

Ben Pearson Tube Benders

**Service and
Maintenance
Manual**

Ben Pearson

Models

BP-08

BPC-09

BP-11

BPC-12

TO THE OWNER

INTRODUCTION

Carefully read and understand this manual before operation begins. Every BEN PEARSON TUBE BENDER is constructed from the finest materials by highly trained, experienced craftsmen.

They have profound interest in your bender's successful performance and have prepared this manual to give you the benefit of their experience.

The manner in which you operate and the care you provide for this bender, will have a direct bearing on its continued successful performance. The manual has been prepared to make it easy for you to learn the methods for proper operation and care.

READ THIS ENTIRE MANUAL. KEEP IT FOR FUTURE REFERENCE. FOR FUTURE REFERENCE, RECORD YOUR MODEL NUMBER, SERIAL NUMBER AND DATE OF DELIVERY IN THE SPACES BELOW.

Huth's policy is to improve its products whenever possible. Huth reserves the right to make changes and/or improvements without incurring any obligation to do so on previously sold products.

This manual relates to benders built after January 1, 2012. For more details on specifics of older benders please call Huth.

WARRANTY OF HUTH/BEN PEARSON PRODUCTS

This warranty is made for the exclusive benefit of the original owner and is not transferable. There is no other warranty applicable to HUTH/BEN PEARSON PRODUCTS, and no representative has any authority to make any representation, promise or agreement except as stated in the warranty.

ONE YEAR WARRANTY*

For one year from the date of invoice the seller will repair the bender if found to be defective in material and workmanship without cost to the purchaser. Following the first 90 days from the date of original invoice, replacement parts are shipped from the seller to the purchaser freight collect. Return parts are shipped prepaid to the seller.

In effecting such repairs, the seller may at its election, repair or replace any part which it finds to be defective.

Tools and dies are warranted for a period of (90) ninety days against defect in material and workmanship.

* During the first 90 days from date of original invoice the seller will pay freight charges for replacement of defective parts.

HUTH Equipment
260 Grant Street
P.O. Box 270467
Hartford, WI 53027
Telephone: 1-800-558-7808
In Wisconsin: 262-673-9440
Fax: 262-673-9443
<http://www.huthbenders.com>

Model Number _____

Serial Number _____

Date Delivered _____

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1. BENDER TERMINOLOGY/COMPONENT LOCATION ---

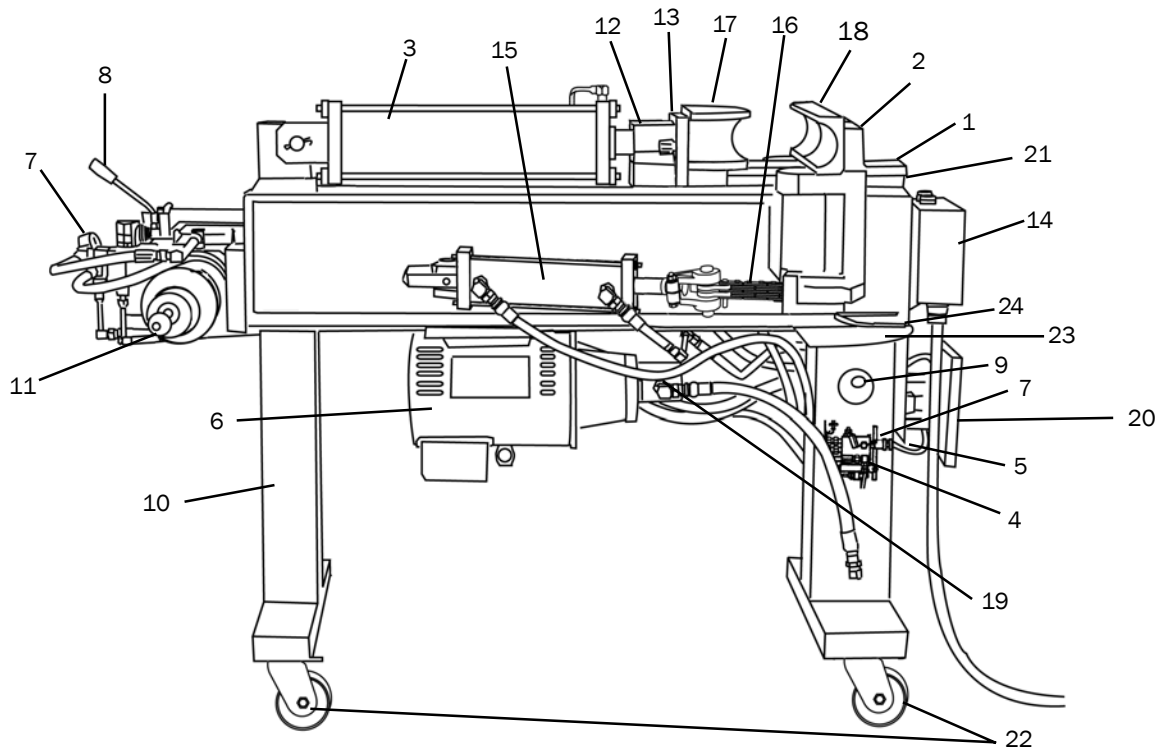
INTRODUCTION

It is important to familiarize yourself with the terms/names and locations of the components used on the bender. Study the illustrations on the following pages and read the terms and descriptions that apply to your model.

The descriptions are number coded to the numbers on the illustrations. To find the description of a component, look up the corresponding number in Section 2: Bender Component Descriptions. To find the description of the controls, look up the corresponding letter in Section 3: Bender Control Descriptions.

The terms used will be used throughout the manual and this section of the manual may be referred to in order to clarify or illustrate a location.

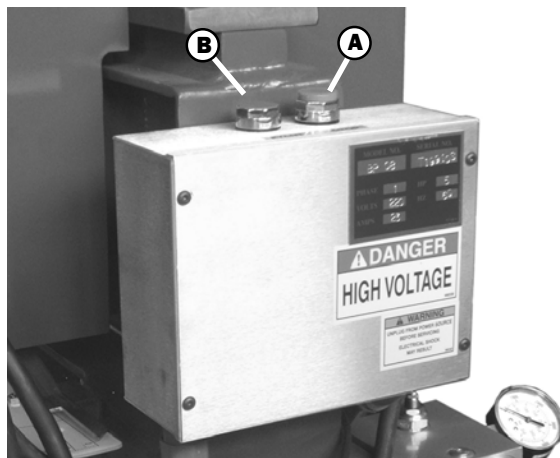
COMPONENT LOCATION BP-08, BPC-09



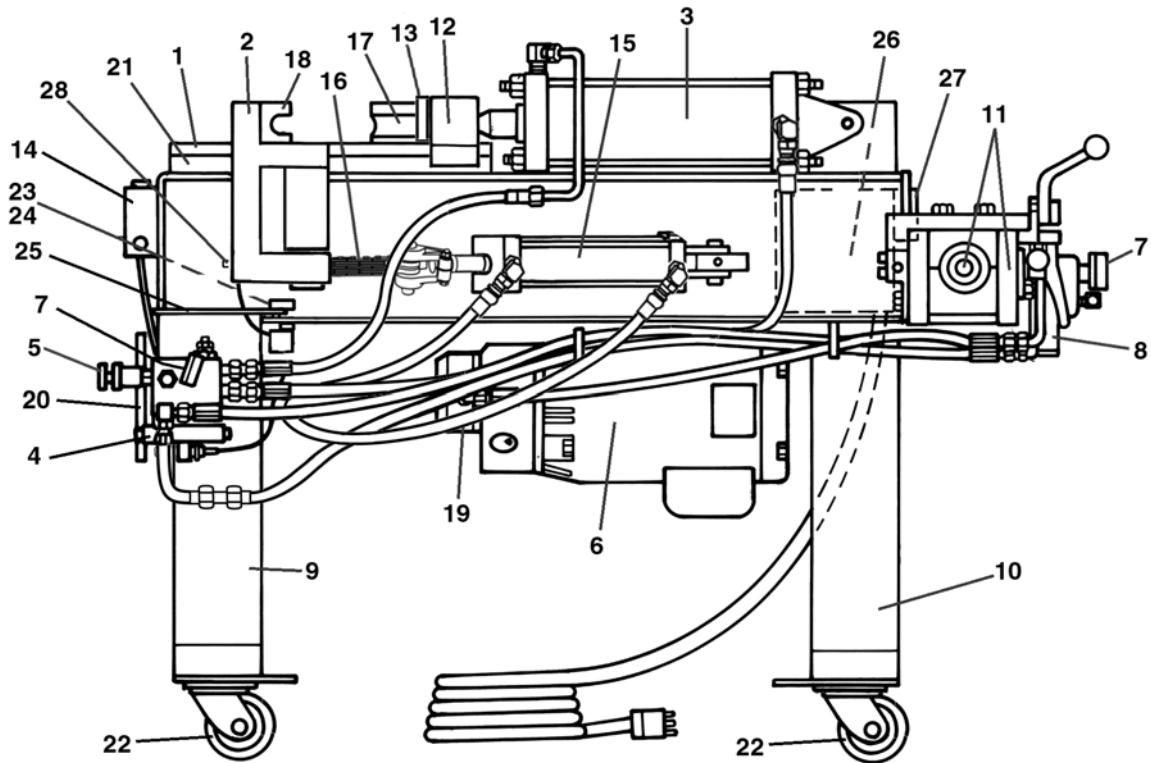
- | | |
|--|--------------------------------|
| 1. Guide Plate | 13. Sled Adaptor |
| 2. Swing Gate | 14. Control Box (Button Box) |
| 3. Main Cylinder | 15. Side Cylinder |
| 4. Directional Valve | 16. Gate Chains |
| 5. Sequence Valve | 17. Radius Die |
| 6. Motor | 18. Back Shoes |
| 7. Hydraulic Pressure Gauge | 19. Hydraulic Pump |
| 8. Swager Control Valve | 20. Knee Pedal |
| 9. Front Leg/Hyd. Reservoir W/Oil Filler Elbow | 21. Riser |
| 10. Rear Leg | 22. Casters |
| 11. Swager/Expander | 23. Manual Depth-of-Bend Plate |
| 12. Sled | 24. Depth-of-Bend Pointer |

MODEL BP-08, BPC-09 CONTROLS

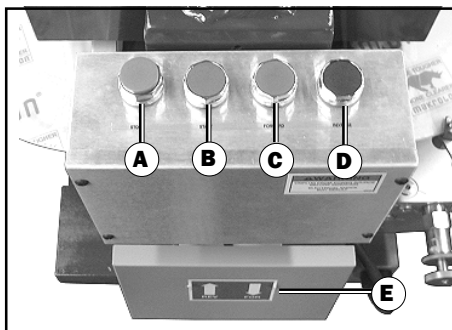
- A. STOP CONTROL BUTTON
B. START CONTROL BUTTON



COMPONENT LOCATION MODEL BP-11, BPC-12

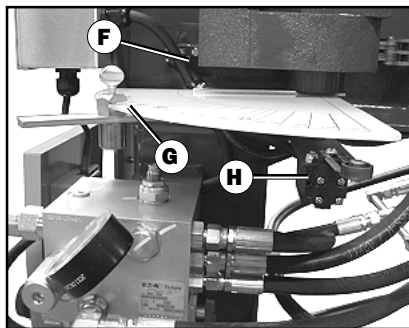


- | | |
|--|--|
| 1. Guide Plate | 15. Side Cylinder |
| 2. Swing Gate | 16. Gate Chain |
| 3. Main Cylinder | 17. Radius Die |
| 4. Directional Valve | 18. Back Shoes |
| 5. Sequence Valve | 19. Hydraulic Pump |
| 6. Motor | 20. Knee Control Pedal |
| 7. Hydraulic Pressure Gauge | 21. Riser |
| 8. Swager Control Valve | 22. Casters |
| 9. Front Leg/Hyd. Reservoir W/Oil Filler Elbow | 23. Depth-of-Bend Plate (Left Side) |
| 10. Rear Leg | 24. Manual Depth-of-Bend Indicator (Left Side) |
| 11. Swager/Expander | 25. Auto Depth-of-Bend Pointer |
| 12. Sled | 26. Control Box (Left Side) |
| 13. Sled Adaptor | 27. Auxiliary Start - Stop (Left Side) |
| 14. Control Box (Button Box) | 28. Home Position Switch |

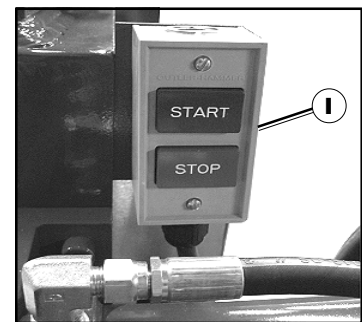


MODEL BP-11 & BPC-12 CONTROLS

- A. STOP CONTROL BUTTON
- B. START CONTROL BUTTON
- C. FORWARD CONTROL BUTTON



- D. REVERSE CONTROL BUTTON
- E. KNEE CONTROL PEDAL
- F. HOME POSITION SWITCH



- G. DEPTH-OF-BEND POINTER
- H. DEPTH-OF-BEND LIMIT SWITCH
- I. AUXILIARY START - STOP SWITCH

2. BENDER COMPONENT DESCRIPTIONS

INTRODUCTION

The following list of component descriptions is keyed to the illustrations on the preceding pages. Refer to your model to find the location of the components and read the corresponding description from this list.

