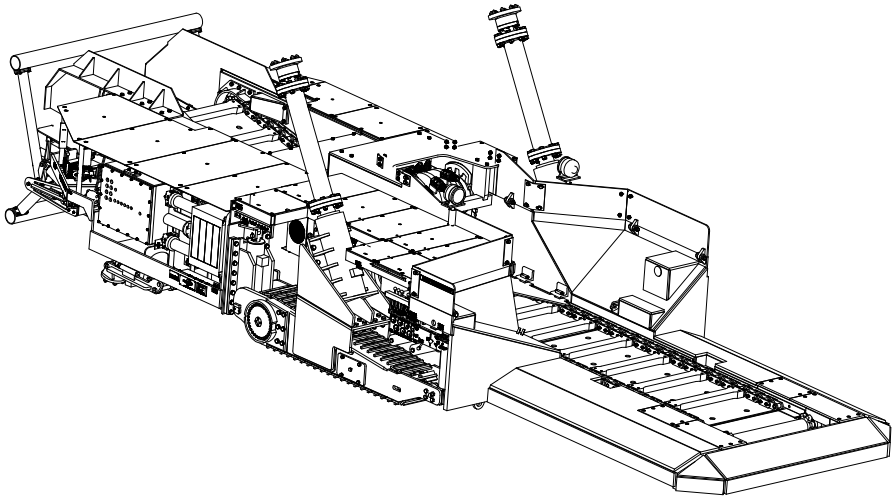
Operation and Maintenance Manual

Bucyrus - Feeder Breaker
Model - 7MFBHM-48DD

Doc. No.: A6474X320



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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.

- Items in lists are marked with bullets.
  - Points in sub-lists are marked with a long dash at the start of the line.

☞ Points in text marked in this way describe individual operations. Follow these instructions step by step. They will help you carry out your work faster and more importantly, safer.

Storage and transport

Maintain the prescribed storage periods and observe the instructions for storage.

Do not store materials or parts in the travel way or in your working area.

Inform the persons involved about the intended transport route and the anticipated duration of the transport.

transport safety device

Ensure that the transport safety devices are correctly fitted.

Fix all moving parts with transport locks.

Never stand under unsupported parts or suspended loads.

means of attachment

Connect the lifting equipment only to the points of attachment provided for that purpose. Observe the different load limits of the attachment points. Also observe the instructions on the transport sheet.

Only use means of attachment which are in good condition and have been designed for the loads to be handled.

For round components use transport straps, only. Never use chains or steel cables for this purpose.

Do not damage the treated or polished surfaces of shafts, sealing surfaces, etc.

mobile handling equipment

When using mobile handling systems for transport make sure that the center of gravity is as low as possible.

Installation and start-up

inclined face

On inclined faces secure all component parts by chains, e.g. to the support.

environmental acceptability

When working with oils, greases and other chemical substances, observe the safety regulations applicable to the product.

Dispose of cleaning rags, etc. which have been soiled with oil, grease or other chemical substances in an environmentally safe manner.

inspection

Inspect the machine and have any malfunctioning, broken or missing parts corrected or replaced before use.

maintenance

Verify that all maintenance has been performed.

instruction and safety tags

Verify that all instruction and safety tags are in place and readable. These are as important as any other equipment on the machine.

operator’s area

Clean any foreign material from the operator’s area.

Overview of safety instructions

WARNING!
The tilt and lift hydraulic cylinders have counterbalance cartridges which serve as load holding valves. Do not replace these cylinders with different style cylinders or the machine may fall. The machine could be damaged or you or other personnel could be seriously injured or killed by the falling machine.
The machine is equipped with lock pins that should be installed when the unit is not being moved. Pin are located near the lift cylinders on both sides of the machine.

WARNING!
This section is intended only to familiarize the user with the major mechanical assemblies of the feeder breaker. All mechanical maintenance should be performed only by a qualified technician with the knowledge of the function of the assemblies involved.

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

NOTICE!
In the event that a sudden jam occurs which could damage the power unit, the breaker is protected by a shear pin.

WARNING!
Before performing maintenance on the machine, the circuit breaker must be in the "OFF" position and the power should be disconnected at the main power source. Follow all Federal and mine safety regulations for lockout/tagout procedures. Electrical shock and accidental machine movement can cause serious injuries or even death to you or the maintenance person.

WARNING!
Do not move any hydraulic control lever unless you are certain that everyone is completely clear of any machine movement. Accidental machine movement can cause serious injuries or even death to you or the maintenance person.

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 the circuit, the load may fall, causing damage to the machine or serious injury or death to you or other workers. Do not rely on counterbalance valves to hold the load. Always block or place a mechanical lock on the load. Follow all Federal and mine safety standards for blocking the load.

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

Storage and transport

This chapter contains important information on the correct storage and transport of the feeder breaker. Observance of the instructions and tips will increase the service life and availability of the machine. You will also be able to carry out the transport work quicker and more safely. Careful attention to the points in this chapter will help you to simplify your day-to-day work.

Storage

corrosion protection

Components coated with temporary corrosion inhibitor are protected for approximately six months.

Before delivery, the hydraulic functions are tested and the hydraulic pressures are preset to OEM specifications.

Storage of the machine and spare parts

no direct exposure to sunlight

Store the equipment indoors or cover with a tarpaulin to protect against direct exposure to sunlight.

dirt and moisture

Protect the equipment and all spare parts stored outdoors against moisture and dirt, e.g. using tarpaulins.

Protect the hydraulic plug connectors and the connectors of the electrical cables with the caps and plugs supplied.

short-term storage

During short-term storage (approximately 4 weeks) of equipment outdoors, but at temperatures above freezing, electrical components need not be removed. Such components must be particularly protected against excessive temperatures, dirt and moisture.

long-term storage

If the equipment is to be stored more than six months, the following lubrication and corrosion inhibiting procedures must be followed:

- If the cylinder rods are exposed, the rods must be coated with a corrosion inhibiting fluid or grease.
- Remove the breather on the hydraulic oil tank and plug. Completely fill the tank with oil.
- Remove breathers from the gear cases and plug. Completely fill all gear cases.
- Lubricate all grease points (see the Maintenance section in Chapter 5 of this manual).
- Coat the conveyor chain and the breaker drive chain with a heavy coat of rust inhibitor fluid or grease.

