BI016912-04 (EN-US)
November 2014

Operation and Maintenance Manual

CM210 Continuous Miner

Serial Numbers GEA00779, GEA00787

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.

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 compartment (optional) from outside the compartment.

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.

operator's compartment (optional)

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

Never climb onto, or climb out of the machine while it is in motion.

Do not operate the machine with any part of your body outside of the operator's compartment in order to prevent body parts from being crushed between the machine and outside objects .

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, it 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.

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
Complete Machine	105,000 lbs.
Tractor Frame Assembly	43,000 lbs.
Gathering Head Assembly	18,000 lbs.
Conveyor Assembly	12,000 lbs.
Cutter Head Assembly	32,000 lbs.

removal and installation of heavy components

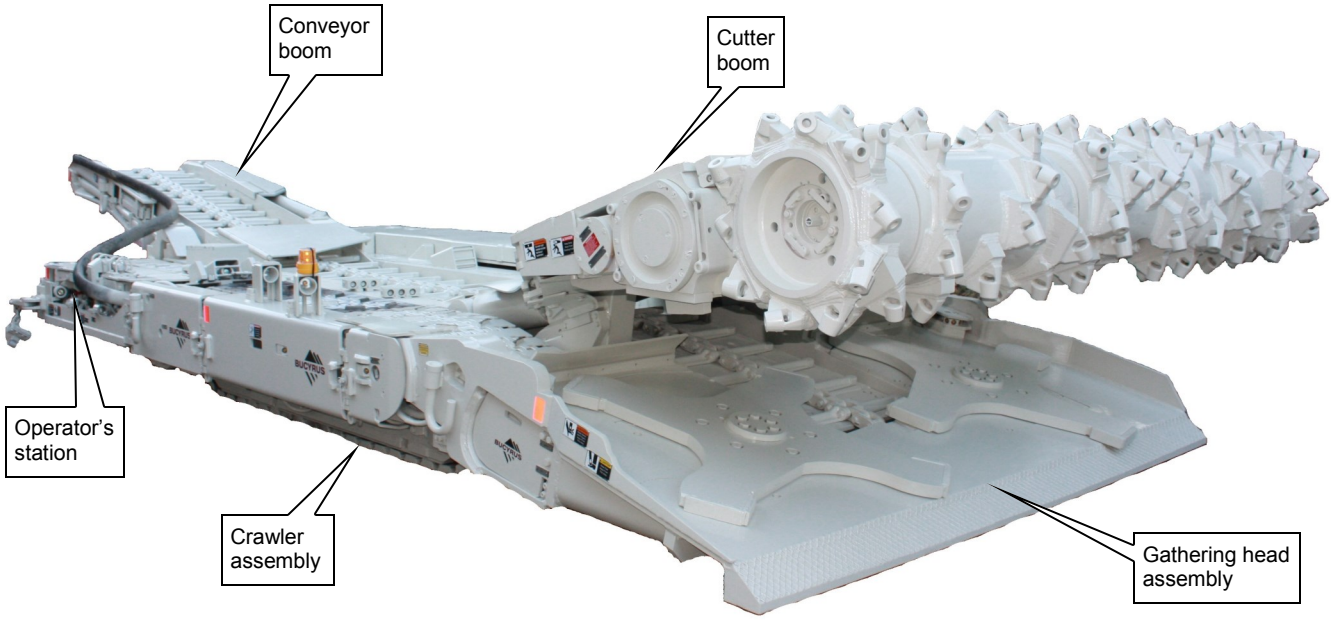
Whenever possible, all removals should be accomplished using an adjustable lifting beam. All supporting members (chains and cables) should be parallel to each other and as nearly perpendicular as possible to the top of the object being lifted.

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.

Fig. 7: Overview of the Continuous Miner



Electrical metering package (optional)

The optional electrical metering package (Fig. 12) consists of a group of meters that monitor current draw on the motors, machine voltage, and cutter and conveyor hours of operation.

"LEFT CUTTER MOTOR" and "RIGHT CUTTER MOTOR"

The "LEFT CUTTER MOTOR" and "RIGHT CUTTER MOTOR" ammeters monitor the current draw by the cutter motors. During normal operation, the two meters should indicate approximately the same current draw. If one meter consistently reads higher than the other meter, shutdown the machine (see Shutdown procedure in this chapter) and contact Maintenance.

"LEFT CONVEYOR MOTOR" and "RIGHT CONVEYOR MOTOR"

The "LEFT CONVEYOR MOTOR" and "RIGHT CONVEYOR MOTOR" ammeters monitor the current draw by the conveyor motors. During normal operation, the two meters should indicate approximately the same current draw. If one meter consistently reads higher than the other meter, shutdown the machine (see Shutdown procedure in this chapter) and contact Maintenance.

"MACHINE VOLTAGE"

The "MACHINE VOLTAGE" voltmeter indicates the control circuit voltage. During normal operation, the indicator should stay between 855 and 1,045 volts (950V ± 10%). Should the meter indicate high or low voltage, shutdown the machine (see Shutdown procedure in this chapter) and contact Maintenance.

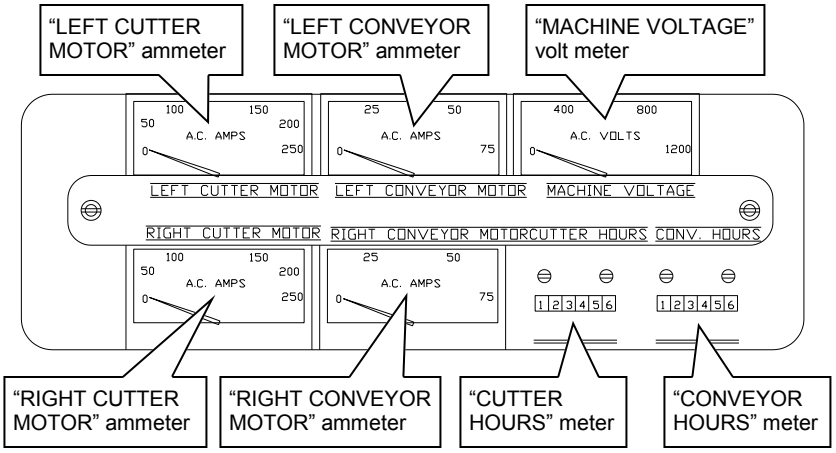
"CUTTER HOURS"

The "CUTTER HOURS" meter indicates the hours of running time for the cutter head motors.

"CONVEYOR HOURS"

The "CONVEYOR HOURS" meter indicates the hours of running time for the conveyor motors.

Fig. 12: Electrical metering package (optional)



Machine control system

A multi-component system is used to control and monitor the functions of the machine. This system consists of the following main components:

- Machine controller
- Power supply
- Input/Output (I/O) modules
- Radio remote
- Graphics display

The following information is presented as a general guide to the capabilities and functions of the control system. Before attempting to operate, service, or troubleshoot the continuous miner, training must be completed.

machine controller

The machine controller is the main control unit of the system. It includes the radio data receiver which is used to receive and decode commands from the radio remote.

power supply

The control system has its own power supply, with the option of having battery backup for the power supply, which provides power to the machine controller and I/O modules.

input/output modules

Input/Output modules are used to read data from and/or send commands to the following machine functions:

- Cutter motors (left and right)
- Gathering head motors (left and right)
- Traction motors (left and right)
- Pump motor
- Hydraulic oil level
- Methane monitoring

Based on the parameter settings and the input received from different components, the control systems has the ability to issue error messages, fault messages, and/or shutdown the machine.

Fault log

The fault log (Fig. 22) allows the user to view the last 100 faults that have occurred since the log was last cleared.

To navigate the fault log page:

- ☞ Press the CONV UP or CONV DOWN key to move the cursor up or down the page.
- ☞ Press SHIFT and CONV UP or CONV DOWN move up or down one page.

It is possible to clear the fault log under the Engineering Setup Menu, which is password protected.

IMPORTANT!
It is not recommended that the fault log be cleared unless the machine controller has been replaced. Retaining the faults is very helpful in troubleshooting a problem when a controller is sent for service. Faults cannot be retrieved once they have been cleared. Use caution and only clear the log if it is absolutely necessary.

Once a fault has been selected, the SHIFT and MENU keys can be used to access more information on the fault (Fig. 23).

Fig 22: Fault log, example

Graphics display

Starting procedure

WARNING!
Failure to read and understand all operating instructions before starting the Continuous Miner could result in serious injury or death to the operator or persons around the machine or cause damage to the machine.

WARNING!
Read all instructions carefully before attempting to start or operate machine.

WARNING!
Understand the functions of all controls before starting the Continuous Miner. Read and follow the instructions on all warning tags on the machine, observe all regulations and safety precautions .

WARNING!
Never operate a Continuous Miner which has been damaged or is not operating properly. Any part of the Continuous Miner which does not function properly can be a hazard. Report it immediately to your supervisor or their designee.

WARNING!
Before starting the Continuous Miner, make sure that no one is in the red zone (Fig. 30 through Fig. 34).

NOTICE!
In extremely cold weather, allow motors and gear cases to idle. This will warm the hydraulic oils and lubricants. Still oils and greases could immobilize the machine.

IMPORTANT!
A pump “growl” means not enough oil is reaching the pumps through the suction lines. Ensure the pump gets primed before continuing operation. Always check the oil level.

DANGER!
Improper position could result in injury or death to the operator by crushing him against the rib or roof supports. It may also cause him to run over the trailing cable or dislodge the roof supports.