1. **GUIDE PLATE** - Track that the sled rides on.
2. **SWING GATE** - Holds shoes in place while bending.
3. **MAIN CYLINDER** - 5" cylinder that controls forward and backward motion of main bending die.
4. **DIRECTIONAL VALVE** - Electrical solenoid valve which controls forward and reverse motion of main cylinder.
5. **SEQUENCE VALVE** - Controls pressure to both side cylinders and can be adjusted from 0 to 1000 PSI.
6. **MOTOR** - Powers hydraulic pump to produce hydraulic pressures.
7. **HYDRAULIC PRESSURE GAUGE** - Measures the hydraulic pressure present while bending or swaging/expanding.
8. **SWAGER CONTROL VALVE** - Controls pressure from the pump for the entire bender. Factory setting is approximately 3000 PSI. Also controls the swager/expander.
9. **FRONT LEG/HYDRAULIC RESERVOIR W/OIL FILLER ELBOW** - Indicates the front of the machine and is also the hydraulic reservoir. The oil filler elbow is on the left side.
10. **REAR LEG** - Indicates the rear (swager/expander end) of the machine.
11. **SWAGER/EXPANDER** - Expands and swages pipe.
12. **SLED** - Guides main bending die.

WARNING!

Do not operate or move this part without a die in position.

13. **SLED ADAPTOR** - Dies are mounted on the sled adaptor.
14. **CONTROL BOX (BUTTON BOX)** - Houses controls and electrical components.
15. **SIDE CYLINDERS** - Cylinders maintain pressure on the swing gates to form the bend.
16. **GATE CHAINS** - Chains are used to connect the side cylinders to the gates.

17. **RADIUS DIE** - Die allows the piping to be stretched and "pulled" through the bend. Dies come in a variety of OD sizes and radii.

WARNING!

Ram/Bumper Die must be used with Back Shoe Die in the same corresponding size.

18. **BACK SHOES** - A clamping die used to hold the pipe in position while bending.

WARNING!

Back shoe dies must be used with Ram/Bumper Dies in the same corresponding size.

WARNING!

Never use the machine as a vice or a press.

19. **HYDRAULIC PUMP** - Driven by a motor to produce hydraulic pressure for bending and swaging operations.
20. **KNEE CONTROL PEDAL** - Controls forward and reverse motion of main cylinder.
21. **RISER** - Supports guide plate off of main frame.
22. **CASTERS** - Wheel assemblies that allow the bender to be moved.
23. **DEPTH-OF-BEND PLATE** - Indicates degrees of bend.
24. **MANUAL DEPTH-OF-BEND INDICATOR** - Located on left side of bender. Indicates gate opening in degrees.
25. **AUTO DEPTH-OF-BEND POINTER** - This protractor is the automotive stop device to ensure accurate bends. As the machine is bending the part, the protractor arm engages a limit switch that stops the forward motion and activates reverse.
26. **CONTROL BOX (LEFT SIDE)** - The box located on the left side houses the electrical controls and components (BP-11, BPC-12).
27. **AUXILIARY START-STOP (LEFT SIDE)** - Located at the rear of the bender and allows the operator to control the motor from the swager/expander end of the bender (BP-11, BPC-12).
28. **HOME POSITION SWITCH** - Signals that the gates are closed to control the reverse motion of the main cylinder when the AUTO DEPTH OF BEND is used (BP-11, BPC-12).

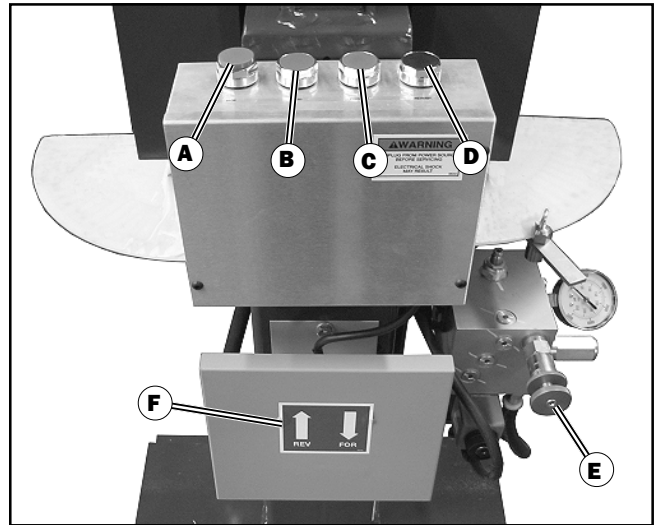
3. BENDER CONTROLS DESCRIPTION LIST

INTRODUCTION

This list of bender control descriptions refers to the illustration on this page. This is meant to show the location and describe the controls. Reading and understanding the descriptions will assist you in getting the most from your Ben Pearson bender.

- A. **STOP CONTROL BUTTON** - Depress this button to completely stop the bender.
- B. **START CONTROL BUTTON** - Depress this button to start the electrical motor and hydraulic pump.
- C. **FORWARD BUTTON** - Depress this button to manually move the main cylinder forward (BP-11, BPC-12).
- D. **REVERSE BUTTON** - Depress this button to manually move the main cylinder in reverse (BP-11, BPC-12).
- E. **SEQUENCE VALVE ADJUSTING KNOB** - The sequence valve controls pressure to both side cylinders and the valve is adjustable from 0 to 1000 PSI with the use of the adjusting knob. To adjust the hydraulic pressure, turn the knob and read the pressure on the adjacent pressure gauge. Normal bending pressure should not exceed 1000 PSI.
- F. **KNEE CONTROL PEDAL** - Controls forward and reverse motion of main cylinder.

FIGURE 3-1 - BP-11, BPC-12



4. PERIODIC MAINTENANCE

INTRODUCTION

The following maintenance should be performed regularly to ensure the long life and proper performance of your bender.

DAILY

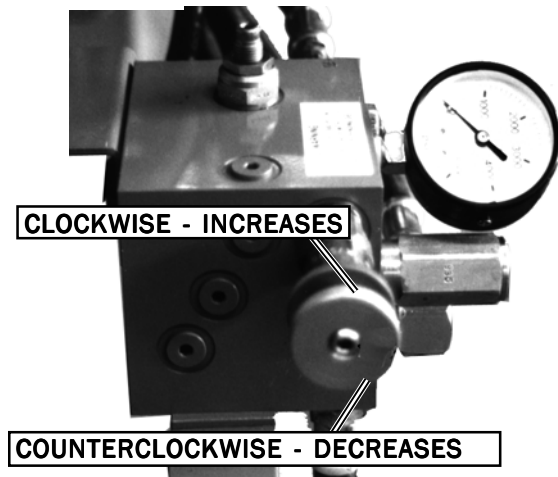
Clean and lubricate the following:

1. Guide Plate - Lubricate with grease. Remove any nicks or burrs.
2. Sled - Keep clean at all times. Never move the sled without a die in position on it.
3. Riser - Guide Plate - Clean any dirt and grit from around the riser - guide plate to allow free movement of the sled.
4. Verify Pressure Settings - 2800-3000 psi at the swager and 500-700 psi at the sequence valve.

TO CHANGE THE PRESSURE SETTING BENDING PRESSURE

1. Install a 5" radius die and appropriate back shoes on the bender.
2. Turn on the bender.
3. Advance until the dies are engaged.
4. Read pressure from the gauge of the sequence valve. Normal bending pressure for tubing is between 500 and 700 psi. The pressure can only be read as the dies are being engaged. Never exceed 1,000 psi.

FIGURE 4-1



5. If pressure is incorrect, adjust pressure using the pressure regulator dial knob of the sequence valve. Turning the knob clockwise increases the pressure. Turning it counterclockwise decreases the pressure. (See FIGURE 4-1.)

If your pressure gauge does not read zero when the dies are engaged, replace the gauge.

SWAGING/EXPANDING PRESSURE

1. Turn on the bender.

WARNING!

Remove any tooling from the swager box.

2. Press swager control handle down until the cylinder extends completely into the swager box. The pressure can only be read as the cylinder is completely engaged. When the pressure is relieved from the cylinder, the gauge should read 0 psi.

WARNING!

Never allow swaging pressure to exceed 3,000 psi.

3. Read the pressure on the gauge. Pressure should be approximately 3,000 psi. Pressure should not exceed 3,000 psi. **If pressure exceeds 3,000 psi, release the valve lever immediately; pull the valve lever up to relieve pressure and reset the valve to a lower pressure.**

FIGURE 4-2

ACORN NUT



4. If the pressure is incorrect, remove the acorn nut and loosen the jam nut on the swager valve pressure stem. With an allen wrench, turn the pressure stem to adjust the pressure. Turning it clockwise will increase the pressure. Turning it counterclockwise will decrease the pressure. Tighten the jam nut and replace the acorn nut to secure the pressure adjusting stem. (See FIGURE 4-2.)
5. After the pressure setting has been adjusted, recheck the pressure setting.

TWICE-A-WEEK

MANUAL DEPTH-OF-BEND CALIBRATION

You may notice that the degree pointer connected to the left side gate may read from 1 to 2 degrees below zero on the depth-of-bend plate. This is set at the factory to compensate for the “spring back” in tubing and should be checked occasionally as follows:

1. Using a 5” radius die and appropriate back shoes, engage the dies and extend the ram die until the pointer on the depth-of-bend plate reads 90-degrees.
2. Using a carpenter’s square, check the alignment of the back gates to ensure a true 90-degree reading.
3. Set the pointer to 90-degrees by tapping gently on the depth-of-bend plate.

AUTOMATIC DEPTH-OF-BEND CALIBRATION (BP-11, BPC-12)

Check the alignment of the Depth-of-Bend Limit Switch. (BP-11, BPC-12)

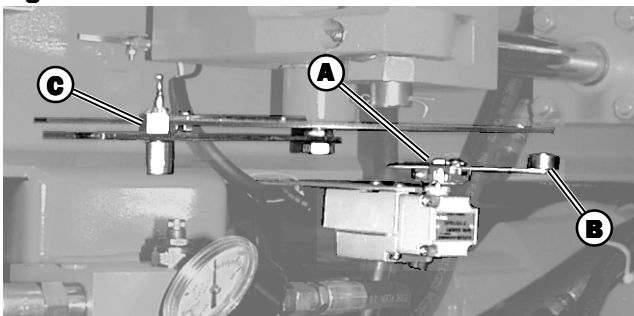
1. Using a 5” radius die and appropriate back shoes, engage the dies and extend the main ram until the pointer on the depth-of-bend plate reads 90-degrees.
2. Using a carpenter’s square, check the alignment of the back gates to ensure a true 90-degree reading.

NOTE: Different materials have different amounts of spring-back.

The depth-of-bend plate and adjustable pointer are located under the right side gate. To check this calibration, use a carpenter’s square and proceed as follows:

1. Align the gates at 90-degrees.
2. Turn the bender off.

Figure 4-3



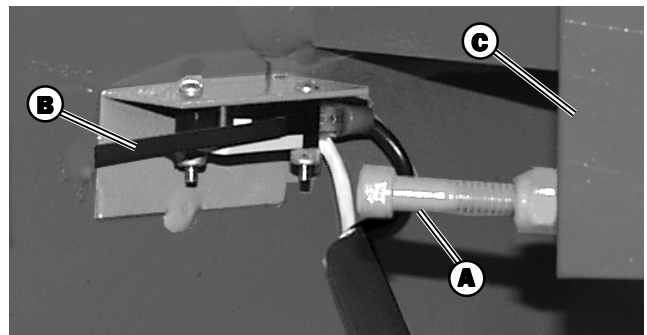
3. Move the adjustable pointer slowly past the 90-degree mark on the Depth-of-Bend Plate. As the pointer crosses 90 degrees, you should hear the limit switch trip (click). If the limit switch does not trip at 90-degrees, perform the following steps: (See FIGURE 4-3.)

- A. Loosen the nut or screw holding the roller arm to the limit switch (key A in fig 4-3).
- B. Move the arm (key B in fig 4-3).
- C. Tighten the nut or screw.
- D. Move the adjustable pointer across the 90-degree mark (key C in fig 4-3). If the limit switch does not trip at 90-degrees, repeat steps A through D.

4. Turn the bender on and move the pointer across the 90-degree mark. As the pointer crosses the 90-degree mark, the main cylinder should reverse.

RETURN TO HOME POSITION CALIBRATION

Figure 4-4



The Home Position Switch (figure 4-4) calibration should rarely be necessary. The gate bolt (A) triggers the switch (B) exactly when the gates (C) close. To adjust the bolt, loosen the locknut and move the bolt in or out, then lock down the locknut.

CAUTION!

Do not over-extend the bolt and exert pressure on the switch.

If the switch is no longer being tripped, perhaps an object or dirt buildup is stopping the gate from closing all the way. Always keep the bending area clean.

