

GLOBAL SERVICE LEARNING

TECHNICAL PRESENTATION



"C" SERIES SKID STEER LOADERS

246C/256C/262C/272C

MULTI TERRAIN LOADERS

277C/287C/297C

COMPACT TRACK LOADERS

279C/289C/299C

**Service Training Meeting Guide
(STMG)**

"C" SERIES SKID STEER LOADERS 246C/256C/262C/272C MULTI TERRAIN LOADERS 277C/287C/297C COMPACT TRACK LOADERS 279C/289C/299C

AUDIENCE

Level II - Service personnel who understand the principles of machine system operation, diagnostic equipment, and procedures for testing and adjusting.

CONTENT

This presentation provides an overview of the "C" Series Skid Steer Loaders and Multi-Terrain Loaders Field Follow Machines. This presentation may be used for self-paced and self-directed training.

OBJECTIVES

After learning the information in this meeting guide, the serviceman will be able to:

1. identify the new service and maintenance features on the "C" Series Skid Steer Loaders and Multi-Terrain Loaders;
2. operate the machine using the new controls for machine travel and work tool functions;
3. operate the instrument cluster screen in the operator mode and service mode;
4. locate and identify the new components on the "C" Series Skid Steer Loaders and Multi-Terrain Loaders;
5. explain the basic operation of the new machine systems.
6. identify the new Cat ET screens used to diagnose the machine systems.

REFERENCES

STMG "B" Series Skid Steer Loaders and Multi-Terrain Loaders - Machine Systems Operation	SERV1783
Salesgram - Extreme Duty Powertrain (XDP) for C - Series SSL's: 3044 and 3046 Engines for Caterpillar Built Machines	TEKQ0590-01
System Operation/Testing and Adjusting	SENR6457
Distributor Type Fuel Pump for 3044 & 3046 Tier 2 Engines	SERV1777

Estimated Time: 8 Hours

Visuals: 81

Handouts: 8

Form: SERV1833-01

Date: 07/08

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NOTES

Changes made to Visuals, 2, 11, 12, and 53.

Text changes made to pages, 5, 7, 15, 26, 28, 29, 36, 37, 39, 53, 62, and 63

July 08 changes:

Text changes made to pages, 1 thru 9, 14 - 15, 30,- 31, 41, 53 - 55, 80 - 86, 92.

Visuals: 31, 58, 74 thru 76 thru 79



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INTRODUCTION

The 246C/256C/262C/272C Skid Steer Loaders, the 277C/287C/297C Multi Terrain Loaders and the 279C/289C/299C Compact Terrain Loaders are the latest generation of Caterpillar Skid Steer Loaders and Multi-Terrain Loaders retaining many of the proven features of the "B" Series machines along with additional performance and many design improvements.

The hydrostatic drive system and work tool hydraulic system are electronically controlled by the Machine Electronic Control Module (ECM). The Machine ECM controls all the functions that the Operator Interlock ECM and Auxiliary Hydraulic ECM controlled on the "B" Series machines. The Machine ECM controls additional functions in the "C" Series machines.

The high flow XPS hydraulic system is now optional on all 246C/256C/262C/272C Skid Steer Loaders, 277C/287C/297C Multi Terrain Loaders and 279C/289C/299C Compact Terrain Loaders.

Ride Control has been added as an option on all "C" Series SSL machines.

This presentation discusses the new components and features of the 246C/256C/262C/272C Skid Steer Loaders, the 277C/287C/297C Multi Terrain Loaders and the 279C/289C/299C Compact Terrain Loaders.

The "C" Series product line brings significant improvements in performance, operator comfort, controllability, versatility, and styling.

KEY NEW FEATURES

- **Operator's Station**
 - **Electronically Controlled Hydrostatic Drive System**
 - **Electronically Controlled Work Tool Hydraulic System**
 - **Improved Electrical System**
 - **Ride Control System (SSL only)**
 - **High Flow Hydraulic XPS System Optional on all Machines**
 - **Creeper Control**
 - **Two-speed Option**
 - **Tough Guard™ Hoses**
 - **Undercarriage with Optional Dual Level Suspension**
-

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The "C" Series Skid Steer Loaders, Multi Terrain Loaders and Compact Terrain Loaders are equipped with several new features as shown in this illustration.

The operator's station has been redesigned with several new controls and an Advanced Machine Information and Control System (AMICS) digital display panel that can display machine information, along with three operator modes and seven service modes.

The hydrostatic drive system is now electronically controlled by the Machine ECM. The joysticks in the cab send signals to the Machine ECM, which sends corresponding signals to the pump control solenoids to control pump output.

The work tool hydraulic system is also electronically controlled by the Machine ECM. The joysticks in the cab send signals to the Machine ECM, which sends corresponding signals to the work tool lift, tilt, and auxiliary solenoids. The solenoids control the work tool directional spools, which control oil to the lift and tilt cylinders and the auxiliary circuit.

The electrical system includes a new single Machine ECM, which controls many more machine functions than the "B" Series machines.



Ride Control has been added as an option on the Skid Steer Loaders only. The Ride Control System operates similarly to current Caterpillar wheel loaders.

The optional high flow XPS hydraulic system is now optional on all "C" Series machines.

A creeper control function has been added, which allows the operator to select a maximum machine travel speed at full joystick movement.

The two-speed function is optional on all machines.

Cat ToughGuard™ hydraulic hoses provide excellent abrasion resistance, which exceeds the capabilities of standard hydraulic hoses.

The MTL undercarriage has been redesigned with greater serviceability in mind, and when fitted, the optional Dual Level Suspension utilizes eight independently pivoting bogie axles for smoother travel.

SIMILARITIES AND DIFFERENCES

FEATURES	DIFFERENT	SIMILAR	SAME
Machine Appearance		X	
Operator's Station	X		
Engine			X
Electrical	X		
Hydrostatic Drive System	X		
Work Tool Hydraulic System	X		
Undercarriage	X		
Maintenance Items		X	

Similarities and Differences

The chart above shows the similarities and differences between the new 246C/256C/262C/272C Skid Steer Loaders, the 277C/287C/297C Multi Terrain Loaders and the 279C/289C/299C Compact Track Loader and the current "B" Series machines.



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OPERATOR'S STATION

The new Skid Steer Loader cab provides optimal space. Machines equipped with the optional enclosed cab (as shown in this illustration), a new door provides the operator with greater visibility to the work tool. The new cab is sealed and has a positive pressure. The cab comes radio ready and the dead engine lower function is now performed from the cab.

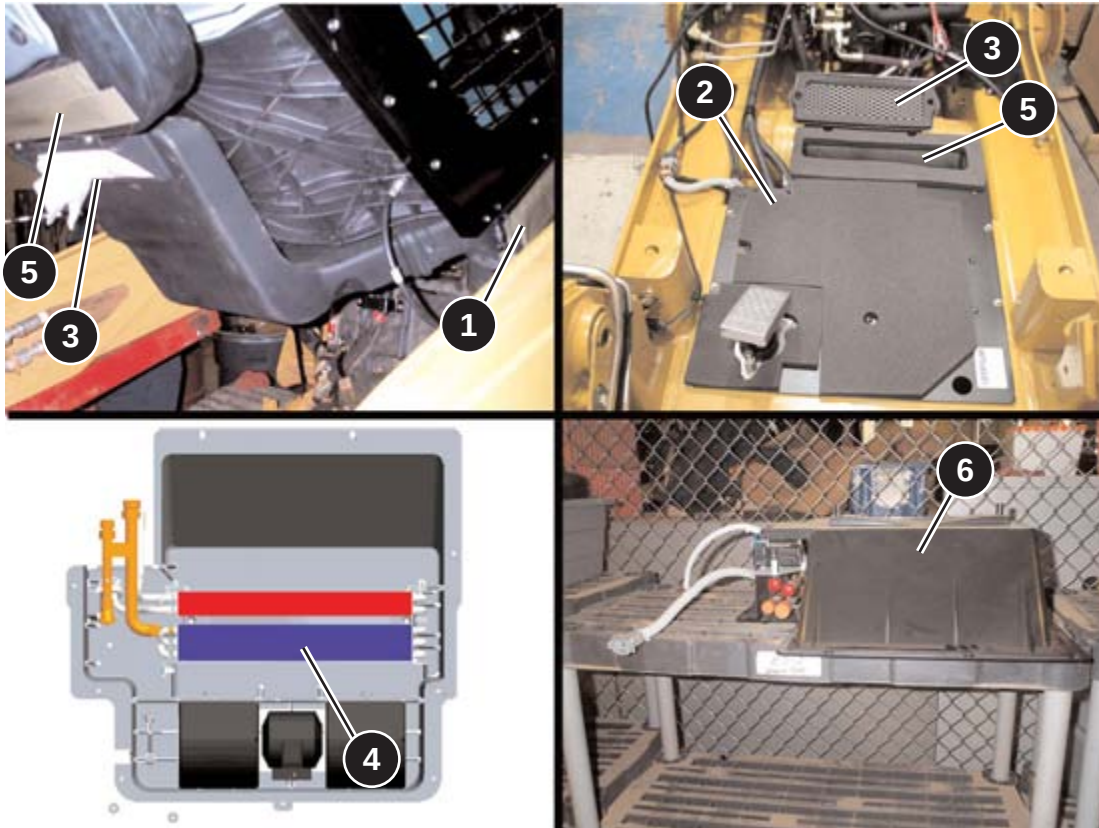
A Rollover Protective Structure (ROPS) cab is standard. A Falling Object Protective Structure II (FOPS II) cab is available as an option. The FOPS II cab can be used for applications that require protection from large, heavy, falling objects.

The top window is bonded and cannot be removed, which improves reliability against leaks and dust entering the cab.



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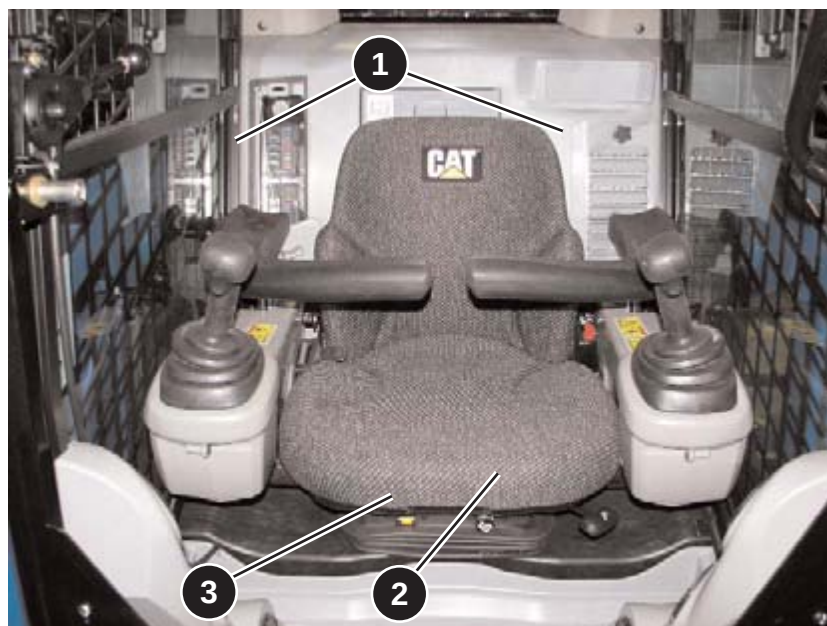
The cab can be raised by removing two bolts at the front of the cab, which allows easy access to components. The bolt (arrow) on the right side of the machine is shown in this illustration. The cab rotates up as a complete unit.



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The top illustrations show the air conditioning ducting. Air flows into the machine through the fresh air inlet (1). Air flows into the evaporator compartment (2) through a duct (3) below the cab. The air passes over the evaporator (4) and is cooled. The cooled air is routed into the cab through a duct (5) on the bottom of the cab.

The bottom right illustration shows the evaporator housing (6) removed from the machine.

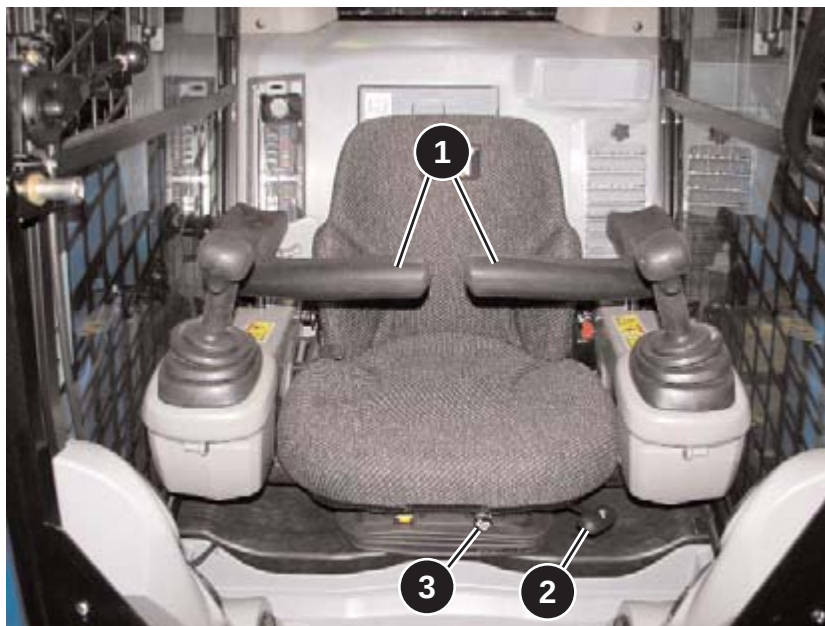


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This cab is equipped with a mechanical suspension seat.

There are two armrests (1) in the "C" Series machines, which rotate from side-to-side. In this illustration the armrests are shown in the UP position.

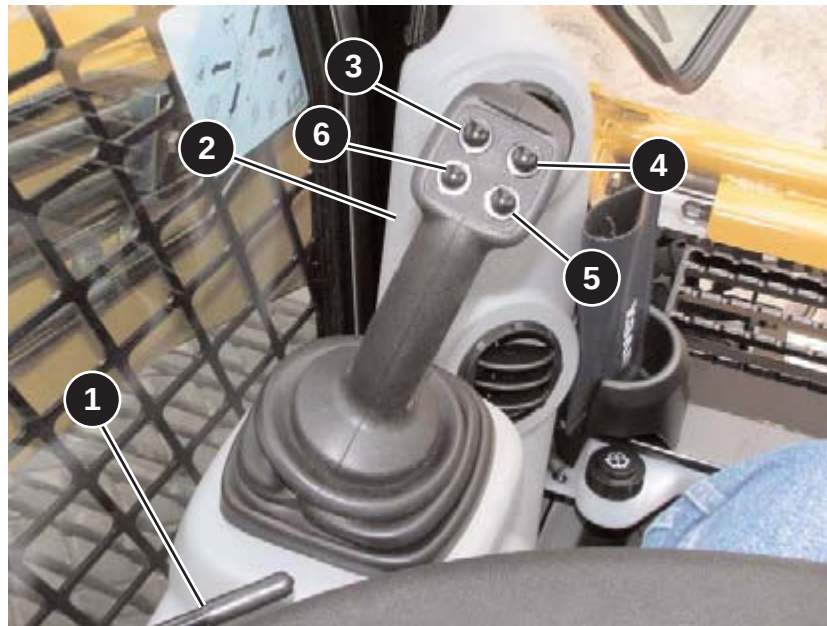
The seat can be moved back and forth with the seat lever (2) below the left side of the seat. The knob (3) located below the center of the seat cab be turned to adjust the seat suspension.



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In this illustration the armrests (1) are shown in the DOWN position.

This cab is equipped with an optional air suspension seat. The seat can be moved back and forth with the seat lever (2) below the left side of the seat. The knob (3) located below the center of the seat can be pulled in or out to adjust the seat suspension by operating an internal pump to inflate the seat bladder.



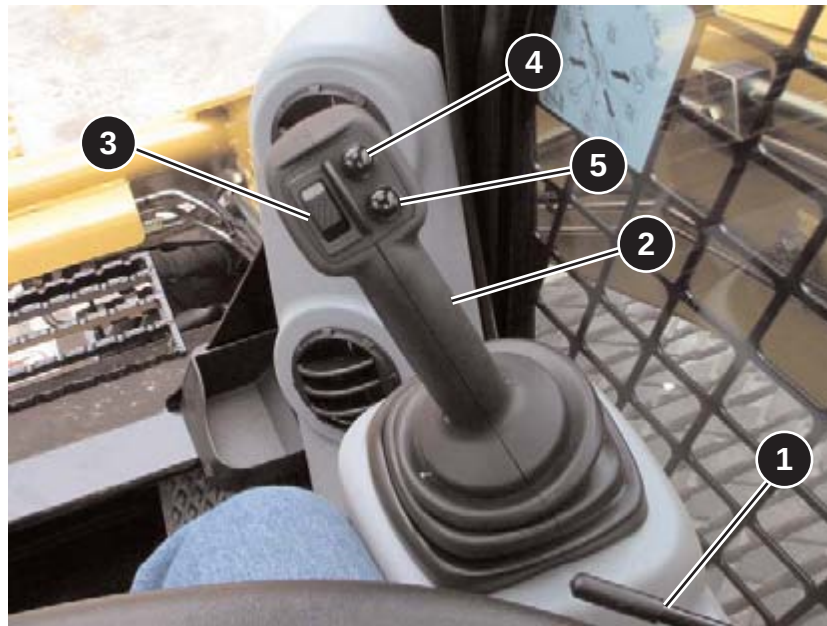
9

The left and right joysticks are adjustable fore / aft independently from the seat. The joystick adjustment lever (1) is located to the rear of the joystick. Additionally the joystick pods are seat mounted, which provides for greater controllability over rough terrain.

In the standard control lever pattern, the left joystick (2) provides directional control and has the same function as previous models. The switches on the left joystick are:

- horn (3)
- auxiliary electrical control "C1" (4)
- auxiliary electrical control "C2" (5)
- continuous flow control (6)

The trigger switch (not visible) located on the front side of joystick is used to control the two-speed function or the auxiliary electrical function "AUX 7." The multifunction switch on the left overhead console determines the functionality of the trigger switch.



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The right joystick adjustment lever (1) is located to the rear of the joystick.

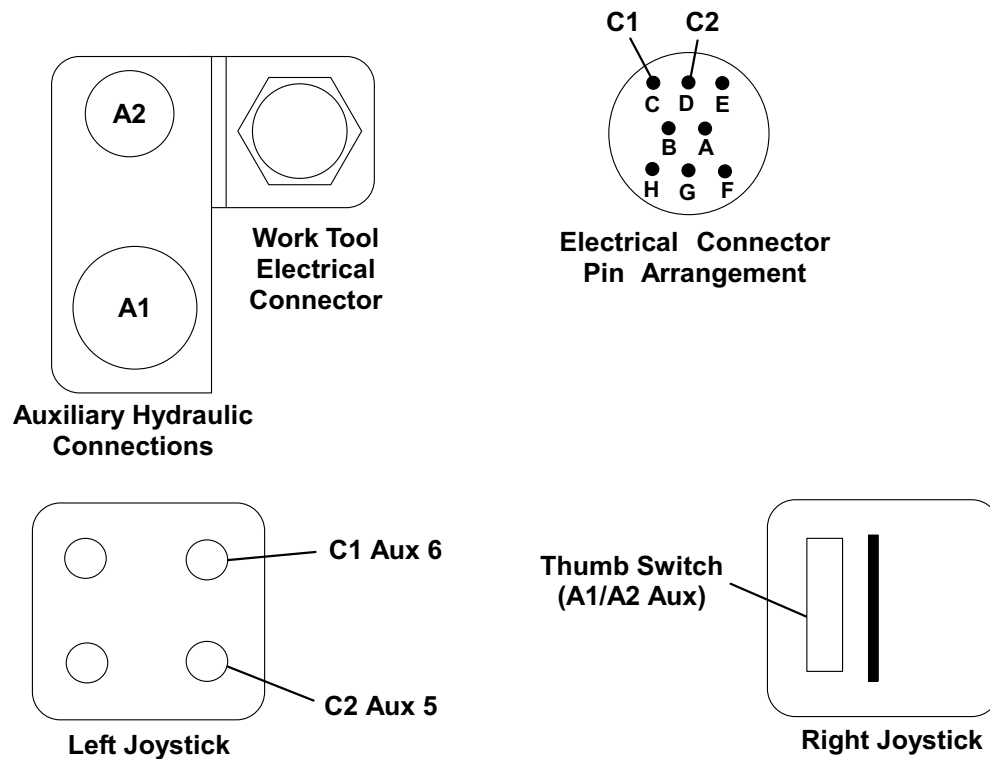
In the standard control lever pattern, the right joystick (2) provides work tool control and functions the same as previous models.

The thumb switch (3) controls the proportional auxiliary hydraulics or the high flow auxiliary hydraulics if the auxiliary hydraulic mode switch is in the HIGH FLOW position.

The switches to the right of the thumb switch operate the work tool control circuit found on high flow machines. The top switch (4) activates the C+ function. The bottom switch (5) activates the C-function.

A trigger switch (not visible) on the front of the joystick controls the FLOAT function. As the implement control is now electro-hydraulic, there is no detent position. Therefore to operate the FLOAT function, depress the switch and move the lever forward or move the lever forward and depress the switch.