WARNING!
Turning on the water sprays prior to cutting prevents the accumulation of dust and the generation of excessive heat which could cause an ignition or explosion.

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

Breaker “ON”/”OFF” in radio remote

The control system allows the main circuit breaker on the miner to be turned on and off using the radio remote control console. This normally requires that a battery backup version of the power supply be installed on the machine.

To turn the breaker off:

☞ Press and hold the “SHIFT” and “C.B. OFF” keys together for two (2) seconds. After two (2) seconds, the breaker off solenoid will energize, turning off the machine circuit breaker.

To turn the breaker on:

It is essential that a battery backup version of the control system power supply be installed for this function to be available. Typically, a hydraulic valve provides the mechanical force for the breaker mechanism. To allow this valve to be operated after loss of power, a hydraulic accumulator is charged by the pump motor during normal “powered” operation of the machine. If the hydraulic accumulator is discharged, then it will not be possible for the breaker to be turned on from the remote.

☞ Press and hold the “SHIFT” and “C.B. ON” keys together for two (2) seconds. After two (2) seconds, the breaker on solenoid will energize, turning on the machine circuit breaker.

IMPORTANT!
The backup accumulator must maintain a minimum pressure of 500 psi for 12 minutes after the pump has been de-energized.

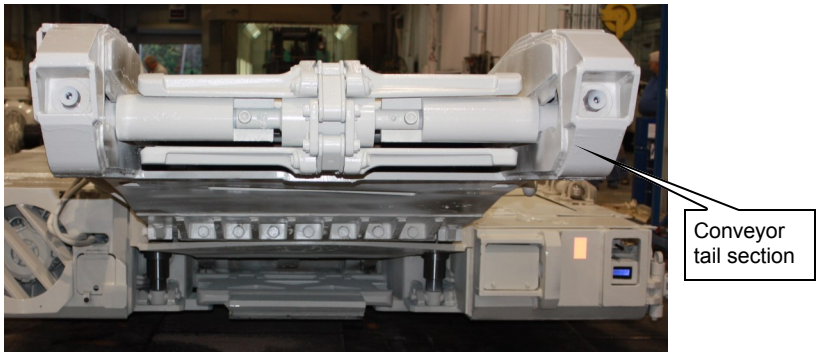
Conveyor tail section

The conveyor tail section (Fig. 44) pivots and has the ability to be raised and/or lowered. The conveyor pivots on the main frame behind and just below the cutter head pivot. Two single acting hydraulic cylinders permit the operator to raise the conveyor discharge end to a maximum height and clearance varying per machine or to lower the discharge end of the conveyor to a specific ground clearance.

A double-acting hydraulic cylinder on the right side of the conveyor permits the discharge end to swing 45 degrees left or right of the conveyor centerline. The range in height and swing of the conveyor with an overhang permits the conveyor to accommodate any haulage vehicle.

Two AC electric motors drive through the gathering head gear cases to a foot shaft sprocket to propel the conveyor chain.

Fig. 44: Conveyor tail section



Gathering head and Continuous loading arms (CLAs)

The gathering head (Fig. 45) loads the material that is mined by the cutter head assembly onto the conveyor for transport to the rear of the machine. The gathering head assembly consists of a gathering pan and two continuous loading arms (CLAs), each driven by a bevel gear case (or pot). Each CLA has 3 to 6 fingers, or blade fan-type rotating assemblies. The CLA's are driven by rotary drive shafts in their respective gear cases. The CLA's gather and force the cut material into the conveyor throat and onto the moving flights.

The AC motors that drive both the conveyor and the gathering head are located on each end of the gathering head assembly. Through each motor lies a specially-constructed torque shaft that extends across the rear of the gathering head frame into a heavy duty input gear case on that side driving the bevel gear input shaft to it.

The input gear cases contain bevel and helical gears that drive each main gear case (pot). These in turn drive the CLAs and the foot shaft at the base of the conveyor. The foot shaft extends across the gathering pan from the right gear case to the left gear case and has a sturdy 4 or 5 tooth sprocket at its center to drive the conveyor chain.

accumulator A bladder accumulator (Fig. 53) is essentially a fluid pressure storage chamber in which the potential energy of a fluid under pressure can be stored against a compressible force of a gas to do useful work. This stored fluid is readily available to perform a given task when called upon by the requirements of the system in which it is used.

breather A breather (Fig. 53) permits air to move in and out of the oil tank reservoir to maintain atmospheric pressure.

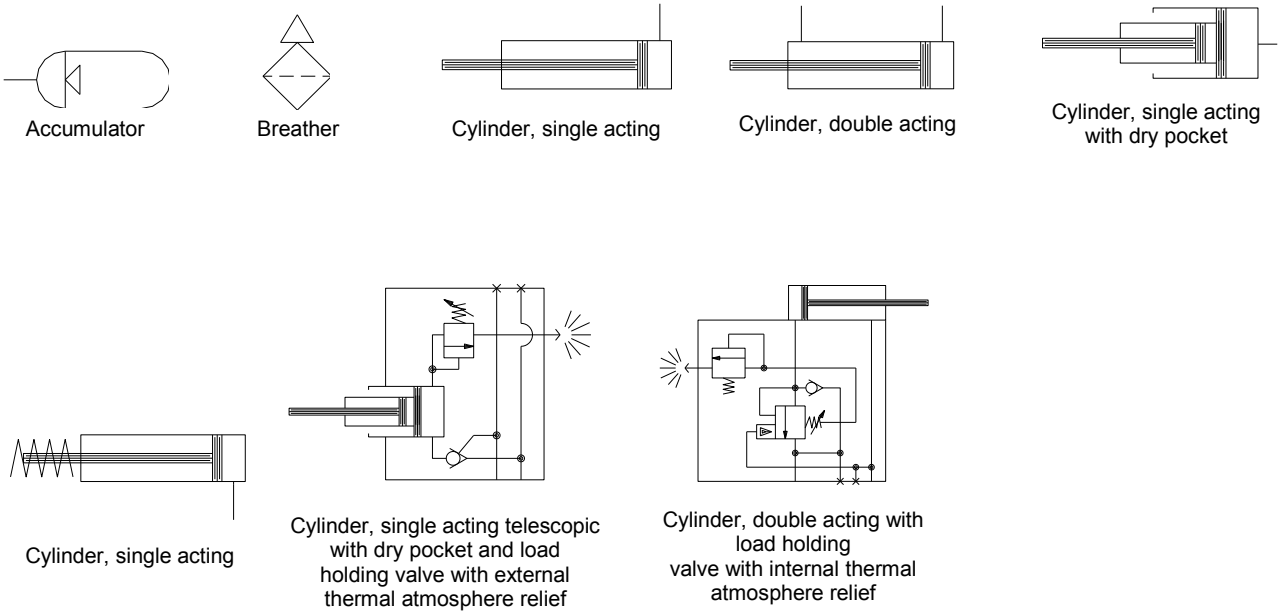
cylinders Cylinders (Fig. 53) are bored and honed steel tubes enclosing a piston connected to a rod that extends out the end of the cylinder. Working surfaces are ground and finely finished with the seals and gaskets incorporated to prevent leakage. Fig. 50 illustrates the location of the hydraulic cylinders on the miner.

A cylinder with pressure applied in only one direction is a single-acting cylinder (e.g. some elevation functions; the weight of the unit maintains pressure on the return). A double-acting cylinder receives input pressure on each side of the piston alternately.

There are four single-acting cylinders on the miner: the conveyor lift cylinders (2) and the gathering head raise cylinders (2). Optionally, there may be conveyor chain take-up cylinders (2), which are also single acting.

There are normally five different double-acting cylinders on a miner: the cutter head raise cylinders (2), the conveyor swing cylinder, and the stabilizer shoe cylinders (2). There is also an optional second conveyor swing cylinder for attaching haulage.

Fig. 53: Accumulator and cylinder hydraulic symbols

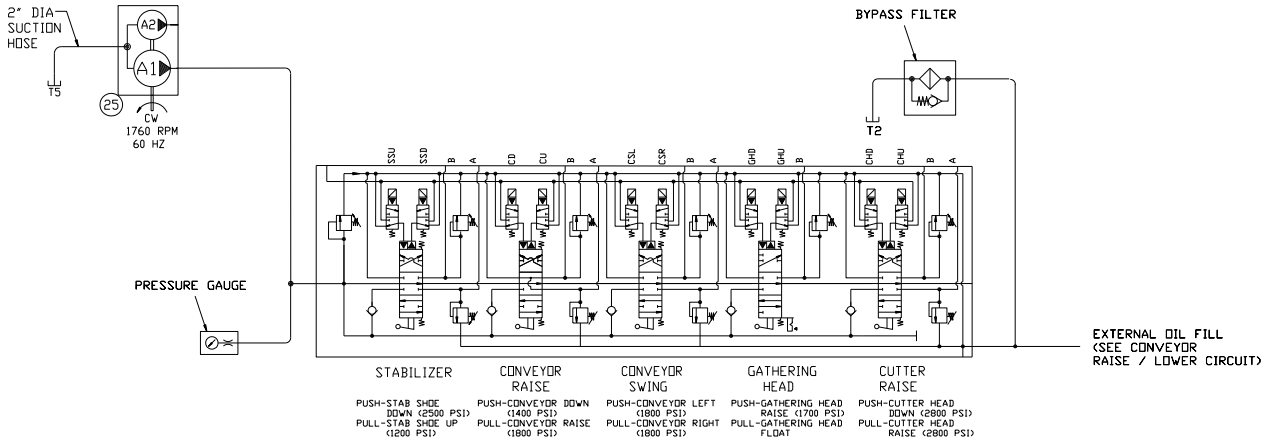


Main flow - primary pressure circuit

The main flow-primary pressure circuit (Fig. 59) is powered by hydraulic pump gear section A1. The A1 gear section is rated at 17gpm at a pressure of 3,000 psi. The system is an open-center circuit and it supplies oil flow to the main control valve. The main control valve operates the cutter head, conveyor raise and swing, gathering head, and stabilizer shoe cylinders along with oil tank fill. After passing through the pump gear section A1, oil enters the main control valve whose relief is set at 3,000 psi. On the return side of the system, oil exits the main control valve. There is a tee to allow external filling of the reservoir (see conveyor raise/lower circuit). Oil enters a 10 micron by-passing return filter before entering the oil reservoir. Once in the reservoir, the oil is forced to flow through and around baffle plates for cooling and de-aerating before re-entering the suction line. Also, located in the reservoir are floor magnets which will trap ferrous metal particles.

