

**SERVICE REPAIR**

**MANUAL**

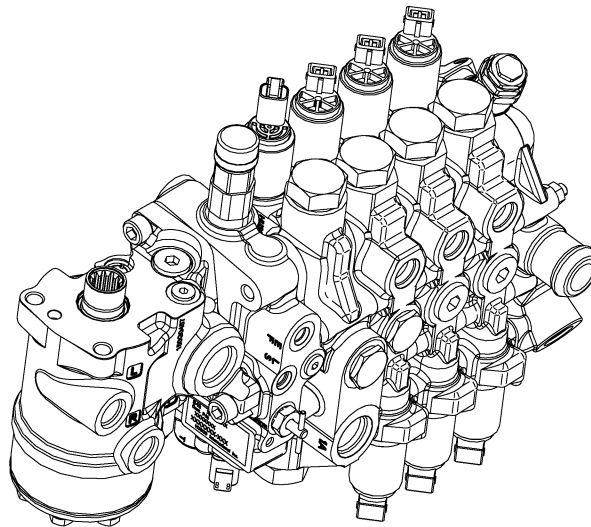
Hyster U005 (H80FT, H90FT, H100FT, H110FT,  
H120FT) Forklift Service Repair Manual

***HYSTER***

# **MAIN CONTROL VALVE WITH VARIABLE DISPLACEMENT PUMP**

**S4.0FT, 4.5FT, 5.5FT, S5.5FTS (S80, 100,  
120FT; S80, 100FTBCS; S120FTS; S120FTPRS)  
[J004];**

**H4.0FT5/FT6; H4.5FTS5, H4.5FT6; H5.0-5.5FT  
(H80, 90, 100, 110, H120FT) [U005]**



# ***HYSTER***

# SAFETY PRECAUTIONS

## MAINTENANCE AND REPAIR

- The Service Manuals are updated on a regular basis, but may not reflect recent design changes to the product. Updated technical service information may be available from your local authorized Hyster® dealer. Service Manuals provide general guidelines for maintenance and service and are intended for use by trained and experienced technicians. Failure to properly maintain equipment or to follow instructions contained in the Service Manual could result in damage to the products, personal injury, property damage or death.
- When lifting parts or assemblies, make sure all slings, chains, or cables are correctly fastened, and that the load being lifted is balanced. Make sure the crane, cables, and chains have the capacity to support the weight of the load.
- Do not lift heavy parts by hand, use a lifting mechanism.
- Wear safety glasses.
- DISCONNECT THE BATTERY CONNECTOR before doing any maintenance or repair on electric lift trucks. Disconnect the battery ground cable on internal combustion lift trucks.
- Always use correct blocks to prevent the unit from rolling or falling. See HOW TO PUT THE LIFT TRUCK ON BLOCKS in the **Operating Manual** or the **Periodic Maintenance** section.
- Keep the unit clean and the working area clean and orderly.
- Use the correct tools for the job.
- Keep the tools clean and in good condition.
- Always use **HYSTER APPROVED** parts when making repairs. Replacement parts must meet or exceed the specifications of the original equipment manufacturer.
- Make sure all nuts, bolts, snap rings, and other fastening devices are removed before using force to remove parts.
- Always fasten a DO NOT OPERATE tag to the controls of the unit when making repairs, or if the unit needs repairs.
- Be sure to follow the **WARNING** and **CAUTION** notes in the instructions.
- Gasoline, Liquid Petroleum Gas (LPG), Compressed Natural Gas (CNG), and Diesel fuel are flammable. Be sure to follow the necessary safety precautions when handling these fuels and when working on these fuel systems.
- Batteries generate flammable gas when they are being charged. Keep fire and sparks away from the area. Make sure the area is well ventilated.

**NOTE:** The following symbols and words indicate safety information in this manual:



### **WARNING**

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.



### **CAUTION**

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury and property damage.

On the lift truck, the **WARNING** symbol and word are on orange background. The **CAUTION** symbol and word are on yellow background.

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This section is for the following models:

S4.0FT, 4.5FT, 5.5FT, S5.5FTS (S80, 100, 120FT; S80, 100FTBCS; S120FTS;  
S120FTPRS) [J004];  
H4.0FT5/FT6; H4.5FTS5, H4.5FT6; H5.0-5.5FT (H80, 90, 100, 110, H120FT)  
[U005]

**Thanks very much for your reading,  
Want to get more information,  
Please click here, Then get the complete  
manual**

**JustClickHere** 

**NOTE:**

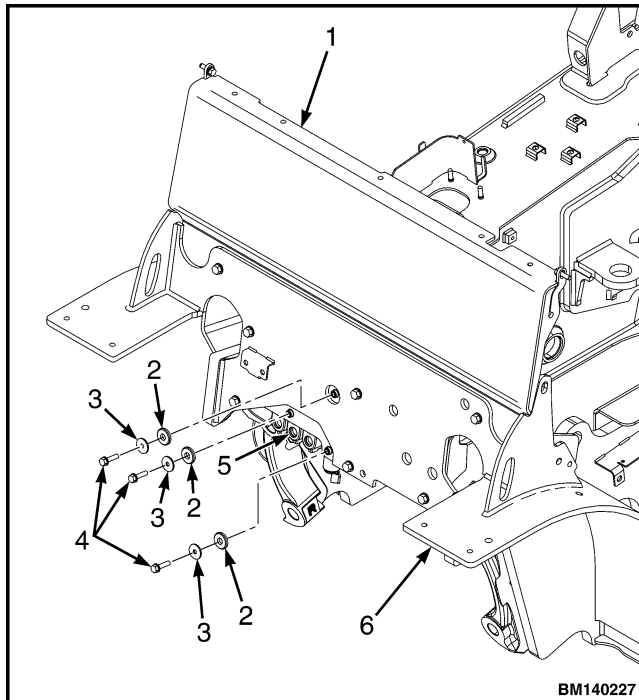
**If there is no response to click on the link above,  
please download the PDF document first, and then  
click on it.**

**Have any questions please write to me:  
[admin@servicemanualperfect.com](mailto:admin@servicemanualperfect.com)**

## General

This section contains a description and repair procedures for an electro-hydraulic main control valve with variable displacement pump used in the hydraulic system for this series of lift trucks.

The electro-hydraulic (E-Valve) main control valve is controlled electronically. It is mounted to the cowl using three mounting bolts. See Figure 1.



**NOTE:** MAJOR COMPONENTS NOT SHOWN FOR CLARITY. VIEW IS FROM THE FRONT.

1. COWL
2. INSERT
3. WASHER
4. MOUNTING CAPSCREW
5. MAIN CONTROL VALVE
6. FRAME

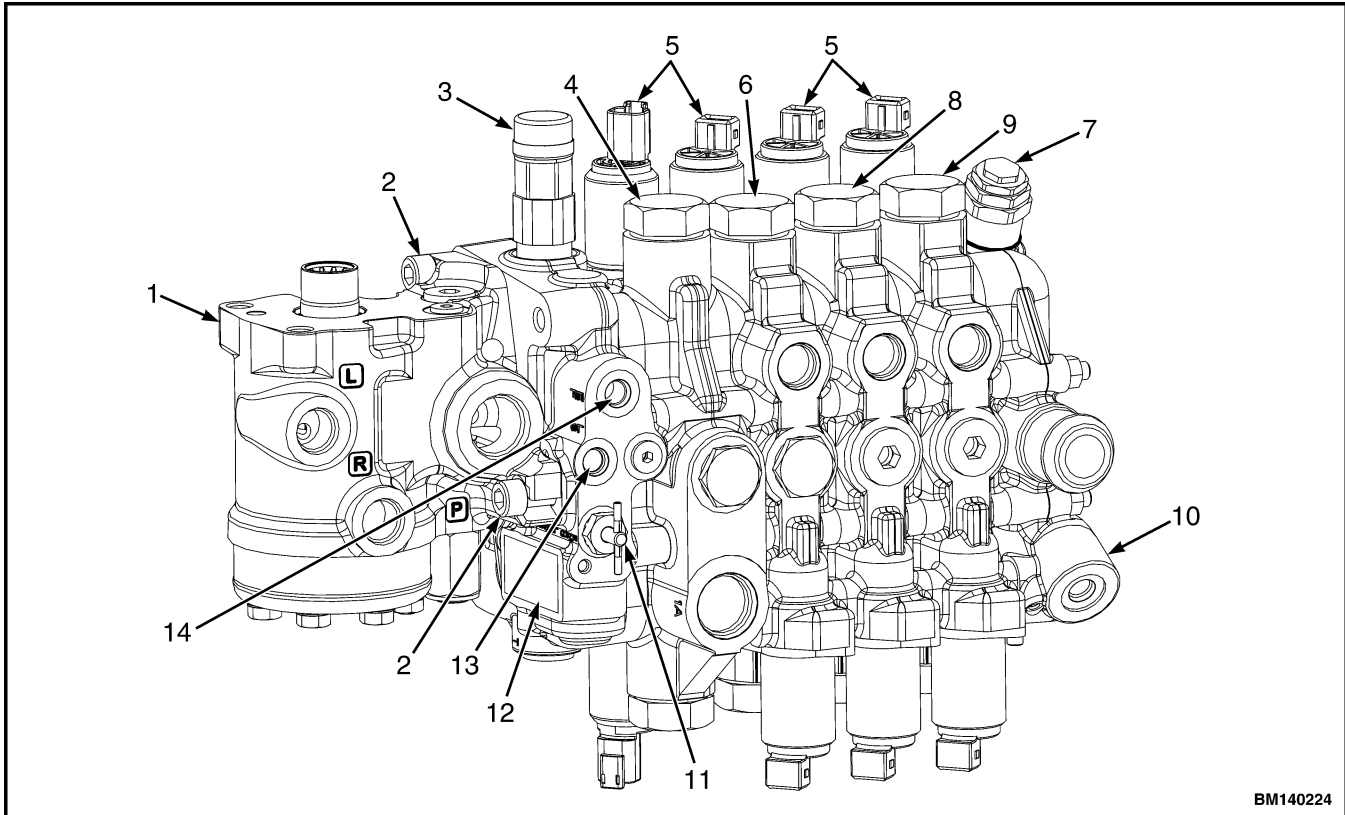
**Figure 1. Main Control Valve Mounting**

The E-Valve with variable displacement pump (VDP) is electronically-controlled, closed-center, single function compensated, and utilizes parallel hydraulic circuitry. Load sensing is done through the VDP. Operating multiple functions simultaneously will result in a non-proportionate increase in pump flow to functions which receive the lowest amount of pressurized fluid. The hydraulic circuitry will incorporate dual pressure relief logic.

