

***ELITE SERIES SURGICAL TABLES  
MAINTENANCE MANUAL***



***MODEL ELITE 6600  
INCLUDING BATTERY MODELS***



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## WARNING



Indicates a possibility of personal injury.

## NOTE

Indicates important facts or helpful hints.



## CAUTION



Indicates a possibility of damage to equipment.

## **BASIC RECOMMENDED TOOLS:**

1/8". 1/4" STRAIGHT BLADE SCREWDRIVERS  
#2 PHILLIPS SCREWDRIVER  
HYDRAULIC PRESSURE GAUGE SKYTRON P.N. 6-050-02  
METRIC ALLEN® WRENCHES 1.5mm-8mm  
ADJUSTABLE CRESCENT WRENCH  
DIGITAL VOLTMETER, TRUE RMS  
METRIC OPEN END WRENCHES 7mm-18mm  
LEVEL (CARPENTERS)

## **BASIC RECOMMENDED MAINTENANCE PROCEDURES**

The basic items notes below should be inspected at a minimal interval period of 6 months (dependant on usage). For optimal usage, safety and longevity of the product, have it serviced only by an authorized Skytron representative with authentic Skytron replacement parts.

- Check Power Cord (if applicable)
- Check Pendant Control (if applicable)
- Check Oil Level in Reservoir
- Check For Hydraulic Leaks
- Check Pressure Relief Valve Setting
- Check All Table Functions
- Check Side Rails
- Check Velcro
- Check Lateral Tilt Housing Bolts
- Lubricate Elevation Slider Assembly with SKYTRON Slider Grease P/N D6-010-89
- Tighten X-Ray Top Stand-Offs, Use Loc-tite
- Lubricate Castors
- Check brake pads for wear and inspect brake cylinders for proper operation.



Only facility-authorized SKYTRON trained, maintenance personnel should troubleshoot the SKYTRON 6600 Surgical Table. Trouble shooting by unauthorized personnel could result in personal injury or equipment damage.

How to contact us:  
Skytron  
5000 36th St. SE, Grand Rapids, MI 49512  
PH: 1-800-759-8766 (SKY-TRON)  
FAX: 616-957-5053

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## EQUIPMENT LABELS AND SPECIFICATIONS

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INDICATES DANGEROUS VOLTAGE, 120 V, 60 Hz



CLASS I DEFIBRILLATION PROOF, TYPE B EQUIPMENT- IPX4 RATED.  
INTERNALLY POWERED EQUIPMENT



PROTECTIVE GROUNDING.  
IN ORDER TO ENSURE PROPER GROUNDING RELIABILITY,  
THIS TABLE MUST BE CONNECTED TO A PROPERLY GROUNDED  
HOSPITAL GRADE OUTLET.



CONNECTION FOR NEUTRAL CONDUCTOR SUPPLIED



UNIT TO BE USED ONLY IN SPECIFIED ENVIRONMENTAL CONDITIONS  
TEMPERATURE: 15° - 30° C (60° -85° F)  
HUMIDITY: 30% - 60% RELATIVE HUMIDITY, NON CONDENSING



AC VOLTAGE

**IPX4**

ENCLOSURE CLASS

**V**

VOLTAGE RATING OF THE UNIT

**A**

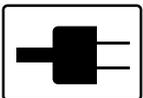
AMPERAGE RATING OF THE UNIT

**HZ**

FREQUENCY OF THE UNIT



ATTENTION, CONSULT MANUAL FOR FURTHER INSTRUCTIONS.  
INDICATES SPECIAL USER ATTENTION.

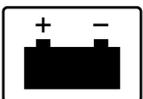


POWERED BY AC VOLTAGE

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## BATTERY MODELS

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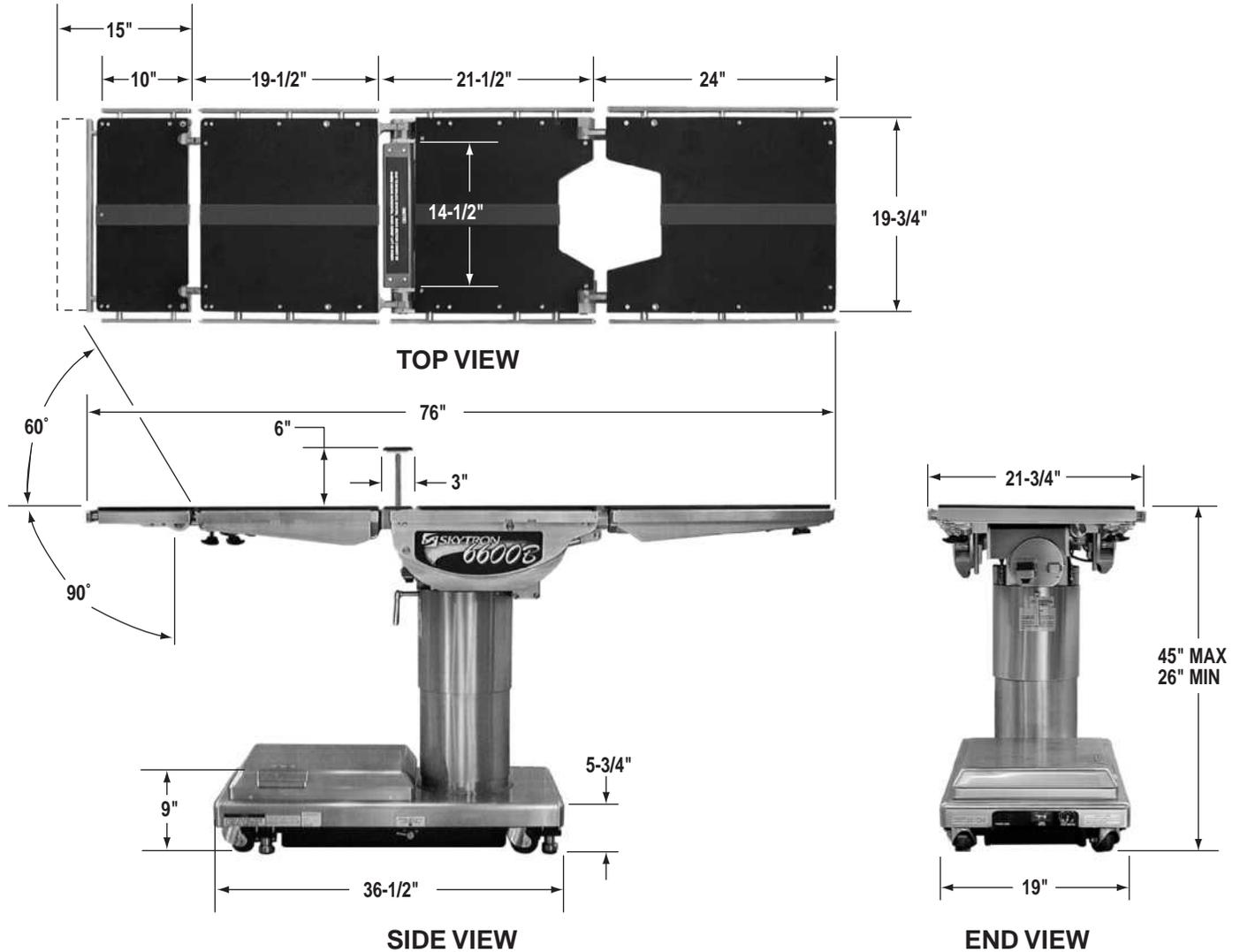
POWERED BY BATTERY

**BATTERY TYPE:** SEALED

LEAD ACID 12V, VALVE REGULATED  
16AH, 10HR (530W/10MIN)

**FUSE:** **15A** 15 AMP FAST ACTING INTERNAL FUSE

## 6600 Series General Purpose Surgical Table Specifications



### Electrical Specifications

Power requirements

Current Leakage

Power Cord

120 VAC, 60Hz, 450 Watts

Less than 100 micro amps

15 feet w/hospital grade connector(removeable)

### ENTECLA CERTIFIED

TO UL2601-1

CAN/CSA601.1, IEC 60601-2-46





## SECTION I HYDRAULIC SYSTEM

### 1-1. General

#### Electro-Hydraulic System

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 120 VAC, 5 amp, 60 Hz.

The table contains the following components. Refer to the block diagram (figure 1-1) for relationship.

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

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

c. Pressure Relief Valve - Provides an alternate oil path when the hydraulic cylinders reach the end of their stroke.

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

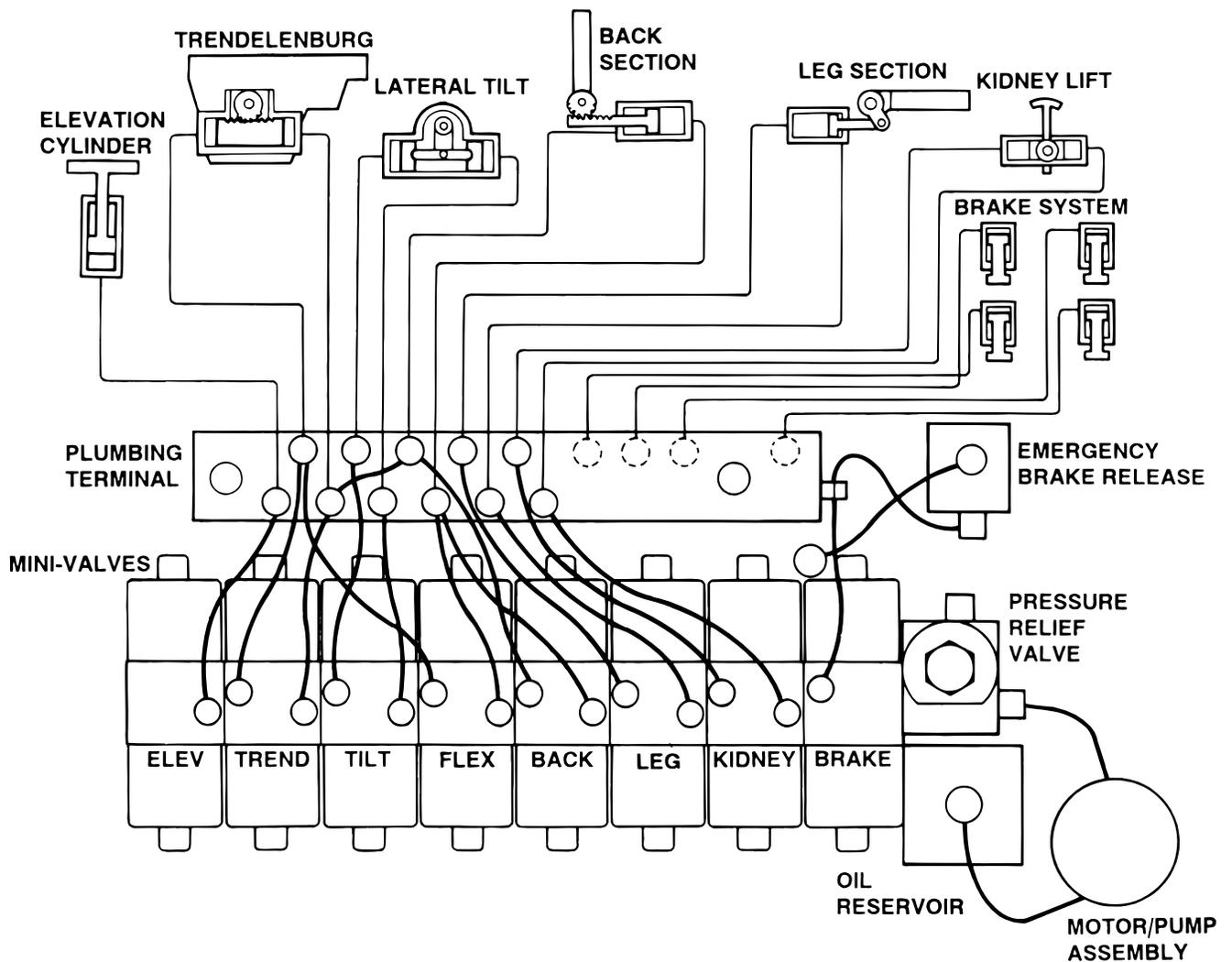


Figure 1-1. Hydraulic Block Diagram

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

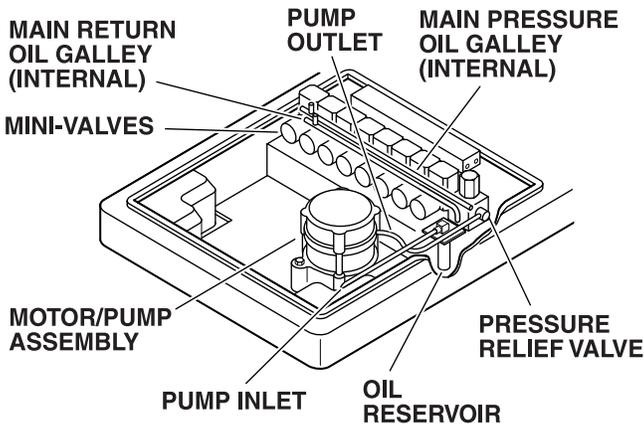
f. Hydraulic Cylinders - They convert the hydraulic fluid pressure and volume into mechanical motion.

**1-2. Component Operation**

**a. Motor/Pump Operation**

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 has 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 1-2.

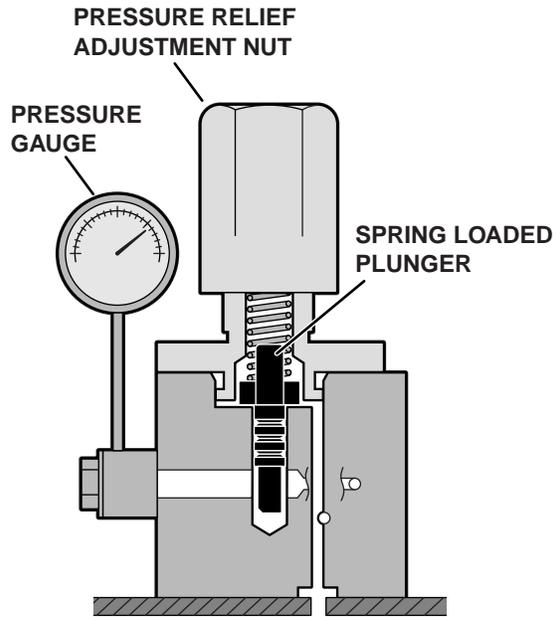


**Figure 1-2.**

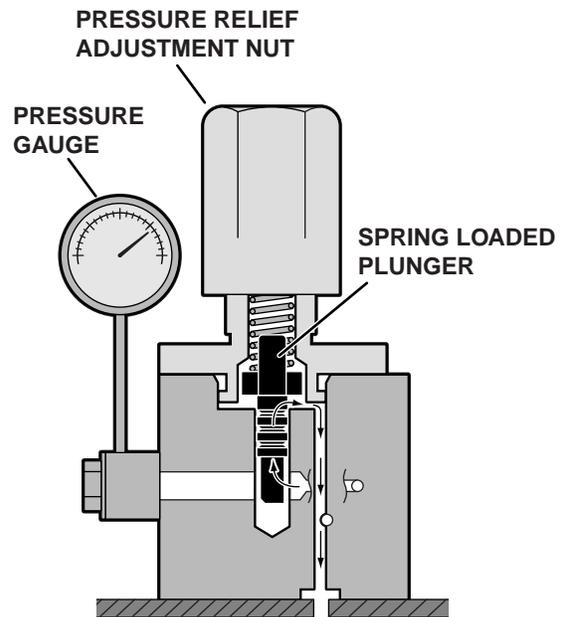
**b. Pressure Relief Valve**

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, and the return oil galley, that internally connect to the reservoir. See figure 1-3.

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. See figure 1-4. 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.)



**Figure 1-3. Pressure Relief Valve Not Functioning**



**Figure 1-4. Pressure Relief Valve Functioning**

### c. Mini-Valves

The operation of the mini-valves is identical for all table functions except the elevation and brake circuits. These two hydraulic circuits use a 3-way (single check valve) type mini-valve. All other functions use a 4-way (dual check valve) type mini-valve.

Either type mini-valve is controlled by two pushing type, electrically operated solenoids. The solenoids 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 the function. The spool valve also opens an oil return circuit which allows the oil to return to the oil reservoir.

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

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

2. Pilot Plunger - There are two plungers in a four-way mini-valve (one in a 3-way mini-valve), one under each check valve. The purpose of the pilot plungers is to mechanically open the return check valve allowing the oil to return back into the reservoir.

3. Check Valve - Two are provided in each four-way mini-valve to seal the oil in the cylinders and oil lines and prevent any movement of the table. One check valve is provided in a 3-way mini-valve.

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 surface movement. A 3-way mini-valve has only one speed adjustment.

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.

### d. Mini-Valve in Neutral Position

(No fluid flow) See figure 1-5.

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.

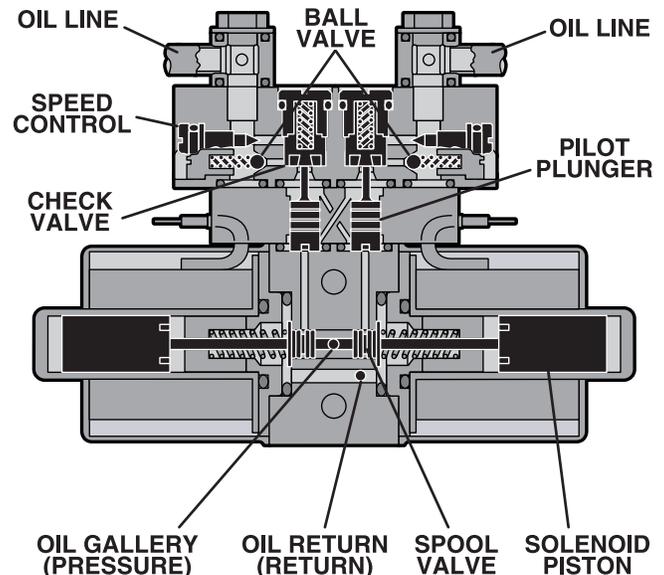
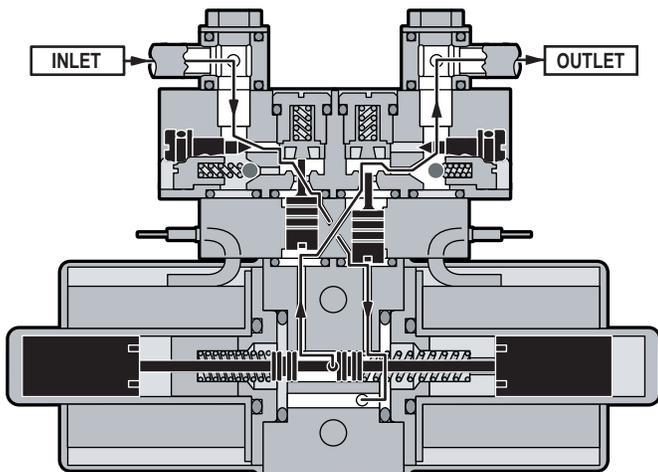


Figure 1-5. Mini-Valve in Neutral Position

### e. Mini-Valve Right Port Activated

(See figure 1-6)

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



**Figure 1-6. Mini-Valve Right Port Activated**

1. Spool Valve - Pushed to the left by electric solenoid. This opens the internal oil pressure galley allowing the fluid to go through the check valve and on to the cylinder. Also, 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.

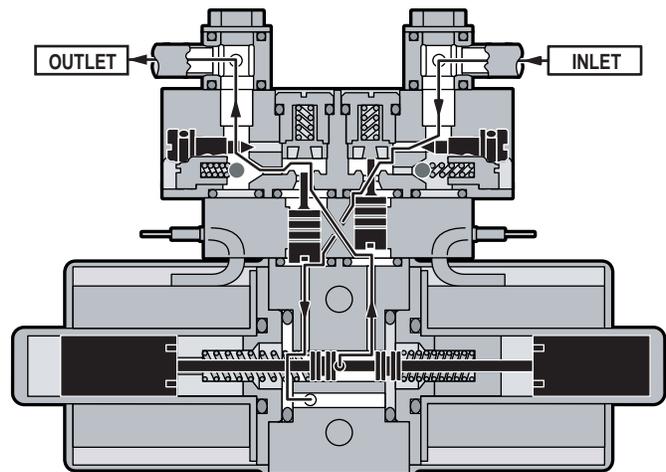
3. Check Valves - Both check valves are opened in this operation mode. The right check valve is pushed open by the oil pressure created by the pump. The oil then continues to go through the lines and pushes the slave cylinder piston to the left. At the same time, the left check valve is held open mechanically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

### f. Mini-Valve Left Port Activated

(See figure 1-7.)

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



**Figure 1-7. Mini-Valve Left Port Activated**

1. Spool Valve - Pushed to the right by electric solenoid. This opens the internal oil pressure galley allowing the fluid to go through the check valve and on to the cylinder. Also, 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.

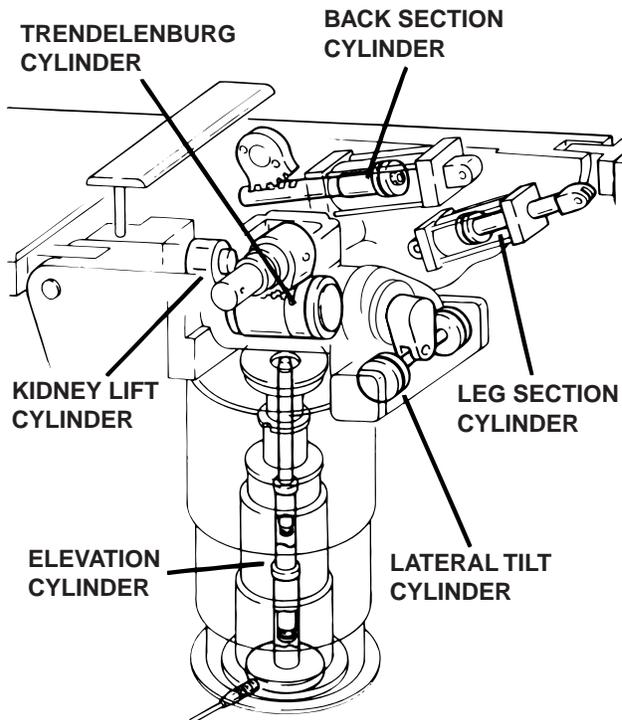
3. Check Valves - Both check valves are opened in this operation mode. The left valve is pushed open by the oil pressure created by the pump. The oil then continues to go through the lines and pushes the slave cylinder piston to the right. At the same time, the right check valve is held open mechanically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

## g. Hydraulic Cylinders (Slave Cylinders)

There are several different types of hydraulic cylinders used in the table that activate the control functions. With the exception of the elevation and brake cylinders, all operate basically the same way. The control functions are listed below. See figure 1-8.

