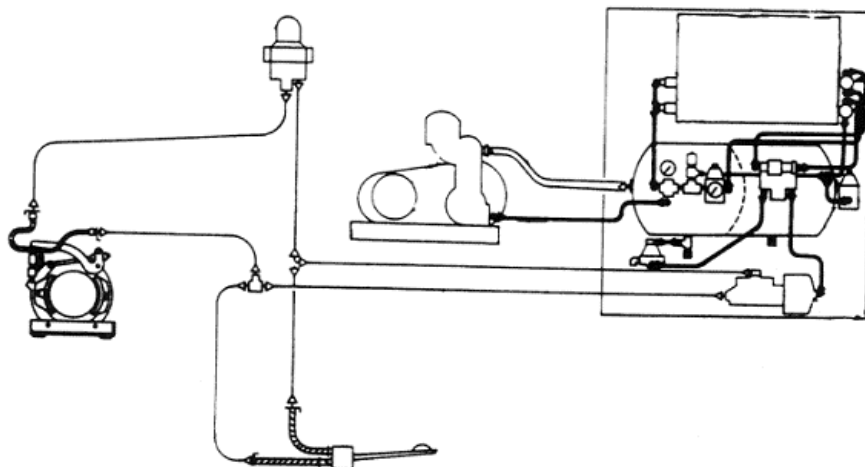
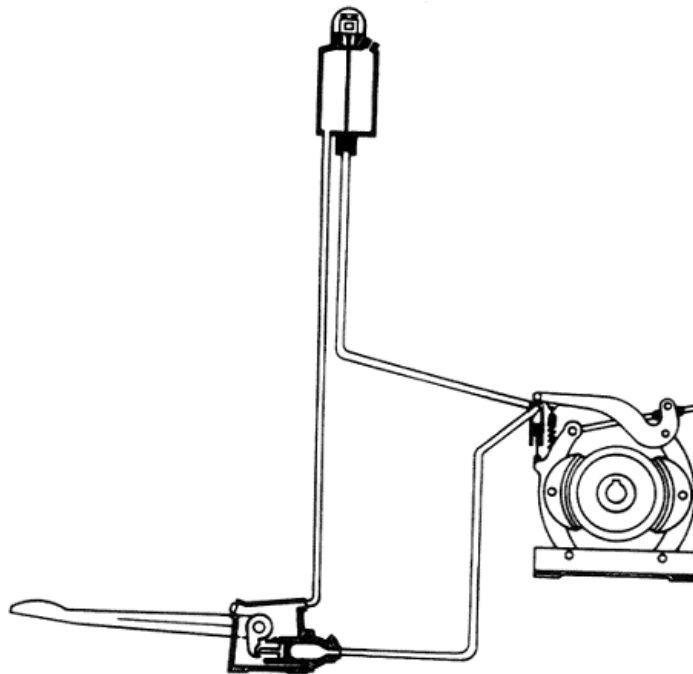




Gemco™ Industrial Brakes

Hydraulic Brake Systems

Type H & HM Installation Dimensions and Service Manual



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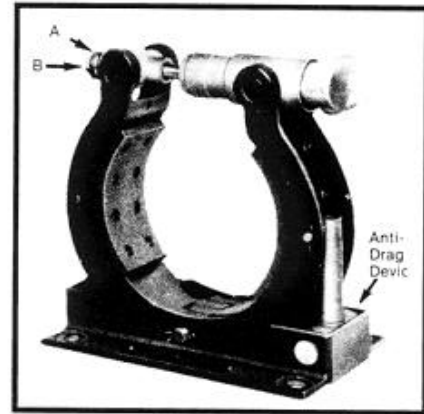
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INSTALLATION INSTRUCTIONS

6 x 3 and 8 x 3 Type H Brake Assemblies

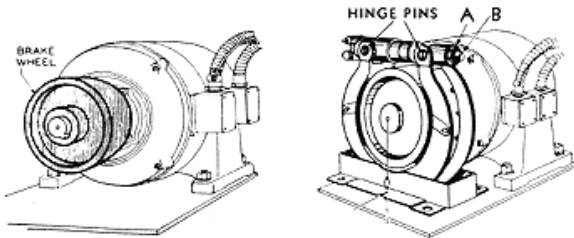
Before installing this brake assembly, please take note:

- A. These instructions show normal floor-mounted installation. The brake may alternately be wall- or ceiling-mounted if necessary.
- B. **The brake base mounting holes are not equal distances from the brake center.** Mounting holes on the anti-drag side are 5-9/16" from the brake pin center. Mounting holes opposite the anti-drag side are 4-15/16" from the brake pin center. **Be sure to position the brake over the correct mounting holes.**
- C. If necessary, the actuator ports may be rotated 180°. Temporarily drive out hinge pin to free actuator.
- D. The brake must be installed with the actuator and hinge pins parallel with the brake base. If necessary, reposition brake by forcing against anti-drag friction.
- E. The brake was correctly adjusted during factory inspection. Clamp nut A and adjusting nut B may be temporarily backed off to ease installation of brake on brake wheel.



BRAKE INSTALLATION

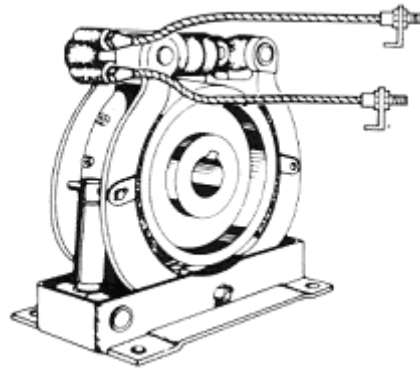
1. Install brake wheel.
2. Slip brake on brake wheel.



3. With clamp nut A loose, tighten adjusting nut B to clamp brake shoes tight against the brake wheel.
4. With actuator and hinge pins parallel with base (per item C above), and with brake wheel and brake pin center lines perpendicular, add shims between brake base and brake platform. Attach base with 5/8" bolts.



5. Using F-17 copper gasket seal, screw short thread end of armored hoses into both actuator ports. Wrench tighten to provide leak-proof hydraulic seals.
6. Use mounting brackets, lock washers and jam nuts provided to attach free ends of hoses to rigid support. Allow hose slack to permit movement of actuator.



7. The brake is now ready to be piped into the hydraulic system. Be sure to adjust the brake before operation.

BRAKE ADJUSTMENT

1. Start with brake shoes clamped tight against brake wheel per item 3.
2. Loosen adjusting nut B two and one half turns and tighten clamp nut A.
3. Both shoes should now be approximately 1/32" from brake wheel.

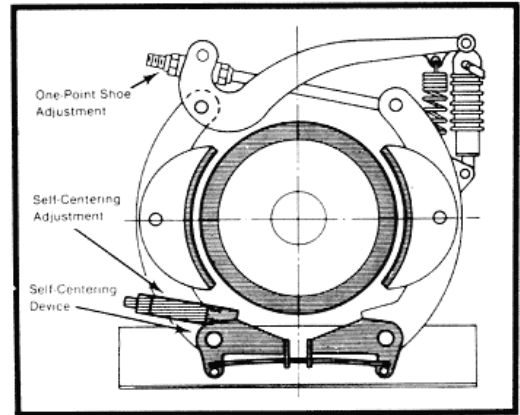
Follow "Brake Adjustment" instructions when readjustment is necessary to compensate for lining wear.

INSTALLATION INSTRUCTIONS

10 x 4, 14 x 6 and 18 x 8 Type H Brake Assemblies

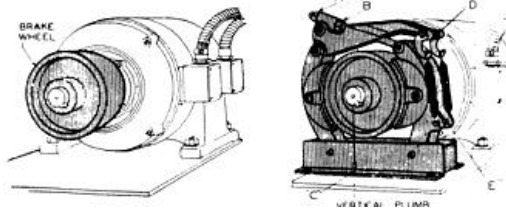
Before installing this brake, note the following features:

- A. This brake is suitable for floor mounting only.
- B. The brake shoes are adjusted by nut A and clamped by nut B.
- C. A shoe-centering plug is at the base of the shoe arm opposite the brake actuator.
- D. The brake assembly is completely adjusted after inspection at the factory. Adjusting nut A may be temporarily backed off to ease installation of the brake on the brake wheel.
- E. The hydraulic actuator should be installed after brake installation.



BRAKE INSTALLATION

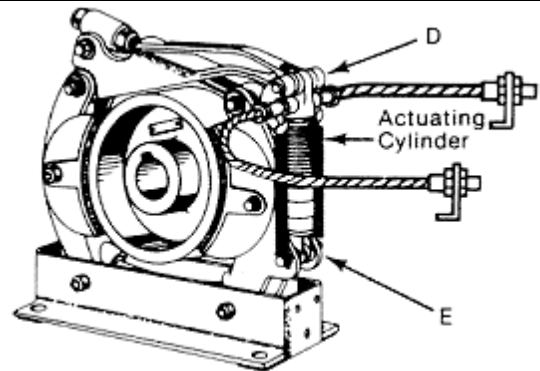
1. Install brake wheel.



2. Slip brake on brake wheel.
3. With clamp nut B loose, tighten adjusting nut A to clamp brake shoe tight against the brake wheel.
4. Level brake base by plumbing center of brake wheel shaft to index hole C in base of the brake.



5. Add shims between the brake and support. Bolt brake base to support.
6. Install brake actuating cylinder between pins D and E.
7. Using F-17 copper gasket seals, screw short thread end of armored hose into both actuating cylinder ports. Wrench tighten to provide leak-free proof seals.



8. Use mounting brackets, lock washers, and jam nuts provided to attach free end of hose to rigid support. Allow hose slack to permit movement of actuator.
9. The brake is now ready to be piped into the hydraulic system. Be sure to adjust the brake before operation.

BRAKE ADJUSTMENT

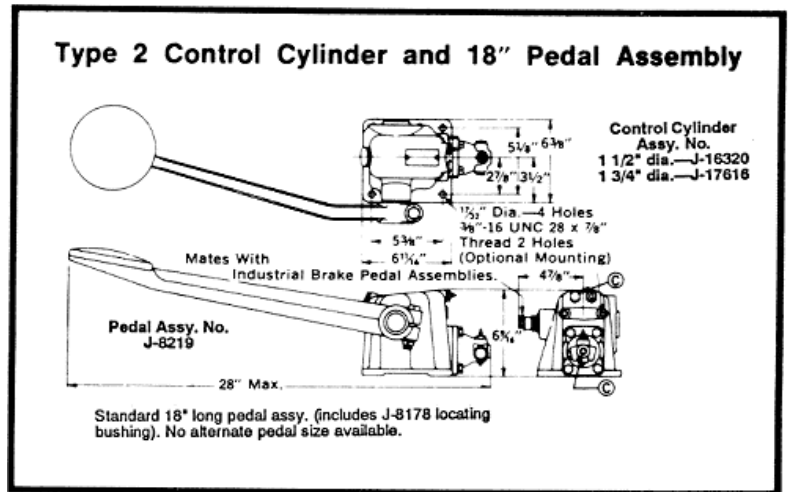
1. Start with brake shoes clamped tight against the brake wheel per item 3.
2. Loosen adjusting nut A three turns. Tighten clamp nut B.
3. Both brake shoes should now be approximately 1/32" from the brake wheel. If both shoes are not an equal distance from the wheel, adjust self-centering mechanism. (See item C above.)

Follow "Brake Adjustment" instructions when re-adjustment is necessary to compensate for lining wear.

INSTALLATION INSTRUCTIONS

Type H Control Cylinder and 18" Pedal Assembly

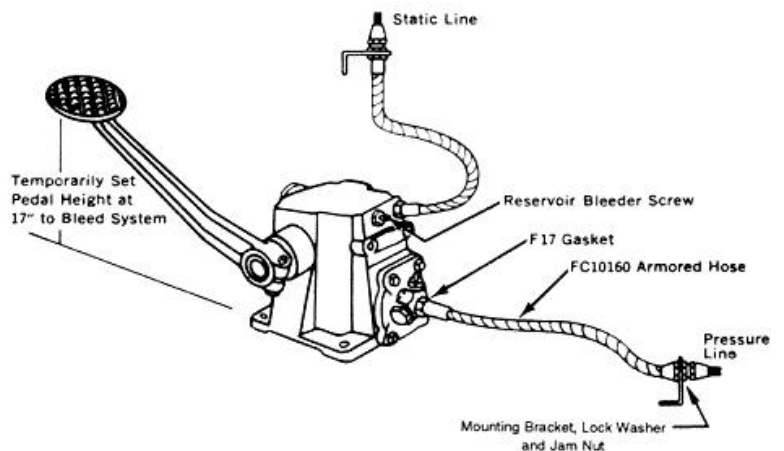
The control cylinder may be located in front, to either side, or to the rear of the standing or seated operator. However, it is essential that the foot *pad* be in a position for the operator to control full pedal force through up to 8" pedal pad travel. (Actual pedal travel depends on the specific system used.) We suggest that the pedal be slipped on the shaft and the control cylinder position be rechecked before the final location is selected.



NOTE: Relocating pedal assembly on shaft changes pad height in increments of 2.4 inches.

INSTALLATION

1. Bolt control cylinder to floor with 1/2" bolts.
2. Using F-17 copper gasket seal, screw short threaded end of two armored hoses into port C. Wrench tighten to provide leak-proof hydraulic seals.
3. Use mounting brackets, lock washers and jam nuts provided to attach free ends of hoses to rigid support.
4. Temporarily install foot pedal with pad 17" above floor level. This permits maximum control cylinder stroke when bleeding system. (Pedal height should be lowered to desired height after the hydraulic system is thoroughly bled.)
5. Control cylinder is now ready to be piped into the hydraulic system.



INSTALLATION INSTRUCTIONS

Type H FRB Fluid Reservoir/Bleeder Assembly

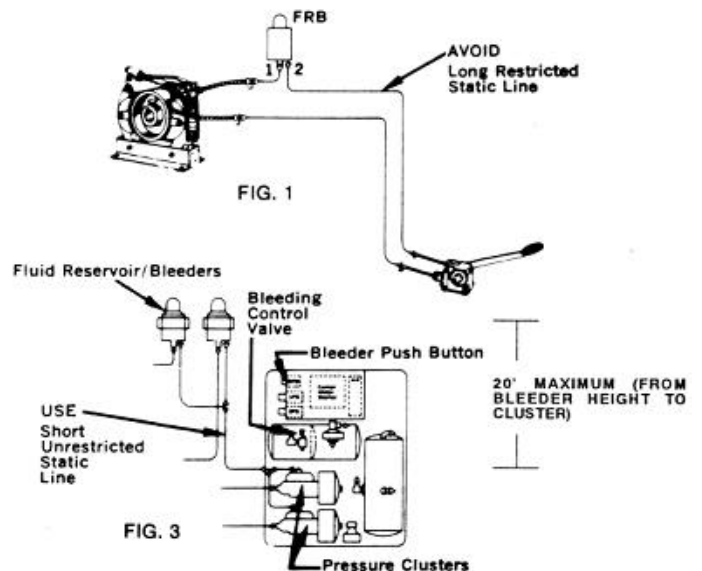
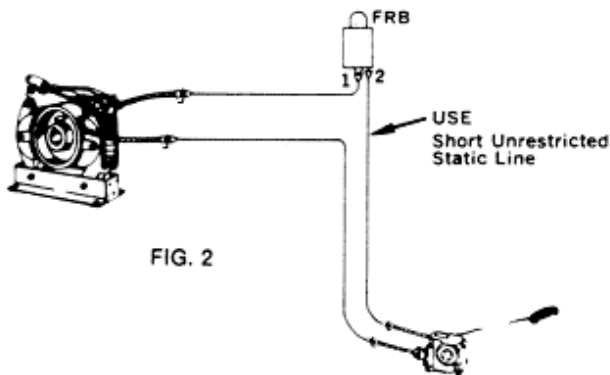
FLUID RESERVOIR/BLEEDER ASSEMBLY		
	<p>PSD0180101 230V DC 45W (J3080)</p> <p>PSD0180100 110V 50/60HZ 45VA (J3083)</p> <p>PSD0180102 NONE: Manually operated. (J70806)</p>	<p>BPB Bleeder Pushbutton Operator (For J3080 • J3083 Assys.) Part No. J-10008</p> <p>OIL TIGHT, surface mounted enclosure with one normally open momentary contact.</p>
	<p>Approximate Fluid Capacity...2$\frac{1}{3}$ qts. Net Weight (without fluid).....9 lbs.</p> <p>This Assembly is compatible with 21B Brake Fluid, or equivalent.</p>	<p>4-MTG Holes For 10-32 Screws</p> <p>3/4-14 Conduit Entrance</p>

The fluid reservoir/bleeder (FRB) assembly is needed in all industrial brake systems:

1. To supplement the control cylinder reservoir on manually operated brake systems or the pressure cluster reservoir on air power hydraulic-operated brake systems.
2. To compensate for the normal height of the brakes above the control cylinder, keeping the brake line full of fluid at all times.
3. To serve as a valuable tool when bleeding the system during installation and maintenance.

FRB INSTALLATION

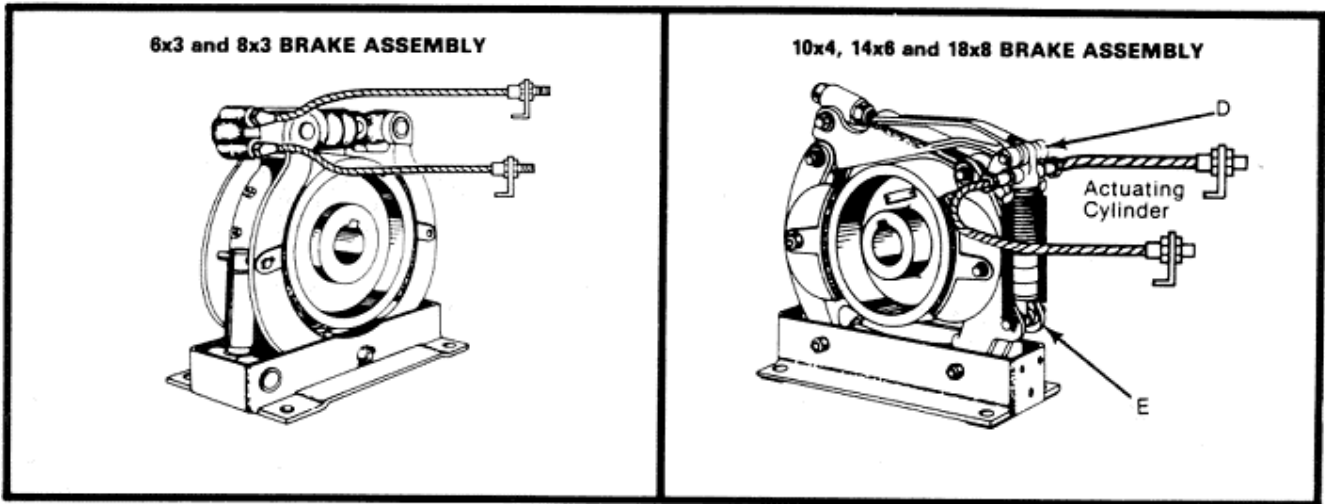
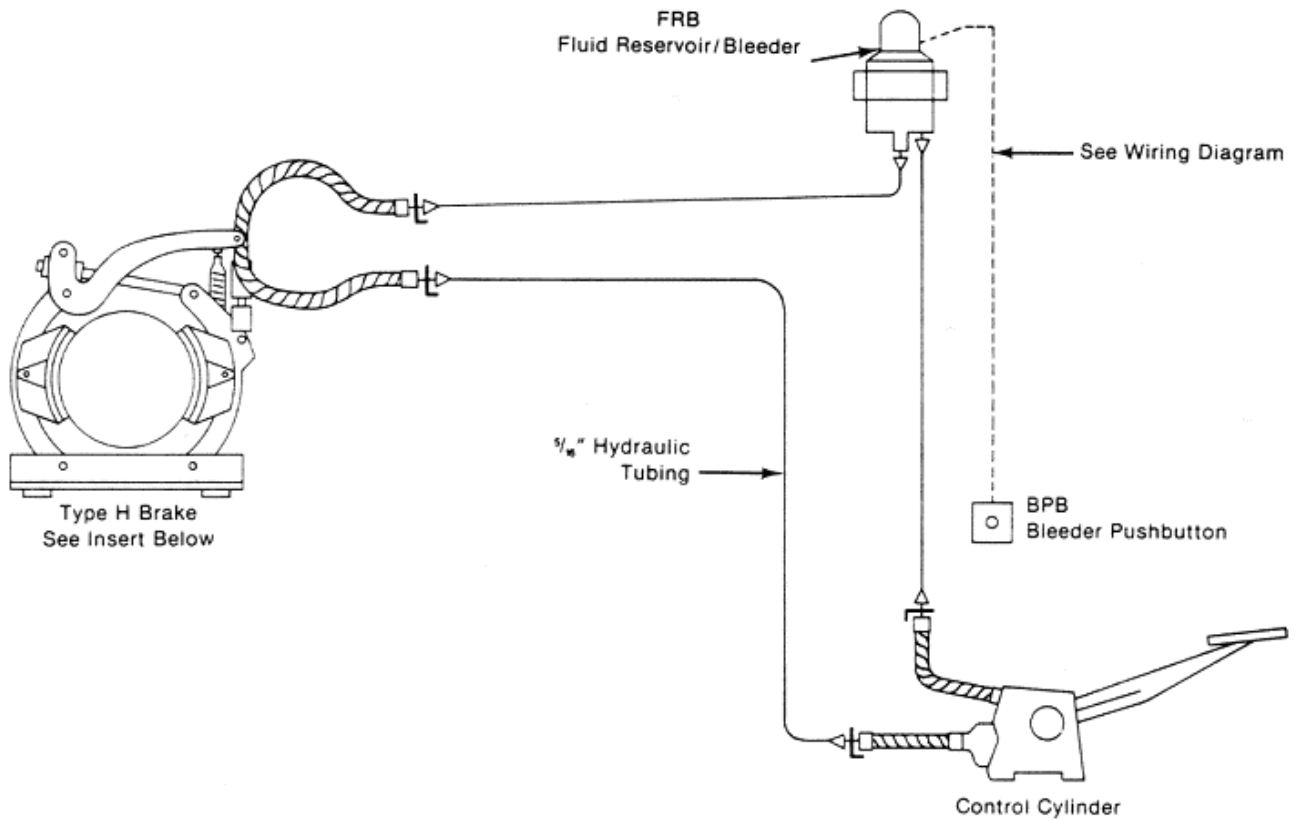
1. Locate the FRB assembly at the highest point in the hydraulic system.
2. Only gravity forces fluid flow in the static return line from the bleeder reservoir to the master cylinder reservoir. Minimize restrictions in this line. Avoid long horizontal static return lines as per Figure 1.



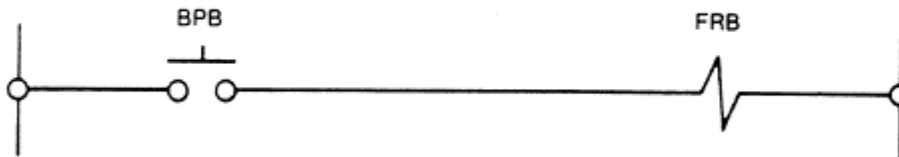
3. Locate the FRB assembly so that the static return line is as short and direct as possible. Manual brake systems should be arranged per Fig. 2. Air power brake system should be arranged per Fig. 3.
4. If the FRB assembly is electrically operated (J-3080 or J-3083), connect to bleeder pushbutton (BPB) in cab if manual hydraulic system or on panel if air power hydraulic system. Refer to applicable wiring diagram.

INSTALLATION INSTRUCTIONS

Type H One Brake, One Station System Piping & Wiring Diagram

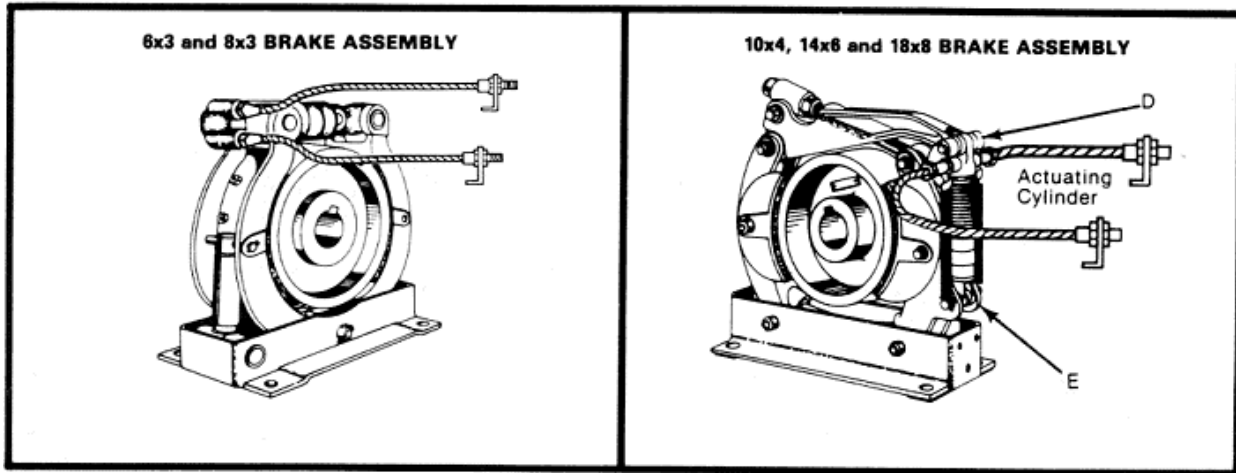
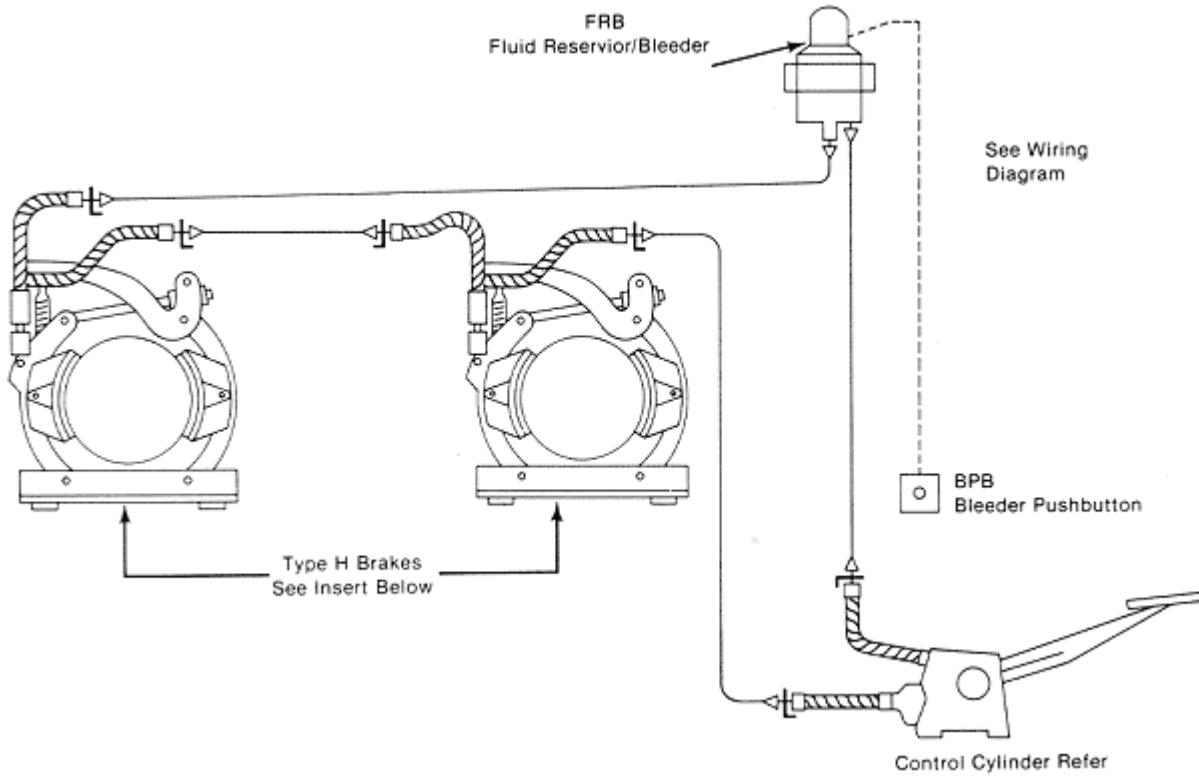


WIRING DIAGRAM FOR 230 V DC OR 115V 50/60 HZ AC FRB

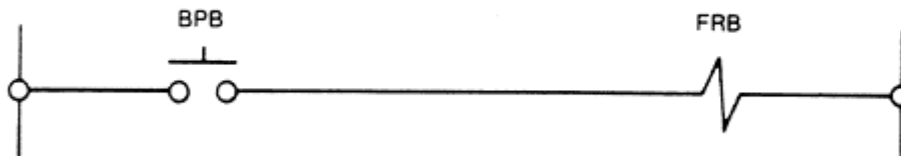


INSTALLATION INSTRUCTIONS

Type H Two Brake, One Station System Piping & Wiring Diagram



WIRING DIAGRAM FOR 230 V DC OR 115V 50/60 HZ AC FRB



INSTALLATION INSTRUCTIONS

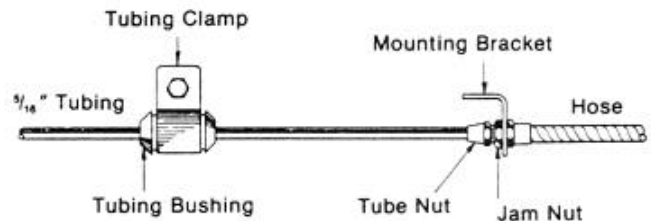
Type H Tubing

TUBING INSTALLATION

1. Refer to applicable system piping diagram. After all system components are mounted, plan layout of hydraulic tubing:
 - a. The length of the pressure line from the control cylinder, or pressure cluster, to the brake and to the FRB fluid reservoir/bleeder is not critical; however, horizontal lines should preferably slope up toward the bleeder to aid movement of air out of the hydraulic system. Avoid any tubing humps, loops or coils, which trap pockets of air.
 - b. The static return line from the FRB reservoir to the control cylinder or pressure cluster should be as short and as direct as possible to aid the gravity flow of fluid. Avoid any tubing humps, loops or coils, which could cause enough restriction to block normal flow of fluid and starve the control cylinder or pressure cluster.

