

SERVICE REPAIR

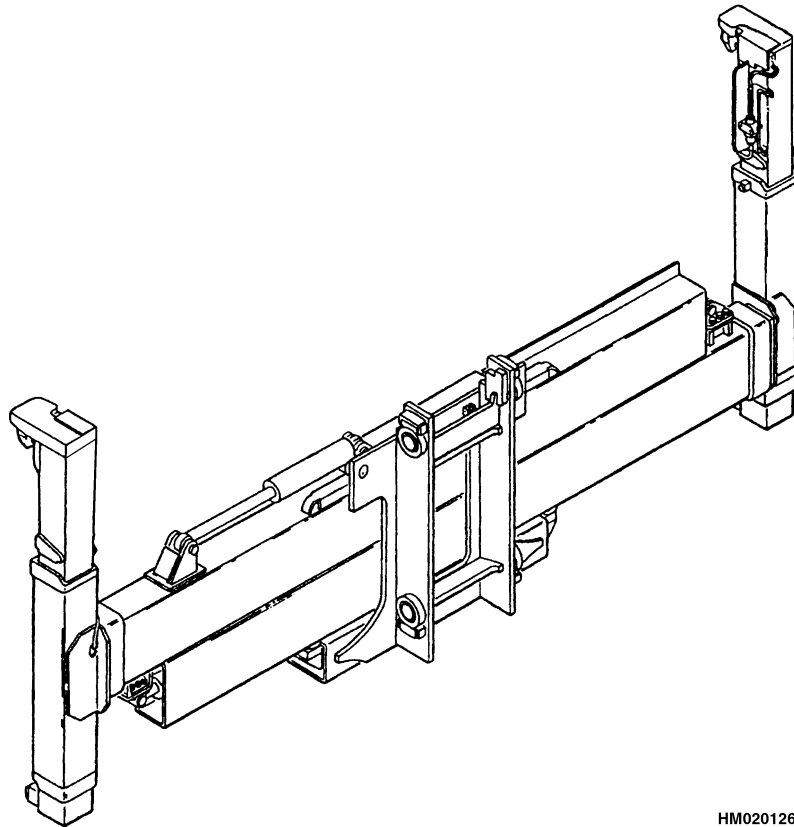
MANUAL

Hyster F007 (H170HD, H190HD, H210HD,
H230HD, H250HD, H280HD) Forklift

HYSTER

EMPTY CONTAINER HANDLING ATTACHMENT

**H10.00-12.00XM-12EC (H360HD-EC) [E019, F019]
MODELS 553, 555, 558**



HM020126

HYSTER

SAFETY PRECAUTIONS

MAINTENANCE AND REPAIR

- 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 condition that can cause immediate death or injury!



CAUTION

Indicates a condition that can cause property damage!

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manual**

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This section is for the following models:

H10.00-12.00XM-12EC (H360HD-EC) [E019, F019]

Models 553, 555, 558

General

This section has the description and repair procedures for telescopic empty container handling attachment and operator controls. See Figure 1. Three methods of engagement are covered in this section as follows:

- Model 553 with one pair of horizontally mounted twist locks
- Model 555 with one pair of suspended hooks
- Model 558 with one pair of vertically mounted twist locks

Description

The extendable container attachment can be used at three widths: 6.1 m (20 ft), 12.2 m (40 ft), and when equipped with optional stops, 9.15 m (30 ft). Models 553 and 558 use twist locks and Model 555 uses hooks, which are entered into side pockets of container corner castings. See Figure 1, Figure 2, Figure 3, and Figure 4. The attachment has a center frame, two outer booms, and two floating vertical end beams. The center frame is installed on the carriage and can move from side to side with the use of a sideshift cylinder. The outer booms, supported by several glide plates for friction reduction, extend and retract from the center frame through the use of hydraulic extension cylinders. The extension cylinders on attachment are actuated by hydraulic pressure from main control valve.

A vertical tube is mounted to the end of each outer boom. A vertical end beam assembly fits into each tube and facilitates engaging and disengaging the attachment with containers. The vertical end beams can move vertically 150 mm (6 in.) to allow alignment when required. This allows the driver the possibility of raising or lowering the attachment after one twist lock or hook has been engaged with a container, so the other end can be accurately aligned before it is inserted.

Header hoses and an electrical cable connect the hydraulic and electrical circuits to the attachment.

Operation

GENERAL

The attachment has hydraulic and electrical circuits to control its operation. See Figure 15, Figure 16, Figure 17, Figure 18, Figure 19, and Figure 20. The operator controls these functions from the operator's compartment. Depending on the model, attachment has selector valves for operation of sideshift, extension cylinders, and twist locks. The electrical circuit incorporates sensors and switches to verify correct position of container to attachment and the twist locks.

NOTE: Model 555 does not have indicators to tell driver that attachment is correctly engaged or disengaged.

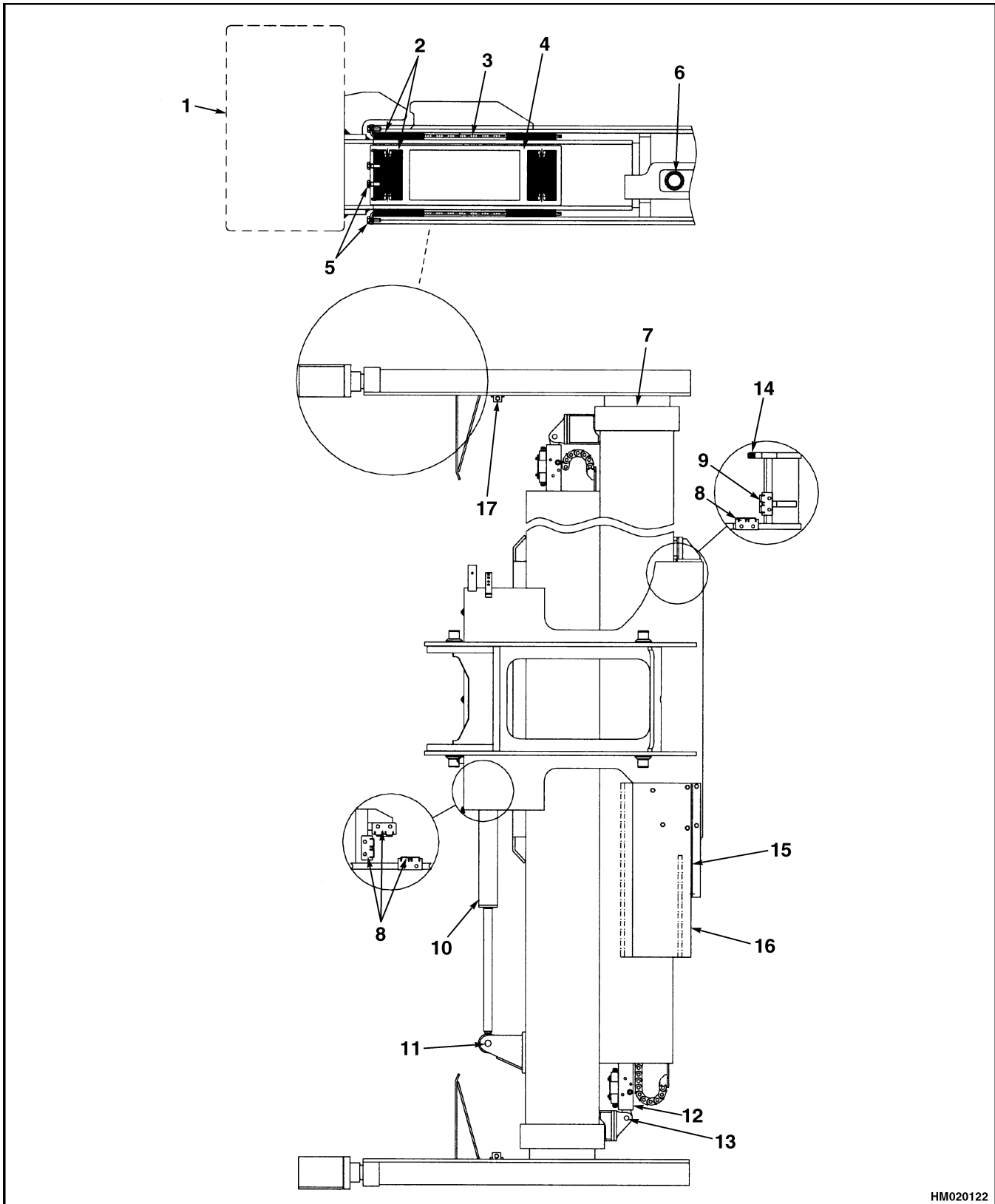
SELECTOR VALVES

Each selector valve has two solenoids that operate the spool. The spool opens and closes a hydraulic

circuit for certain functions. Dependant upon model, selector valves are mounted on a common manifold on attachment.

SIDESHIFT CIRCUIT

The attachment moves horizontally on the carriage. The operator energizes left or right solenoid using sideshift lever. Hydraulic oil is then supplied to appropriate cylinder end and attachment is moved. Relief valve within circuit limits maximum hydraulic pressure to 14.0 MPa (2030 psi). The sideshift cylinder is connected between the carriage and the center frame. There are four glide plates on the bottom and six glide plates on the top of the carriage to guide the movement of the attachment on the carriage. The bottom of the carriage is secured in the forward direction by two stop blocks.

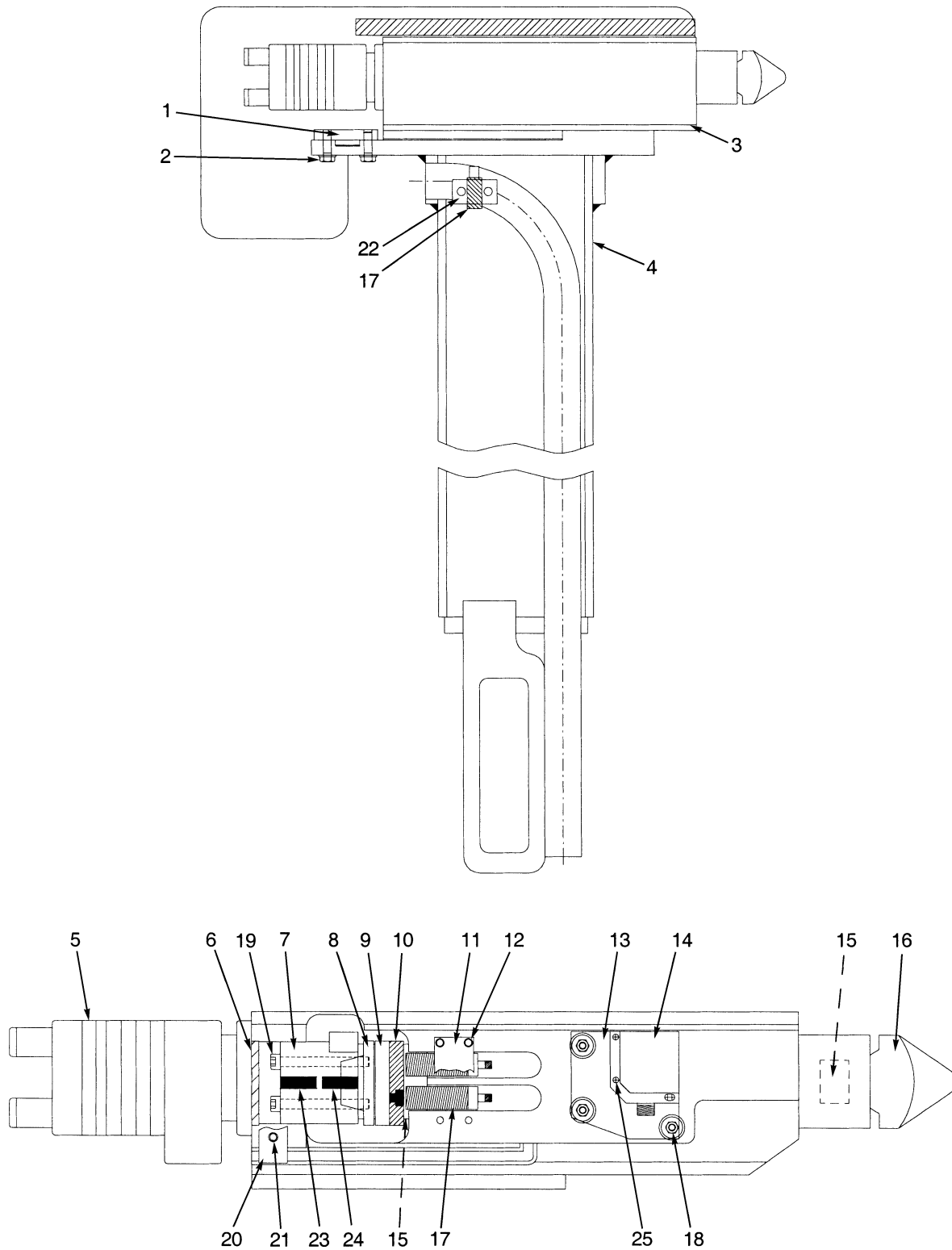


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Figure 1. Empty Container Attachment

Legend for Figure 1

- | | |
|---|--|
| 1. END BEAM ASSEMBLY | 11. PIN, BOLT, NUT |
| 2. WEAR PADS | 12. EXTENSION CYLINDER ASSEMBLY |
| 3. BRACKET | 13. BRACKET, BOLT, NUT, WASHER, PIN, WASHER, |
| 4. BRACKET | COTTER PIN, PIN, SNAP RING |
| 5. BOLT, WASHER | 14. STOP BLOCK, BOLT, WASHER |
| 6. PIN, BOLT, NUT | 15. BRACKET |
| 7. WEAR PADS | 16. COVER |
| 8. WEAR PADS, BRACKET, BOLT, WASHER | 17. PIN, BOLT, NUT |
| 9. WEAR PADS, BRACKET, BOLT, WASHER | |
| 10. SIDESHIFT ASSEMBLY, SOCKET HEAD
SCREWS | |

