SERVICE MANUAL
Tigercat T250B Track Loader

ISSUE 1.2, MARCH, 2009

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* NOTE: The DELIMBER function on the T250B Track Loader is an OPTIONAL installation.

250BT-SM00

T250B Available Literature

Operator's Manual	Part No. 29319A
Service Manual (This Manual)	Part No. 29320A
Parts Catalog	Part No. 29321A

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Tigercat T250B Track Loader

INTRODUCTION

An Operator's manual, Service manual and a Parts catalog are provided by **Tigercat** to assist the dealer, customer and operator in becoming familiar with the features of the Tigercat T250B Track Loader.

Serial Number **250T0501** and up.

The operator's manual will assist the operator with the techniques of proper and safe operation of the T250B Track Loader. There is also important information regarding the safe operation of the saw head. The service manual contains safety and servicing procedures and a preventive maintenance schedule to ensure optimum machine performance.

Section 1 in both the operator's manual and the service manual contains safety information that must be followed. As well, throughout the rest of the manuals, WARNING and CAUTION notices are displayed where necessary, drawing attention to possible hazards when performing certain procedures.

Only trained personnel should be allowed to operate or work on the machine.

The information contained in this manual is current at time of printing. Improvements to the machine are on-going and may not be covered, therefore in these cases contact your **Tigercat** dealer for the appropriate information.

The phrase **“and up”** appearing in this manual after the serial number implies that the related information is current for any machine serial number HIGHER than the serial number preceding the **“and up”**.

Tigercat reserves the right to make changes to the machine after this manual release date that may not immediately appear in this manual.

Every effort is made to send out updates on a regular basis. If the machine in question was built after the release date of this manual and there is a discrepancy, call Tigercat service department. The release date appears on the first page.

The Company reserves the right to change information contained herein at any time without prior notice.

Tigercat Industries Inc.

NON-APPROVED FIELD PRODUCT CHANGES

The installation of any unauthorized attachment or changes made of any kind to this **Tigercat** product could affect the product's ability to perform as originally intended. The product's integrity, stability and safety could be at serious risk.

IT IS **Tigercat** POLICY THAT NO CHANGES ARE TO BE MADE TO ITS PRODUCTS INCLUDING DELETIONS OR ADDITIONS OTHER THAN A **Tigercat** APPROVED OPTION FITTED IN THE FACTORY APPROVED MANNER.

Official approval to make changes or install options is **only** as follows:

i) The relevant options for that product must be shown or listed on current **Tigercat** documentation or literature such as a printed specification sheet, price list, parts manual, or product literature issued by **Tigercat .**

ii) Approved options or product changes authorized in writing by the **Tigercat** Engineering Manager.

Authorization by any other person is unacceptable.

Unauthorized changes made or contributed to by a person or organization may result in creating a dangerous situation and therefore the person or organization will be considered to have assumed the risk involved or be negligent in creating this situation.

Weight is an important factor when considering the addition of options or an attachment, Refer to your **Tigercat** distributor for information on maximum permissible operating weight and the effect the addition of various options may have on your machine.

Tigercat will not be held responsible for any situation that may arise resulting from Non-approved Field Product Changes to its product.

Should **Tigercat** become involved in a suit resulting from changes made to the product without proper authorization by **Tigercat** as stated above, **Tigercat** will take whatever action is appropriate to protect its interests.

The product warranty policy and the certification on any safety items installed on the modified product will become NULL and VOID if the above policy is not adhered to as specified.

Non-approved product changes also nullify warranties given to **Tigercat** by its component manufacturers.

Tigercat Industries Inc.

Tigercat T250B Track Loader

SECTION 1 - SAFETY

MARCH, 2009

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SAFETY SYMBOLS

This safety alert symbol means ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!

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

Understanding Signal Words

DANGER

DANGER identifies the most serious hazards where failure to follow listed procedures would result in a high probability of death or serious injury.

WARNING

WARNING denotes a hazard exists which can result in serious injury or death if proper precautions are not taken.

CAUTION

CAUTION is used in areas where failure to follow listed procedures may cause personal injury, component damage or subsequent malfunction.

GENERAL SAFETY PRECAUTIONS

Remember that safety is a prime responsibility of all.

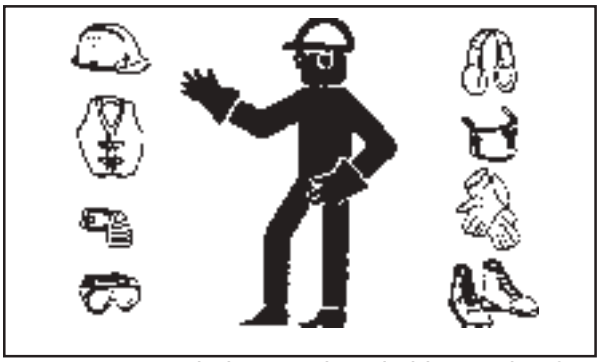
To minimize the risks and promote safety at all times, this section of the operator's manual details a number of safety rules which should always be followed and obeyed.

Study all the safety messages in this manual and on the labels on the machine carefully.

Follow all instructions from safety inspector and supervisors.

Operators of this equipment must be fully trained by a qualified person in safety and operating procedures. The operator must be fully aware of the capabilities and limitations of the equipment and must at no time exceed them. The machine is to be used only for its intended purpose. Learn the most efficient operating techniques.

Do not let an untrained person operate the machine.



Use recommended protective clothing and safety devices such as gloves, safety boots, safety hat, goggles, and ear protection when necessary.

Fellow workers and other bystanders around the machine must also be provided with the appropriate safety devices mentioned above.

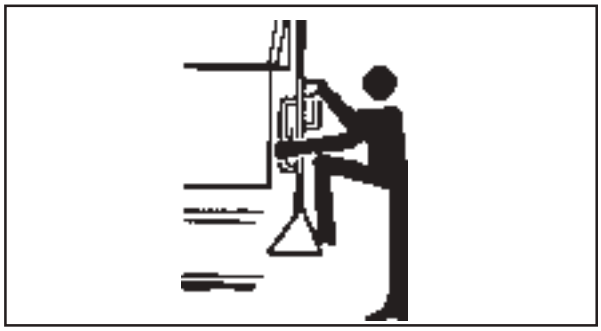
These safety rules highlight both general and specific measures that the operator should be familiar with and adhere to. More specific measures are illustrated with pictograms which may also be attached to the machine in locations pertinent to their respective message. Keep safety labels in good condition. Repair or replace damaged labels.

KEEP CLEAR

When approaching an operating machine on foot, stay at least 300 feet (90M) away from the machine and all related attachments including the grapple, delimber, topping saw and ground saws until the operator recognizes your presence. Make sure that all equipment is shut down with grapple resting securely on stable ground before advancing to the machine.

Always avoid the discharge path of all saws.

Wear a suitable hearing protective device such as earmuffs or earplugs to protect against noise. Prolonged exposure to loud noise can cause impairment or loss of hearing.



Use the handrails and steps provided when mounting and dismounting from the machine. Do not climb onto or jump off the machine at any time. Do not use the seat armrest or joystick as handle when entering or leaving the cab.

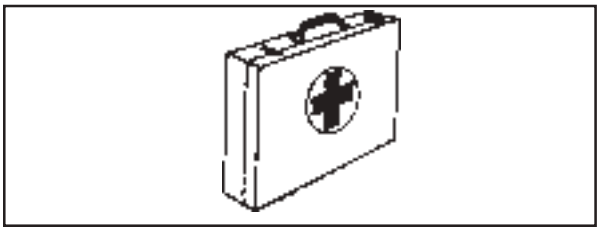
When mounting or dismounting the machine always use the 3 point technique - Use one hand with 2 feet or 2 hands with one foot.

GENERAL SAFETY PRECAUTIONS continued

Avoid mounting or dismounting the machine in areas with slippery surfaces.

If this is not possible clean up or cover slippery surfaces with a non-slip material.

Machines should be completely cleaned of debris at least daily, particularly around the engine exhaust components. Hydraulic oil leaks, excess grease, fuel and oil accumulation (including spillage) should be eliminated immediately. Machine should be washed completely at every major service.



Keep a first aid kit in an easily accessible location on the vehicle at all times.

Do not operate the equipment with anyone in the cab, on platforms, or anywhere else within 300 feet the machine or related equipment. The machine is provided and approved with seating for the operator only.

Do not allow anyone to operate the machine who may not be physically fit or who may be under the influence of alcohol or drugs.

Inspect the machine daily for signs of damage, unusual wear, fluid leaks, or faulty operation. Repair or replace malfunctioning parts and systems immediately.

Do not operate the machine with any defective or inoperable components.

Do not operate the machine with any of the exhaust system, safety covers, or other devices removed.

When moving the machine, ensure that adequate clearance is available on both sides and above the machine or any of its attachments. Extra clearance may be required particularly where the ground is uneven.

Approach with extreme caution, any area where overhanging electrical powerlines are present. Serious injury or death by electrocution can result if the machine or any of its attachments are not kept a safe distance from these lines.

Maintain a minimum distance of 10 ft. (3m) between the machine or boom and any power line carrying up to 50,000 volts or less.

Powerlines carrying more than 50,000 volts require a minimum safety distance of 10 ft. (3m) plus 1/2 inch (10mm) for each addition 1,000 volts above the 50,000 volt level. If State/Provincial, local or job site regulations require even greater safety distances than stated above, adhere strictly to these regulations for your own protection.

When the machine is transported, make sure that it is adequately secured to the transporting vehicle.

Comply with instructions in this manual and also your company's regulations for the operation of this machine.

Read, understand and follow all general safety precautions specified by grapple, delimber and saw manufacturers.

WARNING

Engine exhaust, some of its constituents, and certain vehicle components contain or emit chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

WARNING

Battery posts, terminals and related accessories contain lead and lead compounds. **Wash hands after handling.**

OPERATING SAFETY PRECAUTIONS

Shut off engine when refuelling - DO NOT refuel the engine while smoking or when near open flame or sparks.

During refuelling do not leave the filler nozzle unattended.

Avoid over filling and immediately clean up spilled fuel.

Before starting the engine, check to ensure that all doors, panels, and access covers are installed properly and secured.

Make sure that all of the controls are positioned as specified in the *starting instructions* in the operator's manual.

Check that no other personnel have moved into a hazardous area before starting the machine.

Sound the machine horn before starting the machine.

For engine *starting* and *stopping* procedures refer to STARTING ENGINE and STOPPING ENGINE in SECTION 2 of the THIS MANUAL. For *correct engine speeds,* refer to THROTTLE CONTROL in SECTION 2 of the THIS MANUAL.

Never use a liquid starting aid to start an engine with a pre-heat device.

Prior to commencing work, check all equipment controls to ensure that the machine responds correctly.

Ensure that the windshield guard is installed and properly secured.

Keep the cab door closed when operating the machine to prevent accidental entry of branches and debris into the cab.

Always rest the grapple on solid ground or trailer when not operating, regardless if the engine is running or shut off.

When the engine is running, DO NOT allow anyone in areas of the machine where they may be injured or crushed by moving components.

Maintain a safe operating distance between the machine and other personnel. Never swing the boom with or without trees, over the heads of bystanders.

Use only prearranged and approved signalling practices.

Operate the machine only from a seated position in

OPERATING SAFETY PRECAUTIONS continued

the operator's seat.

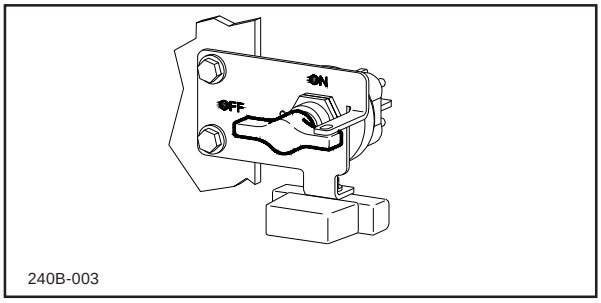
Do not allow other people either in the cab or

anywhere else on the machine.

Before leaving operator's cab, lower the grapple onto solid ground or the trailer.

When leaving the operator's cab for an extended period shut the engine off.

Never work alone. Regularly inform other crew members of your intentions, location and length of



time to perform duties.

Turn the battery disconnect switch off if the vehicle is to be idle for an extended period of time (Example - overnight).

Before transporting the machine:

- Secure the grapple to the trailer.
- Shut down the engine and turn the master disconnect switch off.
- Check to ensure that all doors, panels and access covers are installed and properly secured.

IMPORTANT

24 VOLT

ELECTRICAL SYSTEM

WARNING

Always lower the boom to the ground and shut down the engine before leaving the cab.

WARNING

Safe mounting of this loader onto a trailer or truck is the responsibility of the owner.

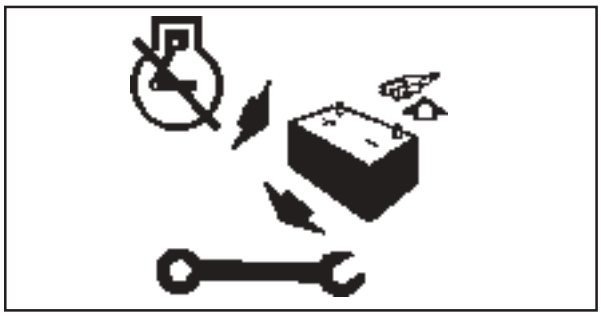
DANGER

A falling or swinging load or boom can cause serious injury or death. Do not operate the loader when personnel are in the area of the machines operating reach or load movement. Do not move the boom or load over the heads of people.

WARNING

Do not allow the driver to remain in the truck cab during loading operations and do not move loads over the top of the truck cab. Serious injury or death or property damage may result.

SERVICING SAFETY PRECAUTIONS



Conduct maintenance inspections at least as frequently as recommended in section 3 of the operator's manual.

When servicing or repairing equipment, shut the engine down. Turn Master Disconnect switch OFF.

Install a “DO NOT START ENGINE” sign on the operator’s cab door when making repairs to the machine.

Before performing maintenance or repair work on any equipment, consult the manufacturer’s instruction manual and follow recommended procedures.

The radiator and the engine cooling system should be inspected daily and cleaned as necessary to maintain moderate engine temperatures.

WARNING

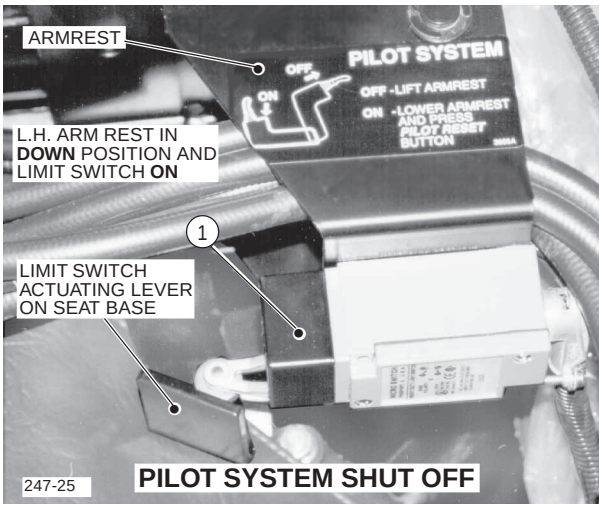
WARNING, HOT FLUIDS AND HOT MACHINE SURFACES CAN CAUSE SERIOUS BURNS!

- Before servicing the machine, allow the engine cooling system, fuel system, exhaust system, hydraulic system and machine surfaces to cool down.
- Use a thermometer to check surface and system temperatures to ensure it is safe to begin service work.
- DO NOT begin service work until the surface or system temperature has cooled down to below 100°F (38°C)!

SAFETY INTERLOCK SWITCH ON LEFT ARMREST:

The left arm rest is equipped with a safety interlock switch (1) to prevent the machine from being operated while the armrest is in the raised position (pilot system is shut off).

NOTE: The engine can be started but the machine functions cannot be operated with the



left arm rest up.

To operate:

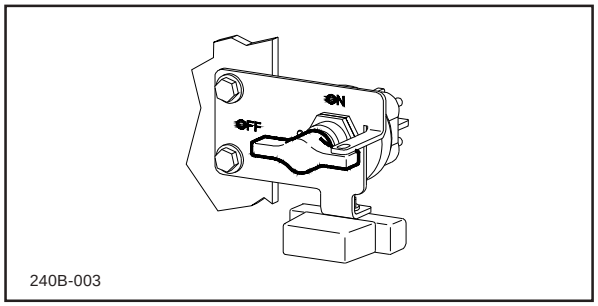
With the engine running and the left arm rest DOWN, push the pilot reset switch.

Once the safety interlock system has been activated, the safety of both the operator and all persons outside the cab becomes the responsibility of the operator.

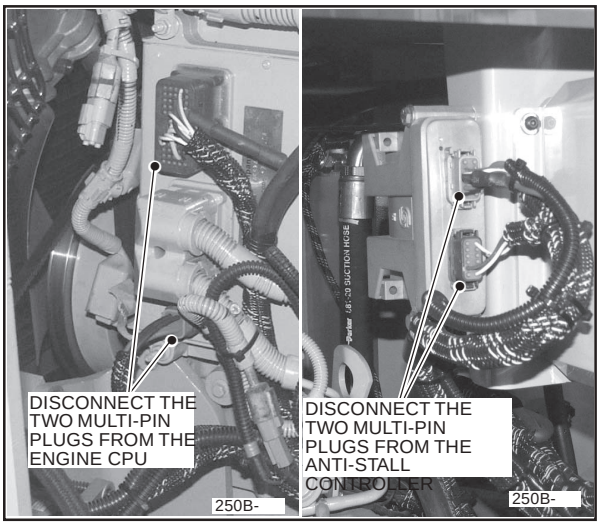
The left arm rest safety interlock switch (pilot system shut off limit switch) and the pilot reset switch are a safety feature and their function must not be defeated in any way.

SERVICING SAFETY PRECAUTIONS continued

Prior to welding on any part of the machine, it should be cleaned and a fire extinguisher should be made available at the welding location. Care must be taken in attaching the welding machine grounding clamp so current does not pass through bearings, especially the swing bearing.



Turn the battery disconnect switch off and disconnect the battery negative terminal. Also, disconnect the engine ground connection from the frame.



Disconnect the engine CPU (Central Processing Unit) by unplugging the two multi-pin connectors from the left side of the engine. Also disconnect the two multi pin connectors on the anti-stall controller.

IMPORTANT

24 VOLT ELECTRICAL SYSTEM

WARNING

Diesel fuel or hydraulic fluid under pressure can penetrate the skin and cause serious personal injury, blindness, or death. If any fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with treating this type of injury.

Never use your bare hand to check for fluid leaks.

Fluid leaks under pressure may not be visible. When searching for leaks, wear work gloves and use a wrench or piece of wood to move hydraulic hoses. Do not grab hold of hydraulic hoses. Wear safety goggles for eye protection.

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

Shut off engine. Only remove engine radiator filler cap when cool enough to touch with bare hands.

Slowly loosen cap to first stop to relieve pressure before removing completely.

Do not change any pressure or relief setting unless authorized instruction has been obtained.

Use the proper tool for the job. Repair or replace worn or damaged tools including lifting equipment immediately.

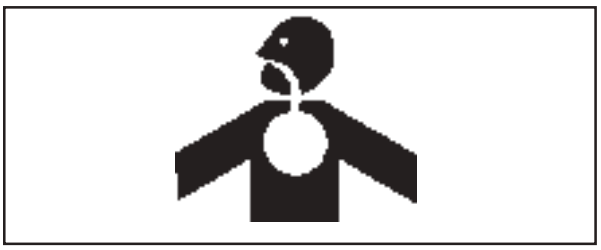
SERVICING SAFETY PRECAUTIONS continued

Keep your hands, feet, head, and loose clothing away from power driven parts. Tie long hair behind your head. Remove rings and other jewellery to prevent electrical shorts and entanglement in moving parts.

Always be aware of machine pinch points that could cause injury. Never place body parts within the range of motion of the working parts of the machine.

Never stand under an object supported with hydraulics. Always use safety stands or a locking device.

Before performing work on the grapple or boom, ensure they are firmly supported.



If the engine is running inside a building, ensure that sufficient ventilation is available to prevent a build-up of toxic exhaust fumes. Run the engine only when it is necessary for testing or adjustments.

Work in a ventilated area. If it is necessary to run an engine in an enclosed area, use an exhaust pipe extension to remove toxic exhaust fumes.

If you don't have an exhaust pipe extension, either work outside, or open the shop doors.

Dispose of all fluids properly according to all applicable laws and regulations for the region.

Do not pour fluids into the ground, stream, pond or lake.

Before draining any fluids, know the proper way to dispose of them.

SERVICING SAFETY PRECAUTIONS continued

FLUID INJECTION INJURY

Hydraulic and diesel fuel systems on forestry machines operate at very high pressures, often 207 bar (3000 psi) and above. If a loose connection or a defect in a hose should occur, a fine, high velocity stream of fluid will result. Even for systems pressurized to as little as 7 bar (100 psi), this fluid stream can penetrate human skin as if it were a hypodermic needle.

Initially, an accidental fluid injection beneath the skin may only produce a slight stinging sensation. There is a danger that you will tend to ignore this, thinking that it will get better with time. Most often, it does not! Within a very short time the wound may begin to throb painfully, indicating that tissue damage has already begun.

Similarly fluid injected directly into a blood vessel can spread rapidly through your circulatory system. The human body has little ability to purge injected fluid.

Diesel fuel or hydraulic fluid under pressure can penetrate the skin and could result in death or serious injury. If any fluid is injected under the skin, a medical doctor familiar with the treatment of this type of injury must surgically remove it within a few hours.

Time becomes critical as tissue damage progresses rapidly. The longer you delay getting professional medical attention, the more damage can occur.

Although fluid injection accidents are rare, the resulting injury has on occasion required the amputation of a finger, a hand or in some cases the entire limb. The longer the delay in getting professional medical aid, the further up the limb the tissue damage can spread. An injury of this type can become very serious or even fatal if not dealt with promptly and properly.

WARNING

Diesel fuel or hydraulic fluid under pressure can penetrate the skin and could result in death or serious injury. If any fluid is injected under the skin, a medical doctor familiar with the treatment of this type of injury must surgically remove it within a few hours.

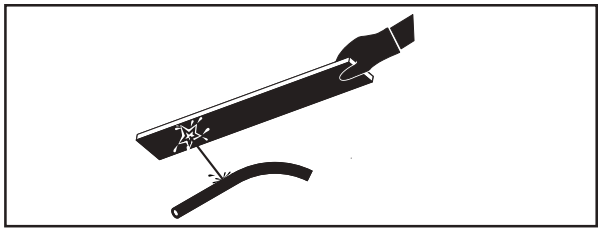
In the event of any suspected fluid injection injury

- **Report the injury to your supervisor <u>immediately</u>.**
- **Seek professional medical attention <u>immediately</u>.**

As always the best defence against suffering the effects of fluid injection is to prevent the accident from occurring in the first place.

When searching for possible fluid leaks

- Never search for leaks with your bare hands. Always wear thick protective gloves.
- Be sure to wear safety goggles for eye protection.
- Keep all body parts well away from the area being investigated for leaks.
- Use the end of a long piece of wood to move hoses or other obstacles.



- Place the end of a long piece of wood in the suspected path of any fluid stream. Never use any part of your body.
- Recognize that the source of the leak and the fluid streaming from it may be very small and not easily visible. You may only be able to see the fluid that accumulates as a result of the fluid stream.

When performing any service work

- Stop the engine and relieve all diesel fuel or hydraulic pressure before disconnecting any lines or otherwise working on the system.
- Never grab any hydraulic or diesel fuel connectors or hoses when they are subjected to pressure.
- Always ensure that hoses are rated for the pressures to which they will be subjected.
- Never use any hoses that you suspect could be defective.

SERVICING SAFETY PRECAUTIONS continued

GREASE INJECTION INJURY WHEN USING PNEUMATIC GREASE GUNS

Pneumatic grease guns can deliver grease at pressures from 17 - 400 Bar (246 - 5801 psi). It takes less than 7 Bar (100 psi) to inject a substance through human skin.

ALWAYS ***get professional medical treatment immediately*** after any type of injection injury.

Provide the physician with information on the type of grease, the pressure setting of the gun, and similar details.

The amount of fluid injected, type of fluid (or material), pressure at which it was injected, and the elapsed time between injection and surgery all influence the chances of successful treatment for this type of serious injury.

Prior to using a high pressure pneumatic grease gun perform the following:

- All operators of high pressure pneumatic grease guns MUST be trained in the hazards of its operations and the treatment for such injuries.
- DO NOT OPERATE a high pressure pneumatic grease gun unless you have been trained in the proper operation and are aware of all safety precautions of such a tool.
- Wear protective clothing such as gloves, safety hat and safety glasses.
- Inspect all parts of the grease gun for wear and tear and replace all worn or damaged parts.
- Ensure that protective shrouds are installed on all grease gun nozzles as safety devices.
- Remove dirt and grease from grease fittings prior to greasing.
- Replace any defective grease fittings on equipment with new fittings immediately.
- When badly positioned fittings are identified, replace them with angled or swivel fittings for easier access.

LIGHTNING SAFETY AWARENESS

WHAT IS A LIGHTNING STRIKE?

Lightning is a discharge of the electricity produced by a thunderstorm. As the thunderstorm develops, many small particles of ice within the storm clouds bump together. These collisions create a positive charge at the top of a cloud and a negative charge at the bottom. As this continues a second positive charge builds up on the ground beneath the cloud, concentrated around high objects such as hills, trees, buildings, equipment and even people.

When the difference between the electrical charge in the cloud and on the ground becomes great enough to overcome the resistance of the insulating air between them, an electrical current flows instantly. This is a lightning strike.

The electrical potential in a lightning strike can be as much as 100 million volts. Lightning strikes can occur over very large distances, even as much as 60 km (37 miles). Lightning travels both in front of and behind a thunderstorm and so strikes happen even when rain has not started or has stopped. Lightning can hit in the same place, many times and often spreads out over 18 m (60 feet) within the soil around the strike point.

Thunder always accompanies lightning. When lightning occurs, the air through which it travels is instantaneously heated to a temperature more than 28,000°C (50,000°F). The air expands rapidly due to this heating, then quickly contracts as it cools. It is this contracting shock wave that we hear as thunder.

In many areas of the world, lightning strikes are second only to flooding as the greatest cause of storm related deaths and injuries. Although only 10% of lightning strike victims are killed, virtually all from cardiac or respiratory arrest, over 70% of those that survive suffer severe, life-long injury and disability. The symptoms of a lightning strike include memory loss, fatigue, chronic pain, dizziness, sleeping difficulty and the inability to complete several tasks at one time.

LIGHTNING SAFETY

In spite of the popular myth that being struck by lightning is an unlikely event, the facts show that lightning strikes occur frequently. As a result loggers are at high risk because their work is outdoors and close to known strike points such as tall trees and heavy equipment.

Loggers can increase their chances of avoiding a lightning strike by following a few simple safety practices.

1. Designate a member of your crew to
   - Monitor daily weather forecasts
   - Observe local weather conditions
   - Alert all other members of the crew when a possible lightning threat develops.
2. Don’t start or continue any work that cannot be stopped immediately, when a storm moves nearby.
3. Anticipate a high-risk situation and take action early by moving to a low-risk location. Do not hesitate. If there is lightning, you are in danger.
4. Obey the rule - **If you see lightning, Flee. If you hear thunder, Clear**.
5. Do not follow the now obsolete guideline to take shelter when the time between seeing lightning and hearing thunder is 30 seconds or less. This does not provide sufficient time to ensure safety. Always follow step 4.
6. Remain in your safe location for 30 minutes after the last sight of lightning or the last sound of thunder.

The safest location during lightning activity is inside a fully enclosed, substantially constructed building, a house, office, school, shopping area, etc. These are the safest because of the electrical wiring and plumbing that they contain. Should lightning strike, the electrical current will travel through the wiring or plumbing into the ground. When such a building is nearby, always seek shelter there first.

LIGHTNING SAFETY CONT'D

Unfortunately loggers do not often work close to buildings and therefore other alternatives need to be considered.

Sheds, weather shelters, hunting blinds, tents and other partially open or small structures are not safe against lightning strikes as they lack the electrically grounded components of larger buildings. They are intended for sun or rain protection only. Do not seek shelter from lightning strikes inside these structures.

The second safest location during lightning activity is inside a fully enclosed car, van, truck or bus with a metal roof and metal sides. The electrical energy of a lightning strike to these vehicles is carried to ground by the conducting outer metal surfaces. This is called the skin effect.

Do not seek safety from lightning strikes in vehicles with fiberglass or plastic body shells or in convertible top vehicles. None of these are safe, as they do not offer skin effect lightning protection.

Heavy forestry equipment such as a skidder, loader, feller buncher, forwarder, etc. with a fully enclosed rollover protective structure (ROPS) cab take advantage of the skin effect and are therefore safe in electrical storms.

However machines with a rollover canopy only are not safe against lightning strikes as they are open to electrically conductive rainwater and do not benefit from the skin effect. Operators of this equipment must abandon their machines and get to a safer location before lightning strikes.

Note that the rubber tires on motor vehicles and heavy equipment do not increase safety from lightning strikes. Lightning has already travelled a great distance through the air to strike the vehicle. In comparison a few inches of rubber in a tire offers absolutely no additional insulation.

WHAT TO DO IF YOU ARE OUTSIDE AND SEE LIGHTNING OR HEAR THUNDER.

If you can, get inside.

1. Run to the nearest building, motor vehicle or fully enclosed ROPS equipment cab immediately. Being anywhere outside is not safe.
2. If inside a building:
   - Don’t watch the lightning storm from open windows or doorways. Stay in inner rooms.
   - Stay well away from corded telephones, electrical appliances, lighting fixtures, radio microphones, electrical sockets and plumbing pipes and fixtures.
3. If inside a motor vehicle or fully enclosed ROPS equipment cab:
   - Under no circumstances whatsoever step outside of the vehicle or off the equipment to move to another shelter. Very dangerous electrical pathways to ground may go through you.
   - Shut down all operation, turn off the engine, close all doors and raise all windows.
   - Sit squarely in the seat with your hands in your lap and your feet flat on the floor mat.
   - Do not touch any metallic objects referenced to the outside of the vehicle. Do not touch any door and window handles, control levers, foot pedals, steering wheels, cab interior walls and any other inside to outside metal objects.
   - Do not touch any radio or telephone connected to an outside antenna.

LIGHTNING SAFETY CONT'D

If you are caught outside and have no where else to go.

1. Avoid wide-open areas where you project above the surrounding landscape.
2. Seek shelter in a low place, such as a ditch, ravine, valley, canyon or cave.
3. Get away from open water such as ponds or streams.
4. Do not take shelter under any isolated tall trees or small groups of trees.
5. Seek shelter amongst the dense, thick growth of the shortest trees.
6. Avoid entering any small enclosures or shelters.
7. Do not seek shelter under any motor vehicle or heavy equipment.
8. Keep clear of any materials that can conduct electricity such as wire fences and gates, metal pipes, poles, rails and tools.
9. Stay at least 15m (50 feet) away from metal objects such as a fuel tank, a vehicle or machinery without a cab, motorcycle, ATV, etc.
10. Stay at least 5m (16 feet) apart from any other members of a group so that lightning won't travel between you.
11. Do not use the telephone except for emergencies.

What to do if you feel your skin tingling, your hair stands on end, light metal objects vibrate or you hear a crackling sound.

1. Lightning is probably about to strike. You only have a few seconds to act.
2. Put your feet together. Crouch down like in a baseball catcher's position. Hold your head down. Cover your ears to protect them against the noise of the thunder.
3. Do not lie flat on the ground. By touching as little of the ground as possible, the lightning may not move across the ground to you.

What to do if a co-worker has been struck by lightning.

1. The victim does not carry any electrical charge. There is no danger to anyone helping this person. You can touch him or her immediately.
2. Call your local emergency response telephone number immediately.
3. If the victim has no pulse, their heart has stopped or they have stopped breathing, start cardiopulmonary resuscitation (CPR) or mouth –to-mouth resuscitation immediately. Use a portable defibrillator if one is available.
4. Be careful about staying in the storm to take care of the victim. You can get hit by lightning too. If you can, move the victim to a building as soon as possible.

To further increase your awareness about lightning safety, see the following web sites.

National Weather Service Lightning Safety
http://www.lightningsafety.noaa.gov

National Lightning Safety Institute
http://www.lightningsafety.com

FIRE PREVENTION

When working in a forest environment, it is impossible to prevent combustible debris from collecting in tight corners of the machine. This debris, in itself, may cause a fire; however, when mixed with fuel, oil or grease in a hot or confined place, the danger of fire is greatly increased.

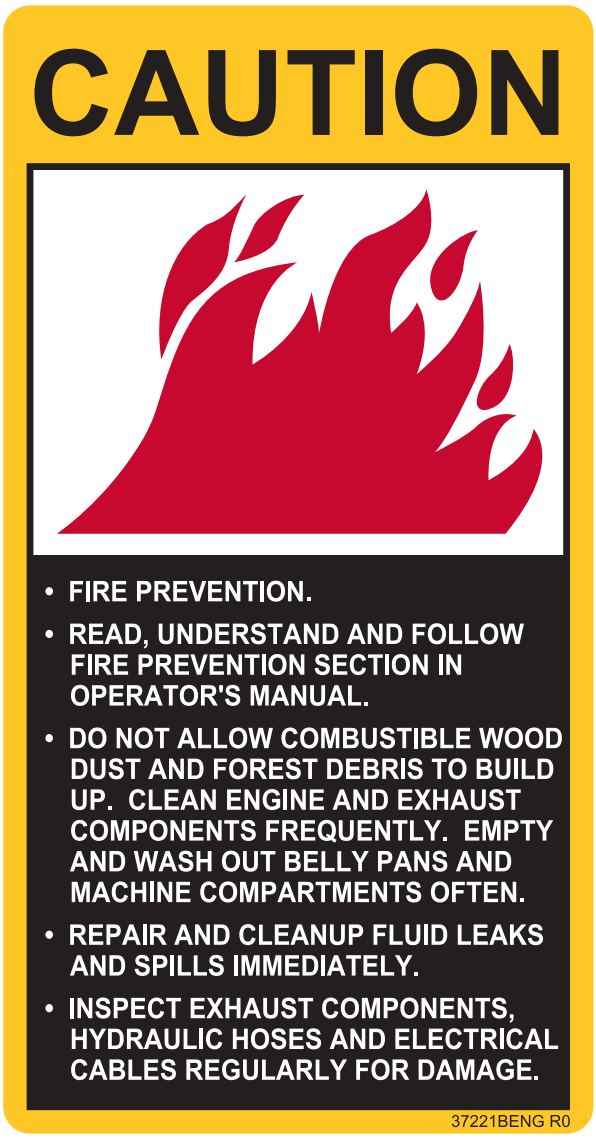
The following fire prevention guidelines should be used to supplement the operator's fire prevention efforts. In no case should the guidelines be used, or assumed, as replacements for diligent operator efforts at preventing fires.

The following guidelines will help to keep your equipment up and running efficiently **and keep the risk of fire to a minimum.**

1. **Maintain a CHARGED fire extinguisher** on the machine at all times and KNOW HOW TO USE IT.
2. **Remove debris and blow out dust regularly** from the air intake doors, engine radiator and charge air cooler, hydraulic oil cooler, diesel fuel cooler and air conditioning condenser core to prevent overheating of the engine and hydraulics and to maintain efficient operation of the machine. Refer to CLEANING A/C CONDENSER, OIL COOLER AND RADIATOR in SECTION 2 of the OPERATOR'S MANUAL.
3. **Blow off all forest debris and fine organic material accumulated** near hot engine exhaust components (turbocharger and exhaust manifold as well as exhaust pipes and muffler) at the completion of each work shift or more frequently when working in logging conditions where large amounts of combustible forest debris are present. Visual inspection after blow off to ensure thorough cleanliness is vital. Engine exhaust systems provide numerous small pockets where saw dust, small wood chips and other flammable forest debris can gather. Even small accumulations close to hot exhaust components can ignite and smolder. If dislodged this smoldering debris can fall into other areas of the machine and thereby spread a fire.
4. **Clean out all accumulated forest debris** (twigs, pine needles, branches, bark, leaves, saw dust, small wood chips) and any other combustible materials from inside the machine belly pans or lower machine structures as well as from areas in proximity to the engine, fuel and hydraulic oil systems no less frequently than at the completion of each work shift.
5. **Inspect the machine regularly** for any signs of diesel fuel or hydraulic system leakage. Check for worn or eroded fuel or hydraulic lines before starting up any equipment.
6. **Clean up any grease, diesel fuel, hydraulic and lubricating oil** accumulation and spillage immediately.
7. **Steam clean the engine,** transmission, brake, fuel and hydraulic tank compartments of all equipment at least once a month or more frequently when working in logging conditions where large amounts of combustible forest debris are present.
8. **Use only nonflammable solutions for cleaning** the machine and components.
9. **Inspect the exhaust system daily** for any signs of **leakage**. Check for worn, cracked, broken or damaged pipes or muffler. Also check for missing or damaged bolts or clamps. Should any exhaust leaks or defective parts be found, repairs must be made immediately. Engine exhaust leaks can cause fires. **Do not operate** the machine until the exhaust leak is repaired.
10. **During daily operation** of the machine, the occurrence of **exhaust leaks** are usually accompanied by a **change or increase in engine exhaust noise levels**. These **audible warnings** cannot be ignored. Should any exhaust leaks occur during operation, the machine must be **shut down immediately** and not put back to work until the necessary repairs have been completed.
11. **Park the machine at least 50 feet away** from other equipment at the end of each shift.
12. **Never leave the machine parked with boom, arch or blade suspended off the ground**. Should their supporting hydraulic hoses burn through during a fire, pressurized hydraulic oil may be injected into the fire and the boom, arch or blade will fall rapidly to the ground.

FIRE PREVENTION continued

13. **Turn the battery disconnect switch to OFF** at shut down to de-energize all electrical circuits.
14. **Remain with the machine** for at least 45 minutes at the end of operations while the machine cools.



15. **Remove all keys,** lock equipment and fuel cap at the end of operations to reduce the risk of vandalism.
16. **Be cautious when smoking.** An open flame, a lighted cigarette, etc., should not be permitted around any vehicle, especially during fuelling operations or when the fuel system is open to the atmosphere or when servicing batteries.
17. **AFTER transporting (trucking) a machine** from one job site to the next, open all doors and access panels and blow off any debris that may have repositioned itself onto the engine and exhaust parts due to wind turbulence caused by the journey.
18. **Before starting repair work,** such as welding, the surrounding area should be cleaned and a fire extinguisher should be close by.
19. **Store rags and other combustible materials** in a safe, fireproof location.
20. **Do not use the machine** on top of or to push piles of burning timber. A machine fire will most probably result.

EQUIPMENT FIRES ADVERSELY EFFECT YOUR ABILITY TO LOG, MAY INCREASE YOUR INSURANCE PREMIUMS DRAMATICALLY OR PREVENT YOU FROM OBTAINING INSURANCE COVERAGE AT ALL.

WHAT TO DO TO PREPARE FOR A MACHINE FIRE

- Prevent the fire from happening in the first place by ensuring that all machine systems are frequently inspected and always well maintained.
- Ensure that any hand held fire extinguishers are charged and in working order. Fire extinguishers require routine care. Follow the manufacturer's instructions for inspection and maintenance shown on the label of the fire extinguisher and in the extinguisher manufacturer's manual.
- Ensure that any pressurized water systems on the machine (if applicable) are charged and in working order. Refer to PRESSURIZED WATER SYSTEM MAINTENANCE in SECTION 3 of the OPERATOR'S MANUAL.
- Ensure that you have the proper fire extinguishers on site. Most fires involving mobile forestry equipment will be Class **A** or **B**.

  Dry chemical extinguishers should be rated **ABC** and pressurized water extinguishers should be rated **A**.

  Class **A** fires involve ordinary combustibles such as wood, cloth, paper, rubber and many plastics, Class **B** fires occur with flammable liquids such as diesel fuel, oil and grease and Class **C** fires apply to energized electrical equipment.

FIRE PREVENTION continued

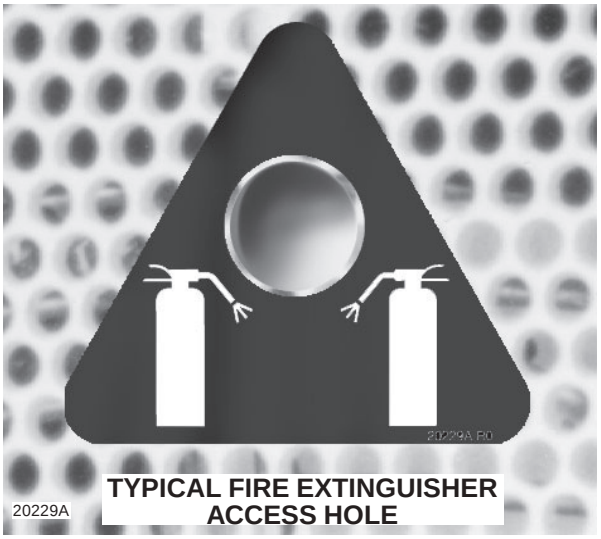
- Ensure that the nozzle of any hand held extinguisher and pressurized water system available on the machine and at the work site fits within the access holes in the doors of the machine.
- Ensure that your fire detection system***** is in working order. Refer to FIRE DETECTION SYSTEM in SECTION 2 of the OPERATOR'S MANUAL.
- Ensure that your fire suppression system****** is charged and in working order. Refer to FIRE SUPPRESSION SYSTEM in SECTION 2 of the OPERATOR'S MANUAL.
- Ensure that you are familiar with the recommended procedures for fire contained in the emergency action plan of your company.
- Ensure that you follow all national, state / provincial and local regulations dealing with fire fighting in effect in your specific geographic region. Regulations will vary from region to region but most will usually require that:
  1. Workers assigned to fire fighting duties must be physically capable of performing them safely and effectively.
  2. Workers designated to use fire fighting equipment as part of an emergency action plan must receive full and proper training from a qualified instructor.
  3. Whenever portable fire extinguishers are provided for use in the workplace, training must be provided to familiarize workers with the general principles of fire extinguisher use and the hazards involved with fire fighting.
  4. Training must be provided upon initial employment and at least annually thereafter.
- Ensure that after you have received the training as outlined above, that you know how to use the fire extinguisher, the pressurized water system (if applicable) and the fire suppression system** on your machine. There is not enough time available to read instructions during a fire emergency.
- Ensure that all information necessary for you to immediately contact all sources of help (local fire department, etc) in the event of a fire emergency is recorded and readily available at all times.

WHAT TO DO WHEN A MACHINE FIRE OCCURS

- If operating the machine when a fire occurs:
  1. Lower all working attachments to the ground.
  2. Shut the engine off.
  3. Activate the fire suppression system******.
  4. Radio or call for help. Be certain to report a fire immediately.
  5. Exit the machine taking fire extinguisher and pressurized water system hose (if applicable) with you.
  6. At all times ensure your own personal safety and the safety of anyone that may be in the area. Approach any fire with extreme caution. All fires can be very dangerous and life threatening.
  7. Only if you can safely do so, turn OFF the battery disconnect switch.
- Before deciding to fight the fire, be certain that:
  1. The fire is small and not rapidly spreading.
  2. There is always a clear, safe escape route to your back.
  3. You have received training in the use of the available fire extinguishing systems and are confident that you can operate them effectively.
- Be aware that engine coolant , diesel fuel or hydraulic hoses could fail during a fire. If this happens, hot coolant, fuel or oil could possibly be ignited by the fire.
- If in any doubt about whether or not to fight the fire – DON'T. Instead stand well clear of the fire and wait for help to arrive.
- If possible a dry chemical fire extinguisher or fire suppression system** should be used first to fight a machine fire. Then immediately afterwards use the pressurized water hose supplied with the machine (if applicable) or a pressurized water extinguisher (if available). A fire suppressed by dry chemical may re-ignite from the heat retained by any debris in the area. The water will cool the area, reducing the chances of re-ignition.

FIRE PREVENTION continued

- Use the **PASS** method. This is the most effective use of a fire extinguisher.
  - **P**ull the pin at the top of the extinguisher that keeps the handle from being pressed. Break the plastic seal as the pin is pulled.
  - **A**im the nozzle at the base of the fire. Do not aim the nozzle at the flames. In order to put out the fire, you must extinguish the fuel, not the flames. Hose nozzles are often clipped to the extinguisher body. Release the hose before taking aim.
  - **S**queeze the handle to release the pressurized extinguishing agent. The handle can be released at any time to stop the discharge.
  - **S**weep from side to side at the base of the fire until the fire is completely out or the fire extinguisher is empty



20229A **TYPICAL FIRE EXTINGUISHER ACCESS HOLE**

- Place the nozzle of the fire extinguisher into the appropriate fire extinguisher access hole and discharge the extinguisher.
- Only if you can safely do so, open the access panels to the machine in the area of the fire.
- Failing all attempts to access the machine compartment, discharge the extinguisher through the mesh or any available openings on the machine.
- Ensure that the machine and all components have cooled down sufficiently after a fire so that re-ignition does not occur.
- Remain with the machine until help arrives.

WHAT TO DO AFTER A MACHINE FIRE HAS OCCURRED

- Before returning the machine to work.
  1. Ensure that the cause of the fire is determined and all appropriate repairs are completed.
  2. Ensure that the fire detection system* or the fire suppression system** is properly serviced and in working order (if applicable).
  3. Ensure that all extinguishers used in fighting the fire are replaced or recharged.
- Notify your equipment dealer and / or **Tigercat Industries Inc.** by completing an incident report, Tigercat form number 5101.

***NOTE:** Fire detection systems are offered by Tigercat as an optional installation on some Tigercat product lines. Please disregard any references made to fire detection systems if not installed on your machine.

****NOTE:** Dry chemical fire suppression systems are offered by Tigercat as an optional installation on some Tigercat product lines. Please disregard any references made to fire suppression systems if not installed on your machine.

DRY CHEMICAL CLEANUP PROCEDURES

Both ABC dry chemical fire extinguishers and fire suppression systems discharge a chemical powder to extinguish the fire. The chemical makeup and the small particle size of the powder as well as the force of the discharge all contribute to the fire fighting capability. These same characteristics also permit the powder to penetrate into and fully cover all components in the vicinity of the discharge.

The following are recommendations for the cleanup and neutralizing of areas exposed to dry chemical powder.

Workers performing this work should wear protective clothing, safety goggles and a fine particle dust mask to minimize their personal exposure to the dry chemical powder.

Ensure that all electrical systems have been completely de-energized prior to any cleanup.

1. In areas of the machine that remained cool and dry during the fire, the dry chemical will stay in powder form.

   Be certain to clean these areas immediately to prevent any settled residual powder from coming into contact with moisture whether through direct contact or humidity in the air.

   Remove the powder residue by blowing off with air, sweeping, dusting or vacuuming using a HEPA filter capable of trapping the small dry chemical particles. Then wipe all surfaces with a damp cloth.

2. In areas exposed to moisture, the dry chemical powder will combine with water to form a paste that is mildly acidic. Note that all surfaces covered by this dry chemical paste including electrical contacts are vulnerable to corrosive attack.

   To neutralize the acidic paste on large surfaces, spray or wash these areas with a mixture of 3 parts hot water to 1 part baking soda. Allow this mixture to stand for several minutes before rinsing with warm water. Wash the area with a mild soap and water solution. Rinse thoroughly with water. Blow-dry to remove all residual water.

   Cleaning of electrical contacts should be done using an electrical contact cleaner that has no flash or fire point and is non-corrosive and non-conductive such as CRC Contact Cleaner 2000.

3. In areas exposed to heat during the fire, the dry chemical powder will melt forming a coating that cakes or crusts on all surfaces.

   To break down the caked dry chemical, spray or wash these areas with a 50/50 mixture of hot water and isopropyl alcohol. Allow this mixture to stand in place for several minutes.

   The caked dry chemical when exposed to moisture is also mildly acidic. Therefore when the break down procedure has been completed, follow this immediately with the neutralizing procedure as described in step 2.

Tigercat T250B Track Loader
SECTION 3 - LUBRICATION & MAINTENANCE

MARCH, 2009

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PREVENTIVE MAINTENANCE SCHEDULE

NEW MACHINE MAINTENANCE

*INITIAL PRE-DELIVERY INSPECTION:-

PERFORM THE INITIAL PRE-DELIVERY INSPECTION
USING Tigercat FORM NUMBERS 5281 AND 5282;
"*PDI AND 50-100 HOUR INSPECTION REPORT*"

*FIRST 50-100 HOUR INSPECTION AND SERVICE REPORT:-

WITH THE OWNER'S MECHANIC PRESENT,
PERFORM AN INSPECTION AND SERVICE
ACCORDING TO THE Tigercat FORM NUMBERS 5281 AND 5282;
"*PDI AND 50-100 HOUR INSPECTION REPORT*"
THIS MUST BE COMPLETED WITHIN THE FIRST 50-100 HOUR TIME FRAME.

***IMPORTANT:** TO QUALIFY FOR CONTINUED WARRANTY,
THIS REPORT MUST BE COMPLETED AND RETURNED TO
Tigercat Industries Inc. WARRANTY DEPARTMENT.

Tightening points:~

- ☐ Check torque on swing bearing retaining bolts
- ☐ Engine mounting bolts
- ☐ Pump drive gearbox mounting bolts
- ☐ Pilot pump mounting bolts
- ☐ Swing gearbox mounting bolts
- ☐ Swing motor mounting bolts
- ☐ Cab securing bolts
- ☐ Boom pin nuts
- ☐ Track shoe bolts
- ☐ Track roller retaining bolts
- ☐ Track sprocket retaining bolts
- ☐ Track drive gearbox mounting bolts
- ☐ Track drive motor mounting bolts
- ☐ All hydraulic connections
- ☐ Hose clamps
- ☐ Pin retainers
- ☐ Any other loose nut, bolt or fitting

NOTE: Use of filters other than genuine Tigercat replacement filters is not recommended.

Refer to diesel engine service manual and attachment manual for additional required maintenance at this scheduled time period.

IMPORTANT

Before driving machine ensure that the track tension (sag) is set correctly.

Track sag may be set less than specified for shipping purposes.

TIGERCAT OIL SAMPLING PROGRAM

Effective for all **2008** model year **200 series log loaders** sold in U.S.A. and Canada, oil sampling must be performed during the warranty period as per the schedule below. Warranty coverage of Powertrain components, specifically main pump, pilot pump (if applicable), swing pump (if applicable), rotary manifold, swing motor, swing gearbox and swing bearing, main control valves, track motors and final drive gearboxes (if applicable) is contingent on performance of regular oil sampling at the owner's expense during the warranty period.

200 Series		
Location	**First Sample**	**Follow-up Samples**
Hydraulic Oil	100 hrs	Every 1000 hrs or 6 Months
Swing Drive Gearbox	100 hrs	Every Oil Change (500 hours or 3 Months)
Track Drive Gearboxes (if applicable)	100 hrs	Every 1000 hrs or 6 Months

FIRST SAMPLE
There will be no charge for the first oil samples required to be taken during the 100-Hour Inspection Service that will be scheduled and performed by your Tigercat dealer. Refer to NEW MACHINE MAINTENANCE in THIS SECTION.

FOLLOW-UP SAMPLES
All follow-up samples must be taken as indicated in the chart above and will be the responsibility of the machine owner.

Copies of all oil analysis results must be forwarded to the Tigercat Warranty Department for continued warranty coverage. If samples are taken using the Tigercat Oil Analysis Program, a copy of all results will automatically be sent to Tigercat.

Tigercat Oil Analysis Kits are available from your Tigercat dealer parts department. If required, arrangements can also be made with your Tigercat dealer to supply and perform all of the required follow-up oil samples.

Refer also to OIL SAMPLE COLLECTION PROCEDURES in THIS SECTION for sample valve and drain plug locations.

TIGERCAT OIL ANALYSIS KITS
Each kit includes a Pre-paid Sample Bottle and Sample Information Form. Pre-printed mailing labels are also included to ensure all samples are quickly returned directly to the lab for immediate analysis and results within 24 hours of receipt.

The same type of sample bottle can be used for all types of oil testing including:
Hydraulic Circuits, Final Drives, Axles, Gearboxes, Engines, etc.

To ensure accurate and meaningful results are obtained, each kit also includes detailed instructions on how properly collect, prepare and ship the oil samples.

Contact your Tigercat Dealer Parts Department to order Kits.

TIGERCAT OIL SAMPLING PROGRAM

OIL SAMPLE COLLECTION PROCEDURES

Fill out the Sample Information Form (SIF) completely and accurately. When taking multiple oil samples, fill out all of the required SIF forms in their entirety, prior to taking any oil samples. Then, immediately package each completed SIF form together with the matching oil sample in the black outer shipping container as each individual sample is taken. This will reduce the possibility of mixing up or incorrectly identifying the SIF forms and oil samples. Incorrectly identified samples could result in a false warning alarm.

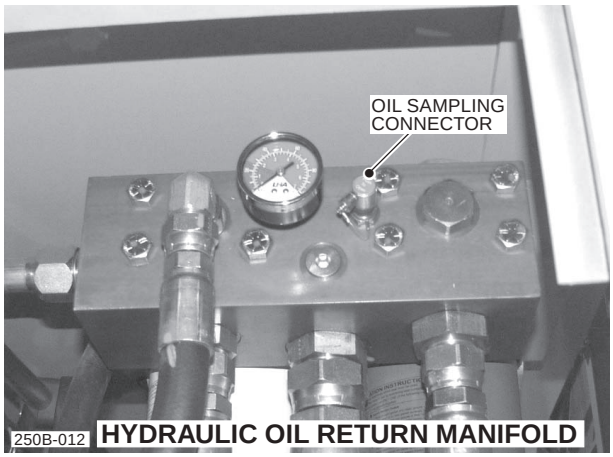
The accuracy of the lab analysis results is very dependent on the quality of the oil sample taken. Collection of clean oil samples that are representative of the main body of oil are essential if meaningful lab results are to be obtained.

Erroneous readings may result if proper collection, handling, packaging and shipping practices are not followed prior to the sample being tested by the lab. To be able to accurately compare and trend the lab results over time, all follow-up samples should be consistently taken from the same location using the same techniques as all previous samples.

- Ensure that all sample valves and drain plugs are clean and free of debris.
- Remove the sample bottle cap only when ready to take the sample. Keep the cap clean – do not put it in your pocket or let it get contaminated in any way.
- Do not allow any airborne dirt, etc. to enter the sample bottle.
- Avoid contamination of the sample – replace the sample bottle cap immediately after filling the bottle to approximately ¾ full. All samples taken should be immediately forwarded to the lab for processing.

Contact your Tigercat dealer to purchase additional or replacement hydraulic sample valves or drain plugs.

In cases where oil samples must be pumped or otherwise drawn out of a reservoir or housing, a hand operated oil suction pump is also available from your Tigercat dealer.



Hydraulic Oil Samples:

- Hydraulic oil samples should be taken from the circulating oil flow at operating temperature, with no functions actuated, using sample valves that are permanently located on the machine whenever possible.
- To obtain a representative oil sample, sample valves must be purged before the actual oil sample is taken. Drain a minimum of 3 or 4 ounces of oil into a separate container and discard this oil using approved recycling methods.
- Replace the dust cover on the sample valve immediately after taking the oil sample and sealing the sample bottle.

Gearbox Samples:

- These samples can be taken during the oil change process.
- To obtain a representative oil sample, ensure the oil is warm and has not settled very long (within 30 minutes of shutdown).
- Place the required drain container under the machine to capture the used oil to be discarded using approved recycling methods.
- Remove the drain plug and allow approximately 50% of the oil to drain, then place the sample bottle in the stream of draining oil to obtain a representative sample.

GENERAL

CAUTION

All handles, steps and platforms must be kept free of grease, oil, fuel mud, snow ice and forest debris to prevent risk of personal injury

WARNING

WARNING, HOT FLUIDS AND HOT MACHINE SURFACES CAN CAUSE SERIOUS BURNS!

- Before servicing the machine, allow the engine cooling system, fuel system, exhaust system, hydraulic system and machine surfaces to cool down.
- Use a thermometer to check surface and system temperatures to ensure it is safe to begin service work.
- DO NOT begin service work until the surface or system temperature has cooled down to below 100°F (38°C)!

- ☑ Clean around filler caps before checking or adding fluids
- ☑ Clean around hydraulic fittings before breaking connection. Plug or cap immediately
- ☑ Clean up spills as soon as possible
- ☑ Always use clean oil and containers
- ☑ Drain dirty oil while still warm
- ☑ Do not exceed recommended fluid levels
- ☑ Service all hydraulic filters after the failure of a pump, motor, cylinder or valve. Failures of this nature could contaminate the entire hydraulic system
- ☑ Top up diesel fuel at each shift to reduce contamination by condensation
- ☑ Clean up oil spills on walking surfaces in engine enclosure immediately
- ☑ Before welding on machine be sure the negative battery terminal is disconnected
- ☑ When welding, secure ground connection as close to working position as possible to prevent arcing across machined surfaces or through bearings
- ☑ Clean away all branches, bark and chips. Clean up all traces of oil to avoid fires
- ☑ Always have a fire extinguisher at hand
- ☑ For safety, always lower boom assy. To the ground when leaving cab, leaving machine unattended or during service

***OIL LOST FROM LEAKAGE**

LEAKAGE RATE	LOST 0IL (LITERS) PER DAY	LOST 0IL (LITERS) PER MONTH	LOST 0IL (LITERS) PER YEAR	LOST 0IL (GALLONS) PER DAY	LOST 0IL (GALLONS) PER MONTH	LOST 0IL (GALLONS) PER YEAR
ONE DROP IN 10 SECONDS	0.424	12.72	152.0	0.112	3.36	40.0
ONE DROP IN 5 SECONDS	0.852	25.6	306.6	0.225	6.75	81.0
ONE DROP PER SECOND	4.26	127.76	1533.1	1.125	33.75	405.0
THREE DROP PER SECOND	14.2	425.86	5110.31	3.75	112.5	1350.0
DROPS BREAK INTO STREAM	90.83	2725.5	32706.0	24.00	720.0	8640.0

SCHEDULED MAINTENANCE

EVERY 8 HOURS:~

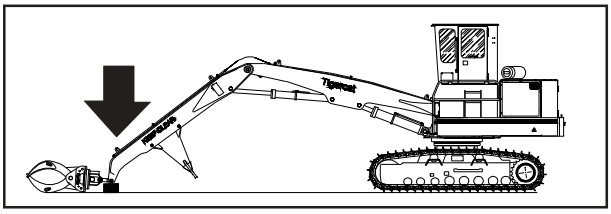
- Check engine coolant level
- Check engine oil level
- Drain fuel/water separator
- Check hydraulic oil level
- Check swing gearbox oil level
  Fill reservoir to halfway mark
- Check air cleaner unloader valve.
- Check air intake filter restriction indicator.
  Replace primary filter if indicator is in red zone. Replace secondary (safety) filter every third primary filter change to guarantee maximum performance and reliability.

Lubricate:~

- Swing pinion;
  1-fitting - 10 shots while swinging
- Swing bearing;
  1-fitting - 10 shots while swinging
- ‡ Boom joints;
  4-fittings - purge
- ‡ Cylinders; boom, stick & tilt;
  4-fittings total - purge

‡ **Lubricating cylinder pins and boom joints:-**

1. Ensure machine is on level ground
2. Fully extend stick boom cylinder
3. Lower main boom and rest grapple firmly on ground or stable trailer



4. While in this position lubricate all cylinder retaining pins and boom joints
   NOTE: This procedure will allow grease to flow to the normally "loaded" side of the pin/bearing surfaces.

Clean:~

- Oil cooler, engine radiator and a/c condensor
- Remove potentially damaging limbs or sticks and all debris

Check:~

- For leakage around hydraulic components and flexible hoses
- For loose nuts, bolts and fittings
- Condition and tension of fan belts.
- All engine air intake system components (including charge air cooler) rubber elbows, connector hoses, tubes and clamps for damage, hardening, wear, cracks, leaks, loose clamps or loose hanger bracket hardware and repair or replace immediately.
- Conduct an overall visual inspection.
- Refer to diesel engine service manual and attachment manual for additional required maintenance at this scheduled time period.

SCHEDULED MAINTENANCE

EVERY 125 HOURS:~

- **Perform 8 hour maintenance**

And in addition replace:~

- Return filters restriction indicator with engine running at high idle and oil flow
- Track drive gearbox oil level with both level plugs in line with the horizontal plane and above center
- Fluid level in batteries unless maintenance free
- Engine rpm.
- All hydraulic pressures
- Hydraulic pumps and motor securing bolts
- Torque tightening points as per new machine maintenance

Visually check for damage to:~

- Main and stick booms and cylinders
- Tracks, track frames and carbody
- Swing bearing area
- Attachment

Make repairs immediately

Visually inspect for:~

- Frayed electrical wiring and hydraulic hoses
- Wear in any other components

Clean/replace:~

- Air conditioner re-circulation filter
- Cab fresh air filter
- Refer to diesel engine service manual and attachment manual for additional required maintenance at this scheduled time period.

EVERY 250 HOURS:~

- **Perform 8 hour maintenance**
- **Perform 125 hour maintenance**

And in addition:~

- Replace engine oil and filter
- Replace engine fuel filter
- Replace air intake primary element
- Pump drive gearbox
- Track drive gearboxes

  Fill track drive gearbox with both level plugs in line with the horizontal plane and above center

EVERY 500 HOURS:~

- **Perform 8 hour maintenance**
- **Perform 125 hour maintenance**
- **Perform 250 hour maintenance**

And in addition replace:~

- Air intake safety element
- Hyd. Oil return filters †
- Hyd. Oil pilot pressure filter †
- Oil in swing gearbox

  Fill reservoir to halfway mark

Lubricate:~

- Door and cover hinges
  8 fittings - 1 shot

Check:~

- Torque on swing bearing and swing gearbox retaining bolts
- Torque on track drive gearboxes and motor mounting bolts
- Track rollers and idlers for oil leakage. These components are filled with oil and considered maintenance free. If oil leakage is detected repair of component(s) will be necessary.
- Refer to diesel engine service manual and attachment manual for additional required maintenance at this scheduled time period.

† **NOTE: Use of filters other than genuine Tigercat replacement filters is not recommended.**

SCHEDULED MAINTENANCE

EVERY 1000 HOURS:~

- **Perform 8 hour maintenance**
- **Perform 125 hour maintenance**
- **Perform 250 hour maintenance**
- **Perform 500 hour maintenance**

And in addition check:~

- Fuel in tank strainer

EVERY 2000 HOURS:~

- **Perform 8 hour maintenance**
- **Perform 125 hour maintenance**
- **Perform 250 hour maintenance**
- **Perform 500 hour maintenance**
- **Perform 1000 hour maintenance**

And in addition:~

- Drain and refill hydraulic oil tank with recommended hydraulic oil. See APPROVED HYDRAULIC OILS
- Replace all air intake rubber components such as elbows and connectors - High temperatures in this area can cause the rubber to harden. See AIR INTAKE MAINTENANCE in THIS SECTION.

APPROVED HYDRAULIC OILS

Use *only* one of the following oils to fill or replenish the hydraulic system.

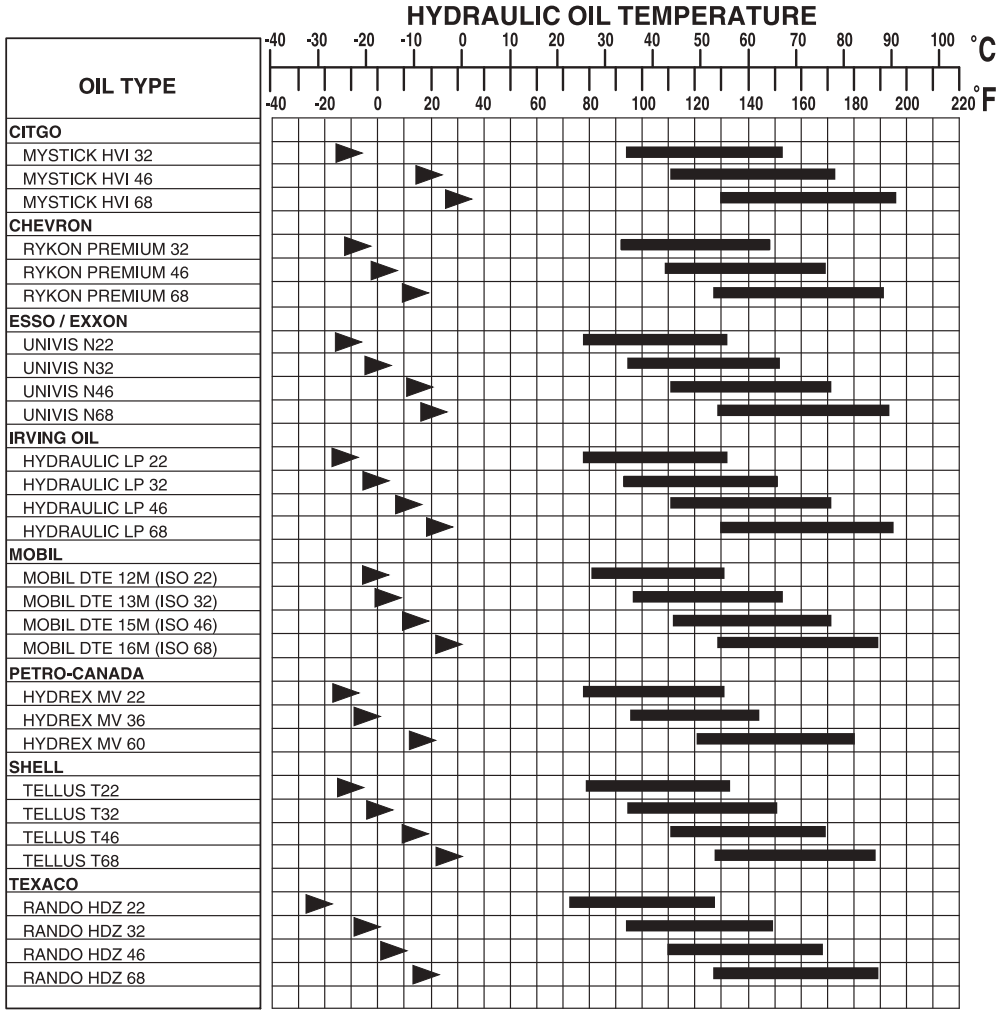
HYDRAULIC OIL OPERATING RANGE

(Not suitable for axle applications)

Tigercat®

OPERATING TEMP. RANGE

LOWEST START-UP TEMP.

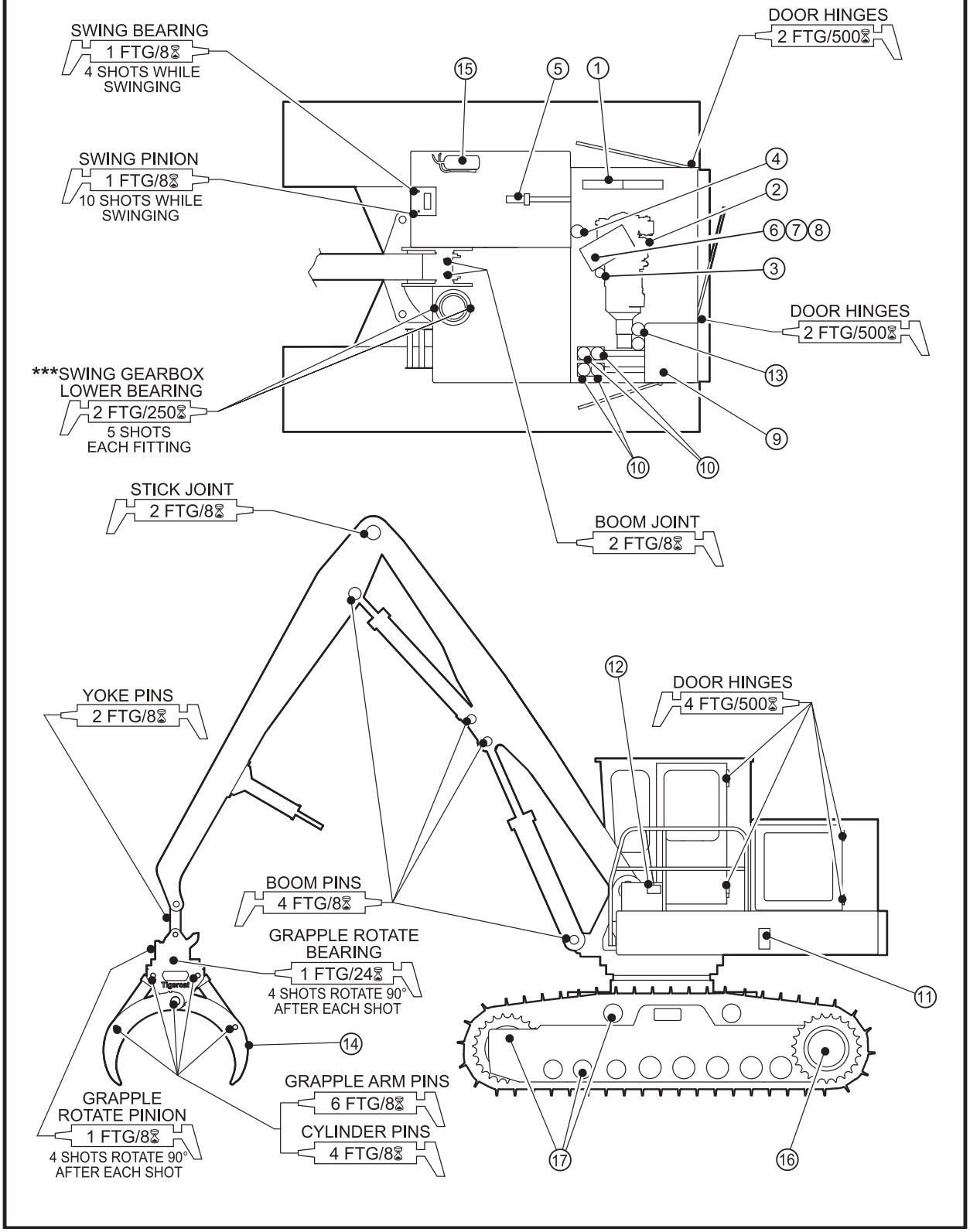


OIL TYPE
CITGO
MYSTICK HVI 32
MYSTICK HVI 46
MYSTICK HVI 68
CHEVRON
RYKON PREMIUM 32
RYKON PREMIUM 46
RYKON PREMIUM 68
ESSO / EXXON
UNIVIS N22
UNIVIS N32
UNIVIS N46
UNIVIS N68
IRVING OIL
HYDRAULIC LP 22
HYDRAULIC LP 32
HYDRAULIC LP 46
HYDRAULIC LP 68
MOBIL
MOBIL DTE 12M (ISO 22)
MOBIL DTE 13M (ISO 32)
MOBIL DTE 15M (ISO 46)
MOBIL DTE 16M (ISO 68)
PETRO-CANADA
HYDREX MV 22
HYDREX MV 36
HYDREX MV 60
SHELL
TELLUS T22
TELLUS T32
TELLUS T46
TELLUS T68
TEXACO
RANDO HDZ 22
RANDO HDZ 32
RANDO HDZ 46
RANDO HDZ 68

⚠ CAUTION OPERATING MACHINE OUTSIDE LIMITS SHOWN WILL RESULT IN FAILURE OF HYDRAULIC COMPONENTS

5168AR03

MACHINE SERIAL NUMBER 250T0501 to 250T0580



Tigercat® T250B Loader
SERVICE AND LUBRICATION POINTS

REFER TO **Tigercat®** OPERATOR'S MANUAL FOR ADDITIONAL INFORMATION

SERVICE POINT NO.	ITEM	SERVICE EVERY						CAPACITY			DESCRIPTION
		8	125	250	500	1000	2000	LITER	US GAL	QTY	
1	COOLING SYSTEM	CHK	CHANGE COOLANT EVERY 2 YEARS					34	9		60/40 ANTIFREEZE/DISTILLEDWATER **
2	ENGINE OIL AND FILTER CUMMINS 'B'	CHK •						•	•		• SEE ENGINE MANUFACTURER'S MAINTENANCE MANUAL FOR PROCEDURES, CAPACITIES AND REPLACEMENT INTERVALS
3	FUEL FILTER (ENGINE)			REP						1	
4	FUEL/WATER SEPARATOR	DRN		REP						1	
5	INTANK FUEL STRAINER					CHK				1	DRAIN TANK, CLEAN OR REPLACE AS NECESSARY
6	AIR CLEANER PRIMARY ELEMENT	CHK								1	CHECK FILTER RESTRICTION INDICATOR. REFER TO 8 HOUR SCHEDULED MAINTENANCE FOR DETAILS.
	AIR CLEANER SAFETY ELEMENT	CHK								1	
7	AIR CLEANER UNLOADER VALVE	CHK				REP				1	REFER TO OPERATOR'S MANUAL SECTION 2 FOR DETAILS
8	AIR INTAKE CONNECTIONS	CHK					REP			1	CHECK FOR LOOSE CLAMPS AND DAMAGED RUBBER COMPONENTS. REPLACE RUBBER COMPONENTS.
9	HYDRAULIC TANK	CHK					D/R	250	66		DRAIN AND REFILL AS REQ'D BY SEASONAL OIL CHANGE. REFER TO APPROVED HYD. OILS
10	RETURN FILTERS † . 3 STANDARD FILTERS . 1 WATER ABSORBING FILTER ON LATER MACHINES		CHK		REP					4	CHECK FILTER RESTRICTION INDICATOR, ON HYDRAULIC OIL RETURN MANIFOLD, WITH ENGINE RUNNING AT HIGH IDLE WITH OIL FLOW
11	PRESSURE FILTER, PILOT †				REP					1	
12	SWING GEARBOX	CHK			D/R						HALF FILL RESERVOIR-SAE 75W90 EP OIL
13	SWING PUMP CHARGE PRESSURE FILTER				REP					1	
14	GRAPPLE, **Tigercat**	SEE LUBRICATION POINTS DIAGRAM									
	GRAPPLE, OTHER MANUFACTURERS	SEE MANUFACTURER'S MAINTENANCE SCHEDULE									
15	FIRE EXTINGUISHER			CHK						1	TURN TO MIX CONTENTS
16	TRACK DRIVE GEARBOX		CHK			D/R		6	1.5	2	CHECK IN HORIZONTAL POSITION FILL WITH SAE 75W90 SYNTHETIC GEAR OIL
17	TRACK ROLLERS & IDLERS				CHK			7.6	2	1	IF LEAKING REMOVE AND REPAIR. FILL WITH SAE 30 OR 40 OIL OR GREASE. REFER TO 500 HOURS SCHEDULED MAINTENANCE FOR DETAILS.

