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Operation and Maintenance Manual

FB110

Serial Number: FBK02199
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SAFETY.CAT.COM

Characters and symbols used

The following characters and symbols are used for safety instructions and important information in the operating manual.

Try to memorize the symbols and their meanings.

DANGER!
Points in the text marked with this symbol draw your attention to immediately impending danger. Possible consequences are: very serious injury or even death.

WARNING!
These points contain information on dangerous situations. Possible consequences are: very serious injury or even death.

CAUTION!
This symbol draws attention to dangerous situations. Possible consequences are: light to moderately serious injuries and machine damage.

NOTICE!
Points in the text marked with this symbol draw attention to harmful situations. Possible consequences are: damage to the machine or damage in the immediate vicinity.

IMPORTANT!
Points in the text marked with this symbol contain useful tips and information intended to facilitate work for you. They do not warn about harmful or dangerous situations.

Operation

Operate the feeder breaker only if you have a profound knowledge of the control elements and their functions. It is necessary that you have been task trained on the respective feeder breaker.

Before start-up, ensure that there are no persons around the machine.

Check that all protective devices are installed on the machine and function properly.

Clean the control panel and operator's area at regular intervals. Ensure that the operating symbols are legible in order to avoid any operator errors and resulting accidents.

Maintenance and repair

Be sure to observe the prescribed maintenance and inspection intervals.

Inform the supervisory personnel and the face crew of any maintenance and repair operations. Give them information on the intended operations and the anticipated duration.

securing

Secure your working area over a wide range, in order to avoid endangering other persons.

Lock-out and disconnect power from the machine to prevent unauthorized and unintentional restarting.

Protect your work area against falling rocks.

replacing components

Stop, lock-out and disconnect power from machine to prevent from restarting before replacing any defective components.

Pass defective components removed on for servicing without delay in order to prevent these parts being reinstalled elsewhere.

original parts

Use only spare parts which satisfy the specified technical requirements. This is only ensured with original Cat® spare parts.
Please refer to the spare parts lists for the order numbers.

lifting

For raising the feeder breaker use only:

- crib blocks with adequate load-holding capacity
- hoists, jacks or cranes with adequate load-carrying capacity

Transport

Before transport

temperatures below freezing

Before transporting the equipment at temperatures below freezing, all hydraulic components operated with emulsion (HFAE or HFAS) must be completely drained and then filled with a corrosion inhibitor/frost-proofing fluid.

Transport of equipment at temperatures between -6° F (-21° C) and 40° F (-40° C) is only permissible when certain measures were taken to meet these conditions at the design and manufacture stages. Nevertheless, the individual parts and devices of this equipment must not be subjected to sudden impact loads at such low temperatures and may only be loaded statically or quasi-statically.

During transport of this equipment with floor-mounted vehicles at such low temperatures, measures must also be taken to ensure that the parts and devices are not subjected to sudden impact loads. At very low temperatures and on poor roads, the transport vehicle speed must therefore be limited to a maximum of 15 mph (25 kph) for truck transport.

electronic components

Electrical and electronic components must be removed for overseas transport or prolonged storage outdoors unless these components or the complete equipment is protected against harmful environmental influences by a suitable packaging.

The electrical cables remain in the equipment. They must be carefully protected against transport damage and soiling of the connections.

Load units, dimensions, and weights

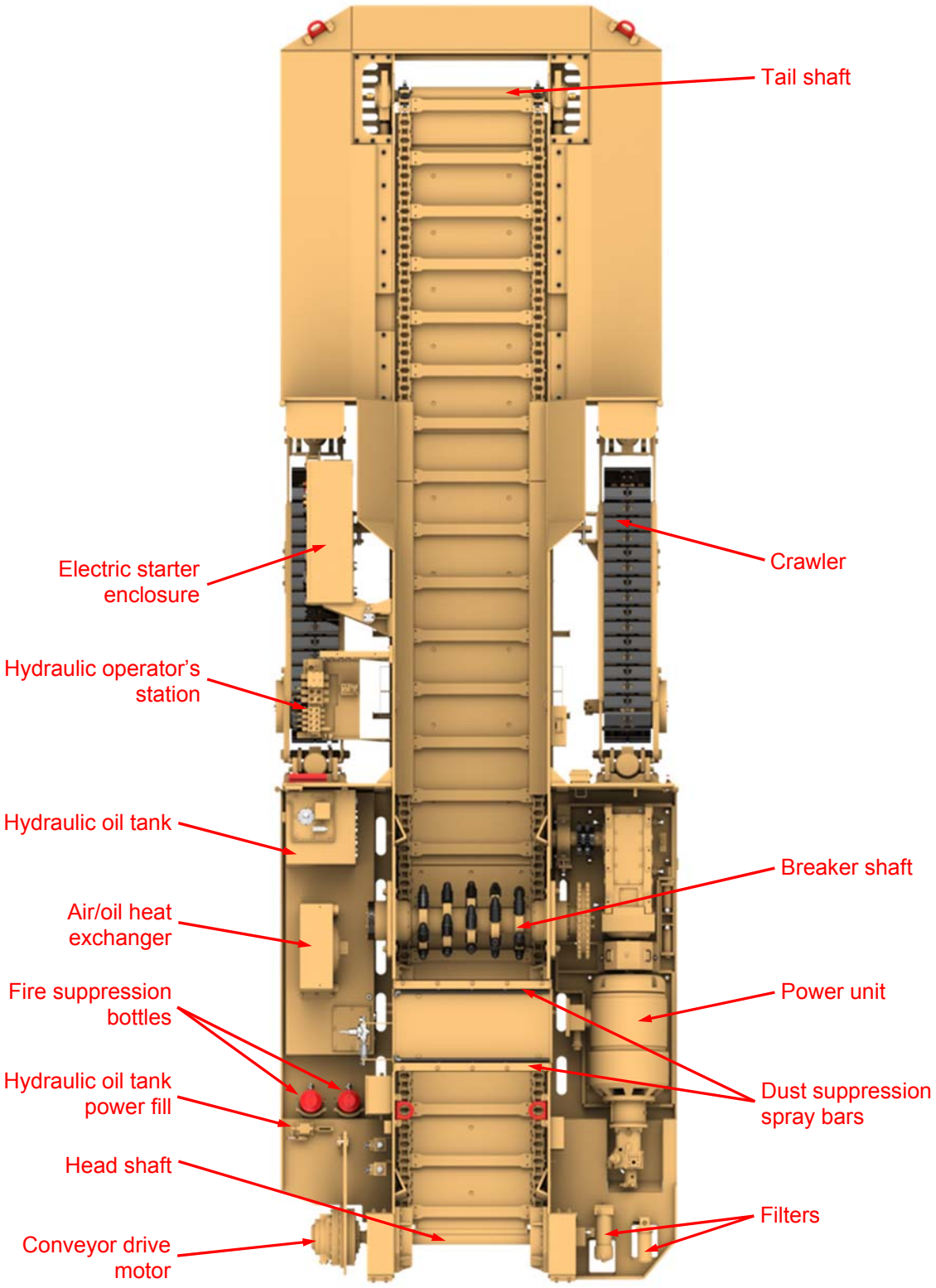
Observe the transport sheets for the machine and spare parts. They contain information on:

- dimensions,
- weights,
- lifting points, etc. (See Fig. 6 for lifting point locations)

Additional information on the dimensions and weights can be found in chapter 6 in this operating manual.