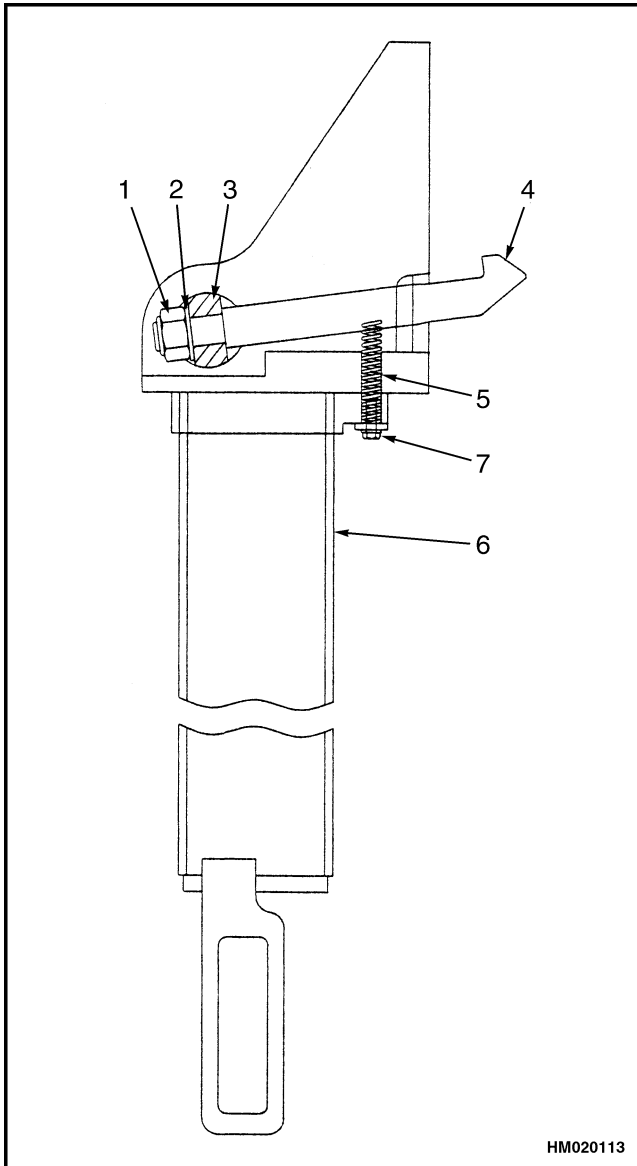


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Figure 2. End Beam Assembly (Model 553)

Legend for Figure 2

- | | |
|-------------------------------|-------------------------|
| 1. PLATE | 14. SENSOR |
| 2. BOLT, LOCKWASHER | 15. BUSHING |
| 3. HOUSING | 16. TWIST LOCK |
| 4. END BEAM | 17. SENSOR |
| 5. HYDRAULIC MOTOR | 18. SHOCK ABSORBER, NUT |
| 6. RING | 19. SOCKET HEAD SCREW |
| 7. SLEEVE | 20. HOSE CLAMP |
| 8. COLLET | 21. BOLT, WASHER |
| 9. RING | 22. BRACKET |
| 10. RINGS, SOCKET HEAD SCREWS | 23. KEY |
| 11. BRACKET | 24. KEY |
| 12. SOCKET HEAD SCREW | 25. SOCKET HEAD SCREW |
| 13. PLATE | |



- | | |
|---------------|----------------|
| 1. NUT | 5. SPRING |
| 2. WASHER | 6. END BEAM |
| 3. STUB SHAFT | 7. PLATE, BOLT |
| 4. HOOK | |

Figure 3. End Beam Assembly (Model 555)

EXTEND AND RETRACT CIRCUIT

The attachments are designed to lift either 20- or 40-ft containers. The optional 30-ft stop kit allows lifting 30-ft containers. The 30-ft position is obtained by energizing the 30-ft stop while extending or retracting the beams.

When the operator selects the extend or retract function with the control lever, the appropriate solenoid is energized and oil from the main control valve is supplied to the extension cylinders via the control valves. A relief valve within the circuit limits hydraulic pressure to a maximum 14.0 MPa (2030 psi) to protect the extension cylinders from damage.

TWIST LOCK CIRCUIT AND CONTROL

For model 553, locking of the twist locks is done manually only. For model 558, locking of the twist locks can be either manually or automatically. Unlocking is always done manually. Locking or unlocking is controlled by energizing the relevant solenoids and spools. Relief valves within the circuit limit the maximum hydraulic pressure to 8 MPa (1160 psi).

Model 553 - Horizontally Mounted

The horizontally-mounted twist lock circuit uses a twist lock motor and three sensors. See Figure 2. The three sensors register if the twist lock is locked, twist lock is unlocked, and container is seated.

To pick up a container, twist locks must be in unlocked position. The horizontal twist locks enter side pockets of container corner castings. When completely entered, the seated sensor registers and switches related amber light ON. When both seated sensors register and both amber lights are ON, twist lock circuit will allow twist lock motor to be operated. For model 553, locking and unlocking of twist locks is done manually only. Opening twist locks is also a manual operation.

To protect against possibility of twist locks opening unintentionally, twist locks have a flat surface, which touches vertical area of the corner casting when container is being carried. The weight of container locks the flat surface of twist lock against vertical area of corner casting and prevents twist lock from turning. It therefore is important to make sure that the attachment is completely seated before locking or unlocking twist locks.

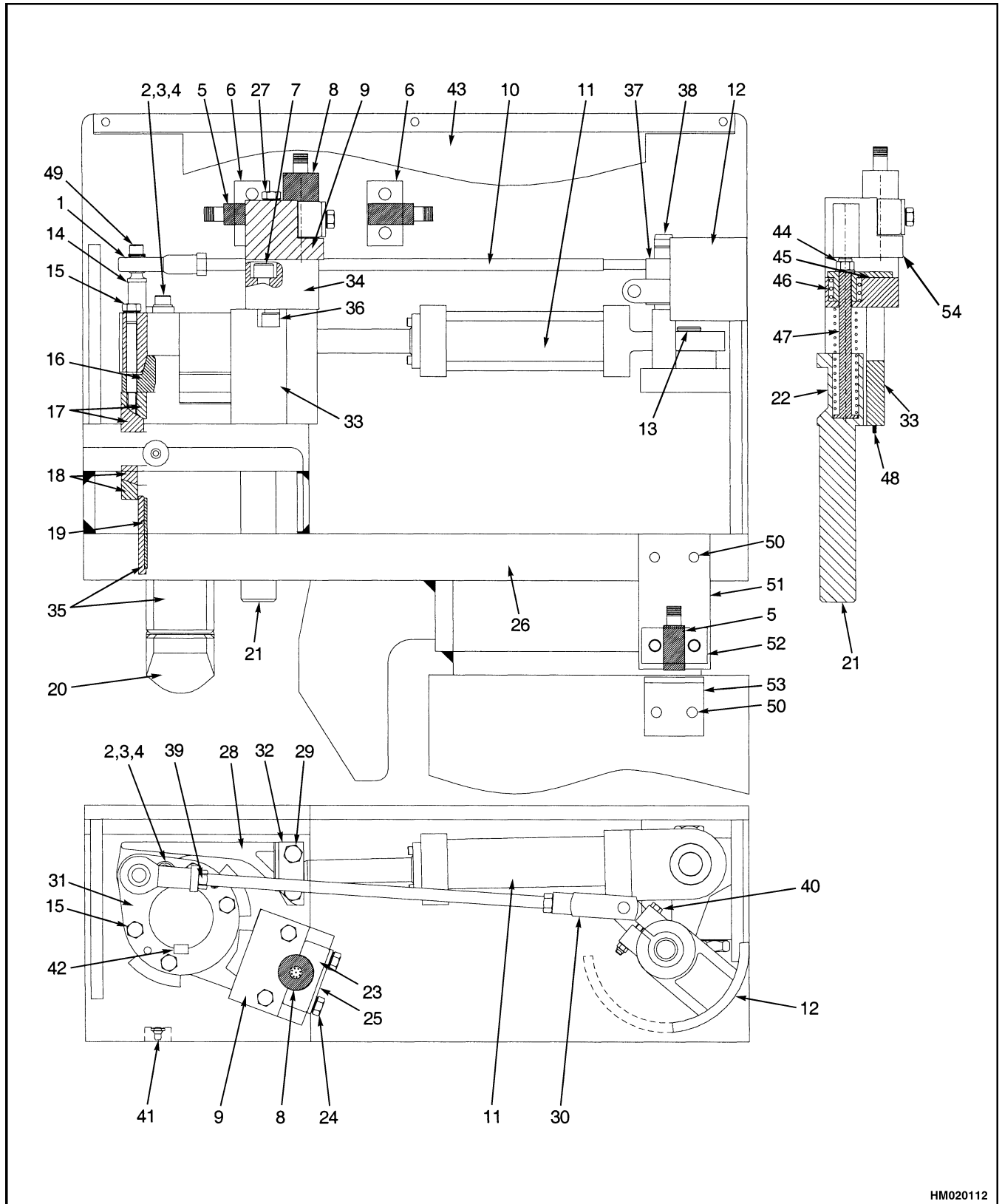


Figure 4. End Beam Assembly (Model 558)

Legend for Figure 4

- | | |
|--|--|
| 1. ROD END | 28. TIE ROD END |
| 2. RING PIN | 29. BOLT, LOCKWASHER, NUT |
| 3. SOCKET HEAD SCREW | 30. ROD END |
| 4. LOCKWASHER | 31. CRANK |
| 5. SENSOR | 32. FLAG |
| 6. SENSOR BRACKET, SPACER, SOCKET HEAD SCREW | 33. SEATED TOWER |
| 7. SOCKET HEAD SCREW | 34. BRACKET |
| 8. SENSOR | 35. SLEEVE |
| 9. BRACKET | 36. SOCKET HEAD SCREW |
| 10. ROD | 37. ARM |
| 11. CYLINDER ASSEMBLY | 38. NUT, WASHER, BUSHING, NYLON WASHER, WASHER |
| 12. INDICATOR | 39. NUT |
| 13. SNAP RING | 40. BOLT, NUT |
| 14. PIN | 41. GREASE NIPPLE |
| 15. BOLT, LOCKWASHER | 42. KEY |
| 16. COLLET | 43. COVER |
| 17. UPPER BEARING | 44. NUT |
| 18. LOWER BEARING | 45. INDICATOR |
| 19. BUSHING | 46. SPRING |
| 20. TWIST LOCK | 47. ROD |
| 21. SEATED PIN | 48. ROLL PIN |
| 22. SPRING | 49. SOCKET HEAD SCREW, WASHER |
| 23. BRACKET | 50. BOLT, LOCKWASHER |
| 24. BOLT, LOCKWASHER | 51. BRACKET |
| 25. TOP PLATE | 52. SENSOR BRACKET, SOCKET HEAD SCREW |
| 26. HEAD | 53. INDICATOR |
| 27. BOLT | |

Model 558 - Vertically Mounted

The vertically-mounted twist lock circuit uses a twist lock cylinder and three sensors. See Figure 4. The three sensors register the following: twist lock is locked, twist lock is unlocked, and container is seated.

To pick up a container, twist locks must be in unlocked position. Vertical twist locks enter top pockets of container corner castings. When completely entered, the seated sensor registers and switches related amber light ON. When both seated sensors register and both amber lights are ON, twist lock circuit will allow twist lock cylinders to be operated. Twist locks may be operated manually by driver, or may operate automatically after a 2-second time delay. Opening the twist locks is always a manual operation.

To protect against the possibility of twist locks opening unintentionally, seated pins have a cam in place which prevents twist lock crank from turning if seated pin is not seated.

LIFTING HOOKS**Model 555**

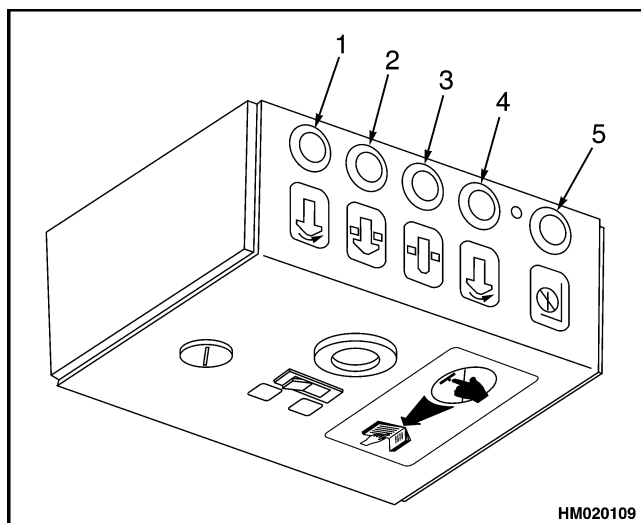
Model 555 does not have sensors or indicator lights to register position of hooks in relation to container. On this type of attachment, all safety monitoring must be done by driver. A good condition of hooks is essential. Check condition of hooks on a daily basis.

To pick up a container, approach container with mast tilted slightly forward. Enter one hook and then maneuver other hook up and down until hook can be entered into side pocket of container.

INDICATOR LIGHTS AND LEDS

There are four indicator lights on left side of attachment and five LEDs in operator's cab. See Figure 5 and Figure 6. Indication is as follows:

- Left Amber Light and LED indicate attachment is seated on left side and ready to have twist locks activated.
- Green Light and LED indicate that both twist locks are in locked position and ready to lift the container.
- Red Light and LED indicate that both twist locks are in unlocked position. It is now possible to move the twist locks into or out of the corner pockets.
- Right Amber Light and LED indicate attachment is seated on right side and ready to have twist locks activated.
- Blue LED (cab only) indicates that overlowering interrupt function or lift interrupt is activated.