WEEKLY

CAUTION!

Do not use strong solvents to clean dirt from the bender; Solvents may damage some components.

1. Using a mild detergent, remove all dirt buildup from the bender. Ensure there is no dirt built up between the gates and the guide plate. Also, check for dirt at the top of the gates and the gate pins. Dirt can cause excessive wear. Dirt may also prevent the dies from mounting correctly.

CAUTION!

Do not use an air hose near the control box.

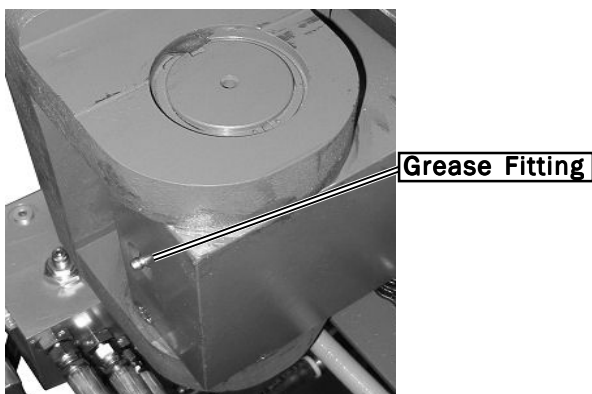
2. Clean dirt and oil from the bending dies and remove any burrs.
3. Check the cylinder shafts for nicks or burrs and remove them using emery cloth.
4. Inspect the segment sets for cracks or damage. Replace if necessary.

CAUTION!

Hose fittings are made of soft metal. Overtightening may damage the fittings and cause leaks.

6. Inspect hoses and fittings for leaks. Tighten as required.
7. Check for bolts or nuts that may have loosened.
8. Inspect all the electrical components, i.e. plug, receptacle, cord, foot pedal, conduit, etc. Replace any damaged electrical components immediately. (See section 6 "MACHINE REPAIR".)
9. Grease two grease fittings as shown in FIGURE 4-5 using a medium weight, all-purpose grease.

FIGURE 4-5



10. Ensure that the bolts in the guide plate are tight.
11. Check that the depth-of-bend indicate plate is tight. If a plate is loose, tighten it so that it is parallel to the bender's main beam. Recalibrate the bender using the procedure explained in the section titled "Depth-of-Bend Calibration".
12. Lubricate the gate chains.

MONTHLY

Perform the following maintenance monthly:

1. Check the oil level of the bender. The bender contains approximately 4 gallons of hydraulic fluid. To check the oil level:
 - A. Reduce the pressure on the sequence valve to 0 psi.
 - B. Using a 5" radius die and back shoes, advance the ram die until the main cylinder is fully extended and stop the bender.
 - C. Visually check the oil level in the filler elbow located on the left side of the machine under the depth-of-bend indicator plate. Oil should appear in the filler elbow or can be felt by inserting your fingertip into the elbow.

NOTE: Do not retract the dies before adding oil.

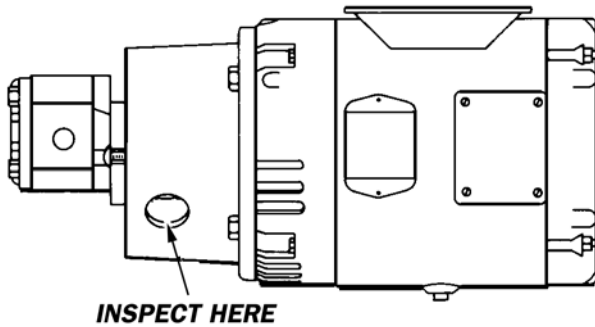
- D. If oil can not be seen or felt, add oil to the filler elbow until it is visible.

NOTE: If oil must be added to the system frequently, check for leaks.

You can use any 10 medium weight, mineral based hydraulic fluid with non-foaming additive. The oil should have an ISO 32 Grade rating.

2. Clean all tooling to remove old grease and nicks and burrs. A light application of lubricating oil is recommended for bending dies and back shoes. Swage and expanding tools should be lightly greased.

FIGURE 4-6



3. Inspect the coupling between the pump and the motor to ensure the allen set screws have not loosened. (See FIGURE 4-6.)

Make sure the two halves of the coupling are separated by the rubber spider.

4. Check and tighten any loose connections in the hose leading from the reservoir to the pump.

NOTE: A loose connection on this hose may not always show a leak, but it will suck air and cause aeration in the system, causing the bender to react with uneven operation.

5. TROUBLESHOOTING

INTRODUCTION

The troubleshooting procedures charted on the following pages contain the problem, the possible cause and the corrective action to be taken.

There are two basic sections: Electrical Troubleshooting and Hydraulic Troubleshooting.

After identifying the problem, proceed with the appropriate corrective action. The chart is organized from the most simple to the more difficult procedures. Be certain the person performing the work has the necessary ability and skills. Observe all safety rules when working on the bender.

Call Huth Equipment for assistance at 1-800-558-7808.

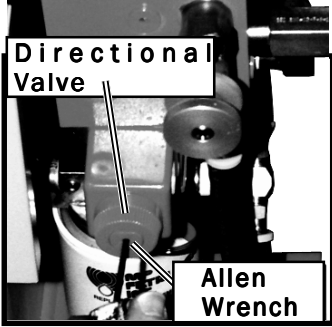
WARNING!

Turn off the bender and LOCK OUT, TAG OUT power before servicing.

ELECTRICAL TROUBLESHOOTING

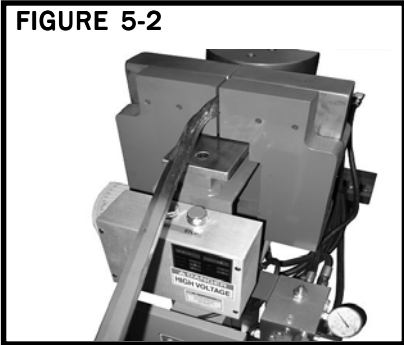
PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
Motor does not run.	Circuit breaker is off.	Turn breaker on.
	Incorrect wiring.	Check voltage supply, phase and wiring.
	Poor connection at plug.	Check wiring.
	Cut in power cord.	Check and replace at once.
	Defective start/stop switch.	Test and replace if needed.
	Motor defective.	Test motor - check with local electrical motor supplier for service center. Replace if needed.
	Defective starter.	Test and replace if needed.
	Overload at contactor tripped.	Reset overload.
	Overload tripped.	Reset and set on Auto Reset.
Internal wiring has become disconnected.	Check wiring at contactor and buttons.	
Motor smokes.	Centrifugal switch sticking in open position.	Remove motor - service at local service center.
Motor shuts off.	Overload safety turning motor off.	Reset overload switch and restart. If problem persists, check wiring for short circuits.
	Overload amp setting is too low.	Check to determine if motor is overloaded.
		Compare to amp draw of motor on motor's specification tag.
	A poor connection at plug or a cut in the power cord exists.	Repair or replace.
	Motor starter defective.	Replace starter.
Motor capacitors defective.	Replace.	
Bender emits shocks.	Lost ground connection.	Check plug-to-receptacle fit.
		Check plug wiring.
		Check cord for damage.
		Check the ground connection at control box.
		The bender or tubing being bent must not come in contact with any other object.
Buttons or knee switch do not activate functions.	Directional valve problem.	Check wiring.
		Check for bad coils.
		See "Power at swager control valve but not at main cylinder" in Hydraulic Troubleshooting section.
	Wiring problem.	Check wiring and connections.
Contact block loose.	Re-secure block to back of button.	

HYDRAULIC TROUBLESHOOTING

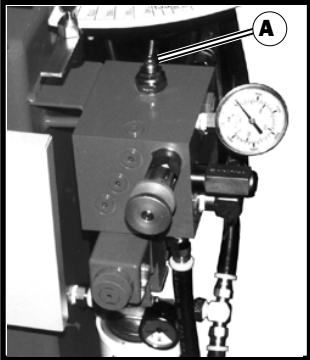
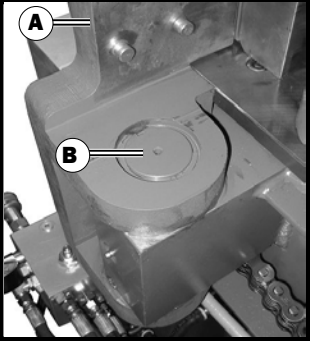
PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION	
Loss of power on either end of bender.	Low pressure.	Adjust pressure. See Section 4 - Periodic Maintenance.	
	Pump not functioning properly.	Key sheared on coupling/coupling loose. Test pump. See topic "Loss of Power to Entire Machine".	
	Bender low on oil.	Fill Tank. See Section 4 - Periodic Maintenance.	
	Hose from tank to pump loose, sucking air.	Secure hose.	
	Aeration of oil.	Check all hoses and fittings. Stop all leaks.	
	Filter in front leg clogged.	Remove, clean and replace.	
	Swager control valve leaks internally - will not build pressure.	Check oil flow to valve. Replace valve.	
Bender stops after bending a few degrees or swaging cannot be done; motor bogs down.	Low Voltage.	Check fuse.	
		Check that bender has its own circuit breaker.	
		Check incoming voltage.	
		Ensure plug and receptacle make good contact.	
	Check cord.		
	Bender low on oil.	Fill Tank. See Section 4 - Periodic Maintenance.	
Filter in front leg clogged.	Remove, clean and replace.		
Back shoe pressure too high.	Lower back pressure.		
Direction valve chatters.	Low voltage.	Check that bender has its own circuit breaker.	
		Check incoming voltage.	
		Ensure plug and receptacle make good contact.	
		Check cord.	
		Check internal wiring and conduit for breaks.	
Power at swager control valve, but not at the main cylinder.	Directional valve not operating properly. FIGURE 5-1 	Operate valve manually by: Using an allen wrench, push the small button on the end of the coil. (see FIGURE 5-1). Left coil retracts cylinder; right coil extends it. Main cylinder should move. If button will not move, the valve is defective. Replace valve. See Section 6 - Machine Repair "Control Valve Replacement". If manual operation is possible, check for voltage at coil on valve. If voltage is present, the coil is bad. Replace valve. See Section 6 - Machine Repair "Control Valve Replacement".	
		Seals in main cylinder are bad.	With a 5" radius die in place, extend the main cylinder as far as possible. Remove the hose from the front of the main cylinder at the end farthest from the cylinder. Place the end of the hose in a bucket and press the forward button. If the seals are good, no oil will come out of the hose.
		Sequence valve PSI set too high.	See Sec 4 - Periodic Maintenance.
		Swager control valve leaking internally.	Replace valve.
		Sequence valve bypassing internally.	Replace valve.

HYDRAULIC TROUBLESHOOTING (continued)

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
Main cylinder keeps moving until it bottoms after knee switch is released.	Direction valve spring is broken	Replace valve. See Section 6 - Machine Repair. See corrective action under "Control Valve Replacement". (Above).
	Dirt in directional valve prevents spring return to neutral center position	Replace valve. See Section 6 - Machine Repair "Control Valve Replacement". (Above).
	Limit Switch (BP-11, BPC-12)	Determine if the limit switch has been tripped. If it has not, readjust the switch. See "Automatic Calibration", "Home Position Calibration" in Section 4 - Periodic Maintenance.
	Electric button.	The button may not have released. Clean and check contacts.
	Knee pedal control.	Check controls and wiring.
	Loose pointer.	Secure pointer.
	Depth-of-bend plate and pointer do not travel horizontally.	Adjust plate and pointer. See "Automatic Depth-of-Bend Calibration" in Section 4 - Periodic Maintenance.
Directional control valve chatters and will not engage properly.	Low voltage.	Check voltage and machine wiring including plug and receptacle.
	Coil is bad.	See Possible Cause under "Directional valve not operating properly".
Directional control valve clicks on return of main cylinder.	Low voltage.	Check voltage and machine wiring including plug and receptacle.
	Coil is bad.	See Possible Cause under "Directional valve not operating properly".
After autobend, main cylinder fully retracts.	Home position switch not calibrated.	See "Return to Home Position Calibration" in Section 4 - Periodic Maintenance.
	Timing relay loose or bad.	Secure or test manually.
Dies drift after completion of bend.	Directional control valve is defective or dirty.	Clean and test directional control valve. Replace if necessary.
	Seals worn is side cylinders.	See "Gates move slowly".
	Sequence valve worn.	Replace valve.
	Main cylinder seals bad.	Check seals. See page 14 - "Power at swager control valve but not at main cylinder".
Directional or swager valve leaks.	Valve body is cracked.	Inspect valve and replace if cracked.
Hydraulic pressure is low.	Improper adjustment.	Adjust pressure. See Section 4 - Periodic Maintenance, "Bending Pressure".
	Connectors on intake hose from reservoir to pump are loose.	Tighten connections.
	Air leaking in.	
Hydraulic pressure drops.	Pump defective.	Test pump. See page 17 - "Loss of hydraulic power to entire machine".
		Check coupler.
		Replace Pump.
Hydraulic pump noisy.	Motor-to-pump coupling loose.	Tighten coupling.
	Key on motor or pump shaft is sheared.	Replace key; inspect motor/pump shaft for damage; replace coupling if damaged.
	Spider on coupling is worn.	Replace coupling or spider.
	The pump is bad.	See page 17 - "Loss of hydraulic power to entire machine".
Pressure reads 3000 psi at swager but there is a loss of bending power.	Main cylinder seals bad.	See page 14 - "Power at swager control valve, but not at main cylinder".