LEGEND

2 FTG/125⌛ LUBRICATION POINT WITH A DESIGNATED NUMBER OF FITTINGS (2 FTG) AND HOURS BETWEEN SERVICING (125⌛). EXCEPT WHERE SPECIFIED, PURGE WITH LITHIUM BASED EP2 GREASE CONTAINING MOLYBDENUM DISULFIDE "MOLY".

** ANTIFREEZE MUST MEET GM 6038M SPECIFICATIONS - SEE ENGINE MANUFACTURER'S MAINTENANCE MANUAL.

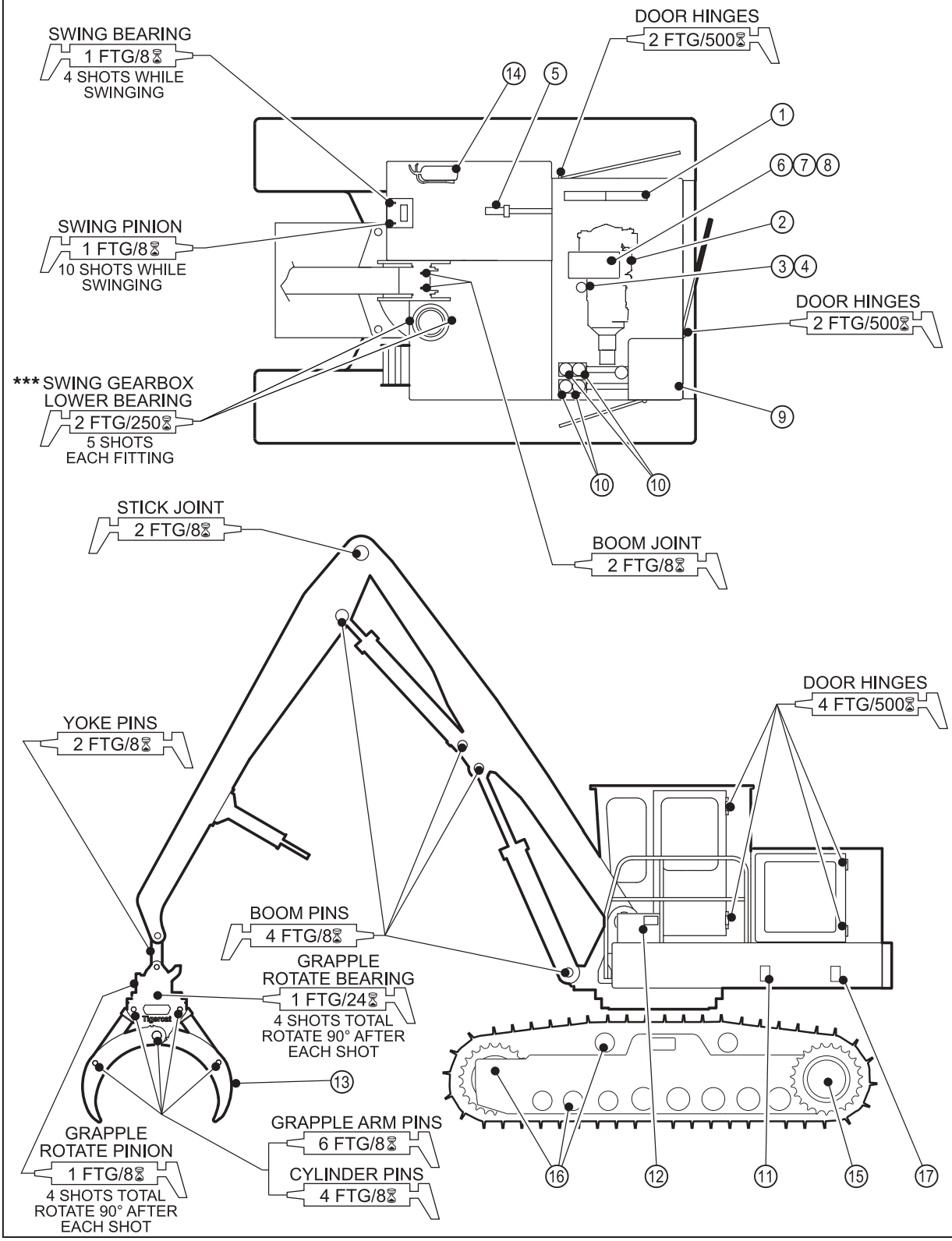
*** DO NOT USE A POWER GREASER. REFER TO SCHEDULED MAINTENANCE: EVERY 250 HOURS IN SECTION 3 OF THE MANUAL FOR DETAILED INSTRUCTIONS. INCORRECT LUBRICATION MAY RESULT IN GEARBOX FAILURE.

† USE OF FILTERS OTHER THAN GENUINE Tigercat REPLACEMENT FILTERS IS NOT RECOMMENDED.

⌛ ….. HOURS
CHK ….. CHECK
REP ….. REPLACE
DRN ….. DRAIN
D/R ….. DRAIN & REFILL

32479B R1

MACHINE SERIAL NUMBER 250T0581 AND UP



Tigercat® T234/T250B Loader On Tracks
SERVICE AND LUBRICATION POINTS

THIS CHART IS INTENDED FOR A QUICK REFERENCE.
ADDITIONAL SERVICE INFORMATION IS CONTAINED IN THE Tigercat® OPERATOR'S MANUAL FOR THIS MACHINE.

SERVICE POINT NO.	ITEM	SERVICE EVERY						CAPACITY			DESCRIPTION
		8	125	250	500	1000	2000	LITER	US GAL	QTY	
1	COOLING SYSTEM	CHK	CHANGE COOLANT EVERY 2 YEARS					30	8		MIXTURE 50% DISTILLED WATER 50% ANTIFREEZE (GM 6038M SPEC.)
2	ENGINE OIL AND FILTER CUMMINS 'B'	CHK •						•	•		• SEE ENGINE MANUFACTURER'S MAINTENANCE MANUAL FOR PROCEDURES, CAPACITIES AND REPLACEMENT INTERVALS
3	FUEL FILTER (ENGINE)			REP						1	
4	FUEL/WATER SEPARATOR	DRN		REP						1	
5	INTANK FUEL STRAINER					CHK				1	DRAIN TANK, CLEAN OR REPLACE AS NECESSARY
6	AIR INTAKE PRIMARY FILTER ELEMENT	CHK								1	CHECK FILTER RESTRICTION INDICATOR. REFER TO 8 HOUR SCHEDULED MAINTENANCE FOR DETAILS.
	AIR INTAKE SAFETY FILTER ELEMENT	CHK								1	
7	AIR CLEANER UNLOADER VALVE	CHK				REP				1	REFER TO OPERATOR'S MANUAL SECTION 2 FOR DETAILS
8	AIR INTAKE CONNECTIONS	CHK					REP			1	CHECK FOR LOOSE CLAMPS AND DAMAGED RUBBER COMPONENTS. REPLACE RUBBER COMPONENTS.
9	HYDRAULIC RESERVOIR	CHK					D/R	250	66		DRAIN AND REFILL AS REQUIRED BY SEASONAL OIL CHANGE. SEE APPROVED HYDRAULIC OILS IN SERVICE MANUAL.
10	RETURN FILTERS (4 ELEMENTS) 3 STANDARD FILTERS 1 WATER ABSORBING FILTER		CHK		REP †					4	CHECK FILTER RESTRICTION INDICATOR, ON FILTER HEADS WITH ENGINE RUNNING AT HIGH IDLE AND WITH OIL FLOW
11	PRESSURE FILTER, PILOT				REP †					1	
12	SWING GEARBOX	CHK			D/R			♦	♦	1	♦ HALF FILL RESERVOIR WITH SAE 75W90 EP OIL
13	GRAPPLE, **Tigercat**	SEE LUBRICATION POINTS DIAGRAM									
	GRAPPLE, OTHER MANUFACTURERS	SEE MANUFACTURER'S MAINTENANCE SCHEDULE									
14	FIRE EXTINGUISHER			CHK						1	TURN TO MIX CONTENTS
15	TRACK DRIVE GEARBOX		CHK			D/R		6	1.5	2	CHECK IN HORIZONTAL POSITION. FILL WITH SAE 75W90 SYNTHETIC GEAR OIL
16	TRACK ROLLERS & IDLERS				CHK			7.6	2	1	CHECK FOR OIL LEAKAGE. FILL WITH SAE 30 OR 40 IF REQUIRED
17	SWING PUMP CHARGE PRESSURE FILTER				REP					1	

LEGEND

2 FTG/125⌛ LUBRICATION POINT WITH A DESIGNATED NUMBER OF FITTINGS (2 FTG) AND HOURS BETWEEN SERVICING (125⌛). EXCEPT WHERE SPECIFIED, PURGE WITH LITHIUM BASED EP2 GREASE CONTAINING MOLYBDENUM DISULFIDE "MOLY".

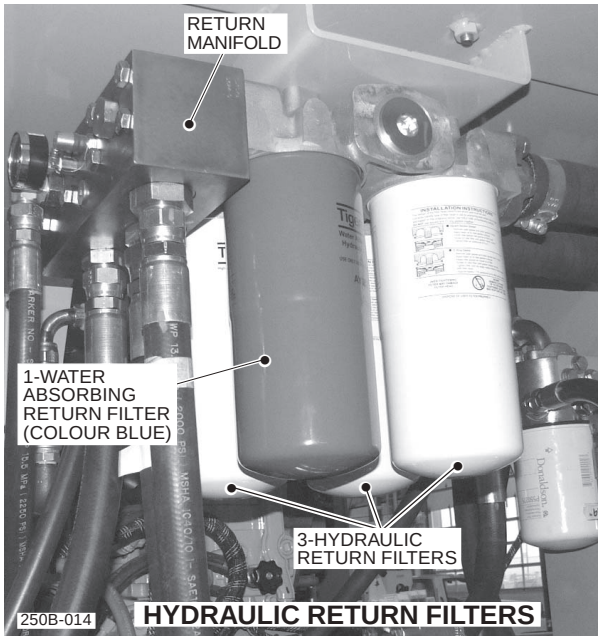
** ANTIFREEZE MUST MEET GM 6038M SPECIFICATIONS - SEE ENGINE MANUFACTURERS MAINTENANCE MANUAL.

*** DO NOT USE A POWER GREASER. REFER TO SCHEDULED MAINTENANCE: EVERY 250 HOURS IN SECTION 3 OF THE MANUAL FOR DETAILED INSTRUCTIONS. INCORRECT LUBRICATION MAY RESULT IN GEARBOX FAILURE.

† USE OF FILTERS OTHER THAN GENUINE TIGERCAT REPLACEMENT FILTERS IS NOT RECOMMENDED.

⌛ ..... HOURS
CHK ..... CHECK
REP ..... REPLACE
DRN ..... DRAIN
D/R ..... DRAIN AND REFILL

37532B R2



HYDRAULIC RETURN FILTERS

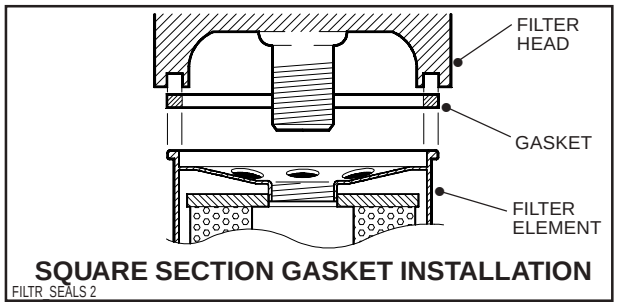
HYDRAULIC OIL RETURN FILTERS

The majority of return oil entering the hydraulic tank passes through 4 spin-on hydraulic oil filters. One of the filters is a water absorbing filter (color blue) which is in place to assist with the removal of unwanted moisture from the hydraulic oil (the filters are rated 10 micron abs).

Each filter head has a bypass valve with a 25 psi cracking pressure so that oil can bypass the filters if they become restricted. The "in" side of the filter heads are connected to a return manifold. A filter restriction indicator and an oil sampling connector are mounted onto the manifold. To check the condition of the filter elements; With the hydraulic oil at **normal operating temperature**, place engine throttle control to FULL and with **no** machine functions operating, the filter restriction indicator should be in the GREEN zone. If the pointer is in the RED zone replace all four filter elements.

Changing the filters:

1. Ensure Loader is on level ground with stabilizers down. Lower grapple to ground and stop engine.
2. Wipe clean the area around the filter and head.
3. Place rags below to catch the spillage of oil.
4. Wearing face protection (in case of an oil squirt), unscrew the old filter. Dispose of old filter and any oil properly.
5. The new **Tigercat** filter is supplied with two gaskets enclosed, examine the filter head closely to determine which gasket should be used and follow the instructions to ensure proper installation.



SQUARE SECTION GASKET INSTALLATION

■ **Square Section Gasket**

Remove used gasket and clean groove in head.

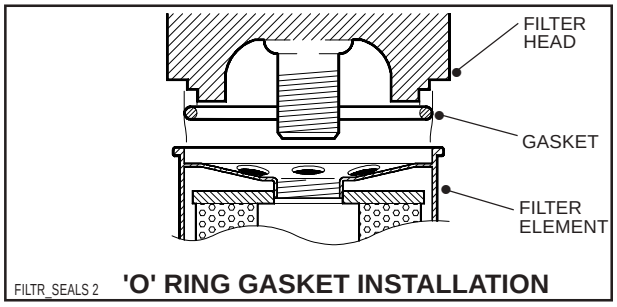
Apply clean oil to new gasket surfaces.

Install new gasket into groove in filter head.

Screw on new filter until gasket makes contact.

Tighten filter an additional 3/4 turn.

DO NOT use bottom nut for filter installation or damage/leakage may result. Bottom nut is to assist in **filter removal only**.



'O' RING GASKET INSTALLATION

● **'O' Ring Gasket**

Remove used gasket and clean gasket seat in head.

Apply clean oil to new gasket surfaces.

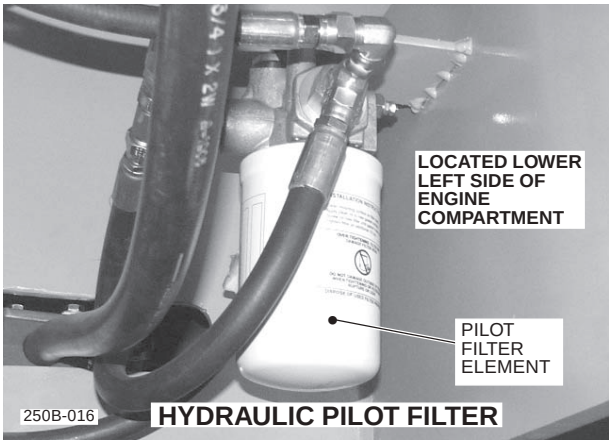
Install new gasket on inside lip of filter.

Screw on new filter until gasket makes contact.

Tighten filter until top edge makes metal to metal contact with filter head. (approximately 1 1/2 additional turns after gasket contact)

DO NOT use bottom nut for filter installation or damage/leakage may result. Bottom nut is to assist in **filter removal only**.

6. Start the engine and check for leaks.



PILOT PRESSURE FILTER

This single full flow filter, is mounted in the output line between the pilot pump and the pilot manifold. For service and replacement intervals see SERVICE AND LUBRICATION CHART in THIS SECTION.

CASE DRAIN STRAINER

The case drain strainer is used to filter all case drain oil from the pumps and motors before it returns to the reservoir. For service and replacement intervals see SERVICE AND LUBRICATION CHART in THIS SECTION.

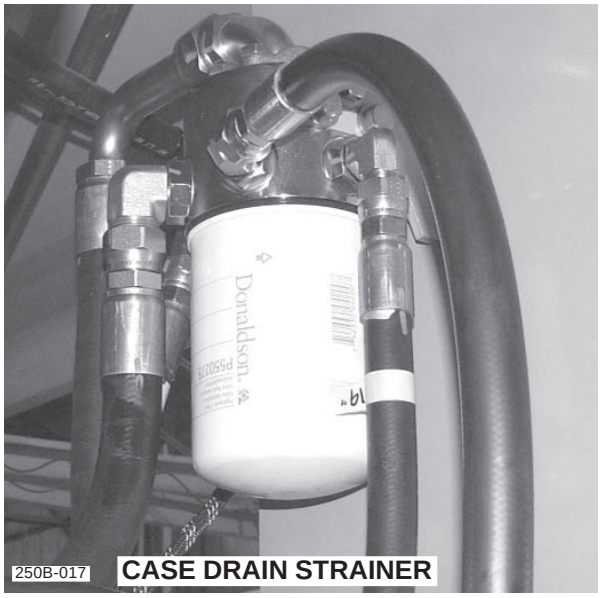
The strainer element requires no regular maintenance over the life of the machine. This element requires maintenance only in the case of damage or contamination due to a hydraulic pump or motor failure.

IMPORTANT:

The strainer element is NOT a filter element. Always use the correct replacement element. Use of an incorrect (filter type) element will result in pump damage.

SWING PUMP CHARGE PRESSURE FILTER

The swing pump charge pressure filter is a full flow filter mounted on a filter head with built-in bypass. The filter is located in the output side of the charge pump. For service and replacement intervals see SERVICE AND LUBRICATION CHART in THIS SECTION.



Changing the filter or strainer:

1. Ensure Loader is on level ground with stabilizers down. Lower grapple to ground and stop engine.
2. Wipe clean the area around the filter and head.
3. Place rags below to catch the spillage of oil.
4. Wearing face protection (in case of an oil squirt), unscrew the old filter. Dispose of old filter and any oil properly.
5. Check the seating area for the gasket on the filter head and wipe it clean.
6. The new filter has an attached gasket, apply hydraulic oil to the gasket surface.
7. Screw on the new filter until the gasket makes contact with the seat in the filter head.
8. Turn filter an additional **1/2 turn by hand** to tighten.

   DO NOT use bottom nut for filter installation or damage/leakage may result. Bottom nut is to assist in **filter removal only**.
9. Start the engine and check for leaks.

IMPORTANT

Contaminated hydraulic fluid can lead to premature failure of hydraulic components and costly repairs. Filters must be replaced at the recommended time intervals, Refer to SCHEDULED MAINTENANCE in THIS SECTION.

Use of hydraulic oil filters other than the Tigercat brand could lead to severe wear and rapid failure of hydraulic system components.

Filters that are an integral part of the engine (fuel and lubricating oil) should be serviced and replaced according to the engine manufacturer's operation and maintenance manual.

In addition to the LUBRICATION AND MAINTENANCE SCHEDULE, the following instructions should also be noted.

AIR CLEANER MAINTENANCE

The most common and most damaging air intake servicing problems are:

OVER SERVICING

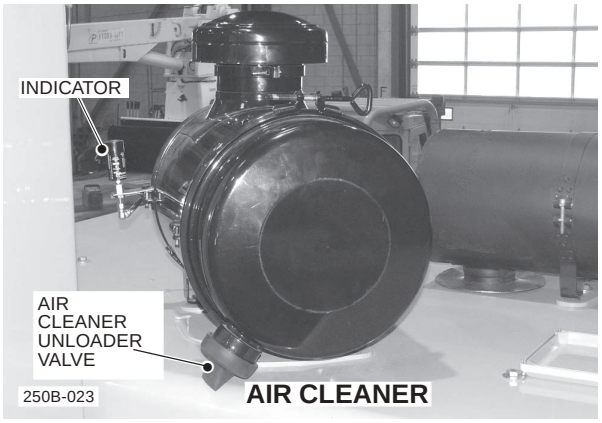
Filter elements increase in dust cleaning efficiency as dust builds up on the media. Looks can be deceiving. A filter that is dirty is actually more efficient than one that is clean. A filter with dust build up on the media reaches nearly 100% dust cleaning efficiency. Only when a filter is so clogged with dirt that air restriction goes beyond the engine manufacturer's guidelines, should be replaced.

IMPROPER SERVICING

Engine exposure to dust during servicing is the largest single factor contributing to engine damage due to dust. Abrasive dust can easily enter the intake system once the air cleaner element has been removed for replacement. The safety element reduces the risk, however it must also be replaced at every third primary element change.

IMPORTANT STEPS TO FOLLOW

1. Release the seal gently to reduce the amount of dust dislodged.
2. Avoid dislodging dust from filter element(s) by gently pulling the element off the outlet tube.
3. Always clean the sealing surface of the outlet tube before inserting a new filter element.
4. Always clean the inside of the outlet tube.
5. Check the old filter, it can help you detect foreign material on the sealing surface that may be causing leakage.
6. Inspect the new filter for damage.
7. Insert the new filter properly. Apply pressure to the outer rim of the filter, not the flexible center.
8. Check connection and ducts for air tight fit. Ensure that all clamps, bolts and connections are tight. Leaks here send dust directly to the engine.

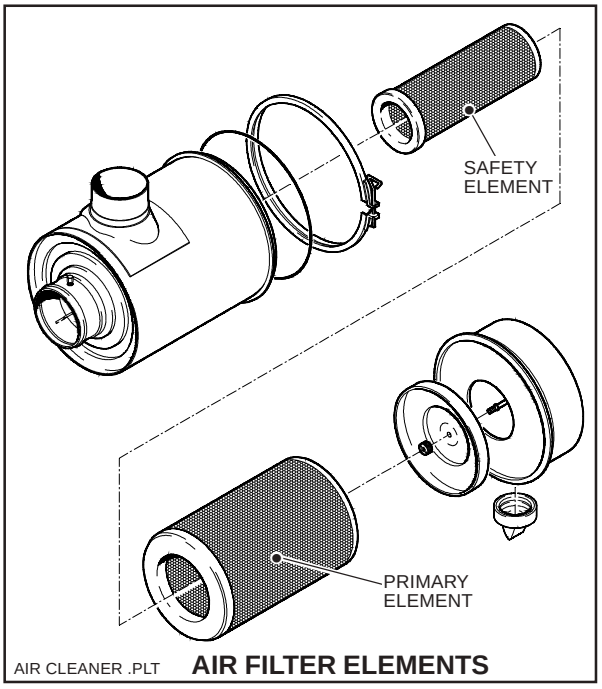


AIR CLEANER

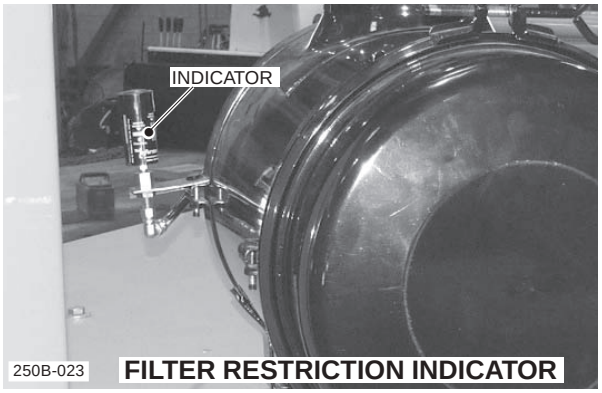
AIR CLEANER

The air cleaner on this machine uses 2 filter elements, a primary element and a safety element.

To ensure maximum engine protection, it is important that the elements be serviced correctly and at proper servicing intervals.



AIR FILTER ELEMENTS

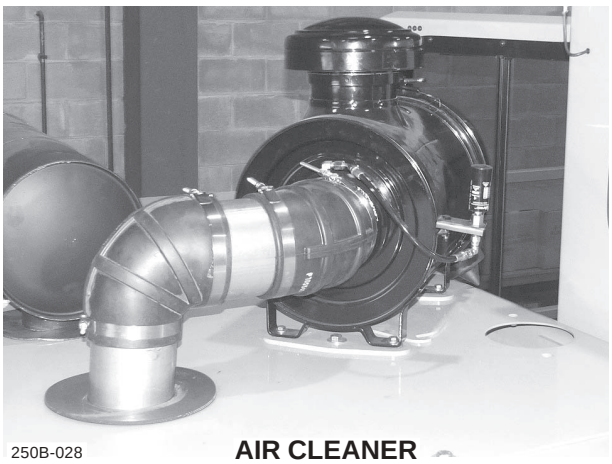


FILTER RESTRICTION INDICATOR

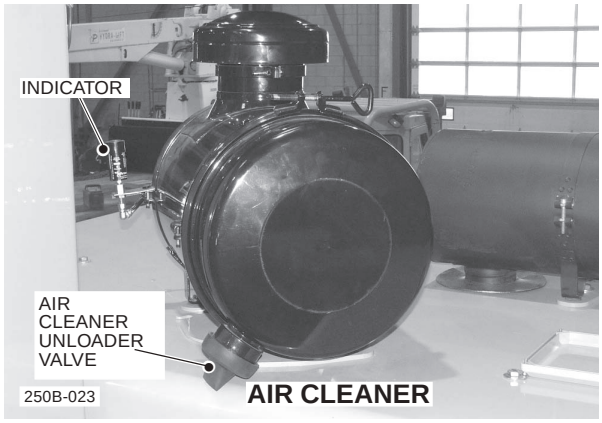
FILTER RESTRICTION INDICATOR

A filter restriction indicator is located in the engine enclosure to the left of the frame access panel. The indicator is remote mounted and is connected to the outlet side of the air filter with a 1/4" diameter hose. Replace the primary air filter when the indicator shows RED. This indicator provides a continuous reading whether the engine is running or is shut down. After replacing the filter, reset the indicator by pressing the reset button.

NOTE: Replace the safety element every third primary filter change.



AIR CLEANER



AIR CLEANER

AIR CLEANER UNLOADER VALVE

This rubber valve on the tube of the air cleaner housing should be checked at the beginning of every shift. (8 hours) If this valve is missing, damaged or has become hard, it will cause the air cleaner to become ineffective. The unloader valve should be replaced every 1000 hours.

Remove the unloader valve from the tube of the air cleaner housing.

Check and clean the valve. A good valve should be soft and flexible. If it is plugged, then check the filter elements, they may need replacing. Re-attach the valve to the tube.

The valve should suck closed at engine warm-up speed.

When operating in high dust conditions this valve should be checked and squeezed every 2 hours to release dust buildup.

INTAKE TUBING AND JOINTS

Check all air intake system components, rubber elbows, connector hoses, tubes and clamps for damage, hardening, wear, cracks, leaks, loose clamps or loose hanger bracket hardware and repair or replace immediately.

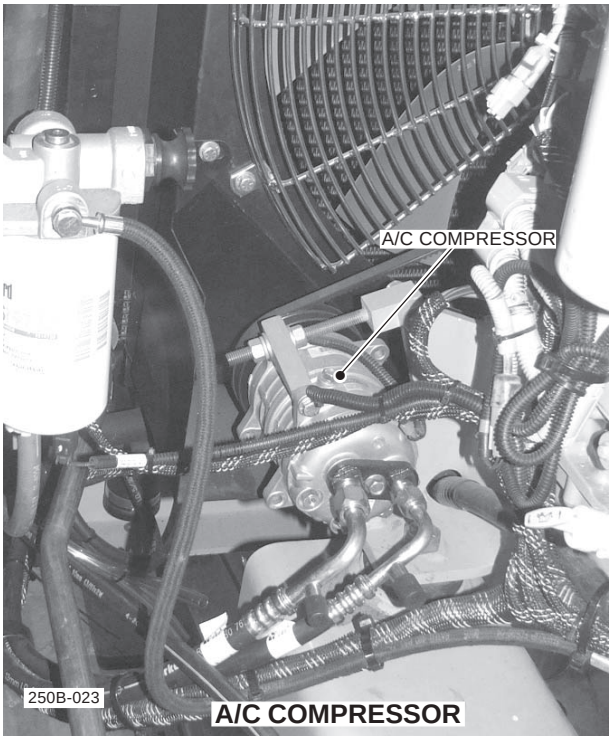
Replace all air intake rubber components such as elbows and connectors every 2000 hours - High temperatures in this area can cause the rubber to harden.

CHECKING AIR CONDITIONING SYSTEM

IMPORTANT: It is recommended that during cold weather when the A/C system is not in use, that it be run for a period of 5 minutes every two weeks to circulate oil to all components of the system.

R134a REFRIGERANT	PAG OIL (polyalkylene glycol)
2 LBS. 15 OZ.	2 OZ.

Any service work must be performed by authorized A/C technicians. The system should be charged with 2 lbs. 12 oz. of R134a refrigerant. At least 2 oz. of PAG (polyalkylene glycol) oil should be present in the system and must be used on 'O' rings and fittings during assembly.

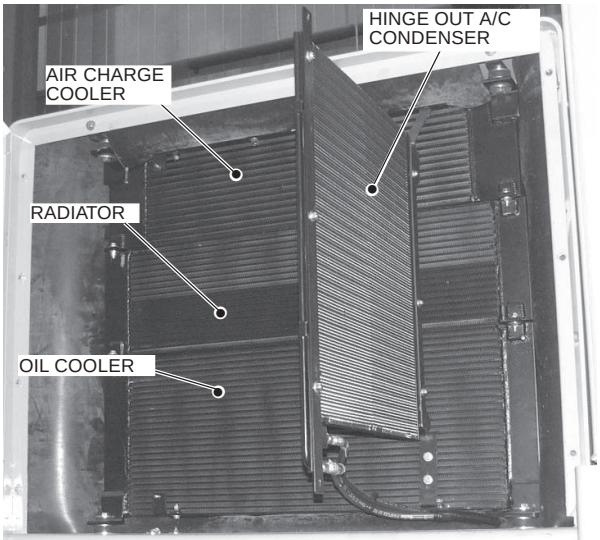


A/C COMPRESSOR

CAUTION

If using compressed air for cleaning, use at 30 psi. or less.

• Always use personal protective equipment to guard against flying debris.



250B-009 **CHECK A/C CONDENSER CORE**

Use the following checklist to maintain system between service intervals. The compressor and charge valves are located on the left side of the engine and accessible through the engine compartment door. The receiver dryer is located in the lower engine compartment beside the front left engine mount and accessible from either underneath the engine compartment or through the engine compartment door.

Perform the following checks on system:

a. Check and adjust compressor drive belt tension. Do not over tighten.

b. Check fresh air filter and re-circulating air filter. Clean or replace as required.

c. Check to see that compressor clutch will engage.

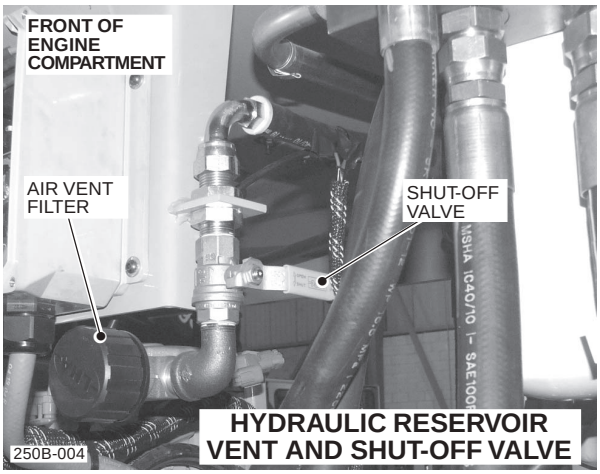
d. Check blower operation and air vents.

e. Check the condenser core for dirt and debris.

SERVICING HYDRAULIC PRESSURIZATION SYSTEM

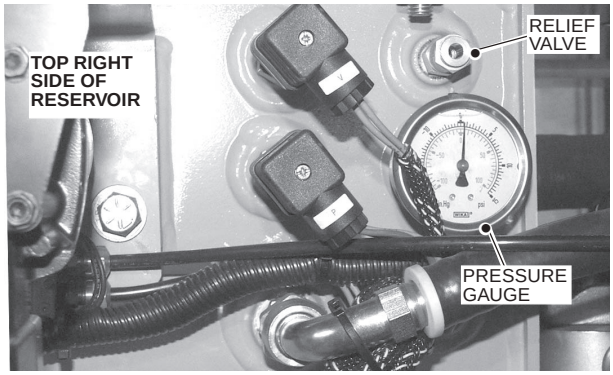
Refer also to HYDRAULIC PRESSURIZATION SYSTEM in SECTION 2 of the OPERATOR'S MANUAL for more information on this system and its operation.

SET HYDRAULIC TANK RELIEF VALVE WITH AIR COMPRESSOR CHARGING SYSTEM

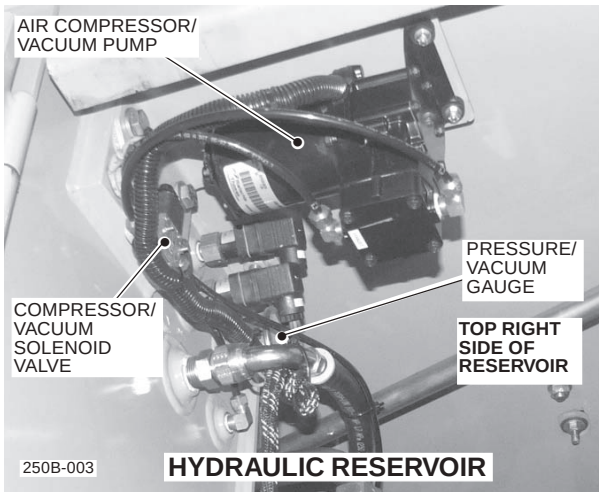


1. Open the air vent ball valve to vent air from the tank.
2. Momentarily remove the rubber nipple on top of the pressure gauge to release any trapped air and insert back into place. Do not cut the rubber nipple off as indicated on the gauge. The gauge should now read 0 psi.
3. Close air vent ball valve and turn relief valve adjustment fully IN.
4. Hold down the charge tank button on the instrument panel, or use the hand fill pump to pressurize the hydraulic tank.

   If using the hand fill pump, remove hose clamp from end of suction hose, remove hose from stored position and operate hand pump until a gauge reading of 11-12 psi is obtained. Close oil fill shut-off valve, place hose in stored position and secure with the hose clamp.



5. Slowly turn the relief valve OUT until the pressure gauge reading drops to 10 psi. Tighten the relief valve locking nut.



6. Watch the tank pressure gauge for several minutes for any indications of a loss in system pressure.
7. If tank pressure falls check all fittings and connections for leaks. NPT connectors must be fastened using pipe sealant to prevent leakage. A properly installed system should be capable of maintaining constant pressure over night.

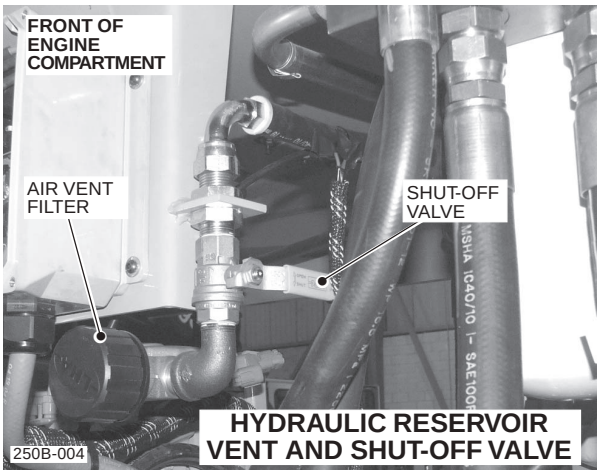
   NOTE: The tank pressure can decrease without substantial leaks due to the contraction of air within the hydraulic tank. This may occur when the air and oil temperature within the tank decreases.

VACUUM PUMP

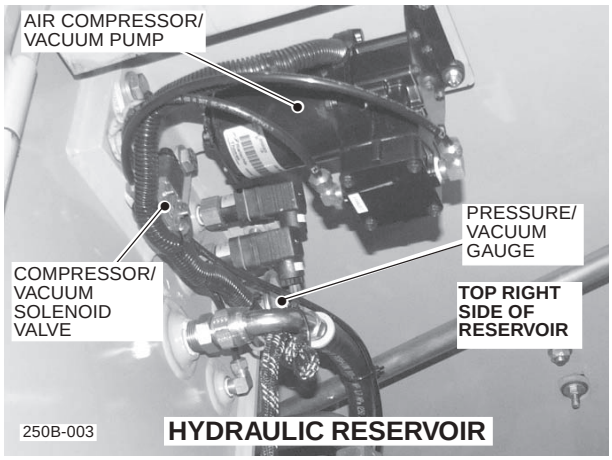
Machines are equipped with a vacuum pump to "hold" the oil in the hydraulic tank when work is being done on the hydraulic system. This eliminates the need to drain the hydraulic reservoir before servicing pumps and other hydraulic components. The air compressor used for hydraulic reservoir pressurization also acts as a vacuum pump for this purpose.

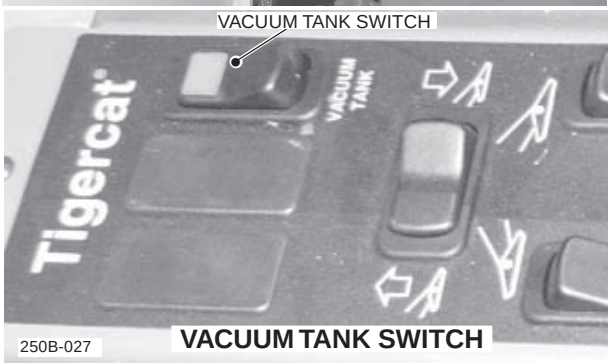
SERVICE NOTE:
Before doing any work on the hydraulic system follow the steps below:

1. Turn the start key to the OFF position and remove the key. **NOTE:** The key switch must be in the OFF position to provide electrical power to the vacuum pump circuit and maintain a constant vacuum.



2. Relieve any pressure in the hydraulic tank by OPENING and CLOSING the *air vent ball valve*.





3. Turn the *vacuum pump switch* ON.

   NOTE:
   The vacuum pump will start and stop as required to maintain a constant vacuum.

4. Perform all required work on the hydraulic system.
5. Turn the *vacuum pump switch* OFF.
6. Relieve the vacuum in the hydraulic tank by OPENING and CLOSING the *air vent ball valve*.

IMPORTANT

It is recommended that the start key be removed while servicing the hydraulic system.

Do not attempt to START the machine or turn key to the RUN position. The vacuum pump only operates when the key switch is in the OFF position.

After using pump to perform service work on pumps or motors, charge tank and purge all air out of the pump and motor case before start-up.

Do not leave machine unattended or overnight with vacuum pump on.

TORQUE CHART

LOCATION	THREAD DIAMETER	TORQUE (LUBRICATED)	
		lbf-ft	Nm
Cylinders			
Piston nut, main boom cylinder	2 1/2"-12 UNF (GC)	1640	2222
Piston nut, stick cylinder	2 1/2"-12 UNF (GC)	1640	2222
Piston nut, heel cylinder	2"-12 UNF (GC)	1500	2035
Piston nut, grapple cylinder	1 3/4"-12 UNF (GC)	1750	2355
Gland, grapple cylinder	4 1/2" I/D CYLINDER	450	607
Keeper plate bolts, heel cylinder	3/4"-10 UNC (G8)	275-325	370-440
Keeper plate bolts, Main boom cylinder	7/8"-14 UNF (G8)	300-325	405-440
Keeper plate bolts, Stick boom cylinder	3/4"-16 UNF (G8)	240-270	323-363
Boom joint and cylinder pin retaining bolts	3/4"-10 UNC (G8)	282-310	393-420
Main and Stick boom pin retaining nut	2"-12 UNF (G8)	400	540
Heel to Stick boom pin retaining nut	1 3/4"-12 UNF (G8)	400	540
Cab securing bolts	7/8"-9 UNC (G8)	400-450	540-610
Swing bearing bolts	7/8"-9 UNC (G8)	400-450	540-610
Swing gearbox mounting bolts	M20-2.5 (10.9)	400	540
Swing motor mounting bolts	M18-2.5 (12.9)	200	275
Engine mounting			
Bolts, bracket/mount to chassis	7/8"-9 UNC (G8)	400-450	540-610
Bolts, bracket to engine	M12-1.75 (10.9)	75	100
Engine cooling fan mounting bolts	M10-1.5 (12.9)	25	30
Pump drive			
Drive plate to flywheel	3/8"-16 UNC (G8)	40	54
Bell housing to engine	M10-1.5 (10.5)	45	60
Undercarriage			
Track shoe bolts	3/4 UNF	T/T*	T/T*
Idler bolts	M16-2 (10.9)	175	235
Roller mounting bolts	7/8"-9 UNC (G8)	450	610
Sprocket bolts	M20-2.5 (10.9)	380	515
Gearbox mounting bolts	3/4"-10UNC (G8)	310	417
Drive motor mounting bolts	M12-1.75 (10.9)	80	110

***T/T** represents **Torque-Turn**, this is a method of torquing the track shoe bolts. Refer to SECTION 11 in the Tigercat SERVICE MANUAL for a complete description on this method of applying torque.

Torque values pertaining to the engine and attachment are provided in the appropriate manuals.

GENERAL TORQUE SPECIFICATIONS

IMPERIAL

The torque values listed below are for general use only. DO NOT use these values if a different torque value or tightening procedure is shown for a specific application.

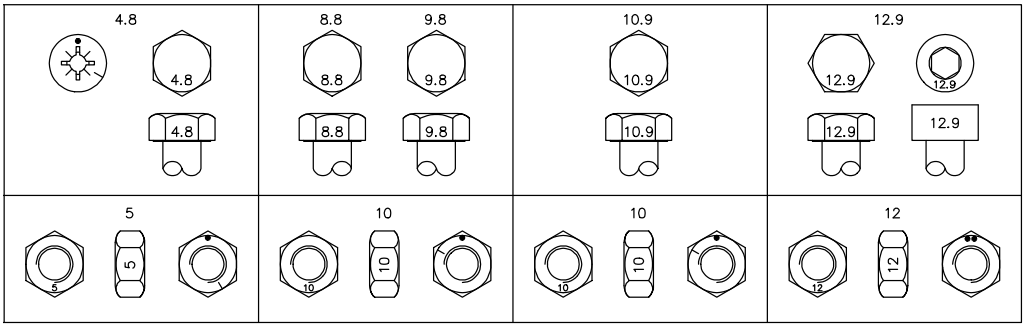
 **GRADE 8 BOLTS**

 **GRADE 5 BOLTS**

IMPERIAL BOLT TORQUE SPECIFICATIONS

GRADE 8 BOLTS					GRADE 5 BOLTS				
COARSE	DRY		LUBRICATED		COARSE	DRY		LUBRICATED	
THREAD	lbf-ft	Nm	lbf-ft	Nm	THREAD	lbf-ft	Nm	lbf-ft	Nm
1/4" - 20	11 - 12	15 - 16	8 - 10	11 - 13	1/4" - 20	7- 8	10 - 11	8 - 10	11 - 13
5/16" - 18	26 - 30	35 - 40	20 - 28	27 - 38	5/16" - 18	14 - 18	19 - 24	10 - 15	13 - 20
3/8" - 16	44 -48	60 - 65	33 - 36	45 - 49	3/8" - 16	31 - 34	42 - 46	23 - 25	31 - 34
7/16" - 14	70 - 77	95 - 104	52 - 57	71 - 77	7/16" - 14	49 - 54	66 - 73	37 - 41	50 - 55
1/2" - 13	106 - 117	144 - 158	80 - 88	109 - 119	1/2" - 13	75 - 83	102 - 112	57 - 63	77 - 85
9/16" - 12	153 - 168	208 - 228	115 - 127	156 - 172	9/16" - 12	109 - 120	148 - 162	82 - 90	111 - 122
5/8" - 11	212 - 233	288 - 316	159 - 175	216 - 237	5/8" - 11	150 - 165	204 - 223	113 - 124	152 - 168
3/4" - 10	376 - 414	510 - 561	282 - 310	393 - 420	3/4" - 10	266 - 293	360 - 397	200 - 220	271 - 298
7/8" - 9	606 - 667	822 - 904	455 - 501	617 - 679	7/8" - 9	394 - 433	535 - 586	296 - 326	402 - 441
1" - 8	909 - 1000	1233 - 1355	682 - 750	925 - 1016	1" - 8	591 - 649	802 - 879	443 - 489	601 - 663
1 1/8" - 7	1288 - 1417	1746 - 1921	966 - 1062	1310 - 1441	1 1/8" - 7	794 - 873	1077 - 1183	596 - 656	808 - 889
1 1/4" - 7	1817 - 1999	2464 - 2710	1360 - 1496	1844 - 2027	1 1/4" - 7	1120 - 1232	1519 - 1670	840 - 924	1139 - 1252
FINE	DRY		LUBRICATED		FINE	DRY		LUBRICATED	
THREAD	lbf-ft	Nm	lbf-ft	Nm	THREAD	lbf-ft	Nm	lbf-ft	Nm
1/4" - 28	13 - 14	18 - 19	10 - 13	14 - 17	1/4" - 28	9 - 10	12 - 13	9 - 10	12 - 13
5/16" - 24	23 - 28	31 - 38	18 - 25	25 - 33	5/16" - 24	17 - 22	23 - 29	16 - 20	21 - 27
3/8" - 24	49 - 54	67 - 73	37 - 41	50 - 55	3/8" - 24	35 - 39	48 - 53	26 - 29	35 - 39
7/16" - 20	78 - 86	106 - 116	58 - 64	79 - 86	7/16" - 20	55 - 61	75 - 83	41 - 45	56 - 61
1/2" - 20	120 - 132	163 - 179	90 - 99	122 - 134	1/2" - 20	85 - 94	116 - 127	64 - 70	87 - 95
9/16" - 18	171 - 188	232 - 255	128 - 141	174 - 191	9/16" - 18	121 - 133	164 - 180	91 - 100	124 - 135
5/8" - 18	240 - 264	326 - 358	180 - 198	244 - 268	5/8" - 18	170 - 187	231 - 253	128 - 141	174 - 191
3/4" - 16	420 - 462	570 - 626	315 - 347	427 - 470	3/4" - 16	297 - 327	403 - 443	223 - 245	303 - 332
7/8" - 14	668 - 735	906 - 996	501 - 550	679 - 745	7/8" - 14	434 - 477	589 - 646	326 - 359	442 - 486
1" - 14	995 - 1096	1359 - 1486	746 - 821	1012 - 1113	1" - 14	646 - 711	876 - 965	484 - 534	657 - 724
1 1/8" - 12	1445 - 1590	1960 - 2155	1083 - 1191	1469 - 1613	1 1/8" - 12	891 - 980	1208 - 1328	668 - 735	906 - 996
1 1/4" - 12	2012 - 2213	2728 - 2997	1509 - 1660	2046 - 2250	1 1/4" - 12	1240 - 1364	1682 - 1849	931 - 1024	1262 - 1387

METRIC



METRIC BOLT TORQUE SPECIFICATIONS

SIZE	CLASS 4.8				CLASS 8.8 OR 9.9				CLASS 10.9				CLASS 12.9			
	LUBRICATED		DRY		LUBRICATED		DRY		LUBRICATED		DRY		LUBRICATED		DRY	
	Nm	lbf-ft	Nm	lbf-ft	Nm	lbf-ft	Nm	lbf-ft	Nm	lbf-ft	Nm	lbf-ft	Nm	lbf-ft	Nm	lbf-ft
M6	4.8	3.5	6.0	4.5	9.0	6.5	11.0	8.5	13.0	9.5	17.0	12.0	15.0	11.5	19.0	14.5
M8	12.0	8.5	15.0	11.0	22.0	16.0	28.0	20.0	32.0	24.0	40.0	30.0	37.0	28.0	47.0	35.0
M10	23.0	17.0	29.0	21.0	43.0	32.0	55.0	40.0	63.0	47.0	80.0	60.0	75.0	55.0	95.0	70.0
M12	40.0	29.0	50.0	37.0	75.0	55.0	95.0	70.0	110.0	80.0	140.0	105.0	130.0	95.0	165.0	120.0
M14	63.0	47.0	80.0	60.0	120.0	88.0	150.0	110.0	175.0	130.0	225.0	165.0	205.0	150.0	260.0	190.0
M16	100.0	73.0	125.0	92.0	190.0	140.0	240.0	175.0	275.0	200.0	350.0	225.0	320.0	240.0	400.0	300.0
M18	135.0	100.0	175.0	125.0	260.0	195.0	330.0	250.0	375.0	275.0	475.0	350.0	440.0	325.0	560.0	410.0
M20	190.0	140.0	240.0	180.0	375.0	275.0	475.0	350.0	530.0	400.0	675.0	500.0	625.0	460.0	800.0	580.0
M22	260.0	190.0	330.0	250.0	510.0	375.0	650.0	475.0	725.0	540.0	925.0	675.0	850.0	625.0	1,075.0	800.0
M24	330.0	250.0	425.0	310.0	650.0	475.0	825.0	600.0	925.0	675.0	1,150.0	850.0	1,075.0	800.0	1,350.0	1,000.0
M27	490.0	360.0	625.0	450.0	950.0	700.0	1,200.0	875.0	1,350.0	1,000.0	1,700.0	1,250.0	1,600.0	1,150.0	2,000.0	1,500.0
M30	675.0	490.0	850.0	625.0	1,300.0	950.0	1,650.0	1,200.0	1,850.0	1,350.0	2,300.0	1,700.0	2,150.0	1,600.0	2,700.0	2,000.0
M33	900.0	675.0	1,150.0	850.0	1,750.0	1,300.0	2,200.0	1,650.0	2,500.0	1,850.0	3,150.0	2,350.0	2,900.0	2,150.0	3,700.0	2,750.0
M36	1,150.0	850.0	1,450.0	1,075.0	2,250.0	1,650.0	2,850.0	2,100.0	3,200.0	2,350.0	4,050.0	3,000.0	3,750.0	2,750.0	4,750.0	3,500.0

TORQUECHARTGENERAL.XLS

PRESSURE SETTINGS FOR T250B LOADER ON TRACKS

Engine RPM	1875 rpm	@ Full throttle (no load)
	900 rpm	@ Idle (no load)

Pilot System

Main Relief	500 psi + 1/2 turn in	@ Full throttle

Main Valve High Pressure Limiting Control

MAIN PUMP P.O.R. ('PX' port)	4500 psi	@ Full throttle
Margin Pressure ('PX' - 'PL')	375 psi	@ Full throttle

Main Valve Port reliefs

Hoist DOWN	Spool out 4.5 turns	8 Seconds
Hoist UP	Spool out 8 turns	8.5 Seconds
Stick IN	Spool out 5.25 turns	6 Seconds
Stick OUT	Spool out 7 turns	6.75 Seconds
Feed Reducer Live Heel Retract	*3300 psi	Spool out 5 turns
Feed Reducer Live Heel Extend	*3300 psi	Spool out 8 turns
Feed Reducer Grapple OPEN	*2500 psi	Spool out 4.75 turns
Feed Reducer Grapple CLOSE	*3500 psi	Spool out 8 turns
Feed Reducer Saws RETRACT	*2500 psi	Spool out 4.5 turns
Feed Reducer Saws CUT	*2500 psi	
Feed Reducer Grapple Rotate CCW (See Note 5)	*1750 psi	
Feed Reducer Grapple Rotate CW (See Note 5)	*1750 psi	
Feed Reducer Delimber OPEN	*2500 psi	Spool out 5.5 turns
Feed Reducer Grapple Saw (Option)	*3000 psi	
Feed Reducer R.H. Track Forward/Reverse	See Note 7	
Feed Reducer L.H. Track Forward/Reverse	See Note 7	
Drive Brake Release Pressure	500 psi	
Drive Begin Of Regulation (See Note 8)	3100 psi	

Note: *Pressures set at* ***Full Throttle*** *unless otherwise specified.*

** Set pressure with gauge on 'PL' port*

Cab Tilt

Cab Tilt Main Relief	3000 psi
Cab Tilt Counterbalance Valves	3500 psi

Swing Pump

Swing Pump Charge Pressure	350 psi
Pump POR	4500 psi + 1/2 turn in
HIGH PRESSURE RELIEF Swing CCW	5100 psi
HIGH PRESSURE RELIEF Swing CW	5100 psi

Swing machine slowly 5 times in each direction before setting pressures. Do not hold pressure over relief more than 8 seconds at a time. Wait 5 seconds to avoid overheating.

Note: *Pressures set at* ***Full Throttle*** *unless otherwise specified.*

ALL PRESSURES MUST BE SET WITH HYDRAULIC OIL AT **OPERATING TEMPERATURE**.

NOTE: The above values are for reference purposes only,
SEE SERVICE MANUAL FOR SETTING PROCEDURE.

PRESSURE SETTINGS FOR T250B LOADER ON TRACKS

NOTES:

1. SYSTEM TO BE AT OPERATING TEMPERATURE WHEN SETTING PRESSURES.
2. ALL PRESSURES MEASURED IN PSI. ALL SPEEDS MEASURED IN SECONDS.
3. F - DENOTES PRESSURES SET AT FULL ENGINE RPM.

   I - DENOTES PRESSURES SET AT ENGINE IDLE.
4. PORT RELIEFS CANNOT BE ADJUSTED. EACH PORT RELIEF HAS A SPECIFIC SETTING AND SHOULD NOT BE INTERCHANGED WITH OTHER PORT RELIEFS.
5. FOR ROTOBEC HD(HEAVY DUTY) AND HULTDINS GRAPPLES SET ROTATE TO 3000 PSI.
6. SET MARGIN PRESSURE WITH PILOT SYSTEM ACTIVATED (DO NOT USE ANY FUNCTIONS). THIS IS THE BOTTOM (LARGE) ADJUSTMENT ON THE MAIN PUMP.
7. TRACK SPEEDS SET TO 12 RPM LOW (10 RPM LOW FOR SHOVEL LOGGER UNDERCARRIAGE OPTION) AND 28 RPM HIGH BY MAKING ADJUSTMENTS IN THE FOLLOWING ORDER:
   - A) SET MOTOR MAXIMUM DISPLACEMENT TO 105cc.
   - B) SET LOW FORWARD (VALVE FLOW SETTING).
   - C) SET HIGH FORWARD (MOTOR MINIMUM DISPLACEMENT).
   - D) SET HIGH REVERSE (VALVE FLOW SETTING).
8. TRACK DRIVE BEGIN OF REGULATION VALVES TO BE SET AT ENGINE IDLE USING THE FOLLOWING PROCEDURE:
   - A) LOWER MAIN PUMP P.O.R. TO 3100 PSI. AT IDLE
   - B) DISCONNECT AND PLUG BOTH MOTOR BRAKE RELEASE LINES.
   - C) OPERATE TRACK IN HIGH SPEED (TRACK SHOULD NOT MOVE).
   - D) ADJUST BEGIN OF REGULATION VALVE ON EACH MOTOR TO GIVE PRESSURE BEWTEEN 800 AND 1000 PSI AT MOTOR TEST PORT.
   - E) RESET MAIN PUMP P.O.R. AT FULL ENGINE RPM AND RECONNECT BRAKE LINES.
9. TILT CAB NOTES:
   - A) TURN COUNTERBALANCE VALVES OUT FULLY, THEN IN 1 TURN.
   - B) TILT VALVE IS FACTORY PRESET.

Parker

Assembly Torque

The 4-Bolt Split Flange consists of four main components:
- A body (flange head)
- An O-ring
- One “captive” or two “split” flange clamps
- Four bolts and washer

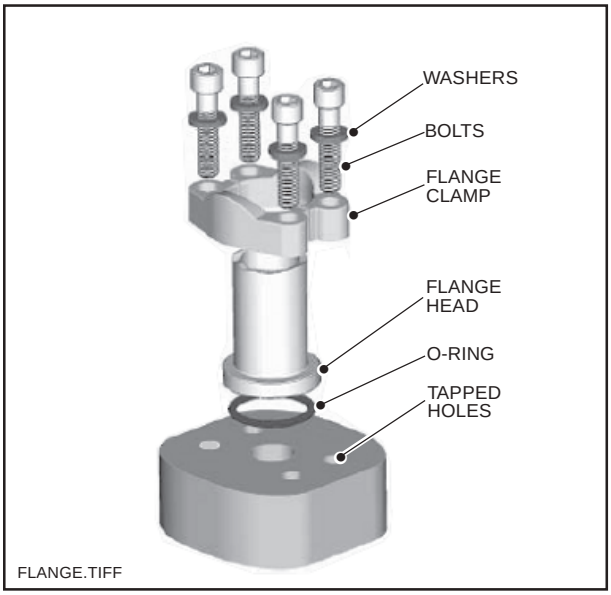


Fig. T8 - 4 Bolt Split Flange Components

The four-bolt port is simply a circular opening (flow passage) surrounded by four tapped holes in a certain pattern for acceptance of the flange clamping bolts. The flat surface of the port compresses the O-ring contained in the groove in the flange head when the clamp bolts are torqued. In some instances, the groove is in the port and not in the flange head. The bolts, through the clamp halves, clamp down the flange head on to the flat surface of the port compressing and trapping the O-ring in the groove and leaving no gap for it to extrude under pressure. The hydraulic pressure is thus sealed by the compressed O-ring as long as the bolts are tightened enough to maintain solid metal to metal contact between the flange head at the outside diameter of the O-ring and the top of the port.

Flange Port Assembly

The steps to properly assemble the flange port clamping bolts are:
1. Make sure sealing surfaces are free of burrs, nicks, scratches or any foreign particles.
2. Lubricate the O-ring.
3. Position flange and clamp halves.
4. Place lock washers on bolts and insert through clamp halves.
5. Hand tighten bolts.
6. Torque bolts in diagonal sequence (see Fig. T9) in small increments to the appropriate torque level listed in Table T6 or Table T7 on this page.

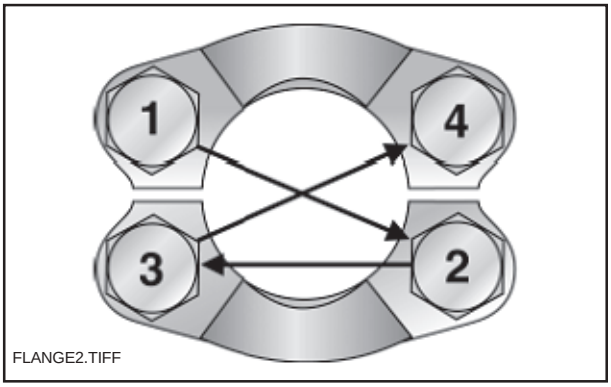


Fig. T9 - Flange Bolt Tightening Sequence

Dash Size	Flange Size	Inch Bolt (J518)	Torque ft. lbs.	Metric Bolt (ISO 6162)	Torque N-m
8	1/2	5/16-18	17 +/- 2	M8	25
12	3/4	3/8-16	25 +/- 3.5	M10	49
16	1	3/8-16	31 +/- 4.5	M10	49
20	1-1/4	7/16-14	41 +/- 5	M12*	85
24	1-1/2	1/2-13	52 +/- 6	M12	85
32	2	1/2-13	60 +/- 6	M12*	135
40	2-1/2	1/2-13	85 +/- 9	M12	95
48	3	5/8-11	144 +/- 15	M16	220
56	3-1/2	5/8-11	125 +/- 8	M16	220
64	4	5/8-11	125 +/- 8	M16	220
80	5	5/8-11	125 +/- 8	M16	220

* Does not meet ISO 6162 specification.

Table T6 - Code 61 Flange Recommended Bolt Torque

DASH SIZE	FLANGE SIZE	INCH BOLT (J518)	TORQUE FT LBS	METRIC BOLT (ISO 6162)	TORQUE N-M
8	1/2	5/16-18	17 +/- 2	M8	25
12	3/4	3/8-16	30 +/- 4.5	M10	49
16	1	7/16-14	46 +/- 4.5	M12	85
20	1 1/4	1/2-13	69 +/- 6	M14*	135
24	1 1/2	5/8-11	125 +/- 8	M16	210
32	2	3/4-10	208 +/- 20	M20	425

* Does not meet ISO 6162 specification.

Table T7 - Code 62 Flange Recommended Bolt Torque

Parker

Assembly Torque

JIC 37 Degree Flare

SAE Dash Size	Thread Size	Tube Connection FFWR	Swivel or Hose Connection FFWR
-2	5/16-24	NA	NA
-3	3/8-24	NA	NA
-4	7/16-20	2	2
-5	1/2-20	2	2
-6	9/16-18	1 1/2	1 1/4
-8	3/4-16	1 1/2	1
-10	7/8-14	1 1/2	1
-12	1 1/16-12	1 1/4	1
-14	1 3/16-12	1	1
-16	1 5/16-12	1	1
-20	1 5/8-12	1	1
-24	1 7/8-12	1	1
-32	2 1/2-12	1	1
-40	3-12	1	1

F.F.W.R : Flats From Wrench Resistance
All values are for Steel, Stainless Steel and Brass

NPTF

SAE Dash Size	Thread Size	Tube Connection TFFT	Swivel or Hose Connection TFFT
-2	1/8-27	2-3	2-3
-3	NA	NA	NA
-4	1/4-18	2-3	2-3
-5	NA	NA	NA
-6	3/8-18	2-3	2-3
-8	1/2-14	2-3	2-3
-10	7/8-14	NA	NA
-12	3/4-14	2-3	2-3
-14	NA	NA	NA
-16	1-11 1/2	1.5-2.5	1.5-2.5
-20	1 1/4-11 1/2	1.5-2.5	1.5-2.5
-24	1 1/2-11 1/2	1.5-2.5	1.5-2.5
-32	2-11 1/2	1.5-2.5	1.5-2.5
-40	NA	NA	NA

T.F.F.T. : Turns from finger tight
All pipe values are for Steel, Stainless Steel and Brass

O'ring Face Seal / Seal-Lok

SAE Dash Size	Thread Size	Tube Connection FFWR	Swivel or Hose Connection FFWR
-2	NA	NA	NA
-3	NA	NA	NA
-4	9/16-18	1/4 TO 1/2	1/2 TO 3/4
-5	NA	NA	NA
-6	11/16-16	1/4 TO 1/2	1/2 TO 3/4
-8	13/16-16	1/4 TO 1/2	1/2 TO 3/4
-10	1-14	1/4 TO 1/2	1/2 TO 3/4
-12	1 3/16-12	1/4 TO 1/2	1/3 TO 1/2
-14	NA	NA	NA
-16	1 7/16-12	1/4 TO 1/2	1/3 TO 1/2
-20	1 11/16-12	1/4 TO 1/2	1/3 TO 1/2
-24	2-12	1/4 TO 1/2	1/3 TO 1/2
-32	NA	NA	NA
-40	NA	NA	NA

F.F.W.R : Flats From Wrench Resistance
All values are for Steel, Stainless Steel and Brass

BSPT

SAE Dash Size	Thread Size	Tube Connection TFFT	Swivel or Hose Connection TFFT
-2	1/8-28	2-3	2-3
-3	NA	NA	NA
-4	1/4-19	2-3	2-3
-5	NA	NA	NA
-6	3/8-19	2-3	2-3
-8	1/2-14	2-3	2-3
-10	NA	NA	NA
-12	3/4-14	2-3	2-3
-14	NA	NA	NA
-16	1-11	1.5-2.5	1.5-2.5
-20	1 1/4-11	1.5-2.5	1.5-2.5
-24	1 1/2-11	1.5-2.5	1.5-2.5
-32	2-11	1.5-2.5	1.5-2.5
-40	NA	NA	NA

T.F.F.T. : Turns from finger tight
All pipe values are for Steel, Stainless Steel and Brass

SAE J1926 Straight Thread Port Assembly Torques

SAE Dash Size	Thread Size	ASSEMBLY TORQUE (+10 % - 0)											
		Non-Adjustable				Adjustable				Plugs			
		Seal-Lok		Triple-Lok Ferulok Pipe Fittings		Seal-Lok		Triple-Lok Ferulok		Hollow Hex HP5ON-S		Hex Head P5ON-S	
		ft. lbs (in. lbs)	N-m	ft. lbs (in. lbs)	N-m	ft. lbs (in. lbs)	N-m	ft. lbs (in. lbs)	N-m	ft. lbs (in. lbs)	N-m	ft. lbs (in. lbs)	N-m
2	5/16-24	(310)	20	(85)	10	(310)	20	(60)	7	(30)	3.5	(85)	10
3	3/8-24	(310)	20	(155)	18	(310)	20	(100)	11	(55)	6	(155)	18
4	7/16-20	(310)	20	(260)	29	(310)	20	(180)	20	(120)	13.5	(260)	29
5	1/2-20	(360)	40	(280)	32	(360)	40	(250)	28	(170)	19	(280)	32
6	9/16-18	(420)	46	(350)	40	(420)	46	(350)	40	(410)	46	(350)	40
8	3/4-16	60	80	(620)	70	60	80	(620)	70	60	80	(620)	70
10	7/8-14	100	135	85	115	100	135	85	115	100	135	85	115
12	1 1/16-12	135	185	135	183	135	185	135	183	135	185	135	183
14	1 3/16-12	175	235	175	237	175	235	175	237	175	235	175	237
16	1 5/16-12	200	270	200	271	200	270	200	271	200	270	200	271
20	1 5/8-12	250	340	250	339	250	340	250	339	250	340	250	339
24	1 7/8-12	305	415	305	414	305	415	305	414	305	415	305	414
32	2 1/2-12	375	510	375	509	375	510	375	509	375	510	375	509

EATON Aeroquip

Assembly Torque

Recommended Parallel Connection Assembly torque

Eaton recommends that a Torque wrench be used to assure proper fitting assembly of these connections.

