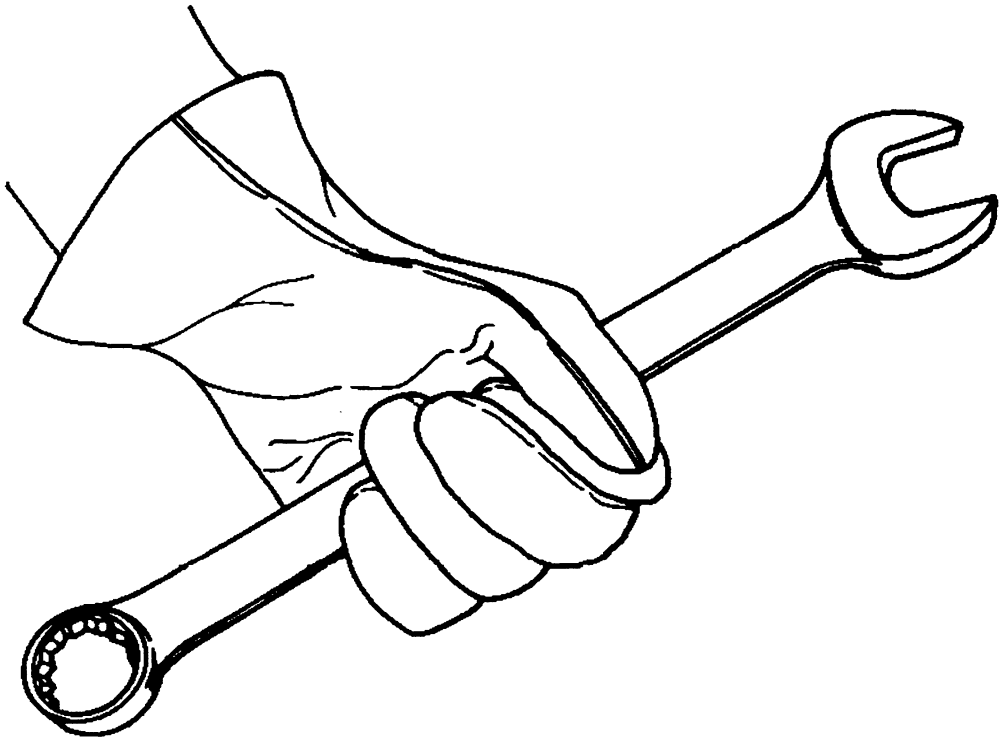
MELROE HYDRAULIC CONTROL VALVE

COMPONENT REPAIR MANUAL



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INTRODUCTION

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

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) 678–6165 for schedule.

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

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

See the INDEX Pafe to find your MODEL Loader, S/N listing, Tab #.

SAFETY INSTRUCTIONS

We Care About Your Safety.

⚠ 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

Warnings on the machine and in the manuals are for your safety. Failure to obey warnings can cause injury or death.

W–2044–1285

IMPORTANT

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

I–2019–0284


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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**			


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HYDRAULIC CONTROL VALVE


bobcat®

MELROE

INGERSOLL-RAND

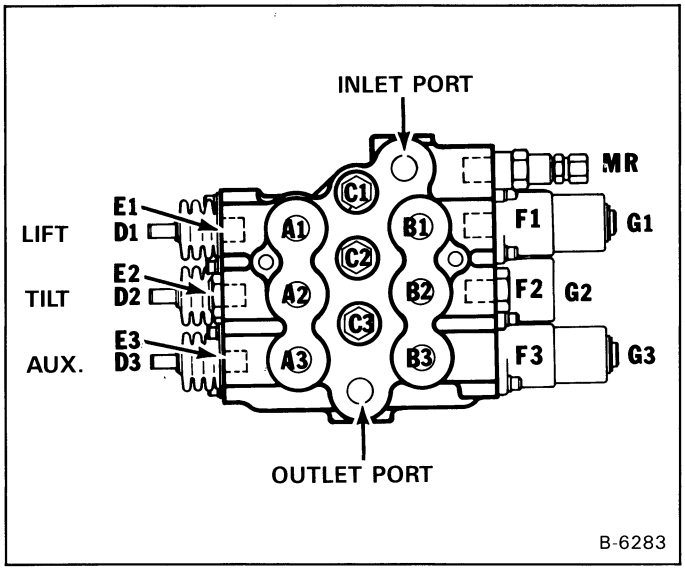


Fig. 1 Melroe Valve for Farmboy, 443, 540 and 640 Series Loaders

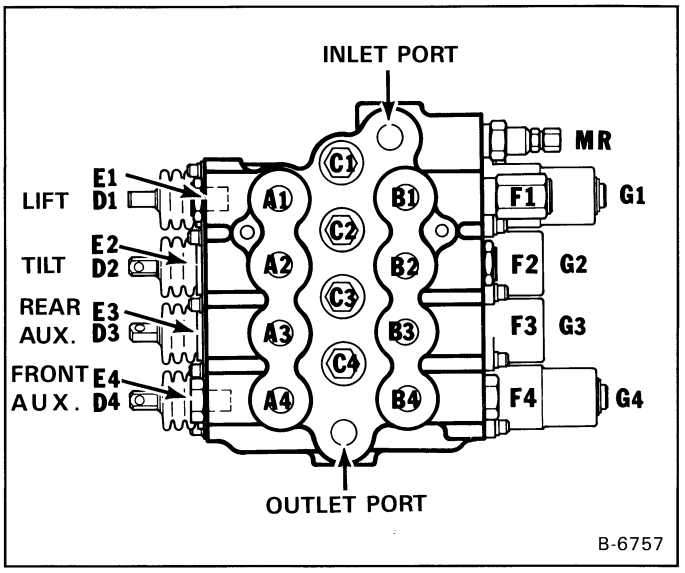


Fig. 2 Melroe Valve for 740 and 843 Series Loaders

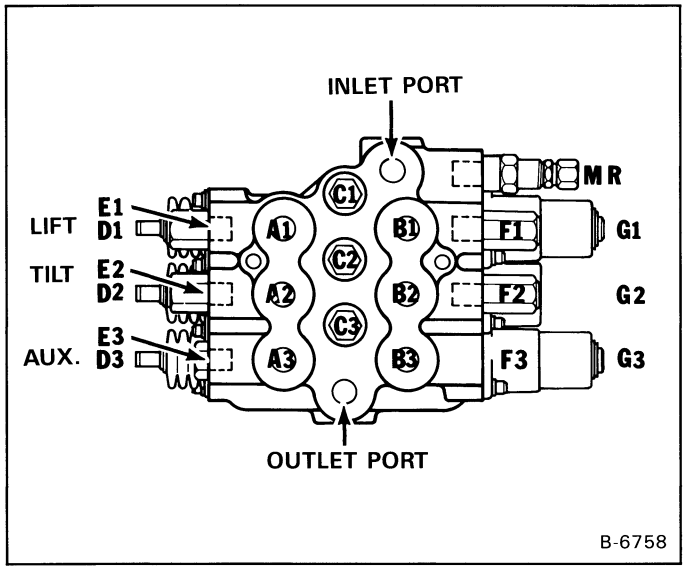
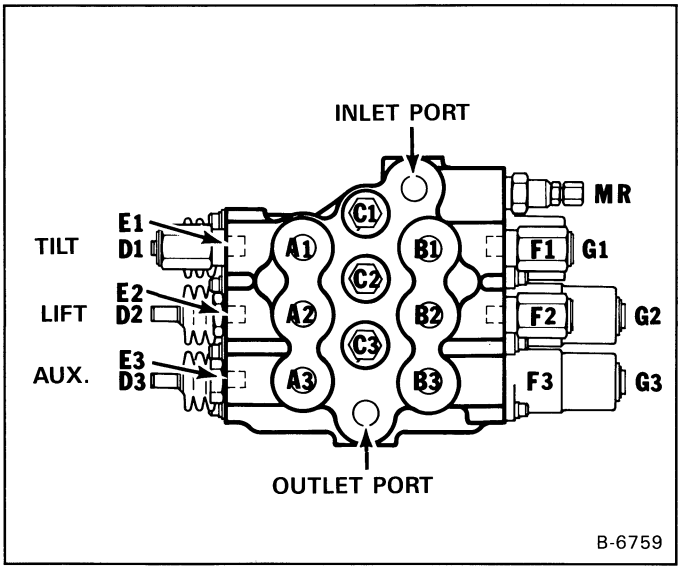