The schematic shown in Fig. 59 is a typical primary pressure circuit. Always refer to the schematic in your parts book for your machine.

Fig. 59: Main flow-primary pressure circuit



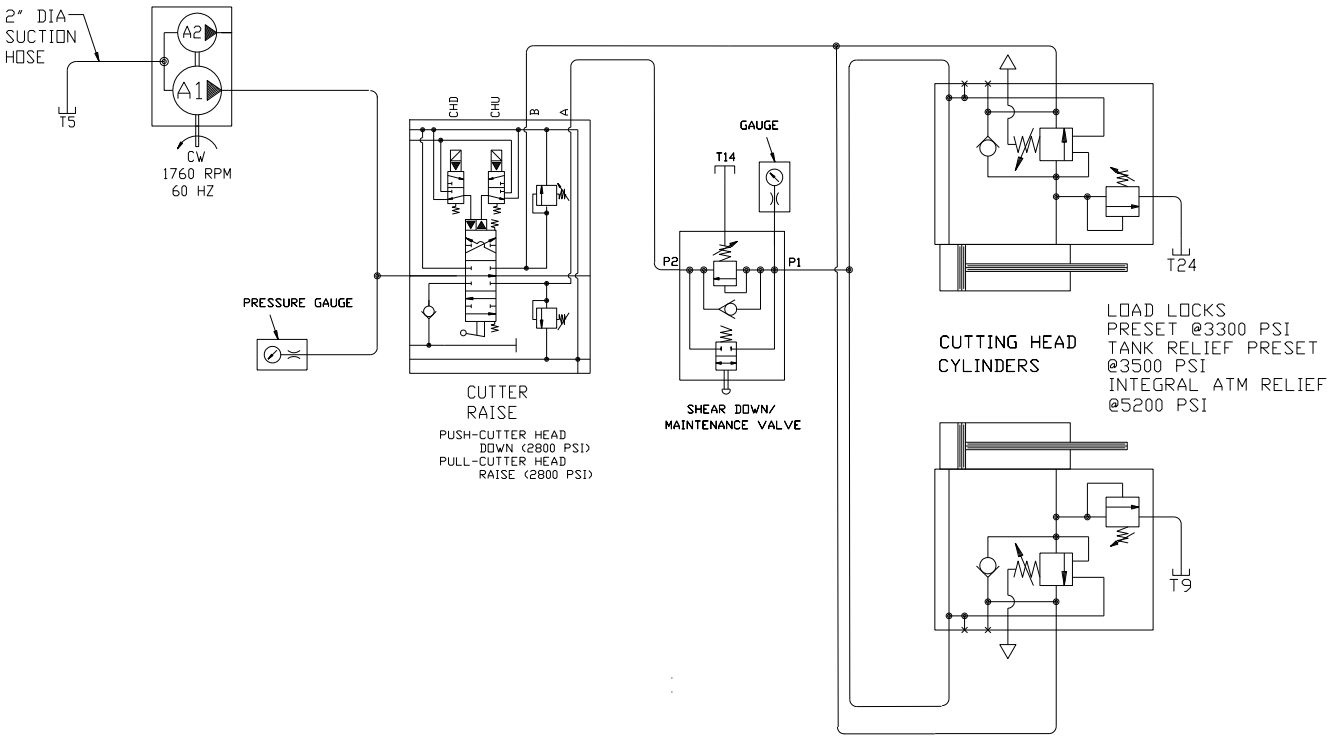
DANGER!
Do not adjust, modify, or remove the load holding cartridge valve mounted in the cutterhead cylinders. It is a safety feature to prevent accidental lowering of the cutter head.

DANGER!
This load holding valve, like those on the stabilizer cylinders is preset. DO NOT ADJUST IT. If it malfunctions, replace it immediately.

WARNING!
You could be seriously injured or killed by falling loads. Block the miner before performing maintenance and always observe the safe working load limits of all lifting and blocking devices.

This schematic shown is Fig. 66 is a typical cutter head cylinder raise circuit. Always refer to the schematic in your parts book for your machine.

Fig. 66: Cutter head raise circuit



Note: Solenoid designations are CHD (cutter head down) and CHU (cutter head up).

Deluge water fire circuit

The deluge fire suppression circuit (Fig. 72) can be operated by manual or remote solenoid control (see Electrical section in this chapter). When the solenoid coil is energized, it shifts a spool, allowing hydraulic oil to travel to a 2-way, 2-position water valve. The hydraulic fluid shifts the spool, allowing the water to pass through it to the deluge fire spray manifolds. For the hydraulic portion of this circuit, see Fig. 68 in the Hydraulic section of this chapter. The water valve has a detent spool, which keeps the valve open. The 2-way, 2-position valve can be operated manually and is typically mounted on the left hand side of the machine. The valve must be manually reset to reset the fire suppression circuit.

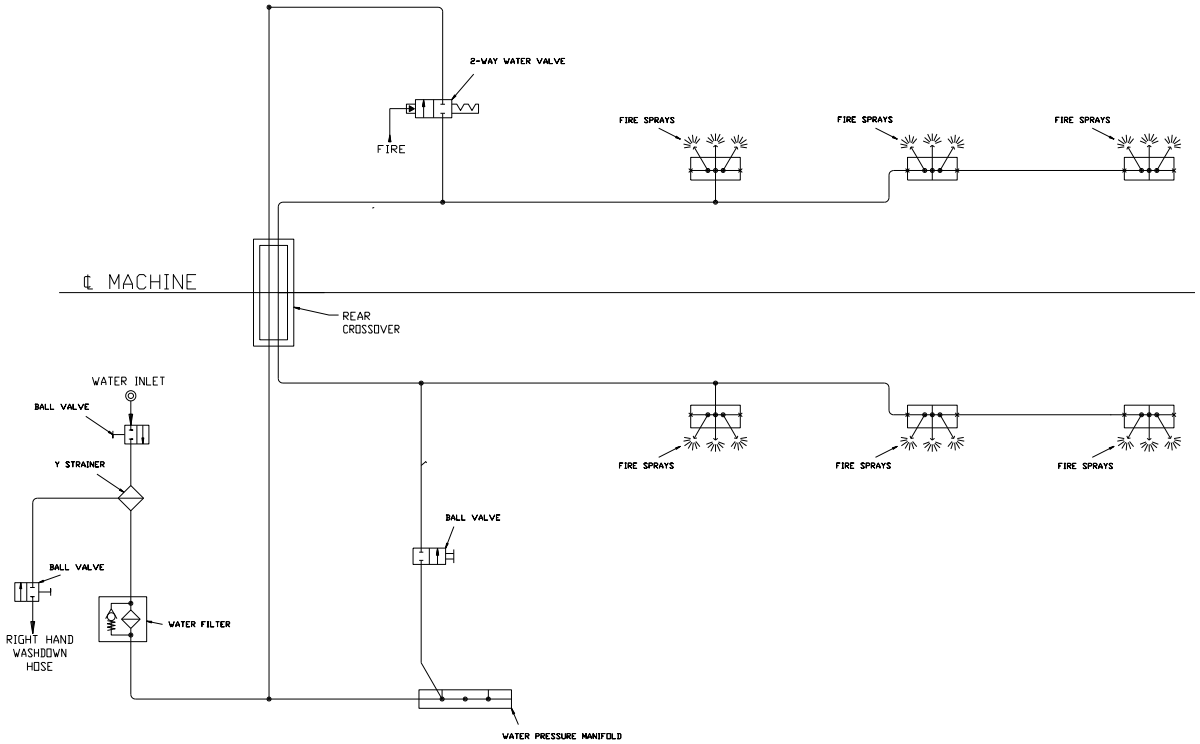
In addition, there is a ball valve used to manually operate the fire suppression circuit typically located on the right rear corner of the machine. The valve must be manually turned off to reset the fire suppression system.

The optional left hand washdown hose water is supplied by the deluge fire suppression system.

The fire suppression circuit must be tested once per shift, minimum (see Maintenance section in this chapter).