Lift function pressure is regulated by the pump pressure compensator. The pump compensator will be set to the maximum system pressure and a clipper relief valve will be present in the transition section of the valve and set slightly higher. The clipper relief valve adjustment is tamper proof. Tilt and auxiliary functions are on secondary relief pressure setting. Lift pressure is not affected by secondary relief operation.

The electronic main control valve with variable displacement pump assembly is divided into the following sections (see Figure 2):

- Steering Control Unit (SCU)
- Transition section
- Lift/Lower section
- Tilt section
- Auxiliary section(s)
- Outlet section



**NOTE:** FOUR FUNCTION CONTROL VALVE SHOWN.

- |  |                              |
|--|------------------------------|
| 1. STEERING CONTROL UNIT (SCU)                 | 7. SECONDARY RELIEF VALVE    |
| 2. SCU MOUNTING CAPSCREW                       | 8. AUXILIARY I SECTION       |
| 3. CLIPPER RELIEF VALVE WITH TAMPER PROOF CAP  | 9. AUXILIARY II SECTION      |
| 4. LIFT/LOWER SECTION                          | 10. ACCUMULATOR PORT         |
| 5. PROPORTIONAL PRESSURE REDUCING VALVE (PPRV) | 11. EMERGENCY LOWERING VALVE |
| 6. TILT SECTION                                | 12. TRANSITION SECTION       |
|  | 13. LOAD SENSING (LS) PORT   |
|  | 14. EF PORT                  |

**Figure 2. Electronic Control Valve With Variable Displacement Pump**



## Main Control Valve Repair

### REMOVE



#### WARNING

Lower carriage completely before working on control valve or hydraulic system. **DO NOT** work under a raised carriage. Put mast in a vertical position, with no forward or back tilt, and lower carriage completely before disconnecting any parts of hydraulic system. The mast can lower suddenly and cause injury if the carriage is not lowered.

**NOTE:** Most of the individual valve components can be removed and replaced while the control valve is installed in the truck. Removal of the control valve for repairs is normally only required to replace a valve section, or to replace the O-rings between the sections.

1. Power wash the interior of the operator compartment to remove any dirt or debris.
2. Move truck to disassembly area and shut off engine.



#### WARNING

Cleaning solvents can be flammable and toxic and cause skin irritation. When cleaning solvents are used, always follow the solvent manufacturer's recommended safety procedures. Wear protective goggles or a face shield to prevent eye injuries.



#### WARNING

Be careful when cleaning with steam. Steam can cause serious burns. Wear protective clothing, gloves, and eye protection. Never expose your skin to steam.

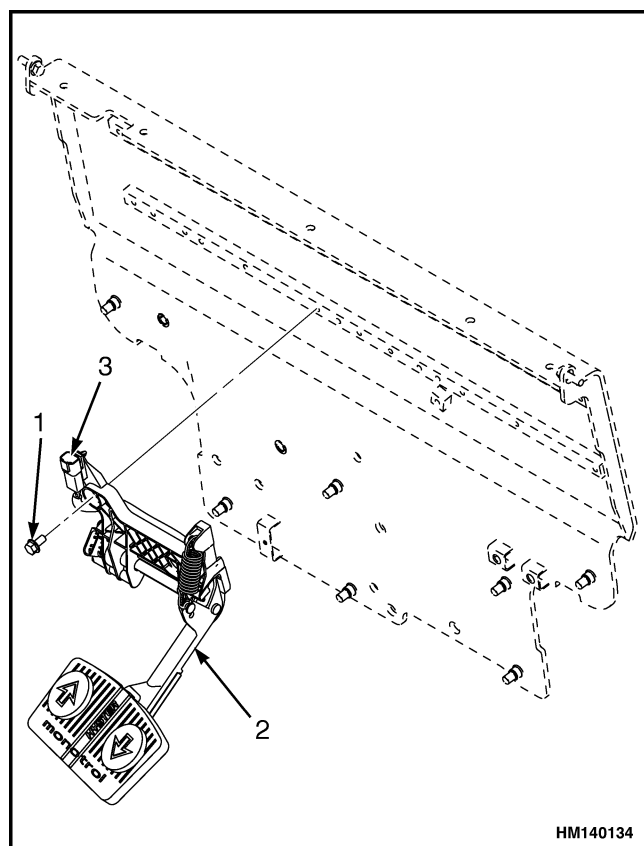
**NOTE:** Take all necessary steps to prevent debris, dust, or other contaminants from entering the valve cavities, hydraulic lines, or replacement parts.

3. Remove the floor plate, kick panel, seal plate, and dashboard. See **Frame** 0100SRM1891 for the procedures.
4. Before disconnecting any hydraulic hoses or removing any parts from the control valve, clean the outside of the valve either by steam cleaning or with cleaning solvent.

5. To remove the accelerator pedal or MONOTROL® pedal assembly, disconnect the cowl wiring harness from the pedal assembly wiring harness and remove three mounting capscrews. See Figure 3.

**NOTE:** To aid in installation, tag all connectors prior to disconnecting from the solenoids.

6. Disconnect the cowl wiring harness from the top auxiliary function Proportional Pressure Reducing Valve (PPRV) solenoids. See Figure 4.



**NOTE:** ACCELERATOR PEDAL NOT SHOWN, HOWEVER, REMOVAL IS THE SAME.

1. MOUNTING CAPSCREW
2. MONOTROL PEDAL ASSEMBLY
3. PEDAL ASSEMBLY WIRING HARNESS

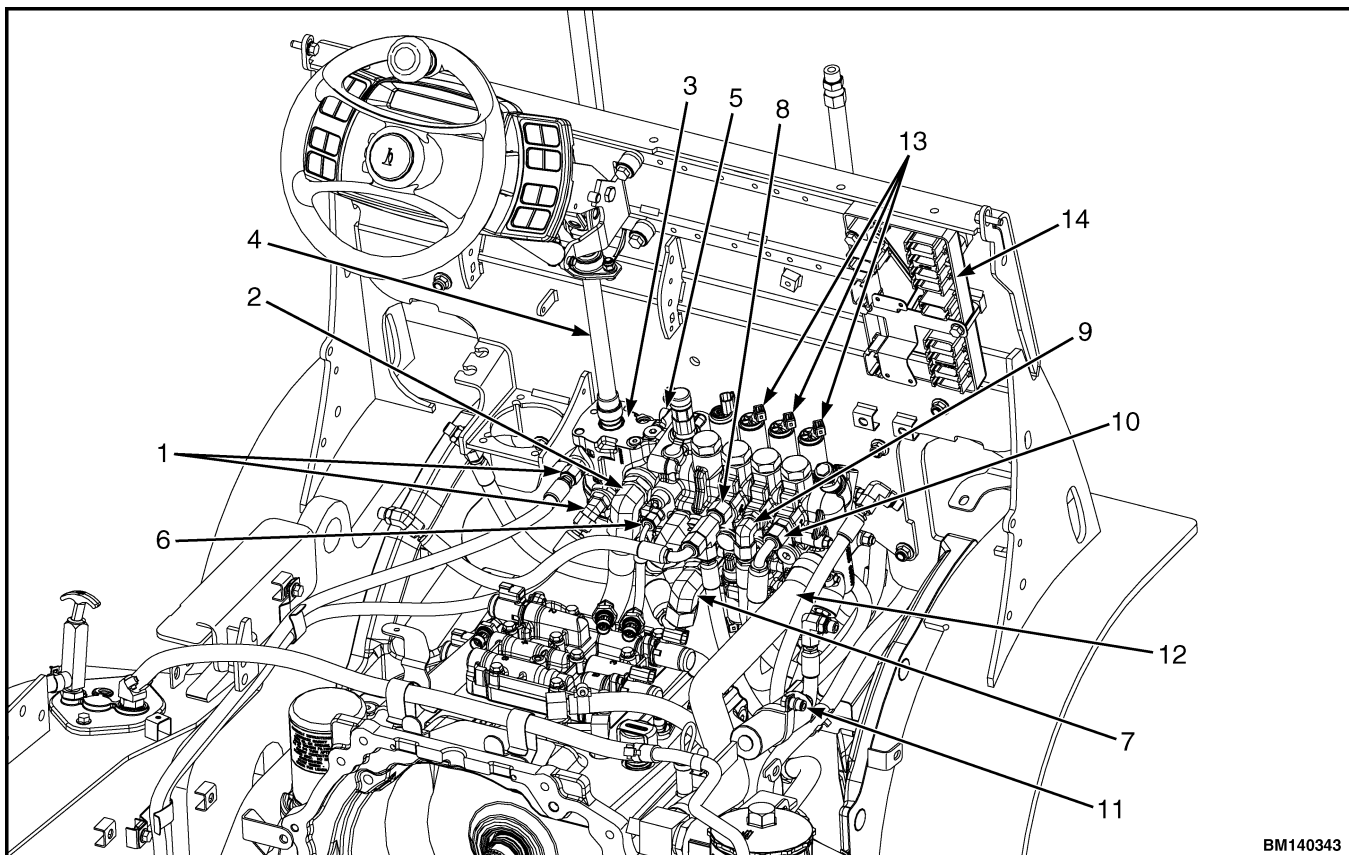
**Figure 3. MONOTROL Pedal Removal**

**CAUTION**

To prevent any foreign matter from getting into either the hydraulic hoses or the hydraulic control valve sections, all openings must have plugs or covers installed immediately after hoses are disconnected from the control valve. This also applies if any other items are removed from the control valve.

**NOTE:** To aid in correctly connecting hydraulic hoses during installation, tag each hose prior to disconnecting from the control valve.

