INTRODUCTION

General

The contents of this Repair Manual, although correct at the time of publication, may be subject to alteration by the manufacturer without notice.

This manual assumes that maintenance personnel have a sound knowledge of workshop practices and safety procedures associated with the repairs of this type of machine. This manual is designed to assist with the more specialised information required for removal and strip-down of major components.

It is recommended that the relevant part of this Repair Manual is studied carefully before proceeding with any maintenance.

Machine identification

To make sure that the correct parts are obtained, always quote the machine Serial Number when ordering parts.

Health and Safety

To prevent injury to personnel and damage to equipment and machinery, care must be taken to operate in a safe manner. Read the Safety Warnings that follow and always work in a safe manner and obey the relevant Warnings.

Throughout this manual and on the machine there are safety notes. Each note starts with a single word. The meaning of these single words is as follows:

WARNING *Identifies a hazard exists. If proper precautions are not taken, it is highly probable that the operator (or others) could be killed or seriously injured.*

CAUTION *Identifies a reminder of safety practices. Failure to observe these safety practices could result in injury to the operator (or others) or damage to the machine.*

In general these notes are used to indicate that the procedures being described in the manual must be followed to avoid serious injury or death to yourself or others. The notes are also used to protect the machine from unsafe maintenance practices.

NOTE: An identification number in bold type, after an item, refers to the number of that item in the main hydraulic schematic illustration.

COMPONENTS

General

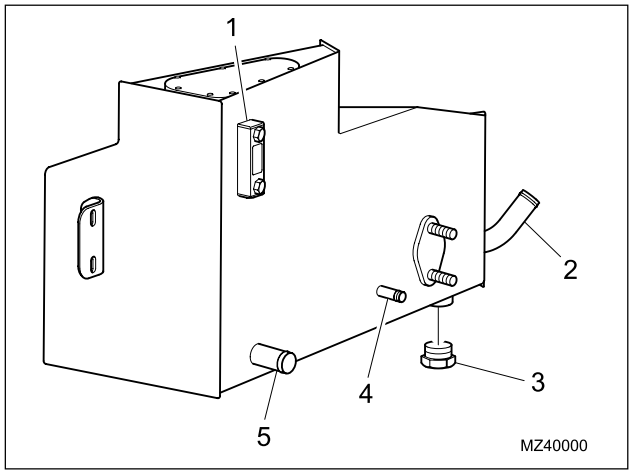
NOTE: An identification number in bold type, after an item, refers to the number of that item in the main hydraulic schematic illustration.

Hydraulic tank (1)

A single hydraulic reservoir feeds the main and auxiliary systems of the machine. A sight glass is fitted to check system contents. An internal 40 µm mesh filter (pre-filtration) separates the clean and dirty sides of the tank. Both system suction lines are taken from the clean side of the mesh filter. All return lines go to a manifold and return fluid to dirty side of tank for pre filtration.

Specifications:

Nominal tank capacity	67 litres
Total system capacity (oil)	128 litres

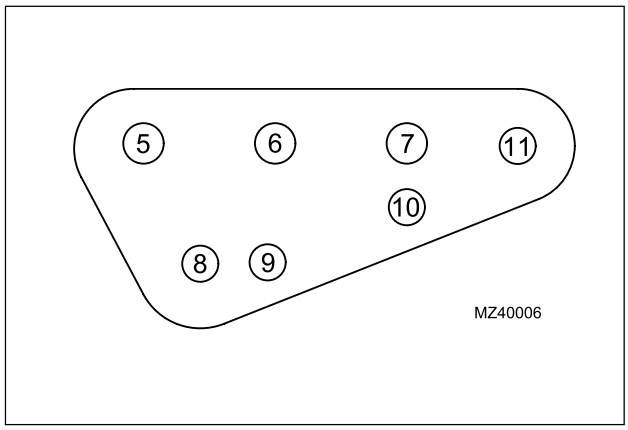


Suction line connections to hydraulic tank

1. Sight glass
2. Suction - Main Pump
3. Drain plug
4. Suction - Auxiliary Pump
5. Filler

Return hose connections to hydraulic tank
(up to Machine S/No.51200471)

5. Return from PVG (Main Control Valve)
6. Return from LS Pump and Filter
7. From LS Pump Case Drain
8. Breather (connected to Filler)
9. Return from Brake and Steering circuits
10. From Trailer Brake (optional)
11. Return from Parking Brake PRV



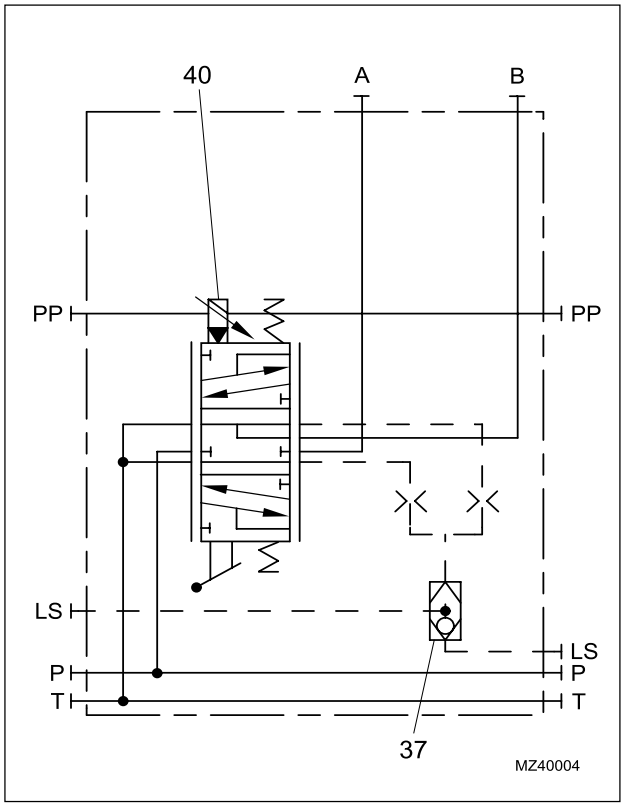
Return hose connections to hydraulic tank
(from Machine S/No.51200472)

5. Return from PVG (Main Control Valve)
6. Return from LS Pump and Filter
7. (Blank fitted)
8. Breather (connected to Filler)
9. Return from Brake circuit
10. From Trailer Brake (optional)
11. Return from Brake and Parking Brake circuit

Lift section (29)

A Port A - connection to service
B Port B - connection to service
PP Pilot pressure
LS Load sensing
T Return to tank
P Pressure

(37) LS shuttle valve
(40) Controller, proportional



Function

Lift service is fully proportional and operated electrically to provide oil flow to the lift circuit.

When the spool is moved from the neutral position, oil at P (standby pressure 20 bar (290 psi)) is delivered to the consumer (service). The oil at the consumer meets a resistance (i.e. to move the piston) and the pressure at P rises to overcome this force. The P line is connected permanently to the LS line; therefore the pump receives a signal to swash to the required position to provide the pressure required to overcome the resistance. The pressure at P will therefore be the LS pressure plus the standby pressure of 20 bar (290 psi).

