
Section 03: Installation Procedures

Machine Installation & Hook-Up

**IMPORTANT**

Before beginning the Machine Installation & Hook-Up it is important to review the entire Pre-Installation section.

Unpacking**Tools Required**

Hammer, 15/16" socket or wrench and knife

- 1) Remove the crate and/or protective material from around the VMC.
- 2) Remove the strapping material from the front doors.
- 3) Unload the boxes from the inside and/or around the VMC.
- 4) Remove the 4 each 5/8" bolts and nuts between the base of the VMC and the pallet.

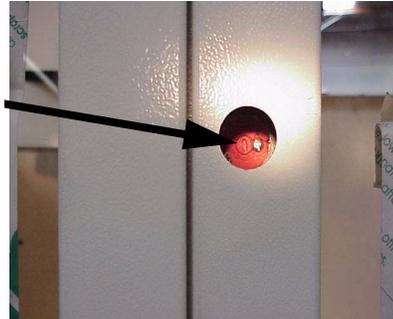
**Unlocking Front
Doors with CE Door
Locks****Tools Required**

Small screwdriver.

- 1) Remove cap on front door frame.



- 2) Release the screw.



- 3) Turn to override door lock.



**Moving the VMC:
Fork Lift**

(See Figure 3-2).

Tools Required

5/32" hex bit socket or Allen wrench.

IMPORTANT



The head and the counterweight must be secured before lifting the VMC. Since the TRM doesn't have a counterweight, only secure the head on the TRM.

- 1) Remove the 4 each (per panel) 1/4-20 cap bolts from the access panel if not already removed.
- 2) Install the fork lift bars through the openings in the base casting. Fork lift bars may be obtained from FADAL if none are available.
- 3) FORK LIFT from the front of VMC.

Note: VMCs EMC, 5, 10, 15, and 15XT have fork lift access supports as part of the base. On the TRM it is recommended that the machine is picked up from the front or the back.

**Moving the VMC:
Crane****IMPORTANT**

For the 6535 use a forklift with a 30,000 plus lifting capacity

(See Figure 3-2).

Tools Required

1/4" and 9/16" hex bit socket or Allen wrench.

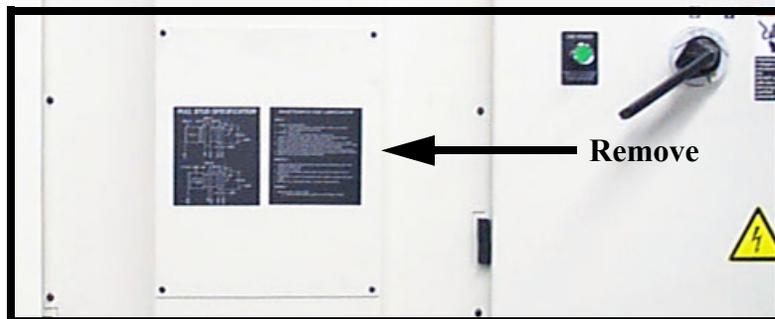
**IMPORTANT**

The head and the counterweight **MUST** be secured before lifting the VMC. Since the TRM doesn't have a counterweight, only secure the head on the TRM.

VMCs 5, 10, 15, and 15XT are **NOT** intended to be lifted by a crane.

- 1) Remove the 1/4-20 cap bolts to the axis scale cover, if installed.
- 2) Remove the 5/16-18 cap bolts securing the front Teleflex cover to the saddle.
- 3) Slide the Teleflex cover toward the front of the VMC.
- 4) Remove the 2 each 1-8 (1.5-6 for the 6535) set screws in the front of the base casting.
- 5) **STANDARD SHEETMETAL:** Install the 2 each 1-8 eye bolts. Place the 1 1/4" steel bar through the top rear hole in the column side. (See Figure 3-2). Use a properly rated lifting strap around bar and through eyebolts for lifting.

SLANT SHEETMETAL: Install the 2 each 1-8 eye bolts (1.5-6 eye bolts for the 6535). Remove upper cover from back of column. Place two 1 1/4" steel bars through the two top holes in the column rear. Use a properly rated lifting strap around bar and through eyebolts for lifting.