7. Disconnect hydraulic hoses from the control valve. See Figure 4. Install plugs or caps on all open hose ends and control valve ports to prevent contamination.
8. Remove the two SCU mounting cap screws and move the SCU approximately 1.3 cm (0.5 in.) to the left. Lower the SCU until the steering shaft is disengaged. Remove the SCU from the lift truck. See Figure 4.
9. Remove and discard three O-rings located between the transition section and the SCU.



- |                                |  |
|--------------------------------|--|
| 1. STEERING SYSTEM HOSES       | 9. AUXILIARY I HOSE  |
| 2. HYDRAULIC INLET HOSE        | 10. AUXILIARY II HOSE  |
| 3. STEERING CONTROL UNIT (SCU) | 11. ACCUMULATOR  |
| 4. STEERING SHAFT              | 12. RETURN HOSE  |
| 5. SCU MOUNTING CAPSCREWS      | 13. AUXILIARY FUNCTION PROPORTIONAL PRESSURE REDUCING VALVE HARNESS (PPRV) |
| 6. LOAD SENSE LINE             | 14. VEHICLE SYSTEMS MANAGER  |
| 7. LIFT/LOWER HOSE             |  |
| 8. TILT HOSE                   |  |

**Figure 4. Hydraulic Hose Removal**

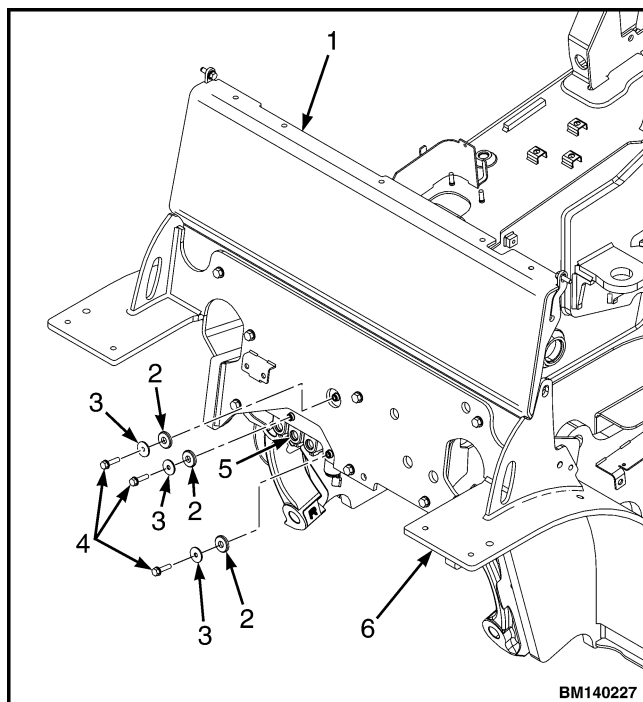
**WARNING**

The main control valve weighs approximately 30.5 kg (67 lb). Use a lifting device capable of lifting the main control valve to avoid the possibility of injury to personnel.

- Support the main control valve with a lifting device. Remove three mounting capscrews, washers, and inserts from the main control valve. See Figure 5.

**NOTE:** To aid in installation, tag all connectors prior to disconnecting from the solenoids.

- Raise the main control valve approximately 25.4 cm (10 in.) to gain access to the lower tilt and auxiliary function Proportional Pressure Reducing Valve (PPRV) solenoids. Disconnect the cowl harness from the lower tilt and auxiliary function (PPRV) solenoids.



- COWL
- INSERT
- WASHER
- MOUNTING CAPSCREW
- MAIN CONTROL VALVE
- FRAME

**Figure 5. Main Control Valve Removal**

- Remove the main control valve from cowl.

**MAIN CONTROL VALVE SECTIONS****General****CAUTION**

While working on an electro-hydraulic main control valve section, place a cover over the remaining sections of the control valve to prevent the possibility of contaminants getting into the control valve openings which could cause damage to the control valve.

**CAUTION**

If O-rings are to be replaced between two sections that have a hydraulic oil leak, replace all O-rings between all sections. This eliminates the possibility of a subsequent oil leak or possible damage to another O-ring.

Disassemble the electro-hydraulic main control valve only as necessary for repairs. Most repairs to the control valve will be for the replacement of O-rings to stop leaks between sections.

**Outlet Control Valve Section****Remove**

- Remove four nuts from the control valve tie rods. See Figure 6.
- Remove the outlet control valve section from the four tie rods and discard 10 O-rings (item 13 in Figure 7) from the auxiliary control valve section.

**Disassemble**

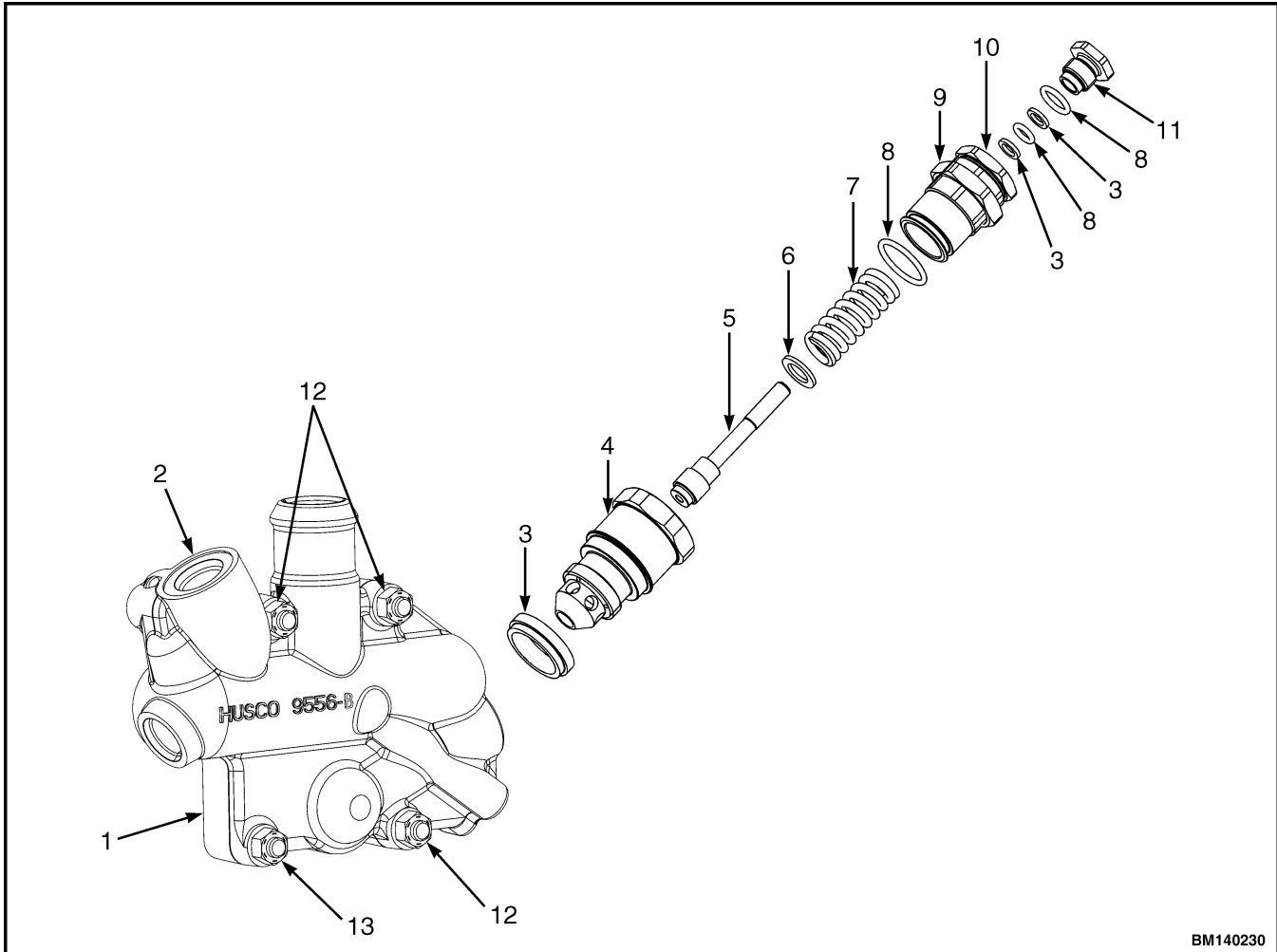
- If the secondary relief valve has been leaking, remove it from the outlet control valve section. See Step 2 through Step 7. See Figure 6.
- Remove the plug from the adjusting nut. Remove and discard the O-ring from the plug. Remove and discard the backup rings and O-ring from the adjusting nut. See Figure 6.

3. While holding the adjustment nut, loosen the jam nut.

**NOTE:** While performing Step 4, count and note the number of turns used to remove the adjusting nut.

4. Remove the adjusting nut and jam nut assembly from the secondary relief valve plug and discard the O-ring on the adjusting nut.

5. Remove the spring, washer, and poppet from the secondary relief valve plug.
6. Remove secondary relief valve plug from outlet control valve section.
7. Remove and discard the backup ring from the secondary relief valve plug.



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- |                                |  |
|--------------------------------|--|
| 1. OUTLET SECTION              | 8. O-RING                              |
| 2. ACCUMULATOR PORT            | 9. JAM NUT                             |
| 3. BACKUP RING                 | 10. ADJUSTING NUT                      |
| 4. SECONDARY RELIEF VALVE PLUG | 11. PLUG                               |
| 5. POPPET                      | 12. TIE ROD AND NUT (13 mm (1/2 in.))  |
| 6. WASHER                      | 13. TIE ROD AND NUT (15 mm (9/16 in.)) |
| 7. SPRING                      |  |

**Figure 6. Outlet Control Valve Section**

**Clean****WARNING**

Cleaning solvents can be flammable and toxic and can cause skin irritation. When using cleaning solvents, always follow the solvent manufacturer's recommended safety procedures.

**WARNING**

Compressed air can move particles so they cause injury to the user or to other personnel. Make sure the path of the compressed air is away from all personnel. Wear protective goggles or a face shield to prevent injury to the eyes.