The pump will always react to the highest pressure requested when more than one service is operated by virtue of the LS shuttle valve in each section.

When the valve returns to neutral the pressure at P drops and therefore the pressure in the LS line also drops.

The spool is operated by pilot oil pressure delivered by the electrical actuator under the command of the ‘Solo’ joystick and is fully proportional.

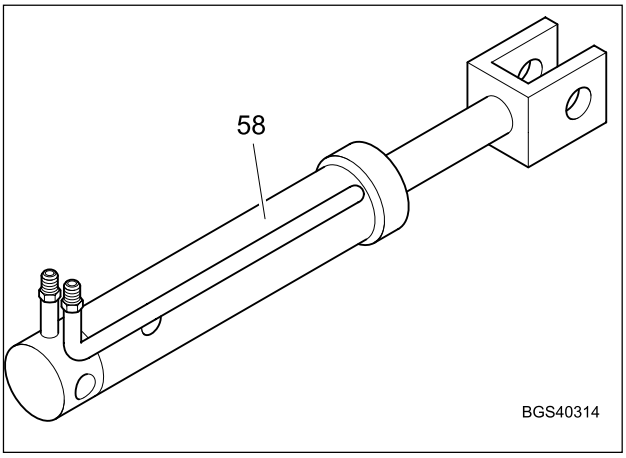
In neutral the spool is ‘half-motored’, connecting port B to the T line.

Autohitch cylinder (58)

The autohitch cylinder, if fitted, is located on the rear of the machine and is used to automatically connect and lift a trailer onto the machine. The pressure oil supplies to the autohitch cylinder are from the autohitch manifold (57).

Specification

Stroke	325 mm
Bore	60 mm

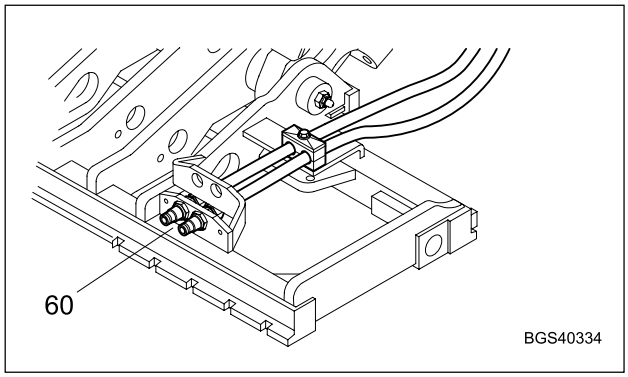


1st service couplings (59).

The 1st service couplings (not illustrated) are of the quick-release type and are used to attach hydraulic services to the front of the machine.

2nd service couplings (60)

The 2nd service couplings are of the quick-release type and, if fitted, are used to attach a second hydraulic attachment to the front of the machine.

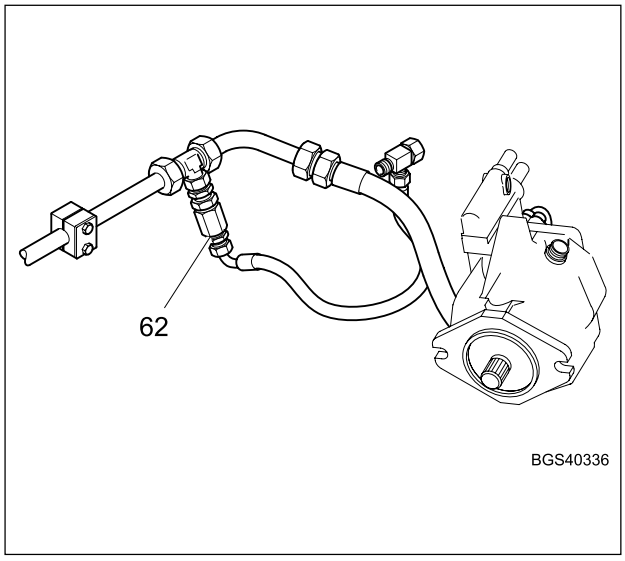


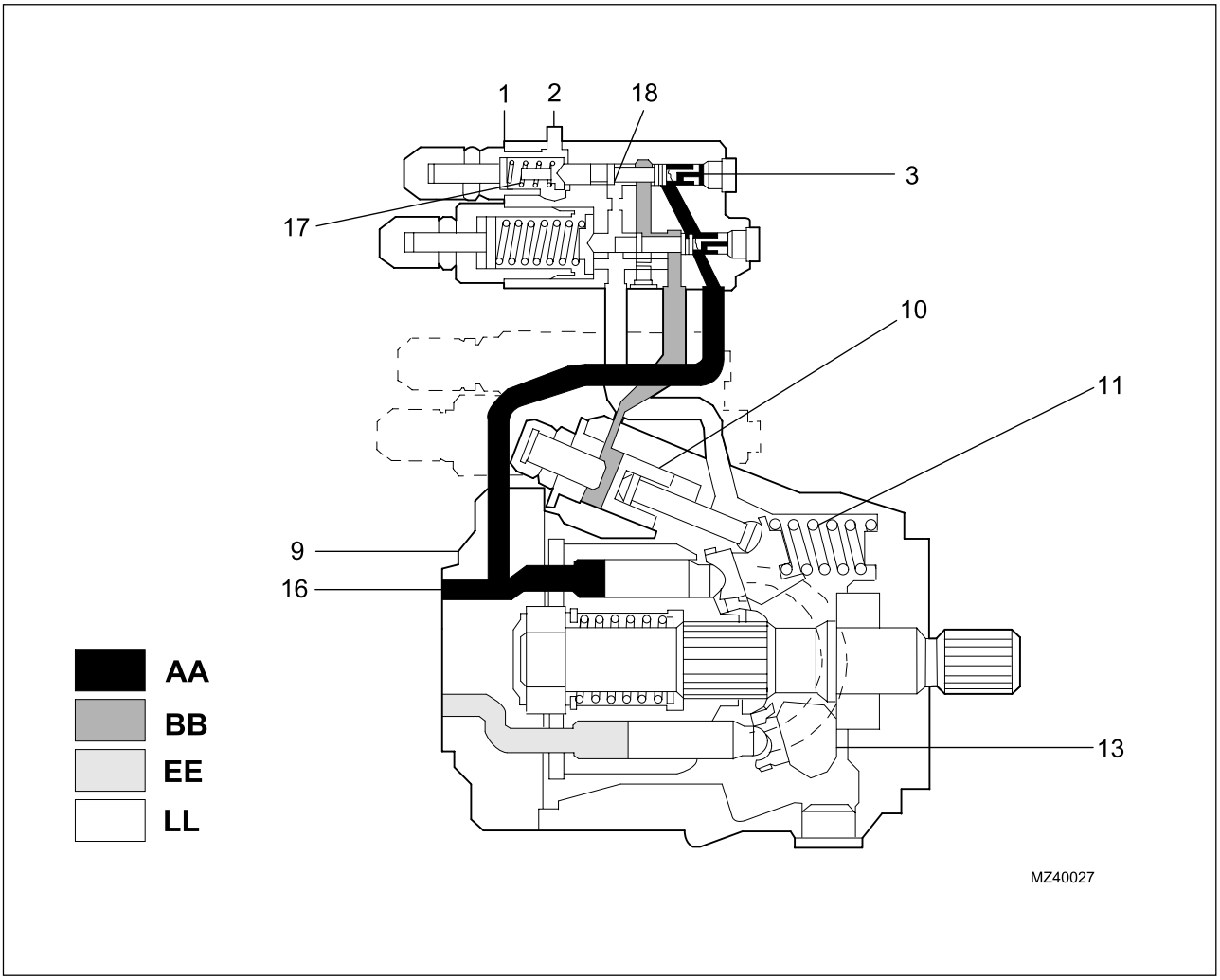
Trailer tipping connection (61)

The trailer tipping connection (not illustrated) is of the quick-release coupling type and, if fitted, connects hydraulic supplies to the trailer tipping service.

