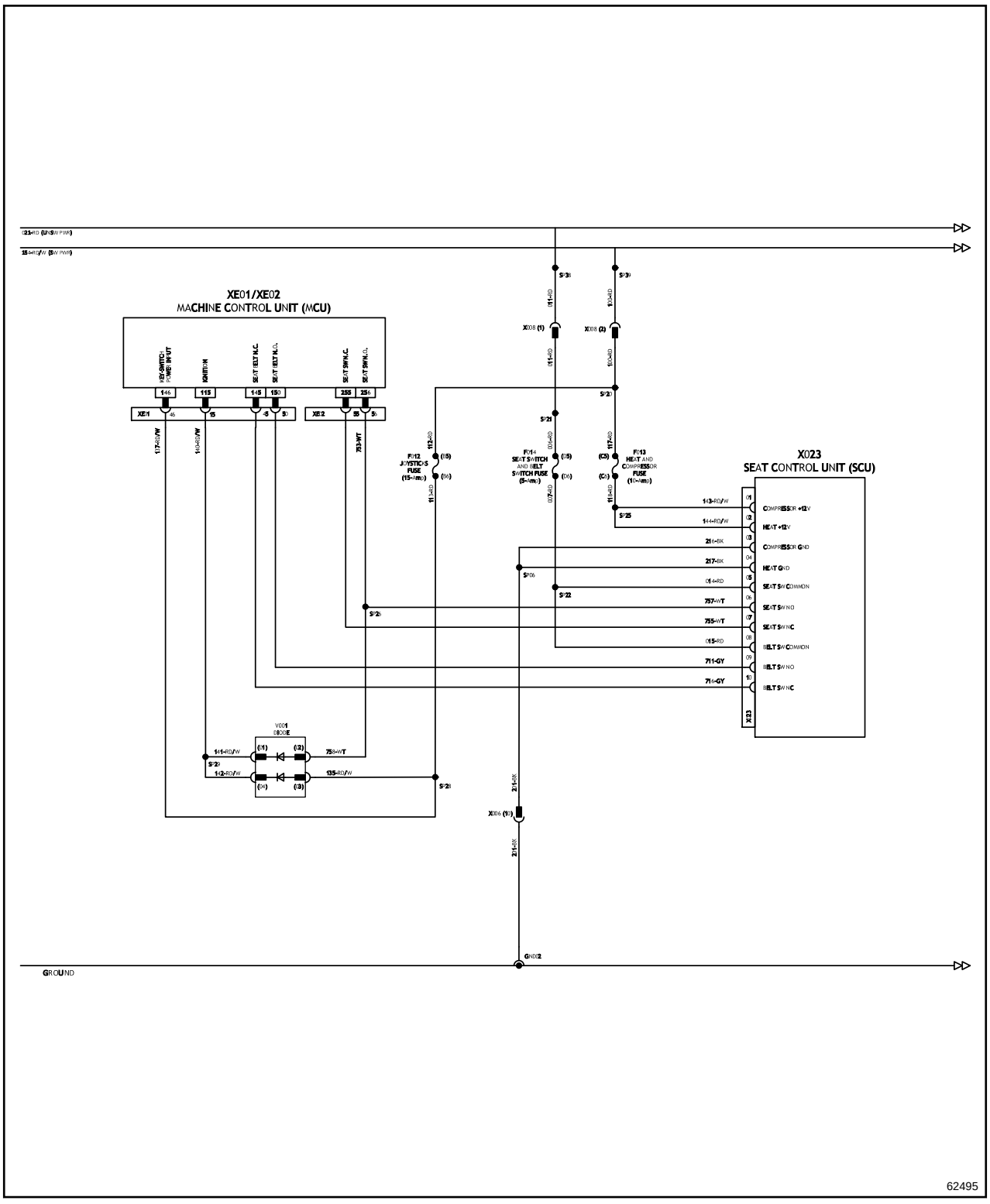


Figure 2-27: Seat

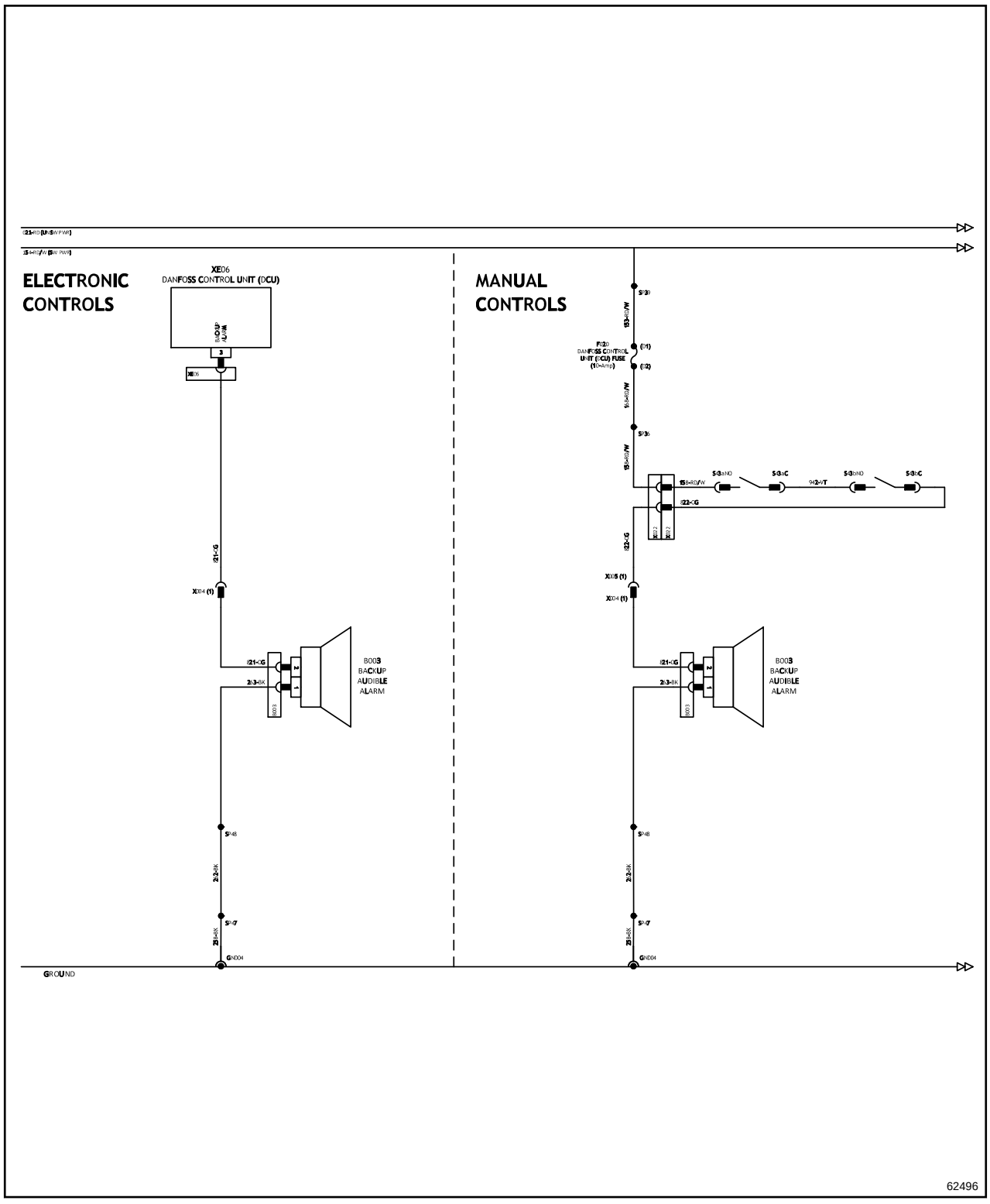


Figure 2-28: Backup Alarm

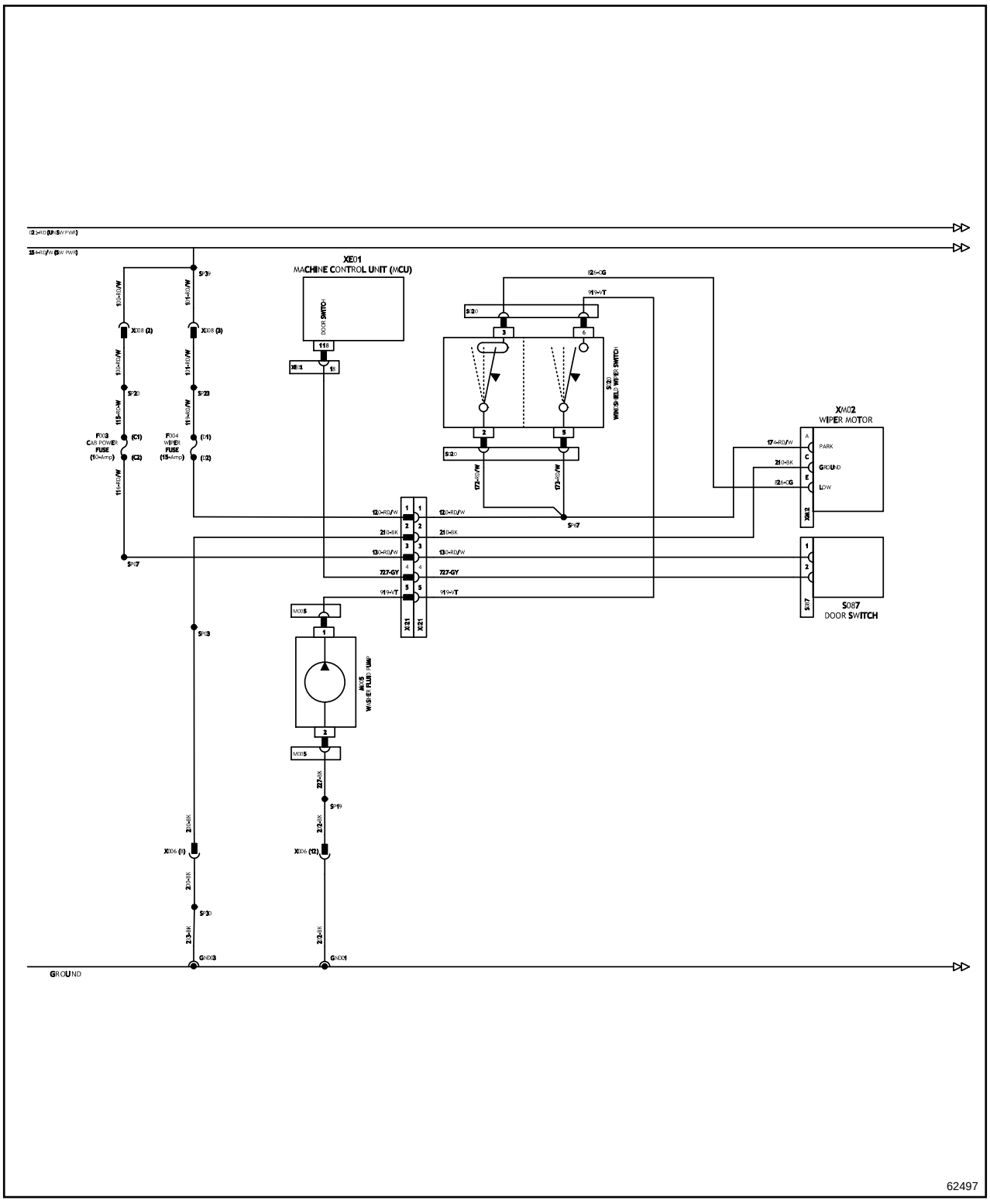
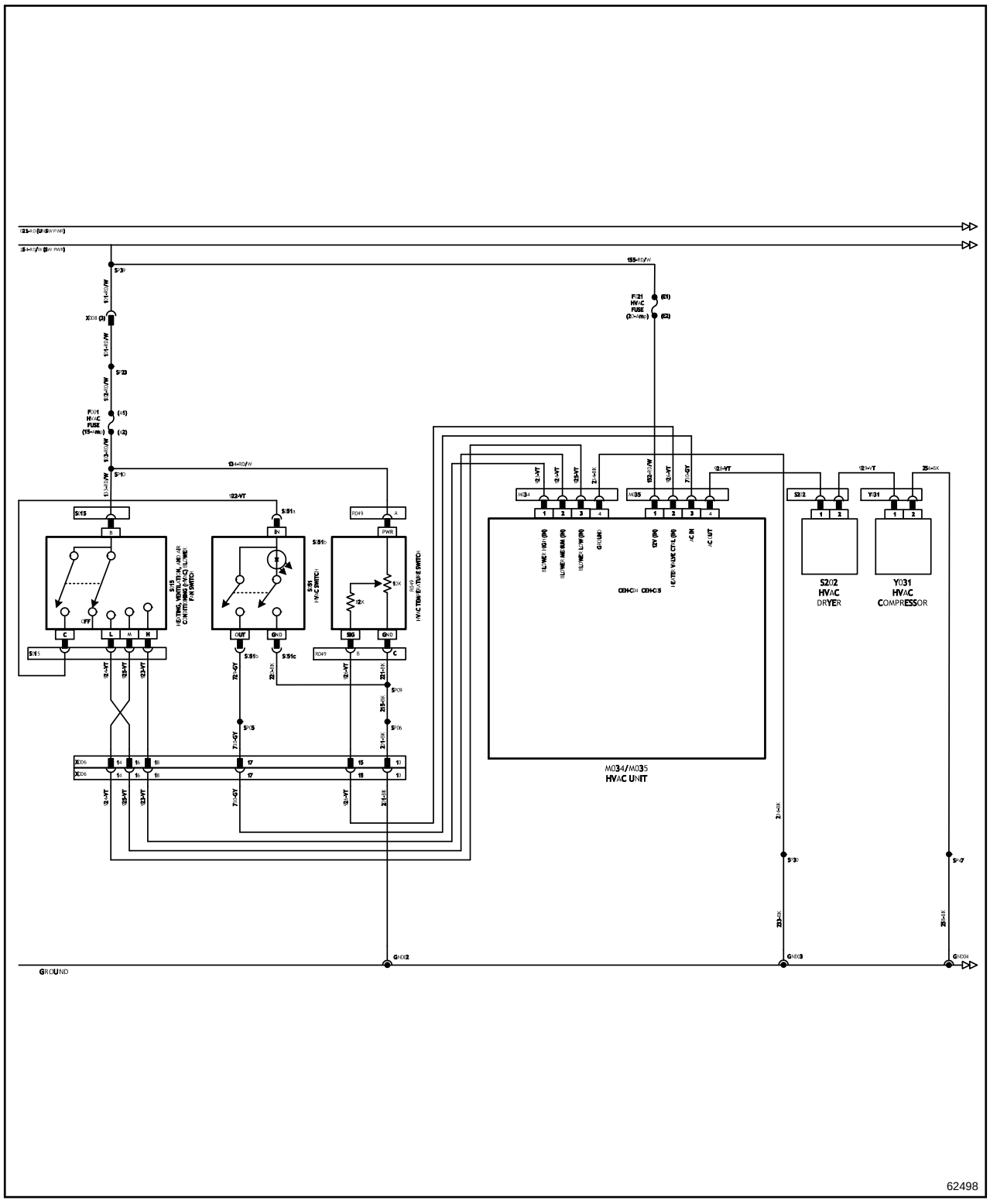


Figure 2-29: Door and Washer


F121
HVAC
FUSE
(61)
(62)
F101
HVAC
FUSE
(15-Amp)
(41)
(42)
S/P30
S/P10
S/P15
S/P16
S/P09
S/P06
S/P07
S/P08
S/P17
S/P18
S/P19
S/P20
S/P21
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S/P55
S/P56

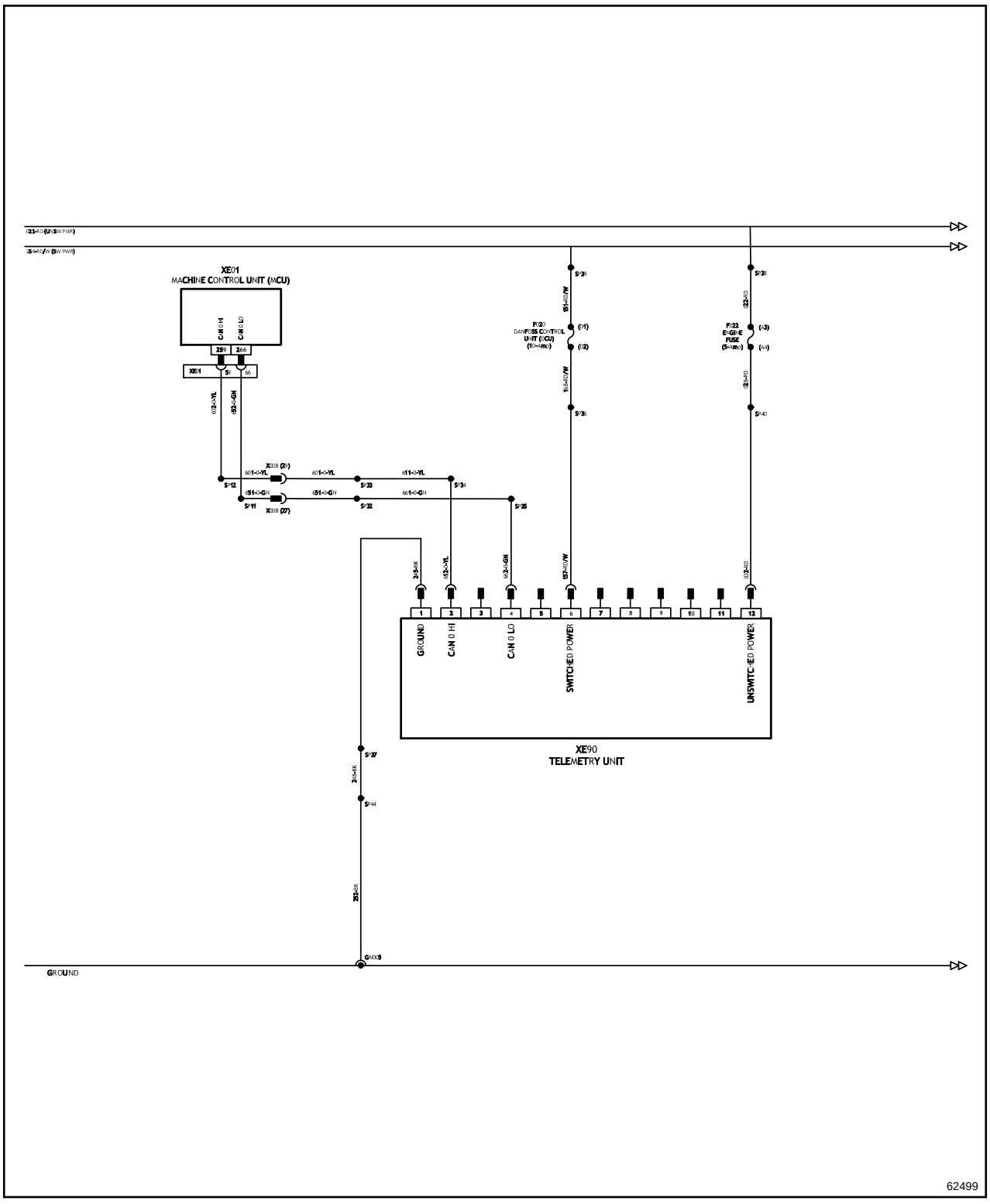


Figure 2-31: Telemetry

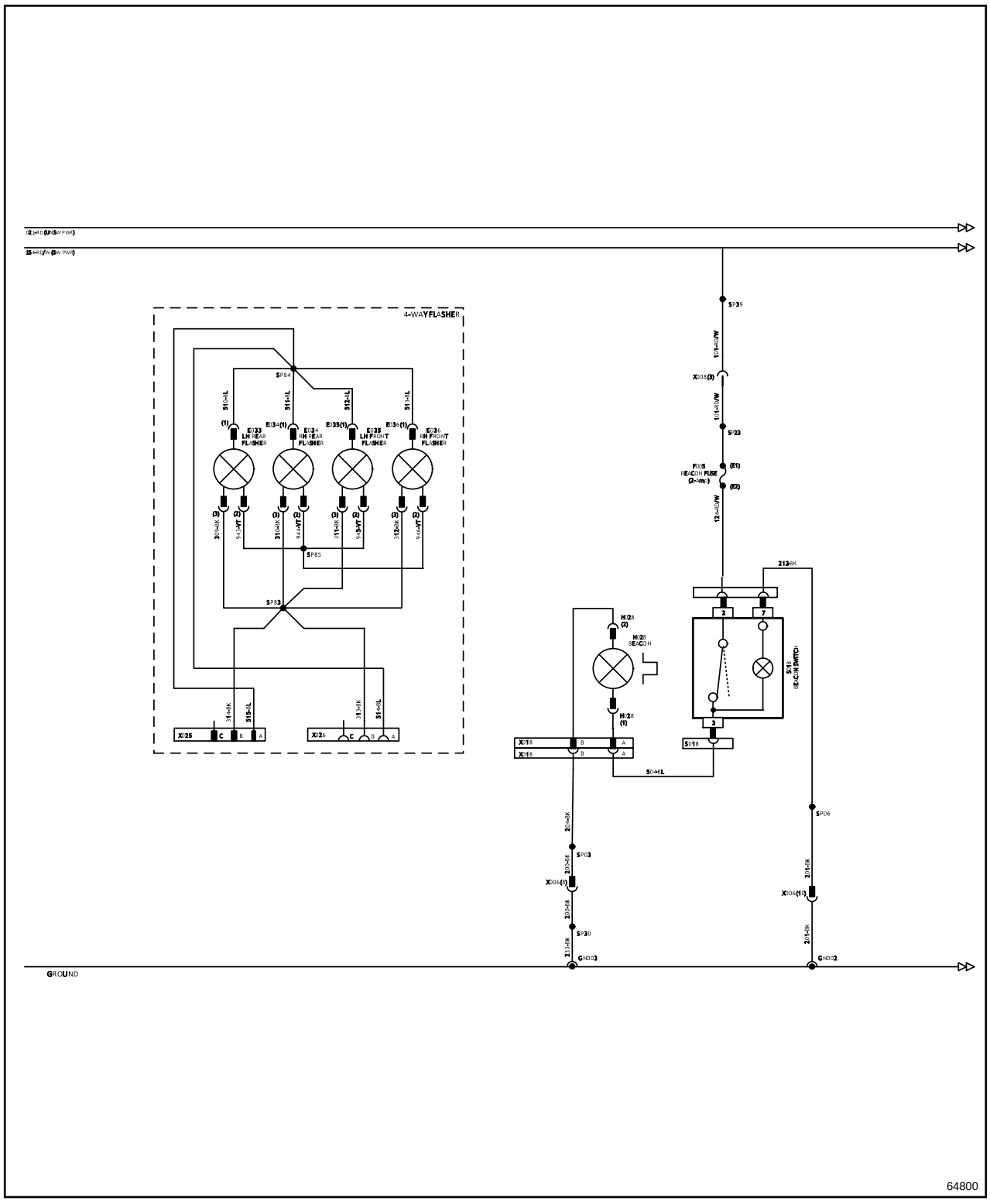


Figure 2-32: Rotating Beacon and Four Way Flashers

Theory of Operation and Sub Circuit Schematics

Machine Power Circuit—Theory of Operation

Unswitched Power

Unswitched power is available from the battery positive terminal to the battery disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR01) to the following:

- 35-amp beacon fuse (F005)
- 30-amp Machine Control Unit (MCU) fuse (F006)
- 20-amp key switch fuse (F008)
- 5-amp seat: seat switch and seat belt switch fuse (F014)
- 10-amp horn/domelight fuse (F015)
- 15-amp starter fuse (F017)
- 20-amp engine fuse (F018)
- 5-amp engine fuse (F022)
- Main power relay (K902) terminal 03
- Grid heater relay (K156) terminal B12

Unswitched power is provided from the 30-amp MCU fuse (F006) to the MCU (XE01) terminals 101, 103, 127, and 128.

Unswitched power is provided from the 20-amp key switch fuse (F008) to key switch (S001) terminals A and B.

Unswitched power is provided from the 5-amp seat: seat switch and seat belt switch fuse (F014) to Seat Control Unit (SCU) (X023) terminals 05 and 08.

Unswitched power is provided from the 10-amp horn/ dome light fuse (F015) to horn relay (K130) terminal D12, horn button (S11) terminal 9, and dome light (E014) terminal E014+.

Unswitched power is provided from the 15-amp starter fuse (F017) to starter motor relay (K155) terminal A7.

Unswitched power is provided from the 20-amp engine fuse (F018) to engine power relay (K157) terminals D10 and D12.

Unswitched power is provided from the 5-amp engine fuse (F022) to engine wire harness connector (E1C1) terminal C8 and to the track unit (XE90).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR02) to the following:

- 15-amp aux pin C fuse (F026)
- 15-amp aux pin D fuse (F027)
- 15-amp aux pin E fuse (F028)
- 15-amp aux pin F fuse (F029)
- 15-amp aux pin G fuse (F030)
- 15-amp aux pin H fuse (F031)

Unswitched power is provided from 15-amp aux pin C fuse (F026) to aux pin C relay (K161) pin A10.

Unswitched power is provided from 15-amp aux pin D fuse (F027) to aux pin D relay (K162) pin C10.

Unswitched power is provided from 15-amp aux pin E fuse (F028) to aux pin E relay (K163) pin A7.

Unswitched power is provided from 15-amp aux pin F fuse (F029) to aux pin F relay (K164) pin C7.

Unswitched power is provided from 15-amp aux pin G fuse (F030) to aux pin G relay (K165) pin A4.

Unswitched power is provided from 15-amp aux pin H fuse (F031) to aux pin H relay (K166) pin C4.

Interlock Circuit

When the seat switch is in the closed position, the SCU (X023) sends output voltage from terminal 07 to the MCU (XE01) terminal 255.

When the seat belt switch is in the closed position, the SCU (X023) sends output voltage from terminal 10 to the MCU (XE01) terminal 145.

When the door switch (S087) is in the open position, the MCU (XE01) no longer receives voltage from terminal 2 of the door switch (S087) to terminal 118 of the MCU (XE01).

With the park brake switch (S065) in the disengaged position, the MCU (XE01) provides power from terminal 139 to the park brake release solenoid (Y043) terminal 1 and resistor (R005). The Danfoss Control Unit (DCU) (XE06) terminal 05 provides a ground for the park brake release solenoid (Y043) terminal 2, energizing the solenoid.

With the interlock circuit complete, all hydrostatic and hydraulic functions become active.

Switched Power

When the key switch (S001) is turned to the ON position, power is provided from key switch (S001) terminal C to diode connector (V004) terminal 2. Power is then provided from diode connector (V004) terminal 1 to main power relay (K902) terminal 02, energizing the relay. With the main power relay (K902) energized, switched power is provided from main power relay (K902) terminal 05 to the following:

- 15-amp Heating Ventilation and Air Conditioning (HVAC) fuse (F001)
- 5-amp instrument display fuse (F002)
- 10-amp cab power fuse (F003)
- 15-amp wiper fuse (F004)
- 2-amp beacon fuse (F005)
- 20-amp socket fuse (F007)
- 25-amp aux electric (L and M) fuse (F009)
- 20-amp work lights switch fuse (F010)
- 20-amp front work lights fuse (F011)
- 15-amp joysticks fuse (F012)
- 10-amp heat and compressor fuse (F013)
- 25-amp aux electric (J) fuse (F016)
- 10-amp lift pump fuse (F019)
- 10-amp Danfoss Control Unit (DCU) fuse (F020)
- 20-amp HVAC fuse (F021)
- 25-amp aux electric (K) fuse (F025)
- Ride control relay 01 (K152) pin 30
- Ride control relay 02 (K153) pin 30
- Radio (A001) pin 9

Switched power is provided to the HVAC blower fan switch (S015) terminal B and to the HVAC temperature switch (R049) terminal A from the 15-amp HVAC fuse (F001).

Switched power is provided to the instrument display (XA01) terminal 20 and to the H/ISO pattern selection switch (S203) terminal 5 from the 5-amp instrument display fuse (F002).

Switched power is provided to the park brake switch (S065) terminal 2, power coupler switch (S040) pins 2 and 5, self leveling switch (S032) terminal 2, door switch (S087) terminal 1, and A/B/C mode switch (S204) terminal 5 from the 10-amp cab power fuse (F003).

Switched power is provided to wiper washer switch (S020), wiper motor (XM02) terminal A from the 15-amp wiper fuse (F004).

Switched power is provided to beacon switch (S018) terminal 2 from the 2-amp beacon fuse (F005).

Switched power is provided to the auxiliary electric (L and M) switch (S205) from the 25-amp aux electric (L and M) fuse (F009).

Switched power is provided to work light switch (S016) terminals 2 and 5 from the 20-amp work lights switch fuse (F010).

Switched power is provided to work light relay (K047) terminal 30 from the 20-amp front work lights fuse (F011).

Switched power is provided to the LH joystick (X010), RH Joystick (X012), diode connector (V001) terminal 3, and MCU terminal 146 from the 15-amp joysticks fuse (F012).

Switched power is provided to SCU (X023) terminals 1 and 2 from the 10-amp heat and compressor fuse (F013).

Switched power is provided to the aux electric (J) switch (S206) terminal 2 from the 25-amp aux electric (J) fuse (F016).

Switched power is provided to the lift pump relay (K158) terminla D7 from the 10-amp lift pump fuse (F019).

For machines with electronic controls, switched power is provided to the DCU (XE05/XE06) terminals 2, 11, and 12, and to the track unit (XE90) pin 6 from the 10-amp DCU fuse (F020). For machines with manual controls, switched power is provided to switch S43a terminal S43aNO from the 10-amp DCU fuse (F020).

Switched power is provided to the HVAC unit (M034/M035) terminal 1 from the 20-amp HVAC fuse (F021).

Switched power is provided to the attachment connection (X024) from the 25-amp aux electric (K) fuse (F025).

Machine Power Circuit Schematic

See **Figures 2-33** through **2-59**.

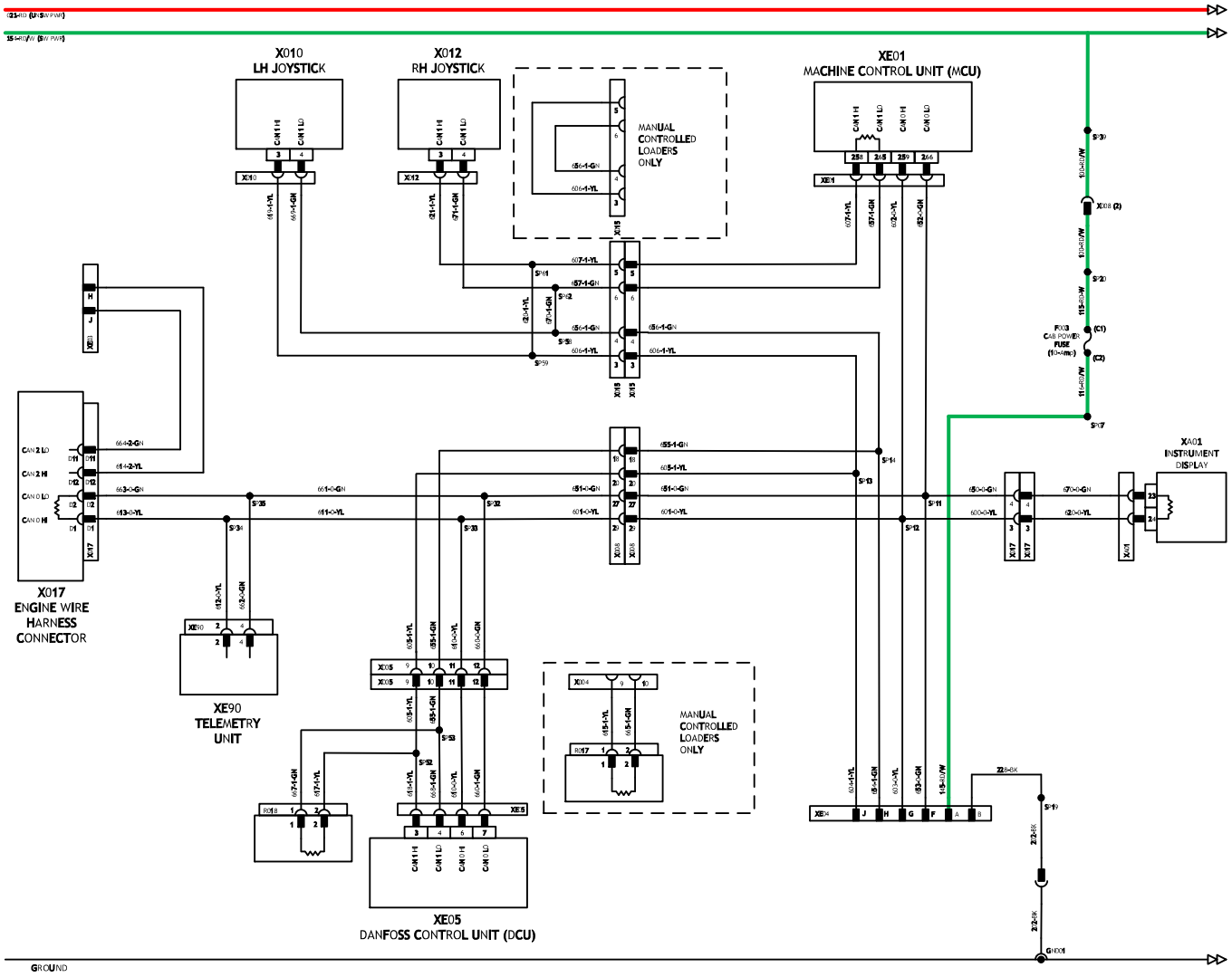


Figure 2-33: Controller Area Network (CAN) Networks and Diagnostic Port

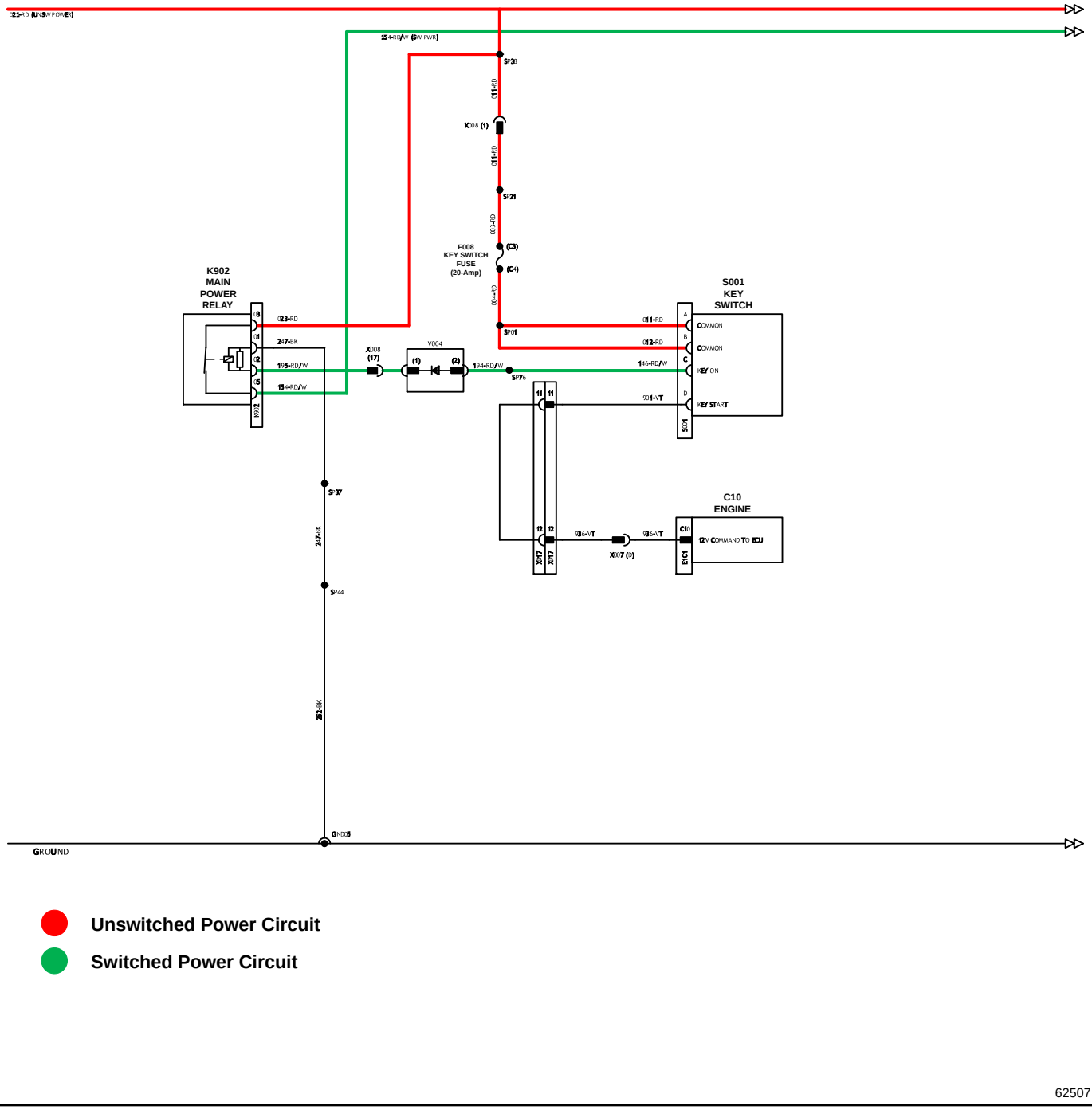


Figure 2-34: Key Switch

2

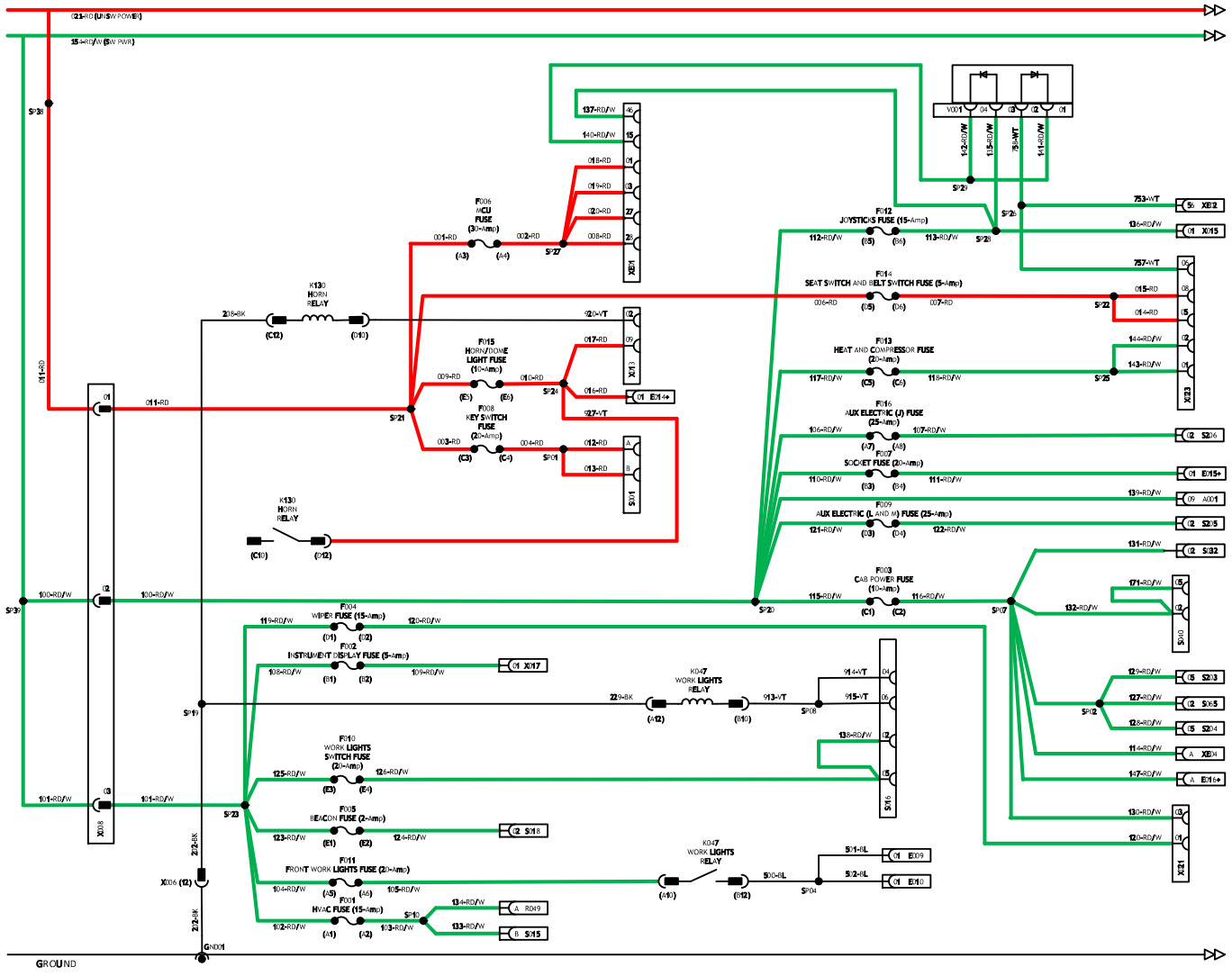
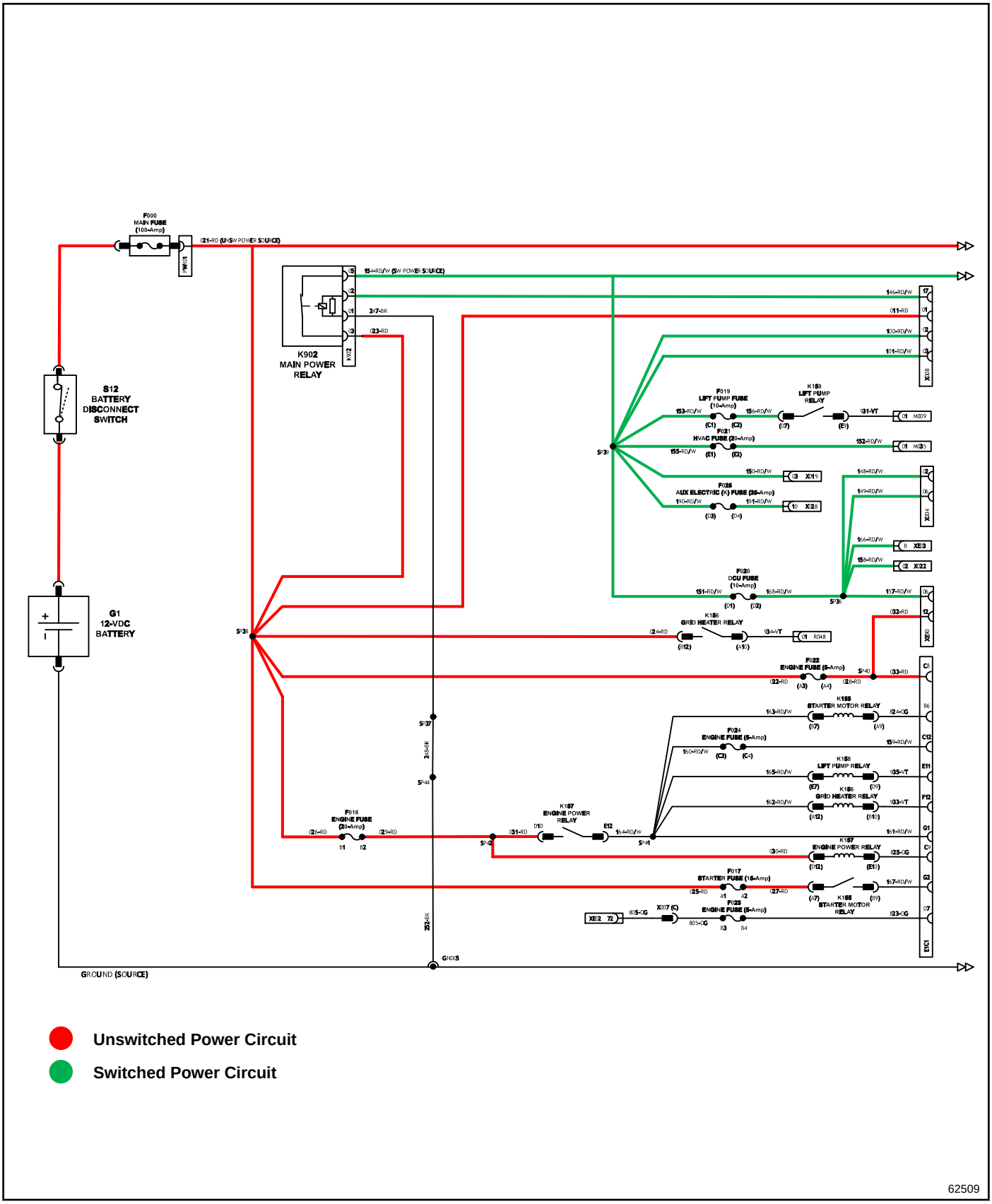


Figure 2-35: Power Distribution - Cabin



62509

Figure 2-36: Power Distribution - Chassis

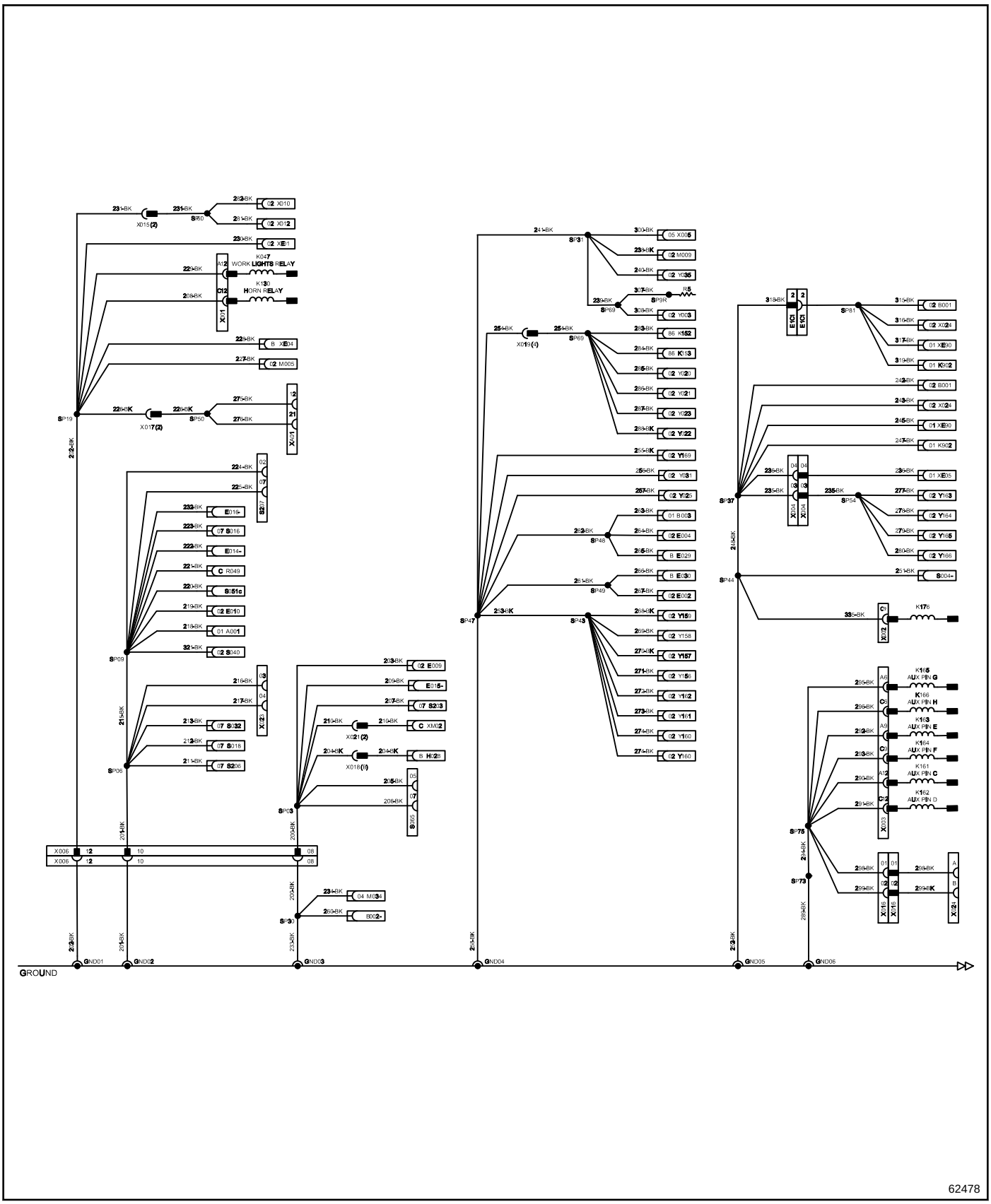


Figure 2-37: Grounds

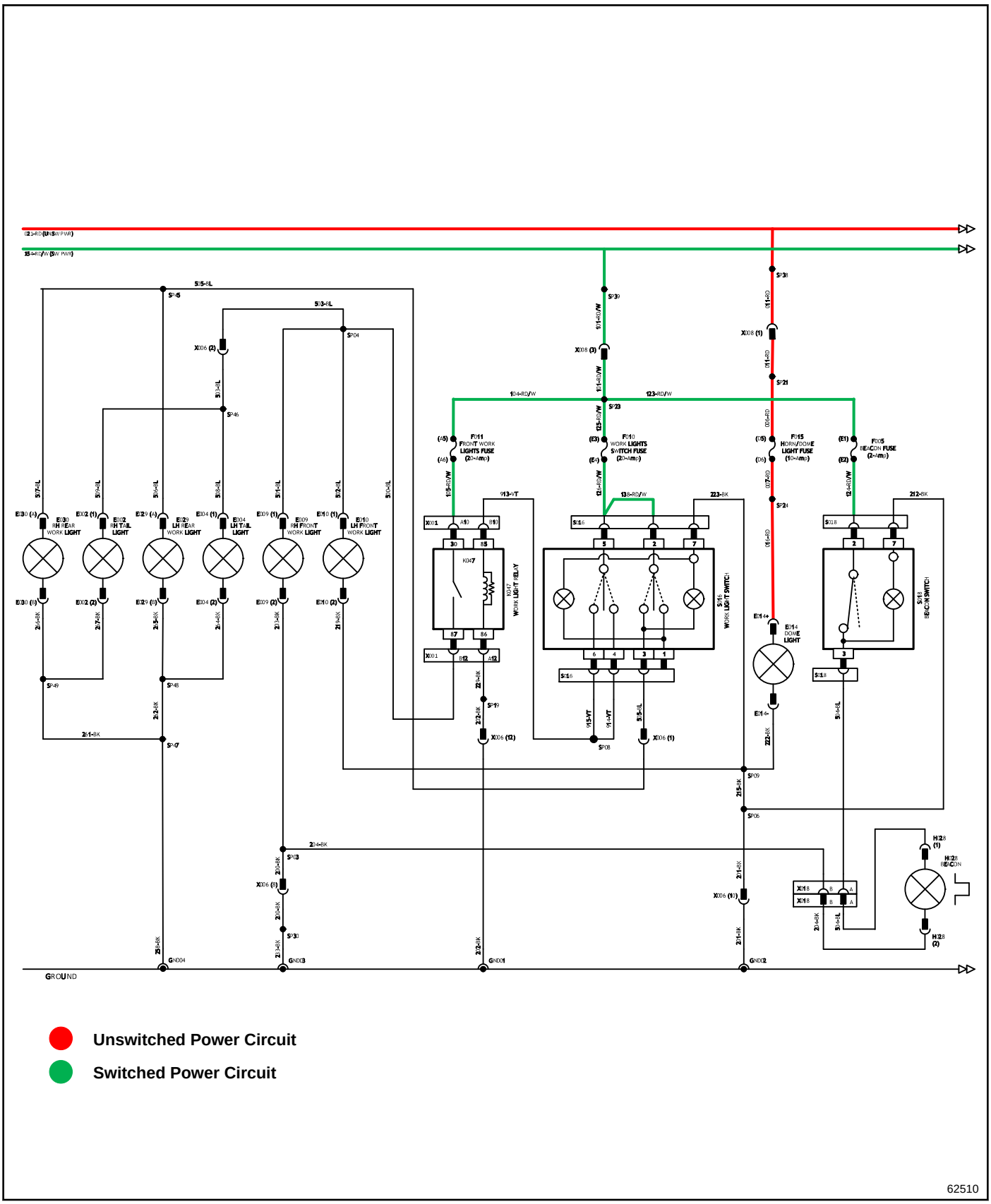


Figure 2-38: Lighting

2

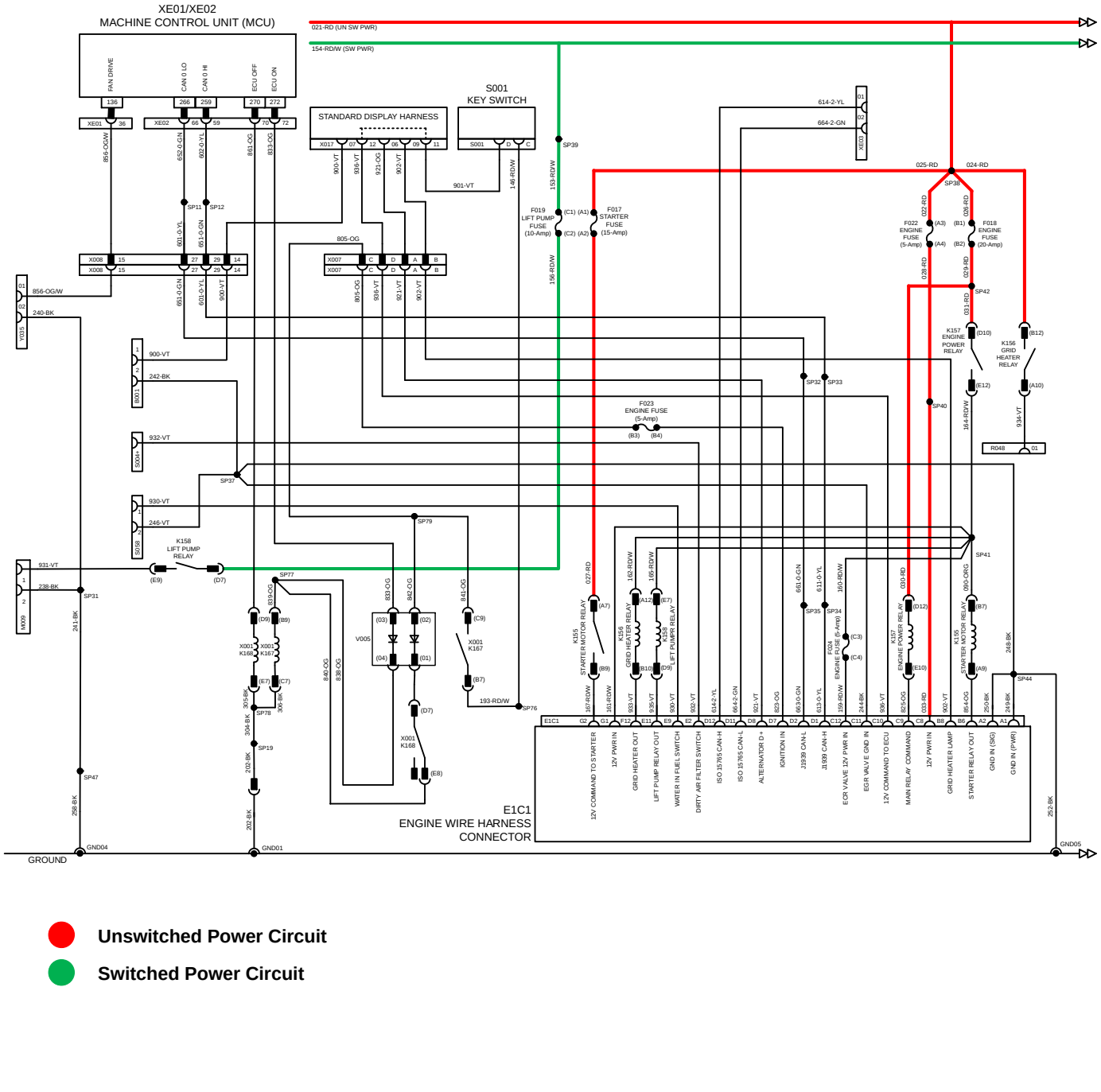


Figure 2-39: Engine Management

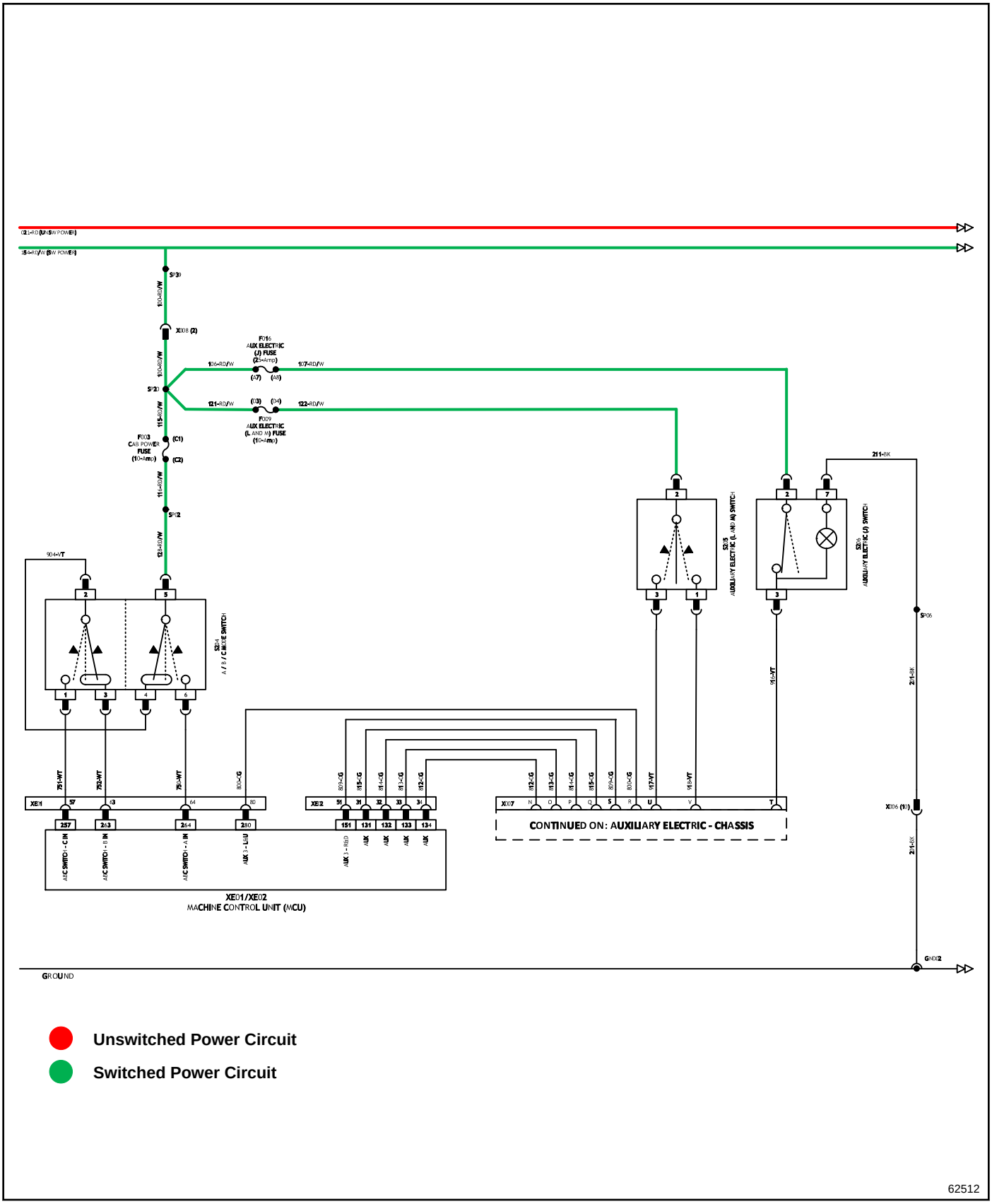


Figure 2-40: Auxiliary Electric - Cab

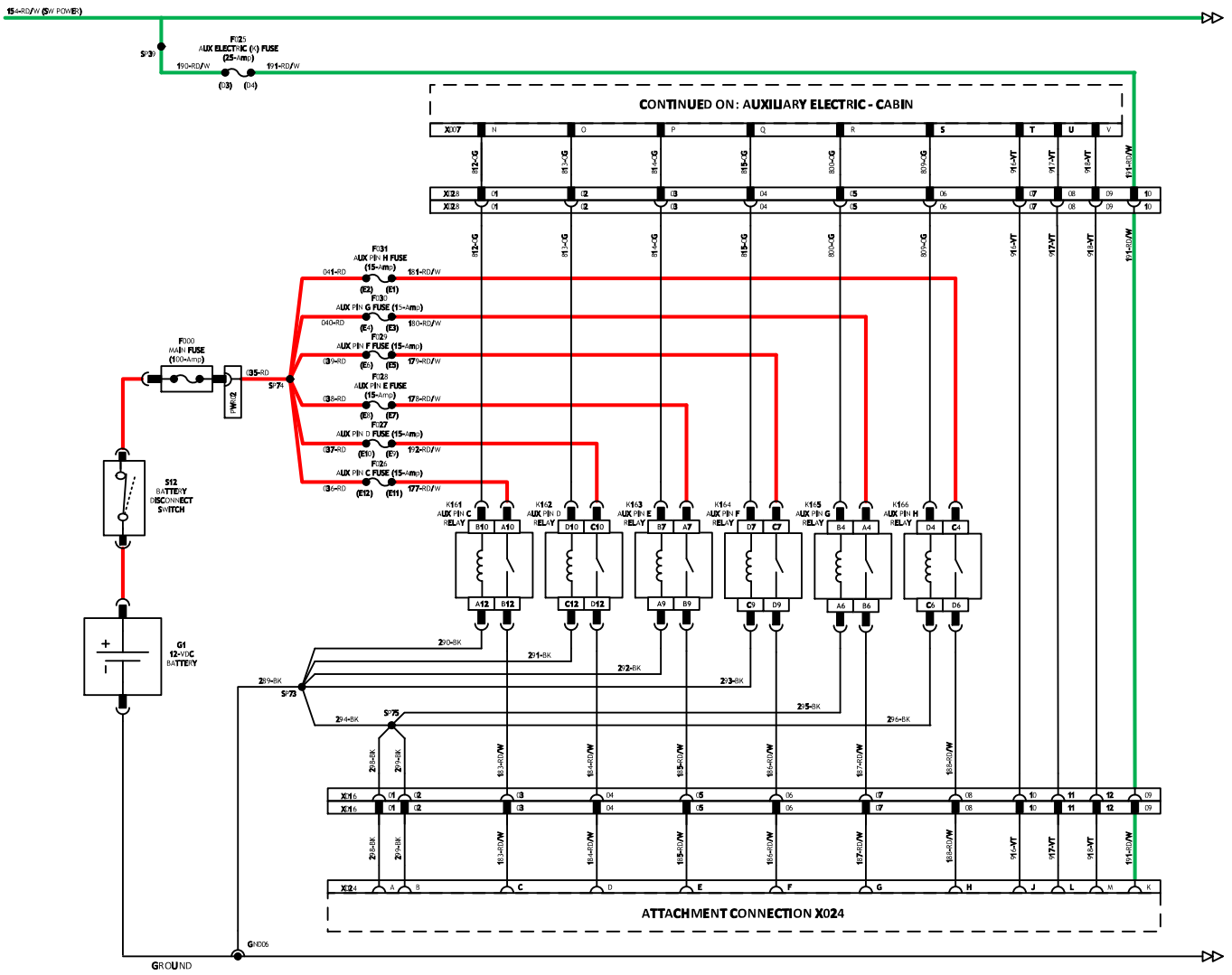


Figure 2-41: Auxiliary Electric - Chassis

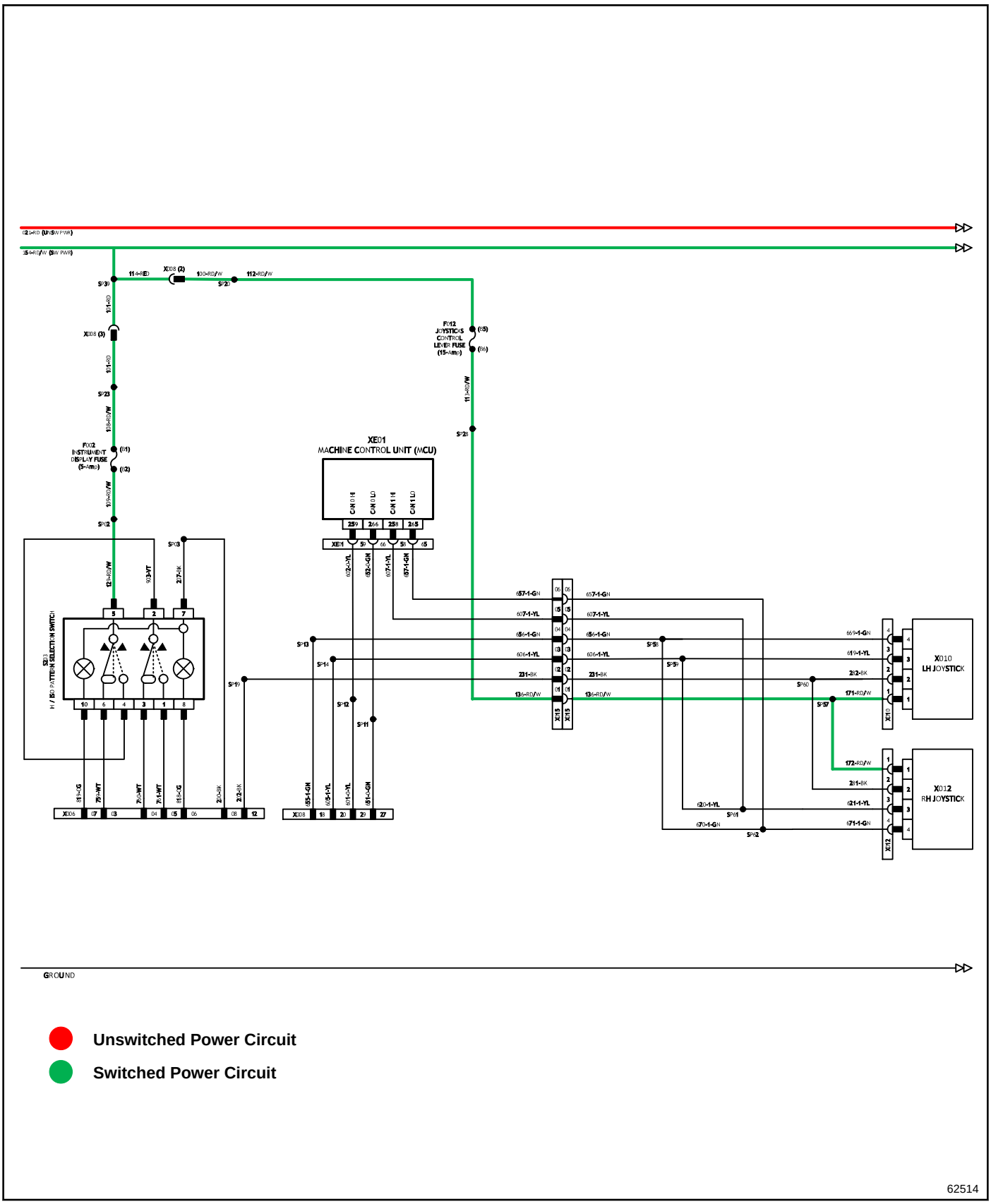


Figure 2-42: Electronic Controls

2

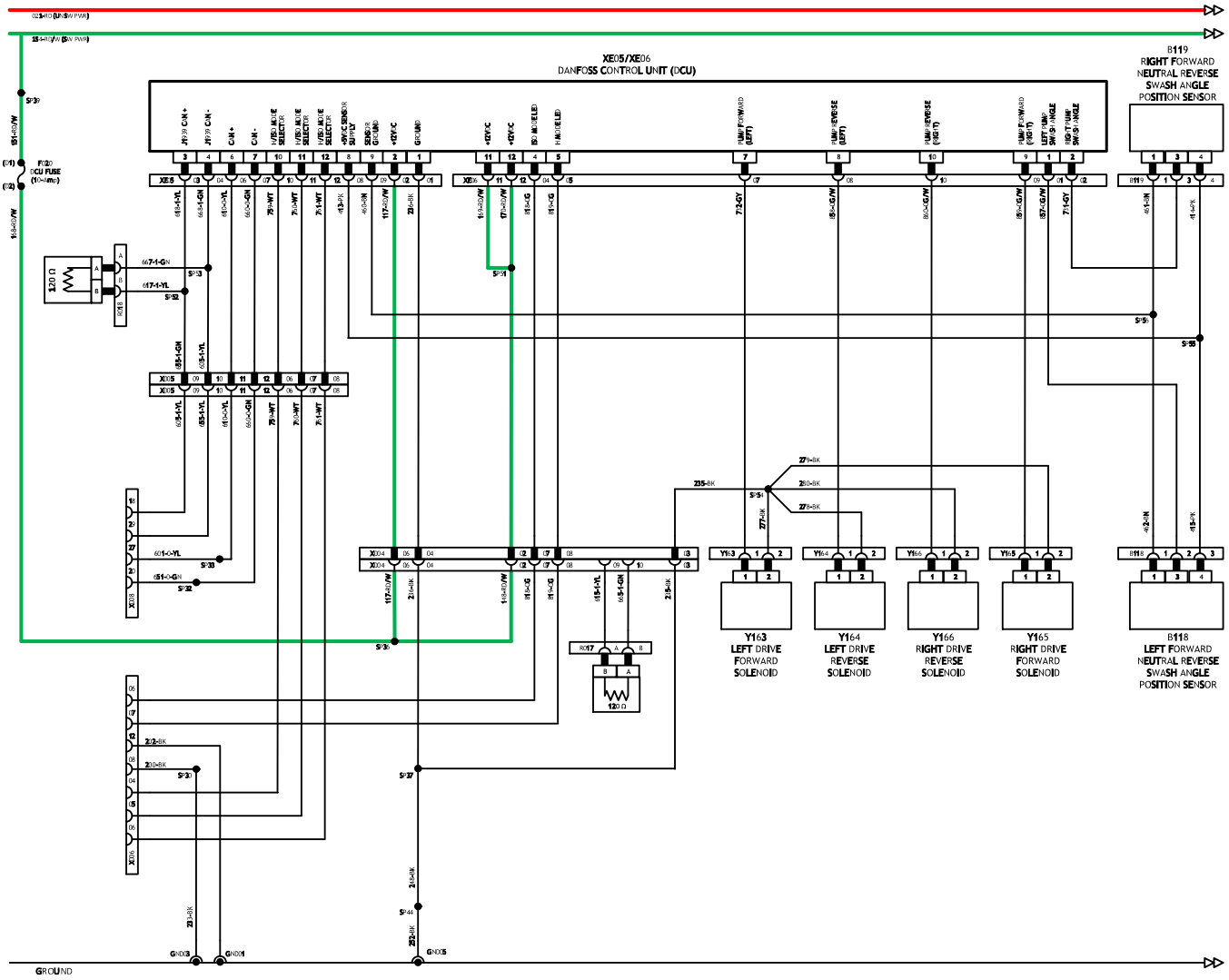


Figure 2-43: Electronic Drive Controls

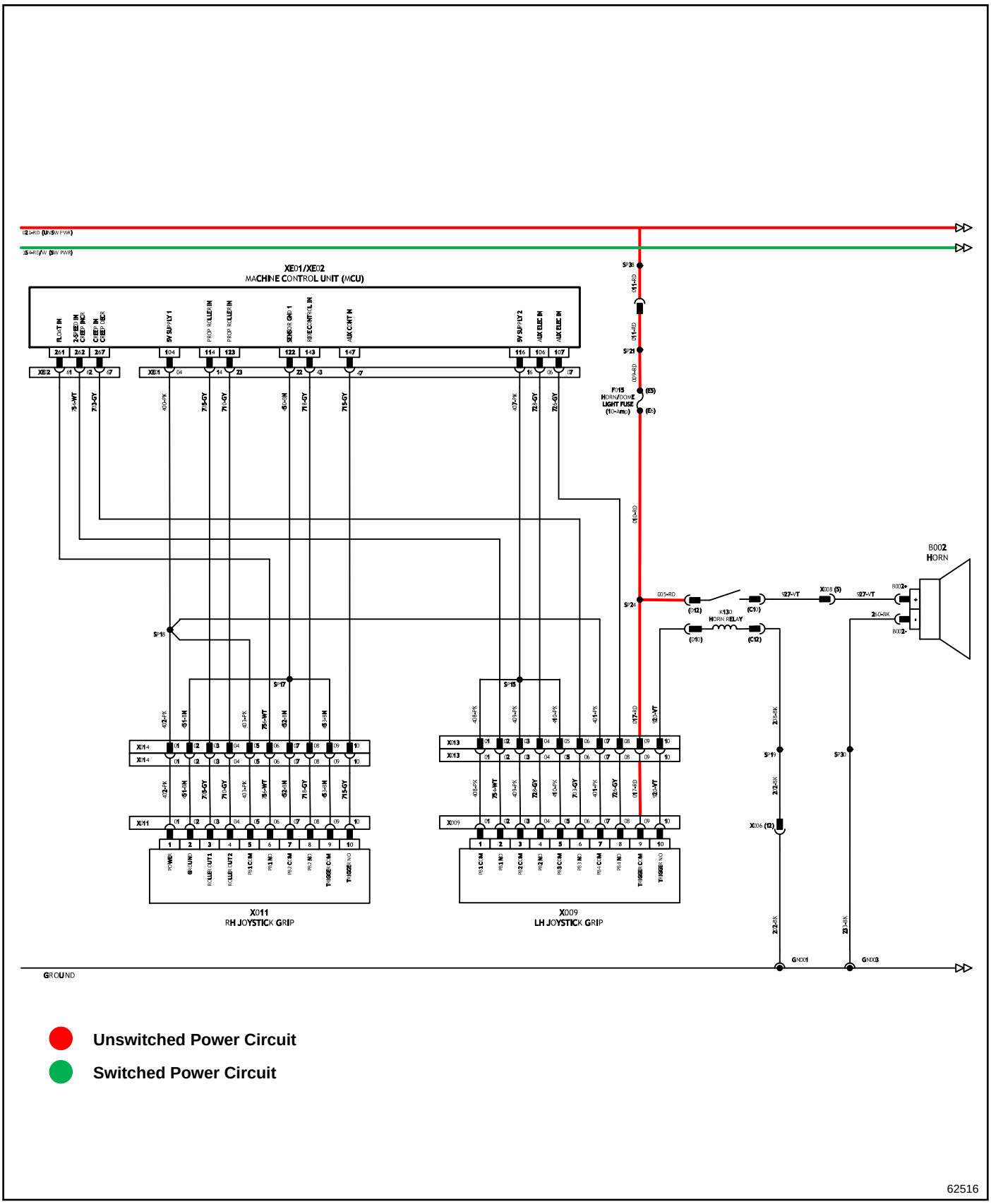


Figure 2-44: Joystick Grip Controls

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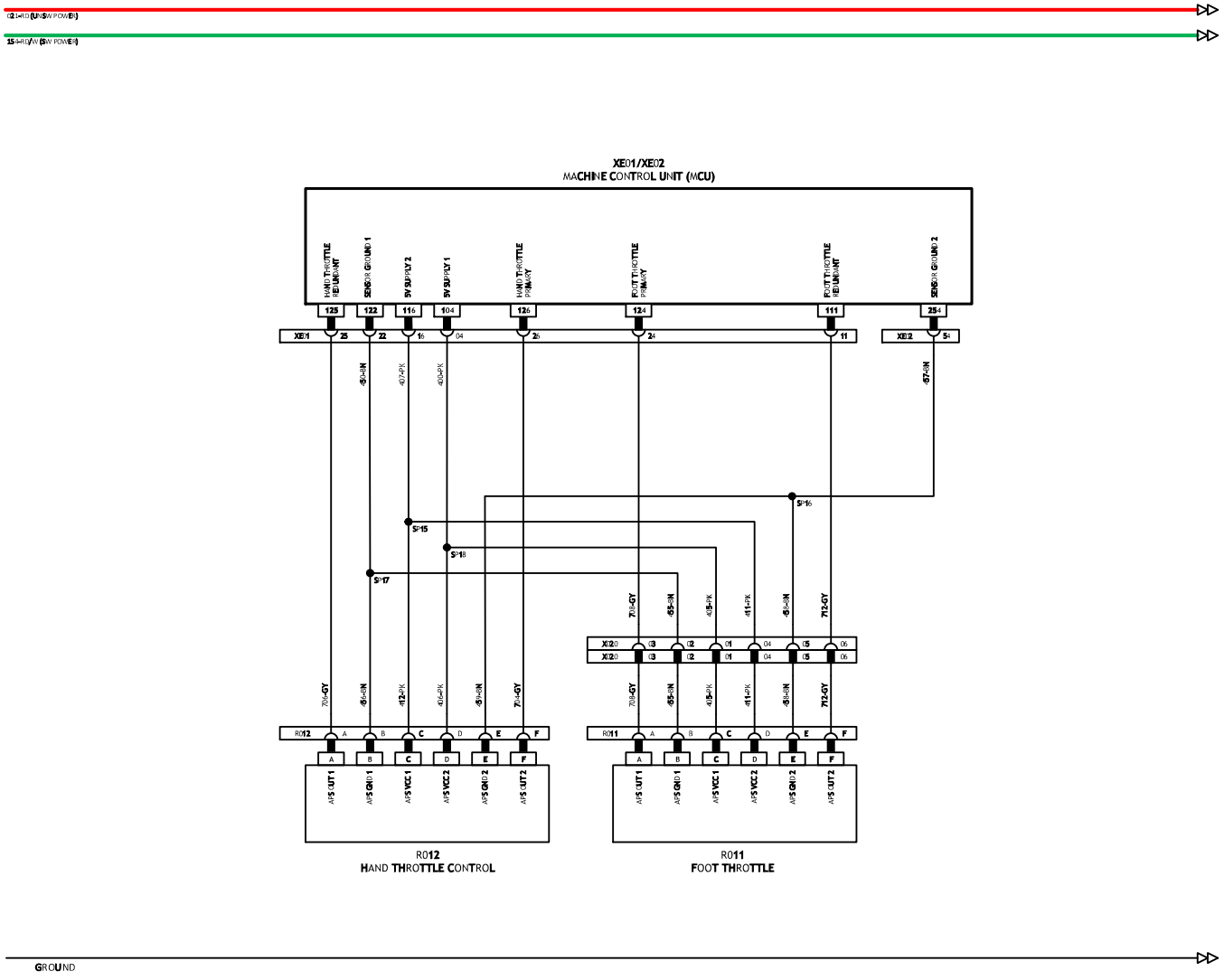


Figure 2-45: Throttles

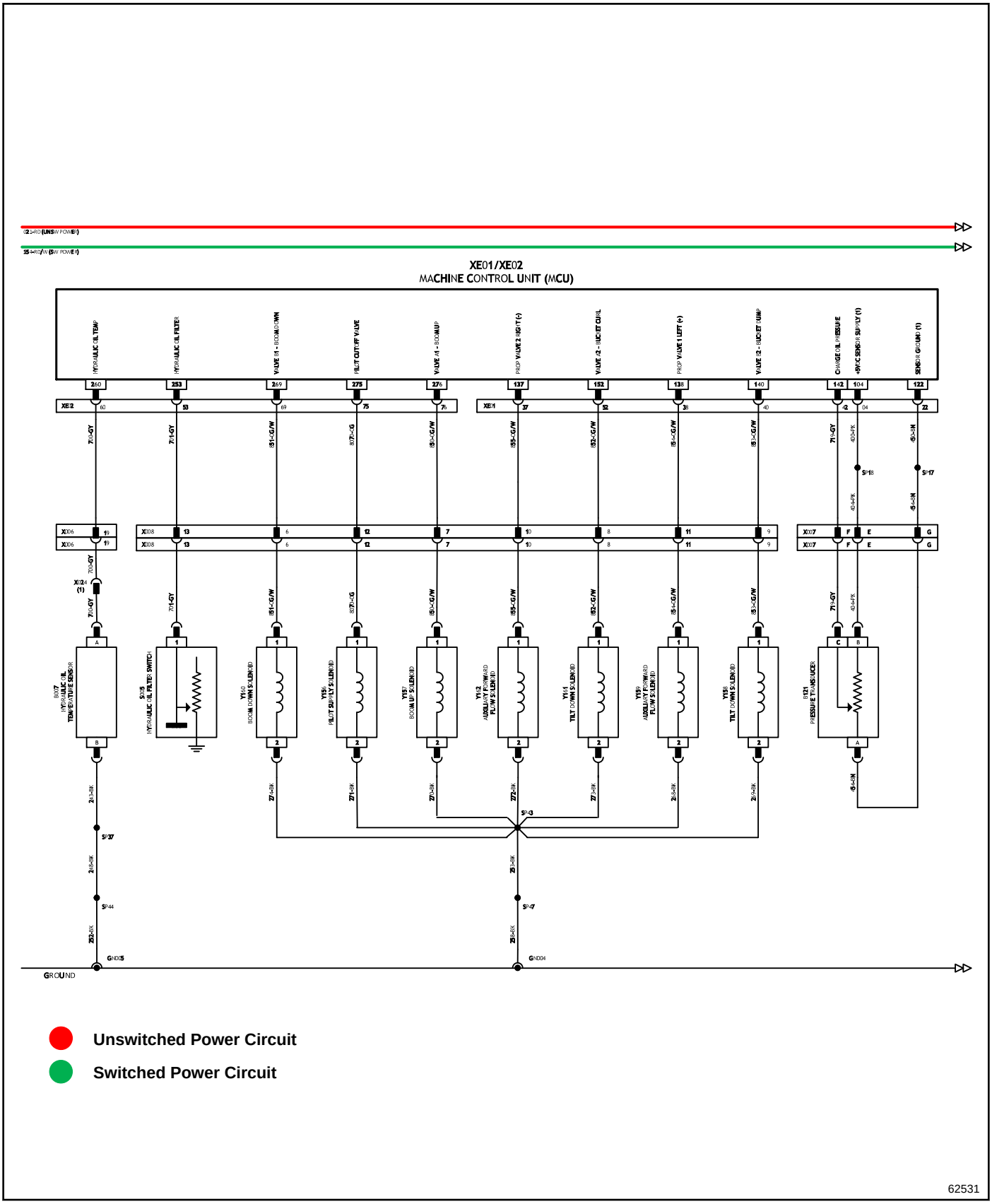


Figure 2-46: Hydraulics - Main

2

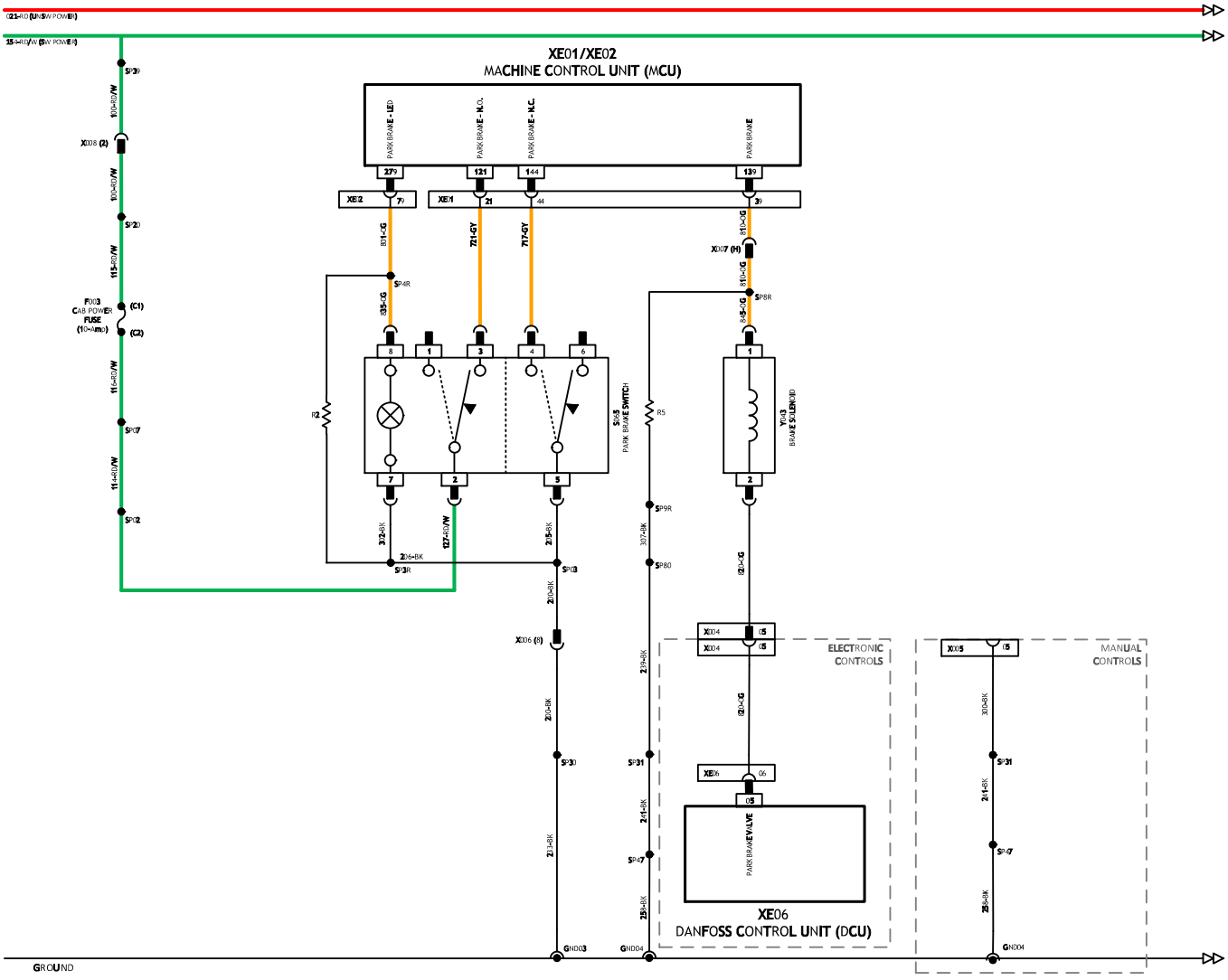


Figure 2-47: Hydraulics - Park Brake

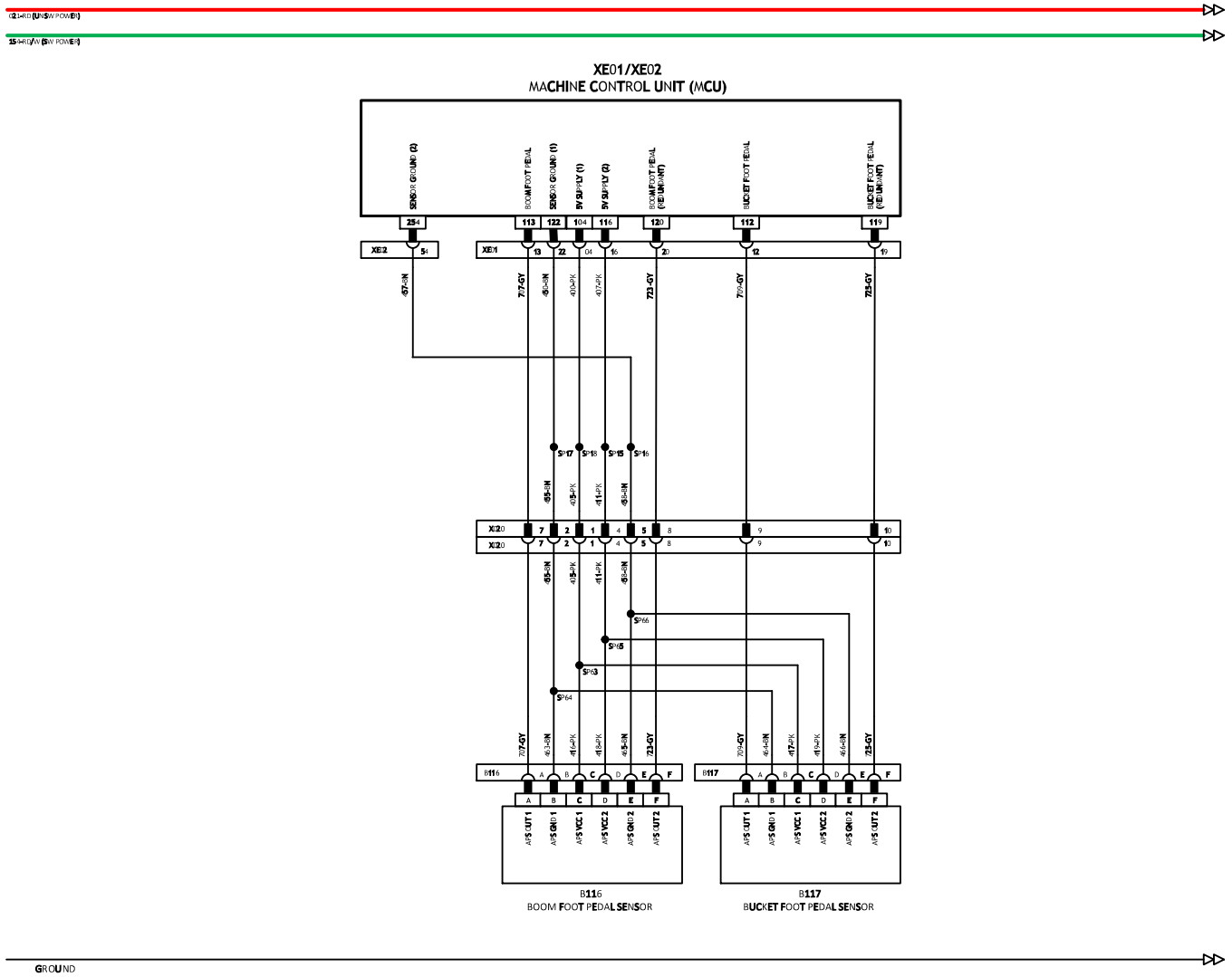
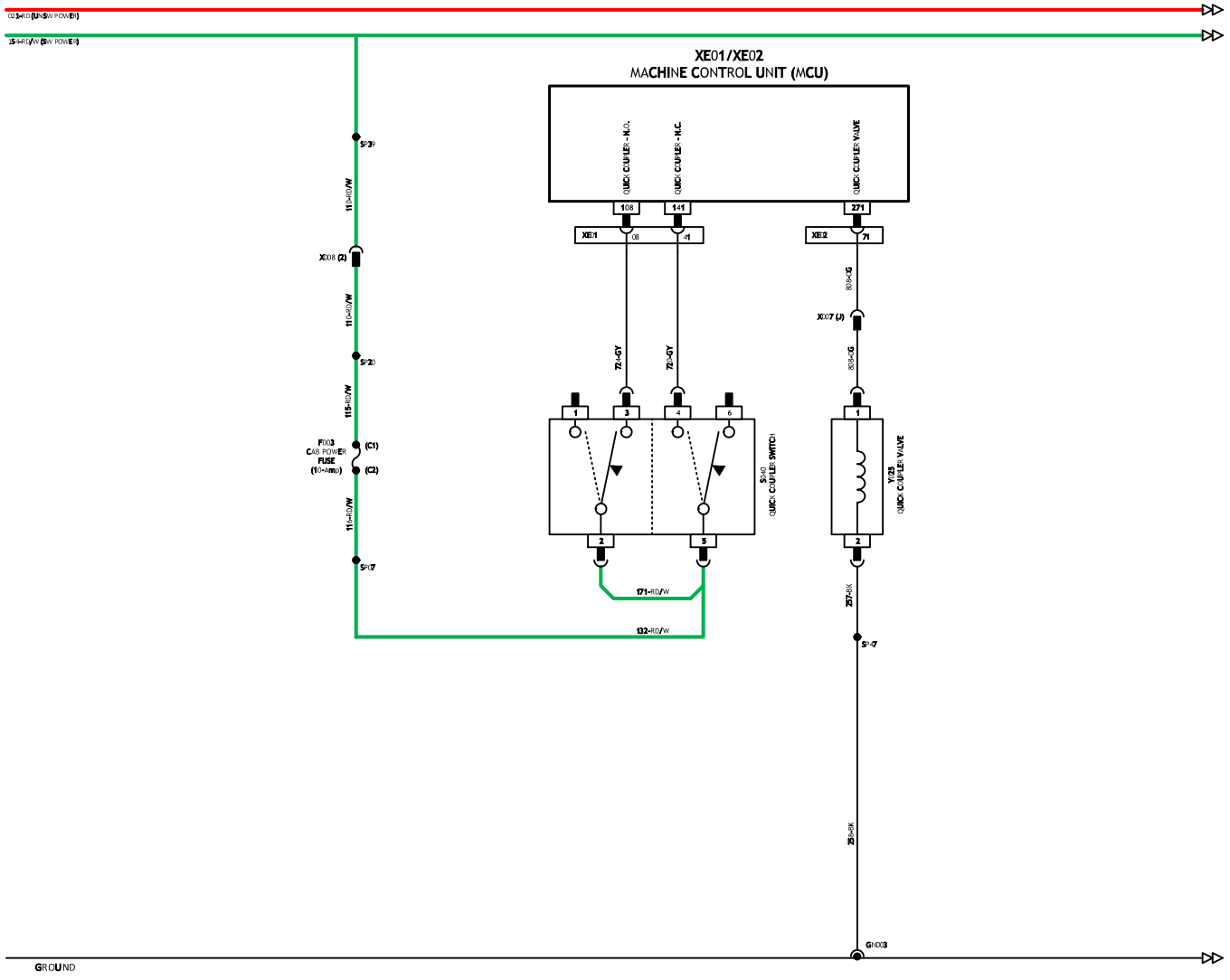


Figure 2-48: Hydraulics - Manual Foot Controls



Unswitched Power Circuit

Switched Power Circuit

62518

Figure 2-49: Hydraulics - Power Coupler

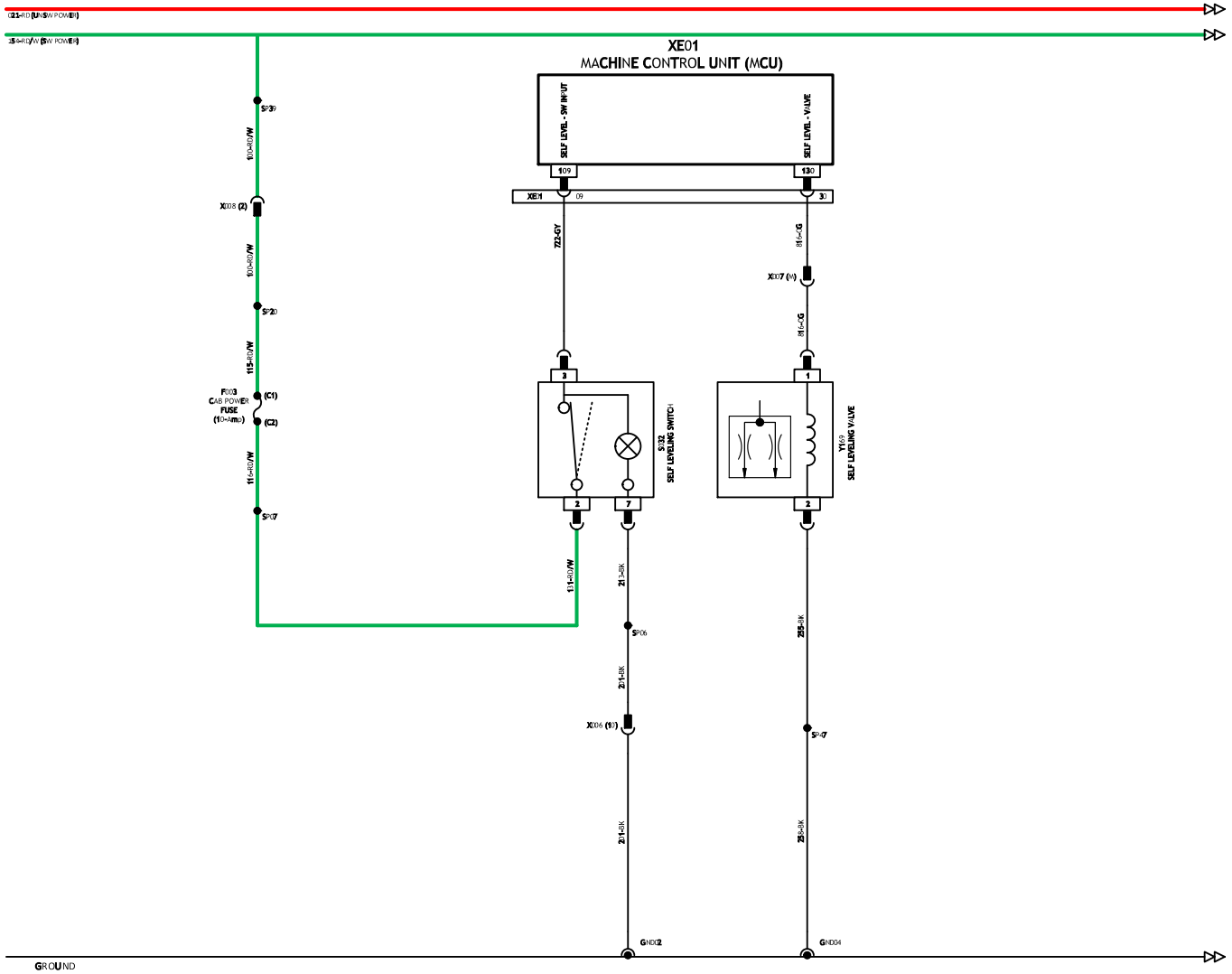
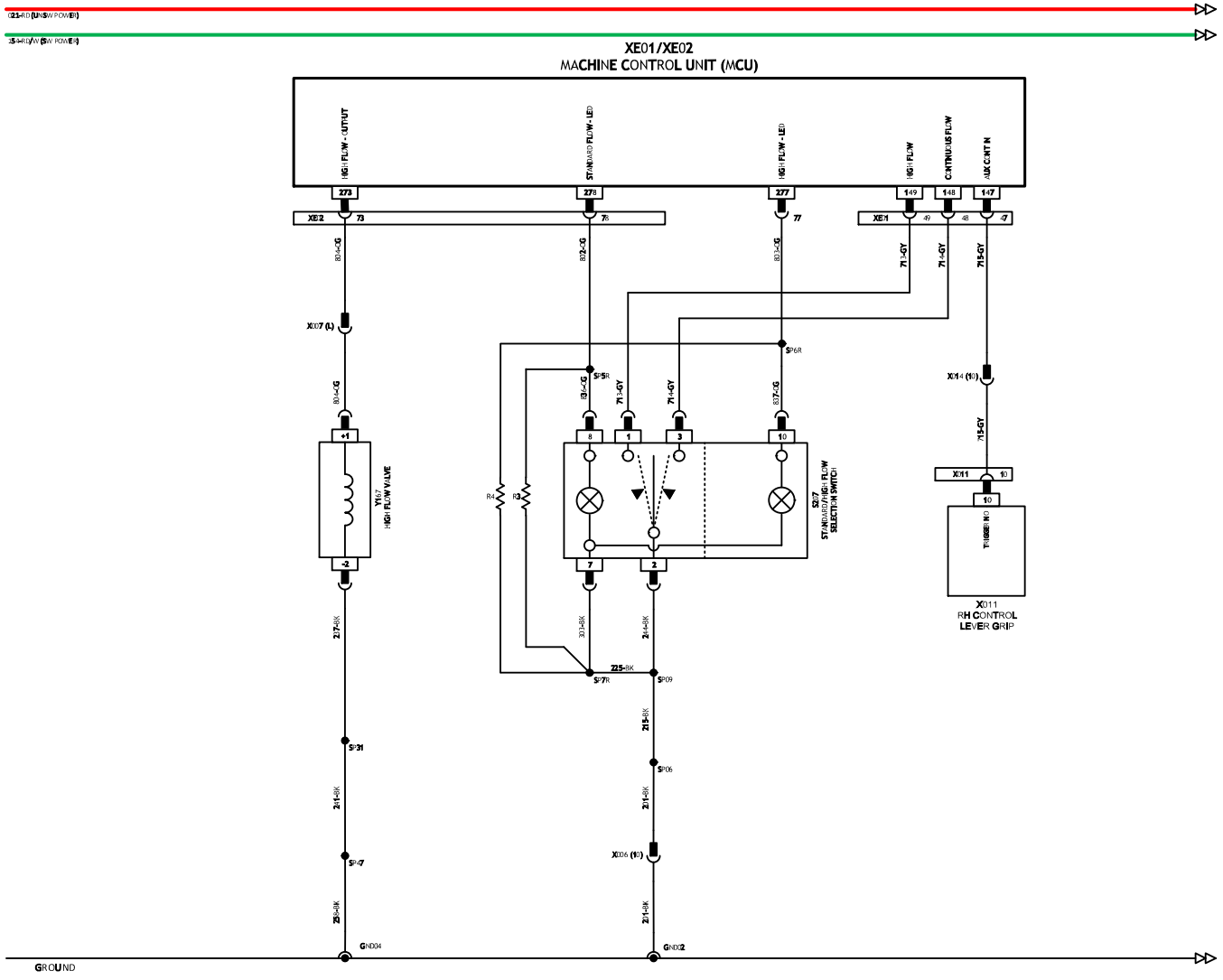


Figure 2-50: Hydraulics - Self Leveling



Unswitched Power Circuit

Switched Power Circuit

62533

Figure 2-51: Hydraulics - Standard/High Flow

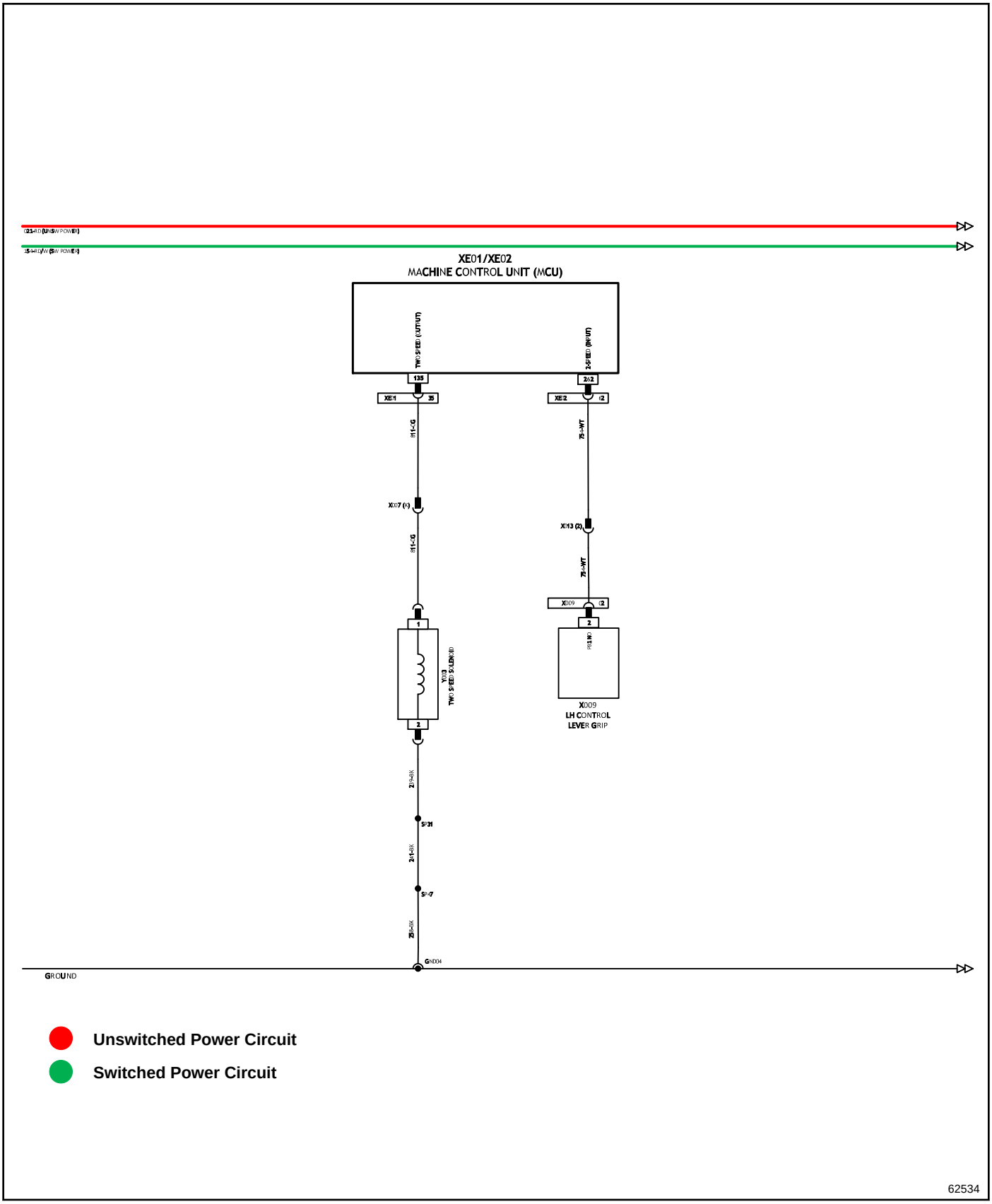


Figure 2-52: Hydraulics - Two Speed

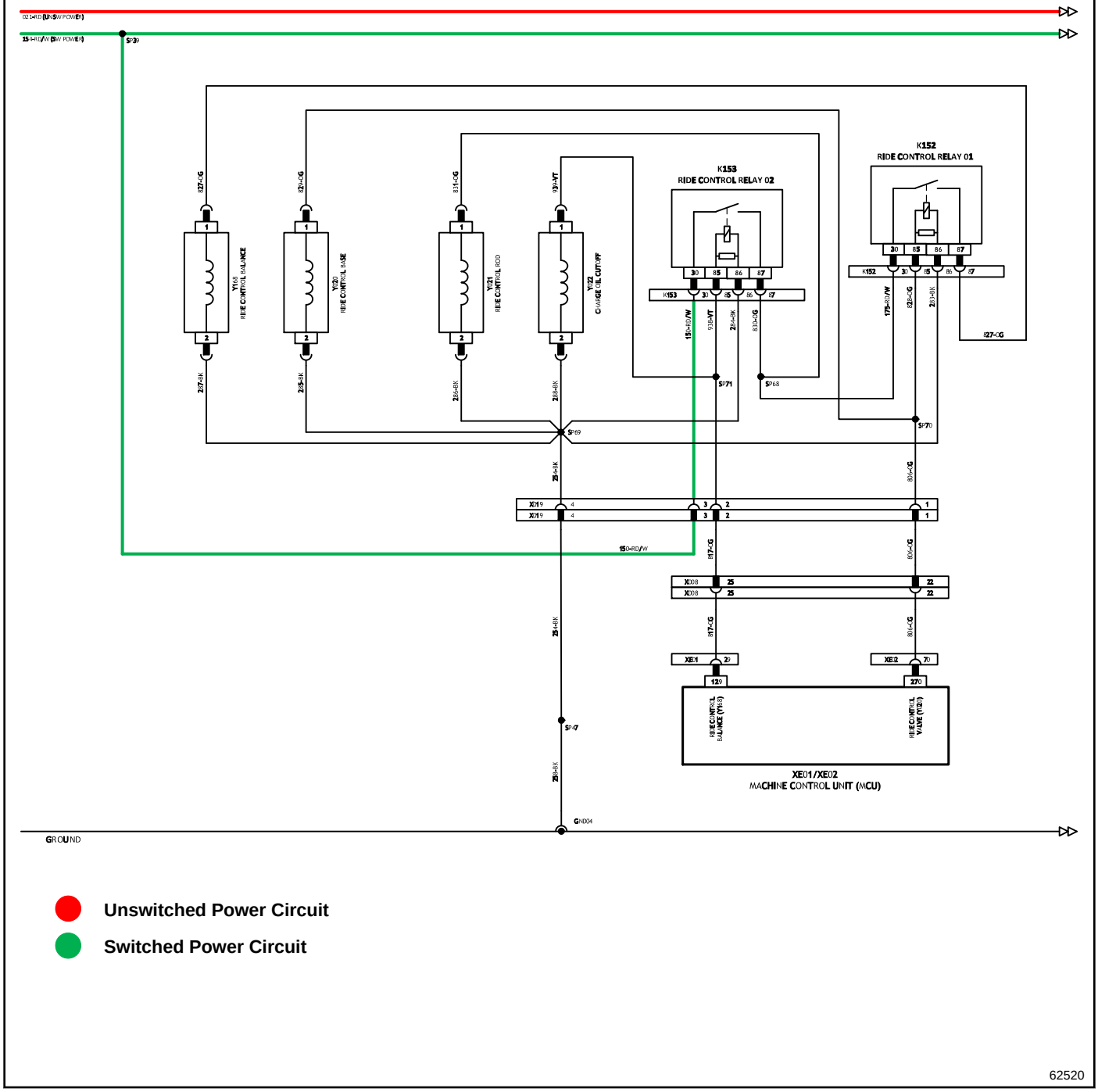


Figure 2-53: Hydraulics - Ride Control

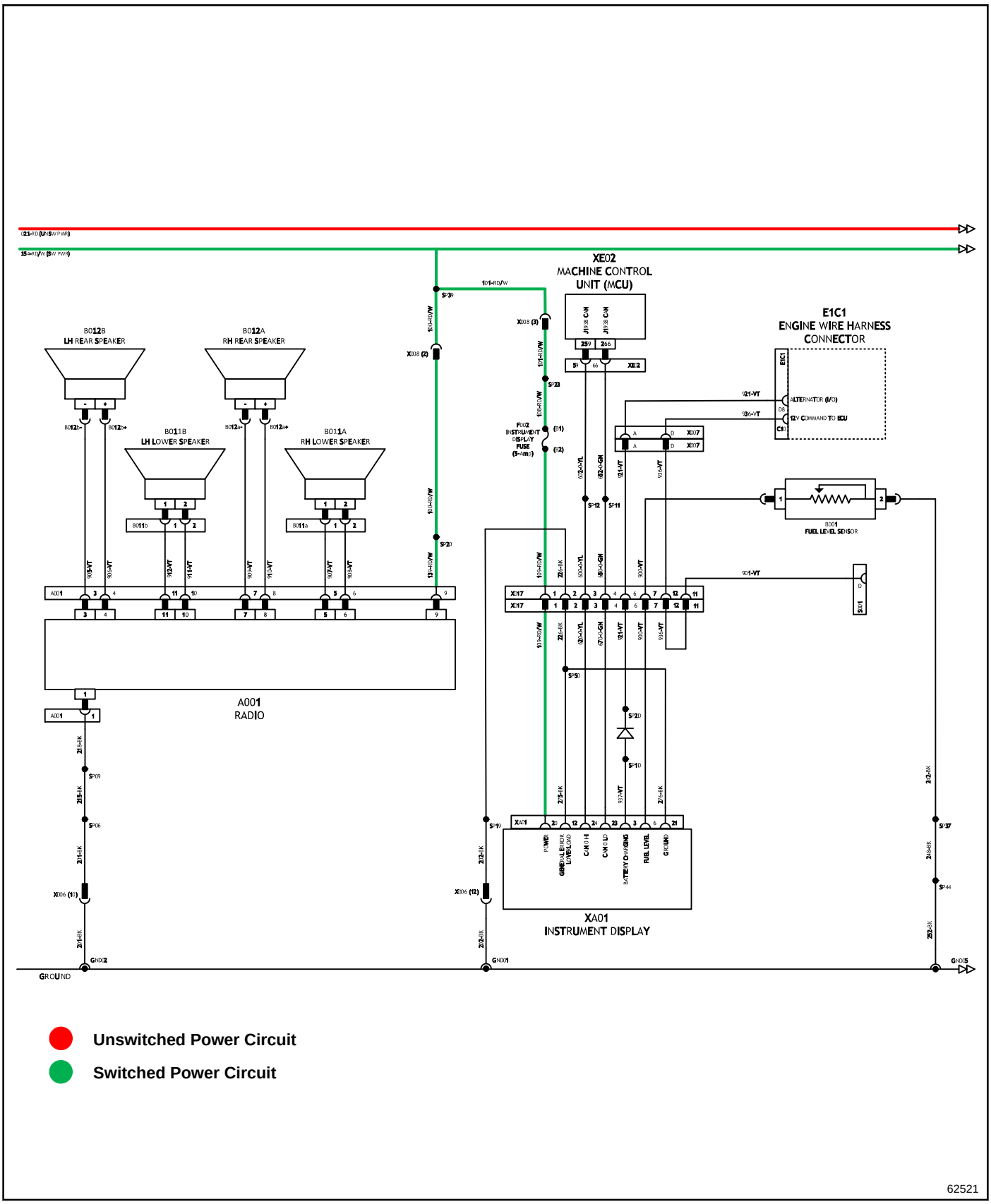


Figure 2-54: Radio and Display

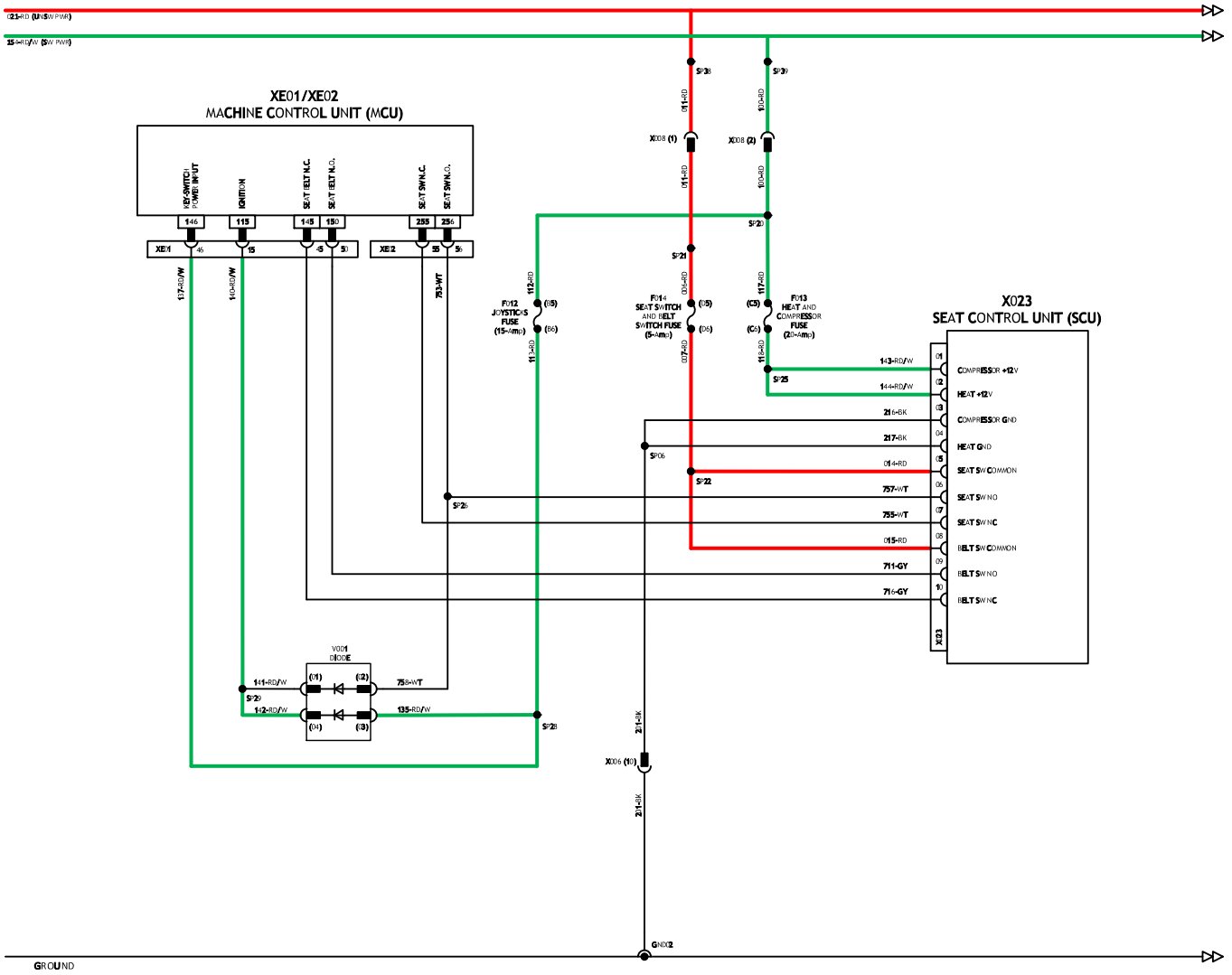


Figure 2-55: Seat

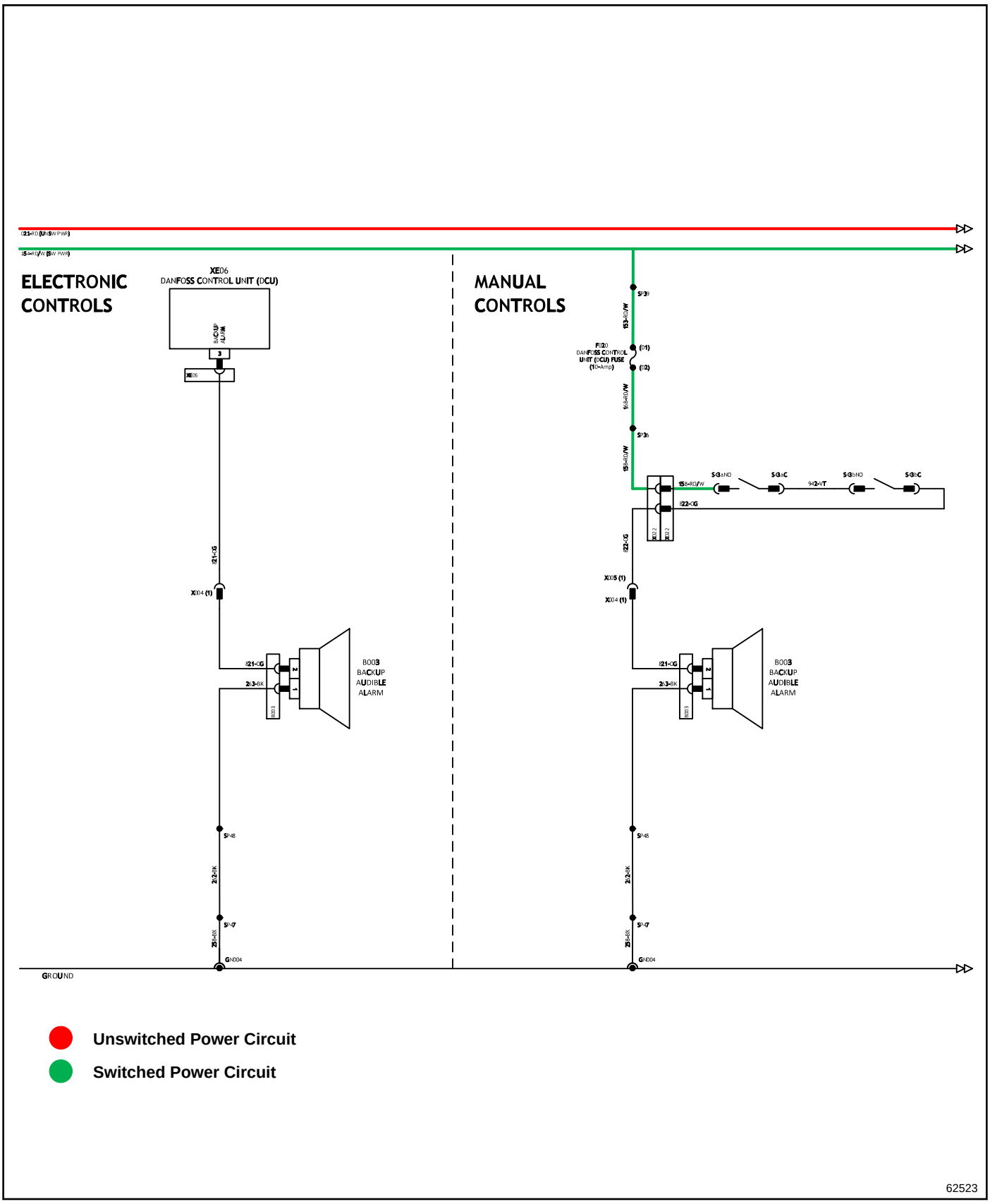


Figure 2-56: Backup Alarm

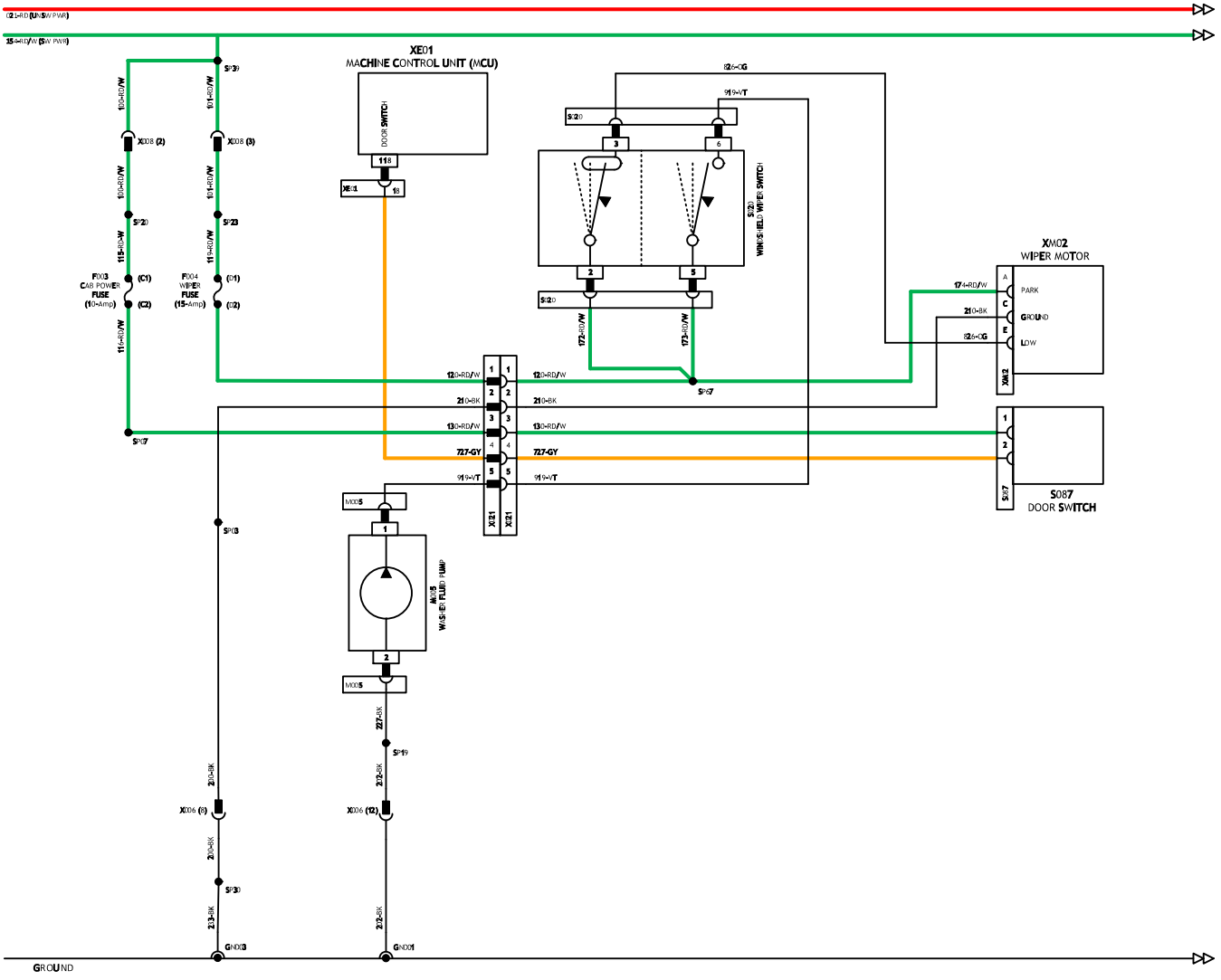


Figure 2-57: Door and Washer

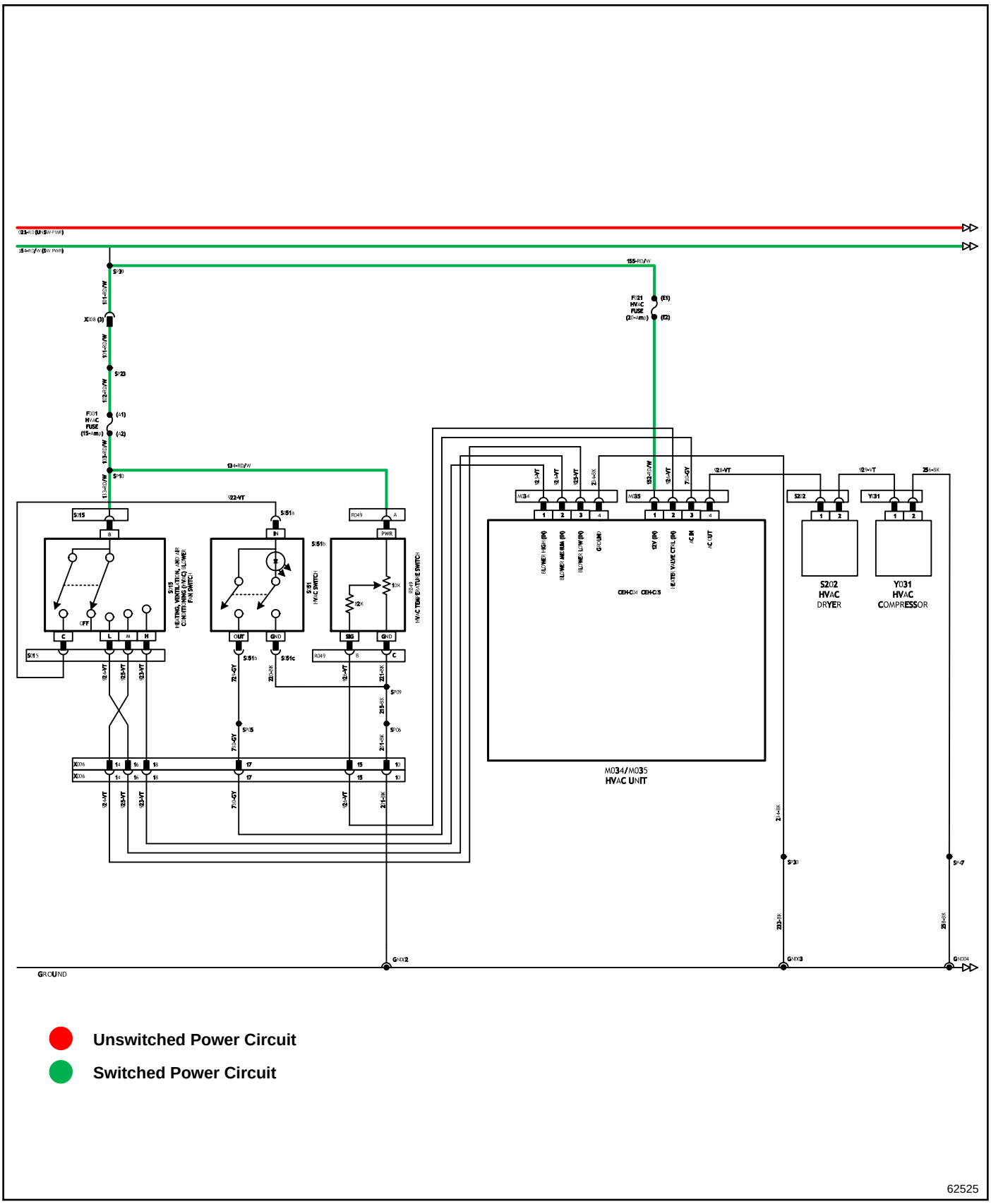


Figure 2-58: Heating, Ventilation, and Air Conditioning (HVAC)

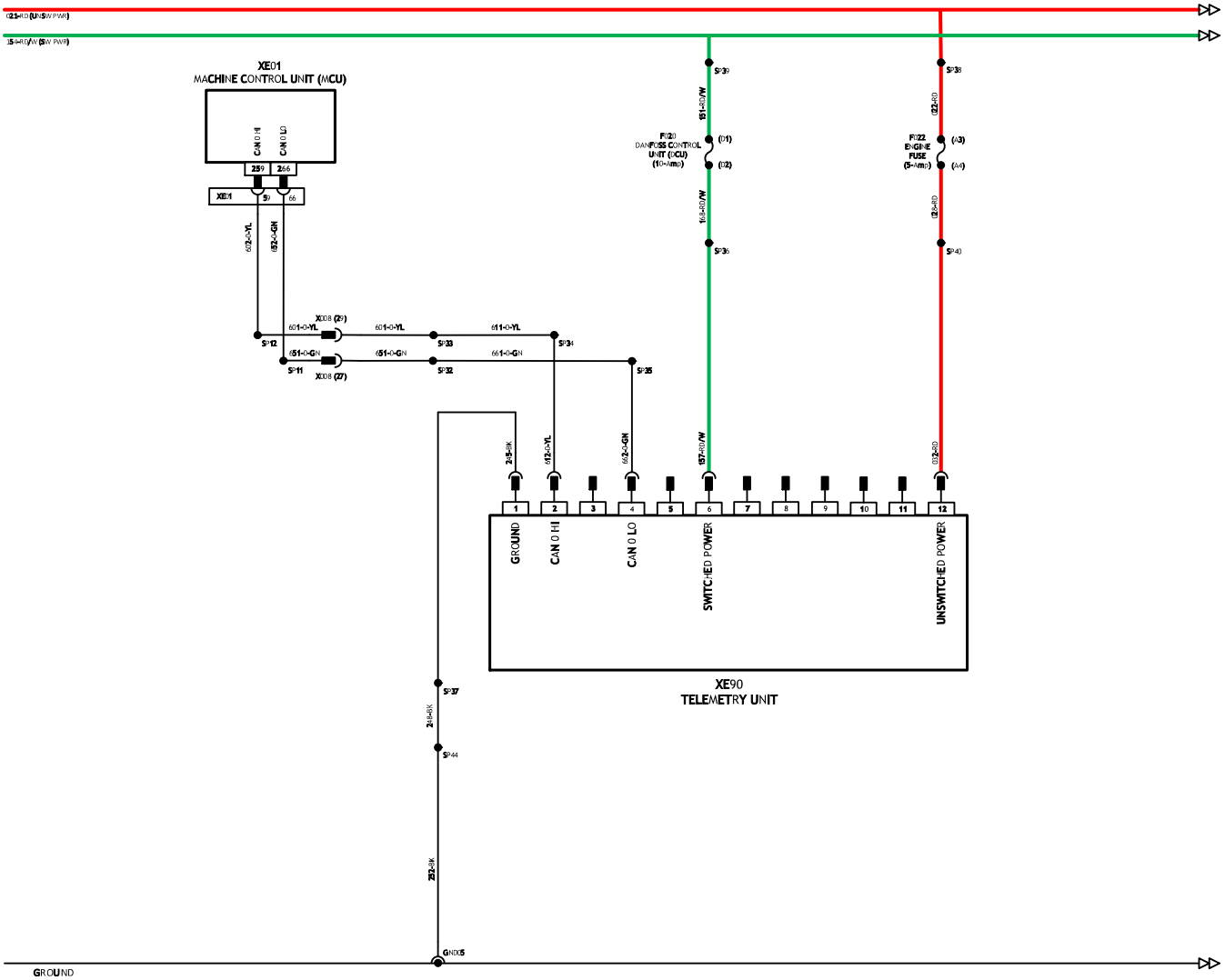


Figure 2-59: Telemetry

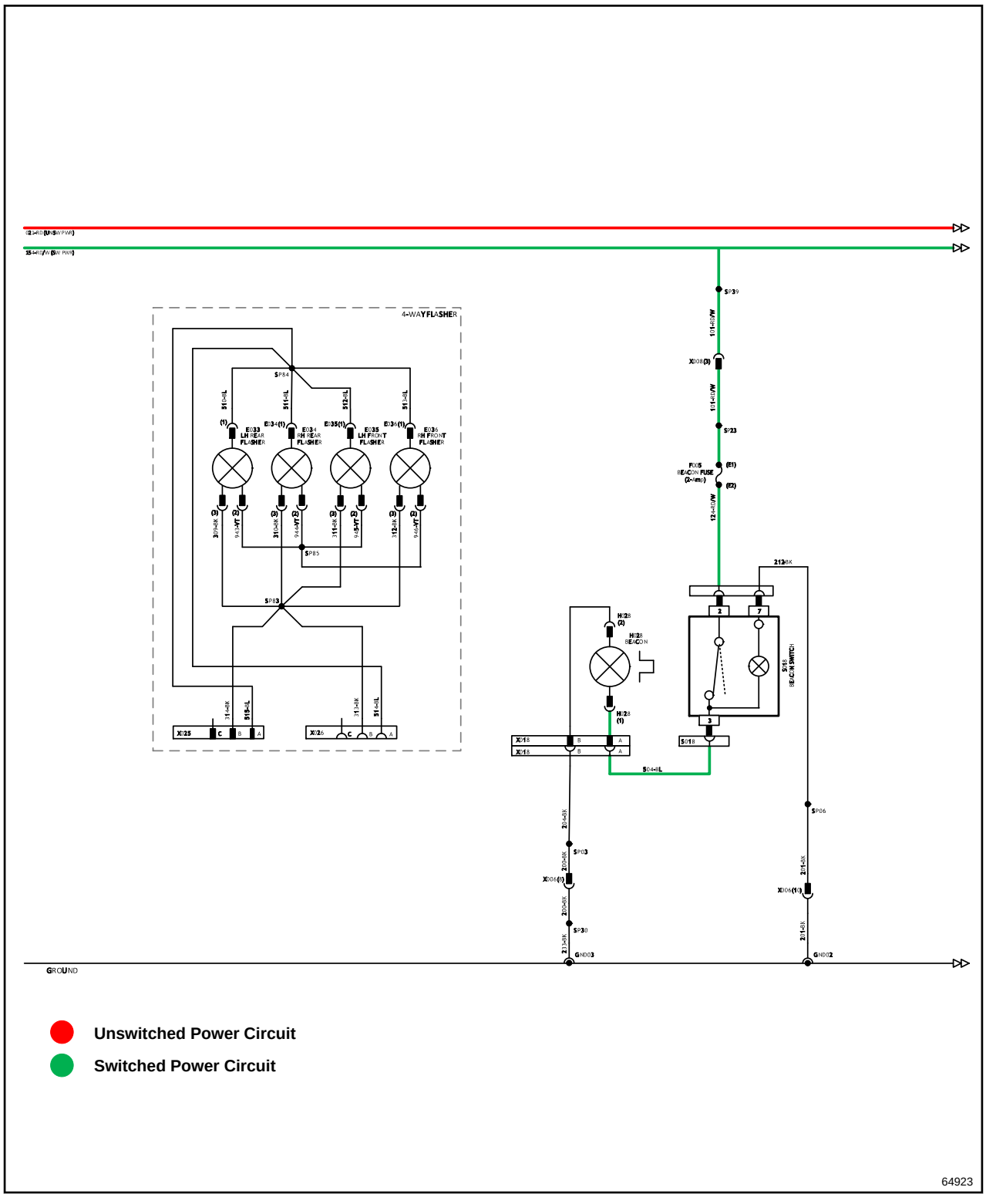


Figure 2-60: Rotating Beacon and Four Way Flashers

Start Circuit—Theory of Operation

Unswitched Power

Unswitched power is available from the battery positive terminal to the battery disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR01) to the following:

- 20-amp key switch fuse (F008)
- Main power relay (K902) terminal 03
- 15-amp starter fuse (F017)
- 20-amp engine fuse (F018)
- Grid heater relay (K156) terminal B12

Unswitched power is provided from the 20-amp key switch fuse (F008) to key switch (S001) terminals A and B.

Unswitched power is provided from the 15-amp starter fuse (F017) to starter relay (K155) terminal A7.

Unswitched power is provided from the 20-amp engine fuse (F018) to engine power relay (K157) terminals D10 and D12.

Switched Power

When the key switch (S001) is turned to the ON position, power is provided from key switch (S001) terminal C to diode connector (V004) terminal 2. Power is then provided from diode connector (V004) terminal 1 to main power relay (K902) terminal 02, energizing the relay. With the main power relay (K902) energized, switched power is provided from main power relay (K902) terminal 05 to the 10-amp lift pump fuse (F019). Power is then provided to the lift pump relay (K158) from lift pump fuse (F019).

Start Circuit

When the key switch (S001) is turned to the START position power is provided from key switch (S001) terminal D to display unit connector (X017) terminal 11. Power is then provided from display unit (X017) connector terminal 12 to engine wire harness connector (E1C1) terminal C10. Power is provided from the engine wire harness connector terminal (E1C1) C10 to the Engine Control Unit (ECU).

The ECU provides a ground through engine wire harness connector (E1C1) terminal C9 to engine power relay (K157) terminal E10, energizing the relay. With engine power relay (K157) energized, power is provided from terminal E12 to the following:

- Starter relay (K155) terminal B7
- Grid heater relay (K156) terminal A12
- Lift pump relay (K158) terminal E7

The ECU provides a ground through engine wire harness connector (E1C1) terminal E11 to pump relay (K158) terminal D9, energizing the relay. Power is then provided from lift pump relay (K158) terminal E9, powering the lift pump.

The ECU provides a ground through engine wire harness connector (E1C1) terminal F12 to grid heater relay (K156) terminal B10, energizing the relay. Power is then provided from grid heater relay (K156) terminal A10 to the engine grid heater.

The ECU provides a ground through engine wire harness connector (E1C1) terminal B6 to starter relay (K155) terminal A9, energizing the relay. With the starter relay (K155) energized power is provided from terminal B9 through engine wire harness connector (E1C1) terminal G2 to the starter solenoid, engaging the starter motor and starting the machine.

Start Circuit Schematic

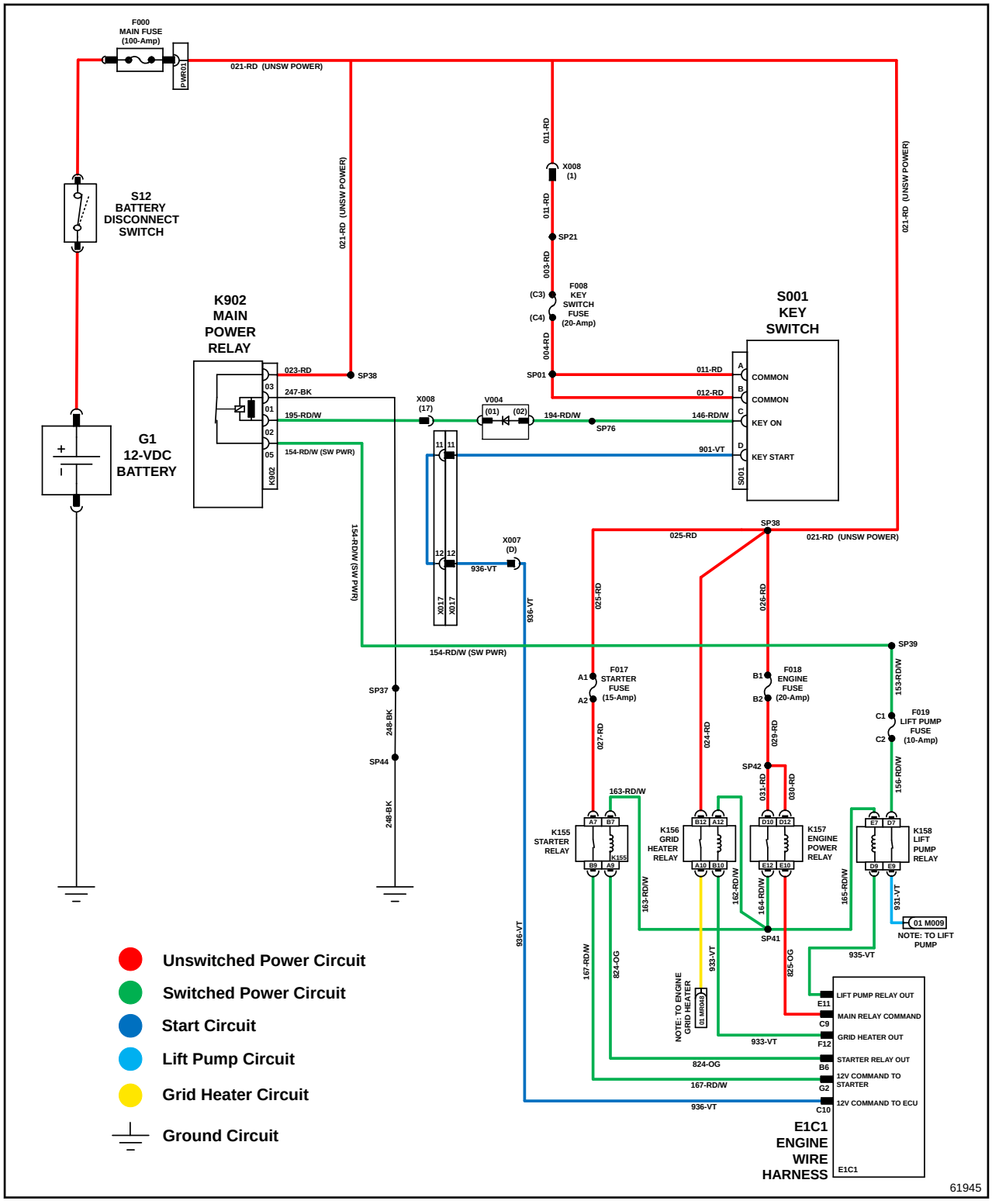


Figure 2-61

Run Circuit—Theory of Operation

Unswitched Power

Unswitched power is available from the battery positive terminal to the battery disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR01) to the following:

- 20-amp key switch fuse (F008)
- 30-amp Machine Control Unit (MCU) fuse (F006)
- Main power relay (K902) terminal 03
- 20-amp engine fuse (F018)
- 5-amp engine fuse (F022)
- Grid heater relay (K156) terminal B12

Unswitched power is provided from the 20-amp key switch fuse (F008) to key switch terminals A and B.

Unswitched power is provided from the 20-amp engine fuse (F018) to engine power relay (K157) terminals D10 and D12.

Unswitched power is provided from the 5-amp engine fuse (F022) to engine wire harness connector (E1C1) terminal C8.

Switched Power

When the key switch (S001) is turned to the ON position, power is provided from key switch (S001) terminal C to diode connector (V004) terminal 02 and Engine Control Unit (ECU) power latch trigger relay (K167) terminal B7. Power is then provided from diode connector (V004) terminal 1 to main power relay (K902) terminal 02, energizing the relay. With the main power relay (K902) energized, switched power is provided from main power relay (K902) terminal 05 to the 10-amp lift pump fuse (F019). Power is then provided to the lift pump relay (K158) from the 10-amp lift pump fuse (F019).

Run Circuit

Unwitched power is provided from the 30-amp MCU fuse (F006) to the MCU (XE01) terminals 101, 103, 127, and 128. Switched power is then provided from the MCU (XE01) to diode connector (V005) terminal 03. Switched power is then provided from diode connector (V005) terminal 04 to ECU power latch trigger relay (K167) terminal B9, energizing the relay. With the ECU power latch trigger relay (K167) energized, power is provided from ECU power latch trigger relay (K167) terminal C9 to the 5-amp engine fuse (F023). The engine wire harness connector (E1C1) terminal D7 is provided switched power from the 5-amp engine fuse (F023). The ECU provides a ground through engine wire harness connector (E1C1) terminal D7, powering the ignition in circuit.

The ECU provides a ground through engine wire harness connector (E1C1) terminal C9 to engine power relay (K157) terminal E10, energizing the relay. With engine power relay (K157) energized, power is provided from terminal E12 to the following:

- Grid heater relay (K156) terminal A12
- Lift pump relay (K158) terminal E7

The ECU provides a ground through engine wire harness connector (E1C1) terminal E11 to pump relay (K158) terminal D9, energizing the relay. Power is then provided from lift pump relay (K158) terminal E9, powering the lift pump.

The ECU provides a ground through engine wire harness connector (E1C1) terminal F12 to grid heater relay (K156) terminal B10, energizing the relay. Power is then provided from grid heater relay (K156) terminal A10 to the engine grid heater.