1. If all components of the outlet control valve section have been removed, clean the outlet control valve section using cleaning solvent and dry using compressed air.
2. If all components have not been removed, clean the outlet control valve section using a lint-free cloth.

**Inspect**

Inspect the outlet control valve section mating surfaces and the bore of the secondary relief valve, if removed, for damage. If either the mating surface or the secondary relief valve bore are damaged, replace the outlet control valve section.

If disassembled, inspect the components of the secondary relief valve. If any components other than O-rings, backup rings, and the spring are damaged, replace the secondary relief valve.

**NOTE:** If the outlet control valve section is not to be reassembled immediately, coat surfaces with clean hydraulic oil to prevent the possibility of rust. Cover the outlet control valve section with a clean, dry, lint-free cloth to prevent the possibility of contaminants entering the outlet control valve section.

**Assemble**

**NOTE:** Coat all backup rings and O-rings with a light coat of clean hydraulic oil to make installation easier.

**NOTE:** Perform Step 1 through Step 7 only if the secondary relief valve was repaired.

1. Install a new backup ring on the secondary relief valve plug. See Figure 6.
2. Install the poppet, washer, and spring into the secondary relief valve plug.
3. Install a new O-ring on the adjusting nut, and install the adjusting nut and jam nut assembly into the secondary relief valve plug using the number of turns noted during disassembly.
4. While holding the adjusting nut in place, tighten the jam nut to  $24 \pm 3 \text{ N}\cdot\text{m}$  ( $18 \pm 2 \text{ lbf ft}$ ).
5. Install a backup ring, O-ring, and backup ring into the adjusting nut.
6. Install a new O-ring onto the plug. Install the plug into the adjusting nut.
7. If removed, install secondary relief valve into outlet control valve section. Tighten relief valve plug to  $45 \pm 4 \text{ N}\cdot\text{m}$  ( $33 \pm 3 \text{ lbf ft}$ ). See the section Pressure Relief Valve Check and Adjustment to adjust the secondary relief valve and check the pressure.

**Install**

**NOTE:** Coat all O-rings with light coat of clean hydraulic oil to make installation easier.

1. Install new O-rings (13, Figure 7 ) into the auxiliary valve section. Install the outlet control valve section on the four tie rods.
2. Install the four nuts on the tie rods. Tighten the three 13 mm ( $\frac{1}{2}$  in.) nuts to  $24 \pm 2 \text{ N}\cdot\text{m}$  ( $212 \pm 18 \text{ lbf in}$ ) and the 15 mm ( $9/16$  in.) nut to  $45 \pm 4 \text{ N}\cdot\text{m}$  ( $33 \pm 3 \text{ lbf ft}$ ). See Figure 6.

**Auxiliary Control Valve Section**

**NOTE:** There is the possibility of having two auxiliary control valve sections depending upon how many functions are on the lift truck. If the main control valve is a four-function control valve, there will be two auxiliary control valve sections. These sections are repaired the same way.

**Remove**

1. Remove the outlet control valve section. See Outlet Control Valve Section, Remove.

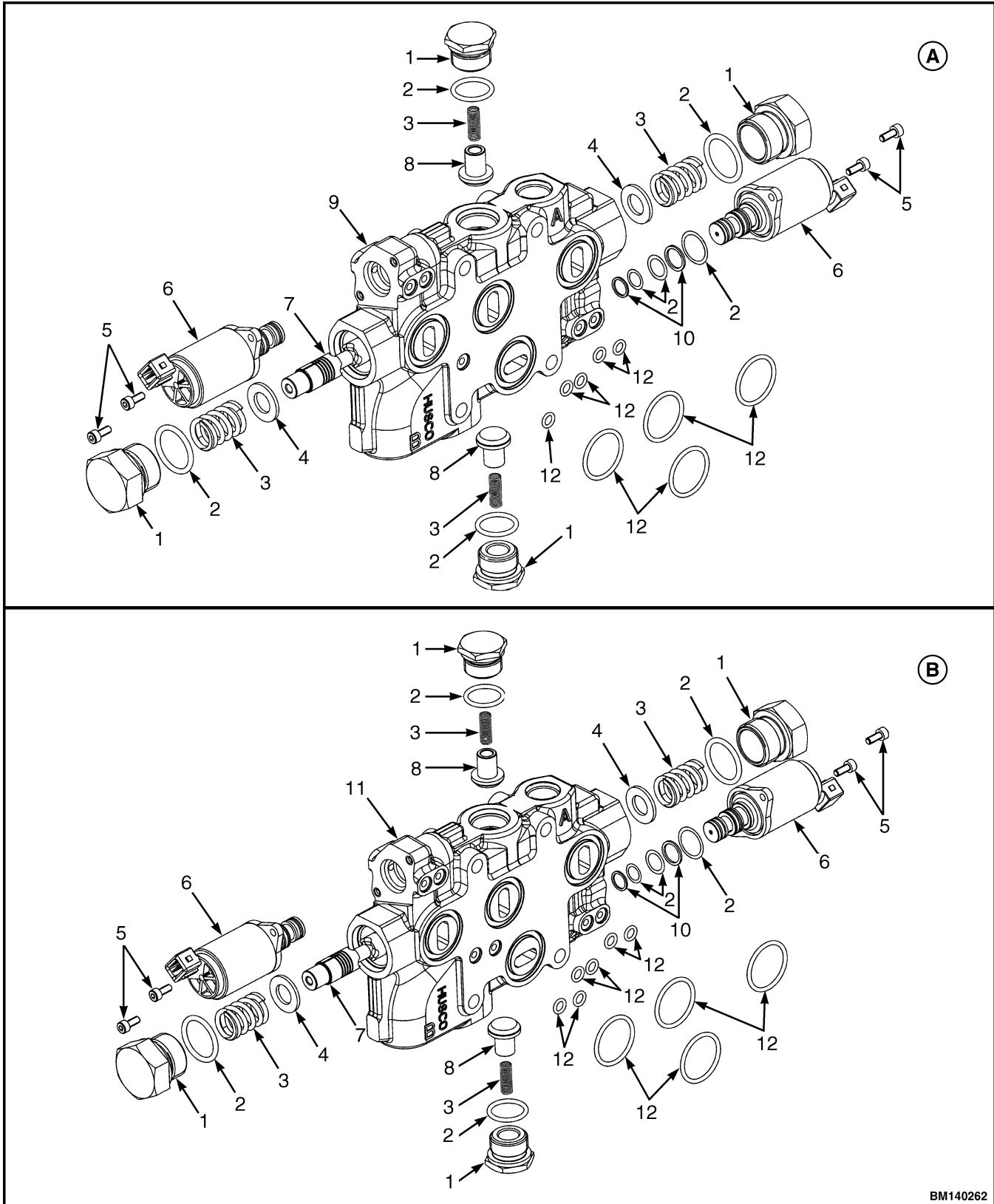


Figure 7. Auxiliary I and II Control Valve Sections



**Legend for Figure 7****A. AUXILIARY I CONTROL VALVE SECTION**

1. PLUG
2. O-RING
3. SPRING
4. WASHER
5. SOCKET HEAD CAPSCREW
6. PROPORTIONAL PRESSURE REDUCING VALVE (PPRV)

**NOTE:** For four function control valve, perform Step 2 and Step 3. For three function control valve, perform Step 3.

2. Remove the auxiliary II control valve section from the four tie rods. Remove and discard O-rings (13, Figure 7) from side of the auxiliary I control valve section.
3. Remove the auxiliary I control valve section from the four tie rods. Remove and discard O-rings from the side of tilt control valve section. See Figure 7.

**Disassemble**

**NOTE:** Disassemble the auxiliary control valve section only as needed to accomplish the repairs required. The disassemble procedures for the auxiliary I and II sections are the same. The auxiliary I section is used in the procedures described below because it contains the anti-stall valve.

1. Remove four capscrews and two proportional pressure reducing valves (PPRV) from the auxiliary control valve section. Remove and discard the backup ring, two O-rings, backup ring, and O-ring from each PPRV. See Figure 7.
2. Remove the plug, spring, washer, and spool from the auxiliary control valve section. Discard the O-ring on the plug. See Figure 7.
3. Remove the plug, spring, and washer from the auxiliary control valve section. Discard the O-ring on the plug. See Figure 7.
4. Remove two plugs, two springs, and two poppets from the auxiliary control valve section. Discard one O-ring from each plug. See Figure 7.

**B. AUXILIARY II CONTROL VALVE SECTION**

7. SPOOL
8. POPPET
9. AUXILIARY I CONTROL VALVE BODY
10. BACKUP RING
11. AUXILIARY II CONTROL VALVE BODY
12. O-RING

**Clean****WARNING**

**Cleaning solvents can be flammable and toxic and can cause skin irritation. When using cleaning solvents, always follow the solvent manufacturer's recommended safety procedures.**

**WARNING**

**Compressed air can move particles so they cause injury to the user or to other personnel. Make sure the path of the compressed air is away from all personnel. Wear protective goggles or a face shield to prevent injury to the eyes.**

1. If all components of the auxiliary control valve section have been removed, clean the auxiliary control valve section and components, except the two PPRVs, using cleaning solvent and dry using compressed air.
2. If all components have not been removed, clean the auxiliary control valve section using a lint-free cloth.

**Inspect**

Inspect the auxiliary control valve section mating surfaces and any open bores for damage. If damage is found, replace the auxiliary control valve section. If the spool has been removed, inspect the spool and the bore for damage. If damage to either the spool or the bore is found, replace the auxiliary control valve section.

**NOTE:** If the auxiliary control valve section is not to be reassembled immediately, coat surfaces with clean hydraulic oil to prevent the possibility of rust. Cover the auxiliary control valve section with a clean, dry, lint-free cloth to prevent the possibility of contaminants entering the auxiliary control valve section.

## Assemble

**NOTE:** Coat all backup rings and O-rings with a light coat of clean hydraulic oil to make installation easier.

**NOTE:** The assembly procedures for the auxiliary I and II sections are the same. The auxiliary I section is used in the procedures described below because it contains the anti-stall valve.