Start-up valve (62)

The start-up valve is fitted in the hydraulic supply line between the LS hydraulic pump (2) and the control valve PVSP inlet section (36). An internal spring valve opens the start-up valve to divert fluid to the hydraulic tank (1) when the engine is being started, offloading the build-up of pressure. When the LS hydraulic pump builds up sufficient pressure, the fluid pressure overcomes the spring valve, which closes and prevents fluid from flowing back to the hydraulic tank (1).





9. LS pump **(2)**
1. LS compensator **(3)**
2. Inlet port
3. Volumetric flow controller
10. Control plunger
11. Control spring
13. Swash plate
16. Pump outlet port
17. Pressure spring (stand-by pressure)
18. Control edge

AA Supply oil
BB Oil at reduced pressure
EE Oil from charge pump
LL Tank

WARNING *Fine jets of hydraulic fluid at high pressure can penetrate the skin. Do not use your fingers to check for hydraulic fluid leaks. Do not put your face close to suspected leaks. If hydaulic fluid penetrates your skin seek mecical help immediately.*

HYDRAULIC LEVEL

Check

1. Position the machine on level ground.

2. Make sure all hydraulic cylinders are fully closed.

3. Stop the engine, apply the parking brake.

4. Open the engine pod cover.

5. Check hydraulic tank sightglass (2), make sure fluid level shows in sightglass and is above the red line.

NOTE: Wait for two minutes, after engine is stopped, before checking fluid level.

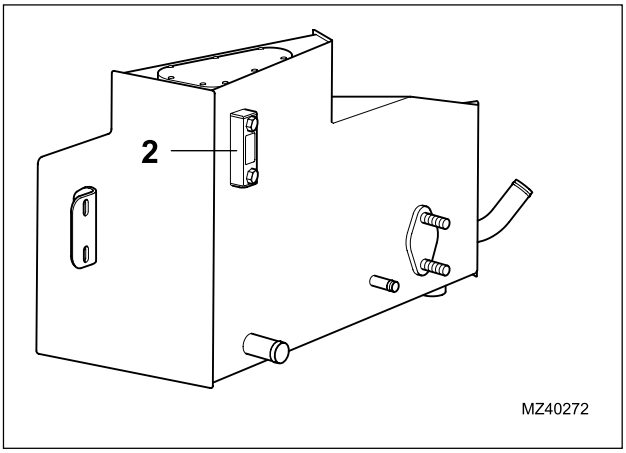
6 .Replenish fluid if necessary as follows:

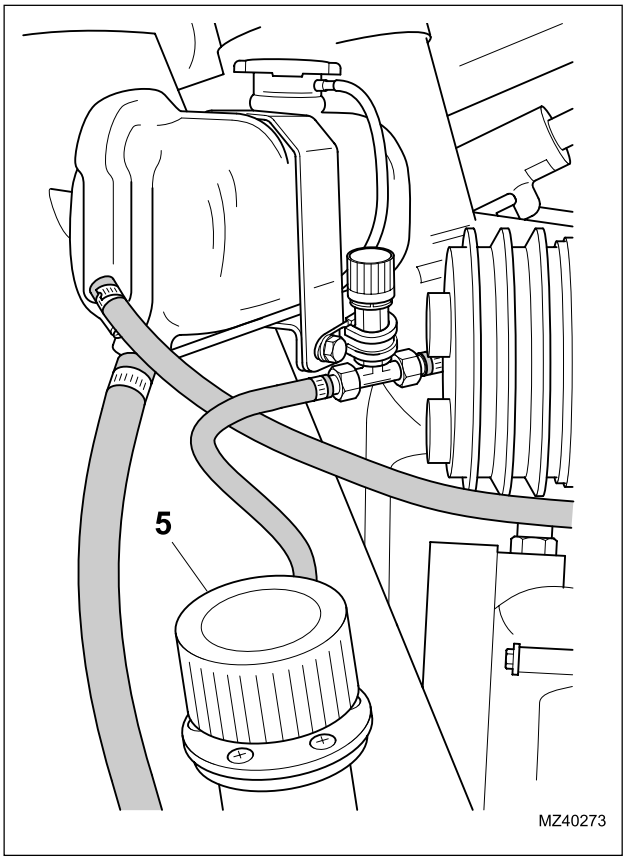
WARNING *The cap maintains an air pressure of 0.3 bar in the hydraulic tank.*

7. Clean filler cap (1) and remove.

8. Top up hydraulic tank with fluid to correct level and refit filler cap.

9. Close engine pod cover.





1. Filler cap
2. Sightglass

HYDRAULIC TANK (1)

Removal

NOTE: Removal and installation of the hydraulic tank is possible with the machine on the ground.However, increasing the ground clearance or positioning the machine over a pit will make the operation easier and quicker.

1. Position the machine over a pit, if available, or lift on axle stands.

2. Stop the engine and chock the machine, apply the parking brake**.**

3. Refer to page 1.1 and dump hydraulic pressure then disconnect the battery.

NOTE: The hydraulic tank contains 67 litres (15 gal) of fluid.

4. Remove the drain plug (2) and drain the hydraulic fluid into a suitable container. Do not reuse the hydraulic fluid unless it can be specially filtered and tested.

5. Remove the hose clips (9) from the suction hoses (4 & 5) of the main and auxiliary pumps and the filler hose (3). Remove the hoses from the hydraulic tank (1).

6. Remove the two sightglass attachment bolts and remove the sightglass (6).

7. Remove the screws securing the return manifold (7) to the tank and lift the manifold to release the gasket (8).

8. Support the hydraulic tank; remove the two nuts from the studs and the two bolts securing the tank to the engine and transmission sub-assembly. Lower the tank and remove from beneath the machine.

