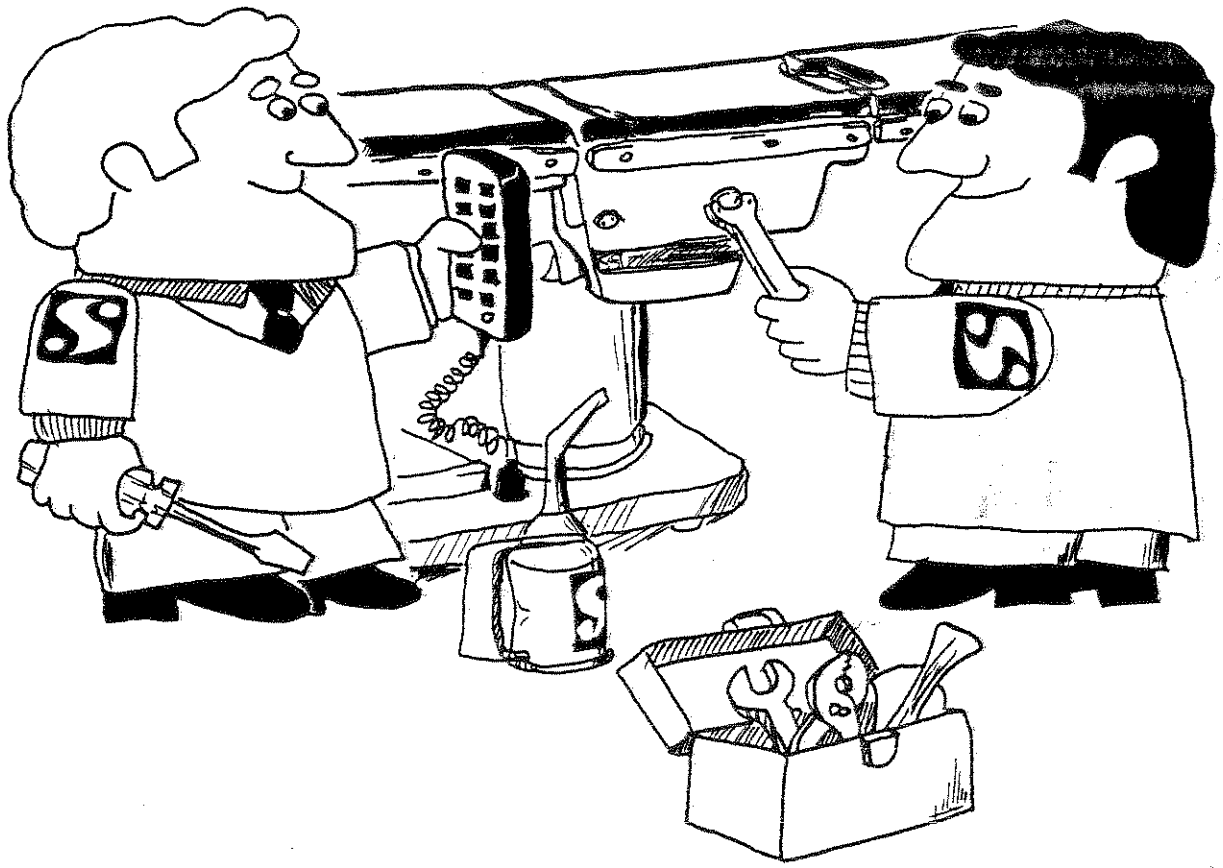
SKYTRON

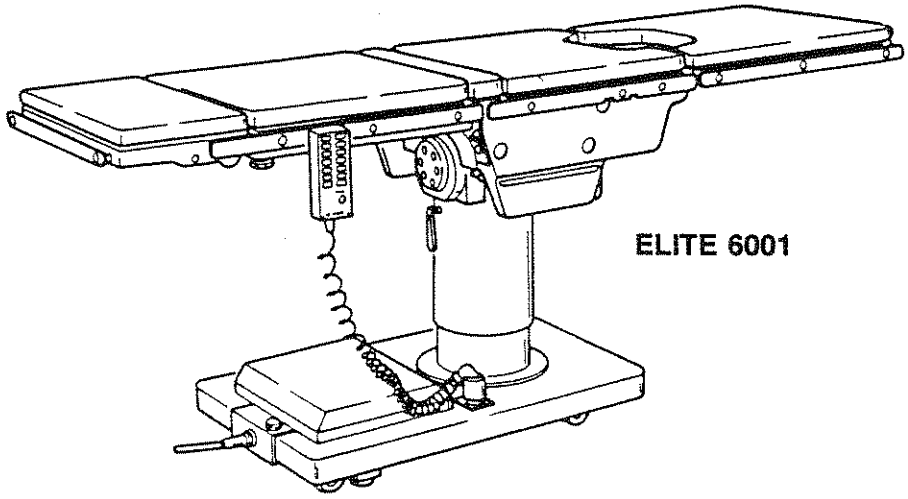
GRAND RAPIDS, MICHIGAN

Maintenance Manual

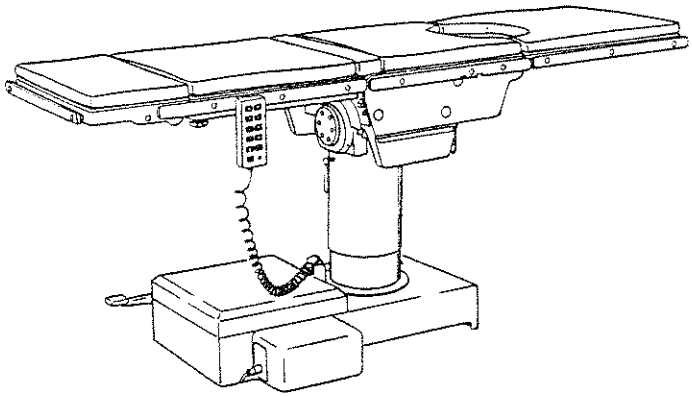


ELITE SURGICAL TABLES

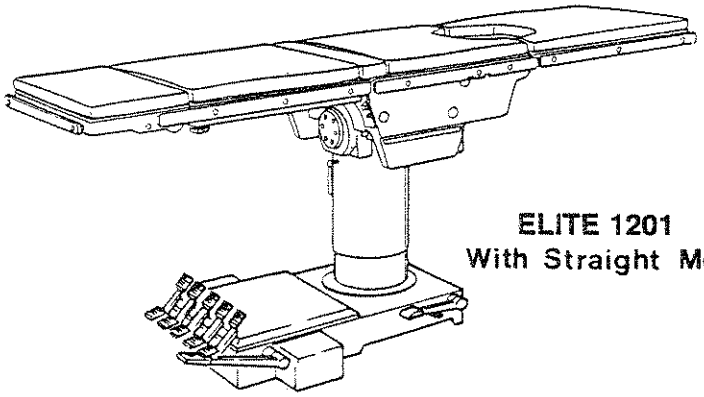
MODELS 1200, 1201, 5000, 5001, 6000 & 6001



ELITE 6001



ELITE 5001 With Optional Side Move Base



ELITE 1201
With Straight Move Base

MODEL IDENTIFICATION

ELITE/1200-Manual-Hydraulic Split Leg Surgical Table*

ELITE/1201-Manual-Hydraulic Solid Leg Surgical Table*

ELITE/5000-Electro-Hydraulic Split Leg Surgical Table*

ELITE/5001-Electro-Hydraulic Solid Leg Surgical Table*

ELITE/6000-Electro-Hydraulic Split Leg Surgical Table

ELITE/6001-Electro-Hydraulic Solid Leg Surgical Table

*May Include Optional Side Move Base

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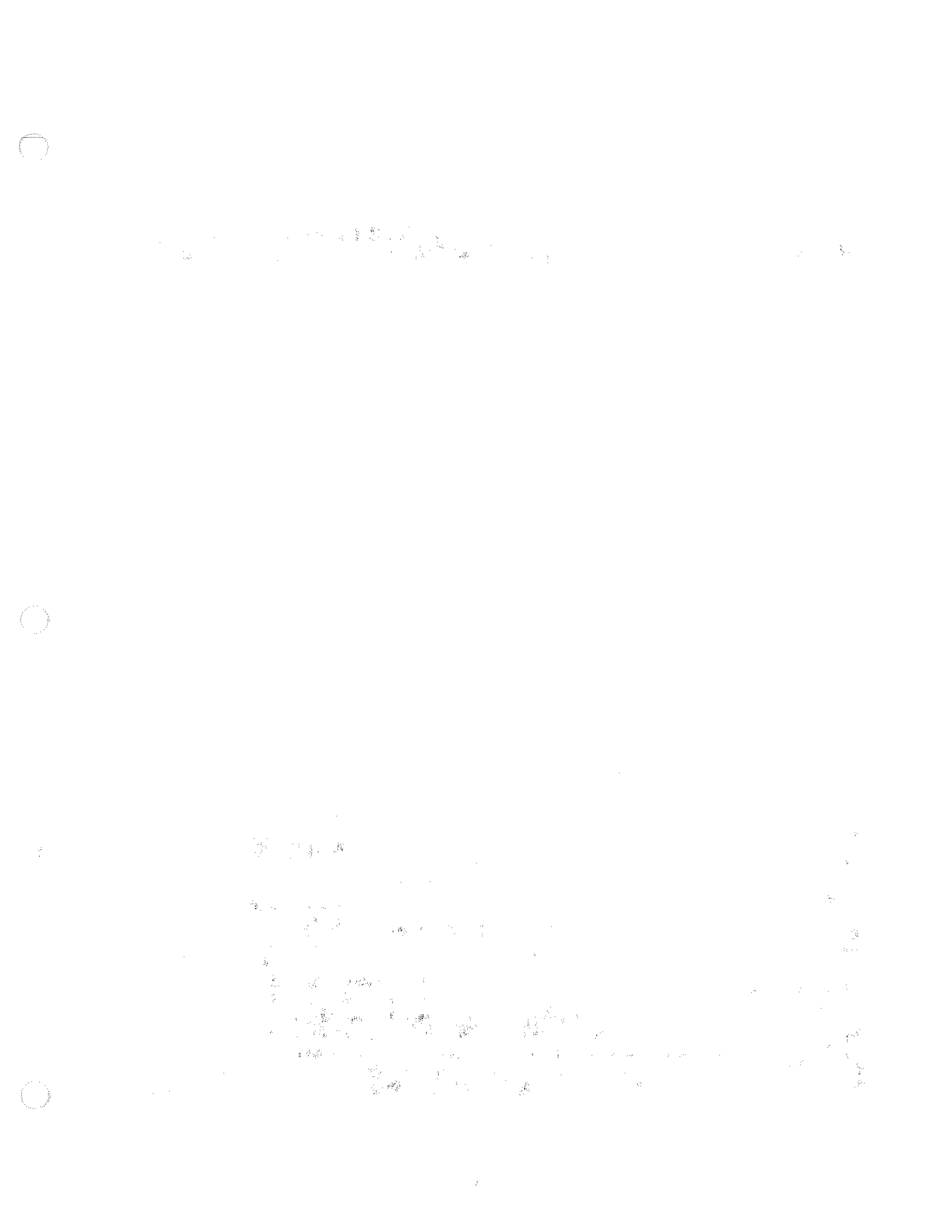

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SECTION I
HYDRAULIC SYSTEM

1-1. General

a. Electro-Hydraulic System
(Models 5000, 5001, 6000 and 6001)

The hydraulic system (with the exception of the hydraulic cylinders and hoses) is contained within the base of the table. The hydraulic valves and pump are electrically controlled by the use of a hand-held push button pendant control. The power requirements for the table are 120v, 5 amp, 60 hz.

The basic functions of the electro-hydraulic tables are all identical. The only differences are the number of individual functions. The 5000 and 6000 models have a manually operated foot/leg section and the 5001 and 6001 models have a power operated foot/leg section. The 6000 and 6001 models also have a flex/reflex function and a power (activation and release) brake system. The 5000 and 5001 models with the side move base option have a power brake activation system with a manual release.

The tables contain the following components. Refer to the block diagrams (figures 1-1., 1-2. and 1-3.) for relationship.

1. Oil Reservoir - Main oil supply. Approximately two quarts.

2. Motor/Pump Assembly - A positive displacement gear type pump provides the necessary oil pressure and volume.

3. Pressure Relief/Dropping Assembly - The pressure relief valve provides an alternate oil path when the hydraulic cylinders reach the end of their stroke. The dropping valve assembly (models 5000 and 5001 only) creates a load in the elevation circuit so that the return valve will open to allow the table to descend.

The 6000 and 6001 models use a three-way mini-valve instead of the dropping valve.

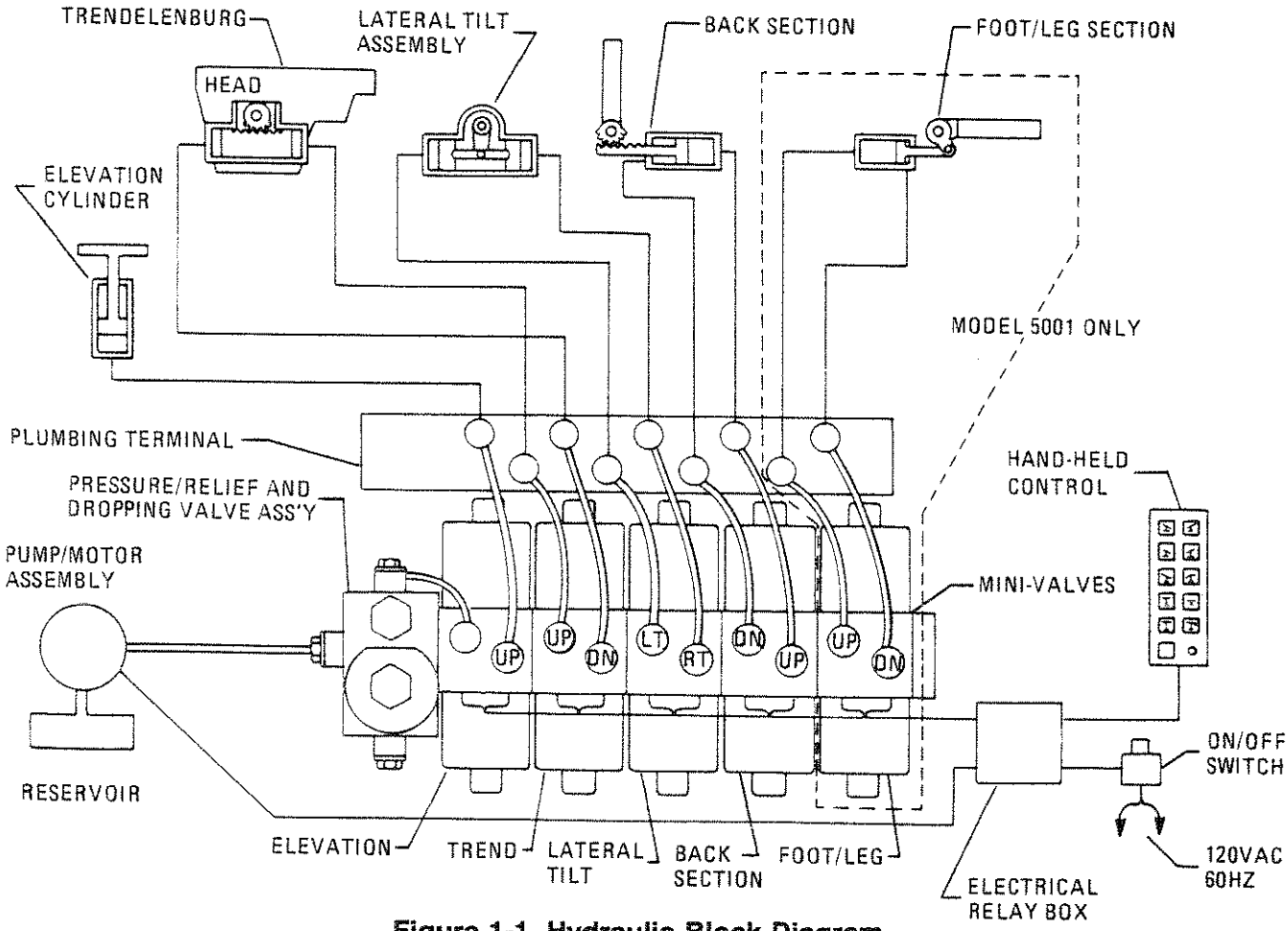

Figure 1-1. Hydraulic Block Diagram
Models 5000 and 5001

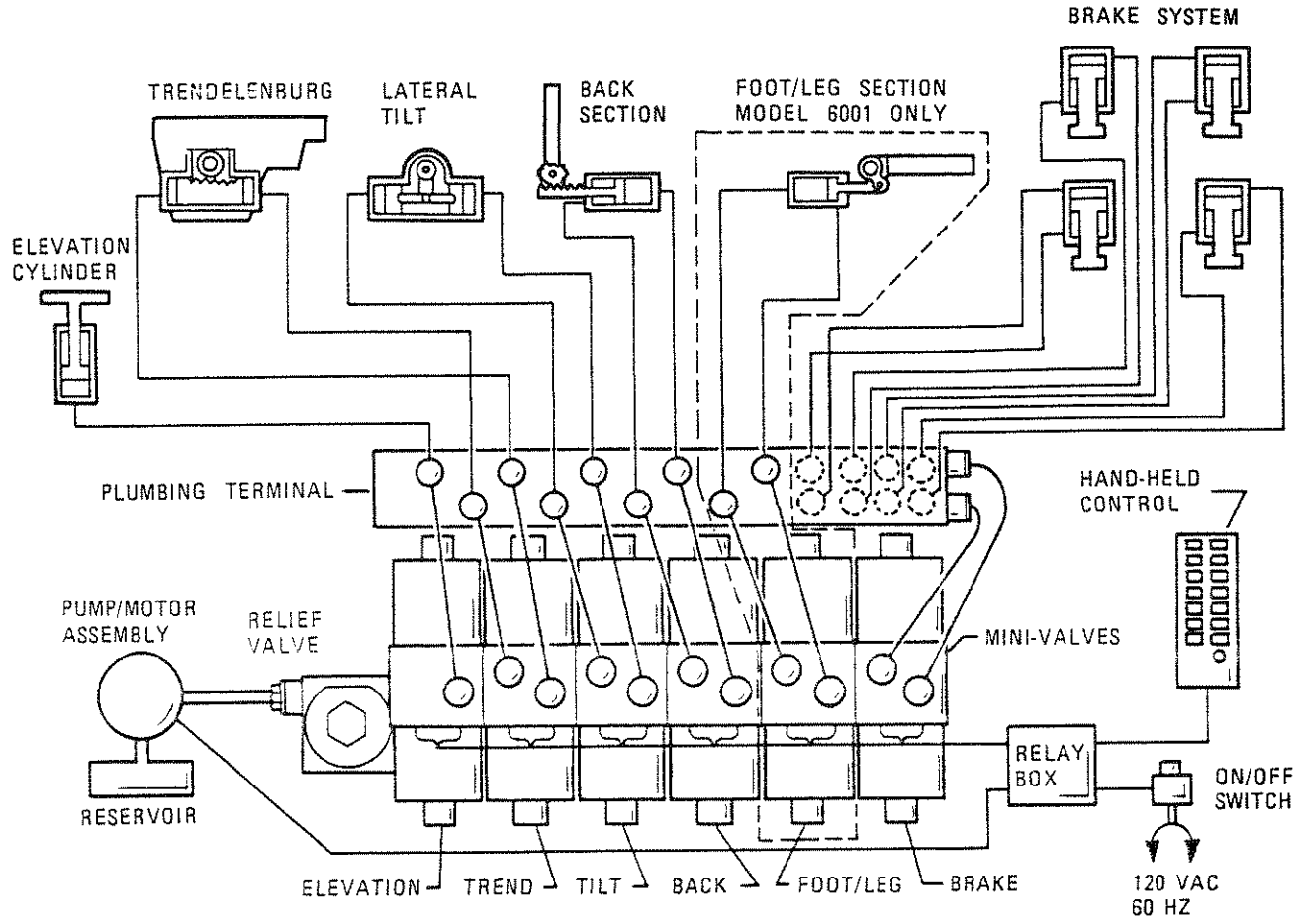

Figure 1-2. Hydraulic Block Diagram Models 6000 and 6001

4. Electro/Hydraulic Mini-Valve Assemblies - These direct the fluid to the appropriate hydraulic cylinders.

5. Hydraulic Lines, Fittings, Connections - They provide a path for the hydraulic oil.

6. Hydraulic Cylinders - They convert the hydraulic fluid pressure and volume into mechanical motion.

7. Brake Circuit Check Valve (Side Move Base Models) - The valve in the main plumbing terminal which traps the hydraulic oil and locks the brake cylinders in the down position.

8. Brake Circuit Release Valve (Side Move Base Models) - The valve controlled by the brake release lever which releases the brake cylinders by allowing the hydraulic oil to return to the reservoir.

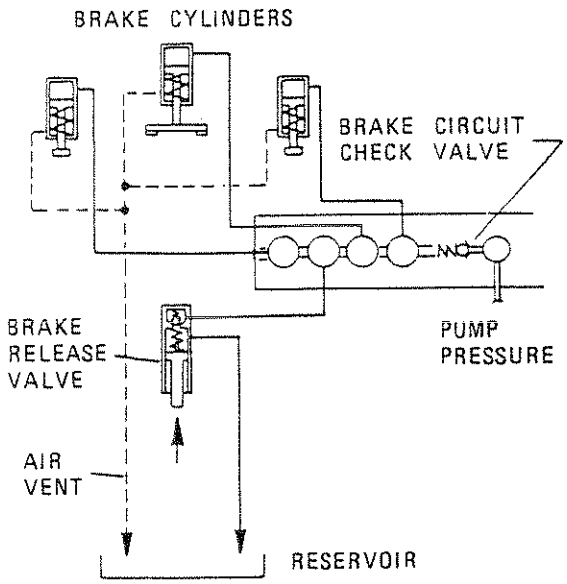

Figure 1-3. 1200/5000 Series Optional Side Move Base Brake Circuit Block Diagram

b. Manual Hydraulic System
(Models 1200 and 1201)

The hydraulic system (with the exception of the hydraulic cylinders and hoses) is contained within the base of the table. The hydraulic valves and pump are manually controlled through the use of foot pedals.

Both the 1200 and 1201 tables are functionally identical except for the operation of their respective foot/leg sections. The Elite/1200 has manually operated split-leg sections and the Elite/1201 has a manual-hydraulic operated solid foot/leg section.

Both the Elite/1200 and the Elite/1201 contain the following hydraulic components. Refer to the block diagrams for relationship. See figures 1-3. and 1-4.

1. Oil Reservoir - Main oil supply. Approximately one quart.

2. Manual Pump/Pressure Relief Assembly - Piston type. A positive displacement manually operated piston pump provides the necessary oil pressure and volume. A pressure relief valve provides an alternate oil path when the hydraulic cylinders reach the end of their stroke.

3. Hydraulic Mini-Valve Assemblies - These direct the fluid to the appropriate cylinders.

4. Dropping Valve Assembly - This provides a return oil path to the reservoir allowing the table top to descend.

5. Hydraulic Lines, Fittings, Connections - They provide a path for the hydraulic oil.

6. Hydraulic Cylinders - These convert the hydraulic fluid pressure and volume into mechanical motion.

7. Brake Circuit Check Valve (Side Move Base Models) - The valve in the main plumbing terminal which traps the hydraulic oil and locks the brake cylinders in the down position.

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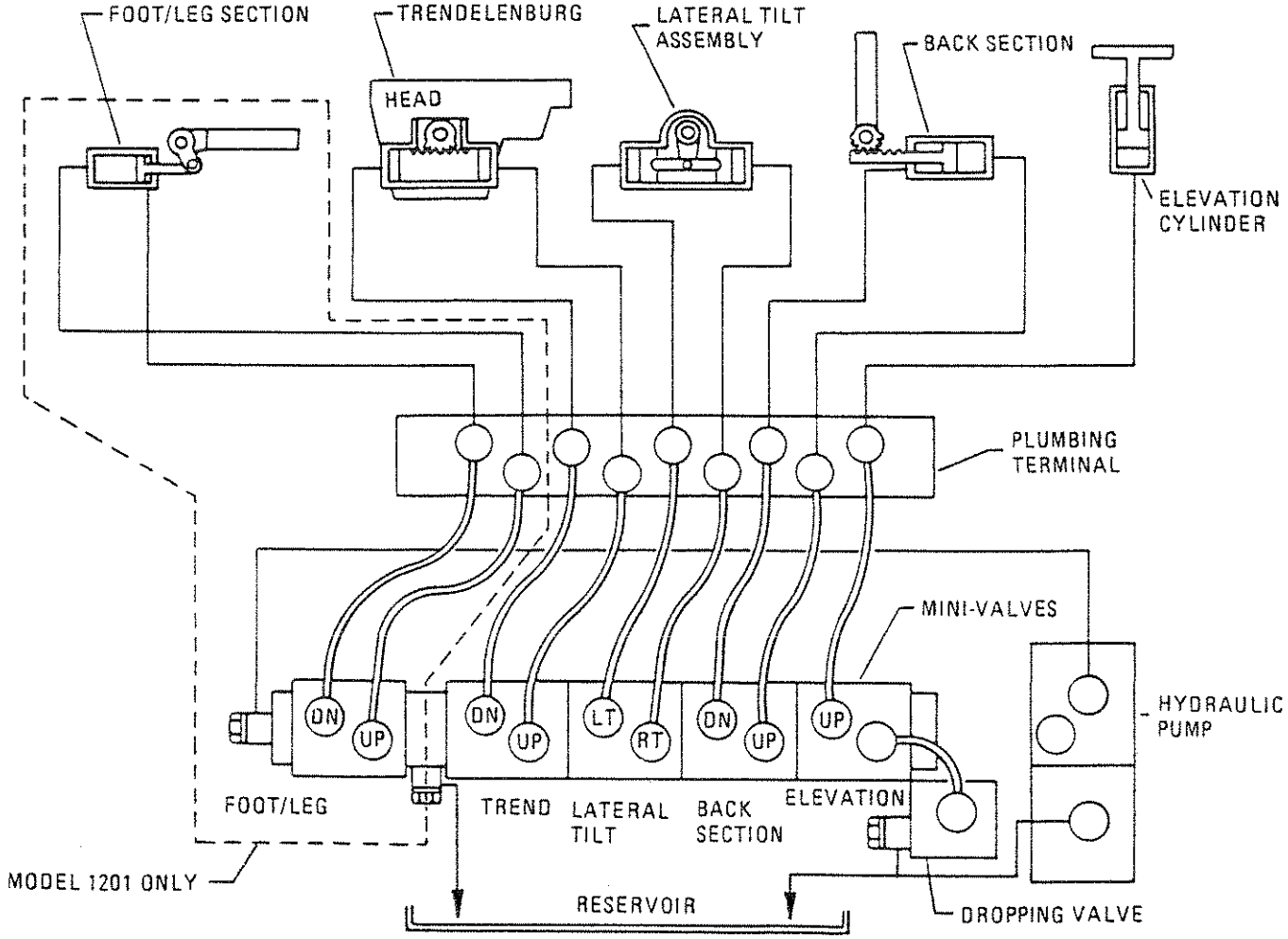


Figure 1-4. Hydraulic Block Diagram Models 1200 and 1201

1-2. Component Operation - All Models

a. Motor/Pump Operation
(Models 5000, 5001, 6000 and 6001)

The *motor/pump* assembly is a gear type pump that provides the oil pressure and volume for the entire hydraulic system. The pump has an inlet side and an outlet side. The inlet side is connected to the reservoir which provides the oil supply. The reservoir makes use of a very fine mesh screen strainer which prevents foreign material from entering the oil system.

