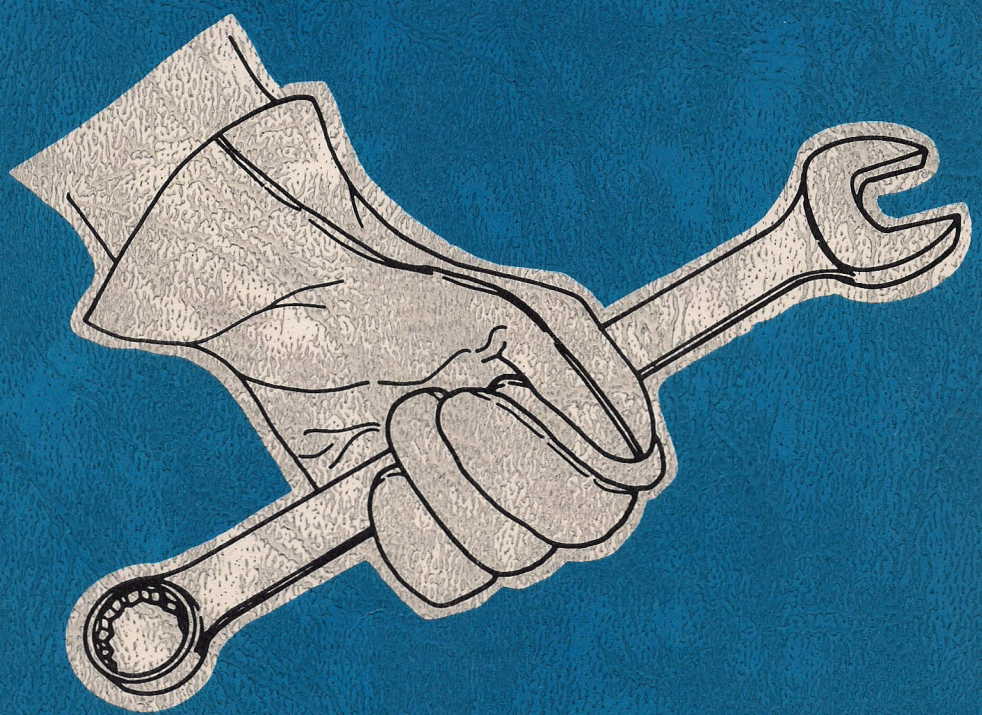
bobcat

MELROE HYDRAULIC CONTROL VALVE

COMPONENT REPAIR MANUAL



MELROE COMPANY

6570041 (4-86)-1.5M

Printed in U.S.A.

WARNINGS

⚠ WARNING

Instructions are necessary before doing service on loader. See warnings and instructions both at beginning and throughout this manual. After doing service or making repair or adjustment, always check function of loader. Failure to obey warnings can cause injury or death.

W-1008

CORRECT

⚠ Never service Bobcat loader without instructions. See Service Manual.

CORRECT

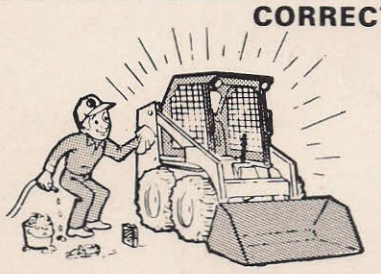
⚠ Don't lift or lower operator cab without instructions.

CORRECT

⚠ Check engine and hydraulic fluids daily.

⚠ Use recommended fluids.

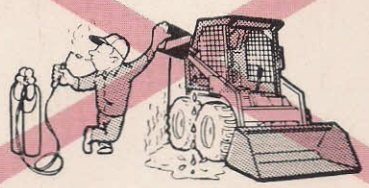
CORRECT



⚠ Cleaning and maintenance are required daily.

⚠ Keep the rear door closed except for service. Close and latch the door before operating loader.

WRONG



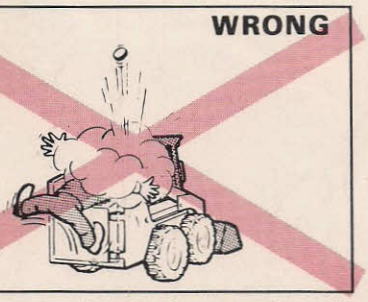
⚠ Do not fill fuel tank with the engine running, while smoking or when near an open flame.

WRONG

⚠ Never work on loader with the lift arms up unless lift arms are held by a lift arm stop.

⚠ Never modify equipment or add attachments not approved by Clark Equipment., Melroe Div.

WRONG

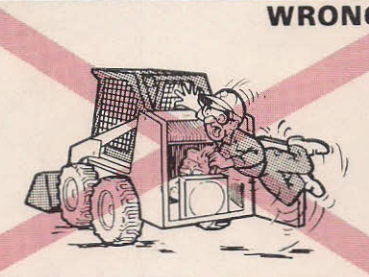


⚠ Stop, cool and clean engine of flammable materials before checking fluids.

⚠ Never service or adjust loader with the engine running unless instructed to do so in the manual.

⚠ Avoid contact with leaking hydraulic fluids or diesel fuel which is under pressure. It can penetrate skin or eyes.

WRONG



⚠ Keep body, loose objects and clothing away from moving parts, electrical contacts, hot parts and exhaust.

WRONG

⚠ Lead-acid batteries produce flammable and explosive gases.

⚠ Keep arcs, sparks, flames and lighted tobacco away from batteries.

⚠ Lead-acid batteries contain sulfuric acid which will damage eyes or skin on contact. If acid contacts eyes, skin or clothing, flush well with water. For contact with eyes, get immediate medical attention.

⚠ Safety Alert Symbol

INTRODUCTION

Melroe recommends that all service technicians attend either field or factory Bobcat Service Workshops for necessary information and education to help in problem analysis.

Workshops are held many times a year at various locations throughout the U.S. and Canada. Contact your District Service Manager or Melroe Service Office Gwinner, N.D. (701) 678-6465 for schedule.

This Component Repair Manual provides the Service Technician with information for servicing Melroe Hydraulic Control Valve.

Make reference to the SERVICE MANUAL for your MODEL Loader to troubleshoot, test, remove and installation of the control valve.

SAFETY INSTRUCTIONS

We care about your safety.

The Bobcat loader is designed to give maximum operator safety; but no machine design can prevent operator error or carelessness.

⚠ WARNING

Wear safety glasses to prevent eye injury when any of the following conditions exist:

- **When fluids are under pressure.**
- **Flying debris or loose material is present.**
- **Engine is running.**
- **Tools are being used.**

W-2019-1285

BEFORE YOU WORK ON THE HYDRAULIC CONTROL VALVE

Read the complete sequence so you know the complete disassembly or assembly procedure before the work is actually started.

⚠ WARNING

For your safety, warnings are on loader and in manual. Failure to obey warnings can cause injury or death.

W-2044-0284

IMPORTANT

This notice identifies procedures which must be followed to avoid damage to the loader.

I-2019-0284

A BUSINESS UNIT OF CLARK EQUIPMENT COMPANY

INDEX

HYDRAULIC CONTROL VALVE INDEX

MODELS	S/N	TAB	SECTION	MANUFACTURER
443	All	1	A	Melroe
540, 640	13001 & Above	1	A	Melroe
740, 843	15001 & Above	1	A	Melroe
750 Series	All	5	A	Melroe
853	All	5	A	Melroe
1213	All	4	A	Melroe
1600	12001 & Above	1	A	Melroe
2000	13001 & Above	1	A	Melroe
2000 RTF	All	1	A	Melroe
2400	All	2	A	Melroe
2400 Series Rear Aux.	All	3	A	Gresen
2410	All	5	A	Melroe
Glossary of Terms	TAB #6			


bobcat

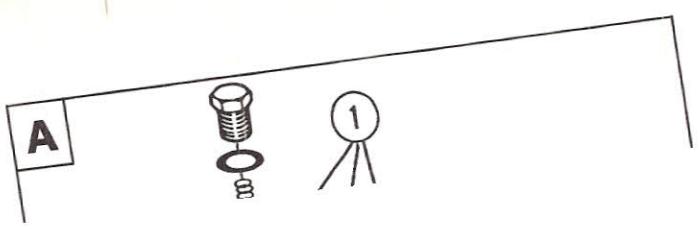
HYDRAULIC CONTROL VALVE

CONTROL VALVE IDENTIFICATION (Cont'd)

Item	BOBCAT MODEL						
	farmboy Fig. 1	440 Fig. 1	540, 640 Fig. 1	740,843 Fig. 2	1600 Fig. 3	2000 Fig. 4	2000 RTF Fig. 5
A-1	Lift Cylinder Rod End					Tilt Cylinder Rod End	
A-2	Tilt Cylinder Base End		Tilt Cylinder Rod End		Tilt Cylinder Base End	Lift Cylinder Rod End	
A-3	Auxiliary Hydraulics (Optional)	Auxiliary Hydraulics		Rear Auxiliary Hydraulics	Auxiliary Hydraulics		
A-4				Front Auxiliary Hydraulics			
B-1	Lift Cylinder Base End W/Orifice				W/Orifice	Tilt Cylinder Base End	
B-2	Tilt Cylinder Rod End		Tilt Cylinder Base End		Tilt Cylinder Rod End	Lift Cylinder Base End	
B-3	Auxiliary Hydraulics (Optional)	Auxiliary Hydraulics		Rear Auxiliary Hydraulics	Auxiliary Hydraulics		
B-4				Front Auxiliary Hydraulics			
C-1	Load Check Valve Lift Function					Load Check Valve Tilt Function	
C-2	Load Check Valve Tilt Function					Load Check Valve Lift Function	
C-3	Load Check Valve Auxiliary Function			Loader Check Valve Rear Auxiliary	Load Check Valve Auxiliary Function		
C-4				Load Check Valve Front Auxiliary			
D-1	Lift Spool					Tilt Spool	
D-2	Tilt Spool					Lift Spool	
D-3	Auxiliary Spool (Optional)	Auxiliary Spool		Rear Auxiliary Spool	Auxiliary Spool		
D-4				Front Auxiliary Spool			

CONTROL VALVE

Disassembly and Assembly



CONTROL VALVE IDENTIFICATION (Cont'd)

	BOBCAT MODEL						
Item	farmboy Fig. 1	440 Fig. 1	540, 640 Fig. 1	740,843 Fig. 2	1600 Fig. 3	2000 Fig. 4	2000 RTF Fig. 5
E-1				Anti-Cavitation Valve	Port Relief Valve		
E-2	Anti-Cavitation Valve		Plug		Anti-Cavitation Valve		Plug
E-3					Plug		
E-4				Plug			
MR	Main Relief Valve						
F-1			Plug	Port Relief Valve			
F-2	Plug		Anti-Cavitation Valve		Port Relief Valve		Plug
F-3							
F-4				Plug			
G-1	Centering Spring Lift Spool	Detent, Lift Spool				Centering Spring Tilt Spool	
G-2	Centering Spring Tilt Spool					Detent Lift Spool	Centering Spring Lift Spool
G-3	Centering Spring Aux. (Opt.)	Detent, Auxiliary Spool		Centering Spring Auxiliary Spool	Detent, Auxiliary Spool		Centering Spring Auxiliary Spool
G-4				Detent Spool			

INSTALLING ON THE CONTROL VALVE, BUT THE PROCEDURE IS THE SAME.

IMPORTANT

When making repairs on hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0284

Mark each valve section and spool so that the parts will be returned to its original bore during assembly. Use bolts to fasten the control valve to a work bench for easier disassembly and assembly.

Remove the load check valves (Item 1) from the top of the valve ("C" Ports) [A].

Remove the following parts from the detent and spool linkage sides of the control valve ("F" & "E" Ports):

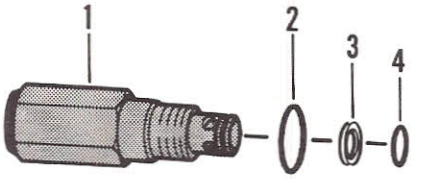
1. Port Relief Valve [B].
2. Anti-Cavitation Valve [C].
3. Plug [D].

Remove the O-rings and back-up washers.

Assembly: Always use NEW O-rings and back-up washers. Tighten to 35-40 ft.-lbs. (47-54 Nm) torque.

B

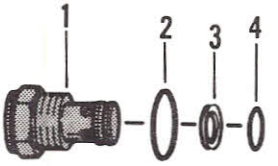
1. Relief Valve
2. O-Ring
3. Back-Up Washer
4. O-Ring



E-1509

C

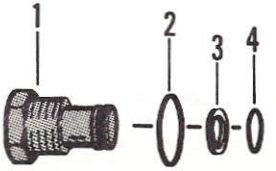
1. Anti-Cavitation Valve
2. O-Ring
3. Back-Up Washer
4. O-Ring



E-1509

D

1. Plug
2. O-Ring
3. Back-Up Washer
4. O-Ring

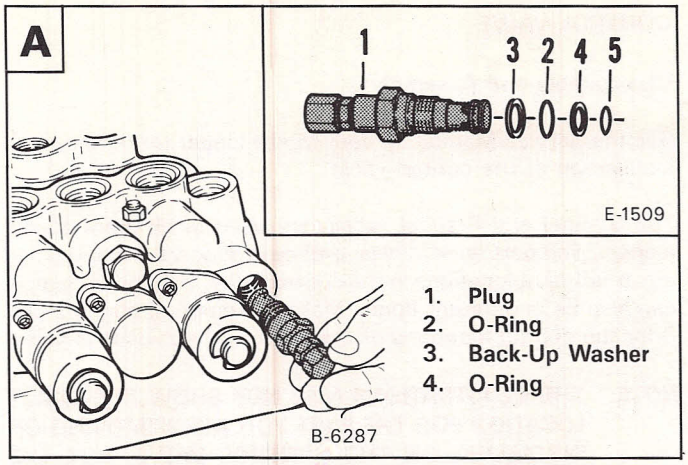


E-1509

CONTROL VALVE (Cont'd)

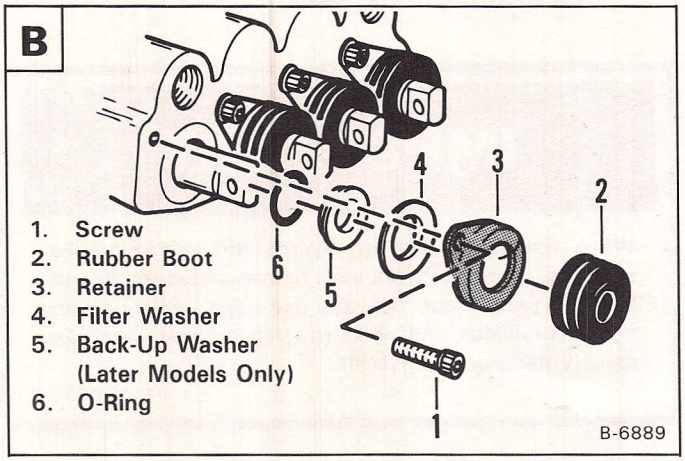
Remove the main relief valve from the control valve [A].

Assembly: Always use NEW O-rings and back-up washers. Tighten to 35-40 ft.-lbs. (47-54 Nm) torque.



Remove the screws (Item 1), rubber boots (Item 2), boot retainer (Item 3) and filter (Item 4) from each spool [B].

Assembly: Tighten the screws to 90-100 in.-lbs. (10-11 Nm) torque.



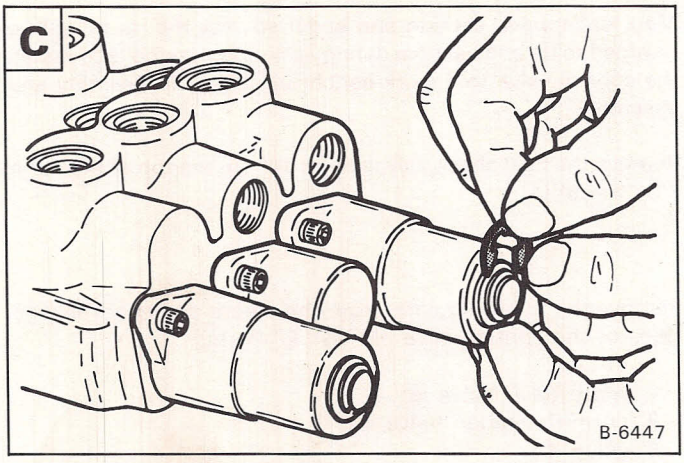
Detent Assembly

The tool listed will be needed to do the following procedure:

MEL-1278 — Detent Tool

Use the following procedure to remove and disassembly the detent assembly.

Remove the snap ring and washer [C].



Remove the screws for the detent cap [D].

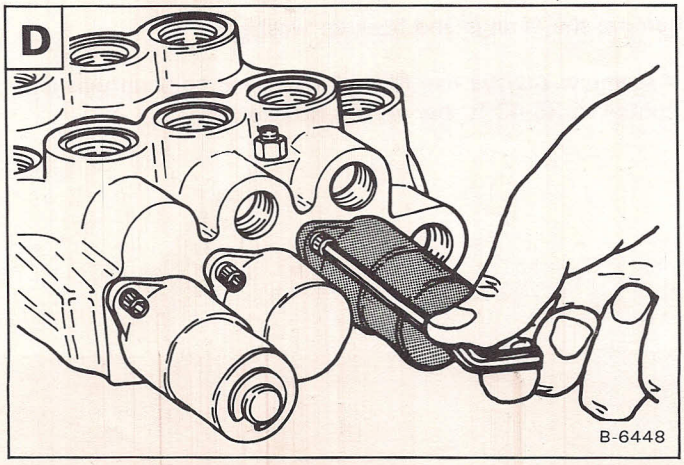
Assembly: Tighten the screws to 90-100 in.-lbs. (10-11 Nm) torque.

Remove the detent cap.

IMPORTANT

The detent assembly has small springs and balls. Do not loose these parts during disassembly and assembly.

I-2012-0284



Remove the detent sleeve, detent balls and springs.

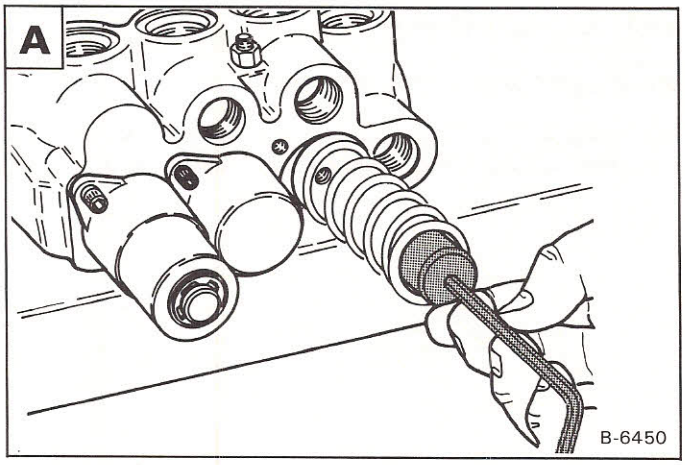
CONTROL VALVE (Cont'd)

Remove the centering spring bolt [A].

NOTE: **Carefully remove the centering spring bolt, because there is spring pressure.**

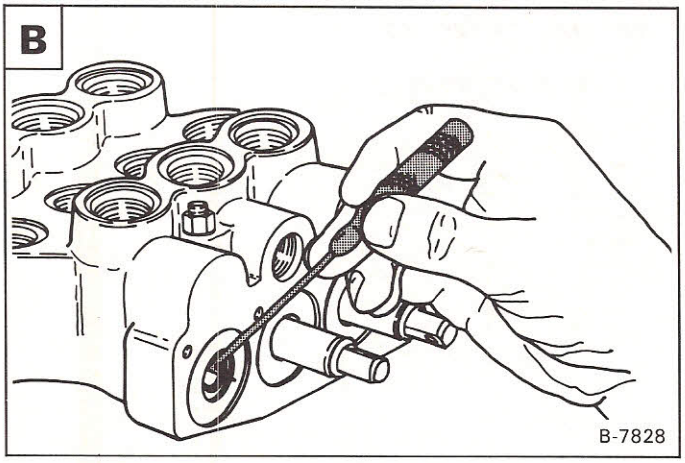
Remove the spool from the bore.

Assembly: For installation of the centering spring (See Page 12 for the correct procedure).



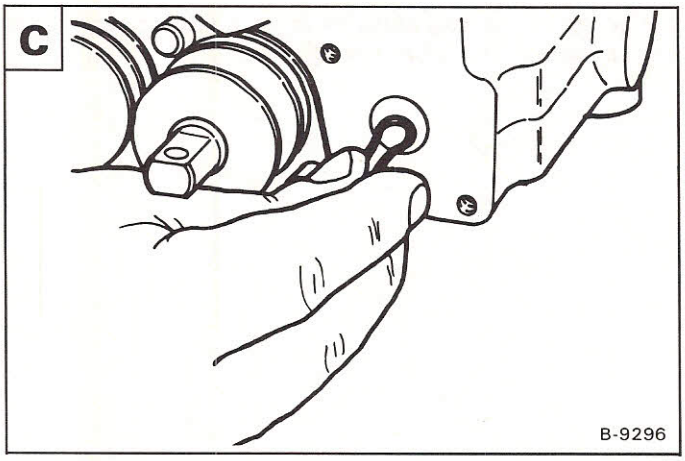
Remove the front and rear quad rings [B].

Use the following procedure to assemble the detent assembly.

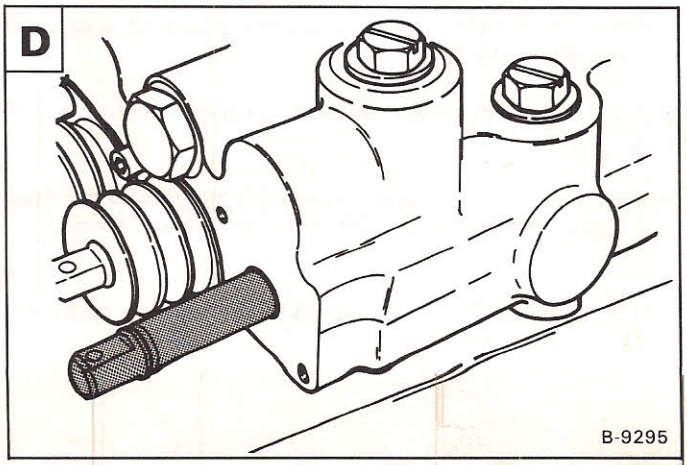


Install a NEW quad ring into the groove in the front of the control valve [C].

NOTE: **SEE PAGES 13, 14, 15 or 16 for seal and valve identification.**



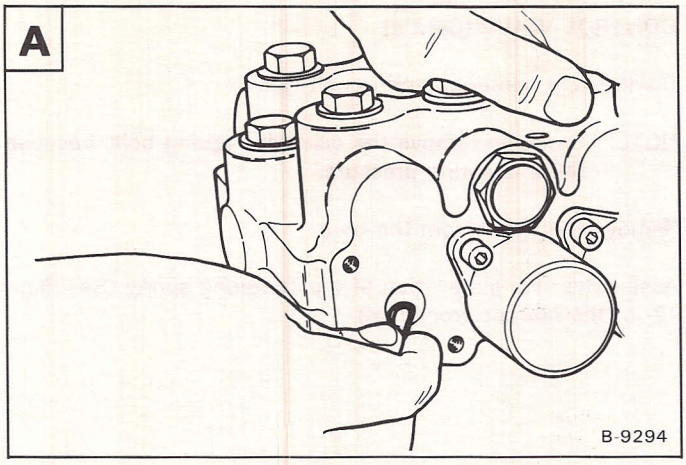
Install the valve spool into the control valve from the rear of the control valve. Push the spool into the valve just far enough so that the rear quad ring can be installed [D].



CONTROL VALVE (Cont'd)

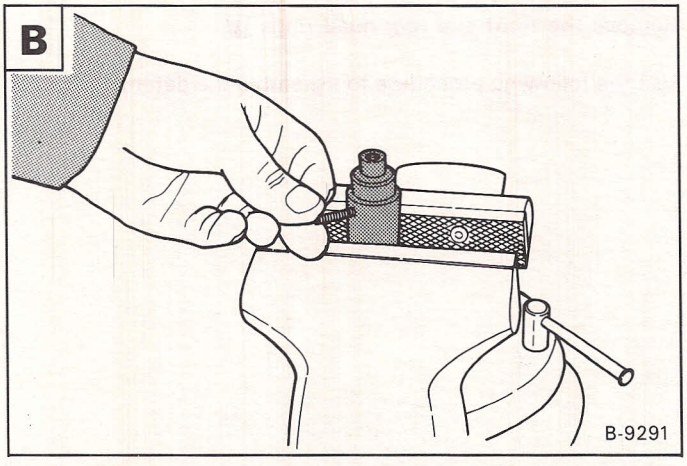
Install a NEW quad ring in the rear of the control valve [A].

Push the valve spool back into the control valve until it is even with the rear machined surface of the control valve.

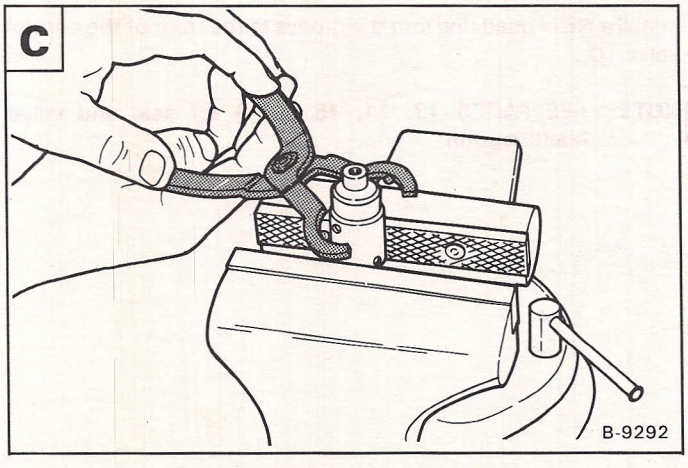


Put the detent adapter into a vise.

Install the detent spring [B].



Put grease on the jaws of the detent tool. Put the detent balls on the jaws of the detent tool [C].

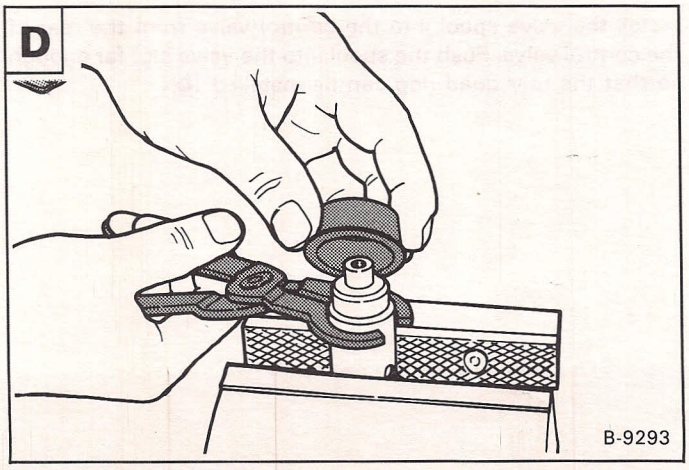


Hold the detent balls in position. Install the spring end cap over the detent adapter [D].

Remove the detent adapter and spring cap assembly from the vise.

Install the centering spring and the other spring cap on the spool and tighten the bolt to 90-100 in.-lbs. (10-11 Nm) torque.

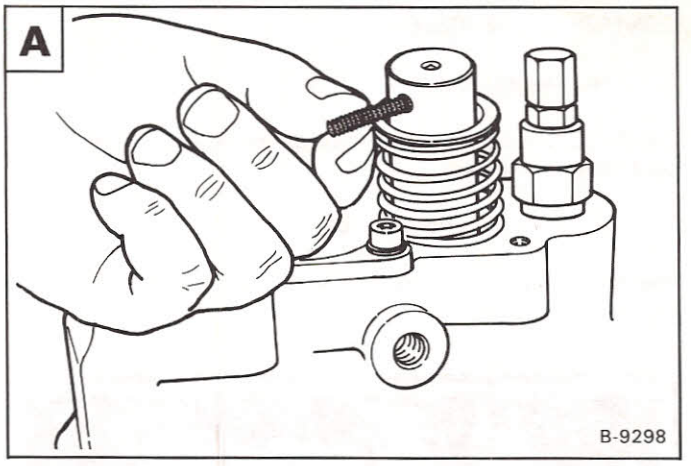
NOTE: To replace the valve spool stud (See Page 12 for the correct procedure).



CONTROL VALVE (Cont'd)

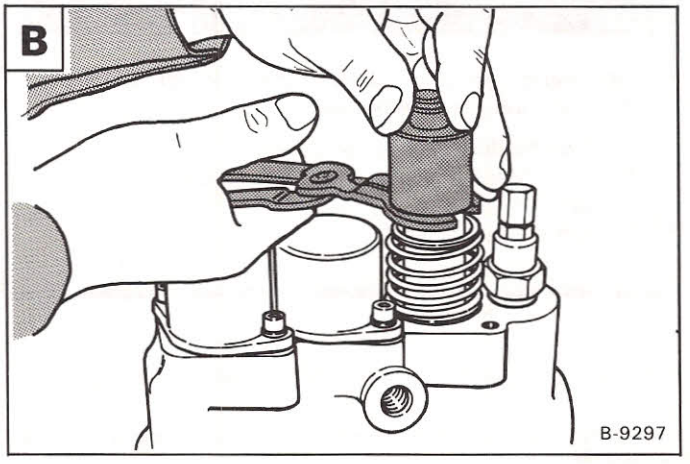
NOTE: Lift and Auxiliary Detent Sleeves are different: Lift Detent Sleeve Bore Depth is 1.160" (29,5 mm). Auxiliary Detent Sleeve Bore Depth is 1.061" (26,9 mm).

Install the detent spring into the detent adapter [A].

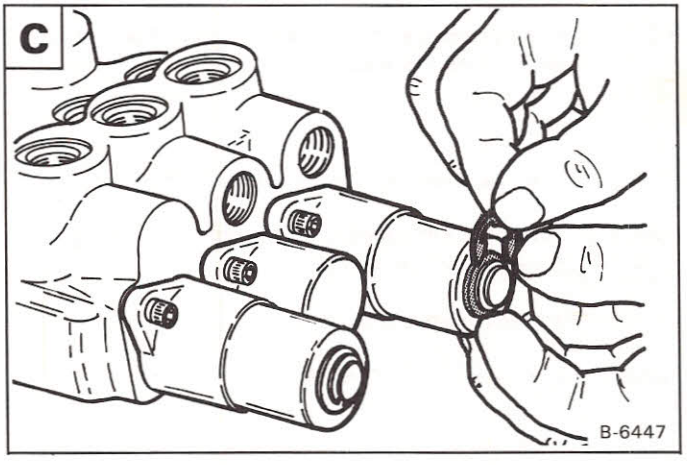


Hold the detent balls in position with the detent tool and slide the sleeve into position [B].

Install the detent cap. Tighten the screws to 90-100 in.-lbs. (10-11 Nm) torque.



Install the washer and snap ring [C].



CONTROL VALVE (Cont'd)

Centering Mechanism

Use the following procedure to disassemble and assemble the centering mechanism.

Remove the screws from the cap [A].

Assembly: Tighten the screws to 90-100 in.-lbs. (10-11 Nm) torque.

⚠ WARNING

Wear safety glasses to prevent eye injury when any of the following conditions exist:

- **When fluids are under pressure.**
- **Flying debris or loose material is present.**
- **Engine is running.**
- **Tools are being used.**

W-2019-1285

Remove the cap. Remove the centering spring bolt [B].

Assembly: Tighten the centering spring bolt to 90-100 in.-lbs. (10-11 Nm) torque.

NOTE: Carefully remove the centering spring bolt, because there is spring pressure.

Remove the spring caps, spring and adapter [C].

Assembly: For correct installation of the centering spring (See Page 12 for the correct procedure).

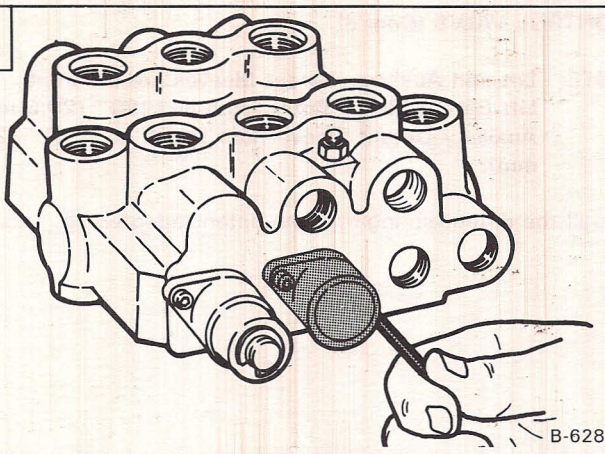
Remove the spool from the bore.

Remove the front and rear O-rings.

Install the front quad ring into the groove [D].

NOTE: See Pages 13, 14, 15 or 16 for seal and valve indentification.

A



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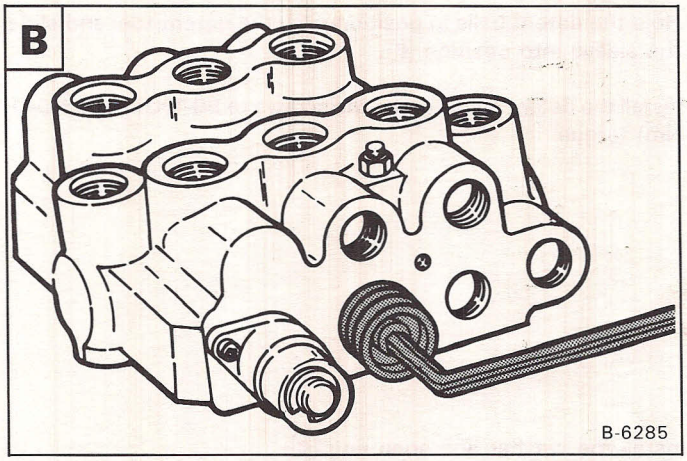
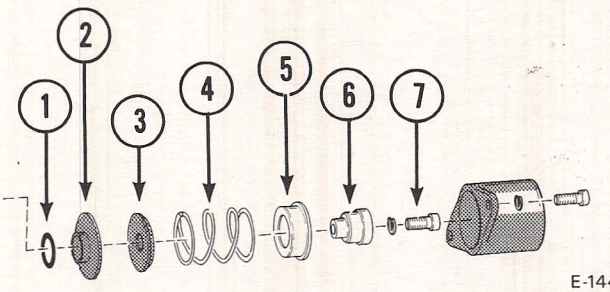
B



B-6285

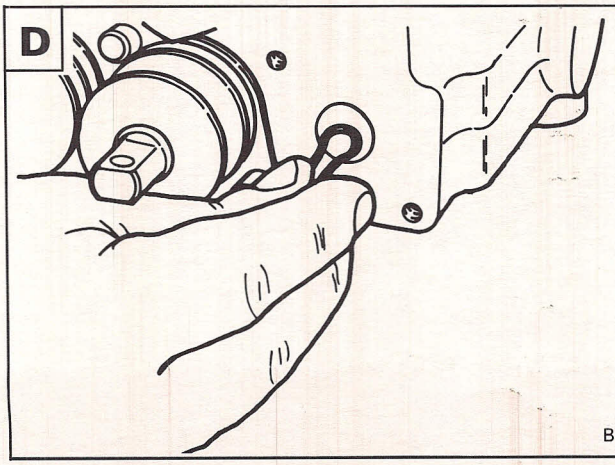
C

1. O-ring
2. Bushing (Early Models)
3. Spring Cap
4. Centering Spring
5. Spring Cap
6. Adapter
7. Bolt



E-1446

D



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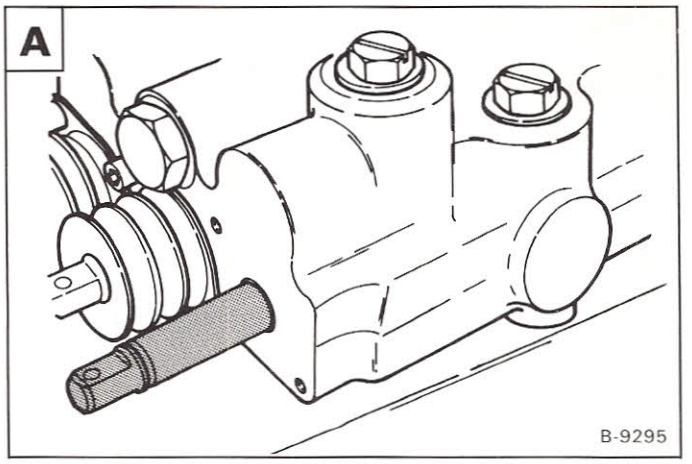
CONTROL VALVE (Cont'd)

Install the valve spool into the valve from the rear of the control valve [A].

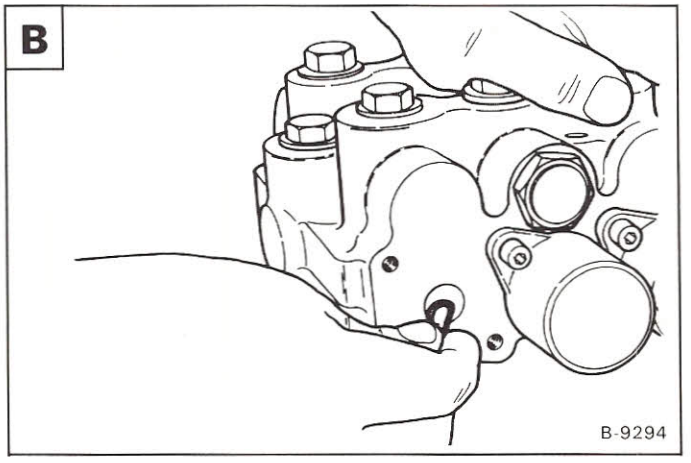
Push the spool into the valve just far enough so the rear quad ring can be installed.



Install the rear quad ring [B].

Push the spool back into the control valve until it is even with the rear machined surface of the valve.

Install the centering mechanism.

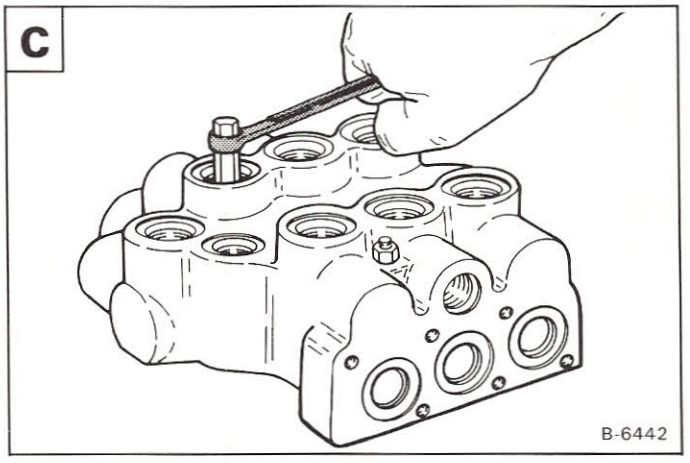


Orifice

On some Model loaders there is a orifice in the top ports. Use the following procedure to remove and install the orifice (See Page 2 and 3 for the correct location).

Loosen the orifice hex nut [C].

Installation: Tighten the orifice hex nut to 90-100 in.-lbs. (10-11 Nm) torque.



Remove the hex nut and orifice [D].

Inspection

Check the spools for scratches or wear.

Check that the spools are not loose in their bores.

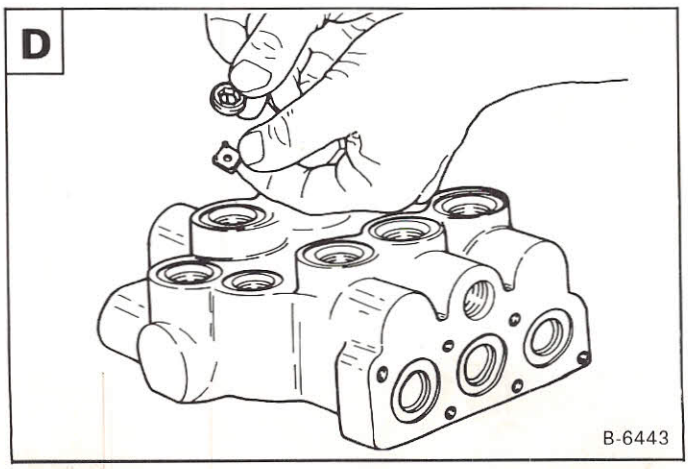
Check that the centering springs are not broken.

Check that the load check valve seats are not worn.

Check the load check poppets for damage.

Check the rubber boots, boot retainers and filters that they are not worn or damage.

Replace the parts as needed.



CONTROL VALVE (Cont'd)

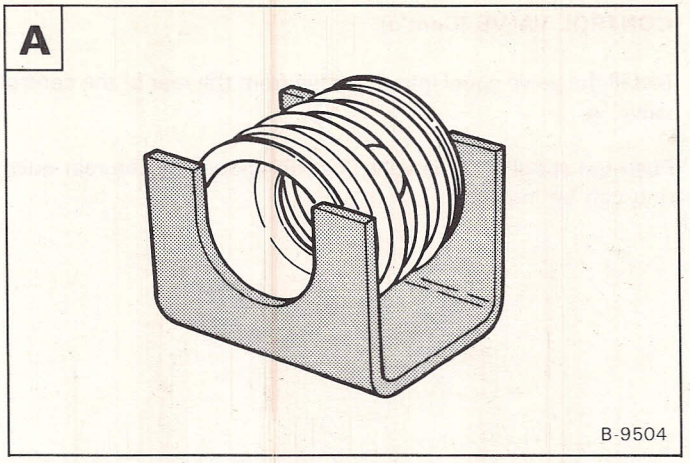
Installation of the Centering Spring

The tool listed will be needed to do the following procedure:

MEL-1285 — Valve Spring Holding Tool

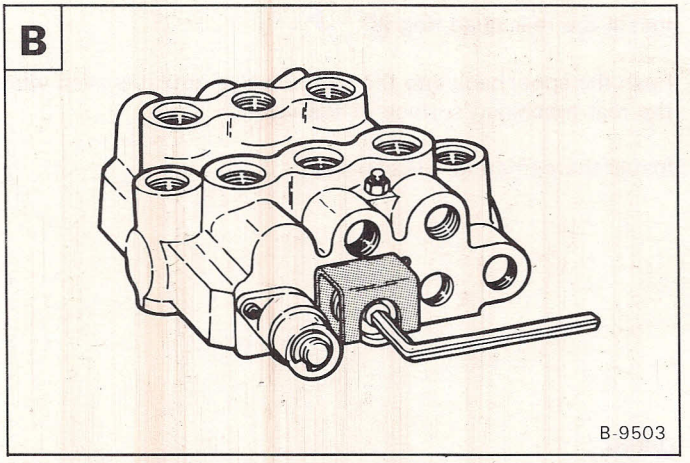
Put the washer and collar into the ends of the spring.

Compress the spring assembly and install it into the holding tool [A].



With the tool in position over the spring, assemble the spring to the spool using an allen wrench [B].

When assembly is completed, remove the tool.



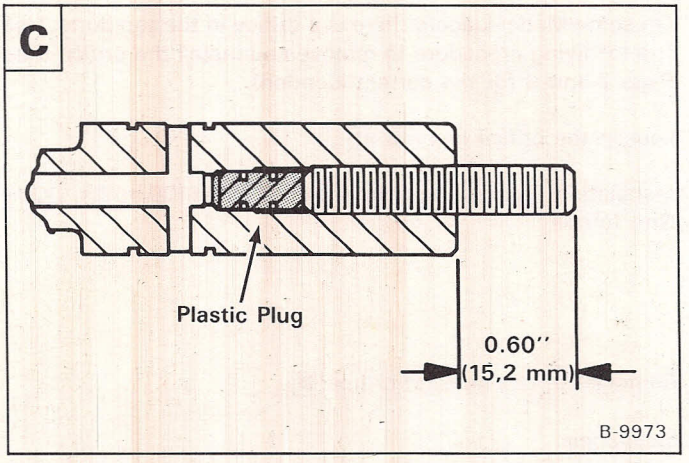
Valve Spool Stud

Install the plastic plug (lift spool only).

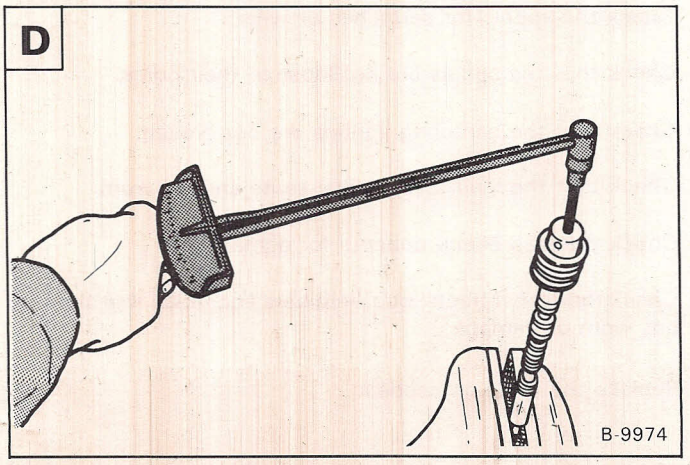
Install the stud and leave about 0.60" (15,2 mm) of the stud sticking out [C].

NOTE: DO NOT use loctite on the threads.

Assemble the centering spring and washers and install detent adapter.



Tighten the adapter to 90 - 100 in.-lbs. (10 - 11 Nm) torque [D].



IDENTIFICATION & INSTALLATION OF SPOOL SEAL

There are two types of seals for the control valve, a quad-ring seal and a lip seal. First identify the control valve (See Page 13, 14, 15 or 16) to find which seal is used. See the Parts Micro-Fiche for your model loader for the part number of the quad-ring seal or the lip seal used. Use the following procedure to install the seals into the control valve.

