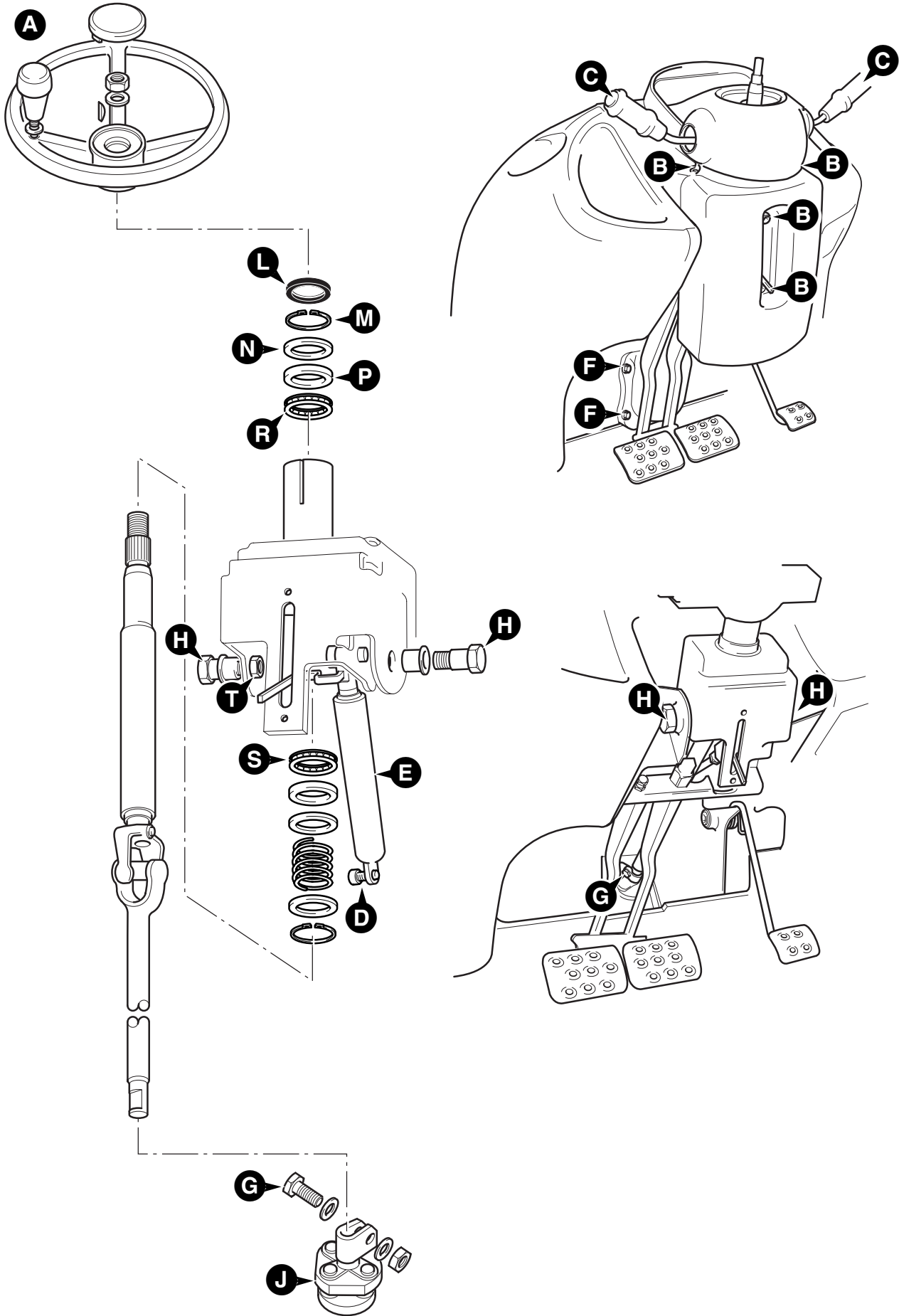


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A396921

Removal and Replacement

The steering column can be tilted to improve operator reach and comfort levels. This type of assembly is referred to as a 'tilt column'.

The illustration on the adjacent page is intended as a guide to removal and replacement.

Removal

- * **1** Park the machine on firm level ground, engage the parking brake and set the transmission to neutral. Lower the loader arms to the ground. Switch OFF the engine, remove the starter key and disconnect the battery.
- 2** Remove the steering wheel as shown at **A**.
- 3** Remove socket screws **B** and take off the steering column pedestal cover.
- 4** Remove the control column switches **C**.
- * **5** Remove the socket screw **D** securing the gas damper strut **E**.
- 6** Remove socket screws **F** and lift up the rubber protective cover behind the brake pedals to gain access to the flexible coupling.
- * **7** Remove the coupling bolt **G** and shoulder bolts **H**. Then carefully withdraw the steering column assembly (with the gas damper strut attached) from the flexible coupling **J**.

Replacement

Replacement is the reverse of the removal sequence.

- * Apply JCB Threadlocker and Sealer to threads of nuts **T**.

Note: The coupling bolt **G** must engage with the cut-out in the shaft.

- * After re-fitting check that the steering tilt functions correctly, and that the direction indicators and lights operate correctly. Check that the wires from the brake pedal switch do not rub on the steering column.

* Torque Settings

Item	Nm	kgf m	lbf ft
D	14	1.4	10.3
H	40	4.1	29.5

Dismantling and Assembly

The illustration on the adjacent page is intended as a guide to dismantling and assembly.

Dismantling

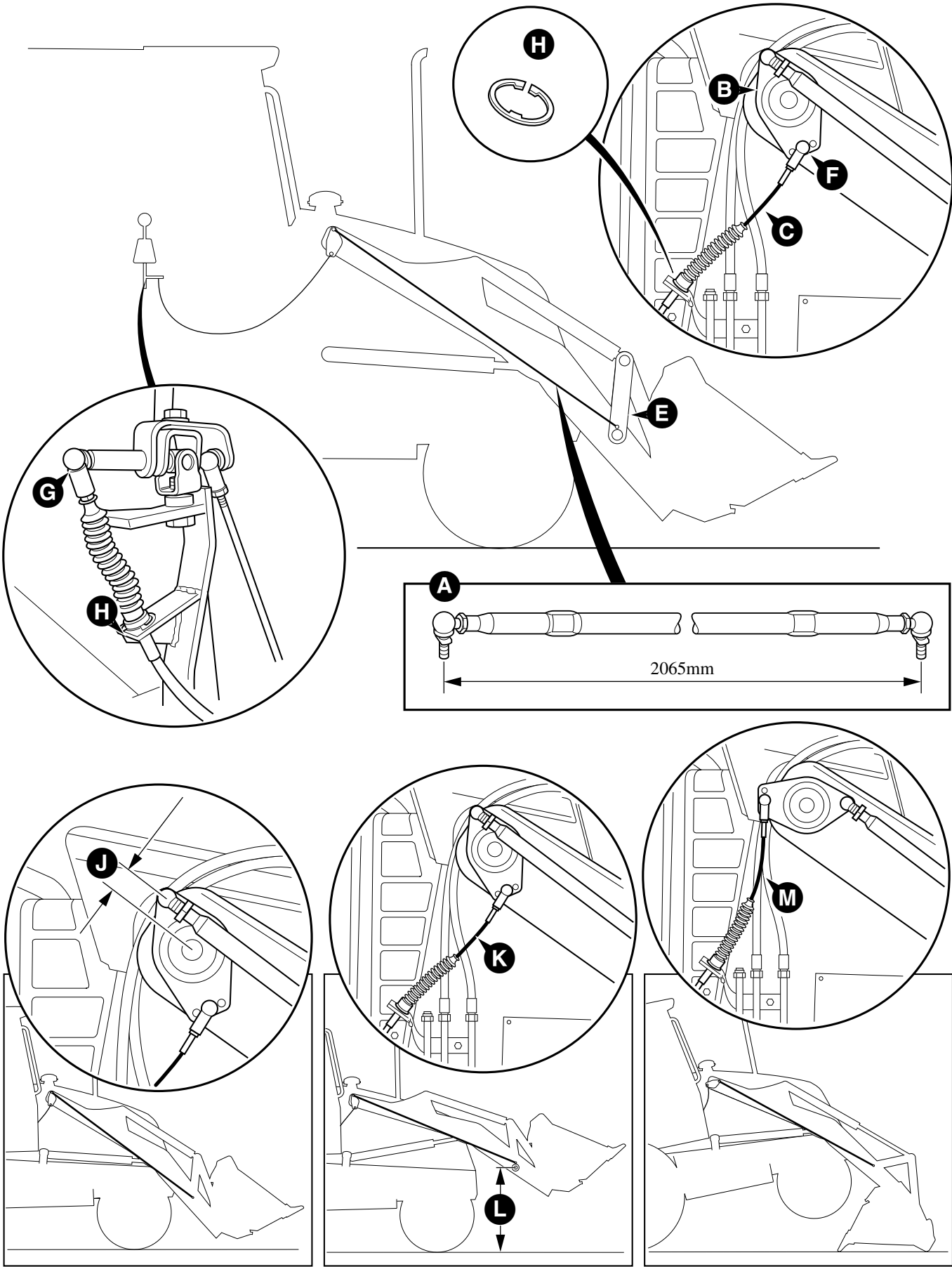
- 1** Using a screwdriver in the slot, carefully prise out the dust seal **L** from the outer column tube.
- 2** Remove external circlip **M**, washer **N**, tolerance ring **P** and withdraw the steering shaft from the outer column tube and pivot bracket.

Note: The top and bottom bearings **R** and **S** housed in the outer column tube are non serviceable parts. They may be removed for cleaning and inspection, but if the bearing(s) have failed a new outer column tube and pivot bracket assembly must be used.

Note: The gas damper strut **E** is a non serviceable part. If the damper is faulty it must be replaced with a new one.

Assembly

Assembly is the reverse of the dismantling sequence.



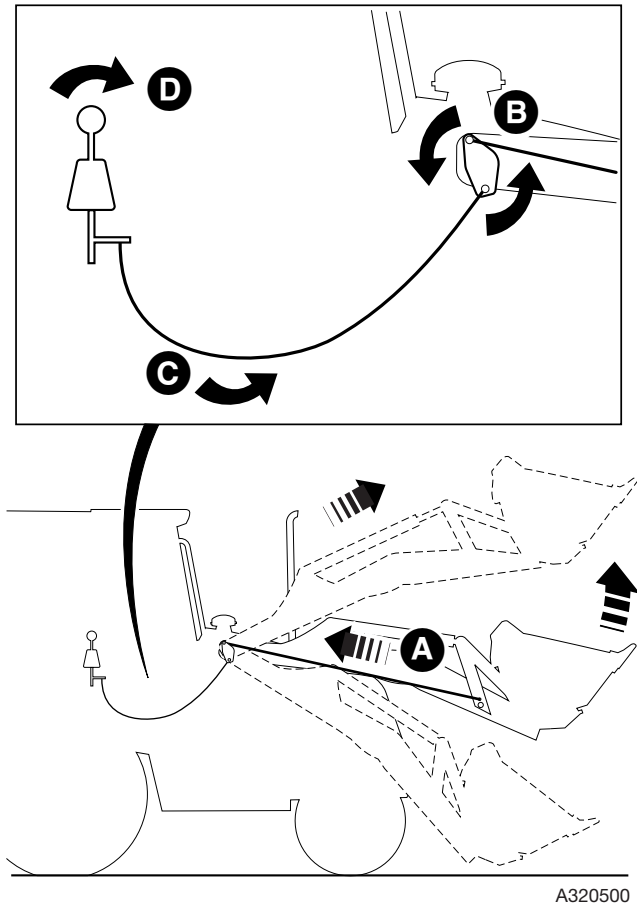
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214e Machines Only

The shovel reset system is designed to automatically tilt the shovel forward when the loader arms are raised, this prevents a heaped shovel from depositing its contents over the back of the shovel onto the bonnet or cab when the loader arms are raised.

When the loader arms are raised the feed back link **A** causes the cam plate **B** to rotate anti-clockwise. The rotation of the cam plate pulls the cable **C** which selects the loader valve block shovel spool **D** to tip the shovel forwards.

When either a cable or feedback link is changed or if the shovel reset system is not operating correctly carry out functional adjustment check.



A320500

Fitting

- 1 Adjust the feedback link **A** to 2065mm (81.3in). After adjusting tighten the lock nuts.
- 2 Fit cam plate **B** with the single threaded hole at the top.
- 3 Fit feed back link **A** to cam plate and shovel lever **E**.
- 4 Connect cable **C** to the bottom centre position **F** on the cam plate **B**, secure in position.

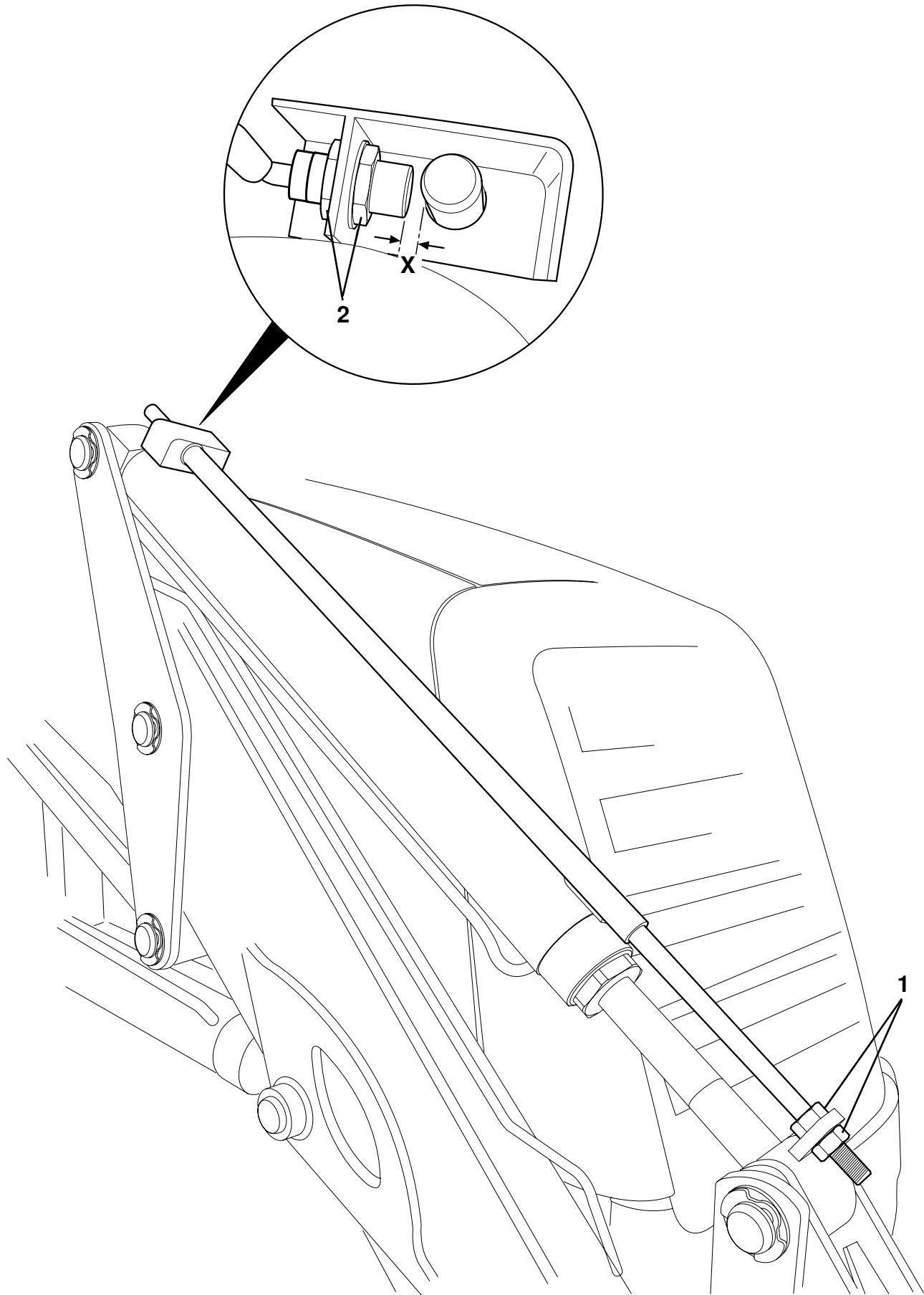
Note: The factory fit position for the cable end ball joint to cam plate is the centre position. Because of component variation it is permissible to fit the cable end ball joint in either the forward or rear position. The forward position will advance the levelling and the rear position will delay the levelling.

- 5 Connect cable **C** to the loader arm control lever **G**.
- 6 Secure cable ends with spring clips **H**.
- 7 Carry out the adjustment procedure.

Adjustment

- 1 Roll the shovel fully back and lower to the ground.
- 2 The feedback link position in relation to the loader arm pivot pin measurement **J** should be 40mm (1.5in). Adjust feedback link as required.
- 3 When the loader arms are raised there should be no slack in the cable at **K** when the shovel arm pivot pin **L** is 1.0 to 1.5 meters (3.5 to 5.0 feet).
- 4 Roll the shovel fully forward and fully retract the lift arms, this will raise the front wheels off the ground.
- 5 In this position there should be slack in the cable at **M**, if not adjust the cable as required.

Note: Whenever any adjustment is made repeat steps 4/5 to make sure there is slack in the cable with the shovel rolled fully forward.



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Operation

This enables you to roll the shovel from the rolled forward position into the digging position quickly and easily.

When you select 'Return To Dig' a proximity switch on one of the loader arms cuts off the hydraulic pressure to the shovel rams immediately the shovel reaches the correct angle for digging.

To select 'Return To Dig':

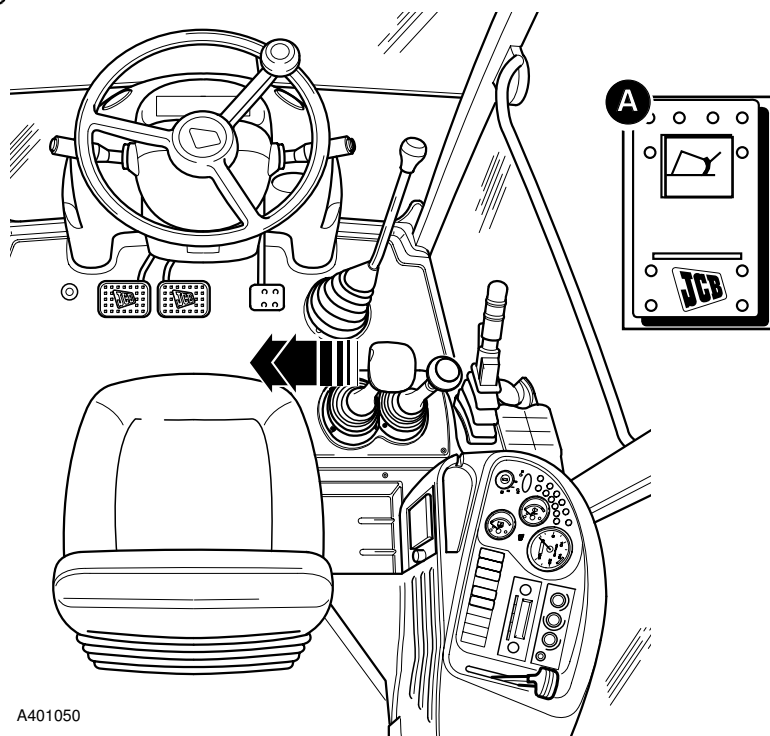
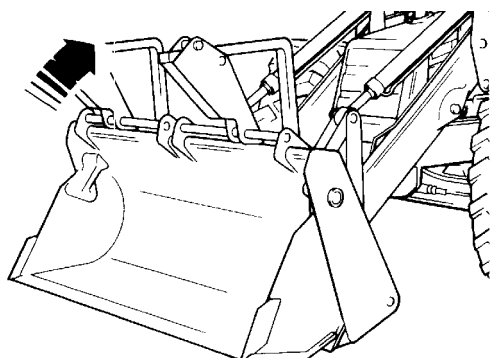
- 1 Press the 'Return To Dig Enable' switch **A** to the ON position, the switch will illuminate.
- 2 Pull the loader lever to the left as far as it will go. You will feel a slight pressure on the lever as it passes through the **Roll Back** position.

Release the lever, it will stay in the detent position until the shovel reaches the return to dig position when the lever will automatically return to the central hold position.

- 3 When return to dig is no longer required press the enable switch to the OFF position.

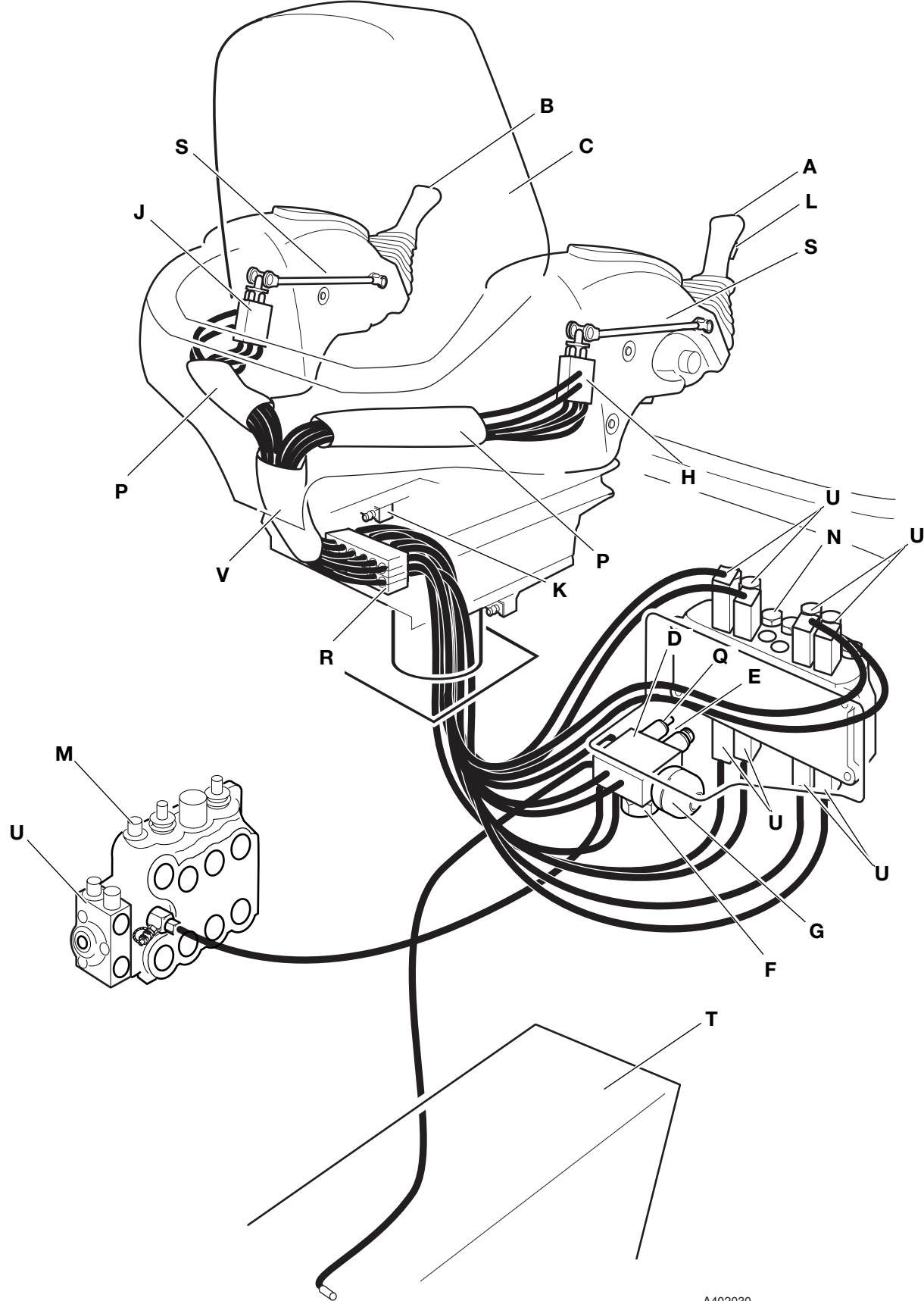
Adjustment

- 1 Lower the loader arms and position the shovel in the required 'Return To Dig' position.
- 2 Switch OFF the engine but leave the ignition ON.
- 3 Press the 'Return To Dig Enable' switch to ON.
- 4 Adjust the rod with nuts **1** so that the LED on the proximity switches illuminates/extinguishes at this position.
- 5 Adjust the proximity switch with nuts **2** to give a clearance **X** of 2 mm (0.08 in).



