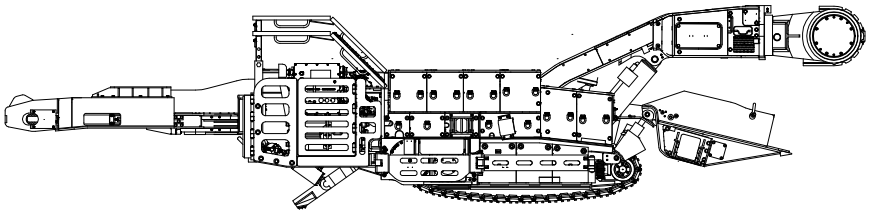
Operation and Maintenance Manual

Bucyrus - Continuous Miner
Model - 30M4-NP

Doc. No.: A6474X337



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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.

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. Safety regulations can be found on the container or on the Material Safety Data Sheet (MSDS) for the product.

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

controls

When starting up machine, do not operate any controls located inside the operator's pit from outside the pit.

starting procedures

Follow the starting procedure instructions in the operations manual.

red zone

Do not operate any levers, pedals or controls if anyone is in the red zone. (See Red Zone in Chapter 5 of this manual)

Operation

training

Operate the machine 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 Continuous Miner.

before start-up

Before start-up, ensure that there are no persons or obstructions in your line of travel or in the articulation area when steering the unit.

protective devices

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

traveling

Use extreme caution when traveling in close quarters or in congested or blind-travel areas.

passengers

Never carry passengers. Passengers may be thrown off the machine or crushed between the machine and outside objects.

safety rules

Always follow all safety rules of each particular mine when operating the machine.

problems and malfunctions

If problems or malfunctions are encountered while operating the unit, the machine must be properly shutdown and the problem corrected immediately.

Transport

Load units: dimensions and weights

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

- dimensions,
- weights,
- lifting points, etc.

Additional information on the dimensions and weights can be found in chapter 6 and in the lifting weight guide (Table 1) in this operating section. Fig. 5 illustrates the position of lifting points of the various assemblies of the machine. For detailed lifting instructions, see component hoisting information.

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.

Table 1: Lifting weights of continuous miner assemblies

Description	Approximate Weight
Tractor Frame	90,000 lbs
Gathering Head	23,158 lbs
Chain & Conveyor	17,000 lbs
Support Frame	50,500 lbs

Whenever possible, all removals should be accomplished using an adjustable lifting beam whenever possible. All supporting members (chains and cables) should be parallel to each other and as nearly perpendicular as possible to the top of the object being lifted.

When it is necessary to remove a component on an angle, remember that the capacity of an eyebolt diminishes as the angle between the supporting members and the object increases. Eyebolts and brackets should never be bent.

When an eyebolt is provided to lift a component, use it to lift only that component.

WARNING!
You could be seriously injured or killed as a result of falling loads. Do not use the eyebolt to lift the component and its related assemblies.

conveyor safety supports

There are two conveyor safety supports, one on each side of the conveyor. The supports are used to block up the conveyor during maintenance operations.

methane monitor

The machine is equipped with a methane monitor that detects the presence of methane in the mine atmosphere. When the miner is being powered up, the monitor looks for methane before any other function is energized. If the methane monitor detects a level of methane within a preset tolerance, the methane monitor relay will close and power will be supplied to the other functions on the machine. (The machine can have optional dual sniffer heads or dual readouts.)

canopy/cab

The miner was shipped from the factory with a protective canopy/cab. Ensure that the canopy/cab is in place and secure at all times to protect the operator from falling debris.

“PUMP START”

The “PUMP START” button (Fig. 10) is used to turn on the pump motor. To start the pump motor, press and hold “PUMP START” and “MOTOR START ENABLE” until the motor starts. The pump motor must be running before any other motor can be started.

“PUMP STOP”

The “PUMP STOP” button (Fig. 10) is used to turn off the pump motor. To stop the pump motor, press “PUMP STOP”.

“CUTTER START”

The “CUTTER START” button (Fig 10) is used to start the cutter head motors. To start the motors, press and hold “CUTTER START” and “MOTOR START ENABLE” until the motors start.

“CUTTER STOP”

The “CUTTER STOP” button (Fig. 10) is used to turn off the cutter head motors. To stop the motors, press “CUTTER STOP”.

“CONVEYOR START”

The “CONVEYOR START” button (Fig. 10) is used to start the conveyor in the forward direction. To start the conveyor, press the “CONVEYOR START” and “MOTOR START ENABLE” buttons.

“CONVEYOR STOP”

The “CONVEYOR STOP” button (Fig 10) is used to stop the conveyor when it is running in the forward direction. To stop the conveyor, press “CONVEYOR STOP”.

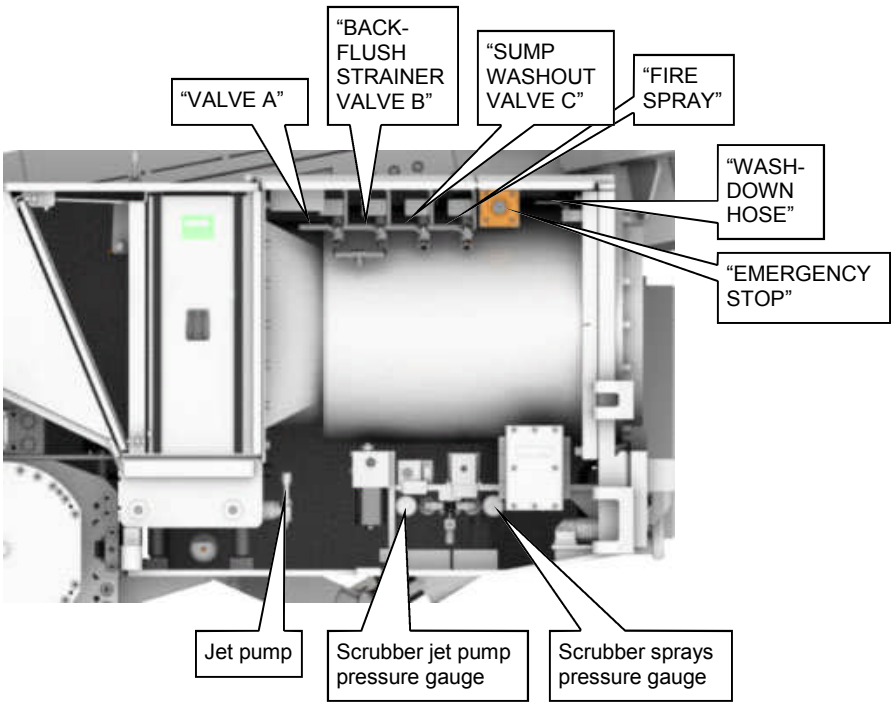
“MOTOR START ENABLE”

The “MOTOR START ENABLE” button (Fig. 10) is used with the “PUMP START”, “CUTTER START” and “CONVEYOR START” buttons to start the pump motor.

“CONVEYOR REVERSE JOG”

The “CONVEYOR REVERSE JOG” button (Fig. 10) is used to jog the conveyor in the reverse direction. To jog the conveyor in reverse, press and hold “CONVEYOR REVERSE JOG”. The conveyor will continue to jog in reverse as long as the button is held. Releasing the button will stop the conveyor.

Fig. 17: Left side controls and indicators



System Menu

The system menu (Fig. 23) allows access to different functions of the control system.

Fig. 23: System menu

Using the radio remote:

- ☞ To enter the system menu screen, press the MENU key.
- ☞ To move the cursor, press the CONV LEFT or CONV RIGHT key.
- ☞ To select an option, press the MENU key.
- ☞ To exit or go back, press the TRAM FORWARD key.

Diagnostic mode

Diagnostic mode allows a large number of monitoring screens to be displayed and selected while the machine is operating and includes the following pages:

- Main monitor page
- Production monitor page
- Boom monitor page
- Pump Monitor page
- Scrubber monitor page
- Cutters monitor page
- Gathering head monitor page
- Traction motor monitor page
- I/O monitor pages - three (3) inputs pages
- I/O monitor pages - two (2) outputs pages
- Network monitor page

See Fig. 24 for examples of various diagnostic pages.

Safety precautions for underground operation

In addition to the preceding instructions for operating the continuous miner, observe the following special precautions after the machine is taken underground.

- Communication is a key element in maintaining safety. Exact instructions and warnings should be given to, and thoroughly understood by, each workman. Good communications between the entire crew must be maintained throughout the shift.
- Check the condition of the trailing cable before turning power on at the power source.
- This machine must be maintained following all applicable laws and regulations.
- Make a visual check of the continuous miner before energizing. Look for loose bolts, covers, locking devices, damaged parts, and cracked or broken lenses. Any part of the machine which does not function properly is a hazard. Report it immediately to your immediate supervisor or their designee.
- Prior to operation, make sure the working area is safe. Make a visual inspection of roof and ribs and take all steps necessary to insure safety.

Tramming safety rules

- Communicate your intentions to the workmen affected by the movement of the continuous miner.
- Check the position of the trailing cable to be sure there is sufficient slack to finish the operation.
- Note the condition of the roadways and physical surroundings of the route.
- Position the cutter and gathering head for tramming.
- Position the stabilizer shoe and booms for tramming.
- Position your body completely inside the operator's pit, facing the intended direction of travel.
- Position the continuous miner in the center of the road way to allow maximum safe clearance. Consistently maintain clearance, which is critical to the safe movement of the continuous miner.