HYDRAULIC TROUBLESHOOTING (continued)		
PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
Hydraulics are ‘jumpy’ or erratic.	Air in hydraulic system.	Ensure that all hoses and fittings are tight.
	Air in hydraulic pump.	Proceed as follows: 1. Top off oil level in reservoir with fresh oil. See Section 4 - Periodic Maintenance. 2. Run bender through its cycle several times until the entire system is purged of air bubbles.
	Oil in reservoir is low.	Add oil. See Section 4 - Periodic Maintenance.
Gates do not return correctly.	Pressure setting at sequence valve is incorrect.	Reset pressure. See Section 4 - Periodic Maintenance.
	Dirt or grease buildup on gate bearing pins.	Clean and lubricate using the following procedures: 1. Remove depth-of-bend plate. 2. Remove degree pointer. 3. Remove clevis pin and move cylinder out of the way. 4. Remove snap ring from swing gate bearing pin. 5. Press out bearing pin. 6. Remove gate. 7. Clean parts, lubricate and reassemble.
	Sequence valve out of adjustment.	See Problem “Pipe Collapses”.
	Air in system.	See “Hydraulics are ‘jumpy’ or erratic” (Above.)
	Side cylinder seals are bad.	See “Gates move slowly” (Below).
Gates move slowly.	Pressure setting incorrect.	Adjust pressure. See Section 4 - Periodic Maintenance.
	Side cylinders are worn.	Set sequence valve to 100 psi. With gates closed and power off, pry the gates open. (See FIGURE 5-2.) If the gates open, the seals in the side cylinders are worn and should be replaced.
		Test seals (PSI set above 100). With a 5” radius die in place, extend the main cylinder as far as possible. Remove the hoses from the front (shaft end) of the side cylinder. (If the hoses drop they will drain the tank.) Depress the forward button. The machine cannot move. If the seals leak, oil will come from the fittings.
Side cylinders leaking.	Cylinders worn.	Replace seals. See above and Section 6 - Machine Repair.
Bender cannot complete bend (Motor running properly).	Pressure set too high. (Usually on large diameter tubing.)	Reduce pressure slowly while bending until bender provides a good quality, even bend.
Pipe collapses.	Swaging valve pressure setting is incorrect.	Adjust pressure. See Section 4 - Periodic Maintenance.
	Defective tubing.	Attempt a bend on another piece of tubing.
	Buildup or caking of material on surface of dies.	Clean dies and lightly oil.
	Gauge of tubing too thin for diameter.	Ensure that 2¼” or larger tubing has at least 13-gauge wall thickness. (Continued)

HYDRAULIC TROUBLESHOOTING (continued)

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
Pipe collapses. (Continuation)	Setting on sequence valve is incorrect. (Travel time of sled and die extension and retraction should be the same.) FIGURE 5-3 	If extension and retraction travel times are not equal: 1. Loosen jam nut on top of sequence valve. 2. Using an allen wrench, turn the adjustment screw (A) on top of valve. (See FIGURE 5-3.) 3. When the extension and retraction speeds match, tighten the locknut to lock adjustment screw in place.
	Side cylinders are worn.	See problem "Gates move slowly".
	Gates not operating properly. FIGURE 5-4 	Check operation of gates: 1. Place a 3" bumper die on the sled and extend the main cylinder to open the gates. 2. Look at the pivot pins on the gates while the gates are opening. The gate (A) and pin (B) (See FIGURE 5-4) should turn at the same time. If the pins do not turn, the key is worn or sheared. The key must be replaced and the pin, bushings, and gate bore inspected for damage. If either are badly scored, replace them.
	Gates slip or tilt.	Remove side cylinder rod clevis from gate and move gate to check slop in pivot. If slop is significant, check bushings in head block for wear. Replace if needed.
	Tooling is damaged.	Check tooling for damage. Replace damaged tooling.
Segment set teeth break.	Arbor wrong size.	See www.huthbenders.com or call factory.
	Arbor needs lubrication.	Apply a thin coating of grease to the arbor and the face of the adjustable collar.
	Adjustable collar is not being used correctly.	See www.huthbenders.com or call factory.
Loss of hydraulic power to entire machine.	Defective pump.	Hold down swager valve handle and look at the pressure gauge. If pressure decreases during reading, replace pump.
	Low oil.	Fill oil tank. See Section 4 - Periodic Maintenance.
	Clogged filter.	Clean or replace filters.
	Swager valve not set correctly.	See Section 4 - Periodic Maintenance.
	Swager valve by-passing internally.	Replace valve.

HYDRAULIC TROUBLESHOOTING (continued)

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
Motor runs but pump does not develop pressure.	Motor rotating in wrong direction. (3 phase only)	TURN OFF MOTOR IMMEDIATELY. Motor should be turning counterclockwise as seen when facing the pump. See Section 6 - Machine Repair.
	Coupler between motor and pump is loose.	Tighten coupler. Check keyways. See Section 4 - Periodic Maintenance.
	Low on oil.	Check oil level. See Section 4 - Periodic Maintenance.
	Defective pump.	Test pump. Hold down swager valve handle and look at the pressure gauge. If pressure decreases during reading, replace pump.
	Clogged filters.	Clean or replace filters.

6. MACHINE REPAIR

GENERAL REPAIR

Calibration Decal Replacement

Should the Calibration Decal of the adjustable collar need to be replaced, proceed as follows:

1. Remove the old decal and clean the area.
2. Be sure the arbor is securely tightened to the cylinder shaft.
3. Place the #61548 Blue and White Segment on the arbor.
4. Expand a piece of 2" tubing just enough to insert another piece of tubing into it. (2.015" I.D.)
5. Locate #5 of the Calibration Decal in the hole of the gun sight.
6. Secure the decal to the adjustable collar.

HYDRAULIC REPAIR

INTRODUCTION

The following hydraulic repair section contains step-by-step instructions for replacing major hydraulic components on your bender. Repair procedures not listed here should be left to qualified service personnel. If you are unfamiliar with hydraulic servicing, contact your distributor for professional service.

WARNING!

Serious injury can occur if hydraulic hoses are connected incorrectly. Pump damage may also occur. Always note the location of hydraulic hoses before removing components to ensure that the hose is connected properly during reassembly.

CONTROL VALVE(S) REPLACEMENT

To replace control valve(s), proceed as follows:

1. Start bender.
2. Drop hydraulic pressure to 0 on the sequence valve.

WARNING!

LOCK OUT, TAG OUT electric plug. (Secure the plug so that it cannot be plugged into the receptacle or place a warning tag on it to prevent it from being plugged into a receptacle.)

3. Turn off and LOCK OUT, TAG OUT all power to the bender.
4. Manually cycle all valves several times to relieve pressure which may be present in hydraulic lines.
5. Tag and disconnect the hydraulic lines and any wiring to the valve which is to be replaced.

6. Remove the attaching hardware that holds the valve in place. Be sure to note the size and quantity of hardware in each location.
7. Remove the valve.

CAUTION!

Overtightening of valve attaching hardware may distort or damage the valve body.

8. Install the replacement valve and secure using the original attaching hardware.
9. Connect hydraulic hoses or lines to the valve body. Be careful not to overtighten the fittings on the hose ends. They are usually made of soft metal and can be easily damaged.
10. Connect any wiring (Directional control valves only) that may have been disconnected.
11. Turn the bender on and test the new valve for proper operation. Cycle the valve several times to remove any air which may be trapped inside the valve.
12. Set the PSI on the valve. See Section 4.

SIDE CYLINDER OR CHAIN REMOVAL

To remove a side cylinder, proceed as follows:

1. Turn the bender on and drop the hydraulic pressure to 0 psi using the sequence valve.
2. Shut off the bender.
3. Remove the cotter pins or clips; retain the clevis pins.
4. Remove the clevis pins at swing gates.
5. Swing the cylinder away from swing gates.

NOTE: Do not move cylinder rod after the hydraulic hoses are removed. This will draw air into the cylinders and cause erratic bender performance. If air is drawn into the cylinder, use the bleeding procedure following this removal procedure.

6. Unscrew hoses from the fittings on the cylinder and cap or plug hoses.
7. Remove the cotter pins or clips; retain clevis pin at the cylinder head end.
8. Remove clevis pin.
9. Remove cylinder.
10. Remove the chains.

SIDE CYLINDER BLEED PROCEDURE

To bleed a side cylinder, proceed as follows.

1. Attach the head-end clevis (opposite the rod) to the swing gate and secure in place using a clevis pin.
2. Attach the hydraulic hose which is normally at the rod end of the cylinder to the head end of the cylinder.
3. Place a bucket or other suitable container under the rod end port of the cylinder to catch the escaping oil during the bleed procedure.
4. Pull the cylinder rod all the way out. This will draw oil from the reservoir into the head end of the cylinder.
5. Push the rod all the way in. This will force air out of the cylinder and into the reservoir. Wait thirty seconds for air to rise to the surface of the reservoir.
6. Repeat the above two steps four or five times. On the last stroke, pull the rod all the way out and leave it in the extended position.
7. Disconnect the hose from the cylinder.
8. Remove the clevis pin and cylinder from the swing gate.

NOTE: When installing the cylinder on the bender, you may need to push or pull the rod to allow slack for attaching the chains to the gates.

9. Install cylinder on the bender using the "Side Cylinder Installation" procedure.

SIDE CYLINDER INSTALLATION

To install a side cylinder, proceed as follows:

NOTE: Perform bleed procedure to ensure the head of the cylinder is free of air.

1. Place head end of cylinder on the bender and secure with a clevis pin.
2. Install pin which retains clevis pin.
3. Swing cylinder into position on the bender.

NOTE: When installing the cylinder on the bender, you may need to push or pull the rod to allow slack for attaching the chains to the gates.

4. Align chain clevis with swing gate and install clevis pin.
5. Install clevis pin retainer.
6. Install hydraulic hoses. Be careful not to overtighten fittings as they are soft metal and can be damaged easily.
7. Cycle the cylinder several times and perform a bend to ensure proper operation.

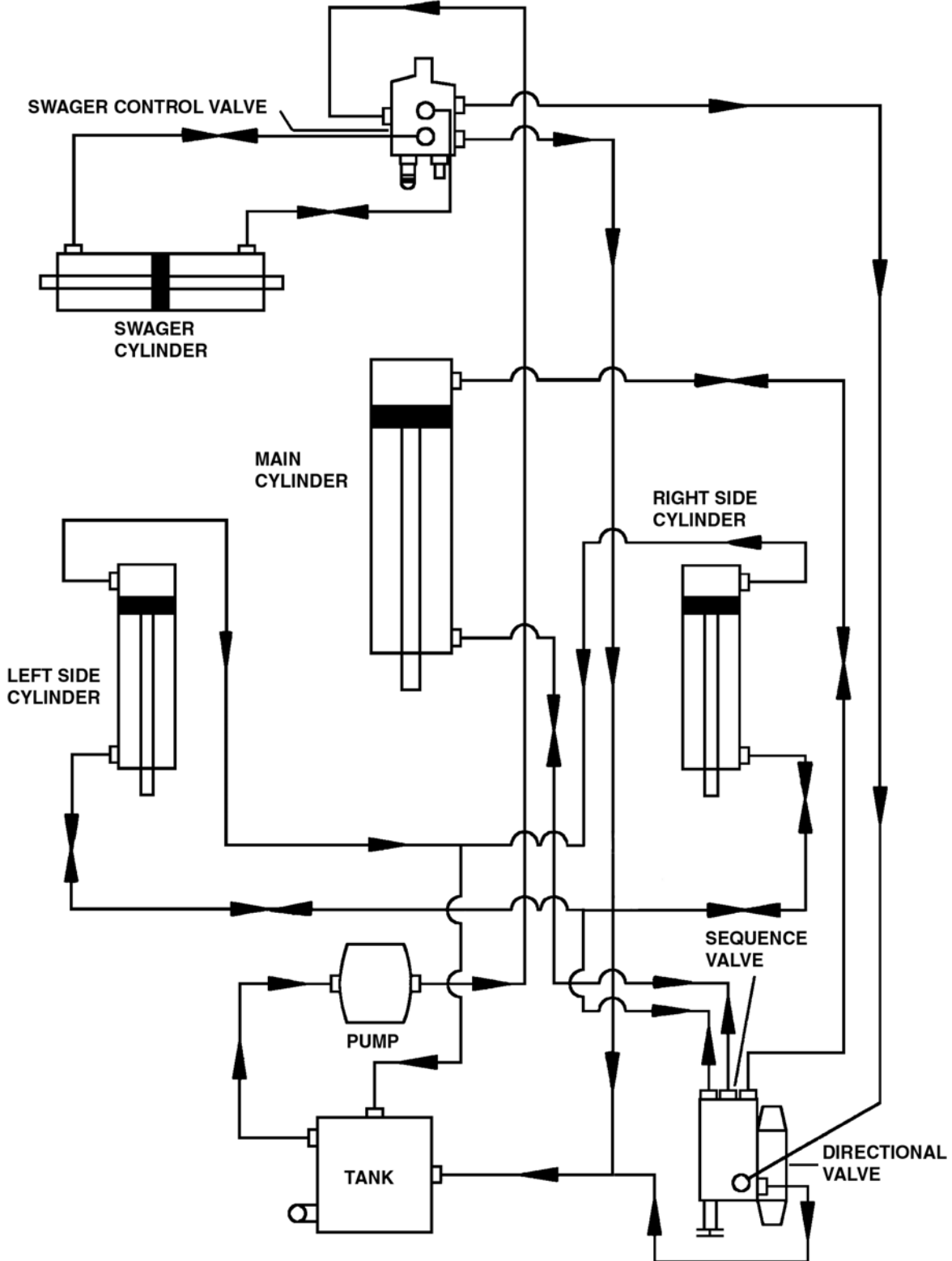
HYDRAULIC FLOW SYSTEM

There is no pressure in the hydraulic system when work is not being done on the bender. All valves are open center and the hydraulic fluid flows through the system until the dies are engaged. Use this hydraulic flow diagram as a diagnostic tool to aid in troubleshooting any bender hydraulic trouble.