Run Circuit Schematic

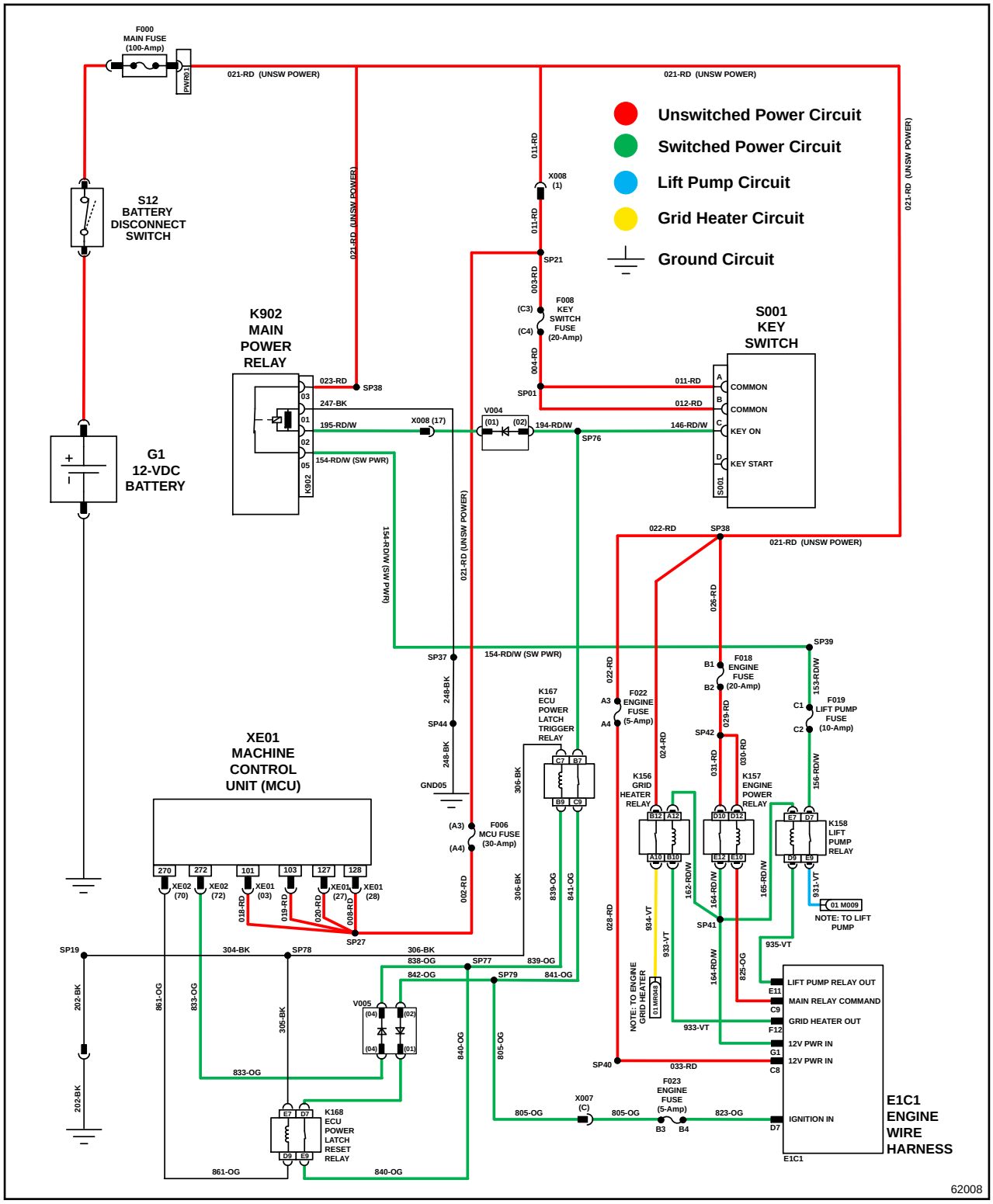


Figure 2-62

Charging Circuit—Theory of Operation

Unswitched Power Circuit

Unswitched power is available from the battery positive terminal to the battery disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR01) to the following:

- 20-amp key switch fuse (F008)
- Main power relay (K902) terminal 03
- 30-amp Machine Control Unit (MCU) fuse (F006)

Unswitched power is then made available from the 20-amp key switch fuse (F008) to key switch pins A and B.

Unswitched power is provided from 30-amp MCU fuse (F006) to the MCU connector terminals:

- 101
- 103
- 127
- 128

Charging Circuit

When the key switch (S001) is turned to the ON position, power is provided from key switch (S001) terminal C to diode connector (V004) terminal 2. Power is then provided from diode connector (V004) terminal 1 to main power relay (K902) terminal 02, energizing the relay. With the main power relay energized, switched power is provided from main power relay pin 05 to the 5-amp instrument display fuse (F002).

Switched power is also provided to the engine wire harness connector (E1C1) terminal D7 from the MCU (XE01) terminal 272.

The alternator sends a signal to engine wire harness connector (E1C1) terminal D8. The engine wire harness connector (E1C1) terminal D8 then provides power to the display unit (XA01) terminal 3 indicating the charging status of alternator.

The alternator produces three-phase Alternating Current (AC). The AC current is rectified by internal diodes and a Direct Current (DC) is available to the internal voltage regulator. When the battery voltage becomes low, current then flows from the voltage regulator to the battery, charging the battery. When battery is fully charged, the regulator stops providing current to the battery.

Charging Circuit Schematic

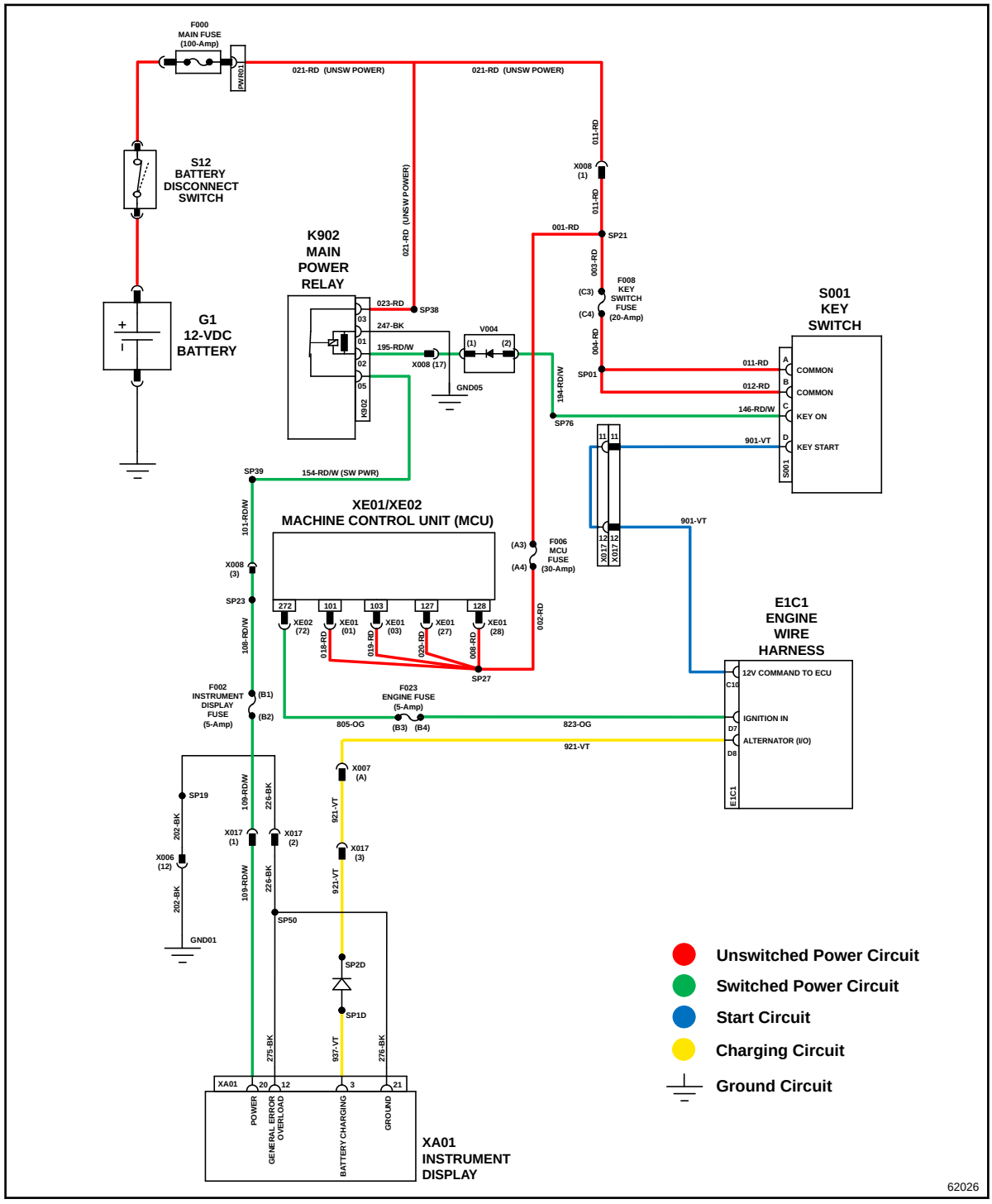


Figure 2-63

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Drive Circuit—Forward Theory of Operation (ISO-Mode)

Unswitched Power Circuit

Unswitched power is available from the battery positive terminal to the battery disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR01) to the following:

- 20-amp key switch fuse (F008)
- Main power relay (K902) terminal 03
- 5-amp seat: seat switch and seat belt switch fuse (F014)

Unswitched power is provided from the 20-amp key switch fuse (F008) to key switch (S001) terminals A and B.

Unswitched power is provided from the 5-amp seat: seat switch and seat belt switch fuse (F014) to Seat Control Unit (SCU) (X023) terminals 05 and 08.

Interlock Circuit

When the seat switch is in the closed position, the SCU (X023) sends output voltage from terminal 07 to the Machine Control Unit (MCU) (XE01) terminal 255.

When the seat belt switch is in the closed position, the SCU (X023) sends output voltage from terminal 10 to the MCU (XE01) terminal 145.

With the park brake switch (S065) in the disengaged position, the MCU (XE01) provides power from terminal 139 to the park brake release solenoid (Y043) terminal 1 and resistor (R005). The Danfoss Control Unit (DCU) (XE05) terminal 05 provides a ground for the park brake release solenoid (Y043) terminal 2, energizing the solenoid.

With the interlock circuit complete, all hydrostatic drive functions become active.

Switched Power

When the key switch (S001) is turned to the ON position, power is provided from key switch (S001) terminal C to diode connector (V004) terminal 2. Power is then provided from diode connector (V004) terminal 1 to main power relay (K902) terminal 02, energizing the relay. With the main power relay (K902) energized, switched power is provided from main power relay (K902) terminal 05 to the following:

- 5-amp instrument display fuse (F002)
- 10-amp cab power fuse (F003)
- 15-amp joysticks fuse (F012)
- 10-amp DCU fuse (F020)

Switched power is provided from the 5-amp instrument display fuse (F002) to the H/ISO pattern selection switch (S203) terminal 5.

Switched power is provided from the 10-amp cab power fuse (F003) to the park brake switch (S065) terminal 2.

Switched power is provided from the 15-amp joysticks fuse (F012) to the LH joystick (X010), diode connector (V001) terminal 3, and MCU (XE01) terminal 146.

Switched power is provided from the 10-amp DCU fuse (F020) to the DCU (XE05/XE06) terminals 2, 11, and 12.

Forward Circuit

When ISO mode is selected on the H/ISO pattern selection switch (S203), switched power is provided from H/ISO pattern selection switch (S203) terminal 5 to H/ISO pattern selection switch (S203) terminal 6. Power is provided from H/ISO pattern selection switch (S203) terminal 6 to the DCU (XE05) terminal 10.

When the LH joystick (X010) is in the forward position (forward), power is provided from the DCU (XE06) terminal 07 to the left drive forward solenoid (Y166) terminal 1, and from the DCU (XE06) terminal 09 to the right drive forward solenoid (Y165) terminal 1, activating both solenoids.

Drive Circuit Forward Schematic (ISO-Mode)

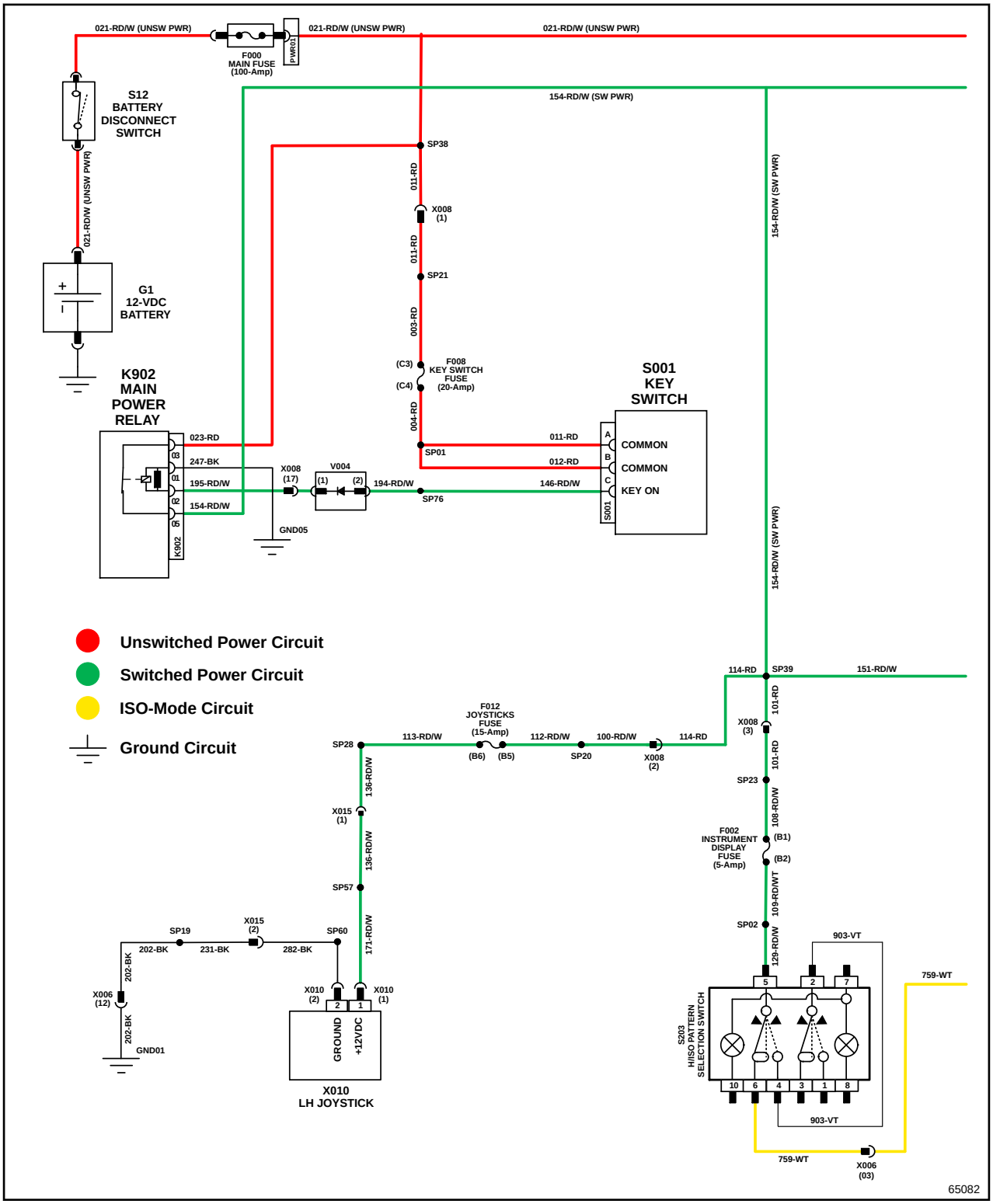


Figure 2-64

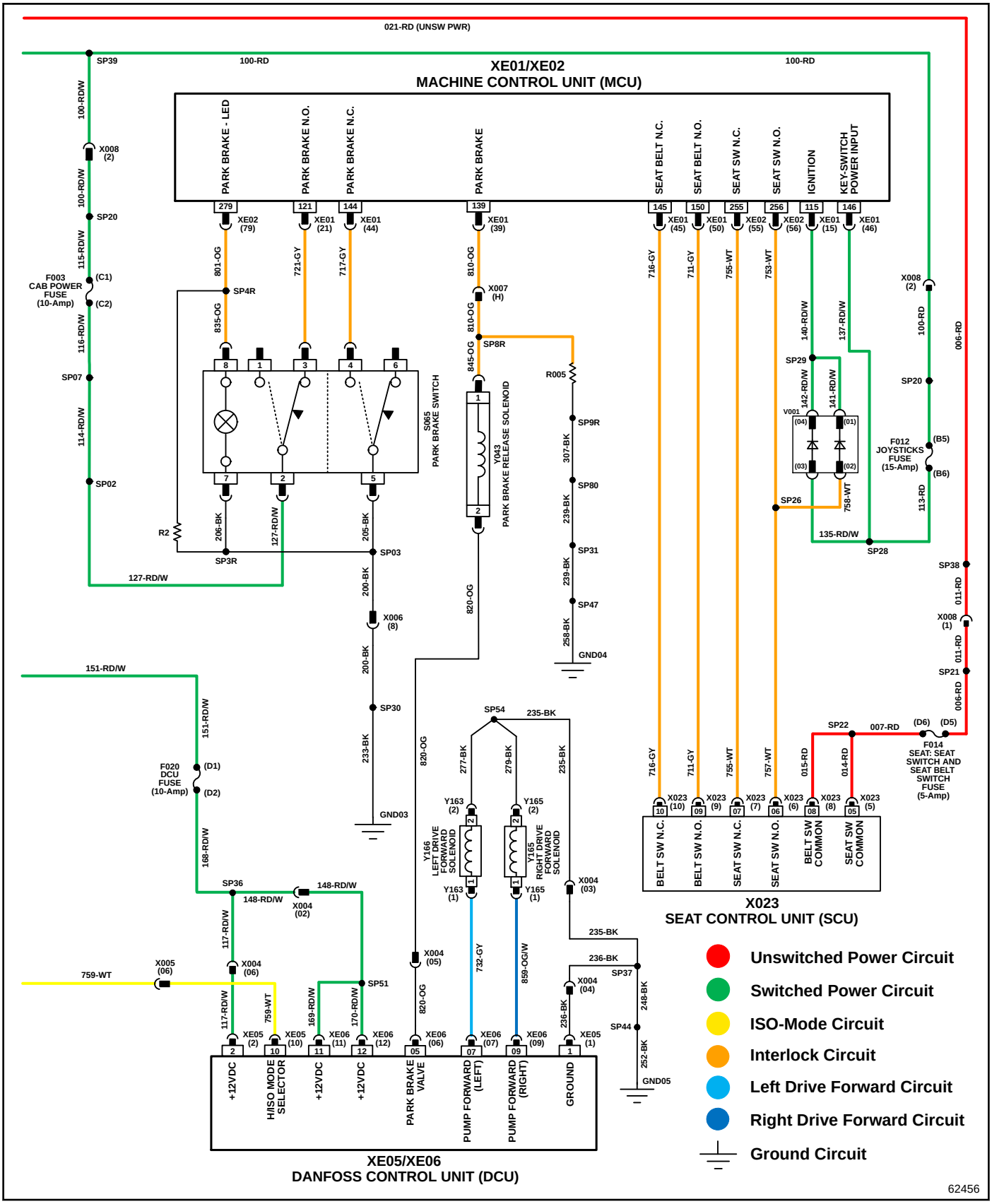

021-RD (UNSW PWR)
XE01/XE02
MACHINE CONTROL UNIT (MCU)
PARK BRAKE - LED
PARK BRAKE N.O.
PARK BRAKE N.C.
PARK BRAKE
SEAT BELT N.C.
SEAT BELT N.O.
SEAT SW N.C.
SEAT SW N.O.
IGNITION
KEY-SWITCH POWER INPUT
S065 PARK BRAKE SWITCH
Y043 PARK BRAKE RELEASE SOLENOID
F003 CAB POWER FUSE (10-Amp)
F012 JOYSTICKS FUSE (15-Amp)
F020 DCU FUSE (10-Amp)
F014 SEAT: SEAT SWITCH AND SEAT BELT SWITCH FUSE (5-Amp)
R2
R005
V001
Y163
Y165
Y166 LEFT DRIVE FORWARD SOLENOID
Y165 RIGHT DRIVE FORWARD SOLENOID
X023
SEAT CONTROL UNIT (SCU)
BELT SW N.C.
BELT SW N.O.
SEAT SW N.C.
SEAT SW N.O.
BELT SW COMMON
SEAT SW COMMON
XE05/XE06
DANFOSS CONTROL UNIT (DCU)
+12VDC
H/ISO MODE SELECTOR
PARK BRAKE VALVE
PUMP FORWARD (LEFT)
PUMP FORWARD (RIGHT)
GROUND
GND03
GND04
GND05
Unswitched Power Circuit
Switched Power Circuit
ISO-Mode Circuit
Interlock Circuit
Left Drive Forward Circuit
Right Drive Forward Circuit
Ground Circuit
62456

Figure 2-65

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Drive Circuit—Forward Theory of Operation (H-Mode)

Unswitched Power Circuit

Unswitched power is available from the battery positive terminal to the battery disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR01) to the following:

- 20-amp key switch fuse (F008)
- Main power relay (K902) terminal 03
- 5-amp seat: seat switch and seat belt switch fuse (F014)

Unswitched power is provided from the 20-amp key switch fuse (F008) to key switch (S001) terminals A and B.

Unswitched power is provided from the 5-amp seat: seat switch and seat belt switch fuse (F014) to Seat Control Unit (SCU) (X023) terminals 05 and 08.

Interlock Circuit

When the seat switch is in the closed position, the SCU (X023) sends output voltage from terminal 07 to the Machine Control Unit (MCU) (XE01) terminal 255.

When the seat belt switch is in the closed position, the SCU (X023) sends output voltage from terminal 10 to the MCU (XE01) terminal 145.

With the park brake switch (S065) in the disengaged position, the MCU (XE01) provides power from terminal 139 to the park brake release solenoid (Y043) terminal 1 and resistor (R005). The Danfoss Control Unit (DCU) (XE06) terminal 05 provides a ground for the park brake release solenoid (Y043) terminal 2, energizing the solenoid.

With the interlock circuit complete, all hydrostatic drive functions become active.

Switched Power

When the key switch (S001) is turned to the ON position, power is provided from key switch (S001) terminal C to diode connector (V004) terminal 2. Power is then provided from diode connector (V004) terminal 1 to main power relay (K902) terminal 02, energizing the relay. With the main power relay (K902) energized, switched power is provided from main power relay (K902) terminal 05 to the following:

- 5-amp instrument display fuse (F002)
- 10-amp cab power fuse (F003)
- 15-amp joysticks fuse (F012)
- 10-amp DCU fuse (F020)

Switched power is provided from the 5-amp instrument display fuse (F002) to the H/ISO pattern selection switch (S203) terminal 5.

Switched power is provided from the 10-amp cab power fuse (F003) to the park brake switch (S065) terminal 2.

Switched power is provided from the 15-amp joysticks fuse (F012) to the LH joystick (X010) terminal 1, RH joystick (X012) terminal 1, diode connector (V001) terminal 3, and MCU (XE01) terminal 146.

Switched power is provided from the 10-amp DCU fuse (F020) to the DCU (XE05/XE06) terminals 2, 11, and 12.

Forward Circuit

When H mode is selected on the H/ISO pattern selection switch (S203), switched power is provided from H/ISO pattern selection switch (S203) terminal 5 to H/ISO pattern selection switch (S203) terminal 4. Switched power is then provided from the H/ISO pattern selection switch (S203) terminal 4 to H/ISO pattern selection switch (S203) terminal 2. Switched power is provided from H/ISO pattern selection switch (S203) terminal 2 to the H/ISO pattern selection switch (S203) terminal 1. Power is provided from H/ISO pattern selection switch (S203) terminal 1 to the DCU (XE06) terminal 11.

When joysticks are in the forward position (forward), power is provided from the DCU (XE06) terminal 07 to the left drive forward solenoid (Y166) terminal 1, and from the DCU (XE06) terminal 09 to the right drive forward solenoid (Y165) terminal 1, activating both solenoids.

Drive Circuit Forward Schematic (H-Mode)

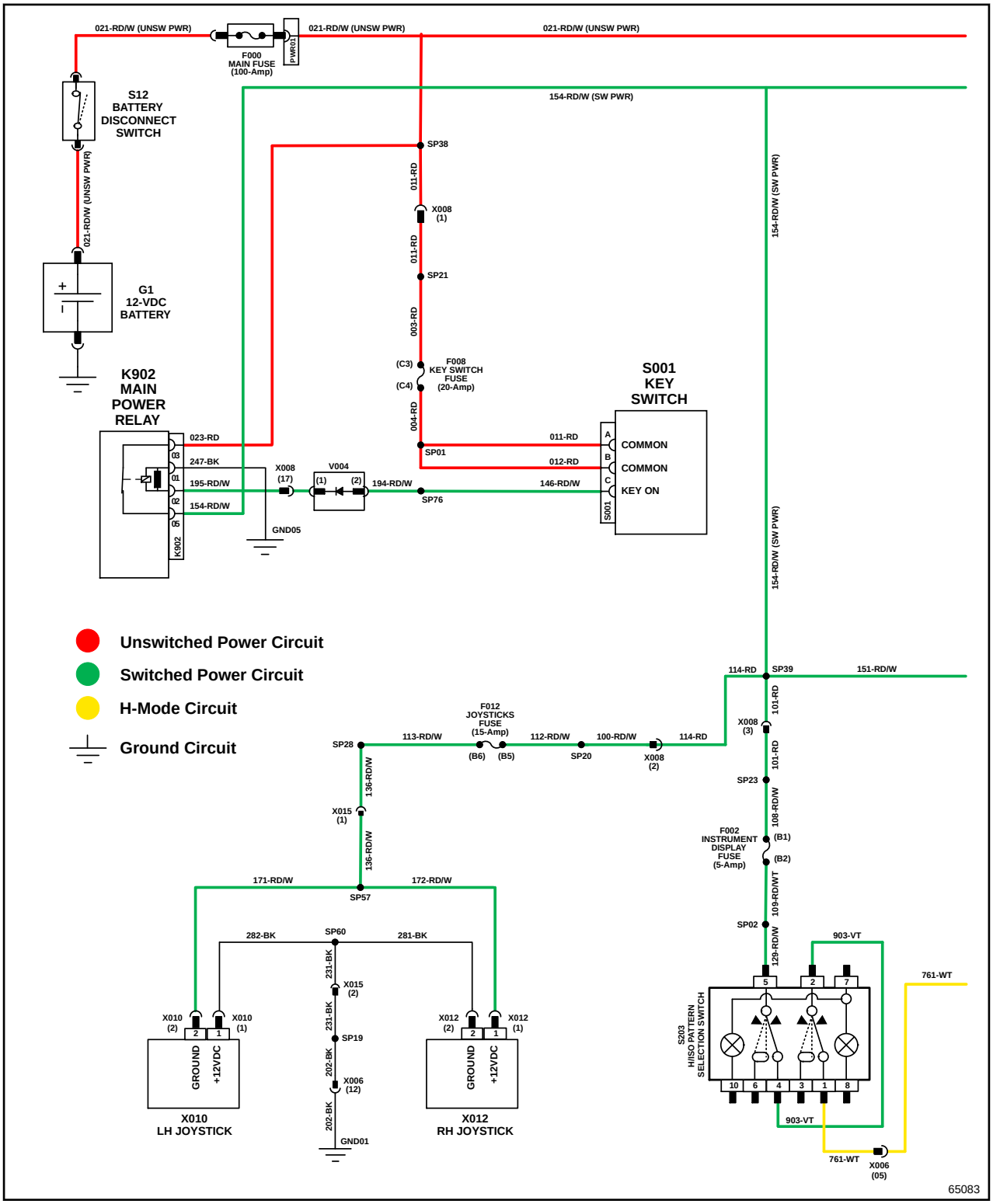


Figure 2-66

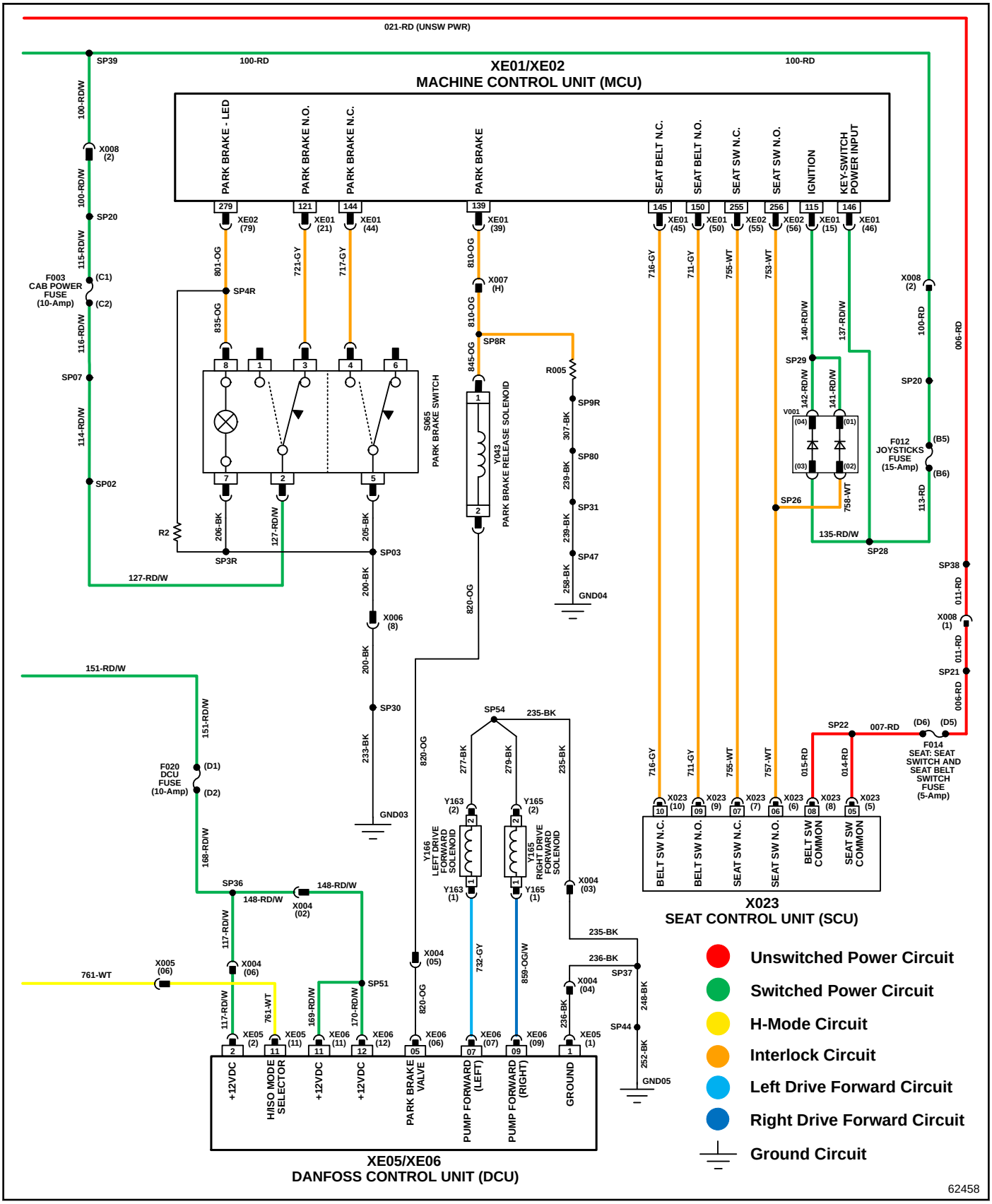

021-RD (UNSW PWR)
XE01/XE02
MACHINE CONTROL UNIT (MCU)
PARK BRAKE - LED
PARK BRAKE N.O.
PARK BRAKE N.C.
PARK BRAKE
SEAT BELT N.C.
SEAT BELT N.O.
SEAT SW N.C.
SEAT SW N.O.
IGNITION
KEY-SWITCH POWER INPUT
S065 PARK BRAKE SWITCH
Y043 PARK BRAKE RELEASE SOLENOID
F003 CAB POWER FUSE (10-Amp)
F012 JOYSTICKS FUSE (15-Amp)
F020 DCU FUSE (10-Amp)
F014 SEAT: SEAT SWITCH AND SEAT BELT SWITCH FUSE (5-Amp)
R2
R005
V001
Y163 LEFT DRIVE FORWARD SOLENOID
Y165 RIGHT DRIVE FORWARD SOLENOID
X023
SEAT CONTROL UNIT (SCU)
BELT SW N.C.
BELT SW N.O.
SEAT SW N.C.
SEAT SW N.O.
BELT SW COMMON
SEAT SW COMMON
XE05/XE06
DANFOSS CONTROL UNIT (DCU)
+12VDC
H/ISO MODE SELECTOR
PARK BRAKE VALVE
PUMP FORWARD (LEFT)
PUMP FORWARD (RIGHT)
GROUND
GND03
GND04
GND05
Unswitched Power Circuit
Switched Power Circuit
H-Mode Circuit
Interlock Circuit
Left Drive Forward Circuit
Right Drive Forward Circuit
Ground Circuit
62458

Figure 2-67

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Drive Circuit—Reverse Theory of Operation (ISO-Mode)

Unswitched Power Circuit

Unswitched power is available from the battery positive terminal to the battery disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR01) to the following:

- 20-amp key switch fuse (F008)
- Main power relay (K902) terminal 03
- 5-amp seat: seat switch and seat belt switch fuse (F014)

Unswitched power is provided from the 20-amp key switch fuse (F008) to key switch (S001) terminals A and B.

Unswitched power is provided from the 5-amp seat: seat switch and seat belt switch fuse (F014) to Seat Control Unit (SCU) (X023) terminals 05 and 08.

Interlock Circuit

When the seat switch is in the closed position, the SCU (X023) sends output voltage from terminal 07 to the Machine Control Unit (MCU) (XE01) terminal 255.

When the seat belt switch is in the closed position, the SCU (X023) sends output voltage from terminal 10 to the MCU (XE01) terminal 145.

With the park brake switch (S065) in the disengaged position, the MCU (XE01) provides power from terminal 139 to the park brake release solenoid (Y043) terminal 1 and resistor (R005). The Danfoss Control Unit (DCU) (XE06) terminal 05 provides a ground for the park brake release solenoid (Y043) terminal 2, energizing the solenoid.

With the interlock circuit complete, all hydrostatic drive functions become active.

Switched Power

When the key switch (S001) is turned to the ON position, power is provided from key switch (S001) terminal C to diode connector (V004) terminal 2. Power is then provided from diode connector (V004) terminal 1 to main power relay (K902) terminal 02, energizing the relay. With the main power relay (K902) energized, switched power is provided from main power relay (K902) terminal 05 to the following:

- 5-amp instrument display fuse (F002)
- 10-amp cab power fuse (F003)
- 15-amp joysticks fuse (F012)
- 10-amp DCU fuse (F020)

Switched power is provided from the 5-amp instrument display fuse (F002) to the H/ISO pattern selection switch (S203) terminal 5.

Switched power is provided from the 10-amp cab power fuse (F003) to the park brake switch (S065) terminal 2.

Switched power is provided from the 15-amp joysticks fuse (F012) to the LH joystick (X010) terminal 1, diode connector (V001) terminal 3, and MCU (XE01) terminal 146.

Switched power is provided from the 10-amp DCU fuse (F020) to the DCU (XE05/XE06) terminals 2, 11, and 12.

Reverse Circuit

When ISO mode is selected on the H/ISO pattern selection switch (S203), switched power is provided from H/ISO pattern selection switch (S203) terminal 5 to H/ISO pattern selection switch (S203) terminal 6. Power is provided from H/ISO pattern selection switch (S203) terminal 6 to the DCU (XE06) terminal 10.

When the LH joystick (X010) is in the backup position (backup), power is provided from the DCU (XE06) terminal 08 to the left drive reverse solenoid (Y164) terminal 1, and from the DCU (XE06) terminal 10 to the right drive reverse solenoid (Y163) terminal 1, activating both solenoids.

Drive Circuit Reverse Schematic (ISO)

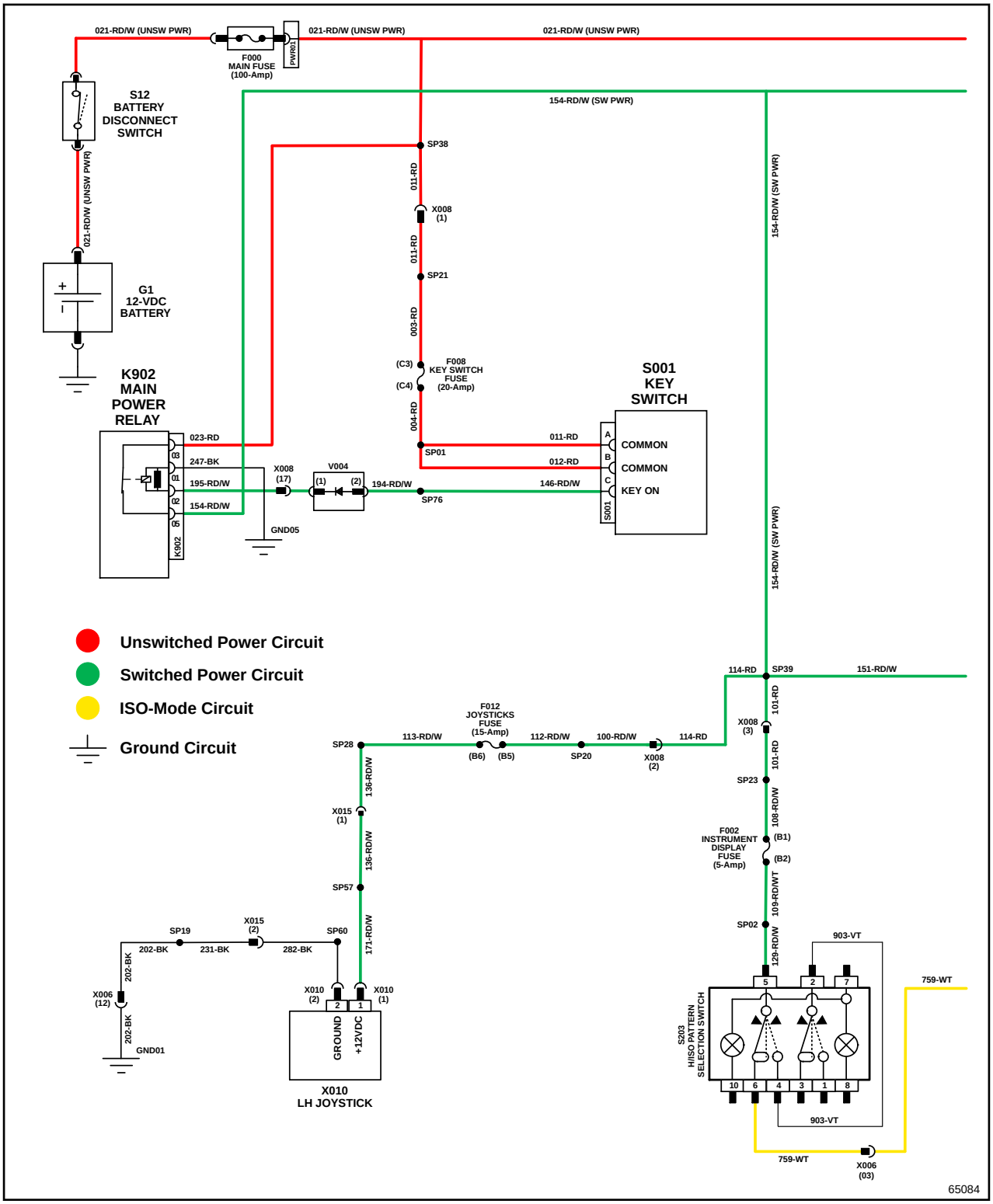


Figure 2-68

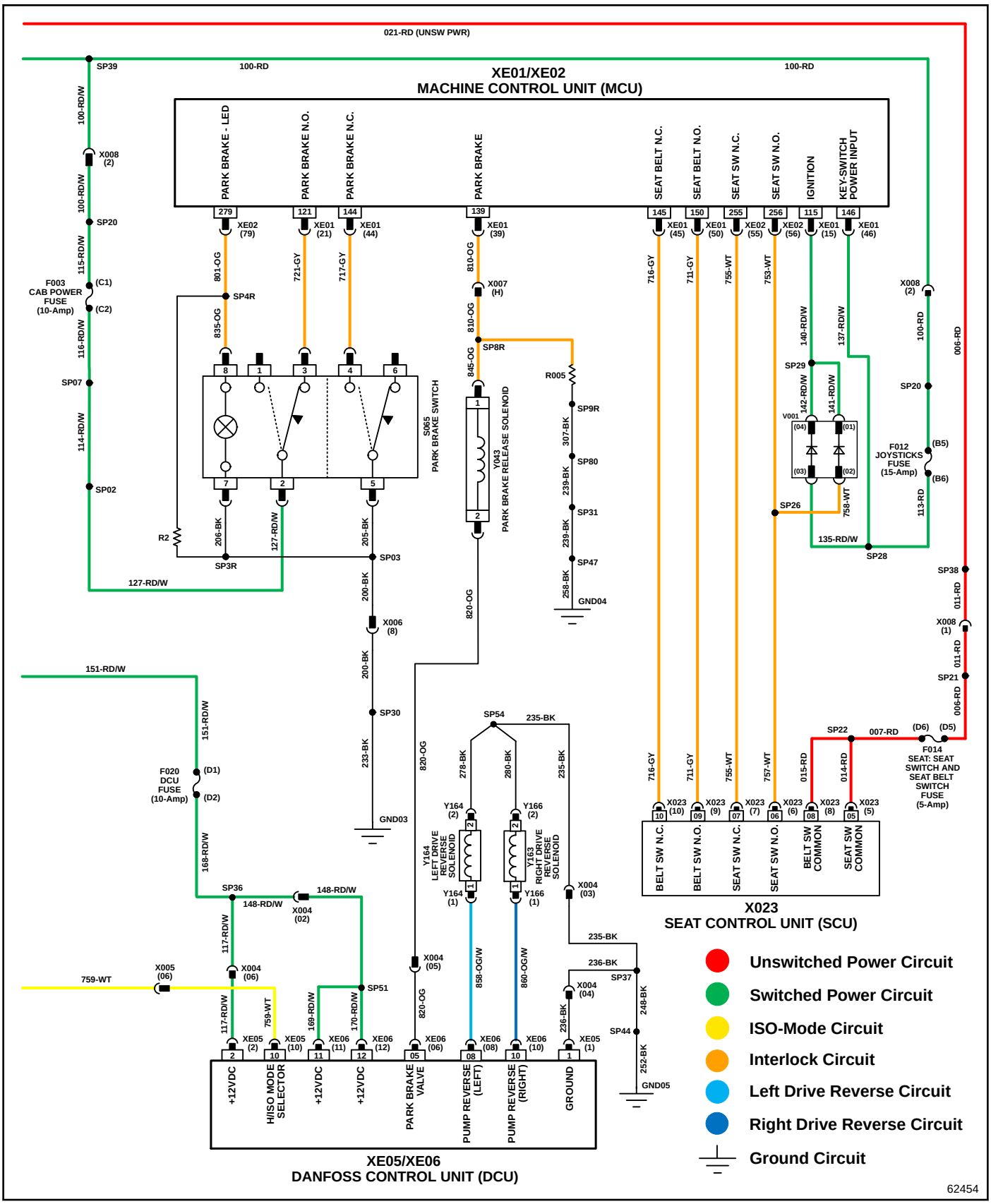

021-RD (UNSW PWR)
XE01/XE02
MACHINE CONTROL UNIT (MCU)
PARK BRAKE - LED
PARK BRAKE N.O.
PARK BRAKE N.C.
PARK BRAKE
SEAT BELT N.C.
SEAT BELT N.O.
SEAT SW N.C.
SEAT SW N.O.
IGNITION
KEY-SWITCH POWER INPUT
SP39
100-RD
100-RD/W
X008 (2)
SP20
115-RD/W
F003 CAB POWER FUSE (10-Amp)
(C1)
(C2)
116-RD/W
SP07
114-RD/W
SP02
127-RD/W
801-OG
721-GY
717-GY
810-OG
X007 (H)
SP8R
835-OG
845-OG
S065 PARK BRAKE SWITCH
Y043 PARK BRAKE RELEASE SOLENOID
R005
SP9R
307-BK
SP80
239-BK
SP31
SP47
258-BK
GND04
R2
206-BK
127-RD/W
205-BK
SP3R
SP03
200-BK
X006 (8)
SP30
233-BK
GND03
820-OG
716-GY
711-GY
755-WT
753-WT
140-RD/W
137-RD/W
SP29
142-RD/W
141-RD/W
V001
F012 JOYSTICKS FUSE (15-Amp)
(B5)
(B6)
113-RD
SP26
758-WT
135-RD/W
SP28
006-RD
SP38
011-RD
X008 (1)
SP21
151-RD/W
F020 DCU FUSE (10-Amp)
(D1)
(D2)
168-RD/W
SP36
148-RD/W
X004 (02)
117-RD/W
759-WT
X005 (06)
X004 (06)
SP51
169-RD/W
170-RD/W
SP54
235-BK
278-BK
280-BK
Y164 (2)
Y166 (2)
Y164 LEFT DRIVE REVERSE SOLENOID
Y163 RIGHT DRIVE REVERSE SOLENOID
Y164 (1)
Y166 (1)
X004 (03)
858-OG/W
860-OG/W
X004 (05)
X004 (04)
236-BK
SP37
248-BK
SP44
252-BK
GND05
SP22
007-RD
(D6)
(D5)
F014 SEAT: SEAT SWITCH AND SEAT BELT SWITCH FUSE (5-Amp)
015-RD
014-RD
X023 (10)
X023 (9)
X023 (7)
X023 (6)
X023 (8)
X023 (5)
BELT SW N.C.
BELT SW N.O.
SEAT SW N.C.
SEAT SW N.O.
BELT SW COMMON
SEAT SW COMMON
X023
SEAT CONTROL UNIT (SCU)
XE05 (2)
XE05 (10)
XE06 (11)
XE06 (12)
XE06 (06)
XE06 (08)
XE06 (10)
XE05 (1)
+12VDC
HI/ISO MODE SELECTOR
+12VDC
+12VDC
PARK BRAKE VALVE
PUMP REVERSE (LEFT)
PUMP REVERSE (RIGHT)
GROUND
XE05/XE06
DANFOSS CONTROL UNIT (DCU)
Unswitched Power Circuit
Switched Power Circuit
ISO-Mode Circuit
Interlock Circuit
Left Drive Reverse Circuit
Right Drive Reverse Circuit
Ground Circuit
62454

Figure 2-69

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Drive Circuit—Reverse Theory of Operation (H-Mode)

Unswitched Power Circuit

Unswitched power is available from the battery positive terminal to the battery disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR01) to the following:

- 20-amp key switch fuse (F008)
- Main power relay (K902) terminal 03
- 5-amp seat: seat switch and seat belt switch fuse (F014)

Unswitched power is provided from the 20-amp key switch fuse (F008) to key switch (S001) terminals A and B.

Unswitched power is provided from the 5-amp seat: seat switch and seat belt switch fuse (F014) to Seat Control Unit (SCU) (X023) terminals 05 and 08.

Interlock Circuit

When the seat switch is in the closed position, the SCU (X023) sends output voltage from terminal 07 to the Machine Control Unit (MCU) (XE01) terminal 255.

When the seat belt switch is in the closed position, the SCU (X023) sends output voltage from terminal 10 to the MCU (XE01) terminal 145.

With the park brake switch (S065) in the disengaged position, the MCU (XE01) provides power from terminal 139 to the park brake release solenoid (Y043) terminal 1 and resistor (R005). The Danfoss Control Unit (DCU) (XE06) terminal 05 provides a ground for the park brake release solenoid (Y043) terminal 2, energizing the solenoid.

With the interlock circuit complete, all hydrostatic drive functions become active.

Switched Power

When the key switch (S001) is turned to the ON position, power is provided from key switch (S001) terminal C to diode connector (V004) terminal 2. Power is then provided from diode connector (V004) terminal 1 to main power relay (K902) terminal 02, energizing the relay. With the main power relay (K902) energized, switched power is provided from main power relay (K902) terminal 05 to the following:

- 5-amp instrument display fuse (F002)
- 10-amp cab power fuse (F003)
- 15-amp joysticks fuse (F012)
- 10-amp DCU fuse (F020)

Switched power is provided from the 5-amp instrument display fuse (F002) to the H/ISO pattern selection switch (S203) terminal 5.

Switched power is provided from the 10-amp cab power fuse (F003) to the park brake switch (S065) terminal 2.

Switched power is provided from the 15-amp joysticks fuse (F012) to the LH joystick (X010) terminal 2, RH joystick (X012) terminal 1, diode connector (V001) terminal 3, and MCU (XE01) terminal 146.

Switched power is provided from the 10-amp DCU fuse (F020) to the DCU (XE05/XE06) terminals 2, 11, and 12.

Reverse Circuit

When H mode is selected on the H/ISO pattern selection switch (S203), switched power is provided from pattern selection switch (S203) terminal 5 to H/ISO pattern selection switch (S203) terminal 4. Switched power is then provided from H/ISO pattern selection switch (S203) terminal 4 to H/ISO pattern selection switch (S203) terminal 2. Switched power is provided from H/ISO pattern selection switch (S203) terminal 2 to H/ISO pattern selection switch (S203) terminal 1. Power is provided from H/ISO pattern selection switch (S203) terminal 1 to the DCU (XE06) terminal 11.

When the joysticks are in the reverse position (back), power is provided from the DCU (XE06) terminal 08 to the left drive reverse solenoid (Y164) terminal 1, and from the DCU (XE06) terminal 10 to the right drive reverse solenoid (Y163) terminal 1, activating both solenoids.

Drive Circuit Reverse Schematic (H-Mode)

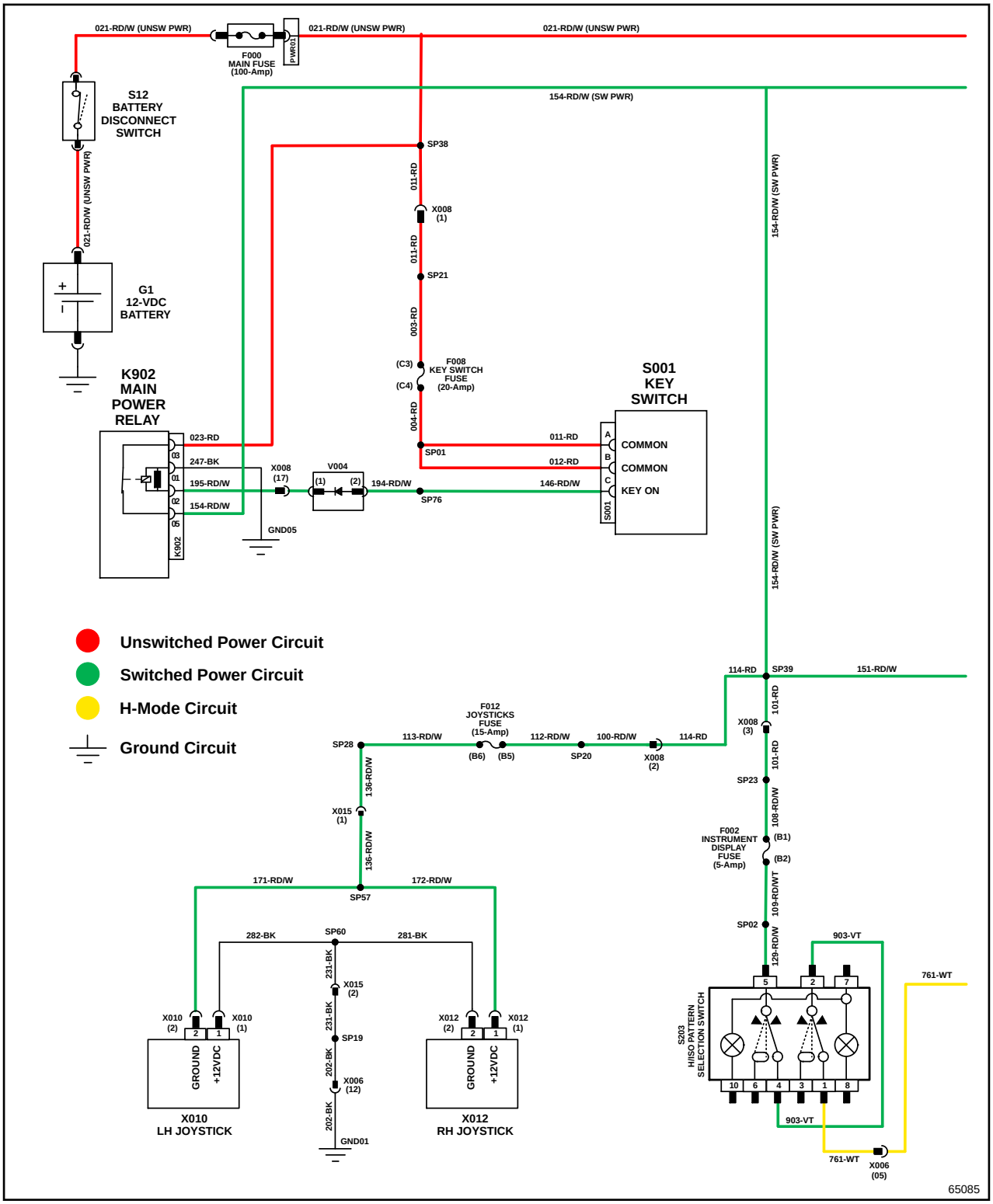


Figure 2-70

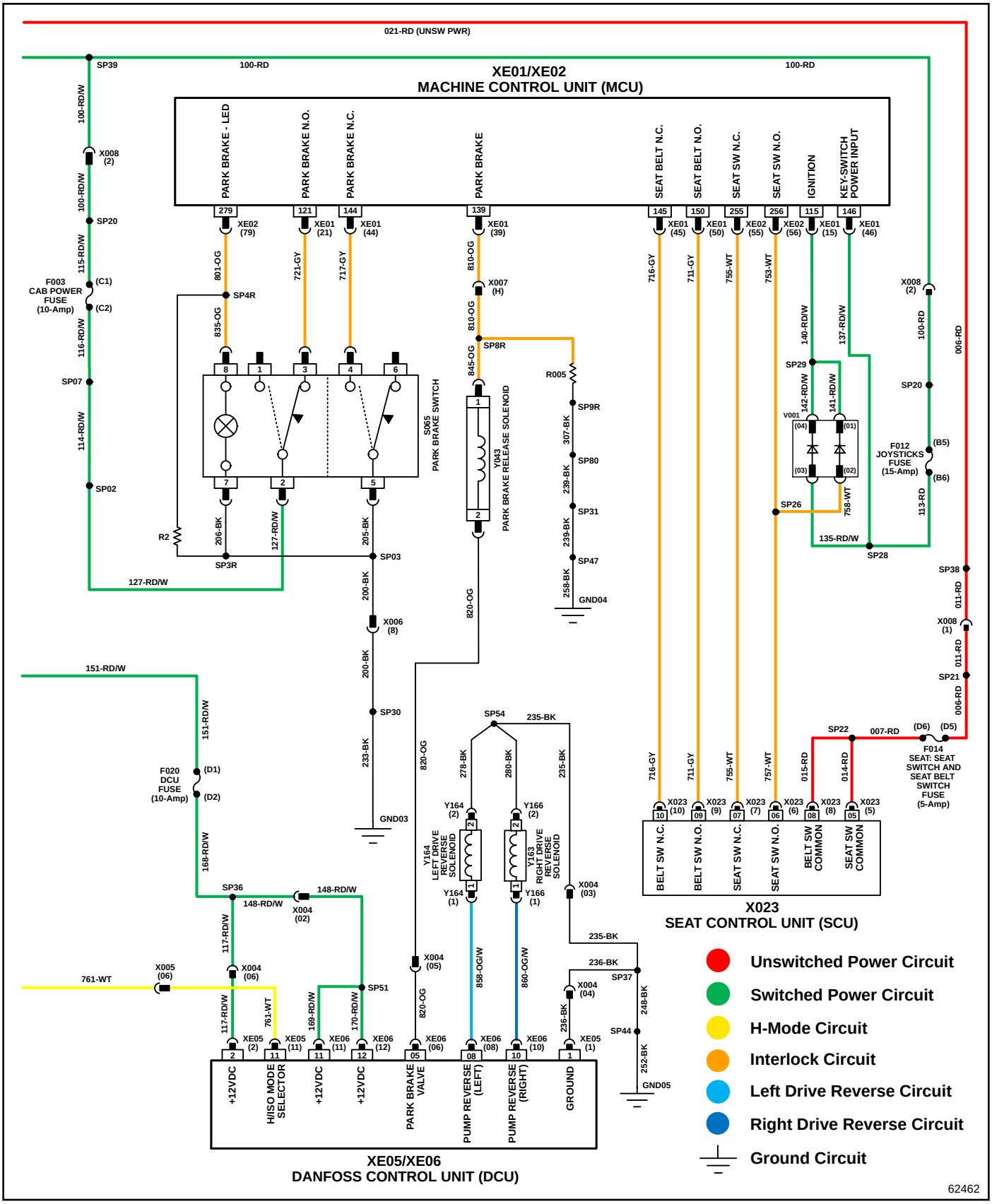

021-RD (UNSW PWR)
XE01/XE02
MACHINE CONTROL UNIT (MCU)
PARK BRAKE - LED
PARK BRAKE N.O.
PARK BRAKE N.C.
PARK BRAKE
SEAT BELT N.C.
SEAT BELT N.O.
SEAT SW N.C.
SEAT SW N.O.
IGNITION
KEY-SWITCH POWER INPUT
SP39
100-RD
100-RD/W
X008 (2)
SP20
115-RD/W
F003 CAB POWER FUSE (10-Amp)
(C1)
(C2)
116-RD/W
SP07
114-RD/W
SP02
127-RD/W
801-OG
721-GY
717-GY
810-OG
X007 (H)
SP8R
845-OG
835-OG
SP4R
S065 PARK BRAKE SWITCH
Y043 PARK BRAKE RELEASE SOLENOID
R005
SP9R
307-BK
SP80
239-BK
SP31
SP47
258-BK
GND04
R2
206-BK
127-RD/W
205-BK
SP3R
SP03
200-BK
X006 (8)
SP30
233-BK
GND03
820-OG
716-GY
711-GY
755-WT
753-WT
140-RD/W
137-RD/W
SP29
142-RD/W
141-RD/W
V001
F012 JOYSTICKS FUSE (15-Amp)
(B5)
(B6)
113-RD
758-WT
SP26
135-RD/W
SP28
006-RD
SP38
011-RD
X008 (1)
SP21
151-RD/W
F020 DCU FUSE (10-Amp)
(D1)
(D2)
168-RD/W
SP36
148-RD/W
X004 (02)
117-RD/W
X005 (06)
761-WT
X004 (06)
SP51
169-RD/W
170-RD/W
SP54
235-BK
278-BK
280-BK
Y164 (2)
Y166 (2)
Y164 LEFT DRIVE REVERSE SOLENOID
Y163 RIGHT DRIVE REVERSE SOLENOID
Y164 (1)
Y166 (1)
X004 (03)
X004 (05)
858-OG/W
860-OG/W
236-BK
SP37
X004 (04)
248-BK
SP44
252-BK
GND05
SP22
007-RD
(D6)
(D5)
F014 SEAT: SEAT SWITCH AND SEAT BELT SWITCH FUSE (5-Amp)
015-RD
014-RD
X023 (10)
X023 (9)
X023 (7)
X023 (6)
X023 (8)
X023 (5)
BELT SW N.C.
BELT SW N.O.
SEAT SW N.C.
SEAT SW N.O.
BELT SW COMMON
SEAT SW COMMON
X023
SEAT CONTROL UNIT (SCU)
XE05 (2)
XE05 (11)
XE06 (11)
XE06 (12)
XE06 (06)
XE06 (08)
XE06 (10)
XE05 (1)
+12VDC
HI/ISO MODE SELECTOR
+12VDC
+12VDC
PARK BRAKE VALVE
PUMP REVERSE (LEFT)
PUMP REVERSE (RIGHT)
GROUND
XE05/XE06
DANFOSS CONTROL UNIT (DCU)
Unswitched Power Circuit
Switched Power Circuit
H-Mode Circuit
Interlock Circuit
Left Drive Reverse Circuit
Right Drive Reverse Circuit
Ground Circuit
62462

Figure 2-71

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Drive Circuit—Right Turn Theory of Operation (ISO-Mode)

Unswitched Power Circuit

Unswitched power is available from the battery positive terminal to the battery disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR01) to the following:

- 20-amp key switch fuse (F008)
- Main power relay (K902) terminal 03
- 5-amp seat: seat switch and seat belt switch fuse (F014)

Unswitched power is provided from the 20-amp key switch fuse (F008) to key switch (S001) terminals A and B.

Unswitched power is provided from the 5-amp seat: seat switch and seat belt switch fuse (F014) to Seat Control Unit (SCU) (X023) terminals 05 and 08.

Interlock Circuit

When the seat switch is in the closed position, the SCU (X023) sends output voltage from terminal 07 to the Machine Control Unit (MCU) (XE01) terminal 255.

When the seat belt switch is in the closed position, the SCU (X023) sends output voltage from terminal 10 to the MCU (XE01) terminal 145.

With the park brake switch (S065) in the disengaged position, the MCU (XE01) provides power from terminal 139 to the park brake release solenoid (Y043) terminal 1 and resistor (R005). The Danfoss Control Unit (DCU) (XE06) terminal 05 provides a ground for the park brake release solenoid (Y043) terminal 2, energizing the solenoid.

With the interlock circuit complete, all hydrostatic drive functions become active.

Switched Power

When the key switch (S001) is turned to the ON position, power is provided from key switch (S001) terminal C to diode connector (V004) terminal 2. Power is then provided from diode connector (V004) terminal 1 to main power relay (K902) terminal 02, energizing the relay. With the main power relay (K902) energized, switched power is provided from main power relay (K902) terminal 05 to the following:

- 5-amp instrument display fuse (F002)
- 10-amp cab power fuse (F003)
- 15-amp joysticks fuse (F012)
- 10-amp DCU fuse (F020)

Switched power is provided from the 5-amp instrument display fuse (F002) to the H/ISO pattern selection switch (S203) terminal 5.

Switched power is provided from the 10-amp cab power fuse (F003) to the park brake switch (S065) terminal 2.

Switched power is provided from the 15-amp joysticks fuse (F012) to the LH joystick (X010) terminal 2, diode connector (V001) terminal 3, and MCU (XE01) terminal 146.

Switched power is provided from the 10-amp DCU fuse (F020) to the DCU (XE05/XE06) terminals 2, 11, and 12.

Right Turn Circuit

When ISO mode is selected on the H/ISO pattern selection switch (S203), switched power is provided from H/ISO pattern selection switch (S203) terminal 5 to the H/ISO pattern selection switch (S203) terminal 6. Power is provided from H/ISO pattern selection switch (S203) terminal 6 to the DCU (XE06) terminal 10.

When the LH joystick (X010) is in the right turn position (right), power is provided from the DCU (XE06) terminal 07 to the left drive forward solenoid (Y166) terminal 1, and from DCU (XE06) terminal 10 to the right drive reverse solenoid (Y163) terminal 1, activating both solenoids.

Drive Circuit Right Turn Schematic (ISO-Mode)

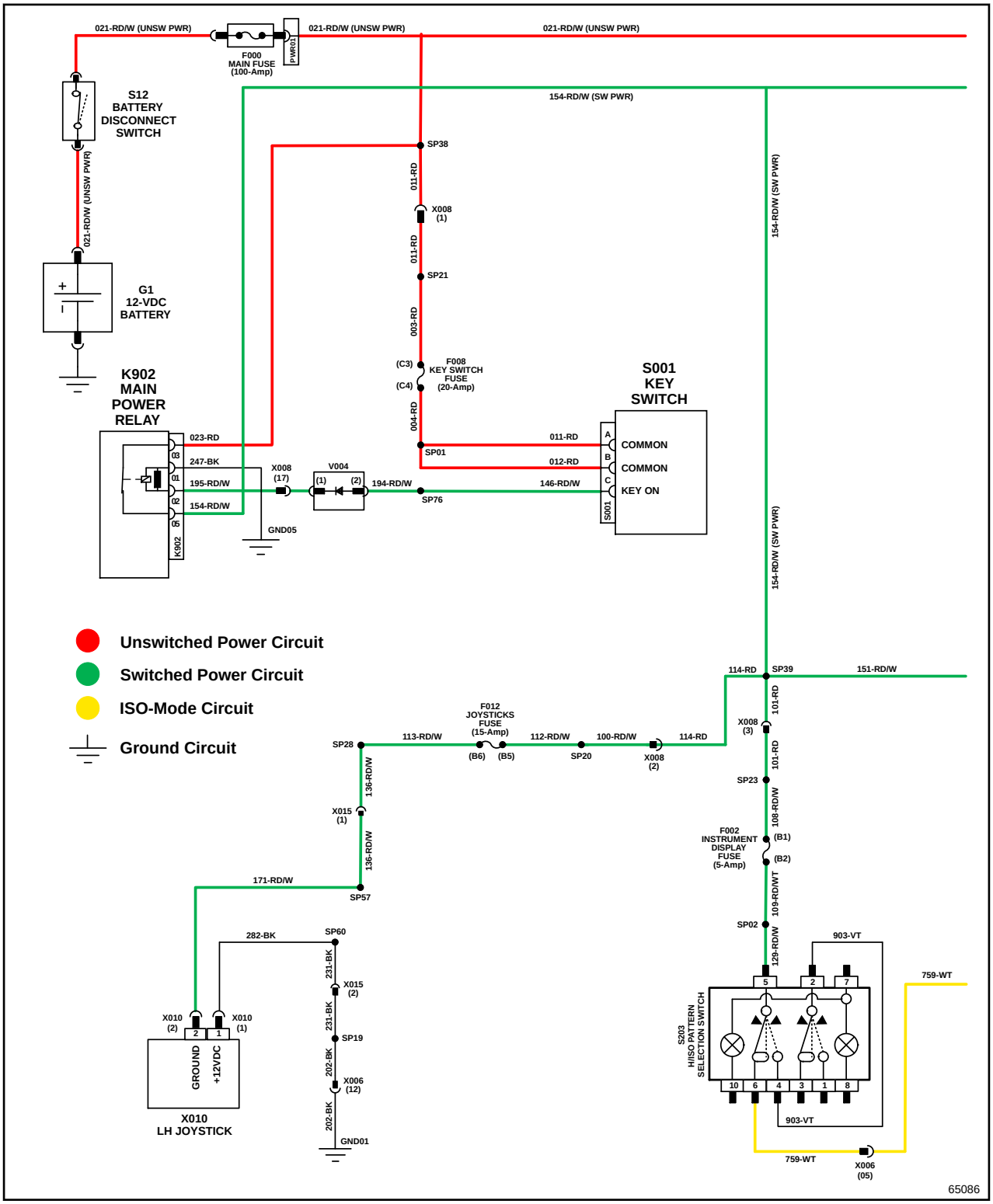


Figure 2-72

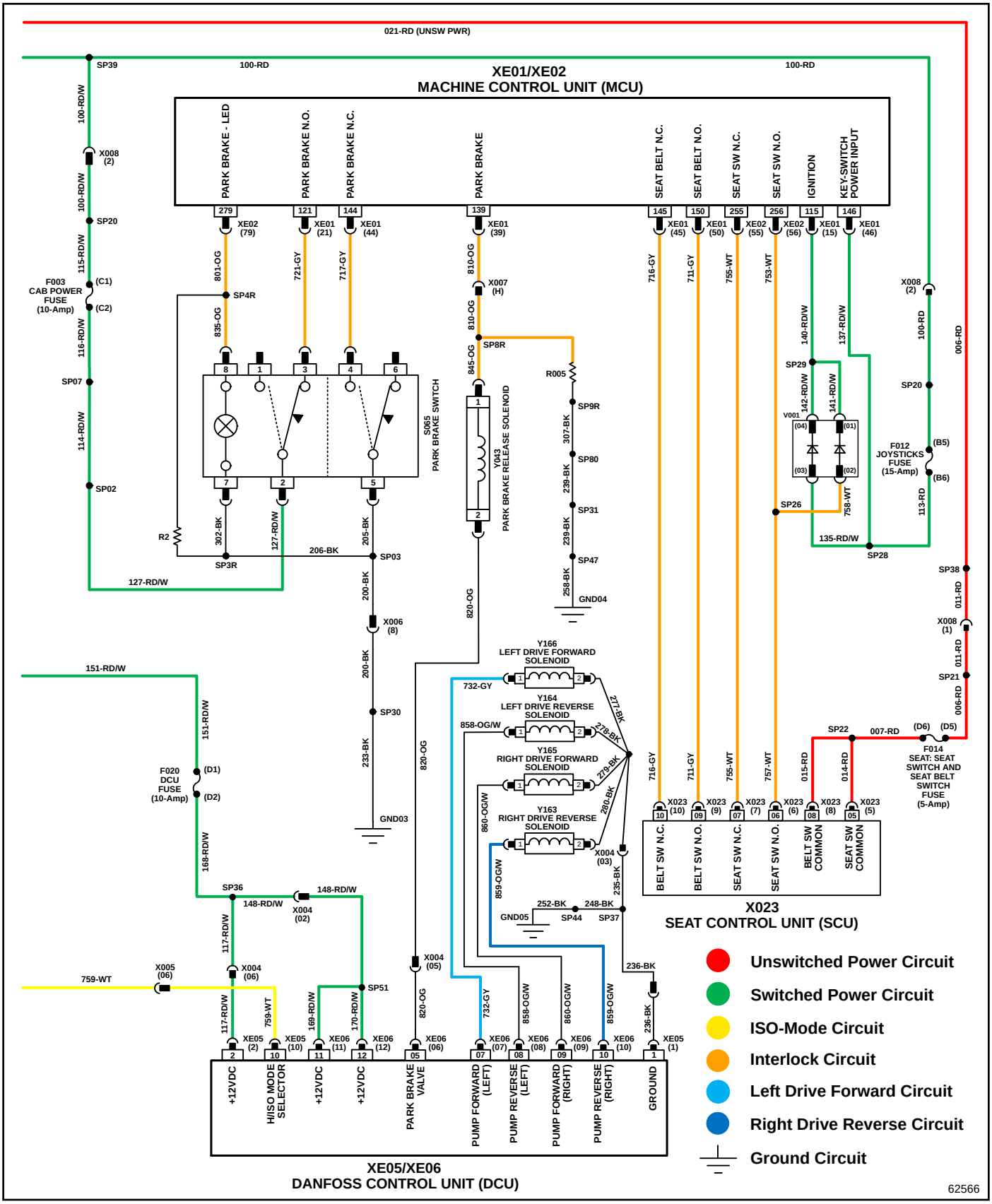

021-RD (UNSW PWR)
XE01/XE02
MACHINE CONTROL UNIT (MCU)
PARK BRAKE - LED
PARK BRAKE N.O.
PARK BRAKE N.C.
PARK BRAKE
SEAT BELT N.C.
SEAT BELT N.O.
SEAT SW N.C.
SEAT SW N.O.
IGNITION
KEY-SWITCH POWER INPUT
SP39
100-RD
100-RD/W
X008 (2)
SP20
115-RD/W
F003 CAB POWER FUSE (10-Amp)
(C1)
(C2)
116-RD/W
SP07
114-RD/W
SP02
127-RD/W
801-OG
835-OG
721-GY
717-GY
SP4R
S065 PARK BRAKE SWITCH
R2
SP3R
302-BK
127-RD/W
206-BK
205-BK
SP03
200-BK
X006 (8)
SP30
233-BK
GND03
810-OG
X007 (H)
SP8R
845-OG
Y043 PARK BRAKE RELEASE SOLENOID
R005
SP9R
307-BK
SP80
239-BK
SP31
SP47
258-BK
GND04
716-GY
711-GY
755-WT
753-WT
140-RD/W
137-RD/W
142-RD/W
141-RD/W
V001
SP29
SP20
SP26
758-WT
135-RD/W
SP28
F012 JOYSTICKS FUSE (15-Amp)
(B5)
(B6)
113-RD
006-RD
SP38
011-RD
X008 (1)
SP21
006-RD
SP22
007-RD
(D6)
(D5)
F014 SEAT: SEAT SWITCH AND SEAT BELT SWITCH FUSE (5-Amp)
015-RD
014-RD
151-RD/W
F020 DCU FUSE (10-Amp)
(D1)
(D2)
168-RD/W
SP36
148-RD/W
X004 (02)
117-RD/W
X005 (06)
759-WT
X004 (06)
SP51
169-RD/W
170-RD/W
X004 (05)
820-OG
732-GY
858-OG/W
860-OG/W
859-OG/W
236-BK
252-BK
248-BK
GND05
SP44
SP37
Y166 LEFT DRIVE FORWARD SOLENOID
Y164 LEFT DRIVE REVERSE SOLENOID
Y165 RIGHT DRIVE FORWARD SOLENOID
Y163 RIGHT DRIVE REVERSE SOLENOID
277-BK
278-BK
279-BK
280-BK
X004 (03)
235-BK
X023 (10)
X023 (09)
X023 (07)
X023 (06)
X023 (08)
X023 (05)
BELT SW N.C.
BELT SW N.O.
SEAT SW N.C.
SEAT SW N.O.
BELT SW COMMON
SEAT SW COMMON
X023
SEAT CONTROL UNIT (SCU)
XE05 (2)
XE05 (10)
XE06 (11)
XE06 (12)
XE06 (06)
XE06 (07)
XE06 (08)
XE06 (09)
XE06 (10)
XE05 (1)
+12VDC
HI/ISO MODE SELECTOR
+12VDC
+12VDC
PARK BRAKE VALVE
PUMP FORWARD (LEFT)
PUMP REVERSE (LEFT)
PUMP FORWARD (RIGHT)
PUMP REVERSE (RIGHT)
GROUND
XE05/XE06
DANFOSS CONTROL UNIT (DCU)
Unswitched Power Circuit
Switched Power Circuit
ISO-Mode Circuit
Interlock Circuit
Left Drive Forward Circuit
Right Drive Reverse Circuit
Ground Circuit
62566

Figure 2-73

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Drive Circuit—Right Turn Theory of Operation (H-Mode)

Unswitched Power Circuit

Unswitched power is available from the battery positive terminal to the battery disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR01) to the following:

- 20-amp key switch fuse (F008)
- Main power relay (K902) terminal 03
- 5-amp seat: seat switch and seat belt switch fuse (F014)

Unswitched power is provided from the 20-amp key switch fuse (F008) to key switch (S001) terminals A and B.

Unswitched power is provided from the 5-amp seat: seat switch and seat belt switch fuse (F014) to Seat Control Unit (SCU) (X023) terminals 05 and 08.

Interlock Circuit

When the seat switch is in the closed position, the SCU (X023) sends output voltage from terminal 07 to the Machine Control Unit (MCU) (XE01) terminal 255.

When the seat belt switch is in the closed position, the SCU (X023) sends output voltage from terminal 10 to the MCU (XE01) terminal 145.

With the park brake switch (S065) in the disengaged position, the MCU (XE01) provides power from terminal 139 to the park brake release solenoid (Y043) terminal 1 and resistor (R005). The Danfoss Control Unit (DCU) (XE06) terminal 05 provides a ground for the park brake release solenoid (Y043) terminal 2, energizing the solenoid.

With the interlock circuit complete, all hydrostatic drive functions become active.

Switched Power

When the key switch (S001) is turned to the ON position, power is provided from key switch (S001) terminal C to diode connector (V004) terminal 2. Power is then provided from diode connector (V004) terminal 1 to main power relay (K902) terminal 02, energizing the relay. With the main power relay (K902) energized, switched power is provided from main power relay (K902) terminal 05 to the following:

- 5-amp instrument display fuse (F002)
- 10-amp cab power fuse (F003)
- 15-amp joysticks fuse (F012)
- 10-amp DCU fuse (F020)

Switched power is provided from the 5-amp instrument display fuse (F002) to the H/ISO pattern selection switch (S203) terminal 5.

Switched power is provided from the 10-amp cab power fuse (F003) to the park brake switch (S065) terminal 2.

Switched power is provided from the 15-amp joysticks fuse (F012) to the LH joystick (X010) terminal 2, RH joystick (X012) terminal 1, diode connector (V001) terminal 3, and MCU (XE01) terminal 146.

Switched power is provided from the 10-amp DCU fuse (F020) to the DCU (XE05/XE06) terminals 2, 11, and 12.

Right Turn Circuit

When H mode is selected on the H/ISO pattern selection switch (S203), switched power is provided from H/ISO pattern selection switch (S203) terminal 5 to the H/ISO pattern selection switch (S203) terminal 4. Switched power is then provided from the H/ISO pattern selection switch (S203) terminal 4 to H/ISO pattern selection switch (S203) terminal 2. Switched power is provided from H/ISO pattern selection switch (S203) terminal 2 to the H/ISO pattern selection switch (S203) terminal 1. Power is provided from H/ISO pattern selection switch (S203) terminal 1 to the DCU (XE06) terminal 11.

When joysticks are in the right turn position (LH joystick [X010] forward RH joystick [X012] back), power is provided from the DCU (XE06) terminal 07 to the left drive forward solenoid (Y166) terminal 1, and from the DCU (XE06) terminal 10 to the right drive reverse solenoid (Y163) terminal 1, activating both solenoids.

Drive Circuit Right Turn Schematic (H-Mode)

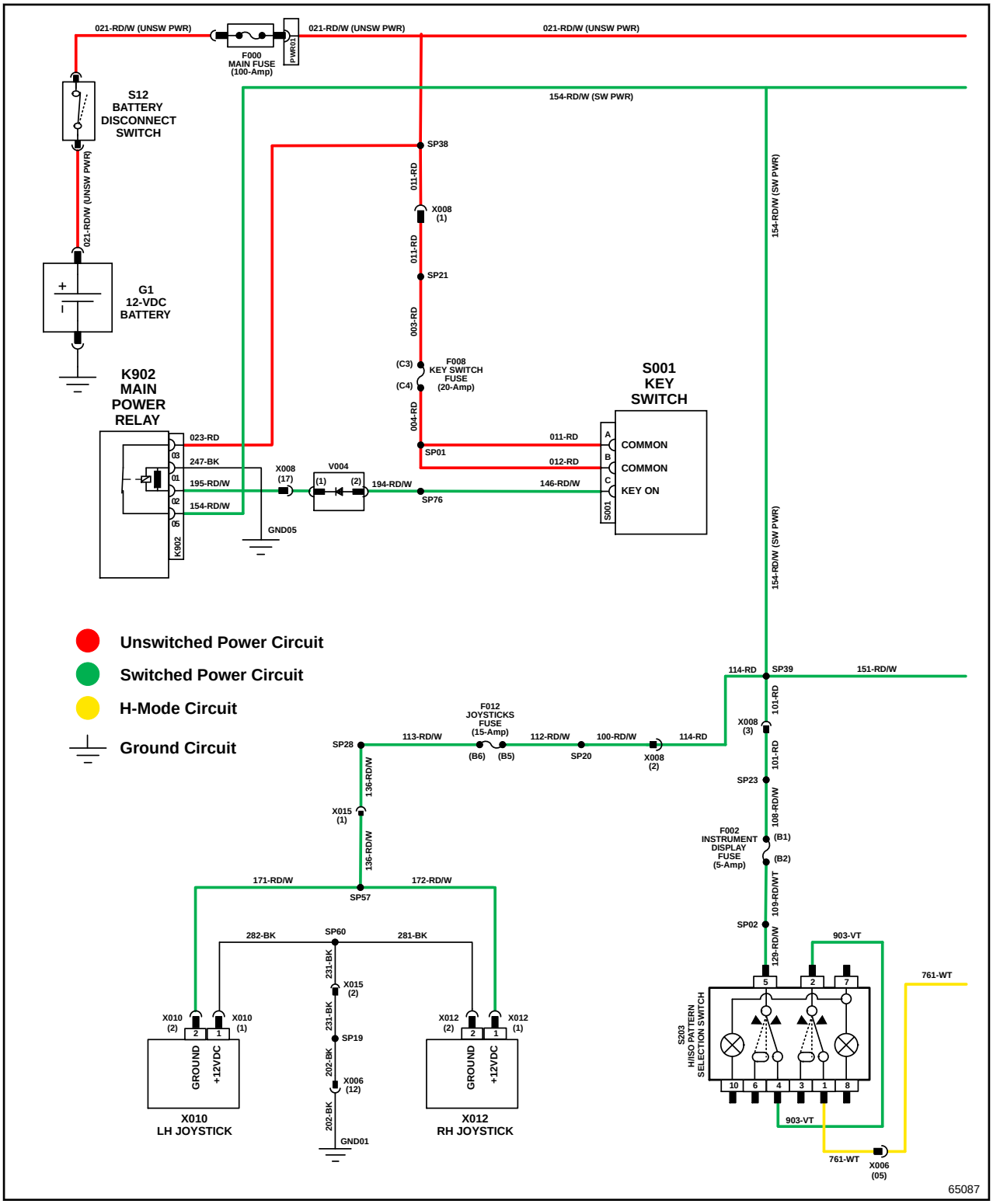


Figure 2-74

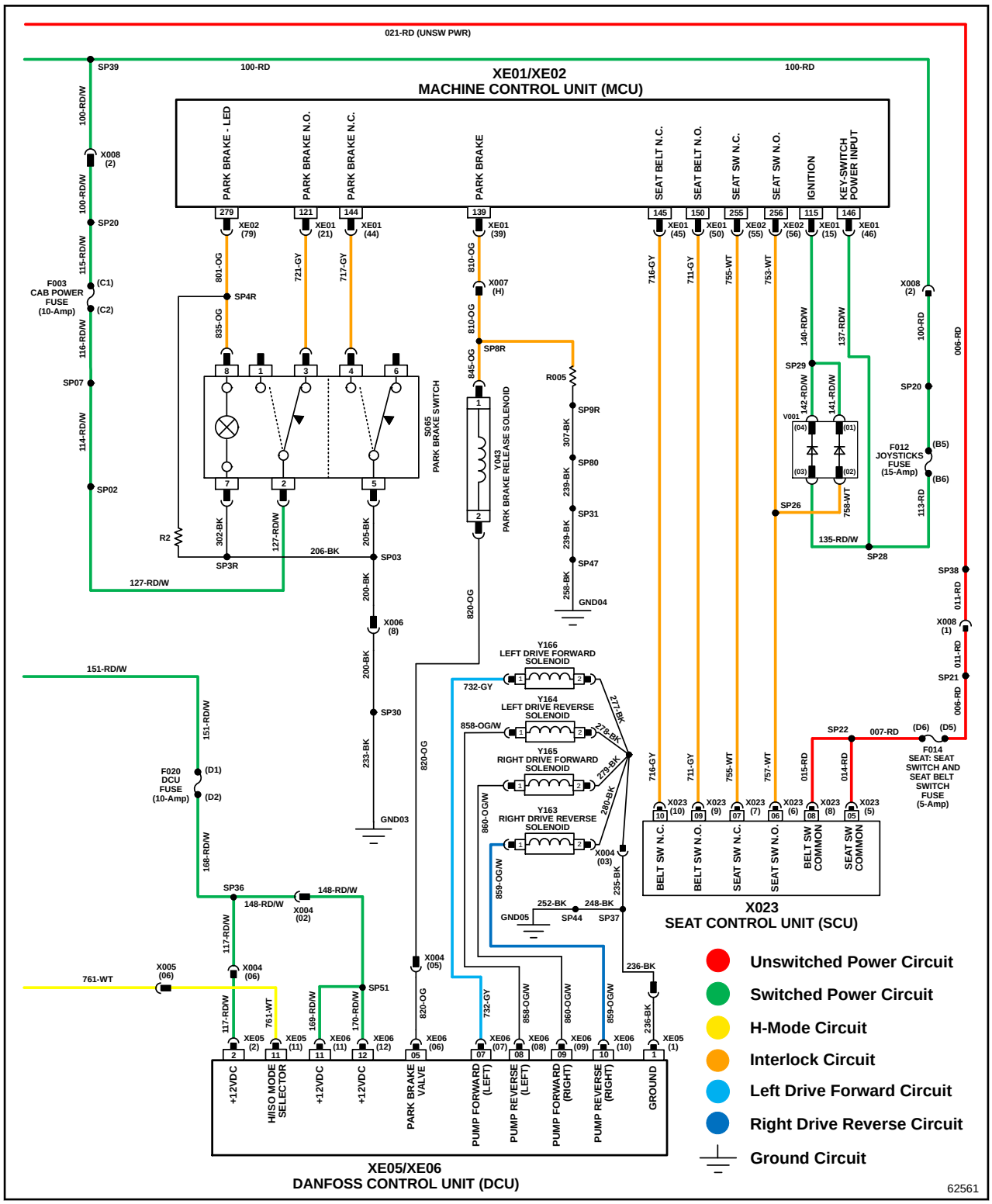

021-RD (UNSW PWR)
XE01/XE02
MACHINE CONTROL UNIT (MCU)
PARK BRAKE - LED
PARK BRAKE N.O.
PARK BRAKE N.C.
PARK BRAKE
SEAT BELT N.C.
SEAT BELT N.O.
SEAT SW N.C.
SEAT SW N.O.
IGNITION
KEY-SWITCH POWER INPUT
F003 CAB POWER FUSE (10-Amp)
S065 PARK BRAKE SWITCH
Y043 PARK BRAKE RELEASE SOLENOID
R005
R2
F012 JOYSTICKS FUSE (15-Amp)
F014 SEAT: SEAT SWITCH AND SEAT BELT SWITCH FUSE (5-Amp)
F020 DCU FUSE (10-Amp)
Y166 LEFT DRIVE FORWARD SOLENOID
Y164 LEFT DRIVE REVERSE SOLENOID
Y165 RIGHT DRIVE FORWARD SOLENOID
Y163 RIGHT DRIVE REVERSE SOLENOID
X023
SEAT CONTROL UNIT (SCU)
BELT SW N.C.
BELT SW N.O.
SEAT SW N.C.
SEAT SW N.O.
BELT SW COMMON
SEAT SW COMMON
XE05/XE06
DANFOSS CONTROL UNIT (DCU)
+12VDC
HI/ISO MODE SELECTOR
PARK BRAKE VALVE
PUMP FORWARD (LEFT)
PUMP REVERSE (LEFT)
PUMP FORWARD (RIGHT)
PUMP REVERSE (RIGHT)
GROUND
Unswitched Power Circuit
Switched Power Circuit
H-Mode Circuit
Interlock Circuit
Left Drive Forward Circuit
Right Drive Reverse Circuit
Ground Circuit
62561

Figure 2-75

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Drive Circuit—Left Turn Theory of Operation (ISO-Mode)

Unswitched Power Circuit

Unswitched power is available from the battery positive terminal to the battery disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR01) to the following:

- 20-amp key switch fuse (F008)
- Main power relay (K902) terminal 03
- 5-amp seat: seat switch and seat belt switch fuse (F014)

Unswitched power is provided from the 20-amp key switch fuse (F008) to key switch (S001) terminals A and B.

Unswitched power is provided from the 5-amp seat: seat switch and seat belt switch fuse (F014) to Seat Control Unit (SCU) (X023) terminals 05 and 08.

Interlock Circuit

When the seat switch is in the closed position, the SCU (X023) sends output voltage from terminal 07 to the Machine Control Unit (MCU) (XE01) terminal 255.

When the seat belt switch is in the closed position, the SCU (X023) sends output voltage from terminal 10 to the MCU (XE01) terminal 145.

With the park brake switch (S065) in the disengaged position, the MCU (XE01) provides power from terminal 139 to the park brake release solenoid (Y043) terminal 1 and resistor (R005). The Danfoss Control Unit (DCU) (XE06) terminal 05 provides a ground for the park brake release solenoid (Y043) terminal 2, energizing the solenoid.

With the interlock circuit complete, all hydrostatic drive functions become active.

Switched Power

When the key switch (S001) is turned to the ON position, power is provided from key switch (S001) terminal C to diode connector (V004) terminal 2. Power is then provided from diode connector (V004) terminal 1 to main power relay (K902) terminal 02, energizing the relay. With the main power relay (K902) energized, switched power is provided from main power relay (K902) terminal 05 to the following:

- 5-amp instrument display fuse (F002)
- 10-amp cab power fuse (F003)
- 15-amp joysticks fuse (F012)
- 10-amp DCU fuse (F020)

Switched power is provided from the 5-amp instrument display fuse (F002) to the H/ISO pattern selection switch (S203) terminal 5.

Switched power is provided from the 10-amp cab power fuse (F003) to the park brake switch (S065) terminal 2.

Switched power is provided from the 15-amp joysticks fuse (F012) to the LH joystick (X010) terminal 2, diode connector (V001) terminal 3, and MCU (XE01) terminal 146.

Switched power is provided from the 10-amp DCU fuse (F020) to the DCU (XE05) terminals 2, 11, and 12.

Left Turn Circuit

When ISO mode is selected on the H/ISO pattern selection switch (S203), switched power is provided from pattern selection switch (S203) terminal 5 to the H/ISO pattern selection switch (S203) terminal 6. Power is provided from H/ISO pattern selection switch (S203) terminal 6 to the DCU (XE06) terminal 10.

When the LH joystick (X010) is in the left turn position (left), power is provided from the DCU (XE06) terminal 08 to the left drive reverse solenoid (Y164) terminal 1, and from DCU (XE06) terminal 09 to the right drive forward solenoid (Y165) terminal 1, activating both solenoids.

Drive Circuit Left Turn Schematic (ISO-Mode)

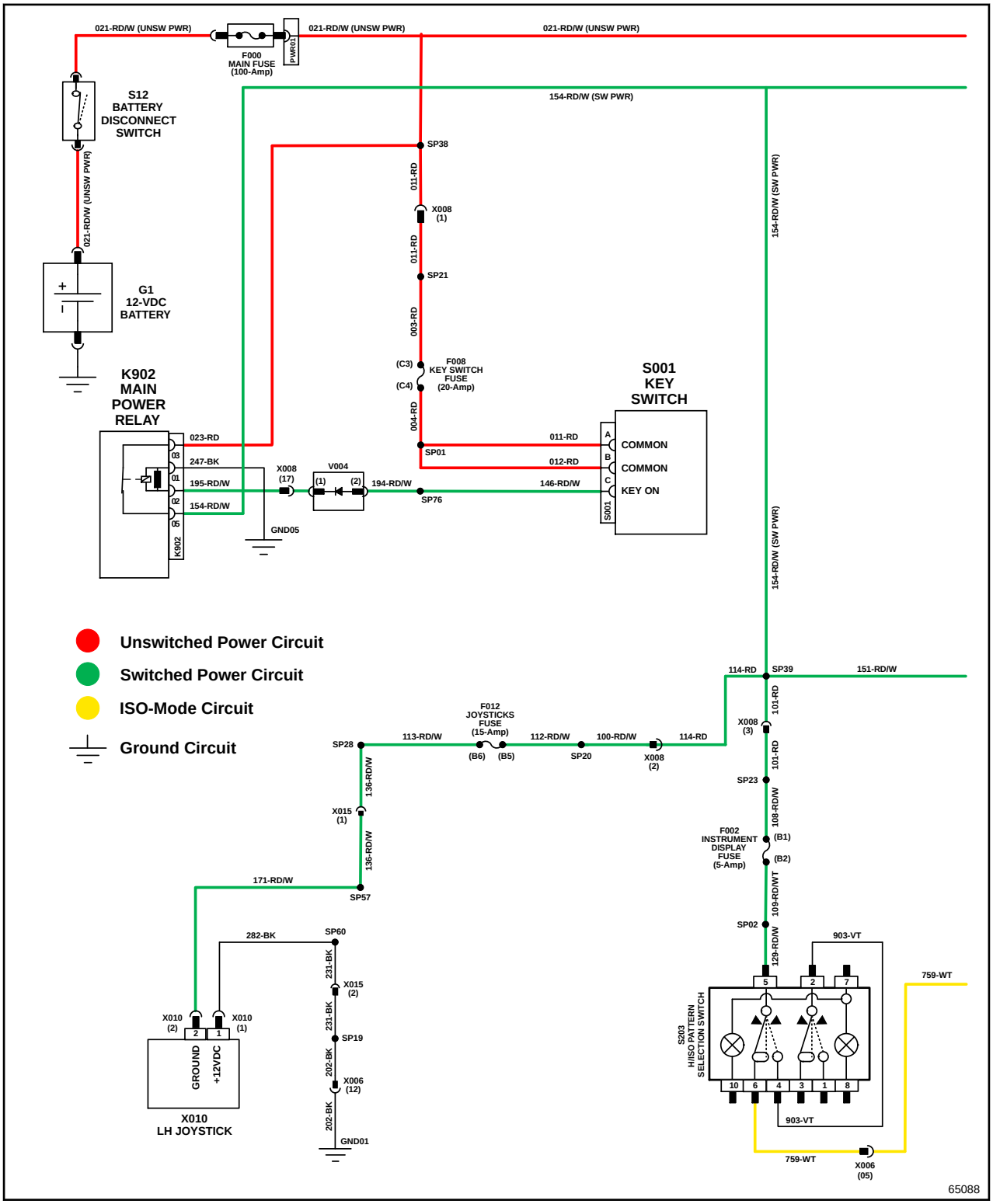


Figure 2-76

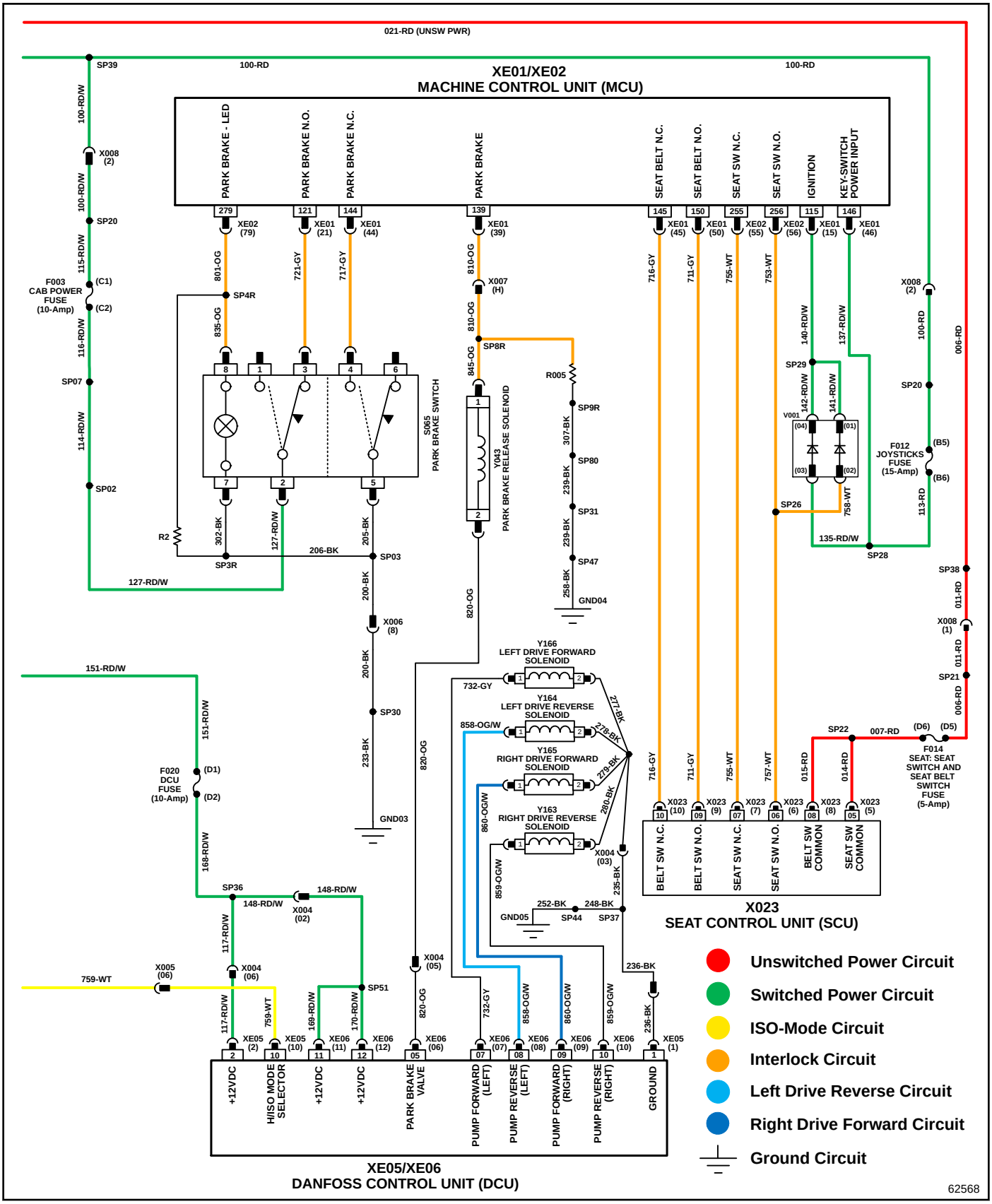

021-RD (UNSW PWR)
XE01/XE02
MACHINE CONTROL UNIT (MCU)
PARK BRAKE - LED
PARK BRAKE N.O.
PARK BRAKE N.C.
PARK BRAKE
SEAT BELT N.C.
SEAT BELT N.O.
SEAT SW N.C.
SEAT SW N.O.
IGNITION
KEY-SWITCH POWER INPUT
SP39
100-RD
100-RD/W
X008 (2)
SP20
115-RD/W
F003 CAB POWER FUSE (10-Amp)
(C1)
(C2)
116-RD/W
SP07
114-RD/W
SP02
127-RD/W
801-OG
721-GY
717-GY
810-OG
X007 (H)
SP8R
845-OG
835-OG
SP4R
S065 PARK BRAKE SWITCH
Y043 PARK BRAKE RELEASE SOLENOID
R005
SP9R
307-BK
SP80
239-BK
SP31
SP47
258-BK
GND04
R2
302-BK
127-RD/W
206-BK
SP3R
SP03
205-BK
200-BK
X006 (8)
SP30
233-BK
GND03
820-OG
716-GY
711-GY
755-WT
753-WT
140-RD/W
137-RD/W
SP29
142-RD/W
141-RD/W
V001
F012 JOYSTICKS FUSE (15-Amp)
(B5)
(B6)
113-RD
758-WT
SP26
135-RD/W
SP28
006-RD
SP38
011-RD
X008 (1)
SP21
Y166 LEFT DRIVE FORWARD SOLENOID
732-GY
Y164 LEFT DRIVE REVERSE SOLENOID
858-OG/W
277-BK
278-BK
Y165 RIGHT DRIVE FORWARD SOLENOID
279-BK
280-BK
Y163 RIGHT DRIVE REVERSE SOLENOID
860-OG/W
X004 (03)
235-BK
859-OG/W
252-BK
248-BK
GND05
SP44
SP37
151-RD/W
F020 DCU FUSE (10-Amp)
(D1)
(D2)
168-RD/W
SP36
148-RD/W
X004 (02)
117-RD/W
759-WT
X005 (06)
X004 (06)
SP51
169-RD/W
170-RD/W
X004 (05)
236-BK
SP22
007-RD
(D6)
(D5)
F014 SEAT: SEAT SWITCH AND SEAT BELT SWITCH FUSE (5-Amp)
015-RD
014-RD
X023 (10)
X023 (09)
X023 (07)
X023 (06)
X023 (08)
X023 (05)
BELT SW N.C.
BELT SW N.O.
SEAT SW N.C.
SEAT SW N.O.
BELT SW COMMON
SEAT SW COMMON
X023
SEAT CONTROL UNIT (SCU)
XE05 (2)
XE05 (10)
XE06 (11)
XE06 (12)
XE06 (05)
XE06 (07)
XE06 (08)
XE06 (09)
XE06 (10)
XE05 (1)
+12VDC
HI/ISO MODE SELECTOR
+12VDC
+12VDC
PARK BRAKE VALVE
PUMP FORWARD (LEFT)
PUMP REVERSE (LEFT)
PUMP FORWARD (RIGHT)
PUMP REVERSE (RIGHT)
GROUND
XE05/XE06
DANFOSS CONTROL UNIT (DCU)
Unswitched Power Circuit
Switched Power Circuit
ISO-Mode Circuit
Interlock Circuit
Left Drive Reverse Circuit
Right Drive Forward Circuit
Ground Circuit
62568

Figure 2-77

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Drive Circuit—Left Turn Theory of Operation (H-Mode)

Unswitched Power Circuit

Unswitched power is available from the battery positive terminal to the battery disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR01) to the following:

- 20-amp key switch fuse (F008)
- Main power relay (K902) terminal 03
- 5-amp seat: seat switch and seat belt switch fuse (F014)

Unswitched power is provided from the 20-amp key switch fuse (F008) to key switch (S001) terminals A and B.

Unswitched power is provided from the 5-amp seat: seat switch and seat belt switch fuse (F014) to Seat Control Unit (SCU) (M5) terminals 05 and 08.

Interlock Circuit

When the seat switch is in the closed position, the SCU (X023) sends output voltage from terminal 07 to the Machine Control Unit (MCU) (M3) terminal 255.

When the seat belt switch is in the closed position, the SCU (X023) sends output voltage from terminal 10 to the MCU (XE01) terminal 145.

With the park brake switch (S065) in the disengaged position, the MCU (XE01) provides power from terminal 139 to the park brake release solenoid (Y043) terminal 1 and resistor (R005). The Danfoss Control Unit (DCU) (XE06) terminal 05 provides a ground for the park brake release solenoid (Y043) terminal 2, energizing the solenoid.

With the interlock circuit complete, all hydrostatic drive functions become active.

Switched Power

When the key switch (S001) is turned to the ON position, power is provided from key switch (S001) terminal C to diode connector (V004) terminal 2. Power is then provided from diode connector (V004) terminal 1 to main power relay (K902) terminal 02, energizing the relay. With the main power relay (K902) energized, switched power is provided from main power relay (K902) terminal 05 to the following:

- 5-amp instrument display fuse (F002)
- 10-amp cab power fuse (F003)
- 15-amp joysticks fuse (F012)
- 10-amp DCU fuse (F020)

Switched power is provided from the 5-amp instrument display fuse (F002) to the H/ISO pattern selection switch (S203) terminal 5.

Switched power is provided from the 10-amp cab power fuse (F003) to the park brake switch (S065) terminal 2.

Switched power is provided from the 15-amp joysticks fuse (F012) to the LH joystick (X010) terminal 2, RH joystick (X012) terminal 1, diode connector (V001) terminal 3, and MCU (XE01) terminal 146.

Switched power is provided from the 10-amp DCU fuse (F020) to the DCU (XE05) terminals 2, 11, and 12.

Left Turn Circuit

When H mode is selected on the H/ISO pattern selection switch (S203), switched power is provided from H/ISO pattern selection switch (S203) terminal 5 to the H/ISO pattern selection switch (S203) terminal 4. Switched power is then provided from the H/ISO pattern selection switch (S203) terminal 4 to H/ISO pattern selection switch (S203) terminal 2. Switched power is provided from H/ISO pattern selection switch (S203) terminal 2 to the H/ISO pattern selection switch (S203) terminal 1. Power is provided from H/ISO pattern selection switch (S203) terminal 1 to the DCU (XE06) terminal 11.

When joysticks are in the left turn position (LH joystick [X010] back and RH joystick [X012] forward), power is provided from the DCU (XE06) terminal 08 to the left drive reverse solenoid (Y164) terminal 1, and from the DCU (XE06) terminal 09 to the right drive forward solenoid (Y165) terminal 1, activating both solenoids.

Drive Circuit Left Turn Schematic (H-Mode)

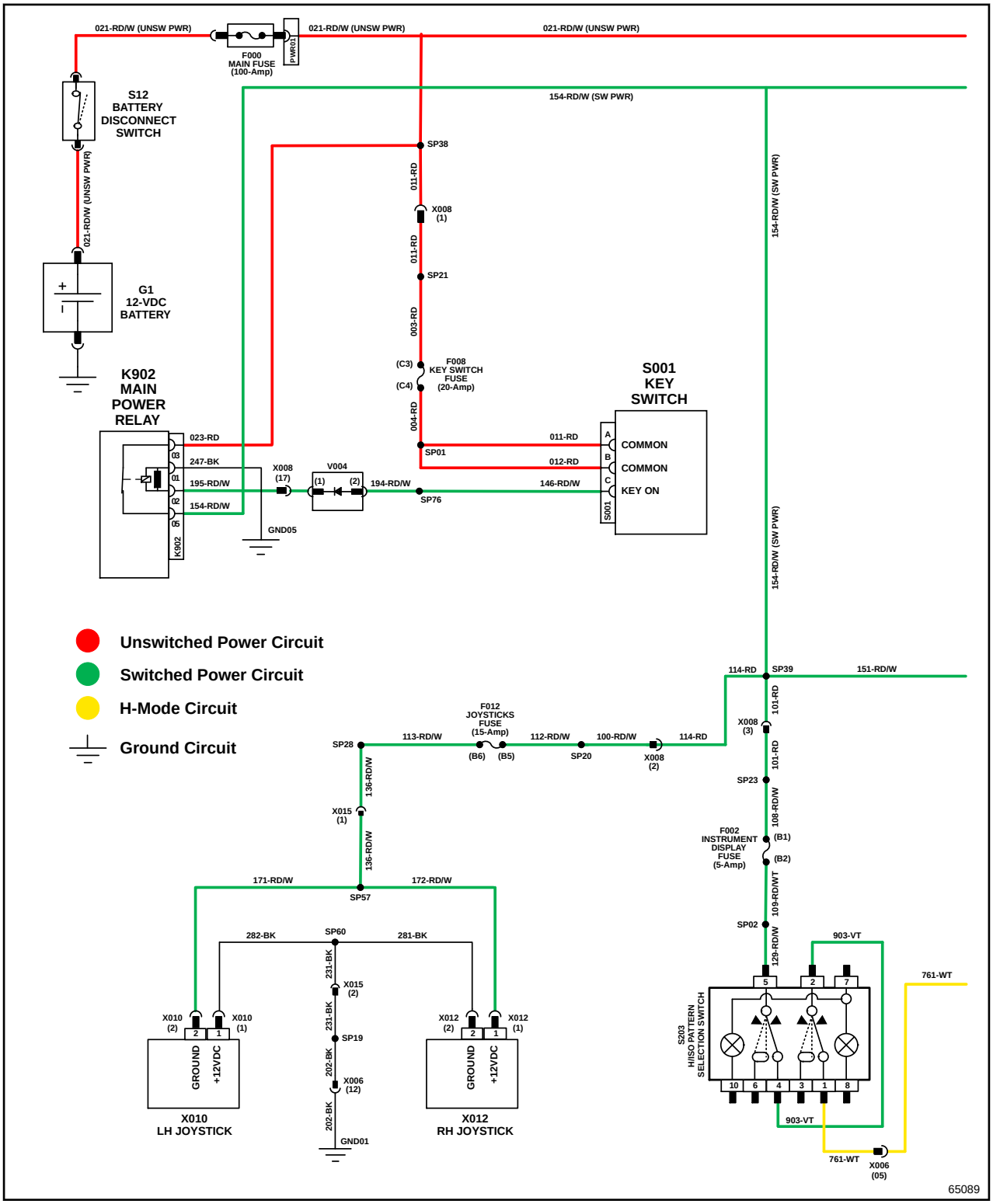


Figure 2-78

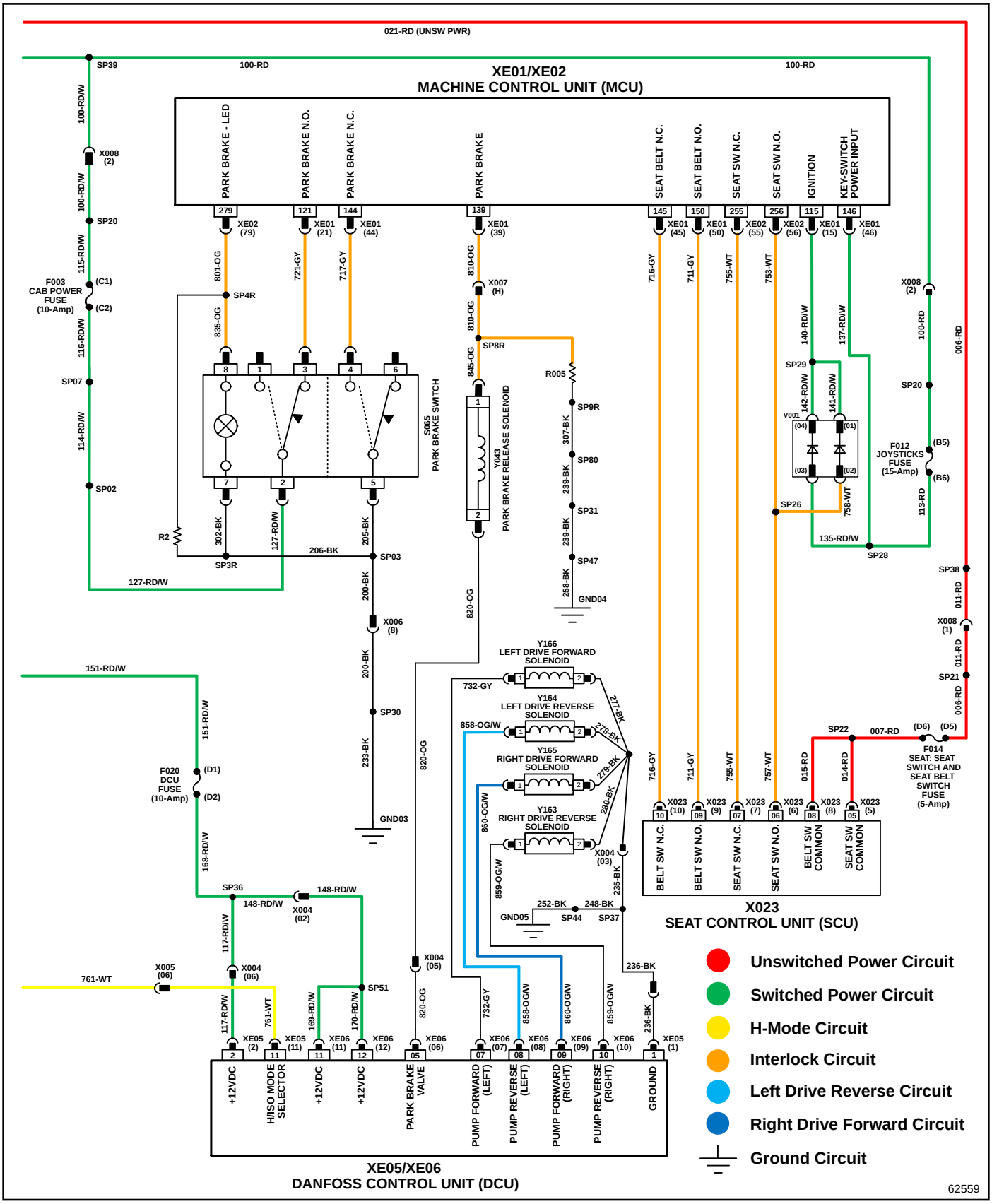

021-RD (UNSW PWR)
XE01/XE02
MACHINE CONTROL UNIT (MCU)
PARK BRAKE - LED
PARK BRAKE N.O.
PARK BRAKE N.C.
PARK BRAKE
SEAT BELT N.C.
SEAT BELT N.O.
SEAT SW N.C.
SEAT SW N.O.
IGNITION
KEY-SWITCH POWER INPUT
SP39
100-RD
100-RD/W
X008 (2)
SP20
115-RD/W
F003 CAB POWER FUSE (10-Amp)
(C1)
(C2)
116-RD/W
SP07
114-RD/W
SP02
127-RD/W
SP4R
801-OG
835-OG
721-GY
717-GY
S065 PARK BRAKE SWITCH
R2
302-BK
127-RD/W
SP3R
206-BK
205-BK
SP03
200-BK
X006 (8)
SP30
233-BK
GND03
810-OG
X007 (H)
SP8R
845-OG
Y043 PARK BRAKE RELEASE SOLENOID
R005
SP9R
307-BK
SP80
239-BK
SP31
SP47
258-BK
GND04
820-OG
716-GY
711-GY
755-WT
753-WT
140-RD/W
137-RD/W
SP29
142-RD/W
141-RD/W
V001
F012 JOYSTICKS FUSE (15-Amp)
(B5)
(B6)
113-RD
758-WT
SP26
135-RD/W
SP28
006-RD
SP38
011-RD
X008 (1)
SP21
Y166 LEFT DRIVE FORWARD SOLENOID
Y164 LEFT DRIVE REVERSE SOLENOID
Y165 RIGHT DRIVE FORWARD SOLENOID
Y163 RIGHT DRIVE REVERSE SOLENOID
732-GY
858-OG/W
860-OG/W
859-OG/W
277-BK
278-BK
279-BK
280-BK
X004 (03)
235-BK
252-BK
248-BK
GND05
SP44
SP37
151-RD/W
F020 DCU FUSE (10-Amp)
(D1)
(D2)
168-RD/W
SP36
148-RD/W
X004 (02)
117-RD/W
X005 (06)
761-WT
X004 (06)
SP51
169-RD/W
170-RD/W
X004 (05)
236-BK
SP22
007-RD
(D6)
(D5)
F014 SEAT: SEAT SWITCH AND SEAT BELT SWITCH FUSE (5-Amp)
015-RD
014-RD
X023
SEAT CONTROL UNIT (SCU)
BELT SW N.C.
BELT SW N.O.
SEAT SW N.C.
SEAT SW N.O.
BELT SW COMMON
SEAT SW COMMON
XE05/XE06
DANFOSS CONTROL UNIT (DCU)
+12VDC
HI/ISO MODE SELECTOR
+12VDC
+12VDC
PARK BRAKE VALVE
PUMP FORWARD (LEFT)
PUMP REVERSE (LEFT)
PUMP FORWARD (RIGHT)
PUMP REVERSE (RIGHT)
GROUND
Unswitched Power Circuit
Switched Power Circuit
H-Mode Circuit
Interlock Circuit
Left Drive Reverse Circuit
Right Drive Forward Circuit
Ground Circuit
62559

Figure 2-79

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Drive Circuit—Two Speed Theory of Operation

Unswitched Power Circuit

Unswitched power is available from the battery positive terminal to the battery disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR01) to the following:

- 20-amp key switch fuse (F008)
- Main power relay (K902) terminal 03
- 5-amp seat: seat switch and seat belt switch fuse (F014)

Unswitched power is provided from the 20-amp key switch fuse (F008) to key switch (S001) terminals A and B.

Unswitched power is provided from the 5-amp seat: seat switch and seat belt switch fuse (F014) to Seat Control Unit (SCU) (X023) terminals 05 and 08.

Interlock Circuit

When the seat switch is in the closed position, the SCU (X023) sends output voltage from terminal 07 to the Machine Control Unit (MCU) (XE01) terminal 255.

When the seat belt switch is in the closed position, the SCU (X023) sends output voltage from terminal 10 to the MCU (XE01) terminal 145.

With the park brake switch (S065) in the disengaged position, the MCU (XE01) provides power from terminal 139 to the park brake release solenoid (Y043) terminal 1 and resistor (R005). The Danfoss Control Unit (DCU) (XE06) terminal 05 provides a ground for the park brake release solenoid (Y043) terminal 2, energizing the solenoid.

With the interlock circuit complete, all hydrostatic drive functions become active.

Switched Power

When the key switch (S001) is turned to the ON position, power is provided from key switch (S001) terminal C to diode connector (V004) terminal 2. Power is then provided from diode connector (V004) terminal 1 to main power relay (K902) terminal 02, energizing the relay. With the main power relay (K902) energized, switched power is provided from main power relay (K902) terminal 05 to the following:

- 10-amp cab power fuse (F003)
- 15-amp joysticks fuse (F012)
- 10-amp DCU fuse (F020)

Switched power is provided from the 10-amp cab power fuse (F003) to the park brake switch (S065) terminal 2.

Switched power is provided from the 15-amp joysticks fuse (F012) to the diode connector (V001) terminal 3 and MCU terminal 146.

Switched power is provided from the 10-amp DCU fuse (F020) to the DCU (XE05) terminals 2, 11, and 12.

Two Speed Circuit

The MCU (XE01) provides switched power from terminal 106 to the LH joystick two speed mode button (K2m) terminal 1. When the LH joystick two speed mode button (K2m) is depressed, switched power from the LH two speed mode button (K2m) terminal 2 returns to the MCU (XE01) terminal 262.

The MCU (XE01) provides power from terminal 135 to the two speed solenoid valve (Y003) terminal 1, energizing the solenoid.

Drive Circuit Two Speed Schematic

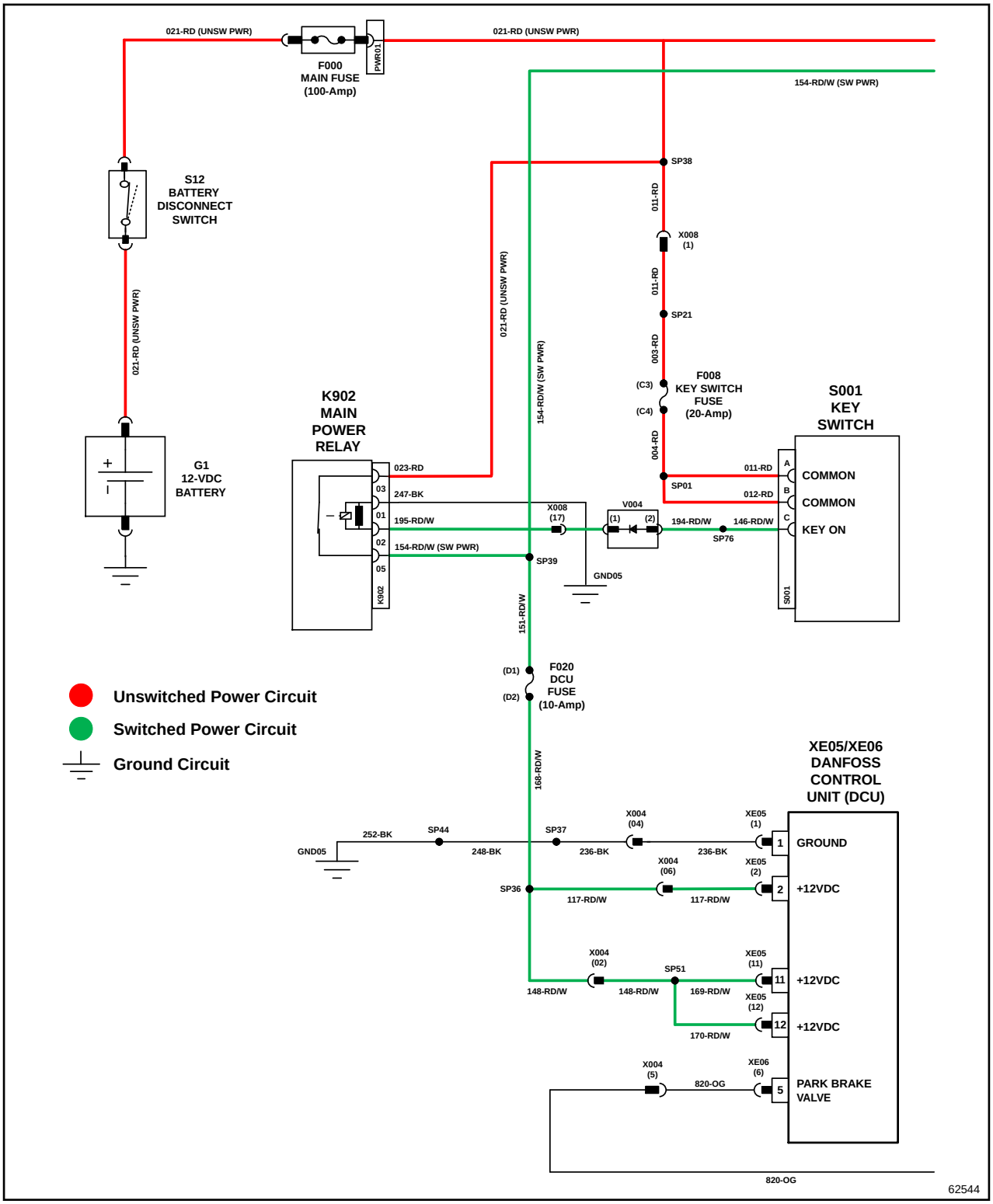


Figure 2-80

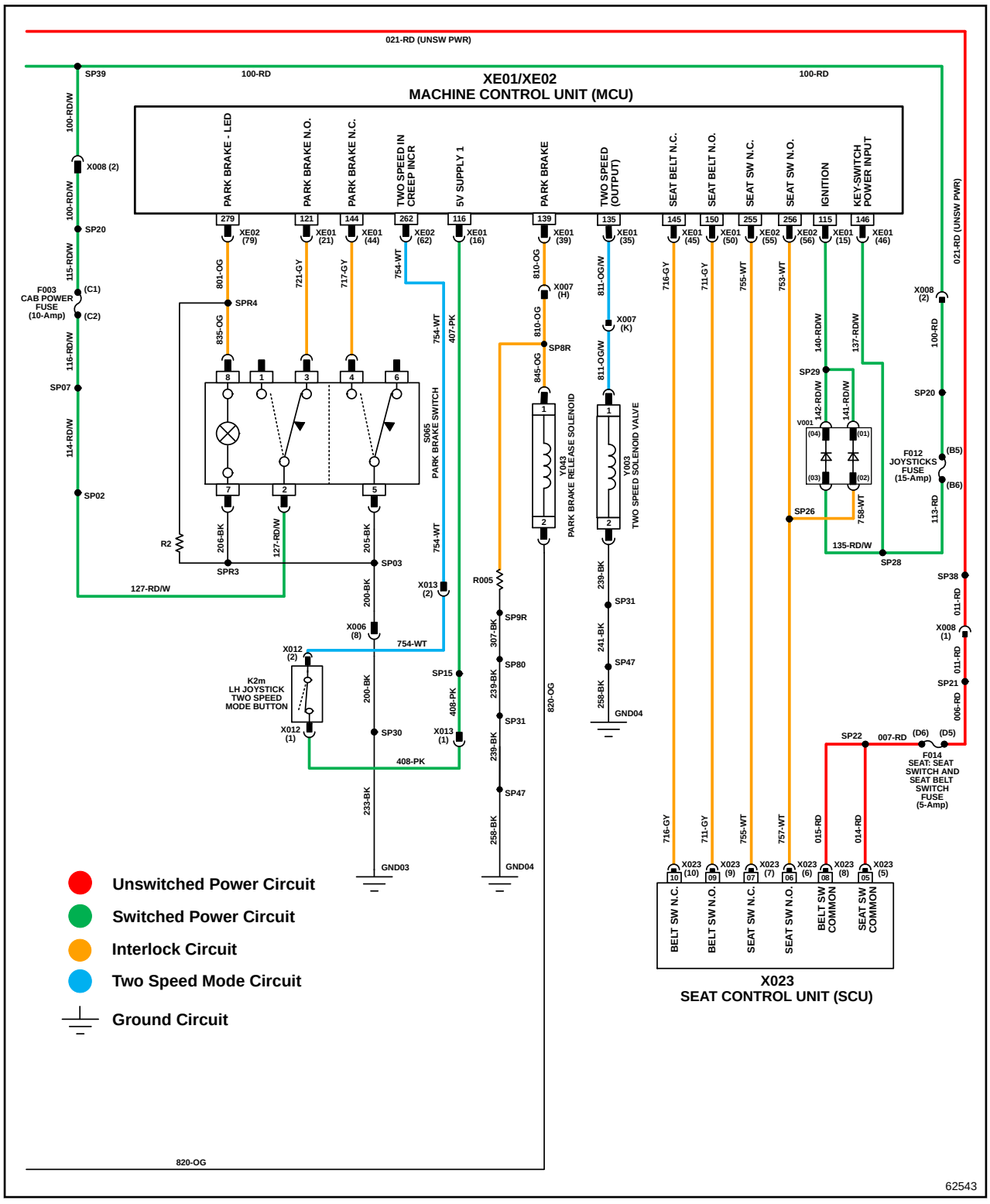

021-RD (UNSW PWR)
XE01/XE02
MACHINE CONTROL UNIT (MCU)
PARK BRAKE - LED
PARK BRAKE N.O.
PARK BRAKE N.C.
TWO SPEED IN CREEP INCR
5V SUPPLY 1
PARK BRAKE
TWO SPEED (OUTPUT)
SEAT BELT N.C.
SEAT BELT N.O.
SEAT SW N.C.
SEAT SW N.O.
IGNITION
KEY-SWITCH POWER INPUT
S065 PARK BRAKE SWITCH
Y043 PARK BRAKE RELEASE SOLENOID
Y003 TWO SPEED SOLENOID VALVE
V001
F003 CAB POWER FUSE (10-Amp)
F012 JOYSTICKS FUSE (15-Amp)
F014 SEAT: SEAT SWITCH AND SEAT BELT SWITCH FUSE (5-Amp)
K2m LH JOYSTICK TWO SPEED MODE BUTTON
R2
R005
GND03
GND04
X023 SEAT CONTROL UNIT (SCU)
BELT SW N.C.
BELT SW N.O.
SEAT SW N.C.
SEAT SW N.O.
BELT SW COMMON
SEAT SW COMMON
Unswitched Power Circuit
Switched Power Circuit
Interlock Circuit
Two Speed Mode Circuit
Ground Circuit
62543

Figure 2-81

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Drive Circuit—Creep Mode Theory of Operation

Unswitched Power Circuit

Unswitched power is available from the battery positive terminal to the battery disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR01) to the following:

- 20-amp key switch fuse (F008)
- Main power relay (K902) terminal 03
- 5-amp seat: seat switch and seat belt switch fuse (F014)

Unswitched power is provided from the 20-amp key switch fuse (F008) to key switch (S001) terminals A and B.

Unswitched power is provided from the 5-amp seat: seat switch and seat belt switch fuse (F014) to Seat Control Unit (SCU) (X023) terminals 05 and 08.

Interlock Circuit

When the seat switch is in the closed position, the SCU (X023) sends output voltage from terminal 07 to the Machine Control Unit (MCU) (XE01) terminal 255.

When the seat belt switch is in the closed position, the SCU (X023) sends output voltage from terminal 10 to the MCU (XE01) terminal 145.

With the park brake switch (S065) in the disengaged position, the MCU (XE01) provides power from terminal 139 to the park brake release solenoid (Y043) terminal 1 and resistor (R005). The Danfoss Control Unit (DCU) (XE06) terminal 05 provides a ground for the park brake release solenoid (Y043) terminal 2, energizing the solenoid.

With the interlock circuit complete, all hydrostatic drive functions become active.

Switched Power

When the key switch (S001) is turned to the ON position, power is provided from key switch (S001) terminal C to diode connector (V004) terminal 2. Power is then provided from diode connector (V004) terminal 1 to main power relay (K902) terminal 02, energizing the relay. With the main power relay (K902) energized, switched power is provided from main power relay (K902) terminal 05 to the following:

- 10-amp cab power fuse (F003)
- 15-amp joysticks fuse (F012)
- 10-amp DCU fuse (F020)

Switched power is provided from the 10-amp cab power fuse (F003) to the park brake switch (S065) terminal 2.

Switched power is provided from the 15-amp joysticks fuse (F012) to the diode connector (V001) terminal 3 and MCU (XE01) terminal 146.

Switched power is provided from the 10-amp DCU fuse (F020) to the DCU (XE05) terminals 2, 11, and 12.

Creep Mode Circuit

The MCU (XE01) provides switched power from terminal 106 to the LH joystick creep mode button (K2l) terminal 5. When the LH joystick creep mode button (K2l) is depressed, switched power from terminal 6 of the LH creep mode button (K2l) returns to MCU (XE01) terminal 267.

The MCU (XE01) provides power from terminal 135 to the two speed solenoid valve (Y003) terminal 1, energizing the solenoid.

Drive Circuit Creep Mode Schematic

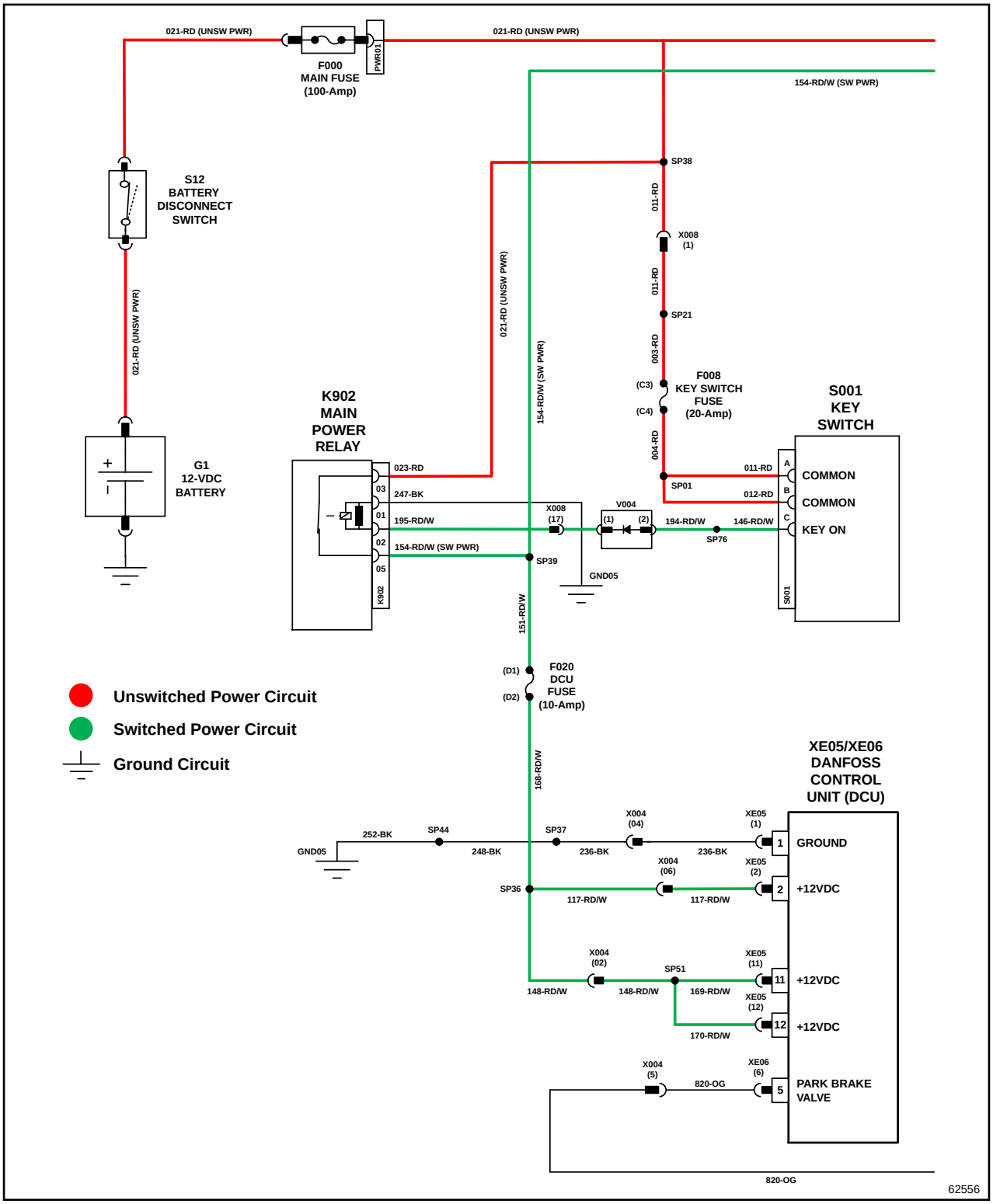


Figure 2-82

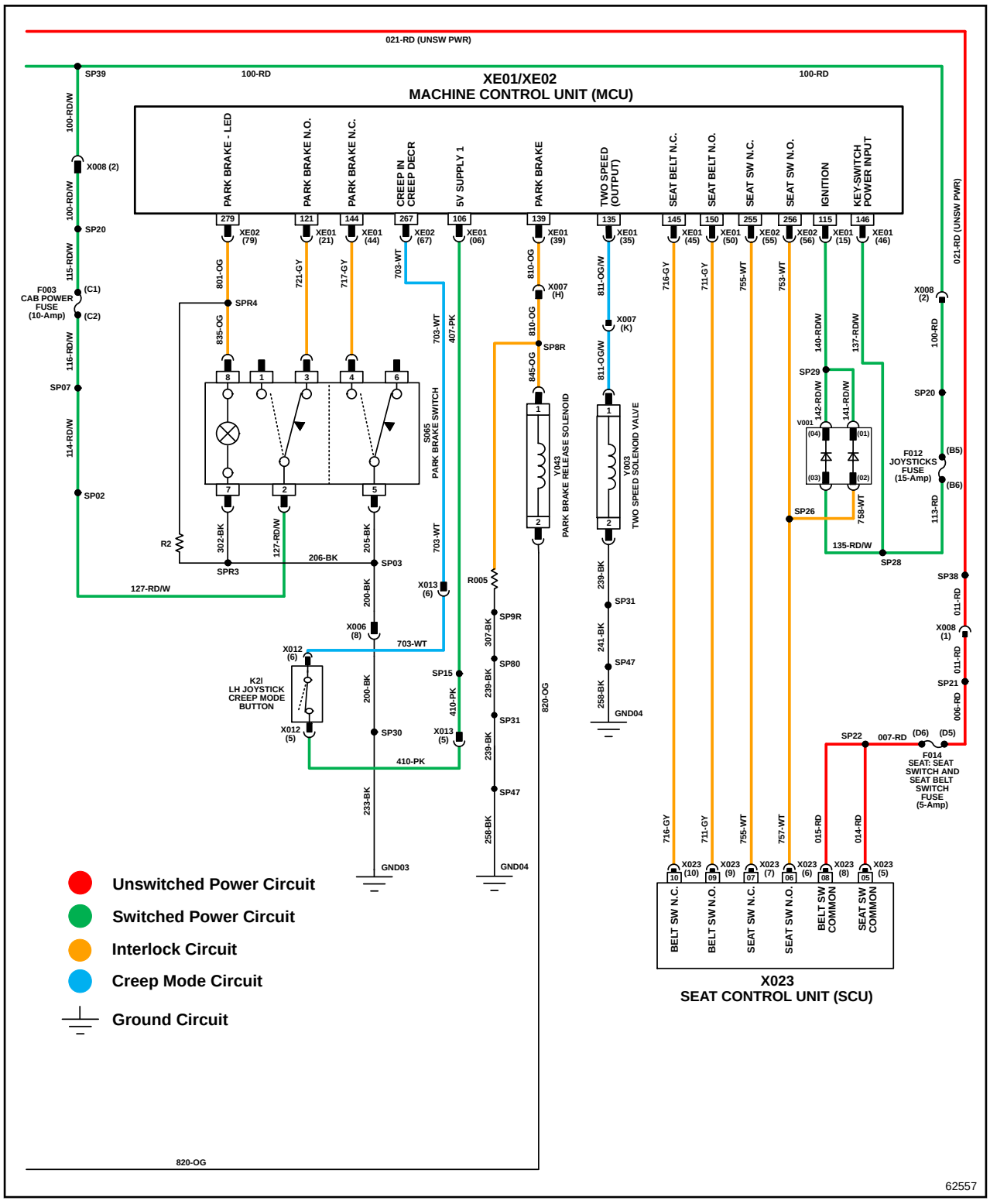

021-RD (UNSW PWR)
XE01/XE02
MACHINE CONTROL UNIT (MCU)
PARK BRAKE - LED
PARK BRAKE N.O.
PARK BRAKE N.C.
CREEP IN CREEP DECR
5V SUPPLY 1
PARK BRAKE
TWO SPEED (OUTPUT)
SEAT BELT N.C.
SEAT BELT N.O.
SEAT SW N.C.
SEAT SW N.O.
IGNITION
KEY-SWITCH POWER INPUT
S065 PARK BRAKE SWITCH
Y043 PARK BRAKE RELEASE SOLENOID
Y003 TWO SPEED SOLENOID VALVE
F003 CAB POWER FUSE (10-Amp)
F012 JOYSTICKS FUSE (15-Amp)
F014 SEAT: SEAT SWITCH AND SEAT BELT SWITCH FUSE (5-Amp)
K2I LH JOYSTICK CREEP MODE BUTTON
R2
R005
V001
GND03
GND04
X023 SEAT CONTROL UNIT (SCU)
BELT SW N.C.
BELT SW N.O.
SEAT SW N.C.
SEAT SW N.O.
BELT SW COMMON
SEAT SW COMMON
Unswitched Power Circuit
Switched Power Circuit
Interlock Circuit
Creep Mode Circuit
Ground Circuit
62557

Figure 2-83

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Boom Controls Circuit—Theory of Operation (ISO-Mode)

Unswitched Power Circuit

Unswitched power is available from the battery positive terminal to the battery disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR01) to the following:

- 20-amp key switch fuse (F008)
- Main power relay (K902) terminal 03
- 5-amp seat: seat switch and seat belt switch fuse (F014)

Unswitched power is provided from the 20-amp key switch fuse (F008) to key switch (S001) terminals A and B.

Unswitched power is provided from the 5-amp seat: seat switch and seat belt switch fuse (F014) to Seat Control Unit (SCU) (X023) terminals 05 and 08.

Interlock Circuit

When the seat switch is in the closed position, the SCU (X023) sends output voltage from terminal 07 to the Machine Control Unit (MCU) (XE01) terminal 255.

When the seat belt switch is in the closed position, the SCU (X023) sends output voltage from terminal 10 to the MCU (XE01) terminal 145.

When the door switch (S087) is in the open position, the MCU (X023) no longer receives voltage from terminal 2 of the door switch (S087) to terminal 118.

With the park brake switch (S065) in the disengaged position, the MCU (XE01) provides power from terminal 139 to the park brake release solenoid (Y043) terminal 1 and resistor (R005). The Danfoss Control Unit (DCU) (XE06) terminal 05 provides a ground for the park brake release solenoid (Y043) terminal 2, energizing the solenoid.

With the interlock circuit complete, all hydrostatic and hydraulic functions become active.

Switched Power

When the key switch (S001) is turned to the ON position, power is provided from key switch (S001) terminal C to diode connector (V004) terminal 2. Power is then provided from diode connector (V004) terminal 1 to main power relay (K902) terminal 02, energizing the relay. With the main power relay (K902) energized, switched power is provided from main power relay (K902) terminal 05 to the following:

- 5-amp instrument display fuse (F002)
- 10-amp cab power fuse (F003)
- 15-amp joysticks fuse (F012)
- 10-amp DCU fuse (F020)

Switched power is provided from the 5-amp instrument display fuse (F002) to the H/ISO pattern selection switch (S203) terminal 5.

Switched power is provided from the 10-amp cab power fuse (F003) to the door switch (S087) terminal 1 and park brake switch (S065) terminal 2.

Switched power is provided from the 15-amp joysticks fuse (F012) to the RH joystick (X012), diode connector (V001) terminal 3, and MCU (XE01) terminal 146.

Switched power is provided from the 10-amp DCU fuse (F020) to the DCU (XE05) terminals 2, 11, and 12.

Boom Circuit

The MCU (XE01) provides power from terminal 276 to the main valve solenoid (Y157) terminal 1, and from MCU terminal 269 to the main valve solenoid (Y160) terminal 1.

When ISO mode is selected on the H/ISO pattern selection switch (S203), switched power is provided from H/ISO pattern selection switch (S203) terminal 5 to the H/ISO pattern selection switch (S203) terminal 6. Power is provided from H/ISO pattern selection switch (S203) terminal 6 to the DCU terminal 10.

With the RH joystick (X012) in the boom up position (back), power is provided from the MCU terminal 276 to the main control valve solenoid (Y157) terminal 1, energizing the solenoid.

With the RH joystick (X012) in the boom down position (forward), power is provided from the MCU terminal 269 to the main control valve solenoid (Y160) terminal 1, energizing the solenoid.

Boom Controls Circuit Schematic (ISO-Mode)

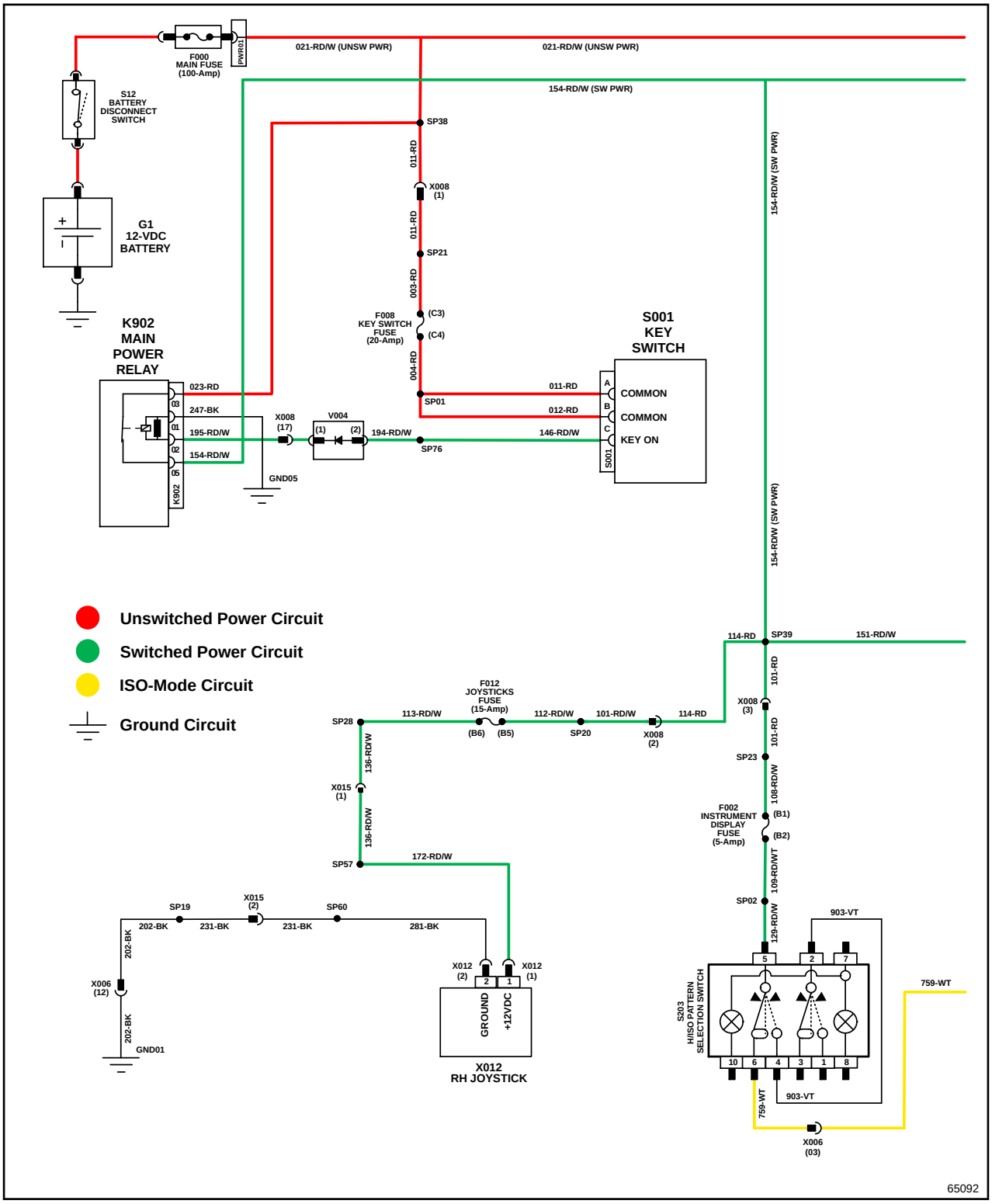


Figure 2-84

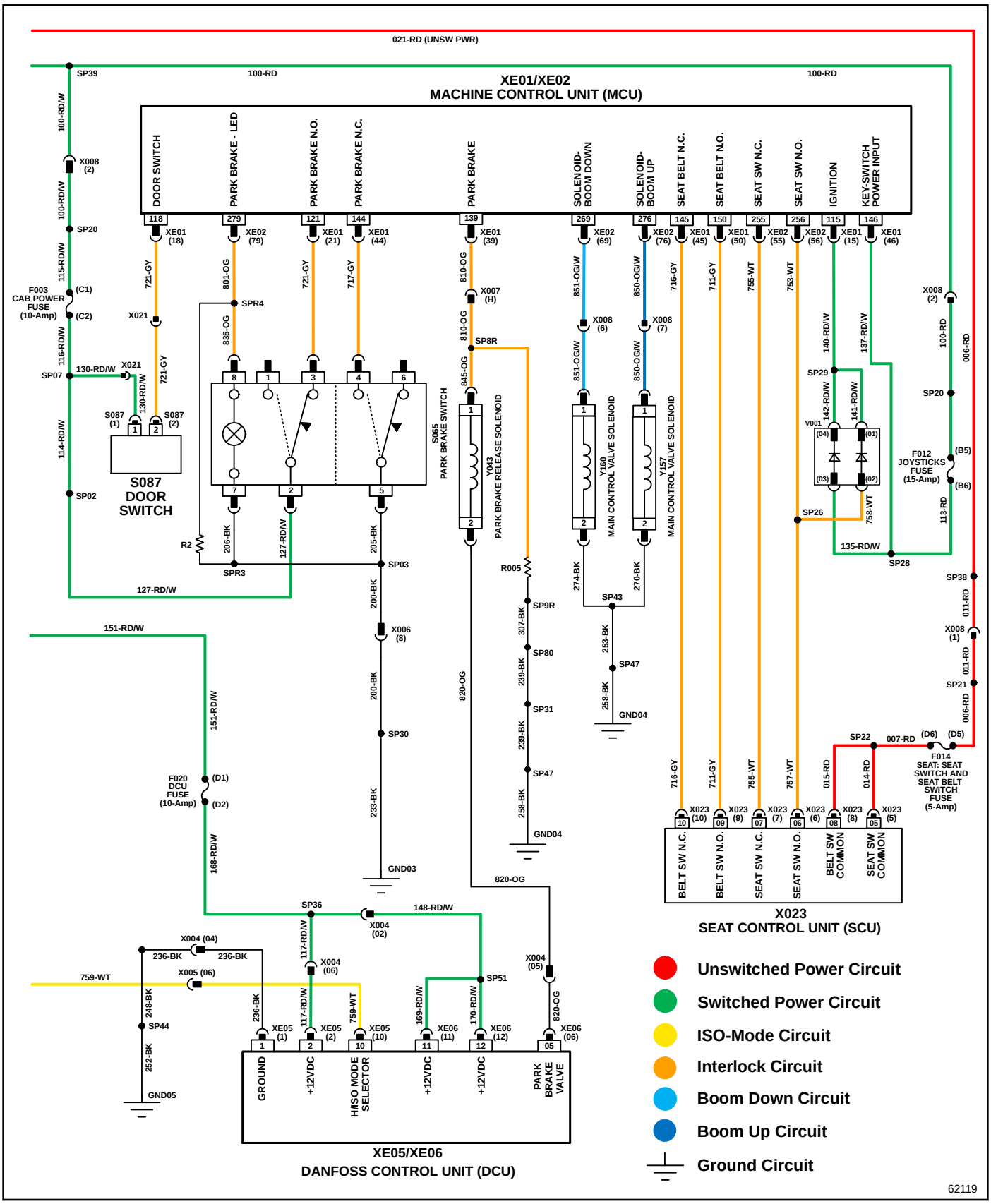

021-RD (UNSW PWR)
XE01/XE02
MACHINE CONTROL UNIT (MCU)
DOOR SWITCH
PARK BRAKE - LED
PARK BRAKE N.O.
PARK BRAKE N.C.
PARK BRAKE
SOLENOID-BOOM DOWN
SOLENOID-BOOM UP
SEAT BELT N.C.
SEAT BELT N.O.
SEAT SW N.C.
SEAT SW N.O.
IGNITION
KEY-SWITCH POWER INPUT
S087 DOOR SWITCH
S065 PARK BRAKE SWITCH
Y043 PARK BRAKE RELEASE SOLENOID
Y160 MAIN CONTROL VALVE SOLENOID
Y157 MAIN CONTROL VALVE SOLENOID
F003 CAB POWER FUSE (10-Amp)
F020 DCU FUSE (10-Amp)
F012 JOYSTICKS FUSE (15-Amp)
F014 SEAT: SEAT SWITCH AND SEAT BELT SWITCH FUSE (5-Amp)
X023
SEAT CONTROL UNIT (SCU)
BELT SW N.C.
BELT SW N.O.
SEAT SW N.C.
SEAT SW N.O.
BELT SW COMMON
SEAT SW COMMON
XE05/XE06
DANFOSS CONTROL UNIT (DCU)
GROUND
+12VDC
HI/SO MODE SELECTOR
+12VDC
+12VDC
PARK BRAKE VALVE
Unswitched Power Circuit
Switched Power Circuit
ISO-Mode Circuit
Interlock Circuit
Boom Down Circuit
Boom Up Circuit
Ground Circuit
62119

Figure 2-85

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Boom Controls Circuit—Theory of Operation (H-Mode)

Unswitched Power Circuit

Unswitched power is available from the battery positive terminal to the battery disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR01) to the following:

- 20-amp key switch fuse (F008)
- Main power relay (K902) terminal 03
- 5-amp seat: seat switch and seat belt switch fuse (F014)

Unswitched power is provided from the 20-amp key switch fuse (F008) to key switch (S001) terminals A and B.