9. Fit blanks to all openings on the tank and hoses on the machine to prevent the ingress of dirt.

Installation

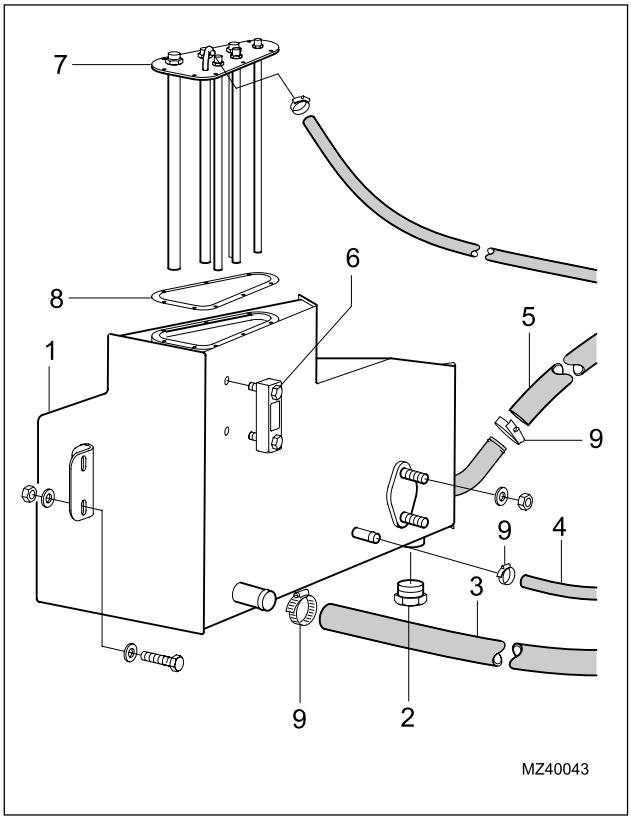
1. Installation is the reverse of removal.

2. Use new hose clips and gaskets

3. Refer to Page 1.66 and replenish the hydraulic tank before engine is started.

4. Purge the hydraulic system by starting the engine and operating all services to fully extend and retract cylinders several times.

5. Refer to Page 1.66, check the hydraulic level and replenish if necessary.



1. Hydraulic tank
2. Drain plug
3. Filler hose
4. Suction hose – auxiliary pump
5. Suction hose – main pump
6. Sightglass
7. Return manifold
8. Gasket
9. Hose clips

PARKING BRAKE VALVE (71)

NOTE: From Machines S/No.51200472 only.

Removal

1. Stop the engine and chock the machine, apply the parking brake**.**

2. Refer to page 1.1 and dump hydraulic pressure then disconnect the battery.

3. Gain access to parking brake valve (1), located on the machine structure, adjacent to the front axle.

4. Disconnect the electrical connector to the parking brake valve solenoid (4).

5. Disconnect the three hydraulic hoses (5) from the parking brake valve (1) and blank the valve connections and open hoses.

6. Remove the bolt (6), washer (3) and nut (2) that attach the parking brake valve (1) to the structure. Remove the parking brake valve (1) from the machine.

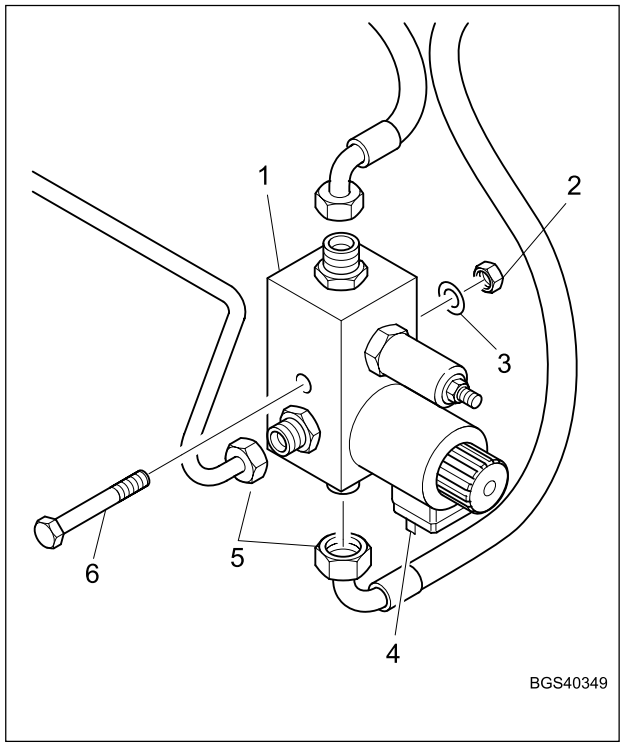
Installation

1. Installation is the reverse of the above procedure.

2. Refer to page 1.66, check the hydraulic level and replenish if necessary before the engine is started.

3. Purge the hydraulic system by starting the engine and operating the fan reverse system and all services. Fully extend and retract cylinders several times.

4. Refer to Page 1.66. Check the hydraulic level and replenish if necessary.



1. Parking brake valve
2. Nut
3. Washer
4. Solenoid valve
5. Hoses
6. Bolt

DUAL BRAKE VALVE (SAFIM)-Servicing

NOTE: From Machines S/No.51200472 only.

Servicing is normally restricted to the replacement of seals in the brake master and brake valve modules of the valve assembly. When any cylinder bore or sliding contact surface is scored, the brake valve must be replaced. The dismantling and installation (General) are similar to that detailed for the single servo valve (refer Page 1.82).

Dismantling (Brake Master Module)

1. Remove the grub screw (2) that secures the pedal pivot pin (5) in position. Carefully drift out the pedal pivot pin (5) from the pedal base and extract the pedal lever (1) and cover (3).

2. Remove the end plug (4) from the brake master module (19).

3. Extract the valve cylinder (17) from the brake master module (19).

4. Remove the circlip (15) from the brake master module (19).

5. Carefully extract the O-seal (13), valve assembly and gland seal (18) from the brake master module (19).

6. Remove the plug (7) and washer (6) from the brake master module (19).

7. Remove the adjuster (8) and nut (9) from the brake master module (19).

8. Remove the screw (10) and pin (12) from the valve assembly. Separate the two end plates (14) and (16) and three springs (11) of the valve assembly.

9. Clean and examine the valve assembly parts and bore, pedal pivot pin (5) and pivot points of the brake master module (19).