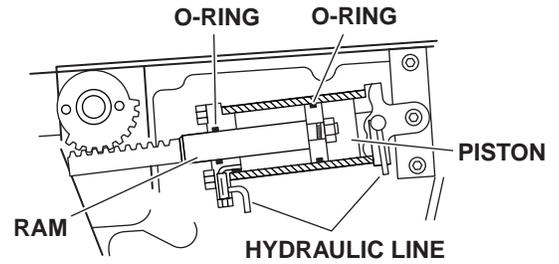
- Back Section--2, double action cylinders
- Leg Section--2, double action cylinders
- Trendelenburg--1, double action cylinder
- Lateral Tilt--1, double action cylinder
- Elevation--1, single action cylinder
- Kidney Lift--1, double action cylinder
- Brakes--4, single action cylinders



**Figure 1-8. Cylinder Placement**

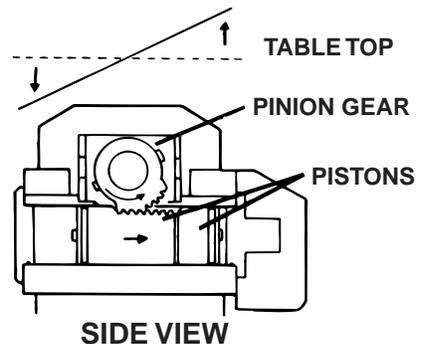
1. Back Section and Leg Section Cylinders - The double action cylinders are closed at one end and have a movable piston with hydraulic fluid on both sides. Connected to this piston is a ram or shaft that exits out of the other end of the cylinder. Through the use of either a gear, or clevis and pin arrangement, 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 the cylinder on 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 1-9.



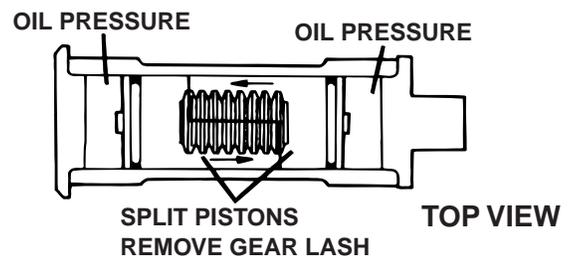
**Figure 1-9. Back Section Cylinder**

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 by bearings at either side. When hydraulic fluid is pumped into one side of the cylinder, the pistons are pushed in one direction, 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 1-10.



**Figure 1-10. Trendelenburg Cylinder Assy.**

In order to remove any looseness or play in the table top, the trendelenburg pistons are made in two pieces as shown in figure 1-11. 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 1-11. Trendelenburg Cylinder Pistons**

3. Lateral Tilt Assembly - The lateral tilt assembly consists of two cylinders, pistons and connecting rods. The connecting rods attach to the lateral tilt lever which connects to the table side frames. When hydraulic fluid is pumped into one cylinder, the piston and connecting rod pushes the lateral tilt lever which tilts the table top to one side. To tilt the table top in the opposite direction, fluid is pumped into the opposite cylinder. See figure 1-12.

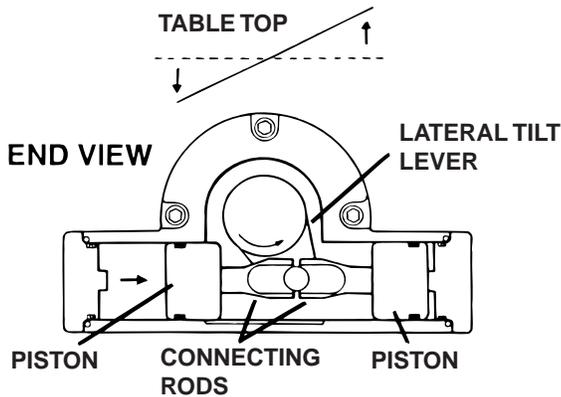


Figure 1-12. Lateral Tilt Cylinder Assembly

4. Elevation Cylinder - This single action cylinder 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 two stage cylinder is 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 slider support assembly is used to support the weight of the upper table section. A stainless steel shroud covers the flexible hydraulic hoses and slider. See figure 1-13.

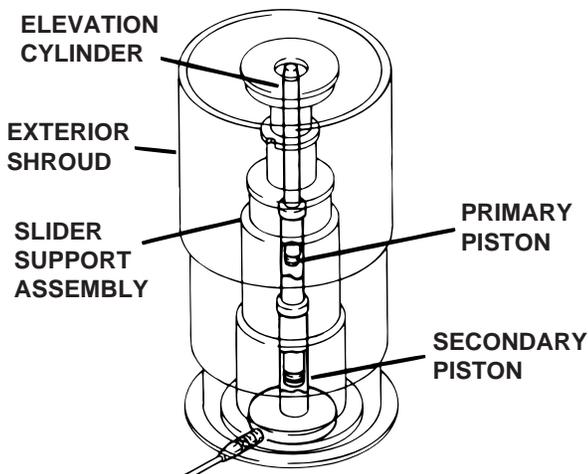


Figure 1-13. Elevation Cylinder Assembly

5. Kidney Lift - The kidney lift cylinder assembly is a unique type of double action cylinder where the piston remains stationary and the outer housing or cylinder has the relative motion. The cylinder housing has rack teeth cut into the top which meshes with a pinion gear. This gear meshes with other gears to supply the up or down drive for the kidney lift bars, depending on which direction the oil is pumped into the cylinder. See figure 1-14. A cross shaft transmits the rotary motion of the cylinder pinion gear to a gear set on the other side of the table. This enables the kidney lift bars to move up and down together without binding.

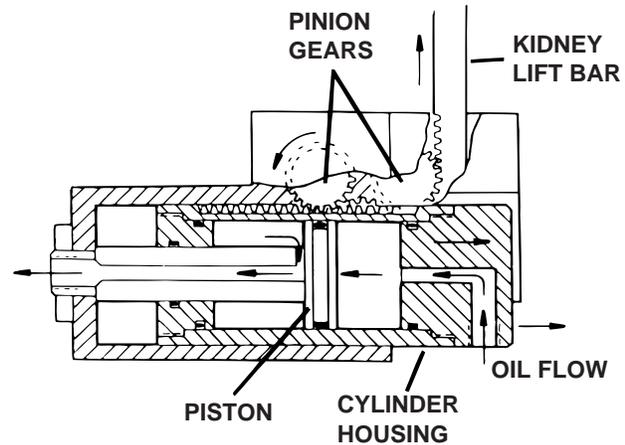


Figure 1-14. Kidney Lift Cylinder Assembly

6. Brake Cylinders - The brake cylinders are single action type similar to the elevation cylinder. The movable piston's ram is connected to a brake pad. See figure 1-15. Oil pumped into the top of the cylinder pushes the piston down raising 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 mini-valve to the reservoir.

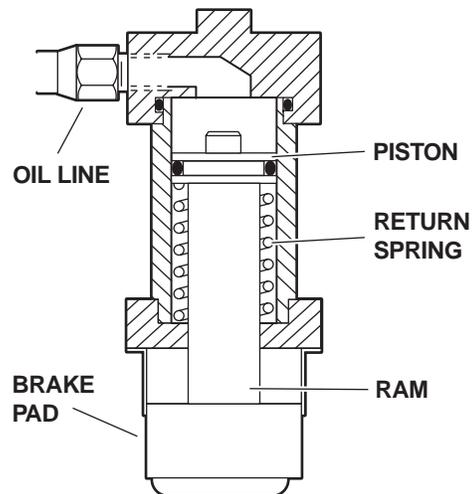


Figure 1-15. Single Action Brake Cylinder

## h. Elevation Cylinder Return Circuit

A three-way (single check valve type) 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 1-16. The open check valve allows a path for the oil in the elevation cylinder to return to the reservoir. 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.

The mini-valve used in the elevation circuit contains only one check valve (all four-way mini-valves use two check valves). The check valve is used to trap the oil in the elevation cylinder thereby supporting the table top. When the top is being lowered the check valve is mechanically held open by the pilot plunger through pump pressure.

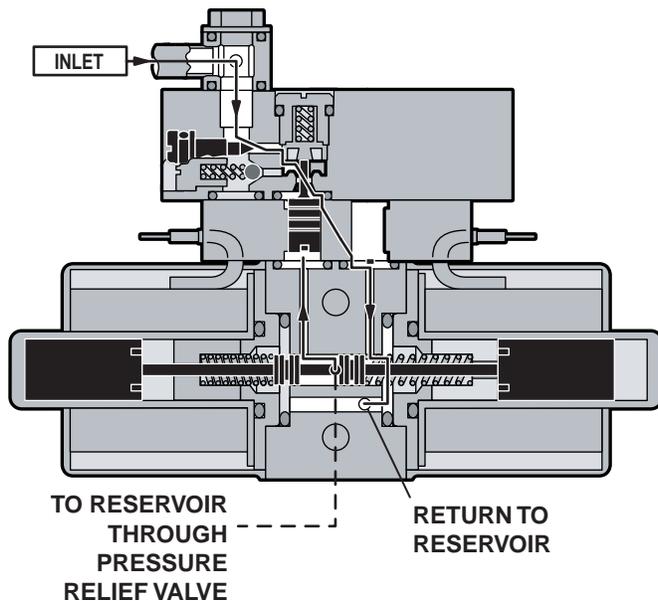


Figure 1-16. Elevation Return Circuit

## i. Brake System

The brake system consists of the following components: (figure 1-17)

1. Single action slave cylinders (4 each).
2. 3-way (single check valve type) mini-valve.

3. Manually controlled emergency brake release.
4. Plumbing terminal, flexible hoses, copper lines and "O" rings.
5. Portions of the electrical system.

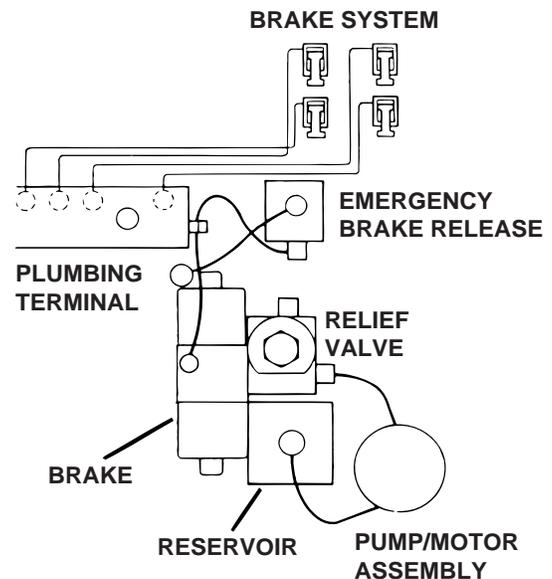


Figure 1-17. Brake System Block Diagram

Each corner of the cast-iron table base has a hydraulic brake cylinder. These single action cylinders are hydraulically connected in parallel to the mini-valve and all four are activated together. It is normal for one corner of the table to raise before the others due to the weight distribution of the table.

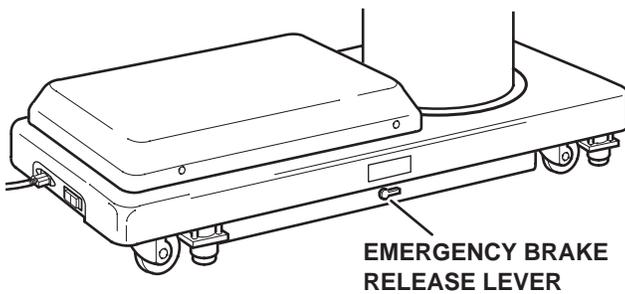
An electronic timer in the relay box is activated when any function on the pendant control is pushed momentarily. The pump/motor and brake system mini-valve are activated and the brake cylinders are completely set. The electronic timer runs for approx. 8-10 seconds.

The brakes are released by pushing the BRAKE UNLOCK button momentarily. An electronic timer in the relay box activates the brake function hydraulic mini-valve and pump/motor.

When activated, the return hydraulic circuit operates similar to the elevation cylinder return circuit. Return springs inside the single action brake cylinders retract the brake pads and provide the pressure to return the hydraulic oil back to the reservoir. The electronic timer operates the return circuit for approximately 8-10 seconds.

**j. Emergency Brake Release**

The emergency brake release is simply a manually operated bypass valve connected in parallel to the brake cylinders and the oil reservoir. See figure 1-18. When the valve is opened (turned counter-clockwise) a return circuit for the brake hydraulic fluid is opened. The return springs force the pistons up pushing the hydraulic oil back into the reservoir and retracting the brake pads.



**Figure 1-18.**

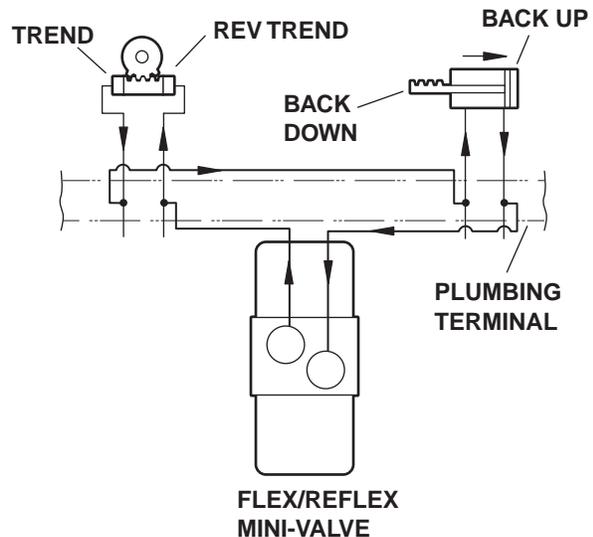
**NOTE**

- The emergency brake release valve must be tightened securely when not in use.
- If the emergency brake release valve has been operated, the UNLOCK button on the pendant control may have to be pressed before brakes will lock again.

If the emergency brake release valve is open or loose, the brakes will release slowly- depending on how loose the valve is, this could take anywhere from a few minutes to several hours.

**k. Flex/Reflex System**

The Flex/Reflex system incorporates an additional mini-valve which connects the trendelenburg and back section hydraulic systems in a series. When FLEX is activated by the pendant control, the Flex/Reflex mini-valve opens the oil pressure path to the Reverse Trendelenburg piston. The return oil path from the Trendelenburg piston is routed through the back section cylinder to the mini-valve return port. See figure 1-19



**Figure 1-19. Flex/Reflex System**

### 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 1-20.

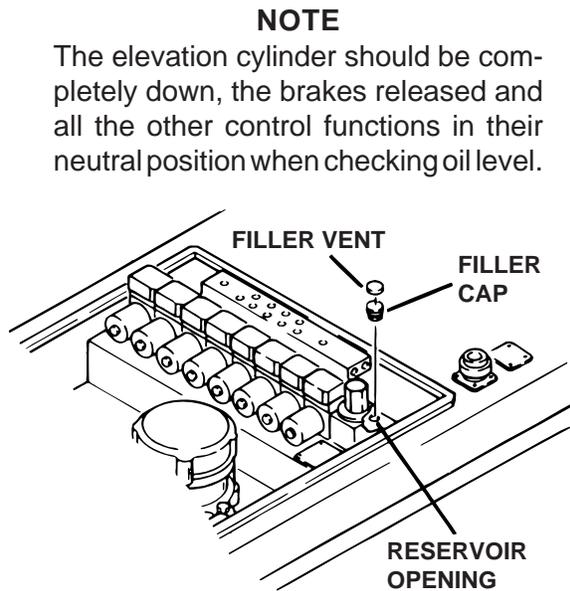


Figure 1-20.

The type of oil that should be used is Mobil DTE #25 or equivalent. This is a very high quality hydraulic oil. The table requires approximately two quarts of oil to operate properly. Exercise caution when determining equivalence to avoid damage to the hydraulic system.

#### 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. Then operate the function until it stalls in both directions.

#### c. Pressure Relief Valve

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

To adjust:

1. Remove the blind cap and attach a hydraulic pressure gauge to the main oil galley using a 6mm plumbing bolt. See figure 1-21.

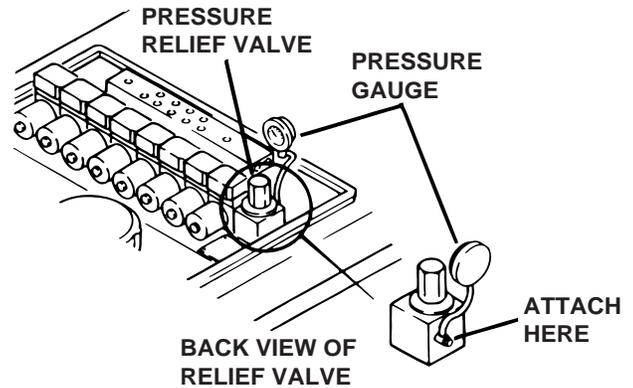


Figure 1-21.

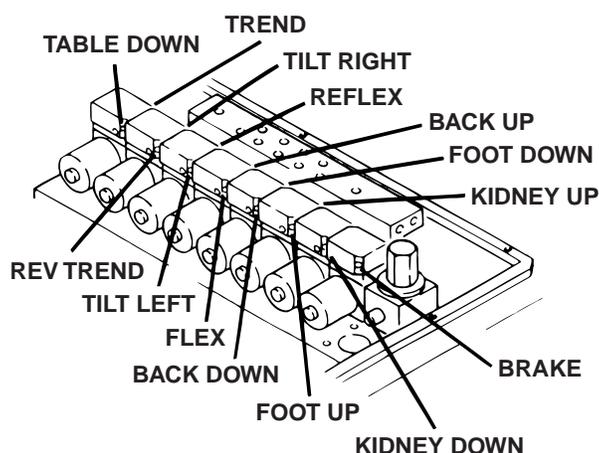
2. Raise the table top until the piston reaches the end of its stroke and stalls. Observe reading on pressure gauge and turn the adjustment nut (clockwise to increase oil pressure, counter-clockwise to decrease) until desired reading is obtained. Pressure should be 8MPA (80KG/CM<sup>2</sup> - 1138 PSI). An erratic reading and/or inability to adjust to the recommended setting may indicate the need for replacement of the pressure relief valve.

#### d. Speed Controls

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

All four-way mini-valves, have two speed controls located in the ends of each valve body. All three-way mini-valves have only one speed control.

One speed control adjusts one direction of a particular function and the opposite speed control adjusts 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. See figure 1-22.



**Figure 1-22.**

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. Use the second hand on a watch and time a particular function. Match that time in the opposite direction by opening or closing the speed control. Approximate operating times are as follows:

Lateral Tilt	7 seconds
Back Up	25 seconds
Back Down	15 seconds
Kidney Lift	7 seconds

A pressure gauge should be used to set the speed of the back section, trendelenburg and flex control functions.

To adjust:

1. Attach the pressure gauge onto the main oil galley as shown in figure 1-21.
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	Up	65KG/CM <sup>2</sup> -925PSI
	Dn	65KG/CM <sup>2</sup> -925PSI
Trendelenburg	Up	65KG/CM <sup>2</sup> -925PSI
	Dn	65KG/CM <sup>2</sup> -925PSI
Flex		70KG/CM <sup>2</sup> -995PSI
Reflex		70KG/CM <sup>2</sup> -995PSI

**NOTE**

When adjusting Flex/Reflex speed controls, set Reflex last.

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.

## SECTION II MECHANICAL TABLE ADJUSTMENTS

### 2-1. Back Section Gear Mesh Adjustment

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 between the gears that might occur.

To adjust:

Loosen the cam locking allen set screw. Use an allen wrench to rotate the eccentric cam. See figure 2-1. Tighten the locking set screw when adjustment is complete.

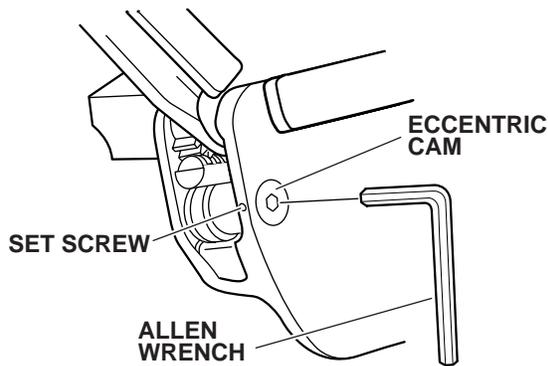


Figure 2-1. Eccentric Cam Adjustment

### 2-2. Hydraulic Cylinder Adjustment

The hydraulic cylinder rams that control both the back and foot / leg sections 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 cams for the back section.

#### a. Back Section

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:

Remove the seat section top for access to the cam locking set screws and loosen the set screws. Use an allen wrench to turn the cylinder eccentric cams as required to shift either cylinder fore or aft as needed so no twisting or flexing of the back section is observed when it is stalled in the full up position. See figure 2-2. Tighten the set screws and replace the seat section top when the adjustment is completed.