- | | |
|-------------------|--------------------|
| 1. LEFT AMBER LED | 4. RIGHT AMBER LED |
| 2. GREEN LED | 5. BLUE LED |
| 3. RED LED | |

Figure 5. Indicator LEDs

LIFT INTERRUPT AND OVERRIDE



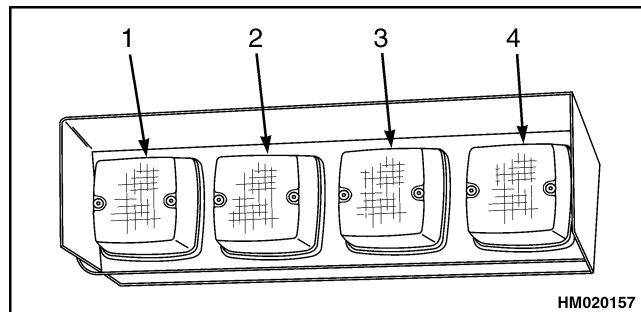
WARNING

Only use override feature for the positioning of twist locks to enable proper locking. Do not use

override feature for general lifting and transport of container.

When attachment is seated and any of the twist locks are between unlocked and locked position, the blue LED inside operator's cab will illuminate and lift interrupt system will not allow lifting of mast.

To override lift interrupt feature, turn override key switch clockwise and push override button while using lift lever.



- | | |
|---------------------|----------------------|
| 1. LEFT AMBER LIGHT | 3. RED LIGHT |
| 2. GREEN LIGHT | 4. RIGHT AMBER LIGHT |

Figure 6. Indicator Lights

OVERLOWERING INTERRUPT AND OVERRIDE



WARNING

When lifting after using the override feature, verify that chains, hoses, and cables are not obstructed in any way.

An overlowering interrupt feature is incorporated on models 553 and 558. The overlowering interrupt function prevents further lowering of attachment when both end beams have been raised in relation to outer booms. This prevents slacking of chains, hoses, and wires over the mast. It also reduces shock on attachment. The blue LED in operator's cab will illuminate when lowering interrupt is activated.

To override overlowering interrupt feature, turn override key switch clockwise and push override button while using lowering lever.

Carriage and Attachment Repair

REMOVE



WARNING

When working on or near mast, see **Safety Procedures When Working Near Mast in Mast 4000 SRM 445**.

Do not work under a raised carriage. Lower carriage or use a chain to prevent carriage and inner mast from lowering. Attach all moving parts of mast to parts that DO NOT move with a chain and make secure.

1. Put mast in a vertical position. Lower carriage onto blocks so lift chains and hoses are not under tension. Shut off engine.



WARNING

Do not disconnect any hydraulic lines when engine is running.

2. Disconnect hydraulic lines to attachment and put caps on open lines. Disconnect electrical connector at attachment. Remove clamps as necessary to remove harness from carriage.



WARNING

Keep control of lift chains when disconnecting them from carriage. Use wire to temporarily connect ends of lift chains to mast. This procedure will prevent lift chains from falling and causing an injury or damage.

3. Remove pin from each chain anchor at carriage. Disconnect lift chains from carriage. Attach a rope to ends of each lift chain to control their movement.
4. Connect a lifting device to attachment main frame using lifting straps. Verify frame will have stability once disconnected. Lifting device with lifting straps must hold 10,000 kg (22,046 lb).



WARNING

When carriage is not connected to mast, it can fall and cause an injury. Make sure carriage has stability and will not fall over when inner mast is raised above carriage.

5. Use lift cylinders to raise inner mast until it is above load rollers of carriage. If hydraulic system cannot be used, connect a lifting device to top of inner mast. Carefully raise inner mast until it is above load rollers of carriage.
6. Carefully move lift truck away from attachment. Put attachment on blocks on a flat surface so that carriage is up.
7. If any of the load rollers need to be replaced, make a note of location of shims.

NOTE: For further details on repairs and adjustments of carriage, see **Mast 4000 SRM 445**.

Attachment Without Carriage Repair

NOTE: Most repairs for attachment can be done while attachment is installed on lift truck. If attachment must be removed, this can be done by either removing carriage and attachment or just attachment.

REMOVE

1. Retract attachment to 6.1 m (20 ft) width. Put mast in vertical position. Shut down engine.
2. Remove sideshift cylinder. See Sideshift Cylinders Repair, Remove.
3. Disconnect hydraulic lines to attachment and put caps on open lines. Disconnect electrical connector at attachment. Remove clamps as necessary to remove harness from carriage.
4. Remove covers for lower sideshift wear pads.
5. Connect a lifting device to attachment main frame using lifting straps. Verify frame will have stability once disconnected. The lifting device with lifting straps must hold 10,000 kg (22,046 lb).
6. Remove bolts from two lower front stop blocks.

7. Remove top two wear blocks to allow easier removal of attachment. Slide lower frame of attachment forward so frame rotates slightly. This

will allow top bar of attachment frame to be released from the carriage. For further disassembly, attachment should be put in a flat position.

Sideshift Cylinders Repair

REMOVE

1. Disconnect hydraulic lines at cylinder. Put caps on open lines and cylinder.
2. Remove cylinder. To remove lock nut from cylinder rod end, use a wrench on flats so rod end will not turn in cylinder.

DISASSEMBLE

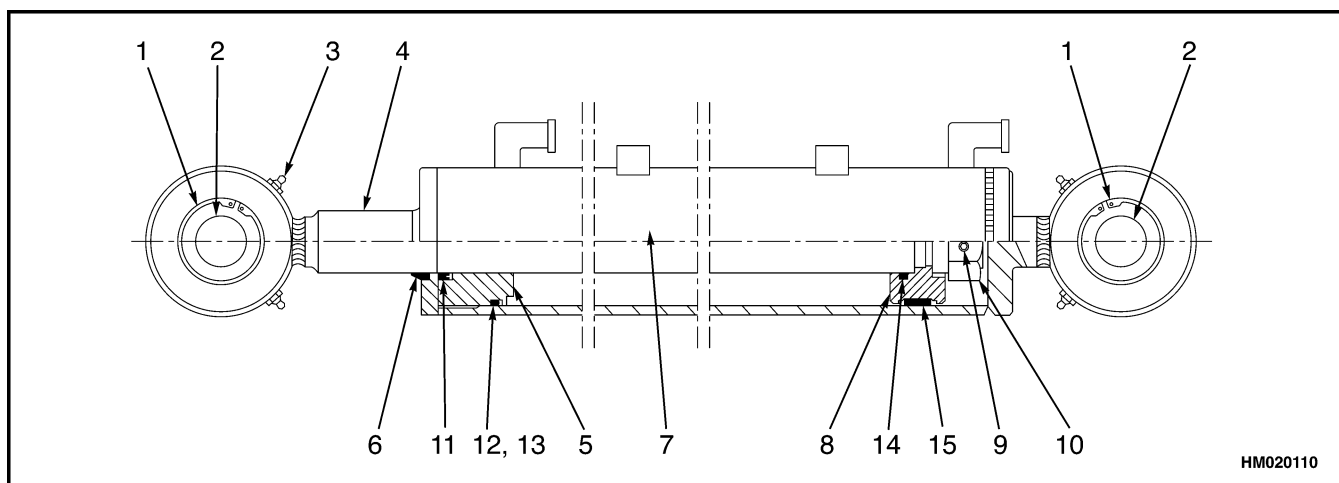
1. Remove gland nut. See Figure 7.
2. Pull rod assembly and retainer from cylinder shell. Remove gland nut from rod.

3. Remove nut and piston from rod.

4. Remove and discard all wipers, seals, backup rings, and O-rings from gland nut.

ASSEMBLE

1. Install new wipers, seals, and backup ring on piston. See Figure 7.
2. Install gland nut piston onto rod and tighten nut to 800 N•m (590 lbf ft).
3. Install rod and piston in shell.



1. SNAP RING
2. SPHERICAL BEARING
3. GREASE NIPPLE
4. PISTON ROD
5. GLAND NUT
6. WIPER RING
7. SHELL
8. PISTON

9. SETSCREW
10. NUT
11. SEAL ROD
12. O-RING
13. BACKUP RING
14. O-RING
15. SEAL PISTON

Figure 7. Sideshift Cylinder

Extension Cylinders Repair

REMOVE

1. Retract attachment to 20-ft position. Shut down engine. See Figure 1 and Figure 8.
2. Disconnect hydraulic lines at chain end (42) and put caps on open lines. Disconnect electrical plugs at chain end.
3. Remove bracket (25) holding chain and hose clamp closest to chain.
4. Start engine. Extend extension beam approximately 1200 mm (4 ft) allowing removal of pin at rod end of extension cylinder.
5. Remove snap ring and pin from rod end of extension cylinder.
6. Retract attachment to 20-ft position. Shut down engine.
7. Using a crane or lift truck, pull extension beam out approximately 1200 mm (4 ft). Carefully guide hose/cable chain into center frame.
8. Remove two bolts holding interface box and reposition box to prevent damage.
9. Support extension cylinder using a crane or lifting device capable of supporting 250 kg (551 lb).
10. Remove six bolts at gland (10) holding extension cylinder.
11. Remove extension cylinder from attachment horizontally until cylinder is completely clear of main frame of attachment. Carefully guide chain to prevent damage.

DISASSEMBLE

1. Remove four bolts (16) that hold ring (6).
2. Slide ring away from cylinder head.
3. Pull piston rod (3) out of cylinder.
4. Piston (13) will touch spacer (11), which will push out gland (10), O-ring (23), bushing (9), and seal ring (22). It will also push out wiper ring (4), guide ring (8), and washer (5).
5. Remove setscrew (15). Remove nut and piston from rod.

6. Inspect components and replace if necessary.

CLEAN AND INSPECT



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 precautions.

Clean parts of the cylinder with solvent. Inspect shell, rod, and piston for wear or damage. Inspect bearing blocks for wear or damage. Install new parts as necessary.

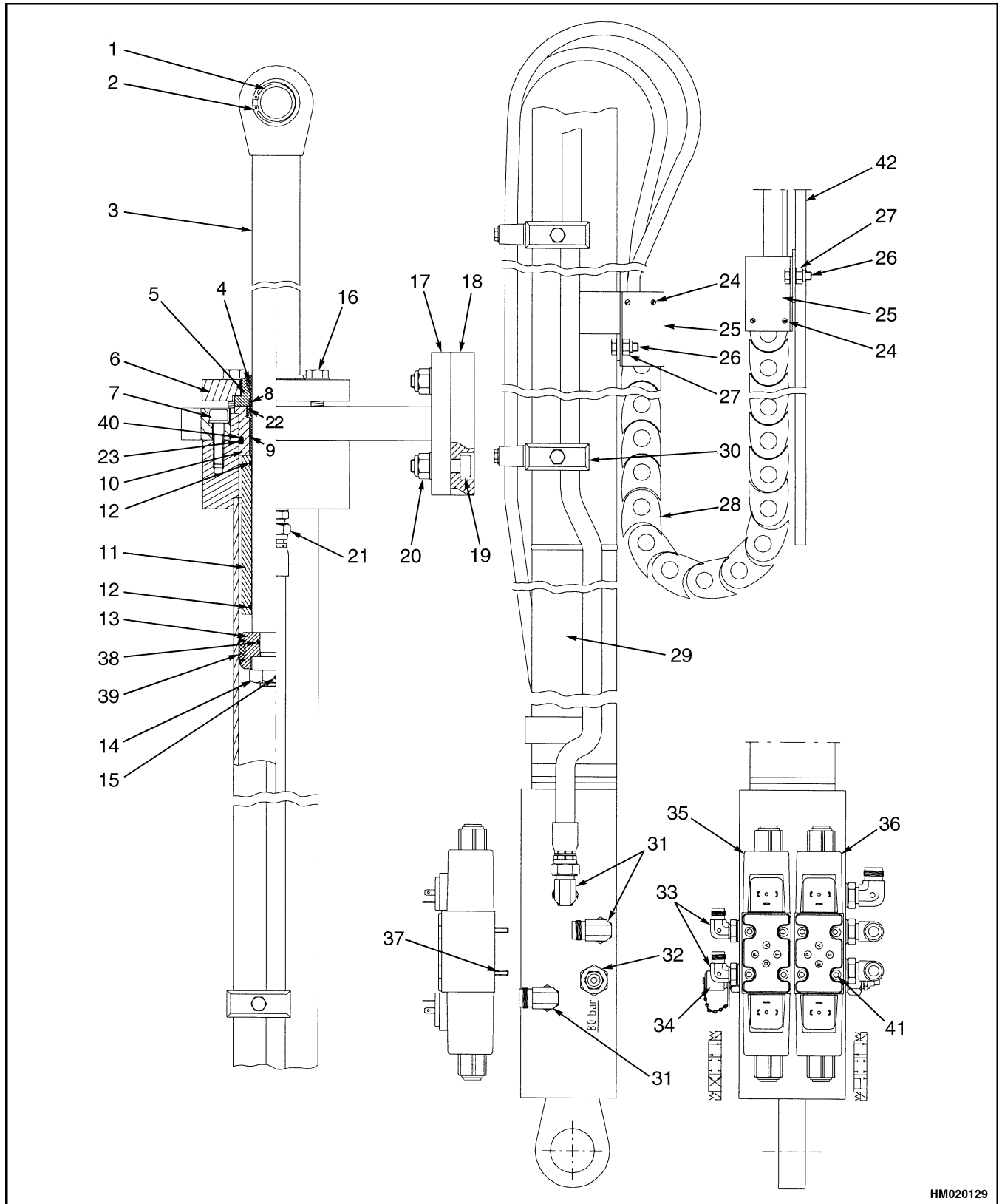
NOTE: The pressure reducer (32) has been sealed and is supplied with a pressure setting of 80 bar (1160 psi). See Figure 8. Do not adjust this pressure setting.