Model BP-08, BPC-09, BP-11, BPC-12

Hydraulic Flow Diagram

FIGURE 6-1



ELECTRICAL REPAIR

INTRODUCTION

The following electrical repair section contains schematics and illustrations to aid in electrical repair. Most of the electrical components cannot be repaired and require only removal and replacement. If replacement parts are installed, refer to pages 22 thru 27 for the correct connections. All repairs must be done by a certified electrician. Be sure all safety rules have been read and understood before beginning servicing.

NOTE: For foreign voltages, be sure voltage, phase, and cycle are identical within the electrical power source.

CAUTION!

Control box contains high voltage.

CAUTION!

Do not use an extension cord between bender and receptacle.

DANGER!

Disconnect power at the receptacle before performing any electrical repairs. High voltage may still be present in the control box after the power is disconnected. Capacitors in the bender box retain an electrical charge.

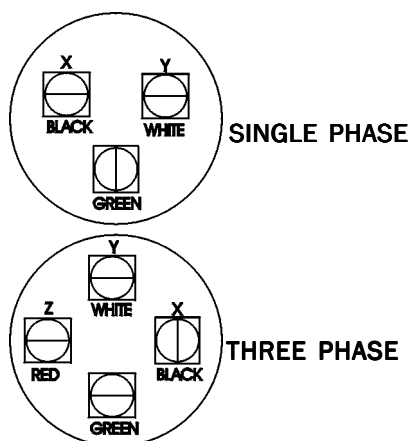
WARNING!

LOCK OUT, TAG OUT electric plug. (Secure the plug so that it cannot be plugged into the receptacle or place a warning tag on it to prevent it from being plugged into receptacle.)

PLUG & RECEPTACLE

For plug and receptacle wiring hookup, see FIGURE 6-2.

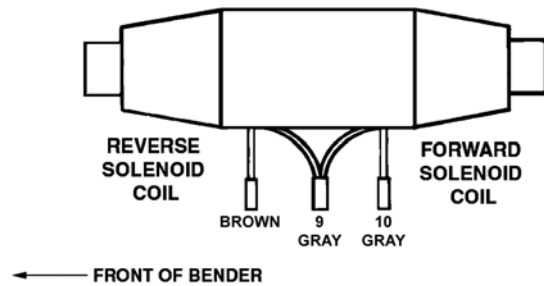
FIGURE 6-2



MODELS BP-11, BPC-12

For directional control valve wiring, see FIGURE 6-3.

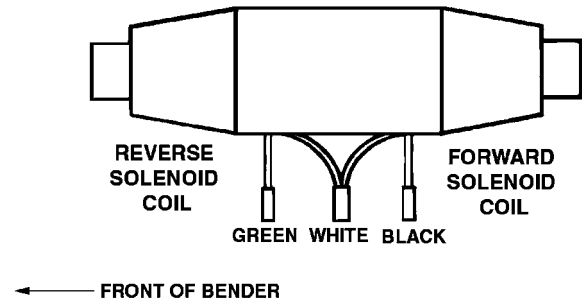
FIGURE 6-3



MODELS BC-08, BPC-09

For directional control valve wiring, see FIGURE 6-4.

FIGURE 6-4



MOTOR

For motor lead connections, refer to the charts below.

Single Phase- 230 Volt

T1+T5	Together
P1	Black Motor Lead
T4+T8	Black Motor Lead

Three Phase - 230 Volt

4+5+6	Together
7+1	Black Motor Lead
8+2	Black Motor Lead
9+3	Black Motor Lead

Three Phase High Voltage

6+9	Together
5+8	Together
4+7	Together
3	Black Motor Lead
2	Black Motor Lead
1	Black Motor Lead

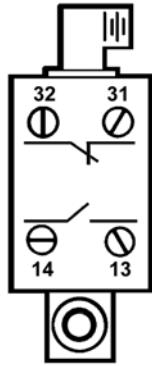
LIMIT SWITCHES

For Model BP-11, BPC-12 Limit Switch wiring, see FIGURE 6-5.

FIGURE 6-5

Depth-of-Bend Limit Switch

13 - Black
14 - Brown

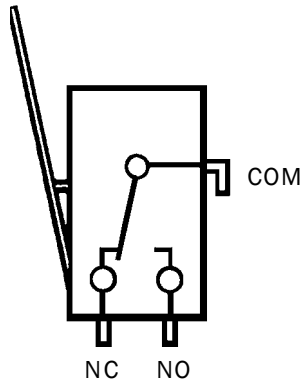


For Model BP-11, BPC-12 Limit Switch wiring, see FIGURE 6-6.

FIGURE 6-6

Limit Switch Home Position

No - Black
Com - WHT

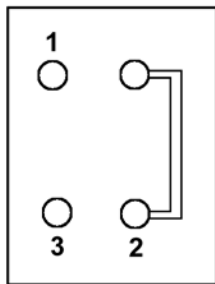


AUXILIARY START - STOP STATION MODELS BP-11, BPC-12

For auxiliary start-stop station wiring, See FIGURE 6-7.

FIGURE 6-7

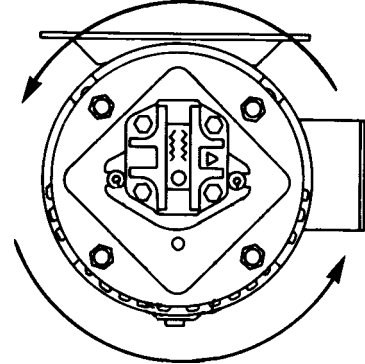
1 - BROWN
2 - GRAY
3 - BLACK



PUMP/MOTOR ROTATION

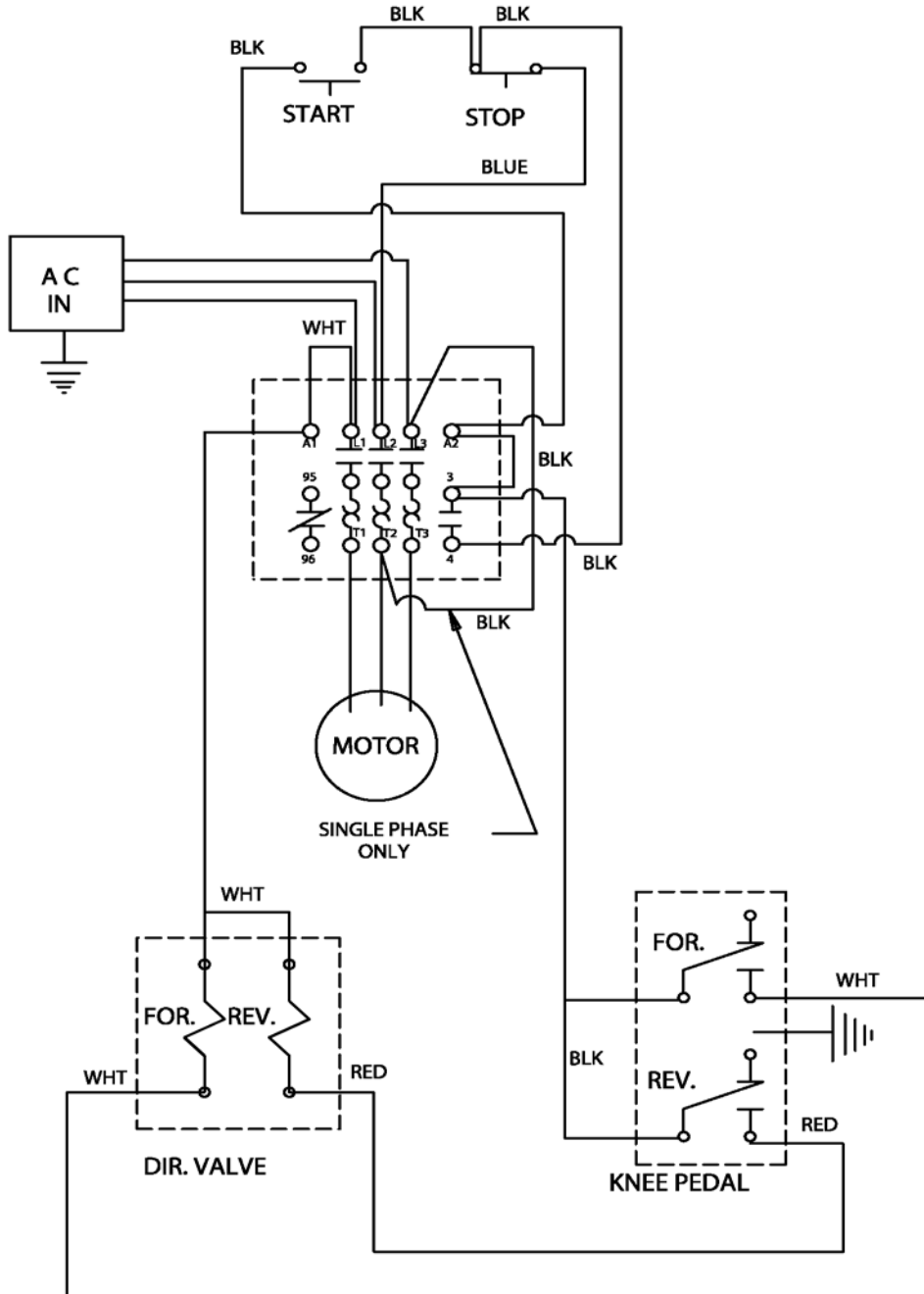
When starting a 3-phase motor, check motor rotation. It should rotate counterclockwise as seen when facing the pump. To check the pump/motor rotation, proceed as follows: (See FIGURE 6-8.)