Fig. 7: Safety features on the feeder breaker

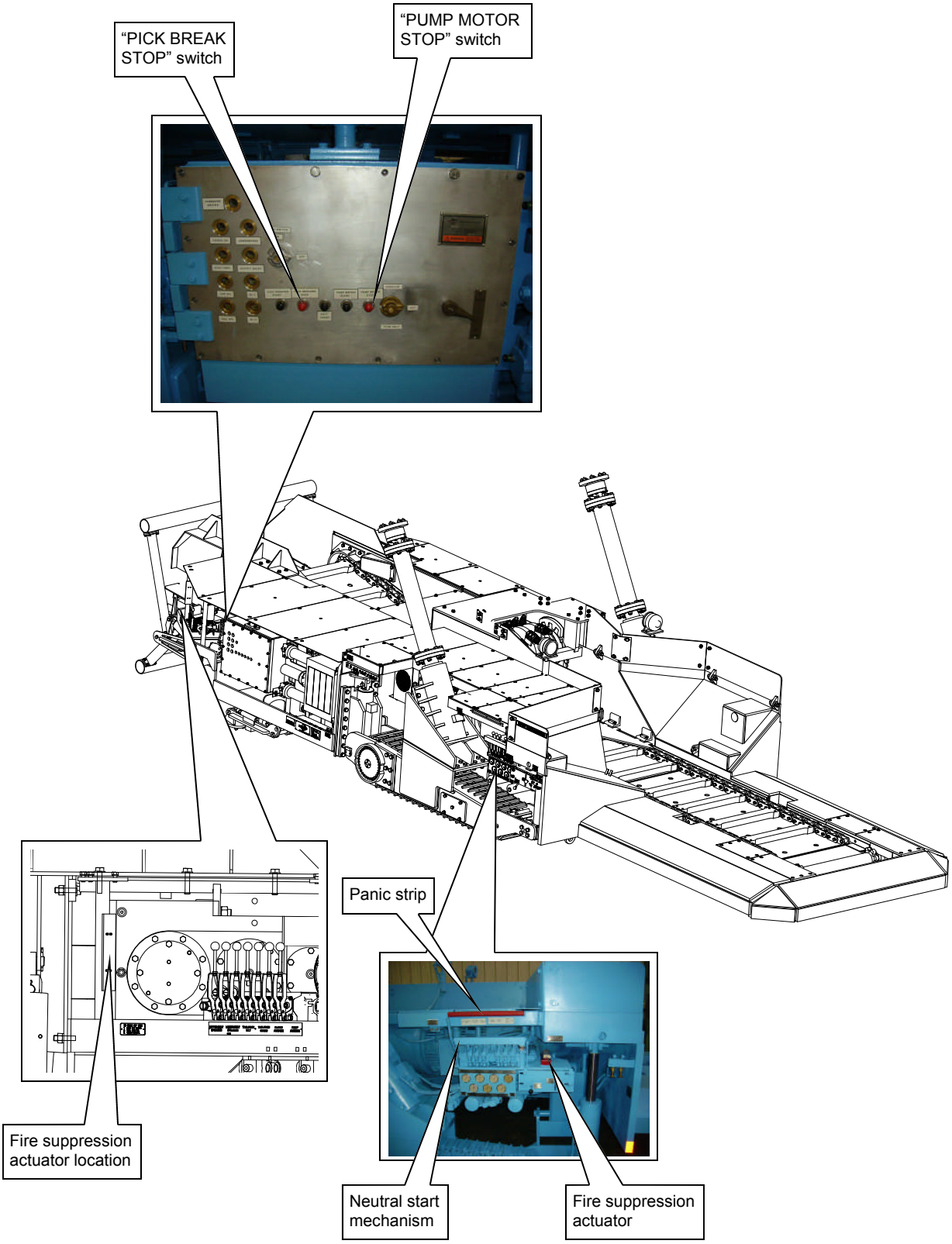
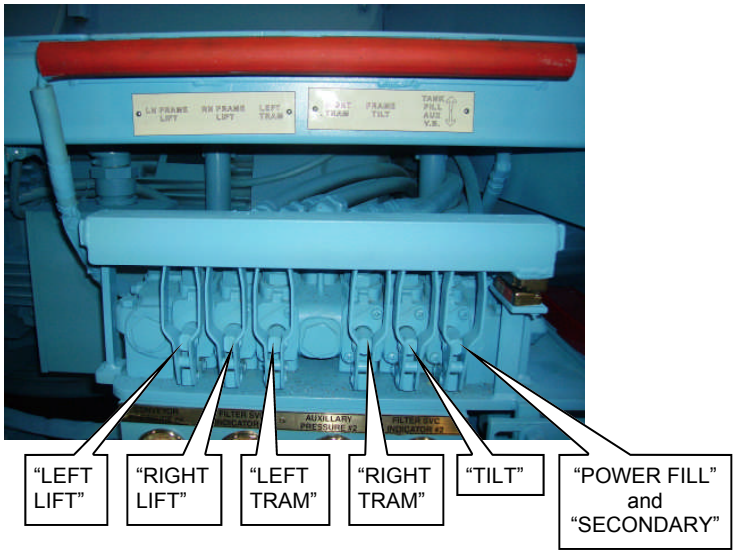


Fig. 11: Primary valve bank



two position conveyor direction and speed control valve

The two position conveyor direction and speed control valve (Fig. 12) controls the feeder breaker conveyor chain direction and speed. Push the control lever down to run the conveyor in the direction of the discharge end and pull the control lever up to run the conveyor in the direction of the receiving end. Conveyor chain speed is controlled by the distance that the control handle is pushed.

tram/conveyor mode control valve

The tram/conveyor mode control valve (Fig. 12) allows the operator to change the machine from tram to conveyor mode. Push the control handle down for conveyor mode and pull the handle up for tram mode.

panic strip

The panic strip (Fig. 12) is used to break the control circuit in emergency situations. Striking the panic strip with a small amount of force will actuate the panic strip: all machine functions are shutdown immediately.

fire suppression

The machine fire suppression (remote) actuators (Fig. 12) is used to activate the fire suppression system on the machine. The fire suppression system is pneumatically actuated and extinguishes with dry chemicals. To actuate the system, pull the safety pin and strike downward on the plunger. Immediately after the plunger is struck, dry chemical will be dispensed throughout the machine. The fire suppression system must be completely recharged with dry chemicals and expellants after it has been actuated.

WARNING!
If the fire suppression actuator is actuated, the system must be completely recharged with dry chemicals and expellants.

Starting procedure - “REGULAR” mode

After reading the previous descriptions and locating each control, the operator is ready to operate the feeder breaker. An experienced operator should monitor a new operator’s indoctrination to the starting procedure.