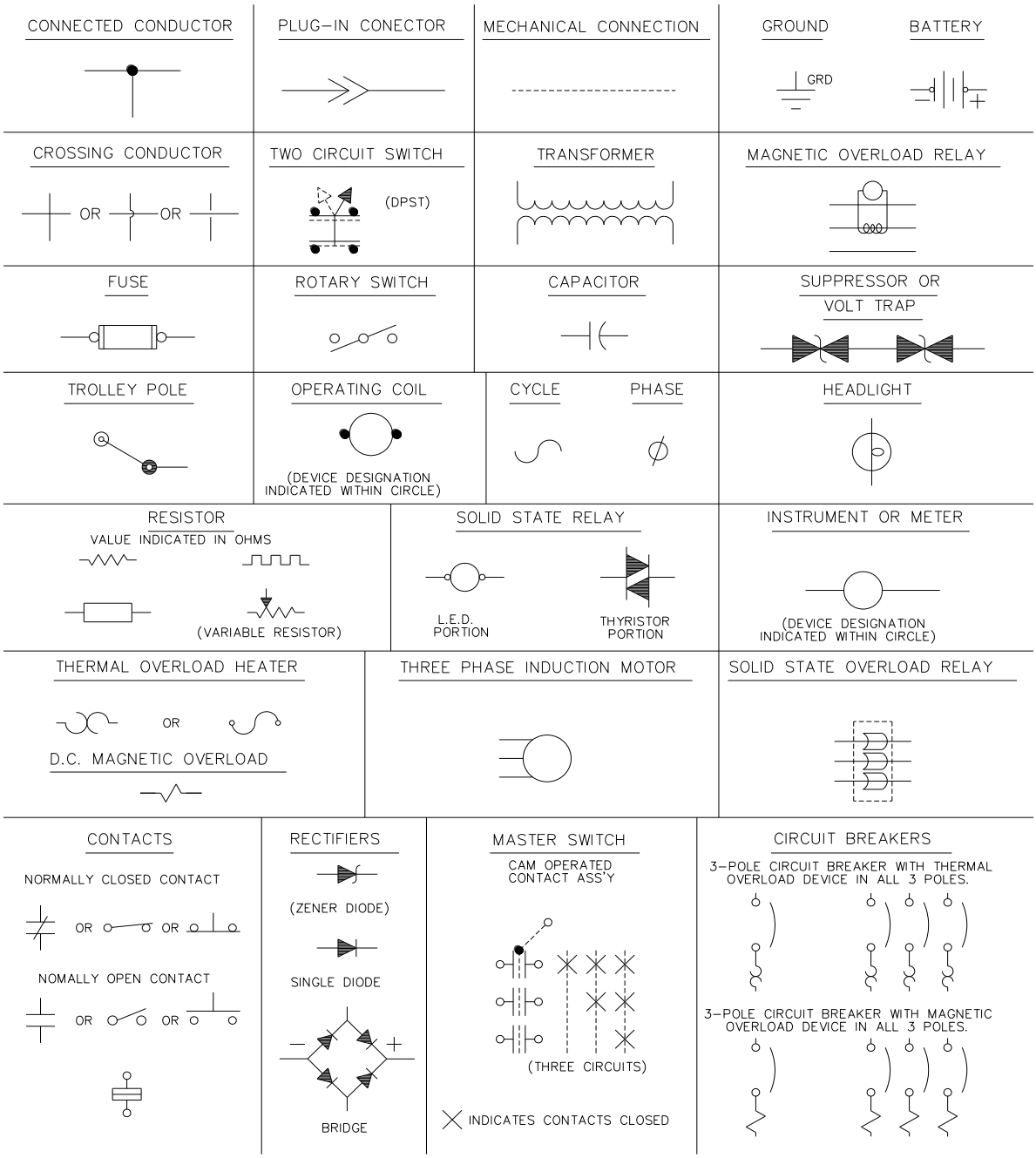
For deluge water fire circuit component locations, see Fig. 73.

Fig. 72: Deluge water fire circuit



Related components share the same designation and when tracing a particular circuit, it may be helpful to think of the flow of electricity as being similar to the flow of water through a hose. When a set of contacts are open, the current cannot flow across them, and when contacts are closed, the current can flow. When three (3) lines are connected in a tee, the current will flow in whatever direction that it can. Like water or hydraulic fluid, an electrical current will also tend to follow the path of least resistance through a circuit. Finally, for a circuit to work, the electrical current must make a complete loop, similar to hydraulic fluid going through a circuit and returning to a tank.

Fig. 79: Standard electrical symbols



Controller case—control breakers

Mounted on the front wall of the controller case (Fig. 85) are control breakers.

control breaker “CB4” “CB4” is a 15A breaker for the 120VAC- supply voltage.

control breaker “CB5” “CB5” is a 15A breaker for the 120VAC+ supply voltage.

Control breaker “CB6” “CB6” is a 10A breaker for the 120VAC- side of the area light circuit.

control breaker “CB7” “CB7” is a 10A breaker for the 12V0AC+ side of the area light circuit.

control breaker “CB8” “CB8” is a 20A breaker for the 12VAC- side of the head light circuit.

control breaker “CB9” “CB9” is a 20A breaker for the 120VAC+ side of the head light circuit.

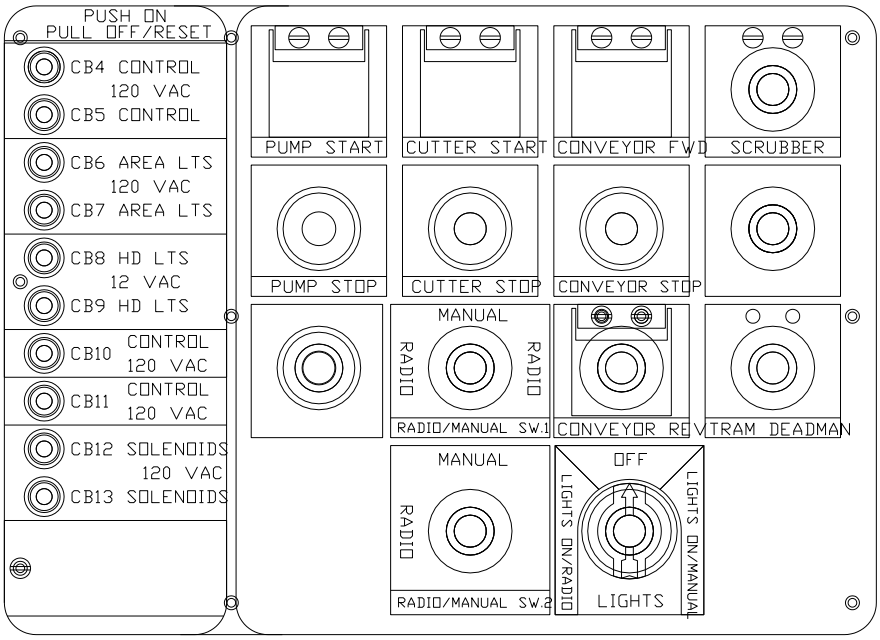
control breaker “CB10” “CB10” is a 5A spare breaker.

control breaker “CB11” “CB11” is a 5A breaker on the 120VAC side of the machine controller power supply circuit.

control breaker “CB12” “CB12” is a 5A breaker on the 120VAC- side of the solenoid circuit.

control breaker “CB13” “CB13” is a 5A breaker on the 120VAC+ side of the solenoid circuit.

Fig. 85: Controller case

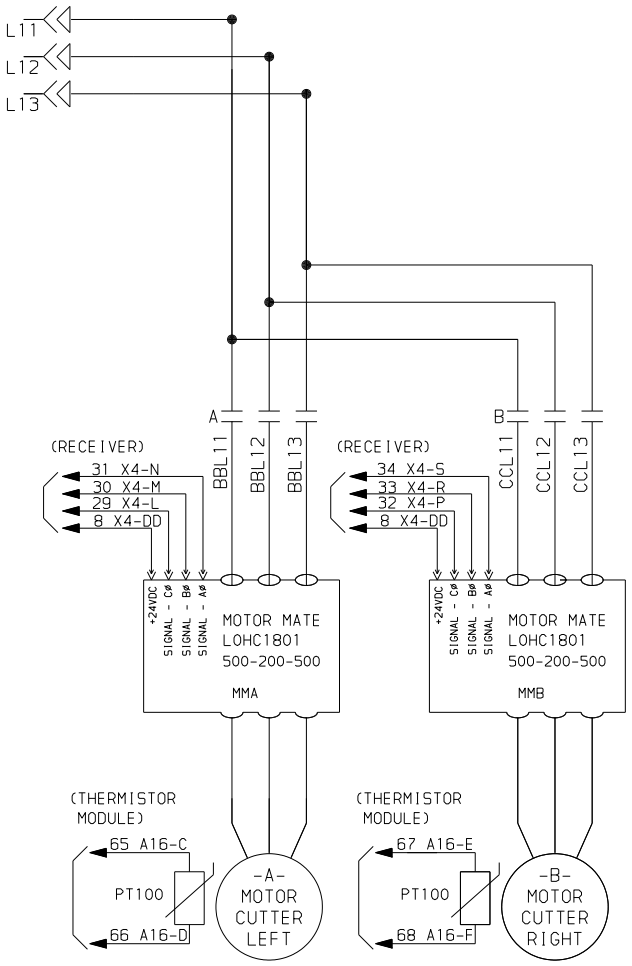


Cutter motor power circuit with control

The pump motor must be running before the cutter motors will start. To start the cutter motors, the “SHIFT” key is pressed and held and then the “CUTTER ON” key is pressed. This completes the circuit across coil “A” and starts the left cutter motor, as well as starting the Time Delay 2, “TD2”, timer for the “B” contactor right cutter motor. Both cutter motors do not start at the same time. When the timer times out, the circuit across coil “B” is completed and the right cutter motor will start. The holding circuit interlock “A” and “B” must be closed. There are motor mates and thermistors on both motors that provide feedback to the control system on the operating state of the motors. In the event that an operating parameter exceeds a preset value, the operating system can shutdown the motors. To manually stop the cutter motors, depress “CUTTER STOP” switch.