The output line of the pump is connected to the main oil galley which is internal and common to all the hydraulic mini-valves and pressure relief valve. Also, common to the hydraulic mini-valves and pressure relief valve is an oil galley that internally connects to the oil reservoir to provide a return path for the hydraulic oil. See figure 1-5.

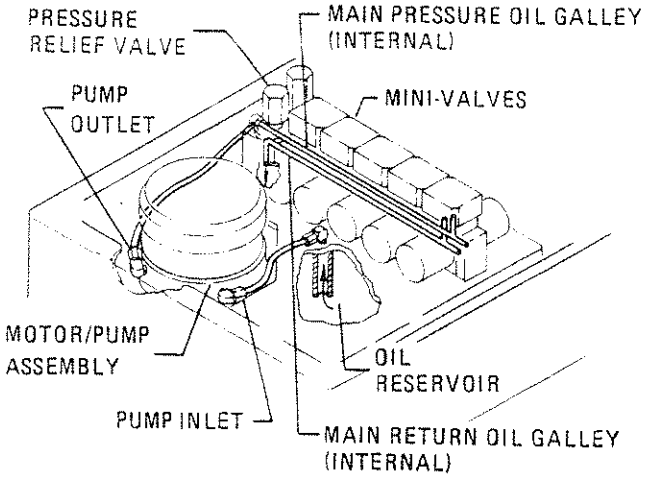


Figure 1-5. Model 5001

b. Manual Pump Operation
(Models 1200 and 1201)

The manual pump is a positive displacement piston type pump that provides oil pressure and volume for the entire hydraulic system. The pump has an inlet side and an outlet side. The inlet side is connected to the reservoir which provides the oil supply. The reservoir uses a very fine screen strainer which prevents foreign matter from entering the oil system.

The output line of the pump is connected to the main oil galley which is internal and common to all the hydraulic mini-valves.

Also, common to the hydraulic mini-valves is a common oil galley that connects to the oil reservoir to provide a return path for the hydraulic oil. See figure 1-6.

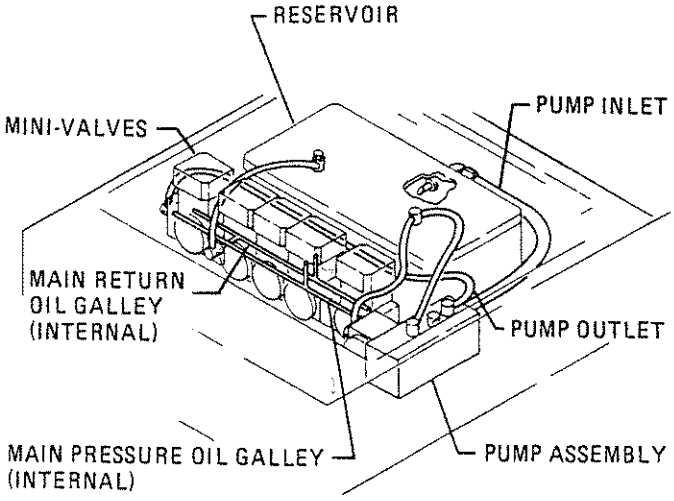


Figure 1-6. Model 1201

The manual pump contains the following basic components: See figure 1-7.

1. Pump plunger piston
2. Induction valve
3. Discharge valve
4. Pressure relief valve

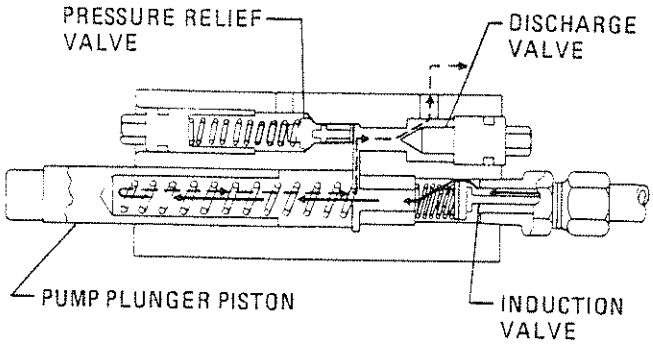


Figure 1-7. Manual Pump

When the pump pedal is pushed down, the pump plunger piston is pushed in. With this movement, the inside pressure varies according to the pump force.

At the time of less pressure (the pedal coming up), the induction valve opens allowing the oil from the reservoir to come inside the pump chamber. When the plunger is pushed in, the induction valve closes and the discharge valve is opened (by the pressure) and the oil is pumped into the appropriate hydraulic cylinder. The discharge valve is necessary because the pump pressure is not constant.

The pressure relief valve is part of the pump body. Its operation will be explained later.

c. Pressure Relief Valve
(Models 5000, 5001, 6000 and 6001)

This device provides an alternate oil path when the hydraulic cylinders reach the end of their stroke and the pump continues to run. If this path were not provided, the pump motor would stall because the oil cannot be compressed. The pressure relief valve is directly connected to the mini-valve bodies and shares both the common internal main pressure oil galley, along with the common return oil galley, that internally connects to the reservoir.

The main component of the valve is an adjustable spring loaded plunger that is pushed off from its seat by the oil pressure. The oil then flows back into the reservoir. Turning the adjustment nut clockwise increases the amount of oil pressure required to open the valve, and turning it counterclockwise decreases the amount of oil pressure. (See adjustment section for specification.)

On models 5000 and 5001, the pressure relief valve is incorporated in the same housing as the dropping valve which will be explained later.

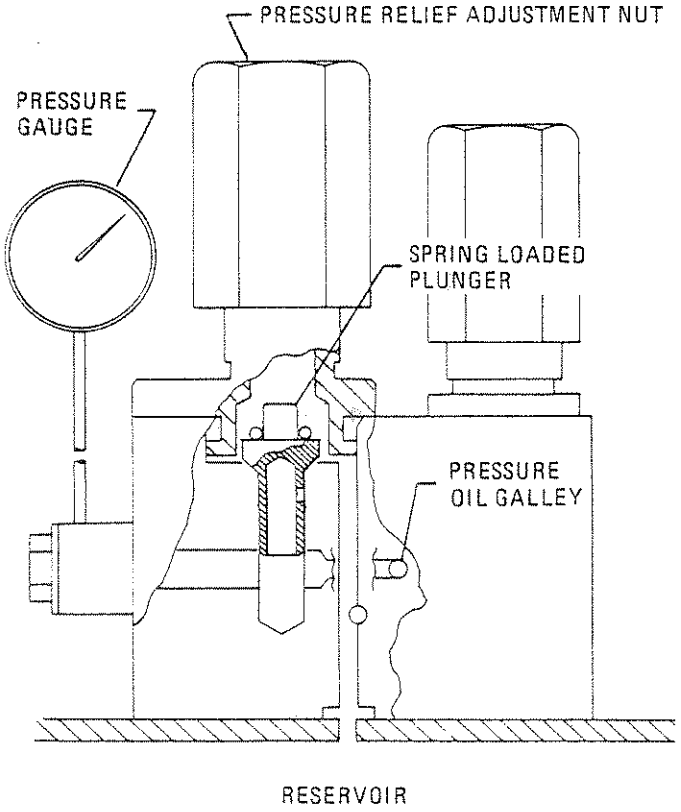


Figure 1-8. Pressure Relief Valve Not Functioning

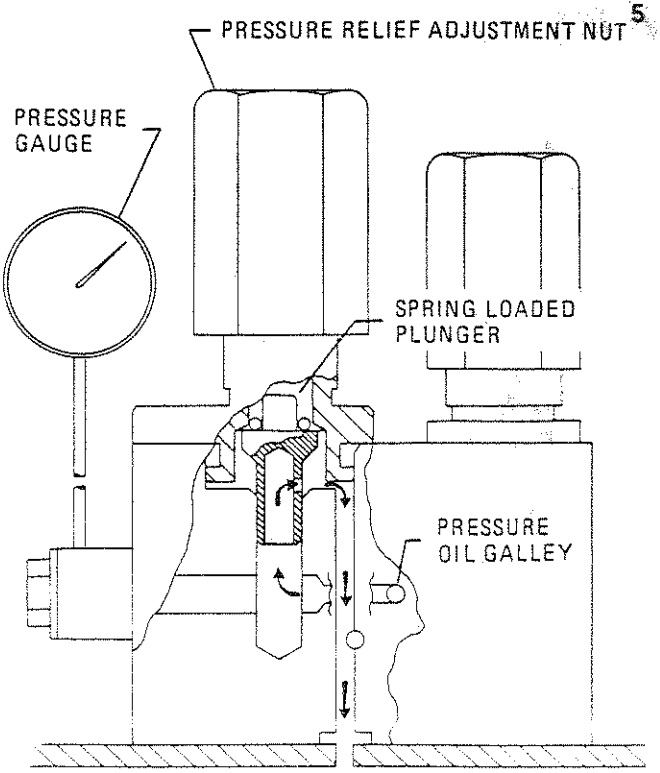


Figure 1-9. Pressure Relief Valve Functioning

d. Pressure Relief Valve
(Models 1200 and 1201)

The operation of the pressure relief valve in the manual table is basically the same as the electric. It provides an alternate oil path when the hydraulic cylinders reach the end of their stroke and the pump pedal continues to be pushed. This alternate path is necessary to prevent damage to oil lines, cylinders, etc.

The pressure relief valve is built into the manual pump body. An external oil line is attached to the relief valve port and provides the oil path back to the reservoir.

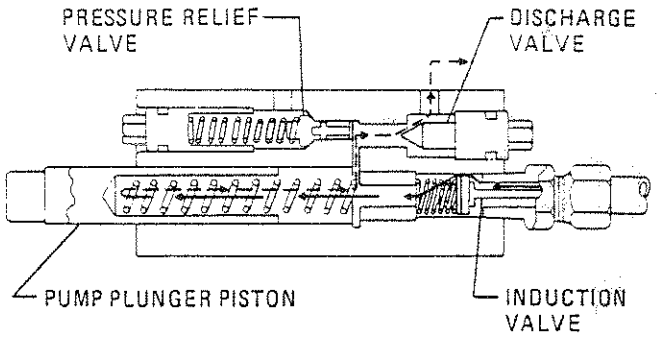


Figure 1-10. Relief Valve Not Functioning

The main component of the pressure relief valve is a spring loaded plunger that is pushed off from its seat by the oil pressure created by the pump. This would happen if the pump pedal were pushed and the oil did not have any place to go (i.e. slave cylinder has reached the end of its stroke or a control function was not selected). The spring loaded plunger is pre-set at the factory and does not require any adjustment.

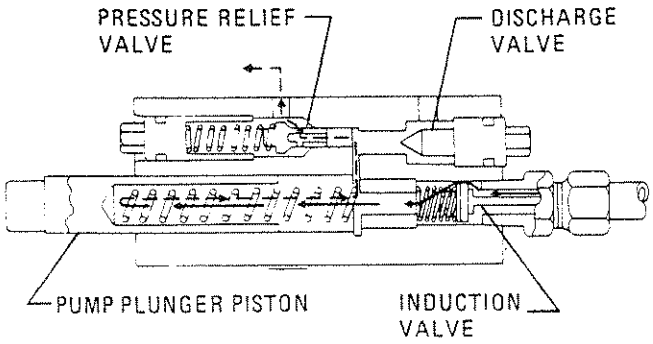


Figure 1-11. Relief Valve Functioning

e. Mini-Valve – All Models

The operation of all of the mini-valves is identical no matter which table function they control (with the exception of the elevation mini-valve on the 1200, 1201, 6000 and 6001 models).

The mini-valve is controlled by two pushing type electrically operated solenoids or manually operated linkage. The solenoids or linkage push the spool valve (located in the lower portion of the valve) one way or the other. This motion opens the main supply galley (which has pump pressure) allowing the oil to flow through the various parts of the mini-valve to either one outlet of the mini-valve, or the other, depending upon which control function has been selected.

The main components of the mini-valve and their functions are listed below:

1. Spool Valve - Opens main oil galley (pump pressure) to either mini-valve outlet depending upon which direction the spool valve is pushed. Also provides return path at the same time for the oil returning back into the reservoir.

2. Pilot Plunger - There are two plungers, one located under each check valve. The purpose of the pilot plungers is to mechanically open the return check valve which allows the oil to return back into the oil reservoir.

3. Check Valve - Two are provided in each mini-valve. They seal the oil in the cylinders and oil lines preventing any movement of the table.

4. Speed Adjustments - There are two speed adjustments in each mini-valve. They are needle valve type controls which restrict the volume of oil *returning* back into the reservoir, thereby controlling the speed of the table surfaces movement.

The speed controls are always located in the return oil circuit. This prevents uncontrolled movement of the piston in the slave cylinder due to one side of the piston being loaded with hydraulic pressure and the other side having no load.

Also, by using this control method, it doesn't matter what size cylinder and piston is used because the speed can be controlled by restricting the return oil. If the pump puts out more volume to a certain slave cylinder than the speed control is allowing to go back to the reservoir, the pressure relief valve provides an alternate path for the pump oil.

f. Mini-valve in neutral position -

(No fluid flow) See figure 1-12.

1. Spool Valve Centered - This closes off both oil pressure and oil return galleys.

2. Pilot Plungers Both Closed - The pilot plungers control the opening of the check valves. If they are closed, the check valves must be closed.

3. Check Valves - Both check valves are closed trapping the oil in the cylinder and oil lines.

4. Speed Adjustment - When the mini-valve is in the neutral position, the speed adjustment does not affect anything because there is not any oil flow.

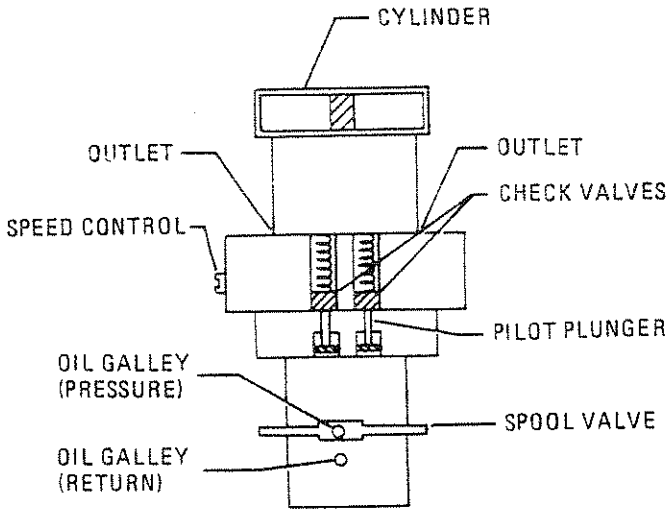


Figure 1-12. Mini-Valve In Neutral Position

g. Mini-Valve in Activated Position
(See figure 1-13.)

Slave Cylinder Piston Moves to Left
Right Mini-Valve Port is Supply Line
Left Mini-Valve Port is Return Line

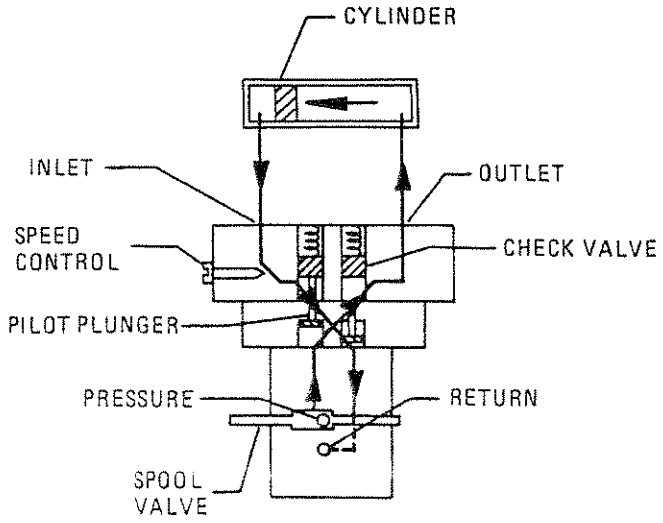


Figure 1-13. Mini-Valve Right Port Activated

1. Spool Valve - Pushed to the left by electric solenoid or mechanical linkage. This opens the internal oil pressure galley allowing the fluid to go through the check valve and on to the cylinder. Also, at the same time, the spool valve opens the oil return line providing an oil path through the internal oil galley back to the reservoir.

2. Pilot Plunger Valve - Left pilot plunger valve is pushed up by the incoming oil pressure mechanically opening the check valve located above it in the return circuit. This action allows the oil from the left side of the slave cylinder to go back into the reservoir. The right pilot plunger valve is not affected in this operation mode.

3. Check Valves - Both check valves are opened in this operation mode. The right check valve is pushed open by the oil pressure created by the pump. The oil then continues to go through the lines and pushes the slave cylinder piston to the left. At the same time, the left check valve is held open mechanically by the pilot plunger providing a return path for the oil through the mini-valve back into the reservoir.

4. Speed Adjustment - The right speed control (output side) does not have any effect in this operation mode because the oil is routed around the speed adjustment through a by-pass valve and then to the output port. The left speed adjustment controls the speed of the table function by restricting the amount of oil going back into the reservoir.

h. Mini-Valve In Activated Position
(See figure 1-14.)

Slave Cylinder Piston Moves to Right
Left Mini-Valve Port is Supply Line
Right Mini-Valve Port is Return Line

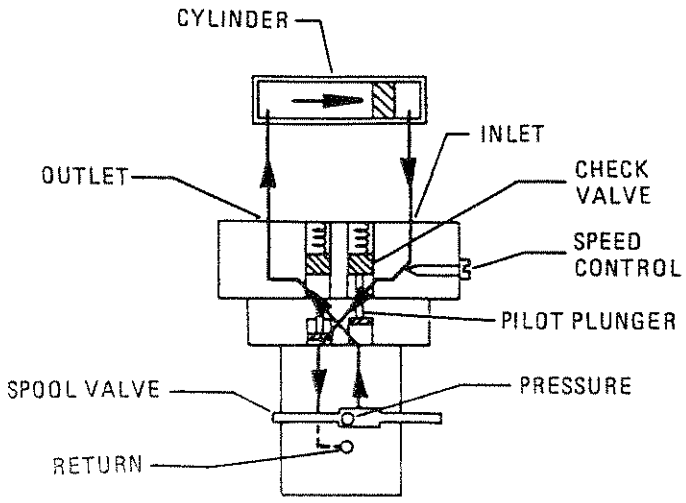


Figure 1-14. Mini-Valve Left Port Activated

1. Spool Valve - It's pushed to the right by electric solenoid or mechanical linkage. This opens the internal oil pressure galley allowing the fluid to go through the check valve and on to the cylinder. Also, at the same time the spool valve opens the oil return line providing an oil path through the internal oil galley back to the reservoir.

2. Pilot Plunger Valve - Right pilot plunger valve is pushed up by the incoming oil pressure mechanically opening the check valve located above it in the return circuit. This action allows the oil from the right side of the slave cylinder to go back into the reservoir. The left pilot plunger valve is not affected in this operation mode.

3. Check Valves - Both check valves are opened in this operation mode. The left valve is pushed open by the oil pressure created by the pump. The oil then continues to go through the lines and pushes the slave cylinder piston to the right. At the same time, the right check valve is held open mechanically by the pilot plunger providing a return path for the oil through the mini-valve back to the reservoir.

4. Speed Adjustment - The left speed control (output side) does not have any effect in this operation mode because the oil is routed around the speed adjustment through a by-pass valve and then to the output port. The right speed adjustment controls the speed of the table function by restricting the amount of oil going back to the reservoir.

i. Hydraulic Cylinders - All Models

There are four (4) types of hydraulic cylinders used in the table that activate the control functions. With the exception of the elevation cylinder and side move base brake cylinders, all operate basically the same way. The control functions are listed below: (See figure 1-15.).

Back Section
Foot/Leg Section - (Manually controlled on models 1200, 5000 and 6000)
Reverse Trendelenburg/Trendelenburg
Lateral Tilt
Elevation
Brake Cylinders

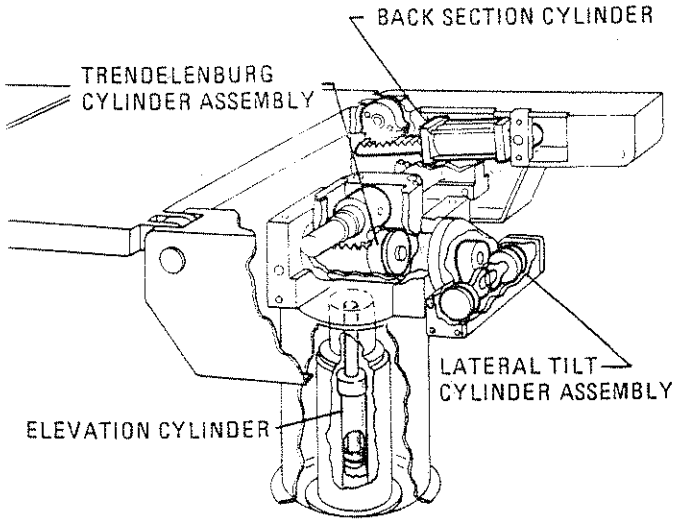


Figure 1-15. Cylinder Placement

1. Back and Foot/Leg Cylinders - The double action cylinder is closed at one end and has a movable piston with hydraulic fluid on both sides. Connected to this piston is a ram or shaft that exits out of the other end of the cylinder. Through the use of either a gear, or clevis and pin arrangement, this ram is connected to a movable table surface.

The movable surface can be moved one way or the other by pumping hydraulic fluid into either side of the piston. Obviously, if oil is pumped into one side of the cylinder, a return path must be provided for the oil on the other side. See figure 1-16.

Both the back section and the foot/leg cylinders are identical in operation. The foot/leg ram has clevis and pin. It is also smaller in diameter to increase the speed of this function. The back section ram has gear type teeth to mesh with the back section gear.

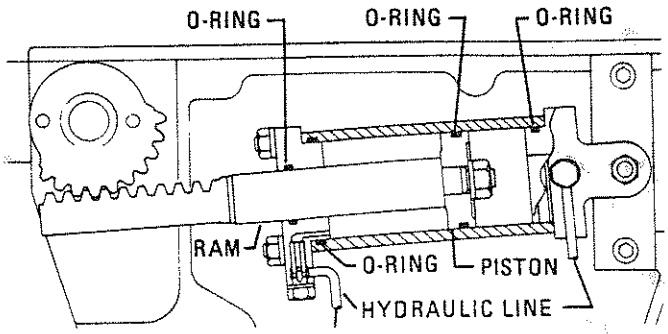


Figure 1-16. Back Section Hydraulic Cylinder

2. Trendelenburg Cylinder Assembly - This cylinder piston arrangement has rack teeth cut into the top of each piston. These teeth mesh with a pinion gear that is connected directly to the table side frames. The pinion gear shaft and table side frames are supported with needle bearings at either side.

When hydraulic fluid is pumped into one side of the cylinder, the pistons are pushed to one side, moving the pinion gear and table side frames with them. Oil pressure can be applied to either side of the piston, making the table tilt end for end. See figure 1-17.

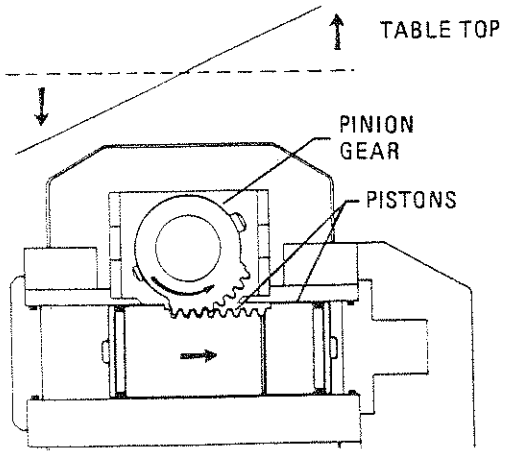


Figure 1-17. Trendelenburg Cylinder Assembly

In order to remove any looseness or play in the table top, the trendelenburg pistons are made in two pieces as shown in figure 1-18. This arrangement eliminates any gear lash between the piston teeth and the table pinion gear due to oil pressure always being present on both sides of the pistons.

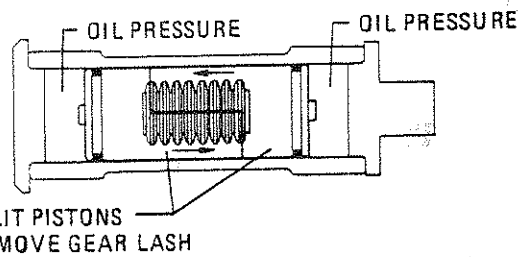


Figure 1-18. Trendelenburg Cylinder Pistons

3. Lateral Tilt Cylinder Assembly - The lateral tilt cylinder assembly consists of two cylinders and two pistons complete with connecting rods. The connecting rods attach to the lateral tilt lever which is fixed directly to the table side frames. The lever and the table side frames are supported on either end with roller bearings.

When hydraulic fluid is pumped into one cylinder, the piston and connecting rod pushes the lateral tilt lever which tilts the table side frames to one side. To tilt the table in the opposite direction fluid is pumped into the opposite cylinder. See figure 1-19.

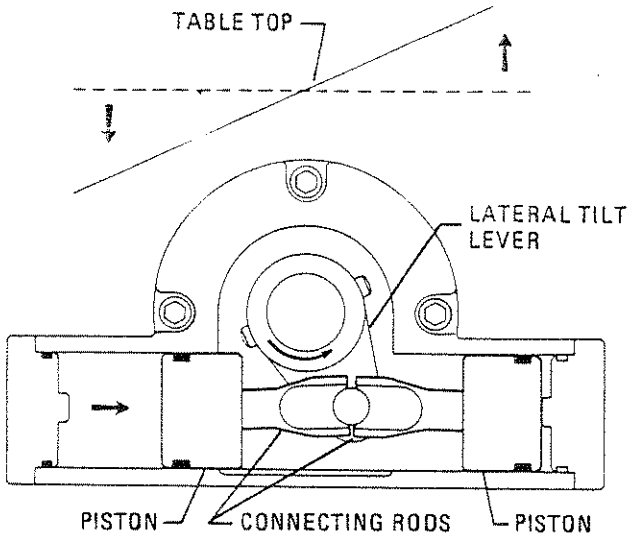


Figure 1-19. Lateral Tilt Cylinder Assembly

4. Elevation Cylinder (Single Action) - This cylinder is different than the others because it does not have hydraulic fluid on both sides of the piston. It depends on the weight of the table top assembly to lower it.

The cylinder is set in the center of the elevation main column. The piston and piston rod are elevated by the driven force of the oil pressure. When lowering, the oil that is accumulated in the cylinder is returned to the oil reservoir through the mini-valve due to the table top weight.

A three-piece slider support assembly is used to support the weight of the upper table section. The stainless steel decorative shrouds cover the flexible hydraulic hoses and slider. See figure 1-20.