NO CHAMFER

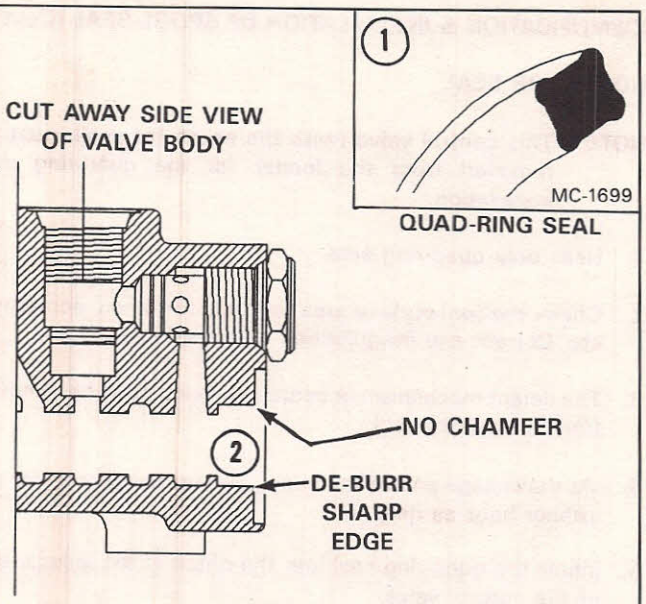
1. Uses only quad-ring seal.
2. Check the seal surface area for rust, corrosion, scratches, etc. Correct any irregularities before continuing. De-burr the sharp edge at the seal area (both ends).
3. At the linkage end of the spool, de-burr the groove for the rubber boot as needed.

NOTE: Lubricate with grease between the seal and retainer before installation (both ends).

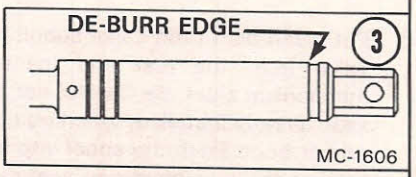
4. Put clean oil on the valve spool. Install the quad-ring seal over the valve spool. Be Careful not to damage the quad-ring seal on the valve spool edges.

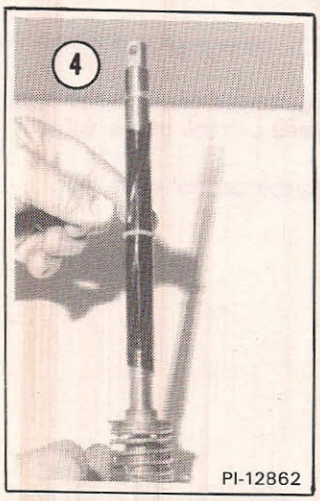
NOTE: An alternate method to protect the quad-ring seal by putting plastic material (Example: Discarded micro-fiche card) over the spool to protect the seal.

5. Install spool into the valve bore.
6. Slide the linkage end quad-ring seal over the rubber boot groove. Be Careful not to damage the seal.
7. Install the quad-ring seal retainer.
8. Continue with assembling the control valve.



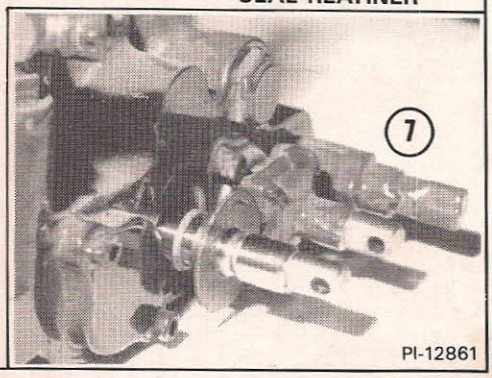
QUAD-RING SEAL





INSTALLING QUAD-RING SEAL ON VALVE SPOOL

INSTALLING QUAD-RING SEAL REATINER

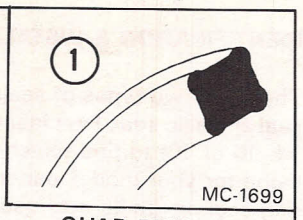


IDENTIFICATION & INSTALLATION OF SPOOL SEAL (Cont'd)

NOTCH FOR SEAL

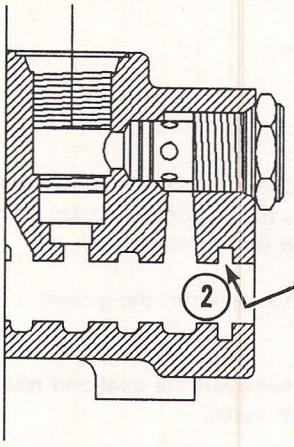
NOTE: This control valve (with the notch for seal) must be removed from the loader for the quad-ring seal installation.

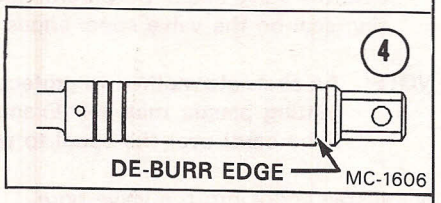
1. Uses only quad-ring seal.
2. Check the seal surface area for rust, corrosion, scratches, etc. Correct any irregularities before continuing.
3. The detent mechanism or centering spring must be removed from the valve spool.
4. At the linkage end of the spool, de-burr the groove for the rubber boot as needed.
5. Install the quad-ring seal into the notch in the linkage end of the control valve.
6. Put clean oil on the valve spool. Install the spool into the valve from the rear end (centering spring or detent mechanism side). Be Careful not to damage the quad-ring seal, already installed, when going over the groove for the rubber boot. Push the spool into the valve just far enough so that the rear quad-ring seal can be installed.
7. Install the quad-ring seal in the rear groove of the valve.
8. Push the valve spool back into the control valve until it is even with the rear machined surface of the valve.
9. Continue with assembling the control valve.



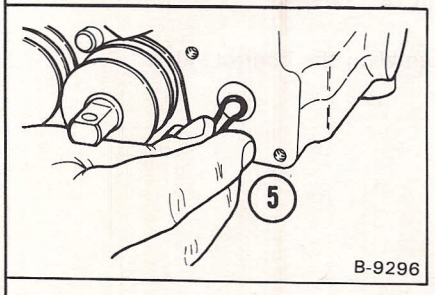
QUAD-RING SEAL

CUT AWAY SIDE VIEW OF VALVE BODY

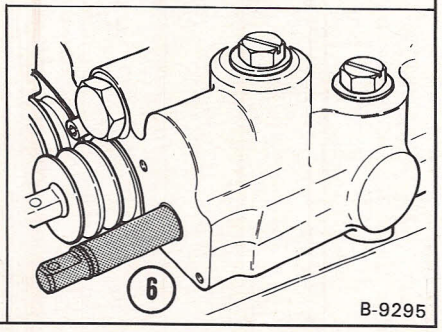




INSTALLING FRONT QUAD-RING SEAL



INSTALLING SPOOL



IDENTIFICATION & INSTALLATION OF SPOOL SEAL (Cont'd)

SHORT CHAMFER

1. Uses only quad-ring seal.

2. Check the seal surface area for rust, corrosion, scratches, etc. Correct any irregularities before continuing. De-burr the sharp edge at the seal area (both ends).

3. At the linkage end of the spool, de-burr the groove for the rubber boot as needed.

NOTE: Lubricate with grease between the seal and retainer before installation (both ends).

4. Put clean oil on the valve spool. Install the quad-ring seal over the valve spool. Be Careful not to damage the quad-ring seal on the valve spool edges.

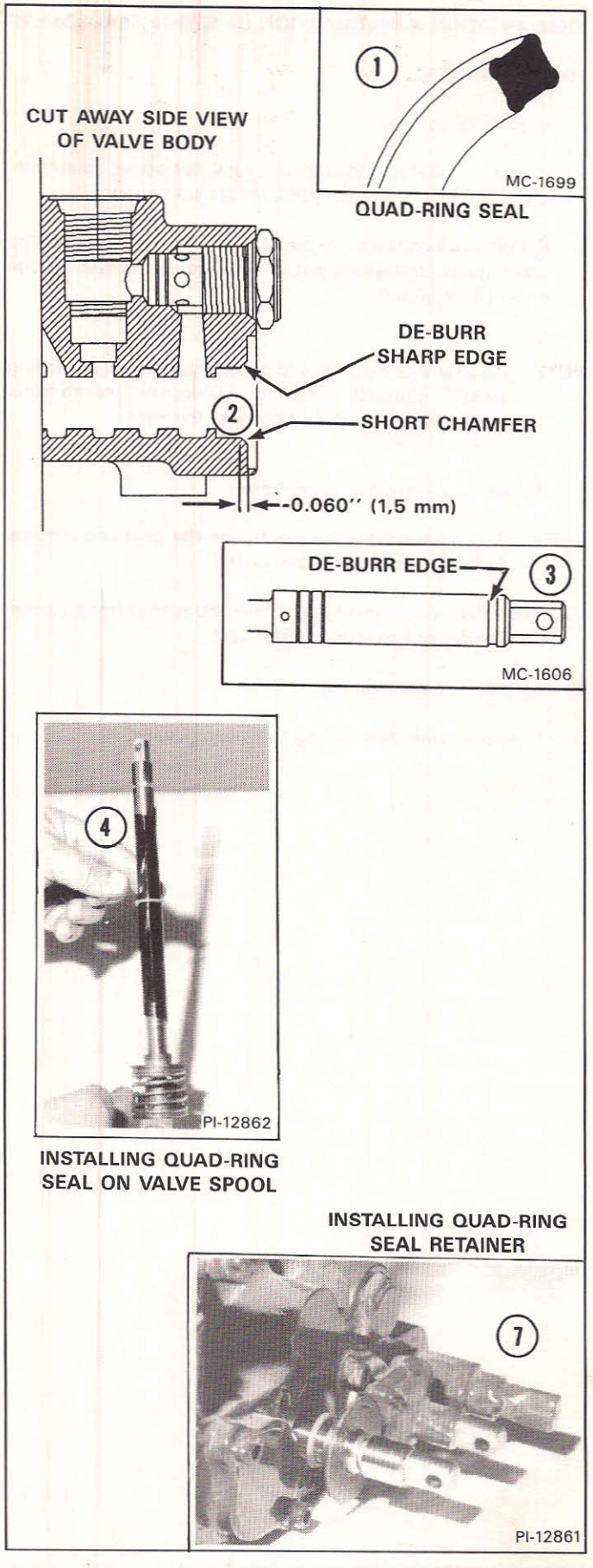
NOTE: An alternate method to protect the quad-ring seal by putting plastic material (Example: Discarded micro-fiche card) over the spool to protect the seal.

5. Install spool into the valve bore.

6. Slide the linkage end quad-ring seal over the rubber boot groove. Be Careful not to damage the seal.

7. Install the quad-ring seal retainer.

8. Continue with assembling the control valve.



IDENTIFICATION & INSTALLATION OF SPOOL SEAL (Cont'd)

LONG CHAMFER

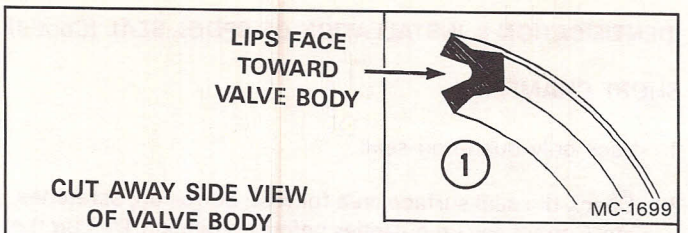
1. Uses only lip seal.
2. Check the seal surface area for rust, corrosion, scratches, etc. Correct any irregularities before continuing.
3. Put clean oil on the valve spool. Install the lip seal over the valve spool, Be Careful not to damage the lip seal on the valve spool edges.

NOTE: An alternate method is to protect the lip seal by putting plastic material (Example: Discarded micro-fiche card) over the spool to protect the seal.

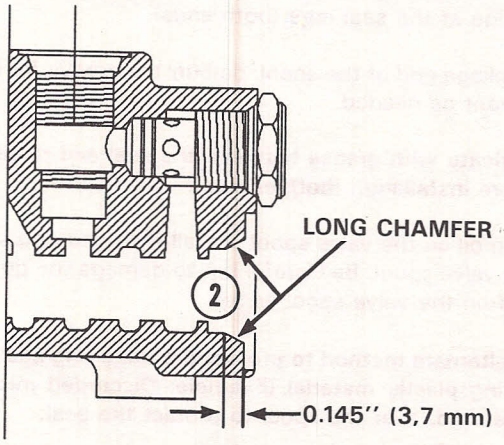
4. Install spool into the valve bore.

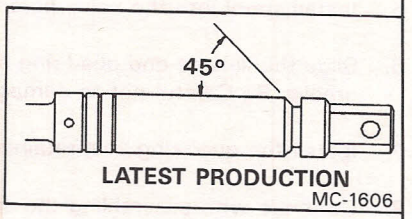
NOTE: Lubricate with grease between the seal and retainer before installation (both ends).

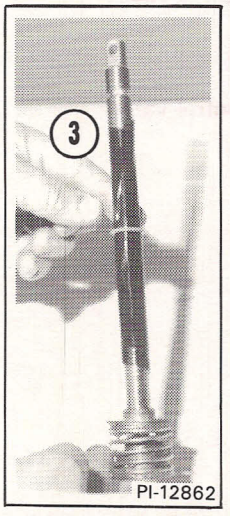
5. Slide the linkage end lip seal over the rubber boot groove. Be Careful not to damage the seal.
6. Install the seal retainer.
7. Continue with assembling the control valve.



CUT AWAY SIDE VIEW OF VALVE BODY



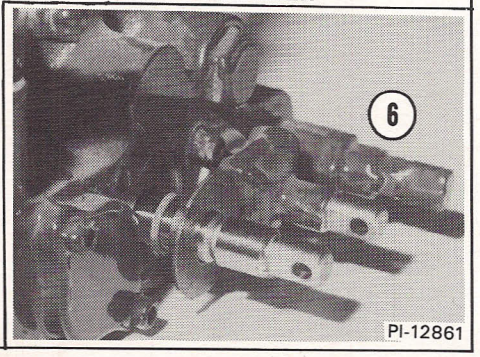




INSTALLING LIP SEAL ON VALVE SPOOL

3

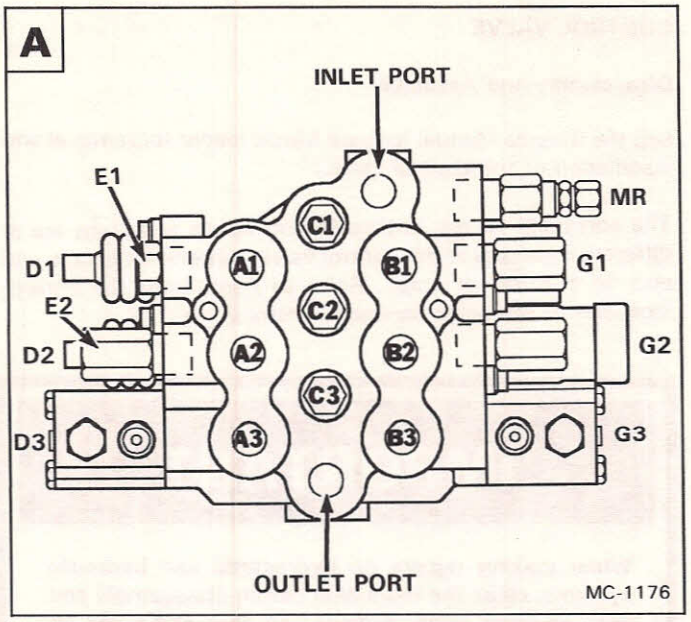
INSTALLING LIP SEAL RETAINER



CONTROL VALVE INDEX 2400

bobcat

2400	
ITEM	**FUNCTION**
A1	Tilt Cylinder Rod End
A2	Lift Cylinder Rod End
A3	Auxiliary Hydraulics
B1	Tilt Cylinder Base End
B2	Lift Cylinder Base End
B3	Auxiliary Hydraulics
C1	Load Check Valve - Tilt
C2	Load Check Valve - Lift
C3	Load Check Valve - Auxiliary
D1	Tilt Spool
D2	Lift Spool
D3	Auxiliary Spool - Solenoid
E1	Port Relief - Tilt
E2	Port Relief - Lift
F1	Anti-Cavitation - Port Relief
F2	Port Relief
G1	Centering Spring - Tilt Spool
G2	Centering Spring - Lift Spool
G3	Centering Spring - Solenoid
MR	Main Relief Valve



CONTROL VALVE

Disassembly and Assembly

See the Service Manual for your Model loader for removal and installation of the control valve.

The port relief valves, anti-cavitation valves and plugs are at different locations in the control valve. Lift and tilt spools can also be in different bores. Refer to Page 1 for the correct locations of the parts for each control valve.

IMPORTANT

When making repairs on hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tube lines and ports to keep dirt out. Dirt can quickly damage the system.

I-2003-0284

Mark each valve, plug and spool location so that the parts will be returned to its original bore during assembly. Use a vise or bolts to fasten the control valve to a work bench for easier disassembly and assembly.

Remove the load check valves (Item 1) from the top of the valve (''C'' Ports) [A].

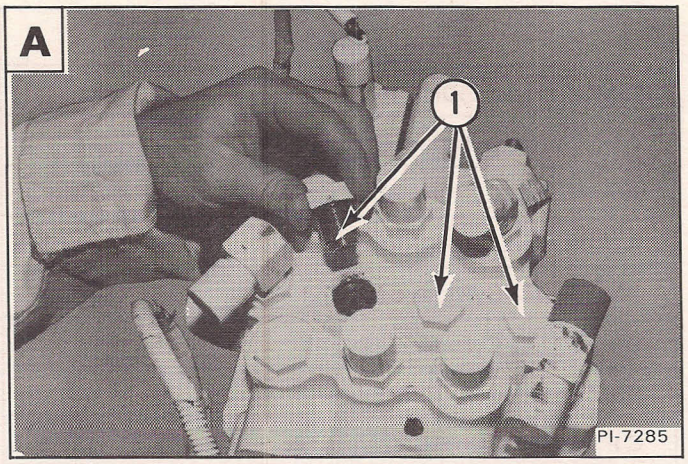
Remove the following parts from the detent and spool linkage sides of the control valve (''F'' & ''E'' Ports):

1. Port Relief Valve [B].
2. Anti-Cavitation Valve [C].
3. Main Relief Valve [D].

Remove the O-rings and back-up washers.

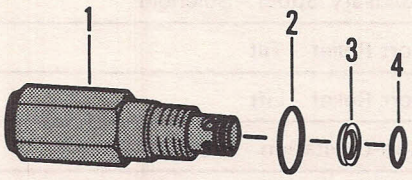
Assembly: Always use NEW O-rings and back-up washers. Tighten to 35-40 ft.-lbs. (47-54 Nm) torque.

A



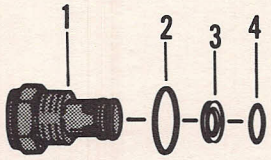
B

1. Relief Valve
2. O-Ring
3. Back-Up Washer
4. O-Ring

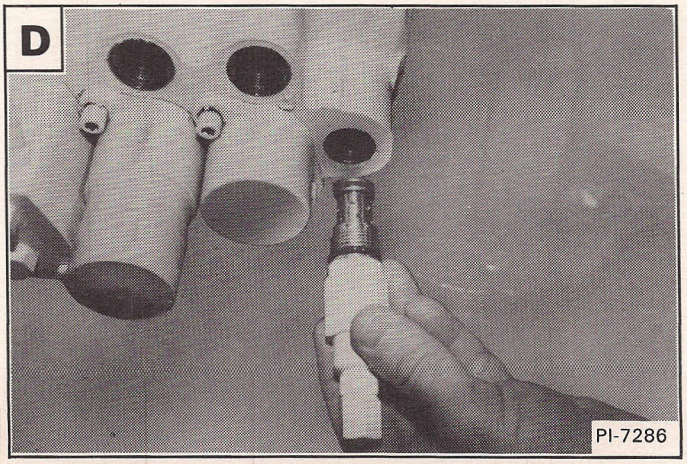


C

1. Anti-Cavitation Valve
2. O-Ring
3. Back-Up Washer
4. O-Ring



D

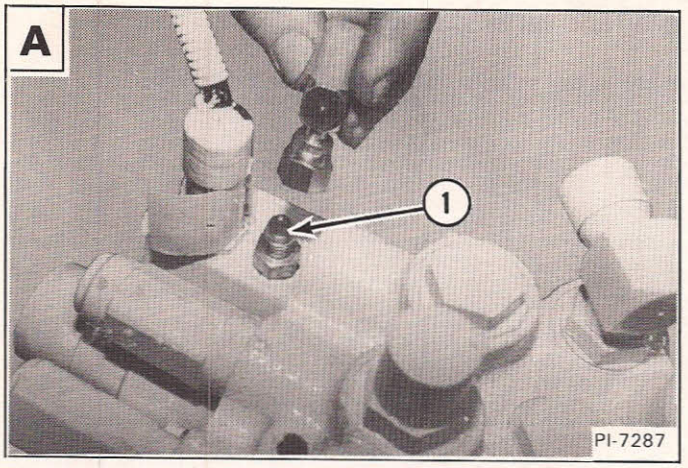


CONTROL VALVE (Cont'd)

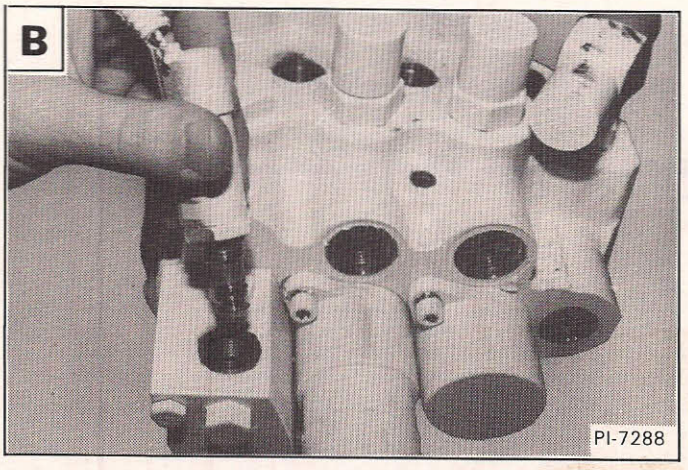
Auxiliary Section

Remove the jumper line from the solenoid block fitting [A].

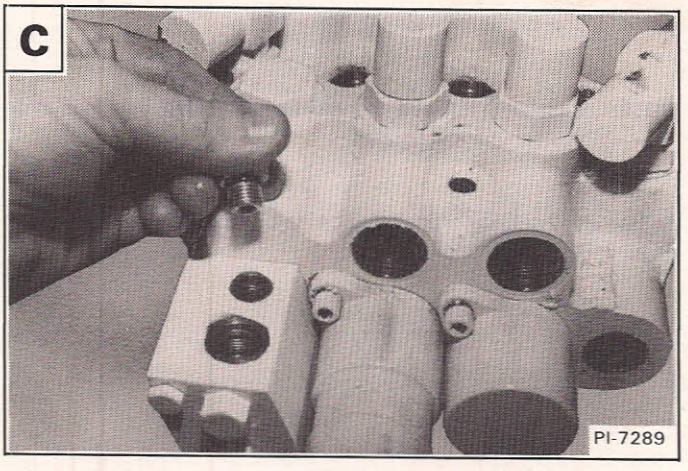
NOTE: Be sure the restrictor (Item 1) is located at the fitting (both solenoid blocks) [A].



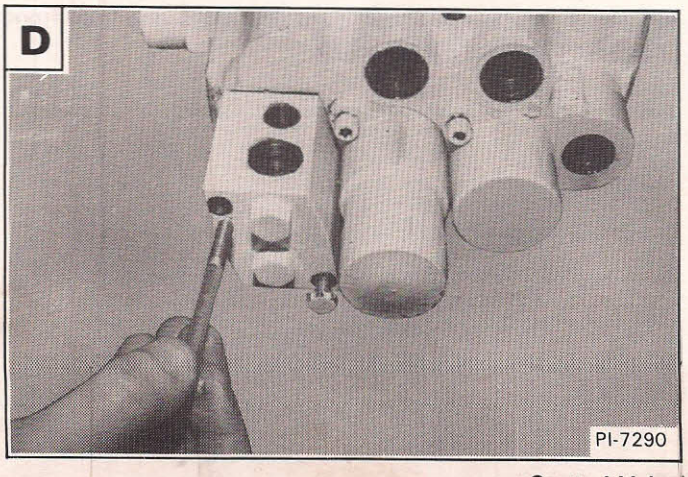
Remove the solenoid from the block [B].



Remove the restrictor fitting from the block [C].

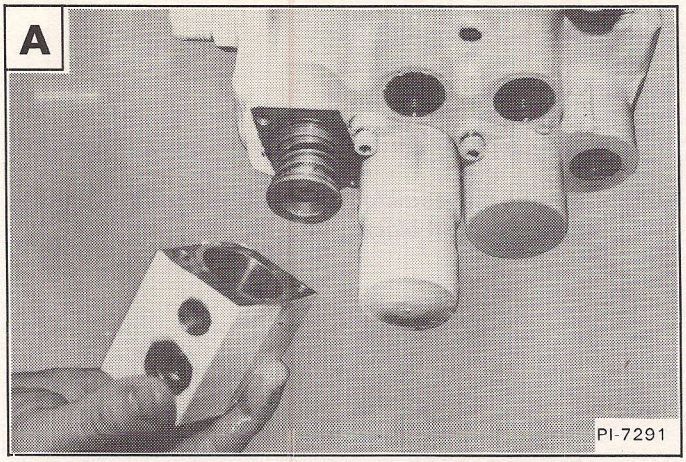


Remove the solenoid block bolts (front and rear) [D].



CONTROL VALVE (Cont'd)

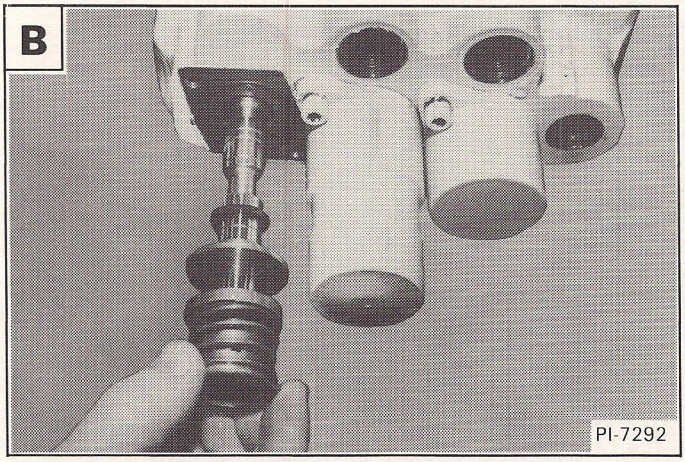
Remove the solenoid blocks (front and rear) [A].



Remove the spool [B].

Install NEW quad rings at assembly.

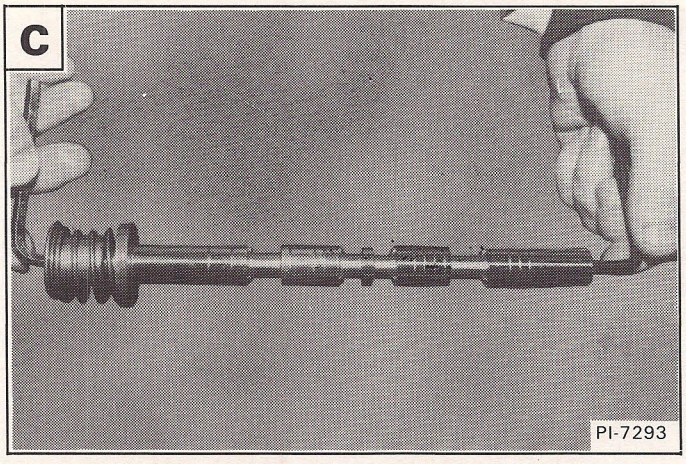
NOTE: See Pages 9 & 10 for seal and valve identification.



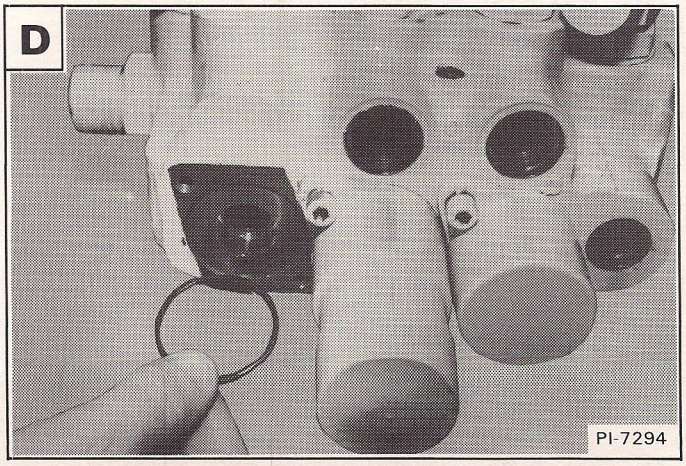
Remove the centering spring bolts [C].

NOTE: Carefully remove the centering spring bolt which is under spring tension.

Assembly: For correct installation of the centering spring (See Page 8 for the procedure).



Remove the back-up washer, quad ring and o-ring from front and rear of the control valve [D].



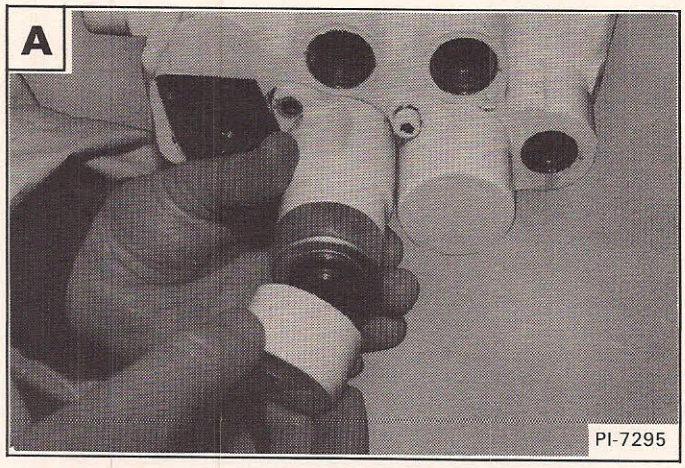
Lift Section Detent Disassembly and Assembly

The tool listed will be needed to do the following procedure:

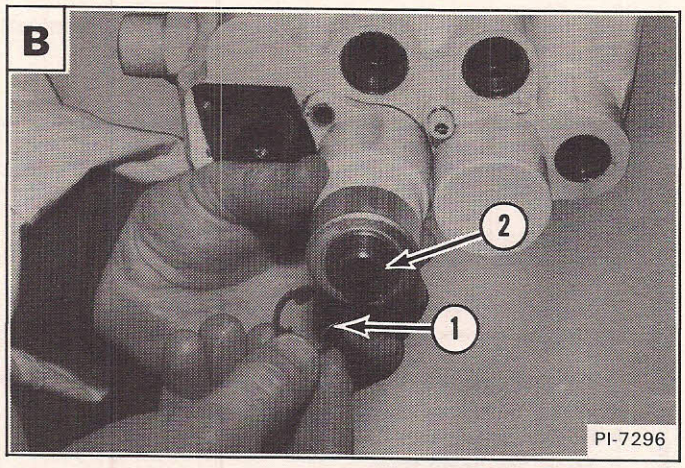
MEL-1278 — Detent Tool

Use the following procedure to remove and disassemble the detent assembly.

Remove the detent dust cap [A].

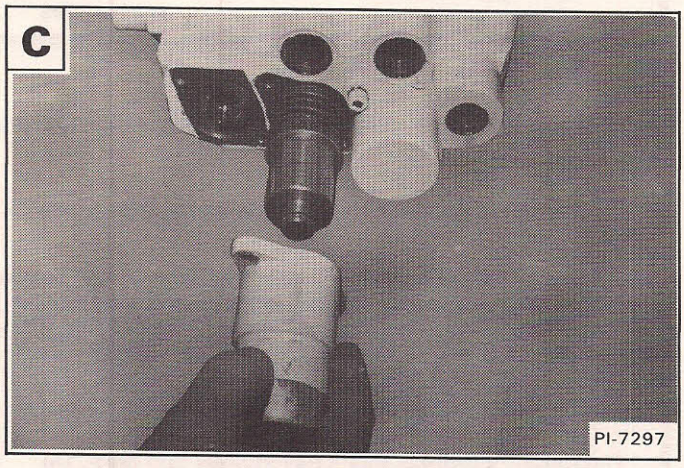


Remove the snap ring (Item 1) and washer (Item 2) [B].



Remove the screws for the detent cap.

Remove the cap [C].



IMPORTANT

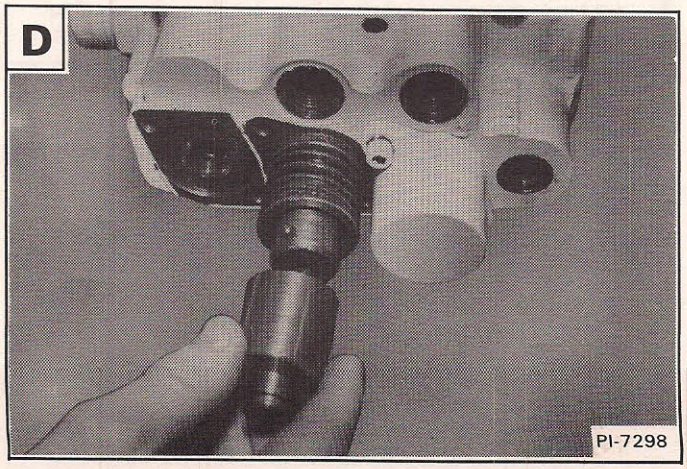
The detent assembly has small springs and balls. Do not loose these parts during disassembly and assembly.

I-2012-0284

Remove the detent sleeve, detent balls and spring [D].

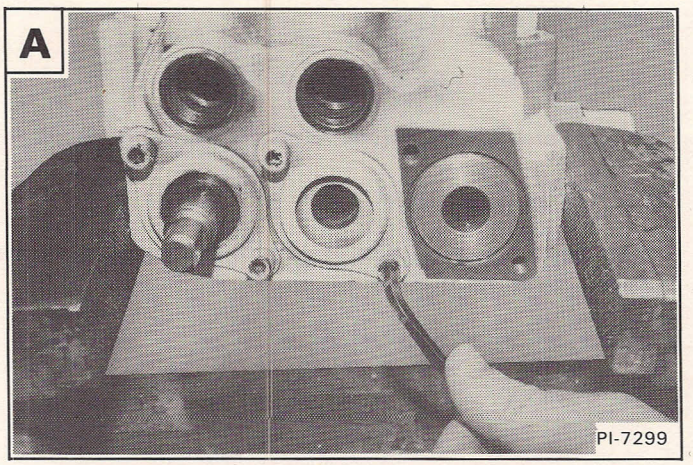
Remove the spool from the bore.

Install NEW quad rings at assembly.

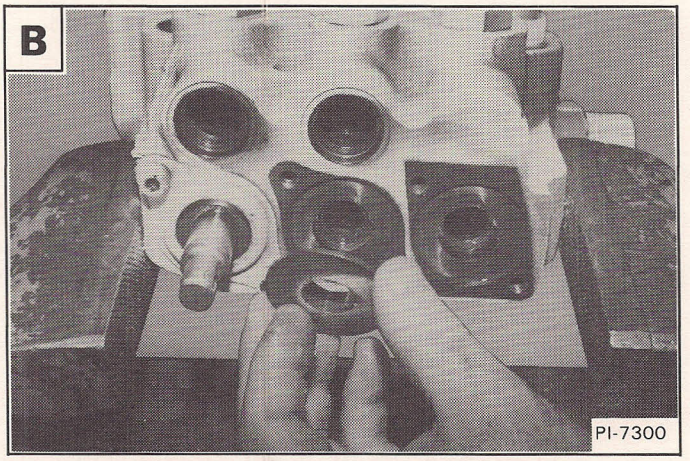


CONTROL VALVE (Cont'd)

Remove the retainer screws and retainer [A].



Remove the back-up washer and quad rings from the front and rear of the control valve [B].



⚠ WARNING

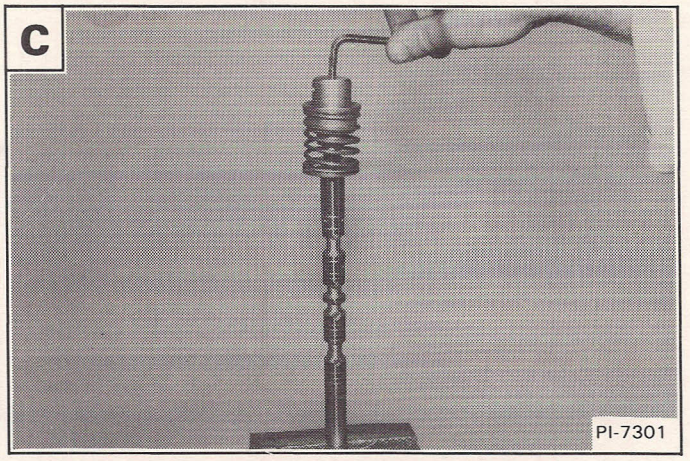
Wear safety glasses to prevent eye injury when any of the following conditions exist:

- **When fluids are under pressure.**
- **Flying debris or loose material is present.**
- **Engine is running.**
- **Tools are being used.**

W-2019-1285

Clamp the spool yoke in a vise and remove the centering spring bolt [C].

NOTE: Remove the bolt carefully, it is under spring tension.



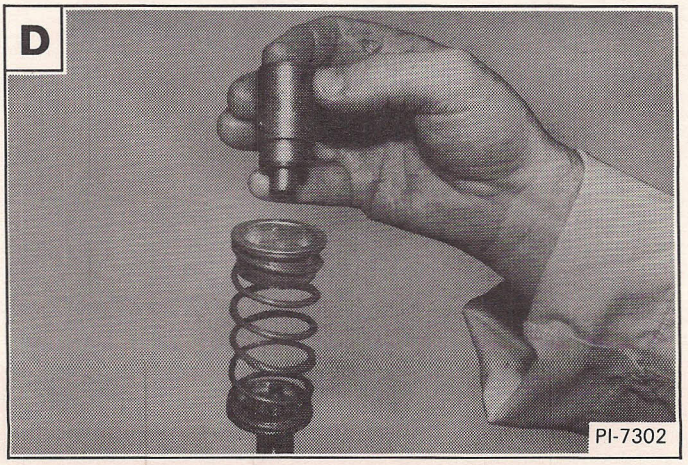
IMPORTANT

The detent assembly has small springs and balls. Do not loose these parts during disassembly and assembly.

I-2012-0284

Remove the adaptor, detent balls and spring from the centering spring [D].

Remove the centering spring assembly from the spool.

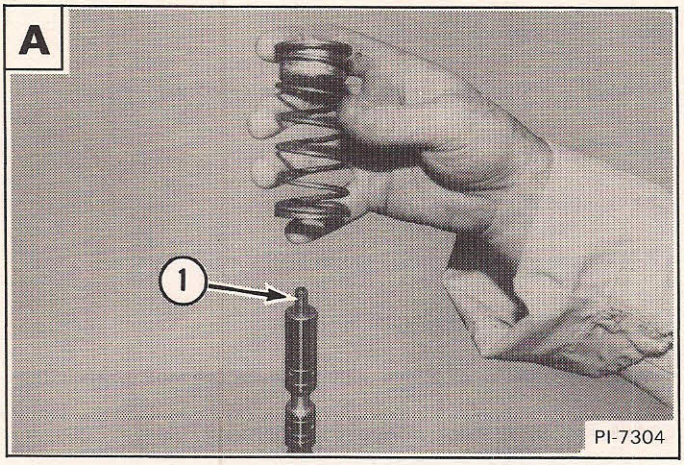


CONTROL VALVE (Cont'd)

Remove the centering spring assembly [A].

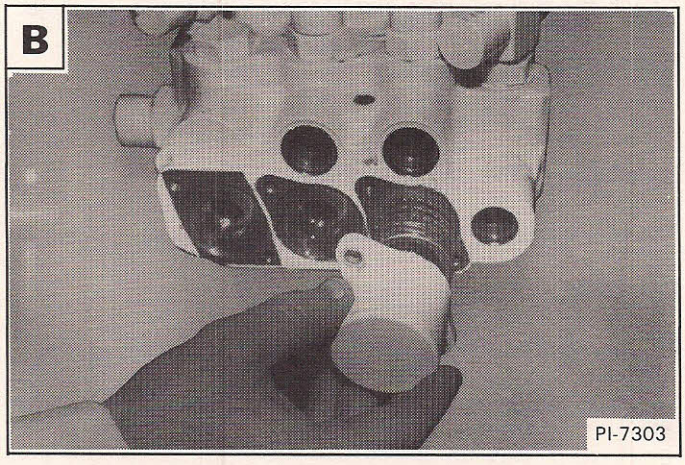
Remove the valve spool stud (Item 1) [A].

See Page 8 for the valve spool stud setting.



Tilt Section

Remove the cap from the centering spring [B].



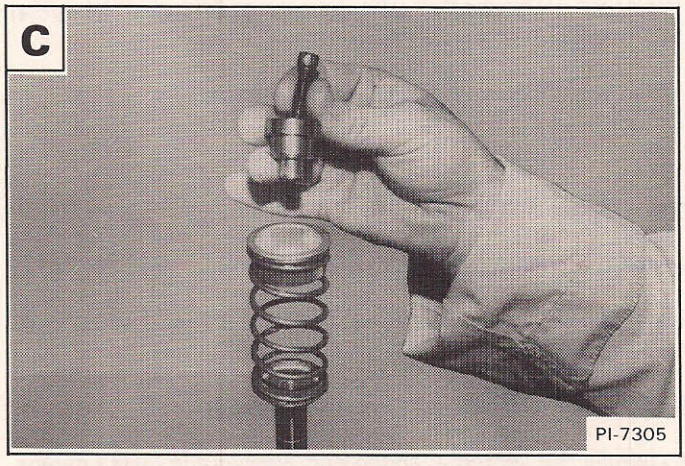
IMPORTANT

The detent assembly has small springs and balls. Do not loose these parts during disassembly and assembly.

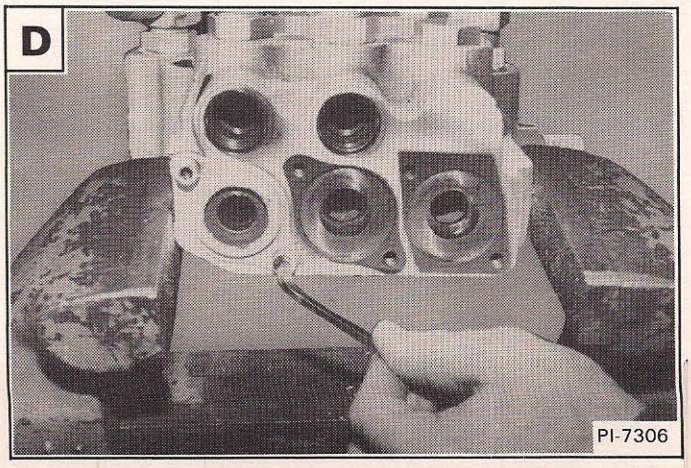
I-2012-0284

Clamp the spoose yoke in a vise and loosen the centering spring bolt.

Remove the bolt, spring retainer and spring assembly [C].



Remove the screws and the retaining plate [D].



CONTROL VALVE (Cont'd)

Remove the back-up washer and the quad ring [A].

Inspection

Check spools for scratches or wear.

Check that spools are not loose in their bores.

Check for broken centering springs.

Check that the load check valves seats are not worn.

Check the load check poppets for damage.

Check the seal retainers and back-up washers for damage.

Replace the parts as needed.

Installation of the Centering Spring

The tool listed will be needed to do the following procedure:

MEL-1285 — Valve Spring Holding Tool

Put the washer and collar into the ends of the spring.

Compress the spring assembly and install it into the holding tool [B].

With the tool in position over the spring, assemble the spring to the spool using an allen wrench.

When assembly is complete, remove the tool.

Valve Spool Stud

Install the plastic plug (lift spool only).

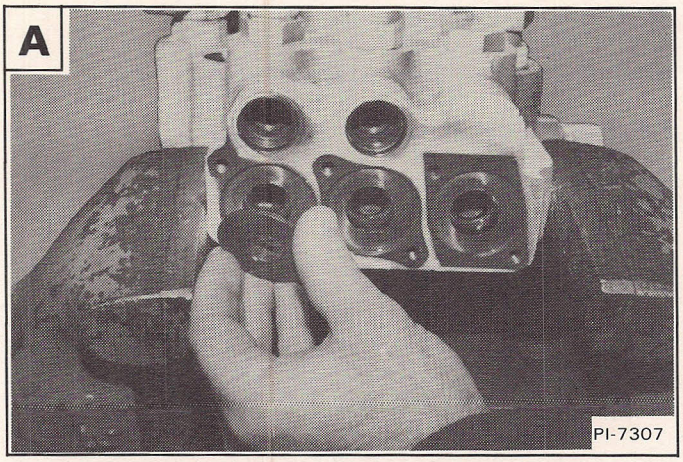
Install the stud and leave about 0.60'' (15.2 mm) of the stud sticking out [C].

NOTE: DO NOT use loctite on the threads.