Fig. 3 Melroe Valve for 1600 Series Loaders



* **Fig. 4** Melroe Valve for 2000 Series Loaders

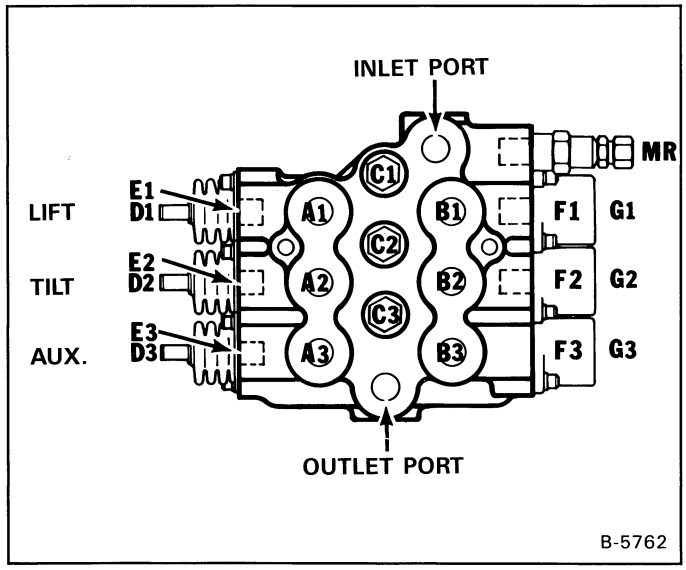


Fig. 5 Melroe Valve for 2000 RTF

	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
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 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			

CONTROL VALVE

Disassembly and Assembly

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

The 3-spool and 4-spool valves are used in different Model loaders. 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 pages 2 and 3 for the correct locations of the parts for each control valve.

NOTE: THE ILLUSTRATIONS MAY NOT SHOW THE EXACT LOCATION FOR THE PART YOU ARE REMOVING OR 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].

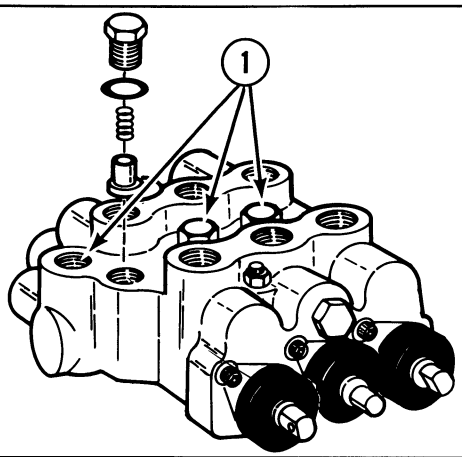
Remove the following parts from the detent and spool linkage sides of the control valve ("F" & "E" Ports):

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.

A



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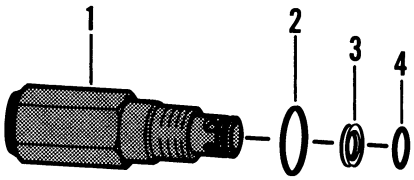
B

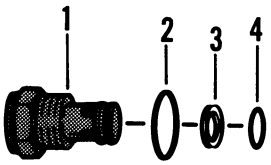
1. Relief Valve
2. O-Ring
3. Back-Up Washer
4. O-Ring



E-1509

C

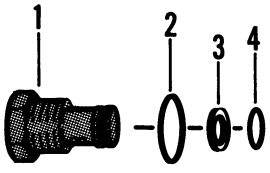
1. Anti-Cavitation Valve
2. O-Ring
3. Back-Up Washer
4. O-Ring



E-1509

D

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

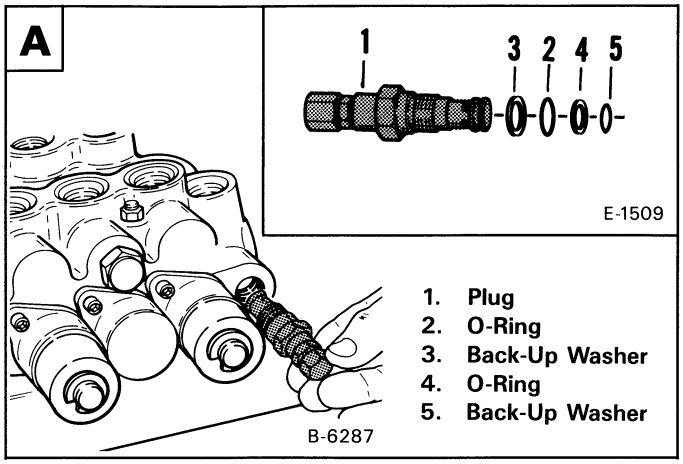


E-1509

CONTROL VALVE (Cont'd)

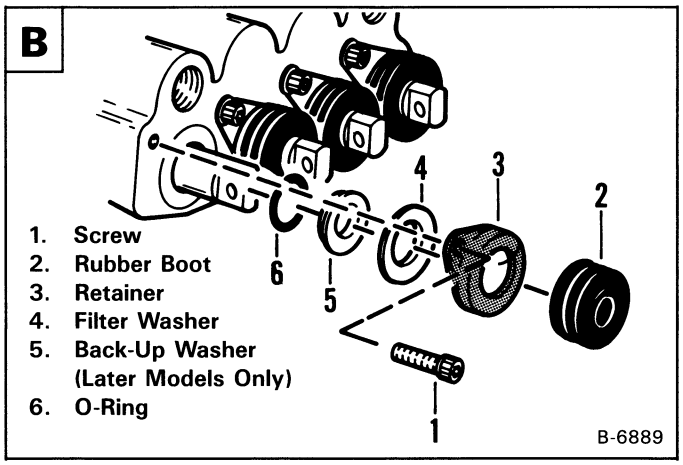
Remove the main relief valve from the control valve [A].

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.



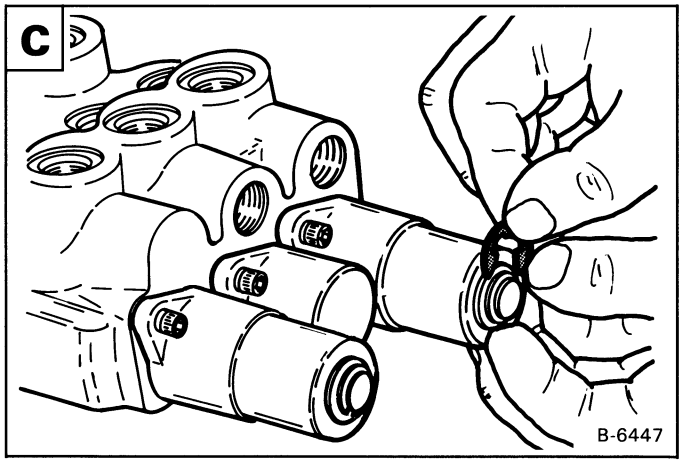
Detent Assembly

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

MEL-1278 — Detent Tool

Use the following procedure to remove and disassemble 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.

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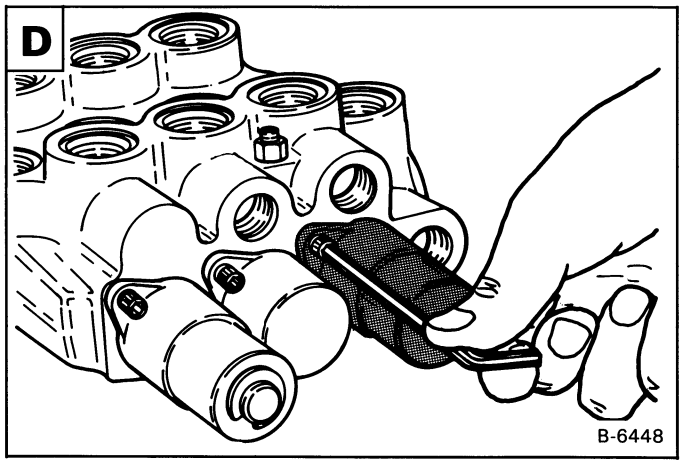


Remove the detent sleeve, detent balls and springs.