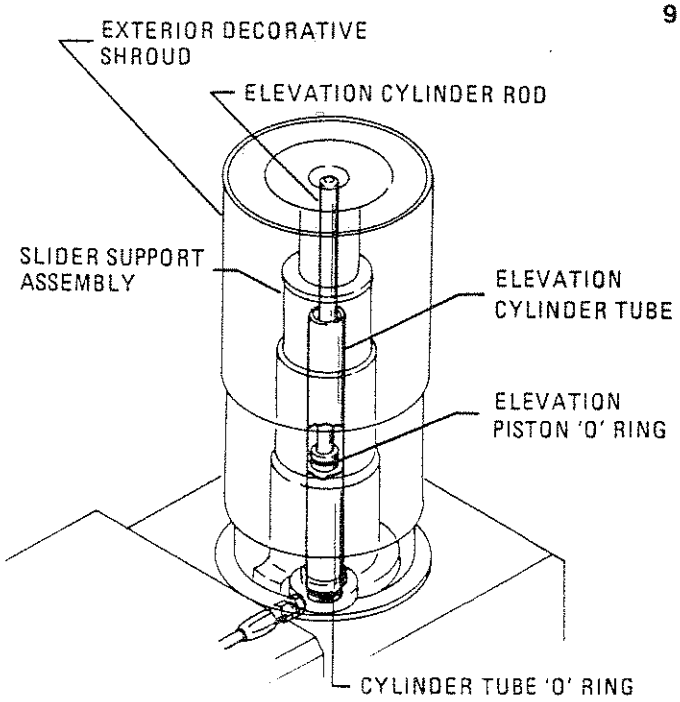


Figure 1-20. Elevation Assembly

5. Brake Cylinders (Side Move Base) - The brake cylinders on the optional side move base are single action cylinders similar to the elevation cylinder. The movable piston's ram is connected to a brake pad. Oil pumped into the top of the cylinder pushes the piston down and raises the table base off its casters. An internal return spring on the bottom of the piston pushes the piston up to return the oil through the brake release valve to the reservoir. Vent lines connect the bottom of the cylinder to the reservoir. See figure 1-21.

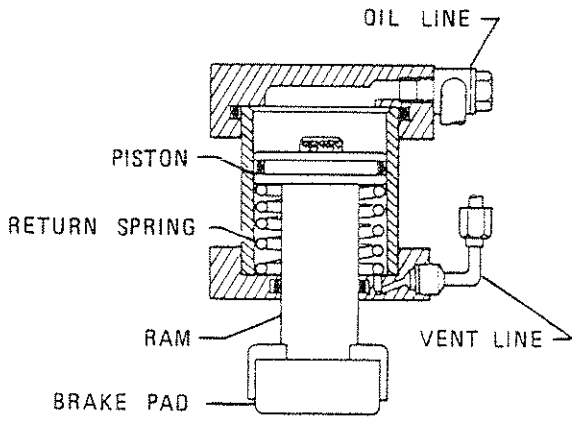


Figure 1-21. 1200/5000 Series Side Move Base Cylinder

(Models 6000 and 6001)

The brake cylinders on the 6000 and 6001 models are double action cylinders similar to the back and foot/leg cylinders. The movable piston's ram is connected to a brake pad. Oil pumped into the top of the cylinder pushes the piston down and raises the table base off its casters. Oil pumped into the bottom of the cylinder pushes the piston up, lowering the base back onto its casters. See figure 1-22.

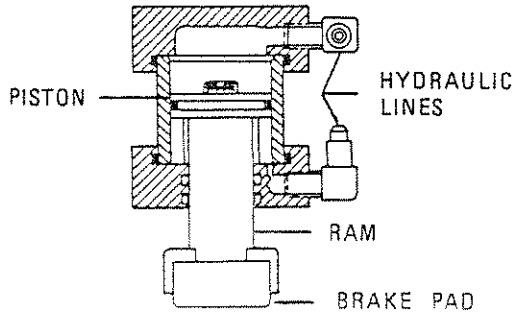


Figure 1-22. 6000 and 6001 Brake Cylinders

j. Dropping Valve Assembly
(Models 5000 and 5001)

The elevation cylinder is designed for only pushing up. The weight of the upper table is what makes the supporting oil discharge into the reservoir and consequently the top to lower. However, in order for the return check valve to be opened in the mini-valve, oil pressure must be created. The dropping valve creates this oil pressure in the system, enabling the pilot plunger to open the return check valve. The open check valve provides a path for the oil in the elevation cylinder to go back into the reservoir.

There are two separate oil circuits involved when the table top is lowered. See figure 1-23.

1. An oil circuit is provided through the dropping valve assembly back into the reservoir creating oil pressure which in turn makes the pilot plunger move up opening the return check valve.

2. The second oil path is the oil returning from the elevation cylinder through the opened check valve and back into the reservoir.

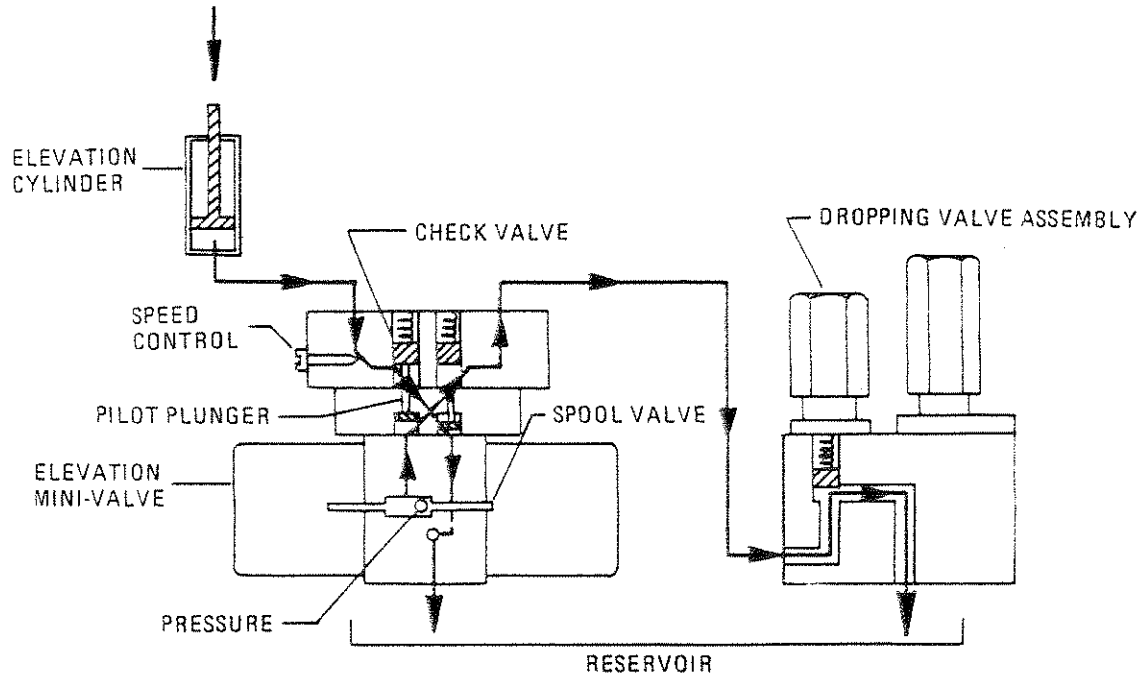


Figure 1-23. 5000 Series Elevation Cylinder Return Circuit

k. Dropping Valve Assembly
(Models 1200 and 1201)

The dropping valve for the manual table allows the oil trapped in the elevation cylinder to return back into the reservoir. It is a one-way valve that is mechanically controlled by the elevation foot pedal. When the foot pedal is placed in the down position, mechanical linkage opens the dropping valve allowing the oil to return into the reservoir and the table top to descend.

The mini-valve used in the elevation circuit contains only one check valve (all other mini-valves use two check valves). The check valve is used only in elevating the table top due to the intermittent pump pressure and is not involved in lowering the table. When the table top is being lowered, the mini-valve components are not involved with the control function, but only provide a common connection between the elevation cylinder and dropping valve. See figure 1-24.

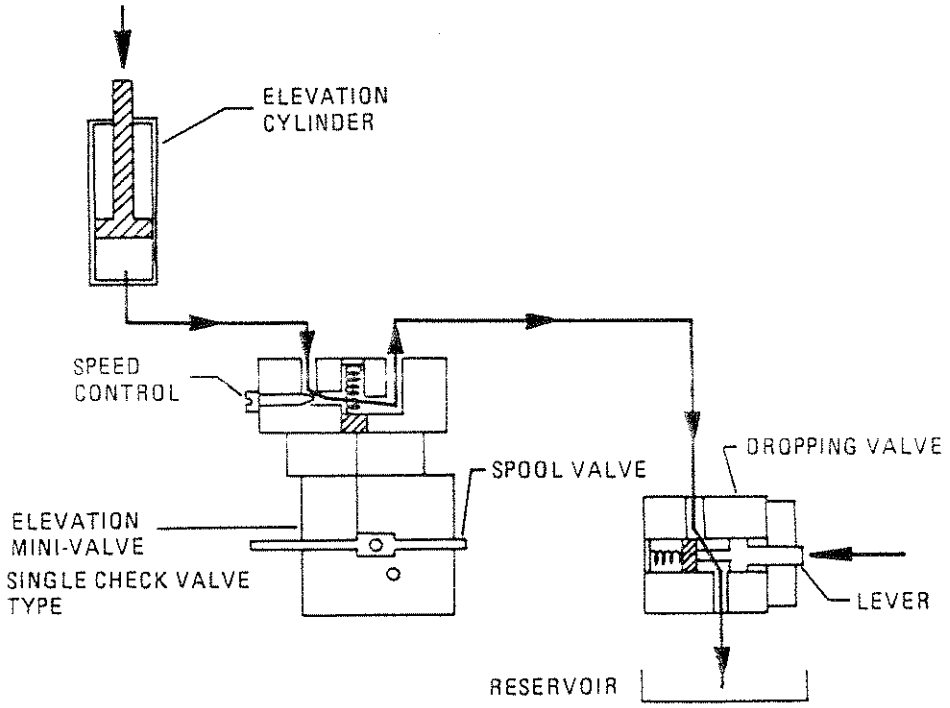


Figure 1-24. 1200 Series Elevation Cylinder Return Circuit

l. Elevation Cylinder Return Circuit
(Models 6000 and 6001)

The 6000 and 6001 tables do not have a dropping valve. A three-way mini-valve controls both the elevation and return circuits. The elevation circuit operation within the mini-valve is identical to the operation of the four-way valves previously described (inlet pressure opens the check valve allowing the oil to enter the cylinder). In the return position, inlet pressure pushes the pilot plunger up and opens the return check valve. See figure 1-25. The open check valve allows a path for the oil in the elevation cylinder to return to the reservoir. There is, however, no continuing pressure oil galley from the pilot plunger. When the pilot plunger valve is opened, the continuing pump pressure opens the pressure relief valve which provides a return oil path to the reservoir.

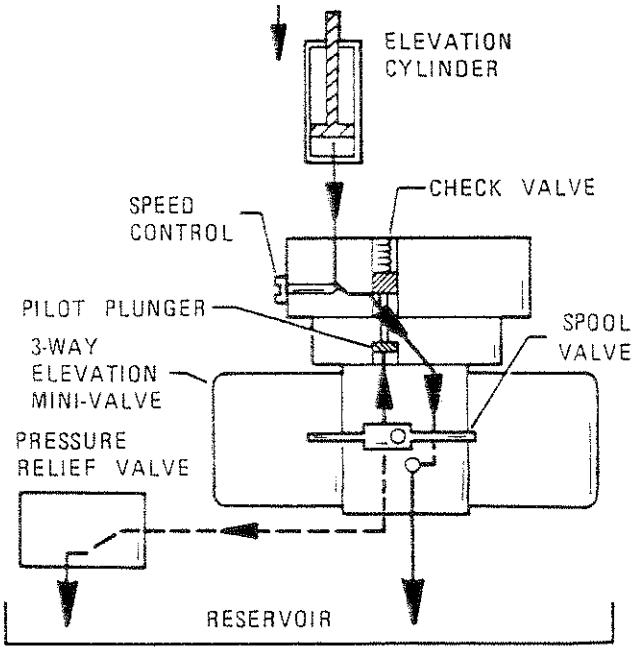


Figure 1-25. 6000 Series Elevation Cylinder Return Circuit

1-3. Hydraulic Adjustments

a. Fluid Level

The fluid level should be approximately 1/2" below the filler hole or gasket surface. If additional fluid is needed, remove the filler vent cap with a phillips screwdriver and add fluid through this opening using a funnel. See figure 1-26.

NOTE

The elevation cylinder should be completely down and all the other control functions in their neutral position when checking oil level.

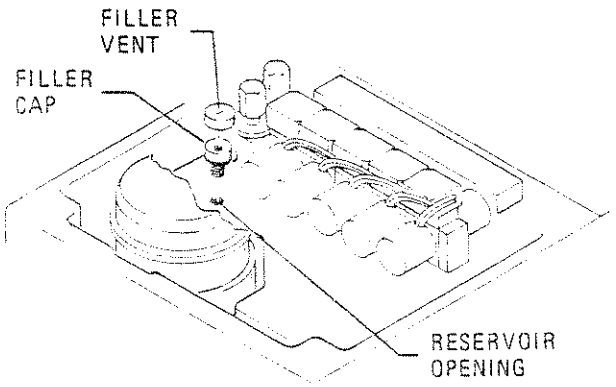


Figure 1-26.

NOTE

Model 5001 shown. Other models are similar.

The type of oil that should be used is Shell Tellus #45 or equivalent. This is a very high quality hydraulic oil. The table requires approximately one quart for the manual models and two quarts for the electric models.

b. Bleeding The Hydraulic System

To purge the air from the hydraulic system, operate each function back and forth at least two or three times.

NOTE

Whenever a hydraulic line or component is replaced, bleed the air out of the lines using the pump pressure before making the final connection.

c. Pressure Relief Valve
(Models 5000, 5001, 6000 and 6001)

The pressure relief valve is adjusted by turning the adjustment nut until the desired pressure is reached.

NOTE

The pressure relief valve is adjusted by turning the brass hex cap on the plunger end of the pump (refer to figure 1-10).

To adjust:

1. Remove the blind cap and attach a hydraulic pressure gauge to the main oil galley using 6mm plumbing bolt. See figure 1-27.

NOTE

Model 5001 shown. Other models are similar.

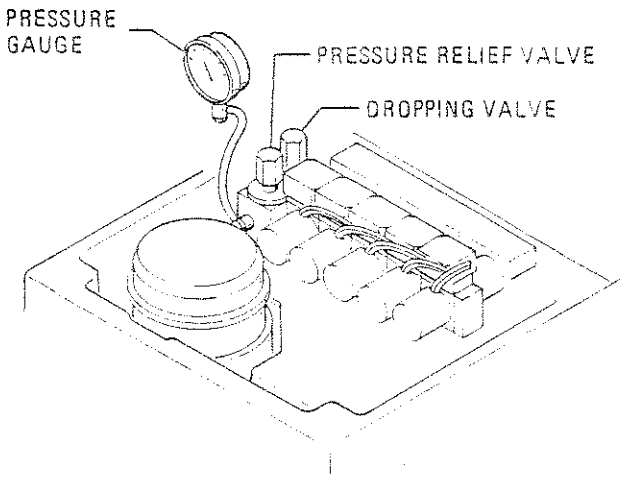


Figure 1-27.

2. Raise the table top unit until it reaches the end of its stroke and stalls. Observe reading on pressure gauge. Turn adjustment nut (clockwise to increase oil pressure, counterclockwise to decrease) until desired reading is obtained. Pressure should be 80 KG/cm² - 1138 PSI.

d. Dropping Valve
(Models 5000 and 5001)

The dropping valve is adjusted by turning the adjustment nut until the desired pressure is reached. To adjust:

1. Attach a hydraulic pressure gauge to the main oil galley using 6mm plumbing bolt. See figure 1-27.

2. As table top is being lowered turn adjustment nut (clockwise to increase, counterclockwise to decrease) until desired reading is obtained. Pressure should be 50KG/cm²-711PSI.

e. Speed Adjustments - All Models

The speed adjustments control the volume of oil returning back to the reservoir thereby controlling the speed of each control function.

Each mini-valve, with the exception of the elevation mini-valve used in the 1200 and 6000 series tables, has two speed adjustments located in the ends of each valve body.

One speed adjustment controls one direction of a particular function and the opposite speed adjustment controls the other direction. They are adjustable by using a small straight blade screwdriver and turning the adjustment screw clockwise to decrease the speed and counterclockwise to increase the speed. Refer to figures 1-28., 1-29. and 1-30.

NOTE

The maximum control speed is reached when the head of the adjustment screw extends approximately 1/16" beyond the valve body.

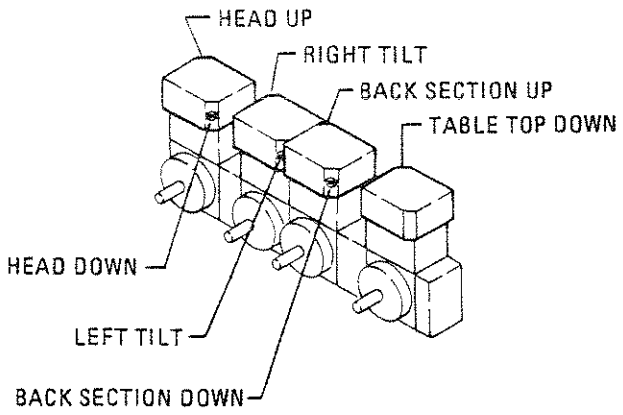


Figure 1-28. Model 1200

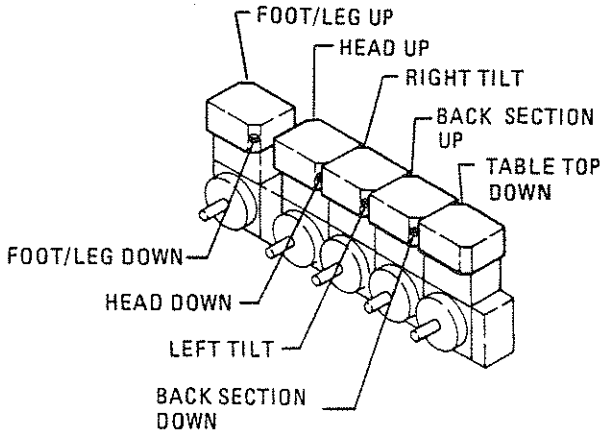


Figure 1-29. Model 1201

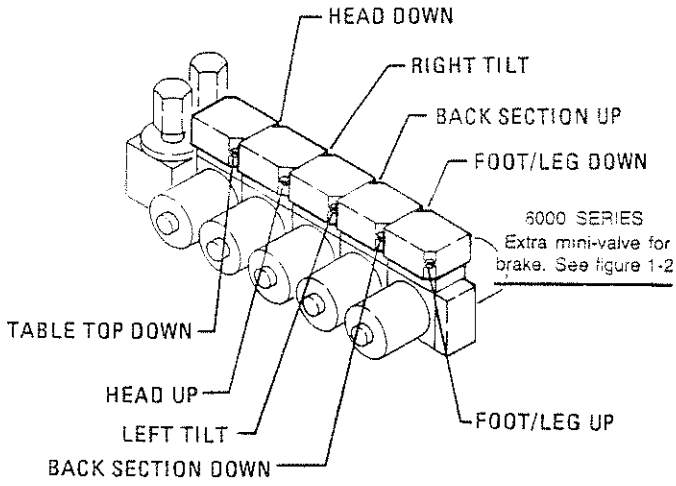


Figure 1-30. Models 5000 and 5001 (6000 and 6001 similar)

Any control function should move in either direction at the same rate. If the rate of a certain function is too slow, open the speed control slightly and recheck.
On the electric tables use the second hand on a watch and time that particular function. Match that time in the opposite direction by opening or closing the speed control. On a manual table, count the number of pump strokes.

Keep in mind that the speed controls are quite sensitive and they do not have any affect after they extend approximately 1/16" beyond the valve body. You will find that most of the control function rates are at almost maximum from the factory.

A pressure gauge can be used to set the speed of each control function.

NOTE

This is only practical on the electric tables.

To adjust:

1. Attach the pressure gauge onto the main oil galley pictured in figure 1-27.

2. The gauge should read the following values when operating the various control functions in either direction. Turn the speed controls until desired values are obtained.

Back Section	50KG/CM²-711PSI
Lateral Tilt	50KG/CM²-711PSI
Trendelenburg	60KG/CM²-853PSI
Foot/Leg Section	35KG/CM²-498PSI

Elevation - There is not a speed adjustment for raising the table. The speed control will only affect the rate of descent and it should equal the rate of elevation.

NOTE

These pressure values should be used as a guideline. If the speed of a control function moves faster in one direction than the other direction, adjust the speed control until they are equal. You may find that the pressure gauge may record a higher reading in one direction. This is normal.

f. Spool Valve Adjustment
(Models 1200 and 1201)

1. If a mini-valve is removed for any reason the spool valve adjustment should be checked.

2. With the control pedal in the neutral position, the back side of the spool valve should extend past the mini-valve body 3mm ± .2. See figure 1-31.

3. If an adjustment is necessary, loosen the jam nut and use a needle nose pliers to turn the threaded spool valve until the desired dimension is obtained.

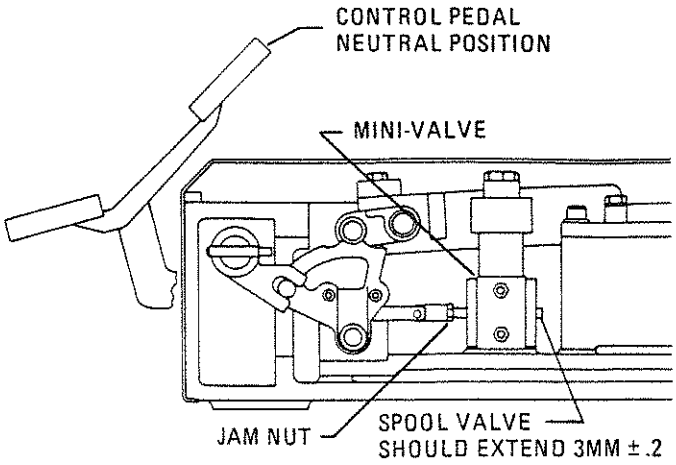


Figure 1-31.

g. Pedal Throw Adjustment
(Models 1200 and 1201)

Each pedal has two stop adjustment bolts that limit the pedal travel. If the pedal travel is not adjusted correctly, the pedal will not stay in the desired control position, or as you try to position one pedal, another pedal will pop out of position.

If an adjustment is needed, proceed as follows:

1. Push either pedal to its full forward position until the stop is felt.

2. Observe the location of where the neutral roller rests on the neutral plate detent. The roller should rest in the middle of the detent.

3. Adjust the pedal forward stop bolt if necessary so that the roller rests in the middle of the detent. It should not go more than 1/16" past the middle. See figure 1-32.

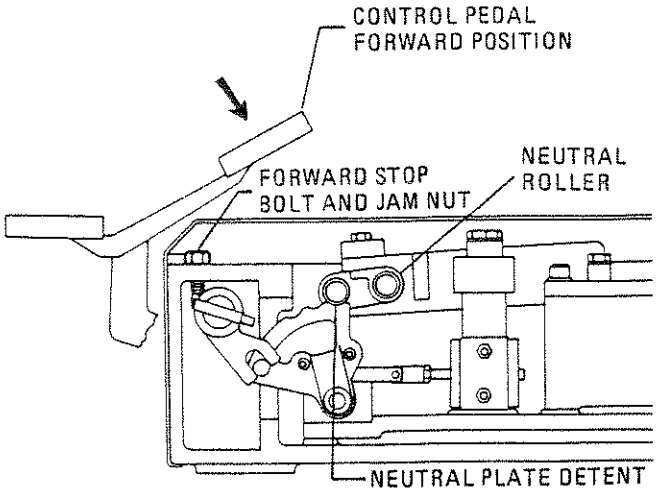


Figure 1-32.

4. Push the pedal to its full rear position until the stop is felt.

5. Observe the location of where the neutral roller rests on the neutral plate detent. The roller should rest in the middle of the detent.

6. Adjust the pedal rear stop bolt, if necessary, so that the roller rests in the middle of the detent. It should not go more than 1/16" past the middle. See figure 1-33.

7. Check each pedal and adjust if necessary.

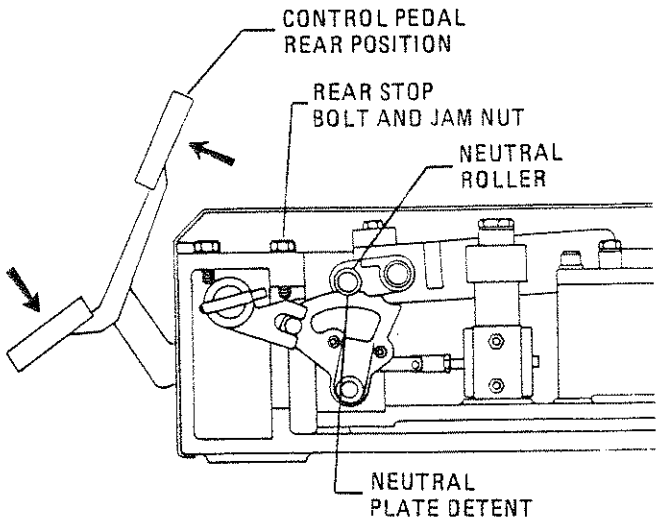


Figure 1-33.

NOTE

This adjustment will affect the adjustment of the other pedals. If you tighten the adjustment screw too much, it will cause all of the remaining control pedals to become loose (too much free play).

2. It may be necessary to adjust each roller several times in order to get all of the pedals adjusted correctly. See figure 1-34.

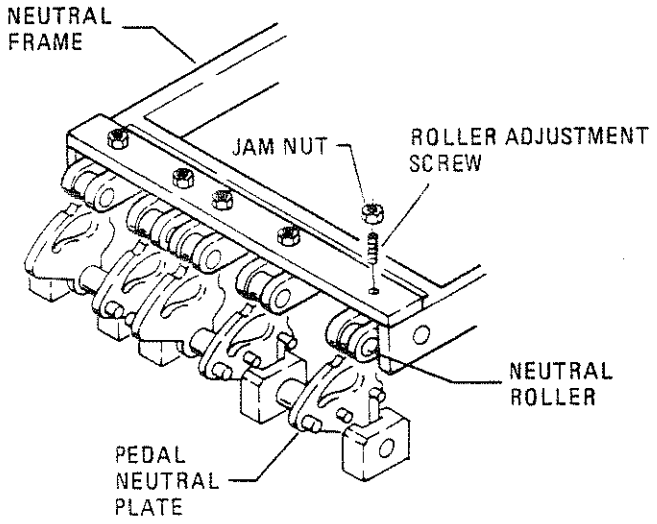


Figure 1-34.

h. Neutral Roller Adjustment
(Models 1200 and 1201)

Each pedal neutral plate is held in position by an adjustable neutral roller. There are four or five neutral rollers (depending upon the model) mounted on a spring loaded frame which provides the pressure to center the pedals.

An adjustment is needed if any of the pedals have more than 1/8" free play.

To adjust proceed as follows:

1. Check the free play in each pedal while in the neutral position. If you can detect more than 1/8" free play in any of the pedals, loosen the jam nut and tighten the roller adjustment screw until the free play is removed.

i. Dropping Valve Adjustment
(Models 1200 and 1201)

The dropping valve provides the return path back to the reservoir for the hydraulic oil that is in the elevation cylinder. It is activated by the foot control lever.

An adjustment may be required if the table top will not go down when the foot control lever is put into the down function.

To adjust:

1. Put the foot control lever in the down position.

2. The neutral plate, or its adjusting bolt, should push in on the dropping valve button in such a manner as to release the hydraulic fluid into the reservoir.

3. Adjust either the valve (by sliding it back and forth) or turn the adjustment bolt (depending on model) so that the valve button is depressed when the foot control lever is in the down position. See figure 1-35. and 1-36.

NOTE

If this adjustment is too tight, the foot pedal will not stay in the down position.