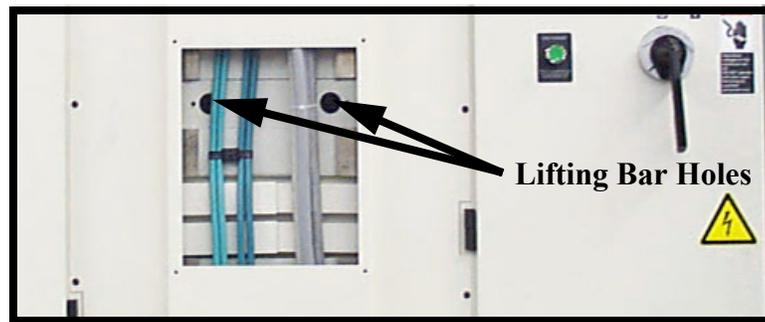


Figure 3-1 Slant Sheetmetal Details

Placing the VMC

- 1) Place the leveling pads (countersink side up) under the leveling bolts. Be sure leveling bolts go into countersink on leveling pads.

Note: Use leveling pad (SHP-0002) (PLC-0063 for slant sheet metal machines, or machines equipped with the HydroSweep option) for placing the machine. Any other pad may cause damage to the machine.

- 2) Remove the fork lift bars or the eye bolts and the steel bar from the column.

3) At this point the VMC is ready for power and air connections.

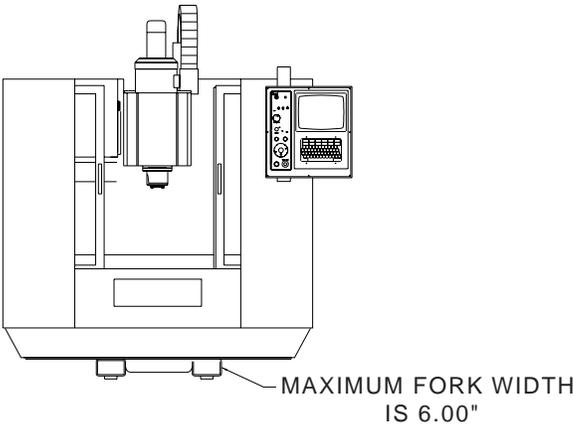
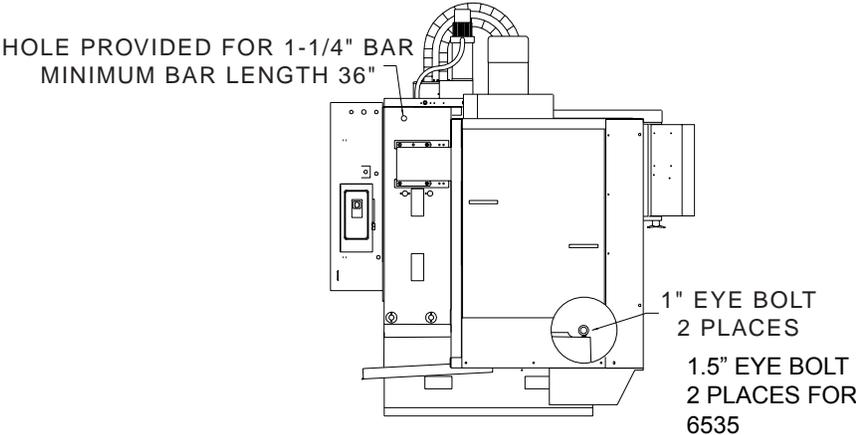
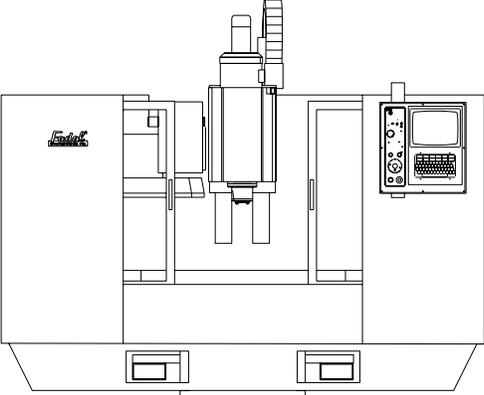


Figure 3-2 Moving the VMC

Air Supply

**IMPORTANT**

AIR PRESSURE REQUIRED: 120 psi before regulator, 80 psi after regulator, 15 scfm (standard cubic feet per minute) momentary.