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Basic System Operation
Component Location

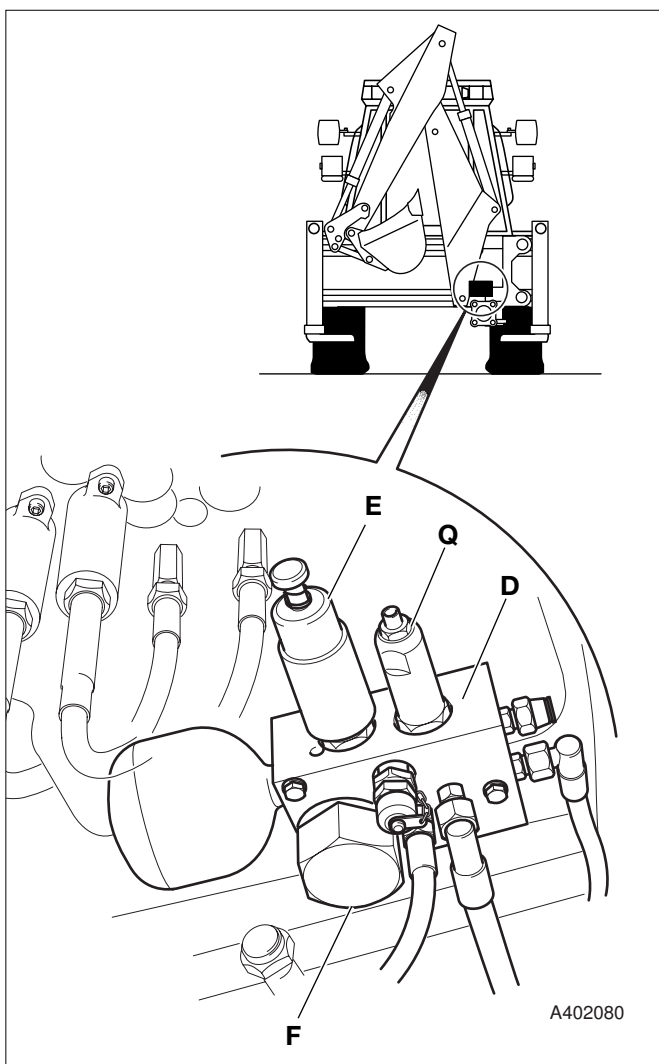


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Basic System Operation

Component Identification

A	Right hand joystick
B	Left hand joystick
C	Operator seat
D	Pilot supply valve
E	Supply valve solenoid
F	Oil filter access plug
G	Accumulator
H	Right hand pilot control valve
J	Left hand pilot control valve
K	Seat mounted micro switch
L	Joystick mounted 'mode switch'
M	Loader valve block
N	Excavator valve block
P	Hose sleeves
Q	Pressure relief valve
R	Hose clamps (seat base mounted)
S	Mechanical linkages
T	Machine hydraulic tank
U	Bolt on spool section - extending dipper (if fitted)
V	Plastic cover panel



* The following section describes the JCB Precision Control system fitted to machines up to serial number 931159. There is another JCB Precision Control system fitted to later machines, which is described in a separate section. Refer to **Precision Control (Servo) - Machines from January 2003**.

Circuit Description

The JCB Precision Control system facilitates operation of the backhoe (excavator) via joysticks **A** and **B** mounted in the arms of the operator's seat. Unlike manual machines the excavator valve spools are moved by hydraulic pressure and not directly by a mechanical levers.

A pilot supply valve **D** maintains a constant supply of oil at servo pressure to the right and left hand pilot control valves **H** and **J**. The valves are mounted at the rear of the seat arm rests.

The joysticks each operate a hydraulic pilot control valve (**H** or **J** as applicable) via a mechanical linkage. These valves in turn operate the excavator valve spools via hydraulic pilot pressure. The interconnecting hoses are routed to and from the pilot control valves through the central seat support pillar and then through the cab floor.

The mechanical linkages **S** incorporate universal type couplings at both ends.

The joysticks control boom, dipper, bucket and slew functions. Unlike manual control machines, the foot pedal controlled auxiliary valve spool (typically used to operate the extending dipper ram) is located on the loader valve block. For details of this valve spool see Section E.

The seat arms incorporating the joysticks are adjustable for both height and length. A gas strut mounted in the left hand arm supports the weight of the assembly when adjusting the height.

Note: Precision control machines - extending dipper.

When fitted, the extending dipper ram is controlled by bolt on spool section **U** located on the loader valve. The spool is actuated by the normal foot pedal via a cable.

Basic System Operation

Component Key:

A	Right hand joystick
B	Left hand joystick
D	Pilot supply valve
E	Supply valve solenoid
F	Oil filter
G	Accumulator
H	Right hand pilot control valve
J	Left hand pilot control valve
K	Seat mounted micro switch
L	Joystick mounted 'mode switch'
M	Loader valve block
N	Excavator valve block
P	Machine hydraulic tank
Q	Pressure relief valve
R	Fuse
S	Solenoid manual override control knob
S1a	Excavator Pilot port - Slew ram spool
S1b	Excavator Pilot port - Slew ram spool
S2a	Excavator Pilot port - Boom ram spool
S2b	Excavator Pilot port - Boom ram spool
S3a	Excavator Pilot port - Dipper ram spool
S3b	Excavator Pilot port - Dipper ram spool
S4a	Excavator Pilot port - Bucket ram spool
S4b	Excavator Pilot port - Bucket ram spool
T	Tank

Note that the diagram opposite shows the servo hoses connected to give the SAE + (JCB +) control pattern. For ISO + control pattern some servo hoses are connected differently at the excavator valve, as shown at **Z**.

Electrical Operation

A solenoid actuated valve is incorporated in the pilot supply valve block **D**. The solenoid is controlled either by micro switch **K** or 'mode switch' **L**.

When the operator seat is revolved to face the rear of the machine switch **K** is closed. This energises solenoid **E** and oil at pilot pressure is diverted to the 2 pilot control valves **H** and **J**, thus enabling the system. Solenoid **E** also incorporates a manual override facility (**S**). This enables the backhoe to be operated in an emergency situation, in the event of solenoid or electrical failure for example.

In some circumstances the operator may require actuation of the backhoe with the seat in the forward position (when un-sticking from boggy ground for example). This is achieved by means of joystick mounted mode switch **L**. The switch energises solenoid **E** and the system is enabled.

The left hand joystick houses a horn switch. On some machines the joysticks also incorporate switches for control of a hydraulic quickhitch and changeover from auxiliary (typically jaw bucket) to extending dipper operation.

Hydraulic Operation

Oil at system pressure flows to the pilot supply valve **D** via a hose connected at the loader valve **M**. An integral pressure relief valve **Q** maintains the oil at 'pilot' pressure.

When the operator actuates the system by revolving the seat to face the rear, or by operating the mode switch, solenoid **E** is energised and moves the pilot supply valve spool. Oil flows to the pilot control valves **H** and **J**.

Each pilot control valve contains four spool valve 'capsules', numbered 1 to 4 on each valve. The valves are operated by moving the associated joystick. With the joystick in the neutral position all the valves vent oil from the excavator valve pilot ports S1-S4 to tank.

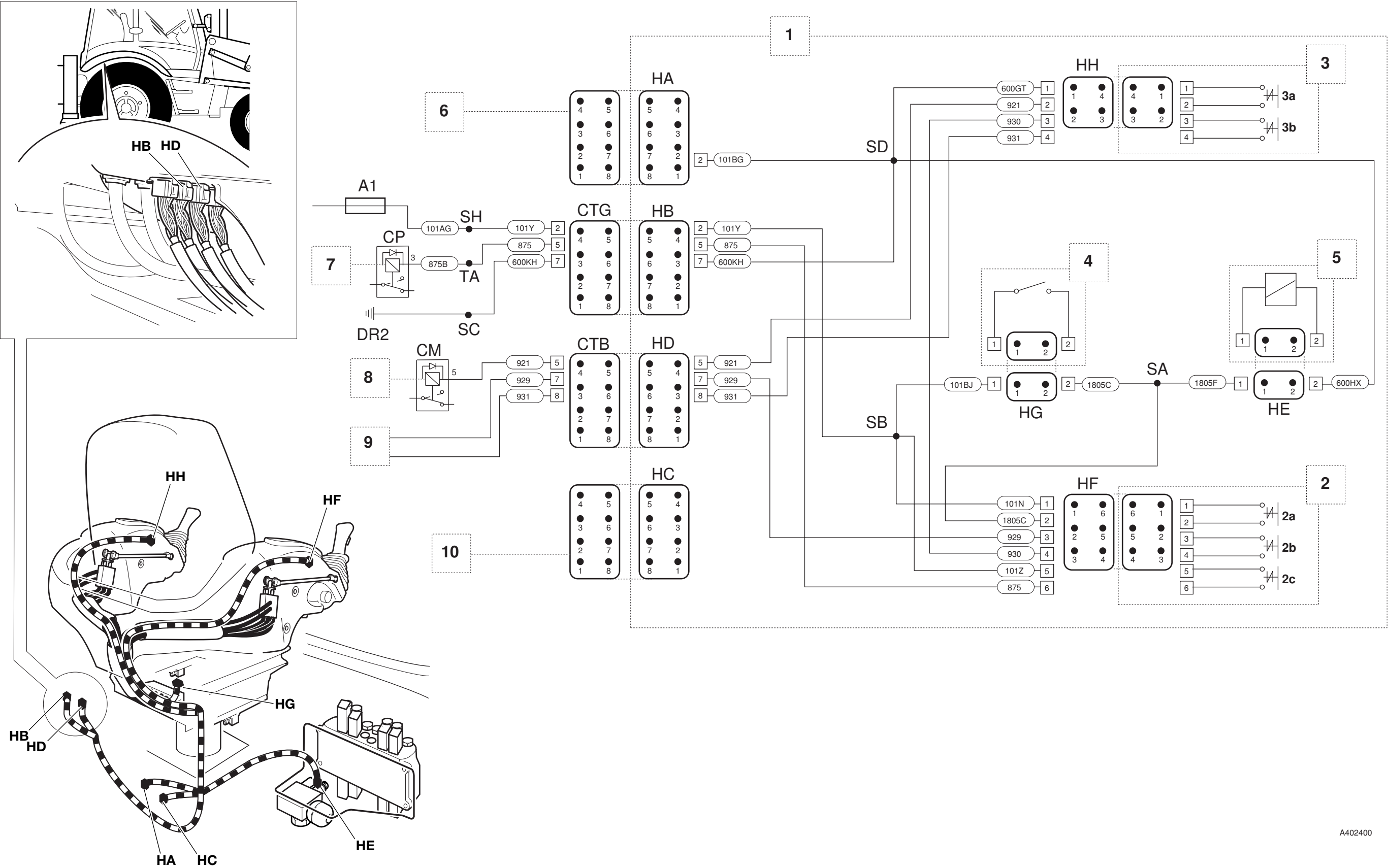
Example Operation:

When the operator moves the right hand joystick forward the mechanical linkage connected to pilot valve **H** pushes spool 1 down. Oil at pilot pressure is diverted to port S3b. in the excavator valve **N**. This causes the dipper spool to move and operate the dipper ram. As the dipper spool moves, oil is vented from port S3a via spool 3 and port T in control valve **H**.

The valve 'capsules' feature proportional control. This enables backhoe precision control. Each valve capsule modulates oil pressure supplied to the associated excavator valve pilot line in proportion to the joystick position. The further the joystick is moved the greater the pilot pressure and the further the associated excavator valve spool moves.

Accumulator **G** maintains hydraulic pressure for several operations of the excavator spools with the engine stopped. This allows venting of pressure from the backhoe hydraulic rams, or lowering of a load in the event of engine failure.

Electrical Connections



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Electrical Connections

On the electrical diagram opposite the electrical connectors (example, CTG to HB) are shown looking on the mating face of each connector when they are disconnected.

The wire numbers and colours, where appropriate, are shown as an aid to identification whilst fault finding.

Before fault finding make sure that you understand how the the electrical circuits work. Most potential faults can be traced using a multimeter to carry out continuity checks on wires, switches and solenoid coils. See **Service Procedures, Electrical Testing Methods** for more details.

Component Key:

- 1 Servo harness
 - HA Auxiliary hydraulics harness loop connector
 - HB Auxiliary hydraulics connector
 - HC Rear cab harness loop connector
 - HD Rear cab harness connector
 - HE Pilot control valve solenoid connector
 - HF Right hand joystick connector
 - HG Seat microswitch connector
 - HH Left hand joystick connector
- 2 Right hand joystick
 - 2a Microswitch - Mode
 - 2b Microswitch - Excavator quickhitch latch control (if fitted)
 - 2c Microswitch - Hydraulic changeover solenoid valve (if fitted)
- 3 Left hand joystick
 - 3a Microswitch - Rear Horn
 - 3b Microswitch - Excavator quick hitch latch control (if fitted)
- 4 Seat mounted microswitch
- 5 Pilot control valve solenoid
- 6 Auxiliary hydraulics wiring harness, see **Basic System Operation, Circuit Schematics**
- 7 Hydraulic change over circuit, see **Basic System Operation, Circuit Schematics, Auxiliary and Hydraclamp Hydraulics**
- 8 Rear horn circuit, see **Basic System Operation, Circuit Schematics**
- 9 Dedicated quick hitch circuit, see **Basic System Operation, Dedicated Quick Hitch**
- 10 Rear cab harness
- A1 Fuse - Hydraulic Auxiliary
- CP Relay base - Auxiliary (jaw bucket)
- CM Relay base - Rear horn

Splices:

- SA
- SB
- SC
- SD
- SH
- TA

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Fault Finding

Introduction

The fault finding procedures are given in the form of flow charts. There are a number of charts, each one dedicated to a particular fault. The charts are designed to identify possible causes by performing checks and where applicable, specific tests. Having identified a cause the suggested remedy is given. The charts are designed to identify causes through a process of elimination, starting with the simplest, most easily rectified faults.

Before proceeding:

- 1** Make sure that the hydraulic fluid is at the correct working temperature (50°C, 122°F).
- 2** Be sure to remove ALL contamination and if possible identify its origin. It may be part of a component from elsewhere in the circuit.
- 3** Replace any seals such as 'O' rings before assembling hydraulic components.

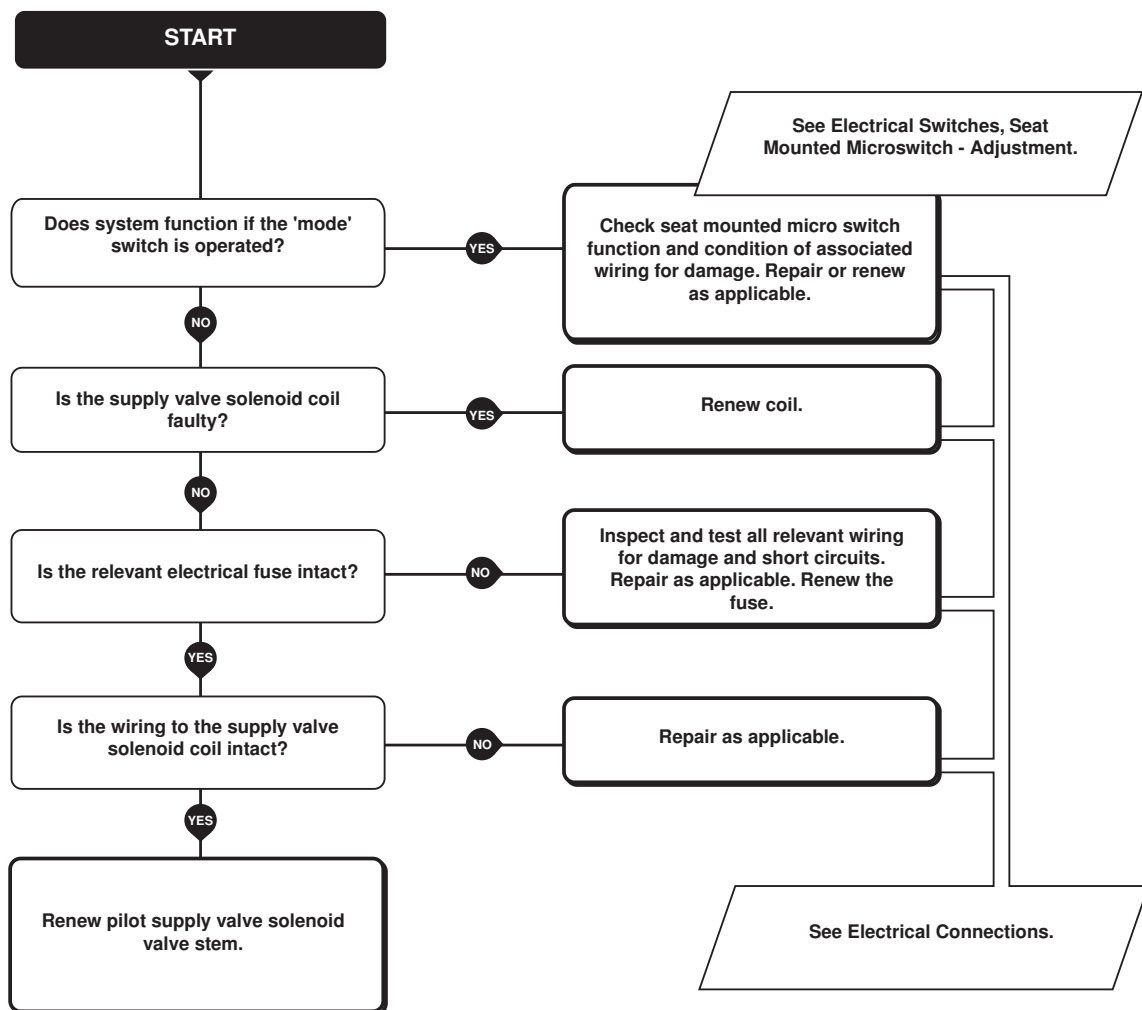
Fault Finding Charts:

Chart A - No Servo Controls (system fails to operate)

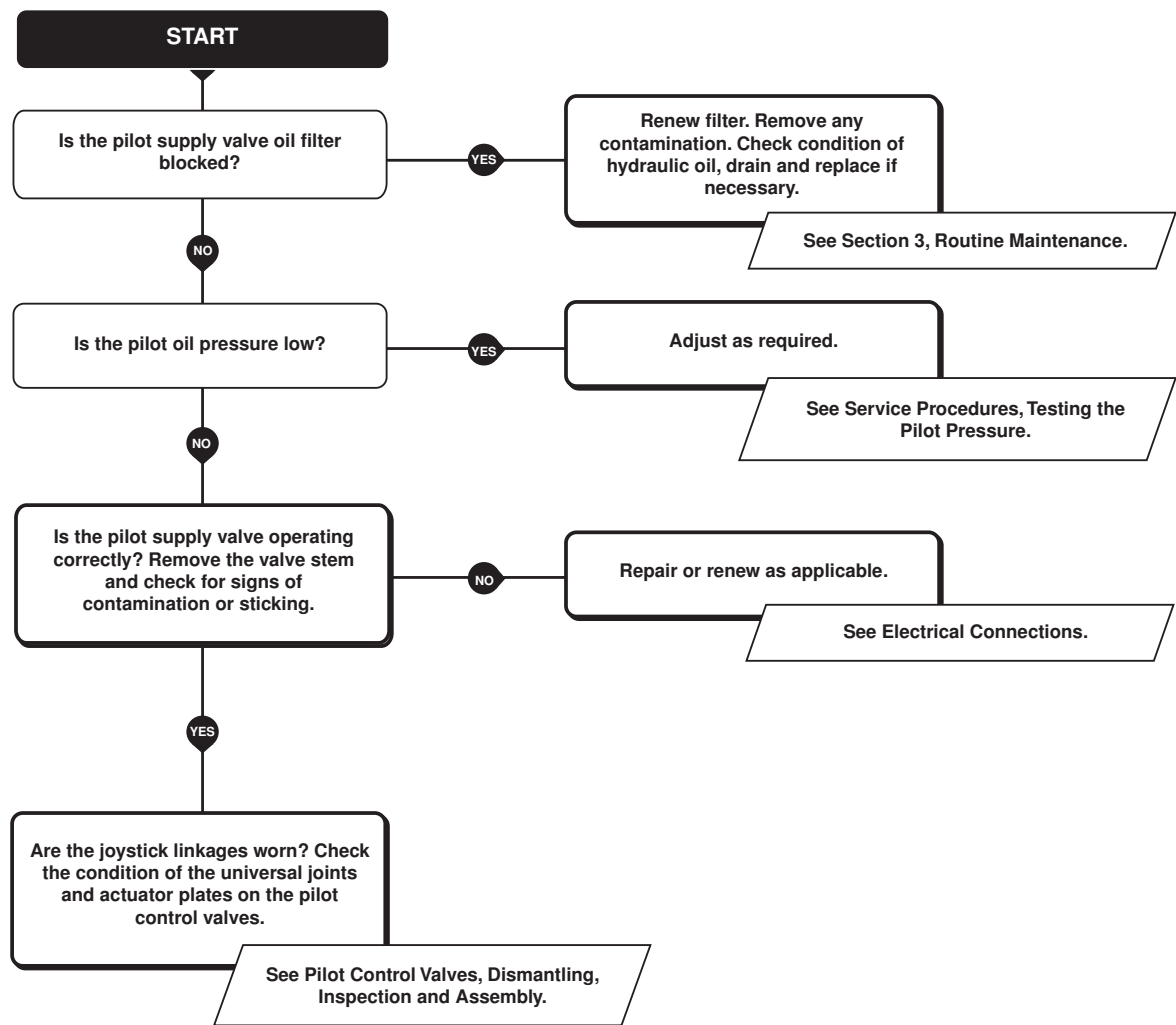
Chart B - All Backhoe Services Slow to Operate

Chart C - One Backhoe Service fails or is Slow to Operate

Chart D - System Fails to Operate when the 'Mode Switch' is Activated (operator seat facing forward)

Fault Finding**Chart A - No Servo Controls (system fails to operate)**

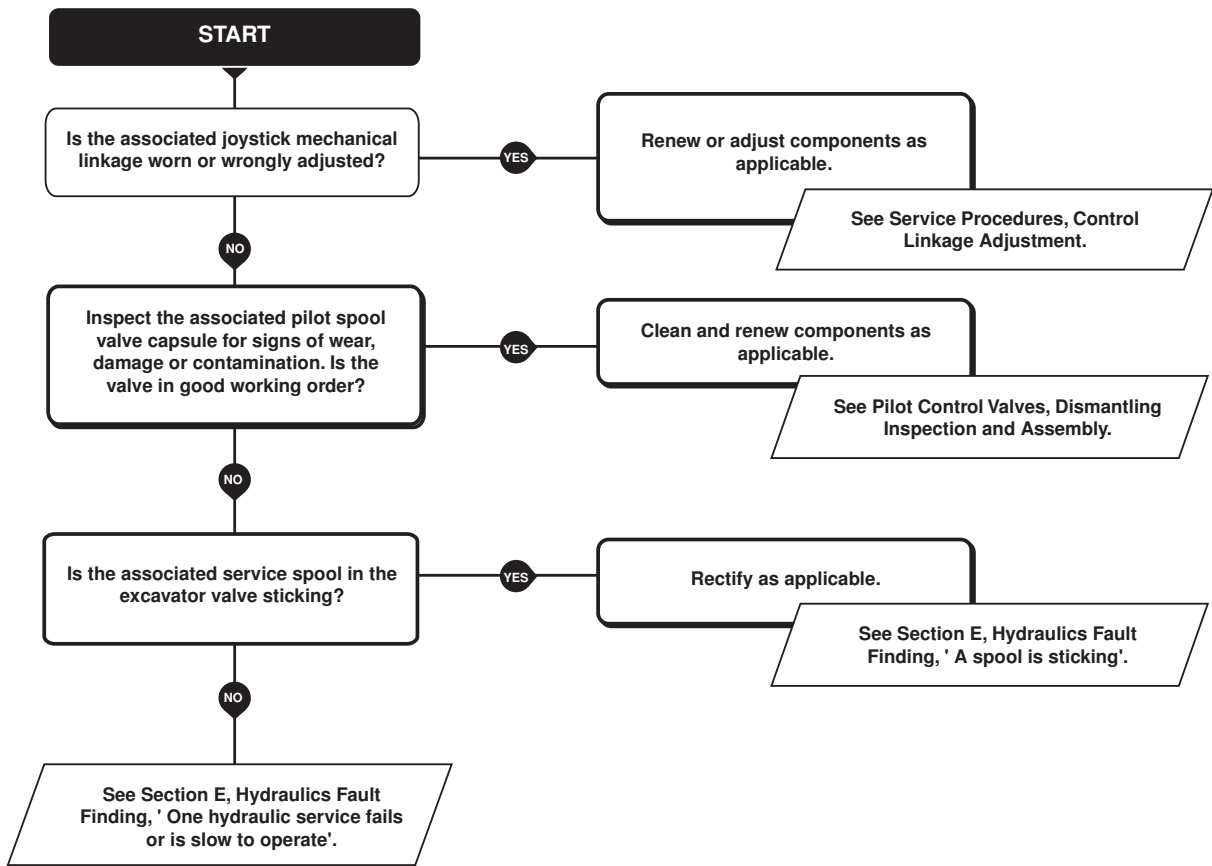
Fault Finding
Chart B - All Backhoe Services Slow to Operate