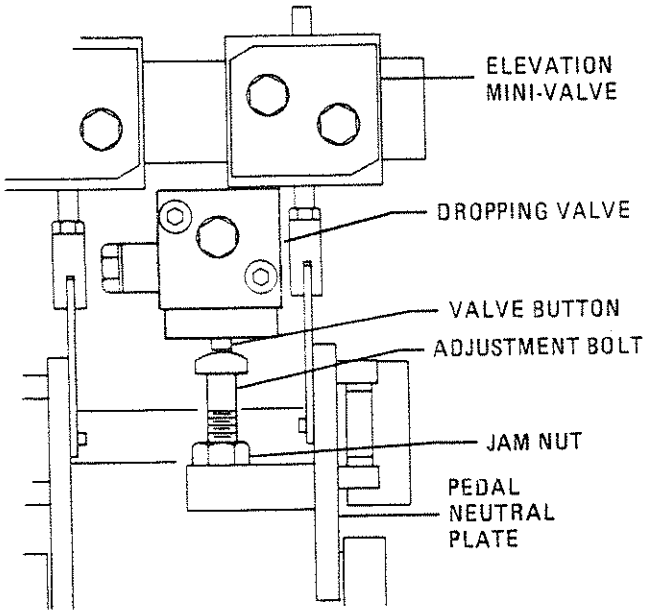


Figure 1-35. Model 1200

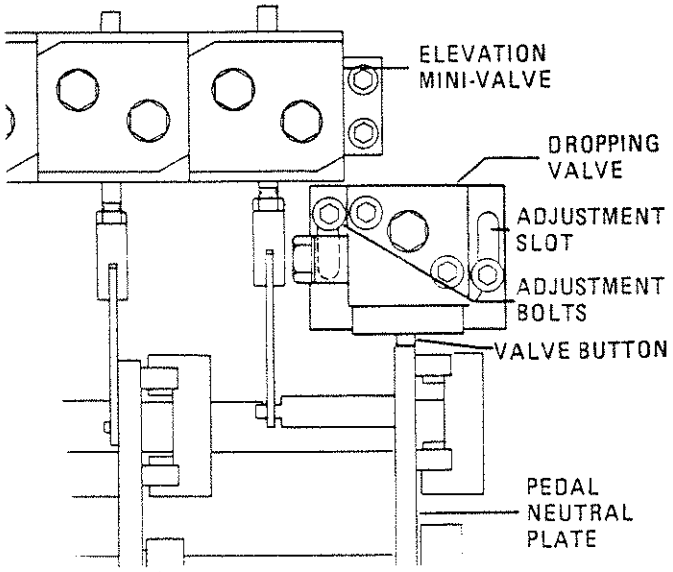


Figure 1-36. Model 1201

SECTION II TABLE ADJUSTMENTS

2-1. Gear Mesh Adjustment Back Section - All Models

The gear mesh is adjusted by the use of an eccentric cam. This cam moves the gear teeth closer together to eliminate gear lash. This adjustment arrangement compensates for any wear that might occur over the years between the two gears.

To adjust:

Loosen the cam locking nut and allen set screw. Use a spanner wrench to rotate the eccentric cam until all of the play between the gears is removed. Use firm pressure on the spanner wrench. See figure 2-1. Tighten locking nut and allen set screw.

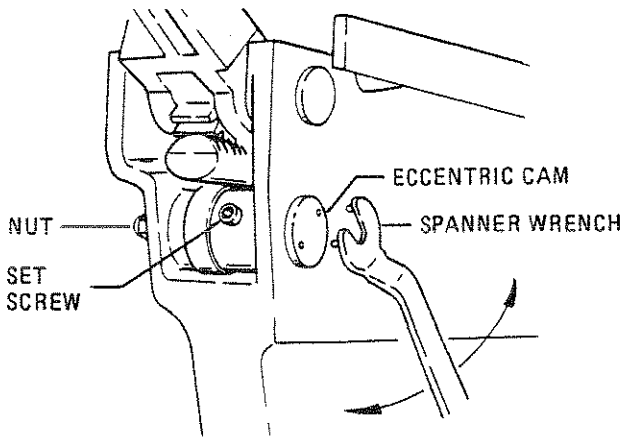


Figure 2-1.

2-2. Hydraulic Cylinder Adjustment

Back Section & Solid Leg Section

The hydraulic cylinder rams that control both the back section and the solid-leg section must move together so that these sections are not twisted when operated. This is accomplished by the use of eccentric cams that move the cylinder bodies fore and aft to adjust their effective stroke.

NOTE

Adjust gear mesh before adjusting eccentric cylinder cams for the back section.

a. Back Section - All Models

Position the back section all the way up until it stalls. Both sides of the back section should stop moving at the same time and should not show any signs of twisting.

Any twisting or flexing of the back section as it approaches the stalled position indicates that one of the cylinders is not reaching its fully extended position at the same time as the other. This condition would require an adjustment.

To adjust:

Loosen the cam locking nuts located inside the table side frames. Use a spanner wrench to turn the cylinder eccentric cams as required to shift either cylinder fore and aft slightly so that the back section does not twist or flex when it is stalled in the up position. See figure 2-2.

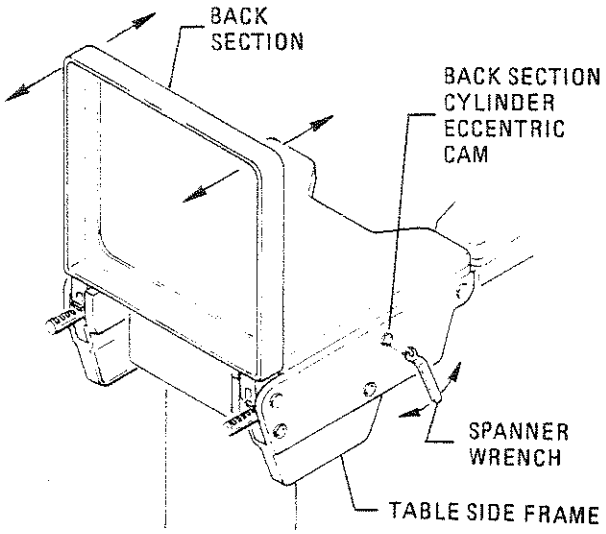


Figure 2-2.

b. Solid-Leg Section
(Models 1201, 5001 and 6001)

Position the solid-leg section all the way up until it is horizontal. Both sides of the leg section should stop moving at the same time and should not show any signs of twisting.

Any twisting or flexing of the solid-leg section as it approaches the stalled position indicates that one of the cylinders is not reaching its fully extended position at the same time as the other. This condition would require an adjustment.

To adjust:

Loosen the cam locking nuts located inside the table side frames. Use a spanner wrench to turn the cylinder eccentric cams as required to shift either cylinder fore and aft slightly so that the leg section does not twist or flex when it is stalled in the up position. Tighten locking nut. See figure 2-3.

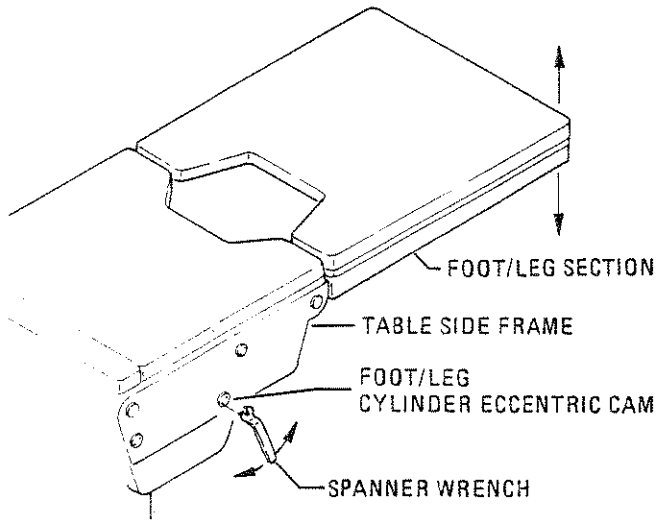


Figure 2-3.

c. Split-Leg Section Horizontal Adjustment
(Models 1200, 5000 and 6000)

Both leg sections should be level or even with each other when the table top is in the horizontal position. If they are not, an adjustment is necessary on the split leg section that is not level.

There are two methods for adjusting the individual split-leg sections depending on when it was manufactured.

The *earlier* models can be identified by the large allen bolt adjacent to the pivot axis. See figure 2-4. On *later* models this bolt has been omitted.

To adjust **EARLY MODELS:**

1. Loosen the three small allen head bolts and the large allen head bolt that are visible from the outside of the table.

2. Loosen the allen head bolt located on the inside of the table frame.

3. Remove the seat section of the table top.

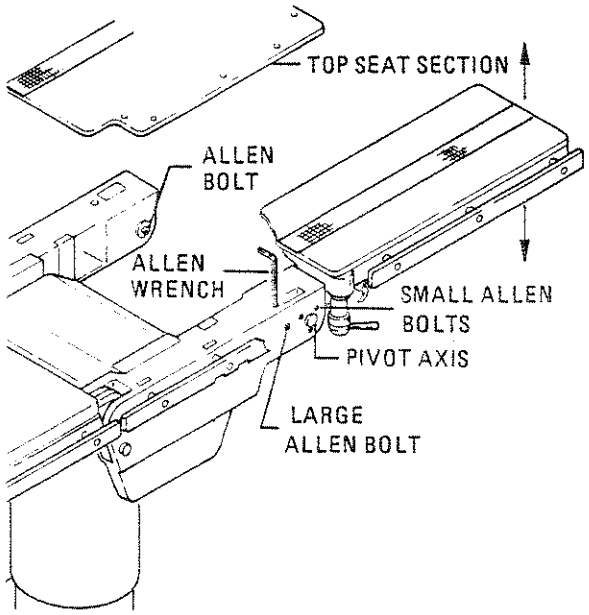


Figure 2-4. Early Model

4. Using an allen wrench, loosen or tighten the adjustment screw as necessary until the leg sections are even with each other and level with the table top.

5. Reinstall seat section and tighten all the allen head cap screws.

To adjust **LATER MODELS:**

1. Loosen the three small allen head bolts that are visible from the outside of the table.

2. Loosen the allen head bolt located on the inside of the table frame.

3. After loosening the jam nut turn the adjusting bolt located under the table frame as required until the leg sections are even with each other and level with the table top. Refer to figure 2-5.

4. Tighten all the allen head cap screws and the adjusting bolt.

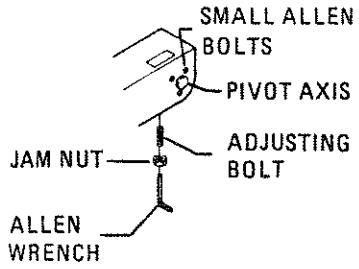


Figure 2-5. Later Model

d. Split-Leg Lateral Adjustment
(Models 1200, 5000 and 6000)

The locking handle should be parallel with the side of the table, with the dots aligned, when tightened. See figure 2-6.

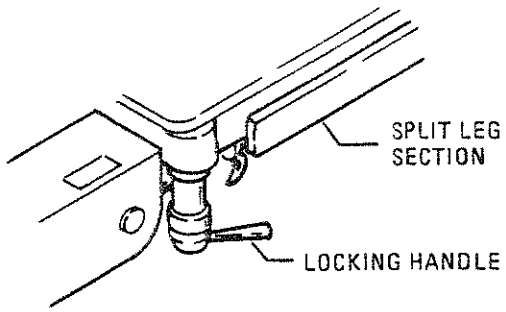


Figure 2-6. Locking Handle Correctly Positioned

An adjustment is necessary if the locking handle extends out the side when tightened. See figure 2-7.

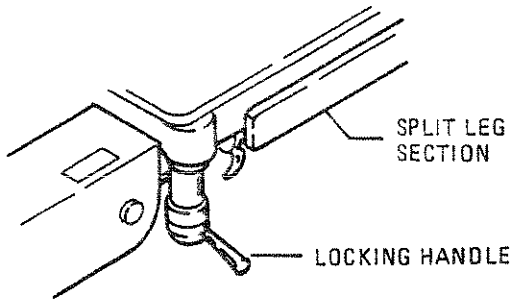


Figure 2-7. Locking Handle Incorrectly Positioned

To adjust:

1. Remove the split-leg section.

2. Loosen the jam nut from the positioning pin. (Located toward inside of table.) See figure 2-8.

3. Remove positioning pin using allen wrench.

4. Remove positioning lock handle.

5. Add shims as required (SKYTRON supplied) on top of handle so that when the handle is tightened, it is parallel with the side of the table.

NOTE

Foot-leg section must be reinstalled to check adjustment.

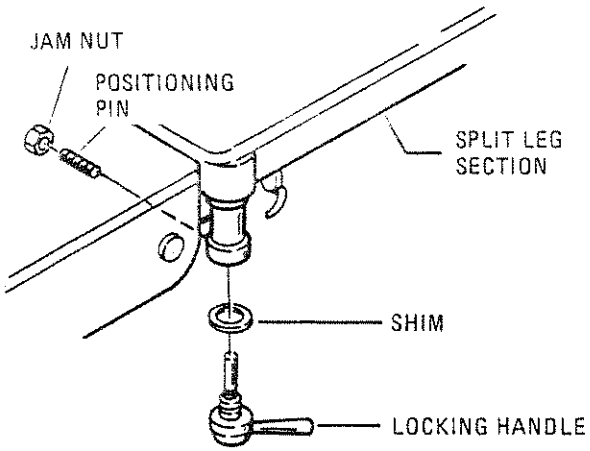


Figure 2-8.

NOTE

Newer models have a locking knob instead of a locking handle and do not require adjustment.

e. Optional Built-in Kidney Lift
(Models 6000 and 6001)

The optional built-in kidney lift is a mechanical, hand-operated system. Manual rotation of the hand crank actuates a combination of shafts, gears, belts and pulleys which in turn raise the kidney lift. See figure 2-9.

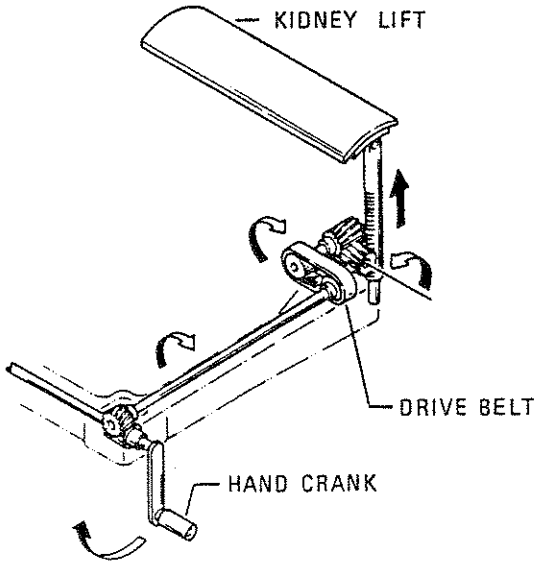


Figure 2-9. Optional Built-in Kidney Lift

f. Adjustable Brake Feet
(Models 6000 and 6001)

The brake cylinders are equipped with adjustable feet to compensate for unlevel floors. This adjustment is easy to accomplish by using a 7/32" pin punch.

1. With the table in position, activate the brake system and rotate the pin punch to adjust the foot as necessary. See figure 2-10.

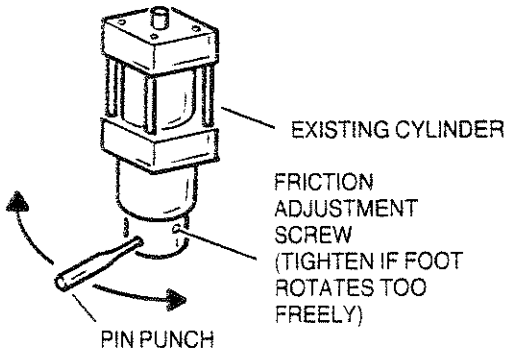


Figure 2-10. Adjustment of Brake Feet

2. Adjustment is required on two corners of the table base for optimum stability. See figure 2-11.

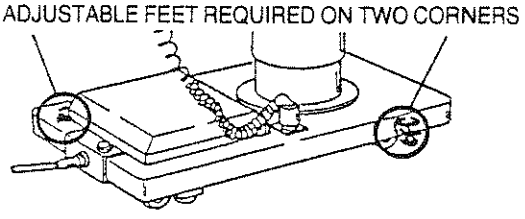


Figure 2-11. Location of Brake Feet

SECTION III HYDRAULIC TROUBLESHOOTING

3-1. Precautions

Before attempting to trouble shoot any hydraulic problem on the table, please read through the precautions and notes below.

CAUTION

When disconnecting any of the hydraulic lines, fittings, joints, hoses, etc., for the following control functions, be sure these table surfaces are in their down position or completely supported.
Elevation
Back Section
Power-Leg Section
When working on the trendelenburg or lateral tilt hydraulic circuits, be sure to support the table top.

CAUTION

Failure to follow these precautions may result in an uncontrolled oil spray and damage to the table or personal injury.

3-2. Troubleshooting Notes

When troubleshooting a table malfunction first determine the following:

1. Does the problem affect all control functions?

2. Does the problem affect only one control function?

3. If the problem affects one control function is it in both directions?

4. Is the problem intermittent?

5. Is the problem no movement of a table surface or does the table surface lose position?

Once the problem has been determined, concentrate on that particular hydraulic circuit or control function.

Listed below are the hydraulic components that are common with all hydraulic circuits. If there is a problem with any of them it could affect all control functions.

1. Motor/Pump Assembly

2. Reservoir

3. Pressure Relief Valve

4. Certain Oil Lines and Galleys

If there was a problem in the following components only one control function would normally be affected.

1. Mini-Valve

2. Dropping-Valve

3. Slave Cylinder

4. Oil Lines

NOTE

Whenever a hydraulic line or component is replaced, bleed the air out of the lines using the pump pressure before making the final connection. After all connections are tight, cycle the control function back and forth two or three times to purge the remaining air from the system.

IMPORTANT

When installing "O" rings use hydraulic oil to thoroughly lubricate the "O" rings and cylinder. Keep everything clean.

Each complete oil circuit is shown on the following pages. When troubleshooting a particular function, refer to the oil circuit diagram and the list of possible problems.

3-3. ELEVATION DIAGNOSIS CHART
ELECTRIC MODELS

Problem	Reason
Table will not elevate properly	Pressure Relief Valve Not Set Properly Low on Oil Spool Valve Not Centered Defective Pump Defective Mini-Valve Defective Solenoid or Wiring Defective Relay Box or Pendant Control
Table will not descend properly	Dropping Valve Incorrectly Adjusted (5000-5001 only) Incorrect Speed Adjustment Bad Check Valve Spool Valve Not Centered Galled Slider Assembly Defective Solenoid or Wiring Defective Relay Box or Pendant Control
Table loses elevation	Bad Check Valve Leaking Mini-Valve Loose Fittings, Joints, Hoses Leaking "O" Ring Inside Cylinder

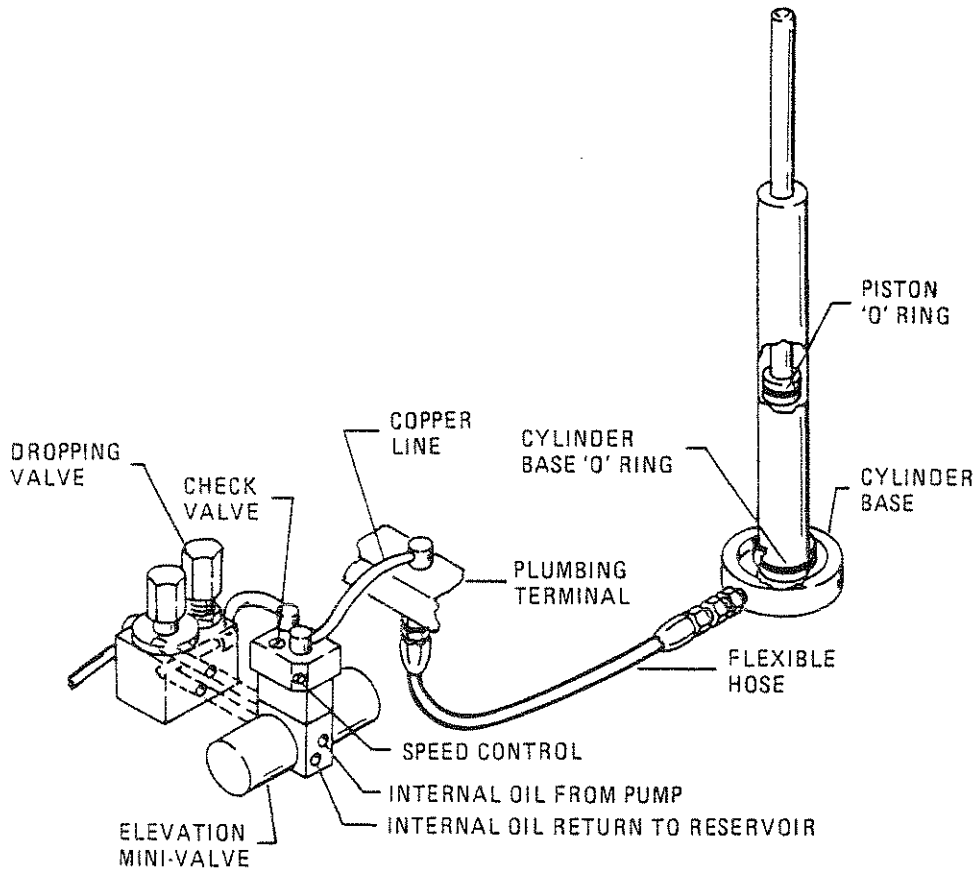


Figure 3-1. Elevation Circuit - Electric Models
Model 5001 shown.

3-4. ELEVATION DIAGNOSIS CHART
MANUAL MODELS

Problem	Reason
Table will not elevate properly	Low on Oil Spool Valve Not Adjusted Properly Incorrect Pedal Linkage Adjustment Defective Pump/Pressure Relief Valve Defective Mini-Valve
Table will not descend properly	Dropping Valve Incorrectly Adjusted or Defective Incorrect Speed Adjustment Spool Valve Not Adjusted Correctly Galled Slider Assembly
Table loses elevation	Leaking Mini-Valve Loose Fittings, Joints, Hoses Leaking "O" Ring Inside Cylinder Leak in Dropping Valve

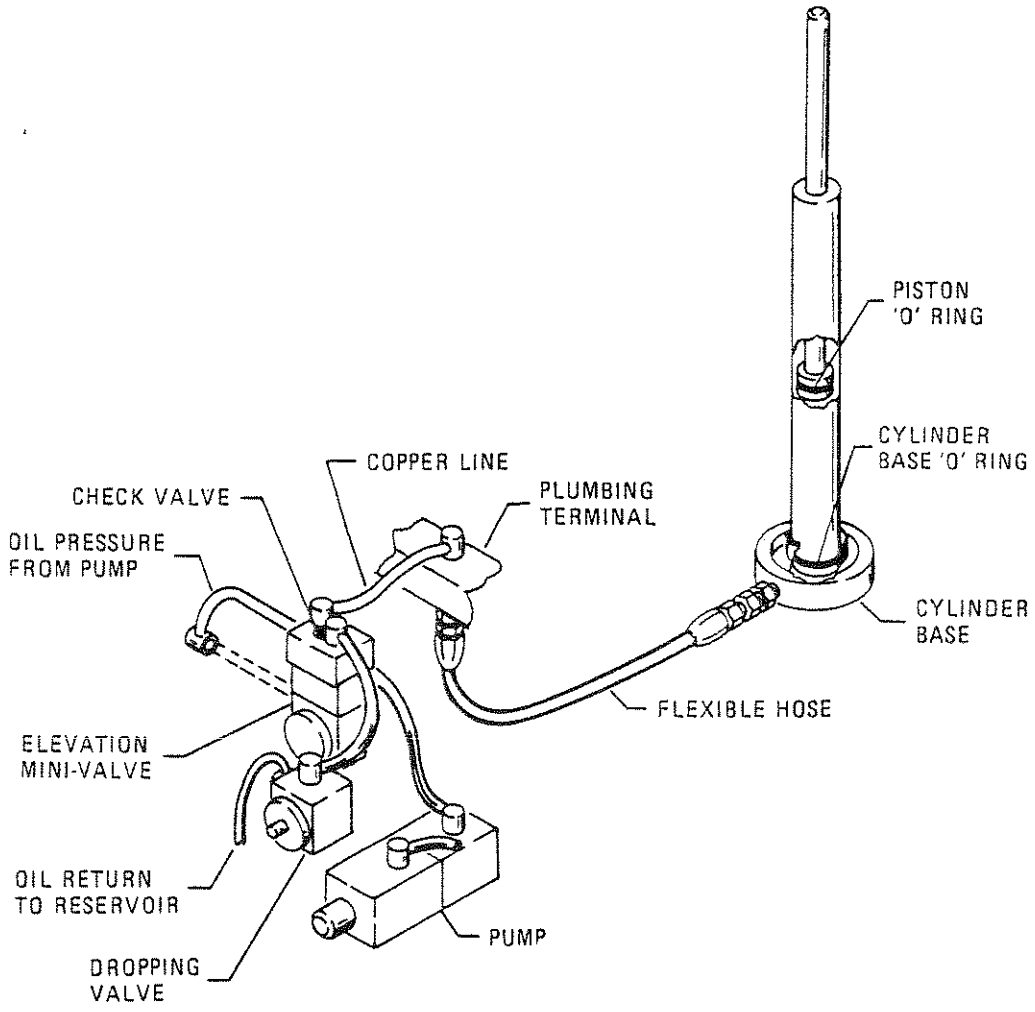


Figure 3-2. Elevation Circuit - Manual Models

3-5. TRENDELENBURG DIAGNOSIS CHART

Problem	Reason
Trendelenburg function moves improperly	Incorrect Speed Adjustment Spool Valve Not Centered or Adjusted Properly Bad Check Valves Low on Oil Pinched Hose Defective Mini-Valve Pressure Relief Valve Not Set Properly (Electric models only) Bad Solenoid or Wiring (Electric models only) Defective Relay Box or Pendant Control (Electric models only)
Trendelenburg function chatters or loses position	Defective or Dirty Check Valve Oil Leakage in Circuit Air Inside Cylinder Pinched Hose Low on Oil