Scrubber motor in radio remote

To start the scrubber fan motor

☞ Ensure that the pump motor is running as the scrubber motor will not start if the pump motor is not running.

☞ Press “SHIFT” and wait 1/4 second.

IMPORTANT!
Holding the “SHIFT” button for two (2) seconds or longer will result in a radio switch fault. If this occurs, all buttons must be released and the start re-attempted.

☞ While holding shift, press “FAN/OFF”. The pre-start warning horn will sound. Continue to hold until the scrubber fan motor turns on.

☞ Release the “FAN/OFF” button. The pre-start warning horn will stop.

IMPORTANT!
The “FAN/OFF” button must be released before “SHIFT”. If “SHIFT” is released first, the fan motor will shut off.

☞ Release the “SHIFT” button.

To stop the scrubber fan motor

☞ Press and hold the “FAN/OFF” button. The fan motor will shut-down immediately.

☞ Release the “FAN/OFF” button.

Conveyor operation from the operator's pit

To start the conveyor motors

- ☞ Place conveyor boom in desired position.
- ☞ Warn **ALL CLEAR** before starting the conveyor.

WARNING!
Warn ALL CLEAR before starting the conveyor. Failure to do so may result in serious injury or death.

- ☞ Ensure that the pump motor is running (see Start procedure in this chapter) as the conveyor motors will not start if the pump motor is not running.
- ☞ Press and hold the "MOTOR START ENABLE" button.
- ☞ Press and hold the "CONVEYOR START" button until the conveyor motors turn on and the conveyor starts running in the forward direction.
- ☞ Release the "CONVEYOR START" button.

To stop the conveyor motors - conveyor forward

- ☞ Press and hold the "CONVEYOR STOP" button. The conveyor motors should shutdown immediately.

To start the conveyor motors in reverse (momentary only)

- ☞ Place conveyor boom in desired position.
- ☞ Warn **ALL CLEAR** before starting the conveyor.

WARNING!
Warn ALL CLEAR before starting the conveyor. Failure to do so may result in serious injury or death.

- ☞ Ensure that the pump motor is running (see Starting procedure in this chapter). The conveyor motors will not start if the pump motor is not running.
- ☞ Press and hold the "MOTOR START ENABLE" button.
- ☞ Press and hold the "CONVEYOR REVERSE JOG" button. The conveyor will continue to run in reverse until the "CONVEYOR REVERSE JOG" key is released.

Hydraulic system schematics

Abbreviations and Symbols

Troubleshooting is easier when you can readily read and understand the diagrams and blueprints of a hydraulic network. To do this, you need to know hydraulic symbols.

Graphic symbols denote the type of function a component performs but do not necessarily show its shape or construction. These schematic symbols are used to trace the system flow from the reservoir to the actual work being performed and then back to the reservoir. The symbols used are shown individually with a functional description where needed. The study of these symbols helps in understanding the system and thereby aids in troubleshooting the system.

In a hydraulic schematic, components are represented on a schematic diagram by symbols. Using the hydraulic symbols to trace a circuit will help to define the relationships of the components and circuits. The component symbols are linked together by lines, which represent the hydraulic hoses and pipes on the miner.

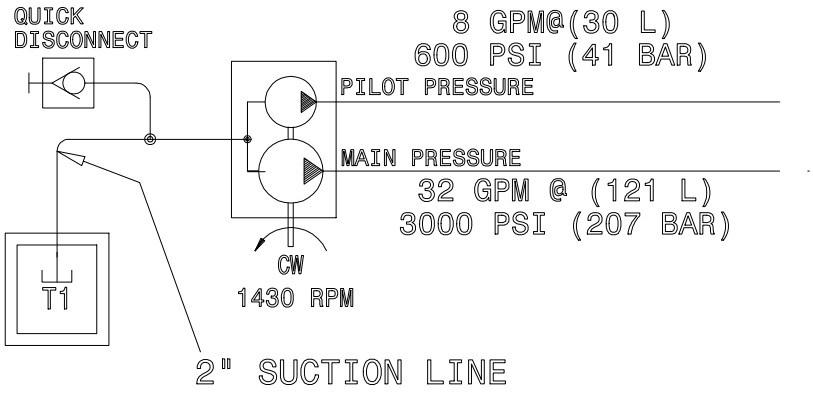
A schematic diagram is an illustration which shows the hydraulic relationship of the various components in the circuits. A schematic diagram does not show the physical location of the components.

IMPORTANT!
Schematics may vary from one unit to the next. Consult the Bucyrus parts manual for the correct schematic for your machine.

Hydraulic pump assembly circuit

Hydraulic power for all of the hydraulically actuated functions originates with the pump assembly (Fig. 46). This pump utilizes two working sections designated as follows: main flow and pilot flow. Oil is supplied from the oil reservoir through a suction line.

Fig. 46: Hydraulic pump circuit

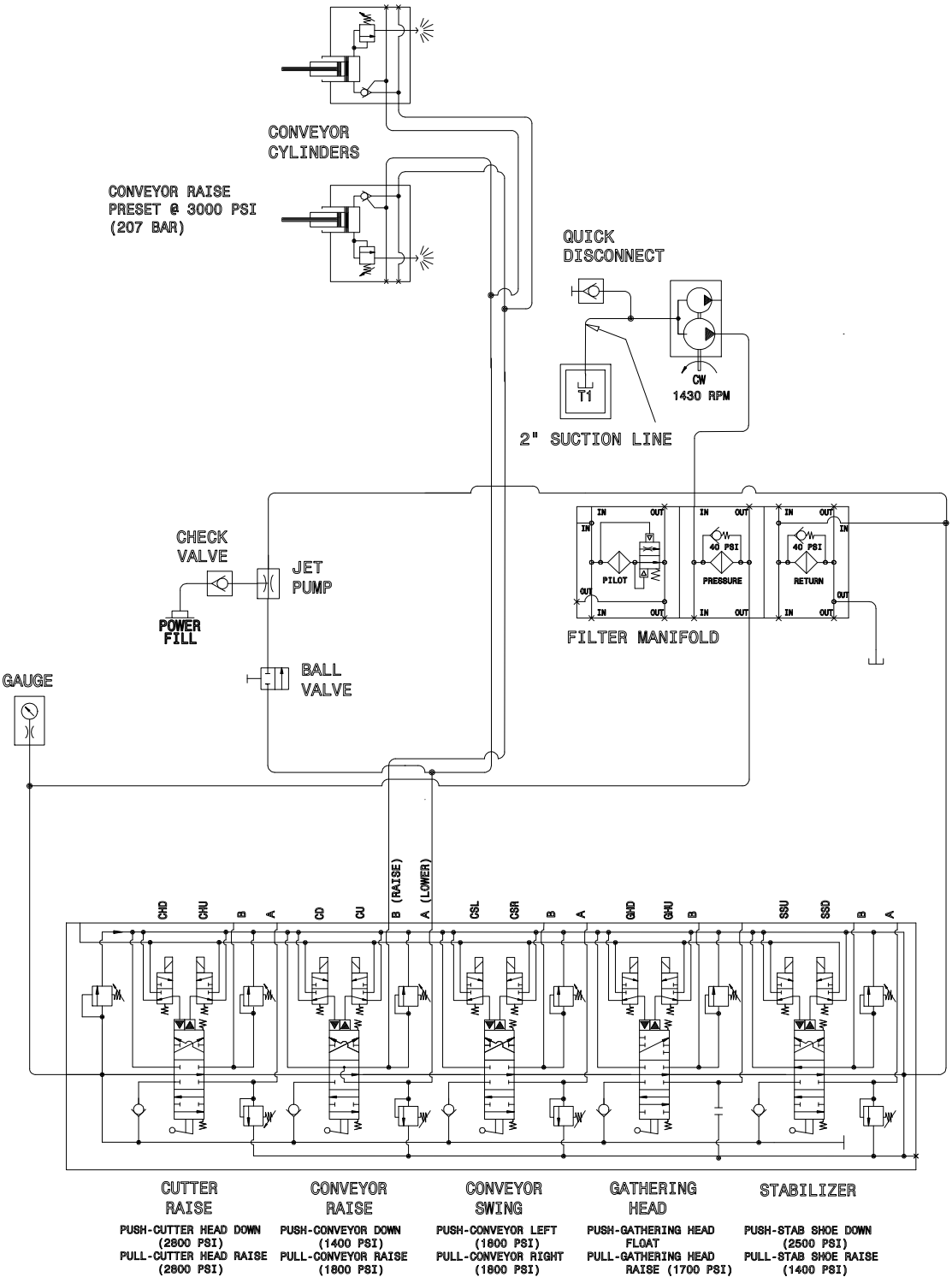


Primary pressure circuit

The primary pressure circuit is powered by the hydraulic pump main pressure. The main pressure section is rated at 32 gpm at a pressure of 3,000 psi (121 Lpm at 207 bar). This open-center circuit supplies oil flow to the Main Control Valve (MCV). The MCV operates the conveyor raise, conveyor swing, stabilizer (stab) shoe, gathering head cylinders, cutter head raise cylinders. From the pump, oil enters a 10 micron by-passing pressure filter and continues to the MCV, whose main relief valve is set at 3,000 psi (207 bar).

For a more detailed description of this circuit, please refer to the individual circuit descriptions later in this section.