1. Install the spool, washer, spring, and plug, with new O-ring, into the bore of the auxiliary control valve section. Tighten the plug to  $14 \pm 1 \text{ N}\cdot\text{m}$  ( $120 \pm 12 \text{ lbf in}$ ). See Figure 7.
2. Install the washer, spring, and plug, with new O-ring, into the auxiliary control valve section. See Figure 7. Tighten the plug to  $14 \pm 1 \text{ N}\cdot\text{m}$  ( $120 \pm 12 \text{ lbf in}$ ).
3. Install two poppets, two springs, and two plugs, with new O-rings installed, into the auxiliary control valve section. See Figure 7. Tighten the plugs to  $81 \pm 8 \text{ N}\cdot\text{m}$  ( $60 \pm 6 \text{ lbf ft}$ ).
4. Install the new O-ring, backup ring, two O-rings, and backup ring on each PPRV. Install two PPRVs and four capscrews into the auxiliary control valve section. See Figure 7. Tighten the capscrews to  $3 \pm 0.3 \text{ N}\cdot\text{m}$  ( $24 \pm 2 \text{ lbf in}$ ).

## Install

**NOTE:** Step 1 and Step 2 are for a three-function control valve. Step 3 through Step 5 are for four-function control valves.

1. Install new O-rings into the side of tilt control valve section. Install the auxiliary I control valve section on the four tie rods. See Figure 8.
2. Install the outlet control valve section. See Outlet Control Valve Section, Install.
3. Install new O-rings into the side of tilt control valve section. Install the auxiliary I control valve section on the four tie rods. See Figure 8.
4. Install the auxiliary II control valve section on the four tie rods. Install new O-rings into the side of auxiliary II control valve section.

5. Install the outlet control valve section. See Outlet Control Valve Section, Install.
6. Install the four nuts on the tie rods on the outlet control valve section. Tighten the three 13 mm ( $\frac{1}{2}$  in.) nuts to  $24 \pm 2 \text{ N}\cdot\text{m}$  ( $212 \pm 18 \text{ lbf in}$ ) and the 15 mm ( $9/16$  in.) nut to  $45 \pm 4 \text{ N}\cdot\text{m}$  ( $33 \pm 3 \text{ lbf ft}$ ). See Figure 6.

## Tilt Control Valve Section

### Remove

1. Remove the outlet control valve section. See Outlet Control Valve Section, Remove.
2. Remove the auxiliary control valve section(s). See Auxiliary Control Valve Section, Remove.
3. Remove the tilt control valve section from the lift/lower control valve section.
4. Remove and discard O-rings from the side of lift/lower control valve section.

### Disassemble

**NOTE:** Disassemble the tilt control valve section only as needed to accomplish the repairs required.

1. Remove four socket head capscrews and two proportional pressure-reducing valves (PPRV) from the tilt control valve section. See Figure 8. Remove and discard the backup ring, two O-rings, backup ring, and O-ring from each PPRV.
2. Remove the plug, spring, washer, and spool from the tilt control valve section. Discard the O-ring on the plug. See Figure 8.
3. Remove the socket head capscrew, spring and piston from the spool.
4. Remove the plug, spring, and washer from the tilt control valve section. Discard the O-ring on the plug. See Figure 8.
5. Remove two plugs, two springs, and two poppets from the tilt control valve section. Discard one O-ring from each plug. See Figure 8.



**Clean**

**WARNING**

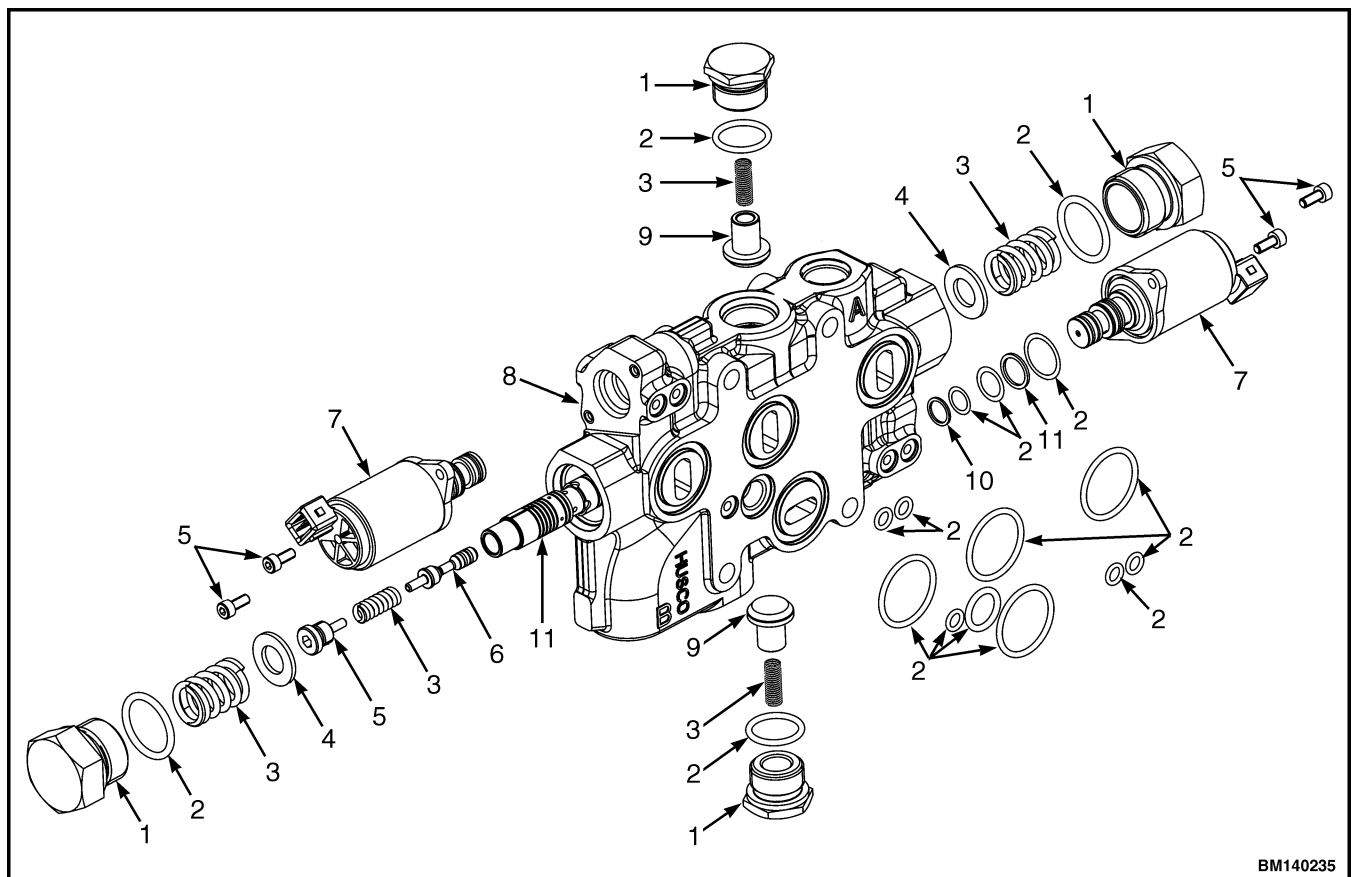
Cleaning solvents can be flammable and toxic and can cause skin irritation. When using cleaning solvents, always follow the solvent manufacturer's recommended safety procedures.

**WARNING**

Compressed air can move particles so they cause injury to the user or to other personnel. Make sure the path of the compressed air is away from all personnel.

**Wear protective goggles or a face shield to prevent injury to the eyes.**

1. If all components of the tilt control valve section have been removed, clean the tilt control valve section and components, except the two PPRVs, using cleaning solvent and dry using compressed air.
2. If not all components have been removed, clean the tilt control valve section using a lint-free cloth.



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- |                         |  |
|-------------------------|--|
| 1. PLUG                 | 7. PROPORTIONAL PRESSURE-REDUCING VALVE (PPRV) |
| 2. O-RING               | 8. TILT CONTROL VALVE BODY                     |
| 3. SPRING               | 9. POPPET                                      |
| 4. WASHER               | 10. BACKUP RING                                |
| 5. SOCKET HEAD CAPSCREW | 11. SPOOL                                      |
| 6. PISTON               |  |

**Figure 8. Tilt Control Valve Section**

**Inspect**

Inspect the tilt control valve section mating surfaces and any open bores for damage. If damage is found, replace the tilt control valve section. If the spool has been removed, inspect the spool and the bore for the spool for damage. If damage to either the spool or the bore is found, replace the tilt control valve section.

**NOTE:** If the tilt control valve section is not to be reassembled immediately, coat surfaces with clean hydraulic oil to prevent the possibility of rust. Cover the tilt control valve section with a clean, dry, lint-free cloth to prevent the possibility of contaminants entering the tilt control valve section.

**Assemble**

**NOTE:** Coat all backup rings and O-rings with a light coat of clean hydraulic oil to make installation easier.

1. Install the piston, spring, and socket head cap-screw in the spool. See Figure 8.
2. Install the spool, washer, spring, and plug, with new O-ring, into the bore of the tilt control valve section. Tighten the plug to  $14 \pm 1 \text{ N}\cdot\text{m}$  ( $120 \pm 12 \text{ lbf in}$ ).
3. Install the washer, spring, and plug, with new O-ring, into the tilt control valve section. Tighten the plug to  $14 \pm 1 \text{ N}\cdot\text{m}$  ( $120 \pm 12 \text{ lbf in}$ ).
4. Install two poppets, two springs, and two plugs, with new O-rings installed, into the tilt control valve section. Tighten the plugs to  $81 \pm 8 \text{ N}\cdot\text{m}$  ( $60 \pm 6 \text{ lbf ft}$ ). See Figure 8.
5. Install the new O-ring, backup ring, two O-rings, and backup ring on each PPRV. Install two PPRVs and four capscrews into the tilt control valve section. Tighten the capscrews to  $3 \pm 0.3 \text{ N}\cdot\text{m}$  ( $24 \pm 2 \text{ lbf in}$ ).