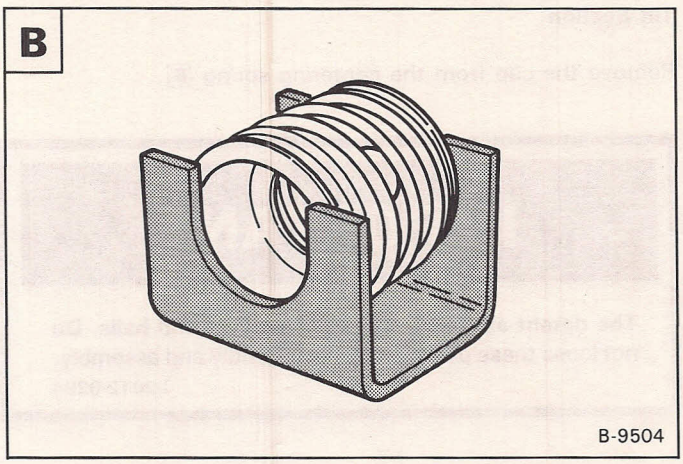
Assemble the centering spring and washer and install detent adapter.

Tighten the adapter to 90-100 in.-lbs. (10-11 Nm) torque [D].

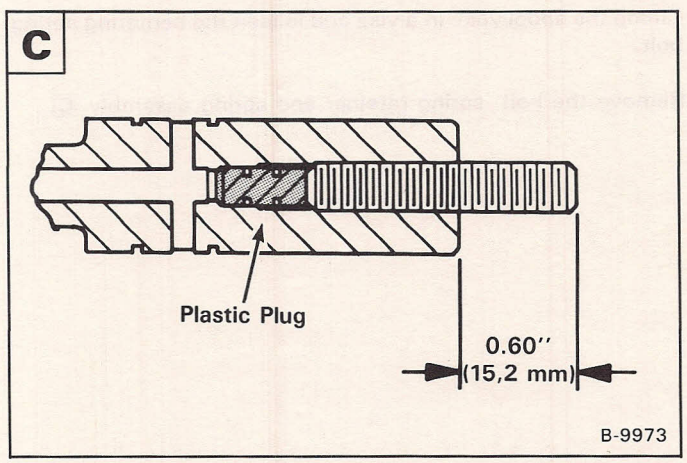
A



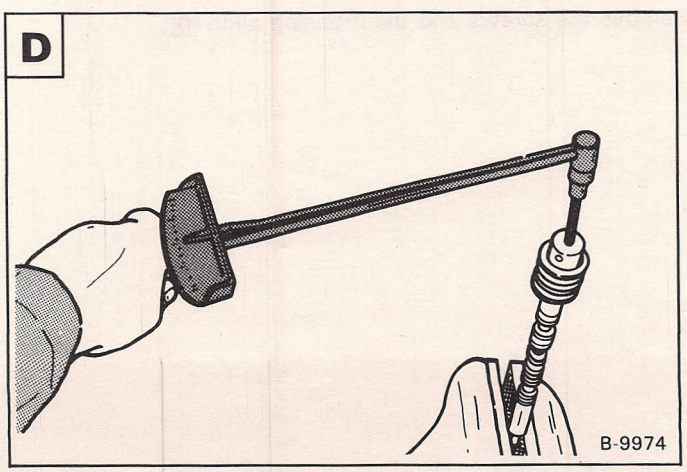
B



C



D



IDENTIFICATION & INSTALLATION OF SPOOL SEAL

There are two types of seals for the control valve, a quad-ring seal and a lip seal. First identify the control valve (See Page 9 or 10) to find which seal is used. See the Parts Micro-Fiche for your model loader for the part number of the quad-ring seal or the lip seal used. Use the following procedure to install the seals into the control valve.

SHORT CHAMFER

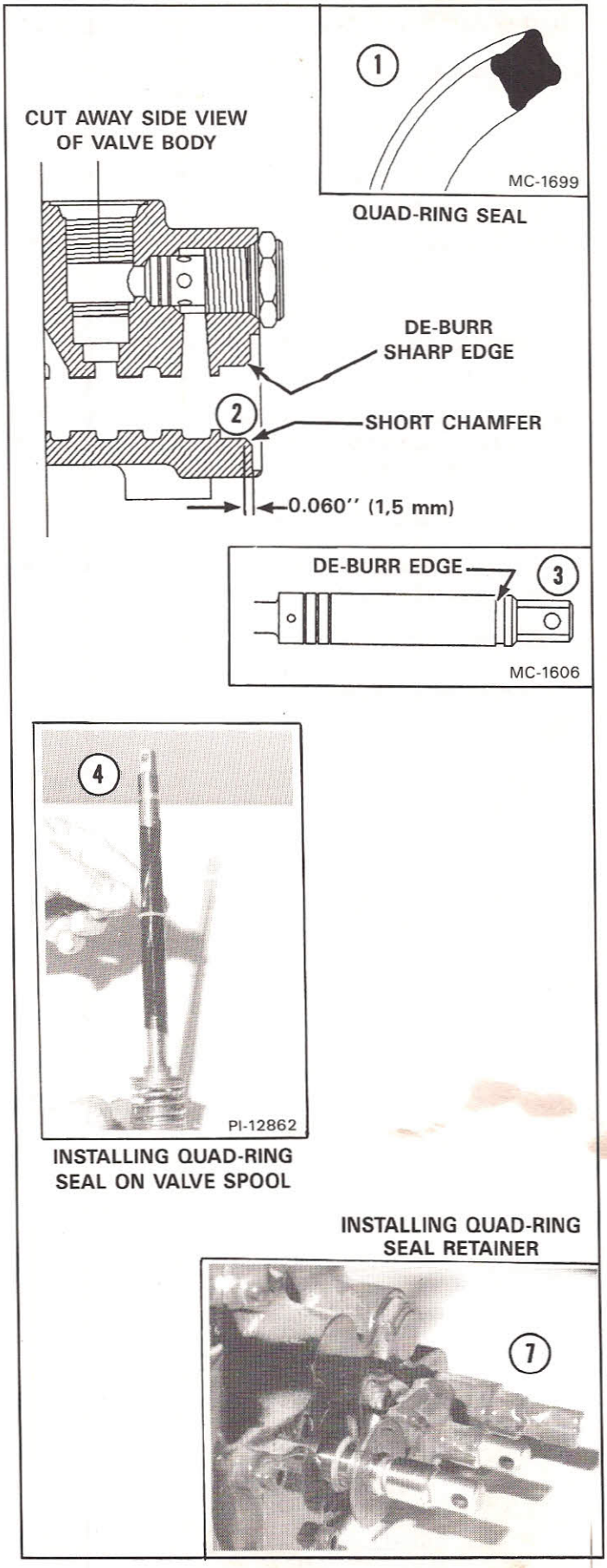
1. Uses only quad-ring seal.
2. Check the seal surface area for rust, corrosion, scratches, etc. Correct any irregularities before continuing. De-burr the sharp edge at the seal area with a file or de-burring tool (both ends).
3. At the linkage end of the spool, de-burr the rubber boot groove as needed.

NOTE: Lubricate with grease between the seal and retainer before installation (both ends).

4. Put clean oil on the valve spool. Install the quad-ring seal over the valve spool. Be Careful not to damage the quad-ring seal on the valve spool edges.

NOTE: An alternate method to protect the quad-ring seal by putting plastic material (Example: Discarded micro-fiche card) over the spool to protect the seal.

5. Install spool into the valve bore.
6. Slide the linkage end quad-ring seal over the rubber boot groove. Be Careful not to damage the seal.
7. Install the quad-ring seal retainer.
8. Continue with assembling the control valve.



IDENTIFICATION & INSTALLATION OF SPOOL SEAL (Cont'd)

LONG CHAMFER

1. Uses only lip seal.

2. Check the seal surface area for rust, corrosion, scratches, etc. Correct any irregularities before continuing.

NOTE: Lubricate with grease between the seal and retainer before installation (both ends).

3. Put clean oil on the valve spool. Install the lip seal over the valve spool. Be Careful not to damage the lip seal on the valve spool edges.

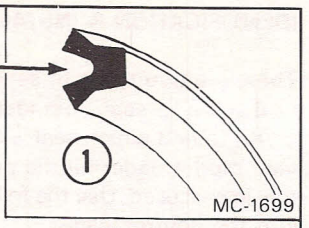
NOTE: An alternate method to protect the lip seal by putting plastic material (Example: Discarded micro-fiche card) over the spool to protect the seal.

4. Install spool into the valve bore.

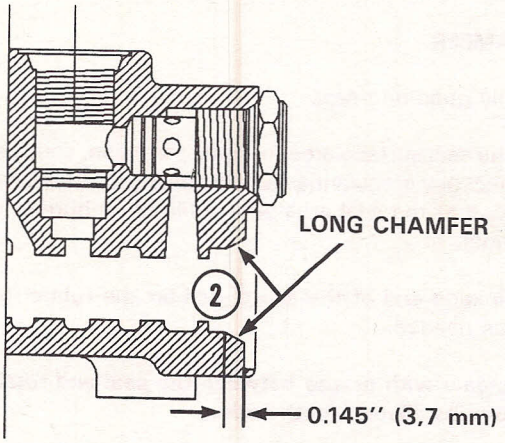
5. Slide the linkage end lip seal over the rubber boot groove. Be Careful not to damage the seal.

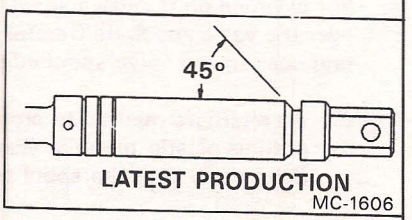
6. Install the seal retainer.

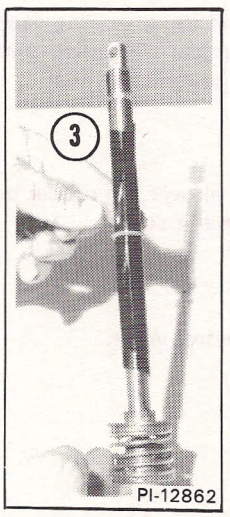
7. Continue with assembling the control valve.



CUT AWAY SIDE VIEW OF VALVE BODY

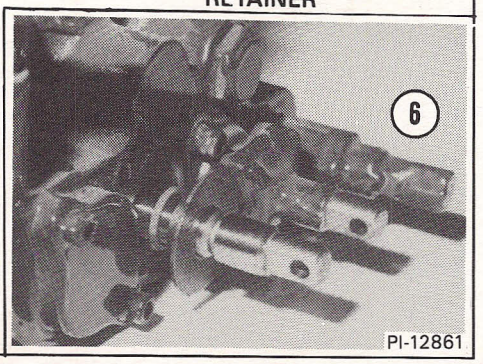






INSTALLING LIP SEAL ON VALVE SPOOL

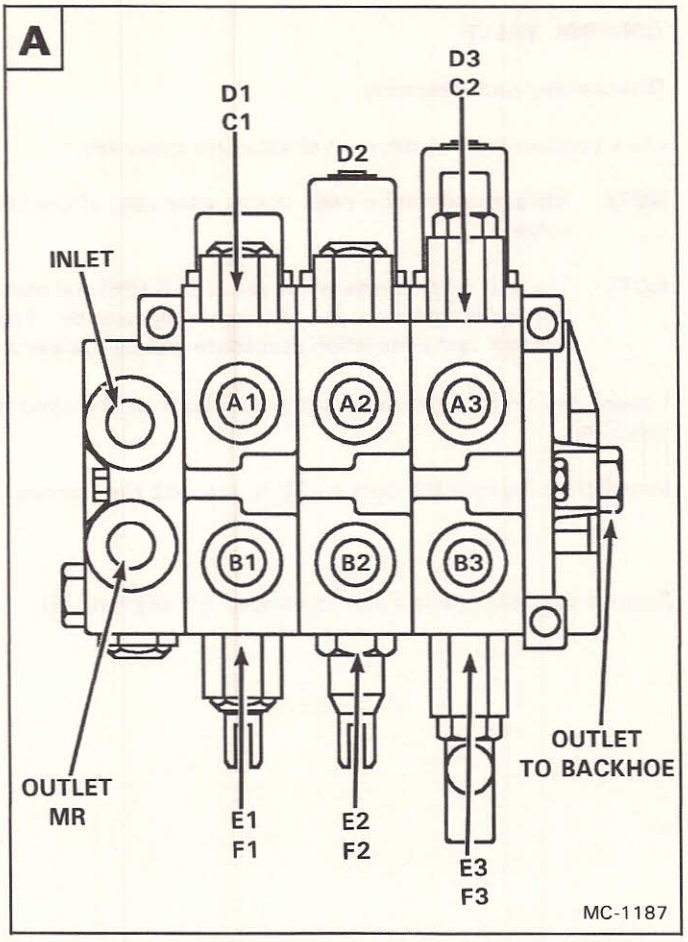
INSTALLING LIP SEAL RETAINER



REAR AUXILIARY CONTROL VALVE INDEX 2400

bobcat

2400 REAR AUXILIARY VALVE	
ITEM	**FUNCTION**
A1	Lock Pin Cylinder (Locked)
A2	Cylinder, Rod End
A3	Auxiliary Attachment
B1	Locking Cylinder
B2	Cylinder, Base End
B3	Auxiliary Attachment
C1	Port Relief (1500 PSI)
C2	Inlet Port
D1	Centering Spring Locking Spool
D2	Centering Spring Lift Spool
D3	Auxiliary Detent
E1	Port Relief (1500 PSI)
E2	Port Relief (1500 PSI)
E3	Inlet Port
F1	Locking Cylinder Spool
F2	Lift Cylinder Spool
F3	Auxiliary Spool
MR	Main Relief (2700 PSI)



CONTROL VALVE

Disassembly and Assembly

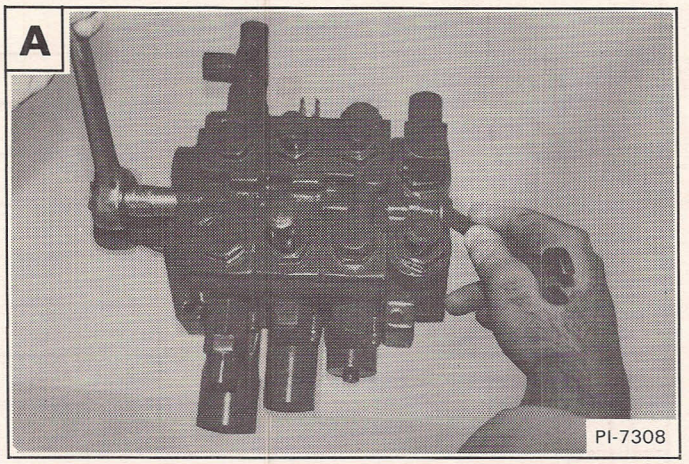
Mark each section of the control valve for assembly.

NOTE: Always use new o-rings during assembly of control valve.

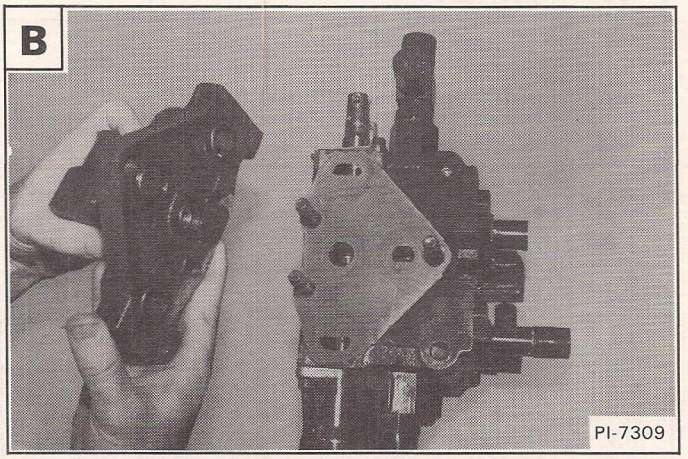
NOTE: The port relief valves are all set at 1500 PSI and have the same function but different appearance. The removal and installation procedure will be the same.

Loosen and remove the nuts on the thru bolts of the control valve [A].

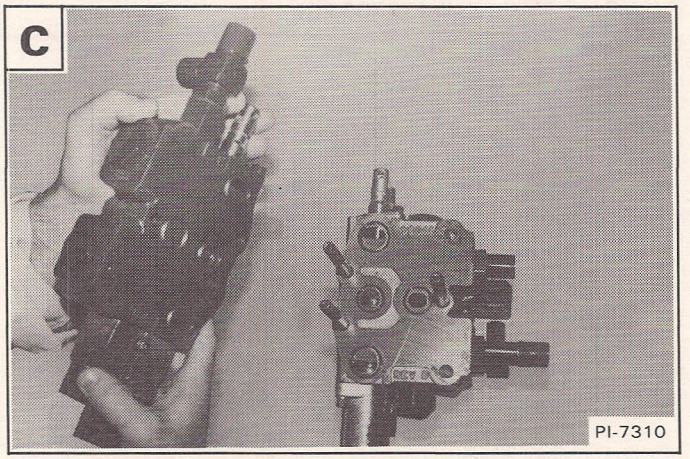
Installation: Tighten the nuts to 32 ft.-lbs. (43 Nm) torque.



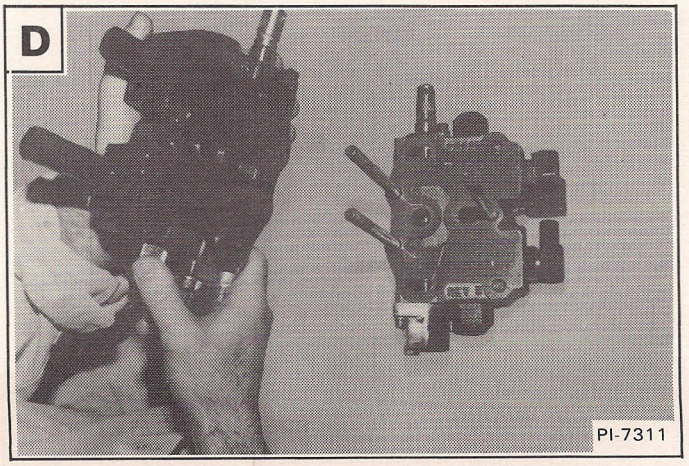
Position the valve on it's end to remove the sections [B].



Remove the auxiliary section [C].

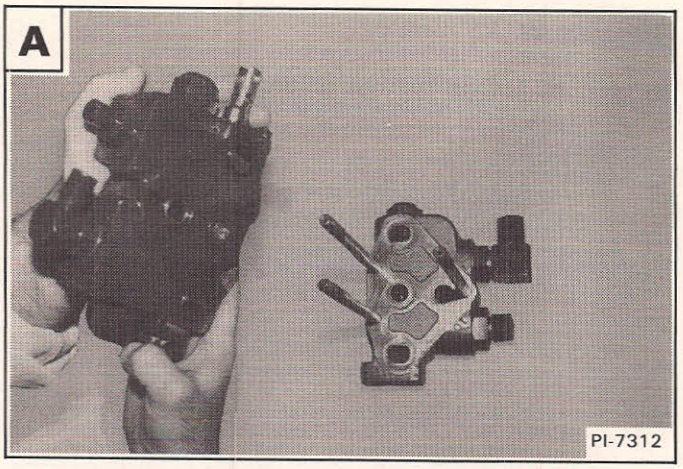


Remove the lift cylinder section [D].



CONTROL VALVE (Cont'd)

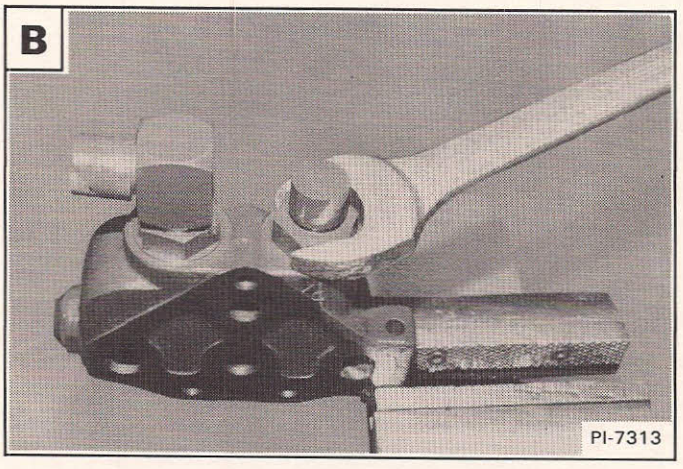
Remove the locking cylinder section [A].



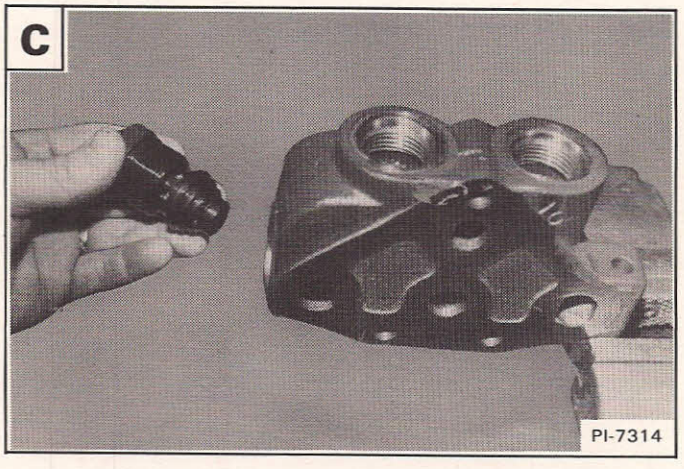
Use a soft jaw vise or wood blocks in the vise to hold the sections for repair.

Inlet Section

Remove the inlet and outlet fittings [B].



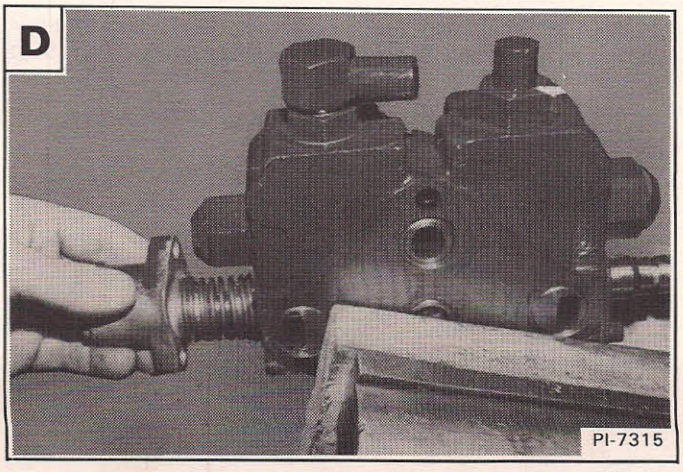
Loosen and remove the main relief valve [C].



Lock Section

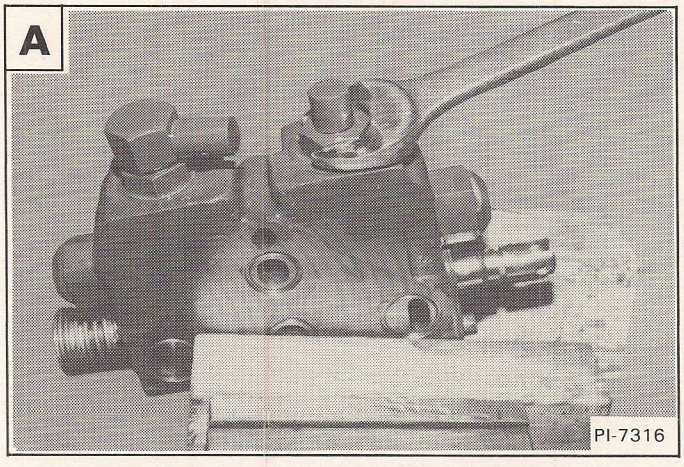
Remove the screws from the centering spring cap.

Remove the cap [D].

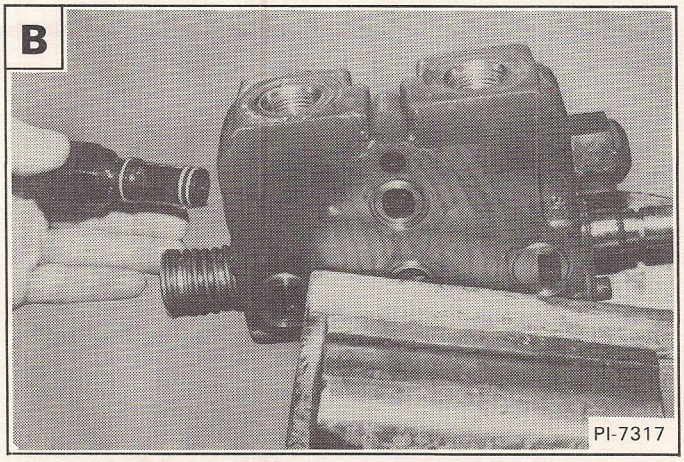


CONTROL VALVE (Cont'd)

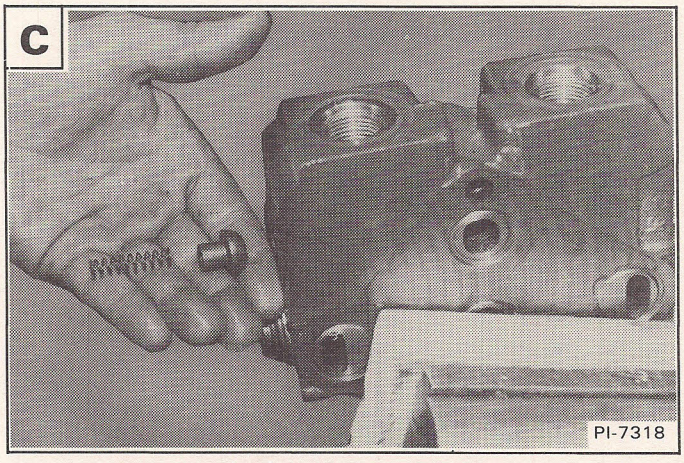
Remove the fittings from the section [A].



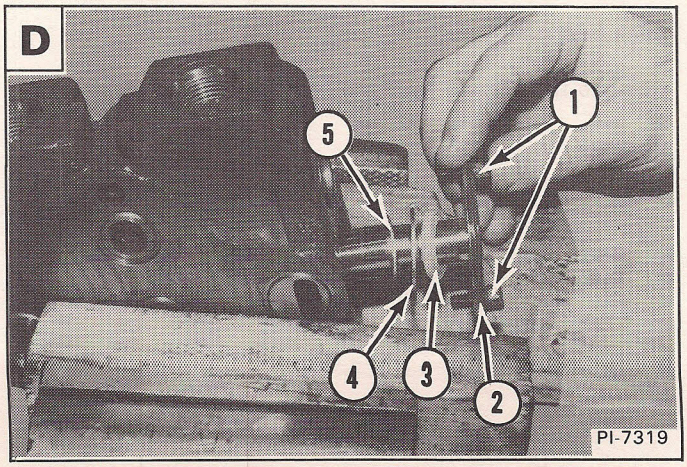
Loosen and remove the port relief valve [B].



Remove the spring and poppet [C].

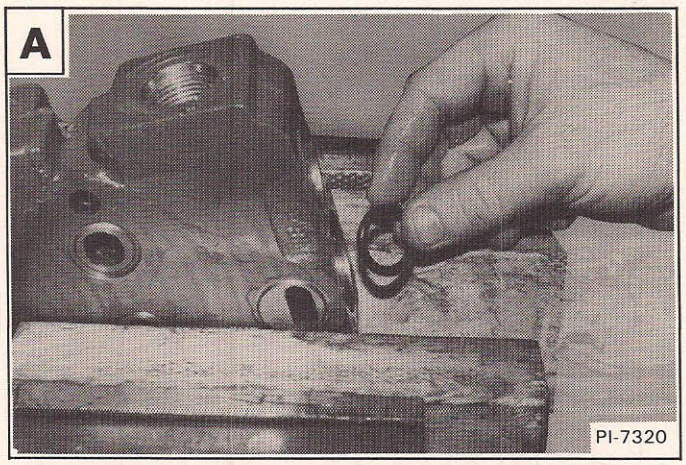


Remove the seal plate screws (Item 1), seal plates (Item 2), seal (Item 2), retainer (Item 4) and back-up washer (Item 5) [D].

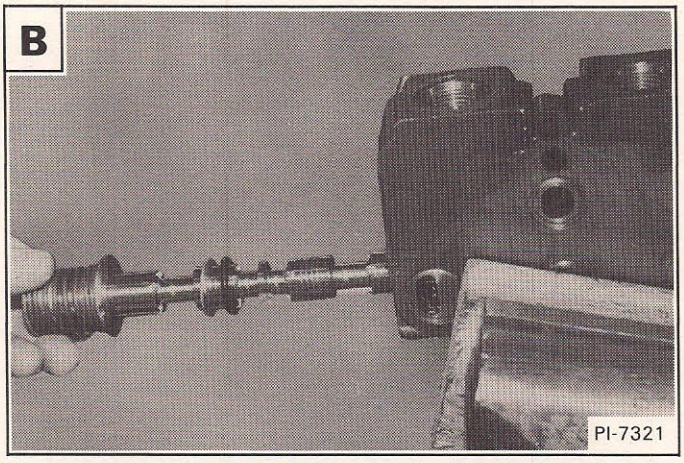


CONTROL VALVE (Cont'd)

Remove the spool o-ring [A].

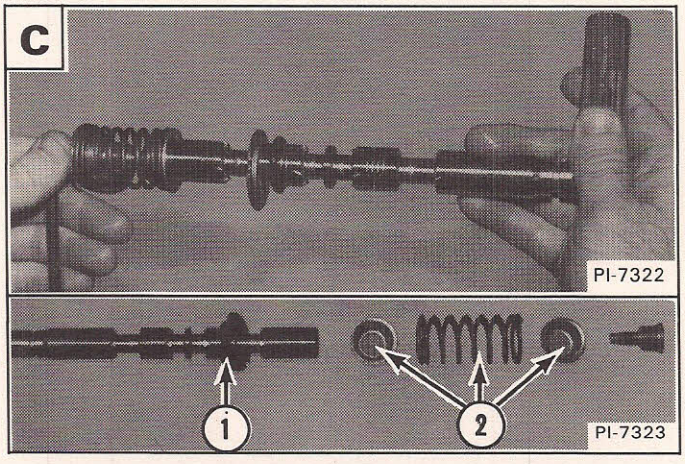


Remove the spool [B].



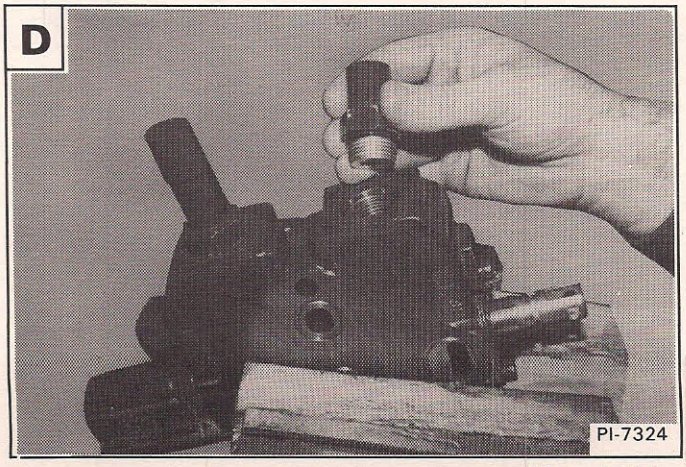
Hold the spool at the yoke end to remove the screw [C].

Remove the spring positioner assembly (Item 1) the back-up washer and O-ring (Item 2) (See Inset) [C].



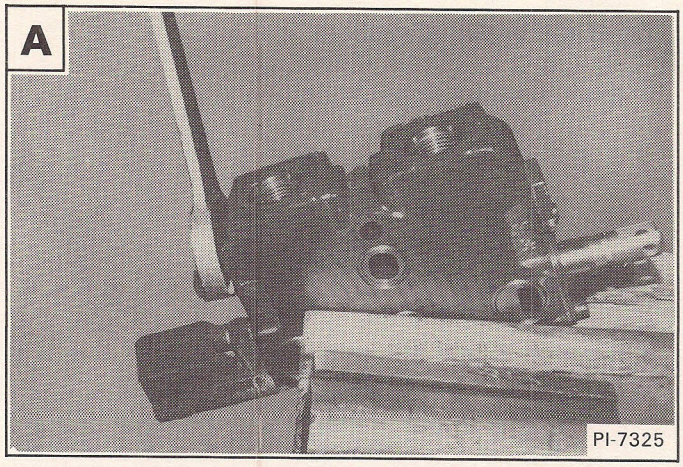
Lift Section

Remove the fittings from the section [D].

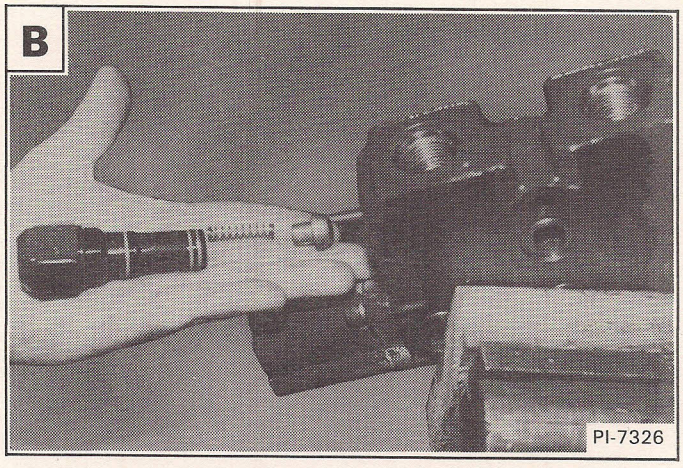


CONTROL VALVE (Cont'd)

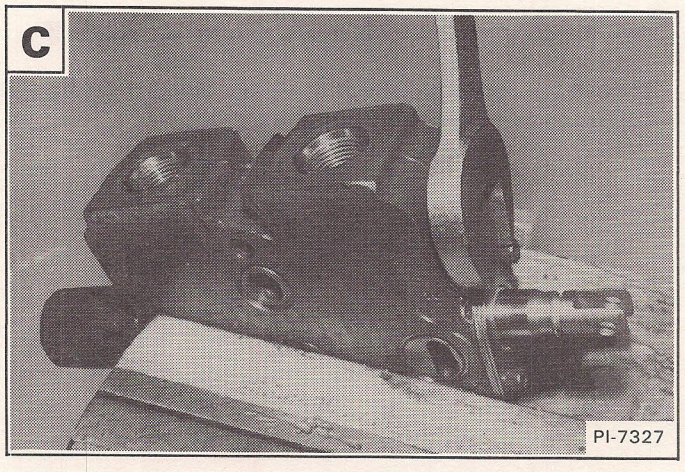
Loosen the port relief valve [A].



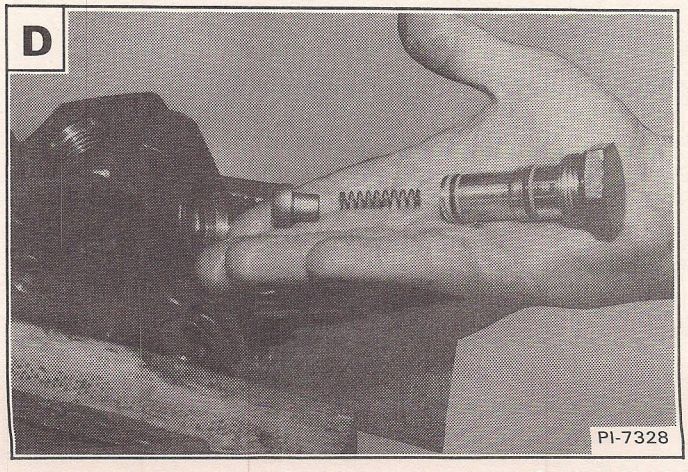
Remove the port relief valve, spring and poppet [B].



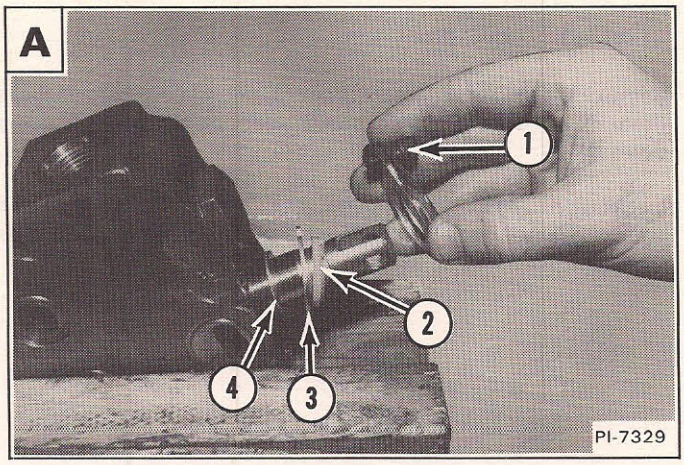
Loosen the anti-cavitation valve [C].



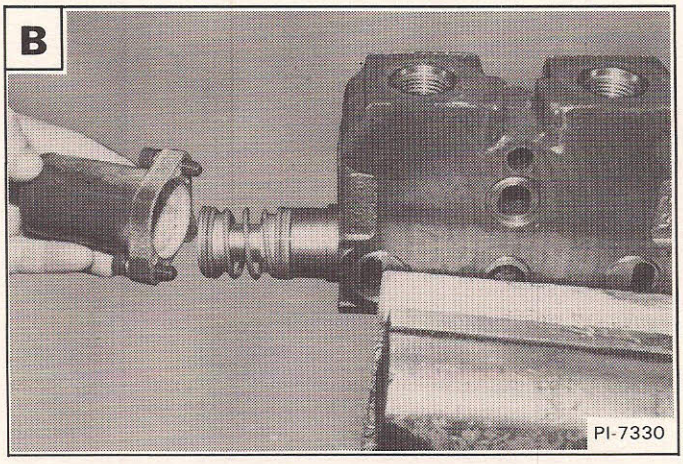
Remove the anti-cavitation valve, spring and poppet [D].



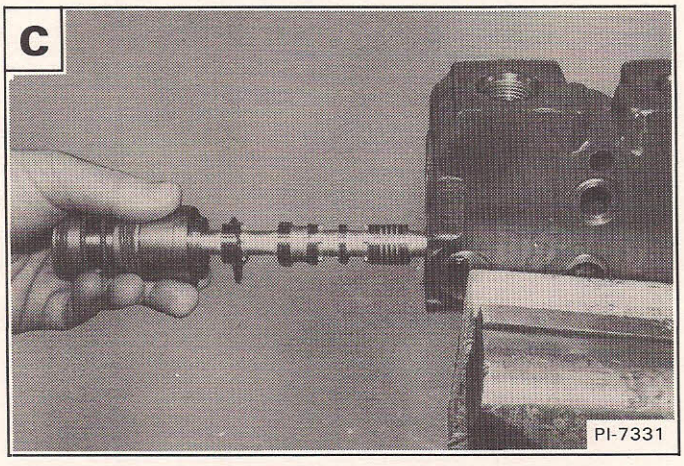
Remove the seal plates (Item 1), seal (Item 2), back-up washer (Item 3) and spacer (Item 4) [A].



Remove the centering spring cap [B].



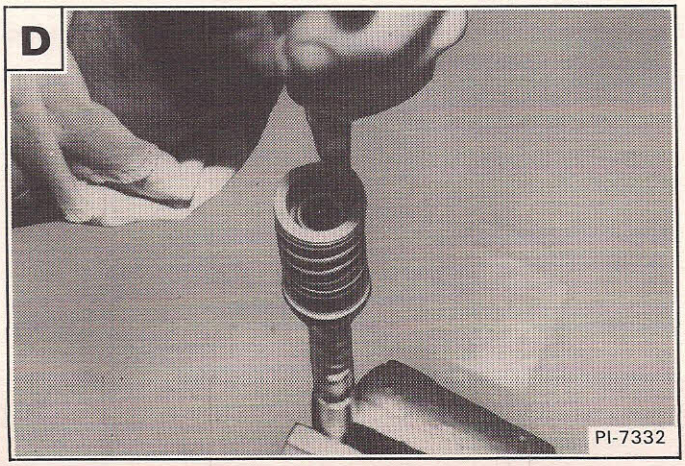
Remove the spool [C].



Put the spool yoke in a vise.

NOTE: The centering spring is under tension, hold spring when removing snap ring.

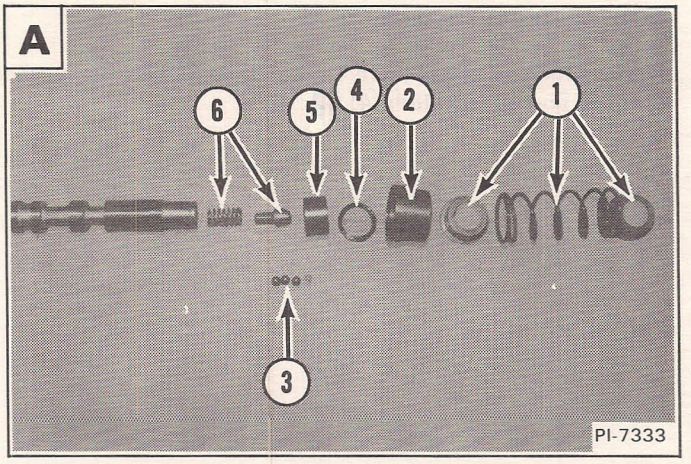
Remove the external snap ring [D].



CONTROL VALVE (Cont'd)

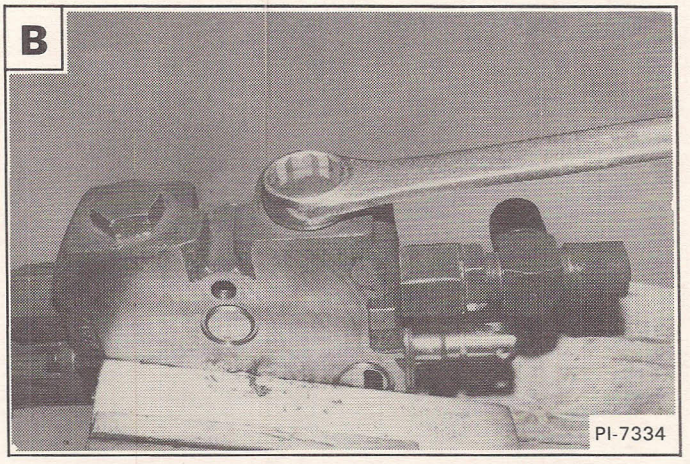
Remove the spring assembly (Item 1), detent cap (Item 2), balls (Item 3), quad ring (Item 4), spacer (Item 5), poppet and spring (Item 6) [A].

Installation: Grease the spring, poppet and balls. Push the poppet against the spring when installing the detent cap over the balls.

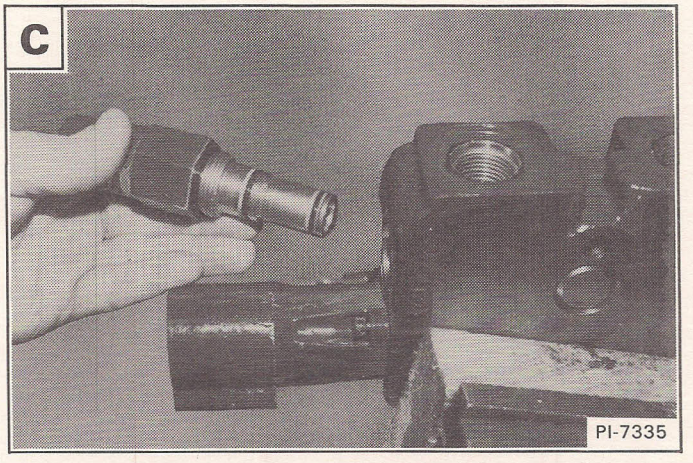


Auxiliary Section

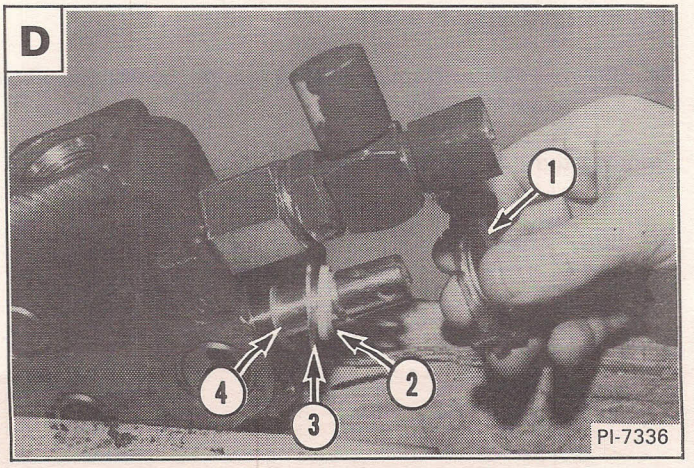
Remove the plugs [B].



Remove the fitting [C].

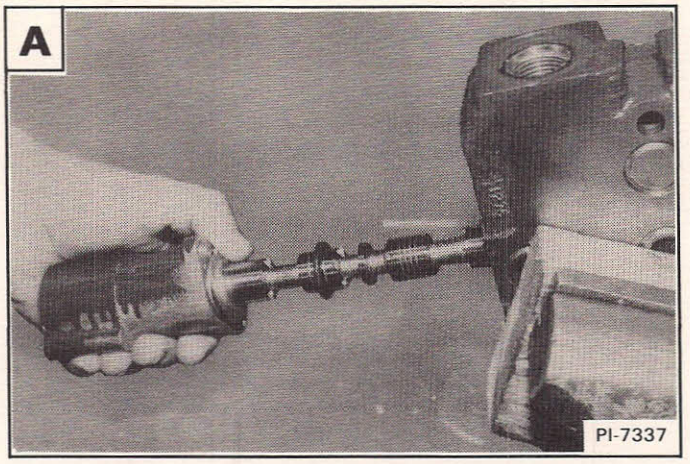


Remove the screws and seal plate (Item 1), seal (Item 2), back-up washer (Item 3) and washer (Item 4) [D].