Fig. 51: Conveyor raise/lower

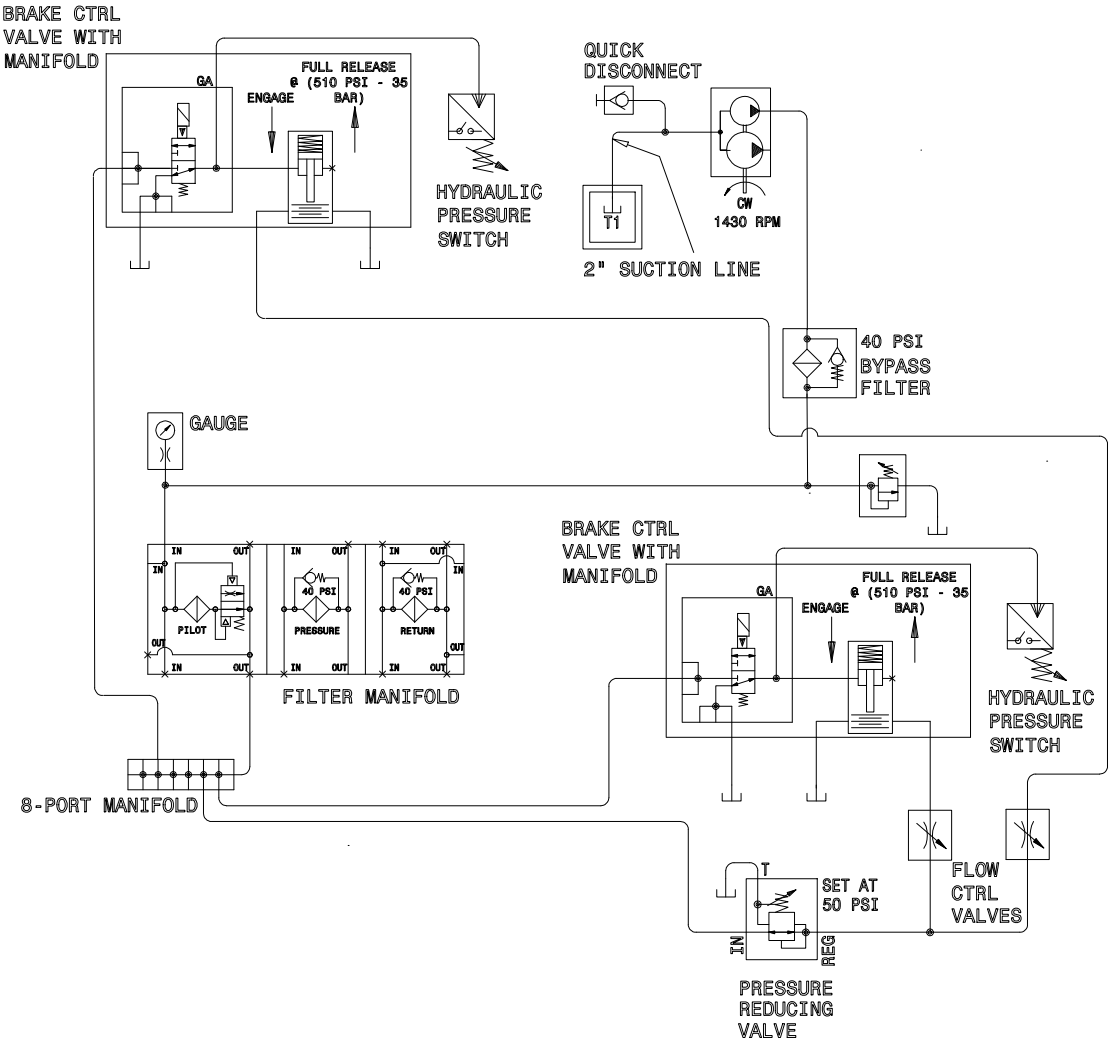


Brake control valve

From the 8-port manifold, pilot oil is supplied to the pressure port of the brake control valve manifold. The brake control valve is a 3 way, 2 position solenoid operated, spring return valve that hydraulically pilots a higher flow 3 way 2 position valve. When the solenoid is de-energized, the brake control pressure is vented to tank which engages the brake. Energizing the solenoid applies pilot pressure to the pistons inside the brake which disengages (releases) the brake. The brake pressure required to fully release the brake is 510 psi (35 bar). A pressure switch is connected to the “GA” port of the brake control valve to monitor the brake pressure. Refer to the electrical section for control details of the pressure switch.

The schematic shown in Fig. 57 is a typical brake circuit. Always refer to the schematic in the Bucyrus parts book for your machine.

Fig. 57: Brake circuit

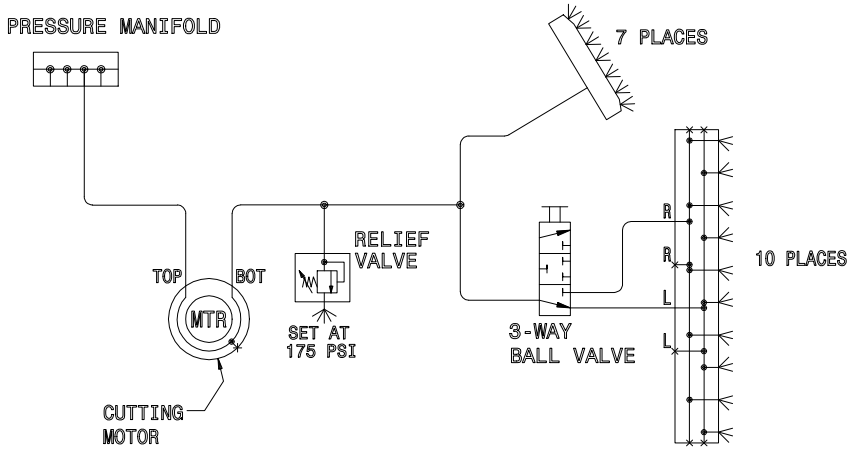


Left hand cutter motor cooling circuit

From the secondary dust-cooling water manifold, water is supplied to the left hand cutter motor cooling circuit (Fig. 63) where it supplies cooling/spray water to the left hand cutter motor and the left hand cutter head sprays. There is a relief valve set at 175 psi between the left hand cutter motor and the dust sprays.

The left hand cutter motor cooling circuit described above and shown in Fig. 63 is typical. The circuit for your machine may vary depending on your dust plan and unique requirements. Always refer to the schematic in the Bucyrus parts book for your machine.

Fig. 59: Left hand cutter motor cooling circuit



Main controller case - rear wall

The rear wall of the main controller case (Fig. 71) is accessed by opening the controller cover and then opening the swing panel. It is typically located on the left side of the machine, midway the tractor frame inside the crawler frame.

IMPORTANT!
This component location information is typical. Always verify component layout with the information in the Bucyrus parts book for your machine.

vacuum contactor "A" Vacuum contactor "A" is the contactor for the left cutter motor.

vacuum contactor "B" Vacuum contactor "B" is the contactor for the right cutter motor.

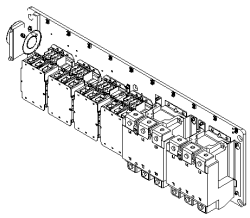
vacuum contactor "CF" Vacuum contactor "CF" is the contactor for the conveyor forward motor.

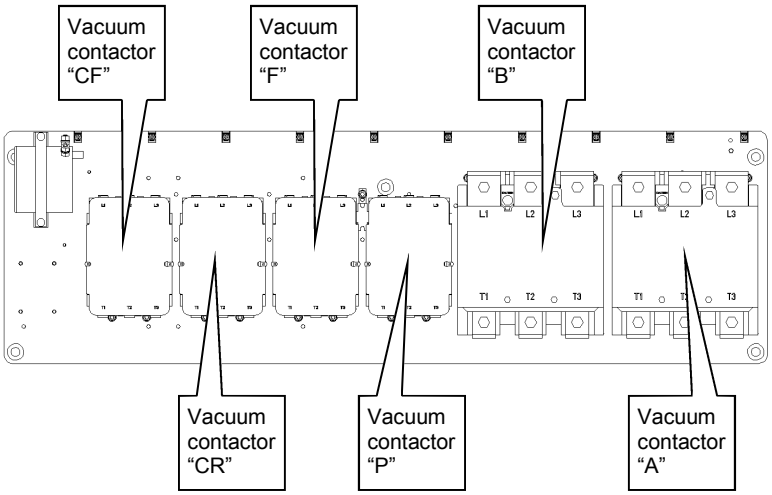
vacuum contactor "CR" Vacuum contactor "CR" is the contactor for the conveyor reverse motor.

vacuum contactor "F" Vacuum contactor "F" is the contactor for the fan motor.

vacuum contactor "P" Vacuum contactor "P" is the contactor for the pump motor.