The schematic shown in Fig. 79 is a typical cutter motor power circuit. Always refer to the schematic in your parts book for your machine.

Fig. 79: Cutter motor circuit

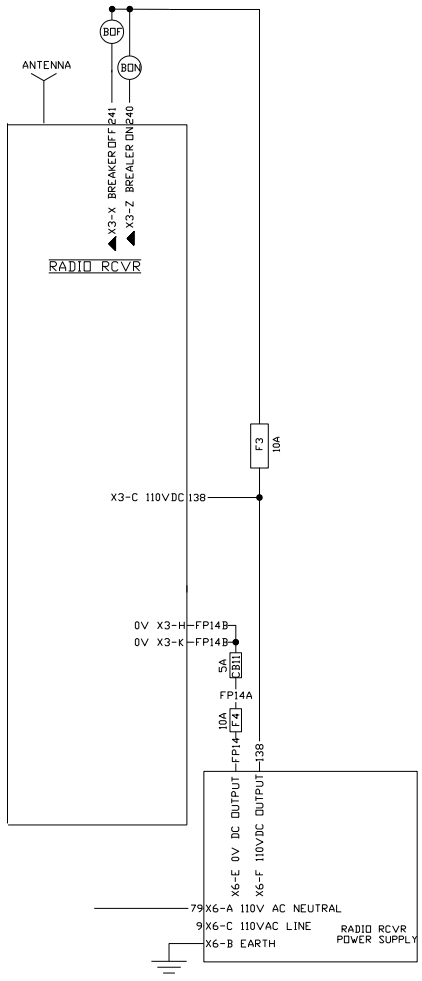


Breaker on and off in radio remote

The control system allows the main circuit breaker CB1, CB2, or auxiliary and tram breaker to be turned on, off, and to reset a tripped breaker using the radio remote control console. This normally requires that a battery backup version of the power supply to be installed on the machine.

The schematic shown in Fig. 100 is a typical breaker on/off in radio remote circuit. Always refer to the schematic in your parts book for your machine.

Fig. 100: Breaker on/off in radio remote schematic



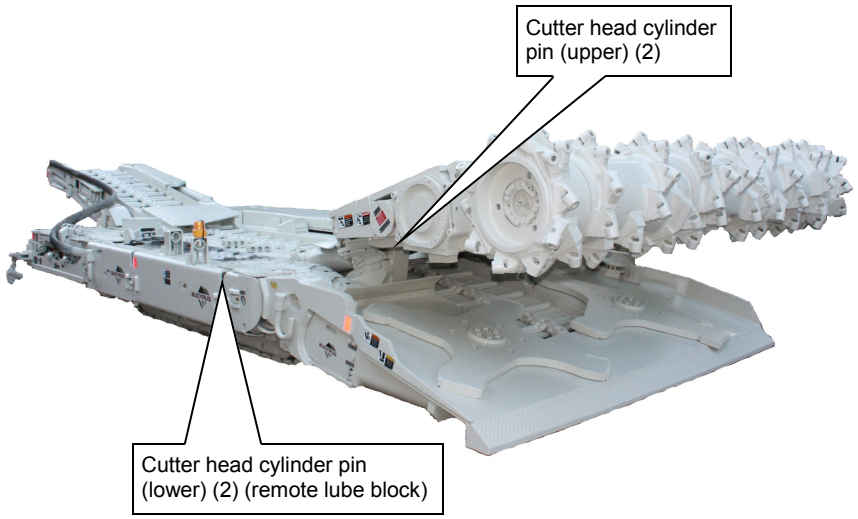
Specific lubrication and maintenance procedures

Every shift

cutter head lift cylinder pins

Lubricate the right and left cylinder pins (upper and lower) through the grease fittings and remote lube block located on each cylinder (Fig. 103). Pump approximately 3 cu. in. (50 cu. cm.) into each fitting.

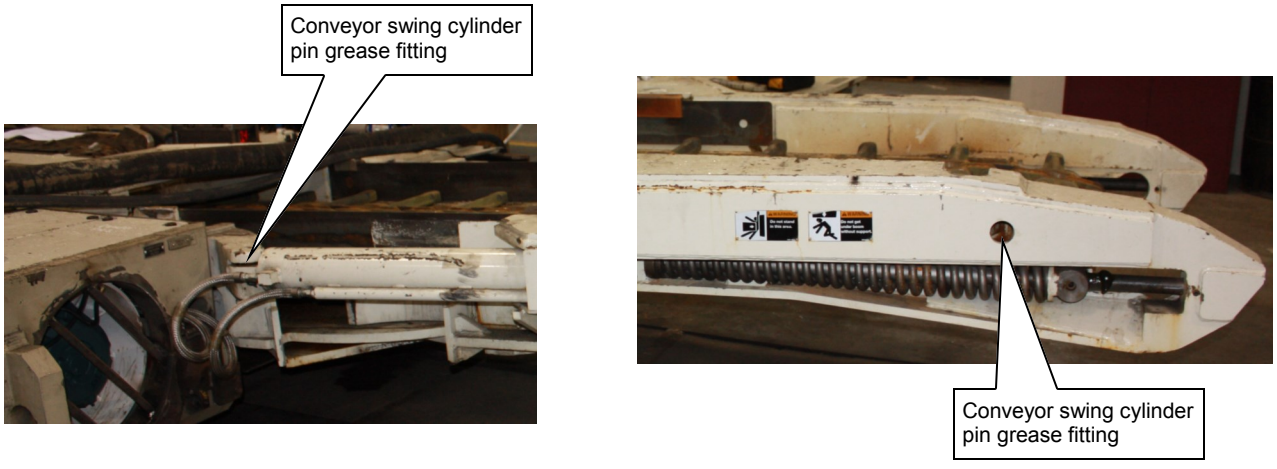
Fig. 103: Cutter head cylinder pin location



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. 104). Pump approximately 3 cu. in. (50 cu. cm.) into each fitting.

Fig. 104: Conveyor swing cylinder pin lubrication



lighting

Turn on the lights and visually inspect for bulbs that need to be replaced.

reflectors and warning tags

Visually inspect the condition and readability of all warning tags, labels, and reflectors for signs of wear or damage. Replace any reflector or tag that is missing or damaged.

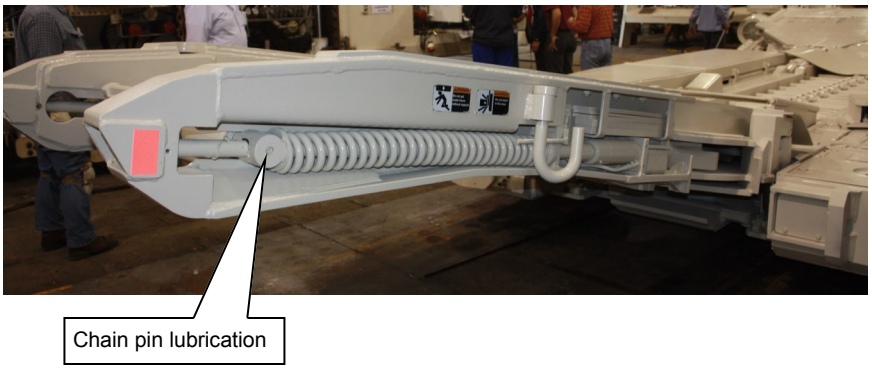
“machine stop/e-stop” switches

Check the “machine stop/e-stop” switches located on each side of the machine for proper operation. Start the machine and strike the “e-stop” switch. The machine pump motor will shutdown, in turn shutting down all other motors. Repeat for the other switch.

chain take-up pin (right and left)

Lubricate the chain take-up pin (Fig. 123) through the grease fitting located on the nut. Pump approximately 3 cu. in (50 cu. cm) of grease into each fitting.

Fig. 123: Chain take-up pin



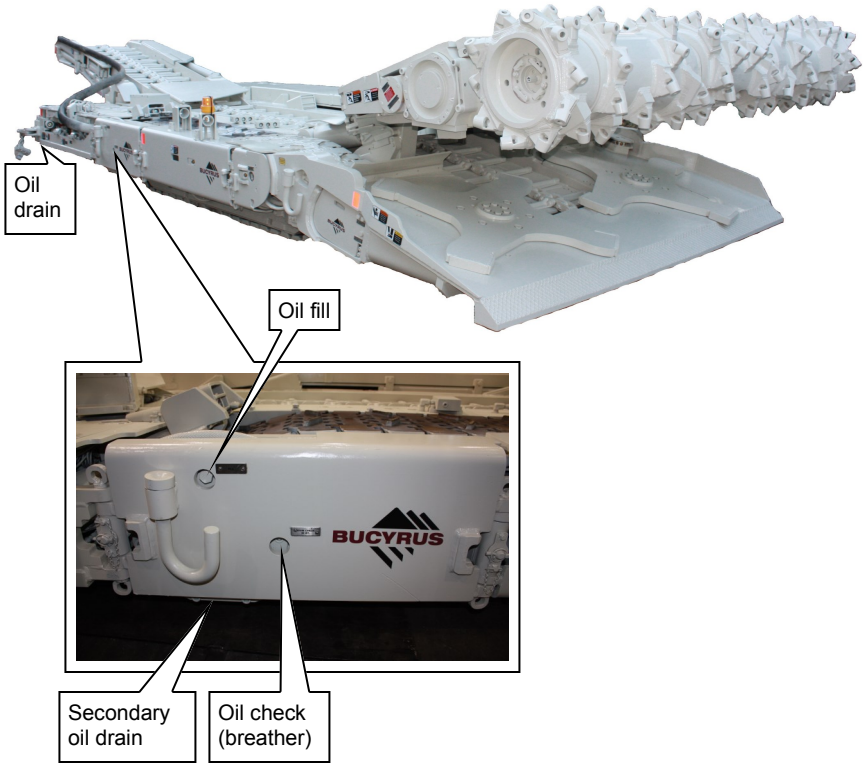
Every six months

tram gear cases

Change the oil in both tram gear cases (Fig. 132).