2. Industrial Hydraulic Systems use 5/16" OD copper tubing. Support tubing every 3 feet with tube bushings and tube clamps.

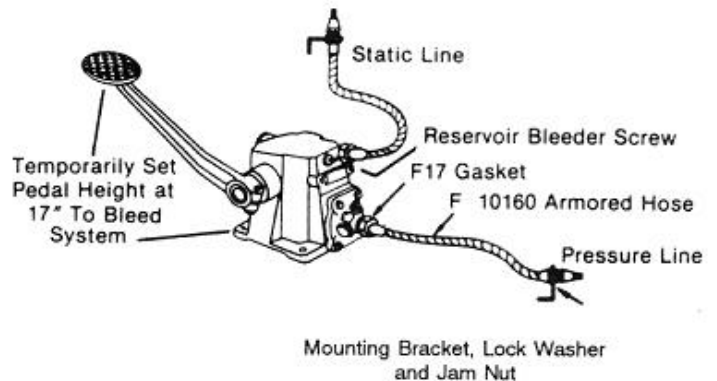
Eliminate tubing kinks or deformities, which could restrict fluid flow.



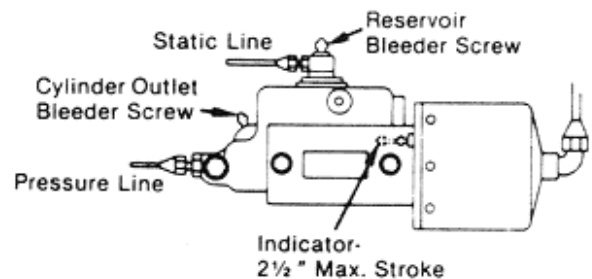
3. Install F-86 tube nut and make 45° flare at each hose or component connection or at tube unions. Do not permit tubing chips, dirt or other foreign matter to enter tube line. Make fluid-tight connection at every tube nut.

FILL HYDRAULIC BRAKE SYSTEM

1. Fill system using ONLY 21B Super Heavy Duty Brake Fluid or equal. The use of fluid other than SAE J1703 will cause the seals to swell and be damaged.
2. Fill FRB reservoir full (capacity is approximately 2-1/3 qts. or 113 in³).
3. Reservoirs of the control and/or pressure cluster are filled by opening the reservoir bleeder screws on the respective assemblies. This allows air to escape and fluid to fill the control cylinder and/or pressure cluster reservoir from the FRB reservoir. Keep FRB reservoir full. Do not allow it to run dry. Close bleeder screws after all air is vented and only clear fluid escapes.
4. The static hydraulic system is now completely full. Refill FRB reservoir.



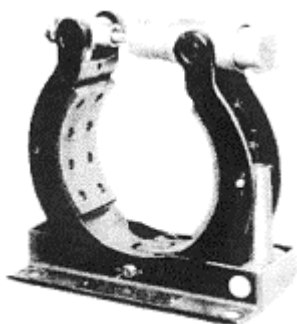
TYPE 2 CONTROL CYLINDER



PRESSURE CLUSTER

SERVICING INSTRUCTIONS

6 x 3 and 8 x 3 Type H Brakes



8" x 3" Type H Brake.

BRAKE RELINING INSTRUCTIONS

Replace brake lining when it is worn to 3/16" thick.

Remove clamp nut 16 and adjusting nut 15 and anti-drag hinge pin 11. Open the brake arms and remove the lining bolts and nuts and lining

* Use new J387 lining bolt and nuts when replacing the lining. Reassemble hinge pin 11 and nuts 15 & 16.

BRAKE ADJUSTMENT

The brake is adjusted with clamp nut 16 loose. Turn adjusting nut 15 wrench tight, with brake lining clamped against the wheel. Then back off adjusting nut two and one half turns and tighten clamp nut. This provides approximately 1/32" brake wheel-to-lining clearance.

TYPE H HYDRAULIC ACTUATOR REMOVAL AND SERVICE

Loosen and remove clamp nut 16 and adjusting nut 15. Tap out hinge pin 8 and remove cylinder from brake.

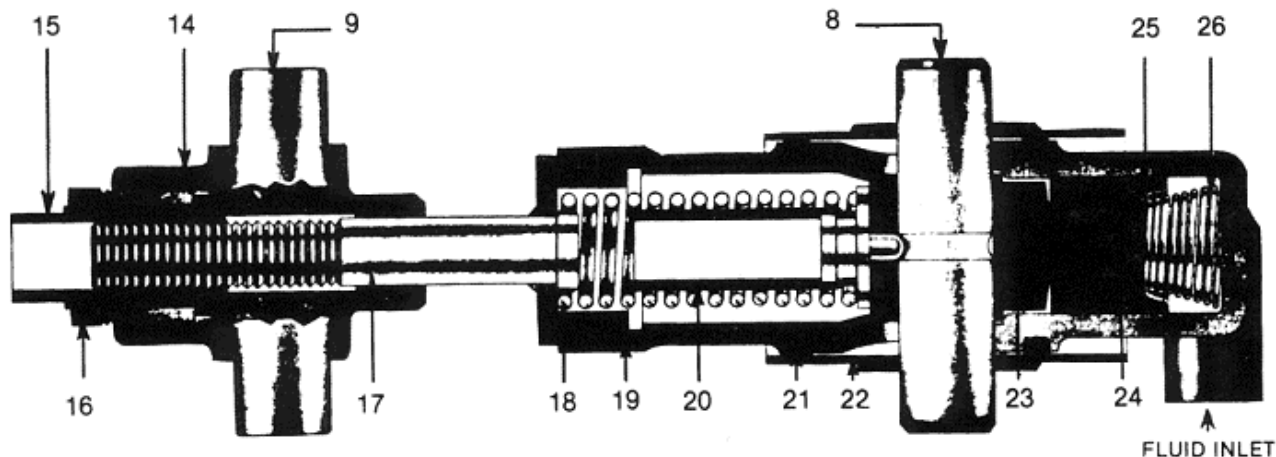
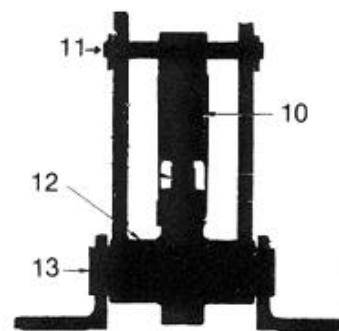
To disassemble cylinder, slide cylinder cover 22 off the body. Unscrew connecting rod 17, being careful that return spring 18 does not force cylinder and connecting rod apart. Remove return spring, spring guide 20, pin guide 23, piston 24, cup 25 and spring 26. Replace complete J7841 actuator, 17-26, if cylinder walls are scratched or pitted. If rebuilding actuator, discard items 21, 24, 25, and 26. Wash remaining parts in denatured isopropyl alcohol. Before reassembly dip all parts in Super Heavy Duty Brake Fluid. Reassemble in reverse order.

ANTI-DRAG ASSEMBLY SERVICE

The anti-drag assembly, 10-13, maintains 1/32" clearance between the attached shoe and lining and the brake-wheel, regardless of lining wear. If the brake is adjusted correctly, the opposite lining clearance is 1/32" and the brake cannot drag.

The anti-drag assembly is prelubricated and no maintenance is required.

If service is necessary, J105190 Anti-Drag Kit is available, which includes a 9414 retractor spring assembly 10, 9429 pin 11, 9428 anti-drag housing 12, and 9423 pin 13.



Cross-section drawing of hydraulic actuator assembly

* As of January 1993 brake assemblies and replacement shoes have bonded linings. These bonded shoes can be rebonded. Additionally rivet type replacement linings can still be purchased for use with old style rivet shoes/linings.

SERVICING INSTRUCTIONS

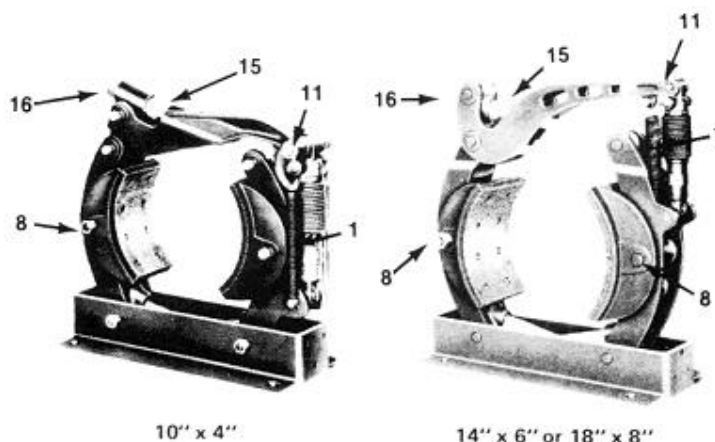
10 x 4, 14 x 6 And 18 x 8 Type H Brakes

BRAKE SHOE RELINING INSTRUCTIONS

To remove brake shoes, remove adjusting nut (16), unhook return spring or springs (1), and remove cylinder pin (11). Open brake arms. If necessary, remove inner adjusting nut (15) to permit lever to pass through slot in lever arm. Remove shoe pins (8) and slide shoes over top of brake wheel.

Replace lining and reassemble brake.

* Brake lining should be replaced before it has worn down to the heads of the brass lining bolts. This will be when the remaining thickness is approximately 1/4" on 10" and 14" brakes and 3/8" on 18" brakes.



ADJUSTMENT

Loosen nut (15) and tighten nut (16) until shoes are against brake wheel. Loosen nut (16) three turns and tighten nut (15). Clearance between lining and brake wheel should then be 1/32". If clearance on each side of brake wheel is unequal after this adjustment, adjust self-centering device at lower end of left brake arm.

The self-centering device on current brakes is adjusted by a 7/16" hex and locked by a 7/8" nut. Turning the hex clockwise moves both shoes to the right. Old style brakes that use an Allen head adjustment should be converted to the current self-centering device by using a J87249 Shoe-Centering Lock Kit.

The hinge pins on the brake are grease lubricated at the factory. The pins should be sparingly relubricated at the seven fittings using a good grade of light bearing grease that will withstand over 200° F. Wipe off any excess grease.

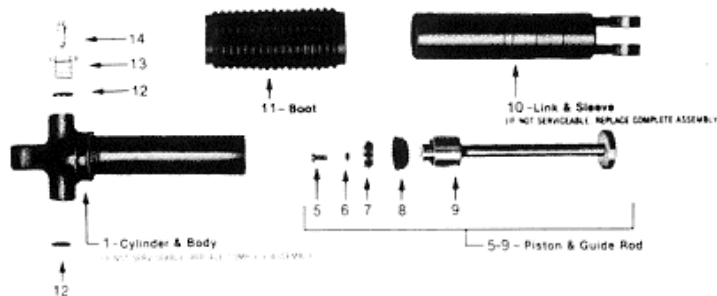


SERVICING THE HYDRAULIC BRAKE CYLINDER

The hydraulic brake cylinder should be replaced or repaired if there is any evidence of brake fluid leaking around the boot. To remove the cylinder, disconnect the hydraulic lines at the hose connections and temporarily cap the lines to prevent loss of brake fluid. Remove the brake cylinder from the brake hoses if they will be replaced or if the brake cylinder will be replaced.

To service the brake cylinder, remove boot (11) and separate the cylinder and body (1) from the link and sleeve (10). Pull the piston and guide rod assembly (5-9) out of the cylinder. If inspection of the cylinder bore shows that it is smooth with no pits or scratches, the assembly may be serviced with a repair kit, which includes items 5-9 and 11. If necessary, replace the brake cylinder.

Before replacing or repairing the brake cylinder, inspect the cup (8). If it is enlarged or very soft, the system may



be contaminated with mineral oil and must be flushed with brake fluid or denatured isopropyl alcohol. Never flush system or clean parts with gasoline, kerosene, cleaning solvent or lubricant.

Prior to reassembly, lubricate parts with brake fluid. Replace cylinder on brake, reconnect hoses and tubing, and rebleed brake system.

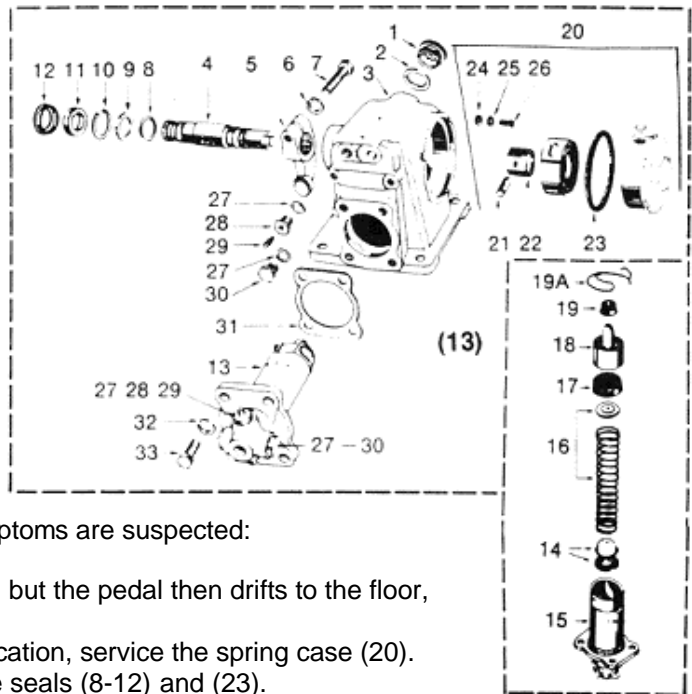
* As of January 1993 brake assemblies and, replacement shoes have bonded linings. These bonded shoes can be rebonded. Additionally rivet type replacement linings can still be purchased for use with old style rivet shoes/linings.

SERVICING INSTRUCTIONS

Type H Control Cylinders



CONTROL CYLINDER
(WITH PEDAL ASSEMBLY)



Service the control cylinder if one or more of the following symptoms are suspected:

1. If normal pedal force and stroke develops braking pressure, but the pedal then drifts to the floor, service the head and barrel (13).
2. If the pedal will not return to normal height after brake application, service the spring case (20).
3. If brake fluid leaks past the shaft or the spring case, replace seals (8-12) and (23).
4. If the supply tank (3) appears defective, discard and replace complete assembly.

When servicing the assembly, always refer to the nameplate assembly number on top of the supply tank.

Note that only 1-1/2" and 1-3/4" diameter assemblies are now available. Two-inch diameter assemblies are no longer manufactured.

SERVICING THE HEAD AND BARREL ASSEMBLY (13)

Temporarily block fluid supply from Fluid Reservoir/Bleeder and drain fluid from the supply tank (3). Remove four stud bolts and head and barrel assembly (13). Clamp barrel lightly in vise in vertical position with piston end up. Remove stop wire (19A), support ring (19), piston (18), cup retainer (17), return spring (16), and valve and valve seat (14). Clean cylinder using only brake fluid or isopropyl alcohol. **Do not** use gasoline, cleaning solvent or mineral oil. Bypass port holes must not be clogged. If cylinder bore is scratched or pitted, discard and replace head and barrel assembly.

Reassemble head and barrel in reverse order using all new parts (14, 16-19A) from Head and Barrel repair kit. Lubricate parts with 21B Brake Fluid. Clean residual fluid from supply tank reservoir and reinstall head and barrel using new head gasket (31). Make sure that piston push rod aligns with socket on lever (5).

SERVICING THE SPRING CASE ASSEMBLY (20)

If the pedal will not return to normal height, loosen the three screws (26) and apply 125-175 in-lb counterclockwise torque to the spring case (20). Tighten screws. If this does not help, the clock spring may be defective. Loosen screws and unwind the spring case clockwise, remove the screws and spring case. The spring case is serviced as a J17626 kit including items 20-26. Note that a new spring case includes a 1-1/4" hex for tightening with standard wrench. A J73923 gasket kit is also available including only items 23-26.

To reassemble, lubricate gasket (23) with brake fluid and slide over spring case (20). Insert assembly into supply tank (3) while rotating to engage pin (21) to slot in shaft (4). Attach three lock washers, case washers and screws loosely. Use wrench to wind spring counterclockwise to 125-175 in-lb torque. Tighten the screws and check torque by installing pedal with pad 14-15" above floor. With head and barrel (13) in place, depressed pedal must return to original height.

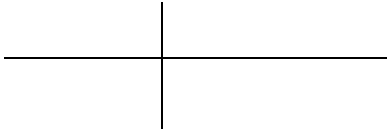
SERVICING THE SHAFT SEAL (8-12)

Remove retainer, felt seal, snap ring, retainer plate and "O" ring. Use new parts (8-12) from J10799 shaft kit. Dip "O" ring and felt seal in brake fluid and reinstall in reverse order.

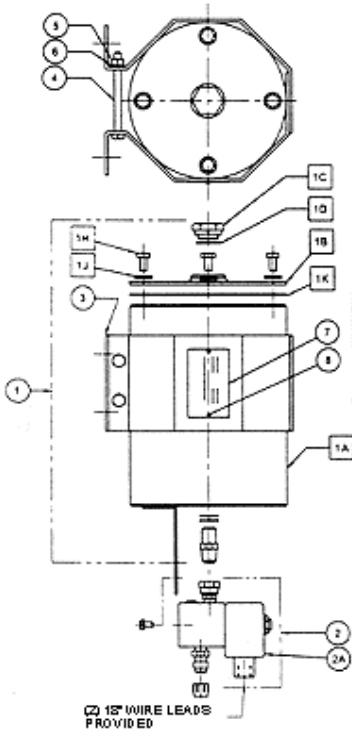
SERVICING INSTRUCTIONS

Type H Fluid Reservoir/Bleeders

(FRB) Fluid Reservoir/Bleeder Assembly



COMPONENT PARTS LIST AND DIAGRAM

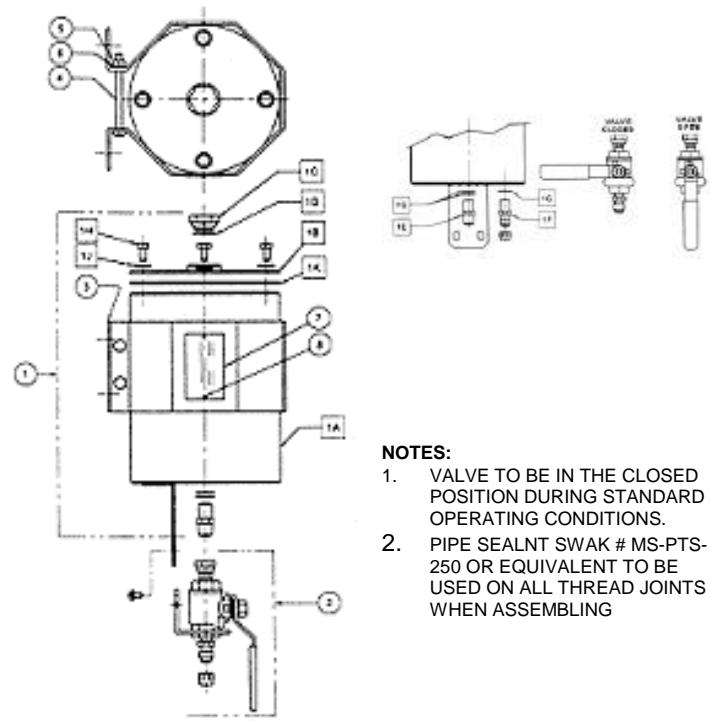


NOTE:
PIPE SEALANT SWAK # MS-PTS-250 OF EQUIVALENT TO BE USED ON ALL THREAD JOINTS WHEN ASSEMBLING

(FRB) Fluid Reservoir/Bleeder Assembly

Assembly No.	Solenoid Voltage
PSD-0180102	Manual Operated

COMPONENT PARTS LIST AND DIAGRAM



- NOTES:**
1. VALVE TO BE IN THE CLOSED POSITION DURING STANDARD OPERATING CONDITIONS.
 2. PIPE SEALNT SWAK # MS-PTS-250 OR EQUIVALENT TO BE USED ON ALL THREAD JOINTS WHEN ASSEMBLING

CHART 1

2	PSD-0179900	VALVE AND SOLENOID ASSEMBLY – 120 VAC	1
2	PSD-0179901	VALVE AND SOLENOID ASSEMBLY – 240 VDC	1
2A	02546003	SOLENOID (COIL BODY ONLY) – 120 VAC	1
2A	02546004	SOLENOID (COIL BODY ONLY) – 240 VDC	1
8	9990266200	SCREW DRIVER "U" SIZE 4 X 3/16" LG	2
7	J010457999	NAMEPLATE FRB UNIT	1
6	9012038000	LOCKWASHER SPLIT 1/4"	2
5	9010302400	NUT HEX FIN JAM 1/4-28	2
4	9010000800	BOLT HEX HD 1/4-28 X 3" LG	2
3	J00848006	CLAMP REMOTE BLEEDER ASSEMBLY	1
2	PSD-01799**	SEE CHART 1	1
1K	PS-0004500	GASKET-COVER FRB UNIT	1
1J	04563096	FLATWASHER 1/4" 18-8 SS	4
1H	05P003045103	SCREW HEX HD CAP 1/4-20 X 1/2" LG 18-8 SS	4
1G	F000017998	GASKET COPPER .52 ID X .70 OD X .03 THK	3
1F	J000269006	FITTING OUTLET 5/16" TUBE BRASS	1
1E	F011955006	ADAPTER FITTING 1/2-20 MALE TO 1/4" NPT MALE	1
1D	F005228998	GASKET COPPER	1
1C	F005227999	FILLER CAP	1
1B	PSD-0179700	COVER WELDMENT – FRB UNIT	1
1A	PSD-0179600	SUPPLY TANK WELDMAN – FRB UNIT	1
1	PSD-0179800	RESERVOIR ASSY FRB UNIT	1
ITEM	PART NO.	DESCRIPTION	QTY

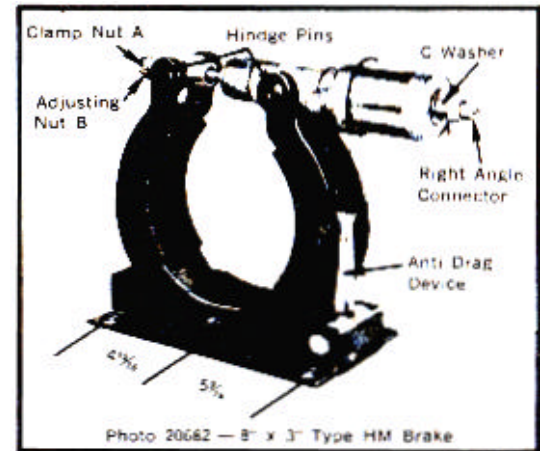
8	9990266200	SCREW DRIVER "U" SIZE 4 X 3/16" LG	2
7	J010457999	NAMEPLATE FRB UNIT	1
6	9012038000	LOCKWASHER SPLIT 1/4"	2
5	9010302400	NUT HEX FIN JAM 1/4-28	2
4	9010000800	BOLT HEX HD 1/4-28 X 3" LG	2
3	J00848006	CLAMP REMOTE BLEEDER ASSEMBLY	1
2	PSD-0179902	SEE CHART 1	1
1K	PS-0004500	GASKET-COVER FRB UNIT	1
1J	04563096	FLATWASHER 1/4" 18-8 SS	4
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1D	F005228998	GASKET COPPER	1
1C	F005227999	FILLER CAP	1
1B	PSD-0179700	COVER WELDMENT – FRB UNIT	1

INSTALLATION INSTRUCTIONS

6 x 3 And 8 x 3 Type HM Brake Assemblies

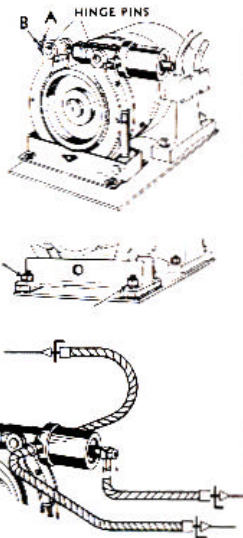
Before installing this brake assembly, please take note:

- A. These instructions show normal floor-mounted installation. This brake may alternately be wall- or ceiling-mounted if necessary.
- B. **The brake mounting holes are not equal distances from the brake center.** Mounting holes on the anti-drag side are 5-9/16" from the brake pin center. Mounting holes opposite the anti-drag side are 4-15/16" from the brake pin center. **Be sure to position the brake over the correct mounting holes.**
- C. The brake must be installed with the actuator and hinge pins parallel with the brake base. If necessary, reposition brake by forcing against anti-drag friction.
- D. The brake was correctly adjusted during factory inspection. Since this brake includes spring set parking, the clamp nut A and adjusting nut B must be backed off to install brake on wheel.
- E. A right angle connector assembly should be installed at the parking cylinder port. The inlet fitting may be rotated to any position and tightened.
- F. The C washer below the parking cylinder port is held tight against the spring barrel end by parking spring force.



BRAKE INSTALLATION

1. Install brake wheel.
2. Loosen clamp nut A and adjusting nut B enough to slip brake over wheel.
3. Tighten adjusting nut B until shoes make firm contact with wheel. Do not tighten further. Final brake adjustment is made after brake is operational.
4. With brake base parallel with actuator (per item C above), and with brake wheel and brake pin center lines perpendicular, add shims between brake base and brake platform. Attach base with 5/8" bolts.
5. Using F-17 copper gasket seals, screw short thread end of armored hoses into all three actuator ports. Wrench tighten to provide leak-proof seals.
6. Use mounting brackets, lock washers and jam nuts provided to attach free end of hose to rigid support. Allow hose slack to permit movement of actuator.
7. The brake is now ready to be piped into the hydraulic system.



FINAL BRAKE ADJUSTMENT

- After brake system is completely connected, filled with brake fluid, and thoroughly bled, step down hard on brake pedal. Green signal light should go "ON," indicating that the parking brake is released. Release brake pedal. The C washer just below the parking cylinder port (see item F above) should now be away from the spring barrel end because the parking spring is now compressed.
1. Retighten adjusting nut B to clamp shoes tight against the brake wheel.
 2. Loosen nut B two and one half turns and tighten clamp nut A.
 3. Both shoes should now be approximately 1/32" from the brake wheel.
 4. The brake is now properly adjusted. Check service brake and parking brake operation

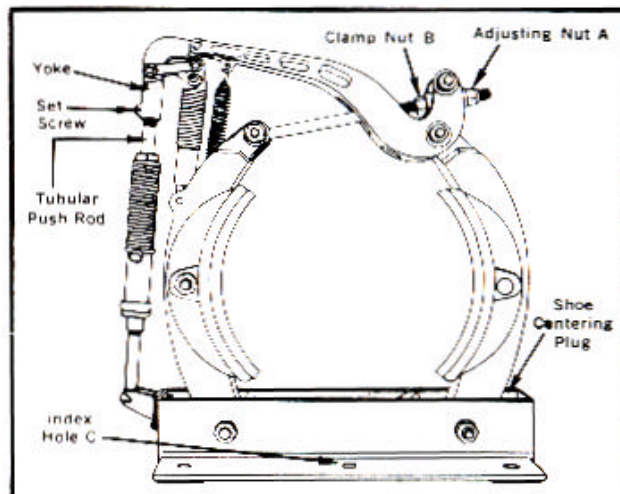
Follow "Final Brake Adjustment" instructions when readjustment is necessary to compensate for lining wear.

INSTALLATION INSTRUCTIONS

10 x 4, 14 x 6 And 18 x 8 Type HM Brake Assemblies

Before installing this brake, note the following features:

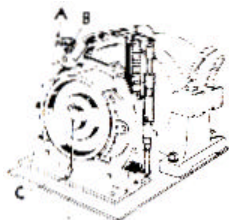
- This brake is suitable for floor mounting only.
- The brake shoes are adjusted by nut A and clamped by nut B.
- A shoe-centering plug is at the base of the shoe arm opposite the brake actuators.
- An Allen head set screw clamps the tubular push rod in the yoke.
- Index hole C is in the center of the brake base.
- The brake assembly is completely adjusted after inspection at the factory.
- Spring force of the parking cylinder applies the 10x4 HM brake, and adjusting nut A must be loosened to slip the brake over the wheel. Spring force of the parking cylinder on 14x6 and 18x8 HM brakes has been temporarily relieved by disconnecting the parking cylinder at the bottom bracket.



- Do not** alter the centering adjustment or the tubular push rod adjustment, nor attach the parking cylinder to the bottom bracket on 14" and 18" brakes until "Final Adjustment" steps.

BRAKE INSTALLATION

- Install the brake wheel.
- 10x4 Brake.** Loosen adjusting nut A enough to slip the brake over the wheel. Slip brake over wheel and tighten nut A until shoes are clamped firmly against the wheel. Note that the shoes will clamp the wheel before nut A reaches original position because the parking cylinder is extended. Additional tightening is not necessary at this time.



- 14x6 and 18x8 Brakes.** Free parking cylinder from bottom bracelet to eliminate all application force. Slip brake over wheel. Loosen clamp nut B and tighten nut A until shoes are clamped firmly against the wheel. Do not attach the parking cylinder to the bottom bracket until "Final Brake Adjustment" steps.

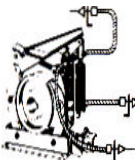
Final adjustments and inspections are made after the brake is hydraulically operational. The brake should remain firmly clamped against the wheel throughout the remaining installation steps.

- Level brake base by plumbing center of brake wheel shaft to index hole C in the base of the brake.

- Add shims between the brake base and support. Bolt brake base to support.



- Using F-17 copper gasket seal, screw short threaded end of armored hoses into both actuating cylinder ports and in parking cylinder port. Do not remove bleeder screw and adaptor from the second port on the parking cylinder unless a second brake is being used. See piping diagram. Wrench tighten hoses to provide leak-proof seals.

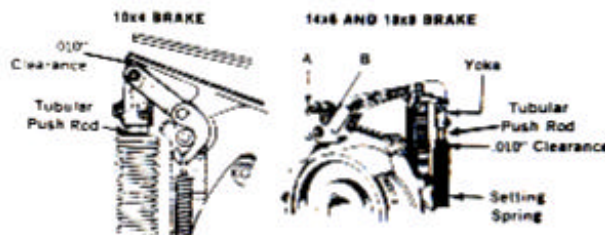


- Use mounting bracelets, lock washers and jam nuts provide to attach free end of hose to rigid support. Allow hose to slack to permit movement of actuator.