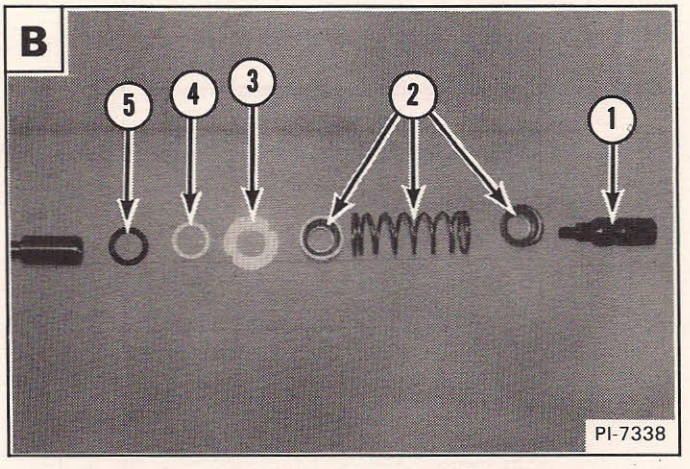
CONTROL VALVE (Cont'd)

Remove the spool, back-up washer and O-ring [A].

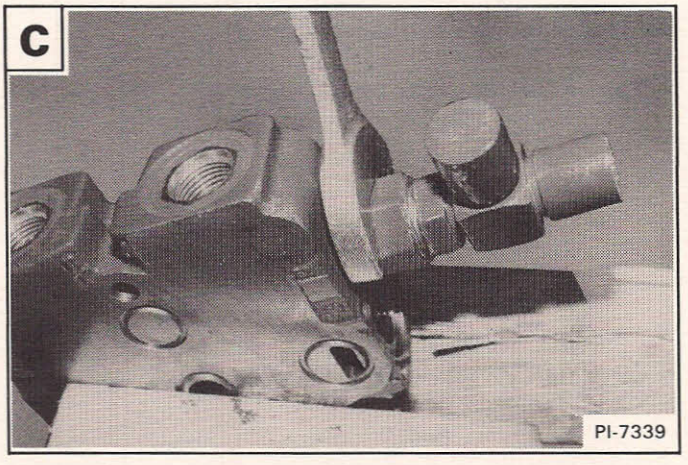


Remove the detent assembly first to remove the centering spring assembly (See Page 10).

Remove the spool bolt (Item 1), spring assembly (Item 2), back-up washer (Item 3), washer (Item 4) and O-ring (Item 5) [B].



Remove the fitting [C].



Auxiliary Detent Adjustment

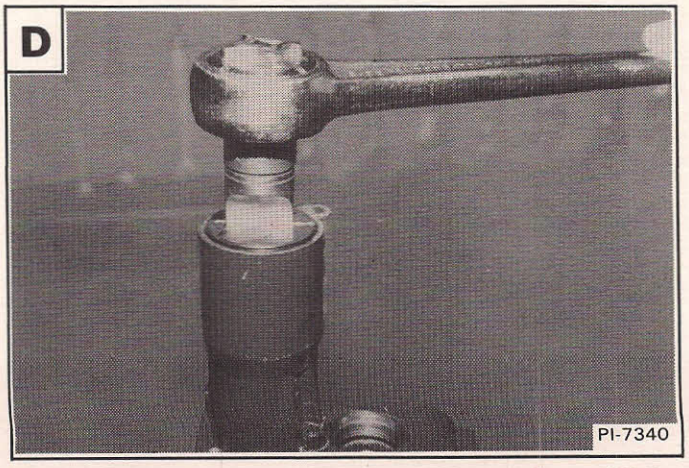
The auxiliary detent spring tension can be adjusted on the control valve.

Turn the cap clockwise to increase tension and counter clockwise to decrease tension [D].

Disassemble the detent as follows:

The cap is under spring tension, hold cap with one hand as cap is removed.

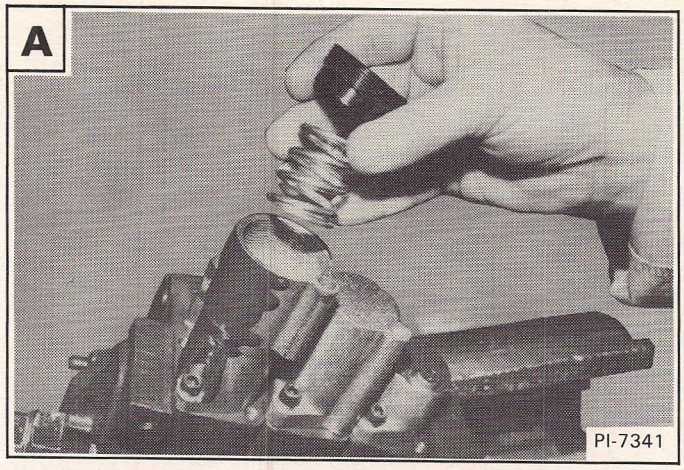
Use a straight slotted tool to loosen the detent cap [D].



CONTROL VALVE (Cont'd)

Remove the cap and spring [A].

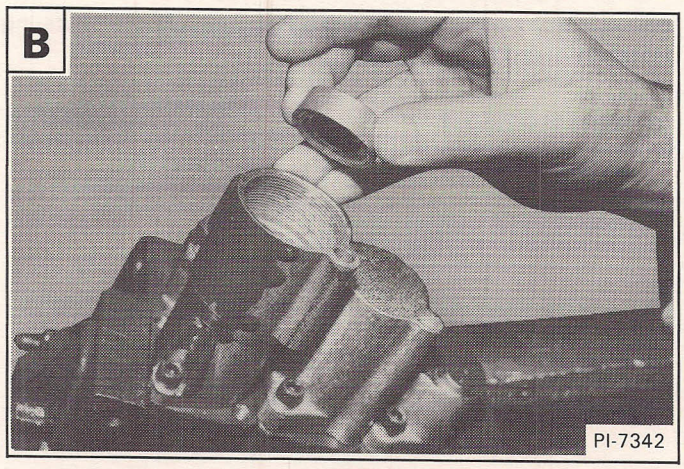
NOTE: Grease spring before assembly.



Remove the detent ball positioner [B].

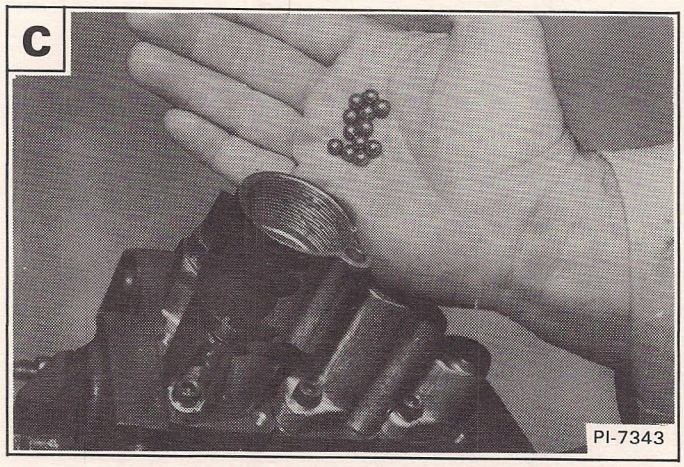
NOTE: Grease the positioner before assembly.

NOTE: Be sure the positioner is installed with concave side down.

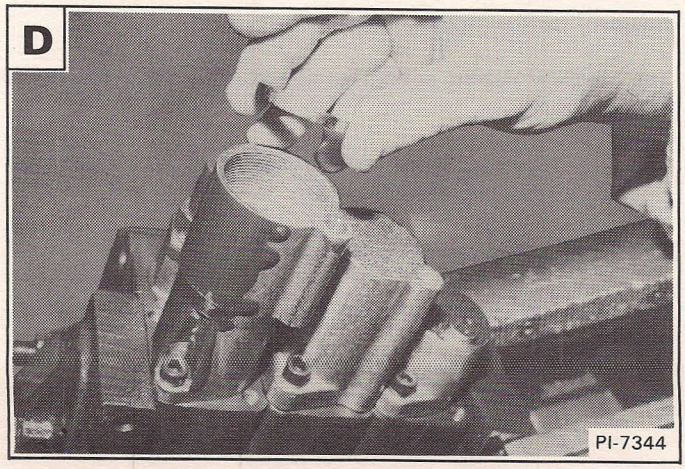


Remove the twelve (12) detent balls [C].

NOTE: Grease the balls before assembly.



Remove the detent washer [D].



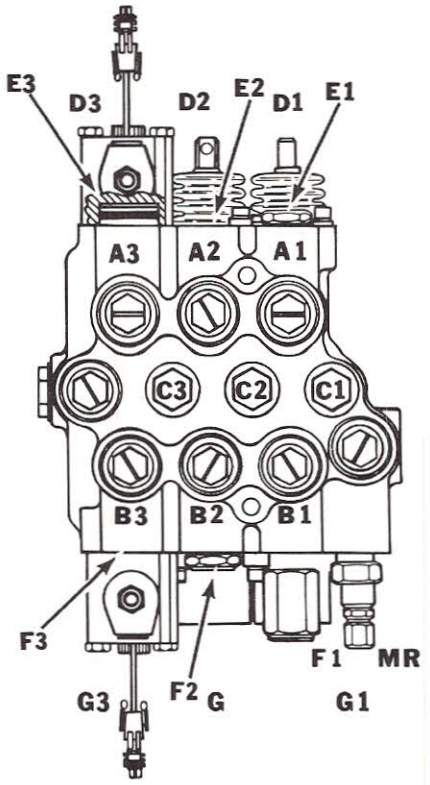
CONTROL VALVE INDEX 1213


bobcat

CONTROL VALVE IDENTIFICATION

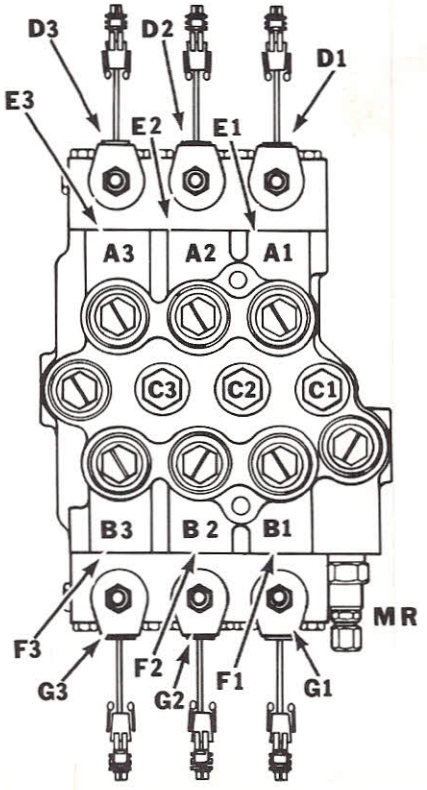
ITEM	1213	
	FRONT VALVE	REAR VALVE
A-1	Lift Cylinder—Rod End	Accumulator—Opens
A-2	Tilt Cylinder—Rod End	Bogie Wheels—Lowers
A-3	Shear—Opens	Shear—Opens
B-1	Lift Cylinder—Base End	Accumulator—Closes
B-2	Tilt Cylinder—Base End	Bogie Wheels—Raises
B-3	Shear—Closes	Shear—Closes
C-1	Load Check—Lift Function	Load Check—Acc. Function
C-2	Load Check—Tilt Function	Load Check—Bogie Wheels Function
C-3	Load Check—Shear Function	Load Check—Shear Function
D-1	Lift Spool	Accumulator Solenoid
D-2	Tilt Spool	Bogie Wheels Solenoid
D-3	Shear Solenoid	Shear Solenoid
E-1	Anti-Cavitation Valve	
E-2		Control Fluid Passage Plug
E-3	Control Fluid Passage Plug	
F-1	Port Relief Valve	
F-2	Anti-Cavitation Valve	Control Fluid Passage Plug
F-3	Control Fluid Passage Plug	
G-1	Centering Spring—Lift Spool	Accumulator—Solenoid
G-2	Centering Spring—Tilt Spool	Bogie Wheels—Solenoid
G-3	Shear—Solenoid	Shear—Solenoid
MR	Main Relief Valve	Main Relief Valve

FRONT VALVE



B-9243

REAR VALVE



B-6581

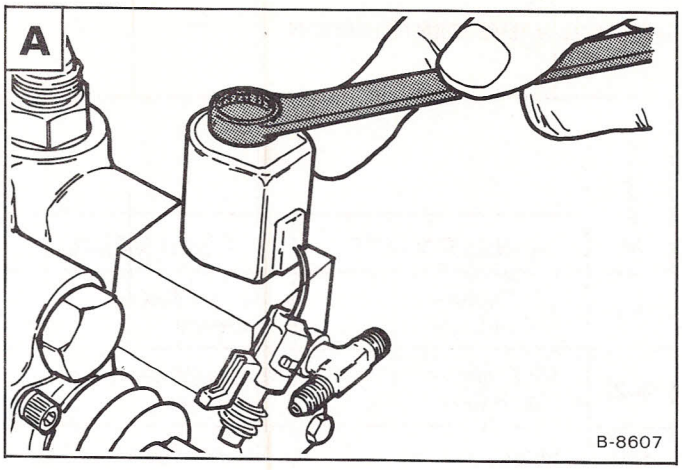
CONTROL VALVE

Spool Electrical Solenoid

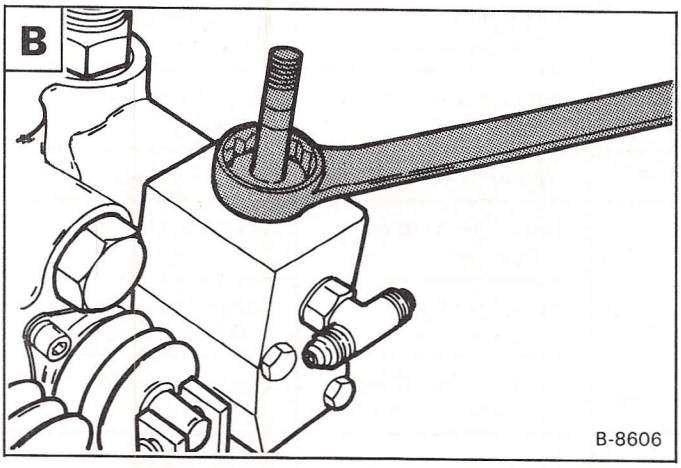
THE FRONT AND REAR CONTROL VALVE USE THE SAME PROCEDURE FOR REMOVAL AND INSTALLATION OF THE ELECTRICAL SOLENOID.

#* Remove the nut at the top of the solenoid [A].

#* Remove the cover and the solenoid coil.



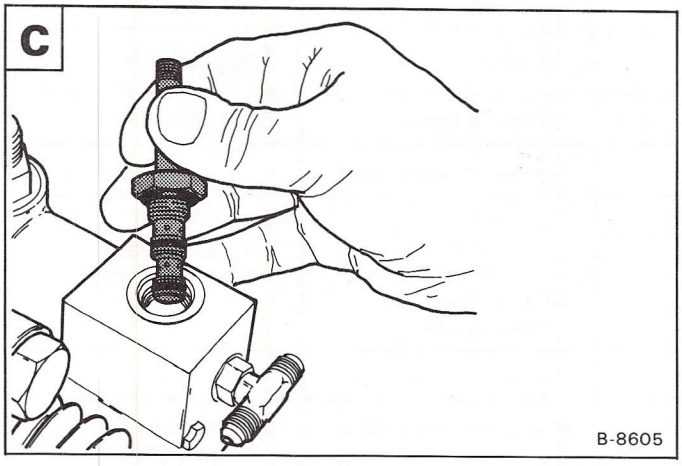
#* Loosen the solenoid valve [B].



#* Remove the solenoid valve [C].

#* Remove the O-rings and back-up washers.

#* Installation: Always use NEW O-rings and back-up washers when installing the solenoid valves.

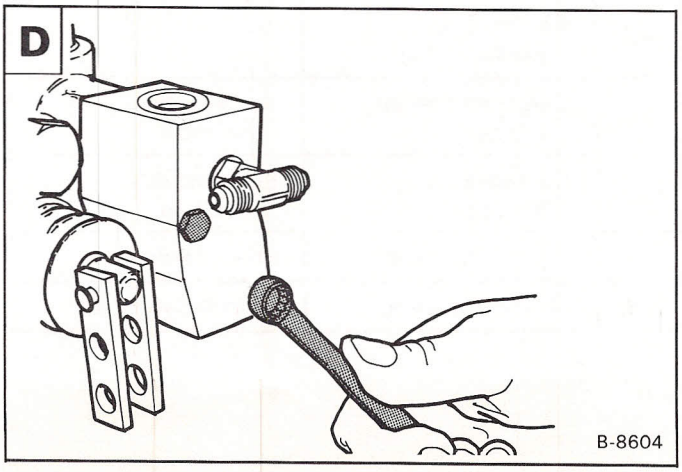


Disassembly and Assembly

NOTE: The procedure will list the difference between the front and rear control valve.

Disconnect the tubeline from the front and rear port block. Remove the bolts from the port block [D].

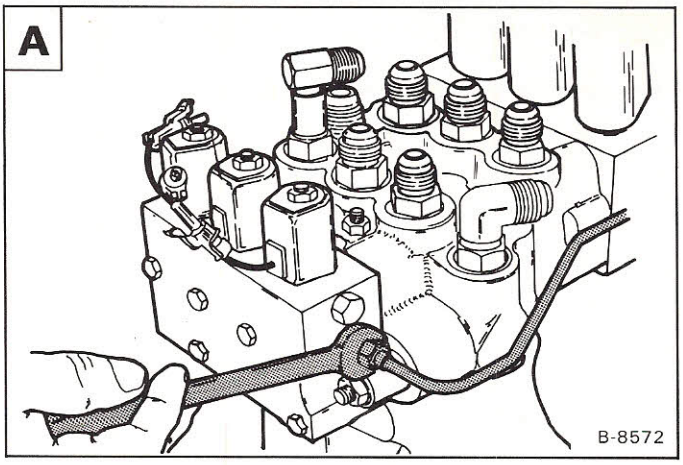
Installation: Tighten the bolts to 90-100 in.-lbs. (10-11 Nm) torque.



Front Control Valve
* Rear Control Valve

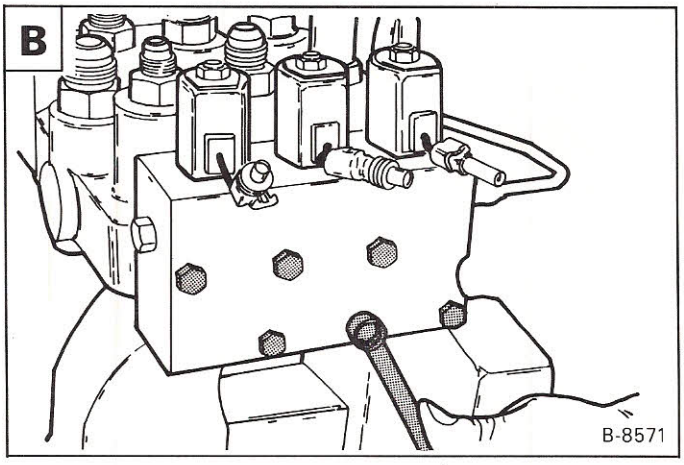
CONTROL VALVE (Cont'd)

* Disconnect the tubeline between the front and rear port block [A].

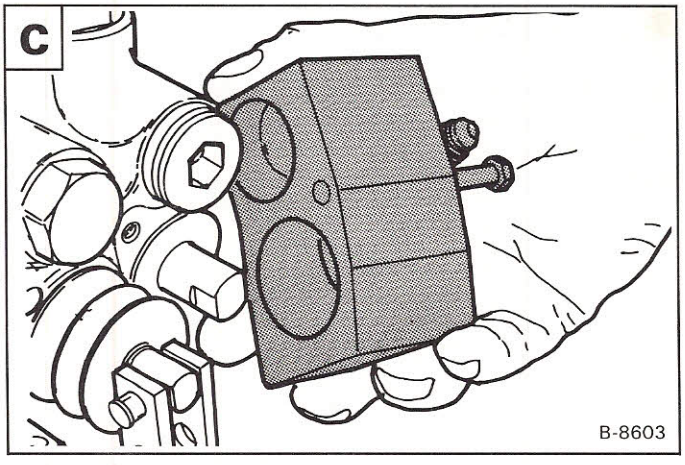


* Remove the bolts at the port block [B].

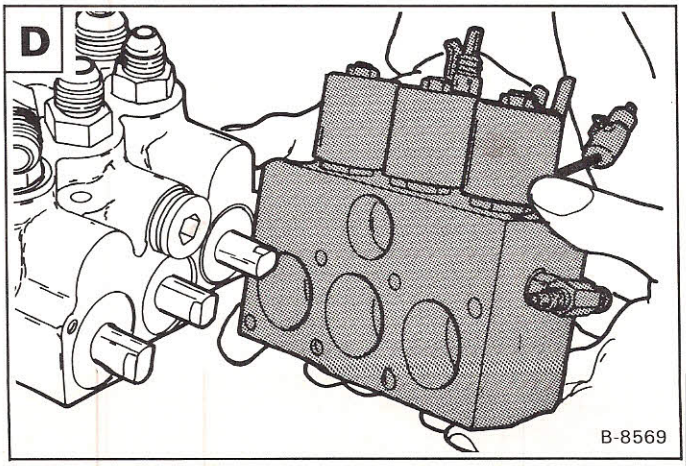
* Installation: Tighten the bolts to 90-100 in.-lbs. (10-11 Nm) torque.



Remove the front port block [C].



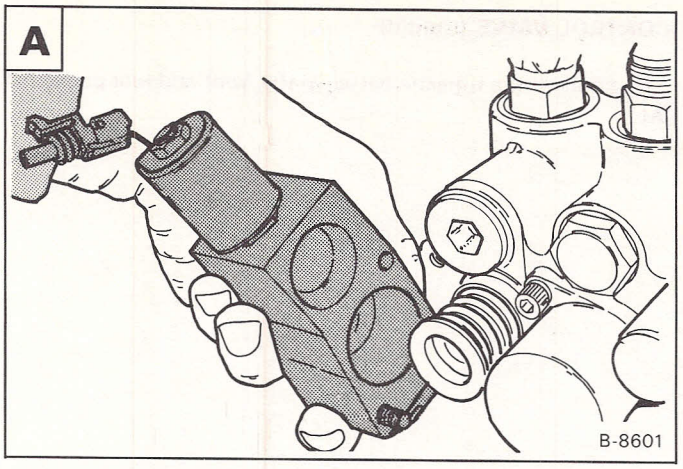
* Remove the front port block [D].



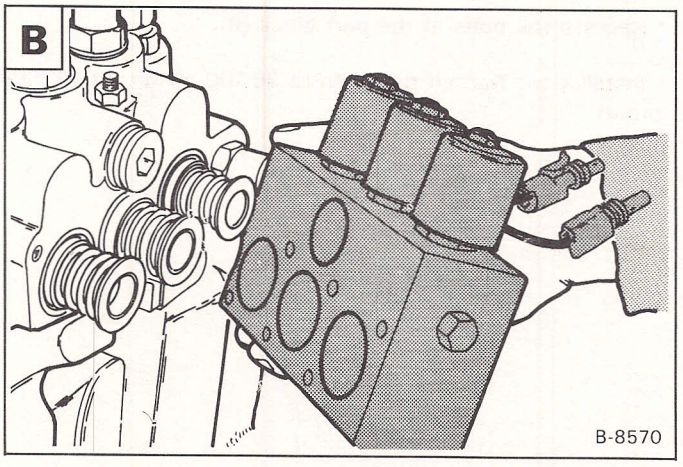
\# Front Control Valve
* Rear Control Valve

CONTROL VALVE (Cont'd)

Remove the bolts and rear port block [A].

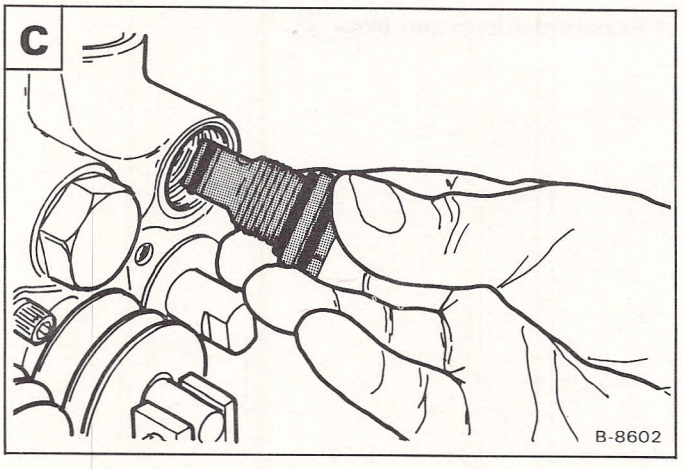


* Remove the bolts and rear port block [B].

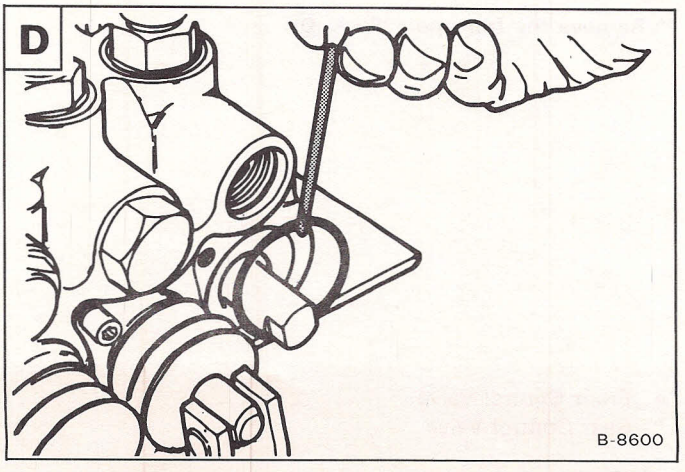


#* Remove the orifice plug [C].

NOTE: In the rear control valve the orifice plug is located in the center section of the control valve.



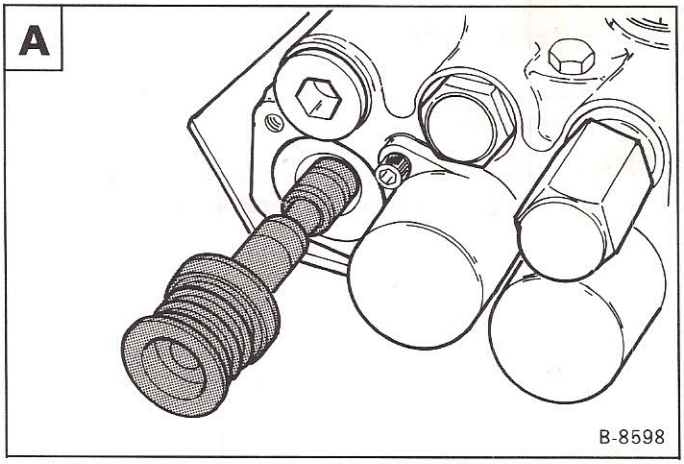
#* Remove the large O-ring [D].



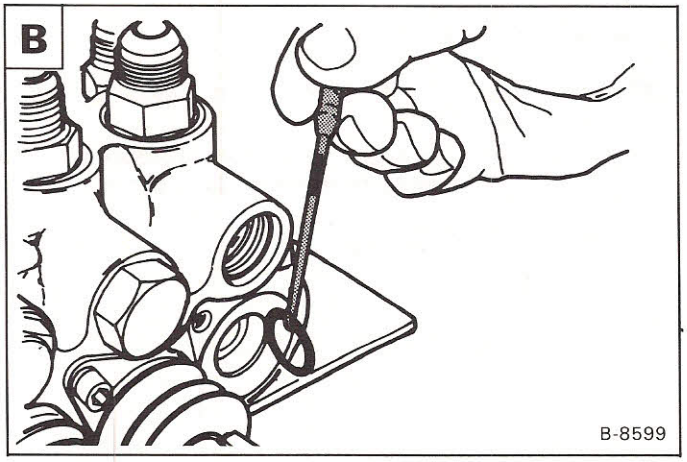
\# Front Control Valve
* Rear Control Valve

CONTROL VALVE (Cont'd)

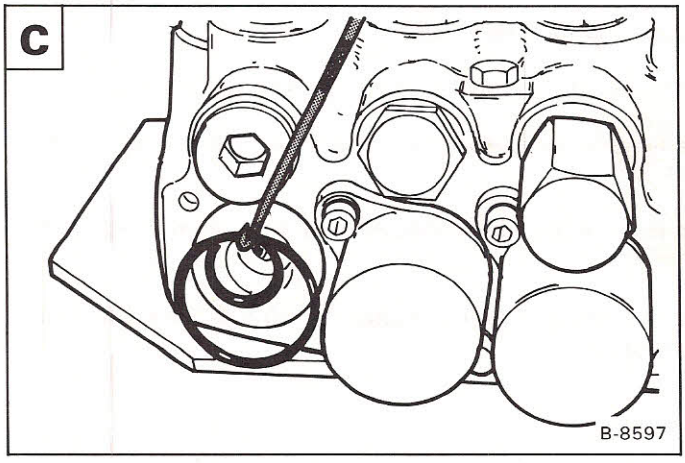
#* Remove the spool(s) from the control valve [A].



#* Remove the quad ring(s) from the front side of the control valve [B].



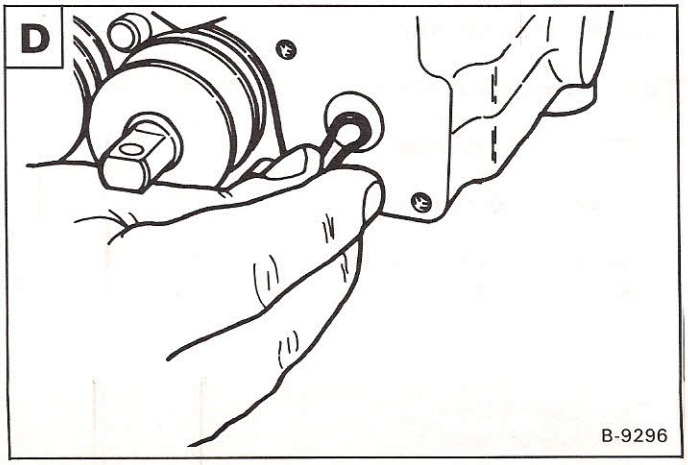
#* Remove the quad rings from the rear side of the control valve [C].



#* Use the following steps for correct installation of the valve spool(s) and quad rings:

1. Install the NEW quad ring into the groove in the front side of the control valve [D].

NOTE: See Pages 10, 11, 12 & 13 for seal and valve identification.

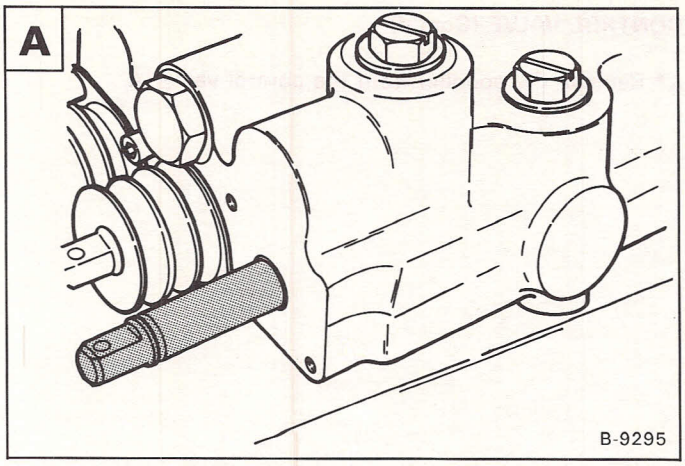


\# Front Control Valve
* Rear Control Valve

CONTROL VALVE (Cont'd)

2. Install the valve spool into the control valve from the rear side of the valve.

3. Push the spool into the control valve just far enough so that the rear side quad ring can be installed [A].

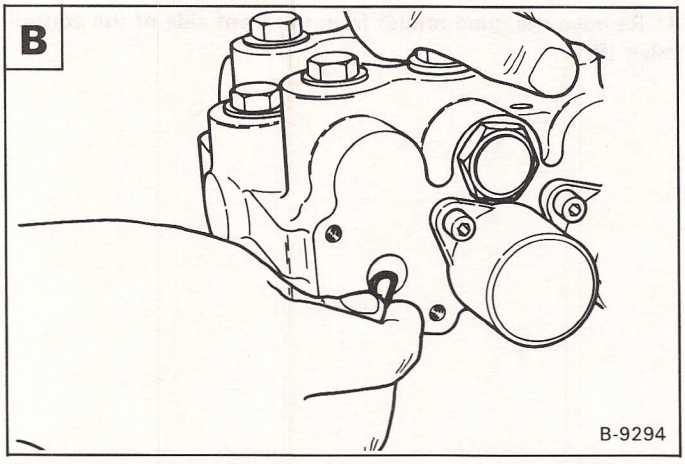


4. Install a NEW quad ring [B].

NOTE: See Pages 10, 11, 12 & 13 for seal and valve identification.

5. Push the valve spool back into the control valve until it is even with the rear side machined surface of the valve.

6. Install the centering spring.



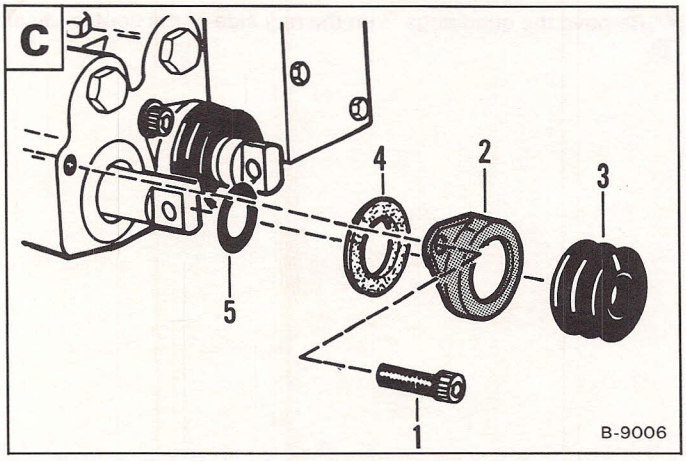
Rubber Boots and Retainer

The procedure is the same for the lift and tilt spool.

Remove the screws (Item 1) and rubber boot retainer (Item 2) [C].

Remove the rubber boot (Item 3), filter (Item 4) and O-ring (Item 5) [C].

Installation: Tighten the screws to 90-100 in.-lbs. (10-11 Nm) torque.



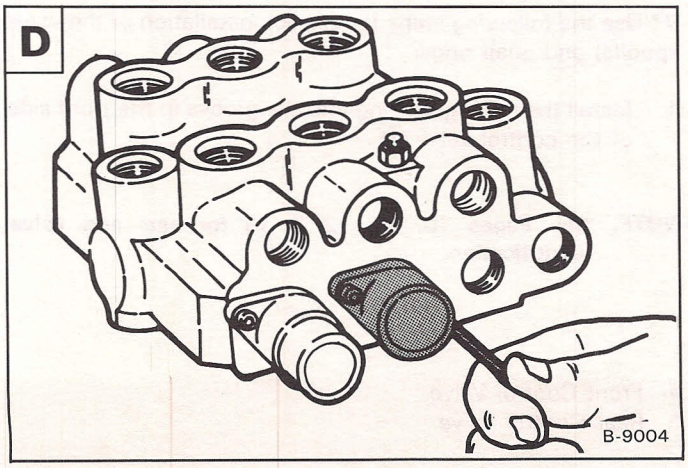
Centering Spring Mechanism

The tool listed will be needed to do the following procedure.

MEL-1285 — Spring Holding Tool

Remove the cap screws [D].

Installation: Tighten the screws to 90-100 in.-lbs. (10-11 Nm) torque.



\# Front Control Valve
* Rear Control Valve

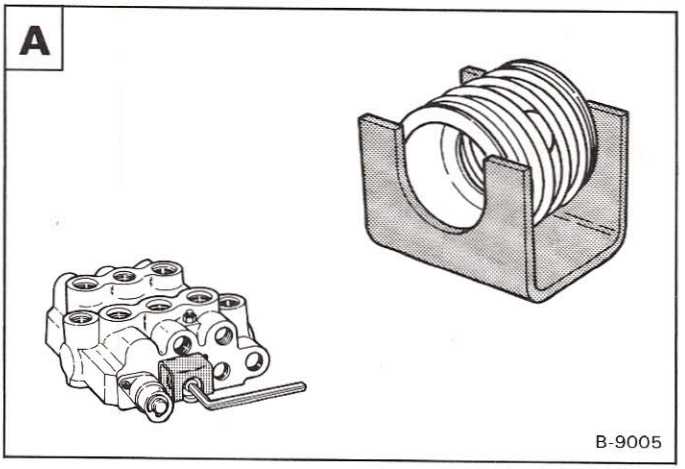
CONTROL VALVE (Cont'd)

#* Remove the center spring bolt.

NOTE: Carefully remove the bolt because there is spring pressure.

#* Installation: Put the washer and collar into the ends of the spring. Compress the spring assembly and install it into the hold tool [A]. Put Loctite on the bolt and tighten to 90-100 in.-lbs. (10-11 Nm) torque.

A



B-9005

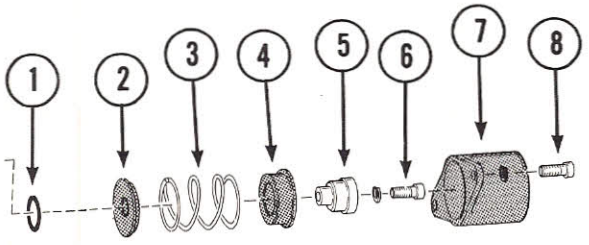
#* Disassembly the centering spring mechanism as shown [B].

Check all the parts and replace the parts that are worn or broken.

Always use NEW O-rings and back-up washers when assembling the control valve.

B

1. O-ring
2. Spring Washer
3. Centering Spring
4. Spring End Cap
5. Adapter
6. Bolt
7. Centering Spring Cap
8. End Cap Screw

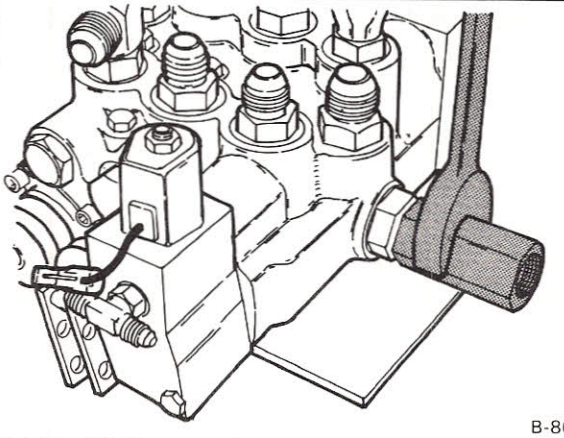


E-1446

240 PSI By-Pass Valve

Loosen the by-pass valve [C].

C

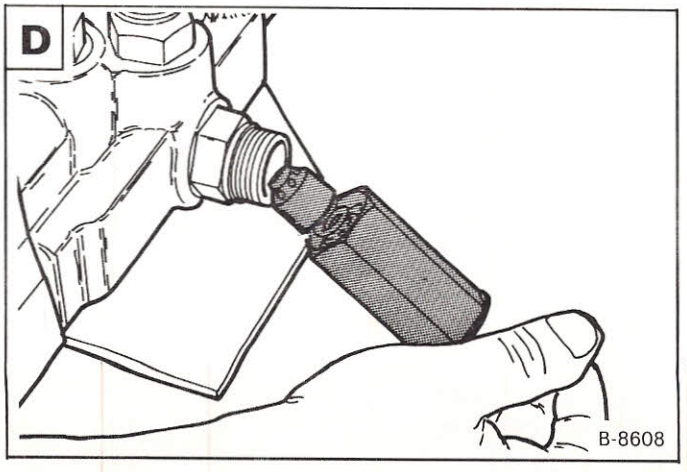


B-8609

Remove the housing, spring and poppet [D].

Clean the parts. Inspect and replace as needed.

D



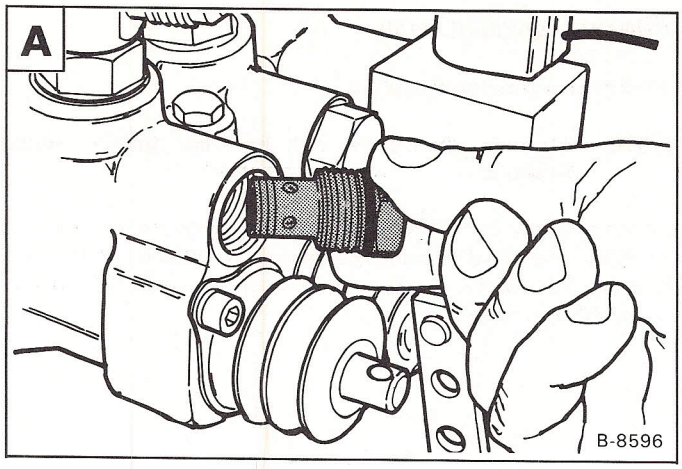
B-8608

\# Front Control Valve
* Rear Control Valve

CONTROL VALVE (Cont'd)

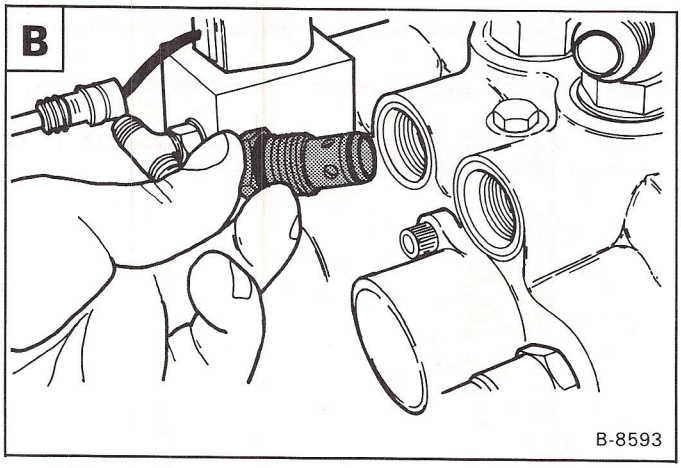
Anti-Cavitation Valve

Remove the anti-cavitation valve from the lift section [A].

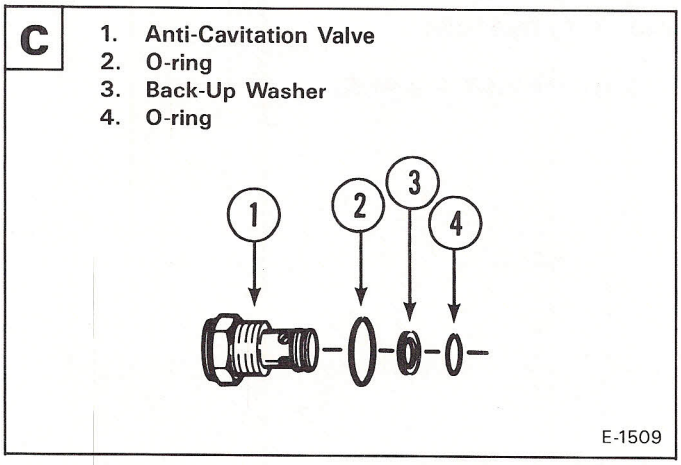


Remove the anti-cavitation valve from the tilt section [B].

Installation: Tighten the anti-cavitation valve to 35-40 ft.-lbs. (47-54 Nm) torque.



Clean and inspect the valve. Install NEW O-rings and back-up washers before installation [C].

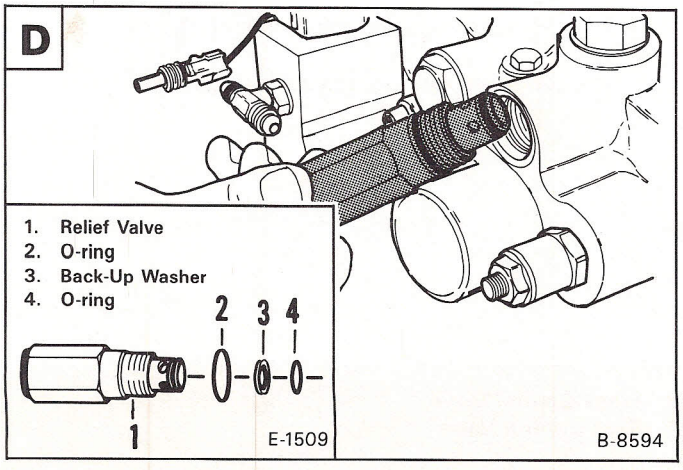


Port Relief Valve

Remove the port relief valve from the control valve [D].

Installation: Tighten the valve to 35-40 ft.-lbs. (47-54 Nm) torque.

Clean and inspect the valve. Install NEW O-rings and back-up washers before installation [D].



\# Front Control Valve
* Rear Control Valve

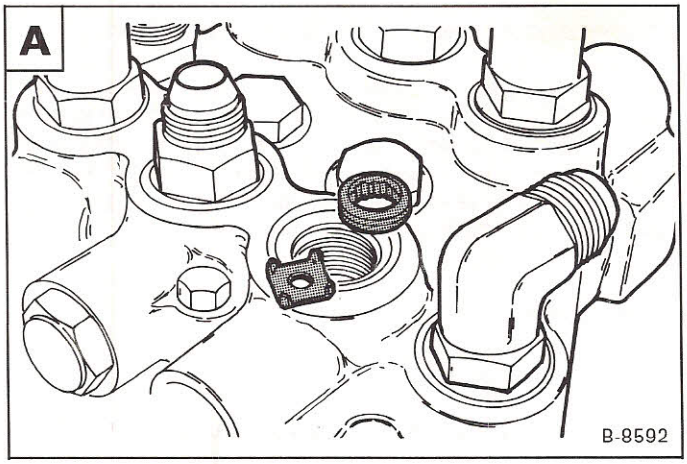
CONTROL VALVE (Cont'd)

Lift Section Orifice

Use an allen wrench and remove the retaining nut.