ASSEMBLE

Follow steps under Disassemble in reverse order.

INSTALL

1. Clean tracks and lubricate in those positions where nylon pads (18) for extension cylinder will come in contact with center beam. See Figure 8.
2. Use a crane or other lifting device capable of supporting 250 kg (551 lb) and install extension cylinder until bracket holding extension cylinder is aligned. Carefully guide hose/cable chain into center frame.
3. Install six bolts holding bracket.
4. Mount interface box using two bolts.
5. Connect electrical connectors at rear of extension cylinder. Connect hydraulic lines to extension cylinder.
6. Start engine. Extend attachment and align piston rod (3) end with extension beam, allowing installation of pin and snap ring. Install pin and snap ring.
7. Retract attachment to 20-ft position. Carefully guide hose/cable chain.



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Figure 8. Extension Cylinder

Legend for Figure 8

- | | |
|-----------------------|---------------------------------------|
| 1. BALL JOINT | 22. SEAL RING |
| 2. SNAP RING | 23. O-RING |
| 3. PISTON ROD | 24. SCREW |
| 4. WIPER RING | 25. BRACKET |
| 5. WASHER | 26. BOLT |
| 6. RING | 27. NUT |
| 7. SOCKET HEAD SCREW | 28. FLEX TRACK CHAIN, CHAIN PART, PIN |
| 8. GUIDE RING | 29. SHELL |
| 9. BUSHING | 30. TOP PLATE, HOSE CLAMP |
| 10. GLAND | 31. FITTING |
| 11. SPACER | 32. PRESSURE REDUCER, SEAL KIT |
| 12. O-RING | 33. FITTING, O-RING |
| 13. PISTON | 34. GAUGE ADAPTER |
| 14. NUT | 35. ELECTROVALVE 24V |
| 15. SETSCREW | 36. ELECTROVALVE 24V |
| 16. BOLT, LOCKWASHER | 37. SOCKET HEAD SCREW |
| 17. SUPPORT | 38. O-RING |
| 18. NYLON PAD | 39. SEAL PISTON |
| 19. SOCKET HEAD SCREW | 40. O-RING |
| 20. NUT | 41. PLUG |
| 21. FITTING | 42. CHAIN END |
-
8. Shut down engine.
 9. Connect hydraulic lines at chain end (42). Connect electrical plugs.
 10. Install bracket (25) holding chain and hose clamp closest to chain.

Vertical End Beams Repair**REMOVE**

1. Disconnect hydraulic lines from valve assembly (6) at bottom end. Put caps on lines. See Figure 17.
2. Disconnect electrical connections at bottom end. See Figure 21.
3. Remove pin, bolt, and nut (17) holding the end beam in place. See Figure 1.

**CAUTION**

When lifting out end beam, carefully guide hydraulic lines and electrical cable through tube in extension beam.

4. Lift end beam out of extension beam using a crane with approximately 250 kg (551 lb) lifting capacity.
5. Place end beam on a flat surface.

INSTALL

1. Place end beam into extension beam using a crane with approximate 250 kg (551 lb) lifting capacity.
2. Install pin, bolt, and nut (17) holding the end beam in place. See Figure 1.
3. Connect electrical connections at bottom end. See Figure 21.
4. Connect hydraulic lines from valve assembly (6) at bottom end. See Figure 17.

HOSE REPLACEMENT IN END BEAMS

NOTE: Hydraulic hoses and electrical cable are inside bent tube with a limited diameter. This does not allow individual replacement of hoses or electrical cable.

1. Disconnect hydraulic hoses and electrical cable at lower side of beam.
2. Connect a string to one of the hoses and pull out hoses from higher end.

3. Replace any defective hoses or cables and tape hoses, cable, and string together.

NOTE: Tape hoses and cables in such a way that each hose coupling is at a different position and can move

separately in order to follow bend in tube. Make sure each hose is marked.

4. Pull attached string and guide upper end of taped hose bundle into tube.
5. Connect hoses at correct connections.

Twist Locks Repair for Model 553

REMOVE

1. Tag and remove hydraulic lines from twist lock motor and disconnect wiring from splitter box.
2. Remove four bolts holding plate in place. See Figure 2.



CAUTION

The weight of twist lock is approximately 50 kg (110 lb). Use lifting device to support twist lock when sliding out.

3. Slide out twist lock assembly by pulling on hydraulic motor end.

DISASSEMBLE

1. Place twist lock assembly on flat area.
2. Remove four socket head bolts and slide out hydraulic motor. See Figure 2.
3. Remove key (23).
4. Remove four socket head screws (19) attached to collet (8) and ring (9).
5. Move sleeve (7) toward hydraulic motor end to release collets (8).
6. Pull out twist lock.
7. Pull out sleeve and collet and remove rings.
8. Inspect bushings (15) for wear and replace if necessary.

CLEAN AND INSPECT



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 precautions.



WARNING

Do not use compressed air at more than 206 kPa (30 psi). Airborne debris can cause injury to personnel. Use approved safety equipment.

1. Inspect nylon disc for wear and damage. Replace nylon disc before indicator bolt head is flush with contact surface of nylon disc.
2. Clean all mechanical parts of twist lock assembly with solvent. Dry parts with compressed air.
3. Inspect all parts of twist lock assembly for damage and wear. If twist lock is worn to less than 25 mm (0.984 in.) replace twist lock. See Figure 11. Inspect lock recess area and replace if damaged or worn.

ASSEMBLE

1. Install bushings (15) and lubricate using multi-purpose grease. See Figure 2.
2. Position two rings (9 and 10) together properly and place in correct location.
3. Insert sleeve.
4. Position twist lock with key slot in top position (unlocked position) and slide into twist lock housing. Position rings (9 and 10) on twist lock shaft.
5. Position collets (8) on twist lock shaft, then slide sleeve (7) with key (24) over twist lock shaft.
6. Insert socket head screws (19) through sleeve and collets. The metal position indicator in ring (10) must line up with unlocked sensor while twist lock is in UNLOCKED position. The notch attached to the sleeve must rest against twist lock housing. Screw socket head screws into ring (9) and tighten.

7. Position hydraulic motor with key (23) and fasten in place with four socket head screws.
8. Connect hydraulic lines and electrical connections.

Hooks Replacement for Model 555

INSPECT



WARNING

The lifting hooks are safety critical components due to the fact that it is the hook that carries all the load when picking up and carrying a container. Hooks are a wearing part and should be inspected for wear and or damage on a regular basis.

1. Check hook for cracks. Replace hook if damaged.
2. Check inside angle of hook. New hooks have 22 mm (0.87 in.) of material between flat portion of hook and top of hook. The hook should be replaced if worn area leaves less than 15 mm (0.59 in.) from start of wear area to flat portion of hook. See Figure 9 and Figure 10.
3. Check wear area of hook where corner casting of container is carried. This area should be inspected and when wear is more than 5% of original thickness, hook should be replaced. See Figure 9 and Figure 10.
4. Check tightness between nuts and threads of hook. Hook should be replaced if threads of hook become worn. See Figure 9.
5. The pin that hook is secured through can wear and should be replaced if excess play is discovered.



WARNING

Do not try to correct hook alignment by bending. Replace damaged hooks.

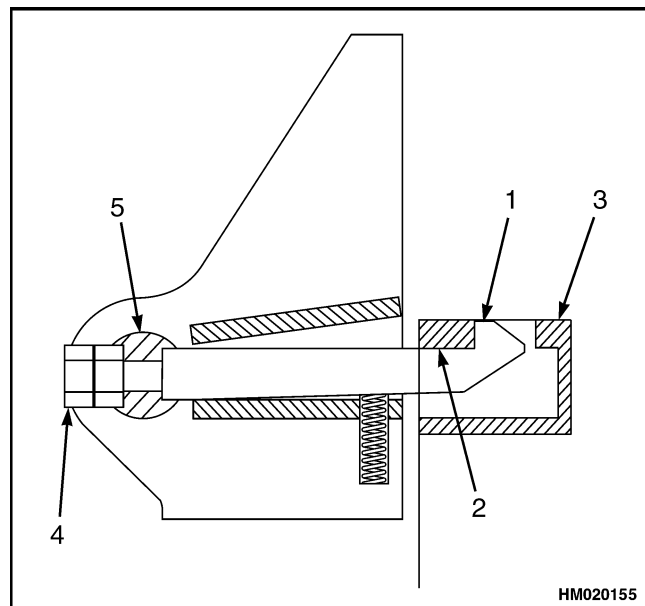
6. A common fault that can be found is hooks get bent sideways. If hook is bent more than 5 degrees, it should be replaced with a straight one.

REMOVE

1. Remove nut and washer that holds hook in place.
2. Remove defective hook.
3. Replace hook if necessary.

INSTALL

1. Install new hook.
2. Assemble nut and washer to hold hook in place.
3. Tighten nut to 110 N•m (81 lbf ft).



- | | |
|-------------------|-----------------|
| 1. INSIDE ANGLE | 4. HOOK THREADS |
| 2. WEAR AREA | 5. PIN |
| 3. CORNER CASTING | |

Figure 9. Hook Inspection

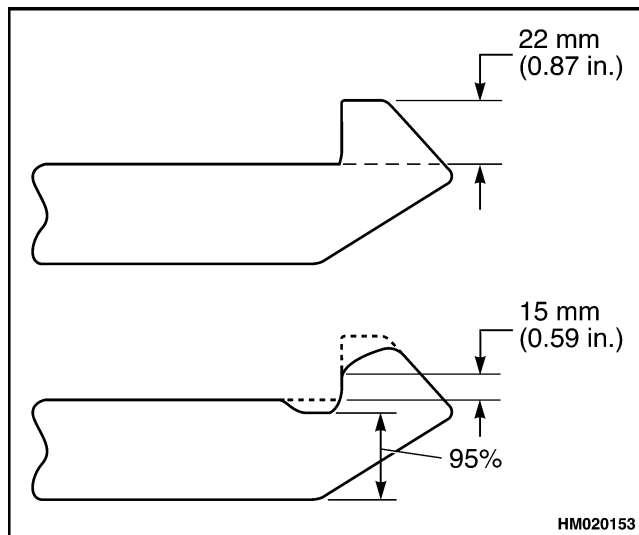


Figure 10. Hook Wear

Twist Locks Repair for Model 558

DISASSEMBLE

1. Remove cover (43). See Figure 4.
2. Remove wiring to sensors and identify location.
3. Remove socket head screw (49), washer, and nut (38). Remove rod (10).
4. Remove ring pin (2), socket head screw (3), and lockwasher (4). Remove pin (14).
5. Remove four bolts (15) from the twist lock crank (31).
6. Install two bolts from Step 5 into two threaded holes in crank and tighten alternately until crank is lifted off twist lock shaft.
7. Key (42) used to locate crank is held in place with a roll pin. Remove roll pin and key from twist lock (20).

NOTE: During performance of Step 8, support twist lock from below to prevent it from dropping out of end beam.

8. Pry collets (16) out of recess in twist lock. Remove twist lock from end beam. The sleeve (35) and lower bearing (18) set may come out with twist lock. This is normal.

CLEAN AND INSPECT



WARNING

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



WARNING

Do not use compressed air at more than 206 kPa (30 psi). Airborne debris can cause injury to personnel. Use approved safety equipment.



CAUTION

Use extra care when inspecting collets and recess areas of twist locks. These are the load bearing areas when a container is lifted.

1. Clean all parts of twist lock assembly with solvent. Dry parts with compressed air. Inspect all parts of twist lock assembly for damage and wear. See Figure 11. If twist lock is worn more than 25 mm (0.98 in.), replace twist lock. Inspect twist lock recesses and replace if damaged.

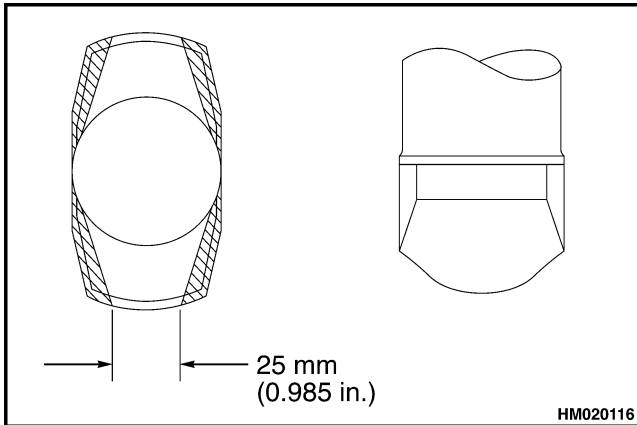


Figure 11. Twist Lock Wear

2. Inspect upper and lower bearing sets for damage. Replace if damaged or worn. Bearings are considered worn and in need of replacement, if axial play of twist lock is more than 3 mm (0.118 in.).

ASSEMBLE

1. Lubricate upper and lower bearings using multi-purpose grease. See Figure 4.
 2. Install sleeve (35) with bushings (19) onto twist lock and position lower bearing (18) on top of sleeve. Install four centering springs in sides of sleeve.
 3. Install upper bearing (17) on top surface of frame plate with threaded holes facing up.
 4. Install twist lock through frame plate in end beam ensuring that upper bearing set is correctly positioned around twist lock. Support the assembly by means of a jack or other suitable device to make sure assembly does not fall out.
 5. Install collets with sloping side facing up.
 6. Install key and roll pin in keyway of twist lock.
- NOTE:** To ease in installation of crank to twist lock, make two alignment pins using M8×75 bolts or socket head screws with heads removed.
7. Install alignment pins into top plate of upper bearing diagonally so each pin guides on half of collets.
 8. Insert tie rod end (28) and fit crank onto alignment pins making sure key and keyway are lined up.
 9. Install two bolts (15) in crank, remove alignment pins, and install remaining two bolts in crank. Tighten all four bolts to 25 N•m (18.44 lbf).
 10. Install lockwasher (4), socket head screw (3), ring pin (2), and holding pin (14).
 11. Install rod (10).
 12. Install cover (43).
 13. Adjust twist lock angle and proximity switches. See Twist Lock Angle Adjustment.
 14. Lubricate complete assembly using multipurpose grease.