The values listed are for steel connections. Contact Eaton Aeroquip for torques values for other materials

Straight Thread O-Ring Boss Low Pressure with 37º (SAEJ514)

Dash Size	Thread Size (inches)	Jam Nut or Straight Fitting Torque lb.-ft.	Jam Nut or Straight Fitting Torque Newton Meters
-03	3/8-24	8-9	12-13
-04	7/16-20	13-15	18-20
-05	1/2-20	14-15	19-21
-06	9/16-18	23-24	32-33
-08	3/4-16	40-43	55-57
-10	7/8-14	43-48	59-64
-12	1 1/16-12	68-75	93-101
-14	1 3/16-12	83-90	113-122
-16	1 5/16-12	112-123	152-166
-20	1 5/8-12	146-161	198-218
-24	1 7/8-12	154-170	209-230
-32	2 1/2-12	218-240	296-325

Straight Thread O-Ring Boss High Pressure with ORS (J1453)

Dash Size	Thread Size (inches)	Jam Nut or Straight Fitting Torque lb.-ft.	Jam Nut or Straight Fitting Torque Newton Meters
-03	3/8-24	8-10	11-16
-04	7/16-20	14-16	20-22
-05	1/2-20	18-20	24-27
-06	9/16-18	24-26	33-35
-08	3/4-16	50-60	68-78
-10	7/8-14	72-80	98-110
-12	1 1/16-12	125-135	170-183
-14	1 3/16-12	160-180	215-245
-16	1 5/16-12	200-220	270-300
-20	1 5/8-12	210-280	285-380
-24	1 7/8-12	270-360	370-490

ORS

Dash Size	Thread Size (inches)	Swivel Nut Torque lb.-ft.	Swivel Nut Torque Newton Meters
-04	9/16-18	10-12	14-16
-06	11/16-20	18-20	24-27
-08	13/16-16	32-35	43-47
-10	1-14	46-50	62-68
-12	1 3/16-12	65-70	88-95
-16	1 7/16-12	92-100	125-136
-20	1 11/16-12	125-140	170-190
-24	2-12	150-165	204-224

SAE 37º (JIC)

Dash Size	Thread Size (inches)	Swivel Nut Torque lb.-ft.	Swivel Nut Torque Newton Meters
-04	7/16-20	11-12	15-16
-05	1/2-20	15-16	20-22
-06	9/16-18	18-20	24-28
-08	3/4-16	38-42	52-58
-10	7/8-14	57-62	77-85
-12	1 1/16-12	79-87	108-119
-16	1 5/16-12	108-113	148-154
-20	1 5/8-12	127-133	173-182
-24	1 7/8-12	158-167	216-227
-32	2 1/2-12	245-258	334-352

Metric

Thread Size		Straight Adapter or Locknut Torque
mm	lb.-ft.	Newton Meters
M10x1	13-15	18-20
M12x1.5	15-19	20-25
M14x1.5	19-23	25-30
M16x1.5	33-40	45-55
M18x1.5	37-44	50-60
M20x1.5	52-66	70-90
M22x1.5	55-70	75-95
M26x1.5	81-96	110-130
M27x2	96-111	130-150
M33x2	162-184	220-250
M42x2	170-192	230-260
M48x2	258-347	350-470

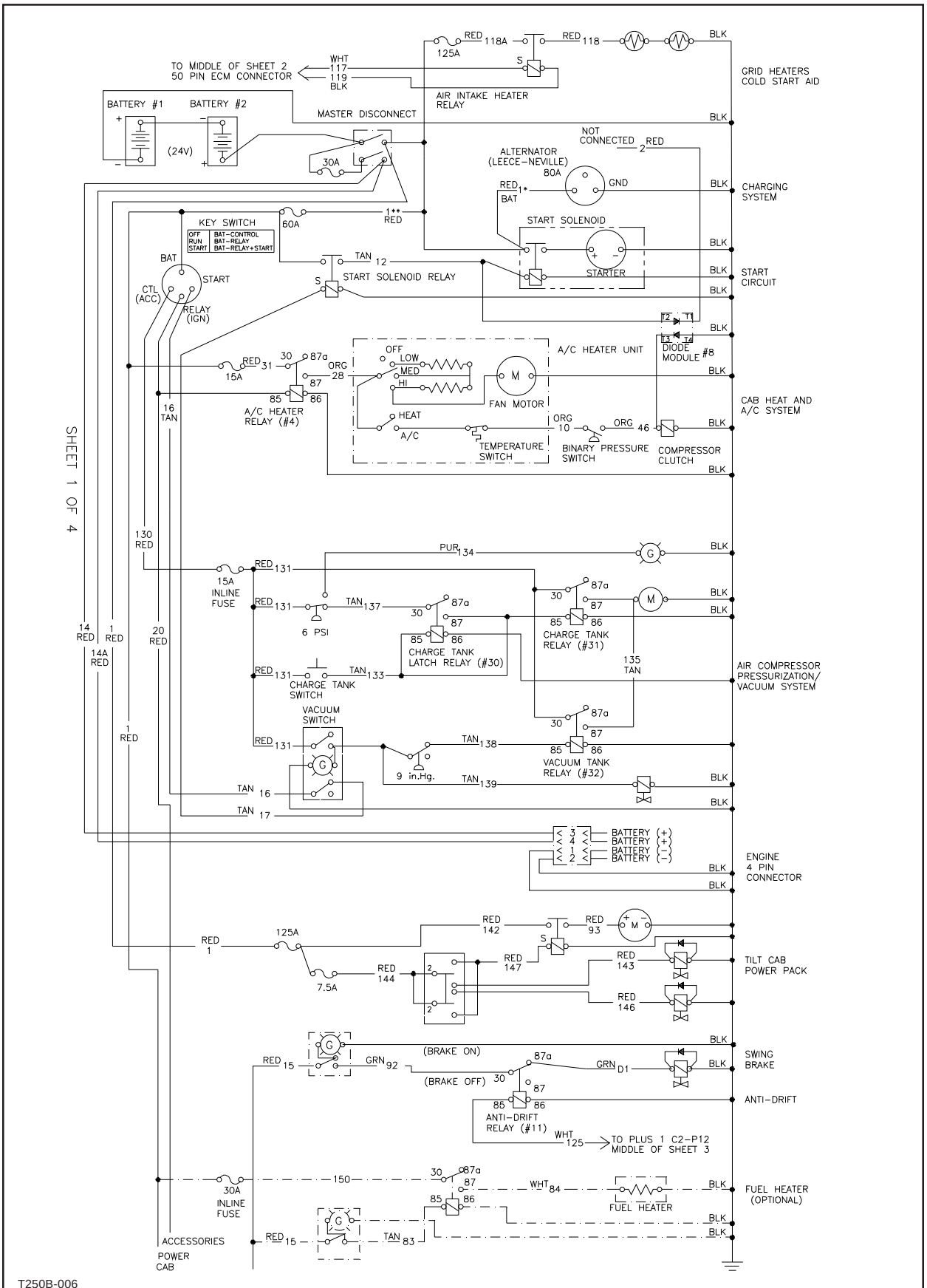
BSPP

Nominal Thread Size		Straight Adapter or Locknut Torque
inches**	lb.-ft.	Newton Meters
G1/8-28	13-15	18-20
G1/4-19	19-23	25-30
G3/8-19	33-40	45-55
G1/2-14	55-70	75-95
G3/4-14	103-118	140-160
G1-11	162-184	220-250
G1 1/4-11	170-192	230-260
G1 1/2-11	258-347	350-470

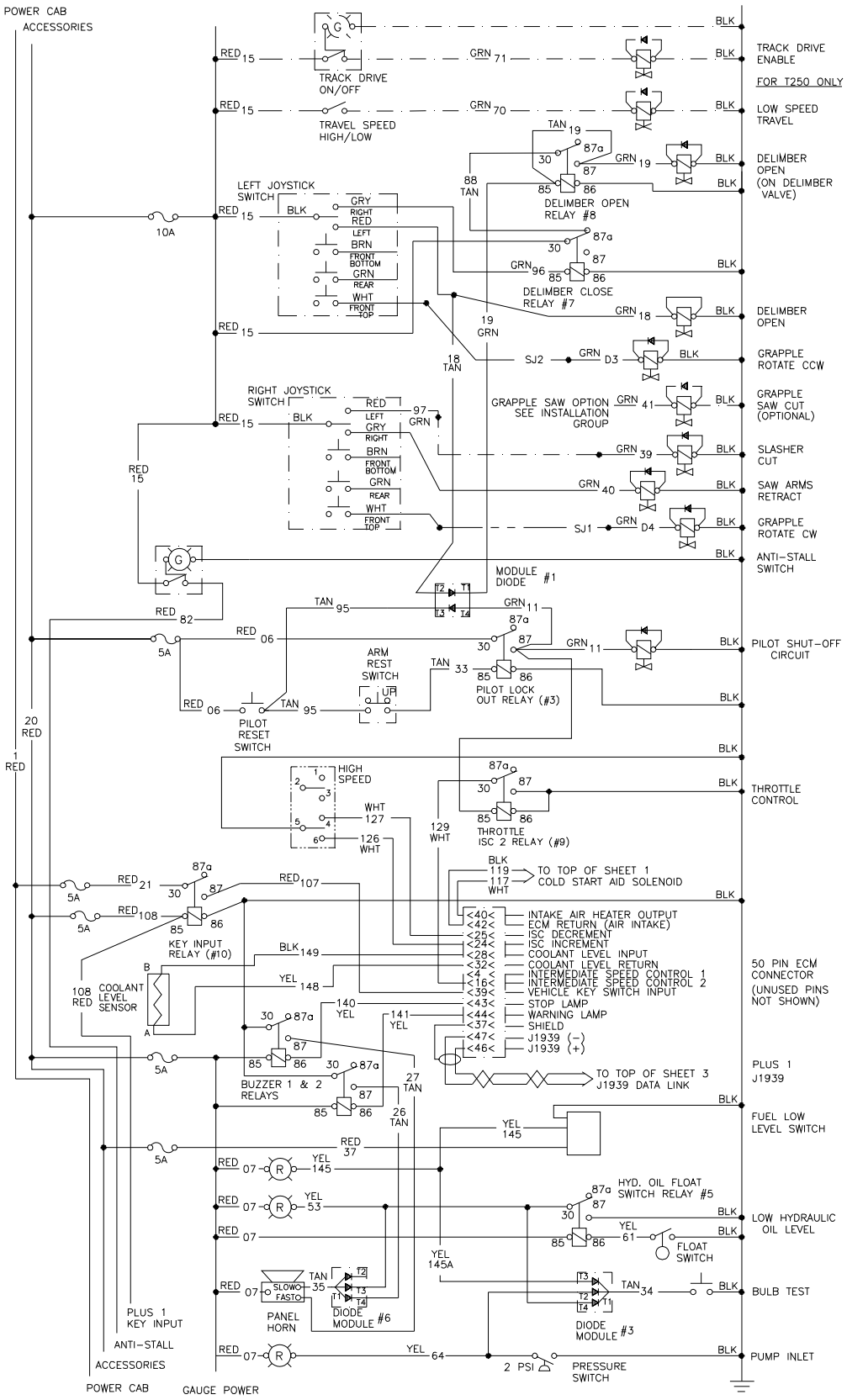
** "G" denotes parallel threads, other than ISO 6149 (Port connection only)

Eaton Aeroquip Fluid Conveyance Products A-HOOV-MC001-E January 2005

ELECTRICAL SCHEMATIC SHEET 1



ELECTRICAL SCHEMATIC SHEET 2



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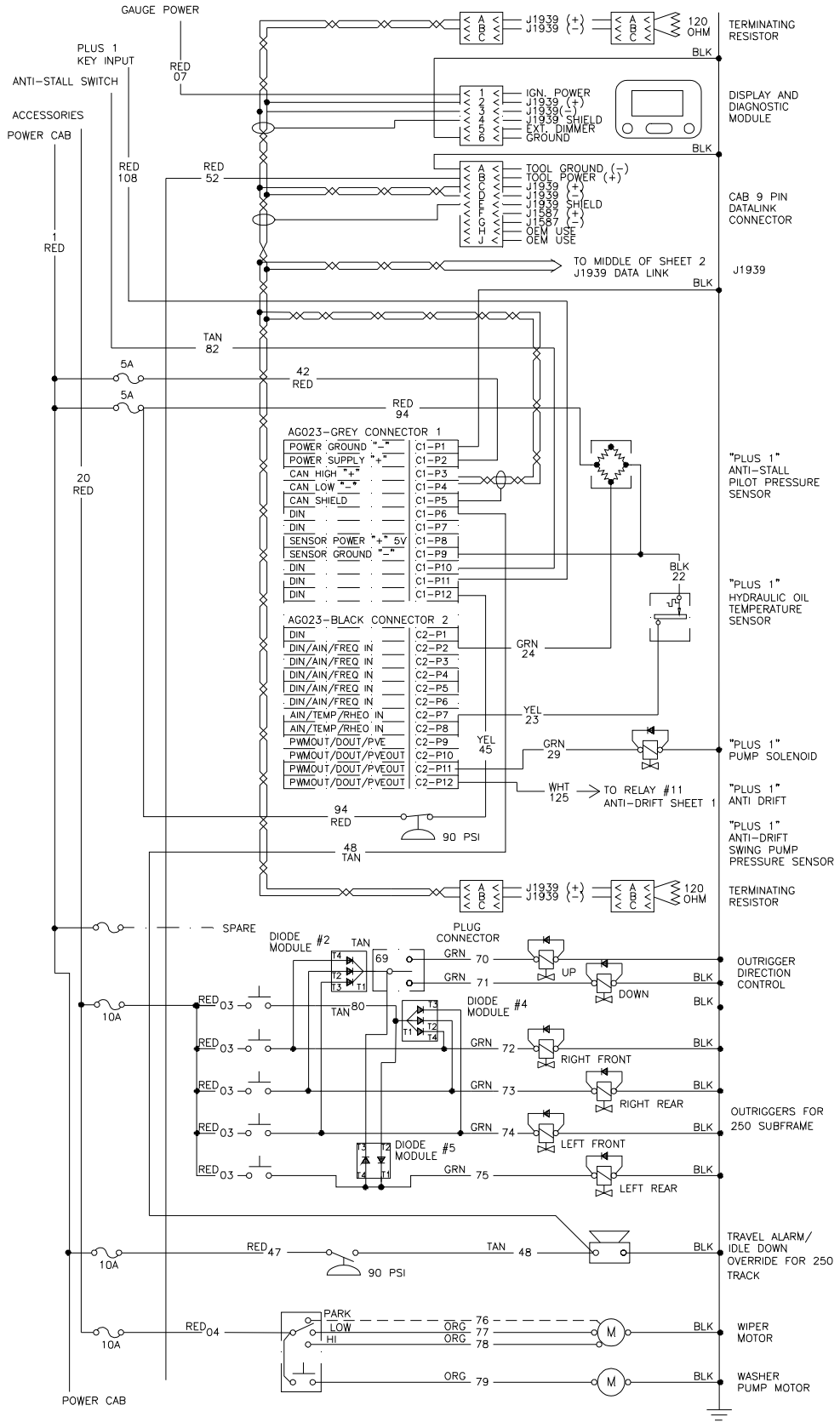

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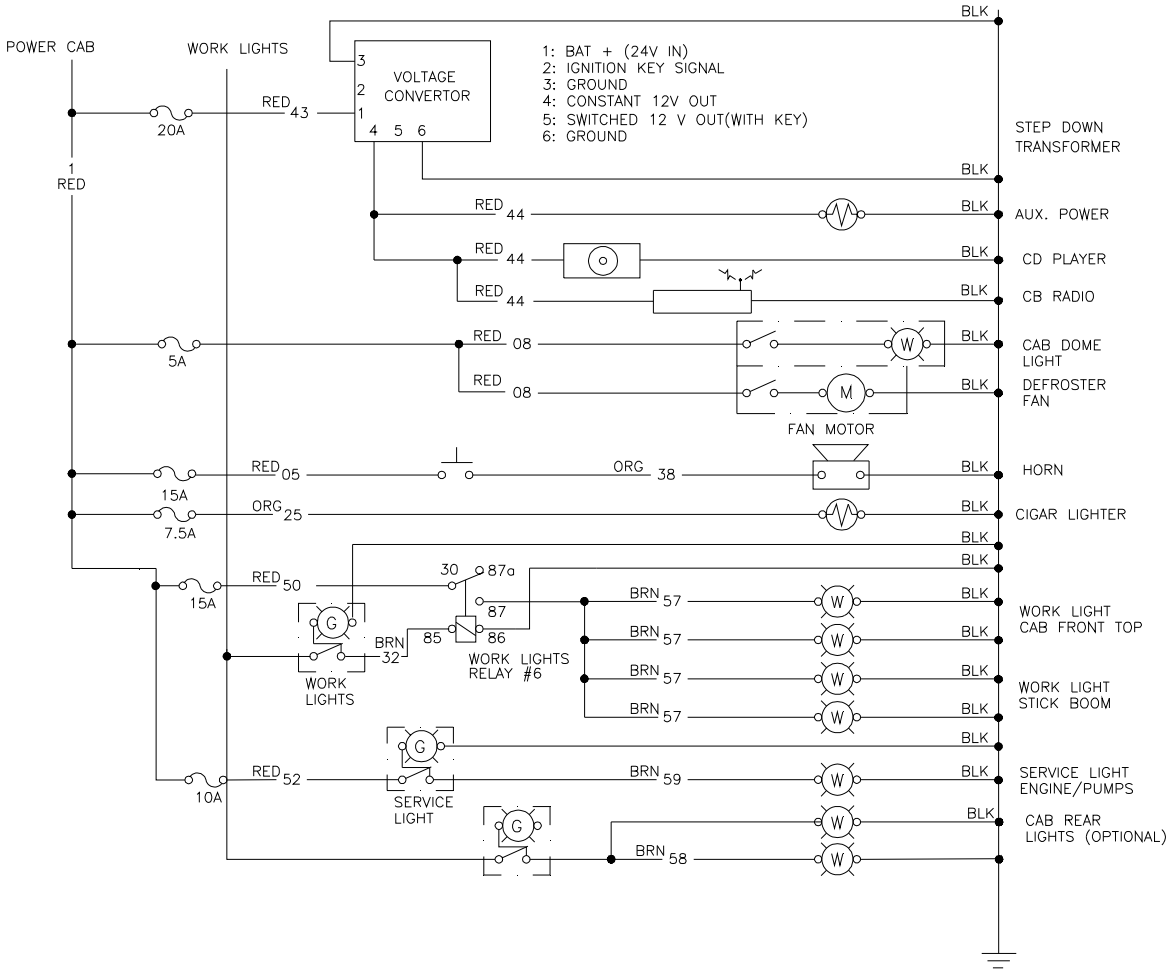

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SECTION 4 - HYDRAULIC SYSTEM

MARCH, 2009

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HYDRAULIC SYSTEM OPERATION

The hydraulic system has two separate circuits;

1. Variable-displacement swing drive closed loop hydraulic circuit with internal charge pump.
2. Variable-displacement main hydraulic circuit for the *track drive/boom hoist and stick/live heel option/delimber/slasher/grapple open/close and grapple rotate*.

   The pilot circuit is supplied oil by the main pump via the main hydraulic valve.

1. MAIN HYDRAULIC SYSTEM

This a closed centre system utilizing a variable-displacement axial-piston pump with load sensing and horsepower limiting control. The load sensing system ensures that the pump will deliver only the amount of oil that is required by an individual function or combination of functions.

This feature improves fuel economy and cuts back on heat generation because power is not wasted on excess pump flow that is not being used. Refer to LOAD SENSING HYDRAULIC SYSTEM in THIS SECTION.

The horsepower limiting control is one which ensures that the engine will not lug down below the full load rpm by reducing the output from the main hydraulic pump. Refer to ENGINE ANTI-STALL description in SECTION 9 of this manual.

The main control valves are pressure and flow compensated to provide *load independent* operation for all functions.

2. SWING SYSTEM

This closed loop circuit uses a variable-displacement piston pump which delivers oil to the swing motor and back to pump. Foot pedal operated pilot valves located in the cab direct pilot oil to the swing pump controller.

The internal charge pump provides make up oil to keep the swing pump charged as well as provide cooling and lubricating oil for the pump.

The swing motor is a bent axis piston type that is bolted to the swing gearbox. The gearbox is a double reduction planetary gear unit with a spring-applied, hydraulic-release disc brake. This provides continuously variable swing speeds up to 9 rpm. A rotary manifold provides hydraulic connection to the undercarriage and permits continuous 360 degree swing.

3. PILOT CIRCUIT

The pilot circuit is supplied with oil from the main via the main control valve. The pilot system is turned on and off by the *pilot shut off valve* located on the *pilot manifold* which is controlled by the armrest switch and the pilot reset button. Refer to PILOT SYSTEM description in SECTION 5 of this manual.

HYDRAULIC OIL RESERVOIR

Also refer to SECTION 2 of the OPERATOR'S MANUAL for additional service information.

Located at the left rear corner of the machine, the hydraulic reservoir (or tank) has a capacity of 66 U.S. gallons (250 L).

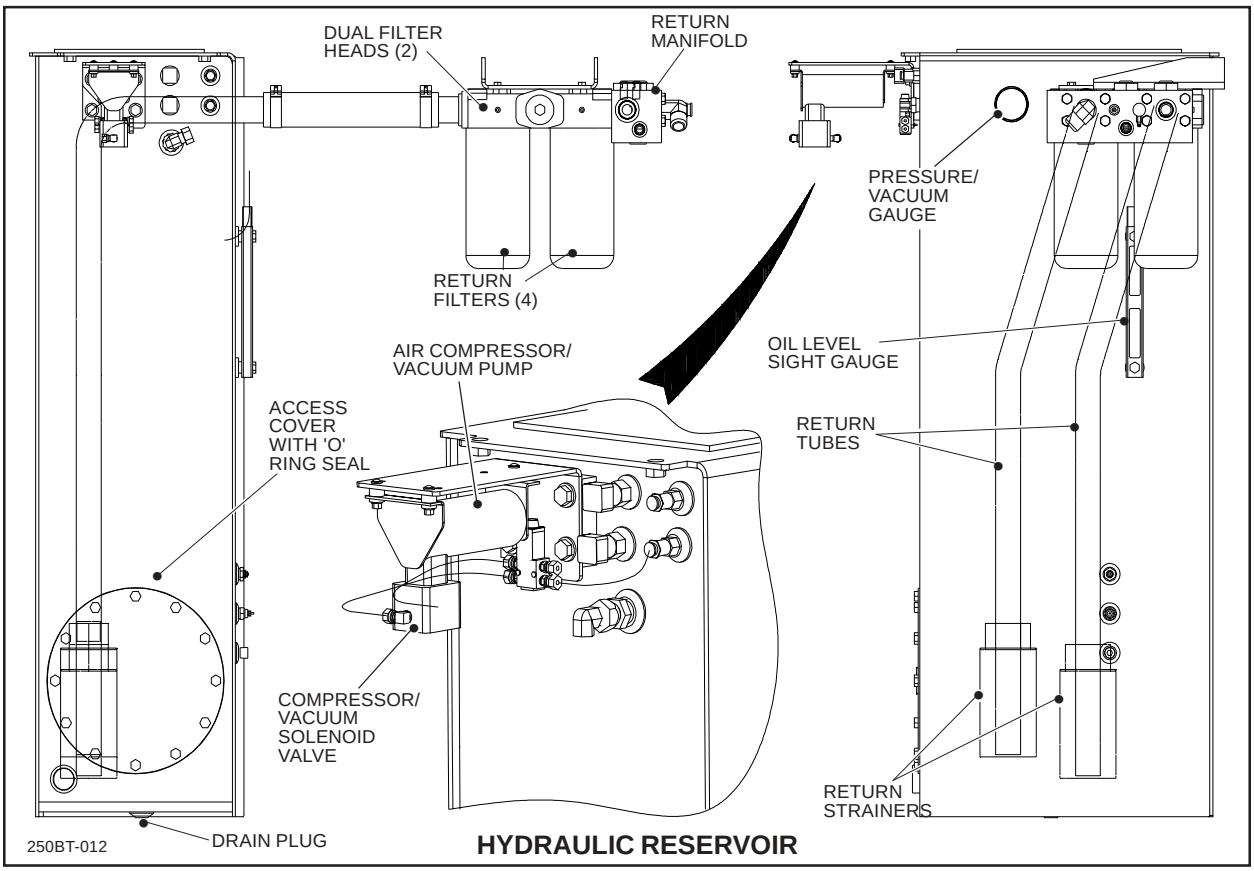
Hydraulic oil is drawn from the tank by the pumps through the suction hose and tube at the base of the tank. The bulk of the oil returning to the tank is directed to the return manifold and the four return filters and from there to the return tubes in the hydraulic tank. There is a bypass valve built into each filter head preset at 25 psi. which will open in the event the elements become restricted. A strainer/diffuser is attached to the end of each of the two return tubes. The reusable return strainers with a 250 micron particle retention, screen oil prior to re-entering the tank.

Case drain oil from the main pump, swing pump, swing motor, and pilot return lines go through a spin-on strainer and returns to the reservoir. The strainer element requires no regular maintenance over the life of the machine. This element requires maintenance only in the case of damage or contamination due to a hydraulic pump or motor failure.

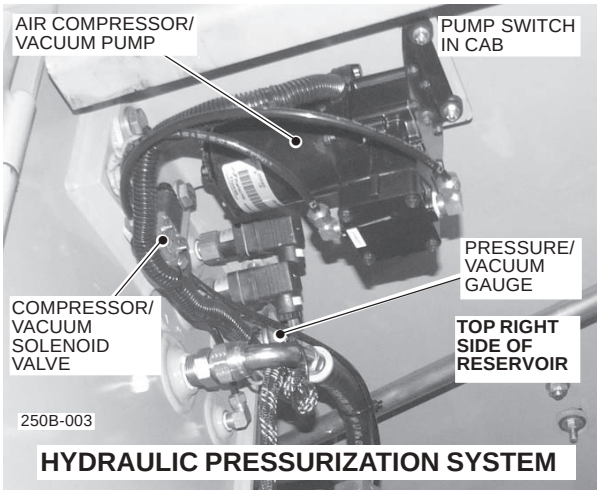
IMPORTANT:

The strainer element is NOT a filter element. Always use the correct replacement element. Use of an incorrect (filter type) element will result in pump damage.

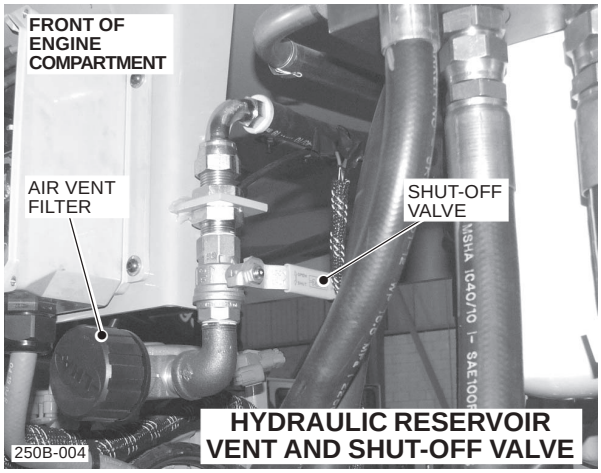
The hydraulic tank is pressurized to assist pump suction, this pressure is referred to as PUMP INLET PRESSURE. Before starting the engine the charge tank switch should be pressed and released with the key switch in the off position. This will start the air compressor which will pump air into the reservoir until the pressure reaches 6 psi at which time the green light in the instrument panel will illuminate indicating that the engine can be started.



HYDRAULIC RESERVOIR



HYDRAULIC PRESSURIZATION SYSTEM

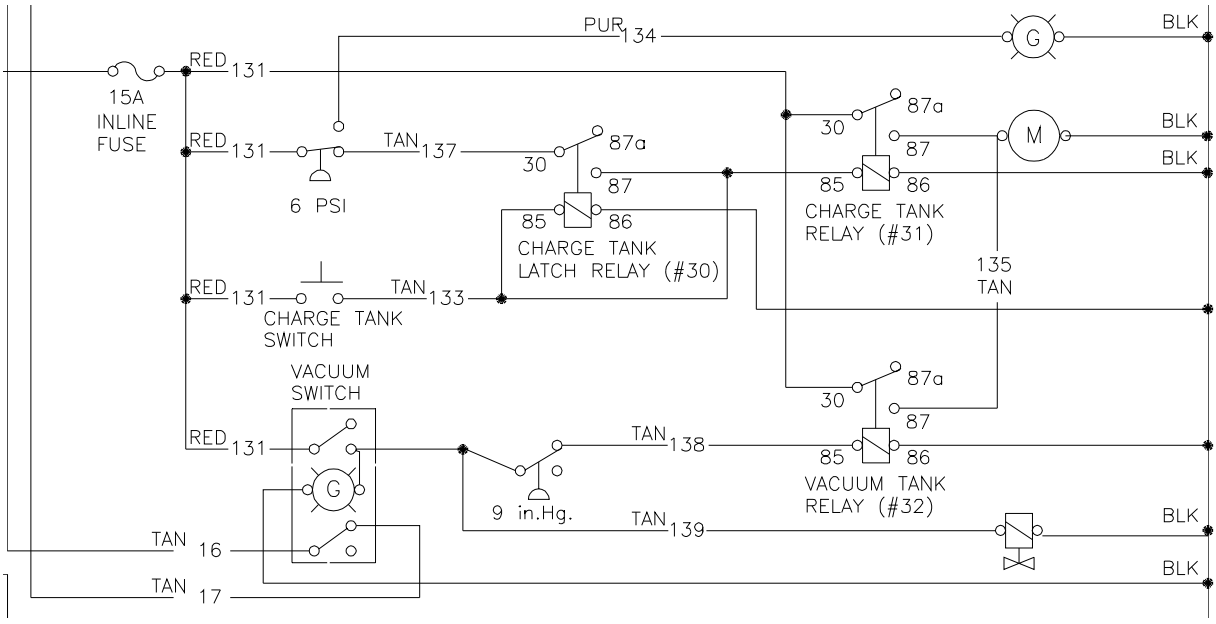


HYDRAULIC RESERVOIR VENT AND SHUT-OFF VALVE

The engine should not be started when the green light is not lit; this will result in too high a vacuum in the pump suction lines which will shorten the life of the pumps. This condition will be indicated by the red pump inlet light being on.

The air compressor can also be used in a vacuum pump mode. Pressing the vacuum tank switch with the key in the off position will turn the compressor on and shift a 4-way valve so that air is pumped out of the reservoir. This can be done before performing service work on the hydraulic system so as to minimize oil loss. The vacuum pump should also be used once weekly when the machine is hot to reduce any water that may have accumulated in the reservoir due to condensation.

After using vacuum pump to perform service work on pumps or motors, charge tank and purge all air out of the pump and motor case before start-up.



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COMPRESSOR ELECTRICAL SCHEMATIC

The electric schematic for the air compressor is shown above and a description of the circuit operation follows.

The charge tank switch is a momentary switch and when it is depressed, voltage is on wire 133 which energizes the coil on relay #30. If the pressure in the reservoir is less than 6 psi, the pressure switch supplies voltage to the relay contacts via wire 137. When the relay coil is energized, the voltage on wire 137 is fed back to wire 133 which latches the relay in the on position and energizes the coil on relay #31 which provides voltage to the compressor motor. The motor will continue to run until the pressure in the reservoir builds up to 6 psi at which point the pressure switch will shift the voltage from wire 137 to wire 134; this causes the green light to come on and the compressor to stop.

380-9AA

VACUUM TANK SWITCH

The vacuum switch is a rocker switch with indicator light which is illuminated when the vacuum system is activated. This switch connects the voltage on wire 131 to wire 139 which energizes the solenoid on the four-way air valve and switches the air flow so that the compressor pumps air out of the tank. Wire 139 is also connected to the vacuum switch and, if the vacuum in the tank is less than 9 inches of mercury, the current flows to the relay #32 coil which shifts the relay and allows current to flow from wire 131 to the compressor motor. The compressor will cycle on and off to maintain a vacuum of 9 inches of mercury in the tank.

TROUBLESHOOTING THE COMPRESSOR SYSTEM

If the compressor fails to operate in both the “charge tank” and “vacuum” mode, check the line fuse which is in wire 131 near the fuse blocks in the main electrical panel in the cab. If the compressor works in one mode, the problem is not in the fuse. If the fuse is OK, check the voltage at wire 135 at the compressor motor connection in both vacuum and charge tank modes. If voltage is present, check the motor wiring connections and the motor itself. If no voltage is present, perform the checks below.

If the charge tank system fails to operate and the green light is not lit, check the pressure gauge at the hydraulic tank to determine if pressure is in the tank. If pressure is in the tank, the green light is faulty, if there is no pressure in the tank, check for voltage in wire 137 in the main electrical panel.

If there is no voltage at 137, check 131 for voltage. If voltage is present at 131 in the panel, check the DIN connector on the pressure switch located by the compressor to determine if voltage is present at wire 131. If voltage is present at 131 check the pressure switch. With no pressure in the tank, current should pass between pressure switch terminals 1 and 2 and should not pass between terminals 1 and 3. If there is no connectivity between terminals 1 and 2, replace the switch. If there is connectivity between terminals 1 and 2, check the DIN connector attachment of wire 137 and wire 131 and then continue checking connections on wire 137 until the problem is found.

If there is voltage at wire 137, remove relay #30 and check for voltage on pin 30, and on pin 85 with the charge switch depressed. If voltage is present on these pins, reinstall the relay and then remove relay #31. Check for voltage at pin 30 and at pin 85 with the charge tank switch depressed. Release the charge tank switch and if there is no voltage at pin 85, replace relay #30 with a new relay and recheck for voltage on pin 85 of relay #31. If voltage is at pin 85, reinstall relay #31 and check for operation. If the compressor fails to run, check for voltage at wire 135 (after the charge tank switch is pressed) and replace relay #31 if no voltage is present.

If the compressor does not run with the vacuum switch depressed, check voltage at wire 139 in the main panel. If no voltage is present, check the vacuum switch and wiring connections. If voltage is at wire 139, remove relay #32 and check for voltage at pin 30 and pin 85. If voltage is not present at pin 30, check fuse and wiring. If voltage is present at pin 85 and the compressor doesn't run, replace relay #32 with a new relay. If voltage is not present at pin 85, check the operation of the vacuum switch. Remove the DIN connector from the vacuum switch and check for voltage at wire 139. If there is voltage at wire 139, check the vacuum switch; there should be continuity between pin 1 and 2 if there is no vacuum in the tank. If there is no continuity, replace the vacuum switch.

Refer also to HYDRAULIC PRESSURIZATION SYSTEM in SECTION 3 and SECTION 2 of the OPERATOR'S MANUAL.

IMPORTANT: Before disconnecting any hoses, release the pressure in the hydraulic tank by opening the air vent ball valve.

The hydraulic hand fill pump, located behind the front access panel, is used for adding oil to the hydraulic oil reservoir via the return filters.

STRAINER/DIFFUSER SERVICE NOTE

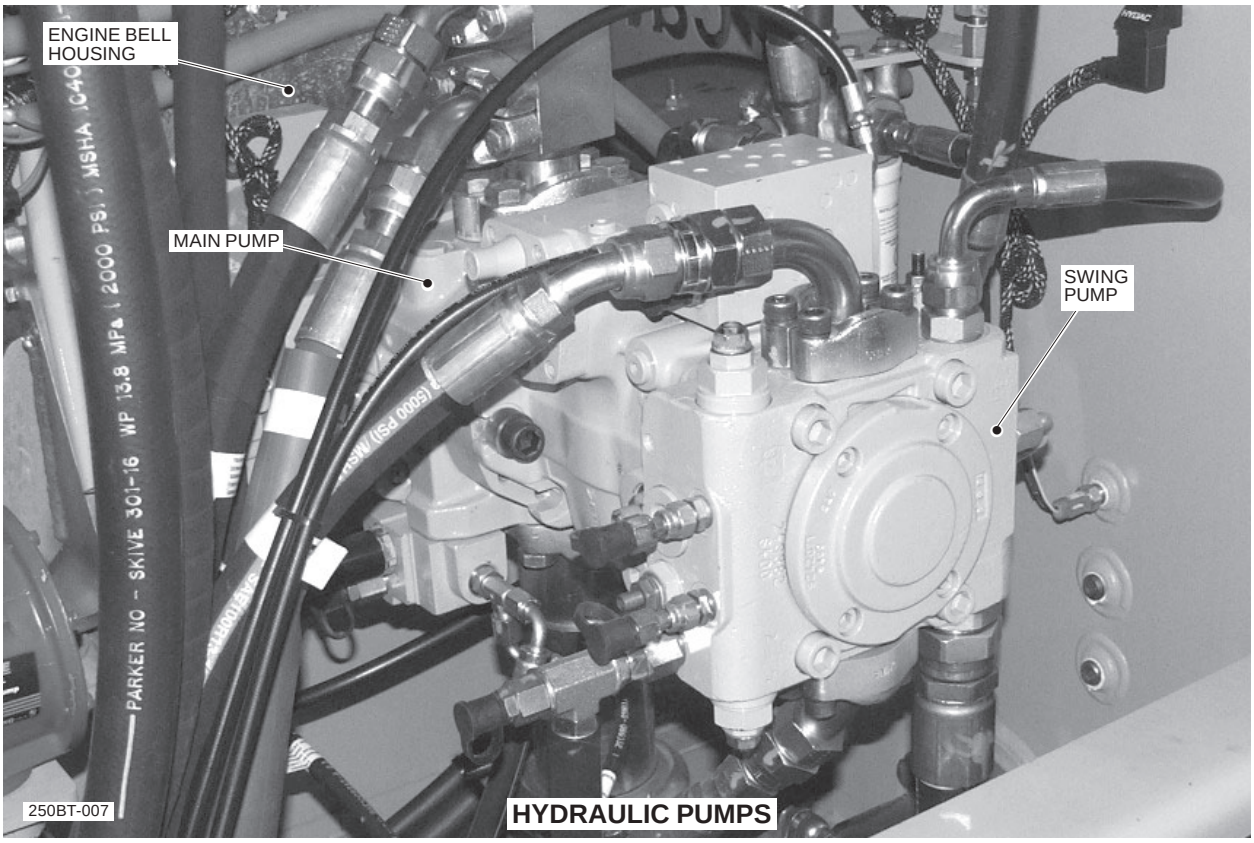
The strainer/diffusers should be checked whenever the hydraulic tank is drained at the intervals specified in the LUBRICATION AND MAINTENANCE SCHEDULE in SECTION 3 of THIS MANUAL.

CHANGING OR CLEANING THE STRAINER/ DIFFUSERS:

This should be performed in the event of a pump failure or hydraulic oil contamination.

1. Position machine on flat level ground with grapple resting on the ground.
2. Stop engine. Turn battery disconnect switch to the OFF position.
3. Release the pressure in the hydraulic tank by opening the air vent valve.
4. Drain the hydraulic tank via a drain plug in the bottom of the tank.
5. Remove the lower access cover and 'O' ring.
6. Before removing the strainers, clean any debris from bottom of the tank and wipe it clean.
7. Remove the four strainers using the hex on the end of strainer. Carefully clean the strainers (avoid damage by rough handling).
8. Check for a **buildup of foreign materials** at the strainer connections.
9. Reinstall the strainers using the hex on end.
10. Reinstall access cover with a NEW "O" ring.
11. Refill and check for leaks.
12. Ensure that the air vent valve is closed.

NOTE: Changing strainer/diffusers and replacing the hydraulic oil tends to aerate the oil. For maximum pump life, the Vacuum Pump should be run for 1 hour after servicing to allow entrained air to escape from the oil prior to applying working pressures to the pumps.



HYDRAULIC PUMPS

HYDRAULIC PUMPS

All hydraulic functions are powered by two pumps. The main and swing pumps are mounted one behind the other on the flywheel housing of the engine. The first pump (main pump) is a piston pump with load sensing, pressure compensating and horsepower limiting controls.

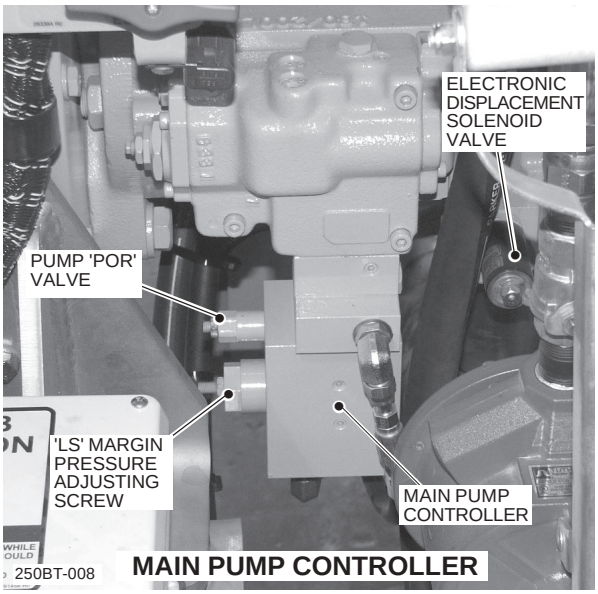
Mounted and coupled to the main pump is the swing pump. It is a pressure compensated piston pump.

For information on the hydraulic circuits that these pumps are part of ; Refer to HYDRAULIC SYSTEM OPERATION in THIS SECTION.

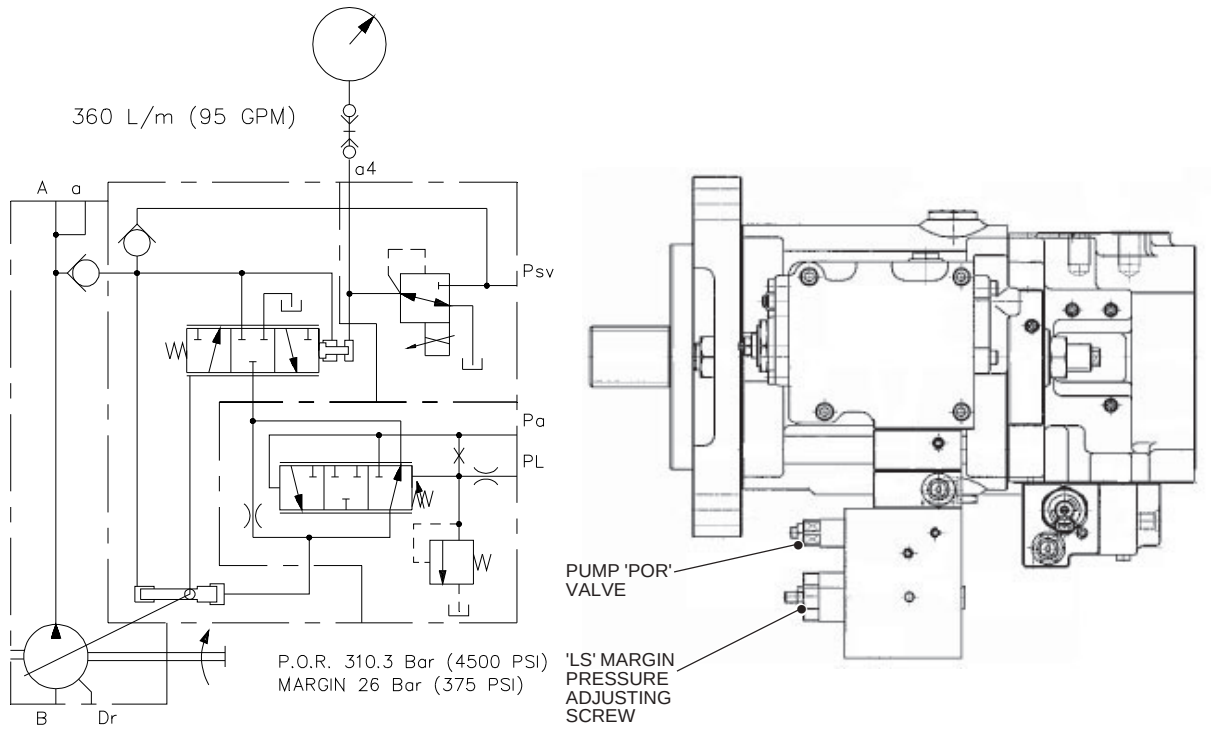
MAIN PUMP

The main pump is an axial-piston, variable-displacement pump with load sensing, pressure compensating, and horsepower limiting controls.

When all of the control valve sections on the main valve are in the neutral position the pump is destroked and the output is just sufficient to maintain a pressure of approx. 500 psi in the pump output line. The swashplate control piston is in a condition where the spring force, swashplate forces and the control pressure forces are balanced.



MAIN PUMP CONTROLLER



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MAIN PUMP CONTROLLER ADJUSTMENT

MARGIN PRESSURE

When a function control lever is moved, i.e. joystick, to activate a function, LS pressure increases to the point where it is equal to the work port pressure and it shifts the LS control valve.

The pump then adjusts its output volume until the pump output pressure exceeds the LS pressure by a small amount. This difference is known as MARGIN PRESSURE (Also known as differential pressure Delta P).

Refer to SET MARGIN PRESSURE in this section.

At this point the LS control valve shifts back to its previous condition and the swashplate control piston will be balanced with the pump output remaining constant until the pressure at the LS port changes. This is a dynamic condition with the swashplate angle changing constantly in response to the load fluctuations. The LS pressure is always equal to the highest work port pressure.

NOTE: If the machine controls are not responding as they should, i.e. boom is jerky or sluggish, the margin pressure setting may be out of adjustment.

Also refer to ENGINE ANTI-STALL in SECTION 9 of this manual.

The pump is protected by a high pressure limiting control which is attached to the main control valve manifold. Refer to HIGH PRESSURE LIMITING CONTROL in this section.

SWING PUMP

For the operation and adjustments of this pump refer to SECTION 15 of THIS MANUAL.

LOAD SENSING

BASIC PRINCIPALS

Figs. 1 & 2 Early hydraulic systems used a fixed displacement pump, with valves to control or adjust flow rates or speeds. This throttling or restricting pump flow to achieve control over the functions causes excess oil to flow over the relief valve. This results in wasting power and at the same time creating heat. SEE FIGS. 1 & 2.

Figs. 3 & 4 In an attempt to recover some of the wasted energy, variable volume pumps evolved. These pumps are power regulated or horsepower controlled and since they reduce the pumps output to maintain a constant system hp, oil flow over the relief valve is less, therefore reducing the wasted power losses and heat generation. SEE FIGS. 3 & 4.

The power wasted in the horsepower control system is still considerable and still requires constant "throttling" by the operator if he wants the speeds to remain as selected.

Figs. 5 & 6 The load control system was developed to address the problems outlined above.

This system combines the energy saving benefits of *flow on demand* with *load compensation at each work port*. The compensator eliminates the need for operator flow adjustments (throttling). SEE FIGS. 5 & 6.

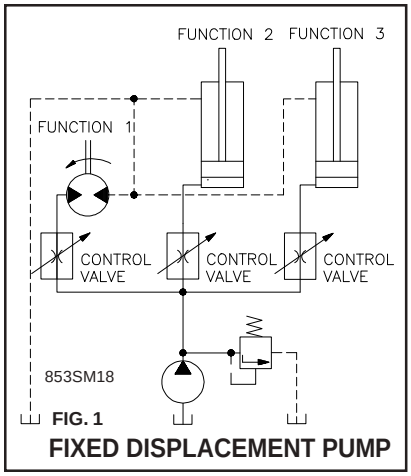


FIG. 1 **FIXED DISPLACEMENT PUMP**

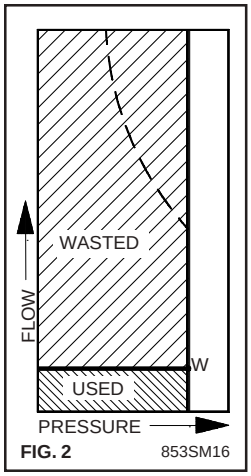


FIG. 2 853SM16

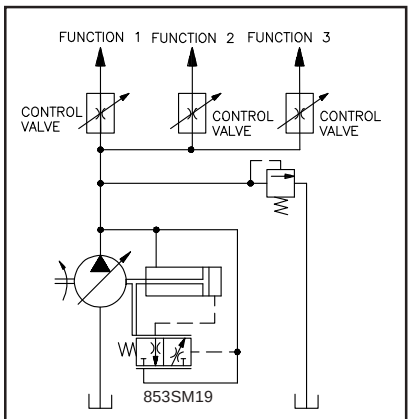


FIG. 3 **HP REGULATED PUMP**

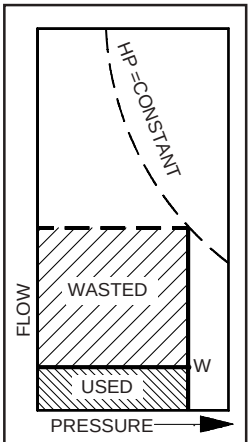


FIG. 4 853SM16

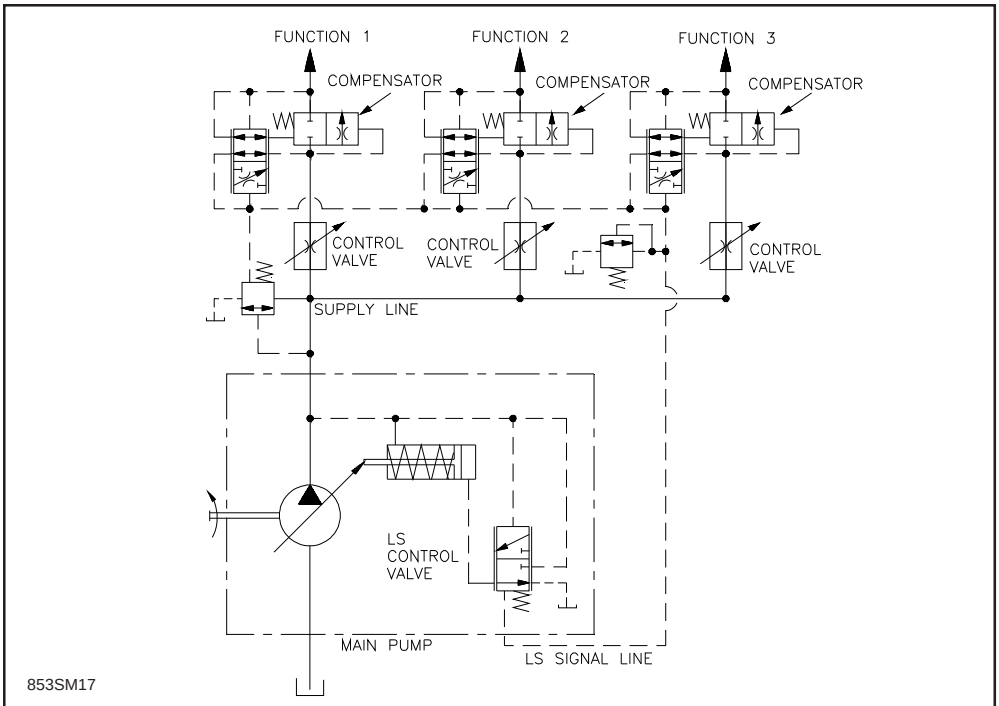


FIG.5 **LOAD SENSING (FLOW ON DEMAND)**

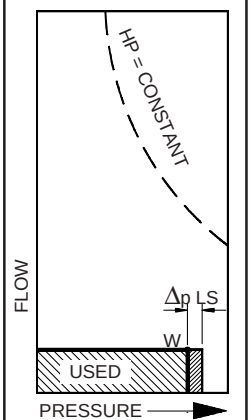
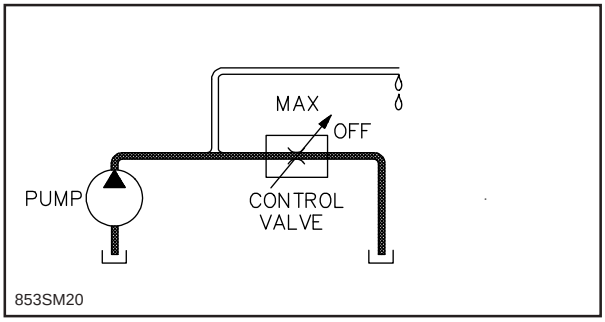


FIG.6 853SM16

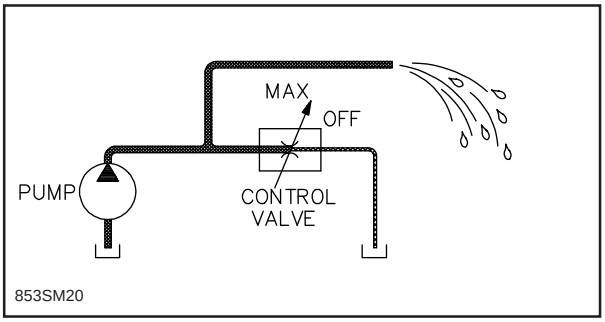
LOAD SENSING BASIC DESCRIPTION

OPEN CENTRE VS. CLOSE CENTRE

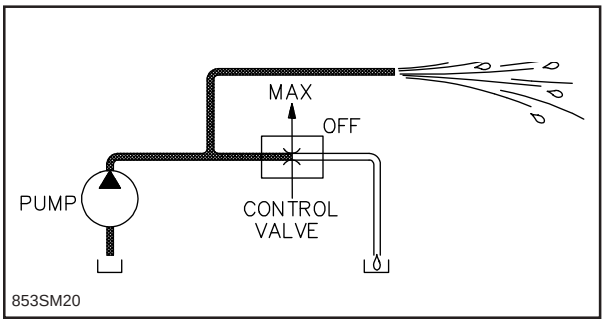
OPEN CENTRE SYSTEM:



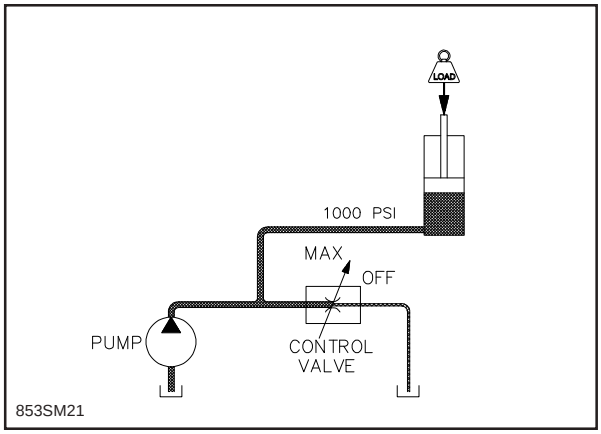
With the control valve in neutral all of the oil from the pump “bypasses” through the open center passage directly to tank. There is no back pressure created by the control valve to force oil into the work port (the work port is actually blocked off when the spool is in neutral, and unblocked when the spool begins to move).



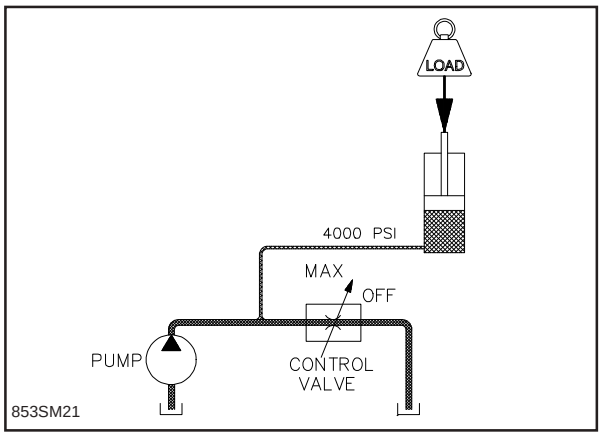
When the control valve lever is moved to actuate a cylinder or motor, the open center passage is blocked off in proportion to the amount the lever is moved. This creates **back pressure** forcing oil into the valve work port to move the load.



When the control valve lever is fully shifted to the maximum flow position the open center passage is completely blocked, and all of the pump flow is forced against the load.



If the oil flowing to the motor or cylinder meets variable loads, this will upset the balance of oil going to the tank and the load. This causes the speed of the function to change with load changes.



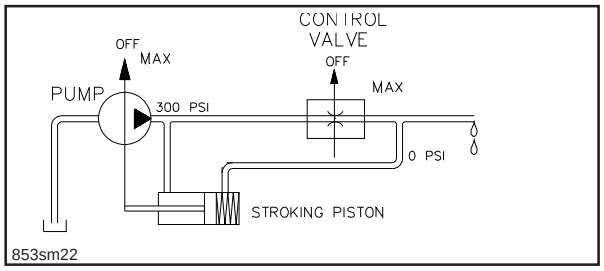
This type of system exhibits the following characteristics;

1. If the load against the cylinder or motor changes, the speed of the function will change.
2. If the load increases on a boom cylinder, the boom will slow or stop. Moving the lever further will increase the pressure against the load, and when high enough, the load will begin to move again.
3. The maximum speed of the function is determined by the maximum flow of the pump.

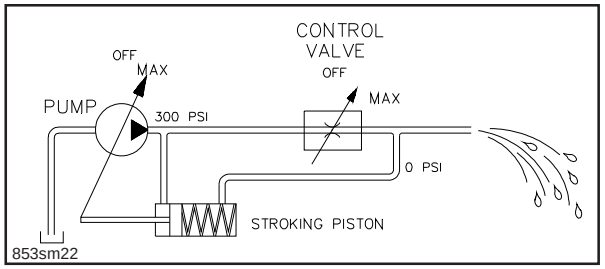
CLOSED CENTRE SYSTEM:

Load sensing systems use variable flow pumps and only flow oil when required. Unlike the open centre system, the control valve does not have an open centre passage. When in neutral, no oil flows through the control valve to tank and the pump output flow is zero. The pump's output flow is controlled by a "stroking piston" which is connected to the pump output, and to the valve's work port or "load". This sense line to the actual working load defines the system as ***load sensing***.

The key component in the system above is the spring in the stroking piston. The pump's output pressure must be 300 psi. higher than the load pressure to compress the spring and reduce the flow of the pump. This 300 psi. is the ***differential*** or ***margin pressure***.



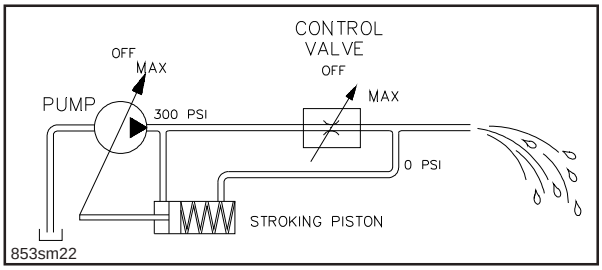
In the figure above the valve is closed blocking the pump from the load. With the load at zero the pump will maintain 300 psi. of ***stand-by pressure*** and pump flow is zero.

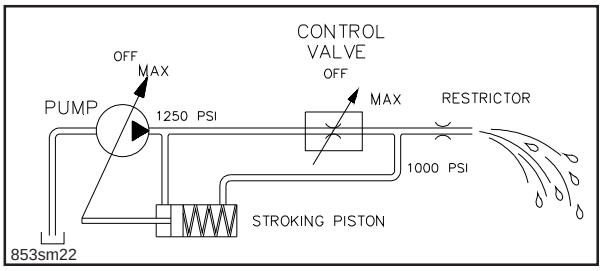


When the control valve lever is moved to actuate a cylinder or motor, the control valve opens the pump to the load. In this case the load is zero and the pump output pressure falls as the oil escapes through the valve. The 300 psi. that was holding the spring in the compressed state is reduced and the spring moves the pump to increase flow. Flow will increase to a level that requires 300 psi. to force the oil through the valve opening. At this point the load pressure combined with the spring force will be high enough to oppose the pump output pressure, and the stroking piston will stop moving.

Changing the control valve lever changes the size of the opening in the valve and upsets the balance of the stroking piston. The stroking piston then adjusts the flow of the pump to find a new balance point. The stroking piston will change the pump's flow until pump pressure is 300 psi. higher than load pressure.

In the figures below note that even though the load pressure may change, (as illustrated by the extra restriction) the flow remains constant. This is because the difference in pressure, or ***differential pressure***, between the pump and load pressures can be maintained by the stroking piston regardless of load. It is important to remember the pump is really responding to the pressure differential resulting from flow through the valve, not the actual load pressure level.





The following are key differences from open centre systems;

1. The load sensing valve's maximum flow is not equal to the pumps maximum flow as with the open centre system. The valves maximum flow is determined by the maximum size of opening or "orifice" it provides.
2. The speed of the load does not change as the load changes. If the load increases on a boom cylinder the pump pressure will increase automatically to maintain the load's original speed. If the load stops, it is because the load is too heavy for the boom to lift. Moving the lever further will not increase the lifting force.
3. A load sensing system provides the speed the operator selects with the lever, and automatically adjusts the pressure to match the load. The open centre system requires the operator to adjust the pressure to match the load and the speed is determined by the load.

OPERATING TIPS

When using the controls on a load sensing system think of what the system is trying to do for you. If you move the lever or pedal 20% of its total angle, the system will provide whatever pressure it takes (up to its maximum capacity if needed) to meet this speed requirement. If you move the lever past the point needed in an attempt to speed up the boom movement, you will only overshoot the speed you wanted. Open centre systems responded to larger lever angles with increased boom speeds, but this system will not. Relax and try to use the least amount of lever action you can.

Load sensing systems respond to rough operation by amplifying these movements. If you find the boom is jerky or always giving “feedback”, you’re probably too active on the controls. If slowing down doesn’t eliminate the roughness, the ***margin pressure*** setting may be too high and can be reduced to calm down the machine’s response.

Refer to SET MARGIN PRESSURE in this section.

Another feature of this system is that the maximum flow of each function, in each direction, can be tuned to your requirements. This is easily done by changing the ***flow adjusting screws*** on each control valve. Take the time to set up your machine, as this greatly reduces fatigue.

Refer to PRESSURE SETTINGS, CYCLE TIMES in SECTION 3 of THIS MANUAL.

MAIN HYDRAULIC CIRCUIT

The main hydraulic circuit utilizes a piston pump, which supplies oil to a load sense system, which operates the track drive, hoist, stick, live heel option, grapple open/close and the saws functions. The control valve is a nine-section plus mid-inlet section, mono-block valve, which sends a load sense signal, from the LS port, to the pump controller whenever one of the functions is activated. Its own spool supplies oil for each function. When all spools are in neutral, no oil is flowing through the valve and hence the system is closed-centre. The pump maintains a stand-by pressure of approximately 500 psi and supplies just enough oil to make up for leakage when all control valves are in neutral. The hoist, stick, and grapple cylinder valve sections utilize cylinder spools, which trap oil in their circuits when the spools are in neutral. The track drive, grapple rotate and saws valve sections use a motor spool which has a passage between the work ports and the return passage when the spool is in neutral.

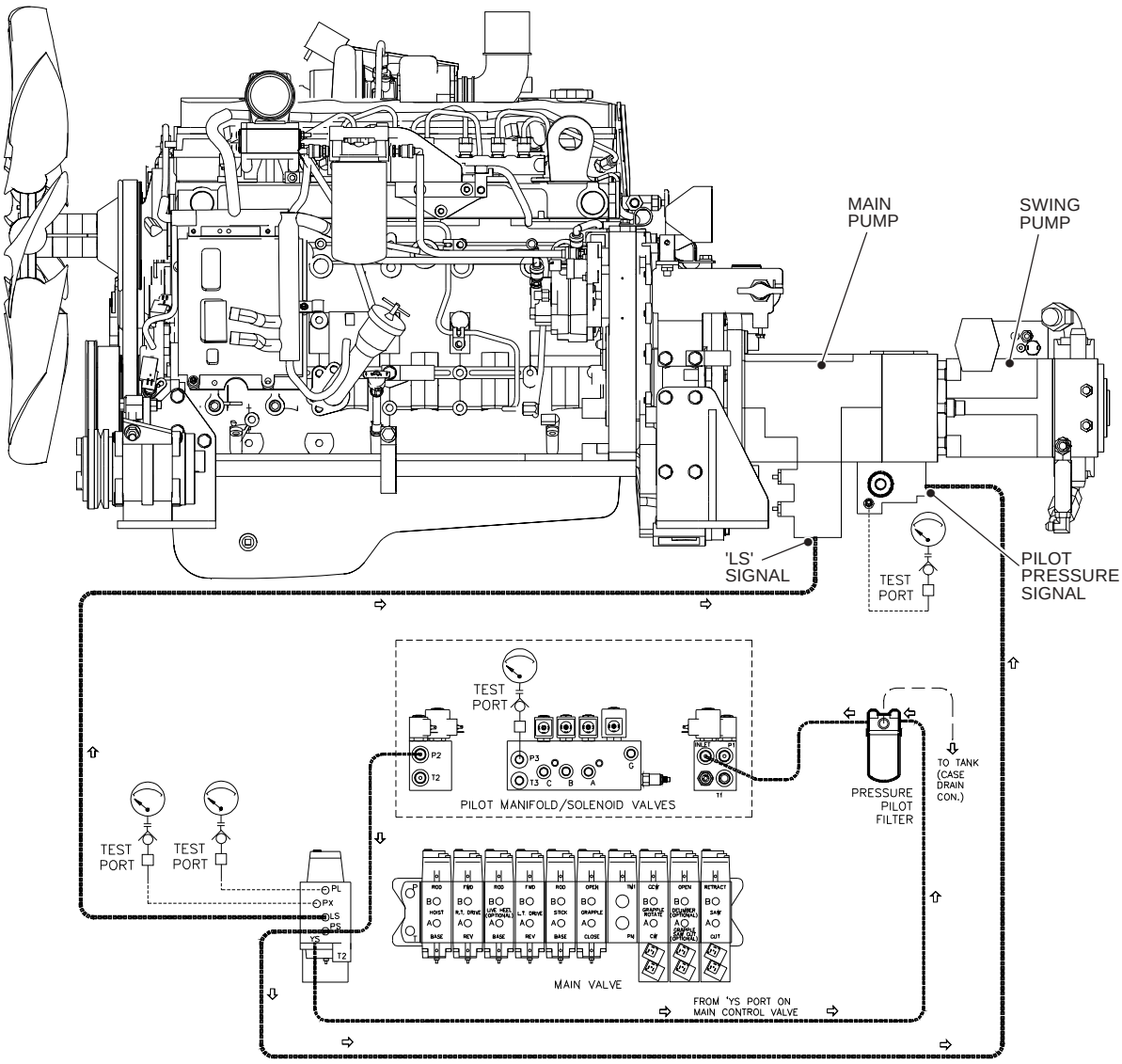
FLOW ON DEMAND AND LOAD COMPENSATION

The combination of control valves and pump used in this system provides flow on demand and load compensation. Flow on demand means that only the required quantity of oil will be delivered to a function by the pump. This will save energy and reduce heat generation in the hydraulic system. Load compensation means that all functions will continue to receive oil regardless of their pressure and without further movement of the control levers.

Without this system, an operator moving control levers halfway on the boom up and stick out controls would find that the lowest pressure function would move and the other would not move. To make both functions move the operator would have to move the high load lever much more than the low load lever. In other words, the operator would have to restrict oil flow to one function while opening up the valve fully to the other. This is what the load compensation system does automatically.

With the load compensation on this unit the operator does not need to continually adjust the control lever to move two or more functions because of pressure differences.

Valves inside of the main control valve spools will automatically adjust flow according to the pilot pressure applied to the spool to move functions independent of load pressure.



LOAD SENSING SYSTEM CIRCUIT DIAGRAM

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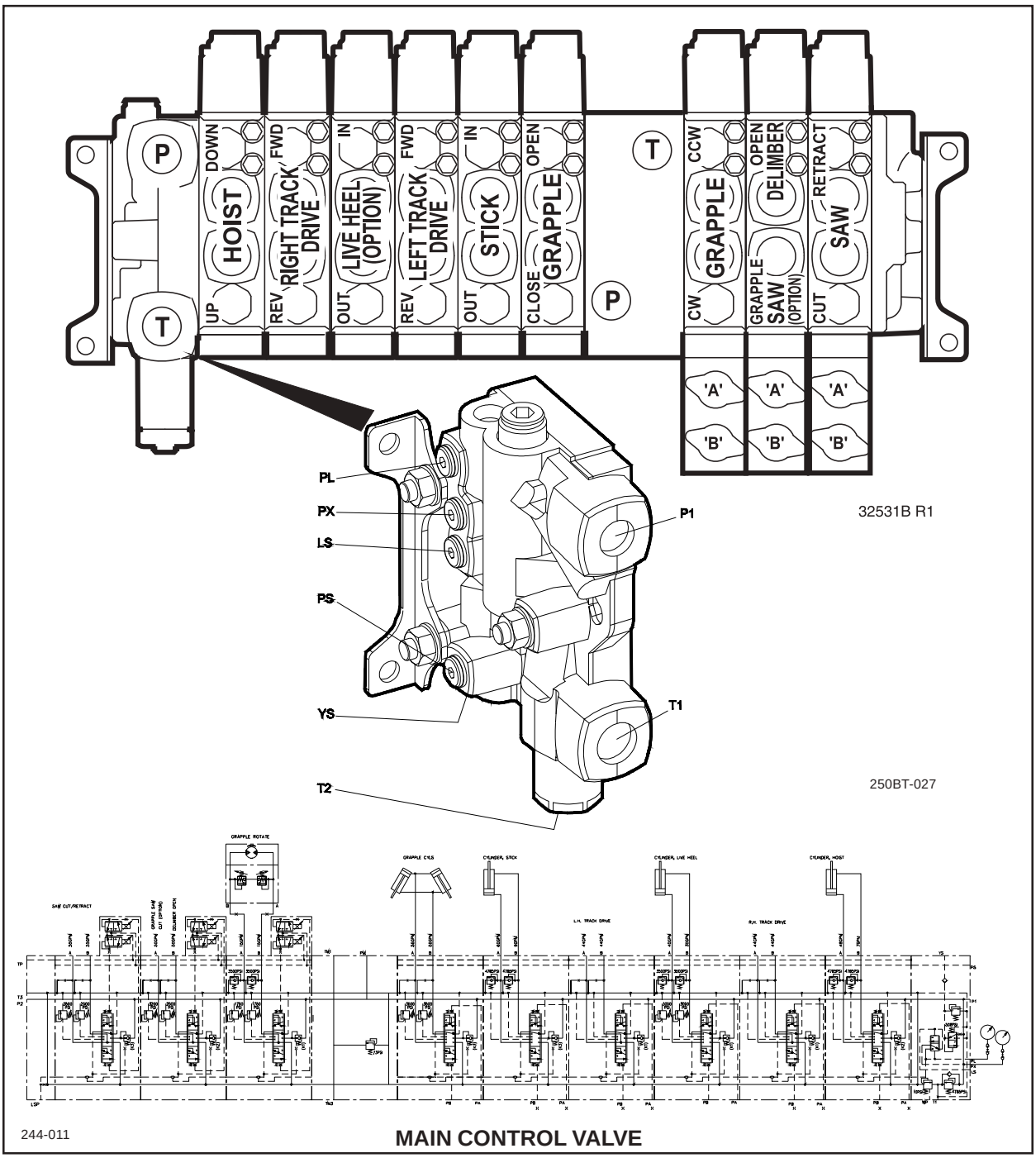


MAIN CONTROL VALVE

MAIN VALVE DESCRIPTION

The main valve is located in the upper frame. It can easily be accessed by removing the valve compartment cover on the left side of the upper frame.

The main valve is a load sensing and pressure compensated proportional valve and consists of nine* spool sections (*Note: the number of sections installed in the valve will vary with options selected). The valve also includes an inlet section, mid inlet section and an end section.

INLET SECTION

The inlet section is equipped with connection ports to the main pump, tank, a load sense signal ('LS') to the main pump. Integrated into the inlet section are the main valve main pressure relief, a load sense signal copy valve, and a counter pressure valve.

Pilot pressure supply

Pilot pressure supply is provided as an internal function of the Main Valve. Pressure is regulated internally to 35 bar (508 psi).

Main Pressure Relief Valve

The inlet section of the main valve houses a 330 bar (4785 psi) direct acting port relief. This pressure relief valve is intended to protect the main pump and main valve from pressure peaks in the system. The cartridge also has a make-up function that allows oil to flow from the tank gallery to the pump gallery in the event of underpressure in the pump circuit. The relief cartridge is not adjustable. Refer to REPLACING MAIN PRESSURE RELIEF VALVE CARTRIDGE in THIS SECTION.

Load sensing system

Shuttle valves installed in each spool section of the main valve provide the load sense signal from the main valve function sending the highest pressure signal. The load sense signal is then copied by the load signal copy valve located in the inlet section of the main valve. The load sense signal is sent from the LS port in the main valve to PL port on the main pump.

Counterpressure Valve

The counterpressure valve, housed in the inlet section, raises the pressure in the valve's tank gallery. Raising the counterpressure reduces the risk of cavitation damage (which decreases the risk of damaging cylinder seals).

END SECTION

The end section is equipped with a separate tank connection for the pilot circuit. The main tank gallery in the boom valve and the pilot circuit tank gallery are not connected. The T1 port is connected to the return filter manifold.

SPOOL SECTIONS

Three of the main valve spool sections (Saw Cut Retract, Grapple Saw, Delimber Open and Grapple Rotate) are equipped with proportional, electro-hydraulic spool actuators. The actuators are spring centered to the neutral position, and are shifted by sending a 24 volt proportional current signal to the appropriate solenoid.

Six of the main valve spool sections (Hoist, Stick, Grapple, Track Drive and Live Heel Option) are equipped with proportional, pilot operated hydraulic spool actuators. The actuators are spring centered to the neutral position, and are shifted by sending a hydraulic signal to the appropriate hydraulic spool actuator.

Spools

Each of the spools installed in the main valve is selected specifically for the function it is controlling. For example, the hoist boom section spool has different characteristics than the track drive spool. These spools cannot be interchanged

Pressure Compensation

The primary purpose of pressure compensation is to maintain a constant flow rate to function (ie: maintain the same speed of movement), regardless of pressure variations in the system. The pressure compensator also contains a load-hold check valve. An orifice is installed immediately down stream of the pressure compensator to smoothly regulate the response of the compensator.

Port Reliefs

The main valve is equipped with port reliefs on each side of all spool sections except the track drive sections. The function of the port relief is to protect the valve and the function cylinder or motor from pressure peaks in the system. The port reliefs also act as anti-cavitation valves, which means they allow oil to flow from the tank gallery in the valve to the service ports in the event of underpressure. The port reliefs cannot be adjusted. Port reliefs installed in each section are specifically designed for use in that section should not be interchanged with port reliefs from other valve sections .