Fig. 71: Main controller case - rear wall



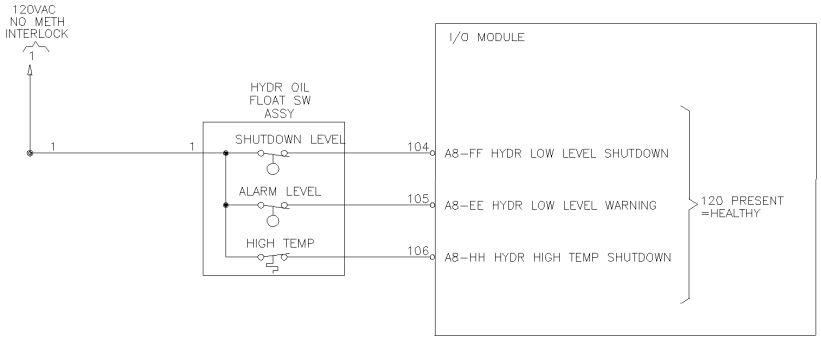


Hydraulic low oil level/high temperature circuit

The hydraulic low oil level/high temperature circuit indicates when the oil level in the hydraulic oil tank is low or when the oil temperature exceeds a preset value. There are two oil level float switches and a temperature switch located within a permissible switch assembly enclosure. When the oil level reaches the first float switch, the switch will open, removing power from the circuit. The control system will then send a low oil warning to the graphics display. When the oil level reaches the second float switch, the switch will open, removing power from the circuit. The control system will then shut down the machine. When the oil temperature exceeds the allowable value programmed into the control system, the switch will open, removing power from the circuit. The control system will then shut down the machine.

The low oil/high oil temperature circuit shown in Fig. 79 is typical for this miner. Always refer to the schematic in the Bucyrus parts book for your machine.

Fig. 79: Hydraulic low oil/high temperature circuit

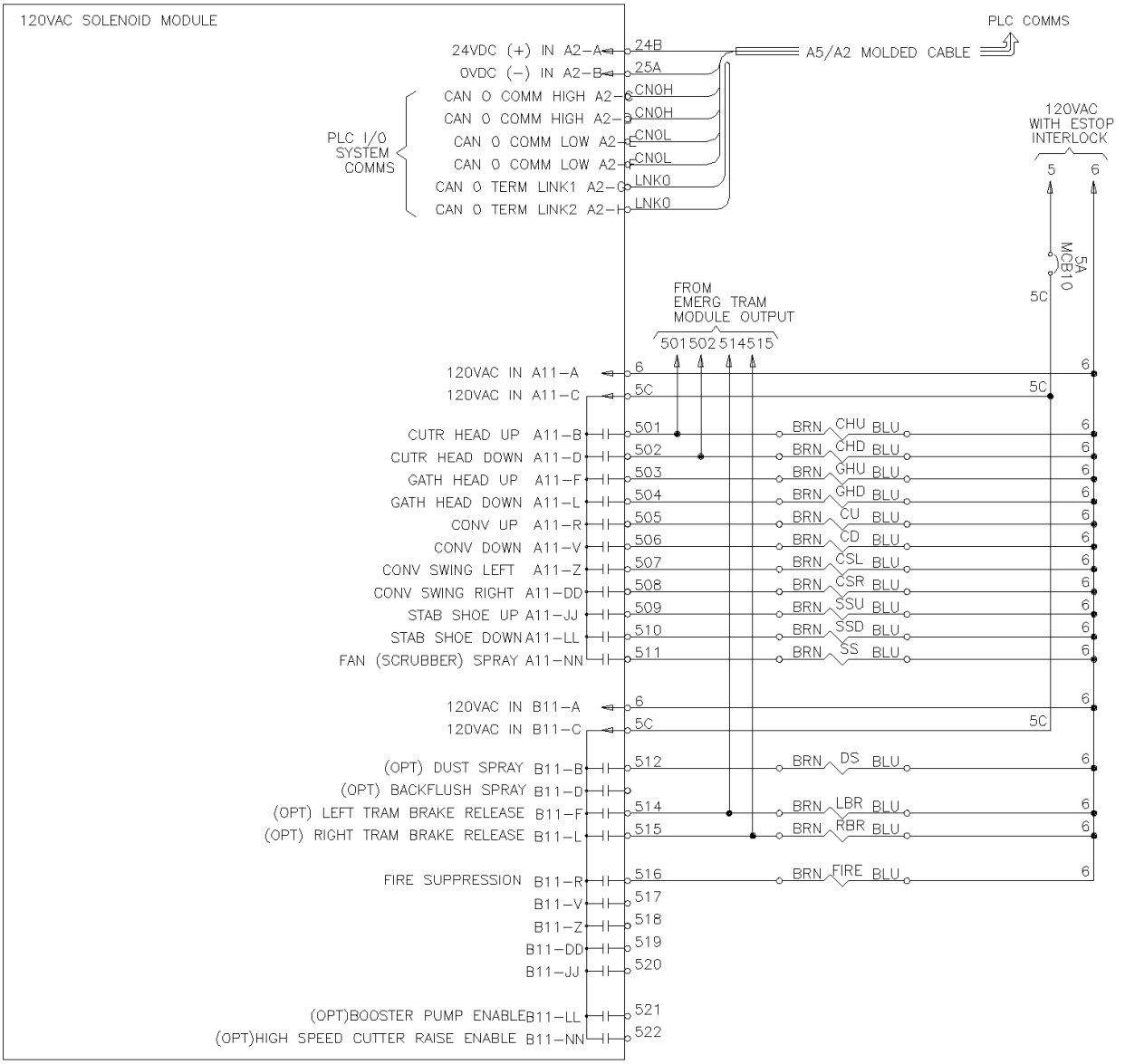


Solenoid control circuit

Solenoids are used to control the hydraulic functions (cylinder movement), brakes, dust sprays, and fire suppression.

The schematic shown in Fig. 88 is typical. Always refer to the schematic in the Bucyrus parts book for your machine.

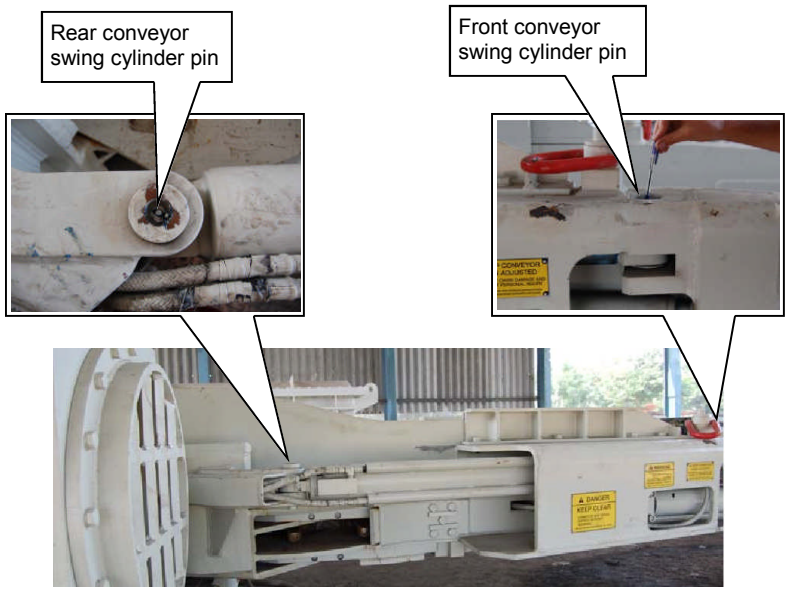
Fig. 88: Solenoid control circuit



conveyor swing cylinder pin (front and rear)

Lubricate the front and rear conveyor swing cylinder pins through the grease fittings located on each end of the cylinder (Fig. 91). Pump approximately 50 cubic cm (3 cubic inches) into each fitting.

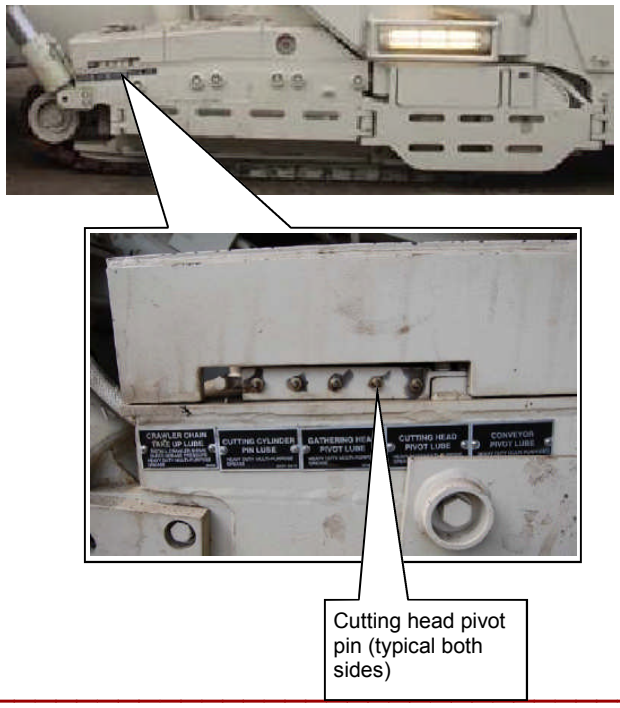
Fig. 91: Conveyor swing cylinder pin lubrication



cutter head pivot pin (left and right)

Lubricate left and right cutter head pivot pins through the grease fittings located on the left and right front lubrication blocks (Fig. 92). Pump approximately 3 cu. in. (50 cu. cm) of grease into each fitting.