WARNING!
Use only load handling devices complying with the technical and legal regulations for the transport of loads. You could be seriously injured or even killed by falling loads. Use only suitable load handling devices.

Fig. 8: Overview of the feeder breaker (covers removed for clarity)



"LH FRAME LIFT"

The fifth section from the operator's left controls the movement of the left cylinder at the pivot point of the crawler, which adjusts the ground clearance on the left side of the machine. To increase the ground clearance, slowly push the control lever away from the operator and to decrease the ground clearance, slowly pull the control lever towards the operator.

"RH FRAME LIFT"

The sixth section from the operator's left controls the movement of the right cylinder at the pivot point of the crawler, which adjusts the ground clearance on the right side of the machine. To increase the ground clearance, slowly push the control lever away from the operator and to decrease the ground clearance, slowly pull the control lever towards the operator.

"FRAME TILT"

The seventh section from the operator's left controls the movement of the cylinders mounted to the underside to the hopper and end of the crawlers, which adjust the discharge height of the machine. To raise the height, slowly push the control lever away from the operator and to lower the height, slowly pull the control lever towards the operator.

"TANK FILL" and "AUX VB"

The sixth lever from the operator's left has two (2) functions, it controls the "TANK FILL" and auxiliary valve bank, "AUX VB" oil flow for the machine. To operate the power fill, turn ball valve handle (Fig. 12) to the open position and push the control lever. To de-energize power fill pump, move control lever to the centered position and turn ball valve handle to closed position. Pull the control lever towards the operator to energize the auxiliary valve bank (if equipped).

WARNING!
The "TANK FILL/AUX VB" lever is the only lever on the valve bank that does not spring return to neutral when released. When not in use, the valve should be manually returned to the neutral position. Failure to do so could result in unexpected machine movement if the secondary valve bank is energized and a lever on the secondary valve bank is inadvertently moved or machine overheating if the power fill pump is left energized. Unexpected machine movement could result in serious injury to personnel or damaged equipment.

To operate the power fill (Fig. 13):

1. Clean suction hose attached to the hydraulic power fill motor, located on top of the oil tank.

2. Remove the suction hose plug and submerge the suction hose in the new oil supply.

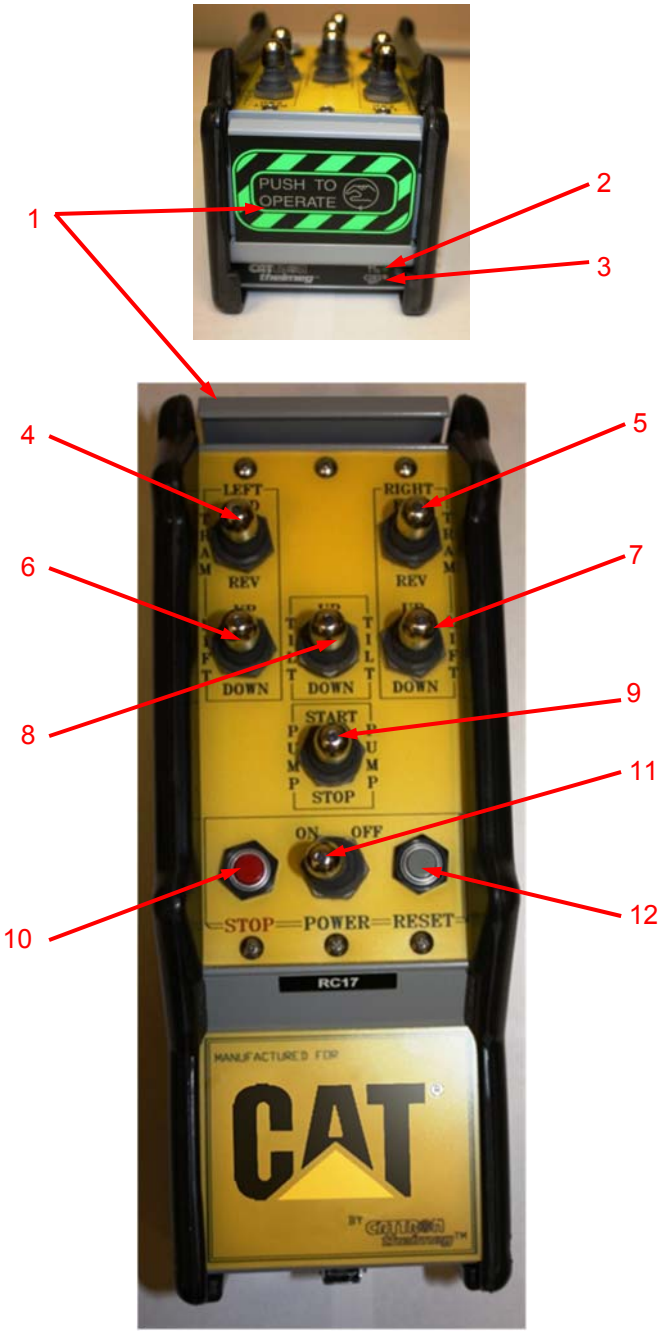
3. Turn the handle of the ball valve to the open position. The handle should now be inline with the hydraulic hose to which it is attached.

4. Position the "TANK FILL/AUX VB" lever in the "TANK FILL" position. Oil from the valve bank will now drive the power fill motor and a suction force will be created in the suction line. Oil from the new oil supply will be drawn through the power fill motor and hydraulic oil return filter to the hydraulic oil tank.

radio remote

The machine is equipped with a wireless remote (Fig. 23) that can be used to control tramming and to operate the lift and tilt cylinders. The radio remote is active when the “CONV/OFF/TRAM” selector switch is in the “TRAM” position and the neutral start guard is in place (valve levers in neutral, guard covering handles, magnetic switch engaged).