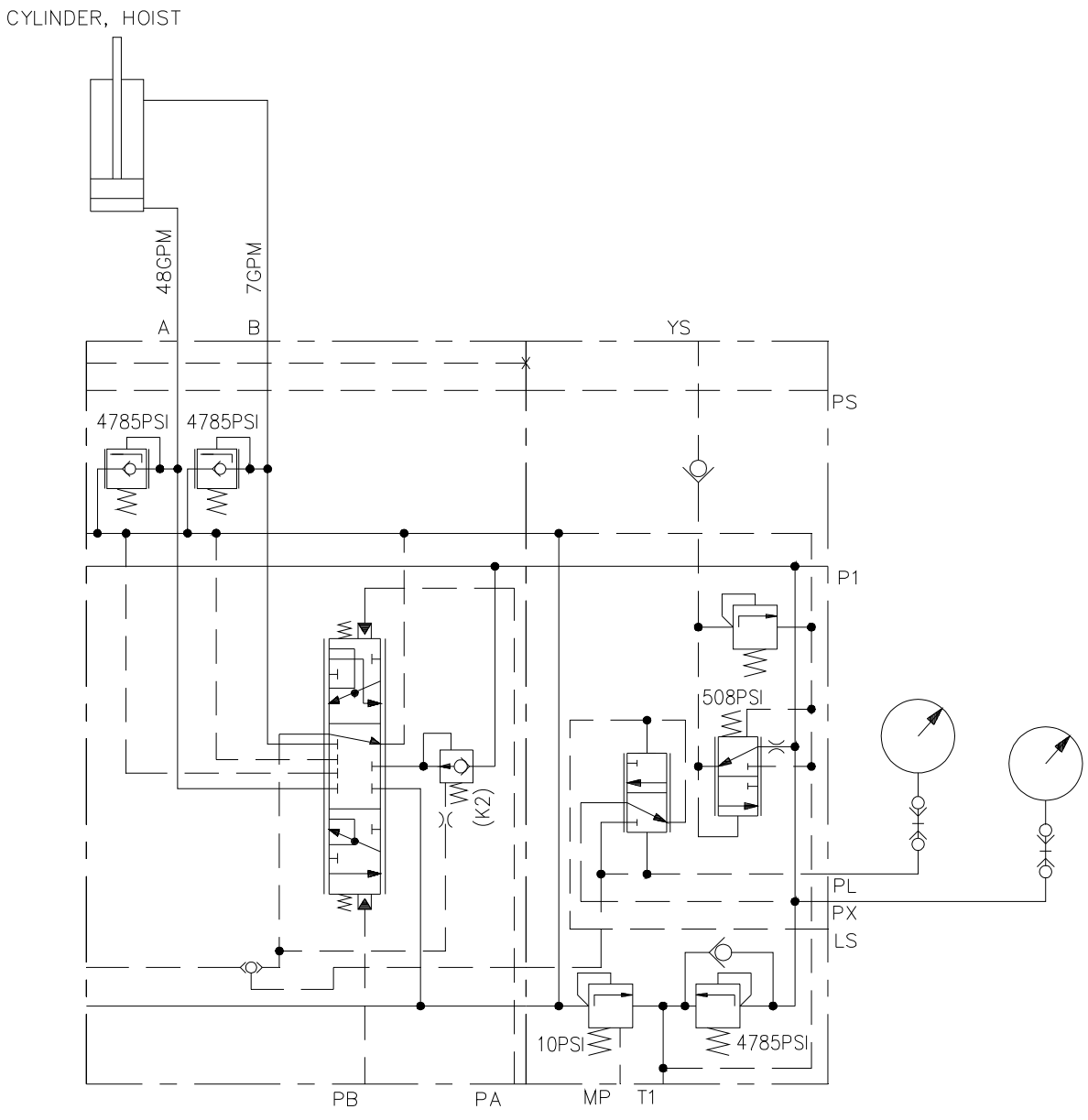
HIGH PRESSURE LIMITING CONTROL

The main pump is protected by a POR valve set to 4500 psi (Gauge at 'PX' test port on the inlet section of the main valve) .

The differential pressure (or the difference between 'PX' port pressure and 'PL' port pressure, observed while a function is operating is set to 375 psi) is known as margin pressure.

NOTE: 'PL' and 'LS' are the same pressure. The 'PL' port is equipped with a test fitting for testing 'LS' pressure.

See SET MARGIN PRESSURE in THIS SECTION.



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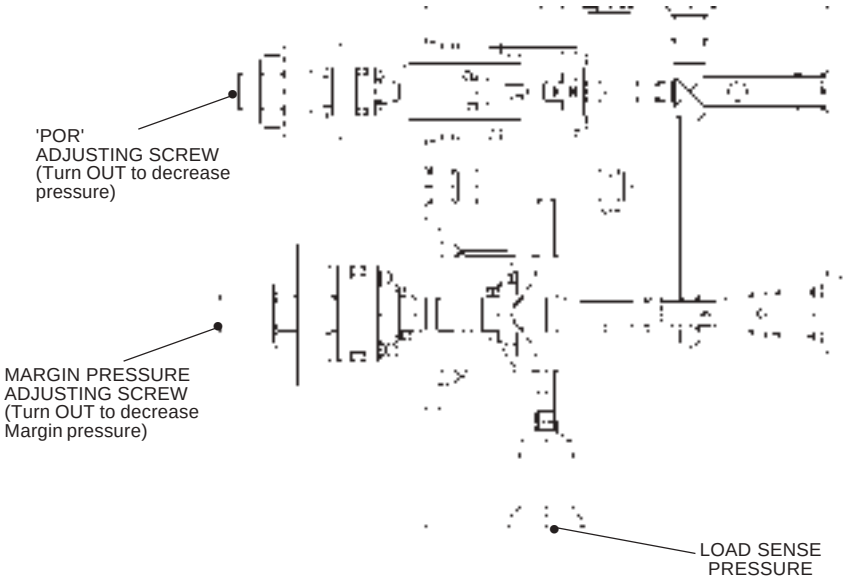
SCHEMATIC DIAGRAM OF "LS" CONTROL & VALVE SECTION

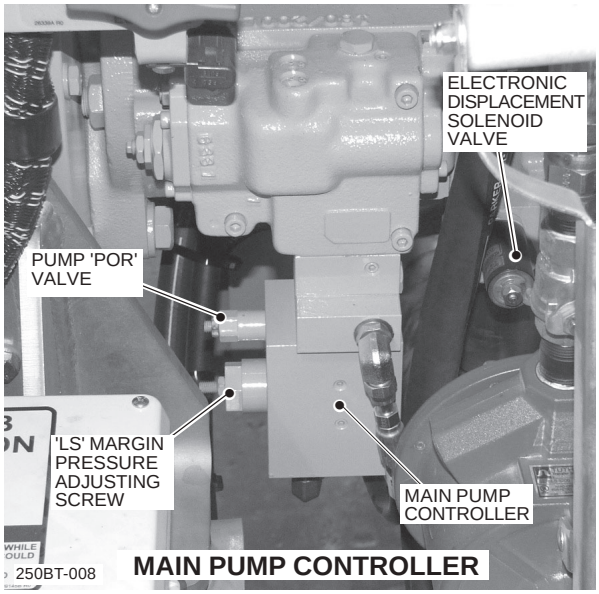


MAIN PUMP CONTROL VALVE

SET MARGIN PRESSURE

MARGIN PRESSURE is the difference between the LOAD SENSE pressure and the PUMP OUTPUT pressure with engine at Idle and pilot circuit engaged. For the load sensing system to operate correctly the differential pressure at 'PX' should be 375 psi higher than 'LS'

****NOTE:** If the margin pressure is not set correctly, the machine controls response may be jerky or sluggish.

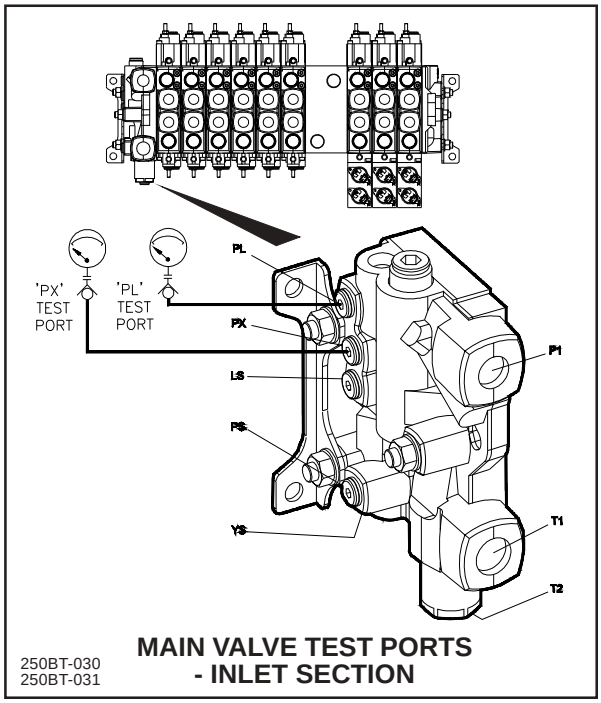


MAIN PUMP CONTROLLER

The margin pressure adjustment is made at the main pump controller attached to the main pump. The pressure gauge connections are the 'PL' and 'PX' gauge test ports on the main valve inlet section.

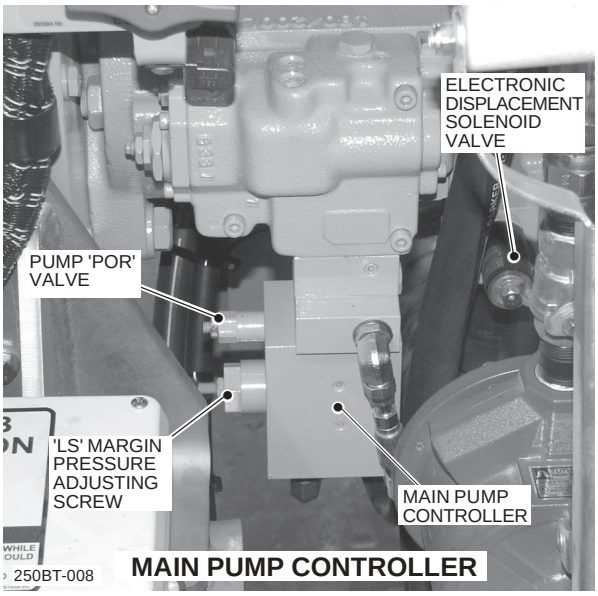
Margin pressure is set at the factory to 375 psi. If required the margin pressure can be adjusted as follows:

1. Use a differential pressure gauge (preferably a differential gauge with ten psi increments).



MAIN VALVE TEST PORTS - INLET SECTION

2. With hydraulic oil at **operating temperature,** Connect one side of the differential pressure gauge to the 'PL' gauge test port located on the inlet section of the main control valve and the other side of the gauge to the pressure 'PX' gauge test port.



MAIN PUMP CONTROLLER

3. Start the engine and and set engine speed to Low Idle.
4. Press PILOT RESET button to activate pilot system with anti-stall switch OFF.
5. Observe gauge.
6. Loosen locknut on margin pressure adjusting screw on main pump controller and turn adjusting screw until the differential reading on gauge/s is 375 psi**. (Turn OUT to decrease Margin pressure).

   NOTE: This is a sensitive adjustment, significant changes in pressure will be noticed with only a small movement of the adjusting screw.

   ****NOTE:** If the margin pressure is not set correctly, the machine controls may not respond as they should, i.e. boom is jerky or sluggish.
7. Allow a short time for pressure reading to stabilize then tighten locknut on adjusting screw.

SECTION 5 - PILOT SYSTEM

AUGUST, 2006

CONTENTS - SECTION 5

CIRCUIT DIAGRAM 5.5, 5.6

ELECTRICAL CIRCUIT 5.5

PILOT SYSTEM COMPONENTS 5.2
- GENERAL DESCRIPTION 5.2
- JOYSTICKS AND FOOT PEDALS 5.4
- PILOT MANIFOLD 5.2
- PILOT SUPPLY VALVE 5.2

PRESSURE SETTINGS 5.5

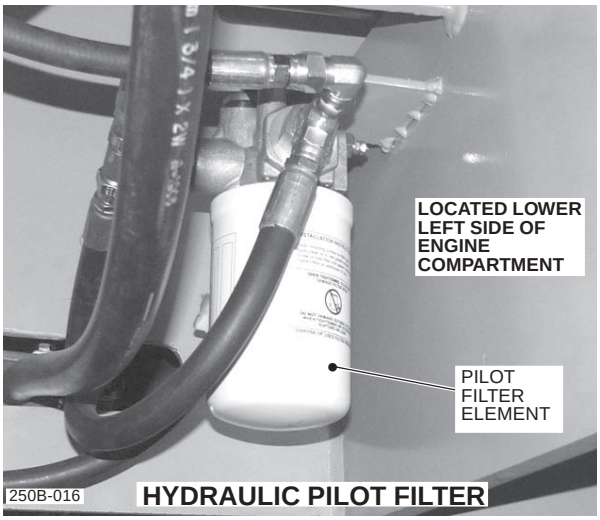
PILOT SYSTEM COMPONENTS

GENERAL DESCRIPTION

The pilot circuit is supplied with oil by the main pump via the attachment valve. A pilot supply valve located in the main valve reduces and maintains the pressure of the oil from the main pump to **500** psi for the pilot system. The pilot oil (**500 psi**) is then supplied to the pilot pressure filter and then to the pilot manifold. Pilot oil is distributed by the pilot manifold to the various pilot actuated functions of the machine. Solenoid operated pilot valves, within the pilot manifold, control the flow of pilot oil to various functions. Joysticks and foot pedals also distribute oil to shift spools in their corresponding control valves.

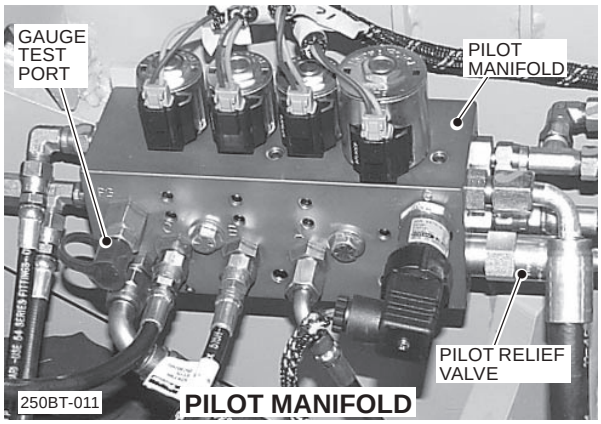
PILOT SUPPLY VALVE (pressure reducing/relieving valve)

The pilot supply valve is a pressure reducing relief valve built into the inlet section of the main control valve. The reducing/relieving valve is not adjustable and is set at **500 psi.** Refer to SET PILOT PRESSURE in THIS SECTION.



PRESSURE FILTER

This filter is a cartridge filter with a built-in differential pressure relief valve, if the pressure differential at the oil filter exceeds 50 psi this valve will bypass the pilot oil back to the tank. This will also result in lower pilot pressure. If a loss of controls or slow response is experienced the filter element may need to be changed.



PILOT MANIFOLD

The pilot manifold is located below the floor plates in the hydraulic valve compartment.

The pilot manifold distributes oil to the following circuits:

- Joysticks (both) (PB) port
- Swing control foot pedal (PB) port
- Gauge test port (P3) port
- Pressure Sensor port (G) port
- Track Drive Enable (A) solenoid valve
- Travel Speed Low (B) solenoid valve
- Swing Brake (B) solenoid valve

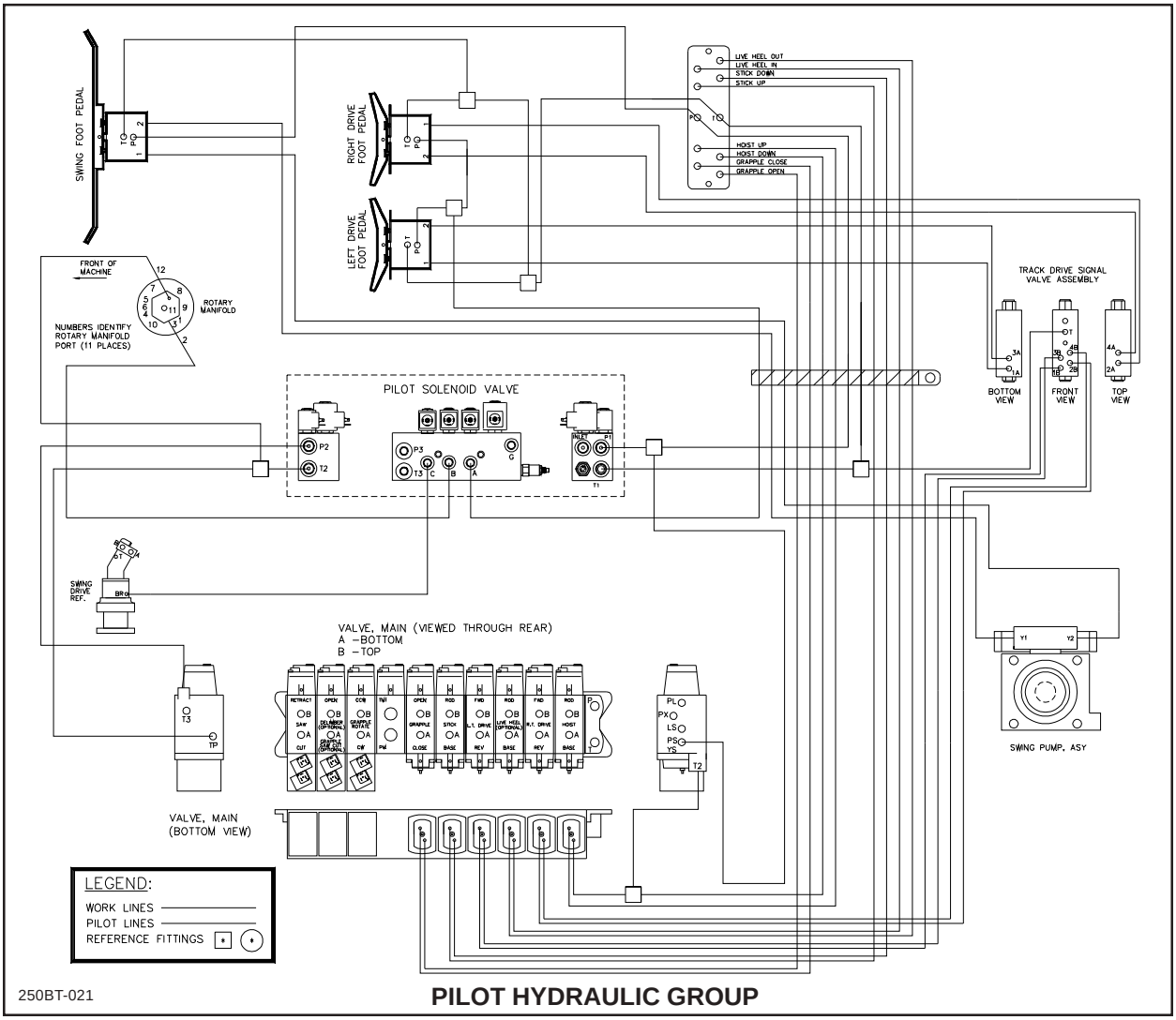
Pilot oil enters the manifold through the **inlet port**.

The **pilot shut off valve,** which is an integral part of the pilot manifold, controls the flow of oil from the INLET port to the four outlet ports labelled (P1, P2, P3 and G) and to the three solenoid operated pilot valves. The **pilot shut off valve** is activated by pressing the pilot reset switch in cab (with the left armrest down).

Two **outlet ports** ('P1 and P2') on each end of the pilot manifold, feed the main control valve PS and LSP ports, the main pump PSV port, both joysticks and the swing foot pedal valve. A gauge test port (P3) has a quick connect fitting installed for connecting a pressure gauge to perform pressure setting procedures.

Three **solenoid operated pilot valves** on the manifold, *when energized***,** supply "on demand" pilot oil to the corresponding functions. These valves are activated by controls in the cab.

Two **tank ports** ('T1 and T2') drain return oil to the reservoir.



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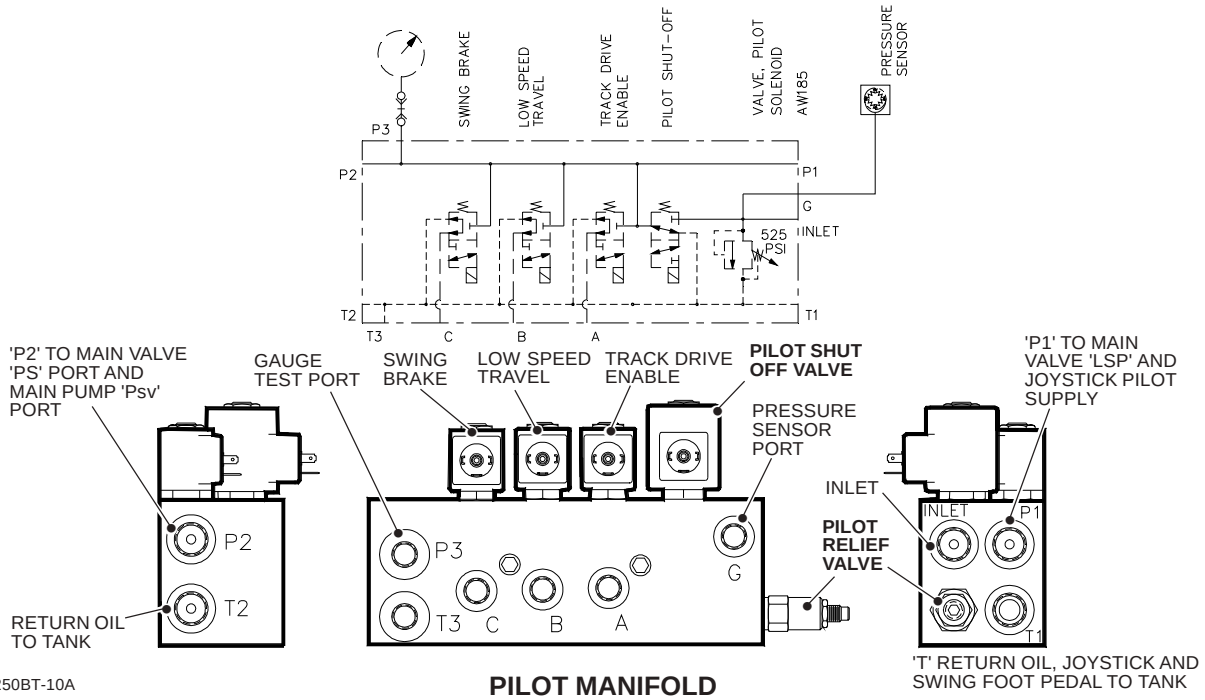
PILOT HYDRAULIC GROUP



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PILOT MANIFOLD

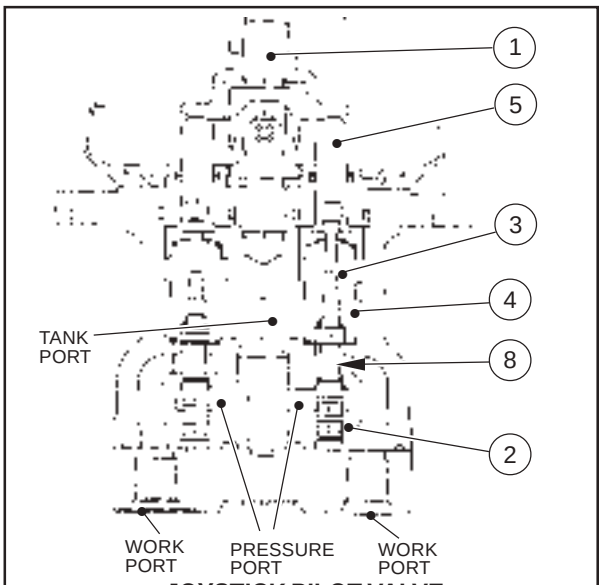
JOYSTICKS AND FOOT PEDALS

These pilot valves are manually operated, directional control valves and operate on the same principle as a direct operating pressure reducing valve. Both the joystick and foot control valves (pedals) use similar spool arrangements. Operated by hand or foot these valves direct pilot oil to the main control valve pilot end caps. The corresponding spool valve then shifts from its centre position and directs pump flow to operate a function.

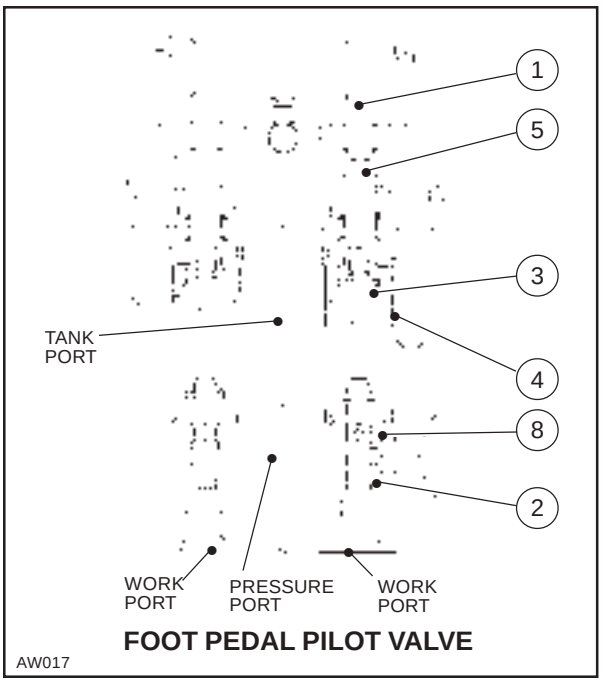
OPERATING DESCRIPTION

In the neutral position the joystick lever, or foot pedal is held centered by return springs (4). When the lever (1) is operated, the plunger (5) is pushed against its return spring (4). At the same time the regulating spool (2) is moved down against the regulating spring (3). When the regulating stroke begins, there is a connection made between the *pressure port*, via holes (8) in the spool and *work ports* in the base of the valve.

Pilot pressure is directly proportional to the operator position of the joystick or foot pedal and the regulating spring characteristics.

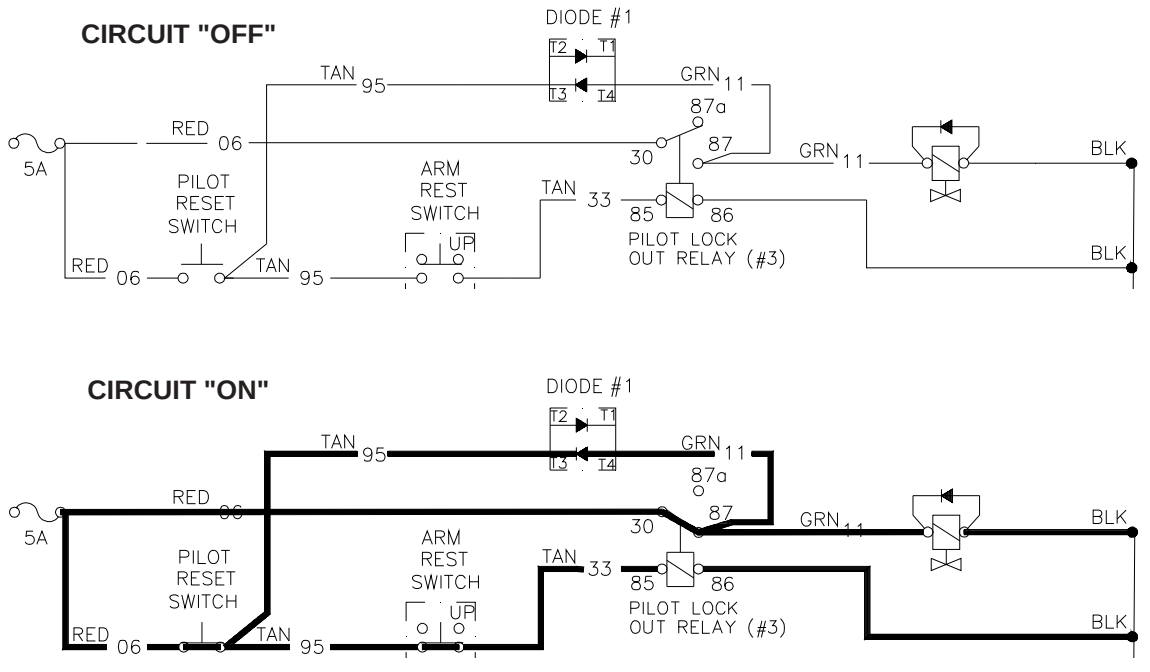


JOYSTICK PILOT VALVE



FOOT PEDAL PILOT VALVE

PILOT SYSTEM ELECTRICAL CIRCUIT



250BT-022
250BT-023

PILOT SYSTEM ELECTRICAL CIRCUIT DIAGRAM

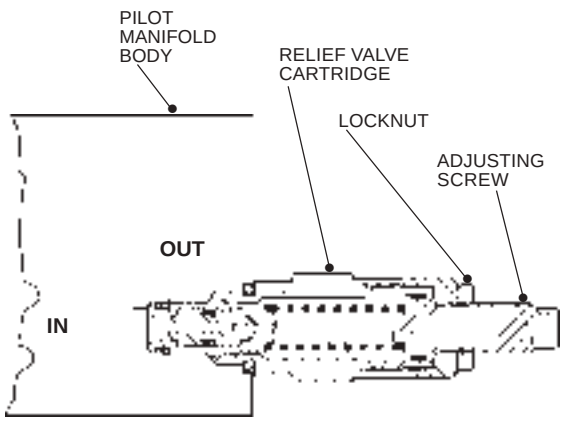
Refer to circuit diagram;

The *pilot shut off* valve solenoid is not energized until the armrest is down and the pilot reset switch is pushed. Wire 33 connects the armrest switch to the *pilot shut off* valve solenoid. Wire 95 connects the pilot reset switch to the armrest switch. When the pilot reset switch is pushed ON with the armrest DOWN, the coil on the pilot shut off relay is energized closing the circuit between wires 6 and 11 to energize the coil in the pilot shut off valve. With the coil energized the valve spool in the pilot shut off valve is shifted to supply oil to the pilot circuit. At the same time wire 95A from the pilot reset switch is connected back to the pilot shut off relay through a diode and thus latches the pilot shut off relay in the energized position.

The diode in the circuit prevents the flow of current to the *pilot shut off* valve solenoid when the armrest switch is open (armrest up). Even if the pilot reset switch is held down, it will not operate. Whenever the arm is raised and the switch opens, the voltage is interrupted to the pilot shut off relay coil and the relay contacts open resulting in the *pilot shut off* valve returning to the normally closed position. This prevents pilot oil from reaching the controls.

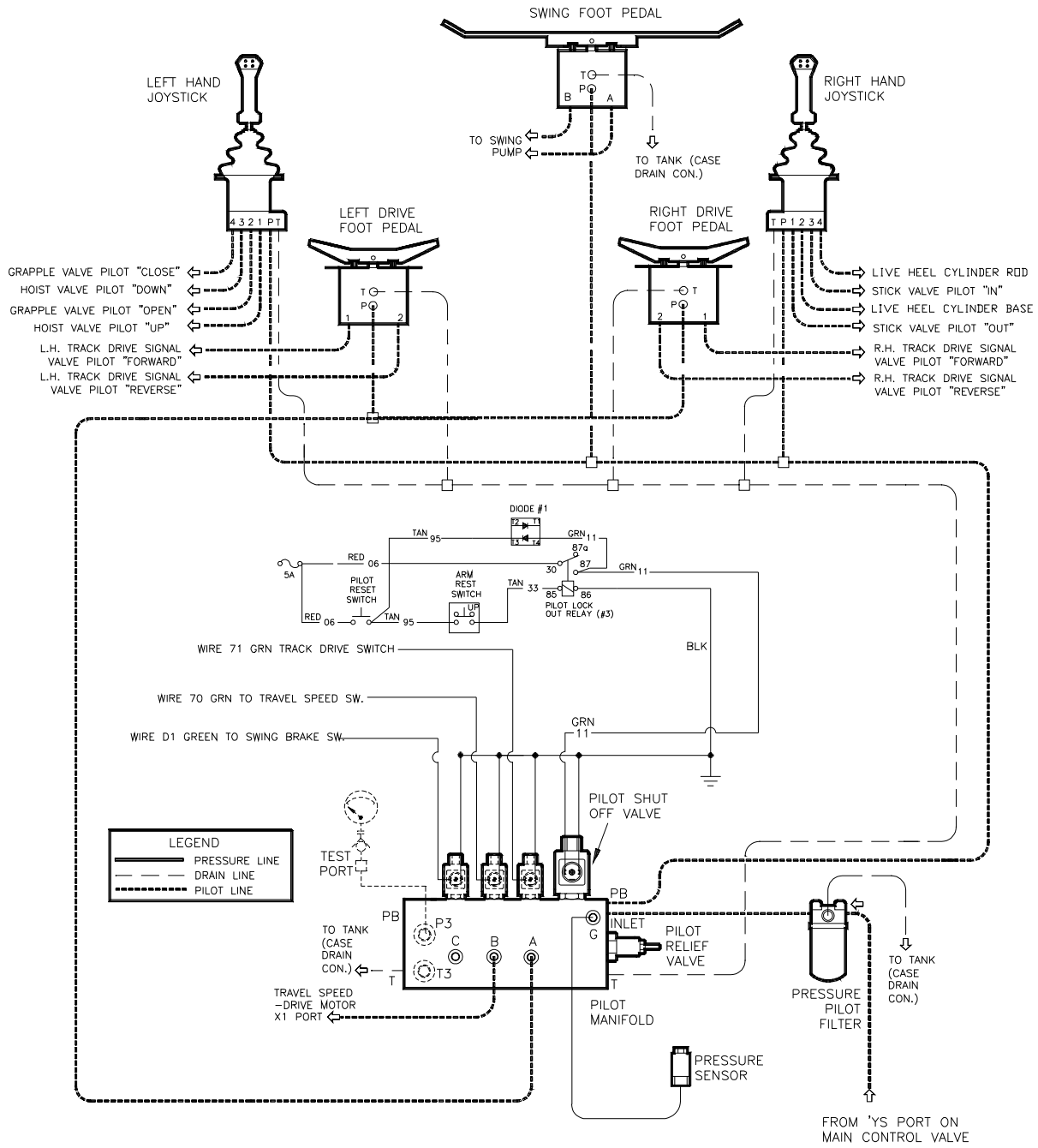
SET PILOT PRESSURE

1. With hydraulic oil at **operating temperature**, connect a 0-1000 psi. gauge to the gauge test fitting on the pilot manifold.
2. Loosen locknut and turn adjusting screw all the way OUT on pilot relief valve, tighten locknut on adjusting screw.
3. Start engine and set throttle in **FULL** position.
4. Loosen locknut on pilot relief valve and turn adjusting screw IN until pressure gauge at pilot manifold reads **500 psi** then turn adjusting screw IN an additional 1/2 turn.
5. Stop engine, and remove pressure gauge.



240B-01

PILOT RELIEF VALVE



250BT-025

PILOT SYSTEM CIRCUIT DIAGRAM

Tigercat T250B Track Loader
SECTION 6 - ELECTRICAL, GAUGES & ALARMS

AUGUST, 2006

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GAUGES AND ALARMS

The T250B Loaders are monitored for proper operation by sensors located in the hydraulic system and on the engine. These sensors are connected to the Plus 1 Electronic Control, PowerView Display and warning lights.

The operator may sound the warning horn at any time.

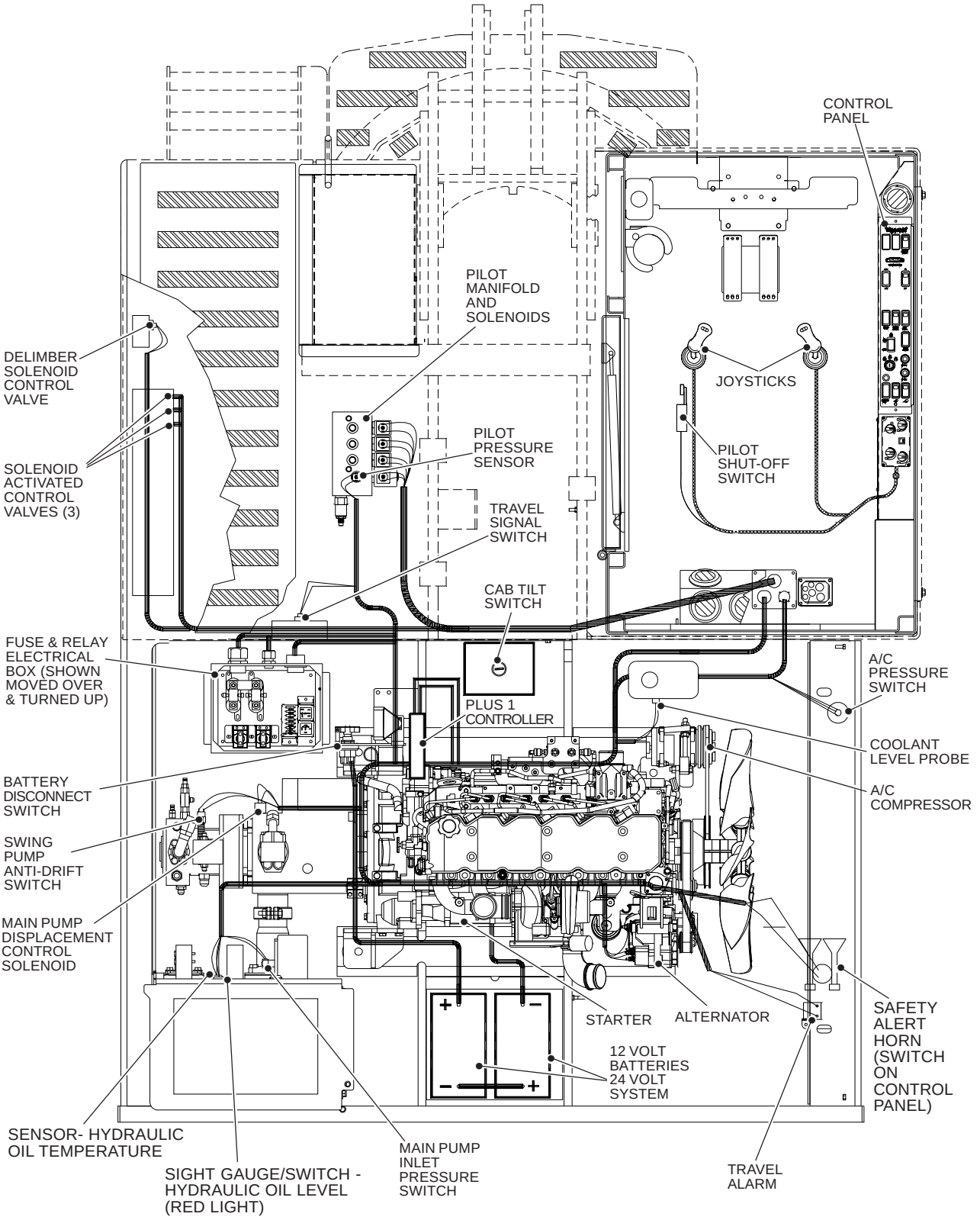
For operation of the PowerView Display and warning lights listed in the sensor chart below, refer to SECTION 2 of the OPERATOR'S MANUAL.

For replacement parts information, refer to GAUGES AND SENDERS in GROUP 600 of the PARTS CATALOG.

SENSOR FUNCTION	DISPLAY	LIGHT	INFORMATION
Engine oil pressure	PowerView	YES	RED Light comes ON below 15psi. * STOP engine below 15 psi
Engine coolant temp.	PowerView	YES	181°F-203°F operating range (Cummins engine) RED light comes ON above 215°F *
Engine coolant level	NONE	YES	RED light comes ON when level in surge tank is LOW
Hydraulic oil temp.	PowerView	YES	RED light comes ON above 205°F *
Hydraulic oil level LOW	SIGHT GLASS	YES	Red light comes ON indicates 13 gallons below FULL *
Pilot Pressure	NONE	NONE	Sensor provides pilot pressure signal for Plus 1 Control Module (Idle Down function)
Wait to start	PowerView	YES	YELLOW light turns ON when grid heater elements ON
Water in fuel	NONE	YES	YELLOW light comes ON when fuel/water separator needs to be drained
Safety Alert HORN	NONE	NONE	Switch on control panel - press to sound horn
Track Drive Signal	NONE	NONE	Switch provides track drive signal for Plus 1 Control Module (Overrides Idle Down function when machine is travelling)

***NOTE:**

Panel buzzer sounds when engine oil pressure too low OR engine coolant temperature too high OR hydraulic oil temperature too high OR hydraulic oil level too low.



250BT-036

SENSORS AND ELECTRICAL COMPONENT LOCATIONS

POWERVIEW DISPLAY MODULE

244-046 **POWERVIEW DISPLAY MODULE**

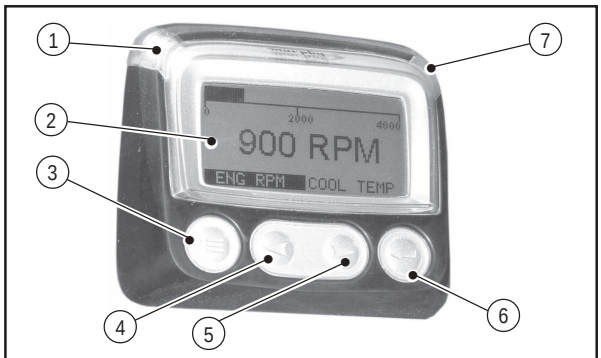
The PowerView Display Module is the operator interface with the electronic engine controls.The PowerView is a multifunction tool that enables the operator to view various engine parameters and service codes. The PowerView includes a graphical backlit LCD screen controlled via menu selection. The display can show either a single parameter or a quadrant display showing 4 parameters simultaneously. Diagnostic capabilities include fault codes with text translation for the most common fault conditions.

The PowerView has four buttons used to navigate the display with ease.

DISPLAY PARAMETERS

The following are some of the functions displayed by the PowerView Display Module:

Engine RPM
Engine Hours
Machine Hours
System Voltage
% Engine Load at the current RPM
Coolant Temperature
Oil Pressure
Fuel Economy
Throttle Position
Engine Manifold Air Temperature
Current Fuel Consumption
Active Service Codes
Stored Service Codes from the engine
Set Units for display (English or Metric)
Engine Configuration Parameters



244-007 **POWERVIEW DISPLAY MODULE**

COMPONENT DESCRIPTION

1. Amber Warning LED
2. Display
3. Menu Key
4. Left Arrow Key
5. Right Arrow Key
6. Enter Key
7. Red Shutdown LED

START-UP OPERATION

KEYPAD FUNCTIONS

MENU KEY - This key is pressed to enter or exit menu screens.

LEFT ARROW KEY - This key is pressed to scroll through the screen either moving the parameter selection toward the left or down.

RIGHT ARROW KEY- This key is pressed to scroll through the screen either moving the parameter selection toward the right or up.

ENTER KEY - This key is pressed to select the parameter that is highlighted on the screen.

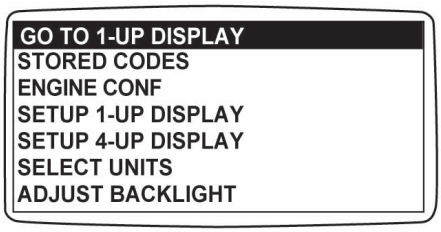
Refer to manufactures Operations Manual (supplied with the machine) for detailed information.

When power is first applied to the PowerView, the “Logo Screen” will be displayed, the “Wait to Start” message will be displayed. Once the “Wait to Start” message is no longer displayed the operator may start the engine. When the engine has started the display will show the single engine parameter display.

244-007 **SINGLE PARAMETER DISPLAY**

MAIN MENU NAVIGATION

1. Starting at the single or four engine parameter display, depress the “Menu Button”.



244-047

2. The first seven items of the “Main Menu” will be displayed.
3. Depressing the “Arrow Buttons” will scroll through the menu selections.
4. Pressing the right arrow button will scroll down to reveal the last items of “Main Menu” screen highlighting the next item down.
5. Use the arrow buttons to scroll to the desired menu item or press the “Menu Button” to exit the Main menu and return to the engine parameter display.

FAULTS AND WARNINGS

During normal operation the single or four parameter screen will be displayed. When the PowerView receives a fault code from an engine control unit the single or four parameter screen will be replaced with the “Active Fault Codes” message.

To acknowledge and “Hide” the fault and return to the single or four parameter display press the “Enter Button”. The display will return to the single or four parameter screen. Indicates Auxiliary Gage Fault. Indicates Fault Warning Indicates Derate or Shutdown Condition Fault

Pressing the “Enter Button” will redisplay the hidden fault. Pressing the “Enter Button” once again will hide the fault and return the screen to the single or four parameter display.

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

Some of the display and warning functions are:

LOW ENGINE OIL PRESSURE - RED LED

This light will come ON when the engine oil pressure falls below 15 psi. If this light comes ON stop the engine and determine cause.

ENGINE COOLANT TEMP. - RED LED

This light will come ON when the engine coolant temperature rises above 215°F If this light comes ON stop engine and determine cause. Do not continue to operate machine.

TACHOMETER

This display indicates the RPM. of the engine.

HOUR METER

There are two options available for displaying hours:

TOTAL ENGINE HOURS - displays total hours the engine has run as provided by the engine computer.

MACHINE HOURS - displays the total hours the engine has run as calculated by the display module.

ENGINE OIL PRESSURE

Oil pressure must be greater than 15 psi at all times. If the oil pressure drops below 15 psi, stop the engine and determine cause. Check engine oil pressure every time the engine is started.

The oil pressure at high idle and full load should normally operate between 30 and 60 psi.

NOTE: At low idle rpm the oil pressure will be low. This is not an abnormal condition, however it must be closely monitored.

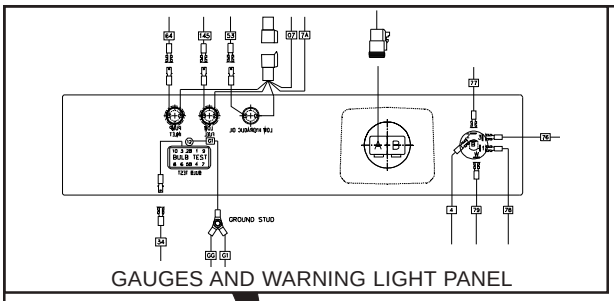
ENGINE COOLANT TEMP.

Normal operating range is between 181°F and 203°F. If the temperature rises beyond 210°F, reduce the load on the engine and check for a plugged radiator. If the temperature does not drop, stop engine and determine cause. Do not continue to operate machine.

VOLTAGE DISPLAY

Normal operating range is between 24-28 volts. A reading in excess of 30 volts indicates a possible faulty voltage regulator. A reading of less than 23 Volts indicates a possible faulty battery or alternator.

Refer to manufactures Operations Manual (supplied with the machine) for detailed information.

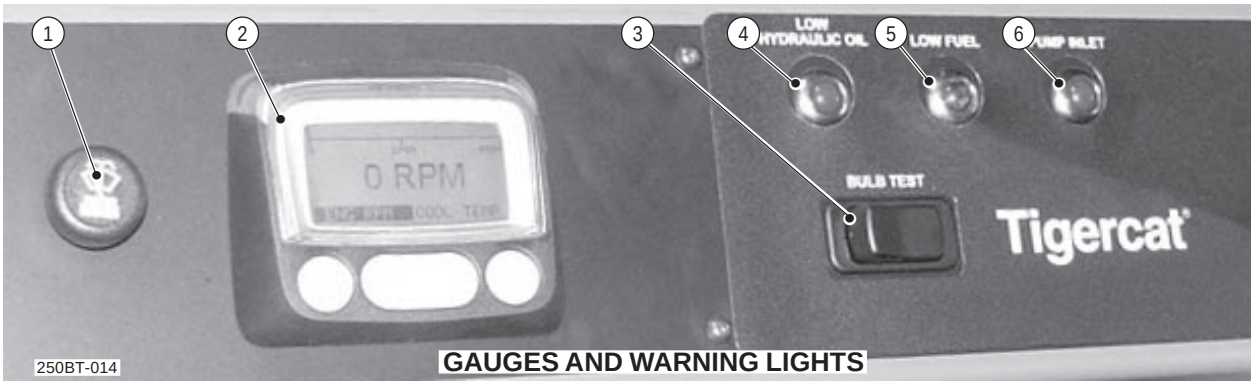


23 PIN CONNECTOR

DEUTSCH PIN	WIRE
A	GG
B	07
C	08
D	34
E	–
F	–
G	45
H	44A
J	53
K	32
L	57
M	58
N	H5
O	L5
P	63
Q	64
R	04
S	SHLD
T	145
U	–
V	–
W	–
X	SPC

CAB WIRING AND ELECTRICAL COMPONENT LOCATIONS

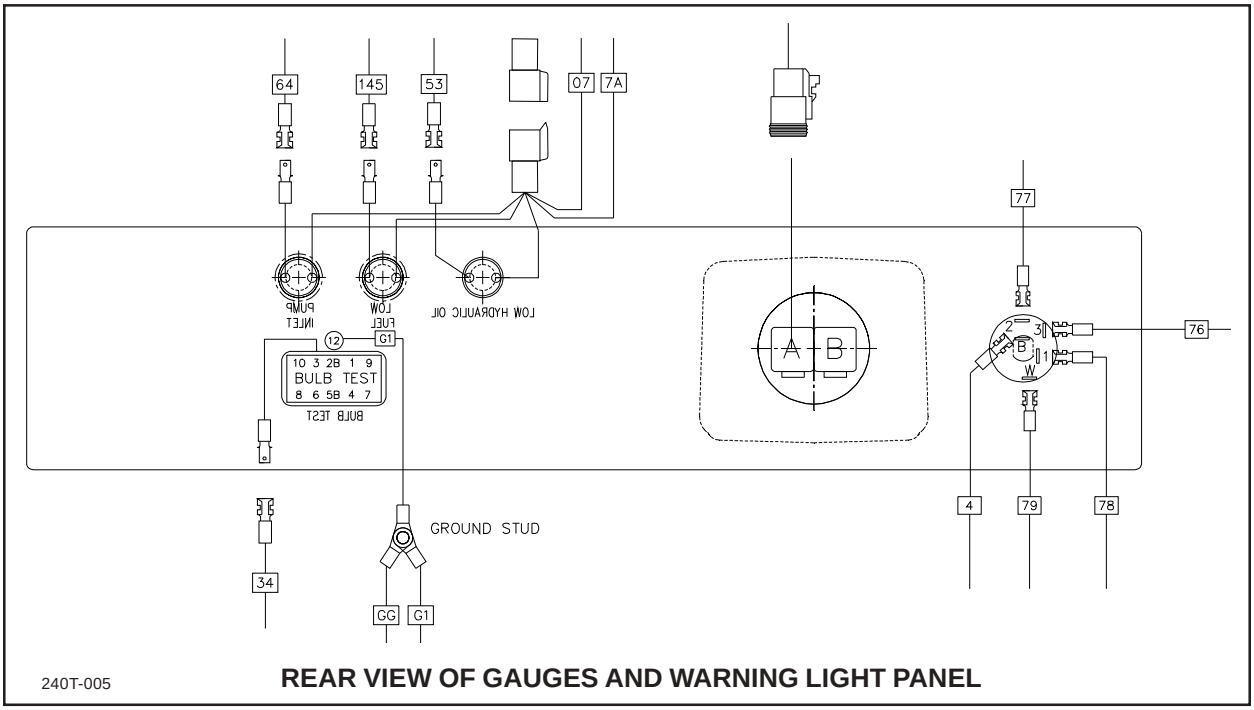
GAUGES AND WARNING LIGHTS



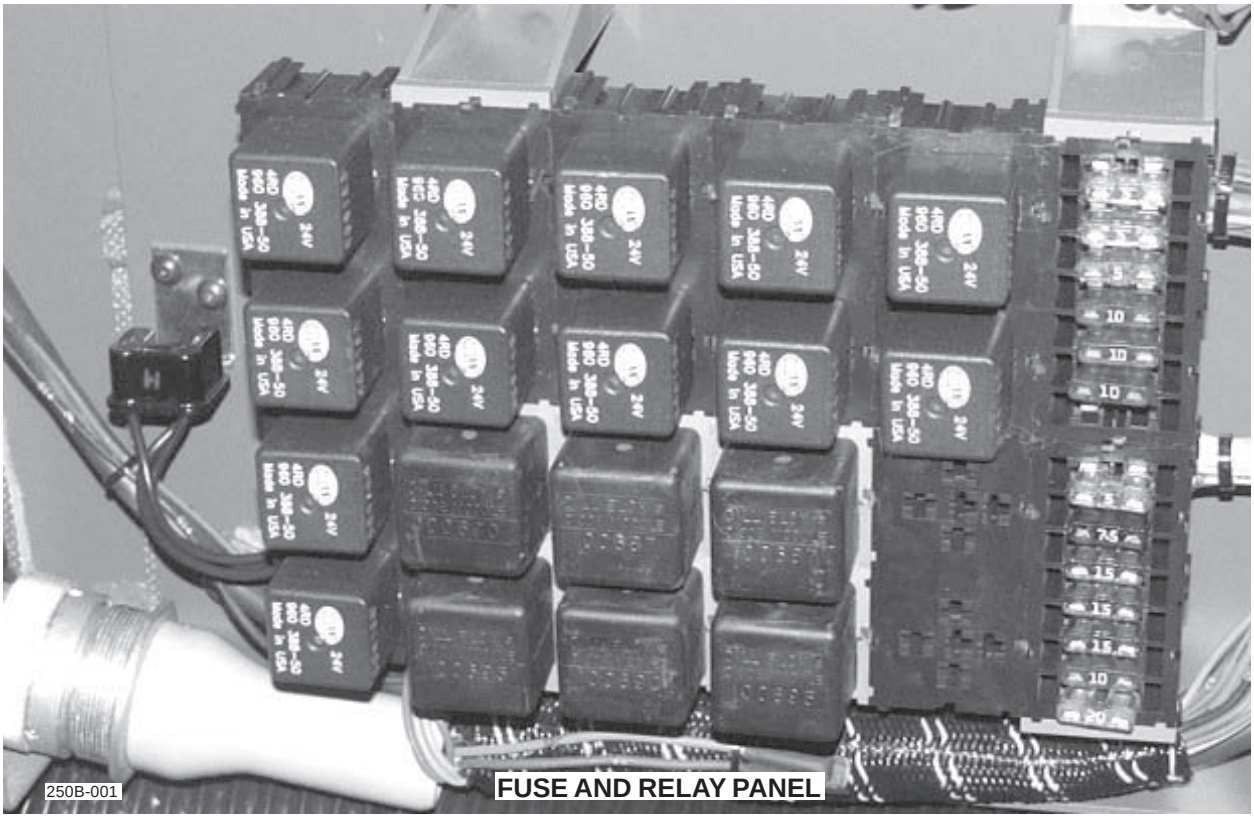
GAUGES AND WARNING LIGHTS

Component description

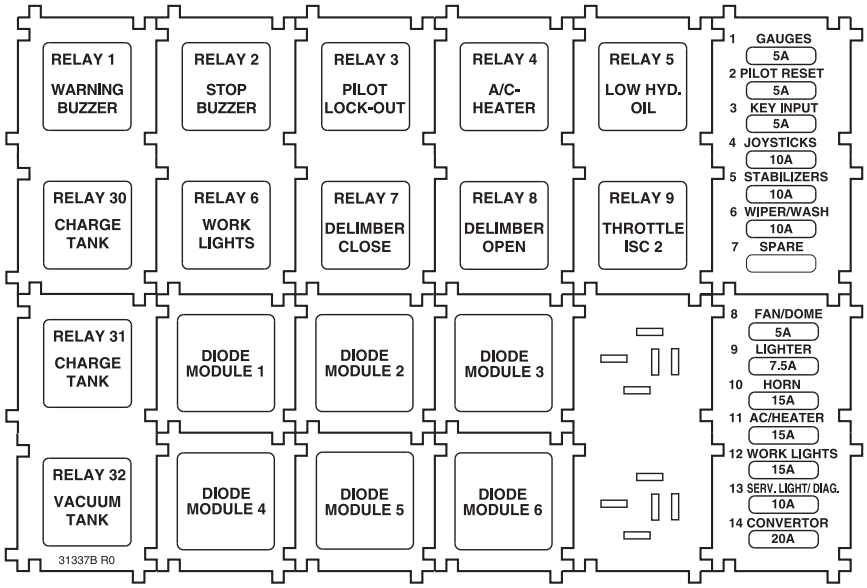
1. Windshield Wiper Switch
2. PowerView Display Module
3. Bulb Test Switch
4. Low Hydraulic Oil Light - Red
5. Low Fuel Light - Yellow
6. Pump Inlet Light - Red



REAR VIEW OF GAUGES AND WARNING LIGHT PANEL



FUSE AND RELAY PANEL



FUSE AND RELAY PANEL

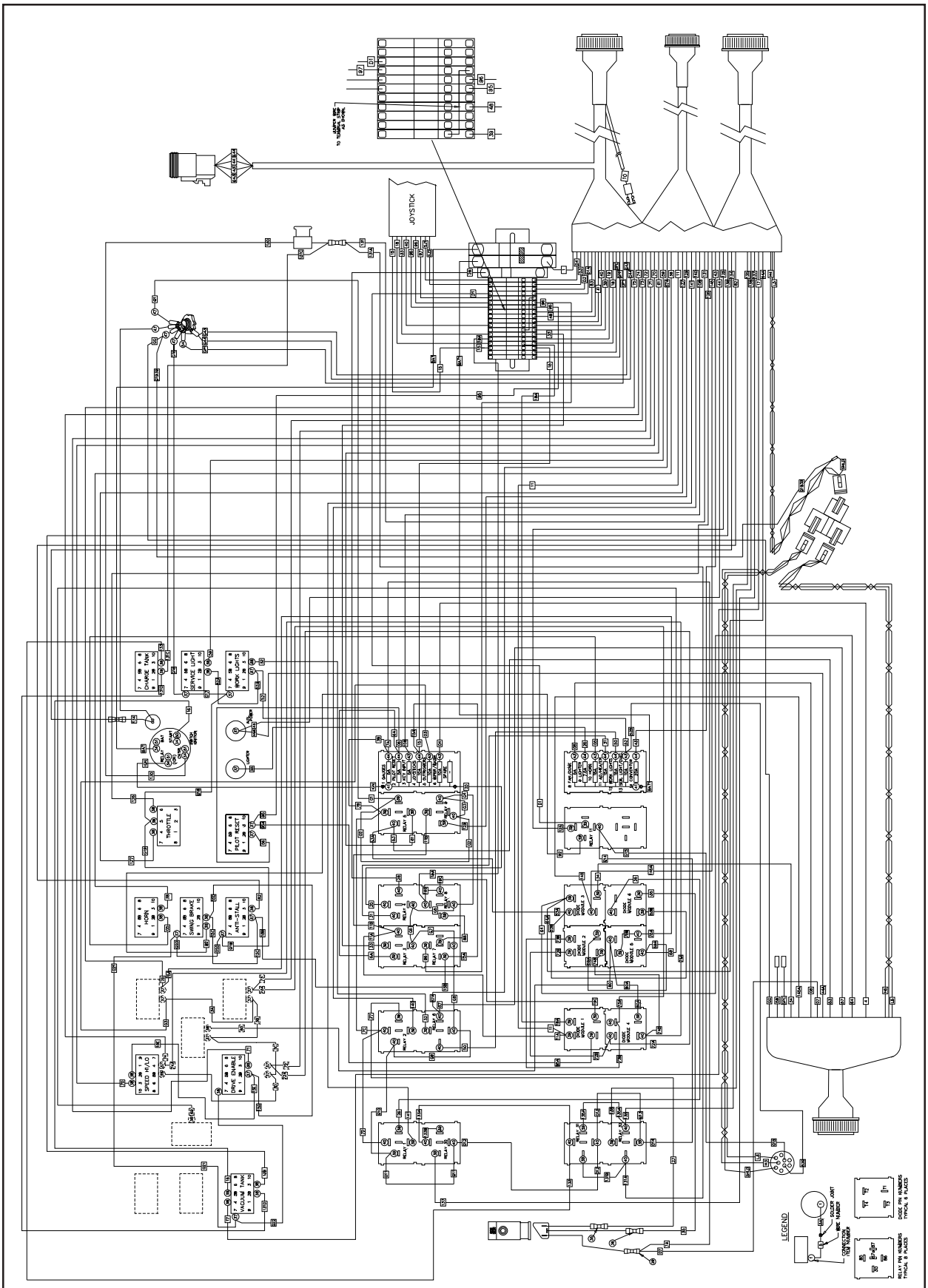
FUSE AND RELAY PANEL

The fuse panel is located inside the control panel behind a removable cover.

Each circuit of the machine is protected by a fuse. If a fuse is blown it must be replaced by one of the same value. If the fuse blows again, the circuit should be inspected for possible short circuit or other malfunction.

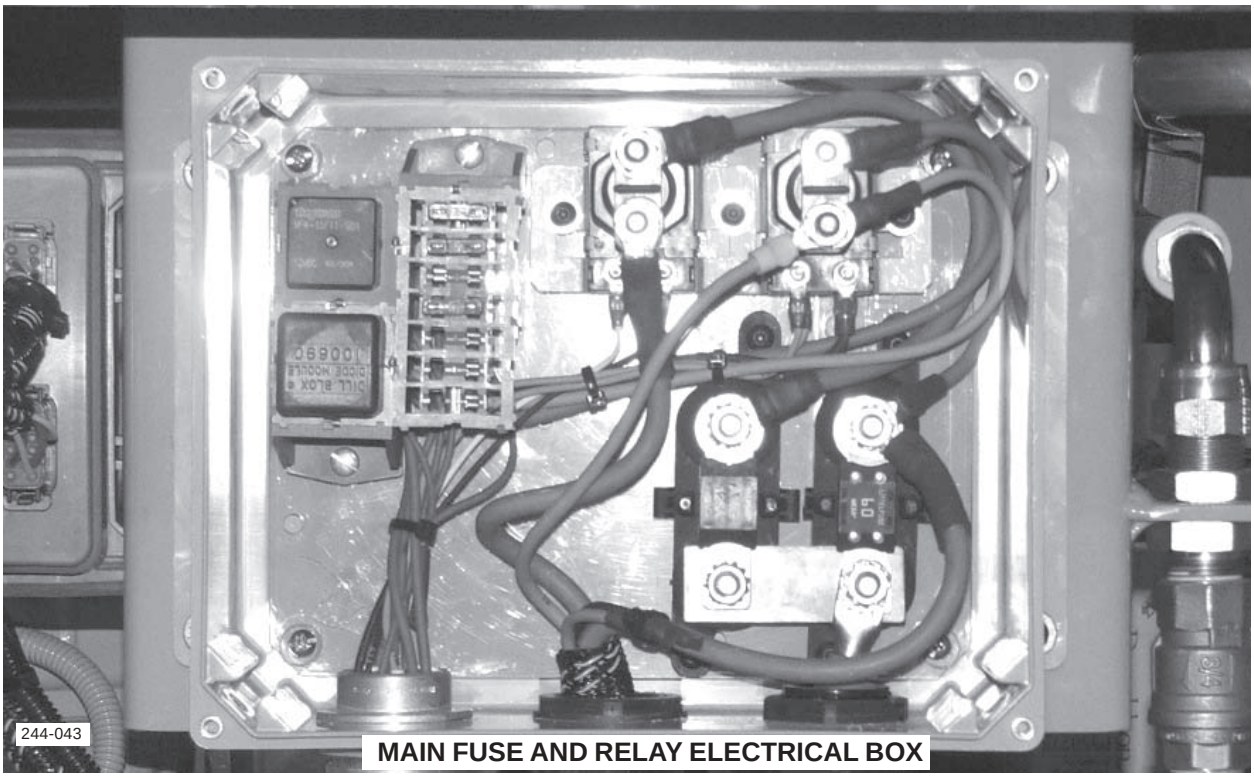
IMPORTANT

24 VOLT
ELECTRICAL SYSTEM

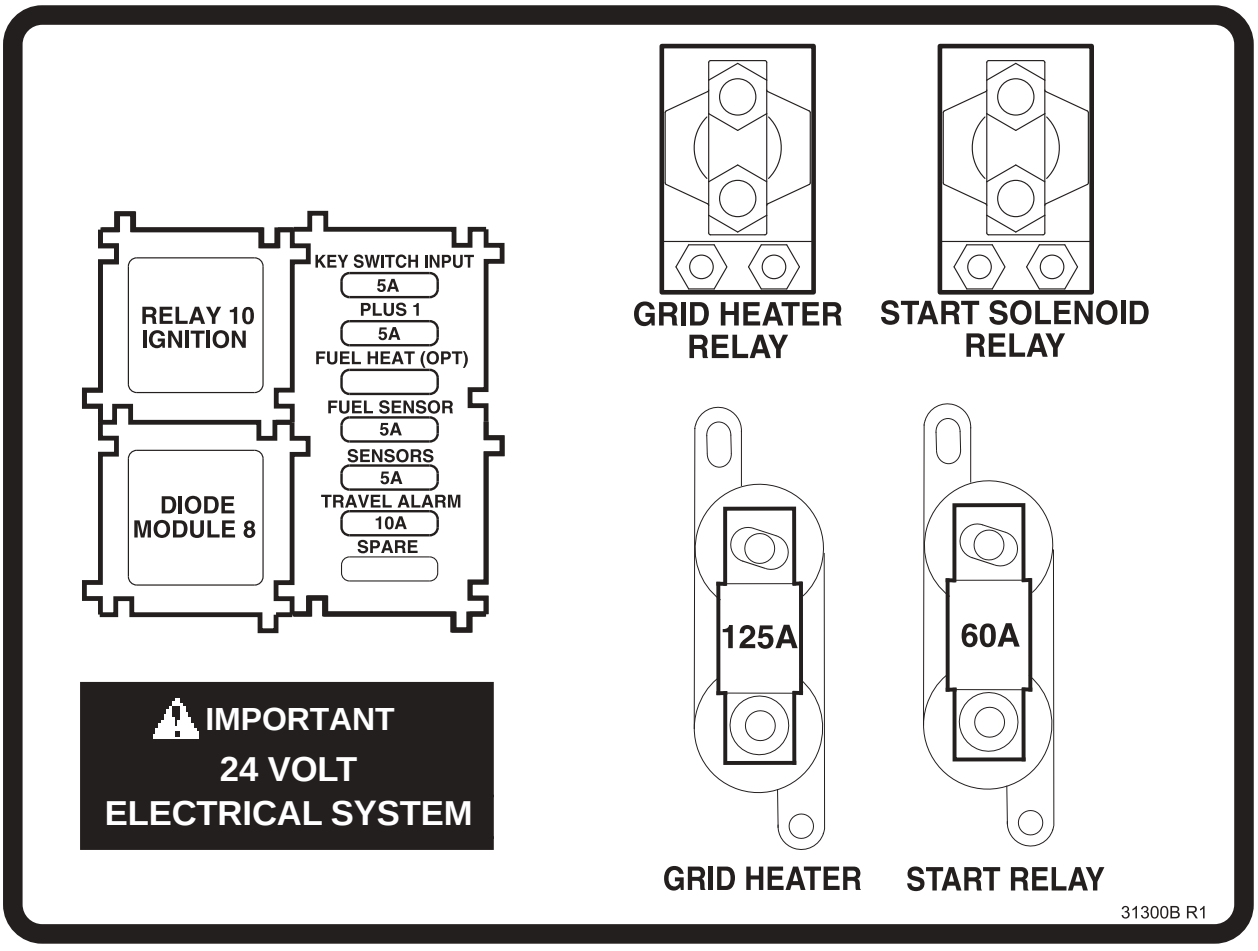


240T2-004

INSTRUMENT PANEL WIRING DIAGRAM



MAIN FUSE AND RELAY ELECTRICAL BOX



FUSES AND RELAYS - ELECTRICAL BOX

This Main Fuse and Relay electrical box is located in the engine compartment.