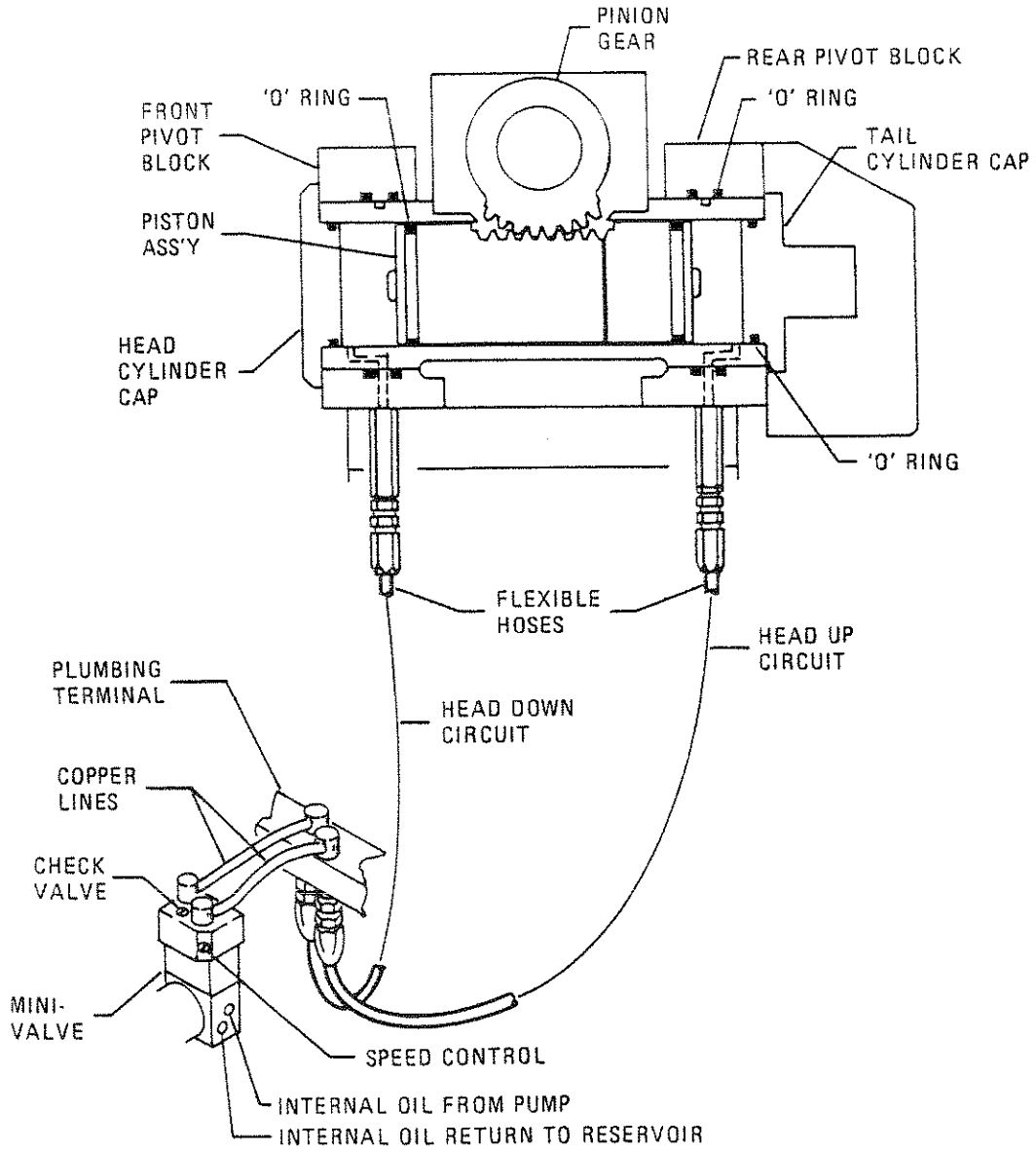
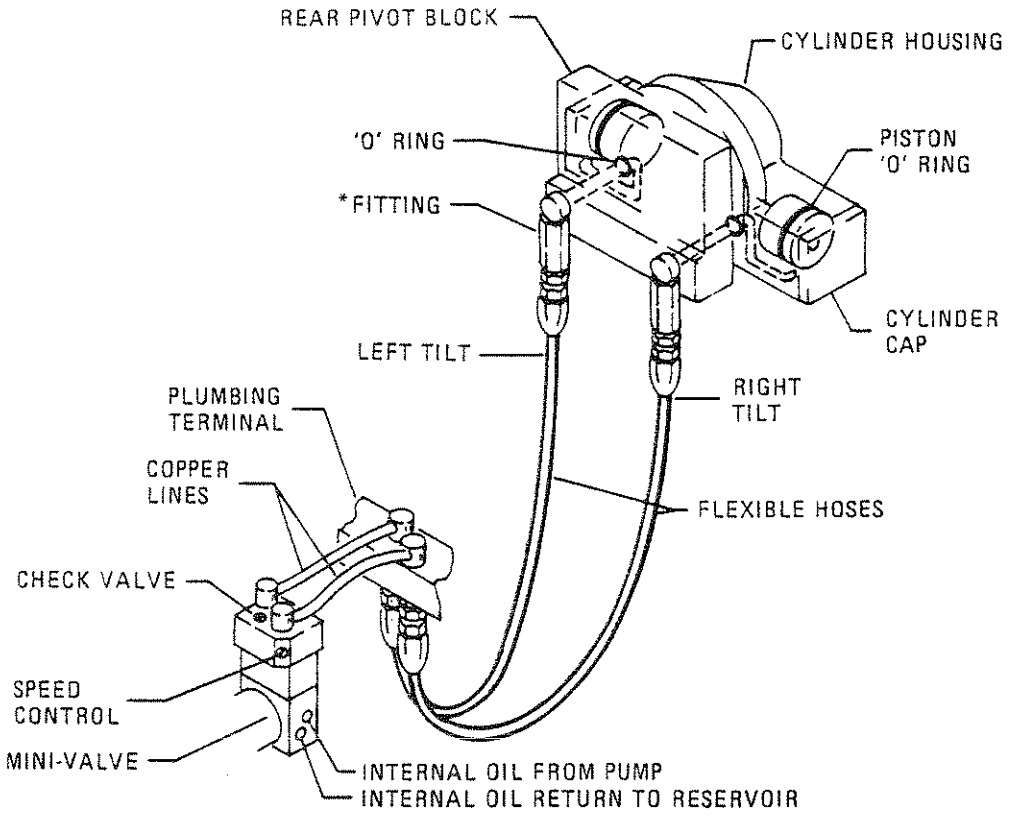


Figure 3-3. Trendelenburg Circuit - All Models

3-6. LATERAL TILT DIAGNOSIS CHART

Problem	Reason
Lateral tilt function moves improperly	Incorrect Speed Adjustment Spool Valve Not Centered or Adjusted Properly Bad Check Valves Low on Oil Pinched Hose Defective Mini-Valve Pressure Relief Valve Not Set Properly (Electric models only) Bad Solenoid (Electric models only) Defective Relay Box or Pendant Control (Electric models only)
Lateral tilt function chatters or loses position	Defective or Dirty Check Valves Oil Leakage in Circuit Air Inside Cylinder Pinched Hose Low on Oil



*Fittings may attach to bottom of Rear Pivot Block.

Figure 3-4. Lateral Tilt Circuit

3-7. BACK SECTION DIAGNOSIS CHART
MODELS 1200, 1201, 5000 and 5001

Problem	Reason
Back section function moves improperly	Incorrect Speed Adjustment
	Spool Valve Not Centered or Adjusted Properly
	Bad Check Valve
	Low on Oil
	Pinched Hose
	Defective Mini-Valve
	Pressure Relief Valve Not Set Properly (Electric models only)
	Bad Solenoid (Electric models only)
	Defective Relay Box or Pendant Control (Electric models only)
Back section function chatters or loses position	Defective or Dirty Check Valve
	Oil Leakage in Circuit
	Air Inside Cylinder
	Pinched Hose
	Low on Oil

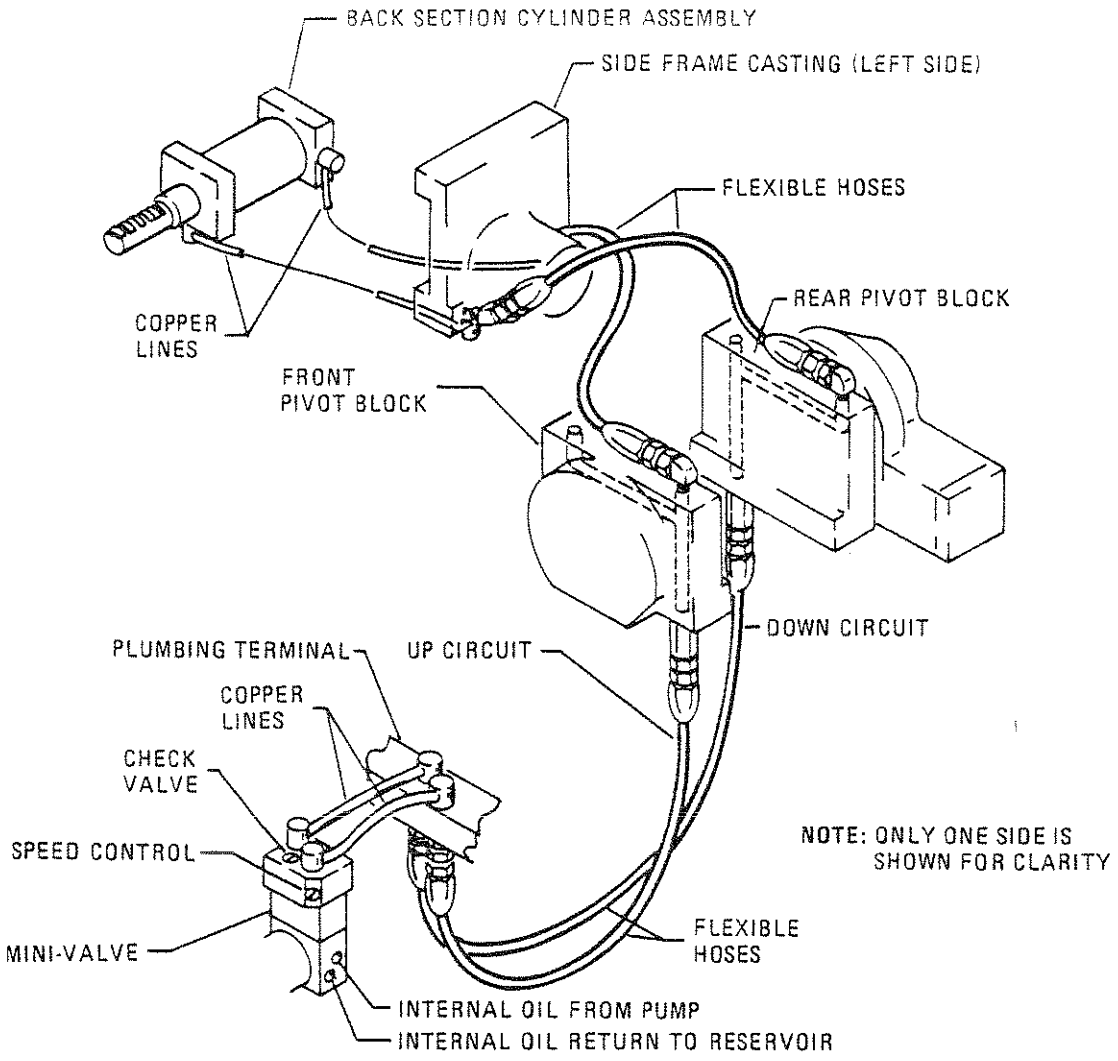


Figure 3-5. Back Section Circuit - Models 1200, 1201, 5000 and 5001

3-8. BACK SECTION DIAGNOSIS CHART
MODELS 6000 and 6001

Problem	Reason
Back section function moves improperly	Incorrect Speed Adjustment
	Spool Valve Not Centered or Adjusted Properly
	Bad Check Valve
	Low on Oil
	Pressure Relief Valve Not Set Properly
	Pinched Hose
	Defective Mini-Valve
	Bad Solenoid
	Defective Relay Box or Pendant Control
Back section function chatters or loses position	Defective or Dirty Check Valve
	Oil Leakage in Circuit
	Air Inside Cylinder
	Pinched Hose
	Low on Oil

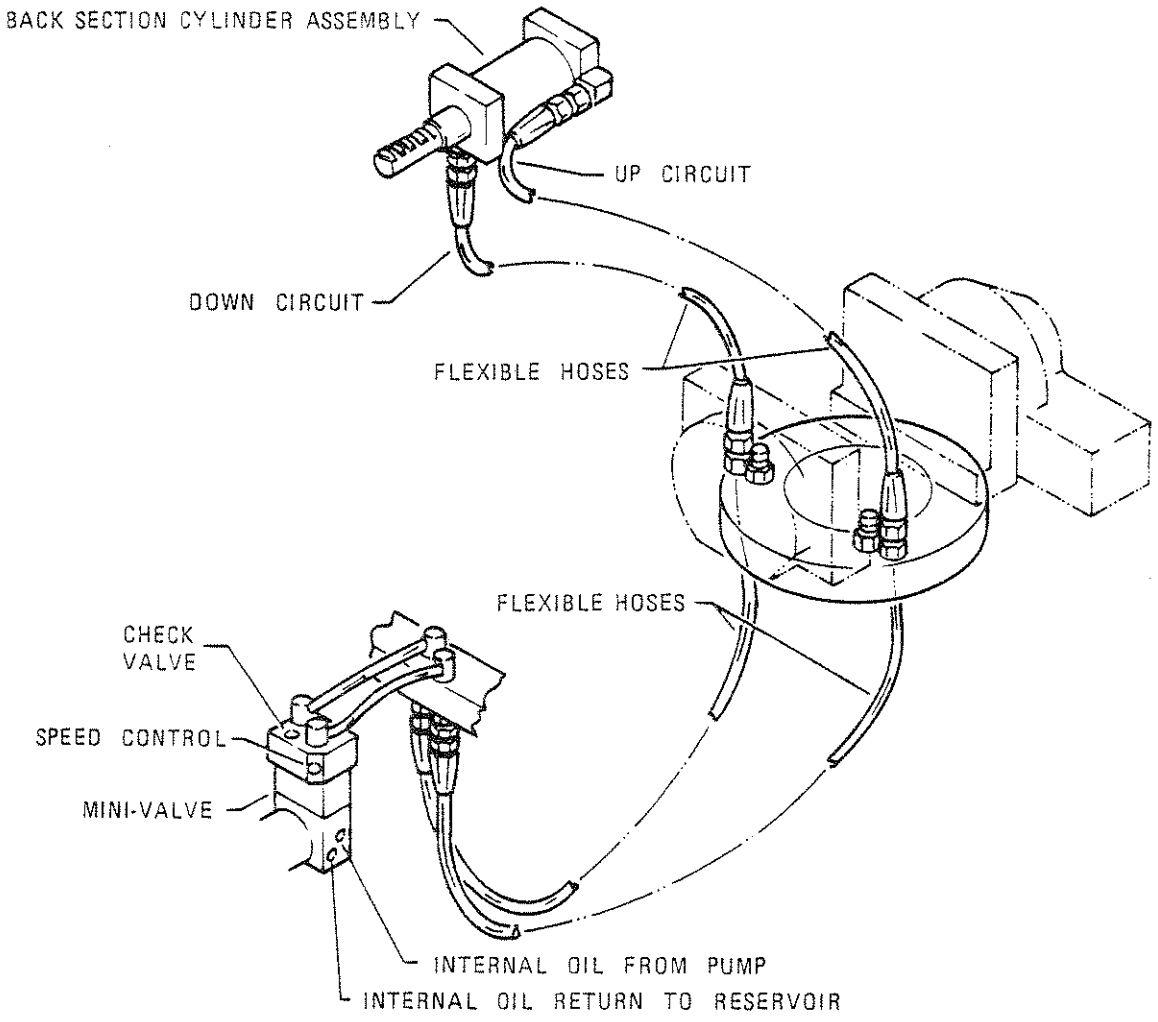


Figure 3-6. Back Section Circuit - Models 6000 and 6001*
*Also Models 1200 and 1201 manufactured after April 1985.

3-9. FOOT/LEG SECTION DIAGNOSIS CHART
MODELS 1201 and 5001

Problem	Reason
Foot/Leg function moves improperly	Incorrect Speed Adjustment
	Spool Valves Not Centered or Adjusted Properly
	Bad Check Valve
	Low on Oil
	Pinched Hose
	Defective Mini-Valve
	Pressure Relief Valve Not Set Properly (Electric models only)
	Bad Solenoid (Electric models only)
	Defective Relay Box or Pendant Control (Electric models only)
Foot/Leg function chatters or loses position	Defective or Dirty Check Valve
	Oil Leakage in Circuit
	Air Inside Cylinders
	Pinched Hose
	Low on Oil

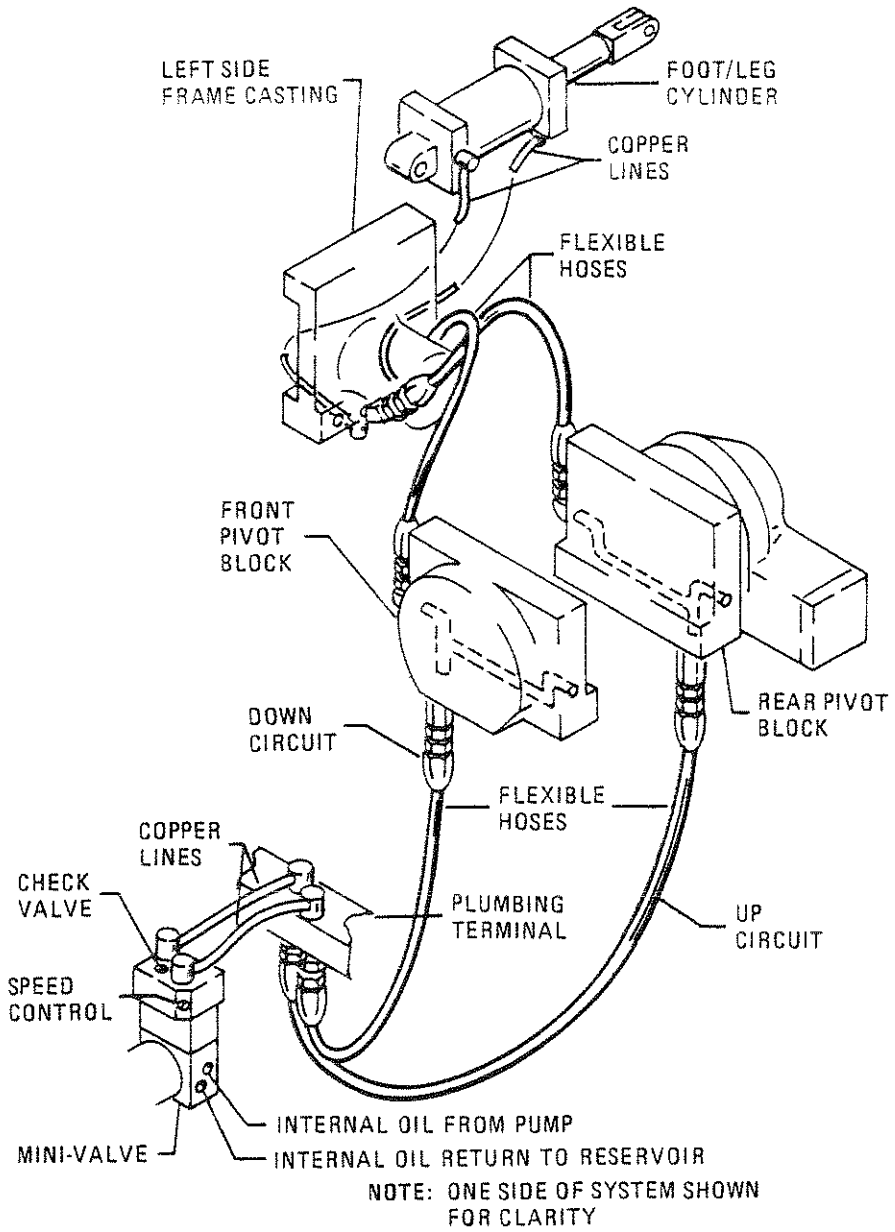


Figure 3-7. Foot/Leg Section Circuit - Models 1201 and 5001

3-10. FOOT/LEG SECTION DIAGNOSIS CHART
MODEL 6001

Problem	Reason
Foot/Leg function moves improperly	Incorrect Speed Adjustment
	Spool Valve Not Centered or Adjusted Properly
	Bad Check Valve
	Low on Oil
	Pressure Relief Valve Not Set Properly
	Pinched Hose
	Defective Mini-Valve
	Bad Solenoid
	Defective Relay Box or Pendant Control
Foot/Leg function chatters or loses position	Defective or Dirty Check Valve
	Oil Leakage in Circuit
	Air Inside Cylinders
	Pinched Hose
	Low on Oil

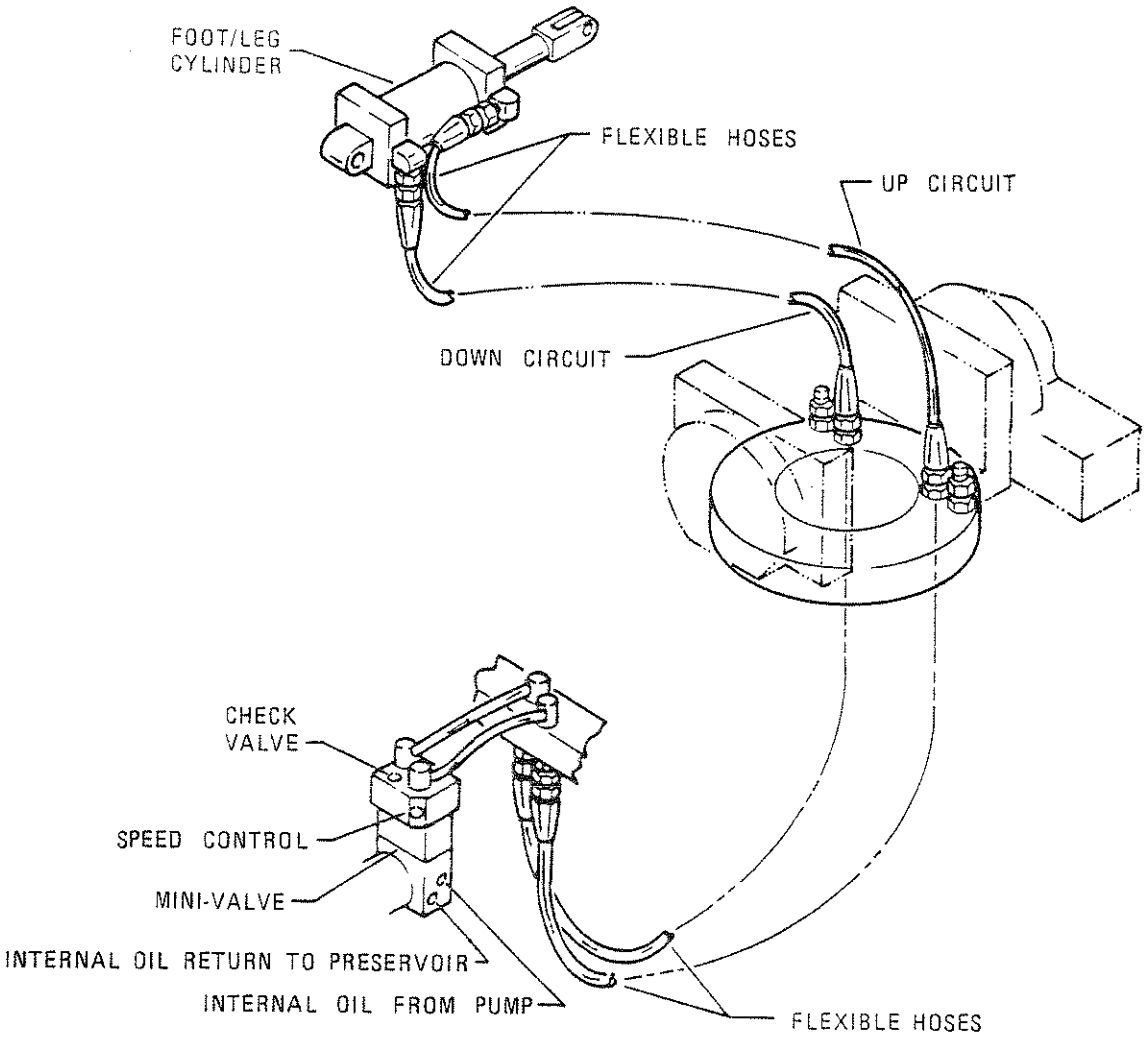


Figure 3-8. Foot/Leg Section Circuit - Model 6001*
*Also 1201 models manufactured after April 1985.

3-11. SIDE MOVE BASE BRAKE CIRCUIT DIAGNOSIS CHART (1200/5000 SERIES)

Problem	Reason
Brakes will not set	Low on Oil
	Pressure Relief Valve Not Set Properly
	Pump Not Supplying Oil Pressure
	Broken or Leaking Oil Line
	Brake Circuit Check Valve Not Seating
	Brake Circuit Release Valve Open
	Defective Relay Box (Electric models only)
	Inoperative Electrical System (Electric models only)
	Brake Cylinder Piston "O" Ring Leaking
Brakes won't stay locked	Broken or Leaking Oil Lines
	Brake Cylinder Piston "O" Ring Leaking
	Brake Circuit Check Valve Not Seating
	Brake Circuit Release Valve Not Completely Closed
Brakes won't retract	Brake Circuit Release Valve Not Opening
	Brake Cylinder Internal Return Spring Broken
	Plugged Vent Lines

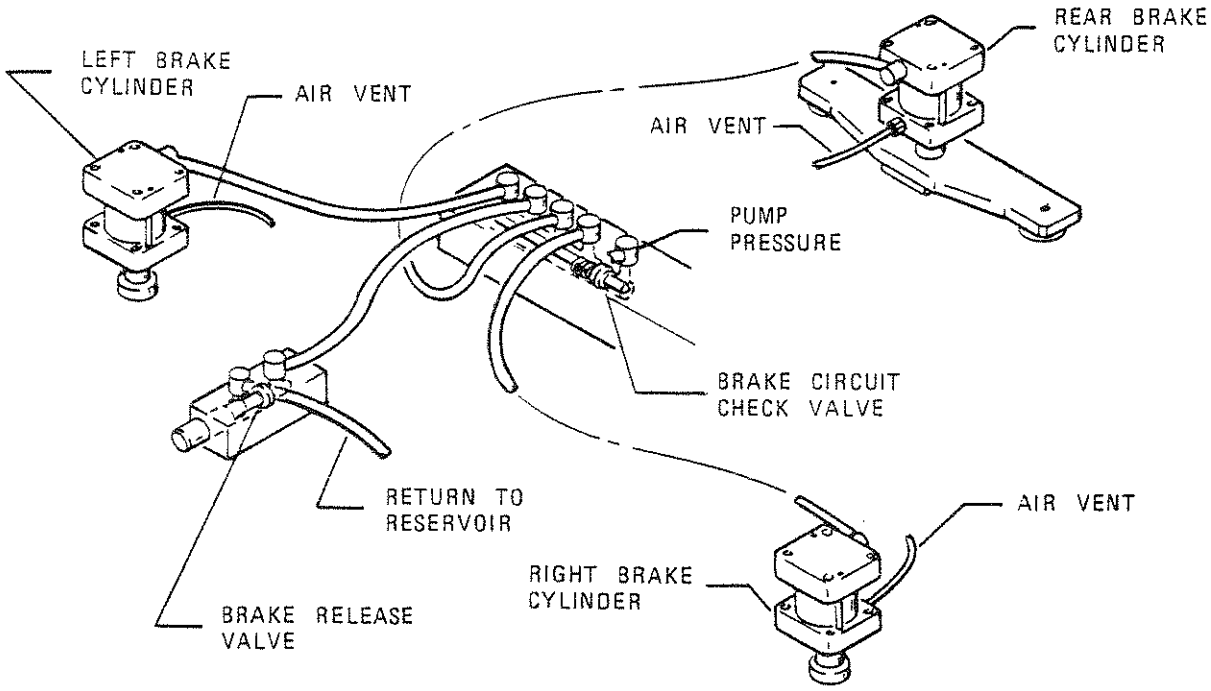


Figure 3-9. 1200/5000 Series Side Move Base Brake Ciruit

3-12. BRAKE CIRCUIT DIAGNOSIS CHART
MODELS 6000 and 6001

Problem	Reason
Brakes will not set properly	Incorrect Speed Adjustment Spool Valve Not Centered or Adjusted Properly Bad Check Valves Low on Oil Pressure Relief Valve Not Set Properly Pinched Hose Defective Mini-Valve Defective Relay Box or Pendant Control
Brakes will not stay locked	Defective or Dirty Check Valves Oil Leakage in Circuit Air Inside Cylinder Pinched Hose Low on Oil
Brakes will not retract properly	Incorrect Speed Adjustment Spool Valve Not Centered or Adjusted Properly Bad Check Vaives Low on Oil Pressure Relief Valve Not Set Properly Pinched Hose Defective Mini-Valve Defective Relay Box or Pendant Control

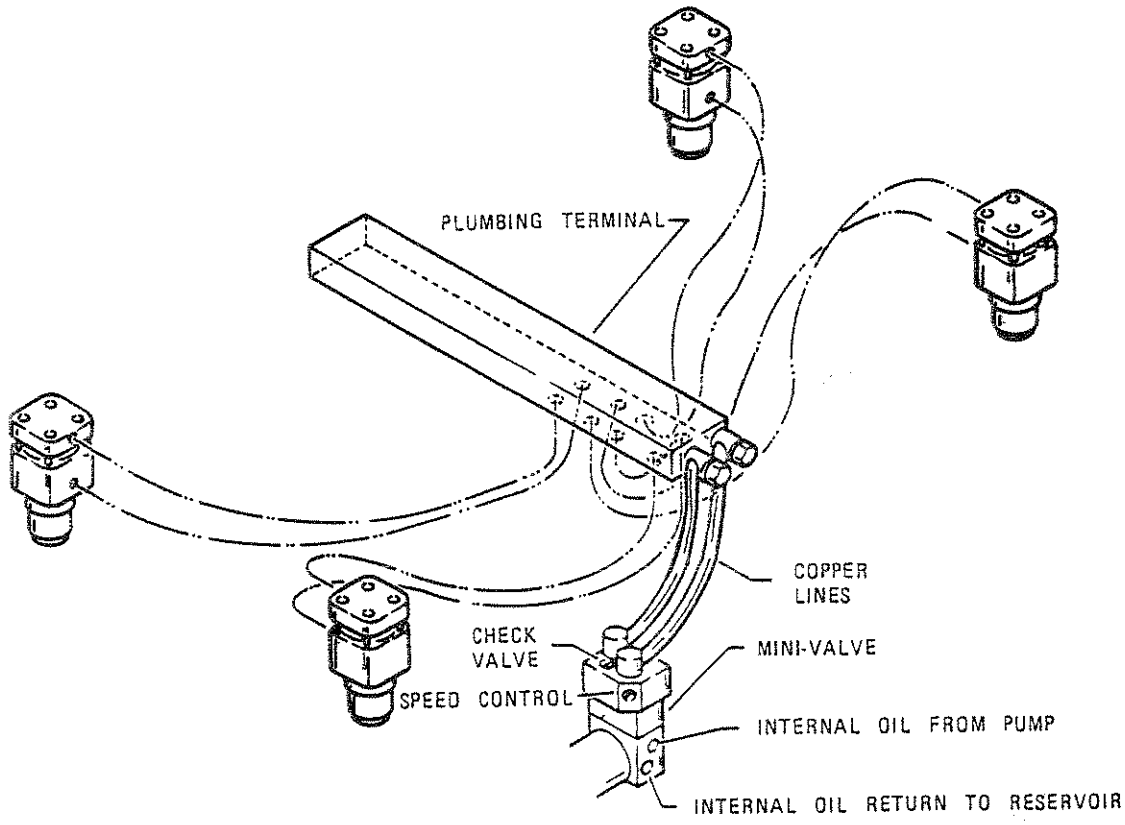


Figure 3-10. Brake Circuit - Models 6000 and 6001

3-13. Flexible Hose Identification and Placement

The following figures will show the correct placement of the flexible hydraulic hoses that are used in the table.

a. Back Section Hose Placement
(Models 1200, 1201, 5000 and 5001)

Figure 3-11. shows the placement of the *short* flexible hoses that connect the pivot-block oil galleys to side frame fittings.