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Fault Finding

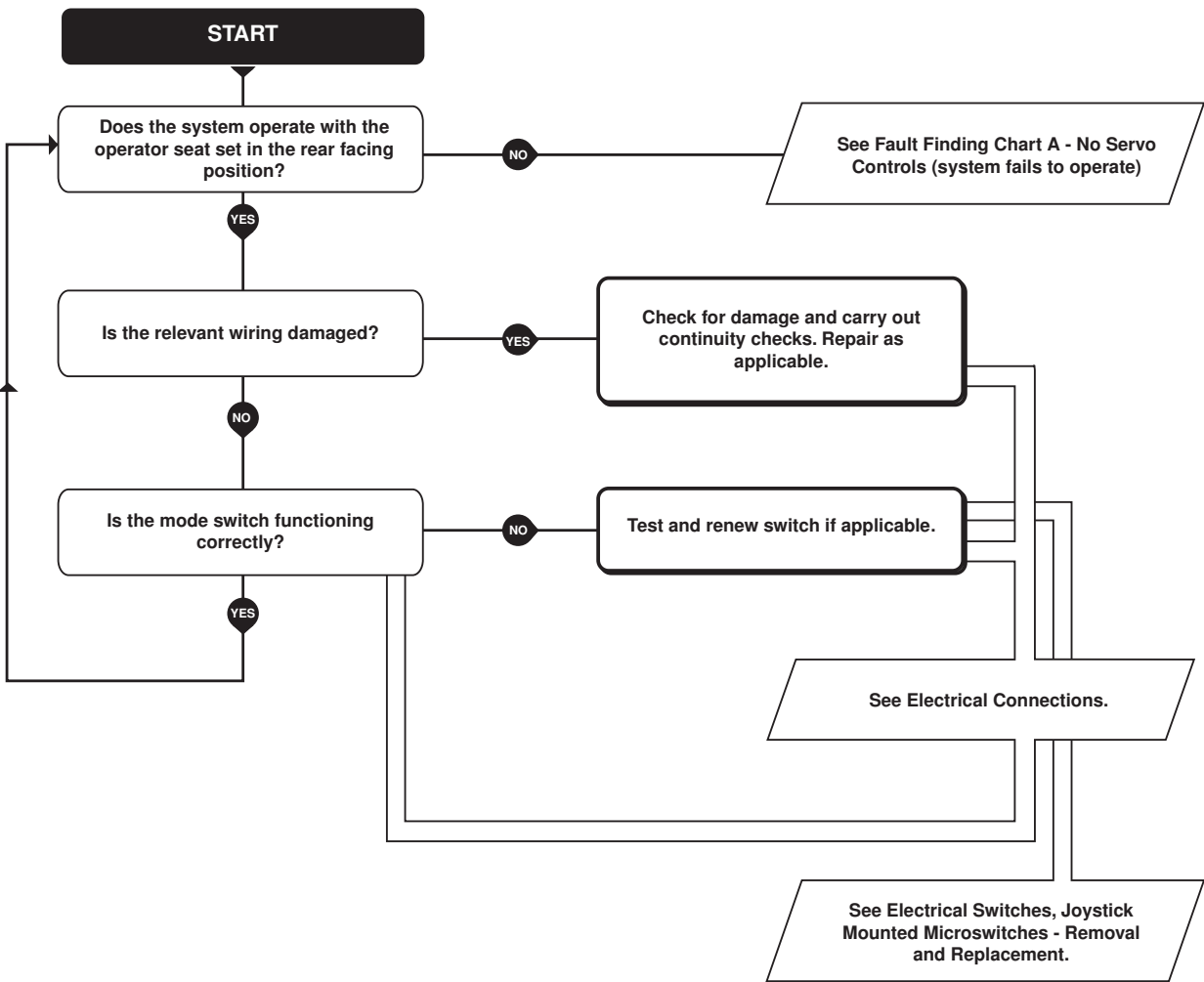
Chart C - One Backhoe Service fails or is Slow to Operate



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Fault Finding

Chart D - System Fails to Operate when the 'Mode Switch' is Activated (operator seat facing forward)



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Service Procedures

Testing the Pilot Pressure

- 1 Position the backhoe to enable access to the pilot supply valve.

Before proceeding further the pilot circuit accumulator pressure must be vented.

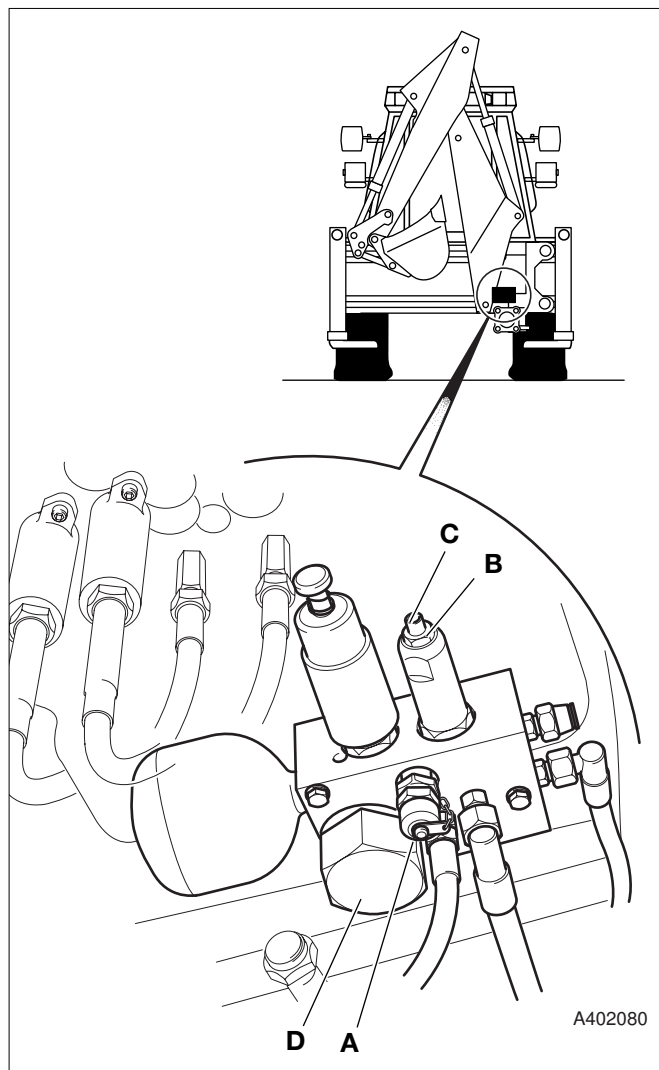
- 2 Stop the engine. With the operator seat set in the rear facing position (for backhoe operation), switch the starter to ON without starting the engine. Operate the joystick controls several times to vent the servo pressure from the accumulator. Switch the starter switch to the OFF position.
- 3 Connect a 0 - 50 bar pressure gauge to the test point **A**.
- 4 With the engine running at 1500 revs/min, operate a backhoe service fully. At the same time check the reading on the gauge. It should be 35 bar (36 kgf/cm² 507 lbf/in²).

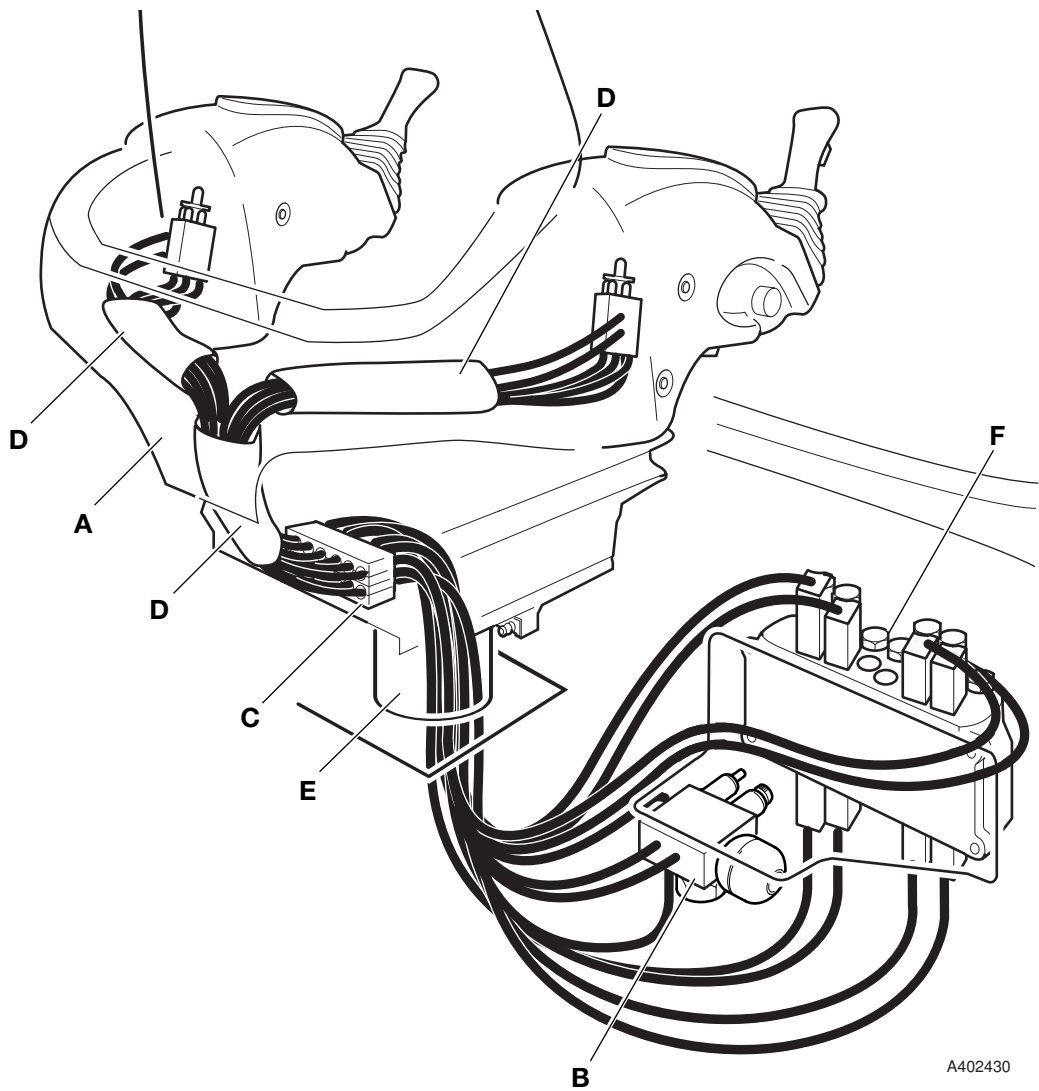
If necessary adjust the pressure as follows:

- 1 Stop the engine. Loosen lock nut **B** and adjust screw **C**. Turn screw **C** clockwise to increase pressure and anti-clockwise to decrease the pressure. When the pressure is correct, tighten the locknut and check the pressure again. Adjust as required.

Renewing the Pilot Supply Valve Oil Filter

- 1 Position the backhoe to enable access to the pilot supply valve.
- 2 Stop the engine. Clean off all dirt on and around the filter cap **D**. Undo the cap. Remove and discard the filter element. The servo system is easily damaged by contaminated hydraulic oil. When installing a new filter element make sure that no dirt is allowed to enter the pilot supply valve.





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Service Procedures

Pilot Hose Removal and Replacement

Before attempting to remove a servo hose the pilot circuit accumulator pressure must be vented.

- 1 Stop the engine. With the operator seat set in the rear facing position (for backhoe operation), switch the starter to ON without starting the engine. Operate the joystick controls several times to vent the servo pressure from the accumulator. Switch the starter switch to the OFF position.
- 2 Note the phasing and routing of the hose to be renewed. Working under the machine, disconnect the applicable hose. Note that the hoses have tags to identify their connections. Plug the open ports. Remove the hose from any ties under the machine.
- 3 Working in the cab remove the plastic shrouds **A** from the seat as required. Disconnect the hose at the pilot control valve **B**. Note that the hoses have tags to identify their connections. Attach some strong string or cord to the end of the disconnected hose.
- 4 Undo the hose clamp **C** at the base of the seat frame.
- 5 Draw the hose up into the cab through pedestal **E** and sleeves **D**. Undo the string from the end of the hose.
- 6 Make sure that the open ends of the new hose are plugged. Tie the correct end of the hose to the string. Draw the hose down through the sleeves **D** and pedestal **E**.
- 7 Remove the string and connect the hose as applicable, making sure to phase it correctly. Refit the hose clamp **C**.
- 8 Tag the new hose at both ends to identify its connections.

Service Procedures

Seat Arms Control Lever - Adjustment

In some instances it may be necessary to adjust the operation of the arms raise/lower control lever **1**.

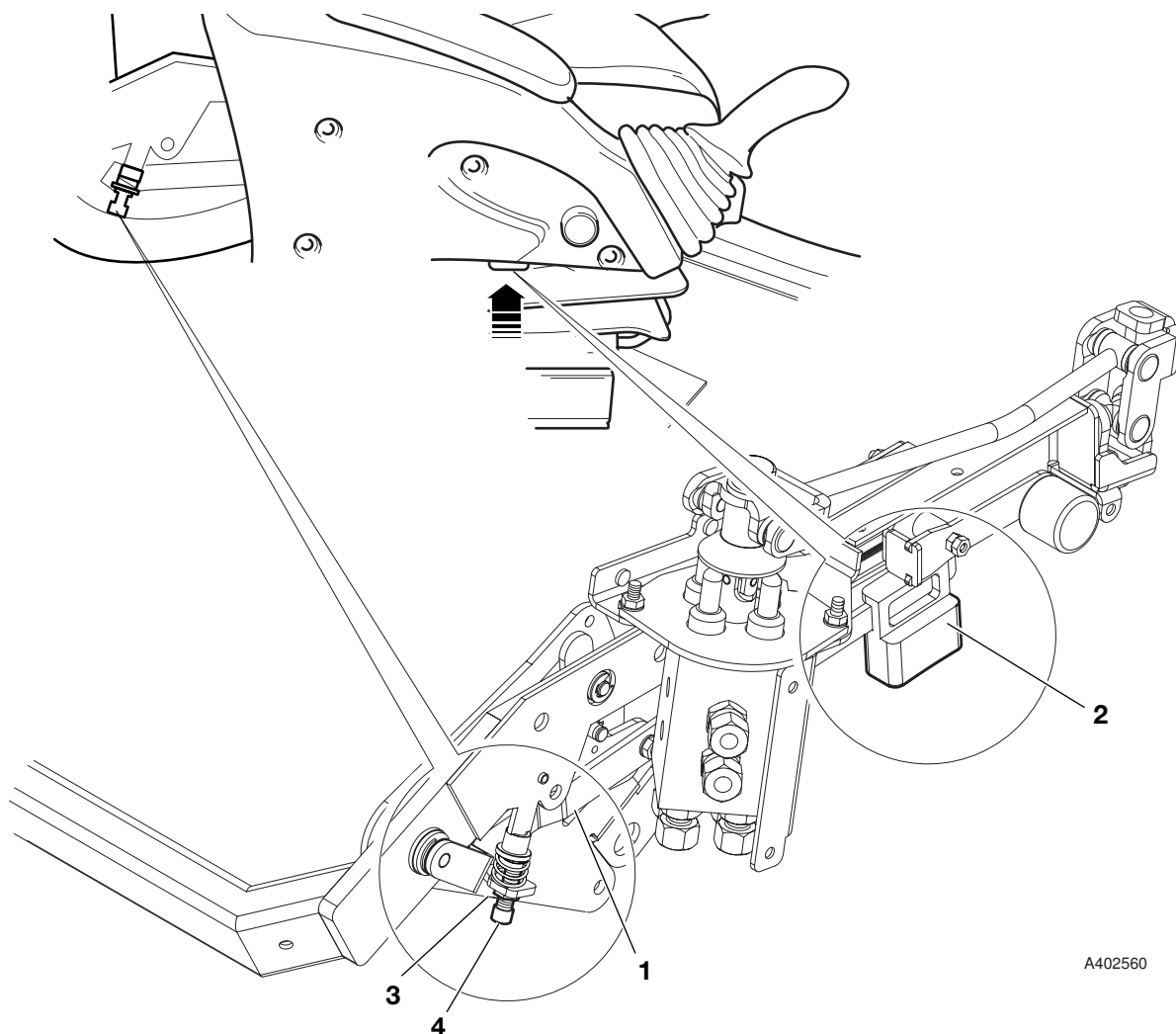
When the button **2** is depressed upwards fully, the arms are released for raise/lower. If the arms are not released, or release but re-lock when the button is fully depressed, adjust the control lever as follows:

If the arms do not release

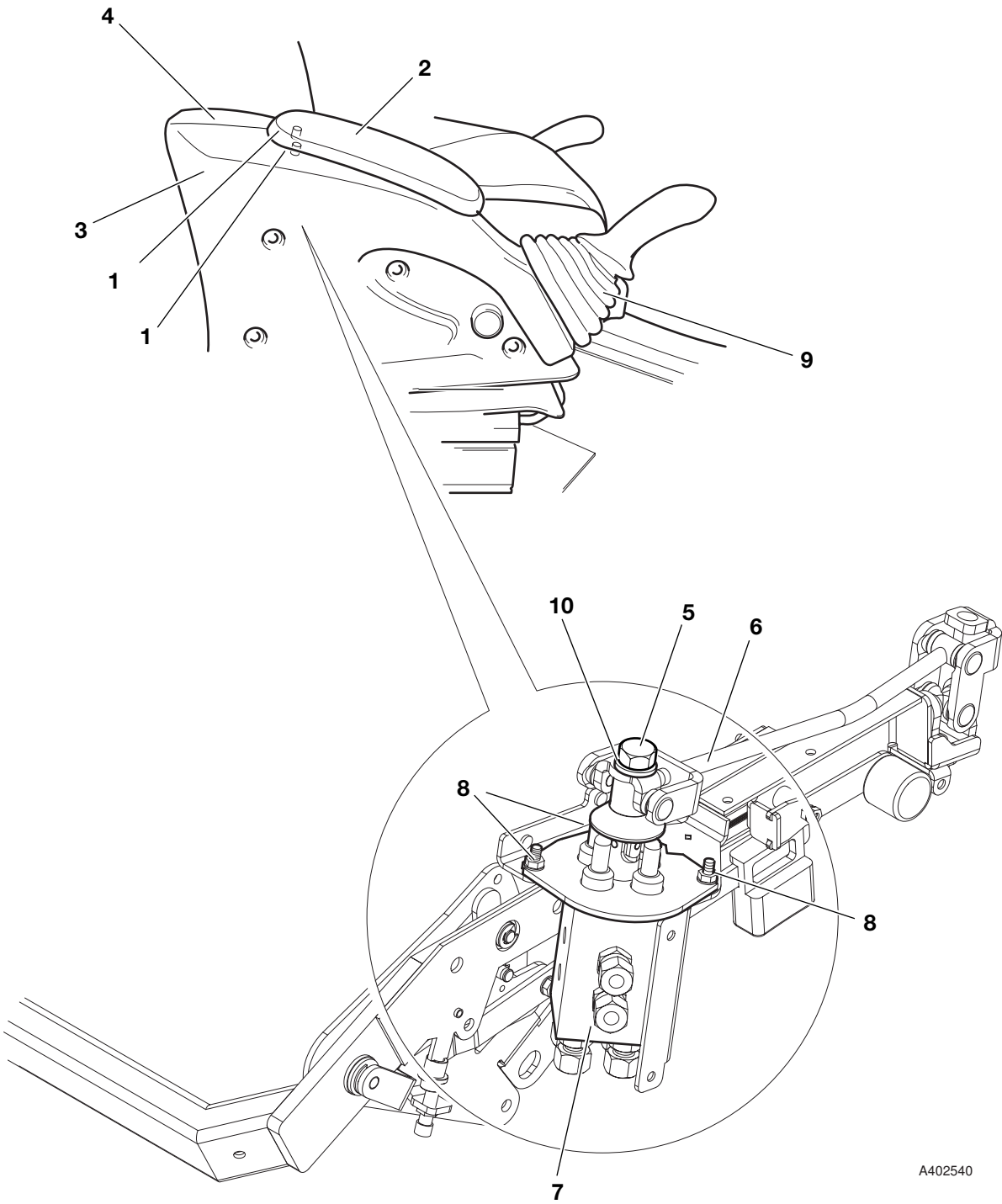
- 1 Slacken lock nut **3** and screw the stop bolt **4** out (anti-clockwise). Test the operation of the control lever and then tighten the lock nut **3**.

If the arms release but re-lock

- 1 Slacken lock nut **3** and screw the stop bolt **4** in (clockwise). Test the operation of the control lever and then tighten the lock nut **3**.



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Pilot Control Valves

Removal and Replacement

Note that the procedure shows the right hand control valve. The removal and replacement procedure for the left hand valve is identical.

Before attempting to remove a pilot control valve the pilot circuit accumulator pressure must be vented.