- The base is now ready to be piped into hydraulic system.

FINAL BRAKE ADJUSTMENT

- After brake system is completely connected, filled with brake fluid and thoroughly bled, operate system to fully compress the parking cylinder. (a) On HM manual cab-operated systems, step down hard on brake pedal and turn parking switch until Green light is "ON." Release brake pedal. Green light should stay "ON." (b) On AHM-HRC air-powered cab-controlled systems, turn parking switch until Green light is "ON." (c) On AHM-ERC remote-controlled systems, power "ON" will automatically compress parking cylinder. Parking cylinder should remain fully compressed during steps 2-7.
- Install pin to connect parking cylinder to bottom bracket on 14" and 18" brakes.
- Turn clamp nut B free and tighten adjusting nut A to clamp brake shoes firmly against the brake wheel.
- Back off adjusting nut A three turns and tighten clamp nut B.
- Both brake shoes should now be approximately 1/32" from the brake wheel. If both shoes are not an equal distance from the wheel, adjust self-centering mechanism. (See item C above.)
- With parking brake still fully released, recheck tubular push rod adjustment to be sure that parking cylinder force does not bear against the top brake lever. There must be clearance as follows:



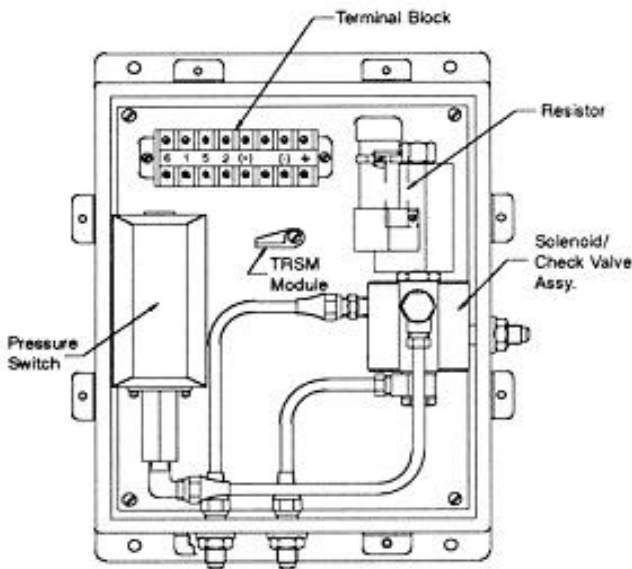
If necessary, loosen set screw and adjust tubular push rod to give indicated .010" clearance and tighten set screw.

- The brake is now properly adjusted. Check service brake and parking brake operation.

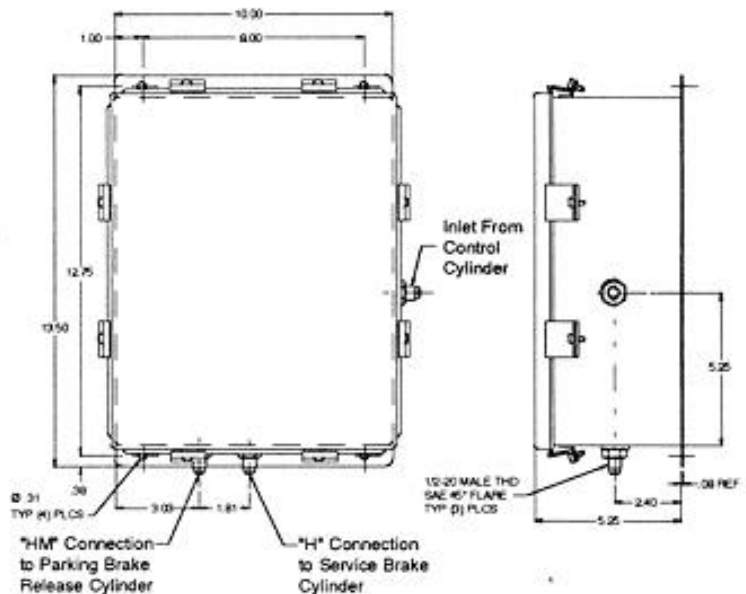
Follow above instructions when readjustment is necessary to compensate for lining wear.

INSTALLATION INSTRUCTIONS

Type HM Parking Brake Control Unit J107206



FRONT VIEW: COVER REMOVED



HOW THE CONTROL UNIT WORKS

This control unit controls the parking brakes in the Type HM brake system. Fluid is forced through the control unit to the brake cylinders. Fluid displaced to the service cylinders applies the service brakes and fluid displaced to the parking brake release cylinders releases the parking brake. When pressure at the control unit inlet port is relieved, the service brakes release; but the fluid in the lines to the releasing cylinders is trapped by the energized check valve in this control unit. When sufficient pressure (400 psi) is built up and trapped in the releasing cylinders, the pressure switch in this control unit closes. This energizes the signal light in the cab and permits the drive motor to be started. When power to this control unit is interrupted, pressure is relieved from the releasing cylinders and the parking brakes are automatically applied by spring force.

Normal brake operation with this control unit energized tests the proper operation of the control unit. Any visible fluid leaks will prevent proper operation and must be repaired to prevent the parking brakes from applying when a good magnetic check valve is energized. The coil used in the check valve is factory preconnected for 230VDC operation. The coil leads must be reconnected at the terminal board for operation at 115V, 50/60 Hz. The rectifier converts 115VAC to 115VDC coil voltage when connected for AC operation. This same rectifier protects the coils from high voltage as is sometimes generated when 230VDC power is interrupted.

INSTALLATION

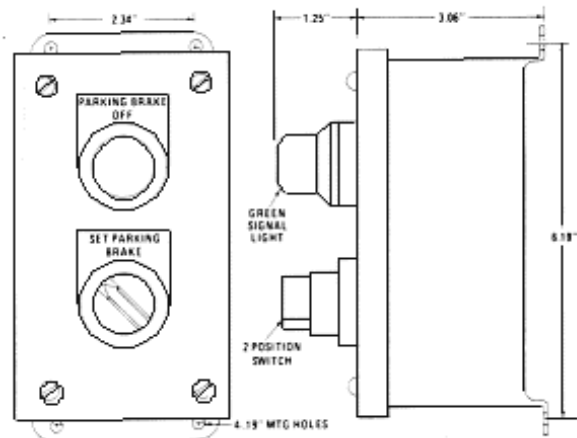
Mount the control unit on the bridge on a rigid vertical surface. On single brake systems, locate the unit near the brake. On 6" and 8" double brake systems, locate the unit midway between the two

PARKING SWITCH AND LIGHT J45767

The parking switch provides operator control of the magnetic check valve in the HM control unit.

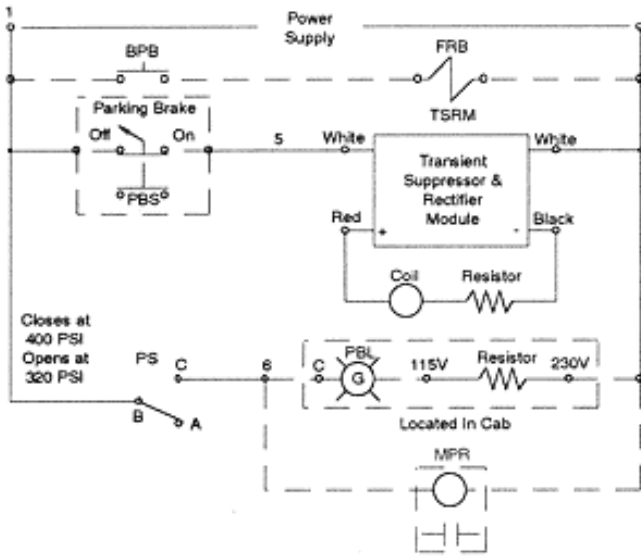
The green signal light is controlled by the pressure switch in the control unit. The signal light assembly uses a standard 115V bulb. A resistor is included for 230V.

Install the parking switch and light in the cab, convenient to the operator. Connect electrical units per applicable diagram.



INSTALLATION INSTRUCTIONS

Type HM Parking Control Unit Wiring Diagram



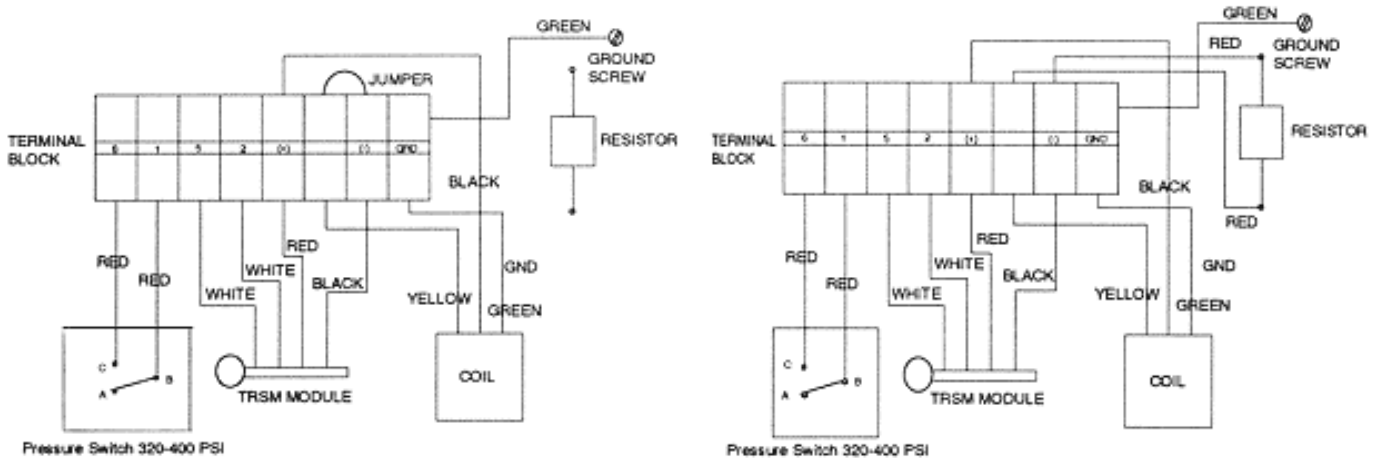
FRB Fluid Reservoir/Bleeder (On Crane)

TSRM Transient Suppressor and Rectifier Module must be connected in circuit at all times. The module will protect the solenoid check valve coils by suppressing voltage surges that can occur in DC power supplies. The module operates as a full wave rectifier when the power supply is 115VAC.

SCV Solenoid Check Valve. Subpart of J107206 HM Control Unit ①

PBL Parking Brake Light. Subpart of J45767 switch and light in cab. Connect as shown for 230V power supply. Use 115V terminal if 115V power supply used.

MPR Motor Pilot Relay. Supplied by customer. Connect contacts to prevent drive motor operation until hydraulic pressure switch is closed.



① **NOTE:** HM control unit is pre-wired for 230V DC operation. If the power supply is 115VAC, the solenoid coil must be re-wired as shown above.

BPB Bleeder Pushbutton. J10008 in cab.

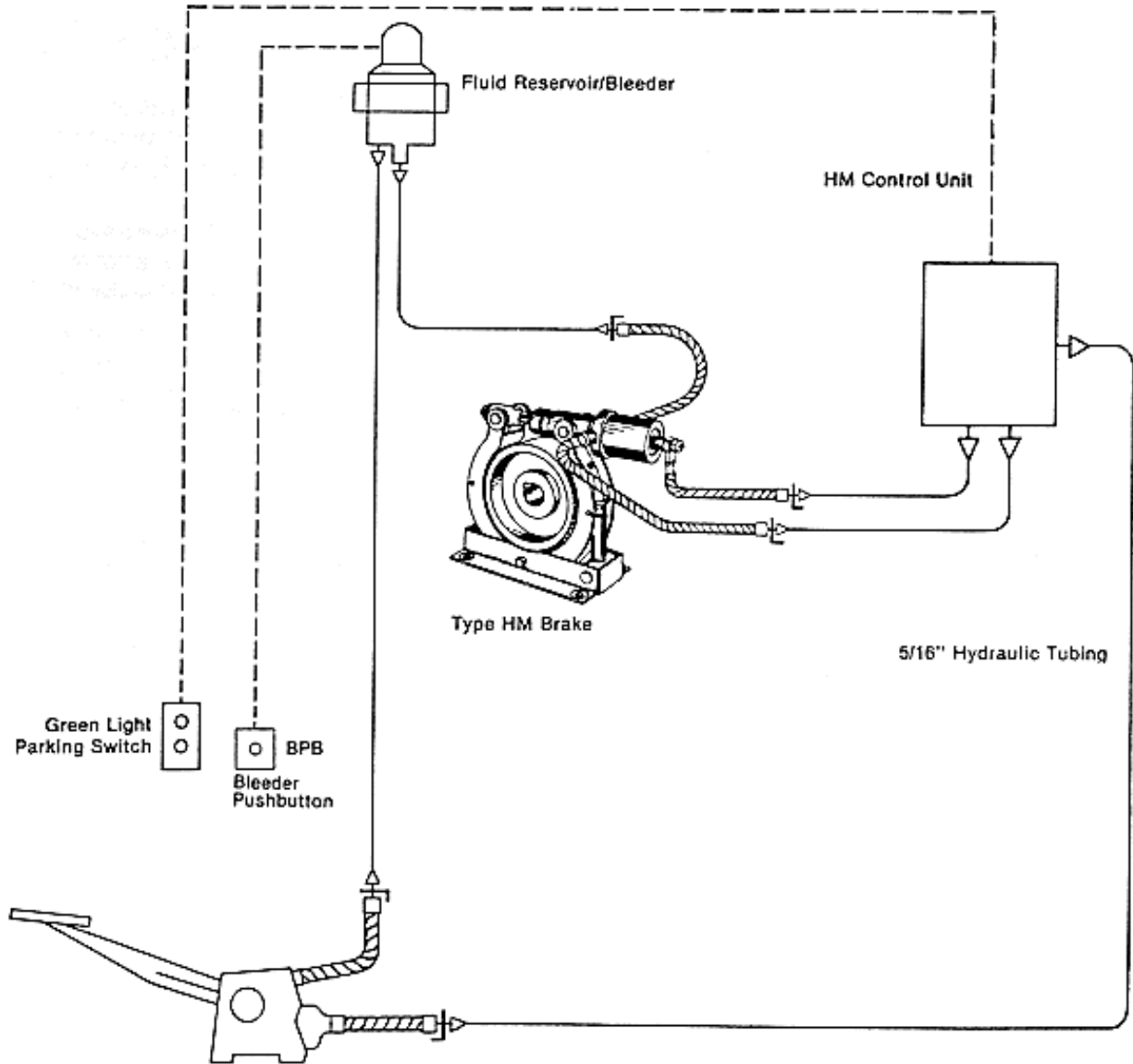
PBS Parking Brake Switch. Sub part of J45767 Switch and Light Assembly. Connect “Normally Closed” terminals so that the TSRM and solenoid check valve are energized to keep the parking brake off when the selector switch is in the “OFF” position and the parking brake is on when the switch is in the “ON” position.

If a “2 station” system is used, use two switch and light assemblies and connect the N.C. and N.O. contacts as a SPDT switch. Block out “OFF” and “ON” legends.

PS Pressure Switch. Subpart of J107206 HM Control Unit. B and C contacts are preconnected for Normally Open switch operation. Switch must be adjusted so that contacts close at 400 psi and open at 320 psi hydraulic pressure.

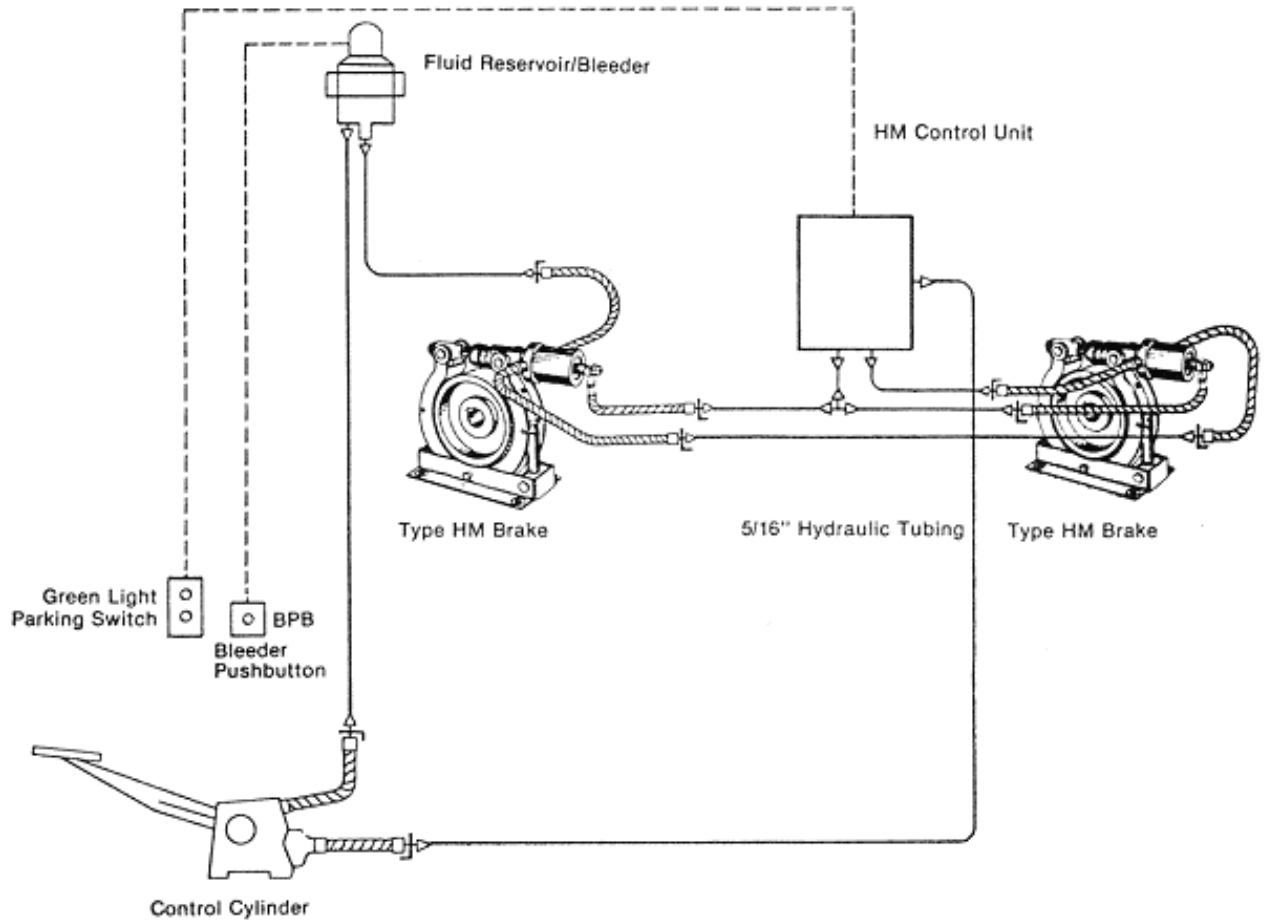
INSTALLATION INSTRUCTIONS

6 x 3 And 8 x 3 Type HM One Brake, One Station Piping Diagram



INSTALLATION INSTRUCTIONS

6 x 3 And 8 x 3 Type HM Two Brake, One Station Piping Diagram

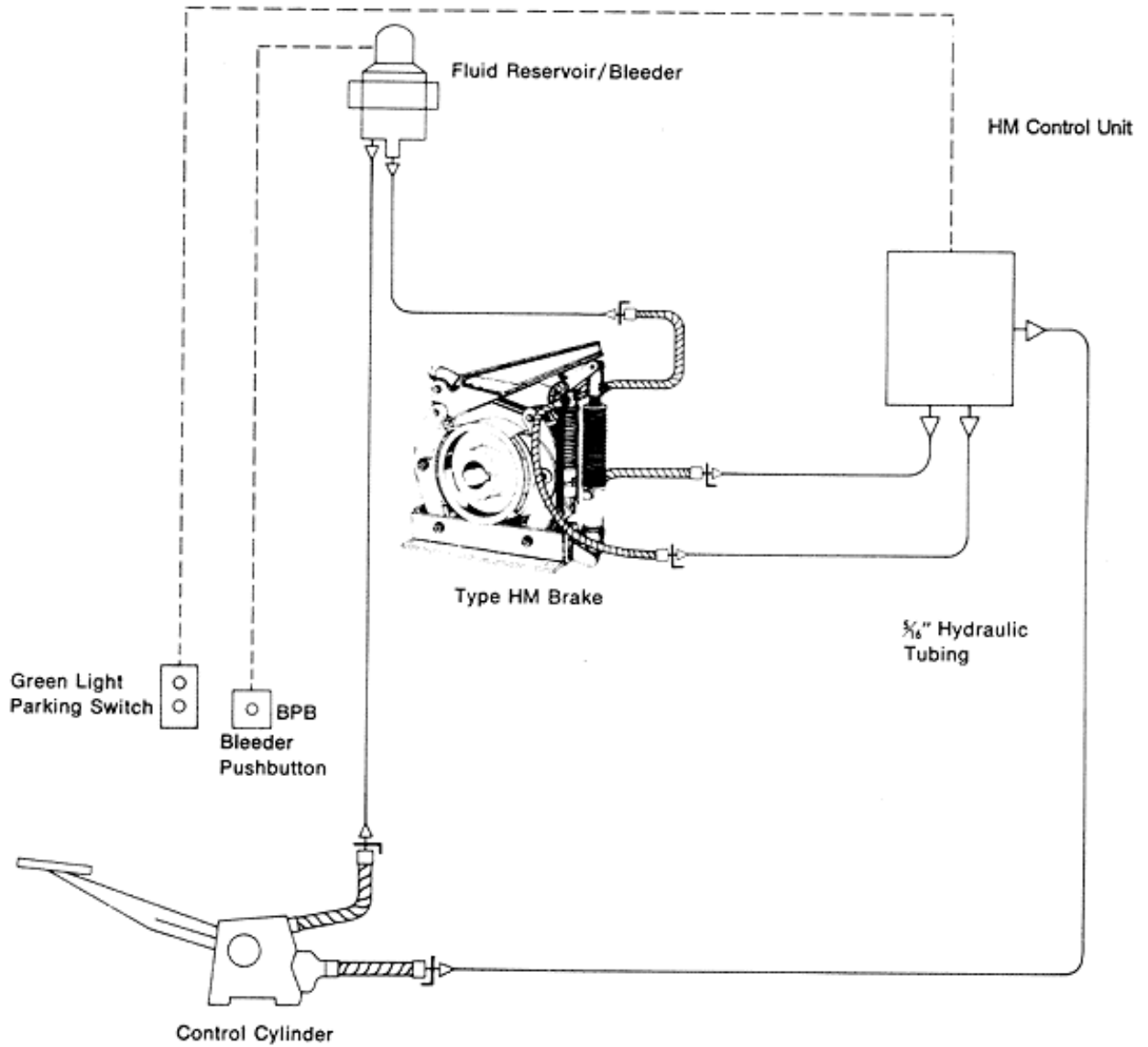


CAUTION:

These units are intended for use with SAE J1703 Automotive Brake Fluid only.

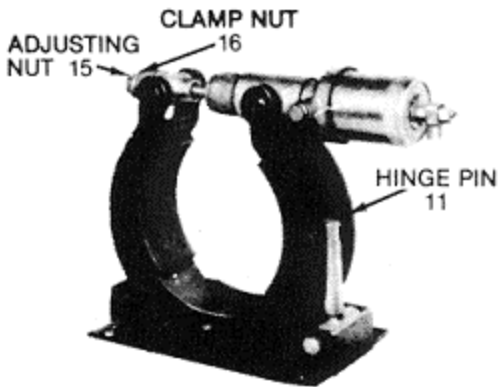
INSTALLATION INSTRUCTIONS

10 x 4, 14 x 6 And 18 x 8 Type HM One Brake, One Station Piping Diagram



SERVICE INSTRUCTIONS

6 x 3 And 8 x 3 Type HM Brakes



BRAKE RELINING, READJUSTMENT AND ANTI-DRAG SERVICE

Brake lining must be replaced when it has worn to less than 3/16" thickness. To reline type HM brakes, the brake arms must be opened by removing clamp nut (16), adjusting nut (15) and hinge pin (11). The brake lining and lining bolt assemblies may then be replaced in the same way as the type H brakes on page 3. However, the parking cylinder must be pressurized to fully compress the parking spring (37) during the entire period of reassembly and adjustment. Reinstall hinge pin, adjusting nut and clamp nut. Tighten adjusting nut wrench-tight and then back off nut two and one half turns to provide 1/32" clearance. Tighten clamp nut.

Operation and service of the anti-drag assembly is the same as for type H brakes.

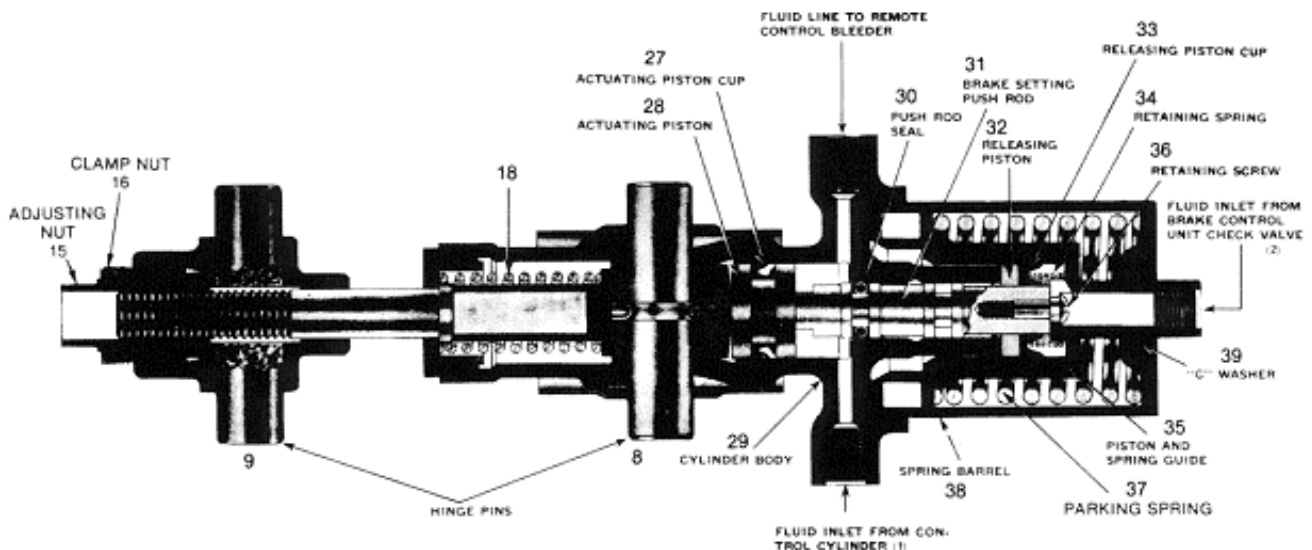
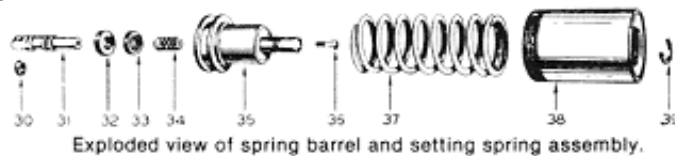
TYPE HM ACTUATOR REMOVAL AND SERVICE

Use pipe wrench to unscrew and remove spring barrel and parking spring assembly (30-38). (See drawing below.) The remaining actuator on the brake can now be removed in the same manner as the type H actuator.

To service the cup, seal and retaining spring, disassemble the spring barrel and parking spring assembly (30-38). Remove retaining screw (36). This releases push rod and seal (30-31), as well as piston (32), cup (33) and retaining spring (34). The spring barrel and parking spring (37-38) are not serviceable and normally need not be further disassembled. If disassembly is attempted, note that the parking spring is preloaded to about 200 pounds force. The use of an arbor press is essential.

If the cylinder walls are scratched or corroded, replace the complete J3054 HM Actuator. Otherwise wash all parts in denatured isopropyl alcohol. Discard items 21, 27, 28, 30 and 33 and use new parts from J73919 Repair Kit. Coat all parts with Super Heavy Duty Brake Fluid and reassemble in reverse disassembly order. To insure proper seal in park release cylinder, be sure the retaining screw (36) is tight.

Note that the park release cylinder must be kept released when the reassembled brake is readjusted.

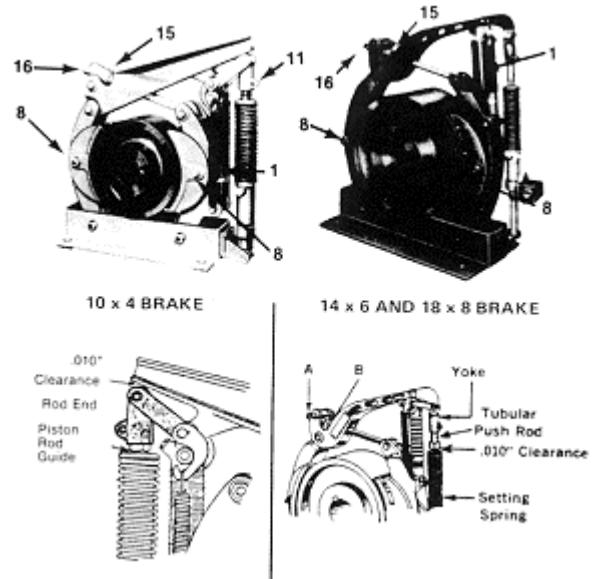


Cross-section drawing of the type HM actuator. Brake is set for parking when parts are in this position.

SERVICE INSTRUCTIONS

10 x 4, 14 x 6 and 18 x 8 Type HM Brakes

Except for an added spring-applied, hydraulic-released HM parking cylinder, type HM brakes are identical to type H hydraulic-applied brakes. Type HM brakes are adjusted in the same way as type H brakes. However, it is essential that the HM parking cylinder be kept fully released and that .010" clearance exist at the top of the HM cylinder (see illustration) during the entire adjustment procedure. Replacement of the brake shoes and service of the self-centering mechanism of the hydraulic brake cylinder is the same as for the type H brake.