Remove the orifice [A].

Clean and inspect the orifice.



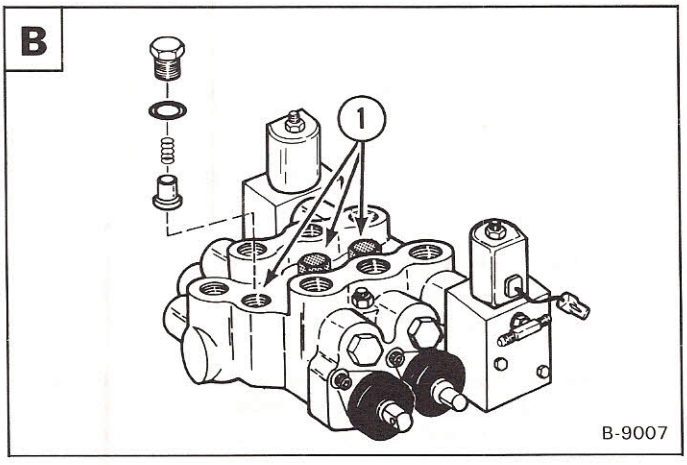
Load Check Valves

#* Remove the load check plug (Item 1) at the top of the control valve [B].

#* Remove the spring and poppet [B].

#* Remove the O-ring. Clean and inspect the poppet for wear.

#* Installation: Tighten the plug to 35-40 ft.-lbs. (47-54 Nm) torque.



Front Control Valve
* Rear Control Valve

IDENTIFICATION & INSTALLATION OF SPOOL SEAL

There are two types of seals for the control valve, a quad-ring seal and a lip seal. First identify the control valve (See Page 10, 11, 12 & 13) to find which seal is used. See the Parts Micro-Fiche for your model loader for the part number of the quad-ring seal or the lip seal used. Use the following procedure to install the seals into the control valve.

NO CHAMFER

1. Uses only quad-ring seal.

2. Check the seal surface area for rust, corrosion, scratches, etc. Correct any irregularities before continuing. De-burr the sharp edge at the seal area with a file or de-burring tool (both ends).

3. At the linkage end of the spool, de-burr the rubber boot groove as needed.

NOTE: Lubricate with grease between the seal and retainer before installation (both ends).

4. Put clean oil on the valve spool. Install the quad-ring seal over the valve spool. Be Careful not to damage the quad-ring seal on the valve spool edges.

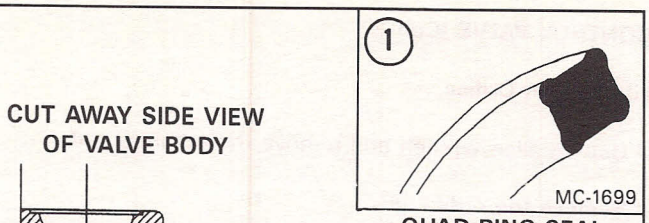
NOTE: An alternate method to protect the quad-ring seal by putting plastic material (Example: Discarded micro-fiche card) over the spool to protect the seal.

5. Install spool into the valve bore.

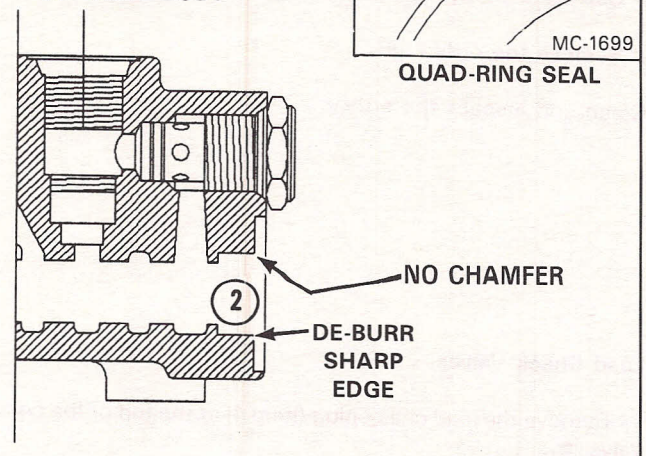
6. Slide the linkage end quad-ring seal over the rubber boot groove. Be Careful not to damage the seal.

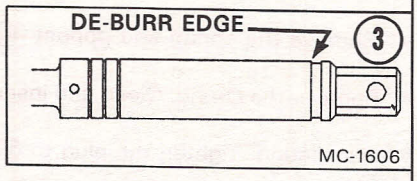
7. Install the quad-ring seal retainer.

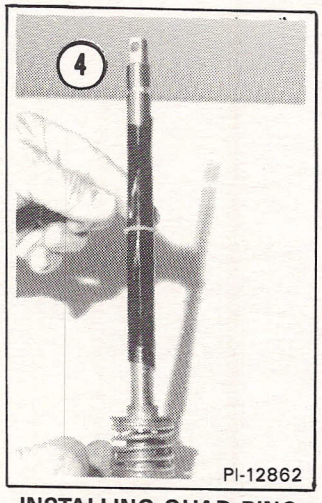
8. Continue with assembling the control valve.



QUAD-RING SEAL

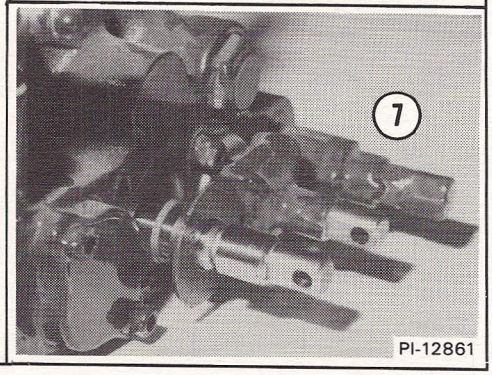






INSTALLING QUAD-RING
SEAL ON VALVE SPOOL

INSTALLING QUAD-RING
SEAL REATINER

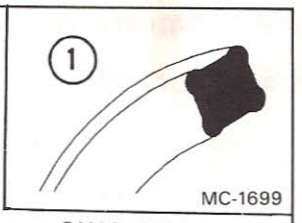


IDENTIFICATION & INSTALLATION OF SPOOL SEAL (Cont'd)

NOTCH FOR SEAL

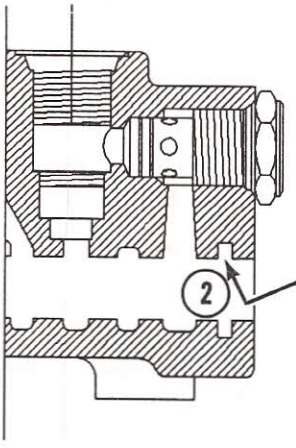
NOTE: This control valve (with the notch for seal) must be removed from the loader for the quad-ring seal installation.

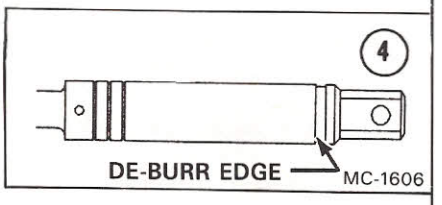
1. Uses only quad-ring seal.
2. Check the seal surface area for rust, corrosion, scratches, etc. Correct any irregularities before continuing.
3. The detent mechanism or centering spring must be removed from the valve spool.
4. At the linkage end of the spool, de-burr the rubber boot groove as needed.
5. Install the quad-ring seal into the notch in the linkage end of the control valve.
6. Put clean oil on the valve spool. Install the spool into the valve from the rear end (centering spring or detent mechanism side). Be Careful not to damage the quad-ring seal, already installed, when going over the groove for the rubber boot. Push the spool into the valve just far enough so that the rear quad-ring seal can be installed.
7. Install the quad-ring seal in the rear groove of the valve.
8. Push the valve spool back into the control valve until it is even with the rear machined surface of the valve.
9. Continue with assembling the control valve.



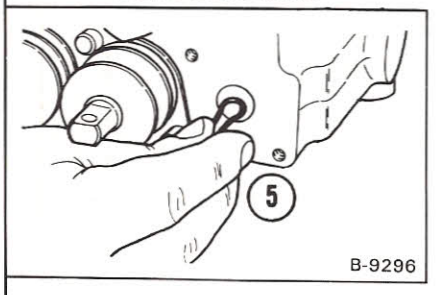
QUAD-RING SEAL

CUT AWAY SIDE VIEW OF VALVE BODY

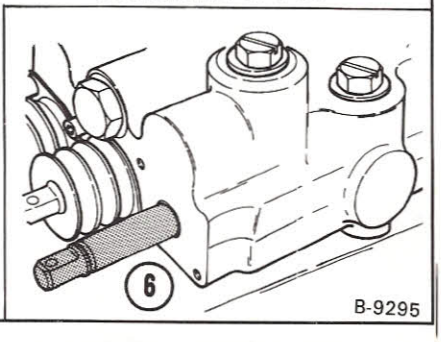




INSTALLING FRONT QUAD-RING SEAL



INSTALLING SPOOL



IDENTIFICATION & INSTALLATION OF SPOOL SEAL

SHORT CHAMFER

1. Uses only quad-ring seal.

2. Check the seal surface area for rust, corrosion, scratches, etc. Correct any irregularities before continuing. De-burr the sharp edge at the seal area with a file or de-burring tool (both ends).

3. At the linkage end of the spool, de-burr the rubber boot groove as needed.

NOTE: Lubricate with grease between the seal and retainer before installation (both ends).

4. Put clean oil on the valve spool. Install the quad-ring seal over the valve spool. Be Careful not to damage the quad-ring seal on the valve spool edges.

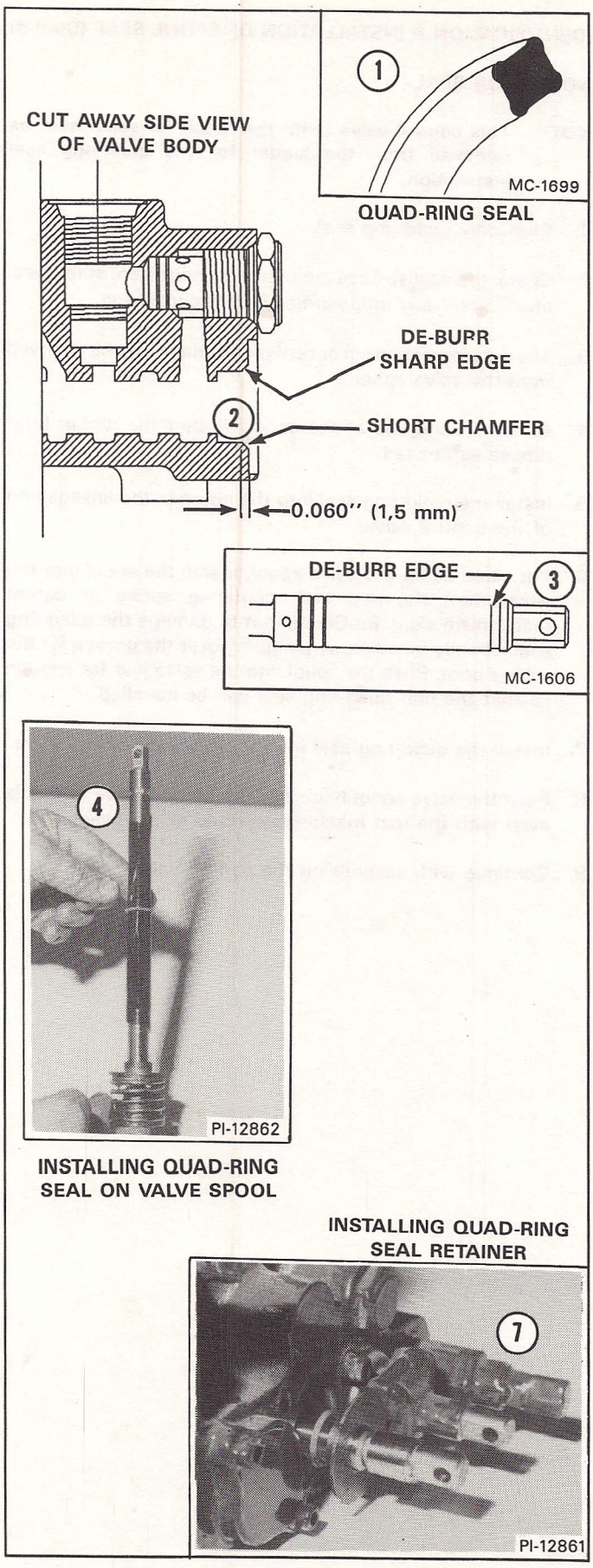
NOTE: An alternate method to protect the quad-ring seal by putting plastic material (Example: Discarded micro-fiche card) over the spool to protect the seal.

5. Install spool into the valve bore.

6. Slide the linkage end quad-ring seal over the rubber boot groove. Be Careful not to damage the seal.

7. Install the quad-ring seal retainer.

8. Continue with assembling the control valve.



IDENTIFICATION & INSTALLATION OF SPOOL SEAL (Cont'd)

LONG CHAMFER

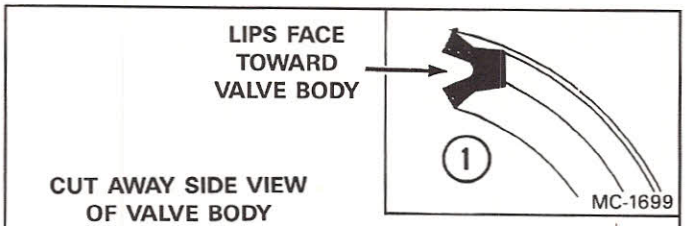
1. Uses only lip seal.
2. Check the seal surface area for rust, corrosion, scratches, etc. Correct any irregularities before continuing.

NOTE: Lubricate with grease between the seal and retainer before installation (both ends).

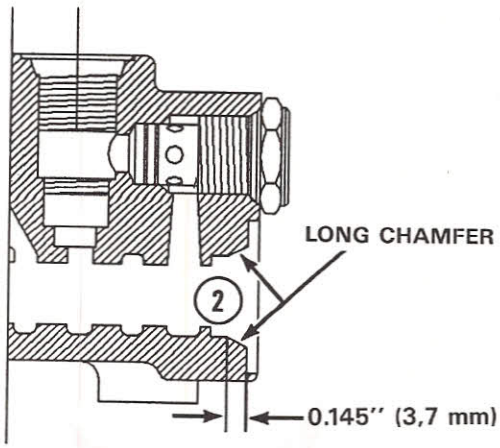
3. Put clean oil on the valve spool. Install the lip seal over the valve spool. Be Careful not to damage the lip seal on the valve spool edges.

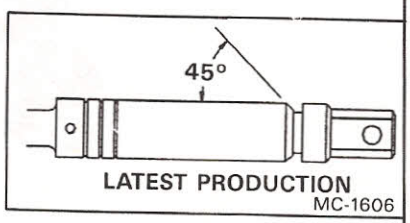
NOTE: An alternate method to protect the lip seal by putting plastic material (Example: Discarded micro-fiche card) over the spool to protect the seal.

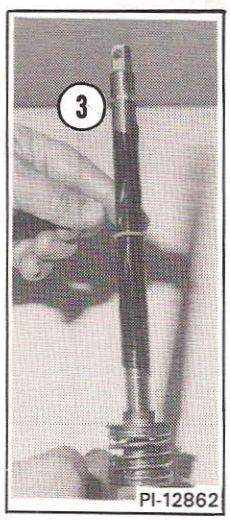
4. Install spool into the valve bore.
5. Slide the linkage end lip seal over the rubber boot groove. Be Careful not to damage the seal.
6. Install the seal retainer.
7. Continue with assembling the control valve.



CUT AWAY SIDE VIEW OF VALVE BODY

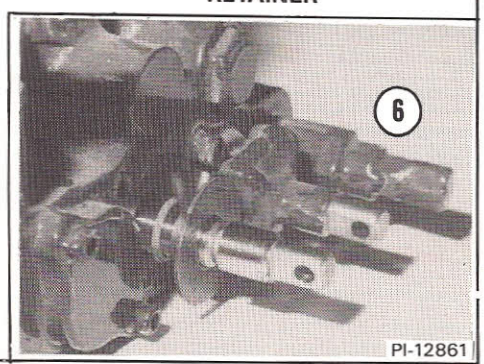






INSTALLING LIP SEAL ON VALVE SPOOL

INSTALLING LIP SEAL RETAINER




bobcat

HYDRAULIC CONTROL VALVE

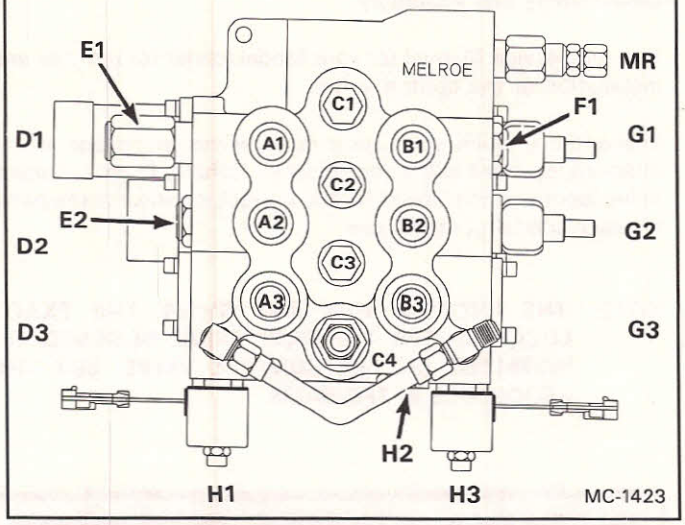

bobcat

CONTROL VALVE IDENTIFICATION

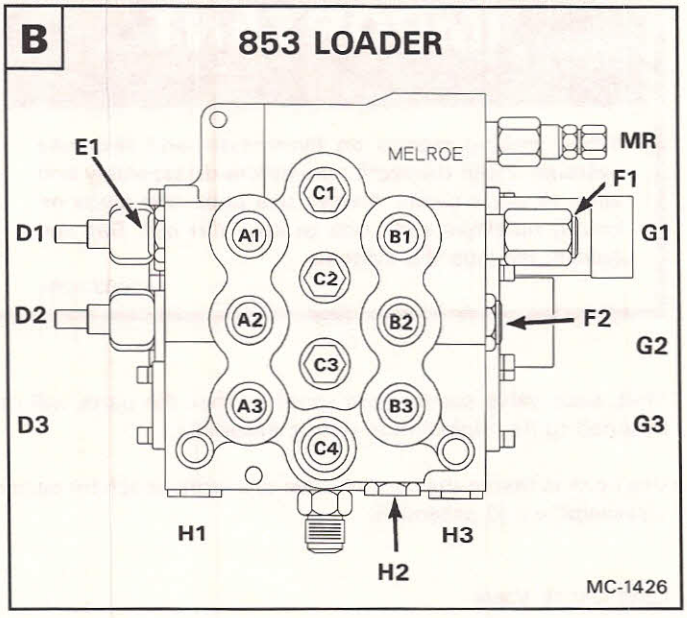
Chart

Item	750 Series	853 Loader	2410 Loader
A1	Lift Cyl. Base End Restrictor	Lift Cyl. - Rod End	
A2	Tilt Cyl. Base End	Tilt Cyl. - Rod End	
A3	Auxiliary Hydraulics		
B1	Lift Cyl. Rod End	Lift Cyl. - Base End Resitrictor	
B2	Tilt Cyl. Rod End	Tilt Cyl. - Base End	
B3	Auxiliary Hydraulics		
C1	Load Check Valve/Lift Function		
C2	Load Check Valve/Tilt Function		
C3	NO Load Check Valve Auxiliary Function		
C4	Oil Cooler By-Pass	Outlet Fluid Flow	
D1	Lift Spool Detent	Lift Spool	
D2	Centering Spring Tilt Spool	Tilt Spool	
D3	Auxiliary Spool		
E1	Port Relief	Anti-Cav. Valve	Port Relief
E2	Anti-Cav. Valve		
F1	Anti-Cav. Valve	Port Relief	
F2		Anti-Cav. Valve	
G1	Lift Spool	Lift Spool Detent	
G2	Tilt Spool	Tilt Spool Centering Spring	
G3	Auxiliary Spool		
H1	Auxiliary Electric Solenoid	Plug	Auxiliary Electric Solenoid
H2	Plug/Port Relief (Optional)		
H3	Auxiliary Electric Solenoid	Plug	Auxiliary Electric Solenoid
MR	Main Relief Valve		

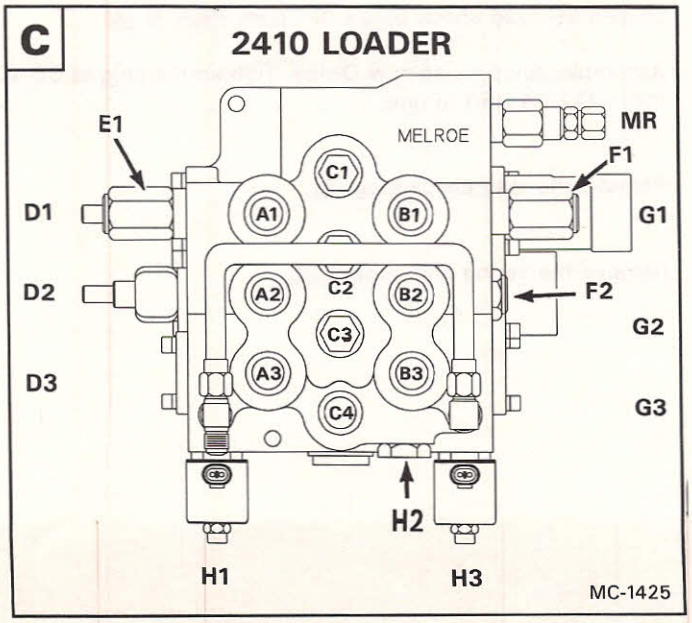
A 750 SERIES



B 853 LOADER



C 2410 LOADER



CONTROL VALVE

Disassembly and Assembly

See the Service Manual for your Model loader for removal and installation of the control valve.

The anti-cavitation valve, port relief valves and plugs are at different locations in the control valve. Refer to Page 1 (Control Valve Identification Chart) for the correct location of the parts for each Model control valve.

NOTE: THE PHOTO'S MAY NOT SHOW THE EXACT LOCATION FOR THE PART BEING REMOVED OR INSTALLED ON THE CONTROL VALVE, BUT THE PROCEDURE IS THE SAME.

IMPORTANT

When making repairs on hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

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Mark each valve section and spool so that the parts will be returned to its original bore during assemble.

Use bolts to fasten the control valve to a work bench for easier disassemble and assemble.

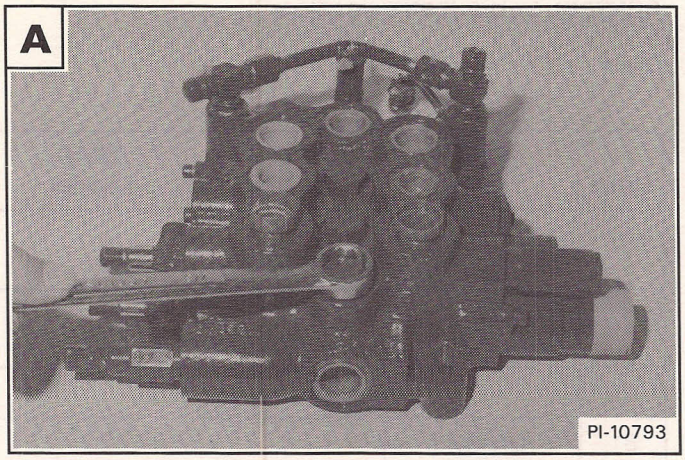
Load Check Valve

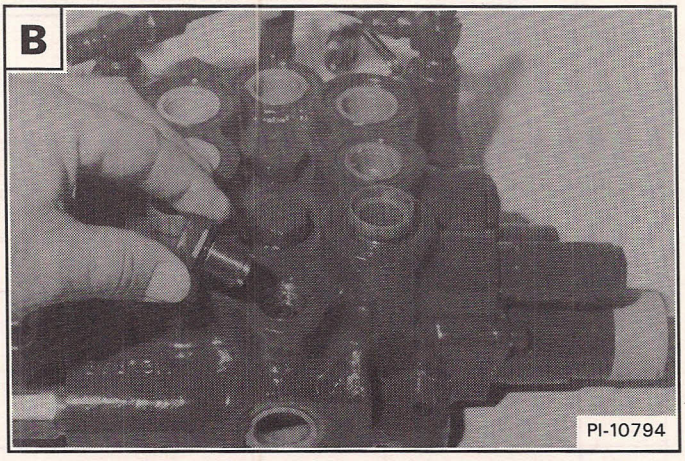
Loosen the load check plug (''C'' port; Page 1) [A].

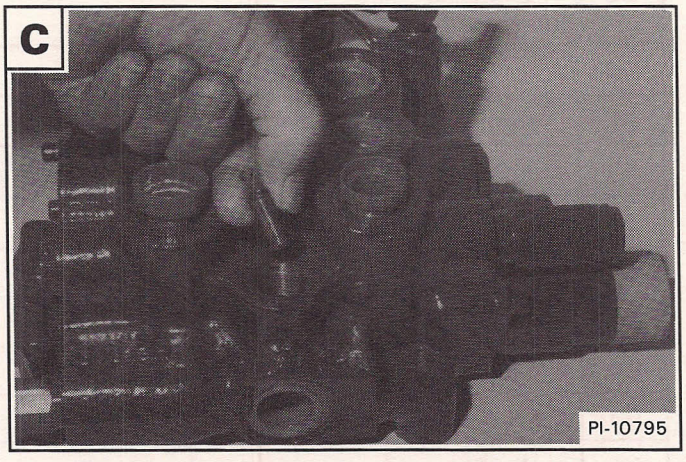
Assemble: Always use new O-ring. Tighten the plug to 35-40 ft.lbs. (47-54 Nm) torque.

Remove the load check plug [B].

Remove the spring and poppet [C].





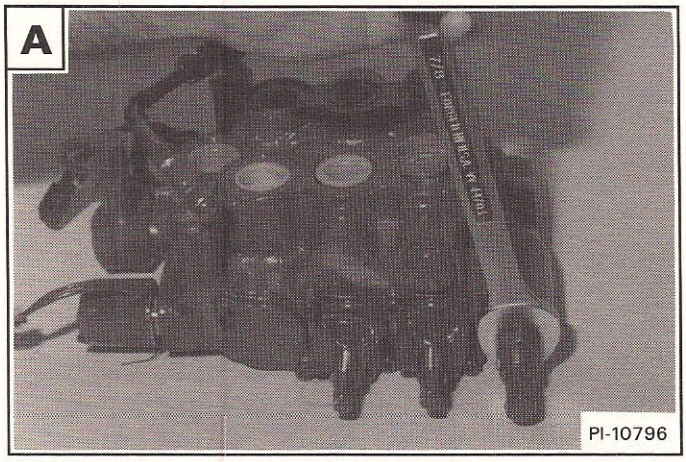


CONTROL VALVE (Cont'd)

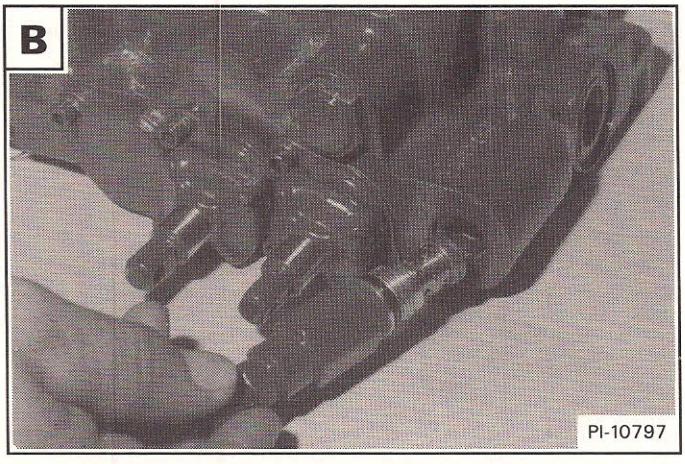
Main Relief Valve

Loosen the main relief valve [A].

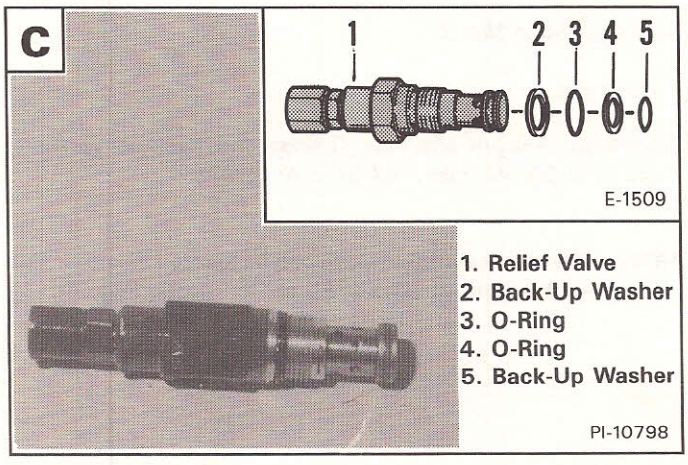
Assemble: Always use new O-rings and back-up washers. Tighten to 35-40 ft.lbs. (47-54 Nm) torque.



Remove the main relief valve [B].



Remove the O-rings and back-up washers from the main relief valve [C].

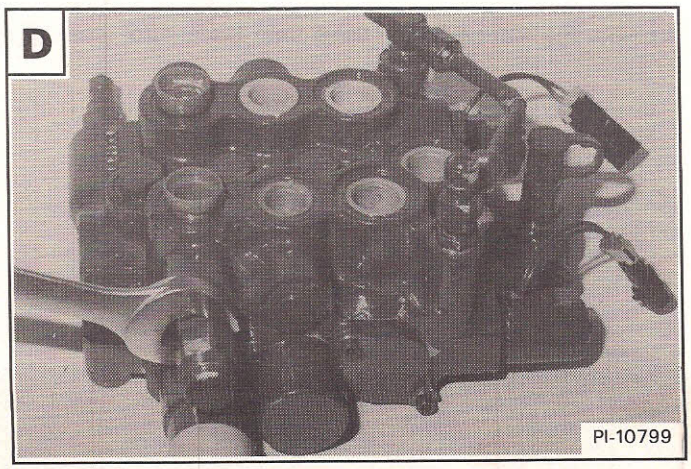


Port Relief Valve

Loosen the port relief valve [D].

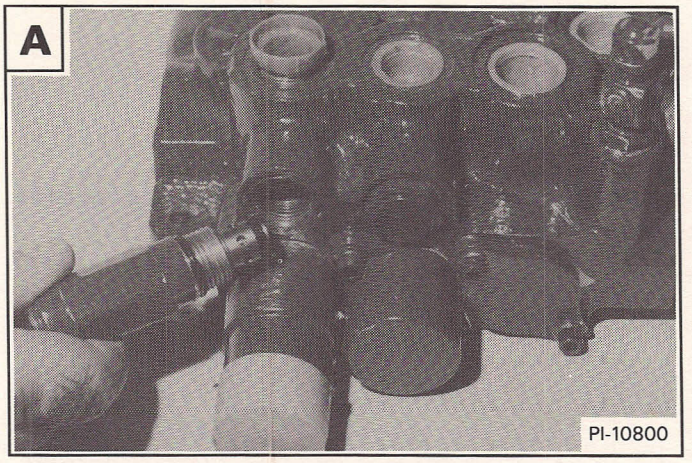
Assemble: Always use new O-rings and back-up washers. Tighten to 35-40 ft.lbs. (47-54 Nm) torque.

NOTE: The port relief valve can be located on either side of the control valve ("E" or "F" ports; Page 1).

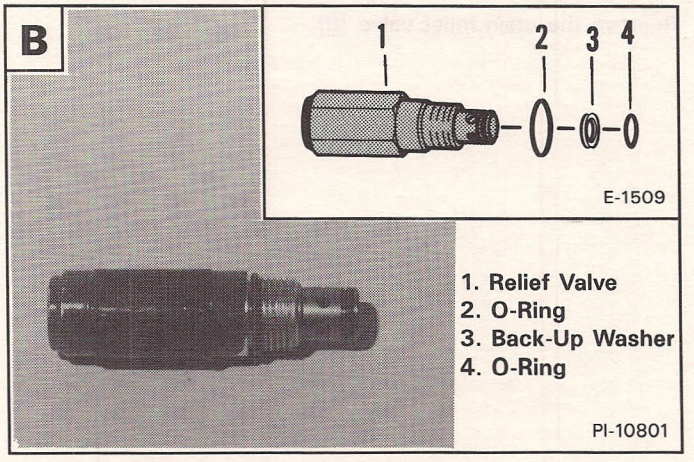


CONTROL VALVE (Cont'd)

Remove the port relief valve [A].



Remove the O-rings and back-up washer from the port relief valve [B].

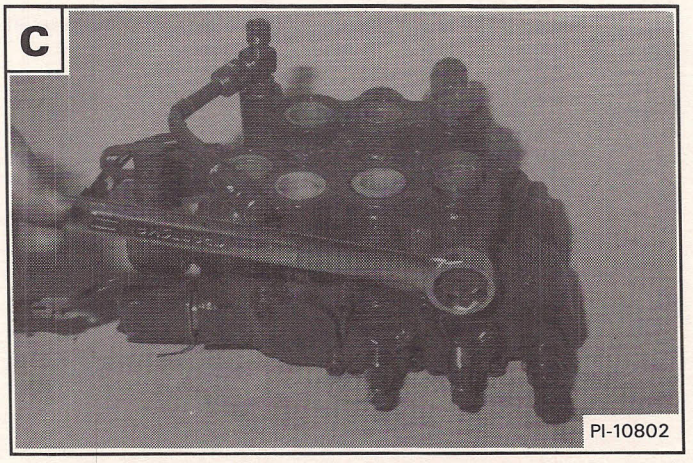


Anti-Cavitation Valve

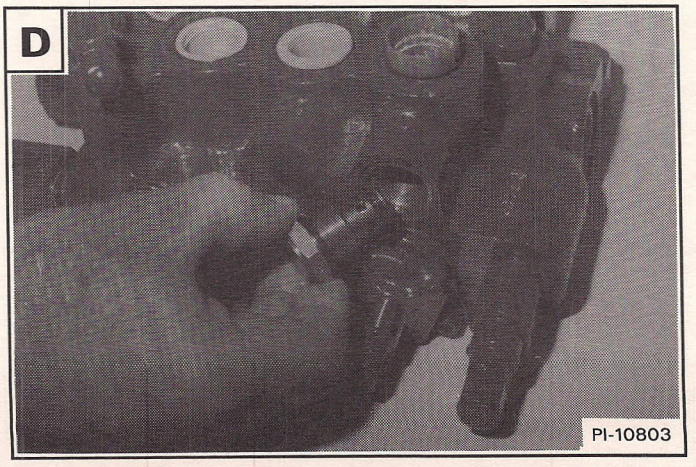
Loosen the anti-cavitation valve [C].

Assemble: Always use new O-rings and back-up washers. Tighten to 35-40 ft.lbs. (47-54 Nm) torque.

NOTE: The anti-cavitation valve can be located on either side of the control valve (''E'' or ''F'' ports; Page 1).

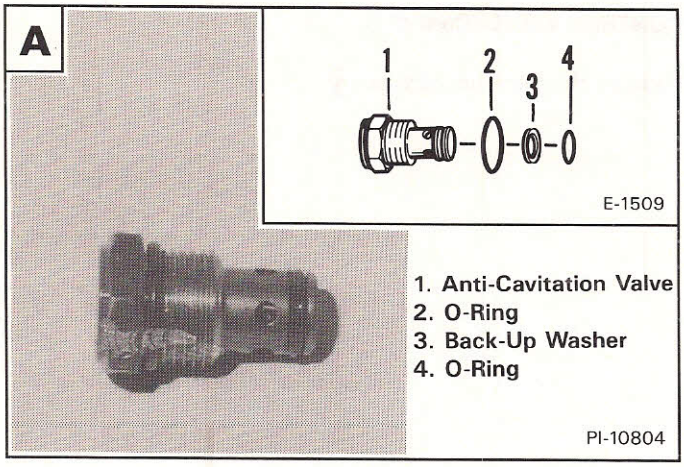


Remove the anti-cavitation valve from the control valve [D].



CONTROL VALVE (Cont'd)

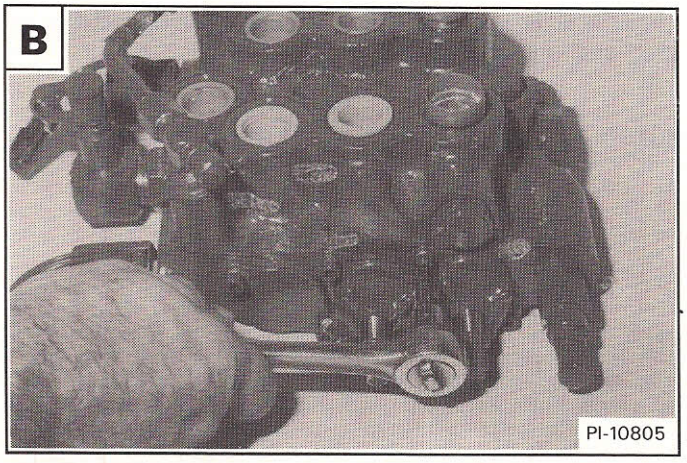
Remove the O-rings and back-up washer from the anti-cavitation valve [A].



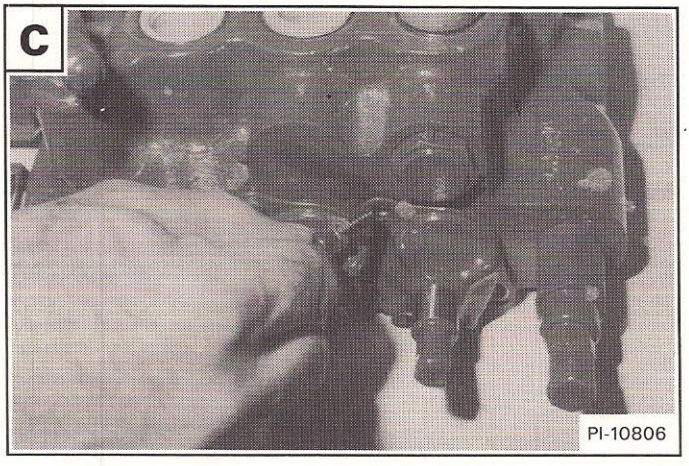
Rubber Boot

Loosen the two screws on the rubber boot retainer [B].

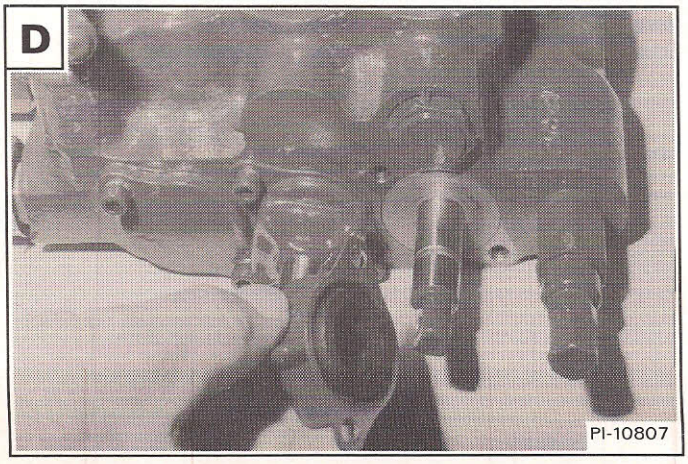
Assemble: Tighten the screws to 90-100 in.lbs. (10,2-11,3 Nm) torque.



Remove the screws [C].

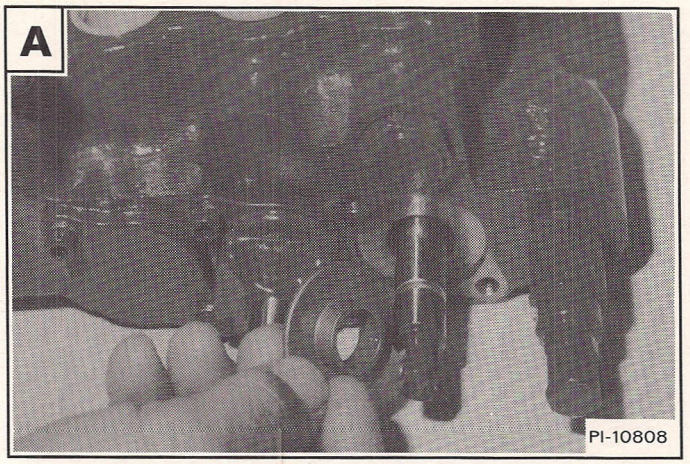


Remove the rubber boot and retainer [D].



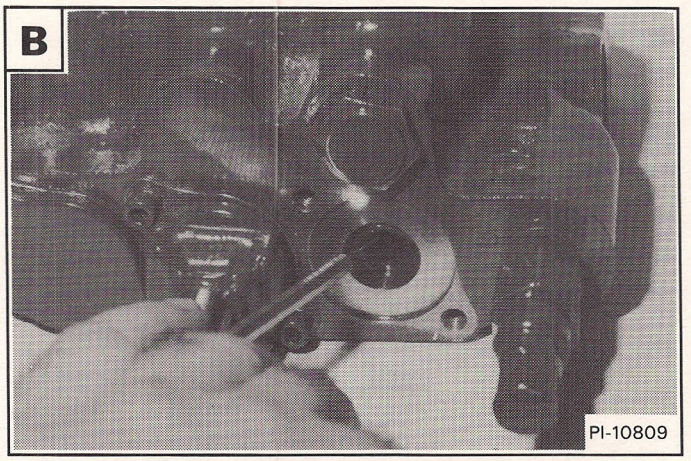
CONTROL VALVE (Cont'd)

Remove the back-up washer [A].



After the spool is removed, use a O-ring pick and remove the spool seal from the spool bore [B].

NOTE: See Pages 14 & 15 for seal and valve identification.

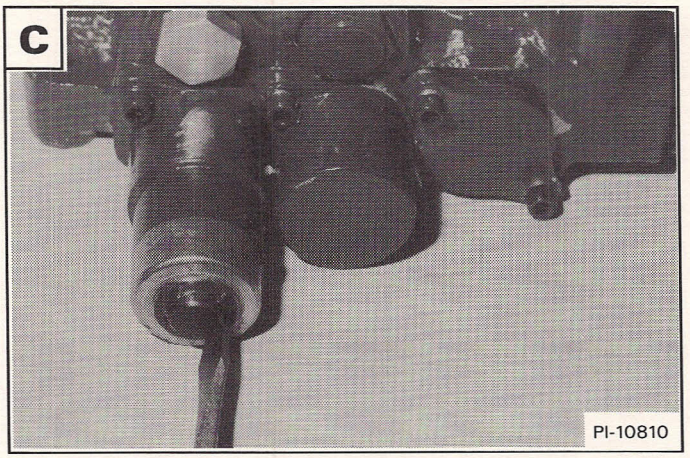


Lift Spool Detent

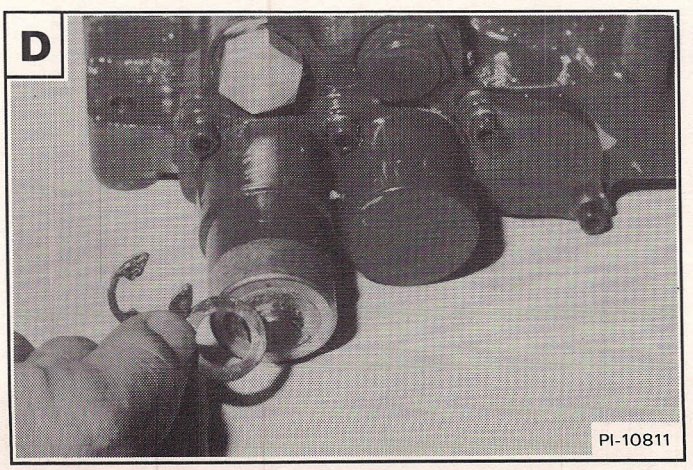
The tool listed will be needed to do the following procedure:

MEL-1278 - Detent Tool

Remove the snap ring with a screwdriver [C].



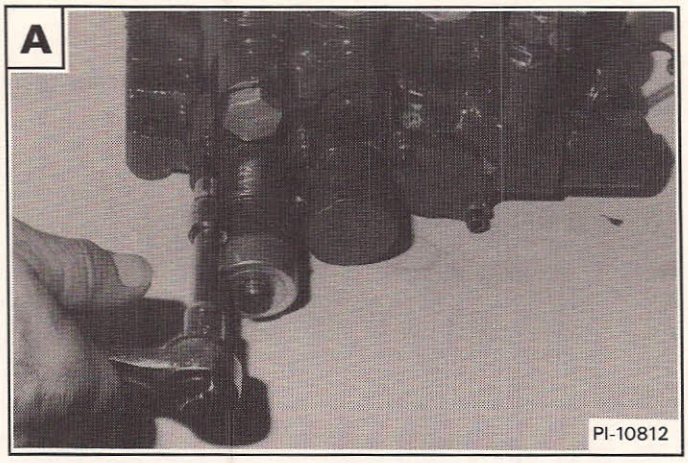
Remove the snap ring and washer [D].