Unswitched power is provided from the 5-amp seat: seat switch and seat belt switch fuse (F014) to Seat Control Unit (SCU) (X023) terminals 05 and 08.

Interlock Circuit

When the seat switch is in the closed position, the SCU (X023) sends output voltage from terminal 07 to the Machine Control Unit (MCU) (XE01) terminal 255.

When the seat belt switch is in the closed position, the SCU (X023) sends output voltage from terminal 10 to the MCU (XE01) terminal 145.

When the door switch (S087) is in the open position, the MCU (XE01) no longer receives voltage from terminal 2 of the door switch (S087) to terminal 118.

With the park brake switch (S065) in the disengaged position, the MCU (XE01) provides power from terminal 139 to the park brake release solenoid (Y043) terminal 1 and resistor (R005). The Danfoss Control Unit (DCU) (XE06) terminal 05 provides a ground for the park brake release solenoid (Y043) terminal 2, energizing the solenoid.

With the interlock circuit complete, all hydrostatic and hydraulic functions become active.

Switched Power

When the key switch (S001) is turned to the ON position, power is provided from key switch (S001) terminal C to diode connector (V004) terminal 2. Power is then provided from diode connector (V004) terminal 1 to main power relay (K902) terminal 02, energizing the relay. With the main power relay (K902) energized, switched power is provided from main power relay (K902) terminal 05 to the following:

- 5-amp instrument display fuse (F002)
- 10-amp cab power fuse (F003)
- 15-amp joysticks fuse (F012)
- 10-amp DCU fuse (F020)

Switched power is provided from the 5-amp instrument display fuse (F002) to the H/ISO pattern selection switch (S203) terminal 5.

Switched power is provided from the 10-amp cab power fuse (F003) to the door switch (S087) terminal 1 and park brake switch (S065) terminal 2.

Switched power is provided from the 15-amp joysticks fuse (F012) to the LH joystick (X010), diode connector (V001) terminal 3, and MCU (XE01) terminal 146.

Switched power is provided from the 10-amp DCU fuse (F020) to the DCU (XE05) terminals 2, 11, and 12.

Boom Circuit

The MCU (XE01) provides power from terminal 276 to the main control valve solenoid (Y157) terminal 1, and MCU terminal 269 to the main control valve solenoid (Y160) terminal 1.

When H mode is selected on the H/ISO pattern selection switch (S203), switched power is provided from H/ISO pattern selection switch (S203) terminal 5 to the H/ISO pattern selection switch (S203) terminal 4. Switched power is then provided from the H/ISO pattern selection switch (S203) terminal 4 to H/ISO pattern selection switch (S203) terminal 2. Switched power is provided from H/ISO pattern selection switch (S203) terminal 2 to the H/ISO pattern selection switch (S203) terminal 1. Power is provided from H/ISO pattern selection switch (S203) terminal 1 to the DCU (XE05) terminal 11.

With the LH joystick (X010) in the boom up position (left), power is provided from the MCU (XE01) terminal 276 to the main control valve solenoid (Y157) terminal 1, activating the solenoid.

With the LH joystick (X010) in the boom down position (right), power is provided from the MCU (XE01) terminal 269 to the main control valve solenoid (Y160) terminal 1, activating the solenoid.

Boom Controls Circuit Schematic (H-Mode)

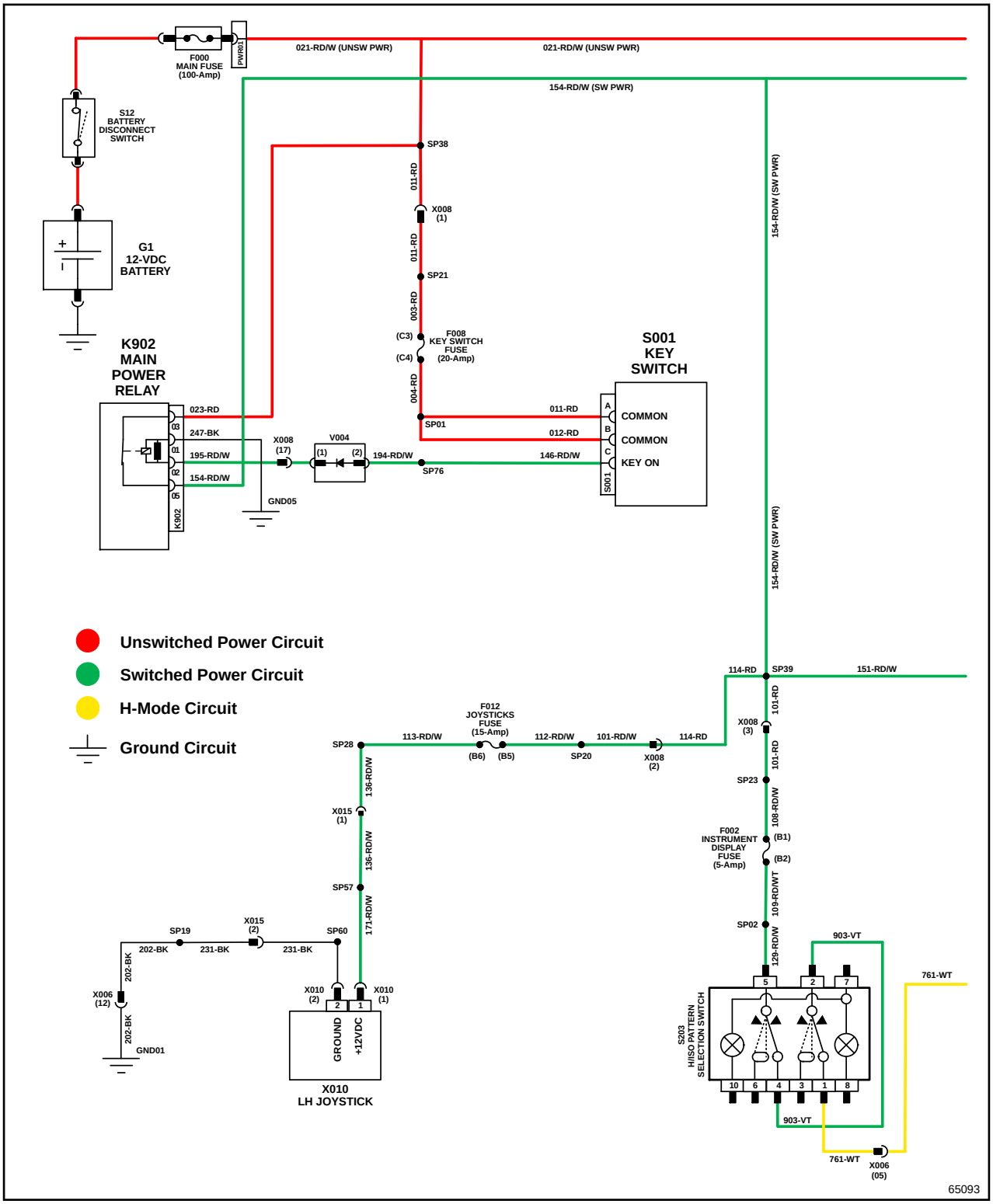


Figure 2-86

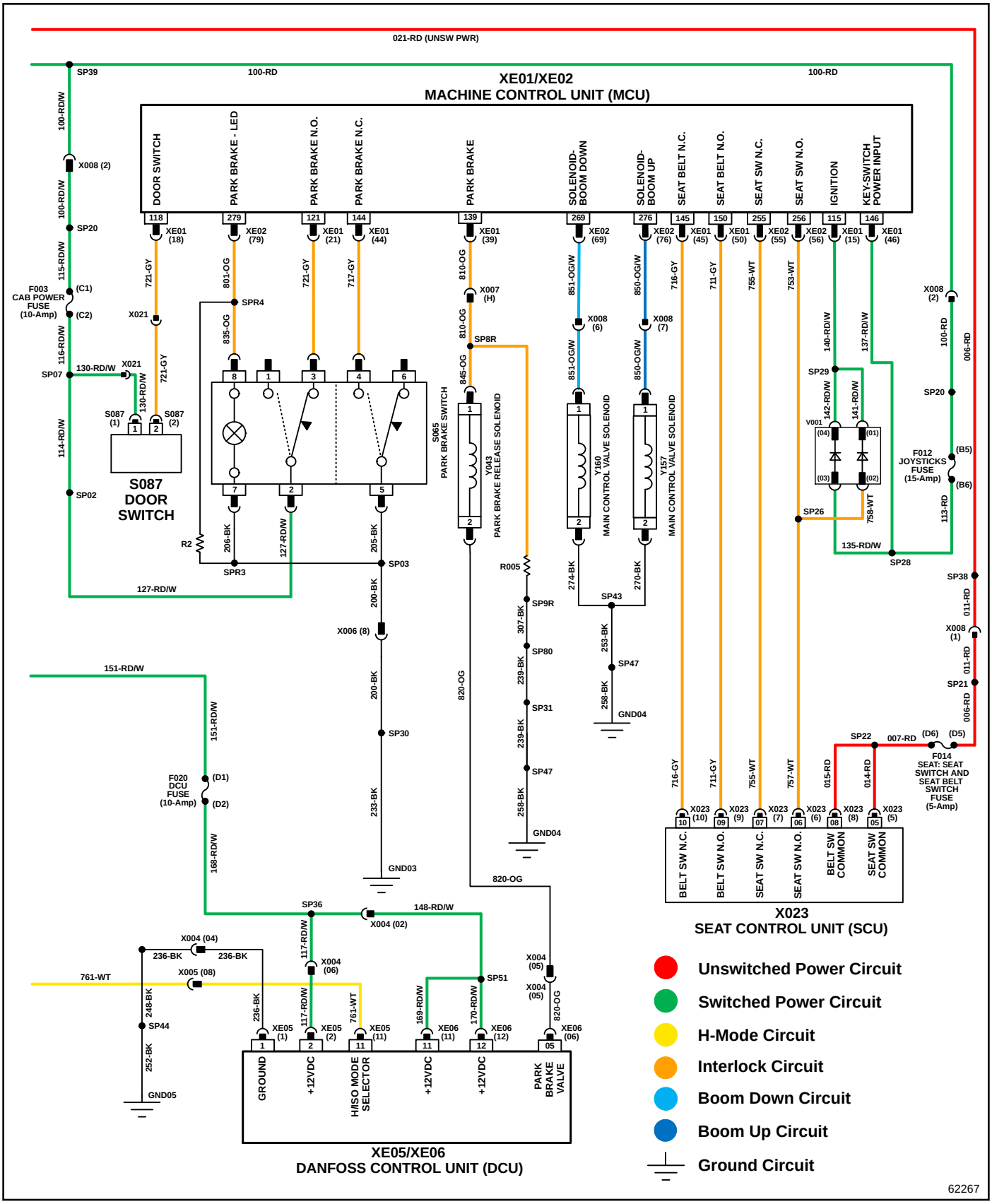

021-RD (UNSW PWR)
XE01/XE02
MACHINE CONTROL UNIT (MCU)
DOOR SWITCH
PARK BRAKE - LED
PARK BRAKE N.O.
PARK BRAKE N.C.
PARK BRAKE
SOLENOID-BOOM DOWN
SOLENOID-BOOM UP
SEAT BELT N.C.
SEAT BELT N.O.
SEAT SW N.C.
SEAT SW N.O.
IGNITION
KEY-SWITCH POWER INPUT
S087 DOOR SWITCH
S065 PARK BRAKE SWITCH
Y043 PARK BRAKE RELEASE SOLENOID
Y160 MAIN CONTROL VALVE SOLENOID
Y157 MAIN CONTROL VALVE SOLENOID
F003 CAB POWER FUSE (10-Amp)
F020 DCU FUSE (10-Amp)
F012 JOYSTICKS FUSE (15-Amp)
F014 SEAT: SEAT SWITCH AND SEAT BELT SWITCH FUSE (5-Amp)
X023
SEAT CONTROL UNIT (SCU)
BELT SW N.C.
BELT SW N.O.
SEAT SW N.C.
SEAT SW N.O.
BELT SW COMMON
SEAT SW COMMON
XE05/XE06
DANFOSS CONTROL UNIT (DCU)
GROUND
+12VDC
HI/SO MODE SELECTOR
+12VDC
+12VDC
PARK BRAKE VALVE
Unswitched Power Circuit
Switched Power Circuit
H-Mode Circuit
Interlock Circuit
Boom Down Circuit
Boom Up Circuit
Ground Circuit
62267

Figure 2-87

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Boom Controls Circuit—Theory of Operation (Manual Controls)

Unswitched Power Circuit

Unswitched power is available from the battery positive terminal to the battery disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR01) to the following:

- 20-amp key switch fuse (F008)
- Main power relay (K902) terminal 03
- 5-amp seat: seat switch and seat belt switch fuse (F014)

Unswitched power is provided from the 20-amp key switch fuse (F008) to key switch (S001) terminals A and B.

Unswitched power is provided from the 5-amp seat: seat switch and seat belt switch fuse (F014) to Seat Control Unit (SCU) (X023) terminals 05 and 08.

Interlock Circuit

When the seat switch is in the closed position, the SCU (X023) sends output voltage from terminal 07 to the Machine Control Unit (MCU) (XE01) terminal 255.

When the seat belt switch is in the closed position, the SCU (X023) sends output voltage from terminal 10 to the MCU (XE01) terminal 145.

When the door switch (S087) is in the open position, the MCU (XE01) no longer receives voltage from terminal 2 of the door switch (S087) to terminal 118.

With the park brake switch (S065) in the disengaged position, the MCU (XE01) provides power from terminal 139 to the park brake release solenoid (Y043) terminal 1 and resistor (R005), energizing the solenoid.

With the interlock circuit complete, all hydrostatic and hydraulic functions become active.

Switched Power

When the key switch (S001) is turned to the ON position, power is provided from key switch (S001) terminal C to diode connector (V004) terminal 2. Power is then provided from diode connector (V004) terminal 1 to main power relay (K902) terminal 02, energizing the relay. With the main power relay (K902) energized, switched power is provided from main power relay (K902) terminal 05 to the following:

- 10-amp cab power fuse (F003)
- 15-amp joysticks fuse (F012)

Switched power is provided from the 10-amp cab power fuse (F003) to the door switch (S087) terminal 1 and park brake switch (S065) terminal 2.

Switched power is provided from the 15-amp joysticks fuse (F012) to the diode connector (V001) terminal 3 and MCU terminal 146.

Boom Circuit

The MCU (XE01) provides power from terminal 104 and 116 to the boom foot pedal sensor (B116) terminals D and E.

With the boom foot pedal sensor (B116) in the boom up position (back), power is provided from the boom foot pedal sensor (B116) to the MCU (XE01) terminals 113 and 120. Power is then provided from MCU (XE01) terminal 276 to the main control valve solenoid (Y157) terminal 1, energizing the solenoid.

With the boom foot pedal sensor (B116) in the boom down position (down), power is provided from boom foot pedal sensor (B116) to the MCU (XE01) terminals 113 and 120. Power is then provided from MCU (XE01) terminal 269 to the main control valve solenoid (Y160) terminal 1, energizing the solenoid.

Boom Controls Circuit Schematic (Manual Controls)

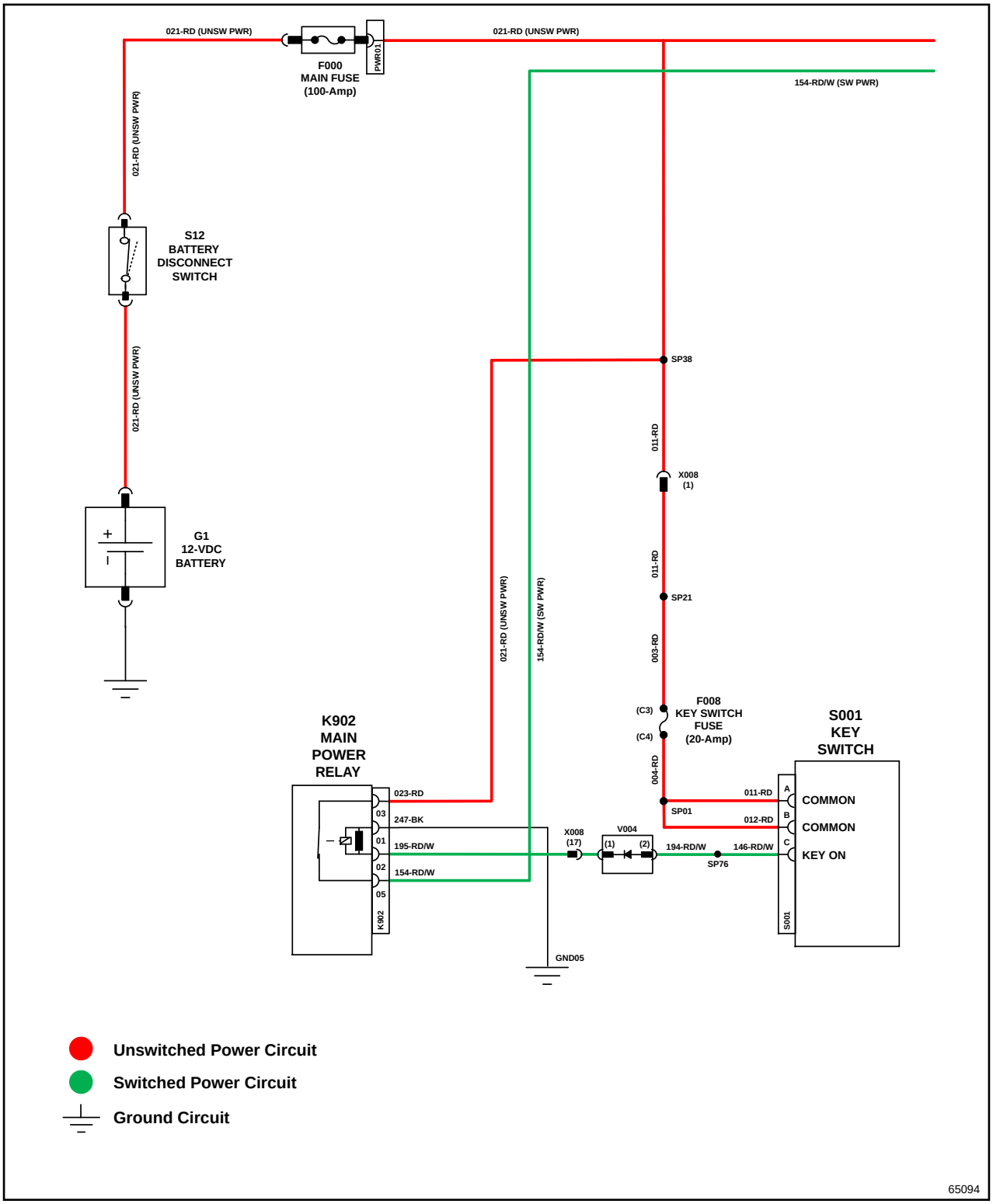


Figure 2-88

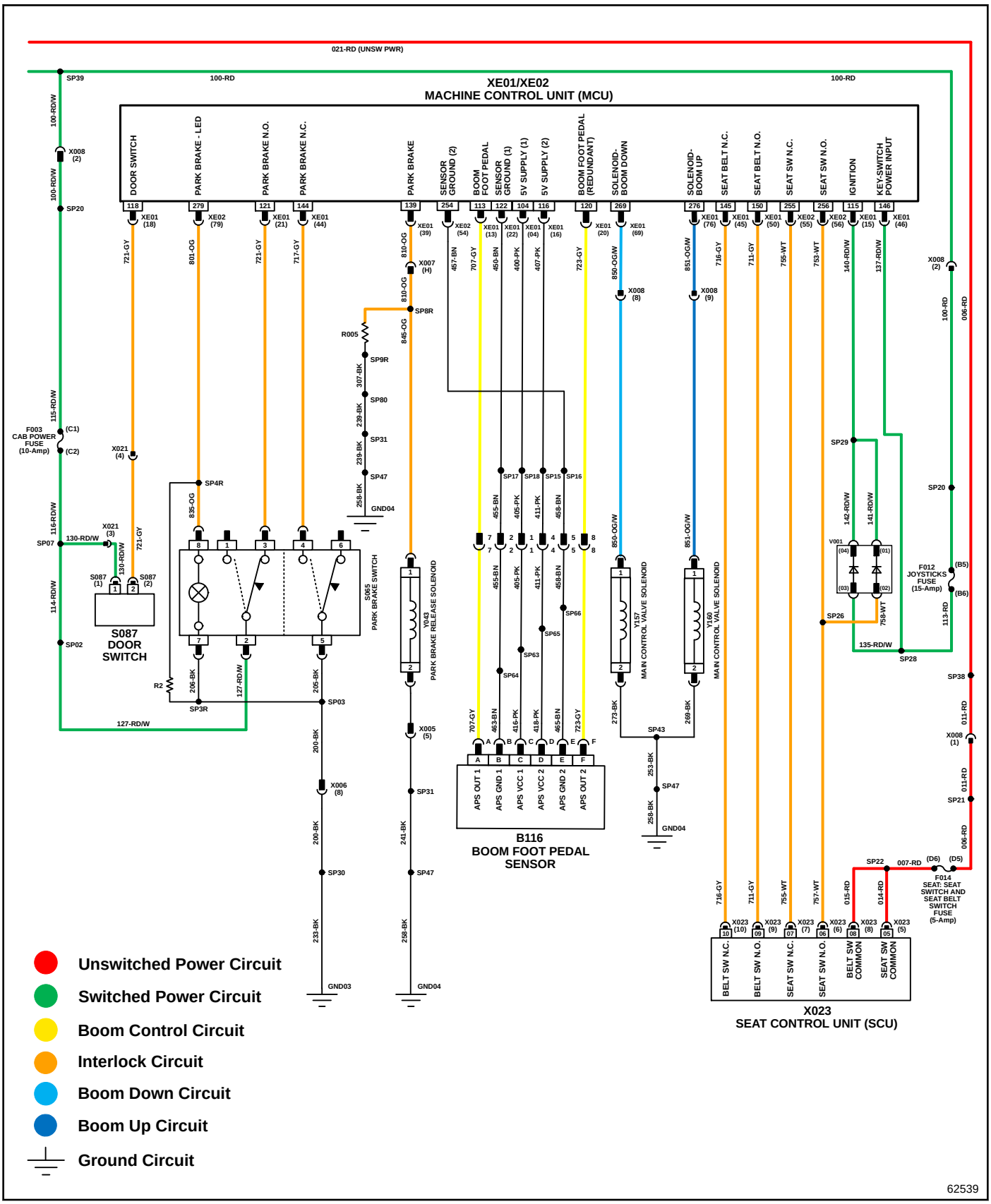

021-RD (UNSW PWR)
XE01/XE02
MACHINE CONTROL UNIT (MCU)
DOOR SWITCH
PARK BRAKE - LED
PARK BRAKE N.O.
PARK BRAKE N.C.
PARK BRAKE
SENSOR GROUND (2)
BOOM FOOT PEDAL SENSOR GROUND (1)
5V SUPPLY (1)
5V SUPPLY (2)
BOOM FOOT PEDAL (REDUNDANT)
SOLENOID-BOOM DOWN
SOLENOID-BOOM UP
SEAT BELT N.C.
SEAT BELT N.O.
SEAT SW N.C.
SEAT SW N.O.
IGNITION
KEY-SWITCH POWER INPUT
F003 CAB POWER FUSE (10-Amp)
S087 DOOR SWITCH
S065 PARK BRAKE SWITCH
Y043 PARK BRAKE RELEASE SOLENOID
Y157 MAIN CONTROL VALVE SOLENOID
Y160 MAIN CONTROL VALVE SOLENOID
V001
F012 JOYSTICKS FUSE (15-Amp)
B116
BOOM FOOT PEDAL SENSOR
APS OUT 1
APS GND 1
APS VCC 1
APS VCC 2
APS GND 2
APS OUT 2
X023
SEAT CONTROL UNIT (SCU)
BELT SW N.C.
BELT SW N.O.
SEAT SW N.C.
SEAT SW N.O.
BELT SW COMMON
SEAT SW COMMON
F014 SEAT: SEAT SWITCH AND SEAT BELT SWITCH FUSE (5-Amp)
Unswitched Power Circuit
Switched Power Circuit
Boom Control Circuit
Interlock Circuit
Boom Down Circuit
Boom Up Circuit
Ground Circuit
62539

Figure 2-89

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Bucket Controls Circuit—Theory of Operation (ISO-Mode)

Unswitched Power Circuit

Unswitched power is available from the battery positive terminal to the battery disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR01) to the following:

- 20-amp key switch fuse (F008)
- Main power relay (K902) terminal 03
- 5-amp seat: seat switch and seat belt switch fuse (F014)

Unswitched power is provided from the 20-amp key switch fuse (F008) to key switch (S001) terminals A and B.

Unswitched power is provided from the 5-amp seat: seat switch and seat belt switch fuse (F014) to Seat Control Unit (SCU) (X023) terminals 05 and 08.

Interlock Circuit

When the seat switch is in the closed position, the SCU (X023) sends output voltage from terminal 07 to the Machine Control Unit (MCU) (XE01) terminal 255.

When the seat belt switch is in the closed position, the SCU (X023) sends output voltage from terminal 10 to the MCU (XE01) terminal 145.

When the door switch (S087) is in the open position, the MCU (M5) no longer receives voltage from terminal 2 of the door switch (S087) to terminal 118.

With the park brake switch (S065) in the disengaged position, the MCU (XE01) provides power from terminal 139 to the park brake release solenoid (Y043) terminal 1 and resistor (R005). The Danfoss Control Unit (DCU) (XE06) terminal 05 provides a ground for the park brake release solenoid (Y043) terminal 2, energizing the solenoid.

With the interlock circuit complete, all hydrostatic and hydraulic functions become alive.

Switched Power

When the key switch (S001) is turned to the ON position, power is provided from key switch (S001) terminal C to diode connector (V004) terminal 2. Power is then provided from diode connector (V004) terminal 1 to main power relay (K902) terminal 02, energizing the relay. With the main power relay (K902) energized, switched power is provided from main power relay (K902) terminal 05 to the following:

- 5-amp instrument display fuse (F002)
- 10-amp cab power fuse (F003)
- 15-amp joysticks fuse (F012)
- 10-amp DCU fuse (F020)

Switched power is provided from the 5-amp instrument display fuse (F002) to the H/ISO pattern selection switch terminal 5.

Switched power is provided from the 10-amp cab power fuse (F003) to the door switch (S087) terminal 1 and park brake switch (S065) terminal 2.

Switched power is provided from the 15-amp joysticks fuse (F012) to the RH joystick (X012), diode connector (V001) terminal 3, and MCU terminal 146.

Switched power is provided from the 10-amp DCU fuse (F020) to the DCU (XE05) terminals 2, 11, and 12.

Bucket Circuit

The MCU (XE01) provides power from terminal 140 to the main control valve solenoid (Y158) terminal 1, and MCU terminal 152 to the main control valve solenoid (Y161) terminal 1.

When ISO mode is selected on the H/ISO pattern selection switch (S203), switched power is provided from pattern selection switch (S203) terminal 5 to the H/ISO pattern selection switch (S203) terminal 6 to the DCU terminal 10.

With the RH joystick (X012) in the bucket curl position (left), power is provided from the MCU terminal 152 to the main control valve solenoid (Y161) terminal 1, energizing the solenoid.

With the RH joystick (X012) in the bucket dump position (right), power is provided from the MCU terminal 140 to the main control valve solenoid (Y158) terminal 1, energizing the solenoid.

Bucket Controls Circuit Schematic (ISO-Mode)

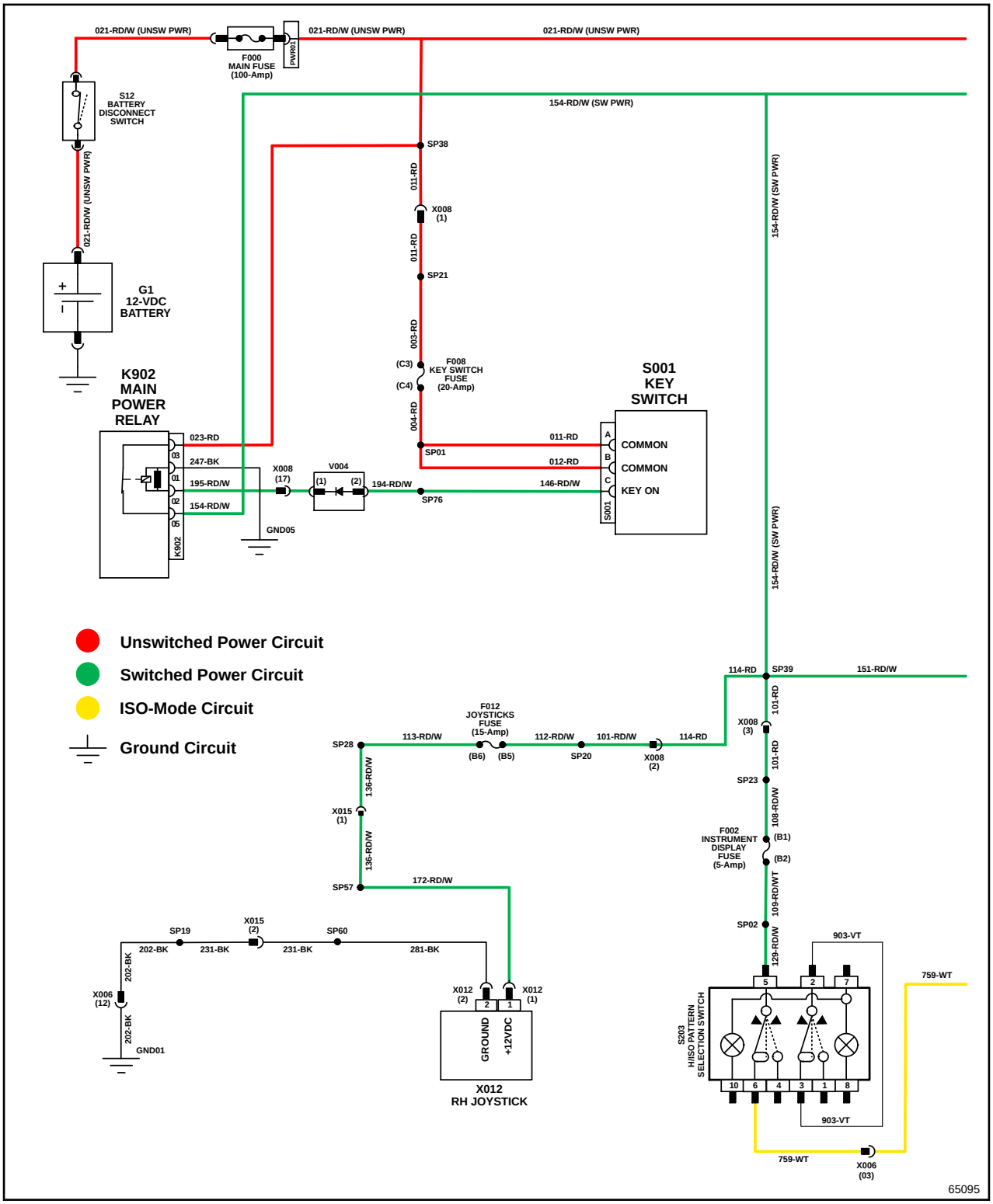


Figure 2-90

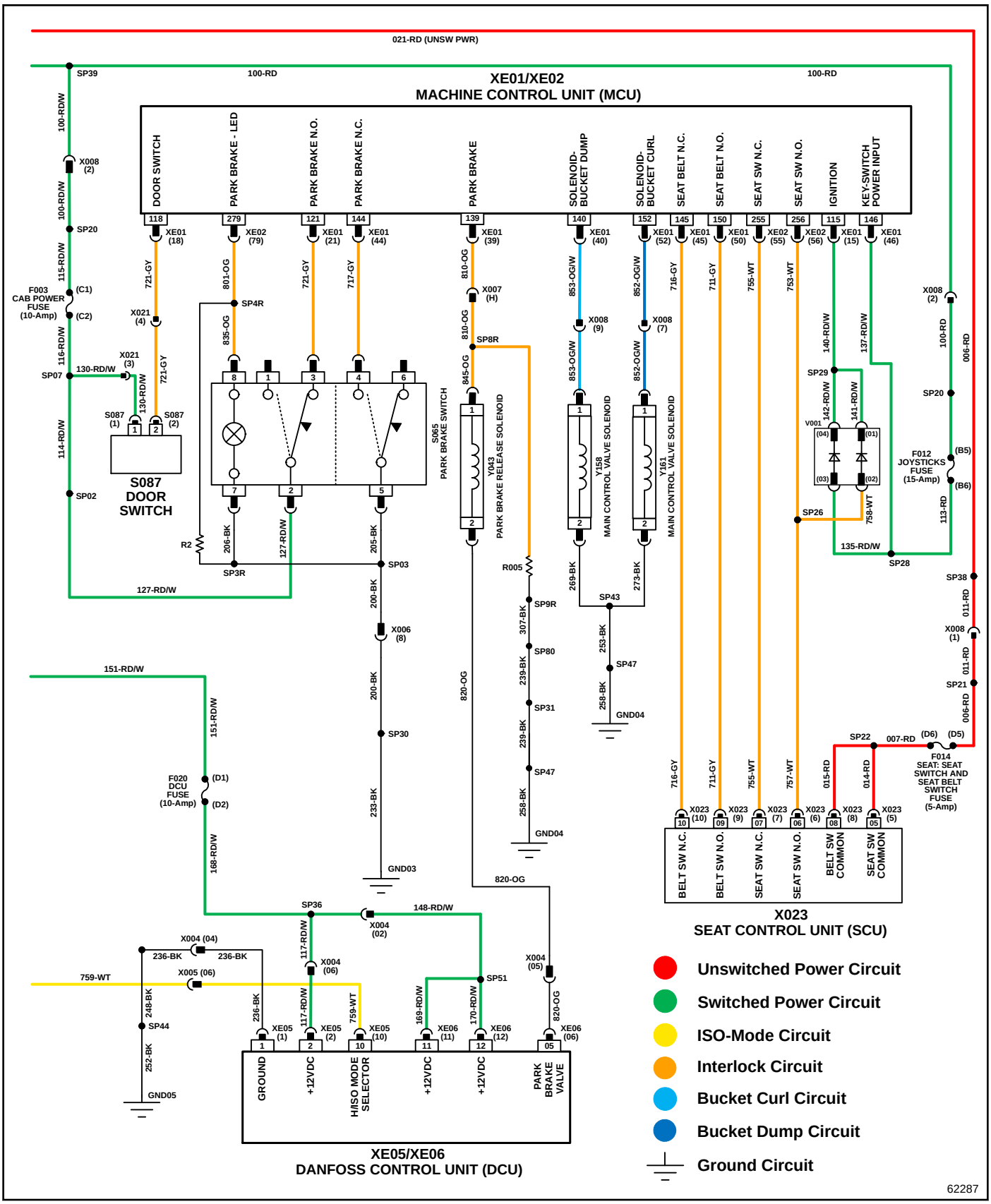

021-RD (UNSW PWR)
XE01/XE02
MACHINE CONTROL UNIT (MCU)
DOOR SWITCH
PARK BRAKE - LED
PARK BRAKE N.O.
PARK BRAKE N.C.
PARK BRAKE
SOLENOID-BUCKET DUMP
SOLENOID-BUCKET CURL
SEAT BELT N.C.
SEAT BELT N.O.
SEAT SW N.C.
SEAT SW N.O.
IGNITION
KEY-SWITCH POWER INPUT
S087 DOOR SWITCH
S065 PARK BRAKE SWITCH
Y043 PARK BRAKE RELEASE SOLENOID
Y158 MAIN CONTROL VALVE SOLENOID
Y161 MAIN CONTROL VALVE SOLENOID
F003 CAB POWER FUSE (10-Amp)
F020 DCU FUSE (10-Amp)
F012 JOYSTICKS FUSE (15-Amp)
F014 SEAT: SEAT SWITCH AND SEAT BELT SWITCH FUSE (5-Amp)
X023
SEAT CONTROL UNIT (SCU)
BELT SW N.C.
BELT SW N.O.
SEAT SW N.C.
SEAT SW N.O.
BELT SW COMMON
SEAT SW COMMON
XE05/XE06
DANFOSS CONTROL UNIT (DCU)
GROUND
+12VDC
HI/SO MODE SELECTOR
+12VDC
+12VDC
PARK BRAKE VALVE
Unswitched Power Circuit
Switched Power Circuit
ISO-Mode Circuit
Interlock Circuit
Bucket Curl Circuit
Bucket Dump Circuit
Ground Circuit
62287

Figure 2-91

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Bucket Controls Circuit—Theory of Operation (H-Mode)

Unswitched Power Circuit

Unswitched power is available from the battery positive terminal to the battery disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR01) to the following:

- 20-amp key switch fuse (F008)
- Main power relay (K902) terminal 03
- 5-amp seat: seat switch and seat belt switch fuse (F014)

Unswitched power is provided from the 20-amp key switch fuse (F008) to key switch (S001) terminals A and B.

Unswitched power is provided from the 5-amp seat: seat switch and seat belt switch fuse (F014) to Seat Control Unit (SCU) (X023) terminals 05 and 08.

Interlock Circuit

When the seat switch is in the closed position, the SCU (X023) sends output voltage from terminal 10 to the Machine Control Unit (MCU) (XE01) terminal 145.

When the seat belt switch is in the closed position, the SCU (X023) sends output voltage from terminal 07 to the MCU (XE01) terminal 255.

When the door switch (S087) is in the open position, the MCU (XE01) no longer receives voltage from terminal 2 of the door switch (S087) to terminal 118.

With the park brake switch (S065) in the disengaged position, the MCU (XE01) provides power from terminal 139 to the park brake release solenoid (Y043) terminal 1 and resistor (R005). The Danfoss Control Unit (DCU) (XE06) terminal 05 provides a ground for the park brake release solenoid (Y043) terminal 2, energizing the solenoid.

With the interlock circuit complete, all hydrostatic and hydraulic functions become active.

Switched Power

When the key switch (S001) is turned to the ON position, power is provided from key switch (S001) terminal C to diode connector (V004) terminal 2. Power is then provided from diode connector (V004) terminal 1 to main power relay (K902) terminal 02, energizing the relay. With the main power relay (K902) energized, switched power is provided from main power relay (K902) terminal 05 to the following:

- 5-amp instrument display fuse (F002)
- 10-amp cab power fuse (F003)
- 15-amp joysticks fuse (F012)
- 10-amp DCU fuse (F020)

Switched power is provided from the 5-amp instrument display fuse (F002) to the H/ISO pattern selection switch (S203) terminal 5.

Switched power is provided from the 10-amp cab power fuse (F003) to the door switch (S087) terminal 1 and park brake switch (S065) terminal 2.

Switched power is provided from the 15-amp joysticks fuse (F012) to the RH joystick (X012), diode connector (V001) terminal 3, and MCU terminal 146.

Switched power is provided from the 10-amp DCU fuse (F020) to the DCU (XE05) terminals 2, 11, and 12.

Bucket Circuit

The MCU (M3) provides power from terminal 140 to the main control valve solenoid (Y158) terminal 1, and from MCU terminal 152 to the main control valve solenoid (Y161) terminal 1.

When H mode is selected on the H/ISO pattern selection switch (S203), switched power is provided from pattern selection switch (S203) terminal 5 to the H/ISO pattern selection switch (S203) terminal 4. Switched power is then provided from the H/ISO pattern selection switch (S203) terminal 4 to H/ISO pattern selection switch (S203) terminal 2. Switched power is provided from H/ISO pattern selection switch (S203) terminal 2 to the H/ISO pattern selection switch (S203) terminal 1. Power is provided from H/ISO pattern selection switch (S203) terminal 1 to the DCU terminal 11.

With the RH joystick (X012) in the bucket curl position (left), power is provided from the MCU (XE01) terminal 152 to the main control valve solenoid (Y161) terminal 1, energizing the solenoid.

With the RH joystick (X012) in the buck dump position (right), power is provided from the MCU (XE01) terminal 140 to the main control valve solenoid (Y158) terminal 1, energizing the solenoid.

Bucket Controls Circuit Schematic (H-Mode)

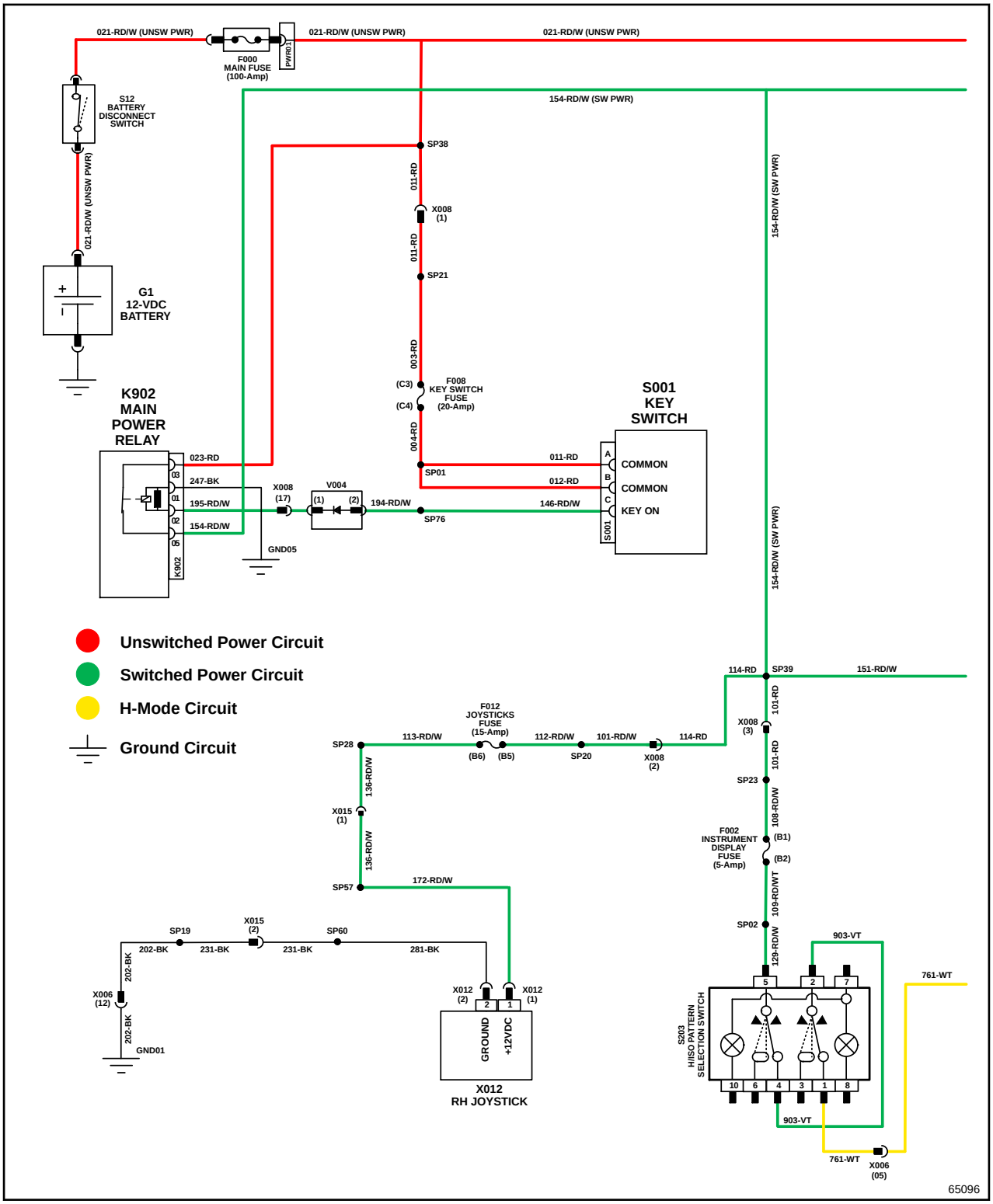


Figure 2-92

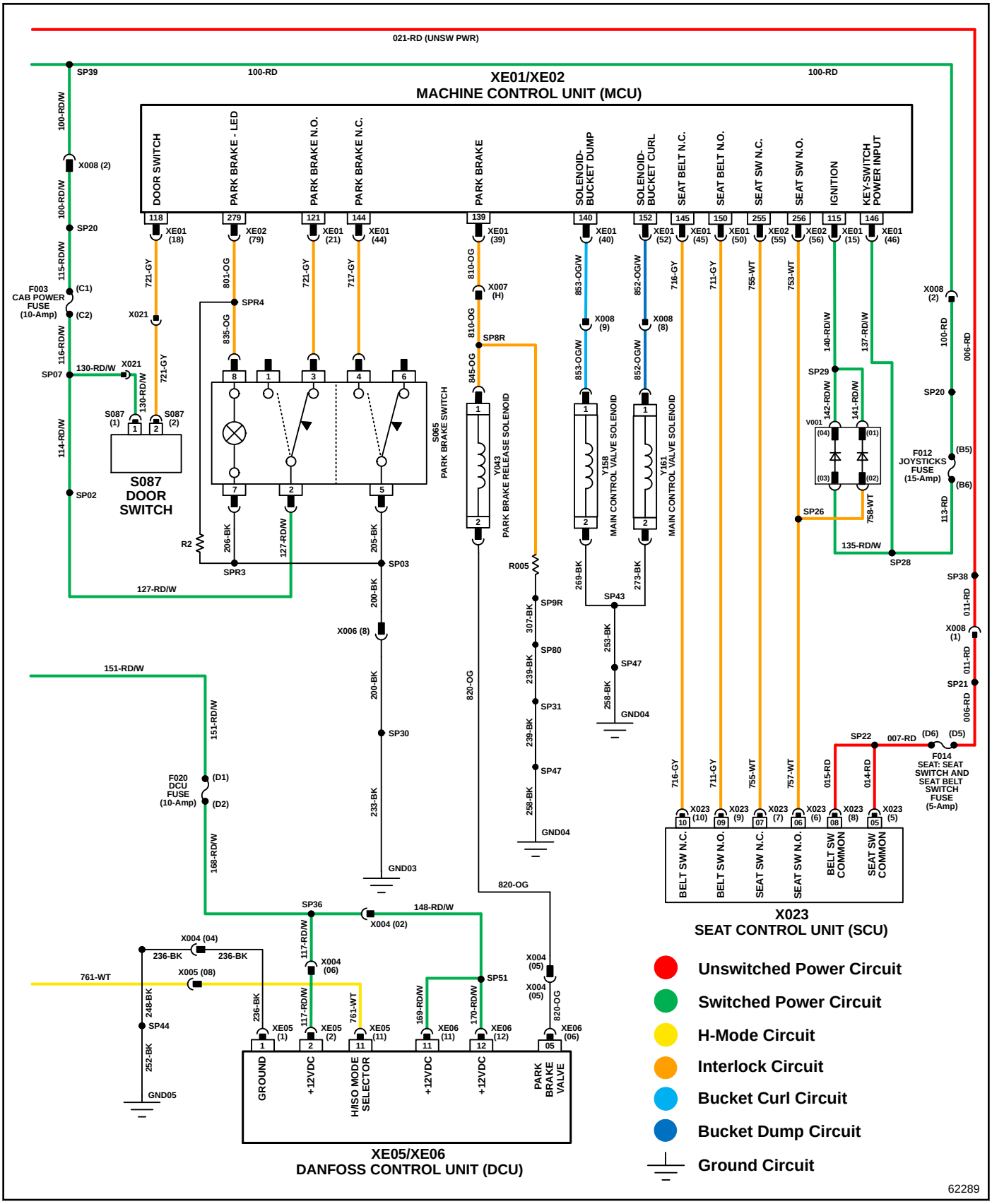

021-RD (UNSW PWR)
XE01/XE02
MACHINE CONTROL UNIT (MCU)
DOOR SWITCH
PARK BRAKE - LED
PARK BRAKE N.O.
PARK BRAKE N.C.
PARK BRAKE
SOLENOID-BUCKET DUMP
SOLENOID-BUCKET CURL
SEAT BELT N.C.
SEAT BELT N.O.
SEAT SW N.C.
SEAT SW N.O.
IGNITION
KEY-SWITCH POWER INPUT
S087 DOOR SWITCH
S065 PARK BRAKE SWITCH
Y043 PARK BRAKE RELEASE SOLENOID
Y158 MAIN CONTROL VALVE SOLENOID
Y161 MAIN CONTROL VALVE SOLENOID
F003 CAB POWER FUSE (10-Amp)
F020 DCU FUSE (10-Amp)
F012 JOYSTICKS FUSE (15-Amp)
F014 SEAT: SEAT SWITCH AND SEAT BELT SWITCH FUSE (5-Amp)
X023
SEAT CONTROL UNIT (SCU)
BELT SW N.C.
BELT SW N.O.
SEAT SW N.C.
SEAT SW N.O.
BELT SW COMMON
SEAT SW COMMON
XE05/XE06
DANFOSS CONTROL UNIT (DCU)
GROUND
+12VDC
HI/SO MODE SELECTOR
+12VDC
+12VDC
PARK BRAKE VALVE
Unswitched Power Circuit
Switched Power Circuit
H-Mode Circuit
Interlock Circuit
Bucket Curl Circuit
Bucket Dump Circuit
Ground Circuit
62289

Figure 2-93

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Bucket Controls Circuit—Theory of Operation (Manual Controls)

Unswitched Power Circuit

Unswitched power is available from the battery positive terminal to the battery disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR01) to the following:

- 20-amp key switch fuse (F008)
- Main power relay (K902) terminal 03
- 5-amp seat: seat switch and seat belt switch fuse (F014)

Unswitched power is provided from the 20-amp key switch (S001) fuse (F008) to key switch (S001) terminals A and B.

Unswitched power is provided from the 5-amp seat: seat switch and seat belt switch fuse (F014) to Seat Control Unit (SCU) (X023) terminals 05 and 08.

Interlock Circuit

When the seat switch is in the closed position, the SCU (X023) sends output voltage from terminal 07 to the Machine Control Unit (MCU) (XE01) terminal 255.

When the seat belt switch is in the closed position, the SCU (X023) sends output voltage from terminal 10 to the MCU (XE01) terminal 145.

When the door switch (S087) is in the open position, the MCU (XE01) no longer receives voltage from terminal 2 of the door switch (S087) to terminal 118.

With the park brake switch (S065) in the disengaged position, the MCU (XE01) provides power from terminal 139 to the park brake release solenoid (Y043) terminal 1 and resistor (R005), energizing the solenoid.

With the interlock circuit complete, all hydrostatic and hydraulic functions become active.

Switched Power

When the key switch (S001) is turned to the ON position, power is provided from key switch (S001) terminal C to diode connector (V004) terminal 2. Power is then provided from diode connector (V004) terminal 1 to main power relay (K902) terminal 02, energizing the relay. With the main power relay (K902) energized, switched power is provided from main power relay (K902) terminal 05 to the following:

- 10-amp cab power fuse (F003)
- 15-amp joysticks fuse (F012)

Switched power is provided from the 10-amp cab power fuse (F003) to the door switch (S087) terminal 1 and park brake switch (S065) terminal 2.

Switched power is provided from the 15-amp joysticks fuse (F012) to the diode connector (V001) terminal 3 and MCU terminal 146.

Bucket Circuit

The MCU (XE01) provides power from terminal 104 and 116 to the bucket foot pedal sensor (B117) terminals D and E.

With the bucket foot pedal sensor (B117) in the bucket curl position (back), power is provided from the bucket foot pedal sensor (B117) to the MCU (XE01) terminals 112 and 119. Power is then provided from MCU (XE01) terminal 276 to the main control valve solenoid (Y158) terminal 1, energizing the solenoid.

With the bucket foot pedal sensor (B117) in the bucket dump position (down), is provided from bucket foot pedal sensor (B117) to the MCU (XE01) terminals 112 and 119. Power is then provided from MCU (XE01) terminal 269 to the main control valve solenoid (Y162) terminal 1, energizing the solenoid.

Bucket Controls Circuit Schematic (Manual Controls)

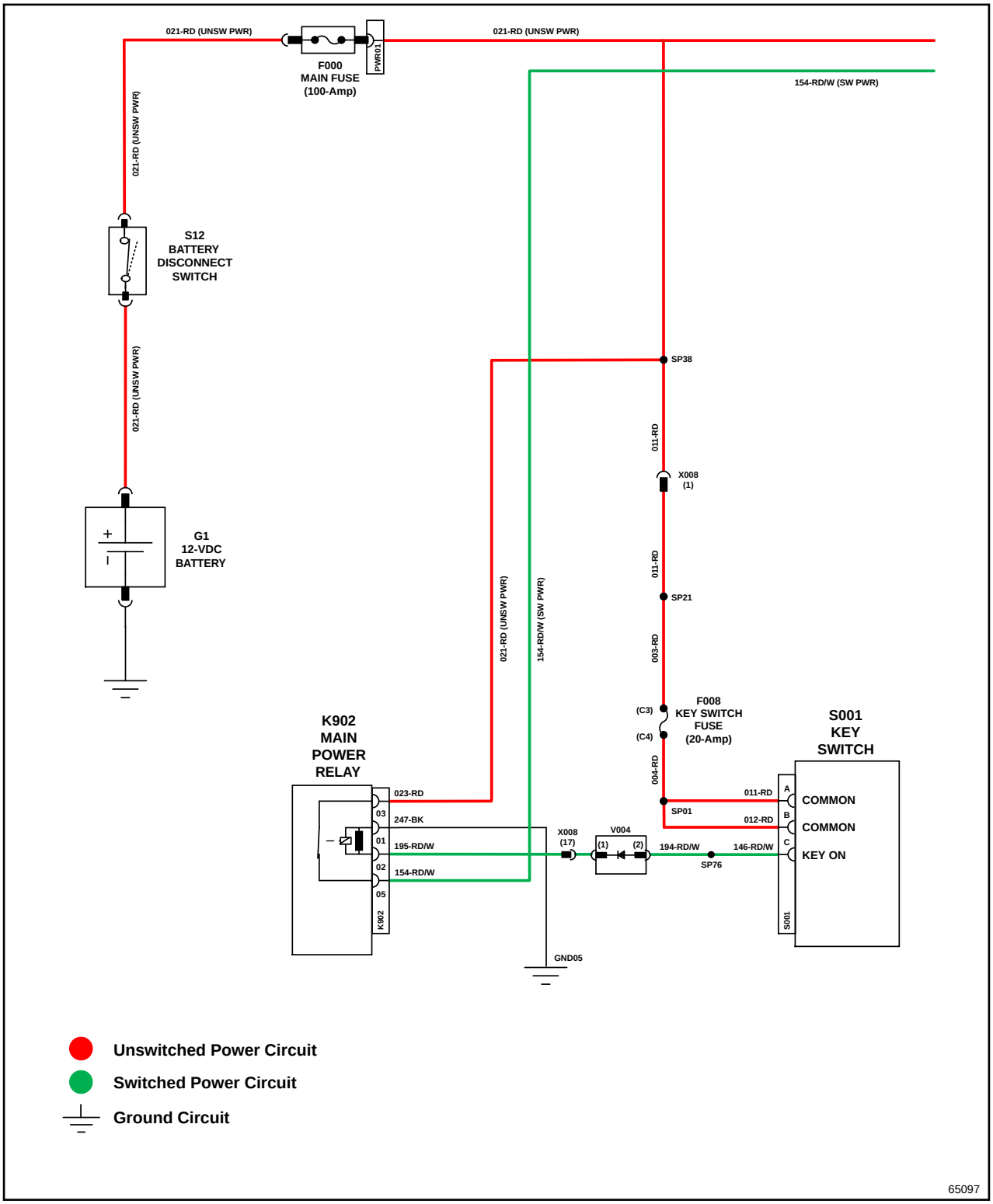


Figure 2-94

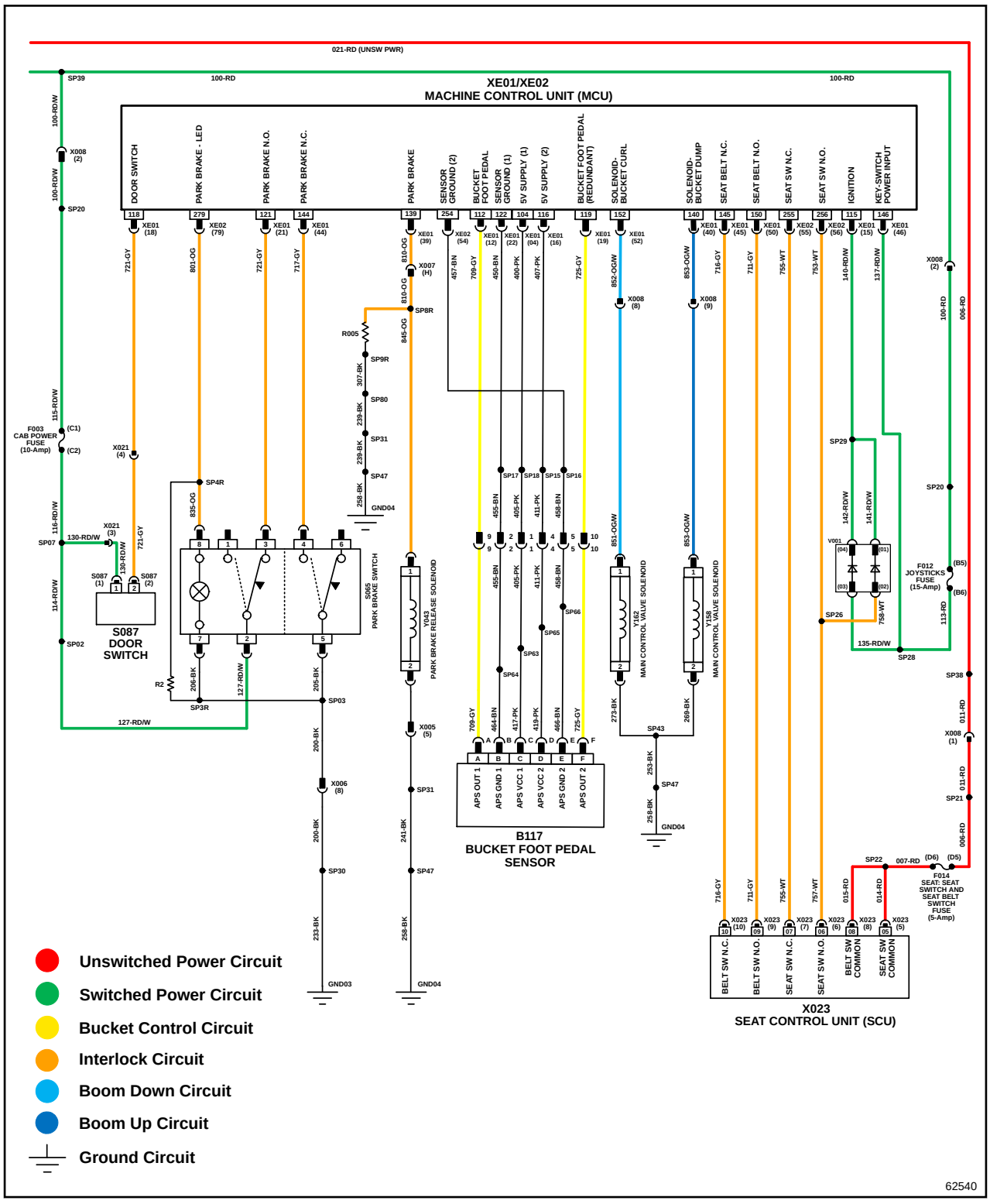

021-RD (UNSW PWR)
XE01/XE02
MACHINE CONTROL UNIT (MCU)
DOOR SWITCH
PARK BRAKE - LED
PARK BRAKE N.O.
PARK BRAKE N.C.
PARK BRAKE
SENSOR GROUND (2)
BUCKET FOOT PEDAL SENSOR GROUND (1)
5V SUPPLY (1)
5V SUPPLY (2)
BUCKET FOOT PEDAL (REDUNDANT)
SOLENOID-BUCKET CURL
SOLENOID-BUCKET DUMP
SEAT BELT N.C.
SEAT BELT N.O.
SEAT SW N.C.
SEAT SW N.O.
IGNITION
KEY-SWITCH POWER INPUT
F003 CAB POWER FUSE (10-Amp)
S087 DOOR SWITCH
S082 PARK BRAKE SWITCH
Y043 PARK BRAKE RELEASE SOLENOID
Y162 MAIN CONTROL VALVE SOLENOID
Y158 MAIN CONTROL VALVE SOLENOID
B117 BUCKET FOOT PEDAL SENSOR
APS OUT 1
APS GND 1
APS VCC 1
APS VCC 2
APS GND 2
APS OUT 2
F012 JOYSTICKS FUSE (15-Amp)
F014 SEAT: SEAT SWITCH AND SEAT BELT SWITCH FUSE (5-Amp)
X023 SEAT CONTROL UNIT (SCU)
BELT SW N.C.
BELT SW N.O.
SEAT SW N.C.
SEAT SW N.O.
BELT SW COMMON
SEAT SW COMMON
Unswitched Power Circuit
Switched Power Circuit
Bucket Control Circuit
Interlock Circuit
Boom Down Circuit
Boom Up Circuit
Ground Circuit
62540

Figure 2-95

Ride Control Circuit—Theory of Operation

Unswitched Power Circuit

Unswitched power is available from the battery positive terminal to the battery disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR01) to the following:

- 20-amp key switch fuse (F008)
- Main power relay (K902) terminal 03
- 5-amp seat: seat switch and seat belt switch fuse (F014)

Unswitched power is provided from the 20-amp key switch fuse (F008) to key switch (S001) terminals A and B.

Unswitched power is provided from the 5-amp seat: seat switch and seat belt switch fuse (F014) to Seat Control Unit (SCU) (X023) terminals 05 and 08.

Interlock Circuit

When the seat switch is in the closed position, the SCU (X023) sends output voltage from terminal 07 to the Machine Control Unit (MCU) (XE01) terminal 255.

When the seat belt switch is in the closed position, the SCU (X023) sends output voltage from terminal 10 to the MCU (XE01) terminal 145.

When the door switch (S087) is in the open position, the MCU (XE01) no longer receives voltage from terminal 2 of the door switch (S087) to terminal 118.

With the park brake switch (S065) in the disengaged position, the MCU (XE01) provides power from terminal 139 to the park brake release solenoid (Y043) terminal 1 and resistor (R005). The Danfoss Control Unit (DCU) (XE06) terminal 05 provides a ground for the park brake release solenoid (Y043) terminal 2, energizing the solenoid.

With the interlock circuit complete, all hydrostatic and hydraulic functions become active.

Switched Power

When the key switch (S001) is turned to the ON position, power is provided from key switch (S001) terminal C to diode connector (V004) terminal 2. Power is then provided from diode connector (V004) terminal 1 to main power relay (K902) terminal 02, energizing the relay. With the main power relay (K902) energized, switched power is provided from main power relay (K902) terminal 05 to the following:

- 10-amp cab power fuse (F003)
- 15-amp joysticks fuse (F012)
- 10-amp DCU fuse (F020)
- Ride control relay 02 (K153) terminal 30

Switched power is provided from the 10-amp cab power fuse (F003) to the door switch (S087) terminal 1 and park brake switch (S065) terminal 2.

Switched power is provided from the 15-amp joysticks fuse (F012) to the diode connector (V001) terminal 3, and Machine MCU (XE01) terminal 146.

Switched power is provided from the 10-amp DCU fuse (F020) to the DCU (XE05) terminals 2, 11, and 12.

Ride Control Circuit

When the RH joystick ride control mode button (K3i) is depressed, the MCU (XE01) provides power from terminal 143 to the RH joystick ride control mode button (K3i) terminal 8, through the RH joystick ride control mode button (K3i) terminal 7, and returns to MCU (XE01) terminal 122.The MCU (XE01) then provides power from terminal 129 to the ride control relay 02 (K153) terminal 85 and charge oil cutoff solenoid (Y022) terminal 1. The MCU (XE01) terminal 270 provides power to the ride control relay 01 (K152) terminal 85 and ride control base solenoid (Y020) terminal 1, energizing the solenoid.

With power provided to the ride control relay 02 (K153) terminal 85, the relay is energized. With the ride control relay 02 (K153) energized, power is provided from ride control relay 02 (K153) terminal 87 to ride control relay 01 (K152) terminal 30 and ride control rod solenoid (Y021) terminal 1, energizing the solenoid.

With power provided to the ride control relay 01 (K152) terminals 30 and 85, the relay is energized. With the ride control relay 01 (K152) energized, power is provided from ride control relay 01 (K152) terminal 87 to ride control balance solenoid (Y168) terminal 1, energizing the solenoid.

Ride Control Circuit Schematic

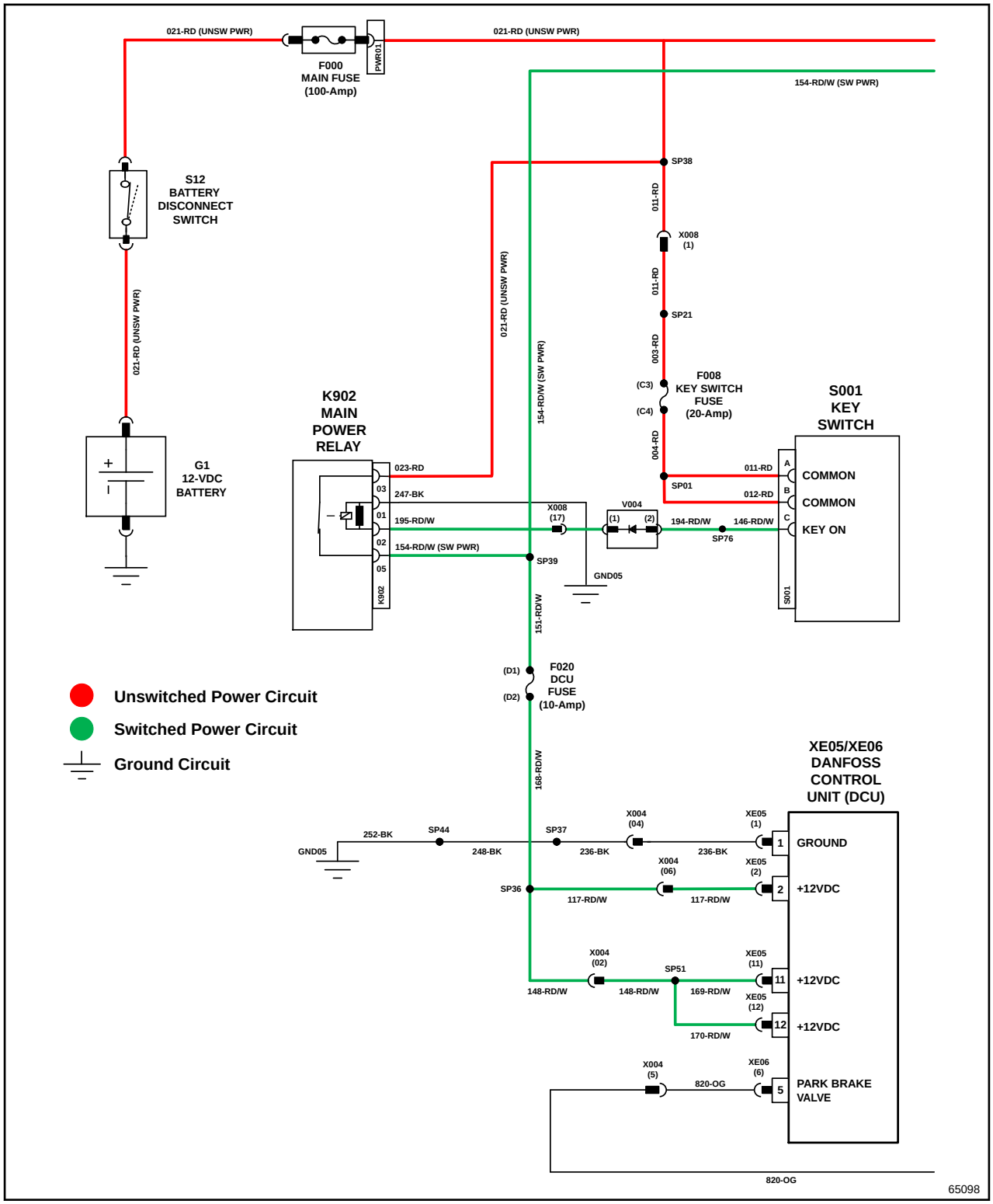


Figure 2-96

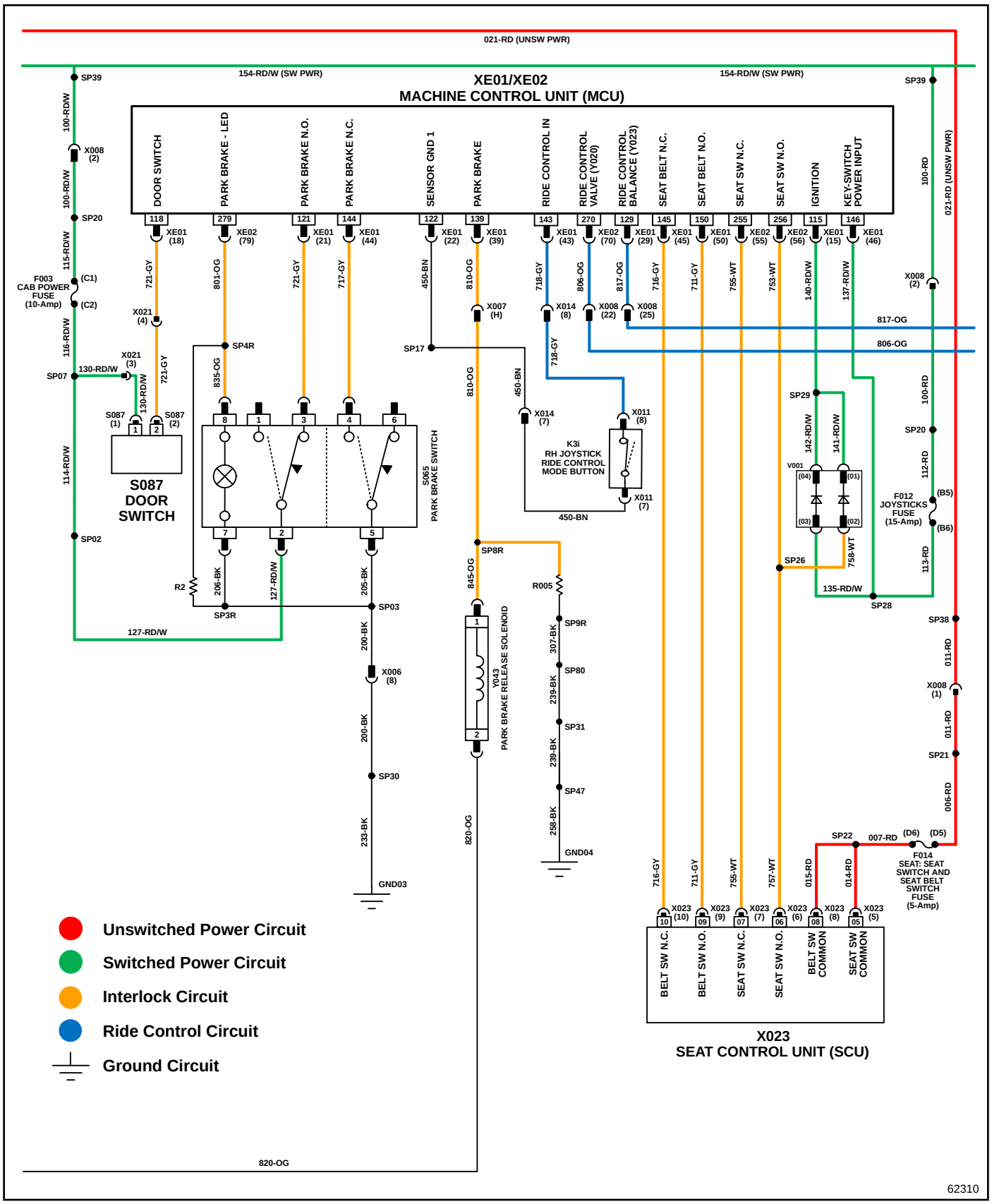

021-RD (UNSW PWR)
154-RD/W (SW PWR)
154-RD/W (SW PWR)
XE01/XE02
MACHINE CONTROL UNIT (MCU)
DOOR SWITCH
PARK BRAKE - LED
PARK BRAKE N.O.
PARK BRAKE N.C.
SENSOR GND 1
PARK BRAKE
RIDE CONTROL IN
RIDE CONTROL VALVE (Y020)
RIDE CONTROL BALANCE (Y023)
SEAT BELT N.C.
SEAT BELT N.O.
SEAT SW N.C.
SEAT SW N.O.
IGNITION
KEY-SWITCH POWER INPUT
S087
DOOR SWITCH
S065
PARK BRAKE SWITCH
K3i
RH JOYSTICK
RIDE CONTROL
MODE BUTTON
Y043
PARK BRAKE RELEASE SOLENOID
F003
CAB POWER
FUSE
(10-Amp)
F012
JOYSTICKS
FUSE
(15-Amp)
F014
SEAT: SEAT
SWITCH AND
SEAT BELT
SWITCH
FUSE
(5-Amp)
X023
SEAT CONTROL UNIT (SCU)
BELT SW N.C.
BELT SW N.O.
SEAT SW N.C.
SEAT SW N.O.
BELT SW COMMON
SEAT SW COMMON
R2
R005
V001
Unswitched Power Circuit
Switched Power Circuit
Interlock Circuit
Ride Control Circuit
Ground Circuit
820-OG
817-OG
806-OG
127-RD/W
135-RD/W
450-BN
62310

Figure 2-97

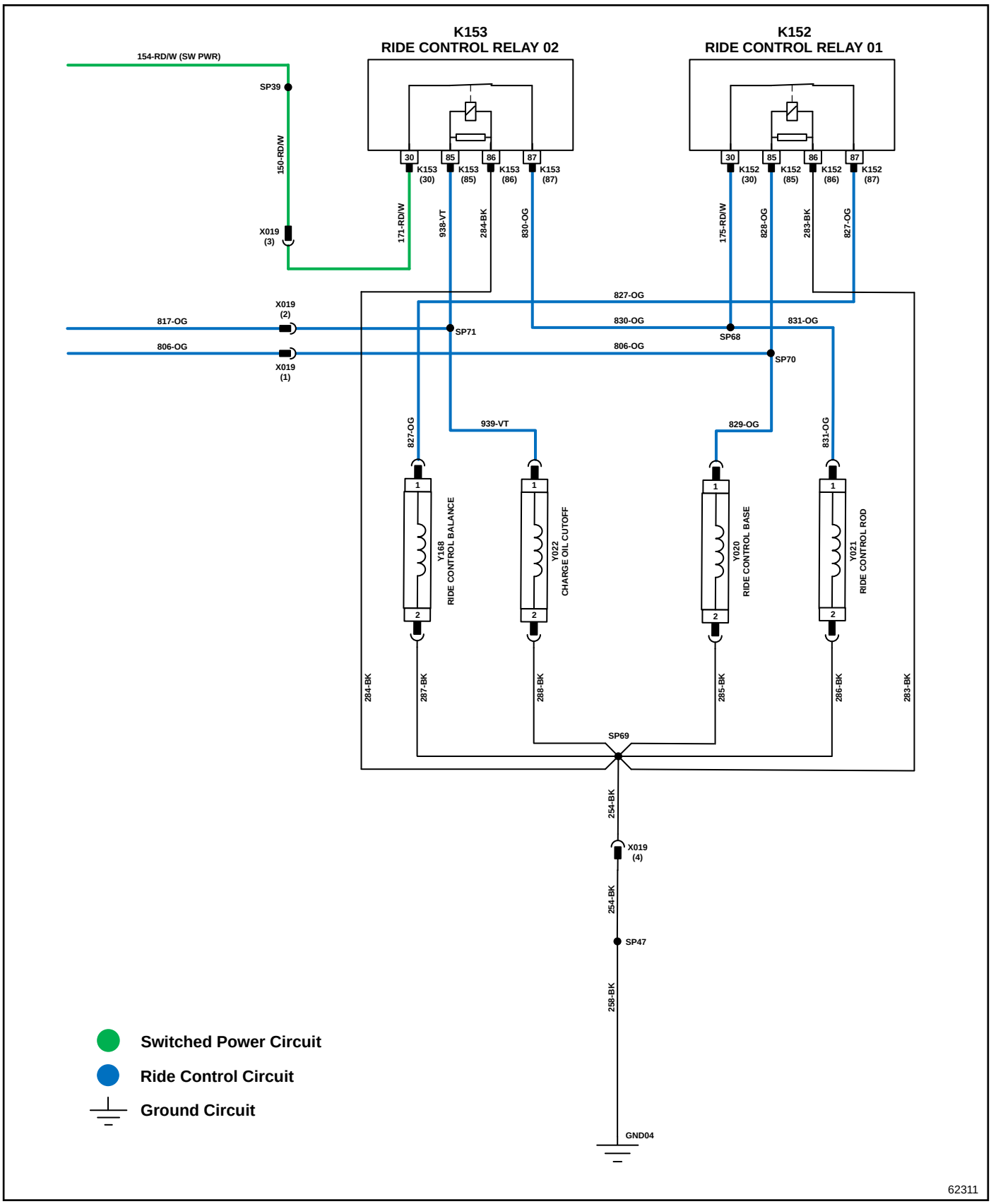

K153
RIDE CONTROL RELAY 02
K152
RIDE CONTROL RELAY 01
154-RD/W (SW PWR)
SP39
150-RD/W
X019
(3)
171-RD/W
938-VT
284-BK
830-OG
175-RD/W
828-OG
283-BK
827-OG
30
85
86
87
K153 (30)
K153 (85)
K153 (86)
K153 (87)
K152 (30)
K152 (85)
K152 (86)
K152 (87)
827-OG
817-OG
X019
(2)
SP71
830-OG
831-OG
SP68
806-OG
806-OG
SP70
X019
(1)
939-VT
829-OG
831-OG
Y168
RIDE CONTROL BALANCE
Y022
CHARGE OIL CUTOFF
Y020
RIDE CONTROL BASE
Y021
RIDE CONTROL ROD
284-BK
287-BK
288-BK
285-BK
286-BK
283-BK
SP69
254-BK
X019
(4)
254-BK
SP47
258-BK
GND04
Switched Power Circuit
Ride Control Circuit
Ground Circuit
62311

Figure 2-98

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Float Control Circuit—Theory of Operation

Unswitched Power Circuit

Unswitched power is available from the battery positive terminal to the battery disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR01) to the following:

- 20-amp key switch fuse (F008)
- Main power relay (K902) terminal 03
- 5-amp seat: seat switch and seat belt switch fuse (F014)

Unswitched power is provided from the 20-amp key switch fuse (F008) to key switch (S001) terminals A and B.

Unswitched power is provided from the 5-amp seat: seat switch and seat belt switch fuse (F014) to Seat Control Unit (SCU) (X023) terminals 05 and 08.

Interlock Circuit

When the seat switch is in the closed position, the SCU (X023) sends output voltage from terminal 07 to the Machine Control Unit (MCU) (XE01) terminal 255.

When the seat belt switch is in the closed position, the SCU (X023) sends output voltage from terminal 10 to the MCU (XE01) terminal 145.

When the door switch (S087) is in the open position, the MCU (XE01) no longer receives voltage from terminal 2 of the door switch (S087) to terminal 118.

With the park brake switch (S065) in the disengaged position, the MCU (XE01) provides power from terminal 139 to the park brake release solenoid (Y043) terminal 1 and resistor (R005). The Danfoss Control Unit (DCU) (XE06) terminal 05 provides a ground for the park brake release solenoid (Y043) terminal 2, energizing the solenoid.

With the interlock circuit complete, all hydrostatic and hydraulic functions become active.

Switched Power

When the key switch (S001) is turned to the ON position, power is provided from key switch (S001) terminal C to diode connector (V004) terminal 2. Power is then provided from diode connector (V004) terminal 1 to main power relay (K902) terminal 02, energizing the relay. With the main power relay (K902) energized, switched power is provided from main power relay (K902) terminal 05 to the following:

- 10-amp cab power fuse (F003)
- 15-amp joysticks fuse (F012)
- 10-amp DCU fuse (F020)

Switched power is provided from the 10-amp cab power fuse (F003) to door switch (S087) terminal 1 and park brake switch (S065) terminal 2.

Switched power is provided from the 15-amp joysticks fuse (F012) to the diode connector (V001) terminal 3 and MCU (XE01) terminal 146.

Switched power is provided from the 10-amp DCU fuse (F020) to the DCU (XE05) terminals 2, 11, and 12.

Float Control Circuit

The MCU (XE01) provides switched power from terminal 104 to the RH joystick float control mode button (K3h) terminal 5. When the RH joystick float control mode button (K3h) is depressed, switched power from terminal 6 of the RH joystick float control mode button (K3h) returns to MCU (XE01) terminal 261.

The MCU (XE01) provides power from terminal 269 to the main control valve solenoid (Y160) terminal 1, energizing the solenoid.

The MCU (XE01) provides power from terminal 276 to the main control valve solenoid (Y157) terminal 1, energizing the solenoid.

Float Control Circuit Schematic

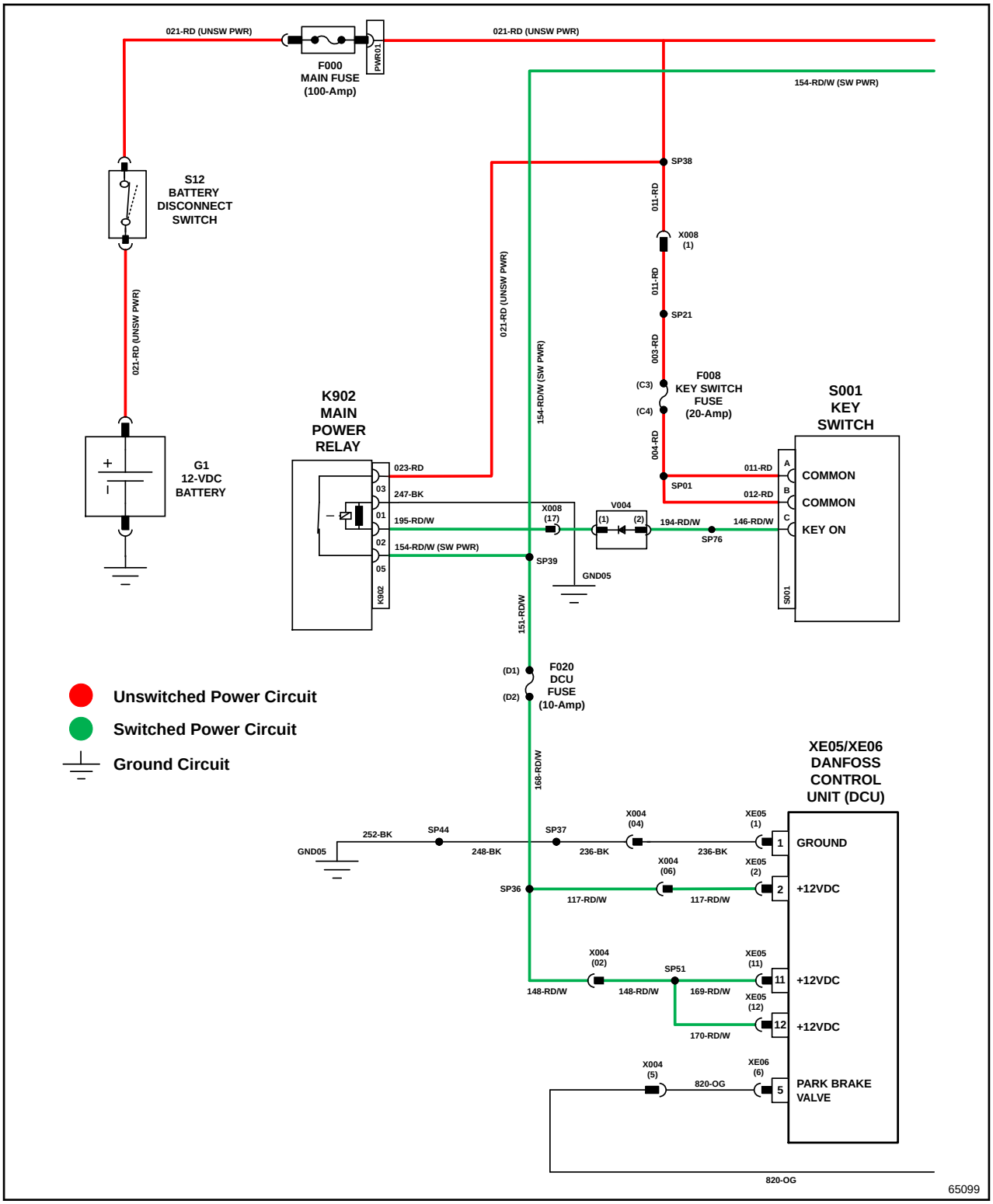


Figure 2-99

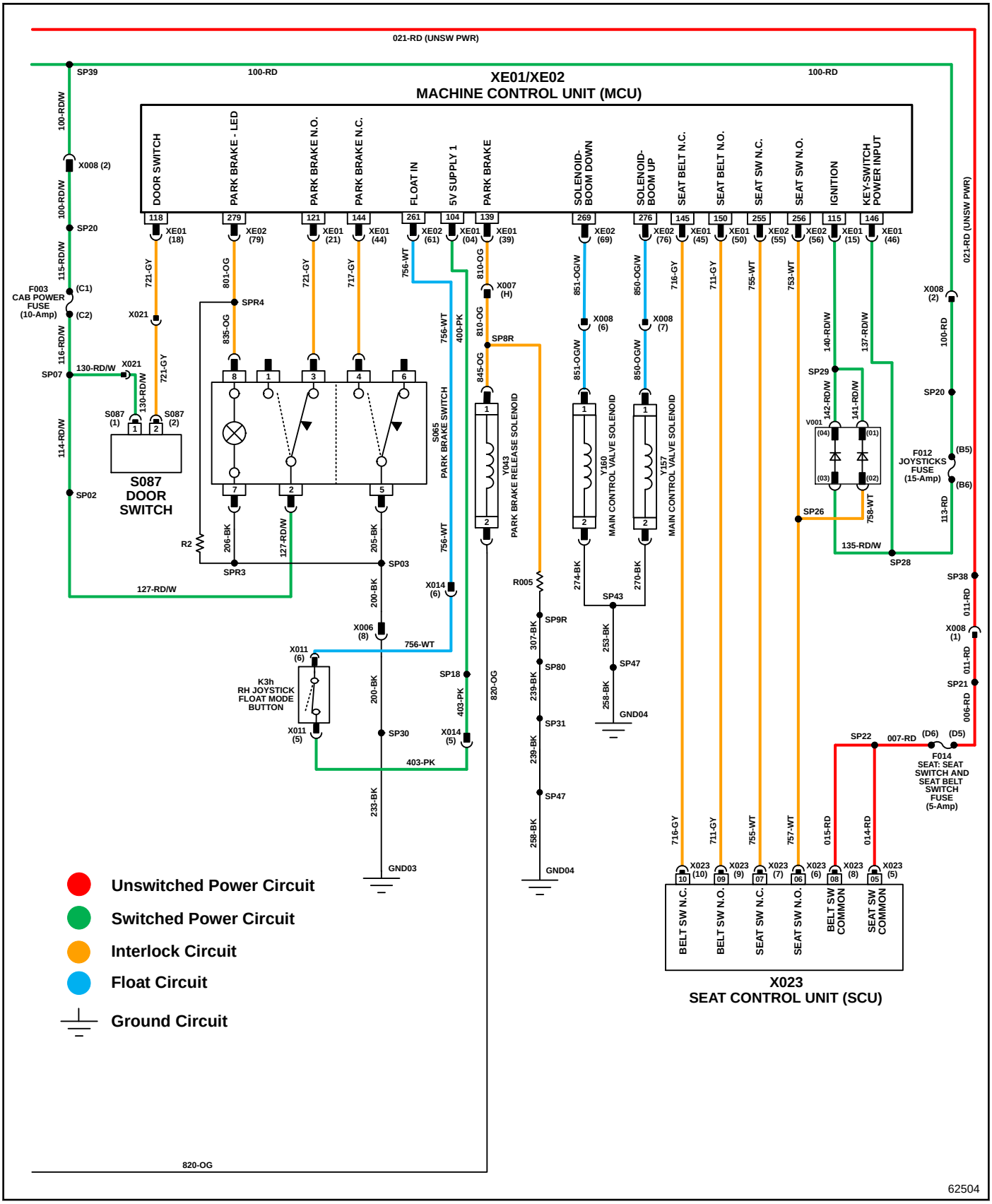

021-RD (UNSW PWR)
XE01/XE02
MACHINE CONTROL UNIT (MCU)
DOOR SWITCH
PARK BRAKE - LED
PARK BRAKE N.O.
PARK BRAKE N.C.
FLOAT IN
5V SUPPLY 1
PARK BRAKE
SOLENOID-BOOM DOWN
SOLENOID-BOOM UP
SEAT BELT N.C.
SEAT BELT N.O.
SEAT SW N.C.
SEAT SW N.O.
IGNITION
KEY-SWITCH POWER INPUT
F003 CAB POWER FUSE (10-Amp)
S087 DOOR SWITCH
S065 PARK BRAKE SWITCH
Y043 PARK BRAKE RELEASE SOLENOID
Y160 MAIN CONTROL VALVE SOLENOID
Y157 MAIN CONTROL VALVE SOLENOID
K3h RH JOYSTICK FLOAT MODE BUTTON
V001
F012 JOYSTICKS FUSE (15-Amp)
F014 SEAT: SEAT SWITCH AND SEAT BELT SWITCH FUSE (5-Amp)
X023 SEAT CONTROL UNIT (SCU)
BELT SW N.C.
BELT SW N.O.
SEAT SW N.C.
SEAT SW N.O.
BELT SW COMMON
SEAT SW COMMON
R2
R005
GND03
GND04
820-OG
Unswitched Power Circuit
Switched Power Circuit
Interlock Circuit
Float Circuit
Ground Circuit
62504

Figure 2-100

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Self Level Circuit—Theory of Operation

Unswitched Power Circuit

Unswitched power is available from the battery positive terminal to the battery disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR01) to the following:

- 20-amp key switch fuse (F008)
- Main power relay (K902) terminal 03
- 5-amp seat: seat switch and seat belt switch fuse (F014)

Unswitched power is provided from the 20-amp key switch fuse (F008) to key switch (S001) terminals A and B.

Unswitched power is provided from the 5-amp seat: seat switch and seat belt switch fuse (F014) to the Seat Control Unit (SCU) (X023) terminals 05 and 08.

Interlock Circuit

When the seat switch is in the closed position, the SCU (X023) sends output voltage from terminal 07 to the Machine Control Unit (MCU) (XE01) terminal 255.

When the seat belt switch is in the closed position, the SCU (X023) sends output voltage from terminal 10 to the MCU (XE01) terminal 145.

When the door switch (S087) is in the open position, the MCU (XE01) terminal 118 no longer receives voltage from the door switch (S087) terminal 2.

With the park brake switch (S065) in the disengaged position, the MCU (XE01) provides power from terminal 139 to the park brake release solenoid (Y043) terminal 1 and resistor (R005). The Danfoss Control Unit (DCU) (XE06) terminal 05 provides a ground for the park brake release solenoid (Y043) terminal 2, energizing the solenoid.

With the interlock circuit complete, all hydrostatic and hydraulic functions become active.

Switched Power

When the key switch (S001) is turned to the ON position, power is provided from key switch (S001) terminal C to diode connector (V004) terminal 2. Power is then provided from diode connector (V004) terminal 1 to main power relay (K902) terminal 02, energizing the relay. With the main power relay (K902) energized, switched power is provided from main power relay (K902) terminal 05 to the following:

- 10-amp cab power fuse (F003)
- 15-amp joysticks fuse (F012)
- 10-amp DCU fuse (F020)

Switched power is provided from the 10-amp cab power fuse (F003) to the door switch (S087) terminal 1, park brake switch (S065) terminal 2, and self level switch (S032) terminal 2.

Switched power is provided from the 15-amp joysticks fuse (F012) to the LH joystick diode (V001) terminal 03, and MCU (XE01) terminal 146.

Switched power is provided from the 10-amp DCU fuse (F020) to the DCU (XE05) terminals 2, 11, and 12.

Self Level Circuit

When the self level switch (S032) is depressed, power is provided from the self level switch (S032) terminal 3 to the MCU (XE01) terminal 109.

The MCU (XE01) provides power from terminal 130 to the self level solenoid valve (Y169) terminal 1, energizing the solenoid.

Self Level Circuit Schematic

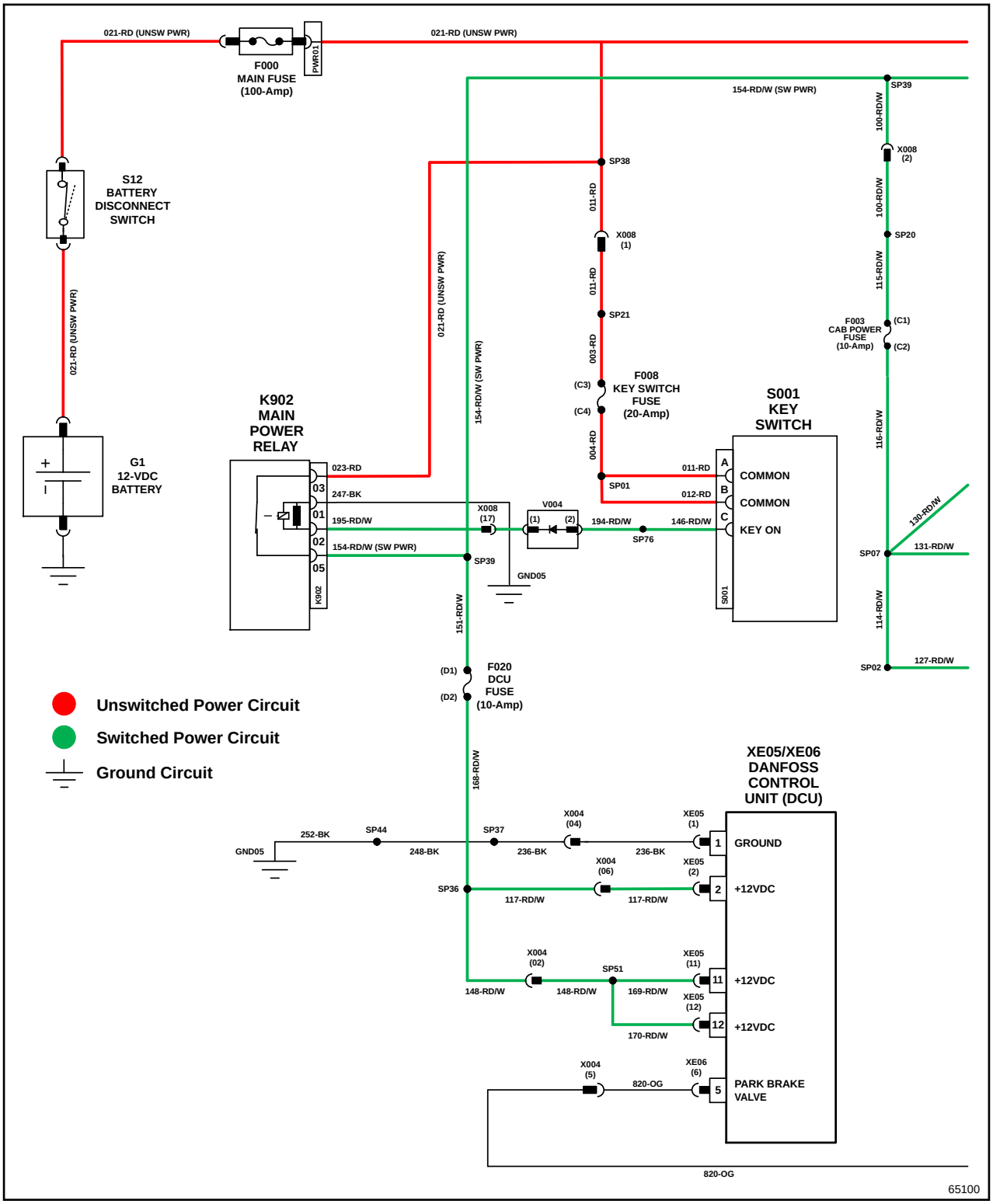


Figure 2-101

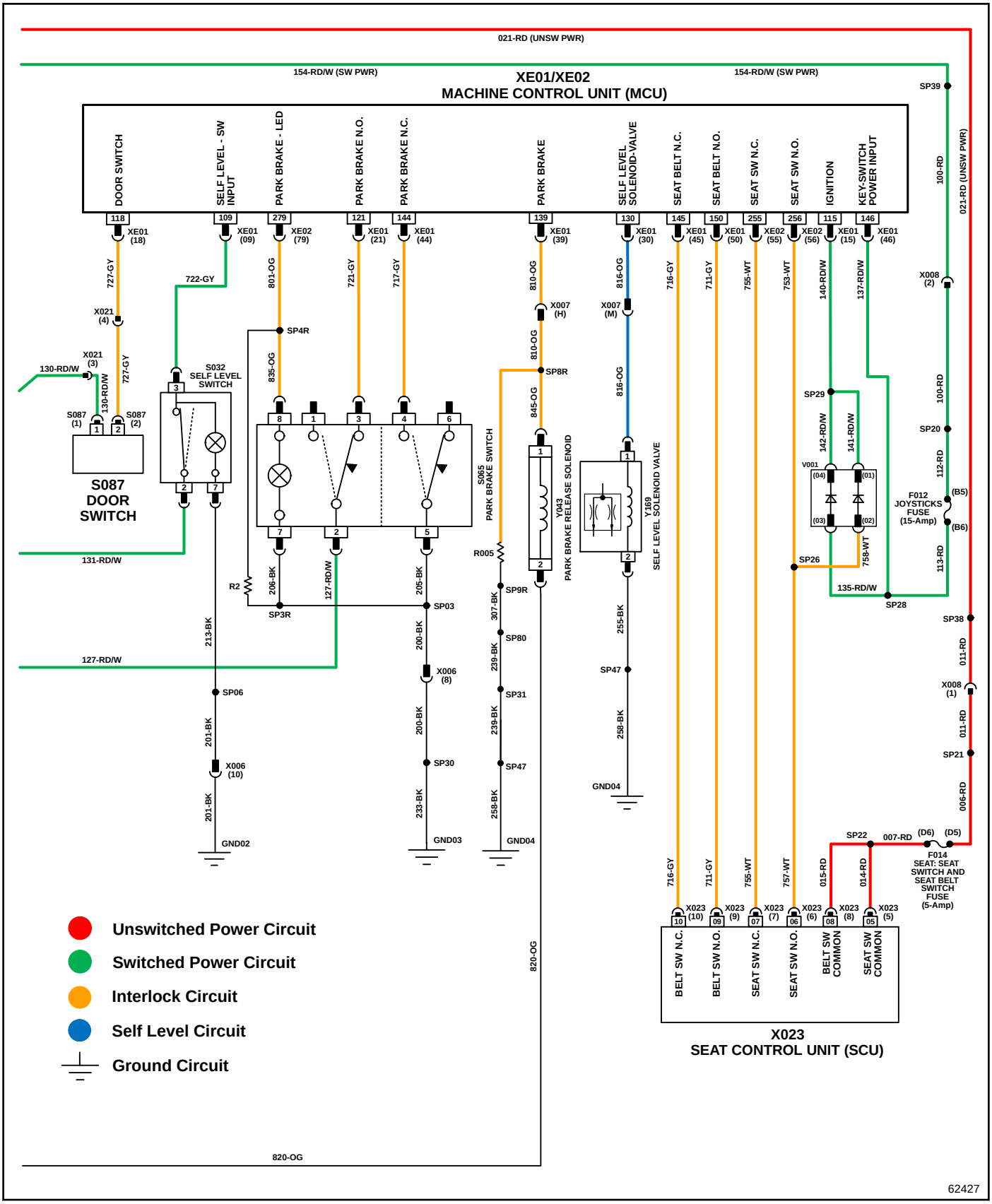

021-RD (UNSW PWR)
154-RD/W (SW PWR)
154-RD/W (SW PWR)
XE01/XE02
MACHINE CONTROL UNIT (MCU)
DOOR SWITCH
SELF LEVEL - SW INPUT
PARK BRAKE - LED
PARK BRAKE N.O.
PARK BRAKE N.C.
PARK BRAKE
SELF LEVEL SOLENOID-VALVE
SEAT BELT N.C.
SEAT BELT N.O.
SEAT SW N.C.
SEAT SW N.O.
IGNITION
KEY-SWITCH POWER INPUT
S087 DOOR SWITCH
S032 SELF LEVEL SWITCH
S065 PARK BRAKE SWITCH
Y043 PARK BRAKE RELEASE SOLENOID
Y169 SELF LEVEL SOLENOID VALVE
F012 JOYSTICKS FUSE (15-Amp)
F014 SEAT: SEAT SWITCH AND SEAT BELT SWITCH FUSE (5-Amp)
X023 SEAT CONTROL UNIT (SCU)
BELT SW N.C.
BELT SW N.O.
SEAT SW N.C.
SEAT SW N.O.
BELT SW COMMON
SEAT SW COMMON
Unswitched Power Circuit
Switched Power Circuit
Interlock Circuit
Self Level Circuit
Ground Circuit
820-OG
62427

Figure 2-102

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Auxiliary Hydraulics Female Coupler Circuit—Theory of Operation

Unswitched Power Circuit

Unswitched power is available from the battery positive terminal to the battery disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR01) to the following:

- 20-amp key switch fuse (F008)
- Main power relay (K902) terminal 03
- 5-amp seat: seat switch and seat belt switch fuse (F014)

Unswitched power is provided from the 20-amp key switch fuse (F008) to key switch (S001) terminals A and B.

Unswitched power is provided from the 5-amp seat: seat switch and seat belt switch fuse (F014) to Seat Control Unit (SCU) (X023) terminals 05 and 08.

Interlock Circuit

When the seat switch is in the closed position, the SCU (X023) sends output voltage from terminal 07 to the Machine Control Unit (MCU) (XE01) terminal 255.

When the seat belt switch is in the closed position, the SCU (X023) sends output voltage from terminal 10 to the MCU (XE01) terminal 145.

When the door switch (S087) is in the open position, the MCU (XE01) no longer receives voltage from terminal 2 of the door switch (S087) to terminal 118.

With the park brake switch (S065) in the disengaged position, the MCU (XE01) provides power from terminal 139 to the park brake release solenoid (Y043) terminal 1 and resistor (R005). The Danfoss Control Unit (DCU) (XE06) terminal 05 provides a ground for the park brake release solenoid (Y043) terminal 2, energizing the solenoid.

With the interlock circuit complete, all hydrostatic and hydraulic functions become active.

Switched Power

When the key switch (S001) is turned to the ON position, power is provided from key switch (S001) terminal C to diode connector (V004) terminal 2. Power is then provided from diode connector (V004) terminal 1 to main power relay (K902) terminal 02, energizing the relay. With the main power relay (K902) energized, switched power is provided from main power relay (K902) terminal 05 to the following:

- 10-amp cab power fuse (F003)
- 15-amp joysticks fuse (F012)
- 10-amp DCU fuse (F020)

Switched power is provided from the 10-amp cab power fuse (F003) to the door switch (S087) terminal 1 and park brake switch (S065) terminal 2.

Switched power is provided from the 15-amp joysticks fuse (F012) to the diode connector (V001) terminal 3 and MCU (XE01) terminal 146.

Switched power is provided from the 10-amp DCU fuse (F020) to the DCU (XE05) terminals 2, 11, and 12.

Auxiliary Hydraulics Female Coupler Circuit

When standard is selected on the standard/high flow selection switch (S207), the MCU (XE01) provides power from terminal 148 to the standard/high flow selection switch (S207) terminal 3. Power is then provided from MCU (XE01) terminal 104 to RH joystick auxiliary hydraulics control button (S10) terminal 1.

When the RH joystick auxiliary hydraulics control button (S10) is in the forward position, the MCU (XE01) terminal 104 provides power to RH joystick auxiliary hydraulics control button (S10) terminal 1. The RH joystick auxiliary hydraulics control button (S10) terminal 1 provides power to the RH joystick auxiliary hydraulics control button (S10) terminal 4. Power then returns to MCU (XE01) terminal 123 from RH joystick auxiliary hydraulics control button (S10) terminal 4. The MCU (XE01) then provides power from terminal 137 to the main control valve solenoid A3 (Y162) terminal 1, energizing the solenoid.

Auxiliary Hydraulics Female Coupler Circuit Schematic

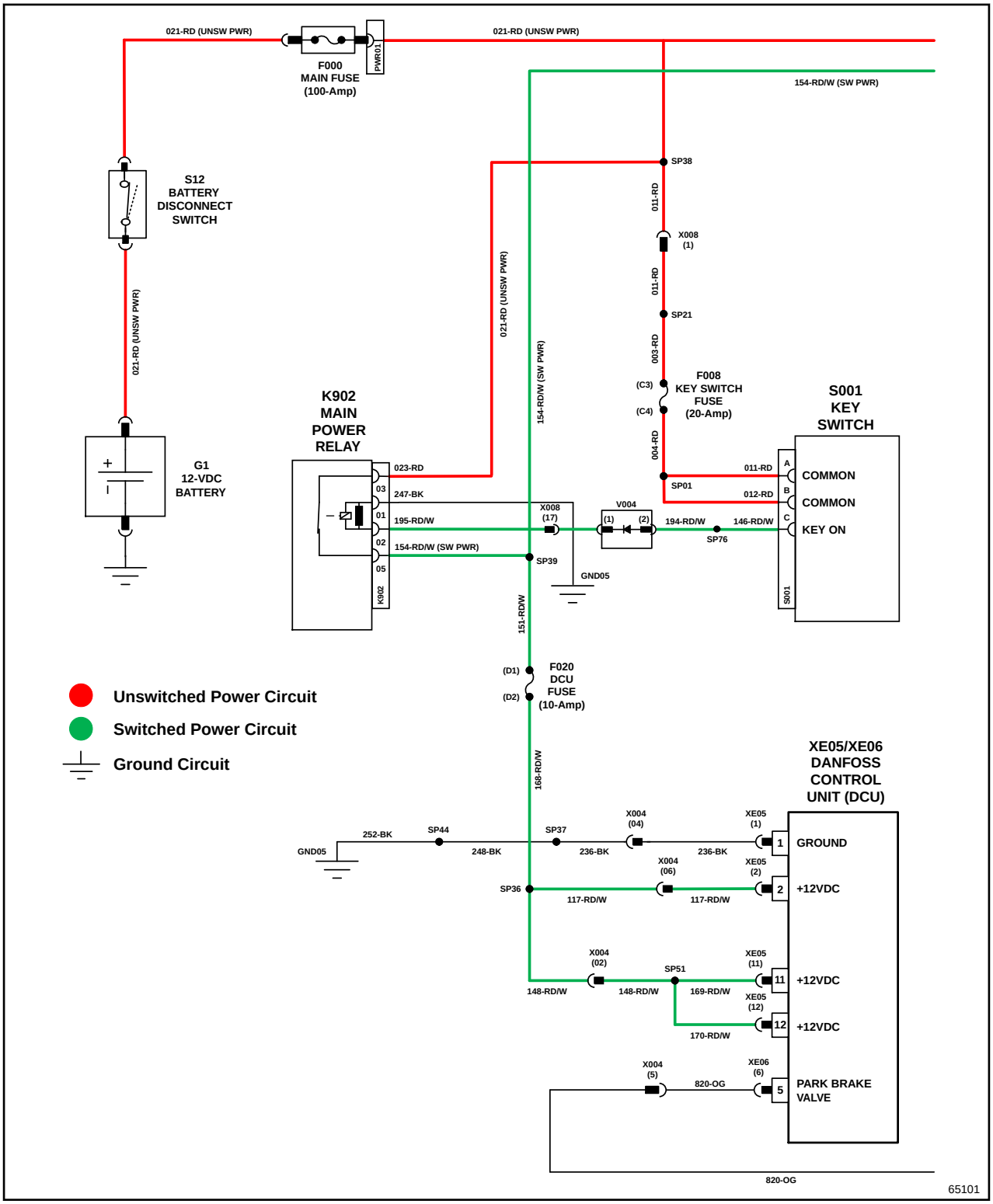


Figure 2-103

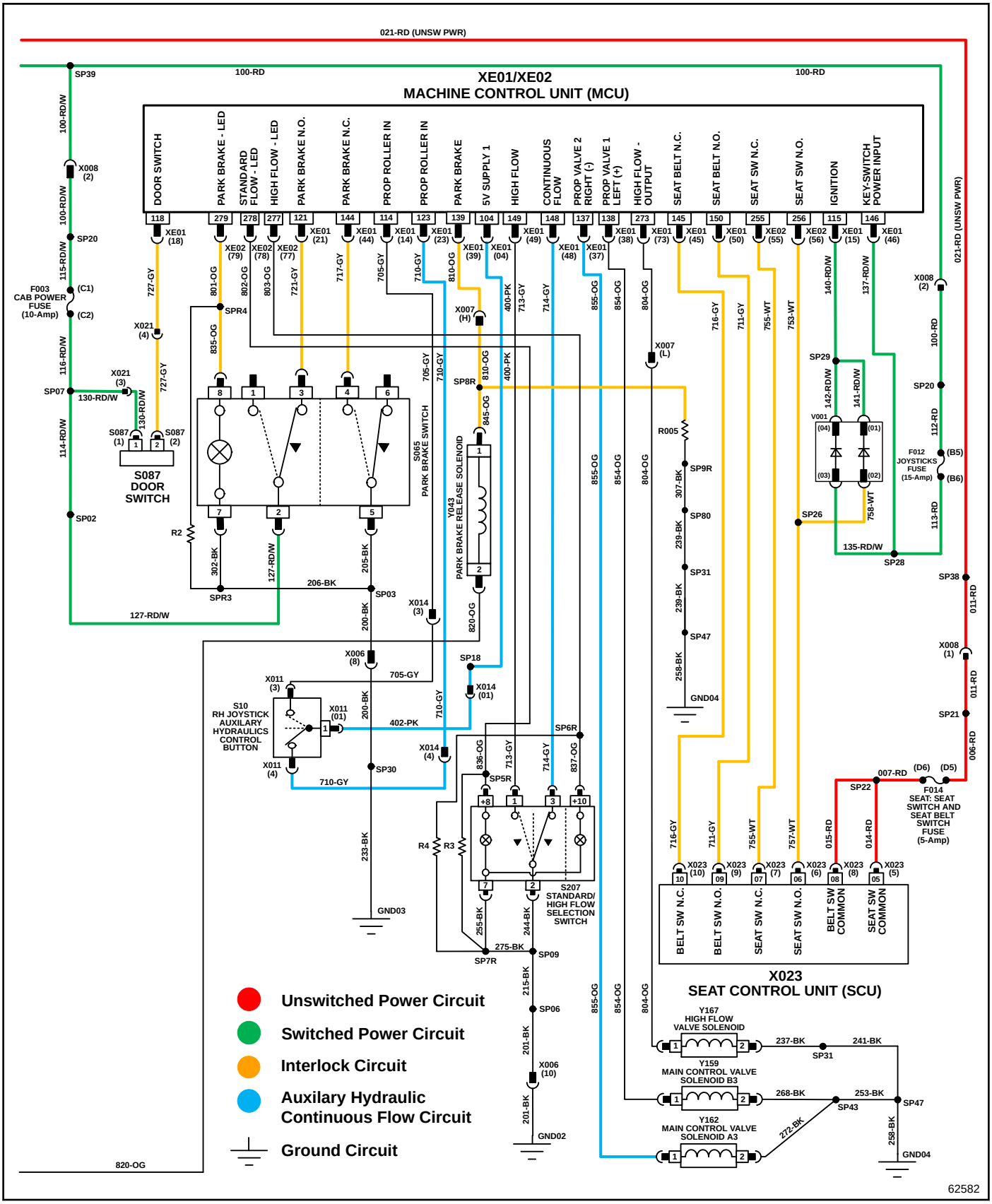

021-RD (UNSW PWR)
XE01/XE02
MACHINE CONTROL UNIT (MCU)
DOOR SWITCH
PARK BRAKE - LED
STANDARD FLOW - LED
HIGH FLOW - LED
PARK BRAKE N.O.
PARK BRAKE N.C.
PROP ROLLER IN
PROP ROLLER IN
PARK BRAKE
5V SUPPLY 1
HIGH FLOW
CONTINUOUS FLOW
PROP VALVE 2 RIGHT (-)
PROP VALVE 1 LEFT (+)
HIGH FLOW - OUTPUT
SEAT BELT N.C.
SEAT BELT N.O.
SEAT SW N.C.
SEAT SW N.O.
IGNITION
KEY-SWITCH POWER INPUT
F003 CAB POWER FUSE (10-Amp)
S087 DOOR SWITCH
S065 PARK BRAKE SWITCH
Y043 PARK BRAKE RELEASE SOLENOID
S10 RH JOYSTICK AUXILARY HYDRAULICS CONTROL BUTTON
S207 STANDARD/ HIGH FLOW SELECTION SWITCH
R2
R3
R4
R005
V001
F012 JOYSTICKS FUSE (15-Amp)
F014 SEAT: SEAT SWITCH AND SEAT BELT SWITCH FUSE (5-Amp)
X023 SEAT CONTROL UNIT (SCU)
BELT SW N.C.
BELT SW N.O.
SEAT SW N.C.
SEAT SW N.O.
BELT SW COMMON
SEAT SW COMMON
Y167 HIGH FLOW VALVE SOLENOID
Y159 MAIN CONTROL VALVE SOLENOID B3
Y162 MAIN CONTROL VALVE SOLENOID A3
Unswitched Power Circuit
Switched Power Circuit
Interlock Circuit
Auxilary Hydraulic Continuous Flow Circuit
Ground Circuit
62582

Figure 2-104

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Auxiliary Hydraulics Male Coupler Circuit—Theory of Operation

Unswitched Power Circuit

Unswitched power is available from the battery positive terminal to the battery disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR01) to the following:

- 20-amp key switch fuse (F008)
- Main power relay (K902) terminal 03
- 5-amp seat: seat switch and seat belt switch fuse (F014)

Unswitched power is provided from the 20-amp key switch fuse (F008) to key switch (S001) terminals A and B.

Unswitched power is provided from the 5-amp seat: seat switch and seat belt switch fuse (F014) to Seat Control Unit (SCU) (X023) terminals 05 and 08.

Interlock Circuit

When the seat switch is in the closed position, the SCU (X023) sends output voltage from terminal 07 to the Machine Control Unit (MCU) (XE01) terminal 255.

When the seat belt switch is in the closed position, the SCU (X023) sends output voltage from terminal 10 to the MCU (XE01) terminal 145.

When the door switch (S087) is in the open position, the MCU (XE01) terminal 118 no longer receives voltage from terminal 2 of the door switch (S087).

With the park brake switch (S065) in the disengaged position, the MCU (XE01) provides power from terminal 139 to the park brake release solenoid (Y043) terminal 1 and resistor (R005). The Danfoss Control Unit (DCU) (XE06) terminal 05 provides a ground for the park brake release solenoid (Y043) terminal 2, energizing the solenoid.

With the interlock circuit complete, all hydrostatic and hydraulic functions become active.

Switched Power

When the key switch (S001) is turned to the ON position, power is provided from key switch (S001) terminal C to diode connector (V004) terminal 2. Power is then provided from diode connector (V004) terminal 1 to main power relay (K902) terminal 02, energizing the relay. With the main power relay (K902) energized, switched power is provided from main power relay (K902) terminal 05 to the following:

- 10-amp cab power fuse (F003)
- 15-amp joysticks fuse (F012)
- 10-amp DCU fuse (F020)

Switched power is provided from the 10-amp cab power fuse (F003) to the door switch (S087) terminal 1 and park brake switch (S065) terminal 2.

Switched power is provided from the 15-amp joysticks fuse (F012) to the diode connector (V001) terminal 3 and MCU (XE01) terminal 146.

Switched power is provided from the 10-amp DCU fuse (F020) to the DCU (XE05) terminals 2, 11, and 12.

Auxiliary Hydraulics Male Coupler Circuit

When standard is selected on the standard/high flow selection switch (S207), the MCU (XE01) provides power from terminal 148 to the standard/high flow selection switch (S207) terminal 3. Power is then provided from MCU (XE01) terminal 104 to RH joystick auxiliary hydraulics control button (S10) terminal 1.

When the RH joystick auxiliary hydraulics control button (S10) is in the back position, the MCU (XE01) terminal 104 provides power to RH joystick auxiliary hydraulics control button (S10) terminal 1. The RH joystick auxiliary hydraulics control button (S10) terminal 1 provides power to the RH joystick auxiliary hydraulics control button (S10) terminal 3. Power then returns to MCU (XE01) terminal 114 from RH joystick auxiliary hydraulics control button (S10) terminal 3. The MCU (XE01) then provides power from terminal 138 to the main control valve solenoid B3 (Y159) terminal 1, energizing the solenoid.

Auxiliary Hydraulics Male Coupler Circuit Schematic

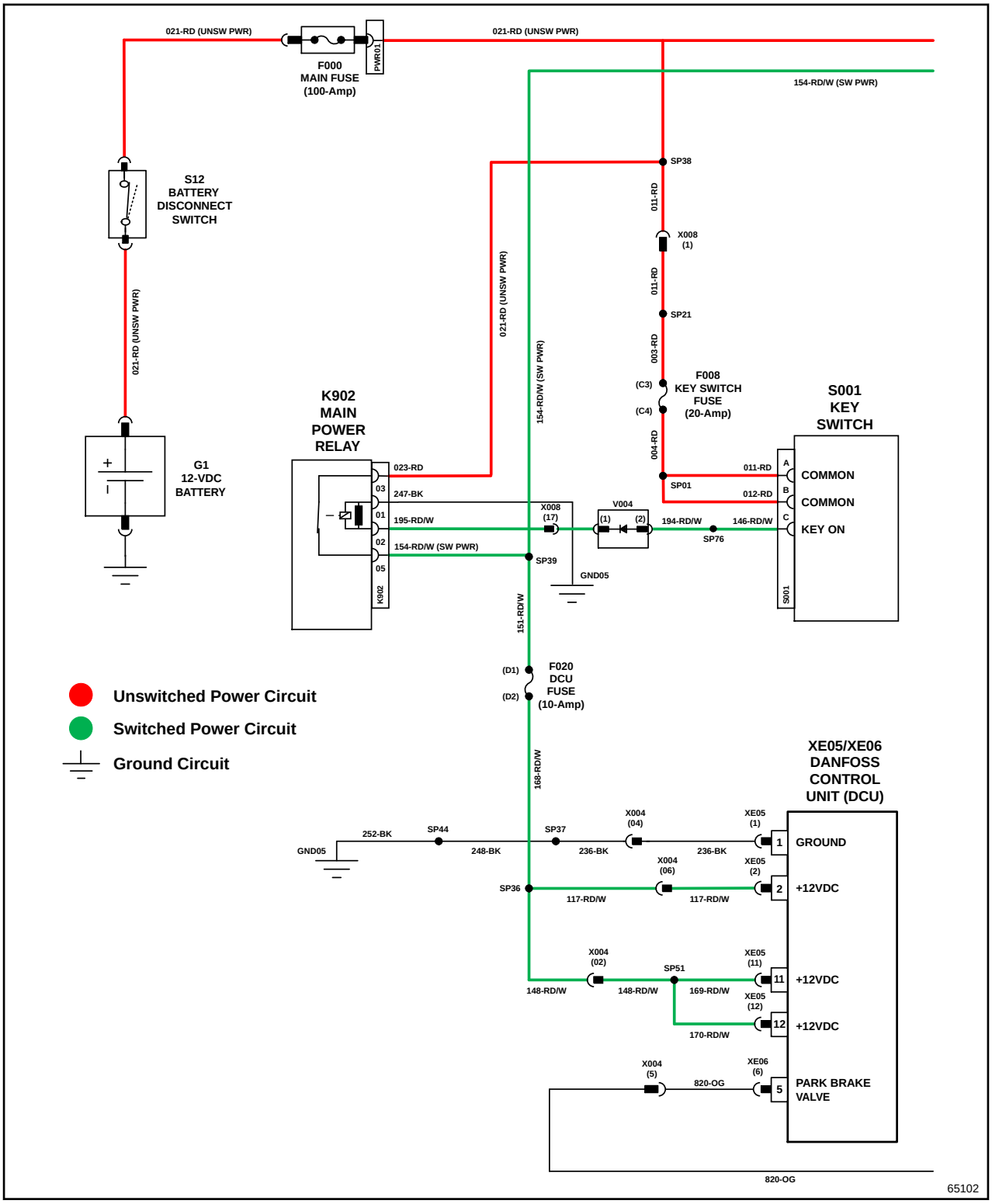


Figure 2-105

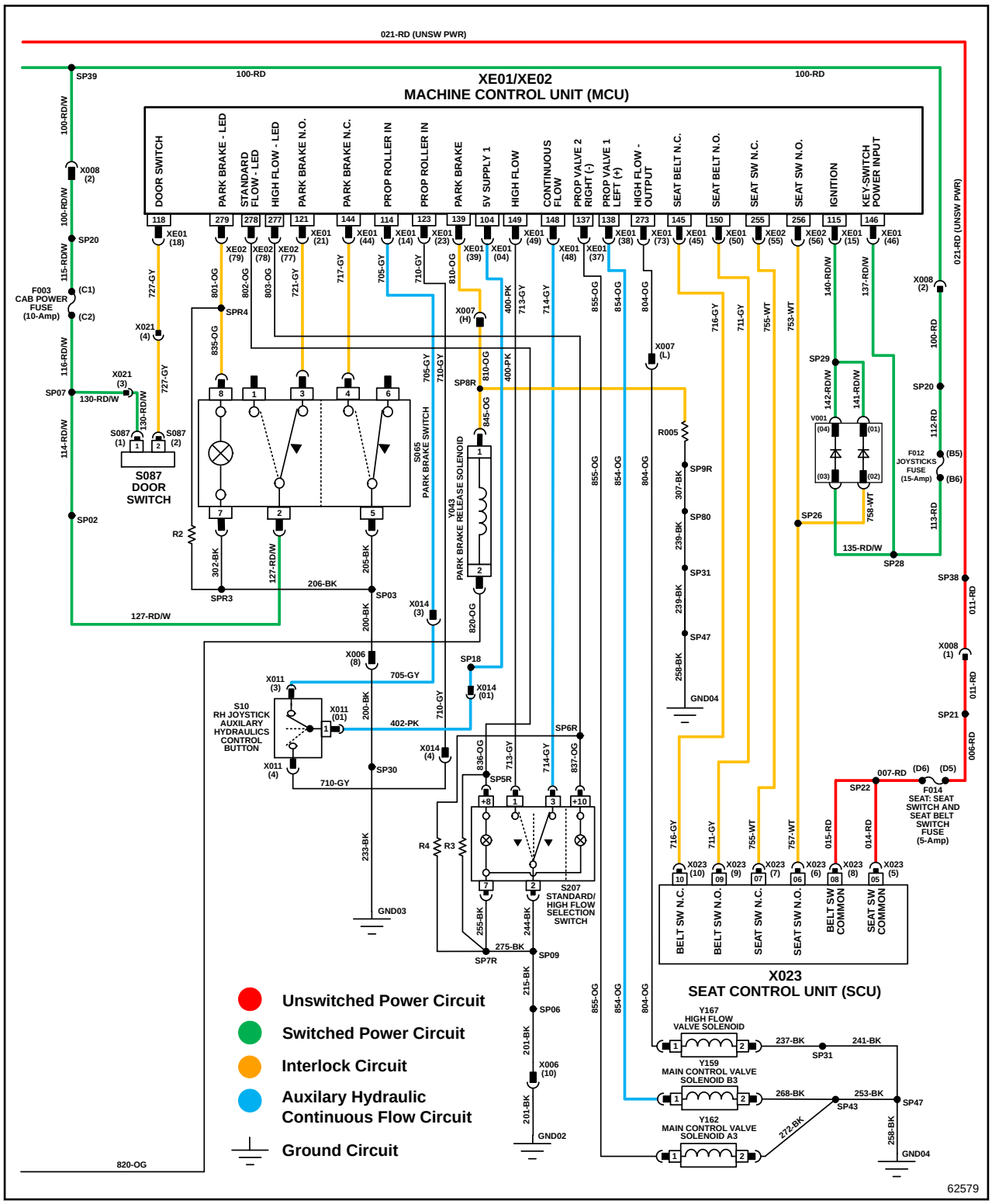

021-RD (UNSW PWR)
XE01/XE02
MACHINE CONTROL UNIT (MCU)
DOOR SWITCH
PARK BRAKE - LED
STANDARD FLOW - LED
HIGH FLOW - LED
PARK BRAKE N.O.
PARK BRAKE N.C.
PROP ROLLER IN
PROP ROLLER IN
PARK BRAKE
5V SUPPLY 1
HIGH FLOW
CONTINUOUS FLOW
PROP VALVE 2 RIGHT (-)
PROP VALVE 1 LEFT (+)
HIGH FLOW - OUTPUT
SEAT BELT N.C.
SEAT BELT N.O.
SEAT SW N.C.
SEAT SW N.O.
IGNITION
KEY-SWITCH POWER INPUT
S087 DOOR SWITCH
S065 PARK BRAKE SWITCH
Y043 PARK BRAKE RELEASE SOLENOID
S10 RH JOYSTICK AUXILARY HYDRAULICS CONTROL BUTTON
S207 STANDARD/ HIGH FLOW SELECTION SWITCH
F003 CAB POWER FUSE (10-Amp)
F012 JOYSTICKS FUSE (15-Amp)
F014 SEAT: SEAT SWITCH AND SEAT BELT SWITCH FUSE (5-Amp)
X023 SEAT CONTROL UNIT (SCU)
BELT SW N.C.
BELT SW N.O.
SEAT SW N.C.
SEAT SW N.O.
BELT SW COMMON
SEAT SW COMMON
Y167 HIGH FLOW VALVE SOLENOID
Y159 MAIN CONTROL VALVE SOLENOID B3
Y162 MAIN CONTROL VALVE SOLENOID A3
Unswitched Power Circuit
Switched Power Circuit
Interlock Circuit
Auxilary Hydraulic Continuous Flow Circuit
Ground Circuit
62579

Figure 2-106

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High Flow Auxiliary Hydraulics Female Coupler Circuit—Theory of Operation

Unswitched Power Circuit

Unswitched power is available from the battery positive terminal to the battery disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR01) to the following:

- 20-amp key switch fuse (F008)
- Main power relay (K902) terminal 03
- 5-amp seat: seat switch and seat belt switch fuse (F014)

Unswitched power is provided from the 20-amp key switch fuse (F008) to key switch (S001) terminals A and B.

Unswitched power is provided from the 5-amp seat: seat switch and seat belt switch fuse (F014) to Seat Control Unit (SCU) (X023) terminals 05 and 08.

Interlock Circuit

When the seat switch is in the closed position, the SCU (X023) sends output voltage from terminal 07 to the Machine Control Unit (MCU) (XE01) terminal 255.

When the seat belt switch is in the closed position, the SCU (X023) sends output voltage from terminal 10 to the MCU (XE01) terminal 145.

When the door switch (S087) is in the open position, the MCU (XE01) no longer receives voltage from terminal 2 of the door switch (S087) to terminal 118.

With the park brake switch (S065) in the disengaged position, the MCU (XE01) provides power from terminal 139 to the park brake release solenoid (Y043) terminal 1 and resistor (R005). The Danfoss Control Unit (DCU) (XE06) terminal 05 provides a ground for the park brake release solenoid (Y043) terminal 2, energizing the solenoid.

With the interlock circuit complete, all hydrostatic and hydraulic functions become active.

Switched Power

When the key switch (S001) is turned to the ON position, power is provided from key switch (S001) terminal C to diode connector (V004) terminal 2. Power is then provided from diode connector (V004) terminal 1 to main power relay (K902) terminal 02, energizing the relay. With the main power relay (K902) energized, switched power is provided from main power relay (K902) terminal 05 to the following:

- 10-amp cab power fuse (F003)
- 15-amp joysticks fuse (F012)
- 10-amp DCU fuse (F020)

Switched power is provided from the 10-amp cab power fuse (F003) to the door switch (S087) terminal 1 and park brake switch (S065) terminal 2.

Switched power is provided from the 15-amp joysticks fuse (F012) to the diode connector (V001) terminal 03 and MCU (XE01) terminal 146.

Switched power is provided from the 10-amp DCU fuse (F020) to the DCU (XE05) terminals 2, 11, and 12.

High Flow Auxiliary Hydraulics Female Coupler Circuit

When high flow is selected on the standard/high flow selection switch (S207), the MCU (XE01) provides power from terminal 149 to the standard/high flow selection switch (S207) terminal 1. Power is then provided from the MCU (XE01) terminal 273 to the high flow valve solenoid (Y167), energizing the solenoid. Power is also provided from MCU (XE01) terminal 104 to RH joystick auxiliary hydraulics control button (S10) terminal 1 when high flow is selected on the standard/high flow selection switch (S207).

When the RH joystick auxiliary hydraulics control button (S10) is in the forward position, the MCU (XE01) terminal 104 provides power to RH joystick auxiliary hydraulics control button (S10) terminal 1. The RH joystick auxiliary hydraulics control button (S10) terminal 1 provides power to the RH joystick auxiliary hydraulics control button (S10) terminal 4. Power then returns to MCU (XE01) terminal 123 from RH joystick auxiliary hydraulics control button (S10) terminal 4. The MCU (XE01) then provides power from terminal 137 to the main control valve solenoid A3 (Y162) terminal 1, energizing the solenoid.

High Flow Auxiliary Hydraulics Female Coupler Circuit Schematic

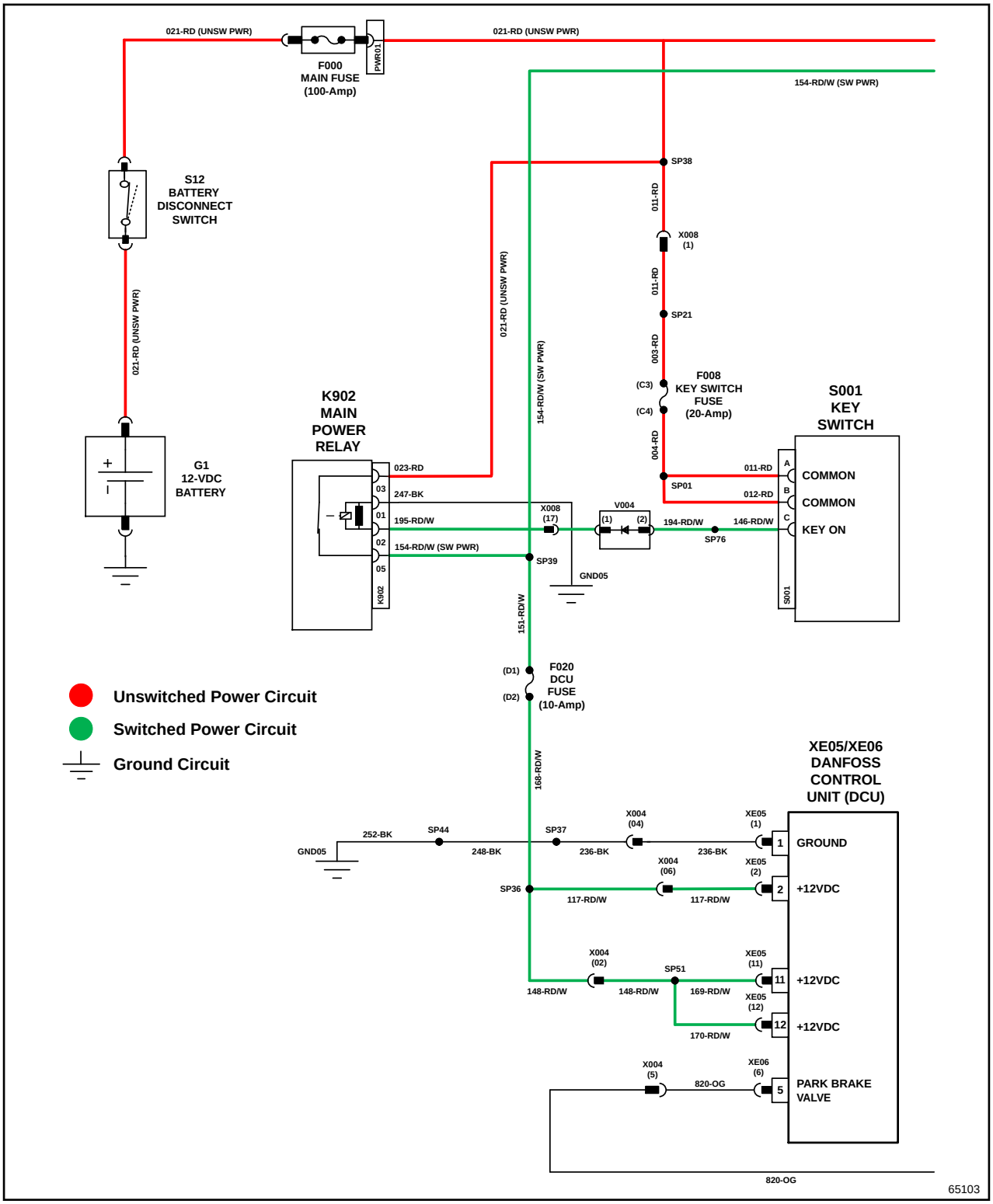


Figure 2-107

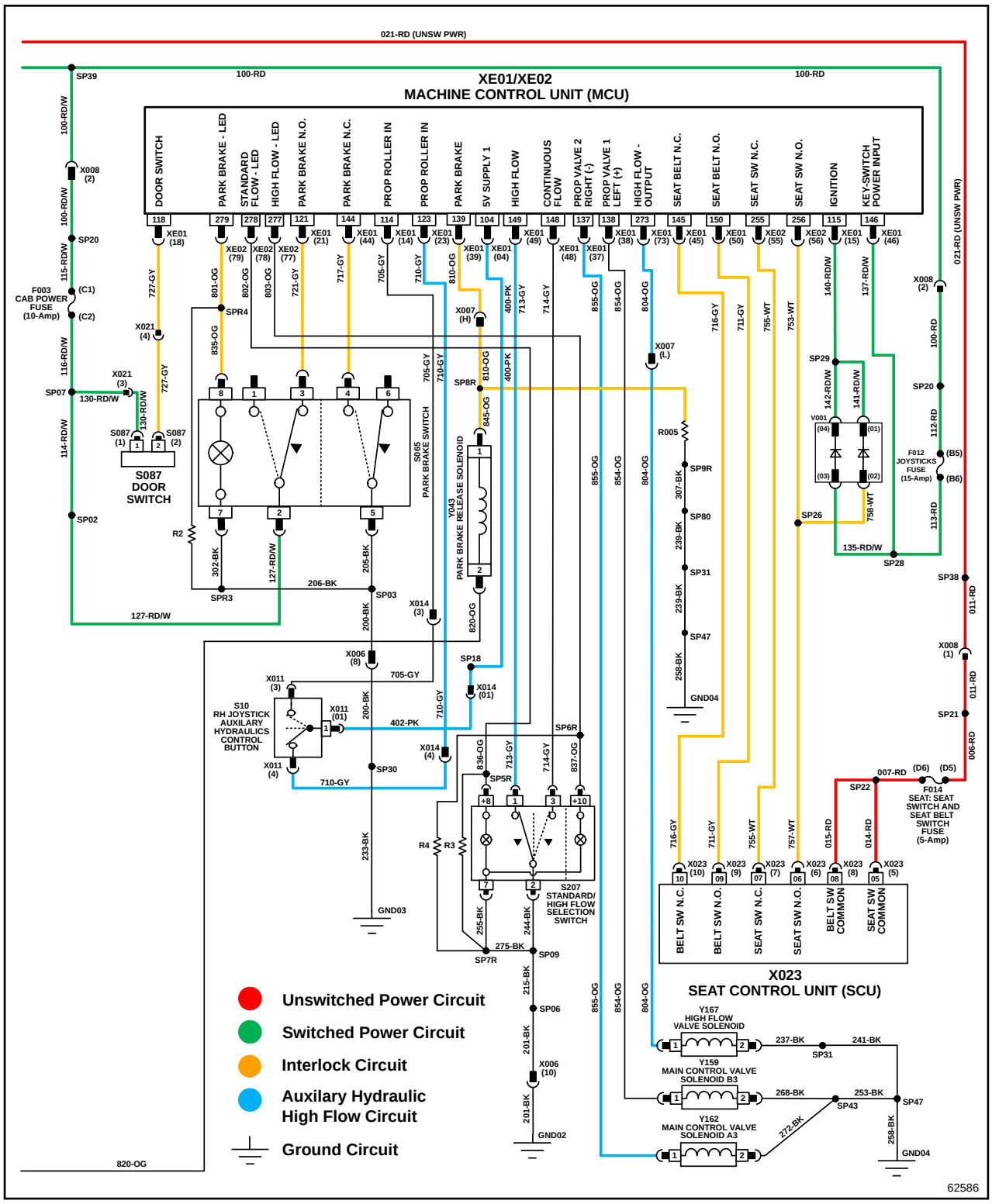

021-RD (UNSW PWR)
XE01/XE02
MACHINE CONTROL UNIT (MCU)
DOOR SWITCH
PARK BRAKE - LED
STANDARD FLOW - LED
HIGH FLOW - LED
PARK BRAKE N.O.
PARK BRAKE N.C.
PROP ROLLER IN
PROP ROLLER IN
PARK BRAKE
5V SUPPLY 1
HIGH FLOW
CONTINUOUS FLOW
PROP VALVE 2 RIGHT (-)
PROP VALVE 1 LEFT (+)
HIGH FLOW - OUTPUT
SEAT BELT N.C.
SEAT BELT N.O.
SEAT SW N.C.
SEAT SW N.O.
IGNITION
KEY-SWITCH POWER INPUT
F003 CAB POWER FUSE (10-Amp)
S087 DOOR SWITCH
S065 PARK BRAKE SWITCH
Y043 PARK BRAKE RELEASE SOLENOID
S10 RH JOYSTICK AUXILARY HYDRAULICS CONTROL BUTTON
S207 STANDARD/ HIGH FLOW SELECTION SWITCH
V001
F012 JOYSTICKS FUSE (15-Amp)
F014 SEAT: SEAT SWITCH AND SEAT BELT SWITCH FUSE (5-Amp)
X023 SEAT CONTROL UNIT (SCU)
BELT SW N.C.
BELT SW N.O.
SEAT SW N.C.
SEAT SW N.O.
BELT SW COMMON
SEAT SW COMMON
Y167 HIGH FLOW VALVE SOLENOID
Y159 MAIN CONTROL VALVE SOLENOID B3
Y162 MAIN CONTROL VALVE SOLENOID A3
Unswitched Power Circuit
Switched Power Circuit
Interlock Circuit
Auxilary Hydraulic High Flow Circuit
Ground Circuit
62586

Figure 2-108

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High Flow Auxiliary Hydraulics Male Coupler Circuit—Theory of Operation

Unswitched Power Circuit

Unswitched power is available from the battery positive terminal to the battery disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR01) to the following:

- 20-amp key switch fuse (F008)
- Main power relay (K902) terminal 03
- 5-amp seat: seat switch and seat belt switch fuse (F014)

Unswitched power is provided from the 20-amp key switch fuse (F008) to key switch (S001) terminals A and B.

Unswitched power is provided from the 5-amp seat: seat switch and seat belt switch fuse (F014) to Seat Control Unit (SCU) (X023) terminals 05 and 08.

Interlock Circuit

When the seat switch is in the closed position, the SCU (X023) sends output voltage from terminal 07 to the Machine Control Unit (MCU) (XE01) terminal 255.

When the seat belt switch is in the closed position, the SCU (X023) sends output voltage from terminal 10 to the MCU (XE01) terminal 145.

When the door switch (S087) is in the open position, the MCU (XE01) terminal 118 no longer receives voltage from terminal 2 of the door switch (S087).

With the park brake switch (S065) in the disengaged position, the MCU (XE01) provides power from terminal 139 to the park brake release solenoid (Y043) terminal 1 and resistor (R005). The Danfoss Control Unit (DCU) (XE06) terminal 05 provides a ground for the park brake release solenoid (Y043) terminal 2, energizing the solenoid.

With the interlock circuit complete, all hydrostatic and hydraulic functions become active.

Switched Power

When the key switch (S001) is turned to the ON position, power is provided from key switch (S001) terminal C to diode connector (V004) terminal 2. Power is then provided from diode connector (V004) terminal 1 to main power relay (K902) terminal 02, energizing the relay. With the main power relay (K902) energized, switched power is provided from main power relay (K902) terminal 05 to the following:

- 10-amp cab power fuse (F003)
- 15-amp joysticks fuse (F012)
- 10-amp DCU fuse (F020)

Switched power is provided from the 10-amp cab power fuse (F003) to the door switch (S087) terminal 1 and park brake switch (S065) terminal 2.

Switched power is provided from the 15-amp joysticks fuse (F012) to the diode connector (V001) terminal 03 and MCU (XE01) terminal 146.

Switched power is provided from the 10-amp DCU fuse (F020) to the DCU (XE05) terminals 2, 11, and 12.

High Flow Auxiliary Hydraulics Male Coupler Circuit

When high flow is selected on the standard/high flow selection switch (S207), the MCU (XE01) provides power from terminal 149 to the standard/high flow selection switch (S207) terminal 1. Power is then provided from the MCU (XE01) terminal 273 to the high flow valve solenoid (Y167), energizing the solenoid. Power is also provided from MCU (XE01) terminal 104 to RH joystick auxiliary hydraulics control button (S10) terminal 1 when high flow is selected on the standard/high flow selection switch (S207).

When the RH joystick auxiliary hydraulics control button (S10) is in the back position, the MCU (XE01) terminal 104 provides power to RH joystick auxiliary hydraulics control button (S10) terminal 1. The RH joystick auxiliary hydraulics control button (S10) terminal 1 provides power to the RH joystick auxiliary hydraulics control button (S10) terminal 3. Power then returns to MCU (XE01) terminal 114 from RH joystick auxiliary hydraulics control button (S10) terminal 3. The MCU (XE01) then provides power from terminal 138 to the main control valve solenoid B3 (Y159) terminal 1, energizing the solenoid.