FIGURE 6-8

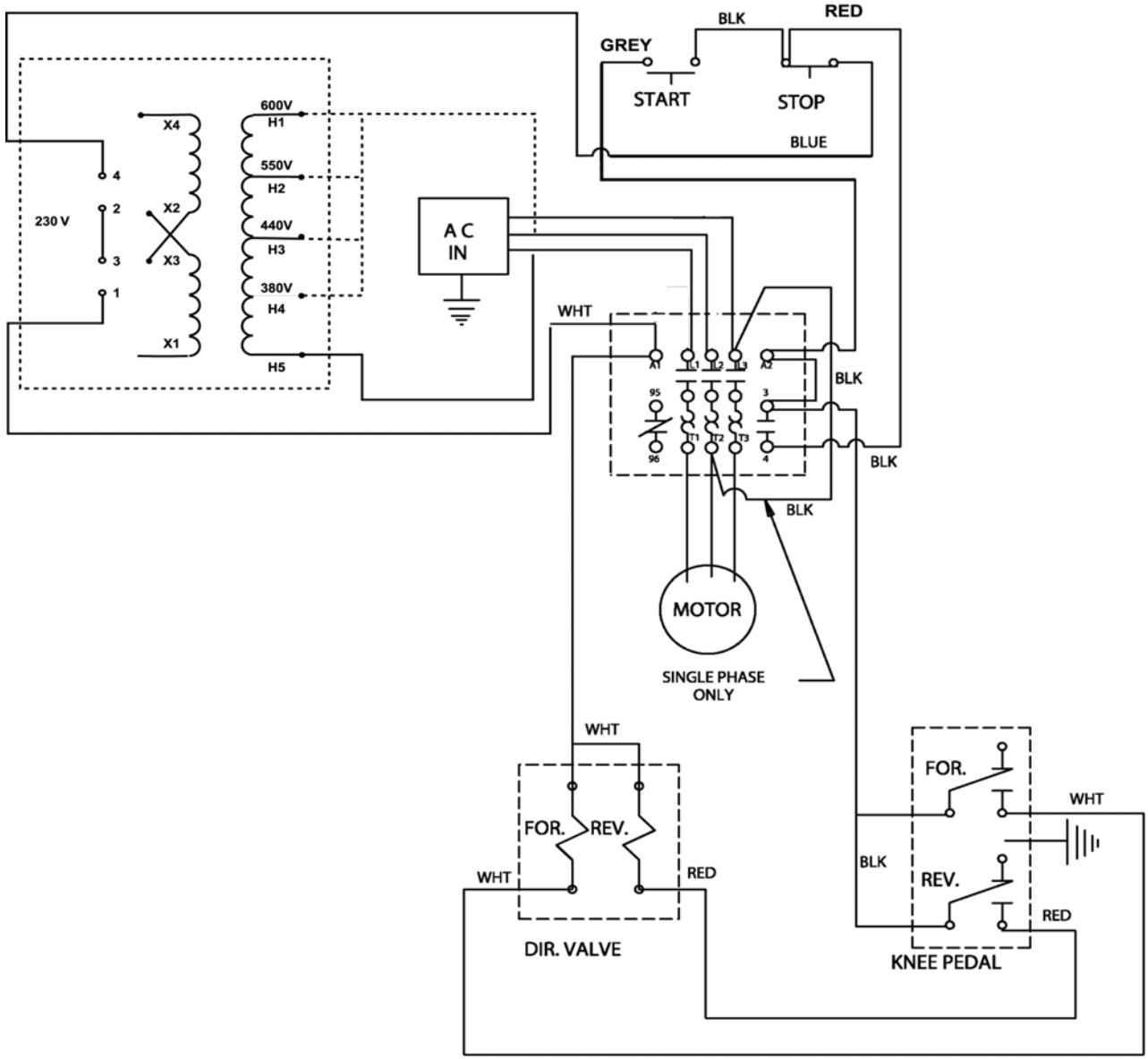


1. Plug in bender.
2. Turn bender on.
3. Depress swager control handle. If swager cylinder rod extends into the swager box, rotation is correct. If cylinder rod does not extend, rotation is incorrect.
4. If rotation is in the wrong direction, unplug the bender.
5. Disassemble the plug and reverse the red and black wires.
6. Reassemble plug and test again.