Fig. 23: Radio remote



1. Push to operate bar (deadman switch)
2. Battery good indicator
3. Battery low indicator
4. Left tram
5. Right tram
6. Left lift cylinder
7. Right lift cylinder
8. Tilt cylinder
9. Pump (breaker motor) start/stop
10. Emergency stop
11. Radio remote power on/off
12. Reset

Control system operating parameters

The following parameters affect the operation of the machine as indicated:

Breaker underspeed

If the breaker underspeed sensor does not pick up within five seconds of the breaker motor starting, the control system will shutdown the breaker motor and a “BREAKER UNDERSPEED ALARM” will be displayed.

Breaker motor overload

If the breaker motor current exceeds a preset value, the control system will shutdown the machine and the “BREAKER MOTOR OVERLOAD ALARM” will be displayed.

Breaker idle shutdown timer

If the conveyor is running and no cars dump on the conveyor within a 2-1/2 minute time period (adjustable within the PLC), the control system will shutdown the conveyor motor.

If no conveyor function is engaged on a running machine within a 15 minute time period (adjustable within the PLC), the control system will shutdown the breaker motor.

High oil temperature

If the hydraulic oil temperature exceeds a preset value of 165° F, the control system will shutdown the machine and the “HIGH OIL TEMPERATURE ALARM” will be displayed.

Low oil level

If the hydraulic oil level falls below a preset level for more than three seconds, the control system will shutdown the machine and the “LOW OIL LEVEL ALARM” will be displayed.

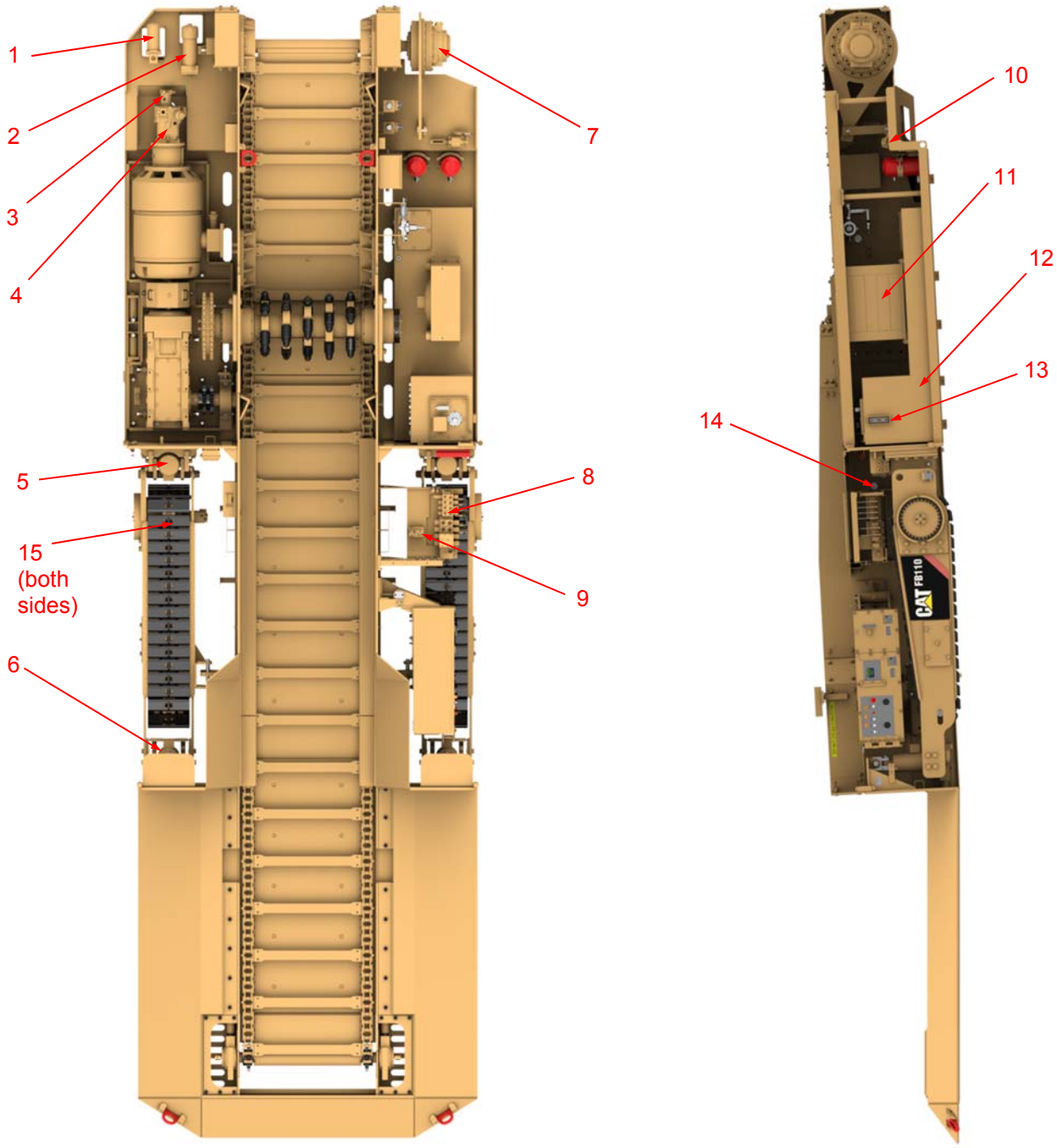
High oil pressure

If the hydraulic oil pressure exceeds 4,800 psi for more than three second, the control system will shutdown the machine and the “HIGH OIL PRESSURE ALARM” will be displayed.

Low pump suction

If the vacuum in the main suction line in the hydraulic oil tank is less than two psi for three seconds, the control system will shutdown the machine and the “LOW PUMP SUCTION ALARM” will be displayed. The vacuum transducer is located in the suction line fitting of the pump suction port.