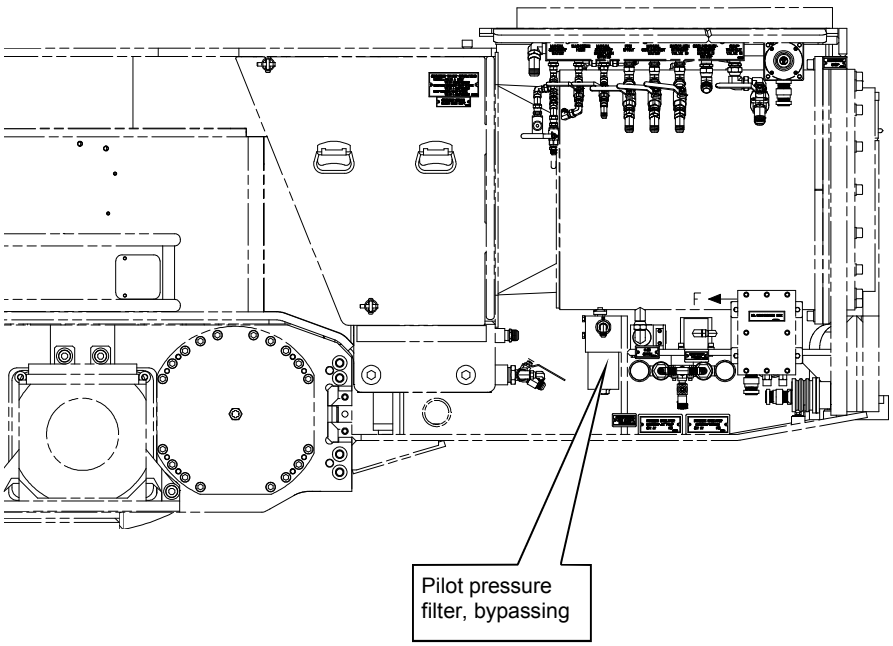
Fig. 92: Cutter head pivot pins (typical both sides)



pilot pressure filter, bypassing

The bypassing pilot pressure filter is located on the left hand side of the machine (Fig. 107). Change the pilot pressure filter element weekly. If the element is extremely dirty, a more frequent change interval may be required.

Fig. 107: Pilot pressure element, bypassing



Every three months

IMPORTANT!
For motor bearings that require high temperature lithium complex grease (Spec. 100-15), Bucyrus provides a special “button” style lubrication fitting (Fig. 108) to prevent the accidental use of multi-purpose lithium complex grease at these locations.

cutter motor bearings

Lubricate the left and right cutter head motor bearings with high temperature lithium complex grease through the two grease fittings located on each side of the cutter head (Fig. 116) using the following procedure:

- ☞ Open the cover (Fig. 110) to access the motor.
- ☞ Inspect the grease fittings on the exit side of the front and rear motor bearing.

  If the exit side motor bearing ports are equipped with spring load relief fittings, then

  - ☞ Lubricate both motor bearings until new grease appears out of the relief ports on the exit side of the bearing.
  - ☞ Operate the motor for five (5) minutes and then inspect for grease leaks in the bearing area.

  If the exit side motor bearing ports are equipped with plugs, then:

  - ☞ Remove the plug and lubricate both motor bearings until new grease appears out of the relief ports on the exit side of the bearing.
  - ☞ Operate the motor for five (5) minutes and then inspect for grease leaks in the bearing area.
  - ☞ Replace the plugs in the ports.

NOTICE!
Incorrect grease or over greasing of the electric motor may cause serious damage to the motor. Follow the greasing procedure outlined above.

IMPORTANT!
Always use the proper tools when adjusting valve cartridges.

IMPORTANT!
Do not start any motors - CLA, cutter head, pump, or traction motors - until all pressures are set. Start the pump motor as directed.

Load holding valve adjustment

The load holding valve is factory preset and should not be field adjusted.

Always refer to your parts manual when ordering load holding valves for the cutter, stabilizer, or conveyor cylinders.

Never rely on the load holding valve as a means of supporting the cutter boom or conveyor boom while making repairs. Always support the cutter boom and conveyor boom with adequate material before working around or underneath the cutter or conveyor.

WARNING!
Never rely on the load holding valve as a means of supporting the cutter or conveyor boom while making repairs. Severe injury or death could result.

The adjustment procedure should start with the pilot pressure circuit because this system is a “closed center” circuit (except for the brake cooling portion) and will build pressure as soon as the pump is started. The cutter head and primary pressure circuits are “open center” circuits and very little pressure is present until a function is activated. The main relief valves on the main control valve (MCV) and cutter head directional control valves, as well as the cooling circuit (heat exchanger) relief valve, should all be adjusted to their lowest settings prior to initial start up and adjustment. Reference circuit descriptions, abbreviations, and terms in the Hydraulic section of this chapter.

Tram track adjustment

☞ 1. Lower the conveyor tail section until it is level with the floor.

☞ 2. Raise the gathering head and cutter head and block both assemblies following standard blocking procedures.

WARNING!
You could be seriously injured or killed by falling loads. Observe the safe working load limits of all blocking devices.

☞ 3. Lower the gathering head and cutter head onto the blocking so that the front end of the miner lifts off the floor.

☞ 4. Extend the stabilizer completely so that the rear end of the miner lifts off the floor.

☞ 5. Securely block under the machine. The machine must be securely supported off the ground with the tram track free to turn.

WARNING!
You could be seriously injured or killed by falling loads. Observe the safe working load of all blocking devices.

☞ 6. Raise the stabilizer, gathering head, and cutter head assemblies so that the weight of the miner rests on the blocking.

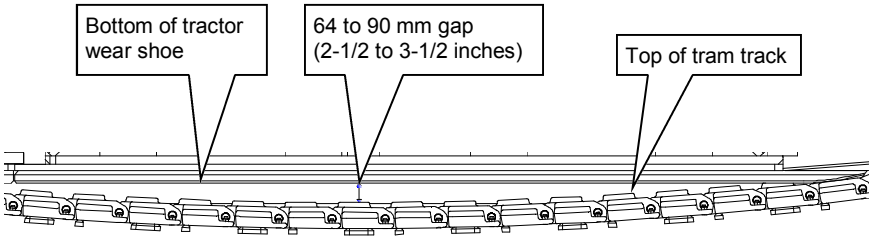
☞ 7. Disconnect the trailing cable to de-energize the miner. Follow all mine lockout/tagout regulations.

WARNING!
Follow all mine lockout/tagout regulations and procedures. Failure to do so could result in machine damage or serious injury or death to personnel.

☞ 8. Double check the tractor frame support blocking now that the weight of the tractor frame is completely upon it.

☞ 9. Evaluate the tram track for proper tension (Fig. 123). The tram track is at the proper tension when it hangs approximately 64 to 89 mm (2-1/2 to 3-1/2 inches) from the bottom wear shoes when the tractor frame is blocked off the floor. Using this evaluation, determine whether step 13, 14, or 15 provides the appropriate sub-procedure to correct improper track tension.

Fig. 123: Tram track adjustment



Cutter head assembly removal and installation

cutter head assembly removal

To remove the cutter head assembly (Fig. 130):

☞ Attach an appropriate lifting device to the boom assembly. Take up the slack in the lifting device so that the weight is supported as the assembly is unpinned from the miner.

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

☞ Lower the gathering head and the cutter head to the floor and position the conveyor tail section level with the floor.

☞ Disconnect and lock out the electrical power to the miner. Follow all applicable regulations regarding lockout/tagout procedures.

WARNING!
Failure to follow all applicable regulations regarding lockout/ tagout procedures may result in machine damage or serious injury or death of personnel.

☞ Disconnect and tag the power cables from the motors. Be sure to tape the power cables as power will be restored to the machine.

☞ Disconnect, tag, and cap the lubrication and hydraulic lines going to the cutting head.

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 under load, the load will fall. Machine damage or serious injury or death to personnel may result.

☞ Remove the two (2) boom pivot pins.

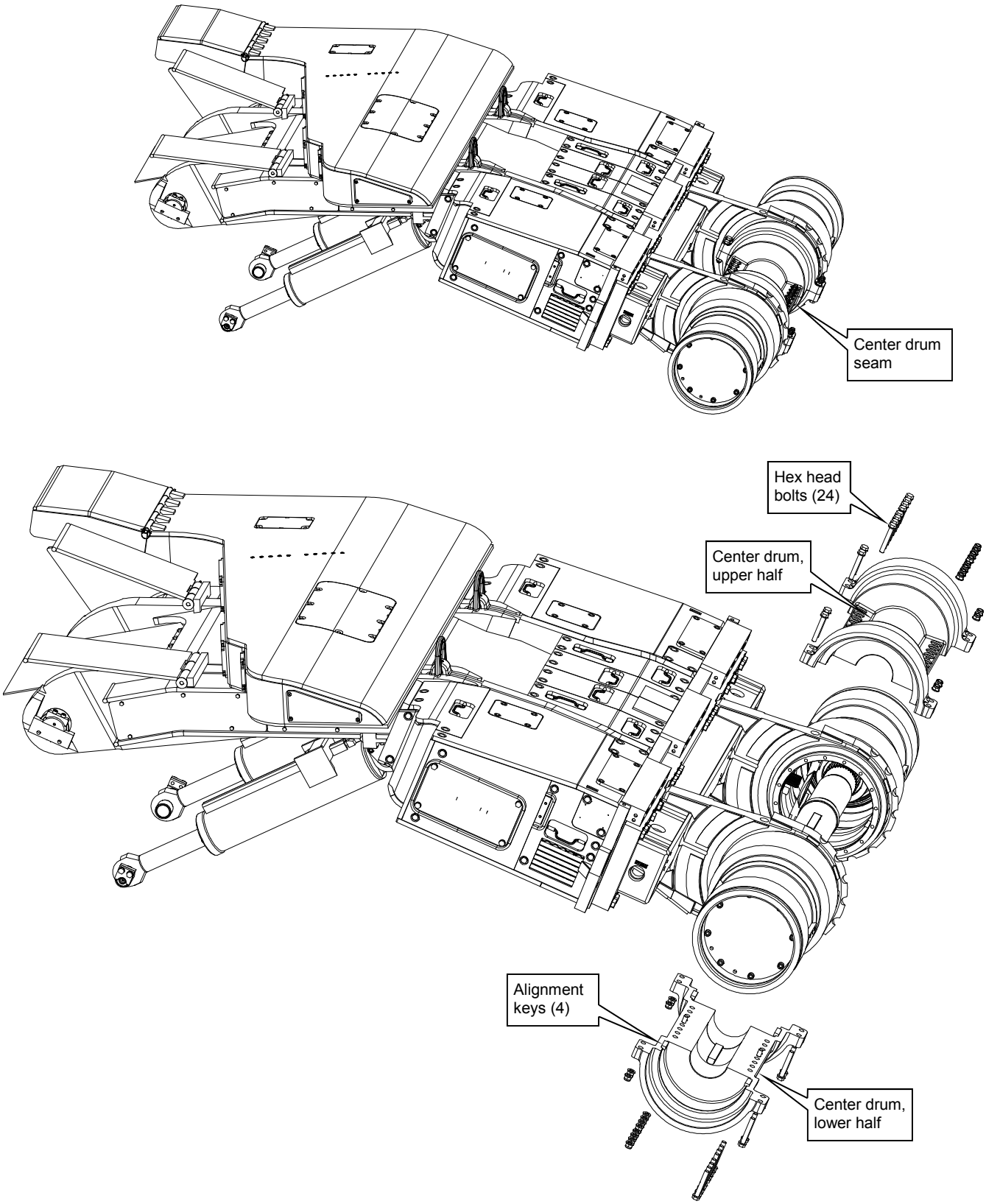
  ☞ Remove the two (2) socket head cap screws from the retaining plate on the right and left pivot pins and remove the retaining plate.