SERVICING THE HM PARK RELEASE CYLINDER

The HM park release cylinder applies the brake with heavy spring force that is held released by continued application of hydraulic pressure. After continued use the hydraulic seals wear and the parking cylinder must be removed for service or replacement.

To remove the HM parking cylinder, first disconnect and temporarily cap the hydraulic line at the brake hose. Then loosen the adjusting nut (16) until the fully extended HM cylinder is unable to apply force against the top brake arm. Now, remove the bottom mounting

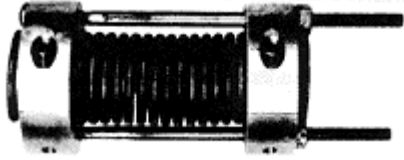
pin. The 14" and 18" HM cylinders can be removed by slipping the piston rod out of the tubular push rod. The 10" HM cylinders must be separated by unthreading the piston rod guide out of the rod end.

The replacement or repaired HM cylinder should be reinstalled in reverse order to the above. The brake should be readjusted after the cylinder has been reconnected into the system, the hydraulic circuit has been completely bled, and with the HM cylinder held released with hydraulic pressure.

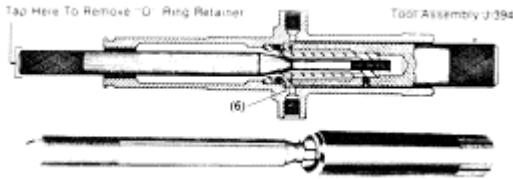
SERVICE INSTRUCTIONS

10", 14" And 18" Type HM Park Release Cylinders

The HM parking cylinder may be overhauled using repair kit J73921. However, three special tools are needed to safely and correctly disassemble and reassemble this cylinder.



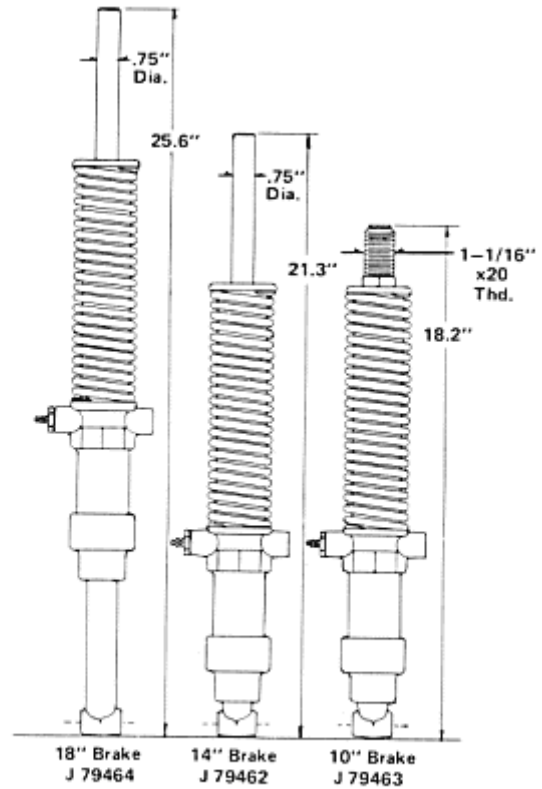
J 391, Spring Clamp Tool. This tool is needed to clamp and hold the setting spring under high force while the piston rod nut, piston and other parts are removed from the piston rod. The tool consists of two matched pairs of clamps, held together with four Allen head cap screws and two through bolts and nuts that clamp and retain the setting spring under 300 pounds force.



J 394, Expanding Drift Tool. This three-piece tool is used to remove and reinstall the O-ring retainer from the cylinder body.



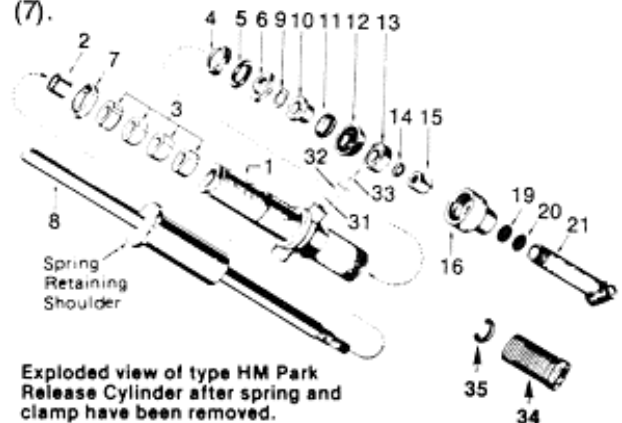
J 392, Pilot Tool. This tool is needed when reinstalling the piston rod back in the partially reassembled cylinder body.



DISASSEMBLY AND REASSEMBLY OF HM PARK RELEASE CYLINDER

Disassembly

1. Clamp J 391, Spring Clamp Tool, on the brake setting spring. Tighten Allen head screws securely, then tighten nuts on through bolts to compress spring until it turns freely on cylinder. **CAUTION - THE SPRING IS NOW UNDER 300 LBS. LOAD AND DANGEROUS. IT SHOULD REMAIN CLAMPED UNTIL IT IS REASSEMBLED ON CYLINDER ASSEMBLY.**
2. Lightly clamp cylinder body (1) in vise and remove cylinder end (16) with mounting lug (21).
3. Now, clamp spring-retaining shoulder (not shaft) of piston rod, remove piston rod nut (15) and lock washer (14), and pull piston rod (8) from opposite end of cylinder. Remove spring and spring clamp from cylinder body.
4. Remove piston (13), cup (12), cup retainer (11), piston stop sleeve (10), and gasket (9) from cylinder. If necessary, push parts out from opposite end of cylinder using 3/4" rod.
5. Insert J 394 Expanding Drift Tool through cylinder until seated, then fully tighten the expanding drift and tap out the O-ring retainer (6) as illustrated above. Then remove the O-ring (5) and bushing (4) through cylinder.
6. Now remove four packing felts (3) and felt washer (7).



SERVICE INSTRUCTIONS

10", 14" And 18" Type HM Park Release Cylinders

Inspect the bore of the cylinder. If it is pitted or scratched, replace the entire HM park release cylinder. If the cup or O-ring is very soft or enlarged, this is evidence of brake fluid contamination and the entire brake system should be flushed and all other components rebuilt or replaced. Inspect J9674 bushing (2). If necessary to replace, rebore to .829"-.831" diameter.

Reassembly

Reassemble all parts in reverse order, using all new parts from repair kit J73921. Before reassembly, wash all parts clean with denatured isopropyl alcohol. Then lubricate all parts before reassembly using Heavy Duty Brake Fluid.

Reinstall bushing (4) with new O-ring (5). Now use J394 expanding drift tool and tap new O-ring retainer (6) in place next to O-ring. Remove tool. Now dip new packing felts (3) and felt washer (7) in brake fluid and insert through small end of cylinder body.

Reinstall brake setting spring with spring clamp tool on cylinder body. Do not remove spring clamp tool. Now slip J 392 pilot tool over threaded end of piston rod and insert rod through small end of cylinder body. Remove pilot tool.

Slip new gasket (9), piston stop sleeve (10), cup retainer (11) and cup (12) into cylinder and over the piston rod (8). Now, holding shoulder of piston rod against setting spring, slide piston (13) in place with square cut recess of piston toward cup. Reassemble lock washer (14) and nut (15). Tighten to 60 ft-lb torque.

Before replacing cylinder end (16), disassemble mounting lug (21). Dip new filter (20) in brake fluid and install with retainer (19). Reassemble mounting lug and cylinder end.

Remove spring clamp tool and reinstall cylinder on brake.

HM PARK RELEASE CYLINDER REPLACEMENT PARTS LIST

Item No.	Name of Part	10" x 4"	14" x 6"	18" x 8"
	Complete Assembly	J-79463	J-79462	J-79464
21	Mounting Lug	J-9681	J-9681	J-9688
8	Piston Rod Assembly	J-23040	J-23041	J-23041
34	Piston Rod Guide	J-9662	Not Used	Not Used
35	"C" Washer	J-9661	Not Used	Not Used

The following parts are used in all the above Releasing Cylinder Assemblies:

Item No.	Name of Part	Number Used	Part Number
1	Cylinder Body	1	J-14704
2	Bushing	1	J-9674
3	9691 Packing Felts	4	*
4	Bushing	1	J-9672
5	10167 "O"-Ring	1	*
6	10229 "O"-Ring	1	*
7	10231 Felt Washer	1	*
9	1733 Gasket	1	*
10	Piston Stop Sleeve	1	J-9697
11	9696 Cup Retainer	1	*
12	9694 Cup	1	*
13	Piston	1	J-9695
14	Shake-proof Lock Washer	1	*
15	14707 Piston Rod Nut	1	*
16	Cylinder End	1	J-79467
19	9680 Filter Retainer	1	*
20	1823 Filter	1	*
31	25 lot pack F17 Gasket	1	J-105376
32	Bleeder Screw Adaptor	1	J-7346
33	Bleeder Screw	1	F-6446

SERVICE INSTRUCTIONS

Brake Wheel Inspection

Brake wheels should be inspected after every two months, 150 hours of operation or 5,000 stops, whichever occurs first. The brake wheel, as well as the brake lining, should be replaced if any of the following conditions are observed:

1. If more than 10% of the original rim thickness (note J below) has been worn away due to normal service. Measurement of brake wheel diameters must not be less than:

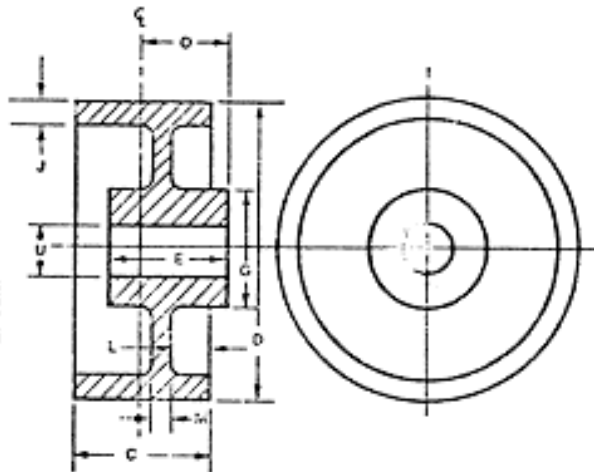
<u>Size</u>	<u>Min Dia.</u>	<u>Size</u>	<u>Min. Dia.</u>
6x3	5-29/32"	14x6	13-7/8"
8x3	7-29/32"	18x8	17-7/8"
10x4	9-7/8"		

2. If the brake wheel is scored more than 1/16" deep over more than 25% of the braking surface.
3. If the brake wheel is scored in any area more than 1/8" deep on 14x6 or 18x8 brake wheel, or more than 3/32" on 6x3, 8x3 or 10x4 brake wheel.
4. If the brake wheel is heat checked or blued over more than 50% of the brake surface. (This condition is caused by overheating. The cause of overheating should be investigated and corrected.)
5. If a crack is found on the rim, web or hub, the brake wheel should be replaced immediately.

Replacement Brake Wheels are available. STOCK bore brake wheel dimensions and part numbers are tabulated below. FINISH bore brake wheels are available for current steel mill type motors.

Brake Wheels are identified by "J" part number stamped on the edge of the rim and on the nameplate on the web.

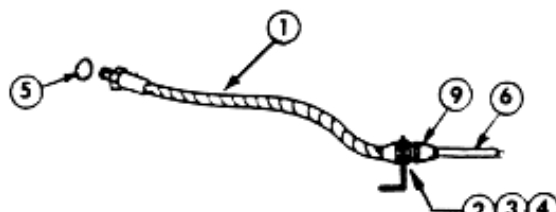
Wheel No.	DIMENSIONS IN INCHES									Weight Lbs.	Wk ³
	D	C	O	G	J	L	M	U	E		
JE76200	6	3.25	3.12	3.00	.50	1.00	.50	-	4.00	16	.55
JE76225	8	3.25	3.12	3.50	.50	1.00	.50	-	4.00	26	1.41
JE76250	10	4.25	3.12	5.00	.62	1.44	.62	1.00	5.50	55	4.25
JE76275	14	6.50	4.25	5.00	.88	2.12	.88	1.50	5.50	121	24.2
JE76300	18	8.50	5.25	7.50	.88	2.62	1.25	1.88	6.38	230	75.8



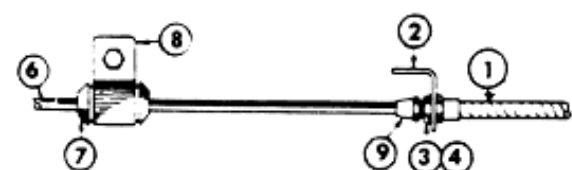
BILL OF MATERIAL

Hydraulic Installation Kits




J-15576 50 Ft. Tubing Kit					
J-73900 2 Hose, 50 Ft. Tubing Kit					
J-73901 4 Hose, 100 Ft. Tubing Kit					
J-73902 2 Hose, 100 Ft. Tubing Kit, with bleeder screw & adaptor					
J-73903 4 Hose, 200 Ft. Tubing Kit					
J-73904 6 Hose, 150 Ft. Tubing Kit					
-	2	4	2	4	6
-	2	4	2	4	6
-	2	4	2	4	6
-	2	4	2	4	6
-	4	8	5	11	11
-	-	1	1	2	1
1	1	-	-	-	1
15	15	35	35	70	55
15	15	35	35	70	55
3	11	14	16	25	30
1	1	3	3	6	5
-	-	-	1	1	2
-	1	3	1	3	3
-	-	-	1	-	-
-	-	-	1	-	-



① 30" Armored Hose J-10160
 ② Hose Mounting Bracket F-5780
 ③ 1/2" - 20 Jam Nut 90-12493-400
 ④ 1/2" Lock Washer 90-11555-100
 ⑤ Copper Gasket Seal F-17
 (Use at each hose-cylinder connection)



⑥ 100' x 5/16" O.D. Copper Tubing A-55980
 50' x 5/16" O.D. Copper Tubing A-37051
 ⑦ Tube Bushing J-5137
 ⑧ Bushing Clamp J-5138
 ⑨ Tube Nut J-86
 Tube Union J-49087
 Tube Tee J-9945
 21B Brake Fluid, gal. F-9314
 ⑩ Bleeder Screw Adaptor J-7346*
 ⑪ Bleeder Screw F-6446*

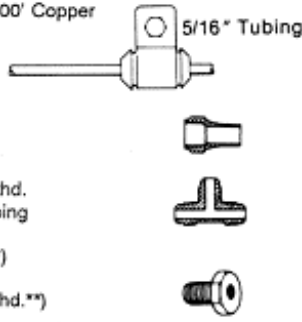
 ← ⑪
 ← ⑩
 ← ⑤

*These parts replace breather on reservoir of Type 2 Control Cylinder when adding Fluid Reservoir/Bleeder system.

REPLACEMENT PARTS

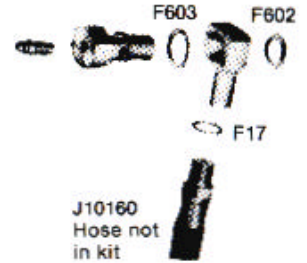
5/16" Tubing, 1/2"-20 SAE Fittings & Misc. Accessories

- A55980 TUBING 5/16" OD x 100' Copper
- J5138 CLAMP
- J5137 TUBE BUSHING
Support tubing every 3 ft.
with J5138 and J5137
- J86 TUBE NUT mates 1/2-20 thd.
with 45° chamfer and flared tubing
- J9945 TUBE TEE (1/2-20 thd.*)
- F996 OUTLET PLUG (1/2-20 thd.**)
- J7346 ADAPTOR PLUG 1/2-20 thd.** with 1/4-28 thd. for F6446
Bleeder Screw



J15555 RIGHT ANGLE KIT

Provides right angle swivel connection and bleeder screw port for any 1/2"-20 cylinder port. This assembly is furnished as standard on 6" and 8" type HM brake parking cylinder. Must be ordered separately if required for any other port.



UNION AND ADAPTOR FITTINGS

- | | | |
|--------------------------------|---------|-------------|
| | A | B |
| | | |
| J49087 UNION (Replaces FC4080) | 1/2-20* | 1/2-20* |
| J269 ADAPTOR | 1/2-20* | 1/2-20** |
| F11955 ADAPTOR | 1/2-20* | 1/4-18 NPT. |
| J71 052 ADAPTOR | 1/2-20* | 7/16-24 |

COPPER GASKETS

Part No.	A	B	C
F17	1/32"	33/64"	45/64"
F602	1/32"	1/2"	13/16"
F603	1/32"	19/32"	13/16"

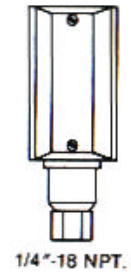
30-INCH ARMORED HOSE



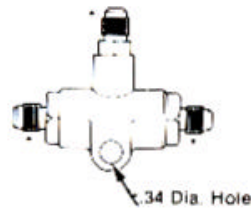
- J10160 HOSE ASSEMBLY - only
- F5780 HOSE BRACKET - anchors hose at * long thread
- J10797 HOSE KIT - includes hose, F-17 gasket for seal at ** short thread, F5780 hose bracket, 1/2-20 jam nut and lock washer

J24684 HYDRAULIC PRESSURE SWITCH

1 pole - 2 position electric contact. Easily read dials allow field adjustment of 50-500 psi pressure range and 10-80 psi pressure differential. This replacement part for HM control unit may also be line mounted in parking cylinder hydraulic line to replace function of obsolete J14853 mechanical limit switch in old HM-2 system or J9738 pressure switch in old HM system.



J18377 TWO-WAY HYDRAULIC CHECK VALVE



This assembly is required for operation of brake system from more than one control station.

*45° Chamfer, mates flared tubing and J86 tube nut
Requires F-17 Gasket Seal at cylinder port



F9314 21B SUPER HEAVY DUTY BRAKE FLUID (6-1 GAL. CASE)

Industrial Brake Systems must be filled only with 21B Super Heavy Duty Brake Fluid meeting SAE J1703 specifications. Do not use mineral oil or any other substitute. Avoid contamination. Purchase brake fluid in 1-gallon cans that can be easily carried to the job site and discarded when empty.

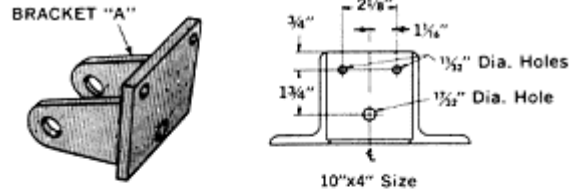
INSTRUCTIONS FOR CONVERTING Type H to Type HM Brake System

1. Install HM Releasing Cylinder and HM Brake Kit parts.
 2. Install J-107154 HM Control Unit and J-45767 Parking Switch and Light.
 3. Add hydraulic tubing and hose to connect HM control unit, HM releasing cylinder and existing brake actuator per piping diagram.
 4. Refill FRB reservoir full using ONLY 21B Super Heavy Duty Brake Fluid, or equal.
 5. Turn crane power ON.
 6. Temporarily reposition brake pedal to permit at least 17" stroke.
 7. Depress BPB bleeder push button. Step on control cylinder brake pedal through *full* stroke. Repeat this step at least 10 to 15 times. Keep FRB reservoir full while refilling brake system. This step will
- refill the pressure line from the control cylinder, to the HM control unit, to the brake actuating cylinder, to the FRB reservoir.
8. To bleed line from HM control unit to HM releasing cylinder -
 - a. Open bleeder screw at HM releasing cylinder on brake.
 - b. Use bleeder hose and glass jar or catch rag and step on brake pedal until clear fluid escapes. Close bleeder screw. Do not operate bleeder during this step.
 - c. This dead ended line should now be bled free of air.
 9. Refill FRB reservoir to within 1" of opening and replace filler cap and gasket.
 10. Adjust brake per instructions.

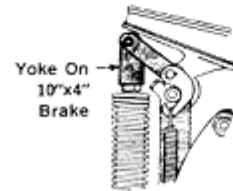
INSTRUCTIONS FOR CONVERTING Type H to Type HM Brake System

CONVERTING 10 x 4 BRAKES

1. Install mounting bracket "A." Brake has three holes in base to mount bracket.
2. Replace original top lever arm with new lever arm furnished in brake kit. Reinstall pin "D" with existing spring hooks, new yoke, pin and link assembly, and new hydraulic actuating cylinder. Attach bottom of hydraulic actuating cylinder to brake shoe with pin "E." Reinstall adjusting nut "A" but do not tighten.
3. Thread tubular push rod on HM releasing cylinder into yoke. Do not tighten yoke until brake is readjusted.
4. Attach bottom of HM releasing cylinder to bracket "A" with J-9670 pin provided.
5. Insert cotter pins in the three pins and reinstall return springs.
6. Brake is now reassembled. It must be readjusted after all other system components are installed and the hydraulic system is refilled and bled.

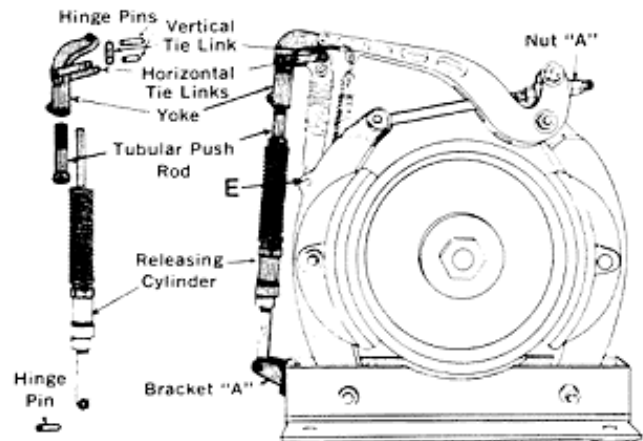
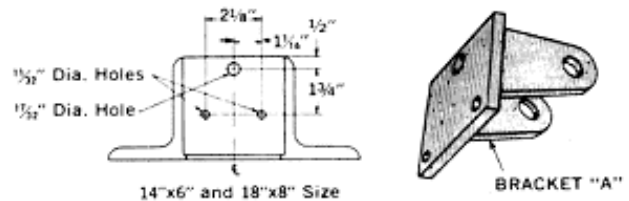


Replace brake lever arm using new lever arm furnished in kit for 10"x4" size brakes



CONVERTING 14x6 AND 18x8 BRAKES

1. Install mounting bracket "A." Brake has three holes in base to mount bracket.
2. Loosen adjusting nut "A." Remove existing hydraulic actuator. Attach bottom of new actuator to brake shoe with pin "E."
3. Attach top of actuator, yoke, tie links, hinge pins, and top lever arm, as illustrated.
4. Thread tubular push rod into yoke. Do not tighten yoke.
5. Insert HM releasing cylinder shaft in yoke. Attach bottom of releasing cylinder to bracket "A."
6. Insert cotter pins at all hinge pins.
7. Brake is now reassembled. It must be readjusted after all other system components are installed and the hydraulic system is refilled and bled.



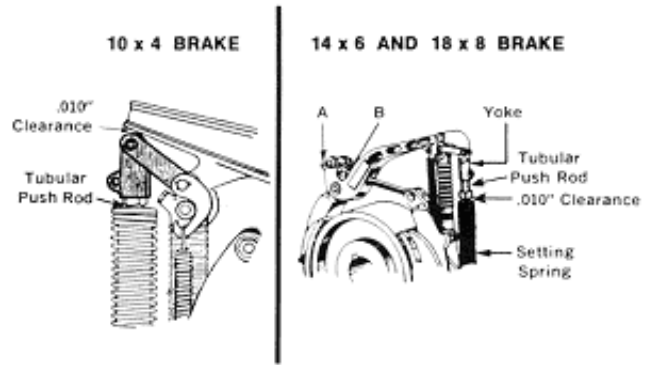
INSTRUCTIONS FOR CONVERTING Type H to Type HM Brake System

FINAL TYPE HM BRAKE ADJUSTMENT OF 10x4, 14x6 AND 18x8 BRAKES

After brake system is completely reconnected, refilled with brake fluid, and thoroughly bled, step down hard on brake pedal. Green signal light should go "ON" indicating that parking brake is released. Release brake pedal. Brake shoes should now be free.

1. Turn clamp nut "B" free and tighten adjusting nut "A" to clamp brake shoes firmly against brake wheel.
2. Back off adjusting nut "A" three turns and tighten clamp nut "B."
3. Both brake shoes should now be approximately 1/32" from the brake wheel. If both brake shoes are not an equal distance from the wheel, adjust self-centering mechanism at bottom of brake shoe arm.
4. With parking brake still fully released, sure that parking cylinder force does not bear against top brake lever. Adjust tubular recheck tubular push rod adjustment to be push rod to give indicated .010" clearance. Tighten Allen head set screw on yoke.

There must be clearance as follows:



5. The brake is now properly adjusted.
6. Check service brake and parking brake operation.

DIMENSIONS

6 x 3 And 8 x 3 Type H and HM Brakes

DIRECT-OPERATED BRAKE ASSEMBLIES ALL DIMENSIONS IN INCHES

TYPE H, HYDRAULIC-APPLIED BRAKE ASSEMBLY, FIGS. 1 & 2

<u>SIZE</u>	<u>6 x 3</u>	<u>8 x 3</u>
Assy. No.	J-23020	J-2779
Assy. Wt.	26 lbs.	28 lbs.
Overall Width, X	12-5/8"	12-5/8"
Overall Height, Y	10-9/16"	12-9/16"

TYPE HM, HYDRAULIC-APPLIED BRAKE WITH SPRING-APPLIED PARKING, FIGS. 1 & 3

<u>SIZE</u>	<u>6x3</u>	<u>8 x 3</u>
Assy. No.	J-24579	J-3205
Assy. Wt.	30 lbs.	32 lbs.
Overall Width, X	18-1/2"	18-1/2"
Overall Height, Y	11-3/32"	13-3/32"

DIMENSIONS COMMON TO BOTH TYPES

Wheel Dia.	D	6"	8"
Shaft Height	J	4-31/32"	5-31/32"
Min. Shoe Clearance	L	4-7/8"	5-29/32"
Brake Wheel Offset	O	3-1/8"	3-1/8"

Hydraulic cylinders include 1/2"-20 thds., mating with F-10160 hydraulic hose and F-17 gasket.

Hydraulic seals are compatible only with 21B Super Heavy Duty Brake Fluid or its equivalent.

Figure 1

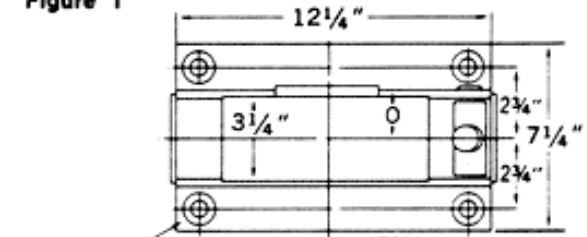


Figure 2

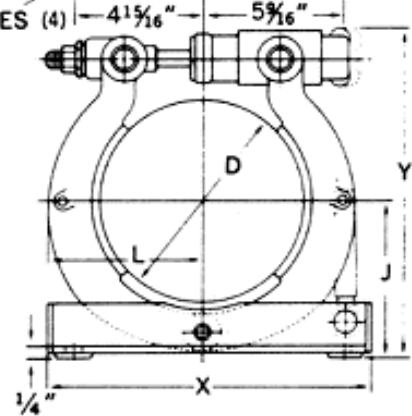
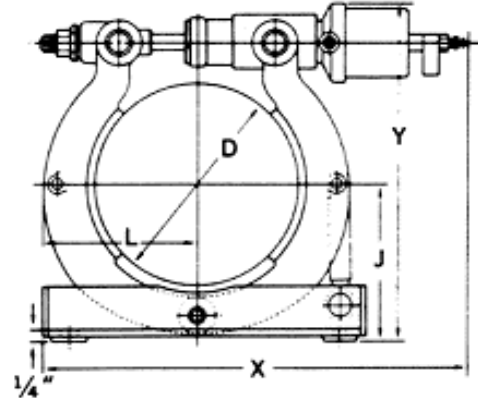


Figure 3



DIMENSIONS

10 x 4 Type H, HM And S Brakes (All Dimension in Inches)

Dimensions common to all 10x4 size brakes.

A	B	C	D	E
8"	3"	4-1/4"	10"	7/8"
J	L	O*	W	Z
9"	10"	3-1/8"	18-1/2"	8-3/16"

*O Brake wheel offset is based on standard Brake wheels.

Type H brake assembly, Fig. 2, hydraulically applied by brake cylinder supplied separately. (Normally use J7905 cylinder for "one brake" manual systems; use J23437 cylinder for "two brake" manual systems. See system specifications for cylinders used on Air/Hydraulic systems.)

BRAKE ASSY. NO.	OVERALL WIDTH X	MAX. HEIGHT Y	ASSY. WT. LBS.
J2926	19-7/16"	19-7/16"	93

Type HM Brake assembly, Fig. 3, supplied with J23437 hydraulic brake cylinder and with HM spring-applied hydraulic-released cylinder.