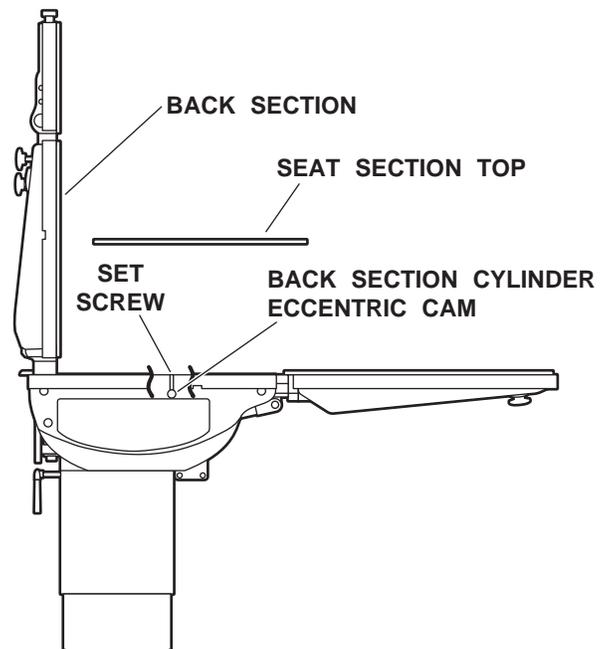


Figure 2-2. Back Section Adjustment

#### b. Leg Section

Position the leg section all the way up. 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 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 and an adjustment is required.

## NOTE

The leg section cylinder eccentric cam is located under the nameplate on the side casting. To make an adjustment, the nameplate will have to be removed and a new nameplate will have to be installed when the adjustment is completed.

To adjust:

Loosen the cam locking set screws located inside the table side frames. See figure 2-3. Use an allen wrench to turn the cylinder eccentric cams as required to shift either cylinder fore or aft as needed so no twisting or flexing of the leg section is observed when it is stalled in the above horizontal position. Tighten set screws when proper adjustment is achieved.

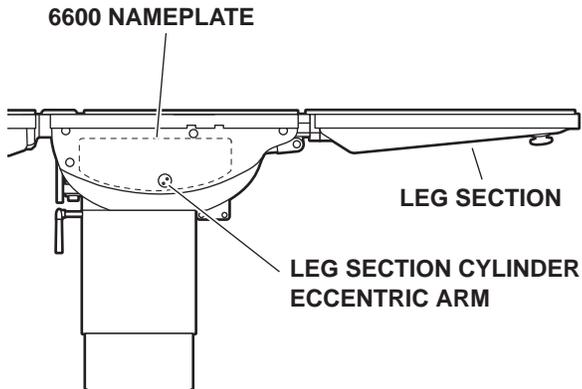


Figure 2-3. Leg Section Adjustment

## 2-3. Head Section Adjustment

The head section can be adjusted to eliminate any flexing throughout its range of travel.

To adjust:

Place the head section in level position and remove the top. See figure 2-4. Loosen but do not remove the allen bolts securing the bearing block to the frame. Loosen the allen bolt in the top of the frame and turn the set screw as required to achieve proper adjustment. One or both of the blocks may require adjustment to achieve proper alignment. Tighten all allen bolts when adjustment is complete. Test the head section throughout its range of travel. Re-adjust as needed. Replace top section when proper adjustment is achieved.

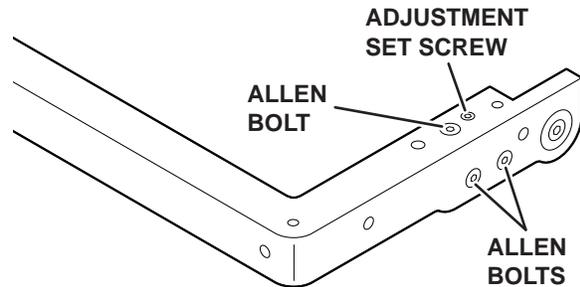


Figure 2-4. Head Section Adjustment

## 2-4. Torque Specifications

If the bolts for the Trendelenburg end caps or the lateral tilt housing are removed, refer to figure 2-5 for the proper torque specifications when installing the bolts.

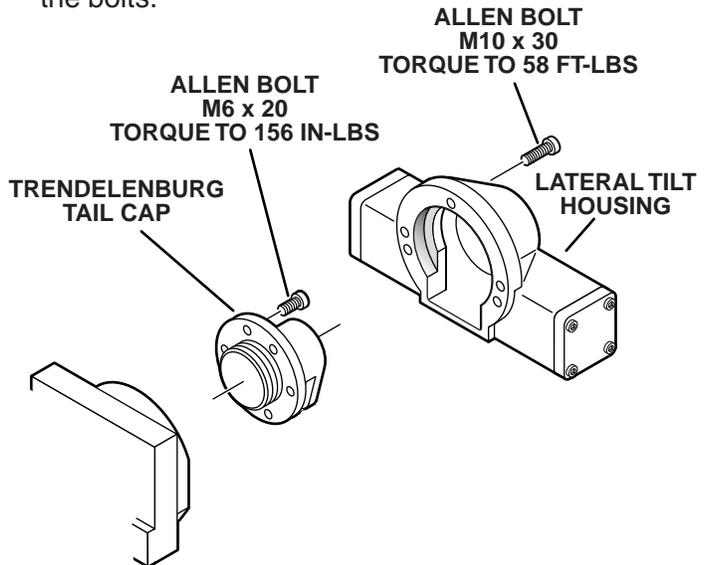


Figure 2-5. Torque Specifications

## NOTE

Trendelenburg Head Cap Bolts Torque to 120in-lbs

## SECTION III HYDRAULIC TROUBLESHOOTING

### 3-1. Precautions

Before attempting to troubleshoot 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  
Leg Section  
Kidney Lift

When working on the trendelenburg or lateral tilt hydraulic circuits, be sure to support the table top. When working on the brake system make sure the brakes are completely retracted.



#### WARNING



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. Slave Cylinder
3. 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.



#### CAUTION



When installing new "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 appropriate oil circuit diagram and the list of possible problems.

### 3-3. ELEVATION DIAGNOSIS CHART

**Problem**

Table will not elevate properly

**Reason**

- 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
- Leaking Cylinder Hose
- Uneven Weight Distribution

Table will not descend properly

- Incorrect Speed Adjustment
- Bad Check Valve
- Spool Valve Not Centered
- Galled Slider Assembly
- Defective Solenoid or Wiring
- Defective Relay Box or Pendant Control
- Uneven Weight Distribution

Table loses elevation

- Bad Check Valve
- Leaking Mini-Valve
- Loose Fittings, Joints, Hoses
- Leaking "O" Ring Inside Cylinder

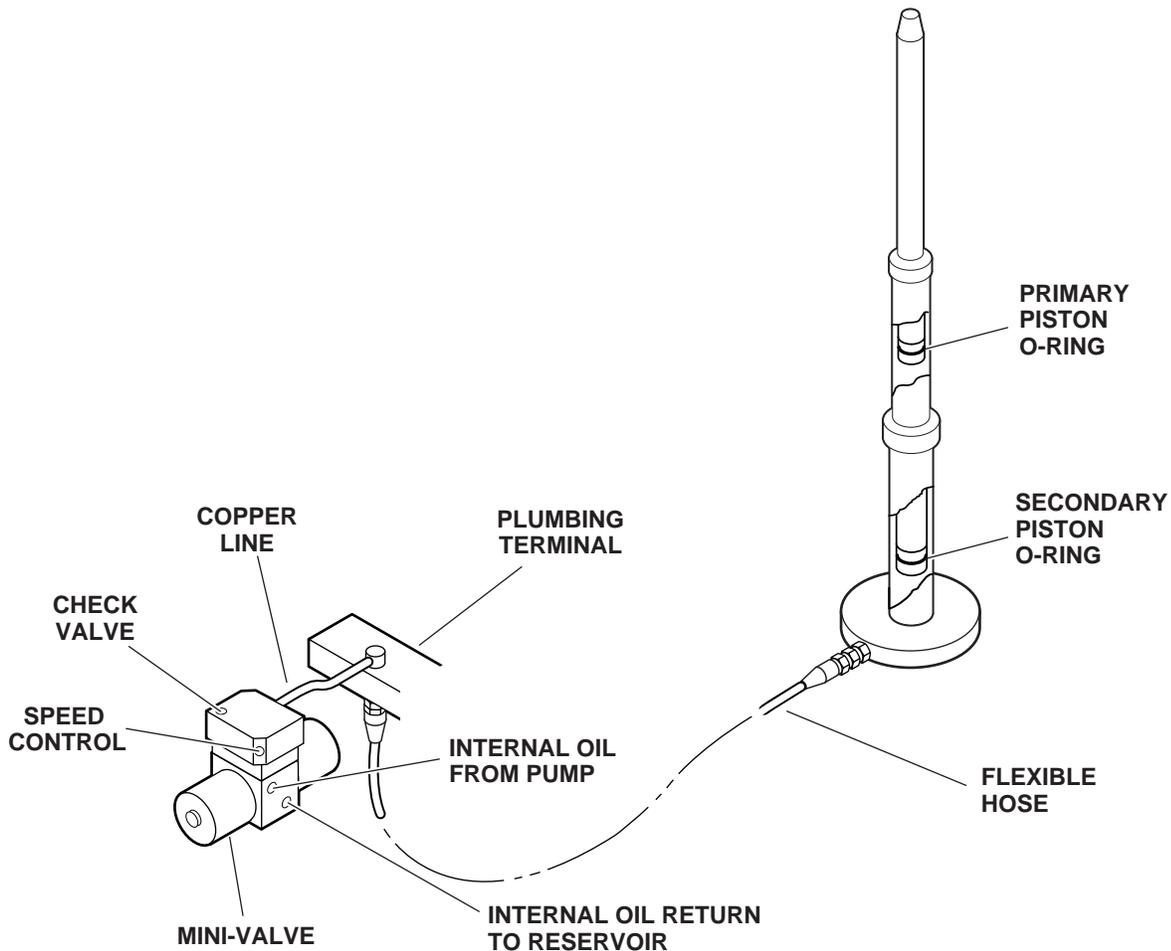


Figure 3-1. Elevation Circuit

### 3-4. TRENDELENBURG DIAGNOSIS CHART

**Problem**

Trendelenburg function moves improperly

**Reason**

- Incorrect Speed Adjustment
- Spool Valve Not Centered
- Bad Check Valves
- Low on Oil
- Pinched Hose
- Defective Mini-Valve
- Pressure Relief Valve Not Set Properly
- Bad Solenoid or Wiring
- Defective Relay Box or Pendant Control

Trendelenburg function chatters or loses position

- Defective or Dirty Check Valve
- Oil Leakage in Circuit
- Air Inside Cylinder
- Pinched Hose
- Low on Oil

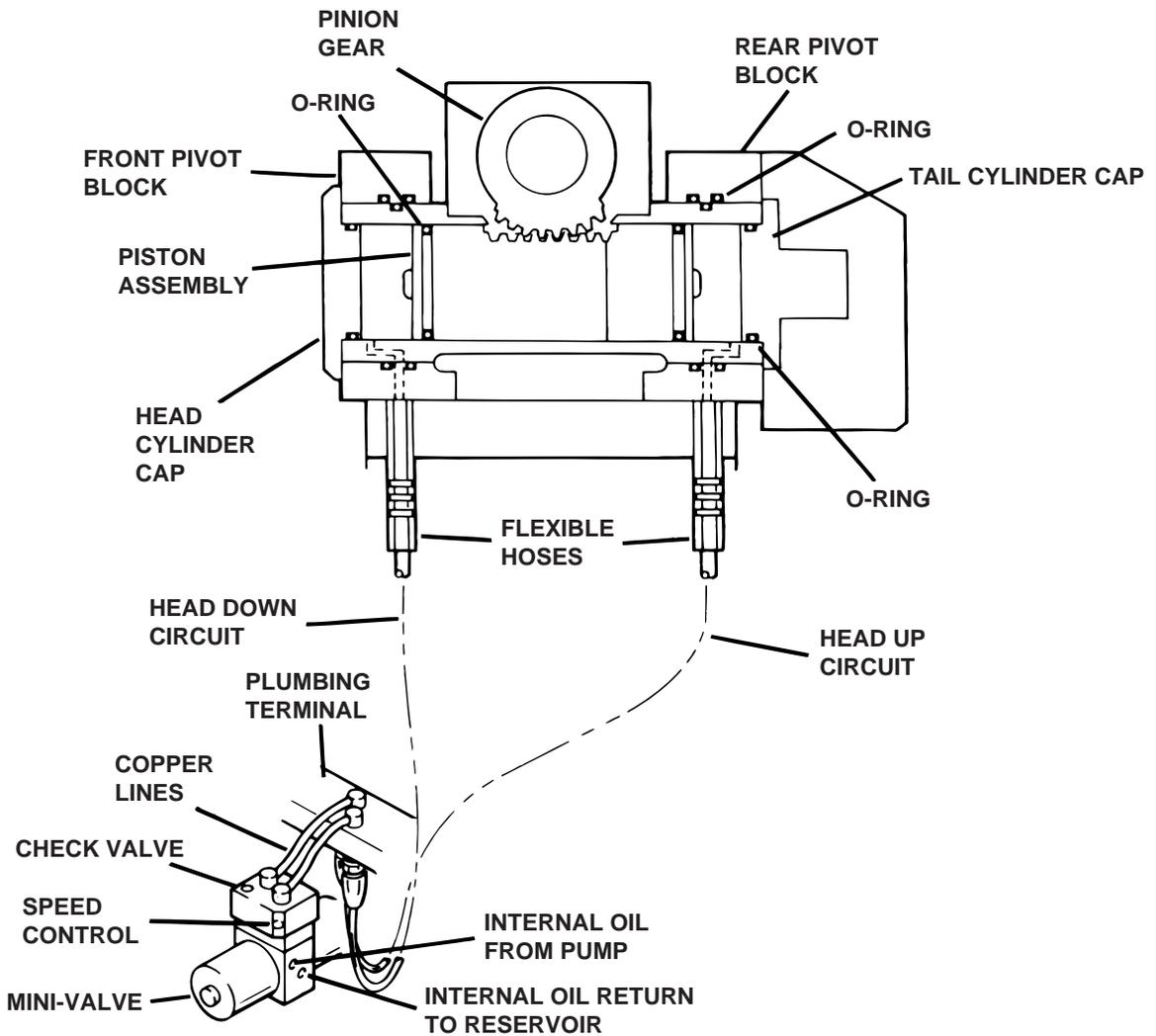


Figure 3-2. Trendelenburg Circuit

### 3-5. LATERAL TILT DIAGNOSIS CHART

**Problem**

Lateral tilt function moves improperly

**Reason**

- Incorrect Speed Adjustment
- Spool Valve Not Centered
- Bad Check Valves
- Low on Oil
- Pinched Hose
- Defective Mini-Valve
- Pressure Relief Valve Not Set Properly
- Bad Solenoid
- Defective Relay Box or Pendant Control

Lateral tilt function chatters or loses position

- Defective or Dirty Check Valves
- Oil Leakage in Circuit
- Air Inside Cylinder
- Pinched Hose
- Low on Oil

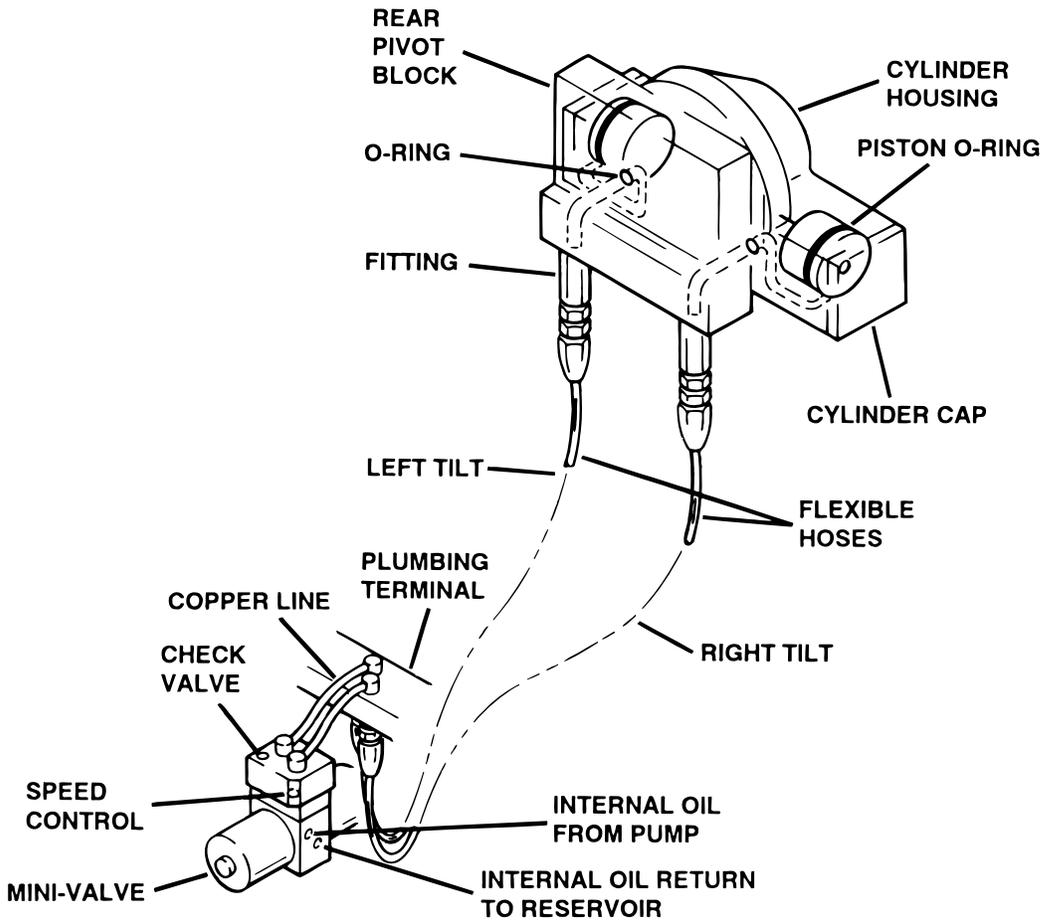


Figure 3-3. Lateral Tilt Circuit

### 3-6. FLEX SYSTEM DIAGNOSIS CHART

**Problem**

Back Section or Trendelenburg function moves improperly

**Reason**

- Incorrect Speed Adjustment (Trendelenburg, Back section or Flex - check with gauge)
- Spool Valve Not Centered
- Bad Check Valves
- Low on Oil
- Pinched Hose
- Defective Mini-Valve
- Pressure Relief Valve Not Set Properly
- Bad Solenoid
- Defective Relay Box or Pendant Control
- Kidney Bridge Raised

**NOTE**

If Flex System does not function properly, check the back section and Trendelenburg functions before adjusting the flex system.

Back Section or Trendelenburg function chatters or loses position

- Defective or Dirty Check Valves
- Oil Leakage in Circuit
- Air Inside Cylinder
- Pinched Hose
- Low on Oil

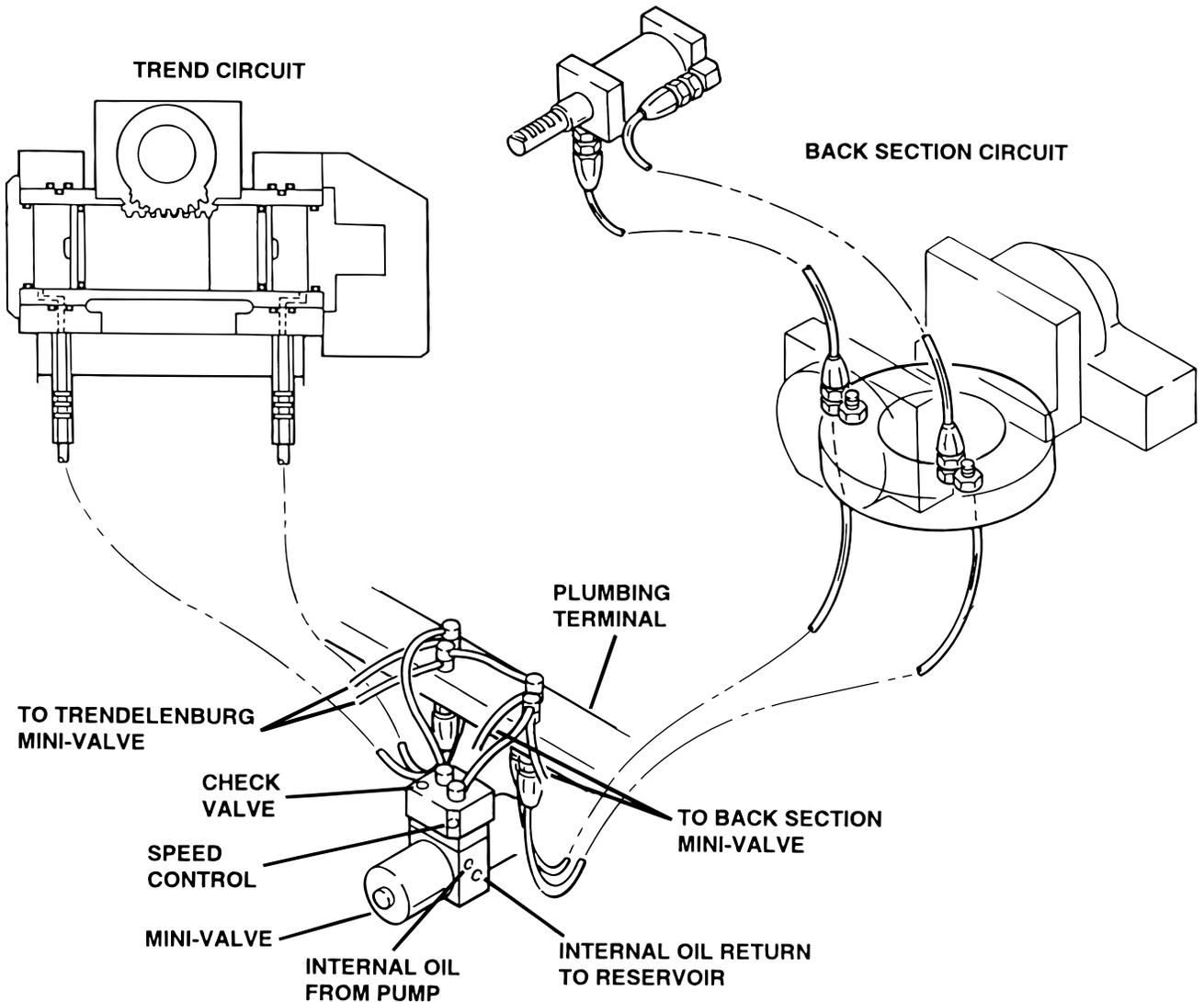


Figure 3-4. Flex System Circuit

### 3-7. BACK SECTION DIAGNOSIS CHART

**Problem**

Back Section function moves improperly

**Reason**

- Incorrect Speed Adjustment
- Spool Valve Not Centered
- Bad Check Valves
- Low on Oil
- Pinched Hose
- Defective Mini-Valve
- Pressure Relief Valve Not Set Properly
- Bad Solenoid
- Defective Relay Box or Pendant Control
- Kidney Bridge Raised