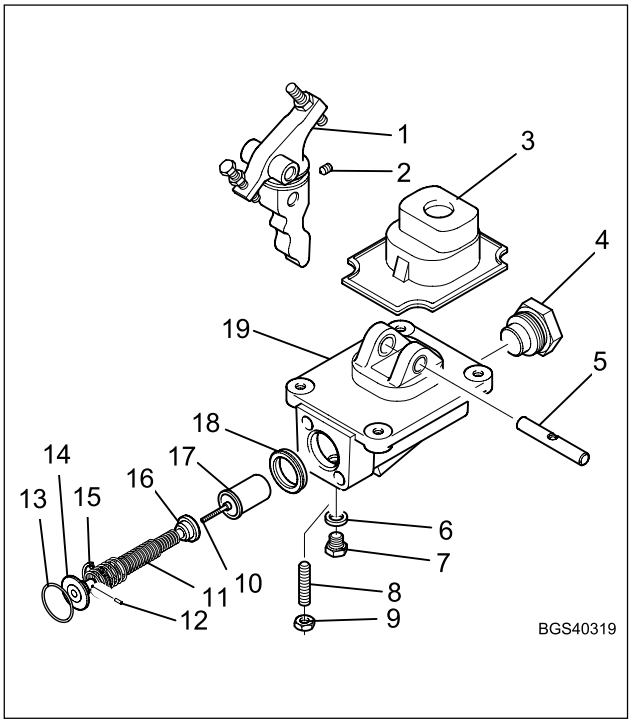
Assembly (Brake master module)

1. Installation is the reverse of the removal.

2. Make sure a new gland seal (18) and O-ring seal (13) are fitted.

3. Before assembly, lightly lubricate the parts from the repair kit and the spool and sleeve with clean hydraulic oil.

4. Make sure all parts are clean before assembly.



1. Pedal lever
2. Grub screw
3. Cover
4. End plug
5. Pivot pin
6. Plug
7. Washer
8. Adjuster
9. Nut
10. Screw
11. Springs
12. Pin
13. O-ring seal
14. End plate
15. Circlip
16. End plate
17. Valve cylinder
18. Gland seal
19. Brake master module

Compensator cylinder (53)

Removal

1. Raise the boom to a suitable height and support using lifting equipment or support stands.

2. Stop the engine and chock the machine, apply the parking brake**.**

3. Refer to page 1.1 and dump hydraulic pressure then disconnect the battery.

WARNING *The compensator cylinder weighs 30 kg (66 lb). Take care when handling, to avoid damage to components and injury to personnel.*

NOTE: On early models, the upper and lower attachment pins are slotted and retained by a locking plate.

4. Support the upper end of the cylinder (1). Remove the bolt (2) and washer (3) retaining the upper attachment pin (4). Drive out the upper attachment pin and lower the cylinder onto the lift cylinder, if fitted, or a suitable support.

5. Identify the hydraulic hoses to make sure they are reconnected correctly. Disconnect the two hydraulic hoses (5) from the cylinder (1), blank the cylinder and open hoses.

NOTE: Make a note of the orientation of the spigot mounting brackets, the sloping side must face the front of the machine.

6. Support the cylinder and remove the four spigot mounting bolts (6) and washers (7) securing lower cylinder to the chassis (8). Remove cylinder from machine complete with spigot mounting brackets (13).

7. Remove the nut (9), washer (10) and bolt (11) attaching the cylinder lower pivot pin (12) to the two spigot mounting brackets (13). Remove the two spigot mounting brackets and the lower pivot pin (12) from the cylinder.

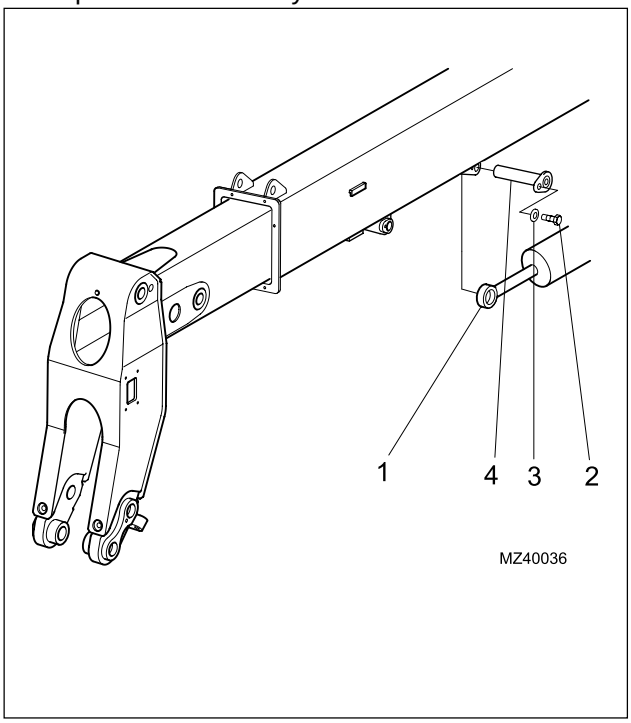
Installation

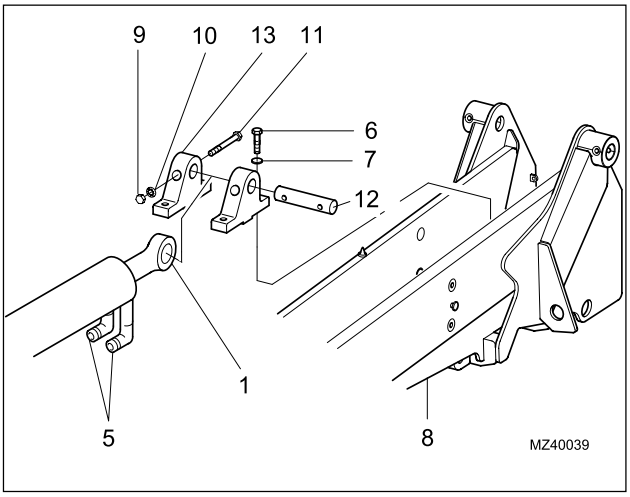
1. Installation is the reverse of the above procedure.

2. Refer to page 1.66, check the hydraulic level and replenish tank before engine is started.

3. Purge the hydraulic system by starting the engine and operating the service to fully extend and retract cylinder several times.

4. Refer to page 1.66 and check the hydraulic level and replenish if necessary.





1. Cylinder **(53)**
2. Bolt
3. Washer
4. Upper attachment pin
5. Hydraulic hoses
6. Bolt (4 off)
7. Washer (4 off)
8. Chassis
9. Nut (2 off)
10. Washer (2 off)
11. Bolt (2 off)
12. Pivot pin
13. Spigot mounting bracket (2 off)

Autohitch cylinder (58)

Removal

1. Stop the engine and chock the machine, apply the parking brake**.**

2. Refer to page 1.1 and dump hydraulic pressure then disconnect the battery.

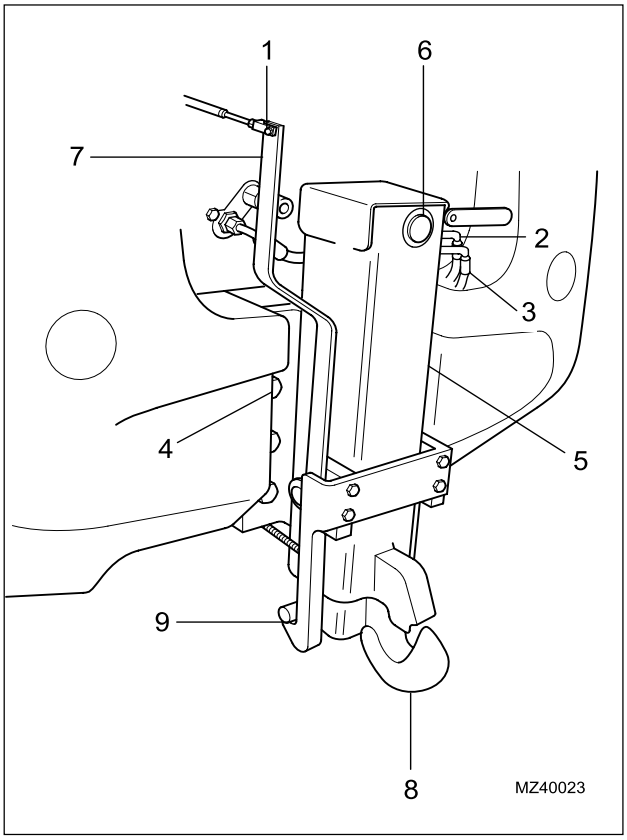
3. Disconnect the autohitch release cable.