WARNING!
The machine should not be started if it’s core temperature is below 30° Fahrenheit. If the machine is started at extremely low temperatures pump and pump motor failure could occur.

IMPORTANT!
Before start-up, check that daily maintenance has been performed on the machine.

- ☞ Operate all primary and secondary valve bank control levers to ensure that they are free and in neutral position.
- ☞ Position the primary valve bank handle lock guard over the valve handles so that they cannot be operated. Make sure the magnetic contactors are fully seated and are in direct contact.

IMPORTANT!
The machine will not start unless all valve control levers on the primary valve bank are in neutral position and the guard is fully closed, engaging the magnetic switch.

- ☞ Check conveyor for any foreign material or objects.
- ☞ Check that all other personnel are within a safe distance of the machine.

WARNING!
Before start-up, check the conveyor for any foreign material or objects and that all other personnel are within a safe distance of the machine.

- ☞ Set main circuit breaker located on the door of the starter enclosure by first moving the circuit breaker lever to the “RESET” position and then to the “ON” position.
- ☞ Turn the “REGULAR/OFF/TRAM ONLY” selector switch located on the cover of starter enclosure to the “REGULAR” position.
- ☞ Engage the “PICK BREAK START” pushbutton located on the cover of the starter enclosure.
- ☞ The contactor M1 will energize and the pick break motor will start.
- ☞ Engage the “PUMP MOTOR START” pushbutton located on the cover of the starter enclosure.
- ☞ The contactor M2 will energize and the pump motor will start.

“IS#1” and “CR1” “IS#1” is an intrinsically safe relay that works in conjunction with the high temperature relay “CR1”. If the hydraulic oil temperature exceeds 150°F, the high temperature switch will shut the pump motor down and the “HI TEMP” indicator light will be illuminated.

“IS#2” and “CR2” “IS#2” is an intrinsically safe relay that works in conjunction with the low oil relay “CR2”. If the oil in the hydraulic tank drops below the bottom of the sight glass on the side of the tank, the low oil switch will shut the pump motor down and the “LOW OIL” light will be illuminated.

“IS#3” and “CR3” “IS#3” is an intrinsically safe relay that works in conjunction with the sequence switch relay “CR3”. If the outby belt stops, the sequence switch will shutdown the pump motor and the “SEQ SW” light will be illuminated.

“IS#4” and “CR4” “IS#4” is an intrinsically safe relay that works in conjunction with the pressure switch relay “CR4”. If the hydraulic pressure exceeds 4,800 psi, the pressure switch will shutdown the pump motor and the “PRESSURE SWITCH” light will be illuminated.

“SR” “SR” is the safety relay. If the panic bar is struck, both the pump motor and the pick break motor will be shutdown and the “SAFETY RELAY” light will be illuminated.

“CR5” “CR5” is the regular mode relay. When the mode switch on the front of the starter enclosure is in the “REGULAR” position, both the pump motor and the pick break motor can be energized.

“CR6” “CR6” is the tram only mode relay. When the mode switch on the front of the starter enclosure is in the “TRAM ONLY” position, only the pump motor can be energized. The pick break motor will not run in “TRAM ONLY” mode.

“CB-2” “CB-2” is the circuit breaker on the control circuit. If the control circuit is overloaded, or if the circuit becomes grounded, “CB2” will trip. To reset the circuit breaker, press the pushbutton on the front of the starter enclosure.

“TR1” “TR1” is the breaker shaft underspeed timer. If the breaker shaft slows down below the normal speed calibrated during initial machine setup for longer than three (3) seconds, the underspeed sensor will shutdown the pick break motor.

“TR2” “TR2” is the override timer for the breaker shaft underspeed timer. During startup, the override timer will allow the breaker shaft to run under speed for approximately seven (7) seconds. This override is active during startup only.

“TR3” “TR3” is the conveyor run time timer. The timer is activated when the pump motor pushbutton, or the start button on the infrared remote, is pushed. The conveyor will run for approximately 2 1/2 minutes. To keep the conveyor running, the operator must push the start button (on the starter enclosure cover or the infrared remote) before the 2 1/2 minutes expires. If the timer is not reset within 2 1/2 minutes, the pump motor will shutdown.

Mechanical assemblies

The following pages contain a brief description of the major mechanical assemblies that are on the feeder breaker.

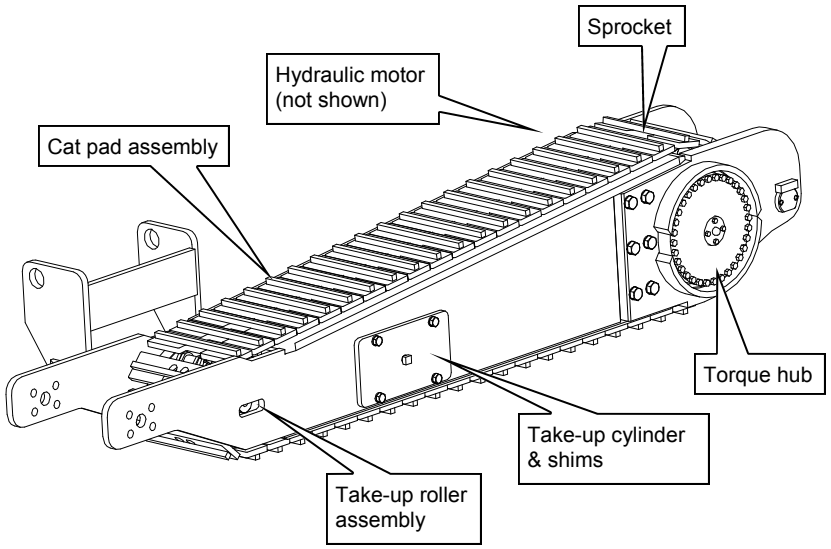
WARNING!
This section is intended only to familiarize the user with the major mechanical assemblies of the feeder breaker. All mechanical maintenance should be performed only by a qualified technician with the knowledge of the function of the assemblies involved.

Crawler assembly (s)

The feeder breaker is trammed by two (2) hydraulically driven crawlers (Fig. 32); one is located on each side of the machine. The complete drive assemblies are housed in crawler frames which enclose, guide and support the tram components. Each tram drive is independently controlled by the operator for moving the machine forward, backward and for making turns.

The crawlers on the machine are hydraulic driven through torque hub gear reducers. Attached to the torque hub is a single sprocket that engages the crawler tracks directly. The crawler track loops around the take-up roller assembly located on the opposite end of the crawler assembly. The idler assembly, along with a grease take-up is used to adjust the tension on the crawler tracks. (See Maintenance section in this chapter for Crawler track adjustment procedure.)