- ☞ Remove the two drain plugs and allow oil to completely drain from the gear case. One drain plug is located under the check and fill plugs, and one drain plug is underneath the reach gears.
- ☞ Clean and reinstall the drain plugs.
- ☞ Remove the fill plug located on top of the gear case.
- ☞ Add oil through the fill plug hole until oil is visible in the sight glass. When filling, allow sufficient time for the oil to travel throughout the gear case.

Fig. 132: Tram gear case



Main control valve adjustment

IMPORTANT!
The main relief is set higher than the port reliefs and will only relieve if a spike occurs in the system or if the port relief does not function properly. This provides protection of the main pump section, A1.

CAUTION!
Do not adjust the main relief over 3,000 psi. Destruction of the valve bank and the main pump could result.

CAUTION!
Always be alert for any unintended machine movement.

IMPORTANT!
Reference the Hydraulic section in this chapter for individual circuit information. Always refer to the hydraulic schematic in your parts manual for your miner.

WARNING!
Two people are required to adjust pressure settings. One person will make the adjustments while the second person must remain at the "Machine stop/E-STOP" at all times during the adjustment procedure. Failure to do so may result in serious injury or death.

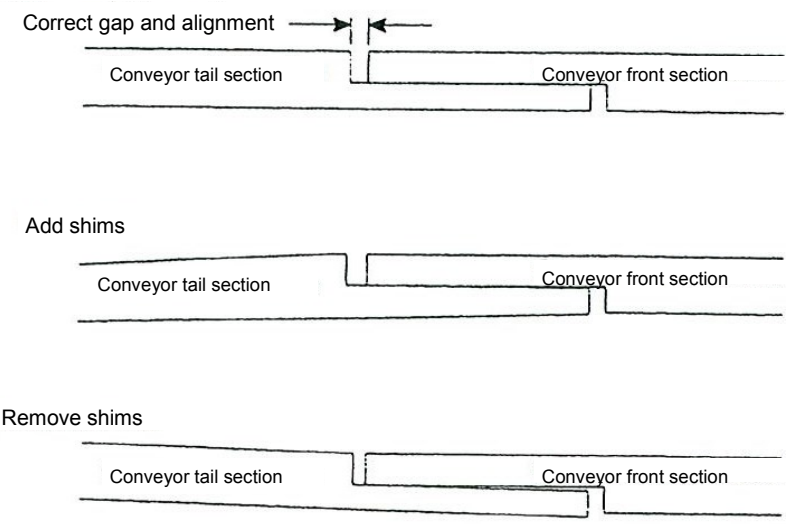
Main relief adjustment

- ☞ Remove the protective cap on the front port relief of the cutter head working section and loosen the nut on the adjusting screw. Turn the adjusting screw in all the way.
- ☞ Loosen the nut on the main relief cartridge. Turn the main relief adjusting screw two turns clockwise.
- ☞ Start the pump (see Start up procedure in this chapter) and activate the stabilizer shoe down function. This will raise the back portion of the machine off the ground.

WARNING!
Keep body parts clear of machine while in raised position or serious injury could result.

- ☞ With the stabilizer shoe down function bottomed out, turn the main relief cartridge adjusting screw in (clockwise) until a pressure of 3,000 psi is obtained.
- ☞ With the stabilizer shoe function in the neutral position, hold the main relief cartridge screw in place and tighten the nut to lock the screw in place. Check the pressure setting to verify that the screw was not moved while tightening the nut.
- ☞ Adjust the stabilizer shoe down port relief (see port relief adjustment procedure in this chapter).
- ☞ Replace the protective cap.

Fig. 146: Tail shim adjustment

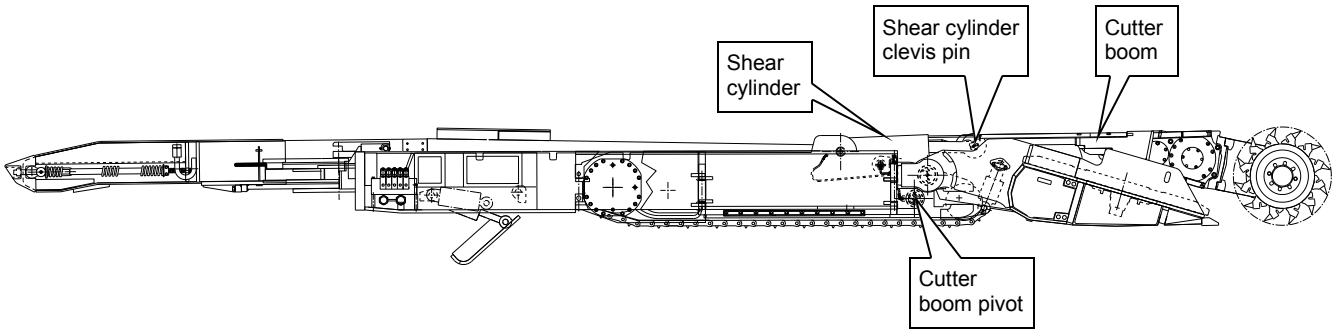


☞ 16. Re-insert the blocking between the top of the tractor frame and the bottom of the conveyor following mine standard blocking procedures.

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

☞ 17. Securely retighten the hex head capscrews.

Fig. 154: Cutter head assembly removal



cutter head assembly installation

To install the cutter head assembly (Fig. 154)

☞ 1. Slowly tram the miner forward toward the raised end of the boom until the pivot pins clear the gathering head backboard.

☞ 2. Lower the boom pivot points until the shear cylinders can reach their boom clevises. Block the boom to keep it in a secure position.

☞ 3. Extend the shear cylinders until their rod end bearings can be inserted into the cutter boom clevises.

☞ 4. Disconnect the trailing cable to de-energize the miner. Follow all Federal and mine regulations regarding lockout/tagout procedures.

WARNING!
Follow all Federal and mine regulations regarding lockout/tagout procedures. Failure to do so may result in serious injury or death.

WARNING!
Do not test the alignment of the shear cylinder rod end bearings and the cutter boom clevis using your fingers. Shifting of the aligned pieces could cause serious injury.

☞ 5. Position the right cylinder's rod end bearing in the boom clevis.

IMPORTANT!
The pin should be inserted so that its retaining channel remains outside the bushing.

☞ 6. Insert the rod end pin through the aligned clevis bushings and rod end bearing.

End cutter drum

end cutter drum removal

To remove the end cutter drum:

☞ 1. Lower the gathering head completely until it touches the floor. Lower the conveyor tail assembly until it is level with the floor.

☞ 2. Raise the cutter head assembly to its highest position. Place blocking underneath the cutter head assembly and lower the cutter head assembly onto the blocking.

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

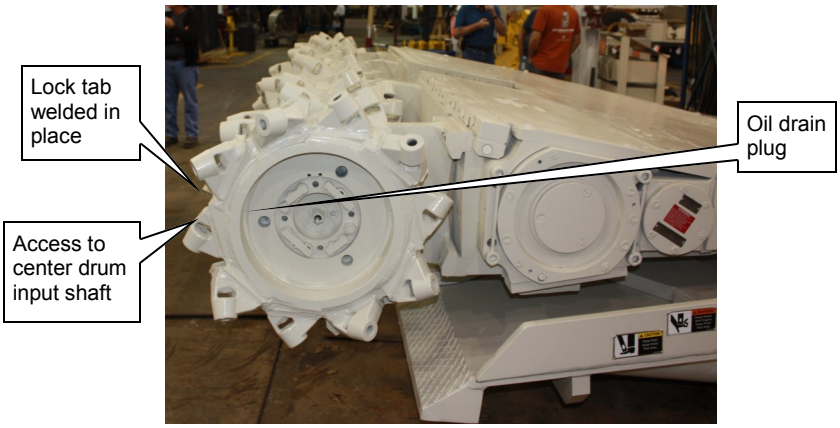
☞ 3. Disconnect the trailing cable to de-energize the miner. Follow all Federal and mine lockout/tagout regulations.

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

☞ 4. Drain the gear case oil before removing the drums.

☞ 5. Remove the lock tabs tack welded to the capscrews using a cutting torch.

Fig. 160: Lock tabs tack welded to capscrews



☞ 6. Remove the long capscrews and nuts on the two alignment dowels which secure the end drum to the cutter drum drive assembly.

☞ 7. Remove plug and center drum input shaft.