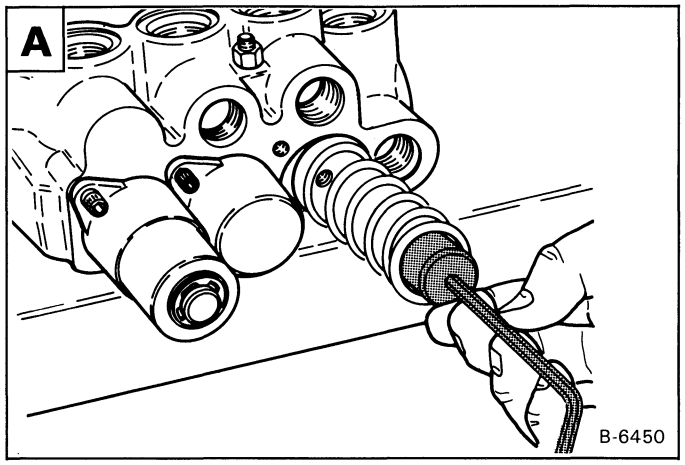
CONTROL VALVE (Cont'd)

Remove the centering spring bolt [A].

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

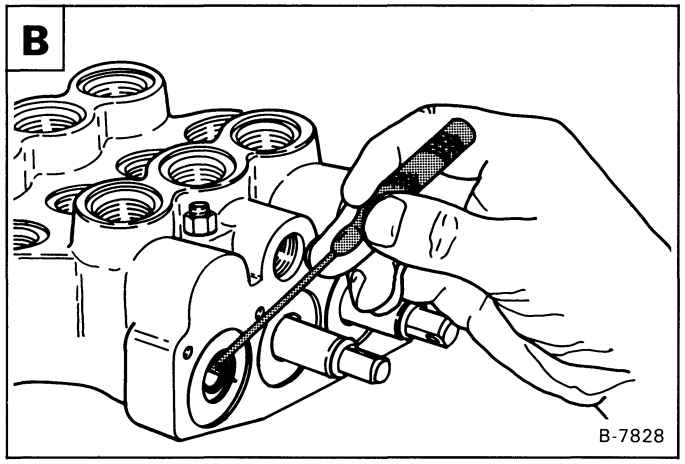
Remove the spool from the bore.

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



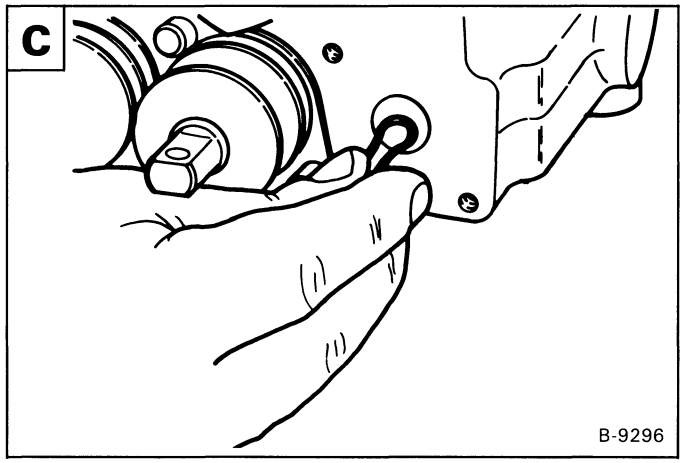
Remove the front and rear quad rings [B].

Use the following procedure to assemble the detent assembly.

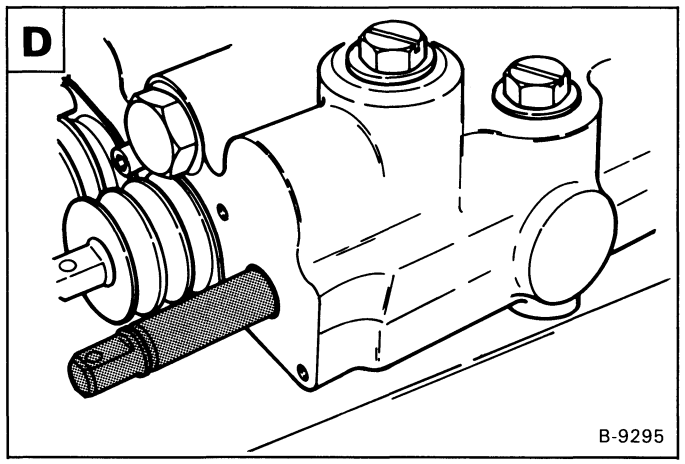


Install a NEW quad ring into the groove in the front of the control valve [C].

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



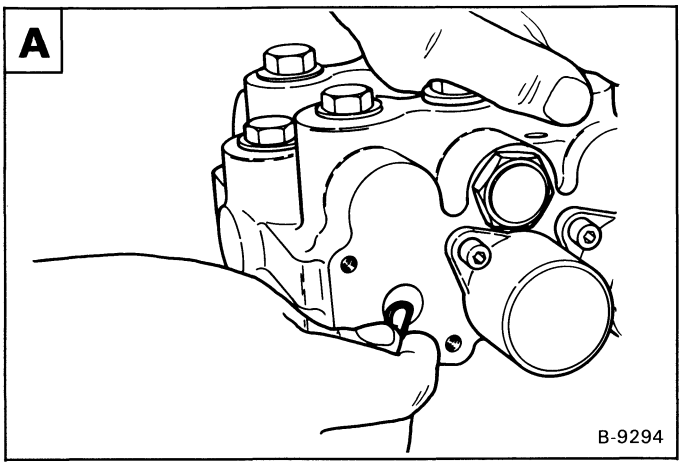
Install the valve spool into the control valve from the rear of the control valve. Push the spool into the valve just far enough so that the rear quad ring can be installed [D].



CONTROL VALVE (Cont'd)

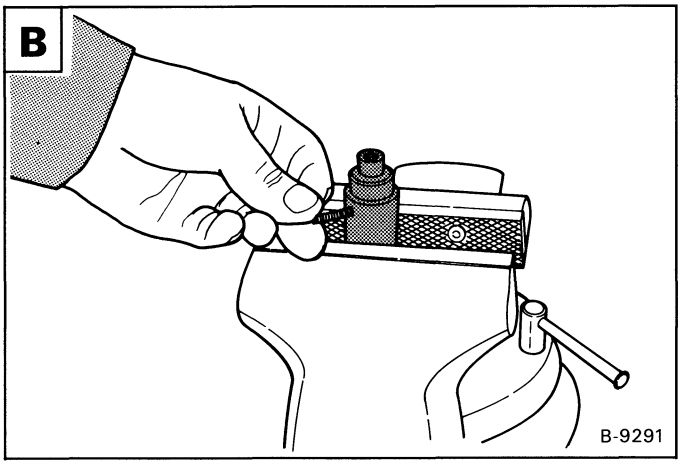
Install a NEW quad ring in the rear of the control valve [A].

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

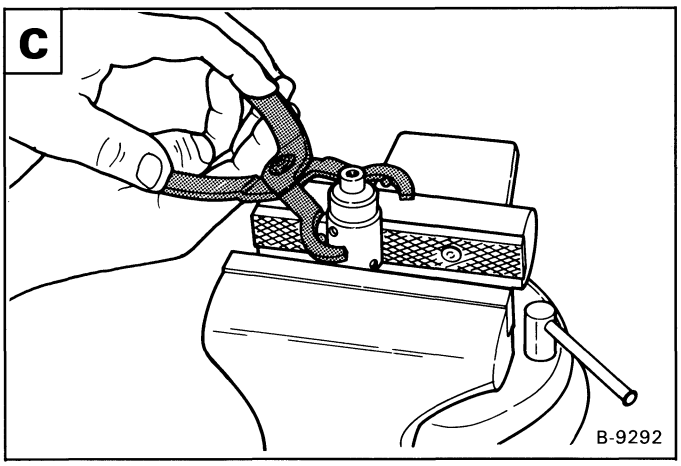


Put the detent adapter into a vise.

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].

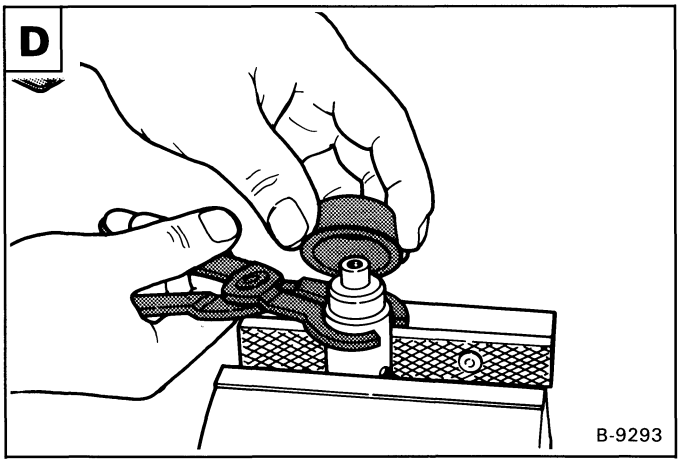


Hold the detent balls in position. Install the spring end cap over the detent adapter [D].