High Flow Auxiliary Hydraulics Male Coupler Circuit Schematic

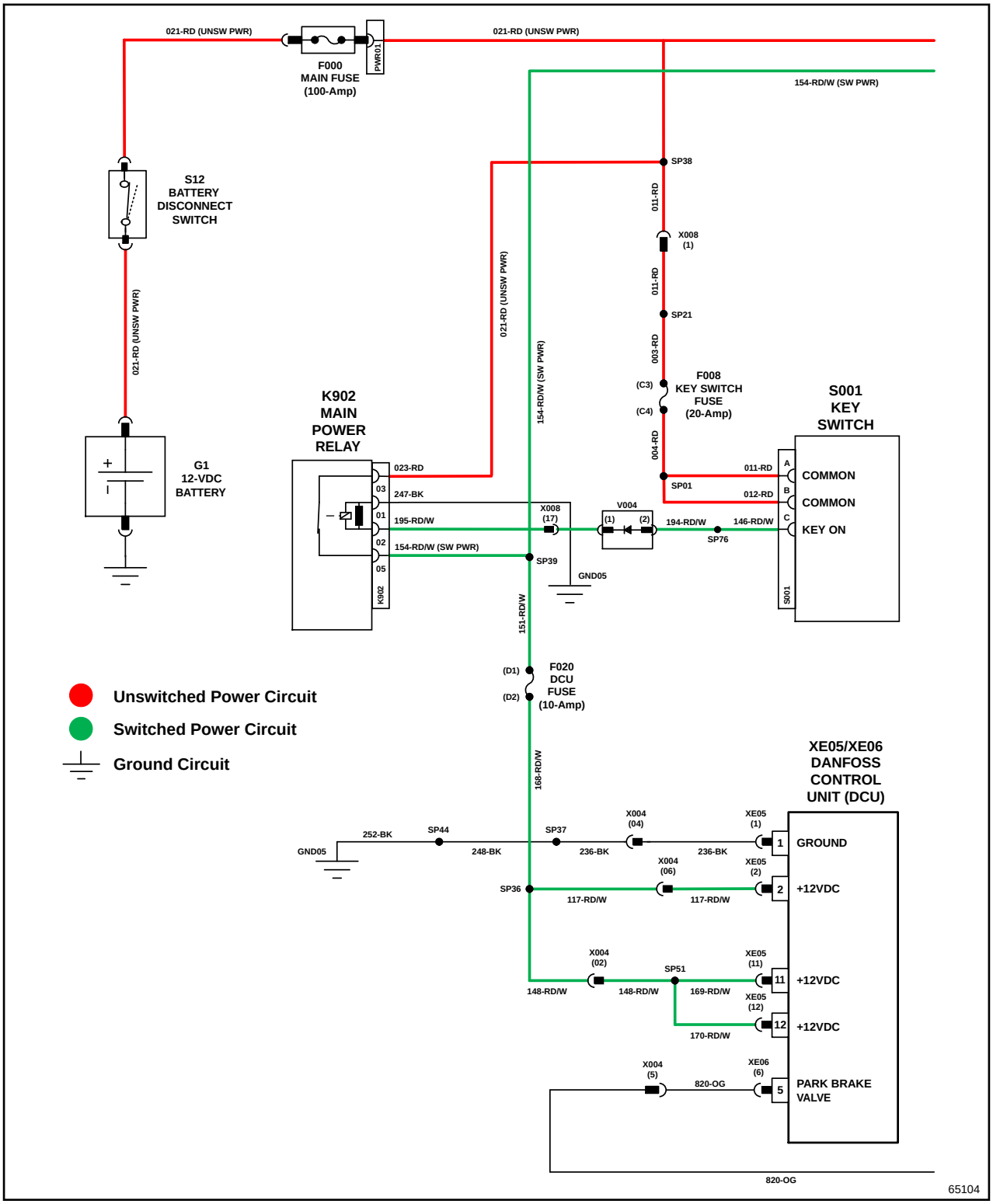


Figure 2-109

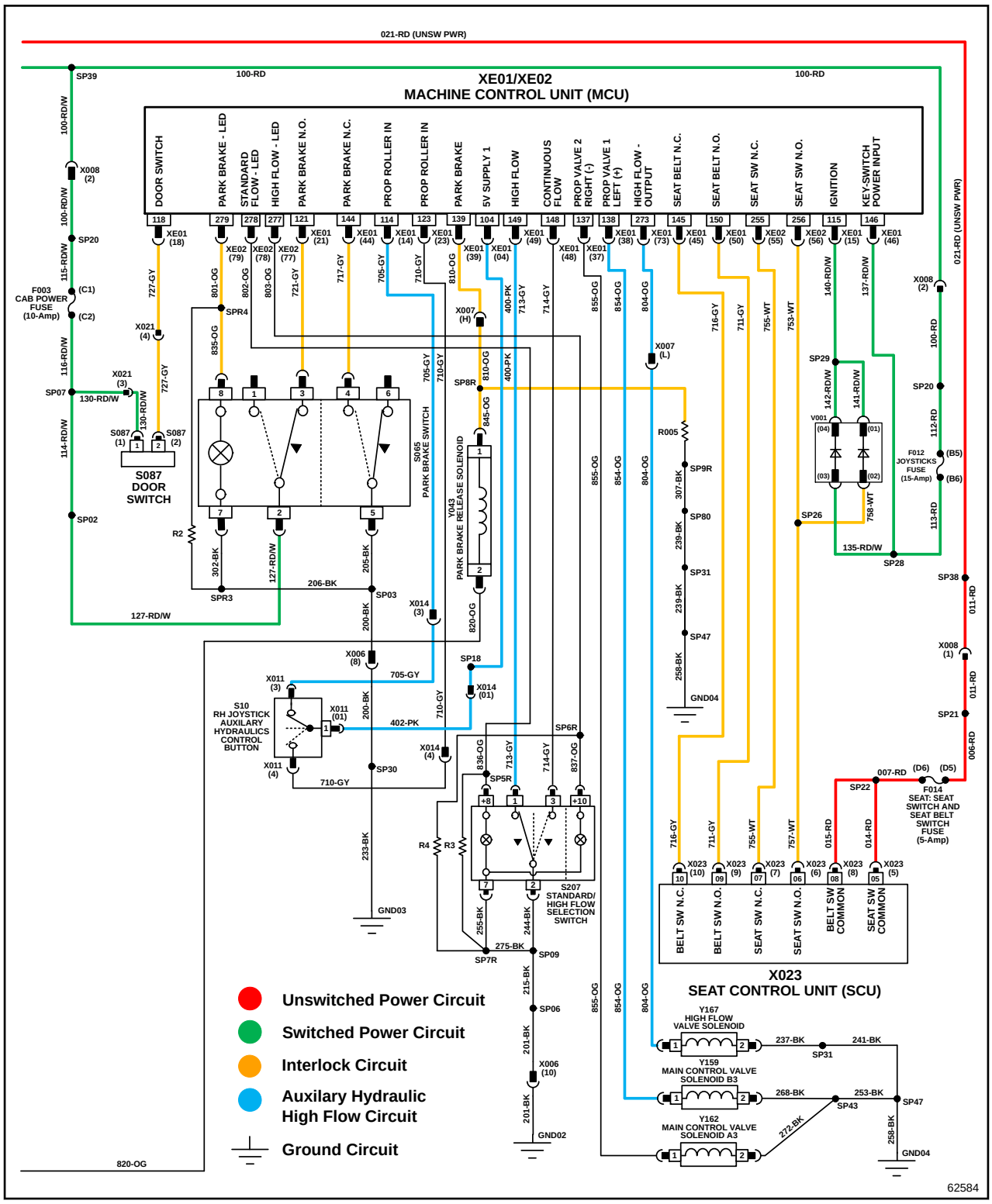

021-RD (UNSW PWR)
XE01/XE02
MACHINE CONTROL UNIT (MCU)
DOOR SWITCH
PARK BRAKE - LED
STANDARD FLOW - LED
HIGH FLOW - LED
PARK BRAKE N.O.
PARK BRAKE N.C.
PROP ROLLER IN
PROP ROLLER IN
PARK BRAKE
5V SUPPLY 1
HIGH FLOW
CONTINUOUS FLOW
PROP VALVE 2 RIGHT (-)
PROP VALVE 1 LEFT (+)
HIGH FLOW - OUTPUT
SEAT BELT N.C.
SEAT BELT N.O.
SEAT SW N.C.
SEAT SW N.O.
IGNITION
KEY-SWITCH POWER INPUT
S087 DOOR SWITCH
S065 PARK BRAKE SWITCH
Y043 PARK BRAKE RELEASE SOLENOID
S10 RH JOYSTICK AUXILARY HYDRAULICS CONTROL BUTTON
S207 STANDARD/ HIGH FLOW SELECTION SWITCH
F003 CAB POWER FUSE (10-Amp)
F012 JOYSTICKS FUSE (15-Amp)
F014 SEAT: SEAT SWITCH AND SEAT BELT SWITCH FUSE (5-Amp)
X023 SEAT CONTROL UNIT (SCU)
BELT SW N.C.
BELT SW N.O.
SEAT SW N.C.
SEAT SW N.O.
BELT SW COMMON
SEAT SW COMMON
Y167 HIGH FLOW VALVE SOLENOID
Y159 MAIN CONTROL VALVE SOLENOID B3
Y162 MAIN CONTROL VALVE SOLENOID A3
Unswitched Power Circuit
Switched Power Circuit
Interlock Circuit
Auxilary Hydraulic High Flow Circuit
Ground Circuit
62584

Figure 2-110

Work Lights Circuit—Theory of Operation

Unswitched Power Circuit

Unswitched power is available from the battery positive terminal to the battery disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR01) to the following:

- 20-amp key switch fuse (F008)
- Main power relay (K902) terminal 03

Unswitched power is then made available from the 20-amp key switch fuse (F008) to key switch (S001) terminals A and B.

Switched Power Circuit

When the key switch (S001) is turned to the ON position, power is provided from key switch (S001) terminal C to diode connector (V004) terminal 2. Power is then provided from diode connector (V004) terminal 1 to main power relay (K902) terminal 02, energizing the relay. With the main power relay (K902) energized, switched power is provided from main power relay (K902) terminal 05 to the following:

- 20-amp work lights switch fuse (F010)
- 20-amp work lights fuse (F011)

Switched power is provided to work light switch (S016) terminals 2 and 5 from the 20-amp fuse (F010).

Switched power is provided to work light relay (K047) terminal 30 from the 20-amp fuse (F011).

Work Lights Circuit

When the work lights switch (S016) is placed in the work position, voltage is supplied from work lights switch terminal 6 to work lights relay (K047) terminal 85. This energizes the relay and turns on the front work lights and tail lights. Voltage is also supplied from terminal 3 of the work lights switch (S016) to rear work lights, turning on the rear work lights.

Work Lights Circuit Schematic

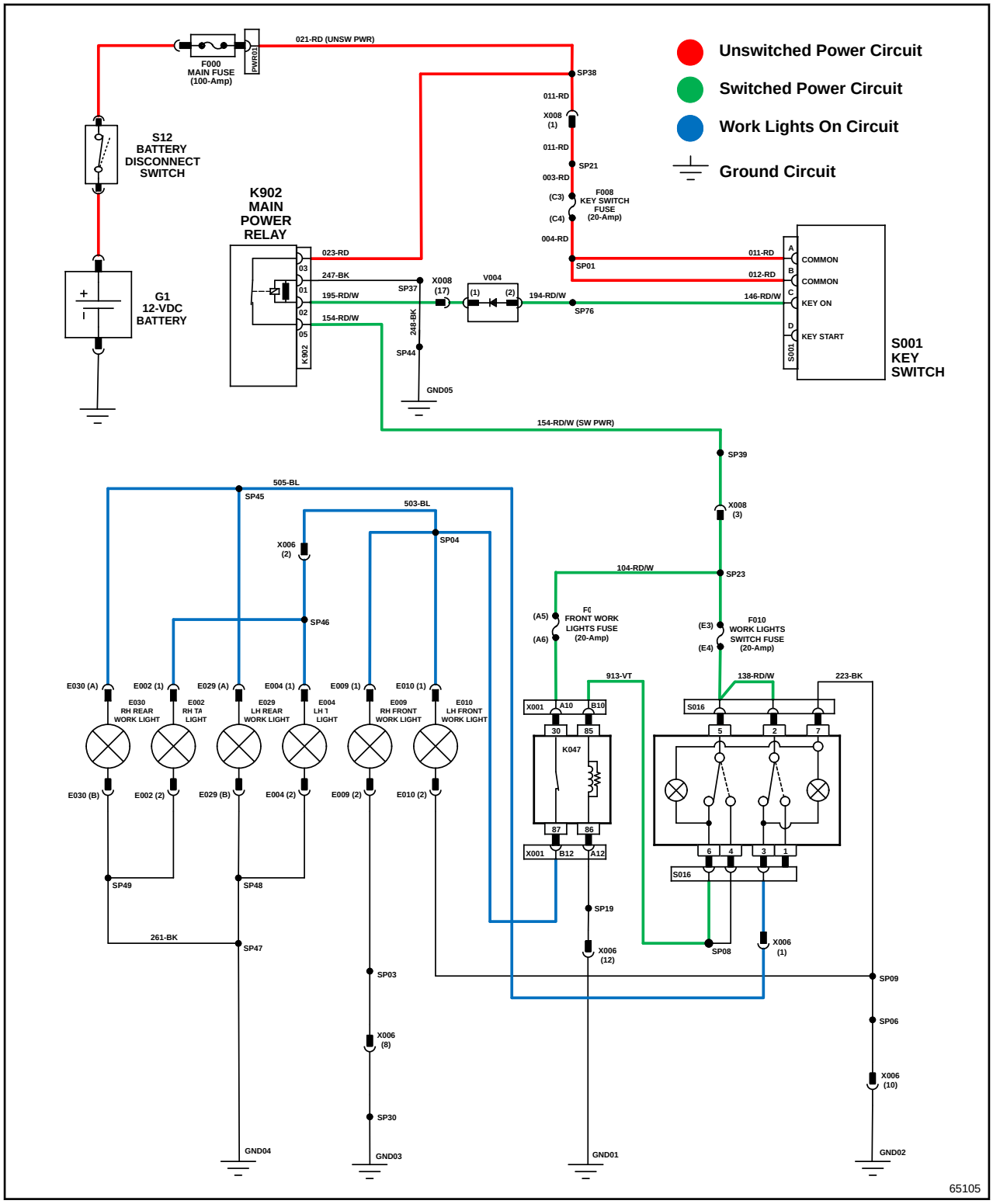


Figure 2-111

Transport Lights Circuit—Theory of Operation

Unswitched Power Circuit

Unswitched power is available from the battery positive terminal to the battery disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR01) to the following:

- 20-amp key switch fuse (F008)
- Main power relay (K902) terminal 03

Unswitched power is then made available from the 20-amp key switch fuse (F008) to key switch (S001) terminals A and B.

Switched Power Circuit

When the key switch (S001) is turned to the ON position, power is provided from key switch (S001) terminal C to diode connector (V004) terminal 2. Power is then provided from diode connector (V004) terminal 1 to main power relay (K902) terminal 02, energizing the relay. With the main power relay (K902) energized, switched power is provided from main power relay (K902) terminal 05 to the following:

- 20-amp work lights switch fuse (F010)
- 20-amp work lights fuse (F011)

Switched power is provided to work light switch (S016) terminals 2 and 5 from the 20-amp fuse (F010).

Switched power is provided to work light relay (K047) terminal 30 from the 20-amp fuse (F011).

Transport Lights Circuit

When the work lights switch (S016) is placed in the transport position, voltage is supplied from work lights switch (S016) terminal 4 to work lights relay (K047) terminal 85. This energizes the relay and turns on the front work lights and tail lights.

Transport Lights Circuit Schematic

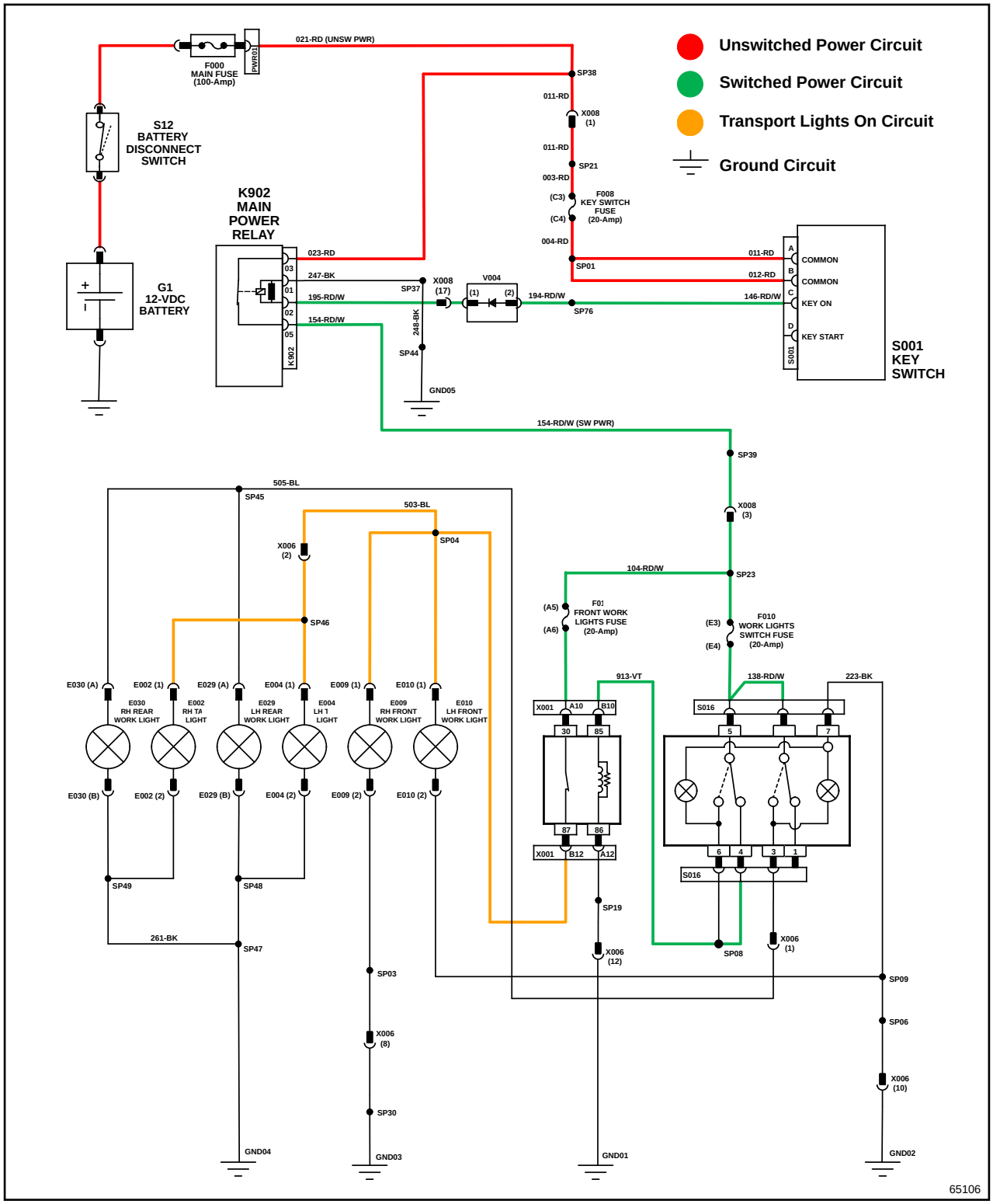


Figure 2-112

Instrumentation—Theory of Operation

Unswitched Power Circuit

Unswitched power is available from the battery positive terminal to the battery disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR01) to the following:

- 20-amp key switch fuse (F008)
- Main power relay (K902) terminal 03
- 35-amp Machine Control Unit (MCU) fuse (F006)

Unswitched power is provided from the 20-amp key switch fuse (F008) to key switch (S001) terminals A and B.

Unswitched power is provided from the 35-amp MCU (XE01) fuse (F006) to the MCU connector terminals 101, 103, 127, and 128.

Fuel Level Sensor Circuit

The float attached to the fuel level sensor (B001) moves as the fuel level changes. The resistance of the fuel level sensor (B001) changes in relation to the position of the float. As the resistance changes, the amount of current flowing through the circuit changes. The amount of current flowing is indicated by the fuel gauge on the instrument display (XA01).

Battery Charge Circuit

When the key switch (S001) is turned to the ON position, power is provided from key switch (S001) terminal C to diode connector (V004) terminal 2. Power is then provided from diode connector (V004) terminal 1 to main power relay (K902) terminal 02, energizing the relay. With the main power relay (K902) energized, switched power is provided from main power relay (K902) pin 05 to the 5-amp instrument display fuse (F002). Switched power is then provided to the instrument display (XA01) terminal 20 from the 5-amp instrument display fuse (F002). Switched power is also provided to the engine wire harness (E1C1) terminal D7 from the MCU (XE01) terminal 272. The alternator sends a signal to engine wire harness (E1C1) terminal D8. The engine wire harness (E1C1) terminal D8 then provides power to the instrument display (XA01) terminal 3 indicating the charging status of the alternator.

Controller Area Network (CAN) Instrumentation

All indicator and warning lights not listed above are controlled through the CAN network.

Instrumentation Schematic

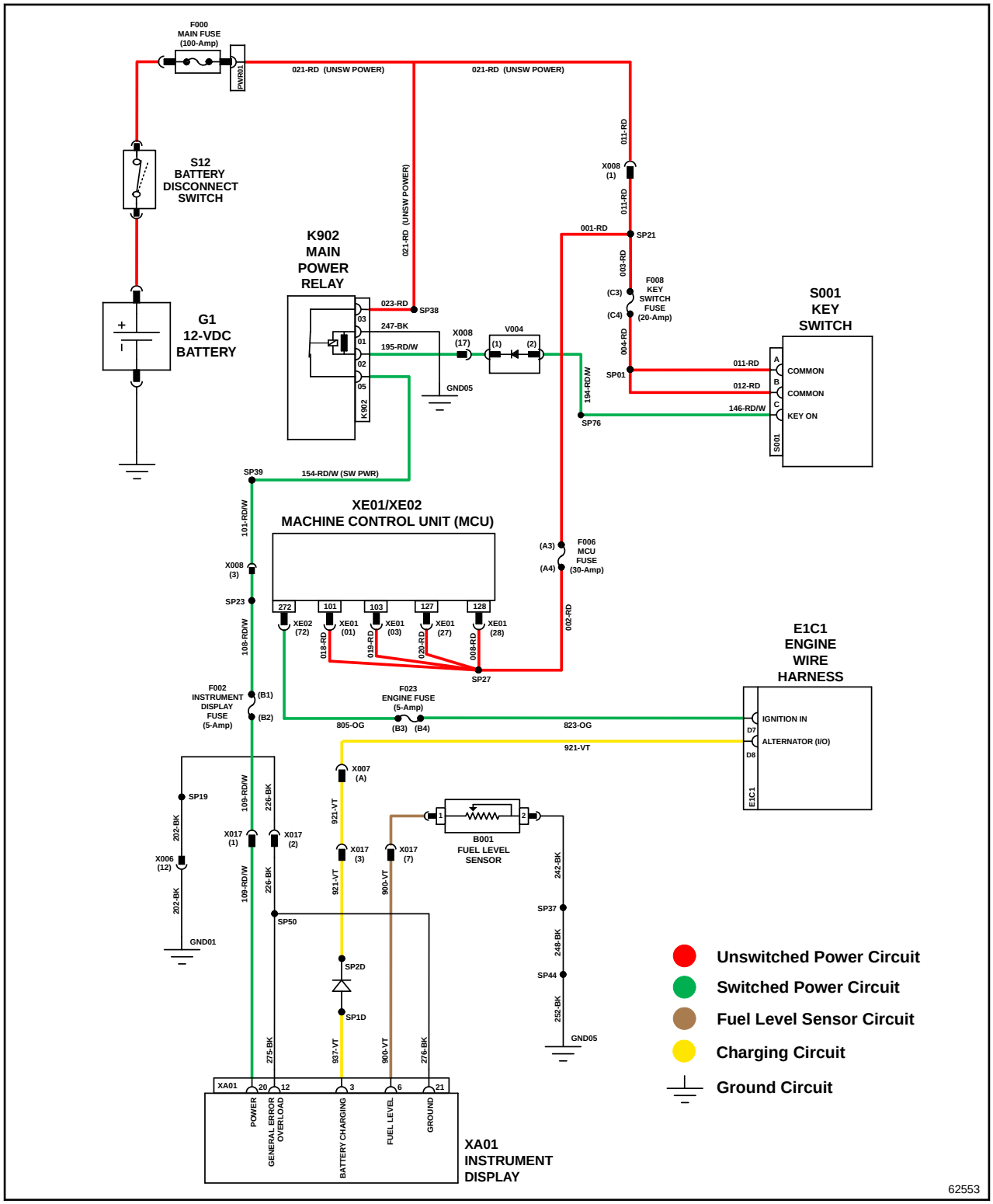


Figure 2-113

Horn Circuit—Theory of Operation

Unswitched Power Circuit

Unswitched power is available from the battery positive terminal to the battery connect/disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR01) to the following:

- 10-amp horn/dome light fuse (F015)
- Horn button (S11) terminal 9
- Horn relay (K130) terminal D12

Horn Circuit

When the horn button (S11) is depressed, power is provided from the horn button (S11) terminal 10 to the horn relay (K130) terminal D10, energizing the relay. With horn relay (K130) energized, power is provided from horn relay (K130) terminal C10 to the horn (B002) terminal B002+, sounding the horn.

Horn Circuit Schematic

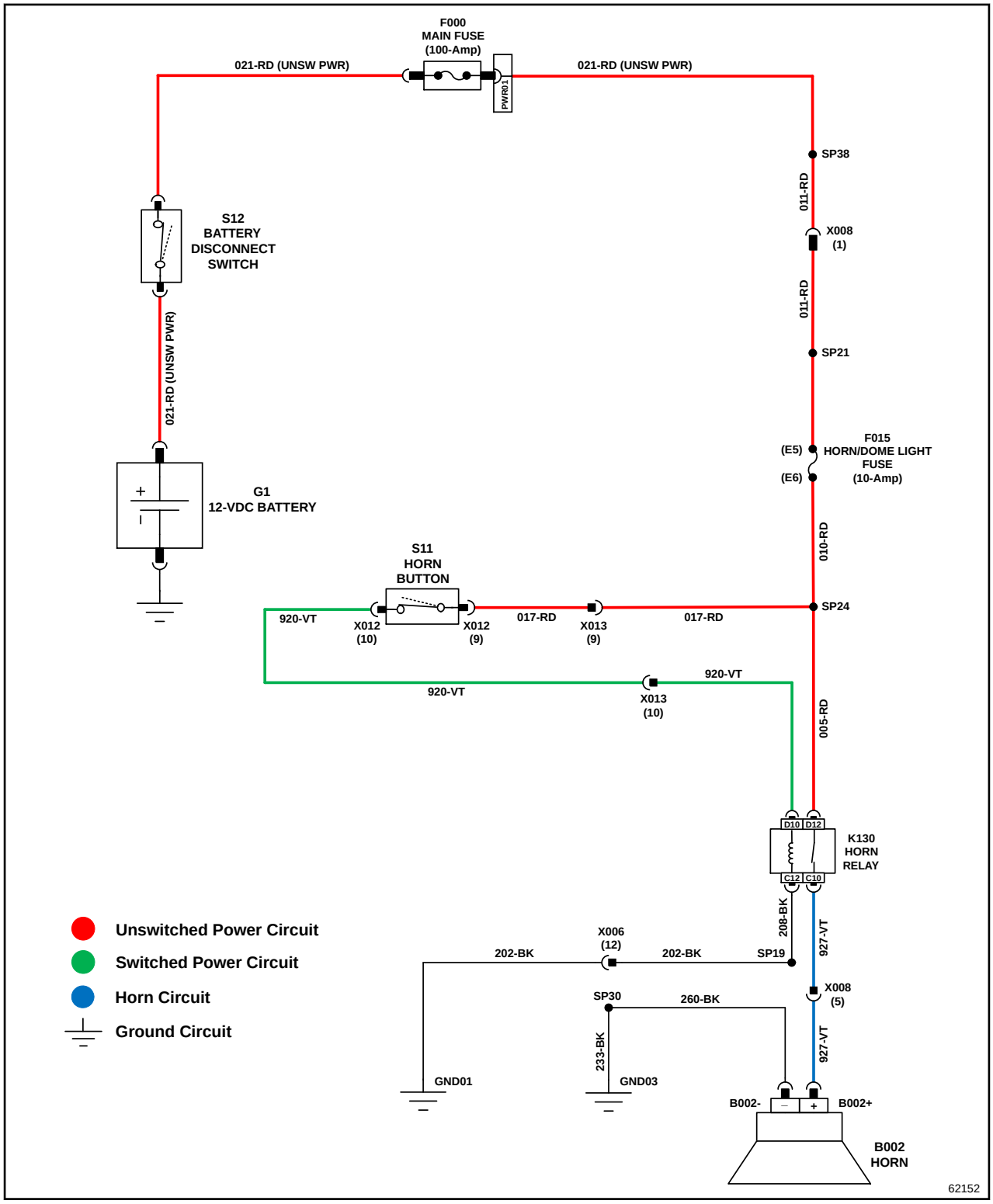


Figure 2-114

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Backup Audible Alarm Circuit—Theory of Operation (Electronic Controls)

Unswitched Power Circuit

Unswitched power is available from the battery positive terminal to the battery connect/disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is made available from the 100-amp main fuse cable connector (PWR01) to the following:

- 20-amp key switch fuse (F008)
- Main power relay (K902) terminal 03
- 5-amp seat: seat switch and seat belt switch fuse (F014)

Unswitched power is provided from the 20-amp key switch fuse (F008) to key switch (S001) terminals A and B.

Unswitched power is provided from the 5-amp seat: seat switch and seat belt switch fuse (F014) to Seat Control Unit (SCU) (X023) terminals 05 and 08.

Interlock Circuit

When the seat switch is in the closed position, the SCU (X023) sends output voltage from terminal 07 to the Machine Control Unit (MCU) (XE01) terminal 255.

When the seat belt switch is in the closed position, the SCU (X023) sends output voltage from terminal 10 to the MCU (M3) terminal 145.

With the park brake switch (S065) in the disengaged position, the MCU (XE01) provides power from terminal 139 to the park brake release solenoid (Y043) terminal 1 and resistor (R005). The Danfoss Control Unit (DCU) (XE06) terminal 05 provides a ground for the park brake release solenoid (Y043) terminal 6, energizing the solenoid.

With the interlock circuit complete, all hydrostatic and hydraulic functions become active.

Switched Power

When the key switch (S001) is turned to the ON position, power is provided from key switch (S001) terminal C to diode connector (V004) terminal 2. Power is then provided from diode connector (V004) terminal 1 to main power relay (K902) terminal 02, energizing the relay. With the main power relay (K902) energized, switched power is provided from main power relay (K902) terminal 05 to the following:

- 10-amp cab power fuse (F003)
- 15-amp joysticks fuse (F012)
- 10-amp Danfoss Control Unit (DCU) fuse (F020)

Switched power is provided from the 10-amp cab power fuse (F003) to the park brake switch (S065) terminal 2.

Switched power is provided from the 15-amp joysticks fuse (F012) to the diode connector (V001) terminal 3, and MCU terminal 146.

Switched power is provided from the 10-amp DCU fuse (F020) to the DCU (XE05) terminals 2, 11, and 12.

Backup Audible Alarm Circuit

When joystick(s) are in the reverse position (back), the DCU provides power from terminal 3 to the backup audible alarm (B003) terminal 2, sounding the backup audible alarm.

Backup Audible Alarm Circuit Schematic (Electronic Controls)

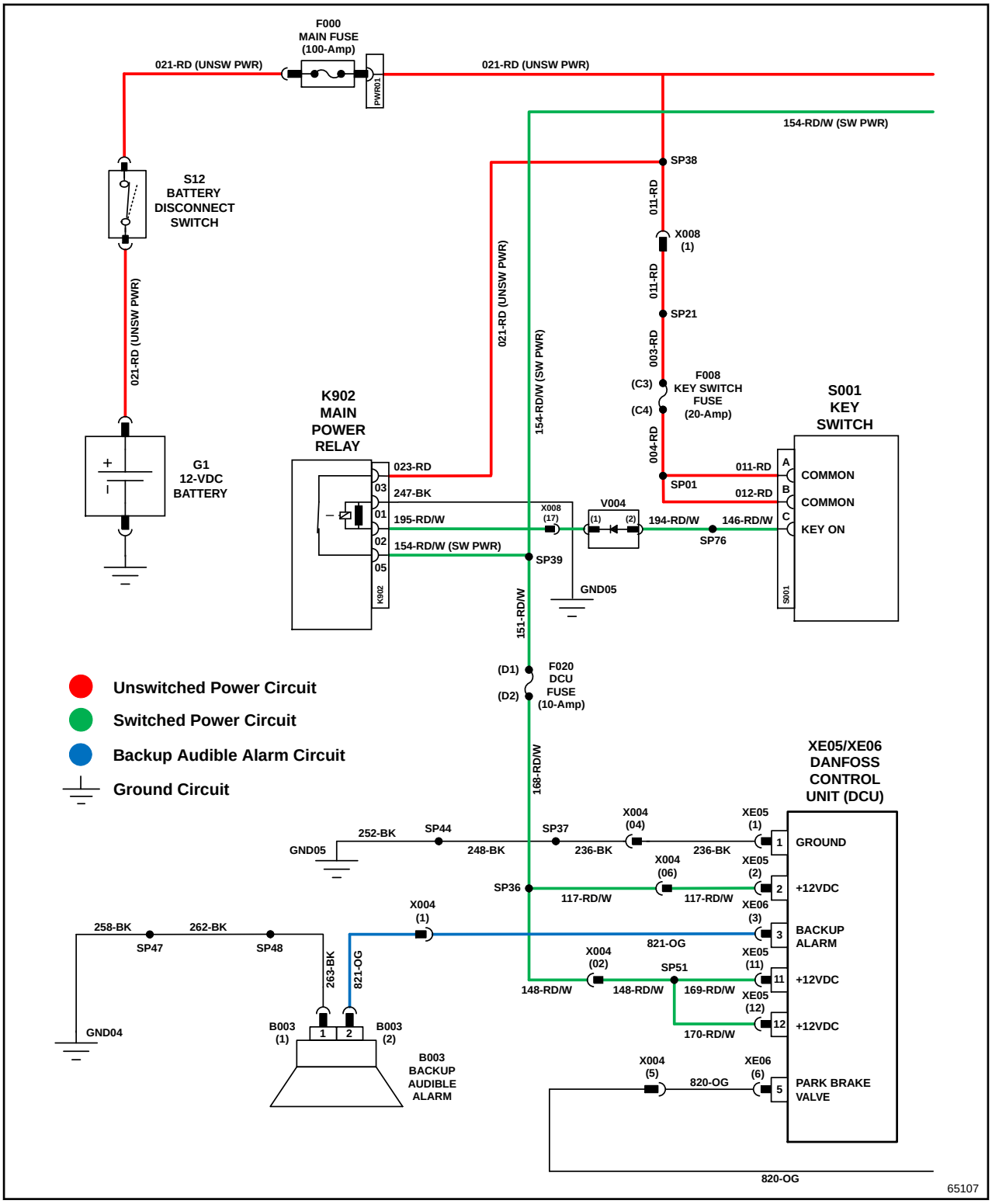


Figure 2-115

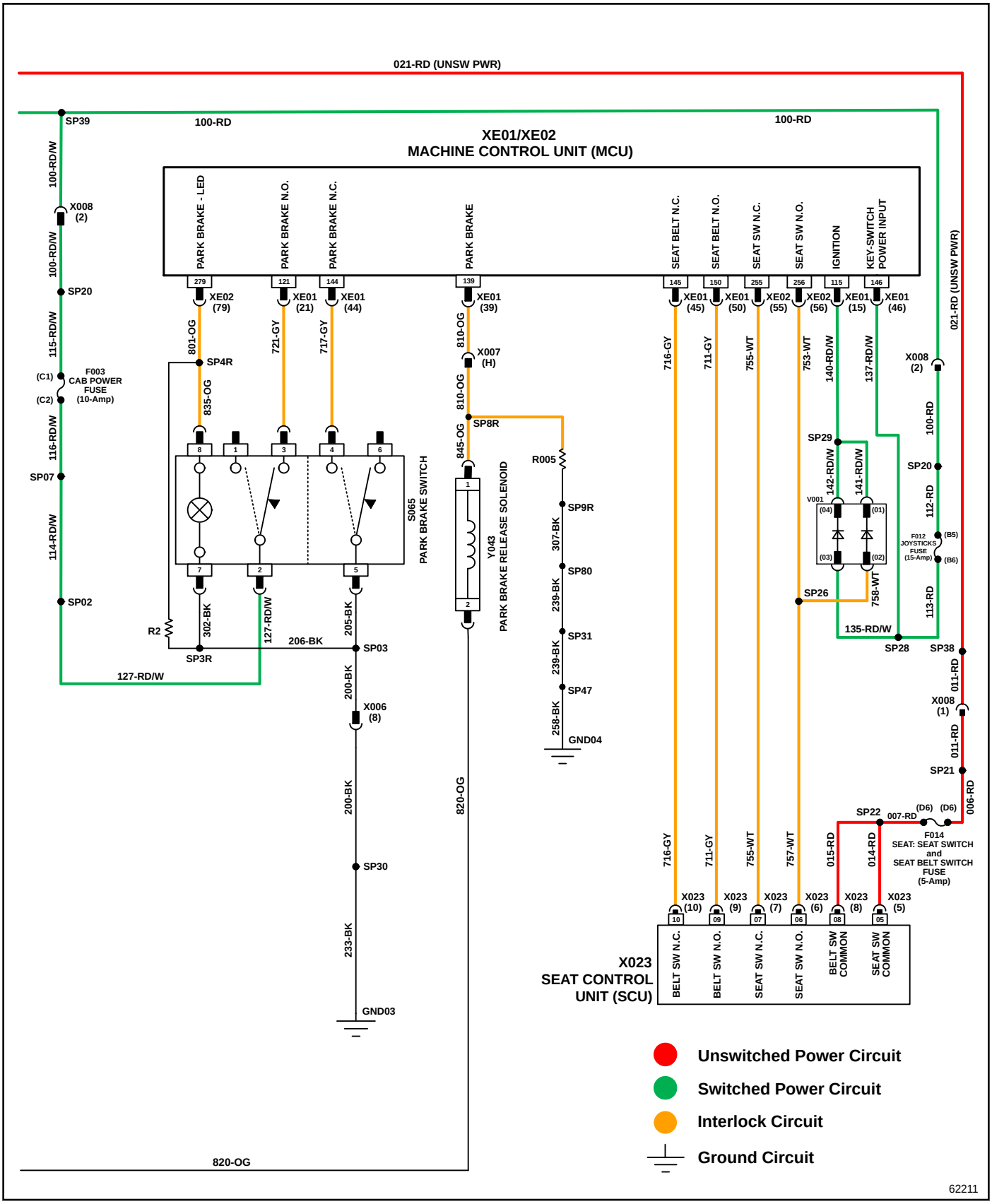

021-RD (UNSW PWR)
SP39
100-RD
100-RD
XE01/XE02
MACHINE CONTROL UNIT (MCU)
PARK BRAKE - LED
PARK BRAKE N.O.
PARK BRAKE N.C.
PARK BRAKE
SEAT BELT N.C.
SEAT BELT N.O.
SEAT SW N.C.
SEAT SW N.O.
IGNITION
KEY-SWITCH POWER INPUT
X008 (2)
SP20
SP07
SP02
F003 CAB POWER FUSE (10-Amp)
SP4R
SP3R
R2
S065 PARK BRAKE SWITCH
SP8R
R005
SP9R
SP80
SP31
SP47
GND04
Y043 PARK BRAKE RELEASE SOLENOID
X007 (H)
SP30
GND03
820-OG
SP29
SP26
SP28
SP38
V001
F012 JOYSTICKS FUSE (15-Amp)
X008 (1)
SP21
SP22
F014 SEAT: SEAT SWITCH and SEAT BELT SWITCH FUSE (5-Amp)
X006 (8)
X023 SEAT CONTROL UNIT (SCU)
BELT SW N.C.
BELT SW N.O.
SEAT SW N.C.
SEAT SW N.O.
BELT SW COMMON
SEAT SW COMMON
Unswitched Power Circuit
Switched Power Circuit
Interlock Circuit
Ground Circuit
62211

Figure 2-116

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Backup Audible Alarm Circuit—Theory of Operation (Manual Controls)

Unswitched Power Circuit

Unswitched power is available from the battery positive terminal to the battery connect/disconnect switch (S12). Unswitched power is then provided to the starter motor and to the 100-amp main fuse (F000).

Unswitched power is available from the 100-amp main fuse cable connector (PWR01) to the following:

- 20-amp key switch fuse (F008)
- Main power relay (K902) terminal 03
- 5-amp seat: seat switch and seat belt switch fuse (F014)

Unswitched power is provided from the 20-amp key switch fuse (F008) to key switch (S001) terminals A and B.

Unswitched power is provided from the 5-amp seat: seat switch and seat belt switch fuse (F014) to Seat Control Unit (SCU) (X023) terminals 05 and 08.

Interlock Circuit

When the seat switch is in the closed position, the SCU (X023) sends an output voltage from terminal 07 to the Machine Control Unit (MCU) (XE01) terminal 255.

When the seat belt switch is in the closed position, the SCU (X023) sends an output voltage from terminal 10 to the Machine Control Unit (MCU) (XE01) terminal 145.

With the park brake switch (S065) in the disengaged position, the MCU (XE01) provides power from terminal 139 to the park brake release solenoid (Y043) terminal 1 and resistor (R005), energizing the solenoid.

With the interlock circuit complete, all hydrostatic and hydraulic functions become active.

Switched Power

When the key switch (S001) is turned to the ON position, power is provided from key switch (S001) terminal C to diode connector (V004) terminal 2. Power is then provided from diode connector (V004) terminal 1 to main power relay (K902) terminal 02, energizing the relay. With the main power relay (K902) energized, switched power is provided from main power relay (K902) terminal 05 to the following:

- 10-amp cab power fuse (F003)
- 15-amp joysticks fuse (F012)
- 10-amp Danfoss Control Unit (DCU) fuse (F020)

Switched power is provided from the 10-amp cab power fuse (F003) to the park brake switch (S065) terminal 2.

Switched power is provided from the 15-amp joysticks fuse (F012) to the diode connector (V001) terminal 3, and MCU terminal 146.

Switched power is provided from the 10-amp DCU fuse (F020) to switch S43a terminal S43aNO.

Backup Audible Alarm Circuit

When joysticks are in the reverse position (back), switch S43a and switch S43b contacts close. With switch S43a contacts closed, switched power is provided from switch S43a terminal S43aC to switch S43b terminal S43bNO. Power is then provided from switch S43b terminal S43bC to the backup audible alarm (B003) terminal 2, sounding the backup audible alarm (B003).

2

Backup Audible Alarm Circuit Schematic (Manual Controls)

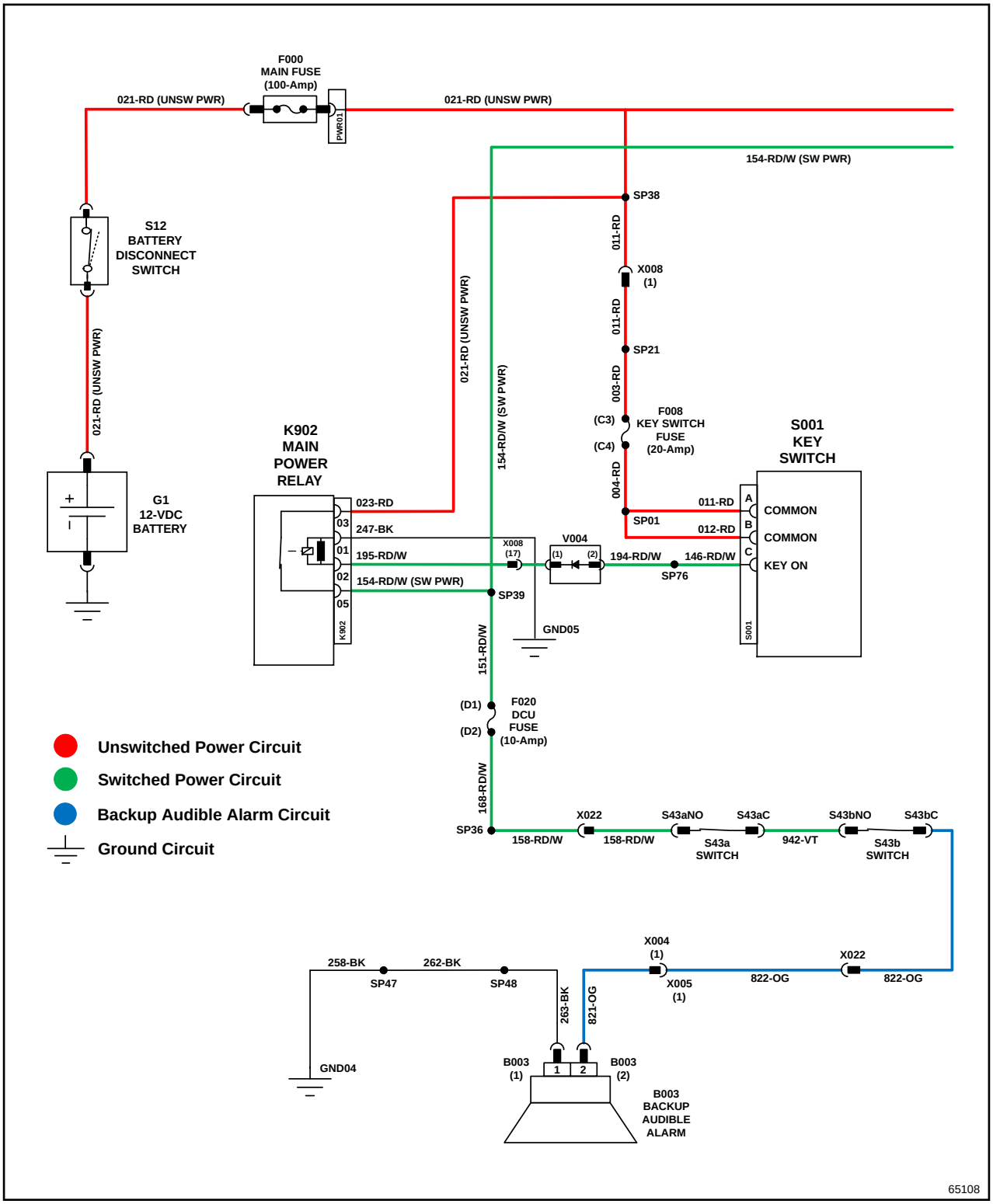


Figure 2-117

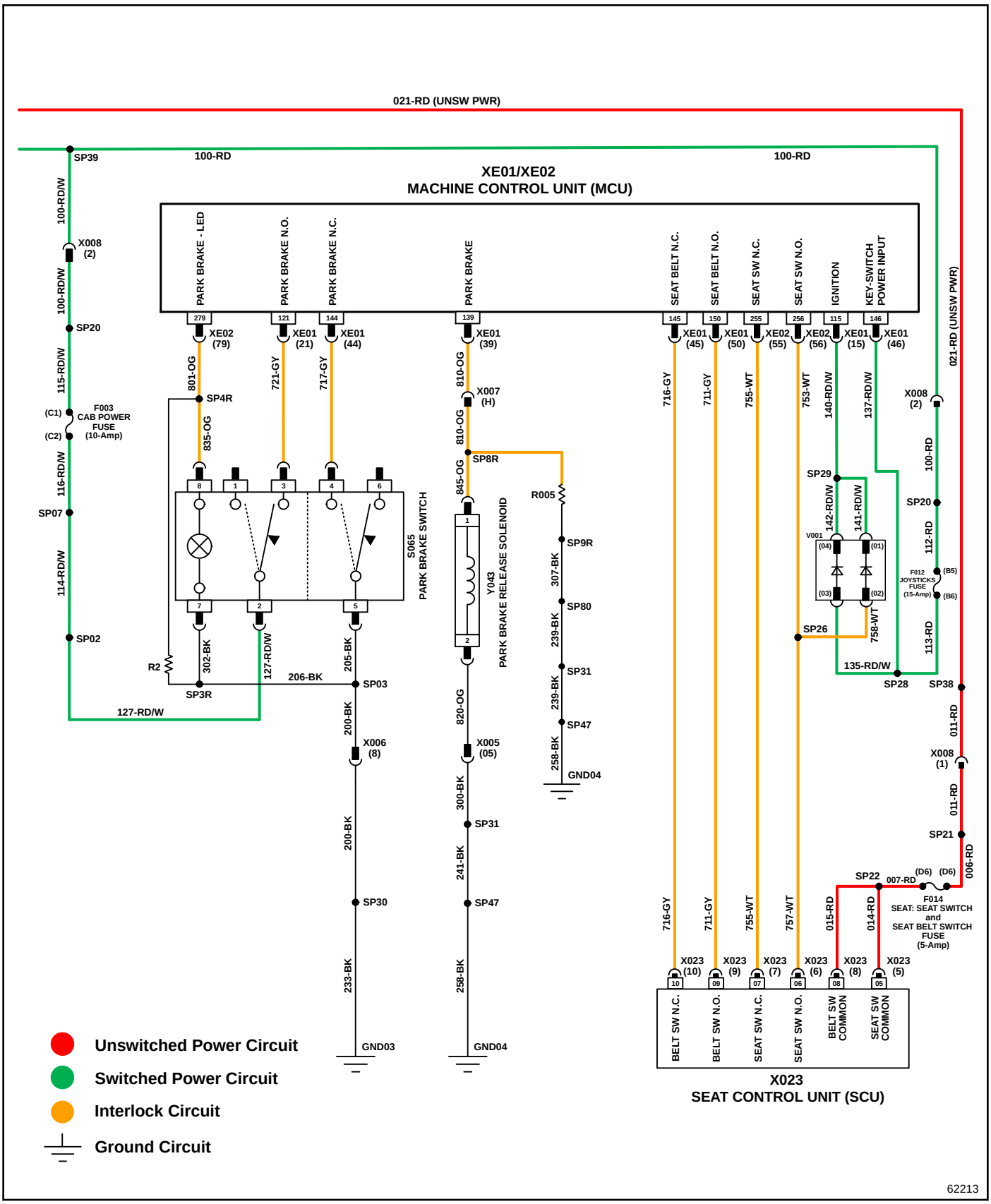

021-RD (UNSW PWR)
SP39
100-RD
100-RD
XE01/XE02
MACHINE CONTROL UNIT (MCU)
PARK BRAKE - LED
PARK BRAKE N.O.
PARK BRAKE N.C.
PARK BRAKE
SEAT BELT N.C.
SEAT BELT N.O.
SEAT SW N.C.
SEAT SW N.O.
IGNITION
KEY-SWITCH POWER INPUT
100-RD/W
X008 (2)
100-RD/W
SP20
115-RD/W
F003 CAB POWER FUSE (10-Amp)
(C1)
(C2)
116-RD/W
SP07
114-RD/W
SP02
801-OG
835-OG
721-GY
717-GY
810-OG
X007 (H)
810-OG
SP8R
845-OG
SP4R
S065 PARK BRAKE SWITCH
Y043 PARK BRAKE RELEASE SOLENOID
R005
SP9R
307-BK
SP80
239-BK
SP31
239-BK
SP47
258-BK
GND04
R2
302-BK
127-RD/W
206-BK
SP03
SP3R
127-RD/W
205-BK
200-BK
X006 (8)
200-BK
SP30
233-BK
GND03
820-OG
X005 (05)
300-BK
SP31
241-BK
SP47
258-BK
GND04
716-GY
711-GY
755-WT
753-WT
140-RD/W
137-RD/W
X008 (2)
021-RD (UNSW PWR)
100-RD
SP29
SP20
142-RD/W
141-RD/W
V001
112-RD
F012 JOYSTICKS FUSE (15-Amp)
SP26
758-WT
113-RD
135-RD/W
SP28
SP38
011-RD
X008 (1)
011-RD
SP21
006-RD
SP22
007-RD
F014 SEAT: SEAT SWITCH and SEAT BELT SWITCH FUSE (5-Amp)
716-GY
711-GY
755-WT
757-WT
015-RD
014-RD
X023 (10)
X023 (9)
X023 (7)
X023 (6)
X023 (8)
X023 (5)
BELT SW N.C.
BELT SW N.O.
SEAT SW N.C.
SEAT SW N.O.
BELT SW COMMON
SEAT SW COMMON
X023
SEAT CONTROL UNIT (SCU)
Unswitched Power Circuit
Switched Power Circuit
Interlock Circuit
Ground Circuit
62213

Figure 2-118

Troubleshooting

Start Circuit

Symptom: Machine Does Not Start.

Probable Cause	Remedy
Faulty or weak battery (G1)	Check battery state of charge.
Faulty 100-amp main fuse (F000)	Replace 100-amp fuse. (See "**Removal and Installation**" on **page 2-230**.)
Loose or corroded battery cable ends and/or chassis grounds: GND01, GND02, GND04, GND05, and/or GND06	Check battery cable ends and/or chassis grounds for loose fit or corrosion.
Faulty or missing cab Power Distribution Module (PDM) fuse: key switch (F008)	Check fuses and replace with same specified current rating.
Faulty or missing chassis PDM fuse(s): starter (F017), engine (F018), and/or lift pump (F019)	Check fuses and replace with same specified current rating.
Faulty key switch (S001)	Test key switch. (See "**Key Switch Test**" on **page 2-201**.)
Faulty starter relay (K155)	Test starter relay. (See "**Relay Test**" on **page 2-200**.)
Faulty lift pump relay (K158)	Test lift pump relay. (See "**Relay Test**" on **page 2-200**.)
Faulty main power relay (K902)	Test main power relay. (See "**Relay Test**" on **page 2-200**.)
Loose or corroded connectors at starter solenoid and/or starter motor	Check for loose or corroded connectors at starter solenoid and/or starter motor. Repair as needed.
Faulty starter	Replace starter. (See"**Starter**" on **page 2-219**.)

Run Circuit

Symptom: Engine Does Not Run.

Probable Cause	Remedy
Faulty or weak battery (G1)	Check battery state of charge.
Fuel level low or empty	Check fuel level.
Loose or corroded battery cable ends and/or chassis grounds: GND01, GND02, GND04, GND05, and/or GND06	Check battery cable ends and/or chassis grounds for loose fit or corrosion.
Faulty or missing cab Power Distribution Module (PDM) fuse: key switch (F008)	Check fuse and replace with same specified current rating.
Faulty or missing chassis PDM fuse(s): engine (F018), lift pump (F019), engine (F022), and/or engine (F023)	Check fuses and replace with same specified current rating.
Faulty key switch (S001)	Test key switch. (See "**Key Switch Test**" on **page 2-201**.)
Faulty main power relay (K902)	Test main power relay. (See "**Relay Test**" on **page 2-200**.)
Faulty lift pump relay (K158)	Test lift pump relay. (See "**Relay Test**" on **page 2-200**.)
Faulty power latch trigger relay (K167)	Test power latch trigger relay. (See "**Relay Test**" on **page 2-200**.)
Faulty power latch reset relay (K168)	Test power latch reset relay. (See "**Relay Test**" on **page 2-200**.)
Faulty diode (V005)	Replace diode.

Charging Circuit

Symptom: Battery Not Charging.

Probable Cause	Remedy
Faulty battery (G1)	Replace battery. (See "**Battery**" on **page 2-217**.)
Faulty or missing cab Power Distribution Module (PDM) fuse(s): display (F002), MCU (F006), and/or key switch (F008)	Check fuses and replace with same specified current rating.
Loose or corroded battery cable ends and/or chassis grounds: GND01, GND02, GND04, GND05, and/or GND06	Check battery cable ends and/or chassis grounds for loose fit or corrosion.
Loose or corroded connectors at alternator (B+ and/or D +)	Check for loose or corroded connectors at alternator (B+ and/or D+). Repair as needed.
Faulty alternator	Replace alternator. (See "**Alternator**" on **page 2-217**.)

Drive Circuit

Symptom: Machine Will Not Drive Forward or Reverse.

Probable Cause	Remedy
Faulty or missing cab Power Distribution Module (PDM) fuse(s): instrument display (F002), cab power (F003), key switch (F008), joysticks (F012), and/or seat: seat switch and seat belt switch (F014)	Check fuses and replace with same specified current rating.
Faulty or missing chassis PDM fuse: Danfoss Control Unit (DCU) (F020)	Check fuse and replace with same specified current rating.
Loose or corroded chassis grounds: GND01, GND03, and/or GND05	Check chassis grounds for loose fit or corrosion.
Faulty park brake switch (S065)	Test park brake switch. (See "**Park Brake Switch Test**" on **page 2-203**.)
Faulty H/ISO pattern selection switch (S203)	Test H/ISO pattern selection switch. (See "**H/ISO Pattern Selection Switch Test**" on **page 2-211**.)
Faulty LH (X010) and/or RH (X012) joystick	Repair or replace LH and/or RH joystick. (See "**Joystick**" on **page 2-226**.)
Possible hydrostatic system failure	See "**Table 3-2**" on **page 3-68**.

Symptom: Machine Will Not Turn Right or Left.

Probable Cause	Remedy
Faulty or missing cab PDM fuse(s): instrument display (F002), cab power (F003), key switch (F008), joysticks (F012), and/or seat: seat switch and seat belt switch (F014)	Check fuses and replace with same specified current rating.
Faulty or missing chassis PDM fuse: DCU (F020)	Check fuse and replace with same specified current rating.
Loose or corroded chassis grounds: GND01, GND03, and/or GND05	Check chassis grounds for loose fit or corrosion.
Faulty park brake switch (S065)	Test park brake switch. (See "**Park Brake Switch Test**" on **page 2-203**.)
Faulty H/ISO pattern selection switch (S203)	Test H/ISO pattern selection switch. (See "**H/ISO Pattern Selection Switch Test**" on **page 2-211**.)
Faulty LH (X010) and/or RH (X012) joystick	Repair or replace LH and/or RH joystick. (See "**Joystick**" on **page 2-226**.)
Possible hydrostatic system failure	See "**Table 3-3**" on **page 3-69**.

Symptom: Creep Mode Will Not Engage.

Probable Cause	Remedy
Faulty or missing cab PDM fuse(s): cab power (F003), key switch (F008), joysticks (F012), and/or seat: seat switch and seat belt switch (F014)	Check fuses and replace with same specified current rating.
Faulty or missing chassis PDM fuse: DCU (F020)	Check fuse and replace with same specified current rating.
Loose or corroded chassis grounds: GND03, GND04, and/or GND05	Check chassis grounds for loose fit or corrosion.
Faulty park brake switch (S065)	Test park brake switch. (See "**Park Brake Switch Test**" on **page 2-203**.)
Faulty LH joystick (X010)	Repair or replace LH joystick. (See "**Joystick**" on **page 2-226**.)
Possible hydrostatic system failure	See **Two Speed Valve Will Not Engage**.

Symptom: Two Speed Control Will Not Engage.

Probable Cause	Remedy
Faulty or missing cab PDM fuse(s): cab power (F003), key switch (F008), joysticks (F012), and/or seat: seat switch and seat belt switch (F014)	Check fuses and replace with same specified current rating.
Faulty or missing chassis PDM fuse: DCU (F020)	Check fuse and replace with same specified current rating.
Loose or corroded chassis grounds: GND03, GND04, and/or GND05	Check chassis grounds for loose fit or corrosion.
Faulty park brake switch (S065)	Test park brake switch. (See "**Park Brake Switch Test**" on **page 2-203**.)
Faulty LH joystick (X010)	Repair or replace LH joystick. (See "**Joystick**" on **page 2-226**.)
Possible hydrostatic system failure	See "**Table 3-6**" on **page 3-72**.

Boom Controls Circuit

Symptom: Boom Will Not Raise/Lower.

Probable Cause	Remedy
Faulty or missing cab Power Distribution Module (PDM) Fuse(s): instrument display (F002), cab power (F003), key switch (F008), joysticks (F012), and/or seat: seat switch and seat belt switch (F014)	Check fuses and replace with same specified current rating.
Faulty or missing chassis PDM fuses: Danfoss Control Unit (DCU) (F020)	Check fuses and replace with same specified current rating.
Loose or corroded chassis grounds: GND01, GND04, and/or GND05	Check chassis grounds for loose fit or corrosion.
Faulty door switch (S087)	Test door switch. (See "**Door Switch Test**" on **page 2-215**.)
Faulty park brake switch (S065)	Test park brake switch. (See "**Park Brake Switch Test**" on **page 2-203**.)
Faulty H/ISO pattern selection switch (S203) (electronic controls)	Test H/ISO pattern selection switch. (See "**H/ISO Pattern Selection Switch Test**" on **page 2-211**.)
Faulty LH joystick (X010) and/or RH joystick (X012) (electronic controls)	Repair or replace LH joystick, and/or RH joystick. (See "**Joystick**" on **page 2-226**.)
Faulty boom foot pedal sensor (S116) (manual controls)	Replace boom foot pedal sensor.
Possible hydraulic system failure	See "**Table 4-6**" on **page 4-49**.

Bucket Controls Circuit

Symptom: Bucket Will Not Dump/Curl.

Probable Cause	Remedy
Faulty or missing cab Power Distribution Module (PDM) fuse(s): instrument display (F002), cab power (F003), key switch (F008), joysticks (F012), and/or seat: seat switch and seat belt switch (F014)	Check fuse and replace with same specified current rating.
Faulty or missing chassis PDM fuse: Danfoss Control Unit (DCU) (F020)	Check fuse and replace with same specified current rating.
Loose or corroded chassis grounds: GND01, GND04, and/or GND05	Check chassis grounds for loose fit or corrosion.
Faulty door switch (S087)	Test door switch. (See "**Door Switch Test**" on **page 2-215**.)
Faulty park brake switch (S065)	Test park brake switch. (See "**Park Brake Switch Test**" on **page 2-203**.)
Faulty H/ISO pattern selection switch (S203) (electronic controls)	Test H/ISO pattern selection switch. (See "**H/ISO Pattern Selection Switch Test**" on **page 2-211**.)
Faulty LH joystick (X010) and/or RH joystick (X012) (electronic controls)	Repair or replace LH joystick, and/or RH joystick. (See "**Joystick**" on **page 2-226**.)
Faulty bucket foot pedal sensor (B117) (manual controls)	Replace bucket foot pedal sensor.
Possible hydraulic system failure	See "**Table 4-7**" on **page 4-49**.

Ride Control Circuit

Symptom: Ride Control Will Not Engage.

Probable Cause	Remedy
Faulty or missing cab Power Distribution Module (PDM) Fuse(s): cab power (F003), key switch (F008), joysticks (F012), and/or seat: seat switch and seat belt switch (F014)	Check fuses and replace with same specified current rating.
Faulty or missing chassis PDM fuse: Danfoss Control Unit (DCU) (F020)	Check fuse and replace with same specified current rating.
Loose or corroded chassis grounds: GND03, GND04, and/or GND05	Check chassis grounds for loose fit or corrosion.
Faulty ride control relay 01 (K152), and/or ride control relay 02 (K153)	Test ride control relay 01, and/or ride control relay 02. (See "**Relay Test**" on **page 2-200**.)
Faulty door switch (S087)	Test door switch. (See "**Door Switch Test**" on **page 2-215**.)
Faulty park brake switch (S065)	Test park brake switch. (See "**Park Brake Switch Test**" on **page 2-203**.)

Probable Cause	Remedy
Faulty RH joystick (X012)	Repair or replace RH joystick. (See "**Joystick**" on **page 2-226**.)
Possible hydraulic system failure	See "**Troubleshooting**" on **page 4-48**.

Float Control Circuit

Symptom: Float Control Will Not Engage.

Probable Cause	Remedy
Faulty or missing cab Power Distribution Module (PDM) fuse(s): cab power (F003), key switch (F008), joysticks (F012), and/or seat: seat switch and seat belt switch (F014)	Check fuses and replace with same specified current rating.
Faulty or missing chassis PDM fuse: Danfoss Control Unit (DCU) (F020)	Check fuse and replace with same specified current rating.
Loose or corroded chassis grounds: GND03, GND04, and/or GND05	Check chassis grounds for loose fit or corrosion.
Faulty door switch (S087)	Test door switch. (See "**Door Switch Test**" on **page 2-215**.)
Faulty park brake switch (S065)	Test park brake switch. (See "**Park Brake Switch Test**" on **page 2-203**.)
Faulty RH joystick (X012)	Repair or replace RH joystick. (See "**Joystick**" on **page 2-226**.)
Possible hydraulic system failure	See "**Table 4-2**" on **page 4-48**.

Self Level Circuit

Symptom: Self Level Will Not Engage.

Probable Cause	Remedy
Faulty or missing cab Power Distribution Module (PDM) fuse(s): cab power (F003), key switch (F008), joysticks (F012), and/or seat: seat switch and seat belt switch (F014)	Check fuses and replace with same specified current rating.
Faulty or missing chassis PDM fuse: Danfoss Control Unit (DCU) (F020)	Check fuse and replace with same specified current rating.
Loose or corroded chassis grounds: GND02, GND03, GND04, and/or GND05	Check chassis grounds for loose fit or corrosion.
Faulty park brake switch (S065)	Test park brake switch. (See "**Park Brake Switch Test**" on **page 2-203**.)
Faulty self level switch (S032)	Test self level switch. (See "**Self Level Switch Test**" on **page 2-209**.)

Probable Cause	Remedy
Faulty door switch (S087)	Test door switch. (See "**Door Switch Test**" on **page 2-215**.)
Possible hydraulic system failure	See "**Table 4-4**" on **page 4-48**.

Auxiliary Hydraulics

Symptom: Auxiliary Hydraulics Do Not Function.

Probable Cause	Remedy
Faulty or missing cab Power Distribution Module (PDM) Fuse(s): cab power (F003), key switch (F008), joysticks (F012), and/or seat: seat switch and seat belt switch (F014)	Check fuses and replace with same specified current rating.
Faulty or missing chassis PDM fuse: Danfoss Control Unit (DCU) (F020)	Check fuse and replace with same specified current rating.
Loose or corroded chassis grounds: GND03, GND04, and/or GND05	Check chassis grounds for loose fit or corrosion.
Faulty standard/high flow selection switch (S207)	Test standard/high flow selection switch. (See "**Standard/High Flow Selection Switch Test**" on **page 2-212**.)
Faulty door switch (S087)	Test door switch. (See "**Door Switch Test**" on **page 2-215**.)
Faulty park brake switch (S065)	Test park brake switch. (See "**Park Brake Switch Test**" on **page 2-203**.)
Faulty RH joystick (X012)	Repair or replace RH joystick. (See "**Joystick**" on **page 2-226**.)
Possible hydraulic system failure	See "**Table 4-8**" on **page 4-50**.

Lighting Circuit

Symptom: Work Lights or Transport Lights Do Not Turn On.

Probable Cause	Remedy
Faulty battery (G1)	Replace battery. (See "**Battery**" on **page 2-217**.)
Loose or corroded battery cable ends and/or chassis grounds: GND01, GND02, GND03, and/or GND04	Check battery cable ends and/or chassis grounds for loose fit or corrosion. (See "**Electrical System and Component Testing**" on **page 2-199**.)
Faulty or missing cab Power Distribution Module (PDM) fuse(s): key switch (F008), lights: work light rocker (F010), and/or lights: front work lights (F011)	Check fuses and replace with same specified current rating.
Faulty work lights relay (K047)	Test work lights relay. (See "**Relay Test**" on **page 2-200**.)
Faulty work lights switch (S016)	Test work lights switch. (See "**Work Lights Switch Test**" on **page 2-213**.)

Instrumentation

Symptom: Warning Light On.

Probable Cause	Remedy
Faulty or missing cab Power Distribution Module (PDM) fuse(s): instrument display (F002), Machine Control Unit (MCU) (F006), and/or key switch (F008)	Check fuses and replace with same specified current rating.
Faulty or missing chassis PDM fuse: engine (F023)	Check fuse and replace with same specified current rating.
Loose or corroded chassis grounds: GND01, GND02, GND03, GND04, GND05, and/or GND06	Check chassis grounds for loose fit or corrosion.
Active Diagnostic Trouble Code (DTC)	Check for active DTC and make appropriate repair.
Faulty fuel level sensor (B001)	Test fuel level sensor. (See "**Fuel Level Sensor Test**" on **page 2-214**.)
Faulty instrument display (XA01)	Replace instrument display. (See "**Standard Instrument Display**" on **page 2-220** or "**Deluxe Instrument Display**" on **page 2-221**.)
Faulty control unit: MCU, Danfoss Control Unit (DCU), and/or Engine Control Unit (ECU)	Replace appropriate control unit.

Horn Circuit

Symptom: Horn Will Not Sound.

Probable Cause	Remedy
Faulty or missing cab Power Distribution Module (PDM) fuse: horn/dome light (F015)	Check fuses and replace with same specified current rating.
Loose or corroded battery cable ends and/or chassis grounds: GND01 or GND03	Check battery cable ends and/or chassis grounds for loose fit or corrosion.
Faulty horn button (S11)	Test horn button. (See "**Horn Switch Test**" on **page 2-202**.)
Faulty horn relay (K130)	Test horn relay. (See "**Relay Test**" on **page 2-200**.)
Faulty horn (B002)	Replace horn. (See "**Horn**" on **page 2-230**.)

Backup Audible Alarm Circuit

Symptom: Backup Audible Alarm Will Not Sound.

Probable Cause	Remedy
Faulty or missing chassis Power Distribution Module (PDM) fuse: Danfoss Control Unit (DCU) (F020)	Check fuse and replace with same specified current rating.
Faulty backup audible alarm (B003)	Replace backup audible alarm.
Faulty switch S43a and/or switch S43b	Replace switch S43a and/or switch S43b.
Loose or corroded battery cable ends and/or chassis Ground: GND04	Check battery cable ends and/or chassis grounds for loose fit or corrosion.

Component Testing

General Information

Repair of the electrical system is limited to replacement of defective component(s) or wiring. When replacing either electrical component(s) and/or wiring, be sure to apply dielectric grease to all connector terminals to prevent corrosion.

Electrical schematics are provided in this section for troubleshooting and/or testing the electrical system. Specific testing and replacement information, where applicable, is provided in this section. In addition, testing suspected faulty component(s) may be necessary to check for shorts and/or breaks in wiring to component(s). A common method of testing wires and/or circuits is to perform a continuity test as described in the following tests.

NOTE

Before performing any component or wiring tests, check for corrosion and/or loose and/or missing connections and pay special attention to all ground points.

If a component(s) (switch, relay, etc.) is removed for testing and/or replacement, make sure to identify and label all wires so component(s) can be installed correctly.

Continuity Test

Required Tools or Equipment
Digital Multimeter

1. Identify and locate wire(s) and/or component(s) to be checked using the electrical schematic(s).

NOTE

Some multimeters may have a continuity tester setting that uses an audible alert to indicate continuity. See the multimeter Operator's Manual for more information.

2. If using a multimeter, set to test ohms or set meter to continuity setting.
3. Disconnect the ends of the wire(s) being tested.
4. Touch multimeter leads to each end of the wire or to terminals of the component to be tested.

   Does multimeter display less than 0.5 ohm and/or does the audible alert sound?

   YES *Wire is good.*

   NO *Proceed to Step 5.*

5. Use a known good jumper wire of correct gauge to bypass the wire in question.
6. Test the function of the circuit.

   Does the circuit now operate properly?

   YES *Replace the wire.*

   NO *Continue testing other wire(s) and component(s) in the circuit.*

Resistance Test

Required Tools or Equipment
Digital Multimeter

1. Identify and locate wire(s) and/or component(s) to be checked using electrical schematic(s).

NOTE

Some digital multimeters make it necessary to select an ohms scale. Select an appropriate range for the component(s) being tested. Refer to specifications listed in the component(s) test procedure.

2. If using a multimeter, set to test ohms.
3. Isolate (disconnect) component(s) to be tested from the circuit to prevent false values through the circuit.
4. Connect multimeter leads to the terminals of the component being tested. Check the component test procedure for specifications and additional test conditions.

   Does the resistance through the component match specified value(s) listed in test procedure(s)?

   YES *Component is good.*

   NO *Replace component.*

Relay Test

See **Figure 2-119**.

Required Tools or Equipment
Digital Multimeter
1- Fused Jumper Wire
1- Jumper Wire

1. Park the machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Remove relay. (See "**Relay**" on **page 2-222**.)

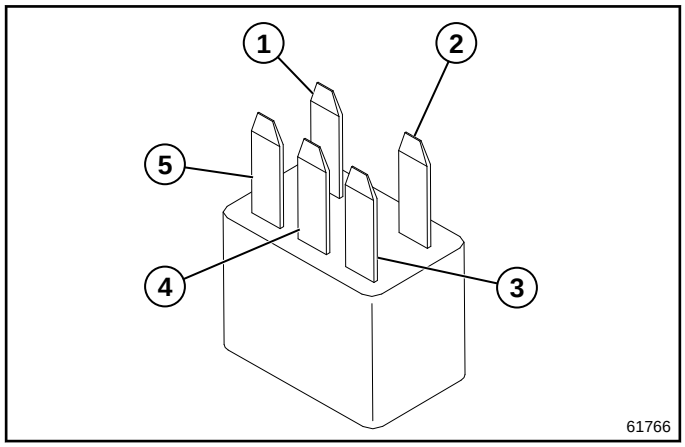


Figure 2-119: Relay Terminal View

3. Set digital multimeter to test for continuity.
4. Connect red test lead to terminal 1.
5. Connect black test lead to terminal 4.
6. Using digital multimeter, test for continuity.

   Is continuity indicated?

   YES *Proceed to Step 7.*

   NO *Relay is faulty. Replace relay.*
7. Connect red test lead to terminal 1.
8. Connect black test lead to terminal 3.
9. Using digital multimeter, test for continuity.

   Is continuity indicated?

   YES *Relay is faulty. Replace relay.*

   NO *Proceed to Step 10.*
10. Connect red test lead to terminal 2.
11. Connect black test lead to terminal 5.
12. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Proceed to Step 13.*

    NO *Relay is faulty. Replace relay.*
13. Connect red test lead to terminal 1.
14. Connect black test lead to terminal 3.
15. Connect one end of a fused jumper wire to a 12-volt DC power source and the other end to terminal 2.
16. Connect one end of a jumper wire to terminal 5 and the other end to a good ground.
17. Using digital multimeter, test for continuity on terminals 1 and 3.

    Is continuity indicated?

    YES *Relay is good.*

    NO *Relay is faulty. Replace relay.*

Key Switch Test

See **Figures 2-120** and **2-121**.

NOTE

Key and keyless ignition switches are tested the same way. Key switch is shown.

Required Tools or Equipment
Digital Multimeter

1. Park the machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Remove key switch. (See "**Key Switch/Keyless Ignition Switch**" on **page 2-222**.)

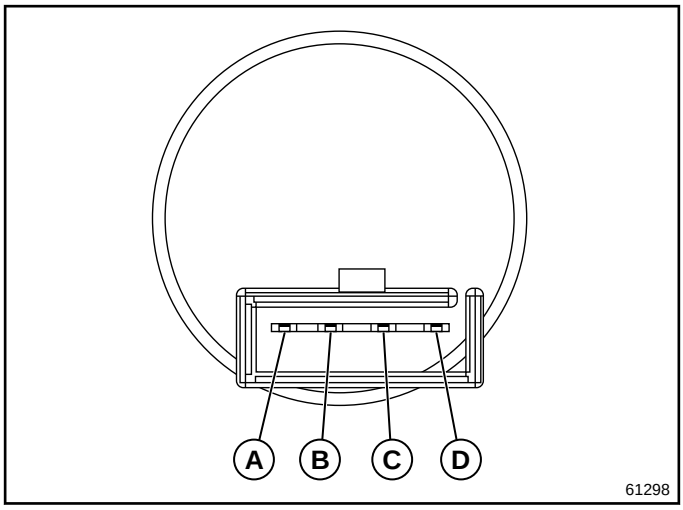


Figure 2-120: Key Switch Pin View

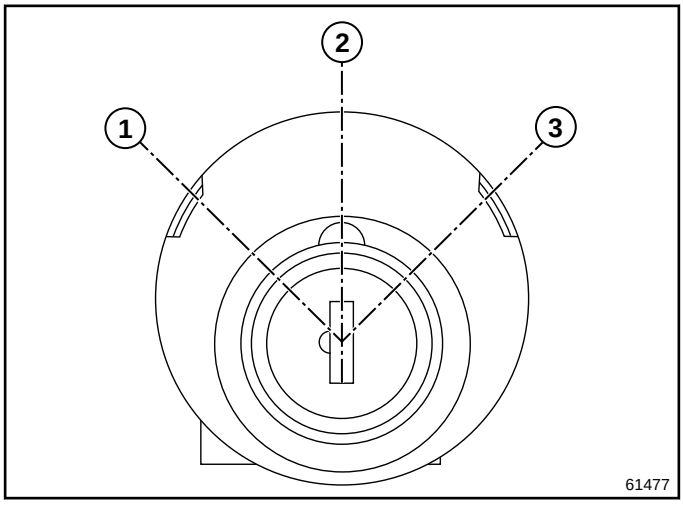


Figure 2-121: Key Switch Top View

3. Set digital multimeter to test continuity.
4. Connect test leads to terminals B and C.
5. Turn key switch to OFF (1).
6. Using digital multimeter, test for continuity.

   Is continuity indicated?

   YES *Key switch is faulty. Replace key switch.*

   NO *Proceed to Step 7.*
7. Connect test leads to terminals A and D.
8. Turn key switch to OFF (1).
9. Using digital multimeter, test for continuity.

   Is continuity indicated?

   YES *Key switch is faulty. Replace key switch.*

   NO *Proceed to Step 10.*
10. Connect test leads to terminals B and C.
11. Turn key switch to ON (2).
12. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Proceed to Step 13.*

    NO *Key switch is faulty. Replace key switch.*
13. Connect test leads to terminals A and D.
14. Turn key switch to START (3) and hold.
15. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Proceed to Step 16.*

    NO *Key switch is faulty. Replace key switch.*
16. Connect test leads to terminals B and C.
17. Turn key switch to START (3) and hold.
18. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Key switch is good.*

    NO *Key switch is faulty. Replace key switch.*

Horn Switch Test

See **Figure 2-122**.

Required Tools or Equipment
Digital Multimeter

1. Park the machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Remove left joystick control lever. (See "**Joystick**" on **page 2-226**.)

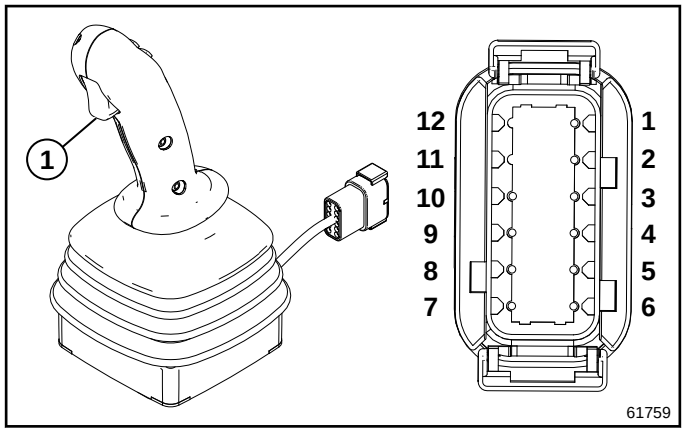


Figure 2-122: Horn Switch

NOTE

Pin numbers are stamped on opposite side of connector.

3. Set digital multimeter to test continuity.
4. Connect red test lead to terminal 10.
5. Connect black test lead to terminal 9.
6. Depress horn switch (1) and hold.
7. Using digital multimeter, test for continuity.

   Is continuity indicated?

   YES *The horn switch is good.*

   NO *The horn switch is faulty. Replace horn switch.*

Seat Switch Test

See **Figure 2-123**.

Required Tools or Equipment
Digital Multimeter

1. Park the machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Disconnect negative battery cable at battery. (See "**Removal and Installation**" on **page 2-217**.)
3. Disconnect seat switch 12 pin connector (black) from behind right rear of seat.

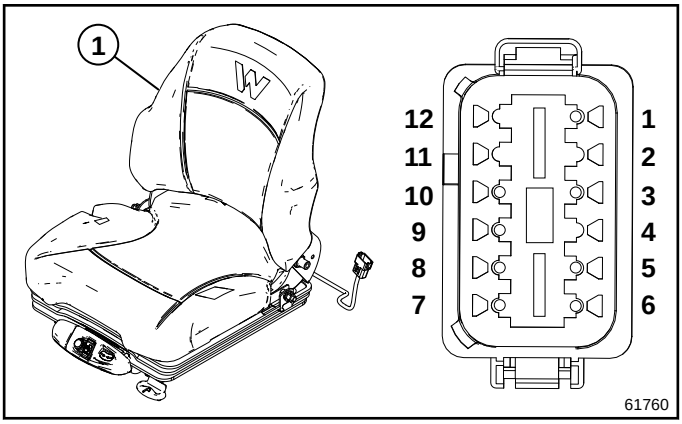


Figure 2-123: Seat Switch 12 Pin Connector

NOTE

Pin numbers are stamped on opposite side of connector.

4. Set digital multimeter to test continuity.
5. Connect red test lead to terminal 5 (**Figure 2-123**).
6. Connect black test lead to terminal 6 (**Figure 2-123**).

NOTE

Enough weight will need to be added to seat to close seat switch contacts.

7. Add weight to seat (1) to engage seat switch.
8. Using digital multimeter, test for continuity.

   Is continuity indicated?

   YES *Seat switch is good.*

   NO *Seat switch is faulty. Replace seat switch.*

Park Brake Switch Test

See **Figure 2-124**.

Required Tools or Equipment
Digital Multimeter

1. Park the machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Remove park brake switch. (See "**Rocker Switch**" on **page 2-224**.)

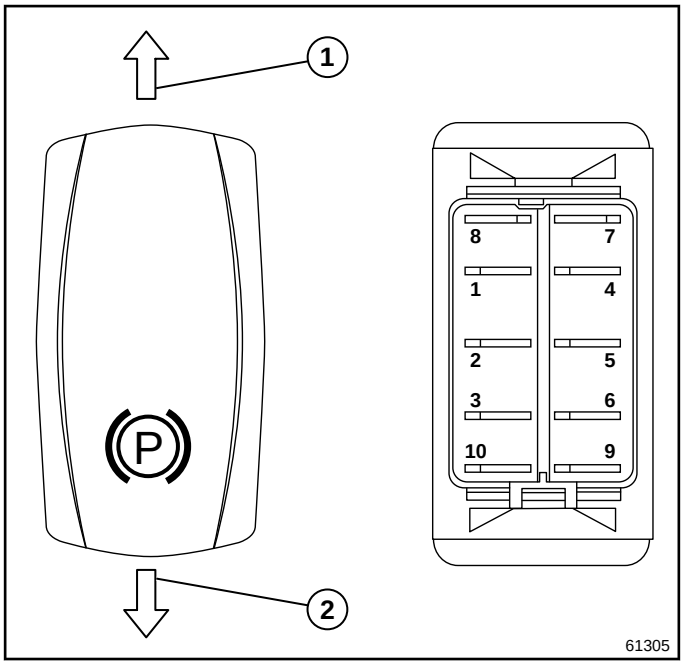


Figure 2-124: Park Brake Switch

3. Set digital multimeter to test continuity.
4. Connect red test lead to terminal 8.
5. Connect black test lead to terminal 7.
6. Using digital multimeter, test for continuity.

   Is continuity indicated?

   YES *Proceed to Step 7.*

   NO *Park brake switch is faulty. Replace park brake switch.*

7. Connect red test lead to terminal 2.
8. Connect black test lead to terminal 3.
9. Depress park brake switch to engage (1) and hold.
10. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Proceed to Step 11.*

    NO *Park brake switch is faulty. Replace park brake switch.*

11. Connect red test lead to terminal 5.
12. Connect black test lead to terminal 6.
13. Depress park brake switch to engage (1) and hold.
14. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Proceed to Step 15.*

    NO *Park brake switch is faulty. Replace park brake switch.*

15. Connect red test lead to terminal 2.
16. Connect black test lead to terminal 1.
17. Depress park brake switch to disengage (2) and hold.
18. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Proceed to Step 19.*

    NO *Park brake switch is faulty. Replace park brake switch.*

19. Connect red test lead to terminal 5.
20. Connect black test lead to terminal 4.
21. Depress park brake switch to disengage (2) and hold.
22. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Park brake switch is good.*

    NO *Park brake switch is faulty. Replace park brake switch.*

Heating, Ventilation, and Air Conditioning (HVAC) Blower Fan Switch Test

See **Figure 2-125**.

Required Tools or Equipment
Digital Multimeter

1. Park the machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Disconnect negative battery cable at battery. (See **Battery**.)

3. Remove HVAC blower fan switch.

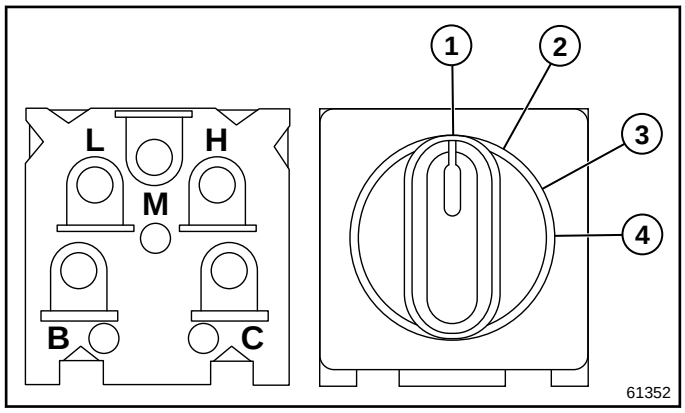


Figure 2-125: HVAC Blower Fan Switch

4. Set digital multimeter to test continuity.
5. Connect red test lead to terminal B.
6. Connect black test lead to terminal C.
7. Set HVAC blower fan switch to OFF (1).
8. Using digital multimeter, test for continuity.

   Is continuity indicated?

   YES *HVAC blower fan switch is faulty. Replace HVAC blower fan switch.*

   NO *Proceed to Step 9.*
9. Connect red test lead to terminal B.
10. Connect black test lead to terminal L.
11. Set HVAC blower fan switch to OFF (1).
12. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *HVAC blower fan switch is faulty. Replace HVAC blower fan switch.*

    NO *Proceed to Step 13.*
13. Connect red test lead to terminal B.
14. Connect black test lead to terminal M.
15. Set HVAC blower fan switch to OFF (1).
16. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *HVAC blower fan switch is faulty. Replace HVAC blower fan switch.*

    NO *Proceed to Step 17.*
17. Connect red test lead to terminal B.
18. Connect black test lead to terminal H.
19. Set HVAC blower fan switch to OFF (1).
20. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *HVAC blower fan switch is faulty. Replace HVAC blower fan switch.*

    NO *Proceed to Step 21.*
21. Connect red test lead to terminal B.
22. Connect black test lead to terminal C.
23. Set HVAC blower fan switch to low (2).
24. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Proceed to Step 25.*

    NO *HVAC blower fan switch is faulty. Replace HVAC blower fan switch.*
25. Connect red test lead to terminal B.
26. Connect black test lead to terminal L.
27. Set HVAC blower fan switch to low (2).
28. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Proceed to Step 29.*

    NO *HVAC blower fan switch is faulty. Replace HVAC blower fan switch.*
29. Connect red test lead to terminal B.
30. Connect black test lead to terminal C.
31. Set HVAC blower fan switch to medium (3).
32. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Proceed to Step 33.*

    NO *HVAC blower fan switch is faulty. Replace HVAC blower fan switch.*
33. Connect red test lead to terminal B.
34. Connect black test lead to terminal M.
35. Set HVAC blower fan switch to medium (3).
36. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Proceed to Step 37.*

    NO *HVAC blower fan switch is faulty. Replace HVAC blower fan switch.*
37. Connect red test lead to terminal B.
38. Connect black test lead to terminal C.
39. Set HVAC blower fan switch to high (4).

40. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Proceed to Step 41.*

    NO *HVAC blower fan switch is faulty. Replace HVAC blower fan switch.*

41. Connect red test lead to terminal B.
42. Connect black test lead to terminal H.
43. Set HVAC blower fan switch to high (4).
44. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *HVAC blower fan switch is good.*

    NO *HVAC blower fan switch is faulty. Replace HVAC blower fan switch.*

Heating, Ventilation, and Air Conditioning (HVAC) Switch Test

See **Figure 2-126**.

Required Tools or Equipment
Digital Multimeter

1. Park the machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Disconnect negative battery cable at battery. (See "**Removal and Installation**" on **page 2-217**.)
3. Remove HVAC switch. (See "**Standard Instrument Display**" on **page 2-220**.)

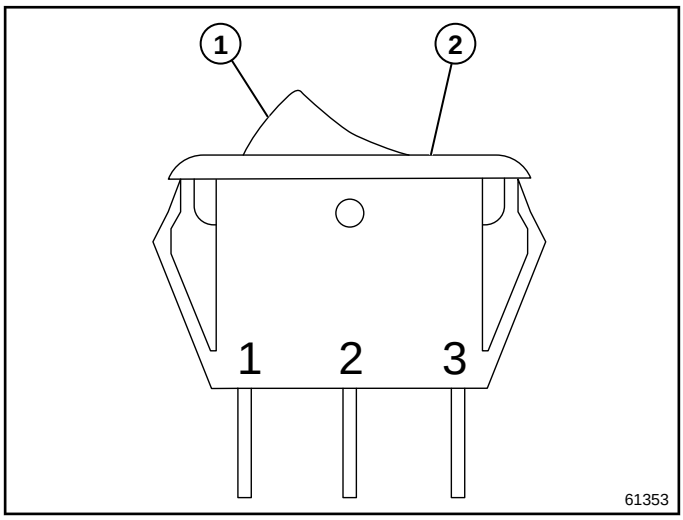


Figure 2-126: HVAC A/C Switch

4. Set digital multimeter to test continuity.
5. Connect red test lead to terminal 2.
6. Connect black test lead to terminal 1.
7. Depress HVAC switch to ON (1).
8. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Proceed to Step 9.*

    NO *HVAC switch is faulty. Replace HVAC switch.*

9. Connect red test lead to terminal 2.
10. Connect black test lead to terminal 3.
11. Depress HVAC switch to ON (1).
12. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Proceed to Step 13.*

    NO *HVAC switch is faulty. Replace HVAC switch.*

13. Connect red test lead to terminal 2.
14. Connect black test lead to terminal 1.
15. Depress HVAC switch to OFF (2).
16. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Proceed to Step 17.*

    NO *HVAC switch is faulty. Replace HVAC switch.*

17. Connect red test lead to terminal 2.
18. Connect black test lead to terminal 3.
19. Depress HVAC switch to OFF (2).
20. Using digital multimeter test for continuity.

    Is continuity indicated?

    YES *HVAC switch is good.*

    NO *HVAC switch is faulty. Replace HVAC switch.*

Heating, Ventilation, and Air Conditioning (HVAC) Temperature Switch Test

See **Figure 2-127**.

Required Tools or Equipment
Digital Multimeter

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Disconnect negative battery cable at battery. (See "**Removal and Installation**" on **page 2-217**.)
3. Remove HVAC temperature switch. (See "**Standard Instrument Display**" on **page 2-220**.)

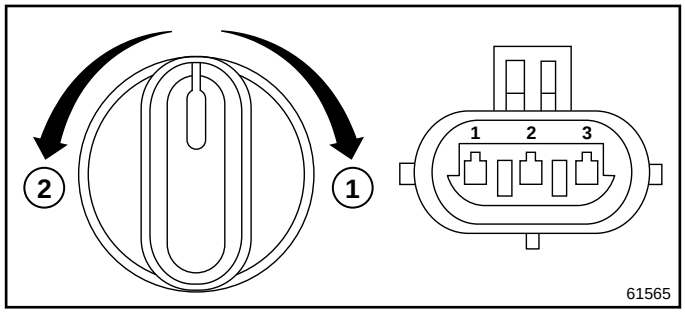


Figure 2-127: HVAC Temperature Switch

NOTE

Pin numbers are stamped on side of connector.

4. Set digital multimeter to test ohms.
5. Connect red test lead to terminal 1.
6. Connect black test lead to terminal 3.
7. Turn HVAC temperature switch knob clockwise to full hot (1).
8. Using digital multimeter, test for ohms.

   Is resistance value approximately 10K ohms?

   YES *Proceed to Step 9.*

   NO *HVAC temperature switch is faulty. Replace HVAC temperature switch.*

9. Connect red test lead to terminal 1.
10. Connect black test lead to terminal 3.
11. Turn HVAC temperature switch knob counterclockwise to full cold (2).
12. Using digital multimeter, test for ohms.

    Is resistance value approximately 10K ohms?

    YES *Proceed to Step 13.*

    NO *HVAC temperature switch is faulty. Replace HVAC temperature switch.*

13. Connect red test lead to terminal 1.
14. Connect black test lead to terminal 2.
15. Turn HVAC temperature switch knob clockwise to full hot (1).
16. Using digital multimeter, test for ohms.

    Is resistance value approximately 82K ohms?

    YES *Proceed to Step 17.*

    NO *HVAC temperature switch is faulty. Replace HVAC temperature switch.*

17. Connect red test lead to terminal 1.
18. Connect black test lead to terminal 2.
19. Turn HVAC temperature switch knob counterclockwise to full cold (2).
20. Using digital multimeter, test for ohms.

    Is resistance value approximately 92K ohms?

    YES *Proceed to Step 21.*

    NO *HVAC temperature switch is faulty. Replace HVAC temperature switch.*

21. Connect red test lead to terminal 2.
22. Connect black test lead to terminal 3.
23. Turn HVAC temperature switch knob clockwise to full hot (1).
24. Using digital multimeter, test for ohms.

    Is resistance value approximately 82K ohms?

    YES *Proceed to Step 25.*

    NO *HVAC temperature switch is faulty. Replace HVAC temperature switch.*

25. Connect red test lead to terminal 2.
26. Connect black test lead to terminal 3.
27. Turn HVAC temperature switch knob counterclockwise to full cold (2).
28. Using digital multimeter, test for ohms.

    Is resistance value approximately 92K ohms?

    YES *HVAC temperature switch is good.*

    NO *HVAC temperature switch is faulty. Replace HVAC temperature switch.*

A/B/C Mode Switch Test

See **Figure 2-128**.

Required Tools or Equipment
Digital Multimeter

1. Park the machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Remove A/B/C mode switch. (See "**Rocker Switch**" on **page 2-224**.)

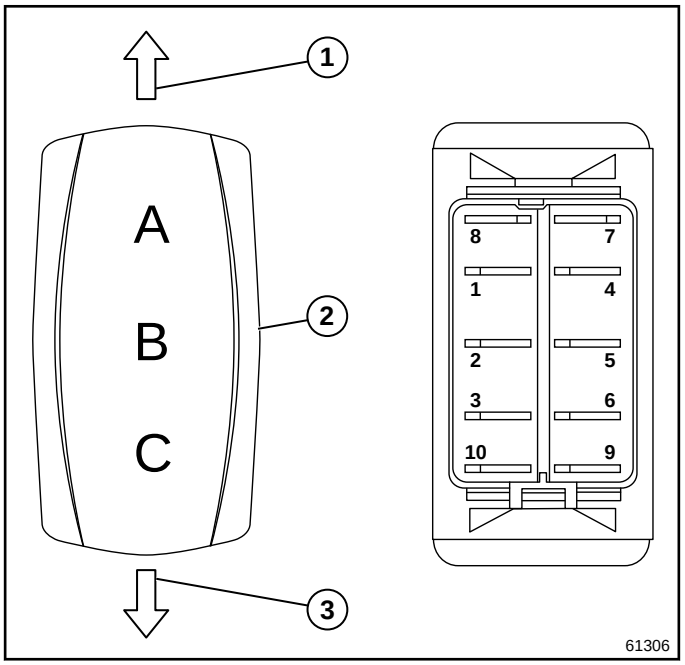


Figure 2-128: A/B/C Mode Switch

3. Set digital multimeter to test continuity.
4. Connect red test lead to terminal 2.
5. Connect black test lead to terminal 3.
6. Depress A/B/C mode switch to A (1) and hold.
7. Using digital multimeter, test for continuity.

   Is continuity indicated?

   YES *Proceed to Step 8.*

   NO *A/B/C mode switch is faulty. Replace A/B/C mode switch.*

8. Connect red test lead to terminal 5.
9. Connect black test lead to terminal 6.
10. Depress A/B/C mode switch to A (1) and hold.
11. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Proceed to Step 12.*

    NO *A/B/C mode switch is faulty. Replace A/B/C mode switch.*

12. Connect red test lead to terminal 2.
13. Connect black test lead to terminal 3.
14. Set A/B/C mode switch to B (2).
15. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Proceed to Step 16.*

    NO *A/B/C mode switch is faulty. Replace A/B/C mode switch.*

16. Connect red test lead to terminal 5.
17. Connect black test lead to terminal 4.
18. Set A/B/C mode switch to B (2).
19. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Proceed to Step 20.*

    NO *A/B/C mode switch is faulty. Replace A/B/C mode switch.*

20. Connect red test lead to terminal 2.
21. Connect black test lead to terminal 1.
22. Depress A/B/C mode switch to C (3) and hold.
23. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Proceed to Step 24.*

    NO *A/B/C mode switch is faulty. Replace A/B/C mode switch.*

24. Connect red test lead to terminal 5.
25. Connect black test lead to terminal 4.
26. Depress A/B/C mode switch to C (3) and hold.
27. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *A/B/C mode switch is good.*

    NO *A/B/C mode switch is faulty. Replace A/B/C mode switch.*

Auxiliary Electric Switch Test

See **Figure 2-129**.

Required Tools or Equipment
Digital Multimeter

1. Park the machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Remove auxiliary electric switch. (See "**Rocker Switch**" on **page 2-224**.)

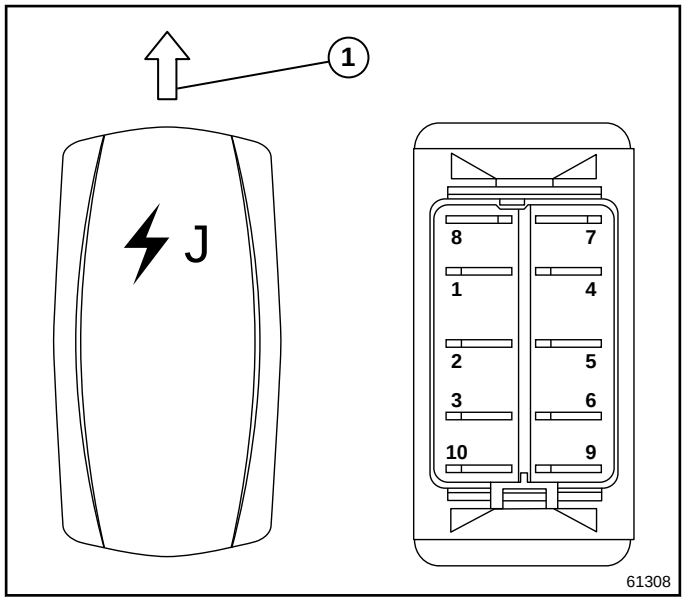


Figure 2-129: Auxiliary Electric Switch

3. Set digital multimeter to test continuity.
4. Connect red test lead to terminal 2.
5. Connect black test lead to terminal 3.
6. Depress auxiliary electric switch to J/engage (1) and hold.
7. Using digital multimeter, test for continuity.

   Is continuity indicated?

   YES *Proceed to Step 8.*

   NO *Auxiliary electric switch is faulty. Replace auxiliary electric switch.*
8. Connect red test lead to terminal 3.
9. Connect black test lead to terminal 7.
10. Depress auxiliary electric switch to J/engage (1) and hold.
11. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Auxiliary electric switch is good.*

    NO *Auxiliary electric switch is faulty. Replace auxiliary electric switch.*

Beacon Switch Test

See **Figure 2-130**.

Required Tools or Equipment
Digital Multimeter

1. Park the machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Remove beacon switch. (See "**Rocker Switch**" on **page 2-224**.)

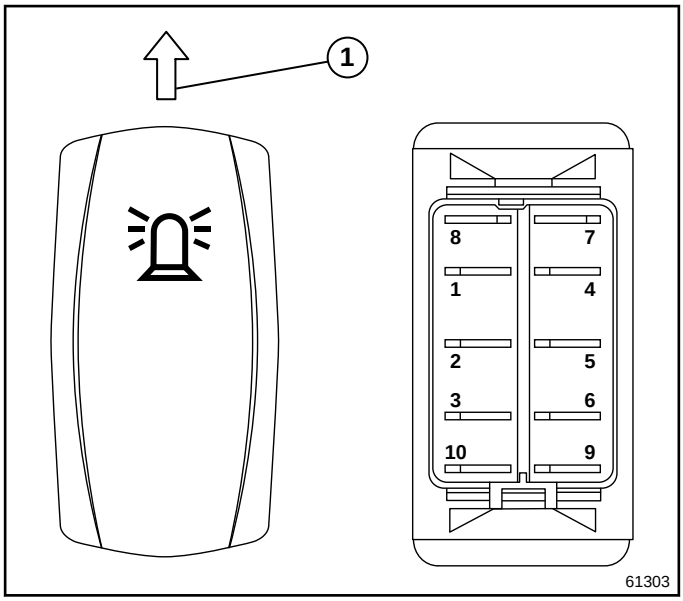


Figure 2-130: Beacon Switch

3. Set digital multimeter to test continuity.
4. Connect red test lead to terminal 2.
5. Connect black test lead to terminal 3.
6. Depress beacon switch to ON (1) and hold.
7. Using digital multimeter, test for continuity.

   Is continuity indicated?

   YES *Proceed to Step 8.*

   NO *Beacon switch is faulty. Replace beacon switch.*
8. Connect red test lead to terminal 3.
9. Connect black test lead to terminal 7.
10. Depress beacon switch to ON (1) and hold.
11. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Beacon switch is good.*

    NO *Beacon switch is faulty. Replace beacon switch.*

Self Level Switch Test

See **Figure 2-131**.

Required Tools or Equipment
Digital Multimeter

1. Park the machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Remove self level switch. (See "**Rocker Switch**" on **page 2-224**.)

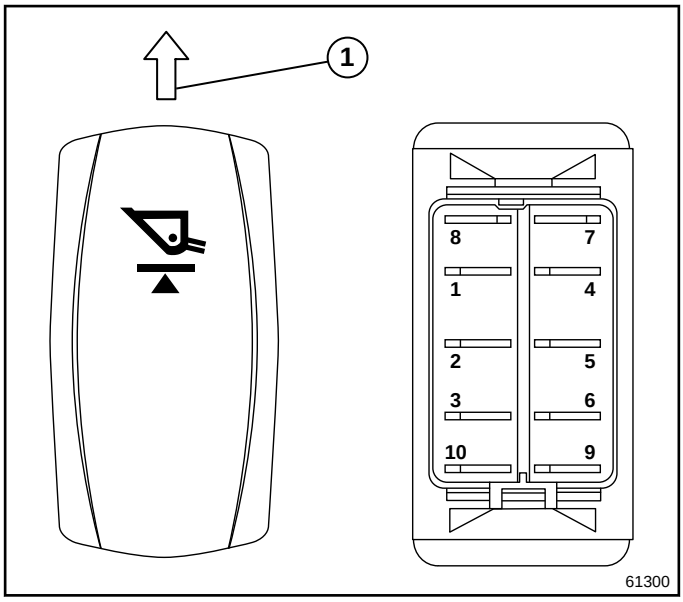


Figure 2-131: Self Level Switch

3. Set digital multimeter to test continuity.
4. Connect red test lead to terminal 2 .
5. Connect black test lead to terminal 7.
6. Depress self level switch to ON (1) and hold.
7. Using digital multimeter, test for continuity.

   Is continuity indicated?

   YES *Proceed to Step 8.*

   NO *Self level switch is faulty. Replace self level switch.*
8. Connect red test lead to terminal 2.
9. Connect black test lead to terminal 3.
10. Depress self level switch to ON (1) and hold.
11. Using digital multimeter, test for continuity.

Is continuity indicated?

YES *Self level switch is good.*

NO *Self level switch is faulty. Replace self level switch.*

Power Coupler Switch Test

See **Figure 2-132**.

Required Tools or Equipment
Digital Multimeter

1. Park the machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Remove power coupler switch. (See "**Rocker Switch**" on **page 2-224**.)

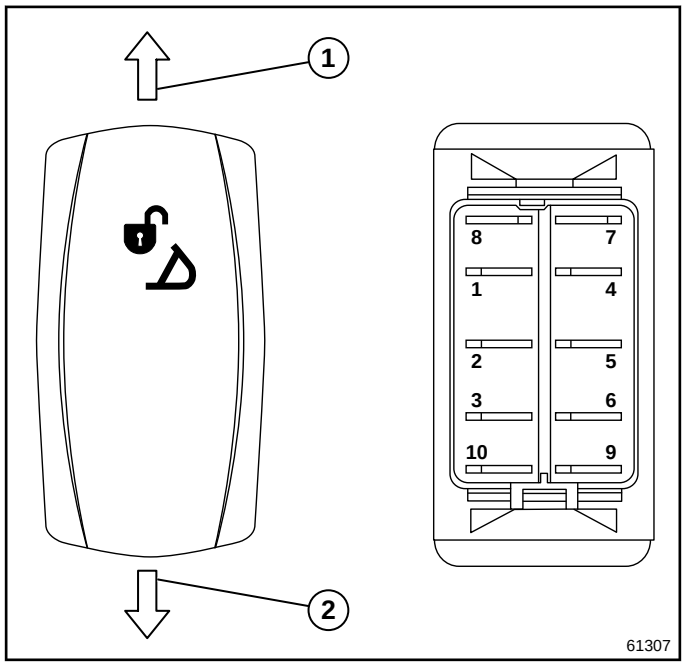


Figure 2-132: Power Coupler Switch

3. Set digital multimeter to test continuity.
4. Connect red test lead to terminal 2.
5. Connect black test lead to terminal 3.
6. Depress power coupler switch to unlock (1) and hold.
7. Using digital multimeter, test for continuity.

   Is continuity indicated?

   YES *Proceed to Step 8.*

   NO *Power coupler switch is faulty. Replace power coupler switch.*

8. Connect red test lead to terminal 5.
9. Connect black test lead to terminal 6.
10. Depress power coupler switch to unlock (1) and hold.
11. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Proceed to Step 12.*

    NO *Power coupler switch is faulty. Replace power coupler switch.*

12. Connect red test lead to terminal 2.
13. Connect black test lead to terminal 1.
14. Depress power coupler switch to lock (2) and hold.
15. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Proceed to Step 16.*

    NO *Power coupler switch is faulty. Replace power coupler switch.*

16. Connect red test lead to terminal 5.
17. Connect black test lead to terminal 4.
18. Depress power coupler switch to lock (2) and hold.
19. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Power coupler switch is good.*

    NO *Power coupler switch is faulty. Replace power coupler switch.*

H/ISO Pattern Selection Switch Test

See **Figure 2-133**.

Required Tools or Equipment
Digital Multimeter

1. Park the machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Remove H/ISO pattern selection switch. (See "**Rocker Switch**" on **page 2-224**.)

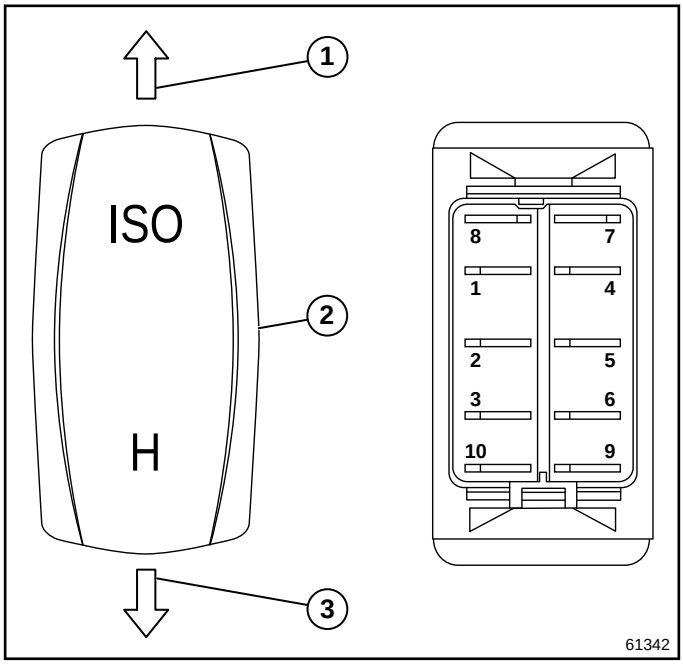


Figure 2-133: H/ISO Pattern Selection Switch

3. Set digital multimeter to test continuity.
4. Connect red test lead to terminal 2.
5. Connect black test lead to terminal 3.
6. Set H/ISO pattern selection to center (2).
7. Using digital multimeter, test for continuity.

   Is continuity indicated?

   YES *Proceed to Step 8.*

   NO *H/ISO pattern selection switch is faulty. Replace H/ISO pattern selection switch.*
8. Connect red test lead to terminal 5.
9. Connect black test lead to terminal 4.
10. Set H/ISO pattern selection to center (2).
11. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Proceed to Step 12.*

    NO *H/ISO pattern selection switch is faulty. Replace H/ISO pattern selection switch.*
12. Connect red test lead to terminal 2.
13. Connect black test lead to terminal 3.
14. Depress H/ISO pattern selection to ISO (1) and hold.
15. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Proceed to Step 16.*

    NO *H/ISO pattern selection switch is faulty. Replace H/ISO pattern selection switch.*
16. Connect red test lead to terminal 5.
17. Connect black test lead to terminal 6.
18. Depress H/ISO pattern selection switch to ISO (1) and hold.
19. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Proceed to Step 20.*

    NO *H/ISO pattern selection switch is faulty. Replace H/ISO pattern selection switch.*
20. Connect red test lead to terminal 2.
21. Connect black test lead to terminal 1.
22. Depress H/ISO pattern selection to H (3) and hold.
23. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Proceed to Step 24.*

    NO *H/ISO pattern selection switch is faulty. Replace H/ISO pattern selection switch.*
24. Connect red test lead to terminal 5.
25. Connect black test lead to terminal 4.
26. Depress H/ISO pattern selection switch to H (3) and hold.
27. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Proceed to Step 28.*

    NO *H/ISO pattern selection switch is faulty. Replace H/ISO pattern selection switch.*
28. Connect red test lead to terminal 8.
29. Connect black test lead to terminal 7.

30. Set H/ISO pattern selection switch to center (2).
31. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Proceed to Step 32.*

    NO *H/ISO pattern selection switch is faulty. Replace H/ISO pattern selection switch.*
32. Connect red test lead to terminal 10.
33. Connect black test lead to terminal 7.
34. Set H/ISO pattern selection switch to center (2).
35. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *H/ISO pattern selection switch is good.*

    NO *H/ISO pattern selection switch is faulty. Replace H/ISO pattern selection switch.*

Standard/High Flow Selection Switch Test

See **Figure 2-134**.

Required Tools or Equipment
Digital Multimeter

1. Park the machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Remove standard/high flow selection switch. (See "**Rocker Switch**" on **page 2-224**.)

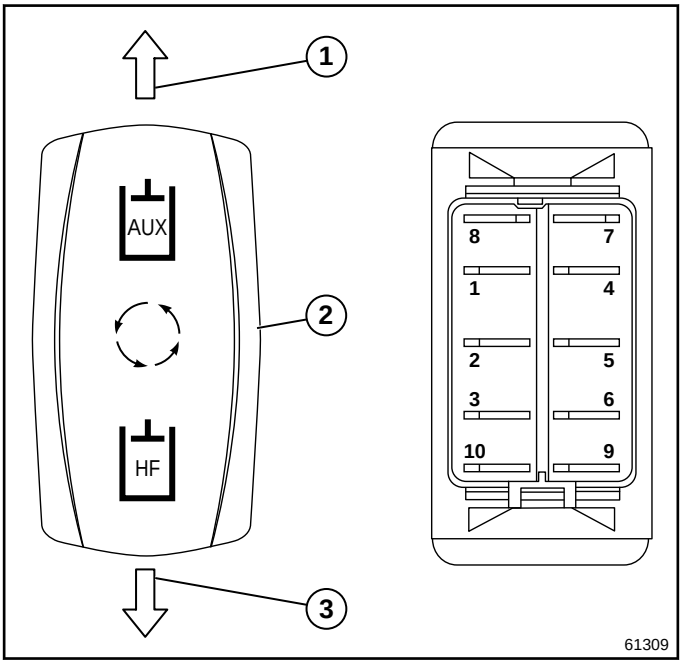


Figure 2-134: Standard/High Flow Selection Switch

3. Set digital multimeter to test continuity.
4. Connect red test lead to terminal 2.
5. Connect black test lead to terminal 3.
6. Depress standard/high flow selection switch to AUX (1) and hold.
7. Using digital multimeter, test for continuity.

   Is continuity indicated?

   YES *Proceed to Step 8.*

   NO *Standard/high flow selection switch is faulty. Replace standard/high flow selection switch.*
8. Connect red test lead to terminal 2.
9. Connect black test lead to terminal 1.
10. Depress standard/high flow selection switch to HF (3) and hold.
11. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Proceed to Step 12.*

    NO *Standard/high flow selection switch is faulty. Replace standard/high flow selection switch.*
12. Connect red test lead to terminal 8.
13. Connect black test lead to terminal 7.
14. Set standard/high flow selection switch to center (2).

15. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Proceed to Step 16.*

    NO *Standard/high flow selection switch is faulty. Replace standard/high flow selection switch.*

16. Connect red test lead to terminal 10.
17. Connect black test lead to terminal 7.
18. Set standard/high flow selection switch to center (2).
19. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Standard/high flow selection switch is good.*

    NO *Standard/high flow selection switch is faulty. Replace standard/high flow selection switch.*

Work Lights Switch Test

See **Figure 2-135**

Required Tools or Equipment
Digital Multimeter

1. Park the machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Remove work lights switch. (See "**Rocker Switch**" on **page 2-224**.)

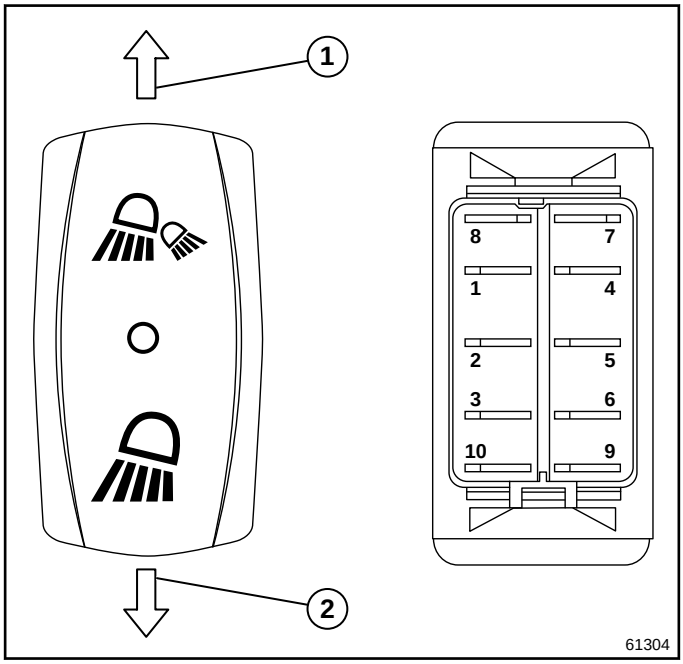


Figure 2-135: Work Lights Switch

3. Set digital multimeter to test continuity.
4. Connect red test lead to terminal 2.
5. Connect black test lead to terminal 3.
6. Depress work lights switch to work (1) and hold.
7. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Proceed to Step 8.*

    NO *Work lights switch is faulty. Replace work lights switch.*

8. Connect red test lead to terminal 5.
9. Connect black test lead to terminal 6.
10. Depress work lights switch to work (1) and hold.
11. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Proceed to Step 12.*

    NO *Work lights switch is faulty. Replace work lights switch.*

12. Connect red test lead to terminal 2.
13. Connect black test lead to terminal 1.
14. Depress work lights switch to transport (2) and hold.
15. Using digital multimeter, test for continuity.

Is continuity indicated?

YES *Proceed to Step 16.*

NO *Work lights switch is faulty. Replace work lights switch.*

16. Connect red test lead to terminal 5.
17. Connect black test lead to terminal 4.
18. Depress work lights switch to transport (2) and hold.
19. Using digital multimeter, test for continuity.

Is continuity indicated?

YES *Proceed to Step 20.*

NO *Work lights switch is faulty. Replace work lights switch.*

20. Connect red test lead to terminal 3.
21. Connect black test lead to terminal 7.
22. Depress work lights switch to work (1) and hold.
23. Using digital multimeter, test for continuity.

Is continuity indicated?

YES *Proceed to Step 24.*

NO *Work lights switch is faulty. Replace work lights switch.*

24. Connect red test lead to terminal 6.
25. Connect black test lead to terminal 7.
26. Depress work lights switch to OFF.
27. Using digital multimeter, test for continuity.

Is continuity indicated?

YES *Work lights switch is good.*

NO *Work lights switch is faulty. Replace work lights switch.*

Fuel Level Sensor Test

See **Figure 2-136**.

Required Tools or Equipment
Digital Multimeter

1. Park the machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Remove fuel level sensor. (See "**Fuel Level Sensor**" on **page 2-231**.)

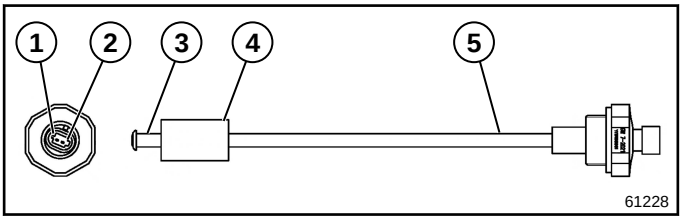


Figure 2-136: Fuel Level Sensor

NOTE

Float shown in empty position.

3. Set digital multimeter to test ohms.
4. Connect test leads to terminals (1 and 2).
5. Move float (4) to full (5), and record reading.

Is resistance value approximately 33 ohms?

YES *Proceed to Step 6.*

NO *Fuel level sensor is faulty. Replace fuel level sensor.*

6. Move float (4) to empty (3), record reading.

Is resistance value approximately 260 ohms?

YES *Fuel level sensor is good.*

NO *Fuel level sensor is faulty. Replace fuel level sensor.*

Door Switch Test

See **Figure 2-137**.

Required Tools or Equipment
Digital Multimeter

1. Park the machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Disconnect negative battery cable at battery. (See "**Removal and Installation**" on **page 2-217**.)
3. Open cab door.

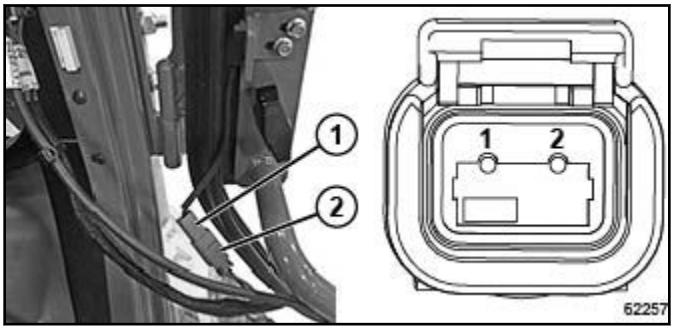


Figure 2-137: Door Switch

4. Disconnect connector (1) from connector (2).

NOTE

Pin numbers are stamped on side of connector.

5. Set digital multimeter to test continuity.
6. Connect red test lead to terminal 1.
7. Connect black test lead to terminal 2.
8. Using digital multimeter, test for continuity.

   Is continuity indicated?

   YES *Proceed to Step 9.*

   NO *Door switch is faulty. Replace door switch.*

9. Connect red test lead to terminal 1.
10. Connect black test lead to terminal 2.
11. Close cab door.
12. Using digital multimeter, test for continuity.

    Is continuity indicated?

    YES *Door switch is faulty. Replace door switch.*

    NO *Door switch is good.*

Pressure Transducer Test

See **Figure 2-138**.

Required Tools or Equipment
Digital Multimeter

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Remove pressure transducer. (See "**Pressure Transducer**" on **page 2-232**.)

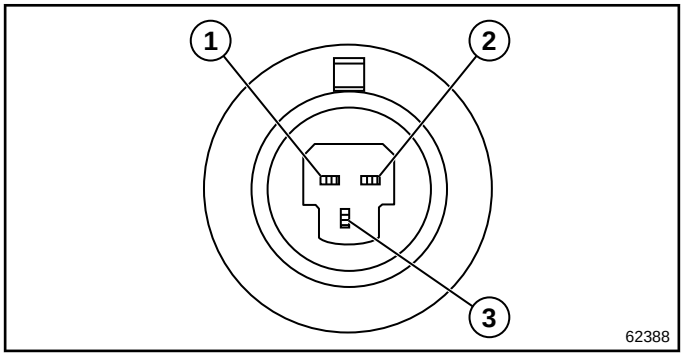


Figure 2-138: Pressure Transducer

3. Set digital multimeter to test ohms.
4. Connect test leads to terminals (1 and 2).
5. Using digital multimeter, test for ohms.

   Does digital multimeter indicate circuit is open?

   YES *Proceed to step 6.*

   NO *Pressure transducer is faulty. Replace pressure transducer.*

6. Connect test leads to terminals (2 and 3).
7. Using digital multimeter, test for ohms.

   Does digital multimeter indicate circuit is open?

   YES *Proceed to step 8.*

   NO *Pressure transducer is faulty. Replace pressure transducer.*

8. Connect test leads to terminals (1 and 3).
9. Using digital multimeter, test for ohms.

   Is resistance value approximately 45k ohms?

   YES *Pressure transducer is good.*

   NO *Pressure transducer is faulty. Replace pressure transducer.*

Repair

Backup Audible Alarm Adjustment Procedure

Adjustment Procedure

See **Figure 2-139**.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Support machine securely. (See "**Support Machine Securely**" on **page 16**.)
3. Start machine and run at low idle.
4. Release park brake.

NOTE

Left hand and right hand backup alarm switches are adjusted the same way. Left hand backup alarm switch is shown.

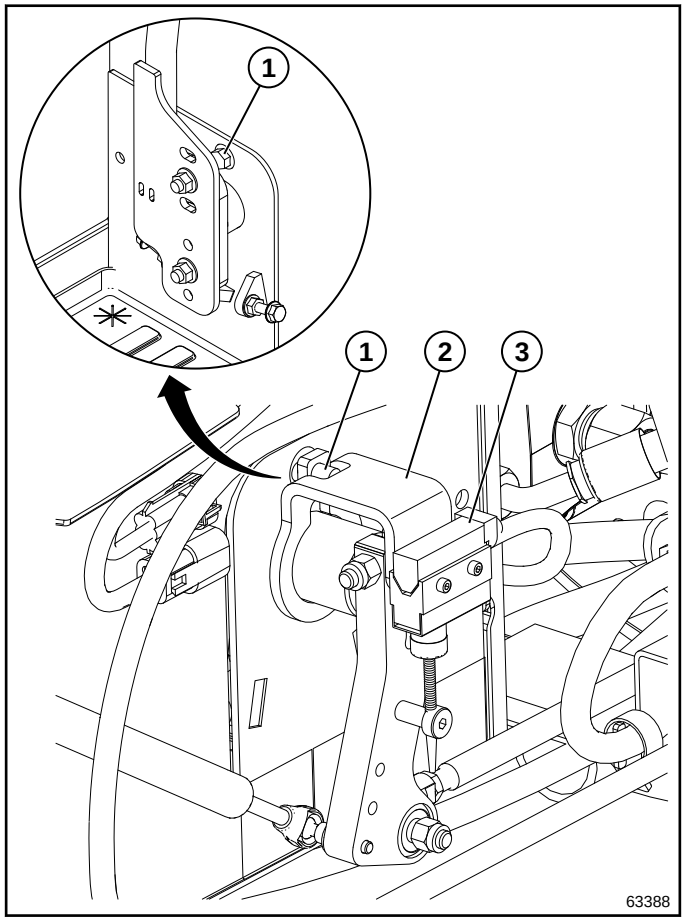


Figure 2-139: Backup Audible Alarm Adjustment

5. Loosen adjustment bolt (1) on right backup audible alarm switch bracket (2), move fully rearward in slot, and retighten. This will ensure the right backup audible alarm switch (3) is closed.
6. Loosen adjustment bolt (1) on left backup audible alarm switch bracket (2).
7. Slightly pull back on the left joystick until the left track/tire begins to turn in reverse.
8. Adjust left backup audible alarm switch (3) until alarm sounds. Retighten adjustment bolt (1).
9. Loosen adjustment bolt (1) on right backup audible alarm switch bracket (2).
10. Slightly pull back on the left and right joysticks until the tracks/tires begin to turn in reverse.
11. Adjust right backup audible alarm switch (3) until alarm sounds. Retighten adjustment bolt.

Battery

Removal and Installation

See **Figures 2-140** and **2-141**.

WARNING

- **Battery posts, terminals, and related accessories contain lead and lead compounds. Wash your hands after handling.**
- **Always wear eye protection when servicing battery. Failure to follow appropriate safety precautions may result in death or serious injury.**

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Open engine cover.

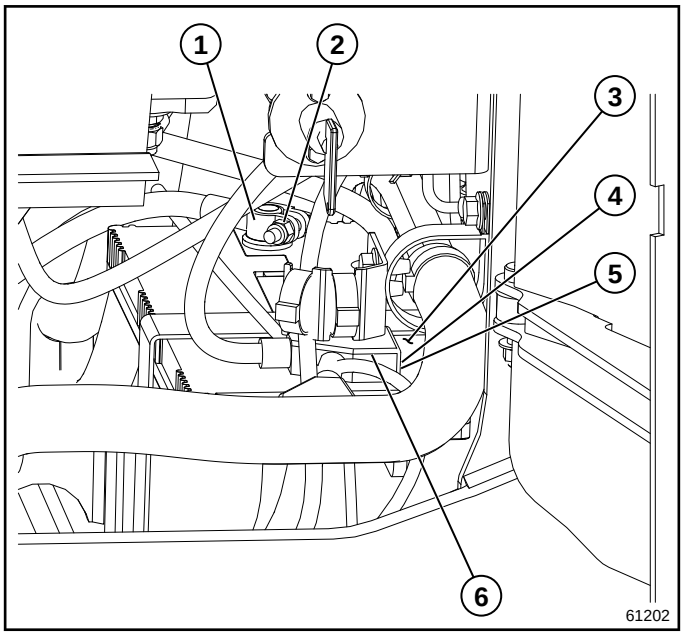


Figure 2-140: Battery Cable Removal and Installation

WARNING

Always disconnect the negative terminal first and positive terminal last. Connect positive terminal first and negative terminal last. Use care when testing live circuits to prevent arcing. Arcing could result in death or serious injury.

3. Loosen nut (2) and remove negative battery cable (1) from battery (3).
4. Remove boot (6) from positive battery cable (4).
5. Loosen nut (5) and remove positive battery cable (4) from battery (3).

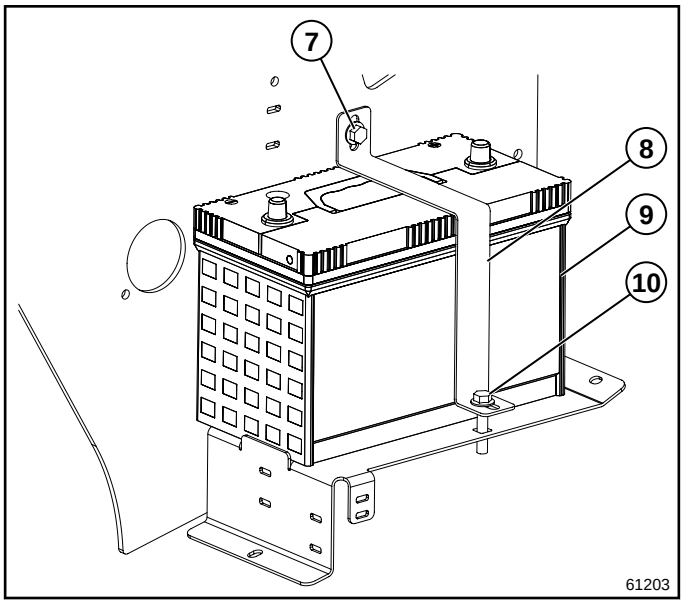


Figure 2-141: Battery Removal and Installation

6. Remove screw (7), bolt (10), and battery strap (8) from machine.

NOTICE

Never dispose of used batteries in garbage. Dispose of used batteries in accordance with all applicable regulations.

7. Remove battery (9) from machine.

Installation Note

Install the battery by reversing the order of removal.

Alternator

Removal and Installation

See **Figures 2-142** through **2-145**.

NOTE

Tag and mark electrical connectors and wiring prior to removal to ensure proper installation.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Open engine cover.

3. Disconnect negative battery cable at battery. (See "**Battery**" on **page 2-217**.)

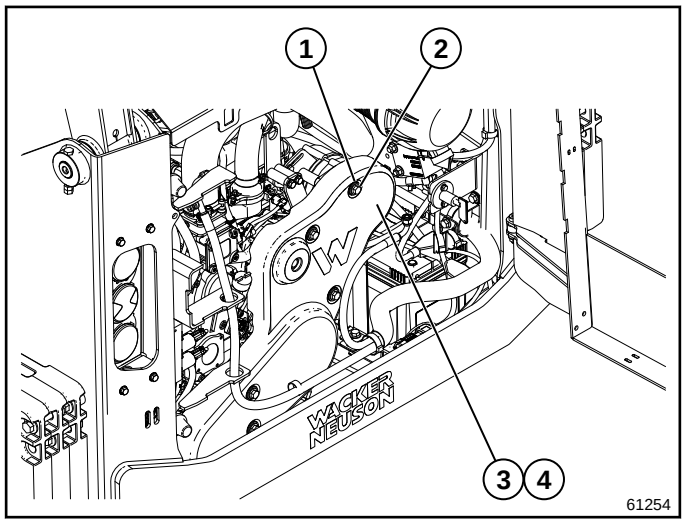


Figure 2-142: Belt Guard Removal and Installation (with A/C)

NOTE

Perform Step 4 for machines with Air Conditioning (A/C).

4. Remove five bolts (2), washers (1), and belt guard (3) from engine (4).

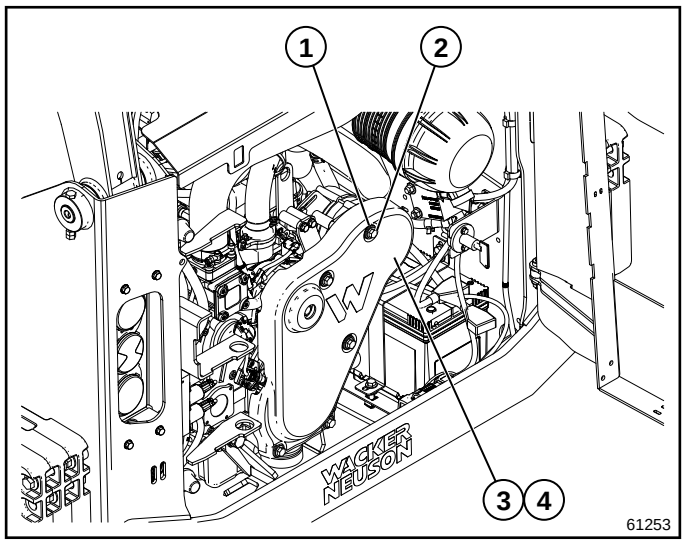


Figure 2-143: Belt Guard Removal and Installation (without A/C)

NOTE

Perform Step 5 for machines without A/C.

5. Remove five bolts (2), washers (1), and belt guard (3) from engine (4).

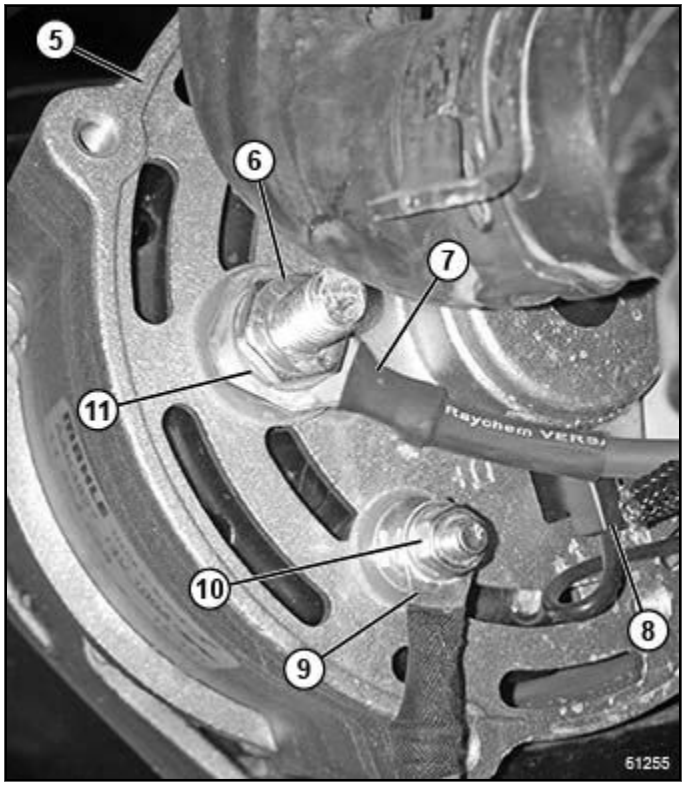


Figure 2-144: Connector Removal and Installation

6. Remove nut (10) and wire (9) from alternator (5).
7. Remove nut (6), washer (11), and wire (7) from alternator (5).
8. Disconnect connector (8) from alternator (5).

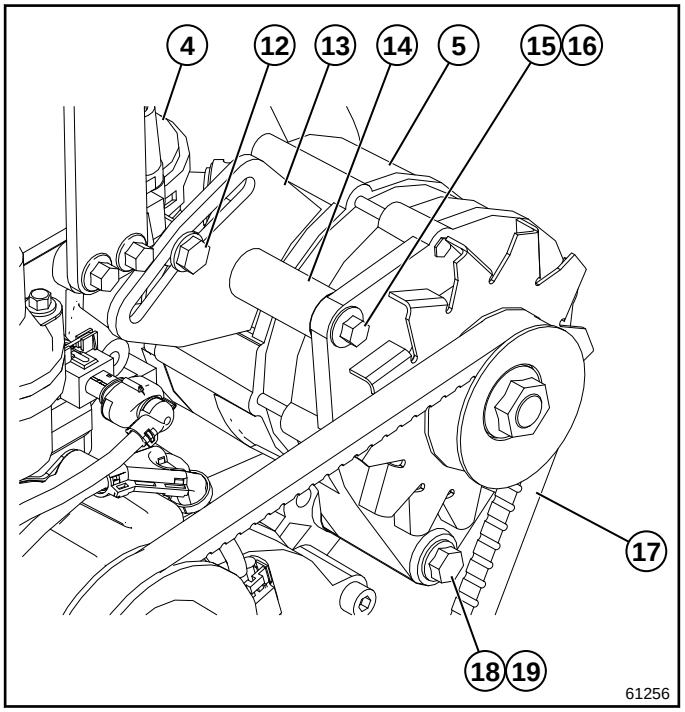


Figure 2-145: Alternator Removal and Installation

9. Loosen bolt (12) from bracket (13) and engine (4). Do not remove bolt.
10. Loosen bolt (18) from alternator (5) and engine (4). Do not remove bolt.
11. Push alternator (5) left and remove belt (17) from alternator (5).
12. Remove nut (15), bolt (16), and sleeve (14) from alternator (5) and engine (4).
13. Support alternator (5) and remove bolt (18), alternator, and spacer (19) from engine (4).

Installation Note

Install the alternator by reversing the order of removal.

Starter

Removal and Installation

NOTE

Tag and mark electrical connectors and wiring prior to removal to ensure proper installation.

See **Figure 2-146**.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Open engine cover to gain access to starter.
3. Disconnect negative battery cable at battery. (See "**Battery**" on **page 2-217**.)

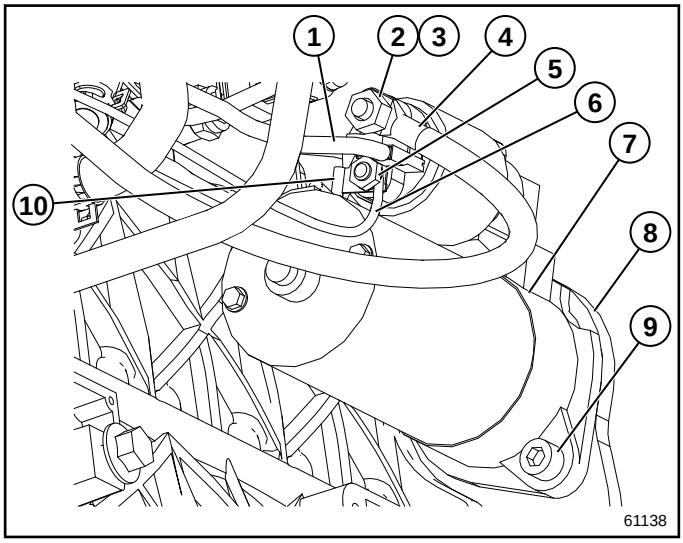


Figure 2-146: Starter Removal and Installation

4. Disconnect connector (1) from starter (7).
5. Remove nut (2), washer (3), and wire (4) from starter (7).
6. Remove nut (5), wire (6), and ground strap (10) from starter (7).
7. Support starter (7) and remove two bolts (9) and starter from engine (8).

Installation Note

Install the starter by reversing the order of removal.

Standard Instrument Display

Removal and Installation

See **Figures 2-147** and **2-148**.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Open engine cover.
3. Disconnect negative battery cable at battery. (See "**Battery**" on **page 2-217**.)

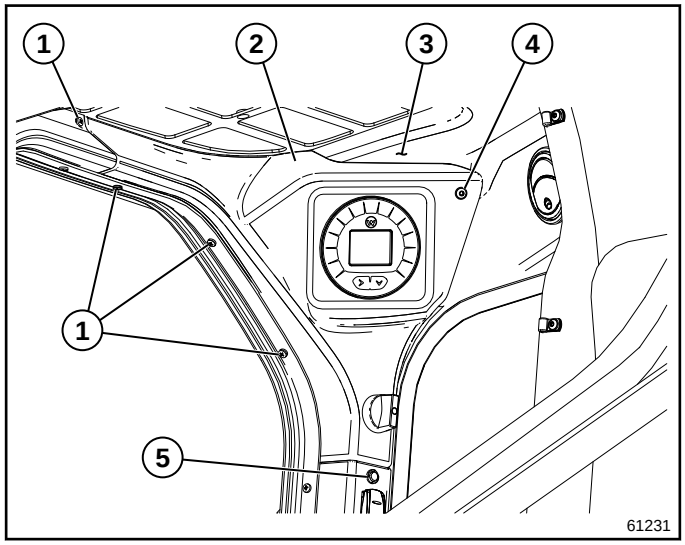


Figure 2-147: Panel Removal and Installation

4. Remove bolt (4) from panel (2).
5. Remove plastic rivet (5) from panel (2).
6. Remove four screws (1) and panel (2) from cab (3).

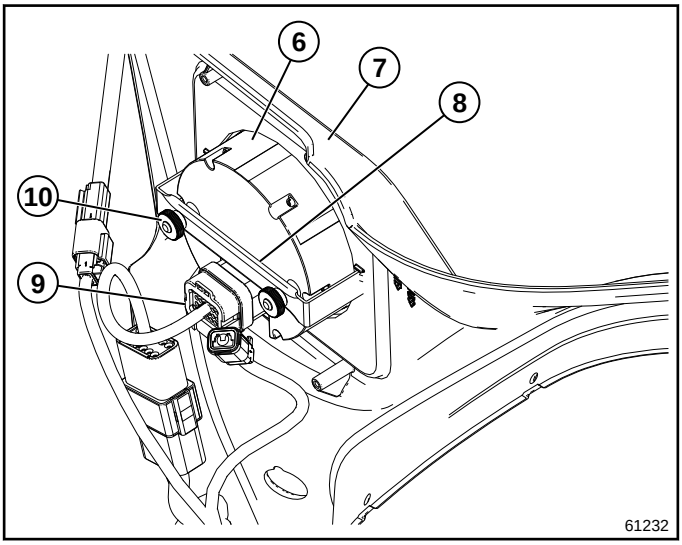


Figure 2-148: Standard Instrument Display Removal and Installation

7. Disconnect connector (9) from standard instrument display (6).
8. Remove two screws (10), bracket (8), and standard instrument display (6) from panel (7).

Installation Note

Install the standard instrument display by reversing the order of removal.

Deluxe Instrument Display

Removal and Installation

See **Figure 2-149** and **Figure 2-150**.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Open engine cover.
3. Disconnect negative battery cable at battery. (See "**Battery**" on **page 2-217**.)

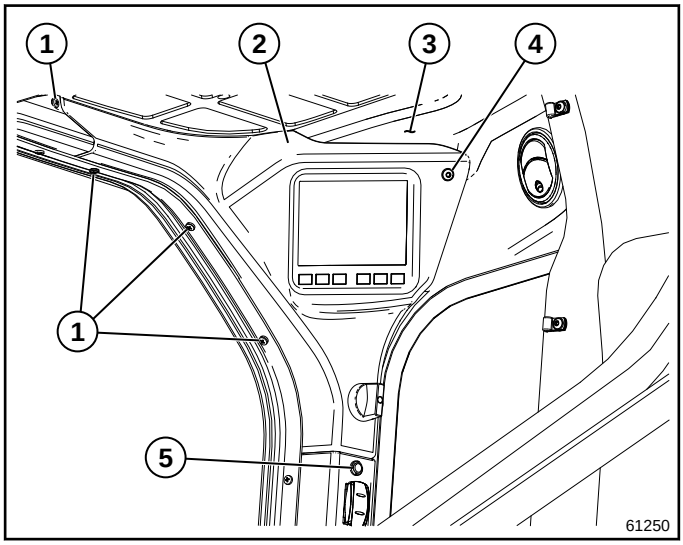


Figure 2-149: Panel Removal and Installation

4. Remove bolt (4) from panel (2).
5. Remove plastic rivet (5) from panel (2).
6. Remove four screws (1) and panel (2) from cab (3).

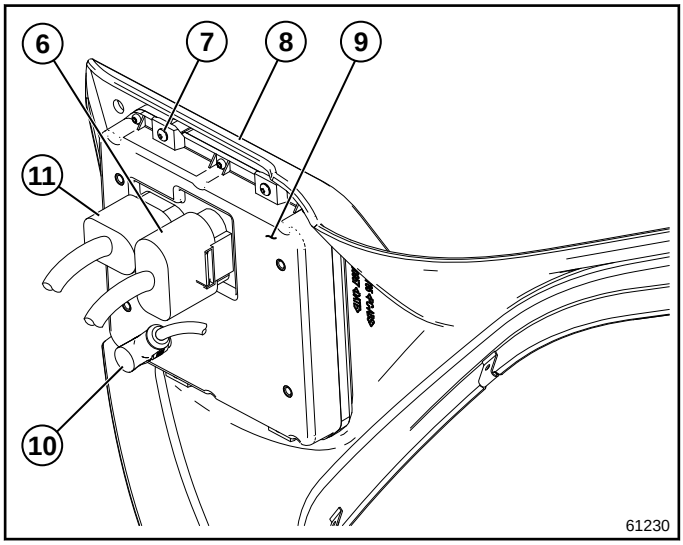


Figure 2-150: Deluxe Instrument Display Removal and Installation

7. Disconnect connector (11) from delux instrument display (9).
8. Disconnect connector (6) from delux instrument display (9).
9. Disconnect connector (10) from delux instrument display (9).
10. Remove four screws (7) and delux instrument display (9) from panel (8).

Installation Note

Install the delux instrument display by reversing the order or removal.

Relay

Removal and Installation

See **Figures 2-151** and **2-152**.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Open engine cover.
3. Disconnect negative battery cable at battery. (See "**Battery**" on **page 2-217**.)

NOTE

Machine is equipped with three Power Distribution Modules (PDM's). One is located in the cab, one behind the left rear taillight, and one in the engine compartment. Engine compartment PDM is shown.