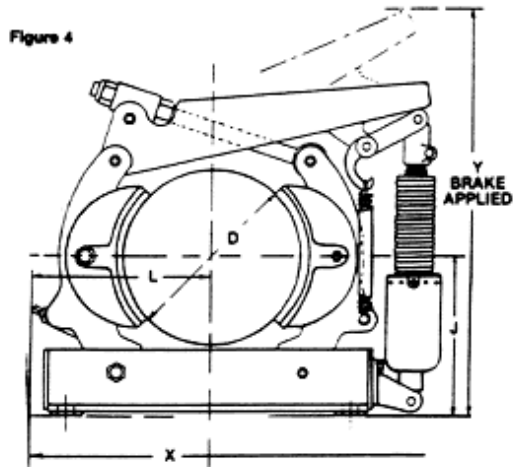
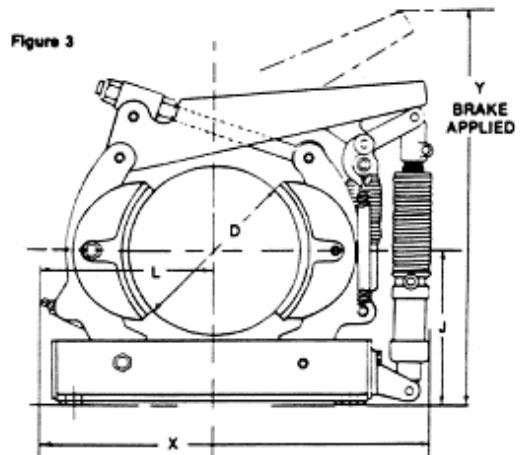
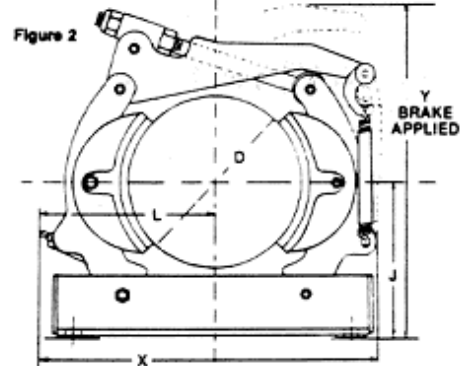
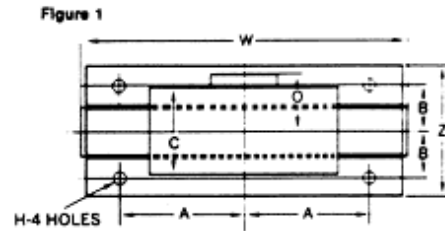
BRAKE ASSY. NO.	OVERALL WIDTH X	MAX. HEIGHT Y	ASSY. WT. LBS.
J34780	23"	23"	107

NOTE: The ports of the hydraulic cylinders on above brakes include 1/2"-20 straight threads that mate with J10160 30" hose, which requires F-17 gasket seals.

All cylinders are compatible only with automotive J1703 hydraulic brake fluid or equal.

Type S brake assembly, Fig. 4, supplied with spring-applied air-released cylinder.

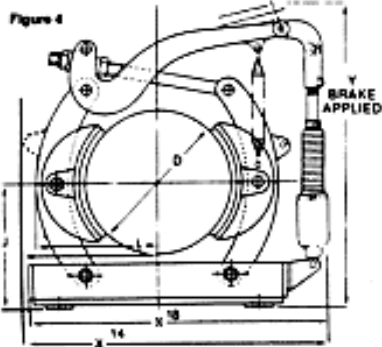
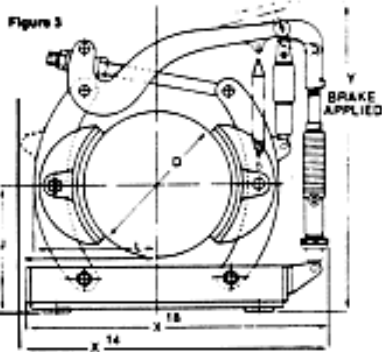
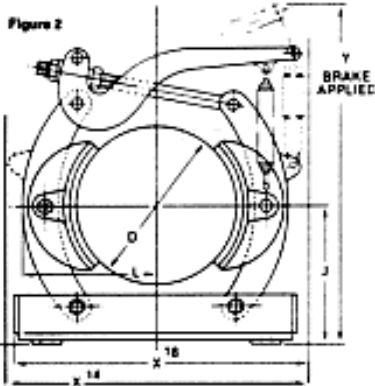
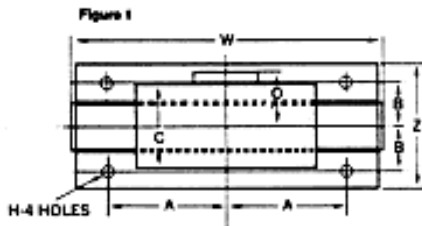
BRAKE ASSY. NO.	OVERALL WIDTH X	MAX. HEIGHT Y	ASSY. WT. LBS.
J53958	23-1/4"	23"	105



DIMENSIONS

14 x 6 And 18 x 8 Type H, HM And S Brakes (All Dimension in Inches)

Dimensions common to all 14" and 18" brakes (in inches).



BRAKE SIZE	A	B	C	D	H
14 x 6	9-1/2"	3-7/16"	6-1/2"	14"	7/8"
18 x 8	11-1/2"	5"	8-1/2"	18"	1-1/16"

	J	K	L	O*	W	Z
14 x 6	11-5/8"	11-1/8"	12-15/16"	4-1/4"	24-1/4"	9-5/8"
18 x 8	13-7/8"	13-7/8"	-	5-1/4"	27-3/4"	13-1/2"

*O Brake wheel offset is based on standard brake wheels.

Type H brake assembly, Fig. 2, hydraulically applied by brake cylinder supplied separately. (Normally use J7905 cylinder for "one brake" manual systems, and use J23437 cylinder for "two brake" manual systems; or see system specifications for cylinders on Air/Hydraulic systems.)

BRAKE SIZE	ASSY. NO.	OVERALL WIDTH X	MAX. HEIGHT Y	ASSY. WT. LBS.
14 x 6	J2929	25-7/8"	28-1/2"	161
18 x 8	J2932	27-3/4"	34-3/8"	266

Type HM Brake assembly, Fig. 3, supplied with J23437 hydraulic brake cylinder and with HM spring-applied hydraulic-released cylinder.

BRAKE SIZE	ASSY. NO.	OVERALL WIDTH X	MAX. HEIGHT Y	ASSY. WT. LBS.
14 x 6	J34735	29-5/8"	28-1/2"	180
18 x 8	J40065	32-1/8"	34-3/8"	286

NOTE: The ports of the hydraulic cylinders on above brakes include 1/2"-20 straight threads that match J10160 30" hose, which requires F-17 gasket seals.

All cylinders are compatible only with automotive J1703 hydraulic brake fluid or equal.

Type S brake assembly, Fig. 4, supplied with spring-applied air-released cylinder.

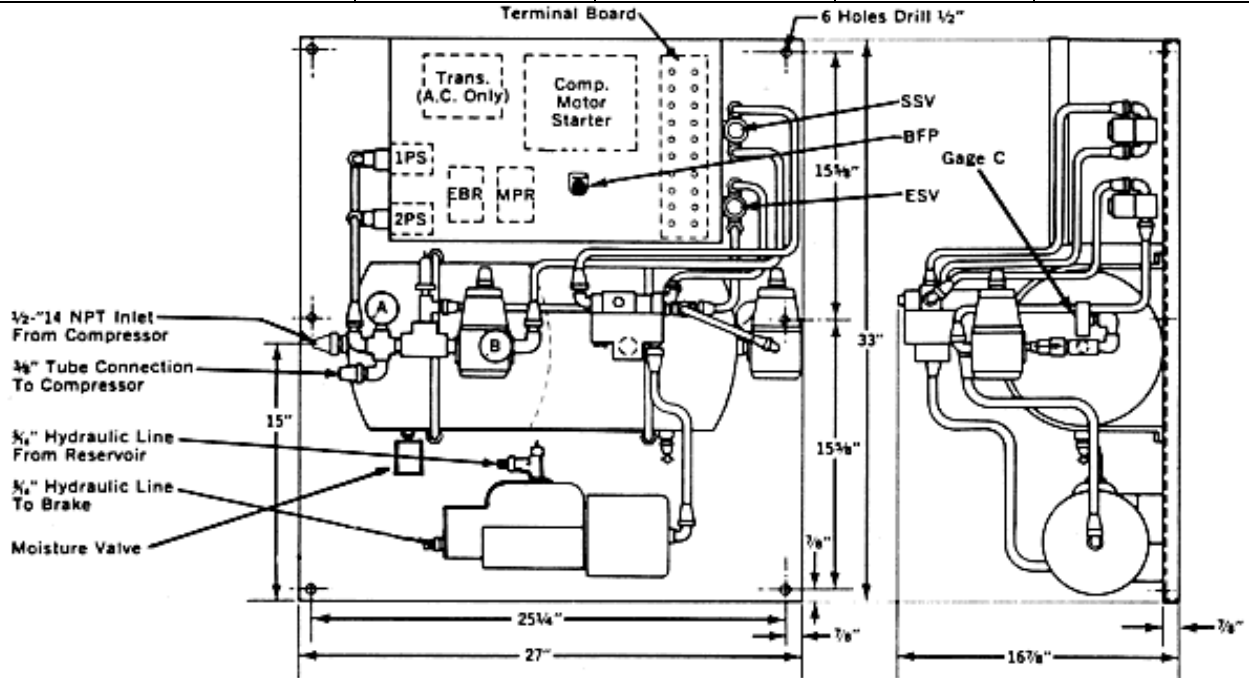
BRAKE SIZE	ASSY. NO.	OVERALL WIDTH X	MAX. HEIGHT Y	ASSY. WT. LBS.
14 x 6	J53957	30-5/16"	28-1/2"	182
18 x 8	J58855	32-5/8"	34-3/8"	288

INSTALLATION INSTRUCTIONS

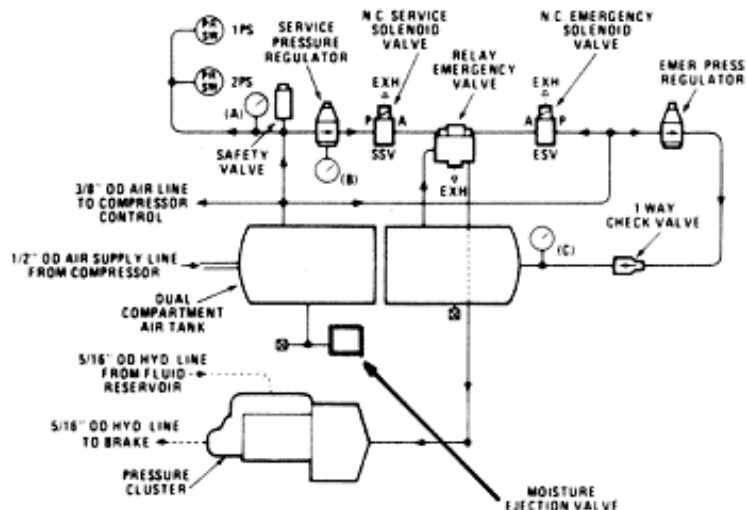
Type A/H-ERC Panel, Small (27" Wide x 33" High)

THESE INSTRUCTIONS COVER INSTALLATION OF THE FOLLOWING PANELS:

Power Supply	380, 460 or 575V, 50/60 Hz AC		230VDC	
Pressure Cluster A/H Ratio	8 x 1	5 x 1	8 x 1	5 x 1
Panel Assy.	J70970	J70971	J70972	J70973



A/H-ERC SMALL PANEL PIPING DIAGRAM



INSTALLATION INSTRUCTIONS

Type A/H-ERC Panel, Small

Mount the panel on a rigid vertical support, low enough for the 1/2" air line from the compressor to slope down to the air reservoir. This permits moisture to drain to the reservoir where it can be automatically ejected by the moisture valve.

Pipe and wire the panel into the system per applicable connection diagrams.

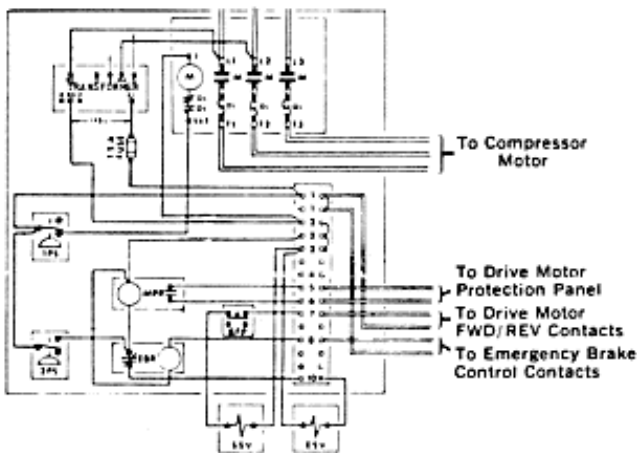
After the brake system is completely piped and wired, turn power ON. Check preset air pressures:

1. Compressor supply pressure at gauge A must range from 65-80 psi. This pressure is controlled by 1 PS N.C. pressure switch.
2. Low pressure step (ON when SSV solenoid valve is energized) is factory set at 30 psi by regulator at gauge B. This may be reset in field. See "Pressure Adjustment Instructions" below.
3. High pressure step (ON when ESV solenoid valve is de-energized) is factory set at 40 psi by regulator in front of gauge C. This may be reset in field. See "Pressure Adjustment Instructions" below.
4. Abnormal low compressor supply pressure is signaled by 2PS N.O. pressure switch, which must close on 60 psi increasing pressure and open on 50 psi decreasing pressure.

SPECIAL BLEEDING AND PRESSURE ADJUSTMENT INSTRUCTIONS FOR A/H-ERC SYSTEM

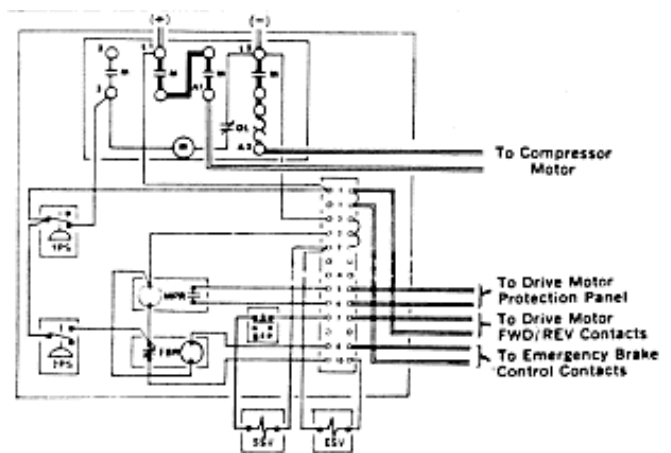
1. Fill fluid reservoir/bleeder and pressure cluster. Bleed the ERC brake circuit by holding BPB bleeder pushbutton in and stroking pressure cluster by repeatedly pushing BFP brake filling pushbutton.
 2. After the brake system is bled and brakes are adjusted, operate system to check performance. The low step pressure should control the empty crane to a slow stop. The high step pressure should control the load crane to a quick stop without abnormal load swing. Either pressure steps may be reset in field; however, low pressure step must be less than the high pressure step.
- Note: Power failure or power shutdown causes high pressure step to apply but initiates slow air pressure bleed-down, which causes complete brake release after 1-2 hours.

AC WIRING DIAGRAM
TYPE A/H-ERC AIR/HYDRAULIC
PREWIRED CONTROL PANEL



Note: Standard AC. Panels Are Designed For 460V. Operation.

DC WIRING DIAGRAM
TYPE A/H-ERC AIR/HYDRAULIC
PREWIRED CONTROL PANEL



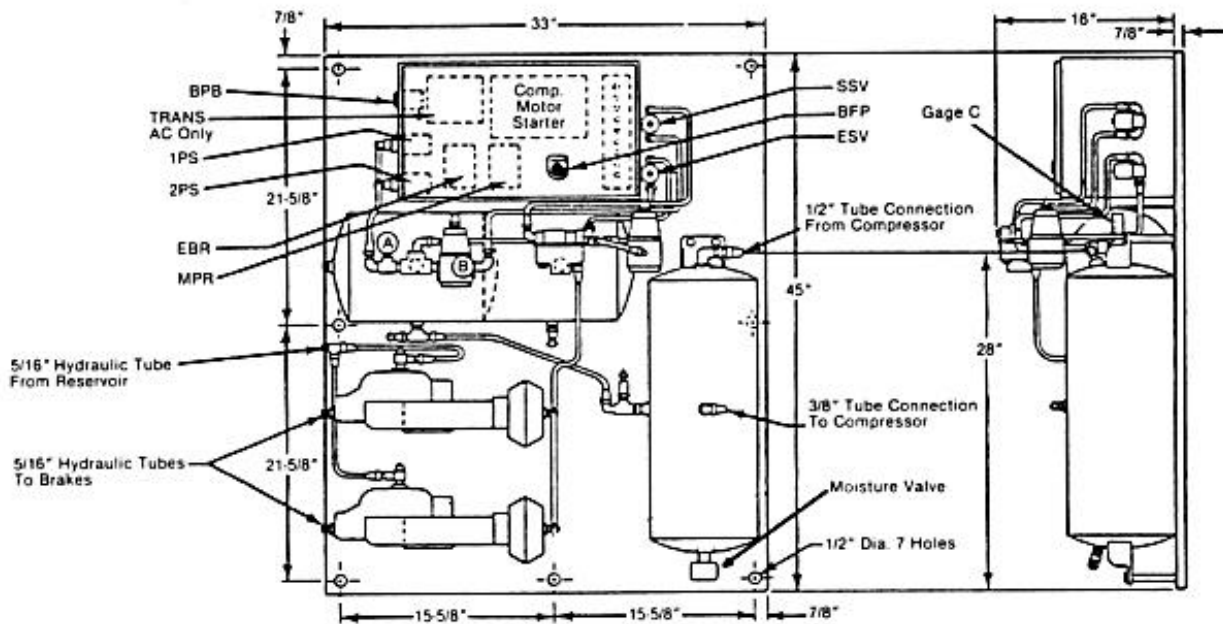
1PS - N.C. Compressor Start-Stop Pressure Switch (80/65 Psi)
 2PS - N.O. System Pressure Switch (60/50 Psi)
 BFB - Brake Filling Pushbutton

INSTALLATION INSTRUCTIONS

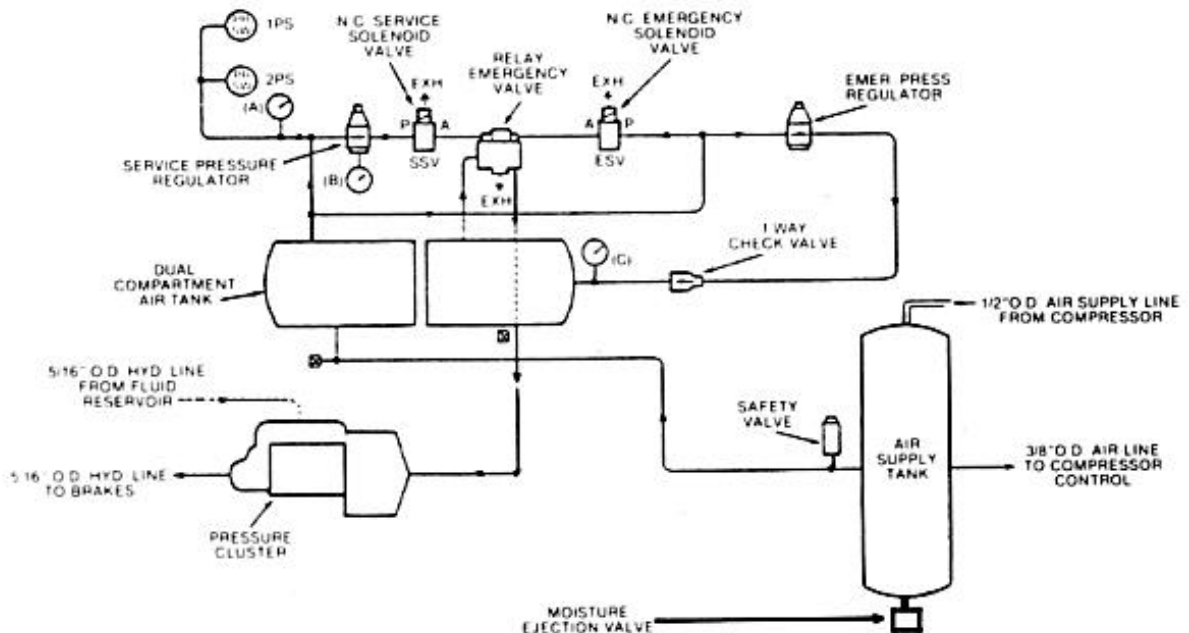
Type A/H-ERC Panel, Large (33" Wide x 45" High)

THESE INSTRUCTIONS COVER INSTALLATION OF THE FOLLOWING PANEL:

Power Supply			380, 460 or 575V, 50/60 Hz AC		230VDC	
Pressure Cluster	Air Hydraulic Ratio		8 x 1	5 x 1	8 x 1	5 x 1
	No. of Pressure Cluster		J70980 J70982	J70981 J70983	J70984 J70986	J70985 J70987



A/H-ERC LARGE PANEL PIPING DIAGRAM



INSTALLATION INSTRUCTIONS

Type A/H-ERC Panel, Large

Mount the panel on a rigid vertical support, low enough for the 1/2" air line from the compressor to slope down to the air reservoir. This permits moisture to drain to the reservoir where it can be automatically ejected by the moisture valve.

Pipe and wire the panel into the system per applicable connection diagrams.

After the brake system is completely piped and wired, turn power ON. Check preset air pressures:

1. Compressor supply pressure at gauge A must range from 65-80 psi. This pressure is controlled by 1PS N.C. pressure switch.
2. Low pressure step (ON when SSV solenoid valve is energized) is factory set at 30 psi by regulator at gauge B. This may be reset in field. See "Pressure Adjustment Instructions" below.
3. High pressure step (ON when ESV solenoid valve is de-energized) is factory set at 40 psi by regulator in front of gauge C. This may be reset in field. See "Pressure Adjustment Instructions" below.
4. Abnormal low compressor supply pressure is signalled by 2PS N.O. pressure switch, which must close on 60 psi increasing pressure and open on 50 psi decreasing pressure.

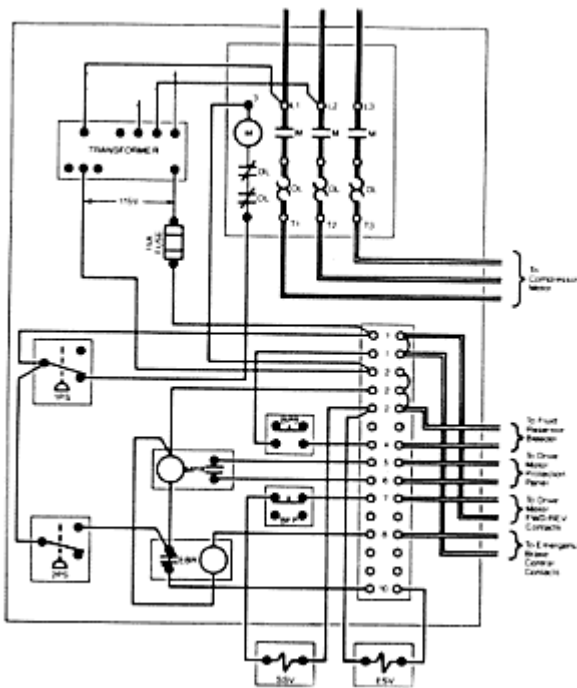
SPECIAL BLEEDING AND PRESSURE ADJUSTMENT INSTRUCTIONS FOR A/H-ERC SYSTEM

1. Fill fluid reservoir/bleeder and pressure cluster. Bleed the ERC brake circuit by holding BPB bleeder pushbutton in and stroking pressure cluster by repeatedly pushing BFP brake filling pushbutton.
2. After the brake system is bled and brakes are adjusted, operate system to check performance. The low step pressure should control the empty crane to a slow stop. The high step pressure should control the loaded crane to a quick stop without abnormal load swing. Either pressure steps may be reset in field; however, low pressure step must be less than the high pressure step.

Note: Power failure or power shutdown causes high pressure step to apply but initiates slow air pressure bleed-down, which causes complete brake release after 1-2 hours.

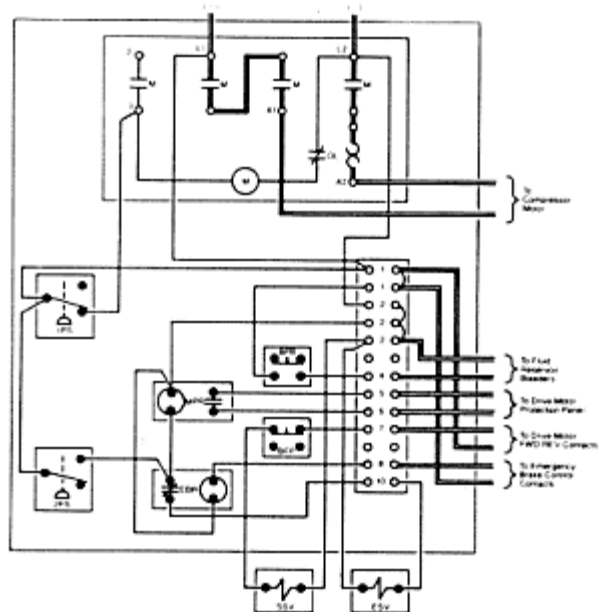
AC WIRING DIAGRAM

TYPE A/H-ERC AIR/HYDRAULIC PREWIRED CONTROL PANEL



DC WIRING DIAGRAM

TYPE A/H-ERC AIR/HYDRAULIC PREWIRED CONTROL PANEL



Note: Standard A.C. Panels Are Designed For 460V. Operation.

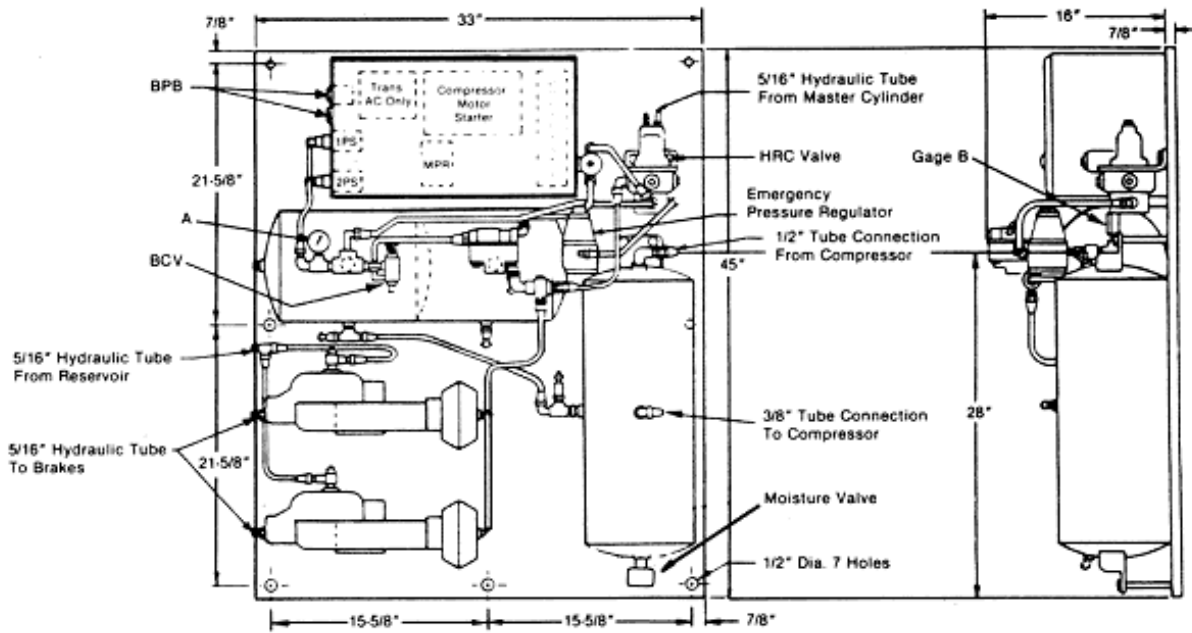
1PS - N C Compressor Start-Stop Pressure Switch 80/65 Psi
 2PS - N. O. System Pressure Switch 60/50 Psi
 BPB - Bleeder Pushbutton
 BFP - Brake Filling Pushbutton

INSTALLATION INSTRUCTIONS

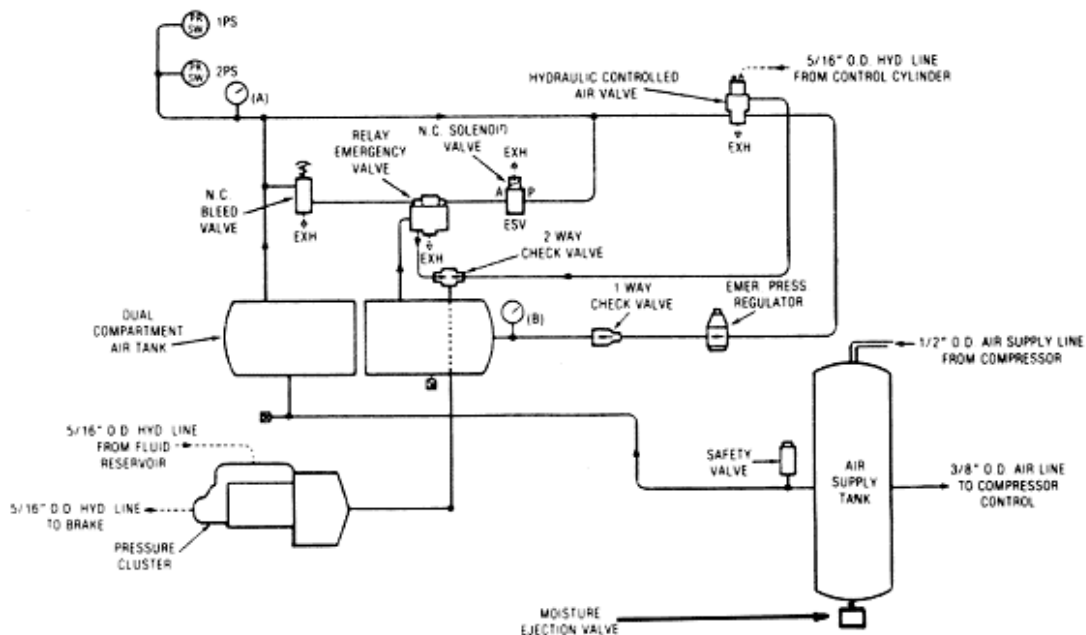
Type A/H-HRC Panel

THESE INSTRUCTIONS COVER INSTALLATION OF THE FOLLOWING PANELS:

Power Supply			380, 460 or 575V, 50/60 Hz AC		230VDC	
Pressure Cluster	Air Hydraulic Ratio		8 x 1	5 x 1	8 x 1	5 x 1
	No. of Pressure Clusters	1 2	J71020 J71022	J71021 J71023	J71024 J71026	J71025 J71027



A/H-HRC PANEL PIPING DIAGRAM



INSTALLATION INSTRUCTIONS

Type A/H-HRC Panel

Mount the panel on a rigid vertical support, low enough for the 1/2" air line from the compressor to slope down to the air reservoir. This permits moisture to drain to the reservoir where it can be automatically ejected by the moisture valve.