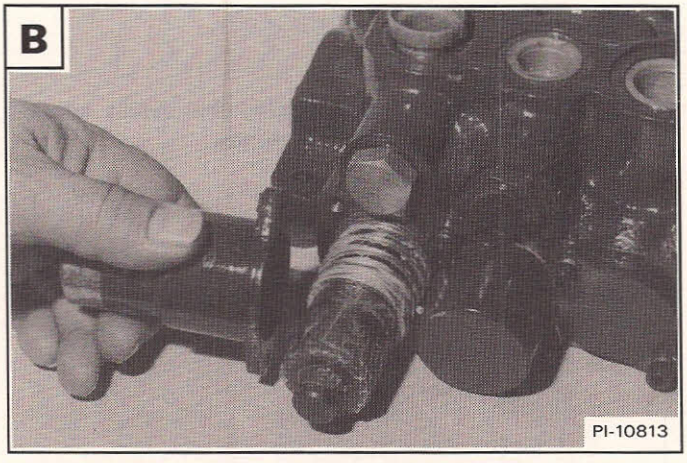
CONTROL VALVE (Cont'd)

Remove the screws from the detent cap [A].

Assemble: Tighten the screws to 90-100 in.lbs. (10,2-11,3 Nm) torque.



Remove the detent cap [B].



IMPORTANT

The detent assembly has small springs and balls. Do not loose these parts during disassembly and assembly.

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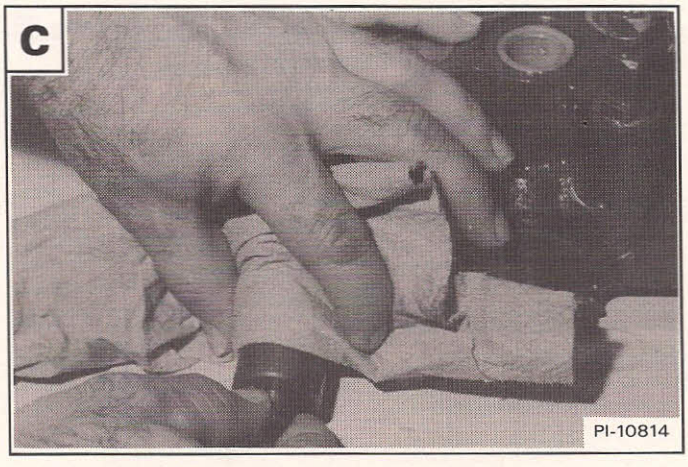
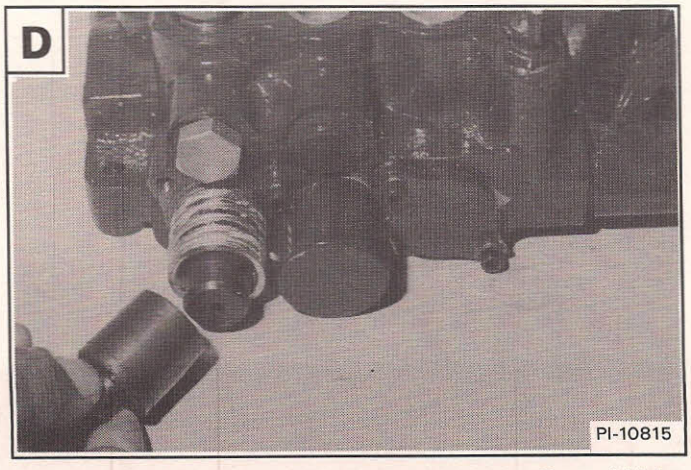
Put a rag around the detent sleeve [C].

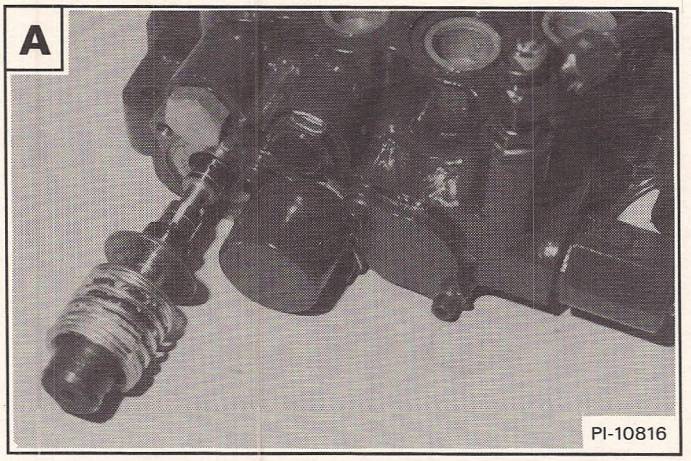


Remove the detent sleeve, detent balls and spring [D].



CONTROL VALVE (Cont'd)

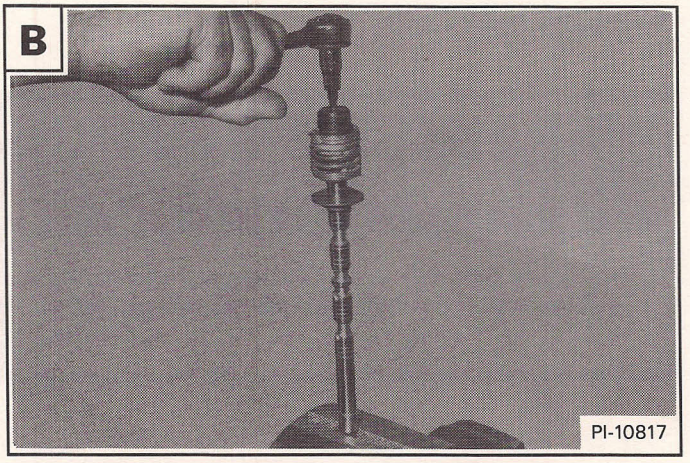
Remove the spool, centering spring, back-up washer and spool seal assembly from the control valve [A].



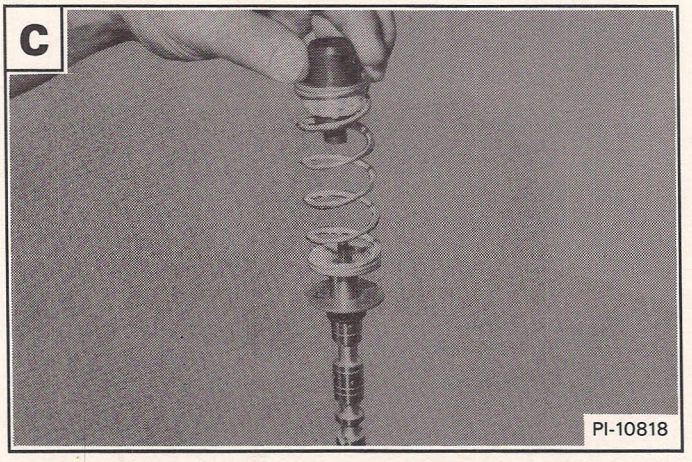
Put the linkage end of the spool in a vise.

NOTE: BE CAREFUL when removing the detent adapter, because there is spring pressure.

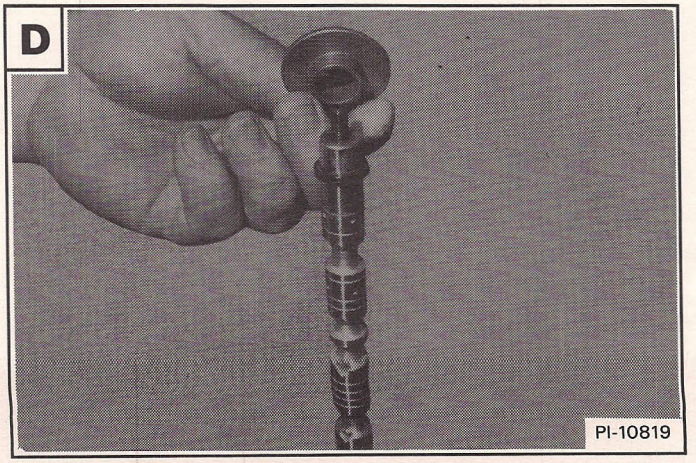
Loosen the detent adapter [B].



Remove the detent adapter, end cap and centering spring [C].



Remove the back-up washer and spool seal [D].



CONTROL VALVE (Cont'd)

Lift Spool Only: Remove the stud from the end of the spool [A].

Removal of the plastic plug:

a. Make a center point in the plug using a 3/16'' drill.

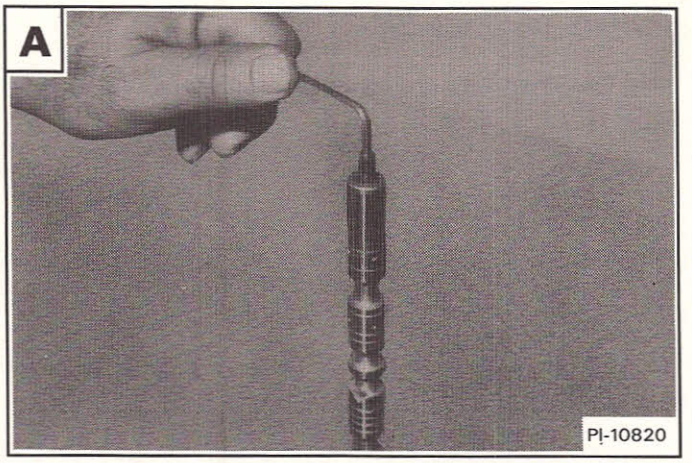
b. Drill a hole all the way through the plug using a 7/64'' tap drill.

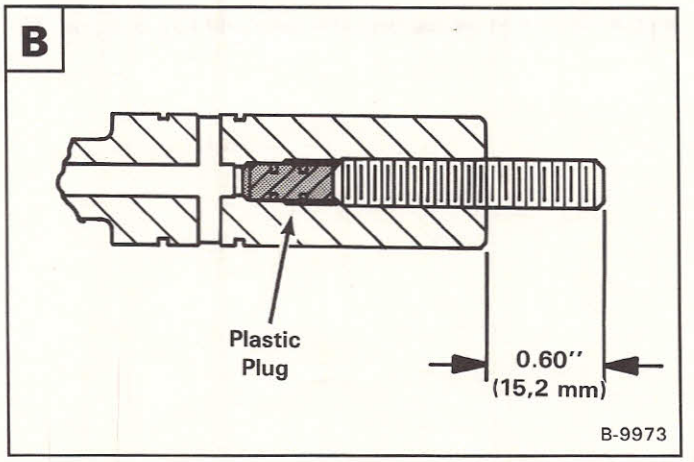
c. Turn a 6-32 tap into the plug. Pull the tap and plug out of the spool. BE CAREFUL, do not break the tap.

d. Clean all the debris from the inside of the spool bore.

Assemble: Install the new plastic plug. Install the stud and leave about 0.60'' (15,2 mm) sticking out [B].

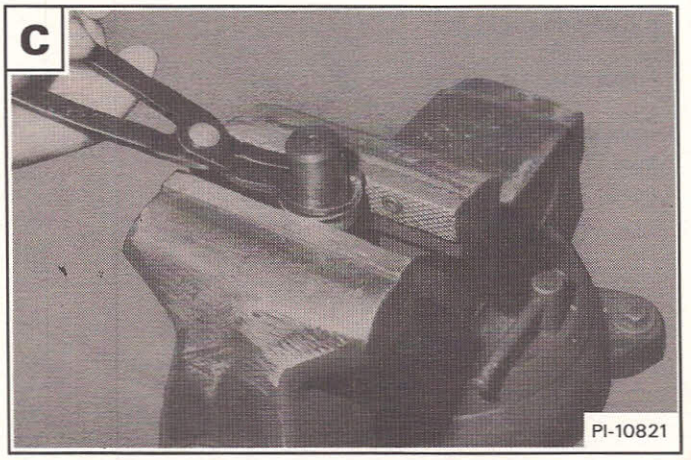
NOTE: DO NOT USE LOCTITE ON THE STUD THREADS.





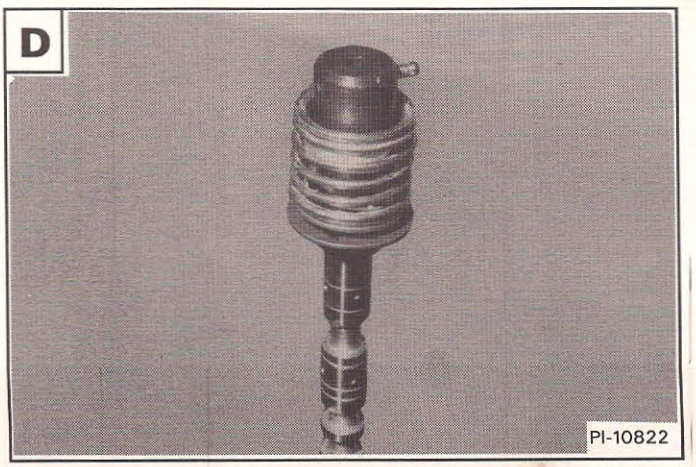
NOTE: Put grease on all detent components surfaces before assembly.

Install the detent balls and spring into the detent adapter. Hold the detent balls in position with the tool and install the detent adapter into the end cap [C].



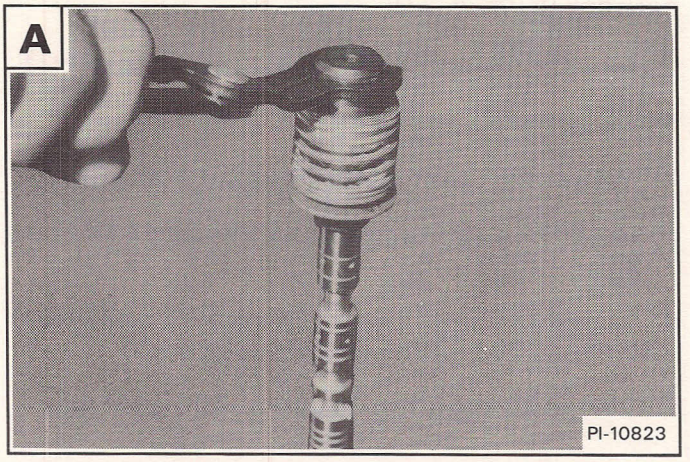
Install the spool seal, back-up washer, centering spring, end cap/detent adapter on the valve spool. Tighten the detent adapter to 90-100 in.lbs. (10,2-11,3 Nm) torque.

Install the detent balls and spring [D].

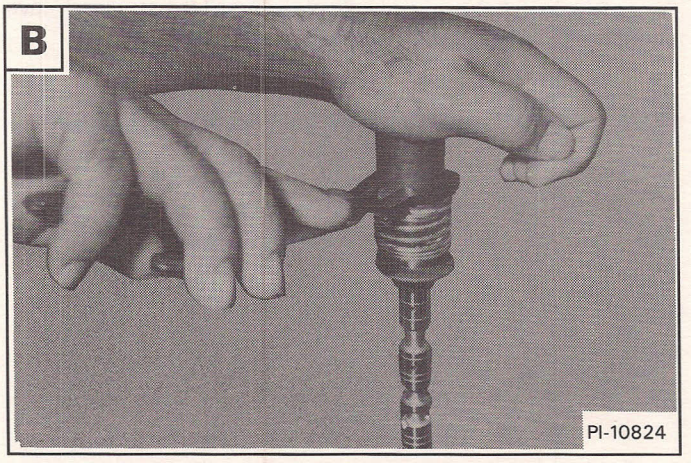


CONTROL VALVE (Cont'd)

Hold the detent balls and spring in position with the tool [A].



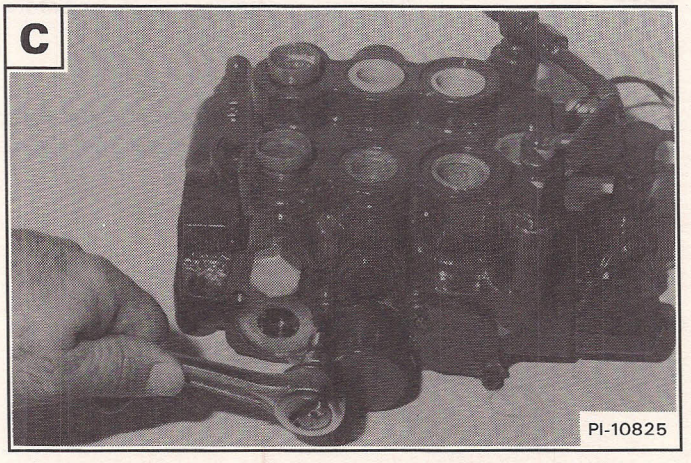
Install the detent sleeve over the balls and into position [B].



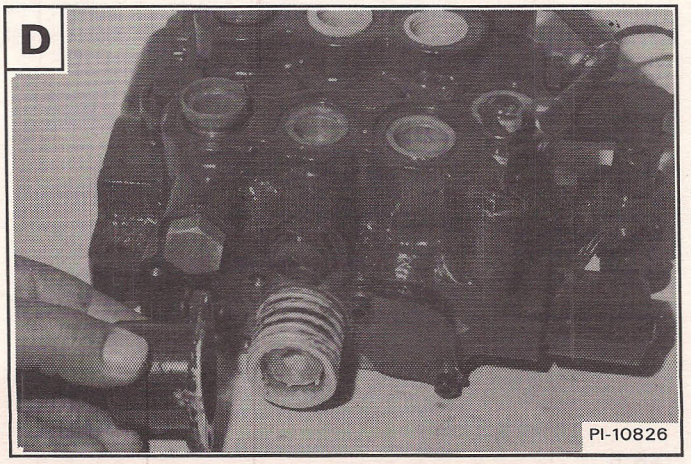
Tilt Centering Spring

Remove the end cap screws [C].

Assemble: Tighten the screws to 90-100 in.lbs. (10,2-11,3 Nm) torque.



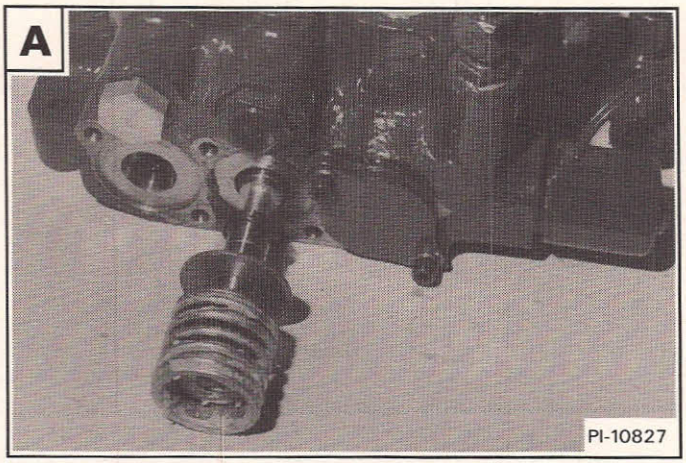
Remove the end cap [D].



CONTROL VALVE (Cont'd)

Remove the spool, centering spring, back-up washer and spool seal [A].

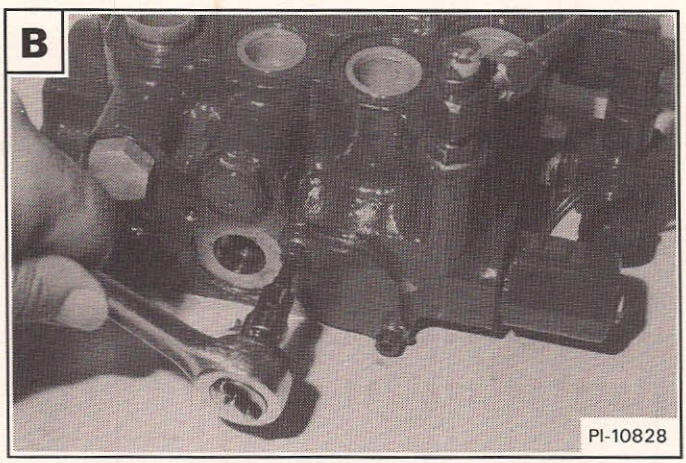
Assemble: If the centering spring bolt is removed, tighten to 90-100 in.lbs. (10,2-11,3 Nm) torque. Put grease on all the centering spring component parts. Always use new spool seal.



Auxiliary Spool

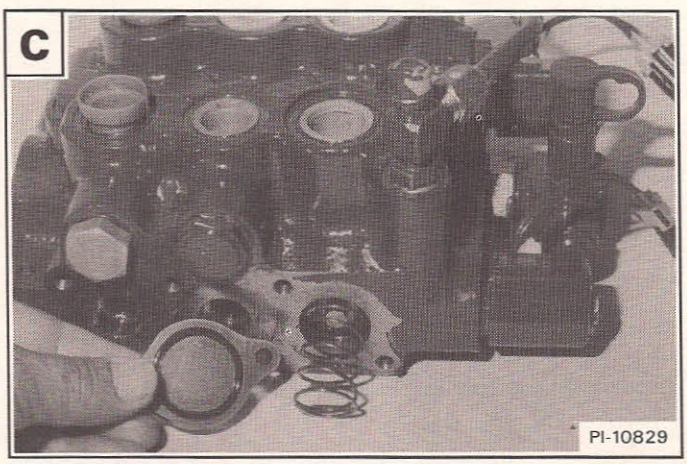
Remove the end plate screws [B].

Assemble: Tighten the screws to 90-100 in.lbs. (10,2-11,3 Nm) torque.

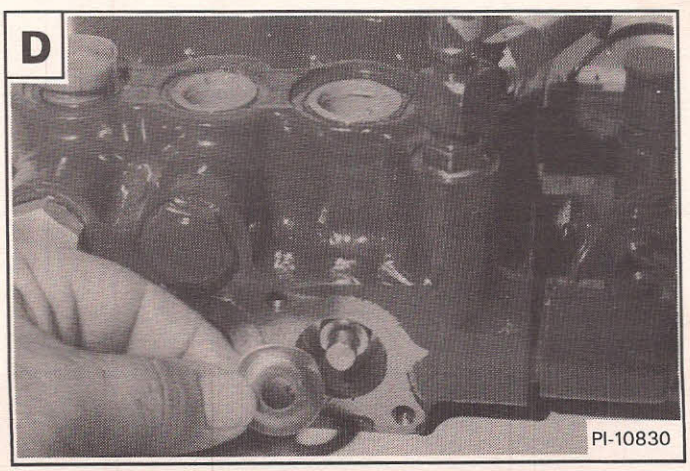


Remove the end plate, O-ring and spring [C].

Remove the end plate, O-ring and spring from the other side.

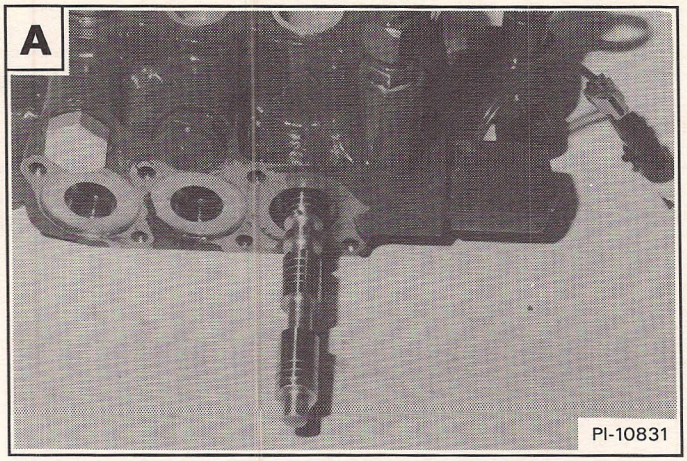


Remove the washer (both sides) [D].



CONTROL VALVE (Cont'd)

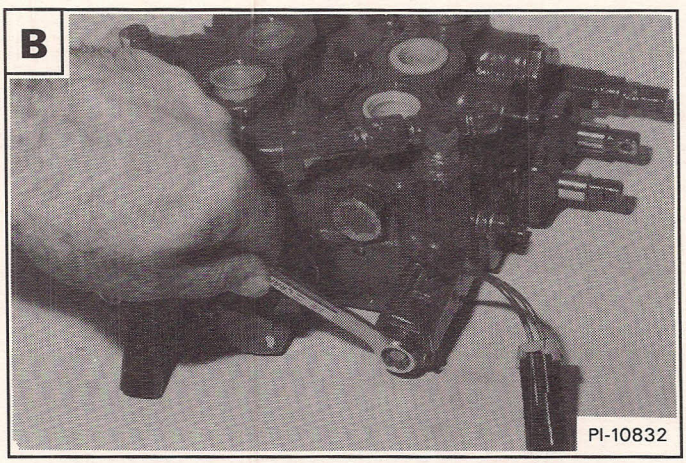
Remove the auxiliary section spool from the control valve [A].



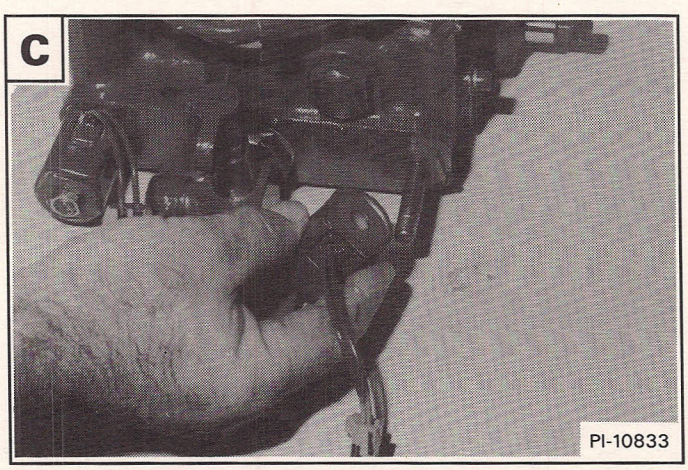
Auxiliary Electric Solenoid

Remove the nut from the end of the solenoid [B].

Assemble: Tighten the nut to 9-12 in.lbs. (1,02-1,36 Nm) torque.

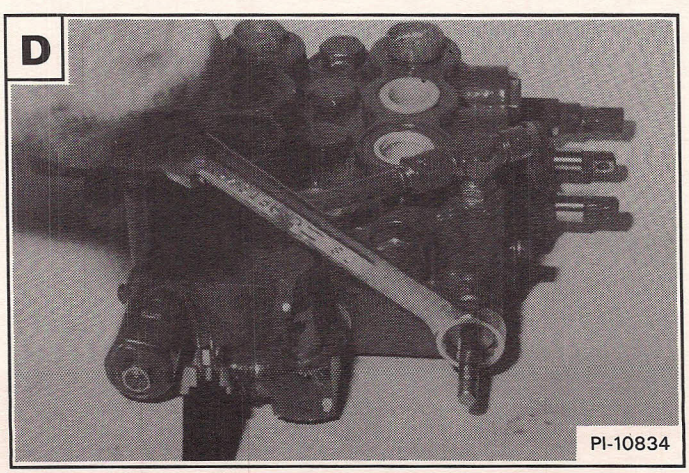


Remove the solenoid coil and end plate [C].



Loosen the electric solenoid valve [D].

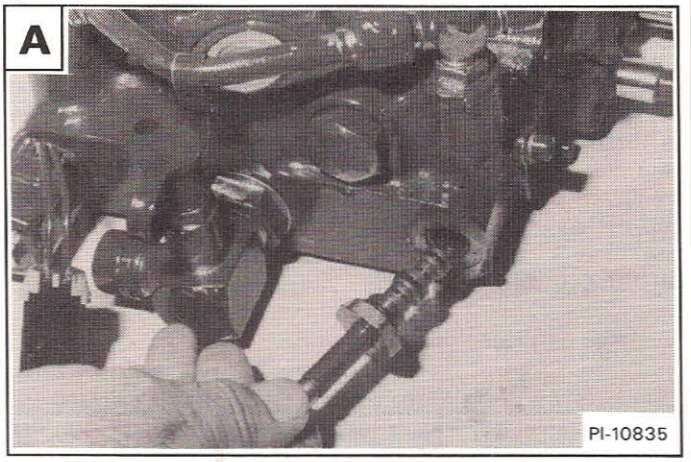
Assemble: Tighten the electric solenoid valve to 96-144 in.lbs. (10,8-16 Nm) torque.



CONTROL VALVE (Cont'd)

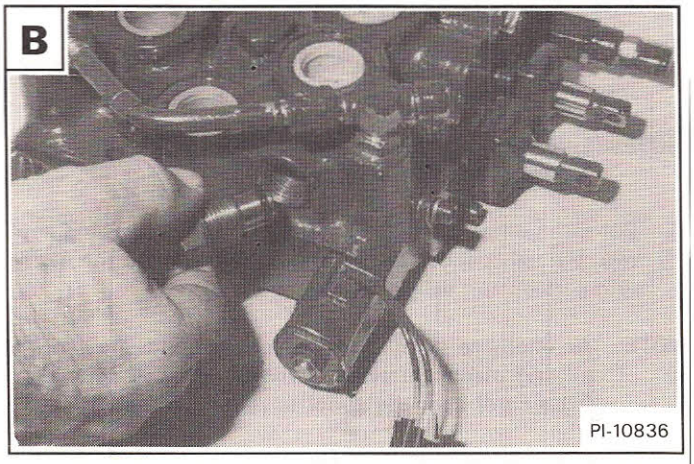
Remove the electric solenoid valve from the control valve [A].

NOTE: Always use new O-rings and back-up washers when assembling.



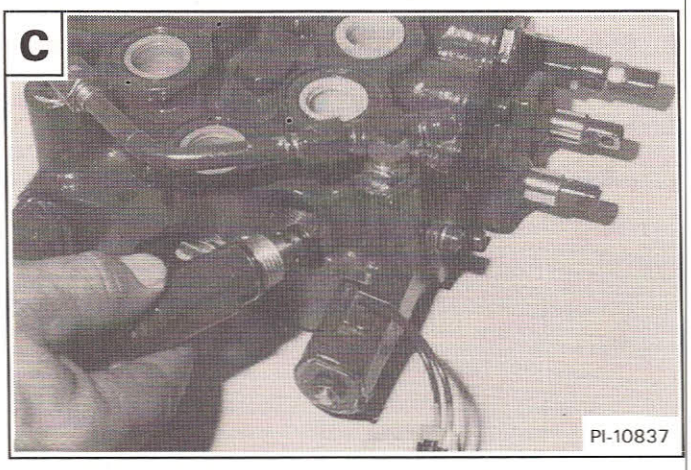
Remove the plug from the control valve (''H'' port; Page 1) [B].

Replace the O-ring.



Depending on the application of the auxiliaries, the control valve may be equipped with a port relief valve (''H'' port; Page 1) [C].

Remove the port relief valve and replace the O-rings and back-up washers (Page 3).



Inspection

Check the spools for wear or scratches.

Check that the spools are not loose in their bore.

Check that the centering springs are not broken.

Check that the load check valve seats are not worn.

Check the load check poppets for damage.

Check the rubber boots and retainers that they are not worn or damaged.

Replace the parts as needed.

IDENTIFICATION & INSTALLATION OF SPOOL SEAL

There are two types of seals for the control valve, a quad-ring seal and a lip seal. First identify the control valve (See Page 14 or 15) to find which seal is used. See the Parts Micro-Fiche for your model loader for the part number of the quad-ring seal or the lip seal used. Use the following procedure to install the seals into the control valve.

SHORT CHAMFER

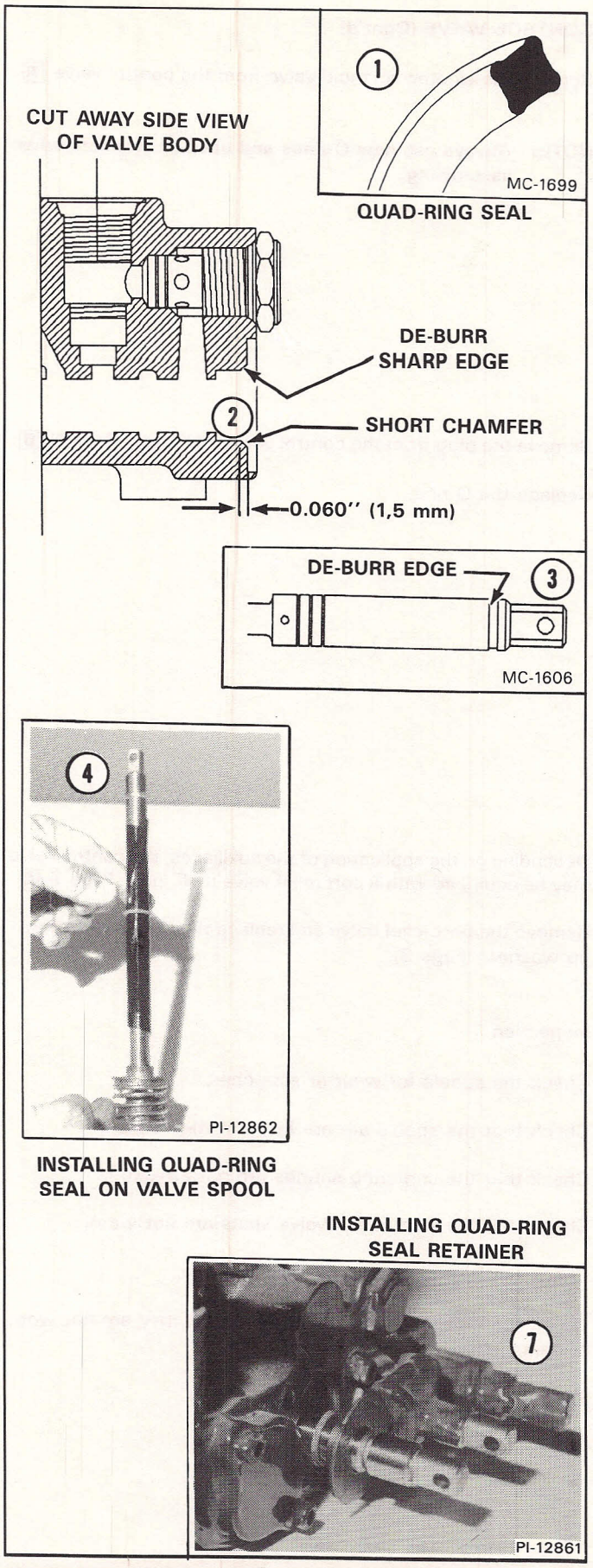
1. Uses only quad-ring seal.
2. Check the seal surface area for rust, corrosion, scratches, etc. Correct any irregularities before continuing. De-burr the sharp edge at the seal area with a file or de-burring tool (both ends).
3. At the linkage end of the spool, de-burr the rubber boot groove as needed.

NOTE: Lubricate with grease between the seal and retainer before installation (both ends).

4. Put clean oil on the valve spool. Install the quad-ring seal over the valve spool. Be Careful not to damage the quad-ring seal on the valve spool edges.

NOTE: An alternate method to protect the quad-ring seal by putting plastic material (Example: Discarded micro-fiche card) over the spool to protect the seal.

5. Install spool into the valve bore.
6. Slide the linkage end quad-ring seal over the rubber boot groove. Be Careful not to damage the seal.
7. Install the quad-ring seal retainer.
8. Continue with assembling the control valve.



IDENTIFICATION & INSTALLATION OF SPOOL SEAL (Cont'd)

LONG CHAMFER

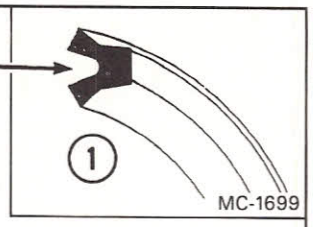
1. Uses only lip seal.
2. Check the seal surface area for rust, corrosion, scratches, etc. Correct any irregularities before continuing.

NOTE: Lubricate with grease between the seal and retainer before installation (both ends).

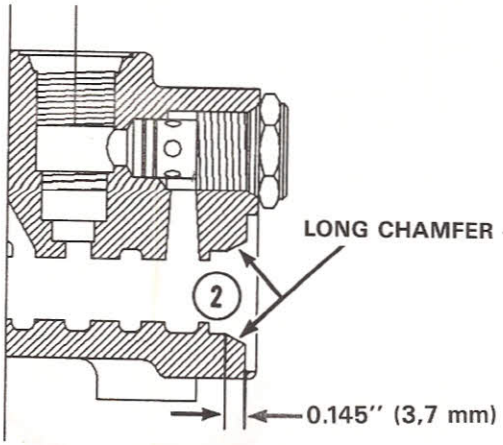
3. Put clean oil on the valve spool. Install the lip seal over the valve spool. Be Careful not to damage the lip seal on the valve spool edges.

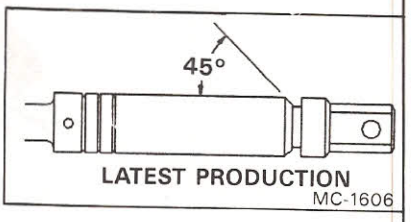
NOTE: An alternate method to protect the lip seal by putting plastic material (Example: Discarded micro-fiche card) over the spool to protect the seal.

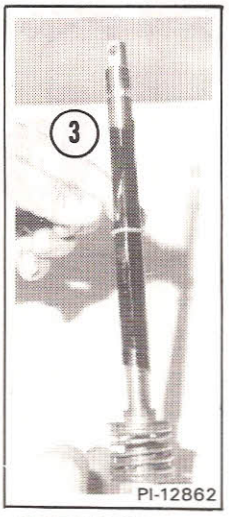
4. Install spool into the valve bore.
5. Slide the linkage end lip seal over the rubber boot groove. Be Careful not to damage the seal.
6. Install the seal retainer.
7. Continue with assembling the control valve.



CUT AWAY SIDE VIEW OF VALVE BODY

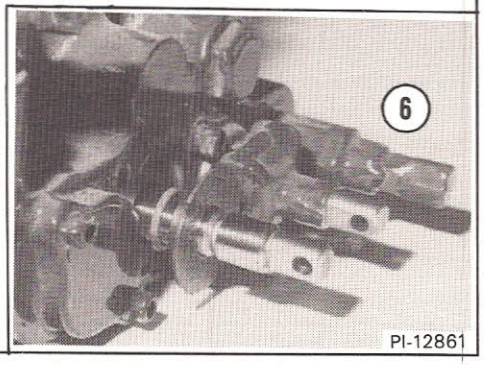






INSTALLING LIP SEAL ON VALVE SPOOL

INSTALLING LIP SEAL RETAINER



bobcat

HYDRAULIC CONTROL VALVE

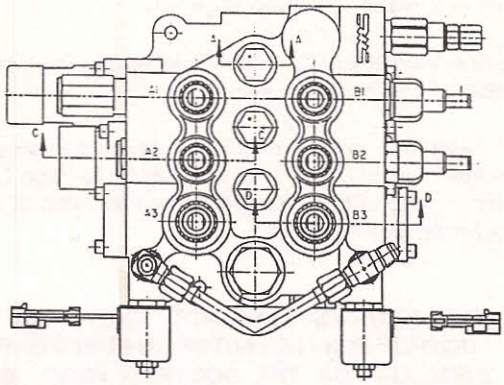

bobcat®

CONTROL VALVE IDENTIFICATION

Chart

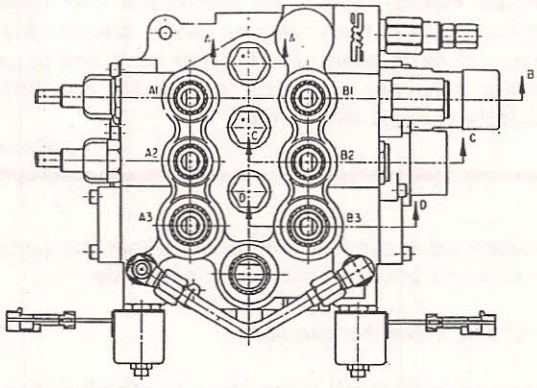
Item	750 Series	853 Series	2410 Loader
A1	Lift Cyl. Base End (Restrictor)	Lift Cyl. - Rod End	
A2	Tilt Cyl. Base End	Tilt Cyl. - Rod End	
A3	Auxiliary Hydraulics		
B1	Lift Cyl. Rod End	Lift Cy. Base End (Resitrictor)	Lift Cyl. Base End
B2	Tilt Cyl. Rod End	Tilt Cyl. - Base End	
B3	Auxiliary Hydraulics		
C1	Load Check Valve/Lift Function		
C2	Load Check Valve/Tilt Function		
C3	NO Load Check Valve Auxiliary Function		
C4	Oil Cooler By-Pass	Outlet Fluid Flow	
D1	Lift Spool Detent	Lift Spool	
D2	Centering Spring Tilt Spool	Tilt Spool	
D3	Auxiliary Spool		
E1	Port Relief	Anti-Cav. Valve	Port Relief for A1
E2	Anti-Cav. Valve	Plug	
F1	Anti-Cav. Valve	Port Relief for B1	
F2	Plug	Anti-Cav. Valve or Port Relief for B2	
G1	Lift Spool	Lift Spool Detent	
G2	Tilt Spool	Tilt Spool Centering Spring	
G3	Auxiliary Spool		
H1	Auxiliary Electric Solenoid		
H2	Plug/Port Relief (Optional) for B3		
H3	Auxiliary Electric Solenoid		
MR	Main Relief Valve		

750 SERIES



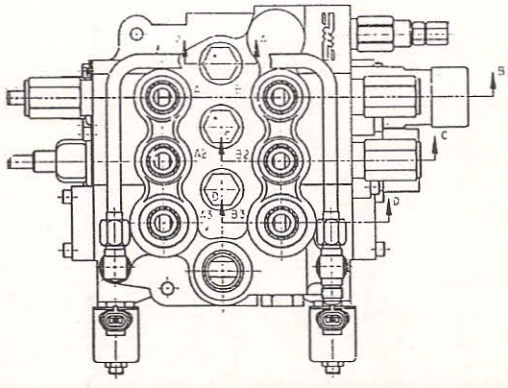
6588142

853 SERIES



6588236

2410 LOADER



6588772

CONTROL VALVE

The following tool is needed for reassembly of the Lift Spool Detent:

MEL1278 — Detent Tool (See Page 13)

See the Service Manual for your Model loader for removal and installation of the control valve.

The anti-cavitation valves, port relief valves and plugs are at different locations in the control valve. Refer to Page 1 (Control Valve Identification Chart) for the correct location of the parts for each Model control valve.

NOTE: THE PHOTO'S MAY NOT SHOW THE EXACT LOCATION FOR THE PART BEING REMOVED FROM OR INSTALLED ON THE CONTROL VALVE, BUT THE PROCEDURE IS THE SAME.

IMPORTANT

When making repairs on hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system.

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Mark each valve section and spool so that the parts will be returned to its original bore during assembly.

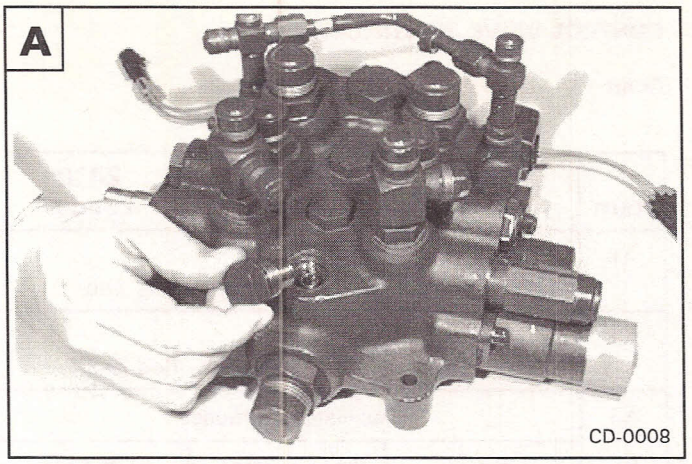
Load Check Valve Disassembly

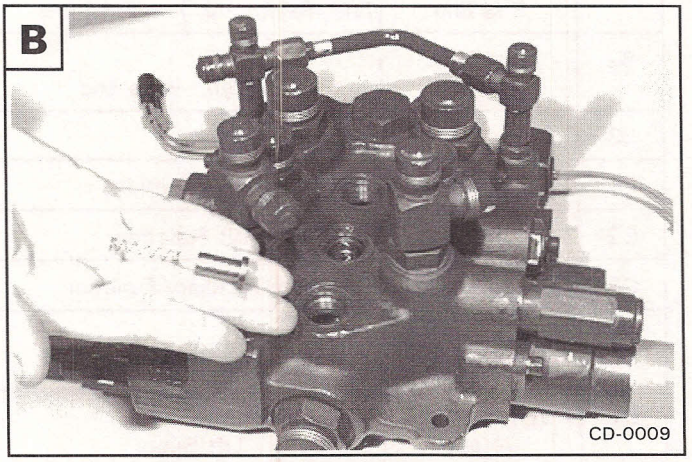
Remove the load check plugs (Item 1) and plug (Item 2) [A].

Remove the O-ring from each plug.

Remove the spring and poppet from both load check valves [B].

Check the load check valve seats and load check poppets for wear or damage. Replace the parts as needed.