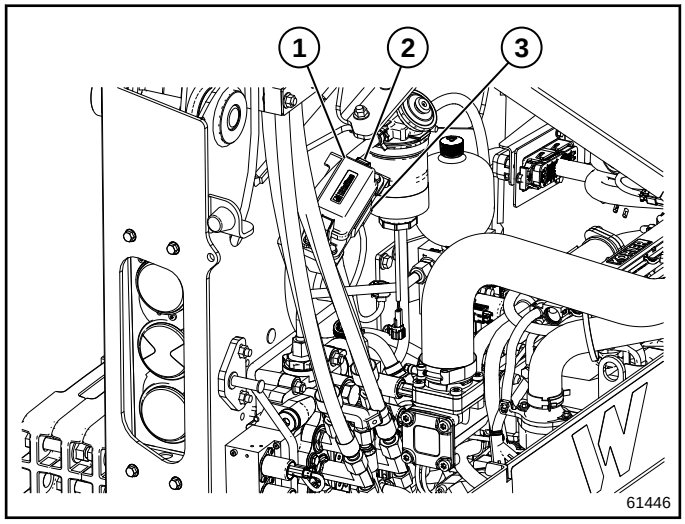


Figure 2-151: Relay Removal and Installation

4. Unclip two clips (2) and remove cover (1) from PDM (3).

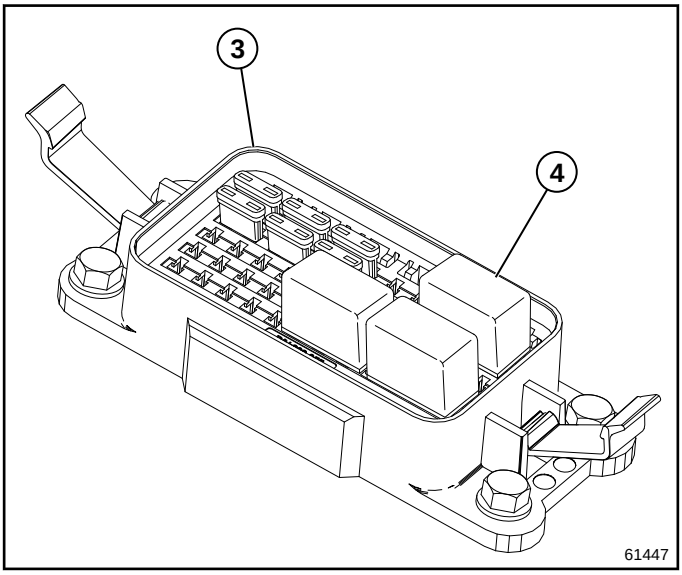


Figure 2-152: Relay Removal and Installation

NOTE

All relays are removed the same way. One is shown.

5. Remove relay (4) from PDM (3).

Installation Note

Install the relay by reversing the order of removal.

Key Switch/Keyless Ignition Switch

Removal and Installation

See **Figures 2-153**, **2-154**, and **2-155**.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Open engine cover.
3. Disconnect negative battery cable at battery. (See "**Battery**" on **page 2-217**.)

NOTE

Key and keyless ignition switches are removed the same way. Key switch is shown.

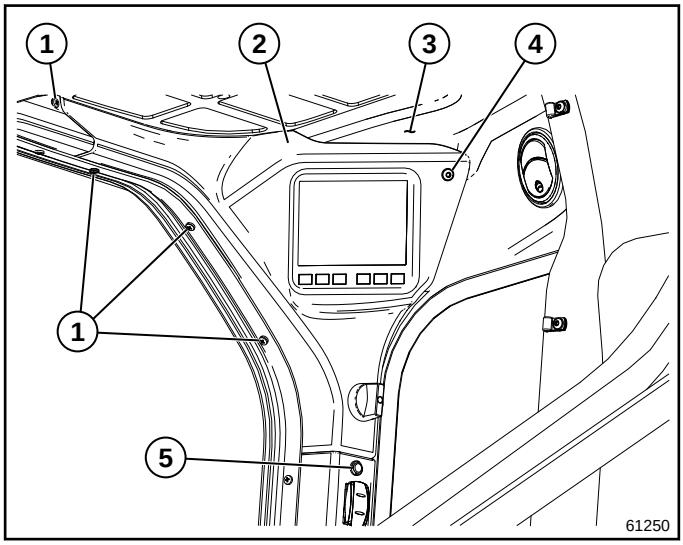


Figure 2-153: Panel Removal and Installation

4. Remove bolt (4) from panel (2).
5. Remove plastic rivet (5) from panel (2).
6. Remove four screws (1) and panel (2) from cab (3).

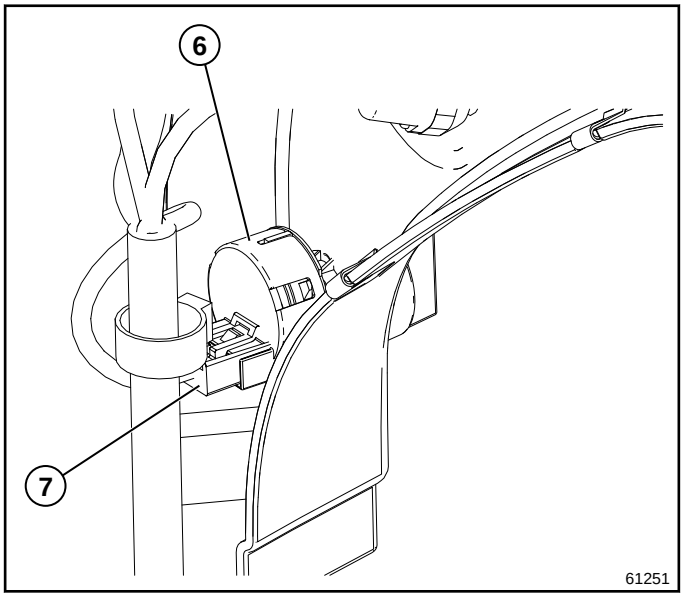


Figure 2-154: Key Switch Connector Removal and Installation

7. Disconnect connector (7) from key switch (6).

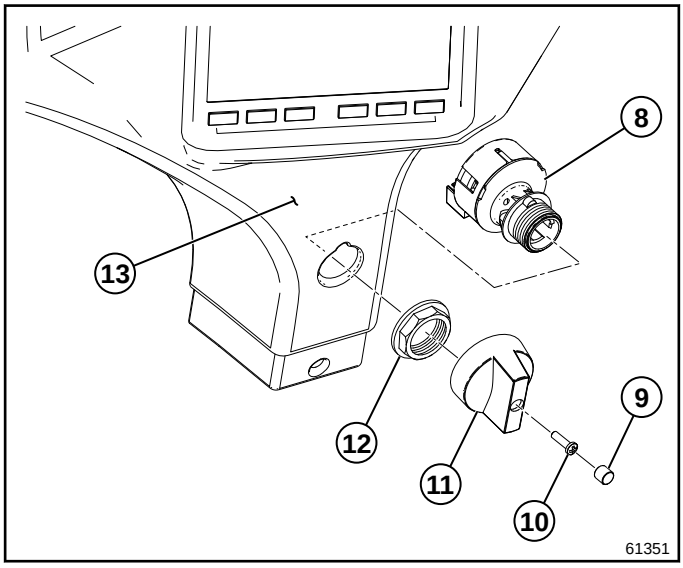


Figure 2-155: Key Switch Removal and Installation

NOTE

Perform Step 8 for keyless ignition switch.

8. Remove plug (9), screw (10), and cap (11) from keyless ignition switch (8).
9. Remove nut (12) and key switch (8) from panel (13).

Installation Note

Install the key switch by reversing the order of removal.

Rocker Switch

Removal and Installation

See **Figures 2-156** and **2-157**.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Open engine cover.
3. Disconnect negative battery cable at battery. (See "**Battery**" on **page 2-217**.)

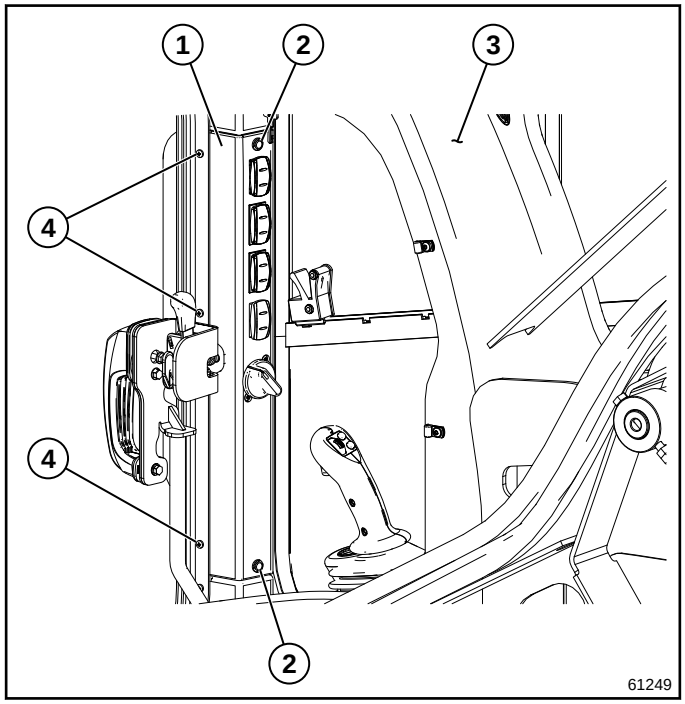


Figure 2-156: Panel Removal and Installation

NOTE

All rocker switches are removed the same way. Park brake rocker switch is shown.

4. Remove three bolts (4) from panel (1).
5. Remove two plastic rivets (2) and panel (1) from cab (3).

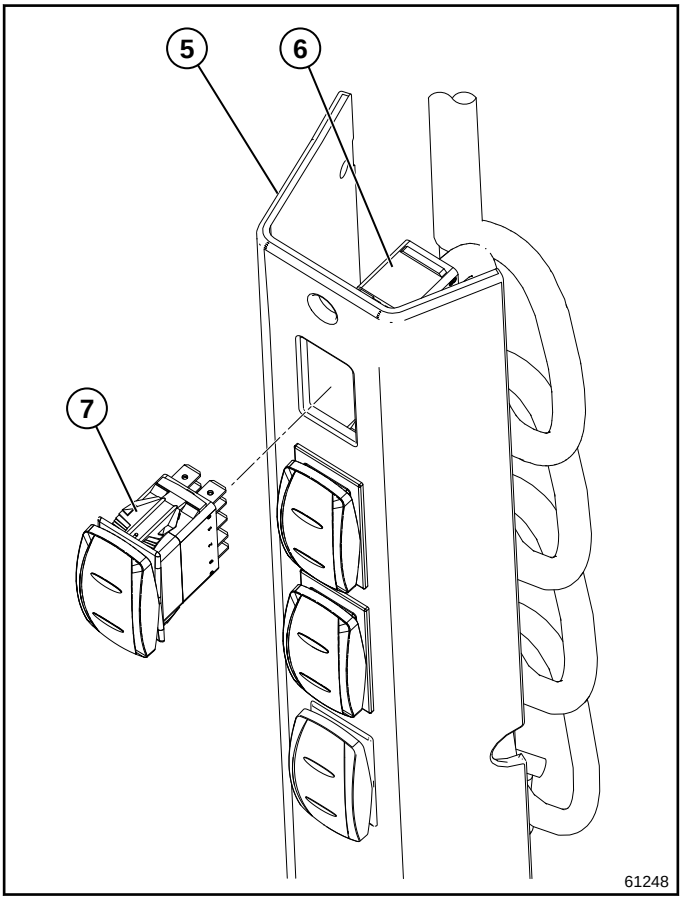


Figure 2-157: Rocker Switch Removal and Installation

6. Disconnect connector (6) from rocker switch (7).
7. Depress tabs and remove rocker switch (7) from panel (5).

Installation Note

Install the rocker switch by reversing the order of removal.

Hand Throttle Control

Removal and Installation

See **Figures 2-158** and **2-159**.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Open engine cover.
3. Disconnect negative battery cable at battery. (See "**Battery**" on **page 2-217**.)

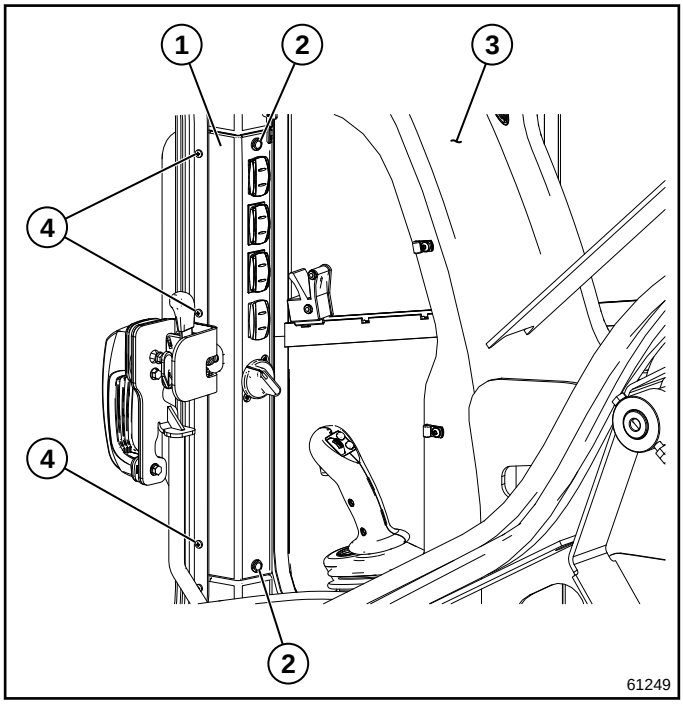


Figure 2-158: Panel Removal and Installation

4. Remove three bolts (4) from panel (1).
5. Remove two plastic rivets (2) and panel (1) from cab (3).

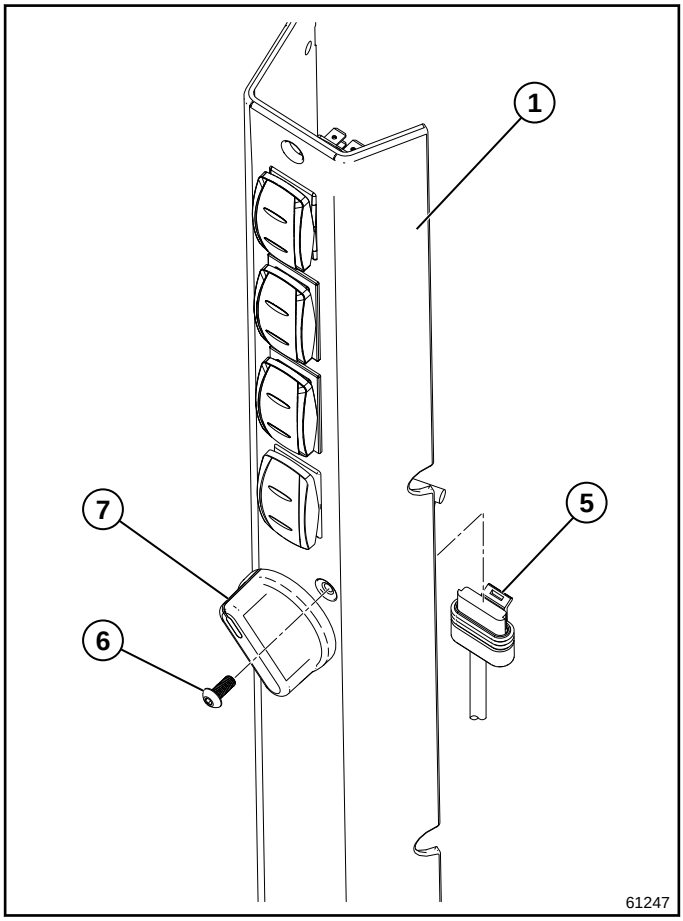


Figure 2-159: Hand Throttle Control Removal and Installation

6. Disconnect connector (5) from hand throttle control (7).
7. Remove two screws (6) and hand throttle control (7) from panel (1).

Installation Note

Install the hand throttle control by reversing the order of removal.

Joystick

Removal and Installation

See **Figure 2-160**.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Open engine cover.
3. Disconnect negative battery cable at battery. (See "**Battery**" on **page 2-217**.)

NOTE

Left hand and right hand joysticks are removed the same way. Left hand joystick is shown.

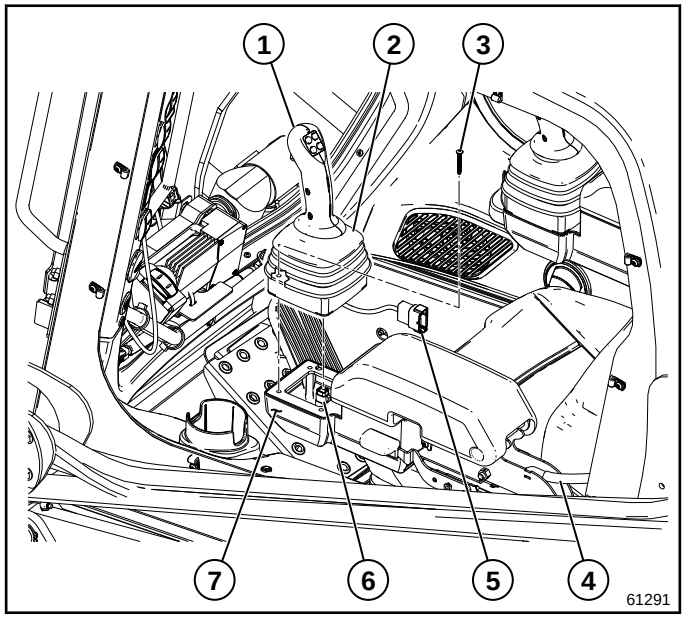


Figure 2-160: Joystick Removal and Installation

4. Pull back boot (2) and remove four screws (3) from joystick (1) and armrest (7).
5. Position joystick (1) aside and disconnect connector (6) from joystick.
6. Disconnect electrical connector (5) from wiring harness (4).

Installation Note

Install the joystick by reversing the order of removal.

Air Filter Restriction Switch

Removal and Installation

See **Figure 2-161**.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Open engine cover.
3. Disconnect negative battery cable at battery. (See "**Battery**" on **page 2-217**.)

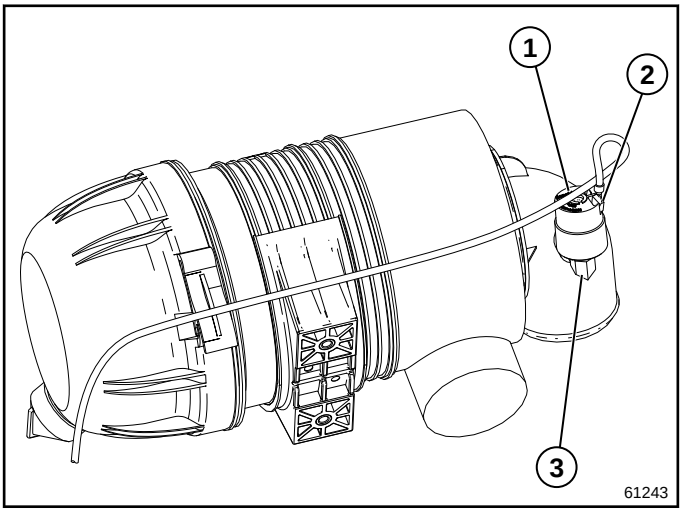


Figure 2-161: Air Filter Restriction Switch Removal and Installation

4. Disconnect connector (2) from air filter restriction switch (1).
5. Remove air filter restriction switch (1) from elbow (3).

Installation Note

Install the air filter restriction switch by reversing the order of removal.

Hydraulic Oil Temperature Sensor

Removal and Installation

See **Figures 2-162** and **2-163**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*
- *Cap and plug hoses and fittings during removal.*

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Disconnect negative battery cable at battery. (See "**Battery**" on **page 2-217**.)

WARNING

- **Support the machine using properly rated jackstands. Never work under a machine supported only by a jack.**
- **Do not use wood or concrete blocks to support the machine. Failure to properly support the machine may result in death or serious injury.**

3. Support machine securely. (See "**Support Machine Securely**" on **page 16**.)

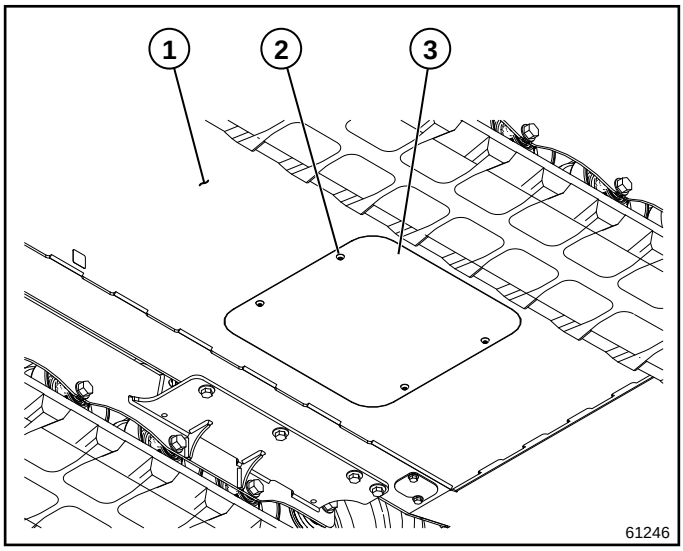


Figure 2-162: Access Cover Removal and Installation

4. Remove four bolts (2) and access cover (3) from bottom of machine (1).

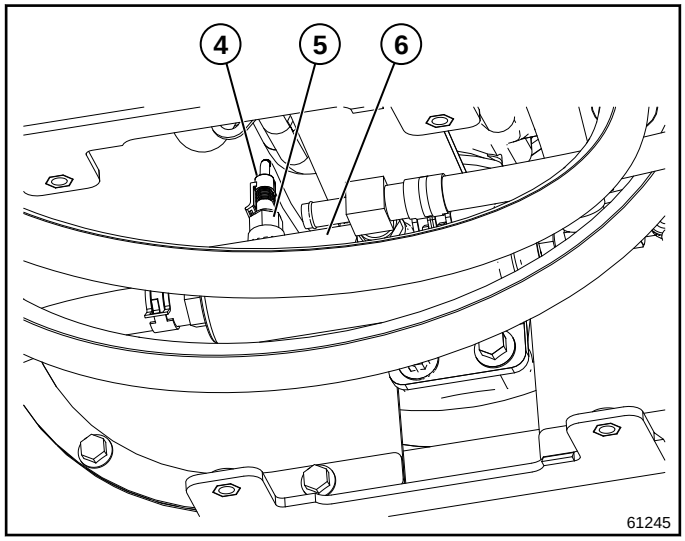


Figure 2-163: Hydraulic Oil Temperature Sensor Removal and Installation

5. Disconnect connector (4) from hydraulic oil temperature sensor (5).
6. Remove hydraulic oil temperature sensor (5) from housing (6).

Installation Note

Install the hydraulic oil temperature sensor by reversing the order of removal.

Engine Oil Pressure Switch

Removal and Installation

See **Figure 2-164**.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Open engine cover.
3. Disconnect negative battery cable at battery. (See "**Battery**" on **page 2-217**.)

⚠ CAUTION

Engine components will become hot during operation. Allow engine components to cool before performing service.

NOTE

Four-cylinder and three-cylinder engine oil pressure switches are removed the same way. Three-cylinder engine oil pressure switch is shown.

4. Open radiator cover.

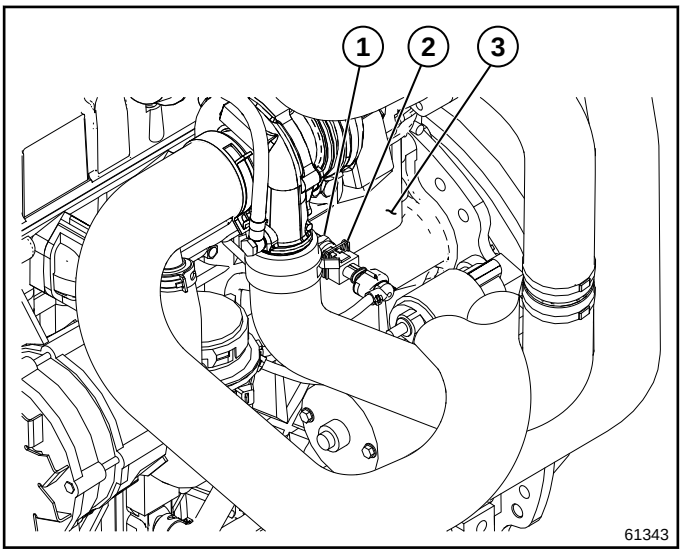


Figure 2-164: Engine Oil Pressure Switch Removal and Installation

5. Disconnect connector (2) from engine oil pressure switch (1).
6. Remove engine oil pressure switch (1) from engine (3).

Installation Notes

- *Install the engine oil pressure switch by reversing the order of removal.*
- *Apply Teflon tape to the threads of the engine oil pressure switch before installing.*

Required Materials
Telfon® Tape

Engine Coolant Temperature Sensor

Removal and Installation

See **Figure 2-165**.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Open engine cover.
3. Disconnect negative battery terminal at battery. (See "**Battery**" on **page 2-217**.)

⚠ CAUTION

Engine components will become hot during operation. Allow engine components to cool before performing service.

4. Open radiator cover.

⚠ WARNING

• Engine coolant is hot and under pressure! Allow the cooling system to cool completely before performing service. Rotate the filler cap 1/2-turn counterclockwise and allow pressure to vent before removing filler cap. Failure to follow appropriate safety precautions may result in death or serious injury.

• Contact with anti-freeze can damage your skin. Use gloves when working with anti-freeze. If you come in contact with anti-freeze, wash it off immediately.

NOTE

Four-cylinder and three-cylinder engine coolant temperature sensors are removed the same way. Three-cylinder engine coolant temperature sensor is shown.

5. Drain cooling system.

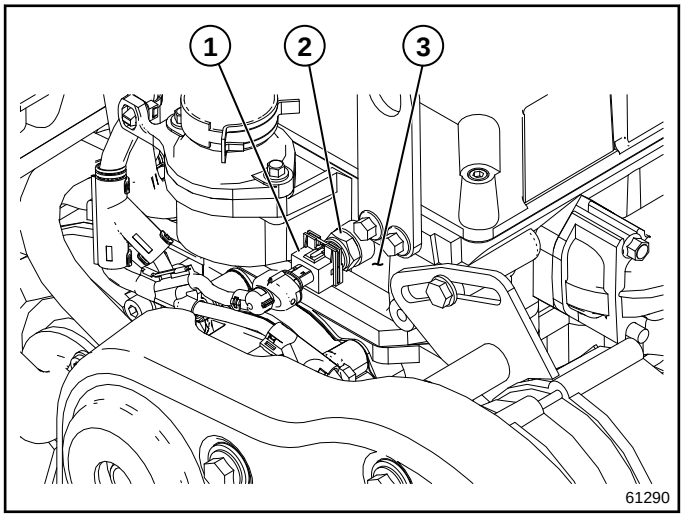


Figure 2-165: Engine Coolant Temperature Sensor Removal and Installation

6. Disconnect connector (1) from engine coolant temperature sensor (2).

7. Remove engine coolant temperature sensor (2) from cylinder head (3).

Installation Notes

Required Materials
Telfon® Tape

- *Install the engine coolant temperature sensor by reversing the oder of removal.*
- *Apply Teflon tape to the threads of the engine coolant temperature sensor before installing.*
- *Fill the radiator with a 50/50 mixture of good quality ethylene glycol-base antifreeze and clean fresh water.*

100-Amp Main Fuse

Removal and Installation

See **Figure 2-166**.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Open engine cover.
3. Disconnect negative battery cable at battery. (See "**Battery**" on **page 2-217**.)

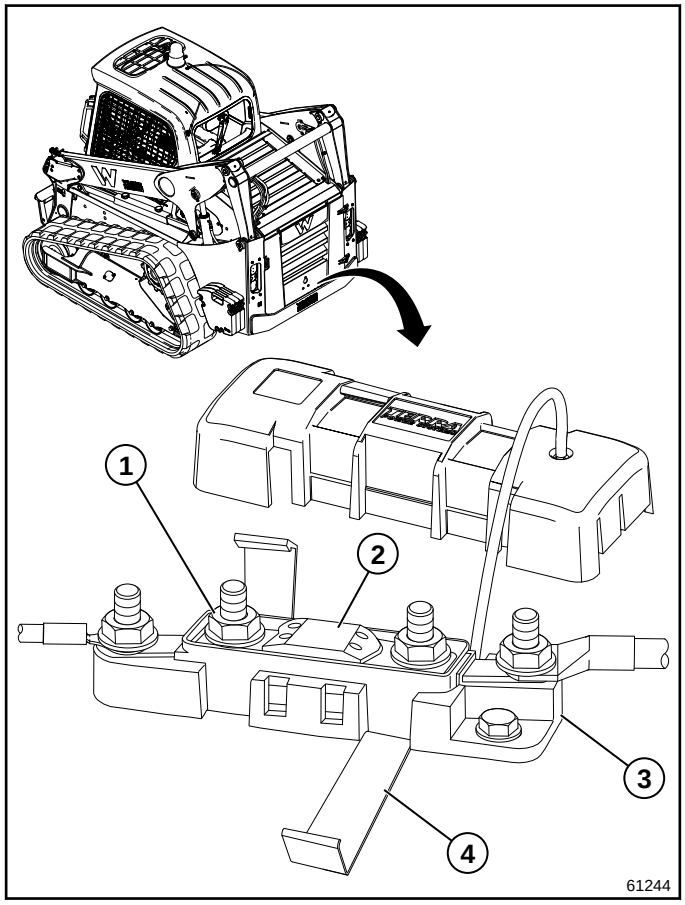


Figure 2-166: 100-Amp Main Fuse Removal and Installation

4. Unclip two clips (4) and open fuse holder (3).
5. Remove two nuts (1) and 100-amp main fuse (2) from fuse holder (3).

Installation Note

Install the 100-amp main fuse by reversing the order of removal.

Horn

Removal and Installation

See **Figure 2-167**.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Open engine cover.
3. Disconnect negative battery cable at battery. (See "**Battery**" on **page 2-217**.)

WARNING

Always ensure cab is secured with safety strut when raising cab. Failure to secure cab with safety strut may result in death or serious injury.

4. Raise cab and secure with safety strut.

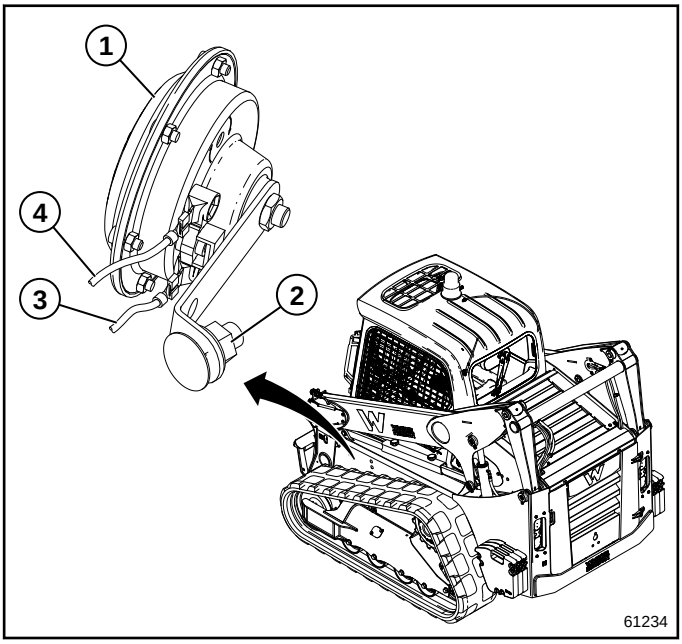


Figure 2-167: Horn Removal and Installation

NOTE

Label all wires before disconnecting to ensure correct installation.

5. Remove two connectors (3 and 4) from horn (1).
6. Remove nut (2) and horn (1) from machine.

Installation Note

Install the horn by reversing the order of removal.

Fuel Level Sensor

Removal and Installation

See **Figure 2-168**.

WARNING

- **Never remove the fuel cap from the fuel tank or add fuel when the engine is running or while the engine is hot.**
- **Do not smoke when handling fuel. Never fill or drain the fuel tank indoors.**
- **Do not spill fuel. Clean spilled fuel immediately.**
- **Never handle or store fuel containers near an open flame or any device that may create sparks and ignite the fuel or fuel vapors.**
- **Be sure to reinstall and tighten fuel cap securely.**
- **Use an approved container; the spout must fit inside the fuel filler neck. Avoid using cans and funnels to transfer fuel.**

CAUTION

Diesel fuel is highly flammable. Handle with care. Use an approved container with a spout that will fit inside the fuel filler neck. Avoid using unapproved containers to transport fuel. Keep all fuel containers clean and closed when not in use.

CAUTION

Dispose of fuel properly. Contact the local environmental department for instructions on disposing of unwanted fuel products.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Open engine cover.

WARNING

Always ensure boom is secured with safety strut when raising boom. Failure to secure boom with safety strut may result in death or serious injury.

3. Raise boom and secure with safety strut.
4. Disconnect negative battery cable at battery. (See "**Battery**" on **page 2-217**.)

WARNING

Always ensure cab is secured with safety strut when raising cab. Failure to secure cab with safety strut may result in death or serious injury.

5. Raise cab and secure with safety strut to gain access to fuel level sensor.

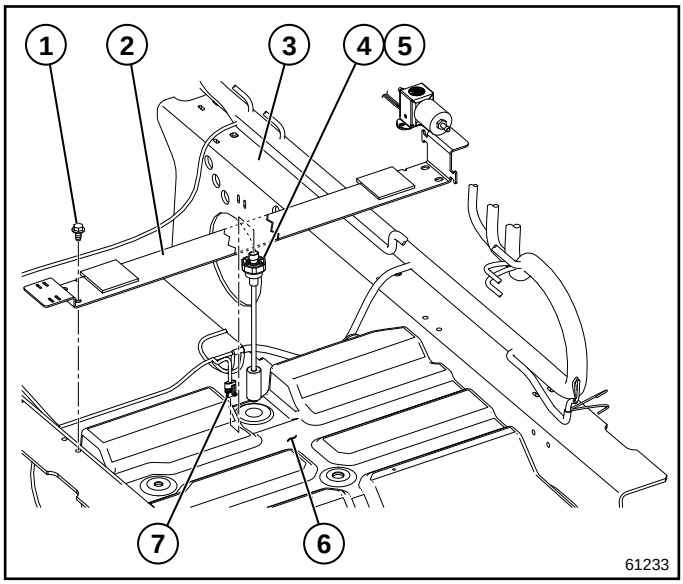


Figure 2-168: Fuel Level Sensor Removal and Installation

6. Remove four screws (1) from mount (2) and inner case (3).
7. Reposition mount (2) to allow fuel level sensor (4) removal from fuel tank (6).
8. Disconnect connector (7) from fuel level sensor (4).
9. Remove fuel level sensor (4) and gasket (5) from fuel tank (6).

Installation Note

Install the fuel level sensor by reversing the order of removal.

Door Switch

Removal and Installation

See **Figure 2-169**.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Disconnect negative battery cable at battery. (See "**Battery**" on **page 2-217**.)

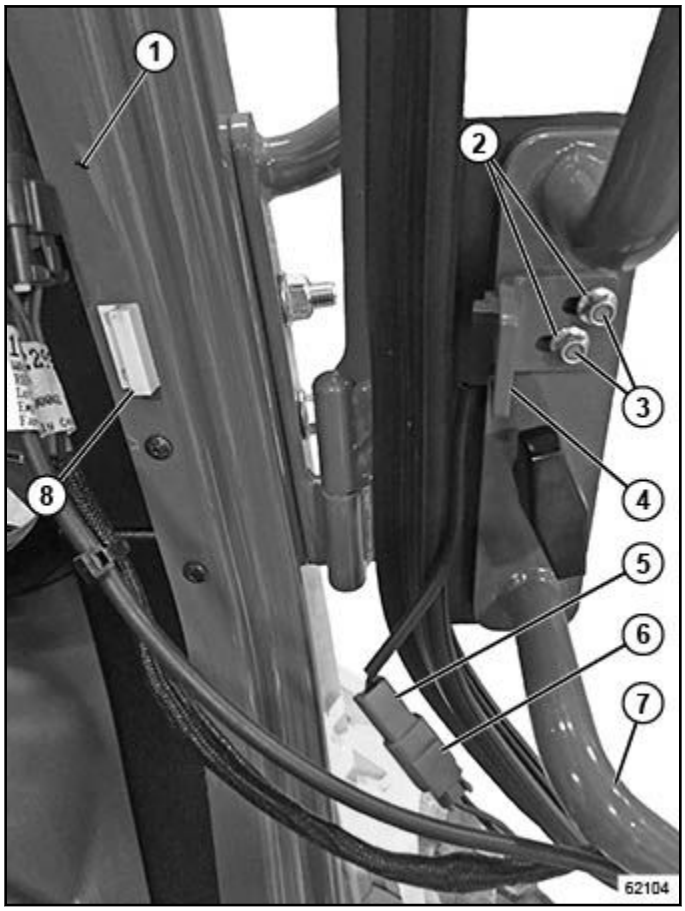


Figure 2-169: Door Switch Removal and Installation

3. Open cab door (7).
4. Disconnect connector (5) from connector (6).

NOTE

Door sensor bracket is adjustable. Note position of door sensor bracket prior to removal to ensure proper installation.

5. Remove two nuts (2) and door sensor bracket (4) from bolts (3) and cab door (7).

NOTE

Note position and location of switch magnet prior to removal to ensure proper installation.

6. Remove door switch magnet (8) from cab (1).

Installation Notes

- *Install the door switch by reversing the order of removal.*
- *Loosely install the door sensor bracket and adjust prior to tightening two nuts.*

Pressure Transducer

Removal and Installation

See **Figure 2-170**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under brake valve/two speed valve.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

WARNING

Always ensure boom is secured with safety strut when raising boom. Failure to secure boom with safety strut may result in death or serious injury.

2. Raise boom and secure with safety strut.

WARNING

Always ensure cab is secured with safety strut when raising cab. Failure to secure cab with safety strut may result in death or serious injury.

3. Raise cab and secure with safety strut to gain access to pressure transducer on brake valve/two speed valve (optional).
4. Disconnect negative battery cable at battery. (See "**Battery**" on **page 2-217**.)

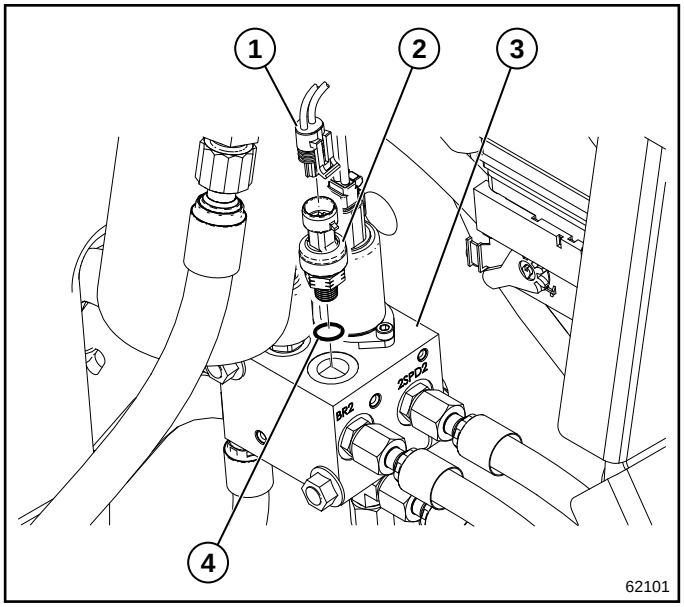


Figure 2-170: Pressure Transducer Removal and Installation

5. Disconnect connector (1) from pressure transducer (2).
6. Remove pressure transducer (2) and O-ring (4) from brake valve/two speed valve (3).

Installation Note

Install the pressure transducer by reversing the order of removal.

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Chapter 3

Hydrostatic Power Train

Specification **3-4**
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Specification

Portable In-Line Filter

Portable In-Line Filter

When hydraulic components fail internally, debris from the failed component can spread throughout the hydraulic system, causing additional damage. This situation can be magnified when dealing with a closed loop traction system where oil is not filtered. In the event of a traction system component failure, It is recommended that all traction system components be disassembled and cleaned, or filtered using a portable in-line filter available through your Wacker Neuson dealer. The portable in-line filter should also be used when testing hydraulic systems or after replacing a failed component.

IMPORTANT

Always install the in-line filter so oil flows through the filter before entering a component. Once filtering has begun, never reverse the flow of oil, or debris will re-enter the system.

Repair Specifications

Specification	
Drive motor bolt torque	214 lb-ft (290 N•m)

Test and Adjustment Specifications

Specification	
Hydrostatic Pressure Relief Setting	406 psi (28 bar)
Charge Pressure (Mechanical)	5221 psi (360 bar)
Charge Pressure (EH)	5511 psi (380 bar)

Commonly Used Terms

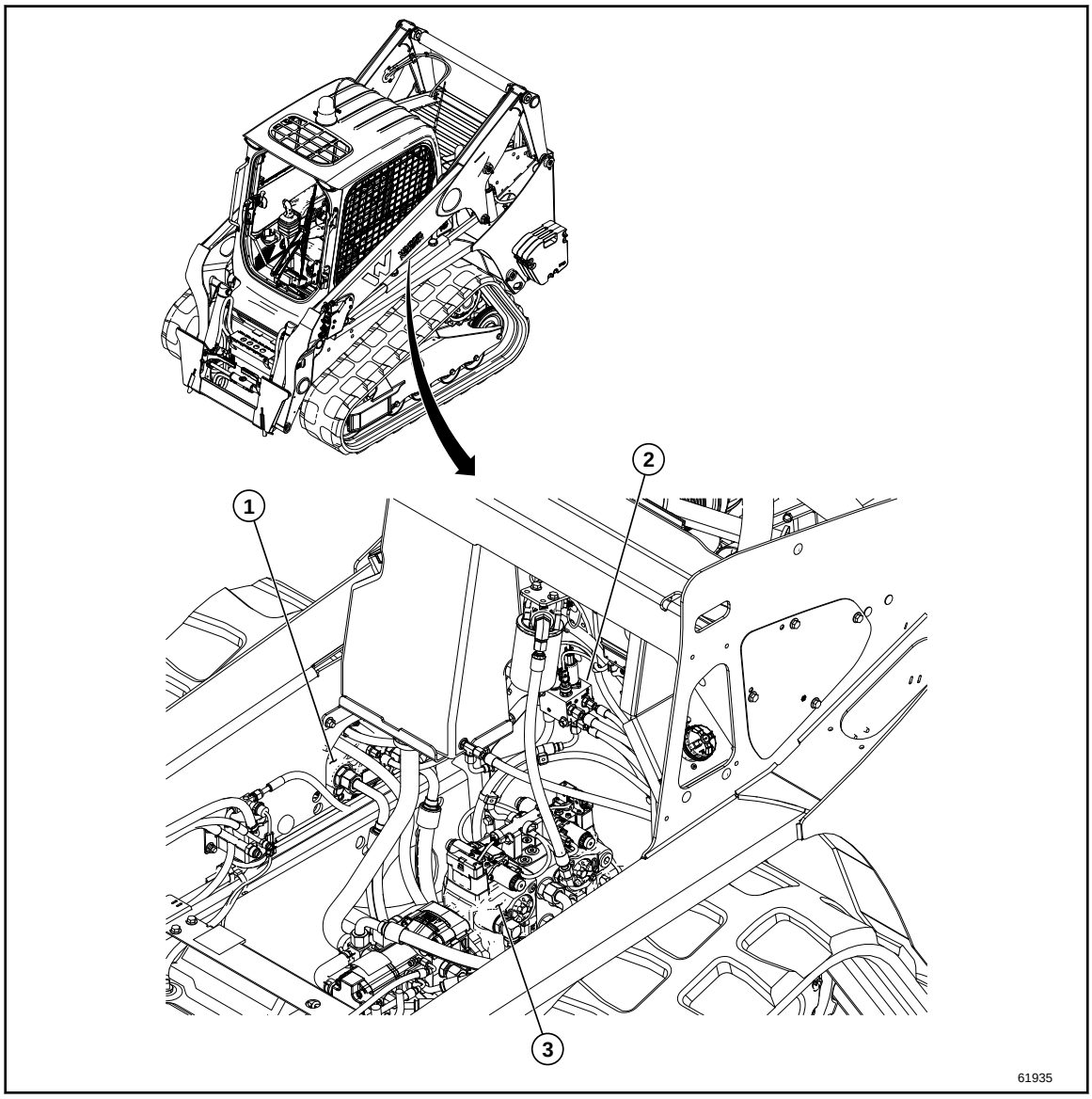
Throughout this manual there are many commonly used terms and phrases. Below is a list of many of these terms and a description of how they are used in this manual.

- **Charge Pressure Oil:** Oil pressure supplied to the cooling fan then regulated by a pressure relief valve in the hydrostatic pump used for lower pressure control functions.
- **Inlet or Drain Oil:** Unpressurized oil either flowing to or from a component.
- **Interlock Circuit:** A safety circuit with a series of switches and relays that allow certain functions to become active after several processes and conditions have been met.
- **Metered Oil:** Oil that is regulated through one or more check or pressure relief valve.
- **Operating Pressure Oil:** Oil provided by the gear pump/pumps to the main hydraulic control valve limited by the control valve relief and/or the high flow relief setting.
- **Drive Pressure Oil:** Oil supplied by the hydrostatic drive pump to the drive motors limited by the main relief setting on the drive pump.
- **Return Oil:** Pressurized oil that is returned to the hydraulic tank or a component after a function is performed.
- **Switched Power:** Power provided to a circuit from a switching device such as a switch or a relay.
- **Unswitched Power:** Power provided to a circuit directly from the battery without going through any switching devices such as a switch or a relay.

Component Location

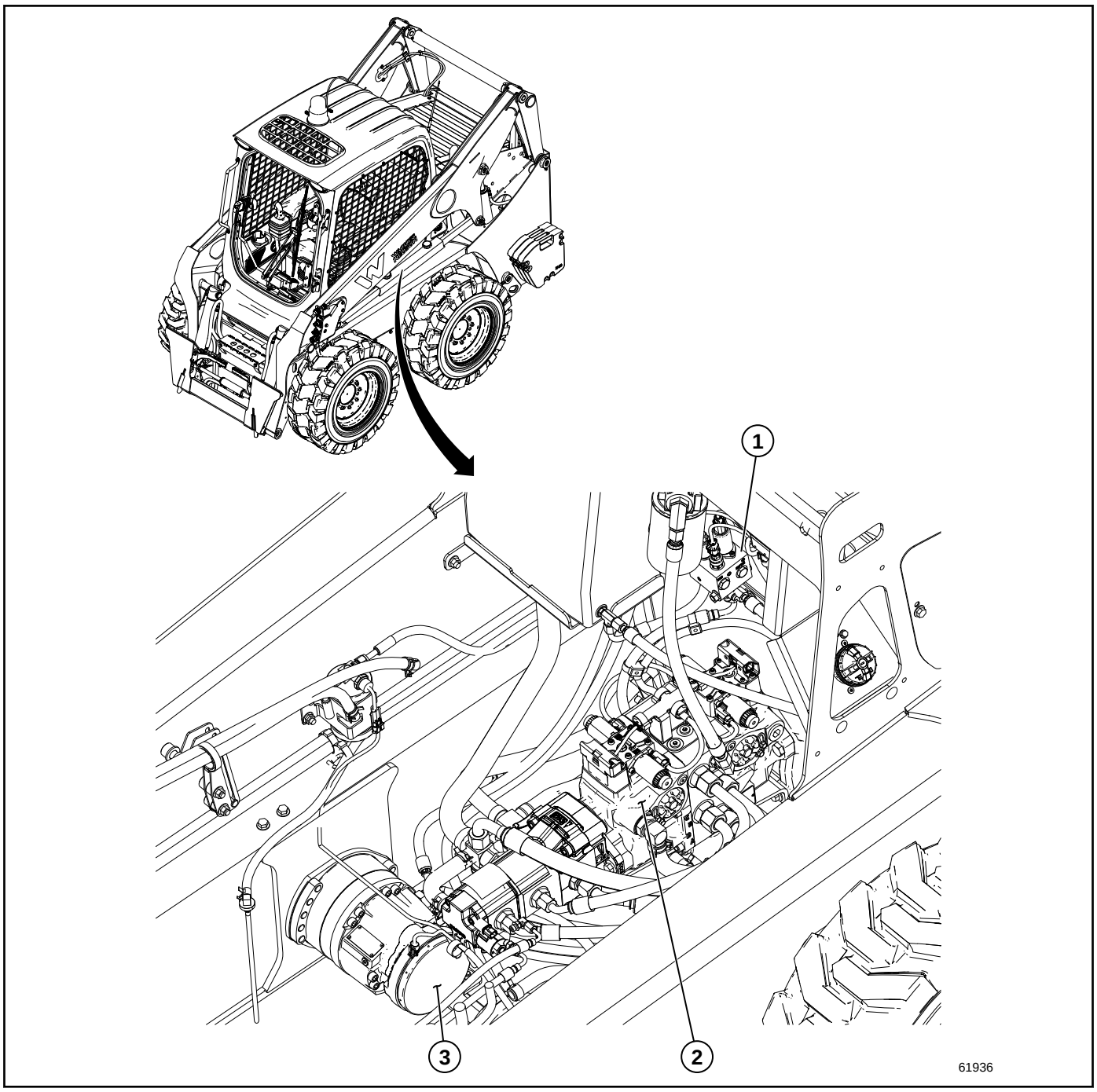
Component Location

See **Figures 3-1** and **3-2**.



1. DRIVE MOTOR (BOTH SIDES)
2. BRAKE VALVE/TWO SPEED VALVE (OPTIONAL)
3. HYDROSTATIC DRIVE PUMP

Figure 3-1: Compact Track Loader Component Location



1. BRAKE VALVE/TWO SPEED VALVE (OPTIONAL)
2. HYDROSTATIC DRIVE PUMP
3. DRIVE MOTOR (BOTH SIDES)

Figure 3-2: Skid Steer Loader Component Location

Hydrostatic Power Train Schematics

Hydrostatic Schematic (Wheeled Machine with Electronic Controls)

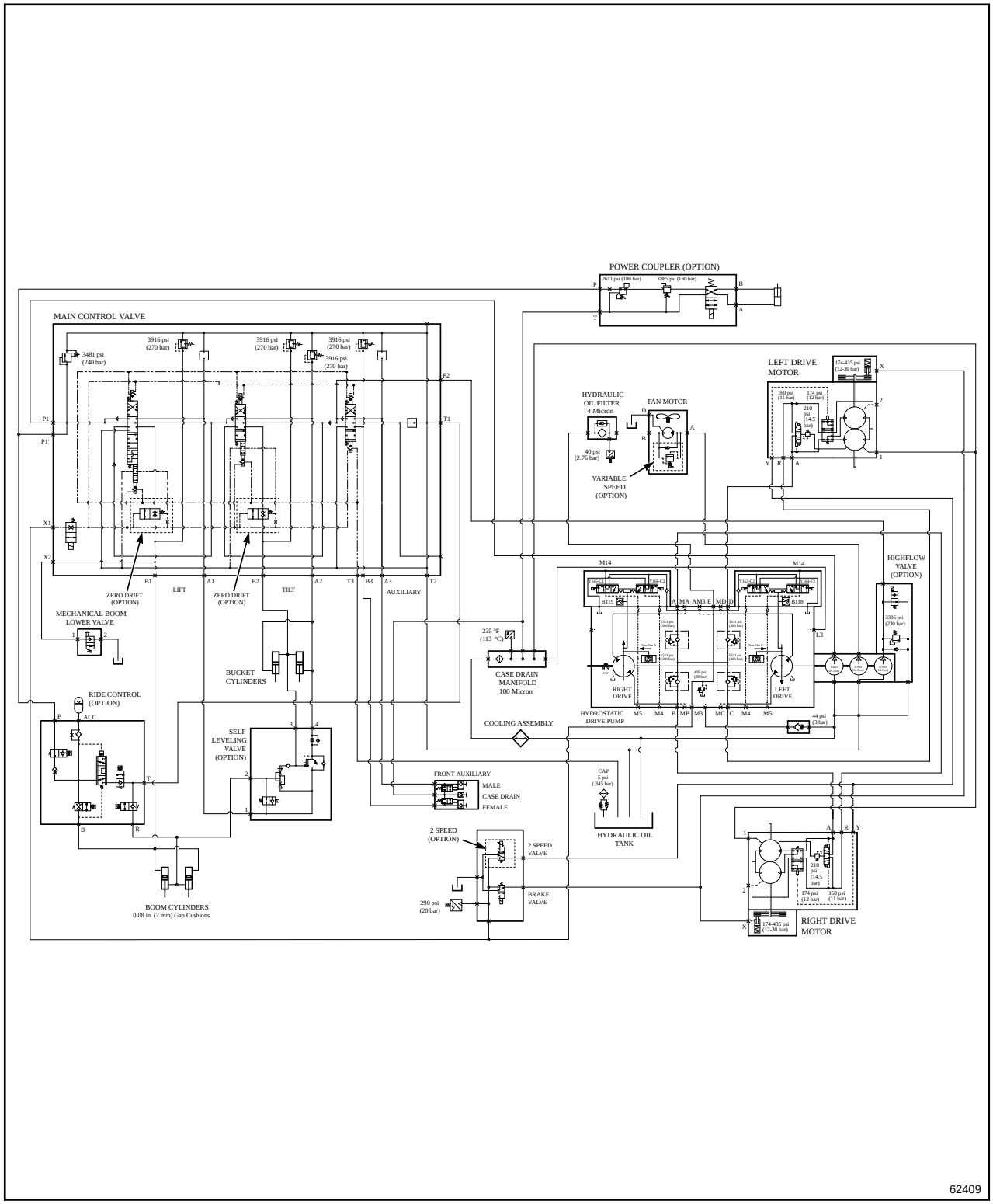


Figure 3-3

Hydrostatic Schematic (Track Machine with Electronic Controls)

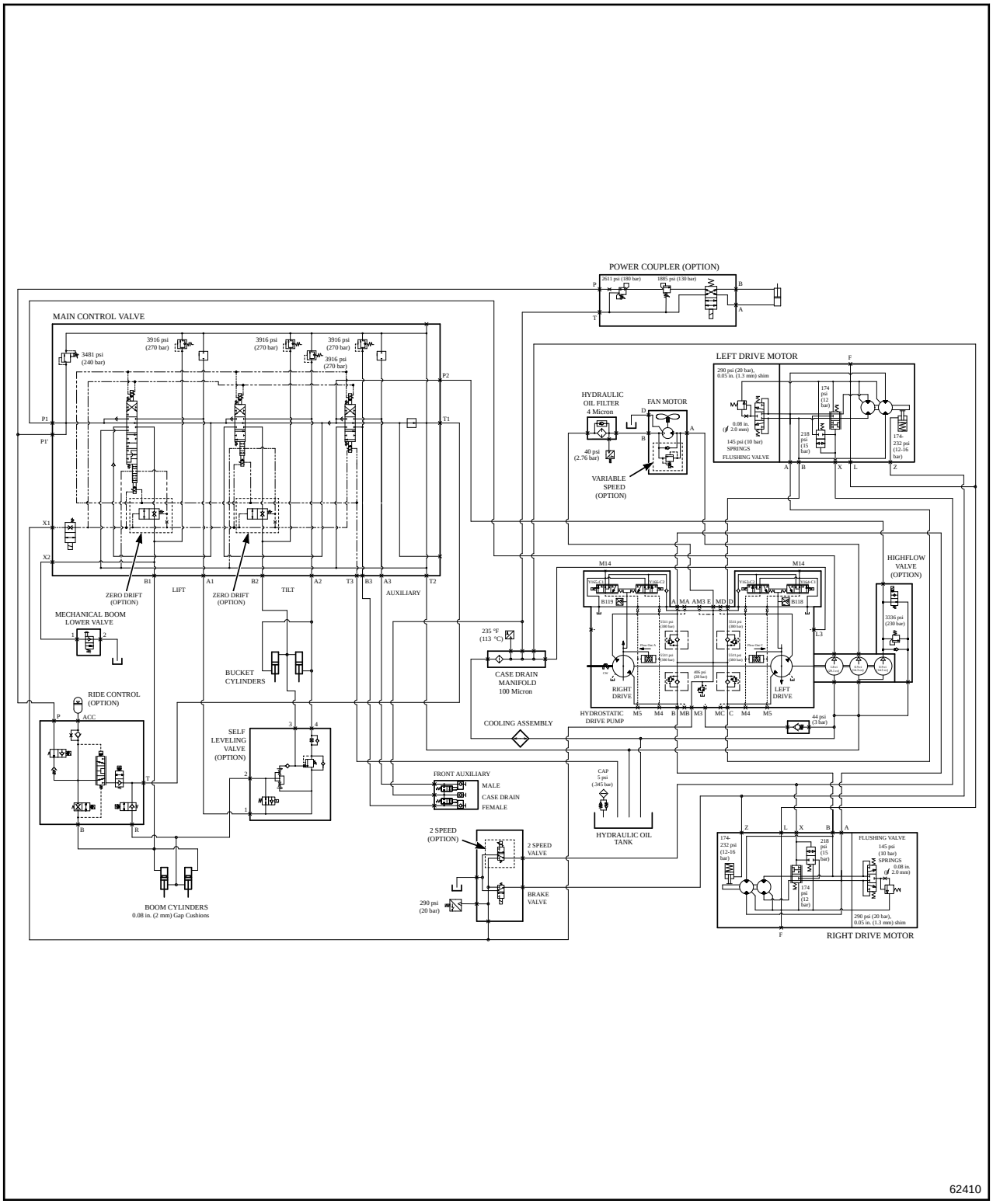


Figure 3-4

Hydrostatic Schematic (Wheeled Machine with Manual Controls)

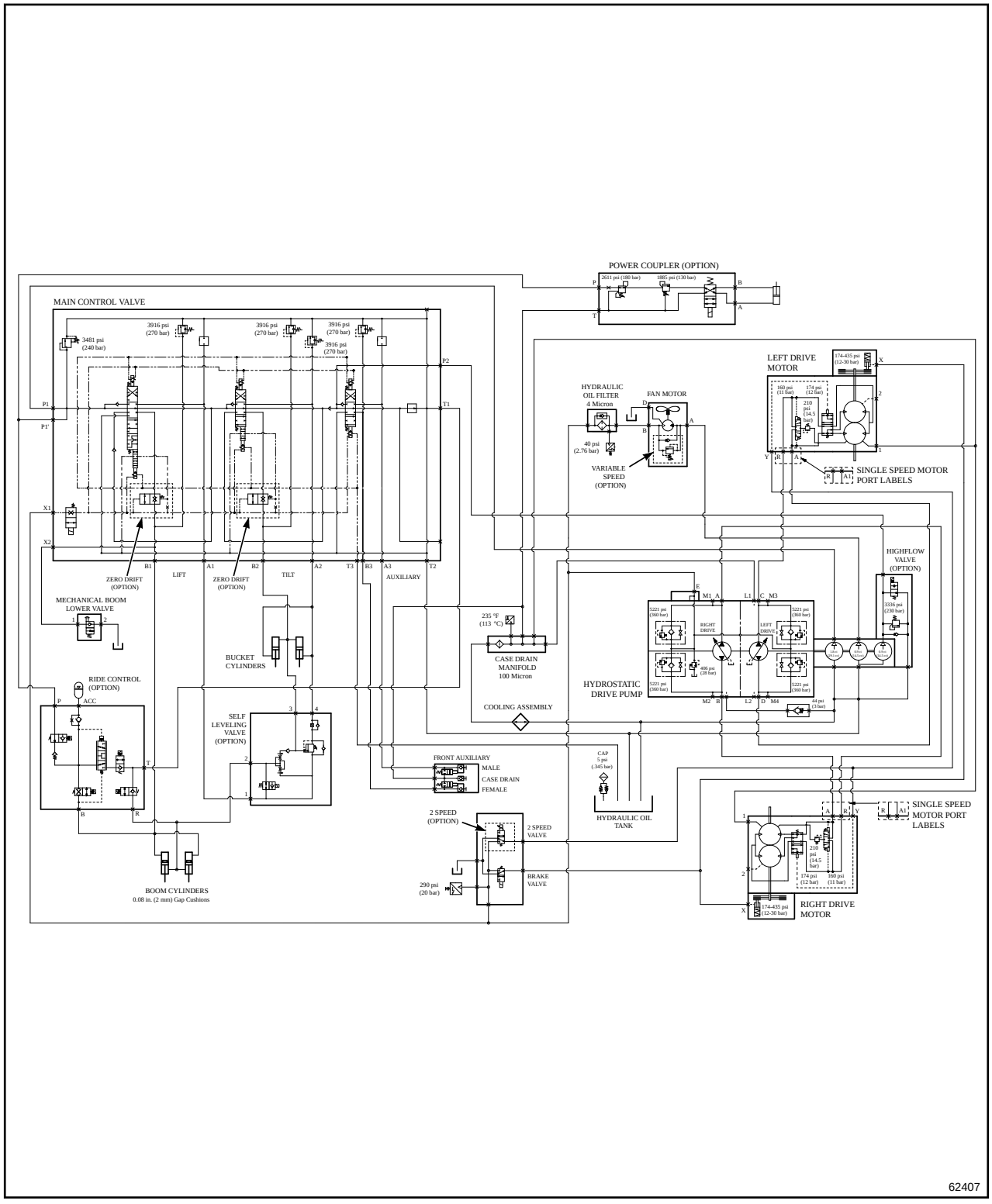


Figure 3-5

Hydrostatic Schematic (Track Machine with Manual Controls)

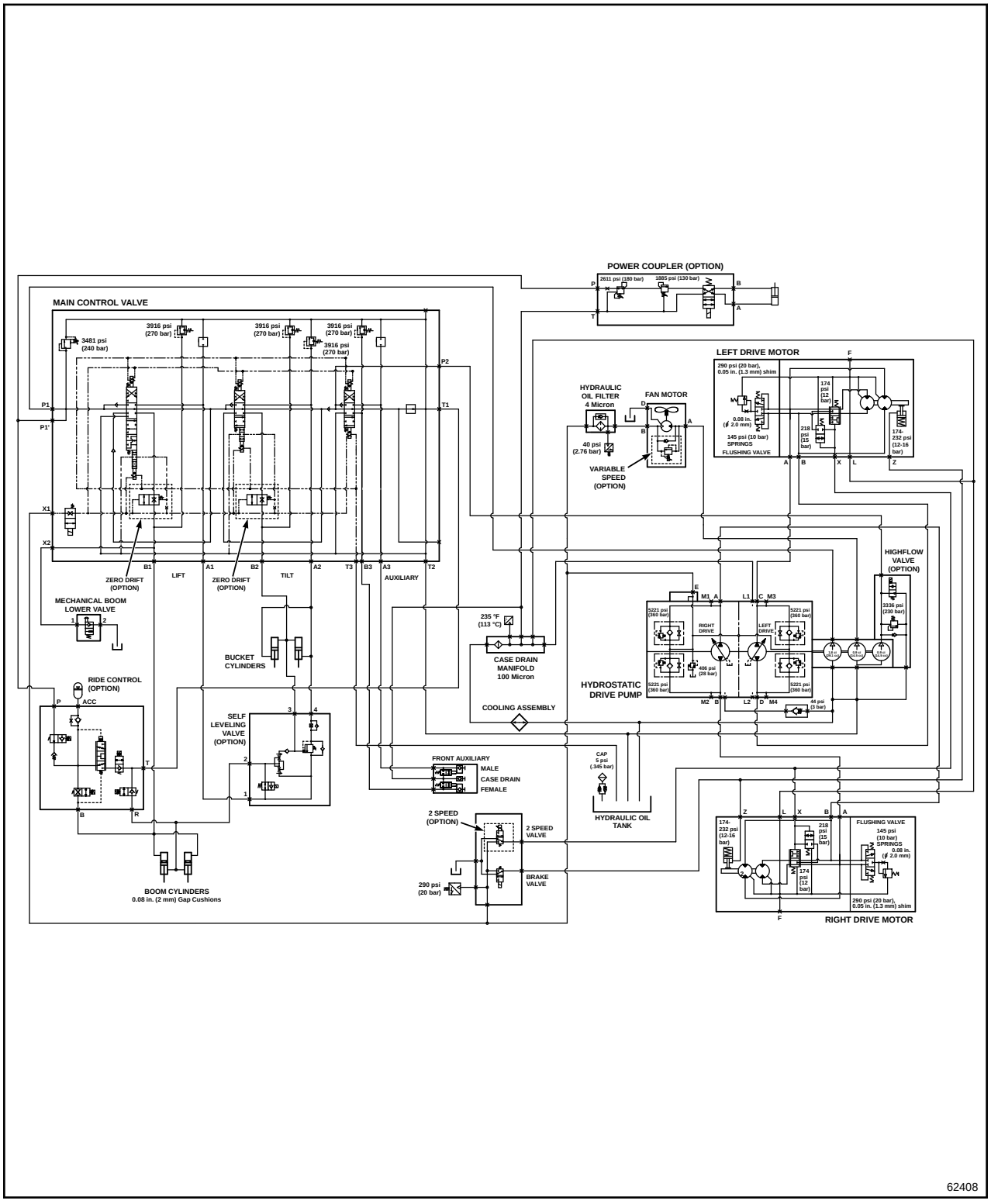


Figure 3-6

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Theory of Operation and Diagnostic Information

Drive Circuit—Neutral Theory of Operation (Wheeled Machine with Electronic Controls)

NOTE

Port names differ between one and two speed drive motors. The two speed motor is described in this theory of operation. If machine is equipped with the one speed drive motor option, please see corresponding schematic for appropriate port naming.

System Conditions:

- Engine running
- Park brake released

Hydrostatic Drive Pump Charge Circuit

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged. The oil is then routed through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The oil exits the hydrostatic drive pump through ports A, B, C, and D, and is routed to ports A and R of both drive motors. Oil is returned from port 1 of both drive motors through a 100 micron filter in the case drain manifold, then through the cooling assembly and back to the hydraulic oil tank. Oil is returned from port L3 of the hydrostatic drive pump through a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Neutral Circuit

With the engine running and park brake set, the swash plate in the hydrostatic drive pump is in the neutral position; the hydrostatic drive pump does not pump any oil and no movement occurs. Charge pressure oil exists at the relief valves and check valves within the hydrostatic drive pump, subsequently ports A, B, C, and D, and ports A and R of both drive motors. The charge pump oil makes up for the leakage from the closed loop hydrostatic drive system replenishing oil as needed.

Drive Circuit Neutral Schematic (Wheeled Machine with Electronic Controls)

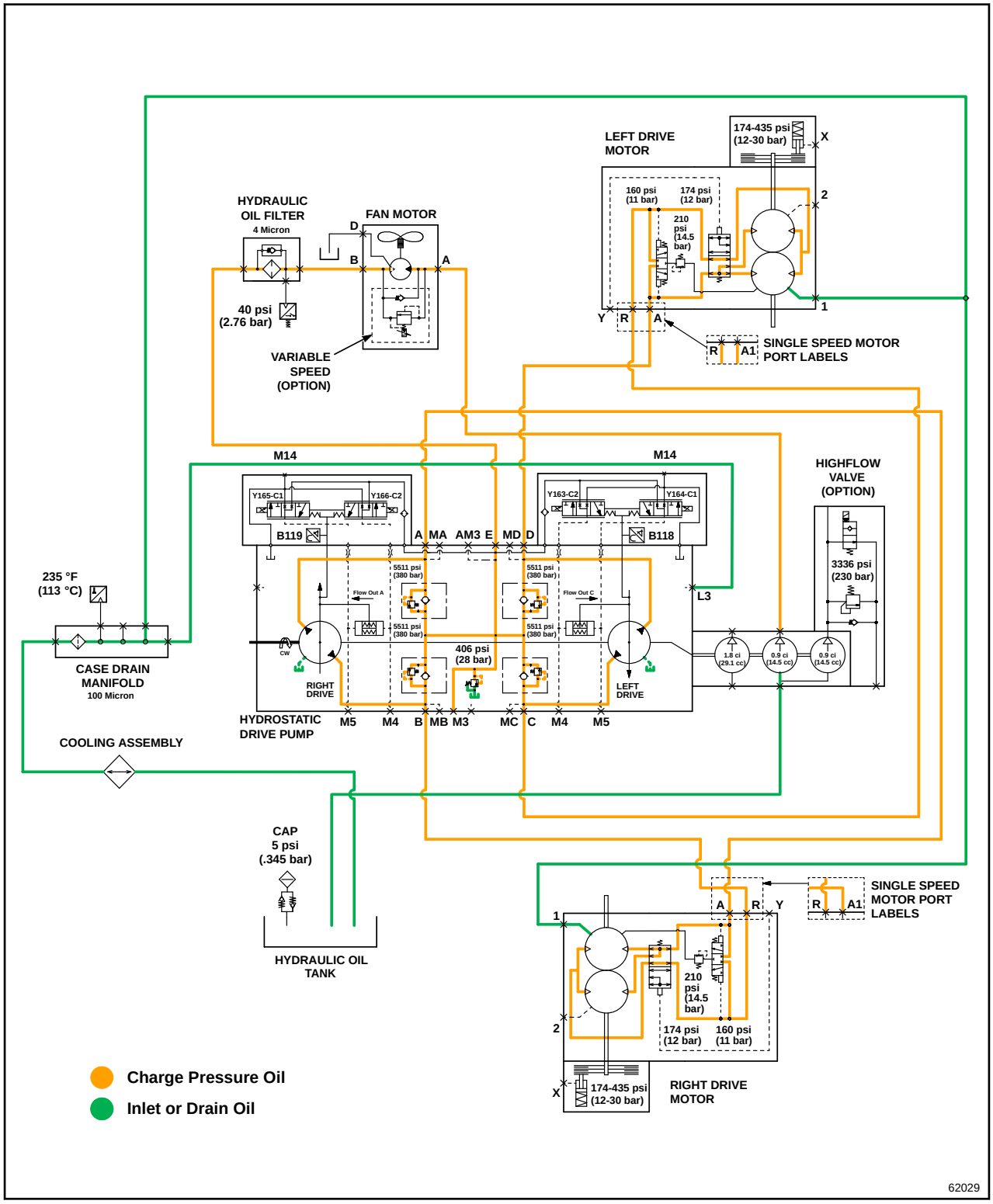


Figure 3-7

Drive Circuit—Neutral Theory of Operation (Track Machine with Electronic Controls)

System conditions:

- Engine running
- Park brake released

Hydrostatic Drive Pump Charge Circuit

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged. The oil is then routed through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The oil exits the hydrostatic drive pump through ports A, B, C, and D, and is routed to ports A and B of both drive motors. Oil is returned from port L of both drive motors through a 100 micron filter in the case drain manifold, then through the cooling assembly and back to the hydraulic oil tank. Oil is returned from port L3 of the hydrostatic drive pump through a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Neutral Circuit

With the engine running and park brake set, the swash plate in the hydrostatic drive pump is in the neutral position; therefore, the hydrostatic drive pump does not pump any oil and no movement occurs. Charge pressure oil exists at the relief valves and check valves within the hydrostatic drive pump, subsequently ports A, B, C, D, and ports A and B of both drive motors. The charge pump oil makes up for the leakage from the closed loop hydrostatic drive system replenishing oil as needed.

Drive Circuit Neutral Schematic (Track Machine with Electronic Controls)

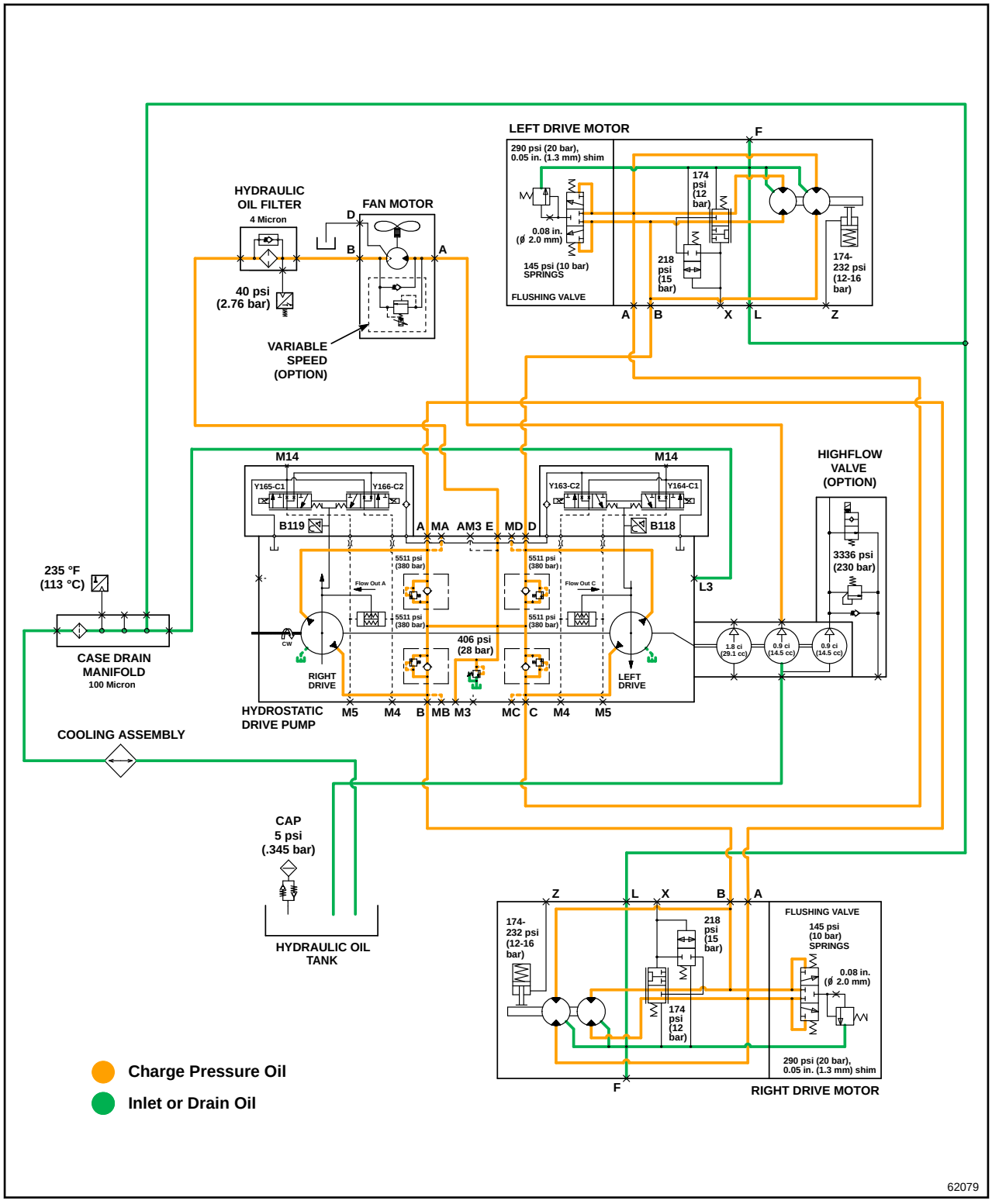


Figure 3-8

Drive Circuit—Neutral Theory of Operation (Wheeled Machine with Manual Controls)

NOTE

Port names differ between one and two speed drive motors. The two speed motor is described in this theory of operation. If machine is equipped with the one speed drive motor option, please see corresponding schematic for appropriate port naming.

System Conditions:

- Engine running
- Park brake released

Hydrostatic Drive Pump Charge Circuit

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged. The oil is then routed through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The oil exits the hydrostatic drive pump through ports A, B, C, and D, and is routed to ports A and R of both drive motors. Oil is returned from port 1 of both drive motors through a 100 micron filter in the case drain manifold, then through the cooling assembly and back to the hydraulic oil tank. Oil is returned from port L1 of the hydrostatic drive pump through a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Neutral Circuit

With the engine running and park brake set, the swash plate in the hydrostatic drive pump is in the neutral position; therefore, the hydrostatic drive pump does not pump any oil and no movement occurs. Charge pressure oil exists at the relief valves and check valves within the hydrostatic drive pump, subsequently at ports A, B, C, and D, and ports A and R of both drive motors. The charge pump oil makes up for the leakage from the closed loop hydrostatic drive system replenishing oil as needed.

Drive Circuit Neutral Schematic (Wheeled Machine with Manual Controls)

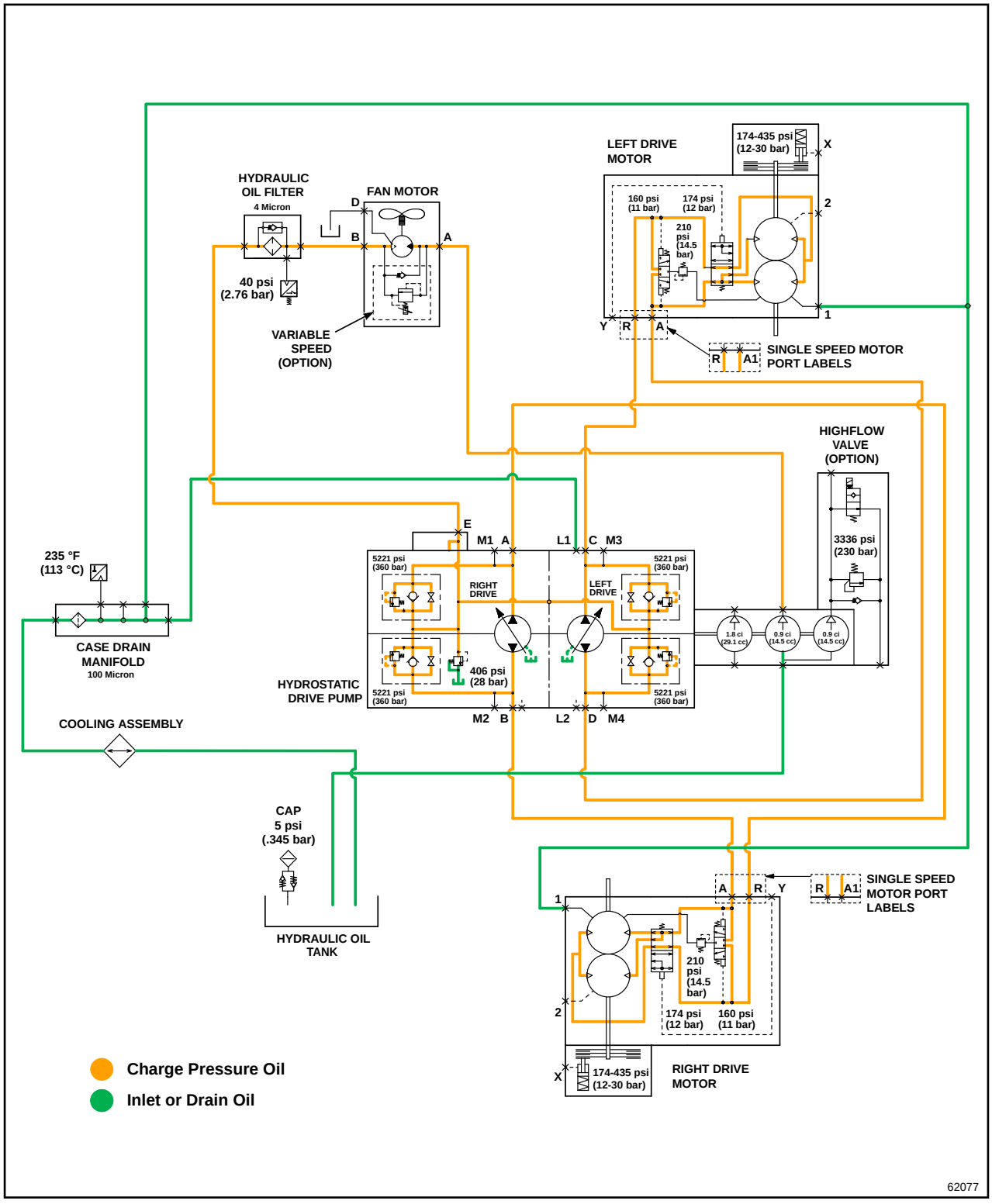


Figure 3-9

Drive Circuit—Neutral Theory of Operation (Track Machine with Manual Controls)

System Conditions:

- Engine running
- Park brake released

Hydrostatic Drive Pump Charge Circuit

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged. The oil is then routed through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The oil exits the hydrostatic drive pump through ports A, B, C, and D, and is routed to ports A and B of both drive motors. Oil is returned from port L of both drive motors through a 100 micron filter in the case drain manifold, then through the cooling assembly and back to the hydraulic oil tank. Oil is returned from port L1 of the hydrostatic drive pump through a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Neutral Circuit

With the engine running and park brake set, the swash plate in the hydrostatic drive pump is in the neutral position; therefore, the hydrostatic drive pump does not pump any oil and no movement occurs. Charge pressure oil exists at the relief valves and check valves within the hydrostatic drive pump, subsequently ports A, B, C, and D, and into ports A and B of both drive motors. The charge pump oil makes up for the leakage from the closed loop hydrostatic drive system replenishing oil as needed.

Drive Circuit Neutral Schematic (Track Machine with Manual Controls)

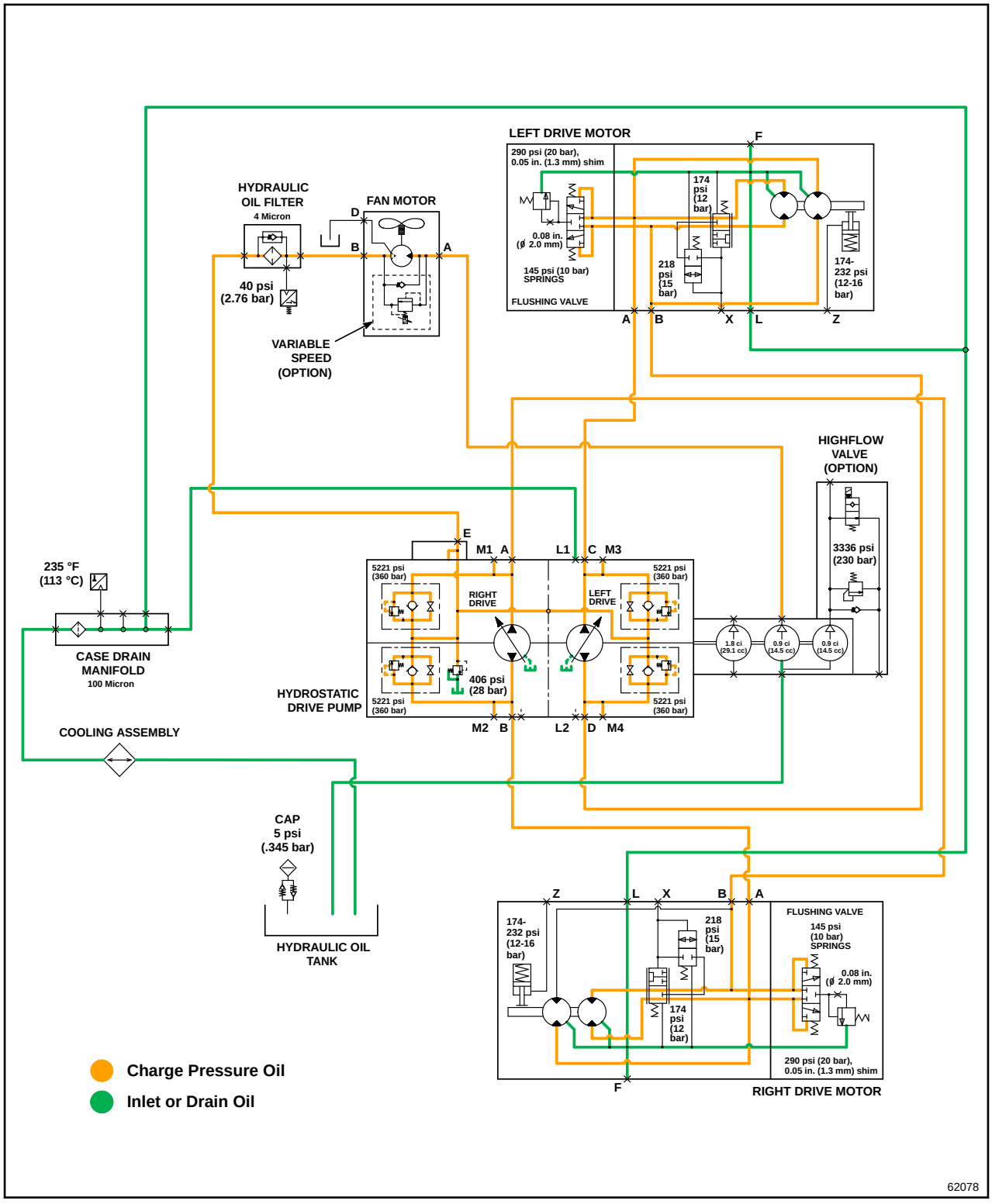


Figure 3-10

Drive Circuit—Forward Theory of Operation (Wheeled Machine with Electronic Controls)

NOTE

Port names differ between one and two speed drive motors. The two speed motor is described in this theory of operation. If machine is equipped with the one speed drive motor option, please see corresponding schematic for appropriate port naming.

System Conditions:

- Engine running
- Park brake released

Hydrostatic Drive Pump Charge Circuit

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged. The oil is then routed through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The oil exits the hydrostatic drive pump through ports A, B, C, and D, and is routed to ports A and R of both drive motors. Oil is returned from port 1 of both drive motors through a 100 micron filter in the case drain manifold, then through the cooling assembly and back to the hydraulic oil tank. Oil is returned from port L3 of the hydrostatic drive pump through a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Forward Theory of Operation

With the joystick(s) moved forward, charge pressure oil is directed to the desired side of the control piston via solenoids Y163-C2 and Y165-C1. This causes the control pistons to increase the displacement of the drive pumps in the forward direction. Pressurized oil is directed out from ports A and D of the hydrostatic drive pump. The oil is then routed to port A of both drive motors, driving the motors in a direction to achieve forward movement of the machine. Clockwise for the right motor and counter-clockwise for the left motor. Return oil exits through port R of both drive motors, and is returned to the hydrostatic drive pump through ports B and C to replenish the intake side of the right and left drive pumps. Drain oil is returned from port 1 of both drive motors to a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Drive Circuit Forward Schematic (Wheeled Machine with Electronic Controls)

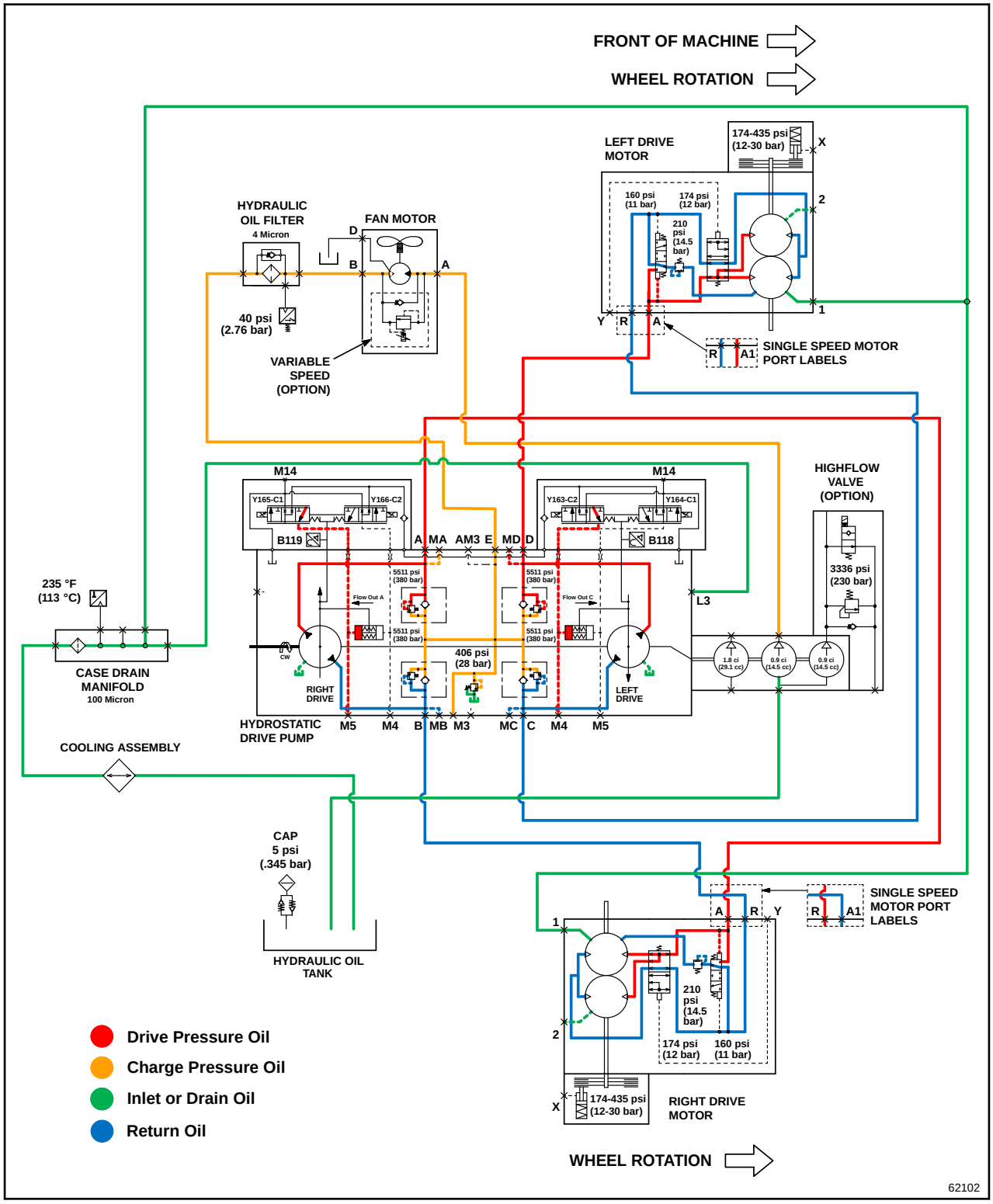


Figure 3-11

Drive Circuit—Forward Theory of Operation (Track Machine with Electronic Controls)

System Conditions:

- Engine running
- Park brake released

Hydrostatic Drive Pump Charge Circuit

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged. The oil is then routed through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The oil exits the hydrostatic drive pump through ports A, B, C, and D, and is routed to ports A and B of both drive motors. Oil is returned from port L of both drive motors through a 100 micron filter in the case drain manifold, then through the cooling assembly and back to the hydraulic oil tank. Oil is returned from port L3 of the hydrostatic drive pump through a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Forward Theory of Operation

With the joystick(s) moved forward, charge pressure oil is directed to the desired side of the control piston via solenoids Y163-C2 and Y165-C1. This causes the control pistons to increase the displacement of the drive pumps in the forward direction. Pressurized oil is directed out from ports A and D of the hydrostatic drive pump. The oil is then routed to port A of the right drive motor and port B of left drive motor, driving the motors in a direction to achieve forward movement of the machine. Clockwise for the right motor and counter-clockwise for the left motor. Return oil exits through port A of the left drive motor and port B of the right drive motor, and is returned to the hydrostatic drive pump through ports B and C to replenish the intake side of the right and left drive pumps. Drain oil is returned from port L of both drive motors to a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Drive Circuit Forward Schematic (Track Machine with Electronic Controls)

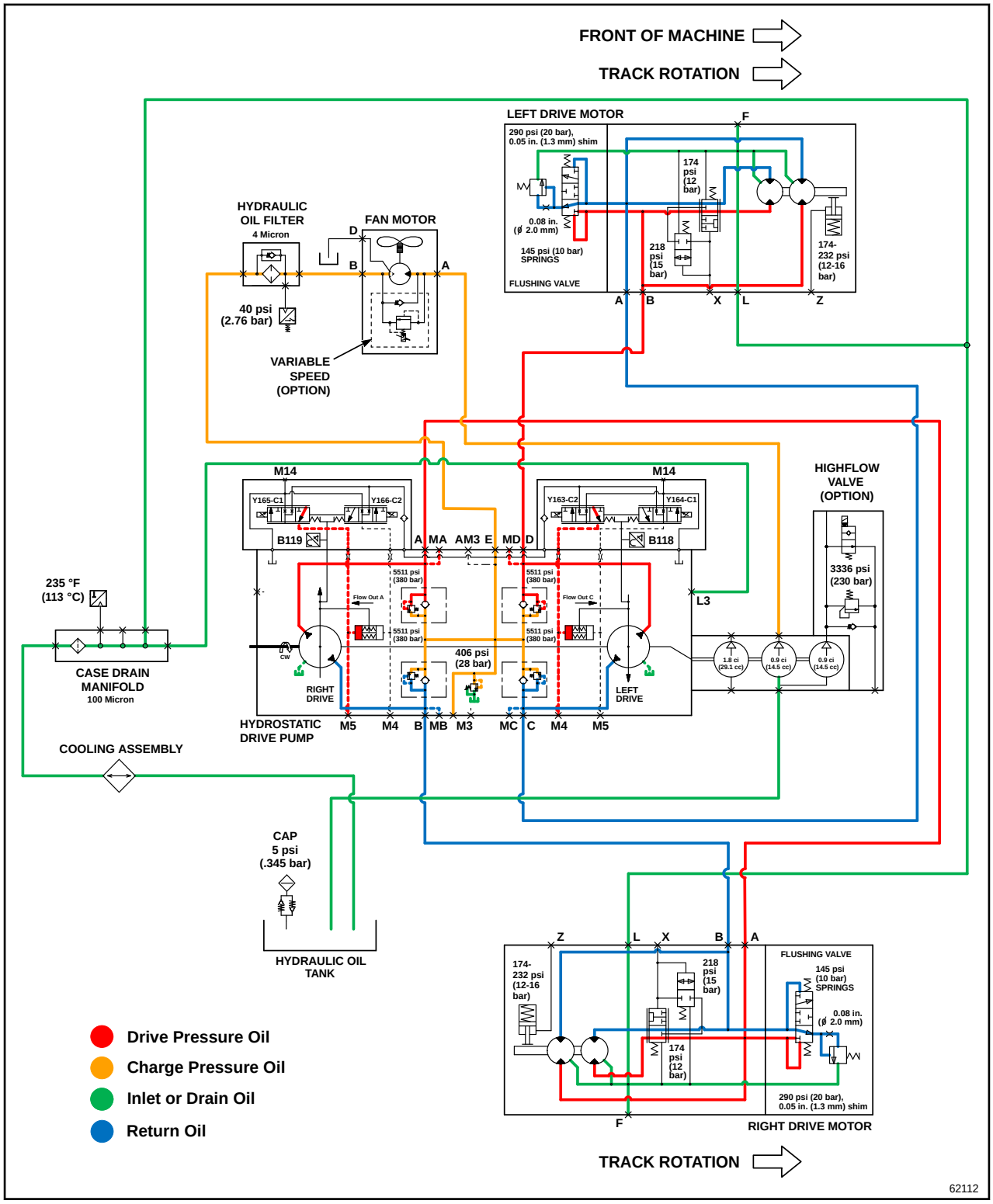


Figure 3-12

Drive Circuit—Forward Theory of Operation (Wheeled Machine with Manual Controls)

NOTE

Port names differ between one and two speed drive motors. The two speed motor is described in this theory of operation. If machine is equipped with the one speed drive motor option, please see corresponding schematic for appropriate port naming.

System Conditions:

- Engine running
- Park brake released

Hydrostatic Drive Pump Charge Circuit

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged. The oil is then routed through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The oil exits the hydrostatic drive pump through ports A, B, C, and D, and is routed to ports A and R of both drive motors. Oil is returned from port 1 of both drive motors through a 100 micron filter in the case drain manifold, then through the cooling assembly and back to the hydraulic oil tank. Oil is returned from port L1 of the hydrostatic drive pump through a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Forward Theory of Operation

With the joystick(s) moved forward, drive pressure oil is directed out from ports B and D of the hydrostatic drive pump. The oil is then routed to port A of both drive motors, driving the motors in a direction to achieve forward movement of the machine. Clockwise for the right motor and counter-clockwise for the left motor. Return oil exits through port R of both drive motors, and is returned to the hydrostatic drive pump through ports A and C to replenish the intake side of the right and left drive pumps. Drain oil is returned from port 1 of both drive motors to a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Drive Circuit Forward Schematic (Wheeled Machine with Manual Controls)

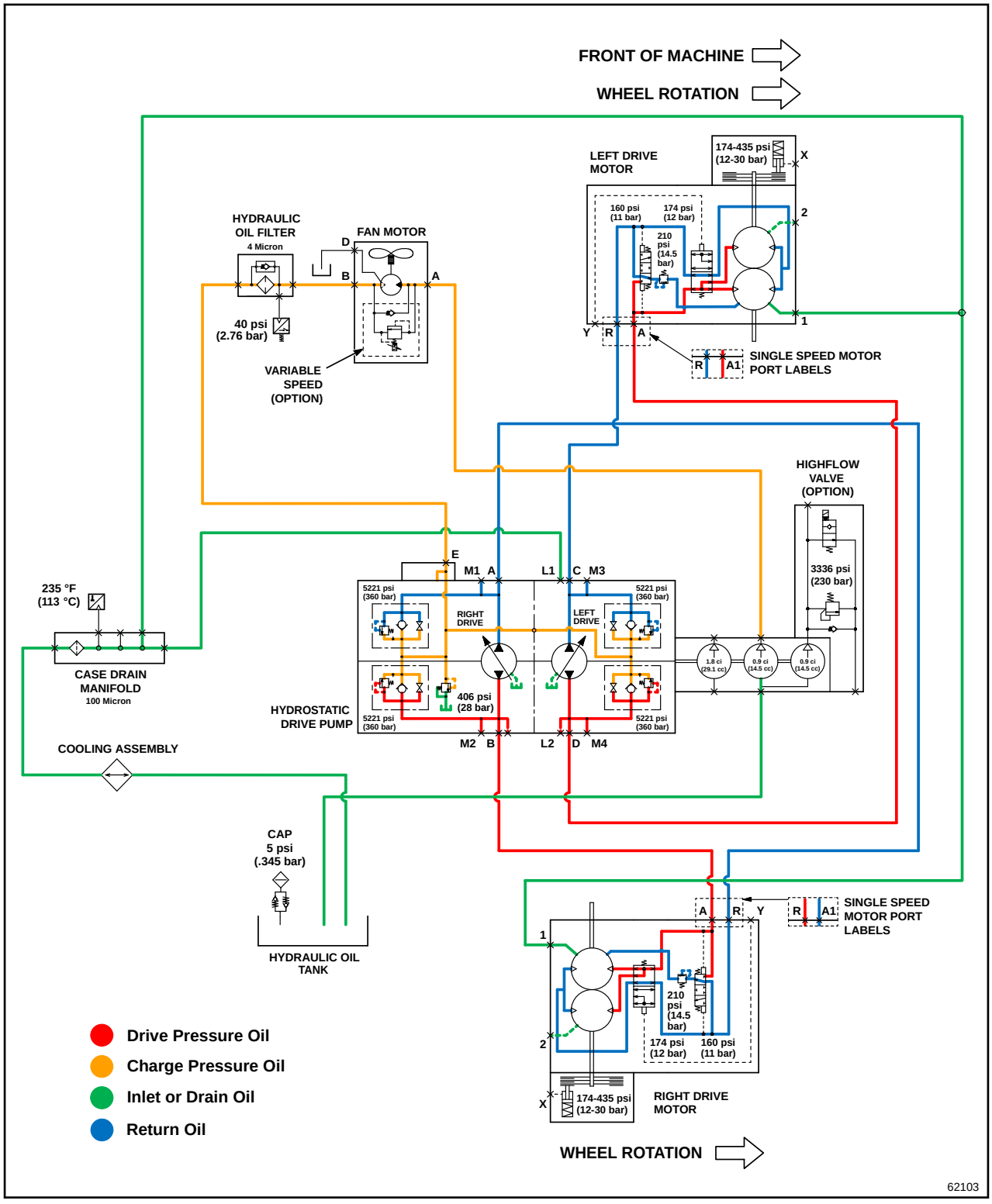


Figure 3-13

Drive Circuit—Forward Theory of Operation (Track Machine with Manual Controls)

System Conditions:

- Engine running
- Park brake released

Hydrostatic Drive Pump Charge Circuit

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged. The oil is then routed through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The oil exits the hydrostatic drive pump through ports A, B, C, and D, and is routed to ports A and B of both drive motors. Oil is returned from port L of both drive motors through a 100 micron filter in the case drain manifold, then through the cooling assembly and back to the hydraulic oil tank. Oil is returned from port L1 of the hydrostatic drive pump through a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Forward Theory of Operation

With the joystick(s) moved forward, drive pressure oil is directed out from ports B and D of the hydrostatic drive pump. The oil is then routed to port A of the right drive motor and port B of left drive motor, driving the motors in a direction to achieve forward movement of the machine. Clockwise for the right motor and counter-clockwise for the left motor. Return oil exits through port A of the left drive motor and port B of the right drive motor, and is returned to the hydrostatic drive pump through ports A and C to replenish the intake side of the right and left drive pumps. Drain oil is returned from port L of both drive motors to a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Drive Circuit Forward Schematic (Track Machine with Manual Controls)

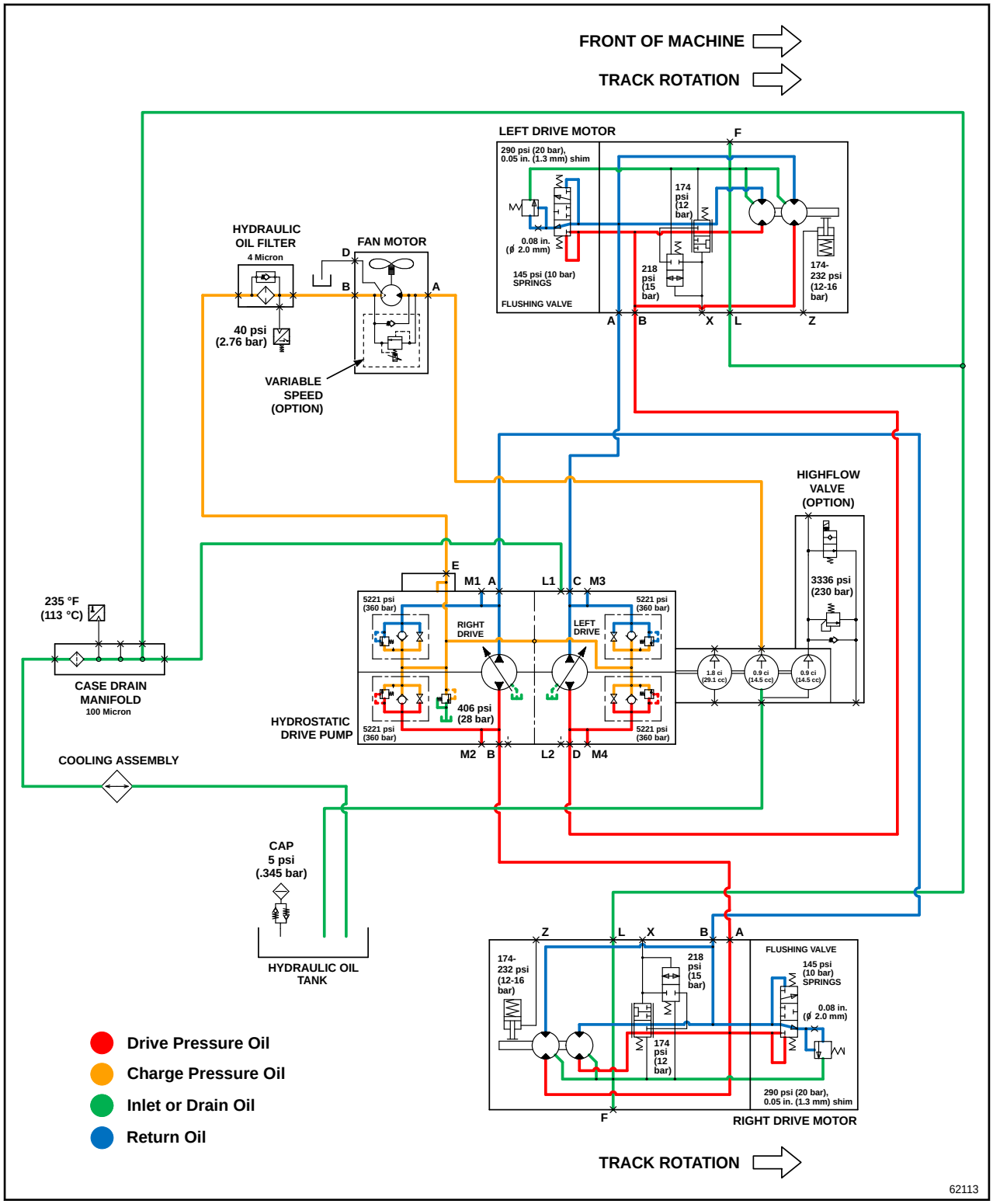


Figure 3-14

Drive Circuit—Reverse Theory of Operation (Wheeled Machine with Electronic Controls)

NOTE

Port names differ between one and two speed drive motors. The two speed motor is described in this theory of operation. If machine is equipped with the one speed drive motor option, please see corresponding schematic for appropriate port naming.

System Conditions:

- Engine running
- Park brake released

Hydrostatic Drive Pump Charge Circuit

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged. The oil is then routed through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The oil exits the hydrostatic drive pump through ports A, B, C, and D, and is routed to ports A and R of both drive motors. Oil is returned from port 1 of both drive motors through a 100 micron filter in the case drain manifold, then through the cooling assembly and back to the hydraulic oil tank. Oil is returned from port L3 of the hydrostatic drive pump through a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Reverse Theory of Operation

With the joystick(s) pulled back, charge pressure oil is directed to the desired side of the control piston via solenoids Y164-C1 and Y166-C2. This causes the control pistons to increase the displacement of the drive pumps in the reverse direction. Pressurized oil is directed out from ports B and C of the hydrostatic drive pump. The oil is then routed to port R of both motors, driving the motors in in a direction to achieve forward movement of the machine. Clockwise for the left motor and counter-clockwise for the right motor. Return oil exits through port A of both drive motors, and is returned to the hydrostatic drive pump through ports A and D to replenish the intake side of the right and left drive pumps. Drain oil is returned from port 1 of both drive motors to a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Drive Circuit Reverse Schematic (Wheeled Machine with Electronic Controls)

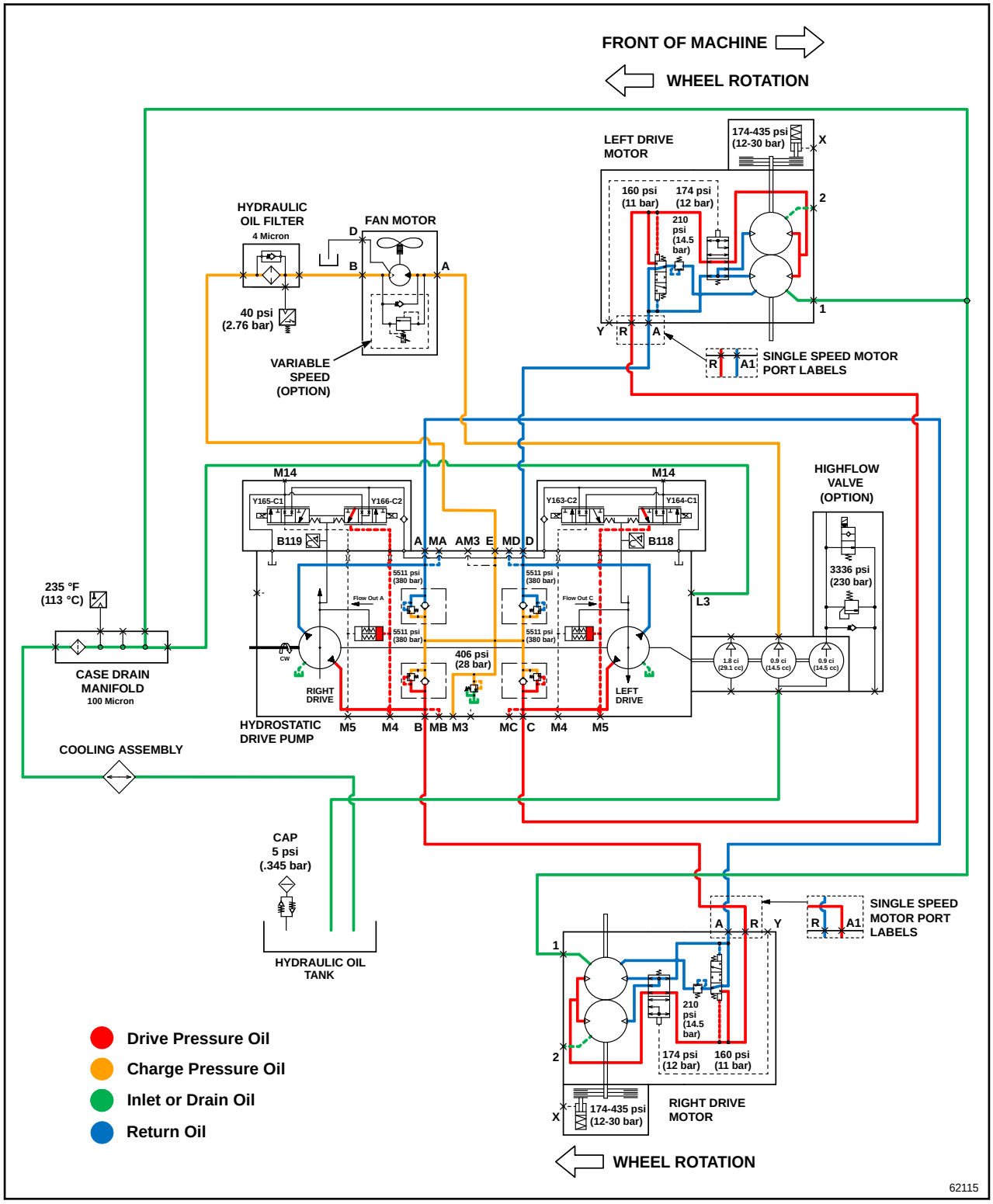


Figure 3-15

Drive Circuit—Reverse Theory of Operation (Track Machine with Electronic Controls)

System Conditions:

- Engine running
- Park brake released

Hydrostatic Drive Pump Charge Circuit

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged. The oil is then routed through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The oil exits the hydrostatic drive pump through ports A, B, C, and D, and is routed to ports A and B of both drive motors. Oil is returned from port L of both drive motors through a 100 micron filter in the case drain manifold, then through the cooling assembly and back to the hydraulic oil tank. Oil is returned from port L3 of the hydrostatic drive pump through a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Reverse Theory of Operation

With the joystick(s) pulled back, charge pressure oil is directed to the desired side of the control piston via solenoids Y164-C1 and Y166-C2. This causes the control pistons to increase the displacement of the drive pumps in the reverse direction. Pressurized oil is directed out from ports B and C of the hydrostatic drive pump. The oil is then routed to port A of the left drive motor and port B of the right drive motor, driving the motors in a direction to achieve reverse movement of the machine. Clockwise for the left motor and counter-clockwise for the right motor. Return oil exits through port B of the left drive motor and port A of the right drive motor, and is returned to the hydrostatic drive pump through ports A and D to replenish the intake side of the right and left drive pumps. Drain oil is returned from port L of both drive motors to a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Drive Circuit Reverse Schematic (Track Machine with Electronic Controls)

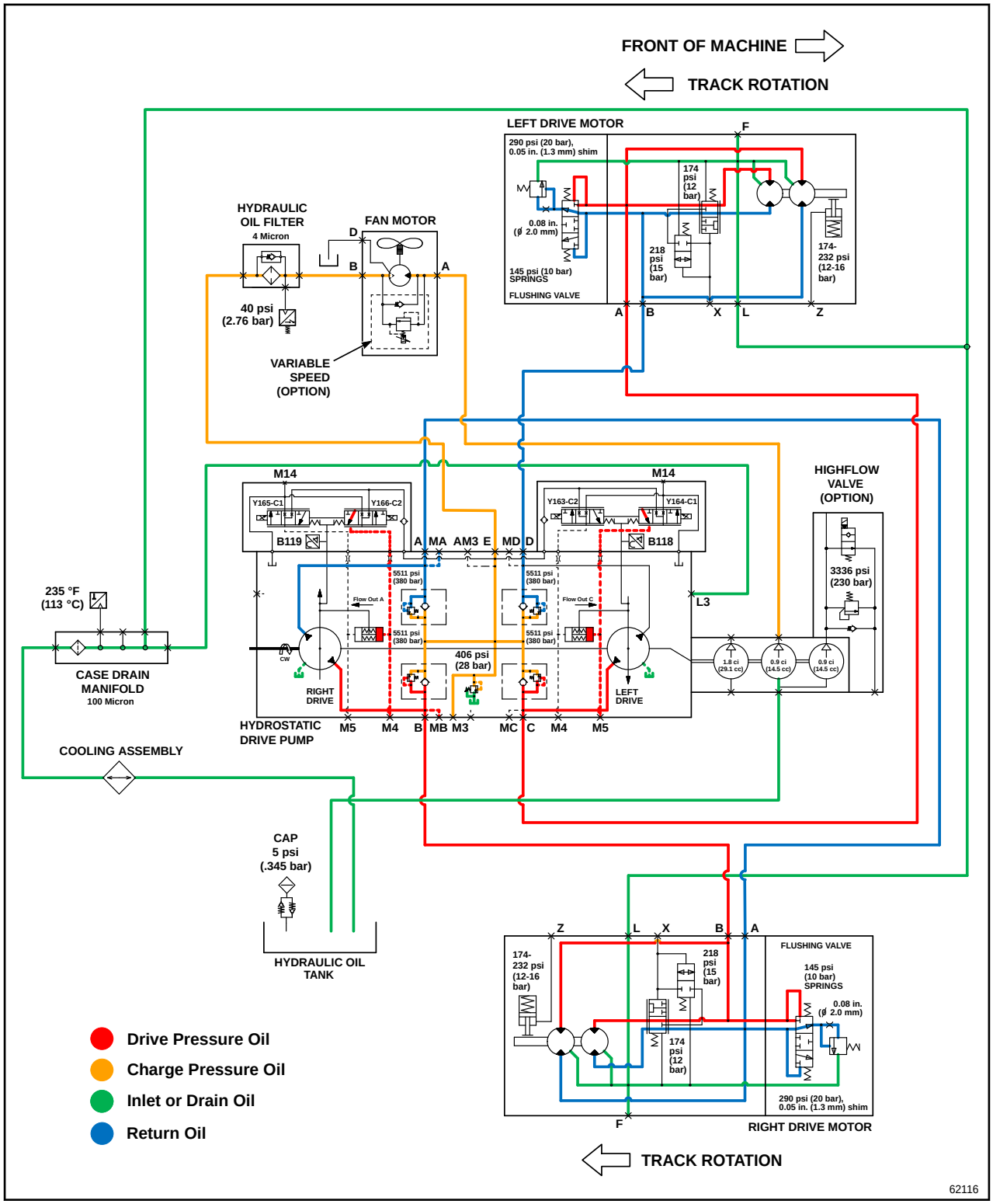


Figure 3-16: Drive Circuit Reverse Schematic

Drive Circuit—Reverse Theory of Operation (Wheeled Machine with Manual Controls)

NOTE

Port names differ between one and two speed drive motors. The two speed motor is described in this theory of operation. If machine is equipped with the one speed drive motor option, please see corresponding schematic for appropriate port naming.

System Conditions:

- Engine running
- Park brake released

Hydrostatic Drive Pump Charge Circuit

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged. The oil is then routed through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The oil exits the hydrostatic drive pump through ports A, B, C, and D, and is routed to ports A and R of both drive motors. Oil is returned from port 1 of both drive motors through a 100 micron filter in the case drain manifold, then through the cooling assembly and back to the hydraulic oil tank. Oil is returned from port L1 of the hydrostatic drive pump through a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Reverse Theory of Operation

With the joystick(s) pulled back, drive pressure oil is directed out from ports A and C of the hydrostatic drive pump. The oil is then routed to port R of both drive motors, driving the motors in in a direction to achieve reverse movement of the machine. Clockwise for the left motor and counter-clockwise for the right motor. Return oil exits through port A of both drive motors, and is returned to the hydrostatic drive pump through ports B and D to replenish the intake side of the right and left drive pumps. Drain oil is returned from port 1 of both drive motors to a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Drive Circuit Reverse Schematic (Wheeled Machine with Manual Controls)

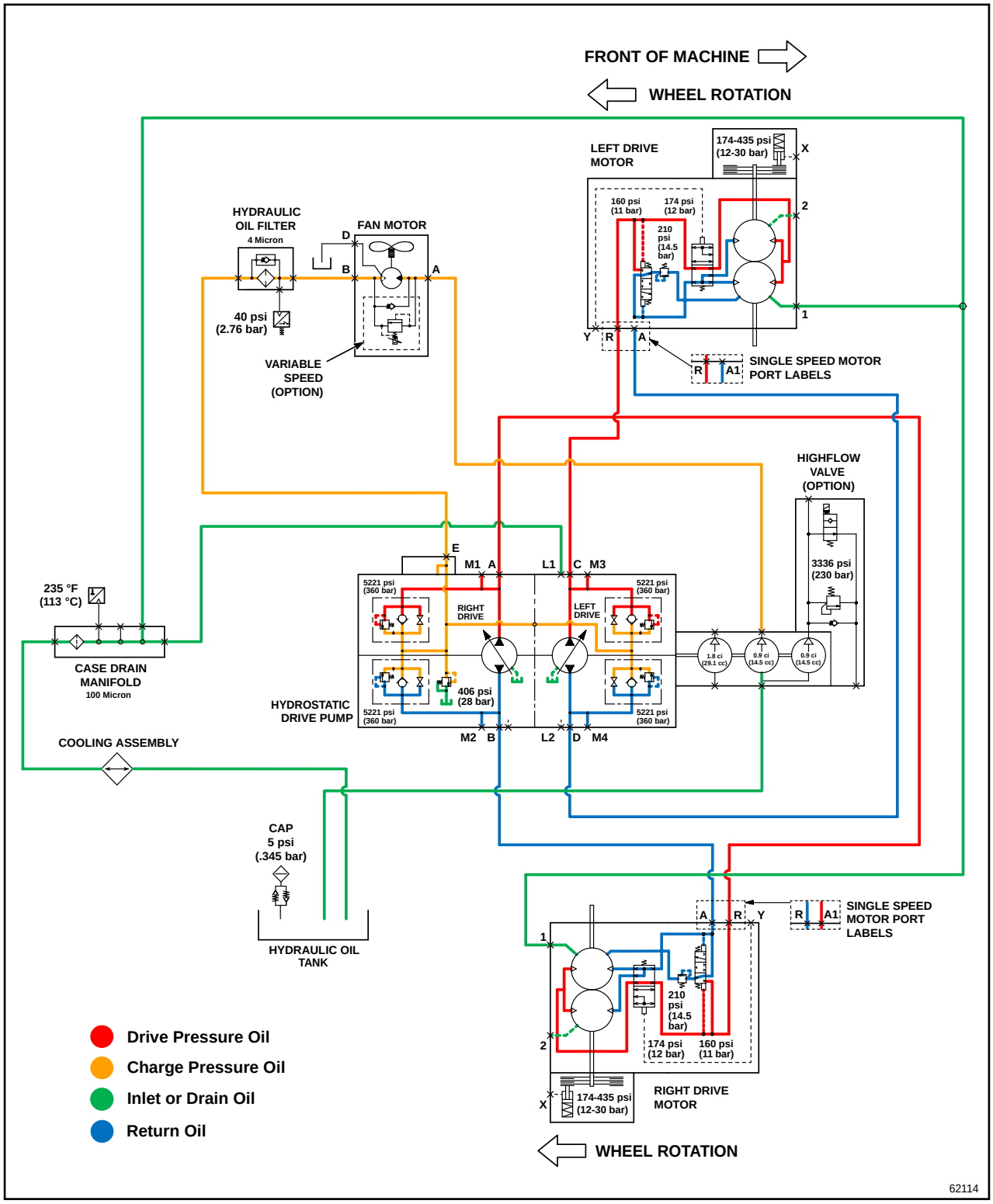


Figure 3-17

Drive Circuit—Reverse Theory of Operation (Track Machine with Manual Controls)

System Conditions:

- Engine running
- Park brake released

Hydrostatic Drive Pump Charge Circuit

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged. The oil is then routed through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The oil exits the hydrostatic drive pump through ports A, B, C, and D, and routed to ports A and B of both drive motors. Oil is returned from port L of both drive motors through a 100 micron filter in the case drain manifold, then through the cooling assembly and back to the hydraulic oil tank. Oil is returned from port L1 of the hydrostatic drive pump through a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Reverse Theory of Operation

With the joystick(s) pulled back, drive pressure oil is directed out from ports A and C of the hydrostatic drive pump. The oil is then routed to port B of the right drive motor and port A of left drive motor, driving the motors in a direction to achieve reverse movement of the machine. Clockwise for the left motor and counter-clockwise for the right motor. Return oil exits through port B of the left drive motor and port A of the right drive motor, and is returned to the hydrostatic drive pump through ports B and D to replenish the intake side of the right and left drive pumps. Drain oil is returned from port L of both drive motors to a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Drive Circuit Reverse Schematic (Track Machine with Manual Controls)

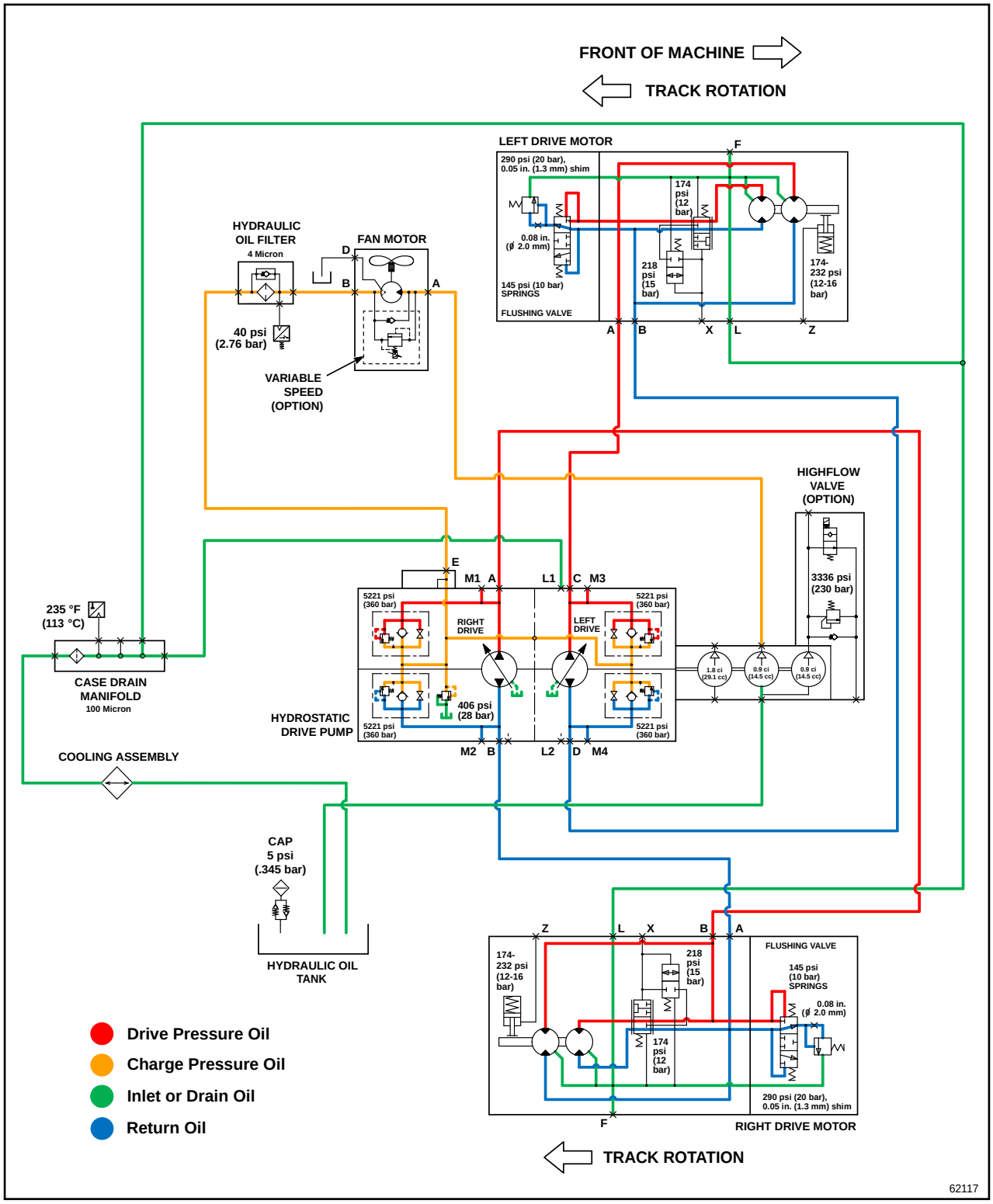


Figure 3-18

Drive Circuit—Right Turn Theory of Operation (Wheeled Machine with Electronic Controls)

NOTE

Port names differ between one and two speed drive motors. The two speed motor is described in this theory of operation. If machine is equipped with the one speed drive motor option, please see corresponding schematic for appropriate port naming.

System Conditions:

- Engine running
- Park brake released

Hydrostatic Drive Pump Charge Circuit

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged. The oil is then routed through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The oil exits the hydrostatic drive pump through ports A, B, C, and D, and is routed to ports A and R of both drive motors. Oil is returned from port 1 of both drive motors through a 100 micron filter in the case drain manifold, then through the cooling assembly and back to the hydraulic oil tank. Oil is returned from port L3 of the hydrostatic drive pump through a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Right Turn Circuit

With the joystick(s) in the right turn position, charge pressure oil is directed to the desired side of the control piston via solenoids Y163-C2 and Y166-C2. This causes the control pistons to increase the displacement of the drive pumps in the right turn directions. Pressurized oil is directed out from ports B and D of the hydrostatic drive pump. The oil is then routed to port A of the left drive motor and port R of the right drive motor, driving the motors in a direction to achieve right turn movement of the machine. Counter-clockwise for the left and right motors. Return oil exits through port R of the left drive motor and port A of the right drive motor, and is returned to the hydrostatic drive pump through ports A and C to replenish the right and left sides of the hydrostatic drive pump. Drain oil is returned from port 1 of both drive motors to a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Drive Circuit Right Turn Schematic (Wheeled Machine with Electronic Controls)

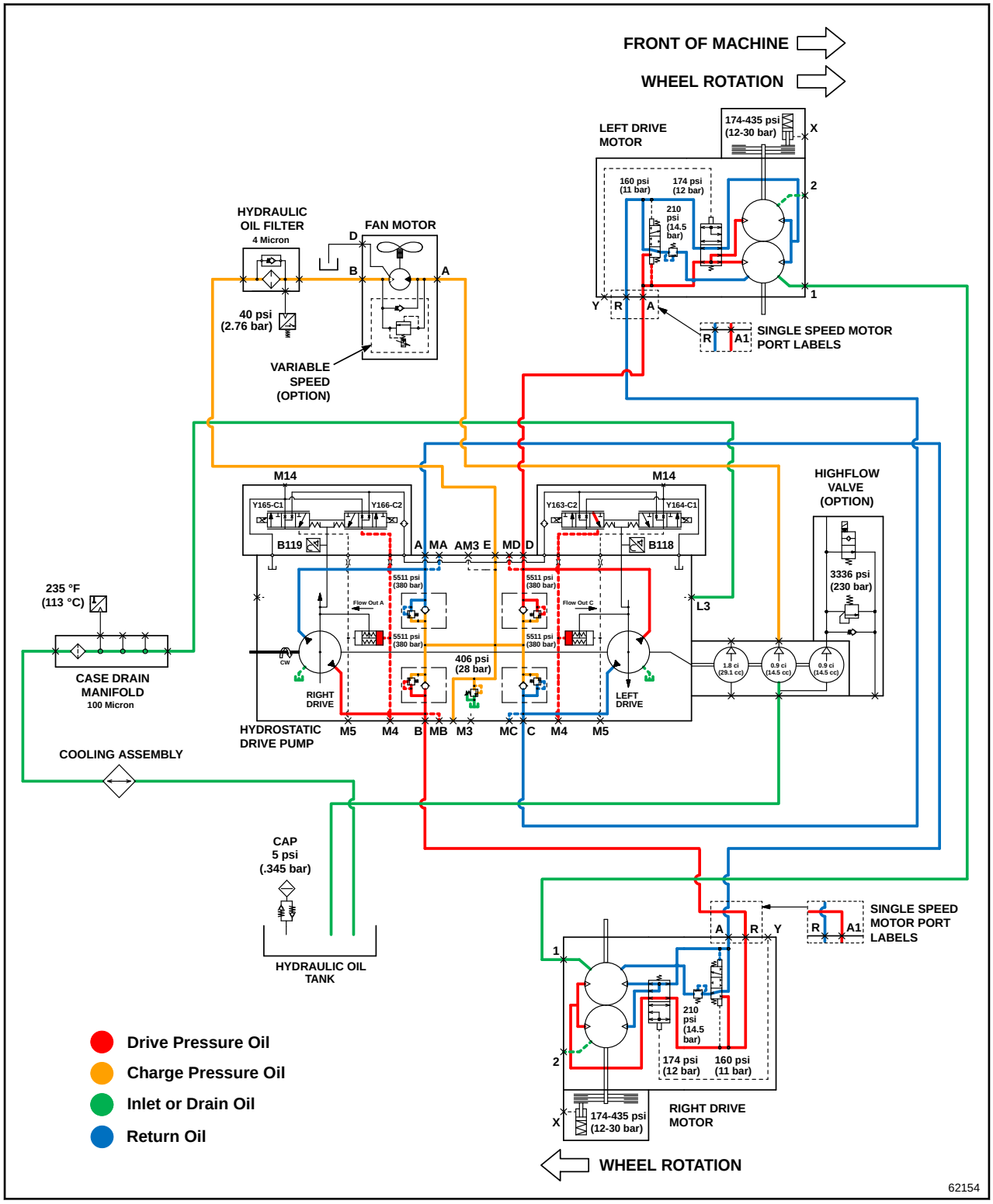


Figure 3-19

Drive Circuit—Right Turn Theory of Operation (Track Machine with Electronic Controls)

System Conditions:

- Engine running
- Park brake released

Hydrostatic Drive Pump Charge Circuit

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged. The oil is then routed through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The oil exits the hydrostatic drive pump through ports A, B, C, and D, and is routed to ports A and B of both drive motors. Oil is returned from port L of both drive motors through a 100 micron filter in the case drain manifold, then through the cooling assembly and back to the hydraulic oil tank. Oil is returned from port L3 of the hydrostatic drive pump through a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Right Turn Circuit

With the joystick(s) in the right turn position, charge pressure oil is directed to the desired side of the control piston via solenoids Y163-C2 and Y166-C2. This causes the control pistons to increase the displacement of the drive pumps in the right turn directions. Pressurized oil is directed out from ports B and D of the hydrostatic drive pump. The oil is then routed to ports B of both the right and left drive motor, driving the motors in a direction to achieve right turn movement of the machine. Counter-clockwise for both right and left motors. Return oil exits through port A of the right and left drive motor, and is returned to the hydrostatic drive pump through ports A and C to replenish the right and left sides of the hydrostatic drive pump. Drain oil is returned from port L of both drive motors to a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Drive Circuit Right Turn Schematic (Track Machine with Electronic Controls)

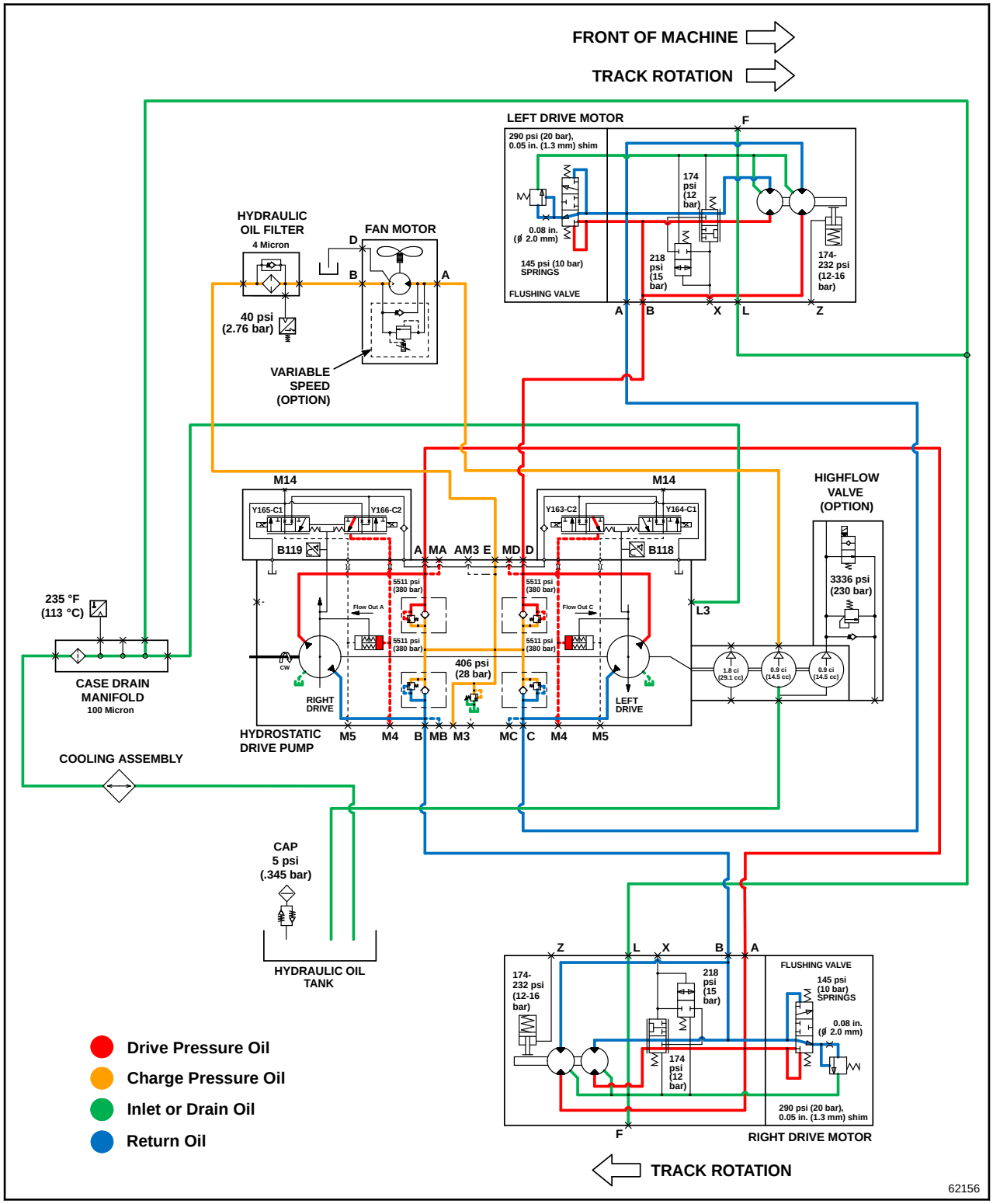


Figure 3-20

Drive Circuit—Right Turn Theory of Operation (Wheeled Machine with Manual Controls)

NOTE

Port names differ between one and two speed drive motors. The two speed motor is described in this theory of operation. If machine is equipped with the one speed drive motor option, please see corresponding schematic for appropriate port naming.

System Conditions:

- Engine running
- Park brake released

Hydrostatic Drive Pump Charge Circuit

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged. The oil is then routed through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The oil exits the hydrostatic drive pump through ports A, B, C, and D, and is routed to ports A and R of both drive motors. Oil is returned from port 1 of both drive motors through a 100 micron filter in the case drain manifold, then through the cooling assembly and back to the hydraulic oil tank. Oil is returned from port L1 of the hydrostatic drive pump through a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Right Turn Circuit

With the left joystick moved forward and the right joystick pulled back, drive pressure oil is directed out from ports A and D of the hydrostatic drive pump. The oil is then routed to port A of the left drive motor and port R of the right drive motor, driving the motors in a direction to achieve right turn movement of the machine. Counter-clockwise for the right and left motors. Return oil exits through port R of the left drive motor and port A of the right drive motor, and is returned to the hydrostatic drive pump through ports B and C to replenish the right and left sides of the hydrostatic drive pump. Drain oil is returned from port 1 of both drive motors to a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Drive Circuit Right Turn Schematic (Wheeled Machine with Manual Controls)

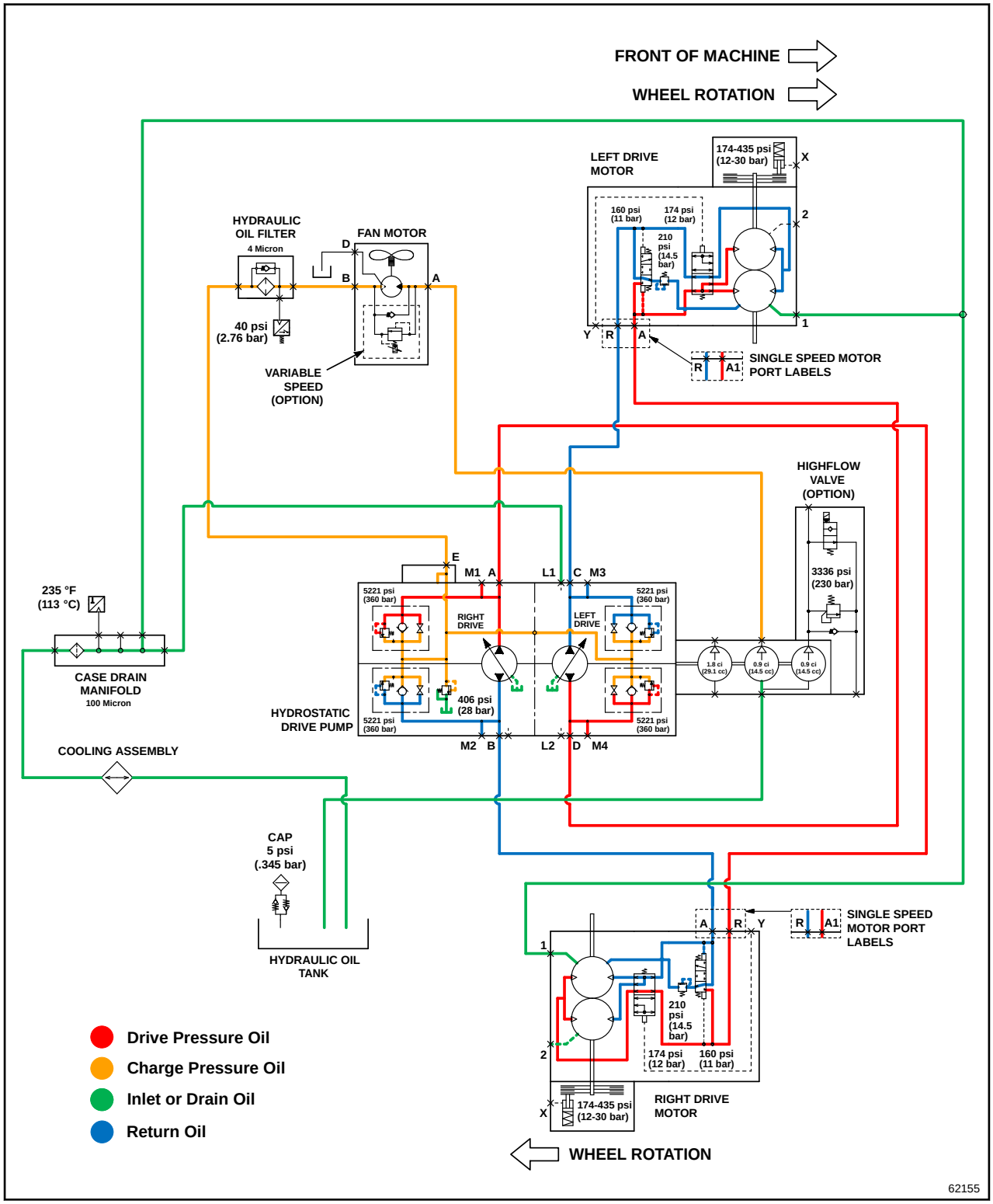


Figure 3-21

Drive Circuit—Right Turn Theory of Operation (Track Machine with Manual Controls)

System Conditions:

- Engine running
- Park brake released

Hydrostatic Drive Pump Charge Circuit

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged. The oil is then routed through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The oil exits the hydrostatic drive pump through ports A, B, C, and D, and is routed to ports A and B of both drive motors. Oil is returned from port L of both drive motors through a 100 micron filter in the case drain manifold, then through the cooling assembly and back to the hydraulic oil tank. Oil is returned from port L1 of the hydrostatic drive pump through a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Right Turn Circuit

With the left joystick moved forward and the right joystick pulled back, drive pressure oil is directed out from ports B and D of the hydrostatic drive pump. The oil is then routed to port B and port A of right drive motor, driving the motors in a direction to achieve right turn movement of the machine. Counter-clockwise for the right and left motor. Return oil exits through port A of the left drive motor and port B of the right drive motor, and is returned to the hydrostatic drive pump through ports A and C to replenish the right and left sides of the hydrostatic drive pump. Drain oil is returned from port L of both drive motors to a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Drive Circuit Right Turn Schematic (Track Machine with Manual Controls)

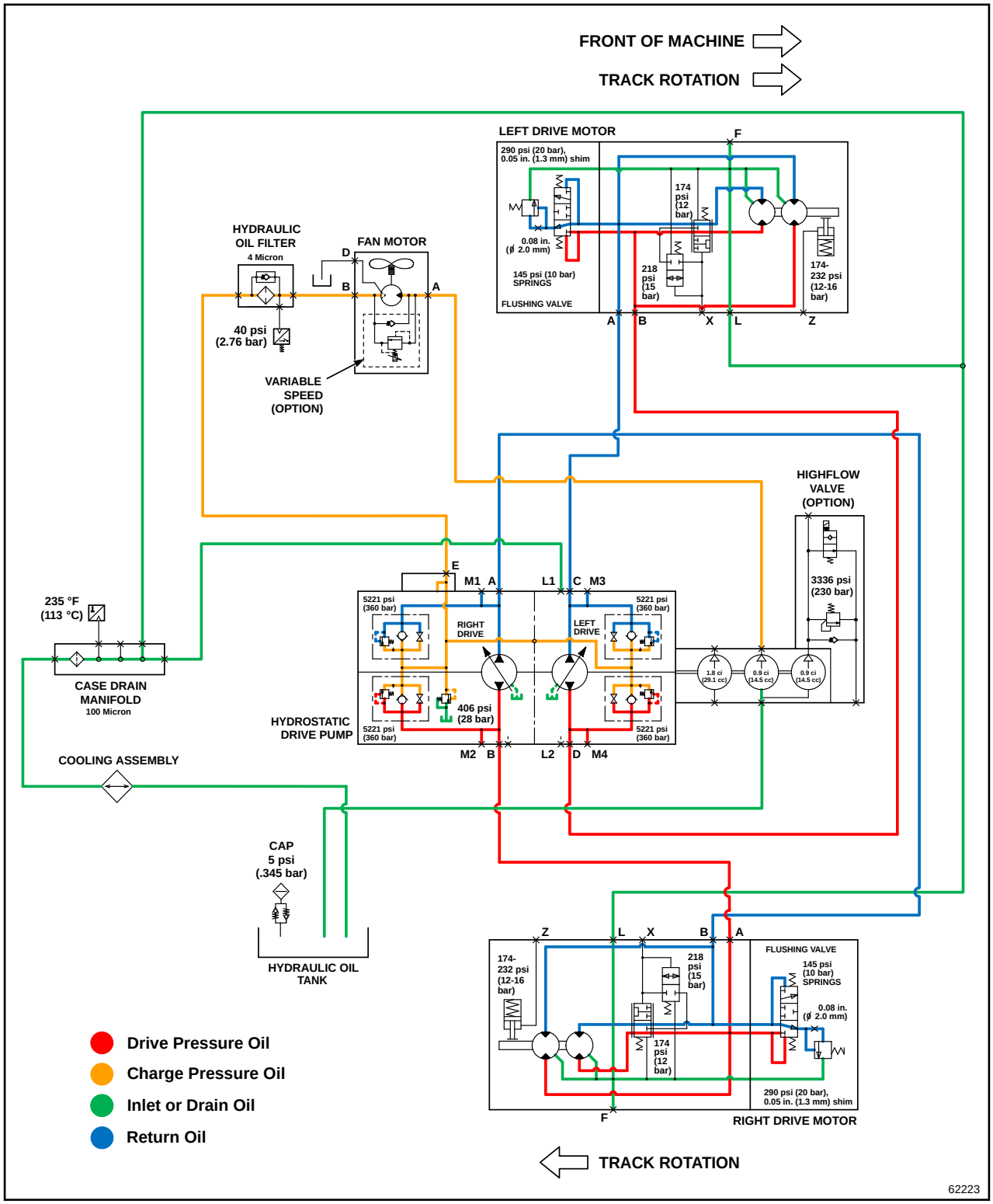


Figure 3-22

Drive Circuit—Left Turn Theory of Operation (Wheeled Machine with Electronic Controls)

NOTE

Port names differ between one and two speed drive motors. The two speed motor is described in this theory of operation. If machine is equipped with the one speed drive motor option, please see corresponding schematic for appropriate port naming.

System Conditions:

- Engine running
- Park brake released

Hydrostatic Drive Pump Charge Circuit

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged. The oil is then routed through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The oil exits the hydrostatic drive pump through ports A, B, C, and D, and is routed to ports A and R of both drive motors. Oil is returned from port 1 of both drive motors through a 100 micron filter in the case drain manifold, then through the cooling assembly and back to the hydraulic oil tank. Oil is returned from port L3 of the hydrostatic drive pump through a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly, and back to the hydraulic oil tank.