Pipe and wire the panel into the system per applicable connection diagrams.

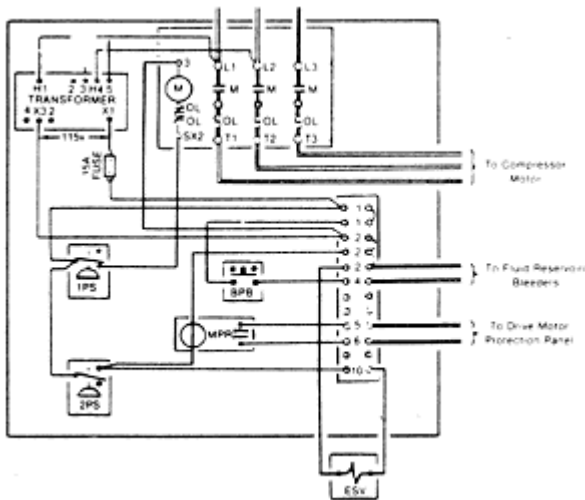
After the brake system is completely piped and wired, turn power ON. Check preset air pressures:

1. Compressor supply pressure at gauge A must range from 65-80 psi. This pressure is controlled by 1PS N.C. pressure switch.
2. Emergency Brake pressure (ON when ESV solenoid valve is de-energized) is factory set at 40 psi. Check gauge B behind pressure regulator. This pressure may be reset in field. See "Pressure Adjustment Instructions" below.
3. Abnormally low compressor supply pressure is signalled by 2PS N.O. pressure switch, which must close on 60 psi increasing pressure and open on 50 psi decreasing pressure.

SPECIAL BLEEDING AND PRESSURE ADJUSTMENT INSTRUCTIONS FOR A/H-HRC SYSTEM

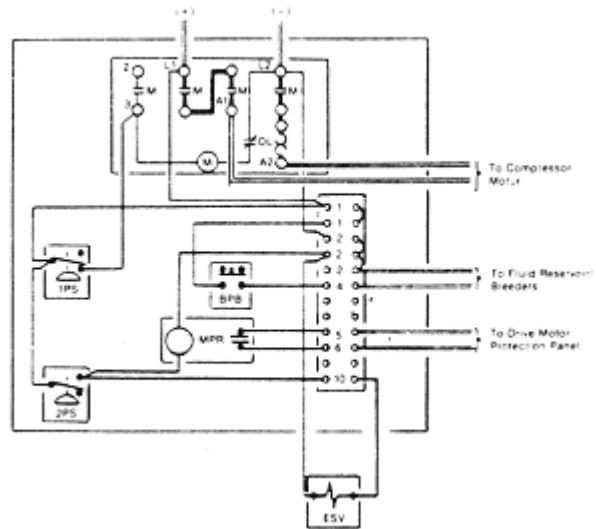
1. Fill fluid reservoir/bleeder(s), pressure cluster(s) and control cylinder (and pilot circuit reservoir if used). Bleed A/H brake circuit by holding BPB bleeder pushbutton in and stroking pressure cluster(s) by repeatedly pushing BCV bleed control valve. Bleed the HRC hydraulic remote controlled circuit by opening the bleeder screw on the HRC valve and pumping the control cylinder until clear fluid escapes from the bleeder screw. Close bleeder screw. If HRC circuit includes coiled or looped hose, move trolley to cause straightest possible hose length when bleeding system.
2. After brake system is bled and brakes are adjusted, operate brake system. Operation should be precise, without noticeable time delay. Check operation of emergency brake step by disconnecting power. The crane should come to a quick stop without abnormal hook swing. Adjust emergency pressure if necessary. Note: Application of emergency brake step initiates slow pressure bleed-down. Brake system is completely released after 1-2 hours.

**AC WIRING DIAGRAM
TYPE A/H-HRC AIR/HYDRAULIC
PREWIRED CONTROL PANEL**



Note: Standard AC Panels Are Designed For 460V operation.

**DC WIRING DIAGRAM
TYPE A/H-HRC AIR/HYDRAULIC
PREWIRED CONTROL PANEL**



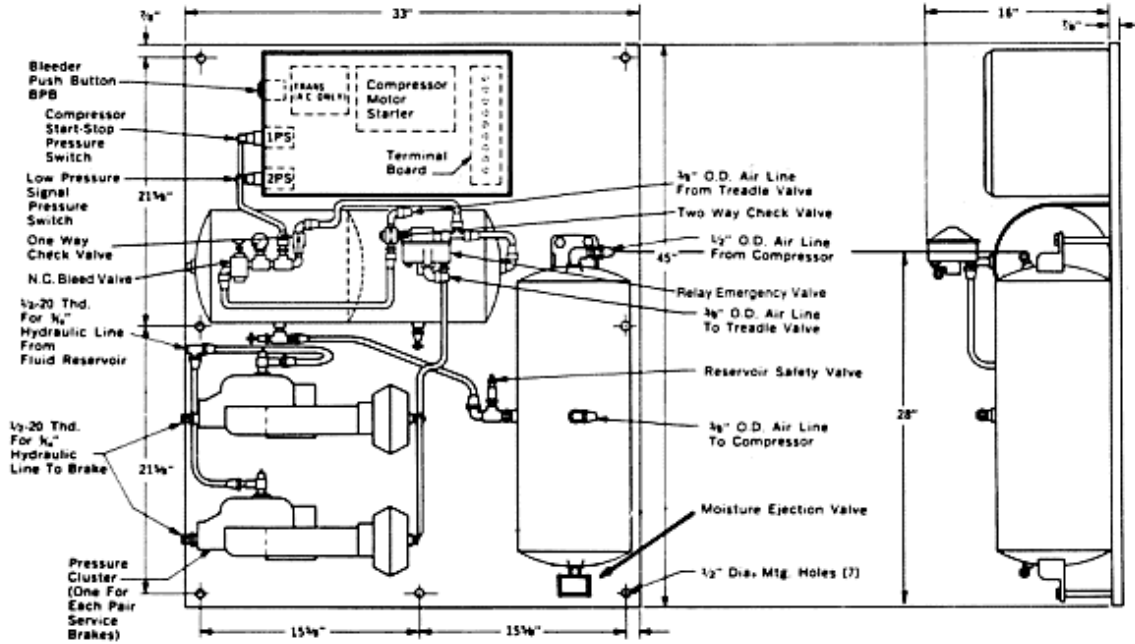
1PS - N.C. compressor Start-Stop Pressure Switch (80/65 PSI)
 2PS - N.O. System Pressure Switch (60/50 PSI)
 BPB - N.O. Bleeder Pushbutton

INSTALLATION INSTRUCTIONS

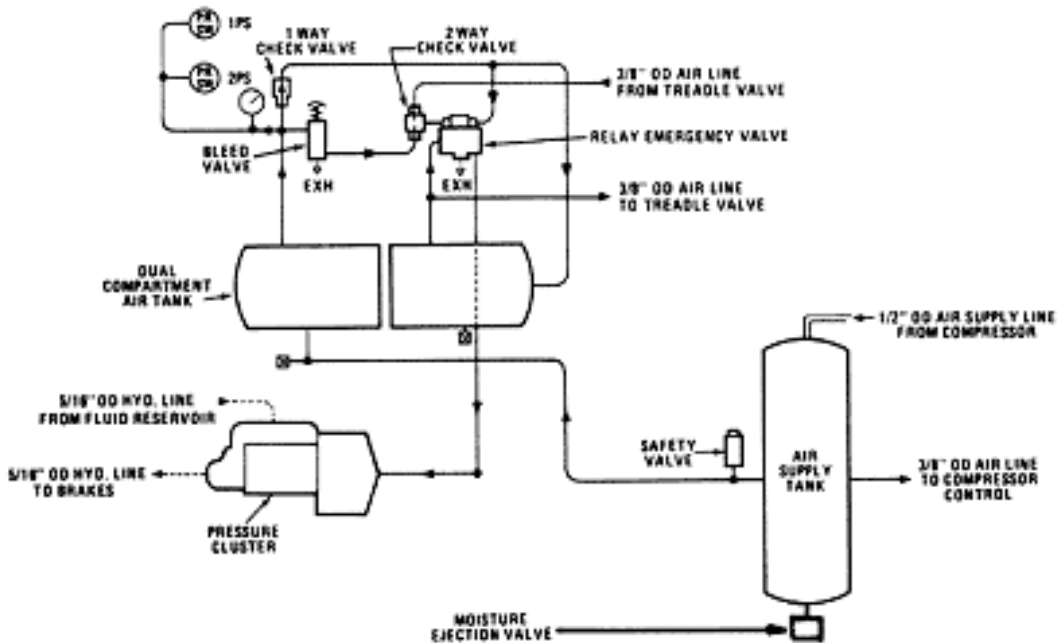
Type A/H-ARC Panel

THESE INSTRUCTIONS COVER INSTALLATION OF THE FOLLOWING PANELS:

Power Supply			380, 460 or 575V, 50/60 Hz AC		230VDC	
Pressure Cluster	Air Hydraulic Ratio		8 x 1	5 x 1	8 x 1	5 x 1
	No. of Pressure Clusters	1 2	J89660 J89662	J89661 J89663	J89664 J89666	J89665 J89667



A/H-ARC PANEL PIPING DIAGRAM



INSTALLATION INSTRUCTIONS

Type A/H-ARC Panel; Foot-Operated Air Treadle Valve

Mount the panel on a rigid vertical support, low enough for the 1/2" air line from the compressor to slope down to the air reservoir. This permits moisture to drain into the reservoir where it can be automatically ejected by the moisture valve.

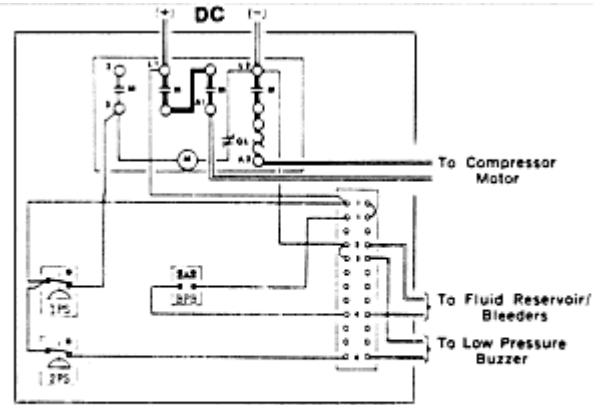
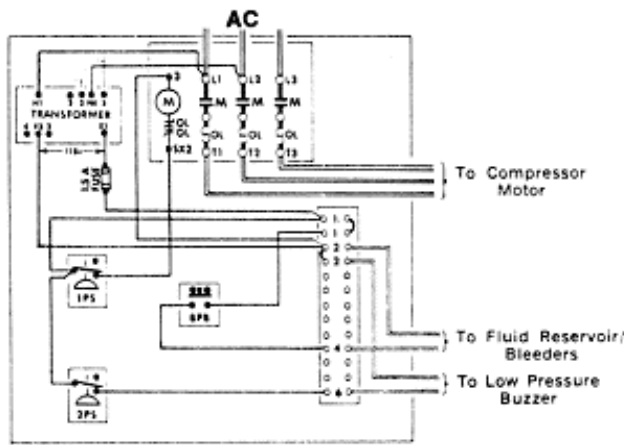
pressure alarm should sound below 50 psi. This is controlled by 2PS N.C. pressure switch. If reservoir pressure drops below 40 psi, the relay emergency valve applies system pressure.

Pipe and wire the panel into the system per applicable connection diagrams. When complete, turn power ON. Check preset air pressures. Compressor supply pressure at gauge A must range from 65-80 psi. This pressure is controlled by 1PS N.C. pressure switch. Low

Special Bleeding Instructions for A/H Systems

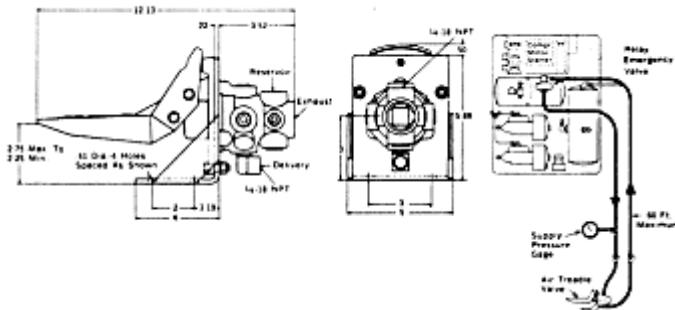
1. Fill fluid reservoir/bleeder(s) and pressure cluster(s). Hold BPB bleeder pushbutton in and stroke pressure cluster by repeatedly pushing Bleeding Control Valve.

ELECTRICAL CONTROL ASSEMBLY - WIRING DIAGRAM



1PS — N.C. Compressor Start-Stop Pressure Switch (80/65 Psi)
 2PS — N.C. System Pressure Switch (60/50 Psi)
 BPB — N.O. Bleeder Pushbutton

Note: Standard AC Panels Are Designed For 460V Operation.



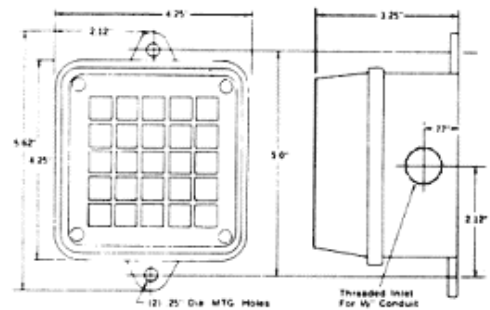
J57159 AIR TREADLE VALVE INSTALLATION

The air treadle valve may be located in front or to either side of the standing or seated operator, but it is essential that the foot pad be in a position convenient for the operator to control the full stroke to provide the "feel" of the brake torque developed. Bolt the bracket to the floor using 3/8" bolts. Install air hoses in reservoir and delivery ports. All other common ports must be plugged.

Pipe reservoir and delivery lines to the air relay valve on panel using 3/8" tubing provided. Install supply pressure gauge in cab.

LOW AIR PRESSURE ALARM INSTALLATION

115VAC - J34778
 230VDC - J24673



Mount alarm in cab. Make connections to panel per wiring diagram.

INSTALLATION INSTRUCTIONS

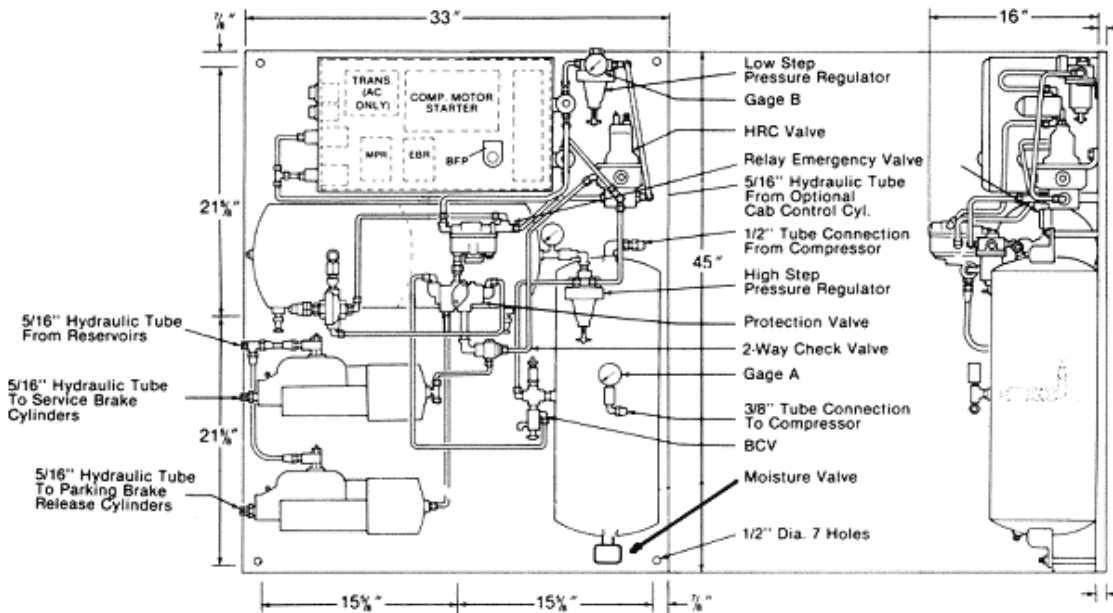
Type A/HM-ERC Panel

THESE INSTRUCTIONS COVER INSTALLATION OF THE FOLLOWING PANEL ASSEMBLIES:

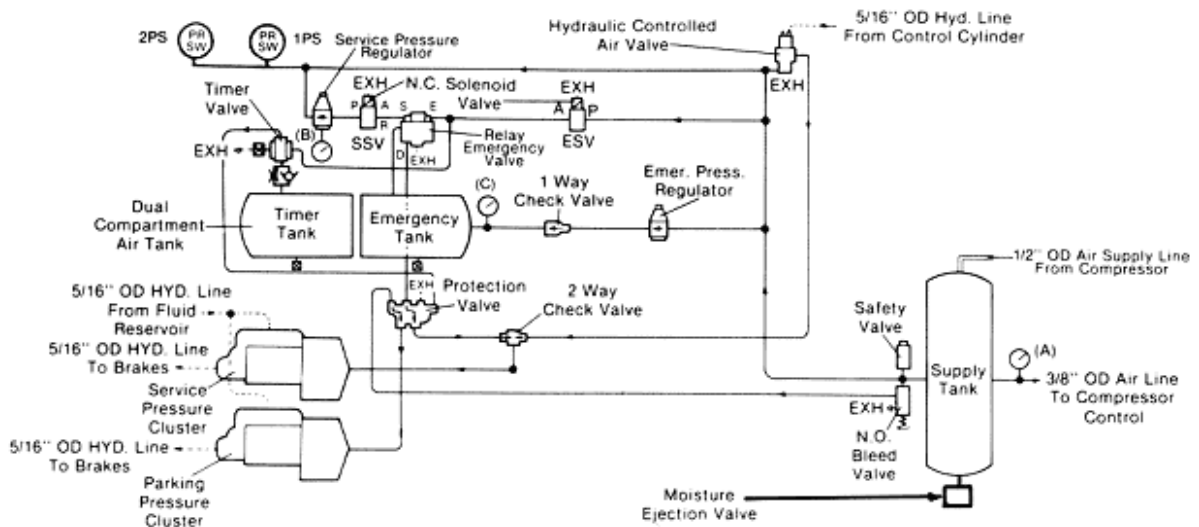
Power Supply			380, 460 or 575V, 50/60 Hz AC		230VDC		
Service Pressure Cluster	Air/Hydraulic Ratio		8 x 1	5 x 1	8 x 1	5 x 1	
	No. of service pressure clusters	1*	33" x 45" Panel	J100650	J100651	J100656	J100657
		2**	Assembly Only	J100652	J100653	J100658	J100659
		2*	(No Enclosure)	J100654	J100655	J100660	J100661
No. of service pressure clusters	1*	Panel Assy. Mounted	J103650	J103651	J103656	J103657	
	2**	Inside 36 x 48 x 18	J103652	J103653	J103658	J103659	
	2*	Enclosure	J103654	J103655	J103660	J103661	

*Also Includes 1-8 x 1 ratio parking brake release pressure cluster below service cluster.

**Also includes 2-8 x 1 ratio parking brake release pressure clusters below service clusters.



A/HM-ERC PANEL PIPING DIAGRAM



INSTALLATION INSTRUCTIONS

Type A/H-ERC Panel

Mount the panel on a rigid vertical support, low enough for the 1/2" air line from the compressor to slope down to the air reservoir. This permits moisture to drain to the reservoir where it can be automatically ejected by the moisture valve.

Pipe and wire the panel into the system per applicable connection diagrams.

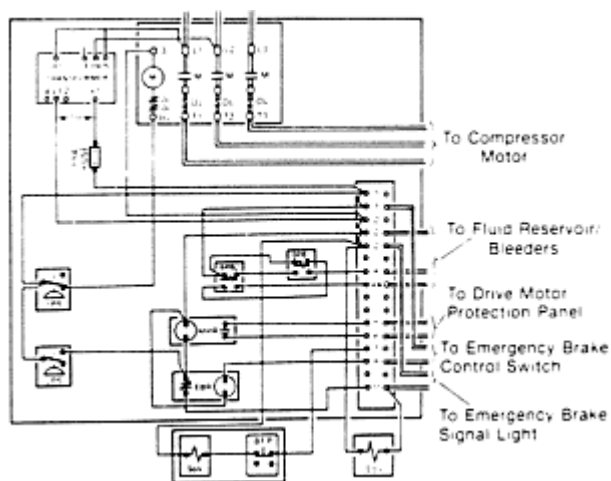
After the brake system is completely piped and wired, turn power ON. Check preset air pressures:

1. Compressor supply pressure at gauge A must range from 75-90 psi. This pressure is controlled by 1PS N.C. pressure switch.
2. Emergency pressure step (ON when ESV solenoid valve is de-energized) is factory set at 40 psi by regulator in front of gauge B.
3. Abnormally low compressor supply pressure is signalled by 2PS N.O. pressure switch, which must close on 60 psi increasing pressure and open on 50 psi decreasing pressure.

SPECIAL BLEEDING AND PRESSURE ADJUSTMENT INSTRUCTIONS FOR A/H-ERC SYSTEM

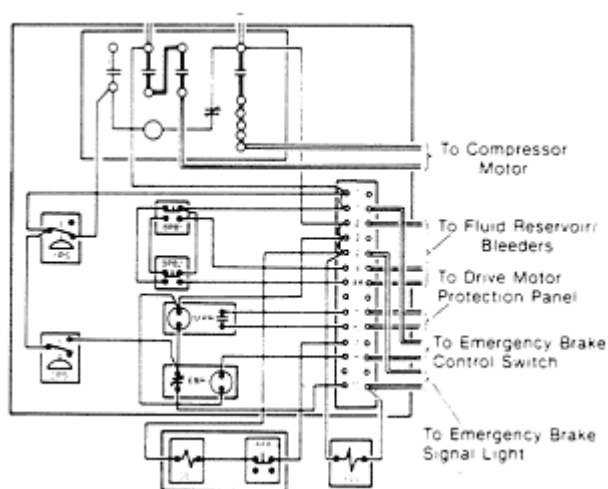
1. Fill fluid reservoir/bleeder(s) (and control cylinder and pilot circuit reservoir if used). Bleed the service brake circuit by holding BPB service brake bleeder pushbutton in and stroking the service brake pressure cluster(s) by repeatedly pushing BFP brake filling pushbutton. Bleed the parking brake circuit by holding BPB parking brake bleeder pushbutton in and stroking the parking brake pressure cluster(s) by repeatedly opening the bleeder screw on the HRC valve and pumping the control cylinder until clear fluid escapes from the bleeder screw. Close bleeder screw. If HRC circuit includes coiled or looped hose, move trolley to cause straightest possible hose length when bleeding system.
2. After the brake system is bled and brakes are adjusted, operate brake system. The low step pressure should control the empty crane to a slow stop. The high step pressure should control the loaded crane to a quick stop without abnormal load swing. Either pressure steps may be reset in the field; however, low pressure step must be less than the high pressure step. If HRC circuit is used, operation should be precise without noticeable time delay. Note: 20 seconds after high pressure step application, the protection valve control pressure is reduced, causing the valve to exhaust parking brake release pressure. Parking brakes are spring applied. High pressure step is then exhausted from the service brake pressure cluster(s).

**AC WIRING DIAGRAM
TYPE A/HM-ERC AIR/HYDRAULIC
PREWIRED CONTROL PANEL**



Note: Standard AC Panels Are Designed For 460V Operation.

**DC WIRING DIAGRAM
TYPE A/HM-ERC AIR/HYDRAULIC
PREWIRED CONTROL PANEL**



1PS - N.C. Compressor Start-Stop Pressure Switch (80/65 PSI)
2PS - N.O. System Pressure Switch (60/50 PSI)
BPB - Bleeder Pushbutton
BFP - Service Brake Filling Pushbutton

INSTALLATION INSTRUCTIONS

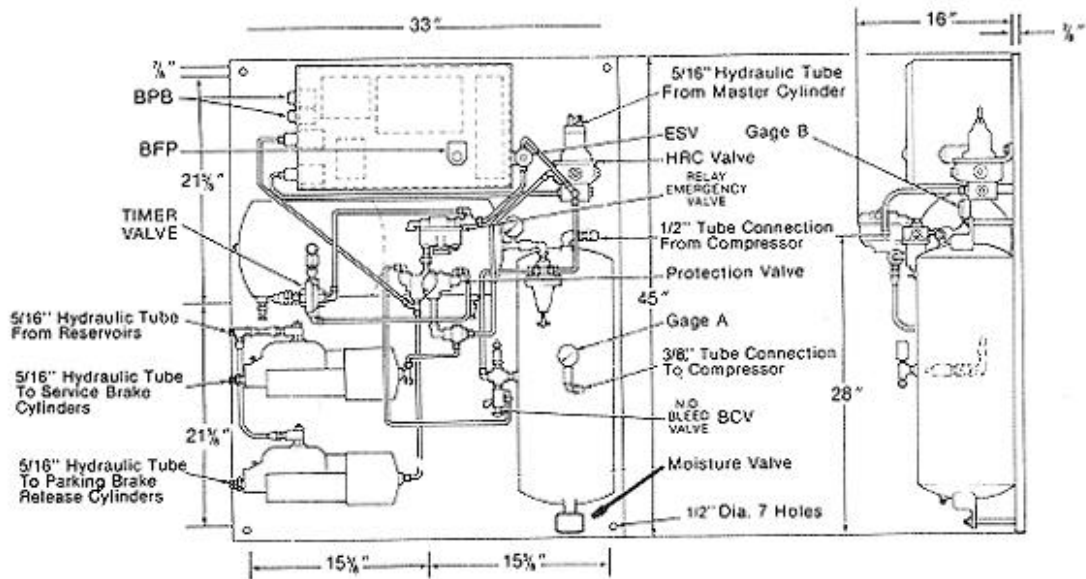
Type A/HM-HRC Panel

THESE INSTRUCTIONS COVER INSTALLATION OF THE FOLLOWING PANEL ASSEMBLIES:

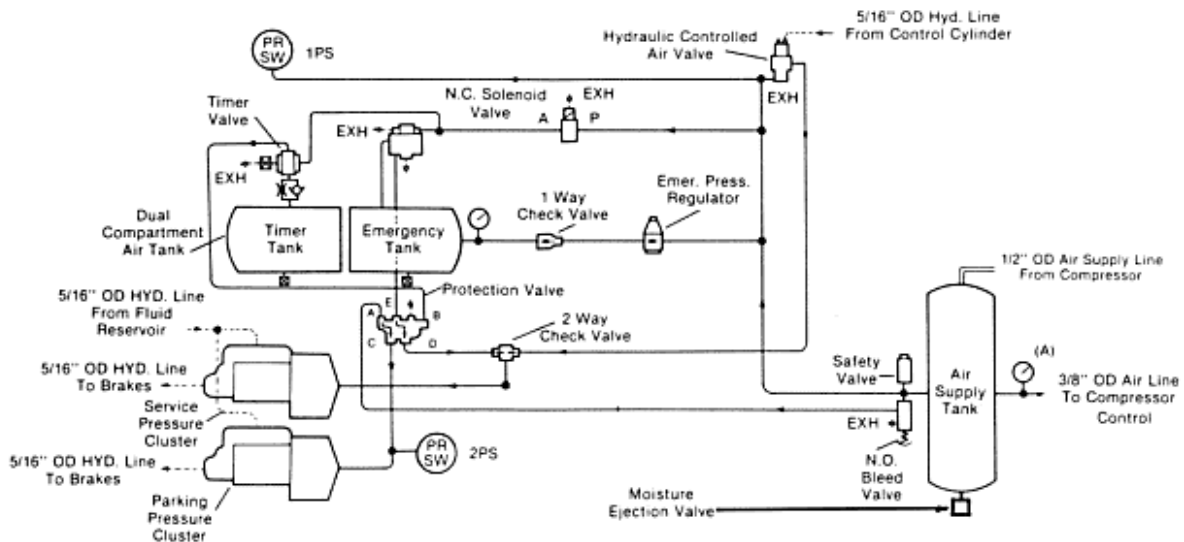
Power Supply			380, 460 or 575V, 50/60 Hz AC		230VDC		
Service Cluster Pressure Cluster	Air/Hydraulic Ratio		8 x 1	5 x 1	8 x 1	5 x 1	
	No. of service pressure clusters	1*	33" x 45" Panel	J100330	J100331	J100336	J100337
		2**	Assembly Only	J100332	J100333	J100338	J100339
		2*	(No Enclosure)	J100334	J100335	J100340	J100341
	1*	Panel Assy. Mounted	J103330	J103331	J103336	J103337	
2**	Inside 36 x 48 x 18	J103332	J103333	J103338	J103339		
2*	Enclosure	J103334	J103335	J103340	J103341		

*Also Includes 1-8 x 1 ratio parking brake release pressure cluster below service cluster.

**Also includes 2-8 x 1 ratio parking brake release pressure clusters below service clusters.



A/HM-HRC PANEL PIPING DIAGRAM



INSTALLATION INSTRUCTIONS

Type A/HM-HRC Panel

Mount the panel on a rigid vertical support, low enough for the 1/2" air line from the compressor to slope down to the air reservoir. This permits moisture to drain to the reservoir where it can be automatically ejected by the moisture valve.

Pipe and wire the panel into the system per applicable connection diagrams.

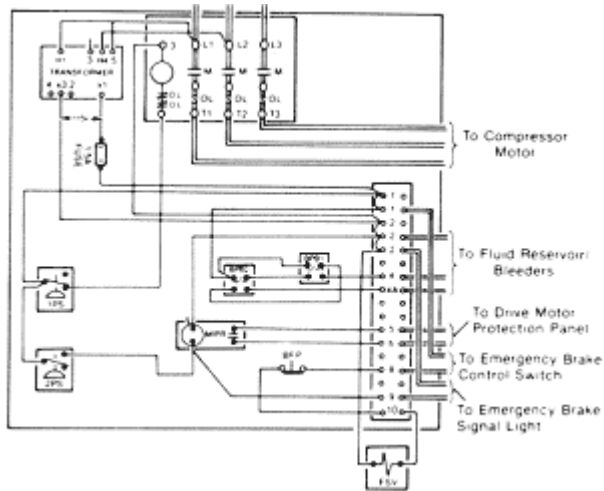
After the brake system is completely piped and wired, turn power ON. Check preset air pressures:

1. Compressor supply pressure at gauge A must range from 75-90 psi. This pressure is controlled by 1PS N.C. pressure switch.
2. Emergency pressure step (ON when ESV solenoid valve is de-energized) is factory set at 40 psi by regulator in front of gauge B.
3. Abnormally low compressor supply pressure is signalled by 2PS N.O. pressure switch, which must close on 60 psi increasing pressure and open on 50 psi decreasing pressure.