WIRE #	GAUGE	COLOUR	TERMINALS		FUNCTION
1B	8GA	RED	27	27	SART SOL POWER
1C	8GA	RED	27	–	FUSE POWER
02	16GA	RED	32	38	ALTERNATOR EXCITE
12A	10GA	TAN	41	42	START SOLENOID
17	16GA	TAN	30*	38	START SOL RELAY
17A	16GA	TAN	30*	38	AUX. START SWITCH
21	16GA	RED	31*	38	AUX. IGN. RELAY
21A	16GA	RED	31*	32	AUX. IGN. RELAY
37	16GA	RED	31*	38	FUEL SENSOR POWER
42	16GA	RED	34	38	PLUS 1 POWER
46A	14GA	ORANGE	32	38	COMPRESS CLUTCH
47	14GA	RED	34	38	TRAVEL ALARM POWER
94	16GA	RED	31	38	SWING SENSOR POWER
94A	16GA	RED	31*	38	PILOT SENSOR POWER
107	16GA	RED	33*	38	KEY SWITCH INPUT
108	16GA	RED	33*	38	KEY SWITCH INPUT
108A	16GA	RED	33*	38	PLUS 1 KEY SIGNAL
117	20GA	WHITE	30	38	GRID HEATER #1 RELAY
119	20GA	BLACK	29	38	ECM RETURN
120	6GA	RED	27	27	GRID HEATER #1 POWER
150	14GA	RED	–	34	FUEL HEATER OPTION
G3	14GA.	BLACK	32	33*	RELAY GROUND
G4	14GA.	BLACK	33*	29	RELAY GROUND
G16	14GA	BLACK	29	38	RELAY GROUND

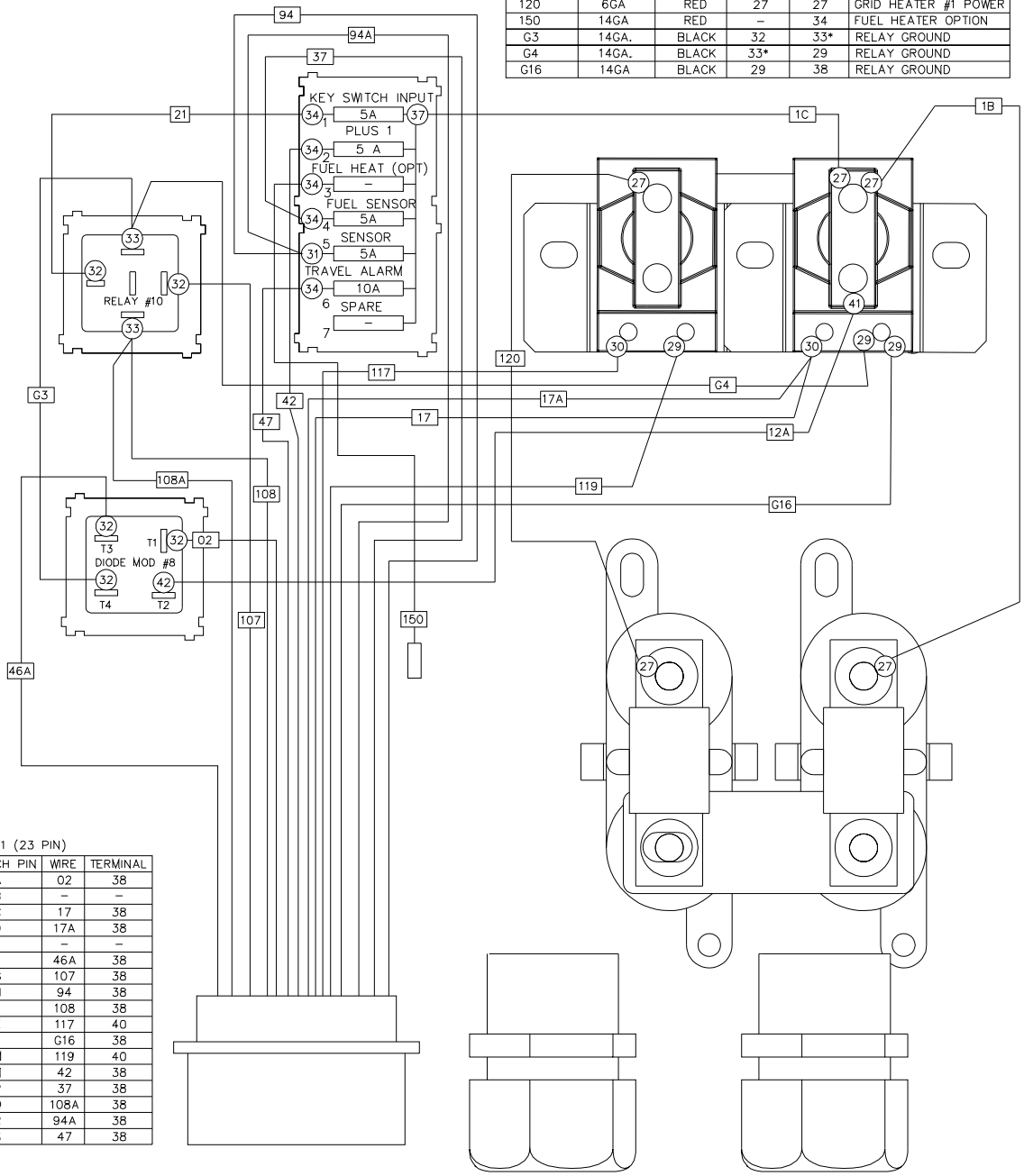


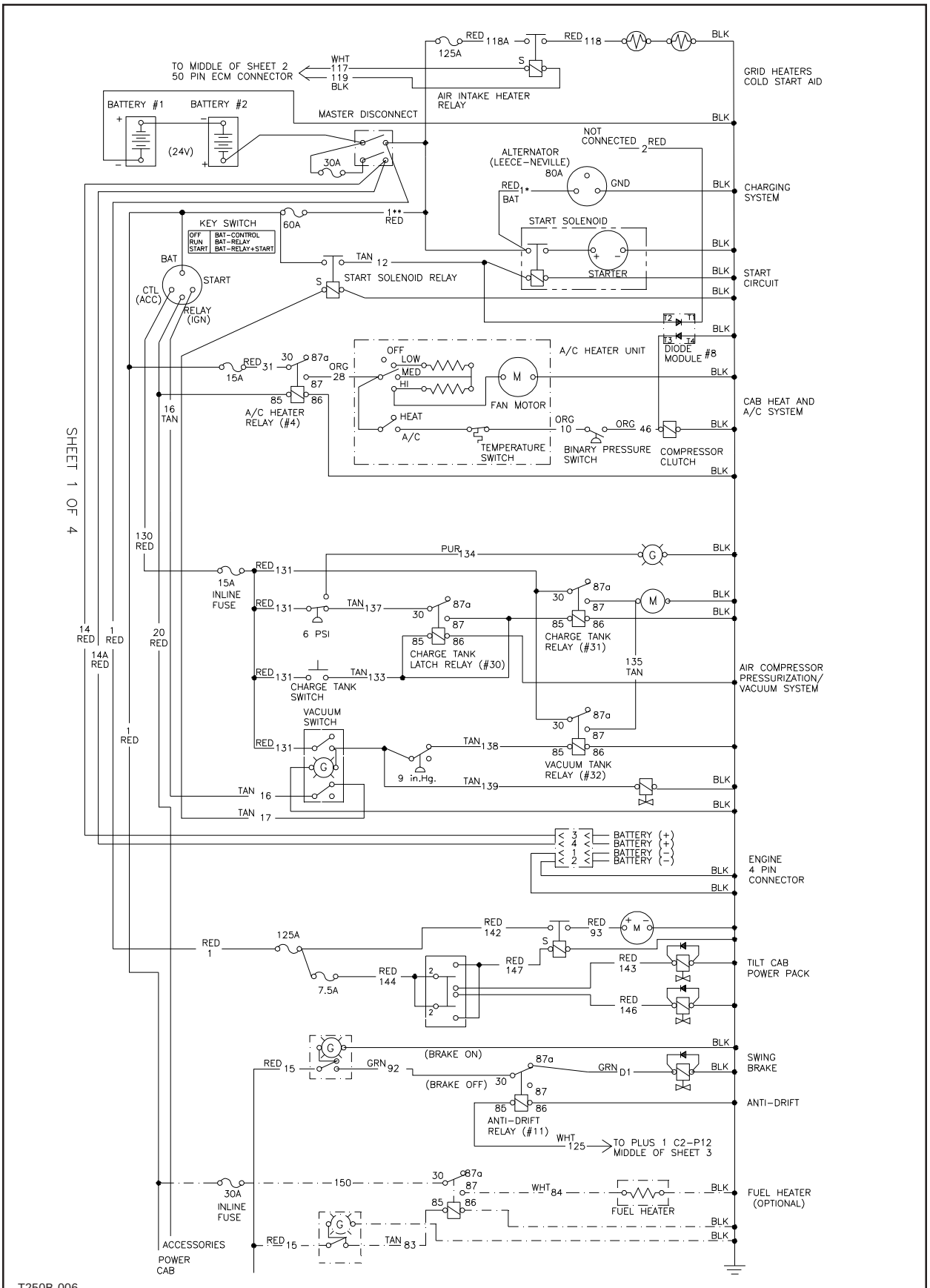
TABLE 1 (23 PIN)

DEUTSCH PIN	WIRE	TERMINAL
A	02	38
B	–	–
C	17	38
D	17A	38
E	–	–
F	46A	38
G	107	38
H	94	38
J	108	38
K	117	40
L	G16	38
M	119	40
N	42	38
P	37	38
Q	108A	38
R	94A	38
S	47	38

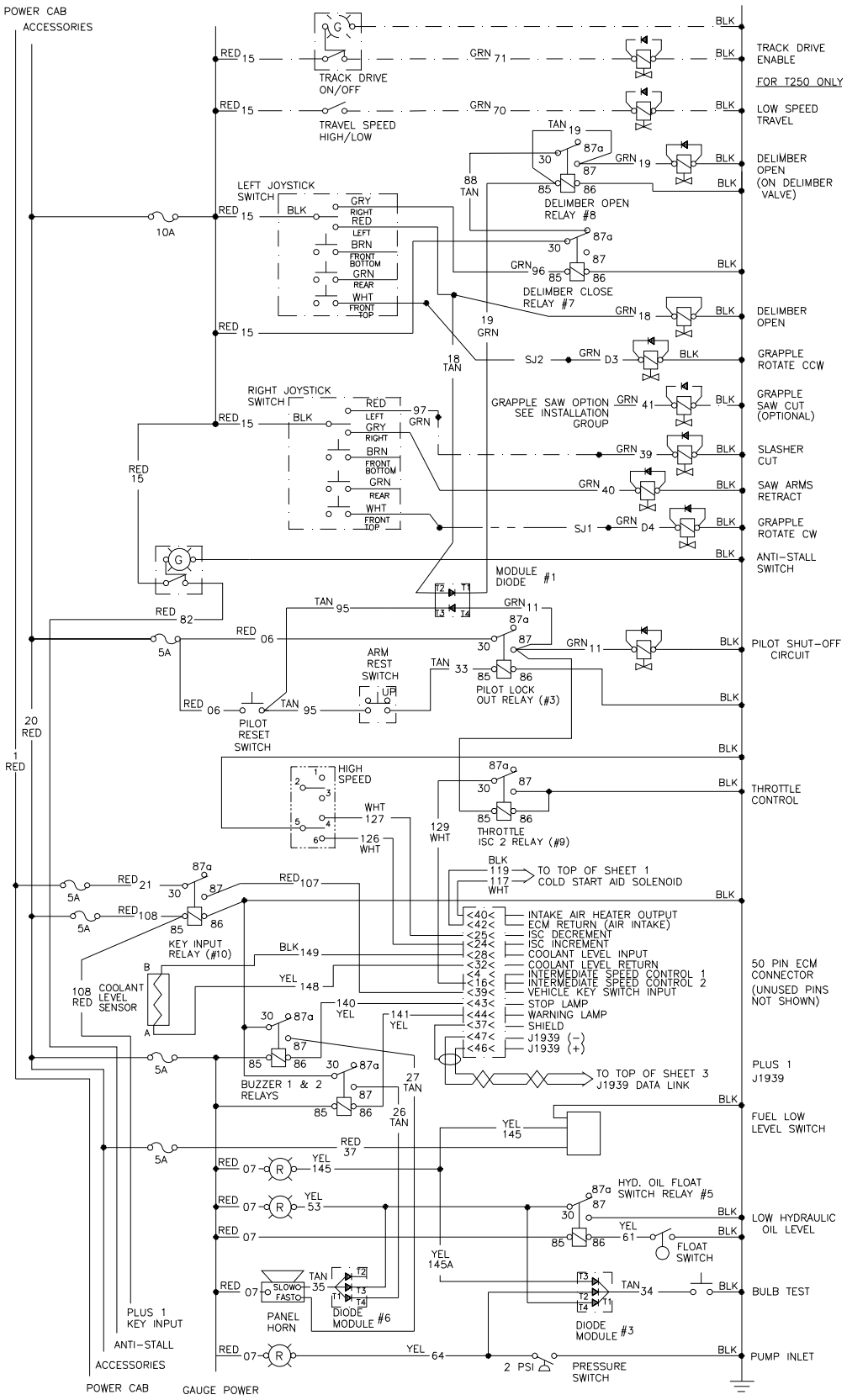
250BT-032(28929B)

ELECTRICAL BOX WIRING DIAGRAM

ELECTRICAL SCHEMATIC SHEET 1

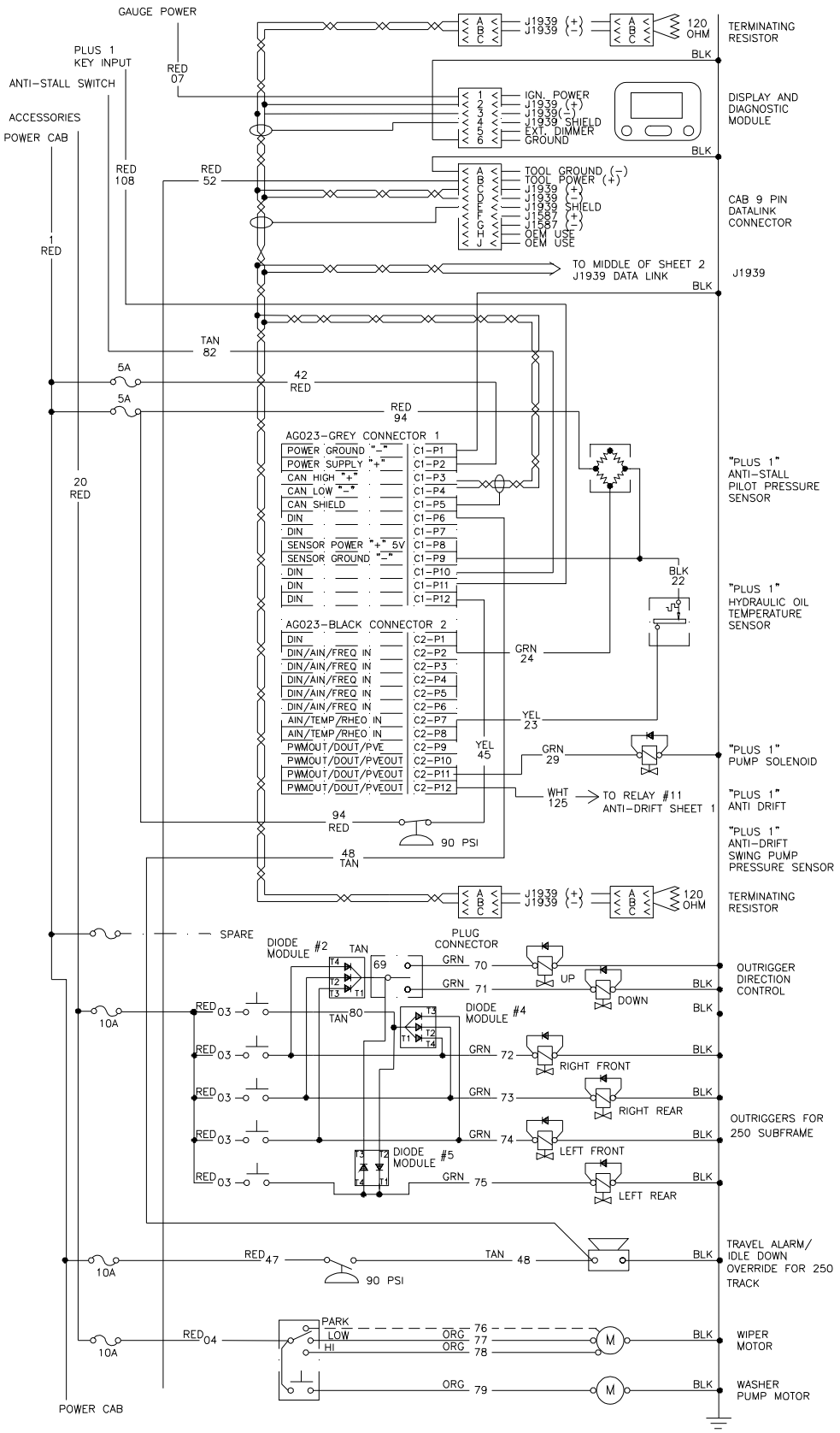


ELECTRICAL SCHEMATIC SHEET 2



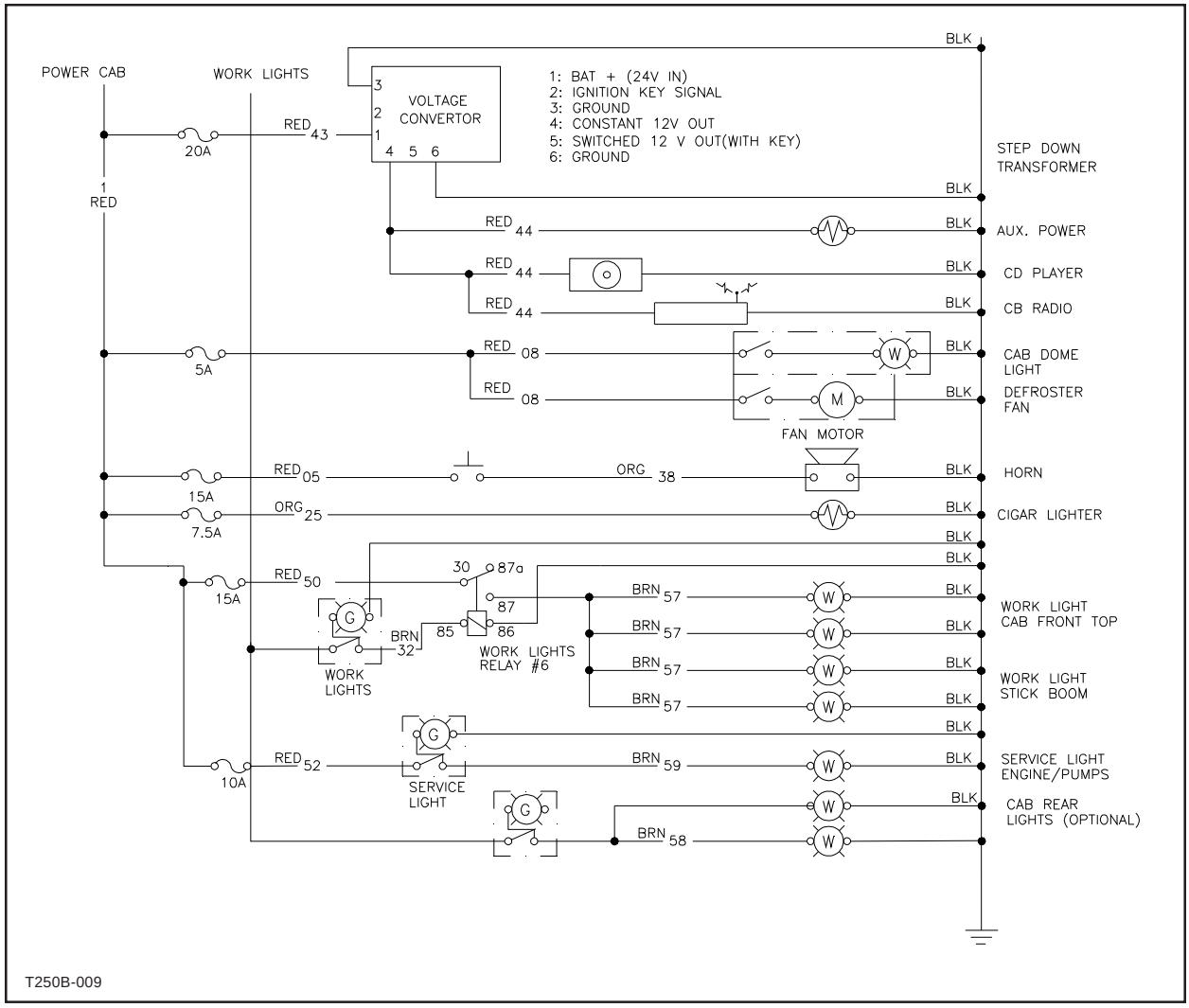
T250B-007

ELECTRICAL SCHEMATIC SHEET 3



T250B-008

ELECTRICAL SCHEMATIC SHEET 4



Tigercat T250B Track Loader

SECTION 7 - ENGINE START AND STOP

AUGUST, 2006

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ENGINE START CIRCUIT 7.2
START CIRCUIT DIAGRAMS 7.3

ENGINE START CIRCUIT

For detailed engine information, refer to the engine manufacturer's manual.

For engine *starting* and *stopping* procedures refer to STARTING ENGINE and STOPPING ENGINE in SECTION 2 of the OPERATOR'S MANUAL. For *correct engine speeds,* refer to THROTTLE CONTROL in SECTION 2 of the OPERATOR'S MANUAL.

To start engine; Turn battery disconnect switch to the ON position. Turn ignition key to the START position and releasing it to the RUN position after the engine starts.

CIRCUIT DESCRIPTION

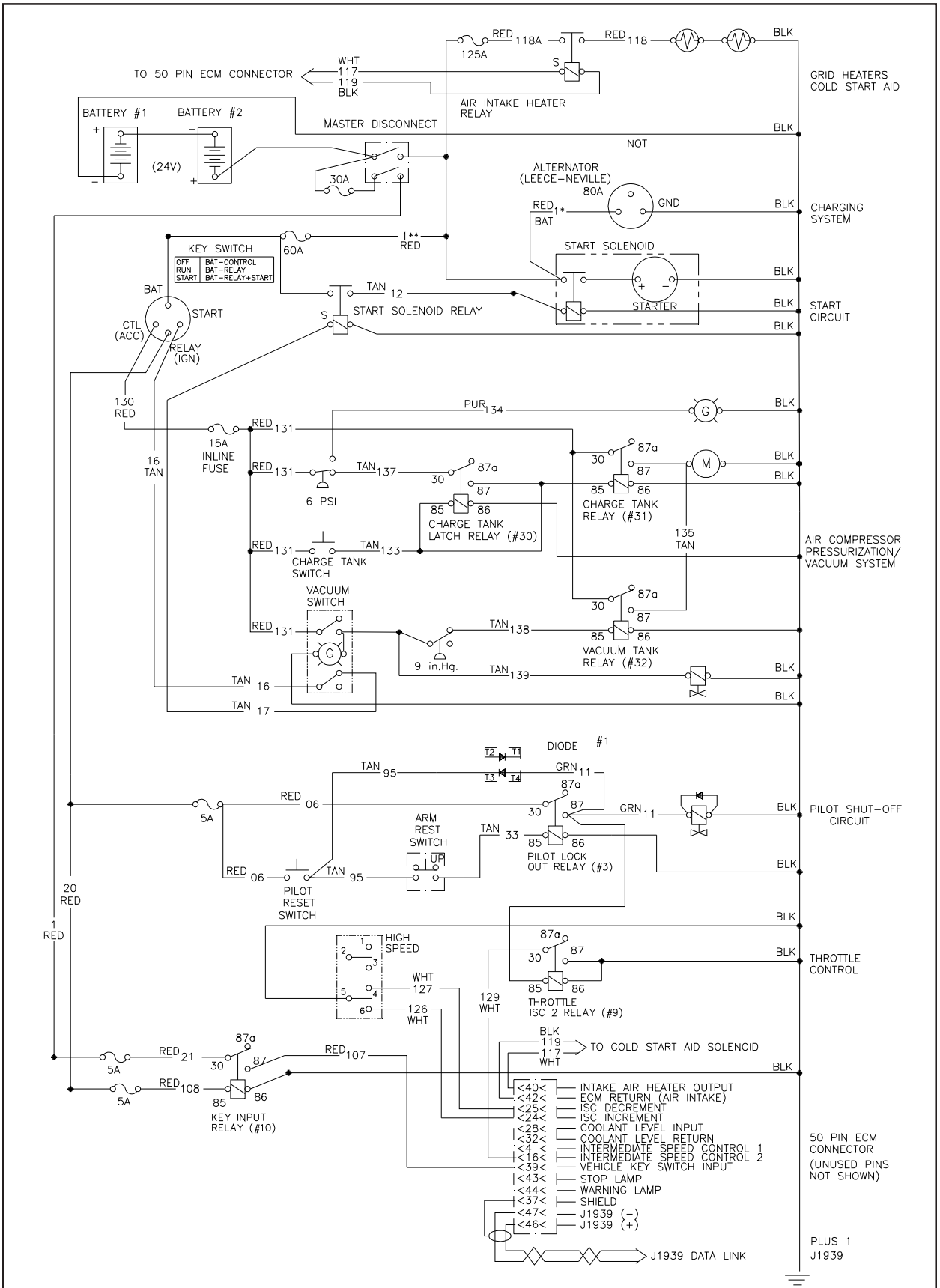
With the *battery disconnect switch* ON, current is supplied the *start solenoid* contact, the positive connection on the *alternator* and the BATTERY contact *of the key switch (ignition switch).*

When the key switch is turned to the START position, the BATTERY contact is connected to the RELAY and START contacts. Current (voltage) then flows through wire (16) through the switch (when hydraulic tank is pressurised) to wire (17) to energize the coils of the *start solenoid relay.* The *start solenoid relay* contacts also close and current flows from the alternator + RED wire (1) through wire (12) to the *starter solenoid coil* to close the contacts and operate the *start motor* to crank the engine.

For the engine computer module (ECM) to supply fuel, there needs to be power at the vehicle key switch input pin (39) on the 50 pin ECM connector. Key input relay (10) and 3 fuses control the signal to the ECM, which together with the start motor, start the engine.

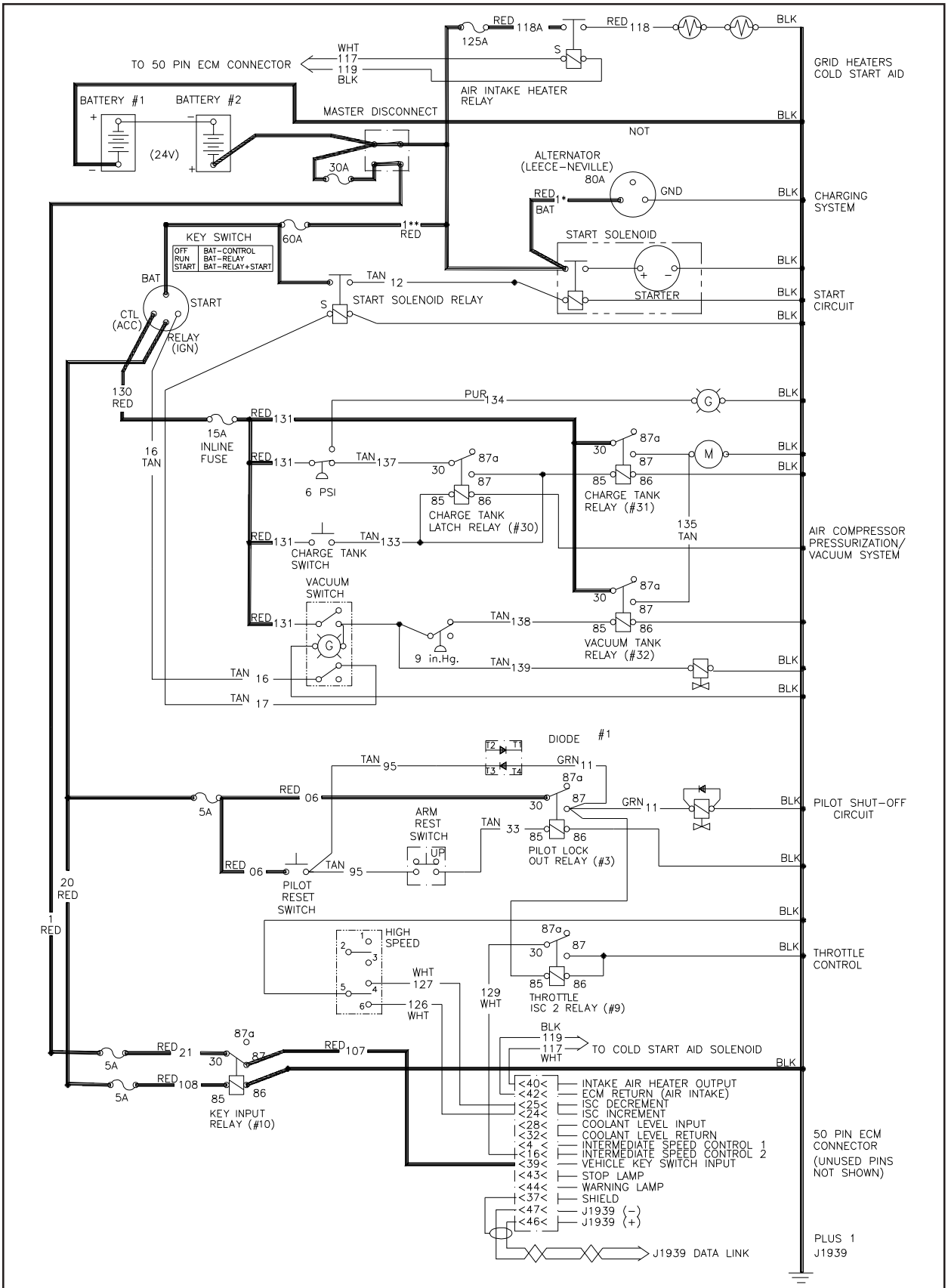
In order to operate the machine functions after starting the engine, the arm rest must be in the latched DOWN position and the PILOT RESET button pushed. This will energize the pilot shut off relay, close the contacts and allow current to flow through wires (6) and (11) to energize the pilot shut off solenoid valve on the pilot manifold. After the PILOT RESET button is released current will continue to flow through wire (95) and the diode to latch the pilot shut off relay in the energized position and allow current to flow through wires (6) and (11) to the pilot shut off solenoid valve.

For additional information on the PILOT SYSTEM refer to SECTION 5 in THIS SERVICE MANUAL.



250BT-038

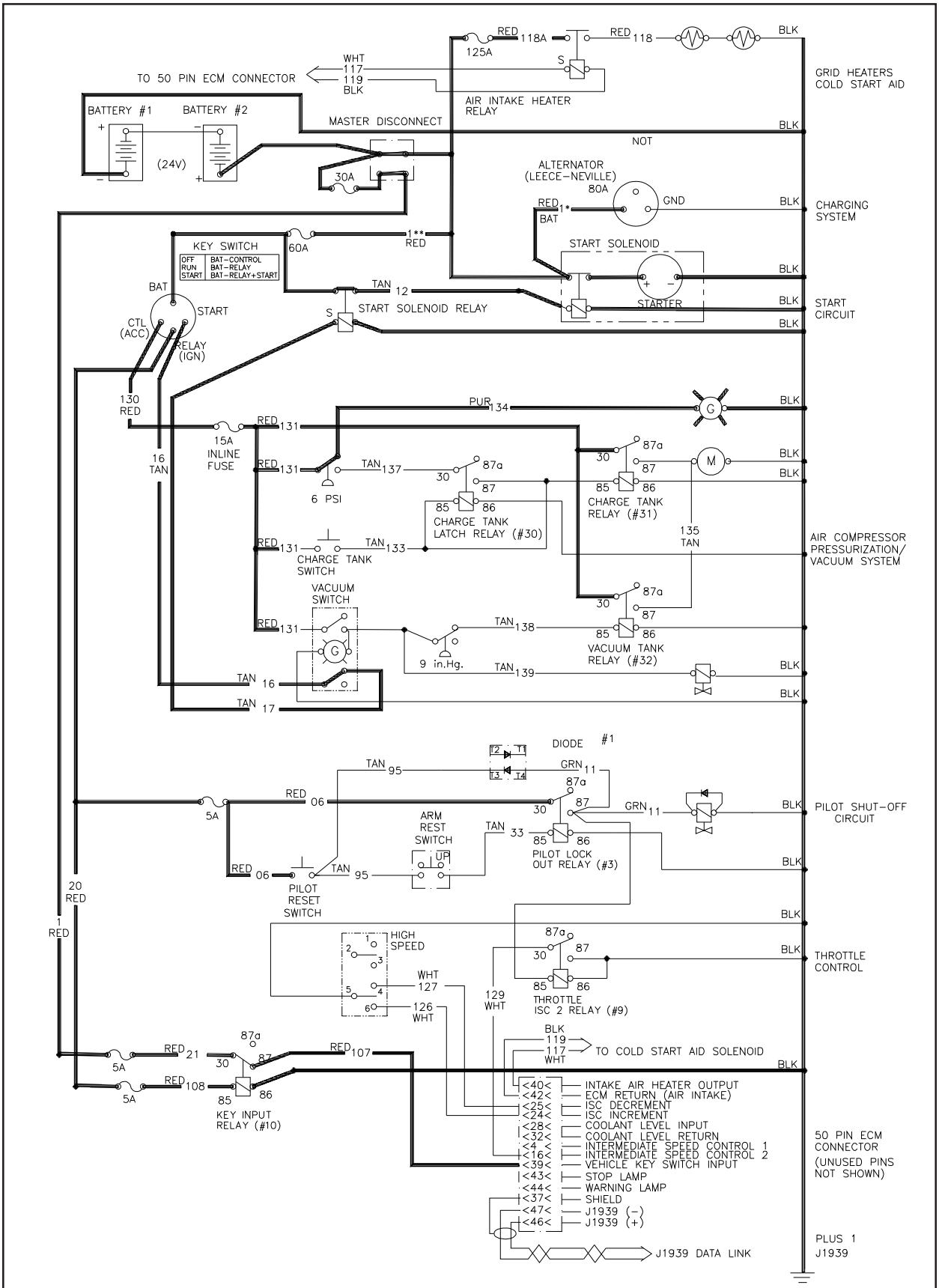
START CIRCUIT - AT REST



START CIRCUIT - AT REST

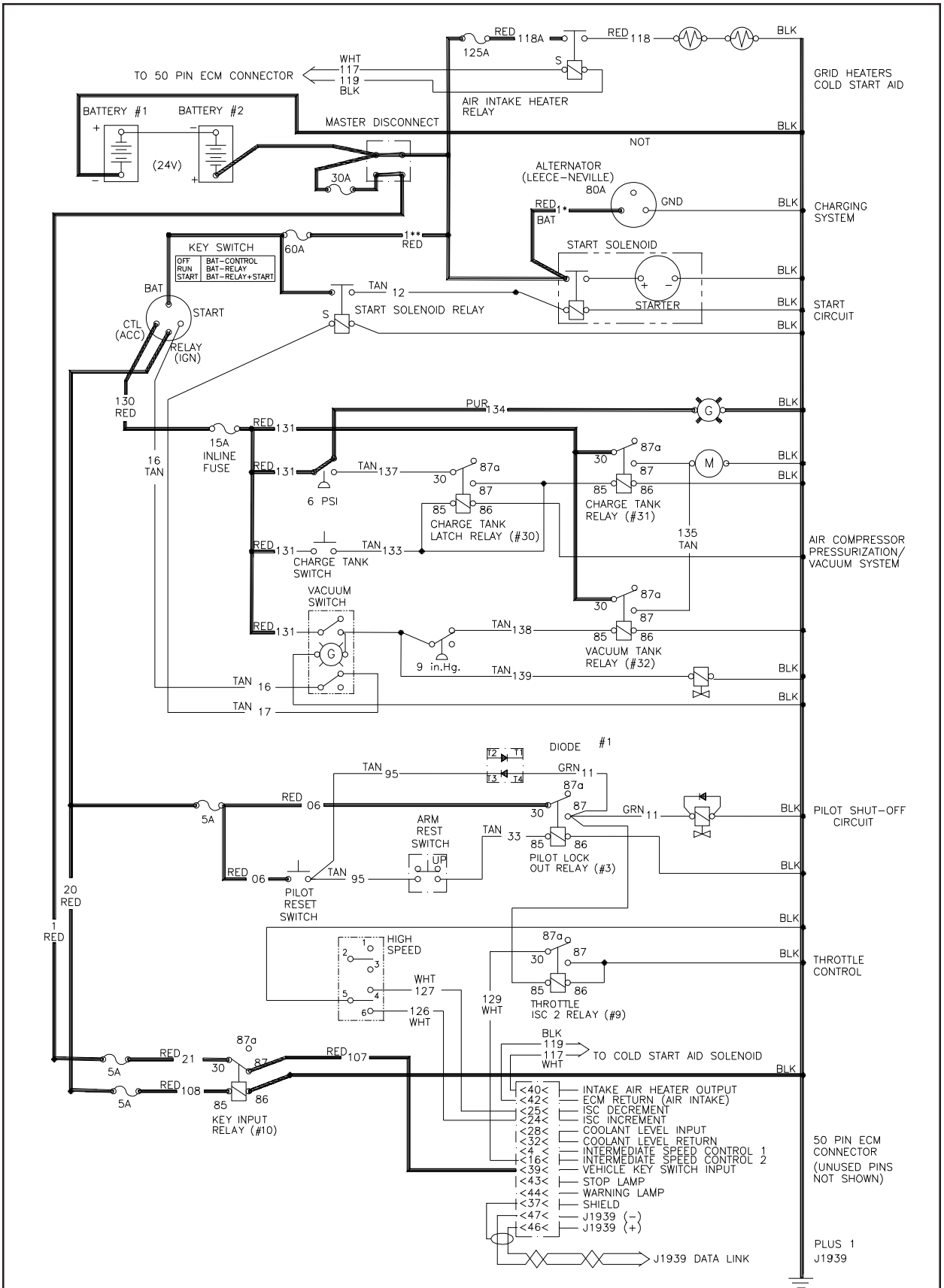
BATTERY DISCONNECT SWITCH - ON

250BT-039



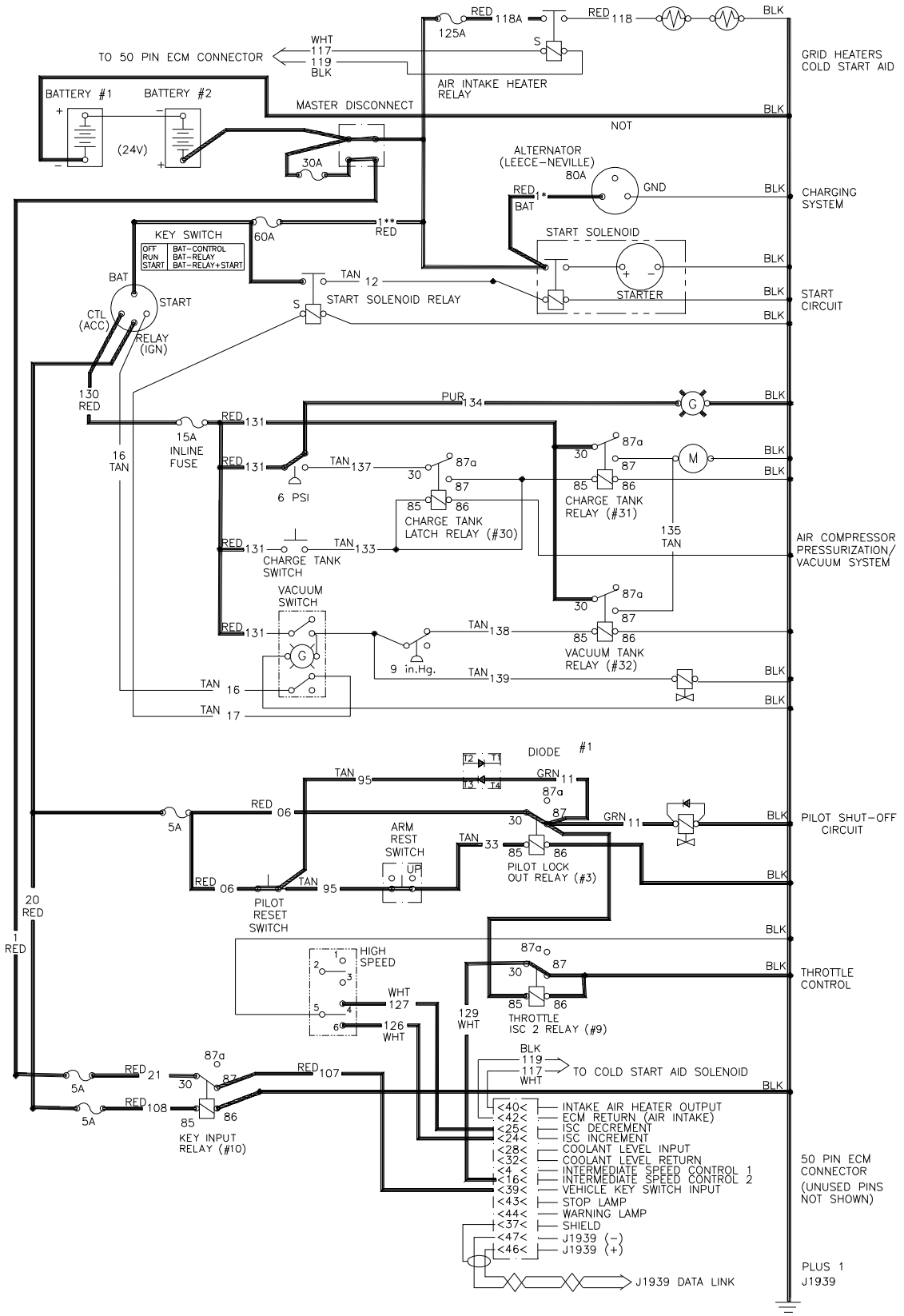
START CIRCUIT - START
IGNITION KEY - START POSITION

250BT-040



240B-041

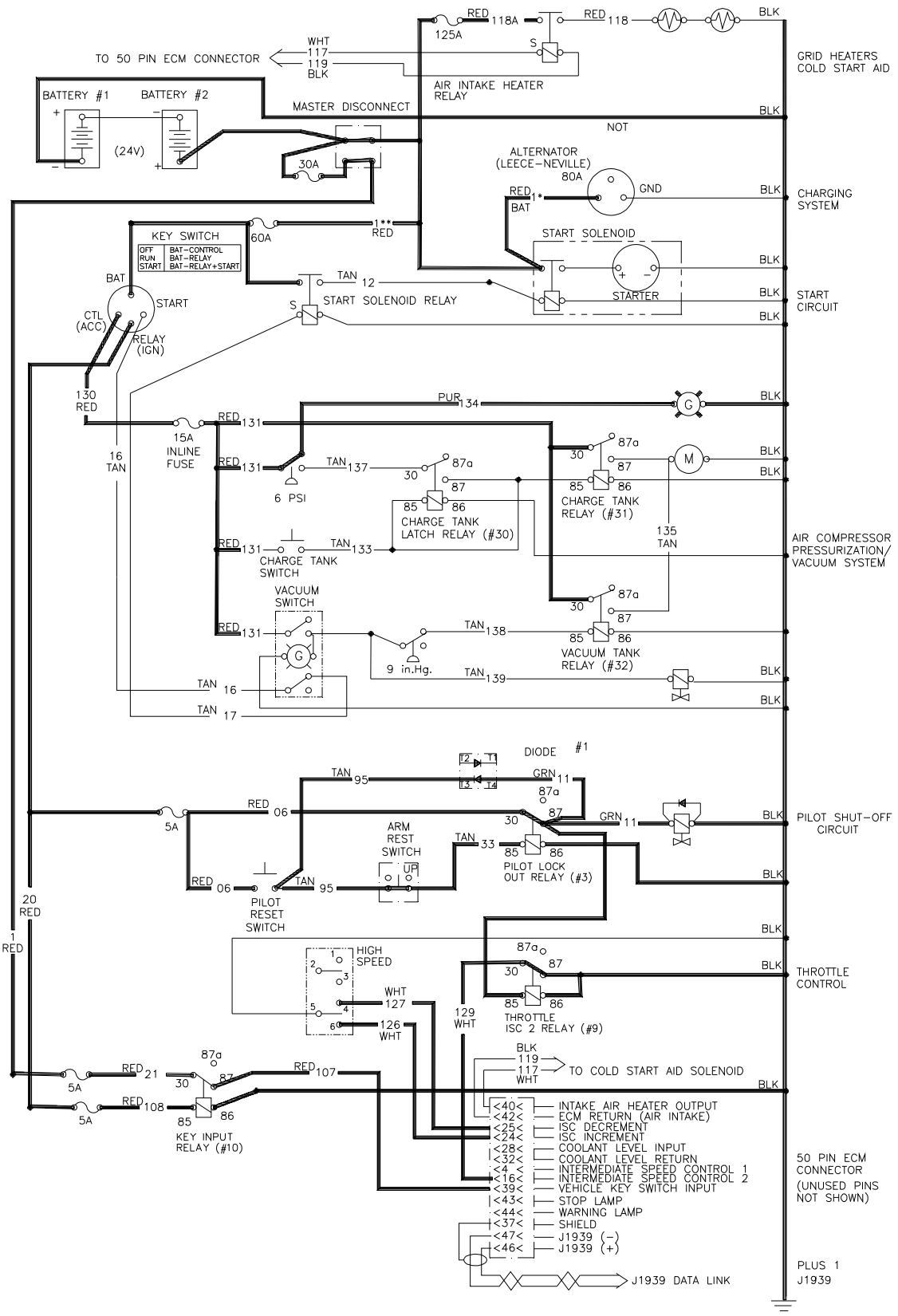
START CIRCUIT - RUN
IGNITION KEY - RUN POSITION



START CIRCUIT - RUN

IGNITION KEY - RUN POSITION
PILOT RESET SWITCH - HELD ON
ARM REST DOWN/ARM REST SWITCH - ON

240B-042



START CIRCUIT - RUN

IGNITION KEY - RUN POSITION
PILOT RESET SWITCH - RELEASED
ARM REST DOWN/ARM REST SWITCH - ON

250BT-043

Tigercat T250B Track Loader

SECTION 9 - ENGINE ANTI-STALL

AUGUST, 2006

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HORSEPOWER LIMITING CONTROL 9.2
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VERIFY ANTI-STALL SETTING ..... *SEE* SECTION 4

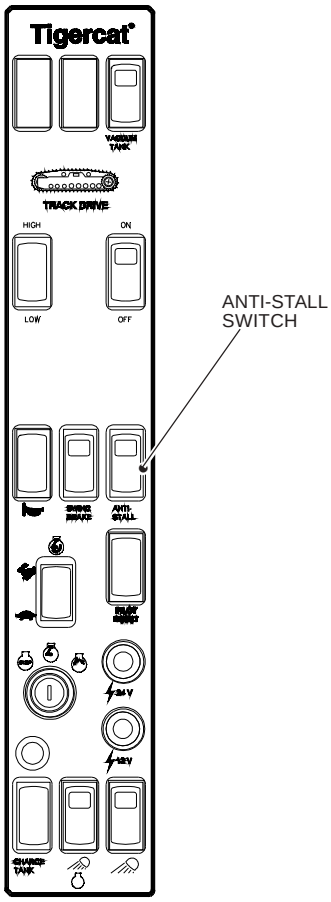
HORSEPOWER LIMITING CONTROL (ANTI-STALL)

GENERAL DESCRIPTION

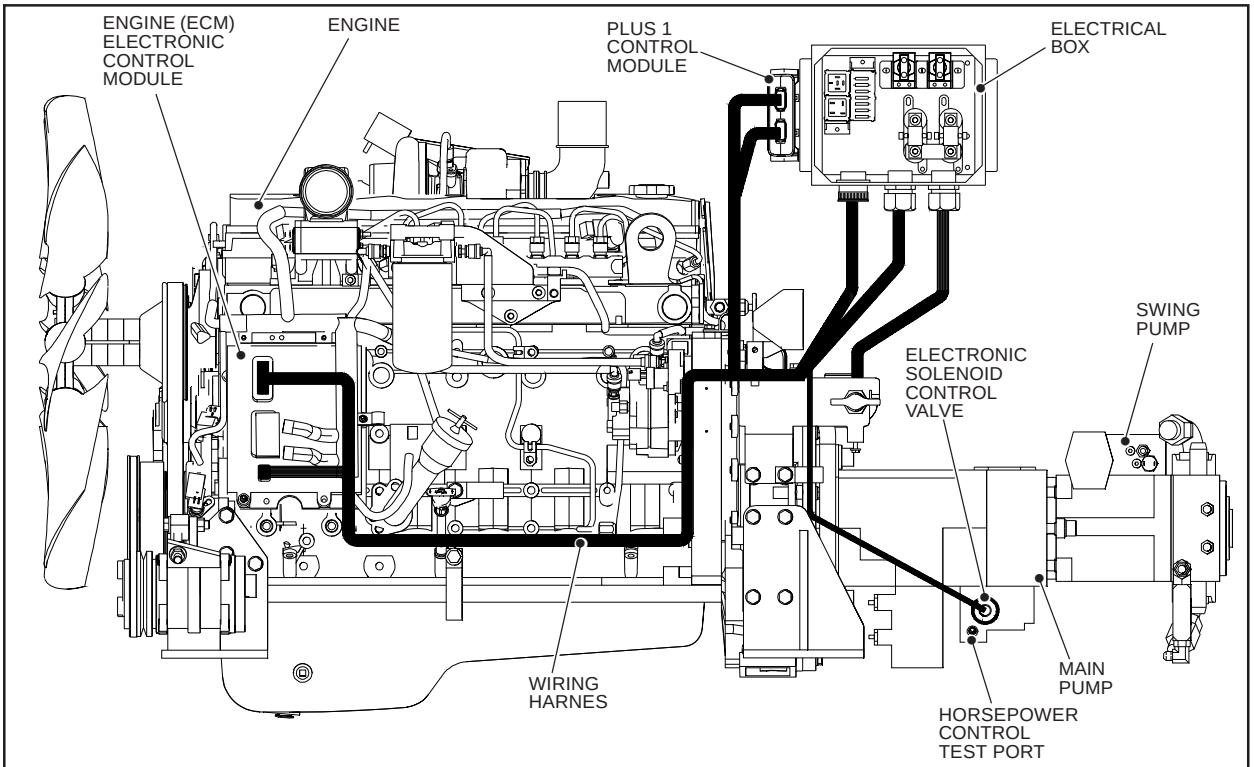
In the past it was common to lug an engine down when several functions with high loads were used at the same time and engine stalling was avoided only by the operator. In order to prevent engine over loading, the Tigercat machine is equipped with an electronic system which detects any drop in engine speed and destrokes the main pump to reduce engine load and thus maintain engine speed. This is done without any input from the operator and in most cases he will be unaware of the operation of this system.

The system used and incorporates the following components:

- A 'Plus 1' control module mounted beside the electrical box in the engine compartment.
- A speed sensor and Engine (ECM) Electronic Control Module (Cummins engine components).
- An electronic solenoid valve mounted on the main pump.
- An anti-stall switch mounted on the instrument panel.
- A wiring harness.



250BT-002 **INSTRUMENT PANEL**



250BT-016 **ANTI-STALL SYSTEM COMPONENTS**

The horsepower control can be turned OFF when required for maintenance work by switching the anti-stall switch in the cab to the off position; the engine may then be used at less than full throttle. During normal operation of this machine the engine speed should be at High Idle and the anti-stall switch should be ON.

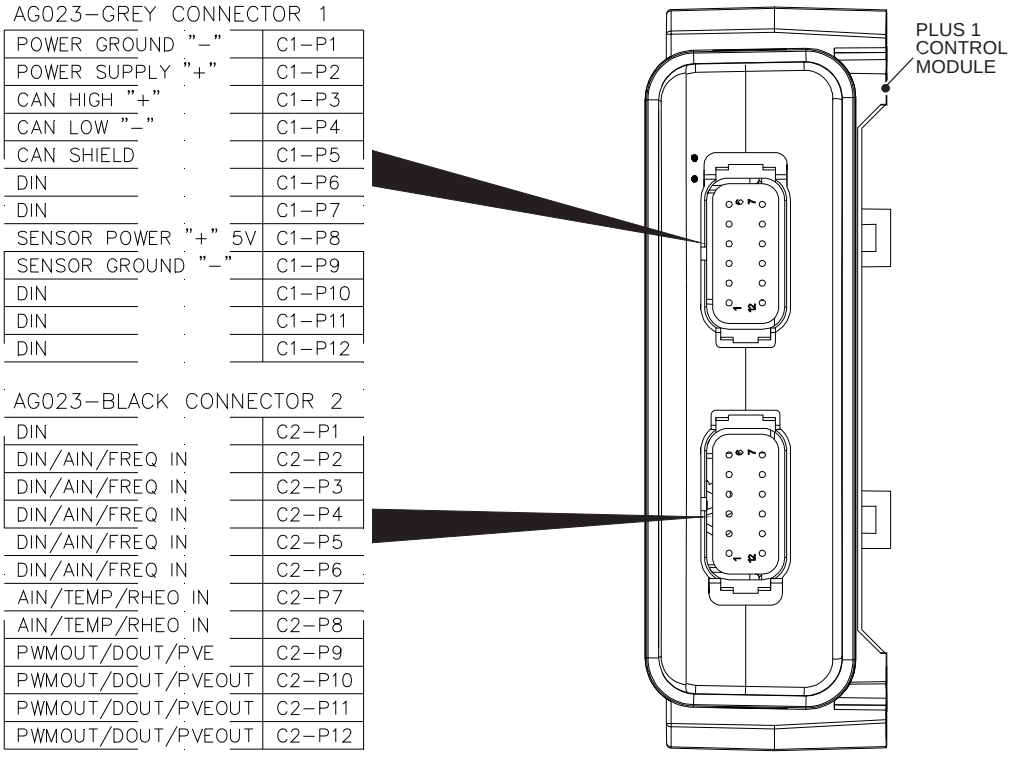
The Plus 1 control module in the engine compartment receives and distributes signals through two 12 pin connectors which are attached to the CAN BUS (Operating on J1939 protocol) engine wiring harness and the main wiring harness.

The pins on the two 12 pin connectors are connected as follows:

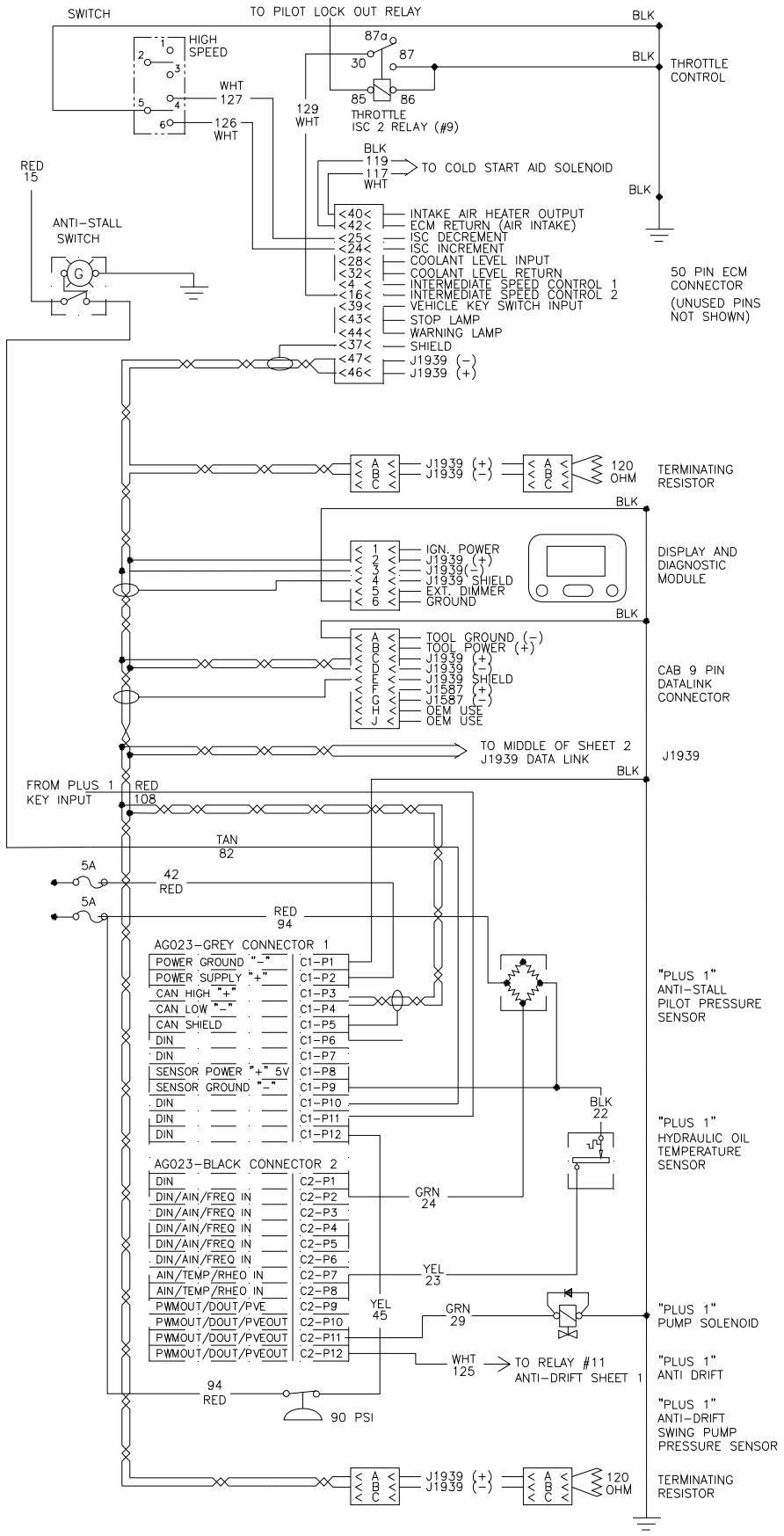
Refer to Horsepower limiting control diagrams;

- Pin C1-P1 is connected to "power ground".
- Pin C1-P2 is connected to "power Supply".
- Pin C1-P3 is connected to "CAN HIGH +".
- Pin C1-P4 is connected to "CAN LOW -".
- Pin C1-P5 is connected to "CAN Shield".
- Pin C1-P6 is connected to the "IDLE DOWN" solenoid.
- Pin C1-P9 is connected to the sensor ground terminals.
- Pin C1-P10 is connected to "ANTI-STALL SWITCH".
- Pin C1-P11 is connected to the "KEY INPUT RELAY" terminal 85.
- Pin C1-P12 is connected to the "SWING PUMP ANTI DRIFT PRESSURE SENSOR".
- Pin C2-P2 is connected to "ANTI-STALL PILOT PRESSURE SENSOR".
- Pin C2-P7 is connected to "HYDRAULIC OIL TEMPERATURE SENSOR".
- Pin C2-P11 is connected to "MAIN PUMP DISPLACEMENT CONTROL SOLENOID".
- Pin C2-P12 is connected to "RELAY #11 ANTI DRIFT".

The system control module constantly monitors the engine speed and any drop below 1800 RPM will result in a reduction of the signal current being sent to the main pump solenoid via wire 29 from pin C2-P11. Above 1800 rpm the signal current value is 700 mA and as the engine speed drops the signal current will drop proportionately. This signal causes the solenoid valve to shift, causing the pump to destroke. This electrical signal is a pulse width modulated signal which provides for precise modulation of the hydraulic valve and the resulting smooth control of the main pump displacement.



250BT-019 **PLUS 1 CONTROL MODULE CONNECTOR PIN ASSIGNMENT** 250BT-017



250BT-018A

PLUS 1 CONTROL ELECTRICAL SCHEMATIC

FAULT FINDING ~ ANTI-STALL QUICK CHECK

The following is a quick procedure to detemine if the anti-stall is functioning properly. If the machine fails any of these tests, then a more detailed diagnosis is necessary. However, there can still be other problems that are not related to the anti-stall system which are being masked.

IMPORTANT: Always ensure that the hydraulic oil is at operating temperature when performing all of the following diagnosis.

A. WHEN DOES THE PROBLEM OCCUR ?

Does the problem occur with the anti-stall ON or OFF?

ANSWERS:

- Occurs with the system ON or OFF

  The problem is likely hydraulic related. This also includes the anti-stall solenoid valve on the main pump.

- Occurs only with the system ON.

  The problem is either related to the hydraulic system, the engine, or the anti-stall system.

B. ANTI-STALL OFF

1. Connect a 0-1000 psi gauge to the 'Horsepower Control' gauge test port on the main pump.
2. Start engine and run at LOW IDLE.
3. Place anti-stall switch in the OFF position.
4. Engage pilot reset switch and activate each function 1 at a time.

Expected Results:

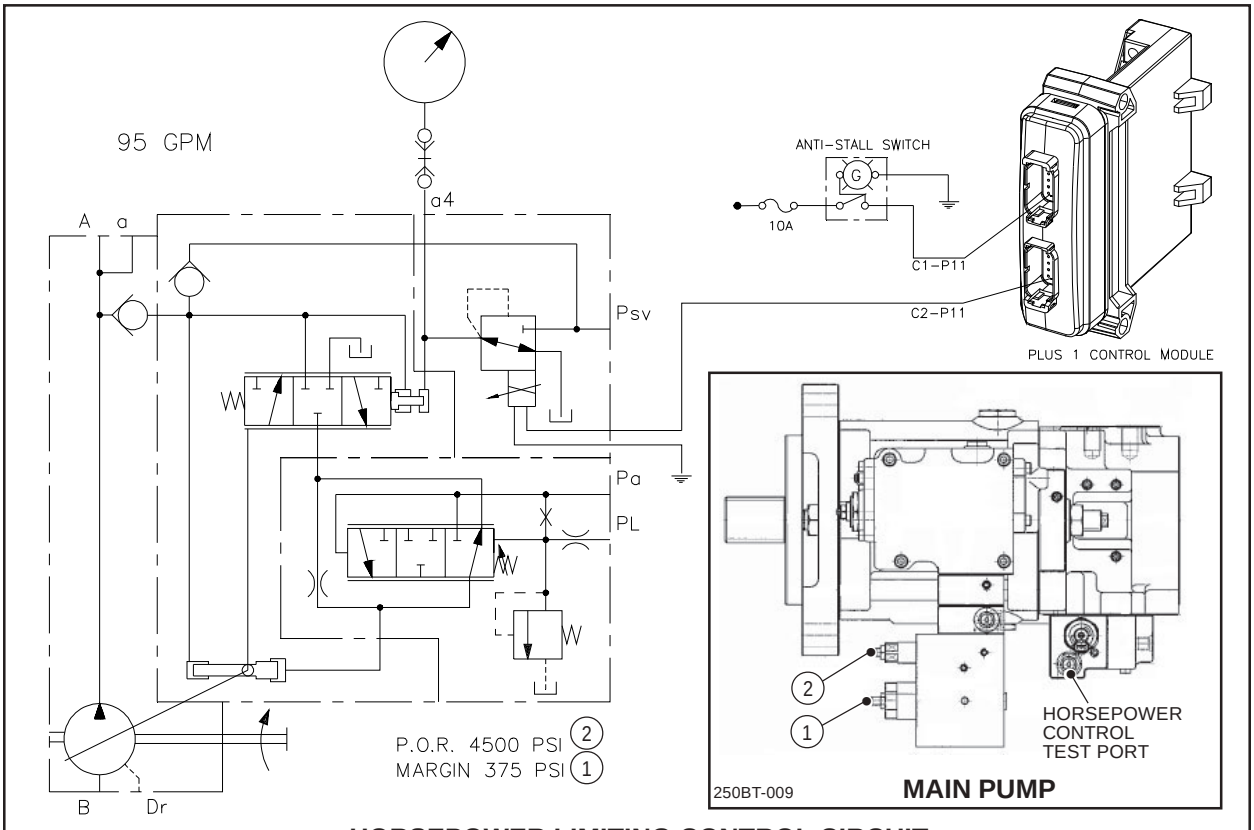
- All functions should operate (Engine may stall).
- Guage pressure should be 0-10 psi.

C. ANTI-STALL ON

1. Connect a 0-1000 psi gauge to the 'Horsepower Control' gauge test port on the main pump.
2. Start engine and run at LOW IDLE.
3. Engage pilot reset switch
4. Place anti-stall switch in the ON position, Guage should read **450-500 psi at LOW IDLE**.
5. Slowly increase engine speed.

Expected Results:

- Guage pressure should begin to decrease as engine speed increases.
- Gauge pressure should be **0-10 psi at full throttle**.



HORSEPOWER LIMITING CONTROL CIRCUIT

ADDITIONAL FAULT FINDING PROCEDURES

The following procedures can be used to diagnose the anti-stall system. They are not in any particular order and should be done if addition diagnoses is required.

A. PILOT PRESSURE.

1. Ensure pilot pressure is correct.

   To verify PILOT PRESSURE refer to PILOT SYSTEM in SECTION 5 of THIS MANUAL.

B. MARGIN PRESSURE

1. Ensure margin pressure is correct.

   To verify MARGIN PRESSURE refer to HYDRAULIC SYSTEM in SECTION 4 of THIS MANUAL.

C. ELECTRICAL POWER TO ANTI-STALL CONTROL MODULE.

1. Remove grey connector from anti-stall control module.
2. Turn ON battery disconnect and an assistant lower armrest and reset pilot switch.
3. Measure DC voltage across pins C1-P1 and C1-P2 on grey connector 1.

   • The electrical power should be 24.0 to 25.5 VDC.

D. SOLENOID VALVE WIRES (AT CONNECTORS)

1. Remove both connectors from anti-stall control module.
2. Measure resistance between pins C1-P1 on grey connector 1 and C2-P11 on black connector 2.

   • The resistance should be 17.0 to 19.5 ohms (at 70 °F to 125 °F hyd oil temp).

E. SOLENOID VALVE COIL (AT COIL)

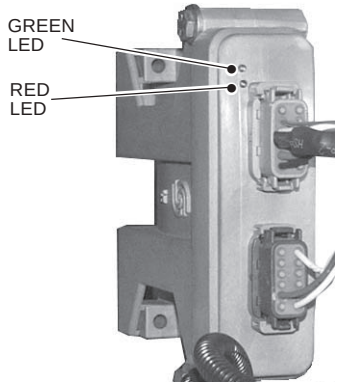
1. Remove connector from anti-stall solenoid valve.
2. Measure resistance of solenoid coil.

   • The resistance should be 17.5 to 19.5 ohms (at 70 °F to 125 °F hyd oil temp).

ELECTRONIC CONTROLLER BLINK CODES

The Plus 1 electronic controller has two LED lights on the front top left side of the controller. A GREEN LED is used to indicate that power is ON and the controller is activated. The RED LED is used to provide a visual warning in the form of BLINK CODES whenever the controller senses a fault in the system.

The following chart can be used for BLINK CODE TRANSLATION AND DIAGNOSTICS.



724E-018 **PLUS 1 ELECTRONIC CONTROLLER**

250B Antistall/Idle Down Blink Code Translation

Fault Code	RED LED Flash Bit Sequence		RED LED Flash Bit Sequence	Device at Fault
1	• •	1 sec	•	PWM Coil Fault (Feedback current is out of Operating Range)
2	• •	1 sec	• •	Pilot Pressure Sender Fault (Voltage is out of Operating Range)
3	• • • •	1 sec	• • • •	Hydraulic Oil Temperature Sender (Resistance is out of Operating Range)
4	• • • •	1 sec	• • • • • •	J1939 CAN BUS Fault (Engine J1939 broadcasts not present or Faulted)

Note: If multiple faults are present a 5 second delay will separate the Fault Code Sequences.

GREEN LED ON Steady indicates System is Activated/ON

Tigercat T250B Track Loader

SECTION 11 - TRACK DRIVE

AUGUST, 2006

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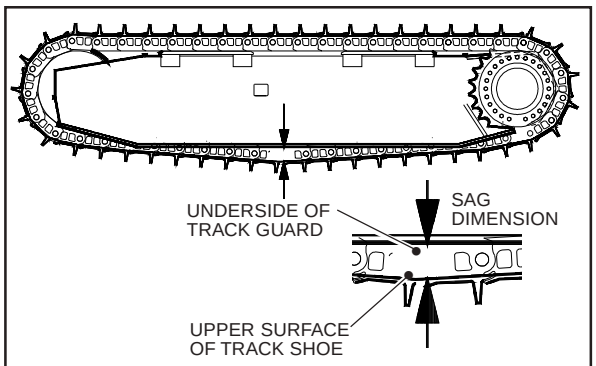
IMPORTANT TRACK DRIVE NOTES

NEW MACHINE

Before driving a new machine ensure that track sag is set correctly. Track sag may be set less than specified for shipping purposes. The correct track sag must be adjusted once a machine has been delivered to the job sight and operating in the accumulated soil buildup in the undercarriage.

TRACK SAG

The **track sag** dimension is very important and should be checked regularly. A 50% increase in the life of the track assembly can be realized, particularly in bushing O/D wear and 'track pitch' by maintaining the correct amount of track sag. A track that is too tight will wear out significantly faster due to increased tension in the chain. Refer to MEASURING TRACK SAG in THIS SECTION.

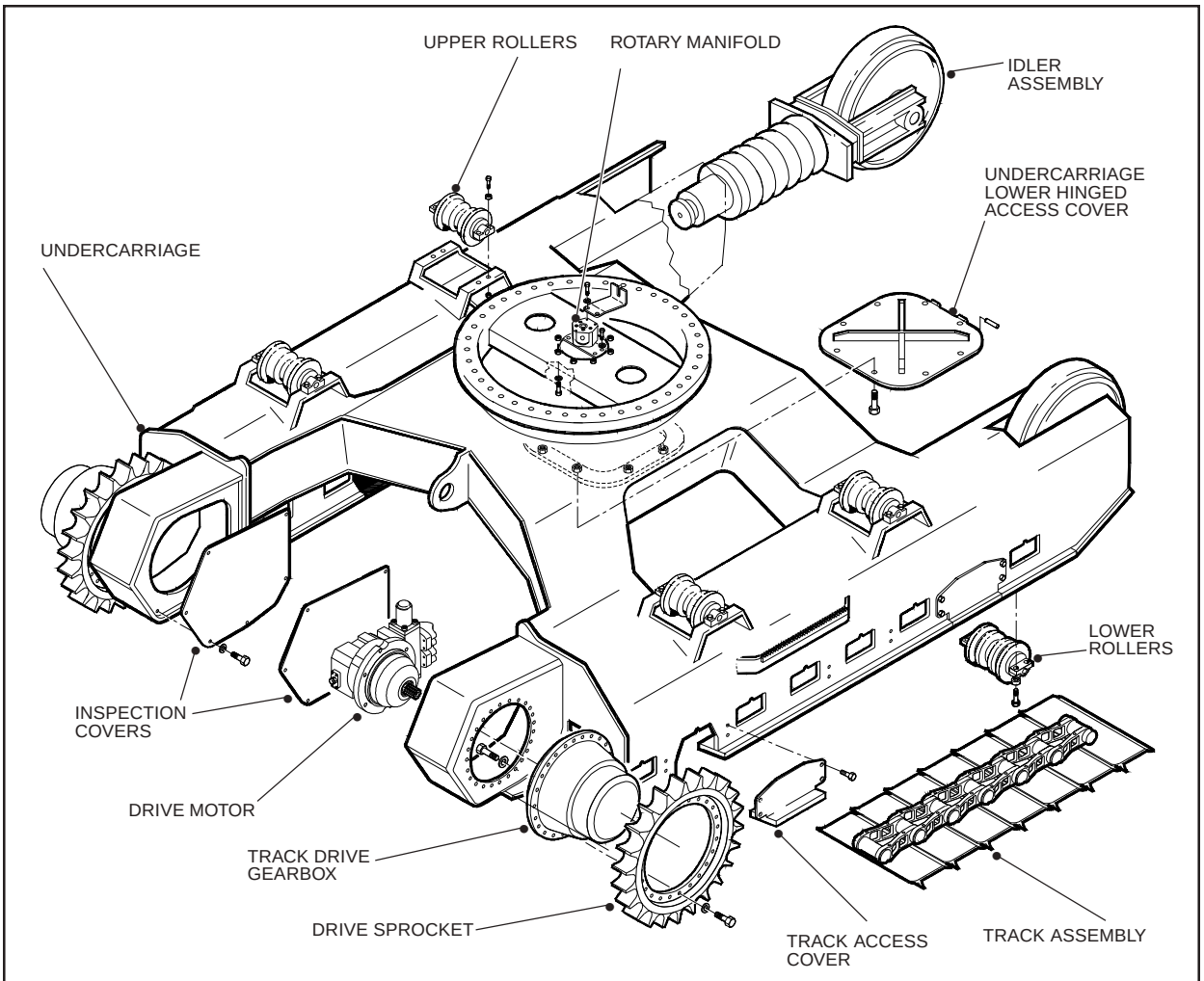


853ILL8 **MEASURING SAG DIMENSION**

STRAIGHT TRAVEL

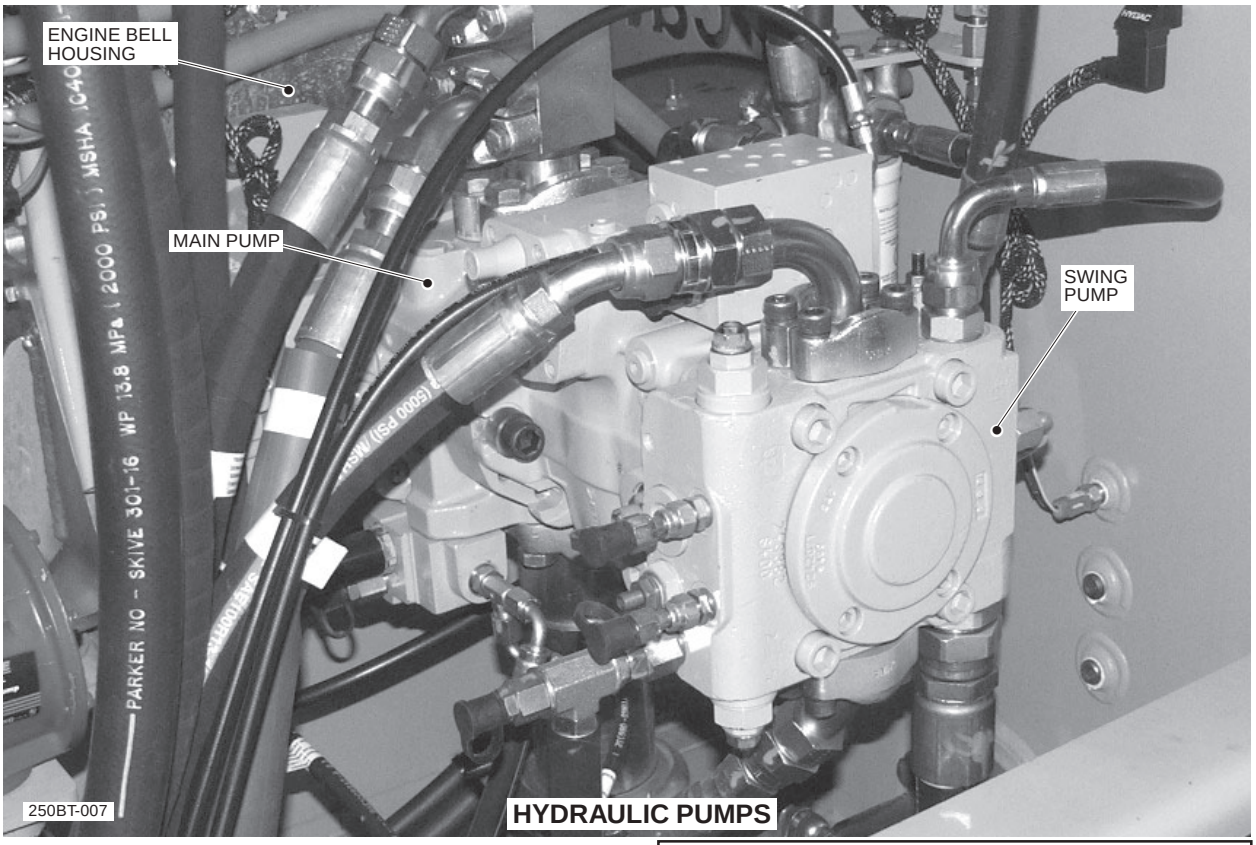
If the machine does not travel straight, the right and left track speeds are not set the same. Refer to TRACK SPEED SET-UP PROCEDURE in THIS SECTION.