4. Identify the hydraulic hoses to make sure they are reconnected correctly. Disconnect the two hydraulic hoses from the right side of the assembly, blank the cylinder connections and open hoses.

WARNING *The autohitch assembly weighs 300 kg (660 lb). Take care when handling assembly to avoid damage to components and injury to personnel.*

5. Support the autohitch assembly and remove the bolts and washers securing assembly to rear service plate. Slide assembly off the locating spigots and remove from machine.

6. Remove the split pin and washer securing the cylinder upper attachment pin (6) and remove pin. Manually operate the release lever (7) and slide the lower hook (8), complete with cylinder, out of the autohitch assembly. Remove the roll pin securing the lower attachment pin (9) to the lower hook and drive out the pin. Remove the cylinder from the lower hook.



1. Release cable
2. Hydraulic hose
3. Hydraulic hose
4. Attachment bolts
5. Autohitch assembly
6. Attachment pin
7. Release lever
8. Lower hook
9. Attachment pin

Installation

1. Installation is the reverse of the above procedure.

2. Refer to page 1.66, check the hydraulic level and replenish tank before engine is started.

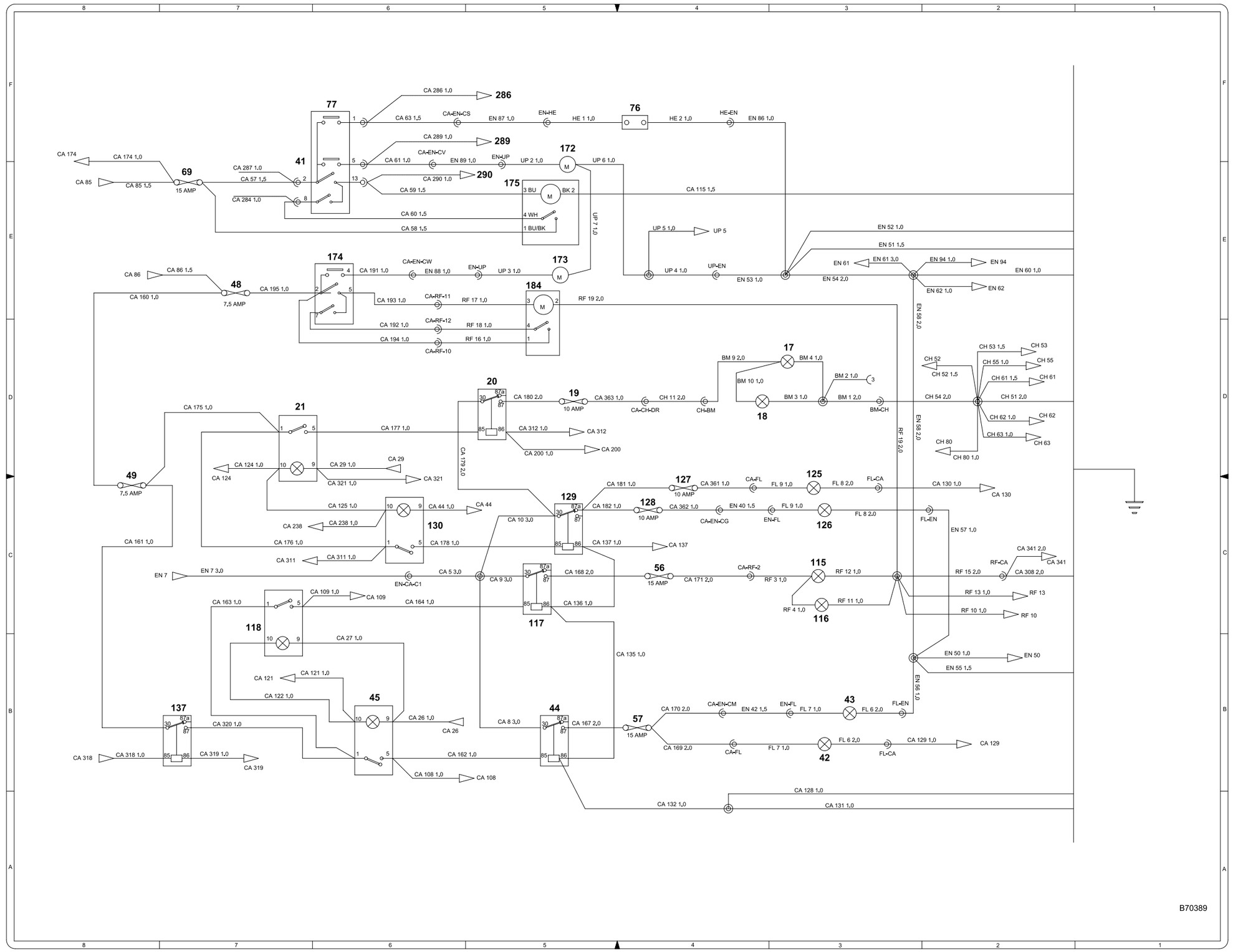
3. Purge the hydraulic system by starting the engine and operating the autohitch service to fully extend and retract cylinder several times.

4. Refer to Page 1.66 and check the hydraulic level and replenish if necessary.

Dismantling

1. Clean the exterior of the cylinder with a suitable solvent and dry with compressed air. Do not use cloths or paper towels to dry component.

SHEET 3 - WIPERS, WASHERS, HORN, WORKLIGHTS



B70389

LONGITUDINAL STABILITY INDICATOR

Description

The Longitudinal Stability Indicator (LSI) monitors the forward stability of the machine. The LSI provides audible and visual signals in order to alert the operator to the condition of a loaded machine.