Back Section function chatters or loses position

- Defective or Dirty Check Valves
- Oil Leakage in Circuit
- Air Inside Cylinder
- Pinched Hose
- Low on Oil

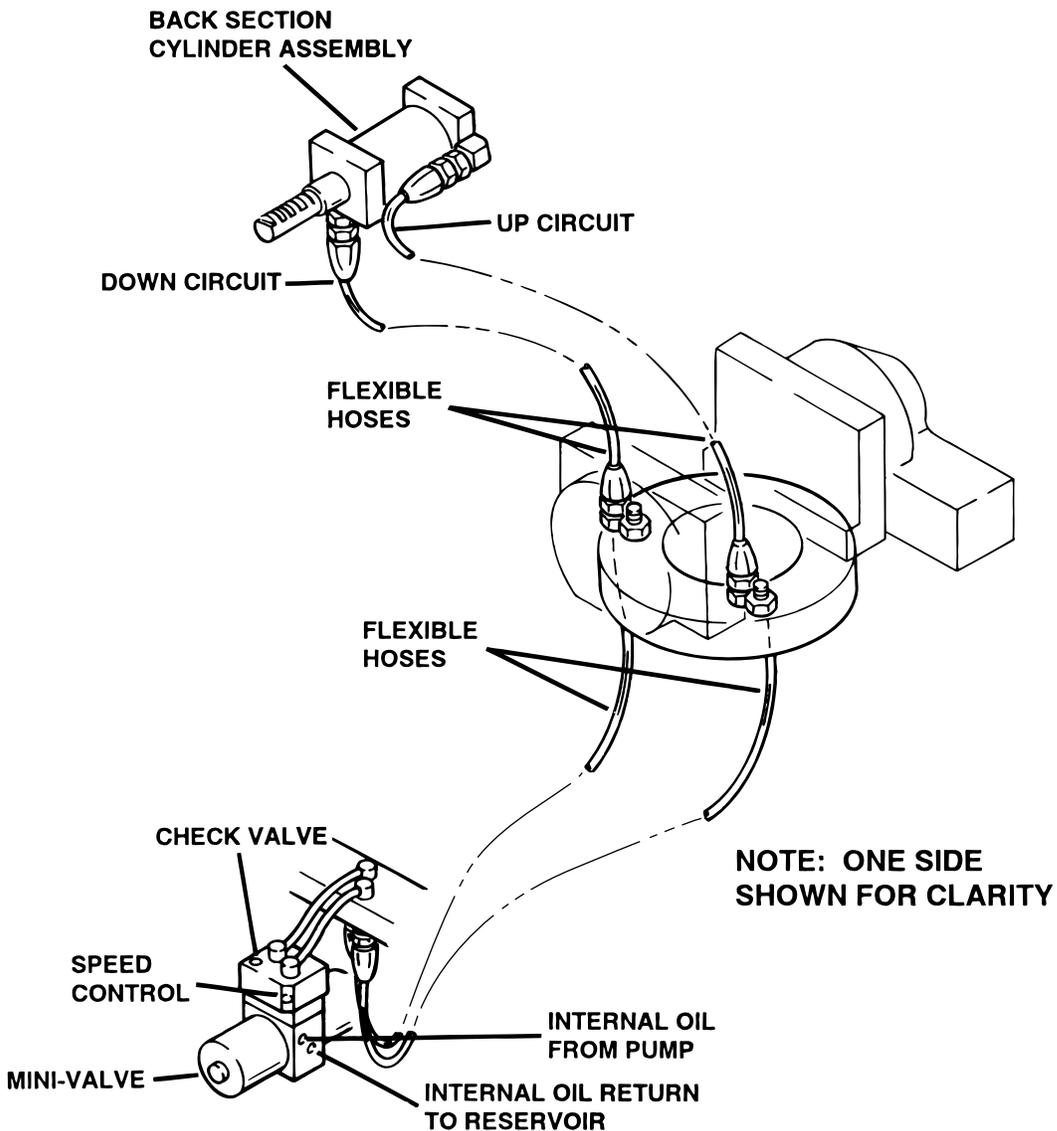


Figure 3-5. Back Section Circuit

### 3-8. LEG SECTION DIAGNOSIS CHART

**Problem**

Leg function moves improperly

**Reason**

- Incorrect Speed Adjustment
- Spool Valve Not Centered
- Bad Check Valves
- Low on Oil
- Pinched Hose
- Defective Mini-Valve
- Pressure Relief Valve Not Set Properly
- Bad Solenoid
- Defective Relay Box or Pendant Control

Leg function chatters or loses position

- Defective or Dirty Check Valves
- Oil Leakage in Circuit
- Air Inside Cylinder
- Pinched Hose
- Low on Oil

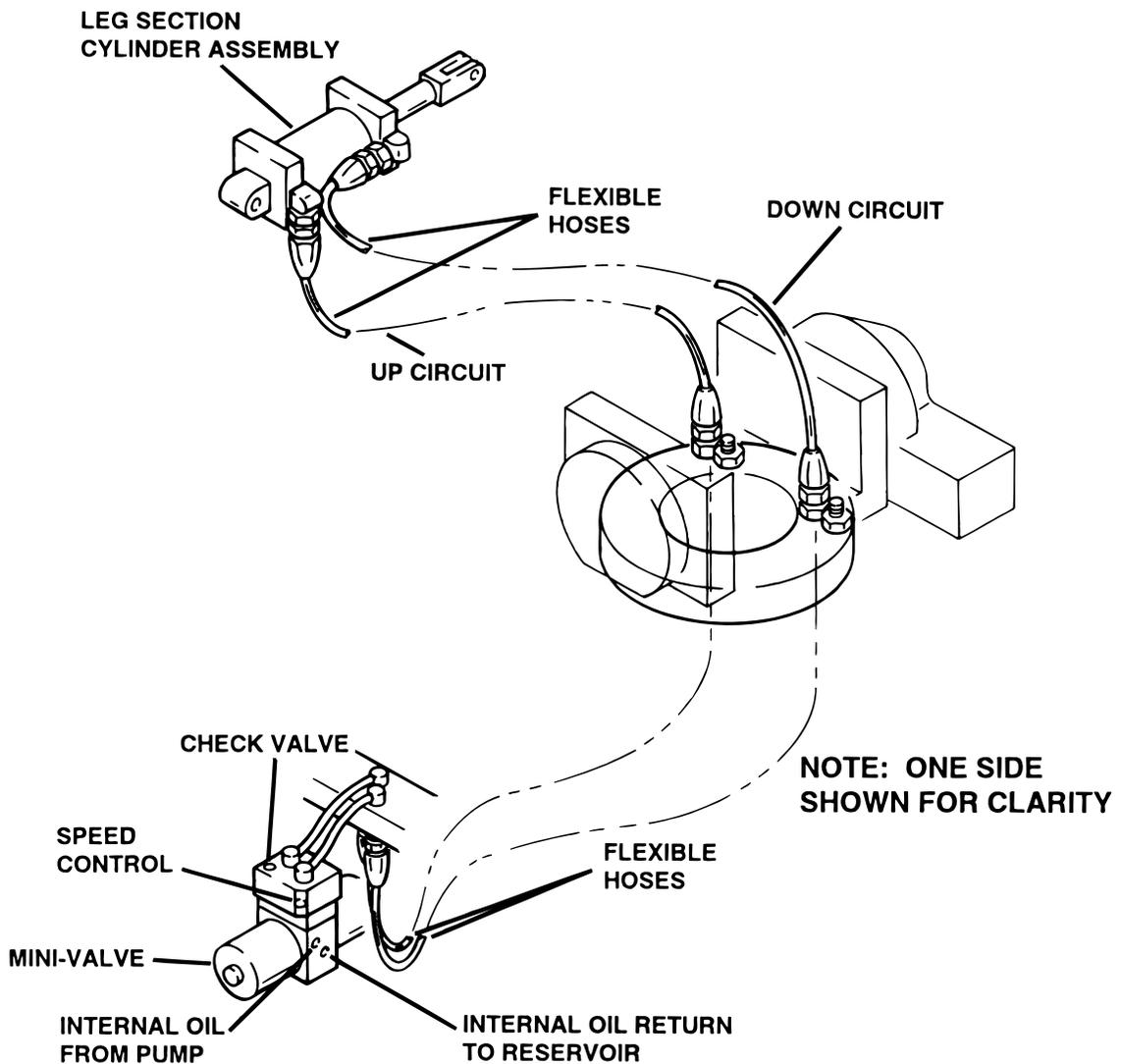


Figure 3-6. Leg Section Circuit

### 3-9. KIDNEY LIFT DIAGNOSIS CHART

**Problem**

Kidney Lift moves improperly

**Reason**

- Incorrect Speed Adjustment
- Spool Valve Not Centered
- Bad Check Valve
- Low on Oil
- Pinched Hose
- Defective Mini-Valve
- Pressure Relief Valve Not Set Properly
- Bad Solenoid
- Defective Relay Box or Pendant Control

Kidney Lift chatters or loses position

- Defective or Dirty Check Valve
- Oil Leakage in Circuit
- Air Inside Cylinder
- Pinched Hose
- Low on Oil
- Lift Rods Binding

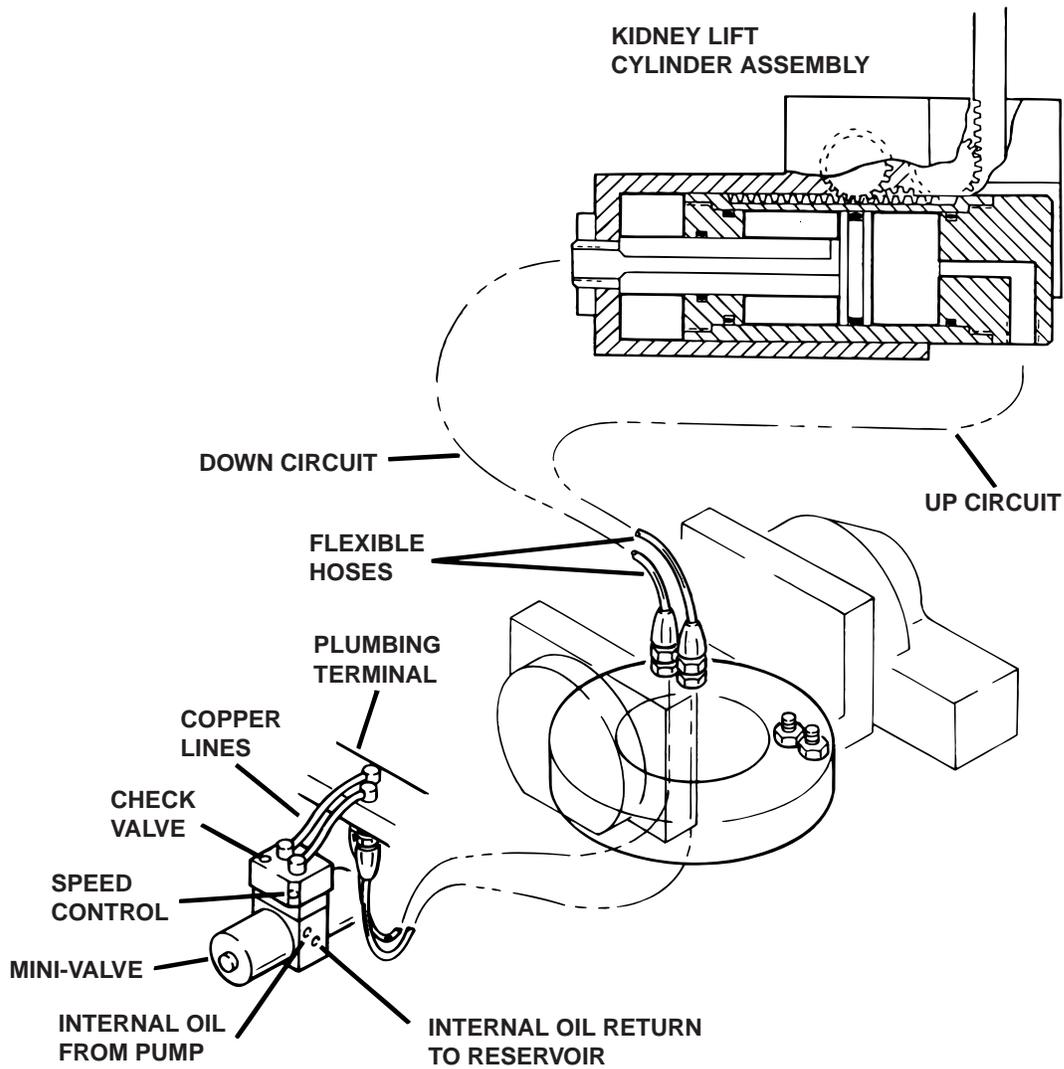


Figure 3-7. Kidney Lift Circuit

### 3-10. BRAKE CIRCUIT DIAGNOSIS CHART

**Problem**

Brakes will not set properly

**NOTE**

If brakes have been released with the Emergency Brake Release Valve, brakes will not reset until BRAKE UNLOCK Circuit has been activated.

**Reason**

- Emergency Brake Release Valve Open or Defective
- Spool Valve Not Centered
- Bad Check Valve
- 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

- Emergency Brake Release Valve Open or Defective
- Defective or Dirty Check Valve
- Oil Leakage in Circuit
- Leaking "O" Ring Inside Cylinder

Brakes will not retract properly

- Incorrect Speed Adjustment
- Bad Check Valve
- Spool Valve Not Centered
- Defective Mini-Valve
- Pinched Hose
- Defective Solenoid or Wiring
- Defective Relay Box or Pendant Control
- Defective Brake Cylinder

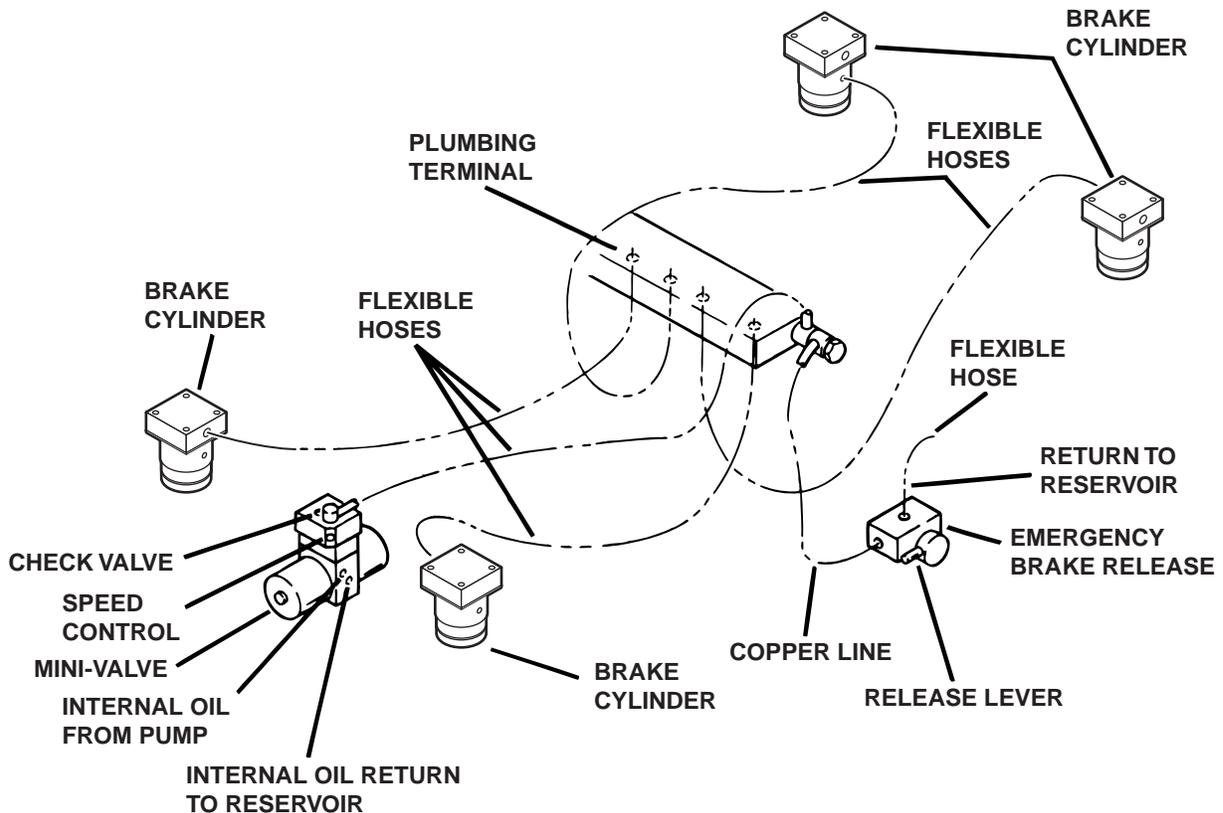
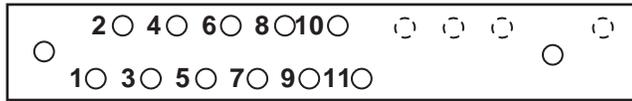


Figure 3-8. Brake System Circuit

### 3-11. Flexible Hose Identification and Placement

The following figures will show the correct placement of the flexible hydraulic hoses used in the table and their respective number codes.

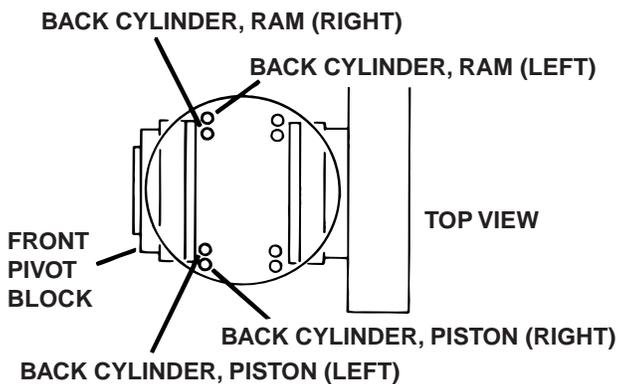
Figure 3-9 shows the hose connections to the plumbing terminal.



NUMBER	FUNCTION
1	ELEVATION
2	REV TREND
3	TREND
4	TILT LEFT
5	TILT RIGHT
6	BACK DOWN
7	BACK UP
8	LEG UP
9	LEG DOWN
10	KIDNEY DOWN
11	KIDNEY UP

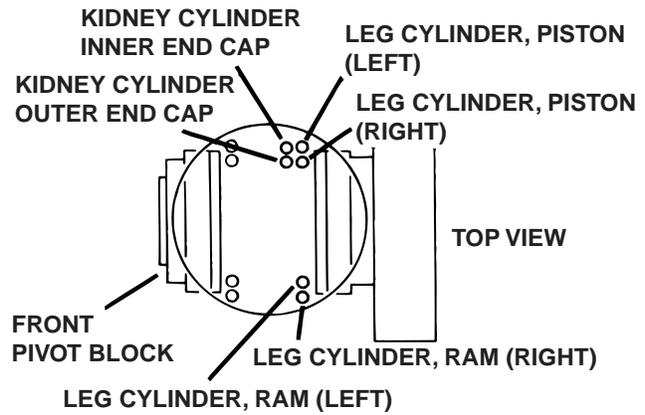
**Figure 3-9. Main Plumbing Terminal**

Figure 3-10 shows the placement of the short flexible hoses which connect to the back section cylinders.



**Figure 3-10. Back Section Hoses**

Figure 3-11 shows the placement of the short flexible hoses which connect to the leg section cylinders and the kidney lift cylinder.

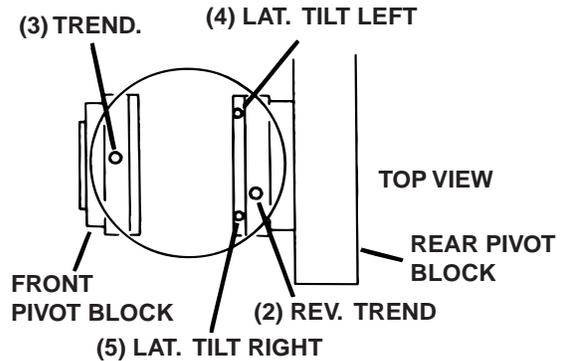


**Figure 3-11. Leg Section/Kidney lift Hoses**

Figure 3-12 shows the placement and number code for the long flexible hoses which connect from the plumbing terminal to the front and rear pivot blocks.

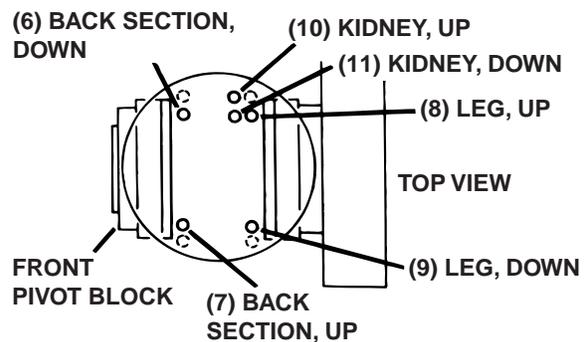
**NOTE**

The number codes will be on a label or stamped into the elevation clamp ring and the plumbing terminal.



**Figure 3-12. Pivot Block Hoses**

Figure 3-13 shows the placement and number code for the long flexible hoses that connect from the elevation clamp ring to the plumbing terminal.



**Figure 3-13. Elevation Clamp Ring Hoses**



## SECTION IV ELECTRICAL SYSTEM

### 4-1. General

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

The electrically operated functions are as follows:

- ELEVATION - Up and Down
- TRENDELENBURG - Head up and down
- LATERAL TILT - Right and left
- BACK SECTION - Up and Down
- LEG SECTION - Up and Down
- FLEX / REFLEX
- KIDNEY LIFT - Up and down
- RETURN TO LEVEL
- BRAKE UNLOCK - Brake release

The power requirements are 120 VAC, 60 Hz. The main power on-off switch is an enclosed DPST circuit breaker type and the power cord is a three-wire, fifteen foot long, UL listed cord with a three-prong hospital grade plug.