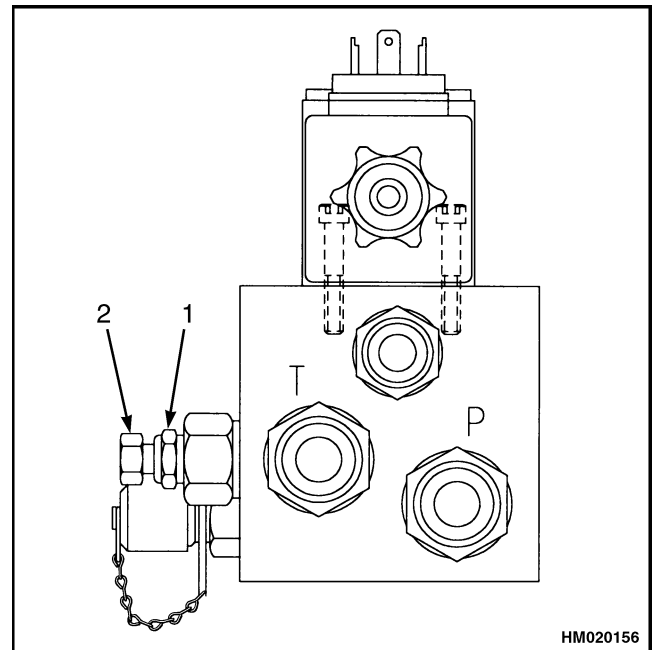
Bleed the System

1. Loosen hose at cylinder or hydraulic motor and operate related function until oil comes out of connection.
2. Retighten hose.
3. Loosen hose for same function at opposite end and operate related function until oil comes out of connection.
4. Repeat procedure at least once.

Valve Assembly

NOTE: The 140-bar relief valve is located on top of carriage.

1. Loosen lock nut. See Figure 12.
2. Turn bolt clockwise to raise pressure. Turn bolt counterclockwise to lower pressure.
3. Tighten lock nut.



1. LOCK NUT

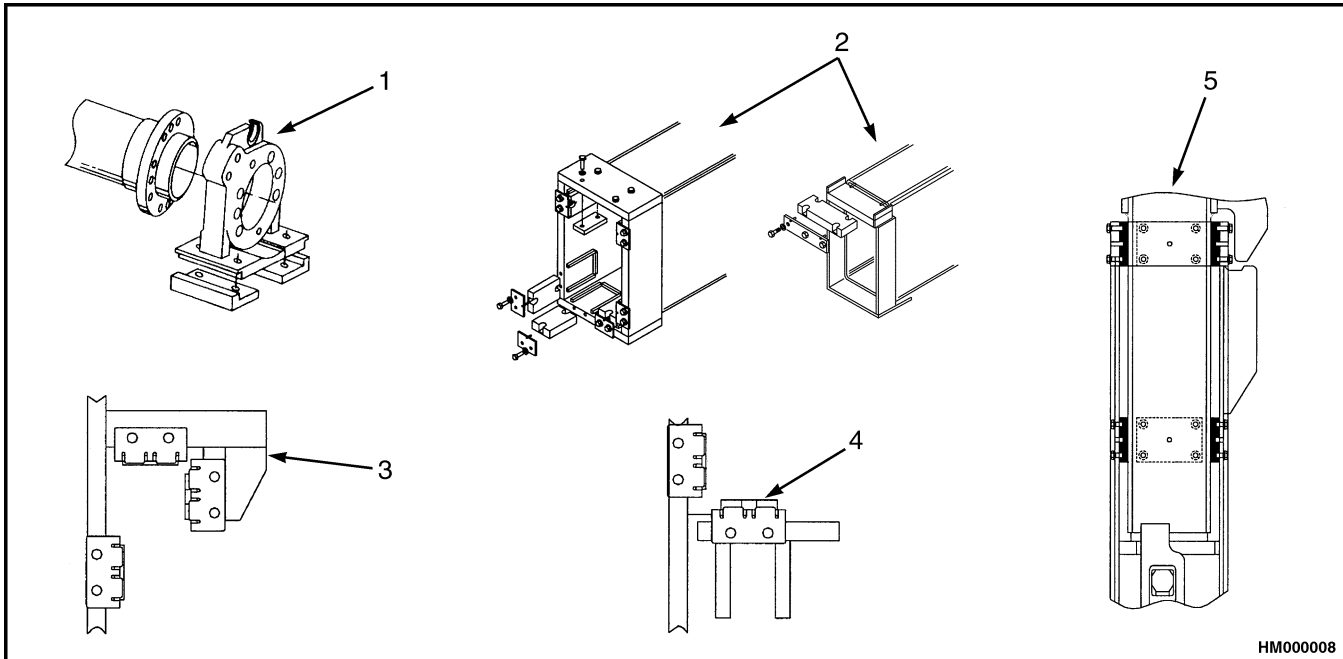
2. BOLT

Figure 12. Valve Assembly

Slide Pad Replacement

NOTE: To gain access to the far end slide pads on end beam, the vertical end beam needs to be removed.

1. Loosen bolts and brackets holding slide pads in place. See Figure 13.
2. Remove slide pad and replace if worn.
3. Mount bracket and bolts as necessary to hold pads in place.



1. EXTENSION CYLINDER SUPPORT
2. MAIN FRAME AND EXTENSION BEAM
3. UPPER SIDESHIFT SLIDE PADS

4. LOWER SIDESHIFT SLIDE PADS
5. END BEAM SLIDE PADS

Figure 13. Slide Pads

Adjustments

TWIST LOCK ANGLE ADJUSTMENT

Model 558 Only

1. Disconnect rod (10) from flag indicator (12). See Figure 4.
2. Remove socket head screw and washer (49), and disconnect rod (10) from pin (14).
3. Remove ring pin (2), socket head screw (3), and lockwasher (4). Remove pin (14).
4. Put piston of the twist lock cylinder in fully NOT-LOCKED position.
5. Put twist lock in fully NOT-LOCKED position.



WARNING

Twist locks can get caught in corner casting of container if twist locks have not been aligned and adjusted properly.

6. Loosen bolts (29) at tie rod end (28) and adjust to required length by turning rod end on cylinder assembly (11). Tighten bolts (29).

7. Insert pin (14).
8. Install lockwasher (4), socket head screw (3), and ring pin (2) holding tie rod end (28) on crank.
9. Install rod (10) onto flag indicator (12) and onto pin (14) using socket head screw and washer (49).

NOTE: After NOT-LOCKED position has been correctly set, piston range of twist lock cylinder ensures a correct LOCKED position.

LOCKED/NOT LOCKED SENSORS ADJUSTMENT

Model 553

1. Loosen bolts holding LOCKED and NOT LOCKED sensors.

2. Adjust space between sensor and ring to 1 mm (0.039 in.) using a feeler gauge.
3. Tighten four bolts holding sensors.

Model 558

1. Check twist lock angle. See Figure 4.
2. Put twist lock in LOCKED position.
3. Loosen nylon mounting sensor bracket (6).
4. Slide LOCKED sensor toward flag (32) until it switches ON, then an additional 3 mm (0.118 in.).
5. Tighten sensor bracket (6).
6. Turn twist locks to NOT-LOCKED position
7. Loosen sensor bracket (6).
8. Slide NOT-LOCKED sensor toward flag (32) until it switches ON, then an additional 3 mm (0.118 in.).
9. Replace sensors if they do not switch ON at a distance equal or larger than 4 mm (0.157 in.).

NOTE: There is some play in movement of twist locks.

10. Check that play in movement of twist lock does not cause a sensor to switch ON or OFF. Verify both end positions by twisting twist lock back and forth.

SEATED SENSOR ADJUSTMENT

Model 553

NOTE: The lenses on front side of sensors will give inaccurate readings if they are dirty or oily. Clean lens with a clean, soft wipe prior to adjusting sensor.

NOTE: When distance between housing and container is set at 25 mm (0.984 in.), there are 12 mm (0.47 in.) of play between the twist lock and inside contact of container pocket.

1. The SEATED sensor should indicate seated. The amber light on the attachment and LED on control box should be ON when distance between twist lock housing and container is 25 to 30 mm (0.984 to 1.181 in.).
2. To make adjustments, remove end beam cover. The top hole provides access to adjustment screw of SEATED sensor.

3. Turn adjustment screw clockwise to increase distance.
4. Turn adjustment screw counterclockwise to decrease distance.

Model 558

1. Check that seated pin (21) can move up and down easily. The force needed to lift a pin is approximately 100 N (22.5 lbf). See Figure 4.
2. Loosen two bolts (27) and remove bracket (9) and sensor (8).
3. Loosen clamp bolts holding sensor and replace sensor if required.
4. Position sensor such that distance between sensor face and bracket mounting surface is 7.9 to 8.1 mm (0.311 to 0.319 in.).
5. Tighten clamp bolts.
6. Mount clamp with sensor using two bolts (27).
7. Slowly move seated pin (21) upward until seated sensor switches ON.
8. Measure distance between bottom end of seated pin (21) and head (26). The distance should be 9 to 10 mm (0.354 to 0.394 in.).
9. Reposition seated sensor higher if distance is more than 10 mm (0.394 in.) and lower if distance is less than 9 mm (0.354 in.).

OVERLOWERING PROTECTION SENSOR ADJUSTMENT (MODELS 553 AND 558)

1. Place end beams in lowered position.
2. Loosen bolts of sensor bracket.
3. Slide sensor toward activating plate until it switches ON.
4. Move sensor 2 mm (0.08 in.) farther toward plate and tighten bolts of sensor bracket.
5. Replace sensor if it has not switched ON at a distance of 4 mm (0.16 in.) from plate.

TORQUE CHART

Table 1. Torque Chart

Item to be Torqued	Torque Value
Twist Lock Cylinder Assembly Screws	38 N•m (28 lbf ft)
Stop Cylinder Assembly Screws	38 N•m (28 lbf ft)
Stop Cylinder Piston Securing Nut	60 N•m (44 lbf ft)
Extension Cylinder Piston Securing Nut	450 N•m (332 lbf ft)
Extension Cylinder Gland Screws	60 N•m (44 lbf ft)
Sideshift Cylinder Piston Securing Nut	800 N•m (590 lbf ft)
Sideshift Cylinder Gland Nut	800 N•m (590 lbf ft)
Standard Hardware	See 8000 SRM 231
Container Hook Securing Nut	110 N•m (81 lbf ft)

Maintenance

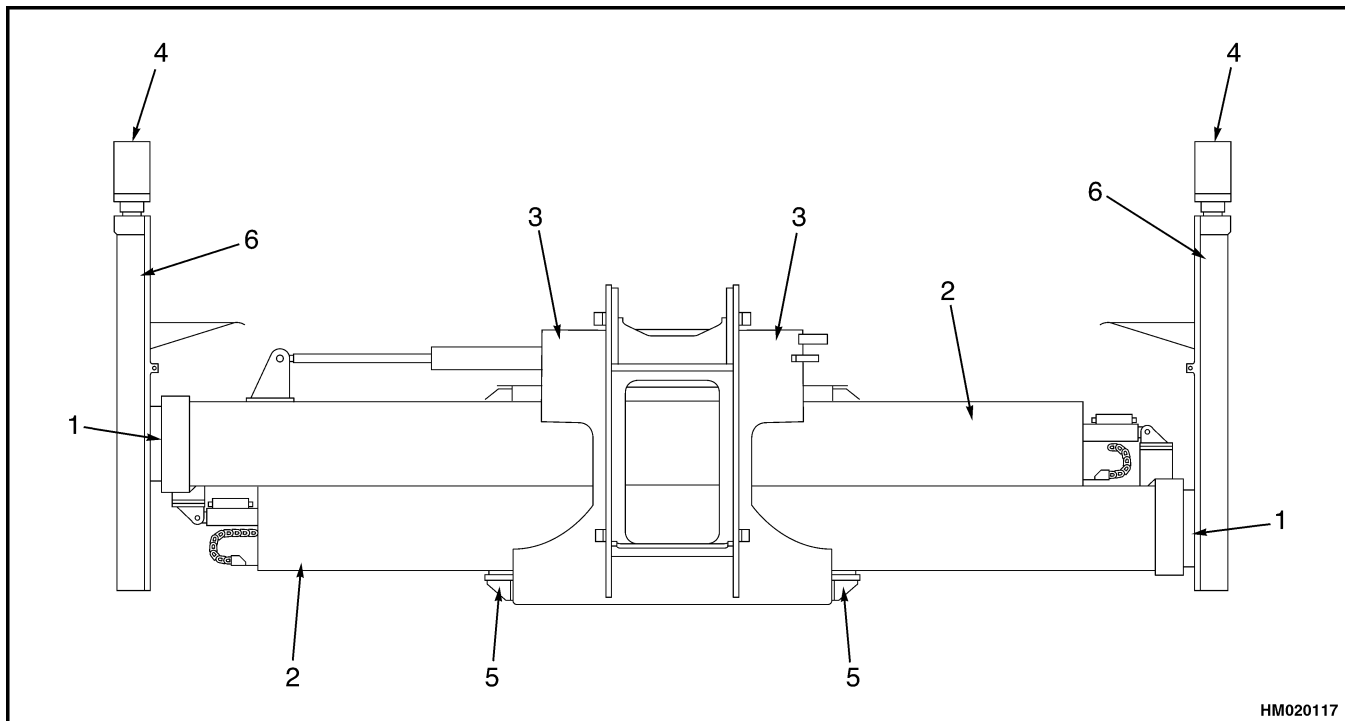


Figure 14. Maintenance Points

Table 2. Maintenance Schedule

Item No.	Item	250 Hr/ 1 Mo	500 Hr/ 3 Mo	1000 Hr/ 6 Mo	2000 Hr/ 1 Yr	Procedure or Quantity	Specification
1	Wear Pads for Main Beams and Extension Beams	XL				Check for wear of 14 nylon pads and replace before metal-to-metal contact between carriage and frame occurs. Apply grease to new pads or in cases where there is screeching noise.	Multipurpose Grease ¹
2	Extension Cylinder Support Wear Pads			X		Check for wear of four nylon pads and replace before metal-to-metal contact between carriage and frame occurs.	
3	Upper Sideshift Slider Pads	X				Check for wear of nylon pads and replace before metal-to-metal contact between carriage and frame occurs.	
4	Twist Lock Housings Model 553	X				Check for wear and possible damage of twist lock and twist lock housing. Replace if damaged.	
4	Lifting Hooks Model 555	X				Check hooks for wear or cracking. If any sign of either defect is suspected, hooks should either be replaced or nondestructive crack tested.	
X = Check C = Change L = Lubricate ¹ Multipurpose grease with 2-4% molybdenum disulfide.							