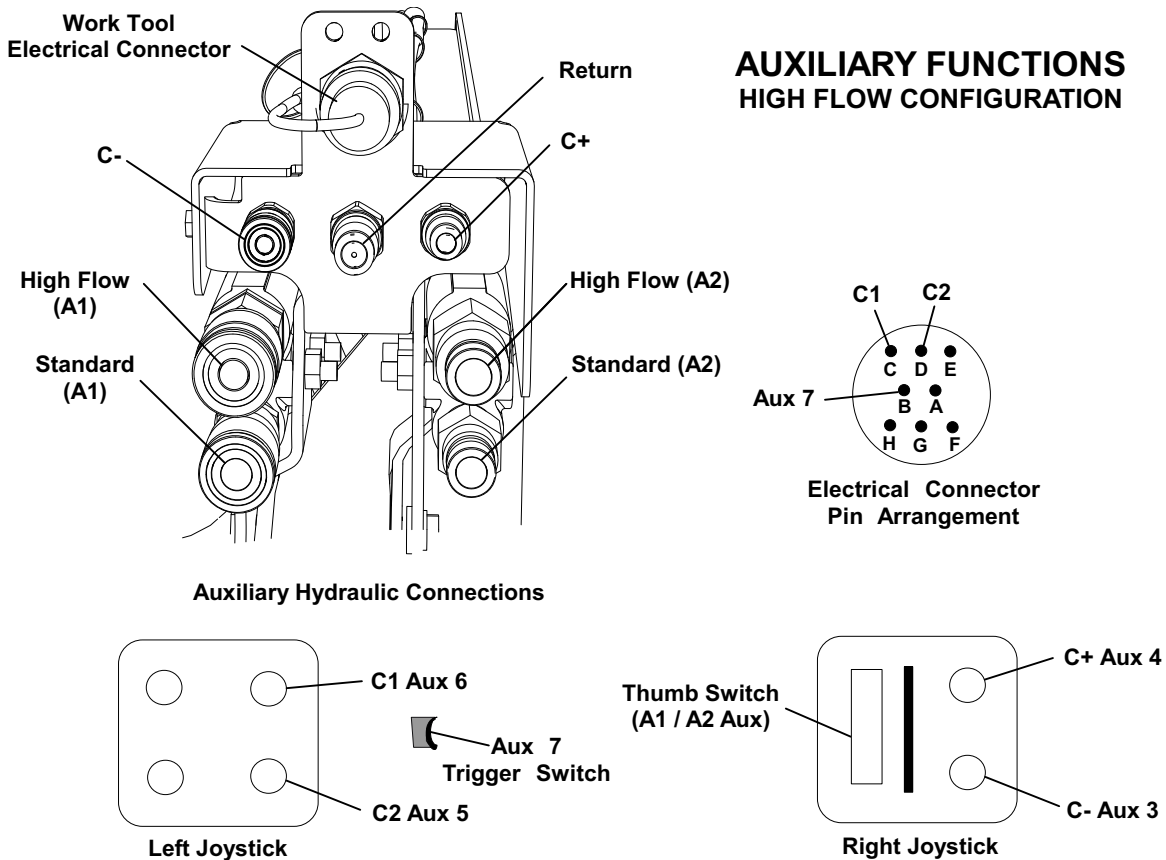
AUXILIARY FUNCTIONS STANDARD CONFIGURATION



This illustration shows the joystick controls and the auxiliary hydraulic and electrical connections on machines with a standard hydraulic configuration.

The thumbswitch on the right joystick controls proportional hydraulic oil flow to the loader arms through the A1 and A2 connectors.

The C1 switch on the left joystick provides electrical power to some work tools through pin C on the work tool electrical connector. The C2 switch on the left joystick provides electrical power to some work tools through pin D on the work tool electrical connector.



This illustration shows the joystick controls and the auxiliary hydraulic and electrical connections on machines equipped with a high flow hydraulic configuration.

The thumbswitch on the right joystick controls proportional hydraulic oil flow to the loader arms through the A1 and A2 connectors. For standard work tools, oil is provided through the standard A1 and A2 hydraulic connectors. For high flow work tools, oil is provided through the high flow A1 and A2 hydraulic connectors.

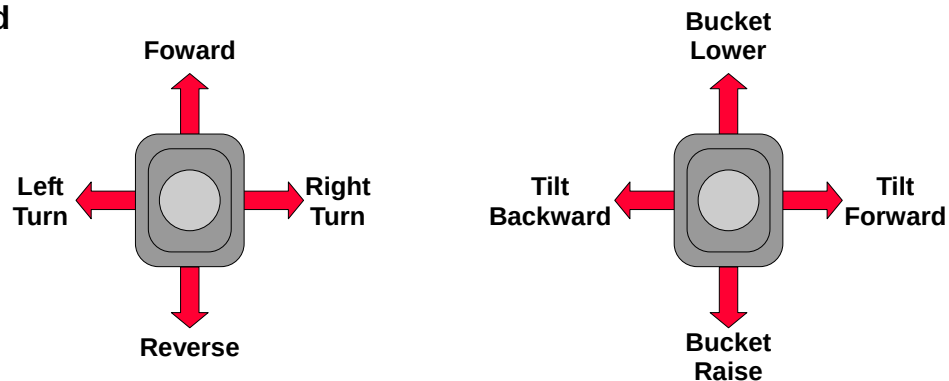
The C+ and C- switches on the right joystick control ON/OFF hydraulic oil flow to the loader arms through the C+ and C- connectors.

The C1 switch on the left joystick provides electrical power to some work tools through pin C on the work tool electrical connector. The C2 switch on the left joystick provides electrical power to some work tools through pin D on the work tool electrical connector.

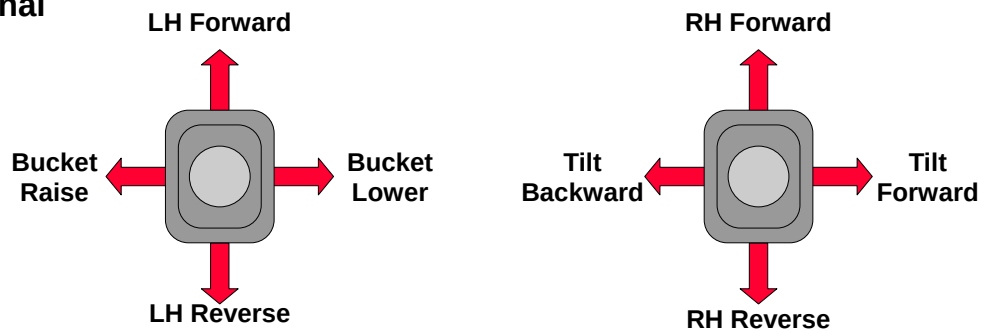
The trigger switch provides electrical power to some work tools through pin B on the work tool electrical connector when the multifunction switch on the left overhead console is in the AUX 7 position.

CONTROL LEVER PATTERNS

Standard

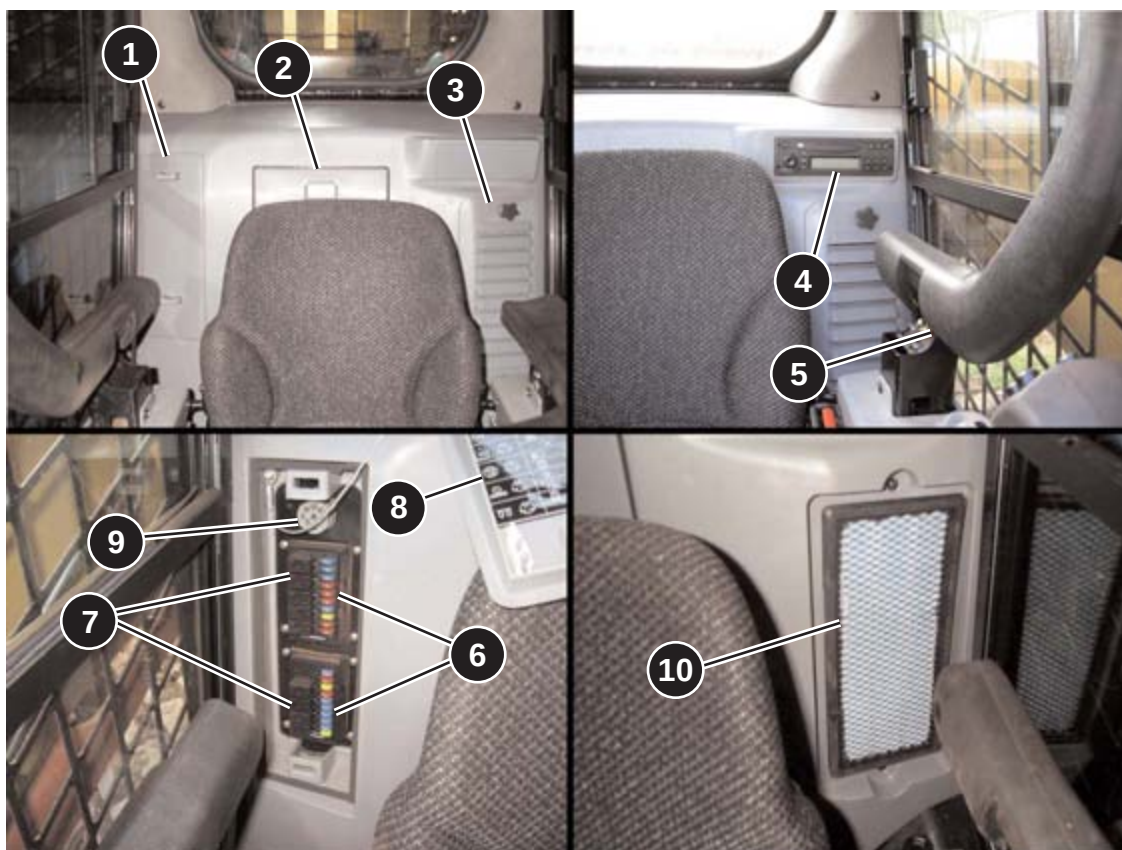


Optional



Two control patterns are available for the "C" Series machines. The control patterns are software enabled attachments. The Standard pattern is the same pattern used on the former machines. The optional pattern provides an alternative control pattern with the convenient control and feel of dual control lever steering and work tool controls.

Films in the operator's compartment identify the installation of the optional pattern on a machine.



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The fuse panel (1), the document compartment (2), the recirculation filter (3), and the radio (4) are all located at the rear of the cab.

NOTE: All machines are equipped with radio wiring and a radio mounting location. However, the radio is a dealer installed component.

The armrest switch (5) is located below the left armrest. The armrest must be down to activate the hydraulic controls.

The fuse panel includes fuses (6) and 10 relays (7). The fuse panel cover (8) includes a decal. A lanyard is attached to the fuse panel and cover. The Cat ET connector (9) is located above the fuse panel.

A pleated automotive style cab recirculation filter (10) replaces the foam recirculation filter used on the "B" Series machines.



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The cab fresh air filter is located on the left side at the rear of cab. Remove the filter cover (arrow) to service the filter element.



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Lifting hooks (arrows) can be attached to optional mounts on the top of the cab for lifting the machine. A four-point lifting kit is optional.



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The governor control lever (1) is shown in the top illustration and the accelerator pedal (2) is shown in the bottom illustration.

A new throttle position sensor (not shown) is located on the accelerator pedal assembly.



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The throttle position sensor (1) is located at the base of the accelerator pedal assembly (2). The throttle position sensor sends a signal to the Machine ECM indicating the accelerator pedal position. The throttle position signal is used by the Machine ECM to control machine underspeed conditions.

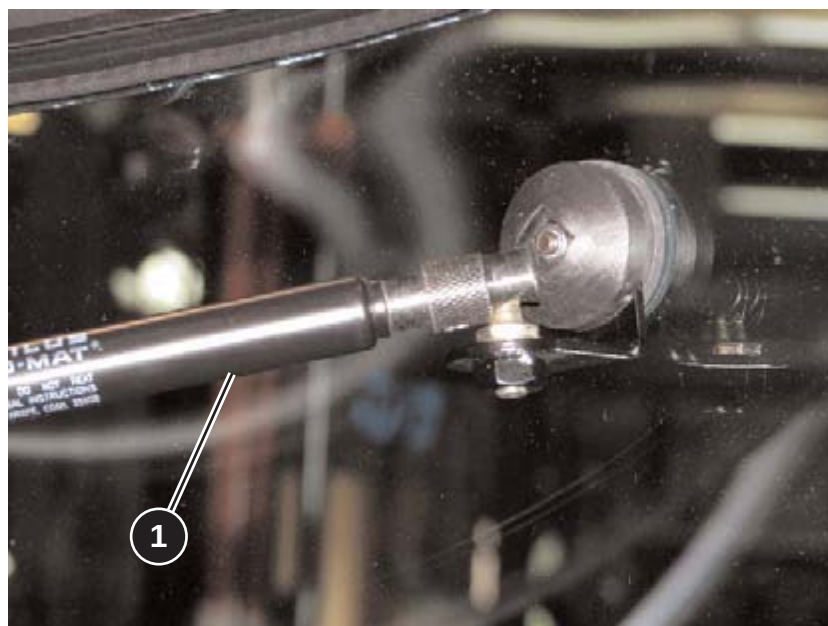


This illustration shows the relocated windshield washer reservoir (arrow).

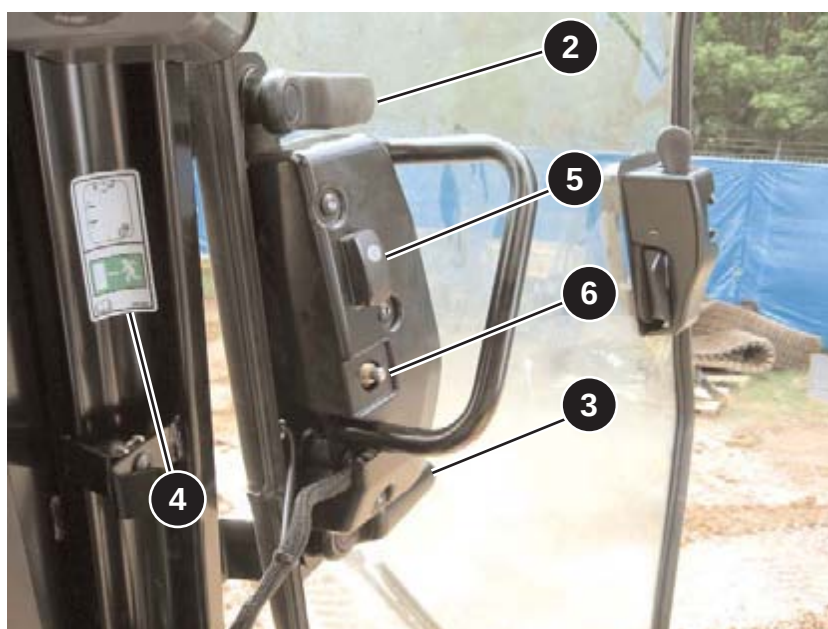


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A dead engine lower handle (arrow) has been installed in the cab to allow the lift arms to be lowered from inside the cab in the event of a dead engine and no electrical power or in the event of an uncharged accumulator.



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In a situation where the operator is unable to lower the lift arms, there is an unlocking mechanism built into the door. To remove the door, the top handle (2) must be pulled up and the bottom handle (3) pulled down. Then, the gas strut (1) must be removed.

A decal (4) is located on the door post that shows the door removal procedure.

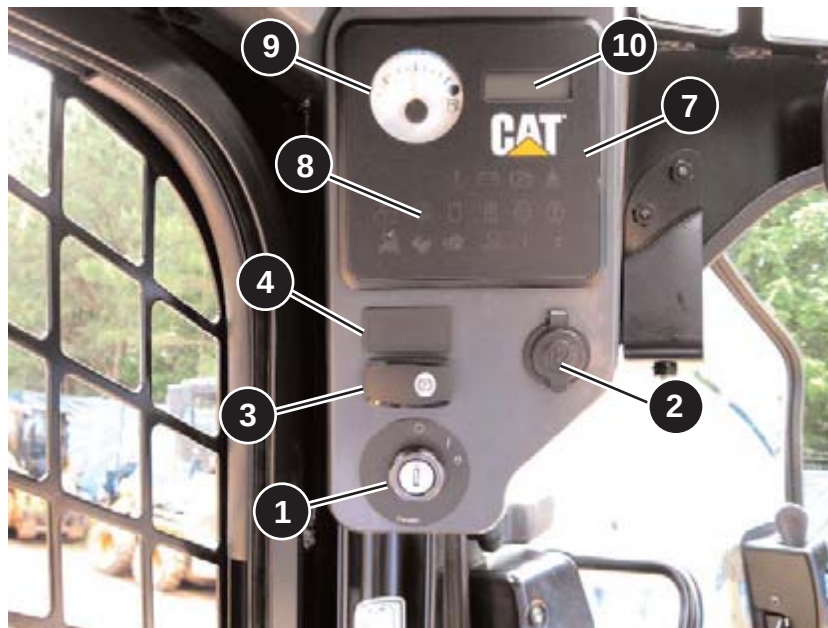
NOTE: For the complete door removal procedure, refer to the "C" Series Operation and Maintenance Manual.

Also visible in the bottom illustration is the windshield washer switch (5) and the door switch (6). The door switch prevents lift arm movement while the door is open. Inadvertent lift arm movement could damage the door.



The left overhead console includes the following switches:

- Auxiliary hydraulic pressure release (1)
- Hydraulic lockout and interlock override (2)
- Rear work lights (3)
- Front work lights (4)
- Auxiliary 7/two-speed selection switch (5)
- Auxiliary electrical control (6)
- Automatic level control (7)
- Work tool coupler control (8)



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The left overhead display includes the key start switch (1), the 12-volt receptacle (2), the parking brake switch (3), and the joystick control pattern switch (4, if equipped). If the pattern switch is installed, either the standard pattern 1, or the optional pattern 2, must be selected to release the parking brake. Indicator Lamps (5) and (6) will blink until a selection is made. The parking brake will not be able to be released until a selection is made. Once a pattern is selected, the appropriate lamp will stay illuminated.

A digital display panel (7) includes the warning indicators (8), the fuel level gauge (9), and the service hour meter (10).

The bottom illustration shows the warning indicators illuminated. There are three warning levels. With a Level 1 warning, the alert indicator is ON continuously. With a Level 2 warning, the alert indicator flashes. With a Level 3 warning, the alert indicator flashes and a warning alarm sounds.



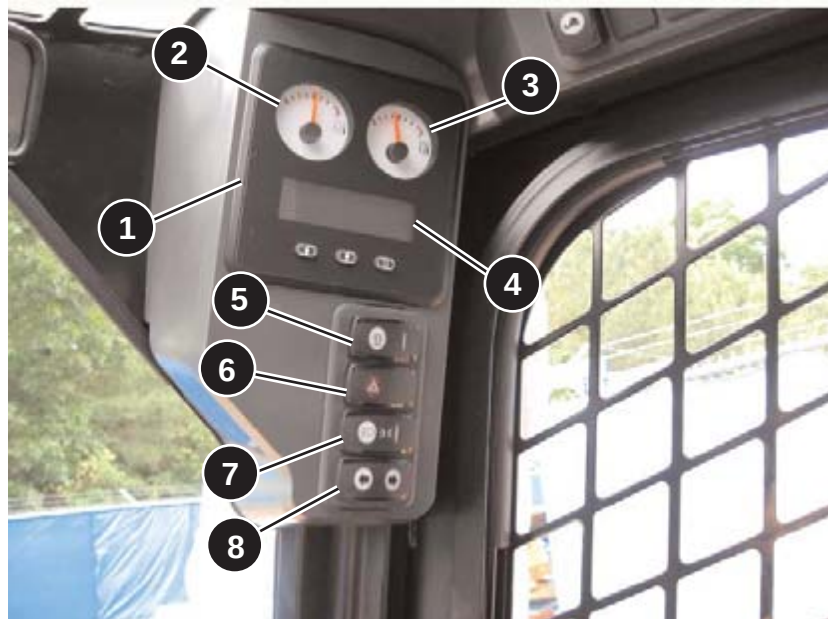
27



28

The heating and air conditioning controls have been moved to the right overhead console. The switches include the fan speed control switch (1), the air conditioning control switch (2), and the temperature control switch (3).

To the left of the heating and air conditioning controls are the creeper switch (4), and the optional ride control switch (5). The creeper control switch allows the operator to select a maximum machine travel speed at full joystick movement.



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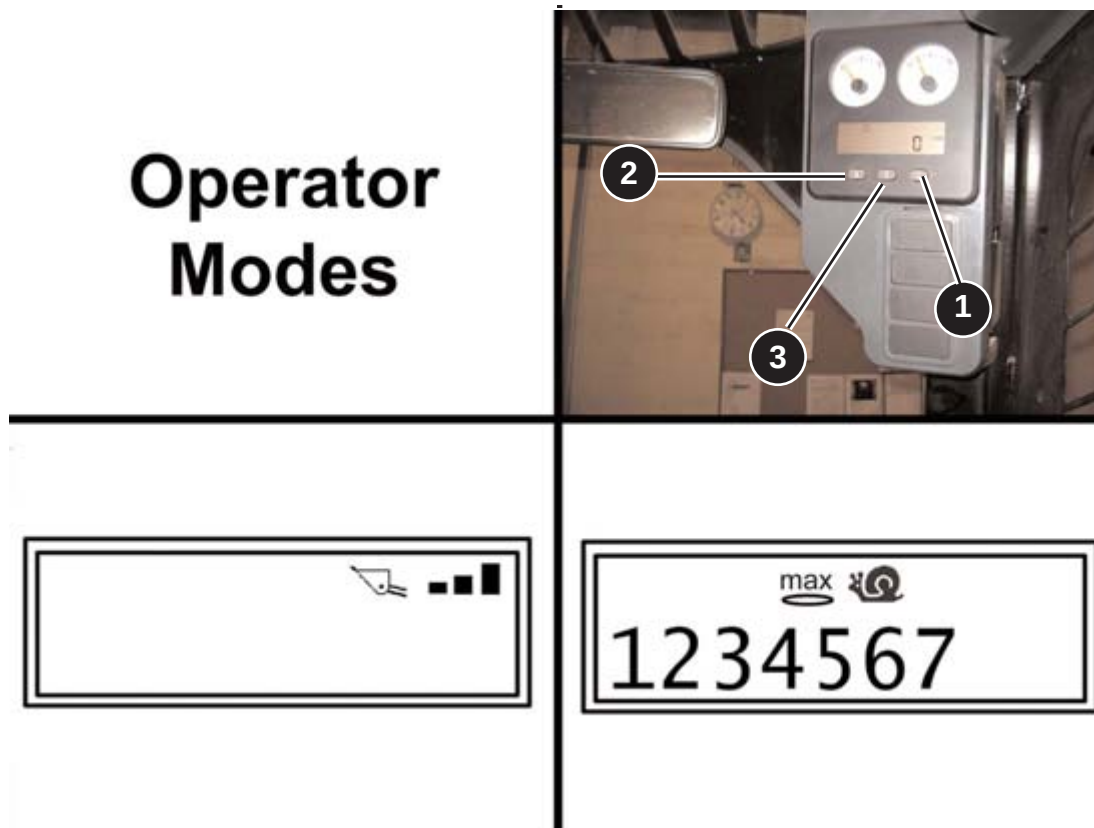
30

The optional Advanced Machine Information and Control System (AMICS) display panel includes a digital display panel (1) with a coolant temperature gauge (2) and a hydraulic oil temperature gauge (3). A digital display window (4) is used to display machine information.