Fig. 32: Crawler assembly main components



NOTICE!
All hydraulic filter elements should be changed after one week of the initial start-up of machine or pre-mature wear of hydraulic components could occur.

Table 2: Lubrication and maintenance schedule

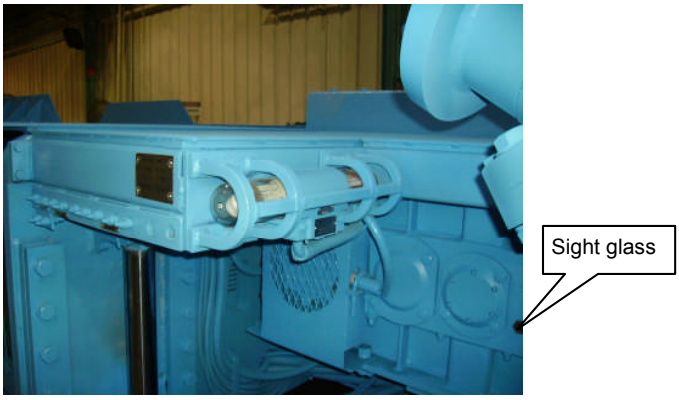
Item	Description	Places	Lubricant	Specification
	Every 8 hours of operation			
1	Head shaft bearings	2		Spec. 100-3
2	Head shaft bearing seals	2		
3	Breaker bearings	2		Spec. 100-3
4	Tail shaft and slide tube bearings	4		Spec. 100-3
5	Hydraulic oil level (check)	1		Spec. 100-1
6	Charge filter (check)	1		
7	Pressure filter (auxiliary circuit) (check)	2		
8	Return filter (check)	1		
9	Pressure filter (hydrostatic) (check)	1		
10	Bits (breaker)	Inspect		
	Weekly			
11	Crawler track take-up bearings	2		Spec. 100-3
12	Conveyor chain tension	1		
13	Fasteners (nuts, bolts and screws)	Inspect		
14	Electrical cables, conduits and glands	Inspect		
15	Hydraulic hoses and connections	Inspect		
16	Tram reducer (s) (check oil level)	2		Spec. 100-2 or Spec. 100-13
17	Breaker reducer (check)	1	Century 220	
18	Conveyor reducer (check)	1	Century 220	
19	Dust system strainer (check)	1		
20	Charge filter (change)	1		
21	Tailpiece bearing	2		Spec. 100-3
	Every 2 weeks			
22	Pressure filter (auxiliary circuit) (change)	2		
23	Return filter (change)	1		
24	Pressure filter (hydrostatic) (change)	1		
	Monthly			
25	Power fill filter (check/change as required)	1		
26	Conveyor tilt cylinders (rod and base)	4		Spec. 100-3
27	Conveyor lift cylinders (rod and base)	4		Spec. 100-3
28	Crawler anchor pin (s)	2		Spec. 100-3
29	Foot cylinder	4		Spec. 100-3
	Every 3 months			
30	Breaker electric motor	2		Spec. 100-3
31	Conveyor electric motor	2		Spec. 100-3
32	Breaker reducer (grease)	2		Spec. 100-3
33	Torque limiter (check clutch wear)	1		
	First 500 hours then every 2500 hours			
34	**Breaker reducer (change)	1	Century 220	
35	**Conveyor reducer (change)	1	Century 220	

** Change reducer oil after first 500 hours of operation and every 2500 hours afterwards.

breaker reducer

Check oil level in the breaker drive reducer (Fig. 51). Oil level should be maintained inside the sight glass on the side of the reducer when it is in operation. If the reducer does not have a sight glass, a pipe plug will be installed in the side of the reducer slightly below the input shaft center line. This is the level that the fluid should be maintained at. The oil should be changed after the first 500 hours of operation. Use Century 220 lubricant.

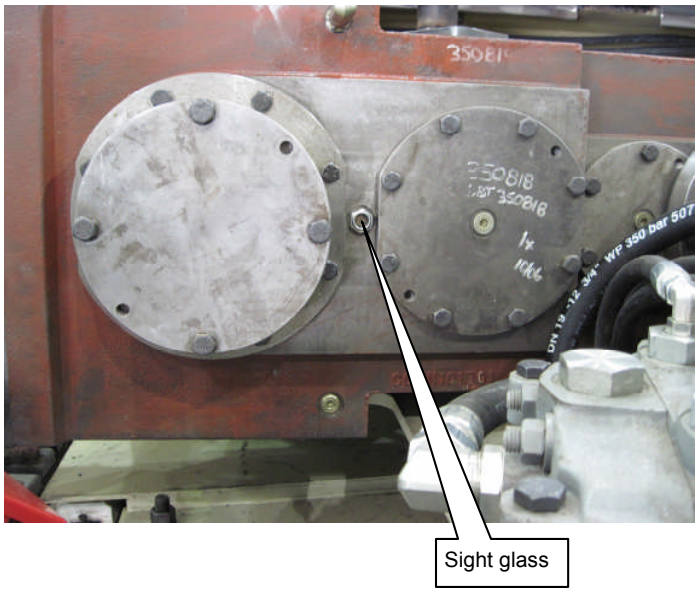
Fig. 51: Breaker reducer



conveyor reducer

Check oil level in the conveyor drive reducer (Fig. 52). Oil level should be maintained inside the sight glass on the side of the reducer when it is in operation. The oil should be changed after the first 500 hours of operation. Use Century 220 lubricant.