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

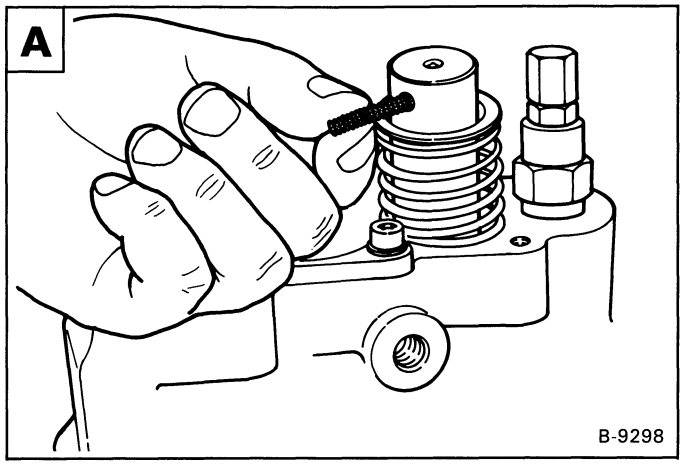
Install the centering spring and the other spring cap on the spool and tighten the bolt to 90-100 in.-lbs. (10-11 Nm) torque.

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



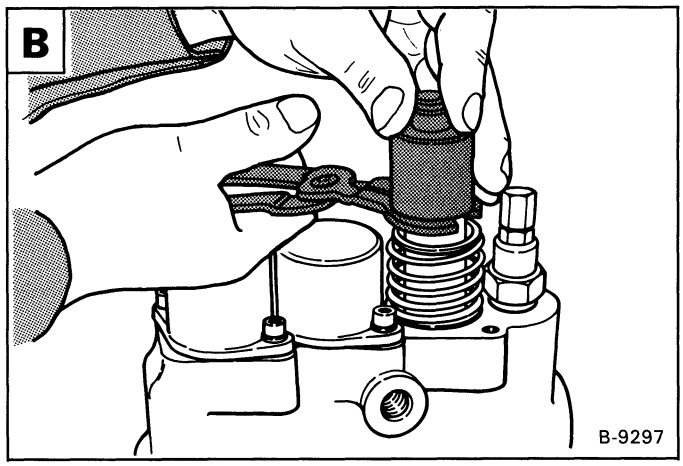
NOTE: Lift and Auxiliary Detent Sleeves are different: Lift Detent Sleeve Bore Depth is 1.160" (29,5 mm). Auxiliary Detent Sleeve Bore Depth is 1.061" (26,9 mm).

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

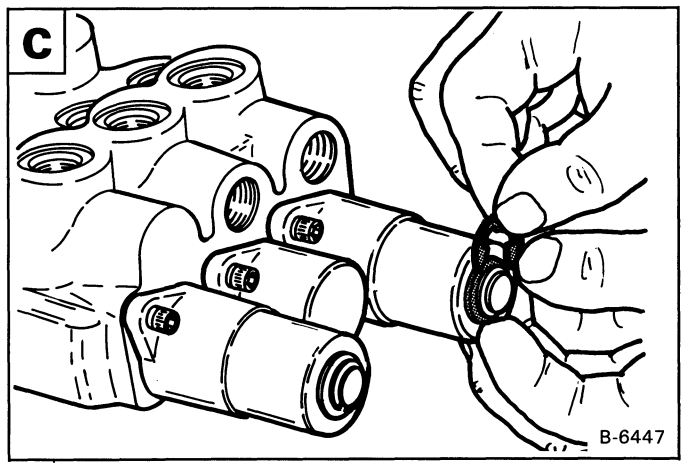


Hold the detent balls in position with the detent tool and slide the sleeve into position [B].

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).

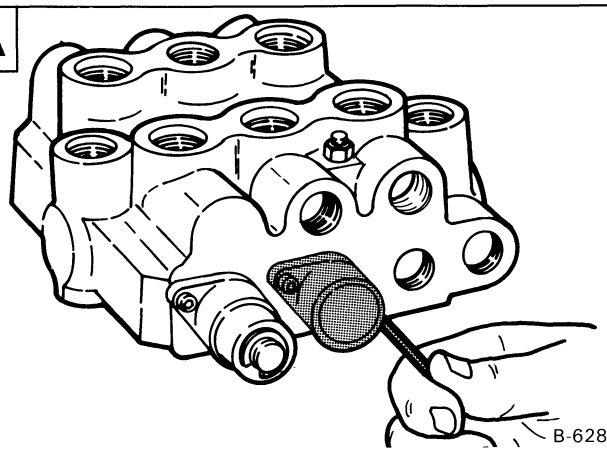
Remove the spool from the bore.

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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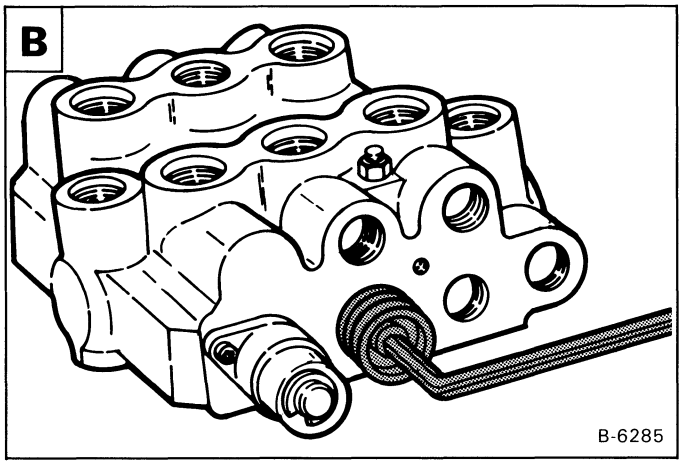
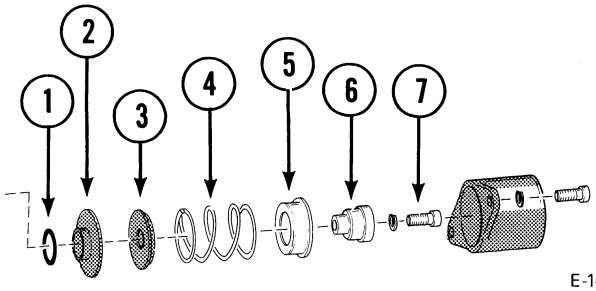
B



B-6285

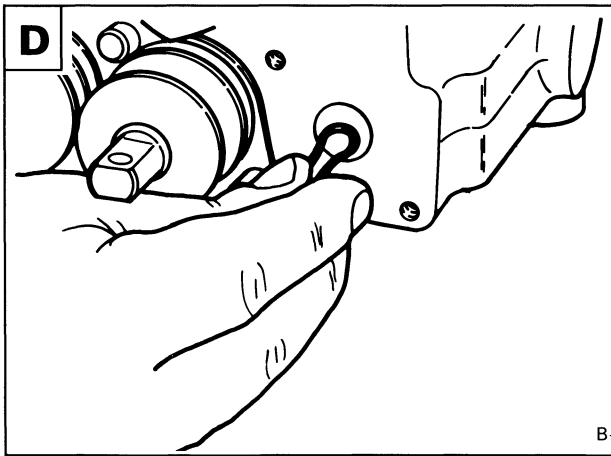
C

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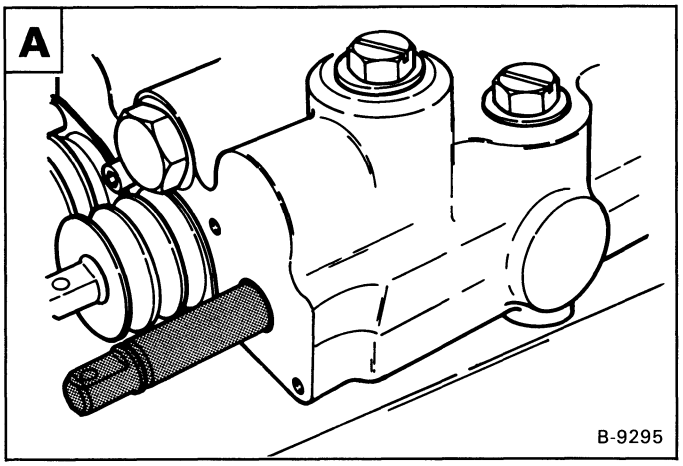
Install the valve spool into the valve from the rear of the control valve [A].