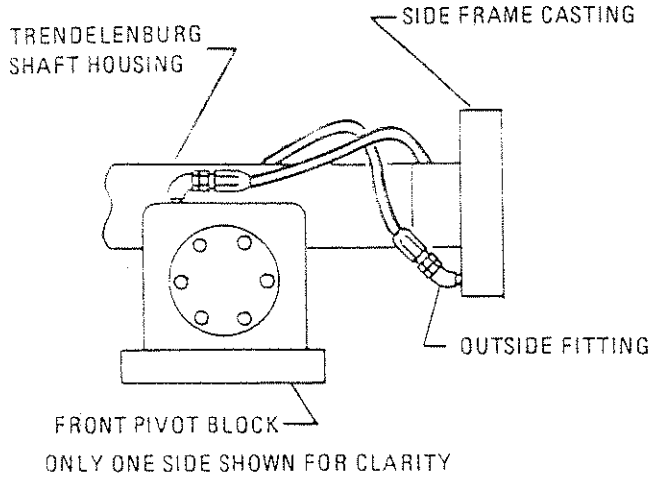


Figure 3-11.

Top hoses of pivot blocks connect to *outside* fittings of side frame castings after crossing over trendelenburg shaft housing.

Top hoses of *front* pivot block control *up* mode of back section.

b. Foot/Leg Section Hose Placement
(Models 1201 and 5001)

Refer to figure 3-12. for the placement of the foot/leg section hoses.

1. *Side* hoses of pivot blocks connect to *inside* fittings of side frame castings after crossing over trendelenburg shaft housing.

2. *Side* hoses of *front* pivot block control *down* mode of foot/leg section.

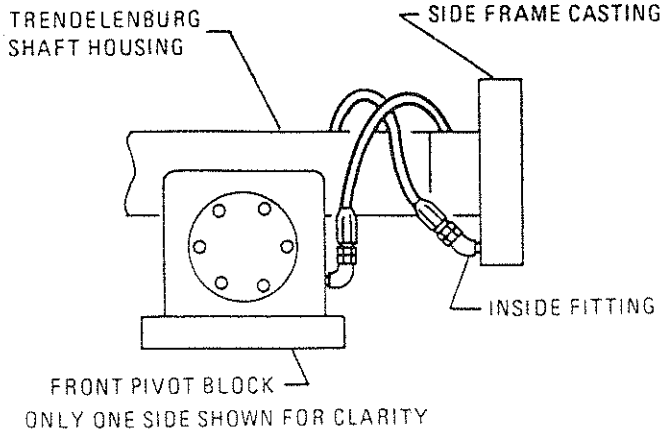


Figure 3-12.

c. Back Section Hose Placement
(Models 6000 and 6001)*

Figure 3-13. shows the placement of the *short* flexible hoses that connect to the back section cylinders.

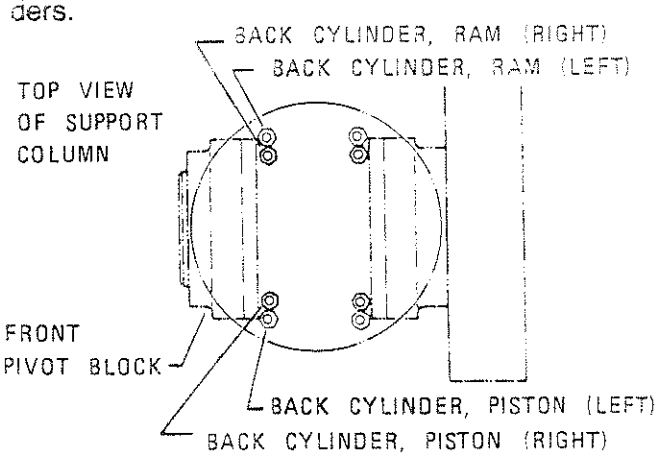


Figure 3-13

d. Foot/Leg Section Hose Placement
(Model 6001)*

*Also 1201 models manufactured after April 1985.

Figure 3-14. shows the placement of the *short* flexible hoses that connect to the foot/leg section cylinders.

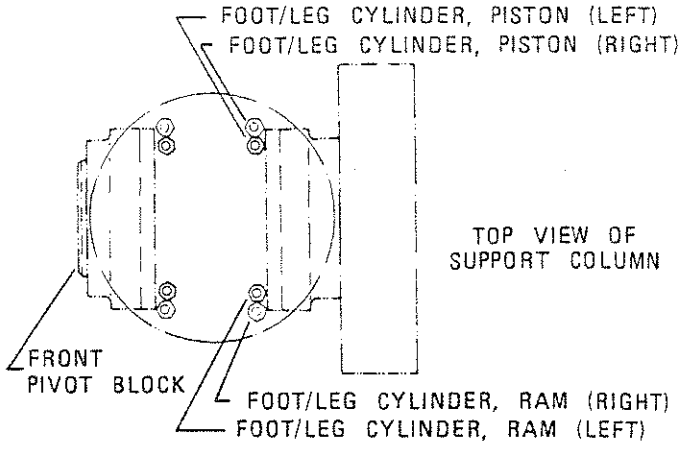


Figure 3-14.

e. Color or Number Codes
(Models 1200 and 5000)

Figure 3-15. shows the placement of color code or number code for the *long* flexible hoses that connect to the front pivot block.

NOTE

The number codes will be stamped into the elevation clamp ring and main plumbing terminal.

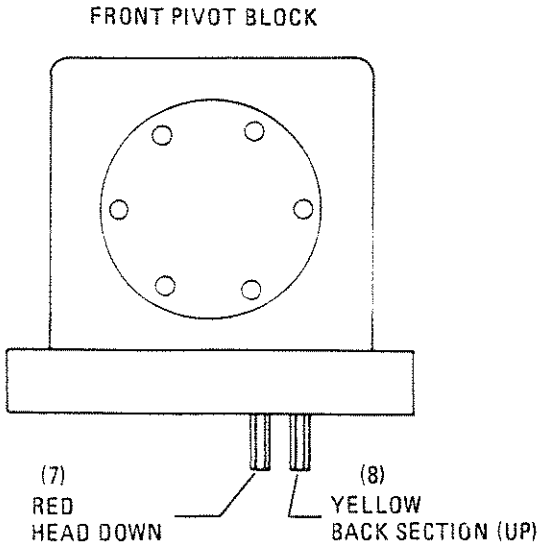


Figure 3-15.

Figure 3-16. shows the placement and color code or number code for the *long* flexible hoses that connect to the rear pivot block.

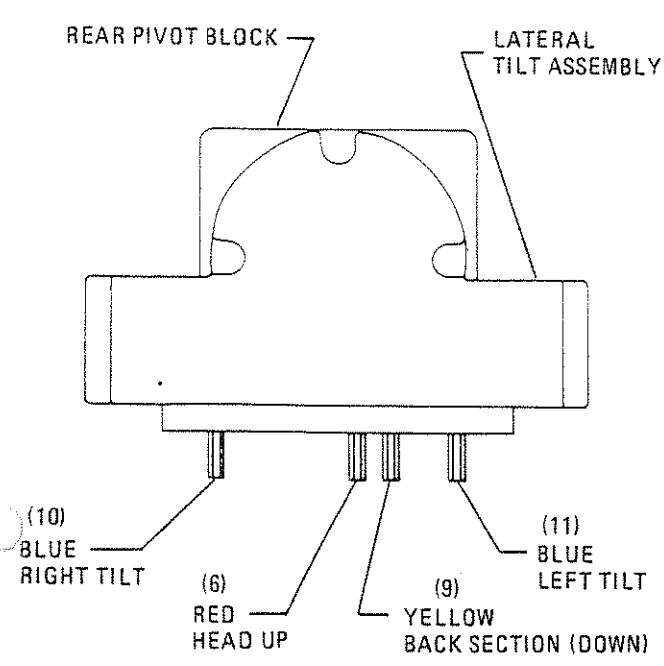


Figure 3-16.

(Models 1201 and 5001)

Figure 3-17. shows the placement and color code or number code for the *long* flexible hoses that connect to the front pivot block.

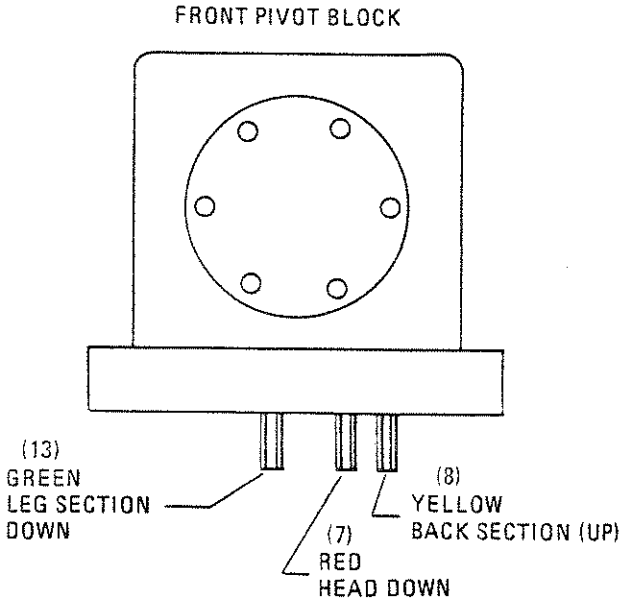


Figure 3-17.

Figure 3-18. shows the placement and color code or number code for the *long* flexible hoses that connect to the rear pivot block.

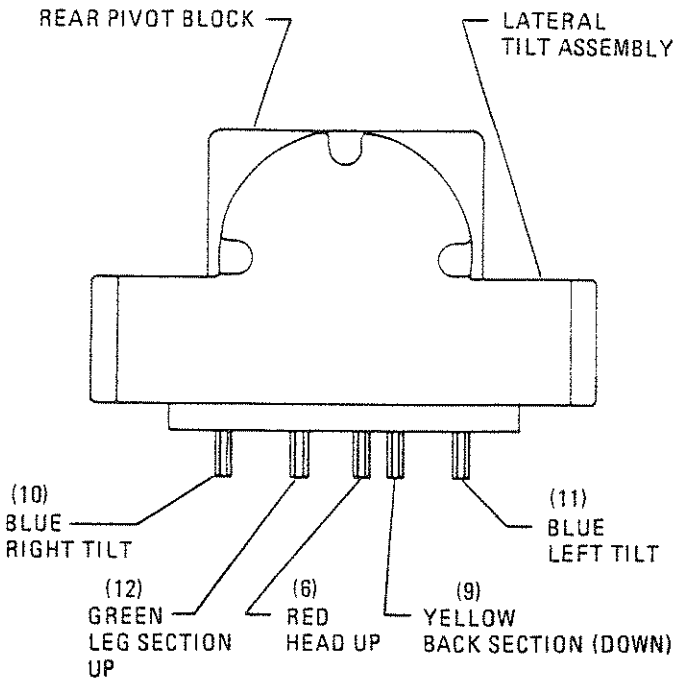


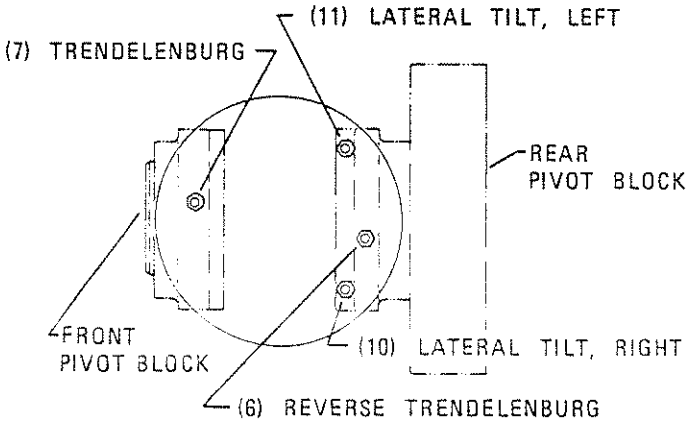
Figure 3-18.

(Models 6000 and 6001)*

Figure 3-19. shows the placement and number code for the *long* flexible hoses that connect to the front and rear pivot blocks.

NOTE

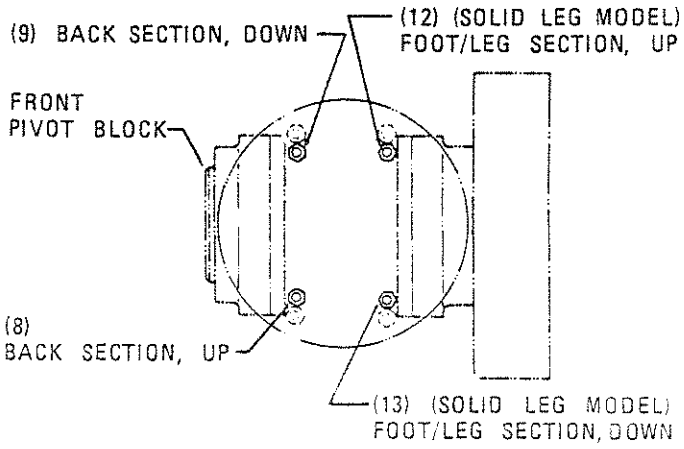
The number code will be stamped into the elevation clamp ring and main plumbing terminal.



TOP VIEW OF SUPPORT COLUMN

Figure 3-19.

Figure 3-20. shows the placement and number code for the *long* flexible hoses that connect to the elevation clamp ring.



TOP VIEW OF SUPPORT COLUMN

Figure 3-20.

SECTION IV ELECTRICAL SYSTEM (Models 5000, 5001, 6000 and 6001)

4-1. General

The complete electrical system (with the exception of the hand-held pendant control) is contained within the base of the table. The pump motor and the hydraulic valves are controlled electrically with the pendant control.

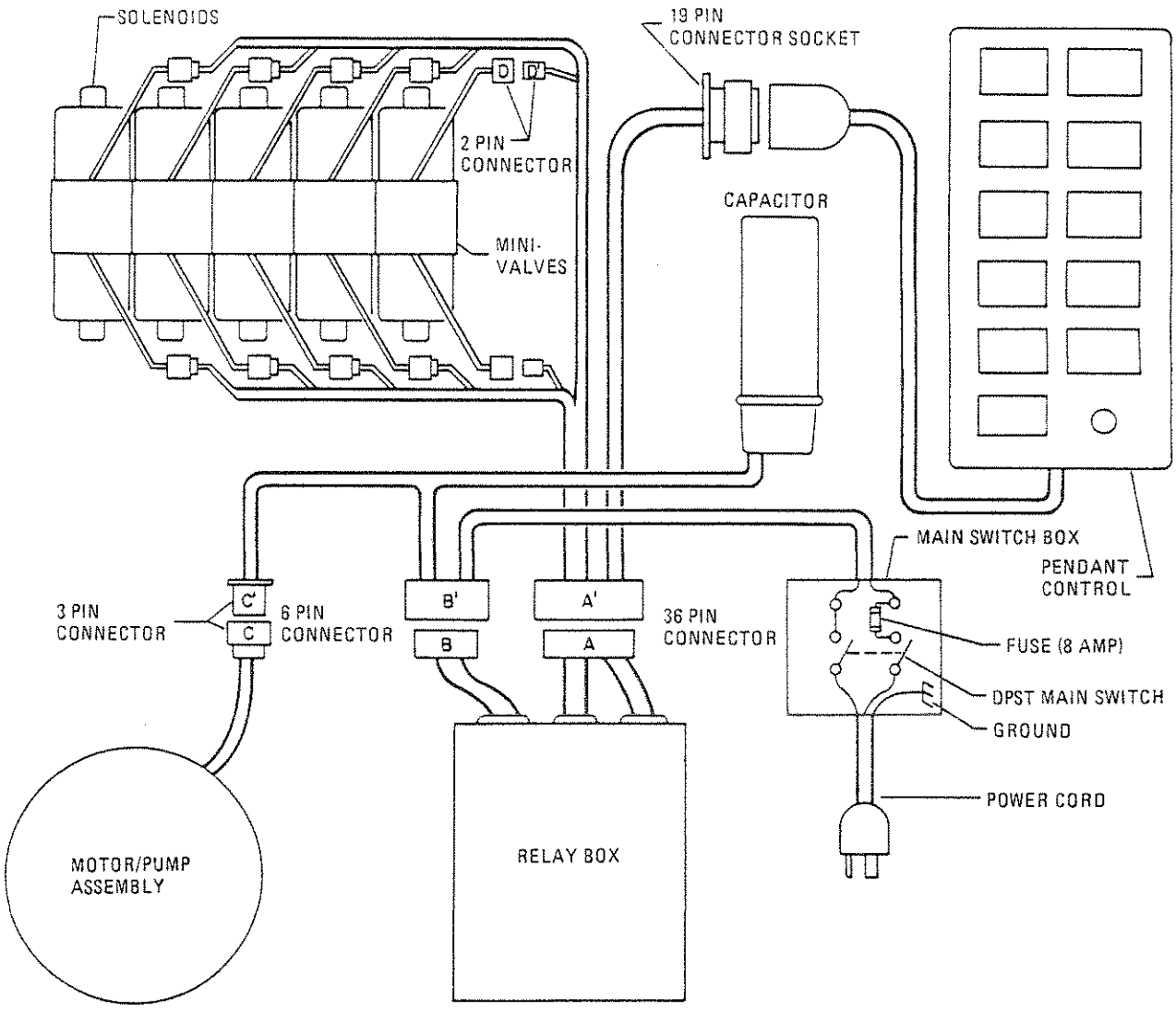
The power requirements are 120V, 5 amp, 60 HZ, protected by an 8 amp fuse. The main power on-off switch is an enclosed DPST type and the power cord is a three-wire, fifteen foot long, UL listed cord with a three-prong hospital grade plug. Current leakage is less than 100 micro amps and the tables are both UL and CSA listed.

The basic electrical functions of all the tables are identical. The only difference between the tables is the number of electrically operated functions. These functions are as follows:

Models 5000, 5001, 6000 and 6001
- Energize (See Note)
- Elevation - up and down
- Trendelenburg - head up and down
- Lateral Tilt - right and left
- Back Section - up and down

Models 5001 and 6001
- Foot/Leg Section - up and down

Models 6000 and 6001
- Flex/Reflex
- Move (brake release)



NOTE: ENERGIZE BUTTON DELETED ON "ONE TOUCH" PENDANT CONTROL – 1987

Figure 4-1. Electrical Circuit Block Diagram - Model 5001

In addition to the above listed functions, on the 5000 and 5001 models with the side move base and the 6000 and 6001 models, initial activation of any function will activate the brake system first.

Additional functions require additional push buttons on the pendant control, more relays and more solenoids; but the basic operation and troubleshooting for all the tables is identical.

4-2. Components

Refer to figures 4-1. and 4-2. for the relationship of the electrical components.

1. Wires, Connectors, Switches, Fuse - These provide the path for the various electrical circuits.

2. Relay Box - Contains the step down transformer, full wave rectifier, and relay switches. The relay switches are activated by the pendant control and in turn energize the solenoids.

3. Hand-Held Pendant Control - Closes micro switches to activate relay box. Operates on 6.3 VDC.

4. Solenoids - These electrically open and close the hydraulic ports of the mini-valve to direct the fluid to the correct cylinders. They operate on 120 VAC.

5. Motor/Pump Assembly - 120 Volt, 60 HZ, 200 Watt capacitor induction motor.

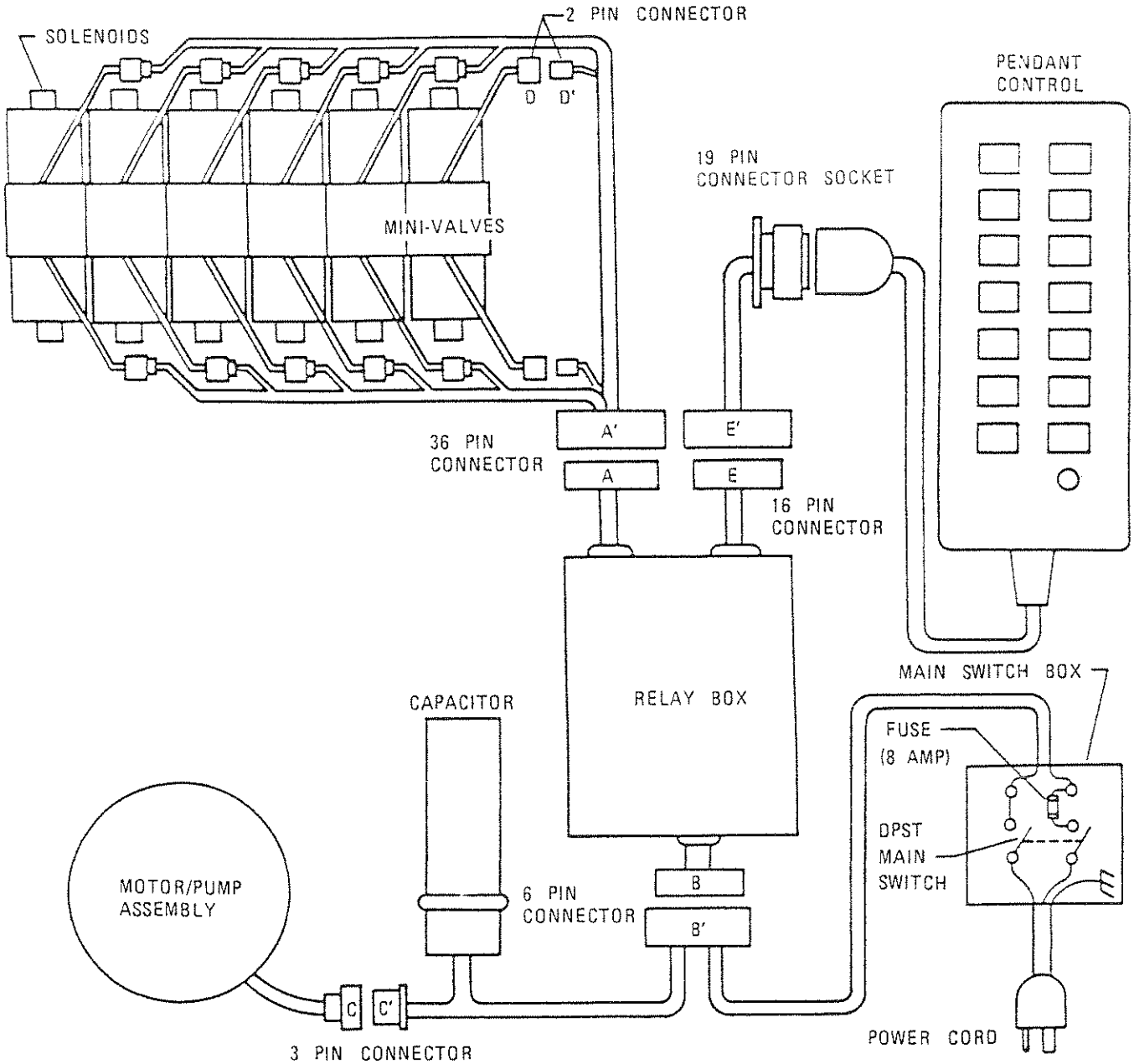


Figure 4-2. Electrical Circuit Block Diagram - Model 6001

SECTION V ELECTRICAL SYSTEM TROUBLESHOOTING

5-1. Troubleshooting Notes

The basic operation of each component will be defined along with a drawing and explanation on how to check it out.

Certain defective components could cause the entire table to stop functioning or only one control function to stop. It would depend on what part of the component failed. Other defective components would only cause one control function to stop.

The following defective components could cause all control functions to be affected:

a. Motor/Pump Assembly (starting capacitor)
b. Main Switch Circuit and Wiring

The following defective components could cause all control functions to be affected or only one control function:

a. Relay Box
b. Pendant Control

The component listed below would only affect one control function:

Solenoid

When troubleshooting an electrical circuit, start at the problem and work back to the power source.

5-2. Main Switch

The main power supply, 120V, 60 HZ, comes in through the power cord and through the main switch. The main switch opens both lines when in the "off" position. An 8 amp fuse is used in one line to protect the complete electrical system and it is located next to the main switch.

a. Main Switch Test

The following test will determine if line voltage is applied to connector B¹, which in turn would power the table.

1. Plug the power cord into the AC 120V supply (wall receptacle) and turn ON main switch.

2. Disconnect connectors B and B¹. See figure 5-1. Leave all other connectors connected.

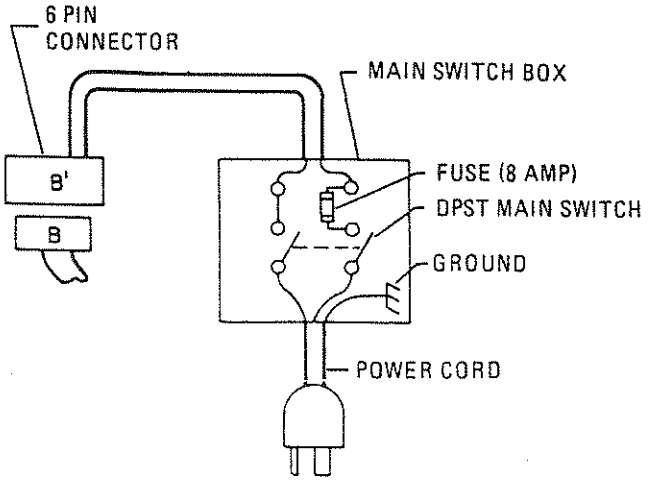


Figure 5-1. Main Switch Box and Fuse (Model 5001 shown)

CAUTION

Line voltage (120 VAC) will be measured in this test. Do not touch uninsulated connector pins or meter test leads.