Left Turn Circuit

With the joystick(s) in the left turn position, charge pressure oil is directed to the desired side of the control piston via solenoids Y164-C1 and Y165-C1. This causes the control pistons to increase the displacement of the drive pumps in the left turn direction. Pressurized oil is directed out from ports A and C of the hydrostatic drive pump. The oil is then routed to port R of the left drive motor and port A of the right drive motor, driving the motors in a direction to achieve left turn movement of the machine. Clockwise for the right and left motors. Return oil exits through port A of the left drive motor and port R of the right drive motor, and is returned to the hydrostatic drive pump through ports B and D to replenish the right and left sides of the hydrostatic drive pump. Drain oil is returned from port 1 of both drive motors to a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Drive Circuit Left Turn Schematic (Wheeled Machine with Electronic Controls)

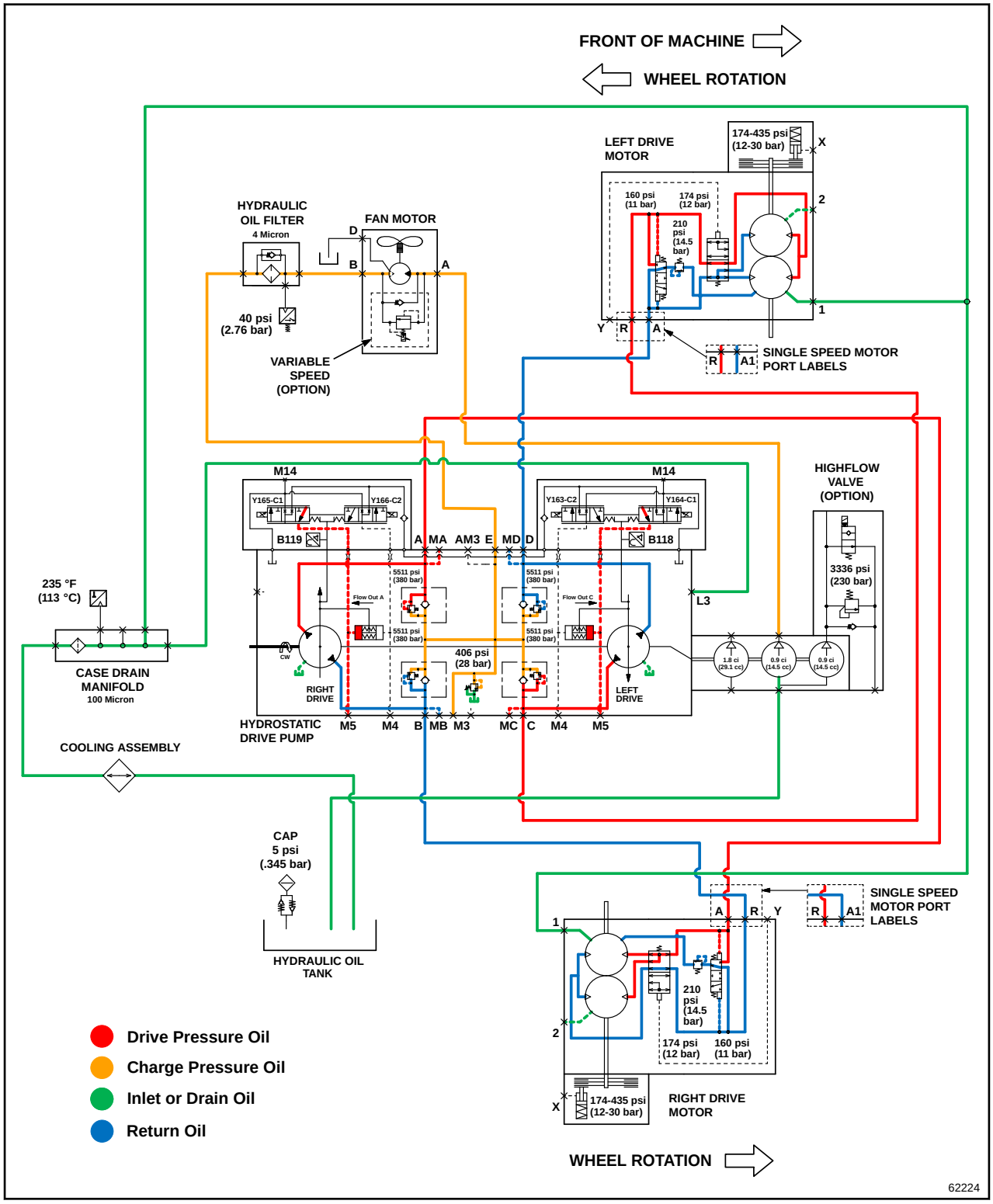


Figure 3-23

Drive Circuit—Left Turn Theory of Operation (Track Machine with Electronic Controls)

System Conditions:

- Engine running
- Park brake released

Hydrostatic Drive Pump Charge Circuit

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged. The oil is then routed through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The oil exits the hydrostatic drive pump through ports A, B, C, and D, and is routed to ports A and B of both drive motors. Oil is returned from port L of both drive motors through a 100 micron filter in the case drain manifold, then through the cooling assembly and back to the hydraulic oil tank. Oil is returned from port L3 of the hydrostatic drive pump through a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Left Turn Circuit

With the joystick(s) in the left turn position, charge pressure oil is directed to the desired side of the control piston via solenoids Y164-C1 and Y165-C1. This causes the control pistons to increase the displacement of the drive pumps in the left turn direction. Pressurized oil is directed out from ports A and C of the hydrostatic drive pump, driving the motors. in a direction to achieve left turn movement of the machine. Clockwise for the right and left motors. Return oil exits through port A of both the right and left drive motors, and is returned to the hydrostatic drive pump through ports B and D to replenish the right and left sides of the hydrostatic drive pump. Drain oil is returned from port L of both drive motors to a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Drive Circuit Left Turn Schematic (Track Machine with Electronic Controls)

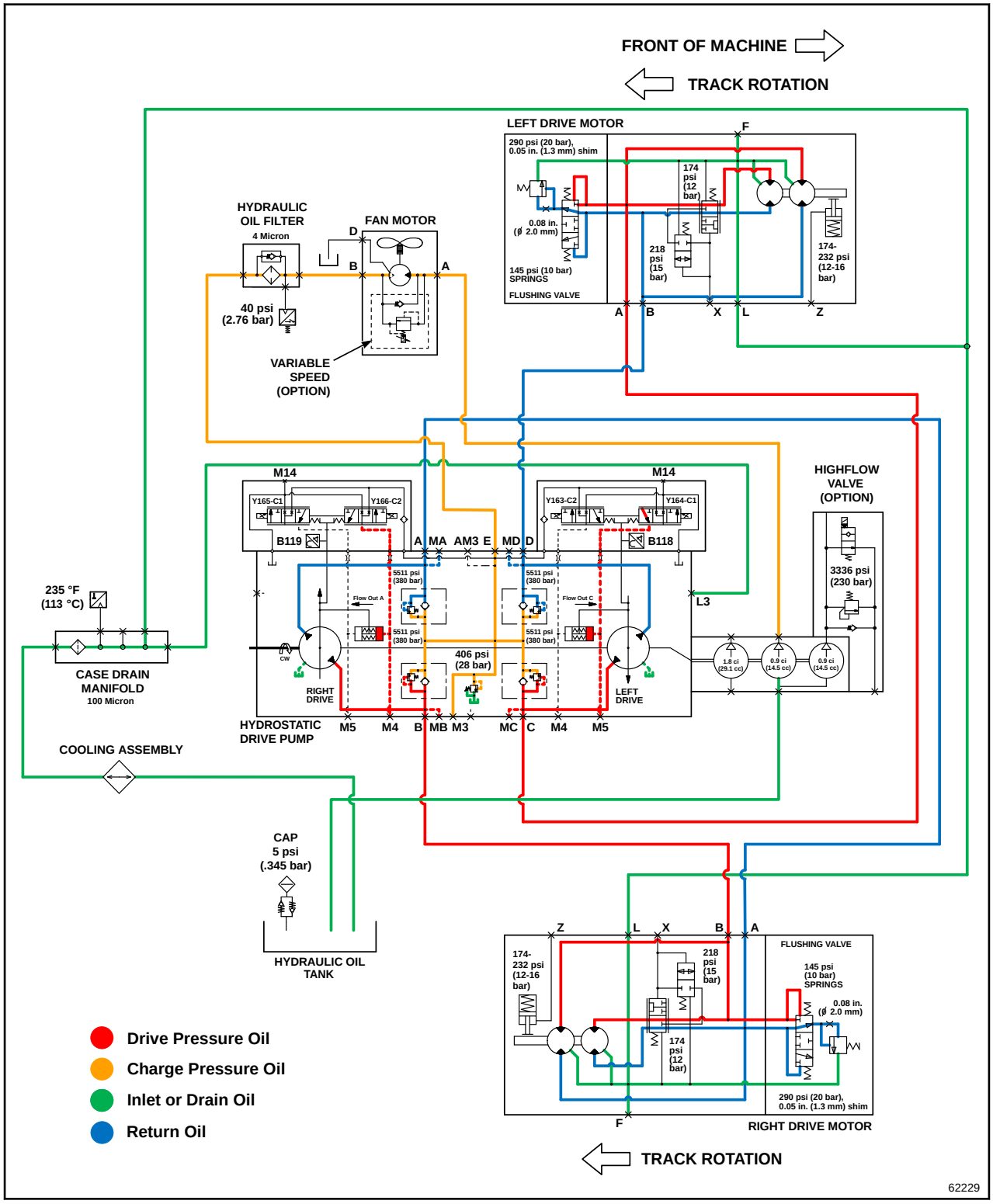


Figure 3-24

Drive Circuit—Left Turn Theory of Operation (Wheeled Machine with Manual Controls)

NOTE

Port names differ between one and two speed drive motors. The two speed motor is described in this theory of operation. If machine is equipped with the one speed drive motor option, please see corresponding schematic for appropriate port naming.

System Conditions:

- Engine running
- Park brake released

Hydrostatic Drive Pump Charge Circuit

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged. The oil is then routed through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The oil exits the hydrostatic drive pump through ports A, B, C, and D, and is routed to ports A and R of both drive motors. Oil is returned from port 1 of both drive motors through a 100 micron filter in the case drain manifold, then through the cooling assembly and back to the hydraulic oil tank. Oil is returned from port L1 of the hydrostatic drive pump through a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Left Turn Circuit

With the left joystick pulled back and the right joystick moved forward, drive pressure oil is directed out from ports B and C of the hydrostatic drive pump. The oil is then routed to port R of the left drive motor and port A of the right drive motor, driving in a direction to achieve left turn movement of the machine. Clockwise for the right and left motors. Return oil exits through port A of the left drive motor and port R of the right drive motor, and is returned to the hydrostatic drive pump through ports A and D to replenish the right and left sides of the hydrostatic drive pump. Drain oil is returned from port 1 of both drive motors to a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Drive Circuit Left Turn Schematic (Wheeled Machine with Manual Controls)

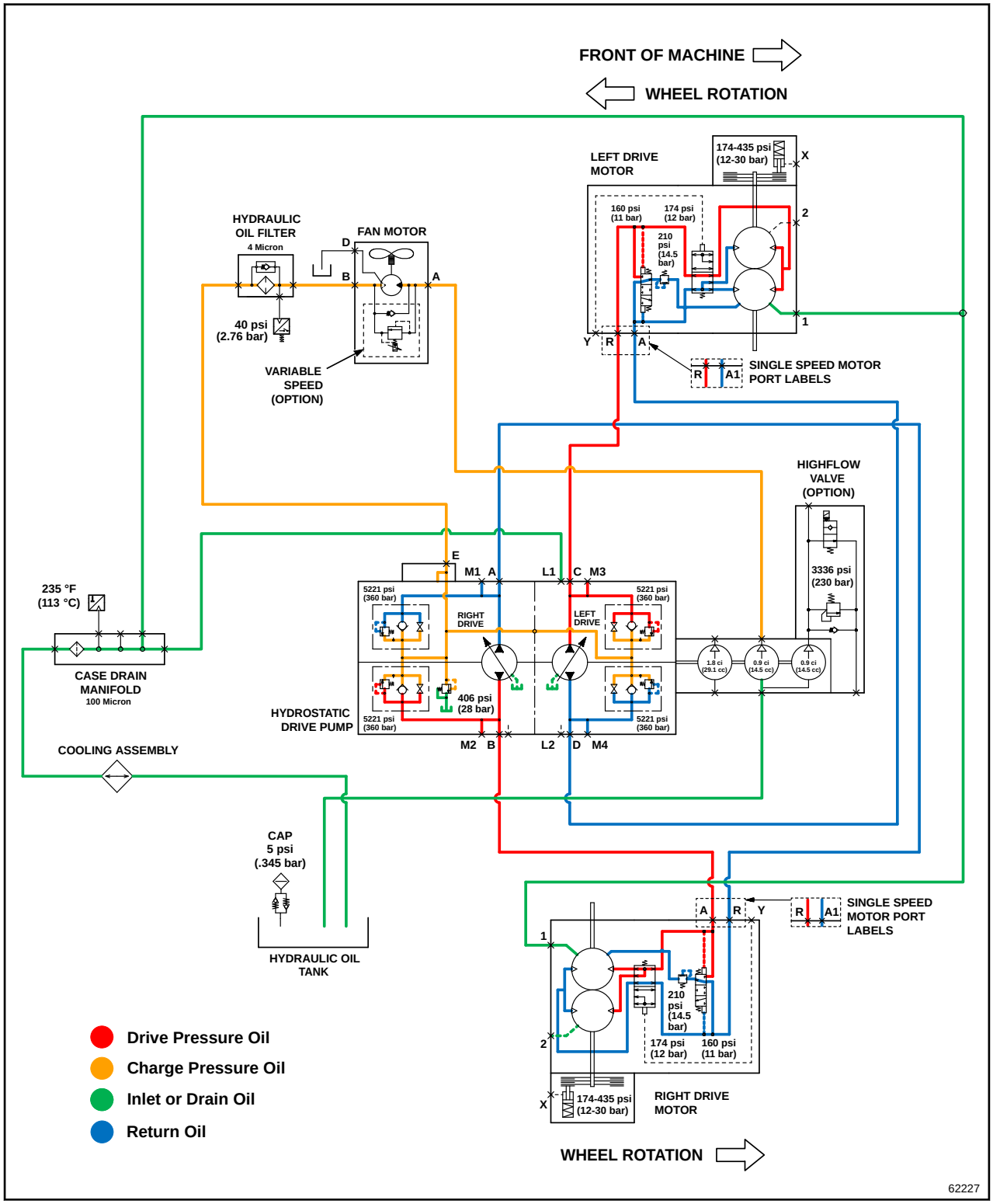


Figure 3-25

Drive Circuit—Left Turn Theory of Operation (Track Machine with Manual Controls)

System Conditions:

- Engine running
- Park brake released

Hydrostatic Drive Pump Charge Circuit

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged. The oil is then routed through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The oil exits the hydrostatic drive pump through ports A, B, C, and D, and is routed to ports A and B of both drive motors. Oil is returned from port L of both drive motors through a 100 micron filter in the case drain manifold, then through the cooling assembly and back to the hydraulic oil tank. Oil is returned from port L1 of the hydrostatic drive pump through a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Left Turn Circuit

With the left joystick pulled back and the right joystick moved forward, drive pressure oil is directed out from ports A and C of the hydrostatic drive pump. The oil is then routed to port A of the left drive motor, driving the motor and port B of right drive motor, driving the motors in a direction to achieve left turn movement of the machine. Clockwise for the right and left motors. Return oil exits through port B of the left drive motor and port A of the right drive motor, and is returned to the hydrostatic drive pump through ports B and D to replenish the right and left sides of the hydrostatic drive pump. Drain oil is returned from port L of both drive motors to a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Drive Circuit Left Turn Schematic (Track Machine with Manual Controls)

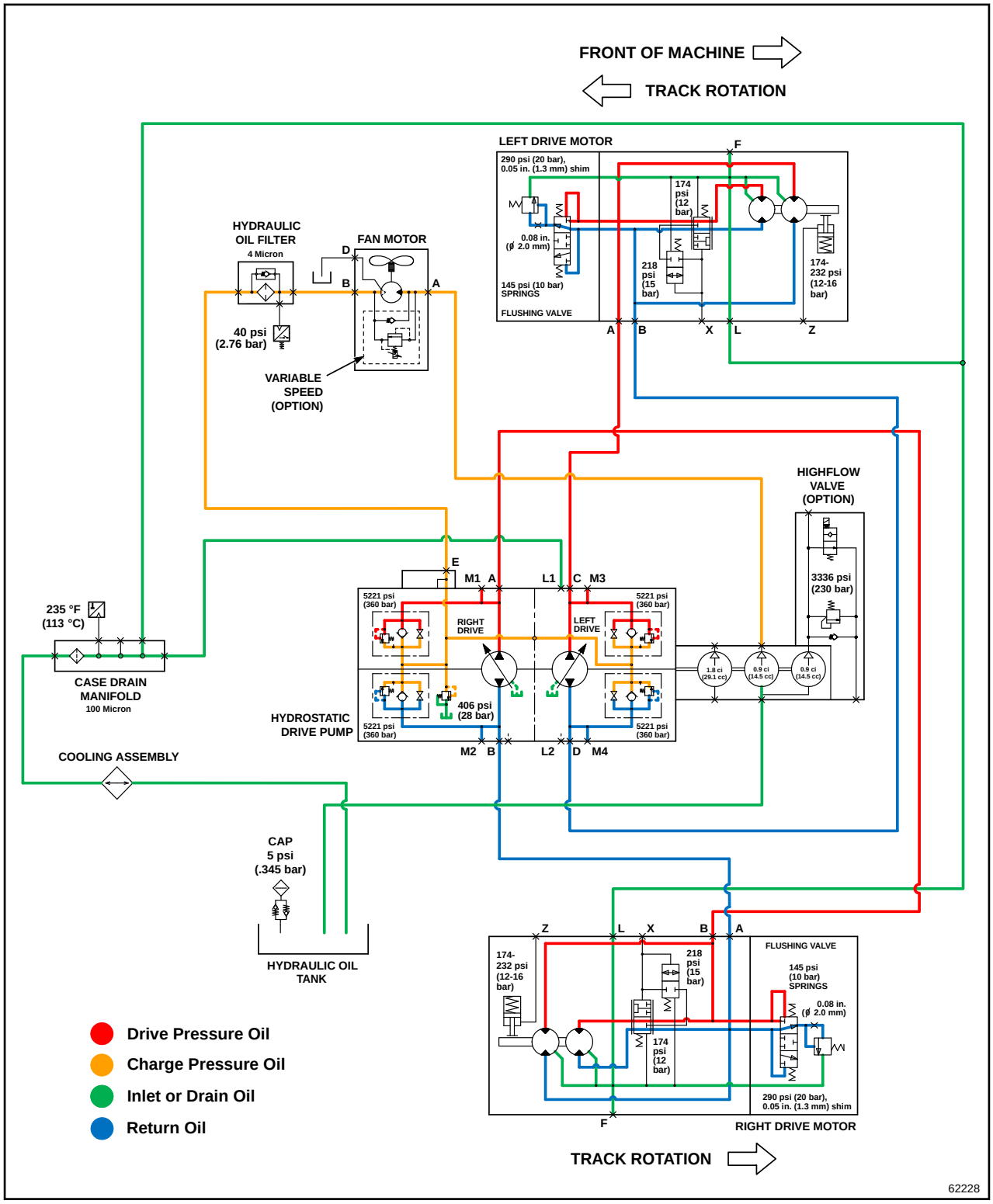


Figure 3-26

Drive Circuit—Brake Valve Theory of Operation (Wheeled Machine with Electronic Controls)

NOTE

Port names differ between one and two speed drive motors. The two speed motor is described in this theory of operation. If machine is equipped with the one speed drive motor option, please see corresponding schematic for appropriate port naming.

System Conditions:

- Engine running
- Park brake disengaged

Oil Supply to Brake Valve

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged. The charge pressure oil is then routed through the hydraulic fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump, which sets the charge pressure via an internal pressure reducing valve in the hydrostatic drive pump. The charge oil exits the hydrostatic drive pump through port M3 and is routed to the brake valve.

Brake Valve Circuit

With park brake switch disengaged, the brake valve solenoid is energized shifting the brake valve spool. Charge oil passes through the brake valve spool and exits the brake valve. Charge pressure oil is routed to port X of both drive motors. When oil pressure reaches 174-435 psi (12-30 bar), the brake is disengaged, releasing the brakes.

Drive Circuit Brake Valve Schematic (Wheeled Machine with Electronic Controls)

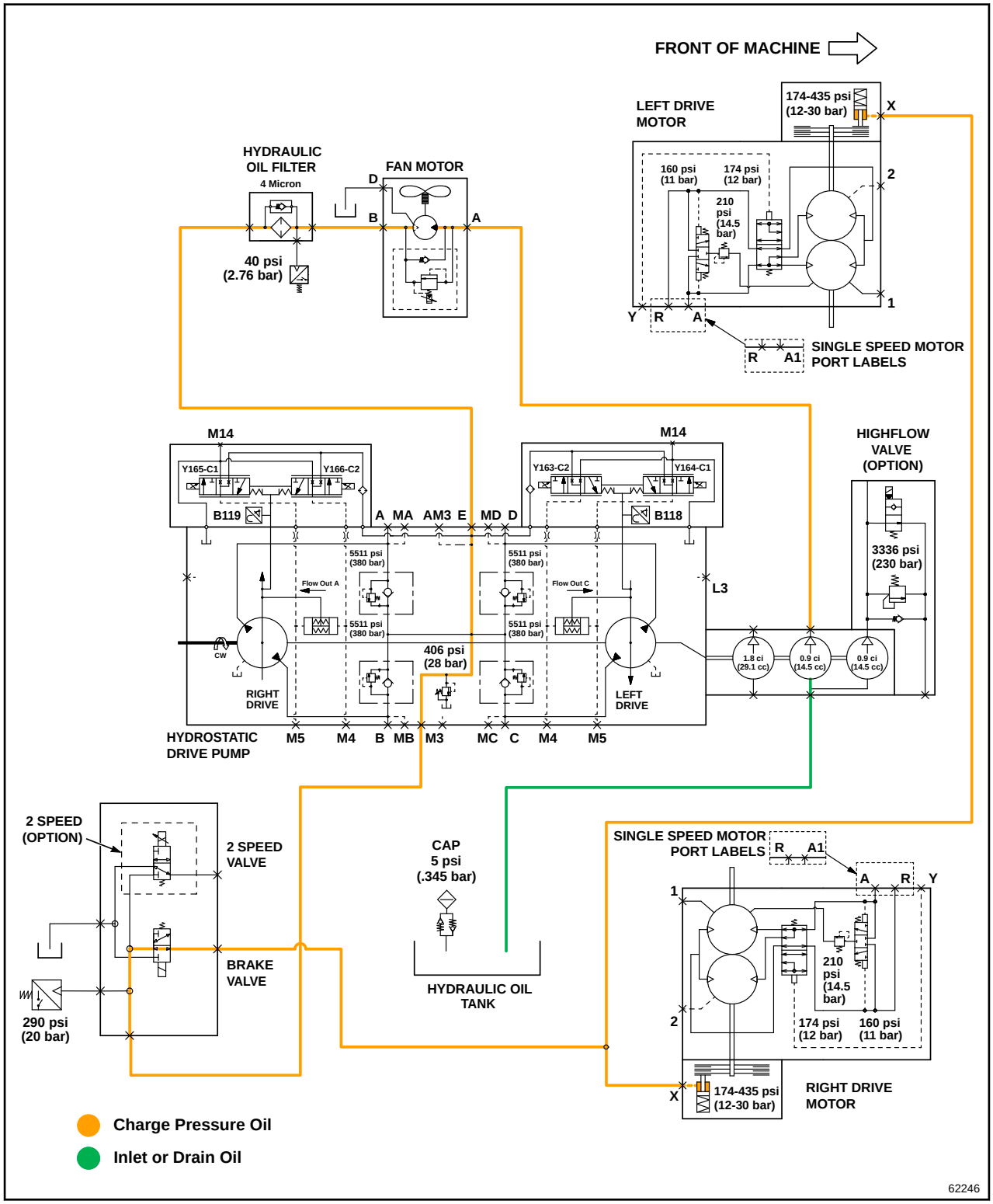


Figure 3-27

Drive Circuit—Brake Valve Theory of Operation (Track Machine with Electronic Controls)

System Conditions:

- Engine running
- Park brake disengaged

Oil Supply to Brake Valve

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged. The charge pressure oil is then routed through the hydraulic fan motor and then through a 4 micron hydraulic oil filter.

The filtered oil enters port E of the hydrostatic drive pump, which sets the charge pressure via an internal pressure reducing valve in the hydrostatic drive pump. The charge oil exits the hydrostatic drive pump through port M3 and is routed to the brake valve.

Brake Valve Circuit

With park brake switch disengaged, the brake valve solenoid is energized shifting the brake valve spool. Charge oil passes through the brake valve spool and exits the brake valve. Charge pressure oil is routed to port Z of both drive motors. When oil pressure reaches 174-232 psi (12-16 bar), the brake is disengaged, releasing the brakes.

Drive Circuit Brake Valve Schematic (Track Machine with Electronic Controls)

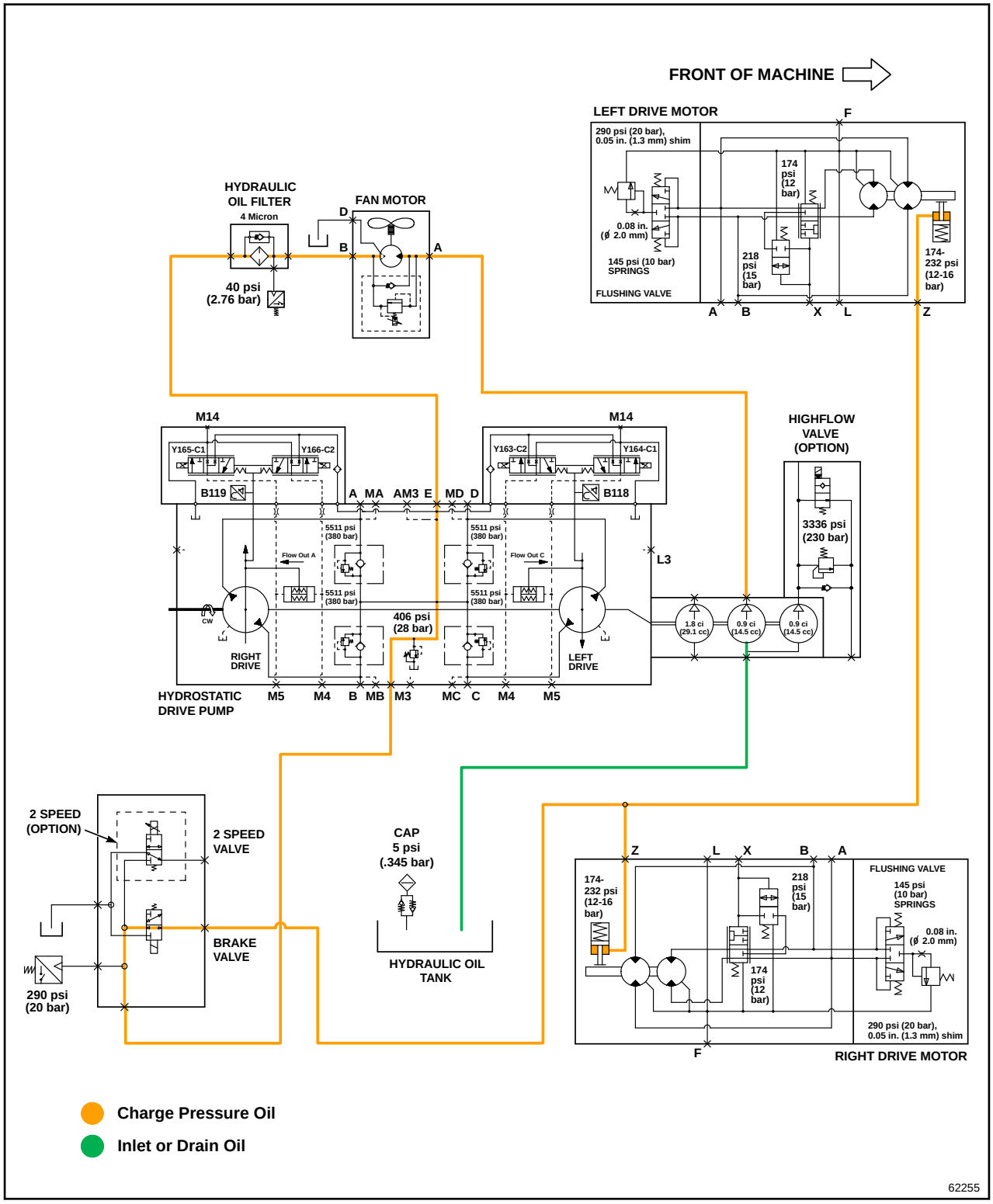


Figure 3-28

Drive Circuit—Brake Valve Theory of Operation (Wheeled Machine with Manual Controls)

NOTE

Port names differ between one and two speed drive motors. The two speed motor is described in this theory of operation. If machine is equipped with the one speed drive motor option, please see corresponding schematic for appropriate port naming.

System Conditions:

- Engine running
- Park brake disengaged

Oil Supply to Brake Valve

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged. The charge pressure oil is then routed through the hydraulic fan motor and then through a 4 micron hydraulic oil filter. The filtered oil is routed to the brake valve.

Brake Valve Circuit

With park brake switch disengaged, the brake valve solenoid is energized shifting the brake valve spool. Charge oil passes through the brake valve spool and exits the brake valve. Charge pressure oil is routed to port X of both drive motors. When oil pressure reaches 174-435 psi (12-30 bar), the brake is disengaged, releasing the brakes.

Drive Circuit Brake Valve Schematic (Wheeled Machine with Manual Controls)

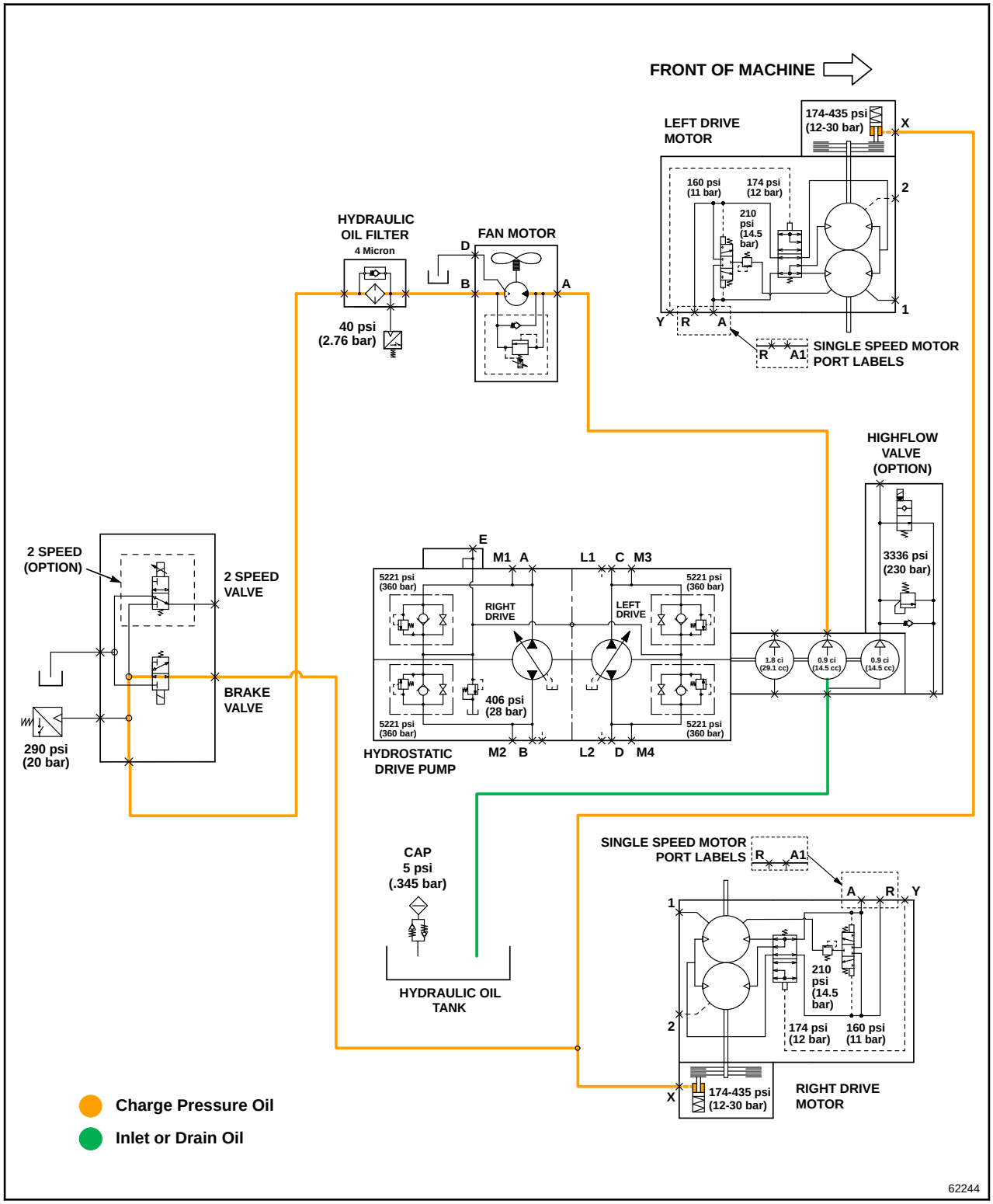


Figure 3-29

Drive Circuit—Brake Valve Theory of Operation (Track Machine with Manual Controls)

System Conditions:

- Engine running
- Park brake disengaged

Oil Supply to Brake Valve

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged. The charge pressure oil is then routed through the hydraulic fan motor and then through a 4-micron hydraulic oil filter. The filtered oil is routed to the brake valve.

Brake Valve Circuit

With park brake switch disengaged, the brake valve solenoid is energized shifting the brake valve spool. Charge oil passes through the brake valve spool and exits the brake valve. Charge pressure oil is routed to port Z of both drive motors. When oil pressure reaches 174-232 psi (12-16 bar), the brake is disengaged, releasing the brakes.

Drive Circuit Brake Valve Schematic (Track Machine with Manual Controls)

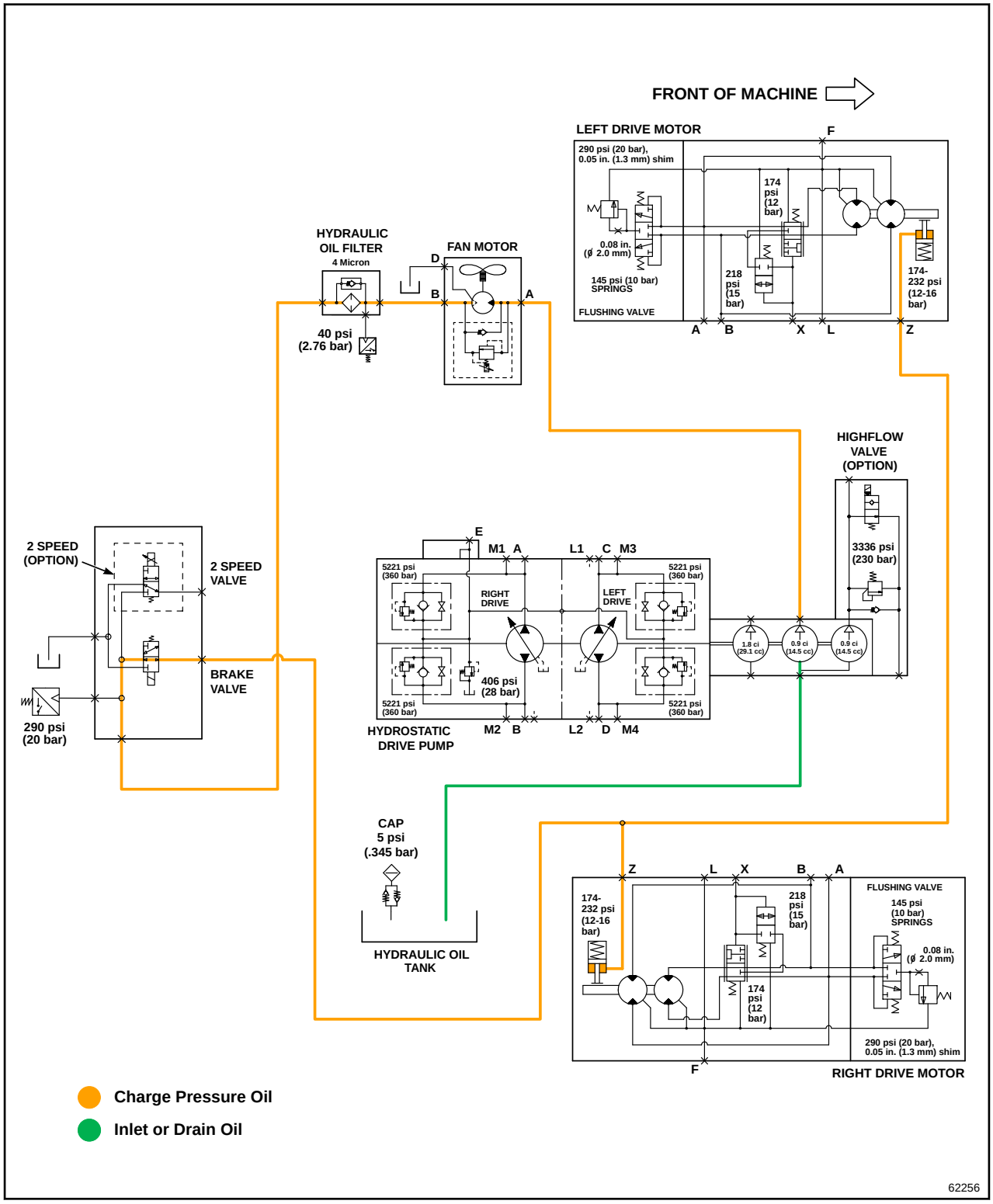


Figure 3-30

Drive Circuit—Two Speed Valve Theory of Operation (Wheeled Machine with Electronic Controls)

NOTE

Port names differ between one and two speed drive motors. The two speed motor is described in this theory of operation. If machine is equipped with the one speed drive motor option, please see corresponding schematic for appropriate port naming.

System Conditions:

- Engine running
- Park brake released

Hydrostatic Drive Pump Charge Circuit

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged. The oil is then routed through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The oil exits the hydrostatic drive pump through ports A, B, C, and D, and is routed to ports A and R of both drive motors. Oil is returned from port 1 of both drive motors through a 100 micron filter in the case drain manifold, then through the cooling assembly and back to the hydraulic oil tank. Oil is returned from port L3 of the hydrostatic drive pump through a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Oil Supply to Two Speed Valve

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged. The charge pressure oil is then routed through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The oil exits the hydrostatic drive pump through port M3 and is routed to the two speed valve.

Two Speed Valve Circuit

With the machine moving forward, depressing the two speed button on the left joystick energizes the two speed valve solenoid and shifts the two speed valve spool. Charge pressure oil passes through the two speed valve spool and exits the two speed valve. Charge pressure oil is routed to port Y of both drive motors. The charge pressure oil then shifts a 174 psi (12 bar) directional control valve, porting drive oil to one section in each drive motor. This results in higher speed output from the drive motor due to the lower displacement achieved for the drive motor.

Drive Circuit Two Speed Valve Schematic (Wheeled Machine with Electronic Controls)

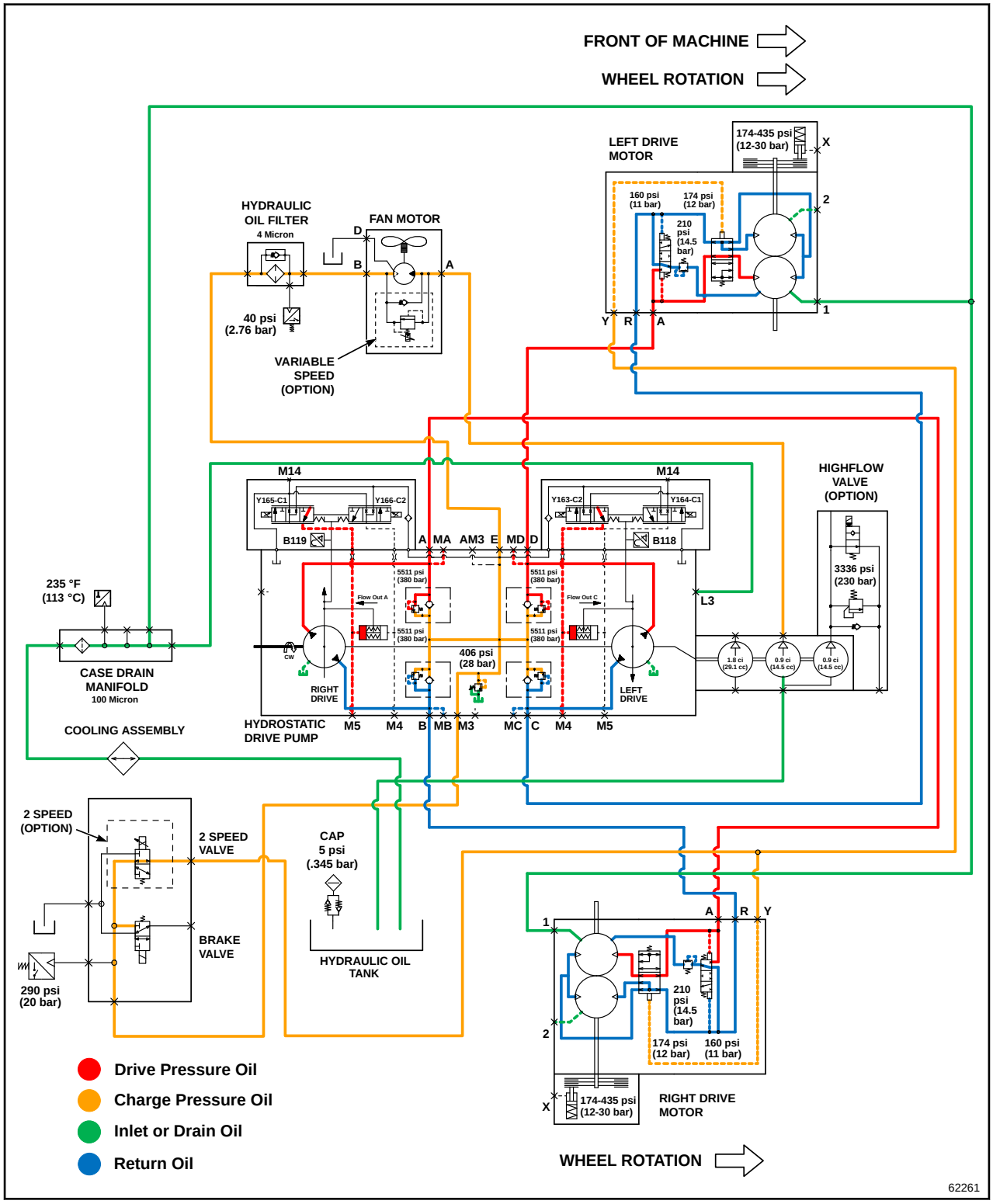


Figure 3-31

Drive Circuit—Two Speed Valve Theory of Operation (Track Machine with Electronic Controls)

System Conditions:

- Engine running
- Park brake released

Hydrostatic Drive Pump Charge Circuit

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged. The oil is then routed through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The oil exits the hydrostatic drive pump through ports A, B, C, and D, and is routed to ports A and B of both drive motors. Oil is returned from port L of both drive motors through a 100 micron filter in the case drain manifold, then through the cooling assembly and back to the hydraulic oil tank. Oil is returned from port L3 of the hydrostatic drive pump through a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Oil Supply to Two Speed Valve

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged. The charge pressure oil is then routed through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The oil exits the hydrostatic drive pump through port M3 and is routed to the two speed valve.

Two Speed Valve Circuit

With the machine moving forward, depressing the two speed button on the left joystick energizes the two speed valve solenoid and shifts the two speed valve spool. Charge pressure oil passes through the two speed valve spool and exits the two speed valve. Charge pressure oil is routed to port X of both drive motors. The change pressure oil then shifts a 174 psi (12 bar) directional control valve and a 218 psi (15 bar) directional control valve, porting drive pressure oil to one section in each drive motor. This results in higher speed output from the drive motor due to the lower displacement achieved for the drive motor.

Drive Circuit Two Speed Valve Schematic (Track Machine with Electronic Controls)

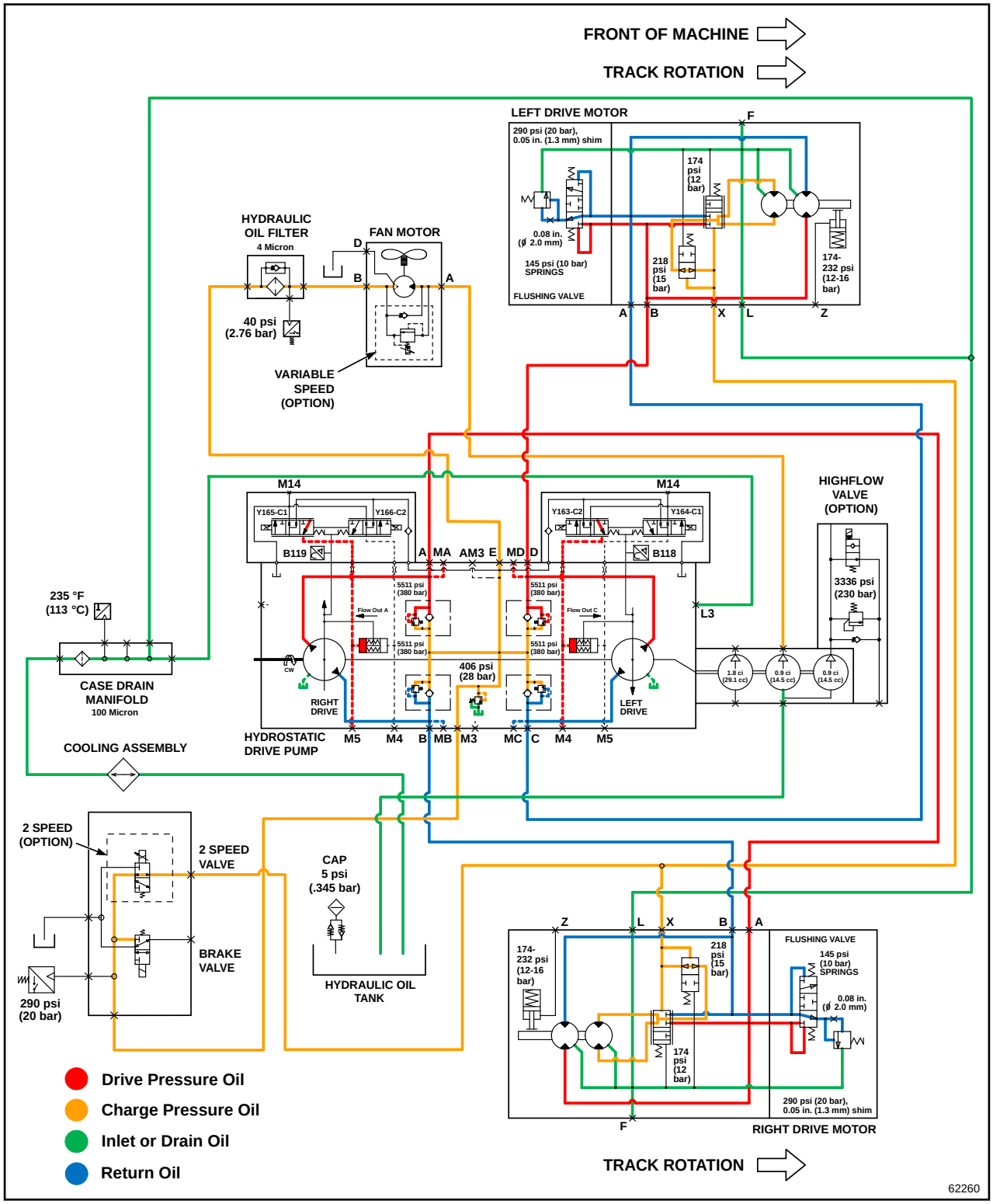


Figure 3-32

Drive Circuit—Two Speed Valve Theory of Operation (Wheeled Machine with Manual Controls)

NOTE

Port names differ between one and two speed drive motors. The two speed motor is described in this theory of operation. If machine is equipped with the one speed drive motor option, please see corresponding schematic for appropriate port naming.

System Conditions:

- Engine running
- Park brake released

Hydrostatic Drive Pump Charge Circuit

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged. The oil is then routed through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The oil exits the hydrostatic drive pump through ports A, B, C, and D, and is routed to ports A and R of both drive motors. Oil is returned from port 1 of both drive motors through a 100 micron filter in the case drain manifold, then through the cooling assembly and back to the hydraulic oil tank. Oil is returned from port L1 of the hydrostatic drive pump through a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Oil Supply to Two Speed Valve

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged. The charge pressure oil is then routed through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil is routed to the two speed valve.

Two Speed Valve Circuit

With the machine moving forward, depressing the two speed button on the left joystick energizes the two speed valve solenoid and shifts the two speed valve spool. Charge pressure oil passes through the two speed valve spool and exits the two speed valve. Charge pressure oil is routed to port Y of both drive motors. The charge pressure oil then shifts a 174 psi (12 bar) directional control valve, porting drive pressure oil to one section in each drive motor. This results in higher speed output from the drive motor due to the lower displacement achieved for the drive motor.

Drive Circuit Two Speed Valve Schematic (Wheeled Machine with Manual Controls)

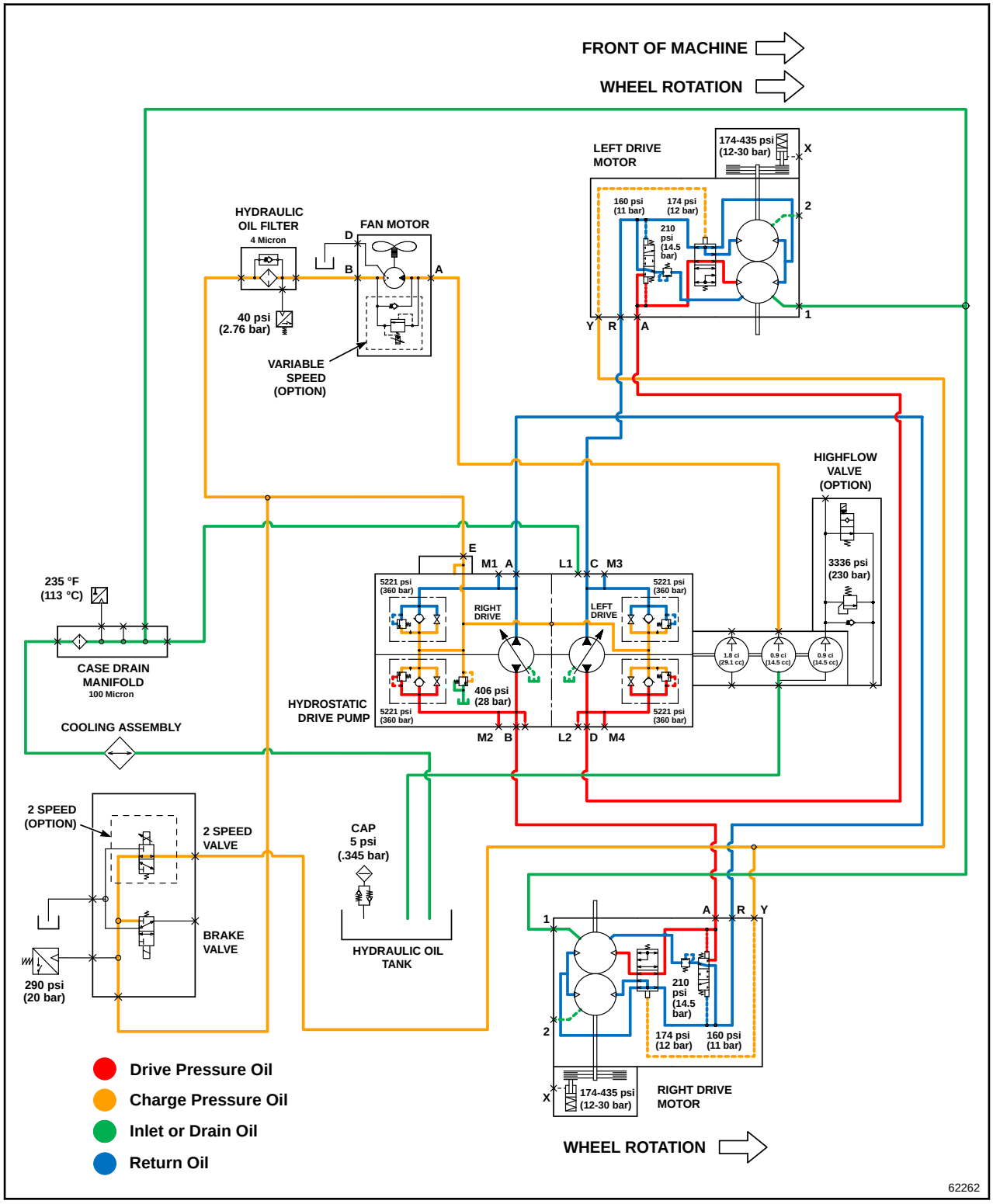


Figure 3-33

Drive Circuit—Two Speed Valve Theory of Operation (Track Machine with Manual Controls)

System Conditions:

- Engine running
- Park brake released

Hydrostatic Drive Pump Charge Circuit

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged. The oil is then routed through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The oil exits the hydrostatic drive pump through ports A, B, C, and D, and is routed to ports A and B of both drive motors. Oil is returned from port L of both drive motors through a 100 micron filter in the case drain manifold, then through the cooling assembly and back to the hydraulic oil tank. Oil is returned from port L1 of the hydrostatic drive pump through a 100 micron filter in the case drain manifold. The oil is routed through the cooling assembly and back to the hydraulic oil tank.

Oil Supply to Two Speed Valve

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged. The charge pressure oil is then routed through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil is routed to the two speed valve.

Two Speed Valve Circuit

With the machine moving forward, depressing the two speed button on the left joystick energizes the two speed valve solenoid and shifts the two speed valve spool. Charge pressure oil passes through the two speed valve spool and exits the two speed valve. Charge pressure oil is routed to port X of both drive motors. The charge pressure oil then shifts a 174 psi (12 bar) directional control valve and a 218 psi (15 bar) directional control valve, porting drive pressure oil to one section in each drive motor. This results in higher speed output from the drive motor due to the lower displacement achieved for the drive motor.

Drive Circuit Two Speed Valve Schematic (Track Machine with Manual Controls)

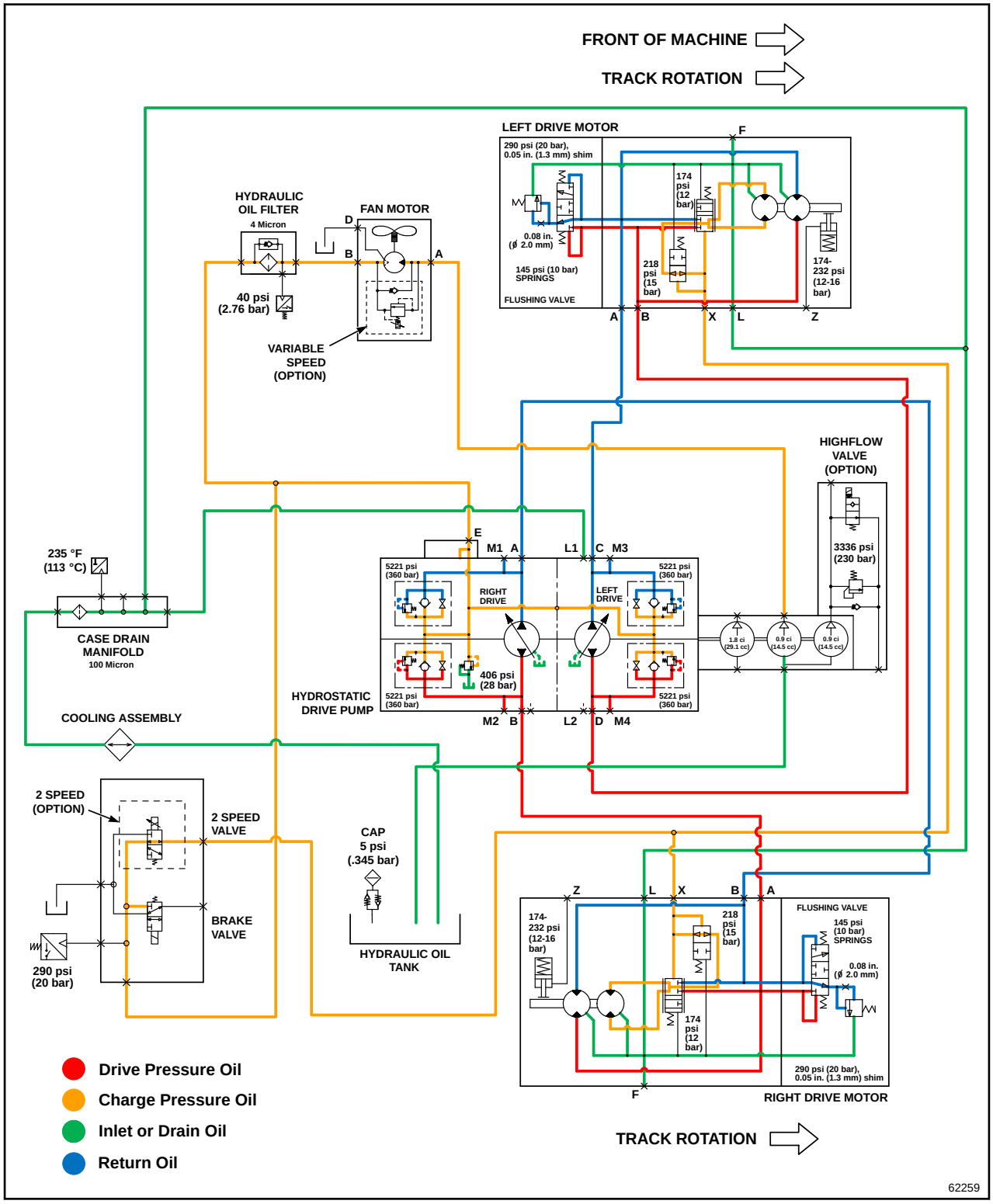


Figure 3-34

Troubleshooting

Troubleshooting

Table 3-1. Park Brake Does Not Release

Probable Cause	Remedy
Hydraulic oil not at correct level in hydraulic oil tank	Fill hydraulic oil tank to correct level. (See "**Hydraulic Oil Tank Drain/Fill Procedure**" on **page 4-64**.)
Hydraulic oil cold	Warm hydraulic oil to operating temperature.
Possible electrical system failure	See "**Park Brake Switch Test**" on **page 2-203**.
Faulty brake valve/two speed valve (optional)	Test brake valve/two speed valve (optional). (See "**Park Brake Circuit Test**" on **page 3-82**.) Replace brake valve/two speed valve (optional). (See "**Brake Valve/Two Speed Valve (Optional)**" on **page 3-91**.)
Incorrect hydrostatic relief valve pressure	Test hydrostatic relief valve pressure. (See "**Charge Pressure Relief Valve Test**" on **page 3-79**.) Replace hydrostatic drive pump. (See "**Hydrostatic Drive Pump (Machines with Manual Controls)**" on **page 3-85** or "**Hydrostatic Drive Pump (Machines with Electronic Controls)**" on **page 3-87**.)
Low operating pressure	Test gear pump. (See "**Gear Pump Test**" on **page 4-60**.) Replace gear pump. (See "**Gear Pump (Two Section)**" on **page 4-68** or "**Gear Pump (Three Section)**" on **page 4-69**.)

Table 3-2. Machine Will Not Move Forward or Reverse

Probable Cause	Remedy
Hydraulic oil not at correct level in hydraulic oil tank	Fill hydraulic oil tank to correct level. (See "**Hydraulic Oil Tank Drain/Fill Procedure**" on **page 4-64**.)
Hydraulic oil cold	Warm hydraulic oil to operating temperature.
Possible electrical system failure	See **Machine Drive Circuit**.
Improperly adjusted drive chain(s) (wheeled machines)	Adjust drive chain(s) as needed.
Broken or damaged drive motor chain(s) (wheeled machines)	Replace broken or damaged drive motor chain(s).
Broken and/or damaged track(s) (track machine)	Replace broken and/or damaged tracks as needed.
Broken and/or damaged track rollers (track machine)	Replace broken and /or damaged track rollers as needed.
Incorrect hydrostatic relief valve pressure	Test hydrostatic relief valve pressure. (See "**Charge Pressure Relief Valve Test**" on **page 3-79**.) Replace hydrostatic drive pump. (See "**Hydrostatic Drive Pump (Machines with Manual Controls)**" on **page 3-85** or "**Hydrostatic Drive Pump (Machines with Electronic Controls)**" on **page 3-87**.)

Table 3-2. Machine Will Not Move Forward or Reverse (Continued)

Probable Cause	Remedy
Low operating pressure	Test gear pump (See "**Gear Pump Test (Three Section)**" on **page 4-60**.) Replace gear pump. (See "**Gear Pump (Two Section)**" on **page 4-68** or "**Gear Pump (Three Section)**" on **page 4-69**.)
Hydrostatic drive pump worn or damaged	Replace hydrostatic drive pump. (See "**Hydrostatic Drive Pump (Machines with Manual Controls)**" on **page 3-85** or "**Hydrostatic Drive Pump (Machines with Electronic Controls)**" on **page 3-87**.)
Damaged control linkage (manual controls)	Replace control linkage.
Left or right drive motor(s) worn or damaged	Replace left or right drive motor(s). (See "**Right Drive Motor (One Speed Wheeled Machine)**" on **page 3-93**, "**Left Drive Motor (One Speed Wheeled Machine)**" on **page 3-95**, "**Right Drive Motor (Two Speed Wheeled Machine)**" on **page 3-97**, "**Left Drive Motor (Two Speed Wheeled Machine)**" on **page 3-99**, "**Drive Motor (One Speed Track Machine)**" on **page 3-101**, or " **Drive Motor (Two Speed Track Machine)**" on **page 3-103**.)

Table 3-3. Machine Will Not Turn Left or Right

Probable Cause	Remedy
Hydraulic oil not at correct level in hydraulic oil tank	Fill hydraulic oil tank to correct level. (See "**Drain/Fill**" on **page 4-64**.)
Hydraulic oil cold	Warm hydraulic oil to operating temperature.
Possible electrical system failure	See **Machine Drive Circuit**.
Low tire pressure (wheeled machines)	Check tire pressure and adjust as needed.
Broken and/or damaged wheels and tires (wheeled machines)	Repair or replace broken and/or damaged wheels and tires as needed.
Improperly adjusted drive chain(s) (wheeled machines)	Adjust drive chain(s) as needed.
Broken or damaged drive motor chain(s) (wheeled machines)	Replace broken or damaged drive motor chain(s).
Broken and/or damaged idler sprockets (wheeled machines)	Replace idler sprockets as needed.
Broken and/or damaged drive sprockets	Replace drive sprockets as needed.
Improperly adjusted track(s) (track machine)	Adjust track(s) as needed.
Broken and/or damaged track(s) (track machine)	Replace broken and/or damaged tracks as needed.
Leaking and/or damaged tensioner cylinder (track machine)	Replace leaking and/or damaged tensioner cylinder as needed.

Table 3-3. Machine Will Not Turn Left or Right (Continued)

Broken and/or damaged track rollers (track machine)	Replace broken and /or damaged track rollers as needed.
Incorrect hydrostatic relief valve pressure	Test hydrostatic relief valve pressure. (See "**Charge Pressure Relief Valve Test**" on **page 3-79**.) Replace hydrostatic drive pump. (See **Hydrostatic Drive Pump (Machines with Manual Controls)** or "**Hydrostatic Drive Pump (Machines with Electronic Controls)**" on **page 3-87**.)
Low operating pressure	Test gear pump. (See "**Gear Pump Test**" on **page 4-60**.) Replace gear pump. (See **Gear Pump (Two Section)** or "**Gear Pump (Three Section)**" on **page 4-69**.)
Hydrostatic drive pump worn or damaged	Replace hydrostatic drive pump. (See "**Removal and Installation**" on **page 3-85** or "**Removal and Installation**" on **page 3-87**.)
Damaged control linkage (manual controls)	Replace control linkage.
Left or right drive motor(s) worn or damaged	Replace left or right drive motor(s). (See "**Right Drive Motor (One Speed Wheeled Machine)**" on **page 3-93**, "**Left Drive Motor (One Speed Wheeled Machine)**" on **page 3-95**, "**Right Drive Motor (Two Speed Wheeled Machine)**" on **page 3-97**, "**Left Drive Motor (Two Speed Wheeled Machine)**" on **page 3-99**, "**Drive Motor (One Speed Track Machine)**" on **page 3-101**, or " **Drive Motor (Two Speed Track Machine)**" on **page 3-103**.)

Table 3-4. Hydrostatic Drive System Operating Hot

Probable Cause	Remedy
Hydraulic oil not at correct level in hydraulic oil tank	Fill hydraulic oil tank to correct level. (See "**Drain/Fill**" on **page 4-64**.)
Cooling assembly is damaged or has dirt or debris in cooling fins	Clean cooling assembly fins of dirt and debris. Replace cooling assembly. (See "**Cooling Assembly**" on **page 4-74**.)
Slippage in hydrostatic drive pump	Replace hydrostatic drive pump. (See "**Hydrostatic Drive Pump (Machines with Manual Controls)**" on **page 3-85** or "**Hydrostatic Drive Pump (Machines with Electronic Controls)**" on **page 3-87**.)
Incorrect hydrostatic relief valve pressure	Test hydrostatic relief valve pressure. (See "**Charge Pressure Relief Valve Test**" on **page 3-79**.) Replace hydrostatic drive pump. (See "**Hydrostatic Drive Pump (Machines with Manual Controls)**" on **page 3-85** or "**Hydrostatic Drive Pump (Machines with Electronic Controls)**" on **page 3-87**.)

Table 3-5. Hydrostatic Drive System Noisy Operation

Probable Cause	Remedy
Hydraulic oil not at correct level in hydraulic oil tank	Fill hydraulic oil tank to correct level. (See "**Drain/Fill**" on **page 4-64**.)
Hydraulic oil cold	Warm hydraulic oil to operating temperature.
Improperly adjusted drive chains (wheeled machines)	Adjust drive chains as needed.
Air in hydraulic system (air bubbles in hydraulic oil)	Check suction line for air leaks. Repair as needed. Operate various hydraulic systems until hydraulic system is free of air.
Hydrostatic pump worn or damaged	Replace hydrostatic drive pump. (See "**Removal and Installation**" on **page 3-85** or "**Removal and Installation**" on **page 3-87**.)
Left or right drive motor(s) worn or damaged	Replace left or right drive motor(s). (See "**Right Drive Motor (One Speed Wheeled Machine)**" on **page 3-93**, "**Left Drive Motor (One Speed Wheeled Machine)**" on **page 3-95**, "**Right Drive Motor (Two Speed Wheeled Machine)**" on **page 3-97**, "**Left Drive Motor (Two Speed Wheeled Machine)**" on **page 3-99**, "**Drive Motor (One Speed Track Machine)**" on **page 3-101**, or " **Drive Motor (Two Speed Track Machine)**" on **page 3-103**.)

Table 3-6. Two Speed Will Not Engage

Probable Cause	Remedy
Hydraulic oil not at correct level in hydraulic oil tank	Fill hydraulic oil tank to correct level. (See "**Drain/Fill**" on **page 4-64**.)
Hydraulic oil cold	Warm hydraulic oil to operating temperature.
Air in hydraulic system (air bubbles in hydraulic oil)	Check suction line for air leaks. Repair as needed. Operate various hydraulic systems until hydraulic system is free of air.
Faulty two speed valve	Replace two speed valve. (See "**Removal and Installation**" on **page 3-91**.)
Incorrect hydrostatic relief valve pressure	Test hydrostatic relief valve pressure. (See "**Charge Pressure Relief Valve Test**" on **page 3-79**.) Replace hydrostatic drive pump. (See "**Hydrostatic Drive Pump (Machines with Manual Controls)**" on **page 3-85**or "**Hydrostatic Drive Pump (Machines with Electronic Controls)**" on **page 3-87**.)

Test and Adjustments

Test Procedures Overview

The following tests are specifically designed to approach hydraulic testing on a system level. The test results will help the technician decide which repairs will best remedy the performance issue experienced by the machine user.

Example: Traction System Performance Complaint
The machine operator reports the machine will not move forward or in reverse.

Basic troubleshooting should be performed before any instrument test is performed. (See "**Troubleshooting**" on **page 3-68**.)

Preliminary checks should always be performed before any instrument test is performed. (See "**Preliminary Checks**" on **page 3-73**.)

If the complaint cannot be resolved through troubleshooting and preliminary checks, a charge pressure test must first be performed to rule out a gear pump issue. Next, the hydrostatic relief test should be performed to rule out a hydrostatic drive pump or relief valve issue. Finally, a park brake circuit test should be performed to confirm the park brake is functioning properly. If all instrument tests are performed without any faulty components found, it would then be safe to assume the machine has faulty drive motors.

Preliminary Checks

Perform the following checks prior to beginning any tests.

1. Check machine for any active or inactive Diagnostic Trouble Codes (DTCs).
2. Check the hydraulic oil tank for proper fluid level, the presence of air or water, and unusual odor.
3. Check all lines and fittings for leaks. Tighten as needed.
4. Check for clogged or damaged hydraulic filter.
5. Inspect cooling assembly for the following:
   - Obstructed air flow
   - Improper plumbing
   - Kinked or damaged hoses
   - Cooling fan freely spins with engine running
6. Inspect mechanical control linkage for the following (manual controls only):
   - Incorrect adjustment or disconnected components
   - Binding, bending, or damaged components
7. Inspect drive system for the following (track machines only):
   - Track improperly adjusted
   - Broken and/or damaged track
   - Leaking and/or damaged tensioner cylinder
   - Broken and/or damaged track rollers
   - Broken and/or damaged drive sprockets
8. Inspect drive system for the following (wheeled machines only):
   - Low tire pressure
   - Broken and/or damaged wheels and tires
   - Improperly adjusted drive chain
   - Broken and/or damaged drive chain
   - Broken and/or damaged drive sprockets
9. Eliminate all mechanical issues prior to starting hydraulic tests.

Charge Pressure Test

Charge Pressure Test (Electronic Controls)

See **Figures 3-35** through **3-37**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*
- *Cap and plug hoses and fittings during removal.*

Required Tools or Equipment
• Pressure Gauge 1000 PSI (69 bar) • Suitable Fittings

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

WARNING

Always ensure boom is secured with safety strut when raising boom. Failure to secure boom with safety strut may result in death or serious injury.

2. Raise boom and secure with safety strut.

WARNING

Always ensure cab is secured with safety strut when raising cab. Failure to secure cab with safety strut may result in death or serious injury.

3. Raise cab and secure with safety strut to gain access to hydrostatic drive pump.

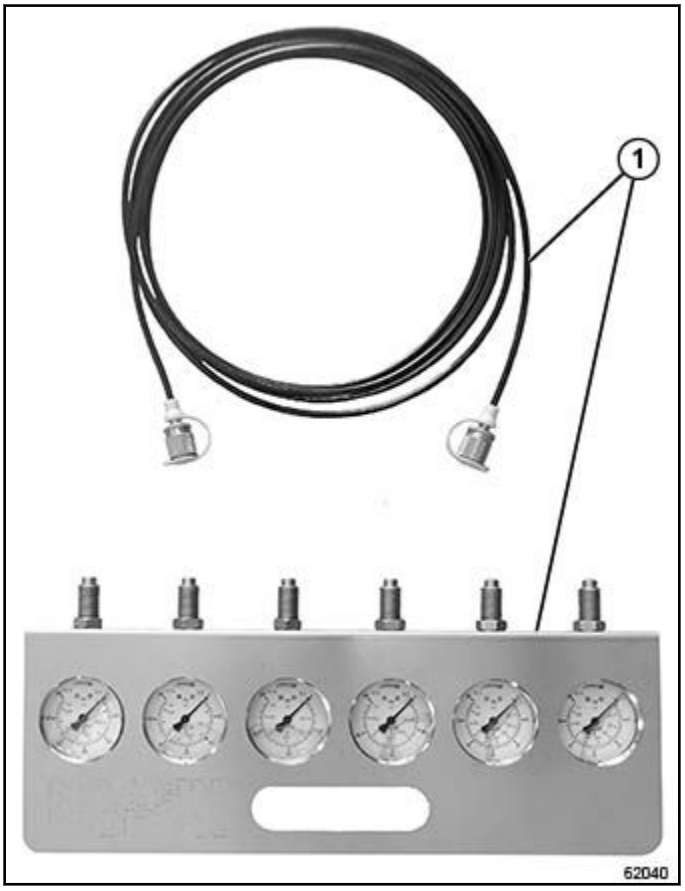


Figure 3-35: Pressure Gauge

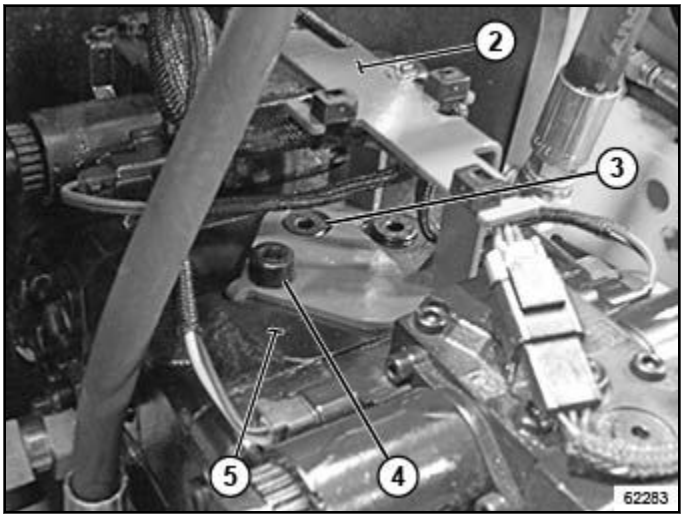


Figure 3-36: Charge Pressure Test (Electronic Controls)

4. Remove bolt (4) from hydrostatic drive pump (5) and bracket (2). Position bracket aside.
5. Remove plug (3) from hydrostatic drive pump (5) port AM3 (6).

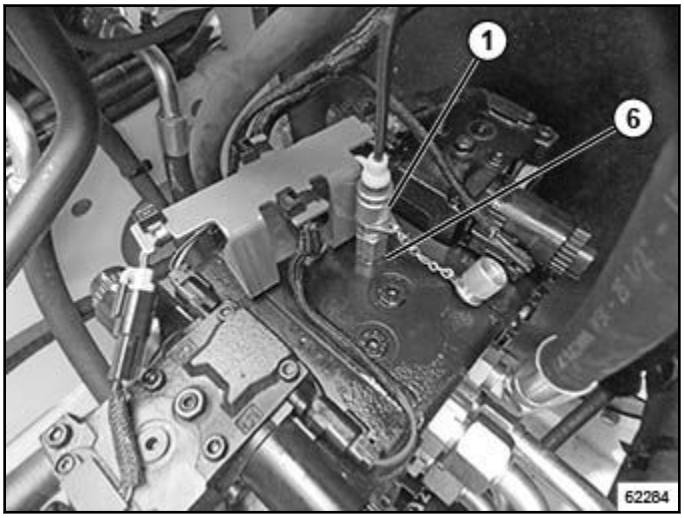


Figure 3-37: Charge Pressure Test (Electronic Controls)

6. Connect pressure gauge (1) to port AM3 (6).
7. Start machine.
8. Verify pressure gauge (1) reads 406 psi (28 bar).

   Does pressure gauge read 406 psi (28 bar)?

   YES *Charge pressure is good. Proceed to step 9.*

   NO *Test charge pressure system. (See "**Charge Pressure System Test**" on **page 3-78**.)*
9. Turn off machine.
10. Disconnect and remove test equipment. Install all hoses and fittings as noted prior to removal.
11. Install and connect all components as noted prior to test.
12. Check hydraulic oil level. Add oil as needed. (See "**Hydraulic Oil Tank Drain/Fill Procedure**" on **page 4-64**.)

Charge Pressure Test (Manual Controls)

See **Figures 3-38** and **3-39**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*
- *Cap and plug hoses and fittings during removal.*

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

WARNING

Always ensure boom is secured with safety strut when raising boom. Failure to secure boom with safety strut may result in death or serious injury.

2. Raise boom and secure with safety strut.

WARNING

Always ensure cab is secured with safety strut when raising cab. Failure to secure cab with safety strut may result in death or serious injury.

3. Raise cab and secure with safety strut.

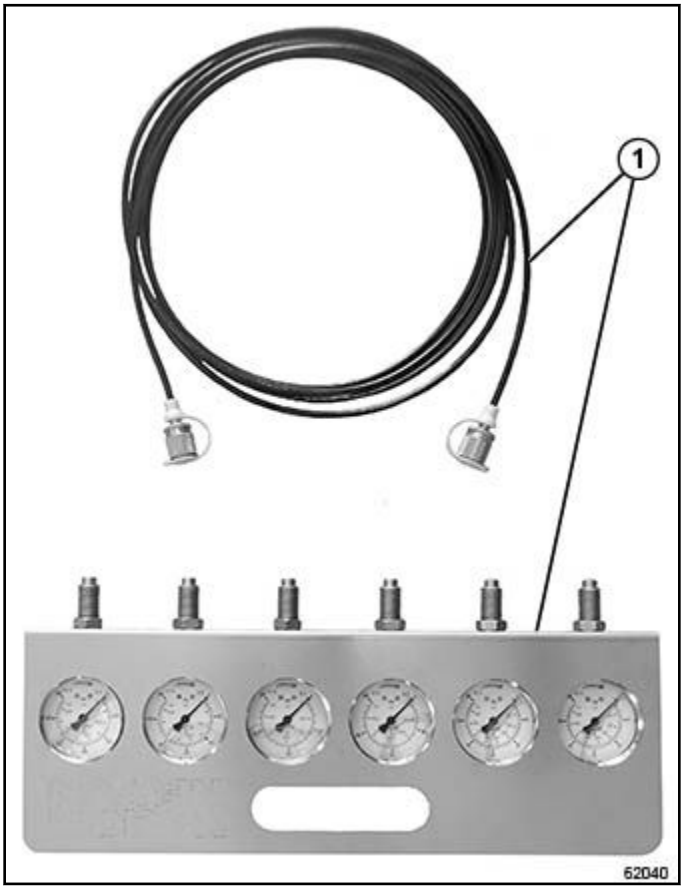


Figure 3-38: Pressure Gauge

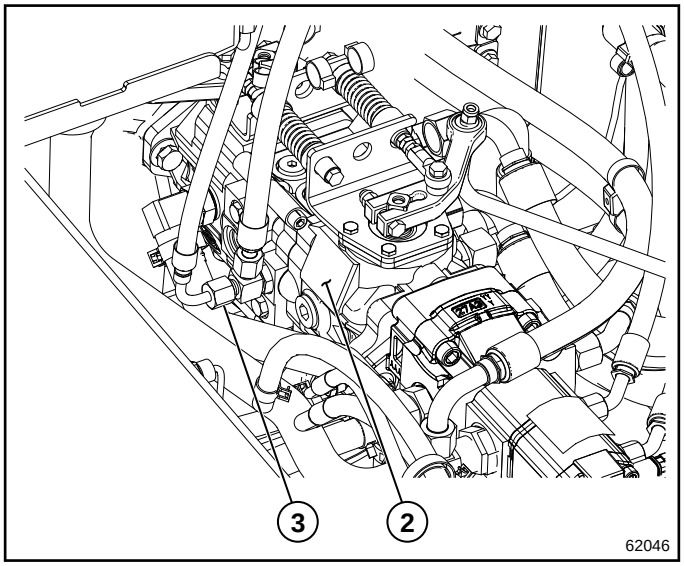


Figure 3-39: Charge Pressure Test (Manual Controls)

4. Remove hose (3) from hydrostatic drive pump (2).
5. Install tee fitting between the hose (3) and drive pump (2). Tighten the tee fitting and hose.
6. Connect pressure gauge (1) to tee fitting.
7. Start machine.
8. Verify pressure gauge (1) reads 406 psi (28 bar).

   Does pressure gauge read 406 psi (28 bar)?

   YES *Charge pressure is good. Proceed to step 8.*

   NO *Test charge pressure system. (See "**Charge Pressure System Test**" on **page 3-78**.)*

9. Turn off machine.
10. Disconnect and remove test equipment. Install all hoses and fittings as noted prior to removal.
11. Install and connect all components as noted prior to test.
12. Check hydraulic oil level. Add oil as needed. (See "**Hydraulic Oil Tank Drain/Fill Procedure**" on **page 4-64**.)

Charge Pressure System Test

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*
- *Cap and plug hoses and fittings during removal.*

Required Tools or Equipment
• Pressure Gauge 1000 PSI (69 bar) • Suitable Fittings

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

WARNING

Always ensure boom is secured with safety strut when raising boom. Failure to secure boom with safety strut may result in death or serious injury.

2. Raise boom and secure with safety strut.

WARNING

Always ensure cab is secured with safety strut when raising cab. Failure to secure cab with safety strut may result in death or serious injury.

3. Raise cab and secure with safety strut to gain access to hydrostatic drive system.
4. Verify all hydraulic lines, fitting, and components are free of leaks, kinks, or damage.

   Is hydraulic system free of any leaks, kink, or damage?

   YES *Charge system is good. Proceed to step 5.*

   NO *Make appropriate repairs to the hydraulic system.*
5. Verify hydraulic filter free of restrictions.

   Is hydraulic filter free of restrictions?

   YES *Hydraulic filter is good. Proceed to step 6.*

   NO *Replace hydraulic filter.*
6. Verify cooling fan is spinning freely.

Is cooling fan spinning freely?

YES *Cooling fan is good. Proceed to step 7.*

NO *Repair or replace fan motor as needed. (See (See "**Fan Motor (One Speed)**" on page 4-70 or "**Fan Motor (Variable Speed)**" on page 4-72.)*

7. Verify park brake/two speed valve is functioning properly. (See "**Park Brake Circuit Test**" on **page 3-82**.)

   Is cooling park brake/two speed valve functioning properly?

   YES *Park brake/two speed valve is good. Proceed to step 8.*

   NO *Repair or Park brake/two speed valve as needed. (See "**Brake Valve**" on **page 3-89** or "**Brake Valve/Two Speed Valve (Optional)**" on **page 3-91**.)*

8. Verify gear pump is functioning properly. (See "**Gear Pump Test**" on **page 4-60**.)

   Is gear pump is functioning properly?

   YES *Gear pump is good. Proceed to step 9.*

   NO *Repair or replace gear pump as needed. (See "**Gear Pump (Two Section)**" on **page 4-68** or "**Gear Pump (Three Section)**" on **page 4-69**.)*

9. Verify hydraulic functions are working properly.

   Are hydraulic functions working properly?

   YES *Main hydraulic valve is good. Proceed to step 10.*

   NO *Repair or replace main control valve. (See "**Main Control Valve**" on **page 4-78**.)*

10. Verify charge pressure relief valve is functioning properly. (See "**Charge Pressure Relief Valve Test**" on **page 3-79**.)

    Does charge pressure relief valve function properly?

    YES *Charge pressure system is good.*

    NO *Repair or replace hydrostatic drive pump. (See **Hydrostatic Drive Pump (Machines with Manual Controls)** or **Hydrostatic Drive Pump (Machines with Electronic Controls)**.)*

Charge Pressure Relief Valve Test

See **Figures 3-40** through **3-42**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

3

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*
- *Cap and plug hoses and fittings during removal.*

Required Tools or Equipment
• Pressure Gauge 1000 PSI (69 bar) • Suitable Fittings

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

WARNING

Always ensure boom is secured with safety strut when raising boom. Failure to secure boom with safety strut may result in death or serious injury.

2. Raise boom and secure with safety strut.

WARNING

Always ensure cab is secured with safety strut when raising cab. Failure to secure cab with safety strut may result in death or serious injury.

3. Raise cab and secure with safety strut.

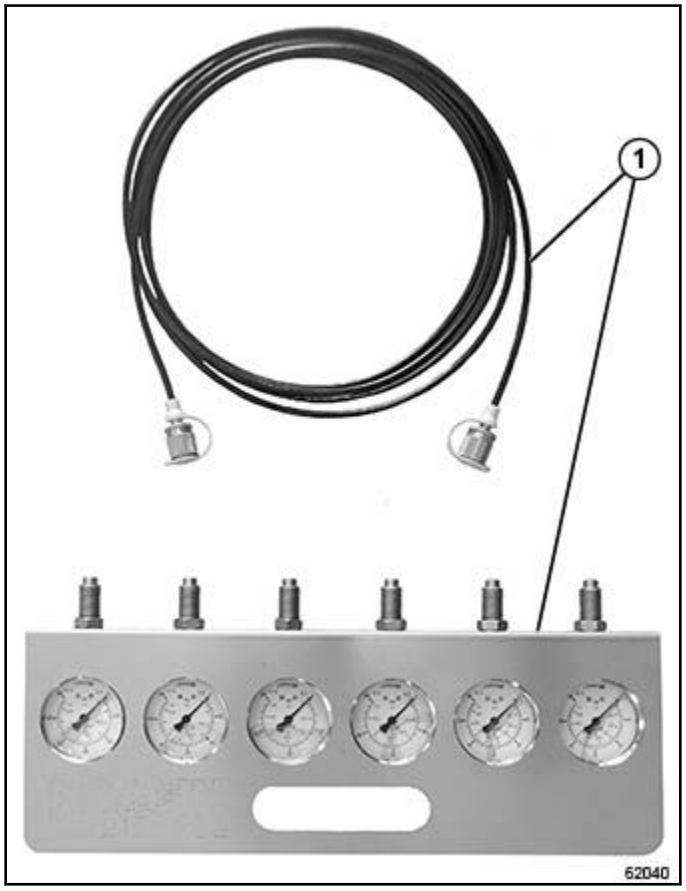


Figure 3-40: Pressure Gauge

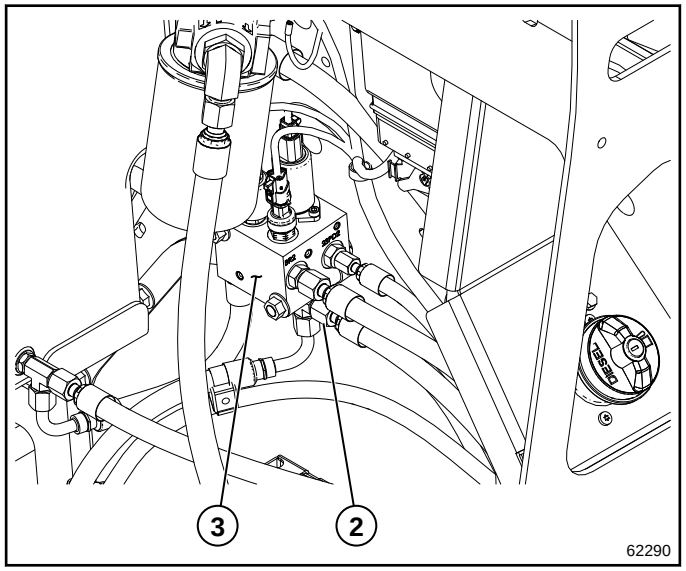


Figure 3-41: Charge Pressure Relief Valve Pressure Test

4. Remove hose (2) from brake valve/two speed valve (3).

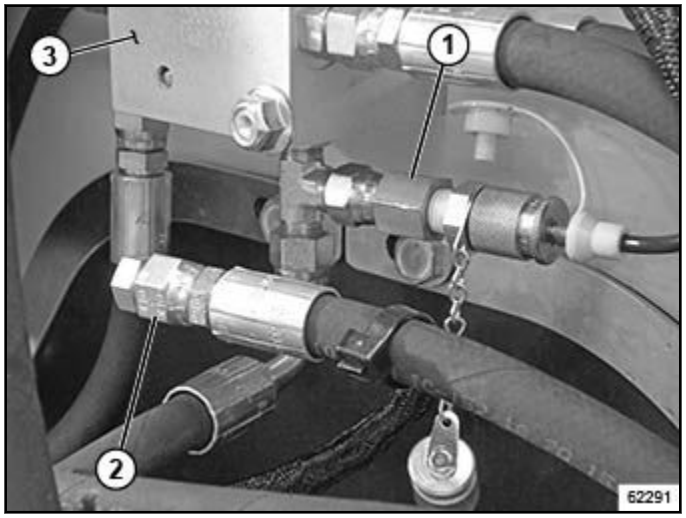


Figure 3-42: Charge Pressure Relief Valve Pressure Test

5. Cap hose (2).
6. Connect pressure gauge (1) to brake valve/two speed valve (3).
7. Start machine.
8. Raise engine RPM to normal operating speed using hand throttle control.
9. Verify pressure gauge (1) reads 406 psi (28 bar).

   Does pressure gauge read 406 psi (28 bar)?

   YES *Charge pressure relief valve. Proceed to step 10*

   NO *Charge pressure relief valve is faulty. Replace charge pressure relief valve.*
10. Turn off machine.
11. Disconnect and remove test equipment. Install all hoses and fittings as noted prior to removal.
12. Install and connect all components as noted prior to test.
13. Check hydraulic oil level. Add oil as needed. (Refer to "**Hydraulic Oil Tank Drain/Fill Procedure**" on **page 4-64**.)

Park Brake Circuit Test

See **Figures 3-43** and **3-44**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*
- *Cap and plug hoses and fittings during removal.*

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

WARNING

Always ensure boom is secured with safety strut when raising boom. Failure to secure boom with safety strut may result in death or serious injury.

2. Raise boom and secure with safety strut.

WARNING

Always ensure cab is secured with safety strut when raising cab. Failure to secure cab with safety strut may result in death or serious injury.

3. Raise cab and secure with safety strut.

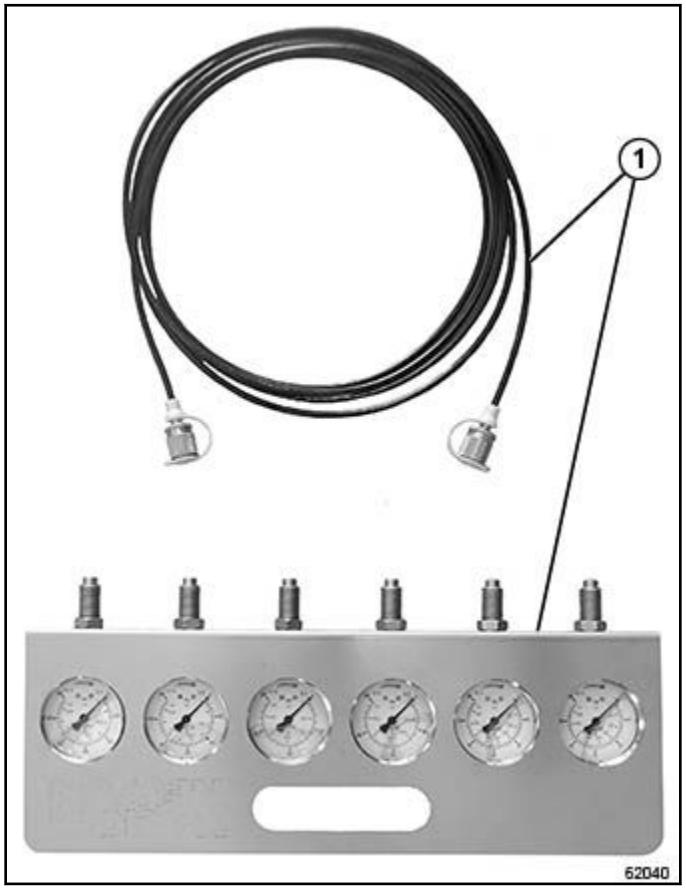


Figure 3-43: Pressure Gauge

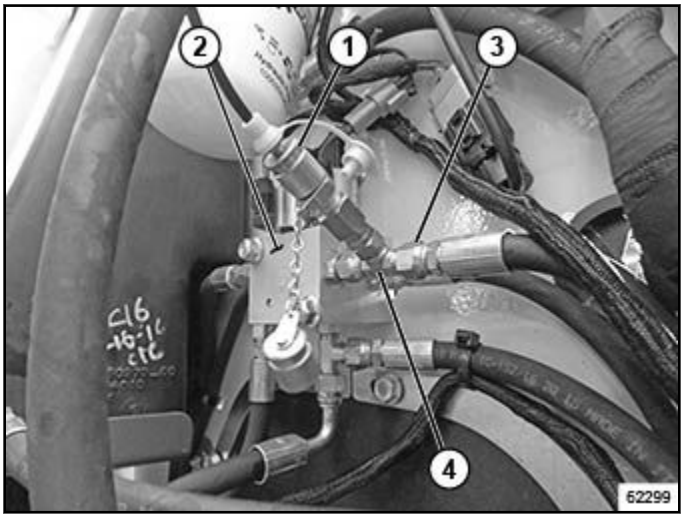


Figure 3-44: Park Brake Circuit Test

4. Remove hose (3) from brake valve/two speed valve (2).
5. Install tee fitting (4) on brake valve/two speed valve (2) and hose (3).
6. Connect pressure gauge (1) to tee fitting (4).
7. Start machine.
8. Disengage park brake.
9. Verify pressure gauge (1) reads 377 to 435 psi (26 to 30 bar).

   Does pressure gauge read 377 to 435 psi (26 to 30 bar)?

   YES *Brake valve/two speed valve is good. Proceed to step 10.*

   NO *Brake valve/two speed valve is faulty. Replace brake valve/two speed valve. (See "**Brake Valve**" on **page 3-89** or "**Brake Valve/Two Speed Valve (Optional)**" on **page 3-91**.)*
10. Turn off machine.
11. Disconnect and remove test equipment. Install all hoses and fittings as noted prior to removal.
12. Install and connect all components as noted prior to test.
13. Check hydraulic oil level. Add oil as needed. (Refer to "**Hydraulic Oil Tank Drain/Fill Procedure**" on **page 4-64**.)

Mechanical Hydrostatic Pump Centering Procedure

Adjustment Procedure

See **Figure 3-45**.

NOTE

Right and left sides are adjusted the same way. Left side is shown.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

WARNING

- **Support the machine using properly rated jackstands. Never work under a machine supported only by a jack.**
- **Do not use wood or concrete blocks to support the machine. Failure to properly support the machine may result in death or serious injury.**

2. Support machine securely. (See "**Support Machine Securely**" on **page 16**.)

WARNING

Always ensure boom is secured with safety strut when raising boom. Failure to secure boom with safety strut may result in death or serious injury.

3. Raise boom and support with safety strut.

WARNING

Always ensure cab is secured with safety strut when raising cab. Failure to secure cab with safety strut may result in death or serious injury.

4. Raise cab and support with safety strut.
5. Remove wheels or tracks from machine.

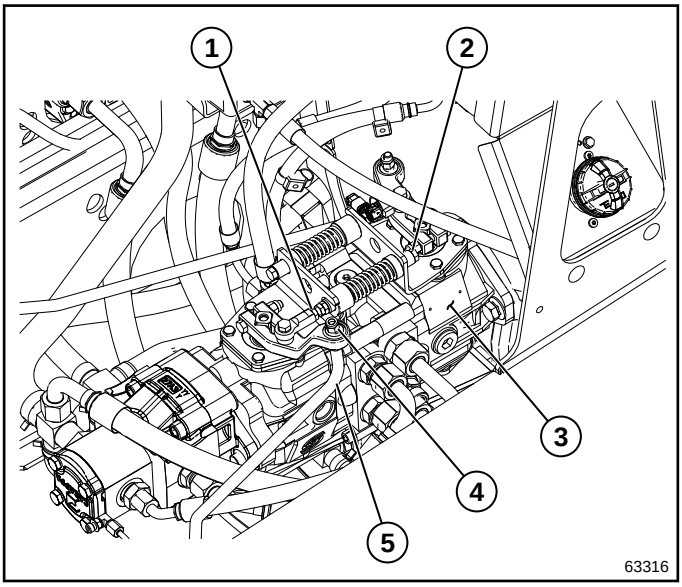


Figure 3-45: Mechanical Hydrostatic Pump Centering

NOTE

Steps 6 through 18 may have to be repeated multiple times.

6. Remove nut (4) and control link (5) from hydrostatic pump (3).
7. Loosen jam nut (1).

NOTE

The cab may have to be raised and lowered multiple times to perform Steps 8 through 18. The drive motor will not rotate with the cab raised and park brake set. The cab will need to be lowered and park brake released in any step requiring the rotation of the drive motor.

8. Lower cab.
9. Start machine and let run at a low idle.
10. Release park brake.
11. Note the rotation of drive motor.

WARNING

Always ensure cab is secured with safety strut when raising cab. Failure to secure cab with safety strut may result in death or serious injury.

12. Raise cab and support with safety strut.
13. Rotate adjusting bolt (2) until drive motor begins to rotate in the opposite direction.

14. Rotate adjusting bolt (2) in the opposite direction of rotation in Step 13. Note the number of turns.
15. When motor begins to rotate in the original direction, turn adjusting bolt (2) in the opposite direction exactly half the number of turns noted in Step 14.
16. Tighten jam nut (1).
17. Lower cab.
18. Start machine and run at high idle, to ensure drive motor is not rotating in either direction.

Installation Note

Install the control link by reversing the order of removal.

Repair

Hydrostatic Drive Pump (Machines with Manual Controls)

Removal and Installation

See **Figures 3-46** and **3-47**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*
- *Cap and plug hoses and fittings during removal.*

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

WARNING

- **Support the machine using properly rated jackstands. Never work under a machine supported only by a jack.**
- **Do not use wood or concrete blocks to support the machine. Failure to properly support the machine may result in death or serious injury.**

2. Support machine securely. (See "**Support Machine Securely**" on **page 16**.)
3. Remove lower access panel from bottom of machine.

WARNING

Always ensure boom is secured with safety strut when raising boom. Failure to secure boom with safety strut may result in death or serious injury.

4. Raise boom and secure with safety strut.

WARNING

Always ensure cab is secured with safety strut when raising cab. Failure to secure cab with safety strut may result in death or serious injury.

5. Raise cab and secure with safety strut to gain access to hydrostatic drive pump.
6. Drain hydraulic oil tank. (See "**Drain/Fill**" on **page 4-64**.)
7. Remove gear pump. (See **Gear Pump (Two Section)** or **Gear Pump (Three Section)**.)

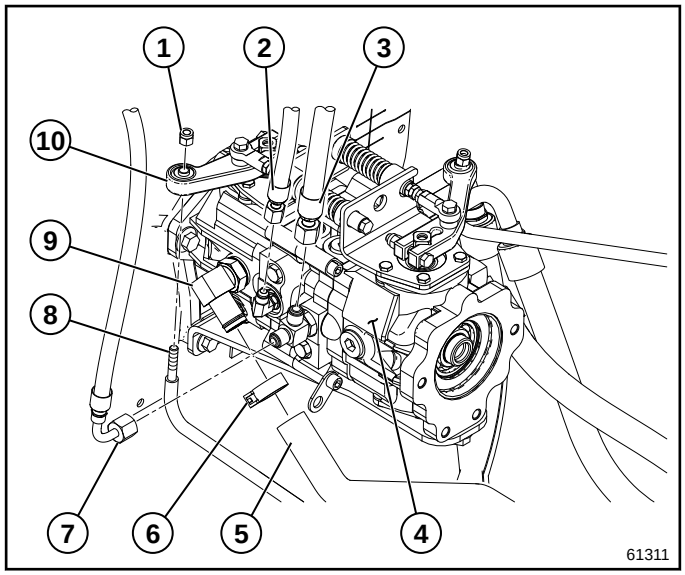


Figure 3-46: Right Side Hoses Removal and Installation

8. Remove hose (2) from hydrostatic drive pump (4).
9. Remove hose (3) from hydrostatic drive pump (4).
10. Remove clamp (6) and hose (5) from hydrostatic drive pump (4).
11. Remove hose (7) from hydrostatic drive pump (4).
12. Remove nut (1) and control link (8) from pump lever (10).

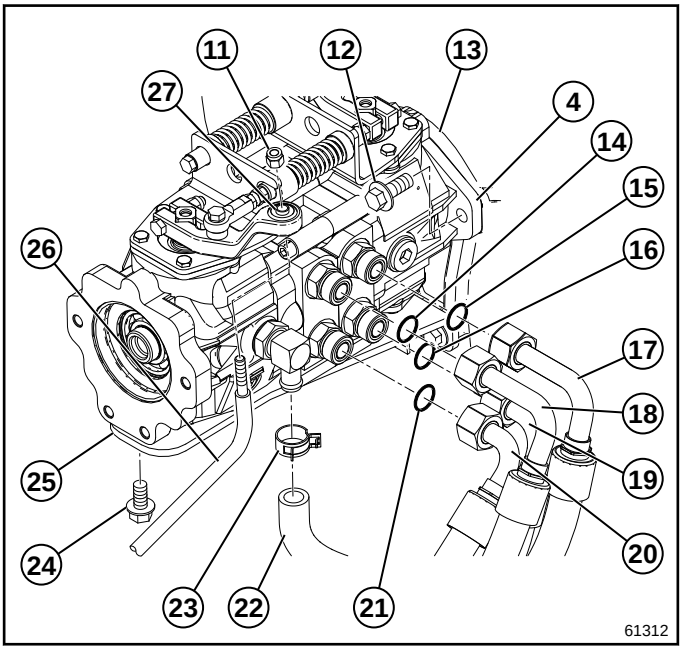


Figure 3-47: Left Side Hoses Removal and Installation

13. Remove hose (20) and O-ring (21) from hydrostatic drive pump (4).
14. Remove hose (19) and O-ring (16) from hydrostatic drive pump (4).
15. Remove hose (18) and O-ring (14) from hydrostatic drive pump (4).
16. Remove hose (17) and O-ring (15) from hydrostatic drive pump (4).
17. Remove clamp (23) and hose (22) from hydrostatic drive pump (4).
18. Remove nut (11) and control link (26) from pump lever (27).
19. Remove bolt (24) from bracket (25) and hydrostatic drive pump (4).
20. Remove two bolts (12) and hydrostatic drive pump (4) from machine (13).

Installation Notes

- *Install the hydrostatic drive pump by reversing the order of removal.*
- *Lightly lubricate O-rings with clean hydraulic oil prior to installation.*
- *Remove caps and plugs as hoses and fittings are installed.*
- *Install hoses and fittings as noted prior to removal.*

Hydrostatic Drive Pump (Machines with Electronic Controls)

Removal and Installation

See **Figures 3-48** and **3-49**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*
- *Cap and plug hoses and fittings during removal.*

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

WARNING

- **Support the machine using properly rated jackstands. Never work under a machine supported only by a jack.**
- **Do not use wood or concrete blocks to support the machine. Failure to properly support the machine may result in death or serious injury.**

2. Support machine securely. (See "**Support Machine Securely**" on **page 16**.)
3. Remove lower access panel from bottom of machine.

WARNING

Always ensure boom is secured with safety strut when raising boom. Failure to secure boom with safety strut may result in death or serious injury.

4. Raise boom and secure with safety strut.
5. Disconnect negative battery cable at battery. (See "**Removal and Installation**" on **page 2-217**.)

WARNING

Always ensure cab is secured with safety strut when raising cab. Failure to secure cab with safety strut may result in death or serious injury.

6. Raise cab and secure with safety strut to gain access to hydrostatic drive pump.
7. Drain hydraulic oil tank. (See "**Drain/Fill**" on **page 4-64**.)
8. Remove gear pump. (See "**Removal and Installation**" on **page 4-68** or "**Removal and Installation**" on **page 4-69**.)

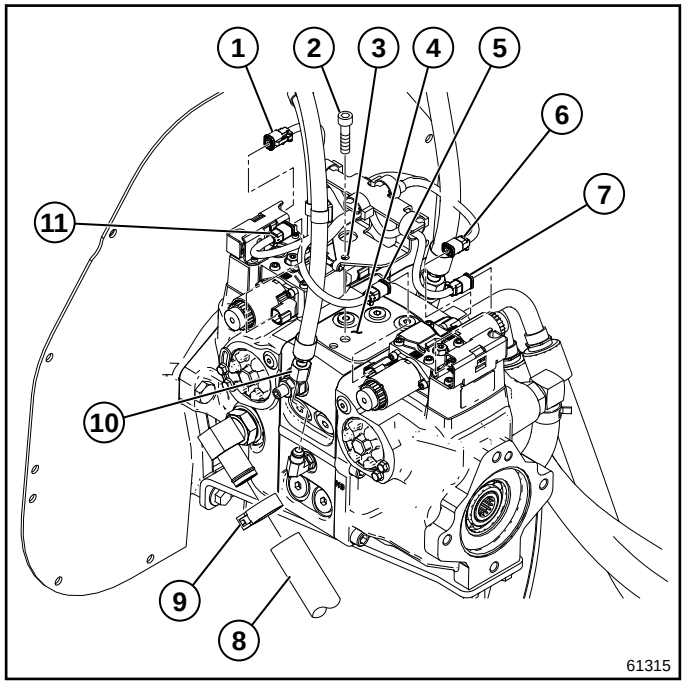


Figure 3-48: Right Side Hoses Removal and Installation

9. Remove clamp (9) and hose (8) from hydrostatic drive pump (4).
10. Remove hose (10) from hydrostatic drive pump (4).
11. Disconnect connector (6) from hydrostatic drive pump (4).
12. Disconnect connector (7) from hydrostatic drive pump (4).
13. Disconnect connector (5) from hydrostatic drive pump (4).
14. Disconnect connector (11) from hydrostatic drive pump (4).
15. Disconnect connector (1) from hydrostatic drive pump (4).
16. Remove bolt (2) and bracket (3) from hydrostatic drive pump (4).

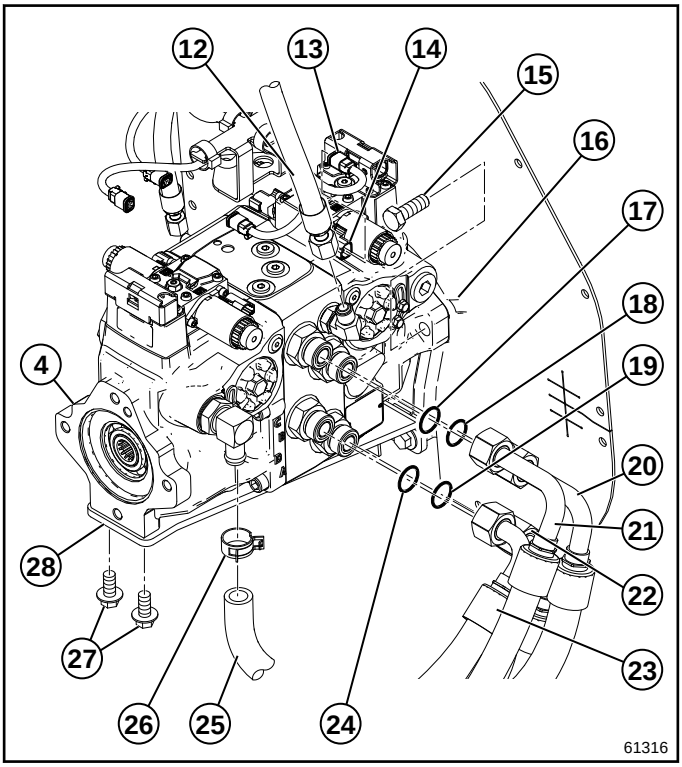


Figure 3-49: Left Side Hoses Removal and Installation

17. Disconnect connector (13) from connector (14).
18. Remove hose (12) from hydrostatic drive pump (4).
19. Remove hose (22) and O-ring (19) from hydrostatic drive pump (4).
20. Remove hose (23) and O-ring (24) from hydrostatic drive pump (4).
21. Remove hose (20) and O-ring (18) from hydrostatic drive pump (4).
22. Remove hose (21) and O-ring (17) from hydrostatic drive pump (4).
23. Remove clamp (26) and hose (25) from hydrostatic drive pump (4).
24. Remove two bolts (27) from bracket (28) and hydrostatic drive pump (4).
25. Remove two bolts (15) and hydrostatic drive pump (4) from machine (16).

Installation Notes

- *Install the hydrostatic drive pump by reversing the order of removal.*
- *Lightly lubricate O-rings with clean hydraulic oil prior to installation.*
- *Remove caps and plugs as hoses and fittings are installed.*
- *Install hoses and fittings as noted prior to removal.*

Brake Valve

Removal and Installation

See **Figure 3-50**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*
- *Cap and plug hoses and fittings during removal.*

NOTE

Tag and mark electrical connectors and wiring prior to removal to ensure proper installation.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

WARNING

Always ensure boom is secured with safety strut when raising boom. Failure to secure boom with safety strut may result in death or serious injury.

2. Raise boom and secure with safety strut.

WARNING

Always ensure cab is secured with safety strut when raising cab. Failure to secure cab with safety strut may result in death or serious injury.

3. Raise cab and secure with safety strut to gain access to brake valve.
4. Disconnect negative battery cable at battery. (See "**Battery**" on **page 2-217**.)

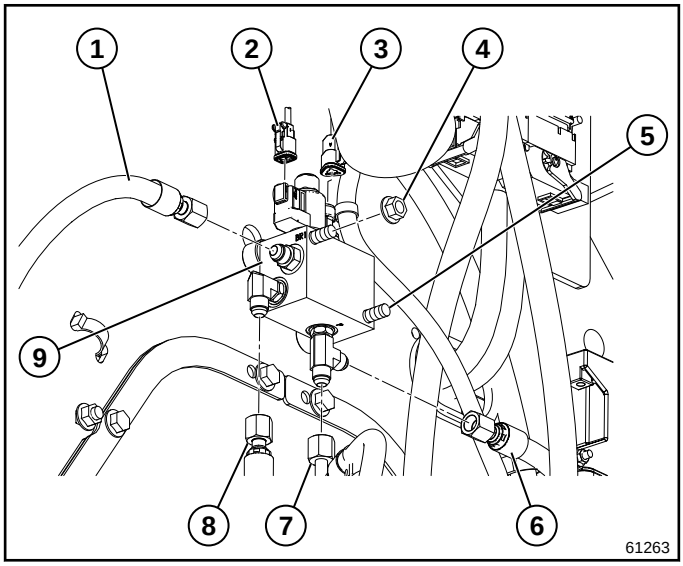


Figure 3-50: Brake Valve Removal and Installation

5. Remove hose (1) from brake valve (9).
6. Remove hose (6) from brake valve (9).
7. Remove hose (7) from brake valve (9).

8. Remove hose (8) from brake valve (9).
9. Disconnect connector (2) from brake valve (9).
10. Disconnect connector (3) from brake valve (9).
11. Remove two nuts (4) and brake valve (9) from two bolts (5).

Installation Notes

- *Install the brake valve by reversing the order of removal.*
- *Lightly lubricate O-rings with clean hydraulic oil prior to installation.*
- *Remove caps and plugs as hoses and fittings are installed.*
- *Install hoses and fittings as noted prior to removal.*

Brake Valve/Two Speed Valve (Optional)

Removal and Installation

See **Figure 3-51**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*
- *Cap and plug hoses and fittings during removal.*

NOTE

Tag and mark electrical connectors and wiring prior to removal to ensure proper installation.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

WARNING

Always ensure boom is secured with safety strut when raising boom. Failure to secure boom with safety strut may result in death or serious injury.

2. Rasie boom and secure with safety strut.

WARNING

Always ensure cab is secured with safety strut when raising cab. Failure to secure cab with safety strut may result in death or serious injury.

3. Raise cab and secure with safety strut to gain access to brake valve/two speed valve.
4. Disconnect negative battery cable at battery. (See "**Battery**" on **page 2-217**.)

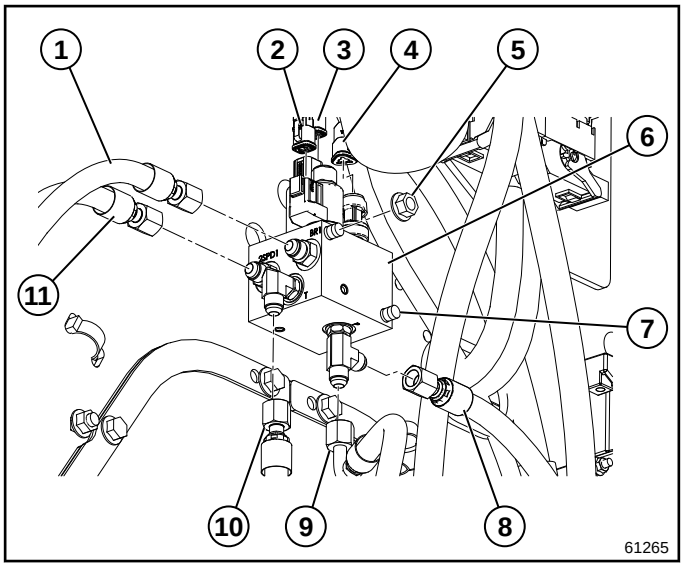


Figure 3-51: Brake Valve/Two Speed Valve Removal and Installation

5. Remove hose (1) from brake valve/two speed valve (6).
6. Remove hose (11) from brake valve/two speed valve (6).
7. Remove hose (10) from brake valve/two speed valve (6).
8. Remove hose (9) from brake valve/two speed valve (6).
9. Remove hose (8) from brake valve/two speed valve (6).
10. Disconnect connector (2) from brake valve/two speed valve (6).
11. Disconnect connector (3) from brake valve/two speed valve (6).
12. Remove wire harness connector (4) from brake valve/two speed valve (6).
13. Remove two nuts (5) and brake valve/two speed valve (6) from two bolts (7).

Installation Notes

- *Install the brake valve/two speed valve by reversing the order of removal.*
- *Lightly lubricate O-rings with clean hydraulic oil prior to installation.*
- *Remove caps and plugs as hoses and fittings are installed.*
- *Install hoses and fittings as noted prior to removal.*

Right Drive Motor (One Speed Wheeled Machine)

Removal and Installation

See **Figures 3-52** through **3-54**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*
- *Cap and plug hoses and fittings during removal.*

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

WARNING

- **Support the machine using properly rated jackstands. Never work under a machine supported only by a jack.**
- **Do not use wood or concrete blocks to support the machine. Failure to properly support the machine may result in death or serious injury.**

2. Support machine securely. (See "**Support Machine Securely**" on **page 16**.)
3. Remove lower access panel from bottom of machine.

WARNING

Always ensure boom is secured with safety strut when raising boom. Failure to secure boom with safety strut may result in death or serious injury.

4. Raise boom and secure with safety strut.
5. Drain hydraulic oil tank. (See "**Drain/Fill**" on **page 4-64**.)

WARNING

Always ensure cab is secured with safety strut when raising cab. Failure to secure cab with safety strut may result in death or serious injury.

6. Raise cab and secure with safety strut to gain access to hydrostatic pump.

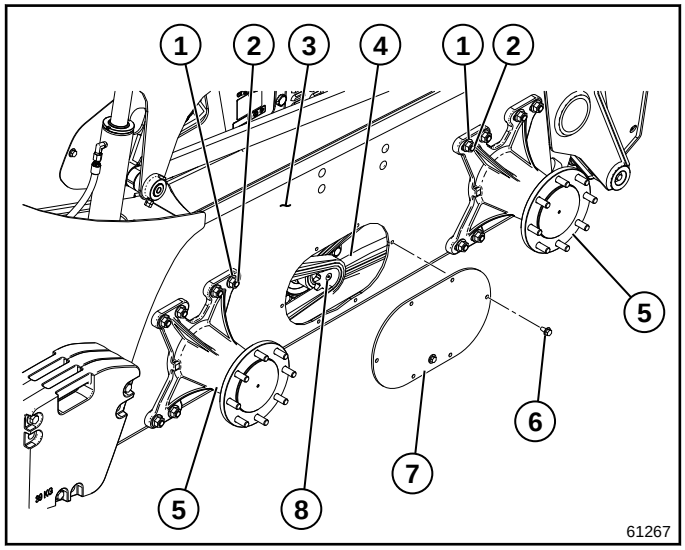


Figure 3-52: Chain Removal and Installation

7. Remove right wheels from machine.
8. Remove six bolts (6) and right side access cover (7) from machine (3).
9. Loosen 16 nuts (1) on bolts (2) and slide wheel hub (5) toward drive motor (8) to loosen chains (4).
10. Remove chains (4) from drive motor (8).

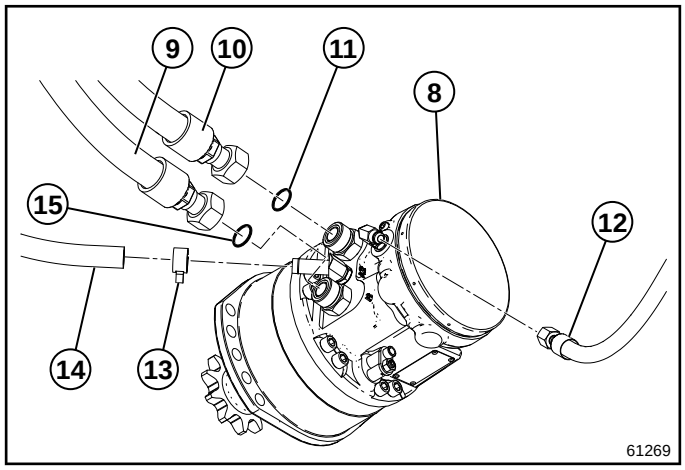


Figure 3-53: Hose Removal and Installation

11. Remove hose (12) from drive motor (8).
12. Remove hose (10) and O-ring (11) from drive motor (8).
13. Remove hose (9) and O-ring (15) from drive motor (8).
14. Remove clamp (13) and hose (14) from drive motor (8).

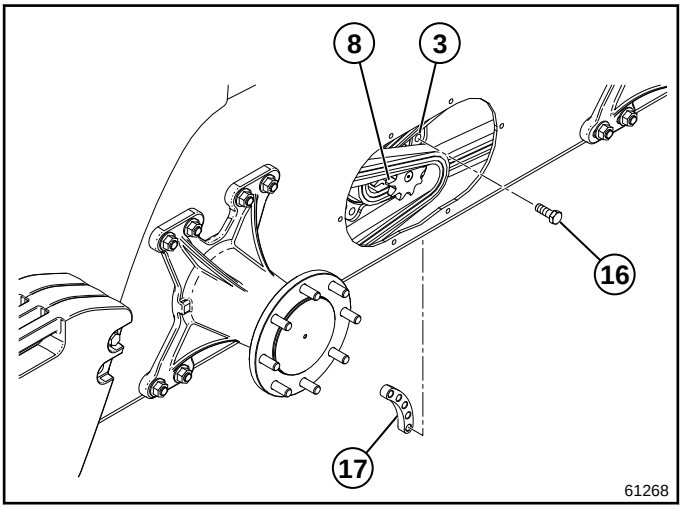


Figure 3-54: Drive Motor Removal and Installation

15. Remove 10 bolts (16) from machine (3), drive motor (8), and two brackets (17).
16. Remove drive motor (8) from machine (3).

Installation Notes

- *Install the drive motor by reversing the order of removal.*
- *Lightly lubricate O-rings with hydraulic oil prior to installation.*
- *Remove caps and plugs as hoses and fittings are installed.*
- *Install hoses and fittings as noted prior to removal.*

Left Drive Motor (One Speed Wheeled Machine)

Removal and Installation

See **Figures 3-55** through **3-57**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*
- *Cap and plug hoses and fittings during removal.*

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

WARNING

- **Support the machine using properly rated jackstands. Never work under a machine supported only by a jack.**
- **Do not use wood or concrete blocks to support the machine. Failure to properly support the machine may result in death or serious injury.**

2. Support machine securely. (See "**Support Machine Securely**" on **page 16**.)
3. Remove lower access panel from bottom of machine.

WARNING

Always ensure boom is secured with safety strut when raising boom. Failure to secure boom with safety strut may result in death or serious injury.

4. Raise boom and secure with safety strut.
5. Drain hydraulic oil tank. (See "**Drain/Fill**" on **page 4-64**.)
6. Remove left wheels from machine.

WARNING

Always ensure cab is secured with safety strut when raising cab. Failure to secure cab with safety strut may result in death or serious injury.

7. Raise cab and secure with safety strut to gain access to hydrostatic pump.

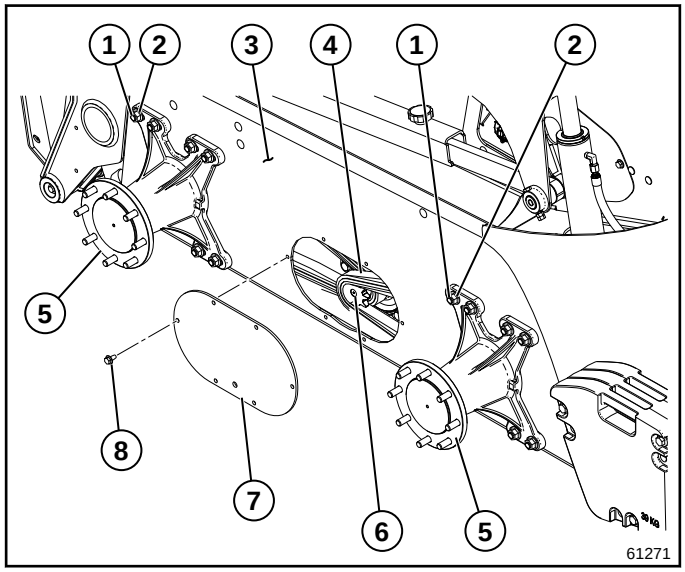


Figure 3-55: Chain Removal and Installation

8. Remove six bolts (8) and access cover (7) from machine (3).
9. Loosen 16 nuts (2) on bolts (1) and slide wheel hub (5) toward drive motor (6) to loosen chains (4).
10. Remove chains (4) from drive motor (6).

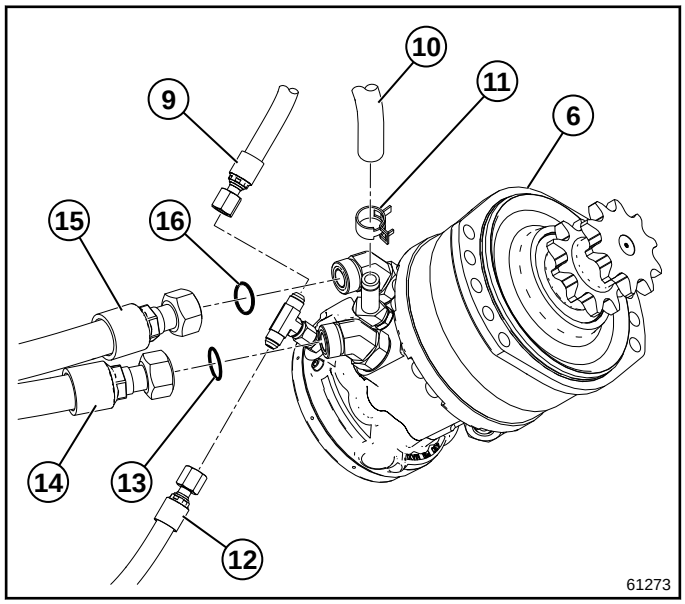


Figure 3-56: Hose Removal and Installation

11. Remove hose (9) from drive motor (6).
12. Remove hose (12) from drive motor (6).
13. Remove hose (15) and O-ring (16) from drive motor (6).
14. Remove hose (14) and O-ring (13) from drive motor (6).
15. Remove clamp (11) and hose (10) from drive motor (6).

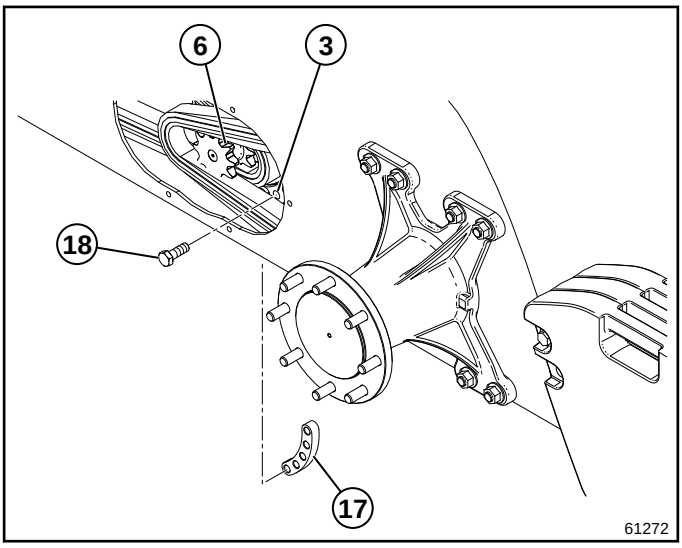


Figure 3-57: Drive Motor Removal and Installation

16. Remove ten bolts (18) from machine (3), drive motor (6), and two brackets (17).
17. Remove drive motor (6) from machine (3).

Installation Notes

- *Install the drive motor by reversing the order of removal.*
- *Lightly lubricate O-rings with clean hydraulic oil prior to installation.*
- *Remove caps and plugs as hoses and fittings are installed.*
- *Install hoses and fittings as noted prior to removal.*

Right Drive Motor (Two Speed Wheeled Machine)

Removal and Installation

See **Figures 3-58** through **3-60**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*
- *Cap and plug hoses and fittings during removal.*

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

WARNING

- **Support the machine using properly rated jackstands. Never work under a machine supported only by a jack.**
- **Do not use wood or concrete blocks to support the machine. Failure to properly support the machine may result in death or serious injury.**

2. Support machine securely. (See "**Support Machine Securely**" on **page 16**.)
3. Remove lower access panel from bottom of machine.

WARNING

Always ensure boom is secured with safety strut when raising boom. Failure to secure boom with safety strut may result in death or serious injury.

4. Raise boom and secure with safety strut.
5. Drain hydraulic oil tank. (See "**Drain/Fill**" on **page 4-64**.)

WARNING

Always ensure cab is secured with safety strut when raising cab. Failure to secure cab with safety strut may result in death or serious injury.

6. Raise cab and secure with safety strut to gain access to hydrostatic pump.

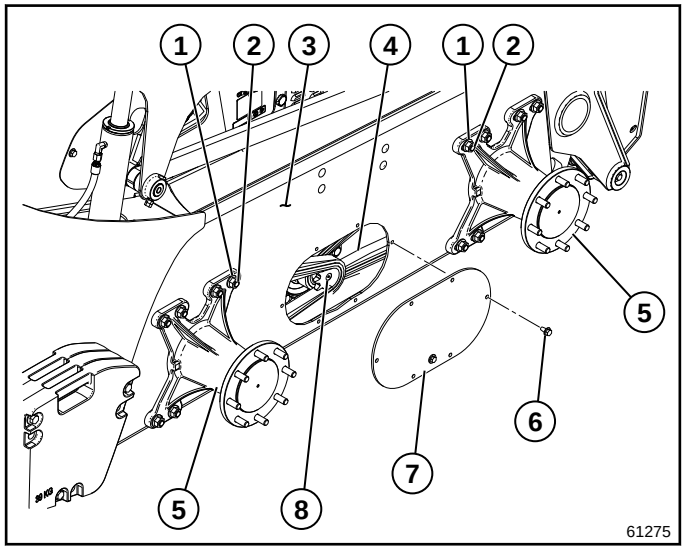


Figure 3-58: Chain Removal and Installation

7. Remove six bolts (6) and access cover (7) from machine (3).
8. Loosen 16 nuts (1) on bolts (2) and slide wheel hub (5) toward drive motor (8) to loosen chains (4).
9. Remove chains (4) from drive motor (8).

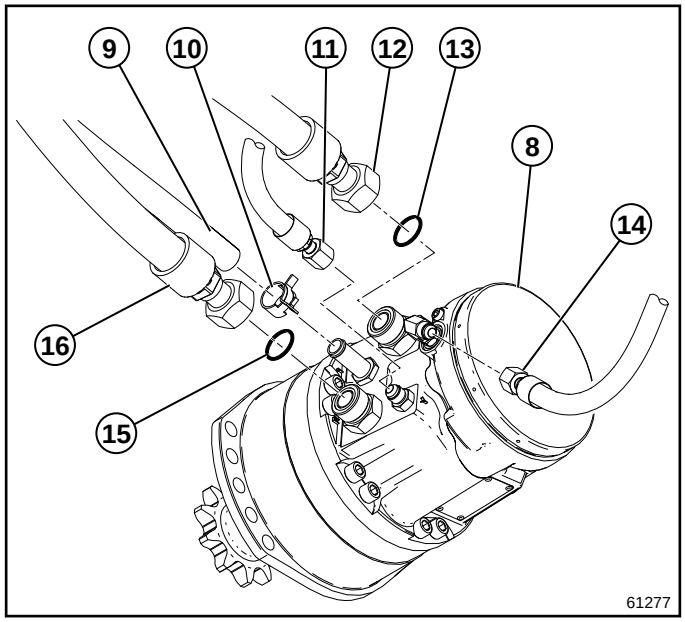


Figure 3-59: Hose Removal and Installation

10. Remove hose (11) from drive motor (8).
11. Remove hose (14) from drive motor (8).
12. Remove hose (12) and O-ring (13) from drive motor (8).
13. Remove hose (16) and O-ring (15) from drive motor (8).
14. Remove clamp (10) and hose (9) from drive motor (8).

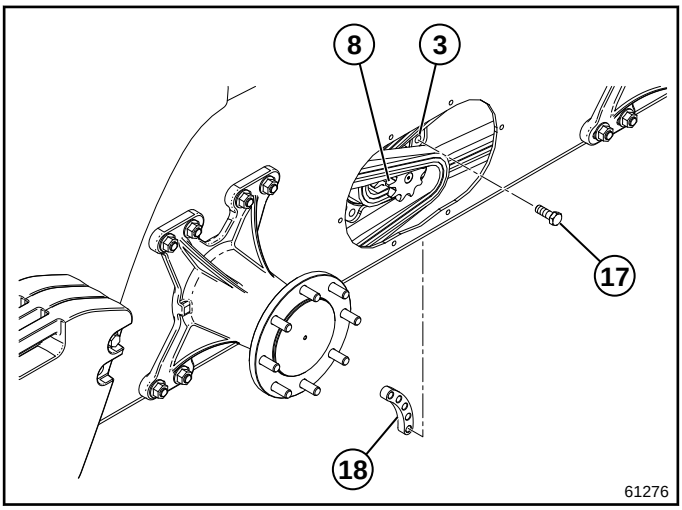


Figure 3-60: Drive Motor Removal and Installation

15. Remove 10 bolts (17) from machine (3), drive motor (8), and two brackets (18).
16. Remove drive motor (8) from machine (3).

Installation Notes

- *Install the drive motor by reversing the order of removal.*
- *Lightly lubricate O-rings with clean hydraulic oil prior to installation.*
- *Remove caps and plugs as hoses and fittings are installed.*
- *Install hoses and fittings as noted prior to removal.*

Left Drive Motor (Two Speed Wheeled Machine)

Removal and Installation

See **Figures 3-61** through **3-63**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*
- *Cap and plug hoses and fittings during removal.*

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

WARNING

- **Support the machine using properly rated jackstands. Never work under a machine supported only by a jack.**
- **Do not use wood or concrete blocks to support the machine. Failure to properly support the machine may result in death or serious injury.**

2. Support machine securely. (See "**Support Machine Securely**" on **page 16**.)
3. Remove lower access panel from bottom of machine.

WARNING

Always ensure boom is secured with safety strut when raising boom. Failure to secure boom with safety strut may result in death or serious injury.

4. Raise boom and secure with safety strut.
5. Drain hydraulic oil tank. (See "**Drain/Fill**" on **page 4-64**.)

WARNING

Always ensure cab is secured with safety strut when raising cab. Failure to secure cab with safety strut may result in death or serious injury.

6. Raise cab and secure with safety strut to gain access to hydrostatic pump.

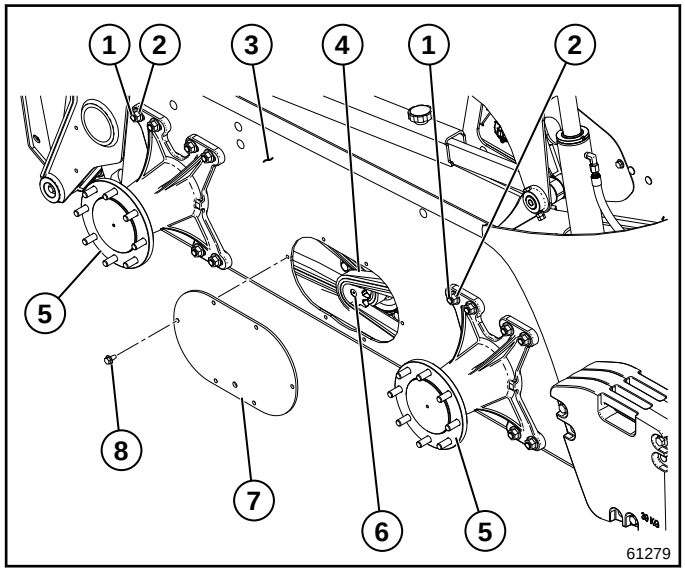


Figure 3-61: Chain Removal and Installation

7. Remove six bolts (8) and access cover (7) from machine (3).
8. Loosen 16 nuts (2) on bolts (1) and slide wheel hub (5) toward drive motor (6) to loosen chains (4).
9. Remove chains (4) from drive motor (6).

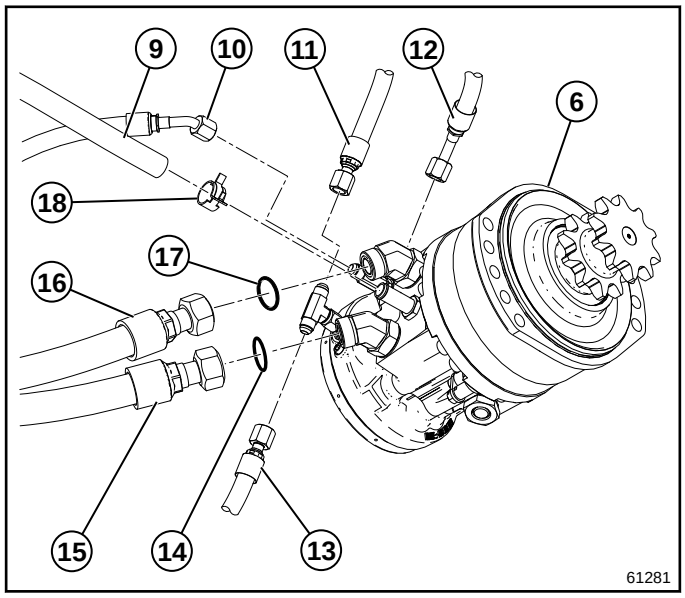


Figure 3-62: Hose Removal and Installation

10. Remove hose (11) from drive motor (6).
11. Remove hose (13) from drive motor (6).
12. Remove hose (10) from drive motor (6).
13. Remove hose (12) from drive motor (6).
14. Remove hose (16) and O-ring (17) from drive motor (6).
15. Remove hose (15) and O-ring (14) from drive motor (6).
16. Remove clamp (18) and hose (9) from drive motor (6).

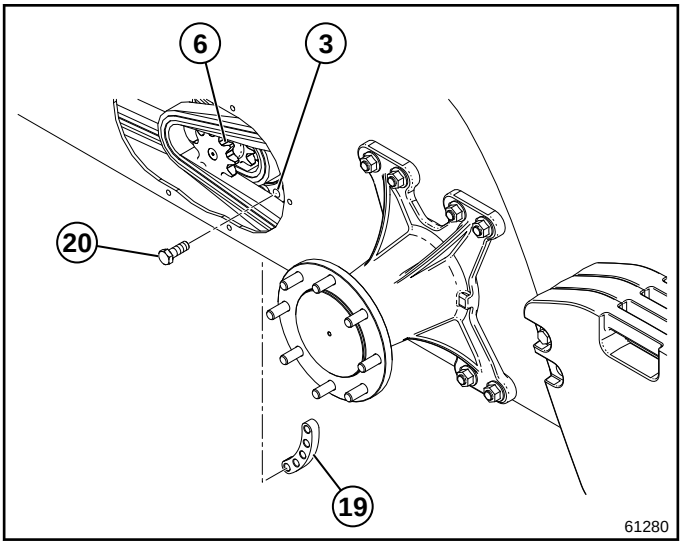


Figure 3-63: Drive Motor Removal and Installation

17. Remove 10 bolts (20) from machine (3), drive motor (6), and two brackets (19).
18. Remove drive motor (6) from machine (3).

Installation Notes

- *Install the drive motor by reversing the order of removal.*
- *Lightly lubricate O-rings with clean hydraulic oil prior to installation.*
- *Remove caps and plugs as hoses and fittings are installed.*
- *Install hoses and fittings as noted prior to removal.*

Drive Motor (One Speed Track Machine)

Removal and Installation

See **Figures 3-64** through **3-66**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*
- *Cap and plug hoses and fittings during removal.*

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

WARNING

- **Support the machine using properly rated jackstands. Never work under a machine supported only by a jack.**
- **Do not use wood or concrete blocks to support the machine. Failure to properly support the machine may result in death or serious injury.**

2. Support machine securely. (See "**Support Machine Securely**" on **page 16**.)

WARNING

Always ensure boom is secured with safety strut when raising boom. Failure to secure boom with safety strut may result in death or serious injury.

3. Raise boom and secure with safety strut.

WARNING

Always ensure cab is secured with safety strut when raising cab. Failure to secure cab with safety strut may result in death or serious injury.

4. Raise cab and support with safety strut.
5. Drain hydraulic oil tank. (See "**Hydraulic Oil Tank Drain/Fill Procedure**" on **page 4-64**.)

NOTE

Both drive motors are removed the same way. Right drive motor is shown.

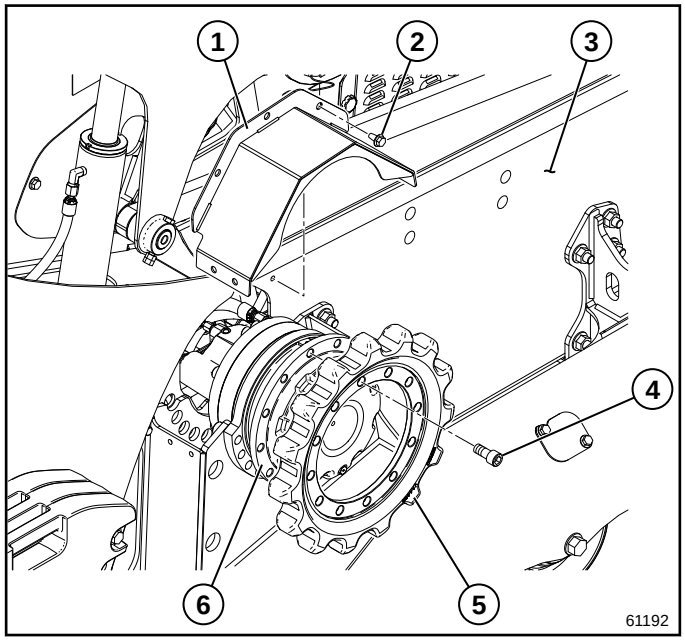


Figure 3-64: Sprocket Removal and Installation

6. Remove six bolts (2) and access cover (1) from machine (3).
7. Remove 12 bolts (4) and sprocket (5) from drive motor (6).

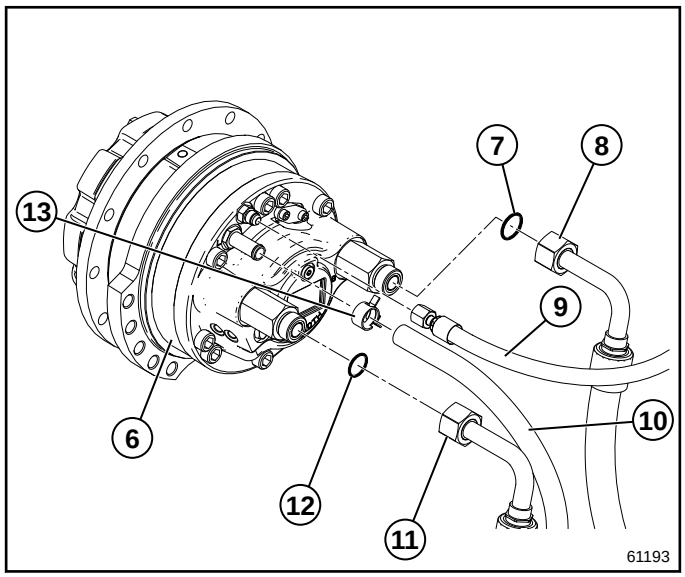


Figure 3-65: Hose Removal and Installation

8. Remove hose (9) from drive motor (6).
9. Remove hose (8) and O-ring (7) from drive motor (6).
10. Remove hose (11) and O-ring (12) from drive motor (6).
11. Remove clamp (13) and hose (10) from drive motor (6).

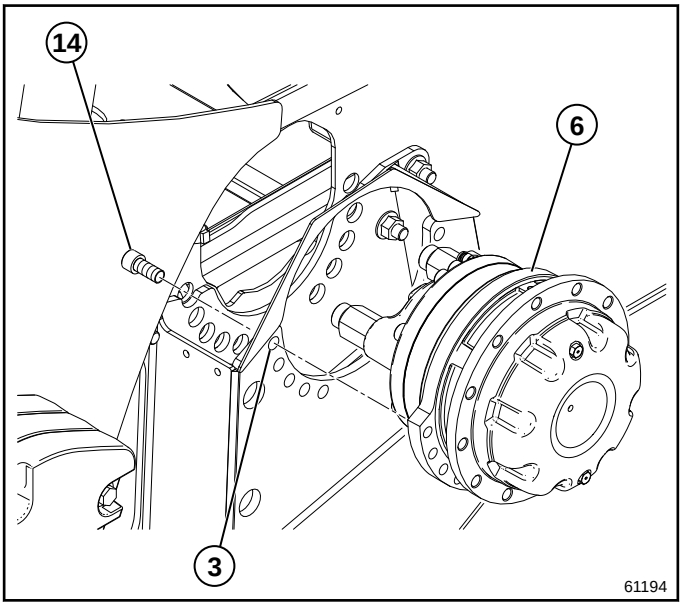


Figure 3-66: Drive Motor Removal and Installation

12. Remove 10 bolts (14) and drive motor (6) from machine (3).

Installation Notes

- *Install the drive motor by reversing the order of removal.*
- *Lightly lubricate O-rings with clean hydraulic oil prior to installation.*
- *Remove caps and plugs as hoses and fittings are installed.*
- *Install hoses and fittings as noted prior to removal.*

Drive Motor (Two Speed Track Machine)

Removal and Installation

See **Figures 3-67** through **3-69**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*
- *Cap and plug hoses and fittings during removal.*

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

WARNING

- **Support the machine using properly rated jackstands. Never work under a machine supported only by a jack.**
- **Do not use wood or concrete blocks to support the machine. Failure to properly support the machine may result in death or serious injury.**

2. Support machine securely. (See "**Support Machine Securely**" on **page 16**.)

WARNING

Always ensure boom is secured with safety strut when raising boom. Failure to secure boom with safety strut may result in death or serious injury.

3. Raise boom and secure with safety strut.

WARNING

Always ensure cab is secured with safety strut when raising cab. Failure to secure cab with safety strut may result in death or serious injury.

4. Raise cab and secure with safety strut.
5. Drain hydraulic oil tank. (See "**Hydraulic Oil Tank Drain/Fill Procedure**" on **page 4-64**.)

NOTE

Both drive motors are removed the same way. Right drive motor is shown.

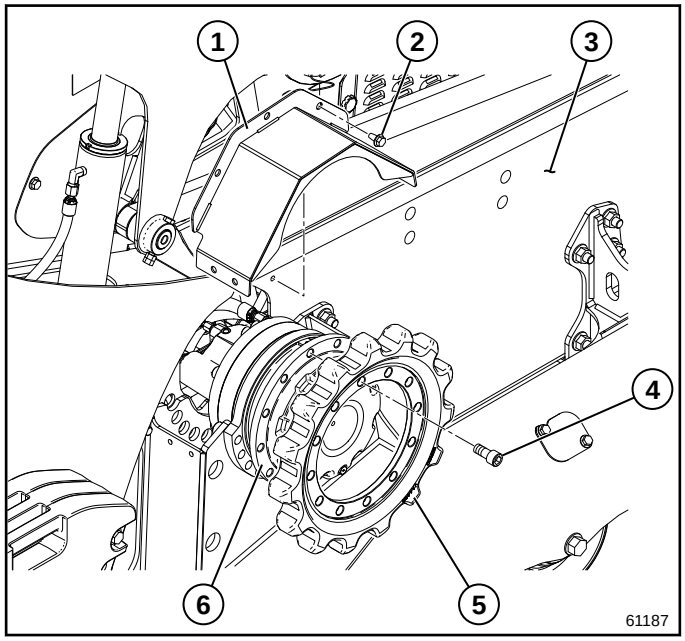


Figure 3-67: Sprocket Removal and Installation

6. Remove six bolts (2) and access cover (1) from machine (3).
7. Remove 12 bolts (4) and sprocket (5) from drive motor (6).