### 4-2. Components

Refer to figure 4-1 for the relationship of the electrical components.

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

**b.** Relay Box - Contains the step down transformer, full wave rectifier, micro-processor and relay switches. The relay switches are activated by the pendant control signal to the micro-processor and in turn energize the solenoids.

**c.** Hand-Held Pendant Control - Contains circuit board mounted switches and a micro-processor which activate the relay box. Operates on 5 VDC.

**d.** 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.

**e.** Motor/Pump Assembly - 120 VAC, 60 HZ, 200 Watt capacitor induction motor.

### 4-3. Battery Model Components

The functions of the battery model tables are the same as the standard 120 VAC models. The electrical components and operation however, vary greatly between the two models. To simplify the troubleshooting procedures, the battery model tables are covered separately in Section VI for the model 6600B.

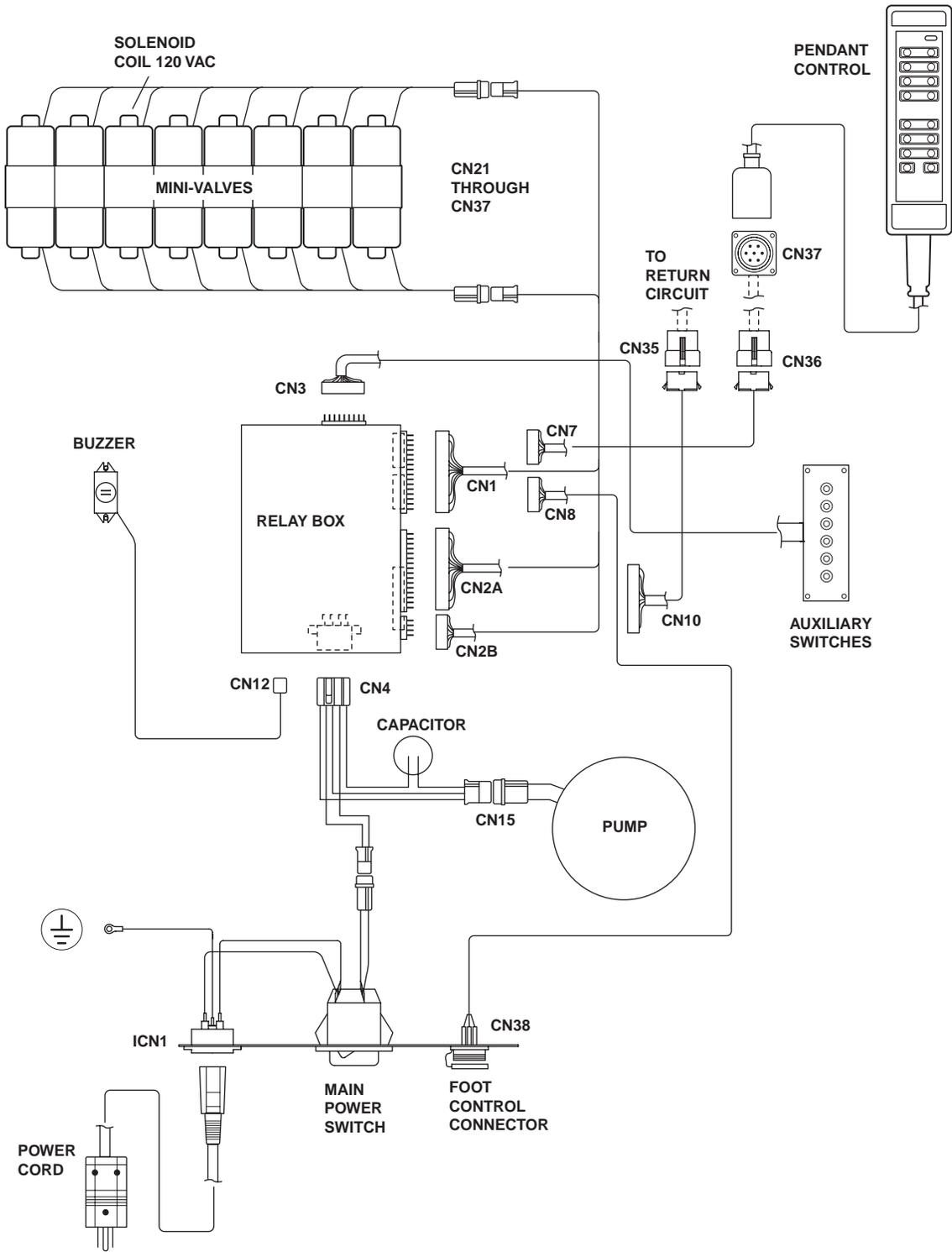


Figure 4-1. 6600 Electrical Circuit Block Diagram

## SECTION V 6600 ELECTRICAL SYSTEM TROUBLESHOOTING

### -1. Troubleshooting Notes

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

#### NOTE

**This section does not cover the battery table components.** They are covered separately in Section 6.

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, 120 VAC, 60 HZ, comes in through the power cord and through the Power Switch. The Power Switch opens both lines when in the "OFF" position. The Power Switch is also a 10 Amp circuit breaker that is used to protect the complete electrical system.

#### a. Main Switch Test

The following test will determine if line voltage is applied to connector CN4, which in turn would power the table.

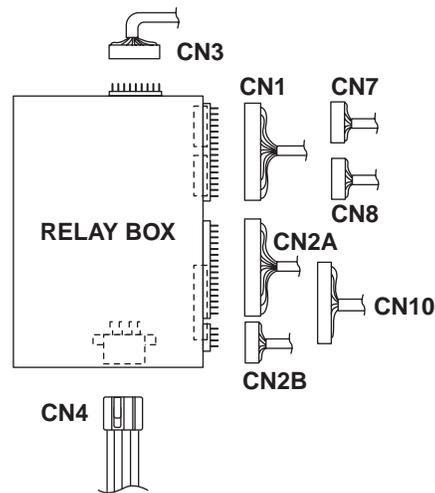
1. Plug the power cord into the 120VAC power supply (wall receptacle) and turn ON the main switch.
2. Disconnect connector CN4 from the relay box. See figure 5-1. Leave all other connectors connected.



**WARNING**

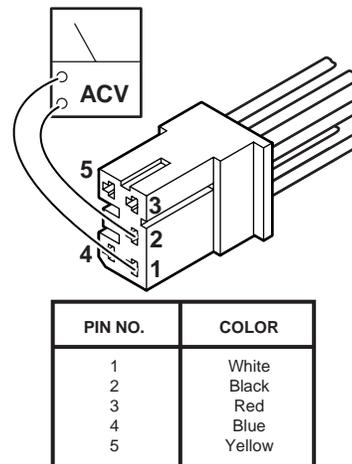


Line voltage (120 VAC) will be measured in this test. Do not touch uninsulated connector pins or meter test leads.



**Figure 5-1. Main Power Test**

3. Use an AC voltmeter capable of measuring 120 VAC and measure the voltage between pins 1 and 2 (black and white wires) located in connector CN4. See figure 5-2. You should receive line voltage 120 VAC.



**Figure 5-2. Connector CN4**

## b. Test Results

If you do not receive the correct voltage measurement, the problem would have to be in the wires, main switch 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. Pendant Control

The Pendant Control is part of the solid state, multiplex, logic control system. The pendant control contains illuminated, circuit board mounted switches and a micro processor. The encoded output from the pendant control is serial bit stream logic.

The output signal is transmitted to the micro processors in the relay box where the logic is decoded and the appropriate relays for the selected function are activated.

Pendant Control troubleshooting should begin by switching the operating mode of the table. For example; if a function fails when operating the table in the AC120V mode, use the auxiliary switches to operate the function. If the function now operates, the problem is probably in the pendant control, connectors or wiring from the pendant control to the relay box.

#### a. Pendant Control Test

There are some serviceable components within the Pendant Control. The cord is detachable and can be tested for continuity between the pins on the connectors. Use the following procedure to test the pendant control cord.

Disconnect the cord from the table connector and from the pendant control connector and using an ohmmeter, test the continuity between the corresponding pins in the connectors. See figure 5-3.

## b. Test Results

If you do not receive the correct readings, the wiring or connector pins may be faulty.

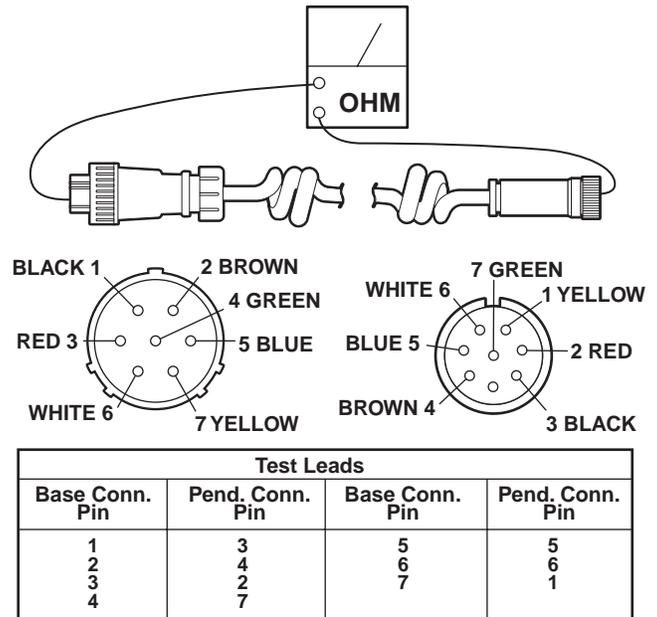


Figure 5-3. Pendant Control Test

#### c. Table Connector CN37 Test

If correct readings are received, test the wiring from the table connector to connector CN7 at the Relay Box. Disconnect connector CN7 from the Relay Box and using an ohmmeter, test the continuity between the corresponding pins in connectors CN7 and the table connector. See figure 5-4.

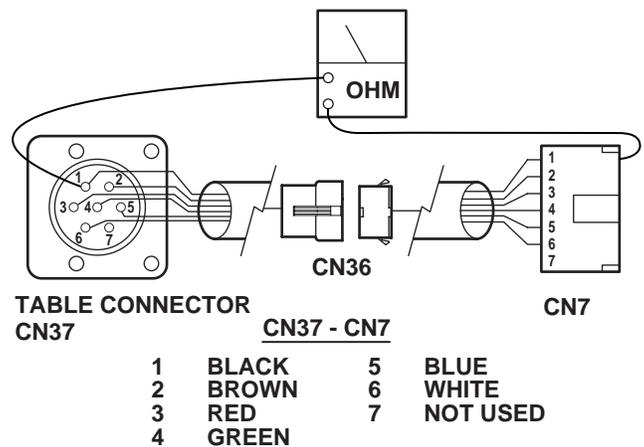


Figure 5-4. Table Connector Continuity Test

#### d. Test Results

If the correct readings are not obtained, test the wiring from the table connector CN37 to connector CN36 (located under the elevation column shroud) and from connector CN7 to CN36. Disconnect connector CN36 and using an ohmmeter, test the continuity between the corresponding pins in connectors CN36 to CN7 and CN36 to CN37. See figure 5-4.

If the correct readings are obtained, this part of the circuit is okay and the problem may be the Pendant Control circuit board or the Relay Box. Contact SKYTRON if all tests performed indicate that the problem is located in the Pendant Control.

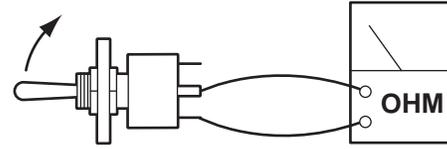


Figure 5-6. Auxiliary Switch Test

#### 5-4. Auxiliary Switches

The following tests will determine if the auxiliary switches are functioning properly.

##### a. Switch Test

Disconnect connector CN3 at the Relay Box and using an ohmmeter check for continuity at the connector pins (pin 1A common) while activating the appropriate switch. See figure 5-5. Meter should read 0 ohms.

##### b. Test Results

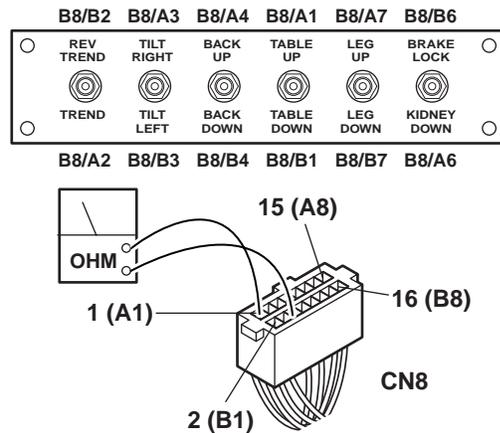
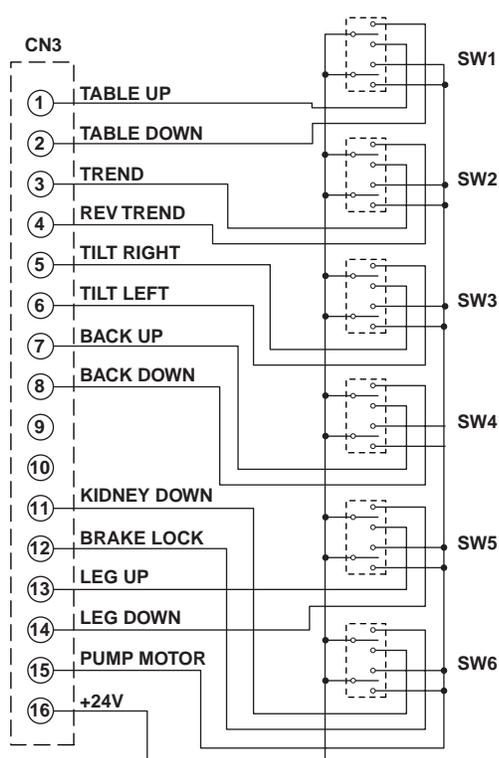
If proper meter readings are not received, test the individual switches as necessary. Using an ohmmeter, test the operation of an individual switch with the (+) test lead at the center terminal of the switch and the (-) test lead at the terminal opposite the direction of the switch actuation. Refer to figure 5-6. Meter should read 0 ohms. If the switches check out, the problem would have to be in the wires, the switch circuit board or connector CN3.

#### 5-5. Relay Box

The 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 power to the pump/motor and is always activated no matter what control function is selected. The brake locking circuit relay is also activated when any control function other than BRAKE UNLOCK is initially selected.

Also, inside the relay box is a step-down transformer and full-wave rectifier which decreases the voltage to 5-6 volts. This low voltage potential controls the relays by the use of the hand-held pendant control buttons. Basically the relays enable a 5-6 volt potential to control the 120 volt circuit.

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



PIN NO	COLOR	PIN NO	COLOR
1 (A1)	Red	9 (A5)	--
2 (B1)	White/Red	10 (B5)	--
3 (A2)	Brown	11 (A6)	White/Purple
4 (B2)	Yellow	12 (B6)	Purple
5 (A3)	Orange	13 (A7)	Gray
6 (B3)	White/Orange	14 (B7)	White/Gray
7 (A4)	White/Brown	15 (A8)	Red/White
8 (B4)	Blue/White	16 (B8)	Pink
	Purple/White (-A)		White/Yellow (-A)

Figure 5-5. Auxiliary Switch Connector CN3

### a. Checking Relay Box Connector CN4

1. Connect the power cord to the table. Plug the power cord into the 120 VAC power supply (wall receptacle) and turn the main switch ON. Leave all connectors connected.



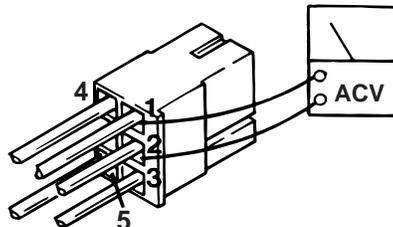
#### WARNING



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

2. Use an AC voltmeter capable of measuring 120 volts and measure the voltage between pins 1 (white) and 2 (black) of connector CN4 for input voltage. See figure 5-7. Meter should read line voltage 120 VAC.

3. Activate any table function with the Pendant Control and using an AC voltmeter, test the voltage at pins 3 and 4 of CN4 for output to the pump. Meter should read 120 VAC.



PIN NO.	COLOR
1	WHITE
2	BLACK
3	RED
4	BLUE
5	YELLOW

Figure 5-7. Connector CN4

### b. 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.

### c. Checking Output to Solenoids

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



#### WARNING



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

### NOTE

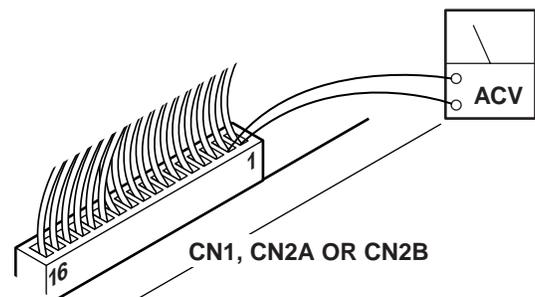
•The Brake Lock function is activated by pressing any function button (except BRAKE UNLOCK). A timer in the Relay Box allows continuous output for about 7 seconds. If the brakes are already locked, no output is provided.

•The BRAKE UNLOCK button activates another timer in the relay box which allows continuous output for the brake release function for approximately 7 seconds. If the brakes are released (using the BRAKE UNLOCK button) no output is provided.

1. The power cord should be plugged into the wall receptacle and Power Switch turned ON.

2. Disconnect the motor connector. All other connectors should be connected. Test connectors CN1, CN2A and CN2B from the back while attached to the relay box.

3. Activate each of the Pendant Control buttons measure the voltage for the corresponding connector pins with an AC voltmeter. See figure 5-8. Meter should read 120VAC.



CN1		CN2A	
FUNCTION	PINS	FUNCTION	PINS
Table Up	1 - 2	Back Up	1 - 2
Table Down	3 - 4	Back Down	3 - 4
Trend	5 - 6	Slide Foot	5 - 6
Rev Trend	7 - 8	Slide Head	7 - 8
Tilt Right	9 - 10	Kidney Up	9 - 10
Tilt Left	11 - 12	Kidney Down	11 - 12
Reflex	13 - 14	Leg Up	13 - 14
Flex	15 - 16	Leg Down	15 - 16
		CN2B	
		Brake Set	1 - 2
		Brake Unlock	3 - 4

Figure 5-8. Solenoid Output Connectors

#### d. 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.

#### e. Checking Output to Pendant Control

The output to the Pendant Control can not be tested without specialized equipment. If all tests have been conducted and it appears that the Relay Box is faulty, contact SKYTRON.

#### 5-6. 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 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.

#### NOTE

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.



#### WARNING



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. See figure 5-9.
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 must be pushed during this test. The motor will run when this test is performed, and the brake locking solenoid will be activated by any function other than UNLOCK.

#### c. Test Results:

If you do not receive the correct voltage, the problem could be in the wires leading to the connectors. The problem could also be in the relay box or the Pendant Control (refer to appropriate 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. Test #2

The solenoid can be checked out using an ohm-meter R x 1 scale.

1. Measure the resistance between the two pin connector in question as shown in figure 5-9. Connector must be disconnected. Polarity of meter leads is not important.
2. The meter should read approximately 58 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 multi-meter.

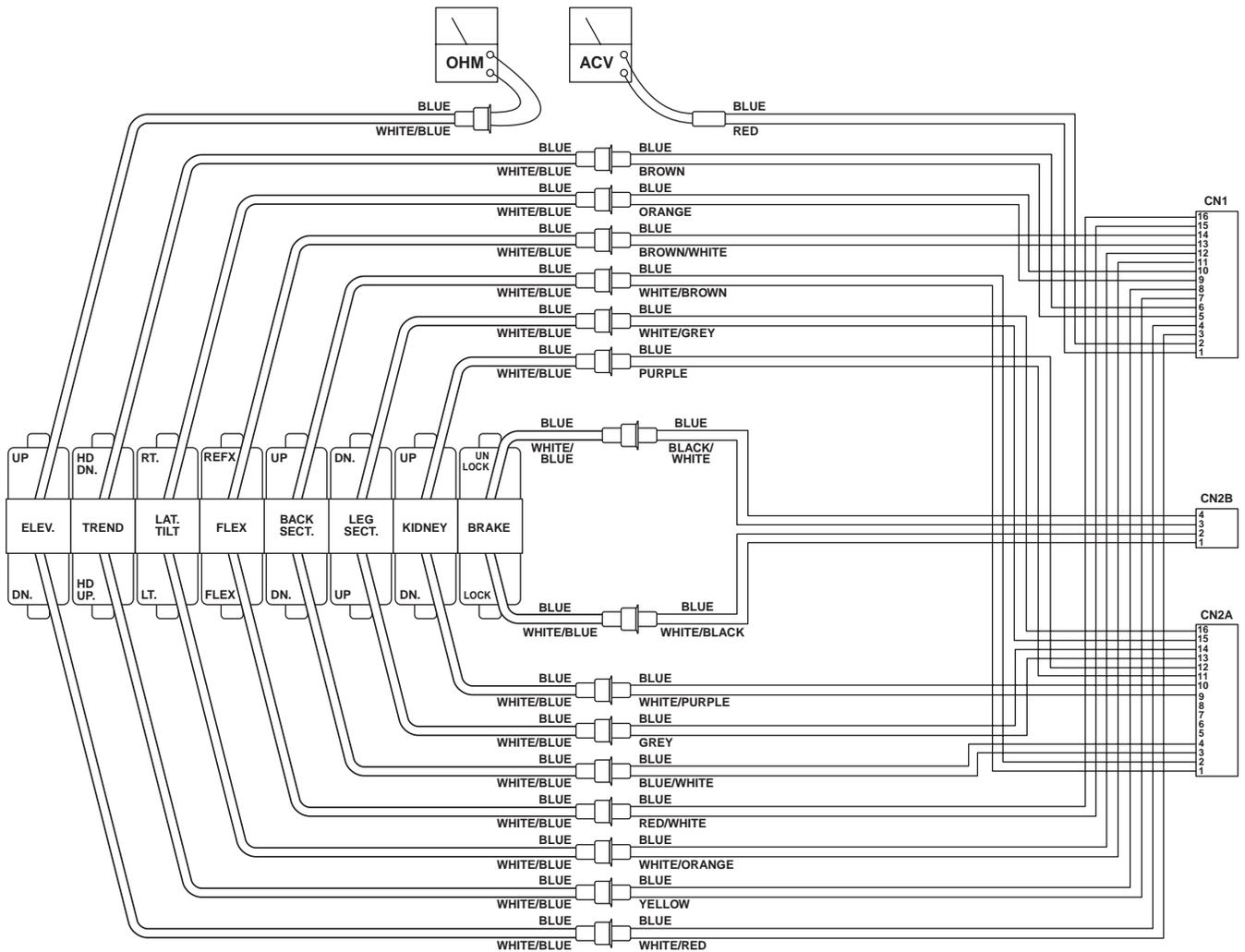


Figure 5-9. Solenoid Test

## 5-7. 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 along side the motor/pump assembly.

### a. Motor/Pump Test

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



#### WARNING



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 power supply (wall receptacle). Turn main switch ON.