3. Use an AC voltmeter capable of measuring 120 VAC and measure the voltage between pins 1 and 4 (black and white wires) located in connector B¹. See figure 5-2. You should receive line voltage 120 VAC.

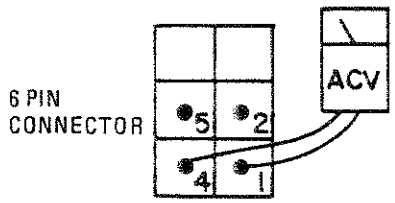


Figure 5-2. Back View Connector B¹

CONNECTOR B¹ COLOR CODE

Pin 1 - White or Black
Pin 2 - Blue
Pin 3 - Black or White
Pin 4 - Red

b. Test Results

If you do not receive the correct voltage measurement, the problem would have to be in the wires, main switch, fuse, or power cord. If the correct voltage is obtained, everything is good up to this point and the problem would have to be in another area.

5-3. Relay Box

The 120 volt power supply is directly connected to the relay contacts. When these contacts are closed, 120 volts is supplied to the solenoids which are mounted on the hydraulic mini-valves. One relay is used to supply 120V to the pump/motor and is always activated no matter what control function is selected. On 6000 and 6001 models, the brake locking circuit relay is also activated when any control function other than MOVE is selected.

Also, inside the relay box is a step-down transformer and full-wave rectifier which decreases the line voltage to 6.3 volts. This low voltage potential controls the relays by the use of the hand-held pendant control buttons. Basically the relays enable a 6.3 voltage potential to control the 120 volt circuit.

a. Relay Box Test

The following tests will determine if the relay box is functioning correctly.

b. Step #1 - Checking Connector B

1. Plug the power cord into the 120 VAC supply (wall receptacle). Leave the main switch in the "off" position.

2. Disconnect B and B'. See figures 5-3. and 5-4. Leave all other connectors connected.

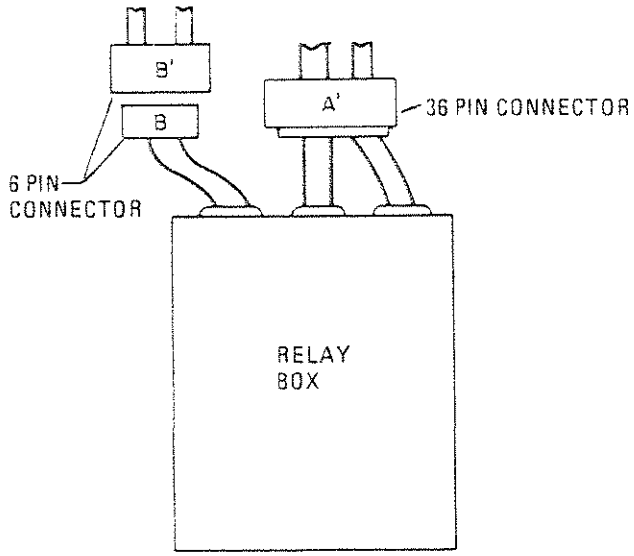


Figure 5-3. Models 5000 and 5001

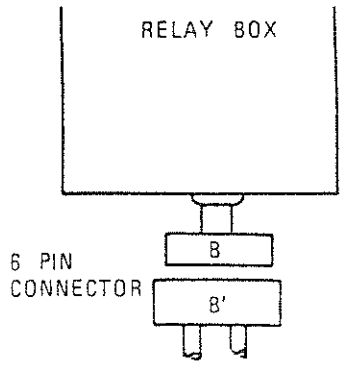


Figure 5-4. Models 6000 and 6001

3. Use an ohmmeter R x 1 scale to measure the following connector pins in connector B. See figure 5-5.

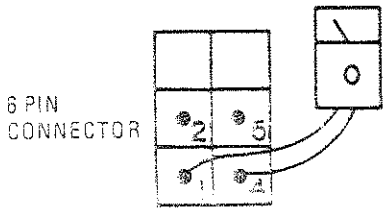


Figure 5-5. Back View Connector B

CONNECTOR B COLOR CODE
Pin 1 Blue
Pin 2 Blue
Pin 4 Yellow
Pin 5 Red

+ Test Lead	− Test Lead	Meter Reading
1	4	Approx. 200-300 Ohms
1	2	0 Ohms
1	5	∞ Infinity
4	5	∞ Infinity

c. Test Results:

If you do not receive the correct meter readings, the relay box or wiring is defective. If the correct readings are obtained, this part of the relay box is okay. Proceed to the next step.

d. Step #2 - Models 5000 and 5001, Checking Low Voltage (Connector A)

This test checks the low voltage applied to the pendant control buttons.

1. The power cord should be plugged into the wall receptacle and main switch turned ON.

2. Disconnect connector A and A¹. See figure 5-5. All other connectors should be connected.

3. Use a DC voltage meter 10V scale, or equivalent, and measure the following connector pins located in connector A. See figure 5-6.

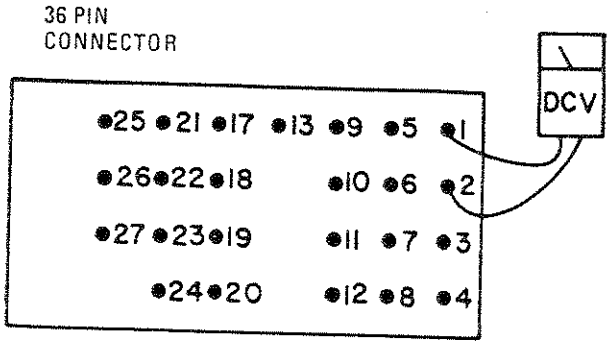


Figure 5-6. Back View Connector A (Model 5001)

CONNECTOR A COLOR CODE

Pin 1 White	*Pin 13 Blue/White
Pin 2 Orange	Pin 17 White/Red
Pin 3 Black	Pin 18 White/Yellow
Pin 4 Red	Pin 19 White/Orange
Pin 5 Yellow	Pin 20 White/Violet
Pin 6 Red/White	Pin 21 White/Blue
Pin 7 Violet	Pin 22 Black/White
Pin 8 Blue	Pin 23 White/Green
Pin 9 Green/White	Pin 24 White/Brown
Pin 10 Green	Pin 25 Brown/White
Pin 11 Brown	*Pin 26 White/Grey
*Pin 12 Grey	*Pin 27 White/Black

*Pins 12, 13, 26 and 27 are omitted on Model 5000.

+ Test Lead	– Test Lead	Meter Readings DC Volts
1	2	OV
1	3	6-10V
1	4	6-10V
1	5	6-10V
1	6	6-10V
1	7	6-10V
1	8	6-10V
1	9	6-10V
1	10	6-10V
1	11	6-10V
1	12	6-10V*
1	13	6-10V*
2	3	6-10V

*Omitted on Model 5000.

e. Test Results:

If you do not receive the correct meter readings, the relay box or wiring is defective. If the correct readings are obtained, this part of the relay box is okay. Proceed to the next step.

f. Step #2 - Models 6000 and 6001, Checking Low Voltage (Connector E)

This test checks the low voltage applied to the pendant control buttons.

1. The power cord should be plugged into the wall receptacle and main switch turned ON.

2. Disconnect connector E and E¹. See figure 5-4. All other connectors should be connected.

3. Use a DC voltage meter 10V scale, or equivalent, and measure the following connector pins located in connector E. See figure 5-7.

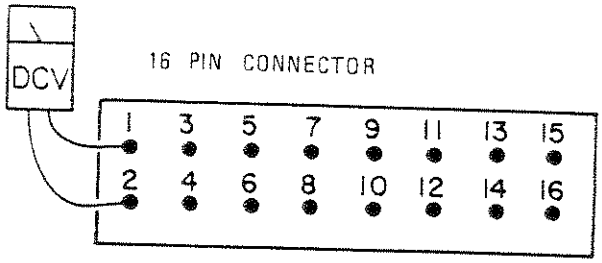


Figure 5-7. Back View Connector E (Model 6001)

CONNECTOR E COLOR CODE

1 Red/White	2 White
3 Black	4 Red
5 White/Red	6 Yellow
7 Brown	8 White/Brown
9 Blue/White	10 Orange
11 White/Orange	*12 Grey
*13 White/Grey	14 White/Yellow
15 Violet/White	16 Black/White

*Pins 12 and 13 are omitted on Model 6000.

+ Test Lead	− Test Lead	Meter Readings DC Volts
1	2	OV
1	3	6-10V
1	4	6-10V
1	5	6-10V
1	6	6-10V
1	7	6-10V
1	8	6-10V
1	9	6-10V
1	10	6-10V
1	11	6-10V
1	12	6-10V*
1	13	6-10V*
1	14	6-10V
1	15	6-10V
1	16	6-10V
2	3	6-10V

*Omitted on Model 5000.

g. Test Results:

If you do not receive the correct meter readings, the relay box or wiring is defective. If the correct readings are obtained, this part of the relay box is okay. Proceed to the next step.

h. Step #3 - Models 5000 and 5001, Checking High Voltage (Connector A)

This test checks the high voltage (120V) that is used to energize the solenoids.

CAUTION

120 VAC will be measured in this test. Do not touch uninsulated connector pins or meter test leads.

1. The power cord should be plugged into the wall receptacle and main switch turned ON.

2. Disconnect connector A and A' and the motor connector C and C'. See figure 4-1. All other connectors should be connected.

3. A paper clip or small jumper wire must be used to electrically close the relay contacts in order to make this test. This jumper wire will be used to connect pins 1 through 13 in the 36-pin connector block. These pins are low voltage (6.3V) and there is no danger of electric shock.

4. Use an AC voltmeter capable of measuring 120 VAC and measure the voltage between the indicated connector pins located in Connector A. See figure 5-8.

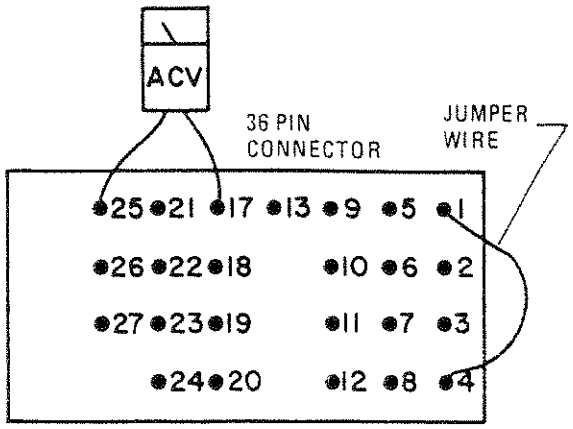


Figure 5-8. Back View Connector A (Model 5001)

Pins 1 thru 13 - Low Voltage 6.3 VDC
Pins 17 thru 27 - High Voltage 120 VAC

+ Test Lead	− Test Lead	Pins Jumped	Meter Reading
25	17	1 and 4	120V
25	18	1 and 5	120V
25	19	1 and 6	120V
25	20	1 and 7	120V
25	21	1 and 8	120V
25	22	1 and 9	120V
25	23	1 and 10	120V
25	24	1 and 11	120V
25	26	1 and 12	120V*
25	27	1 and 13	120V*

*Omitted on Model 5000.

i. Test Results:

If you do not receive the correct meter readings, the relay box or wiring is defective and should be replaced.

NOTE

Before deciding the relay box is defective, check the wires and pins in the connector blocks to make sure they are not loose or making a bad connection with their mate.

j. Step #3 - Models 6000 and 6001, Checking High Voltage (Connector A)

This test checks the high voltage (120V) that is used to energize the solenoids.

CAUTION

120 VAC will be measured in this test. Do not touch uninsulated connector pins or meter test leads.

1. The power cord should be plugged into the wall receptacle and main switch turned ON.

2. Disconnect connectors A and A', E and E', and the motor connector C and C'. See figure 5-2. All other connectors should be connected.

3. A jumper wire must be used to electrically close the relay contacts in order to make this test. The jumper wire will be used to connect pins 1 through 16 in the 16-pin connector E. See figure 5-10. These pins are low voltage (6.3V) and there is no danger of electric shock.

4. Use an AC voltmeter capable of measuring 120 VAC and measure the voltage between the indicated connector pins located in Connector A. See figure 5-9.

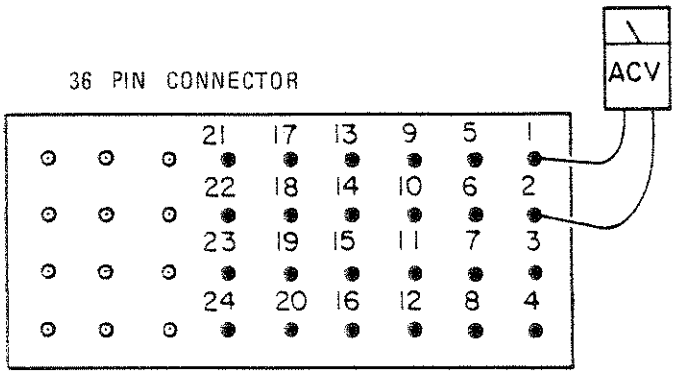


Figure 5-9. Back View Connector A (Model 6001)

CONNECTOR A COLOR CODE

1 Red	13 Orange
2 Blue	14 Blue
3 White/Red	15 White/Orange
4 Blue	16 Blue
5 Yellow	17 Grey
6 Blue	18 Blue
7 Brown	19 White/Grey
8 Blue	20 Blue
9 White/Brown	21 White/Black
10 Blue	22 Blue
11 Blue/White	23 Black/White
12 Blue	24 Blue

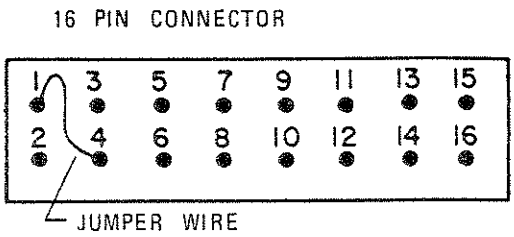


Figure 5-10. Back View Connector E (Model 6001)

CONNECTOR E COLOR CODE

1 Red/White	2 White
3 Black	4 Red
5 White/Red	6 Yellow
7 Brown	8 White/Brown
9 Blue/White	10 Orange
11 White/Orange	*12 Grey
*13 White/Grey	14 White/Yellow
15 Violet/White	16 Black/White

*Pins 12 and 13 are omitted on Model 6000.

Connector A is High Voltage 120 VAC.
Connector E is Low Voltage 6.3 VDC.

Connector A		Connector E	
+ Test Lead	− Test Lead	Jumper Wire	Meter Reading
1	2	1 — 4	120V
3	4	1 — 5	120V
5	6	1 — 6	120V
7	8	1 — 7	120V
9	10	1 — 8	120V
11	12	1 — 9	120V
13	14	1 — 10	120V
15	16	1 — 11	120V
17	18	1 — 12	120V*
19	20	1 — 13	120V*
21	22	1 — 4	120V
23	24	1 — 16	120V

*Omitted on Model 6000.

k. Test Results:

If you do not receive the correct meter readings, the relay box or wiring is defective and should be replaced.

NOTE

Before deciding the relay box is defective, check the wires and pins in the connector blocks to make sure they are not loose or making a bad connection with their mate.

5-4. Pendant Control

The Pendant Control consists of between 9 and 14 micro switches (buttons) depending upon the model. The energize button is wired in series with the other switches and must be depressed before any of the other control buttons will work to complete the circuit.

When any of the circuits are completed (by depressing the energize button and a control button) the appropriate relay contacts (located in the relay box) close and 120V potential is applied to the solenoid to operate the hydraulic mini-valve. The Pendant Control has only 6.3 volts applied to it.

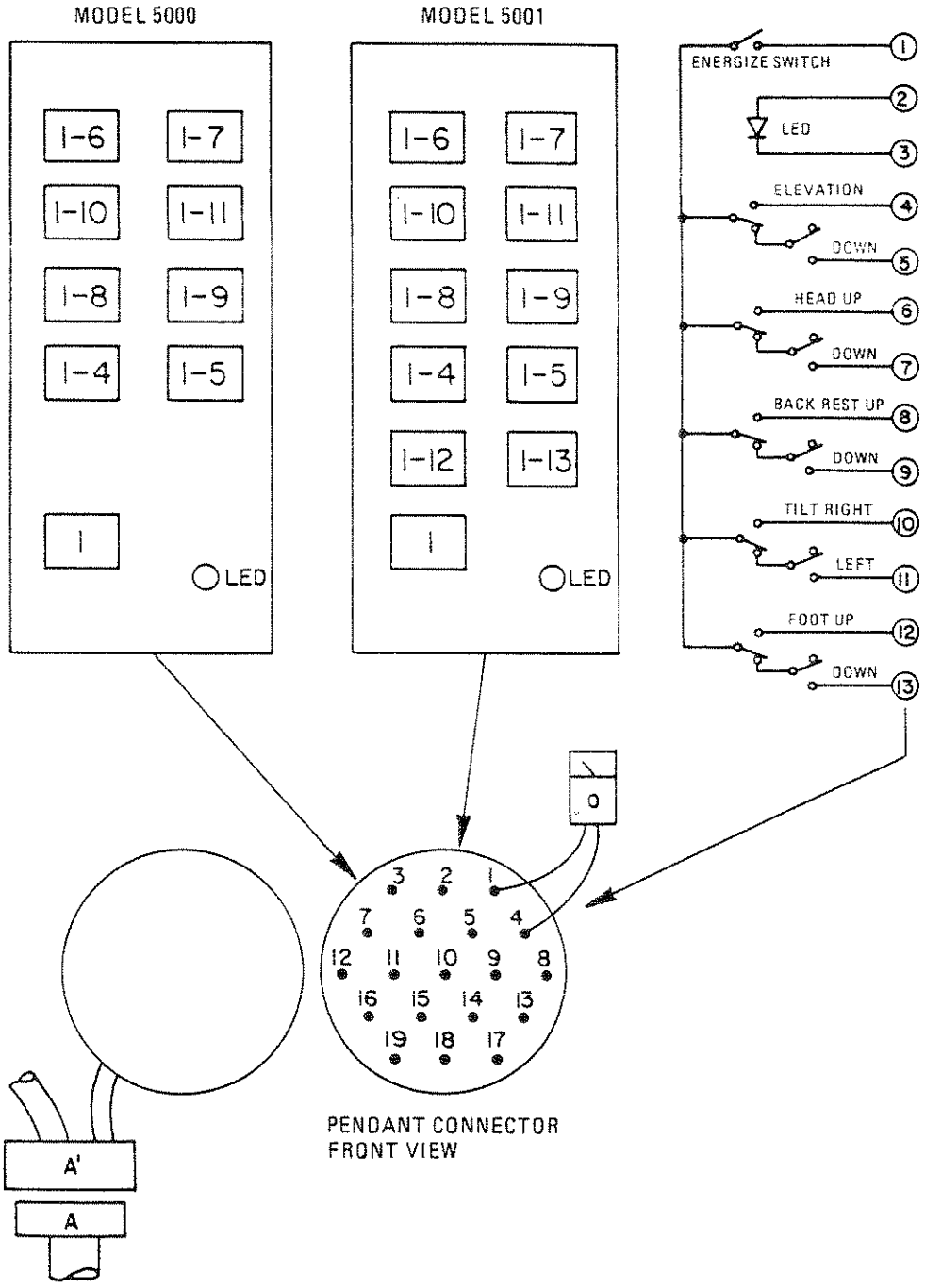


Figure 5-11. Pendant Control (Models 5000 and 5001)

a. Pendant Control Test

The following test will determine if the micro switches inside the Pendant Control are functioning correctly.

1. Unplug the 19 pin connector from the base of the table. You will be checking the cord side connector.

2. Use an ohmmeter R x 1 and check the continuity between pins 1 through 16. See figures 5-11. and 5-12.

3. Ohmmeter must show continuity between the pins that are indicated when the appropriate buttons are pressed. (The energize button if applicable must be pressed at the same time as the control button when making this test.)

NOTE

Pins 2 and 3 are connected to the LED (power on light on the pendant control) and cannot be checked with an ohmmeter.

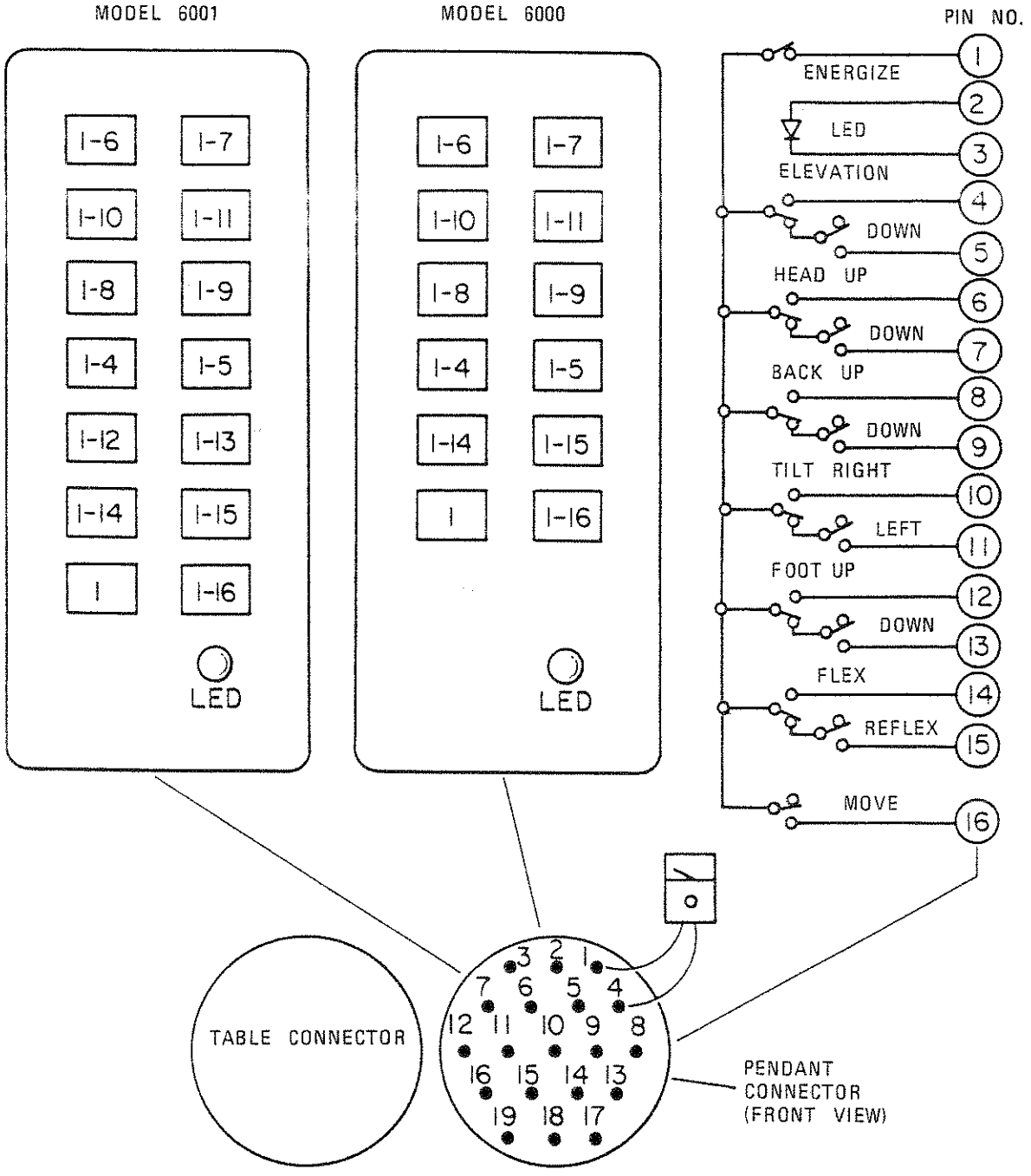


Figure 5-12. Pendant Control (Models 6000 and 6001)

b. Test Results:

If you do not receive continuity between any of the pins, either the micro switch in the Pendant Control is defective or a wire is broken. Either of these problems can be repaired easily.

If you receive correct readings with the meter, there is nothing wrong with the Pendant Control.

c. Wiring Harness Test

The following test checks the wires leading from the relay box connector to the 19 pin connector table socket. These wires apply low voltage to the pendant control buttons. This test is similar to the test performed on the connectors explained in the relay box test.

1. The power cord should be plugged into the wall socket and the main switch turned ON.

2. Disconnect the 19 pin pendant control connector. All other connectors should be connected.

3. Use a DC voltmeter 10V scale and measure the following pins located in the 19 pin table socket connector. See figure 5-13.

+ Test Lead	− Test Lead	Meter Readings DC Volts
1	2	OV
1	3	6-10V
1	4	6-10V
1	5	6-10V
1	6	6-10V
1	7	6-10V
1	8	6-10V
1	9	6-10V
1	10	6-10V
1	11	6-10V
1	12	6-10V*
1	13	6-10V*
1	14	6-10V**
1	15	6-10V**
1	16	6-10V**
2	3	6-10V

*Omitted on Model 5000 and 6000.
**Models 6000 and 6001 only.

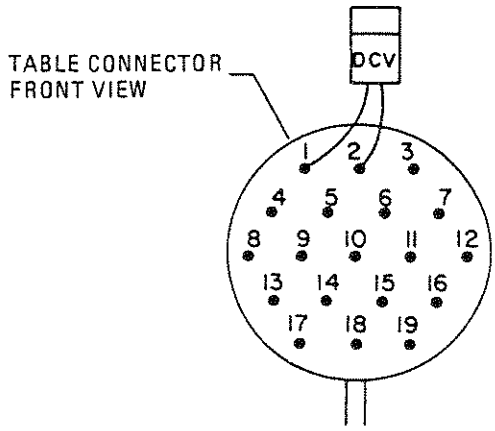


Figure 5-13. Front View Table Connector

d. Test Results:

If you do not receive the correct voltage reading, the wiring or connector pins are faulty. If the correct readings are obtained, this part of the circuit is okay.

5-5. Solenoids

The solenoids are energized by 120 volt potential that is controlled by the relays located inside the relay box.

The solenoid windings are protected from excessive heat with an internal thermal fuse that will open after approximately seven (7) minutes of continuous operation. The solenoid must be replaced if the internal thermal fuse has been blown. The solenoids are mounted directly on either side of the hydraulic mini-valves and push the spool valve in one direction or the other depending upon which solenoid is activated.

a. Solenoid Test

The following tests will check the voltage applied to the solenoids and the resistance of the solenoid coil.

NOTE

If a solenoid does not function when the pendant control button is pushed, the problem could be the pendant control, the relay box, or the solenoid.

Each solenoid is controlled with 120V source coming from the relay box. This source can easily be checked by measuring the voltage at the 2 pin connector in question.

CAUTION

Line voltage will be measured in this test. Do not touch uninsulated connector pins or meter test leads.

b. Step #1

1. Plug the table cord into the wall receptacle and turn main switch ON.

2. Disconnect the 2 pin connector from the solenoid in question, connector D' shown for example in Figures 5-14. and 5-15.

3. Use a voltmeter capable of measuring 120 VAC and measure the voltage across the 2 pin connector. Polarity of meter leads is *not* important.