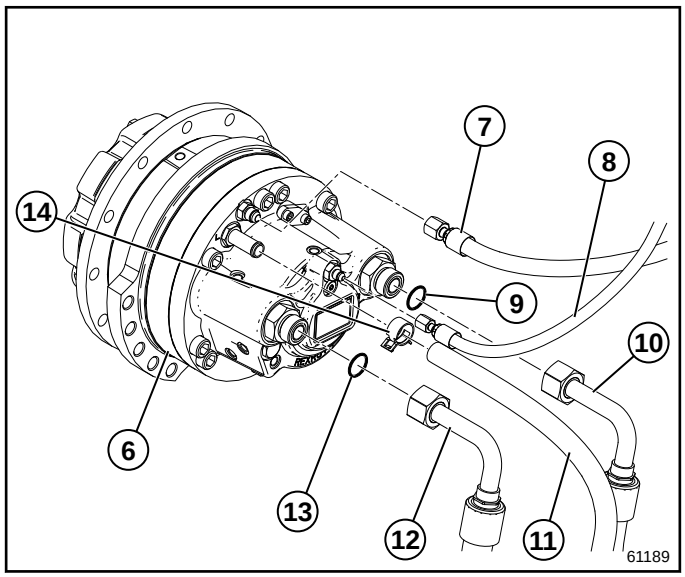


Figure 3-68: Hose Removal and Installation

8. Remove hose (7) from drive motor (6).
9. Remove hose (8) from drive motor (6).
10. Remove hose (10) and O-ring (9) from drive motor (6).
11. Remove hose (12) and O-ring (13) from drive motor (6).
12. Remove clamp (14) and hose (11) from drive motor (6).

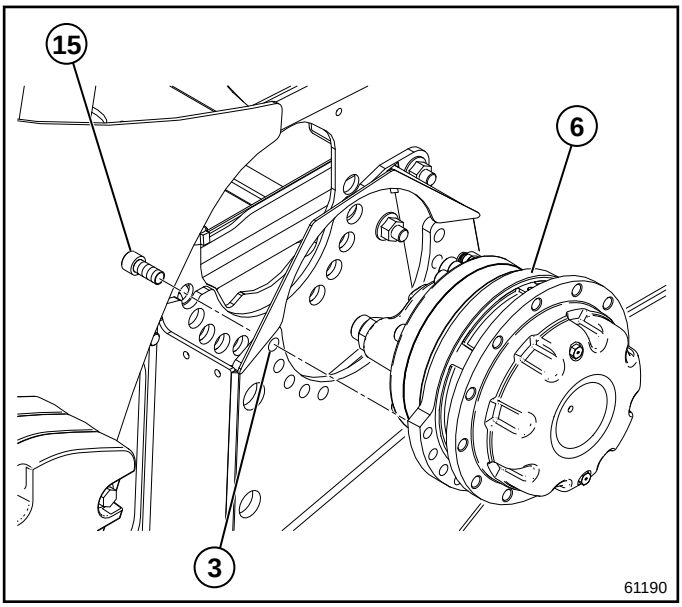


Figure 3-69: Drive Motor Removal and Installation

13. Remove 10 bolts (15) and drive motor (6) from machine (3).

Installation Notes

- *Install the drive motor by reversing the order of removal.*
- *Lightly lubricate O-rings with clean hydraulic oil prior to installation.*
- *Remove caps and plugs as hoses and fittings are installed.*
- *Install hoses and fittings as noted prior to removal.*

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Chapter 4

Hydraulics

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Specifications

Test and Adjustment Specifications

Table 4-1. Test and Adjustment Specifications

Main Relief Valve Adjustment	3481 psi (240 bar)
Gear Pump Operating Pressure	3626 psi (250 bar)
Gear Pump Section 1 Flow	20 GPM (76 LPM) @ 2725 RPM
Gear Pump Section 2 Flow	10.5 GPM (40 LPM) @ 2725 RPM
Auxiliary Hydraulics Flow	15 GPM (57 LPM) @ 2725 RPM
High Flow Auxiliary Hydraulics	20 GPM (76 LPM) @ 2725 RPM
Hydraulic Cylinder Operating Pressure	3481 psi (240 bar)
Boom/Bucket Cylinder Leak Down	0.24 in. (6 mm)/Hour

Repair Specifications

Specification	
Pressure transducer	10 lb-ft (13 N•m)
Brake valve/two speed valve hoses (all)	19 lb-ft (26 N•m)
Fan motor (variable/one speed) fan nut	30 lb-ft (40 N•m)

Commonly Used Terms

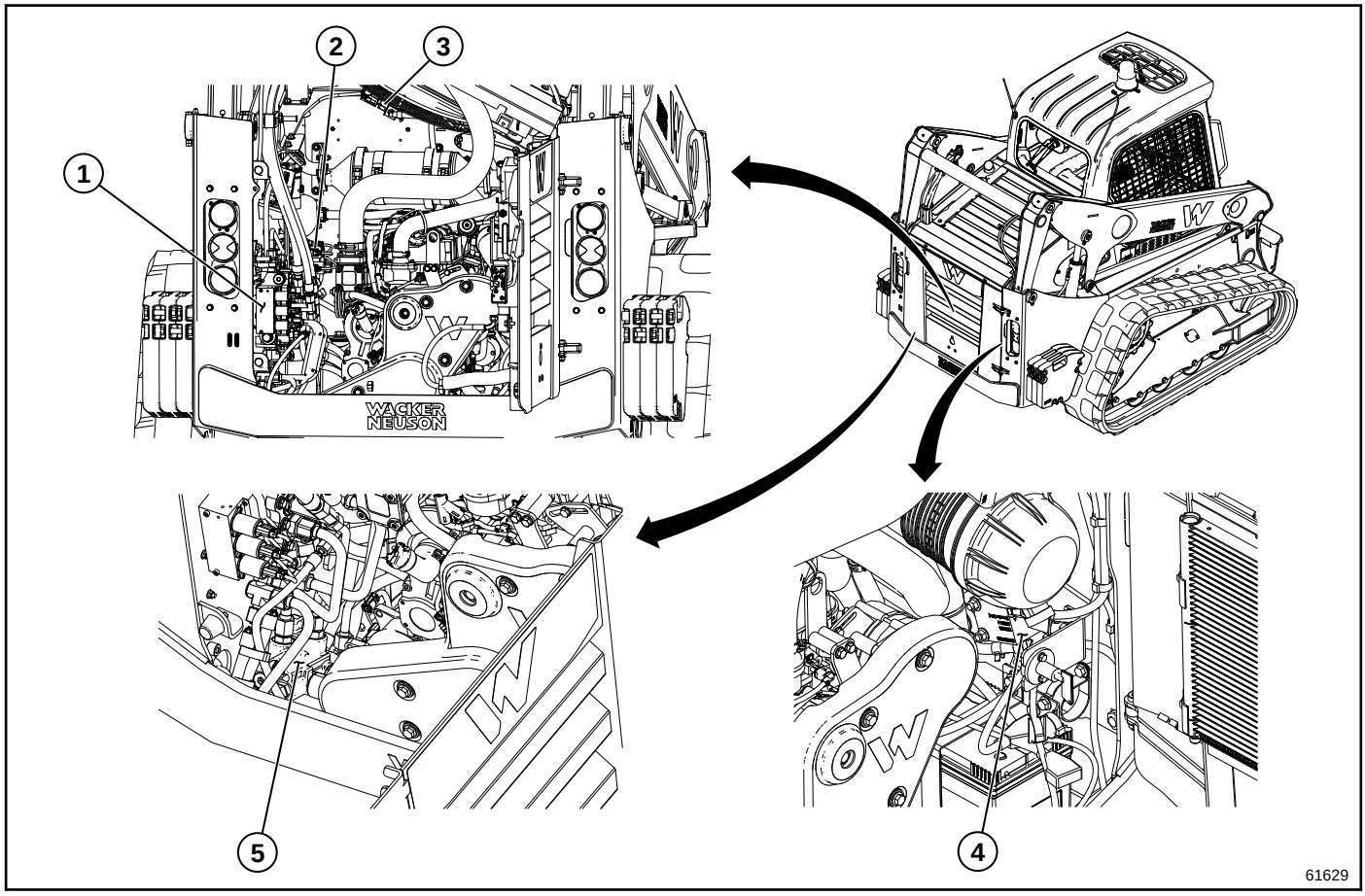
Throughout this manual there are many commonly used terms and phrases. Below is a list of many of these terms and a description of how they are used in this manual.

- **Charge Pressure Oil:** Oil provided from the hydrostatic pump after it has been regulated by a pressure relief valve.
- **Inlet or Drain Oil:** Unpressurized oil either flowing to or from a component.
- **Interlock Circuit:** A safety circuit with a series of switches and relays that allow certain functions to become active after several processes and conditions have been met.
- **Metered Oil:** Oil that is regulated through one or more check or pressure relief valve.
- **Operating Pressure Oil:** Oil provided directly from the hydraulic pump without traveling through the hydrostatic pump where it is regulated by a pressure relief valve.
- **Return Oil:** Pressurized oil that is returned to the hydraulic tank or a component after a function is performed.
- **Switched Power:** Power provided to a circuit from a switching device such as a switch or a relay.
- **Unswitched Power:** Power provided to a circuit directly from the battery without going through any switching devices such as a switch or a relay.

Component Location

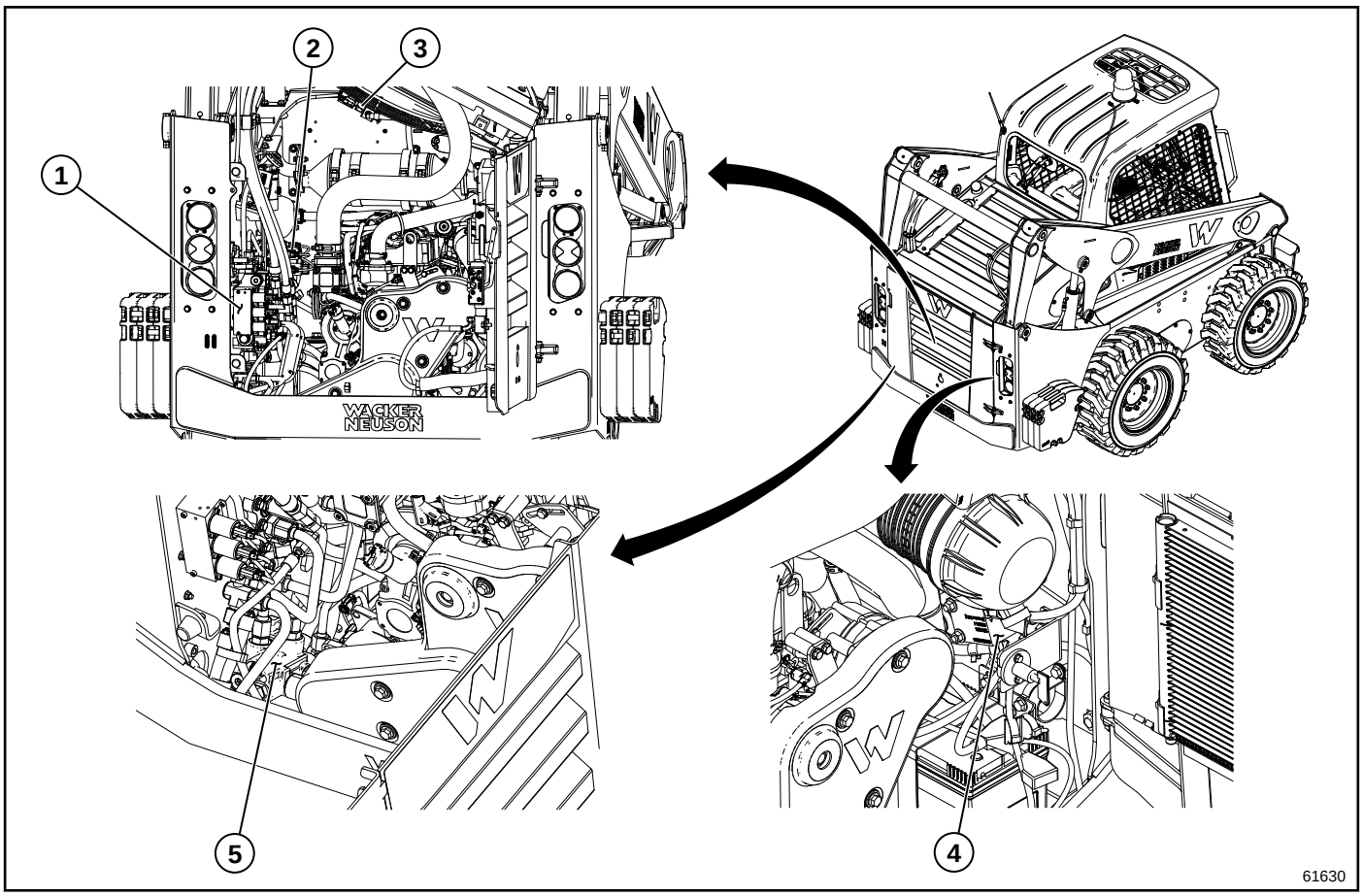
Component Location

See **Figures 4-1** through **4-6**.



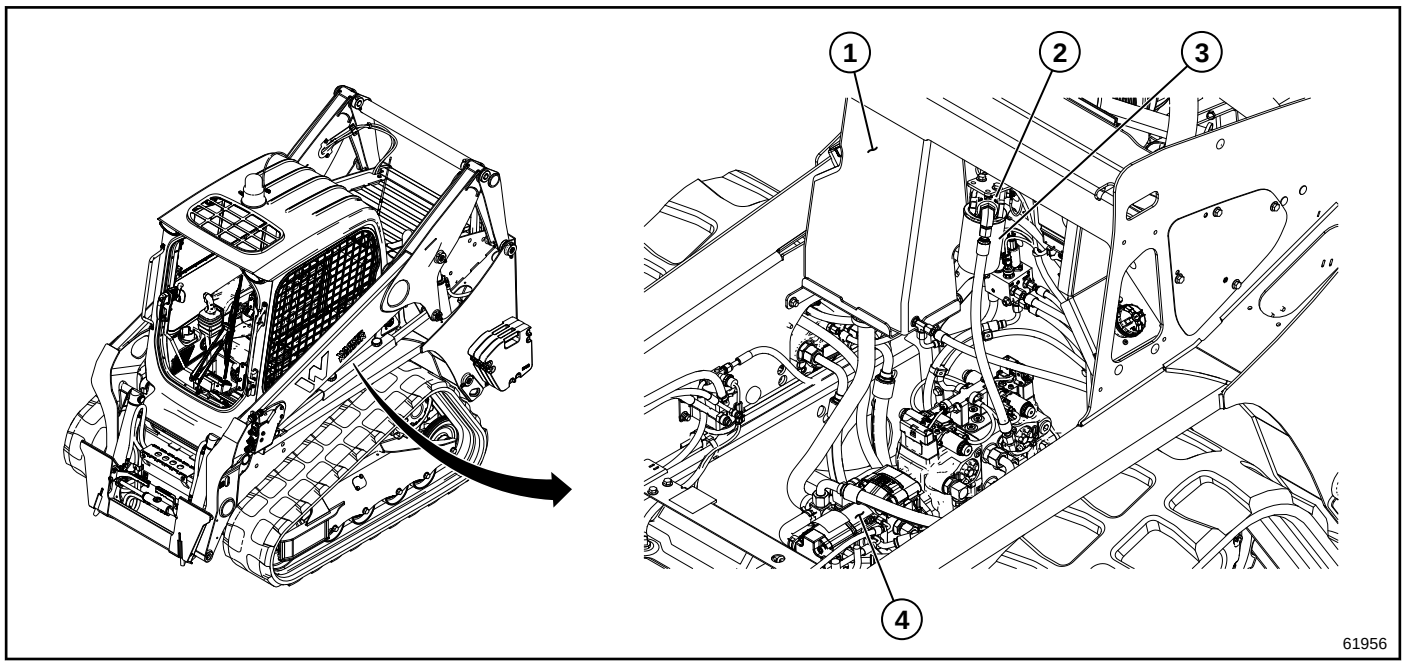
1. MAIN VALVE
2. POWER RIDE (OPTIONAL)
3. FAN MOTOR
4. POWER COUPLER VALVE (OPTIONAL)
5. SELF LEVELING VALVE (OPTIONAL)

Figure 4-1: Compact Track Loader (CTL) Component Location



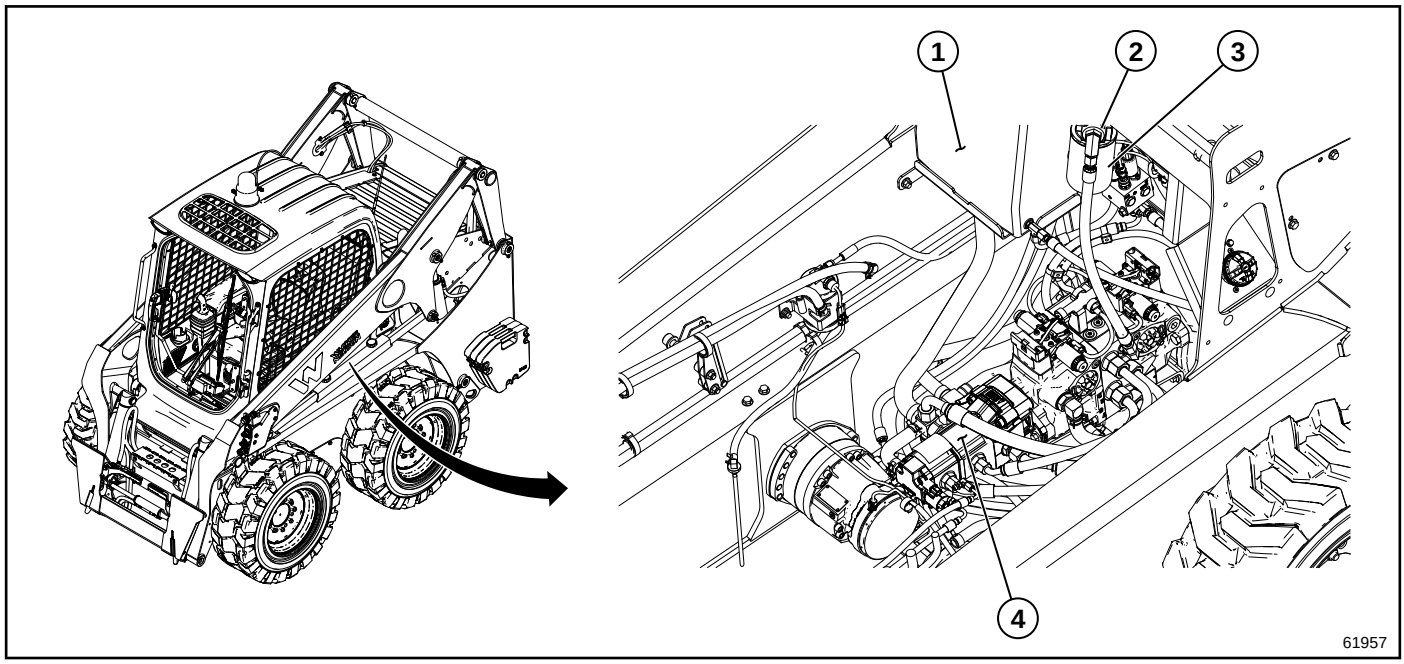
1. MAIN VALVE
2. POWER RIDE (OPTIONAL)
3. FAN MOTOR
4. POWER COUPLER VALVE (OPTIONAL)
5. SELF LEVELING VALVE (OPTIONAL)

Figure 4-2: Skid Steer Loader (SSL) Component Location



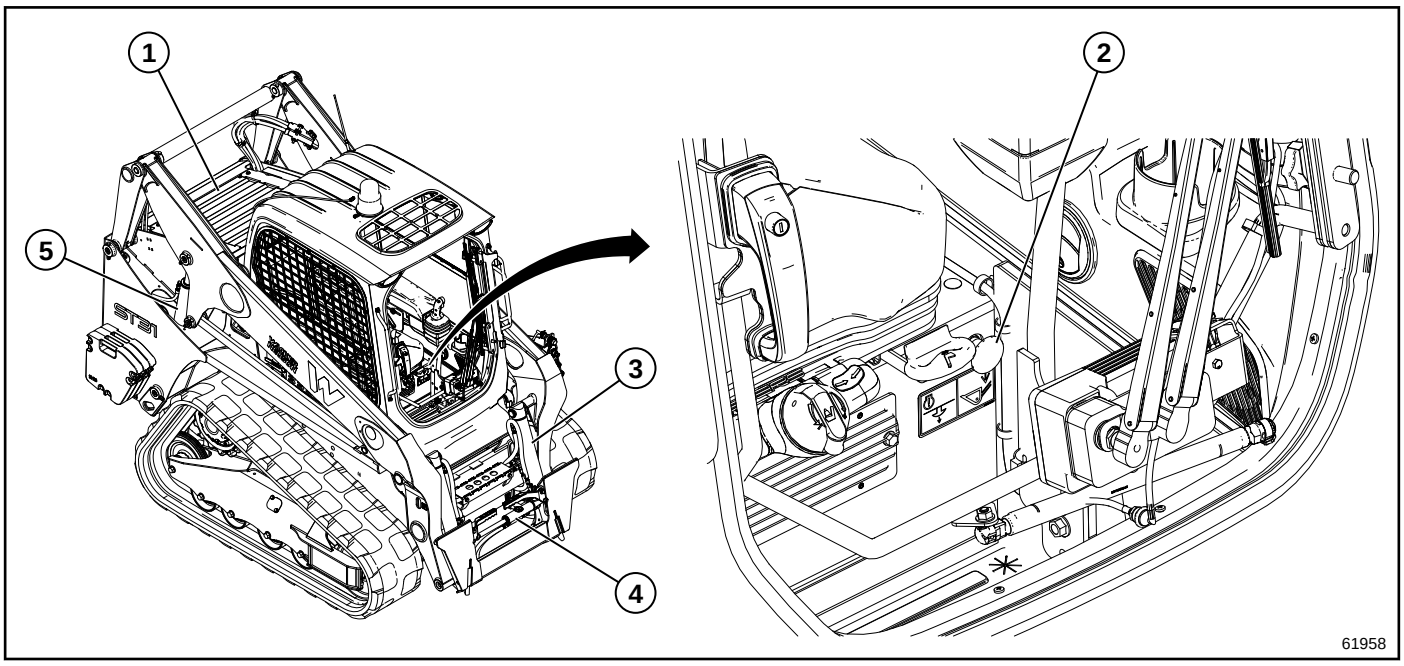
1. HYDRAULIC OIL TANK
2. HYDRAULIC OIL FILTER HOUSING
3. HYDRAULIC OIL FILTER
4. GEAR PUMP

Figure 4-3: CTL Component Location



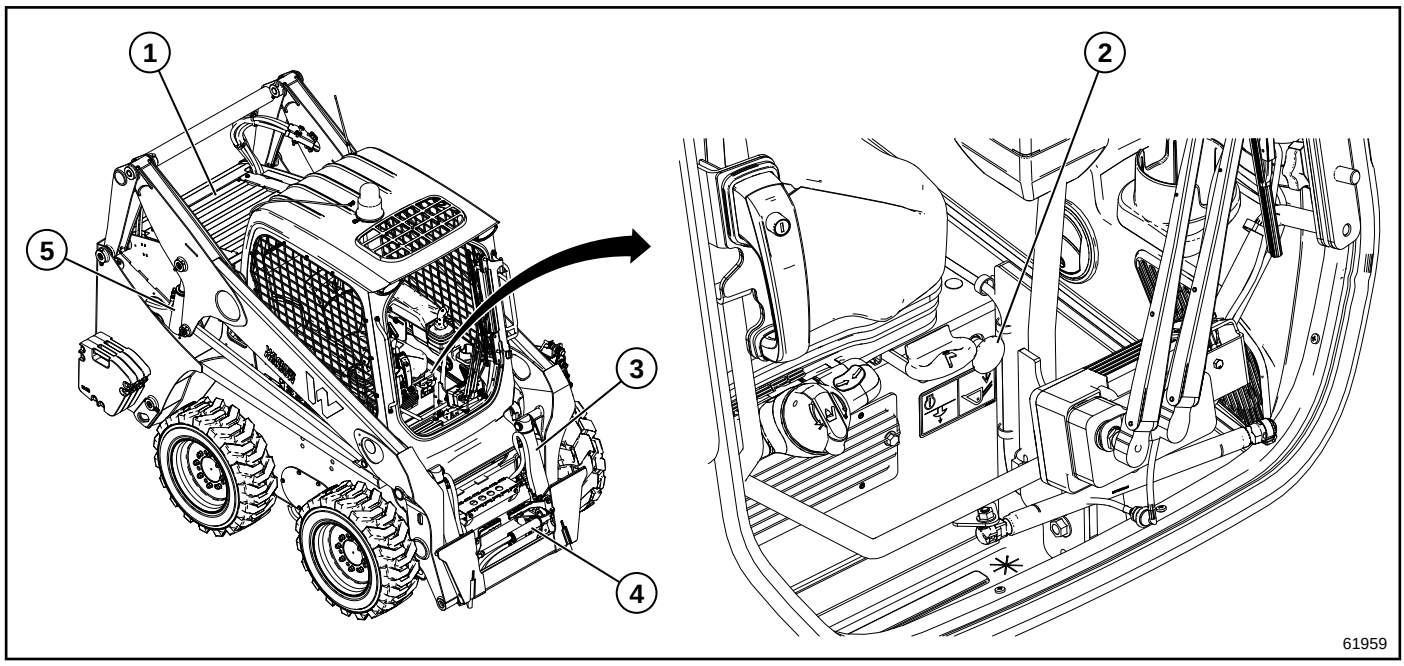
1. HYDRAULIC OIL TANK
2. HYDRAULIC OIL FILTER HOUSING
3. HYDRAULIC OIL FILTER
4. GEAR PUMP

Figure 4-4: SSL Component Location



1. COOLING ASSEMBLY
2. EMERGENCY BOOM LOWER VALVE
3. BUCKET CYLINDER
4. POWER COUPLER CYLINDER (OPTIONAL)
5. BOOM CYLINDER

Figure 4-5: CTL Component Location



1. COOLING ASSEMBLY
2. EMERGENCY BOOM LOWER VALVE
3. BUCKET CYLINDER
4. POWER COUPLER CYLINDER (OPTIONAL)
5. BOOM CYLINDER

Figure 4-6: SSL Component Location

Hydraulic Schematic

Hydraulic Schematic (Wheeled Machine with Electronic Controls)

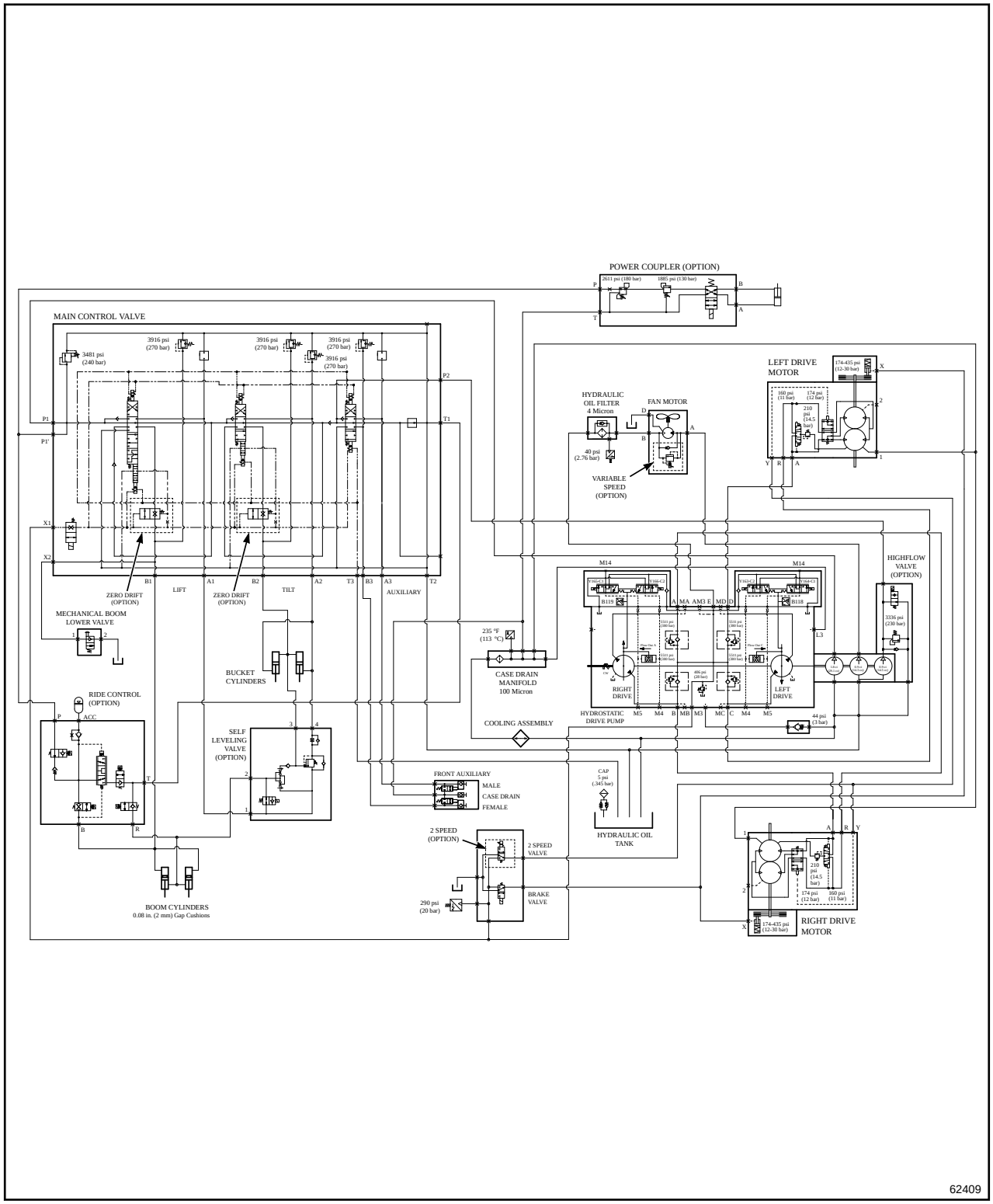


Figure 4-7

Hydraulic Schematic (Track Machine with Electronic Controls)

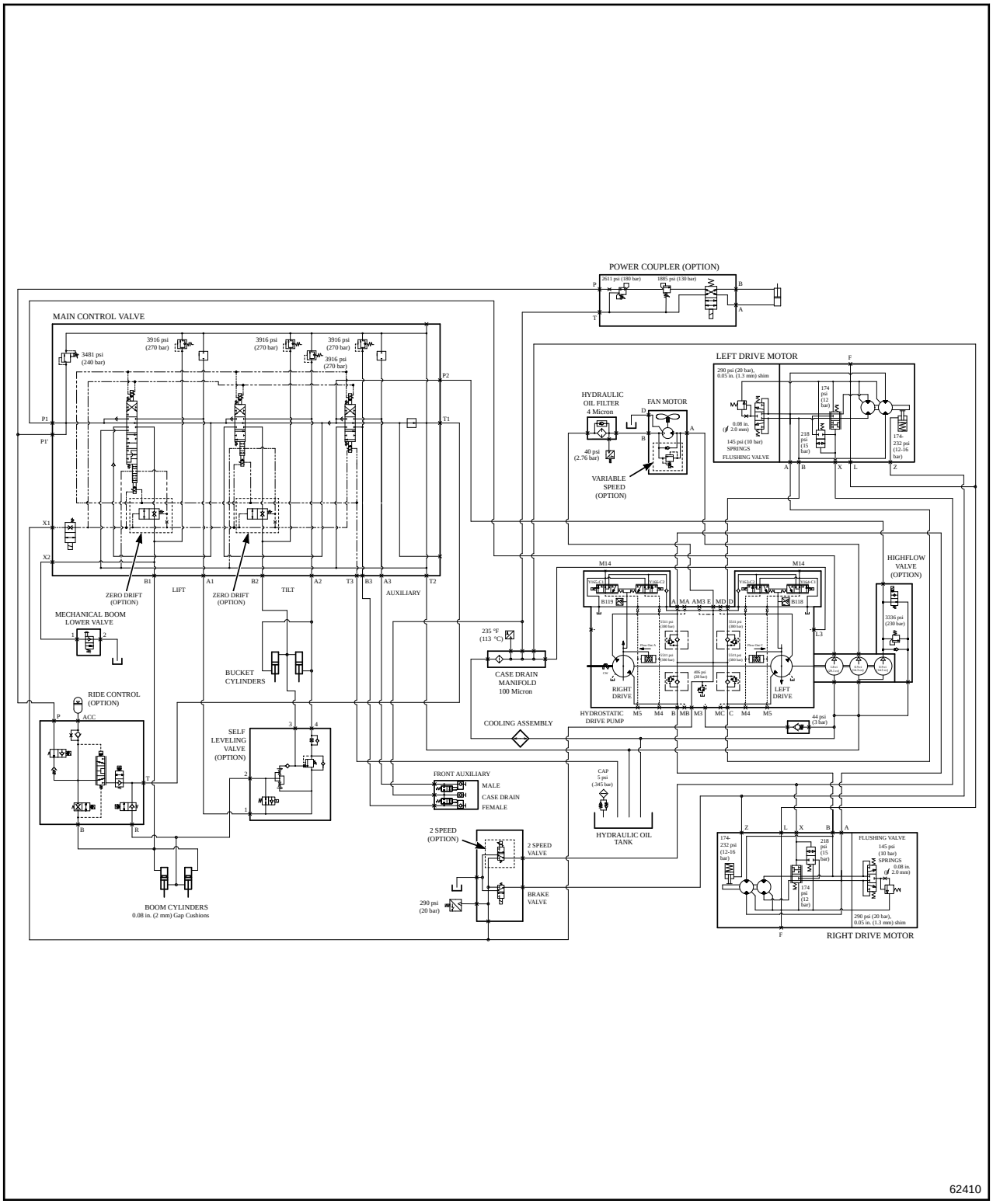


Figure 4-8

Hydraulic Schematic (Wheeled Machine with Manual Controls)

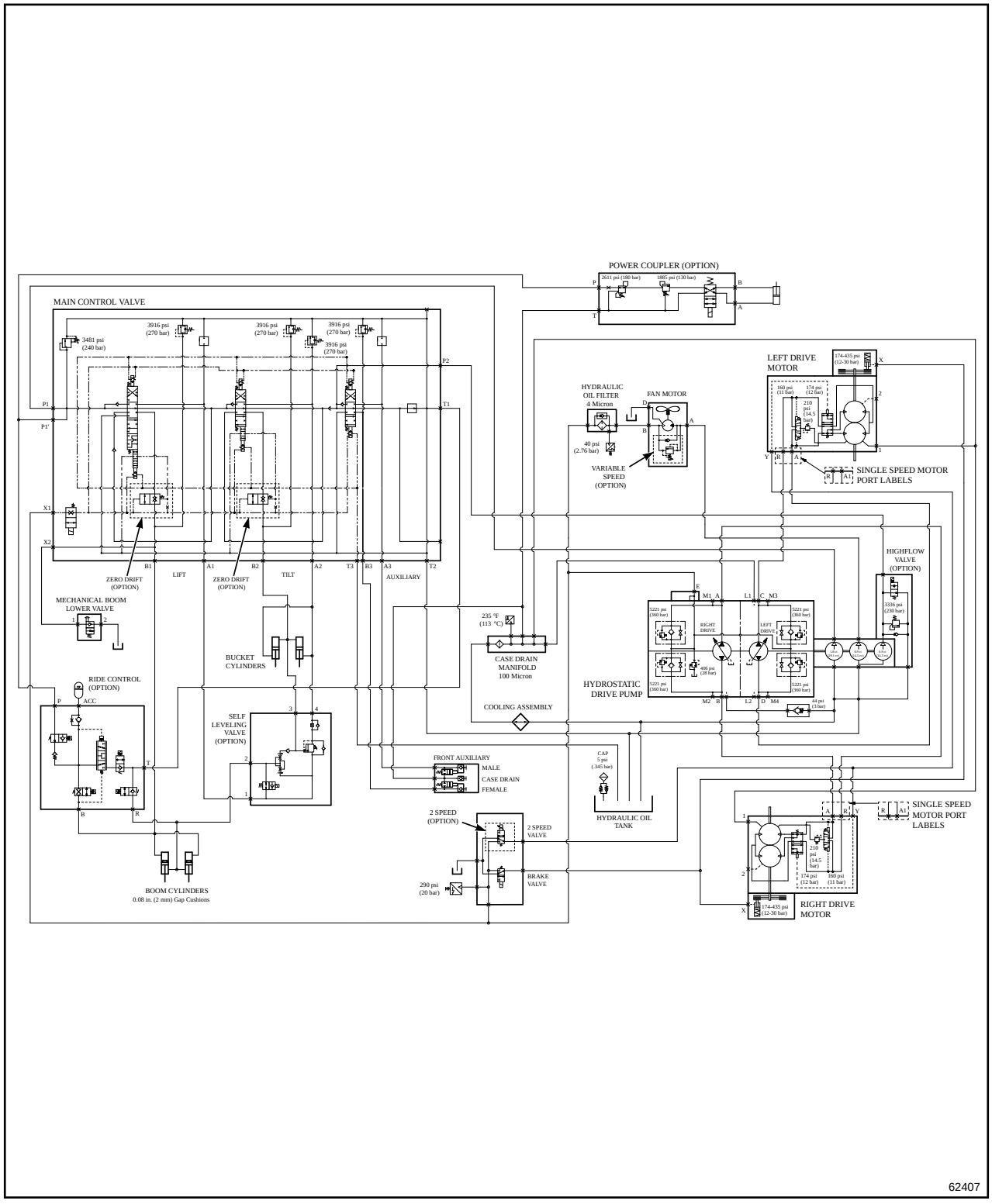


Figure 4-9

Hydraulic Schematic (Track Machine with Manual Controls)

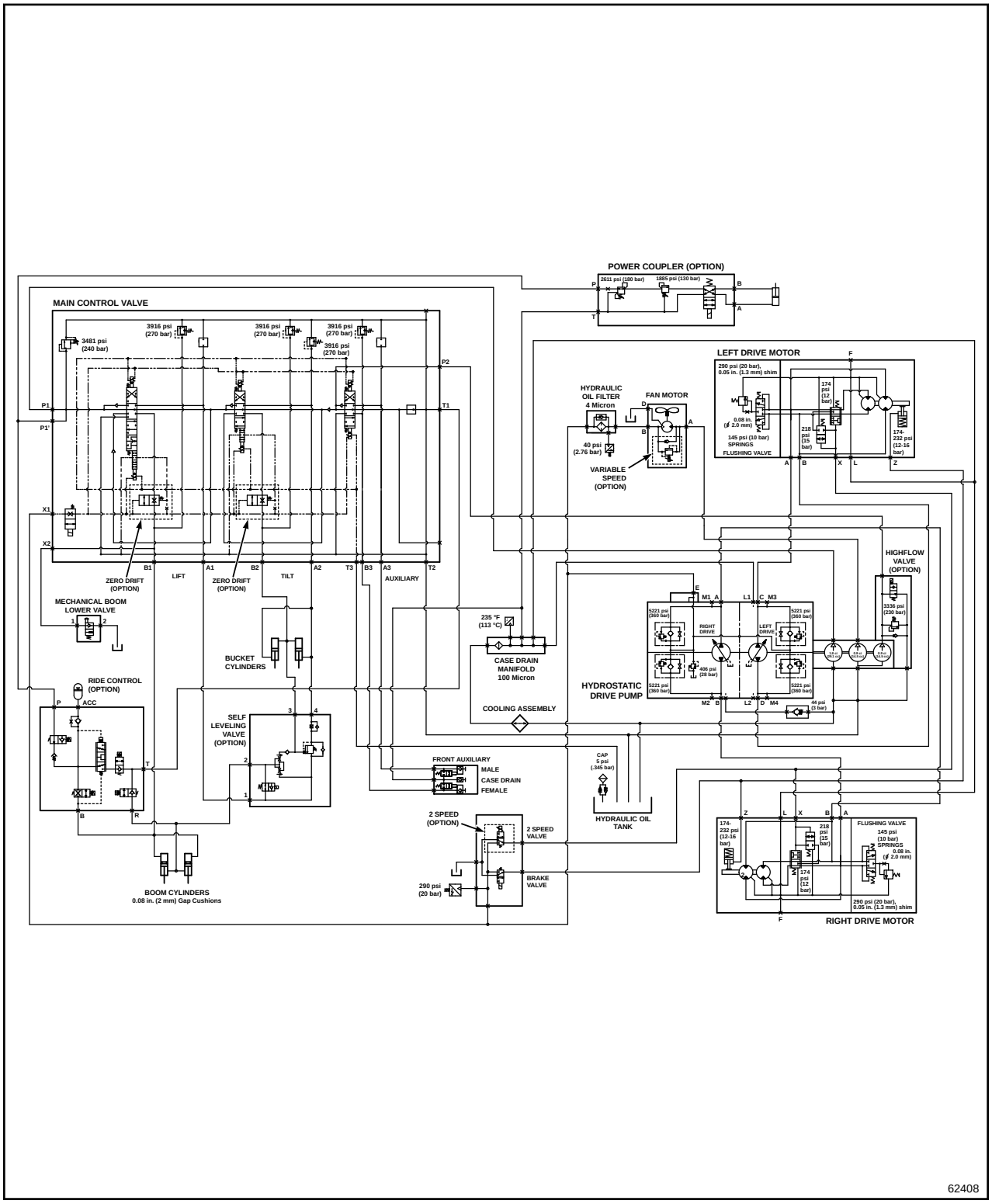


Figure 4-10

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Theory of Operation and Diagnostic Information

Boom Raise Circuit—Theory of Operation

System Conditions:

- Engine running
- Park brake released

Oil Supply to Main Control Valve

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into sections 1 and 2 of the gear pump where it is charged. The operating pressure oil is routed from section 2 of the gear pump through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The hydrostatic drive pump port M3 supplies charge pressure oil to port X1 on the main control valve. When the park brake is released, a solenoid is energized and the interlock spool in the main control valve shifts. This supplies charge pressure oil to the lift, tilt, and auxiliary spools. Section 1 of the gear pump supplies operating pressure oil to port P1 of the main control valve.

Boom Raise Circuit

When the boom control is in the raise position the lift spool solenoid is energized, shifting the lift spool. Operating pressure oil is routed through the main control valve from port P1 through the lift spool to the main control valve port B1. Operating pressure oil is then routed from main control valve port B1 to the piston side of the boom cylinders, causing the boom to raise.

Return oil is forced from the rod side of the boom cyliders and is routed to port 2 of the self leveling valve, through the self leveling valve, and out of port 1 of self leveling valve. Return oil is routed from port 1 of self leveling valve to the main control valve port A1. Return oil is then routed from the main control valve port A1 through the lift spool, out of the main control valve port T2, and then returned to the hydraulic oil tank.

Circuit Relief

The boom raise circuit is protected by the 3481 psi (240 bar) main system relief valve. If the pressure on the operating pressure oil circuit of the relief valve reaches 3481 psi (240 bar), the valve will open. Operating pressure oil exits the main control valve at port T2 and returns to the hydraulic oil tank.

The boom raise circuit is protected by a secondary 3916 psi (270 bar) pressure relief. If the pressure on the operating pressure oil circuit of the relief valve reaches 3916 psi (270 bar), the valve will open. Operating pressure oil exits the main control valve at port T2 and returns to the hydraulic oil tank.

Boom Raise Circuit Schematic

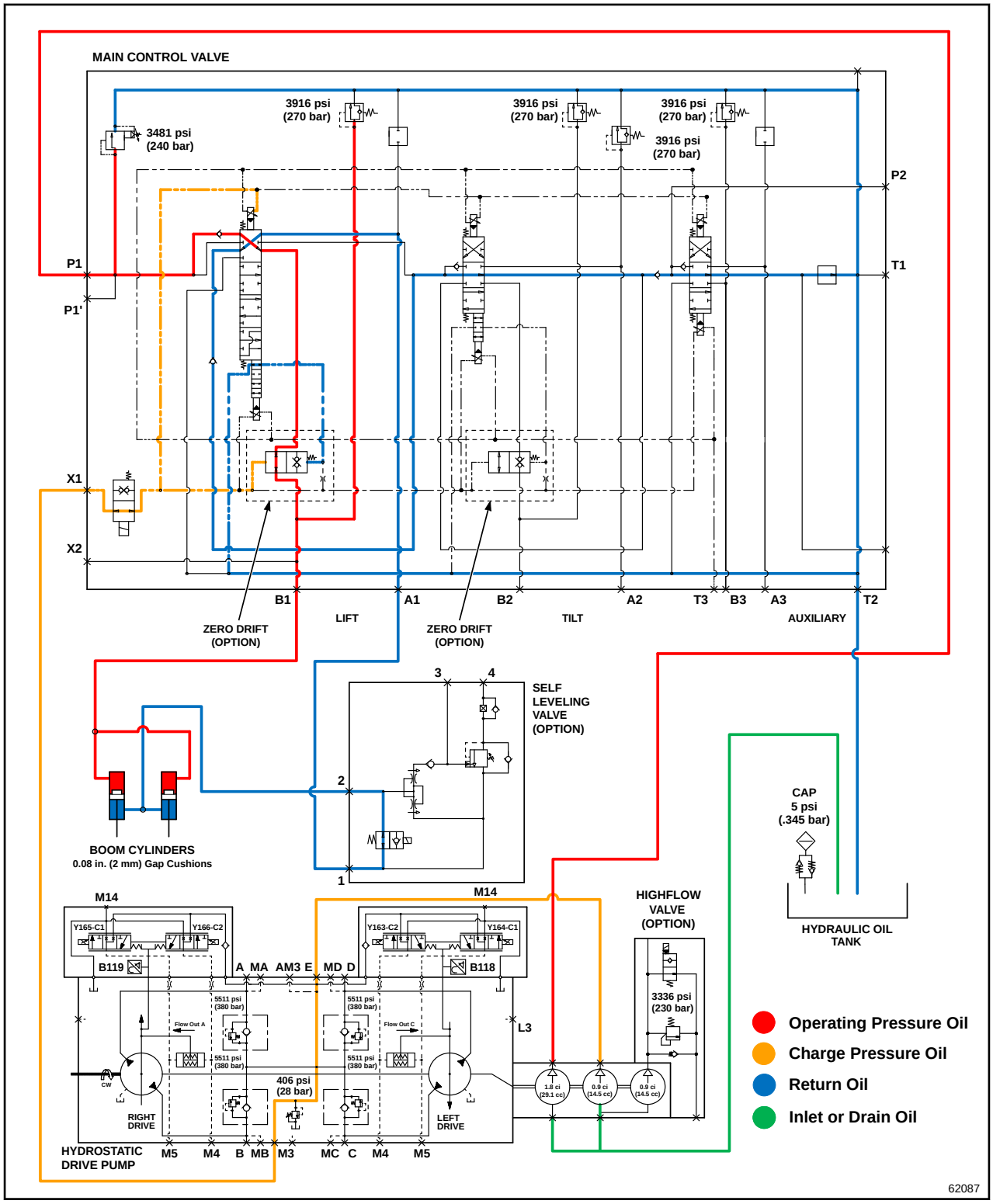


Figure 4-11

Boom Lower Circuit—Theory of Operation

System Conditions:

- Engine running
- Park brake released

Oil Supply to Main Control Valve

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into sections 1 and 2 of the gear pump where it is charged. The operating pressure oil is routed from section 2 of the gear pump through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The hydrostatic drive pump port M3 supplies charge pressure oil to port X1 on the main control valve. When the park brake is disengaged, a solenoid is energized and the interlock spool in the main control valve shifts. This supplies charge pressure oil to the lift, tilt, and auxiliary spools. Section 1 of the gear pump supplies operating pressure oil to port P1 of the main control valve.

Boom Lower Circuit

When the boom control is in the raise position the lift spool solenoid is energized, shifting the lift spool. Operating pressure oil is routed through the main control valve from port P1 through the lift spool to the main control valve port A1. Operating pressure oil is then routed from port A1 of the main control valve to port 1 of the self leveling valve, through the self leveling valve, and out of port 2 of the self leveling valve. Operating pressure oil is then routed from self leveling valve port 2 to the rod side of the boom cylinders, causing the boom to lower.

Return oil is forced from the piston side of the boom cylinders and is routed to port B1 of the main control valve. Return oil is then routed from the main control valve port B1 through the tilt spool, out of the main control valve port T2, and then returned to the hydraulic oil tank.

Circuit Relief

The boom lower circuit is protected by the 3481 psi (240 bar) main system relief valve. If the pressure on the operating pressure oil circuit of the relief valve reaches 3481 psi (240 bar), the valve will open. Operating pressure oil exits the main control valve at port T2 and returns to the hydraulic oil tank.

Boom Lower Circuit Schematic

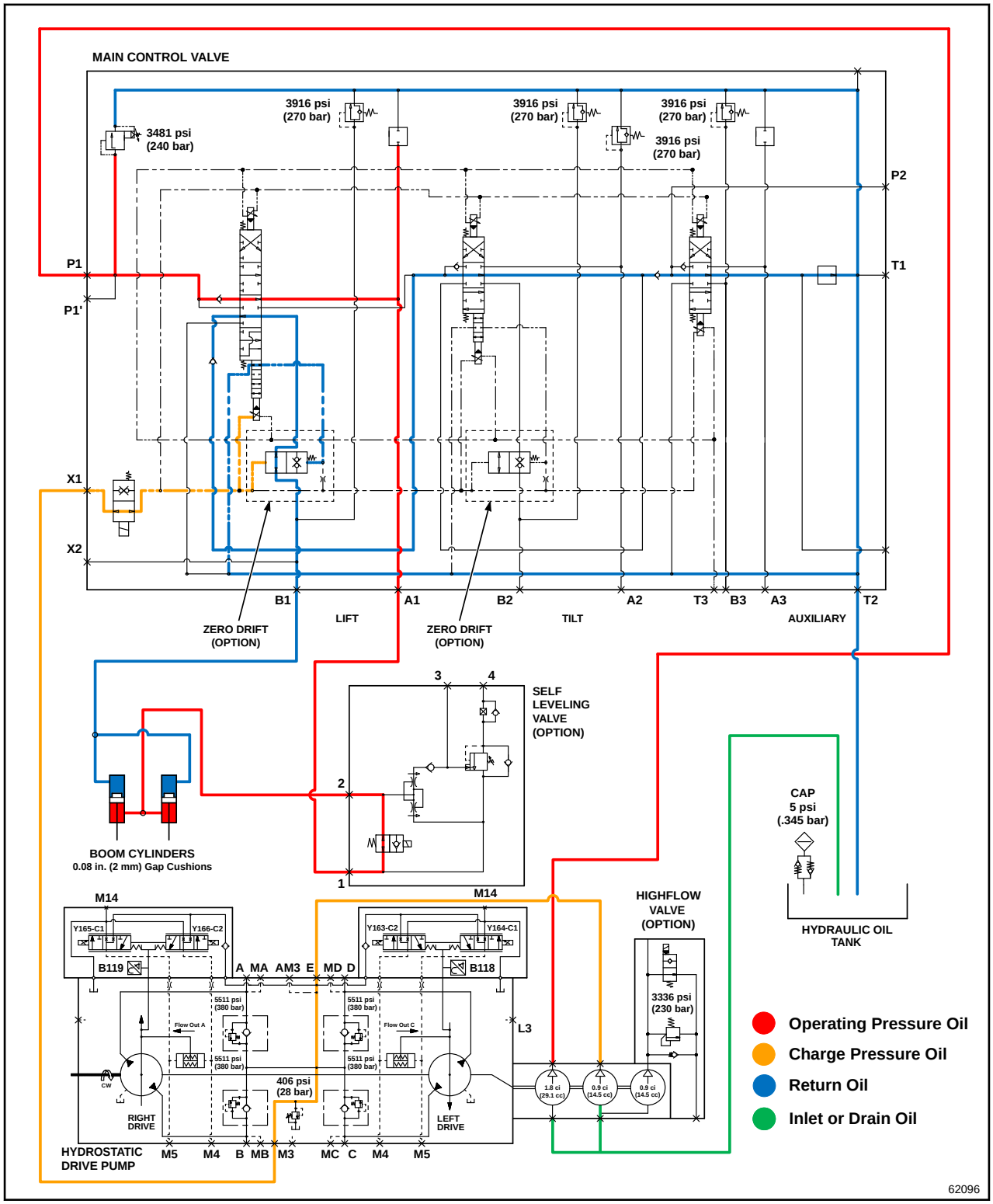


Figure 4-12

Mechanical Boom Lower Circuit—Theory of Operation

Equipment Condition

- Boom in raised position

Mechanical Boom Lower Circuit

When the mechanical boom lower valve is in the open position, the boom raise circuit pressure is relieved. Oil is forced from the piston side of the lift cylinders by the weight of the boom and supported load. Drain oil is routed from the lift cyliders to the main control valve port M2. Oil then drains from main control valve port X2 to the mechanical boom lower valve port 1. Hydraulic fluid passes through the mechanical boom lower valve spool and out of the mechanical boom lower valve port 2. Drain oil is then routed back to the hydraulic oil tank, causing the boom to lower.

Mechanical Boom Lower Circuit Schematic

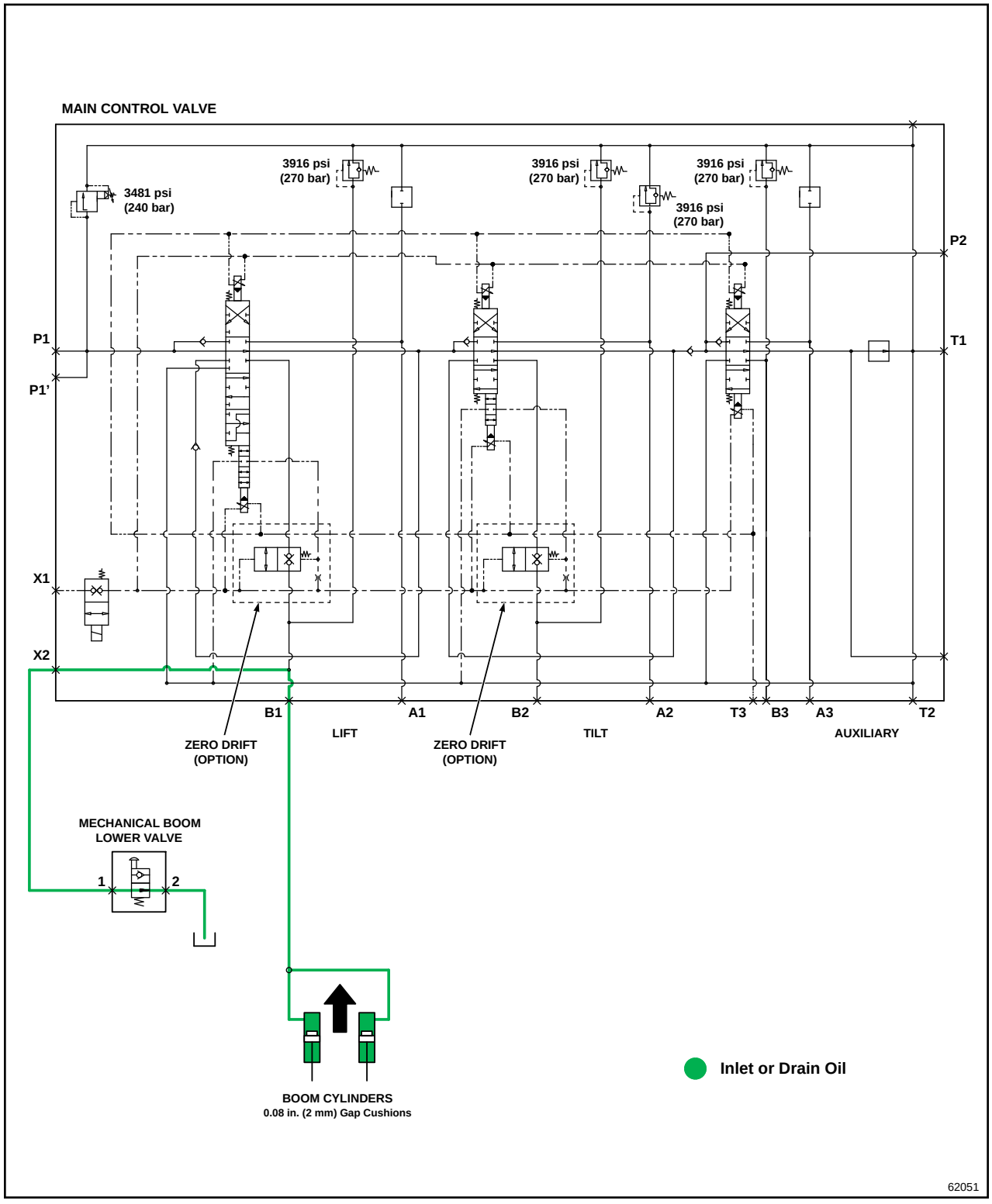


Figure 4-13

Bucket Curl Circuit—Theory of Operation

System Conditions

- Engine running
- Park brake released

Oil Supply to Bucket Valve

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into sections 1 and 2 of the gear pump where it is charged. The operating pressure oil is routed from section 2 of the gear pump through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The hydrostatic drive pump port M3 supplies charge pressure oil to port X1 on the main control valve. When the park brake is released, a solenoid is energized and the interlock spool in the main control valve shifts. This supplies charge pressure oil to the lift, tilt, and auxiliary spools. Section 1 of the gear pump supplies operating pressure oil to port P1 of the main control valve.

Bucket Curl Circuit

When the bucket control is in the curl position, the tilt spool solenoid is energized, shifting the tilt spool. Operating pressure oil is routed through the main control valve from port P1 through the tilt spool to the main control valve port A2. Operating pressure oil is then routed from main control valve port A2 to the rod side of the bucket cylinder, causing the bucket to curl.

Return oil is forced from the piston side of the bucket cyliders and is routed to the main control valve port B2. Return oil is routed from the main control valve port B2 through the tilt spool, out of the main control valve port T2, and then returned to the hydraulic oil tank.

Circuit Relief

The bucket curl circuit is protected by the 3481 psi (240 bar) main system relief valve. If the pressure on the operating pressure oil circuit of the relief valve reaches 3481 psi (240 bar), the valve will open. Operating pressure oil exits the main control valve at port T2 and returns to the hydraulic oil tank.

The bucket curl circuit is protected by a secondary 3916 psi (270 bar) pressure relief. If the pressure on the operating pressure oil circuit of the relief valve reaches 3916 psi (270 bar), the valve will open. Operating pressure oil exits the main control valve at port T2 and returns to the hydraulic oil tank.

Bucket Curl Circuit Schematic

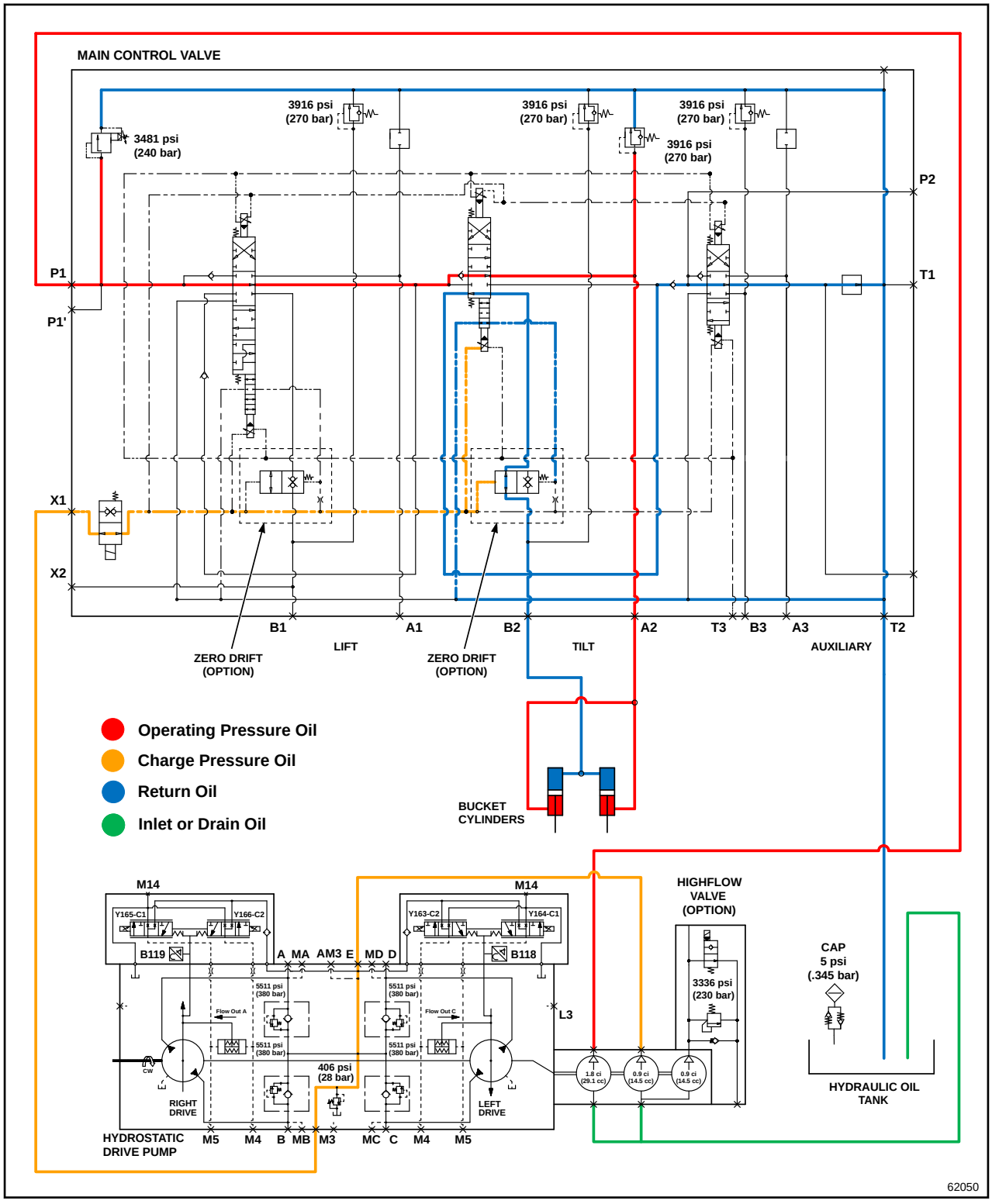


Figure 4-14

Bucket Dump Circuit—Theory of Operation

System Conditions

- Engine running
- Park brake released

Oil Supply to Main Control Valve

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into sections 1 and 2 of the gear pump where it is charged. The operating pressure oil is routed from section 2 of the gear pump through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The hydrostatic drive pump port M3 supplies charge pressure oil to port X1 on the main control valve. When the park brake is released, a solenoid is energized and the interlock spool in the main control valve shifts. This supplies charge pressure oil to the lift, tilt, and auxiliary spools. Section 1 of the gear pump supplies operating pressure oil to port P1 of the main control valve.

Bucket Curl Circuit

When the bucket control is in the dump position, the tilt spool solenoid is energized, shifting the tilt spool. Operating pressure oil is routed through the main control valve from port P1 through the tilt spool to the main control valve port B2. Operating pressure oil is then routed from main control valve port B2 to the piston side of the bucket cylinder, causing the bucket to dump.

Return oil is forced from the piston side of the bucket cyliders and is routed to the main control valve port A2. Return oil is routed from the main control valve port A2 through the tilt spool, out of the main control valve port T2, and then returned to the hydraulic oil tank.

Circuit Relief

The bucket dump circuit is protected by the 3481 psi (240 bar) main system relief valve. If the pressure on the operating pressure oil circuit of the relief valve reaches 3481 psi (240 bar), the valve will open. Operating pressure oil exits the main control valve at port T2 and returns to the hydraulic oil tank.

The bucket dump circuit is protected by a secondary 3916 psi (270 bar) pressure relief. If the pressure on the operating pressure oil circuit of the relief valve reaches 3916 psi (270 bar), the valve will open. Operating pressure oil exits the main control valve at port T2 and returns to the hydraulic oil tank.

Bucket Dump Circuit Schematic

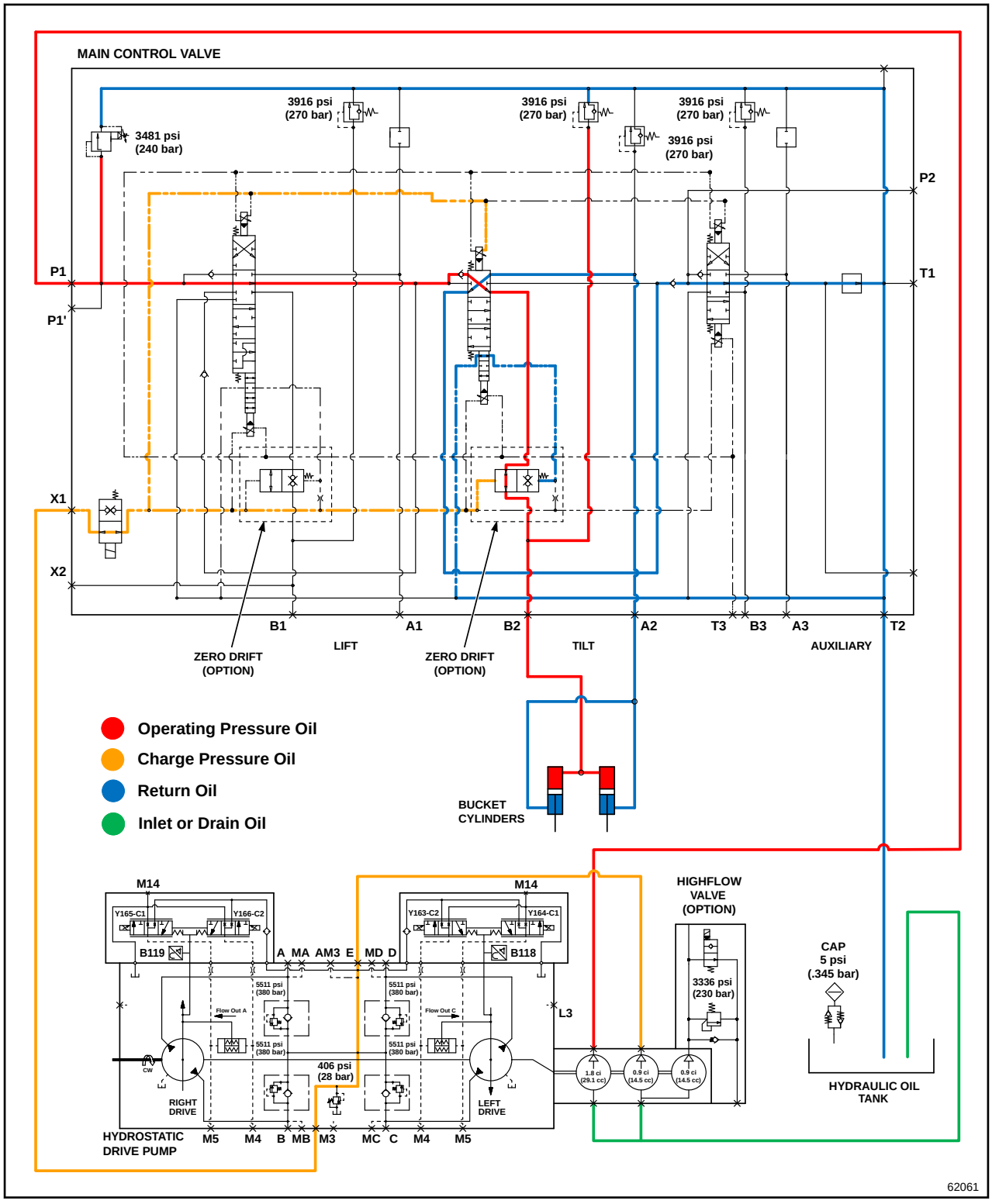


Figure 4-15

Fan Motor (One Speed) Circuit—Theory of Operation

System Conditions:

- Engine running

Fan Motor Circuit

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged.

Operating pressure oil is then routed to the fan motor port A. The oil flows through the fan motor, operating the fan motor. Excess oil is routed out of the fan motor through port D and drains back to the hydraulic oil tank. Oil exits the fan motor through port B and is routed into a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump where it is then supplied to the hydrostatic drive system.

Fan Motor (One Speed) Circuit Schematic

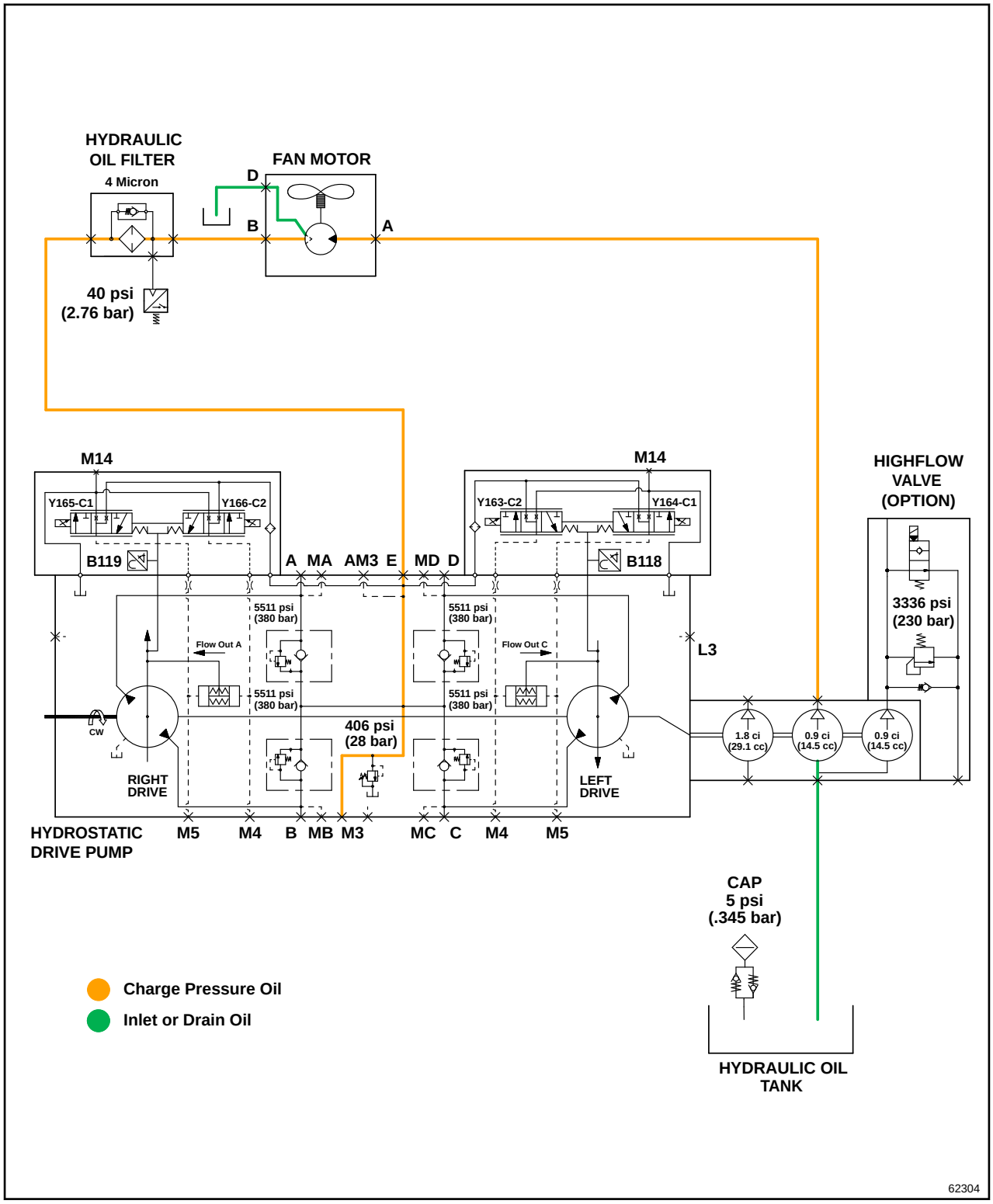


Figure 4-16

Variable Speed Fan Motor (High Speed) Circuit—Theory of Operation

System Conditions:

- Engine running

Fan Motor High Speed Circuit

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged.

Operating pressure oil is then routed to the fan motor port A. When the engine temperature is high enough, the fan motor solenoid will deactivate. A portion of the oil flow is diverted around the fan motor through a check valve. The majority of the oil flows through the fan motor, operating the fan motor on high speed. Excess oil is routed out of the fan motor through port D and drains back to the hydraulic oil tank. Oil exits the fan motor through port B and is routed into a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump where it is then supplied to the hydrostatic drive system.

Variable Speed Fan Motor (High Speed) Circuit Schematic

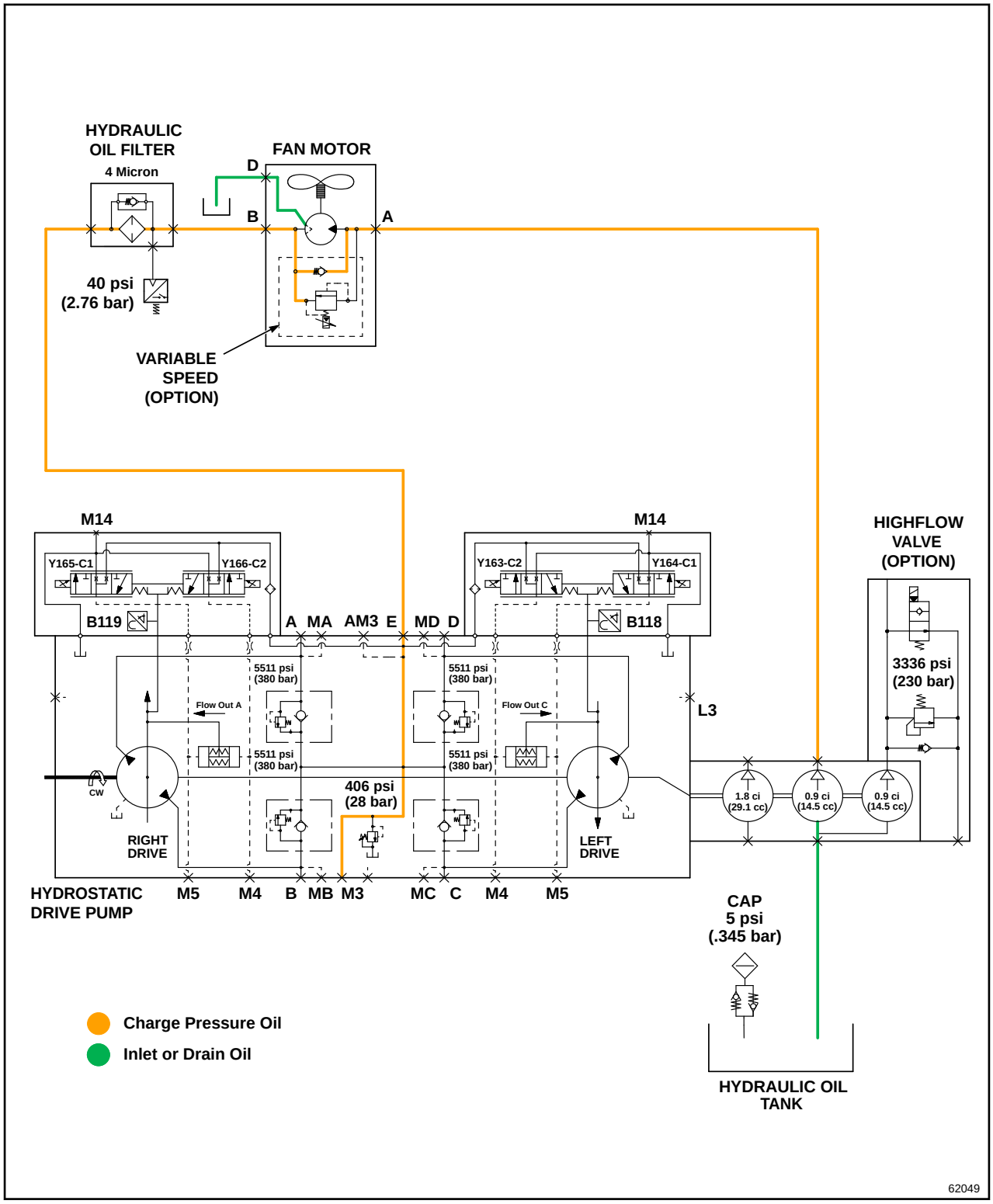


Figure 4-17

Variable Speed Fan Motor (Low Speed) Circuit—Theory of Operation

System Conditions:

- Engine running

Fan Motor Low Speed Circuit

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 2 of the gear pump where it is charged.

Operating pressure oil is then routed to the fan motor port A. When the engine temperature is low enough, the fan motor solenoid will energize. A portion of the oil flow is diverted around the fan motor through a check valve and energized fan motor solenoid. The remainder of the oil flows through the fan motor, operating the fan motor on low speed. Excess oil is routed out of the fan motor through port D and back to the hydraulic oil tank. Oil exits the fan motor through port B and is routed into a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump, where it is then supplied to the hydrostatic drive system.

Variable Speed Fan Motor (Low Speed) Circuit Schematic

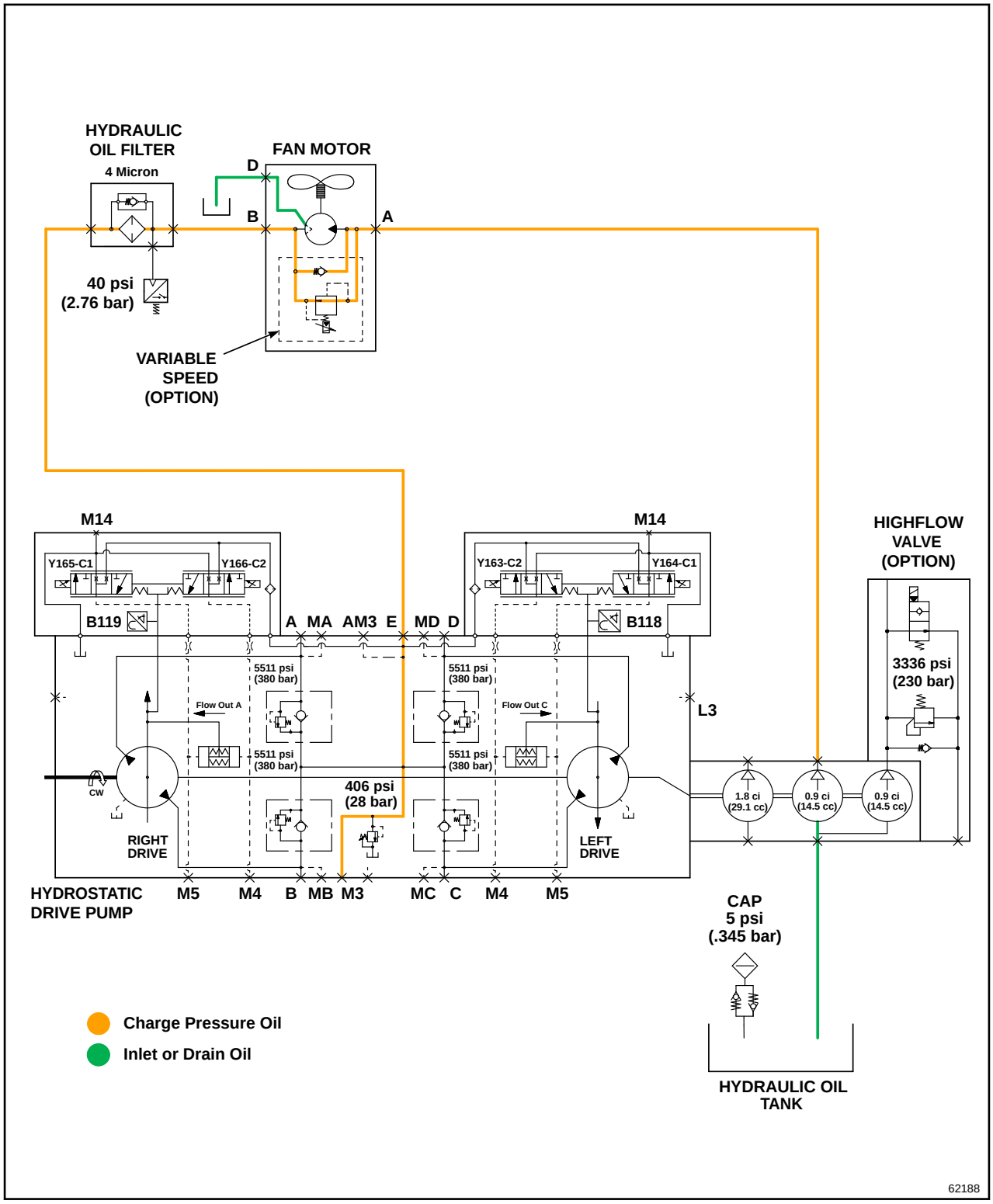


Figure 4-18

Ride Control Circuit—Theory of Operation

System Conditions:

- Engine running
- Park brake released

Ride Control Charging Circuit

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 1 of the gear pump. Operating pressure oil is routed from section 1 of the gear pump to port P1 of the main control valve. The operating pressure oil is then routed through the main control valve and out of port P1'. From port P1' of the main control valve, operating pressure is routed to port P of the ride control valve. Operating pressure is routed through the ride control valve and out of the accumulator (ACC) port, where it charges the ACC.

Ride Control Balancing Circuit

When the ride control function is activated, the ride control balance solenoid and the ride control rod solenoid activates, shifting the ride control balance spool and ride control rod spool. With both spools shifted, oil pressure is then balanced on both sides of the lift cylinders and in the ACC. The ride control balancing circuit is activated every 3 seconds when ride control is active.

Ride Control Active Circuit

When the ride control function is activated, and after ride control balance is complete, the ride control base solenoid and the ride control rod solenoid is energized. With the ride control base solenoid and the ride control rod solenoid energized, the ride control base spool and ride control rod spool shifts. With the ride control base spool and ride control rod spool shifted, oil is then allowed to enter the ride control valve port B from the piston side of the boom cylinders. During an impact, the oil pressure is spiked and is routed from the ride control valve port B, through the ride control base spool, then to the ride control valve ACC port, where it is absorbed by the ACC. Metered oil is then returned to the ride control valve ACC port, through the ride control base spool, then to ride control valve port B. Metered oil is routed from port B of the ride control valve and back to the piston side of the boom cylinders through an orifice and out of the ride control valve at port R to the piston end of the boom cylinders. Supply or return oil is allowed to enter or return from the piston end of the boom cylinders from the ride control valve at port R. Supply or return oil is routed through ride control valve from ride control valve port R to ride control valve port T. Supply or return oil is then routed from the ride control valve port T to the main control valve port T1, through the main control valve to port T2, then to the hydraulic oil tank.

Ride Control Circuit Schematic

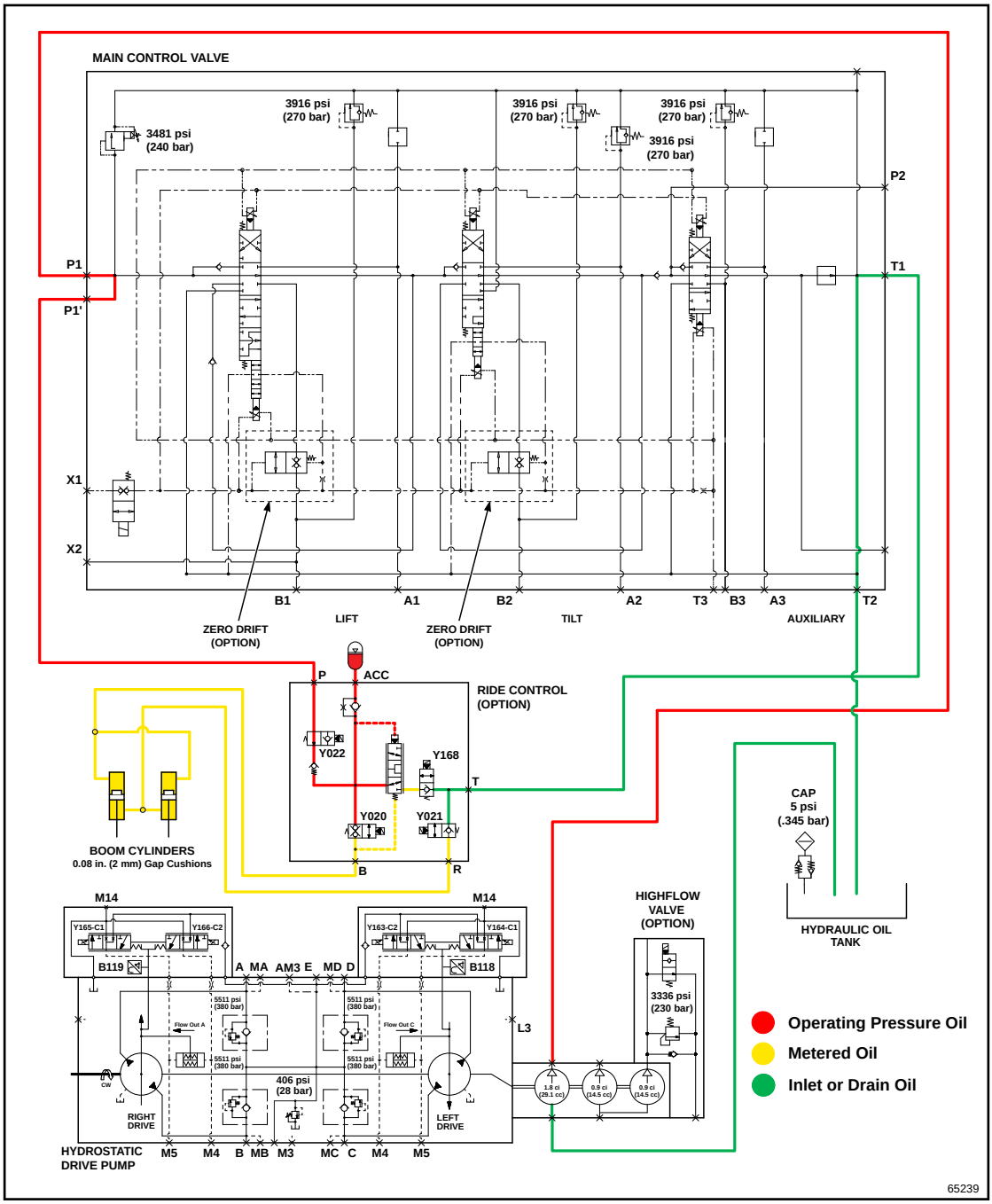


Figure 4-19: Ride Control Charging Circuit

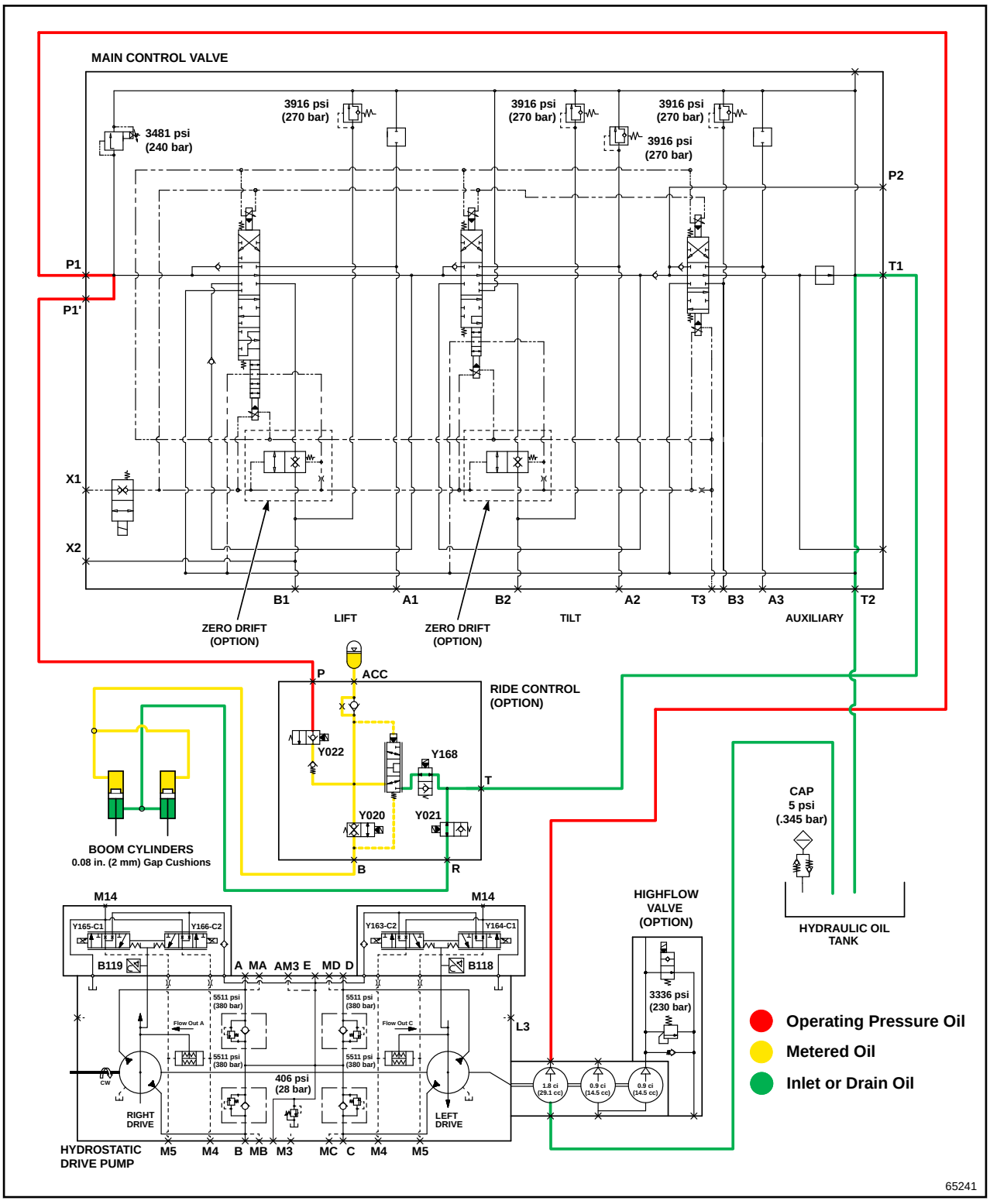


Figure 4-20: Ride Control Balancing Circuit

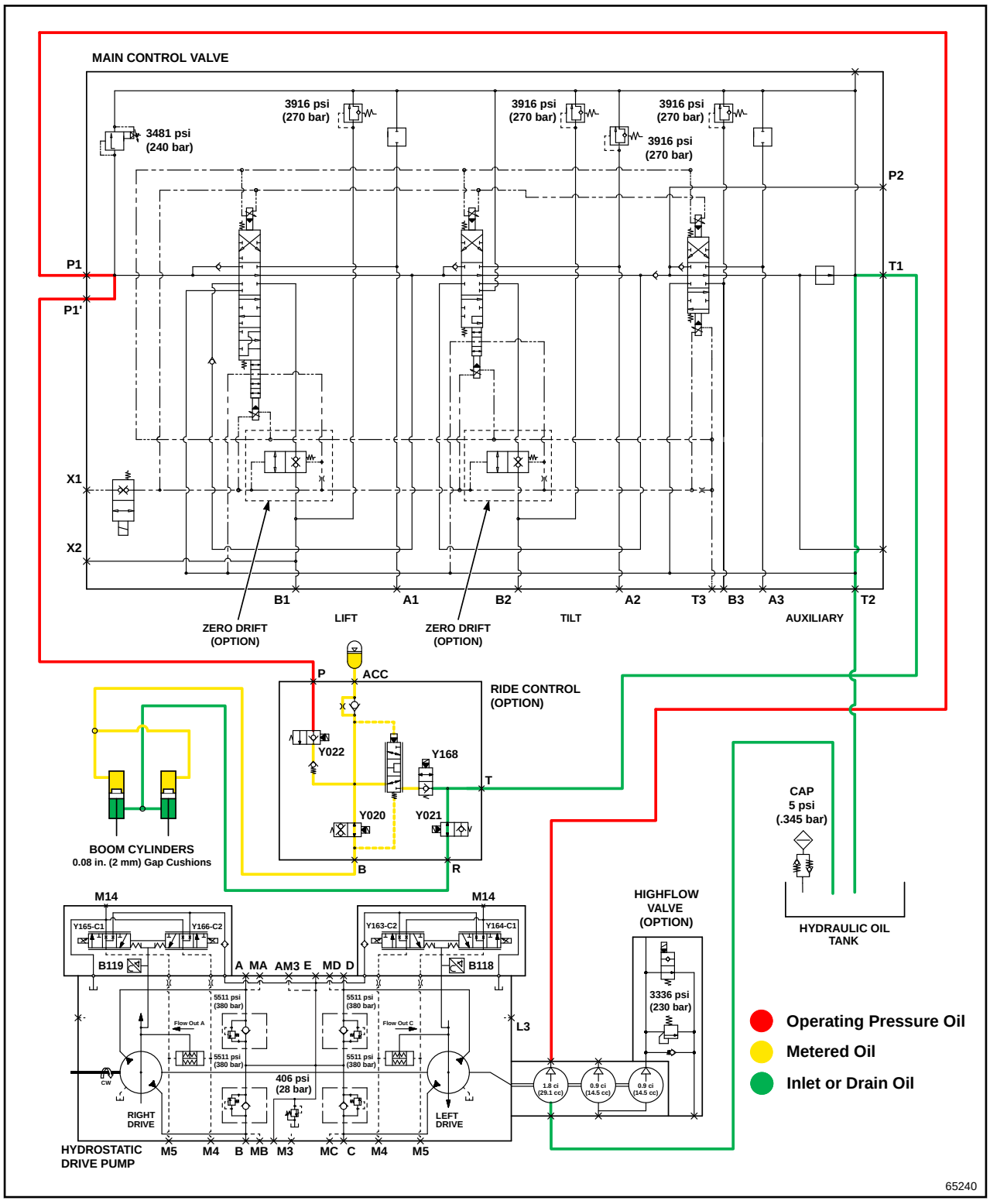


Figure 4-21: Ride Control Active Circuit

Self Leveling Circuit—Theory of Operation

System Conditions:

- Engine running
- Park brake released

Oil Supply to Main Control Valve

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into sections 1 and 2 of the gear pump where it is charged. The operating pressure oil is routed from section 2 of the gear pump through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The hydrostatic drive pump port M3 supplies charge pressure oil to port X1 on the main control valve. When the park brake is released, a solenoid is energized and the interlock spool in the main control valve shifts. This supplies charge pressure oil to the lift, tilt, and auxiliary spools. Section 1 of the gear pump supplies operating pressure oil to port P1 of the main control valve.

Self Leveling Circuit

With the self leveling function active, the self leveling spool solenoid is energized, shifting the self leveling spool. When the boom control is in the raise position, the lift spool solenoid is energized, shifting the lift spool. Operating pressure oil is routed through the main control valve from port P1, through the lift spool, and to the main control valve port B1. Operating pressure oil is then routed from the main control valve port B1 to the piston side of the boom cylinders, causing the boom to raise. As the boom cylinders extend, metered oil from the rod side of the lift cylinders is directed to the self leveling valve port 2. Metered oil is then directed through the self leveling valve and out of the self leveling valve port 3, where it supplies the piston side of the bucket cylinders. Bucket cylinders will extend at a rate proportional to that of the boom cylinders, allowing the bucket to stay level.

Return oil is forced from the rod side of the bucket cylinders and is routed to port 4 of the self leveling valve, through the self leveling valve, and out of port 1 of the self leveling valve. Return oil is routed from port 1 of the self leveling valve to the main control valve port A1. Return oil is then routed from the main control valve port A1 through the lift spool, out of the main control valve port T2, and then returned to the hydraulic oil tank.

Circuit Relief

The boom raise circuit is protected by the 3481 psi (240 bar) main system relief valve. If the pressure on the operating pressure oil circuit of the relief valve reaches 3481 psi (240 bar), the valve will open. Operating pressure oil exits the main control valve at port T2 and returns to the hydraulic oil tank.

The boom raise circuit is protected by a secondary 3916 psi (270 bar) pressure relief. If the pressure on the operating pressure oil circuit of the relief valve reaches 3916 psi (270 bar), the valve will open. Operating pressure oil exits the main control valve at port T2 and returns to the hydraulic oil tank.

Self Leveling Circuit Schematic

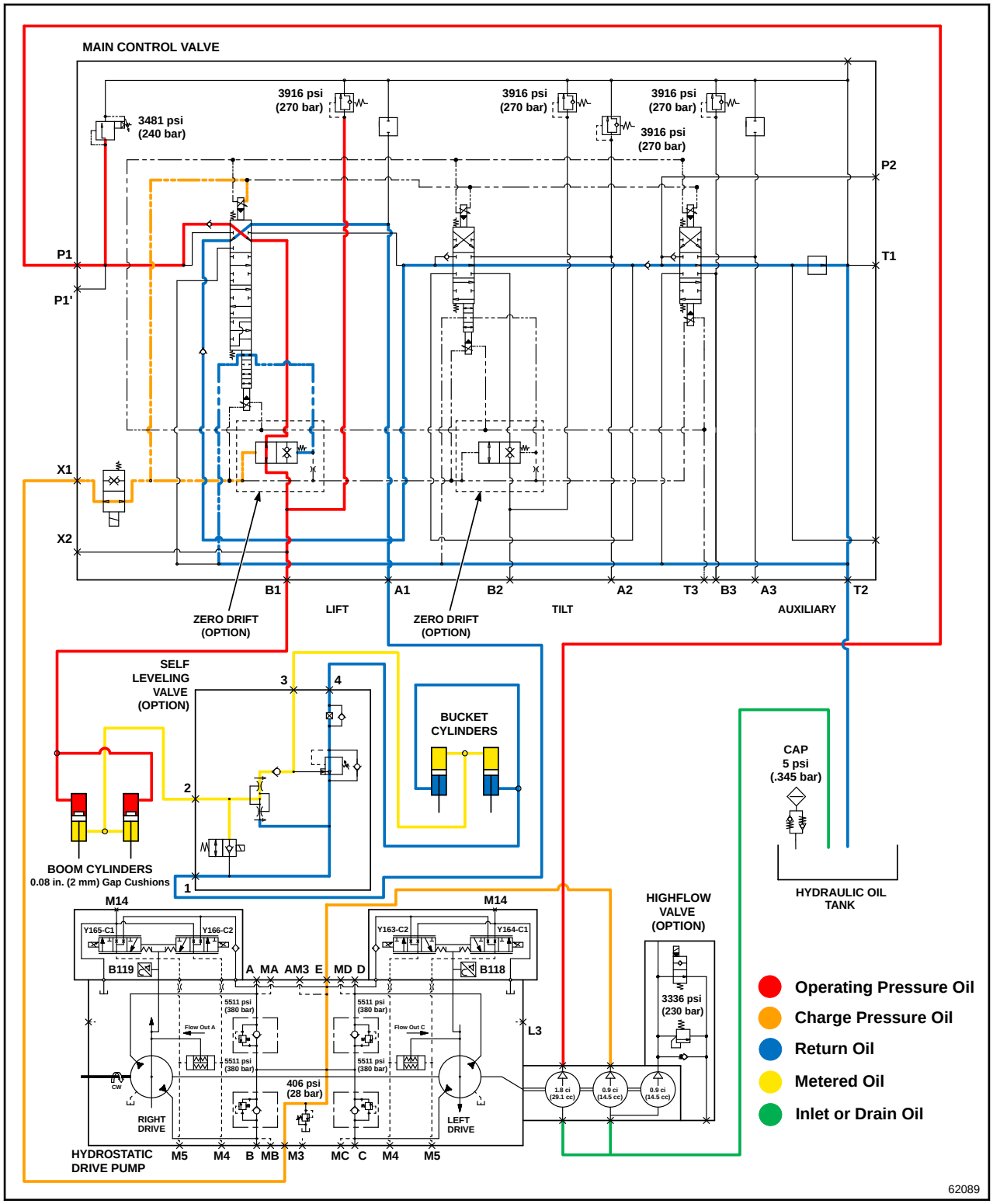


Figure 4-22

Power Coupler Lock Circuit—Theory of Operation

System Conditions:

- Engine running
- Power coupler in locked position

Oil Supply to Power Coupler

The hydrostatic pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 1 of the gear pump where it is charged. Operating pressure oil is then routed into the main control valve through port P1. Oil is routed out of main control valve port P1 to power coupler valve port P.

Power Coupler Lock Circuit

Operating pressure oil supplied by section 1 of the gear pump enters the power coupler valve at port P. When oil pressure reaches 1885 psi (130 bar), a pressure relief shifts in the power coupler valve, allowing metered oil to pass through the power coupler spool and exit the quick hitch valve through port A. Metered oil then enters the piston end of the cylinder, shifting the cylinder to the locked position.

As the cylinder shifts to the locked position, return oil is forced from the rod side of the cylinder and into the power coupler valve through port B. Return oil passes through the power coupler spool and exits the power coupler valve through port T. After return oil exits the power coupler valve port T, it is routed through the 100 micron case drain manifold, removing dirt and debris. Return oil is then routed from the case drain manifold to a cooling assembly where it is cooled. Return oil is routed from the cooling assembly back to the hydraulic oil tank.

Power Coupler Circuit Safety

If oil pressure reaches 2611 psi (180 bar) on return oil or metered oil side of the power coupler lock circuit, a safety shifts in the power coupler valve. With the saftey shifted, metered oil is blocked to the power coupler cylinder, keeping the power coupler cylinder from locking.

Power Coupler Lock Circuit Schematic

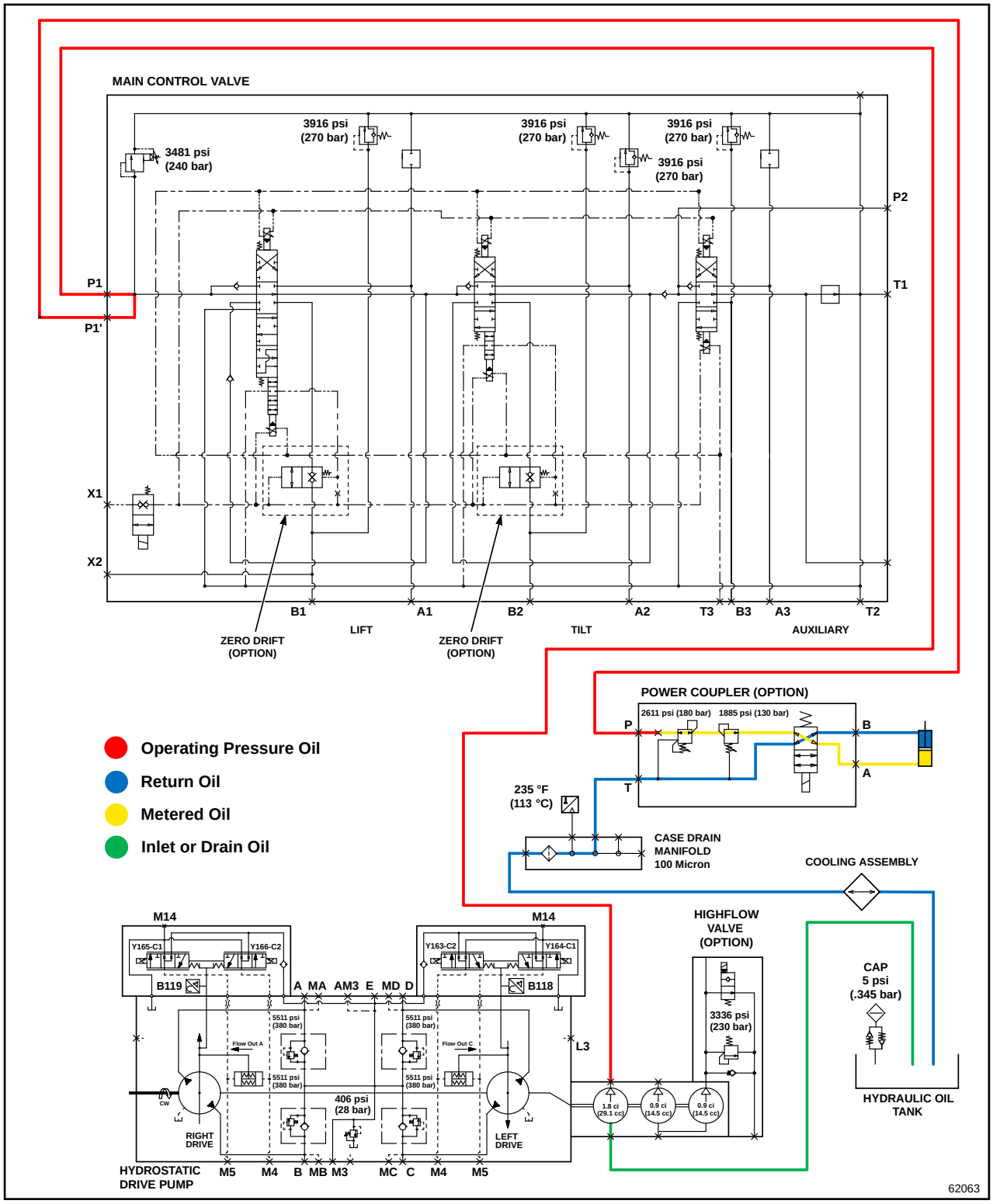


Figure 4-23

Power Coupler Unlock Circuit—Theory of Operation

System Conditions:

- Engine running
- Power coupler in locked position

Oil Supply to Power Coupler

The hydrostatic pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into section 1 of the gear pump where it is charged. Operating pressure oil is then routed into the main control valve through port P1. Oil is routed out of main control valve port P1' to power coupler valve port P.

Power Coupler Lock Circuit

Operating pressure oil supplied by section 1 of the gear pump enters the power coupler valve at port P. When oil pressure reaches 1885 psi (130 bar) a pressure relief shifts in the power coupler valve, allowing metered oil to pass through the power coupler spool and exit the quick hitch valve through port B. Metered oil then enters the rod end of the cylinder, shifting the cylinder to the unlocked position.

As the cylinder shifts to the unlocked position, return oil is forced from the piston side of the cylinder and into the power coupler valve through port A. Return oil passes through the power coupler spool and exits the power coupler valve through port T. After return oil exits the power coupler valve port T, it is routed through the 100 micron case drain manifold, removing dirt and debris. Return oil is then routed from the case drain manifold to a cooling assembly where it is cooled. Return oil is routed from the cooling assembly back to the hydraulic oil tank.

Power Coupler Circuit Safety

If oil pressure reaches 2611 psi (180 bar) on return oil or metered oil side of the power coupler unlock circuit, a safety shifts in the power coupler valve. With the saftey shifted, metered oil is blocked to the power coupler cylinder, keeping the power coupler cylinder from locking.

Power Coupler Unlock Circuit Schematic

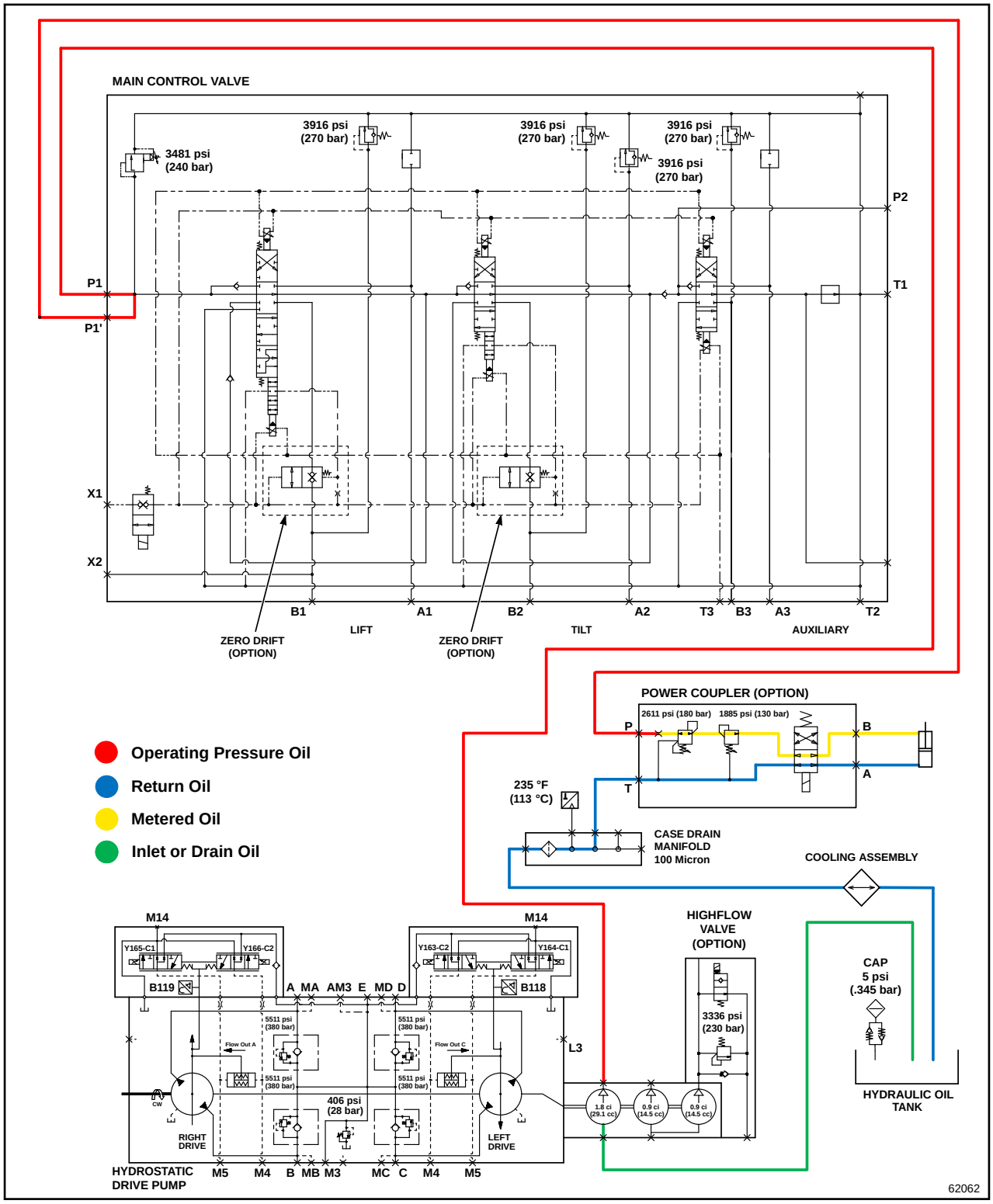


Figure 4-24

Auxiliary Hydraulics Female Coupler Circuit—Theory of Operation

System Conditions:

- Engine running
- Park brake released

Oil Supply to Main Control Valve

The hydrostatic pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into sections 1 and 2 of the gear pump where it is charged. The operating pressure oil is routed from section 2 of the gear pump through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic pump. The hydrostatic pump port M3 supplies charge pressure oil to port X1 on the main control valve. When the park brake is released, a solenoid is energized and the interlock spool in the main control valve shifts. This supplies charge pressure to the boom, bucket, and auxiliary spools. Section 1 of the gear pump supplies operating pressure oil to port P1 of the main control valve.

Auxiliary Hydraulics to Female Connector Circuit

When the standard/highflow selection switch is in the AUX position, the auxiliary spool solenoid is energized, and shifts the auxiliary spool. Operating pressure oil is routed through the main control valve from port P1 through the auxiliary spool to the main control valve port B3. Operating pressure oil is then routed from main control valve port B3 to the female auxiliary connection, providing operating pressure oil to auxiliary attachment.

Return oil from the auxiliary attachment passes through the male auxiliary connector and is routed to the main control valve port A3. Return oil is routed from the main control valve port A3 through the auxiliary spool, out of the main control valve port T2, and then returned to the hydraulic oil tank. Return oil is also routed from the case drain connector to the 100 micron case drain manifold, removing dirt and debris. Return oil is then routed from the case drain manifold to a cooling assembly where it is cooled. Return oil is routed from the cooling assembly back to the hydraulic oil tank.

Circuit Relief

The auxiliary hydraulics circuit is protected by the 3481 psi (240 bar) main system relief valve. If the pressure on the operating pressure oil circuit of the relief valve reaches 3481 psi (240 bar), the valve will open. Operating pressure oil exits the main control valve at port T2 and returns to the hydraulic oil tank.

The auxiliary hydraulics circuit is protected by a secondary 3916 psi (270 bar) pressure relief. If the pressure on the operating pressure oil circuit of the relief valve reaches 3916 psi (270 bar), the valve will open. Operating pressure oil exits the main control valve at port T2 and returns to the hydraulic oil tank.

Auxiliary Hydraulics Female Coupler Circuit Schematic

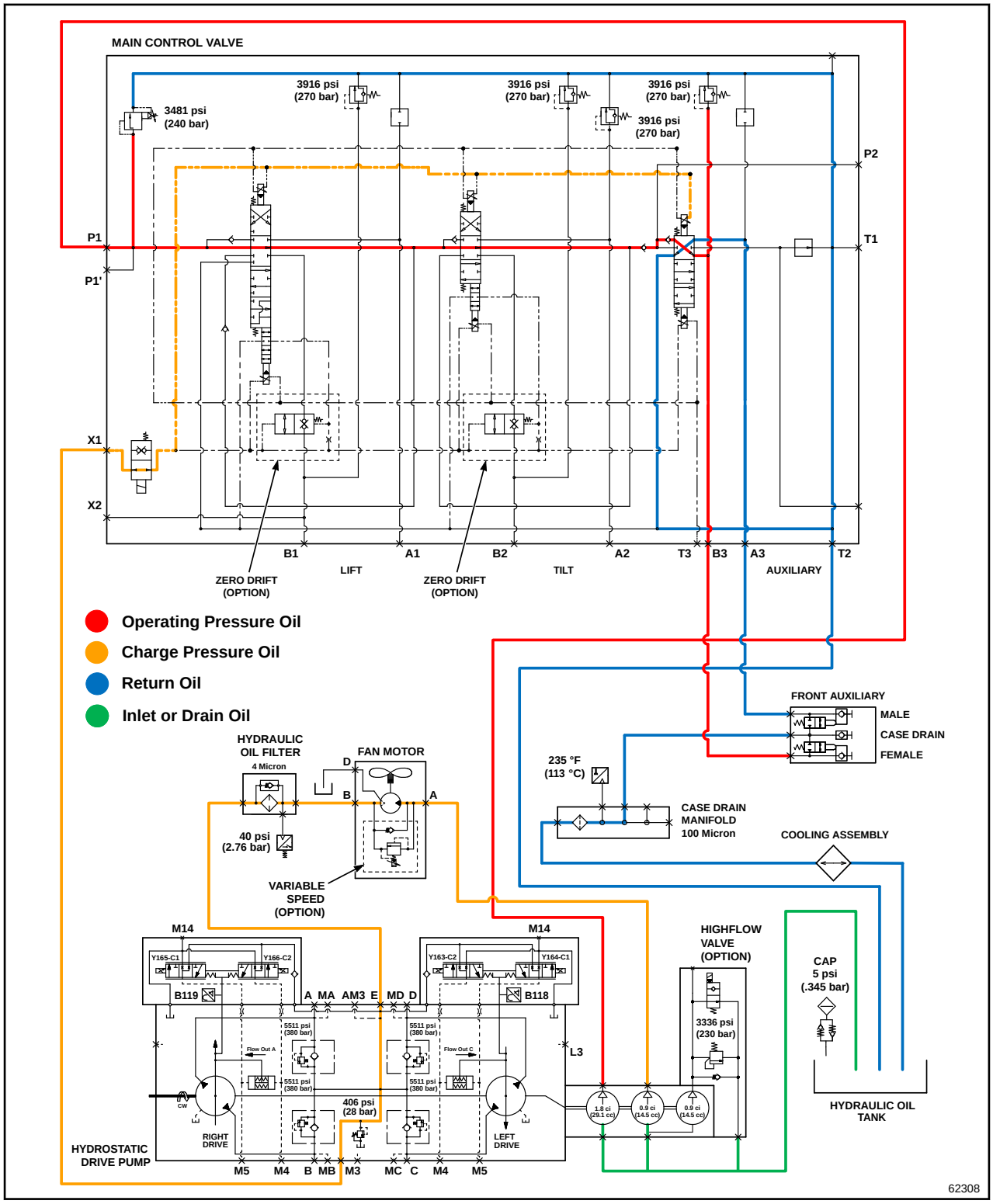


Figure 4-25

Auxiliary Hydraulics Male Coupler Circuit—Theory of Operation

System Conditions:

- Engine running
- Park brake released

Oil Supply to Main Control Valve

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into sections 1 and 2 of the gear pump where it is charged. The operating pressure oil is routed from section 2 of the gear pump through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The hydrostatic drive pump port M3 supplies charge pressure oil to port X1 on the main control valve. When the park brake is released, a solenoid is energized and the interlock spool in the main control valve shifts. This supplies charge pressure to the boom, bucket, and auxiliary spools. Section 1 of the gear pump supplies operating pressure oil to port P1 of the main control valve.

Auxiliary Hydraulics to Male Connector Circuit

When the standard/highflow selection switch is in the AUX position, the auxiliary spool solenoid is energized and shifts the auxiliary spool. Operating pressure oil is routed through the main control valve from port P1 through the auxiliary spool to the main control valve port A3. Operating pressure oil is then routed from main control valve port A3 to the male auxiliary connection, providing operating pressure oil to auxiliary attachment.

Return oil from the auxiliary attachment passes through the female auxiliary connector and is routed to the main control valve port B3. Return oil is routed from the main control valve port B3 through the auxiliary spool, out of the main control valve port T2, and then returned to the hydraulic oil tank. Return oil is also routed from the case drain connector to the 100 micron case drain manifold, removing dirt and debris. Return oil is then routed from the case drain manifold to a cooling assembly where it is cooled. Return oil is routed from the cooling assembly back to the hydraulic oil tank.

Circuit Relief

The auxiliary hydraulics circuit is protected by the 3481 psi (240 bar) main system relief valve. If the pressure on the operating pressure oil circuit of the relief valve reaches 3481 psi (240 bar), the valve will open. Operating pressure oil exits the main control valve at port T2 and returns to the hydraulic oil tank.

The auxiliary hydraulics circuit is protected by a secondary 3916 psi (270 bar) pressure relief. If the pressure on the operating pressure oil circuit of the relief valve reaches 3916 psi (270 bar), the valve will open. Operating pressure oil exits the main control valve at port T2 and returns to the hydraulic oil tank.

Auxiliary Hydraulics Male Coupler Circuit Schematic

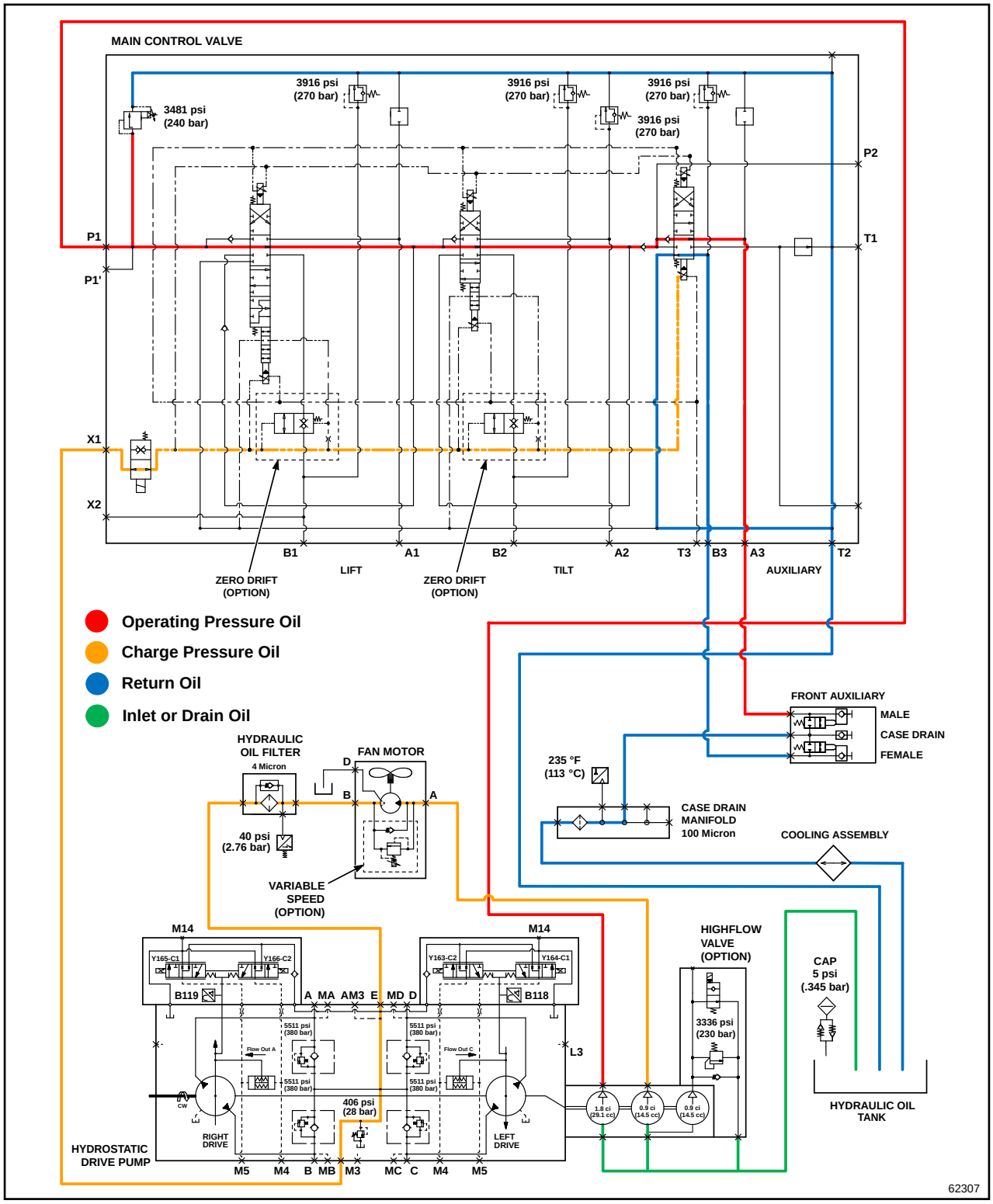


Figure 4-26

High Flow Auxiliary Hydraulics Female Coupler Circuit—Theory of Operation

System Conditions:

- Engine running
- Park brake released

Oil Supply to Main Control Valve

The hydrostatic pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into sections 1, 2, and 3 of the gear pump where it is charged. The operating pressure oil is routed from section 2 of the gear pump through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic pump. The hydrostatic pump port M3 supplies charge pressure oil to port X1 on the main control valve. When the park brake is released, a solenoid is energized and the interlock spool in the main control valve shifts. This supplies charge pressure to the boom, bucket, and auxiliary spools. Section 1 of the gear pump supplies operating pressure oil to port P1 of the main control valve. Section 3 of the gear pump supplies operating pressure oil to port P2 of the main control valve.

Auxiliary Hydraulics to Female Connector Circuit

When the standard/highflow selection switch is in the HF position, the auxiliary spool solenoid is energized, and shifts the auxiliary spool. Operating pressure oil is routed through the main control valve from ports P1 and P2 through the auxiliary spool to the main control valve port B3. Operating pressure oil is then routed from main control valve port B3 to the female auxiliary connection, providing operating pressure oil to auxiliary attachment.

Return oil from the auxiliary attachment passes through the male auxiliary connector and is routed to the main control valve port A3. Return oil is routed from the main control valve port A3 through the auxiliary spool, out of the main control valve port T2, and then returned to the hydraulic oil tank. Return oil is also routed from the case drain connector to the 100 micron case drain manifold, removing dirt and debris. Return oil is then routed from the case drain manifold to a cooling assembly where it is cooled. Return oil is routed from the cooling assembly back to the hydraulic oil tank.

Circuit Relief

The auxiliary hydraulics circuit is protected by the 3481 psi (240 bar) main system relief valve. If the pressure on the operating pressure oil circuit of the relief valve reaches 3481 psi (240 bar), the valve will open. Operating pressure oil exits the main control valve at port T2 and returns to the hydraulic oil tank.

The auxiliary hydraulics circuit is protected by a secondary 3916 psi (270 bar) pressure relief. If the pressure on the operating pressure oil circuit of the relief valve reaches 3916 psi (270 bar), the valve will open. Operating pressure oil exits the main control valve at port T2 and returns to the hydraulic oil tank.

High Flow Auxiliary Hydraulics Female Coupler Circuit Schematic

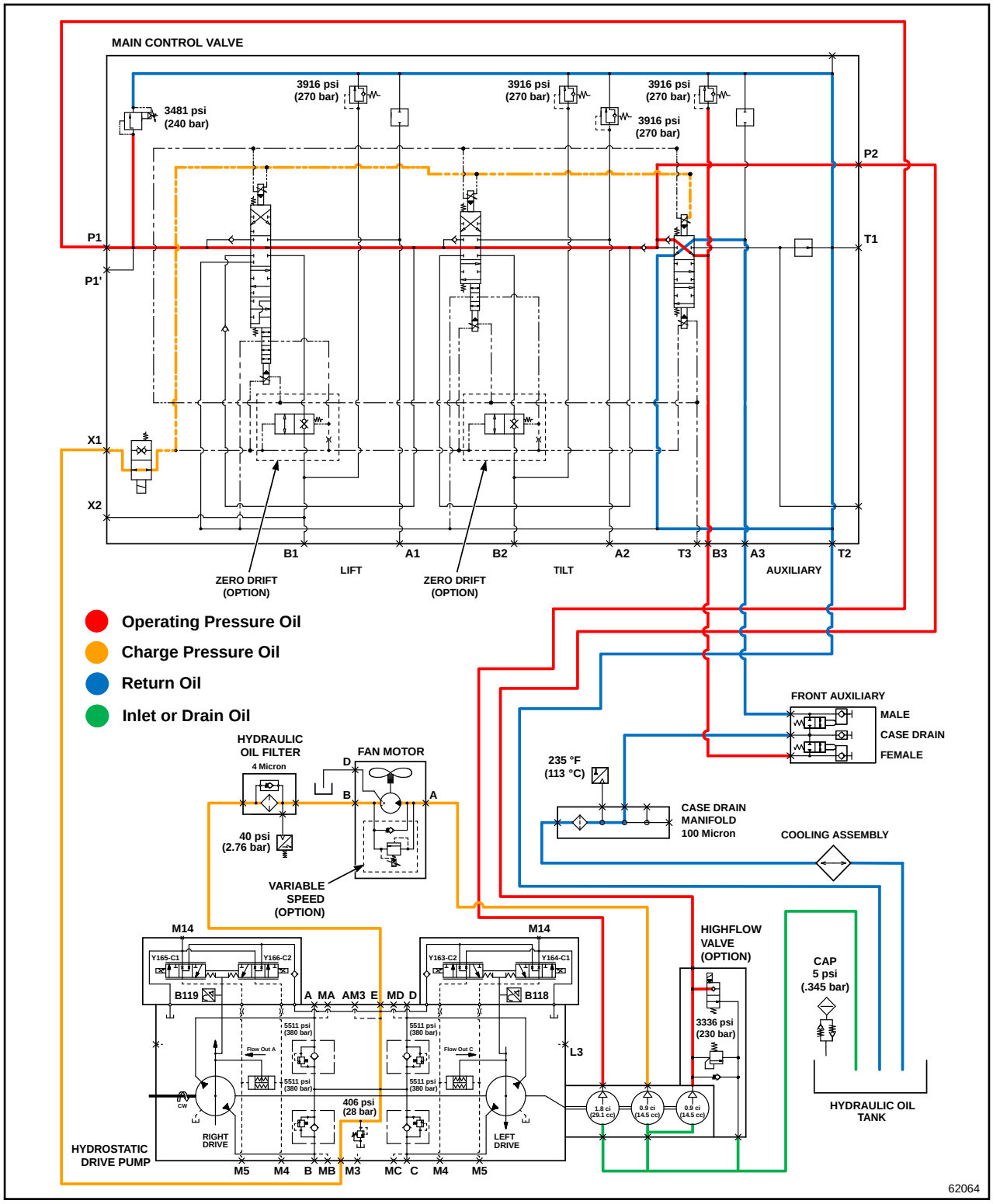


Figure 4-27

High Flow Auxiliary Hydraulics Male Coupler Circuit—Theory of Operation

System Conditions:

- Engine running
- Park brake released

Oil Supply to Main Control Valve

The hydrostatic drive pump and gear pump are driven by the engine. Oil is drawn from the hydraulic oil tank into sections 1, 2, and 3 of the gear pump where it is charged. The operating pressure oil is routed from section 2 of the gear pump through the fan motor and then through a 4 micron hydraulic oil filter. The filtered oil enters port E of the hydrostatic drive pump. The hydrostatic drive pump port M3 supplies charge pressure oil to port X1 on the main control valve. When the park brake is released, a solenoid is energized and the interlock spool in the main control valve shifts. This supplies charge pressure to the boom, bucket, and auxiliary spools. Section 1 of the gear pump supplies operating pressure oil to port P1 of the main control valve. Section 3 of the gear pump supplies operating pressure oil to port P2 of the main control valve.

Auxiliary Hydraulics to Male Connector Circuit

When the standard/highflow selection switch is in the HF position, the auxiliary spool solenoid is energized, and shifts the auxiliary spool. Operating pressure oil is routed through the main control valve from ports P1 and P2 through the auxiliary spool to the main control valve port A3. Operating pressure oil is then routed from main control valve port A3 to the male auxiliary connection, providing operating pressure oil to auxiliary attachment.

Return oil from the auxiliary attachment passes through the female auxiliary connector and is routed to the main control valve port B3. Return oil is routed from the main control valve port B3 through the auxiliary spool, out of the main control valve port T2, and then returned to the hydraulic oil tank. Return oil is also routed from the case drain connector to the 100 micron case drain manifold, removing dirt and debris. Return oil is then routed from the case drain manifold to a cooling assembly where it is cooled. Return oil is routed from the cooling assembly back to the hydraulic oil tank.

Circuit Relief

The auxiliary hydraulics circuit is protected by the 3481 psi (240 bar) main system relief valve. If the pressure on the operating pressure oil circuit of the relief valve reaches 3481 psi (240 bar) the valve will open. Operating pressure oil exits the main control valve at port T2 and returns to the hydraulic oil tank.

The auxiliary hydraulics circuit is protected by a secondary 3916 psi (270 bar) pressure relief. If the pressure on the operating pressure oil circuit of the relief valve reaches 3916 psi (270 bar), the valve will open. Operating pressure oil exits the main control valve at port T2 and returns to the hydraulic oil tank.

High Flow Auxiliary Hydraulics Male Coupler Circuit Schematic

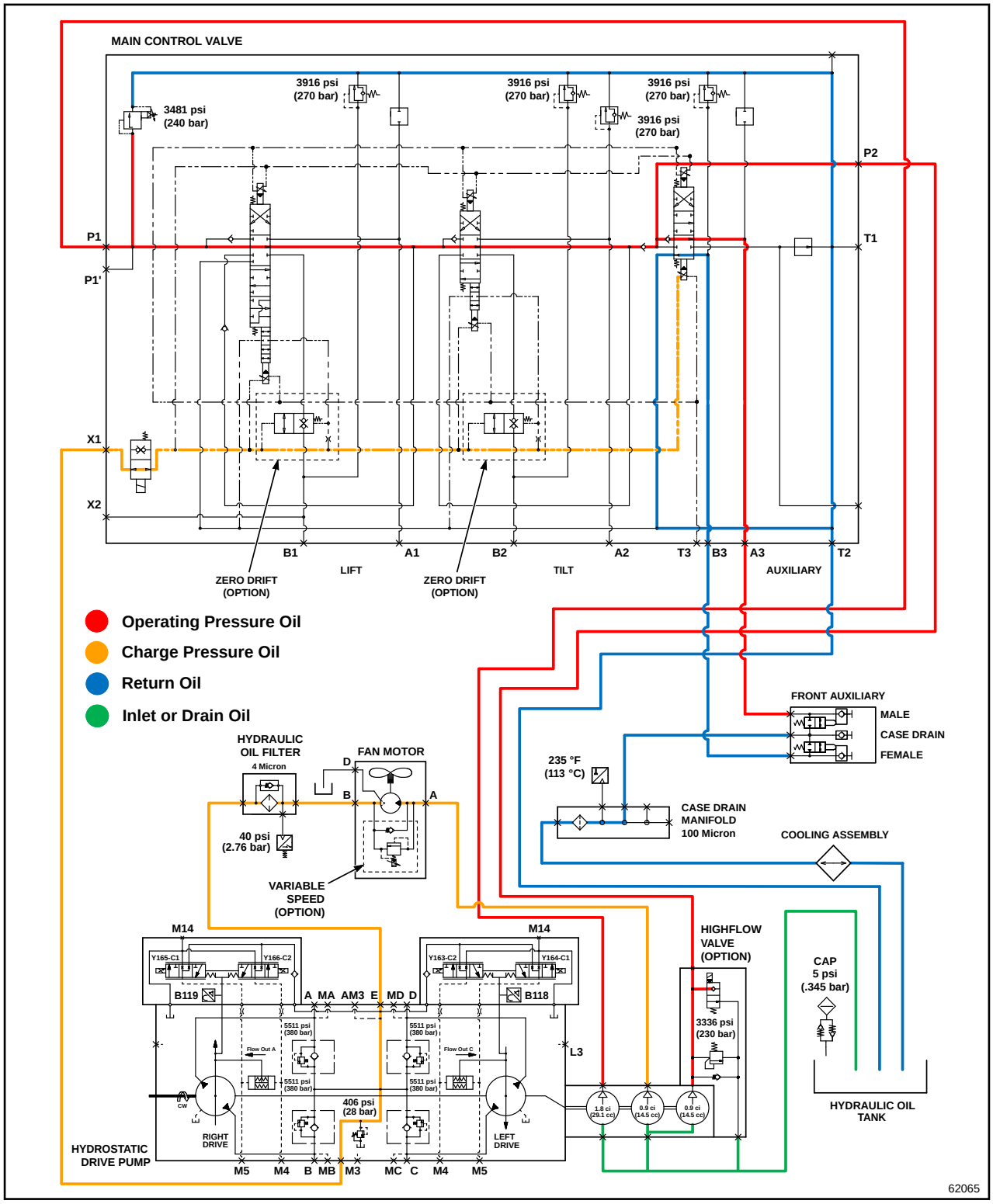


Figure 4-28

Troubleshooting

Troubleshooting

Table 4-2. Ride Control Does Not Function

Probable Cause	Remedy
Hydraulic oil not at correct level in hydraulic oil tank	Fill hydraulic oil tank to correct level. (See "**Hydraulic Oil Tank Drain/Fill Procedure**" on **page 4-64**.)
Hydraulic oil cold	Warm hydraulic oil to operating temperature.
Possible electrical system failure	See "**Ride Control Circuit**" on **page 2-193**.
Incorrect hydraulic system main relief valve setting	Test hydraulic system main relief valve. (See "**Hydraulic System Main Relief Valve Test and Adjustment**" on **page 4-56**.)
Faulty boom cylinder(s)	Test boom cylinder(s). (See "**Boom Cylinder Leakage Test**" on **page 4-51**.) Replace boom cylinder(s). (See "**Boom Cylinders**" on **page 4-88**.)
Faulty ride control valve	Replace ride control valve. (See "**Ride Control Valve**" on **page 4-82**.)

Table 4-3. Power Coupler Does Not Function

Probable Cause	Remedy
Hydraulic oil not at correct level in hydraulic oil tank	Fill hydraulic oil tank to correct level. (See "**Hydraulic Oil Tank Drain/Fill Procedure**" on **page 4-64**.)
Hydraulic oil cold	Warm hydraulic oil to operating temperature.
Incorrect hydraulic system main relief valve setting	Test main hydraulic system relief valve. (See "**Hydraulic System Main Relief Valve Test and Adjustment**" on **page 4-56**.)
Faulty power coupler cylinder	Replace power coupler cylinder. (See "**Power Coupler Cylinder**" on **page 4-86**.)
Faulty power coupler valve	Replace power coupler valve. (See "**Power Coupler Valve**" on **page 4-85**.)

Table 4-4. Self Leveling Does Not Function

Probable Cause	Remedy
Hydraulic oil not at correct level in hydraulic oil tank	Fill hydraulic oil tank to correct level. (See "**Hydraulic Oil Tank Drain/Fill Procedure**" on **page 4-64**.)
Hydraulic oil cold	Warm hydraulic oil to operating temperature.
Possible electrical system failure	See "**Self Level Circuit**" on **page 2-194**.
Incorrect hydraulic system main relief valve setting	Test hydraulic system main relief valve. (See **Hydraulic System Main Relief Valve Test and Adjustment**.)

Table 4-4. Self Leveling Does Not Function (Continued)

Incorrect boom cylinder operating pressure	Pressure test boom cylinders. (See "**Hydraulic Cylinder Pressure Test**" on **page 4-58**.)
Faulty boom cylinder(s)	Test boom cylinder(s). (See "**Boom Cylinder Leakage Test**" on **page 4-51**.) Replace boom cylinder(s). (See "**Boom Cylinders**" on **page 4-88**.)
Faulty bucket cylinder(s)	Test bucket cylinder(s). (See"**Bucket Cylinder Leakage Test**" on **page 4-52**.)
Faulty self leveling valve	Replace self leveling valve. (See"**Self Leveling Valve**" on **page 4-84**.)

Table 4-5. Fan Motor Does Not Operate

Probable Cause	Remedy
Hydraulic oil not at correct level in hydraulic oil tank	Fill hydraulic oil tank to correct level. (See "**Hydraulic Oil Tank Drain/Fill Procedure**" on **page 4-64**.)
Hydraulic oil cold	Warm hydraulic oil to operating temperature.
Faulty fan motor	Replace fan motor. (See "**Fan Motor (One Speed)**" on **page 4-70** or "**Fan Motor (Variable Speed)**" on **page 4-72**.)

Table 4-6. Boom Does Not Raise or Lower

Probable Cause	Remedy
Hydraulic oil not at correct level in hydraulic oil tank	Fill hydraulic oil tank to correct level. (See "**Hydraulic Oil Tank Drain/Fill Procedure**" on **page 4-64**.)
Hydraulic oil cold	Warm hydraulic oil to operating temperature.
Possible electrical system failure	See **Boom/Bucket Circuit**.
Incorrect boom cylinder operating pressure	Pressure test boom cylinders. (See "**Hydraulic Cylinder Pressure Test**" on **page 4-58**.)
Faulty boom cylinder(s)	Test boom cylinder(s). (See "**Boom Cylinder Leakage Test**" on **page 4-51**.) Replace boom cylinder(s). (See "**Boom Cylinders**" on **page 4-88**.)

Table 4-7. Bucket Does Not Curl or Dump

Probable Cause	Remedy
Hydraulic oil not at correct level in hydraulic oil tank	Fill hydraulic oil tank to correct level. (See "**Hydraulic Oil Tank Drain/Fill Procedure**" on **page 4-64**.)
Hydraulic oil cold	Warm hydraulic oil to operating temperature.
Possible electrical system failure	See **Boom/Bucket Circuit**.
Incorrect bucket cylinder operating pressure	Pressure test bucket cylinders. (See "**Hydraulic Cylinder Pressure Test**" on **page 4-58**.)

Table 4-7. Bucket Does Not Curl or Dump (Continued)

Faulty bucket cylinder(s)	Test bucket cylinder(s). (See "**Bucket Cylinder Leakage Test**" on **page 4-52**.) Replace bucket cylinder(s). (See "**Bucket Cylinder**" on **page 4-87**.)

Table 4-8. Auxiliary Hydraulics Does Not Function

Probable Cause	Remedy
Hydraulic oil not at correct level in hydraulic oil tank	Fill hydraulic oil tank to correct level. (See "**Hydraulic Oil Tank Drain/Fill Procedure**" on **page 4-64**.)
Hydraulic oil cold	Warm hydraulic oil to operating temperature.
Possible electrical system failure	See "**Auxiliary Hydraulics**" on **page 2-196**.
Faulty high flow solenoid (machines with high flow option)	Test auxiliary hydraulics high flow. (See "**High Flow Auxiliary Hydraulics Flow Test**" on **page 4-54**.)
Inadequate auxiliary hydraulics flow	Test auxiliary hydraulics flow. (See "**Auxiliary Hydraulics Flow Test**" on **page 4-53**.)

4

Test and Adjustments

Test Procedures Overview

The following tests are specifically designed to approach hydraulic testing on a system level. The test results will help the technician to decide which repairs will best remedy the performance issue experienced by the machine user.

Example: Boom Function Performance Complaint. The machine operator reports the boom will not raise.

Basic troubleshooting should be performed before any instrument test is performed. (See "**Troubleshooting**" on **page 4-48**.)

Preliminary checks should always be performed before any instrument test is performed. (See "**Preliminary Checks**" on **page 4-50**.)

If the complaint cannot be resolved through troubleshooting and preliminary checks, a gear pump test must first be performed to rule out a gear pump issue. Next, the hydraulic relief test should be performed to rule out a main control valve relief valve issue. Finally, a hydraulic cylinder pressure test should be performed to confirm the main control valve is providing adequate hydraulic pressure to the boom cylinders. If all instrument tests are performed without any faulty components found, it would then be safe to assume the boom cylinder(s) is faulty.

Preliminary Checks

Perform the following checks prior to beginning any tests.

1. Check machine for any active or inactive Diagnostic Trouble Codes (DTCs).
2. Check the hydraulic oil tank for proper fluid level, the presence of air or water, and unusual odor.
3. Check all lines and fittings for leaks. Tighten as needed.
4. Check all hydraulic cylinders for external leaks.
5. Check for clogged or damaged hydraulic filter.
6. Inspect cooling assembly for the following:
   - Obstructed air flow
   - Improper plumbing
   - Kinked or damaged hoses
7. Eliminate all mechanical issues prior to starting hydraulic tests.

Boom Cylinder Leakage Test

See **Figure 4-29**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Mark boom cylinder rod (1) 0.24 in. (6 mm) from base of boom cylinder (2) as shown in **Figure 4-29**.

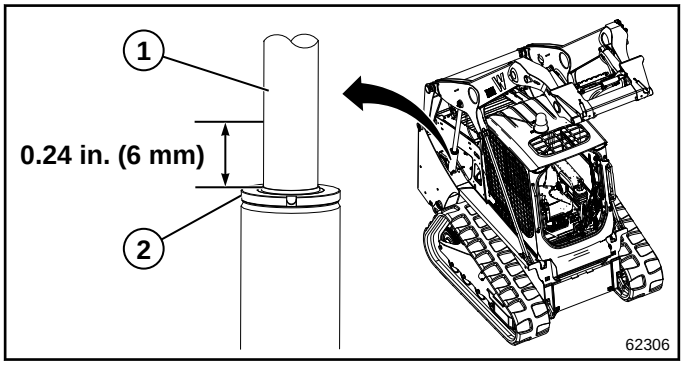


Figure 4-29: Boom Cylinder Leakage Test

CAUTION

Do not scratch, scribe, or gouge boom cylinder rod. Scratching, scribing, or gouging boom cylinder rod may result in boom cylinder leakage. Failure to comply may result in damage to equipment.

3. Repeat Step 2 for remaining boom cylinder.
4. Allow boom cylinders to support weight of boom and attachment for 1 hour.

   Did boom cylinder(s) leak down 0.24 in. (6 mm) or more?

   YES *Boom cylinder(s) is faulty. Replace boom cylinder(s). (See "**Boom Cylinders**" on **page 4-88**.)*

   NO *Boom cylinder(s) are good.*

4

Bucket Cylinder Leakage Test

See **Figure 4-30**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

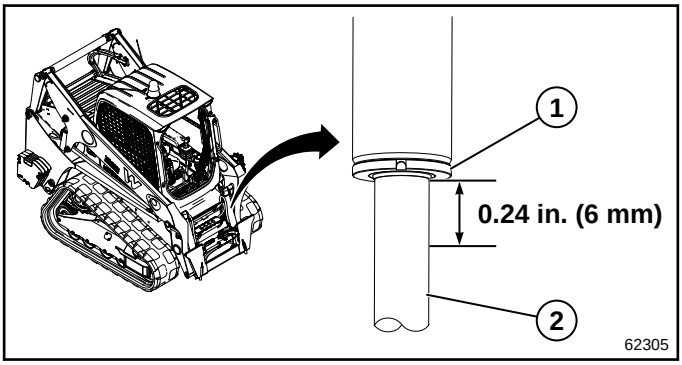


Figure 4-30: Bucket Cylinder Leakage Test

CAUTION

Do not scratch, scribe, or gouge bucket cylinder rod. Scratching, scribing, or gouging bucket cylinder rod may result in bucket cylinder leakage. Failure to comply may result in damage to equipment.

2. Raise boom so that attachment is 4 to 6 in. (102 to 152 mm) off ground.
3. Tilt attachement to full curled position.
4. Mark bucket cylinder rod (2) 0.24 in. (6 mm) from base of bucket cylinder (1) as shown in **Figure 4-30**.
5. Repeat Step 4 for remaining bucket cylinder.
6. Allow bucket cylinders to support weight of attachment for 1 hour.

   Did bucket cylinder(s) leak down 0.24 in. (6 mm) or more?