Table 2. Maintenance Schedule (Continued)

Item No.	Item	250 Hr/ 1 Mo	500 Hr/ 3 Mo	1000 Hr/ 6 Mo	2000 Hr/ 1 Yr	Procedure or Quantity	Specification
4	Twist Lock Assemblies Model 558	XL				Check for wear and possible damage of twist lock and twist lock sleeve. Replace if in doubt. Lubricate four fittings.	Multipurpose Grease ¹
5	Lower Sideshift Slider Pads	X				Check for wear of nylon pads and replace before metal-to-metal contact between carriage and frame occurs.	
6	End Beam Slider Pads	X				Check for wear of nylon pads and replace before metal-to-metal contact between end beam and extension beam occurs.	
X = Check C = Change L = Lubricate ¹ Multipurpose grease with 2-4% molybdenum disulfide.							

ADDITIONAL ATTACHMENT MAINTENANCE

1. Inspect main attachment components for damage, cracks, and distortion.
2. Inspect signal and control systems for correct operation.
3. Check hydraulic pressures periodically.
4. Check all hydraulic cylinders for leaks and reseal if necessary.
5. Inspect all hydraulic hoses for damage and leakage. Replace any damaged or leaking hoses.

INTERFACE BOXES

Model 555

NOTE: Box is on left side, positioned on extension cylinder. See Figure 21.

LED	No.	Interface Box	Function	Indication Status
Green		SpB5	Indicates +24V supply voltage present	ON When Present
Yellow	3	SpB5	Indicates command extend LH present	ON When Present
Yellow	4	SpB5	Indicates command retract LH present	ON When Present

NOTE: Box is on right side, positioned on extension cylinder.

LED	No.	Interface Box	Function	Indication Status
Green		SpB6	Indicates +24V supply voltage present	ON When Present
Yellow	3	SpB6	Indicates command extend RH present	ON When Present
Yellow	4	SpB6	Indicates command retract RH present	ON When Present

NOTE: Box is on sideshift cylinder, positioned on carriage.

LED	No.	Interface Box	Function	Indication Status
Green		SpB8	Indicates +24V supply voltage present	ON When Present
Yellow	1	SpB8	Indicates command sideshift LH present	On When Present
Yellow	2	SpB8	Indicates command sideshift RH present	ON When Present

Models 553 and 558

NOTE: Box is on left side, positioned on extension cylinder.

LED	No.	Interface Box	Function	Indication Status
Green		SpB5	Indicates +24V supply voltage present	ON When Present
Yellow	1	SpB5	Indicates command lock twist lock LH present	ON When Present
Yellow	2	SpB5	Indicates command unlock twist lock LH present	ON When Present
Yellow	3	SpB5	Indicates command extend LH present	ON When Present
Yellow	4	SpB5	Indicates command retract LH present	ON When Present

NOTE: Box is on right side, positioned on extension cylinder.

LED	No.	Interface Box	Function	Indication Status
Green		SpB6	Indicates +24V supply voltage present	ON When Present
Yellow	1	SpB6	Indicates command lock twist lock RH present	ON When Present
Yellow	2	SpB6	Indicates command unlock twist lock RH present	ON When Present
Yellow	3	SpB6	Indicates command extend RH present	ON When Present
Yellow	4	SpB6	Indicates command retract RH present	ON When Present

NOTE: Box is near sideshift cylinder, positioned on carriage.

LED	No.	Interface Box	Function	Indication Status
Green		SpB8	Indicates +24V supply voltage present	ON When Present
Yellow	1	SpB8	Indicates command sideshift LH present	ON When Present
Yellow	2	SpB8	Indicates command sideshift RH present	ON When Present

NOTE: Box is near LH twist lock head, positioned on vertical end beam cylinder.

LED	No.	Interface Box	Function	Indication Status
Green		SpB3	Indicates +24V supply voltage present	ON When Present
Yellow	1	SpB3	Indicates LH twist lock is locked	ON When Present
Yellow	2	SpB3	Indicates LH twist lock is unlocked	ON When Present
Yellow	3	SpB3	Indicates LH twist lock is seated	ON When Present
Yellow	4	SpB3	Indicates overlowering interrupt not activated	On When Not Activated

NOTE: Box is near RH twist lock head, positioned on vertical end beam cylinder.

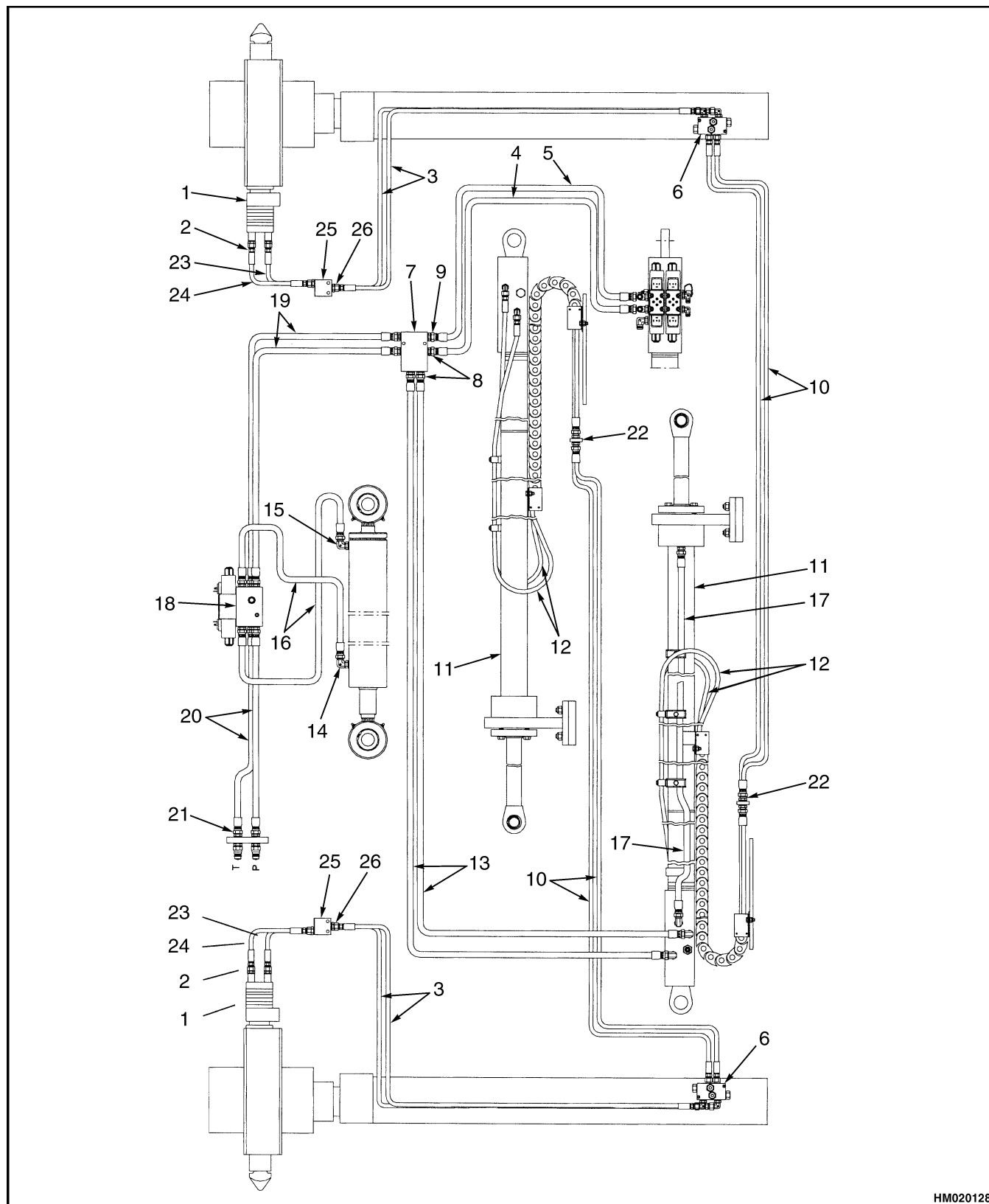
LED	No.	Interface Box	Function	Indication Status
Green		SpB4	Indicates +24V supply voltage present	ON When Present
Yellow	1	SpB4	Indicates RH twist lock is locked	ON When Present
Yellow	2	SpB4	Indicates RH twist lock in unlocked	ON When Present
Yellow	3	SpB4	Indicates RH twist lock is seated	ON When Present
Yellow	4	SpB4	Indicates overlowering interrupt not activated	ON When Present

Troubleshooting

PROBLEM	POSSIBLE CAUSE	PROCEDURE OR ACTION
No attachment functions or no attachment functions in one direction.	Check lift truck hydraulic supply valve for correct operation.	Repair supply valve.
	Low main hydraulic pressure at attachment main relief valve.	Adjust pressure at main relief valve to 140 bar (2031 psi).
	Dirt in relief valve cartridge.	Clean or replace relief valve.
	No electrical power at solenoids of both lift truck and chassis.	Check for proper voltage at solenoids. If voltage is present, replace solenoid. If voltage is not present, check appropriate switch.
Low attachment response time.	Low hydraulic pressure at attachment main relief valve.	Adjust pressure at main relief valve to 140 bar (2031 psi).
Both extension beams will not extend.	Low hydraulic pressure at attachment main relief valve.	Adjust pressure at main relief valve to 140 bar (2031 psi).
	No electrical power at solenoids of both lift truck and chassis.	Check for proper voltage at solenoid. If voltage is present, replace solenoid. If voltage is not present, check appropriate switch.
One extension beam will not extend.	No electrical power at solenoid mounted on rear of extension cylinder.	Check for proper voltage at solenoids. If voltage is present, replace solenoid. If voltage is not present, check appropriate switch.
	Shock relief pressure is too low.	Set relief valve pressure to 80 bar (1160 psi).
Both extension beams will not retract.	Low hydraulic pressure at attachment main relief valve.	Adjust pressure at main relief valve to 140 bar (2031 psi).
	No electrical power at solenoid valves on both lift truck and chassis.	Check for proper voltage at solenoids. If voltage is present, replace solenoid. If voltage is not present, check appropriate switch.

PROBLEM	POSSIBLE CAUSE	PROCEDURE OR ACTION
One extension beam will not retract.	No electrical power at solenoid valve mounted on rear of extension cylinder.	Check for proper voltage at solenoid. If voltage is present, replace solenoid. If voltage is not present, check appropriate switch.
All twist locks will not operate.	Low hydraulic pressure at attachment main relief valve.	Adjust pressure at main relief valve to 140 bar (2031 psi).
	No electrical power at solenoid valves on both lift truck and chassis supply valves.	Check for proper voltage at solenoid. If voltage is present, replace solenoid. If voltage is not present, check appropriate switch.
Twist locks of one end beam will not operate.	No electrical power at twist lock solenoid.	Check wiring harness at solenoid or replace faulty solenoid.
	Faulty solenoid.	Replace solenoid.
	Mechanical obstacle stopping movement of twist lock tie rod.	Remove obstacle.
Sideshift cylinder will not function.	Low hydraulic pressure at attachment main relief valve.	Replace main relief valve.
	No electrical power at solenoid valves on both lift truck and chassis.	Check for proper voltage at solenoids. If voltage is present, replace solenoid. If voltage is not present, check appropriate switch.
	No power at solenoid on auxiliary block.	Check for proper voltage at solenoid. If voltage is present, replace solenoid. If voltage is not present, check appropriate switch.
One or all indicator lights do not function.	Blown fuse or bulb.	Replace blown fuse or bulb.
	Proximity sensor switch is not functioning.	No input signal to sensor switch. When sensor switch is activated, an LED in sensor is illuminated. Replace faulty sensor switch. Adjust distance between sensor switch and sensor bracket to proper value.

PROBLEM	POSSIBLE CAUSE	PROCEDURE OR ACTION
One or all indicator lights do not function. (Cont.)	Electric circuit of a particular function is open.	Check for blown fuses or loose connectors. Check proper functioning of printed circuit board.
Hydraulic functions other than function selected are operating at same time.	Electric solenoid or relief solenoid of a function other than selected function is stuck in an open position.	Clean or replace solenoid.
Lowering interrupt function does not operate properly.	Proximity switch for beam extension is not functioning properly.	Check input signal to switch. Check functioning of switch. Check proper proximity switch setting.
	Printed circuit board has a problem.	Check PCB3, PCB4, PCB1.
Lift interrupt function does not operate properly.	Proximity switches for locked and/or unlocked position are not functioning properly.	Check input signal to switch. Check functioning of switch. Check proper proximity switch setting.
	Printed circuit board has a problem.	Check PCB3, PCB4, PCB1.
Auto locking function does not work properly.	Proximity switch for seated signal is not functioning properly.	Check input signal to switch. Check functioning of switch. Check proper proximity switch setting.
	Proximity switches for locked and/or unlocked position are not functioning properly.	Check input signal to switch. Check functioning of switch. Check proper proximity switch setting.
	Printed circuit board has a problem.	Check PCB3, PCB4, PCB1.