The switches below the digital display panel include the beacon switch (5), the hazard flashers (6), the optional roading lights (7), and the optional turn signals (8).

The bottom illustration shows all the available icons that can be displayed on the digital display window.

NOTE: Not all icons displayed above are currently available for use.



The optional Advanced Machine Information and Control System (AMICS) display panel will show various machine information in three Operator Modes and eight Service Modes. The function selector key (1) is used to toggle between available modes. The scroll up key (2) and scroll down key (3) are used to toggle between screens or settings within a mode.

The three Operator Modes are:

- Mode 1 (Display Screen): displays basic machine information including engine speed (default start-up mode shown in the top right illustration), system voltage, and job clock.
- Mode 2 (Implement Control): displays the current lift and tilt function response setting (bottom left illustration). The three implement response settings are Fine Control, Medium Control, and Coarse Control. Fine control is one bar, medium control is two bars, and coarse control is three bars. The default setting is medium. Fine control provides a more precise implement response.
- Mode 3 (Creeper Control): displays the current creeper control setting (bottom right illustration). There are 10 creeper settings, which allow the maximum machine travel speed to be set between 5% and 100% of full speed.



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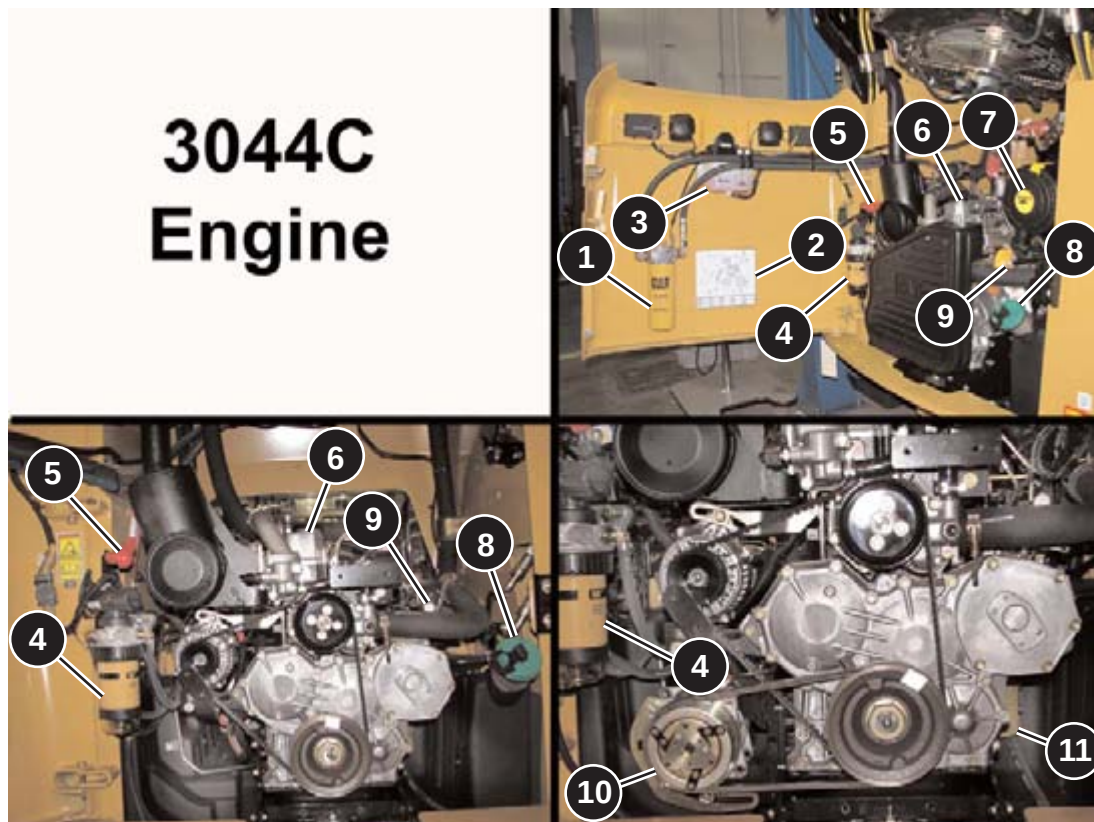
33

These illustrations show the display panel in the Service Mode. To display the Service Mode press and hold the function select key (1) and the scroll up key (2) for at least three seconds. The function select key allows navigation between modes and the arrows keys allow navigation within each mode. The eight Service Modes are:

- Mode 0 (Active Diagnostics): displays the active diagnostic codes. If no active faults are present the display will show "0 - 0" (top illustration). The bottom illustration shows an active diagnostic code.
- Mode 1 (Logged Diagnostics): displays the logged diagnostic codes.
- Mode 2 (Active Events): displays the active event codes.



- Mode 3 (Logged Events): displays the logged event codes.
- Mode 4 (Software P/N Machine): displays the currently installed Machine ECM software part number.
- Mode 5 (Machine Parameters): displays the engine coolant temperature, the hydraulic oil temperature, and the left and right drive motor speed and direction.
- Mode 6 (Component Status): displays the status of the throttle position, the joystick position, the parking brake switch, the backup alarm relay, the stop lamp relay, and the ride control status.
- Mode 7 (Units): allows the units to be set to Metric or English.



ENGINE

The 3044C engine is similar to the "B" Series machines. The engine ratings have been increased and an ATAAC has been added to the 272C and 297C machines to increase power. The bottom views show the front of the engine with the engine cover removed. The following components have new locations in the engine compartment:

- Hydraulic oil filter (1)
- Maintenance and lubrication points decal (2)
- Engine coolant reservoir (3)
- Fuel filter and priming pump (4)
- Jump start receptacle (5)
- Oil filler cap - (relocated from the front timing cover to the valve cover, (6)
- Air cleaner decal (7): A decal has been added to the air filter housing to ensure proper installation. The dust ejector must also be checked daily to ensure it is not plugged.



- Fuel tank and filler cap (8)
- Engine oil dipstick (9)
- Air conditioning compressor (10): The compressor has been moved into the engine compartment and is now driven by a belt.
- Engine oil filter (11)



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The oil filter (1) is now mounted vertically for improved serviceability. The "C" Series engine is equipped with an open breather system(2).



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An Air to air aftercooler (ATAAC) (1) has been added to the 272C Skid Steer Loader and the 297C Multi-Terrain Loader. The ATAAC housing (2) and hydraulic drive motor (3) for the ATAAC fan are located at the back of the engine compartment behind the cab. The ATAAC motor is driven by oil from the ATAAC pump (not shown) which is mounted to the charge pump.

The ATAAC fan forces air through the aftercooler and out the top of the engine compartment. Debris can be cleaned from the ATAAC by opening a panel (4) behind the cab.

Also located on the side of the ATAAC housing is the air conditioning condenser (where fitted).



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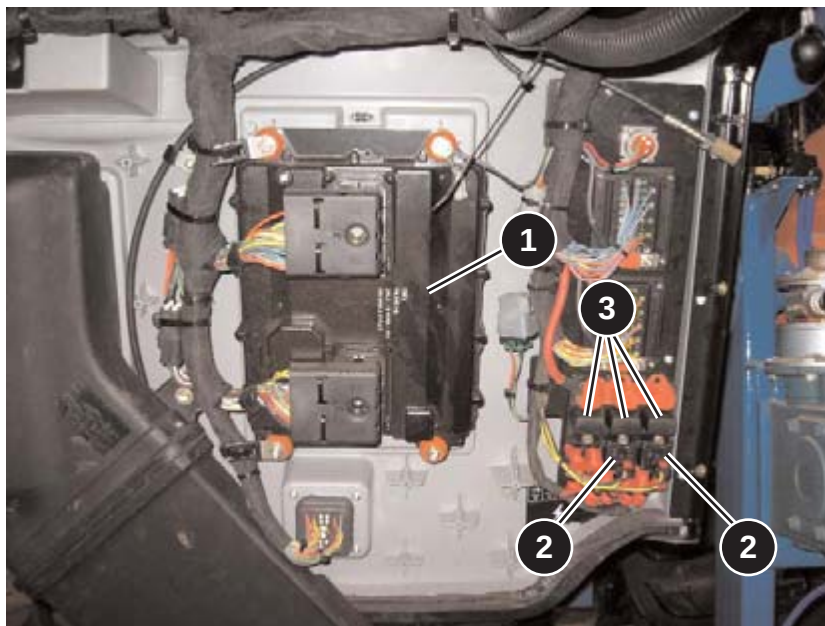
In cold weather, the glow plugs are powered by the Machine ECM through the cold start relay when the key start switch is turned to the ON position. The glow plug indicator (arrow) on the left overhead console will illuminate when the key start switch is turned on and go out when the engine is ready to start.

The ECM will monitor both the engine coolant temperature and the hydraulic oil temperature. If either temperature is below the preset value, the glow plugs will be activated.



ELECTRICAL SYSTEM

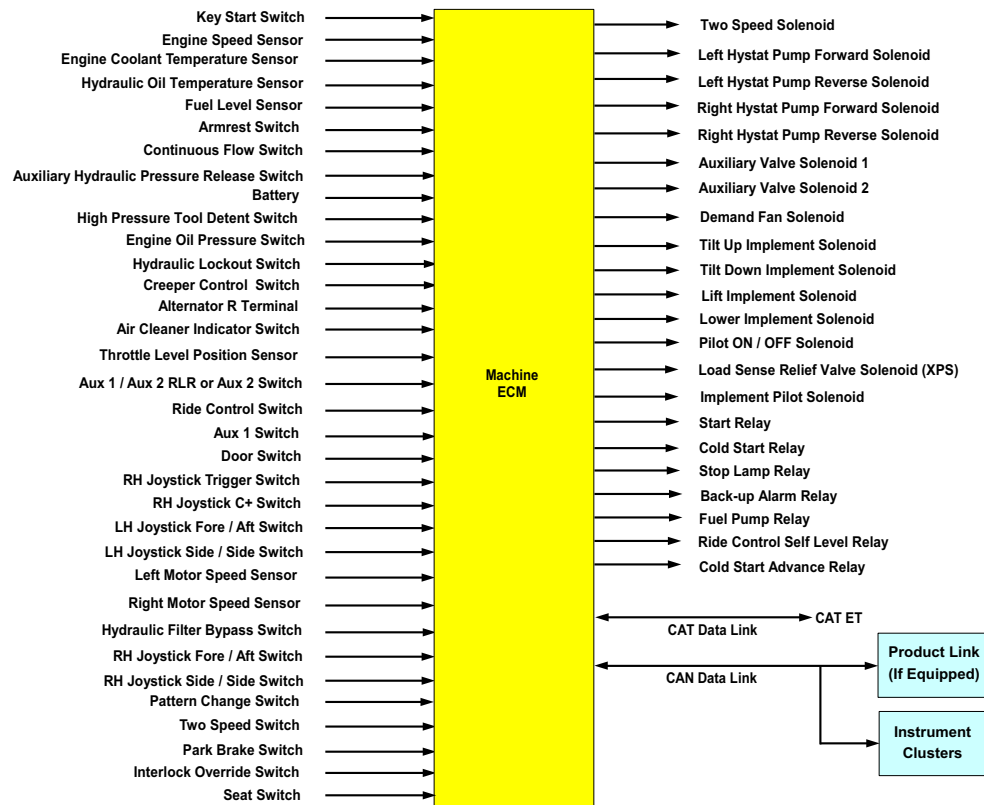
The battery (arrowed) has been relocated under the cab from the engine compartment. A remote jump start receptacle is located in the engine compartment as previously described.



The single Machine ECM (1) is located at the back of the cab. Two power relay modules (2) and six fuses (not visible) are also located behind the cab. The fuses are accessed by removing the fuse covers (3).

The Machine ECM is an A4:M1 ECM with two 70-pin connectors.

The Machine ECM on the "C" Series machines replaces the Operator Interlock ECM and Auxiliary Hydraulic ECM on the "B" Series machines.

MACHINE ECM INPUTS AND OUTPUTS

This illustration shows the Machine ECM inputs and outputs. There are several more machine functions that are controlled by the Machine ECM in the "C" Series machines.

The Machine ECM controls the following hydrostatic drive features:

- two-speed control
- Creeper control
- Joystick steering and speed control
- Neutral interlock
- Underspeed control
- Power management control
- Fault management control
- Uncommanded track movement detection



The Machine ECM controls the following work tool hydraulic system features:

- Auxiliary bleed off control
- Auxiliary tool control
- Bucket tilt control
- Lift arm raise/lower control
- Continuous flow control
- Interlock override control
- Joystick pattern changer
- Ride control

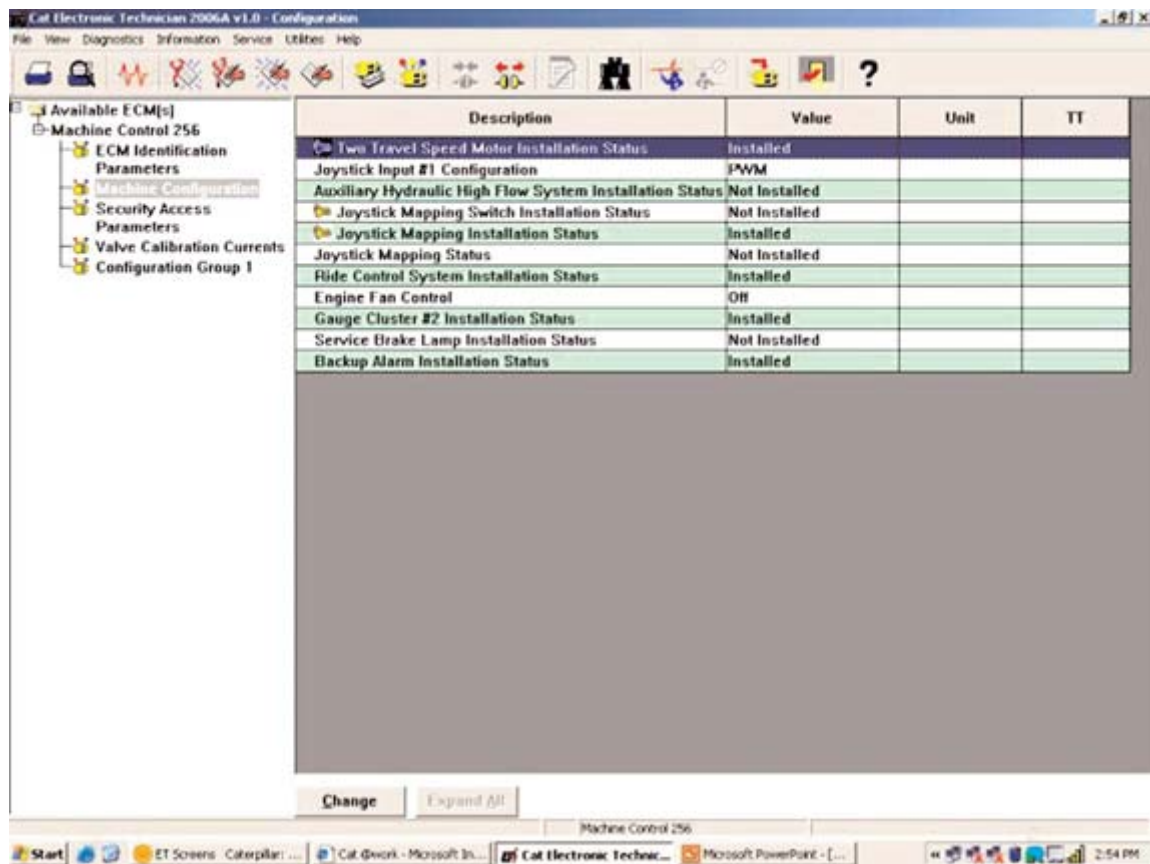
The Machine ECM controls the following machine system features:

- Engine start interlock
- Glow plug start control
- Hydraulic demand fan control

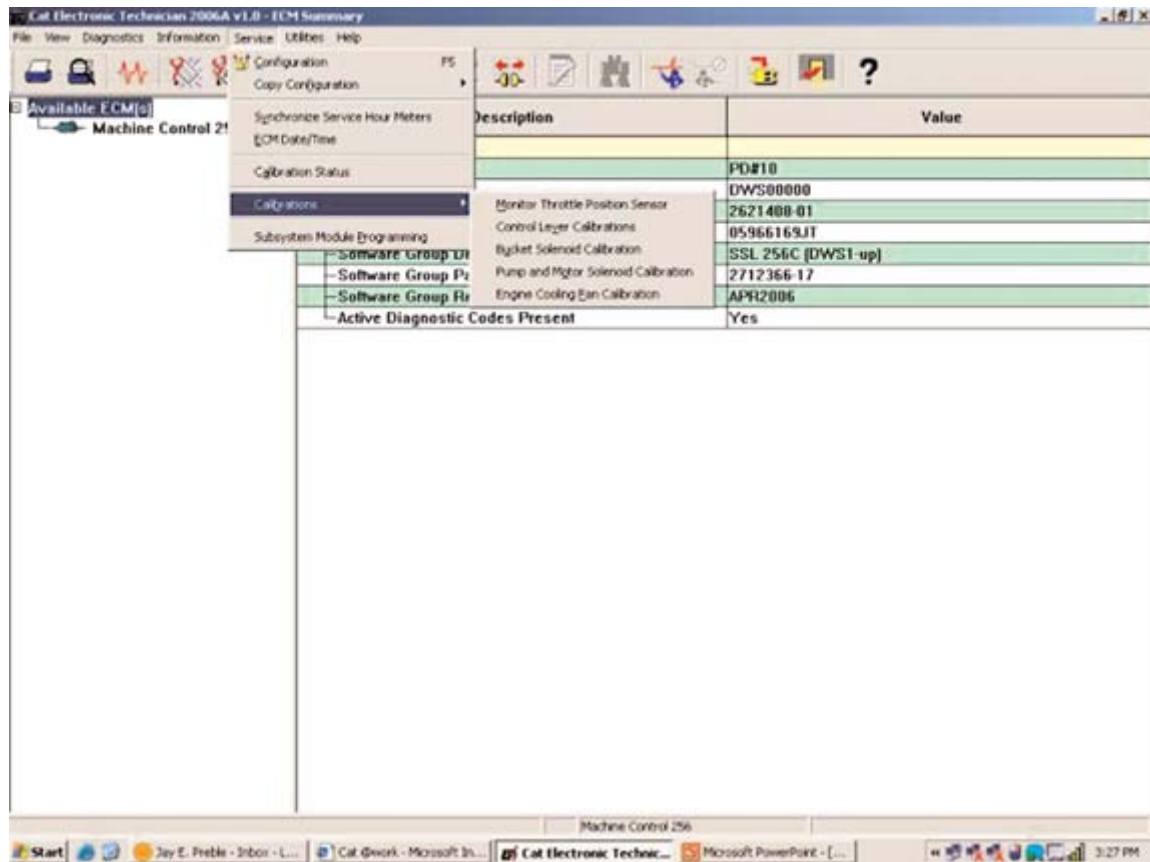
Description	Value	Unit	Min	Max	ECM
Engine Speed	972	RPM	0	1590	Machine Control 256
Engine Coolant Temperature	111	Deg F	102	111	Machine Control 256
Hydraulic Oil Temperature	82	Deg F	81	82	Machine Control 256
Hydraulic Filter Bypass Status	Filtering				Machine Control 256
Brake Lamp Driver	Unavailable Parameter				Machine Control 256
Backup Alarm	Off				Machine Control 256
Engine Cooling Fan Solenoid Current	Unavailable Parameter	Amps			Machine Control 256
Engine Fan Control	Off				Machine Control 256
Ride Control Switch	Off				Machine Control 256
Ride Control	Off				Machine Control 256
Ride Control System Installation Status	Installed				Machine Control 256

Cat ET can be used for configuring and diagnosing the "C" Series machines. This screen shows the Machine status screen. Several status screen are available to aid in troubleshooting Machine ECM controlled functions. The screens are:

- Machine
- Interlock
- Engine
- Hystat inputs
- Hystat outputs
- Hystat control
- Implement control
- Auxiliary hydraulics
- High flow
- Joystick

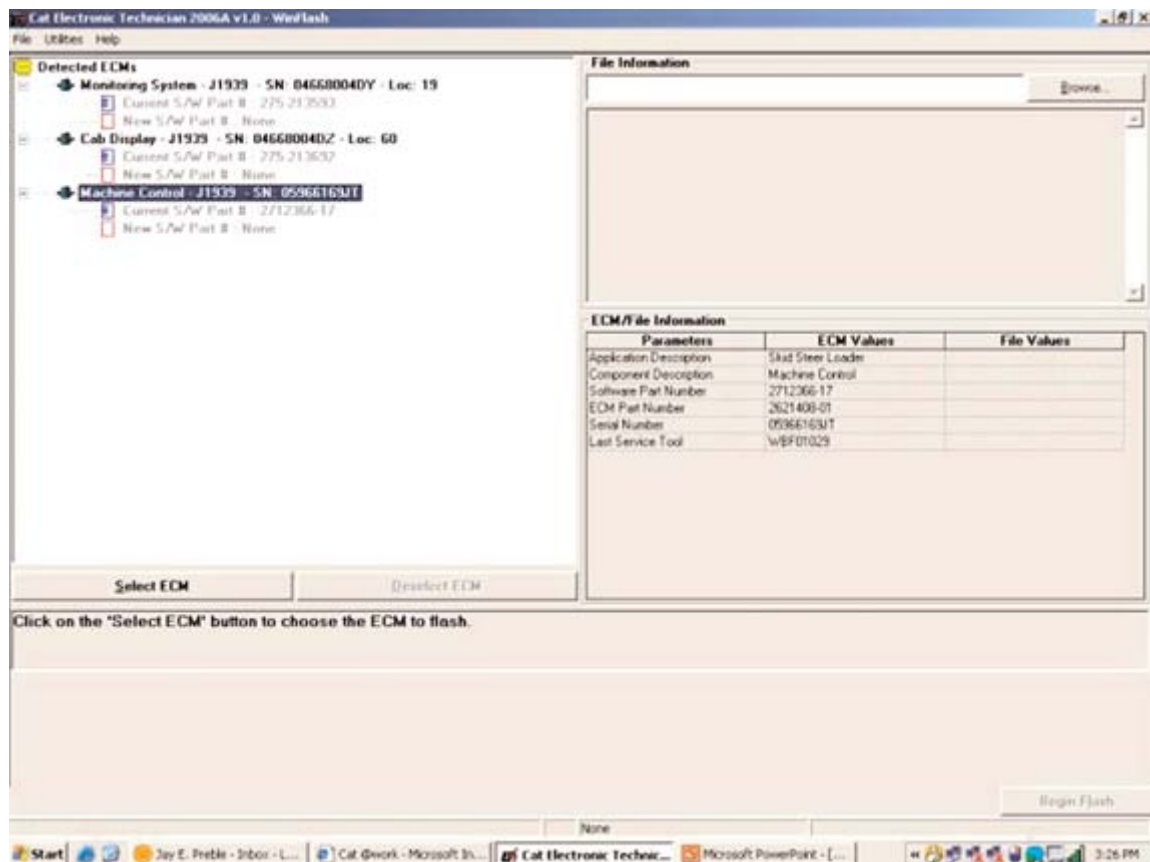


This illustration shows the machine Configuration screen. Several "C" Series machine features can be installed using the Configuration screen.