Check the speed of each track and follow the set-up procedures closely to obtain straight travel.



240T-13 **TRACK DRIVE ASSEMBLY**

TRACK DRIVE COMPONENTS



HYDRAULIC PUMPS

All hydraulic functions are powered by two pumps. The main and swing pumps are mounted one behind the other on the flywheel housing of the engine. The first pump (main pump) is a piston pump with load sensing, pressure compensating and horsepower limiting controls.

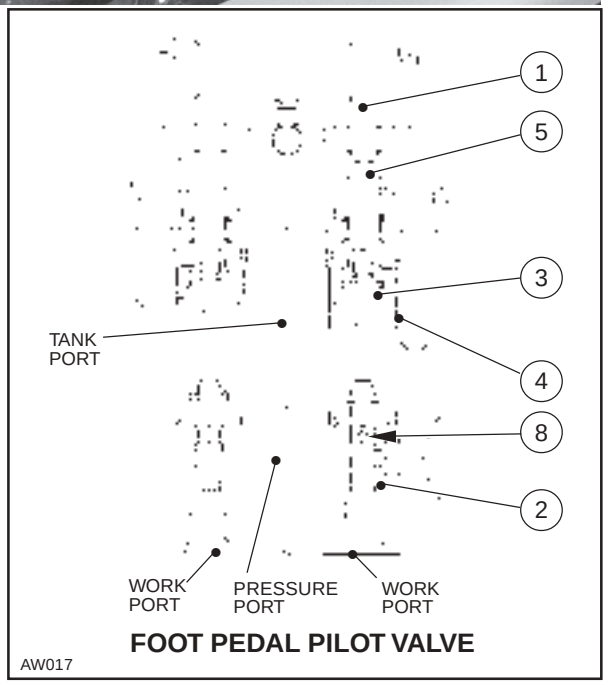
Mounted and coupled to the main pump is the swing pump. It is a pressure compensated piston pump.

The track drive circuit utilizes the main pump to supply hydraulic oil to both the left and right track drive motors via two valve sections in the main control valve.

For a more detailed description of the main pump, refer to SECTION 12 in THIS SERVICE MANUAL.

FOOT PEDAL CONTROL VALVE

The drive function is controlled by two center foot pedal valves which send proportional pilot signals to the left and right track drive spool sections in the main control valve which supply oil to the track drive motors.



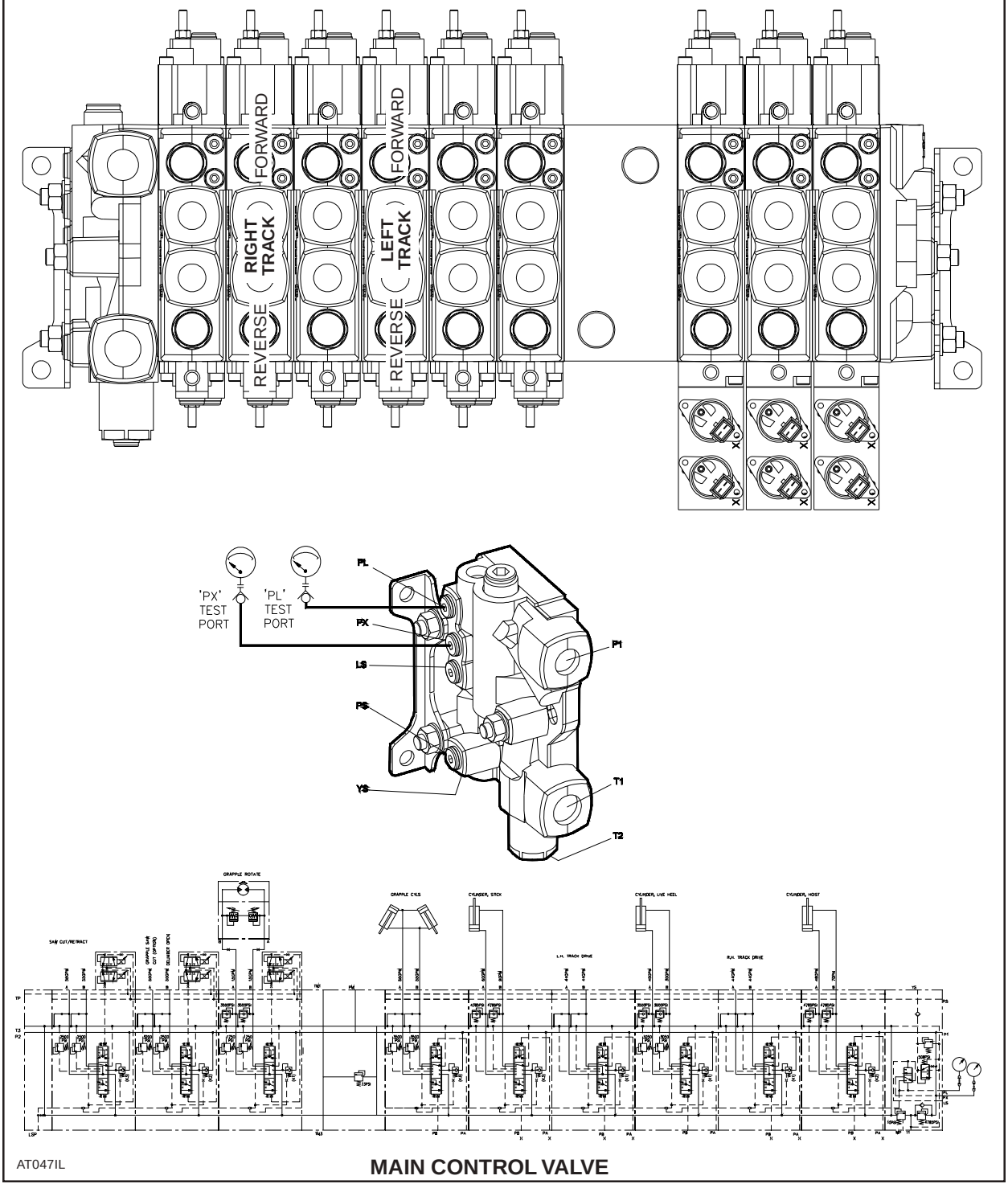
FOOT PEDAL PILOT VALVE

For a detailed description of the foot pedal control valves, refer to SECTION 5 in THIS MANUAL.

TRACK CONTROL VALVES

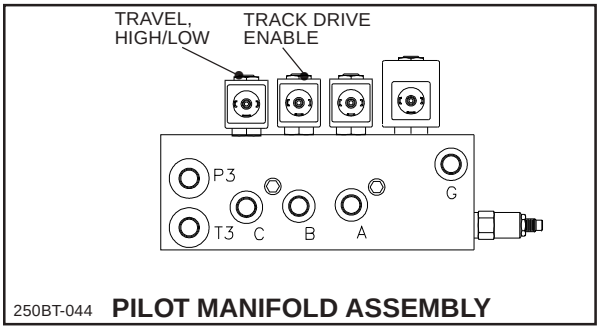
The right track forward and reverse function is controlled by one of nine spool sections in the main control valve and the left track forward and reverse function is controlled by one of nine spool sections in the main control valve. The control valves are located in the upper frame below the floor plates inside the valve compartment.

For a detailed description of the "hoist" and "stick" control valves, refer to the applicable section in THIS MANUAL.



AT047IL

MAIN CONTROL VALVE



250BT-044 **PILOT MANIFOLD ASSEMBLY**

TRAVEL AND DRIVE ENABLE SOLENOID VALVES

Pilot oil flows to both track drive foot pedals via the *track drive enable* solenoid valve located on the pilot manifold assembly. A *track drive switch* in the operator's cab when in the ON position energizes this solenoid valve and allows pilot oil to flow to the 'P' port on the foot pedal control valves. When the switch is in the 'OFF' position, the valve is de-energized and pilot oil is blocked from reaching the foot pedal control valves.

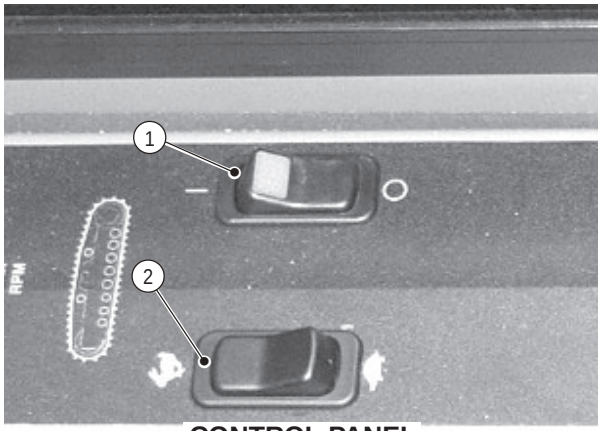
A *travel high/low* solenoid valve located next to the *drive enable* solenoid valve on the pilot manifold assembly controls the flow of pilot oil to the *drive speed change valve* in both track drive motors. A *track speed switch* in the operator's cab when in the "LOW" position energizes this solenoid valve and allows pilot oil to shift the spool in the drive speed change valve and place the motor at maximum displacement (slower speed). When the switch is in the "HIGH" position, the solenoid valve is de-energized preventing pilot oil from reaching the drive speed change valve in the motor which places the motor at minimum displacement (higher speed).

Travelling

Travel is accomplished by turning the track drive switch to the ON position and depressing both foot pedals simultaneously. Travel over distances should be done in the forward direction to reduce the wear on track components. Track drive gearboxes are considered to be at the rear of the machine when travelling in the forward direction.

Steering

Steering the machine is achieved by operating the tracks at different speeds and should only be done when moving; rotating the tracks in opposite directions should be avoided where possible.



240T-001 **CONTROL PANEL**

TRACK DRIVE ~ SWITCH (1)

Placing this switch in the OFF position will prevent the loader from being accidentally driven while loading or unloading.

Place this switch in the ON position to drive the machine. The light in the switch will be ON.

DRIVE SPEED ~ SWITCH (2)

Two drive speed ranges are possible. LOW position will provide a slow driving speed. HIGH position provides a faster speed with reduced driving torque.

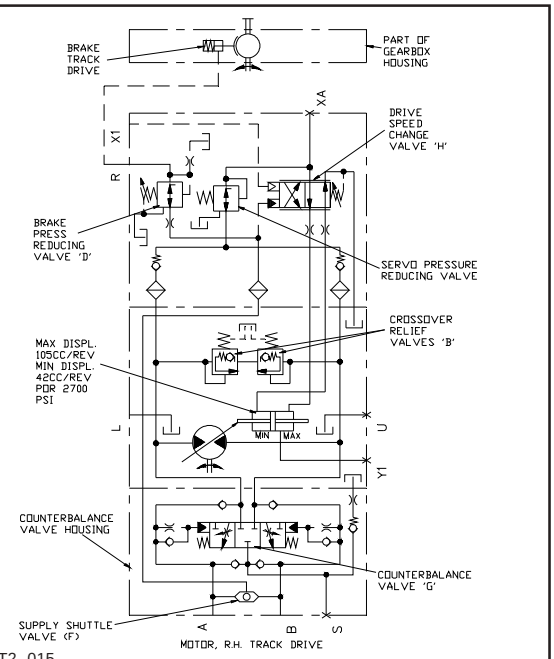
Place this switch in the LOW position when maneuvering around the loading area.

The HIGH position should only be used with the loader on flat solid ground. A flat bed trailer should be used to transport the loader over greater distances.

TRACK DRIVE HYDRAULIC CIRCUIT DESCRIPTION

The power is transmitted to the tracks by a variable displacement piston motor through a triple reduction planetary gearbox on each track frame. The gearbox has an integral spring apply, hydraulic-release, multi-disc brake which is automatically released whenever the drive system is pressurized.

In order to control the machine movement in situations where the machine may roll down a grade, each motor is equipped with a counterbalance valve. These valves have a spool valve which controls the flow of oil out of the motor. In the *motor schematic diagram* it is shown in the centre, closed position.



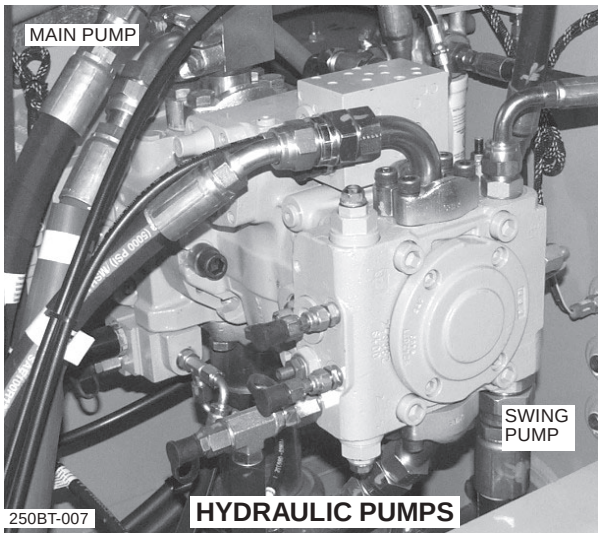
240T2- 015

TRACK DRIVE MOTOR SCHEMATIC

The valve will remain in the closed position as long as there is no oil pressure in the line from the track control valve. When the track control valve spool is shifted and oil flows to the motor, a check valve in the counterbalance valve (G) opens and oil pressure builds up in the motor pistons.

The motor cannot move until the oil pressure shifts the counterbalance spool to permit the oil on the low pressure side of the motor to flow back through the counterbalance valve to the track control valve and then to tank.

The hydraulic motor is equipped internally with a *drive speed change valve* which is controlled by a switch in the cab (TRACK DRIVE HIGH/LOW) and a solenoid operated control valve on the pilot manifold assembly. For further information refer to TRAVEL AND DRIVE ENABLE SOLENOID VALVES in THIS SECTION.



250BT-007

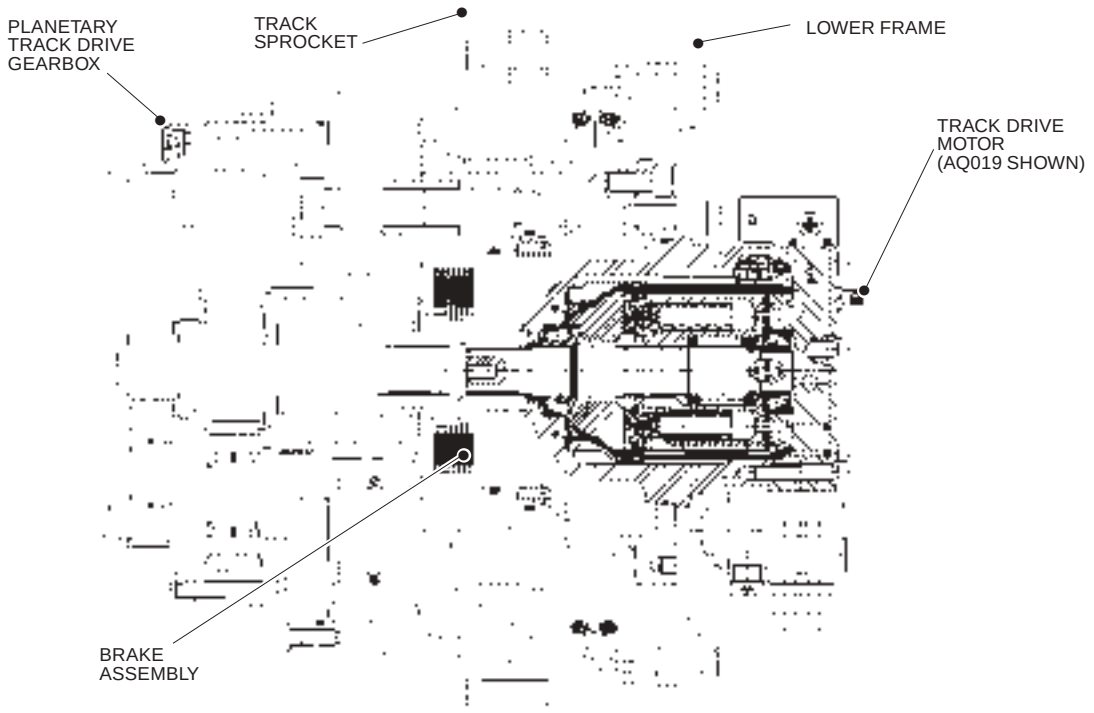
HYDRAULIC PUMPS

CIRCUIT DESCRIPTION

The main pump is an axial-piston, variable-displacement pump with load sensing, pressure compensating, and horsepower limiting controls.

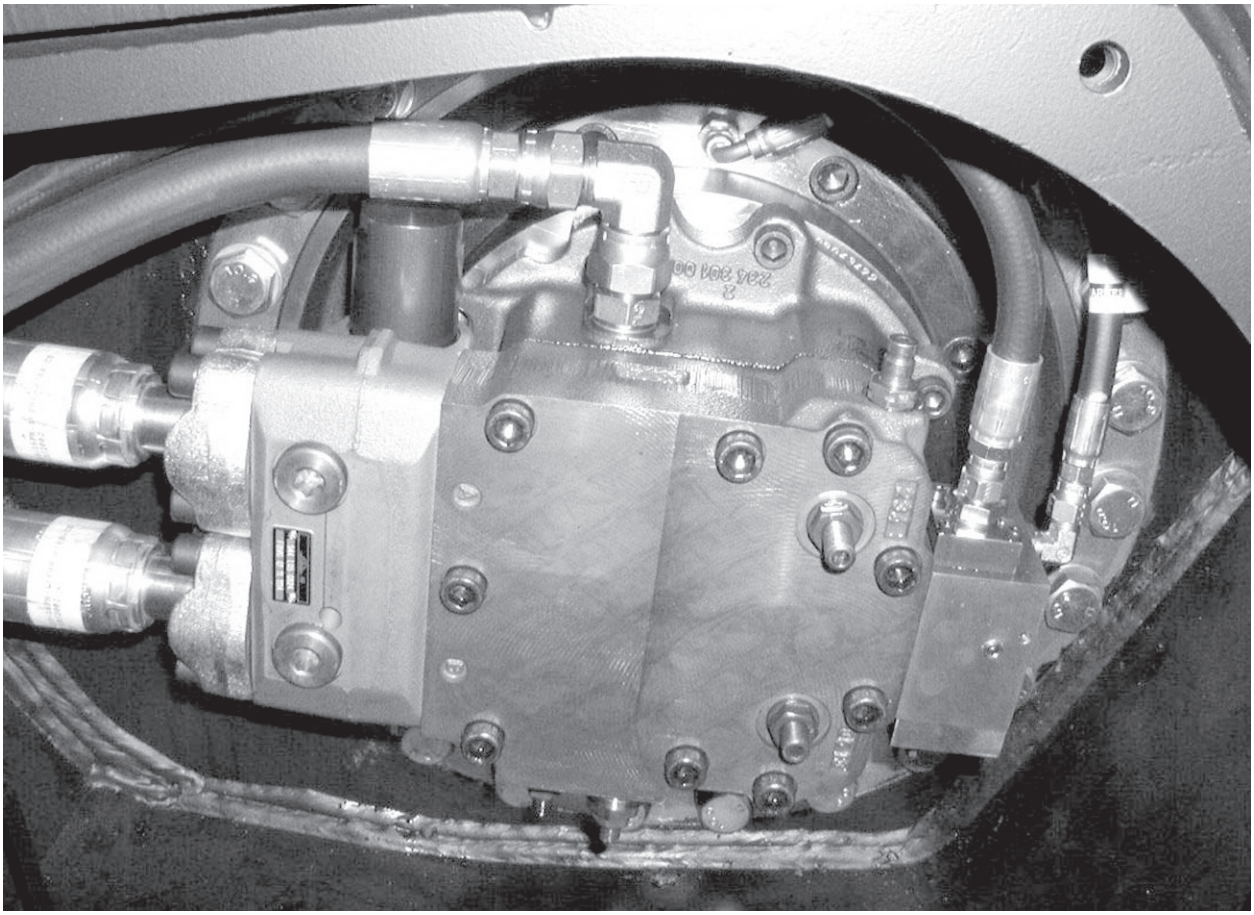
When all of the control valve sections on the main valve are in the neutral position the pump is destroked and the output is just sufficient to maintain a pressure of approx. 500 psi in the pump output line. The swashplate control piston is in a condition where the spring force, swashplate forces and the control pressure forces are balanced.

The track drive circuit utilizes the main pump to supply hydraulic oil flow to the left and right hydraulic track motor 'A' and 'B' ports via two spool sections in the main control valve.Two foot pedal control valves in the cab when operated in the FORWARD or REVERSE direction direct pilot oil to the DRIVE SIGNAL VALVE through the valve to each end of the *track* spool sections of the main control valve. A drive enable solenoid valve on the pilot manifold assembly controlled by a DRIVE ON/ OFF switch in the cab, controls the supply of pilot oil to the drive foot pedals. With the switch ON and the foot pedals depressed, the track spools in the main control valve will shift directing oil from the pumps to the track drive motors. Return oil from the motors is directed back through the spool sections, to the *outlet* section, through the dual head return oil filter and back to tank.



BK004-822

TRACK DRIVE MOTOR AND GEARBOX ASSEMBLY

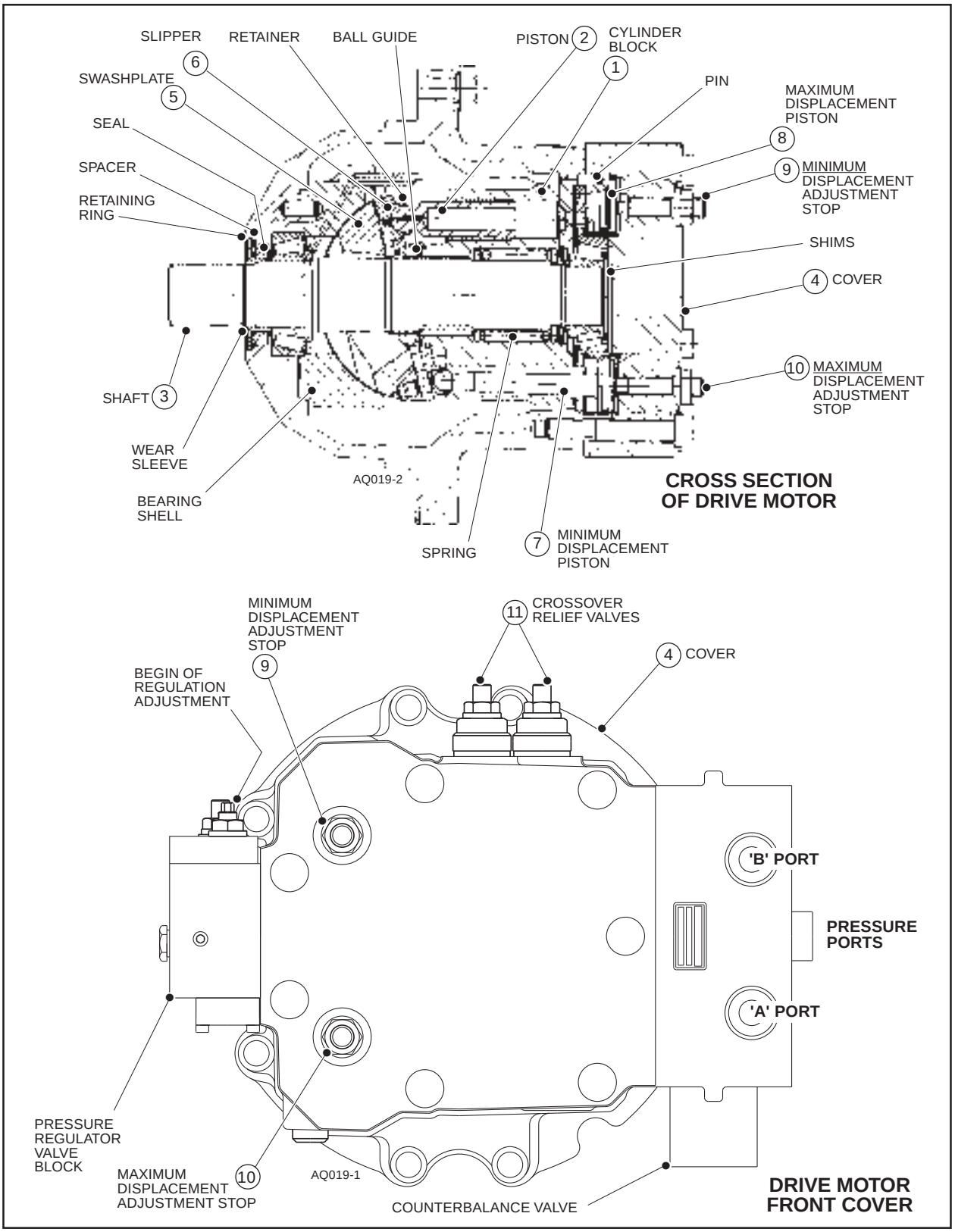


DRIVE MOTOR DESCRIPTION

The drive motor is a variable displacement swashplate design. The motor is interchangeable from side to side.

The motor rotating group consists of a cylinder block (1) with nine pistons (2) and an output shaft (3) that is splined to the cylinder block.

Supply oil from the drive control valve enters the motor through the cover (4) to the pistons. During operation, high pressure supply oil enters the



piston bores in the cylinder block (1). This forces the pistons against an angled swashplate (5). Piston sliding action causes the rotating group to turn. The cylinder block is splined to the output shaft (3) which causes the output shaft to turn. During the second half of the motor rotation, low pressure is discharged as the pistons ride up to a higher position on the swashplate. To reverse rotation, oil flow is reversed. During operation a small amount of supply oil flows through the centre of each piston. This oil lubricates the piston to slipper (6) joint and the slipper to swashplate area.

High pressure supply oil also flows through a tube to lubricate the swashplate to bearing shell area. Normal leakage and lubrication oil aid in flushing and cooling the motor during drive operation.

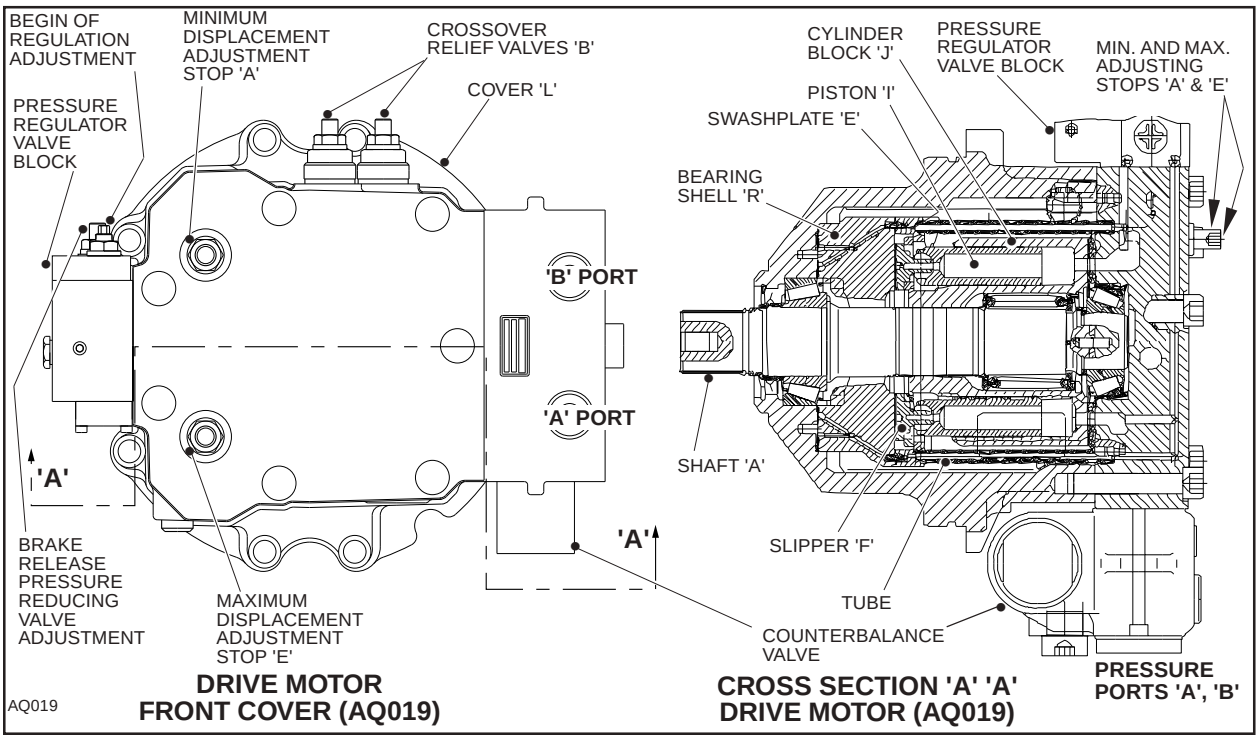
The swashplate (5) angle is changed by the **minimum** displacement piston (7) and **maximum** displacement piston (8). When supply oil acts on the **minimum** displacement piston (7), the motor runs at its highest speed. When supply oil acts on the **maximum** displacement piston (8), the motor runs at its slowest speed. The **maximum** displacement piston is larger than the **minimum** piston and will hold the motor in **maximum** displacement when equal pressure acts on both pistons.

NOTE: Swashplate angle (motor displacement) is limited by the minimum and maximum displacement pistons contacting the minimum (9) and maximum (10) displacement adjustment stops. For minimum displacement, the maximum displacement piston contacts the minimum displacement adjustment stop. For maximum displacement, the minimum displacement piston contacts the maximum displacement adjustment stop.

Refer to front cover illustration;

The drive motor cover (4) consists of several components to operate the drive functions.

The minimum displacement adjustment stop (9) limits the minimum angle the swashplate can move. The maximum displacement adjustment stop (10) limits the maximum angle the swashplate can move. The crossover relief valve(s) (11) protects the motor circuit from pressure spikes.

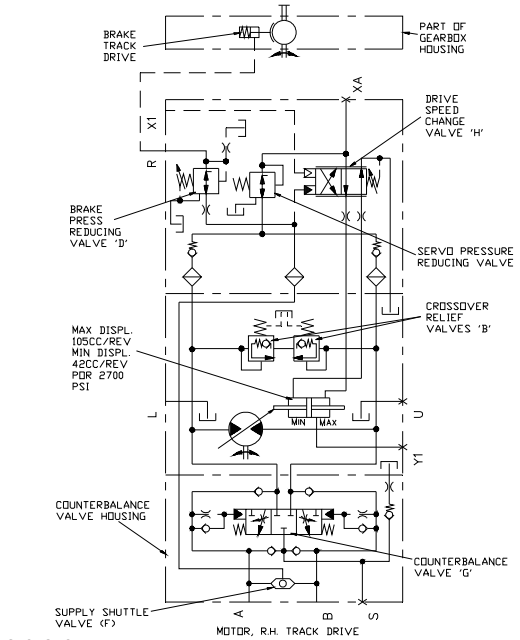


The drive motor may be operated in two ranges;

MAXIMUM DISPLACEMENT = 105cc/rev.
MINIMUM DISPLACEMENT = app. 50cc/rev.

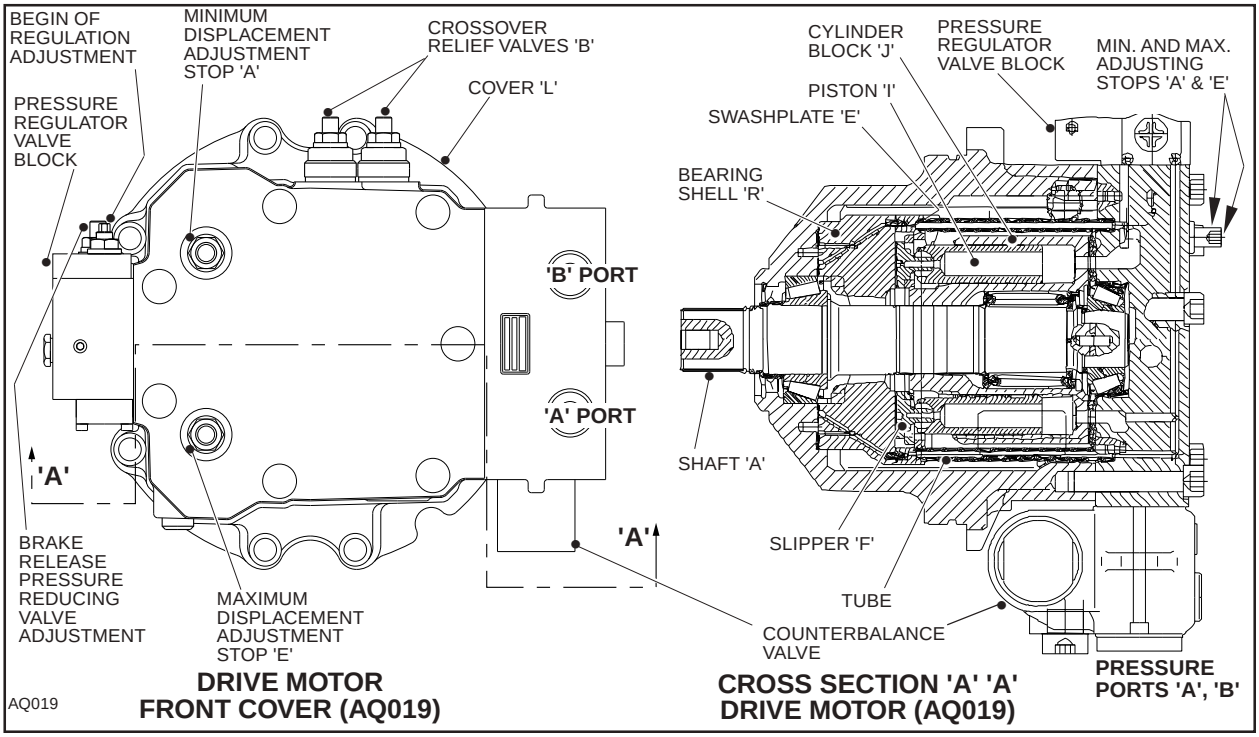
These two ranges are controlled by a solenoid pilot valve on the pilot manifold which is operated by the TRACK (LOW/DRIVE) switch in the cab. In the LOW position the solenoid on the pilot valve is energized and the motor is in its **maximum** displacement mode which will give the **slowest** speed and maximum tractive effort.

For faster travelling modes the TRACK (LOW/DRIVE) switch can be put in the DRIVE position and the motor will be in its **minimum** displacement position which will give the **fastest** speed. When in this high speed mode the motor will automatically increase motor displacement in the event that a high load is encountered, e.g. a short grade or obstacle. This increase in motor displacement is controlled by the drive speed change valve. This valve controls the hydraulic pressure signal to the maximum displacement piston. The piston increases motor displacement as the pressure rises above the drive speed change valve setting.



240T2- 015

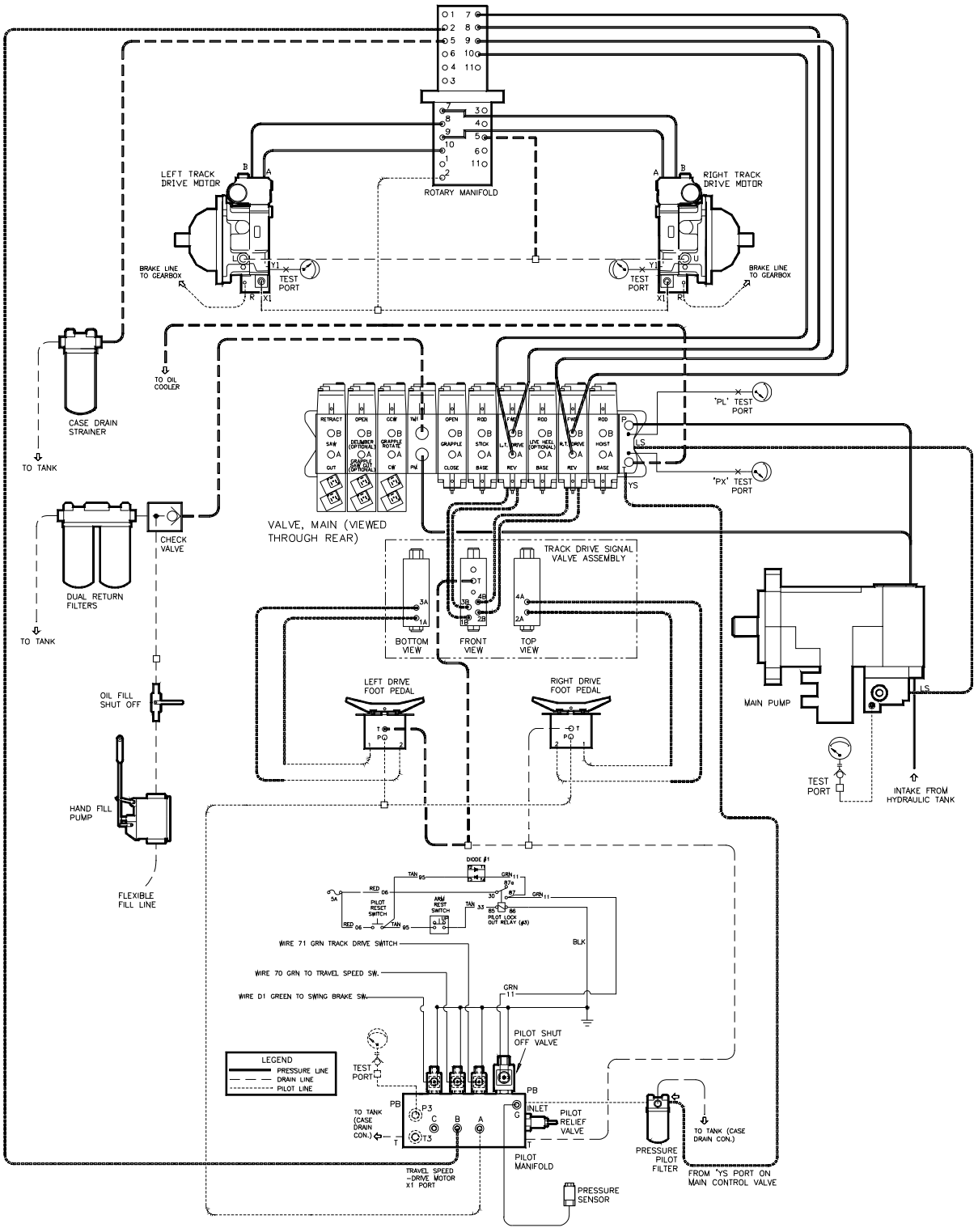
TRACK DRIVE MOTOR SCHEMATIC



AQ019

DRIVE MOTOR FRONT COVER (AQ019)

CROSS SECTION 'A' 'A' DRIVE MOTOR (AQ019)



250BT-045

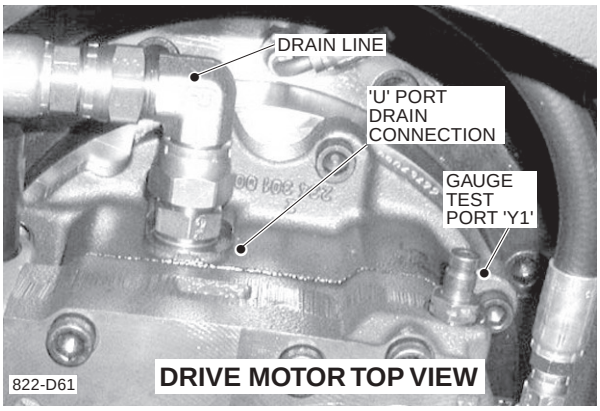
BASIC TRACK DRIVE CIRCUIT DIAGRAM

DRIVE MOTOR START-UP PROCEDURE

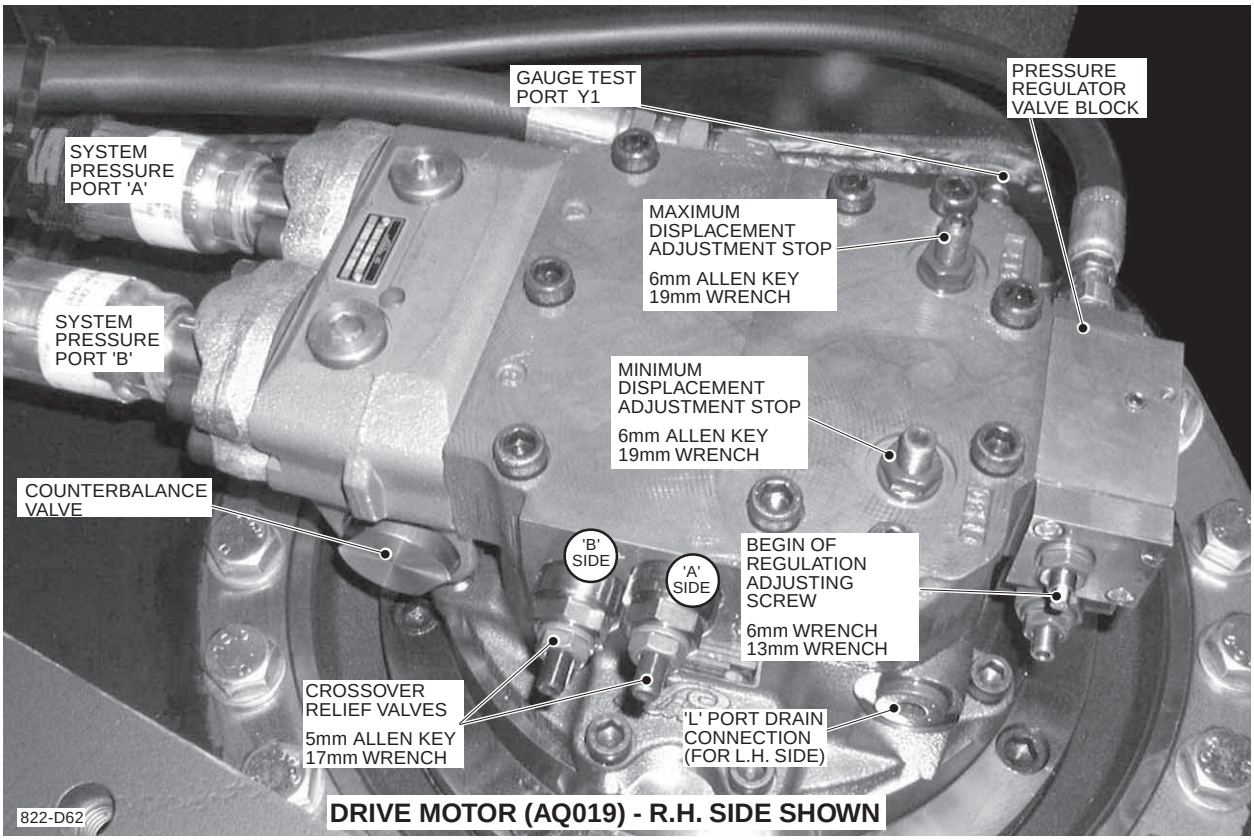
IMPORTANT:

The drive motor will be damaged if is not filled with oil before operating the drive function. This procedure must be performed whenever a new drive motor or drive pump is installed or whenever oil has been drained from the motor.

1. Disconnect drive motor drain line on top of motor.
2. Install plug in line to minimize loss of oil.
3. Remove port adapter from motor drain port.
4. Fill motor with oil through the drain port. Add oil slowly until level is to the top of drain port.
5. Re-connect drain line.
6. Run each drive motor **slowly** with track off the ground for three track revolutions to remove air from the drive circuit.



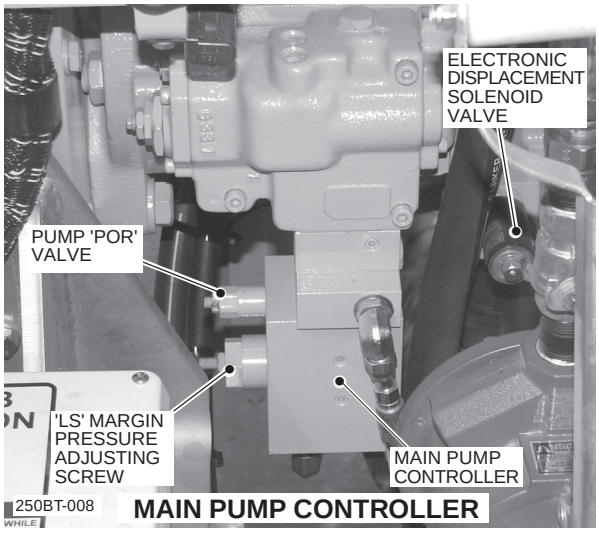
DRIVE MOTOR TOP VIEW



DRIVE MOTOR (AQ019) - R.H. SIDE SHOWN

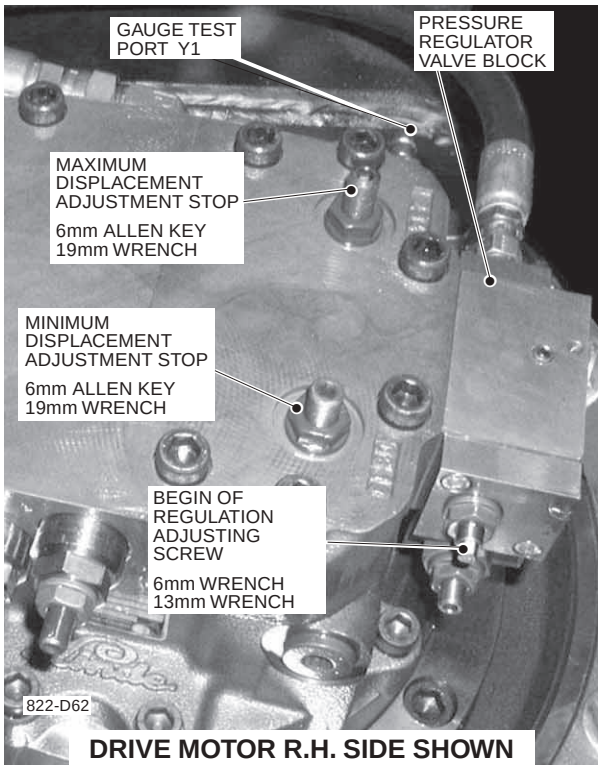
SET BEGIN OF REGULATION (DRIVE SPEED CHANGE VALVE)

1. Ensure hydraulic oil is at **operating temperature.**
2. Remove both LEFT and RIGHT drive motor inspection covers.
3. Disconnect LEFT and RIGHT brake line at port on final drive gearbox. Plug hose with size 06 JIC plug and cap port adapter on gearbox.
4. Install a 0 to 5,000 psi gauge on drive motor gauge test ports 'Y1', and the 'PX' test port on the main control valve, size 04JIC quick connect.
5. Start engine and set throttle to LOW IDLE.
6. Lower left arm rest and depress the pilot reset switch to activate the *pilot system*.
7. Place DRIVE HIGH/LOW switch to HIGH position.
8. Activate LEFT track drive foot pedal in both FORWARD and REVERSE directions to ensure that the track does not move.



MAIN PUMP CONTROLLER

9. With the aid of an assistant, activate LEFT track drive foot pedal in the FORWARD direction and set the main pump POR to 3100 psi.
10. With the aid of an assistant, activate LEFT track drive foot pedal in the FORWARD direction and check pressure reading on gauge at motor gauge test port 'Y1' it should show between **800 and 1,000 psi.**



DRIVE MOTOR R.H. SIDE SHOWN

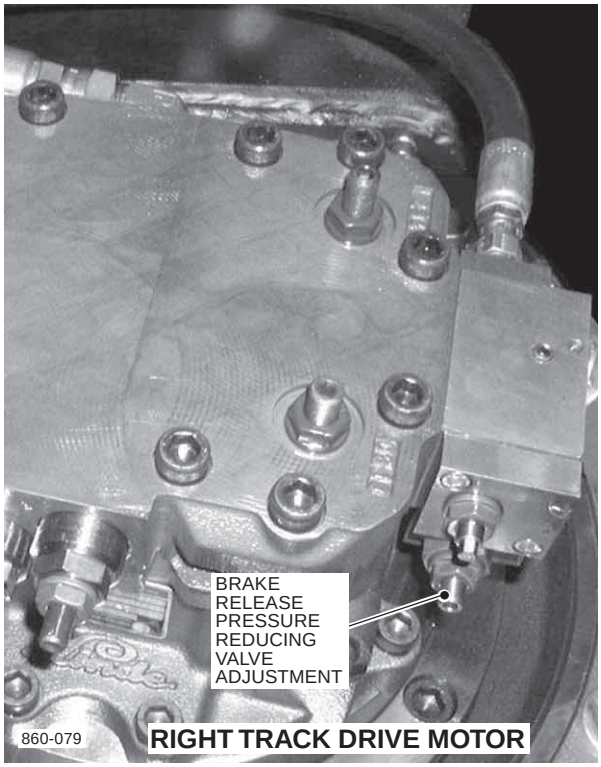
If adjustment is required, loosen locknut on *begin of regulation adjusting screw* and turn screw **in** to increase pressure or **out** to decrease pressure. Tighten locknut.

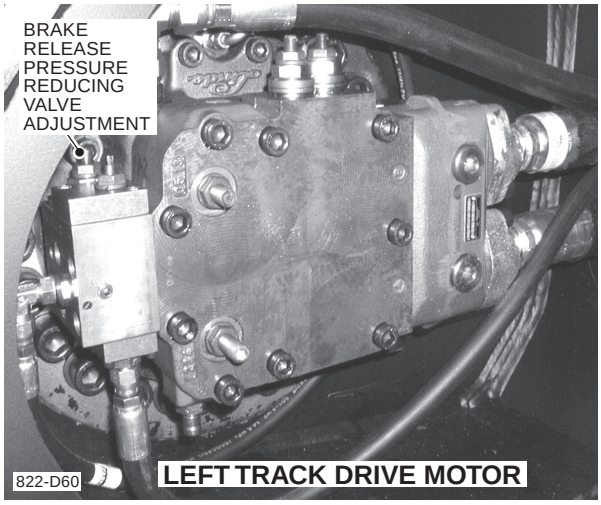
11. Repeat steps (4) through (9) for the right drive motor.
12. Reset main pump POR to 4500 psi
11. Re-connect brake line(s) to both gearboxes.
12. Remove pressure gauges and wipe up any spills.
13. Replace both LEFT and RIGHT drive motor inspection covers.

TRACK DRIVE BRAKE RELEASE PRESSURE

1. Ensure hydraulic oil is at **operating temperature.**
2. Remove both LEFT and RIGHT drive motor inspection covers.
3. Disconnect LEFT and RIGHT brake line at port on final drive gearbox. Install a test hose and tee fitting between the brake lines and ports on final drive gearboxes.
4. Install a 0 to 1,000 psi gauge on both tee fittings.
5. Start engine and set throttle to FULL THROTTLE.
6. Lower left arm rest and depress the pilot reset switch to activate the *pilot system*.
7. With the aid of an assistant, activate LEFT track drive foot pedal in the FORWARD direction and check brake pressure reading on gauge at brake line it should show **500 psi.**

   If adjustment is required, loosen locknut on *brake pressure reducing valve* and turn screw **in** to increase pressure or **out** to decrease pressure. Tighten locknut.
8. Repeat step (7) for the right track drive brake pressure adjustment.
9. Set engine speed to low idle, shut engine off and remove test gauges, hoses and fittings.
10. Reinstall LEFT and RIGHT brake line at port on final drive gearbox. Wipe up any spilled oil.
11. Reinstall both LEFT and RIGHT drive motor inspection covers.





TRACK SPEED SET-UP PROCEDURE

IMPORTANT:

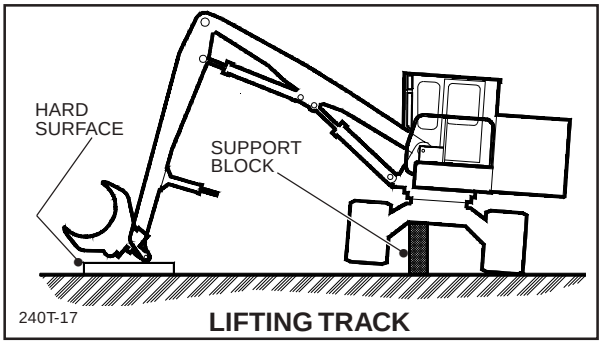
- Ensure hydraulic oil is up to **operating temperature.**

1. Remove both left and right final drive inspection covers to access track drive motors.

LEFT TRACK ADJUSTMENT

POSITION MACHINE:

2. Swing boom to LEFT side of machine.
3. Place grapple on solid ground and by forcing down with boom controls, lift track clear of ground. (Hoist down and stick out)



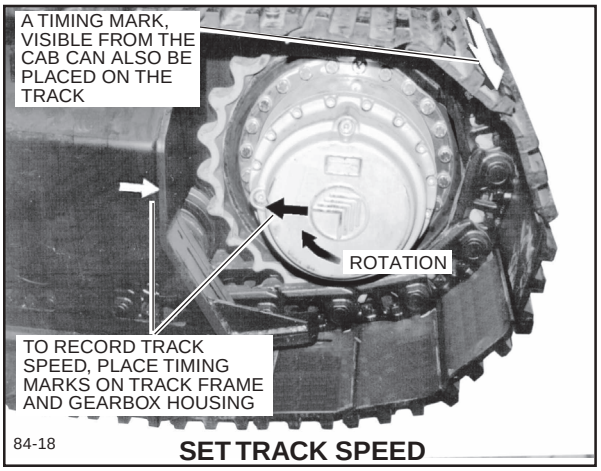
LIFTING TRACK

4. Use blocks to firmly support track frame in raised position. DO NOT place arms, legs or body under track while in the raised position.

SET LOW SPEED (motor maximum displacement)

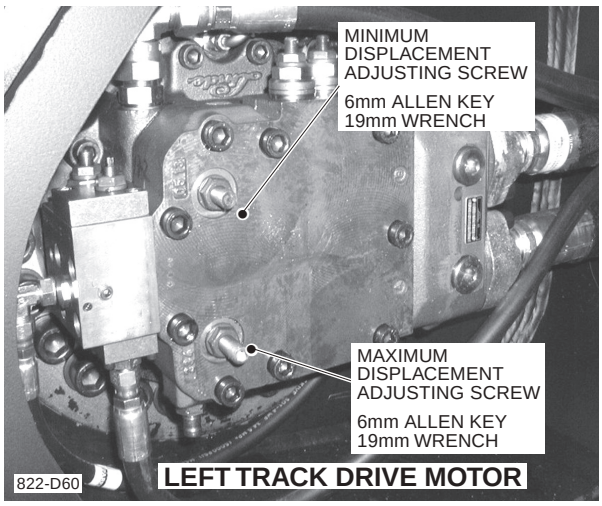
NOTE: Turn the maximum displacement adjusting screw either IN (clockwise) to speed up or OUT (counterclockwise) to slow down the final drive.

5. Set TRACK HIGH/LOW switch to LOW.
6. Set throttle to FULL.

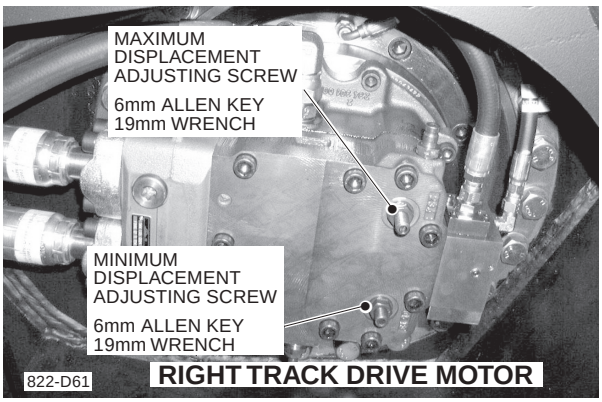


SET TRACK SPEED

7. With an assistant depressing the LEFT TRACK drive pedal FORWARD, record the track drive sprocket speed. A reading of **12 rpm** is desired.
8. Turn the maximum displacement adjustment screw on the left drive motor IN to speed up or OUT to slow down the final drive. Continue adjusting the motor and checking the track drive sprocket speed until **12 rpm** is obtained.



LEFT TRACK DRIVE MOTOR



RIGHT TRACK DRIVE MOTOR

SET HIGH SPEED
(motor minimum displacement)

9. Turn HIGH/LOW switch to HIGH.
10. Set engine to full throttle.
11. With an assistant depressing the left track drive pedal forward record the track drive sprocket speed. A reading of 28 rpm is desired.
12. Turn the minimum displacement adjustment screw on the left drive motor OUT to speed up or IN to slow down the final drive. Continue adjusting the motor and checking the track drive sprocket speed until 28 rpm is obtained.

IMPORTANT: DO NOT exceed 30 rpm since over speeding will damage the drive motor.

RIGHT TRACK ADJUSTMENT

13. Lower the left track onto the ground, swing the boom around to the right side of the machine and proceed to raise the right track clear of the ground.
14. Use blocks to firmly support track frame in raised position. DO NOT place arms, legs or body under track while in the raised position.
15. Follow steps 5 through 12 from LEFT TRACK ADJUSTMENT.
16. Lower machine down onto the ground, stop the engine and replace the final drive inspection covers.

SET STRAIGHT TRAVEL

Following completion of TRACK SPEED SET-UP PROCEDURE, try driving machine in both forward and reverse directions with the 'DRIVE/LOW' switch in both 'HIGH' and 'LOW' positions.

If machine does not travel straight, the right and left track speeds are not set the same, therefore the above set-up procedures need to be rechecked.

TRACK COMPONENTS

IMPORTANT:

New machine: Before driving a new machine ensure that track sag is set correctly. Track sag may be set less than specified for shipping purposes.

The correct track sag must be adjusted once a machine has been delivered to the job sight and operating in the accumulated soil build-up in the undercarriage.

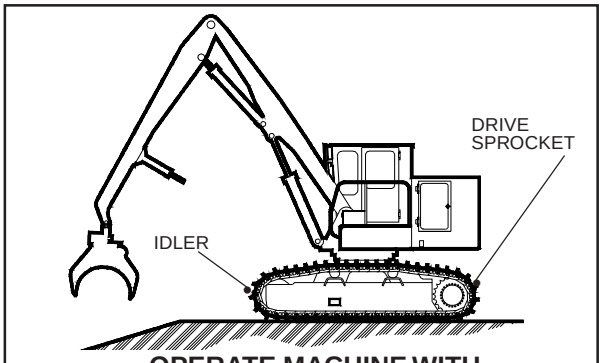
TRACK SAG NOTE:

The track sag dimension is very important and should be checked regularly, 50% increase in the life of the track assembly can be realized, particularly bushing O/D wear and track pitch by maintaining the correct amount of track sag. A track that is too tight will wear out significantly faster due to increased tension in the chain.

Track components operate under varying terrain conditions, most of which cause excessive wear. Wear to one component can quickly spread to the rest of the track assembly.

To ensure that the track components are always in good running order, a periodic inspection should be made to ensure that components have not come loose, that bolts are at the correct torque, that components are within the specified wear limits (discussed further in this section) and where applicable, check lubrication points.

For a guide on inspection, refer to the PERIODIC MAINTENANCE SCHEDULE in SECTION 3 OF THIS MANUAL.

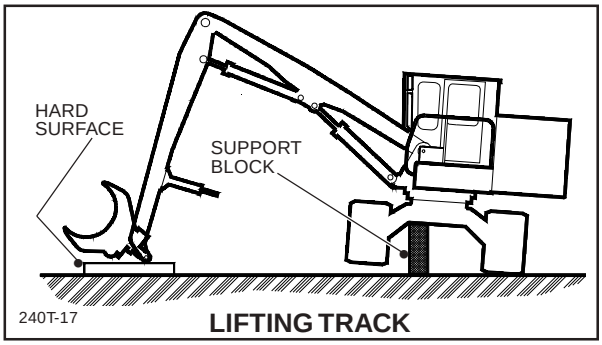


OPERATE MACHINE WITH GRAPPLE OVER IDLERS

OPERATING THE MACHINE

Whenever possible the machine should always be operated with the felling head over the IDLERS and not over the SPROCKETS.

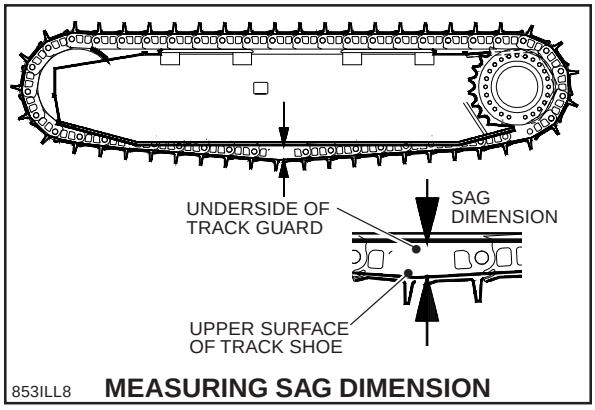
Operating over the sprockets will result in overloading of the contact surfaces between the sprocket and the track bushings. Bushings could crack during sprocket impact.



LIFTING TRACK

MEASURING TRACK SAG

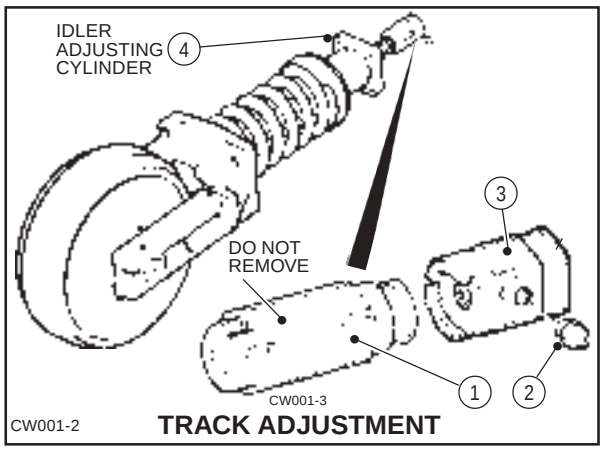
1. Swing boom to side of machine.
2. Place grapple on ground as shown and by forcing down with boom controls, lift track clear of ground.
3. Rotate track in forward and reverse several times. Stop the track while in reverse. Do not clean the track.
4. Stop engine.
5. Measure distance between top surface of track shoe at centre of lower surface of track frame.



MEASURING SAG DIMENSION

6. This dimension should be between 6" and 8" for normal operations.

NOTE: If track sag is less than specified, track chain wear will be accelerated. If track sag is excessive, it is possible for the track to jump off the sprocket.



CW001-2 **TRACK ADJUSTMENT**

TRACK SAG ADJUSTMENT

To tighten track, attach adjustment fitting adapter (3) onto valve body (1). Connect a grease gun to the grease fitting (2) on the adjustment fitting adapter (3). Add grease until track sag dimension is within recommended limits. Remove adjustment fitting adapter.

CAUTION: The grease is under very high pressure, DO NOT REMOVE the adjustment fitting valve body (1) from the idler adjusting cylinder (4).

To loosen track, slowly loosen valve body (1) until grease begins to escape via a relief passage in the valve body housing, grease will be seen escaping from around valve body threads. When track sag is correct, tighten valve body.

TORQUING UNDERCARRIAGE BOLTS

It is important to check the torque values of the track shoe retaining bolts and the bottom roller retaining bolts at the NEW MACHINE MAINTENANCE time period (first 100 hours) and the EVERY 125 HOURS SCHEDULED MAINTENANCE time period.

When installing new components, all traces of paint and dirt must be removed from all mating surfaces including the contact area under the bolt head and nut.

Both the bolt and the nut on the track shoes should be lightly lubricated with SAE 30 oil and tightened using the **Torque-turn** method.

The torque-turn method involves torquing the bolt to an *initial predetermined value*, plus an additional 1/3 turn (not the value shown in the torque charts). This ensures a more accurate and consistent torquing of the bolts, with less likelihood of the bolt/nut coming loose later.

When checking the torque values at the first 100 hours and every 125 hours thereafter use the CHECKING TORQUE values listed in the following paragraphs.

If loose shoes or under torqued bolts are discovered during the FIRST 100 HOUR check, they should be removed, surfaces cleaned, and reused using the **torque-turn** method. If the shoe is not loose but a single bolt is low on torque, loosen the bolt and re torque-turn.

If loose or under torqued bolts are discovered any time after the 100 HOUR check, the bolts and nuts must be replaced with **NEW** ones, surfaces cleaned, and re **torque-turned**.

TRACK SHOE RETAINING BOLTS

Track shoes must be fastened together applying the exact torque values shown below and using the **Torque-turn** method described in TORQUING UNDER CARRIAGE BOLTS earlier in this section.

TRACK COMPONENT TORQUE VALUES

Track shoe bolts and nuts are designed specifically for this purpose and should not be substituted with standard off the shelf hardware.

Only bolts with grade '12.9' or '170' designation forged in the head are approved.

When checking the torque values at the first 100 hours and every 125 hours thereafter use the checking torque value.

Track shoe bolts ~ 3/4" UNC

TORQUE-TURN ..... 220LBF/FT. + 1/3 TURN.

CHECKING TORQUE ..... 450 LBF/FT.

ROLLER RETAINING BOLTS

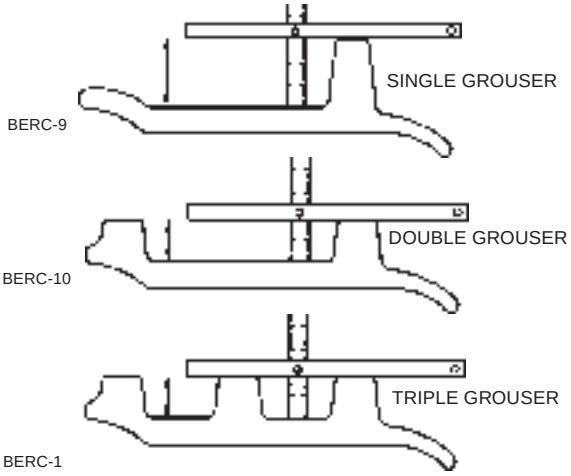
The rollers must be fastened to the lower frame applying the exact torque values shown below.

When installing new rollers, apply "NEVER-SEEZ" to the bolt.

When checking the torque values at the first 100 hours and every 125 hours thereafter use the torque value(s) shown below.

Roller bolts ~ 7/8" UNC
TORQUE ..... 450 LBF/FT.

For a complete maintenance check Refer to the PREVENTIVE MAINTENANCE SCHEDULE in SECTION 3 of this manual.



GROUSER WEAR (HEIGHT)

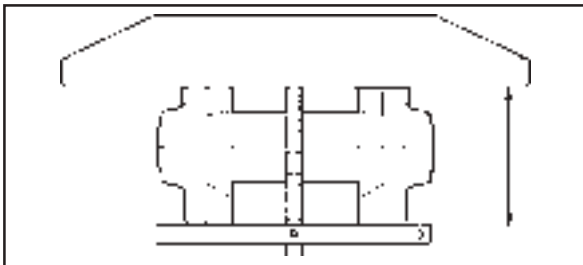
WEAR LIMITS

TRACK SHOE GROUSER HEIGHT WEAR

WEAR LIMITS

	New	75% wear	100% wear
Single	2.82" (716.2mm)	1.37" (348mm)	0.93" (236.2mm)
Double	1.37" (348mm)	0.71" (180.3mm)	0.43" (109.2mm)
Triple	1.06" (269.2mm)	0.51" (129.5mm)	0.36" (91.4mm)

NOTE: Allowable wear for soft ground conditions is 100%. Allowable wear for rocky ground conditions is 75%.



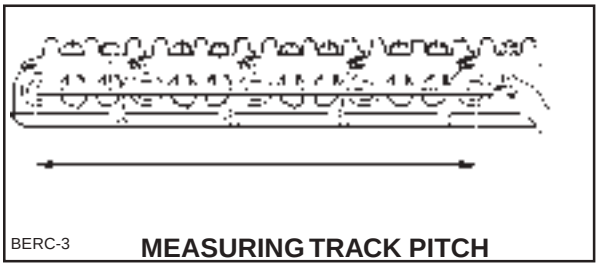
TRACK LINK WEAR (HEIGHT)

TRACK LINK WEAR

WEAR LIMITS
New link height ..... 4.78" (121.5mm)
50% wear ..... 4.60" (116.8mm)
75% wear ..... 4.48" (113.8mm)
100% wear ..... 4.34" (110.2mm)

PIN AND BUSHING WEAR

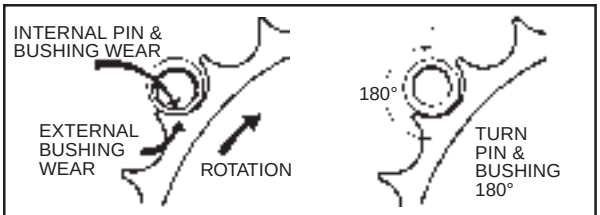
To obtain the track internal wear, i.e., the wear between the pin and the internal diameter of the bushing, measure the track pitch over four sections of track (5 pins).



BERC-3 **MEASURING TRACK PITCH**

To take this measurement,

1. Remove slack by placing a steel pin between sprocket and chain, then slowly move machine in reverse to tighten chain.
2. Measure pitch across two four link sections, except section on each side of the master pin, to find average chain wear.



BERC-4 **PIN/BUSHING INTERNAL WEAR**

NOTE: Wear to the pins and bushings only occurs in a small localised area, to extend the life of these components, the pins and bushings may be turned 180° or replaced provided other components are within specified wear limits:

1. Track link wear is 75% or less.
2. Change in track pitch is 32.50:" (825.5mm) per link or less.
3. Bushing external wear less than 100% or 75% or less in rocky ground.
4. There is at least 0.008" (0.2mm) press fit available between pin and bushing and link.

WEAR LIMITS

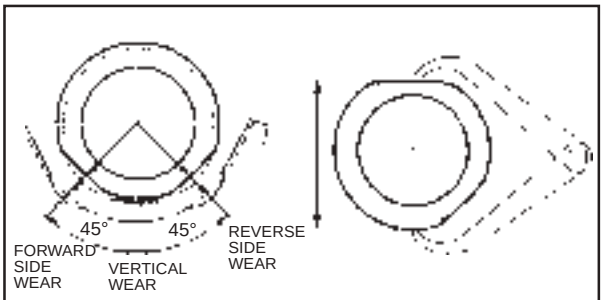
New length of four sections	32" (813.0mm)
75% worn	32.37"(822.2mm)
100% worn	32.50"(825.5mm)

NOTE: Allowable wear in rocky ground is 75%

NOTE: These wear limits are to be used as a guide for when to turn the pins and bushings. If pins and bushings are not to be turned, the chain can be run past the 100% wear limit, until chain failure.

BUSHING WEAR, OUTSIDE DIAMETER

Use a calliper to measure the wear of the bushing O.D. in three places.



MEASURING BUSHING WEAR BERC-5

NOTE: Bushing outside diameter is measured at three places because of the forward and reverse travel of the machine and a vertical wear that takes place.

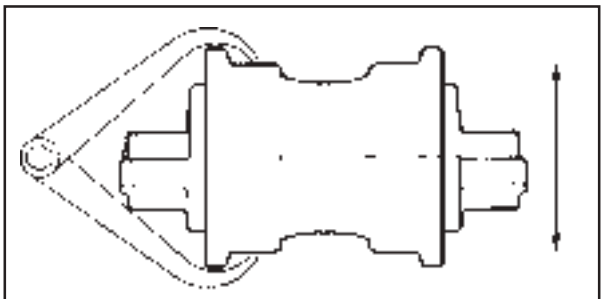
WEAR LIMITS

New bushing O.D.	2.62" (66.6mm)
75% worn	2.5" (63.5mm)
100% worn	2.43" (61.7mm)

NOTE: Allowable wear in rocky ground is 75%

ROLLER WEAR

Measure the roller diameter on the tread contact surface with a large calliper to obtain the worst wear condition.



BERC-6 **MEASURING ROLLER WEAR**

If accessibility to the rollers is impaired by guards, then concentrate on the front and rear rollers, these will be the most worn.