2. Disconnect the 3 pin connector CN15 at the motor. Leave all other connectors connected. See figure 5-10.

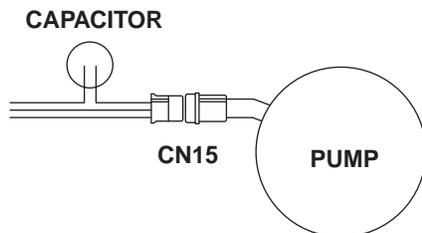


Figure 5-10.

3. Use a voltmeter capable of measuring 120 VAC and measure the following connector pins in connector CN15. See figure 5-11.

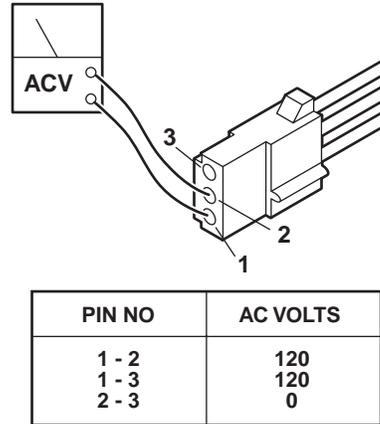


Figure 5-11. Connector CN15

### 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 appropriate 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. Connector CN15 should be disconnected.

3. Use the R x 100 scale of the ohmmeter and touch pins 2 and 3 of connector CN15. See figure 5-11.

**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.

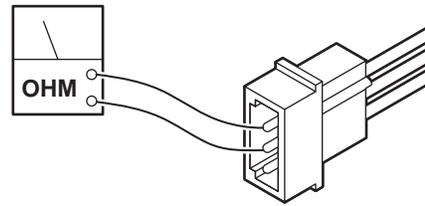
**NOTE**

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.

**f. Step #3**

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

1. Turn main power switch OFF.
2. Connector CN15 should be disconnected.
3. Use the R x 1 scale of the ohmmeter and measure the resistance between the pins located in the pump connector CN15. See figure 5-12.



PIN NO	METER
1 - 2	Approx. 5 ohms
1 - 3	Approx. 4 ohms
2 - 3	Approx. 8 ohms

**Figure 5-12. Pump Connector CN15**

**g. Test Results:**

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

### 5-8. Return-to-Level Micro-Switches.

The return-to-level feature is activated by a single button on the pendant control and automatically levels the major table functions, lateral tilt, Trendelenburg, back section, and leg section.

The kidney lift has a back section-up inhibit switch to prevent the table back section from damaging the kidney lift when the lift is raised. The back section still has the capability to be lowered, but will not raise above horizontal until the kidney lift is completely down. If the back section is raised above horizontal, the system will not allow the kidney lift to be raised. An audible alarm will sound if the kidney lift inhibit switch is activated and either function is activated - raising back section when Kidney lift is up or raising kidney bridge when back section is above horizontal.

The return-to-level / kidney inhibit system consists of 9 micro-switches, 2 electrical connectors, and the related wiring. The micro-switches are mounted on or adjacent to the function they control and are wired for normally open or normally closed opera-

tion. The micro-switches are either cam or lever actuated and can be adjusted at the individual switch mounting brackets.

The micro-switches operate on low voltage, and control the function circuits (pump/motor and appropriate solenoid valves) when activated by the pendant control LEVEL button.

The micro-switches are wired to the relay box through a riser cord and to the 15 pin connector CN10. See figure 5-13 for switch location and identification.

### 5-9. Troubleshooting

If a problem is suspected in the return circuits, disconnect the connector CN10 from the Relay Box to eliminate the circuits. Ensure that all table functions operate properly using the Pendant Control. If the functions do not work properly using the Pendant Control, refer to the appropriate test section and make all needed repairs before working on the return circuits.

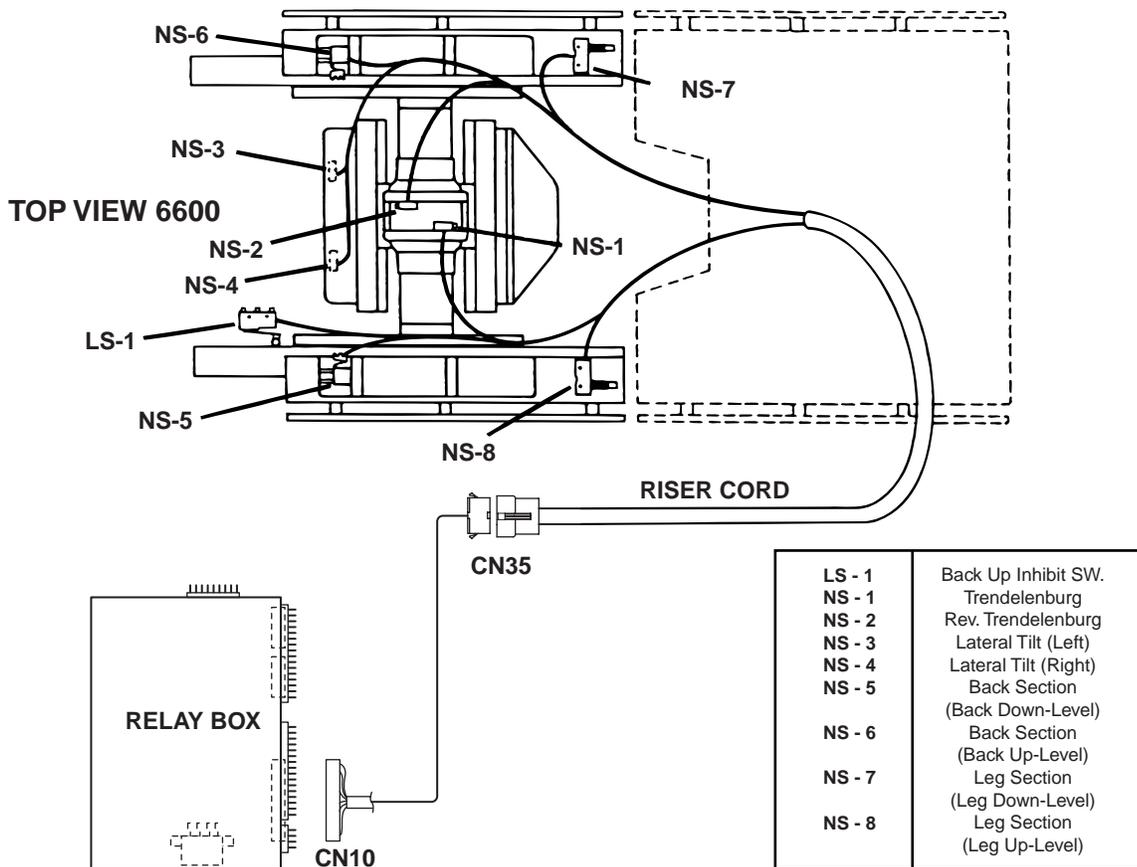


Figure 5-13.

### NOTE

It is normal for the back section to move up if the LEVEL button is pushed when connector CN10 is disconnected from the relay box.

All of the micro-switches are connected to the relay box via a wiring harness and the micro-switch riser cord using connectors CN10 and CN35. Connector CN35 is located under the slider shroud in the same area as the hydraulic hoses. Connector CN10 plugs into the relay box and is the most convenient location to make circuit continuity checks. See figure 5-14 for connector pin locations.

### NOTE

Wire colors may vary, however, connection from indicated pins on CN35 to pins on CN10 remain the same.

### a. Switch Test

Turn Main Power ON, lock the table brakes, and place the table top sections in a level position with the Kidney Lift down. Disconnect connector CN10 from the relay box and using an ohmmeter, test the wiring and switch operation at the appropriate pin numbers for the micro-switch in question as shown in figures 5-15 through 5-19.

### NOTE

Be sure to isolate the circuit when making continuity checks.

### NOTE

If you do not receive the proper continuity results at connector CN10 it does not necessarily mean the micro-switch is defective. There could be a problem with the riser cord between connectors CN10 and CN35, or in the wiring from the switch to connector CN35. Further tests will have to be made to determine the exact problem.

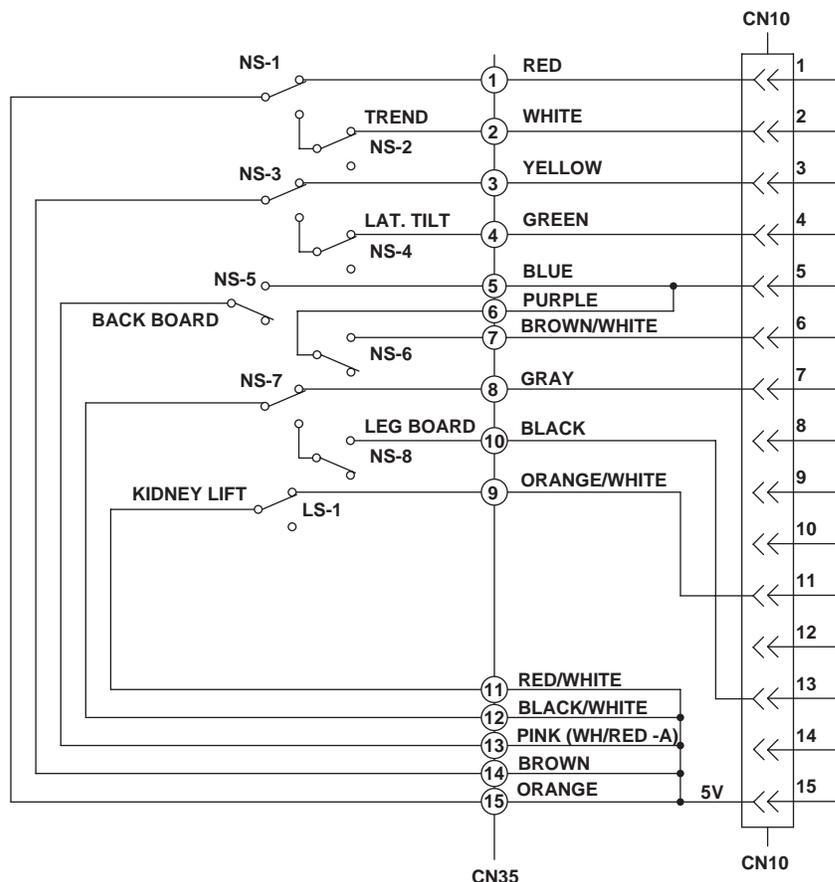
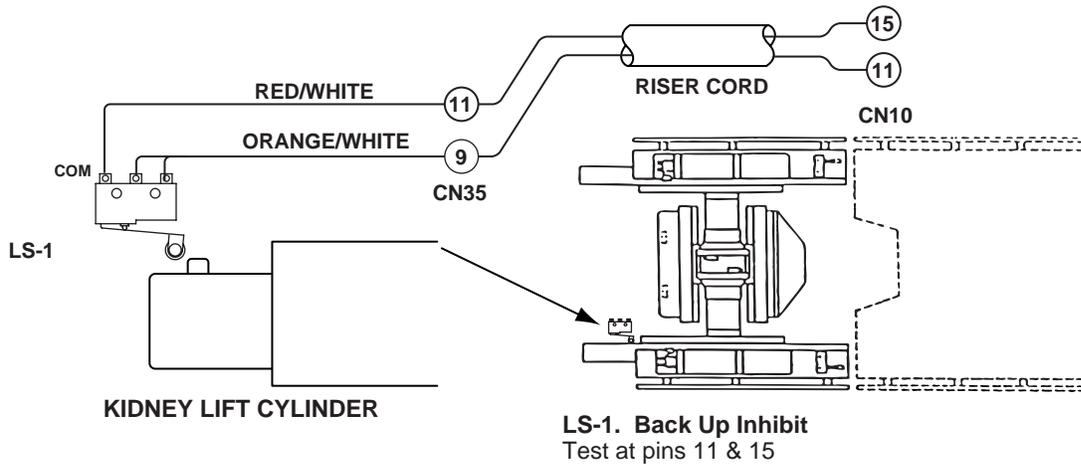


Figure 5-14. Return Micro-Switch Test

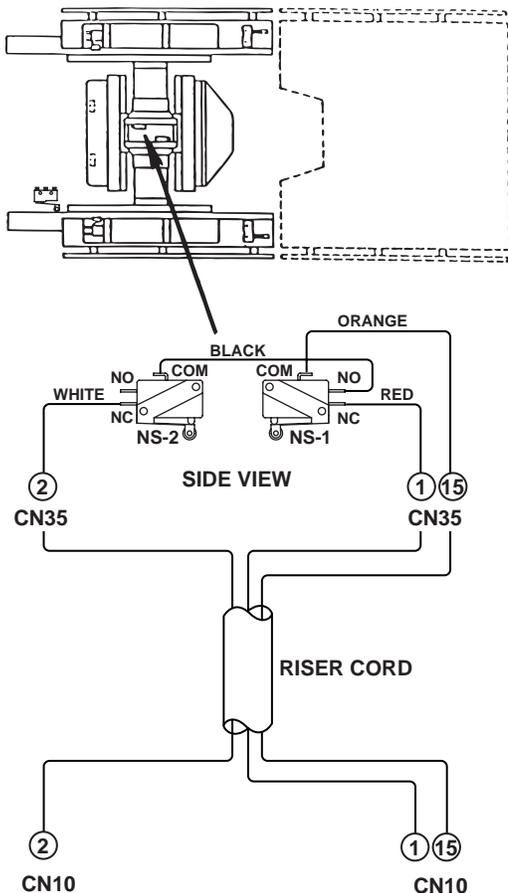


(Base)

Table Position	Switch Position	Meter Reading
K-Lift Dn	Open	Infinity
K-Lift Up	Closed	0

When K-Lift is UP, Back Section Can Not go above horizontal

Figure 5-15. Back Up Inhibit Switch



**NS-1. Trendelenburg**  
Test at pins 1 & 15

Table Position	Switch Position	Meter Reading
Level	Open	Infinity
RevTrend	Open	Infinity
Trend	Closed	0

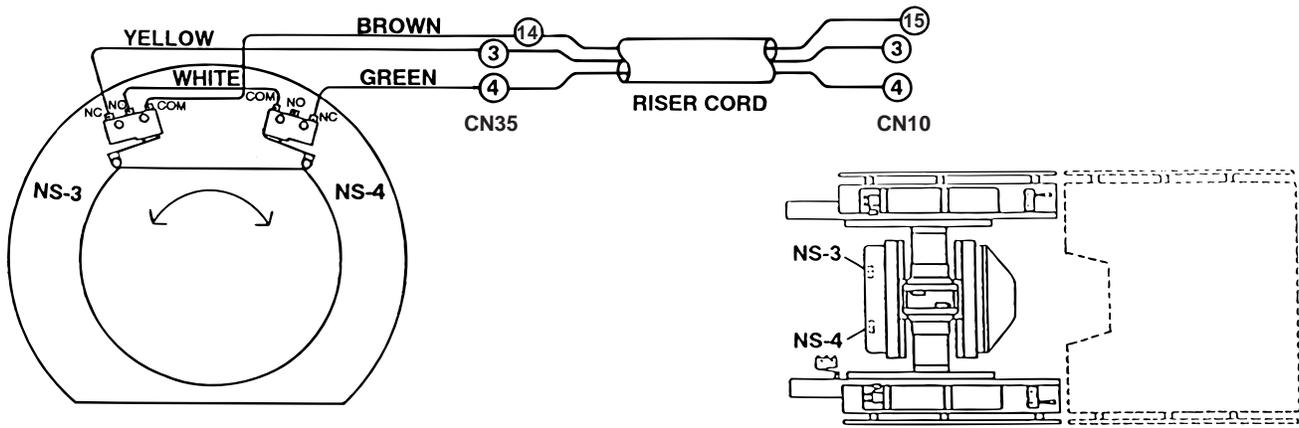
When table is in Trendelenburg Position, NS-1 brings the top back to level.

**NS-2. Reverse Trendelenburg**  
Test at pins 2 & 15

Table Position	Switch Position	Meter Reading
Level	Open	Infinity
RevTrend	Closed	0
Trend	Open	Infinity

When table is in Reverse Trendelenburg Position, NS-2 brings the top back to level.

Figure 5-16. Trendelenburg Return Switches



**NS-3. Lateral Tilt-Left**

Test at pins 3 & 15

Table Position	Switch Position	Meter Reading
Level	Open	Infinity
Tilt-Right	Open	Infinity
Tilt -Left	Closed	0

When table is in Tilt-Left Position, NS-3 brings the top back to level.

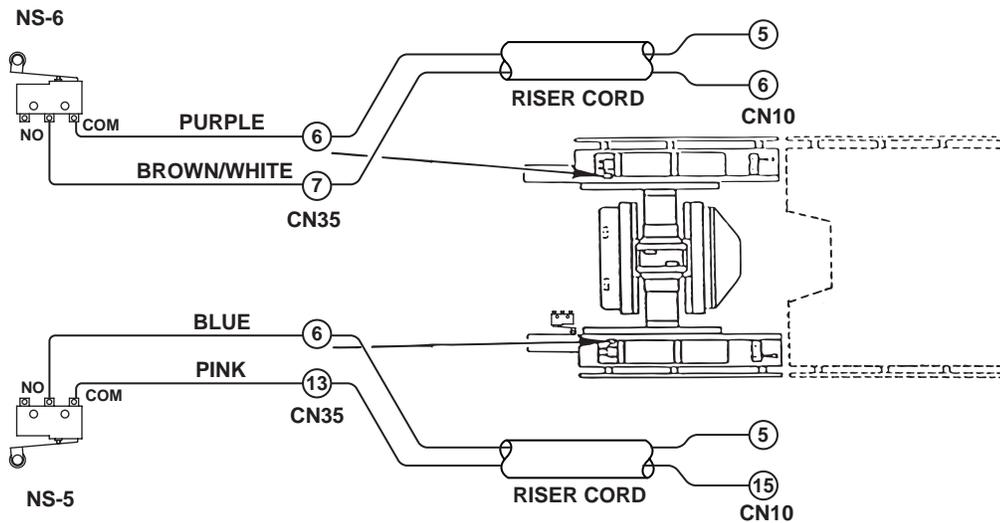
**NS-4. Lateral Tilt-Right**

Test at pins 4 & 15

Table Position	Switch Position	Meter Reading
Level	Open	Infinity
Tilt-Right	Closed	0
Tilt-Left	Open	Infinity

When table is in Tilt-Right Position, NS-4 brings the top back to level.

**Figure 5-17. Lateral Tilt Return Switches**



**NS-5. Back Section Down**

Test at pins 5 & 15

Table Position	Switch Position	Meter Reading
Level	Closed	0
Back-Dn	Open	Infinity
Back-Up	Closed	0

When the Back Section is Down, NS-5 brings the Back Section Up to level.

**NS-6. Back Section Up**

Test at pins 6 & 15

Table Position	Switch Position	Meter Reading
Level	Open	Infinity
Back-Dn	Open	Infinity
Back-Up	Closed	0

When the Back Section is Up, NS-6 brings the Back Section Down to level.

**Figure 5-18. Back Section Return Switches**

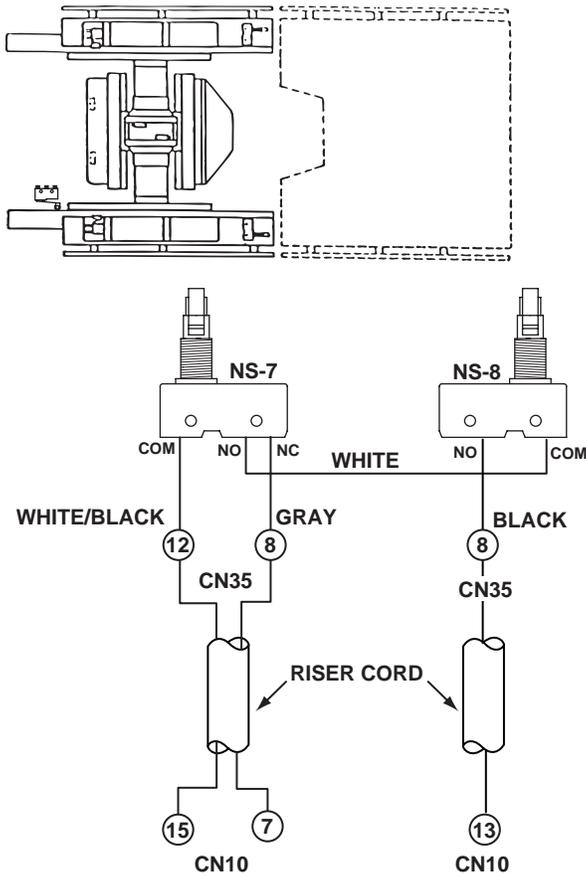


Figure 5-19. Leg Section Return Switches

**b. Switch Adjustment.**

If proper readings are not obtained during test or if table does not properly return to level, use the following procedure to adjust the switches.

1. Apply table brakes and (using a level) level the table top using the TRENDELENBURG and LATERAL-TILT function buttons on the pendant control.