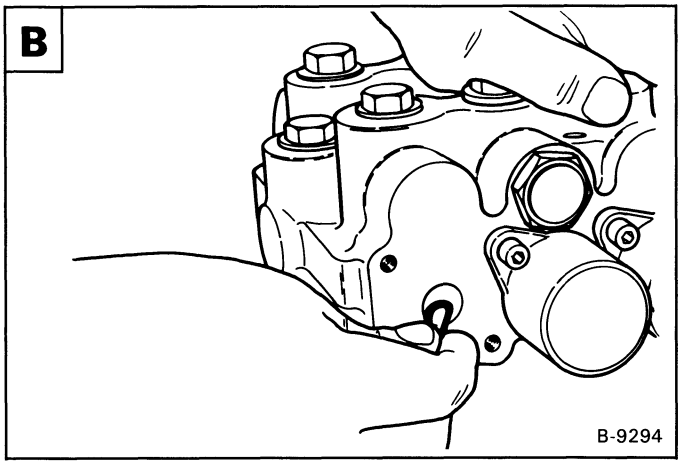
Push the spool into the valve just far enough so the rear quad ring can be installed.



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.

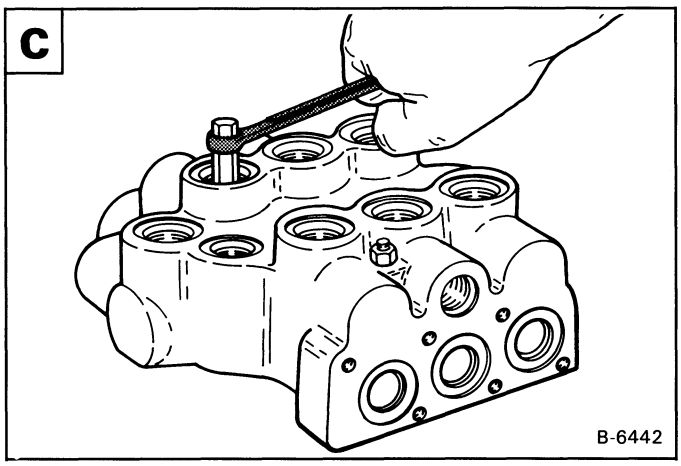


Orifice

Some Model loaders use an orifice in a top port. 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.

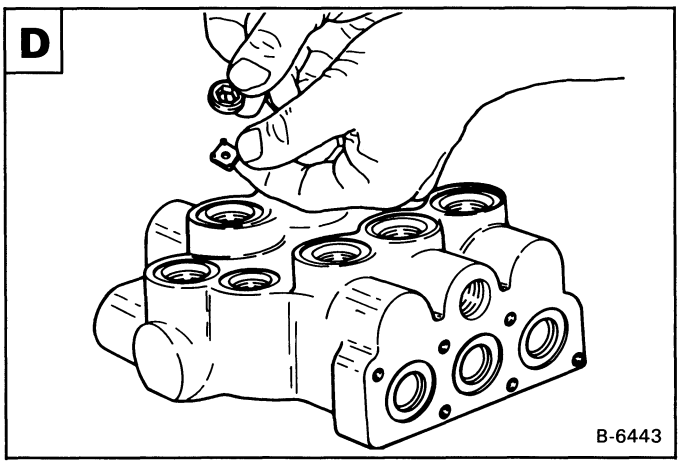
Check that the centering springs are not broken.

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.



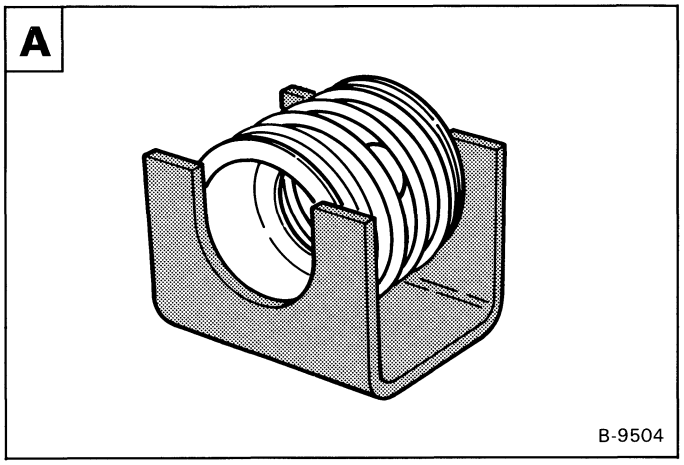
Installation of the Centering Spring

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

MEL-1285 — Valve Spring Holding Tool

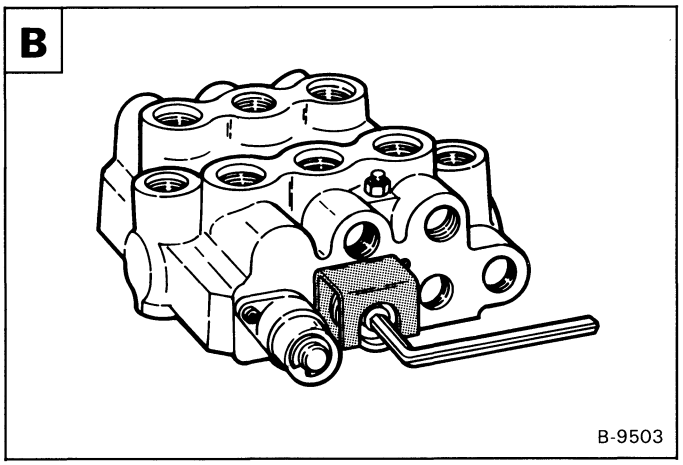
Put the washer and collar in the ends of the spring.

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.



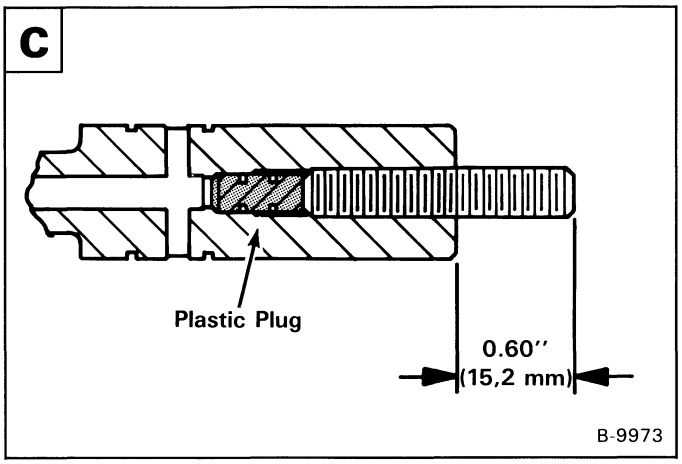
Valve Spool Stud

Install the plastic plug (lift spool only).

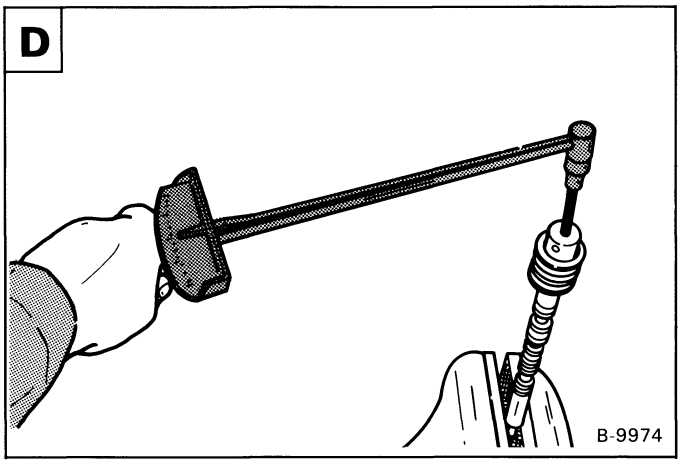
Install the stud and leave about 0.60" (15,2 mm) of the stud sticking out [C].