SPECIAL BLEEDING AND PRESSURE ADJUSTMENT INSTRUCTIONS FOR A/HM-HRC SYSTEM

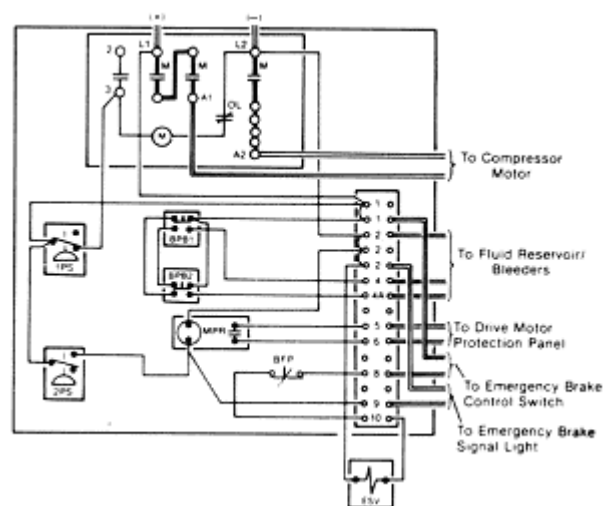
1. Fill fluid reservoir/bleeder(s), pressure cluster(s) and control cylinder (and pilot circuit reservoir if used). Bleed the service brake circuit by holding BPB service brake bleeder pushbutton in and stroking the service brake pressure cluster(s) by repeatedly pushing BFP brake filling pushbutton. Bleed the parking brake circuit by holding BPB parking brake bleeder pushbutton in and stroking the parking brake pressure cluster(s) by repeatedly pushing the BCV bleed control valve. Bleed the HRC circuit (if used) by opening the bleeder screw on the HRC valve and pumping the control cylinder until clear fluid escapes from the bleeder screw. Close bleeder screw. If HRC circuit includes coiled or looped hose, move trolley to cause straightest possible hose length when bleeding system.
2. After the brake system is bled and brakes are adjusted, operate brake system. Operation should be precise, without noticeable time delay. Check operation of emergency brake step by disconnecting power. The crane should come to a quick stop without abnormal hook swing. Adjust emergency brake pressure at gauge B if necessary. Note: twenty seconds after high pressure step application, the protection valve control pressure is reduced, causing the valve to exhaust parking brake release pressure. Parking brakes are spring applied. High pressure step is then exhausted from the service brake pressure cluster(s).

**AC WIRING DIAGRAM
TYPE A/HM-HRC AIR/HYDRAULIC
PREWIRED CONTROL PANEL**



Note: Standard AC Panels Are Designed For 460V Operation.

**DC WIRING DIAGRAM
TYPE A/H-HRC AIR/HYDRAULIC
PREWIRED CONTROL PANEL**



1PS - N.C. Compressor Start-Stop Pressure Switch (80/65 PSI)
 2PS - N.O. System Pressure Switch (60/50 PSI)
 BPB - Bleeder Pushbutton
 BFP - Service Brake Filling Pushbutton

INSTALLATION INSTRUCTIONS

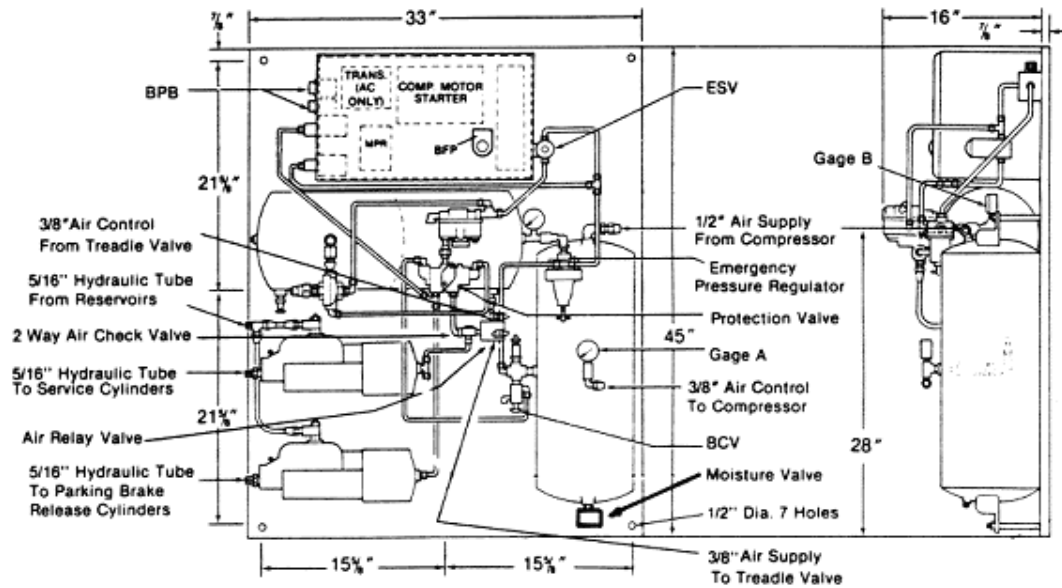
Type A/HM-ARC Panel

THESE INSTRUCTIONS COVER INSTALLATION OF THE FOLLOWING PANEL ASSEMBLIES:

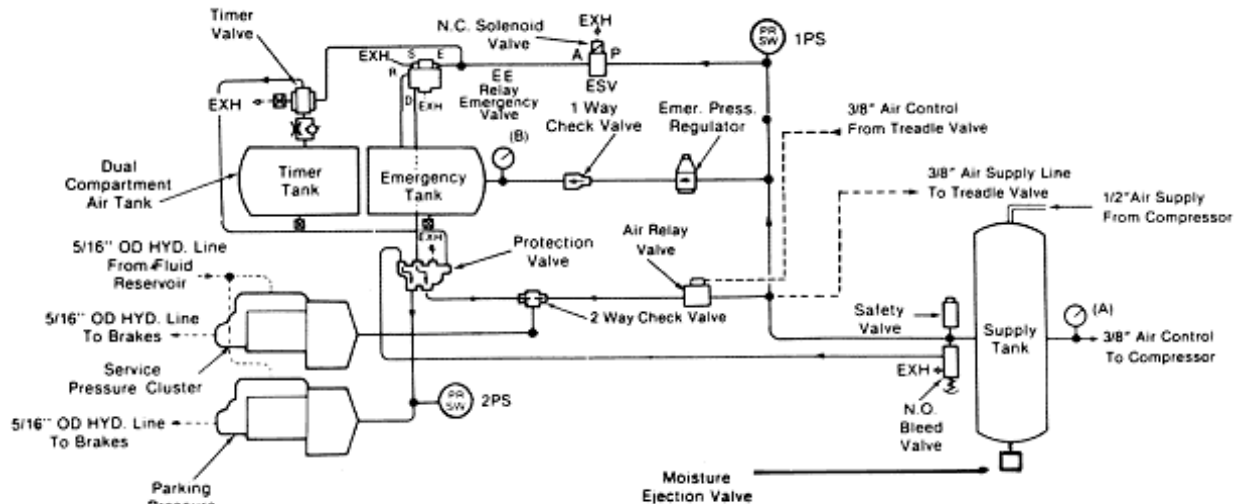
Power Supply			380, 460 or 575V, 50/60 Hz AC		230VDC		
Service Pressure Cluster	Air Hydraulic Ratio		8 x 1	5 x 1	8 x 1	5 x 1	
	No. of service pressure clusters	1*	33" x 45" Panel	J104400	J104401	J104406	J104407
		2**	Assembly Only	J104402	J104403	J104408	J104409
		2*	(No Enclosure)	J104404	J104405	J104410	J104411
	1*	Panel Assy. Mounted	J104424	J104425	J104430	J104431	
2**	Inside 36 x 48 x 18	J104426	J104427	J104432	J104433		
2*	Enclosure	J104428	J104429	J104434	J104435		

*Also Includes 1-8 x 1 ratio parking brake release pressure cluster below service cluster.

**Also includes 2-8 x 1 ratio parking brake release pressure clusters below service clusters.



A/HM-ARC PANEL PIPING DIAGRAM



INSTALLATION INSTRUCTIONS

Type A/HM-ARC Panel

Mount the panel on a rigid vertical support, low enough for the 1/2" air line from the compressor to slope down to the air reservoir. This permits moisture to drain to the reservoir where it can be automatically ejected by the moisture valve.

Pipe and wire the panel into the system per applicable connection diagrams.

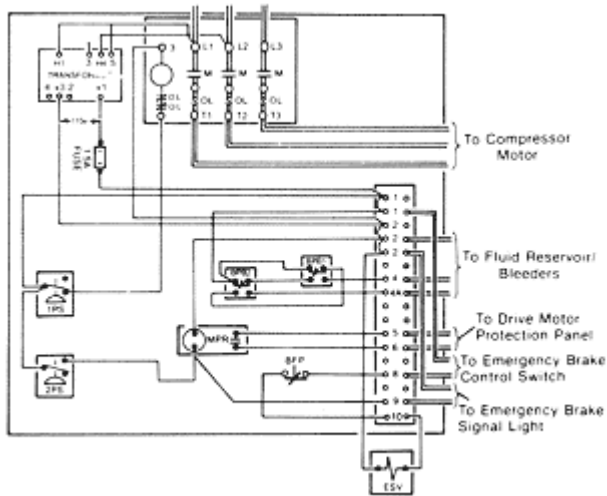
After the brake system is completely piped and wired, turn power ON. Check preset air pressures:

1. Compressor supply pressure at gauge A must range from 75-90 psi. This pressure is controlled by 1PS N.C. pressure switch.
2. Emergency pressure step (ON when ESV solenoid valve is de-energized) is factory set at 40 psi by regulator in front of gauge B.
3. Abnormally low compressor supply pressure is signalled by 2PS N.O. pressure switch, which must close on 60 psi increasing pressure and open on 50 psi decreasing pressure.

SPECIAL BLEEDING AND PRESSURE ADJUSTMENT INSTRUCTIONS FOR A/HM-ARC SYSTEM

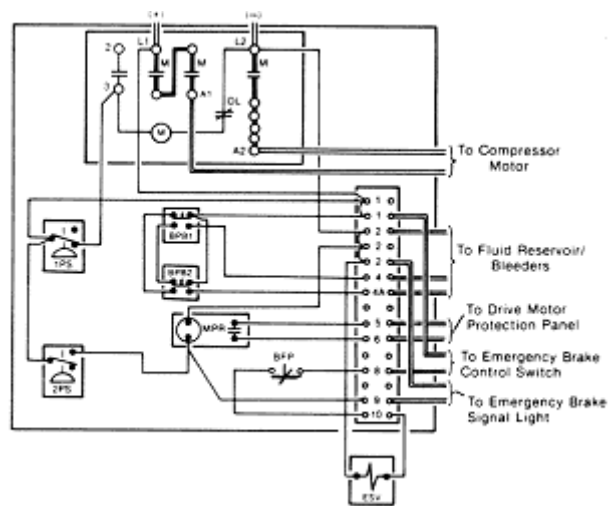
1. Fill fluid reservoir/bleeder(s) and pressure cluster(s). Bleed the service brake circuit by holding BPB service brake bleeder pushbutton in and stroking the service brake pressure cluster(s) by repeatedly pushing BFP brake filling pushbutton. Bleed the parking brake circuit by holding BPB parking brake bleeder pushbutton in and stroking the parking brake pressure cluster(s) by repeatedly pushing the BCV bleed control valve.
2. After the brake system is bled and brakes are adjusted, operate brake system. Operation should be precise, without noticeable time delay. Check operation of emergency brake stop by disconnecting power. The crane should come to a quick stop without abnormal hook swing. Adjust emergency brake pressure at gauge B if necessary. Note: twenty seconds after high pressure step application, the protection valve control pressure is reduced, causing the valve to exhaust parking brake release pressure. Parking brakes are spring applied. High pressure step is then exhausted from the service brake pressure cluster(s).

**AC WIRING DIAGRAM
TYPE A/HM-ARC AIR/HYDRAULIC
PREWIRED CONTROL PANEL**



Note: Standard AC Panels Are Designed For 460V Operation.

**DC WIRING DIAGRAM
TYPE A/HM-ARC AIR/HYDRAULIC
PREWIRED CONTROL PANEL**



1PS - N.C. Compressor Start-Stop Pressure Switch (80/65 PSI)
 2PS - N.O. System Pressure Switch (60/50 PSI)
 BPB - Bleeder Pushbutton
 BFP - Service Brake Filling Pushbutton

INDEX

System Piping And Wiring Diagrams

System Type	No. of Brakes	Special Features	Piping Diagram	Wiring Diagram	
				AC	DC
			Ref. No.	Ref. No.	Ref. No.
AH-ARC (previously Type A/H)	1		511	561/2A	561/2D
	2		512	561/2A	561/2D
	4		514*	564A*	564D*
	8		518	568A	568D
AHM-ARC	1		611	881/2A	881/2D
	2		612	881/2A	881/2D
	4	2 Prk Brks	613	883A	883D
	4	4 Prk Brks	614	884A	884D
AH-HRC	1		711	761/2A	761/2D
	2		712	761/2A	761/2D
	4		714	764A	764D
AHM-HRC	1		811	881/2A	881/2D
	2		812	881/2A	881/2D
	4	2 Prk Brks	813*	883A*	883D*
	4	4 Prk Brks	814	884A	884D
AH-ERC (With Cab Control)	1		911	961/2A	961/2D
	2		912	961/2A*	961/2D*
	2	Trdl in Cab	912T	961/2A	961/2D
	4	Trdl in Cab	914T	964A	964D
AH-ERC (Without Cab Control)	1		1011	1061/2A	1061/2D
	2		1012	1061/2A	1061/2D
	4		1014	1064A	1064D
AHM-ERC (With Cab Control)	1		1111	1181/2A	1181/2D
	2		1112	1181/2A	1181/2D
	4	2 Prk Brks	1113	1183A	1183D
	4	4 Prk Brks	1114	1184A	1184D
AHM-ERC (Without Cab Control)	1		1211	1281/2A	1281/2D
	2		1212	1281/2A	1281/2D
	4	2 Prk Brks	1213	1283A	1283D
	4	4 Prk Brks	1214	1284A	1284D

* Typical Diagrams included in following pages.
Specified diagrams supplied with order or on request.

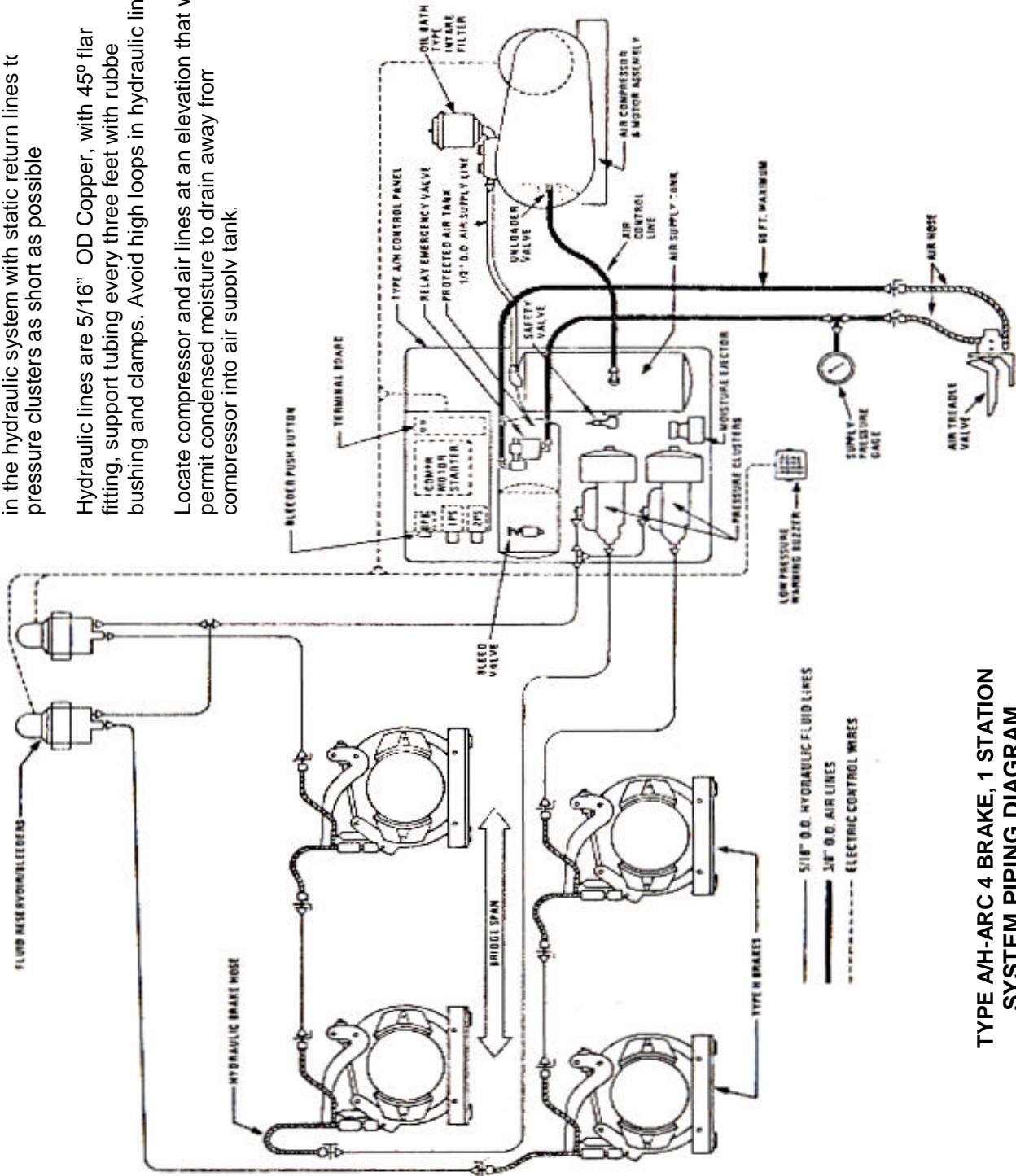
DIAGRAM

Type AH-ARC Four Brake, One Station System Piping

Mount both bleeders near panel, at same height, highes in the hydraulic system with static return lines to pressure clusters as short as possible

Hydraulic lines are 5/16" OD Copper, with 45° flar fitting, support tubing every three feet with rubber bushing and clamps. Avoid high loops in hydraulic lines

Locate compressor and air lines at an elevation that will permit condensed moisture to drain away from compressor into air supply tank

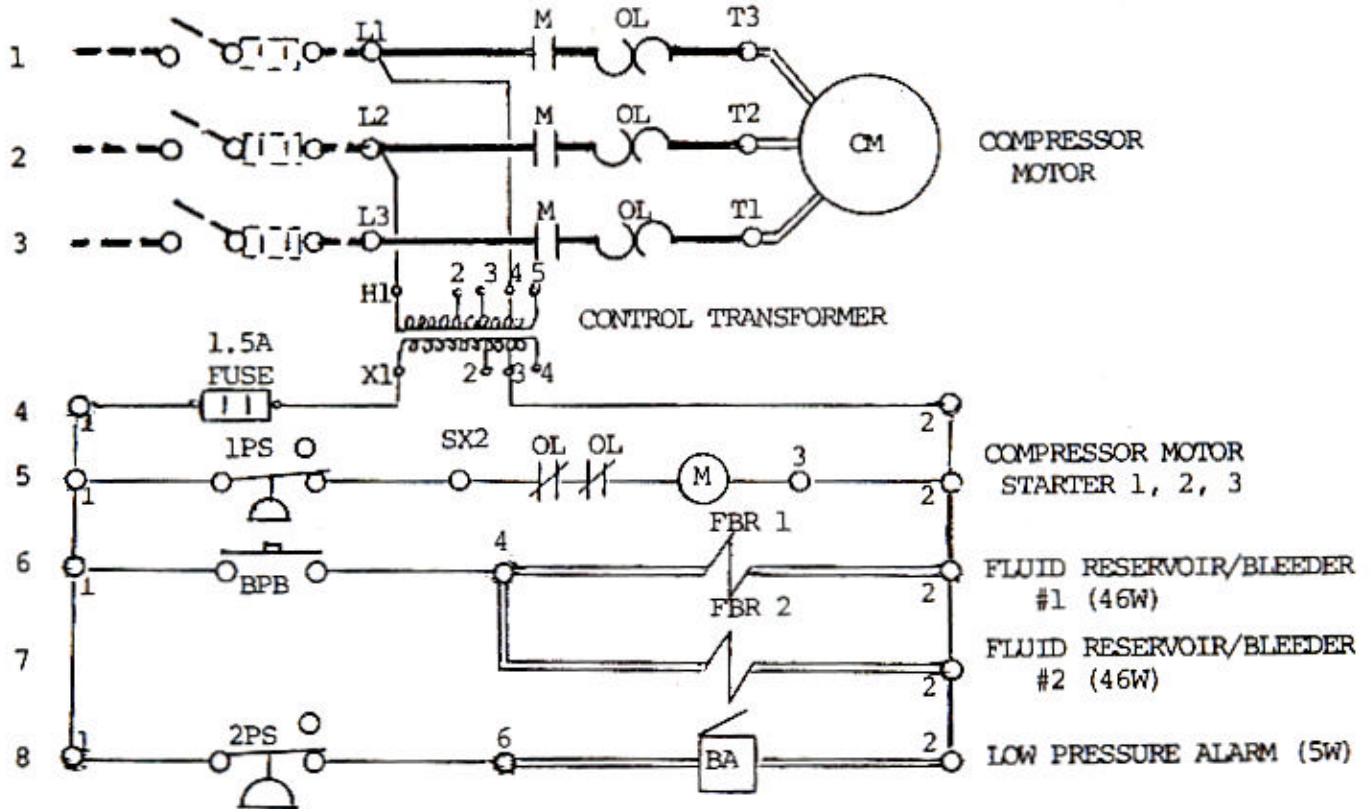


TYPE AH-ARC 4 BRAKE, 1 STATION SYSTEM PIPING DIAGRAM

DIAGRAM

Type A/H- Four Brake Industrial System

ELEMENTARY WIRING DIAGRAM



1PS - NC Compressor Start-Stop Pressure Switch (80/65 PSI)

2PS - NC System Pressure Switch (60/50 PSI)

BPB - No Bleeder Pushbutton

○ - Terminals on Control Panel

— - Single Lines - Wiring or Components by MagneTek

══ - Double Lines - Wiring by Purchaser

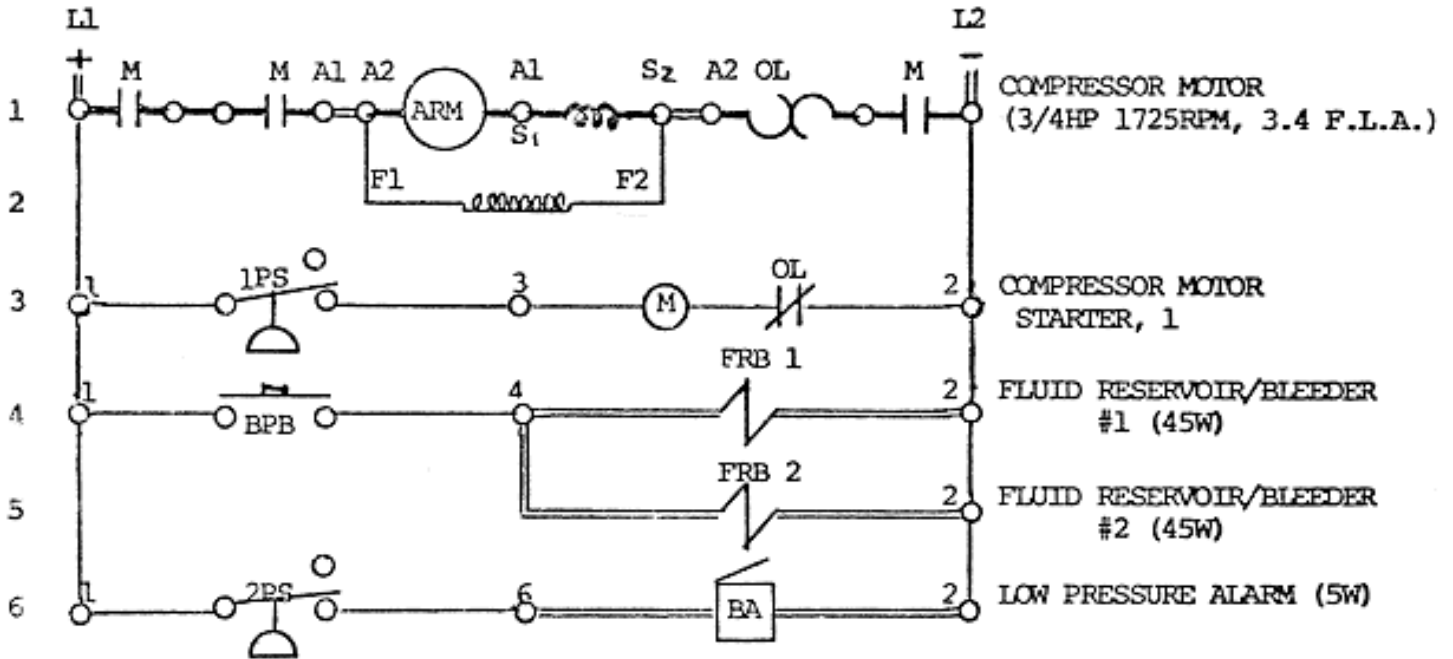
NOTE: AC Panels are prewired for 460V. High and Low voltage control leads must be reconnected for 230, 380 or 575V.

CAUTION: Connect Motor Leads for Rotation as indicated by arrow on compressor. Do not start compressor until crankcase is filled with oil. Short circuit protection should be provided in accordance with National Electrical Code.

DIAGRAM

Type A/H- Four Brake Industrial System

ELEMENTARY WIRING DIAGRAM 230VDC



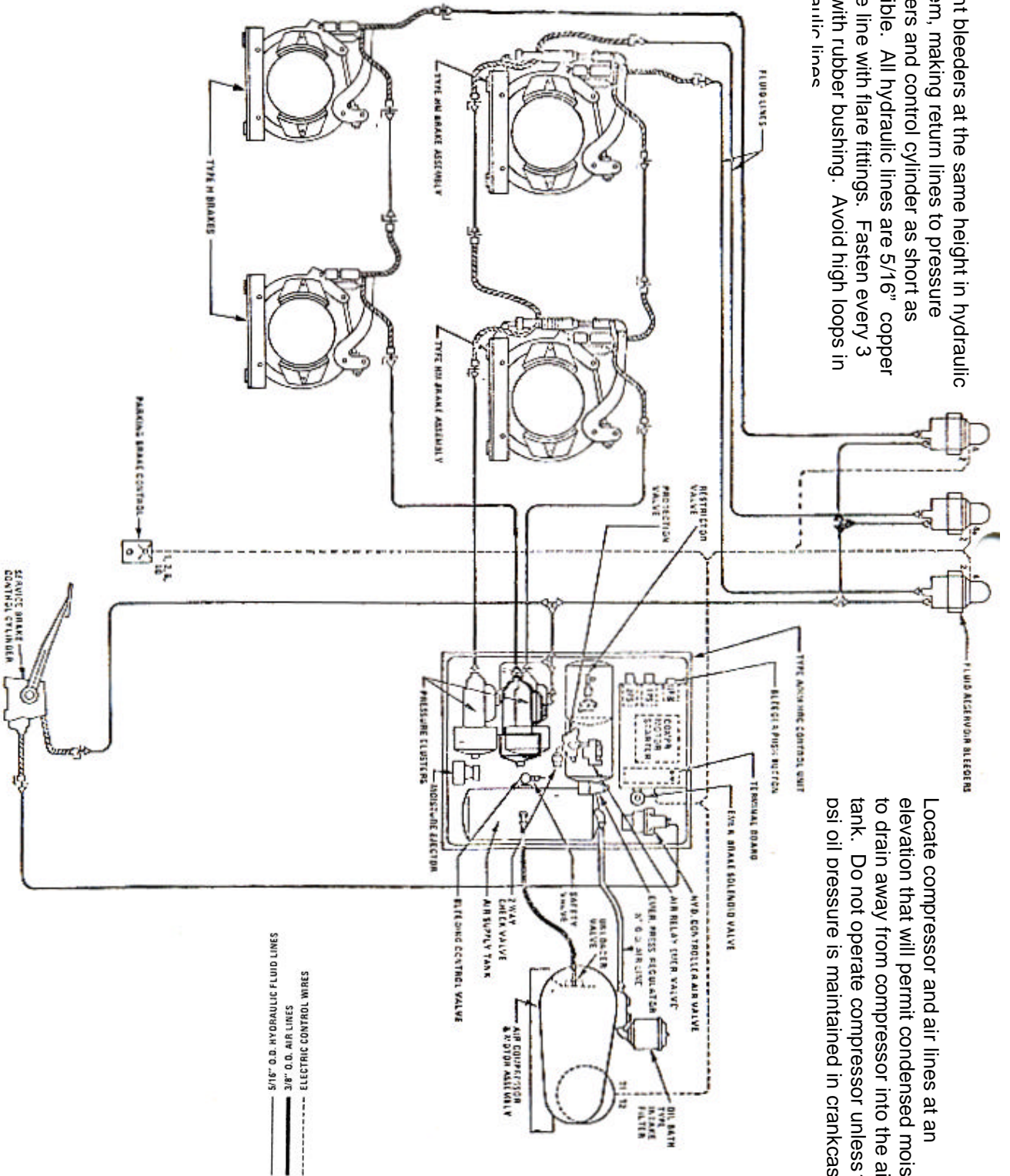
- 1PS - NC Compressor Start-Stop Pressure Switch (80/65 PSI)
- 2PS - NC System Pressure Switch (60/50 PSI)
- BPB - No Bleeder Pushbutton
- - Terminals on Control Panel
- - Single Lines - Wiring or Components by MagneTek
- ══ - Double Lines - Wiring by Purchaser

CAUTION: Connect Motor Leads for Rotation as indicated by arrow on compressor.
 Do not start compressor until crankcase is filled with oil.
 Short circuit protection should be provided in accordance with National Electrical Code.