Fig. 28: Hydraulic component locator



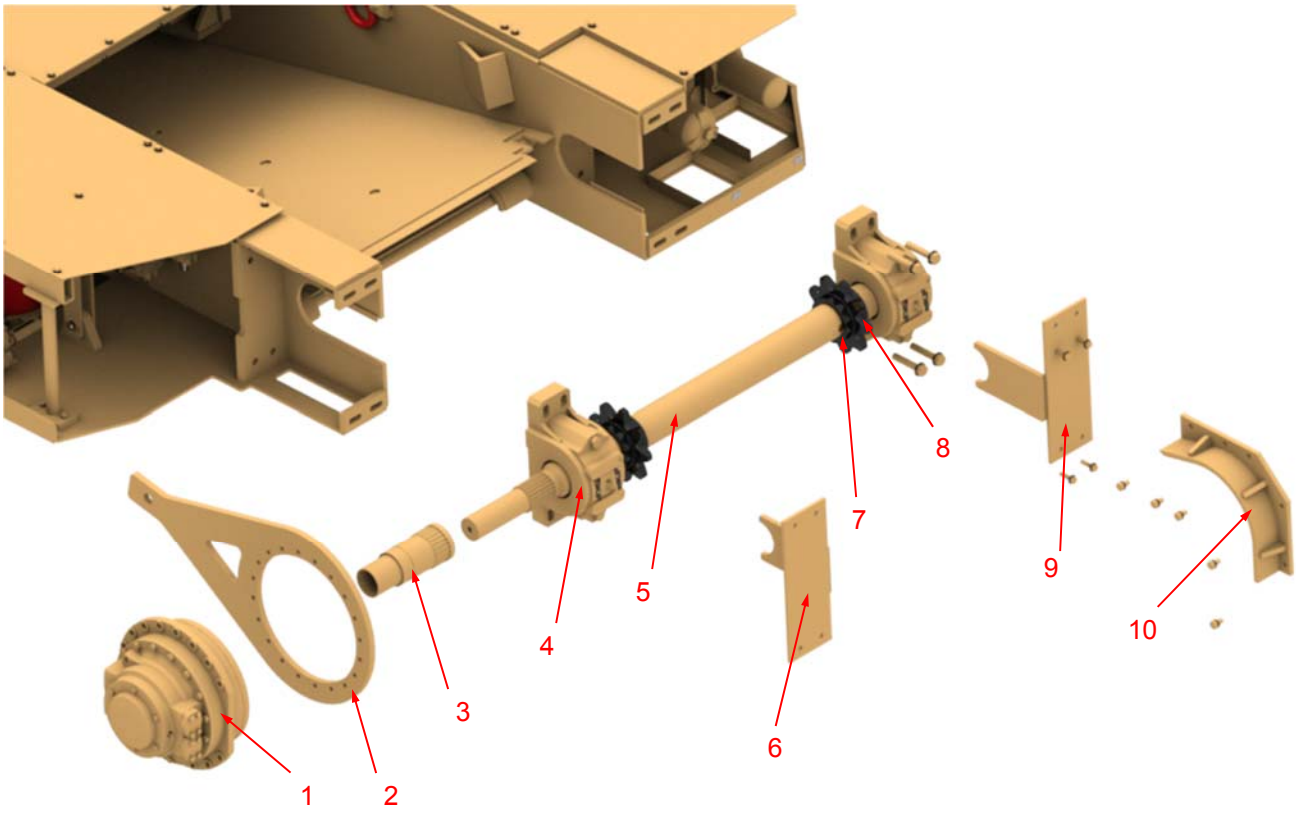
1. Return filter
2. Pressure filter
3. Piggyback gear pump
4. Open loop load sense pump
5. Frame lift cylinder (2)
6. Frame tilt cylinder (2)
7. Conveyor motor
8. Valve bank
9. Conveyor/tram engage valve
10. Hydraulic power fill ball valve
11. Air / oil heat exchanger
12. Hydraulic oil tank
13. Hydraulic oil level/temperature gauge
14. System pressure gauge
15. Tram motor (2)

Head shaft assembly

The feeder breaker is equipped with a head shaft (Fig. 33) located on the discharge end of the conveyor. The head shaft is driven from the left hand side via a hydraulic motor directly mounted to the head shaft.

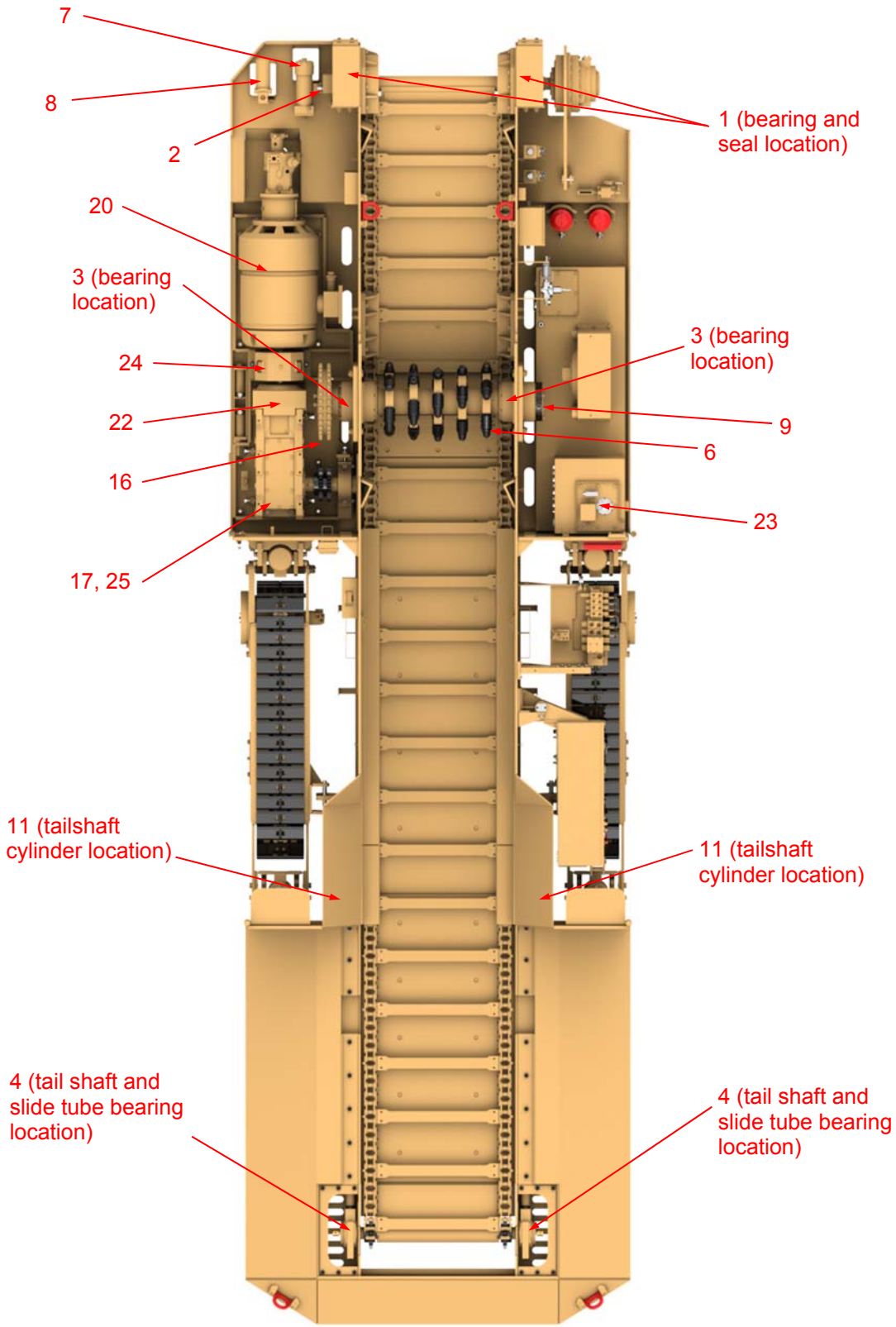
IMPORTANT!
Weld on split sprockets are available for replacement/emergency rebuilds. See the Cat® parts manual for your machine or contact your Cat® service engineer.