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

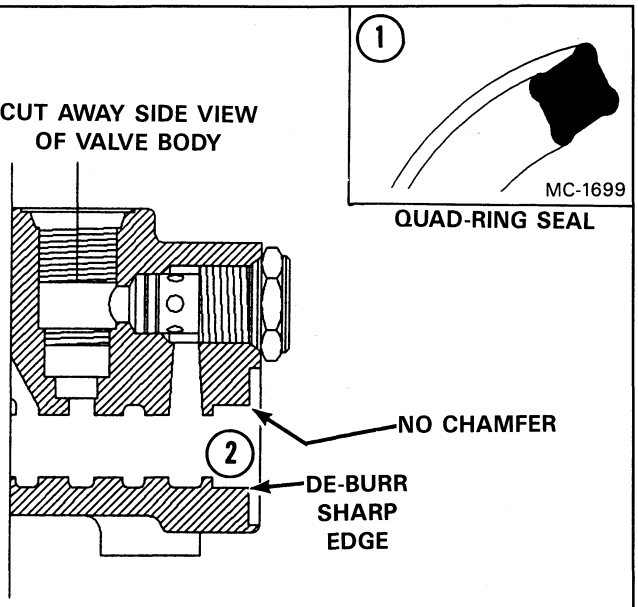
1. Uses only quad-ring seal.
2. Check the seal surface area for rust, corrosion, scratches, etc. Correct any irregularities before continuing. De-burr the sharp edge at the seal area (both ends).
3. At the linkage end of the spool, de-burr the groove for the rubber boot as needed.

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

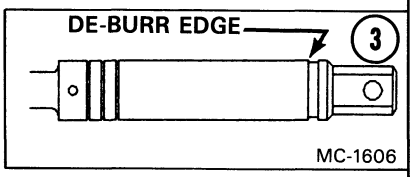
4. Put clean oil on the valve spool. Install the quad-ring seal over the valve spool. Be Careful not to damage the quad-ring seal on the valve spool edges.

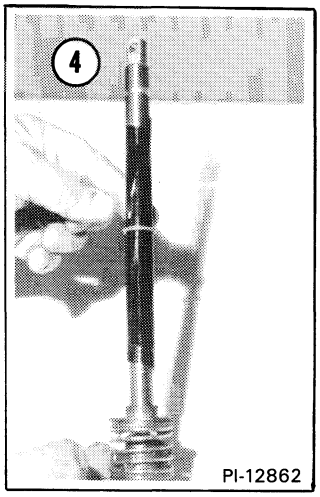
NOTE: An alternate method to protect the quad-ring seal by putting plastic material (Example: Discarded micro-fiche card) over the spool to protect the seal.

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.



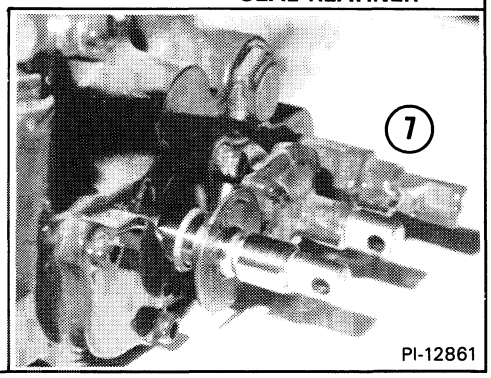
QUAD-RING SEAL





INSTALLING QUAD-RING SEAL ON VALVE SPOOL

INSTALLING QUAD-RING SEAL REATINER

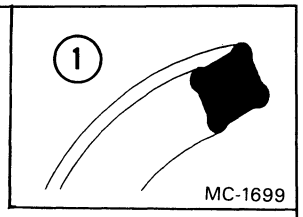


IDENTIFICATION & INSTALLATION OF SPOOL SEAL (Cont'd)

NOTCH FOR SEAL

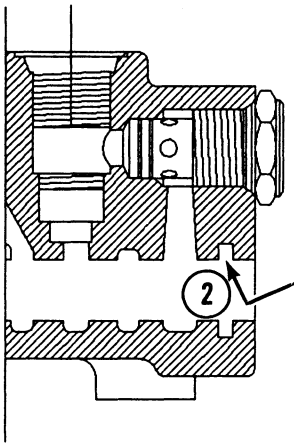
NOTE: This control valve (with the notch for seal) must be removed from the loader for the quad-ring seal installation.

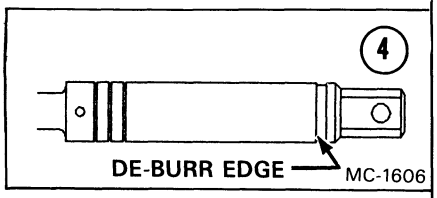
1. Uses only quad-ring seal.
2. Check the seal surface area for rust, corrosion, scratches, etc. Correct any irregularities before continuing.
3. The detent mechanism or centering spring must be removed from the valve spool.
4. At the linkage end of the spool, de-burr the groove for the rubber boot as 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.



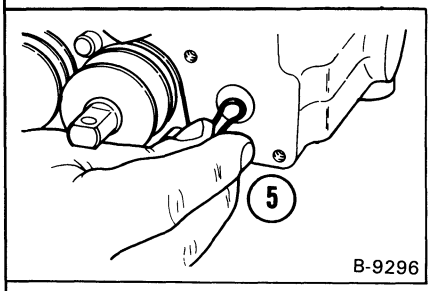
QUAD-RING SEAL

CUT AWAY SIDE VIEW OF VALVE BODY

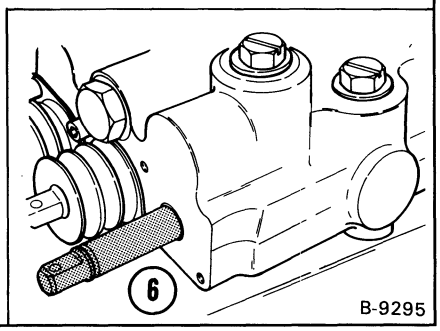




INSTALLING FRONT QUAD-RING SEAL



INSTALLING SPOOL



IDENTIFICATION & INSTALLATION OF SPOOL SEAL (Cont'd)

SHORT CHAMFER

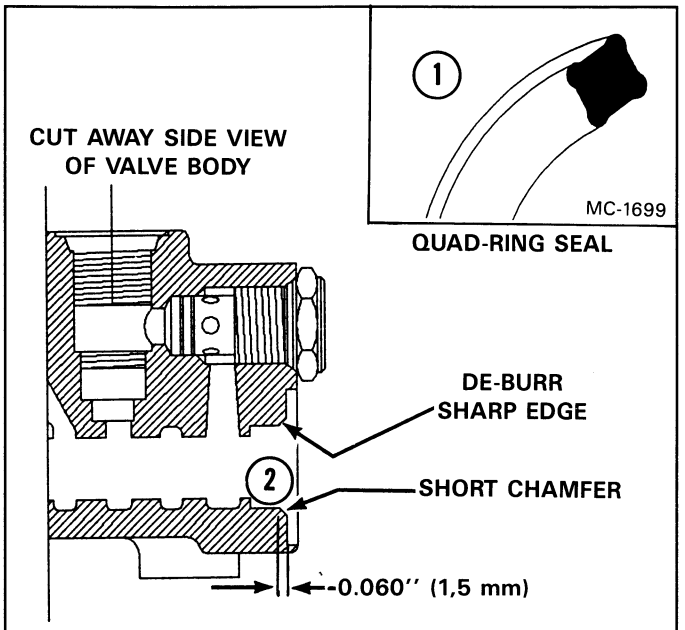
1. Uses only quad-ring seal.
2. Check the seal surface area for rust, corrosion, scratches, etc. Correct any irregularities before continuing. De-burr the sharp edge at the seal area (both ends).
3. At the linkage end of the spool, de-burr the groove for the rubber boot as needed.

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

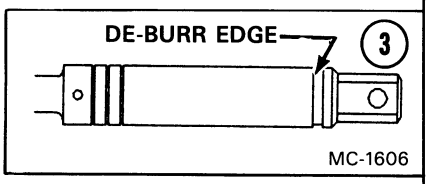
4. Put clean oil on the valve spool. Install the quad-ring seal over the valve spool. Be Careful not to damage the quad-ring seal on the valve spool edges.