Fig. 52: Conveyor reducer

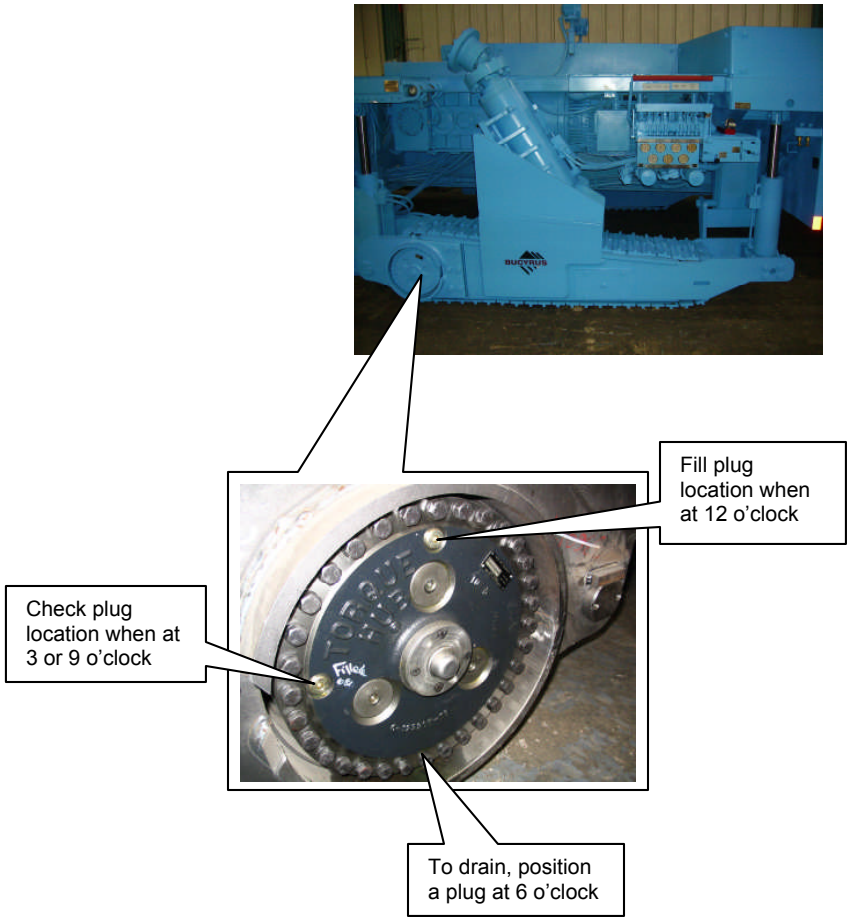


tram reducer

Change oil in the tram reducer (Fig. 68).

- ☞ Clean all dirt and debris from and around the level and fill plugs.
- ☞ Rotate reducer until drain plug is at the 6 o'clock position and remove drain plug and allow the oil to completely drain.
- ☞ Clean and reinstall drain plug.
- ☞ Rotate reducer until plugs are at the 12 o'clock and 3 o'clock positions.
- ☞ Add oil (80W-90) through the fill hole until fluid begins to flow from the check plug.
- ☞ When filling the reducer, allow enough time for all cavities inside the reducer to fill.
- ☞ Install level and fill plugs.
- ☞ Do not overfill reducer.

Fig. 68: Tram reducer oil change



Crawler track

The crawler track is a complete assembly and should be checked for wear and correct tension at regular intervals.

To adjust tension on the crawler track with the take-up cylinders proceed as follows (Fig. 71):

☞ Raise complete crawler assembly off ground and securely block under the machine. The machine must be securely supported off the ground with the crawler free to turn.

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.

☞ Chain sag should be 1 3/4” at the center of the crawler.

☞ Remove the access cover located on the side of the crawler and locate the needle valve inside crawler frame. Turn valve knob counter clockwise (CCW) to open valve and pump grease into the fitting until the correct adjustment is achieved. Chain sag should be 1 3/4” at the center of the crawler.

☞ Turn needle valve knob clockwise (CW) to close.

WARNING!
If only one side of the machine is raised, be careful and only move the control lever for that particular side. Moving the wrong control lever could cause the machine to move and fall off its supports. You could be seriously injured or even killed by falling loads.

☞ Run crawler in forward direction for 3 minutes at slow speed.

☞ Run crawler in reverse direction for 3 minutes at slow speed.

☞ Shutdown machine.

☞ If necessary, re-adjust chain sag.

☞ Add or remove required amount of shims to maintain correct tension.

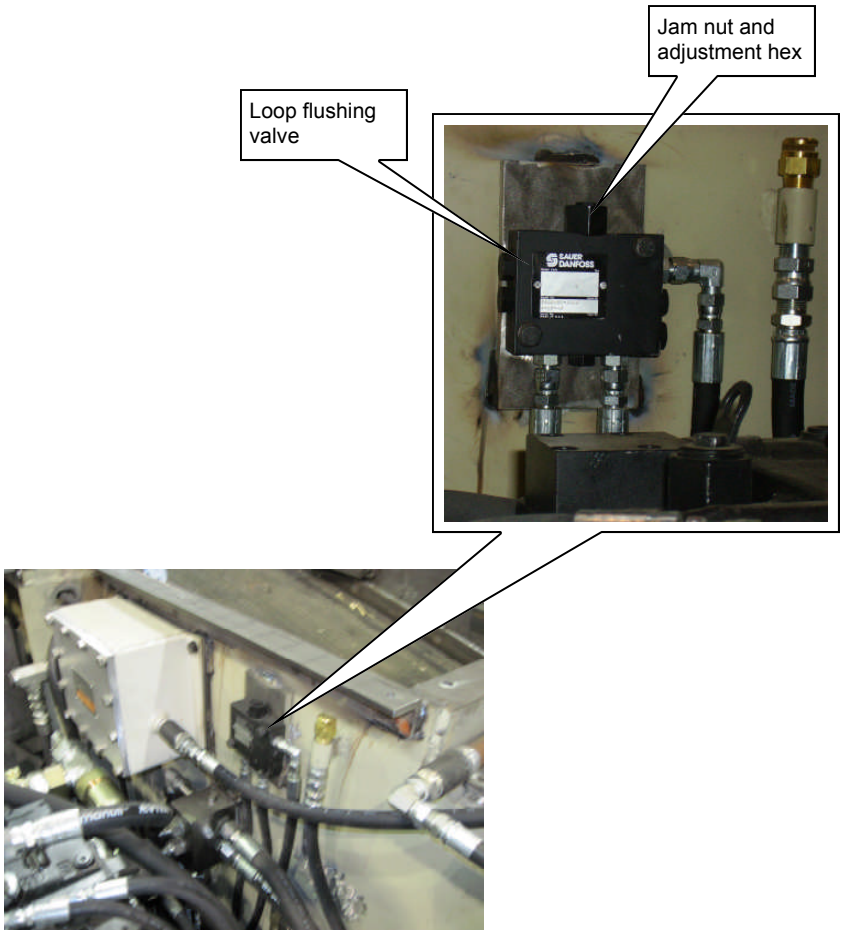
☞ Release grease pressure in the cylinder by loosening the grease fitting and then turning the needle valve knob counter clockwise (CCW), allowing the shims to maintain the correct tension.