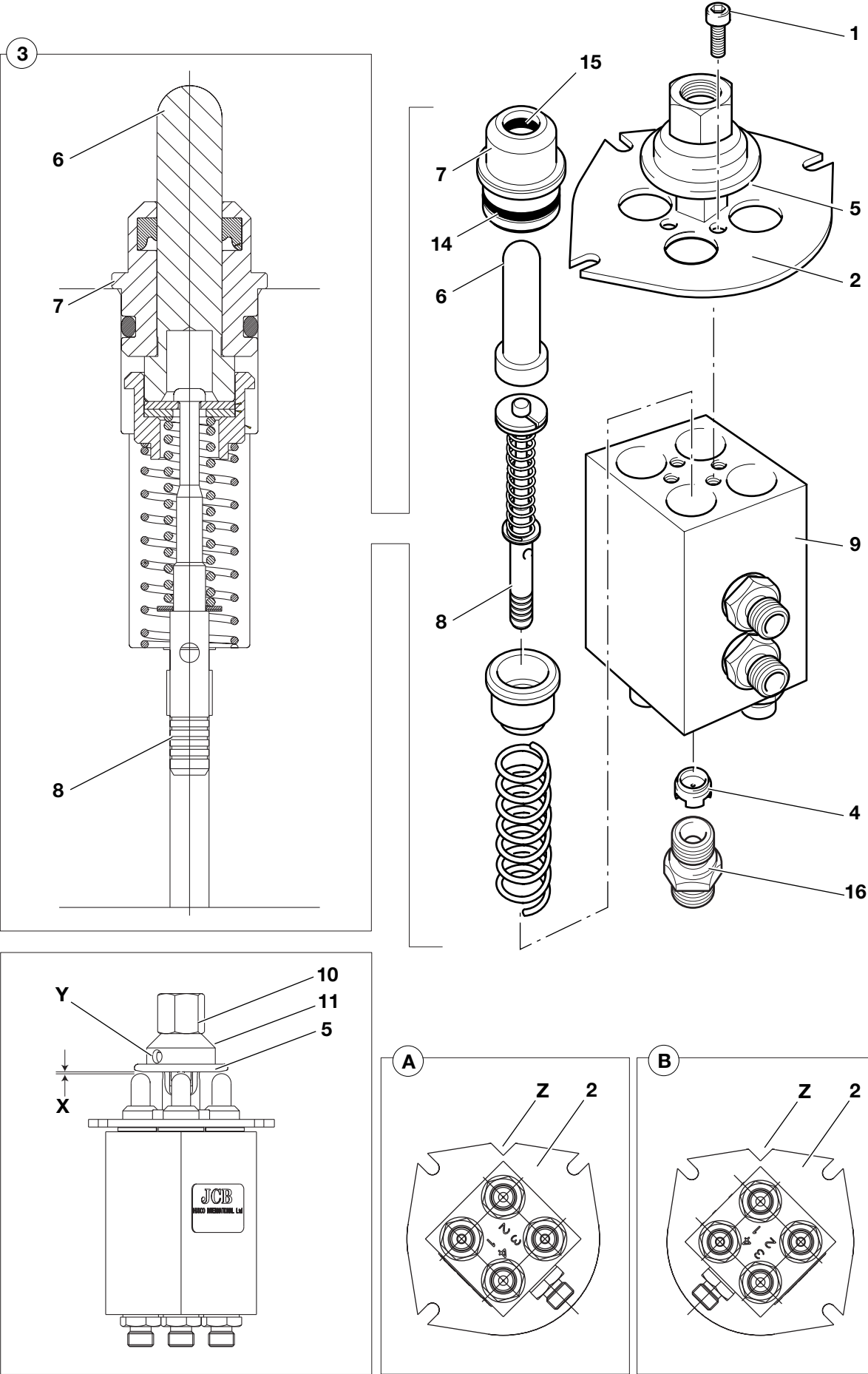
- 1 Stop the engine. With the operator seat set in the rear facing position (for backhoe operation), switch the starter to ON without starting the engine. Operate the joystick controls several times to vent the servo pressure from the accumulator. Switch the starter switch to the OFF position.

Removal

- 1 Reach inside the arm assembly and undo the two arm rest fixing bolts **1**. Carefully lift the rear of the arm rest **2** and pull it to the rear to release.
- 2 Undo the retaining screws and remove the plastic covers **3** and **4**. Undo and remove bolt **5** together with lock washer **10**. Lift the link rod **6** to one side.
- 3 Note the phasing of the hoses connected at the valve **7**. If the hoses are not already tagged, tie on your own tags. Make sure you have recorded the connections correctly, enabling correct re-connection when replacing the valve. Disconnect the hoses at the valve. Cap all open hoses and ports.
- 4 Undo the three fixing bolts **8** and lift out the valve.

Replacement

Replacement is the reverse of removal. Make sure that the joystick gaiter **9** is correctly located.



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Pilot Control Valves

Dismantling, Inspection and Assembly

Note that the procedure shows the right hand control valve. The procedure for the left hand valve differs only in the location of one way restrictors **4** and orientation of joint mechanism assemblies **2**.

Dismantling

- 1** Undo the three cap screws **1**. Lift off the joint mechanism assembly **2**.
- 2** Pull out the four valve capsule assemblies **3**.
- 3** Remove the six adaptors **16** from the ports. Note that the adaptors incorporate seals. Note that one way restrictors **4** are fitted to some ports as follows:
Right hand valve - ports 1 and 3.
Left hand valve - ports 2 and 4.

Inspection

- 1** Inspect the underside of the wobble plate **5** for signs of excessive wear. If wear is evident the complete assembly **2** must be renewed.
- 2** Inspect the universal joint for signs of excessive play. If wear is evident the complete assembly **2** must be renewed.
- 3** Inspect the mating faces of plungers **6** and bushes **7** for signs of excessive wear. If wear is evident the valve capsule must be renewed as a complete assembly.
- 4** If the valve has been contaminated with debris be sure to remove it from all internal drillings. Carefully inspect the mating faces of spools **8** and body **9**. If scoring is evident the complete valve must be renewed.
- 5** Make sure that one way restrictors **4** are free from debris.

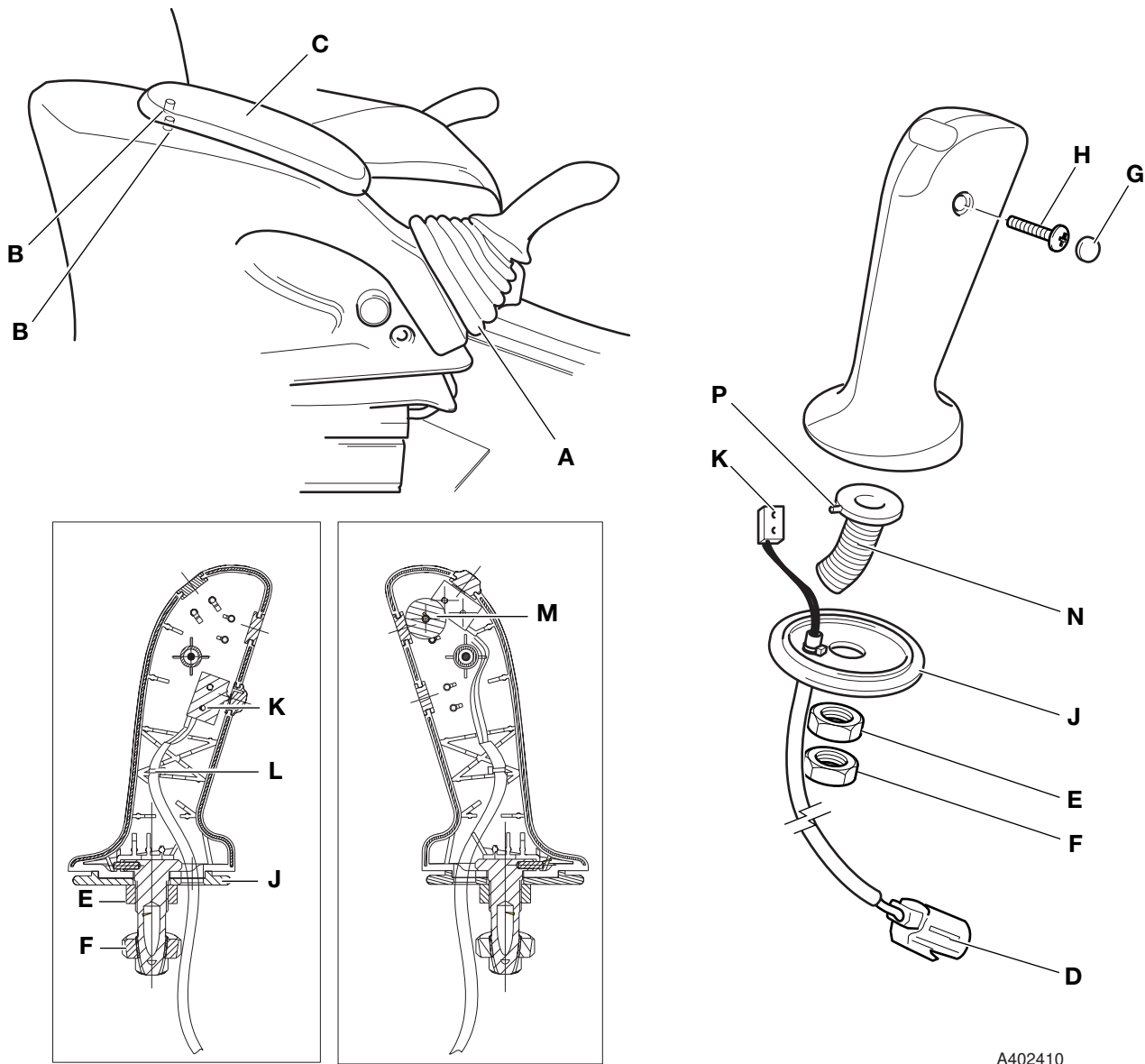
Assembly

Assembly is the reverse dismantling but note the following:

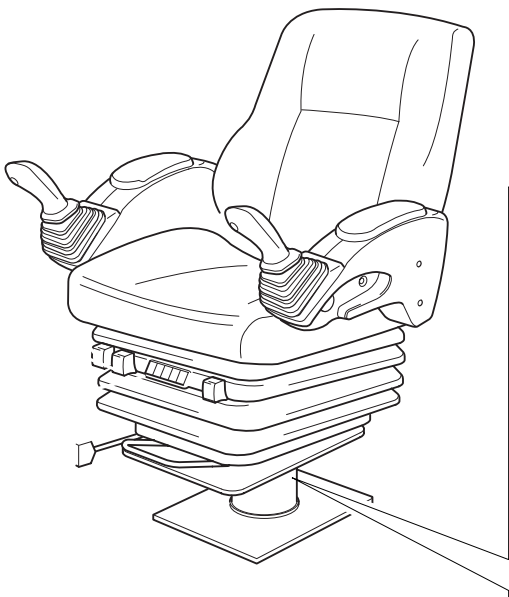
- 1** The valve assembly is susceptible to malfunction and damage if it is contaminated with debris or dirt. Make sure that all components are clean and free from debris.
- 2** Renew all 'O' rings **14** and seals **15**.
- 3** Be sure to fit the one way restrictors **4** the correct way up and in the correct ports. See Dismantling, Step 3.
- 4** Apply JCB HP Grease to the mating faces of wobble plate **5** and plungers **6**.
- 5** Be sure to orientate the joint mechanism assembly **2** correctly. On left hand valves note that the slot **Z** aligns with port **2** as shown at **A**. On right hand valves the slot **Z** aligns with port **1** as shown at **B**.
- 6** If the joint mechanism assembly **2** is to be renewed it must be adjusted correctly. With the assembly fixed in position, check the dimension **X**. The wobble plate **5** must be positioned so that it just makes contact with the top of the valve plungers. If there is a gap at **X**, or if the plate is depressing the plungers adjust as follows: Hold the collar **11** using a suitable rod located in hole **Y**. Slacken the lock nut **10** and then screw the collar **13** up or down as required. Tighten the lock nut **10**.

Torque Settings:

Item	Nm	Kgf m	lbf ft
1	9	1	7
10	9	1	7
16	30	3	22



A402410



A402590

Electrical Switches

Joystick Mounted Microswitches, Removal and Replacement

Note that the procedure shows the right hand joystick. the procedure is very similar for the left hand joystick. Note that where the joysticks incorporate more than one switch, all switches must be renewed as a complete harness and switch assembly.

Removal

- 1 With the operator seat set in the rear facing position (for backhoe operation), pull off the gaiter **A**.
- 2 Reach inside the arm assembly and undo the two arm rest fixing bolts **B**. Carefully lift the rear of the arm rest **C** and pull it to the rear to release.
- 3 Uncouple the joystick harness connector **D** from the servo harness. Note the orientation of the joystick. Slacken the lock nut **E** followed by lock nut **F**. Unscrew the joystick and remove it from the machine. Remove lock nuts **E** and **F**.
- 4 Drill a small hole in the centre of plastic cap **G**. Screw in a self tapping screw. Using pliers, grip the screw and draw out the cap **G**. Undo screw **H**. Lever off the aluminium base plate **J**.
- 5 Carefully part the two halves of the joystick making sure that components are not lost. Lift the switches **K** off their location pins. Note that replacement switches are supplied together with a new base plate **J**, wiring harness and connector already assembled.

Replacement

Replacement is the reverse of removal but note the following:

- 1 When assembling the joystick ensure that the wiring harness is located correctly. Cable tie **L** must be located to prevent strain on the wire connections at the switches. Make sure that bush **M** is fitted correctly (if applicable). If spigot **N** has been removed make sure it is fitted with its alignment pin **P** correctly located. Fit a new plastic cap **G**.
- 2 When screwing the joystick assembly to the control linkage be sure to orientate it correctly before tightening the lock nut **F**.

Seat Mounted Microswitch, Removal, Replacement and Adjustment.

Important Note: Some machines may be fitted with two seat mounted microswitches, one on each side of the seat. On Precision Control machines only switch **Z** is used. Note that switch **Z** is located on the left side of the seat when set in the rear facing position. When renewing the switch make sure you re-connect the wiring harness to the correct switch. Under no circumstances attempt to connect to the switch on the right hand side of the seat.

Removal

- 1 With the operator seat set in the forward facing position (for loader operation), uncouple the electrical connector **X**. Undo the two retaining screws **W** and remove the switch.

Replacement

Replacement is the reverse of removal.

Adjustment

The switch must be adjusted to operate only when the operator seat is locked in the rear facing position. This is essential for safe operation of the machine, preventing backhoe operation until the operator is correctly seated.

- 1 With the operator seat set in the rear facing position (for backhoe operation), locate the adjustable bolt **V** on the seat pedestal. Loosen the lock nut **U** and screw the bolt in or out until the switch is heard to operate. Tighten lock nut **U**.
- 2 Start the machine and test the system.

Basic System Operation

Component Location

TBA

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Basic System Operation

Component Identification

A	Right hand joystick controller
B	Left hand joystick controller
C	Operator seat
D	Servo pressure supply valve
E	Isolation valve solenoid
F	Accumulator
G	Servo pressure regulating valve
H	Servo pressure relief valve
J	Loader valve block
K	Excavator valve block
L	Hydraulic tank

The following section describes the JCB Precision Control system fitted to machines from January 2003. There is another JCB Precision Control system fitted to earlier machines, which is described in a separate section. Refer to **Precision Control (Servo) - Machines up to serial number 931159**.

Circuit Description

The JCB Precision Control system facilitates operation of the backhoe (excavator) via joystick controllers **A** and **B** mounted in the arms of the operator's seat. Unlike manual machines the excavator valve spools are moved by hydraulic pressure and not directly by mechanical levers.

A servo pressure supply valve **D** maintains a constant supply of oil at servo pressure to the right and left hand joystick controllers.

The joysticks each directly operate pressure reducing valves. These valves in turn operate the excavator valve spools via hydraulic servo pressure. The interconnecting hoses are routed to and from the joystick controllers through the central seat support pillar and then through the cab floor.

The joysticks control the boom, dipper, bucket and slew functions.

Basic System Operation

Hydraulic Operation

Oil at system pressure flows to the servo pressure supply valve **C** via a hose connected at the excavator valve **J**. An integral pressure regulating valve **F** maintains the oil at 'servo' pressure.

When the operator actuates the system by locking the seat in the forward or reverse facing position and raising forward the arm rests, the isolation valve solenoids **D** are energised and oil is directed to the joystick controllers **A** and **B**.

Each joystick controller contains four spool valve 'capsules', numbered 1 to 4 on each valve. The valves are operated by moving the associated joystick. With the joystick in the neutral position the valves vent the oil from the excavator valve servo pilot ports to tank **K**.

Example Operation:

When the operator moves the right hand joystick **B** forward this pushes spool 3 down. Oil at servo pressure is directed to port **S5b** at the excavator valve **J**. This causes the boom spool to move and operate the boom ram. As the boom spool moves, oil is vented from port **S5a** via spool 1 and port **T** to tank.

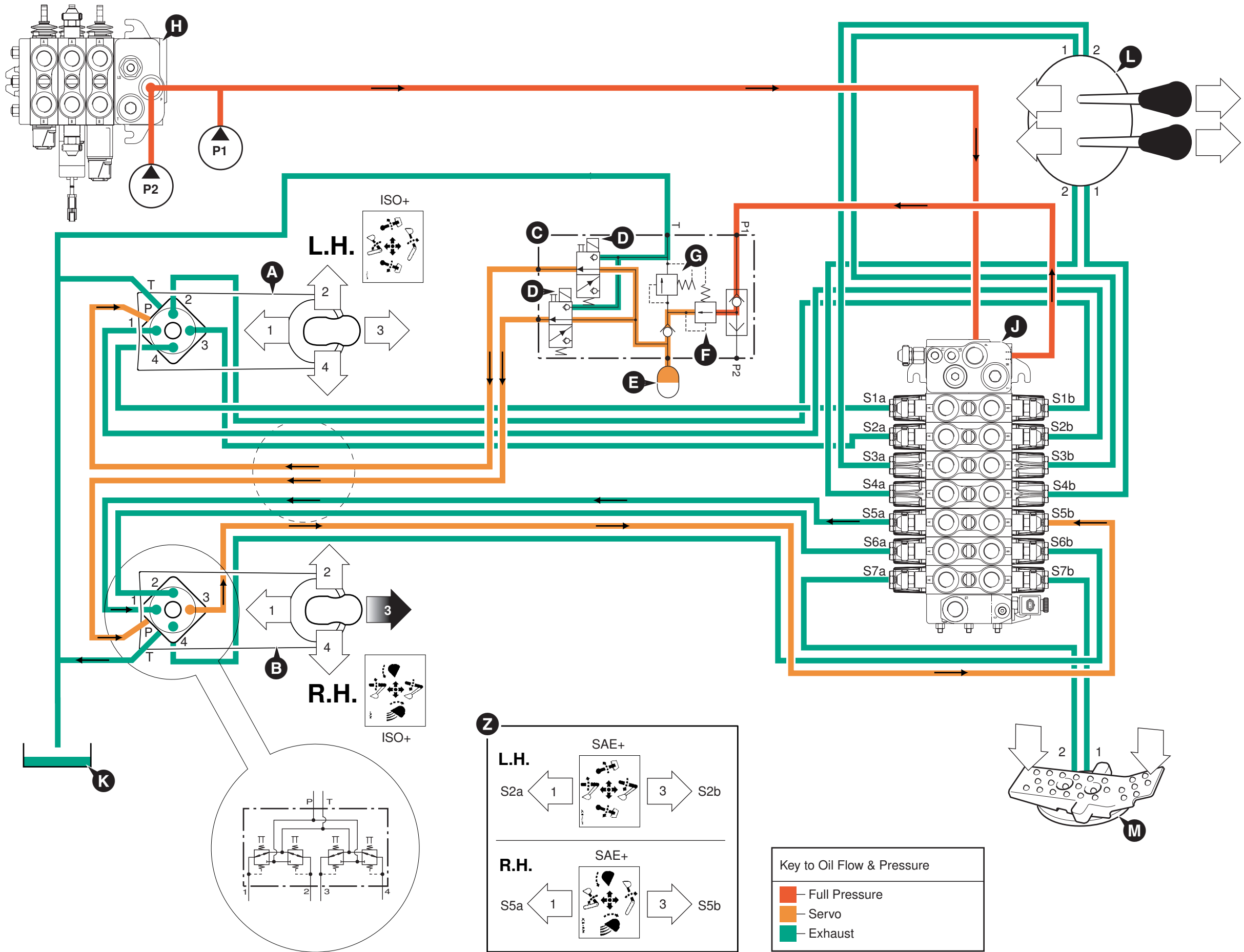
The valve 'capsules' feature proportional control. This enables backhoe precision control. Each valve capsule regulates the oil pressure supplied to the associated excavator valve pilot line in proportion to the joystick position. The further the joystick is moved the greater the servo pressure and the further the associated excavator valve spool moves.

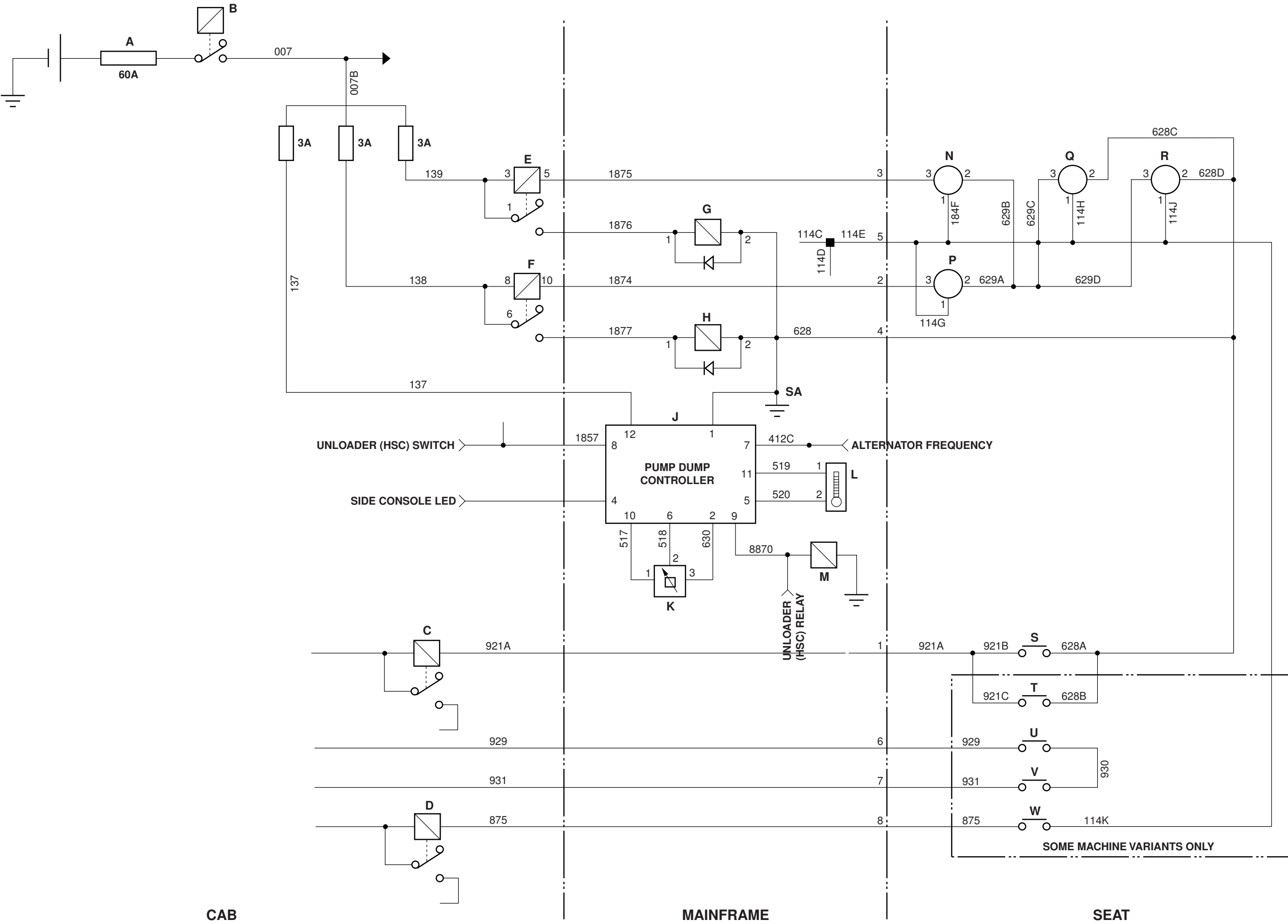
Accumulator **E** maintains servo pressure for several operations of the excavator spools with the engine stopped. This allows venting of pressure from the backhoe hydraulic rams, or lowering of a load in the event of engine failure.

Note: The diagram opposite shows the servo pilot hoses connected to give the ISO + control pattern. For SAE + control pattern the servo pilot hoses are connected differently at the excavator valve as shown at **Z**.

Component Key:

- A** Left hand joystick controller
- B** Right hand joystick controller
- C** Servo pressure supply valve
- D** Isolation valve solenoids
- E** Accumulator
- F** Servo pressure regulating valve
- G** Servo pressure relief valve
- H** Loader valve block
- J** Excavator valve block
- K** Hydraulic tank
- L** Stabiliser controls
- M** Auxiliary footpedal
- S1a** Servo pilot port - Slew ram spool
- S1b** Servo pilot port - Slew ram spool
- S2a** Servo pilot port - Dipper ram spool
- S2b** Servo pilot port - Dipper ram spool
- S3a** Servo pilot port - R.H. stabiliser ram spool
- S3b** Servo pilot port - R.H. stabiliser ram spool
- S4a** Servo pilot port - L.H. stabiliser ram spool
- S4b** Servo pilot port - L.H. stabiliser ram spool
- S5a** Servo pilot port - Boom ram spool
- S5b** Servo pilot port - Boom ram spool
- S6a** Servo pilot port - Bucket ram spool
- S6b** Servo pilot port - Bucket ram spool
- S7a** Servo pilot port - Auxiliary spool (Extending Dipper)
- S7b** Servo pilot port - Auxiliary spool (Extending Dipper)





Basic System Operation

Electrical Operation - Joystick Controller

There are two solenoid actuated isolation valves incorporated in the servo pressure supply valve block, which when energised direct servo pressure to enable the R.H. and L.H. joystick controllers. Each valve solenoid is controlled by proximity switches via a relay.