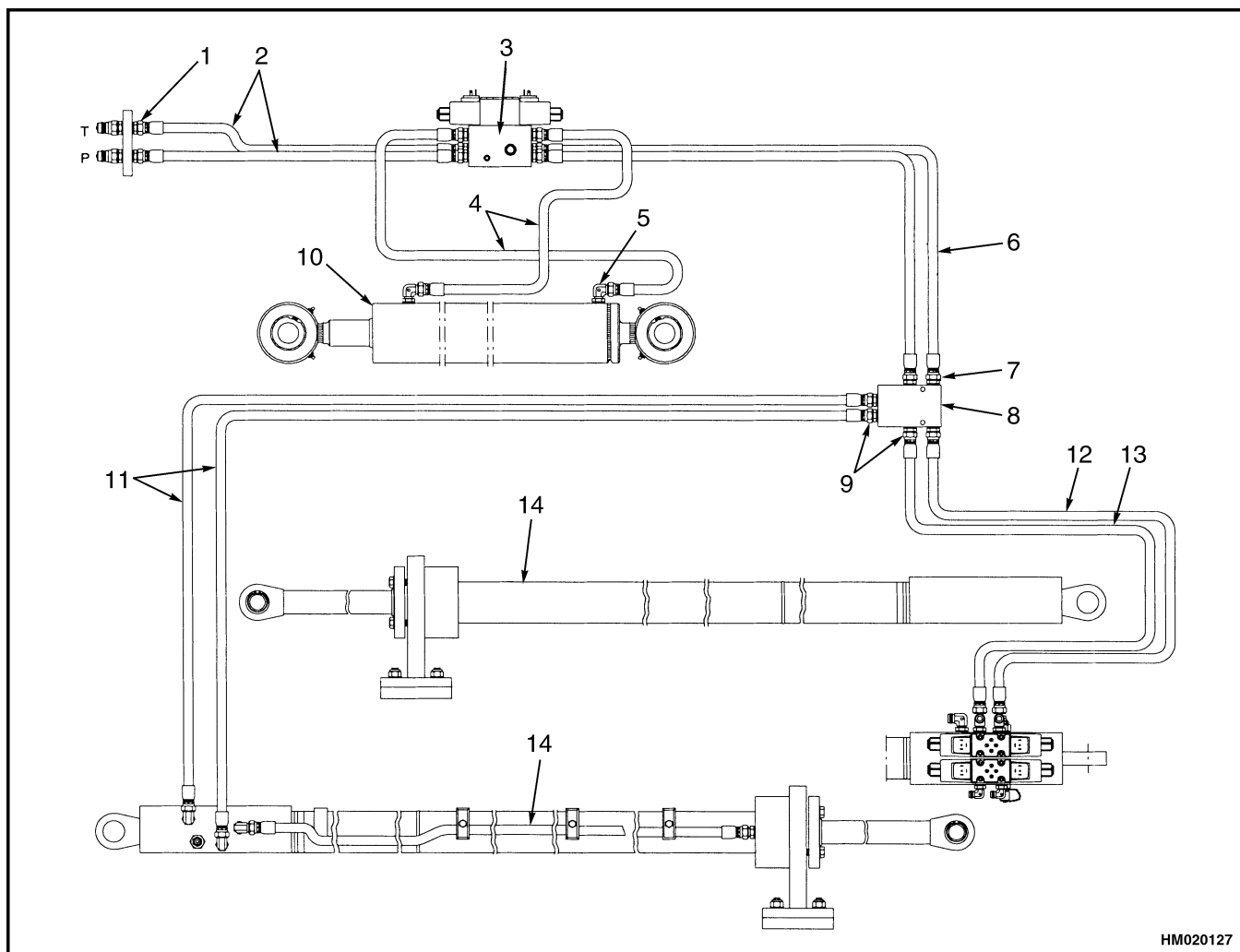


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Figure 15. Hydraulic System Model 553

Legend for Figure 15

- | | |
|---------------------------------|------------------------|
| 1. HYDRAULIC MOTOR | 14. SIDESHIFT ASSEMBLY |
| 2. FITTING, O-RING | 15. FITTING, O-RING |
| 3. HOSE ASSEMBLY | 16. HOSE ASSEMBLY |
| 4. HOSE ASSEMBLY | 17. HOSE ASSEMBLY |
| 5. HOSE ASSEMBLY | 18. VALVE ASSEMBLY |
| 6. VALVE ASSEMBLY | 19. HOSE ASSEMBLY |
| 7. FITTING, O-RING | 20. HOSE ASSEMBLY |
| 8. FITTING, O-RING | 21. FITTING, O-RING |
| 9. MANIFOLD | 22. FITTING, O-RING |
| 10. HOSE ASSEMBLY | 23. HOSE ASSEMBLY |
| 11. EXTENSION CYLINDER ASSEMBLY | 24. HOSE ASSEMBLY |
| 12. HOSE ASSEMBLY | 25. MANIFOLD |
| 13. HOSE ASSEMBLY | 26. FITTING, O-RING |



- | | | |
|--------------------|---------------------------------|---------------------------------|
| 1. FITTING, O-RING | 6. HOSE ASSEMBLY | 11. HOSE ASSEMBLY |
| 2. HOSE ASSEMBLY | 7. FITTING, O-RING | 12. HOSE ASSEMBLY |
| 3. VALVE ASSEMBLY | 8. MANIFOLD | 13. HOSE ASSEMBLY |
| 4. HOSE ASSEMBLY | 9. FITTING, O-RING | 14. EXTENSION CYLINDER ASSEMBLY |
| 5. FITTING, O-RING | 10. SIDESHIFT CYLINDER ASSEMBLY | |

Figure 16. Hydraulic System Model 555

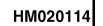
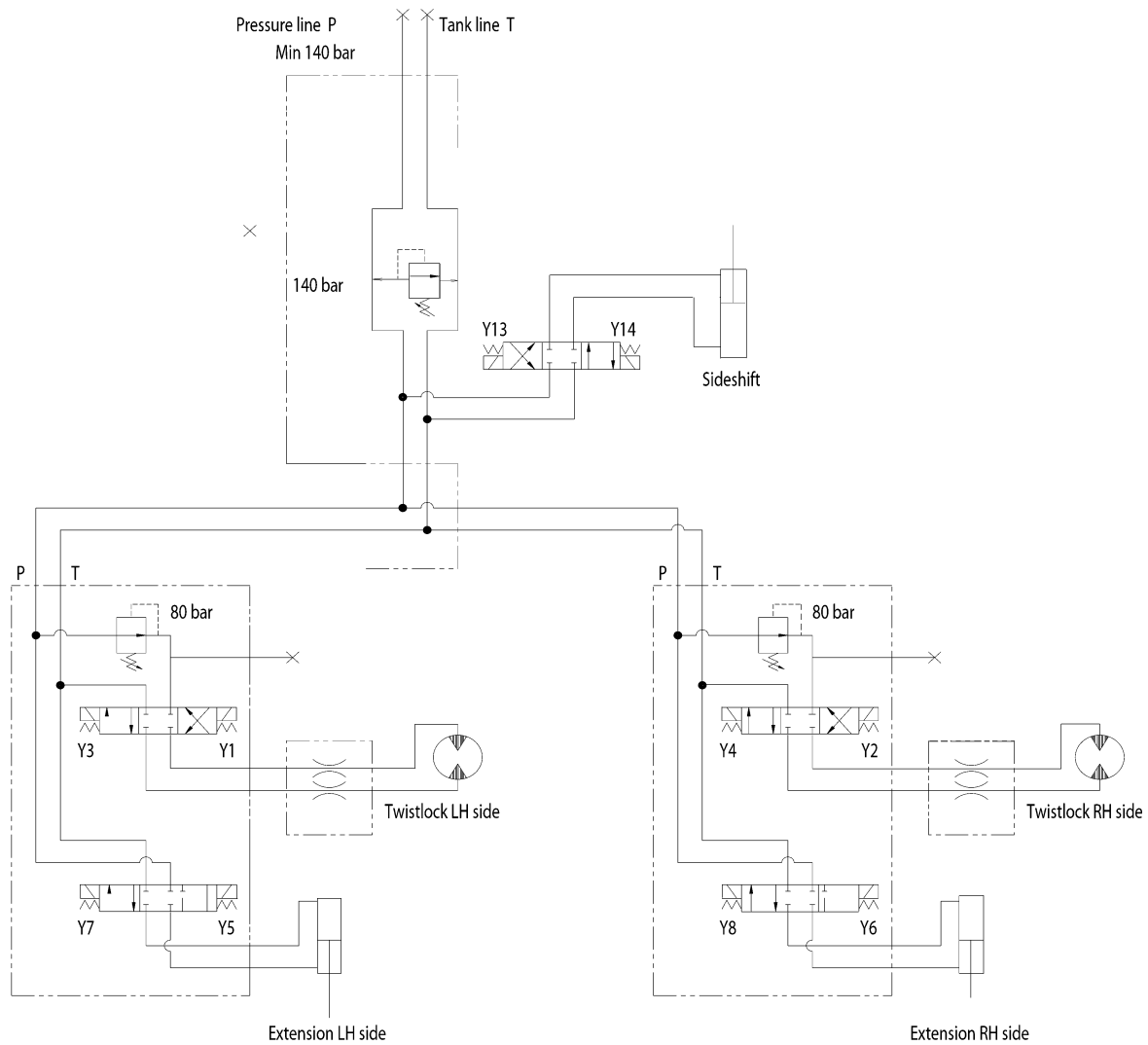


Figure 17. Hydraulic System Model 558

Legend for Figure 17

- | | |
|---------------------------------|------------------------|
| 1. HOSE ASSEMBLY | 12. HOSE ASSEMBLY |
| 2. TWIST LOCK CYLINDER ASSEMBLY | 13. HOSE ASSEMBLY |
| 3. FITTING, O-RING | 14. SIDESHIFT ASSEMBLY |
| 4. HOSE ASSEMBLY | 15. FITTING, O-RING |
| 5. HOSE ASSEMBLY | 16. HOSE ASSEMBLY |
| 6. VALVE ASSEMBLY | 17. HOSE ASSEMBLY |
| 7. FITTING, O-RING | 18. VALVE ASSEMBLY |
| 8. FITTING, O-RING | 19. HOSE ASSEMBLY |
| 9. MANIFOLD | 20. HOSE ASSEMBLY |
| 10. HOSE ASSEMBLY | 21. FITTING, O-RING |
| 11. EXTENSION CYLINDER ASSEMBLY | 22. FITTING, O-RING |



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Figure 18. Hydraulic Diagram - Horizontal Twist Lock Model 553