The following components can be calibrated using Cat ET:

- Throttle position sensor
- Joystick control levers
- Work tool hydraulic system solenoids
- Hystat pump solenoids
- Demand fan solenoid



The Machine ECM, left console display, and right console display can all be flashed using the Cat ET WinFlash program.

MACHINE ECM INPUTS AND OUTPUTS**Interlock Strategy**

The interlock strategy is similar to the "B" Series machines, but is now controlled by the Machine ECM. This illustration shows the input and output components (red) used to control the interlock function.

The Machine ECM prohibits the engine from starting and de-energizes the pilot ON/OFF solenoid valve and the implement pilot shutoff solenoid valve until certain conditions are met. The Machine ECM disables the work tool hydraulic system until the operator is seated with the armrest down, the door closed, the hydraulic lockout switch off, and the park brake released.

The Machine ECM reads the input signals from various switches on the machine. The armrest switch is a normally open switch located at the hinge point for the left armrest. The armrest switch closes when the left armrest is lowered. The seat switch is a normally open switch that is located below the operator's seat. The seat switch closes when the operator is seated in the seat. The door switch is a normally open switch located on the inside of the door. The door switch closes when the door is closed.



The Machine ECM determines operator requests from input signals from the key start switch, the park brake switch, and the hydraulic lockout switch.

The Machine ECM controls engagement of the starter motor. The start relay is powered by the Machine ECM when the following inputs are seen: the key start switch, the armrest switch, and the seat switch.

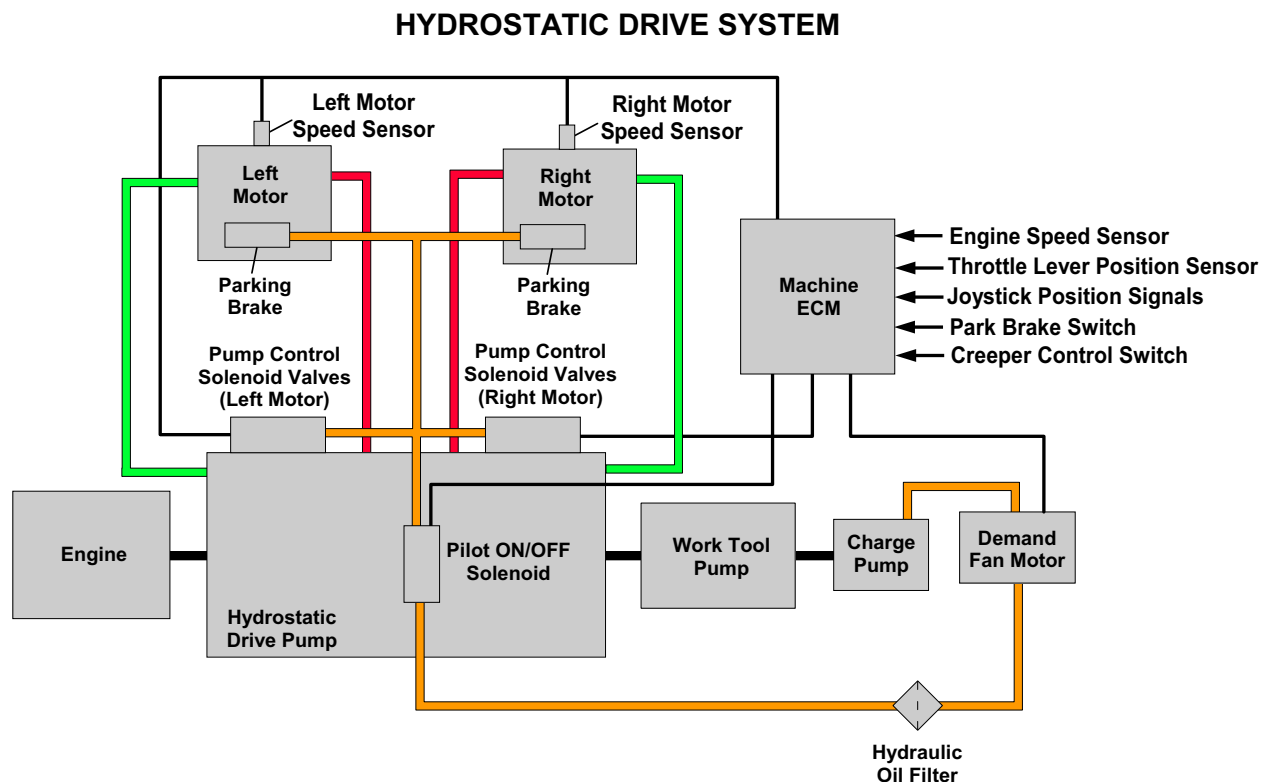
An open circuit on the key start switch input disables machine starting. A short to ground on the key switch input blows a fuse, disabling machine starting. A short to battery on the key start switch input causes the start relay to be continuously energized as long as the armrest switch and seat switch remain in the closed position.

An open circuit or short to ground to the start relay disables machine starting. Shorts to battery in the start relay circuit cause the start relay to be continuously energized, resulting in starter motor damage.

The implement pilot shutoff solenoid and park brake solenoid are energized by the Machine ECM when the park brake switch is depressed. Once energized, the implement pilot shutoff solenoid will not be disabled with the park brake switch.

NOTE: *If the selectable pattern switch is installed, a pattern (1 or 2) must be chosen before the park brake can be released.*

The work tool hydraulic system can be disabled independently of the travel system by depressing the optional hydraulic lockout switch or by opening the operator's compartment door. The implement pilot shutoff solenoid remains energized as long as the hydraulic lockout switch and the door switch remain closed to ground. Opening either of the switches causes the ECM to disable the solenoids. The implement pilot shutoff solenoid is re-energized when the hydraulic lockout switch and the door switch are closed to ground.



POWER TRAIN

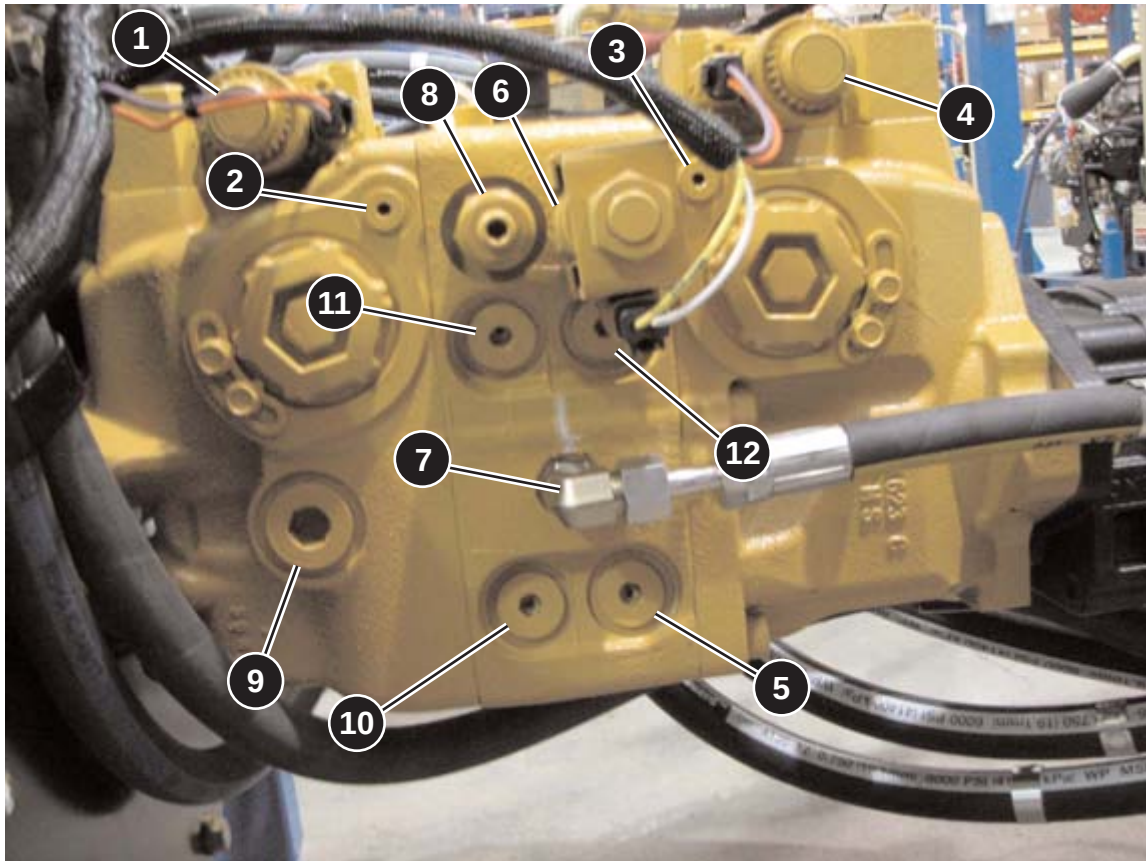
The hydrostatic drive system is now electronically controlled by the Machine ECM through four pump control solenoids. The joysticks send a signal to the ECM when moved by the operator. The ECM sends corresponding signals to the pump control solenoid valves, which control pump output flow to the travel motors.

Each motor includes a speed sensor for the feedback signal to Machine ECM. The ECM also receives input from the engine speed sensor and the throttle lever position sensor to control the underspeed function. The speed sensing valve has been eliminated.

The travel pilot solenoid and park brake solenoid have been eliminated and replaced by the travel pilot ON/OFF solenoid valve located on the hydrostatic pump. The park brake switch sends a signal to the ECM to control the park brake function.

The creeper switch sends a signal to the Machine ECM, which allows the operator to select a maximum machine travel speed at full joystick movement.

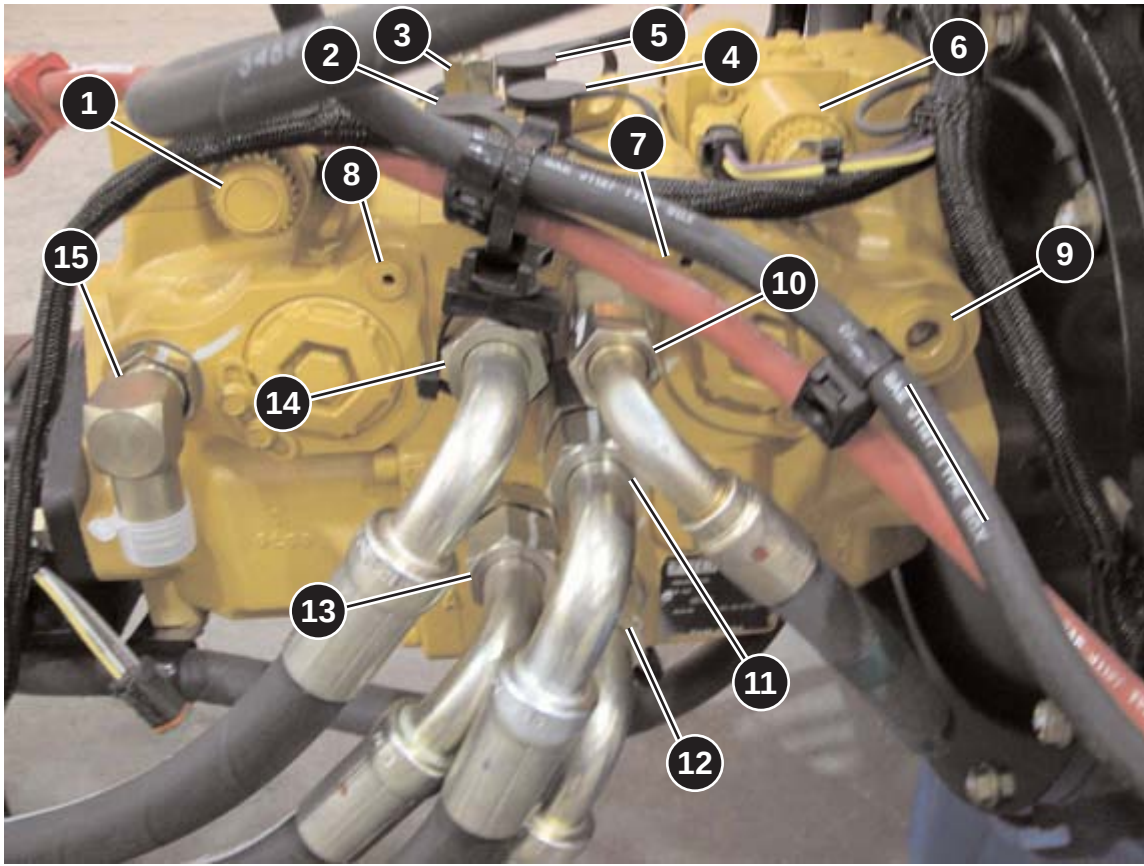
A two-speed valve is also located on the pump if the machine is equipped with the optional two-speed motors.



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This illustration shows the right side of the hydrostatic pump. From this side of the pump the following components are visible:

- Left motor reverse pump solenoid (1)
- Left motor servo pressure port (2)
- Right motor servo pressure port (3)
- Right motor reverse pump solenoid (4)
- Right reverse crossover relief and makeup valve (5)
- Pilot ON/OFF solenoid valve (6)
- Charge oil to implement pilot shutoff valve (7)
- Charge relief valve (8)
- Case drain port (9)
- Left reverse crossover relief and makeup valve (10)
- Left forward crossover relief and makeup valve (11)
- Right forward crossover relief and makeup valve (12)



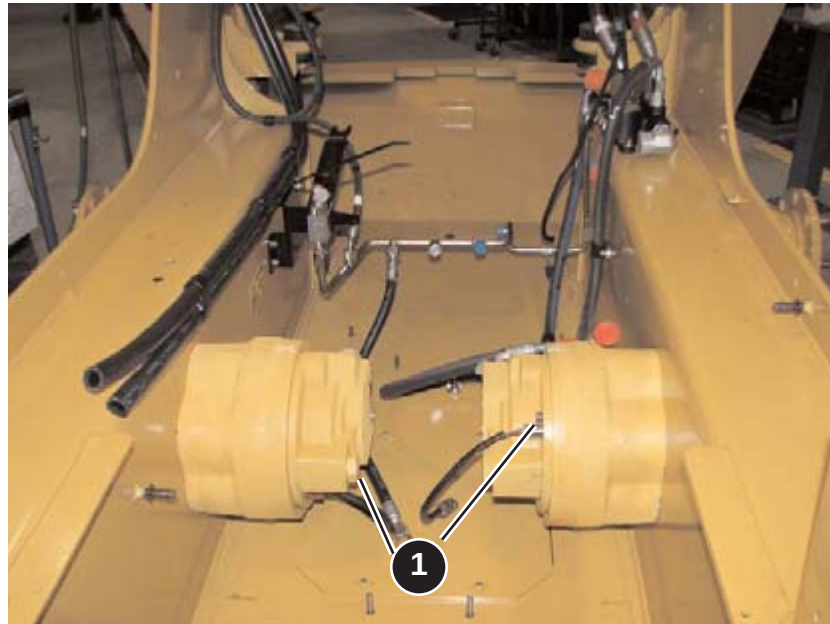
49

This illustration shows the left side of the hydrostatic pump. From this side of the pump the following components are visible:

- Right forward pump solenoid (1)
- Right forward drive loop port (MC) (2)
- Brake supply port (3)
- Left forward drive loop port (MB) (4)
- Charge pressure tap (5)
- Left forward pump solenoid (6)
- Left motor servo pressure port (7)
- Right motor servo pressure port (8)
- Case drain port (9)



- Charge oil inlet port (10)
- Left forward travel drive loop port (11)
- Left reverse travel drive loop port (12)
- Right reverse travel drive loop port (13)
- Right forward travel drive loop port (14)
- Case drain port (15)



50

The SSL travel drive motors are radial piston motors with a similar type of design as the "B" Series machines. The brakes are spring engaged and hydraulically released. The MTL drive motors are axial piston motors

Each hydrostatic drive motor contains a flushing valve. The flushing valve maintains a minimum system pressure as it drains some oil from the low pressure side of the drive loop. The pump crossover relief valves help supply the makeup oil that the flushing valve drains.

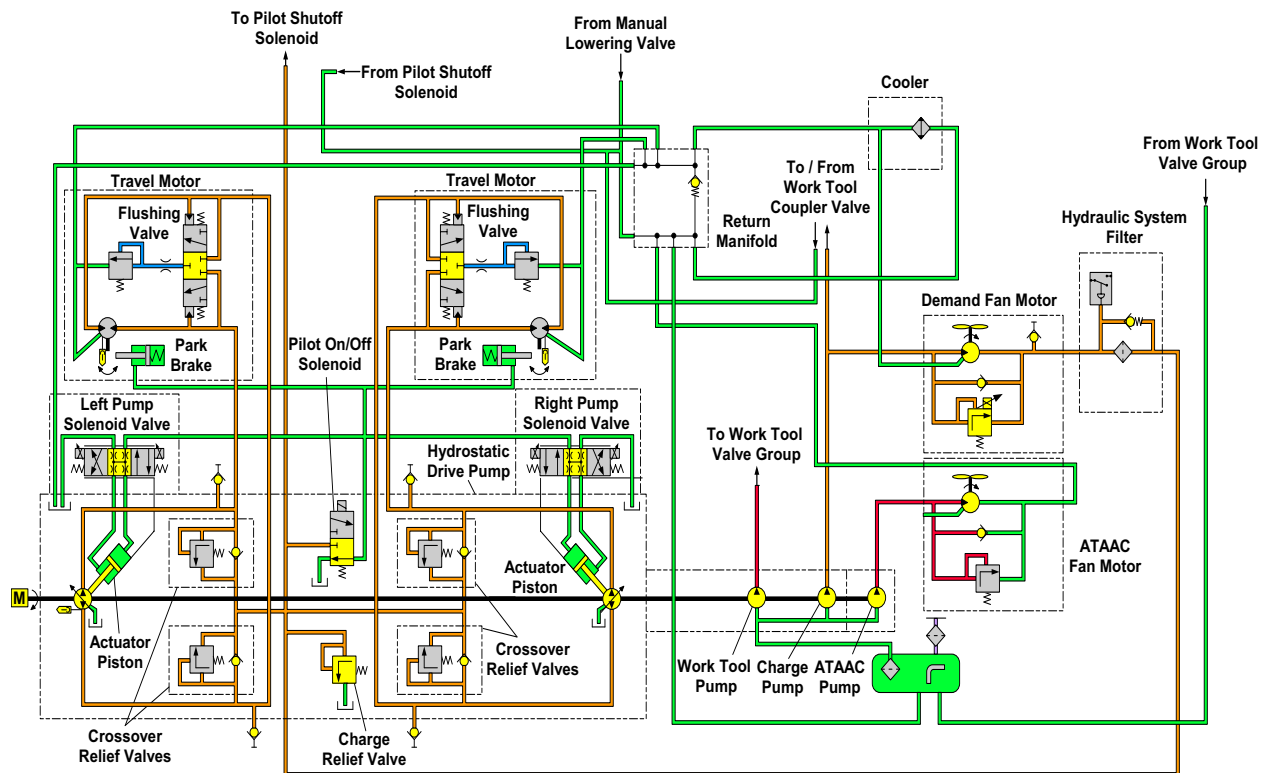
As the oil flows to the case drain, heat and any contamination is purged from the drive loop.

The "C" Series travel motors each contain a speed sensor (1) that send a speed signal to the Machine ECM indicating motor speed and direction.

A two-speed travel system is optional on all machines. The SSL two-speed travel motor contains additional spools and passages which force the motor to spin faster for the same flow rate to control flow from the pump. The MTL two-speed travel motors utilize a swashplate to control the flow to achieve the same end result.

A two-speed solenoid is mounted below the hydrostatic drive pump. The two-speed solenoid valve is used to shift the travel motor control spool.

HYDROSTATIC DRIVE SYSTEM PARK BRAKE APPLIED



This illustration shows the "C" Series machines hydrostatic drive hydraulic system in the HOLD position.