**Install**

1. Install new O-rings on the side of lift/lower control valve section.
2. Install the tilt control valve section on the lift/lower control valve section.

3. Install the auxiliary I and II (if equipped) control valve sections. See Auxiliary Control Valve Section, Install.
4. Install the outlet control valve section. See Outlet Control Valve Section, Install.
5. Install the four nuts on the tie rods of the outlet control valve section. Tighten the three  $13 \text{ mm}$  ( $\frac{1}{2} \text{ in.}$ ) nuts to  $24 \pm 2 \text{ N}\cdot\text{m}$  ( $212 \pm 18 \text{ lbf in}$ ) and the  $15 \text{ mm}$  ( $9/16 \text{ in.}$ ) nut to  $45 \pm 4 \text{ N}\cdot\text{m}$  ( $33 \pm 3 \text{ lbf ft}$ ). See Figure 6.

**Lift/Lower Control Valve Section****Remove**

1. Remove the outlet control valve. See Outlet Control Valve Section, Remove.
2. Remove the auxiliary control valve section(s). See Auxiliary Control Valve Section, Remove.
3. Remove the tilt control valve section. See Tilt Control Valve Section, Remove.
4. Remove lift/lower control valve section from transition control valve section.
5. Remove and discard O-rings from side of transition control valve section.

**Disassemble**

**NOTE:** Disassemble the lift/lower control valve section only as needed to accomplish the repairs required.

1. Remove four socket head capscrews and two proportional pressure-reducing valves (PPRV) from top and bottom of lift/lower control valve section. See Figure 9. Remove and discard the O-rings and backup rings from each PPRV.
2. Remove the socket head plug from bottom of lift/lower control valve section. Remove and discard O-ring from plug. See Figure 9.
3. Remove the spring, spool, piston, backup ring, and washer from the bottom of lift/lower control valve section. See Figure 9.

4. Remove the socket head plug, spring, and washer from top of lift/lower control valve section. Remove and discard O-ring from plug. See Figure 9.
5. Remove load check valve, spring, O-ring, and poppet. Discard O-ring. Remove and discard O-ring from load check valve. See Figure 9.

### Clean

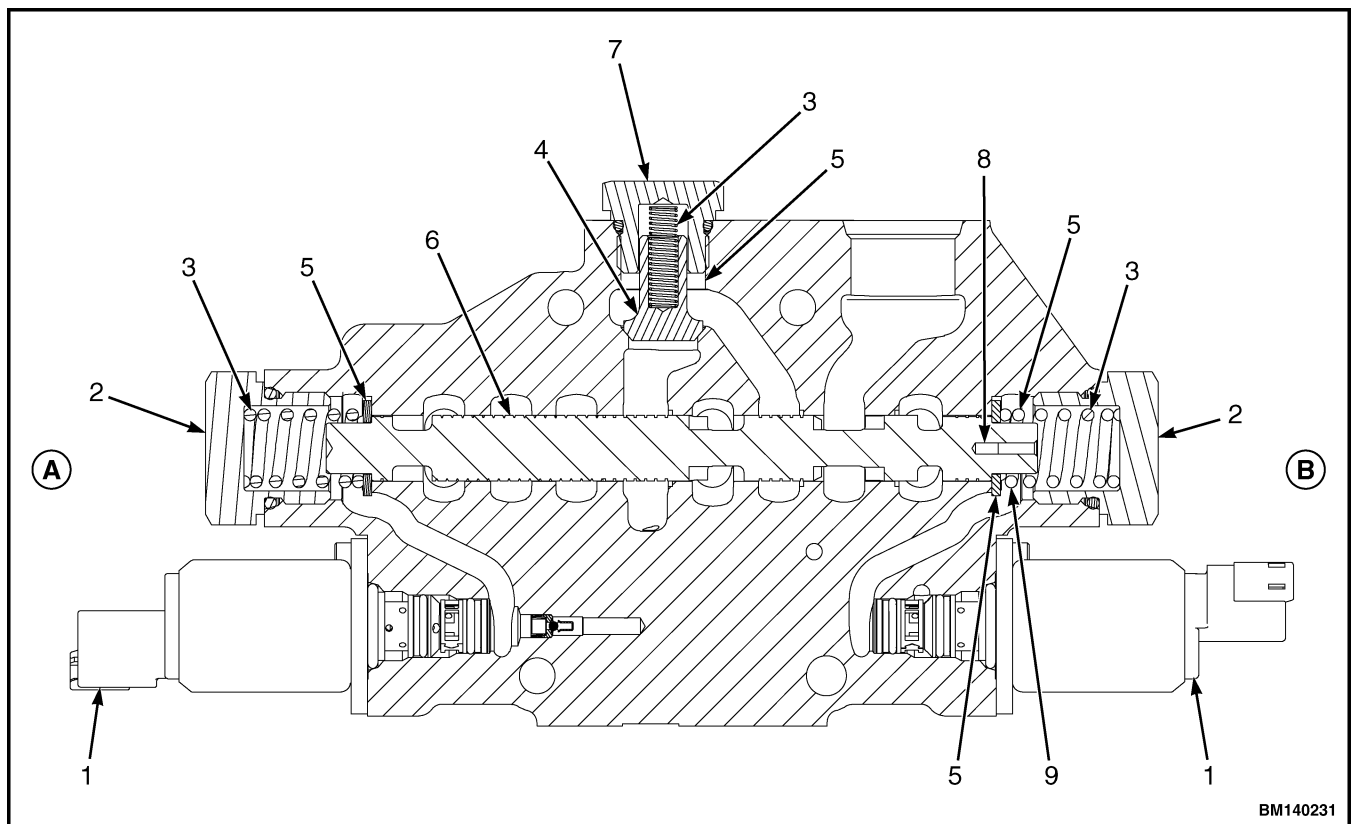
#### WARNING

Cleaning solvents can be flammable and toxic and can cause skin irritation. When using cleaning solvents, always follow the solvent manufacturer's recommended safety procedures.

#### WARNING

Compressed air can move particles so they cause injury to the user or to other personnel. Make sure the path of the compressed air is away from all personnel. Wear protective goggles or a face shield to prevent injury to the eyes.

1. If all components of the lift/lower control valve section have been removed, clean the lift/lower control valve section and components, except the two PPRVs, using cleaning solvent and dry using compressed air.
2. If all components have not been removed, clean the lift/lower control valve section using a lint-free cloth.



#### A. TOP

1. PROPORTIONAL PRESSURE REDUCING VALVE
2. SOCKET HEAD PLUG
3. SPRING
4. POPPET

#### B. BOTTOM

5. O-RING
6. SPOOL
7. LOAD CHECK VALVE
8. PISTON
9. BACKUP RING

**Figure 9. Lift/Lower Control Valve Section**

**Inspect**

Inspect the lift/lower control valve section mating surfaces and any open bores for damage. If damage is found, replace the lift/lower control valve section. If the spool has been removed, inspect the spool and the bore for damage. If damage to either the spool or the bore is found, replace the lift/lower control valve section.

**NOTE:** If the lift/lower control valve section is not to be reassembled immediately, coat surfaces with clean hydraulic oil to prevent the possibility of rust. Cover the lift/lower control valve section with a clean, dry, lint-free cloth to prevent the possibility of contaminants entering the lift/lower control valve section.

**Assemble**

1. Install new O-ring on load check valve. Install poppet, O-ring, spring, and load check valve on lift/lower control valve section. See Figure 9.
2. Install new O-ring on plug. Install washer, spring, and socket head plug on top of lift/lower control valve section. See Figure 9. Tighten plug to  $81 \pm 8 \text{ N}\cdot\text{m}$  ( $60 \pm 6 \text{ lbf ft}$ ).
3. Install washer, backup ring, piston, spool, and spring on bottom of lift/lower control valve section. See Figure 9.
4. Install new O-ring on plug. Install socket head plug on bottom of lift/lower control valve section. See Figure 9. Tighten plug to  $81 \pm 8 \text{ N}\cdot\text{m}$  ( $60 \pm 6 \text{ lbf ft}$ ).
5. Install backup rings and O-rings on two proportional pressure-reducing valves (PPRV). Install two PPRV and four socket head capscrews in top and bottom of lift/lower control valve section. Tighten capscrews to  $14 \pm 1 \text{ N}\cdot\text{m}$  ( $120 \pm 12 \text{ lbf in}$ ).

**Install**

1. Install new O-rings on side of transition control valve section.
2. Install lift/lower control valve section on transition control valve section.
3. Install the tilt control valve section. See Tilt Control Valve Section, Install.

4. Install the auxiliary control valve section. See Auxiliary Control Valve Section, Install.
5. Install the outlet control valve section. See Outlet Control Valve Section, Install.

**Transition Section****Remove**

1. Remove the outlet control valve section. See Outlet Control Valve Section, Remove.
2. Remove the auxiliary control valve section(s). See Auxiliary Control Valve Section Remove.
3. Remove the tilt control valve section. See Tilt Control Valve Section, Remove.
4. Remove the lift/lower control valve section. See Lift/Lower Control Valve Section, Remove.
5. Remove four tie rods from the transition control valve section.

**Disassemble****CAUTION**

The transition section is equipped with a clipper relief valve. **DO NOT** disassemble or adjust the clipper relief valve. Removing the tamper proof cap and disassembling and/or adjusting the clipper relief valve will void and/or cancel any warranties. Contact your dealer for more information.

**CAUTION**

When removing the emergency load lowering valve, use care to not damage the tip of the emergency load lowering valve.

**NOTE:** Disassemble the transition control valve section only as needed to accomplish the repairs required.

Remove the emergency load lowering valve from the transition section. Remove and discard the O-ring from valve. See Figure 10.