Fig. 33: Head shaft main components



1. Hydraulic motor
2. Torque arm
3. Coupling
4. Bearing (2)
5. Headshaft
6. Head shaft filler, left hand
7. Key (2)
8. Sprocket (2)
9. Head shaft filler, right hand
10. Sprocket guard (2)

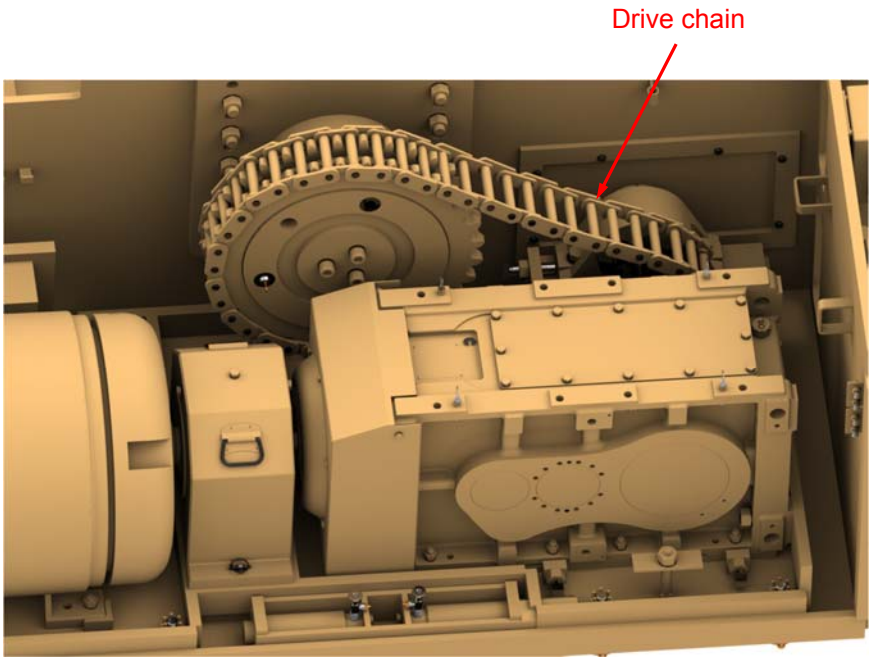
Fig. 39: Lubrication chart



breaker shaft drive chain

With the machine not running and locked out/tagged out, check the breaker shaft drive chain tension. There should be approximately 1 inch of swag in the bottom of the chain (Fig. 48). If the swag is greater or less than 1 inch, adjust the drive chain tension (see Breaker shaft drive chain adjustment procedure in this chapter).

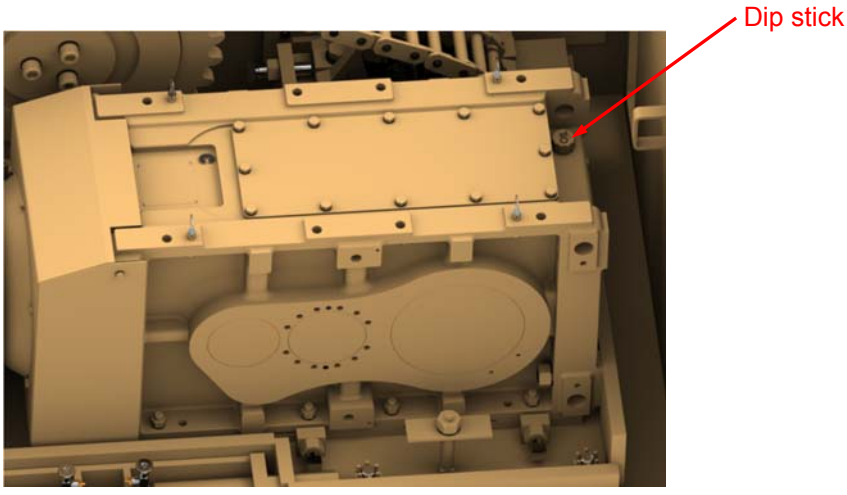
Fig. 48: Breaker shaft drive chain tension



break shaft drive reducer oil

With the machine setting as level as possible, check the oil level in the gear reducer using the dip stick located on the reducer (Fig. 49). If needed, add oil (Spec. 100-6).