The charge pump sends oil through the demand fan motor and hydraulic oil filter to the charge pump relief valve, the crossover relief and makeup valves, the park brake solenoid valve, the two-speed solenoid valve (if equipped), and the implement pilot shutoff valve.

When the engine is started, the pilot ON/OFF solenoid is de-energized. The solenoid valve directs oil to drain and the park brakes are engaged by spring force. When the operator depresses the park brake switch, a signal is sent to the Machine ECM. The ECM energizes the Pilot ON/OFF solenoid. The solenoid valve directs oil to the park brake piston and the pump control solenoid valves. Charge oil acts against spring force to release the park brakes.

The pump solenoid valves control charge oil to the actuator pistons upon command of the Machine ECM. The actuator pistons control the swashplates. The angle of the swashplates control the amount of oil and the direction of oil flow from the pump to the motors.



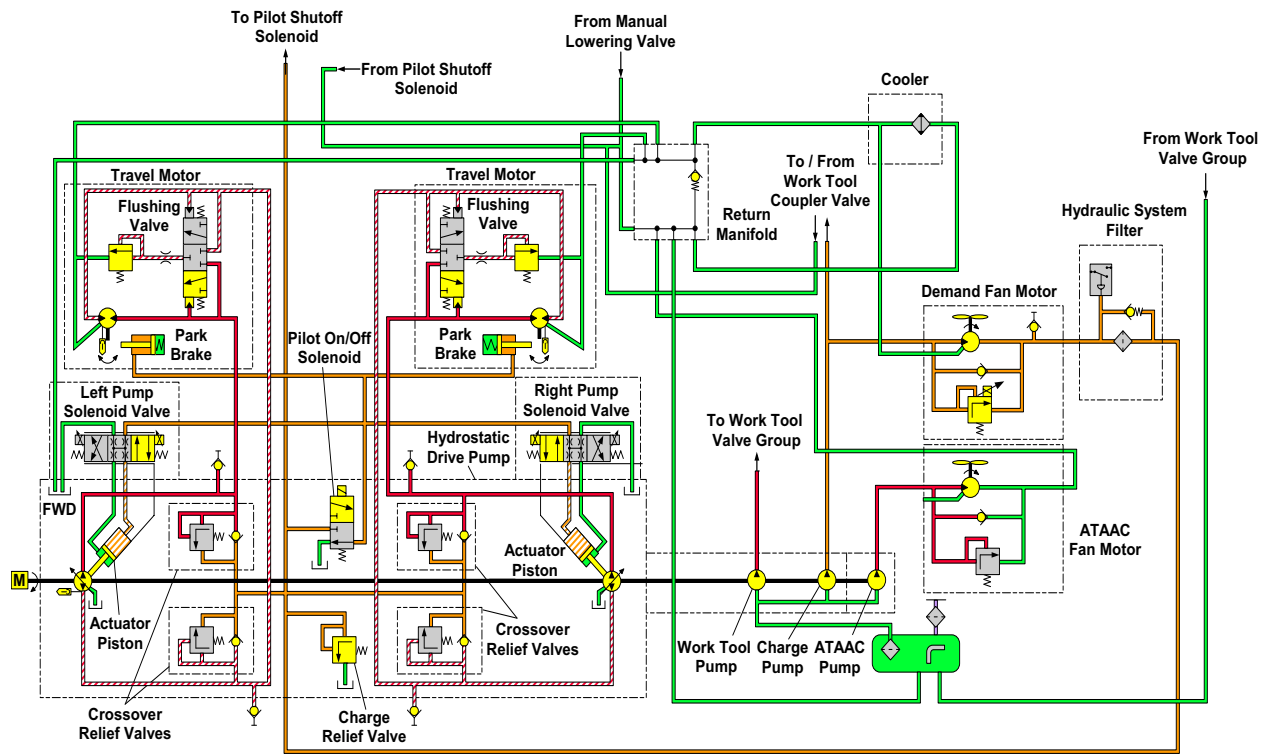
In HOLD, the speed and direction control lever is centered. No signal is sent from the control lever to the Machine ECM. The pump control valves are held in the center position by spring force and no pressure oil is directed to the actuator pistons. With no signal pressure oil to either end of the actuator pistons, the pistons stay in the centered or neutral position.

The centering springs for the actuator pistons hold the swashplates at zero angle. With the swashplates in this position, the hydrostatic drive pump group does not produce oil flow. Without output from the hydrostatic drive pump group to turn the drive motors, the machine does not move.

The crossover relief and makeup valves protect the system by either maintaining a minimum drive loop pressure or reducing pressure spikes in the drive loops. At machine start-up, the makeup valves open to direct charge oil to both sides of the pump and motor. The oil in both lines to the drive motors are approximately at charge pressure.

The main purpose of the travel motor flushing valve is to drain used hot oil from the low pressure side of the drive loop to case drain, which purges heat and contamination from the drive loop. The relief valve in the flushing valve also controls the minimum pressure in the low pressure side drive loop when the machine moves.

HYDROSTATIC DRIVE SYSTEM FORWARD



This illustration shows the conditions that are present when the speed and direction lever is moved to the FORWARD position.

As the speed and direction lever is moved forward, a signal is sent to the Machine ECM. The ECM sends corresponding signals to the right and left pump forward solenoids. The pump solenoid valves direct signal pressure to the actuator pistons.

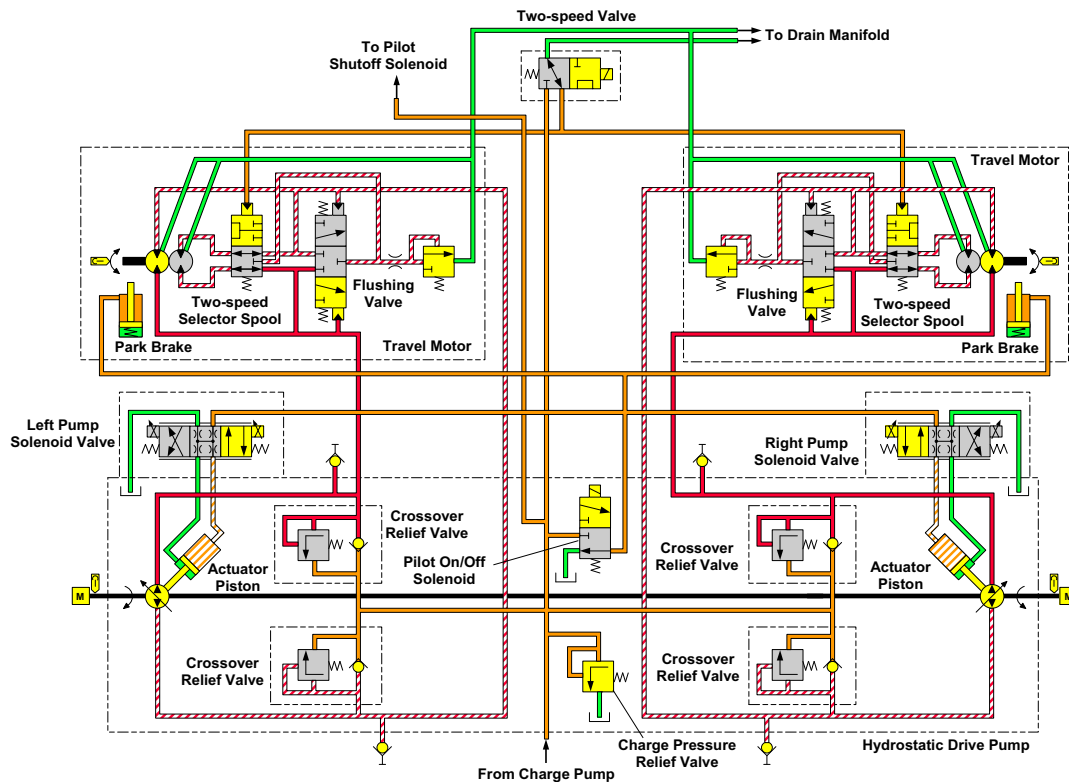
The Machine ECM receives feedback signals from the travel motor speeds sensors. The ECM processes the speed signals and sends the appropriate signals to the right and left pump forward solenoids to precisely control machine ground speed.

For FORWARD, the oil flows to the end of both actuator pistons. The magnitude of the Machine ECM signal to the right and left pump forward solenoids determines the signal pressure oil at the actuator piston and how far the actuator pistons move.



The signal pressure oil at the actuator pistons moves the swashplates to the forward position. As the swashplates move, pump output flow increases and is sent to the drive motors. The oil from the pump also flows to the top of the flushing valve and moves it down. With the flushing valve moved, oil from the low pressure side of the drive motors flows through the flushing valve and the relief valve back to the return manifold.

With no restrictions in the drive motor loop, the oil flow causes the drive motors to rotate, and the machine moves FORWARD.

**TWO-SPEED SSL HYDROSTATIC DRIVE SYSTEM
RABBIT MODE / FORWARD**

This illustration shows the "C" Series SSL machines hydrostatic drive pump and motors with the two-speed option in the Forward/Rabbit Mode position.

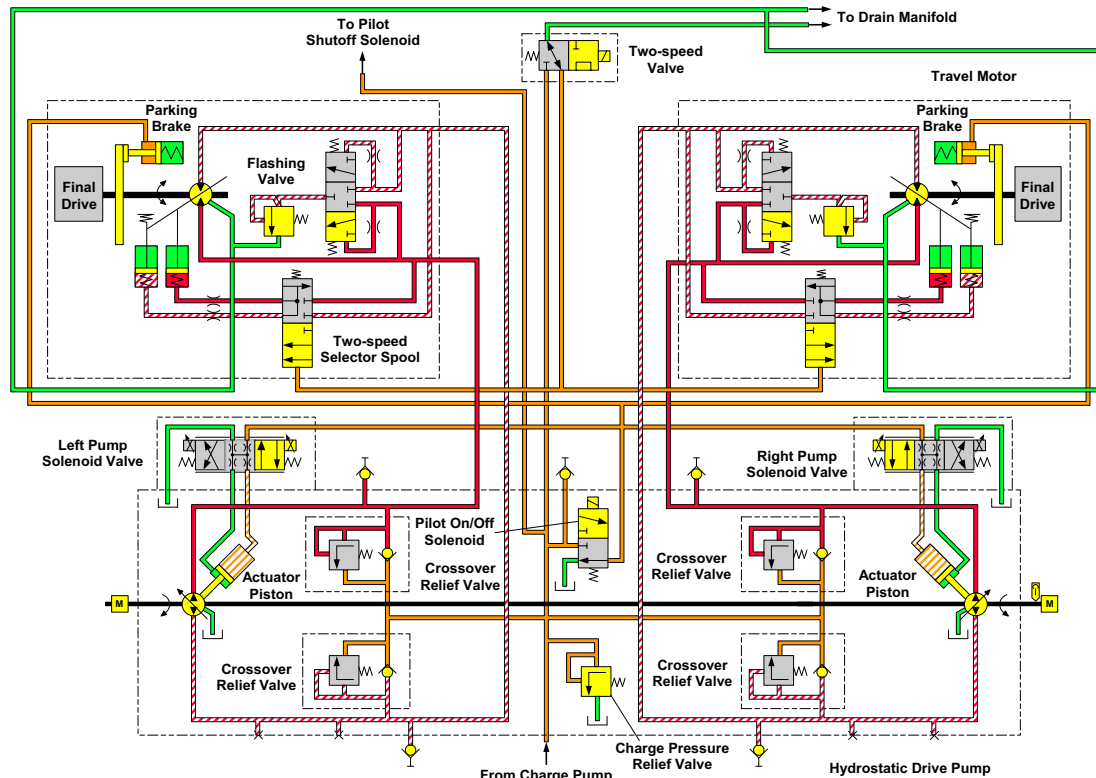
The two-speed solenoid valve is used to direct charge oil to shift the two-speed selector spool, which controls oil flow from the hydrostatic pump to half of the travel motor pistons.

NOTE: The schematic shows two motor symbols in each motor. Each motor symbol represents half of the pistons in the motor.

The travel motor is a radial-piston type motor. Two sets of passages direct flow to and from the hydrostatic pump to the motor pistons. On the "C" Series Skid Steer Loaders half of the oil flow passages are blocked.

In Turtle Mode, pump operation is identical to the standard hydrostatic drive system and the two-speed travel motor operates the same as the standard travel motor. The two-speed solenoid is de-energized and oil flows past the two-speed selector spool.



TWO-SPEED MTL HYDROSTATIC DRIVE SYSTEM
RABBIT MODE / FORWARD

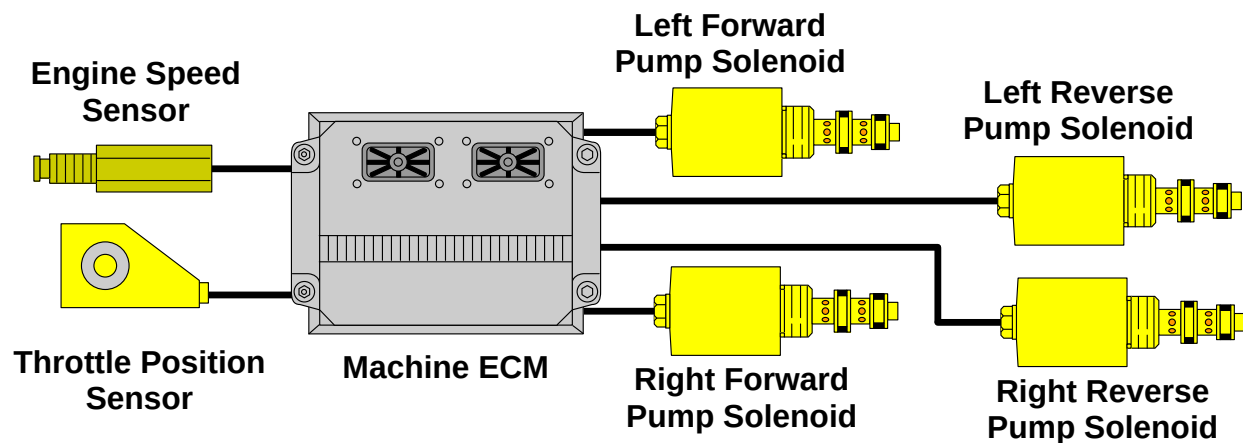
To activate Rabbit Mode, the operator must select Rabbit Mode on the multifunction switch located on the left overhead console and then press the left joystick trigger switch on the front of the speed and direction lever. The multifunction switch and trigger switch signal the Machine ECM, which energizes the two-speed solenoid.

The two-speed solenoid valve directs charge oil to shift the two-speed selector spool. The two-speed selector spool blocks oil flow from the hydrostatic pump to half of the travel motor oil flow passages.. The travel motor speed increases due to the decreased displacement of the travel motor. The charge oil keeps the pistons seated, avoiding wear.

The default state for the two-speed travel system is Turtle Mode. The Machine ECM returns the machine to Turtle Mode whenever the machine is turned off.

The MTL drive motor is an axial piston motor design utilizing a planetary final drive. With the two-speed option enabled, a two-speed valve shifts a two-speed selector spool which varies the angle of the swashplate, therefore increasing motor speed accordingly.

ELECTRONIC CONTROL SYSTEM ENGINE UNDERSPEED FUNCTION



This illustration shows the components used to control the machine underspeed function.

The underspeed function of the Machine ECM senses the increase and decrease in the engine speed caused by the total load on the machine. The underspeed function distributes the available engine power between the requirements of the hydrostatic drive system and implement hydraulic system. When the underspeed function is needed, the Machine ECM will automatically signal the appropriate pump control solenoids to decrease or increase the hydrostatic pump displacement.

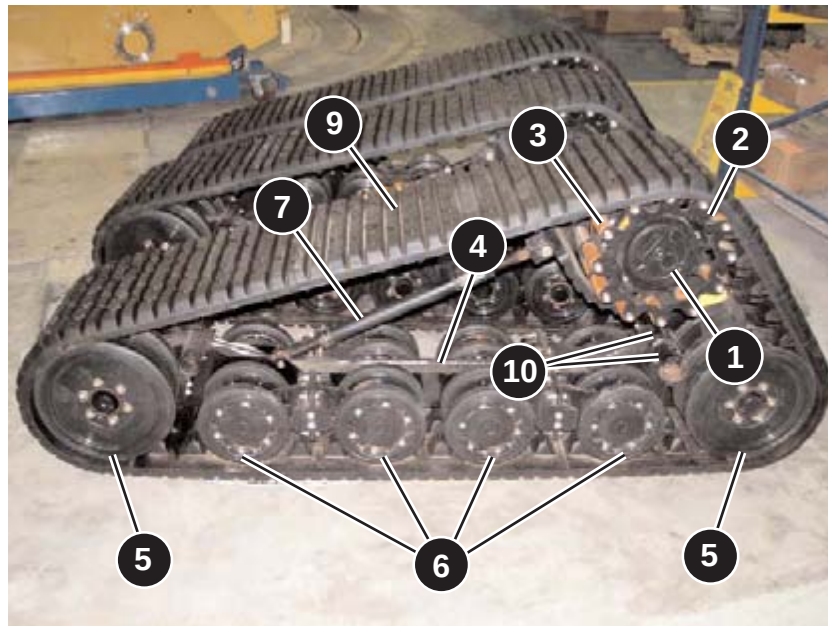
The Machine ECM uses the engine speed sensor and the throttle lever position sensor to perform the underspeed function. The Machine ECM determines desired engine speed by reading the signal from the throttle position sensor. The ECM determines actual engine speed by reading the signal from the engine speed sensor.

If the engine speed is too low, the Machine ECM decreases the the hydrostatic pump displacement as necessary to reduce the power demand and keep the engine from stalling.

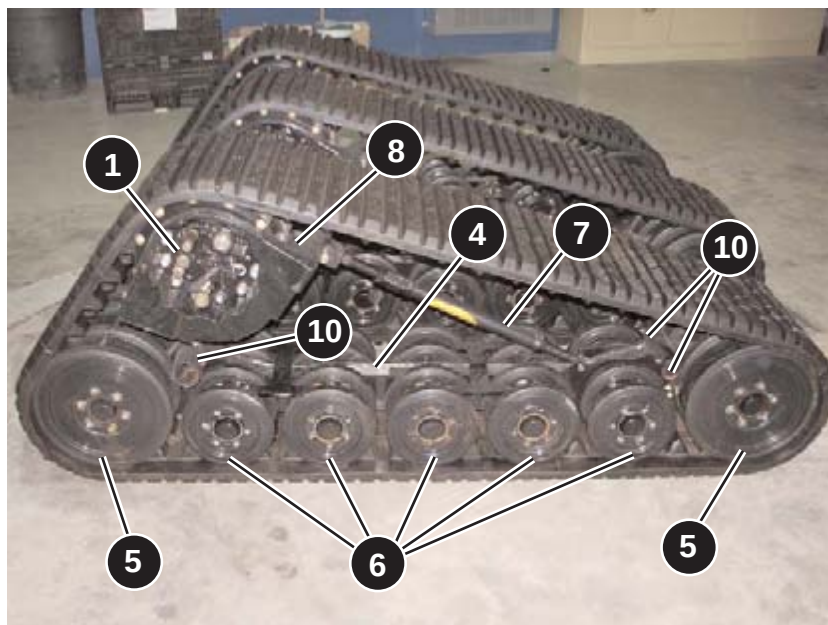


When a travel mode is selected and the engine speed is increased, the Machine ECM increases the signal to the pump control solenoid valves. This action results in higher speed once the speed and direction lever is moved.

When the machine decelerates, the travel motor speed sensors send a signal to the ECM indicating a decrease in ground speed. The ECM sends a corresponding signal to de-energize the pump control solenoids. Also, the charge pump sends less oil flow to the pump control solenoid valves. With a decreased Machine ECM signal to the pump control solenoid valves and less charge pump oil flow to the solenoid valves, the hydrostatic pump begins to destroke. This action also prevents engine lug.



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Two types of undercarriages are available on the "C" Series Multi-Terrain Loaders. The top illustration shows the Dual Level Suspension (DLS). The bottom illustration shows the Single Level Suspension (SLS).

The Dual Level Suspension uses flexible torsional axles with pivoting bogie wheels, which allows each undercarriage roller assembly to flex independently for smoother travel.

Each undercarriage assembly consists of a hydrostatic axial piston motor (1) which has the drive sprocket assembly (2) attached to it. The sprocket assembly can be removed as a unit to service the roller sleeves or rings (3).



The hydrostatic motor requires an oil change after the first 250 service hours and every subsequent 500 service hours.

The roller frame assembly (4) supports the front and rear idler wheels (5) and the bogie wheels (6).

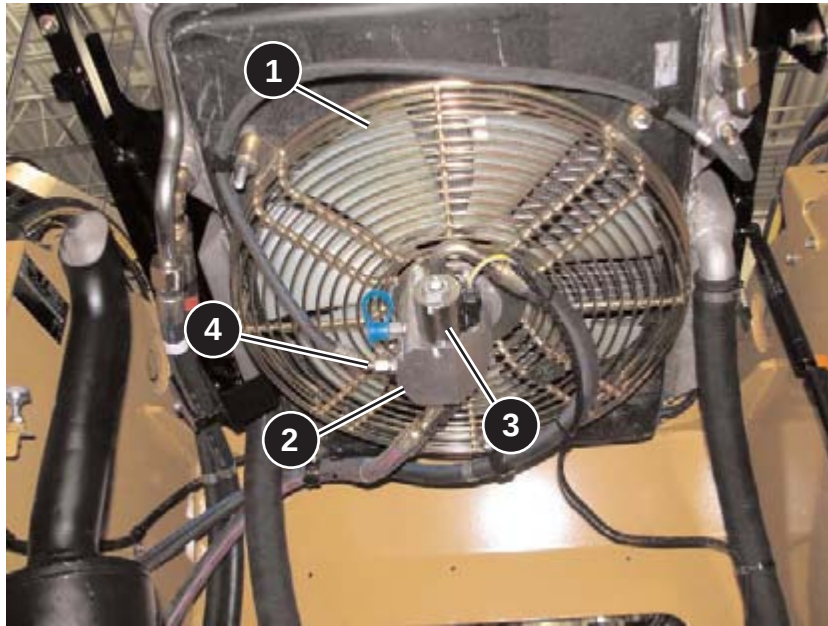
The tensioner (7) allows adjustment of the track tension. As the hydrostatic piston motor support structure (drive table) (8) rotates, the drive sprocket group rotates engaging the triple row of lugs on the track (9).