WEAR LIMITS, LARGER ROLLERS

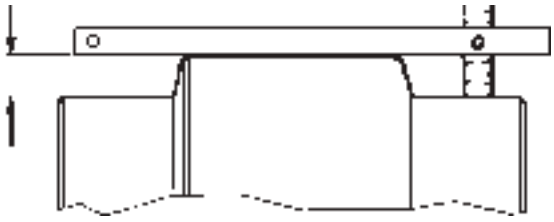
New roller.	8.26" (210.0mm)
75% worn	7.64" (194.0mm)
100% worn	7.36" (187.0mm)

WEAR LIMITS, SMALLER & UPPER ROLLERS

New roller.	6.61" (168.0mm)
75% worn	6.10" (155.0mm)
100% worn	5.91" (150.0mm)

IDLER WEAR

Measure the idler wheel side diameters (tread contact surface) at several points to obtain the worst wear condition. Position a depth gauge or measuring tape as close as possible toward the centre of the idler with the gauge flat on the centre flange and parallel to the idler shaft.



BERC-7 **MEASURING IDLER WEAR**

WEAR LIMITS
New idler dimension ..... 0.85" (22.0mm)
100% wear ..... 1.18" (30.0mm)

SECTION 12 - BOOM

AUGUST, 2006

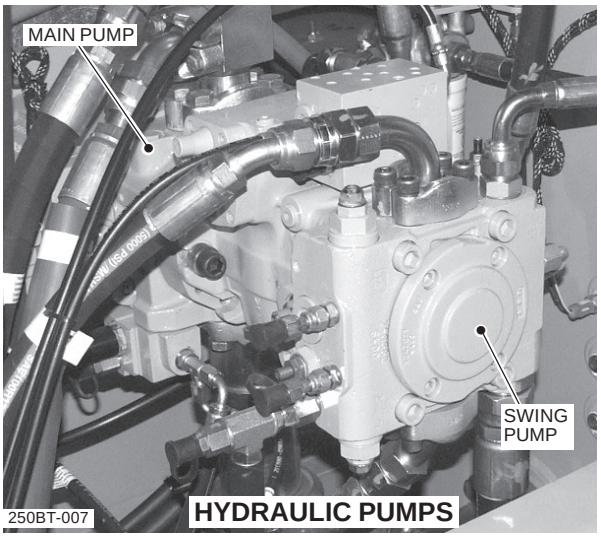
CONTENTS - SECTION 12

CIRCUIT DESCRIPTION 12.4
CIRCUIT DIAGRAM 12.6
CONTROL VALVES
JOYSTICK CONTROL VALVE. *SEE* SERVICE MANUAL SECTION 5
FILTERS
HYDRAULIC RETURN 12.3
HOIST VALVE RELIEF VALVE SETTINGS 12.7
PRESSURE SETTINGS
SUMMARY 12.7, 12.8
STICK VALVE RELIEF VALVE SETTINGS 12.8

BOOM SYSTEM COMPONENTS

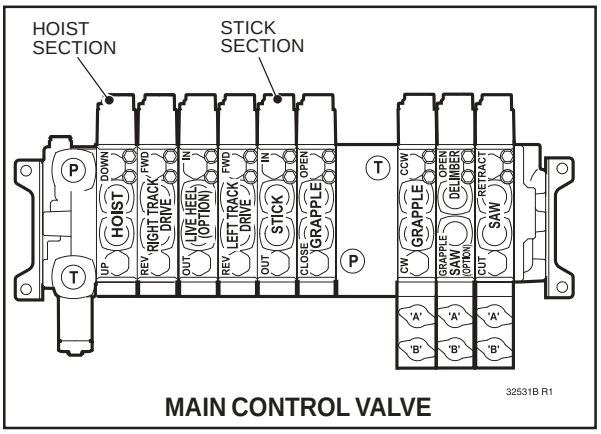
HYDRAULIC PUMPS

All hydraulic functions are powered by two pumps. The main and swing pumps are mounted one behind the other on the flywheel housing of the engine. The first pump (main pump) is a piston pump with load sensing, pressure compensating and horsepower limiting controls.



HYDRAULIC PUMPS

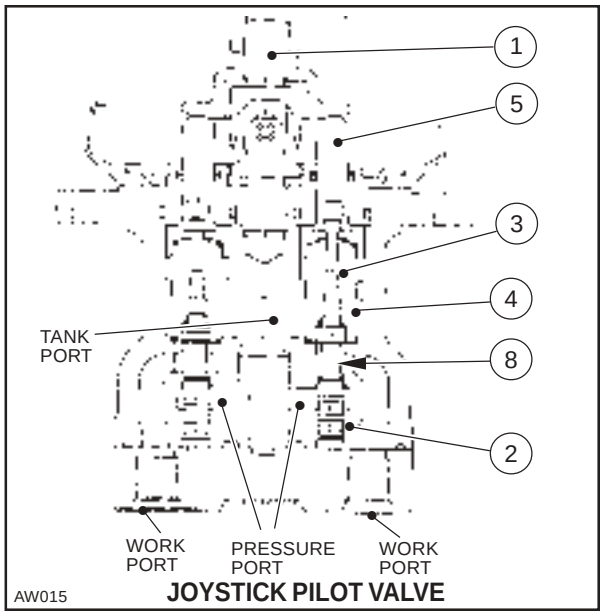
Mounted and coupled to the main pump is the swing pump. It is a pressure compensated piston pump.



MAIN CONTROL VALVE

The boom circuit utilizes the main pump to supply hydraulic oil to the HOIST and STICK circuits via two valve sections in the main control valve.

For a more detailed description of the main pump, refer to SECTION 4 in THIS SERVICE MANUAL.



JOYSTICK PILOT VALVE

JOYSTICK CONTROL VALVE

The hoist boom and stick boom functions are controlled by the left and right joysticks which when operated send proportional pilot signals to the two boom control valves which supply oil to the two boom cylinders.

For a detailed description of the joystick control valve refer to SECTION 5 in THIS MANUAL.

BOOM VALVE SPOOL SECTIONS

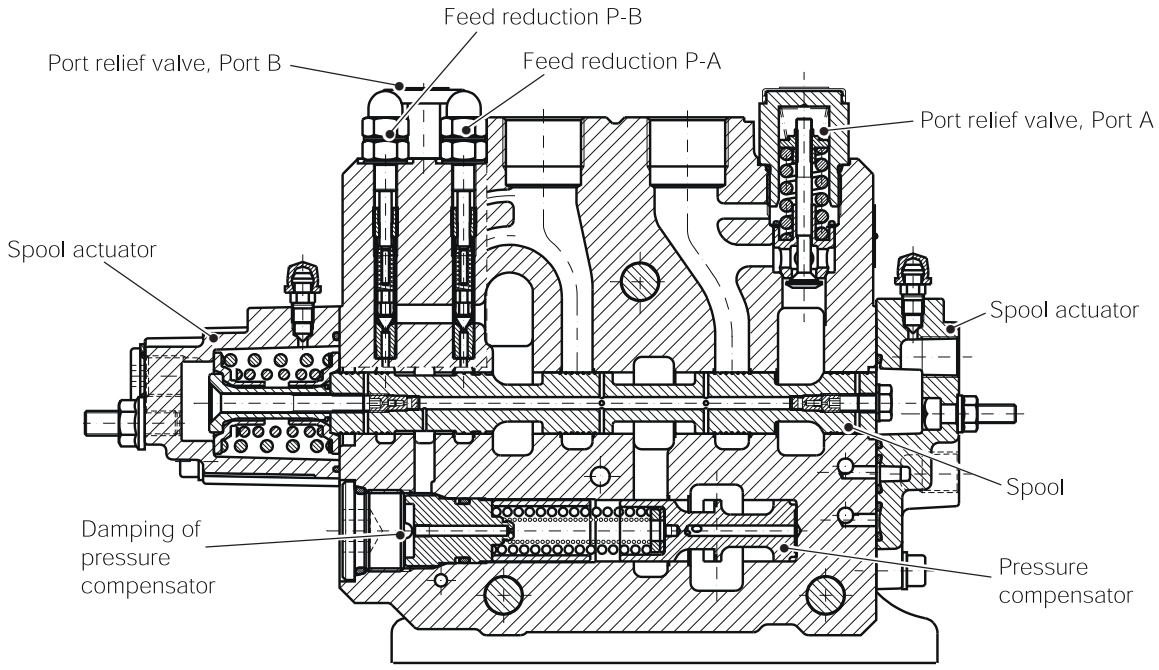
Six of the main valve spool sections (Hoist, Stick, Grapple, Track Drive and Live Heel Option) are equipped with proportional, pilot operated hydraulic spool actuators. The actuators are spring centered to the neutral position, and are shifted by sending a hydraulic signal to the appropriate hydraulic spool actuator.

Spools

Each of the spools installed in the main valve is selected specifically for the function it is controlling. For example, the hoist boom section spool has different characteristics than the track drive spool. These spools cannot be interchanged

Pressure Compensation

The primary purpose of pressure compensation is to maintain a constant flow rate to function (ie: maintain the same speed of movement), regardless of pressure variations in the system. The pressure compensator also contains a load-hold check valve. An orifice is installed immediately down stream of the pressure compensator to smoothly regulate the response of the compensator.



CROSS SECTION OF SPOOL SECTION

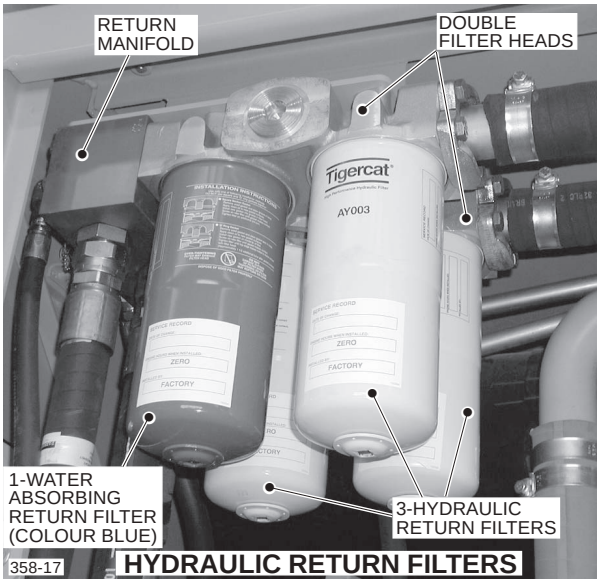
Port Reliefs

The main valve is equipped with port reliefs on each side of all spool sections except the track drive sections. The function of the port relief is to protect the valve and the function cylinder or motor from pressure peaks in the system. The port reliefs also act as anti-cavitation valves, which means they allow oil to flow from the tank gallery in the valve to the service ports in the event of underpressure. The port reliefs cannot be adjusted. Port reliefs installed in each section are specifically designed for use in that section should not be interchanged with port reliefs from other valve sections .

HYDRAULIC RETURN FILTERS

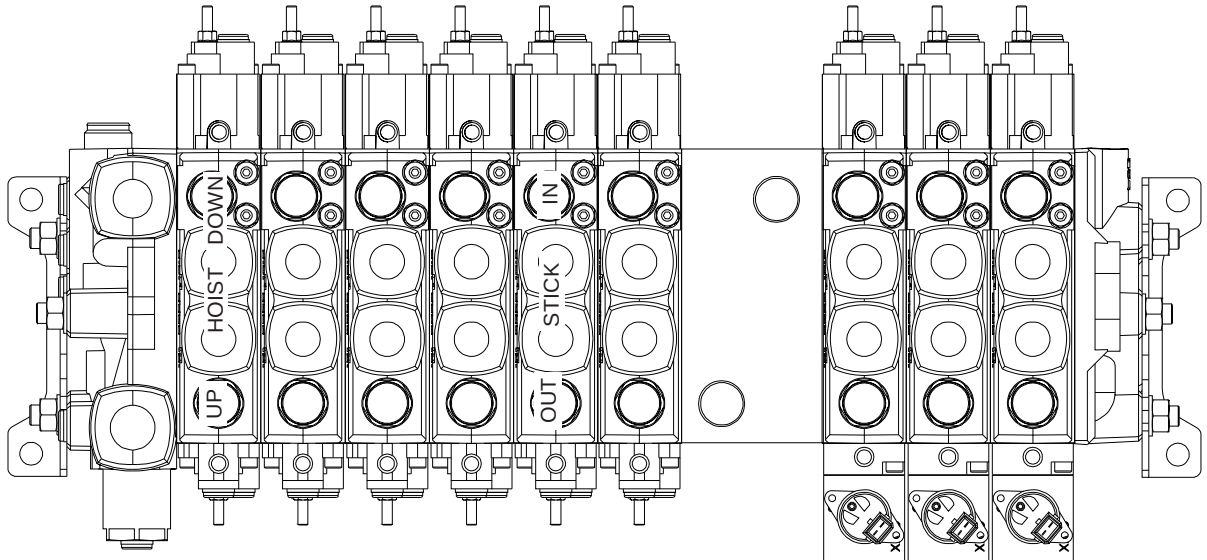
The majority of return oil entering the hydraulic tank passes through 4 spin-on hydraulic oil filters. One of the filters is a water absorbing filter (color blue) which is in place to assist with the removal of unwanted moisture from the hydraulic oil (the filters are rated 10m abs).

Each filter head has a bypass valve with a 25 psi cracking pressure so that oil can bypass the filters if they become restricted. The "in" side of the filter heads are connected to a return manifold. A filter restriction indicator and an oil sampling connector are mounted onto the manifold. To check the

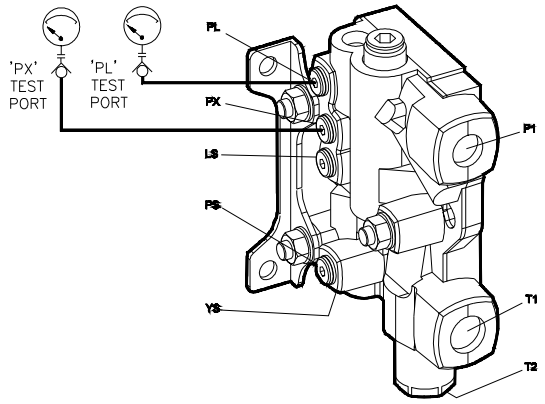


HYDRAULIC RETURN FILTERS

condition of the filter elements; With the hydraulic oil at **normal operating temperature**, place engine throttle control to FULL and with **no** machine functions operating, the filter restriction indicator should be in the GREEN zone. If the pointer is in the RED zone replace all four filter elements.



250BT-030



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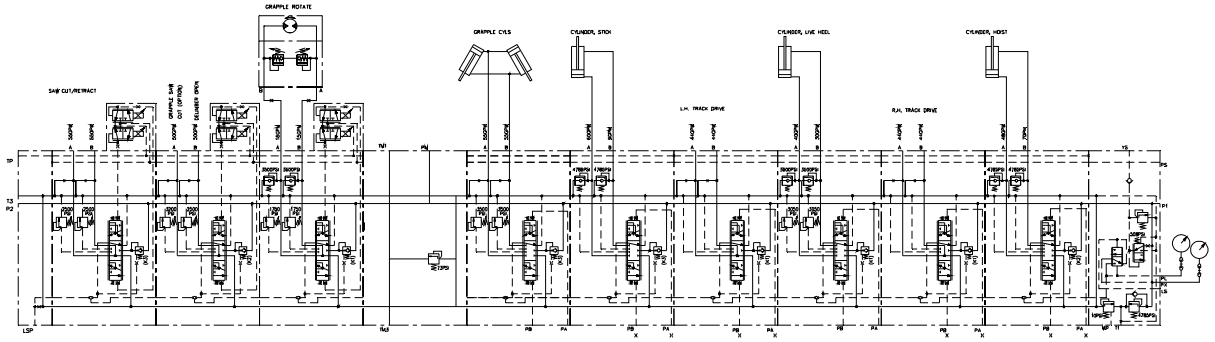


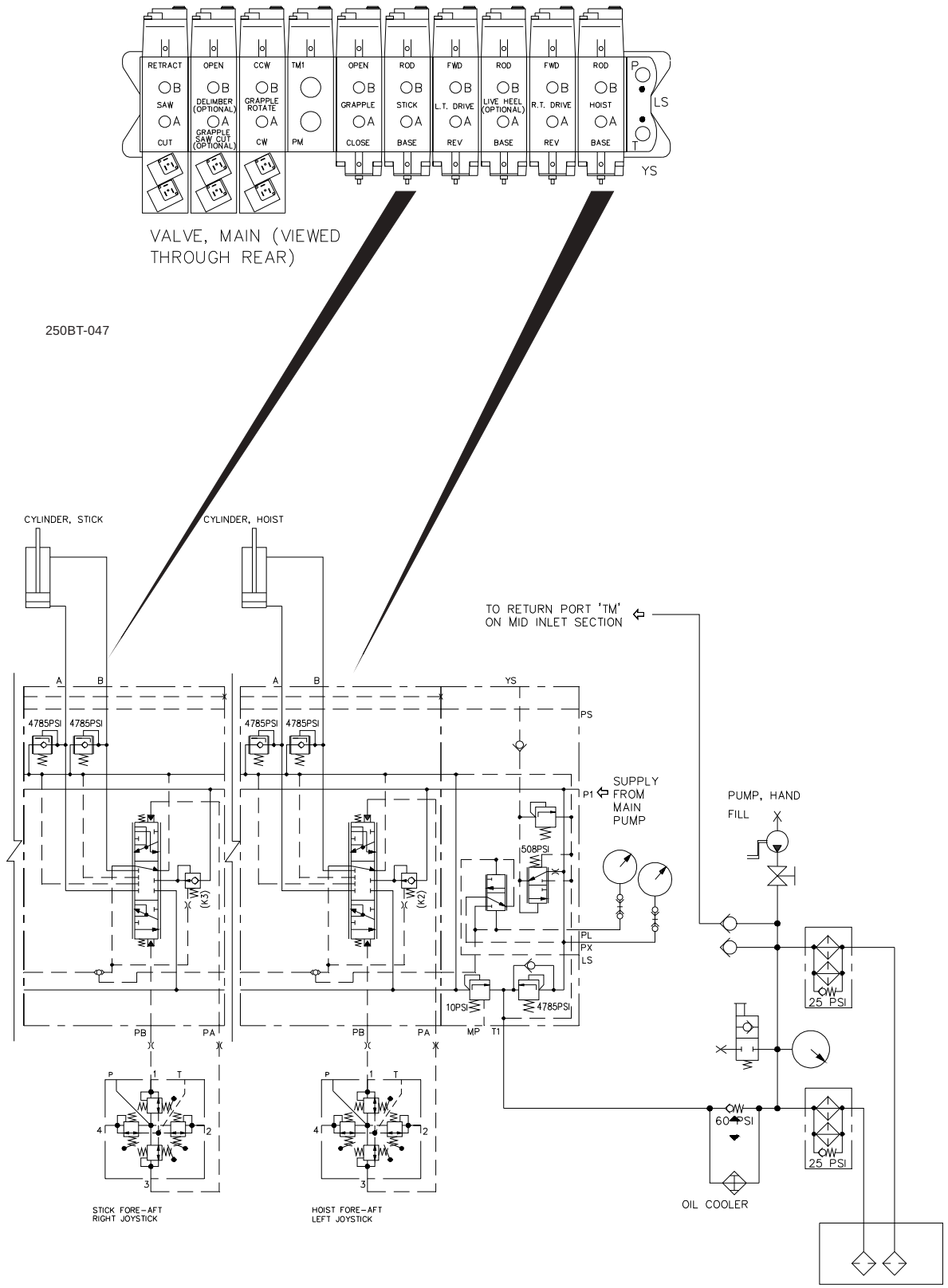
250BT-014

MAIN CONTROL VALVE

BOOM CIRCUIT DESCRIPTION

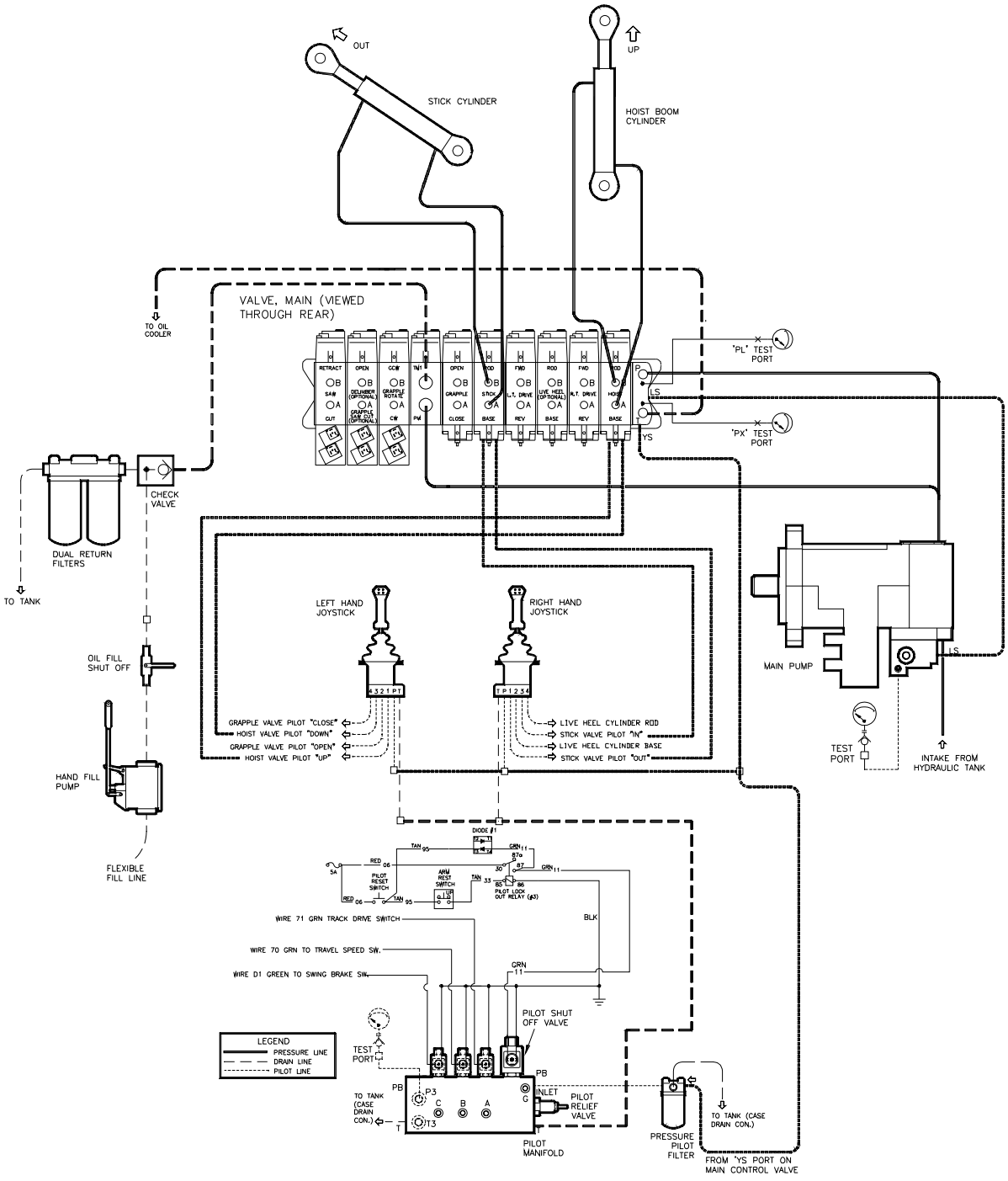
The boom circuit is supplied with oil from the main pump. The two boom valves receive oil at the inlet section of the main control valve and direct the oil through the spool sections when either of the joysticks are actiavte.

Moving either of the joysticks in the cab will direct pilot oil to the spool actuator end of the hoist or stick spool sections in the boom valves to shift the spools and direct hydraulic oil from the pump to the hoist or stick hydraulic cylinders to raise or lower to booms. Return oil from the cylinders is directed back through the spool sections, to the outlet port, to the oil cooler and through the return manifold to the two dual head return oil filters and back to tank.



250BT-046

HOIST AND STICK CIRCUIT (OTHER SECTIONS REMOVED FOR CLARITY)



250BT-048

BOOM CIRCUIT

PRESSURE SETTINGS

CAUTION

Use caution when in the cab as a slight touch of the controls can cause sudden rotation of the upper frame and booms or movement of the tracks

CAUTION

Be aware of other personnel in the area. Operator is responsible for the safe operation of the machine.

WARNING

Ensure that no one is standing near the grapple during this procedure.

IMPORTANT

Avoid blowing oil over relief for longer than five seconds, as this will cause excessive heating of the hydraulic fluid.

HOIST VALVE RELIEF VALVE SETTINGS

Main pump POR setting ..... 4500 psi

Main relief setting ..... 4875 psi

Hoist up port relief setting ..... 4875 psi

Hoist down port relief setting ..... 4875 psi

NOTE: The main and port relief valves are not adjustable, the following procedure is for checking pressure only.

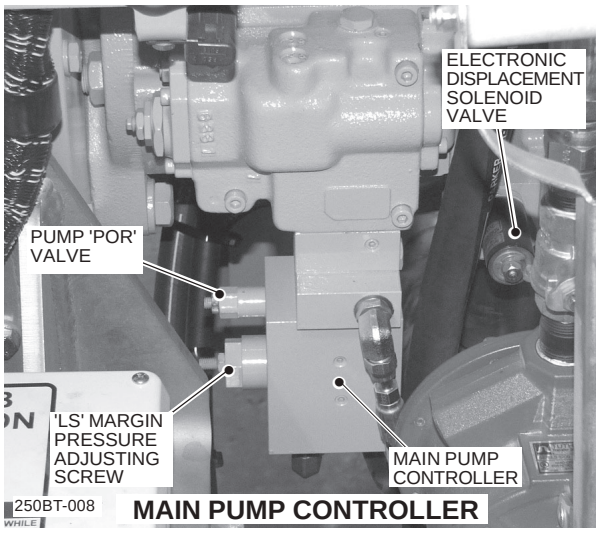
1. Position machine on flat level ground.
2. Ensure that the hydraulic oil is at **operating temperature.**
3. Connect a 0 - 5000 p.s.i. pressure gauge to the "PX" valve test port on the inlet section of the main control valve.
4. Start the engine, and put the throttle control to the **FULL** position. Lower left arm rest and depress the pilot reset switch to activate the *pilot system*.
5. While holding the L.H. joystick in the HOIST UP position (fully extended), check gauge pressure reading. Should be 4500 psi.

   While holding the L.H. joystick in the HOIST DOWN position (fully retracted), check gauge pressure reading. Should be 4500 psi.

IMPORTANT

Approach the gauge reading slowly and deliberately by turning the adjusting screw in a little at a time. The pressure setting must not exceed the above value.

If less than set value in one direction but OK in the other direction the port relief valve for the low reading circuit is malfunctioning, replace the port relief valve.



MAIN PUMP CONTROLLER

If less than set value in both directions turn pump POR valve adjusting screw **in** (the pressure reading should increase if the POR was set too low) until set value is obtained on gauge.

If when adjusting POR setting the pressure does not change then the main relief is malfunctioning and should be replaced.

6. After checking pressures and if POR valve was adjusted reset the POR to 4500 psi. Tighten locknut on POR adjusting screw taking care not to turn the adjusting screw.
7. Stop engine. Remove pressure gauge and wipe up any excess oil from test port area.

CAUTION

Use caution when in the cab as a slight touch of the controls can cause sudden rotation of the upper frame and booms or movement of the tracks

CAUTION

Be aware of other personnel in the area. Operator is responsible for the safe operation of the machine.

WARNING

Ensure that no one is standing near the grapple during this procedure.

IMPORTANT

Avoid blowing oil over relief for longer than five seconds, as this will cause excessive heating of the hydraulic fluid.

STICK VALVE RELIEF VALVE SETTINGS

Main pump POR setting ..... 4500 psi

Main relief setting ..... 4875 psi

Stick out port relief setting ..... 4875 psi

Stick in port relief setting 4875psi

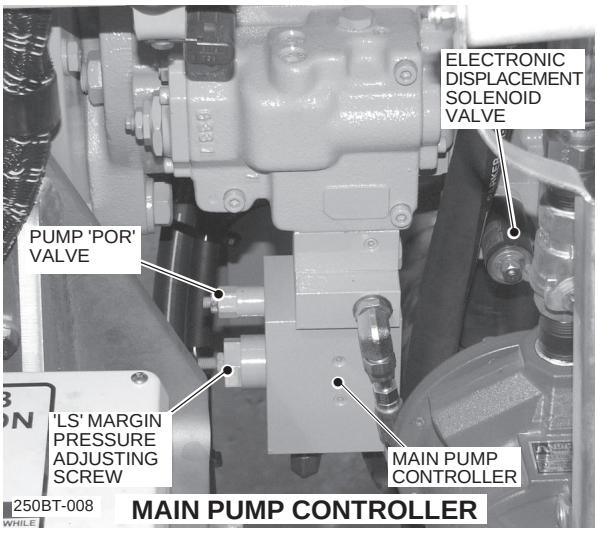
1. Position machine on flat level ground.
2. Ensure that the hydraulic oil is at **operating temperature.**
3. Connect a 0 - 5000 p.s.i. pressure gauge to the "PX" valve test port on the inlet section of the main control valve.
4. Start the engine, and put the throttle control to the **FULL** position. Lower left arm rest and depress the pilot reset switch to activate the *pilot system*.
5. While holding the R.H. joystick in the STICK OUT position (fully extended), check gauge pressure reading. Should be 4500 psi.

   While holding the L.H. joystick in the STICK IN position (fully retracted), check gauge pressure reading. Should be 4500 psi.

IMPORTANT

Approach the gauge reading slowly and deliberately by turning the adjusting screw in a little at a time. The pressure setting must not exceed the above value.

If less than set value in one direction but OK in the other direction the port relief valve for the low reading circuit is malfunctioning, replace the port relief valve.



MAIN PUMP CONTROLLER

If less than set value in both directions turn pump POR valve adjusting screw **in** (the pressure reading should increase if the POR was set too low) until set value is obtained on gauge.

If when adjusting POR setting the pressure does not change then the main relief is malfunctioning and should be replaced.

6. After checking pressures and if POR valve was adjusted reset the POR to 4500 psi. Tighten locknut on POR adjusting screw taking care not to turn the adjusting screw.
7. Stop engine. Remove pressure gauge and wipe up any excess oil from test port area.

SECTION 15 - SWING

AUGUST, 2006

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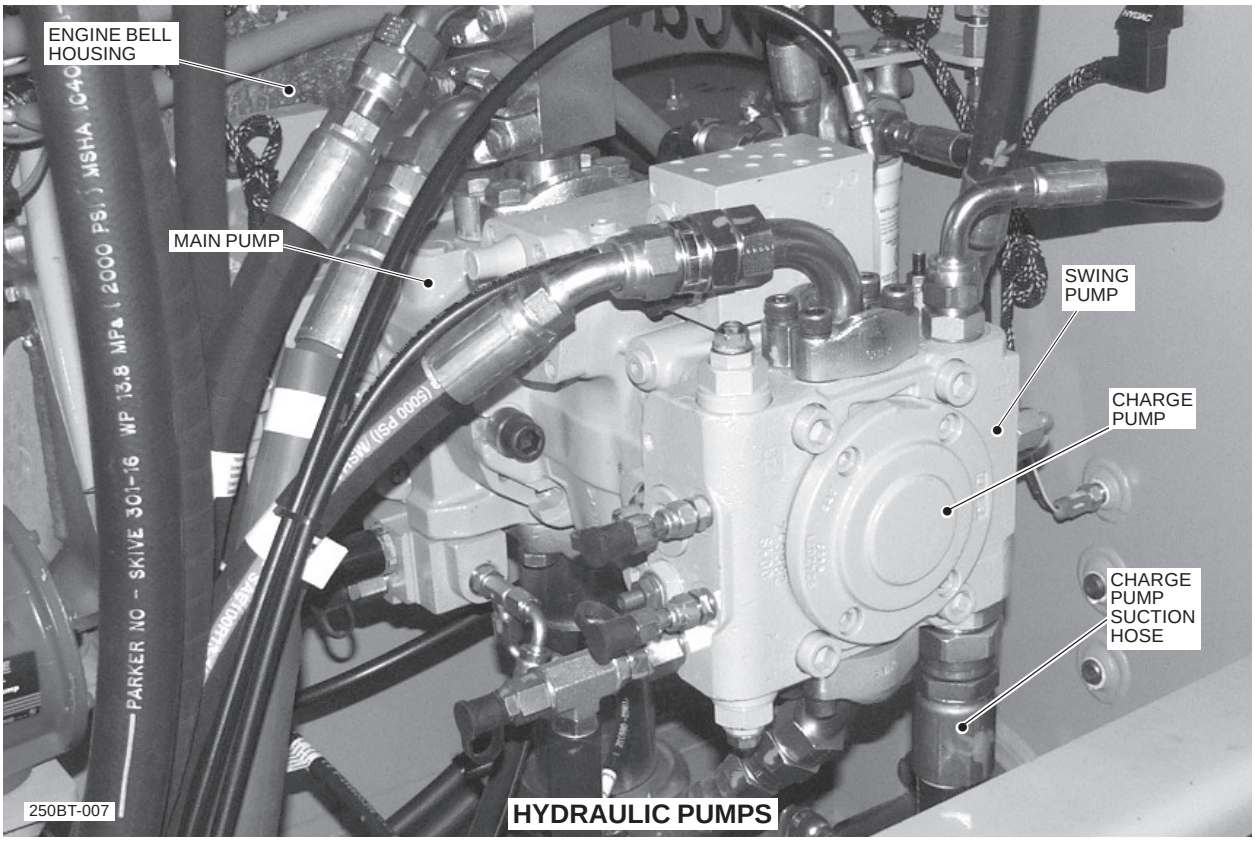
SWING DRIVE COMPONENTS



SWING PUMP

All hydraulic functions are powered by two pumps mounted one behind the other on the flywheel housing of the engine. The first pump (main pump) is a piston pump with load sensing, pressure compensating and horsepower limiting controls.

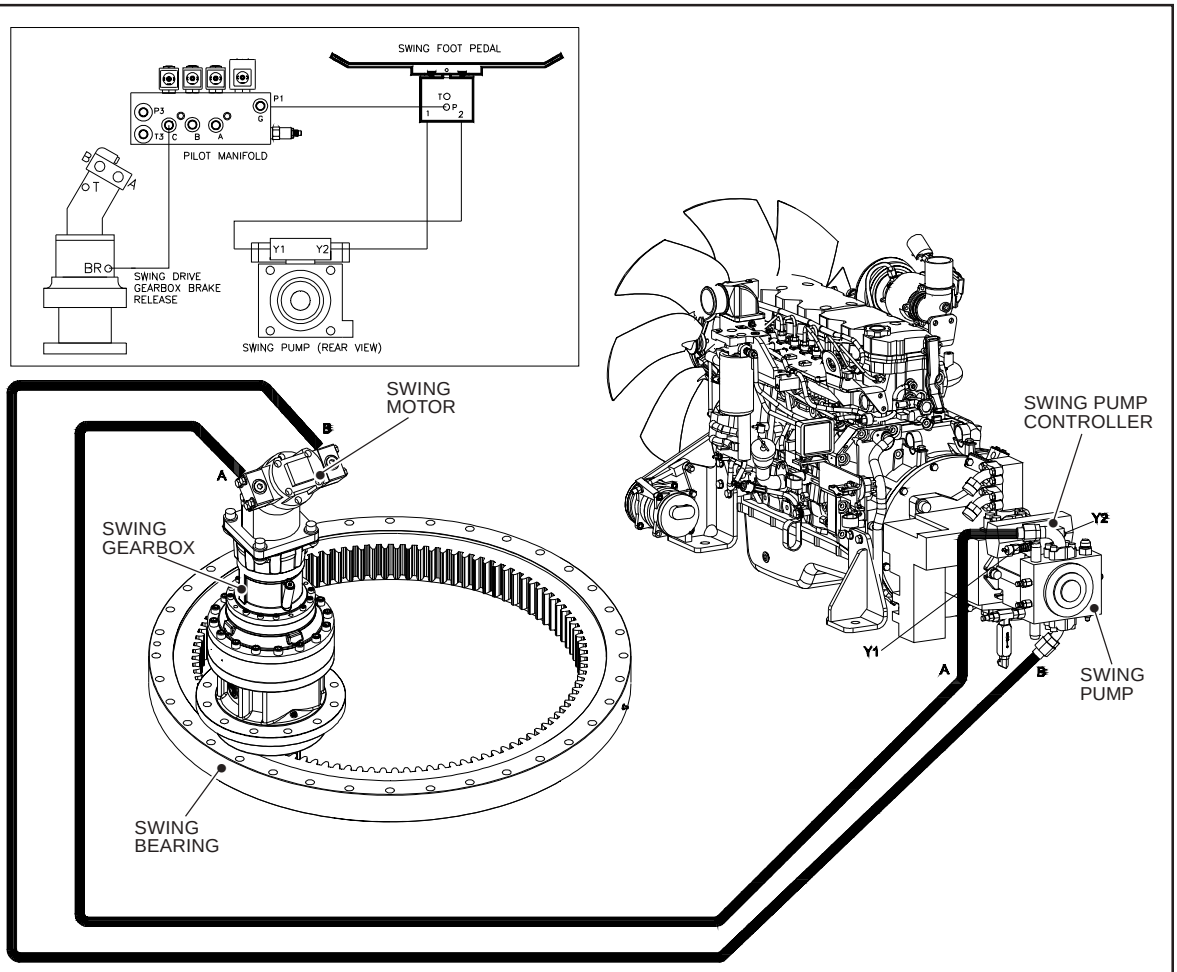
Mounted and coupled to the main pump is the swing pump. The primary components of the swing system are the hydraulic pump, hydraulic motor and swing drive gearbox. The hydraulic pump and hydraulic motor are connected together by two hydraulic hoses. The pump converts the mechanical power of the diesel engine into hydraulic power. This high pressure flow of hydraulic oil is then transmitted to the hydraulic motor through a connecting hose. The motor then reconverts the hydraulic power back into mechanical power to drive the swing gearbox used to swing the upper frame. Low pressure hydraulic oil flow then returns from the motor to the pump through the other connecting hose thereby completing a continuous closed loop hydraulic circuit.

A hydraulic system is termed closed loop when the hydraulic oil returning from the motor is fed straight back to the pump without first returning to tank. When the swing system is operating, one side of the closed loop is a high pressure supply while the other side is a low pressure return. The supply and return will alternate from side to side of the closed loop as the direction of swing rotation is changed from left to right.

The swing drive pump is actually two separate hydraulic pumps mounted in a common case and driven by the same input drive shaft.

The primary pump is a variable displacement, swashplate, in line axial piston type pump. The volume and direction of oil flow from the piston pump is determined by the angle of the tiltable swashplate. When the swashplate is stroked to a maximum displacement angle, the piston pump will produce maximum flow in one direction in the closed loop. As the swashplate is de-stroked, the flow smoothly decreases until there is no flow at an angle of zero (0°). Continuing to angle the swashplate past this neutral position steplessly reverses the direction of flow from the piston pump.

The secondary pump of the drive pump is a fixed displacement, internal gerotor type pump that provides charge oil (cooling, lubricating and make-up oil) for the hydrostatic pump and motors in the closed loop system. The charge pump also provides initial pilot oil for the pilot system.



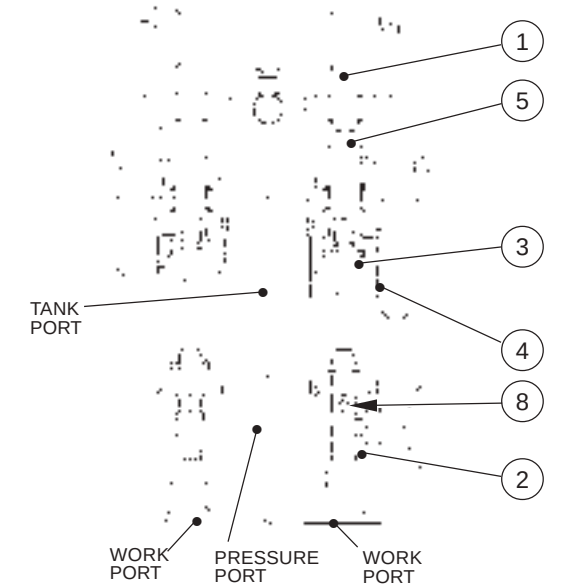
250BT-049 **SWING DRIVE CONTINUOUS CLOSED LOOP HYDRAULIC CIRCUIT**

As previously mentioned a hydraulic system is termed closed loop when the hydraulic oil returning from the motor is fed straight back to the pump without first returning to tank. When the swing system is operating, one side of the closed loop is a high pressure supply while the other side is a low pressure return.

FOOT PEDAL CONTROL VALVE

The swing function is controlled by the center foot pedal valve which sends proportional pilot signals to the swing pump controller to stroke the pump swashplate producing oil flow to the swing motor.

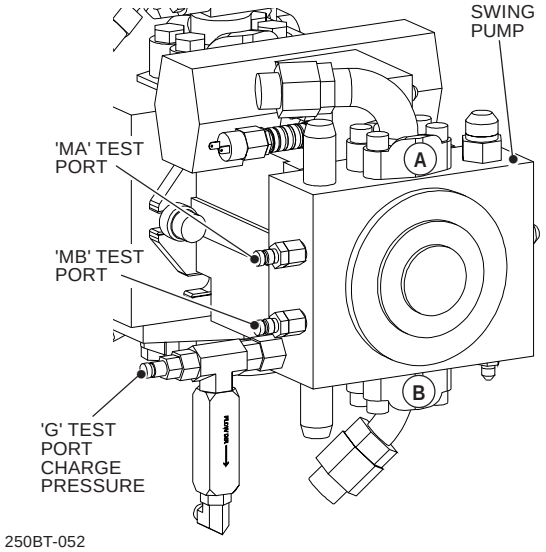
In the neutral position the foot pedal is held centered by return springs (4). When the lever (1) is operated, the plunger (5) is pushed against its return spring (4). At the same time the regulating spool (2) is moved down against the regulating spring (3). When the regulating stroke begins, there is a connection made between the *pressure port*, via holes (8) in the spool and *work ports* in the base of the valve.



FOOT PEDAL PILOT VALVE

AW017

Pilot pressure is directly proportional to the operator position of the foot pedal and the regulating spring characteristics.



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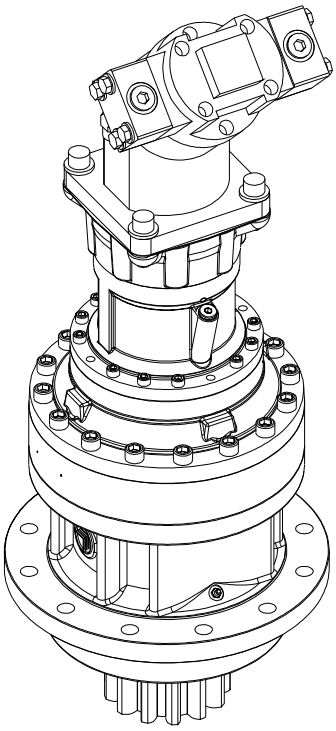
SWING PUMP TEST PORTS



250BT-053

SWING MOTOR AND GEARBOX

SWING MOTOR

The swing motor is mounted directly onto the input of the swing planetary gearbox. The motor is a fixed displacement, bent axis, axial piston type.

High pressure oil from the swing pump enters the motor via port A or port B depending on the direction of swing required. This oil is then directed to a set of pistons inside the motor rotating group cylinder housing. These pistons push against the back of the output shaft at an angle, causing the shaft to rotate.

MOTOR REMOVAL NOTE:
Before removing the drive motor, drain the oil from the reservoir bottle by disconnecting the hose at the oil fill tube. Replace the oil fill tube.

IMPORTANT: Do not allow dirt to enter the gearbox during and after the motor has been removed.

After the motor has been replaced, partly fill the reservoir with correct oil. Bleed swing gearbox by loosening air bleed plug. Add oil to reservoir until half full.

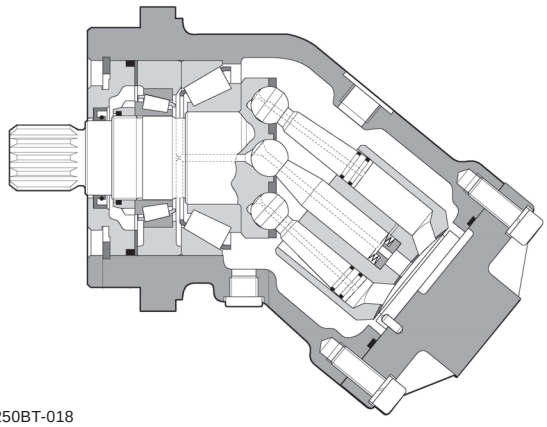
SWING DRIVE GEARBOX

Power is transmitted from the motor to a double reduction planetary gearbox. The swing gearbox upper gearing is lubricated by oil stored in a reservoir attached to the side of the gearbox cover. The reservoir must remain half full of oil* at all times. The lower bearing area is lubricated by grease where the cavity is filled with grease at assembly, a grease fitting is not provided since additional greasing is not necessary.

To fill the gearbox with oil, unscrew the air bleed plug located on the motor flange, remove the cap on the reservoir and add oil to the reservoir. When oil begins to come out of the air bleed hole replace the plug and continue to add oil until the reservoir is half full. Replace the cap on the reservoir.

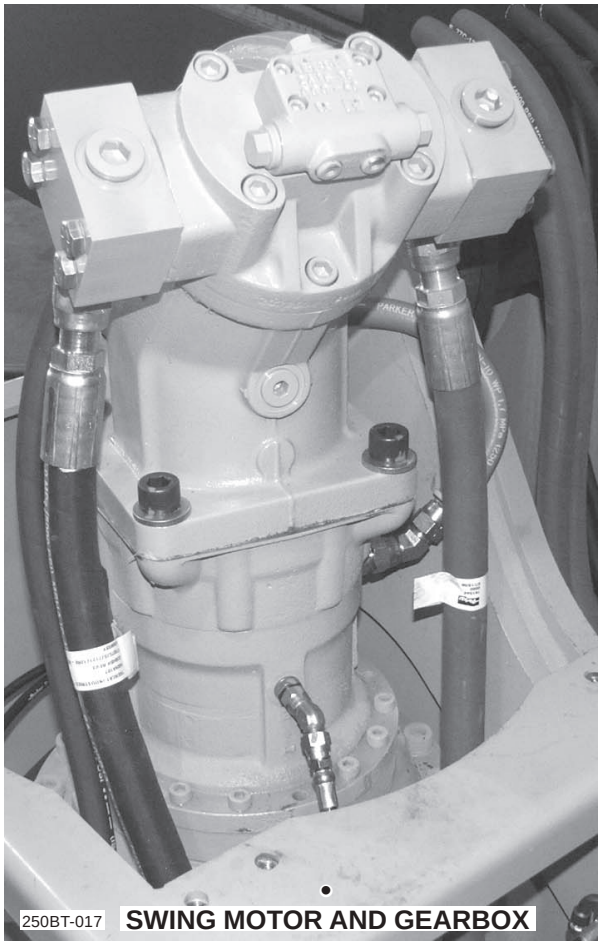
To drain the gearbox unscrew the drain plug and allow oil to drain into a suitable container. To facilitate draining, the oil should be warm.

*For correct oil specification and maintenance schedule, refer to SECTION 3 in THIS MANUAL.

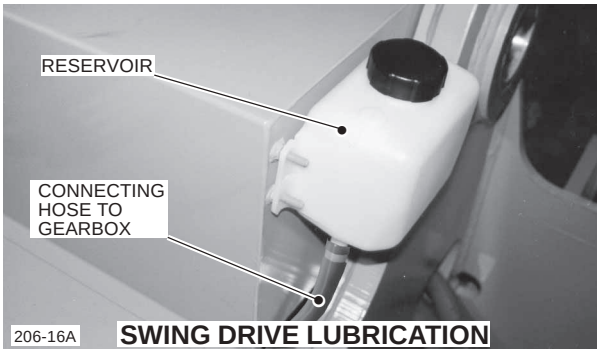


250BT-018

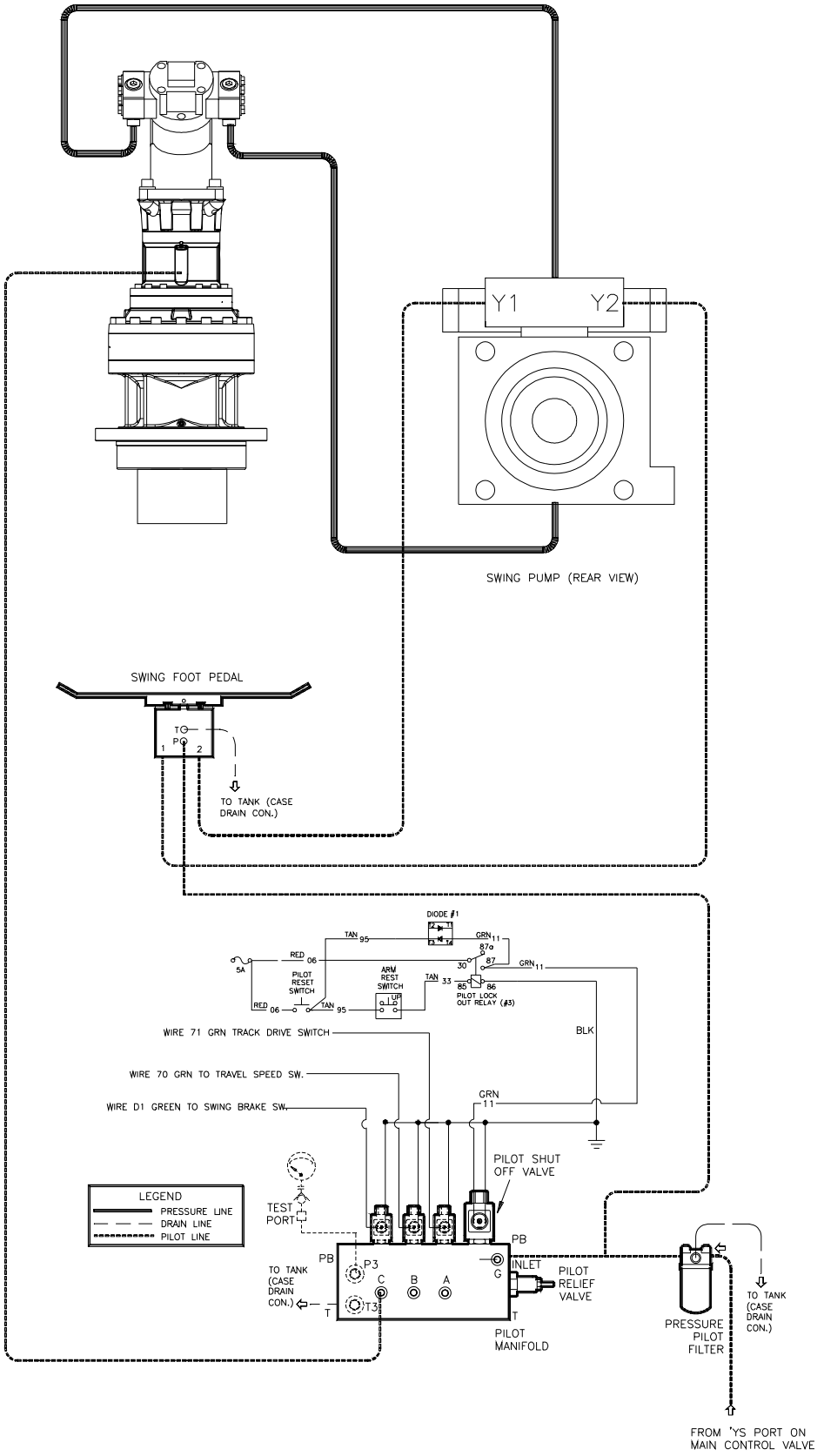
SWING MOTOR CROSS SECTION



250BT-017 **SWING MOTOR AND GEARBOX**



206-16A **SWING DRIVE LUBRICATION**



SWING DRIVE CIRCUIT

250BT-015

PRESSURE SETTINGS

CAUTION

Use caution when in the cab as a slight touch of the controls can cause sudden rotation of the upper frame and booms or movement of the tracks.

CAUTION

Be aware of other personnel in the area. Operator is responsible for the safe operation of the machine.

WARNING

Ensure that no one is standing near the grapple during this procedure.

IMPORTANT

Avoid blowing oil over relief for longer than five seconds, as this will cause excessive heating of the hydraulic fluid.

SET SWING RELIEF VALVES

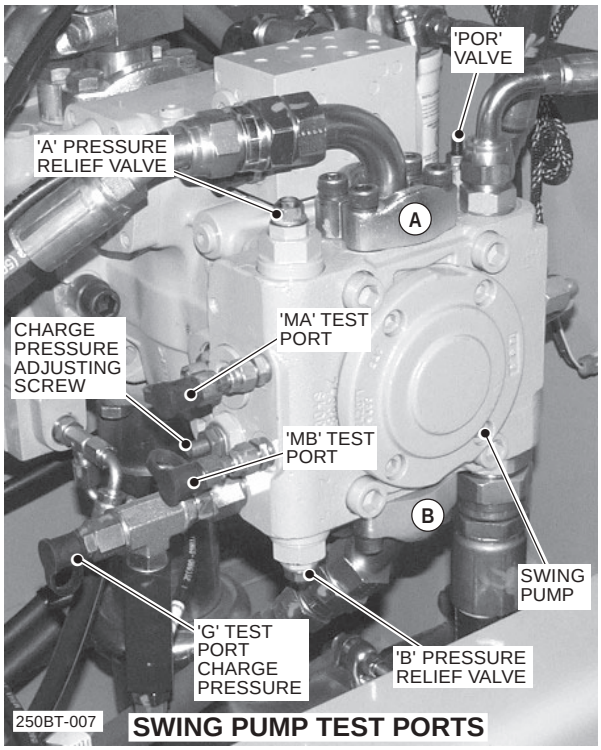
Swing pump POR setting .... 4500 psi + 1/2 turn

Swing ccw high pressure relief ..... 5100 psi

Swing cw high pressure relief ..... 5100 psi

Swing charge pressure relief ..... 350 psi

1. Position machine on flat level ground.
2. Ensure that the hydraulic oil is at **operating temperature.**
3. Install a 0-5000 psi pressure gauge on the 'MA' and 'MB' test ports on the swing pump.
4. Install a 0-1000 psi pressure gauge on the 'G' test port on the swing pump.
5. Start engine and place throttle control in **IDLE**.
6. Lower left arm rest and depress the pilot reset switch to activate the *pilot system*.
7. Place the swing brake switch in the **ON** position.
8. Observe the gauge on the 'G' test port, charge pressure should be 350 psi. If reguired loosen locknut and turn adjusting screw in to increase pressure or out to decrease pressure.



SWING PUMP TEST PORTS

9. Press and hold the swing foot pedal in the SWING LEFT position, check gauge pressure reading. If less than set value, turn *swing left relief valve* adjusting screw **in** until set value is obtained on gauge.
10. Tighten locknut on adjusting screw taking care not to turn the adjusting screw.
11. Press and hold the swing foot pedal in the SWING RIGHT position, check gauge pressure reading. If less than set value, turn *swing right relief valve* adjusting screw **in** until set value is obtained on gauge.
12. Tighten locknut on adjusting screw taking care not to turn the adjusting screw.
13. Repeat steps 9 and 11 to verify settings.

set POR relief valve:

14. Increase engine speed to **FULL** throttle.
15. Loosen locknut on *swing POR relief* and unscrew adjusting screw until gauge reads **4500 psi** and then turn screw **in 1/2 turn**.
16. While holding the foot pedal in the SWING LEFT position, check gauge pressure reading, should be 5100 psi +/- 20 psi.
17. Tighten locknut on adjusting screw taking care not to turn the adjusting screw.
18. Shut engine off, remove gauges and wipe up any spilled oil.

SWING BEARING WEAR LIMITS

It is important that the swing bearing be periodically inspected for wear. Any significant wear will be noticeable by observing too much "tilting" of the upper frame relative to the lower frame. A small amount of designed-in clearance in the bearing is normal and is present in a new machine.

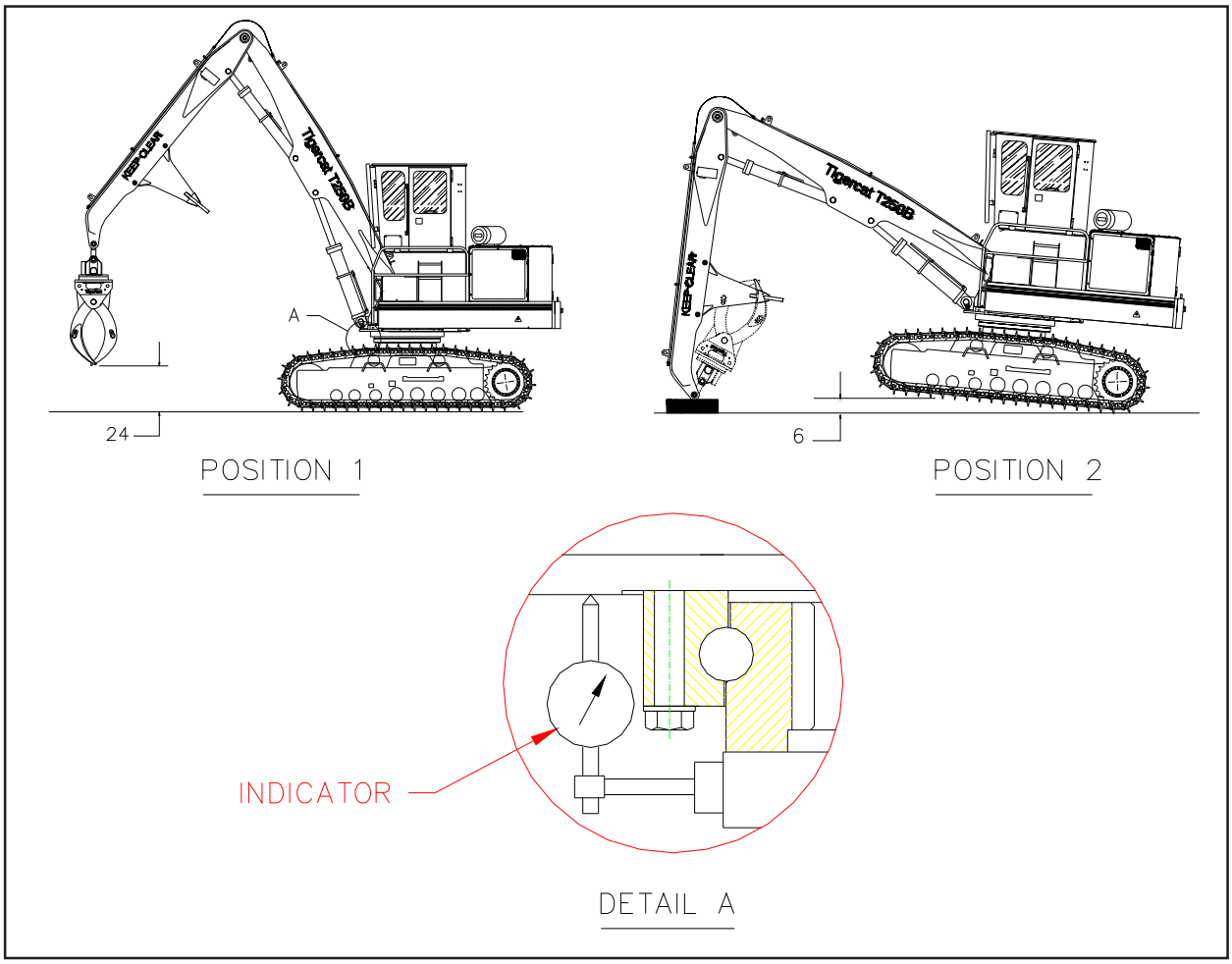
Too much clearance will affect the backlash between the ring gear and the drive pinion and if left unchecked will cause damage to the gear teeth and ultimately the swing drive gearbox.

The main cause of wear in the ball race can be due to a lack of lubricant or not following the proper lubricating procedure. A damaged or missing peripheral seal will also contribute to early wear by allowing dirt particles to enter the ball race.

Regular inspection of the seal should be carried out and the proper lubricating procedure should be followed. Refer to FILTER AND LUBRICATION SCHEDULE in SECTION 3 of THIS MANUAL.

The following procedure will verify the amount of wear in the ball race:

1. Position machine with boom fully extended as in **position 1**.
2. Set dial indicator (A) to zero.
3. Lower boom as in **position 2**.
4. Note tilt reading on dial indicator.
5. Return machine to **position 1**.
6. Check to see if reading on dial indicator has returned to zero, if not **repeat steps 1 thru 4**.
7. Rotate upper frame **90 deg.** and repeat steps 1 thru 6.
8. The bearing is considered to be worn when the **total play is 0.105"** or greater.



SWING BEARING SEAL KIT

INSTALLATION INSTRUCTIONS

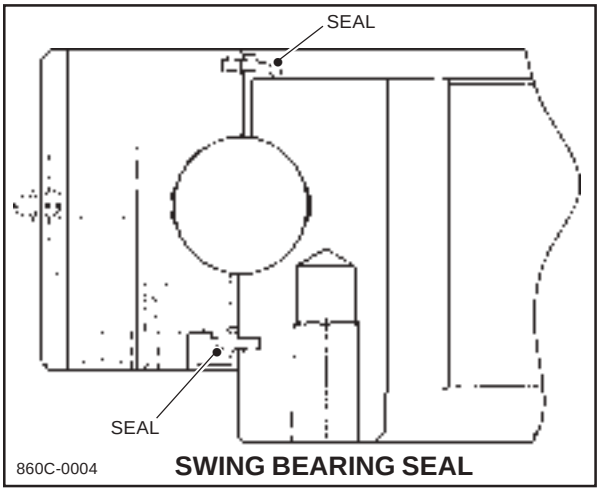
1. Remove all traces of former seal and glue from the seal groove.

   Groove should then be cleaned with a non-residue commercial solvent.

2. Wipe the seal with the same solvent.
3. Apply a bead of adhesive (BN157) to the seal groove (avoid the adhesive from being extruded into the bearing cavity as the seal is installed.)
4. Insert the seal into the groove (the length of seal provided is longer than required), trim the excess with a sharp knife or pruning shears in such a manner to smoothly meet the adjoining end. Place a drop of crazy glue (BN158) on the end so that the two ends will be joined.
5. Immediately butt the two ends together, aligning them as quickly as possible. Hold together without movement (motion weakens and may destroy the bond). After 2 minutes the joint will be strong enough.

   NOTE: Read the precautions on adhesive container. Avoid getting adhesive on your fingers. It will bond them together.

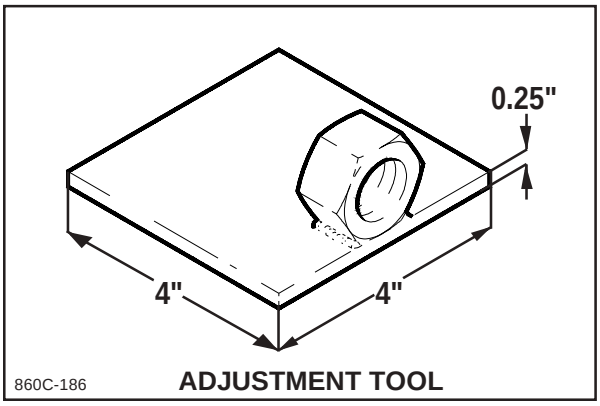
6. Coat joint with grease from bearing. Moisture or high humidity may weaken bond unless protected with grease.
7. Examine seal for contact withseal surface on race ring.
8. Re-grease the bearing until grease extrudes from under the seal to remove any foreign matter.



SWING BEARING SEAL

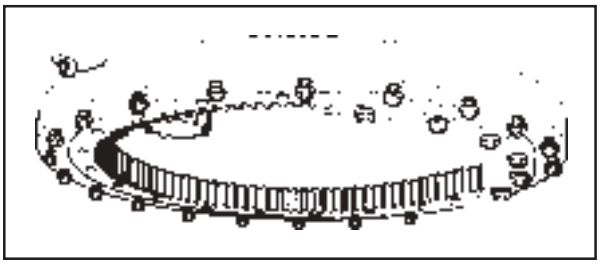
ADJUST SWING BEARING BACKLASH

Make up adjustment tool from a 4" x4" piece of 0.25" thick steel plate.

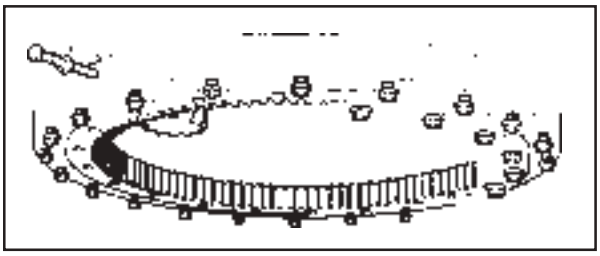


ADJUSTMENT TOOL

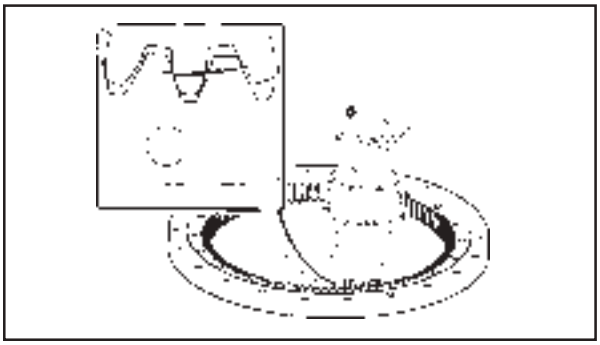
Weld a 1" nut on the plate as shown.



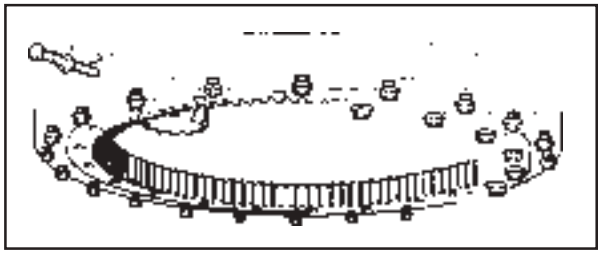
Position the adjustment tool up against the underside of the turntable 1/2" away from the bearing. Weld the tool to the turntable as shown using 1/4" fillet weld.



Install a 1" x 6" hex head bolt in the nut.

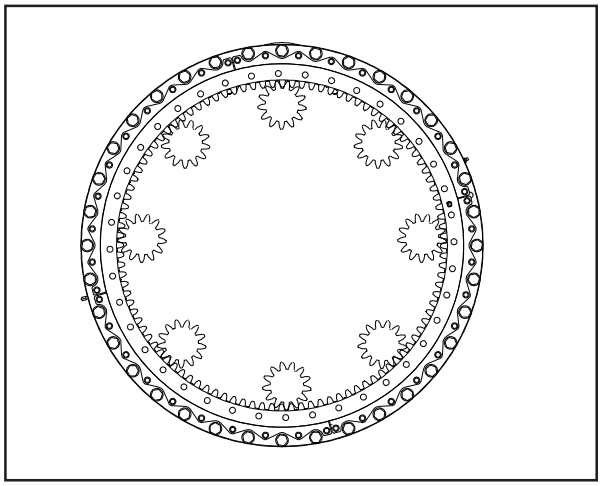


Check the backlash between the pinion gear and swing bearing gear teeth. Should be 0.017" to 0.026".

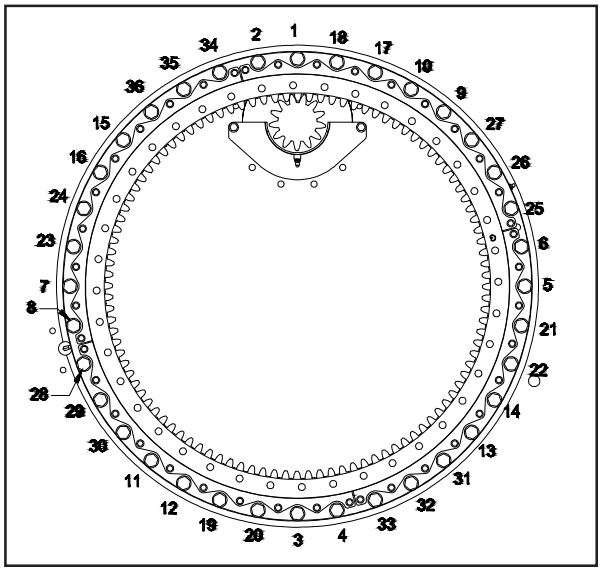


Adjust the hex head bolt to decrease the backlash or swing the upper 180° and adjust the hex head bolt to reposition swing bearing to obtain acceptable backlash of 0.017" to 0.026".

Torque four pairs of swing bearing outer race bolts located at 90° to each other to 450 lbs. ft.

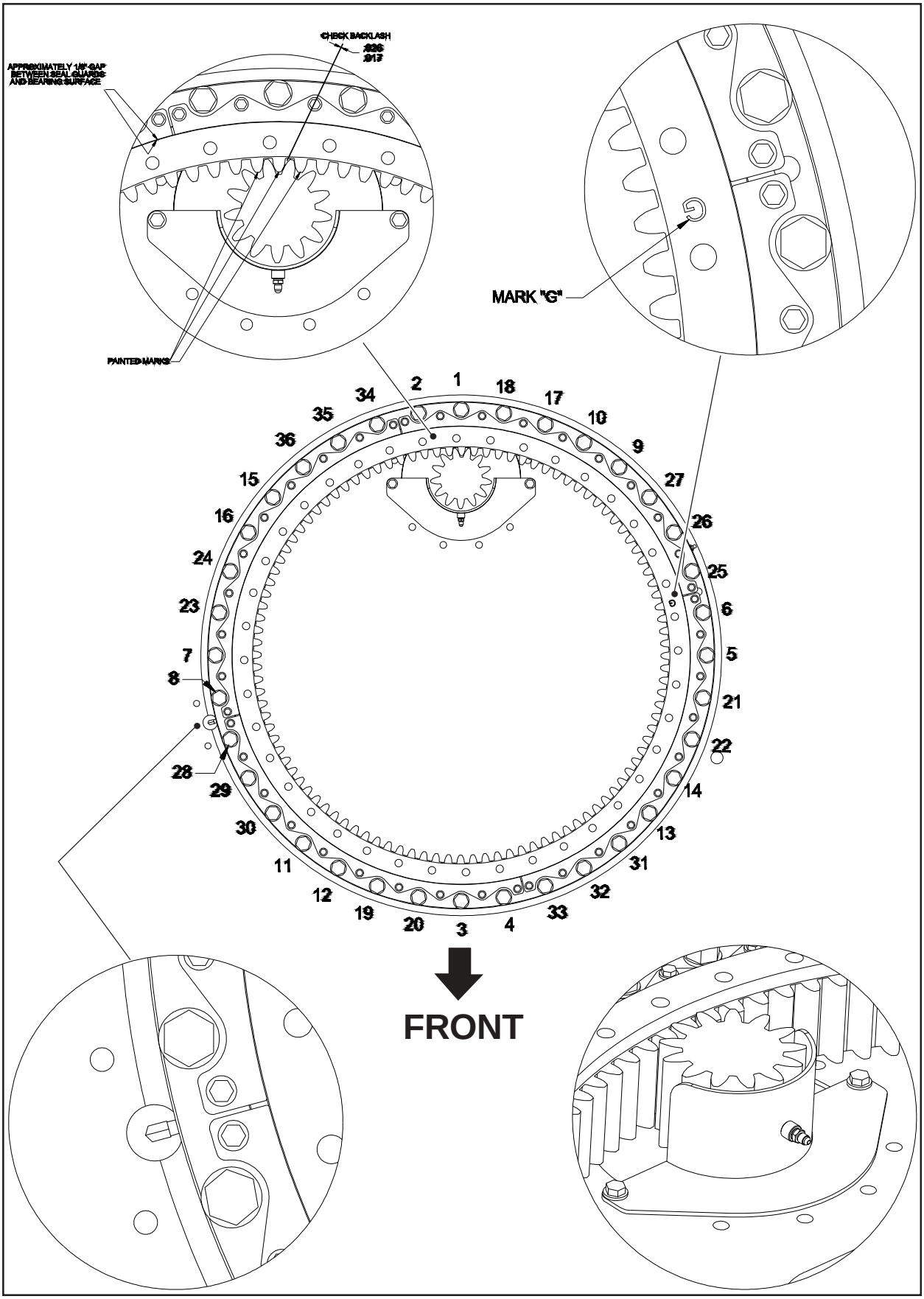


Recheck and adjust backlash every 45° of gear rotation to obtain acceptable backlash of 0.017" to 0.026".