DIAGRAM

Type A/HM-HRC Four Brake System With Two HM Parking Brakes - Piping

Mount bleeders at the same height in hydraulic system, making return lines to pressure clusters and control cylinder as short as possible. All hydraulic lines are 5/16" copper brake line with flare fittings. Fasten every 3 feet with rubber bushing. Avoid high loops in hydraulic lines



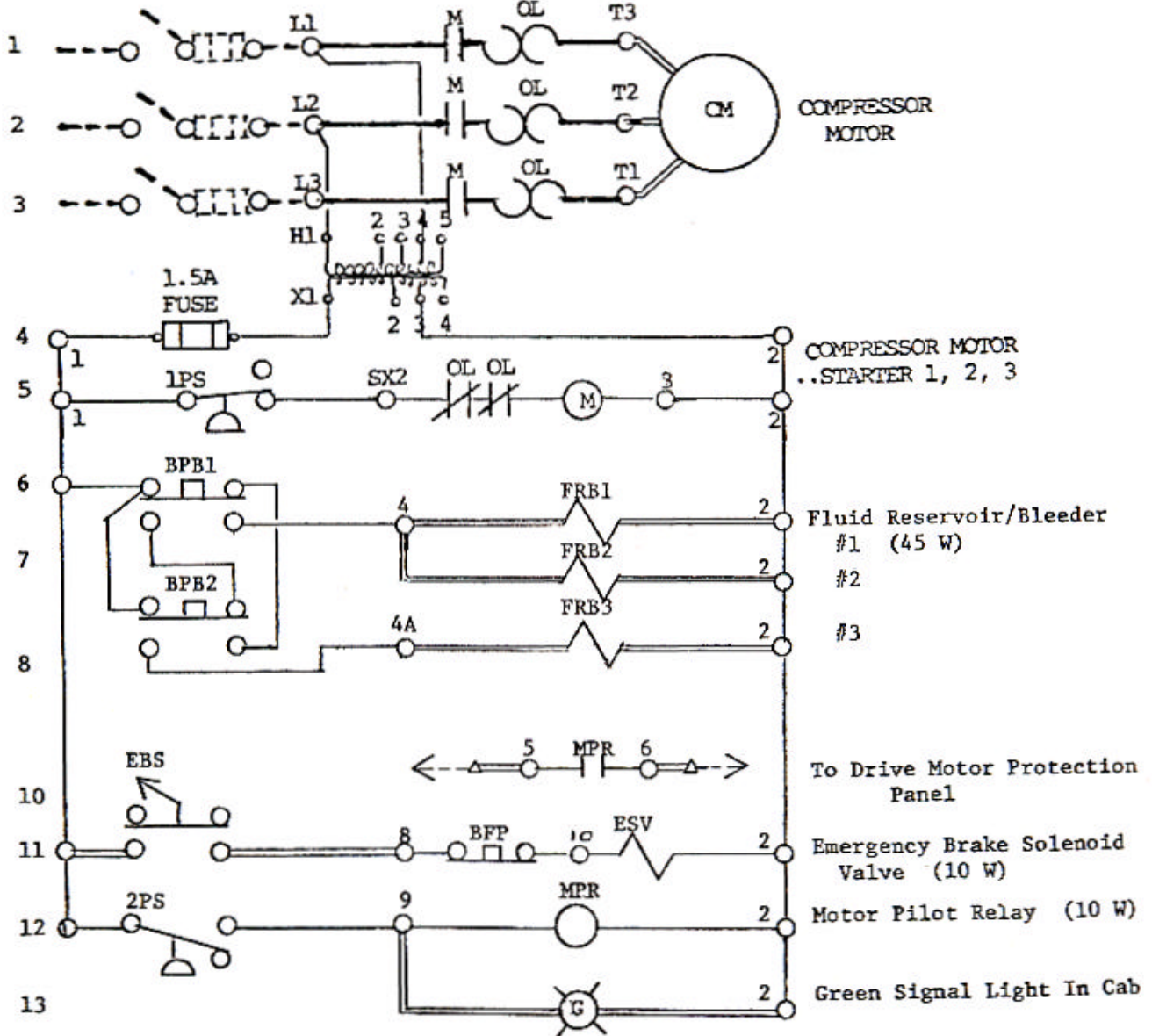
TYPE A/HM-HRC FOUR BRAKE SYSTEM WITH TWO HM PARKING BRAKES

Locate compressor and air lines at an elevation that will permit condensed moisture to drain away from compressor into the air tank. Do not operate compressor unless 16 psi oil pressure is maintained in crankcase

DIAGRAM

Type A/HM-HRC Four Brake System With Two HM Parking Brakes

AC ELEMENTARY WIRING DIAGRAM



1PS - NC Compressor Start-Stop Switch (90/75 PSI)

BPB - Bleeder Pushbutton

BFP - NC Bleeding Pushbutton

EBS - Emergency Brake Switch in Cab

2PS - NO Pressure Switch (60/50 PSI)

○ - Terminals on Control Panel

△ - Terminals by Purchaser

— - Single Lines - Wiring or Components by MagneTek

══ - Double Lines - Wiring by Purchaser

NOTE:

Panels are prewired for 460V. High and Low voltage control leads must be reconnected for 230, 380 or 575V.

CAUTION:

Connect Motor Leads for Rotation as indicated by arrow on compressor.

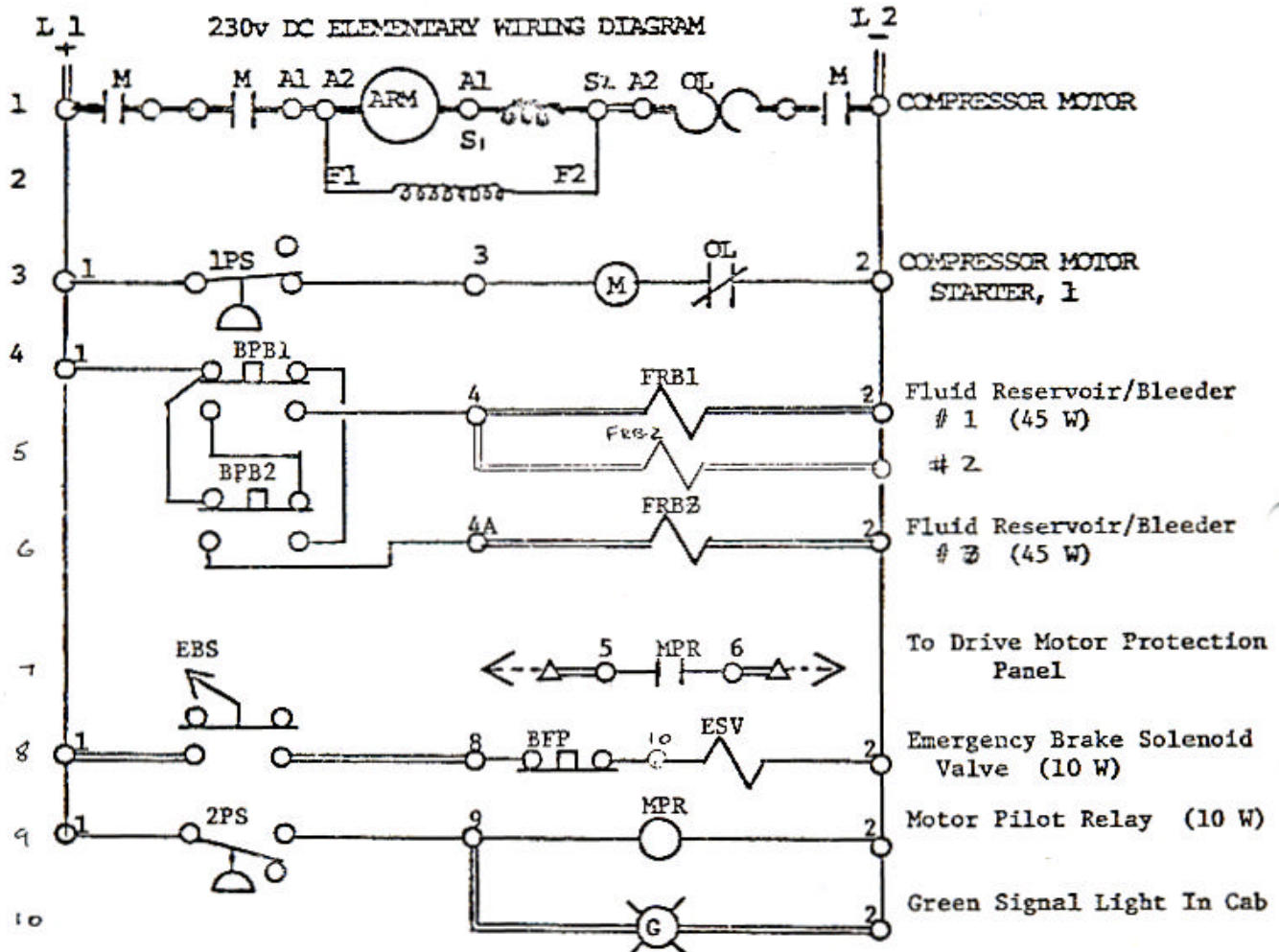
Do not start compressor until crankcase is filled with oil.

Short circuit protection should be provided in accordance with National Electrical Code.

DIAGRAM

Type A/HM-HRC Four Brake System With Two HM Parking Brakes

230VDC ELEMENTARY WIRING DIAGRAM



- 1PS - NC Compressor Start-Stop Switch (90/75 PSI)
- BPB - Bleeder Pushbutton
- BFP - NC Bleeding Pushbutton
- EBS - Emergency Brake Switch in Cab
- 2PS - NO Pressure Switch (60/50 PSI)
- - Terminals on Control Panel
- △ - Terminals by Purchaser
- - Single Lines - Wiring or Components by MagneTek
- ≡ - Double Lines - Wiring by Purchaser

CAUTION:

Connect Motor Leads for Rotation as indicated by arrow on compressor.

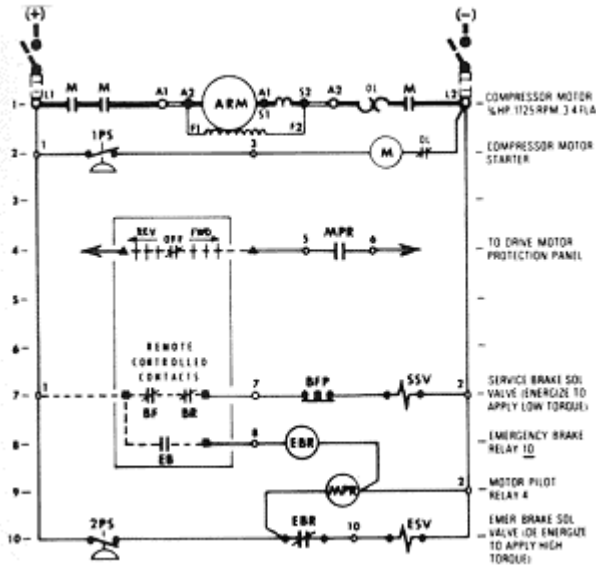
Do not start compressor until crankcase is filled with oil.

Short circuit protection should be provided in accordance with National Electrical Code.

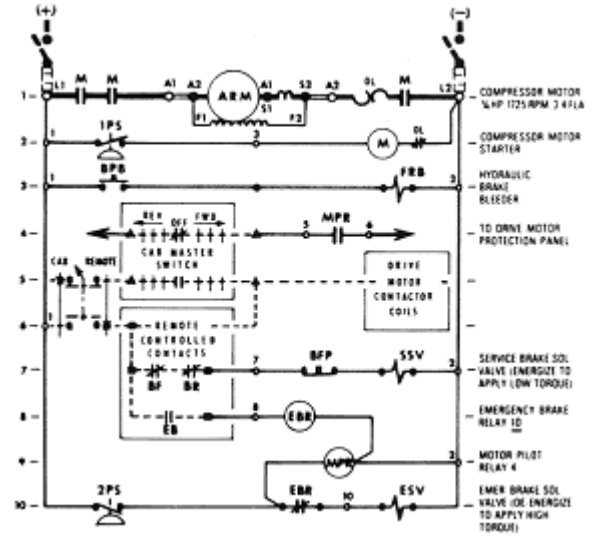
DIAGRAM

Type A/HM-ERC Brake System

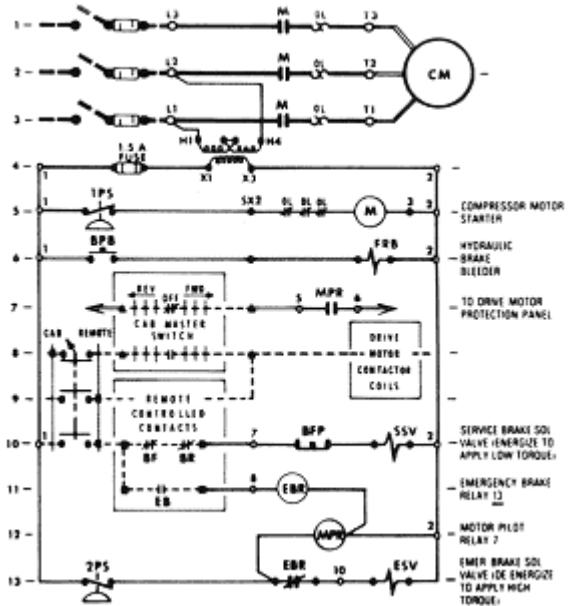
230VDC ELEMENTARY WIRING DIAGRAM FOR SYSTEMS WITHOUT CAB CONTROL



230VDC ELEMENTARY WIRING DIAGRAM FOR SYSTEMS WITH AUXILIARY CAB CONTROL



460V 60Hz ELEMENTARY WIRING DIAGRAM FOR SYSTEMS WITH AUXILIARY CAB CONTROL



NOTE: Components Connected By Solid Lines Are Parts Supplied in MagneTek Brake System.

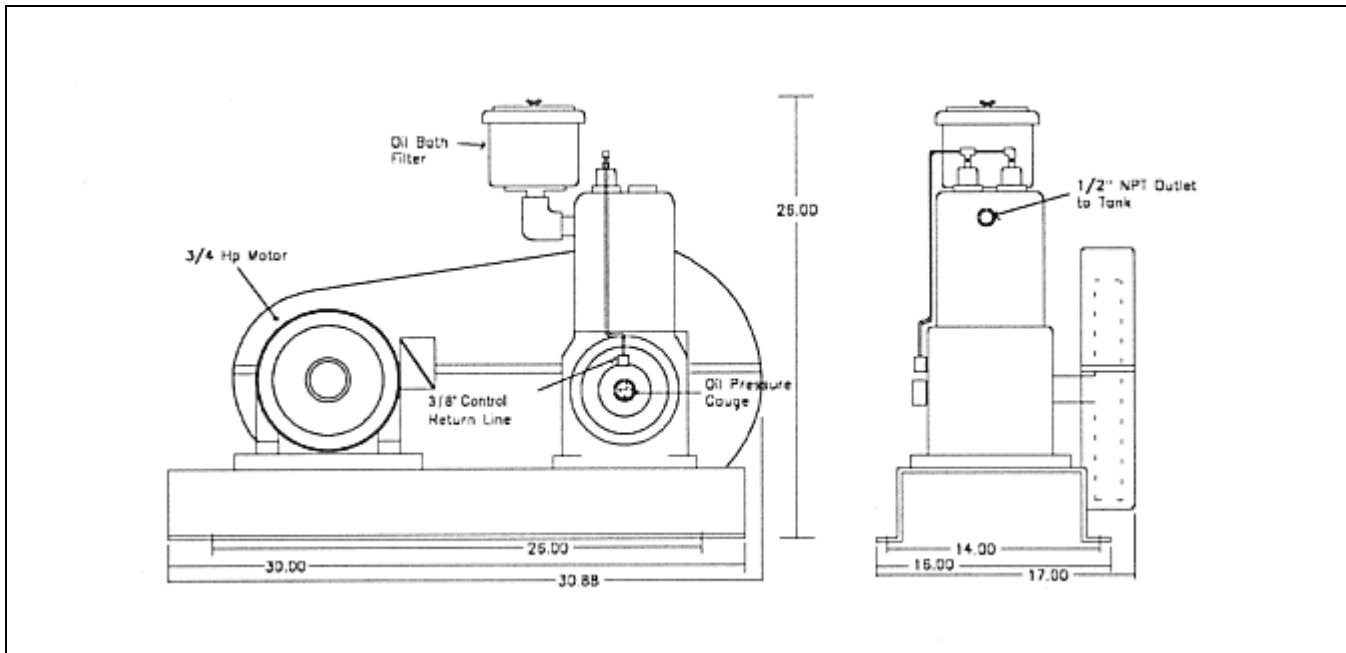
- △ - Terminals On Crane Control Panels.
- - Terminals On Remote Control Panels.
- - Terminals On Brake Control Panel.
- 1PS - N.C. Pressure Switch
(Opens @ 80 PSI, Closes @ 65 PSI)
- BPB - N.O. Bleeder Pushbutton (In Cab)
- BF, BR - N.C. Service Brake Contacts
(Arrange To Open When Drive Motor Is Started)
- BFP - N.C. Bleeding Pushbutton
- EB - N.O. Emergency Brake Contact
(Arrange To Close When Brake Button On Remote Station Is Depressed)
- 2PS - N.O. Pressure Switch
(Closes @ 60 PSI, Opens @ 50 PSI)

CAUTION: Connect Motor Leads for Correct Rotation as Indicated by Arrow on Compressor. DO NOT START COMPRESSOR UNTIL CRANKCASE IS FILLED WITH OIL. Connect MPR Contacts to Prevent Remote Operation Unless Sufficient Air Pressure is Available for Safe Braking.

Provision must be made to protect against short circuits in accordance with requirements of N.E.C.

INSTALLATION INSTRUCTIONS

Air Compressor and Motor Assembly



COMPRESSOR ASSY. NO.	MOTOR HP	MOTOR VOLTAGE	MOTOR PULLEY PD	BELT LENGTH
J-70941	3/4	575, 3 ph., 60 Hz	3.9"	51"
J-70942*	3/4	460, 3 ph., 60 HZ	3.9"	51"
J-70943	3/4	230V DC	3.9"	51"

*J-70942 is also suitable for use on 380V, 3 ph, 50 Hz.

Mount the compressor near the air hydraulic panel. Position the compressor so that the fan type compressor flywheel is at least 12 inches from the wall to allow ample air circulation. Elevate the compressor so the 1/2" outlet is above the reservoir inlet on the panel, to allow any moisture to drain to the reservoir. Use 1/2" tubing for compressor supply line and 3/8" tubing for compressor control line.

Fill compressor crankcase with nondetergent oil of grade and type recommended by compressor manufacturer. Fill oil bath air filter to indicated line.

Connect compressor motor to starter on panel. Be sure that motor rotates compressor in direction of arrow.

Start compressor and check pressure. Lubrication pressure gauge should indicate 16 psi. Air reservoir pressure should reach 80 psi. Check for air leakage. Tighten fittings if necessary.

INSTALLATION INSTRUCTIONS

Bleeding Hydraulic Brake System

Turn crane power ON so that the FRB bleeder solenoid can be operated. If air/hydraulic system is used, the air system must be piped and wired with power ON and with normal air pressure.

Brake fluid is drawn from the FRB reservoir through the static return line to the master cylinder and pumped through the brake system pressure line. The reservoir must initially be completely full of fluid as per filling instructions above. The FRB reservoir must be *kept* full during the bleeding operation.

Each successive full cylinder stroke forces fluid farther downstream. The master cylinder must be stroked enough times to force fluid through the complete brake system. Volume of the 5/16" OD tubing is 0.6 in³ per foot. With the control cylinder brake pedal temporarily set for maximum 17" pedal travel, or the pressure cluster operated at full 1-1/2" stroke, displacement is as follows:

ASSEMBLY		MAX DISPLACEMENT	FILLED PER STROKE LENGTH OF TUBING
J-16320	1-1/2" Dia. Control Cylinder	3.4 in ³	5 ft.
J-17616	1-3/4" Dia. Control Cylinder	4.6 in ³	7 ft.
J-54085 or 6	1-3/4" Dia. Pressure Cluster	5.7 in ³	9 ft.

Example: Brake System using JF-17616 control cylinder, with 70-foot pressure line from cylinder to brake and to FRB bleeder, must be fully stroked at least 10 times to fill the complete system.

1. Depress BPB bleeder pushbutton to unseat the FRB bleeder check valve.
2. Step on control cylinder brake pedal through full 17" travel, or stroke pressure cluster on panel forward (see panel installation instructions). Keep foot on pedal or keep pressure cluster stroked forward.
3. Disengage BPB (bleeder pushbutton).
4. Remove foot from pedal or retract pressure cluster.
5. Repeat steps 1-4 enough times to fill the complete system. Remember, fluid travel is only 5 to 7 feet. The above cycle must be performed enough times to fill the entire length of interconnecting tubing.
6. Refill FRB reservoirs frequently during bleeding sequences to prevent reinjecting air in system.
7. The brake system is completely bled when the system is operated without operating the bleeder pushbutton and the brake pedal has a solid feel after less than 8" pedal travel, or if the pressure cluster stroke indicator shows less than 1-1/2" travel.
8. Reset brake pedal for comfortable operator height and to provide approximately 8" maximum travel.
9. NOTE: Manually operated type HM systems require a special bleeding procedure in addition to above steps. After the service brake system is bled:
 - a. Temporarily attach a bleeder hose to the bleeder screw on the HM brake releasing cylinder and open the bleeder screw.
 - b. Pump the brake pedal until only clear fluid is expelled from the releasing cylinder bleeder screw. Do not open the service brake bleeder during this step.
 - c. Close the releasing cylinder bleeder screw and repeat at the second HM brake, if used.
10. Refill FRB reservoir to within 1" of opening and replace filler cap and gasket.

It is recommended that the brake system be rebled after a short period of operation.

SERVICE INFORMATION

Troubleshooting Instructions

TROUBLE	STEP-BY-STEP PROCEDURE
Complete loss of pedal	<ol style="list-style-type: none"> 1. Check clearance between brake lining and wheel. 2. Check bleeder fluid level, bleeder solenoid operation and bleed system. If system has two stations bleed from both. If pedal is extremely light during bleeding on one-station system and fluid is not entering bleeder, replace control cylinder. On two-station system replace control cylinder, and if this does not improve operation check crossover valve and replace if necessary. <ol style="list-style-type: none"> A. If solenoid fails to function replace solenoid or pushbutton, or correct wiring fault. 3. Inspect lines and units for leaks. Correct faults. 4. Replace control cylinder or fluid reservoir bleeder. On two-station system, check crossover valve.
Actuating cylinder stays extended (service brake will not release)	<ol style="list-style-type: none"> 1. Open any tube connection near actuating cylinder. <ol style="list-style-type: none"> A. If actuating cylinder does not release, replace it. B. If actuating cylinder releases, replace control cylinder; on two-station system determine which should be replaced.
Gradual loss of pedal during service application	<ol style="list-style-type: none"> 1. Inspect lines and units for leaks. 2. If repeated applications do not disclose visible leaks, replace control cylinder. 3. If necessary, replace actuating cylinder.
Parking brake does not stay released unless operator stands on pedal	<ol style="list-style-type: none"> 1. If good signal lamp does not light when pressure switch closes, check wiring circuits and voltage, and check for leaks in hydraulic system. 2. If lamp lights but brake will not stay released, check at brake control unit for open circuit in unit and for lack of power from switch.
Parking brake stays released for short interval only	<ol style="list-style-type: none"> 1. Power supply interruptions from collector rail breaks or other sources may need correction. 2. Bleed system. 3. Replace releasing cylinder and/or brake control unit.

CAUTION:

These units are intended for use with SAE J1703 Automotive Brake Fluid only.

GENERAL

Type A/H Panel Operation And Troubleshooting

Hydraulic Brake Systems

Industrial Brake Products

AH-ARC, AH-ERC, and AH-HRC Panel Operation for

Air-Over-Hydraulic Brake Systems

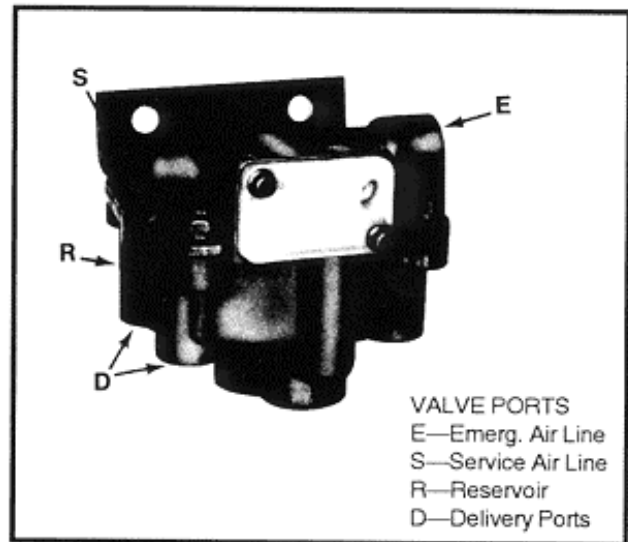
The AH panels have the following common components (as illustrated in panel piping diagrams):

- Air storage tank(s)
- Protected air storage tank
- Starter with controls for compressor
- Pressure switches
- Pressure cluster(s)
- Moisture ejection valve
- Relay Emergency Valve (REV)

The relay emergency valve is the heart of the panel operation. Understanding this valve function will assist in understanding the AH panel operation.

This valve controls pressure to the service brake pressure cluster. It applies pressure from the right half of the horizontal reservoir. Whenever emergency port E is pressurized above 50 psi, reservoir port R pressure is poised for application to delivery port D at whatever pressure is applied to service port S. Without pressure at the service port, no pressure is applied to the delivery port.

Whenever emergency port pressure drops below 40 psi, pressure at the reservoir port is applied to the delivery port. Hence the valve applies pressure to the service brake pressure cluster in "emergencies," although a tiny "bleed-down bypass" bleeds delivery port pressure through the service port. After several hours the "emergency" brake pressure is fully released.



GENERAL

Type A/H Panel Operation And Troubleshooting

Panel Operation Summary

- | | |
|----------------------------------|---|
| 1) AH-ARC Normal Service Braking | Air is delivered to the service port on relay emergency valve (REV) via air treadle valve located in operator's cab. Applying pressure to service port meters air to the pressure clusters, which forces hydraulic fluid to the brake(s). |
| 2) AH-ERC Normal Service Braking | Air is delivered to service port on relay emergency valve (REV) by opening (energizing) the service solenoid valve (SSV). REV valve meters air to the pressure cluster(s), which forces hydraulic fluid to the brake(s). |
| 3) AH-HRC Normal Service Braking | Depressing foot pedal on control cylinder in operator's cab delivers hydraulic pressure to hydraulically controlled air valve. Air is metered through a check valve to pressure cluster(s), which forces hydraulic fluid to the brake. |

NOTE: In all cases, for normal service braking, 50 psi of air pressure must be present at the emergency port on the relay emergency valve (REV).

- A. For AH-ARC panels, air is piped through a one-way check valve from the storage tank.
- B. For AH-ERC and AH-HRC panels, air is piped from the storage tank but through a normally closed solenoid. The solenoid (emergency solenoid valve) must be held open (energized) so air is delivered to the emergency port.

GENERAL

Type A/H Panel Operation And Troubleshooting

Panel Operation Summary

- 4) Emergency Braking
- Whenever emergency port pressure drops below 40 psi on the REV, air from the protected tank will be delivered to the pressure cluster(s), which forces hydraulic fluid to the brake.

NOTE: Emergency braking can occur when:

- A. Loss of air pressure or low air pressure
- B. Loss of power (AH-ERC, AH-HRC)
- C. PS2 pressure switch opens (AH-ERC, AH-HRC)
- D. Closing emergency solenoid valve (de-energized) by contact control. This is commonly referred to as the second step of braking for AH-ERC panels.

- 5) 1PS Pressure Switch (J078061) Turns compressor on/off.
- 6) 2PS Pressure Switch (J078061) AH-ARC panel sounds low pressure alarm. Emergency braking occurs as noted above for AH-ERC and AH-HRC systems.
- 7) BPB Bleeder Push Button (J010068) Opens bleeder(s) by energizing solenoid on fluid reservoir bleeder.
- 8) MPR - Motor Protection Relay On AH-ERC/AH-HRC panels, relay provides contact for customer use as motor protection.
- 9) BFP - Brake Filling Push Button Strokes pressure cluster for bleeding hydraulic lines.
- 10) Moisture Ejection Valve Each brake application causes a small amount of air to expel accumulated moisture in storage tank.

GENERAL

Type A/H Panel Operation and Troubleshooting

Troubleshooting Hints

<u>PROBLEM</u>	<u>POSSIBLE SOLUTION</u>
Brake does not actuate	A. Observe pressure cluster to determine if unit "stroked forward." An 8 x 1 cluster has an indicating rod, a 5 x 1 cluster has a rubber boot that moves. If cluster strokes, panel may be operating and problem is at brake. B. Relay emergency valve not functioning. C. No power or no air pressure. D. Solenoid valve not functioning.
Brake stays set	No air on emergency port of REV so brake is actuated.
Brake "spongy"	Air trapped in hydraulic lines; system needs to be bled.

Bleeding Procedure

- 1) Open fluid reservoir bleeder (BPB) by depressing push button (and holding in).
- 2) Stroke pressure cluster forward by doing one of the following, depending on panel:
 - A. AH-ARC - depress bleeding control valve or treadle valve.
 - B. AH-ARC - depress BFP brake filling push button.
 - C. AH-HRC - depress bleeding control valve or control cylinder.
- 3) Release push button (BPB).
- 4) Retract pressure cluster by releasing step 2.

This procedure will have to be repeated many times to completely bleed the system. Fluid travel is only five to seven feet. Refill reservoir(s) frequently during bleeding.

If the pressure cluster stroke is reduced to a travel of about 1-1/2", this may be an indication that the system is bled.