An extra (third) row of drive lugs and an extra (third) row of rollers has been added to the sprocket assembly on the "C" Series machines. Also, a extra (fourth) row of bogie wheels has been added to the "C" Series machines

Grease fittings (10) (2 front/2 rear) are located on the front and rear torsion axle tubes of the undercarriage.

***Note:** Grease fittings are located at the front and at the rear of both the DLS and SLS undercarriage. Not all grease fittings are visible in the illustrations.*

The undercarriage area is more open which aids cleaning and does not retain dirt and debris



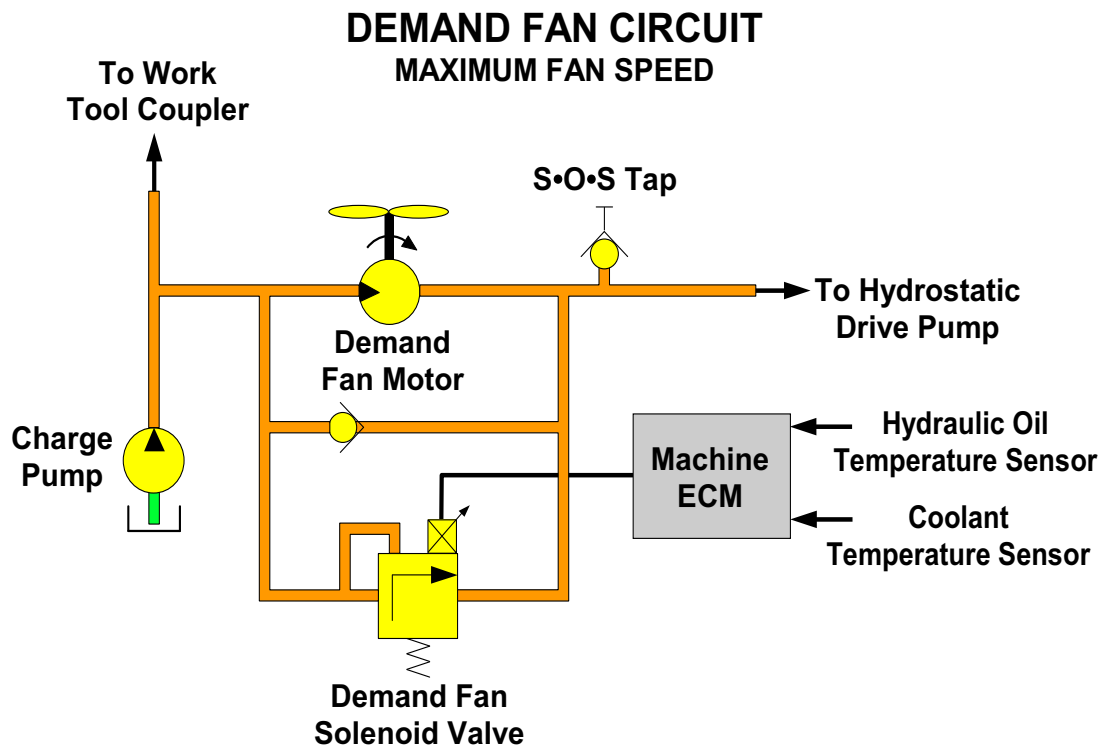
58

The fan (1) and fan motor (2) are located in the rear compartment. The fan provides cooling air for the radiator and hydraulic oil cooler. The fan motor receives oil flow from the charge pump to drive the fan.

The "C" Series machines are equipped with a demand fan, which is standard on all machines. Fan speed is controlled by the Machine ECM through a solenoid (3) on the fan motor. The demand fan solenoid regulates the amount of oil flow supplied to the fan motor and also acts as a relief valve for the fan circuit at high engine speeds.

The Machine ECM controls the fan speed based on signals from the coolant temperature sensor and the hydraulic oil temperature sensor.

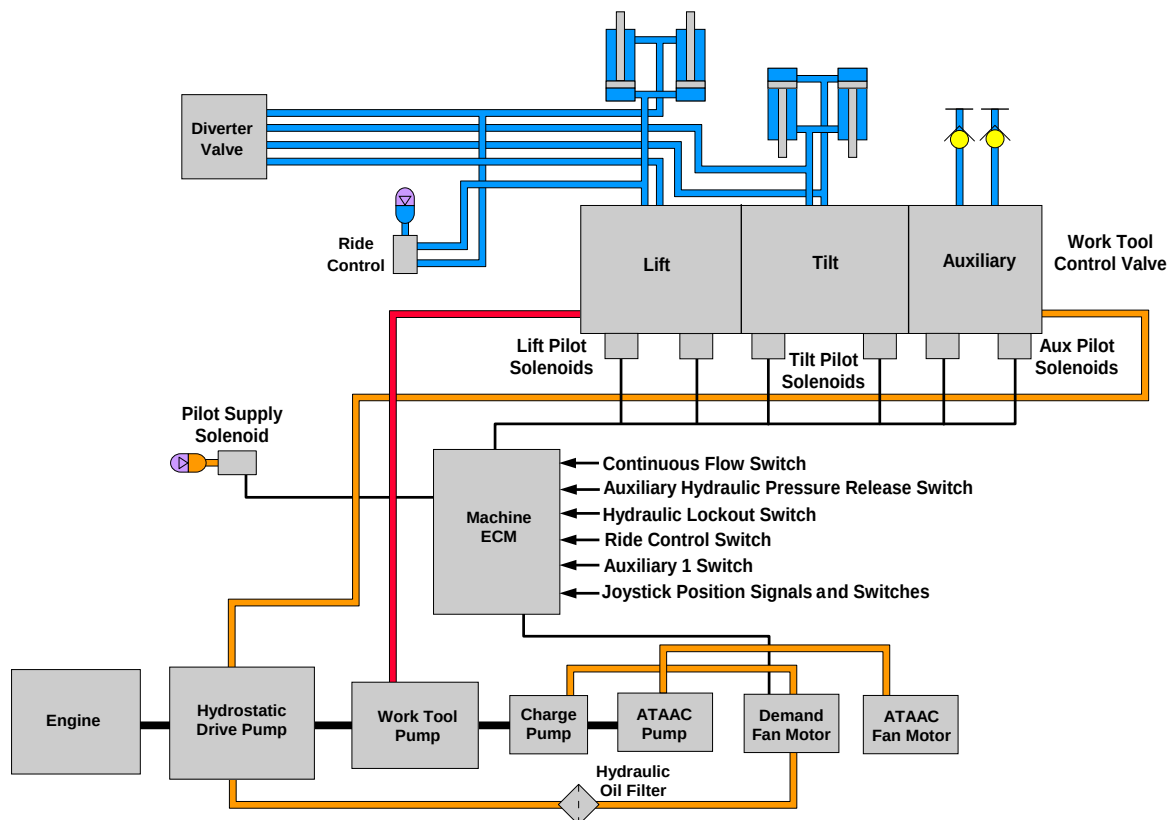
The hydraulic oil sampling port (4) is located on the fan motor.



Oil from the charge pump flows to the demand fan motor. The demand fan solenoid regulates the amount of oil flow supplied to the fan motor and also acts as a relief valve for the fan circuit at high engine speeds. Oil from the fan motor flows through the hydraulic oil filter to the hydrostatic drive pump..

The machine ECM will send a proportional current signal to the solenoid valve to increase or decrease fan speed based on signals from the hydraulic oil temperature sensor and coolant temperature sensor. If the machine ECM senses that either of the input signals are absent, it will then close the valve fully, allowing the cooling fan to run at maximum speed.

WORK TOOL HYDRAULIC SYSTEM



WORK TOOL HYDRAULIC SYSTEM

The work tool hydraulic system is now electronically controlled by the Machine ECM through the lift, tilt, and auxiliary solenoid valves. The joysticks send a signal to the ECM when moved by the operator. The ECM sends corresponding signals to the solenoid valves, which control the position of the lift, tilt, and auxiliary directional spools.

The work tool control valve internal hydraulic components are very similar to the "B" Series machines.

A pilot shutoff solenoid valve replaces the work tool pilot solenoid.

The electronically controlled auxiliary function is the same as the "B" Series machine.

The ride control system is new to the "C" Series machines and operates similar to Caterpillar wheel loaders.

The work tool self level option is the same as the "B" Series machines.

The XPS High Flow Hydraulic System is now optional on all "C" Series machines.

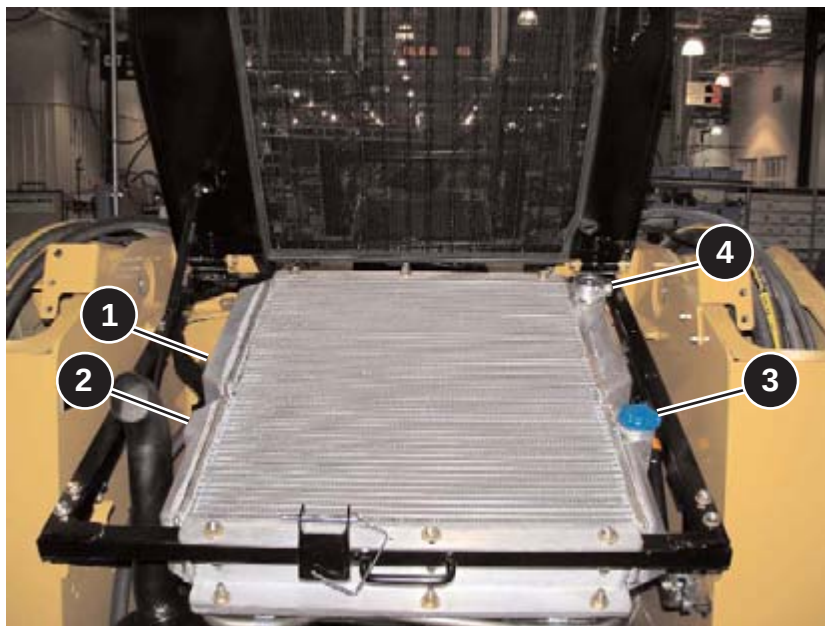


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The hydraulic tank includes a new breather (1) at the top of tank that is serviceable. The tank will have a hydraulic oil level sight glass (2) on the side of tank that is more visible from the right side of the machine.

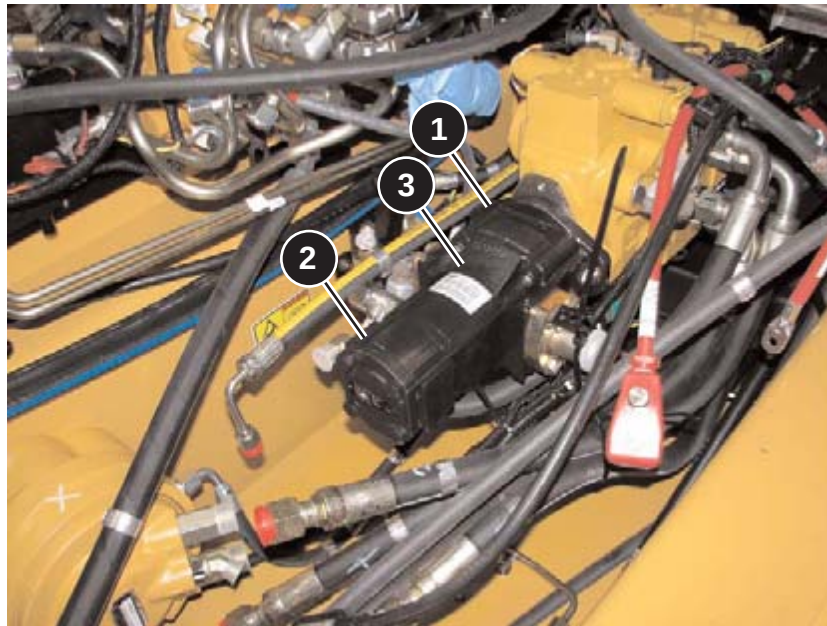


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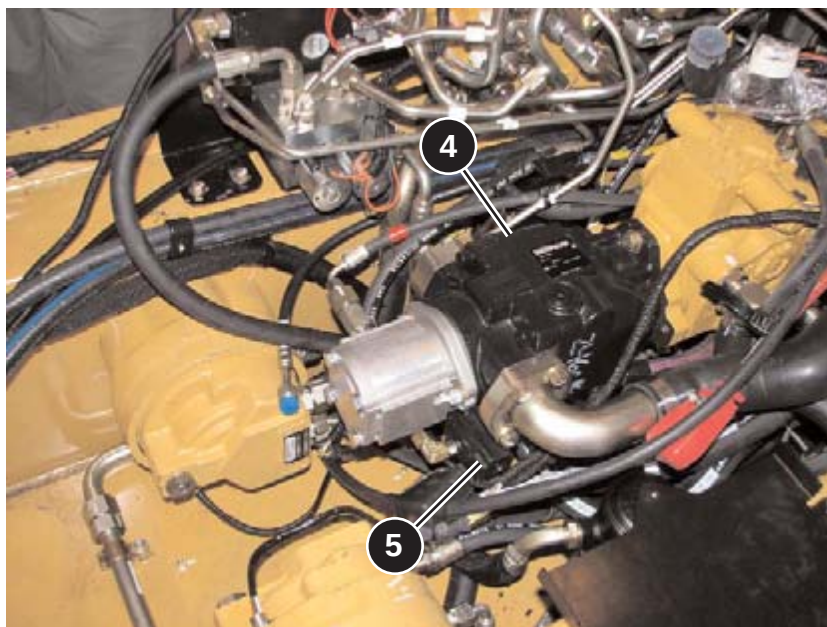
The radiator (1) and hydraulic oil cooler (2) are more accessible in the "C" Series machines because the grill raises to a higher angle than the "B" Series machines.

An oil fill access (3) has been added to the oil cooler to allow hydraulic oil to be added to the hydraulic system without having to raise the cab to access the hydraulic tank.

Also visible in this illustration is the radiator cap (4).



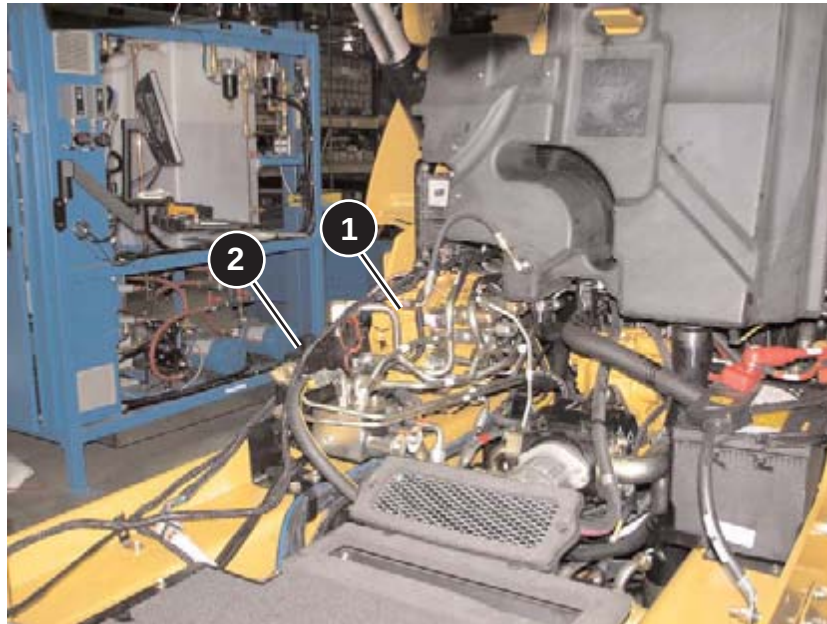
64



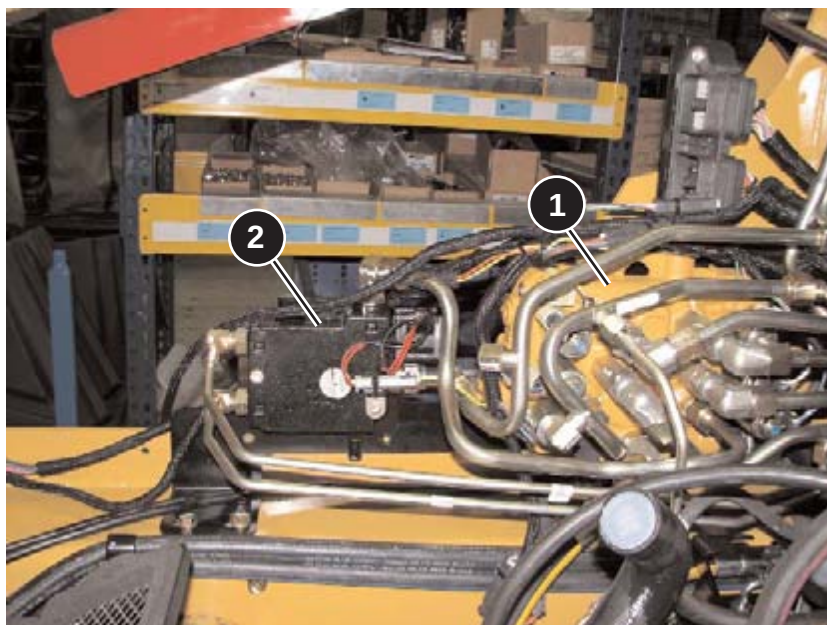
65

The top illustration shows the standard work tool gear pump (1) for a machine without the High Flow option. Also shown is the ATAAC pump (2) mounted to the charge pump (3).

The bottom illustration shows the variable displacement piston pump (4) for machines with the High Flow option. The pumps have not changed but the pump control valve (5) is now located on the bottom of the pump.



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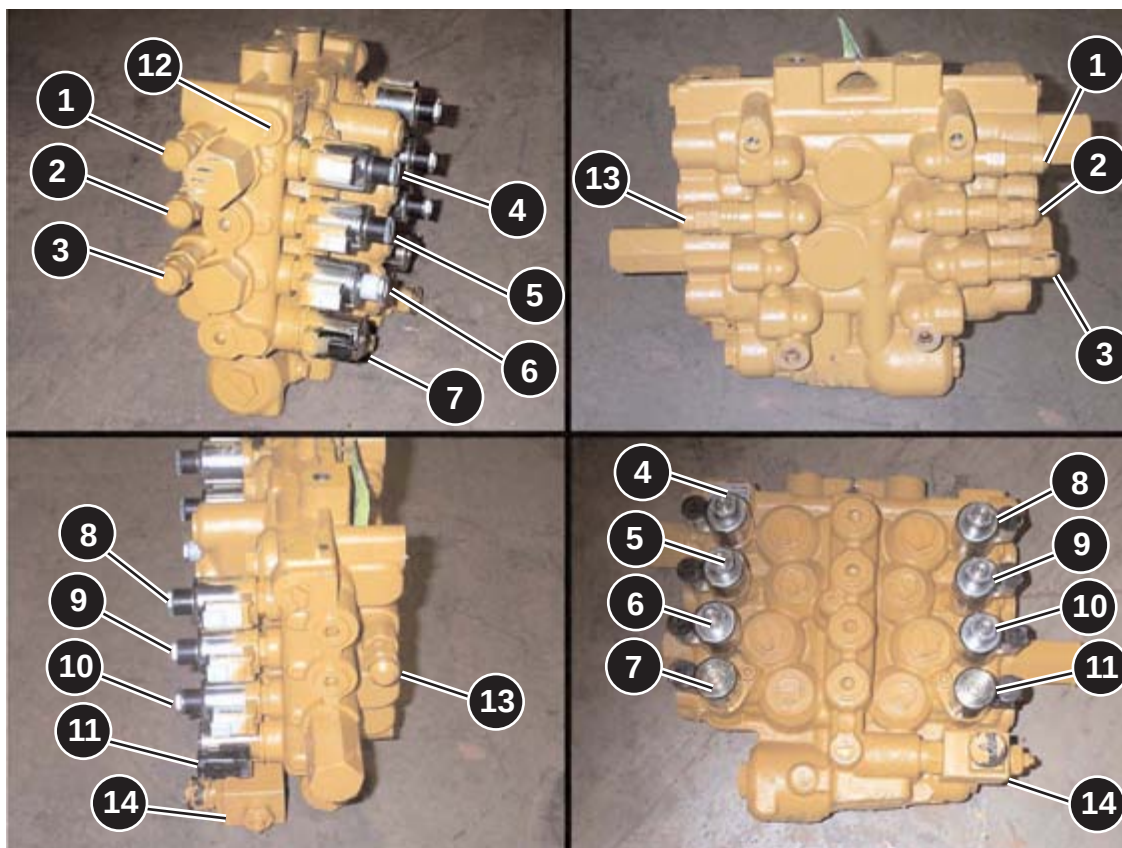


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The work tool control valve (1) and diverter (self-leveling) valve (2) are located above the right frame rail. The self-leveling option has the same functionality as the "B" Series machines.

A removable panel (not visible) allows easy access to the components located below the right side of the cab.

The diverter valve can be easily accessed to allow installation in the field.