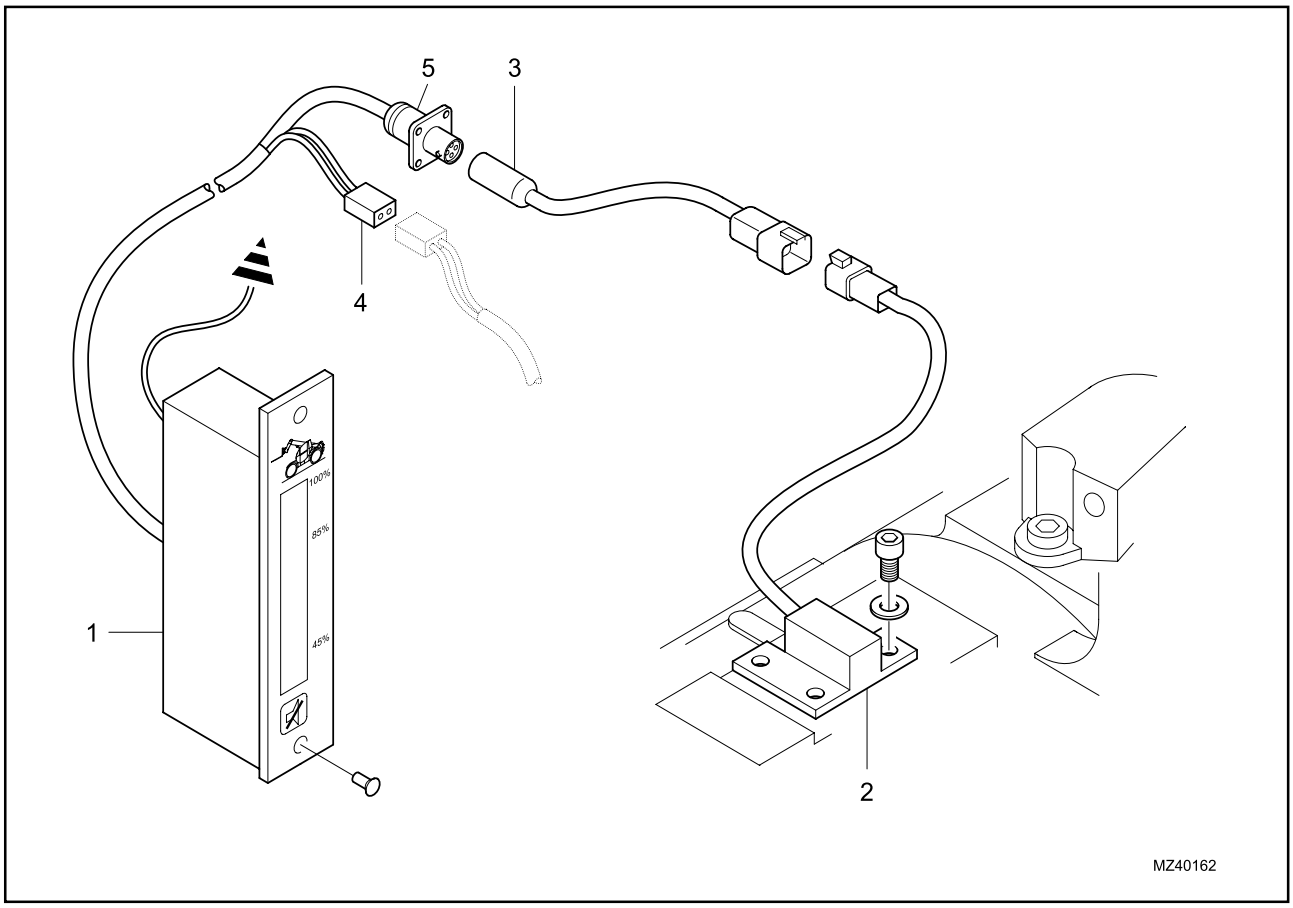
The main components of the LSI are a sensor (2) and a display module (1). The sensor is mounted on the rear axle and the display module is located inside the cab on the cab right side console. An intermediate harness (3) connects to the display module connector (5) and the sensor. The intermediate harness is routed from the space between the rear of the cab and the hydraulic control valve through the cab to the instrument panel. The LSI is powered by the machines electrical system and power is supplied to the display module through a connector (4).

The LSI is activated when the engine start switch is turned to the ON position. The sensor sends electrical signals to the display module which then provide the operator with audible and visual signals. The display module attempts to simulate the load chart for the machine.

The electrical signal that is sent from the sensor to the display module is proportional to the strain that is applied to the sensor. The sensor is subject to the same strains that are applied to the rear axle. These strains depend on the weight of the load that is carried on the work tool and the amount of boom extension.

The following power supply table shows the power supply required to operate the LSI. The current will depend on the load that is indicated on the display module (1).

Power Supply	
Nominal Voltage	12 Volts DC
Voltage Range	10.5 Volts to 15.5 Volts
Current	100mA to 300mA (1)



2. Ensure the display module is in the normal operating mode.

3. Press the push button (20) marked “SPAN” and hold pressed. Only the green indicator (7) must flash.

4. At the same time press the  button (18) on the display module. Green indicator (7) must illuminate continuously for two to three seconds and the audible alarm must sound once. Green indicator (7) must then start to flash again. The zero setting has now been reset, but the 100% calibration point has remained unchanged.