Fig. 49: Gear reducer oil level

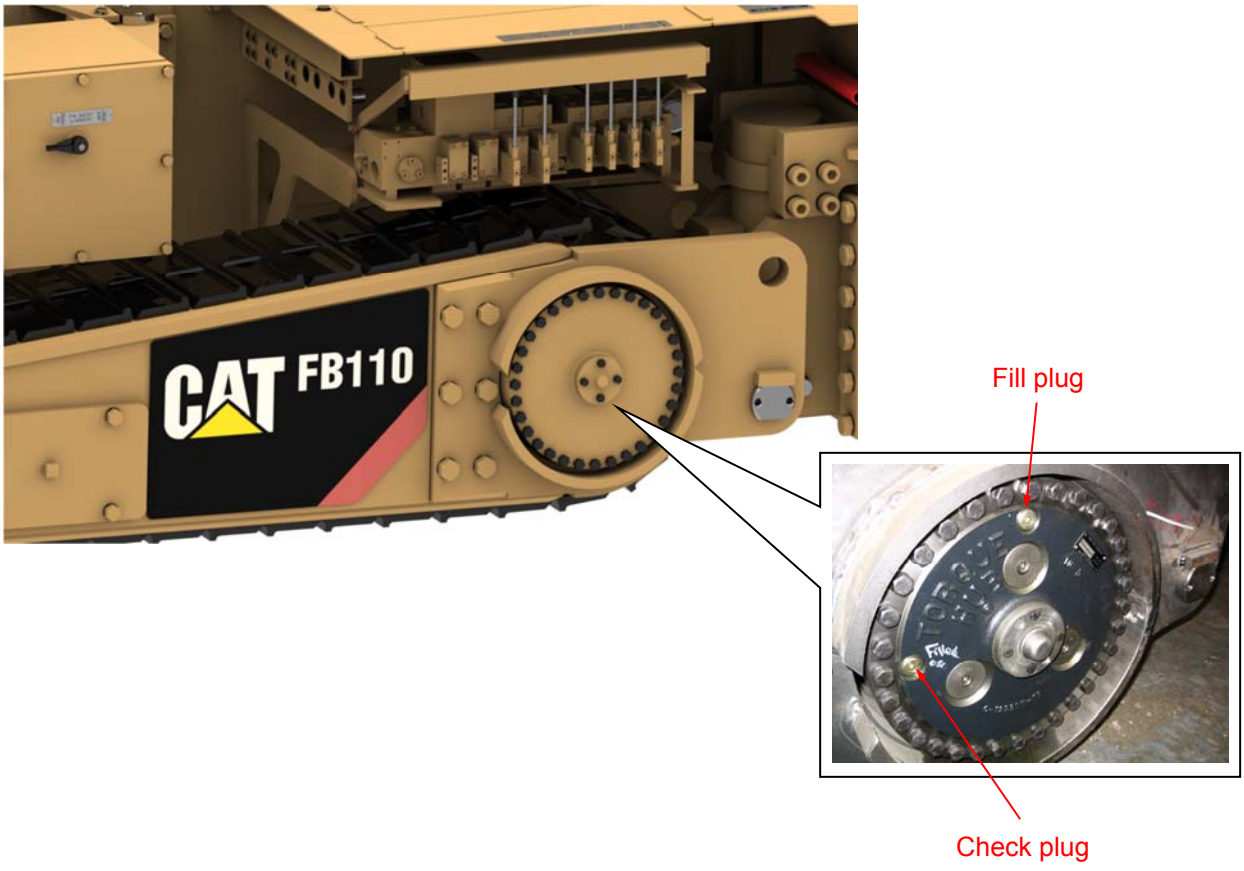


torque hub

Change oil in the torque hubs (Fig. 57).

1. Clean all dirt and debris from and around the level and fill plugs.
2. Rotate the torque hube until drain plug is at the 6 o'clock position and remove drain plug and allow the oil to completely drain.
3. Clean and reinstall drain plug.
4. Rotate torque hub until plugs are at the 12 o'clock and 3 o'clock positions.
5. Add oil (Spec. 100-2 or 100-13) through the fill hole until fluid begins to flow from the check plug.
6. When filling the torque hub, allow enough time for all internal cavities to fill. Do not overfill.
7. Install level and fill plugs.

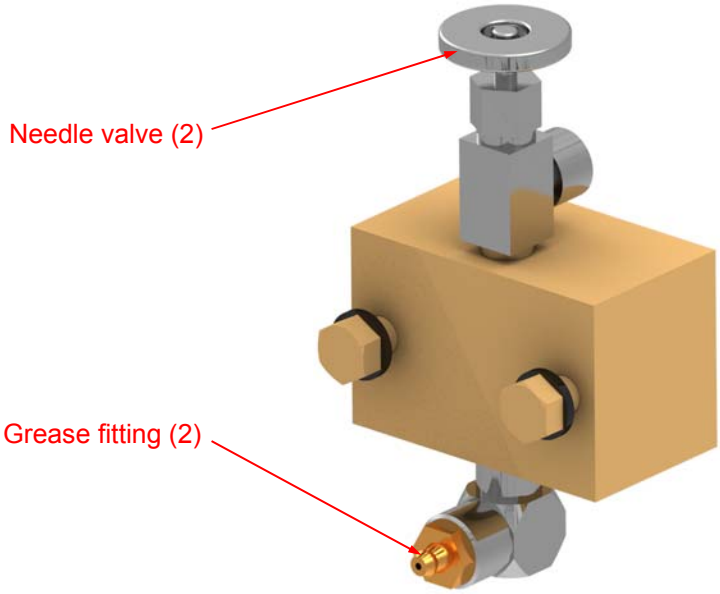
Fig. 57: Torque hub oil change



WARNING!
Due to grease cylinders being under high pressure, do not stand in direct line of grease fitting or needle valve when releasing pressure. You could be seriously injured from high pressure grease.

7. Store any unused shims inside the shim storage boxes.

Fig. 59: Conveyor chain adjustment



Note: Needle valve should always be open unless tensioning conveyor chain. Never operate the conveyor with the needle valve closed.