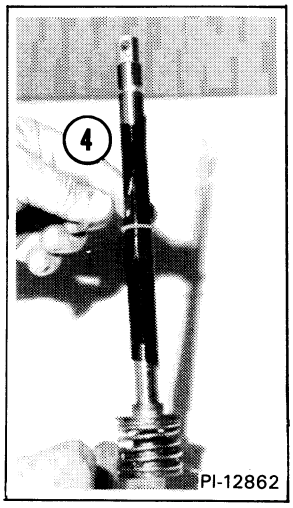
NOTE: An alternate method to protect the quad-ring seal by putting plastic material (Example: Discarded micro-fiche card) over the spool to protect the seal.

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.



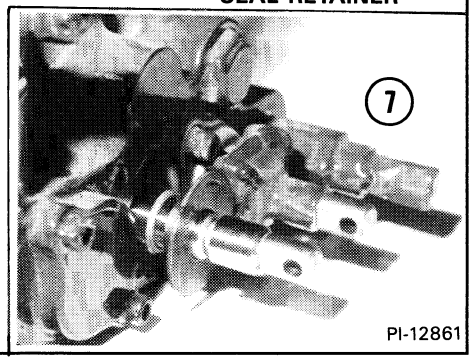
QUAD-RING SEAL





INSTALLING QUAD-RING
SEAL ON VALVE SPOOL

INSTALLING QUAD-RING
SEAL RETAINER



IDENTIFICATION & INSTALLATION OF SPOOL SEAL (Cont'd)

LONG CHAMFER

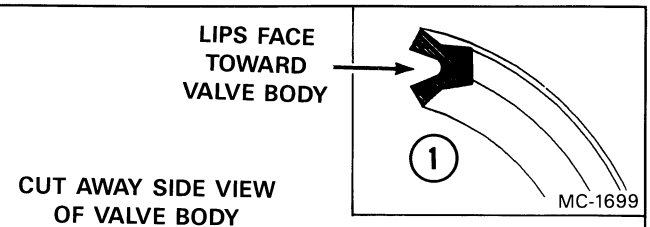
1. Uses only lip seal.
2. Check the seal surface area for rust, corrosion, scratches, etc. Correct any irregularities before continuing.
3. Put clean oil on the valve spool. Install the lip seal over the valve spool, Be Careful not to damage the lip seal on the valve spool edges.

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.

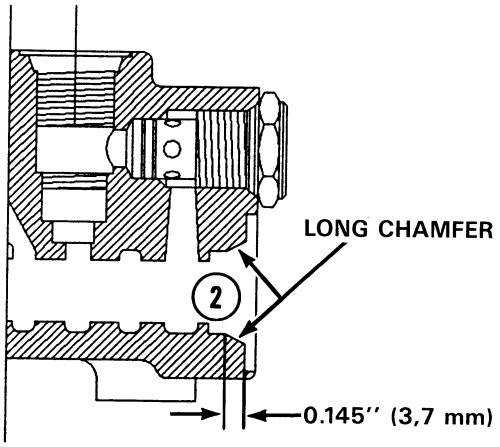
4. Install spool into the valve bore.

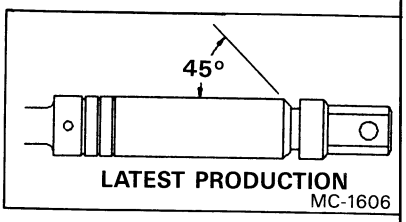
NOTE: Lubricate with grease between the seal and retainer before installation (both ends).

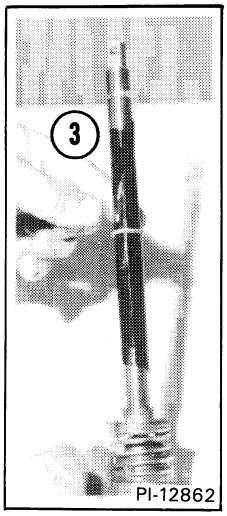
5. Slide the linkage end lip seal over the rubber boot groove. Be Careful not to damage the seal.
6. Install the seal retainer.
7. Continue with assembling the control valve.



CUT AWAY SIDE VIEW OF VALVE BODY



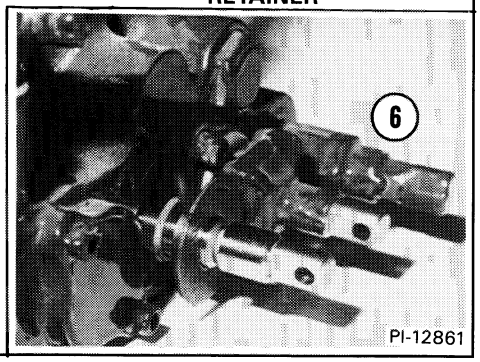




INSTALLING LIP SEAL ON VALVE SPOOL

3

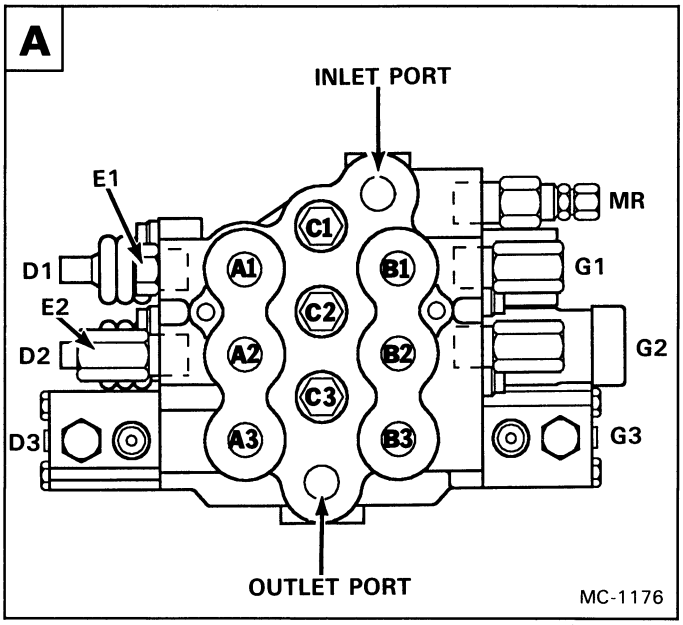
INSTALLING LIP SEAL RETAINER



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].

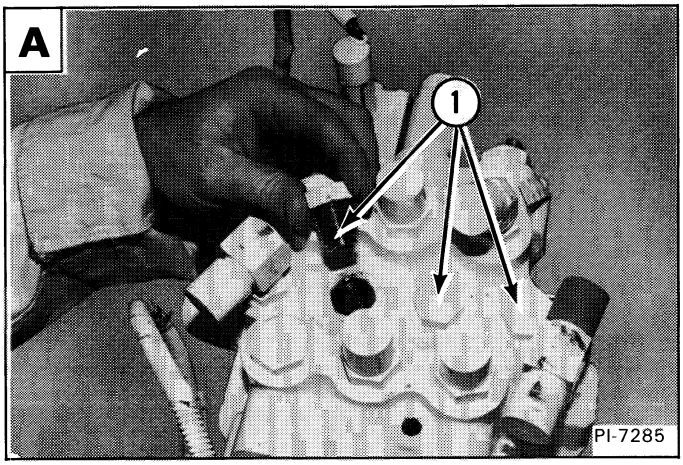
Remove the following parts from the detent and spool linkage sides of the control valve (''F'' & ''E'' Ports):

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

Remove the O-rings and back-up washers.

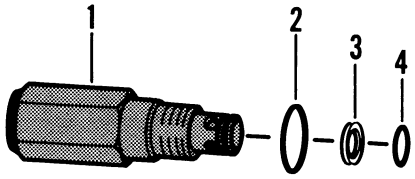
Assembly: Always use NEW O-rings and back-up washers. Tighten to 35-40 ft.-lbs. (47-54 Nm) torque.