To make the joystick controllers active the seat must first be locked in the forward or rear facing position, thereby closing either the seat forward proximity switch **Q** or seat rear proximity switch **R**. The operator must then raise forward the arm rests. Raising the R.H. arm rest closes the R.H. arm proximity switch **P** energising relay **F** and the R.H. isolation valve solenoid **H**, making the R.H. joystick controller active. Similarly the L.H. joystick controller is made active when the L.H. arm rest is raised forward.

When an arm rest is pushed back by the operator, the proximity switch in that arm rest will open and de-energise the relay and solenoid, servo pressure will be isolated and the joystick controller in that arm rest will be disabled.

Should the operator move the seat from the forward or rear facing position, the appropriate proximity switch will open and servo pressure to both joystick controllers will be isolated, both joystick controllers will be disabled.

The L.H. joystick houses a horn switch **S**. On some machine variants the joysticks also incorporate switches **U** and **V** for control of a hydraulic quickhitch, and an auxiliary changeover switch **W**, typically to select between jaw bucket and extending dipper operation.

Component Key:

A	Primary Fuse
B	Relay
C	Rear Horn Relay
D	Auxiliary Changeover Relay
E	Isolation Valve Relay - L.H. Joystick
F	Isolation Valve Relay - R.H. Joystick
G	Isolation Valve Solenoid - L.H. Joystick
H	Isolation Valve Solenoid - R.H. Joystick
J	Pump Dump Controller (Power Management ECU)
K	Throttle Position Sensor
L	Hydraulic Oil Temperature Sensor
M	Unloader Valve (HSC) Solenoid
N	Proximity Switch - L.H. Arm Rest
P	Proximity Switch - R.H. Arm Rest
Q	Proximity Switch - Seat Forward
R	Proximity Switch - Seat Rear
S	Rear Horn Switch
T	Rear Horn Switch
U	Quickhitch Switch
V	Quickhitch Switch
W	Auxiliary Change-over Switch
SA	Splice

Pump Dump Controller (Power Management ECU)

The electronic control unit is mounted in the engine compartment and is used to control engine hydraulic power.

When operating under conditions of high engine load and/or conditions of high hydraulic oil temperature (when operating hammer attachments for example), the pump dump controller **J** automatically activates the unloading valve (HSC) circuit, dumping the hydraulic oil flow from the secondary pump section (P2) to tank.

1 Engine Load Condition:

The pump dump controller **J** compares the 'actual' engine speed signal from the alternator stator with the engine speed 'demanded' signal from the throttle position sensor **K**.

If the engine speed should start to slow under conditions of high load, the pump dump controller **J** energises the unloader valve (HSC) solenoid **M** and illuminates an LED on the side console. The flow from the secondary pump section (P2) is dumped to tank reducing the flow available to the hydraulic system, thereby reducing the load on the engine. When the engine speed recovers the pump dump controller de-energises the unloader valve (HSC) solenoid (extinguishing the LED on the side console), enabling the hydraulic system to operate normally.

The operating parameters are as follows:

- a At engine speeds below 1000 rpm, as determined by the throttle position sensor, the unloader valve (HSC) solenoid will always be energised.
- b At 1000 rpm the unloader valve (HSC) solenoid will be energised if the engine rpm falls more than 150 rpm below the 'no load' engine speed as determined by the throttle position sensor. The unloader valve (HSC) solenoid will de-energise when the engine rpm recovers to less than 25 rpm below the 'no load' engine speed as determined by the throttle position sensor.
- c At engine speeds greater than 1000 rpm, the unloader valve (HSC) solenoid energise and de-energise set points are increased by 10 rpm for every 100 rpm increase in engine speed.

2 Hydraulic Oil Temperature Condition:

The pump dump controller **J** monitors the hydraulic oil temperature via a sensor **L** fitted at the rear of the hydraulic oil tank.

If the oil temperature should reach 90°C, the pump dump controller **J** energises the unloader valve (HSC) solenoid **M** and illuminates an LED on the side console. The flow from the secondary pump section (P2) is dumped to tank reducing the flow available to the hydraulic system. The pump continues to circulate the oil around the neutral circuit and through the oil cooler until the oil temperature has reduced sufficiently. When the oil temperature has fallen to less than 70°C, the pump dump controller de-energises the unloader valve (HSC) solenoid (extinguishing the LED on the side console), enabling the hydraulic system to operate normally.

Basic System Operation

Joystick Controllers - Description

The joystick controllers operate as direct operated pressure reducing valves and consist of a hand control lever, four pressure reducing valves and the housing. Each pressure reducing valve consists of a control spool, control spring, return spring and a plunger.

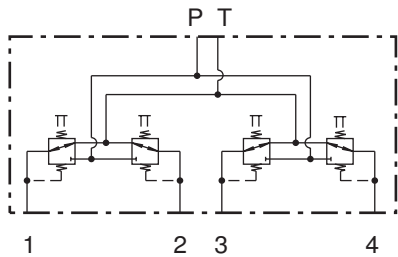
In neutral the control lever 5 is kept in the central position by the return spring 8. Service ports 1, 2, 3 and 4 are connected to the tank port T via gallery 11.

When the control lever 5 is operated, plunger 9 pushes against return spring 8 and control spring 7. The control spring 7 moves the control spool 6 down-wards and closes the connection between the relevant service port and the tank port T. The service port is connected to the pressure port P via gallery 11.

The control phase begins when the control spool 6 has found its balance between the force of the control spring 7 and the force which results from the hydraulic pressure in the selected port.

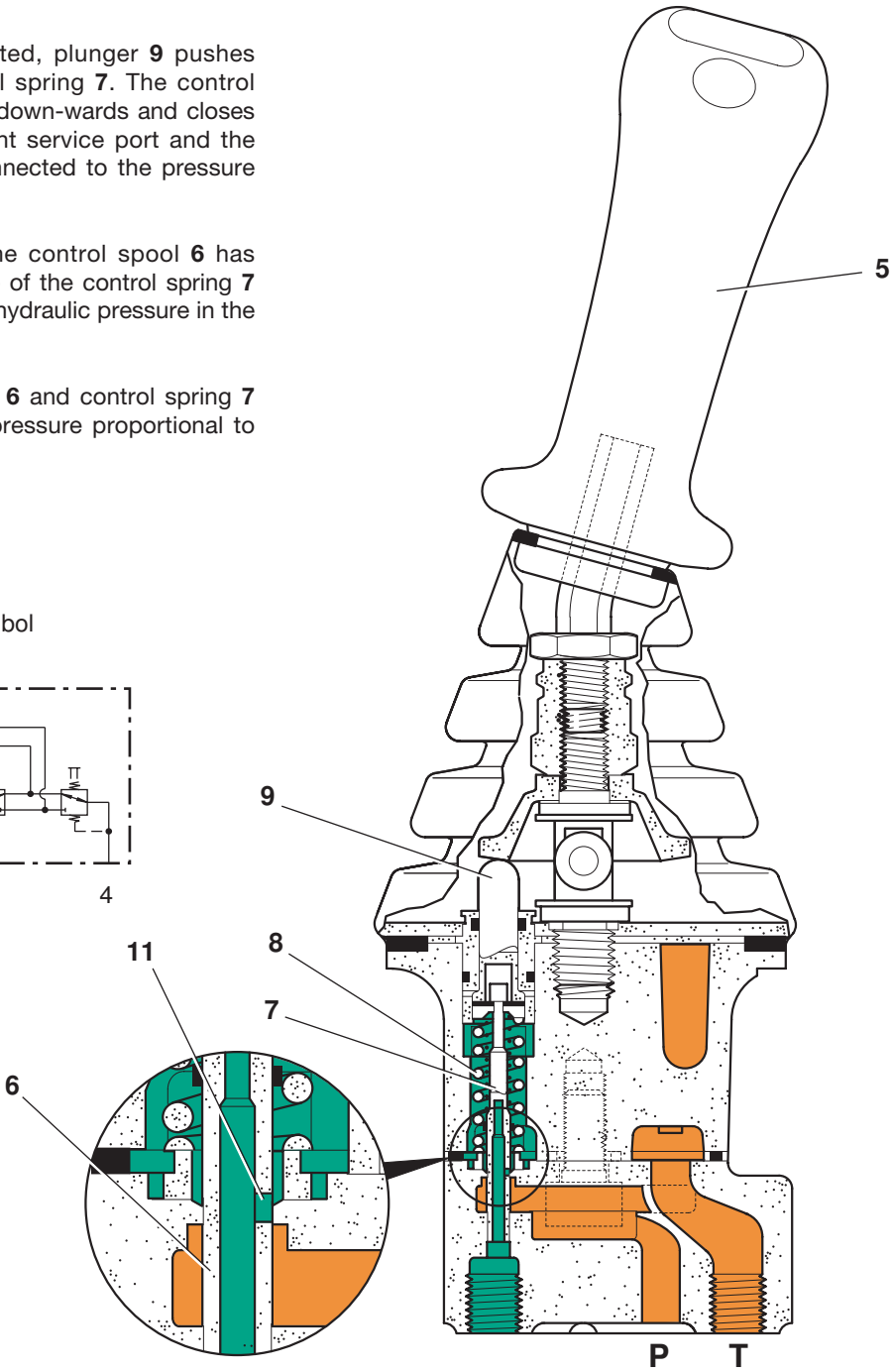
The interaction of the control spool 6 and control spring 7 enables the plunger 9 to produce pressure proportional to the position of the control lever 5.

Hydraulic symbol



Key to Oil Flow & Pressure	
	Full Pressure
	Pressure
	Servo
	Neutral
	Exhaust
	Cavitation
	Lock Up

A390630



A403930

Basic System Operation

Servo Pressure Supply Valve - Description

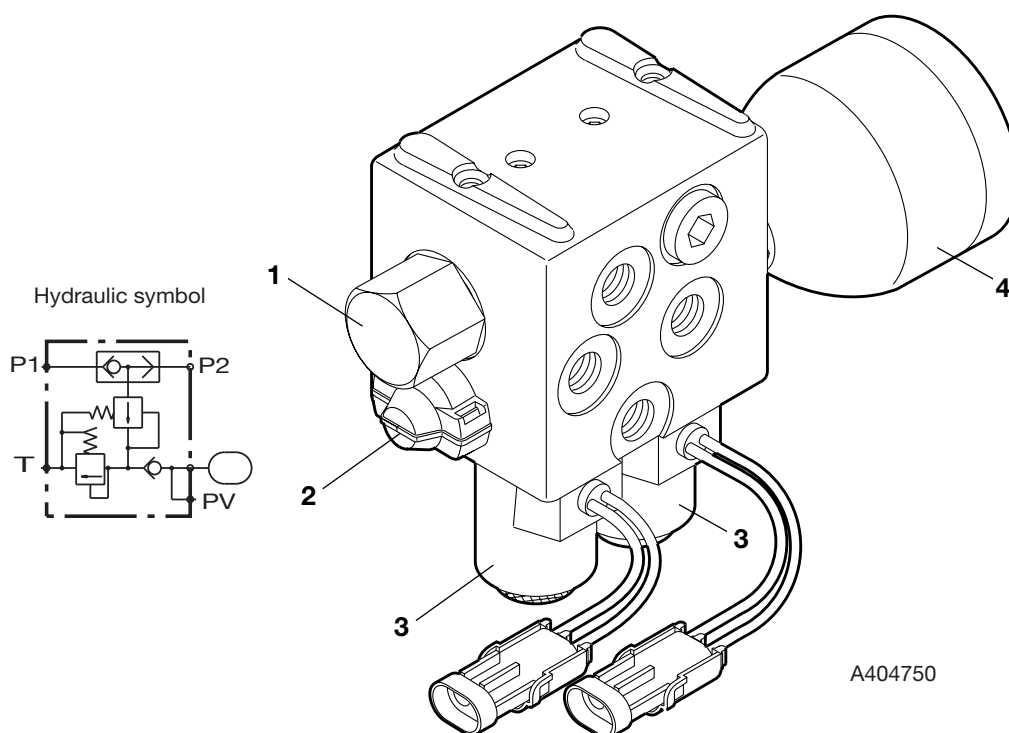
The servo pressure supply valve is fitted with a pressure regulating valve **1**, a pressure relief valve **2** and two solenoid valves **3** for servo pressure isolation.

The servo system is supplied from a single line tapped into the hydraulic pump feed at the excavator valve block. The pressure regulating valve **1** maintains servo pressure by regulating the incoming supply pressure. The valve is non-adjustable and is factory set with shims.

The pressure relief valve **2** is adjustable and limits the maximum pressure, protecting the valve block from over-pressurisation by opening and allowing excess pressure to vent to tank.

Down stream of the pressure regulating valve is located the servo accumulator **4** with its associated non return valve. The accumulator traps and stores servo pressure to enable the excavator spools to be operated for a limited period with a stopped engine. This allows the excavator end to be lowered safely to the ground should the engine stop.

The servo isolator solenoid valves **3** are energised by proximity switches on the drivers seat. When the seat arm rest is raised forward, the proximity switch closes and energises the relevant isolator solenoid, directing servo pressure to the particular joystick controller. When the arm rest is folded back the proximity switch opens and the isolation solenoid is de-energised, the isolation valve spool is spring returned to the closed position isolating the supply to the joystick controller.



Fault Finding

Introduction

The fault finding procedures are given in the form of flow charts. There are a number of charts, each one dedicated to a particular fault. The charts are designed to identify possible causes by performing checks and where applicable, specific tests. Having identified a cause the suggested remedy is given. The charts are designed to identify causes through a process of elimination, starting with the simplest, most easily rectified faults.

When fault finding note the following:

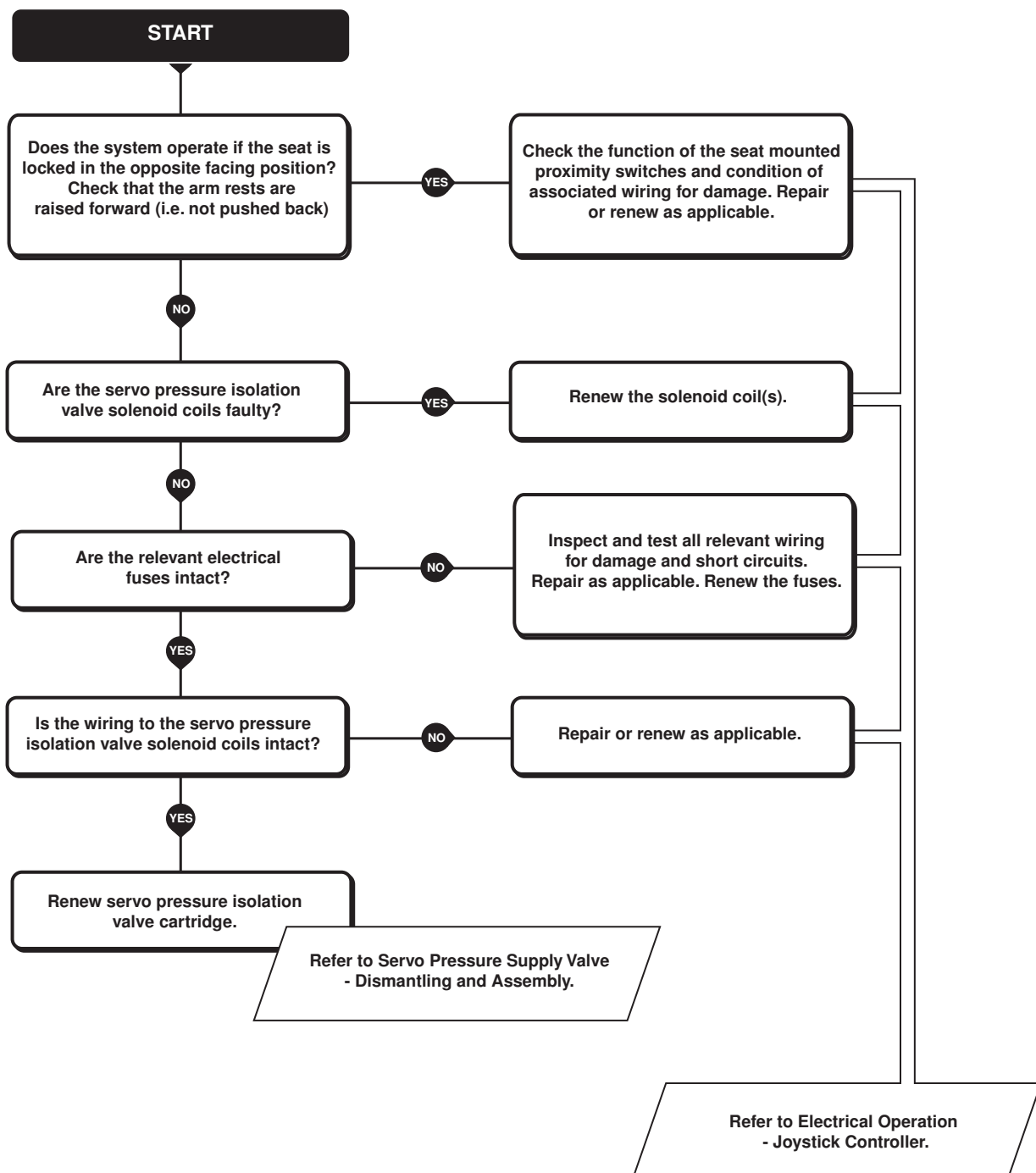
- 1** Make sure that the hydraulic fluid is at the correct working temperature (50°C, 122°F).
- 2** If hydraulic contamination is found be sure to remove ALL debris, and if possible identify its origin. It may be part of a component from elsewhere in the hydraulic circuit.
- 3** Renew any seals such as 'O' rings when re-assembling hydraulic components.

Fault Finding Charts:

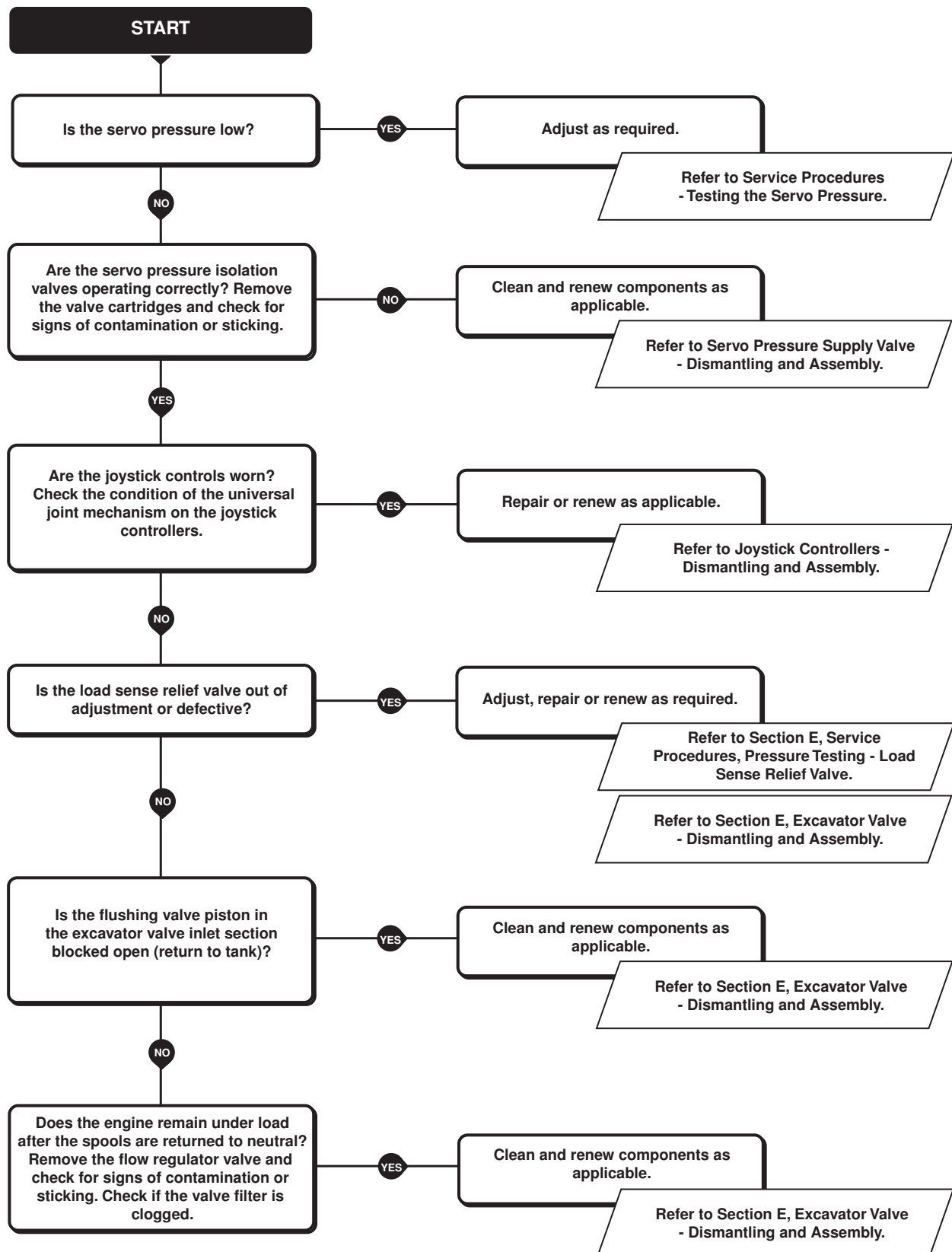
Chart A - No Servo Controls (system fails to operate)

Chart B - All Backhoe Services Slow to Operate

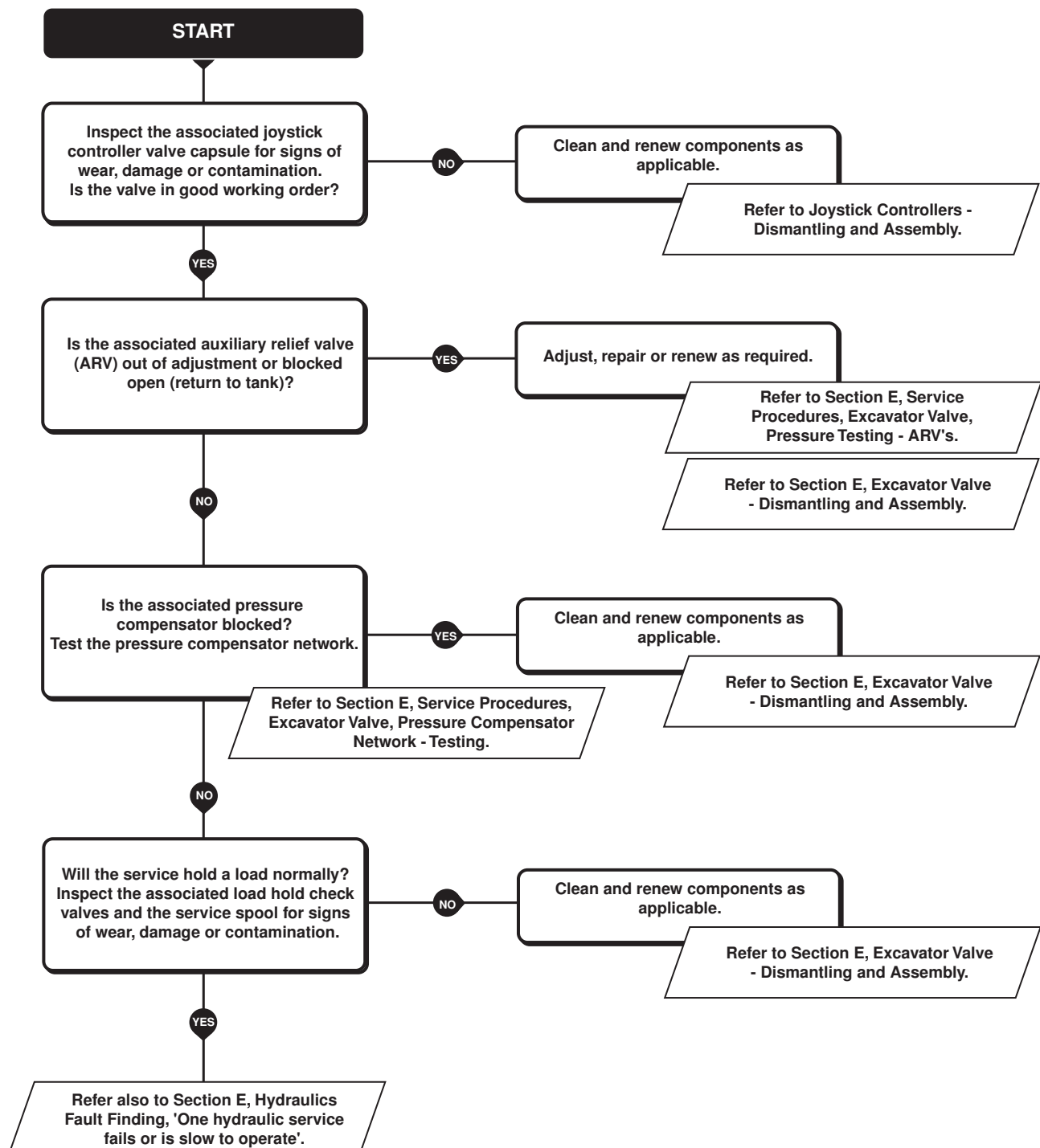
Chart C - One Backhoe Service fails or is Slow to Operate

Fault Finding**Chart A - No Servo Controls (system fails to operate)**

A405600

Fault Finding**Chart B - All Backhoe Services Slow to Operate**

A405670

Fault Finding**Chart C - One Backhoe Service fails or is Slow to Operate**

A405690

Service Procedures

Testing the Servo Pressure

TBA

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Joystick Controllers

Removal and Replacement

⚠ DANGER

Hydraulic fluid at system pressure can injure you. Before disconnecting or connecting hydraulic hoses, stop the engine and operate the controls to release pressure trapped in the hoses. Make sure the engine cannot be started while the hoses are open.