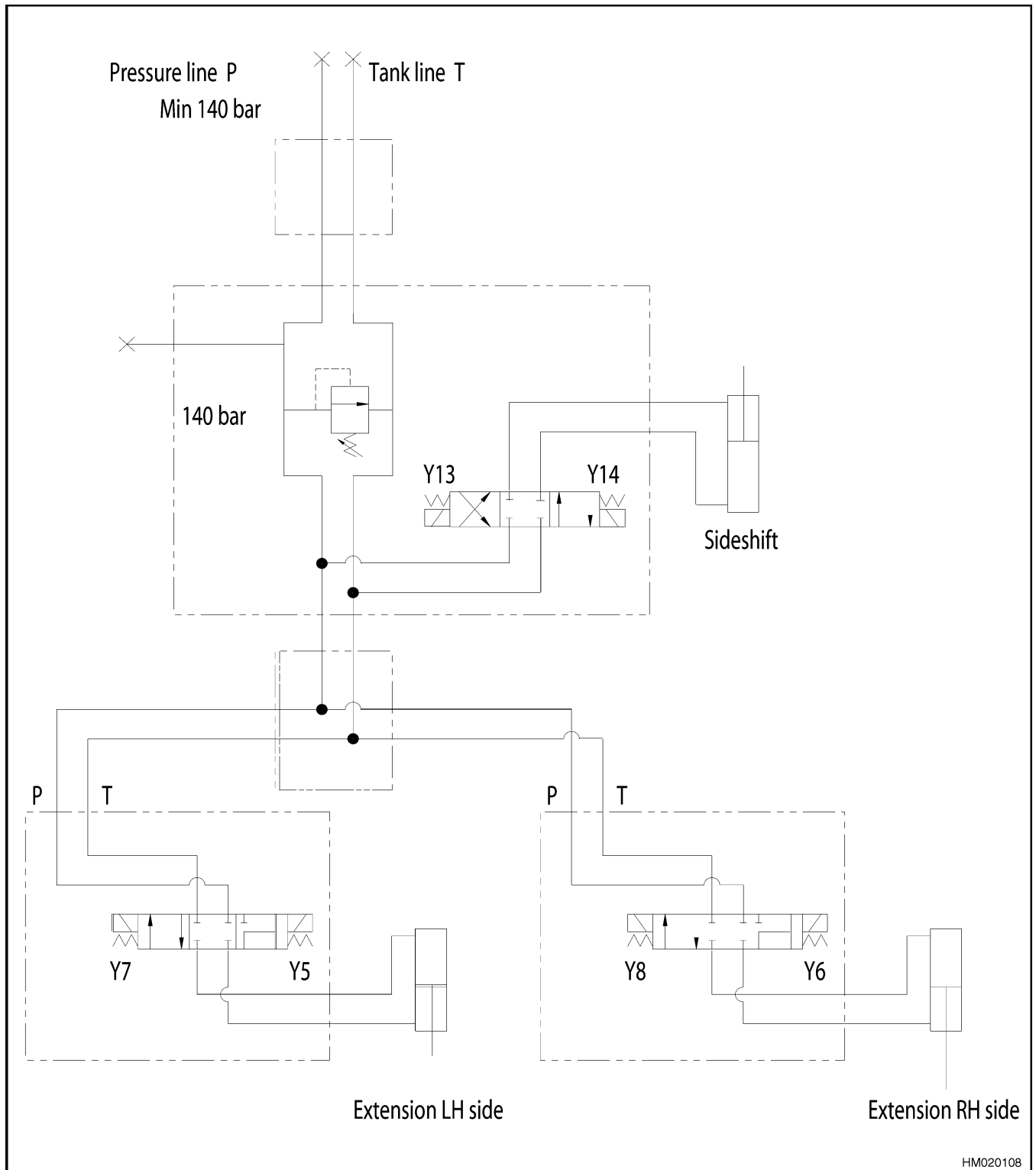


Figure 19. Hydraulic Diagram - Suspended Hooks Model 555

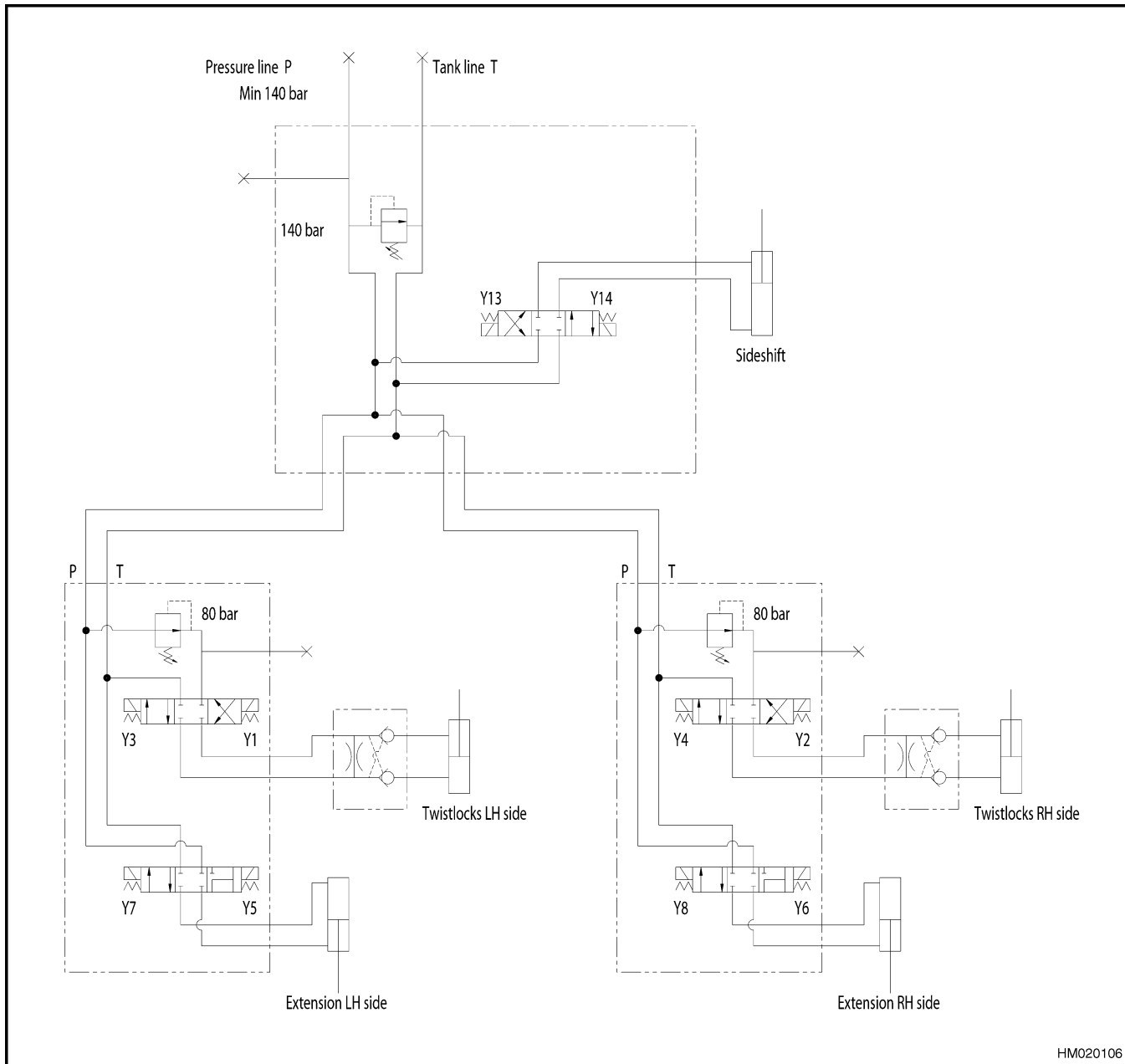
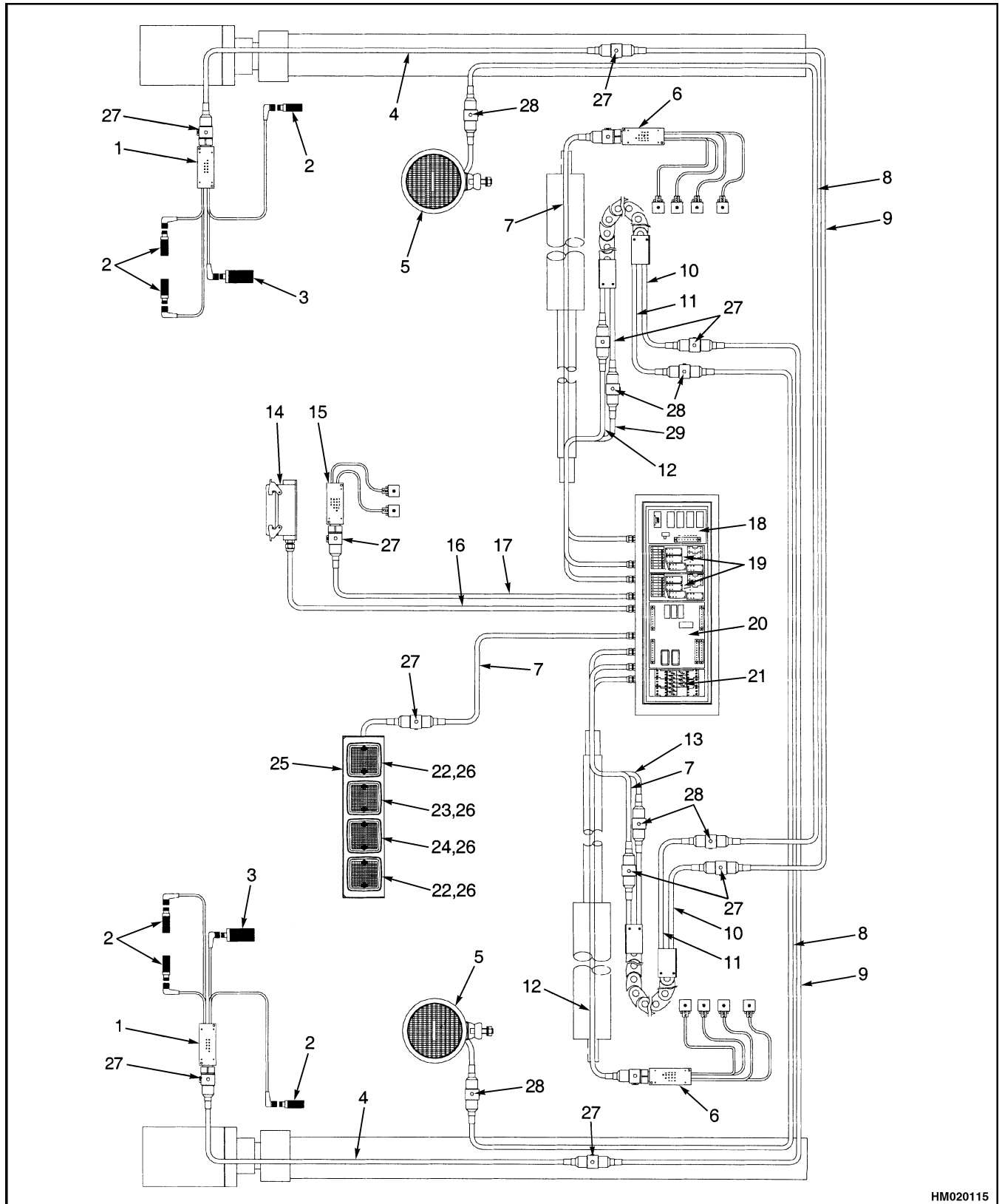


Figure 20. Hydraulic Diagram - Vertical Twist Lock Model 558



HM020115

Figure 21. Electric Diagram

Legend for Figure 21

- | | |
|----------------------------|----------------------------|
| 1. INTERFACE BOX | 16. CABLE ASSEMBLY |
| 2. SENSOR | 17. CABLE ASSEMBLY |
| 3. SENSOR | 18. PRINTED CIRCUIT |
| 4. CABLE ASSEMBLY | 19. PRINTED CIRCUIT |
| 5. BEAM LIGHT | 20. STANDARD CARD |
| 6. INTERFACE BOX | 21. FUSE CARD |
| 7. CABLE ASSEMBLY | 22. INDICATION LIGHT AMBER |
| 8. CABLE ASSEMBLY | 23. INDICATION LIGHT RED |
| 9. CABLE ASSEMBLY | 24. INDICATION LIGHT GREEN |
| 10. CABLE ASSEMBLY | 25. LIGHT PANEL |
| 11. CABLE ASSEMBLY | 26. BULB |
| 12. CABLE ASSEMBLY | 27. COVER |
| 13. CABLE ASSEMBLY | 28. COVER |
| 14. HOUSING, COVER, INSERT | 29. CABLE ASSEMBLY |
| 15. INTERFACE BOX | |

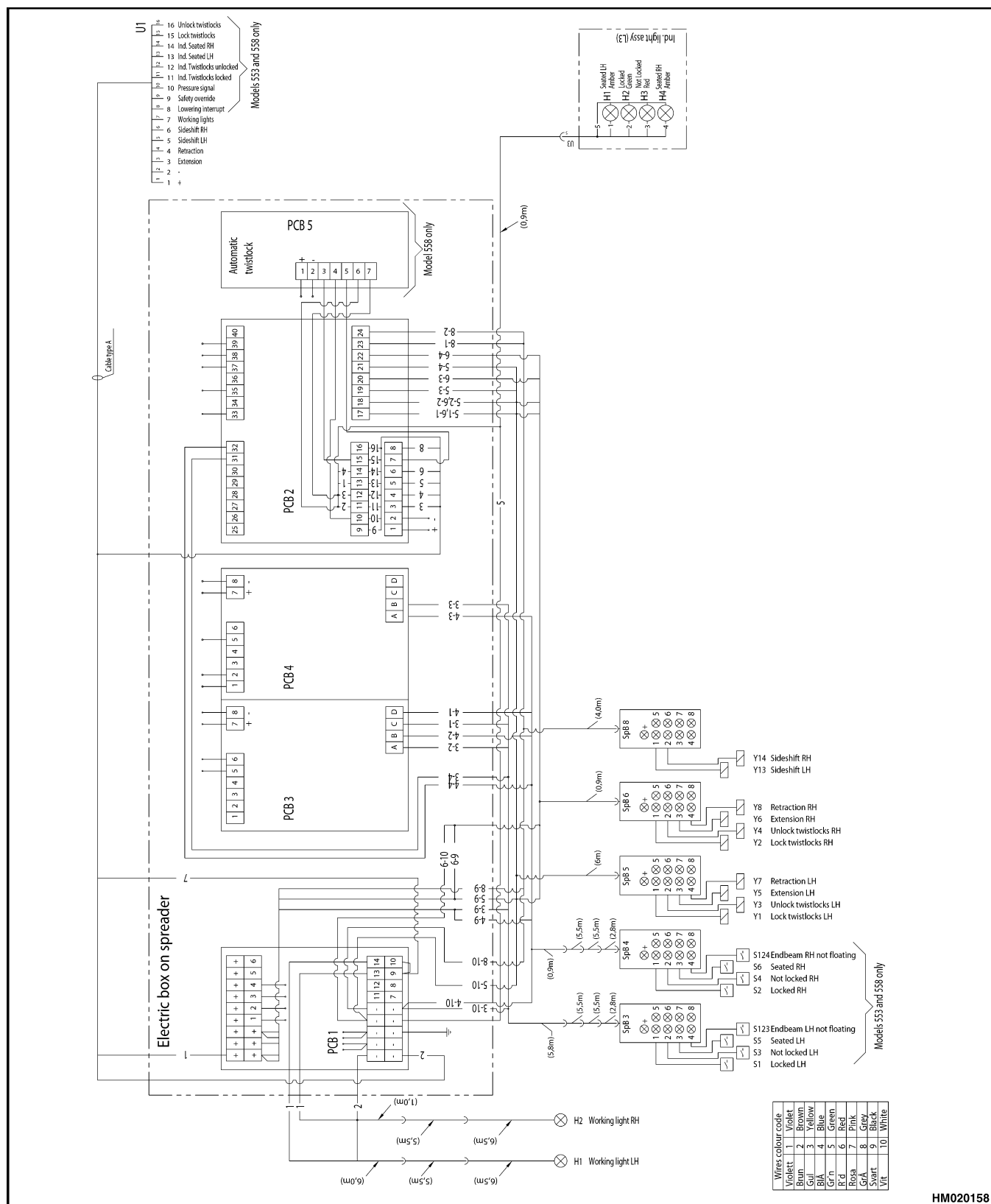


Figure 22. Wiring Diagram



Figure 23. Electric Schematic Diagram