A



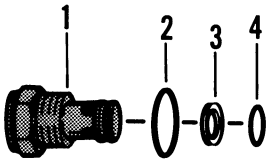
B

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

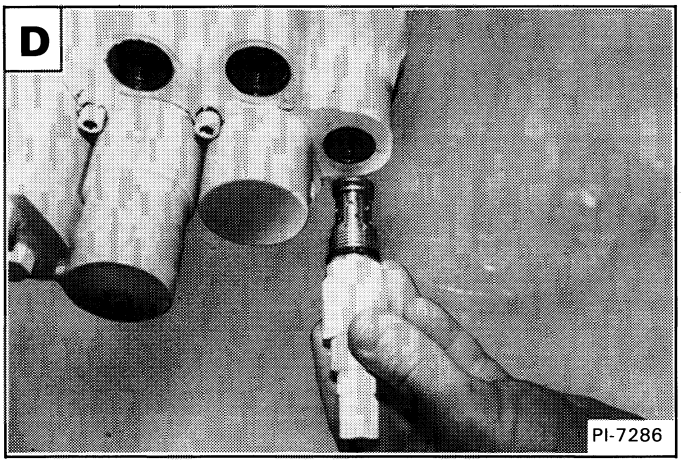


C

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



D

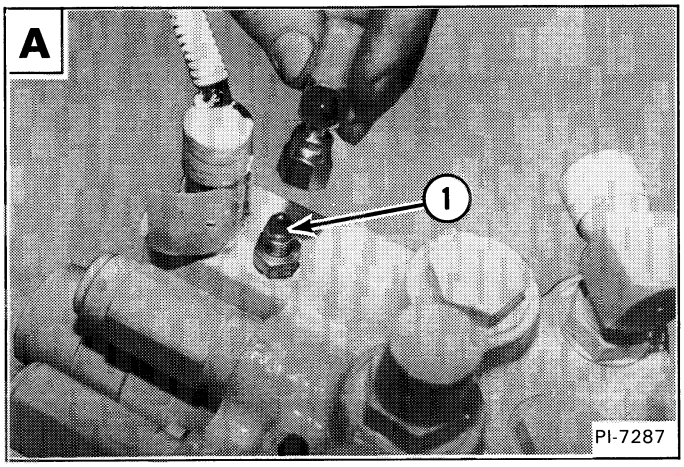


CONTROL VALVE (Cont'd)

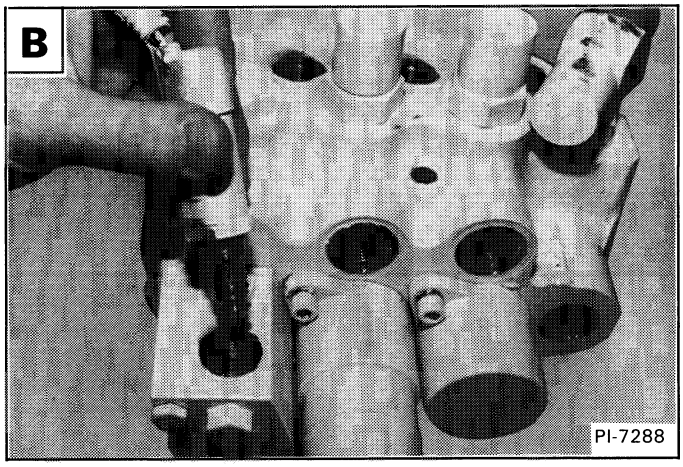
Auxiliary Section

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

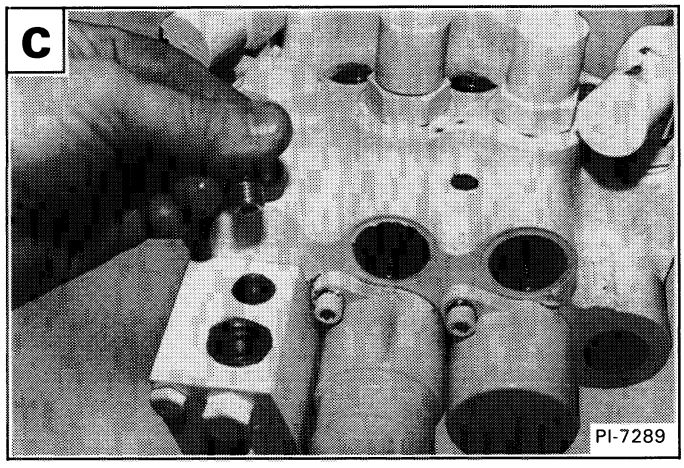
NOTE: Be sure the restrictor (Item 1) is located at the fitting (both solenoid blocks) [A].



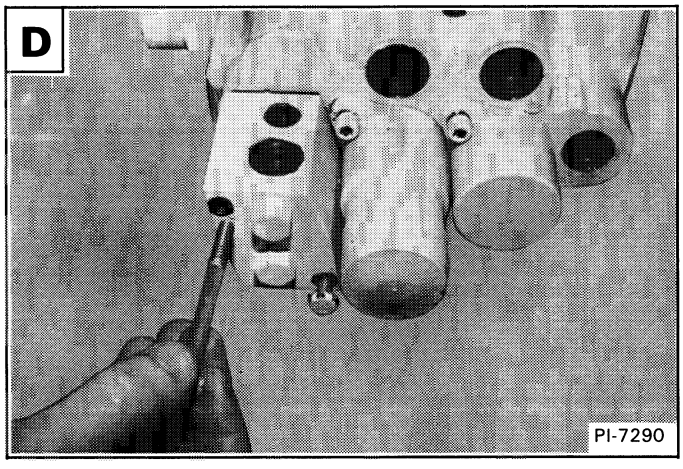
Remove the solenoid from the block [B].



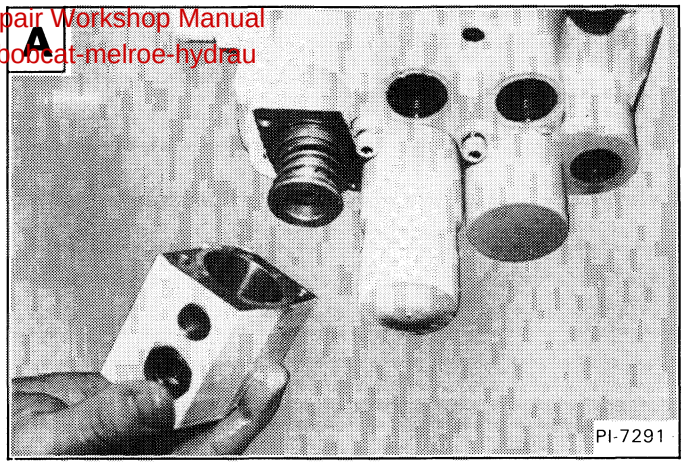
Remove the restrictor fitting from the block [C].



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



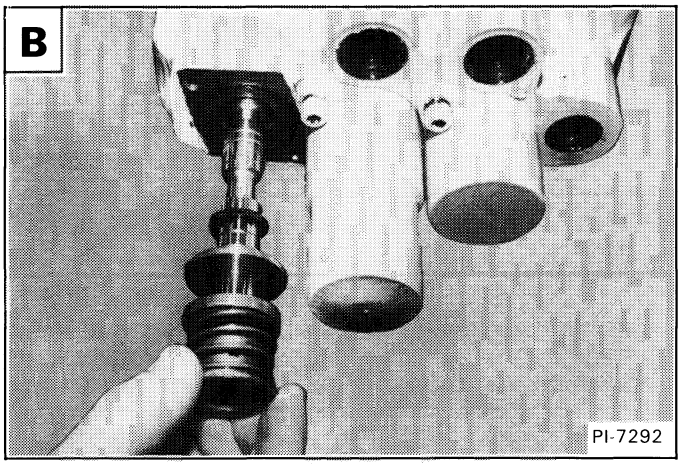
Remove the solenoid blocks (front and rear) [A].



Remove the spool [B].

Install NEW quad rings at assembly.

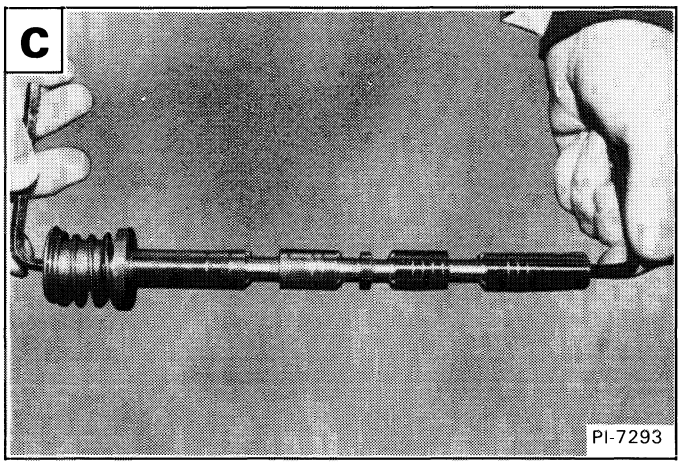
NOTE: See Pages 9 & 10 for seal and valve identification.



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].