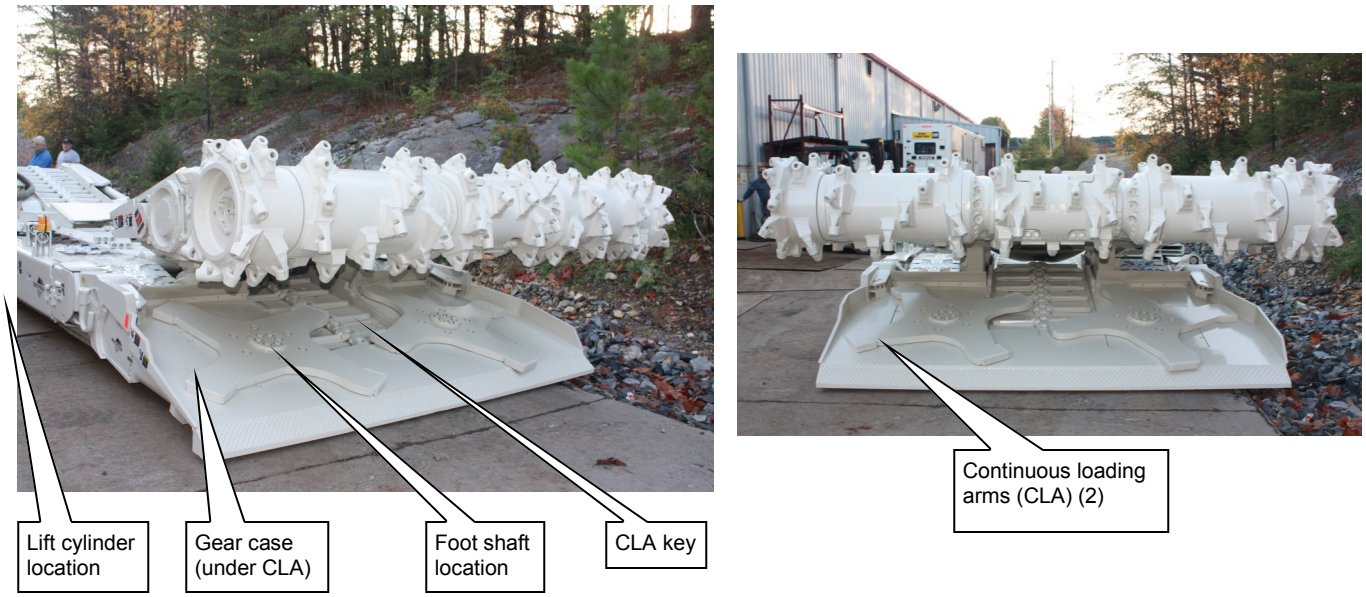
☞ 8. Remove the drum by sliding it off the hub.

☞ 9. Remove the drum alignment key (Fig. 161) and store for reinstallation.

Gathering head assembly

The gathering head assembly (Fig. 168) consists of the gathering pan, the continuous loading arms (CLAs), lift cylinders, and drive motors.

Fig. 168: Gathering head assembly



gathering head assembly removal

To remove the gathering head assembly

☞ 1. Lower the conveyor tail section until it is level with the floor. Lower the gathering head until it rests on the floor. Place blocking under the rear of the gathering head to stabilize its position during and after removal of the pivot pins and disconnection of the lift cylinders.

☞ 2. Raise the cutter head to its highest point and place blocking underneath it. Lower the cutter head onto the blocking.

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

☞ 3. Disconnect the trailing cable to de-energize the miner. Follow all Federal and mine regulations for lockout/tagout.

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

☞ 18. Remove the pipe plug from the end of the motor (Fig. 174).

☞ 19. Slide the drive shaft through the gathering head motor and into the gathering head gear case (the drive shaft end without the threaded hole should be inserted first). The shaft may require some adjustment so that its end fits into the gear case.

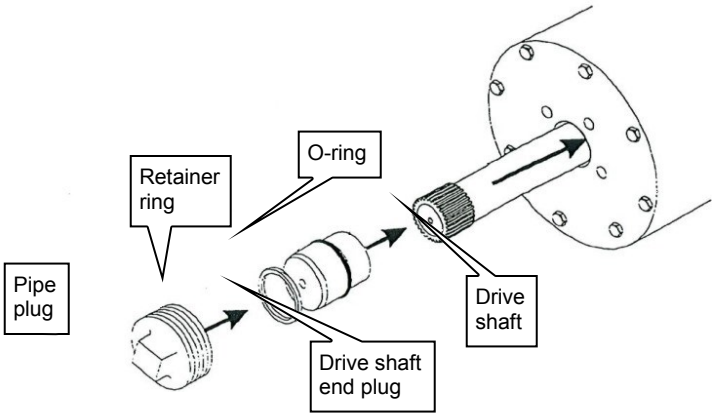
☞ 20. Install the o-ring into the channel on the shaft end plug.

☞ 21. Insert the drive shaft end plug into position in the center of the motor.

☞ 22. Insert the retaining ring to secure the shaft end plug inside the motor housing.

☞ 23. Replace the pipe plug into the end of the motor.

Fig. 174: Drive shaft installation



☞ 24. Reconnect water hosing.

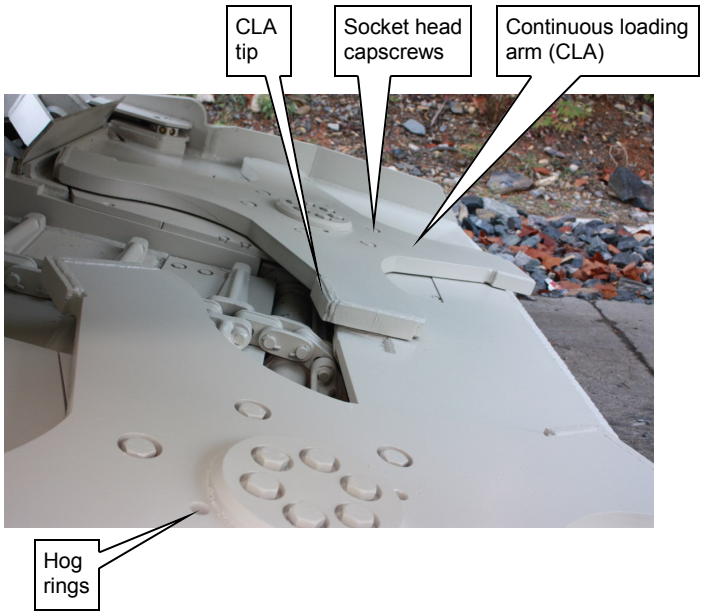
☞ 25. Replace the gathering head motor side access cover. Secure the cover to the gathering head by inserting and tightening the hex head capscrews.

☞ 26. Replace the upper deck cover and secure to the gathering head by inserting and tightening the hex head capscrews.

☞ 27. If removed, install the CLA over the motor (see CLA removal and installation procedure in this chapter).

CLA removal and installation

Fig. 182: Continuous loading arms (CLAs)



CLA removal

To remove a CLA:

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

☞ 2. Raise the cutter head assembly to its highest position. Place blocking under the cutter head assembly. Lower the cutter head assembly onto the blocking.

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

☞ 3. Disconnect the trailing cable to de-energize the miner. Follow all Federal and mine regulations for lockout/tagout.

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

☞ 4. Remove the hog rings (Fig. 182) from around each of the CLA's socket head capscrews.

☞ 5. Remove the socket head capscrews located where the arms meet the CLA hub.

☞ 6. Remove the capscrews located in the center of the CLA hub. The CLA should now be free and able to be removed.

primary planetary gear installation

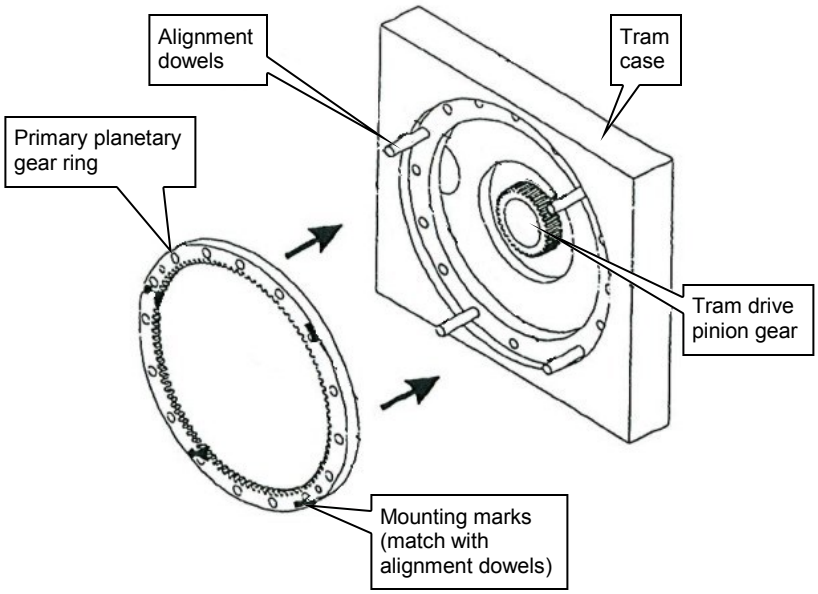
To install the tram primary planetary gear:

☞ 1. Insert alignment dowels into four of the sixteen capscrew holes in the tram case (Fig. 190).

☞ 2. To facilitate gear ring insertion, mark the mounting holes of the primary planetary gear ring that corresponds to the holes in which dowels were placed.

☞ 3. Slide the primary planetary gear ring onto the alignment dowels so the dowels appear through the marked holes.