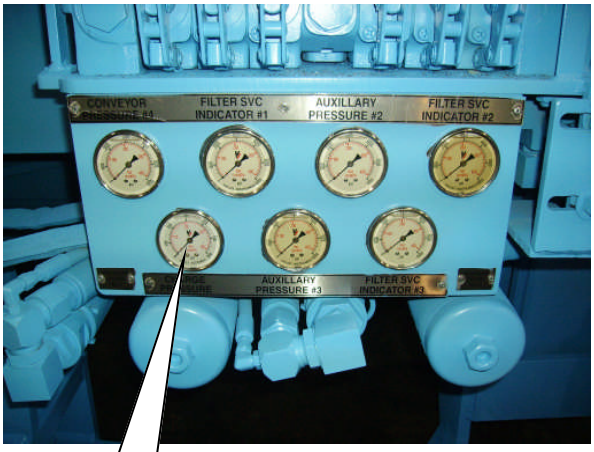
☞ Install shim retainer plate.

WARNING!
Due to grease cylinder being under high pressure, do not visually inspect to see if grease is released. You could be seriously injured from high pressure grease.

☞ Store and secure any unused shims on back of crawler cover plate.

Fig. 75: Loop flushing valve





- ☞ Remove the four (4) nuts, bolts, and lock washers from each of the head shaft bearings. Note that there may be bearing shims under the bearing. If shims are present, make note of their thichness, quantity and location.

- ☞ Attach an appropriate lifting device to the head shaft and slide out towards the rear of the frame.

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

How to install the head shaft

To install the head shaft assembly proceed as follows (Fig. 80):

- ☞ Attach an appropriate lifting device to the head shaft and slide in the slots located at the end of the feeder breaker. The gear reducer may be installed on shaft and installed into feeder if the feeder frame is equipped with an access notch.

- ☞ Reinstall bearing shims, if applicable, back into the same location as they were removed from. Make sure to install the shims of the same thickness and quantity.

- ☞ Align the head shaft bearings with the mounting holes in frame and secure each with the four (4) nuts, bolts, and lock washers. Torque bolts to 645 ft-lbs.

WARNING!
The headshaft must turn freely by hand. If the headshaft does not turn freely by hand, the bearings will fail prematurely.

- ☞ Install the left and right sprocket guards, head shaft filler plates, tailpiece hoppers, amd tailpiece tilt cylinders.

- ☞ Connect the central lubrication hoses on both head shaft bearings.

- ☞ Install the hydraulic motor onto the input shaft of the gear reducer.

  - ☞ Install the five 1/2” X 2 1/4” hex head mouting bolts, lock washers, and flat washers and torque to 104 ft-lbs.

  - ☞ Reconnect hydraulic hoses.

- ☞ Install the conveyor gear reducer (see Conveyor gear reducer removal/installation procedure in this chapter). The gear reducer may have been installed with the headshaft if the feeder breaker frame is equipped with an access notch. Fill with Century 220 lubricant to oil is visible in the sight glass.

- ☞ Clean and lubricate splined end of head shaft with ISO 68 hydraulic fluid.

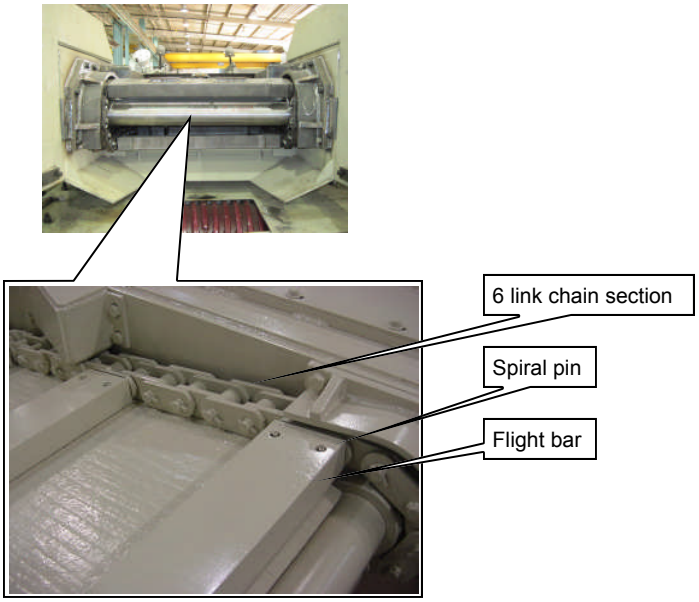
Conveyor chain

The conveyor chain (Fig. 85) is made up of one basic chain assembly which repeats sequentially along the entire chain loop. As soon as any component of the conveyor chain is worn the component or complete conveyor chain assembly must be replaced.

Each conveyor chain section consists of the following main components:

- 6 link chain section
- flight bar
- spiral pin

Fig. 85: Conveyor chain main components



How to remove the crawler drive assembly

To remove the crawler drive assembly proceed as follows (Fig. 90):

- ☞ Raise complete crawler assembly off ground and securely block under the machine. The machine must be securely supported off the ground with the crawler free to turn.

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.

- ☞ Crawler track tension must be released (see Crawler track adjustment in this chapter).
- ☞ Separate the crawler pads (see How to remove the crawler track assembly in this chapter) and fold pads back to clear sprocket.
- ☞ Disconnect, cap and tag all hydraulic hoses to hydraulic motor.
- ☞ Remove slotted nut, roll pin and washer from lift cylinder anchor pin.
- ☞ Remove anchor pin from crawler frame and crawler guide weldment.
- ☞ Remove the six (6) bolts and lock washers that secure the removable side plate to crawler frame and remove side plate.
- ☞ Remove the twelve (12) bolts and lock washers that secure the torque hub to the crawler frame.
- ☞ Attach an appropriate lifting device to the torque hub and slide complete assembly out of crawler frame.
- ☞ Remove the four (4) bolts and lock washers that secure the hydraulic motor and adapter plate to the torque hub.
- ☞ Attach an appropriate lifting device to the torque hub and slide complete assembly out of crawler frame.

CAUTION!
Do not bump hydraulic motor or hydraulic motor fittings when removing the motor from the machine.

- ☞ Remove the adapter plate and motor from the torque hub as an assembly.
- ☞ If not replacing the hydraulic motor, it is not necessary to separate the adapter plate from the hydraulic motor. If replacing the hydraulic motor, remove the four (4) nuts and lock washers that secure the hydraulic motor to the adapter plate. And remove adapter plate.

How to remove the breaker shaft assembly

To remove the breaker shaft assembly proceed as follows (Fig. 93).