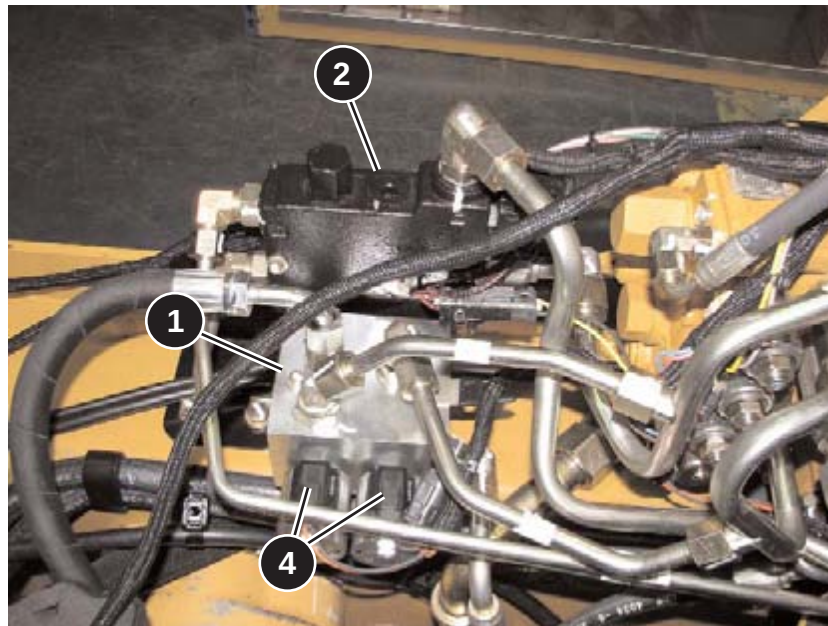


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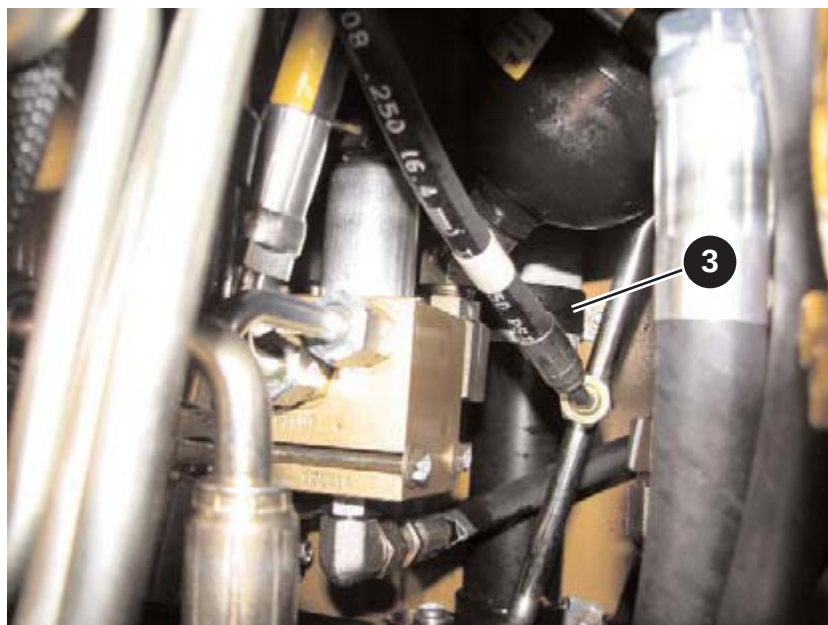
These illustrations show the work tool control valve on a High Flow machine in different positions. The top left illustration shows the work tool control valve in the same position as it would be installed above the right frame rail in the machine.

The components visible are:

- Auxiliary line relief valve (1)
- Tilt head end line relief valve (2)
- Lift line relief valve (3)
- Auxiliary supply solenoid valve (4)
- Tilt forward solenoid valve (5)
- Raise solenoid valve (6)
- C+ solenoid valve (7)
- Auxiliary return solenoid valve (8)
- Tilt back solenoid valve (9)
- Lower solenoid valve (10)
- C- solenoid valve (11)
- Pilot pressure port (12)
- Tilt rod end line relief valve (13)
- Load sense relief valve (14)



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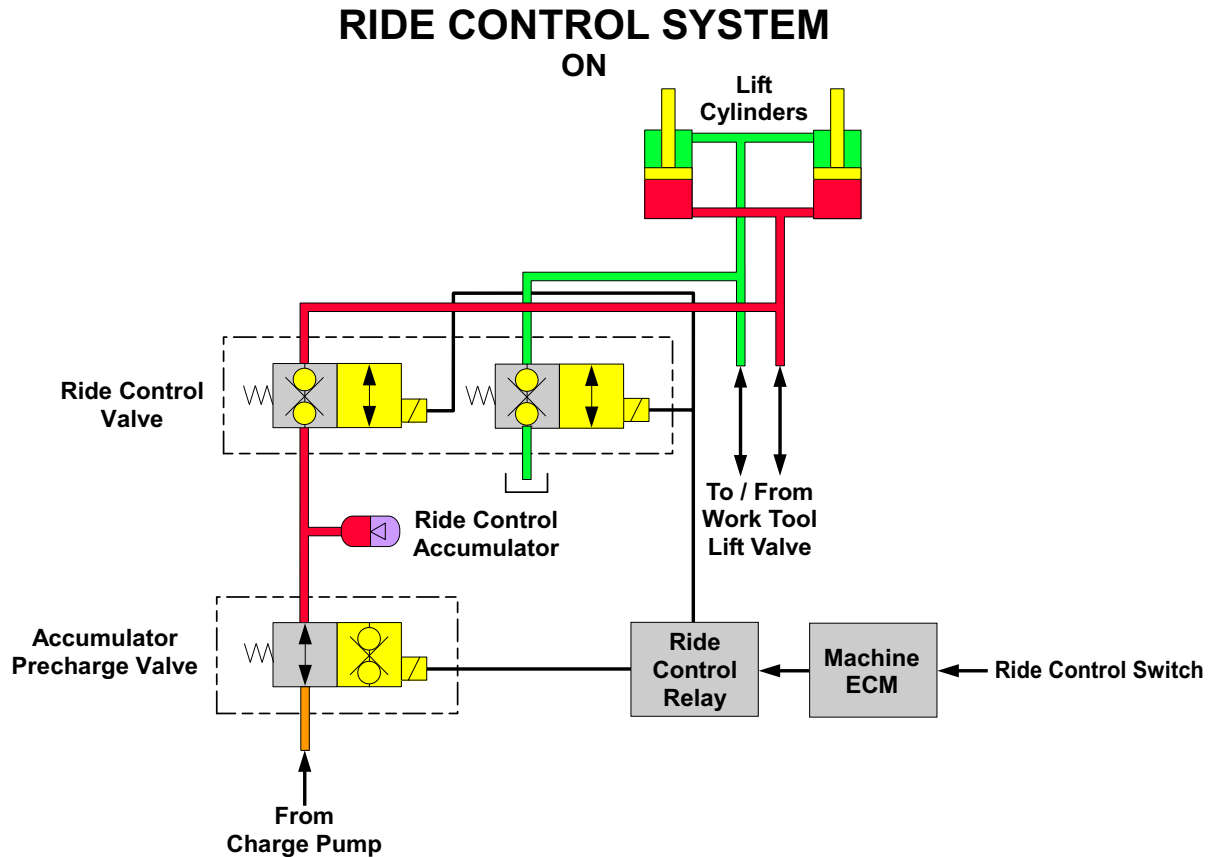


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Travel at high speeds over rough terrain causes work tool movement. The optional Ride Control System acts as a shock absorber by absorbing work tool forces, which stabilize the machine.

The new ride control valve (1) is located next to the diverter valve (2) above the right frame rail. The ride control accumulator (3) is located near the bottom of the right frame rail. The accumulator precharge valve (not shown) is mounted next to the accumulator. The ride control valve contains two solenoids (4).

The Ride Control System is controlled by the Machine ECM. The Machine ECM receives a signal from the ride control switch to operate the ride control system. The ECM sends a signal to the ride control relay, which energizes the ride control solenoids. The Ride Control System is speed sensitive. The system activates at 8 km/h (5 mph) and deactivates at 6 km/h (3.7 mph).



This illustration shows a hydraulic schematic of the Ride Control System. With the Ride Control System ON and the lift control valve in HOLD, oil is blocked at both the rod and head ends of the lift cylinders.

When the ride control switch is activated, a signal is sent to the Machine ECM. When the ground speed activation threshold is reached, the ECM sends a corresponding signal to the ride control relay. The ride control relay energizes the ride control solenoids and the precharge solenoid and oil from the head end of the lift cylinders flows through the left ride control solenoid which connects the head end of the lift cylinders to the ride control accumulator. Oil from the rod end of the lift cylinders is open to the tank through the right ride control solenoid.

The accumulator precharge solenoid isolates the accumulator from the charge pump oil.

With the Ride Control System OFF, the ride control solenoids are de-energized. Oil from the rod end of the lift cylinders is blocked from flowing to the tank through the right ride control solenoid. Charge oil flows through the precharge valve to charge the ride control accumulator.

When the ride control relay is energized by the Machine ECM, the relay sends an override voltage signal to the self-level diverter solenoid regardless of the self-level switch position. The self-level diverter solenoid decouples the lift and tilt cylinders while the Ride Control System is active.



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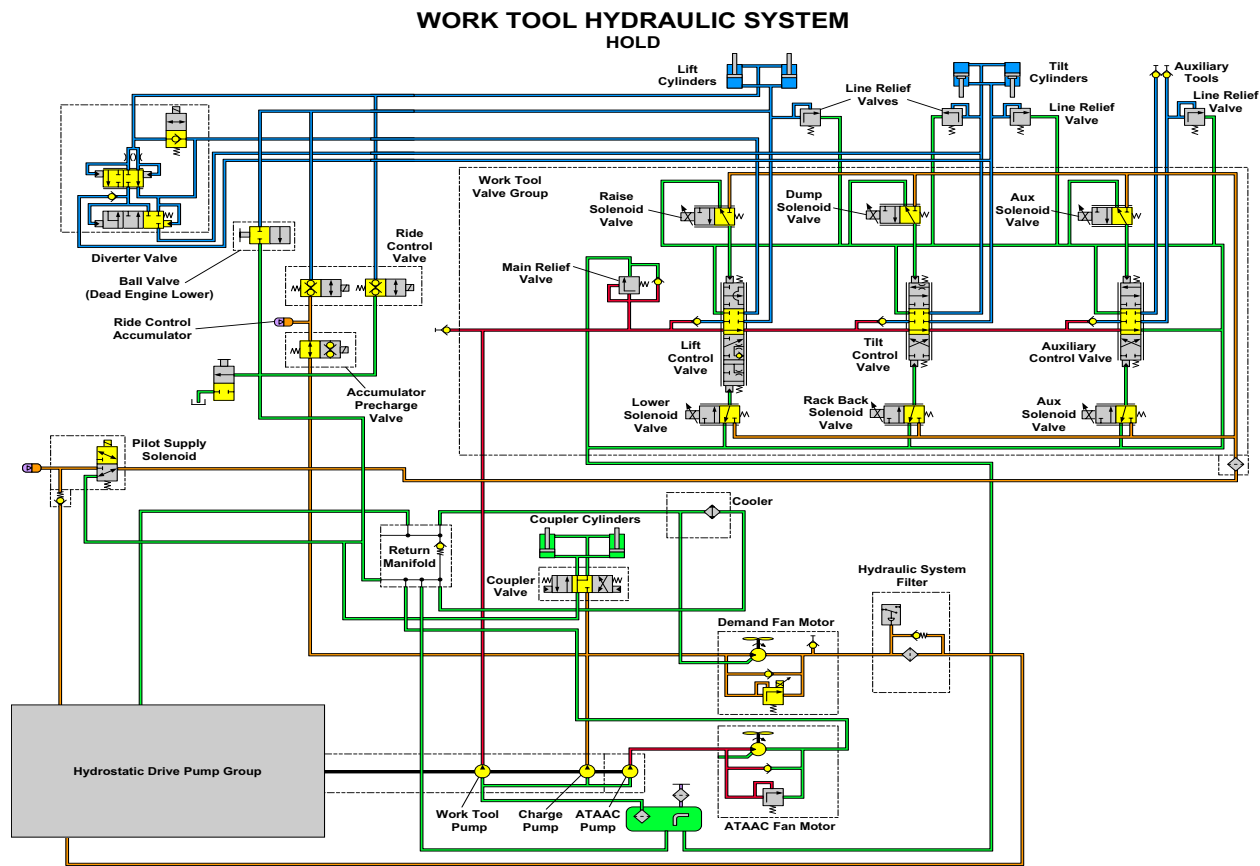
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The implement pilot shutoff valve (1) is located on the right frame rail to the rear of the right travel motor. The pilot shutoff solenoid (2) blocks oil to the work tool control valve solenoids when the hydraulic lockout switch in the cab is activated.

The pilot accumulator (3) provides tilt, dump, and work tool auxiliary lowering capabilities for a limited time after the engine has been shut down.



Cat ToughGuard™ hydraulic hoses are used on the "C" Series machines. ToughGuard™ hoses provide abrasion resistance, which exceeds the capabilities of standard hydraulic hoses. The ToughGuard™ hoses include a polyethylene exterior cover, which eliminates the need for nylon, or plastic add-on protection in most applications.



This illustration shows the work tool hydraulic system in the HOLD position.

The "C" Series machines are equipped with an open-center work tool hydraulic system the same as the "B" Series machines. However, the lift, tilt, and auxiliary functions are now electro-hydraulically controlled, the same as the auxiliary functions were on the "B" Series machines.

The work tool hydraulic system consists of a tank, a fixed displacement pump, a control valve group, two lift cylinders, two tilt cylinders, and an auxiliary work tool. The work tool control valves are in parallel as to pump flow. The work tool hydraulic system shares a hydraulic tank, an oil filter, and an oil cooler with the hydrostatic drive system.

The lift, tilt, and auxiliary valve spools are each controlled by two solenoid valves located in the work tool control valve group. The hydrostatic drive system charge pump provides pilot oil to the solenoid valves. The charge relief valve in the hydrostatic pump group limits the maximum pilot system pressure.

An accumulator provides tilt, dump, and work tool auxiliary lowering capabilities for a limited time after the engine has been shut down.



The optional automatic level control uses a diverter valve to maintain the work tool in a level position during the raising of the loader arms.

At machine start-up with the work tool control lever in HOLD, the charge pump sends oil through the fan motor and the oil filter to the hydrostatic drive pump group.

From the hydrostatic drive pump group, charge oil is sent to the pilot shutoff valve solenoid and to the lift, tilt, and auxiliary solenoids in the work tool control valve group. The energized pilot shutoff valve solenoid enables pilot oil to be available at the work tool solenoid valves. The pilot shutoff valve solenoid and the work tool solenoid valves are energized by the Machine ECM.

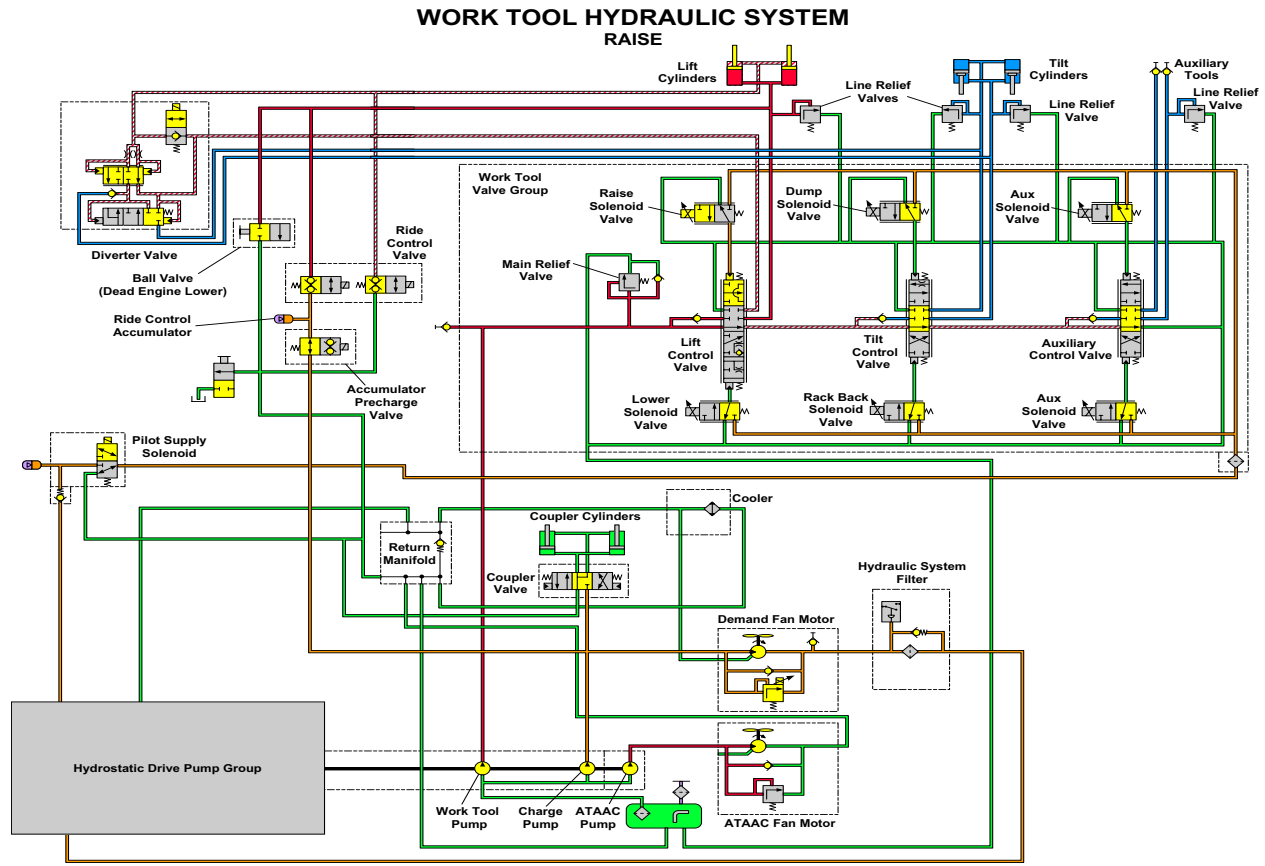
When the auxiliary thumbswitch on the work tool joystick is activated or the work tool control lever is moved from the HOLD position, a signal is sent to the Machine ECM. The Machine ECM sends a corresponding signal to energize a solenoid, which directs pilot oil to the appropriate control valve spool in the control valve group. The more the thumbswitch or work tool control lever is moved, the higher the pilot oil flow that is directed to the work tool control valve spool.

The amount of pilot oil to the work tool control valve group determines the distance the spool in the control valve shifts and the amount of hydraulic oil directed to the cylinders from the pump.

The tilt circuit is equipped with line relief valves for the rod and head ends of the cylinder. The lift circuit is equipped with a line relief valve and a manual lowering valve on the head end of the lift cylinder circuit.

The auxiliary circuit is equipped with a line relief valve for the two auxiliary lines.

With all the control valve group valves in HOLD (shown), the pump supply oil flows through the center passage of each valve before returning to the tank. When in HOLD, a centering spring keeps the control spool centered. Pump supply oil enters the supply passages, flows around the control spool, and flows to the next valve. Supply oil also flows to the load check valve.



When the operator moves the work tool control lever to the RAISE position, a signal is sent to the Machine ECM. The Machine ECM sends a corresponding signal to energize the raise solenoid valve, which directs pilot oil to the top of the lift valve spool in the control valve group. The lift valve spool is shifted down by pilot oil which blocks the oil flow through the center of the valve to the next valve.

The return oil from the rod end flows through an internal passage in the lift control valve spool. The oil flowing through the internal passage is restricted creating pressure which is less than system pressure.

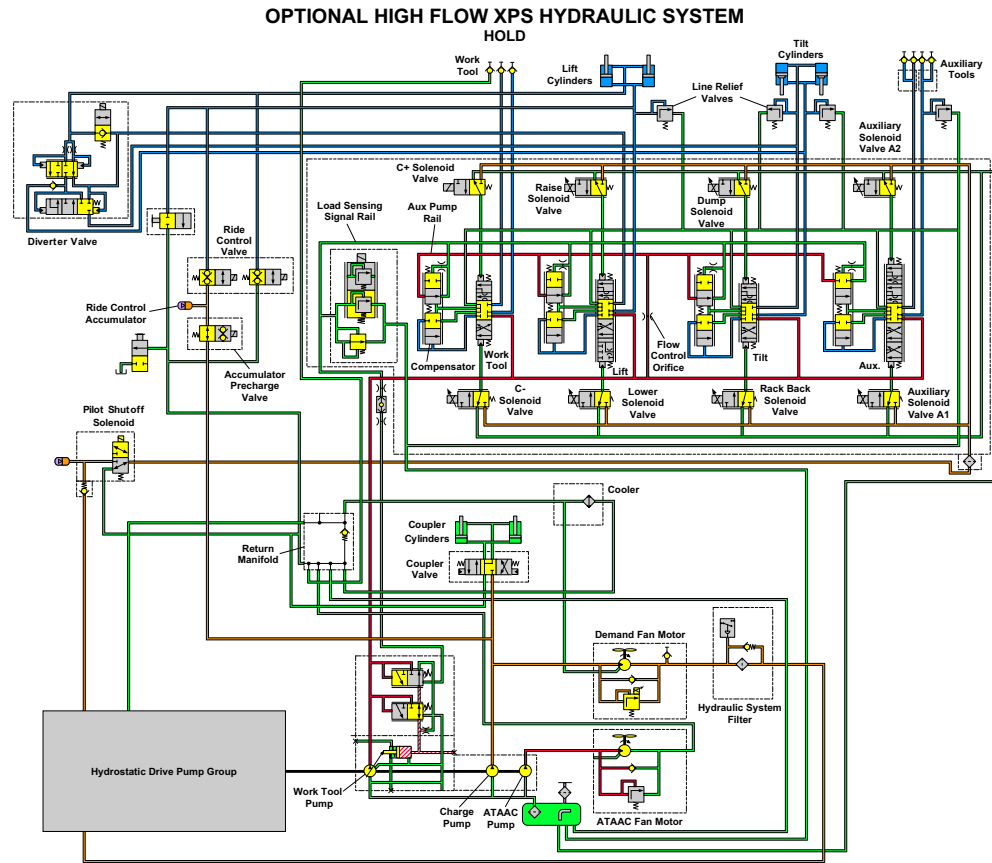
After flowing through the internal passage the return oil can become supply oil for the tilt control valve or auxiliary control.