Electrical Wiring Diagram - 230 Volts
Model BP-08, BPC-09

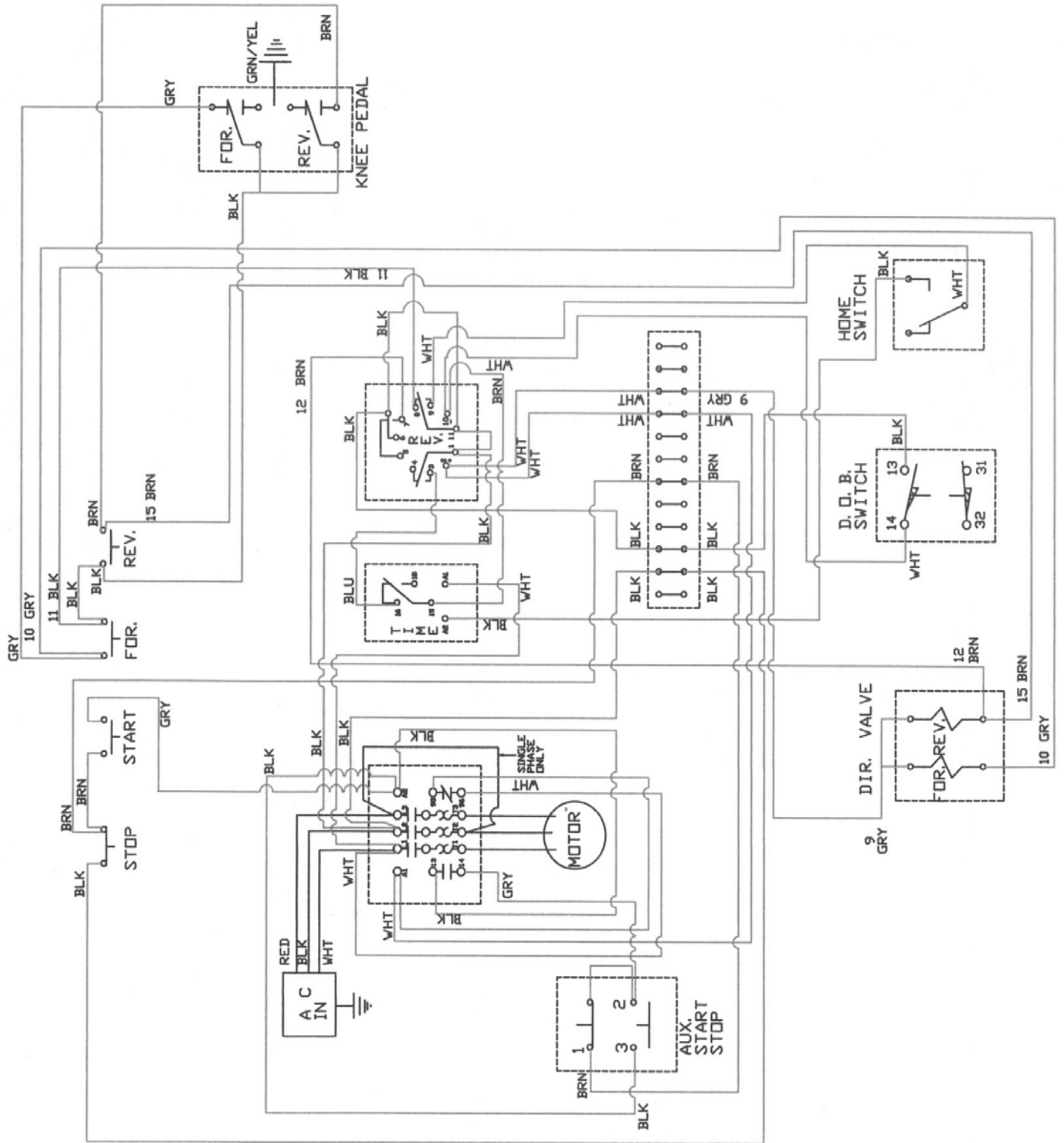


Electrical Wiring Diagram - High Voltage Model BP-08, BPC-09

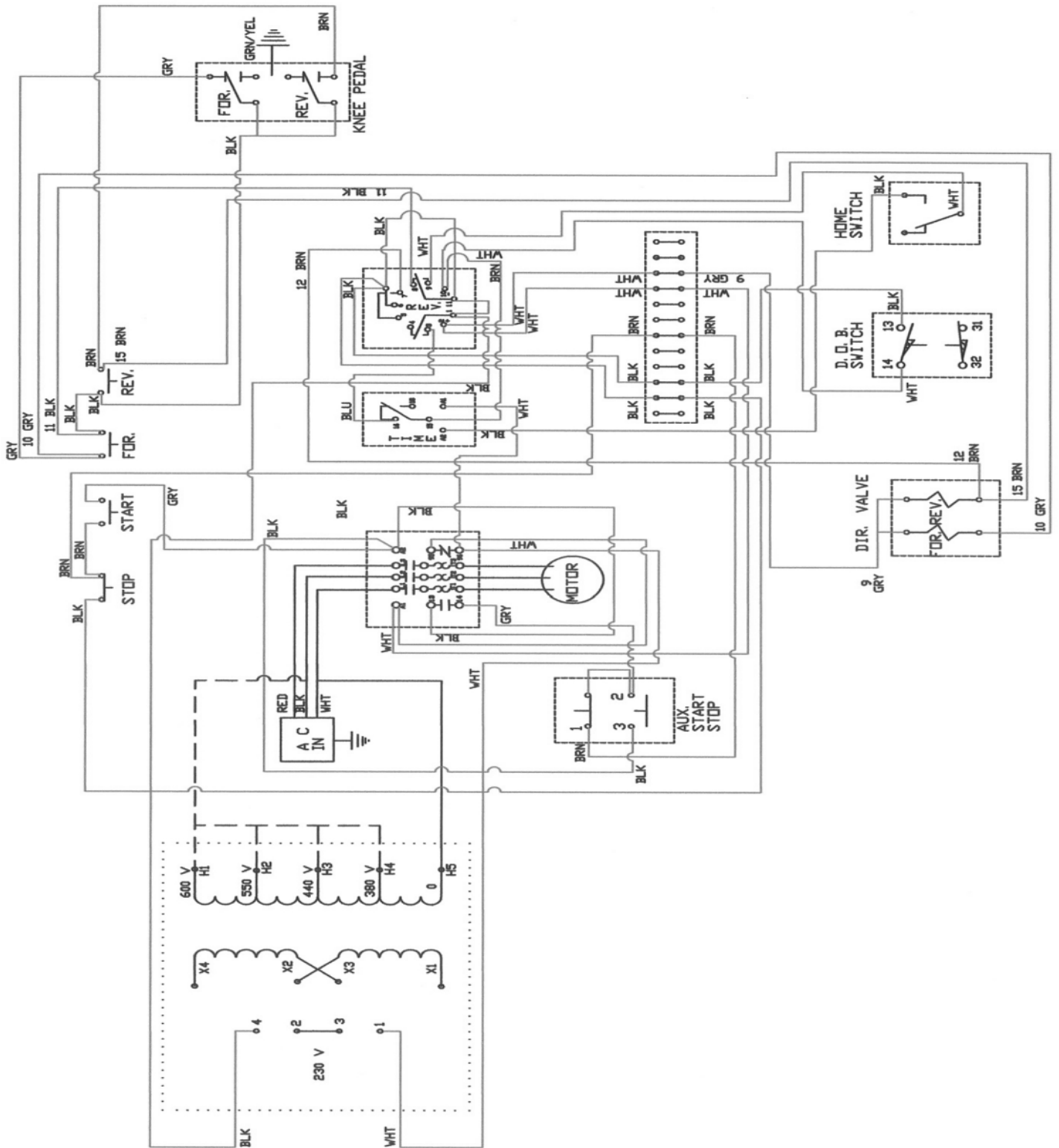


Electrical Wiring Diagram

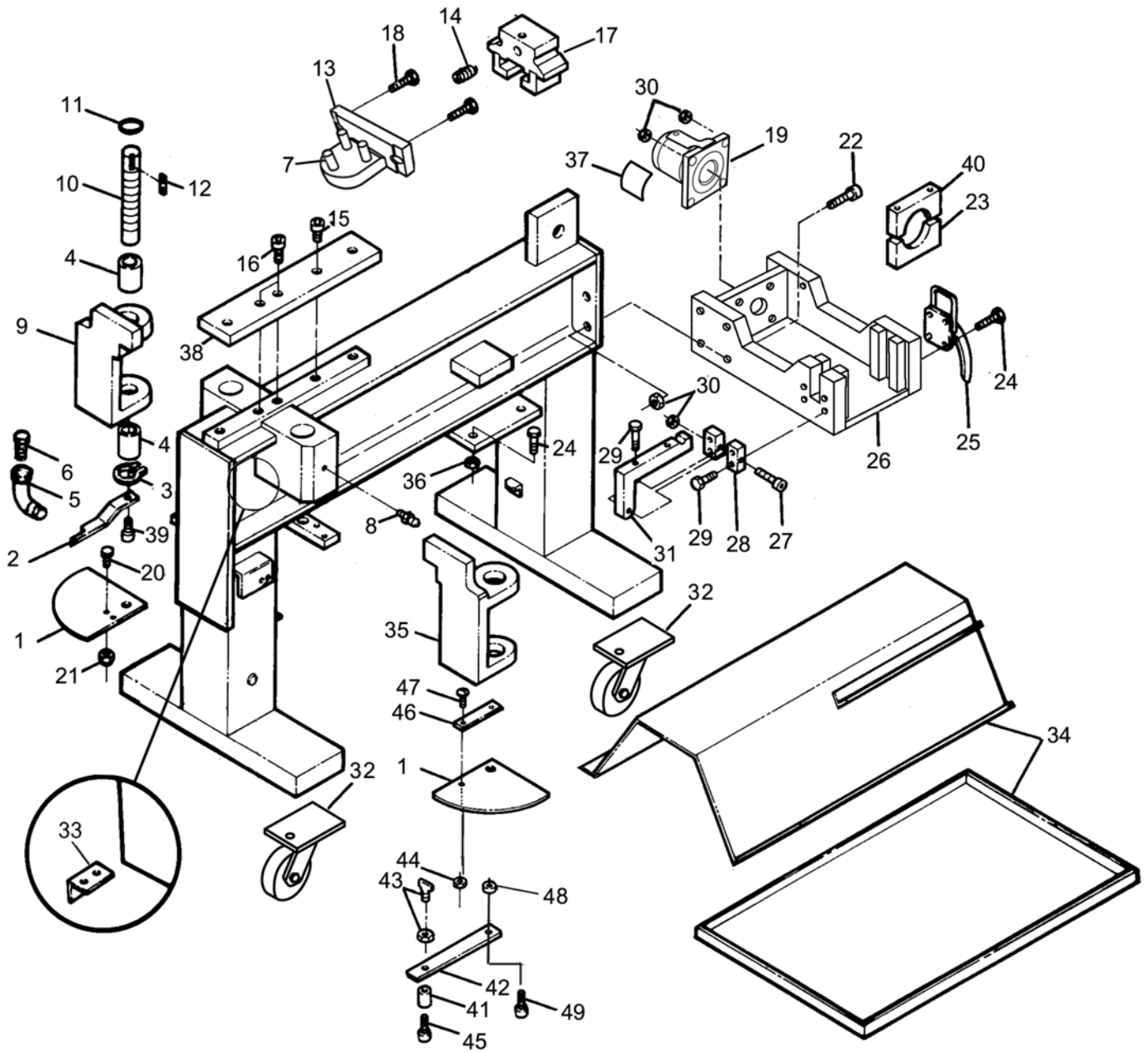
Model BP-11, BPC-12



Electrical Wiring Diagram - High Voltage BP-11, BPC-12



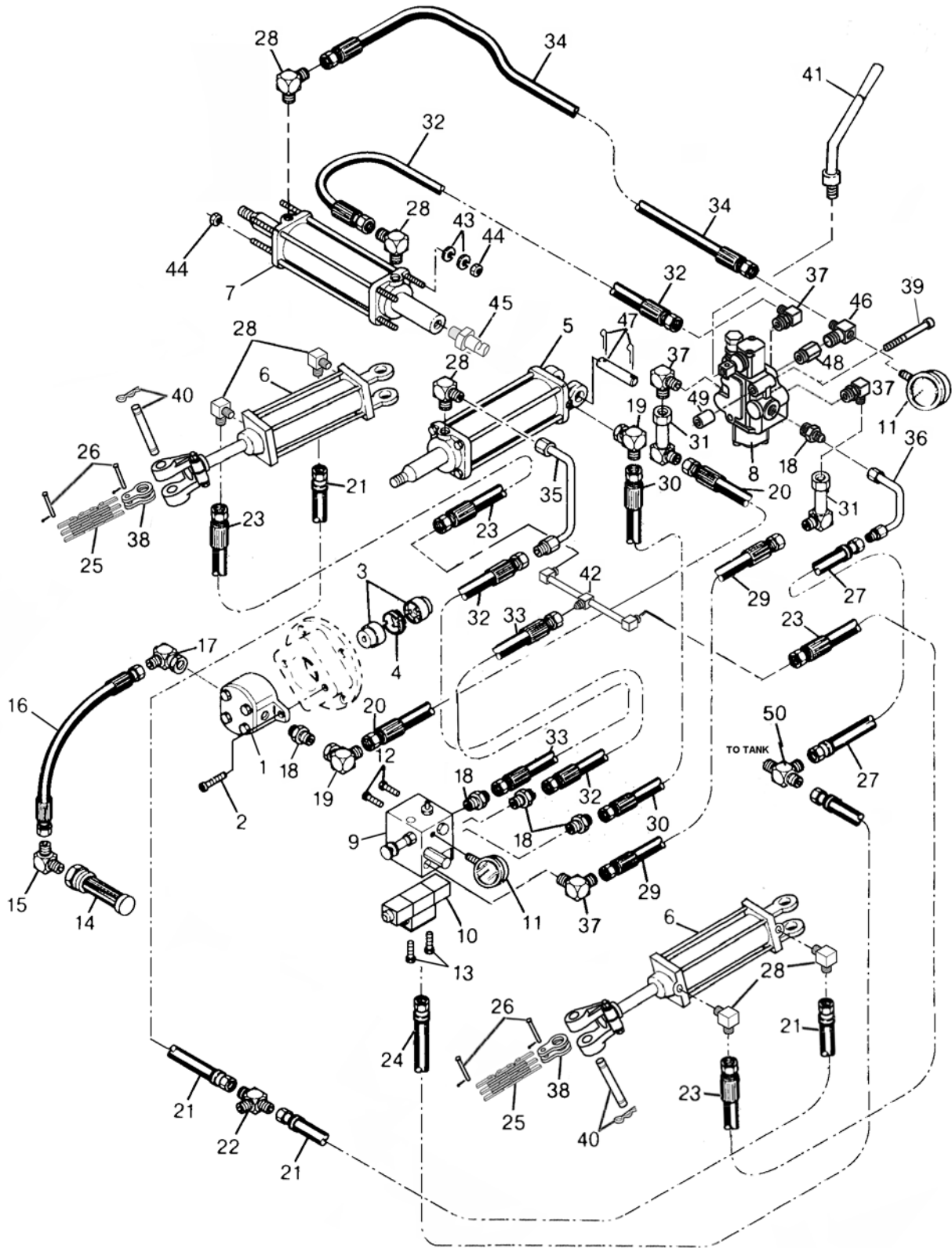
Frame Replacement Parts



Frame Replacement Parts

KEY	PART NO.	DESCRIPTION	Quantity			
			BP-08	BPC-09	BP-11	BPC-12
1	91160	Plate, Depth Of Bend	1	1	2	2
2	91153	Pointer	1	1	1	1
3	90094	Ring, Outside Snap	2	2	2	2
4	91050	Bushing, Head Block	4	4	4	4
5	92042	Elbow, Street 3/4	1	1	1	1
6	839	Cap, Vent	1	1	1	1
7	60642	Pins, Sled Adaptor	3	3	3	3
8	97234	Fitting, Grease	2	2	2	2
9	91113	Gate, Left	1	1	1	1
10	91042	Pin, Gate	2	2	2	2
11	90093	Ring, Inside Snap	2	2	2	2
12	90092	Keyway	2	2	2	2
13	81005	Sled Adaptor	1	1	1	1
14	97050	Spring	1	1	1	1
15	97204	Screw, Soc. Hd. 1/2-13 x 1	3	3	3	3
16	97205	Screw, Soc. Hd. 1/2-13 x 2-1/4	2	2	2	2
17	91033	Sled	1	1	1	1
18	97251	Bolt, Hex 3/4-10 x 3-1/2	2	2	2	2
19	81022	Adjustable Collar	1	1	1	1
20	97260	Bolt, 1/4-20 x 3/4	2	2	2	2
21	97210	Locknut, 1/4 - 20	2	2	2	2
22	97217	Screw, Soc. Hd. 1/2-13 x 1-1/2	4	4	4	4
23	69401	Holder, Collet, Bottom	1	1	1	1
24	97336	Bolt, Hex 3/8-16 x 3/4	4	4	4	4
25	97176	Clamp, Swager Arm	1	1	1	1
26	34021	Swager Frame	1	1	1	1
27	97232	Bolt, Hex 1/2-13 x 4	1	1	1	1
28	91061	Hinge Block	2	2	2	2
29	97335	Bolt, Hex, 3/8-16 x 1-1/2	4	4	4	4
30	97208	Nut, Jam 1/2-13	5	5	5	5
31	91059	Swager Arm	1	1	1	1
32	81016	Caster, Swivel	4	4	4	4
33	91098	Home Switch Bracket	--	--	1	1
34	91025	Tray, Flat	1	1	--	--
	91096	Tray, Deluxe	--	--	1	1
35	91114	Gate, Right	1	1	1	1
36	97225	Nut, Lock	4	4	4	4
37	61780	Decal	1	1	1	1
38	91047	Plate, Guide	1	1	1	1
39	97204	Bolt, Hex, 1/2-13 x 1	1	1	1	1
40	69400	Holder, Collet, Top	1	1	1	1
41	97000	Cam	--	--	1	1
42	91152	Handle	--	--	1	1
43	91150	Pointer, Brass	--	--	1	1
44	97224	Locknut, 10-32	--	--	1	1
45	97226	Screw, Socket Hd, 1/4-20 x 7/8	--	--	1	1
46	91151	Support, Depth-of-Bend	--	--	1	1
47	97239	Screw, Rd. Hd. 10-32 x 1/2	--	--	1	1
48	97222	Locknut, 1/2-13	--	--	1	1
49	97211	Bolt, 1/2-13 x 1-1/2	--	--	1	1

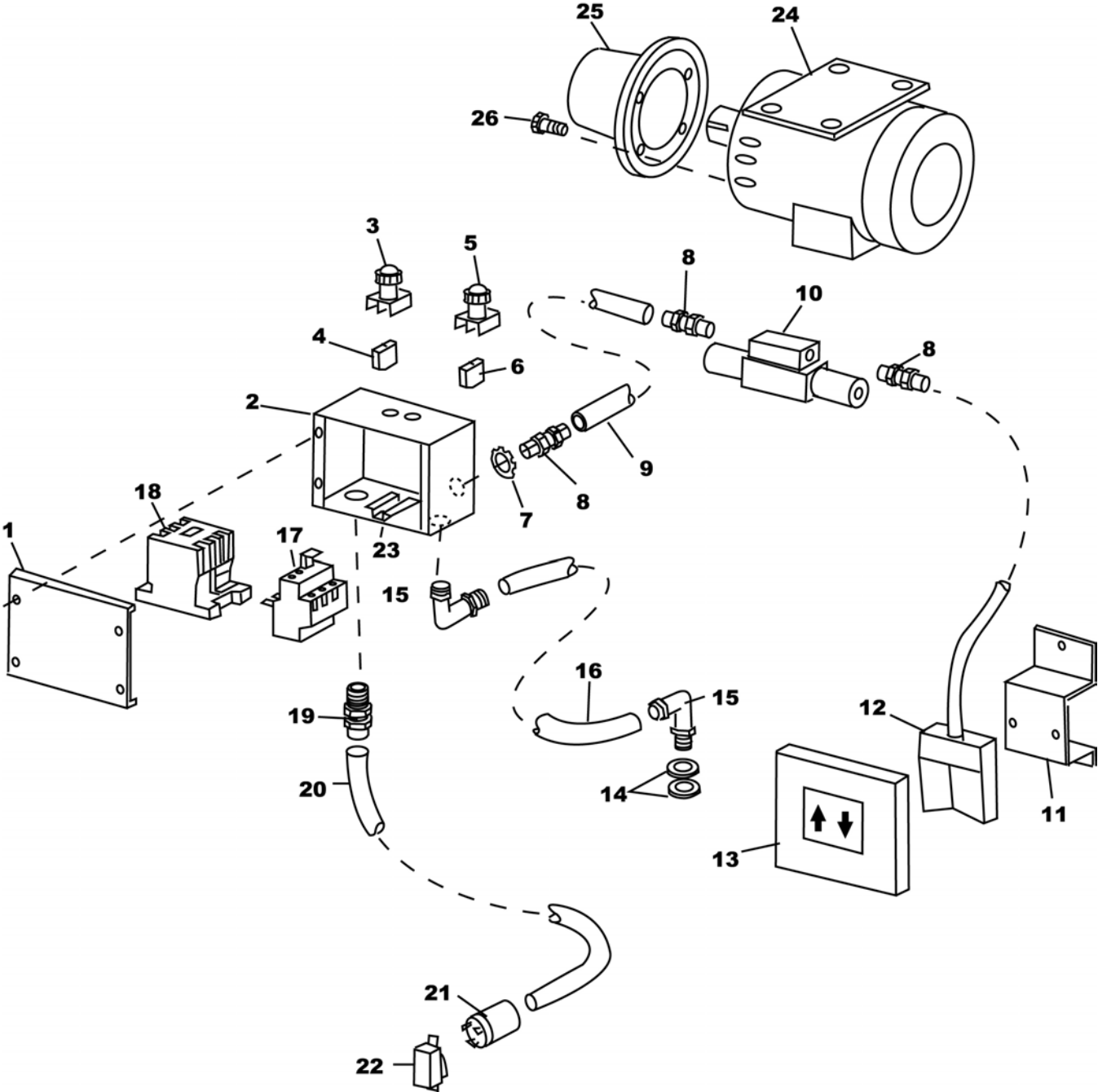
Hydraulic Replacement Parts



Hydraulic Replacement Parts

KEY	PART NO.	DESCRIPTION	QUANTITY	REMARKS
1	92114	Pump, Hydraulic	1	
2	97267	Bolt, Hex Hd. 3/8"-16 x 1"	2	
3	92356	Coupler	1	Includes P/N 92358 Spyder
4	92358	Spyder, Rubber	1	
5	92172	Cylinder, Main, Agricultural	1	Includes Pin
6	76014	Cylinder, Side Agricultural	2	Includes Pins
7	76013	Cylinder, Double End	1	Sold as Assembly Only
8	92103	Valve, Swager	1	
9	92165	Valve, Sequence	1	
10	92164	Valve, Directional	1	220 Volt
11	92100	Gauge, Pressure	2	
12	97221	Bolt, Hex 3/8"-16 x 1/2"	2	
13	97377	Screw, Sk. Hd. Cap 10-24 x 7/8"	4	
14	92045	Filter, Easy Flow	1	
15	92010	90 Ftg, 1/2ML NPT x 3/8ML JIC	1	
16	92272	Hose, #8, 19" Lg.	1	
17	92078	Elbow, 90 Degrees, 1/2-5/8	1	
18	92006	Str, 3/8ML JIC x 1/2ML SAE O'R	5	
19	92021	90 Elb, 3/8ML JIC x 3/8FM JIC SVL	1	
20	92273	Hose, #6, 41" Lg.	1	
21	76018	Hose, Return, #6, 30" Lg.	2	
22	92015	Branch, T Ftg, 3/8 x 3/8 x 1/4	1	
23	76019	Hose, #6, 11" Lg.	2	
24	92280	Hose, Return, #6, 13" Lg.	1	
25	60475	Chain	2	
26	60476	Pin	4	
27	92279	Hose, Return, #6, 56" Lg.	1	
28	92009	90 Ftg, 1/2ML NPT x 3/8ML JIC	9	
29	92275	Hose, #6, 58" Lg.	1	
30	92274	Hose, #6, 50" Lg.	1	
31	92023	90 Lg Elb, 3/8 ML JIC x 3/8FM JIC	2	
32	92264	Hose, #6, 23-1/2" Lg.	2	
33	92261	Hose, #6, 15-1/2" Lg.	1	
34	92263	Hose, #6, 19" Lg.	1	
35	92312	Tube, 6-6	1	Cylinder
36	92313	Tube, 6-6	1	Valve
37	92004	90 Elb, 1/2ML SAE O'R 3x8ML JIC	4	
38	81004	Chain Anchor	4	
39	97206	Socket Head Cap Screw, 3/8"-16 x 3-1/4"	2	
40	92202	Pin, Side Cylinder	4	
41	92109	Handle, Swager	1	
42	92314	Fitting, 3-Way	1	
43	97383	Washer, Lock 1/2"	4	
44	97208	Nut, Jam 1/2"-13	10	
45	61247	Cylinder Rod Adapter	1	
46	92009DT	90 Ftg, 1/2ML NPT x 3/8ML JIC, DT	1	For Pressure Gauge
47	92203	Pin, Main Cylinder	1	
48	92008	Str Ftg, 1/2ML SAE O'R x 1/2 FM NPT	1	
49	70045	Bushing, Steel	2	
50	92028	Str Ftg, 1/2ML NPT x 3/8ML NPT	1	