INT-3-1-11/1

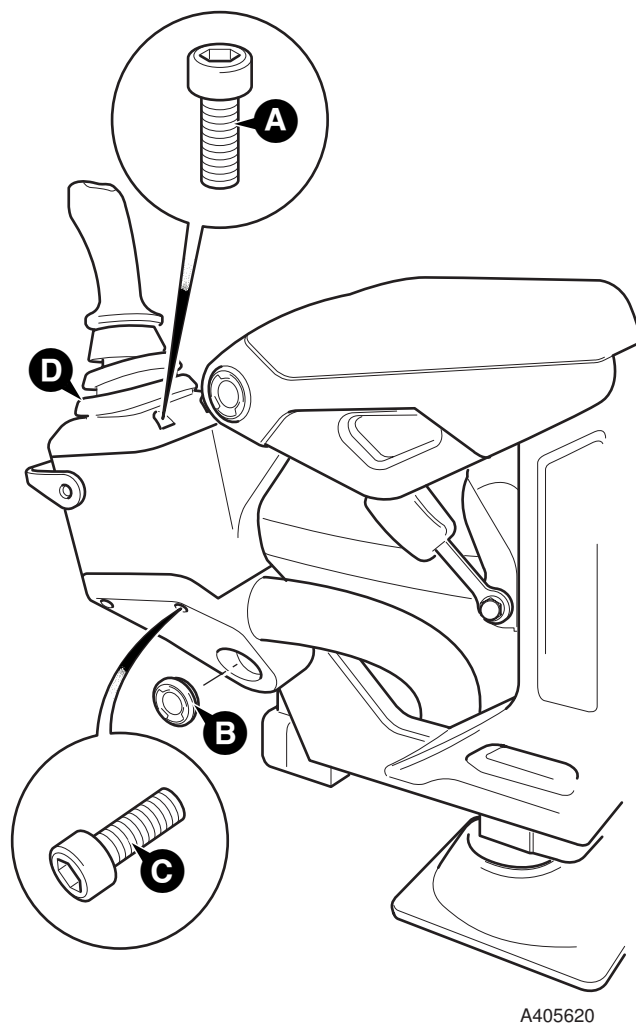
Note that the procedure shows the left hand joystick controller. The removal and replacement procedure for the right hand joystick controller is identical.

Removal

- 1 Park the machine on firm level ground, engage the parking brake and set the transmission to neutral. Lower the attachments to the ground and stop the engine.

Before attempting to remove a joystick controller, vent the pilot circuit accumulator hydraulic pressure as follows:

- 2 With the operator seat locked in the rear facing position and with the arm rests raised forward (for backhoe operation), switch the starter to ON without starting the engine. Operate the joystick controls several times to vent the hydraulic pressure from the servo system and backhoe rams. Turn the starter switch to the OFF position and remove the key.
- 3 Remove the screws **A** (4 off) and lift off the top retaining plate as shown.
- 4 Using a screwdriver, carefully prise out the plastic cap **B**. Remove the screws **C** (2 off) and take off the lower cover to reveal the connections at the valve block.
- 5 Disconnect the electrical harness connector for the joystick handle switches.
- 6 Disconnect all hydraulic hoses from the valve block and plug the ports to prevent ingress of dirt. Label each hose before disconnecting to ensure correct replacement. Plug hose ends to prevent ingress of dirt.
- 7 Carefully prise back the rubber gaiter **D** to reveal the fixing bolts (4 off) securing the valve to the arm rest. Remove the fixing bolts and lift the valve assembly from the seat.



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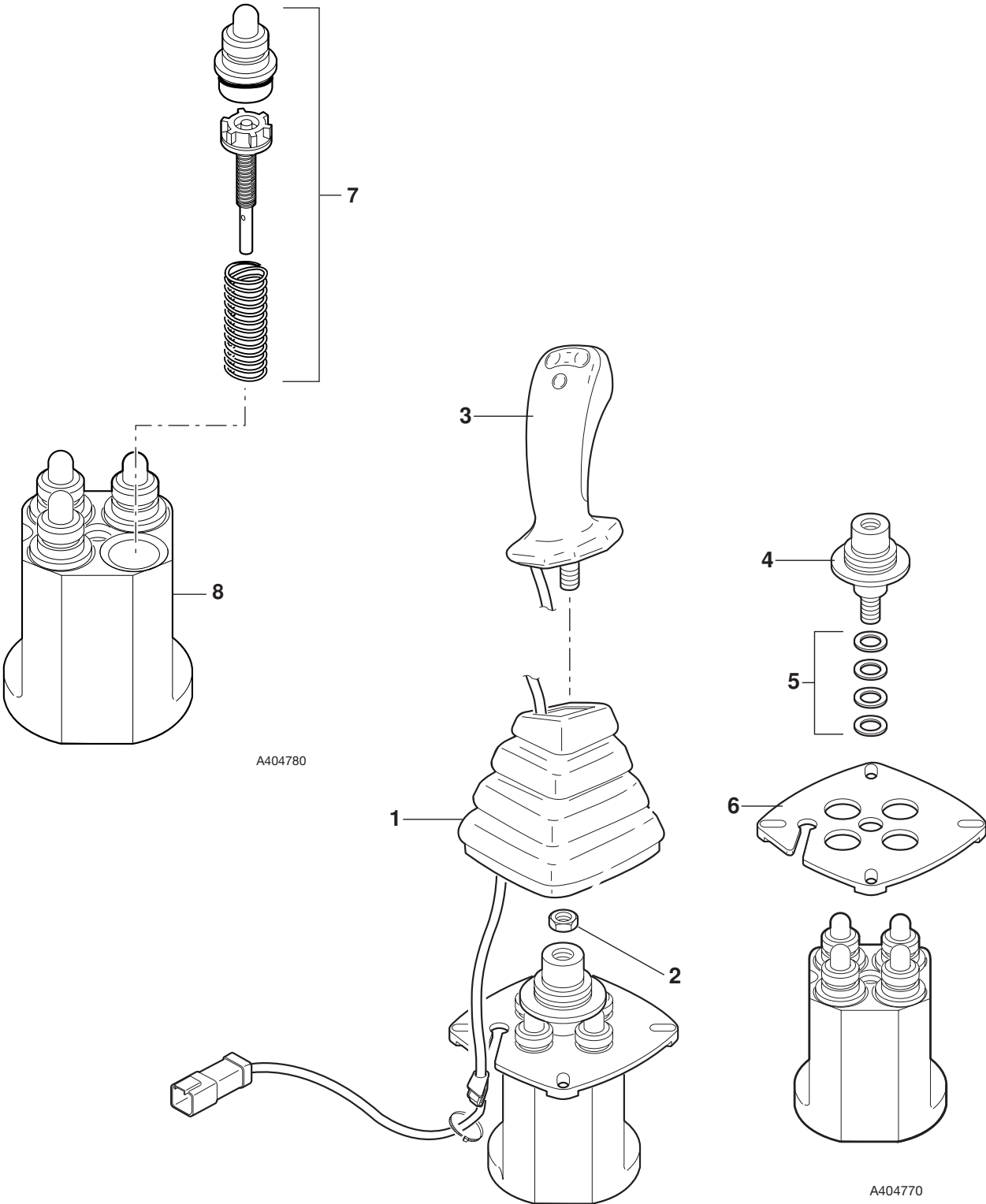
Replacement

Replacement is the reverse of the removal sequence.

Note: All hydraulic adaptors that are installed together with a bonded sealing washer must also have JCB Threadseal applied to the threads of the adaptor.

Joystick Controllers

Dismantling and Assembly



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Joystick Controllers

Dismantling and Assembly

Dismantling

The illustration shown on the opposite page is intended as a guide to dismantling. Be sure to note the location of all components when dismantling. Although some components may appear to be identical they are not interchangeable. Make sure that components are assembled in their original positions.

Great care should be taken when dismantling and assembling a valve to avoid the following:-

- Contamination
- Damage to spools
- Damage to seal grooves

Any of the above may result in possible problems with the operation of the valve.

- 1 Remove the joystick controller from the machine, refer to **Joystick Controller - Removal and Replacement**.
- 2 Carefully prise back the rubber gaiter **1**, loosen lock nut **2** and unscrew the handle **3**.
- 3 Unscrew the universal joint assembly **4**. Take care to keep all the shims **5** together.
- 4 Remove the retaining plate **6**. Carefully withdraw the regulating valve assemblies **7** from the valve body **8**.

Assembly

Assembly is the reverse of the dismantling sequence.

- 1 Clean the valve components in an appropriate solvent.
- 2 Renew all 'O' rings and back-up rings.
- 3 Lubricate parts with JCB Hydraulic Fluid before assembling. Make sure that all the parts move freely.

Torque Settings

Item	Nm	kgf m	lbf ft
2	40	4.1	29.5
4	50	5.1	36.9

Regulating Valve Assemblies

Each of the regulating valve assemblies **7** can be removed as shown. Care must be taken to ensure that the spool is not damaged when removing it from the valve body. Note that all spools are similar in appearance but must not be interchanged as they are matched to their bores. All spools have the same centring and sealing components.

Servo Pressure Supply Valve

Removal and Replacement

⚠ WARNING

Make the machine safe before working underneath it. Park the machine on level ground, lower the arms. Apply the parking brake, put the transmission in neutral and stop the engine. Chock both sides of all four wheels.

Disconnect the battery, to prevent the engine being started while you are beneath the machine.

GEN-1-2

⚠ DANGER

Hydraulic fluid at system pressure can injure you. Before disconnecting or connecting hydraulic hoses, stop the engine and operate the controls to release pressure trapped in the hoses. Make sure the engine cannot be started while the hoses are open.

INT-3-1-11/1

Removal

- 1 Park the machine on firm level ground, engage the parking brake and set the transmission to neutral. Lower the attachments to the ground and stop the engine.

Before attempting to remove the valve, vent the pilot circuit accumulator hydraulic pressure as follows:

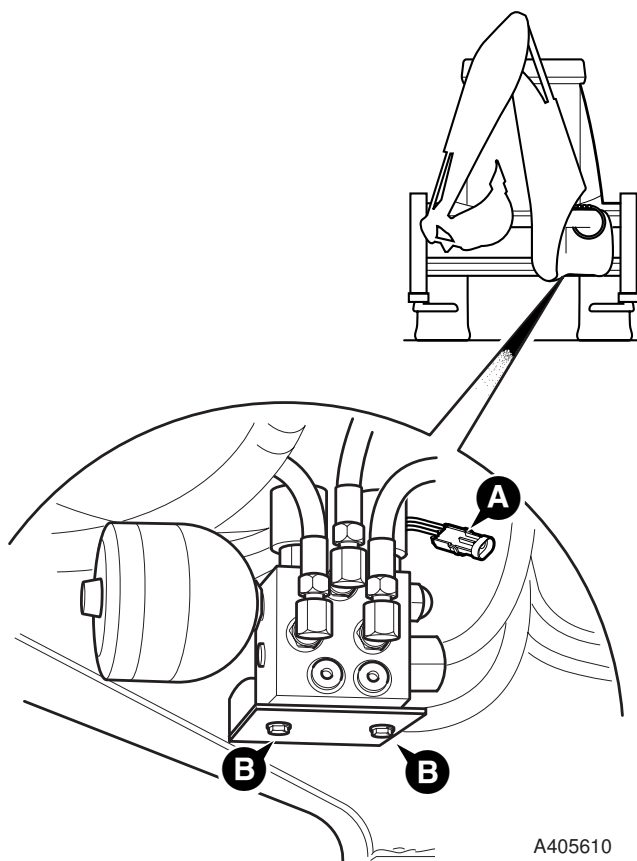
- 2 With the operator seat locked in the rear facing position and with the arm rests raised forward (for backhoe operation), switch the starter to ON without starting the engine. Operate the joystick controls several times to vent the hydraulic pressure from the servo system and backhoe rams. Turn the starter switch to the OFF position and remove the key.
- 3 Working underneath the rear of the machine as shown, disconnect the electrical harness connectors **A** at the solenoids. Label each connector before disconnecting to ensure correct replacement.
- 4 Disconnect all hydraulic hoses from the valve block and plug the ports to prevent ingress of dirt. Label each hose before disconnecting to ensure correct replacement. Plug hose ends to prevent ingress of dirt.
- 5 Take hold of the valve assembly, loosen and remove the fixing bolts **B** securing the valve to the chassis. Lift the valve assembly from the machine.

Replacement

Replacement is the reverse of the removal sequence.

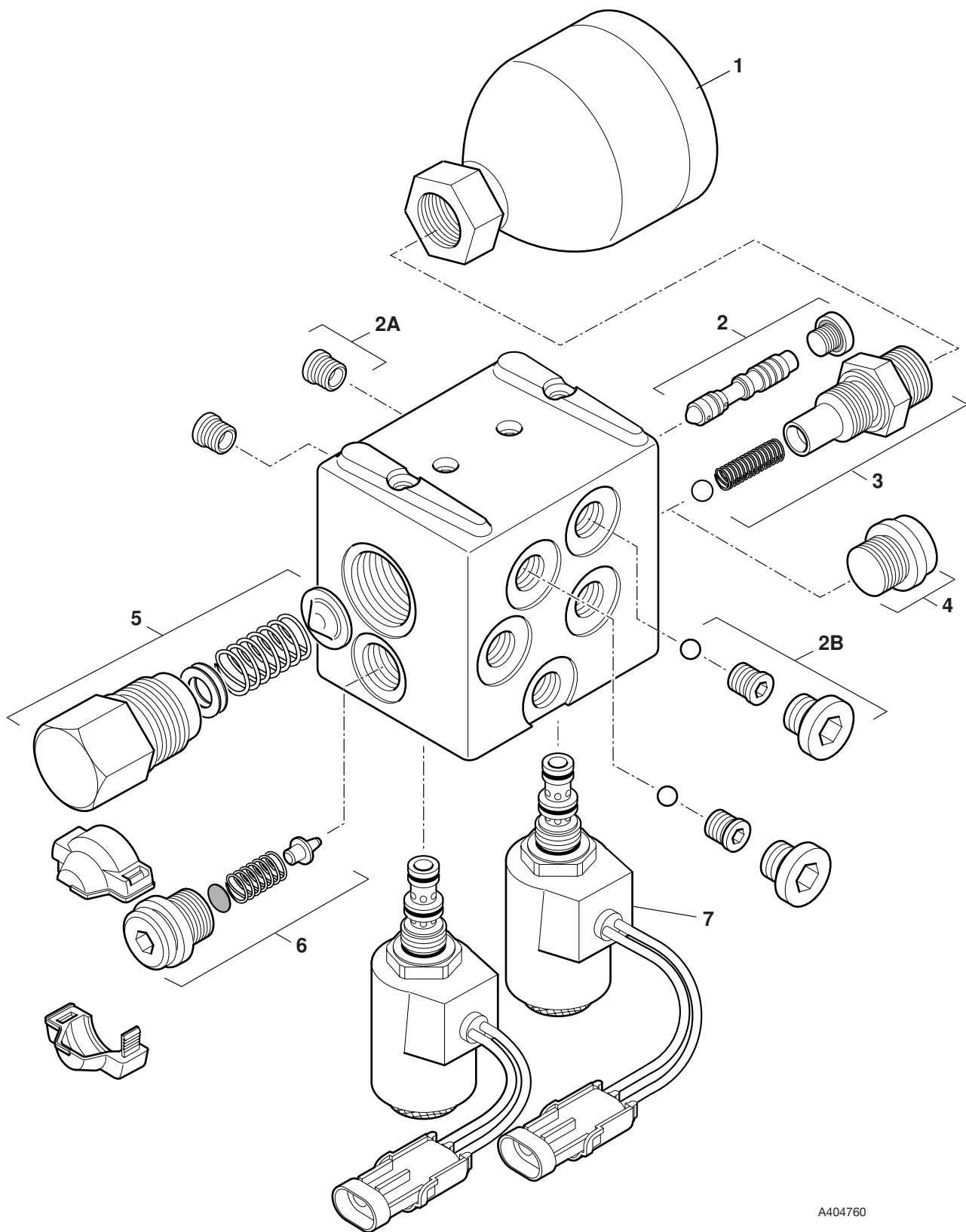
After replacement check the valve pressure settings. Refer to **Service Procedures - Testing the Servo Pressure**.

Note: All hydraulic adaptors that are installed together with a bonded sealing washer must also have JCB Threadseal applied to the threads of the adaptor.



Servo Pressure Supply Valve

Dismantling and Assembly



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Servo Pressure Supply Valve

Dismantling and Assembly

Dismantling

The illustration shown on the opposite page is intended as a guide to dismantling. Be sure to note the location of all components when dismantling. Although some components may appear to be identical they are not interchangeable. Make sure that components are assembled in their original positions.

Great care should be taken when dismantling and assembling a valve to avoid the following:-

- Contamination
- Damage to spools
- Damage to seal grooves

Any of the above may result in possible problems with the operation of the valve.

- 1 Remove the servo pressure supply valve from the machine, refer to **Servo Pressure Supply Valve - Removal and Replacement**.

Note: The illustration depicts a complete strip down, but to carry out specific servicing/repairs, e.g. renewal of one of the solenoids, it is only necessary to dismantle the relevant components.

Assembly

Assembly is the reverse of the dismantling sequence.

- 1 Clean the valve components in an appropriate solvent.
- 2 Renew all 'O' rings and back-up rings.
- 3 Lubricate parts with JCB Hydraulic Fluid before assembling. Make sure that all the parts move freely.

Torque Settings

Item	Nm	kgf m	lbf ft
1	100	10.2	73.8
2	10	1	7.4
2A	10	1	7.4
2B	30	3	22.1
3	100	10.2	73.8
4	100	10.2	73.8
5	150	15.3	110.6
6	100	10.2	73.8
7	15-20	1.5-2	11-14.8

Accumulator

The accumulator **1** can be removed as shown. Take great care when handling the accumulator, the unit is pre-charged with nitrogen gas and further dismantling of the accumulator should not be attempted. The adaptor assembly **3** incorporates a non-return valve with a spring and ball as shown.

Regulating Valve Assembly

The regulating valve assembly **5** can be removed as shown. The valve is non-adjustable and is factory set with shims. Take care to keep all the shims together.

Pressure Relief Valve

The pressure relief valve **6** can be removed as shown.

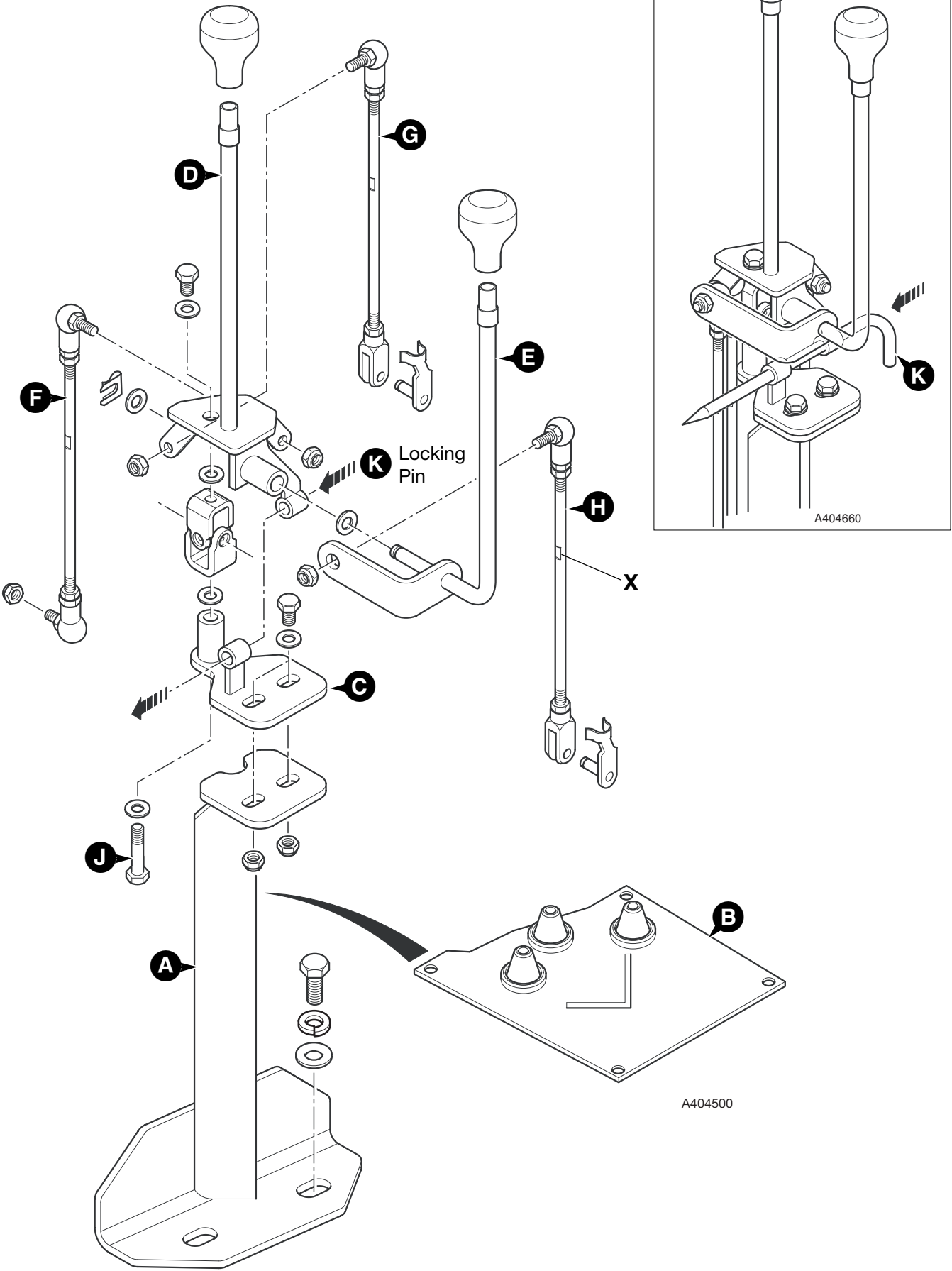
Solenoid Isolation Valves

The solenoid isolation valves **7** can be removed as shown. It is possible to remove the valve cartridges for cleaning or resealing without removing the complete valve from the machine. If there is evidence of damage to the valve or its seat caused by debris then the cartridge must be renewed.