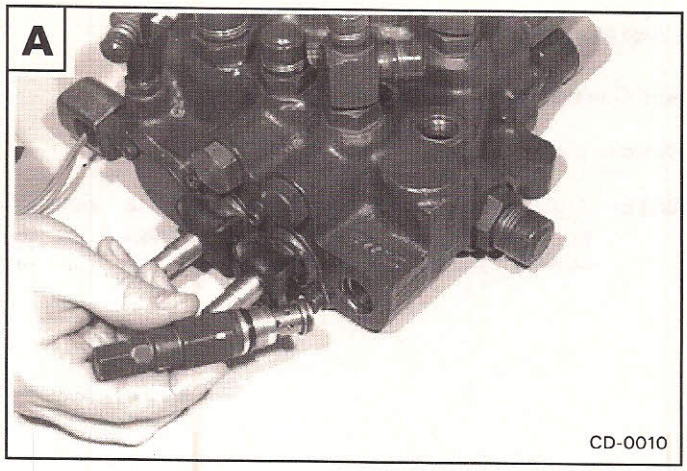




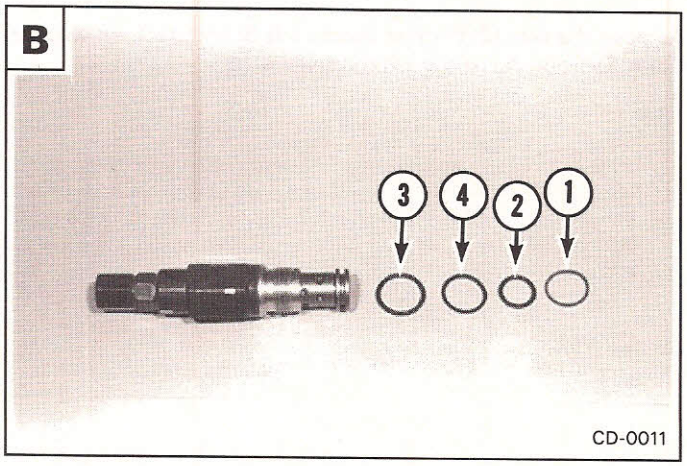
CONTROL VALVE (Cont'd)

Main Relief Valve Disassembly

Remove the main relief valve [A].



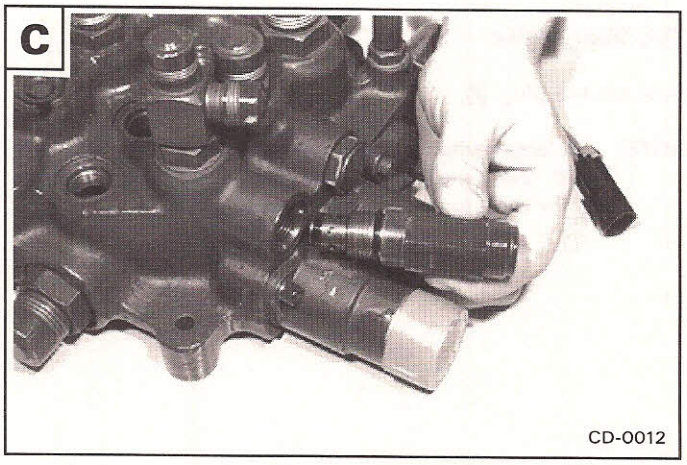
Remove the glide ring (Item 1), two (2) O-rings (Items 2 & 3) and back-up washer (Item 4) from the main relief valve [B].



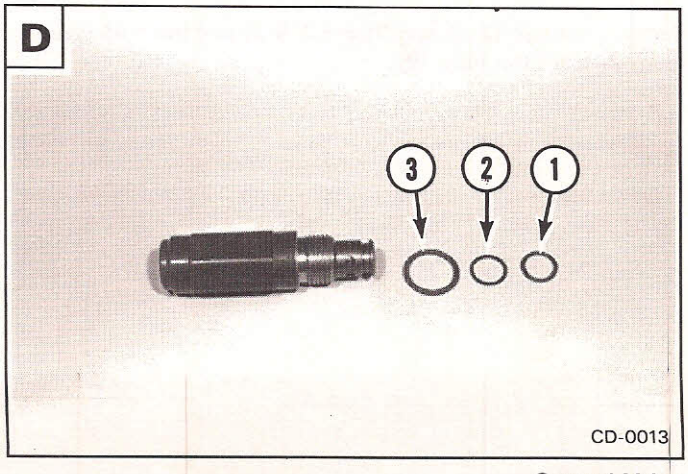
Port Relief Valve Disassembly

Remove the port relief valve [C].

NOTE: The port relief valve can be located in the "E", "F" or "H2" (If equipped with optional auxiliary port relief valve) ports depending on model. Refer to Page 1 for the correct location and quantity.



Remove the two (2) O-rings (Items 1 & 3) and back-up washer (Item 2) from the port relief valve [D].

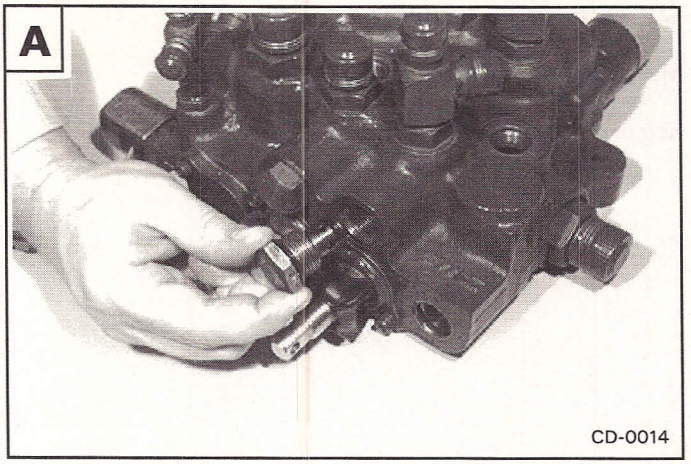


CONTROL VALVE (Cont'd)

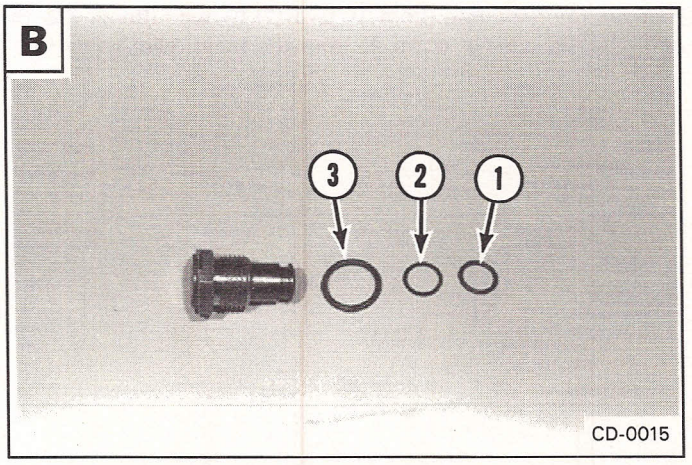
Anti-Cavitation Valve Disassembly

Remove the anti-cavitation valve [A].

NOTE: Anti-cavitation valves can be located in "E" and "F" ports depending on model. Refer to Page 1 for the correct location and quantity.



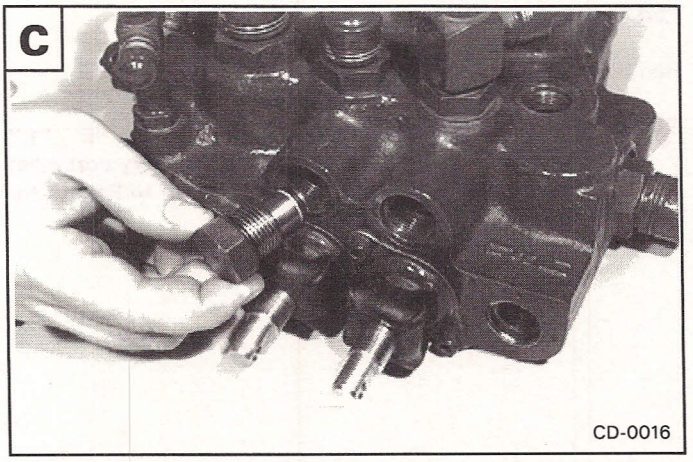
Remove the two (2) O-rings (Items 1 & 3) and back-up washer (Item 2) from the anti-cavitation valve [B].



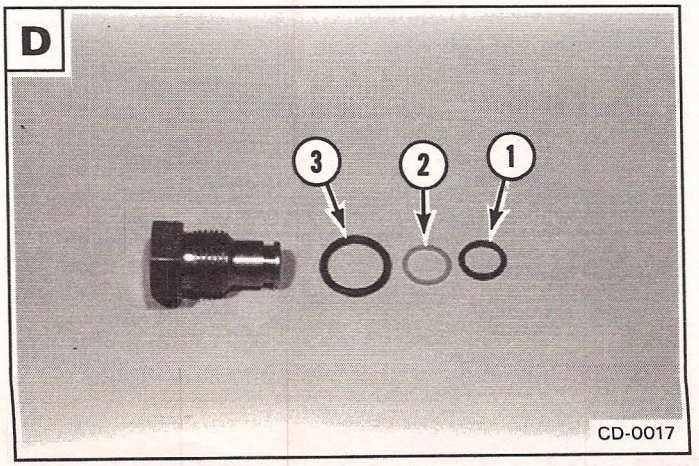
Plug Disassembly

Remove the plug [C].

NOTE: The anti-cavitation valve can be located in the "E", "F" and "H2" ports depending on model. Refer to Page 1 for the correct location and quantity.



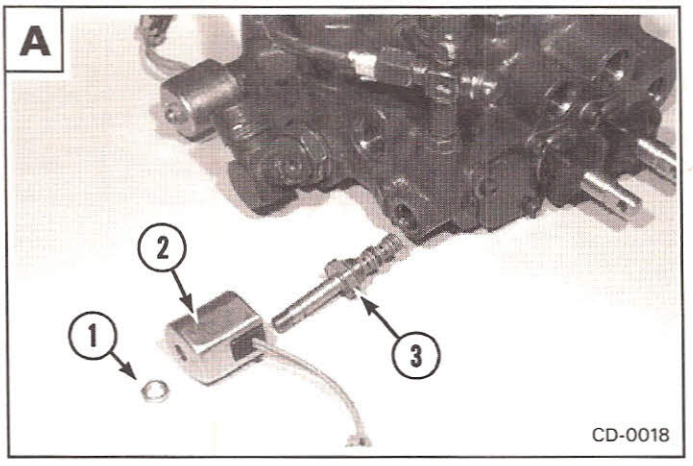
Remove the two (2) O-ring (Items 1 & 3) and back-up washer (Item 2) from the plug [D].



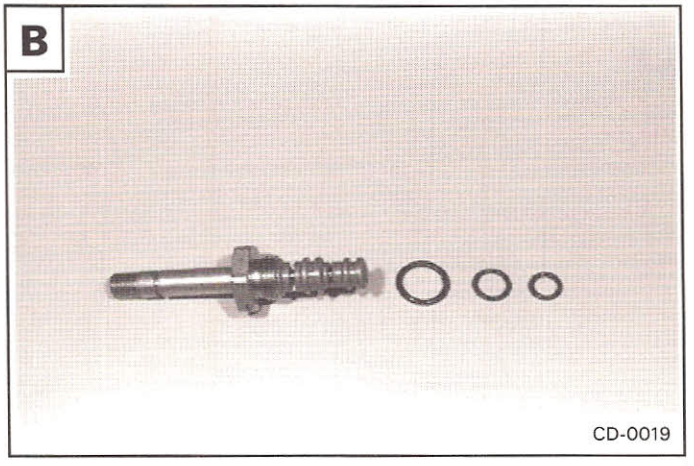
CONTROL VALVE (Cont'd)

Auxiliary Electric Solenoid Disassembly

Remove the nut (Item 1), solenoid coil (Item 2) and solenoid valve (Item 3) from the valve body [A].

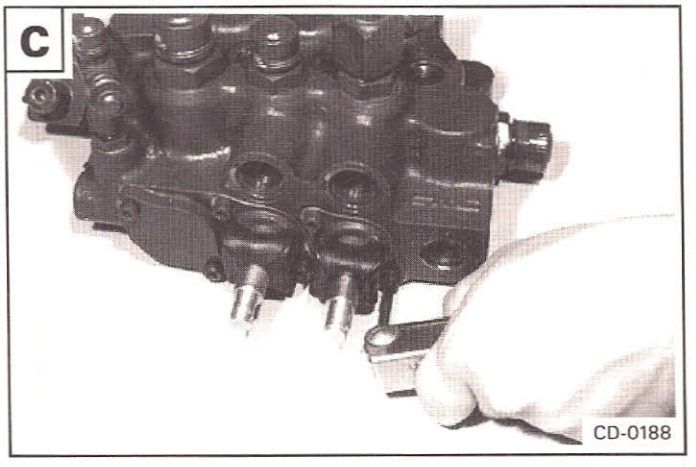


Remove the three (3) O-rings from the solenoid valve [B].



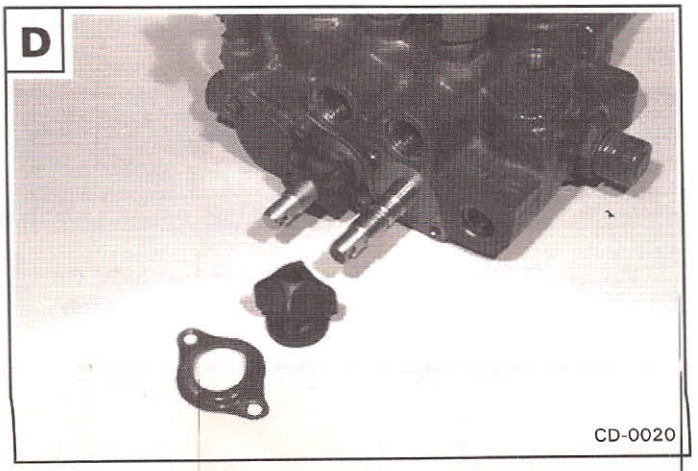
Rubber Boot Disassembly

Remove the two (2) screws from the rubber boot retainer [C].



Remove the rubber boot and retainer [D].

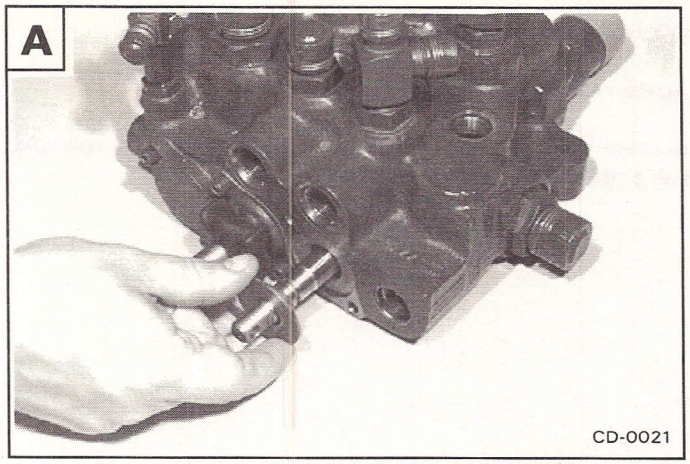
Check the rubber boot for wear or damage. Replace as necessary.



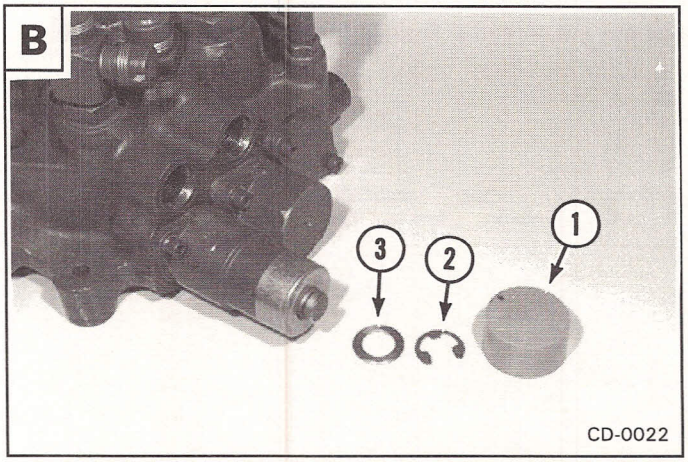
CONTROL VALVE (Cont'd)

Lift Spool and Detent Disassembly

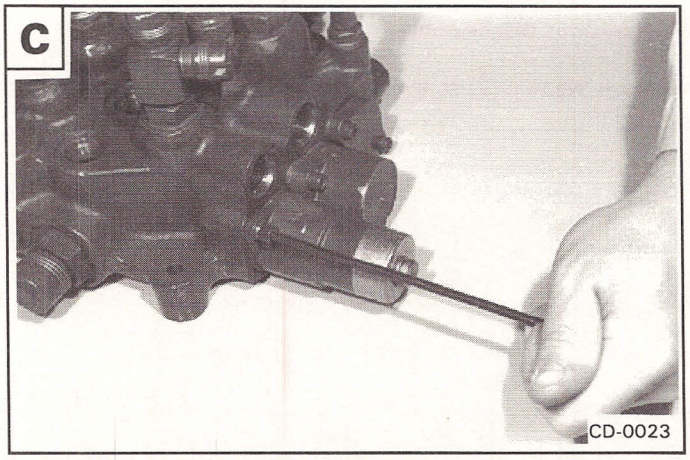
Remove the back-up washer [A].



Remove the cap (Item 1), snap ring (Item 2) and washer (Item 3) [B].



Remove the two (2) screws and two (2) lock washers from the detent cap [C].



While holding the detent sleeve in position with a punch, remove the detent cap [D].

IMPORTANT

The detent assembly has small springs and balls. Do not loose these parts during disassembly and assembly.

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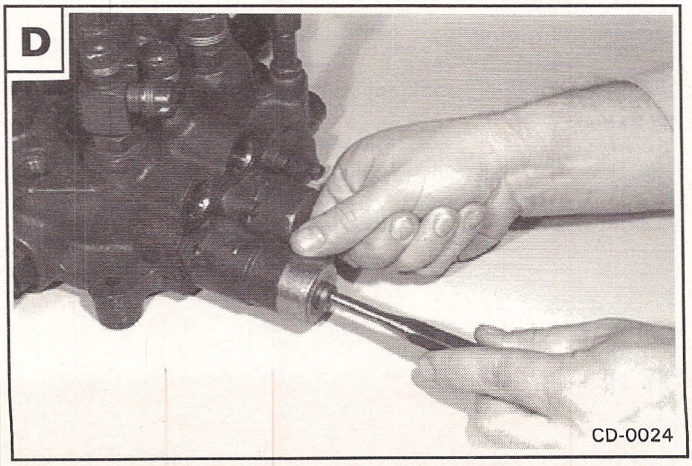
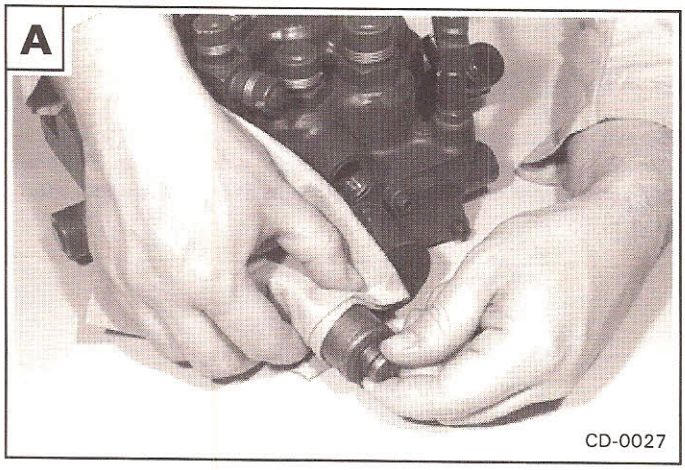


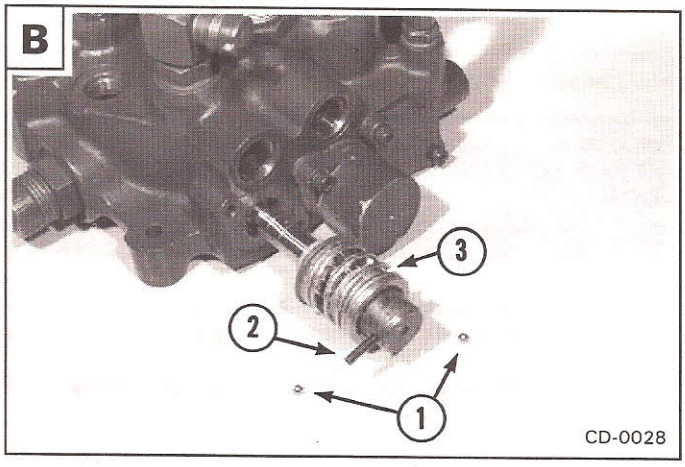
Lift Spool and Detent Disassembly (Cont'd)

Put a clean cloth around the detent sleeve and spring to catch the detent balls. Remove the detent sleeve [A].

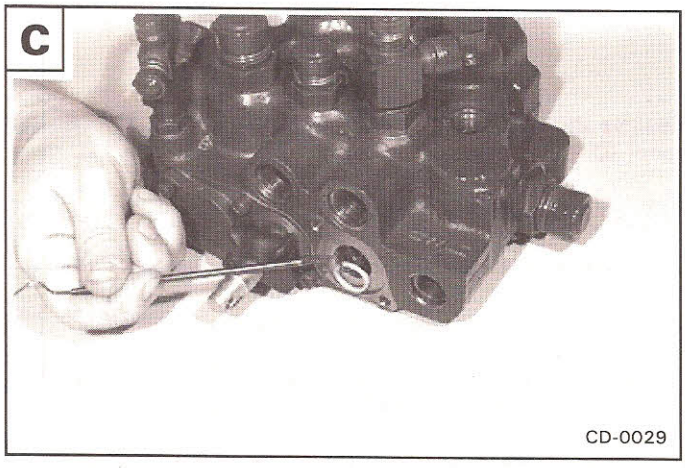


Remove the two (2) detent balls (Item 1) and spring (Item 2) from the detent adapter [B].

Remove the spool assembly (Item 3) from the valve body [B].



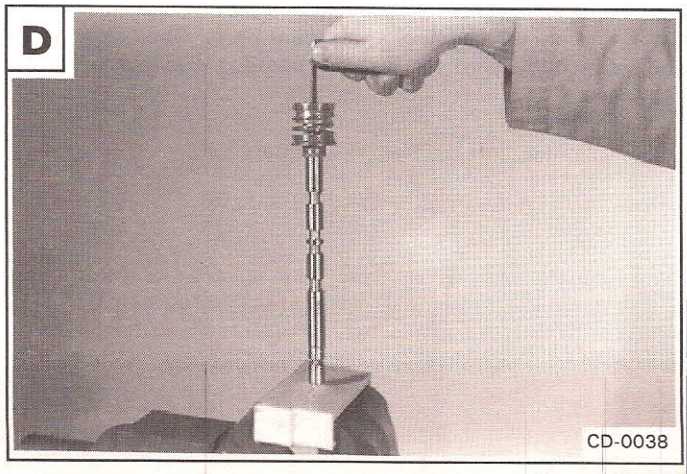
Use an O-ring pick to remove the spool seal from the linkage end of the spool bore [C].



Put the linkage end of the spool in a vise [D].

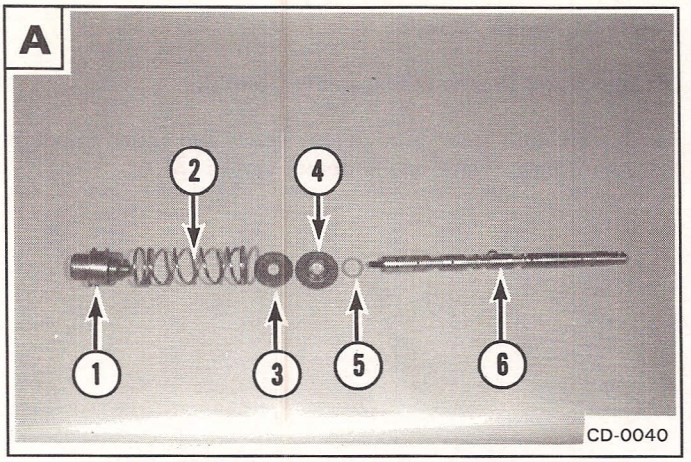
Loosen the detent adapter [D].

NOTE: The detent adapter is under spring pressure. BE CAREFUL when removing the detent adapter.



Lift Spool and Detent Disassembly (Cont'd)

Remove the detent adapter and spring centering collar assembly (Item 1), spring (Item 2), spring centering washer (Item 3), back-up washer (Item 4) and spool seal (Item 5) from the spool (Item 6) [A].



Hold a clean cloth around the detent adapter (Item 1) and spring centering collar (Item 2) to catch the detent balls. Remove the detent adapter [B].

IMPORTANT

The detent assembly has small springs and balls. Do not loose these parts during disassembly and assembly.

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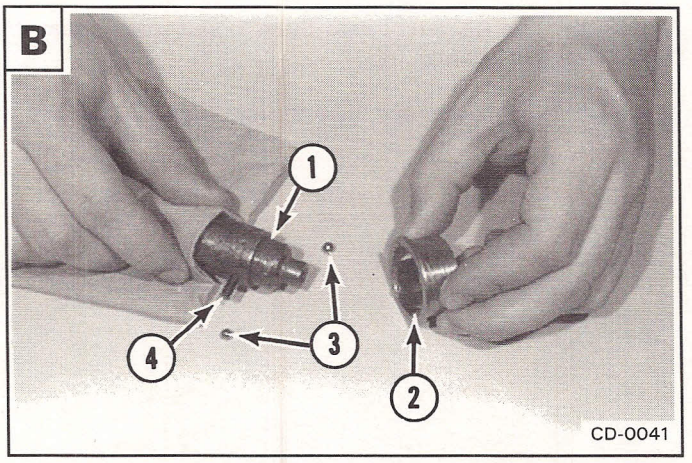
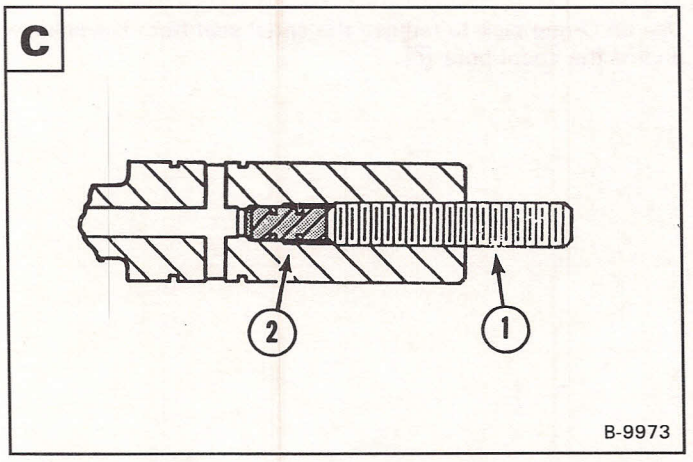


Remove the two (2) detent balls (Item 3) and spring (Item 4) from the detent adapter (Item 1) [B].

Remove the stud (Item 1) and plastic plug (Item 2) from the spool [C].



Removal of the plastic plug:

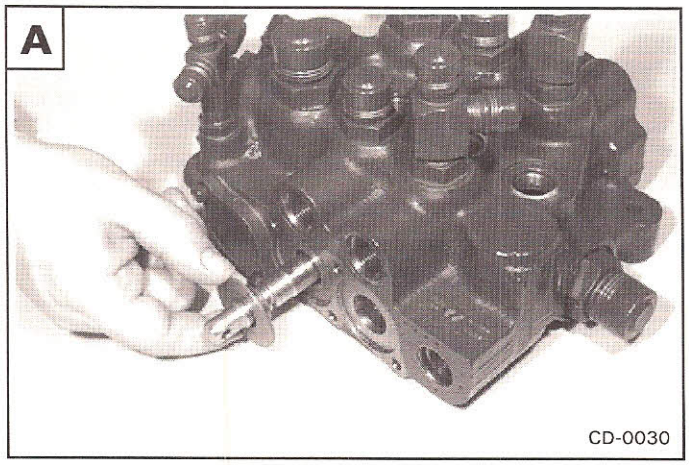
1. Make a center point in the plug using a 3/16'' drill.
2. Drill a hole all the way through the plug using a 7/64'' drill.
3. Turn a 6-32 UNC tap into the plug. Pull the tap and plug out of the spool. BE CAREFUL not to break the tap.
4. Clean all the debris from the inside of the spool bore.

Clean and dry all lift spool and detent parts. Check the parts and valve body bore for wear or damage. Replace parts as needed.

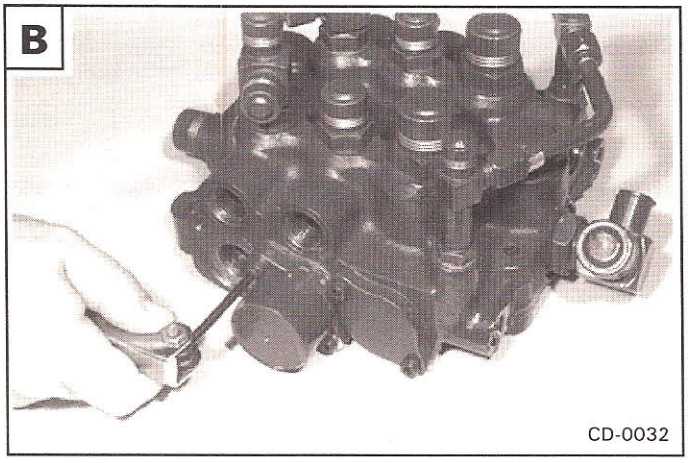
CONTROL VALVE (Cont'd)

Tilt Spool and Centering Spring

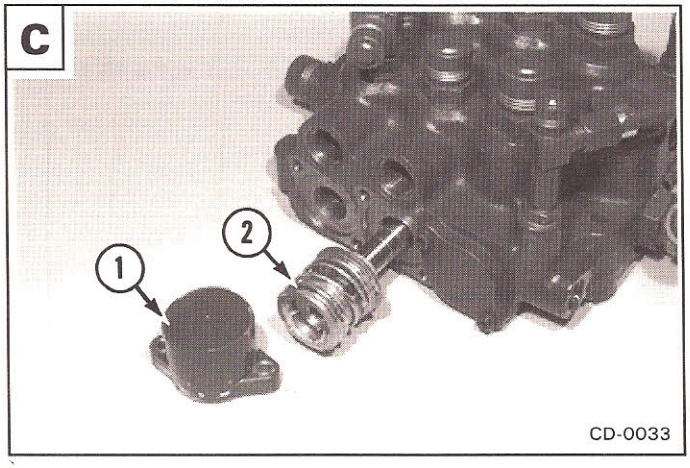
Remove the back-up washer [A].



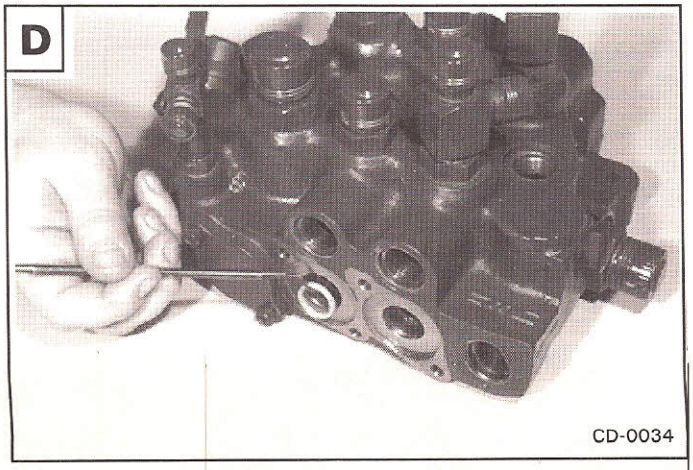
Remove the screws from the end cap [B].



Remove the end cap (Item 1) and spool assembly (Item 2) from the valve body [C].



Use an O-ring pick to remove the spool seal from the linkage end of the spool bore [D].

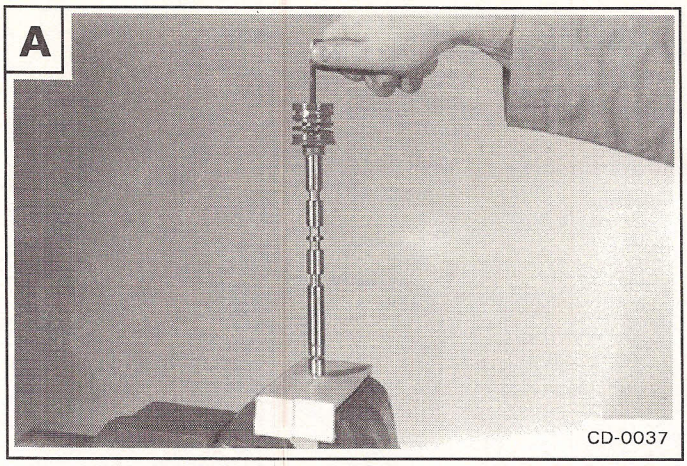


Tilt Spool and Centering Spring (Cont'd)

Put the linkage end of the spool in a vise [A].

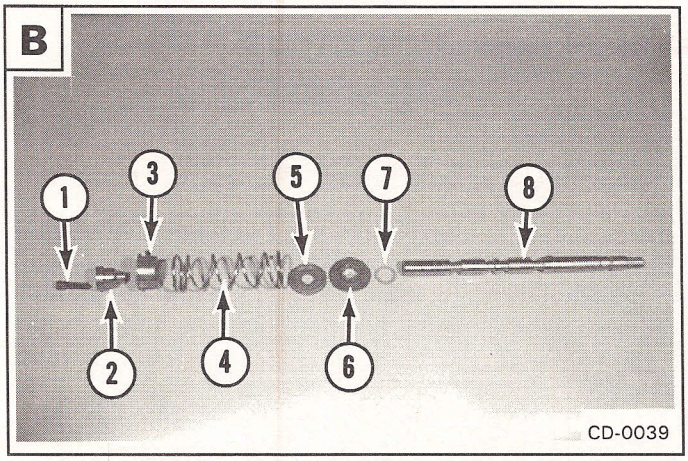
Loosen the screw [A].

NOTE: BE CAREFUL when removing the screw. The screw is under spring pressure.



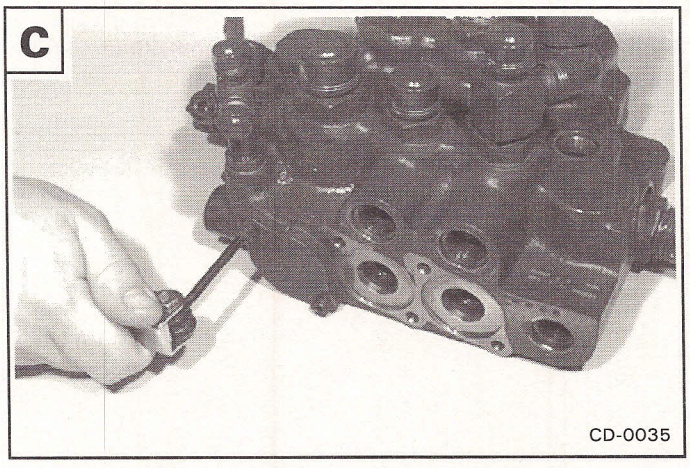
Remove the screw and lock washer (Item 1), adapter (Item 2), spring centering collar (Item 3), spring (Item 4), spring centering washer (Item 5), back-up washer (Item 6) and spool seal (Item 7) from the spool (Item 8) [B].

Clean and dry all tilt spool and centering spring parts. Check the parts and valve body bore for wear or damage. Replace parts as needed.



Auxiliary Spool Disassembly

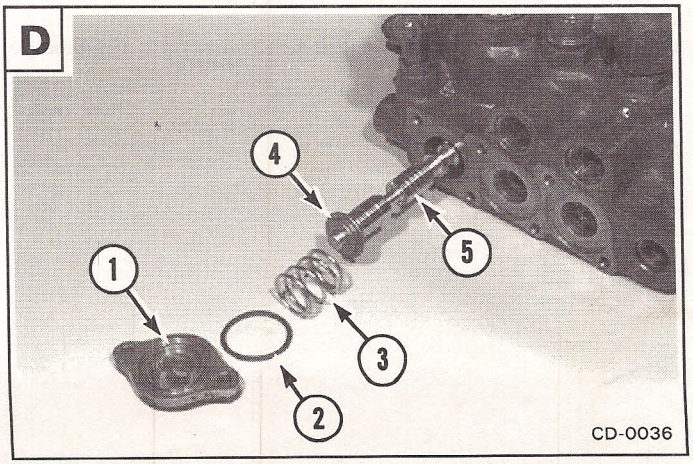
Remove the two (2) screws from both end plates [C].



Remove the end plate (Item 1) O-ring (Item 2), spring (Item 3) and spring centering washer (Item 4) from both ends of the valve body [D].

Remove the spool (Item 5) from the valve body [D].

Clean and dry all auxiliary spool parts. Check the parts and valve body bore for wear or damage. Replace parts as needed.



CONTROL VALVE (Cont'd)

All parts must be clean before assembly. Clean parts in solvent as needed and allow to air dry.

The anti-cavitation valves, port relief valves and plugs are at different locations in the control valve. Refer to Page 1 (Control Valve Identification Chart) for the correct location of the parts for each Model control valve.

NOTE: THE PHOTO'S MAY NOT SHOW THE EXACT LOCATION FOR THE PART BEING INSTALLED ON THE CONTROL VALVE, BUT THE PROCEDURE IS THE SAME.

Auxiliary Spool Assembly

Apply oil to the spool (Item 5) and install the spool into the valve body [A].

Apply a light coating of petroleum jelly to the two (2) new O-rings (Item 2). Install the O-rings into the end plates (Item 1) [A].

Install a spring centering washer (Item 4), spring (Item 3) and end plate (Item 1) on each end of the valve body [A].

Install two (2) new screws into each end plate [B].

Tighten the screws to 90-100 in.-lbs. (10,0-11,5 Nm) torque.

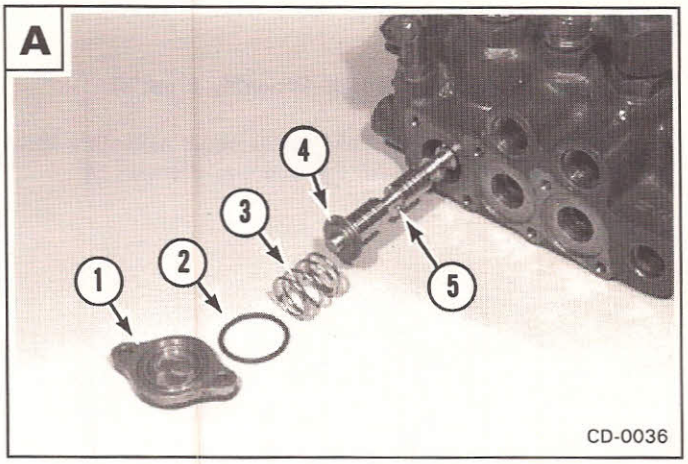
Tilt Spool and Centering Spring Assembly

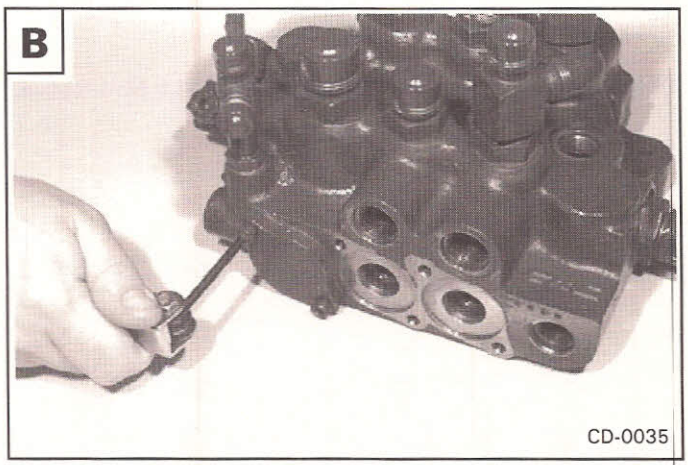
Apply a light coating of petroleum jelly to a new spool seal (Item 7). Install the spool seal with lips toward the valve body, over the spool (Item 8) [C].

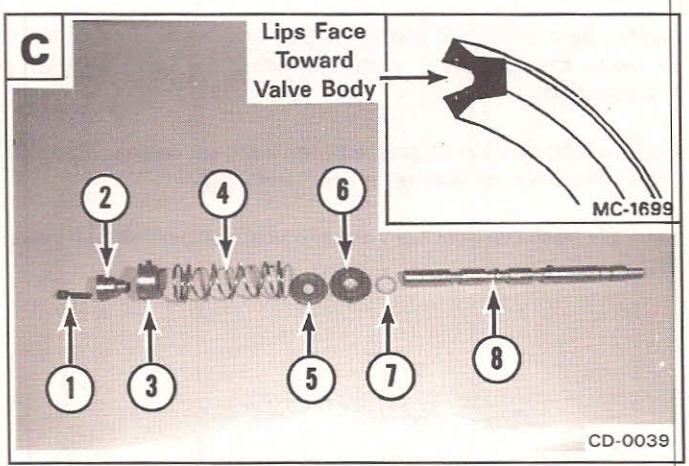
Apply a light coating of grease to the centering spring parts (Items 2-6). Install the back-up washer (Item 6), spring centering washer (Item 5), spring (Item 4), spring centering collar (Item 3) and adapter (Item 2) onto the spool (Item 8) [C].

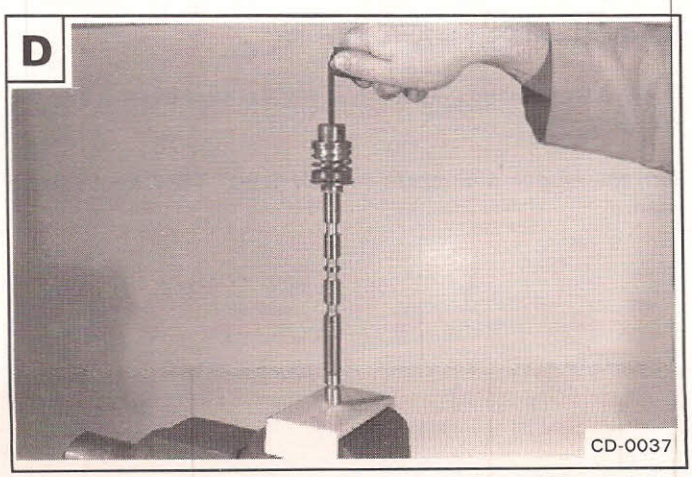
With the linkage end of the spool in a vise, install a screw and lock washer into the adapter [D].

Tighten the screw to 90-100 in.-lbs. (10,0-11,5 Nm) torque.



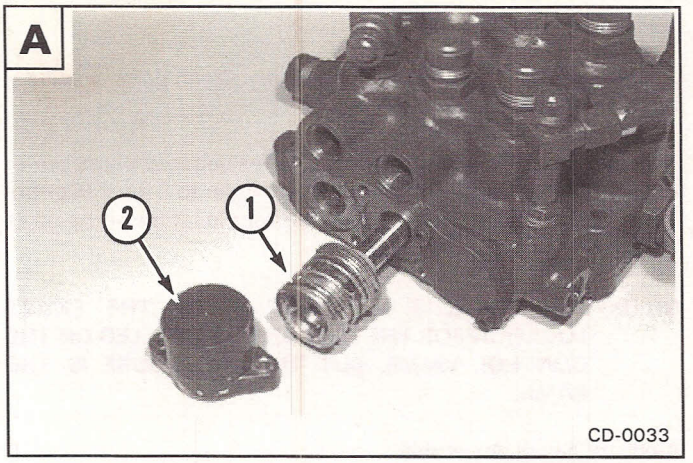






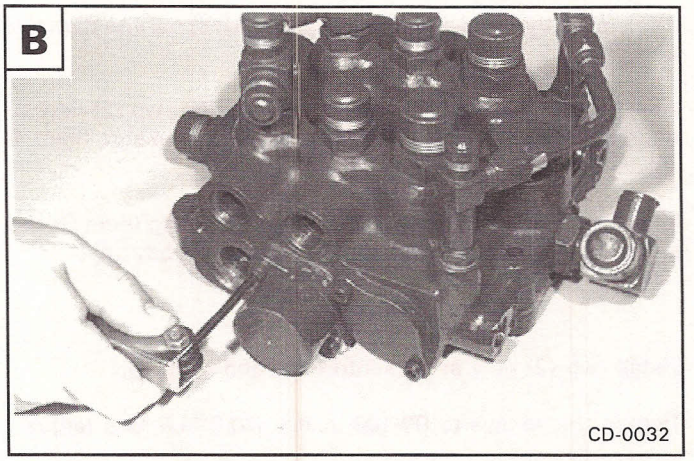
Tilt Spool and Centering Spring Assembly (Cont'd)

Apply oil to the spool assembly. Install spool assembly (Item 1) into the valve body. Install the end cap (Item 2) [A].



Install two (2) screws in the end cap [B].

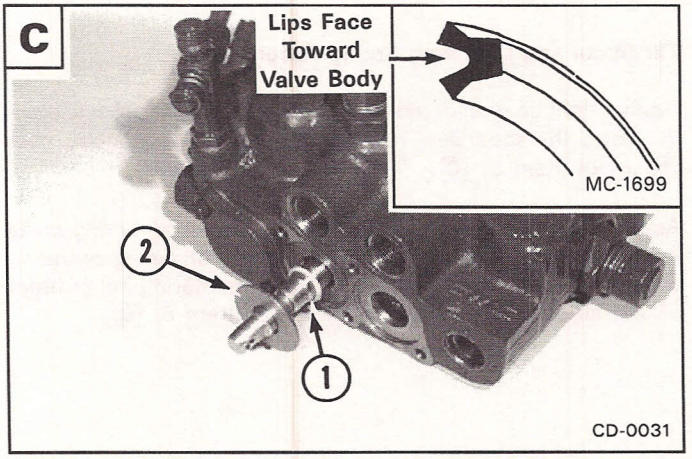
Tighten the screws to 90-100 in.-lbs. (10,0-11,5 Nm) torque.



Apply a light coating of petroleum jelly to a new spool seal (Item 1). Install the spool seal, with lips toward the valve body over the spool [C].

Apply a light coating of grease to the back-up washer (Item 2). Install the back-up washer on the spool [C].