- ☞ Turn the machine main circuit breaker (CB1) to the “OFF” position.
- ☞ Lock out and tag the power center. Follow standard Federal and mine lockout/tagout procedures.

WARNING!
Before performing maintenance on the machine, the circuit breaker must be in the “OFF” position and the power should be disconnected at the main power source. Electrical shock and accidental machine movement can cause serious injuries or even death to you or the maintenance person.

- ☞ Remove all breaker shaft covers.

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

- ☞ Remove and cap all grease lines from the breaker shaft.
- ☞ Properly support the breaker shaft reducer so that it does not fall during breaker shaft removal. Ensure that he power unit reaction pin is in place and not removed during this procedured.
- ☞ Attach an appropriate lifting device to the breaker shaft. Take all slack out of the lifting device in order to support the assembly when mounting hardward is removed.
- ☞ Remove the hardware from the breaker side plates.
- ☞ Disengage the pilot fit (1/8 inch) between the stub shaft and bolt flange before attempting to lift the power unit from the machine.
- ☞ Lift the breaker shaft out of the machine.

How to assemble the conveyor power unit (Fig. 94)

- ☞ Install the key in the electric motor shaft.
- ☞ Apply Never Seez to the electric motor shaft and install the coupling hub onto the electric motor shaft. Roughly position the hub even with the end of the shaft. Do not tighten the set screw as final positioning of the hub will be determined at the end of assembly.
- ☞ Install the element onto the coupling hub on the electric motor.
- ☞ Apply Never Seez onto the hydrostatic pump splined shaft. Install the remaining coupling hub onto the hydrostatic pump splined shaft (refer to Fig. 93 for dimensions).
- ☞ Clean all mating surfaces on the connecting tube and the electric motor.
- ☞ Apply Loctite 242 (blue) to the eight bolts and install bolts, flat washers, and lock washers into the connecting tube Torque incrementally and evenly to 170 ft-lbs as follows:
  - Step 1: 50 ft-lbs
  - Step 2: 100 ft-lbs
  - Step 3: 170 ft-lbs

IMPORTANT!
It is extremely important that the connecting tube pulls up evenly on the electric motor. If the connecting tube is cocked, misalignment between the pump and the electric motor will occur and the coupling will fail.

- ☞ Install the hydrostatic pump. Align the pilot hub on the pump with the pilot bore of the connecting tube while simultaneously engaging the jaws of the Rotex coupling halves.
- ☞ Install four bolts, flat washers, and lock washers and torque incrementally and evenly to 280 ft-lbs as follows:
  - Step 1: 90 ft-lbs
  - Step 2: 200 ft-lbs
  - Step 3: 280 ft-lbs

  Refer to Figure 93 to verify distance between the coupling jaws and the coupling element of 0.18”. This distance must be maintained to avoid element failure. Adjust the gap as required by repositioning the hub on the electric motor shaft as required.
- ☞ Check coupling half alignment by using a straight edge across the two coupling halves (see Fig. 95). Rotate the electric motor and measure the spacing in at least two places to ensure the electric motor and pump shafts are aligned. If there is misalignment, the connecting tube may be cocked or the mating surfaces may not be clean. This misalignment must be corrected before proceeding with assembly.

Foot cylinder removal and installation

To remove a foot cylinder (reference Fig. 100):

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

- ☞ 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.

- ☞ Remove the cotter pin from the outrigger arm pin, remove the castle nut, and washer and pull the outrigger arm pin.
- ☞ Remove the two cotter pins from the cylinder eye pin and pull the cylinder eye pin.

To install a foot cylinder (reference Fig. 100):

- ☞ Mount the cylinder eye to the outrigger mount plate.
  - ☞ Position the cylinder eye in the outrigger mount plate clevis.
  - ☞ Insert the cylinder eye pin through the cylinder eye and outrigger mount plate clevis.
  - ☞ Install the two cotter pins through the cylinder eye pin.
- ☞ Position the foot clevis on the rod eye and align the rod eye in the outrigger arm weldment.
- ☞ Install the outrigger arm pin through the outrigger arm weldment, foot, and rod eye. Install the washer and castle nut on the end of the pin.
- ☞ Reconnect the hydraulic hoses to the cylinder.
- ☞ Reconnect power to the machine.
- ☞ Purge the hydraulic system of air.

Belt spreader cylinder removal and installation

To remove a belt spreader cylinder (Fig. 103):

- ☞ If removing the upper belt spreader cylinder, position the upper belt spreader at its lowest position and securely block. If removing the lower belt spreader cylinder, position the lower belt spreader at ground level.
- ☞ Shut down the feeder breaker (See Shutdown procedure in this chapter).
- ☞ Turn the circuit breaker to the “OFF” position. Disconnect and lock and tag out the main power source. Follow all Federal and mine practices for locking and tagging out a power source.

WARNING!
Before performing maintenance on a machine, the circuit breaker should be in the “OFF” position and the power supply should be locked and tagged out at the main power source. Failure to do so may result in electrical shock or accidental machine movement.

- ☞ Disconnect, tag, and cap all 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 the hose is disconnected while circuit pressurized, the load will fall and accidental machine movement could occur. Machine damage or serious injury or death may result.

- ☞ Attach an appropriate lifting device to the cylinder, taking up the slack so that the weight of the cylinder rests on the lifting device.

WARNING!
Observe the safe working load limit of all lifting devices. Serious injury or death can occur from falling loads.

- ☞ Disconnect the rod end of the cylinder from the belt spreading lifting arm by removing the two (2) cotter pins from the retaining pin and knocking out the pin.
- ☞ Disconnect the tube end of the cylinder from the frame by removing the two (2) cotter pins from the retaining pin and knocking out the pin.

Contaminants in hydraulic systems

The primary cause of hydraulic component failure is system contamination. Cleanliness must be a high priority when servicing the hydraulic system. Even very small particles can damage system components be scoring valves, clogging orifices, and wearing seals prematurely. It is not the intent of this operation manual to outline a contamination control program but some of the most effective steps that have been identified in successful programs are listed below for your information.

1. Ensure that bulk oils are at acceptable cleanliness levels.

   Areas where Bucyrus America, Inc. customers have made improvements in the past include:

   - implement ISO Cleanliness Code standards for bulk hydraulic oils
   - evaluate bulk oil shipments for cleanliness by conducting particle counts and maintain records
   - minimize drum usage by utilizing tote tanks and five gallon pails
   - use plastic versus steel storage tanks, if possible
   - install desiccant breathers on all bulk tanks
   - use sealed plastic containers for adding oil to small sumps
   - locate bulk tanks near equipment and pump directly to reservoirs
   - use filter carts to maintain oil cleanliness standards
   - properly train personnel on the importance of clean oil and best practices for storage and handling
   - monitor your program closely and look for continuous improvement

2. Eliminate contamination source through “clean” maintenance practices. This is best achieved by understanding the primary sources of contamination during maintenance and troubleshooting.