Note: If removing components from a valve block that is fitted on a machine the pilot circuit accumulator pressure must be vented first. With the operator seat locked in the rear facing position and with the arm rests raised forward (for backhoe operation), switch the starter to ON without starting the engine. Operate the joystick controls several times to vent the hydraulic pressure from the servo system and backhoe rams. Turn the starter switch to the OFF position and remove the key.

Dismantling and Assembly

Loader Valve Controls



Dismantling and Assembly

Loader Valve Controls

The illustration on the adjacent page shows the control rods and linkages for the loader control valve and is intended as a guide to the dismantling and assembly.

Dismantling

- 1 Park the machine on firm level ground, apply the parking brake. Lower the loader arms and excavator to the ground, switch OFF the engine and remove the starter key. Disconnect the battery.
- 2 Working in the cab, remove the console panels surrounding the loader levers as shown at **Z**.
- 3 Uncouple the transmission dump switch electrical connector and remove the wires from the connector. Use a screwdriver to release the wires/pins from the connector, alternatively cut the wires and re-solder on assembly.
- 4 Remove the control lever knobs and gaiters.
- 5 Disconnect the control rods from the loader valve spools. Remove the bolts securing the complete lever assembly to the chassis and withdraw the control levers and mounting bracket through the floor aperture.

Assembly

Assembly is the reverse of the dismantling sequence.

- 1 Bolt the mounting bracket **A** to the chassis.
- 2 Fit the rubber cover **B** over the mounting bracket, make sure it is fitted the correct way round. Do not fix it to the floor at this stage.
- 3 Bolt the mounting plate **C** to mounting bracket as shown.
- 4 Assemble the loader lever **D** and auxiliary lever **E** together, with the washers and retaining clip as shown.
- 5 Fit the control rods **F**, **G** and **H** to the lever assembly. Ensure that the locking flats **X** are at the top.

Note: If necessary, loosen the lock nuts and rotate the end fittings to give equal amounts of adjustment (thread) at each end of the control rod.

- 6 Fit the lever assembly to the mounting plate **C** as shown, do not tighten the bolt **J** at this stage.
- 7 Thread the control rods through the rubber cover **B** and connect them to the loader valve spools.
- 8 Adjust the control rods as necessary, see **Adjustment**. After the control rods are adjusted fit the gaiters over the control levers.

- 9 Thread the transmission dump switch cable through the loader control lever and fit the wires/pins into the electrical connector. Couple the connector to the chassis harness and fit the control lever knobs.
- 10 Connect the battery, check that the controls and transmission dump switch operate correctly.
- 11 Refit the rubber cover **B** and the console panels around the loader levers.

Adjustment

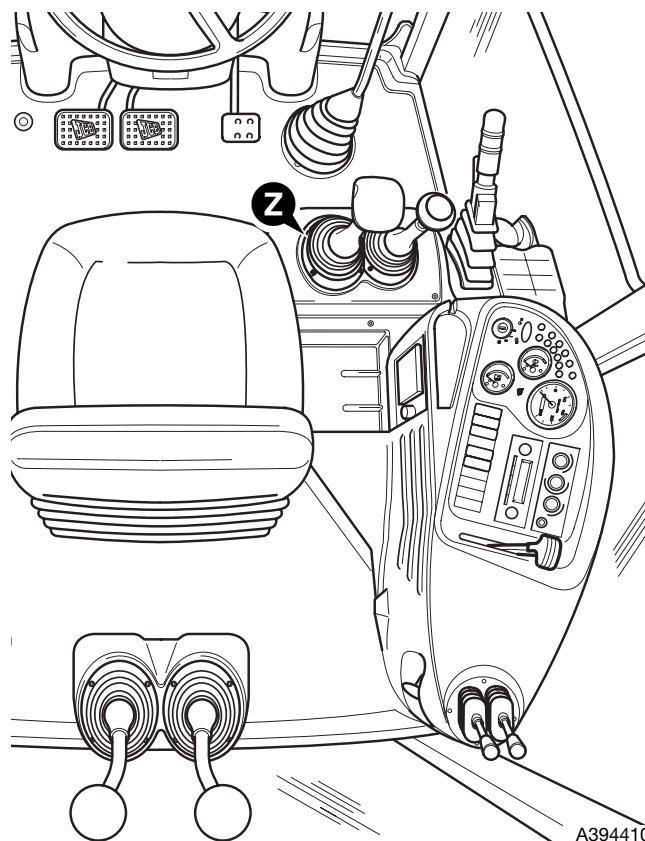
- 1 Fit the control lever locking pin **K** as shown, tighten bolt **J** when aligned.

Note: If there is no lever locking pin with the machine use a suitable diameter metal bar.

- 2 Adjust the control rods **F** and **G** until the locking pin is a sliding fit, then tighten the control rods lock nuts.

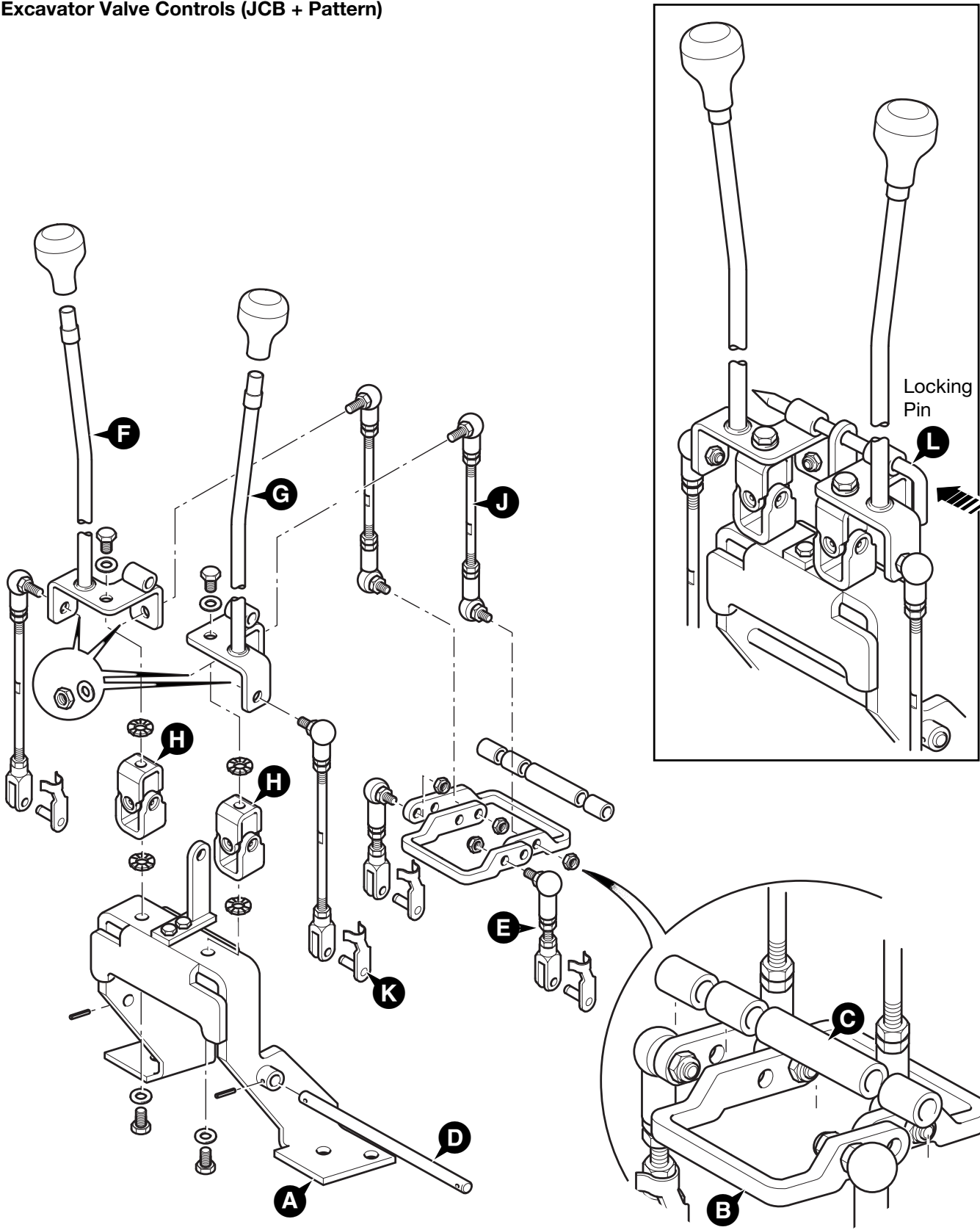
Note: Make sure there is an equal amount of thread at each end of the control rod.

- 3 Adjust the auxiliary control rod **H** until the auxiliary lever **E** aligns with loader lever **D**, then tighten the control rod lock nuts.
- 4 Remove the lever locking pin **K**.



Dismantling and Assembly

Excavator Valve Controls (JCB + Pattern)



A404810

Dismantling and Assembly

Excavator Valve Controls

The illustration on the adjacent page shows the control rods and linkages for the excavator control valve and is intended as a guide to the dismantling and assembly. Note JCB + pattern controls shown.

Dismantling

- 1 Park the machine on firm level ground, apply the parking brake. Lower the loader arms, move the excavator to the R.H. side of the machine and lower to the ground. Switch OFF the engine and remove the starter key. Disconnect the battery.
- 2 Working in the cab, remove the console panels surrounding the excavator levers as shown at **Z**.
- 3 Uncouple the rear horn switch electrical connector and remove the wires from the connector. Use a screwdriver to release the wires/pins from the connector, alternatively cut the wires and re-solder on assembly.
- 4 Remove the control lever knobs and gaiters.
- 5 Disconnect the control rods from the excavator valve spools. Remove the bolts securing the complete lever assembly to the excavator valve mounting plate and withdraw the control levers and mounting bracket through the floor aperture.

Assembly

Assembly is the reverse of the dismantling sequence.

- 1 Bolt the mounting bracket **A** to the excavator valve mounting plate.
- 2 Assemble the pivot levers **B** and spacers **C** to the mounting bracket and insert the pivot shaft **D**. Fit the short control rods **E** (2 off) to the pivot lever assembly as shown.
- 3 Assemble the excavator levers **F** and **G** to the mounting bracket together with the universal joints **H**. Fit the longer control rods **J** (4 off) to the lever assembly as shown.

Note: If necessary, loosen the lock nuts and rotate the end fittings to give equal amounts of adjustment (thread) at each end of the control rod.

- 4 Connect the control rods to the excavator valve spools with the clevis pins **K**.
- 5 Adjust the control rods as necessary, see **Adjustment**. After the control rods are adjusted fit the gaiters over the control levers.

- 6 Thread the rear horn switch cable through the control lever and fit the wires/pins into the electrical connector. Couple the connector to the chassis harness and fit the control lever knobs.
- 7 Connect the battery, check that the controls and rear horn switch operate correctly.
- 8 Refit the console panels around the excavator levers.

Adjustment

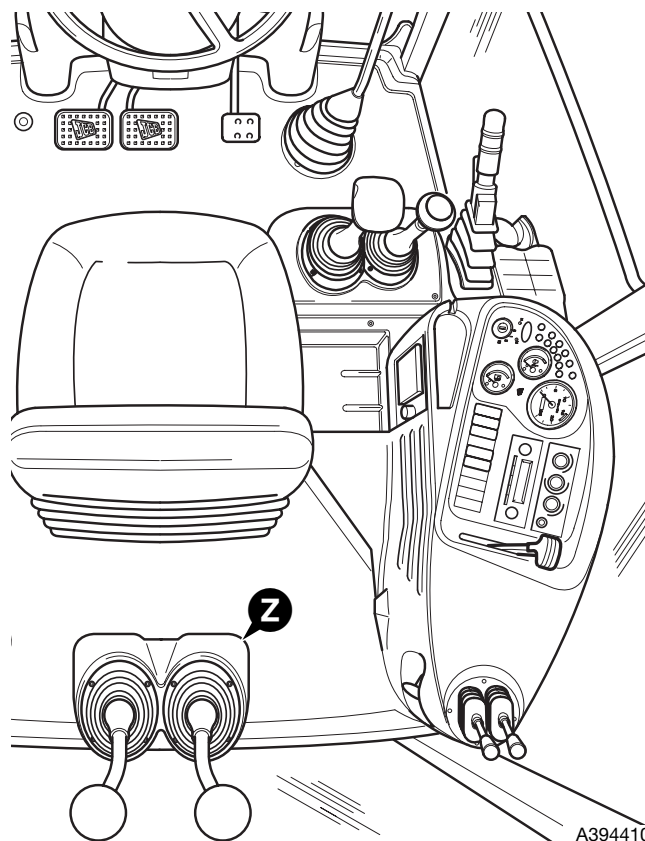
- 1 Fit the control lever locking pin **L** as shown.

Note: If there is no lever locking pin with the machine use a suitable diameter metal bar.

- 2 Adjust the control rods until the locking pin is a sliding fit, then tighten the control rods lock nuts.

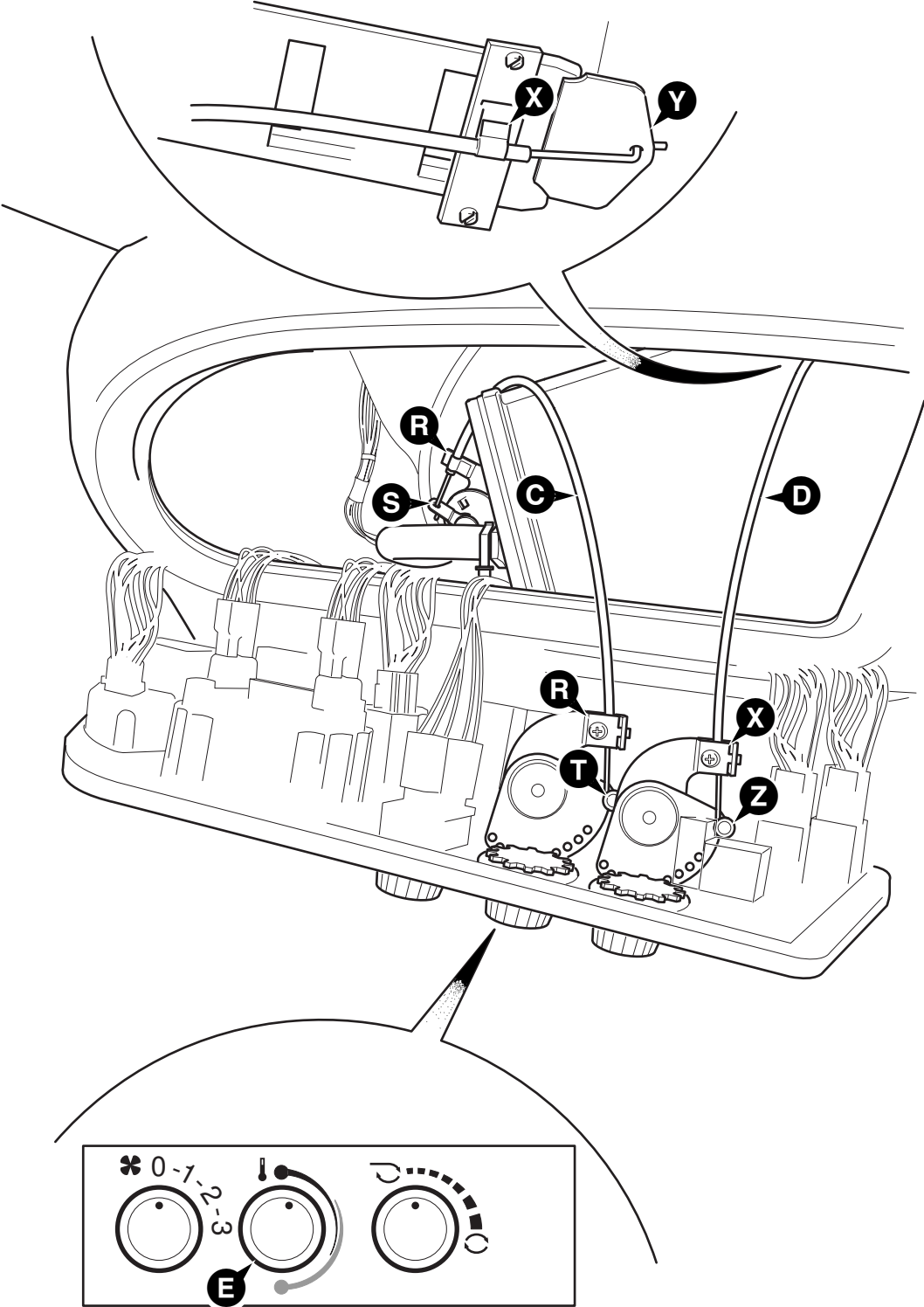
Note: Make sure there is an equal amount of thread at each end of the control rod.

- 3 Remove the lever locking pin **L**.



Removal and Replacement

Cab Heater Controls



A404491

Removal and Replacement

Cab Heater Controls

The cab heater controls **A** and associated cables are housed in the R.H. side console as shown.

There are two control cables which operate the re-circulation vent and the hot water valve. Both the cables can be accessed by removing the side console instrument panel.

Removal

- 1 Park the machine on firm level ground, apply the parking brake. Lower the loader arms and excavator to the ground, switch OFF the engine and remove the starter key.
- 2 Remove the fixing **B** at the top of the instrument panel and carefully lift the panel forward to reveal the connections at the back.
- 3 Disconnect the temperature control cable **C** by releasing the cable outer sheath from the clips **R** at each end, and unhooking the cable from the water valve lever **S** and from the pin **T** at the control knob.
- 4 Disconnect the re-circulation vent cable **D** by releasing the cable outer sheath from the clips **X** at each end, and unhooking the cable from the vent **Y** and from the pin **Z** at the control knob.

Replacement

Replacement is the reverse of the removal sequence.

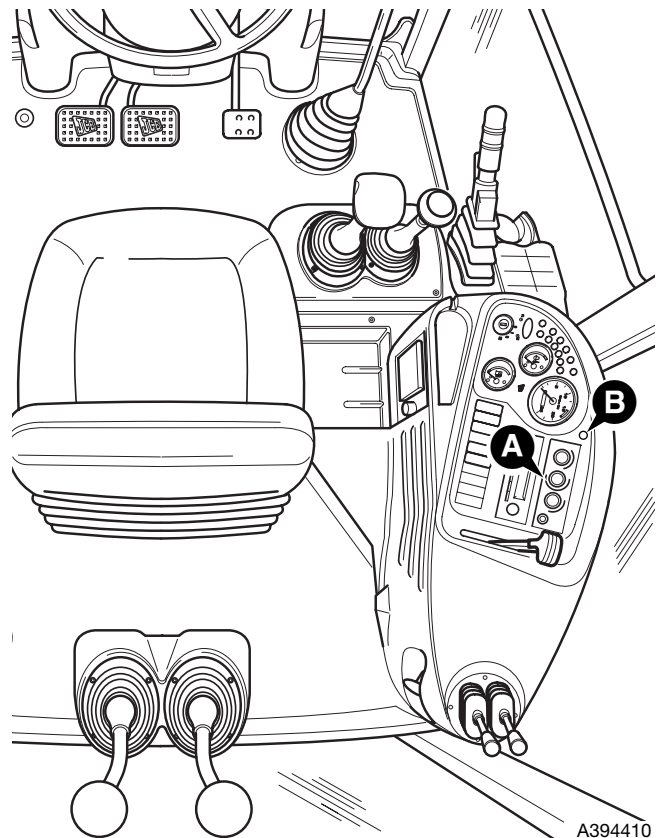
After fitting the cables, operate the heater controls and check that they function correctly.

Adjustment

If the control cable **C** is not correctly assembled it is possible that the heater cannot be turned fully off.

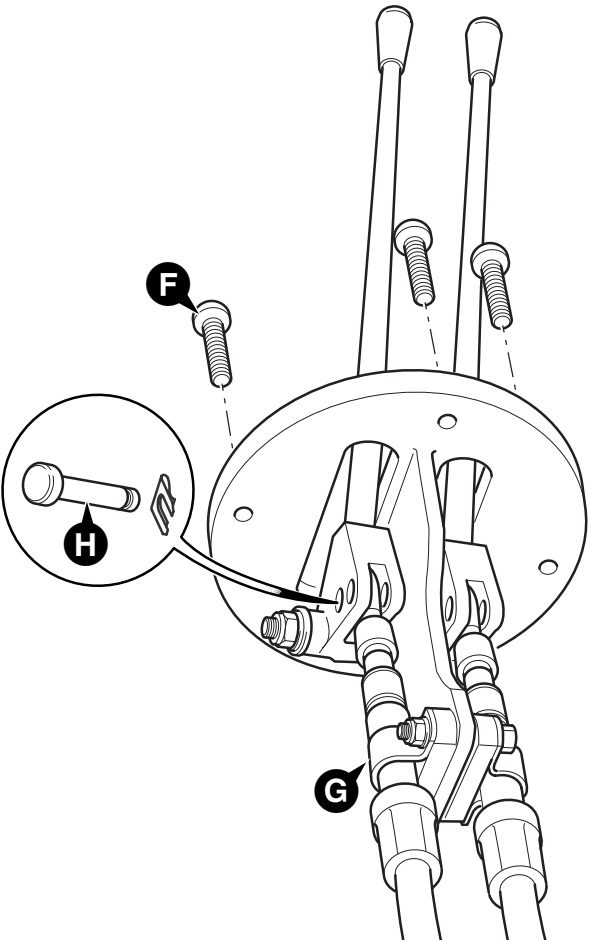
To ensure that the heater can be turned fully OFF, the temperature control cable **C** should be adjusted so that the water valve will close FULLY within the range of movement of the control knob as follows:

- 1 Set the water valve control lever **S** to the fully closed position.
- 2 Turn the heater control knob **E** a small amount clockwise from the closed position, i.e. a fraction before the cold position on the decal as shown.
- 3 Tighten the cable clips **R** to clamp the cable outer sheath.
- 4 Check the heater control range of movement and that the water valve can be fully closed by turning the knob.

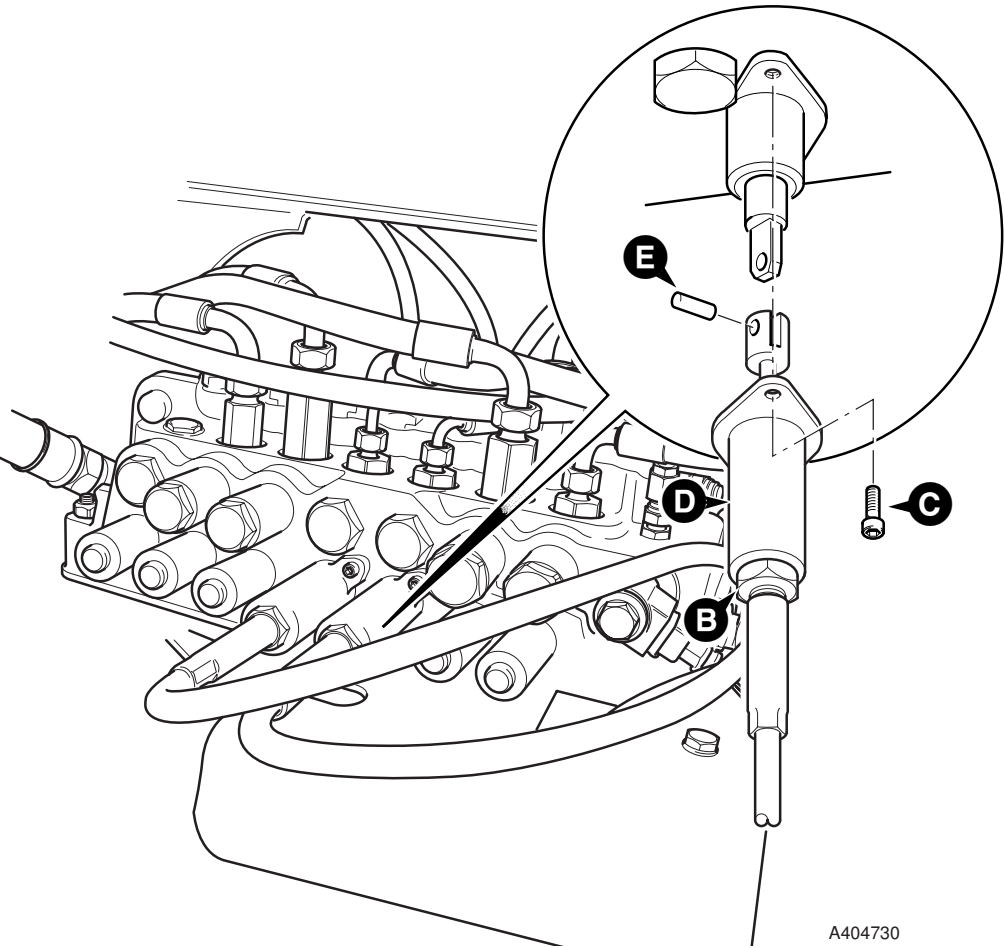


Removal and Replacement

Stabiliser Controls



A404700



A404730

Removal and Replacement

Stabiliser Controls

The stabiliser controls **A** and associated cables are housed in the R.H. side console as shown.