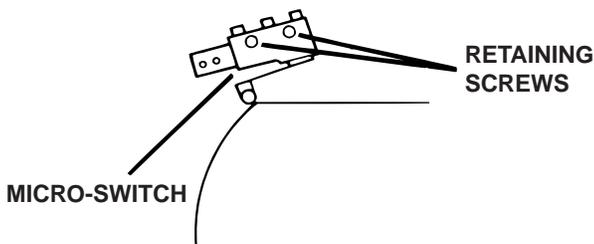


Figure 5-20. Micro-Switch Adjustment

**NS-7. Leg Section Down**  
Test at pins 7 & 15

Table Position	Switch Position	Meter Reading
Level Leg-Dn	Open Closed	Infinity 0

When the Leg Section is Down, NS-7 brings the Leg Section Up to level.

**NS-8. Leg Section Up**  
Test at pins 8 & 15

Table Position	Switch Position	Meter Reading
Level Leg-Dn	Open Open	Infinity Infinity

When the Leg Section is Up, NS-8 brings the Leg Section Down to level.

2. For all switches except the Leg Section switches, carefully loosen the switch retaining screws, and adjust the switches as needed. See figure 5-20.

3. To adjust the Leg Section switches remove seat section top, loosen the 2 phillips head screws securing bracket, adjust the switch, tighten the screws and replace the seat section top. See figure 5-21.

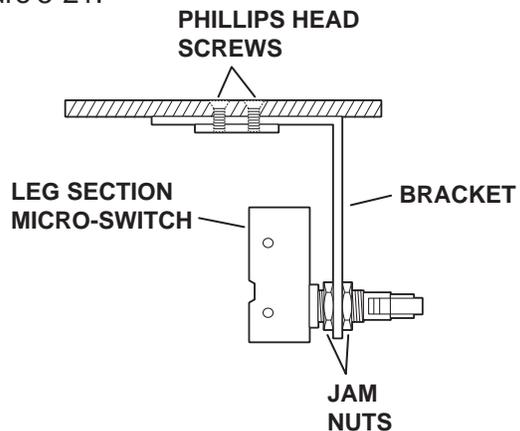


Figure 5-21. Leg Section Micro-Switch Adjustment.

# 6600B

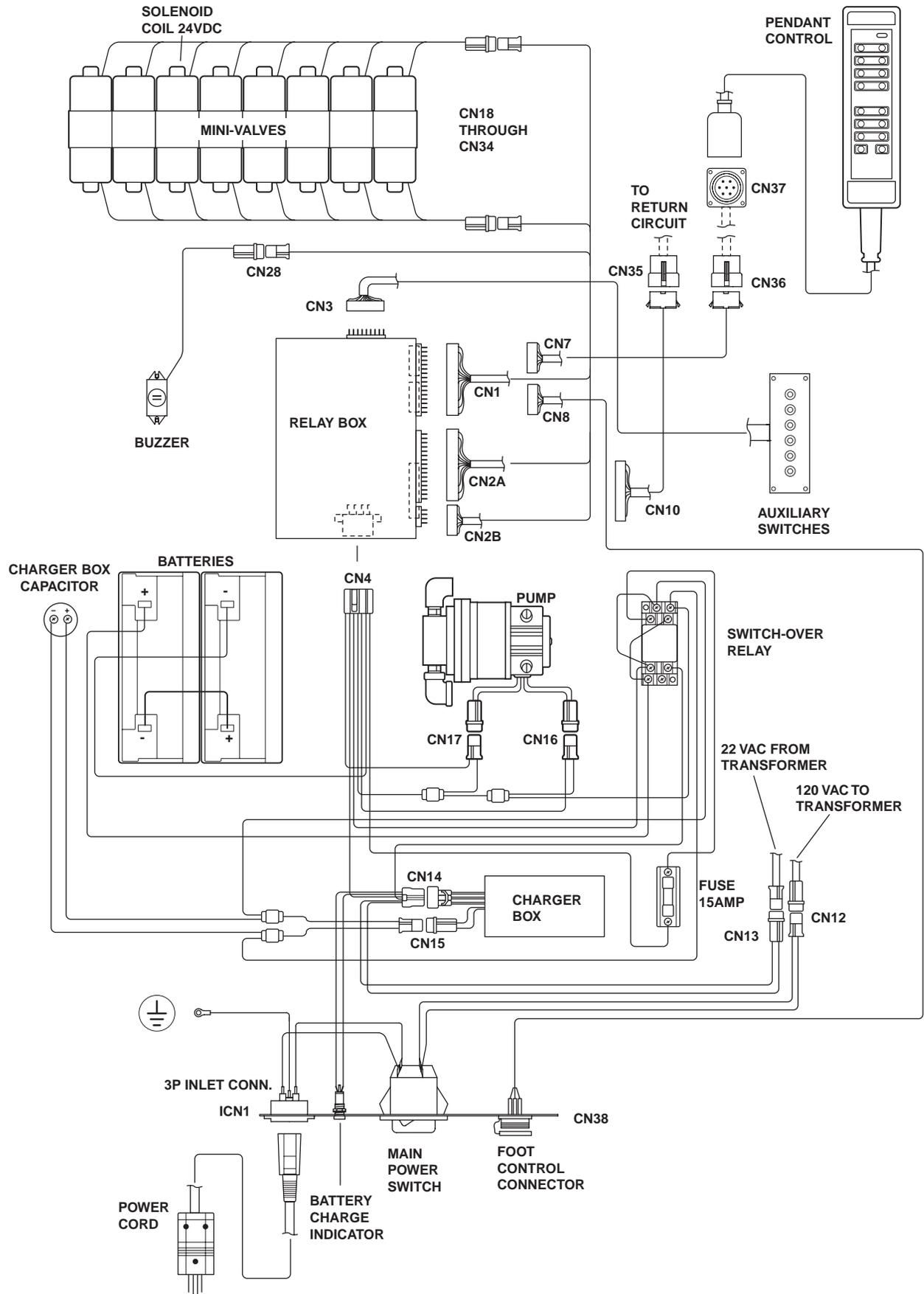


Figure 6-1. Electrical Circuit Block Diagram, Model 6600B

## SECTION VI -6600B- BATTERY MODEL, ELECTRICAL TROUBLESHOOTING

## 6-1. General

The battery table components operate on 24VDC. The internal charging system also incorporates the components to transform the 120VAC input to 24VDC output to the components.

## 6-2. Troubleshooting Notes

The basic operation of each component will be defined along with a figure and an 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
- b. Main Switch Circuit and Wiring
- c. Pendant control

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

- a. Relay Box
- b. Pendant Control
- c. Auxilliary Switches

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.

**NOTE**

- Battery table troubleshooting should begin by switching the operating mode. For example; if a function fails in the AC120V mode, switch to the BATTERY mode. If the function now operates, the problem is probably located between the power cord and the relay box. If the function also fails in battery operation, use the auxiliary switches. If the function now operates, the problem is probably in the pendant control, connectors or wiring from the pendant control to the relay box.
- All connector pins are numbered usually with very small numbers.

## 6-3. Main Switch

The main power supply, 120 VAC, 60 HZ, comes in through the power cord and through the Power Switch. The Power Switch opens both lines when in the "OFF" position. The Power Switch is also a 10 Amp circuit breaker that is used to protect the complete electrical system.

## a. Main Switch Test

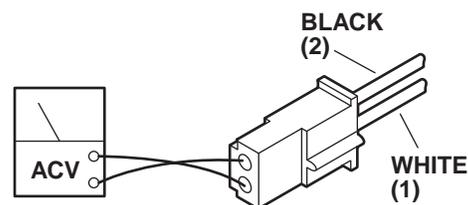
The following test will determine if line voltage is applied to connector CN12, which in turn would supply 120VAC power to the table.

1. Plug the power cord into the 120VAC supply (wall receptacle) and turn the main switch ON.
2. Disconnect connector CN12. See figure 6-1. Leave all other connectors connected.

**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 2 (black and white wires) located in connector CN12. See figure 6-2. You should receive line voltage 120 VAC.



**Figure 6-2. Connector CN12 Test**

## b. Test Results

If the correct voltage is obtained, everything is good up to this point and the problem would have to be in another area.

If you do not receive the correct measurements, the problem would have to be in the wires, Power Switch, Power Cord, or main electrical Power Cord connector (3p inlet connector).

Check the continuity from the power cord connector ICN1, through the switch and wiring to connector CN12. Remove the power cord, disconnect CN12 (black and white wires), and test as shown in figure 6-3.

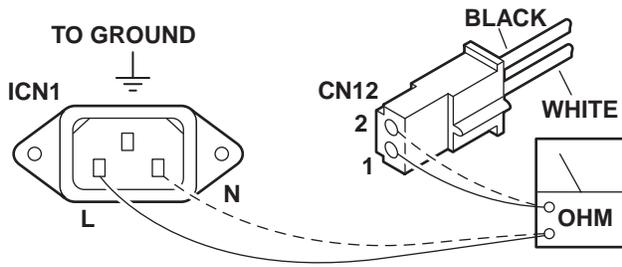


Figure 6-3. CN12 to ICN1 Continuity Test

#### 6-4. Batteries

The BATTERY operating mode is powered by two 12 volt batteries connected in series to provide the 24 volt operating power.

The battery system voltage should be 24VDC at a range of 22VDC to 26VDC. If the battery charge level falls below 23.5 volts the BATTERY operation indicator on the pendant control will blink indicating that the batteries require recharging. The built-in charging system automatically keeps the batteries at the proper charge level when the AC120V operating mode is ON. The charging system will operate while the table is being operated in the AC120V mode.

##### a. Battery System Test

1. Disconnect the main power cord and using a DC voltmeter, test each individual battery at its terminals. Meter should read 12VDC  $\pm$  1V.
2. To accurately test the batteries, they must be tested under a full load. Disconnect the main power cord and make sure all other connectors are connected.
3. Turn BATTERY power ON and elevate the table to its full up position.
4. Continue to press the TABLE UP button on the pendant control so that the pump motor continues to run and using a DC voltmeter, check the voltage drop of each battery individually. See figure 6-4.
5. Meter should read 12VDC  $\pm$  1VDC.

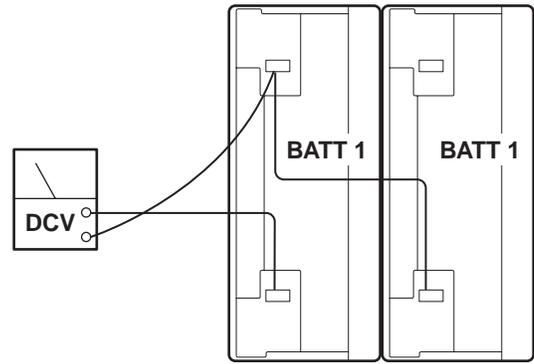


Figure 6-4.

##### b. Test Results

A reading of 11 volts or below indicates the battery needs charging.

After batteries have been fully charged, repeat the full load test. If either battery's voltage drops below 11VDC it should be replaced.

#### 6-5. Battery Charging Box/AC120V Transformer

The Battery Charging Box contains the battery charging system as well as the components for AC120V operation (except the transformer).

##### a. Transformer Test

1. Confirm 120VAC input at CN12 using Main Switch test in 6-3a.
2. Connect CN12, disconnect CN13 (brown and red wires) and using an AC voltmeter, test the transformer output at CN13. See figure 6-5.
3. Meter should read 22VAC.

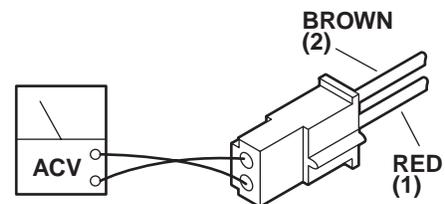


Figure 6-5. Connector CN13 Test

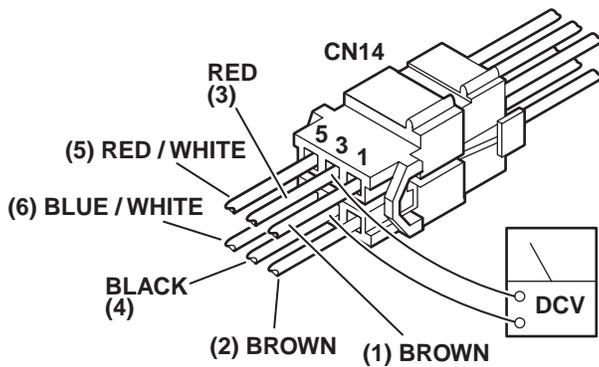
**b. Test Results**

If the correct voltage is obtained, everything is good up to this point and the problem would have to be in another area.

If you do not receive the correct measurements, the problem may be in the wires, connectors, or transformer. The transformer is located in the rear of the base under the stainless steel base cover. The stainless steel cover will have to be disconnected and lifted from the base for access to the transformer for further testing.

**c. Battery Charging Box Test**

1. Make sure all connectors are connected and turn AC120V operation ON. Using a DC voltmeter, test pin 3(+) and pin 4(-) of CN14. DO NOT disconnect connector CN14. See figure 6-6.



**Figure 6-6. Connector CN14**

2. Meter should read  $26.5 \pm 0.5$  VDC.

3. Test pin 5(+) and pin 6(-) of CN14 with DC voltmeter to test operation of CHARGING indicator light (next to power cord connector).

4. Meter should read  $26.5 \pm 0.5$  VDC if charger is operating. If batteries are fully charged there will be under 5 volts at pins 5 and 6.

**d. Test Results**

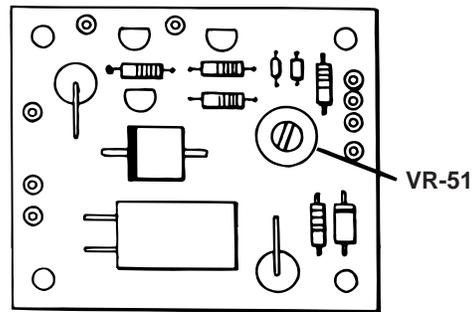
If you do not receive the correct readings, the charger system, connectors, wires, or the transformer may be defective.

**e. Charging System Output Adjustment**

If output reading at pins 3 and 4 is not  $26.5 \pm 0.5$  VDC, the output can be adjusted at the variable resistor VR51 on the circuit board inside the Charging Box. See figure 6-7. Turn the adjuster clockwise to decrease the voltage. Counterclockwise to increase the voltage.

**NOTE**

The battery connectors must be disconnected to adjust the battery charger output.



**Figure 6-7.**

**NOTE**

Normal charging time for a fully discharged battery is approximately 8 hours.

6-6. Switch-Over Relay

a. Switch-Over Relay in OFF Position

The Switch-Over Relay supplies the 24 volt input power from either the BATTERY or AC120V operating modes to the relay box for table operation. In the normal OFF position, BATTERY power is supplied to the relay box. See figure 6-8.

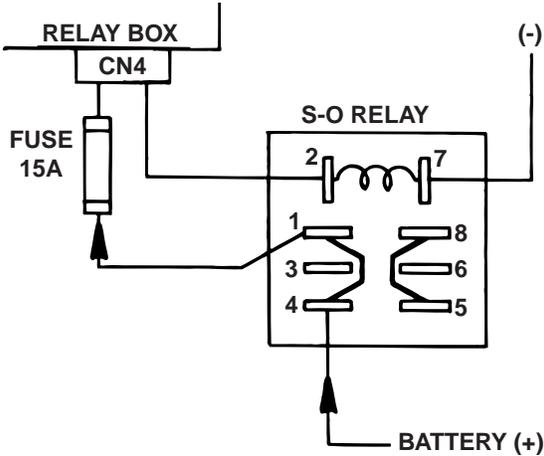


Figure 6-8. Relay in OFF Position

b. Switch-Over Relay in Activated Position

When the AC120V mode is activated by the main switch, a signal from the relay box activates the Switch-Over Relay. The relay then supplies the AC operating mode output power to the relay box and also activates the battery charging circuit. See figure 6-9.

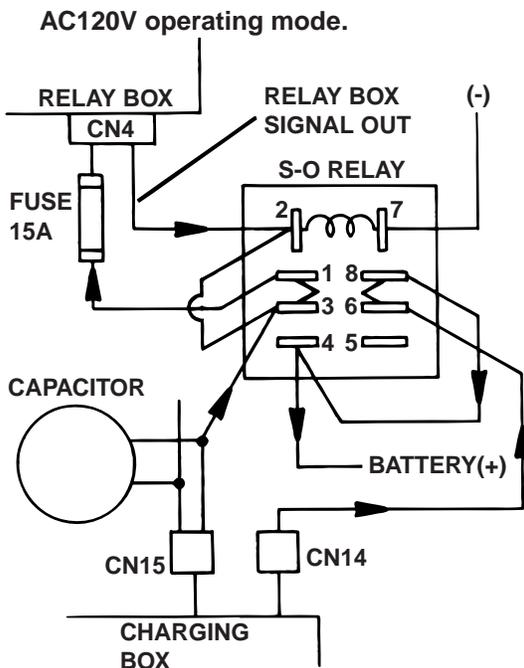


Figure 6-9. Relay in Activated Position

NOTE

The battery charging circuit is only operational when the table is in the AC120V operating mode.

c. Switch-Over Relay Test

Using a DC voltmeter, test the operation of the relay in both the OFF (AC120V - OFF) and Activated (AC120V - ON) positions. See figure 6-10.

NOTE

The Switch-Over Relay mounting block may have to be removed from the base for test access.

OFF: (AC120V - OFF)

- term. 7(-) and term. 1(+) = 24 to 28VDC
- term. 7(-) and term. 6(+) = 0VDC

Activated: (AC120V - ON)

- term. 7(-) and term. 6(+) = 26.5±1VDC

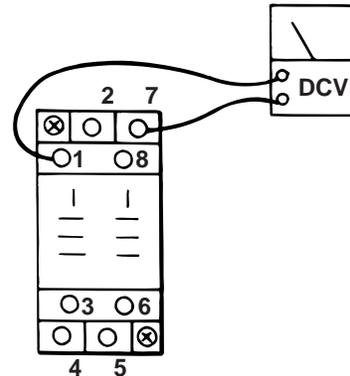


Figure 6-10. Switch-Over Relay

6-7. Pendant Control

The Pendant Control is part of the solid state, multiplex, logic control system. The pendant control contains illuminated, circuit board mounted switches and a micro processor. The encoded output from the pendant control is serial bit stream logic.

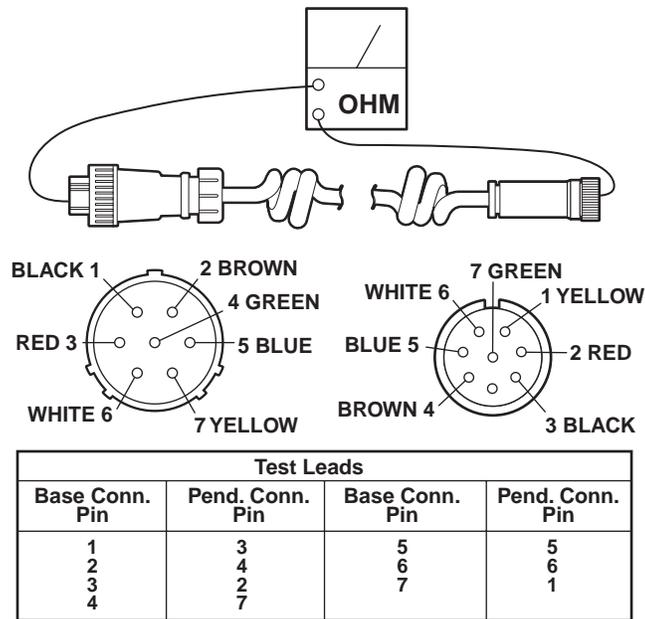
The output signal is transmitted to the micro processors in the relay box where the logic is decoded and the appropriate relays for the selected function are activated.

Pendant Control troubleshooting should begin by switching the operating mode of the table. For example; if a function fails when operating the table in the AC120V mode, switch to the BATTERY mode. If the function now operates, the problem is not the pendant control and probably is a problem located between the power cord and the relay box. If the function also fails when in battery operation, use the auxiliary switches to operate the function. If the function now operates, the problem is probably in the pendant control, connectors or wiring from the pendant control to the relay box.

**a. Pendant Control Test**

There are some serviceable components within the Pendant Control. The cord is detachable and can be tested for continuity between the pins on the connectors. Use the following procedure to test the pendant control cord.

Disconnect the cord from the table connector and from the pendant control connector and using an ohmmeter, test the continuity between the corresponding pins in the connectors. See figure 6-11.



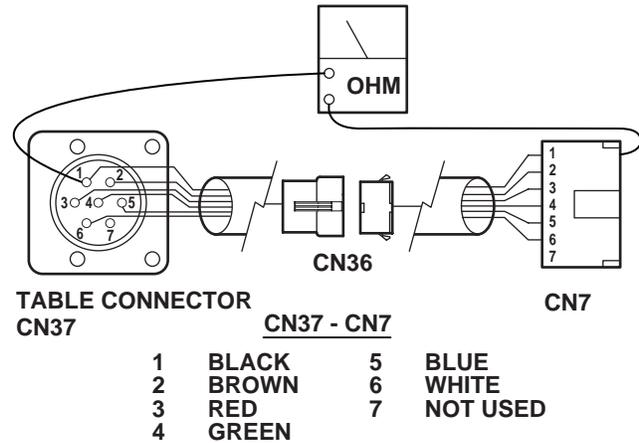
**Figure 6-11. Pendant Control Test**

**b. Test Results**

If you do not receive the correct readings, the wiring or connector pins may be faulty.

**c. Table Connector CN37 Test**

If correct readings are received, test the wiring from the table connector to connector CN7 at the Relay Box. Disconnect connector CN7 from the Relay Box and using an ohmmeter, test the continuity between the corresponding pins in connectors CN7 and the table connector. See figure 6-12.



**Figure 6-12. Table Connector Continuity Test**

**d. Test Results**

If the correct readings are not obtained, test the wiring from the table connector CN37 to connector CN36 (located under the elevation column shroud) and from connector CN7 to CN36. Disconnect connector CN36 and using an ohmmeter, test the continuity between the corresponding pins in connectors CN36 to CN7 and CN36 to CN37. Refer to figure 6-12.