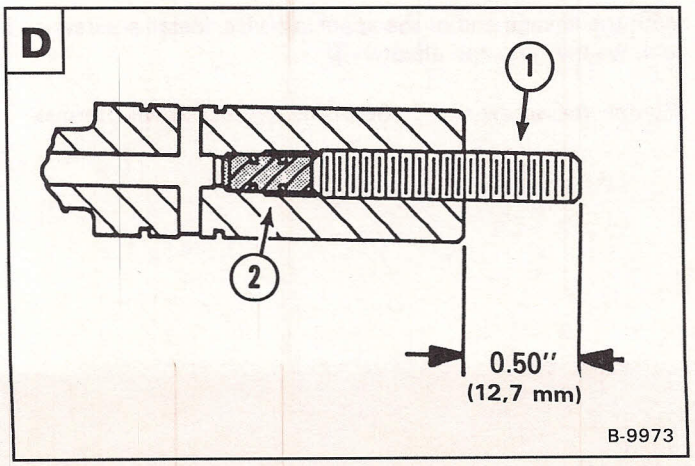
Carefully push the back-up washer and spool seal into the valve body.



Lift Spool and Detent Assembly

Install a new plastic plug (Item 2) and the stud (Item 1) into the lift spool [D].

Turn the stud in until approximately 0.50'' (12,7 mm) can be seen.



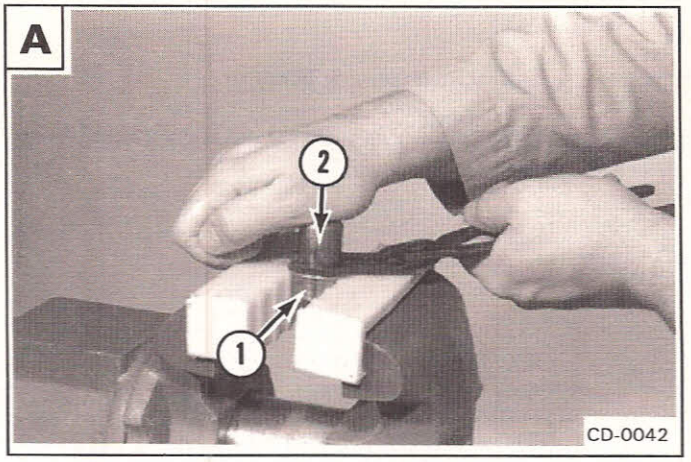
Lift Spool and Detent Assembly (Cont'd)

Apply a light coating of grease to all of the detent components before assembly.

Put the spring centering collar (Item 1) into a vise [A].

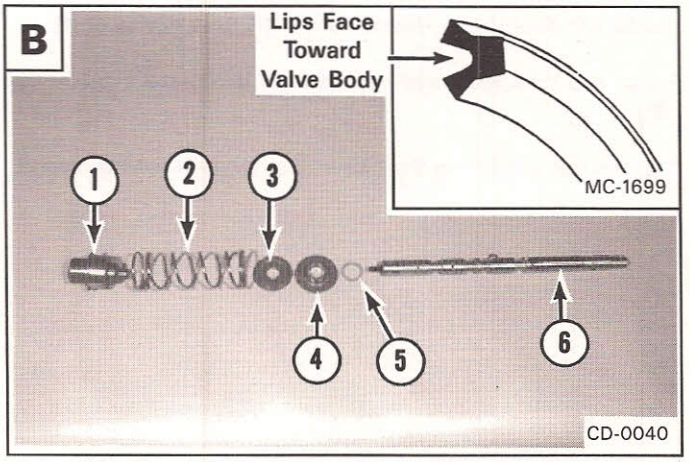
Install a spring and two (2) detent balls into the detent adapter (Item 2).

Holding the detent balls in position with the detent tool (MEL-1278), install the detent adapter (Item 2) into the spring centering collar (Item 1) [A].

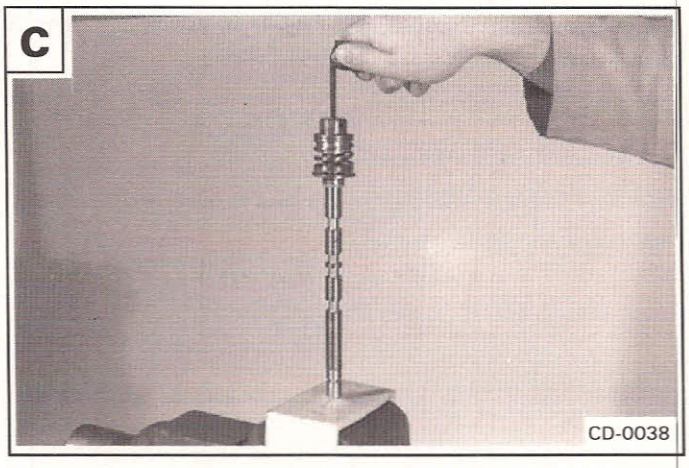


Apply a light coating of petroleum jelly to a new spool seal (Item 5). Install the spool seal, with lips toward the valve body, over the spool (Item 6) [B].

Apply a light coating of grease and install the back-up washer (Item 4), spring centering washer (Item 3), spring (Item 2) and detent adapter assembly (Item 1) onto the spool (Item 6) [B].



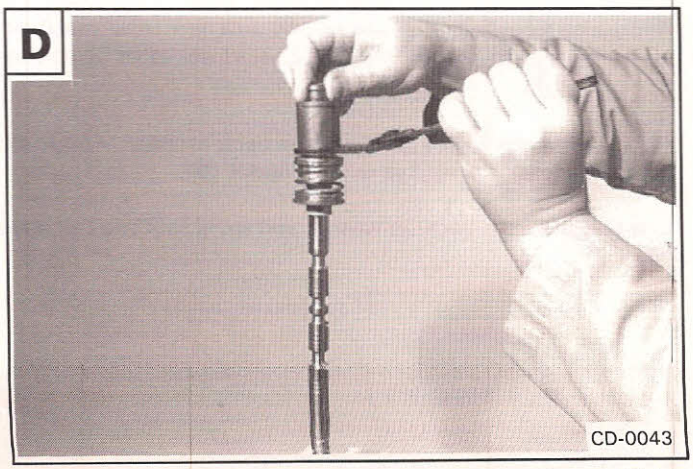
With the linkage end of the spool in a vise, tighten the detent adapter to 90-100 in.-lbs. (10,0-11,5 Nm) torque [C].



Apply a light coating of grease to the detent balls, spring and detent sleeve before assembly.

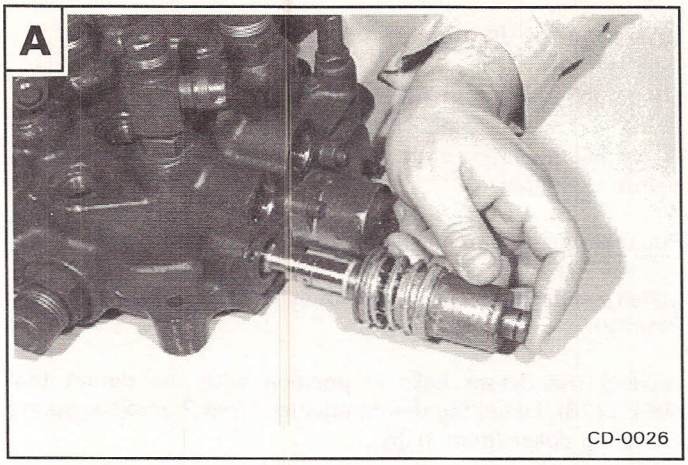
Install a spring and two (2) detent balls into the detent adapter (Item 1).

Holding the detent balls in position with the detent tool (MEL-1278), install the detent sleeve (Item 2) over the detent adapter (Item 1) [D].



Lift Spool and Detent Assembly (Cont'd)

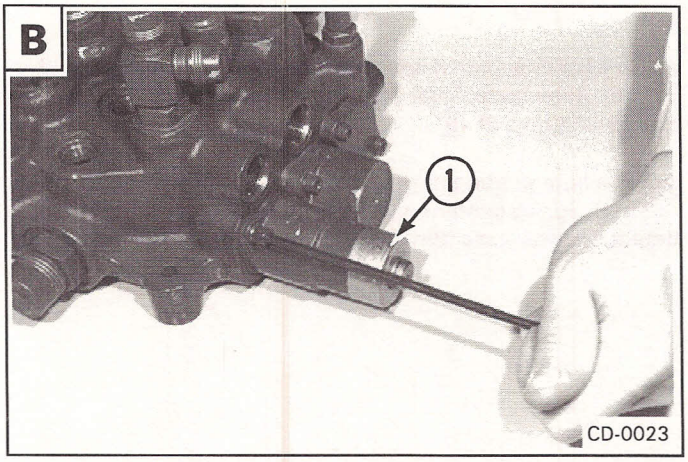
Apply oil to the spool assembly. Install the spool assembly into the valve body [A].



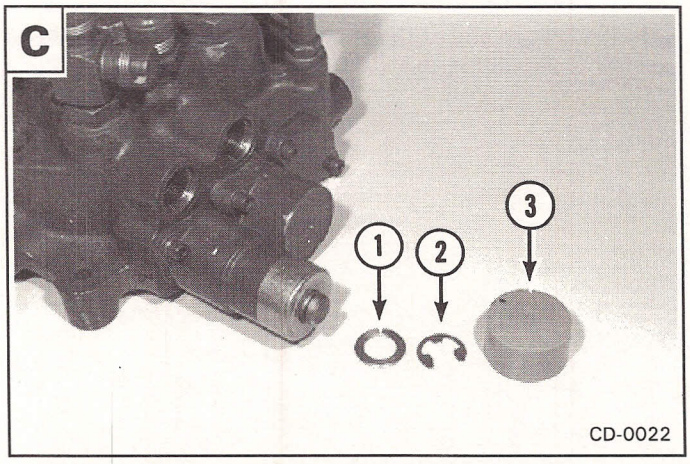
Install the detent cap (Item 1) over the detent sleeve [B].

Install two (2) screws and lock washers to retain the detent cap [B].

Tighten the screws to 90-100 in.-lbs. (10,0-11,5 Nm) torque.



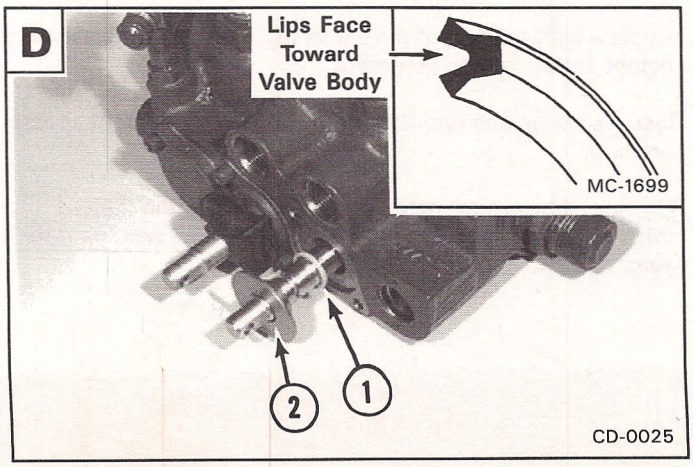
Install the washer (Item 1) snap ring (Item 2) and cap (Item 3) [C].



Apply a light coating of petroleum jelly on a new spool seal (Item 1). Install the spool seal, with lips toward the valve body, over the spool [D].

Apply a light coating of grease to the back-up washer (Item 2). Install the back-up washer on the spool [D].

Carefully push the back-up washer and spool seal into the valve body.

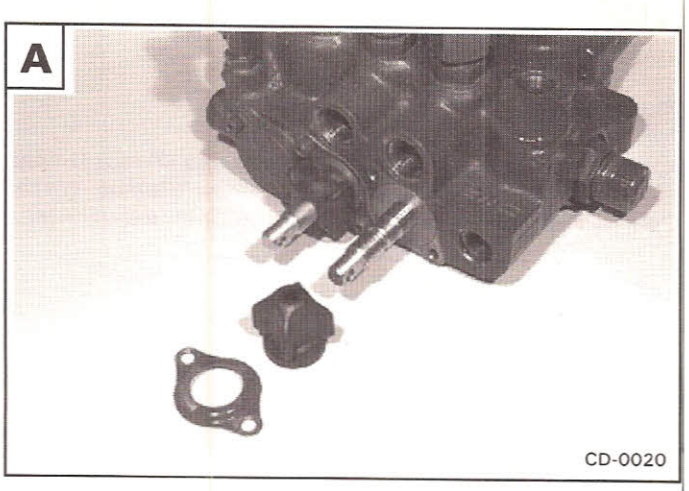


CONTROL VALVE (Cont'd)

Rubber Boot Assembly

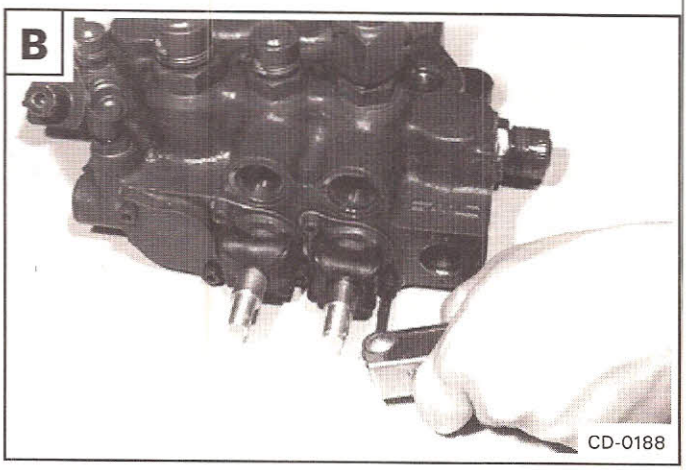
Install a new rubber boot in the retainer. Install the rubber boot and retainer onto the valve body [A].

Push the rubber boot toward the valve body to seat the rubber boot in the spool groove [A].



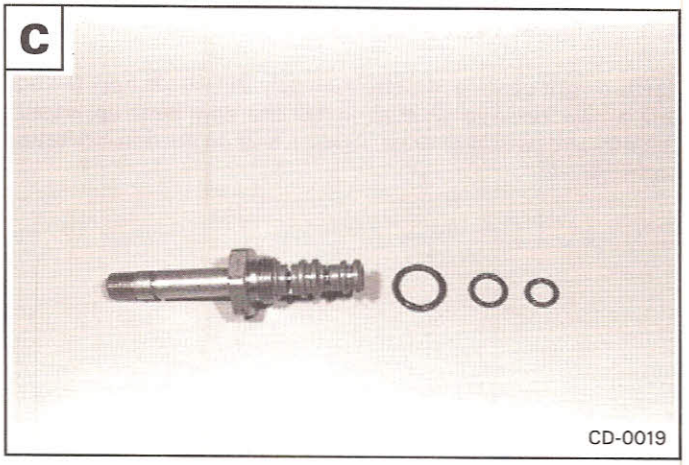
Install the two (2) screws through the rubber boot retainer [B].

Tighten the screws to 90-100 in.-lbs. (10,0-11,5 Nm) torque.



Auxiliary Electric Solenoid Assembly

Apply a light coating of petroleum jelly to three (3) new O-rings. Install the O-rings on the solenoid valve [C].

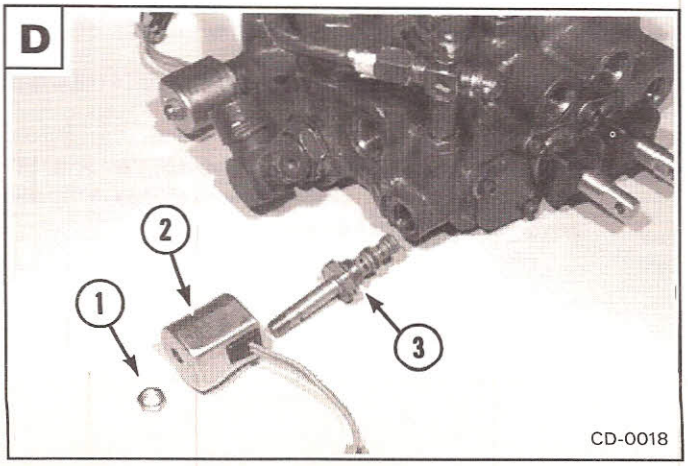


Install the solenoid valve (Item 3) into the valve body [D].

Tighten the solenoid valve to 8-12 ft.-lbs. (11-16 Nm) torque.

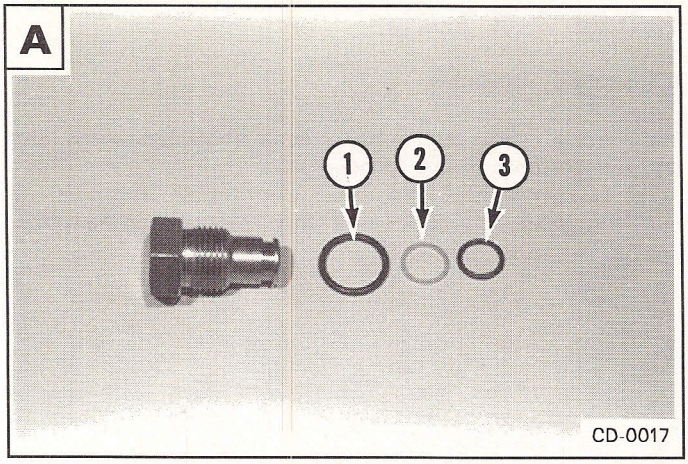
Install the solenoid coil (Item 2) and nut (Item 1) on the solenoid valve [D].

Tighten the nut to 9-12 in.-lbs. (1,0-1,4 Nm) torque.



Plug Assembly

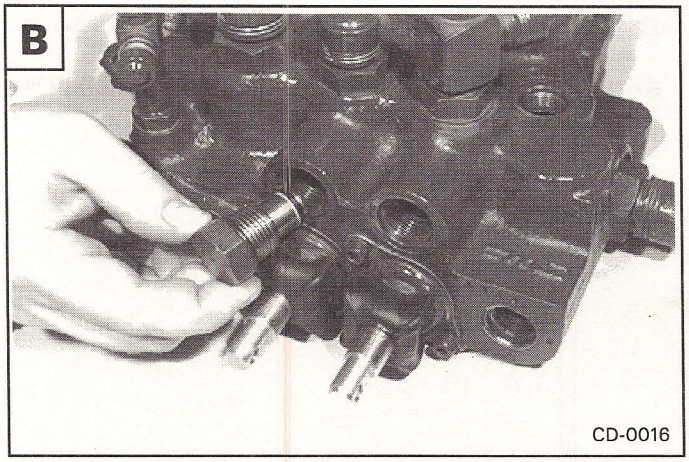
Apply a light coating of petroleum jelly to two (2) new O-rings and a new back-up washer. Install the new back-up washer (Item 2) and two (2) O-rings (Items 1 & 3) on the plug [A].



Install the plug into the valve body [B].

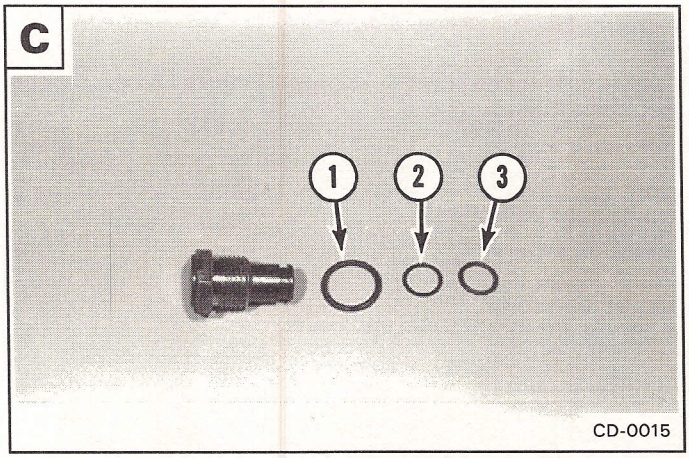
Tighten the plug to 35-40 ft.-lbs. (47-54 Nm) torque.

NOTE: Plugs can be located in the "E", "F" and "H2" ports depending on model. Refer to Page 1 for the correct location and quantity.



Anti-Cavitation Valve Assembly

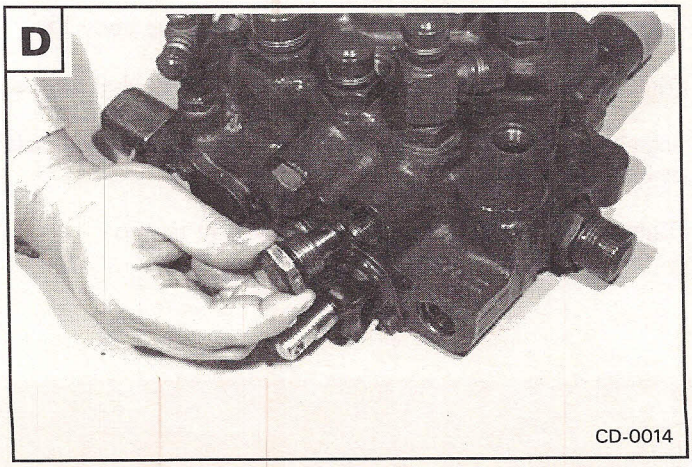
Apply a light coating of petroleum jelly to two (2) new O-rings and a new back-up washer. Install the new back-up washer (Item 2) and two (2) O-rings (Items 1 & 3) on the anti-cavitation valve [C].



Install the anti-cavitation valve into the valve body [C].

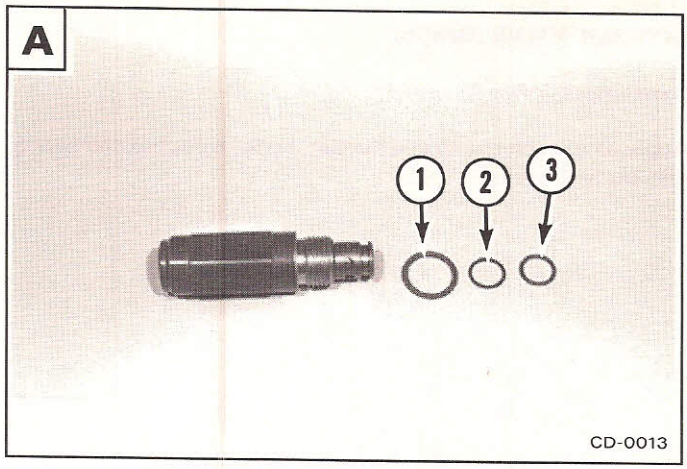
Tighten the anti-cavitation valve to 35-40 ft.-lbs. (47-54 Nm) torque.

NOTE: Anti-cavitation valves can be located in "E" and "F" ports depending on model. Refer to Page 1 for the correct location and quantity.



Port Relief Valve Assembly

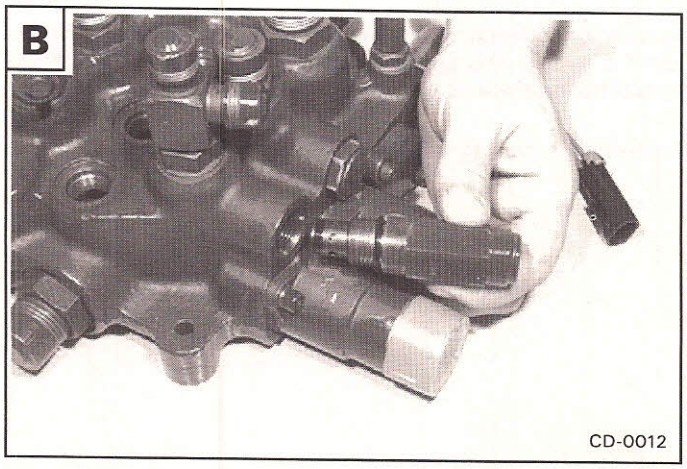
Apply a light coating of petroleum jelly to two (2) new O-rings and a new back-up washer. Install the new back-up washer (Item 2) and two (2) new O-rings (Items 1 & 3) on the port relief valve [A].



Install the port relief valve into the valve body [B].

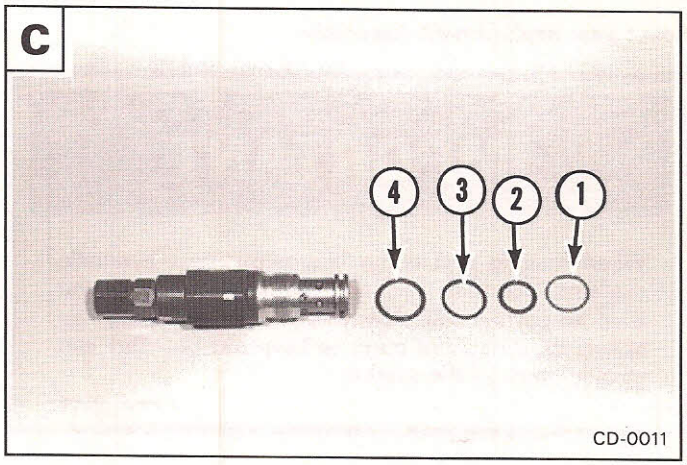
Tighten the plug to 35-40 ft.-lbs. (47-54 Nm) torque.

NOTE: The port relief valve can be located in the "E", "F" and "H2" (If equipped with optional auxiliary port relief valve) ports depending on model. Refer to Page 1 for the correct location and quantity.



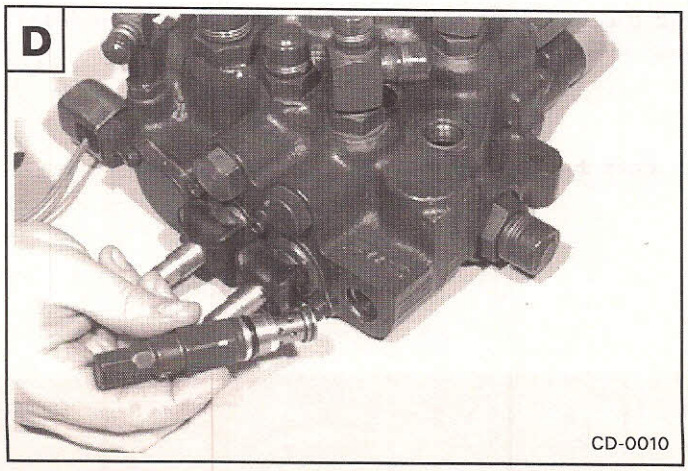
Main Relief Valve Assembly

Apply a light coating of petroleum jelly to a new glide ring, two (2) new O-rings and a new back-up washer. Install the two (2) new O-rings (Items 2 & 4), back-up washer (Item 3) and glide ring (Item 1) on the main relief valve [C].



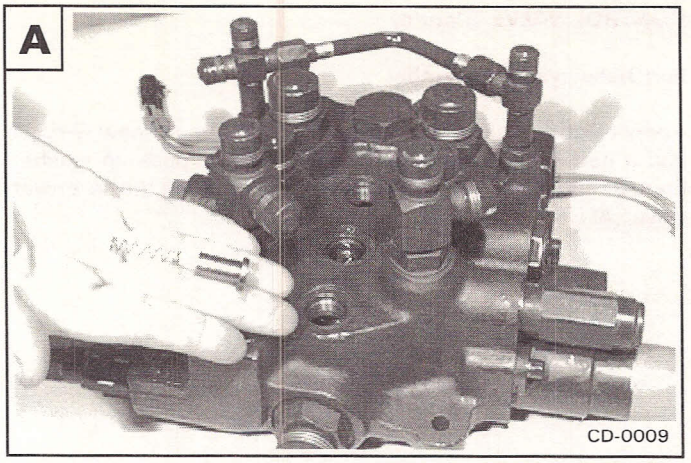
Install the main relief valve into the valve body [D].

Tighten the main relief valve to 35-40 ft.-lbs. (47-54 Nm) torque.



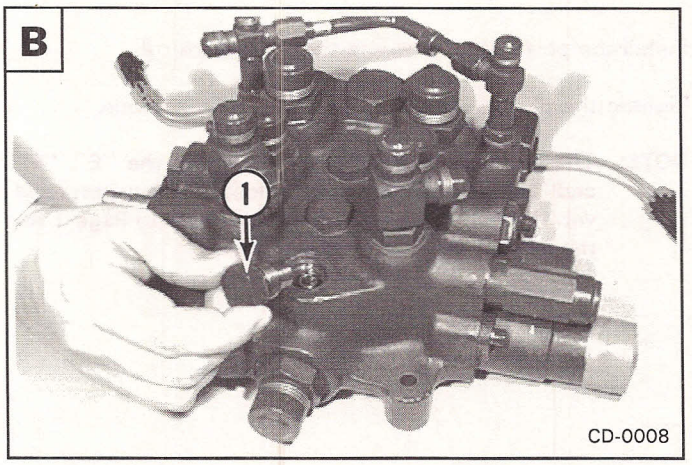
Load Check Valve Assembly

Apply oil to each spring and poppet. Install a poppet and spring into ports 1 and 2.



Apply a light coating of petroleum jelly to three (3) new O-rings. Install a new O-ring on both load check plugs and the plug. Install the load check plugs (Item 1) and plug (Item 2) [B].

Tighten each plug to 35-40 ft.-lbs. (47-54 Nm) torque.



Spool Seal Replacement Assembly

IMPORTANT

When making repairs on hydrostatic and hydraulic systems, clean the work area before disassembly and keep all parts clean. Always use caps and plugs on hoses, tubelines and ports to keep dirt out. Dirt can quickly damage the system

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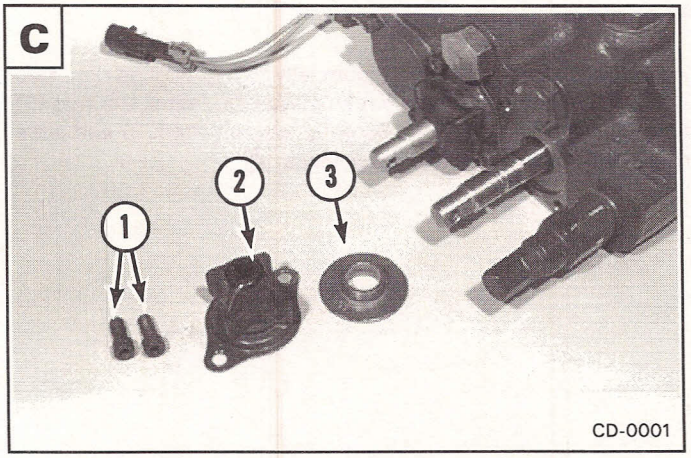
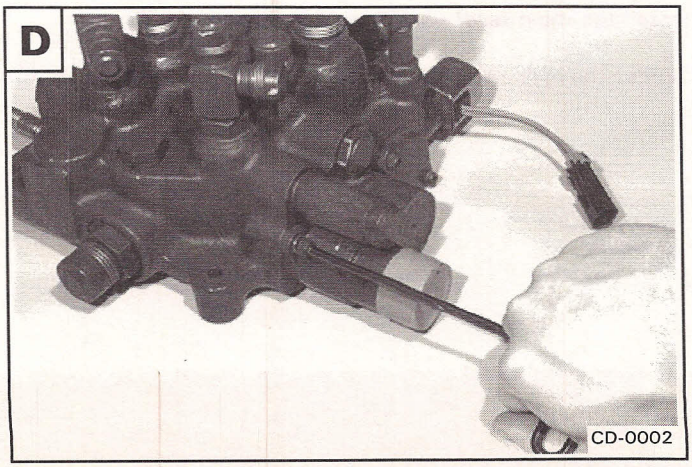
Remove the two (2) screws (Item 1), rubber boot (Item 2) and back-up washer (Item 3) [C].



Remove the two (2) screws [D].

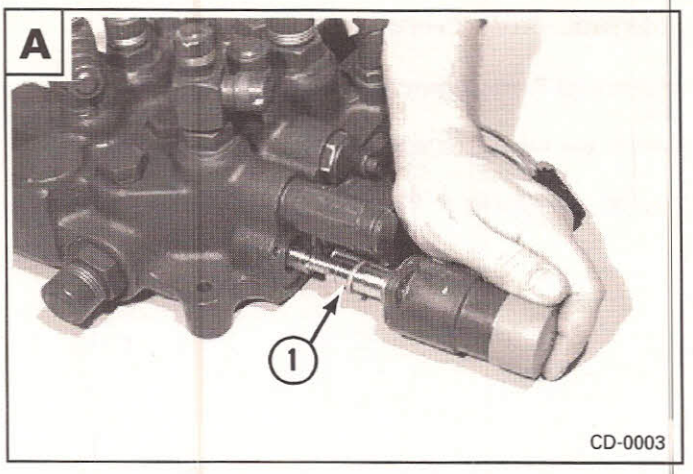


Spool Seal Replacement Assembly (Cont'd)

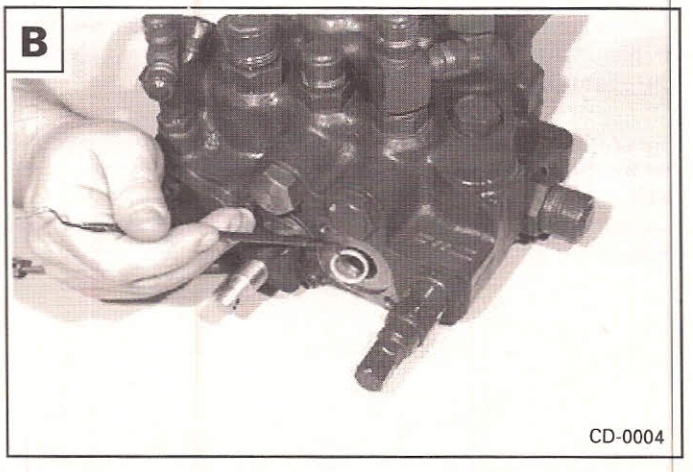
Remove the spool assembly from the bore by pushing on the linkage end of the spool [A].

NOTE: When servicing the lift spool, the detent end cap must not be removed from the spool or reassembly of the detent will be required. When servicing the tilt spool, the end cap can be removed.

Remove the spool seal (Item 1) over the spool [A].

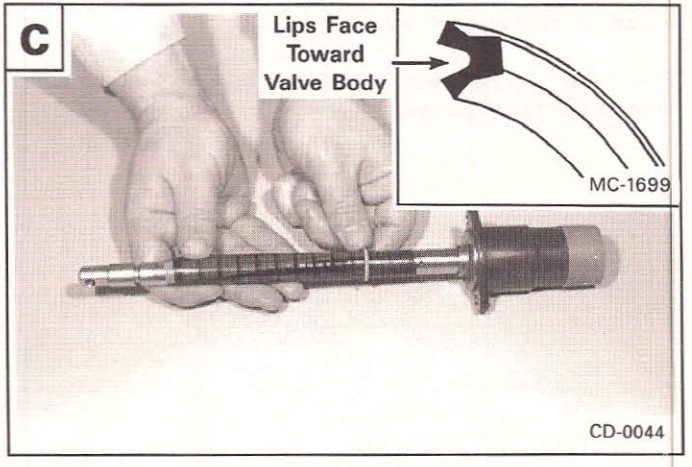


Remove the spool seal from the spool bore [B].

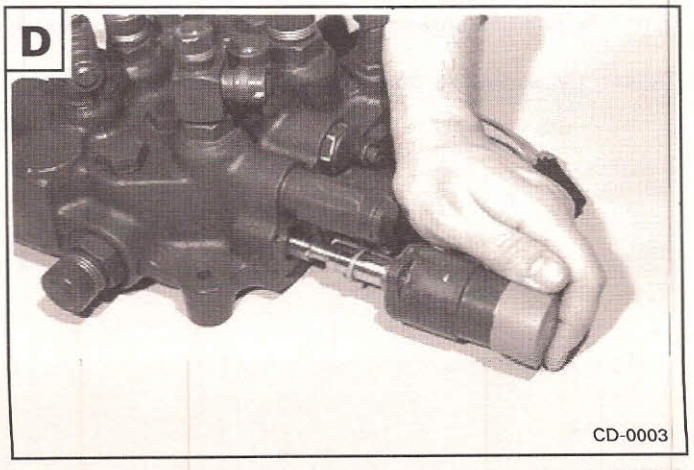


Apply a light coating of petroleum jelly to a new spool seal. Install the spool seal, with lips toward the valve body, over the spool [C].

NOTE: To protect the spool seal from damage during installation, put plastic material (example: discarded microfiche card) over the spool while installing the spool seal.



Apply oil to the spool. Install the spool into the valve body [D].

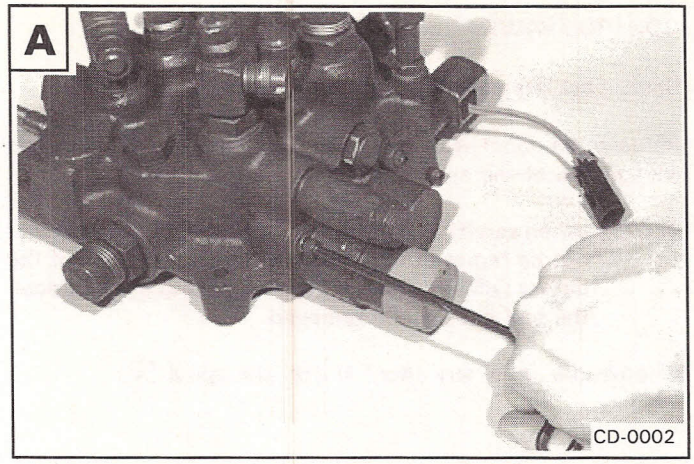


CONTROL VALVE (Cont'd)

Spool Seal Replacement Assembly (Cont'd)

Installl the two (2) screws to retain the end cap [A].

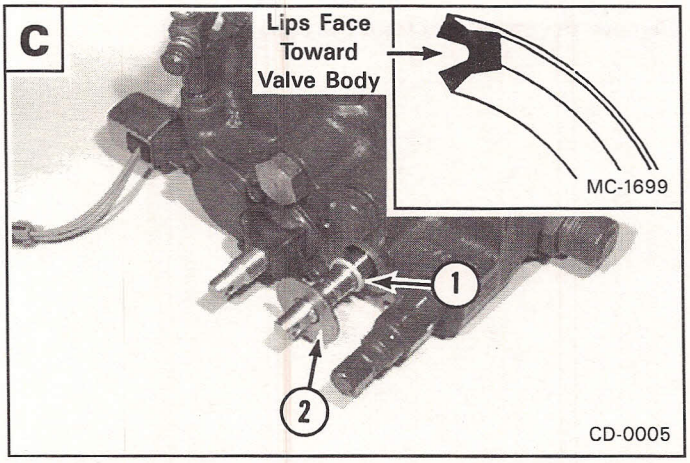
Tighten the screws to 90-100 in.-lbs. (10,0-11,5 Nm) torque.



Apply a light coating of petroleum jelly to a new spool seal (Item 1). Install the spool seal, with lips toward the valve body, over the spool [B].

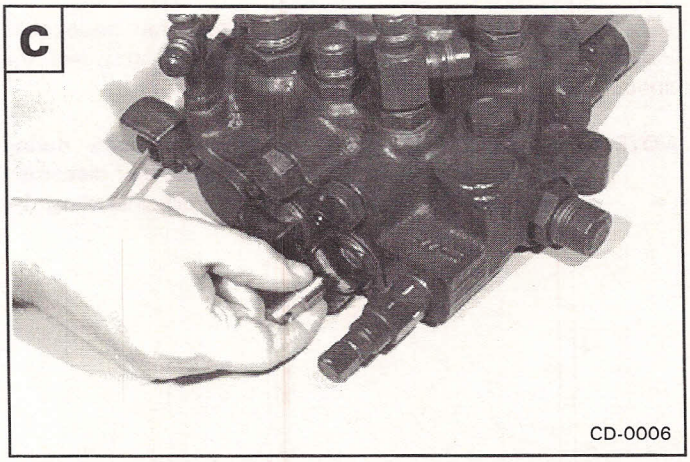
Apply a light coating of grease to the back-up washer (Item 2). Install the back-up washer on the spool [B].

Carefully push the back-up washer and spool seal into the valve body.



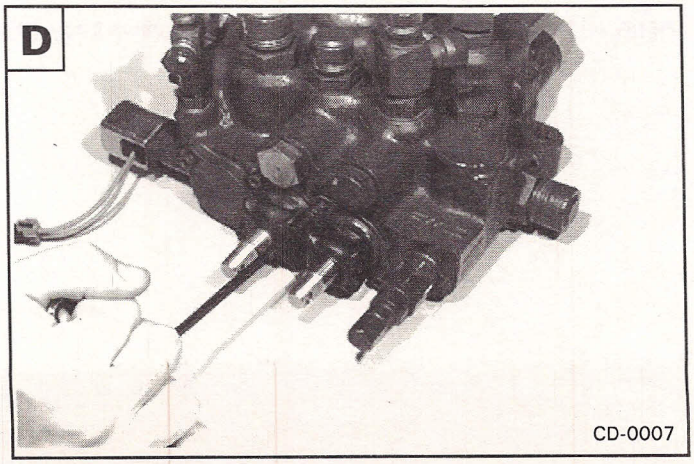
Install the rubber boot onto the valve body [C].

Push the rubber boot toward the valve body to seat the rubber boot in the spool groove.



Install the two (2) screws through the rubber boot retainer [D].

Tighten the screws to 90-100 in.-lbs. (10,0-11,5 Nm) torque.



GLOSSARY OF TERMS AND COMPONENTS

For Hydraulic and Hydrostatic Systems

AUXILIARY HYDRAULICS — A set of hydraulic lines, couplers and valve used to operate an attachment.

CAVITATION — A gaseous condition within oil which is caused by a pressure drop due to a restriction.

CYLINDER, HYDRAULIC — A device which converts fluid power into linear mechanical force and motion.

Cylinder, Lift — Used to raise the lift arms and attachment.

Cylinder, Tilt — Used to operate the bucket or attachment.

Base End — The fixed end of the hydraulic cylinder. This end has the larger displacement area.

Rod End — The end of a hydraulic cylinder which has the moveable rod. This end has a smaller displacement due to the area of the rod.

DETENT — A device used to hold the spool of a hydraulic valve engaged for continuous flow of fluid.

DRIFT — Motion due to internal leakage past internal components in the hydraulic system.

FLOW METER — A testing device which gauges the flow rate at a given pressure and temperature.

FLOW RATE — The volume of fluid passing a point in a given time, under specific pressure and temperature.

LEAKAGE — Fluid which escaped past seals, gears, pistons, etc.

MICRON — The size of openings in a hydraulic filter. One micron equals 0.00004 inch.

MOTOR, HYDROSTATIC — A device for converting fluid energy into mechanical force and motion - usually rotary motion. Basic design types are piston and geroller.

ORIFICE — A restricted passage in a hydraulic circuit. Usually a small hole limiting flow which creates a pressure differential in a circuit.

PISTON DISPLACEMENT — The volume of air or fluid moved or displaced by moving the piston from one end of its stroke to the other.

PRESSURE — Force per unit area, usually given in PSI.

Back Pressure — The pressure encountered on the return side of the system, due to restrictions (tubelines, coolers, filter, etc.).

Charge Pressure — A regulated pressure used to force fluid into the hydrostatic system.

Cracking Pressure — The pressure at which a relief valve, etc. begins to open and pass hydraulic fluid.

Differential Pressure — The difference in pressure between any two points in a system or a component (Also called pressure drop).

Operating Pressure — The pressure at which a system is normally operated.

Rated Pressure — The operating pressure which is recommended for a component or a system by a manufacturer.

System Relief Pressure — The pressure at which the system relief valve is set and will return oil back to tank.

NOTES

GLOSSARY OF TERMS AND COMPONENTS (Cont'd)

For Hydraulic and Hydrostatic Systems

PUMP, HYDRAULIC — A device which converts mechanical force and motion into hydraulic fluid power.

PUMP, HYDROSTATIC — A hydraulic pump, usually a piston type, operating at high pressure (3000 to 5000 PSI) and can pump to either port as directed.

RESTRICTOR — A device place in a line or passage which normally causes a pressure drop in one direction (Example: floating orifice).

ROTATING GROUP — A cylindrical block with a series of holes and pistons. The rotating group is usually connected to the splined pump shaft and runs at or near engine speed.

VALVE — A device which controls fluid flow direction and pressure.

Anti-Cavitation Valve — A valve used to supplement fluid flow from a return passage in the control valve to a cylinder port.

By-Pass Valve — A valve used to direct the normal flow of fluid to another route at a given pressure.

Closed Center Valve — A valve that does not allow fluid flow when it is in neutral.

Load Check Valve — A valve used to hold a load when the spool is initially moved to cause fluid flow to a pressure port.

Directional Control Valve — A valve used to direct fluid flow from a pump to actuators.

Flow Control Valve — A valve used to supply a specific volume of fluid for a specific function.

Open Center Valve — A valve that allows fluid flow when it is in neutral.

Pilot Operated Valve — A two-stage relief valve. A pilot senses system load and opens to allow a larger relief port to open.

Poppet Valve — A spring loaded valve which prevents fluid flow when it is closed against a seat.

Pressure Control Valve — A valve which directs fluid flow into a given passage according to the amount of pressure it senses.

Priority Flow Divider Valve — A valve that divides the flow by first satisfying the needs of one circuit and the remainder of the flow is directed to another circuit.

Relief Valve — A pressure limiting valve.

Replenishing Valve — A valve used to add fluid to maintain a full hydraulic or hydrostatic system.

Shuttle Valve — A valve moved by high pressure to open the return (low pressure) side of the hydrostatic drive loop for fluid to be returned to the system for cooling.

Shut-Off Valve — A valve used to allow fluid flow or block fluid flow.

Spool Directional Valve — A valve used to direct fluid flow from a pump to a working circuit.

Volume Control Valve — A valve used to regulate the amount of fluid that goes to a circuit.

VANES — Any plate, blade or similiar device attached to an axis and moved by air or liquid.

NOTES

GLOSSARY OF TERMS AND COMPONENTS (Cont'd)

For Hydraulic and Hydrostatic Systems

VISCOSITY — The internal resistance of a fluid, caused by molecular attraction, which makes it resist flow.

NOTES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