  ☞ On either side, force the main pivot pin inward from the outboard side, using the two (2) tapped jack screw holes, if necessary.

☞ Connect electrical power to the machine.

☞ Extend the shear cylinders to push the boom pivots out of their tractor frame clevises.

Fig. 133: Center drum removal and installation



cutter drum drive gear case removal

The cutter head gear case may be removed with cutter drum installed but it is easier with it removed.

To remove the cutter drum drive gear case (Fig. 138):

☞ Disconnect and lockout the trailing cable. Follow all applicable regulatory lockout/tagout procedures.

WARNING!
Failure to follow all regulatory lockout/tagout procedures may result in machine damage or serious injury or death of personnel.

☞ Remove the cutter head center drum (see Center cutter drum removal procedure in this chapter).

☞ Remove the cutter head end drums (see End drum removal procedure in this chapter).

☞ Ensure that the cutter head assembly is adequately blocked.

☞ Securely block the cutter head gear case so that it will not fall when it is unbolted from the frame.

WARNING!
Observe the safe working load limits of all lifting and blocking devices. You can be seriously injured or killed by falling loads.

IMPORTANT!
During the removal of the cap screws that secure the gear case to the frame, it may be necessary to adjust the blocking under the gear case. Ensure that the gear case is securely blocked at all times and that it does not shift as it is unbolted.

☞ Remove the cover off of the clutch.

☞ Remove the snap ring from the motor shaft and then pull the motor shaft out.

☞ Carefully loosen and remove the forty (40) capscrews that secure the cutter head gear case to the cutter head support frame.

☞ Connect the trailing cable to energize the miner.

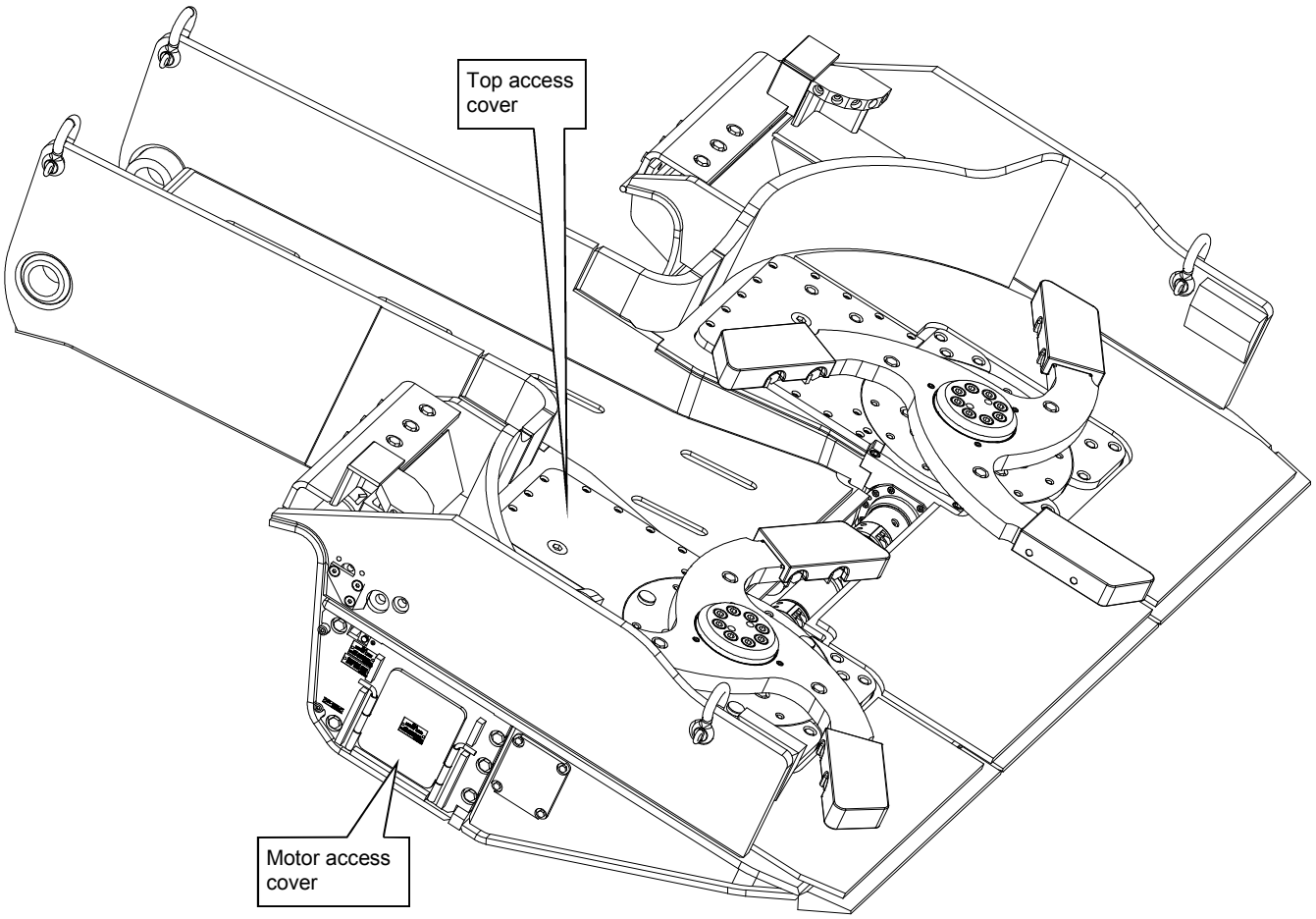
WARNING!
Stand clear of the miner and the gear case while tramming the miner. You could be seriously injured or killed by falling loads.

Do not attempt to start the cutter head motors. You could be seriously injured or killed.

CAUTION!
Use care when tramming the miner away from the gear case. While each cutter motor is supported by a bracket at the rear of the motor, excessive bumping could cause the motor to fall.

☞ Slowly tram the miner away from the gear case.

Fig. 141: Gathering head motor removal and installation



CLA installation

To install a continuous loading arm (CLA) (Fig. 144):

- ☞ Install the three dowel pins into the pot disc.
- ☞ Position the CLA on the gathering head ensuring that CLAs are aligned as shown in Fig. 143.
- ☞ Insert the three capscrews into the arms and tighten.
- ☞ Insert the retainer cap into the center of the arm.
- ☞ Apply Loctite 262 to the eight (8) socket head capscrews and install the capscrews into the retainer plate. Torque incrementally and evenly in a crossing pattern to 734 lb-ft (995 Nm) as follows:

  Step 1: Snug
  Step 2: 245 ft-lb (332 Nm)
  Step 3: 500 ft-lb (678 Nm)
  Step 4: 734 ft-lb (995 Nm)

- ☞ Reconnect the trailing cable.

CLA tip replacement

CLA tip replacement

To replace a CLA tip (Fig. 144):

- ☞ Lower the gathering head assembly until it touches the floor.
- ☞ Raise the cutter head assembly to its highest position and block.