If the correct readings are obtained, this part of the circuit is okay and the problem may be the Pendant Control or the Relay Box. Contact SKYTRON if all tests performed indicate that the problem is located in the Pendant Control.

### 6-8. Auxiliary Switches

The following tests will determine if the auxiliary switches are functioning properly.

#### a. Switch Test

Disconnect connector CN3 at the Relay Box and using an ohmmeter check for continuity at the connector pins (pin 1A common) while activating the appropriate switch. See figure 6-13. Meter should read 0 ohms.

#### b. Test Results

If proper meter readings are not received, test the individual switches as necessary. Using an ohmmeter, test the operation of an individual switch with the (+) test lead at the center terminal of the switch and the (-) test lead at the terminal opposite the direction of the switch actuation. Refer to figure 6-14. Meter should read 0 ohms. If the switches check out, the problem would have to be in the wires, the switch circuit board or connector CN3.

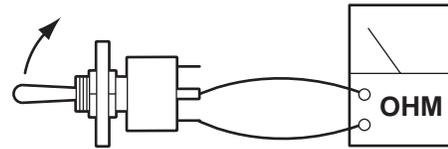


Figure 6-14. Auxiliary Switch Test

### 6-9. Relay Box

The power supply is directly connected to the relay contacts. When these contacts are closed, 24 volts is supplied to the solenoids which are mounted on the hydraulic mini-valves. One relay is used to supply power to the pump/motor and is always activated no matter what control function is selected. The brake locking circuit relay is also activated when any control function other than BRAKE UNLOCK is initially selected.

Also, inside the 6600B relay box is a step-down transformer and full-wave rectifier which decreases the voltage to 5-6 volts. This low voltage potential controls the relays by the use of the hand-held pendant control buttons. Basically the relays enable a 5-6 volt potential to control the 24 volt circuit.

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

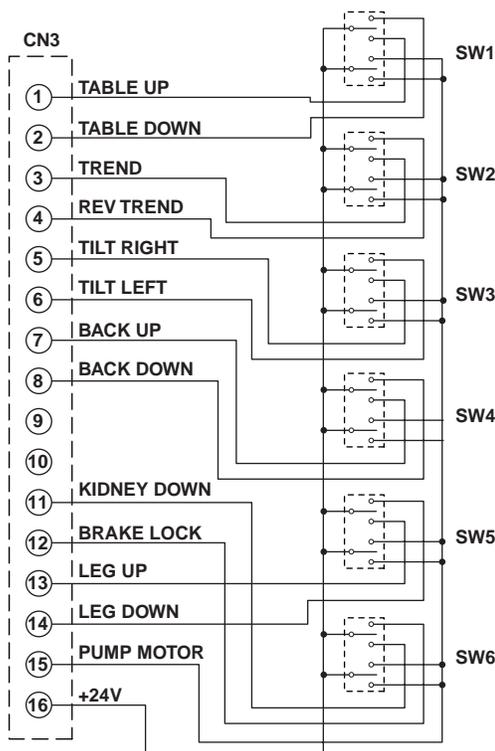
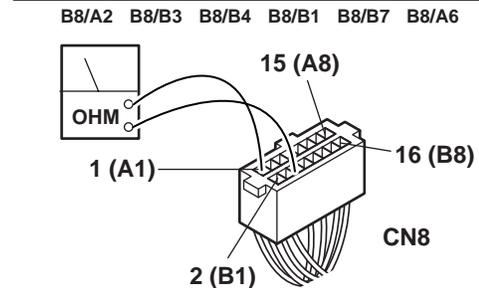
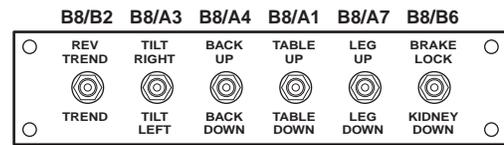


Figure 6-13. Auxiliary Switch Connector CN9



PIN NO	COLOR	PIN NO	COLOR
1 (A1)	Red	9 (A5)	--
2 (B1)	White/Red	10 (B5)	--
3 (A2)	Brown	11 (A6)	White/Purple
4 (B2)	Yellow	12 (B6)	Purple
5 (A3)	Orange	13 (A7)	Gray
6 (B3)	White/Orange	14 (B7)	White/Gray
7 (A4)	White/Brown	15 (A8)	Red/White
8 (B4)	Blue/White	16 (B8)	Pink

## 6600B

### a. Checking Relay Box Input Power

1. Connect power cord to table. Plug the power cord into the 120VAC supply (wall receptacle). Disconnect connector CN4, leave all other connectors connected.

2. Using a DC voltmeter, test input power for both the BATTERY and AC120V operating modes. See figure 6-15. Meter should read approximately 24 -28 volts.

BATTERY mode (Main Power OFF)	AC120V mode (Main Power ON)
pin1=(+)	pin 5=(+)
pin2=(-)	pin 6=(-)

#### Connector CN4 Color Code

Pin 1 Red	Pin 5 White
Pin 2 Blue	Pin 6 Black
Pin 3 Yellow	Pin 7 Yellow
Pin 4 Blue	

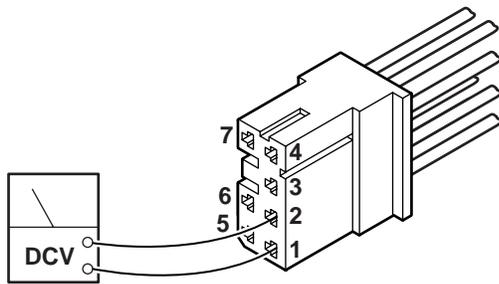


Figure 6-15. Relay Box Input

### b. Test Results:

If you do not receive the correct meter readings, the problem is in the input wiring, connectors or components. If the correct readings are obtained, proceed to the next step.

### c. Checking Output to Pump

1. Disconnect pump connector CN16, connect all other connectors and activate the AC120V operating mode.

2. Test CN16 at pin 1(+) and pin 2(-) with a DC voltmeter. Meter should read approximately 24-28 volts when any function button is activated. If no voltage is present, use an ohmmeter to test the continuity from CN16 to CN4 (yellow and blue wires). Refer to figure 6-15 for CN4 pin locations.

### d. Checking Output to Solenoids

This test checks the voltage that is used to energize the solenoids.

1. Activate either BATTERY or AC120V operating mode.

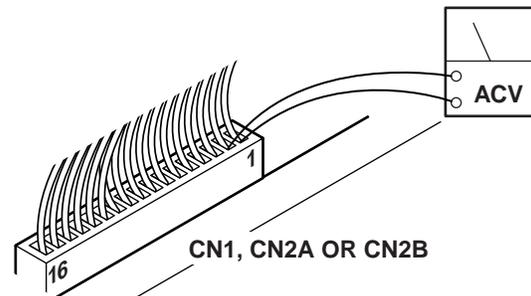
#### NOTE

•The Brake Lock function is activated by pressing any function button (except BRAKE UNLOCK). A timer in the Relay Box allows continuous output for about 7 seconds. If the brakes are already locked, no output is provided.

•The BRAKE UNLOCK button activates another timer in the relay box which allows continuous output for the brake release function for approximately 7 seconds. If the brakes are already released (using the BRAKE UNLOCK button) no output is provided.

2. Test connectors CN1, CN2A and CN2B from the back while attached to the relay box. All connectors should be connected.

3. Activate each of the pendant control buttons and measure the output voltage for the corresponding connector pins with a DC voltmeter. See figure 6-16. Meter should read 24 volts.



CN1		CN2A	
FUNCTION	PINS	FUNCTION	PINS
Table Up	1 - 2	Back Up	1 - 2
Table Down	3 - 4	Back Down	3 - 4
Trend	5 - 6	Slide Foot	5 - 6
Rev Trend	7 - 8	Slide Head	7 - 8
Tilt Right	9 - 10	Kidney Up	9 - 10
Tilt Left	11 - 12	Kidney Down	11 - 12
Reflex	13 - 14	Leg Up	13 - 14
Flex	15 - 16	Leg Down	15 - 16
		CN2B	
		Brake Set	1 - 2
		Brake Unlock	3 - 4

Figure 6-16. Solenoid Output Connectors

**e. Test Results:**

If you do not receive the correct meter readings, the relay box 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.
- If the battery power is ON and no table functions have been activated for 3 hours, the power off circuit will interrupt the battery power.

**f. Checking Output to Pendant Control**

The output to the Pendant Control can not be tested without specialized equipment. If all tests have been conducted and it appears that the Relay Box is faulty, contact SKYTRON.

**6-10. Main Wire Harness Continuity Tests**

If correct meter readings are not received in tests between components, before replacing the components, test the Main Wire Harness to be sure all connectors and wires are making a good connection.

**a. CN4 to Batteries Test**

1. Disconnect connectors CN4 and the (+) and (-) connectors from the batteries. Leave all other connectors connected.
2. Using an ohmmeter, test for continuity between pin 1 of CN4 and battery (+) connector. Also test between pin 2 of CN4 and battery (-) connector. See figure 6-17.

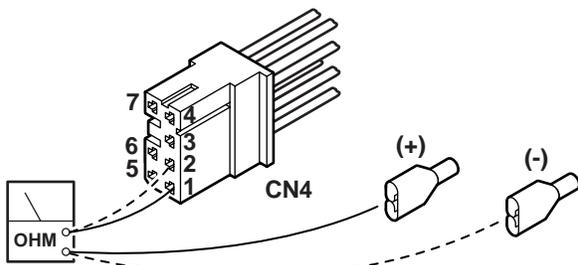
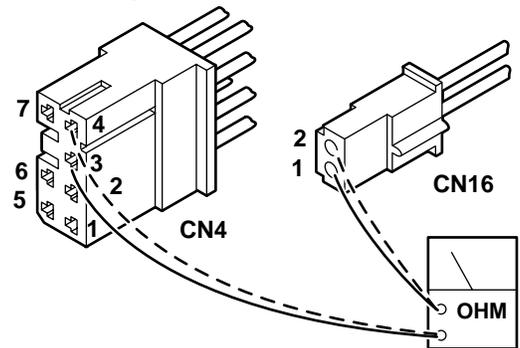


Figure 6-17.

**b. CN4 to Pump Test**

1. Disconnect connectors CN4, CN16 and CN17. Leave all other connectors connected.
2. Using an ohmmeter, test for continuity between the pins of CN4 and pins on CN16 and CN17. See figure 6-18.

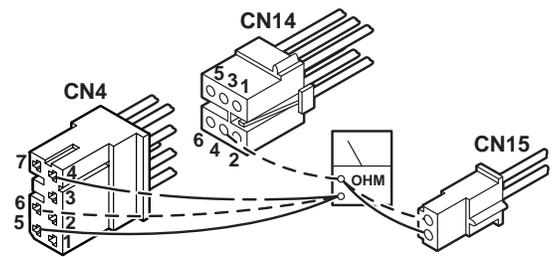


CN-4	CN-16	OHMS
3	1	0
4	2	0

Figure 6-18.

**c. CN4 to Charging Box Test**

1. Disconnect connectors CN4, CN14 and CN15. Leave all other connectors connected.
2. Using an ohmmeter, test for continuity between pins 4, 5 and 6 of CN4, pins 1 and 2 of CN15, and pin 4 of CN14. See figure 6-19.



CN-15	CN-4	CN-14	OHMS
1	5		0
	6	4	0
2	4		0

Figure 6-19. CN4, CN14, and CN15

**NOTE**

The 15 amp battery protection fuse is in the line between CN4 pin 1 and the battery connector. Test the continuity of the fuse if correct meter reading is not received.

6-11. Solenoids

The solenoids are energized by 24 volt potential that is controlled by the relay box.

The solenoid windings are protected from excessive heat by an internal thermal fuse that will open after approx. 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.

b. Test #1

1. Activate either BATTERY or AC120V operating mode.
2. Disconnect the 2 pin connector from the solenoid in question, all other connectors should be connected. See figure 6-20.

3. Use a DC voltmeter and measure the voltage across the 2 pin connector. Pin 1(+), and pin 2(-). Meter should read approximately 24-28 volts.

NOTE

- The appropriate pendant control button must be pushed during this test. The motor will run when this test is performed, and the brake locking solenoid will be activated by any function other than UNLOCK.
- 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.

c. Test Results:

If you do not receive the correct voltage, the problem could be in the wires leading down to the connector. The problem could also be in the relay box or the Pendant Control (refer to appropriate 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.

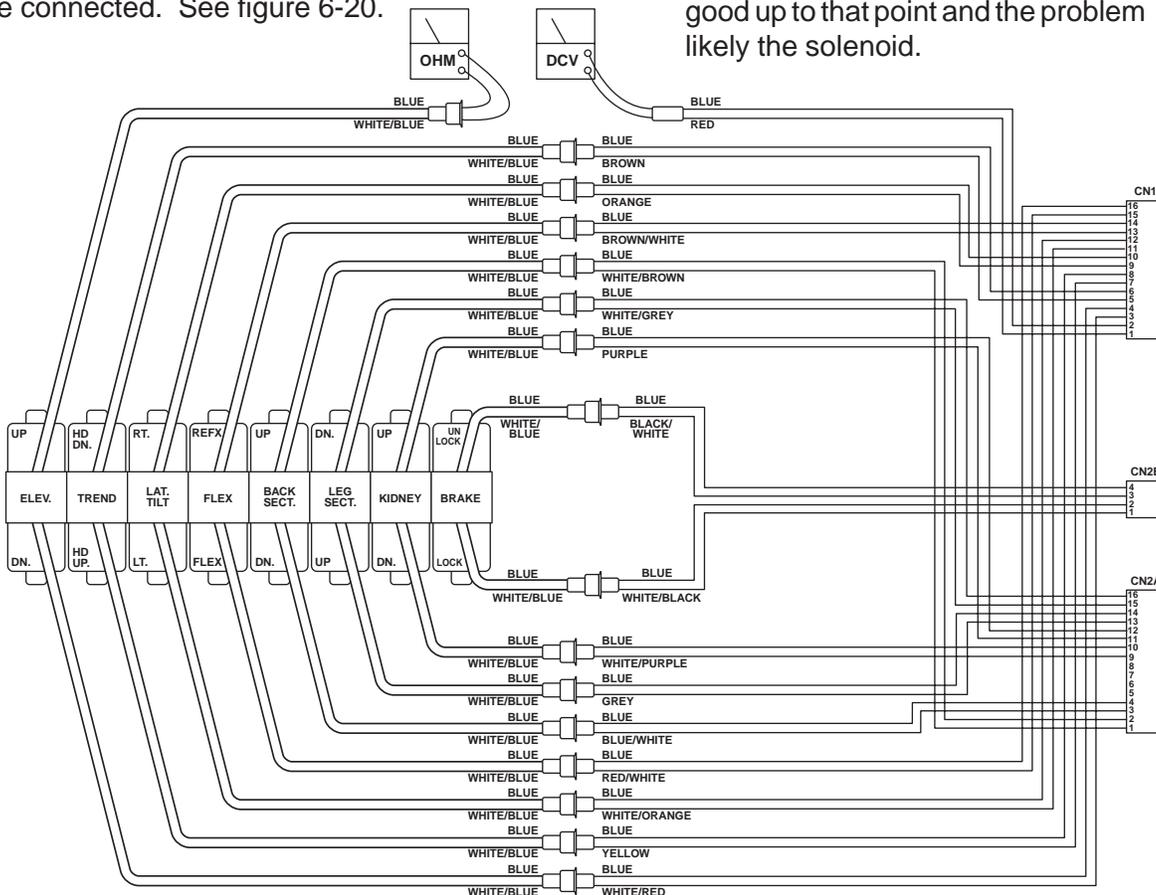


Figure 6-20. Solenoid Test

**d. Test #2**

The solenoid can be checked out using an ohm-meter R x 1 scale.

1. Measure the resistance between the two pin connector in question as shown in figure 6-20. Connector must be disconnected. Polarity of meter leads is not important.

2. The meter should read approximately 16 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 multi-meter.

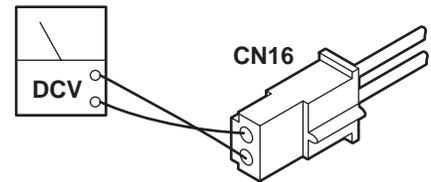
**6-12. Motor/Pump Assembly**

The hydraulic pump motor is a thermally protected 24 volt DC electric motor. 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 insulators in the base of the table.

**a. Motor/Pump Test**

1. Disconnect motor connector CN16. Leave all other connectors connected and activate either BATTERY or AC120V operating mode.

2. Activate any function and use a DC voltmeter to measure across the two pin connector. Pin 1(+) and pin 2(-). See figure 6-21. Meter should read 24-28 volts.

**Figure 6-21. Motor Input Voltage****NOTE**

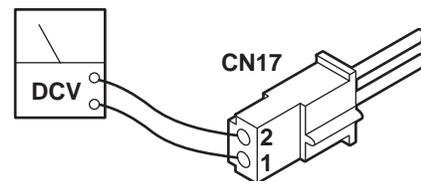
If the pump has been activated continuously for 1-1/2 to 2 minutes, the thermal relay will interrupt the power to the pump.

**b. Thermal Protector Test**

The Thermal Protector is built in to the pump motor and is used to interrupt the current flow to the pump motor to protect it from possible damage due to overheating.

1. Turn OFF both BATTERY and AC120V operating modes.

2. Use an ohmmeter to test for continuity between terminals 1 and 2 on the connector CN17. See figure 6-22.

**Figure 6-22. Thermal Protector**

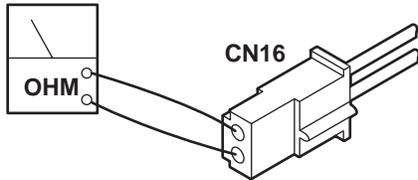
3. The Thermal Relay should reset itself after approximately one minute.

4. The Thermal Relay should activate after 1-1/2 to 2 minutes of continuous pump operation.

**c. Motor Resistance Test**

The motor can be statically checked for resistance using an ohmmeter. This test is not 100% accurate because you are checking the motor with very low voltage from the meter and without any load.

1. Using an ohmmeter R x 1 scale, measure the resistance between the two pins of CN16. See figure 6-23.
2. The meter should read 1 to 2 ohms at room temperature.
3. Measure the resistance between either pin and ground.
4. Meter should read infinity.



**Figure 6-23. Motor Connector CN12**

**d. Test Results:**

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

## SECTION VII ELECTRICAL SYSTEM ADJUSTMENTS

### 7-1. Relay Box Adjustments (Battery Table Only)

The Relay Box contains variable resistors for adjusting the operating timers for the BRAKE SET and BRAKE UNLOCK functions. The Relay Box for the battery model tables also has variable resistors for setting the Power Off timer and the battery recharge warning circuit. These timers are set at the factory and usually never need adjustment. If an adjustment is necessary, remove the relay box cover and use the following procedures. See figure 7-1.

#### a. Brake Release Timer

The Brake Release Timer is set for about 7 seconds and is controlled by the variable resistor VR1 on the relay box circuit board. Turn the adjuster clockwise to increase the operating time. Counterclockwise to decrease the operating time.

#### b. Brake Set Timer

The Brake Set Timer is set for about 7 seconds and is controlled by the variable resistor VR2 on the relay box circuit board. Turn the adjuster clockwise to increase the operating time. Counterclockwise to decrease the operating time.

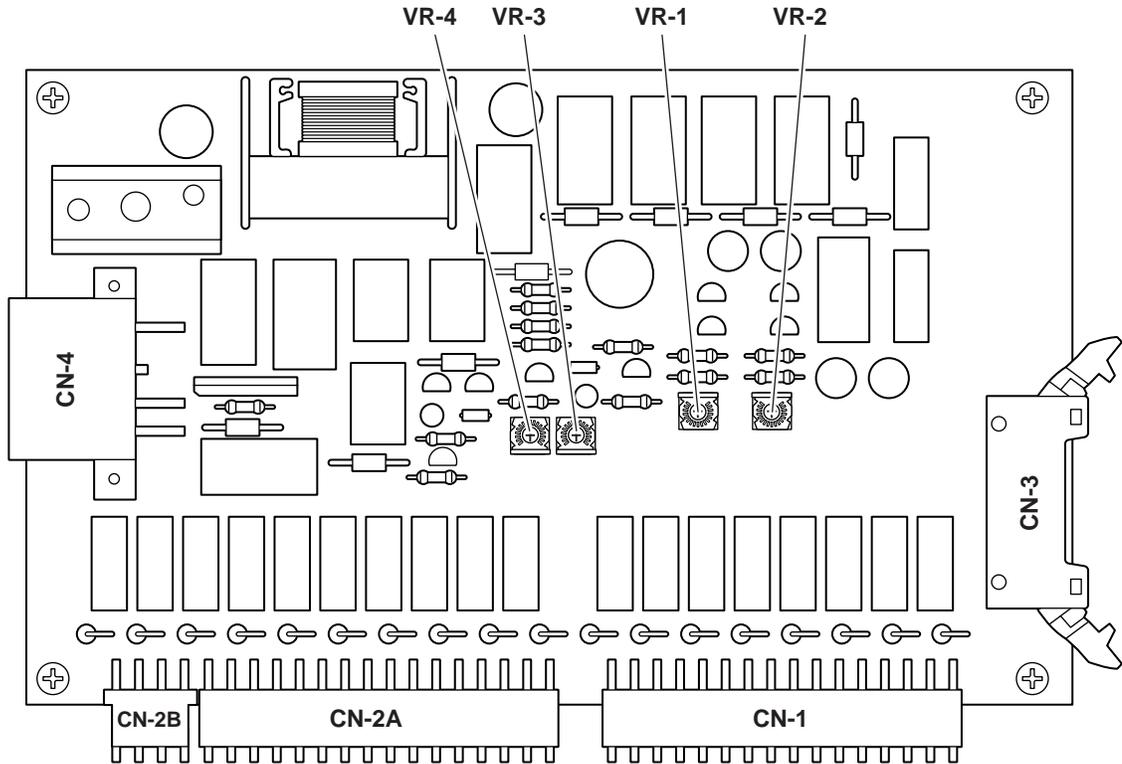


Figure 7-1. Relay Box Adjustments