Apply Loctite 242 to all bolts and torque swing bearing mounting bolts to 400-450 lbs.ft. with sequence shown above.

SWING BEARING TORQUE SEQUENCE



SECTION 17 - GRAPPLE

AUGUST, 2006

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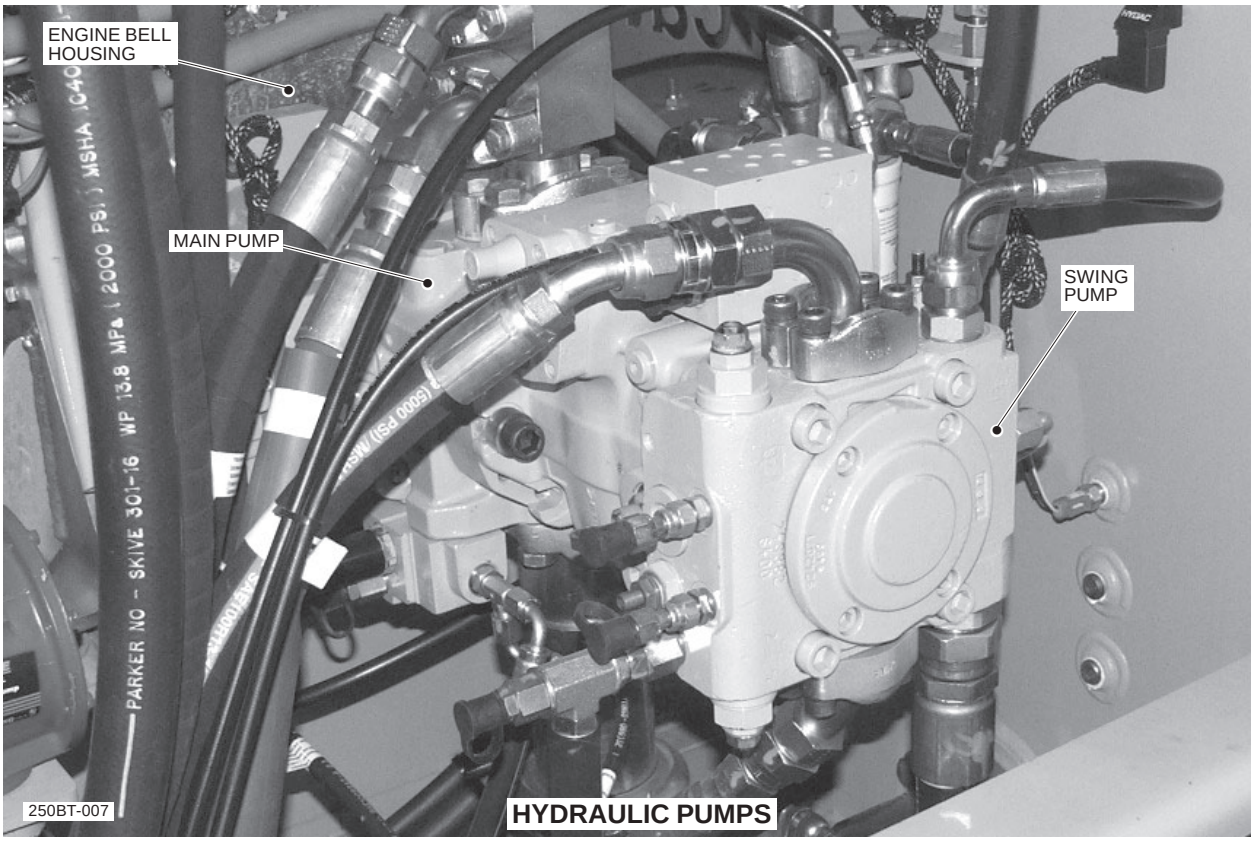
GRAPPLE SYSTEM COMPONENTS



PUMP

The main pump is an axial-piston, variable-displacement pump with load sensing, pressure compensating, and horsepower limiting controls.

The grapple circuit utilizes the main pump to supply hydraulic oil to the grapple open/close control valve spool section and the grapple rotate control valve spool section in the "main" control valve.

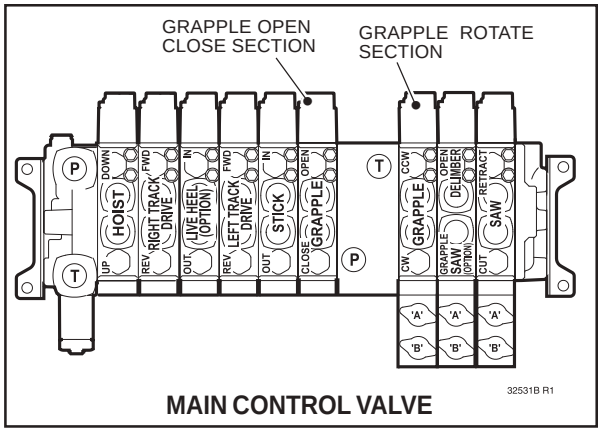
For a more detailed description of the main pump, refer to SECTION 4 in THIS SERVICE MANUAL.

JOYSTICK CONTROL VALVE AND SWITCHES

The grapple open/close functions are controlled by the left joystick. Tilt the left joystick to the left to open the grapple and tilt the joystick to the right closes the grapple.

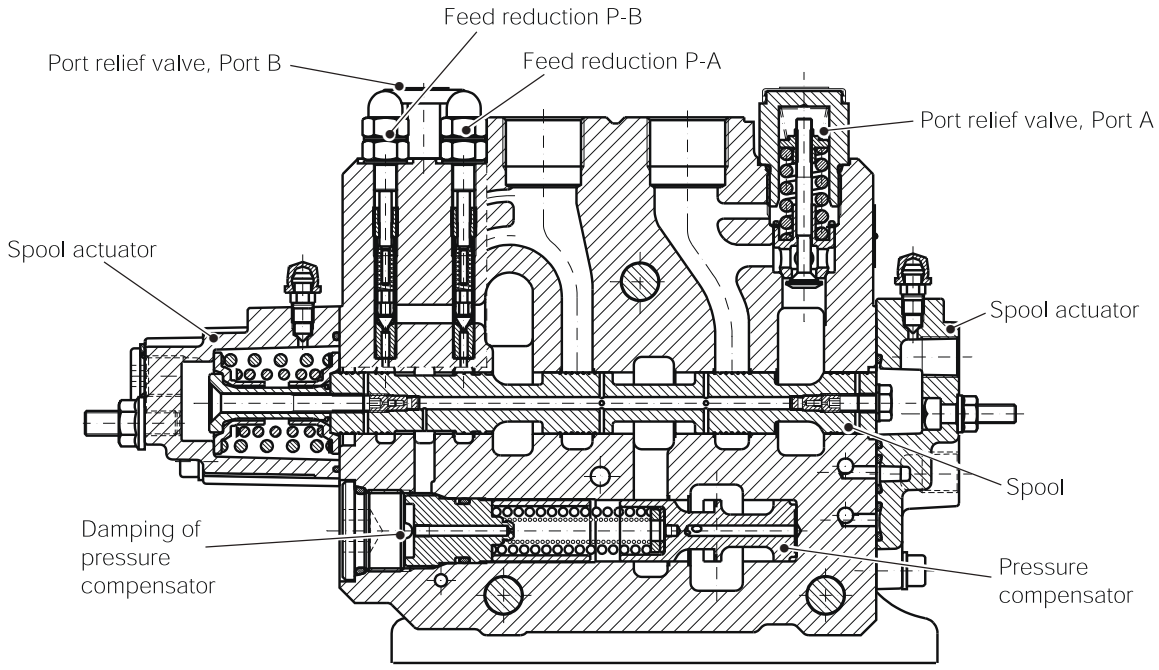
When operating the grapple open/close functions the left joystick sends proportional pilot signals to the grapple open/close function control valve to shift a spool and supply system oil to the grapple open/close cylinders.

For a detailed description of the joystick control valve refer to SECTION 5 in THIS MANUAL.

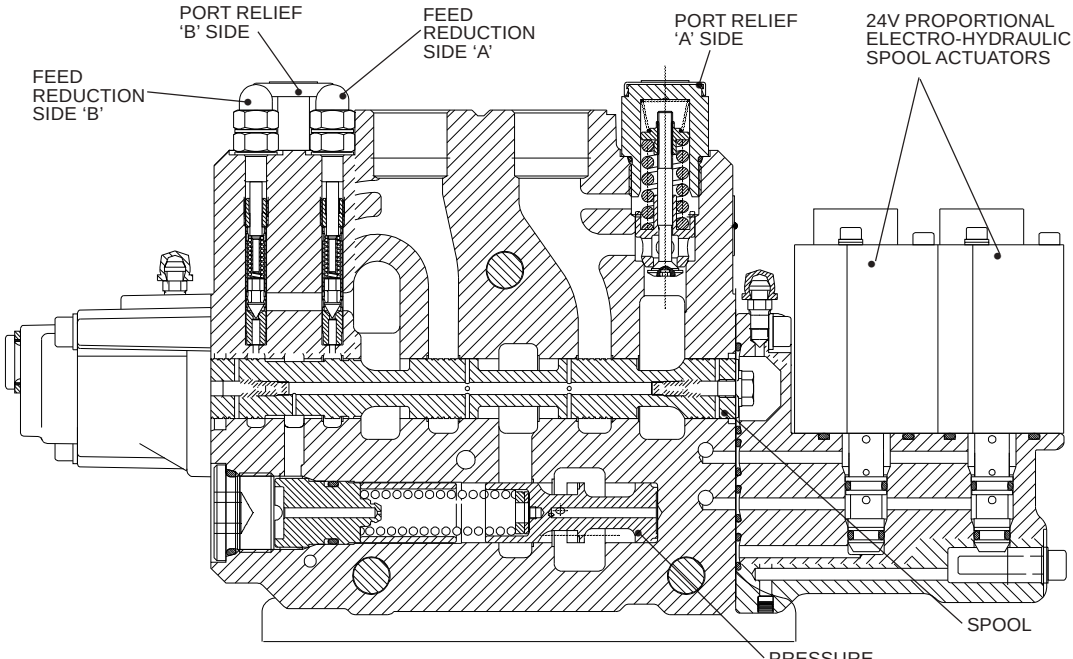


MAIN CONTROL VALVE

The grapple rotate functions are controlled by the left and right joystick top front finger switches. When operating the grapple rotate functions the switches send electrical signals to the electro-hydraulic control valve solenoids. When the solenoids are activated the solenoid plunger shifts and provides a pilot signal to the grapple rotate function control valve to shift a spool and supply system oil to the grapple rotate motor.



GRAPPLE OPEN/CLOSE SPOOL SECTION



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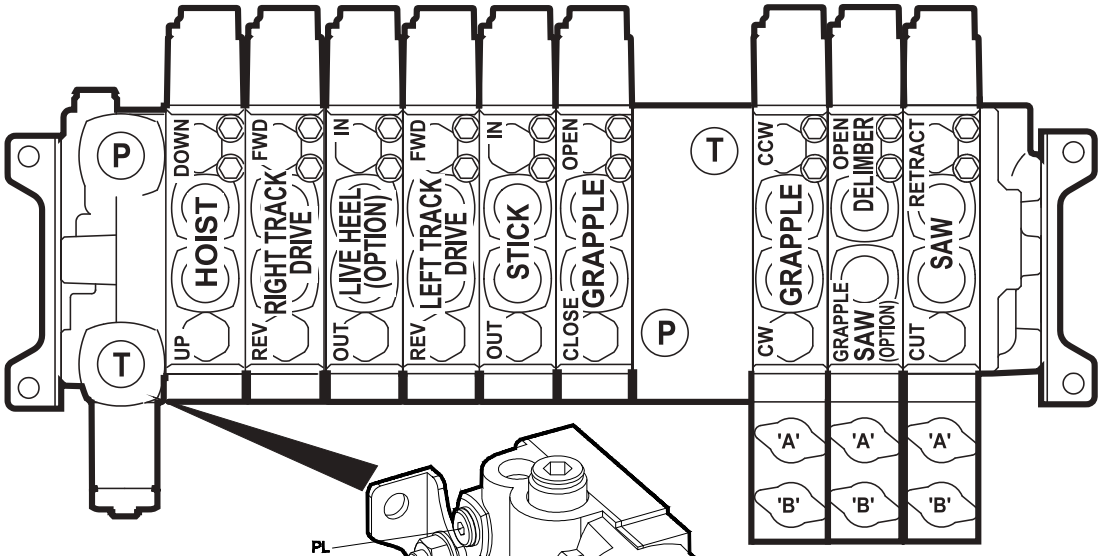
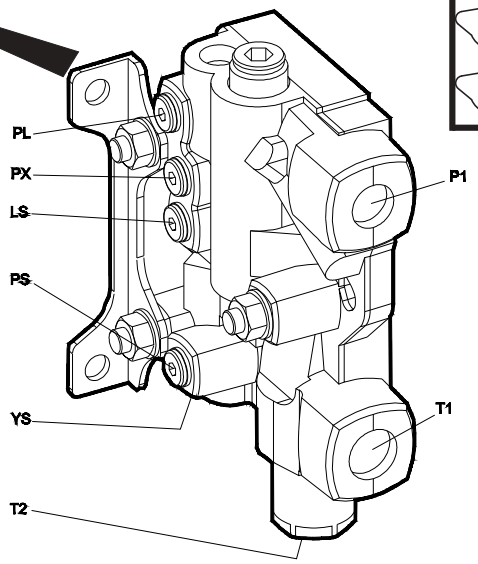
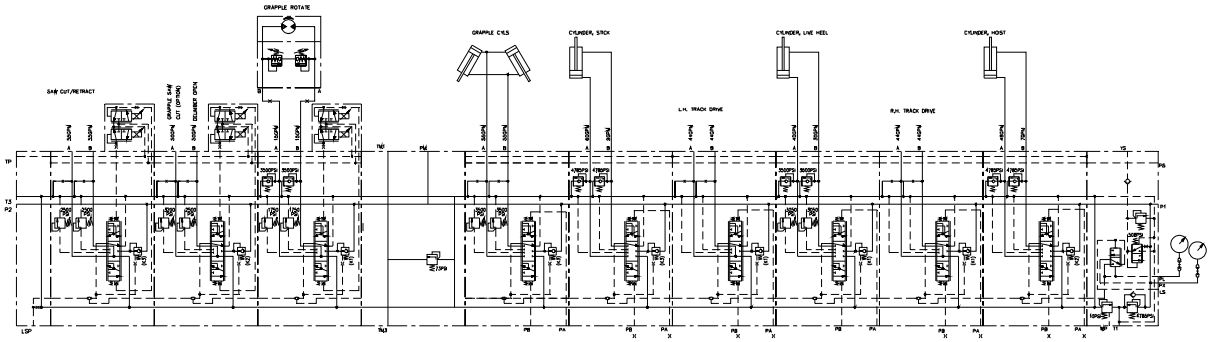
GRAPPLE ROTATE SPOOL SECTION





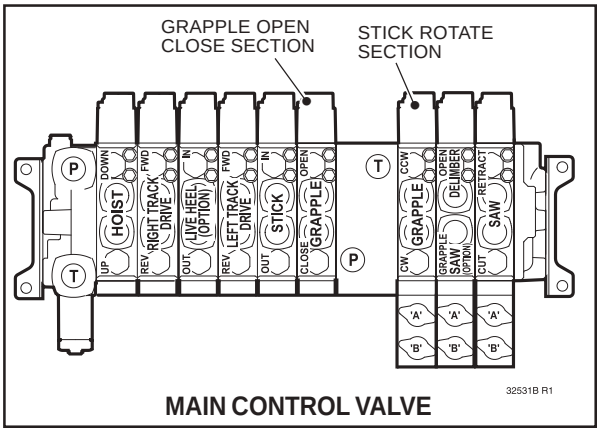


MAIN CONTROL VALVE

GRAPPLE CONTROL VALVES

The grapple open/close function is controlled by one of nine spool sections in the main control valve and the grapple rotate motor is controlled by one of nine spool section in the main control valve. The main control valve is located in the upper frame below the floor plates inside the valve compartment.

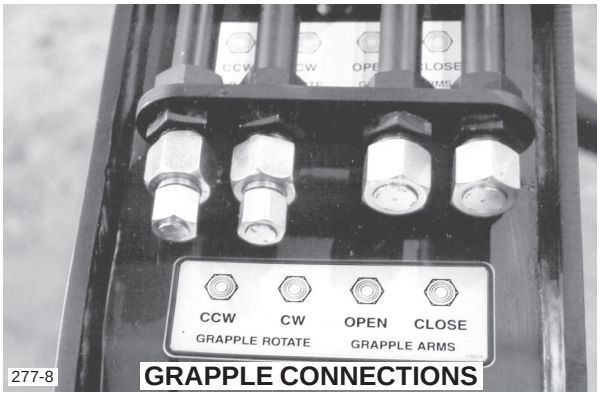
For a detailed description of the main control valve, refer to SECTION 4 in THIS MANUAL.



MAIN CONTROL VALVE

GRAPPLE CONNECTIONS TO BOOM

When a factory installed grapple is not specified, hydraulic lines are provided up to the end of the boom and sealed off with steel plugs.



277-8 **GRAPPLE CONNECTIONS**

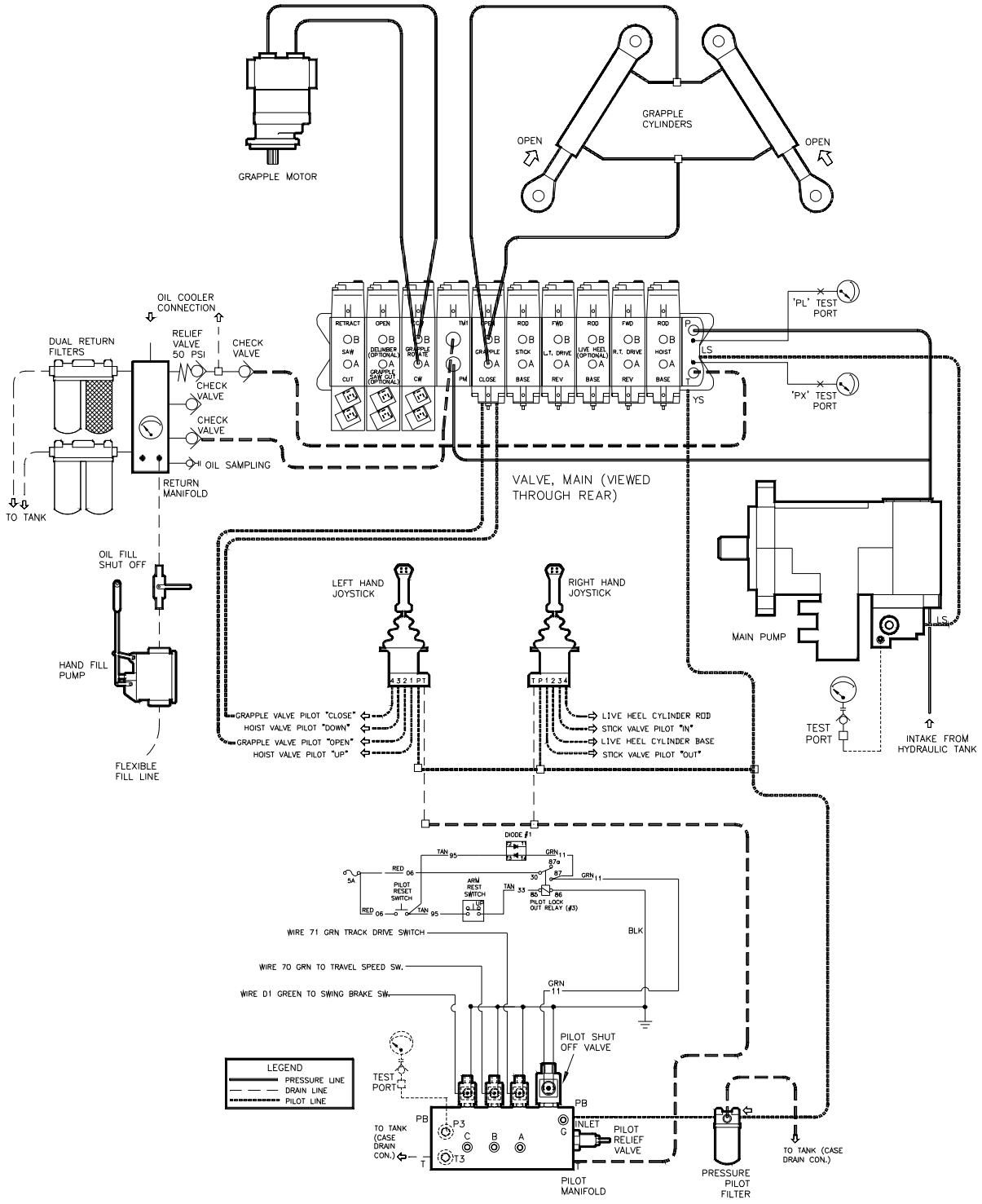
GRAPPLE CIRCUIT DESCRIPTION

The grapple circuit is supplied with oil from the main pump. The grapple valves receive oil at the inlet section of the main control valve and direct the oil through the spool sections when either of the grapple functions are actiavted.

Moving L.H. joystick in the cab will direct pilot oil to the end of the grapple open/close spool section in the main control valve to shift the spool and direct hydraulic oil from the pump to the grapple open/close hydraulic cylinders to OPEN or CLOSE the grapple arms.

Return oil from the cylinders is directed back through the spool sections, to the outlet section, through the dual head return oil filter and back to tank.

Pressing the R.H. or L.H. joystick finger switches will activate the solenoid controls on the graplle rotate control valve. This will direct pilot oil to the ends of the grapple rotate spool section in the main control valve to shift the spool and direct hydraulic oil from the pump to the rotate motor to rotate the grapple in either a CLOCKWISE or COUNTERCLOCKWISE direction.



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GRAPPLE CIRCUIT

CAUTION

Use caution when in the cab as a slight touch of the controls can cause sudden rotation of the upper frame and booms or movement of the tracks

CAUTION

Be aware of other personnel in the area. Operator is responsible for the safe operation of the machine.

WARNING

Ensure that no one is standing near the grapple during this procedure.

IMPORTANT

Avoid blowing oil over relief for longer than five seconds, as this will cause excessive heating of the hydraulic fluid.

PRESSURE SETTINGS

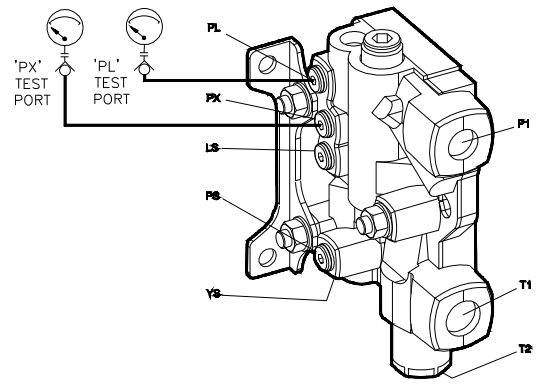
GRAPPLE OPEN/CLOSE RELIEF VALVE SETTINGS

Main pump POR setting ..... 4500 psi

Grapple open feed reducer setting ..... 2500 psi

Grapple close feed reducer setting .... 3500 psi

1. Position machine on flat level ground .
2. Ensure that the hydraulic oil is at **operating temperature.**



250BT-031

GAUGE INSTALLATION

3. Connect a 0 - 5000 p.s.i. pressure gauge to the main control valve 'PL' test port on the inlet section of the main control valve.
4. Start the engine, and set the throttle control to the **IDLE** position. Lower left arm rest and depress the pilot reset switch to activate the pilot system.
5. While holding the L.H. joystick in the GRAPPLE OPEN position (cylinders fully retracted), check gauge pressure reading.
6. If Less than set value adjust feed reducer. Turn adjusting screw in to increase pressure or turn screw out to decrease pressure.
7. While holding the L.H. joystick in the GRAPPLE CLOSE position (cylinders fully extended), check gauge pressure reading.
8. If Less than set value adjust feed reducer. Turn adjusting screw in to increase pressure or turn screw out to decrease pressure.

   NOTE: Relief valves are not adjustable. If less than set value in one direction but OK in the other direction the relief valve for the low pressure circuit must be replaced.
9. Stop engine. Remove pressure gauge and wipe up any excess oil from test port area.

CAUTION

Use caution when in the cab as a slight touch of the controls can cause sudden rotation of the upper frame and booms or movement of the tracks

CAUTION

Be aware of other personnel in the area. Operator is responsible for the safe operation of the machine.

IMPORTANT

Avoid blowing oil over relief for longer than five seconds, as this will cause excessive heating of the hydraulic fluid.

WARNING

Ensure that no one is standing near the grapple during this procedure.

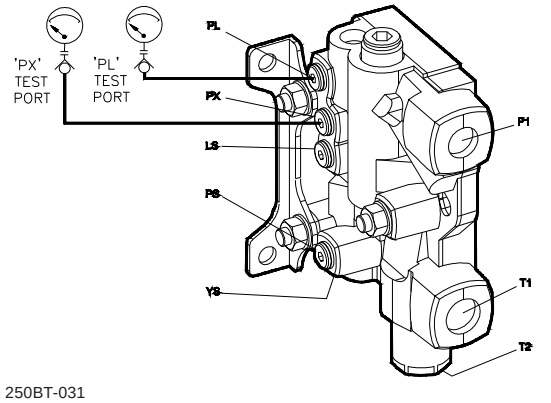
GRAPPLE ROTATE RELIEF VALVE SETTINGS

Main pump POR setting ..... 4500 psi

Rotate clockwise feed reducer setting 1750 psi

Rotate counterclockwise feed reducer setting ..... 1750 psi

1. Position machine on flat level ground.
2. Ensure that the hydraulic oil is at **operating temperature.**
3. Position and secure grapple to prevent from rotating in either direction.



250BT-031

GAUGE INSTALLATION

4. Connect a 0 - 5000 p.s.i. pressure gauge to the main control valve 'PL' test port on the inlet section of the main control valve.
6. Start the engine, and set the throttle control to the **IDLE** position. Lower left arm rest and depress the pilot reset switch to activate the pilot system.
7. While pressing the R.H. joystick front finger switch in the ROTATE CLOCKWISE position, check gauge pressure reading.
8. If Less than set value adjust feed reducer. Turn adjusting screw in to increase pressure or turn screw out to decrease pressure.
9. While pressing the L.H. front finger switch joystick in the ROTATE COUNTERCLOCKWISE position, check gauge pressure reading.
10. If Less than set value adjust feed reducer. Turn adjusting screw in to increase pressure or turn screw out to decrease pressure.

    NOTE: Relief valves are not adjustable. If less than set value in one direction but OK in the other direction the relief valve for the low pressure circuit must be replaced.
11. Release grapple from it's secured position.
12. Stop engine. Remove pressure gauge and wipe up any excess oil from test port area.

Tigercat T250B Track Loader

SECTION 18 - DELIMBER/SLASHER

AUGUST, 2006

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CIRCUIT DIAGRAM 18.7, 18.8, 18.9
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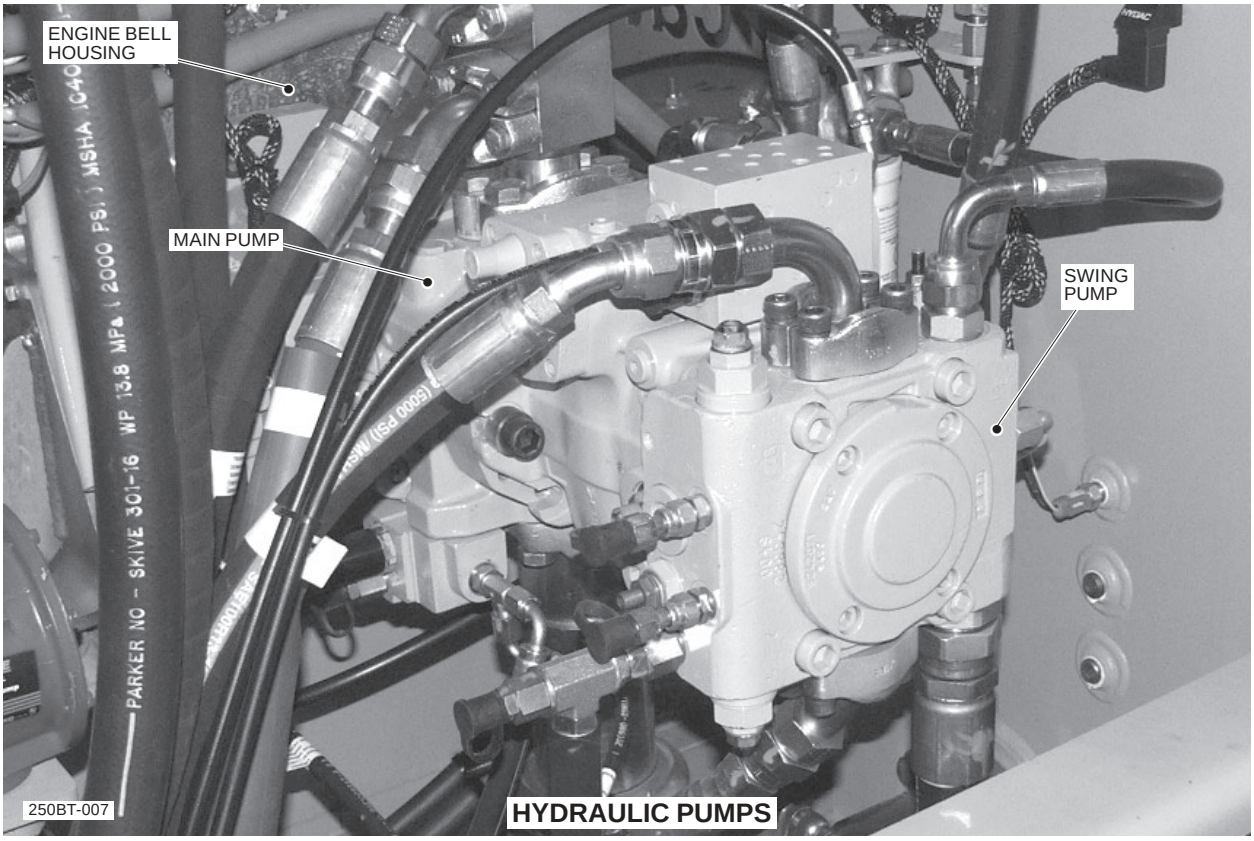
DELIMBER/SLASHER CIRCUIT COMPONENTS



PUMP

The main pump is an axial-piston, variable-displacement pump with load sensing, pressure compensating, and horsepower limiting controls.

The delimber and slasher circuits utilize the main pump to supply hydraulic oil to the delimber and slasher control valve spool sections in the "main" control valve.

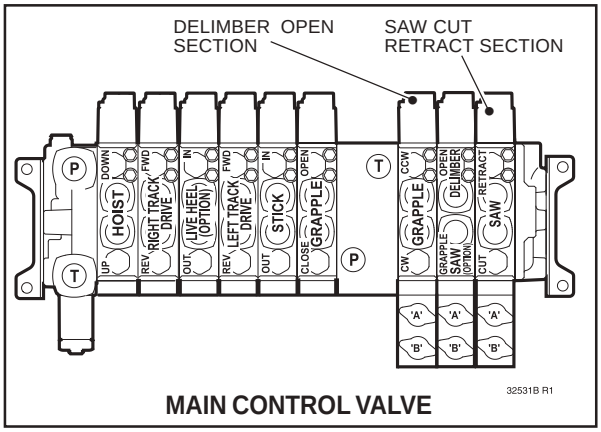
For a more detailed description of the main pump, refer to SECTION 4 in THIS SERVICE MANUAL.

DELIMBER CONTROL VALVE

The delimber arms OPEN/CLOSE functions are controlled by one of nine spool sections in the main control valve.

SAW CUT CONTROL VALVE

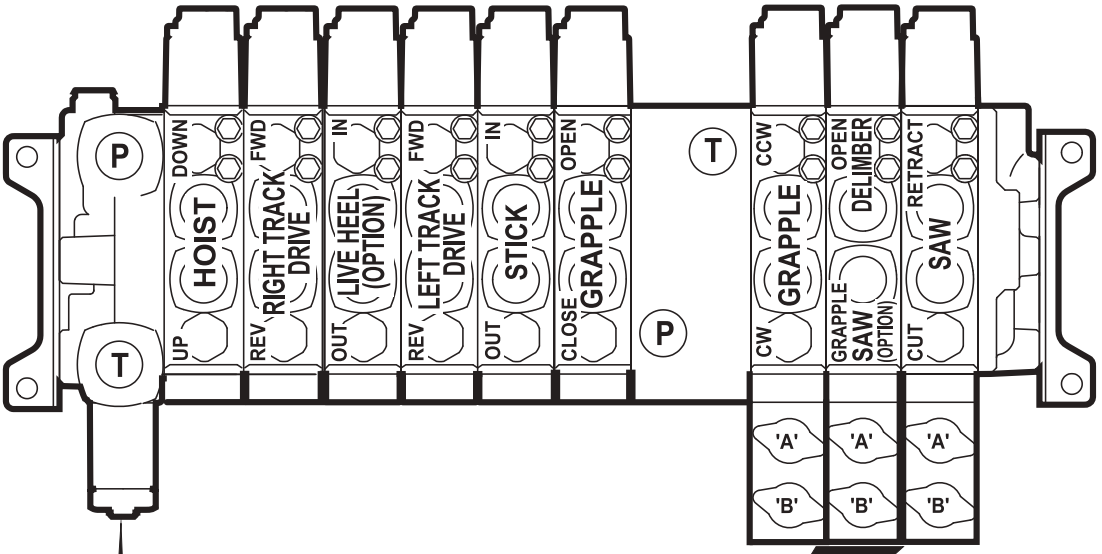
The saw cutting function is controlled by one of nine spool sections in the main control valve.



SAWS RETRACT CONTROL VALVE

The slasher saw cutting function and the retraction of both the slasher saw and the top saw are controlled by one of nine spool sections in the main control valve.

For a detailed description of the main control valve, refer to SECTION 4 in THIS MANUAL.



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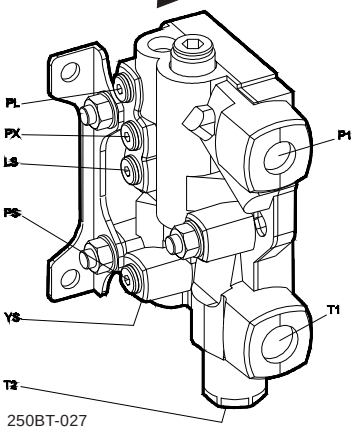

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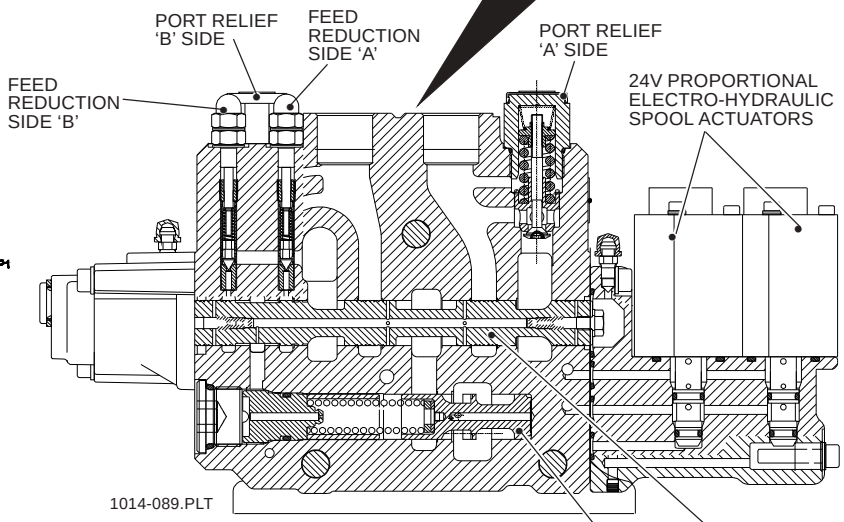
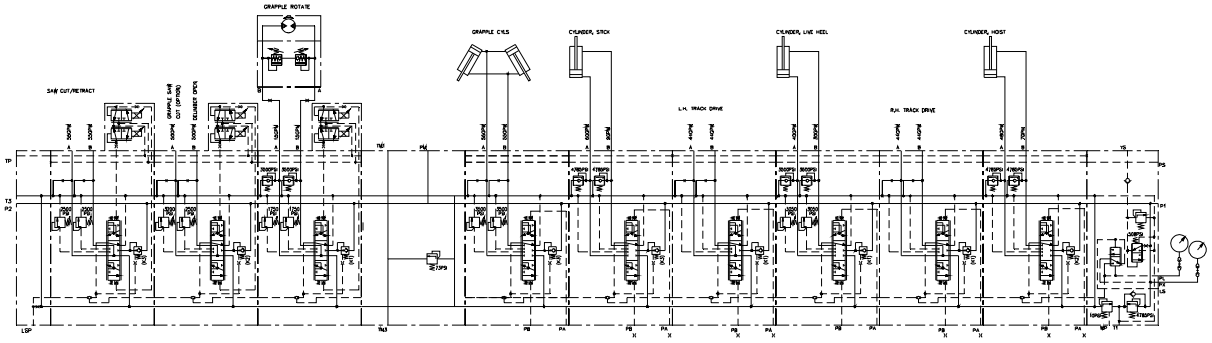


SPOOL SECTION



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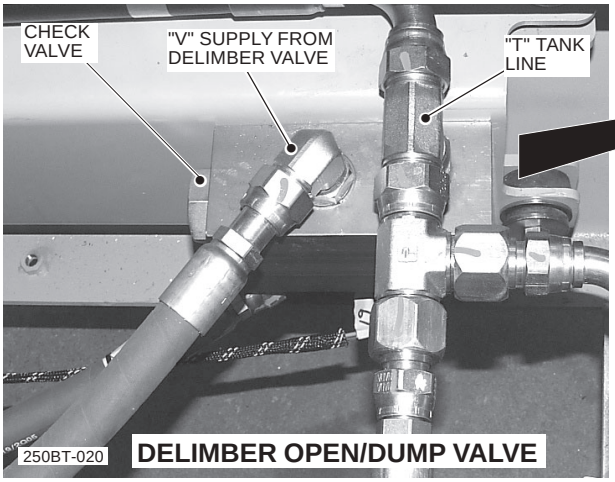
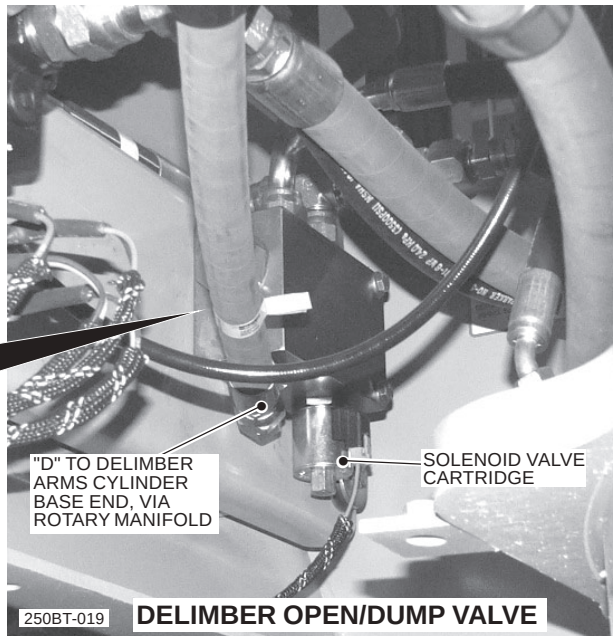
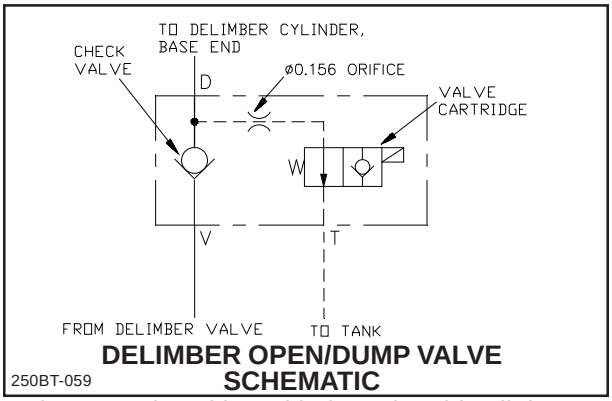
MAIN CONTROL VALVE

DELIMBER OPEN/DUMP VALVE

The delimber open/dump valve is a solenoid operated three way directional valve consisting of an aluminium valve body, a screw-in, solenoid operated valve cartridge and a screw-in check valve cartridge. The valve is located in the upper frame.

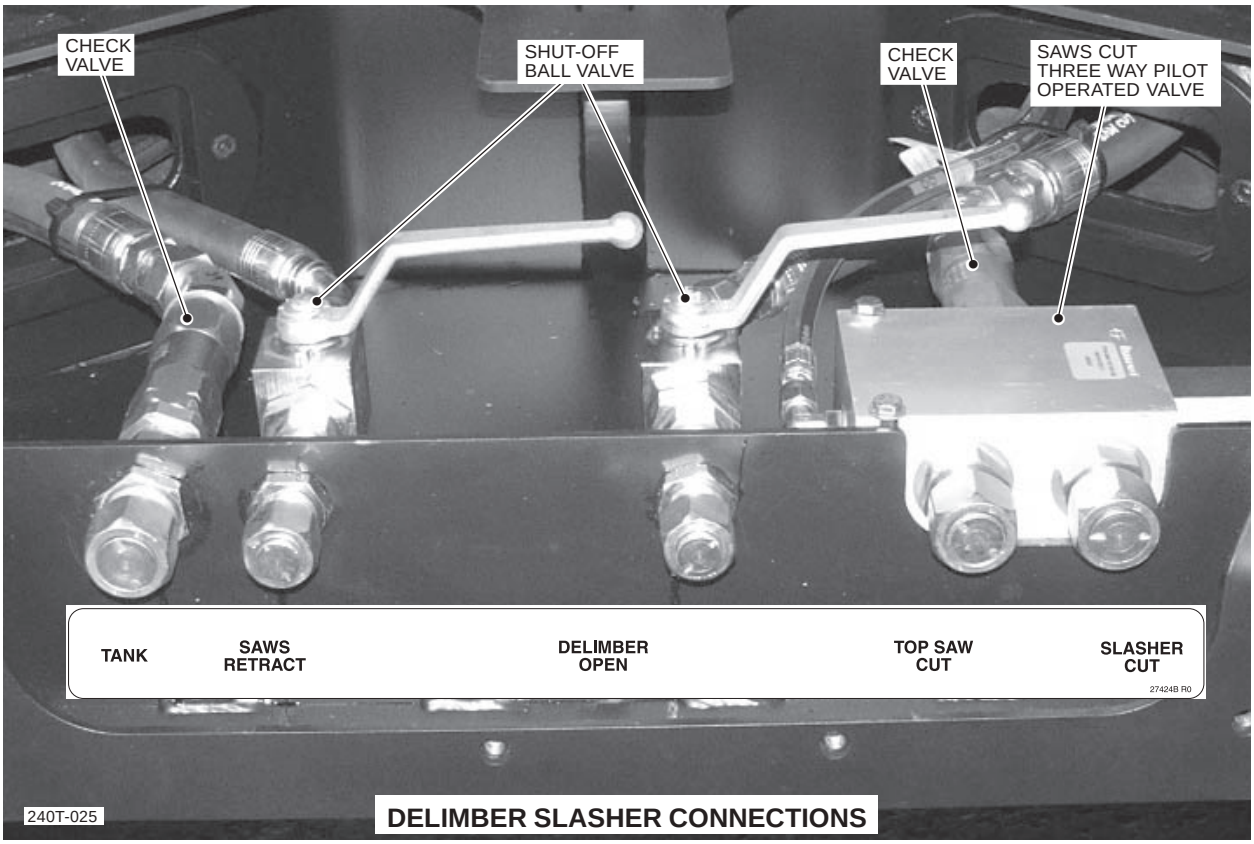






In the neutral position with the solenoid coil de-activated, port 'D' is open to tank port 'T', allowing oil to flow from the base end of the delimber arms cylinder and "dump" to tank. An orifice in the connecting port controls the flow of this return oil so that the delimber arms do not CLOSE too fast.

When the LH. joystick switch is pressed to OPEN the delimber arms, the solenoid coil on the dump valve is energized and shifts the valve cartridge to block the connection between ports 'D' and 'T' and instead allow system oil to flow from port 'V', "through" the check valve to port 'D' to the base end of the cylinder to open the delimber arms.



DELIMBER SLASHER CONNECTIONS

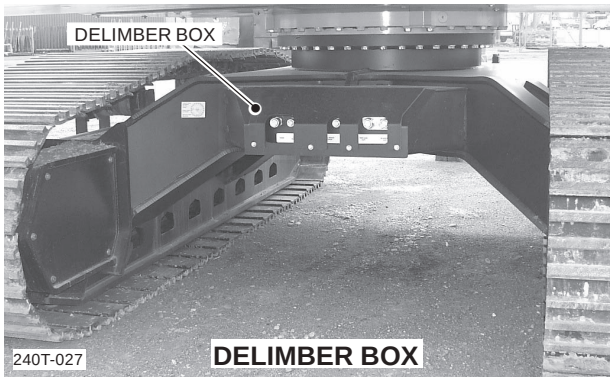
DELIMBER/SLASHER CONNECTIONS

Hydraulic connections for the delimber and slasher are located on the undercarriage in the delimber box. The connections consist of two No.12 JIC connector fittings and three No. 16 JIC connector fittings. All fittings are capped when not in use with special steel caps to prevent leakage. Always ensure caps are tightly in place when not operating a delimber or slasher. When making the hydraulic connection to either the delimber or the slasher, it is very important to clean around the fittings before disconnecting them to prevent dirt from entering the system.

IMPORTANT

Always check hydraulic oil level after connecting and running the delimber and/or slasher.

For information on the DELIMBER or SLASHER, please refer to the MANUFACTURERS MANUAL.



DELIMBER BOX

SHUT-OFF (BALL) VALVES

Two ball valves, one in the saws retract circuit and one in the delimber open circuit provide a means of shutting off these circuits when connecting or disconnecting hoses.

CHECK VALVES

Two check valves prevent the flow of hydraulic fluid from the tank return circuit and saws cut circuit when connecting and disconnecting hoses.

PILOT OPERATED THREE-WAY VALVE

A pilot operated three-way directional valve consisting of an aluminium valve body and a screw-in, pilot operated valve cartridge is used to divert hydraulic oil flow from the stick valve saws cut circuit and direct the flow to the top saw cut circuit when the pilot is deactivated and slasher cut circuit when the pilot is activated by the delimber open circuit.

DELIMBER/SLASHER CIRCUIT DESCRIPTION

REFER TO CIRCUIT DIAGRAMS

The delimber/slasher circuit is supplied with hydraulic oil by an axial-piston, variable-displacement pump. Two spool sections in the main control valve hydraulically control the delimber or slasher functions.

Two 3-position joystick switches and two relays (numbers 7 and 8) electrically control the delimber and slasher functions:-

Open delimber arms; Push LEFT side of L.H. Joystick switch, Current flows through wires 18 to energize the DELIMBER OPEN SOLENOID on the delimber valve and allow pilot oil to shift the spool in the delimber spool section of the delimber valve and direct system oil to the delimber arms cylinders. Current also flows through wire 18 to energize the DELIMBER OPEN RELAY (8) and allow current to energize the DELIMBER OPEN/DUMP VALVE SOLENOID. This will allow system oil from the delimber spool section to flow through the ROTARY MANIFOLD to the base end of the DELIMBER ARM CYLINDERS to open the arms.

Current also flows via the contacts of DELIMBER CLOSE RELAY (7) through wire 88 and jumper wire 19 to "latch" RELAY (8) in the energized position so that the joystick switch may be released to the spring return center position while the delimber arms remain in the OPEN position. A diode in diode module #1 in wire 18 prevents the current from traveling back to the joystick switch and also the DELIMBER OPEN SOLENOID on the delimber valve, which was de-energized when the joystick switch was released.

Close delimber arms; Push RIGHT side of L.H. Joystick switch, Current flows through wire 96 and energizes DELIMBER CLOSE RELAY (7).

In this condition oil from the base end of the DELIMBER ARMS CYLINDER is returned to tank via the DELIMBER OPEN/DUMP VALVE, due to oil entering the rod end of the cylinders from the DELIMBER ACCUMULATOR to close the arms.

Cut with delimber top saw; Push RIGHT side of L.H. Joystick switch, Push LEFT side of R.H. joystick switch, Current flows through wire 97 to wire 39 and energizes SAW SOLENOID on SAW valve.

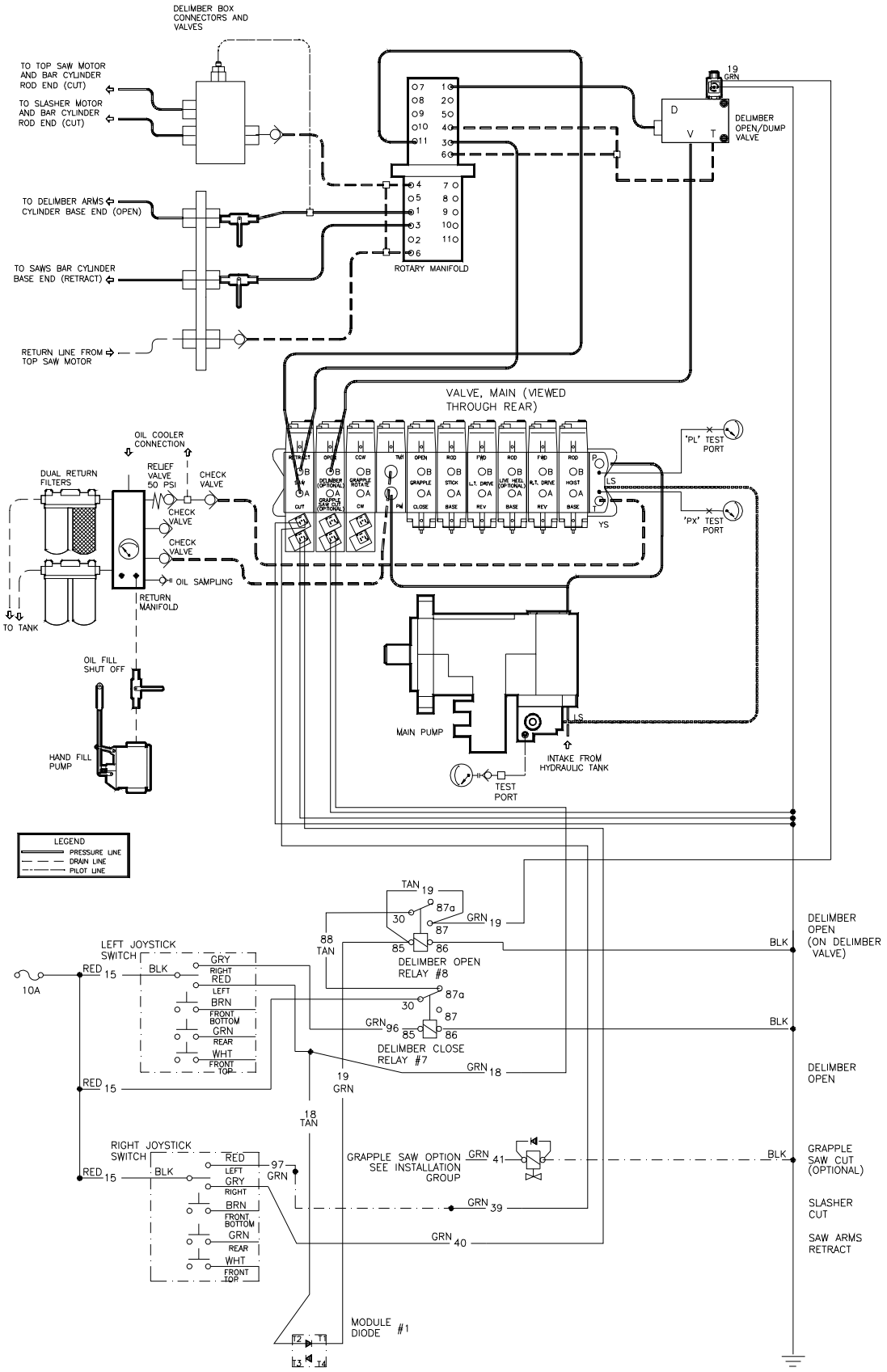
Pilot oil flows through the SAW CUT solenoid pilot valve to shift the spool in the SAW CUT valve to allow system oil to flow through the ROTARY MANIFOLD to the pilot operated three-way valve. Because the delimber knives are closed there is no pressure to shift the three-way valve and the system oil flows to the TOP SAW MOTOR and the rod end of the TOP SAW CYLINDER to run the saw motor and cut with the saw bar.

Cut with slasher saw; Push LEFT side of L.H. Joystick switch, Push LEFT side of R.H. joystick switch, Current flows from L.H. joystick switch through wire 18 and 19, to open delimber knives. Current also flows from R.H. joystick switch through wire 97 to wire 39, to energize SLASHER CUT solenoid on SAW valve.

Pilot oil flows through the SLASHER CUT solenoid to shift the spool in the SLASHER CUT valve to allow system oil to flow through the ROTARY MANIFOLD to the pilot operated three-way valve. Because the delimber knives are open there is pressure to shift the three-way valve and the system oil flows to SLASHER SAW MOTOR and the rod end of the BAR CYLINDER to run the saw motor and cut with the saw bar.

Retract delimber top saw and/or slasher saw; Push RIGHT side of R.H. joystick switch, Current flows through wire 40 and energizes TOP SAW/ SLASHER SAW RETRACT solenoid on SAW valve.

Pilot oil flows through the TOP SAW/SLASHER SAW RETRACT solenoid valve to shift the spool in the SAW RETRACT VALVE to allow system oil to flow through the ROTARY MANIFOLD to the base end of the TOP SAW BAR CYLINDER and the SLASHER SAW CYLINDER base end to retract the saw bar(s).



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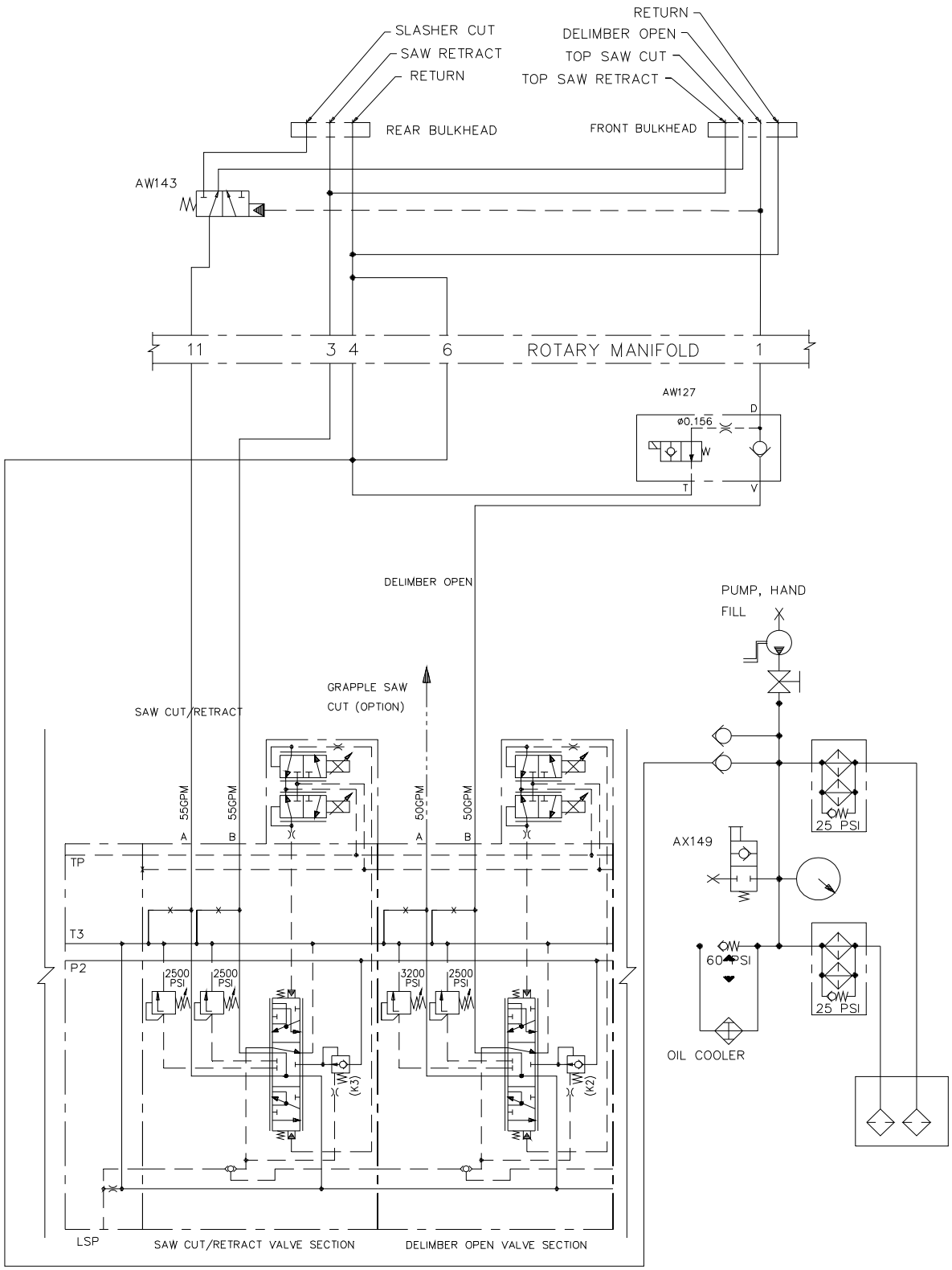
DELIMBER/SLASHER CIRCUIT



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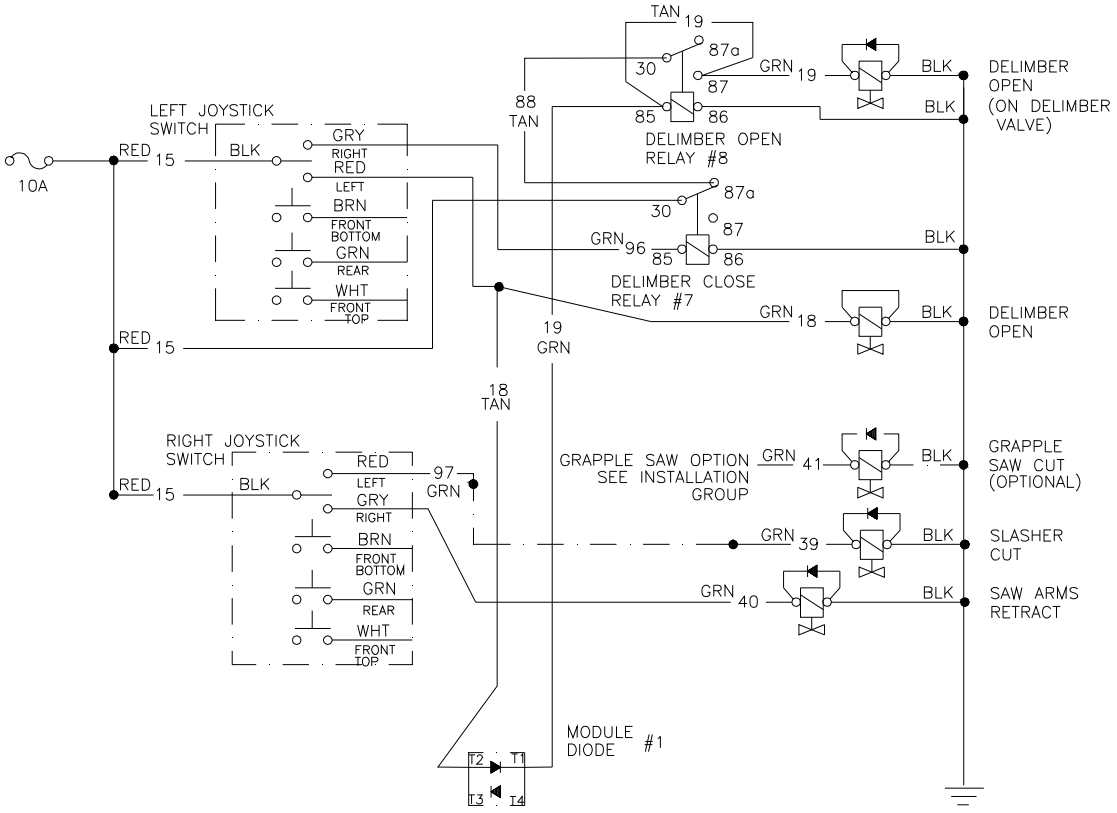
DELIMBER/SLASHER HYDRAULIC SCHEMATIC



250BT-061

DELIMBER/SLASHER ELECTRICAL SCHEMATIC

TROUBLESHOOTING
DELIMBER RELAY CIRCUIT

If an electrical problem is suspected, the operation of the joystick switches and the delimber relays can be verified with the following procedure.

1. With the *delimber arms switch* in OPEN position, voltage should be present at wires 18 and 19; if so, go to step 2. If voltage is not present in wire 18, operate the joystick switch in the other direction (ARMS CLOSE) and check wire 96. If voltage is present at wire 96, there may be problem in the *joystick switch* or in wire 18 from the joystick switch to the instrument panel. If voltage is not present in wire 96, check for voltage at wire 15 in the *instrument panel*. If voltage is not present at wire 15, check *10 amp fuse*; if voltage is present at wire 15, check *joystick switch* and wiring to switch.
2. With the *delimber arms switch* RELEASED to center position, voltage should still be present at wire 19 but not at wire 18. If this is the case go to step 3. If voltage is present at wire 18, check *diode module no. 1*. If voltage is not present at wire 19, check *relays 7 & 8*.
3. With the *delimber arms switch* in CLOSED position, voltage should be present at wire 96 and voltage at wire 19 will drop to zero. If voltage on wire 19 does not drop to zero, check *relay 7* for operation.
4. With the *delimber arms switch* RELEASED to center position, voltage will drop to zero on wire 96 and will remain at zero on wire 19. If this does not happen suspect the *joystick switch*.
5. When the *saw switch* in the CUT (SAW EXTEND) position, voltage should be present at wire 97 and 39 regardless of the delimber arms position. If this does not happen check jumper wire between wire 97 and 39 at terminal strip.
6. When the *saw switch* is in the RETRACT position, voltage should be present in wire 40 regardless of the delimber arms position.

PRESSURE SETTINGS FOR TOP SAW CUT, SLASHER CUT AND DELIMBER

CAUTION

Use caution when in the cab as a slight touch of the controls can cause sudden rotation of the upper frame and booms or movement of the tracks

CAUTION

Be aware of other personnel in the area. Operator is responsible for the safe operation of the machine.

WARNING

Ensure that no one is standing near the grapple during this procedure.

IMPORTANT

Avoid blowing oil over relief for longer than five seconds, as this will cause excessive heating of the hydraulic fluid.

NOTE:

The Delimber and/or Slasher hydraulic hoses must be disconnected at the loader bulkhead connections before carrying out the following procedure. Cap the hoses to keep clean and use the appropriate steel caps on the bulkhead fittings to prevent leakage during the pressure setting procedure.

RELIEF VALVE SETTING - TOP SAW CUT
Main Pump POR setting ..... 4500 psi

Saw cut feed reducer setting ..... 2500 psi

1. Position machine on level ground.
2. Ensure that the hydraulic oil is at **operating temperature.**
3. Connect a 0 - 5000 p.s.i. pressure gauge to the main control valve 'PL' test port on the inlet section of the main control valve.
4. Start the engine, and set the throttle control to the **IDLE** position. Lower left arm rest and depress the pilot reset switch to activate the pilot system.
5. While holding the R.H. joystick switch in the SAW EXTEND position, check gauge pressure reading at "PX" connection.
6. If Less than set value adjust feed reducer. Turn adjusting screw in to increase pressure or turn screw out to decrease pressure.
7. Stop engine, remove pressure gauges and wipe up any excess oil from test port area.

RELIEF VALVE SETTING
SLASHER CUT, SAW RETRACT

Main pump POR setting ..... 4500 psi

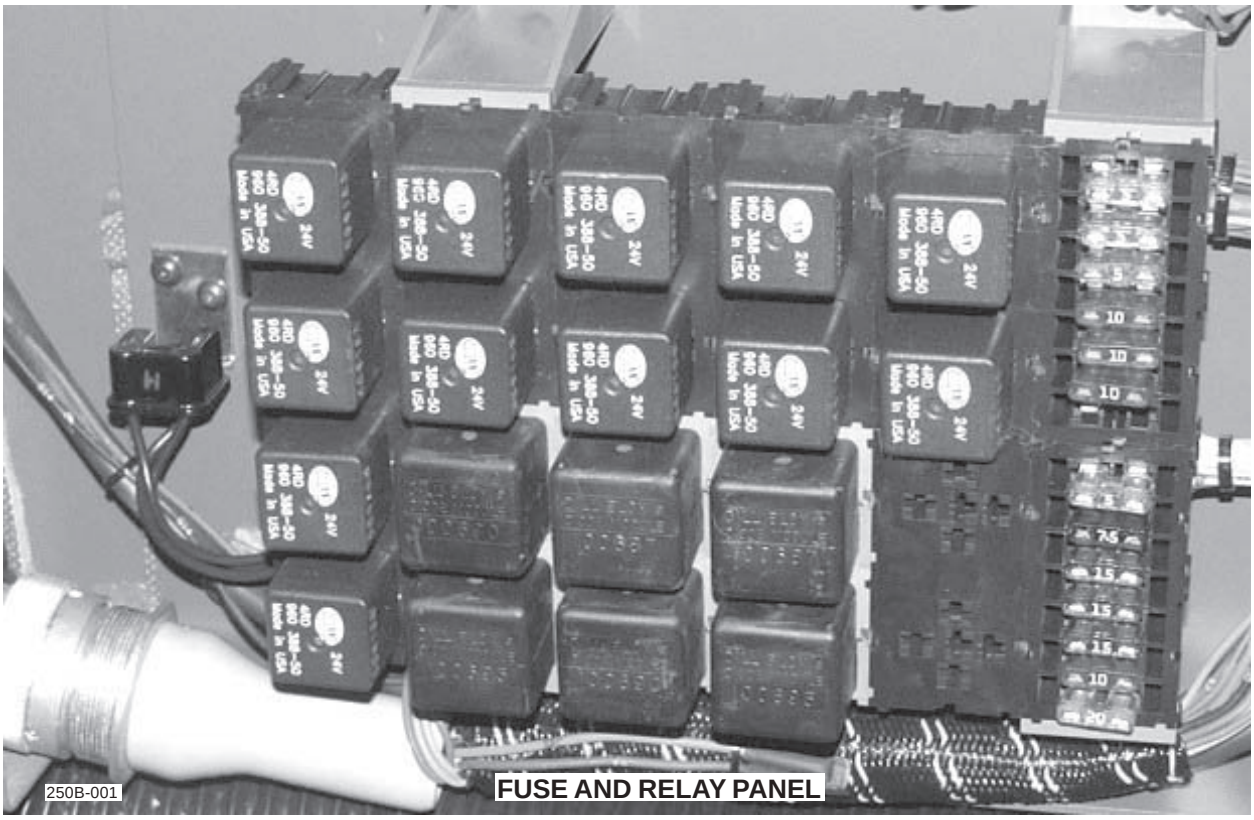
Saw retract feed reducer setting..... 2500 psi

1. Position machine on level ground.
2. Ensure that the hydraulic oil is at **operating temperature.**
3. Connect a 0 - 5000 p.s.i. pressure gauge to the main control valve 'PL' test port on the inlet section of the main control valve.
4. Start the engine, and set the throttle control to the **IDLE** position. Lower left arm rest and depress the pilot reset switch to activate the pilot system.
5. While holding the R.H. joystick switch in the SAW RETRACT position, check gauge pressure reading at "PX" test connection.
6. If Less than set value adjust feed reducer. Turn adjusting screw in to increase pressure or turn screw out to decrease pressure.
7. Stop engine, remove pressure gauges and wipe up any excess oil from test port area.

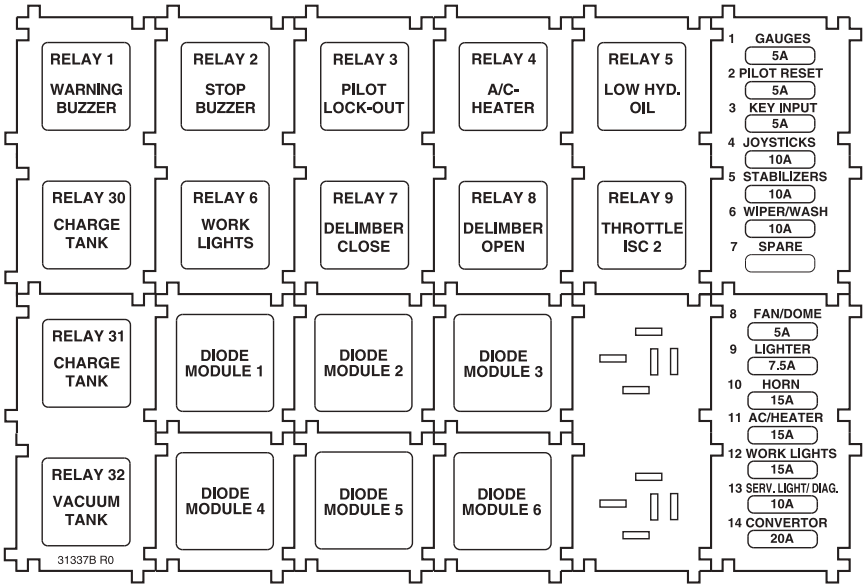
RELIEF VALVE SETTINGS - DELIMBER ARMS
Main pump POR setting ..... 4500 psi

Delimber open feed reducer setting:- . 2500 psi

1. Position machine on level ground.
2. Ensure that the hydraulic oil is at **operating temperature.**
3. Connect a 0 - 5000 p.s.i. pressure gauge to the main control valve 'PL' test port on the inlet section of the main control valve.
4. Start the engine, and set the throttle control to the **IDLE** position. Lower left arm rest and depress the pilot reset switch to activate the pilot system.
5. While holding the L.H. joystick switch in the DELIMBER OPEN position, check gauge pressure reading at "PX" test connection.
6. If Less than set value adjust feed reducer. Turn adjusting screw in to increase pressure or turn screw out to decrease pressure.
7. Stop engine, remove pressure gauges and wipe up any excess oil from test port area.
8. Re-connect delimber and slasher hoses to bulkhead fittings on loader.



FUSE AND RELAY PANEL



FUSE AND RELAY PANEL

FUSE AND RELAY PANEL

The fuse panel is located inside the control panel behind a removable cover.

Each circuit of the machine is protected by a fuse. If a fuse is blown it must be replaced by one of the same value. If the fuse blows again, the circuit should be inspected for possible short circuit or other malfunction.

IMPORTANT

24 VOLT
ELECTRICAL SYSTEM