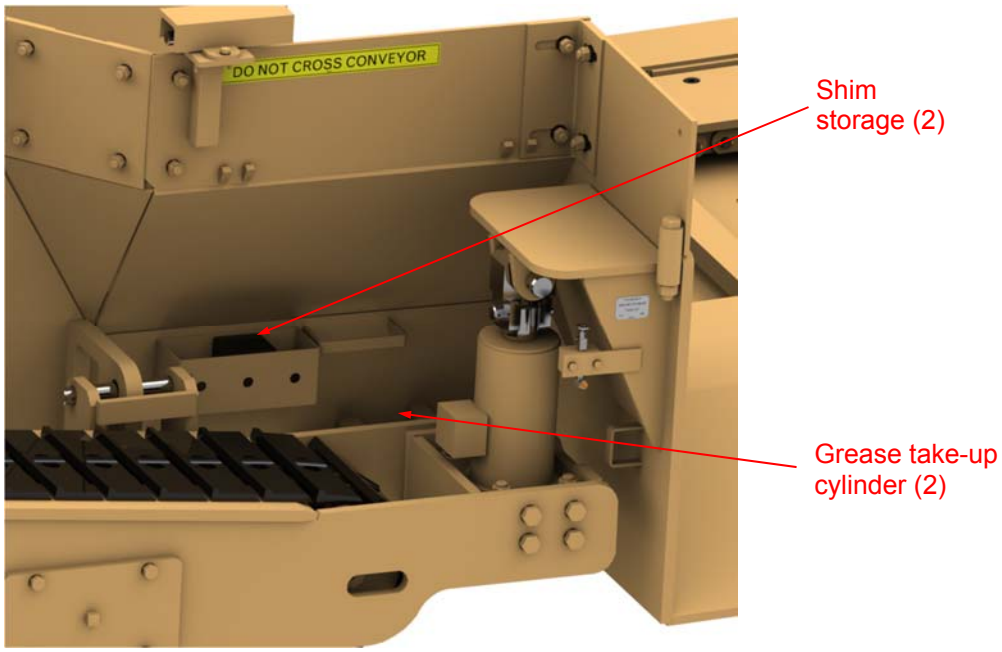
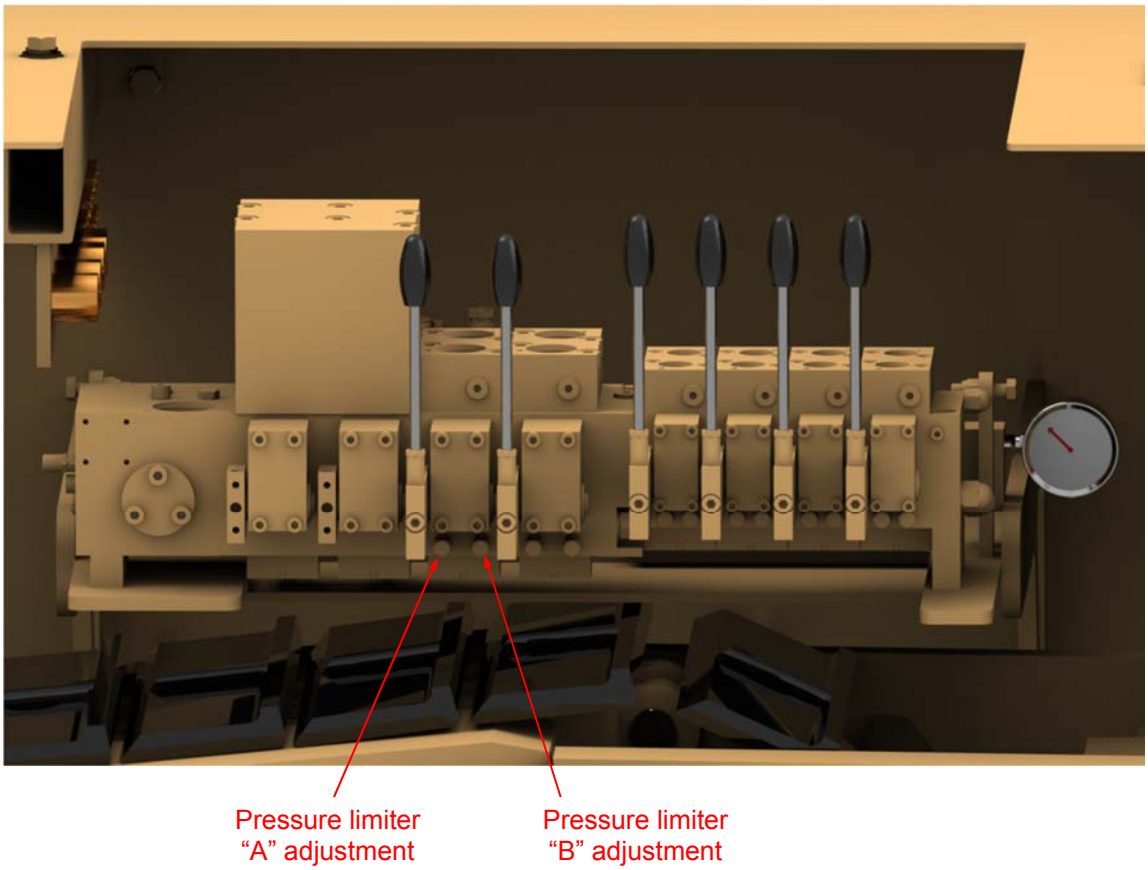


Fig. 65: Pressure limiter adjustment



5. Connect conveyor chain (see Conveyor chain replacement in this chapter.

6. Connect central lubrication hoses and lubricate the tailshaft slide plate and take-up bearings with Spec. 100-3 grease until grease is seen coming out of the return port of the central grease manifold (marked tailshaft bearing grease return) and from the tailshaft slide plate tube.

7. Adjust tension on the conveyor chain (see Conveyor chain adjustment in this chapter).

8. Coat the twelve (12) 3/4-10X1-1/2” countersunk bolts with Never Seez and install the tailshaft retainers. Fill the bolt heads with blue RTV silicone.

9. Open the grease valves on the conveyor chain take-up manifold to allow shims to carry the conveyor chain load.

10. With machine running, visually inspect tail shaft to ensure that the chain is smoothly engaging the rollers or sprockets.

Table 4: Terminal connections

Terminal	Connection
Front	
1	No connection
2	No connection
3	4-20mA Output - Positive (+)
4	4-20mA Output - Common (1)
5	No connection
6	No connection
7	Sensor Input (+)
8	Sensor Input Common (-)

Terminal	Connection
Back	
9	No connection
10	No connection
11	No connection
12	No connection
13	No connection
14	No connection
15	AC Input (N)
16	AC Input (H)

5. Restore power to the machine.

Setup and display indicators

When power is applied to the TAC monitor, the display will should show the following:

000 RPM - displays the actual value from the remote speed sensor. If "Line Open" is displayed, check the 4-20mA line. The maximum line resistance is 0-500 ohm.

10-XXXX RPM - displays the current speed range of the TAC monitor (10 to XXXX RPM). The display should read 10-100 RPM. If the correct range is not selected, chose the correct range as follows:

1. Press **and hold** the "SET" button for approximately 4 seconds. The display should now show models from 100 RPM top range to 6000 RPM top range.

2. Using the arrow key, highlight the 100 RPM top range model from the list.

3. With the 100 RPM top range model selected, press **and hold** the "SET" button for approximately 4 seconds. The display will now change back to normal operation with eh new RPM range shown on the bottom of the screen.

Note: If a selection is not made with approximately 10 seconds, the display will return to normal operation and will keep the existing model speed range.

How to install the crawler drive assembly

To install the crawler drive assembly proceed as follows (Fig. 79):

1. Remove old crawler drive assembly (see previous section, How to remove crawler drive assembly).

WARNING!
You could be seriously injured or even killed by falling loads. Observe the safe working load of the lifting devices and keep a safe distance away from suspended loads.

2. Inspect all components for wear or damage prior to installation.

3. Place sprocket onto torque hub and secure with the twenty (20) bolts and lock washers. Apply Loctite 242 (blue) to bolts and torque incrementally and evenly in a crossing pattern as follows.

   - Step 1: 70 ft-lb
   - Step 2: 140 ft-lb
   - Step 3: 210 ft-lb

4. Thoroughly clean and degrease the adapter plate and mating faces of the torque hub and hydraulic tram motor.

5. Apply Loctite 518 gasket eliminator or equivalent to the adaptor plate. Be sure to apply the sealant completely around all bolt holes to prevent leakage.

6. Place hydraulic motor gasket onto motor adapter plate.

7. Apply Loctite 518 to the second side of the motor gasket.

8. Install adapter plate and gasket onto hydraulic motor and secure with the four (4) nuts and lock washers. Apply Loctite 242 (blue) to nuts.

9. Apply Loctite 518 to the adapter plate gasket.

10. Place adapter plate gasket onto the adapter plate.

11. Apply Loctite 518 gasket eliminator or equivalent to the second side of the adaptor plate gasket. Be sure to apply the sealant completely around all bolt holes to prevent leakage.