NOTE

The appropriate pendant control button and energize button if applicable must be pushed during this test. The motor will run when this test is performed.

On Models 6000 and 6001, the brake locking solenoid will be activated by any function other than MOVE.

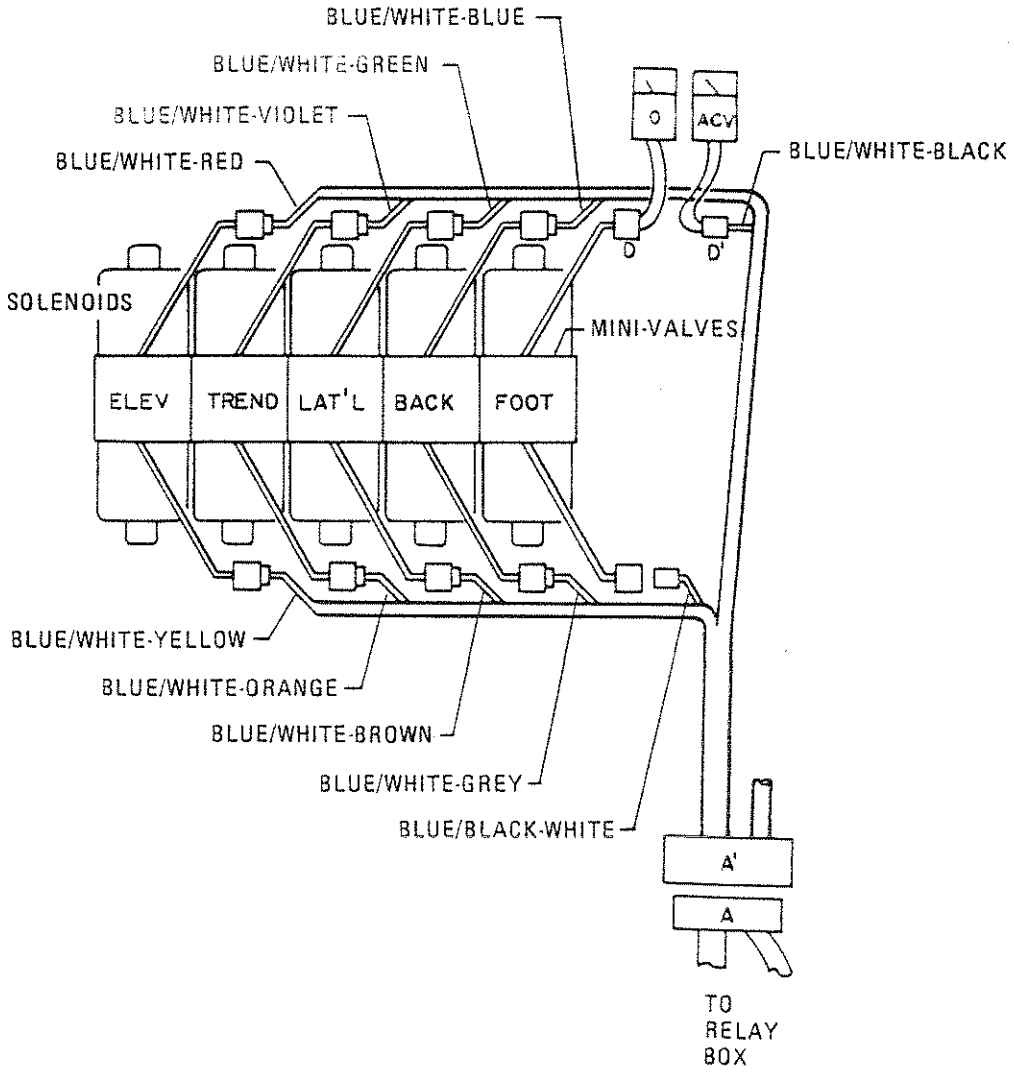


Figure 5-14. Model 5001 Solenoid Test

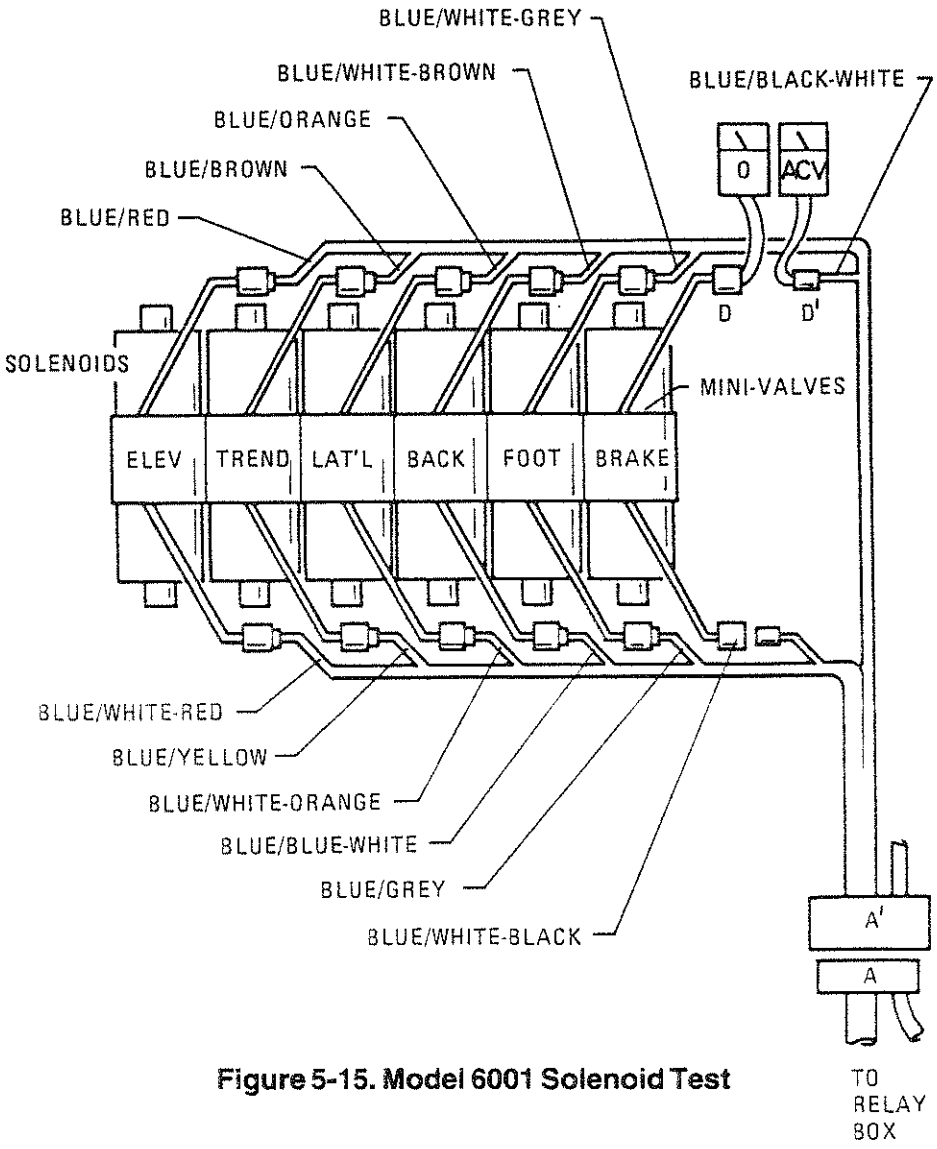


Figure 5-15. Model 6001 Solenoid Test

c. Test Results:

If you do not receive the correct voltage, the problem could be in the wires leading down to connector A'. The problem could also be in the relay box or the Pendant Control (refer to that section for troubleshooting).

If the correct voltage is obtained, everything is good up to that point and the problem is more than likely the solenoid.

d. Step #2

The solenoid can be checked out using an ohmmeter R x 1 scale.

1. Measure the resistance between the two pin connector in question, connector D shown for example in Figures 5-14. and 5-15. Connector must be disconnected. Polarity of meter leads is not important.

2. The meter should read approximately 80-90 ohms at room temperature.

3. Measure the resistance between either pin and ground.

4. Meter should read infinity.

e. Test Results:

If the solenoid does not check out with the meter, it is more than likely defective and must be replaced.

NOTE

Whenever there are several components of the same type, a defective unit can also be detected by substituting a known good unit or wire connector. In some cases this may be faster than using a multimeter.

5-6. Motor/Pump Assembly

The electric motor is a capacitor start type with a rating of 120 VAC, 200 watts. The field windings are protected with a thermal protector that will open the winding circuit if the motor is run continuously for approximately 10 minutes. This protector will take about 10 minutes to automatically reset. The oil pump unit is attached to the bottom of the motor and is a gear type displacement pump with a pumping capacity of .4 liter per min. The Motor/Pump Assembly is mounted on an insulated motor plate in the base of the table. The starting capacitor is mounted alongside the hydraulic mini-valves.

a. Motor/Pump Test

The following tests will check the voltage applied to the motor and the resistance of the motor field windings.

CAUTION

Line voltage will be measured in this test. Do not touch uninsulated connector pins or meter test leads.

b. Step #1

1. Plug the power cord into 120 VAC supply (wall receptacle). Turn main switch ON.

2. Disconnect the 3 pin connector C' and C at the motor. Leave all other connectors connected. See figure 5-16.

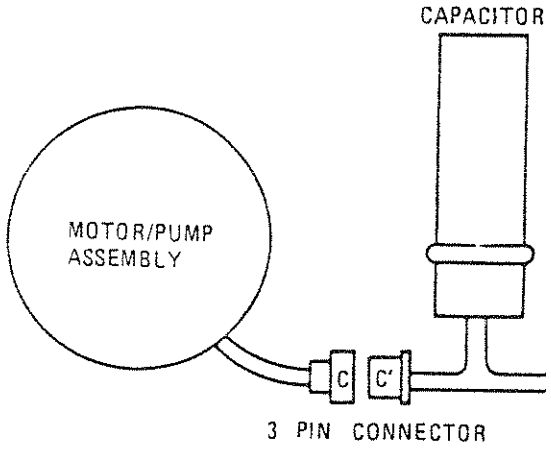


Figure 5-16.

3. Use a voltmeter capable of measuring 120 VAC and measure the following connector pins in connector C'. See figure 5-17.

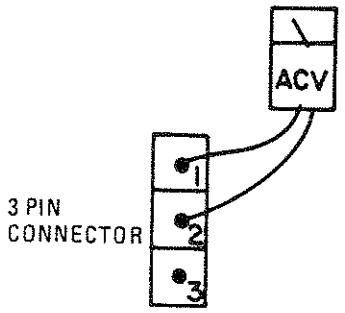


Figure 5-17. Back View Connector C'

CONNECTOR C' COLOR CODE

1 - Red
2 - Blue
3 - Yellow

+ Test Lead	– Test Lead	Meter Readings AC Volts
1	2	120 ACV
1	3	120 ACV
2	3	OV

c. Test Results:

If you do not receive the correct meter readings, the problem could be in the wires, connectors, relay box, or main switch (refer to that section for troubleshooting).

If the correct voltage is obtained, everything is good up to that point and the problem could be either the motor or the starting capacitor.

d. Step #2

If the starting capacitor is shorted or grounded the motor will not run. Capacitors very seldom fail,-and it requires a dielectric tester to accurately test one. However, an ohmmeter can be used to determine if the capacitor will store a low voltage charge and most of the time this is adequate.

1. Turn the main switch OFF.

2. Connectors C' and C should be disconnected.

3. Use the R x 100 scale of the ohmmeter and touch pins 2 and 3 of connector C'. See figure 5-17.

e. Test Results:

The meter needle should move up scale and then back down to infinity. This would indicate that the capacitor is storing an electrical charge.

NOTE

The capacitor may have to be discharged first (by shorting pins 2 and 3 together) before you will be able to see the ohmmeter needle swing up the scale.

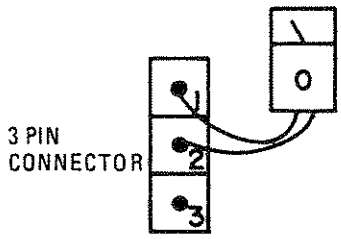


Figure 5-18. Back View Connector C

CONNECTOR C COLOR CODE
1 - Red
2 - White
3 - Yellow

f. Step #3

The motor windings can be statically checked for resistance using an ohmmeter.

1. Turn main power switch OFF.

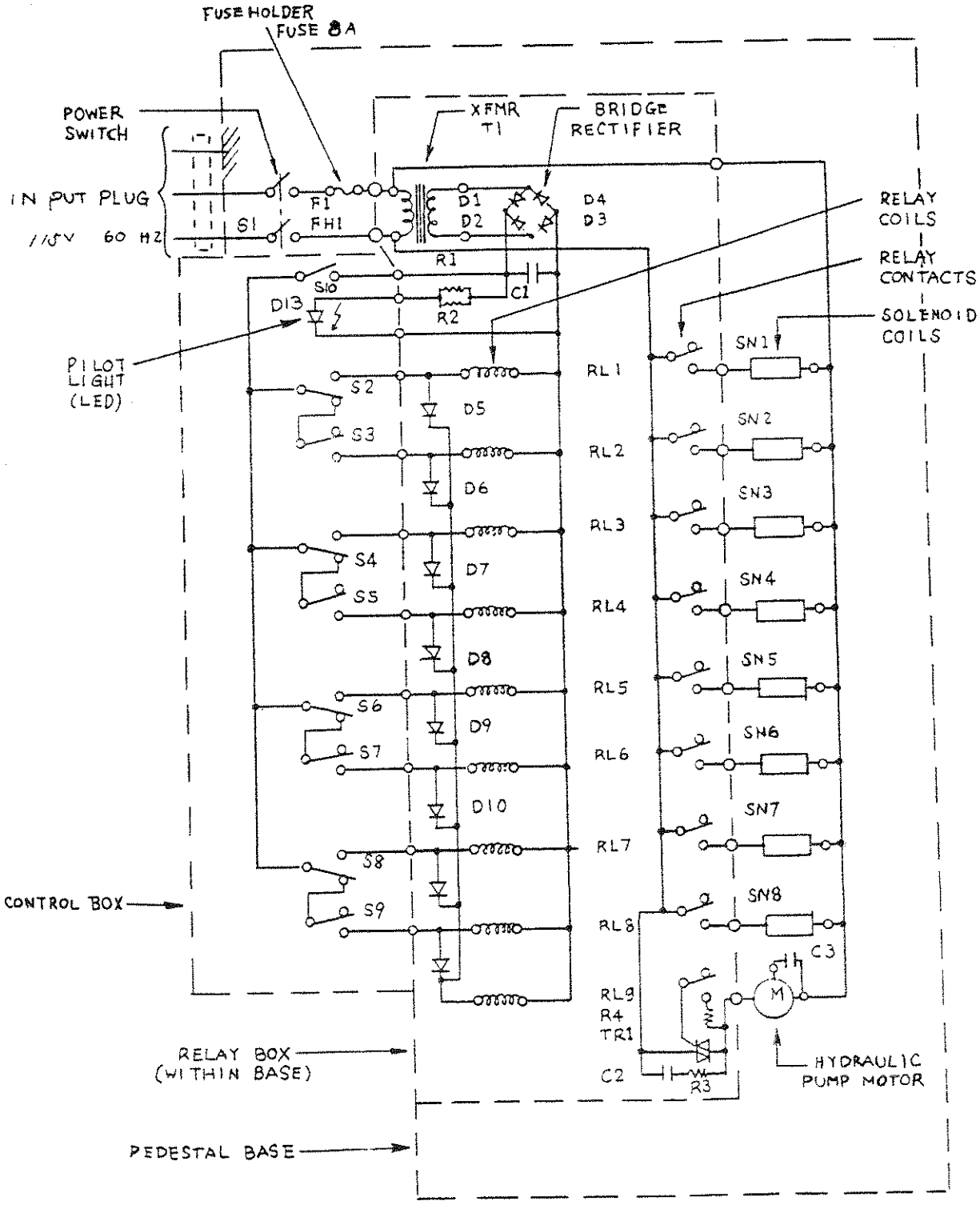
2. Connectors C' and C should be disconnected.

3. Use the R x 1 scale of the ohmmeter and measure the resistance between the pins located in 3 pin connector C shown on the chart. See figure 5-18.

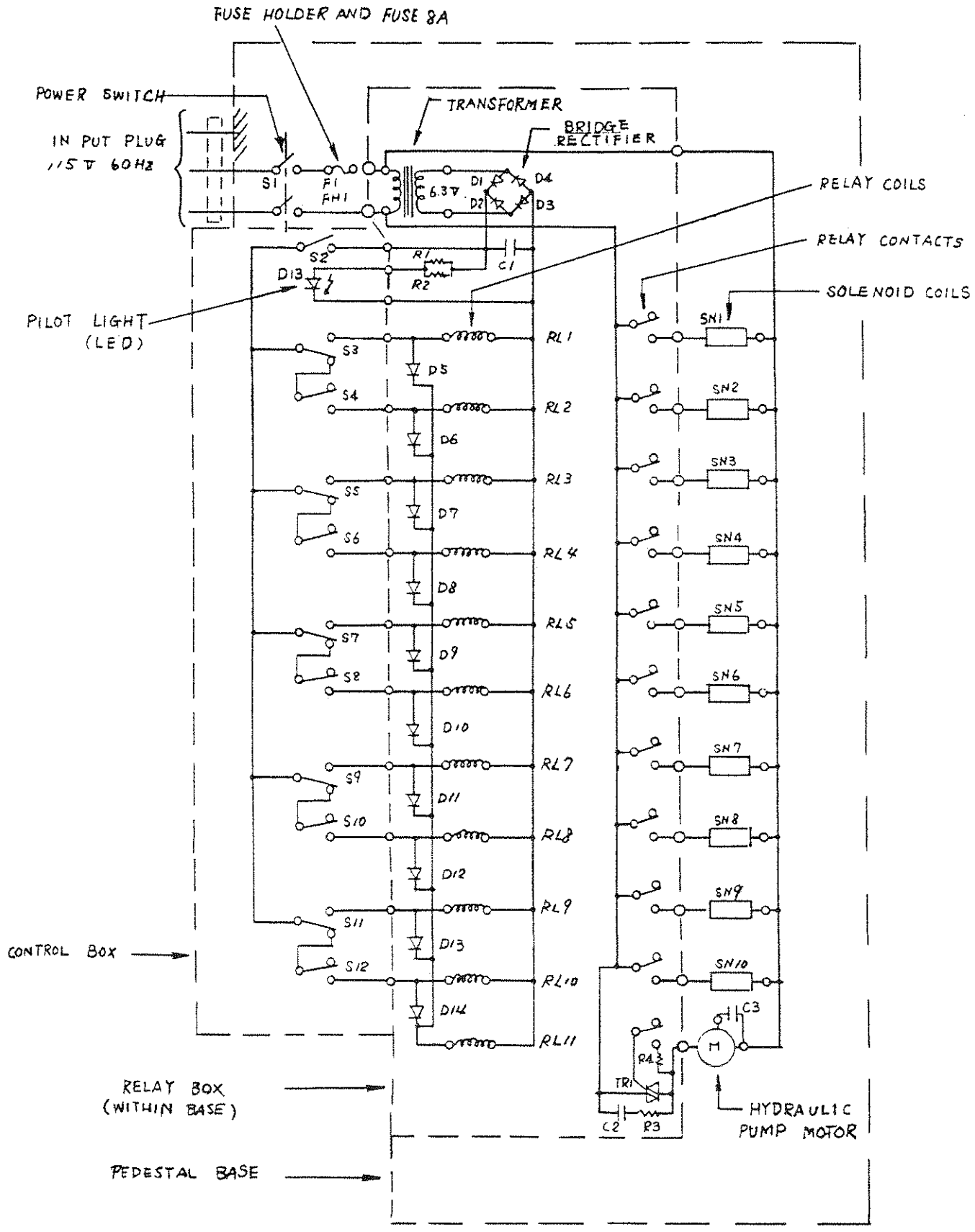
+ Test Lead	– Test Lead	Meter Reading
1	2	Approx. 5 Ohms
1	3	Approx. 4 Ohms
2	3	Approx. 8 Ohms

g. Test Results:

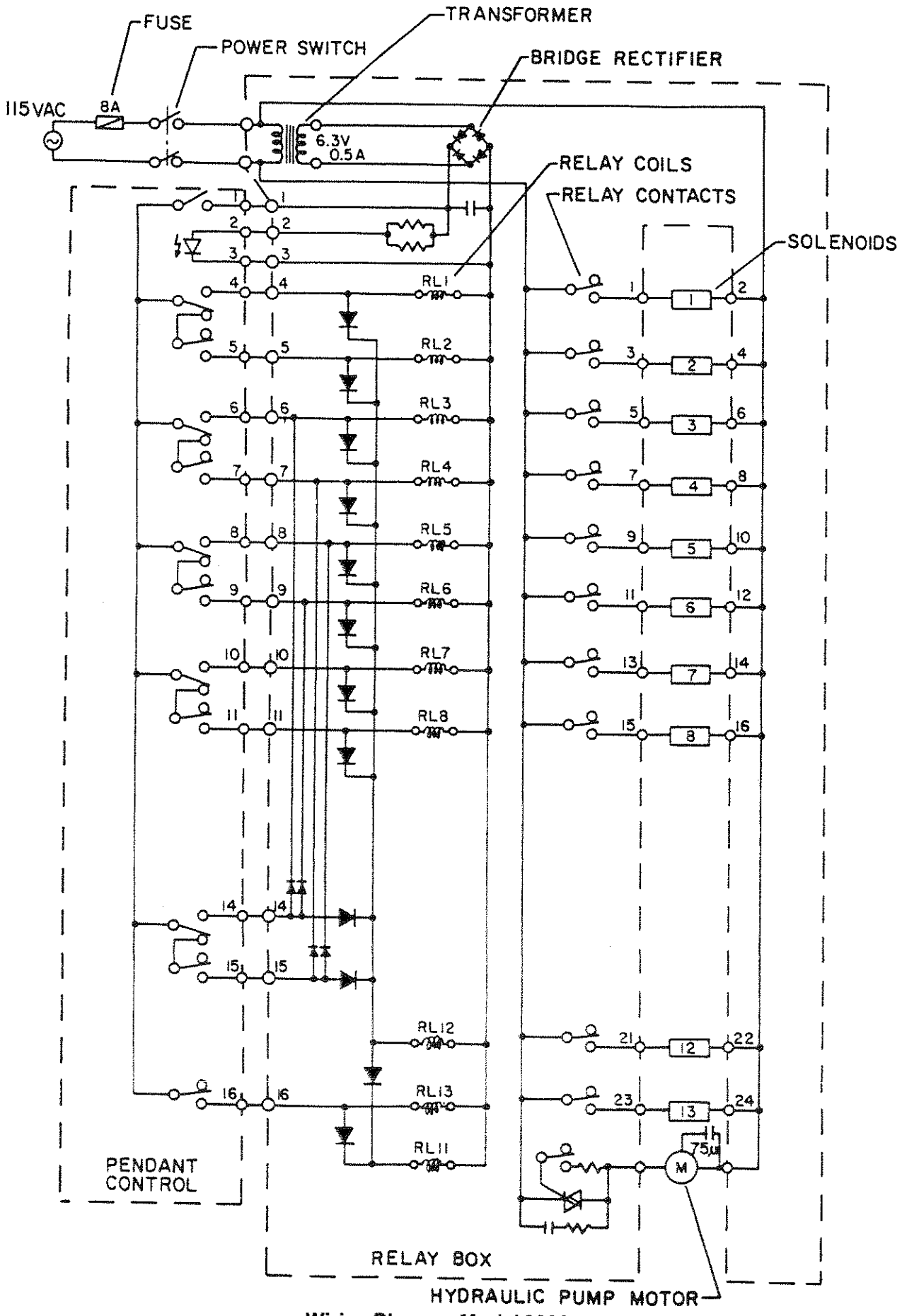
If you do not receive the correct meter readings, the motor or wiring is defective.



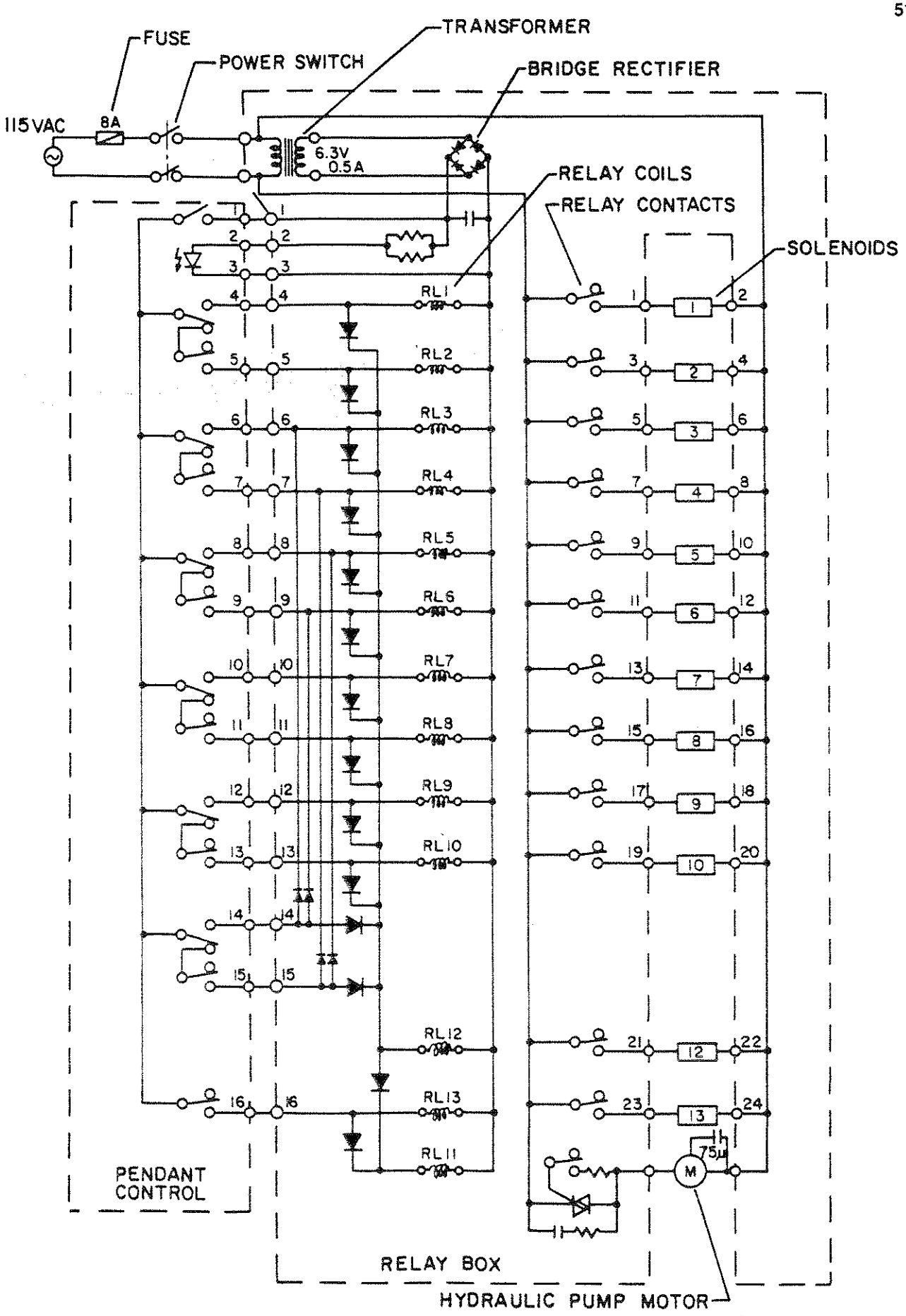
Wiring Diagram Model 5000



Wiring Diagram Model 5001



Wiring Diagram Model 6000



Wiring Diagram Model 6001