5. Stop the engine. Turn engine start switch to the OFF position.

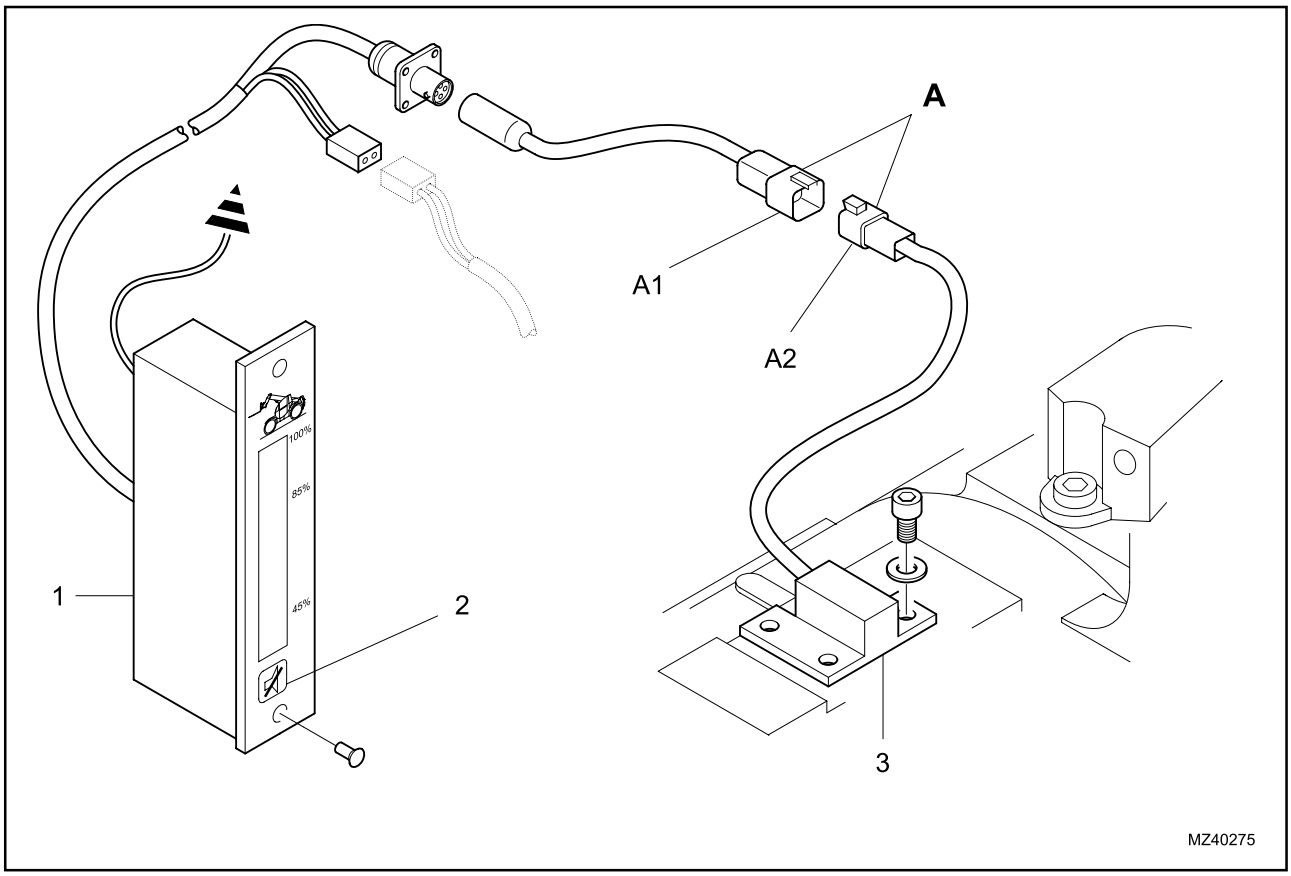
Testing Load Sensor Function

Functional test of Load Sensor Indicator

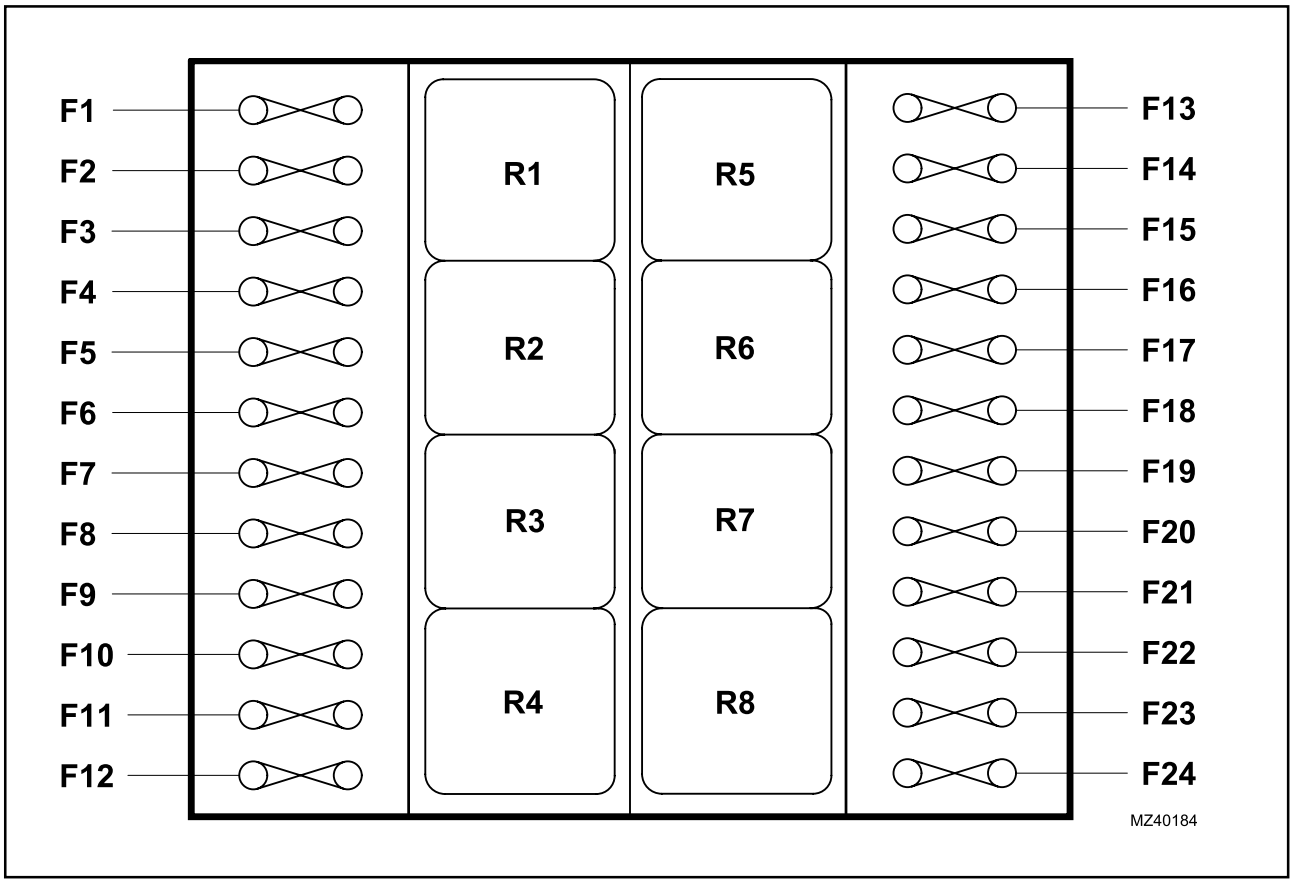
1. Switch on ignition.

2. Switch on the road travel switch on and ensure the bottom light of the indicator comes on.

3. Press test switch (2) on the display module (1), ensure all lights come on and buzzer is heard.



1	Longitudinal stability indicator	A	Load sensor connector A
2	Test switch	A1	Machine harness connector
3	Load Sensor (155)	A2	Load sensor cable connector



Fuses

F1	7.5 Amp	-	Rear wiper
F2	7.5 Amp	-	Working lights
F3	10 Amp	-	Road switch
F4	10 Amp	-	Direction indicators/Radio
F5	25 Amp	-	Heater
F6	5 Amp	-	Hydraulic controls
F7	3 Amp	-	Safe load indicator
F8	10 Amp	-	Rear fog lights
F9	15 Amp	-	Rear working lights
F10	7.5 Amp	-	Front working lights
F11	10 Amp	-	Engine run/Fuel sender/Brake low pressure light
F12	10 Amp	-	Stop lights/Steering sensor/ Transmission dump light

Relays

R1			Boom working lights
R2			Ignition
R3			Direction indicators
R4			Transmission dump
R5			Front working lights
R6			Rear working lights
R7			Side working lights
R8			Headlights
F13	5 Amp	-	Right hand side light
F14	5 Amp	-	Left hand side light
F15	7.5 Amp	-	Right hand main beam
F16	7.5 Amp	-	Left hand main beam
F17	7.5 Amp	-	Right hand dip beam
F18	7.5 Amp	-	Left hand dip beam
F19	10 Amp	-	Hazard warning light
F20	10 Amp	-	Transmission controls
F21	10 Amp	-	Interior light/Beacon/Din socket
F22	15 Amp	-	Steering column multifunction switch
F23	10 Amp	-	Headlight flash
F24	7.5 Amp	-	Instrument panel
F25			Air conditioning