There are two control cables which operate the R.H. and L.H. stabiliser control valves on the excavator valve block.

Note the routing of the existing cables and route the new cable(s) in the same way.

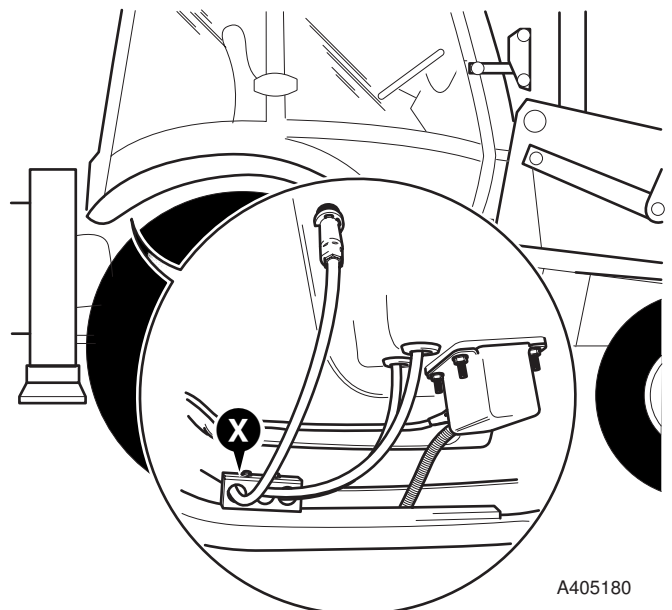
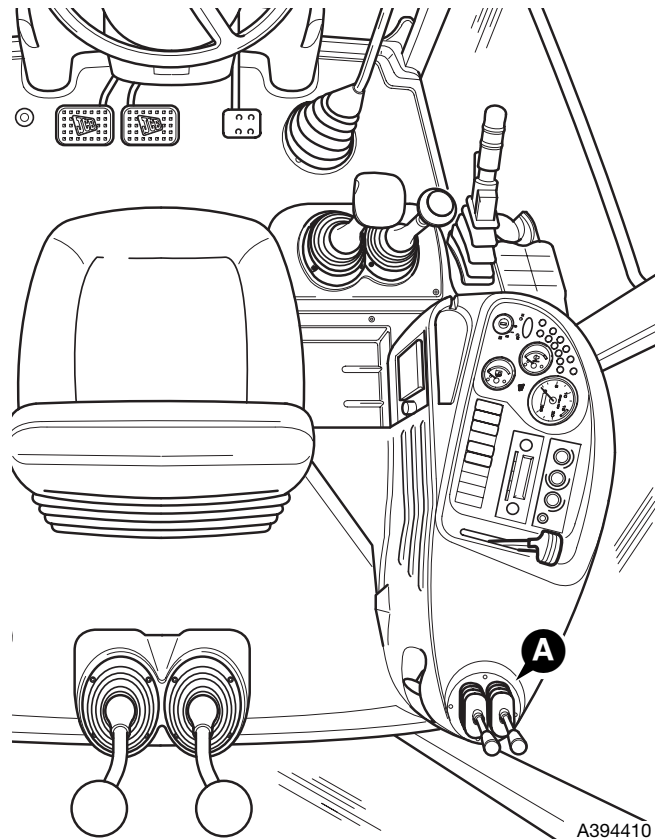
Removal

- 1 Park the machine on firm level ground, apply the parking brake. Lower the loader arms and excavator to the ground, switch OFF the engine and remove the starter key.
- 2 Working under the machine at the excavator valve, undo the locknut **B**. Remove the screws **C** and slide back the housing **D** to reveal the clevis as shown. Remove the clevis pin **E** to release the cable from the spool.
- 3 Feed the end of the cable back underneath the cab to the rear wheel arch on the R.H. side of the machine and release the cable from the clamp assembly at position **X** as shown.
- 4 Working in the cab, remove the fixings **F** from around the base of the control levers and carefully withdraw the lever assembly from the side console to reveal the cables connected on the underside.
- 5 Remove the clamp **G** securing the cables to the bracket. Remove the spring clip and clevis pin **H** to release the cable.
- 6 From inside the side console, carefully pull the cable up into the cab through the aperture in the cab floor.

Replacement

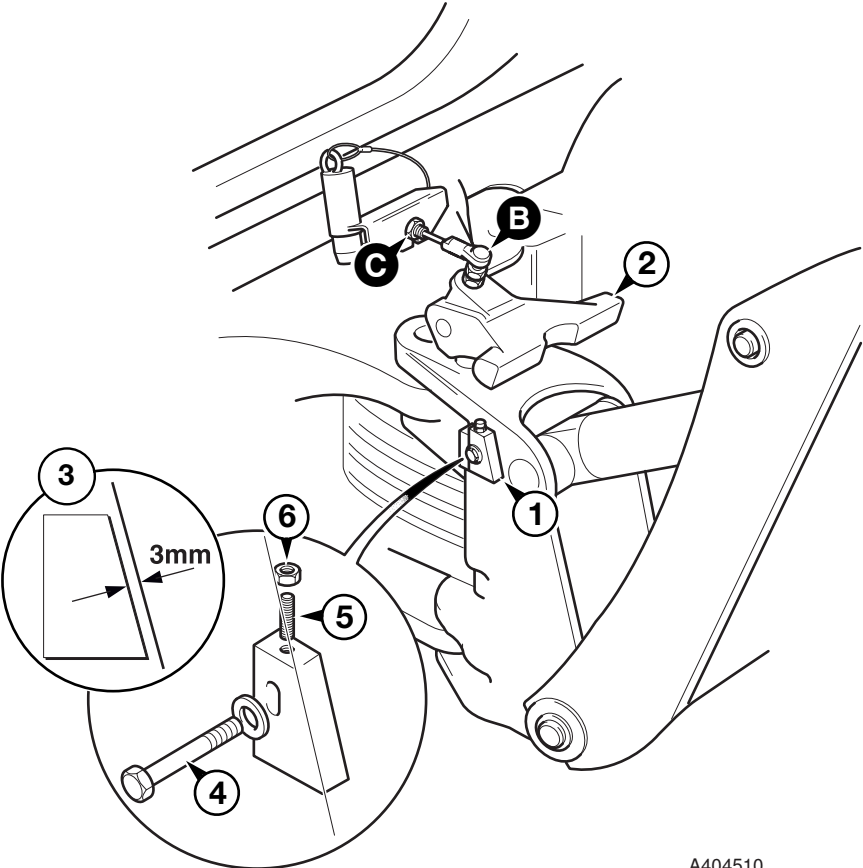
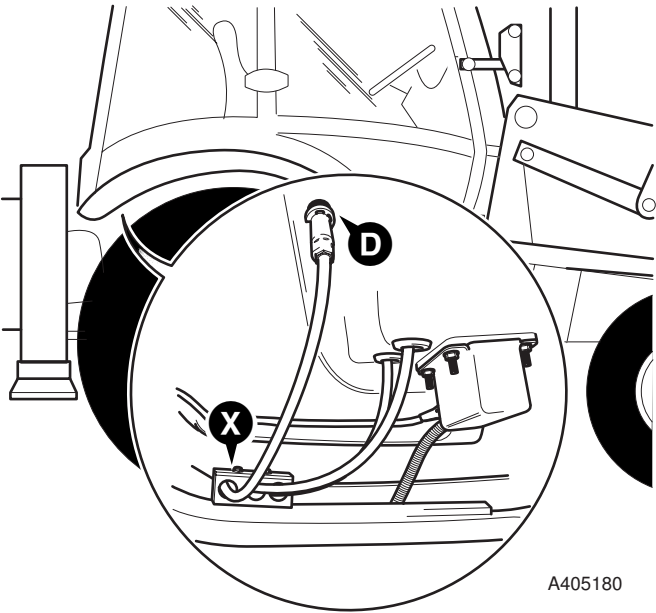
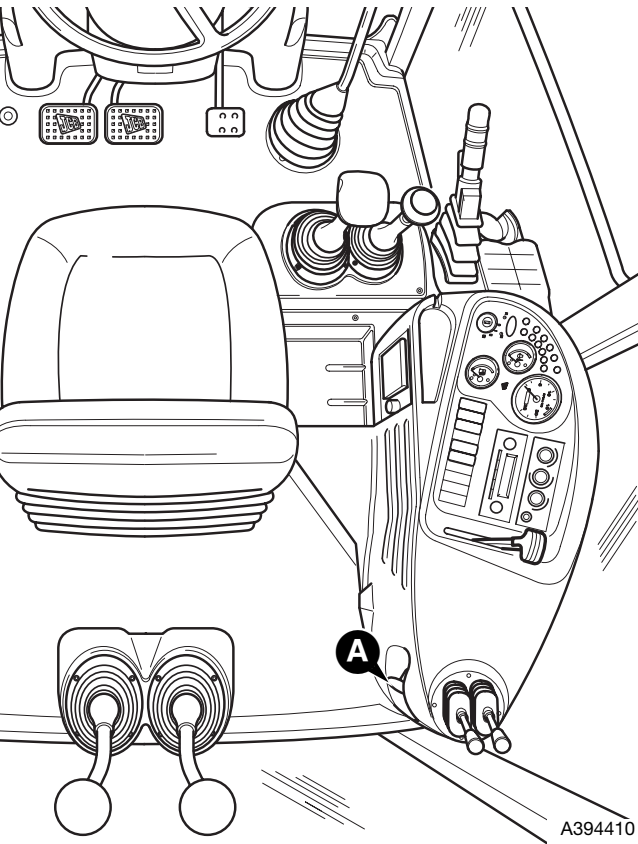
Replacement is the reverse of the removal sequence.

After fitting the cable(s), operate the controls and check that the stabilisers function correctly.



Removal and Replacement

Boom Lock Cable



Removal and Replacement

Boom Lock Cable

The boom lock control **A** and associated cable is housed in the R.H. side console as shown.

Note the routing of the existing cable and route the new cable in the same way.

Removal

- 1 Park the machine on firm level ground, apply the parking brake. Lower the loader arms and excavator to the ground, switch OFF the engine and remove the starter key.
- 2 Working at the boom, remove the cable ball stud **B** from the boom lock casting.
- 3 Loosen the lock nut and disconnect the bulkhead fitting **C** from the bracket. Feed the end of the cable back underneath the cab to the rear wheel arch on the R.H. side of the machine and release the cable from the clamp assembly at position **X** as shown. Remove the spring clip **D** from the outer sleeve.
- 4 Working in the cab, unscrew the knob and lock nut from the boom lock control **A**. Remove the fixings from the side console panel and carefully lift up the rear corner of the side console panel over the boom lock control outer sleeve.
- 5 With the rear corner of the side console panel lifted up, carefully pull the boom lock cable up into the cab through the aperture in the cab floor.

Replacement

Replacement is the reverse of the removal sequence.

- 1 After fitting the cable, with the control knob pressed down adjust the bulkhead fitting **C** to take up any slack in the cable. The cable should be tight but must not lift the boom lock from its fully down position.
- 2 Operate the boom and check that the boom lock will engage and disengage correctly using the control knob in the cab. Check the boom stop setting, see **Boom Stop Setting**.

Boom Stop Setting

The boom stop block should be set as follows:

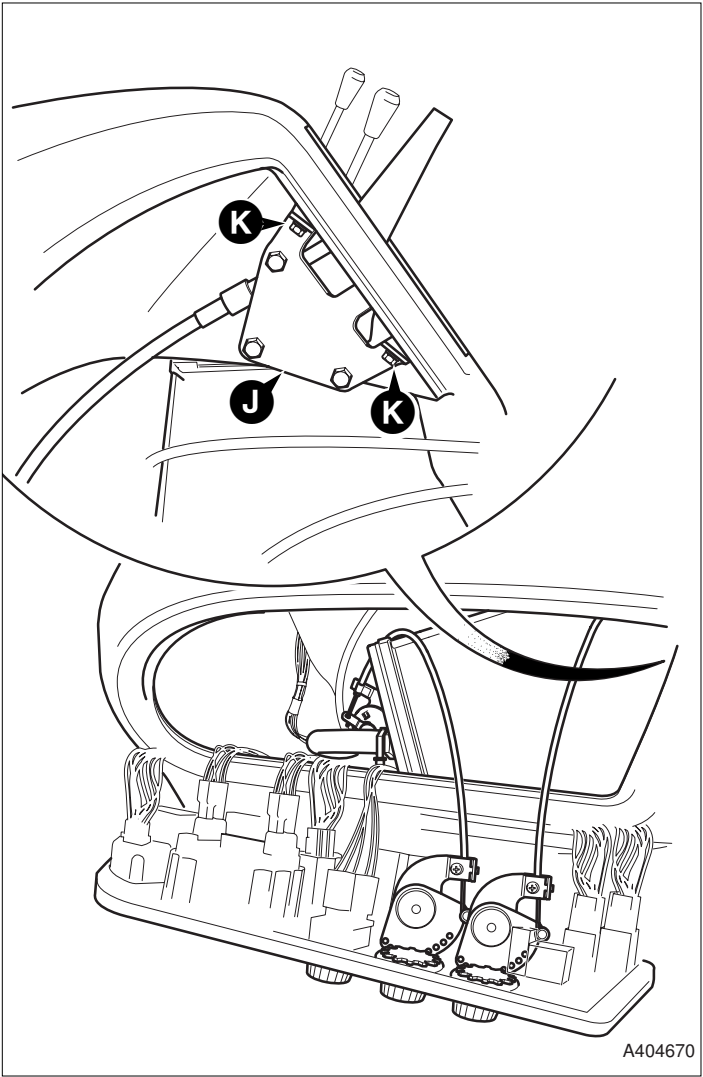
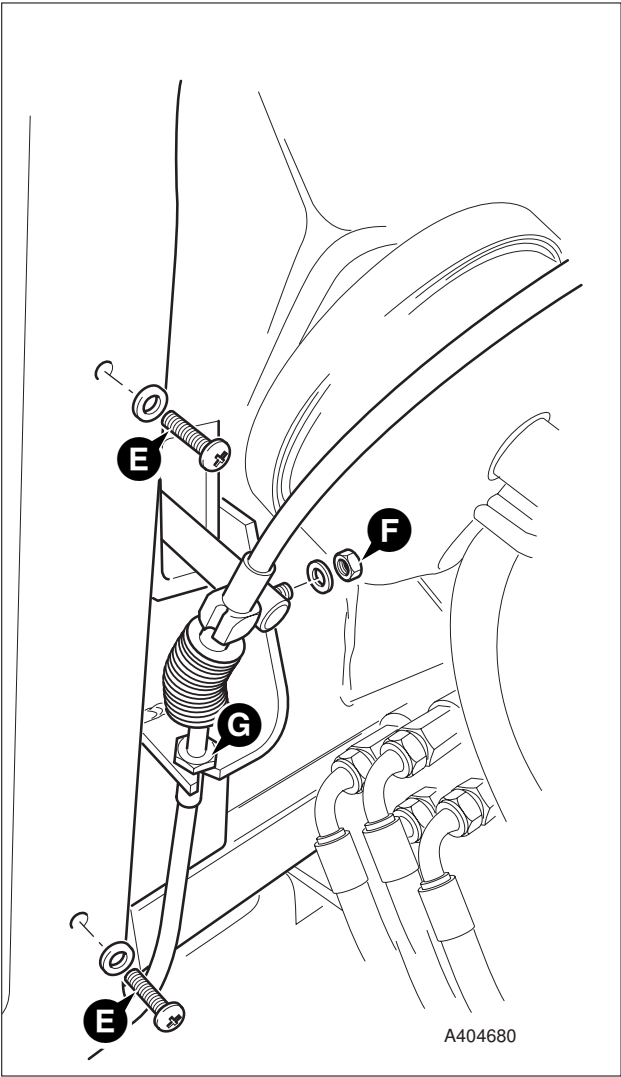
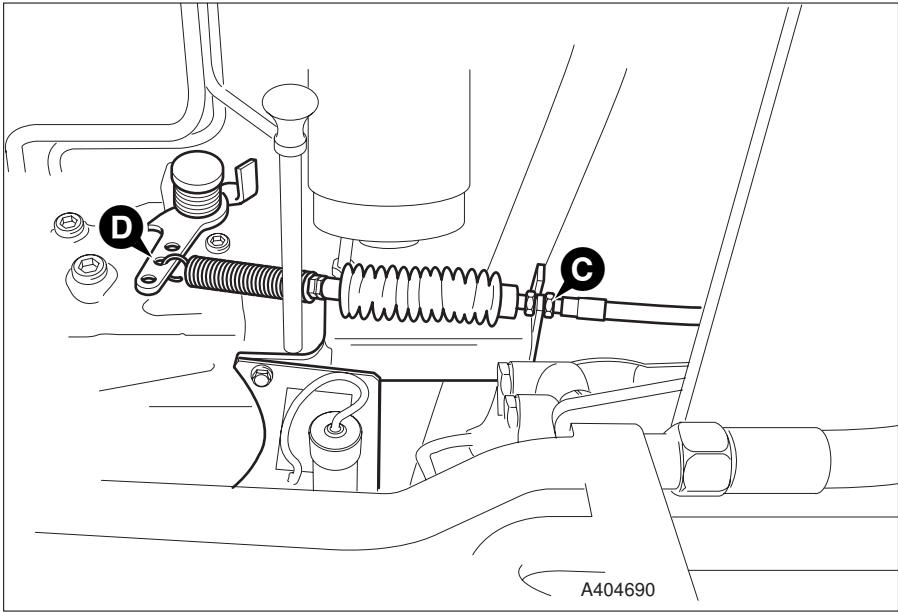
- 1 Lightly secure the boom stop block **1** in its lowest position.
- 2 Raise the boom lock **2** using the control knob in the cab.
- 3 Fully raise the boom (i.e. the boom ram fully retracted) and engage the boom lock using the control knob in the cab.
- 4 With the engine switched OFF, operate the excavator control levers several times to vent any residual pressure from the boom ram.
- 5 Adjust the boom stop block **1** until there is 3 mm (1/8 in.) gap between the stop and the boom profile as shown at **3**.
- 6 Tighten clamping bolt **4**. Tighten grubscrew **5** and lock nut **6**.
- 7 Switch ON the engine. Fully raise the boom (i.e. the boom ram fully retracted) and raise the boom lock using the control knob in the cab.
- 8 If the boom lock does not release readjust the stop block as follows:
 - a Loosen the lock nut **6** and slacken the grubscrew **5** a further half turn.
 - b Loosen clamping bolt **4** and reposition the stop block. Retighten bolt **4** and lock the grubscrew.
- 9 Operate the boom and check that the boom lock will engage and disengage correctly using the control knob in the cab.

Torque Settings

Item	Nm	kgf m	lbf ft
E	476	48	352

Removal and Replacement

Engine Throttle Cable



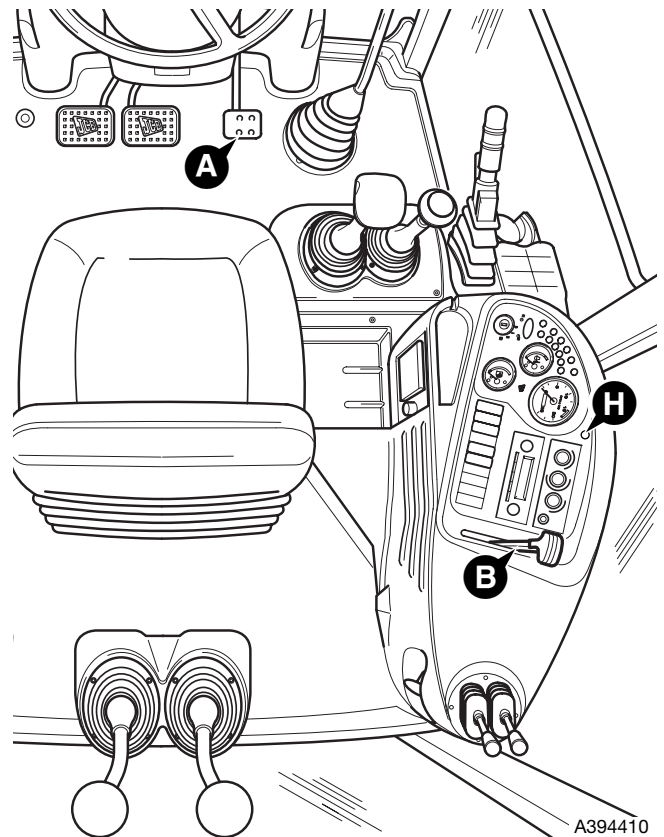
Removal and Replacement

Engine Throttle Cable

The engine throttle cable is routed from the L.H. side of the engine compartment to connect with the footpedal **A** at the engine compartment bulkhead, and to the hand throttle lever **B** housed in the R.H. side console as shown.

Removal

- 1 Park the machine on firm level ground, apply the parking brake. Lower the loader arms and excavator to the ground, switch OFF the engine and remove the starter key.
- 2 Open the bonnet and remove the engine side covers.
- 3 At the L.H. side of the engine compartment, disconnect the throttle cable by loosening the lock nut **C** and unhooking the cable from the fuel injector pump lever **D** as shown. Feed the end of the cable back across the engine compartment to the bulkhead on the R.H. side.
- 4 Working at the R.H. side of the engine compartment at the bulkhead, remove the screws **E** and ease back the rubber bulkhead cover to reveal the end of the footpedal lever as shown. Remove the nut **F** and disconnect the cable pivot block from the footpedal. Loosen the lock nut **G** and release the cable from the bracket. Feed the cable back underneath the cab to the rear wheel arch on the R.H. side of the machine.
- 5 Working in the cab, remove the fixing **H** at the top of the instrument panel and carefully lift the panel forward to reveal the hand throttle lever and mounting bracket assembly **J** inside the side console as shown.
- 6 Remove the hand throttle lever knob. Remove the screws **K**, taking hold of the hand throttle lever assembly withdraw the handle through the slot in the panel.
- 7 From inside the side console, carefully pull the cable up into the cab through the aperture in the cab floor.



Replacement

Replacement is the reverse of the removal sequence.

After fitting the cable, operate the hand and foot throttle controls and check that they function correctly.

Removal and Replacement

Auxiliary Footpedal Cable

The auxiliary footpedal control **A** is mounted in the cab floor as shown. The cable operates the auxiliary control valve located adjacent to the excavator valve. The cable is accessible underneath the rear L.H. corner of the cab.

Note the routing of the existing cable and route the new cable in the same way.

Removal

- 1 Park the machine on firm level ground, apply the parking brake. Lower the loader arms and excavator to the ground, switch OFF the engine and remove the starter key.
- 2 Working at the rear of the machine at the auxiliary valve, undo the locknut **B**. Remove the screws **C** and slide back the housing **D** to reveal the clevis as shown. Remove the clevis pin **E** to release the cable.
- 3 At the footpedal remove the U-clamp **F** securing the cable to the bracket. Remove the spring clip **G** to release the cable. If the cable is to be replaced, remove and retain the microswitch operating tab **H** from the old cable as shown.

Replacement

Replacement is the reverse of the removal sequence.