Fig. 190: Alignment dowels and gear ring mounting



☞ 4. Carefully insert the primary planetary gear assembly into the gear ring, ensuring that the extension of the sun gear faces out from the centerline of the miner and that the internal gear teeth of the primary carrier are seated securely onto the tram drive pinion gear.

☞ 5. Place the two adapter plate dowels into two 1” holes on the bottom left and right corners of the adapter plate.

☞ 6. Orient the adapter plate with the adapter dowels along the bottom edge.

☞ 7. Slide the adapter plate onto the four alignment dowels.

☞ 8. Insert and tighten twelve socket head capscrews into the holes in the adapter plate not blocked by the alignment dowels.

☞ 9. Remove the four alignment dowels and insert and tighten the final four socket head capscrews to secure the adapter plate and gear ring to the tram case.

tram case installation

To install the tram case:

☞ 1. Block up the tram case adjacent to its tractor frame position at a level that makes it easy to slide the case into the tractor frame.

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

☞ 2. Thread the guide wires through the tram case exit opening, between the sprocket gears, and out the tram case entry opening.

☞ 3. Slide the tram case into position in the tractor frame.

IMPORTANT!
The guide wires will be used to pull the tram track links onto the tram case sprocket after the tram case is installed.

WARNING!
Before attempting to slide the tram case into the tractor frame, ensure that the tram motor electrical and water connections are out of the way. Failure to do so may result in damage to the electrical and water connections.

☞ 4. Slide the tram case into position in the tractor frame.

☞ 5. Install the bolts that secure the motor side of the tram case to the tractor frame.

☞ 6. Install the bolts that secure the sprocket side of the tram case to the tractor frame.

☞ 7. Replace the tram motor (see Tram motor removal and installation procedure in this chapter).

☞ 8. While feeding the tram track from the front of the miner (near the idler), pull on the tram track guide wires until a link of the tram track engages the sprocket.

☞ 9. Connect the trailing cable to energize the miner.

WARNING!
Stand clear of the miner when using the motor to pull the tram track through the tram case.

☞ 10. Use the tram motor to slowly rotate the sprocket and pull the tram track through the case until the end appears out the bottom.

WARNING!
Double check that the links of the tram track are correctly seated onto the tram drive sprocket. Improper engagement of the tram track links onto the sprocket can cause serious mechanical damage.

Tram sprocket removal and installation

tram sprocket removal

To remove the tram sprocket:

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

☞ 2. Raise the gathering head and cutter head and place a small stack of blocking under these two assemblies.

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. Place blocking in multiple locations under the miner tram track. When the miner is lowered, the tram track should be secured between the blocking and the tractor frame.

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

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

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

WARNING!
Follow all federal and mine lockout/tagout regulations. 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. Remove the two rub rail pins that secure the tram rub rail to the two rub rail sections adjacent to it and remove the tram rub rail to expose the tram case.

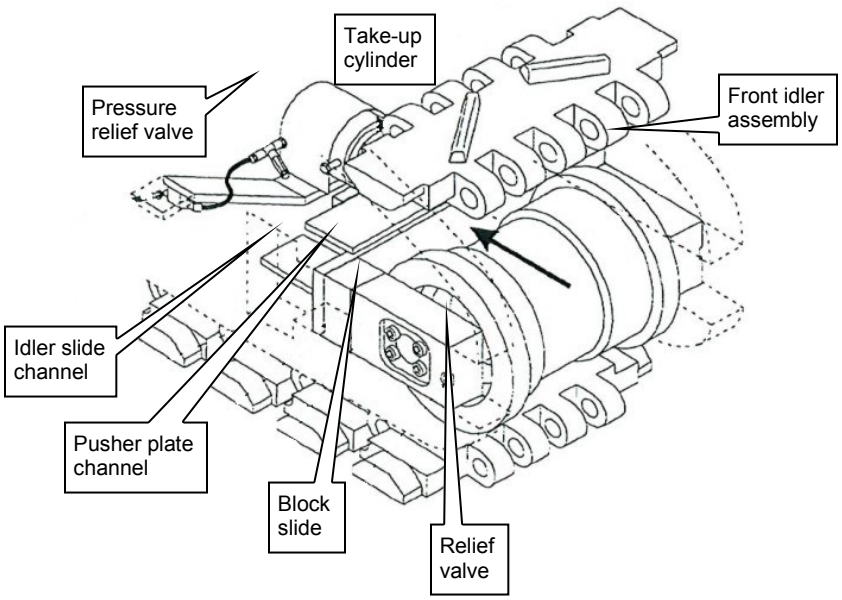
☞ 10. Remove the hex head capscrew and lock washer that secures the front rub rail to the tractor frame and open the cover.

☞ 11. Attach the grease gun to the fitting on the grease take-up cylinder (Fig. 207) and pump grease to extend the cylinder and remove pusher plate pressure on the idler shims.

☞ 3. Insert the block slides of the front idler assembly (Fig. 218) into the idler slide channel. The relief valve of the slide blocks must be oriented toward the front of the miner. The grease fittings must be oriented to the outside of the miner.

☞ 4. Push the front idler assembly into the slide channel until the block slides are against the pusher plate channel guides.

Fig. 218: Front idler installation



☞ 5. Connect the two ends of the tram track and using the hammer and punch, insert the track pin to secure the two track links together.

☞ 6. Using the hammer and punch, insert the two roll pins into the track pin to secure the pin in the links.

☞ 7. Adjust the tram track tension (see Tram track adjustment procedure in the Adjustment procedures section of this chapter).

☞ 8. Close the front rub rail cover and replace the hex head capscrews and lock washers that secure the front rub rail to the tractor frame.

☞ 10. Remove the hex head capscrew, flat washer, lockwasher, and hex head nut that secures the three power cable lugs to the three motor lugs.

☞ 11. Remove the two socket head capscrews and lockwashers that secure the stuffing box's half-moon clamp to the junction box.

☞ 12. Remove the clamp and slide the stuffing box out of the junction box. The power cable should be completely disconnected from the motor.

☞ 13. To prevent damage to the power cable lugs and gland assembly, cover the power cable and secure it to the miner in a safe location.

☞ 14. To protect the motor's electrical connections, replace the motor junction box cover and secure it using four hex head capscrews and lockwashers.

☞ 15 Remove the twelve hex head capscrews and lock-washers to secure the scrubber fan/motor assembly to the tractor frame.

WARNING!
The scrubber fan/motor is now detached from the tractor frame and can be removed. The hydraulic pump motor is extremely heavy. Prepare to support its weight before removing it from the tractor frame.

☞ 16. Carefully slide the scrubber fan/motor out of the tractor frame.

Superbolt, Inc. uses an average friction factor of 0.055 for torque calculations. It must be emphasized that the tensioners must be tightened several times to stabilize at the low values. After many repeat tightenings, the friction factor can be as low as 0.045. Due to these variations in friction factor, moly-based lubricants are used instead of graphite-based lubricants only in the following cases.

- On very large jackbolts when the torque required for a specific preload would be too high; or,
- Where space restrictions prohibit the use of sufficiently large torque wrenches.

In some cases, Superbolt tensioners are “broken in” at the factory to lower the friction factor for field installation.

Fel-Pro C-870 molybdenum-disulfide paste has performed similarly to JL-M. Other molybdenum pastes and greases tested had much high friction factors. Testing for friction factor is recommended for all critical installations where lubricant and/or bolt and nut materials are unknown.

Table 3: Flow chart I for troubleshooting excessive noise

Pump Noisy		Motor Noisy		Relief/Counterbalance Valve Noisy	
Cause	**Remedy**	**Cause**	**Remedy**	**Cause**	**Remedy**
Cavitation	A		C	Setting too low or too close to another valve setting	D
Air in fluid	B	Motor or coupling worn or damaged		Worn poppet and seat	E
Coupling misaligned	C				
Pump worn or damaged	E				

Remedies

A. Any or all of the following:

- ☞ replace dirty filters
- ☞ wash strainers in solvent compatible with system fluid
- ☞ clean clogged inlet line
- ☞ clean reservoir breather vent
- ☞ change system fluid
- ☞ change to proper pump drive motor speed
- ☞ check fluid temperature

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

D. ☞ install and/or adjust pressure gauge

E. ☞ overhaul or replace defective parts

Table 11 (continued): Electrical system troubleshooting

Trouble, symptom or cause	Probable cause	Test, check and/or remedy
chart contact life or overheating of motor contactor	☞ Filing or dressing.	☞ Do not file silver contacts. Rough spots or discoloration will not harm contacts or impair their efficiency.
	☞ Interrupting excessively high currents.	☞ Install larger unit. Check for grounds, shorts or excessive motor currents.
	☞ Excessive jogging.	☞ Install larger unit rated for jogging service.
	☞ Short circuit or ground fault.	☞ Remove fault and check to be sure fuse or breaker size is correct.
	☞ Loose connections in power circuit.	☞ Clean and tighten.
	☞ Sustained overload.	☞ Check for excessive motor load current or install larger unit.
failure to pick-up and seal	☞ Low voltage.	☞ Check system voltage and voltage dips during starting.
	☞ Wrong coil or wrong connection.	☞ Check coil marking and wiring.
	☞ Mechanical obstruction.	☞ With power off, check for free movement of armature and contacts.
	☞ Coil open or overheated.	☞ Replace.
failure to drop out	☞ Voltage not removed.	☞ Check coil circuit or length of leads from supply voltage to coil. May be excessive.
	☞ Contacts welded.	☞ See welding under contacts section.
open circuit	☞ Mechanical damage.	☞ Handle and store coils carefully.