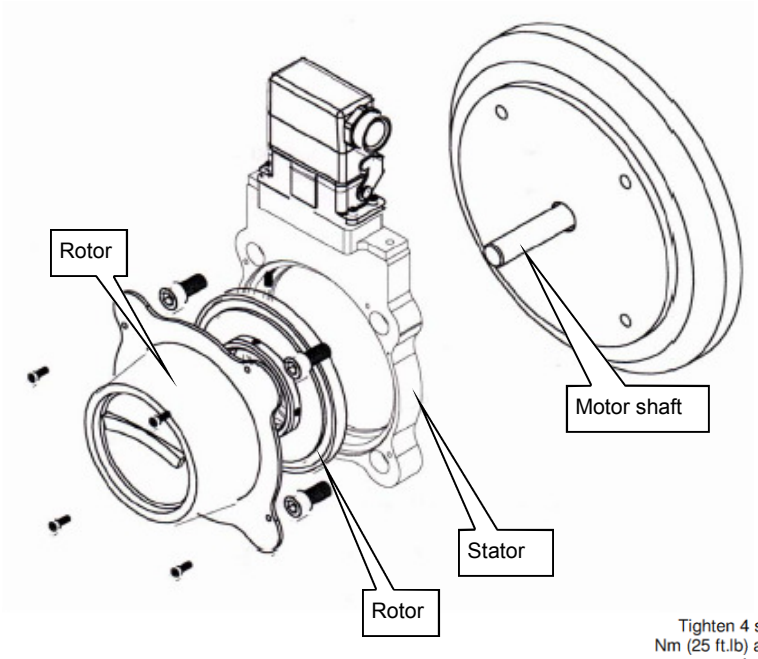
WARNING!
Observe the safe work load limits of all blocking devices. You can be seriously injured or killed by falling loads.

- ☞ Disconnect and lock out the electrical power to the miner. Follow all applicable regulations regarding lockout/tagout procedures.

WARNING!
Failure to follow all applicable regulations regarding lockout/ tagout procedures may result in machine damage or serious injury or death of personnel.

- ☞ Grind off the weld which secures the two (2) keeper plates and save the plates for reassembly.
- ☞ Remove the two (2) hex head capscrews that secure the tip to the arm and remove the tip.
- ☞ Slide a new tip onto the arm and secure with two (2) hex head capscrews.
- ☞ Weld the two (2) keeper plates to secure the two (2) hex head capscrews.
- ☞ Reconnect the trailing cable.

Fig. 149: Motor encoder



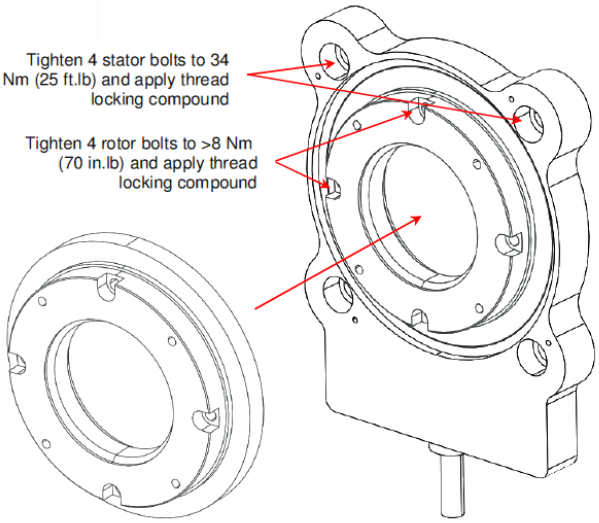


Fig. 150: Encoder rotor and stator alignment

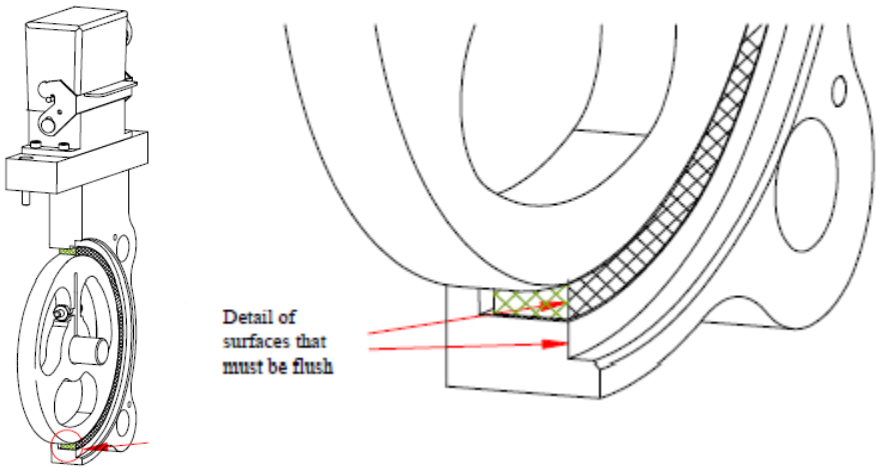
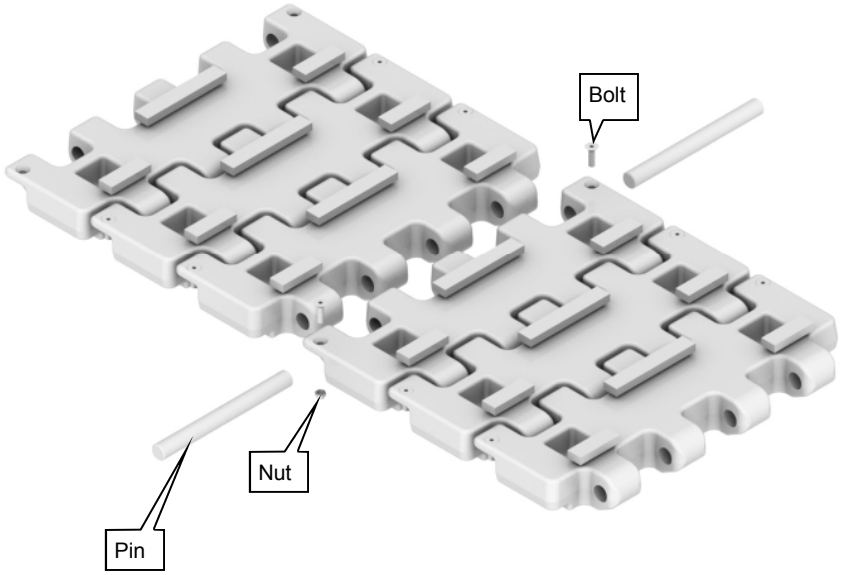


Fig. 152: Crawler chain removal and installation



Conveyor assembly

The conveyor assembly (Fig. 160) can be raised and lowered with hydraulic cylinders. The assembly is attached to the main frame at a pair of raised pivots. The discharge section of the conveyor has a double clevis swing pivot and can swing 45° to the left or right.