12. Install motor and adapter plate assembly onto torque hub, being careful not to damage motor shaft or gasket. Secure with the (4) bolts and lock washers. Apply Loctite 242 (blue) to bolts and torque incrementally and evenly in a crossing pattern as follows:

    - Step 1: 25 ft-lb
    - Step 2: 50 ft-lb
    - Step 3: 70 ft-lb

15. With the aid of a lifting device, slowly lift hydrostatic pump and carefully align pump half and motor half of coupling. Secure pump to connecting tube with four (4) bolts and lockwashers. Coupling spacing should be .18” (4.5 mm) after pump mounting bolts are tightened.

16. Align mounting holes and shaft of gear pump with hydrostatic pump and secure with four (4) bolts and lockwashers.

17. Install completed power unit onto machine. (See How to install the power unit)

18. Fill hydrostatic pump thru case drain port with system oil before running pump.

19. Check gearbox oil level. Oil should be visible in the lower sight glass only.

CAUTION!
Failure to fill the hydraulic motor thru the case drain port to prime the motor will result in catastrophic damage to the motor.

Tilt cylinder removal and installation (typical both sides of machine

To remove a tilt cylinder (Fig. 88):

1. Shutdown the feeder breaker (see Shutdown procedure in this chapter).

2. Turn the circuit breaker to the “OFF” position and disconnect and lock and tag out the main power source. Follow all standard Federal and mine practices for locking/tagging out power sources.

WARNING!
Before performing maintenance on the machine, the circuit breaker should be in the “OFF” position and power should be locked and tagged out at the main power source. Electrical shock or accidental machine movement can cause serious injury or death to personnel.

3. Disconnect, tag, and cap the hydraulic hoses going to the cylinder.

WARNING!
Never disconnect a hydraulic hose if the circuit is pressurized or if there is a load on the circuit. If a hose is disconnected while the circuit is pressurized or a load is on it, the load will fall, causing damage to the machine or serious injury or death to personnel.

4. Attach an appropriate lifting device to the tilt cylinder.

WARNING!
Serious injury or death can result from falling loads. Observe the safe working load limits of lifting devices and keep a safe distance from suspended loads.

5. Pull the cotter pin out of the pin through the rod eye and remove the pin.

6. Unbolt the eight 1 inch hex head bolts from the crawler frame and cylinder cradle.

7. Remove the trunnion blocks from the cylinder mounting trunnions.

5. Lift the cylinder free from machine.

Table 6: Troubleshooting excessive heat

Pump Heated		Motor Heated		Relief Valve Heated		Fluid Heated	
Cause	**Remedy**	**Cause**	**Remedy**	**Cause**	**Remedy**	**Cause**	**Remedy**
Fluid heated	See Fluid Heated	Fluid heated	See Fluid Heated	Fluid heated	See Fluid Heated	System pressure too high	D
Cavitation	A	Excessive load	C	Valve setting incorrect	D	Fluid dirty or low supply	F
Air in fluid	B	Worn or damaged motor	E	Worn or damaged valve	E	Incorrect fluid viscosity	F
Excessive load	C					Faulty fluid cooling system	G
Worn or damaged pump	E					Worn pump, valve, motor, cylinder, or other component	E

Remedies

A. Any or all of the following:

- ☞ replace dirty filters
- ☞ clean clogged inlet line
- ☞ clean reservoir breather vent
- ☞ change system fluid
- ☞ change to proper pump drive motor speed

B. Any or all of the following:

- ☞ tighten leaky inlet connections
- ☞ fill reservoir to proper levels: with few exceptions, all return lines should be below fluid level in the reservoir
- ☞ bleed air from system
- ☞ replace pump shaft seal; also replace shaft if worn at seal journal

C. All of the following:

- ☞ align unit
- ☞ check condition of seals, bearings, and coupling
- ☞ locate and correct mechanical binding
- ☞ check for workload in excess of circuit design

D. ☞ adjust setting on valve

E. ☞ overhaul or replace defective parts

F.
- ☞ change filters
- ☞ check system fluid viscosity; change if necessary
- ☞ fill reservoir to proper level

G.
- ☞ clean cooler and/or strainer
- ☞ repair or replace cooler

Table 12 (continued): Valve troubleshooting

Trouble or symptom	Probable cause	Test, check and/or remedy
oil leaks at either end of spool	☞ Over-pressurized tank core.	☞ Correct high back pressure condition.
	☞ Worn or damaged spool seals.	☞ Replace seals and seal retainers.
spring centered spools do not return to neutral	☞ Broken centering spring.	☞ Replace centering spring.
	☞ Misalignment of operating linkage.	☞ Check linkage for mechanical binding.
	☞ Foreign particles in system.	☞ Clean valve and system.
load will not hold	☞ Cylinder leaking or worn.	☞ Check cylinder, repair as needed.
	☞ Port relief valve not holding.	☞ Remove and clean or replace.
	☞ Spool or housing scored or worn excessively.	☞ Replace section.
load drops when spool moved from neutral	☞ Dirt or foreign particles lodged between check valve poppet and seat.	☞ Disassemble, clean, and reassemble.
	☞ Scored or sticking check valve poppet.	☞ Replace poppet.
no motion, slow, or erratic system operation	☞ Worn pump.	☞ Check flow and pressure.
	☞ Defective cylinder or motor.	☞ Repair or replace.
	☞ Low reservoir oil level.	☞ Add oil to specifications.
	☞ Clogged suction strainer.	☞ Clean or replace.
	☞ Suction line restricted.	☞ Check lines.
	☞ Relief valve not properly set.	☞ Check pressure setting.
	☞ Relief valve poppet or seat scored and sticking open.	☞ Replace relief valve.
	☞ Valve spool not shifted full stroke.	☞ Check spool linkage travel.

Permissible media

Lubrication fluids and greases

NOTICE!
Use only lubrication fluids and greases approved by Caterpillar. These fluids and greases have been tested at Caterpillar and guarantee reliable operation of the mechanical and hydraulic functions of the machine.

IMPORTANT!
The lubrication fluids and greases listed in the same table can be mixed. Other products may only be used if the supplier can guarantee that they are equivalent.
Differently composed fluids and greases must not be mixed as this may change the consistency, i.e. the mixture can become thinner so that the lubrication effect is not sufficient. It may also be dangerous to use lubricating greases and fluids having the same specification base but different origins.
In case of doubt, the manufacturer of the lubrication to be used should be contacted as to the compatibility of the lubrication in question.

IMPORTANT!
Caterpillar expressly points out that the approval of the listed products relates only to the pure technical use in our mechanical and hydraulic systems. The responsibility for the constituents used in the hydraulic concentrates lies solely with the respective manufacturer.

IMPORTANT!
Be sure to use the manufacturer's instructions for use.

NOTICE!
When performing maintenance on the machine, all used oil and lubricants should be disposed of per your local EPA standards.