   - always clean the area around the component that is to be removed and inspected
   - store components in a plastic bag after inspection and prior to replacement on the machine
   - cap off all hoses/fittings

Hydraulic pump

Table 11: Hydraulic pump troubleshooting

Trouble or symptom	Probable cause	Test, check and/or remedy
pump makes excessive noise	☞ Vacuum leaks in suction line.	☞ Check for leaks in fittings or damaged suction lines.
	☞ Vacuum leaks in the pump shaft seal.	☞ Check pump shaft seal for signs of brittleness or damage due to excessive heat. Replace seal as required.
	☞ Poor alignment with drive mechanism.	☞ Check pump shaft and motor shaft insert, as well as pilot engagement, for interference.
	☞ Incorrect fluid in system.	☞ Check fluid specifications - change fluid if necessary.
	☞ System relief settings.	☞ Pressure adjustment too low or cartridge fouled with foreign material. Readjust to correct setting and/or clean foreign material from cartridge.
	☞ Pump cavitation.	☞ Check fluid level for proper level. Check for aeration of fluid reservoir. Check for vacuum leaks in suction lines. Repair all faults as required and/or replace pump as required.
	☞ Worn or damaged gears/ housing.	☞ Replace pump.
	☞ Worn or faulty bearing.	☞ Replace pump.
	☞ Reversed rotation.	☞ Check pump motor wiring.
	☞ Plugged or restricted suction line or suction strainer.	☞ Clean by removing the foreign material blocking oil flow.
	☞ Plugged reservoir filter breather.	☞ Clean or replace filter breather as required.
seal leak	☞ Torn or worn seals.	☞ Replace seal.
	☞ Gland bearing worn.	☞ Excessive gland bearing wear will likely require pump replacement.
	☞ Seal deterioration (soft or gummy).	☞ Check oil for fluid compatibility. Drain oil tank and replace oil as required or if questionable. Replace seals.
	☞ Seal deterioration (hardened or loss of elasticity).	☞ Replace seal.
	☞ Seal deterioration (flat spots on I.D.).	☞ Check pump shaft for possible bearing wear. Replace seal.
	☞ Loose or worn pump parts.	☞ Replace worn pump parts.

Technical data

This chapter contains the most important technical data on the Model 7MFBHM-48DD Feeder Breaker. Further data can be found in the spare parts lists. At the end of this chapter you will find information on the bolt tightening torques, HFA fluids, greases, etc. Read this chapter through carefully and pay particular attention in particular to the safety instructions.

The technical data listed in this chapter is for stock machines only. Customer specials may not be listed.

Components of the feeder breaker

Technical data sheet

general

Overall length:	
without tailpiece	approx. 33’ (9,992 mm)
with tailpiece	approx. 36’ 6” (11,134 mm)
Overall width:	approx. 10” 7” (3232 mm)
Tramming height (min.):	approx. 48” (1,199 mm)
Ground clearance (min.):	approx. 7” (190 mm)
Ground clearance (max.):	approx. 24” (622 mm)
Receiving height (min.):	approx. 13” (330 mm)
Discharge height (max.)	approx. 48” (1,199 mm)
Operating height (max.):	approx. 74” (1,864 mm)
Level hopper capacity:	approx. 370 ft³ (10.5 m^3)
Capacity (w/ optional 12” sideboards):	approx. 420 ft³ (12 m^3)
Receiving impact plate:	HRS + CCO wear plate
Breaker impact plate:	T1 + CCO wear plate
Coal line material:	HRS + CCO wear plate
Return line material:	HRS + CCO wear plate
Mainframe side plates:	HRS + CCO wear plate
Weight (machine only):	approx: 80,000 lbs (36,288 kg)

performance

Material input size (max.):	approx. 1’ x 2’ x 3’ (305 mm x 610 mm x 915 mm)
Maximum material strength:	approx. 30,000 psi (207 N/mm^2)
Nominal output size:	approx. 8” (203 mm) (one dimension)
	approx. 1” (25.4 mm) (pick to flight clearance)
Discharge rate (max.):	approx. 1,225 TPH @ 135 fpm ($1.1E^6$ kg/hr @ 39.6 m/min)
Material to be broken:	Coal @ 65 lb/ft³ (1,041 kg/m^3)

Table 20: Invert emulsion hydraulic fluid (Spec. 100-5)

	Supplier	Brand name
1	Unocal 76	FR Fluid
2	Conoco Inc.	FR Hydraulic Fluid
3	Atlantic Richfield Company	Duro FR-HD
4	Brooks Oil Company	Brooks Fire Resistant Hydraulic Fluid B
5	Cincinnati – Vulcon Company	Vulcon FR Fluid #1
6	Cities Service Oil company	Citgo Pacemaker Invert FR Fluid
7	Century Oils Limited	Aquacent Light
8	Fiske Bros. Refining Company	Lubriplate HO-Retard
9	Getty Oil Company (Veedol, Tidewater)	Veedol Auburn FRH
10	Gulf Oil Company	FR Fluid
11	E.F. Houghton	Houghto-Safe 5046 Houghto-Safe 5046W
12	Century (Fuchs)	Hulsafe 600
13	Imperial Oil and Grease	Astrol 587
14	Mobil Oil Corporation	Pyrogard D
15	National Oil and Chemical Co.	Erifon 1, 2, and 3
16	Pennzoil	Maxmul FRP/G
17	Quaker Chemical Company	Quintolubric 958 Series Quintolubric 958 Series
18	Henery E. Sanson and Sons MFGE Company	Hydra-Mul Premium Emulsion Fluid
19	Southwest Grease and Oil Company, Inc.	Invert Emulsion Fire Resistant Hydraulic Fluid
20	Southwest Petroleum Corp.	Swepco Fire Resistant Hydraulic Oil #718
21	Standard Oil Company of Ohio (Boron Sohio)	Staysol FR
22	Sun Oil company	Sunsafe F
23	Tower Oil Company	Safoil Anti-Wear Hydraulic Fluid
24	Wynn Oil company	Hydra-Safe Heavy Medium
25	Lubrication Engineers	6455 Monolec Fire Resistant Hydraulic Fluid
26	Hydrotex	HY-Guard