**Clean**

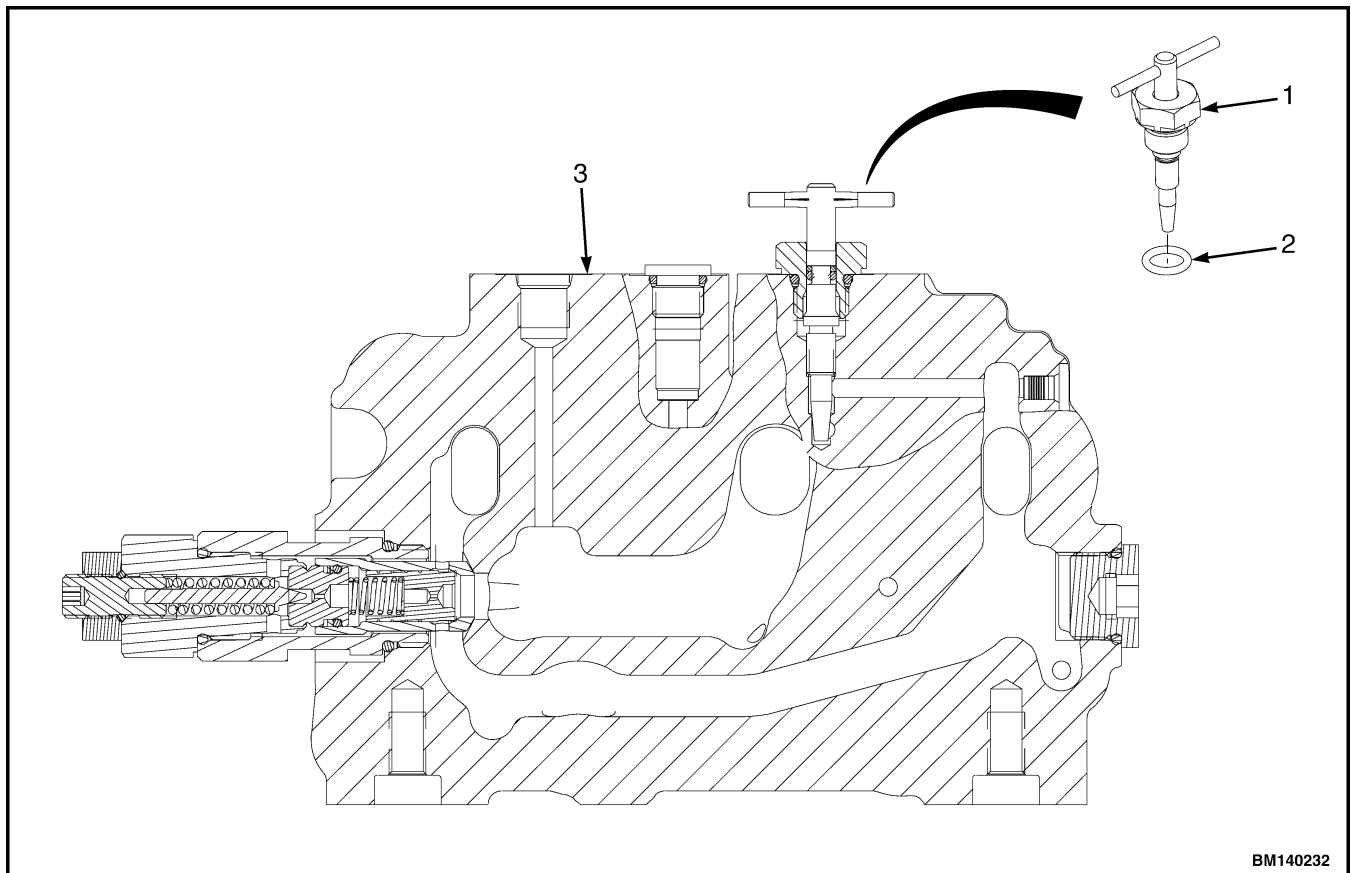
Clean the transition control valve section using a lint-free cloth.

**Inspect**

Inspect the transition control valve section mating surfaces and any open bores for damage. If damage is found, replace the transition control valve section.

If the clipper relief valve is not working correctly, contact your dealer.

**NOTE:** If the transition control valve section is not to be reassembled immediately, coat surfaces with clean hydraulic oil to prevent the possibility of rust. Cover the transition control valve section with a clean, dry, lint-free cloth to prevent the possibility of contaminants entering the transition control valve section.



**NOTE:** TAMPER PROOF CAP FOR CLIPPER RELIEF VALVE NOT SHOWN FOR CLARITY.

- |                                  |                                     |
|----------------------------------|-------------------------------------|
| 1. EMERGENCY LOAD LOWERING VALVE | 3. TRANSITION CONTROL VALVE SECTION |
| 2. O-RING                        |                                     |

**Figure 10. Transition Control Valve Section**

**Assemble****CAUTION**

The transition section is equipped with a clipper relief valve. **DO NOT disassemble or adjust the clipper relief valve. Removing the tamper proof cap and disassembling and/or adjusting the clipper relief valve will void and/or cancel any warranties. Contact your dealer for more information.**

Install emergency load lowering valve, with new O-ring installed, into transition control valve section. Tighten emergency load lowering valve to  $14 \pm 1 \text{ N}\cdot\text{m}$  ( $120 \pm 12 \text{ lbf in}$ ).

**Install**

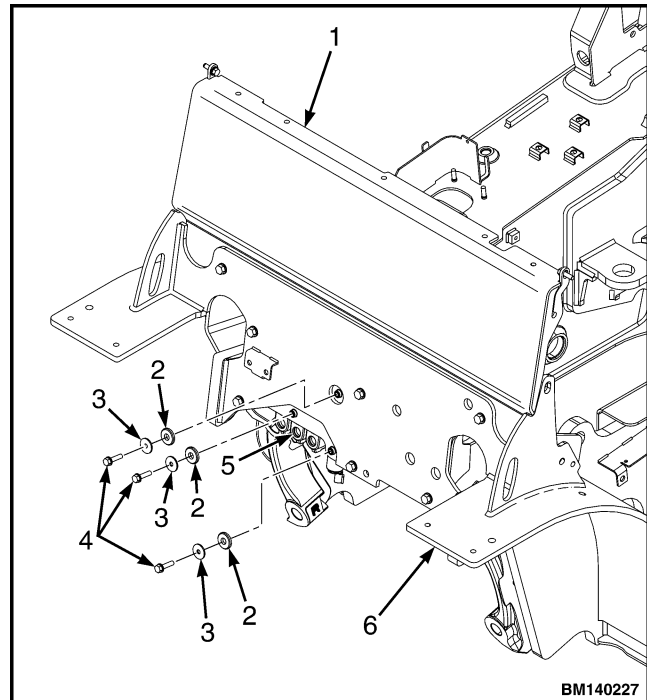
1. Install four tie rods into the transition control valve section.
2. Install lift/lower control valve section. See Lift/Lower Control Valve Section, Install.
3. Install the tilt control valve section. See Tilt Control Valve Section, Install.
4. Install the auxiliary control valve section(s). See Auxiliary Control Valve Section, Install.
5. Install the outlet control valve section. See Outlet Control Valve Section, Install.
6. Install the four nuts on the tie rods of the outlet control valve section. Tighten the three 13 mm ( $\frac{1}{2}$  in.) nuts to  $24 \pm 2 \text{ N}\cdot\text{m}$  ( $212 \pm 18 \text{ lbf in}$ ) and the 15 mm ( $\frac{9}{16}$  in.) nut to  $45 \pm 4 \text{ N}\cdot\text{m}$  ( $33 \pm 3 \text{ lbf ft}$ ). See Figure 6.

**INSTALL****WARNING**

The main control valve weighs approximately 30.5 kg (67 lb). Use a lifting device capable of lifting the main control valve, to avoid the possibility of injury to personnel.

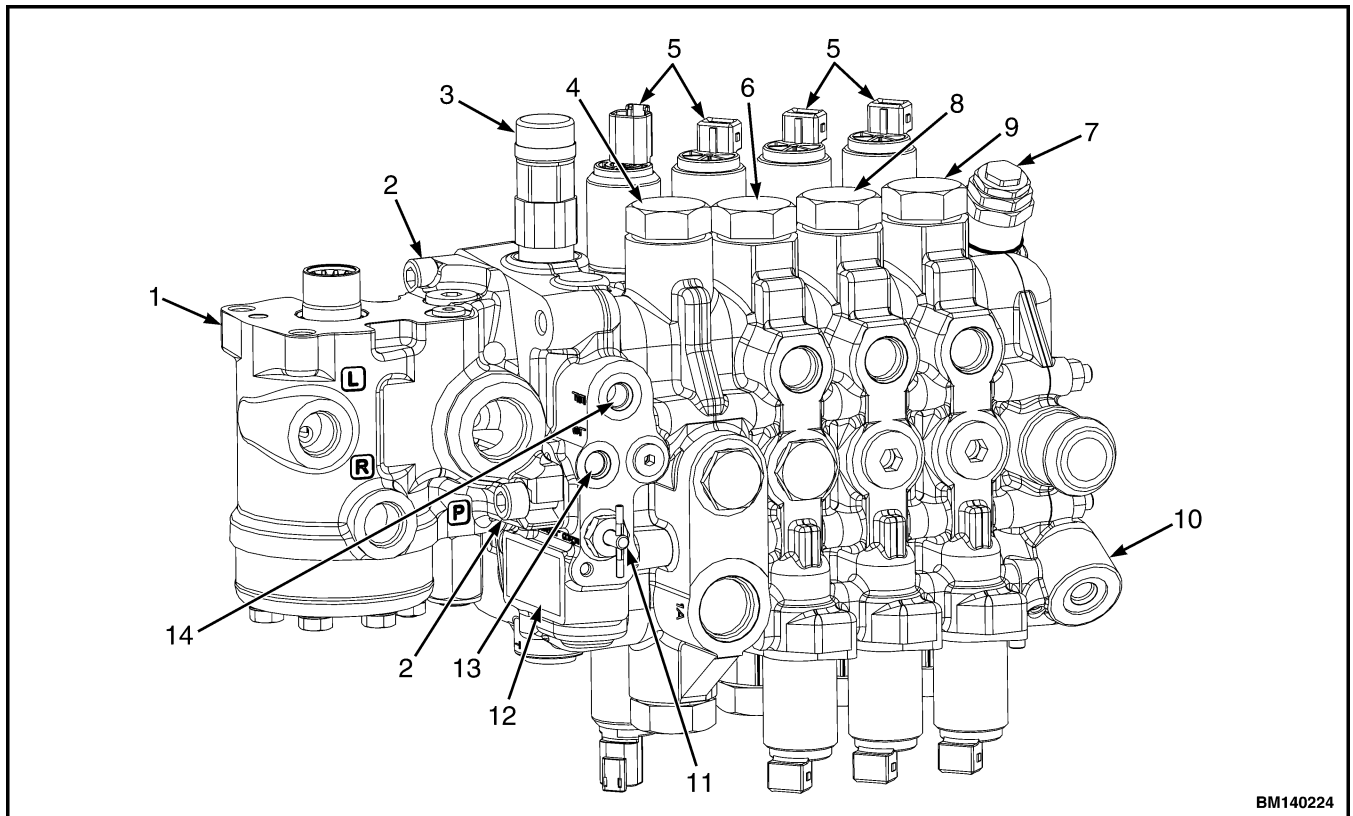
1. Lower the control valve enough to allow the cowl wiring harness to be connected to the lower PPRV solenoid connectors as noted during removal. See Figure 4.