   YES *Bucket cylinder(s) faulty. Replace curl/dump cylinder(s). (See "**Bucket Cylinder**" on **page 4-87**.)*

   NO *Bucket cylinder(s) are good.*

Auxiliary Hydraulics Flow Test

Auxiliary Hydraulics Flow Test

See **Figure 4-31**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

Required Tools or Equipment
• Flow Meter 40 GPM (151 LPM) • Pressure Gauge 5000 psi (345 bar) • Suitable Fittings

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

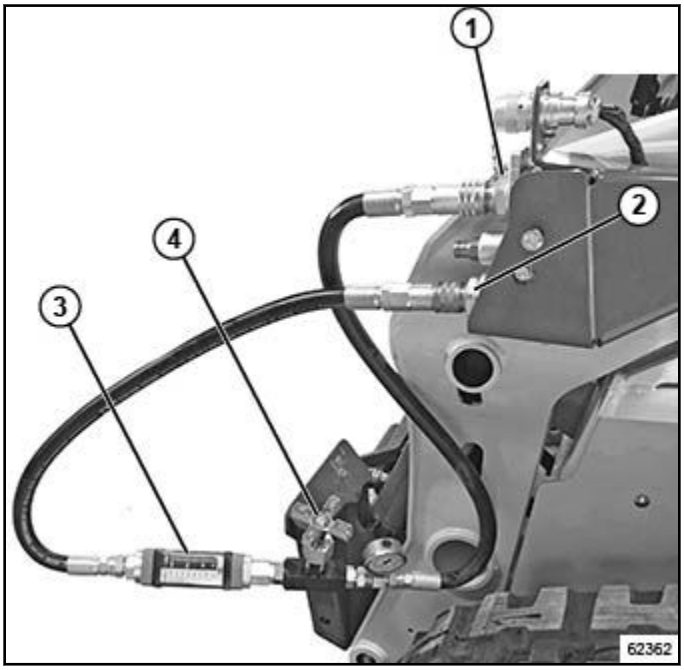


Figure 4-31: Auxiliary Hydraulics Flow Test

2. Connect inlet side of flow meter (3) to male auxiliary coupler (1).
3. Connect outlet side of flow meter (3) to female auxiliary coupler (2).
4. Ensure flow meter valve (4) is fully open.
5. Start machine.
6. Raise engine speed to 2725 RPM using hand throttle control.
7. Allow hydraulic oil to warm to 140° F (60° C) by slowly closing flow meter valve (4) until gauge reads 1000 psi (69 bar). Do not exceed relief pressure of 3481 psi (240 bar).
8. Open flow meter valve (4) until valve is completely open.
9. Activate auxiliary hydraulics on right joystick.
10. Check reading on flow meter (3) to ensure gear pump is producing 15 GPM (57 LPM).

    Does flow meter read 15 GPM (57 LPM)?

    YES *Gear pump is good. Proceed to step 11.*

    NO *Gear pump is faulty. Replace gear pump. (See **Gear Pump (Two Section)** or **Gear Pump (Three Section)**.)*

11. Turn off machine.
12. Disconnect and remove test equipment. Install all hoses and fittings as noted prior to removal.

13. Check hydraulic oil level. Add oil as needed. (See **Hydraulic Oil Tank Drain/Fill Procedure**.)

High Flow Auxiliary Hydraulics Flow Test

High Flow Auxiliary Hydraulics Flow Test

See **Figure 4-32**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

Required Tools or Equipment
• Flow Meter 40 GPM (151 LPM)

Required Tools or Equipment
• Pressure Gauge 5000 psi (345 bar) • Suitable Fittings

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

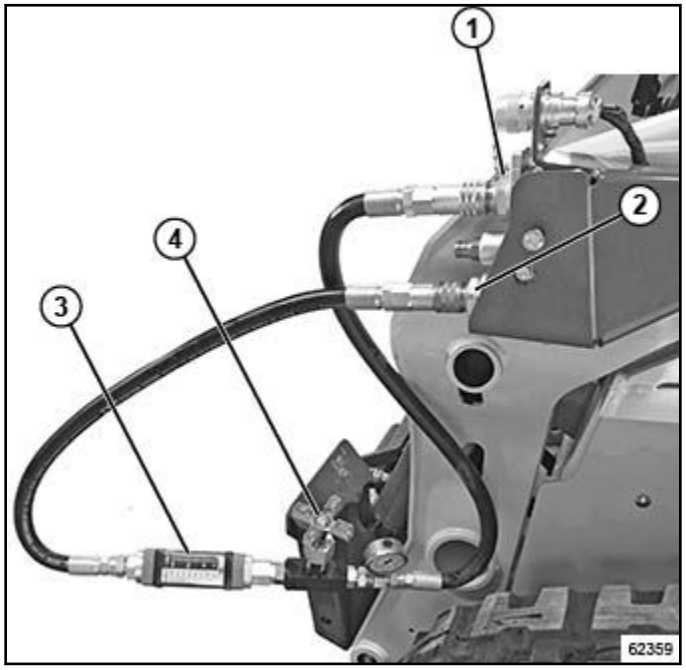


Figure 4-32: High Flow Auxiliary Hydraulics Flow Test

2. Connect inlet side of flow meter (3) to male auxiliary coupler (1).
3. Connect outlet side of flow meter (3) to female auxiliary coupler (2).
4. Ensure flow meter valve (3) is fully open.
5. Start machine.
6. Raise engine speed to 2725 RPM using hand throttle control.
7. Allow hydraulic oil to warm to 140° F (60° C) by slowly closing flow meter valve (4) until gauge reads 1000 psi (6895 kPa). Do not exceed relief pressure of 3481 psi (240 bar).
8. Open flow meter valve (4) until valve is completely open.
9. Depress HF switch.
10. Activate auxiliary hydraulics on right joystick.
11. Check reading on flow meter (3) to ensure gear pump is producing 20 GPM (76 LPM).

Does flow meter read 20 GPM (76 LPM)?

YES *Gear pump is good. Proceed to step 12.*

NO *Gear pump is faulty. Replace gear pump. (See "**Gear Pump (Two Section)**" on **page 4-68** or "**Gear Pump (Three Section)**" on **page 4-69**.)*

12. Turn off machine.
13. Disconnect and remove test equipment. Install all hoses and fittings as noted prior to removal.
14. Check hydraulic oil level. Add oil as needed. (See "**Hydraulic Oil Tank Drain/Fill Procedure**" on **page 4-64**.)

Hydraulic System Main Relief Valve Test and Adjustment

Hydraulic System Main Relief Valve Test

See **Figure 4-33**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

Required Tools or Equipment
• Flow Meter 40 GPM (151 LPM)
• Pressure Gauge 5000 psi (345 bar)

Required Tools or Equipment
• Suitable Fittings

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

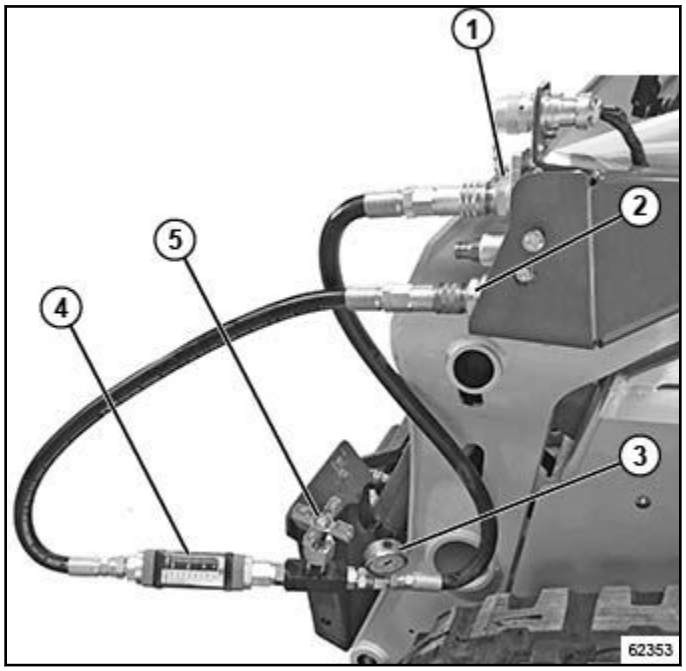


Figure 4-33: Hydraulic System Main Relief Valve Pressure Test

2. Connect inlet side of flow meter (4) to male auxiliary coupler (1).
3. Connect outlet side of flow meter (4) to female auxiliary coupler (2).
4. Ensure flow meter valve (5) is fully open.
5. Start machine.
6. Raise engine speed to 2725 RPM using hand throttle control.
7. Allow hydraulic oil to warm to 140° F (60° C) by slowly closing flow meter valve until gauge reads 1000 psi (6895 kPa). Do not exceed relief pressure of 3481 psi (240 bar).
8. Open flow meter valve (5) until valve is completely open.
9. Activate auxiliary hydraulics on right joystick.
10. Check reading on flow meter to ensure gear pump is producing 15 GPM (57 LPM).
11. Slowly close flow meter valve (5) until main relief valve opens. Verify gauge (3) reads 3481 psi (240 bar).

Does main relief valve open at 3481 psi (240 bar)?

YES *Main relief valve is adjusted properly. Proceed to step 12.*

NO *Adjust main relief valve. (See "**Main Relief Valve Adjustment**" on **page 4-57**.)*

12. Turn off machine.
13. Disconnect and remove test equipment. Install all hoses and fittings as noted prior to removal.
14. Install and connect all components as noted prior to test.
15. Check hydraulic oil level. Add oil as needed. (See "**Hydraulic Oil Tank Drain/Fill Procedure**" on **page 4-64**.)

Main Relief Valve Adjustment

See **Figure 4-34**.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Turn off machine.
3. Open engine cover.

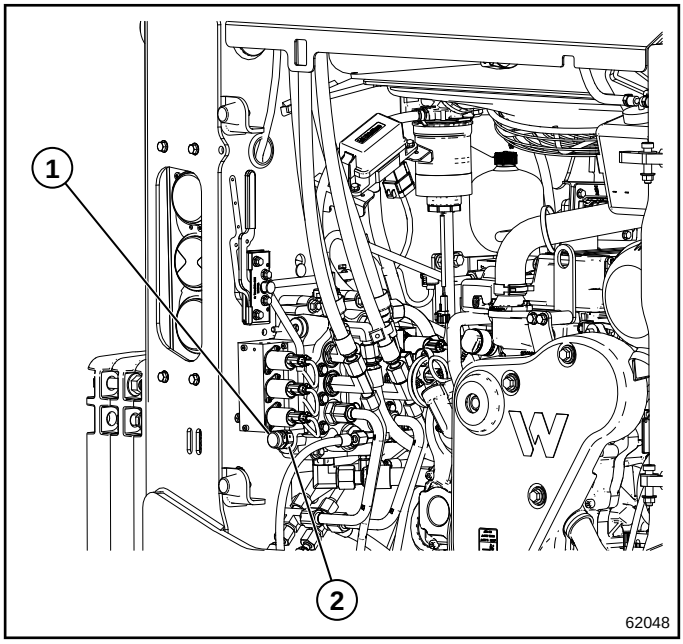


Figure 4-34: Main Relief Valve Adjustment

4. Loosen jamnut (2).
5. Turn adjusting screw (1) clockwise to increase relief pressure or counterclockwise to decrease relief pressure.
6. Perform Hydraulic System Main Relief Valve Test. (See "**Hydraulic System Main Relief Valve Test**" on **page 4-56**.)
7. Repeat steps 1 through 6 until relief pressure is 3481 psi (240 bar). If relief pressure cannot be obtained, replace main control valve. (See "**Main Control Valve**" on **page 4-78**.)

Hydraulic Cylinder Pressure Test

See **Figures 4-35** and **4-36**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTE

All hydraulic cylinders are pressure tested the same way. Left side boom cylinder is shown.

Required Tools or Equipment
• Pressure Gauge 5000 PSI (345 bar) • Suitable Fittings

1. Park machine safely. (See **Park Machine Safely**.)

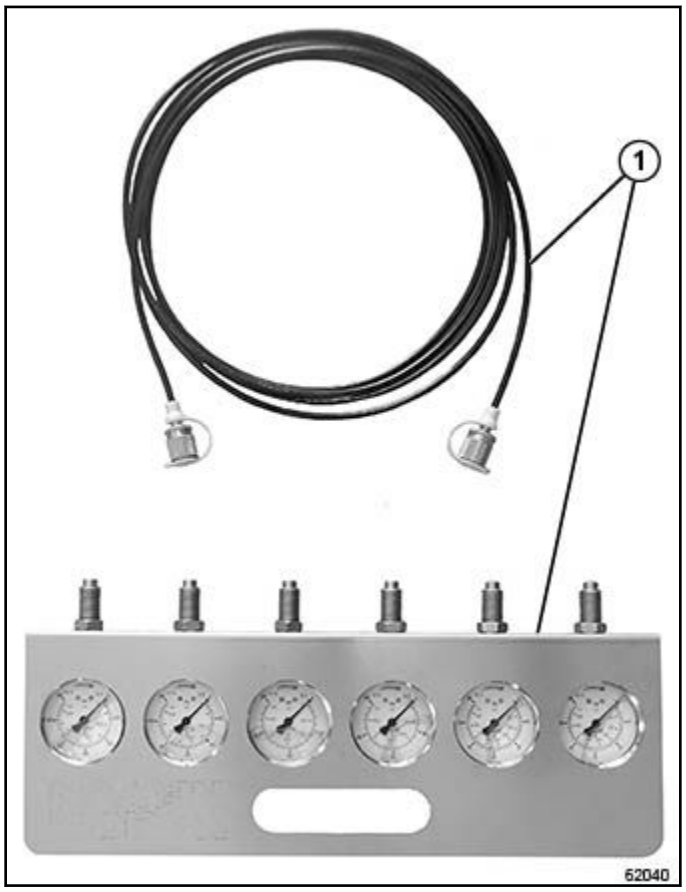


Figure 4-35: Pressure Gauge

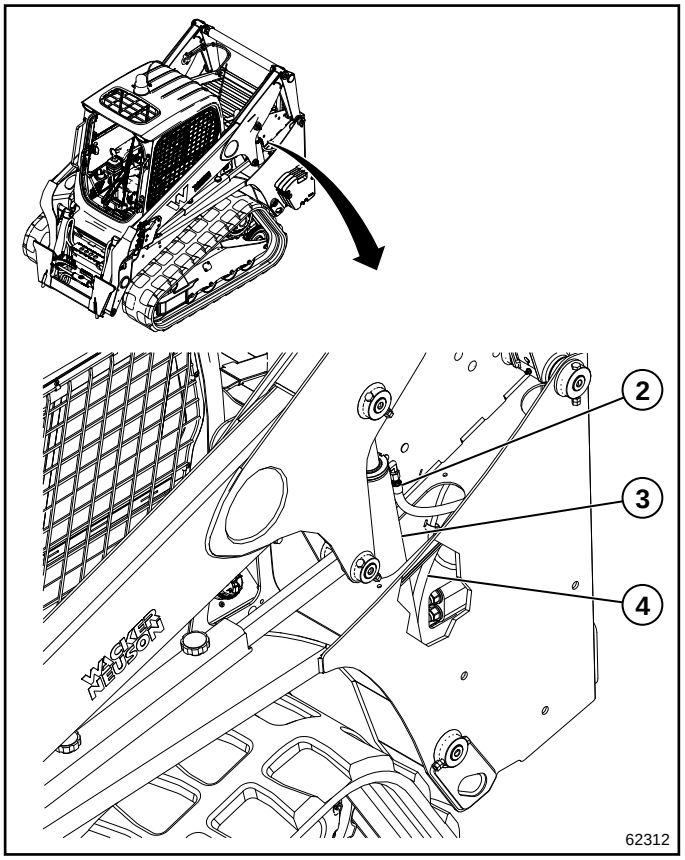


Figure 4-36

2. Remove hose (4) from boom cylinder (3).

CAUTION

Ensure opposite boom cylinder hose is capped prior to performing pressure test. Failure to comply may result in damage to equipment.

3. Connect pressure gauge (1) to hose (4).
4. Remove opposite boom cylinder hose (4).
5. Cap hose (4).
6. Start machine.
7. With the aid of an assistant, activate controls to boom raise position and verify pressure gauge (1) reads 3481 psi (240 bar).

   Does pressure gauge read 3481 psi (240 bar)?

   YES *Main control valve is good. Proceed to step 8.*

   NO *Main control valve is faulty. Replace main control valve. (See "**Main Control Valve**" on **page 4-78**.)*

8. Turn off machine.
9. Disconnect pressure gauge (1) from hose (4).
10. Install hose (4) on boom cylinder (3).
11. Install opposite boom cylinder hose (4).
12. Remove hose (2) from boom cylinder (3).

CAUTION

Ensure opposite boom cylinder hose is capped prior to performing pressure test. Failure to comply may result in damage to equipment.

13. Connect pressure gauge (1) to hose (2).
14. Remove opposite boom cylinder hose (2).
15. Cap hose (2).
16. Start machine.
17. With the aid of an assistant, activate controls to boom raise position and verify pressure gauge (1) reads 3481 psi (240 bar).

    Does pressure gauge read 3481 psi (240 bar)?

    YES *Main control valve is good. Proceed to step 18.*

    NO *Main control valve is faulty. Replace main control valve. (See "**Main Control Valve**" on **page 4-78**.)*

18. Turn off machine.
19. Disconnect and remove test equipment. Install all hoses and fittings as noted prior to removal.
20. Install and connect all components as noted prior to test.
21. Check hydraulic oil level. Add oil as needed. (See "**Hydraulic Oil Tank Drain/Fill Procedure**" on **page 4-64**.)

Gear Pump Test

Gear Pump Test (Three Section)

See **Figures 4-37** and **4-38**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*
- *Cap and plug hoses and fittings during removal.*

Required Tools or Equipment
• Flow Meter 40 GPM (151 LPM) • Pressure Gauge 5000 psi (345 bar) • Suitable Fittings

NOTE

*Section 3 of gear pump cannot be tested at outlet port. See "**High Flow Auxiliary Hydraulics Flow Test**" on **page 4-54** to test section 3 of gear pump.*

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

WARNING

Always ensure boom is secured with safety strut when raising boom. Failure to secure boom with safety strut may result in death or serious injury.

2. Raise boom and secure with safety strut.

WARNING

Always ensure cab is secured with safety strut when raising cab. Failure to secure cab with safety strut may result in death or serious injury.

3. Raise cab and secure with safety strut to gain access to gear pump.

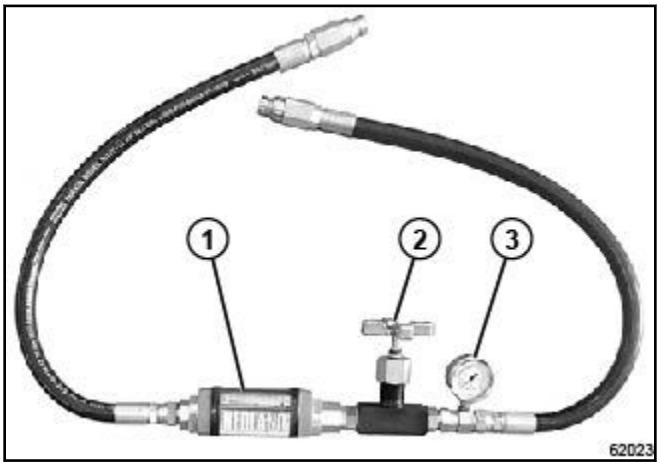


Figure 4-37: Flow Meter

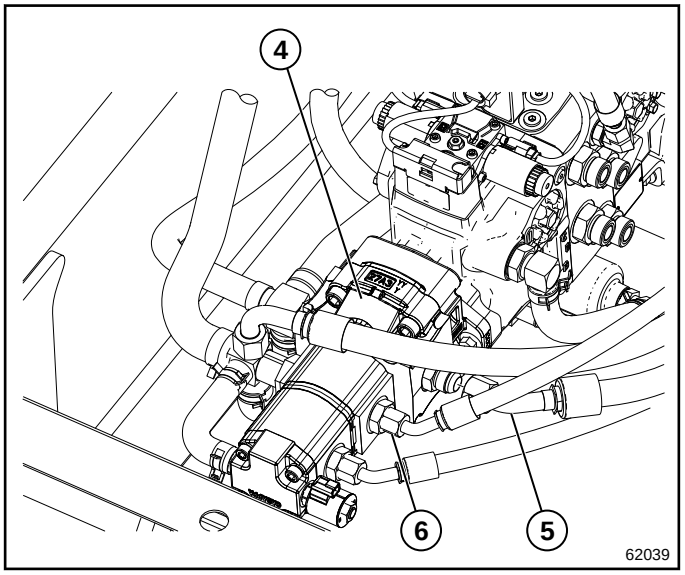


Figure 4-38: Drive Motor Hose Removal

4. Disconnect outlet hose from section 1 of gear pump (4).
5. Connect inlet side of flow meter (1) to section 1 of gear pump (4).
6. Connect outlet side of flow meter (1) to outlet hose (5).
7. Ensure flow meter valve (2) is fully open.
8. Start machine.
9. Raise engine speed to 2725 RPM using hand throttle control.
10. Allow hydraulic oil to warm to 140° F (60° C) by slowly closing flow meter valve (2) until gauge (3) reads 1000 psi (69 bar). Do not exceed relief pressure of 3481 psi (240 bar).
11. Open flow meter valve (2) until valve is completely open.
12. Verify flow meter (1) reads 20 GPM (76 LPM).

    Does flow meter (1) 20 GPM (76 LPM)?

    YES *Gear pump is good. Proceed to step 13.*

    NO *Gear pump is faulty. Replace gear pump. (See "**Gear Pump (Two Section)**" on **page 4-68** or "**Removal and Installation**" on **page 4-69**.)*
13. Turn off machine.
14. Disconnect outlet side of flow meter (1) from outlet hose (5).
15. Disconnect inlet side of flow meter (1) from section 1 of gear pump (4).
16. Disconnect outlet hose (6) from gear pump (4).
17. Connect inlet side of flow meter (1) to section 2 of gear pump (4).
18. Connect outlet side of flow meter (1) to outlet hose (6).
19. Ensure flow meter valve (2) is fully open.
20. Start machine.
21. Raise engine speed to 2725 RPM using hand throttle control.
22. Allow hydraulic oil to warm to 140° F (60° C) by slowly closing flow meter valve (2) until gauge (3) reads 1000 psi (69 bar). Do not exceed relief pressure of 3481 psi (240 bar).
23. Open flow meter valve (2) until valve is completely open.
24. Verify flow meter (1) reads 10.5 GPM (40 LPM).

    Does flow meter (1) 10.5 GPM (40 LPM)?

    YES *Gear pump is good. Proceed to step 25.*

    NO *Gear pump is faulty. Replace gear pump. (See "**Gear Pump (Two Section)**" on **page 4-68** or "**Gear Pump (Three Section)**" on **page 4-69**.)*
25. Turn off machine.
26. Disconnect and remove test equipment. Install all hoses and fittings as noted prior to removal.
27. Install and connect all components as noted prior to test.
28. Check hydraulic oil level. Add oil as needed. (Refer to "**Hydraulic Oil Tank Drain/Fill Procedure**" on **page 4-64**.)

4

Gear Pump Test (Two Section)

See **Figures 4-39** and **4-40**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*
- *Cap and plug hoses and fittings during removal.*

Required Tools or Equipment
• Flow Meter 40 GPM (151 LPM) • Pressure Gauge 5000 psi (345 bar) • Suitable Fittings

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

WARNING

- **Support the machine using properly rated jackstands. Never work under a machine supported only by a jack.**
- **Do not use wood or concrete blocks to support the machine. Failure to properly support the machine may result in death or serious injury.**

2. Support machine securely. (See "**Support Machine Securely**" on **page 16**.)

WARNING

Always ensure boom is secured with safety strut when raising boom. Failure to secure boom with safety strut may result in death or serious injury.

3. Raise boom and secure with safety strut.
4. Bypass the interlock circuit.

WARNING

Always ensure cab is secured with safety strut when raising cab. Failure to secure cab with safety strut may result in death or serious injury.

5. Raise cab and secure with safety strut to gain access to gear pump.

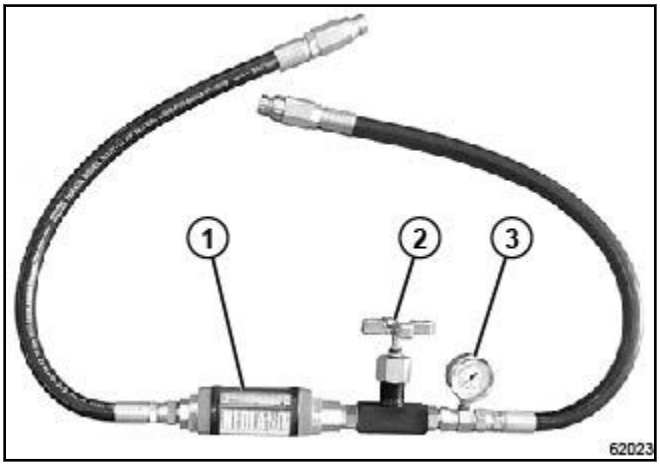


Figure 4-39: Flow Meter

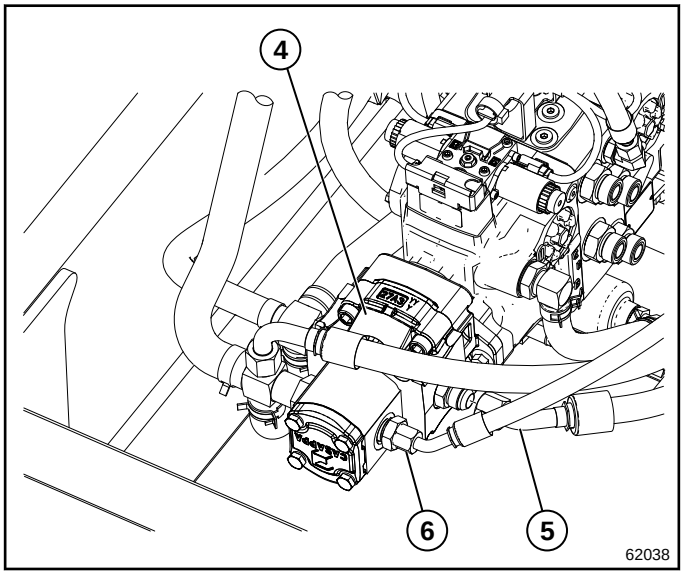


Figure 4-40: Drive Motor Hose Removal

6. Disconnect outlet hose from section 1 of gear pump (4).
7. Connect inlet side of flow meter (1) to section 1 of gear pump (4).
8. Connect outlet side of flow meter (1) to outlet hose (5).
9. Ensure flow meter valve (2) is fully open.
10. Start machine.
11. Raise engine speed to 2725 RPM using hand throttle control.
12. Allow hydraulic oil to warm to 140° F (60° C) by slowly closing flow meter valve (2) until gauge (3) reads 1000 psi (69 bar). Do not exceed relief pressure of 3481 psi (240 bar).
13. Open flow meter valve (2) until valve is completely open.
14. Verify flow meter (1) reads 20 GPM (76 LPM).

    Does flow meter (1) read 20 GPM (76 LPM)?

    YES *Gear pump is good. Proceed to step 15.*

    NO *Gear pump is faulty. Replace gear pump. (See "**Gear Pump (Two Section)**" on page 4-68 or "**Gear Pump (Three Section)**" on page 4-69.)*
15. Turn off machine.
16. Disconnect outlet side of flow meter (1) from outlet hose (5).
17. Disconnect inlet side of flow meter (1) from section 1 of gear pump (4).
18. Disconnect outlet hose (6) from section 2 of gear pump (4).
19. Connect inlet side of flow meter (1) to section 2 of gear pump (4).
20. Connect outlet side of flow meter (1) to outlet hose (6).
21. Ensure flow meter valve (2) is fully open.
22. Start machine.
23. Raise engine speed to 2725 RPM using hand throttle control.
24. Allow hydraulic oil to warm to 140° F (60° C) by slowly closing flow meter valve (2) until gauge (3) reads 1000 psi (69 bar). Do not exceed relief pressure of 3481 psi (240 bar).
25. Open flow meter valve (2) until valve is completely open.
26. Verify flow meter (1) reads 10.5 GPM (40 LPM).

    Does flow meter (1) 10.5 GPM (40 LPM)?

    YES *Gear pump is good. Proceed to step 27.*

    NO *Gear pump is faulty. Replace gear pump. (See "**Gear Pump (Two Section)**" on page 4-68 or "**Gear Pump (Three Section)**" on page 4-69.)*
27. Disconnect and remove test equipment. Install all hoses and fittings as noted prior to removal.
28. Install and connect all components as noted prior to test.

29. Check hydraulic oil level. Add oil as needed. (Refer to "**Hydraulic Oil Tank Drain/Fill Procedure**" on **page 4-64**.)

Repair

Hydraulic Oil Tank Drain/Fill Procedure

Drain/Fill

See **Figure 4-41**.

WARNING

Always ensure cab is secured with safety strut when raising cab. Failure to secure cab with safety strut may result in death or serious injury.

WARNING

The hydraulic system is under pressure, and the oil may be hot.

- **Always allow the machine to cool completely before performing service.**
- **Always relieve pressure in the hydraulic system before performing service.**
- **Always use appropriate safety equipment and clothing to protect exposed skin and eyes from high pressure oil.**
- **Tighten all connections to proper specifications before applying pressure.**
- **Never use bare hands to check for leaks. Oil under pressure can penetrate the skin, and can cause gangrene within a few hours if not properly removed. Use a piece of cardboard to check for leaks.**

Failure to follow appropriate safety precautions may result in death or serious injury.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Cap and plug hoses and fittings during removal.*
- *Hydraulic system oil capacity is 7.25 gallons (27.4 liters).*
- *Hydraulic oil tank capacity is 2.5 gallons (9.4 liters).*
- *Loosen hydraulic oil tank cap to allow tank to vent when draining hydraulic oil.*

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

WARNING

Always ensure boom is secured with safety strut when raising boom. Failure to secure boom with safety strut may result in death or serious injury.

2. Raise boom and secure with safety strut.

WARNING

Always ensure cab is secured with safety strut when raising cab. Failure to secure cab with safety strut may result in death or serious injury.

3. Raise cab and secure with safety strut.

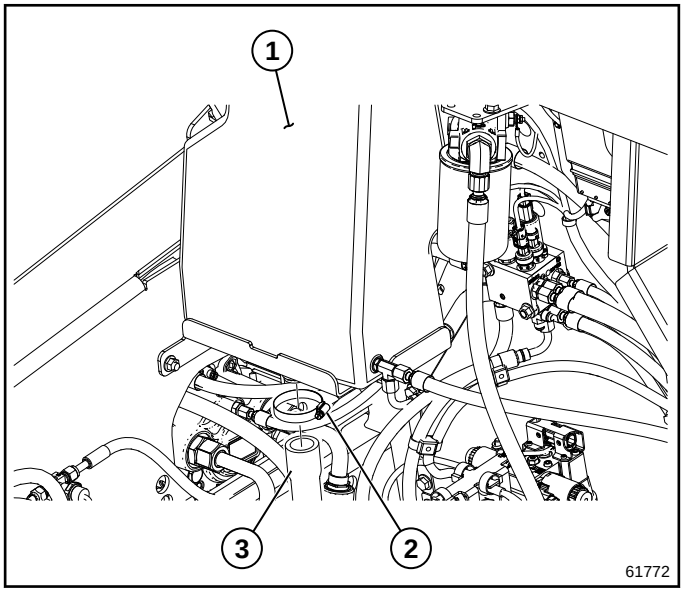


Figure 4-41: Hydraulic Oil Tank Drain/Fill Procedure

4. Remove clamp (2) and hose (3) from hydraulic oil tank (1) and allow hydraulic oil tank to completely drain into drain pan.

Installation Notes

- *Install hose (3) on hydraulic oil tank (1) with clamp (2).*
- *Replace hydraulic oil filter. (See "**Removal and Installation**" on **page 4-76**.)*
- *Refill hydraulic oil tank using approved hydraulic oil.*
- *Start engine. Check hydraulic system for leaks. Repair as necessary.*
- *Check hydraulic oil and add if necessary.*

Hydraulic Oil Tank

Removal and Installation

See **Figures 4-42** and **4-43**.

WARNING

The hydraulic system is under pressure, and the oil may be hot.

- **Always allow the machine to cool completely before performing service.**
- **Always relieve pressure in the hydraulic system before performing service.**
- **Always use appropriate safety equipment and clothing to protect exposed skin and eyes from high pressure oil.**
- **Tighten all connections to proper specifications before applying pressure.**
- **Never use bare hands to check for leaks. Oil under pressure can penetrate the skin, and can cause gangrene within a few hours if not properly removed. Use a piece of cardboard to check for leaks.**

Failure to follow appropriate safety precautions may result in death or serious injury.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*
- *Cap and plug hoses and fittings during removal.*

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

WARNING

Always ensure boom is secured with safety strut when raising boom. Failure to secure boom with safety strut may result in death or serious injury.

2. Raise boom and support with safety strut.
3. Open engine cover.
4. Open radiator cover.

WARNING

Always ensure cab is secured with safety strut when raising cab. Failure to secure cab with safety strut may result in death or serious injury.

5. Raise cab and support with safety strut.
6. Drain hydraulic oil tank. (See **Hydraulic Oil Tank Drain/Fill Procedure**.)

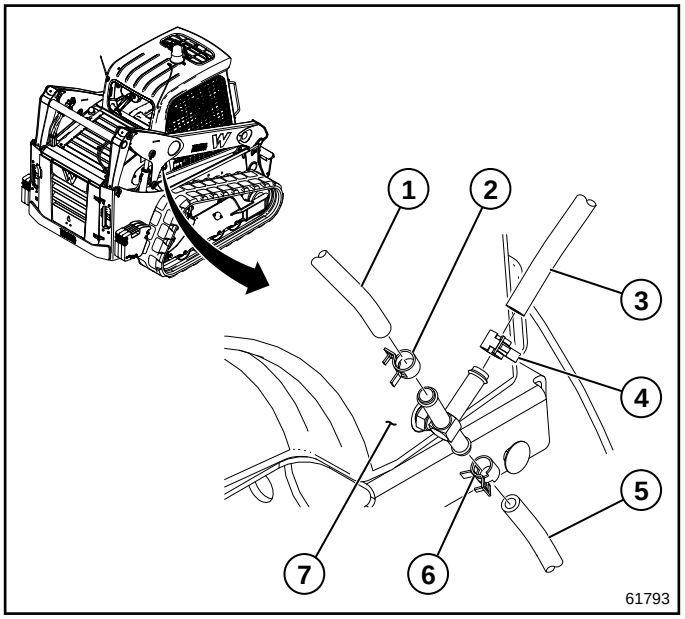


Figure 4-42: Hose Removal and Installation

7. Remove clamp (2) and hose (1) from rear of hydraulic oil tank (7).
8. Remove clamp (4) and hose (3) from rear of hydraulic oil tank (7).
9. Remove clamp (6) and hose (5) from rear of hydraulic oil tank (7).

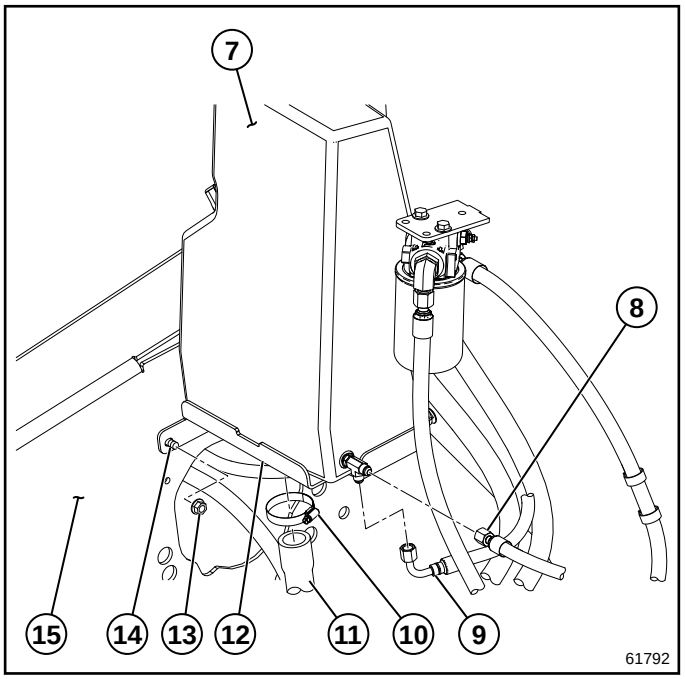


Figure 4-43: Hydraulic Oil Tank Removal and Installation

10. Remove clamp (10) and hose (11) from hydraulic oil tank (7).
11. Remove hose (8) from hydraulic oil tank (7).
12. Remove hose (9) from hydraulic oil tank (7).
13. Remove four nuts (13) from bolts (14).
14. Remove hold down plate (12) and hydraulic oil tank (7) from machine (15).

Installation Notes

- *Install the hydraulic oil tank by reversing the order of removal.*
- *Replace hydraulic oil filter. (See "**Removal and Installation**" on **page 4-76**.)*
- *Refill hydraulic oil tank.*
- *Start engine. Check hydraulic oil system for leaks and repair as necessary.*
- *Check hydraulic oil level and add if necessary.*

Gear Pump (Two Section)

Removal and Installation

See **Figure 4-44**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and wash skin thoroughly that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe area clean around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*
- *Cap and plug hoses and fittings during removal.*

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

WARNING

Always ensure boom is secured with safety strut when raising boom. Failure to secure boom with safety strut may result in death or serious injury.

2. Raise boom and secure with safety strut.

WARNING

Always ensure cab is secured with safety strut when raising cab. Failure to secure cab with safety strut may result in death or serious injury.

3. Raise cab and secure with safety strut to gain access to gear pump.
4. Drain hydraulic oil tank. (See "**Hydraulic Oil Tank Drain/Fill Procedure**" on **page 4-64**.)

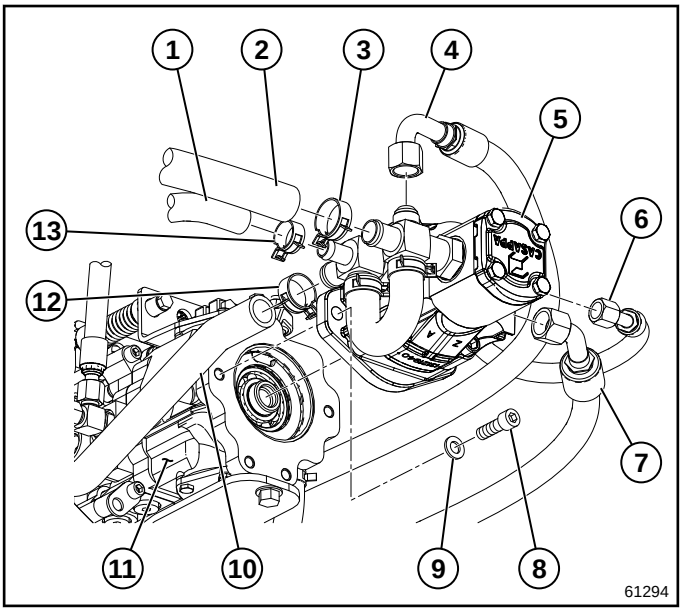


Figure 4-44: Gear Pump Removal and Installation

5. Remove clamp (13) and hose (1) from gear pump (5).
6. Remove clamp (3) and hose (2) from gear pump (5).

7. Remove clamp (12) and hose (10) from gear pump (5).
8. Remove hose (4) from gear pump (5).
9. Remove hose (6) from gear pump (5).
10. Remove hose (7) from gear pump (5).
11. Remove two bolts (8), washers (9), and gear pump (5) from hydrostatic pump (11).

Installation Notes

- *Install the gear pump by reversing the order of removal.*
- *Remove caps and plugs as hoses and fittings are installed.*
- *Install hoses and fittings as noted prior to removal.*

Gear Pump (Three Section)

Removal and Installation

See **Figure 4-45**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*
- *Cap and plug hoses and fittings during removal.*

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

WARNING

Always ensure boom is secured with safety strut when raising boom. Failure to secure boom with safety strut may result in death or serious injury.

2. Raise boom and secure with safety strut.
3. Disconnect negative battery cable at battery. (See "**Battery**" on **page 2-217**.)

WARNING

Always ensure cab is secured with safety strut when raising cab. Failure to secure cab with safety strut may result in death or serious injury.

4. Raise cab and secure with safety strut to gain access to gear pump.
5. Drain hydraulic oil tank. (See "**Hydraulic Oil Tank Drain/Fill Procedure**" on **page 4-64**.)

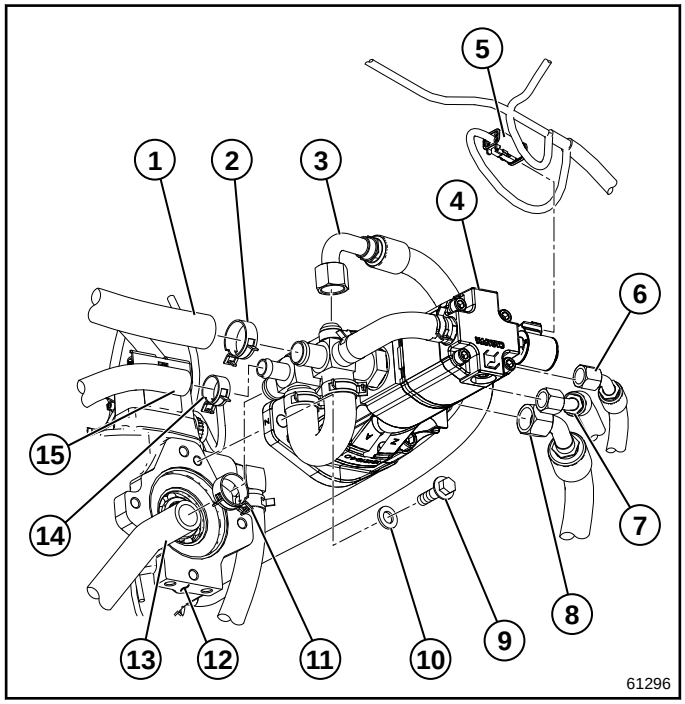


Figure 4-45: Gear Pump Removal and Installation

6. Remove clamp (14) and hose (15) from gear pump (4).
7. Remove clamp (2) and hose (1) from gear pump (4).
8. Remove clamp (11) and hose (13) from gear pump (4).
9. Remove hose (3) from gear pump (4).
10. Remove hose (6) from gear pump (4).
11. Remove hose (7) from gear pump (4).
12. Remove hose (8) from gear pump (4).
13. Disconnect connector (5) from gear pump (4).
14. Remove two bolts (9), washers (10), and gear pump (4) from hydrostatic pump (12).

Installation Notes

- *Install the three section gear pump by reversing the order of removal.*
- *Lightly lubricate O-rings with clean hydraulic oil prior to installation.*
- *Remove caps and plugs as hoses and fittings are installed.*
- *Install hoses and fittings as noted prior to removal.*

Fan Motor (One Speed)

Removal and Installation

See **Figures 4-46** through **4-48**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*
- *Cap and plug all hoses and fittings upon removal.*

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Open engine cover.
3. Open radiator cover to gain access to fan motor.

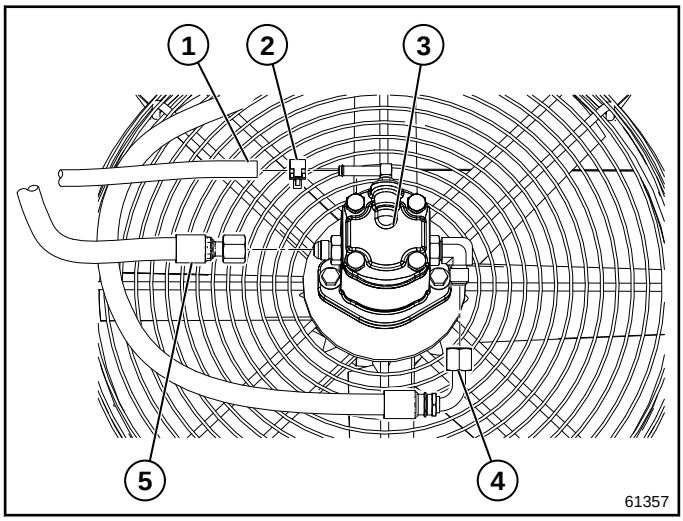


Figure 4-46: Hose Removal and Installation

4. Remove clamp (2) and hose (1) from fan motor (3).
5. Remove hose (5) from fan motor (3).
6. Remove hose (4) from fan motor (3).

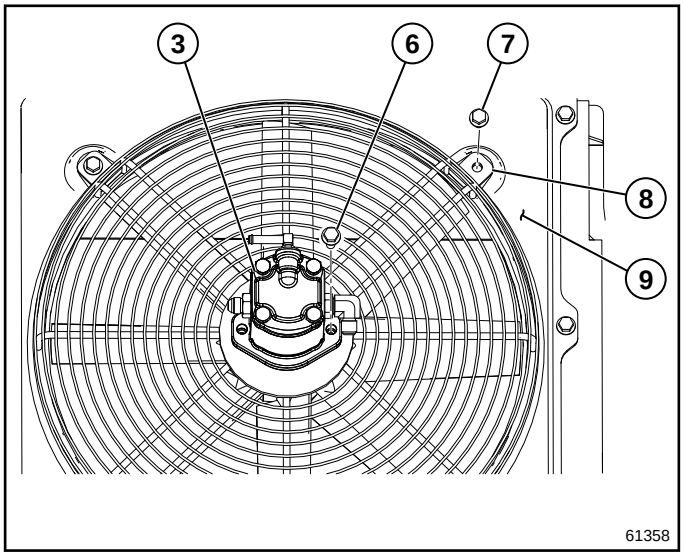


Figure 4-47: Fitting Removal and Installation

7. Remove four bolts (7), fan motor (3), and guard (8) from machine (9).
8. Remove two bolts (6) from fan motor (3) and guard (8).

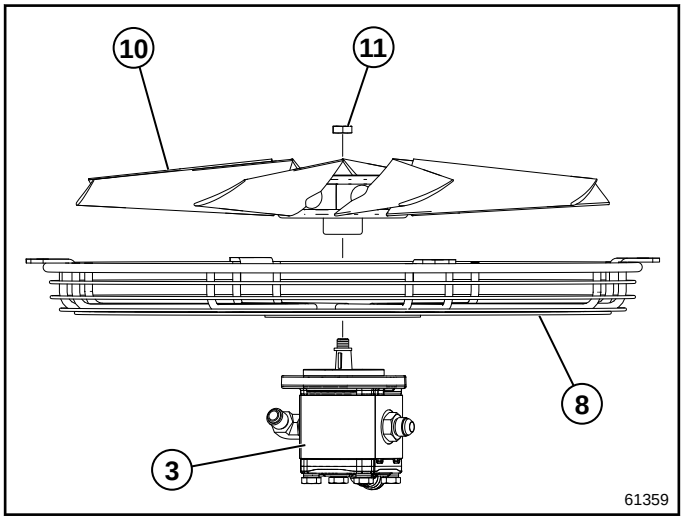


Figure 4-48: Fan Motor Removal and Installation

9. Remove nut (11), fan (10), and guard (8) from fan motor (3).

Installation Notes

- *Install the fan motor by reversing the order of removal.*
- *Lightly lubricate O-rings with clean hydraulic oil prior to installation.*
- *Remove caps and plugs as hoses and fittings are installed.*
- *Install hoses and fittings as noted prior to removal.*

Fan Motor (Variable Speed)

Removal and Installation

See **Figures 4-49** through **4-51**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Disconnect negative battery cable at battery. (See "**Battery**" on **page 2-217**.)
3. Open radiator cover to gain access to fan motor.

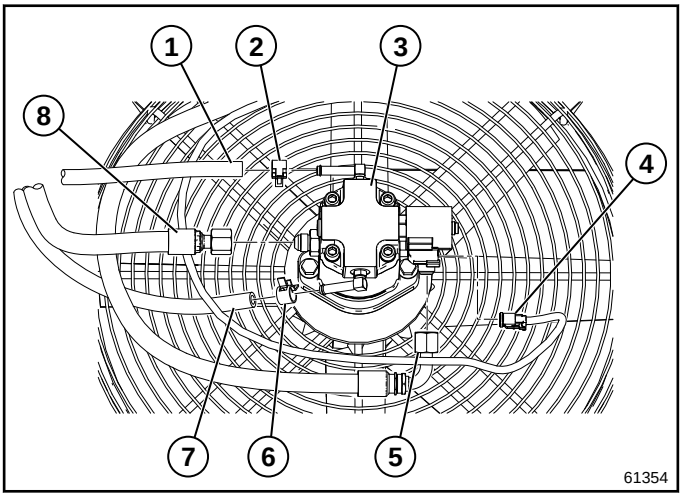


Figure 4-49: Hose Removal and Installation

4. Disconnect connector (4) from fan motor (3).
5. Remove clamp (2) and hose (1) from fan motor (3).
6. Remove clamp (6) and hose (7) from fan motor (3).
7. Remove hose (5) from fan motor (3).
8. Remove hose (8) fromfan motor (3).

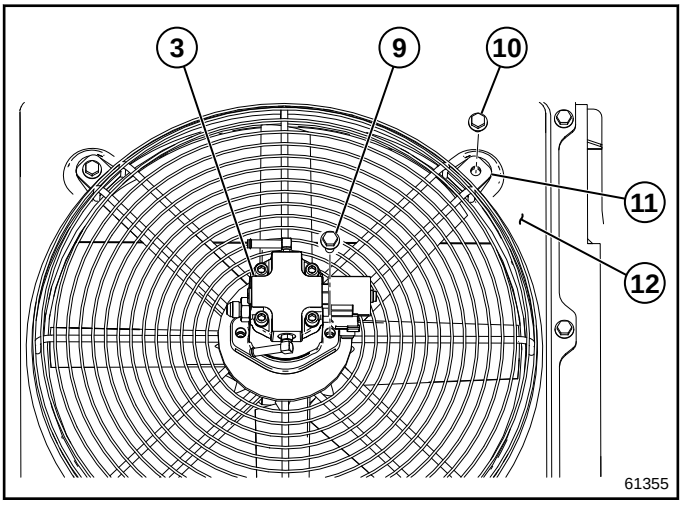


Figure 4-50: Fitting Removal and Installation

9. Remove four bolts (10), fan motor (3) and guard (11) from machine (12).
10. Remove two bolts (9) from fan motor (3) and guard (11).

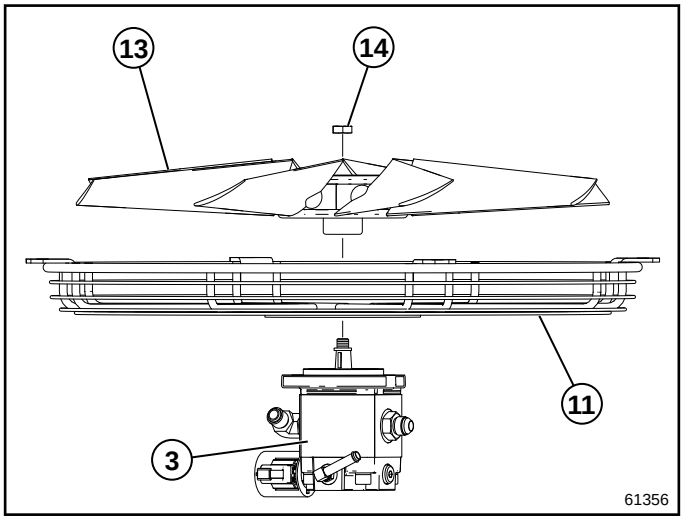


Figure 4-51: Fan Motor Removal and Installation

11. Remove nut (14), fan (13), and guard (11) from fan motor (3).

Installation Notes

- *Install the fan motor by reversing the order of removal.*
- *Lightly lubricate O-rings with clean hydraulic oil prior to installation.*
- *Remove caps and plugs as hoses and fittings are installed.*
- *Install hoses and fittings as noted prior to removal.*

Cooling Assembly

Removal and Installation

See **Figures 4-52** and **4-53**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Note routing of hoses during removal to ensure proper installation.*
- *Cap and plug hoses and fittings during removal.*
- *Note location of tiedown straps during removal to ensure proper installation.*

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Open engine cover.
3. Open radiator cover.

WARNING

- **Engine coolant is hot and under pressure! Allow the cooling system to cool completely before performing service. Rotate the filler cap 1/2-turn counterclockwise and allow pressure to vent before removing filler cap. Failure to follow appropriate safety precautions may result in death or serious injury.**
- **Contact with anti-freeze can damage your skin. Use gloves when working with anti-freeze. If you come in contact with anti-freeze, wash it off immediately.**

4. Drain cooling system.

WARNING

Always ensure boom is secured with safety strut when raising boom. Failure to secure boom with safety strut may result in death or serious injury.

5. Raise boom and secure with safety strut.

WARNING

Always ensure cab is secured with safety strut when raising cab. Failure to secure cab with safety strut may result in death or serious injury.

6. Raise cab and secure with safety strut.
7. Drain hydraulic oil. (See "**Drain/Fill**" on **page 4-64**.)
8. Remove fan motor. (See "**Removal and Installation**" on **page 4-70** or "**Removal and Installation**" on **page 4-72**.)

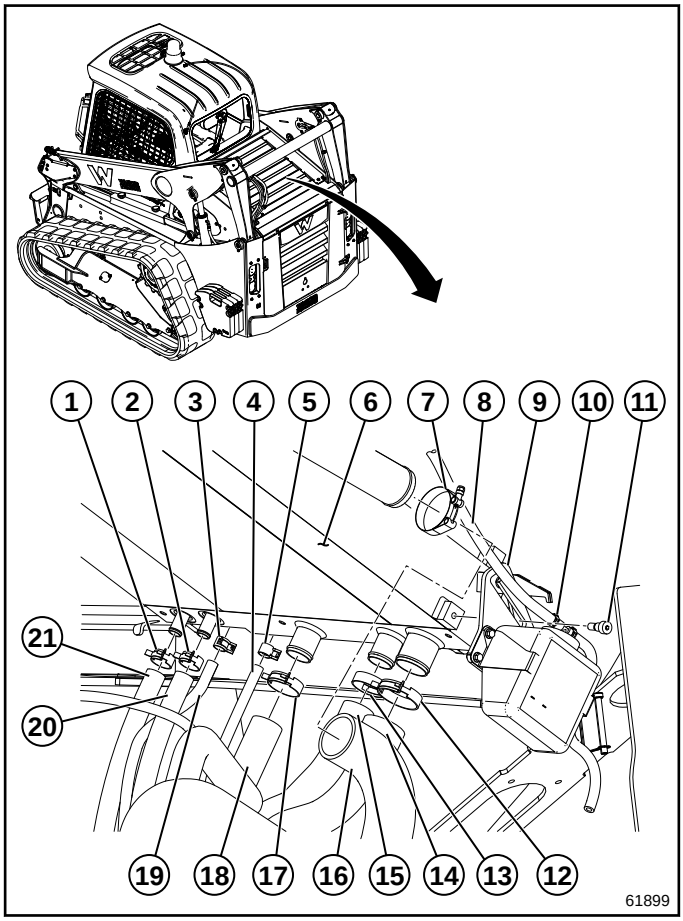


Figure 4-52: Cooling Assembly Hoses Removal and Installation

9. Remove clamp (10) and hose (8) from cooling assembly (6).
10. Remove clamp (7) and hose (16) from cooling assembly (6).
11. Remove clamp (12) and hose (14) from cooling assembly (6).
12. Remove clamp (13) and hose (15) from cooling assembly (6).
13. Remove clamp (17) and hose (18) from cooling assembly (6).
14. Remove clamp (5) and hose (4) from cooling assembly (6).
15. Remove clamp (3) and hose (19) from cooling assembly (6).
16. Remove clamp (2) and hose (20) from cooling assembly (6).
17. Remove clamp (1) and hose (21) from cooling assembly (6).
18. Remove bolt (11) and radiator prop (9) from cooling assembly (6).

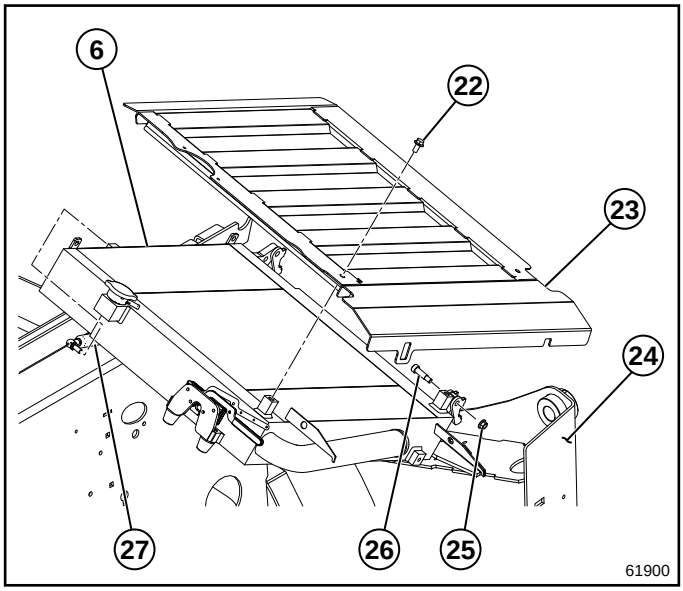


Figure 4-53: Cooling Assembly Removal and Installation

19. Remove two bolts (22) and radiator cover (23) from cooling assembly (6).
20. Disconnect strut (27) from cooling assembly (6).
21. Attach suitable lifting device to cooling assembly (23).
22. Using lifting device, remove two nuts (25), bolts (26), and cooling assembly (6) from machine (24).

Installation Notes

- *Install the cooling assembly by reversing the order of removal.*
- *Replace hydraulic oil filter. (See "**Removal and Installation**" on **page 4-76**.)*
- *Refill hydraulic oil tank using approved hydraulic oil. See ("**Drain/Fill**" on **page 4-64**.)*
- *Fill the radiator with a 50/50 mixture of good quality ethylene glycol-base anti-freeze and clean fresh water.*
- *Start engine. Check hydraulic system and cooling system for leaks. Repair as necessary.*
- *Check hydraulic oil and add if necessary.*
- *Check engine coolant and add if necessary.*

Hydraulic Oil Filter Housing

Removal and Installation

See **Figure 4-54**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*
- *Cap and plug all hoses and fittings upon removal.*

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

WARNING

Always ensure boom is secured with safety strut when raising boom. Failure to secure boom with safety strut may result in death or serious injury.

2. Raise boom and secure with safety strut.
3. Disconnect negative battery cable at battery. (See "**Battery**" on **page 2-217**.)

WARNING

Always ensure cab is secured with safety strut when raising cab. Failure to secure cab with safety strut may result in death or serious injury.

4. Raise cab and support with safety strut.

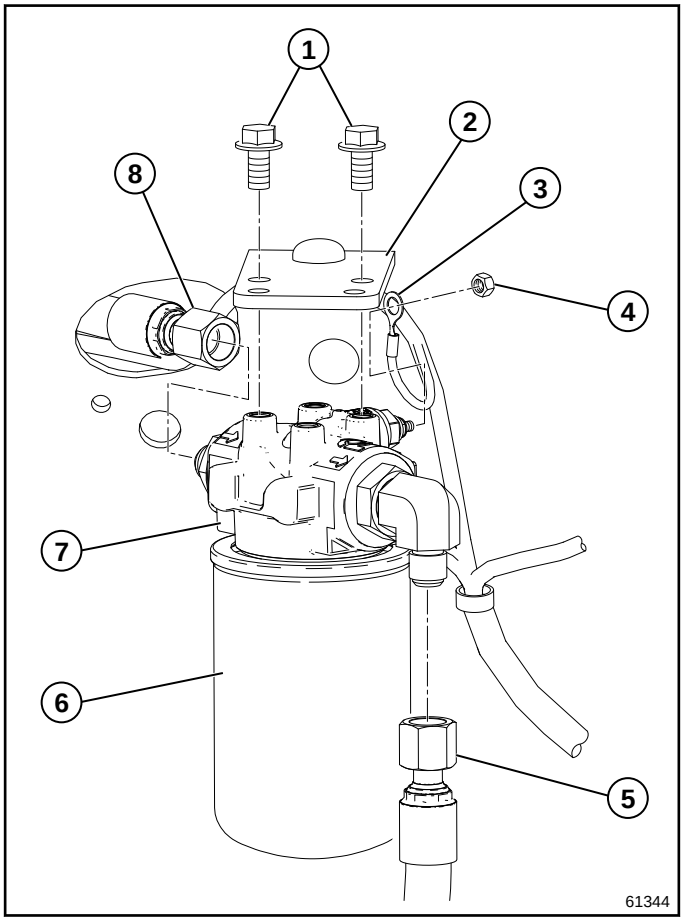


Figure 4-54: Hydraulic Oil Filter Housing Removal and Installation

5. Remove hydraulic oil filter (6) from hydraulic oil filter housing assembly (7).
6. Remove hose (8) from hydraulic oil filter housing assembly (7).
7. Remove hose (5) from hydraulic oil filter housing assembly (7).
8. Remove nut (4) and wire (3) from hydraulic oil filter housing assembly (7).
9. Remove two bolts (1) and hydraulic oil filter housing assembly (7) from bracket (2).

Installation Notes

- *Install the hydraulic oil filter housing by reversing the order of removal.*
- *Lightly lubricate O-rings with clean hydraulic oil prior to installation.*
- *Remove caps and plugs as hoses and fittings are installed.*
- *Install hoses and fittings as noted prior to removal.*

Main Control Valve

Removal and Installation

See **Figures 4-55** and **4-56**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*
- *Cap and plug hoses and fittings during removal.*

NOTE

Tag and mark electrical connectors and wiring prior to removal to ensure proper installation.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

WARNING

Always ensure boom is secured with safety strut when raising boom. Failure to secure boom with safety strut may result in death or serious injury.

2. Raise boom and secure with safety strut.
3. Disconnect negative battery cable at battery. (See "**Removal and Installation**" on **page 2-217**.)

WARNING

Always ensure cab is secured with safety strut when raising cab. Failure to secure cab with safety strut may result in death or serious injury.

4. Raise cab and secure with safety strut.
5. Drain hydraulic oil tank. (See "**Drain/Fill**" on **page 4-64**.)
6. Open engine cover to gain access to main control valve.

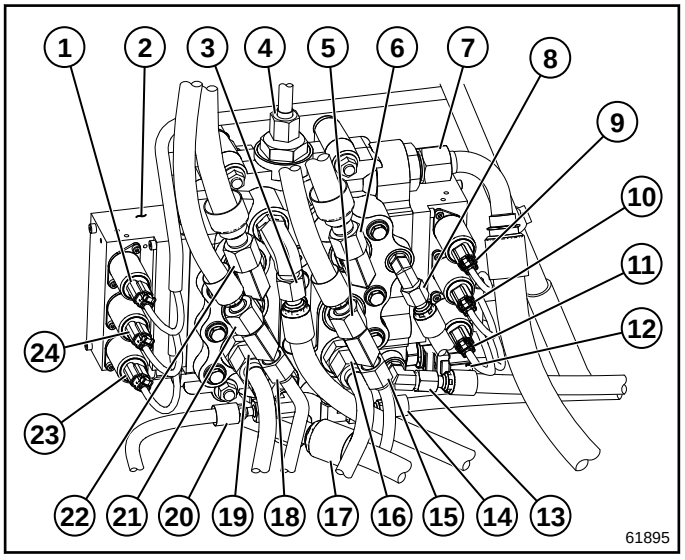


Figure 4-55: Main Control Valve Hoses Removal and Installation

NOTE

Main control valve is removed in similar fashion on all machines. Hydraulic hoses may vary depending on optional equipment.

7. Disconnect connector (1) from main control valve (2).
8. Disconnect connector (9) from main control valve (2).
9. Disconnect connector (10) from main control valve (2).
10. Disconnect connector (11) from main control valve (2).
11. Disconnect connector (23) from main control valve (2).
12. Disconnect connector (24) from main control valve (2).
13. Disconnect connector (12) from main control valve (2).
14. Remove hose (3) from main control valve (2).
15. Remove hose (4) from main control valve (2).
16. Remove hose (5) from main control valve (2).
17. Remove hose (6) from main control valve (2).
18. Remove hose (7) from main control valve (2).
19. Remove hose (8) from main control valve (2).
20. Remove hose (13) from main control valve (2).
21. Remove hose (14) from main control valve (2).
22. Remove hose (15) from main control valve (2).
23. Remove hose (16) from main control valve (2).
24. Remove hose (17) from main control valve (2).
25. Remove hose (18) from main control valve (2).
26. Remove hose (19) from main control valve (2).
27. Remove hose (20) from main control valve (2).
28. Remove hose (21) from main control valve (2).
29. Remove hose (22) from main control valve (2).

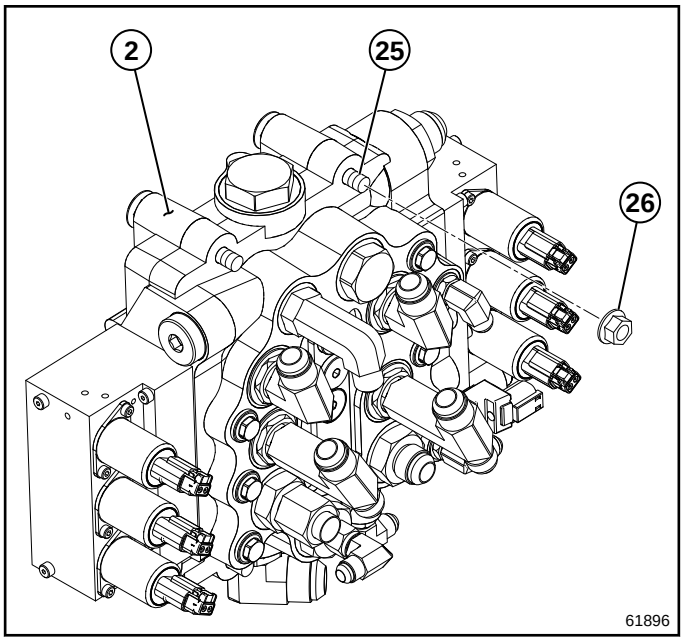


Figure 4-56: Main Control Valve Removal and Installation

30. Remove three nuts (26) and main control valve (2) from bolts (25).

Installation Notes

- *Install the main control valve by reversing the order of removal.*
- *Replace hydraulic oil filter. (See"**Removal and Installation**" on **page 4-76**.)*
- *Refill hydraulic oil tank.*
- *Start engine. Check hydraulic system for leaks. Repair as necessary.*
- *Check hydraulic oil and add if necessary.*

Mechanical Boom Lower Valve

Removal and Installation

See **Figure 4-57**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*
- *Cap and plug hoses and fittings during removal.*

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

WARNING

Always ensure boom is secured with safety strut when raising boom. Failure to secure boom with safety strut may result in death or serious injury.

2. Raise boom and secure with safety strut.

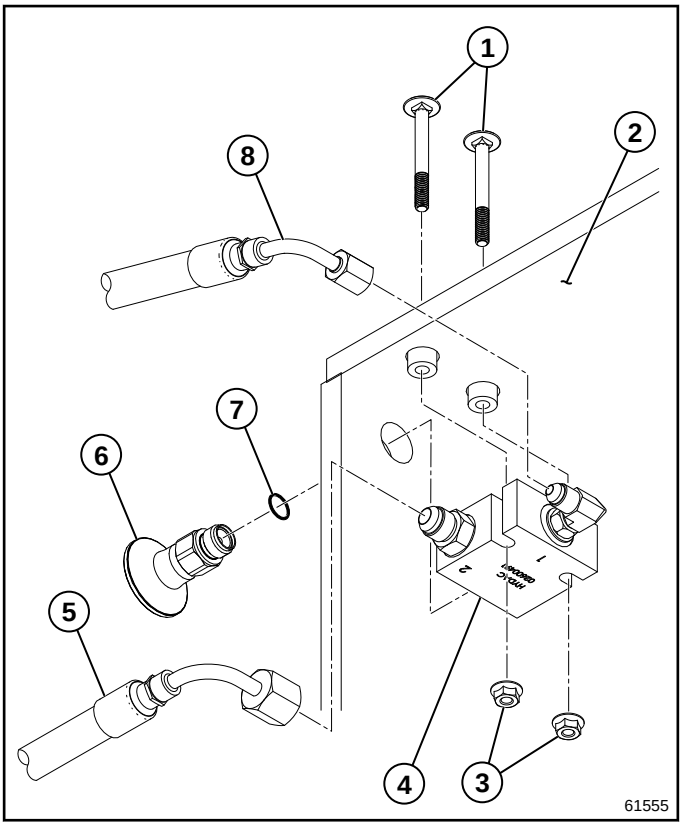


Figure 4-57: Mechanical Boom Lower Valve Removal and Installation

3. Remove knob (6) and O-ring (7) located below operator's seat from mechanical boom lower valve (4).

WARNING

Always ensure cab is secured with safety strut when raising cab. Failure to secure cab with safety strut may result in death or serious injury.

4. Raise cab (2) and secure with safety strut.

5. Remove hose (8) from mechanical boom lower valve (4).
6. Remove hose (5) from mechanical boom lower valve (4).
7. Remove two nuts (3), bolts (1), and mechanical boom lower valve (4) from cab (2).

Installation Notes

- *Install the mechanical boom lower valve by reversing the order of removal.*
- *Lightly lubricate O-rings with clean hydraulic oil prior to installation.*
- *Remove caps and plugs as hoses and fittings are installed.*
- *Install hoses and fittings as noted prior to removal.*

Ride Control Valve

Removal and Installation

See **Figures 4-58** and **4-59**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*
- *Cap and plug hoses and fittings during removal.*

NOTE

Tag and mark electrical connectors and wiring prior to removal to ensure proper installation.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Disconnect negative battery cable at battery. (See "**Battery**" on **page 2-217**.)
3. Open radiator cover to gain access to ride control valve.

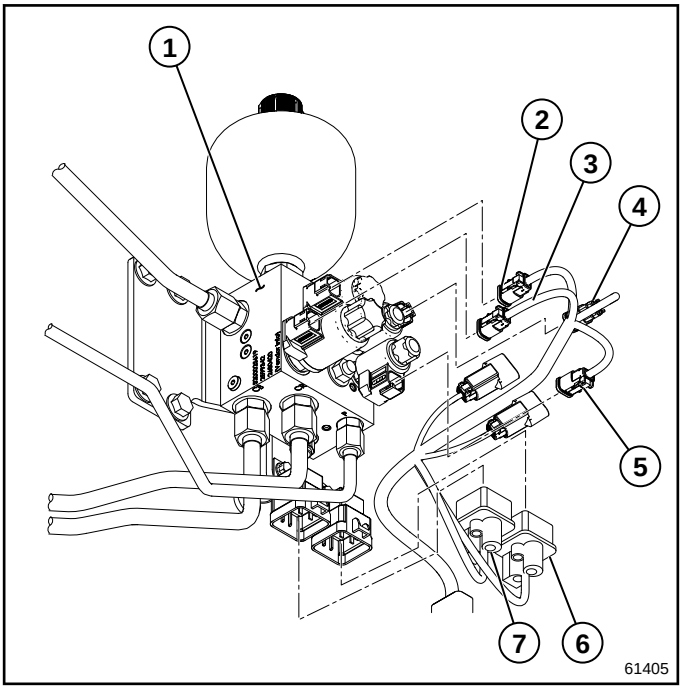


Figure 4-58: Wire Harness Connectors Removal and Installation

4. Disconnect connector (2) from ride control valve (1).
5. Disconnect connector (3) from ride control valve (1).
6. Disconnect connector (4) from ride control valve (1).
7. Disconnect connector (5) from ride control valve (1).
8. Disconnect connector (6) from ride control valve (1).
9. Disconnect connector (7) from ride control valve (1).

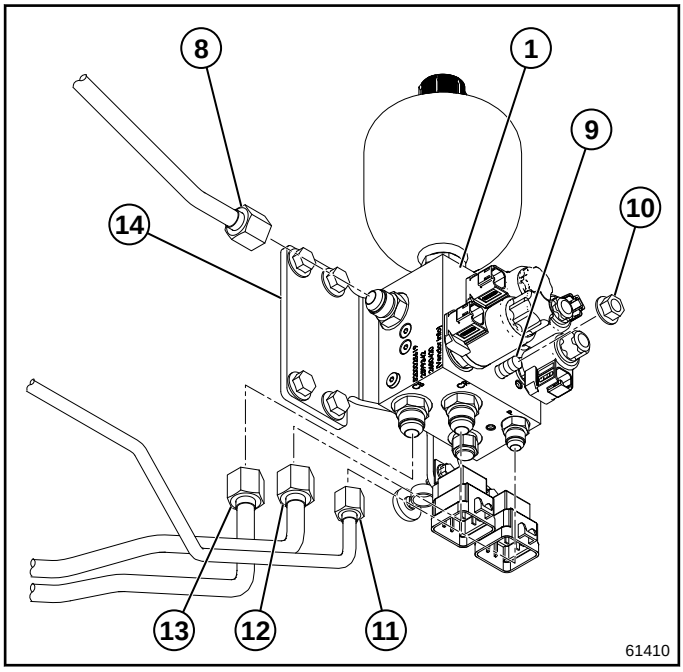


Figure 4-59: Ride Control Valve Removal and Installation

10. Remove hose (8) from ride control valve (14).
11. Remove hose (11) from ride control valve (1).
12. Remove hose (12) from ride control valve (1).
13. Remove hose (13) from ride control valve (1).
14. Remove two nuts (10) and ride control valve (1) from bolts (9) and bracket (14).

Installation Notes

- *Install the ride control valve by reversing the order of removal.*
- *Lightly lubricate O-rings with clean hydraulic oil prior to installation.*
- *Remove caps and plugs as hoses and fittings are installed.*
- *Install hoses and fittings as noted prior to removal.*

Self Leveling Valve

Removal and Installation

See **Figure 4-60**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*
- *Cap and plug hoses and fittings during removal.*

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Disconnect negative battery cable at battery. (See "**Battery**" on **page 2-217**.)
3. Remove counter weights on left side of machine.

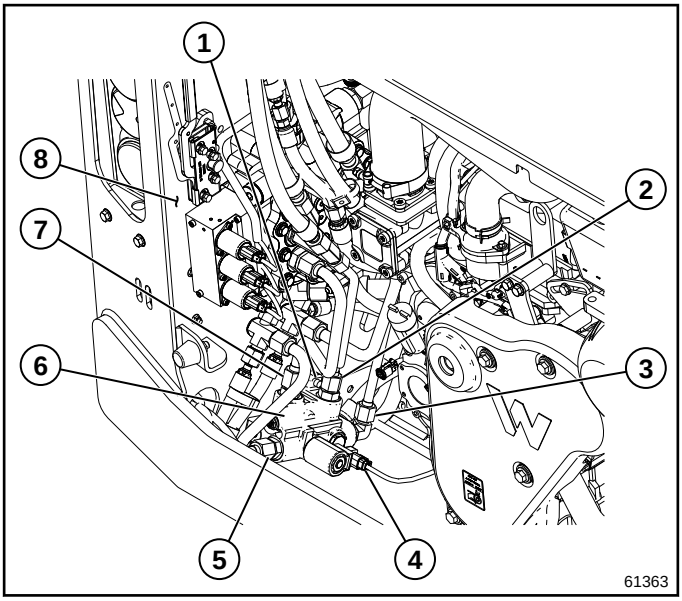


Figure 4-60: Hose Removal and Installation

4. Disconnect connector (4) from self leveling valve (6).
5. Remove hose (5) from self leveling valve (6).
6. Remove hose (7) from self leveling valve (6).
7. Remove hose (2) from self leveling valve (6).
8. Remove hose (3) from self leveling valve (6).
9. Remove three bolts (1) and self leveling valve (6) from machine (8).

Installation Notes

- *Install the self leveling valve by reversing the order of removal.*
- *Lightly lubricate O-rings with clean hydraulic oil prior to installation.*
- *Remove caps and plugs as hoses and fittings are installed.*
- *Install hoses and fittings as noted prior to removal.*

Power Coupler Valve

Removal and Installation

See **Figure 4-61**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*
- *Cap and plug hoses and fittings during removal.*

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Disconnect negative battery cable at battery. (See "**Battery**" on **page 2-217**.)

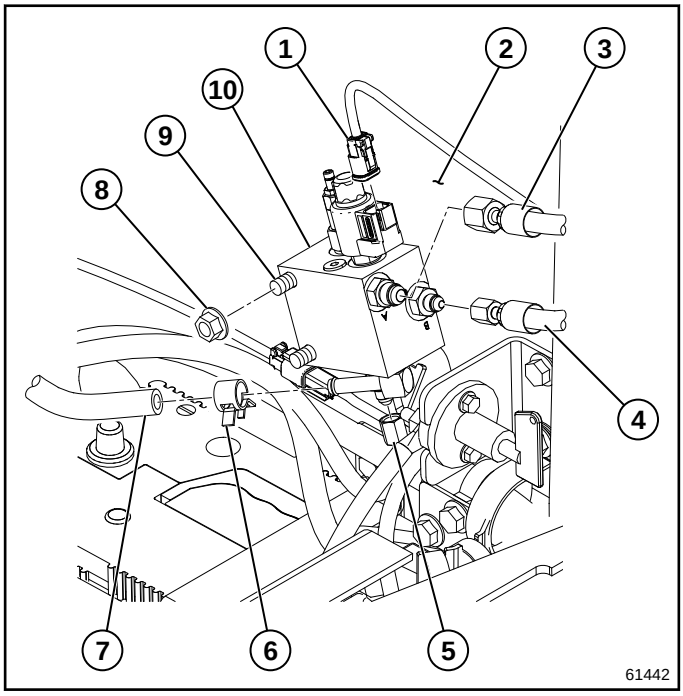


Figure 4-61: Power Coupler Valve Removal and Installation

3. Disconnect connector (1) from power coupler valve (10).
4. Remove hose (3) from power coupler valve (10).
5. Remove hose (4) from power coupler valve (10).
6. Remove hose (5) from power coupler valve (10).
7. Remove clamp (6) and hose (7) from power coupler valve (10).
8. Remove two nuts (8) and power coupler valve (10) from bolts (9) and machine (2).

Installation Notes

- *Install the power coupler valve by reversing the order of removal.*
- *Lightly lubricate O-rings with clean hydraulic oil prior to installation.*
- *Remove caps and plugs as hoses and fittings are installed.*
- *Install hoses and fittings as noted prior to removal.*

Power Coupler Cylinder

Removal and Installation

See **Figure 4-62**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*
- *Cap and plug hoses and fittings during removal.*

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

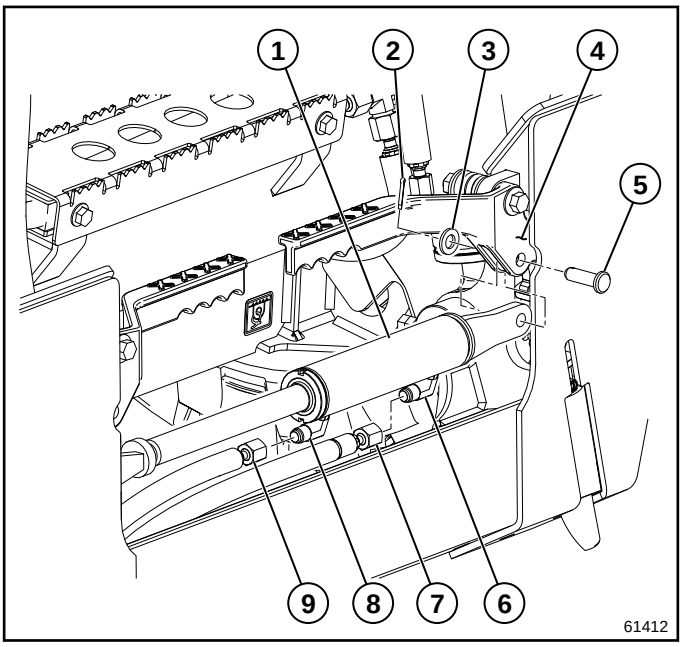


Figure 4-62: Power Coupler Cylinder Removal and Installation

2. Remove hose (9) from fitting (8).
3. Remove hose (7) from fitting (6).
4. Remove two retaining pins (2), washers (3), pins (5), and power coupler cylinder (1) from lever (4).

Installation Notes

- *Install the power coupler cylinder by reversing the order of removal.*
- *Lightly lubricate O-rings with clean hydraulic oil prior to installation.*
- *Remove caps and plugs as hoses and fittings are installed.*
- *Install hoses and fittings as noted prior to removal.*

Bucket Cylinder

Removal and Installation

See **Figures 4-63** and **4-64**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*
- *Cap and plug hoses and fittings during removal.*

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

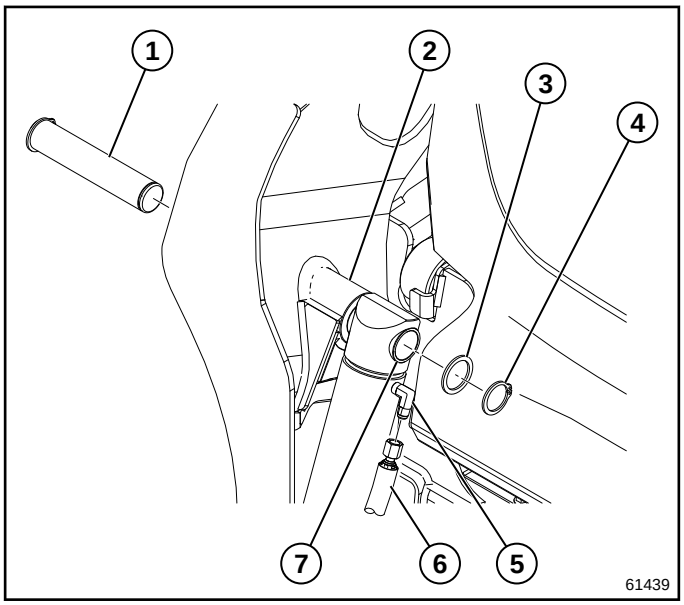


Figure 4-63: Upper Pin Removal and Installation

2. Remove hose (6) from fitting (5).
3. Remove retaining ring (4), ring (3), and pin (1) from machine (2) and bucket cylinder (7).

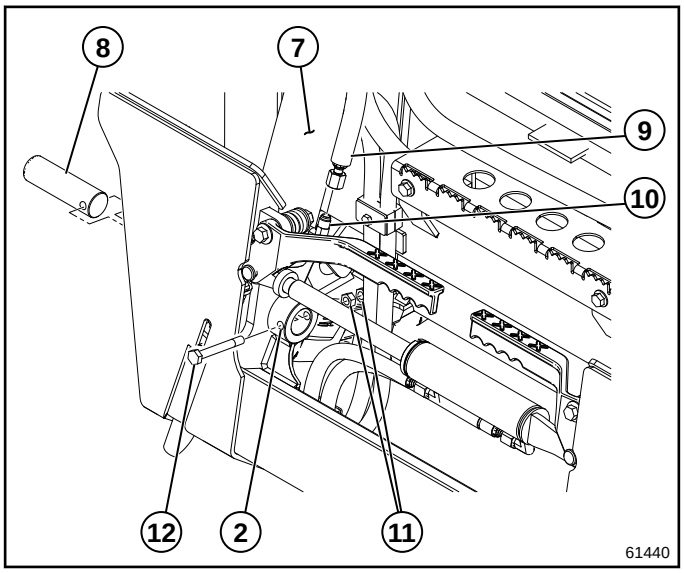


Figure 4-64: Lower Pin Removal and Installation

4. Remove hose (9) from fitting (10).
5. Remove two nuts (11), bolt (12), and pin (8) from machine (2) and bucket cylinder (7).
6. Remove bucket cylinder (7) from machine (2).

Installation Notes

- *Install the bucket cylinder by reversing the order of removal.*
- *Lightly lubricate O-rings with clean hydraulic oil prior to installation.*
- *Remove caps and plugs as hoses and fittings are installed.*
- *Install hoses and fittings as noted prior to removal.*

Boom Cylinders

Removal and Installation

See **Figure 4-65**.

WARNING

Hydraulic system operates at high pressures and temperatures. Always allow hydraulic oil to cool and relieve pressure in hydraulic reservoir before working on hydraulic system. Wear eye protection and gloves to prevent injury. Open lines and hoses slowly and wait for any residual pressure to relieve before continuing to open lines and hoses. Failure to comply may result in injury or death to personnel.

WARNING

Prolonged contact with lubricating oil may cause skin rash. Remove saturated clothing immediately and thoroughly wash skin that comes in contact with lubricating oil. Failure to comply may result in injury or death to personnel.

WARNING

Spilled hydraulic oil is slippery and creates a hazardous condition. Clean up and properly dispose of hydraulic oil. Failure to comply may result in injury or death to personnel.

CAUTION

Wipe clean area around all fluid connections prior to removal. Cap and plug all hoses, lines, fittings, and ports during removal to prevent contamination of system components. System must be kept clean from contaminants. Failure to comply may result in damage to equipment.

NOTES

- *Position drain pan under hoses being removed.*
- *Tag and mark hoses and fittings prior to removal to ensure proper installation.*
- *Inspect O-rings upon removal for wear or damage and replace as necessary.*
- *Cap and plug hoses and fittings during removal.*

NOTE

Both boom cylinders are removed the same way. Left boom cylinder is shown.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Remove counterweights from machine.

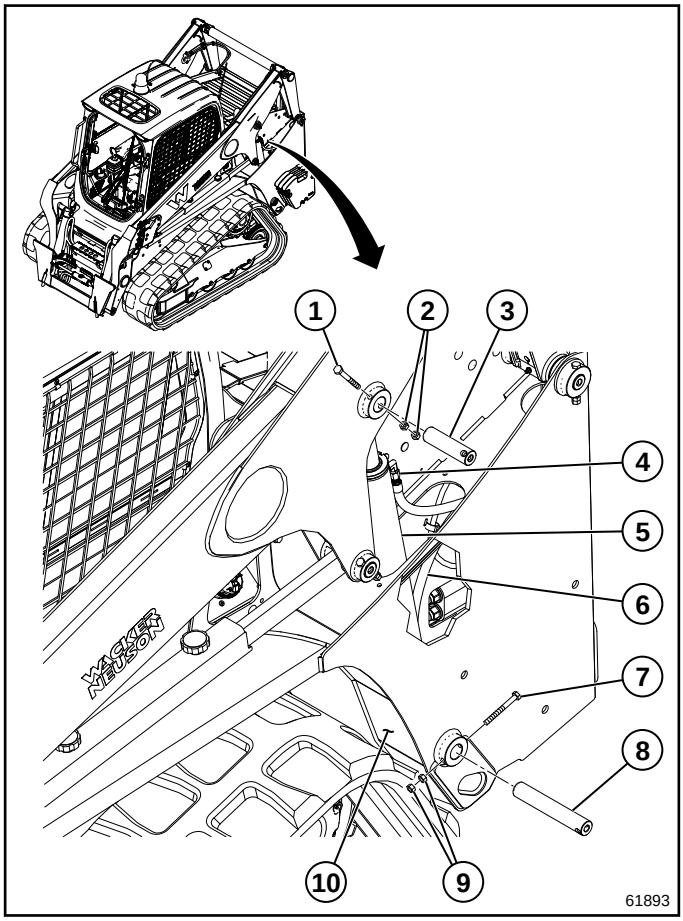


Figure 4-65: Boom Cylinders Removal and Installation

3. Remove hose (4) from boom cylinder (5).
4. Remove hose (6) from boom cylinder (5)
5. Remove two nuts (2), screw (1), and pin (3) from boom cylinder (5) and machine (10).
6. Support boom cylinder (5) and remove two nuts (9), screw (7), and pin (8) from boom cylinder and machine (10).
7. Remove boom cylinder (5) from machine (10).

Installation Notes

- *Install the boom cylinder by reversing the order of removal.*
- *Start engine. Check hydraulic system for leaks. Repair as necessary.*
- *Check hydraulic oil and add if necessary.*

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Chapter 5

WANDA Diagnostics and Configuration

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5

Diagnostics

Drive Pump Calibration

See **Figures 5-1** through **5-6**.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

WARNING

- **Support the machine using properly rated jackstands. Never work under a machine supported only by a jack.**
- **Do not use wood or concrete blocks to support the machine. Failure to properly support the machine may result in death or serious injury.**

WARNING

This calibration routine will cause the machine's wheels/tracks to move both forward and backward. The machine must be raised off the ground using jackstands. The operator must be in the seat with seatbelt fastened. The engine must be at full throttle. Failure to heed these warnings could result in permanent injury or death.

2. Support machine securely. Make sure wheels are not contacting the ground. (See "**Support Machine Securely**" on **page 16**.)
3. Using interface cable, connect Personal Computer (PC) with WANDA software to the machine diagnostic port.
4. Turn key switch to ON.
5. Start WANDA software.



Figure 5-1: Machine Identification Screen

5

6. Ensure machine identification parameters are correct and click the Next button (1) on the Machine Identification screen.
7. Sit in seat.
8. Fasten seat belt.
9. Start machine.
10. Raise idle to full throttle.
11. Allow hydraulic oil to reach operating temperature.



Figure 5-2: Main Menu

5

12. Click on the Calibration button (2) in the main menu.



Figure 5-3: Calibration Screen

13. Click on the Drive Pump button (3) in the calibration screen.

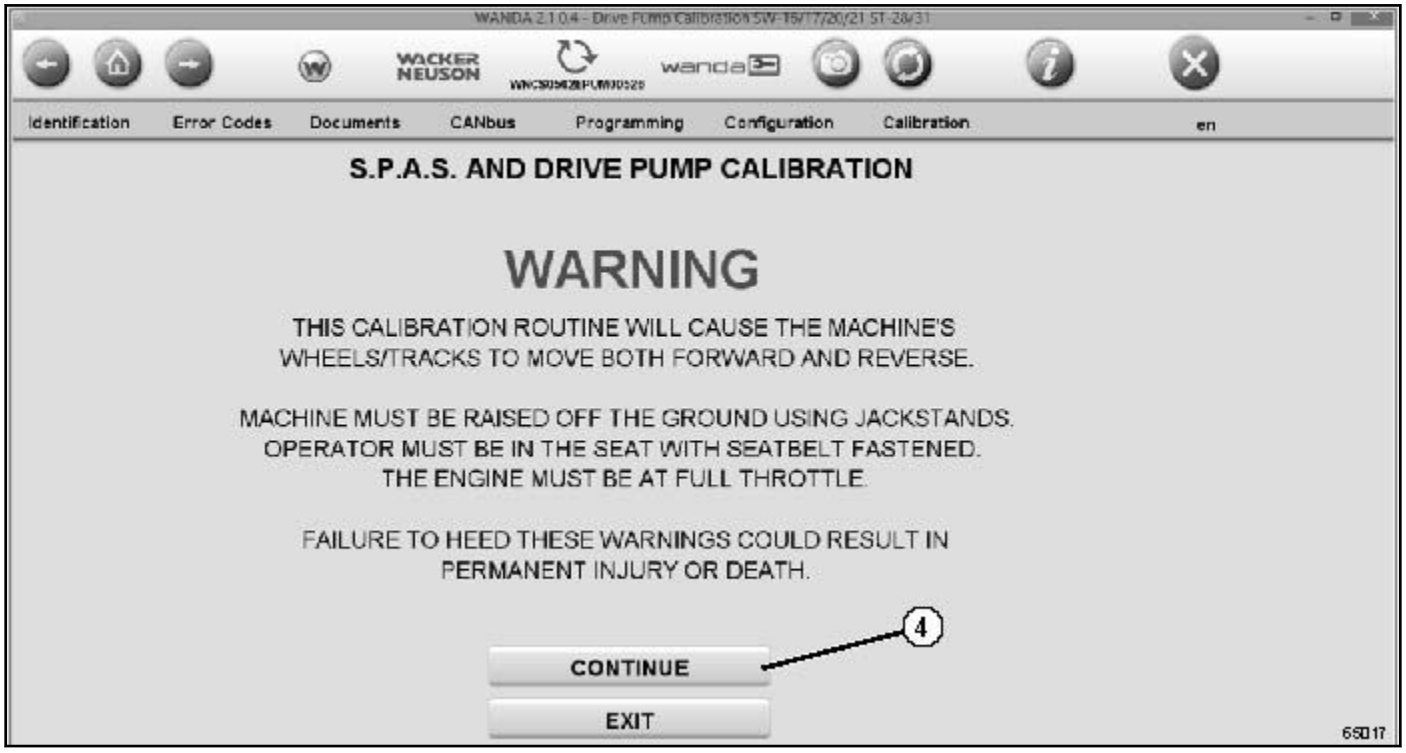


Figure 5-4: S.P.A.S. and Drive Pump Calibration Warning Screen

5

14. Click on the CONTINUE button (4) in the S.P.A.S. and Drive Pump Calibration Warning screen.

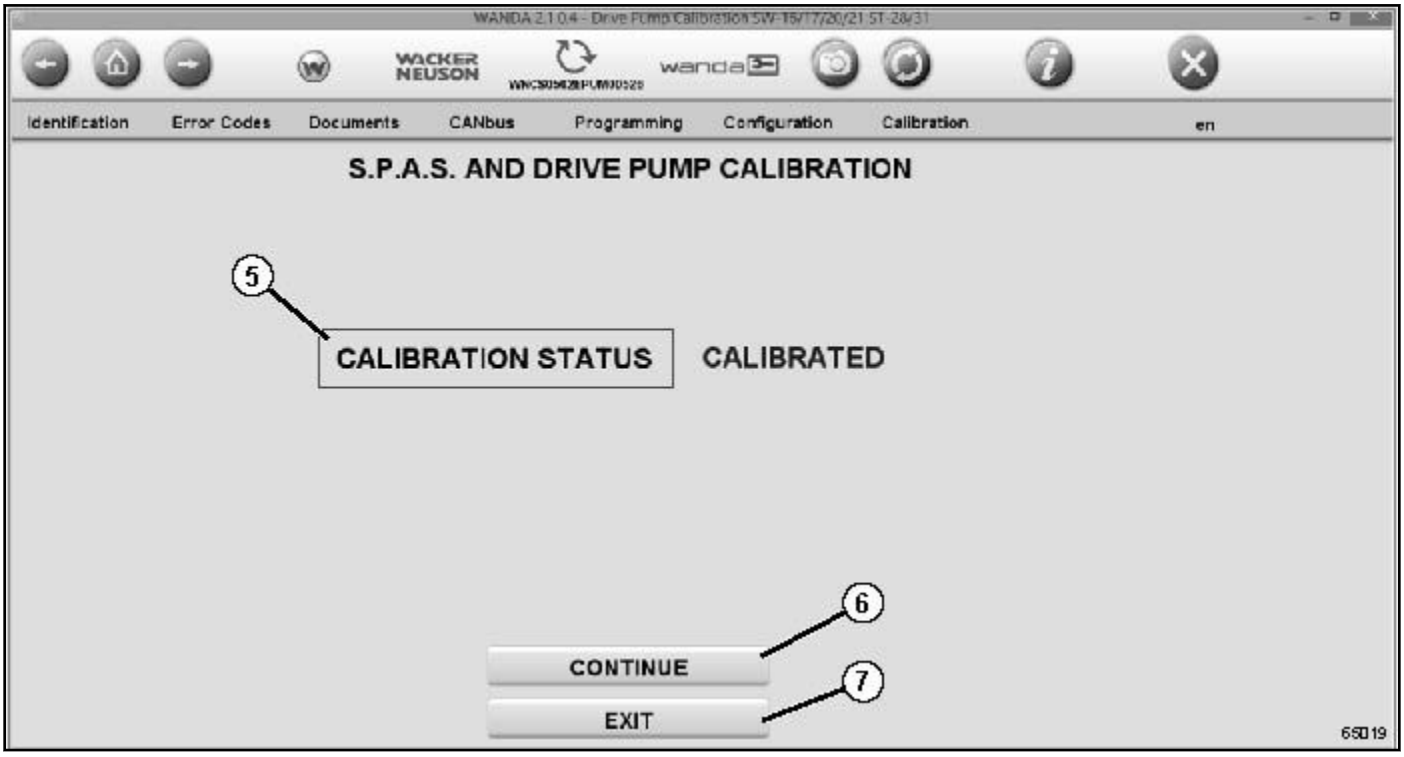


Figure 5-5: S.P.A.S. and Drive Pump Calibration Message Screen

15. If the machine has not been calibrated, a NOT CALIBRATED message will appear next to the CALIBRATION STATUS (5) on the S.P.A.S. and Drive Pump Calibration message screen. Click on the CONTINUE button (6) if the NOT CALIBRATED message appears. If the machine has been calibrated, a CALIBRATED message will appear on the S.P.A.S. and Drive Pump Calibration message screen. Click on the EXIT button (7) if the CALIBRATED message appears.

⚠ WARNING

Make sure the area around the machine is clear. The wheels/tracks will be operating until the calibration procedure is complete. Failure to do so may result in death or serious injury.

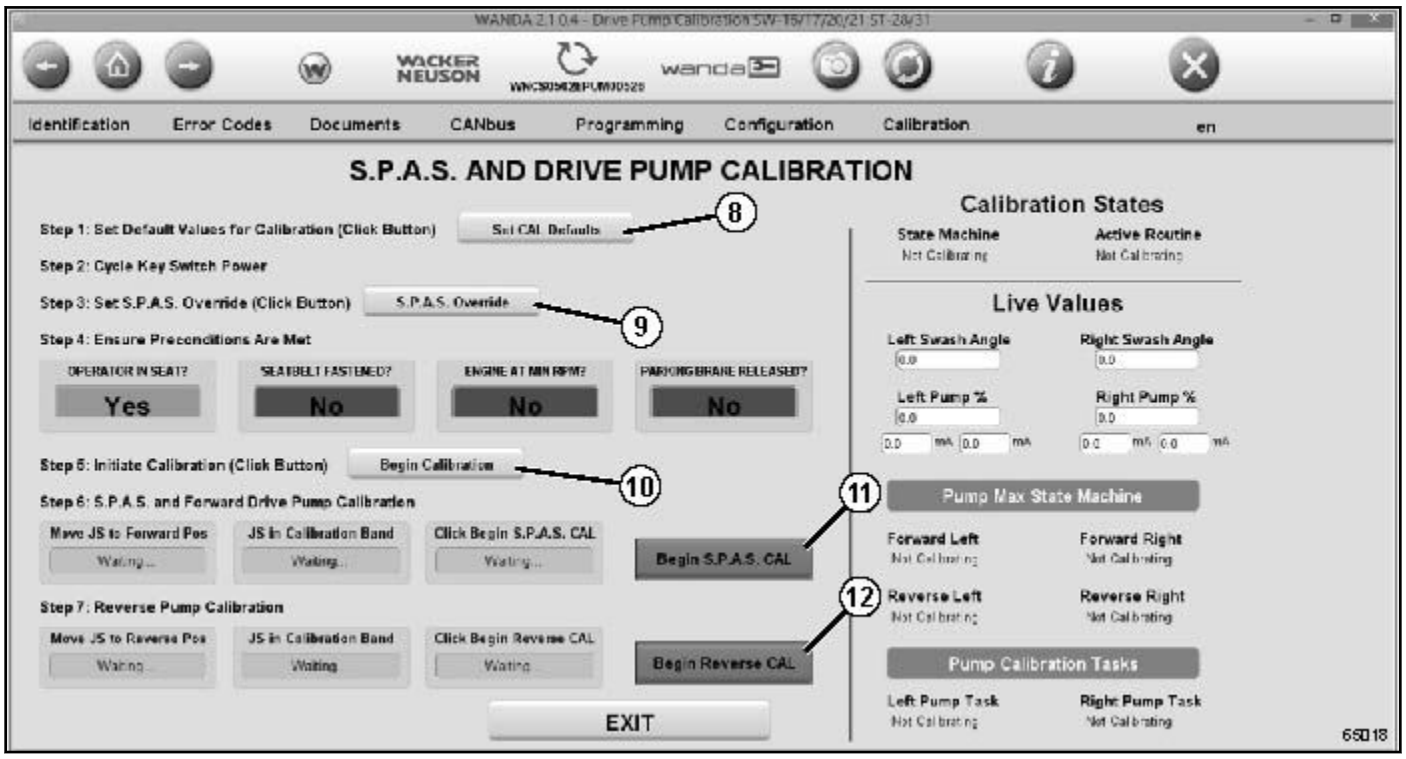


Figure 5-6: S.P.A.S. and Drive Pump Calibration Screen

16. Click on the Set CAL Defaults button (8) in the S.P.A.S. and Drive Pump Calibration screen.
17. Turn throttle to low idle and cycle key off for 30 seconds.
18. Start engine and raise idle above a minimum of 2,000 RPM.
19. Click on the S.P.A.S. Override button (9) in the S.P.A.S. and Drive Pump Calibration screen.
20. Make sure all preconditions listed have been met:
    - Operator in seat
    - Seatbelt fastened
    - Engine idle above 2,000 RPM
    - Park brake released
21. Click on the Begin Calibration button (10) in the S.P.A.S. and Drive Pump Calibration screen.
22. Move left joystick into straight forward position and hold.
23. Click on the Begin S.P.A.S. CAL button (11) in the S.P.A.S. and Drive Pump Calibration screen.

NOTE

If calibration fails, restart calibration at Step 13. A calibration failure will occur if the hydraulic oil is not at operating temperature, the left or right joystick is moved during calibration, or if the calibration did not achieve proper results.

24. After forward calibration has completed, move left joystick to the straight back position.
25. Click on the Begin Reverse (12) CAL button in the S.P.A.S. and Drive Pump Calibration screen.

26. After a successful calibration is completed, a Drive Pump Calibration Completed window will appear. Click the OK button in the Drive Pump Calibration Completed window.

27. Once the machine has been calibrated, a CALIBRATED message will appear on the. S.P.A.S. and Drive Pump Calibration message screen. Click on the EXIT button after the CALIBRATED message appears.

Straight Tracking

See **Figures 5-7** through **5-10**.

NOTE

The machine should not veer off of center more than 5 ft (1.5 M) in either direction, over a distance of 150 ft (45.7 M), when the machine is at full speed.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

2. Install a bucket to help balance the machine.

WARNING

This calibration routine will require the machine to move both forward and backward:

- **The operator must be in the seat with seatbelt fastened.**
- **The engine must be at full throttle.**
- **There must be a flat clean surface with approximately 150 – 300 ft (45.7 - 91.4 M) of clear area for the machine to operate.**
- **The area should be marked off and free of all traffic.**

Failure to heed these warnings could result in permanent injury or death.

3. Using interface cable, connect Personal Computer (PC) with WANDA software to the machine diagnostic port.

4. Turn key switch to ON.

5. Start WANDA software.



Figure 5-7: Machine Identification Screen

5

6. Ensure machine identification parameters are correct and click the Next button (1) on the Machine Identification screen.
7. Sit in seat.
8. Fasten seat belt.
9. Start machine.
10. Raise engine idle to maximum RPM.

NOTE

A straight reference line on the operating surface is helpful with checking the ability of the machine to operate in a straight line.

11. Move machine to a flat clean surface with approximately 150 to 300 ft. (46 to 91 m.) of clear running area.



Figure 5-8: Main Menu

5

12. Click on the Calibration button (2) in the main menu.



Figure 5-9: Calibration Screen

13. Click on the Straight Tracking button (3) in the calibration screen.

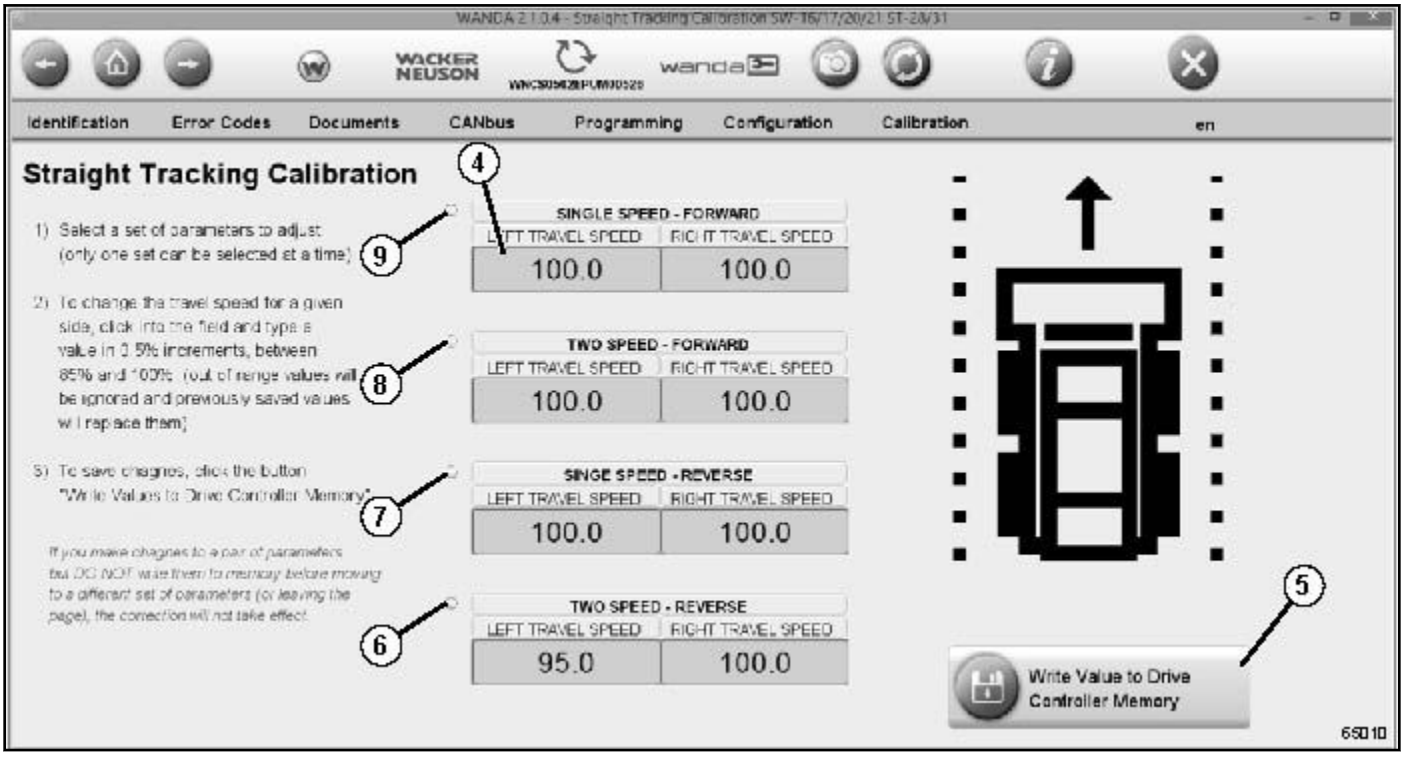


Figure 5-10: Straight Tracking Calibration Screen

5

14. Make sure all travel speeds (4) are set at 100.0. If travel speed is not set at 100.0, click in appropriate box and enter 100.0.

NOTE

Perform Steps 15 and 16 only if travel speed has been adjusted.

15. Click Write Value to Drive Controller Memory button (5).

16. Click the OK button to accept changes.

17. Select SINGLE SPEED - FORWARD (9) in the Straight Tracking Calibration screen.

18. Operate the machine in single speed mode in the straight forward direction at full speed.

19. Pick a point in the distance or use a straight reference line and monitor the machine for drifting to one side.

20. If machine does not drift, no adjustment is needed. Repeat procedure for all other speeds and directions (TWO SPEED - FORWARD (8), SINGLE SPEED - REVERSE (7), and TWO SPEED - REVERSE (6)). If machine drifts, determine which side has the faster travel speed as follows:
    - Machine drifts right - LEFT SIDE TRAVEL SPEED
    - Machine drifts left - RIGHT SIDE TRAVEL SPEED

NOTE

Travel speed (4) cannot be reduced below 85.0. If a value is entered below 85.0 it will revert back to the previously set value.

21. Click in the box that the faster travel speed was observed. Reduce the travel speed (5) by 0.5. Repeat steps 14 through 20 until machine does not drift in any speed or direction.

EDC Threshold Tuning

See **Figures 5-11** through **5-14**.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)

WARNING

- **Support the machine using properly rated jackstands. Never work under a machine supported only by a jack.**
- **Do not use wood or concrete blocks to support the machine. Failure to properly support the machine may result in death or serious injury.**

WARNING

This calibration routine will cause the machine's wheels/tracks to move both forward and backward. The machine must be raised off the ground using jackstands. The operator must be in the seat with seatbelt fastened. The engine must be at full throttle. Failure to heed these warnings could result in permanent injury or death.

2. Support machine securely. Make sure wheels are not contacting the ground. (See **Support Machine Securely**.)
3. Using interface cable, connect Personal Computer (PC) with WANDA software to the machine diagnostic port.
4. Turn key switch to ON.
5. Start WANDA software.



Figure 5-11: Machine Identification Screen

6. Ensure machine identification parameters are correct and click the Next button (1) on the Machine Identification screen.
7. Sit in seat.
8. Fasten seat belt.
9. Start machine.
10. Raise engine idle above 2,000 RPM.
11. Allow hydraulic oil to reach operating temperature.



Figure 5-12: Main Menu

5

12. Click on the Calibration button (2) in the main menu.



Figure 5-13: Calibration Screen

13. Click on the EDC Threshold Tuning button (3) in the calibration screen.
14. Change to H control pattern.
15. Set idle to creep mode.
16. Set the creep mode value to 3% (one bar) on the display by tapping the bottom left button on the left joystick.

WARNING

Make sure the area around the machine is clear. The wheels/tracks will be operating until the calibration procedure is complete. Failure to do so may result in death or serious injury.

NOTE

Make sure the park brake does not engage during the procedure. If park brake sets, release the park brake and continue with procedure.

17. Move left joystick into straight forward position and hold for 3 seconds.



Figure 5-14: EDC Threshold Tuning Screen

5

18. If the left tack/tires begin to rotate continuously without stopping, decrease the Left Forward value by 5 mA – 20 mA. To decrease the value, click in the Left Forward box (4) on the EDC Threshold Tuning screen, type in the value, click the Write Value to Drive Controller Memory button (5), then click OK to accept the change.

19. If the left tack/tires do not rotate continuously without stopping, increase the Left Forward value. To increase the value, click in the Left Forward box on (4) the EDC Threshold Tuning screen, type in the value, click the Write Value to Drive Controller Memory button (5), then click OK to accept the change. The rotation should be very slow and without stopping.

20. Once the tracks/tires continuously rotate, reduce the setting by 5 mA.

21. Make sure the track/tires cannot rotate continuously. If the track/tires do not rotate continuously, the threshold value is properly set.

22. Repeat Steps 17 through 21 for Left Reverse, Right Forward, and Right Reverse.

Swash Plate Angle Sensor (SPAS) Override

See **Figures 5-15** through **5-18**.

NOTE

The SPAS override will only be active for the duration of the current key cycle.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Using interface cable, connect Personal Computer (PC) with WANDA software to the machine diagnostic port.
3. Turn key to ON.
4. Start WANDA software.



Figure 5-15: Machine Identification Screen

5. Ensure machine identification parameters are correct and click the Next button (1) on the Machine Identification screen.



Figure 5-16: Main Menu

6. Click on the Calibration button (2) in the main menu.



Figure 5-17: Calibration Screen

7. Click on the S.P.A.S. Override button (3) in the calibration screen.

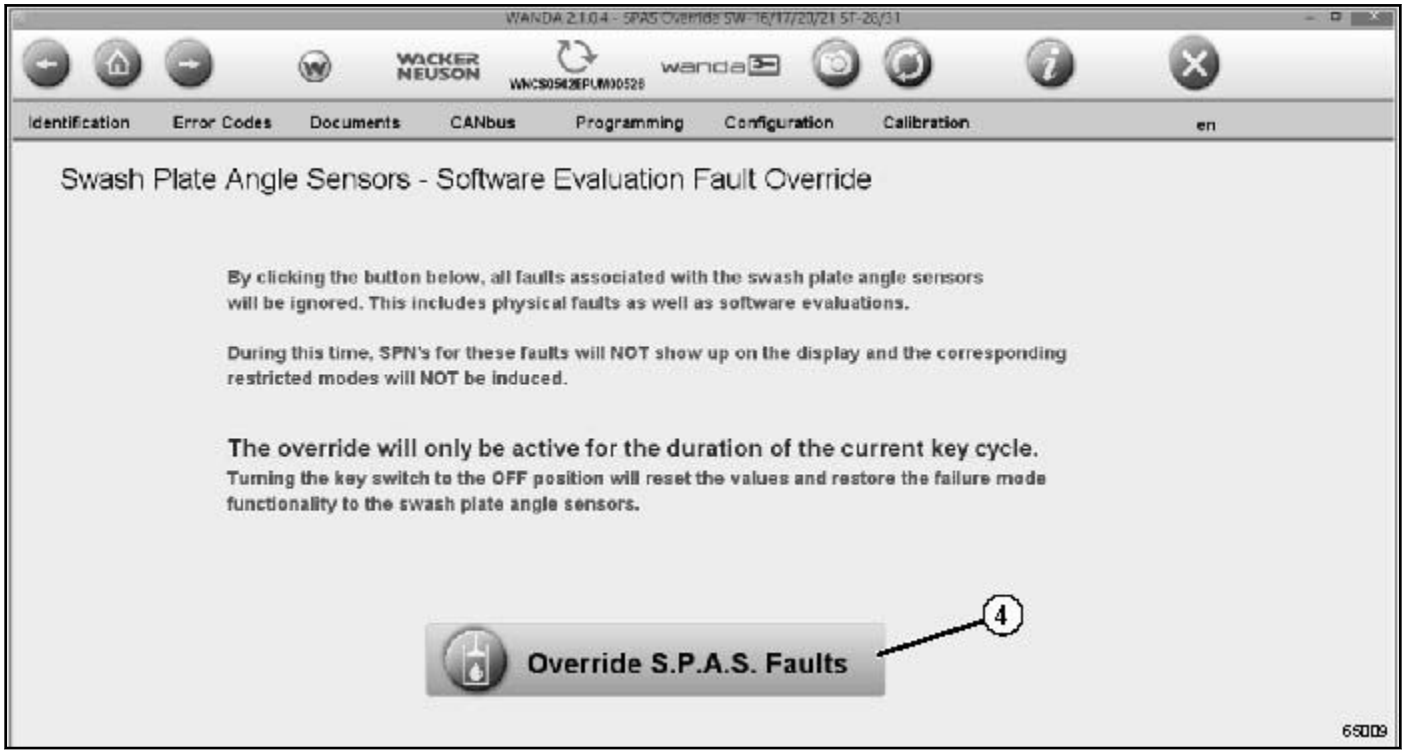


Figure 5-18: Swash Plate Angle Sensor - Software Evaluation Fault Override

5

8. Click on the Override S.P.A.S. Faults button (4) in the Swash Plate Angle Sensor - Software Evaluation Fault Override screen.

Configuration

Creating a Workgroup Profile

See **Figures 5-19** through **5-22**.

NOTES

The workgroup profile provides the ability to customize the machine response and performance relative to the joystick input to meet the operator's experience level.

Drive configurations selections are currently being set to Standard from factory.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Using interface cable, connect Personal Computer (PC) with WANDA software to the machine diagnostic port.
3. Turn key switch to ON.
4. Start WANDA software.



Figure 5-19: Machine Identification Screen

5. Ensure machine identification parameters are correct and click the Next button (1) on the Machine Identification screen.

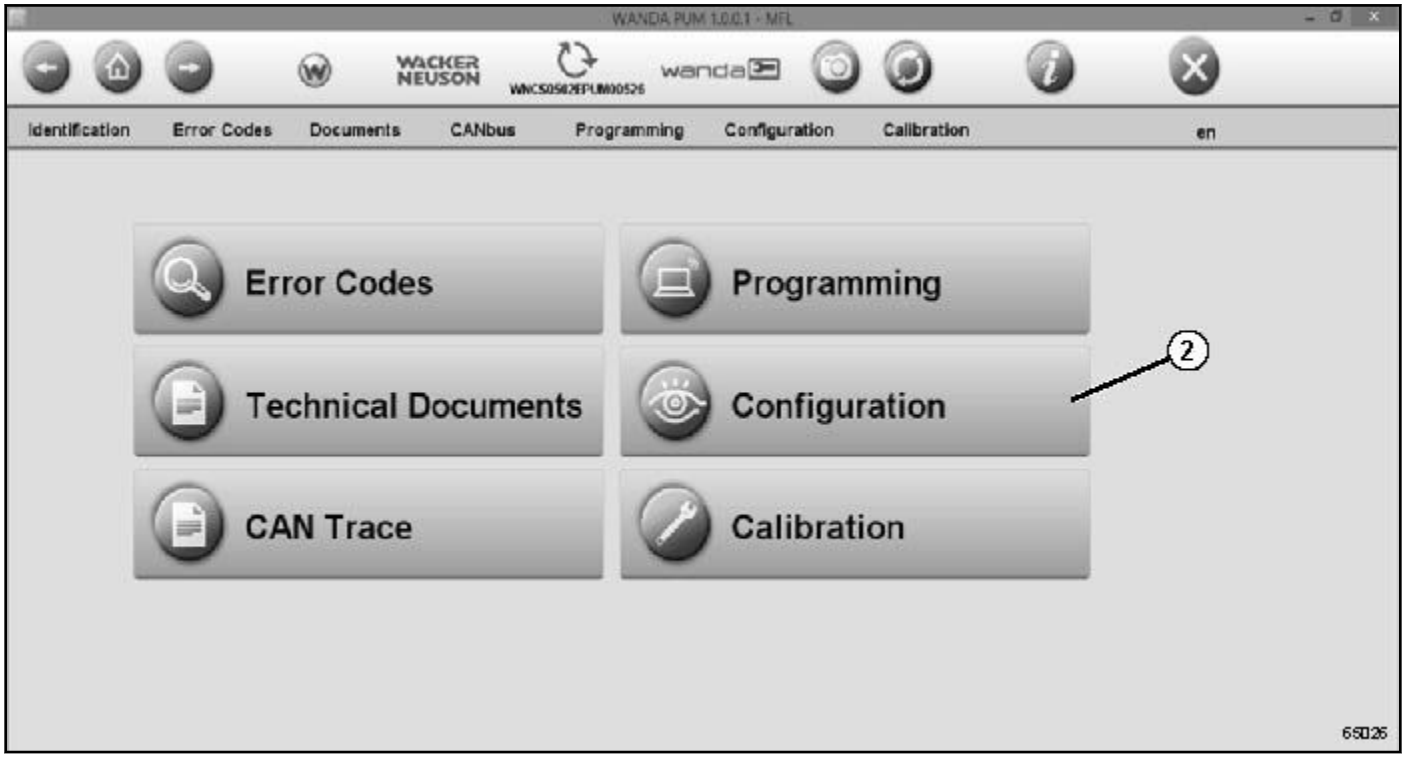


Figure 5-20: Main Menu

6. Click on the Configuration button (2) in the main menu.

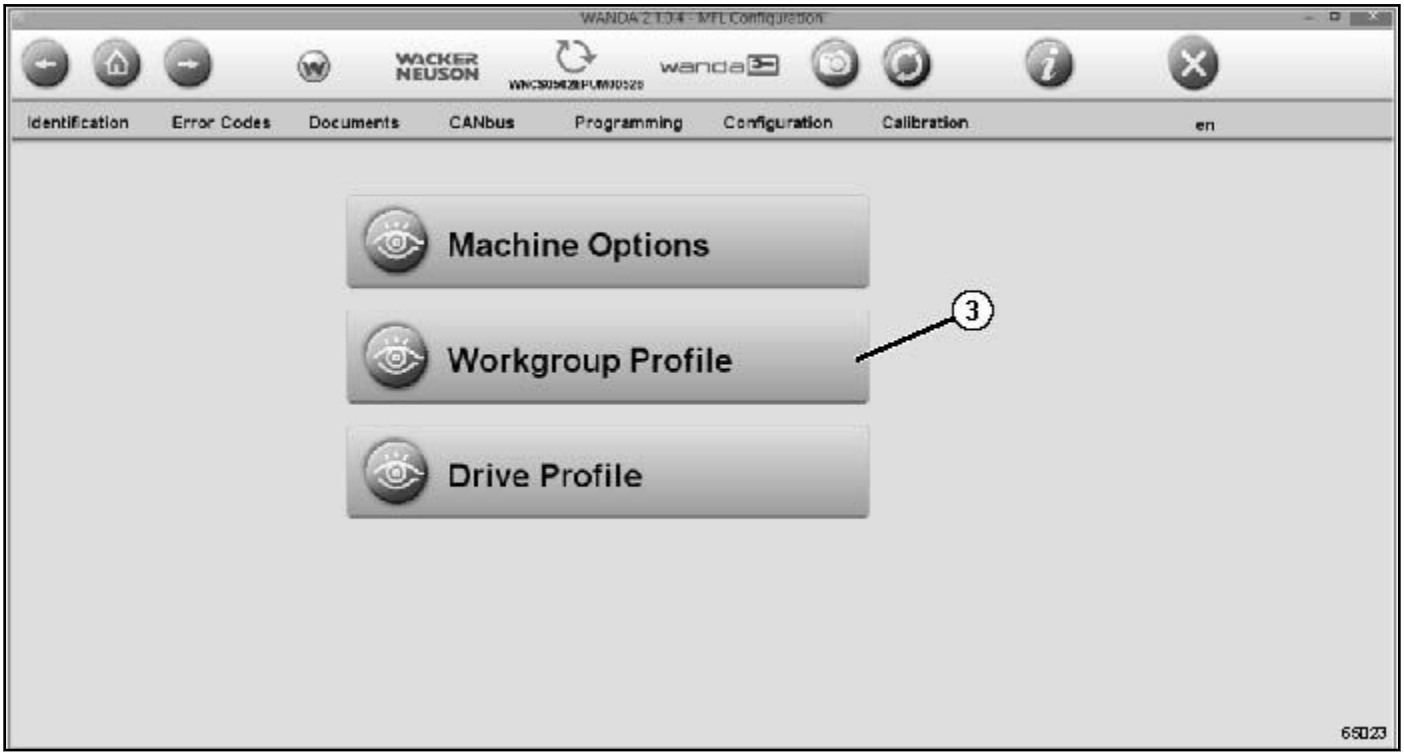


Figure 5-21: Configuration Screen

5

7. Click on Workgroup Profile button (3) in the Configuration screen.

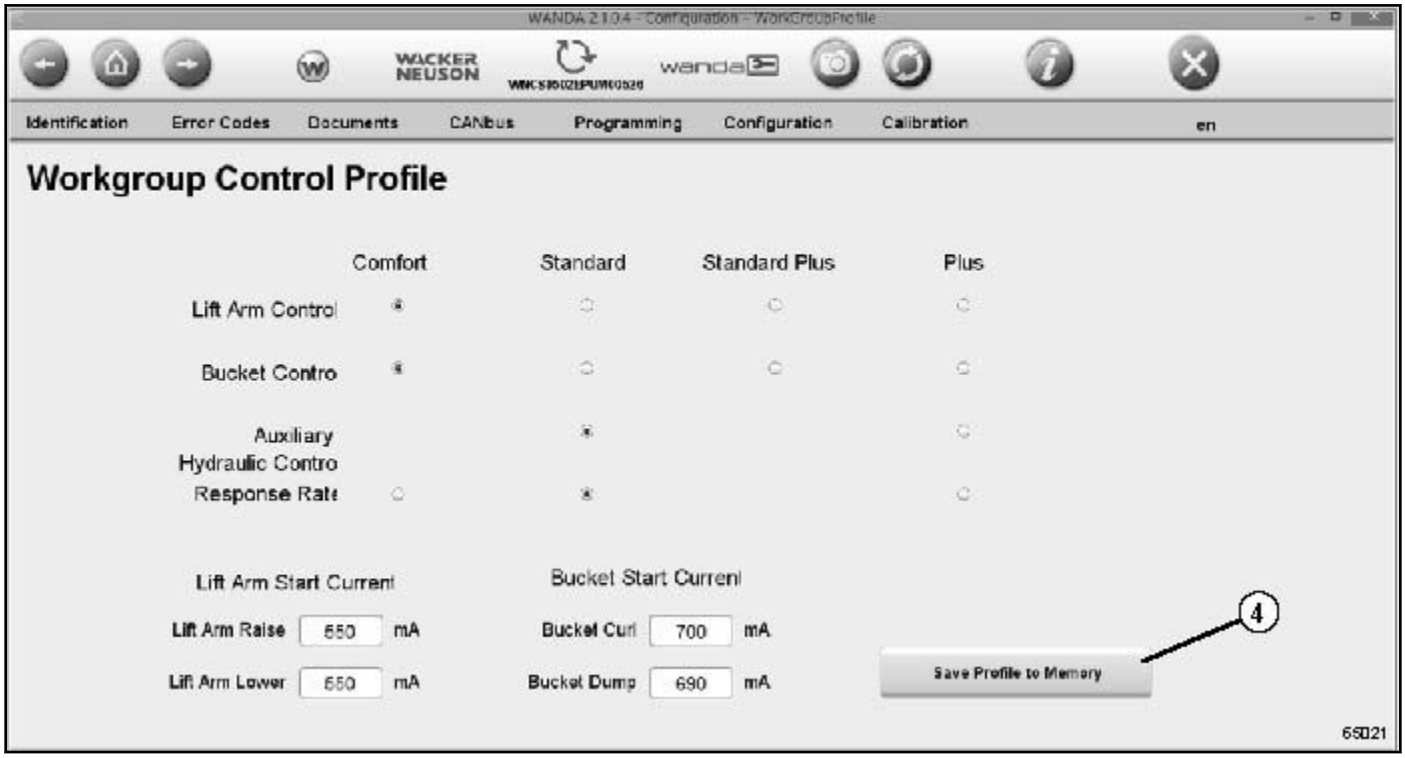


Figure 5-22: Workgroup Profile Screen

5

8. Click on all desired workgroup profile selections in the Workgroup Profile screen. Below describes how all drive profile selections affect the machine:

   Lift Arm Control:

   - Comfort - fine machine movements
   - Standard - intermediate machine movements
   - Standard Plus- intermediate machine movements. Slightly quicker than standard.
   - Plus - quick machine movements.

   Bucket Control:

   - Comfort - fine machine movements
   - Standard - intermediate machine movements
   - Standard Plus- intermediate machine movements. Slightly quicker than standard.
   - Plus - quick machine movements

   Auxiliary Hydraulic Control:

   - Comfort - relaxed machine response
   - Standard - intermediate machine response
   - Plus - rapid machine response

   Response Rate:

   - Comfort - relaxed machine response
   - Standard - intermediate machine response
   - Plus - rapid machine response

9. After all applicable options are selected, click on the Save Profile to Memory button (4).

Creating Drive Profile

See **Figures 5-23** through **5-26**.

NOTES

Drive configuration profiles provide the ability to customize the machine response and performance relative to the joystick input to meet the operator's experience level.

Drive configuration selections are currently being set to Standard from factory.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Using interface cable, connect Personal Computer (PC) with WANDA software to the machine diagnostic port.
3. Turn key switch to ON.
4. Start WANDA software.



Figure 5-23: Machine Identification Screen

5. Ensure machine identification parameters are correct and click the Next button (1) on the Machine Identification screen.

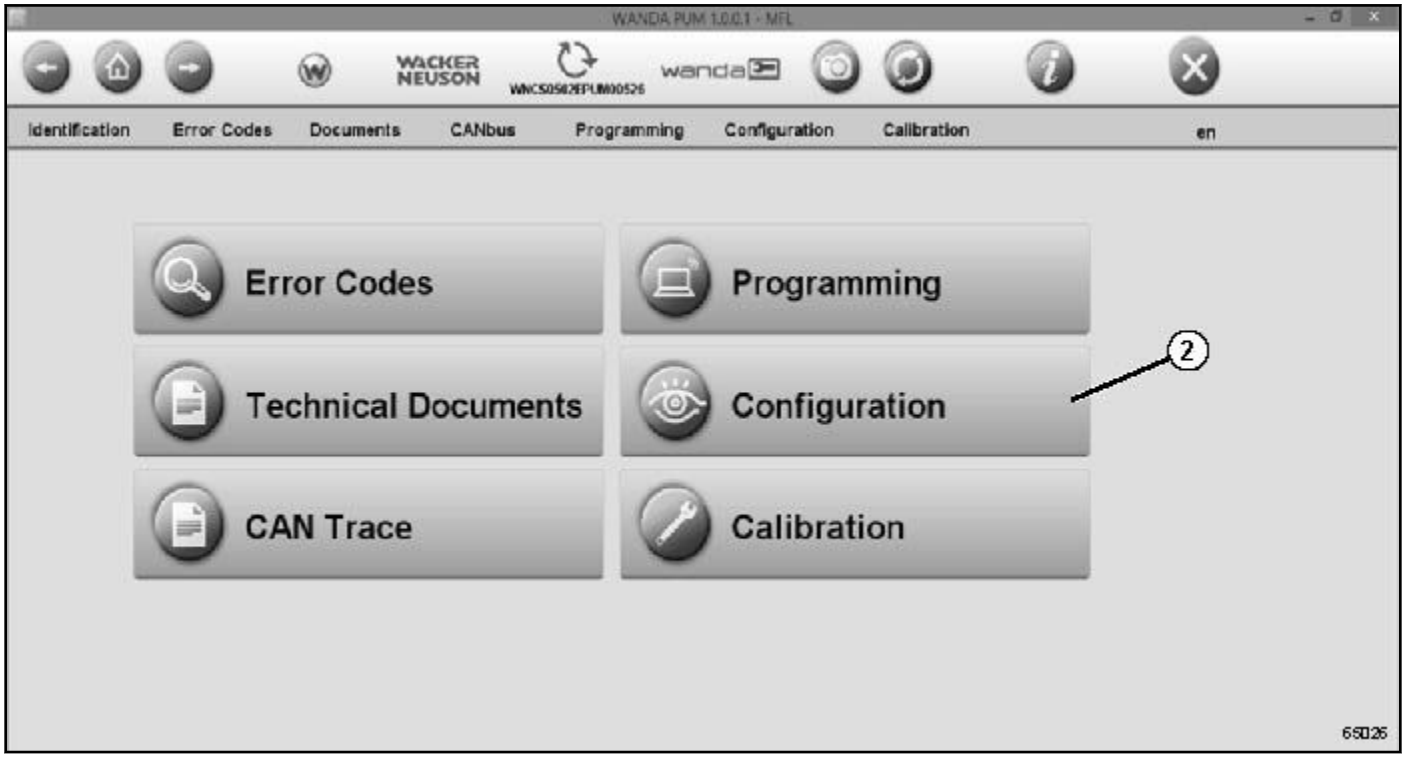


Figure 5-24: Main Menu

6. Click on the Configuration button (2) in the main menu.

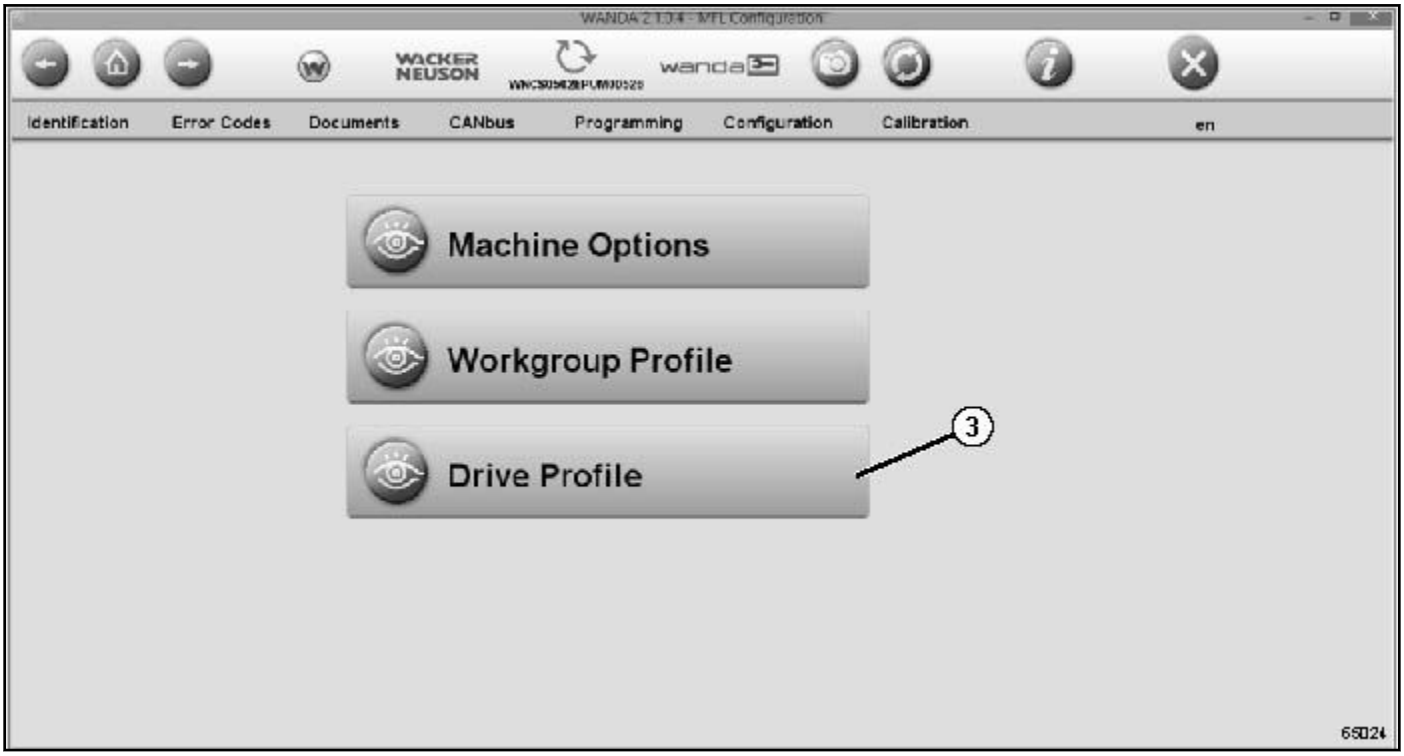


Figure 5-25: Configuration Screen

5

7. Click on Drive Profile button (3) in the Configuration screen.

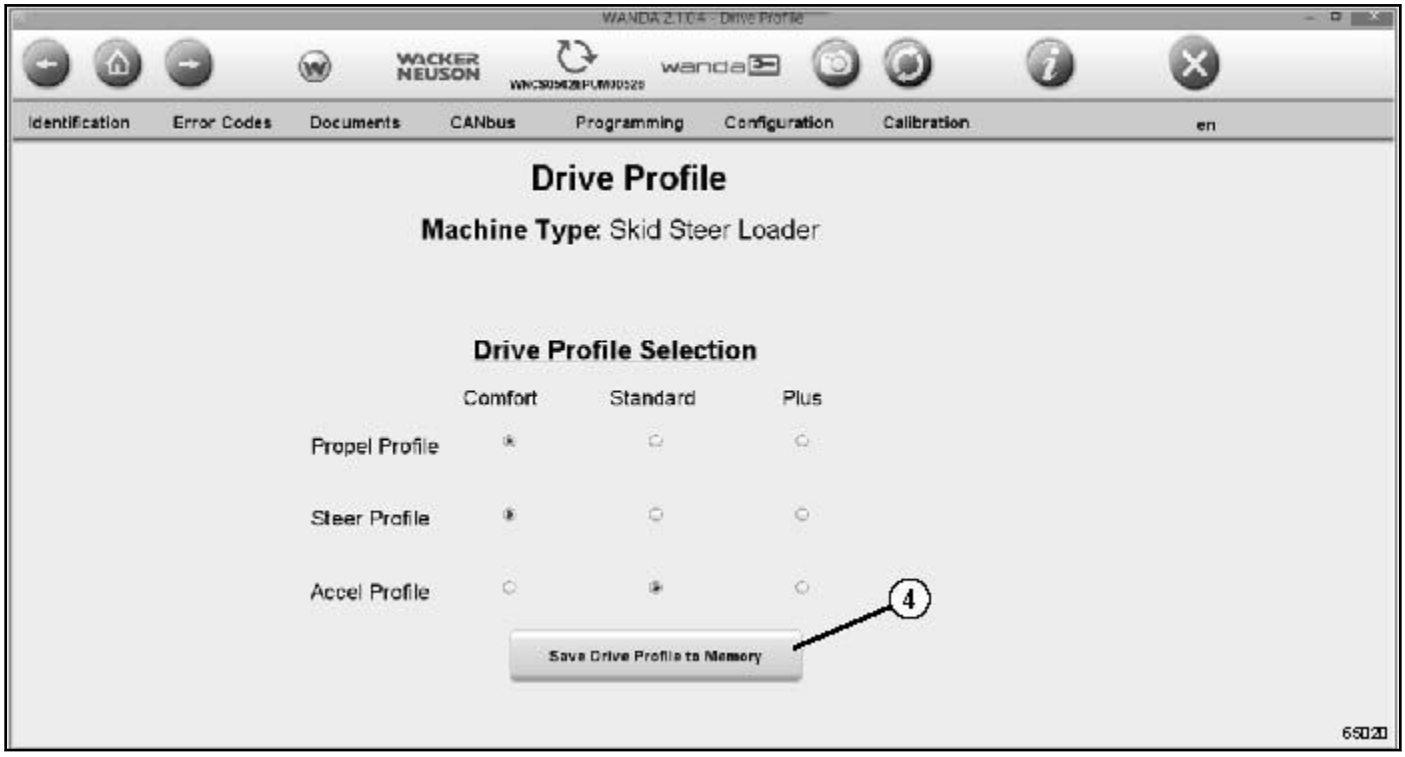


Figure 5-26: Drive Profile Screen

5

8. Make all desired Drive Profile Selections in the Drive Profile screen. Below describes how all drive profile selections affect the machine:

   Propel Profile:

   - Comfort - fine machine movements
   - Standard - intermediate machine movements
   - Plus - quick machine movements

   Steer Profile:

   - Comfort - fine machine movements
   - Standard - intermediate machine movements
   - Plus - quick machine movements

   Accel Profile:

   - Comfort - relaxed machine response
   - Standard - intermediate machine response
   - Plus - rapid machine response

9. After all applicable options are selected, click on the Save Drive Profile to Memory button (4).

Machine Configuration

See **Figures 5-27** through **5-30**.

1. Park machine safely. (See "**Park Machine Safely**" on **page 15**.)
2. Using interface cable, connect Personal Computer (PC) with WANDA software to the machine diagnostic port.
3. Turn key switch to ON.
4. Start WANDA software.



Figure 5-27: Machine Identification Screen

5. Ensure machine identification parameters are correct and click the Next button (1) on the Machine Identification screen.

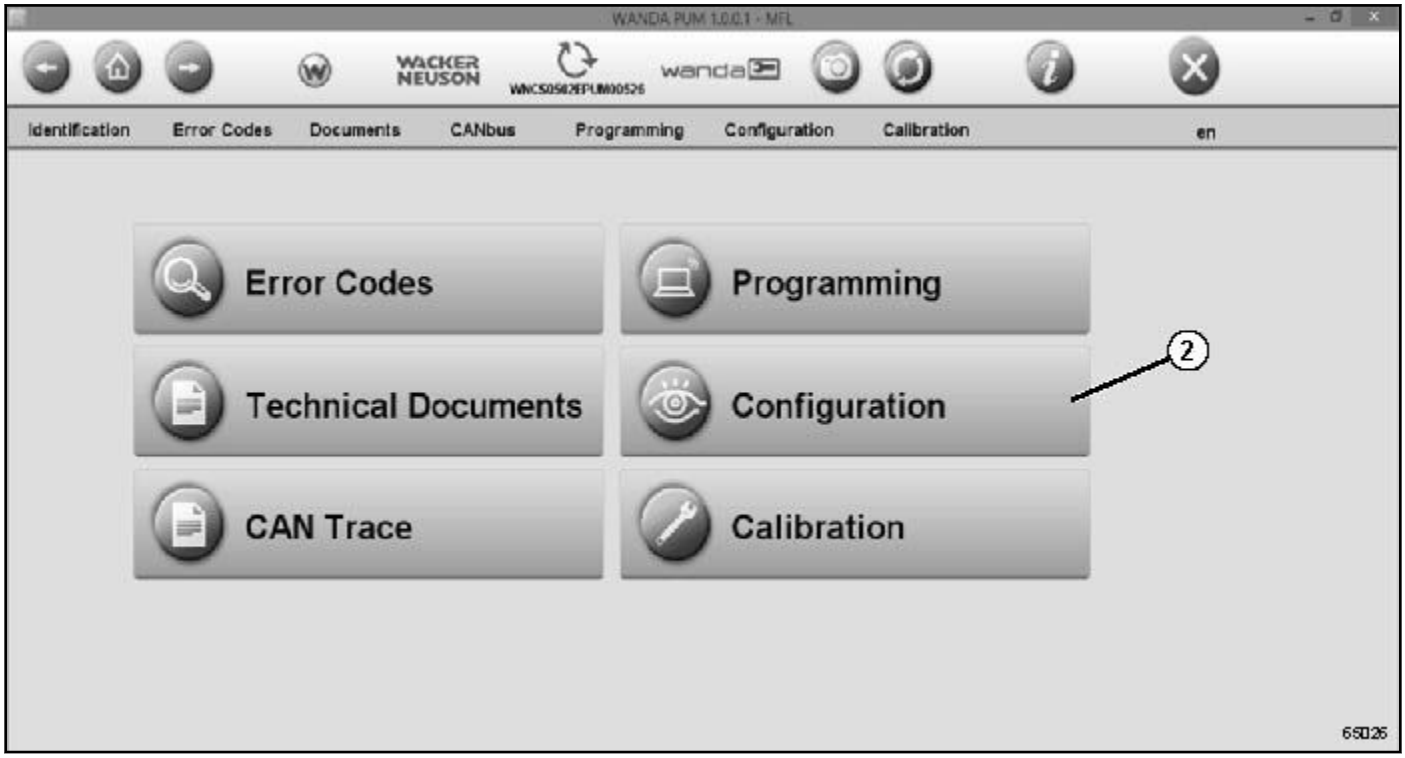


Figure 5-28: Main Menu

5

6. Click on the Configuration button (2) in the main menu.

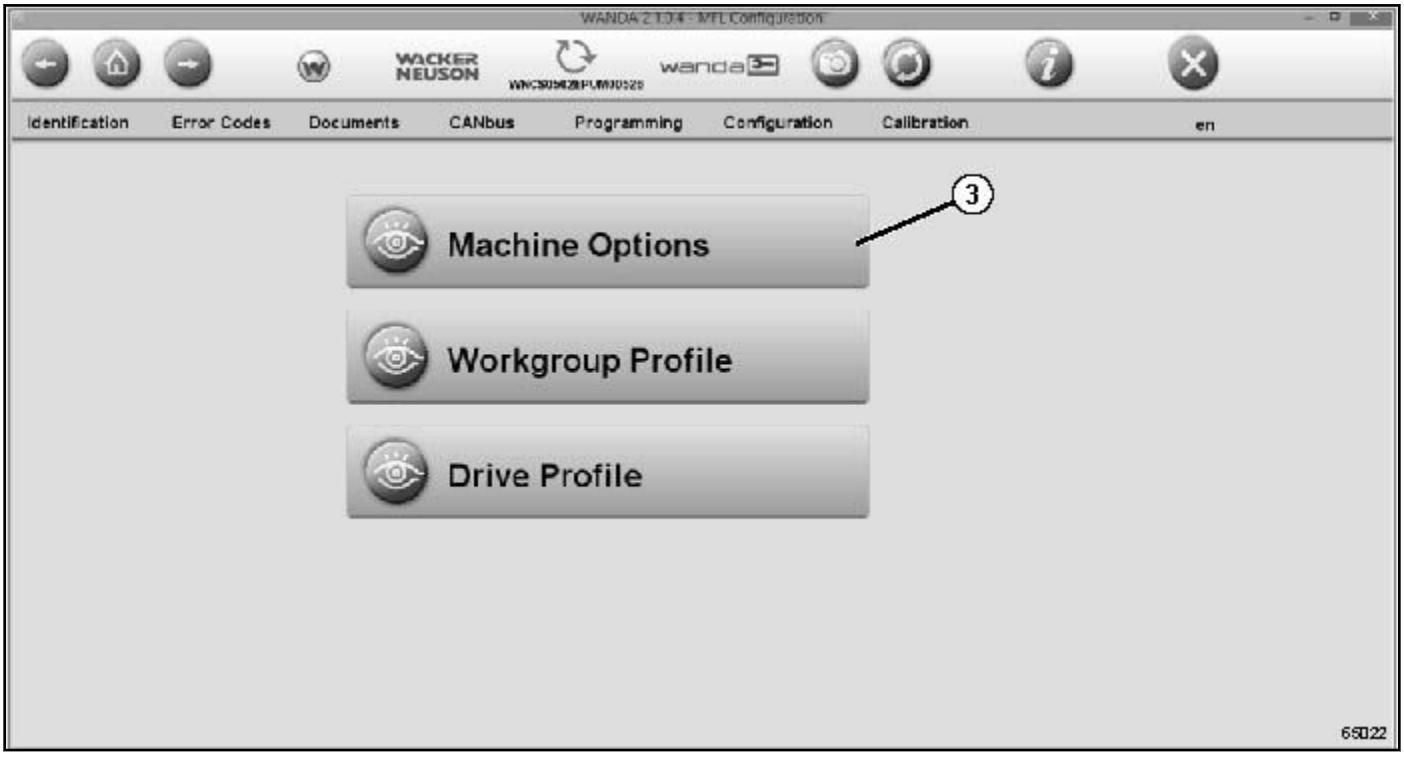


Figure 5-29: Configuration Screen

7. Click on Machine Options button (3) in the Configuration screen.



Figure 5-30: Machine Options Screen

8. Click on all applicable Machine Type (4), Drive Control Type (7), and Machine Options (5) in the Machine Options screen.

9. After all applicable options are selected, click on the write configuration in memory button (6).

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