Electrical Replacement Parts
Models BP-08, BPC-09

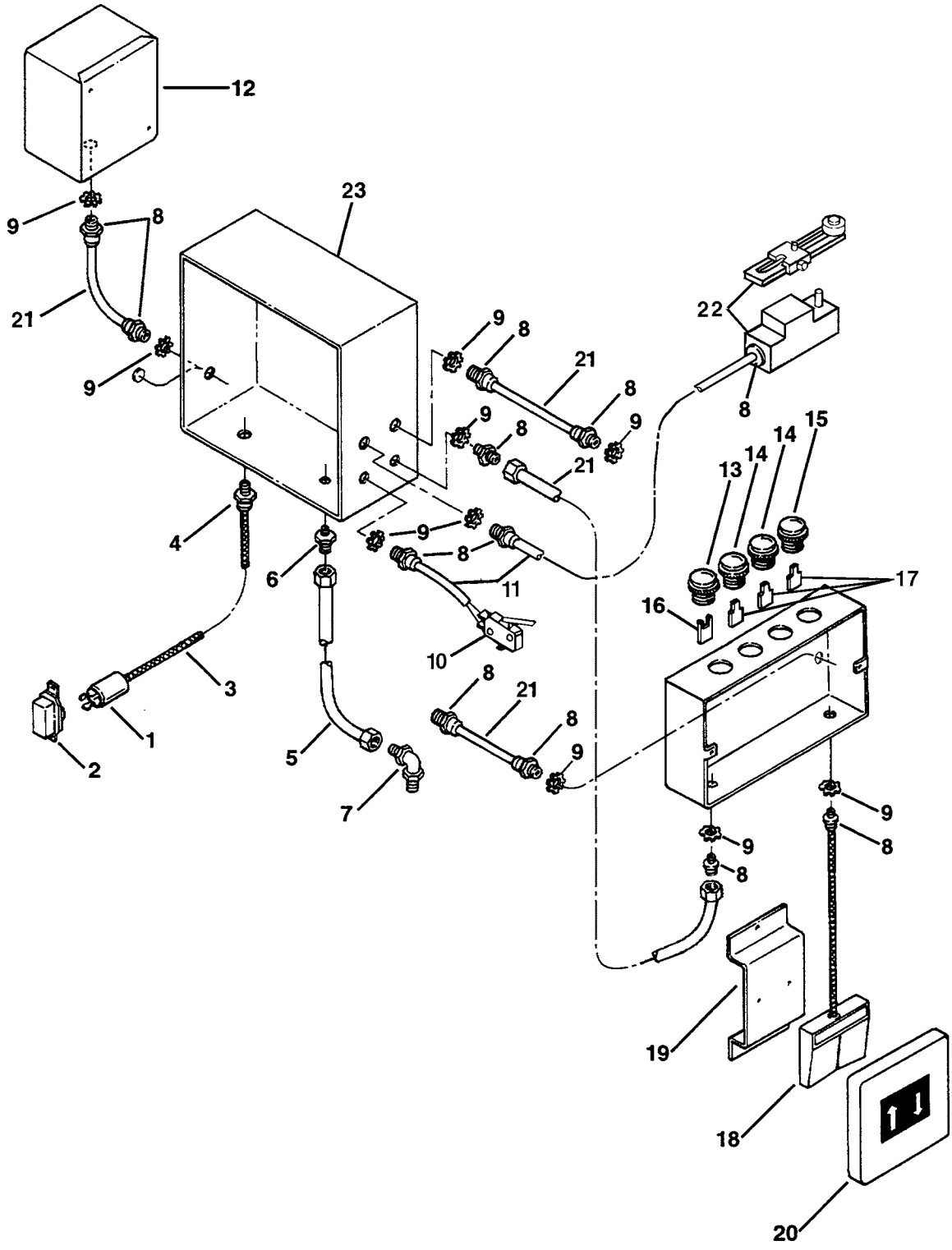


Electrical Replacement Parts
Models BP-08, BPC-09

KEY	PART NO.	DESCRIPTION	QUANTITY	REMARKS
1	95108	Lid, Control Box	1	
2	95107	Control Box	1	
3	95512	Green Push Button	1	
4	95515	Open Contact	1	
5	95511	Red Push Button	1	
6	95514	Closed Contact	1	
7	95429	Locknut	1	
8	95449	Cord Grip	3	
9	95508	16-3 Cord	39	Inches
10	92164	Directional Valve	1	
11	97469	Mount, Pedal	1	
12	95419DT	Switch, Knee Pedal	1	
13	97448	Pad, Knee Pedal	1	
14	97248	Washer, Reducing	2	
15	95236	Conduit, 3/8" 90 Degree	2	
16	95234	Conduit, 3/8"	36	Inches
17	95503	Overload, Single Phase	1	
	95518	Overload, Three Phase	1	
18	95502	Contactor, Single Phase	1	
	95519	Contactor, Three Phase	1	
19	95459	Cord Grip	1	
20	95370	Cord, Power, Single Phase	20	Feet
	95371	Cord, Power, Three Phase	20	Feet
21	95206	Plug, Single Phase	1	
	95208	Plug, Three Phase	1	
22	95207	Receptacle, Single Phase	1	
	95209	Receptacle, Three Phase	1	
23	95510	DIN Rail	2	Inches
24	95019	Motor, 5 HP Single Phase	1	
	95020	Motor, 5 HP Three Phase	1	
25	95021	Motor Pump Mount	1	
26	97400	Bolt, Hex 1/2-13 x 3/4	4	

Electrical Replacement Parts

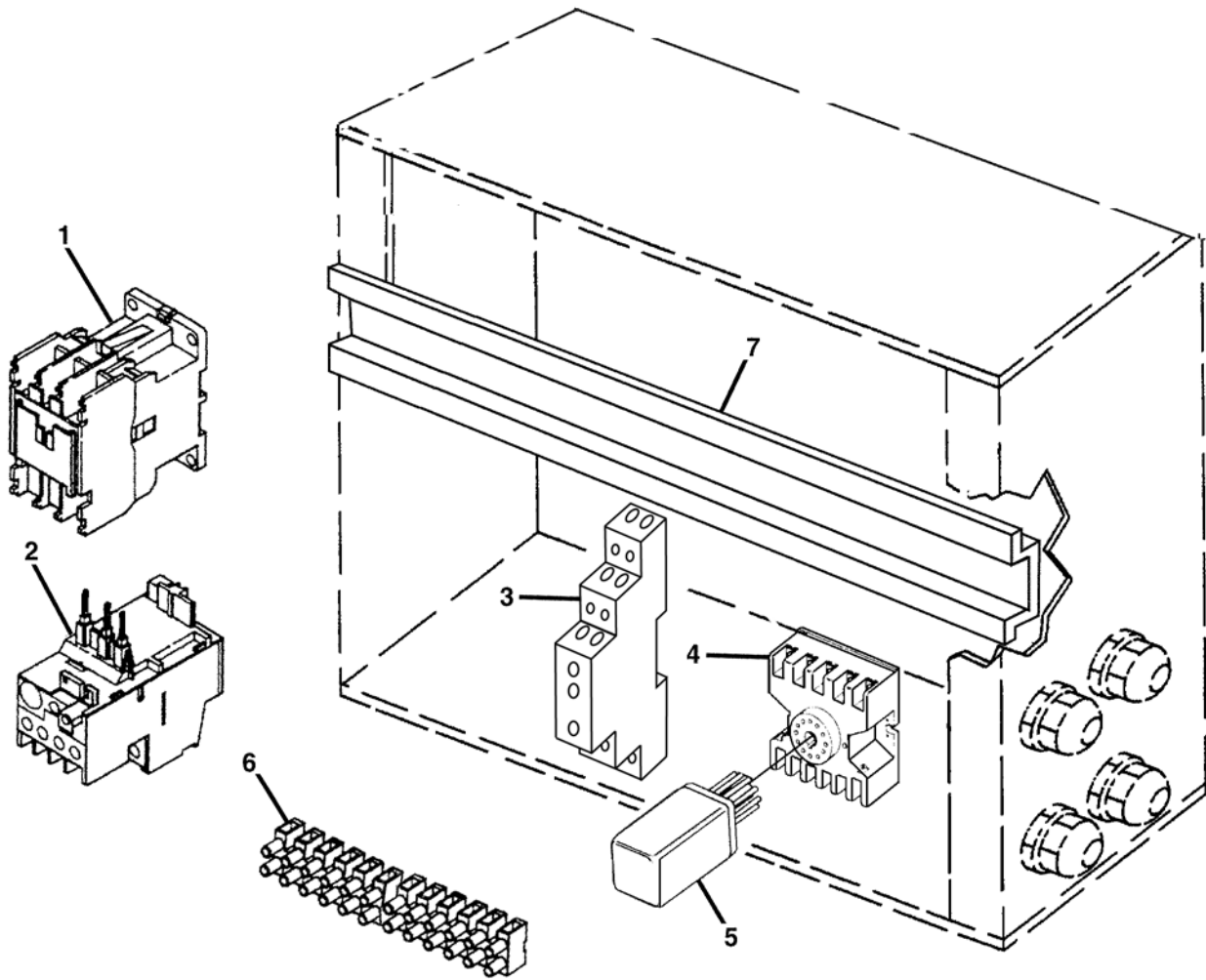
Models BP-11, BPC-12



Electrical Components - Models BP-11, BPC-12

REF.	PART NO.	DESCRIPTION	QUANTITY	REMARKS
1	95206	Plug, Single Phase	1	
	95208	Plug, Three Phase	1	
2	95207	Receptacle, Single Phase	1	
	95209	Receptacle, Three Phase	1	
3	95370	Power Cord, Single Phase	1 each	Sold by the foot
	95371	Power Cord, Three Phase	1 each	Sold by the foot
4	95172	Kellum	1	
5	95234	3/8" Conduit	1 each	Sold by the inch
6	95235	3/8" Straight Connector Conduit	1	
7	95236	3/8" 90° Connector Conduit	1	
8	95449	Cord Grip	7	
9	95429	Lock Nut	7	
10	95420	Home Position Switch	1	
11	95508	16-3 Cord	1 each	Sold by the inch
12	95509	Sub Station	1	
13	95511	Red Push Button	2	
14	95512	Green Push Button	3	
15	95513	Black Push Button	1	
16	95514	Closed Contact	3	
17	95515	Open Contact	5	
18	95419	Pedal Control	1	
19	97447	Pedal Mount Plate	1	
20	97448	Knee Pad	1	
21	95364	16-4 Cord	1 each	Sold by the inch
22	62786	Limit Switch	1	
23		Control Box		See Page 36 for components

Electrical Control Box Components - Models BP-11, BPC-12



REF.	PART NO.	DESCRIPTION	QUANTITY		REMARKS
			BP-11	BPC-12	
1	95502	Contactors, Single Phase	1	1	
	95519	Contactors, Three Phase	1	1	
2	95503	Overload Relay, Single Phase	1	1	
	95518	Overload Relay, Three Phase	1	1	
3	95461	Timer Relay	1	1	
4	95463	11-Pin Relay Socket	1	1	
5	95435	3P3T Relay	1	1	
6	95507	Terminal Strip	1	1	
7	95510	DIN Rail	1	1	Sold by the inch