If the work tool control lever is only partially shifted, some pump supply oil is metered through the center of the lift valve to the next circuit and then to the tank (unless one of the other control valves is fully shifted).

If the lift circuit is stalled in either direction, no oil returns from the lift cylinders to become supply oil for the tilt circuit. If the lift control spool is fully shifted, there will also be no oil metered to the tilt circuit. The tilt circuit will not function until the pilot valve for the lift circuit is moved from the fully shifted position.

NOTE: *Supply oil to the tilt and auxiliary circuits are shown in pink and red stripes to reflect that the lift control valve is of a series flow design.*



This illustration shows the optional High Flow XPS Hydraulic System.

The High Flow XPS system features a load sensing, pressure compensated, variable displacement piston pump and closed-center control valves used in a Proportional Priority Pressure Compensated (PPPC) hydraulic system. The PPPC hydraulic system divides the oil flow between each operating circuit in the system. The amount of oil directed to a particular circuit is proportional to the position of the compensator control spool.

Because the valves are pressure compensated, cylinder speeds will not change as the load varies as long as the pump can meet system flow needs. When the flow demands of the system exceed the total flow available from the pump, the flow is divided proportionally between all activated circuits; however, the work tools will all move slower due to the reduced amount of flow available.

The "A1" solenoid and "A2" solenoid provide pilot oil to shift the control spool for the auxiliary functions. These solenoids are proportionally controlled by the Machine ECM.



The operation of the valve is identical to that of the B Series valve, however the high flow selector switch has been removed. The High Flow operation is now controlled by the presence of a High Flow enabled worktool being detected across pins F and G on the worktool electrical connector. The high flow operation functions similar to the "standard flow" circuit, except that the Machine ECM directs more current to the A1 or A2 solenoid valves, allowing the auxiliary control spool to shift farther. When the thumbswitch is in the High Flow mode (maximum UP or DOWN position), higher current is sent to the auxiliary solenoid. This will allow more hydraulic oil flow to the auxiliary hydraulic circuit.

A dual stage load sensing relief valve is used to maintain system pressure. The system pressure is increased during high flow operation through the "A1" or "A2" solenoid.

When only the high flow circuit is active, the Machine ECM will energize the XPS control solenoid for the dual stage load sensing relief valve. The pressure cut-off spool within the Pump Control Valve will now limit the maximum pressure.

The "C+" solenoid and "C-" solenoid provide pilot oil to shift the control spool for supplying oil to the secondary auxiliary lines on the work tool lift arm. The "C+" and "C-" solenoids are ON/OFF and controlled by switches on the work tool joystick. Operation of these circuits will cause the XPS control solenoid valve to de-energize, (should pins F and G be shorted together) therefore reducing the max system pressure to the "standard" value. Upon releasing the buttons, the ECM will re-energize the XPS control solenoid valve.

NOTE: *Although the outer two envelopes on each end of the auxiliary/high flow spool are identical on the schematic, more flow is allowed through the outermost envelopes.*



Compact Track Loader Update

The CTL range consists of three machines, the 279C, 289C and the 299C. These machines are built on the current MTL chassis and Tier 3 engine configurations, but are equipped with a CAT designed and manufactured suspended CTL style undercarriage. This undercarriage design utilizes a steel embedded MHE style track, a large external drive sprocket, a grease tensioner with Spring recoil system and all steel sprockets, rollers and idlers.

The undercarriage is mounted to the chassis by four fully independent torsional axles. The machine is two speed as standard, with a max runout speed of 8.5 mph.

The drive motors are of a similar design to that of the MTL drive motors, both are axial piston drive motors, with planetary outboard final drives, for information on the operation of the two speed system, please refer to page 59 for more detailed information.



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The undercarriage design comprises of the following main components:

- Frame assembly (1)
- Recoil / grease tensioner and front idler assembly (2)
- Drive motor and planetary final drive (3)
- Rear idler (4)
- Roller wheels (5)
- Torsion axles (6)
- Track (7)

The sprockets, idlers and roller wheels are high strength cast iron, oil filled for life, with duo-cone metal face seals and machined steel backed bronze bearings. The track has steel embeds to provide a metal on metal interface with the drive sprocket. The recoil / tensioner provides for ease of service, undercarriage frontal shock absorption and to prevent debris from damaging the track



Tier 3 UPDATE

From February 2008, the 3044C DIT Tier 2 engine was replaced by the C3.4 Turbocharged Tier 3 engine, with the horsepower ratings for each machine remaining the same as Tier 2.

The C3.4 Tier 3 engine has been redesigned to include the following features:

- ..Denso Fuel Injection Pump has been replaced by a Bosch unit.
- ..Sound suppression material fitted as standard.
- ..Open Circuit Breather system.

The 69kW 272C, 297C and 299C machines have a Boost Control Device (BCD) fitted to the Bosch Fuel Pump, this device limits the free acceleration smoke by limiting the boost pressure, instead of the boost going to maximum, the BCD ramps up the pressure, thus reducing the amount of free acceleration smoke created.



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CONCLUSION

This presentation has provided information on the "C" Series Skid Steer Loaders, Multi Terrain Loaders and Compact Terrain Loaders.

Key service features, new components, and component locations were identified and discussed.

This presentation supports the service manual. For service repairs, adjustments, and maintenance, always refer to the Operation and Maintenance Manual, Service Manuals, and other related service publications.

VISUAL LIST

1. Model view
2. Key new features
3. Similarities and differences
4. Operator's station
5. Right side of cab
6. Air conditioning ducting
7. Mechanical suspension seat
8. Armrests in down position
9. Joystick adjustment lever
10. Right joystick adjustment lever
11. Auxiliary functions - standard configuration
12. Auxiliary functions - high flow configuration
13. Control lever patterns
14. Fuse panel
15. Cab fresh air filter
16. Lifting hooks
17. Governor control lever
18. Throttle position sensor
19. Throttle position sensor
20. Windshield washer reservoir
21. Dead engine lower knob
22. Door unlocking mechanism
23. Door removing procedure decal
24. Left overhead console
25. Left overhead display
26. Warning indicators illuminated
27. Heating and air conditioning controls
28. Creeper control switch
29. Right overhead display panel
30. Digital display window
31. Operator modes
32. Display panel in service mode
33. Select key and scroll up key
34. 3044C engine
35. Oil filter
36. Air to air aftercooler (ATAAC)
37. Panel opening for cleaning
38. Glow plug indicator
39. Electrical system
40. Machine ECM
41. Machine ECM inputs and outputs
42. Machine status screen
43. Machine configuration screen
44. Component calibration using ET
45. Cat ET Winflash program
46. Machine ECM inputs and outputs - interlock strategy
47. Hydrostatic drive system
48. Left side of hydrostatic pump
49. Right side of hydrostatic pump
50. Travel drive motors speed sensor
51. Hydrostatic drive system - Part brake applied
52. Hydrostatic drive system - Forward
53. SSL hydro drive sys - Rabbit mode/forward
54. MTL hydros drive syst - Rabbit mode/forward
55. Electronic control system - engine underspeed function
56. Dual Level Suspension (DLS)
57. Single Level Suspension (SLS)
58. Fan and fan motor
59. Demand fan circuit - Maximum speed
60. Work tool hydraulic system
61. Hydraulic tank breather
62. Hydraulic oil level sight glass
63. Radiator and hydraulic oil cooler
64. Work tool gear pump
65. Variable displacement piston pump
66. Work tool control valve and diverter valve
67. Work tool control valve and diverter valve
68. Work tool control valve positions
69. Ride control valve
70. Ride control accumulator
71. Ride control system - On
72. Implement pilot shutoff valve
73. Pilot accumulator valve
74. ToughGuard™ hydraulic hoses
75. Work tool hydraulic system - Hold
76. Work tool hydraulic system - Raise
77. High flow hydraulic system - Hold
78. CTL Model view
79. CTL undercarriage call out
80. C3.4 engine view
81. Conclusion

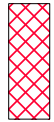
HYDRAULIC SCHEMATIC COLOR CODE

	Black - Mechanical connection. Seal		Red - High pressure oil
	Dark Gray - Cutaway section		Red/White Stripes - 1st pressure reduction
	Light Gray - Surface color		Red Crosshatch - 2nd reduction in pressure
	White - Atmosphere or Air (No pressure)		Pink - 3rd reduction in pressure
	Purple - Pneumatic pressure		Red/Pink Stripes - Secondary source oil pressure
	Yellow - Moving or activated components		Orange - Pilot, charge, or Torque Converter oil
	Cat Yellow - (Restricted usage) Identification of components within a moving group		Orange / White Stripes - Reduced pilot, charge, or TC oil pressure
	Brown - Lubricating oil		Orange Crosshatch - 2nd reduction in pilot, charge, or TC oil pressure.
	Green - Tank, sump, or return oil		Blue - Trapped oil
	Green / White Stripes - Scavenge Oil or Hydraulic Void		

HYDRAULIC SCHEMATIC COLOR CODE

This illustration identifies the meanings of the colors used in the hydraulic schematics and cross-sectional views shown throughout this presentation.

HYDRAULIC SCHEMATIC COLOR CODE

	Black - Mechanical connection. Seal		Red - High pressure oil
	Dark Gray - Cutaway section		Red/White Stripes - 1st pressure reduction
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	Green / White Stripes - Scavenge Oil or Hydraulic Void		

Machine Walk-around Checklist

Directions: Use this sheet when performing a machine orientation lab exercise.

Place a check in the blank after locating each of the following controls:

- _____ Key start switch
- _____ Armrests
- _____ Governor lever
- _____ Accelerator pedal
- _____ Left joystick
- _____ Horn
- _____ Continuous flow switch
- _____ Auxiliary electrical controls (C1/C2, if equipped)
- _____ Auxiliary electrical control for pin "B" on loader arm (if equipped)
- _____ Two-speed switch
- _____ Multifunction switch
- _____ Right joystick
- _____ Thumbswitch for A1/A2 auxiliary control
- _____ Secondary auxiliary control switches (C+/C-, if equipped)
- _____ Park brake switch
- _____ Creeper switch
- _____ Ride control switch (if equipped)
- _____ Pattern changer switch (if equipped)
- _____ HVAC controls (if equipped)
- _____ Dead engine lower knob

Place a check in the blank if the fluid level is acceptable:

- _____ Engine oil level
- _____ Hydraulic system oil level
- _____ Cooling system fluid level
- _____ Fuel level

Machine Walk-around Checklist (continued)

Place a check in the blank after locating each of the following components:

- _____ Cab hold-down bolts
- _____ Fuse panel
- _____ Cab recirculation filter
- _____ Cab fresh air filter
- _____ Hydraulic oil filter
- _____ Engine oil fill cap
- _____ Engine oil filter
- _____ Fuel filter and water separator
- _____ Air filter indicator
- _____ Fuel tank and filler cap
- _____ Engine jump start receptacle
- _____ Battery
- _____ Machine ECM
- _____ Power relay modules
- _____ ATAAC housing and ATAAC motor (if equipped)
- _____ Hydraulic fill cap (top off)

Place a check in the blank after locating each of the following gauges and indicators:

- _____ Fuel level gauge
- _____ Service hour meter
- _____ Coolant temperature gauge (if equipped)
- _____ Hydraulic oil temperature gauge
- _____ Digital display window (if equipped)

Left Overhead Display - Indicator Identification



List the name of each indicator shown above:

1) _____

9) _____

2) _____

10) _____

3) _____

11) _____ (if equipped)

4) _____

12) _____ (if equipped)

5) _____ (if equipped)

13) _____

6) _____

14) _____ (if equipped)

7) _____

15) _____ (if equipped)

8) _____

16) _____ (if equipped)

Optional AMICS Display - Mode Identification

Display each operator mode and service mode on the digital display window. Describe the function of each mode.

Operator Modes

Mode 1: _____

Mode 2: _____

Mode 3: _____

Service Modes

Mode 0: _____

Mode 1: _____

Mode 2: _____

Mode 3: _____

Mode 4: _____

Mode 5: _____

Mode 6: _____

Mode 7: _____

Machine Systems Component Identification

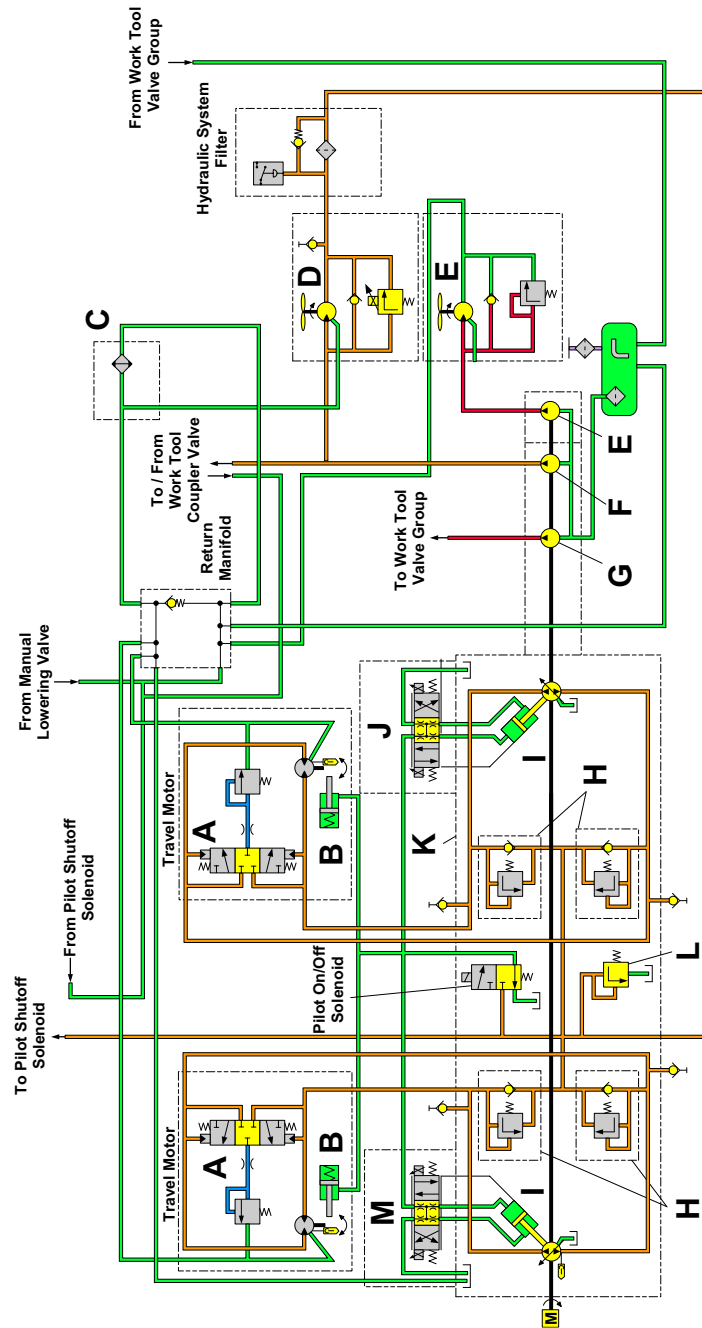
Place a check in the blank after locating each of the following components:

- _____ ATAAC pump
- _____ ATAAC motor
- _____ Charge pump
- _____ Work tool pump
- _____ Hydrostatic drive pump
- _____ Hydrostatic drive pump control solenoids
- _____ Pilot ON/OFF solenoid valve
- _____ Two-speed solenoid valve (if equipped)
- _____ Travel motor speed sensors
- _____ Engine speed sensor
- _____ Throttle lever position sensor
- _____ Pilot shutoff valve solenoid and accumulator
- _____ Diverter valve
- _____ Work tool control valve
- _____ Load sense relief valve (High Flow System, if equipped)
- _____ Ride control valve (if equipped)
- _____ Ride control accumulator (if equipped)
- _____ Work tool coupler solenoid valve
- _____ Oil cooler
- _____ Hydraulic oil tank breather

Hydrostatic Drive System

Directions: Fill in the blanks next to

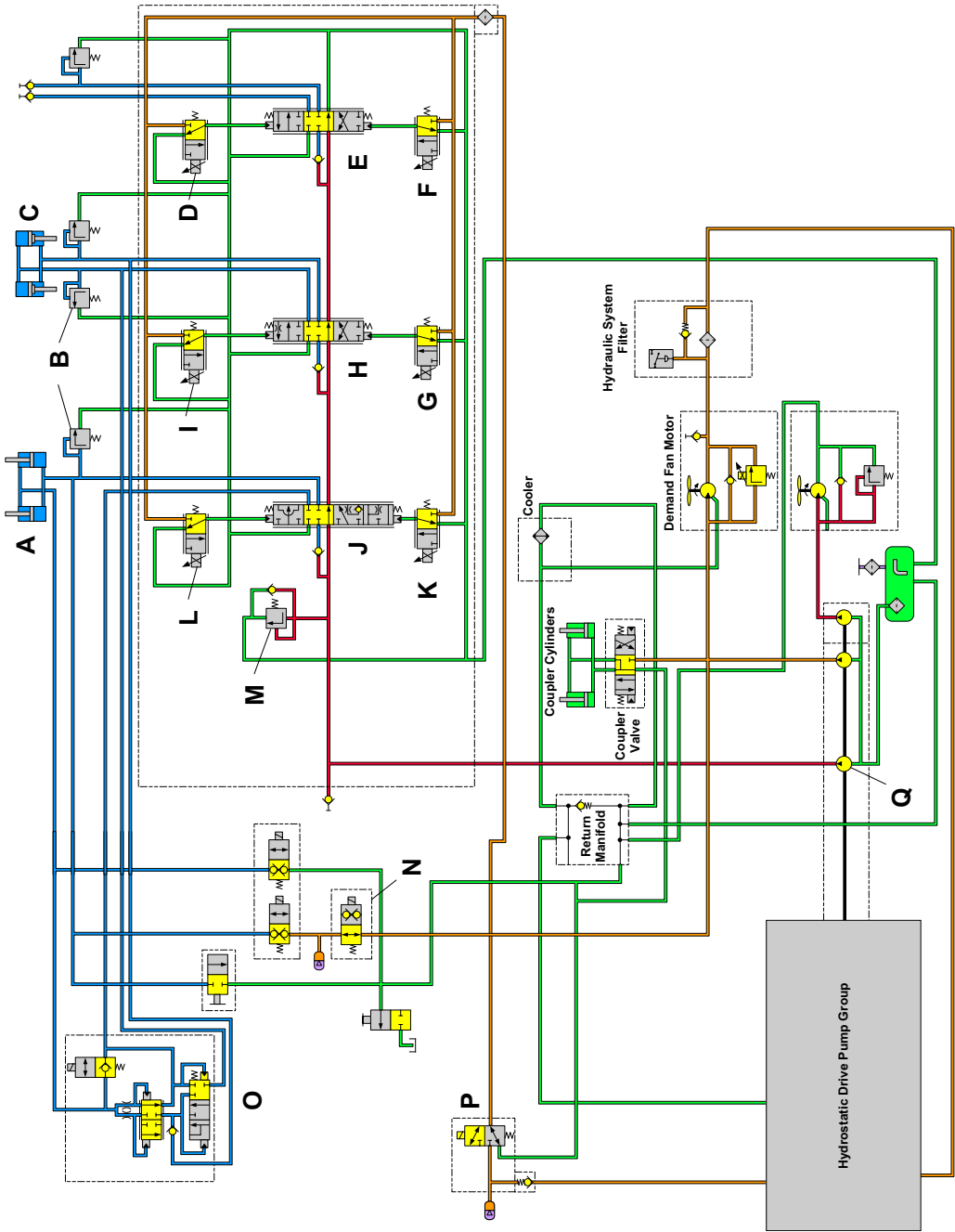
- A _____
- B _____
- C _____
- D _____
- E _____
- F _____
- G _____
- H _____
- I _____
- J _____
- K _____
- L _____
- M _____



Work Tool Hydraulic System

Directions: Fill in the blanks next to the letters with the correct term.

- A _____
- B _____
- C _____
- D _____
- E _____
- F _____
- G _____
- H _____
- I _____
- J _____
- K _____
- L _____
- M _____
- N _____
- O _____
- P _____
- Q _____



Posttest

1. The left and right joysticks:
 - A. are not adjustable
 - B. move only with the seat adjustment
 - C. are adjustable independently from the seat
 - D. are adjusted using a pushbutton below the joystick
2. Which of the following filters has been relocated on the "C" Series machines?
 - A. Engine air filter
 - B. Recirculation filter
 - C. Fresh air filter
 - D. None of the above
3. The optional digital display panel includes a digital display window and which of the following gauges?
 - A. Hydraulic oil temperature gauge
 - B. Coolant temperature gauge
 - C. Engine oil pressure gauge
 - D. Both A and B
4. How many operator modes are available on the digital display?
 - A. 1
 - B. 2
 - C. 3
 - D. 4
5. The ATAAC fan is hydraulically driven by the:
 - A. ATAAC pump
 - B. hydrostatic drive pump
 - C. charge pump
 - D. work tool pump
6. Which of the following switches is an input to the Machine ECM for the interlock control?
 - A. Seat switch
 - B. Armrest switch
 - C. Door switch
 - D. All of the above

7. Which of the following components has been eliminated from the hydrostatic drive system on the "C" Series machines?
- A. Motor flushing valve
 - B. Speed sensing valve
 - C. Charge relief valve
 - D. Crossover relief valve
8. The functions of the travel pilot valve solenoid and the pilot on/off solenoid are now controlled by the:
- A. pump control solenoid
 - B. travel pilot valve solenoid
 - C. pilot shutoff solenoid
 - D. park brake solenoid
9. The tilt and lift functions are controlled by the:
- A. Machine ECM
 - B. work tool pilot valves
 - C. work tool relay
 - D. mechanical linkage
10. Which of the following components is new to the work tool hydraulic system?
- A. Work tool pilot valves
 - B. Auxiliary solenoid valve
 - C. Pilot shutoff valve
 - D. Flow control orifice

Posttest Answer Key

1. **C**
2. **B**
3. **D**
4. **C**
5. **A**
6. **D**
7. **B**
8. **D**
9. **A**
10. **C**