2. Install three inserts into holes on cowl where the control valve will be mounted. While supporting the main control valve in place on the cowl, install three mounting capscrews and washers through the front of the cowl into the control valve. Tighten the capscrews to  $19 \text{ N}\cdot\text{m}$  ( $14 \text{ lbf ft}$ ). See Figure 11.
3. Coat new O-rings with clean hydraulic oil. Install O-rings between transition control valve section and SCU.
4. Position the SCU under the steering shaft and raise the SCU to engage the steering shaft. When the steering shaft is completely engaged, position the SCU against the main control valve, and install two mounting capscrews. Tighten capscrews to  $45$  to  $55 \text{ N}\cdot\text{m}$  ( $33$  to  $41 \text{ lbf ft}$ ). See Figure 12.



1. COWL
2. INSERT
3. WASHER
4. MOUNTING CAPSCREW
5. MAIN CONTROL VALVE
6. FRAME

**Figure 11. Main Control Valve Installation**



BM140224

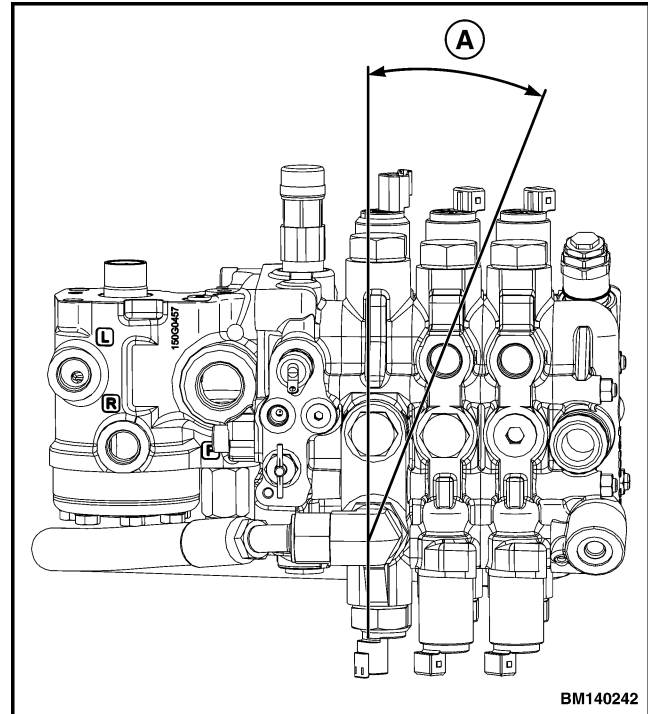
**NOTE:** FOUR FUNCTION CONTROL VALVE SHOWN.

- |  |                              |
|--|------------------------------|
| 1. STEERING CONTROL UNIT (SCU)                 | 8. AUXILIARY I SECTION       |
| 2. SCU MOUNTING CAPSCREW                       | 9. AUXILIARY II SECTION      |
| 3. CLIPPER RELIEF VALVE                        | 10. ACCUMULATOR PORT         |
| 4. LIFT/LOWER SECTION                          | 11. EMERGENCY LOWERING VALVE |
| 5. PROPORTIONAL PRESSURE REDUCING VALVE (PPRV) | 12. TRANSITION SECTION       |
| 6. TILT SECTION                                | 13. LOAD SENSING (LS) PORT   |
| 7. SECONDARY RELIEF VALVE                      | 14. EF PORT                  |

**Figure 12. Electronic Control Valve With Variable Displacement Pump**

**NOTE:** When connecting the lift/lower hose, be sure it is in correct position as shown in Figure 13.

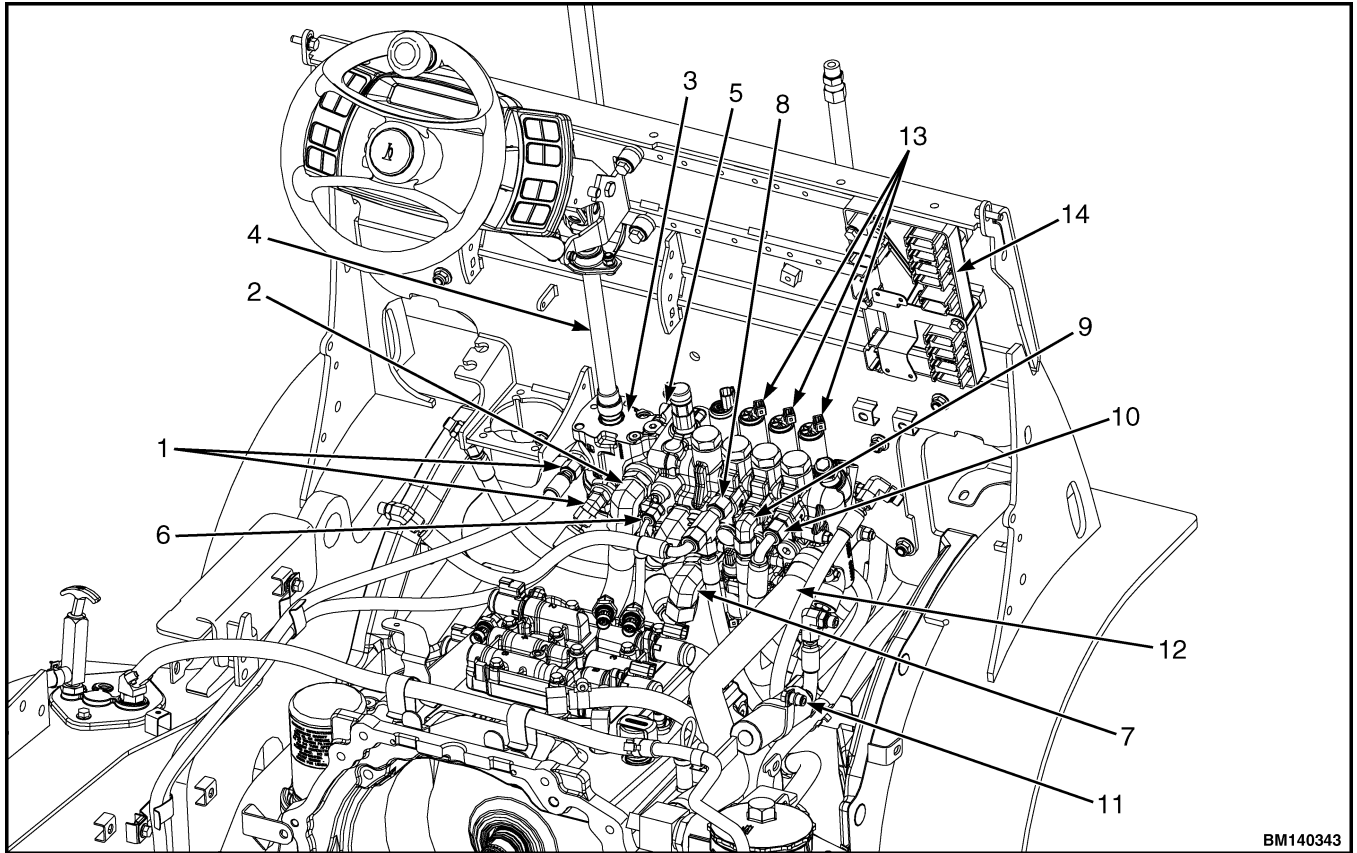
5. Remove all caps and plugs from control valve and hose fittings. Connect hydraulic hoses to the control valve as noted during removal. See Figure 14.
6. Connect the cowl wiring harness to the top PPRV solenoids as noted during removal.
7. Apply adhesive compound, (Hyster P/N 251099), to the three mounting capscrews. Using the three capscrews that hold the throttle base to the cowl, install the pedal assembly on the lift truck. Connect the cowl wiring harness to the pedal assembly wiring harness. Tighten the bolts to 19 to 25 N·m (168 to 221 lbf in). See Figure 15.
8. Install the dashboard, seal plate, kick panel, and floor plate. See **Frame** 0100SRM1891
9. Perform the calibration procedures described in the section .



A.  $90^{\circ} \pm 5^{\circ}$

**Figure 13. Lift/Lower Hose Orientation**





BM140343

- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>1. STEERING SYSTEM HOSES</li> <li>2. HYDRAULIC INLET HOSE</li> <li>3. STEERING CONTROL UNIT (SCU)</li> <li>4. STEERING COLUMN SHAFT</li> <li>5. SCU MOUNTING CAPSCREWS</li> <li>6. LOAD SENSE LINE</li> <li>7. LIFT/LOWER HOSE</li> <li>8. TILT HOSE</li> </ol> | <ol style="list-style-type: none"> <li>9. AUXILIARY I HOSE</li> <li>10. AUXILIARY II HOSE</li> <li>11. ACCUMULATOR</li> <li>12. RETURN HOSE</li> <li>13. AUXILIARY FUNCTION PROPORTIONAL PRESSURE REDUCING VALVE HARNESS (PPRV)</li> <li>14. VEHICLE SYSTEMS MANAGER</li> </ol> |
|--|---|

**Figure 14. Hydraulic Hose Installation**