Fig. 160: Conveyor assembly

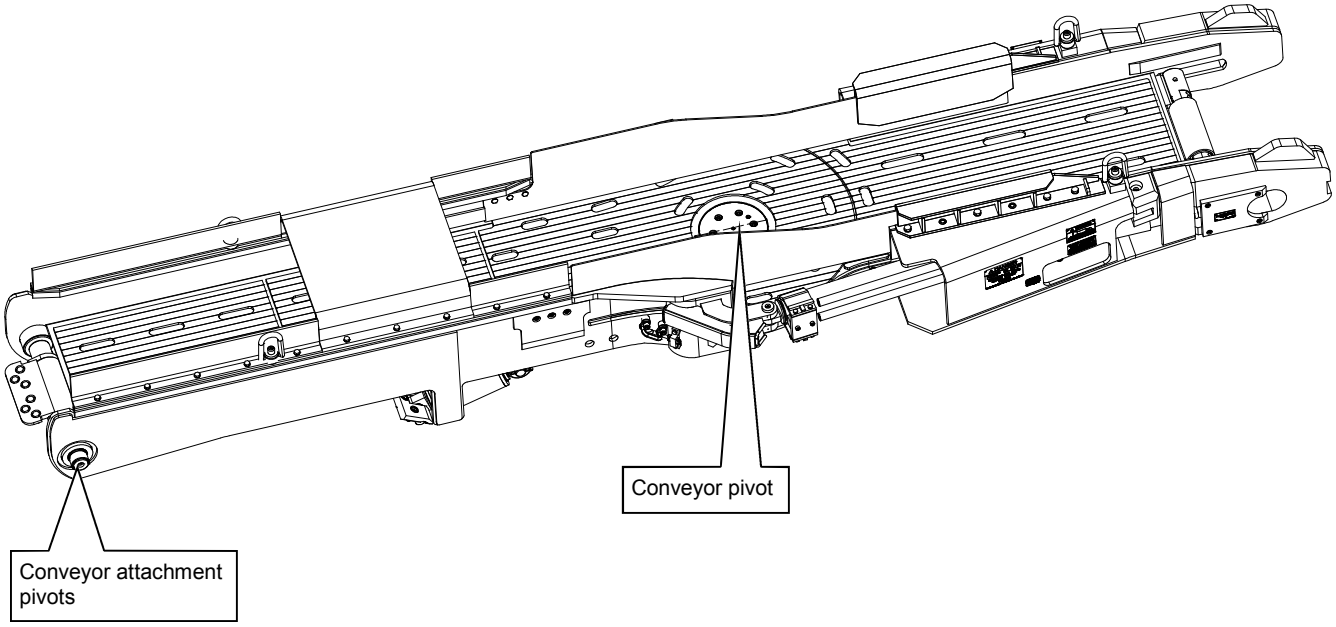
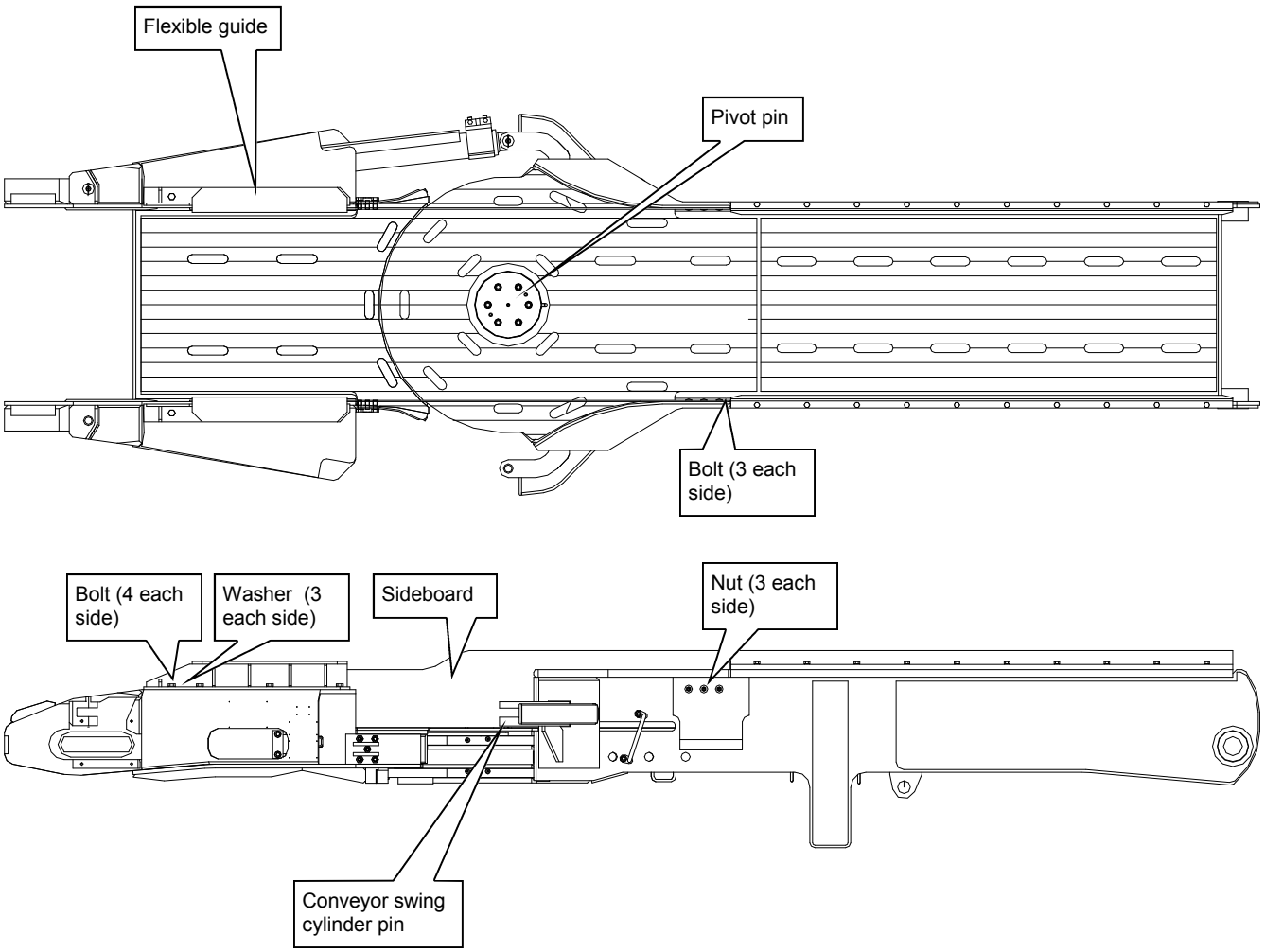


Fig. 164: Discharge conveyor removal and installation



Individual hydraulic circuit failures

Perform the following checks on the individual circuits in conjunction with the general troubleshooting:

Cutter head raise

- ☞ Check pilot supply pressure at remote control valves.
- ☞ Check pilot pressure at the Raise pilot cylinder on the cutter head directional control valve when the remote control valve is in the Raise position.
- ☞ Check the directional control valve for proper operation.
- ☞ Check to see that piping has not been crossed, especially if the problem occurs after maintenance or repair work.
- ☞ Check that the "in-line" counterbalance holding valve is piloted and shifting to direct retract port cylinder oil flow back to tank.
- ☞ Check to see that there is no mechanical bind.
- ☞ Check cylinders for bypassing.
- ☞ Check for pilot pressure on the cutter head cylinder's holding valves. Also check that the valves are shifting to send oil back to the tank. (Note: cylinder removal will be required to safely achieve this)

Cutter head lower

- ☞ Check pilot supply pressure at remote control valves.
- ☞ Check pilot pressure at the Lower pilot cylinder on the cutter head directional control valve when the remote control valve is in the Lower position.
- ☞ Check the direction control valve for proper operation.
- ☞ Check to see that piping has not been crossed, especially if the problem occurs after maintenance or repair work.
- ☞ Check to see that there is no mechanical bind or hydraulic block.
- ☞ Check flow control valve cartridge.
- ☞ Check cylinders for bypassing.
- ☞ Check for pilot pressure on the cutter head cylinder's holding valves. Also check that the valves are shifting to send (extend port) oil back to the tank. Note: cylinder removal will be required to safely achieve this.

Bearings

Table 11: Bearing troubleshooting

Trouble, symptom or cause	Probable cause	Test, check and/or remedy
overheating bearing	☞ Wrong type of grease or oil.	☞ Consult the lubrication chart for the proper lubricant.
	☞ Low oil level; loss of lubricant through seal; excessive grease.	☞ Oil level should normally be at the center of lowest ball or roller in bearing; check seals for signs of leaking.
	☞ Insufficient clearance in bearing.	☞ Replacement bearing should be identical to original equipment to ensure proper internal clearance.
	☞ Housing bore out of round; housing warped; excessive distortion of housing; undersized housing bore.	☞ Check and scrape housing bore to relieve pinching of bearing; be sure pedestal surface is flat and shims cover entire area of pillow block base when applicable.
	☞ Shaft out of line.	☞ Correct alignment and be sure shafts are coupled in a straight line.
noisy bearing	☞ Insufficient clearance in bearing.	☞ Replacement bearing should be identical to original equipment to ensure proper internal clearance.
	☞ Foreign matter acting as abrasive.	☞ Clean bearing housing and replace worn seals.
	☞ Housing bore out of round; housing warped; excessive distortion of housing; undersized housing bore.	☞ Check and scrape housing bore to relieve pinching of bearing; be sure pedestal surface is flat and shims cover entire area of pillow block base when applicable.
	☞ Shaft and other parts of bearing assembly distorted.	☞ Replace bearing, shaft and other parts as needed.
vibrating bearing	☞ Enlarged housing bore causing spinning of outer ring in housing.	☞ Re-bore housing and press steel bushing in bore, then machine bore to correct size.
	☞ Foreign matter acting as abrasive.	☞ Clean bearing housing and replace worn seals.
	☞ Unbalanced loading	☞ Check balance of rotating parts and rebalance as needed.
unsatisfactory performance	☞ Chip in bearing housing; insufficient clearance in bearing; Ball or roller dented from extreme loading.	☞ Replace with OEM bearing; do not hammer on any part of bearing; clean housing and use fresh lube.

Approved suppliers:

Table 14: Anti-wear hydraulic oil (Spec 100-1)

	Supplier	Brand name
1	Amoco Oil Company	Amoco AW Oil No. 68
2	Gulf Oil	Harmony 68 AW
3	Mobil Oil Corporation	Mobil DTE-16
4	Chevron U.S.A.	Chevron hydraulic Oil Aw ISO 68
5	Sun Oil Company	Sunvis 868
6	Unocal 76	Unax AW 68
7	Shell Oil Company	Shell Hydraulic Oil #33
8	Century Lubricating Oils, Inc.	Hydraulic AW 68
9	Atlantic Richfield Company	Duro AW S-315 Oil
10	Texaco Lubricants Company	Texaco Rando Oil HD 68
11	Exxon	Nuto 68
12	Pennzoil	Pennzbell AW 68 Hydraulic Oil
13	Standard Oil Company Standard Oil Co. of Ohio Boron Oil Company BP Oil Inc.	 Industron 54 Industron 53 Energol HLP-C68
14	Lubricating Engineers	6120 Monolec Hydraulic Oil
15	Conoco Inc.	Super Hydraulic oil 68
16	Hydrotex	Systems 5K 68
17	Phillips	Maginus A Oils 81350
18	Miners Oil	Hydraulic Oil 68AW

Table 15: Extreme pressure gear oils (Spec. 100-2)

	Supplier	Brand name
1	Amoco Oil Company	Amoco Permagear EP 460
2	Gulf oil	EP Lubricant HD 460
3	Mobil Oil Corporation	Mobil Gear 634 Mobil Gear 636
4	Chevron U.S.A.	Chevron Gear Compound EP ISO 460
5	Sun Oil Company	Sunep 460
6	Unocal 76	Extra Duty NL Gear Lube 7 EP Extra Duty NL Gear Lube 8 EP
7	Shell Oil company	Shell Omala 680
8	Century Lubricating Oils, Inc.	Hulbest EP-7 Powergear 460
9	Texaco Lubricants Company	Meropa 680
10	Exxon	Spartan EP 460
11	Pennzoil	Super Maxol EP 460 Gear Lube Super Maxol EP 460 Gear Lube
12	Lubricating Engineers	608 Almosal Vari-Purpose Gear Lubricant
13	Conoco Inc.	Gear oil 460
14	Hydrotex	933 Industrial Gear Lubricant
15	Phillips	All Purpose Gear Oil 85W-90 5EP
16	Miners Oil	Gear Oil EP460