- 1) Connect the 3/8" air hose to the VMC.
- 2) Check the pressure gauge for 120 psi and adjust the regulator on the VMC if necessary.
- 3) Check for air leaks at the fitting and around the air regulator.
- 4) It is important that the air compressor turns on when the pressure drops to approximately 120 PSI. This assures the VMC a constant 80 PSI.

Power Check

**WARNING**

Do NOT power on the VMC before completing this section.

Tools Required

Fluke DMM, screwdriver or Wago tool 210-141 (ST-26), 5/16" hex bit socket and 3/4" open or box wrench.

Verify the Main Power Fuses

- 1) With the main disconnect switch in the off (down) position, open the cover to the main disconnect box.
- 2) Measure and record the incoming voltage across the terminal block of the main disconnect. (See Figure 3-3).

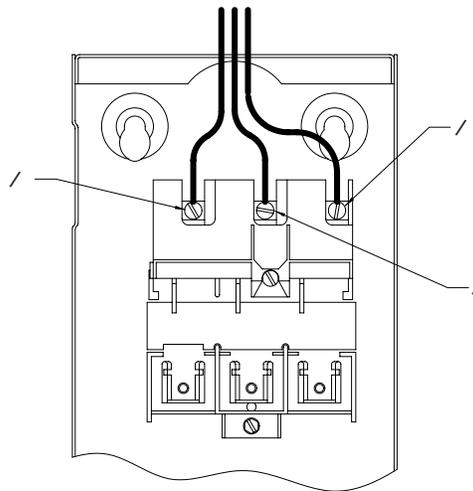


Figure 3-3 Main Disconnect Terminal Block

- 3) Using table **B- 3 in Appendix B (MAIN POWER FUSES)**, verify that the fuses match the voltage and machine type, e.g. 4020HT, 240V, 60HZ, 3Ø = 45A.

Verify the MOV Surge Suppressor Board

1) Locate the MOV Surge Suppressor Board (see figure 3-4).

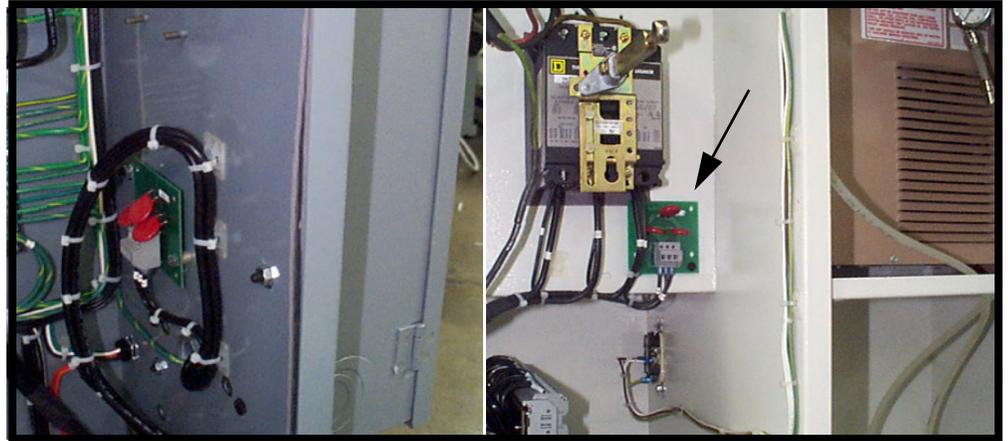


Figure 3-4 MOV Surge Suppressor Board

2) Find the part number on the board.

- a. If your incoming voltage is *under* 250 VAC, then an 1170-0 (PCB-0145) should be installed.
- b. If your incoming voltage is *over* 250 VAC, then an 1170-1 (PCB-0146) should be installed.

3) Identify the jumper and AC input locations. Use **figures 3-10 through 3-14** for three phase and single phase transformers.

- a. Where are the jumpers located?
- b. Where are the AC inputs (L1, L2, L3) located?

4) With the jumper and AC input locations, locate the voltage setting of the transformer using the table in either **Figure 3-10 (3 phase)** or **Figure 3-11 (single phase)**.

EXAMPLE:	Jumper (Step 6a)	AC Input (Step 6b)	=	Voltage Setting
	3-6	8	=	240VAC

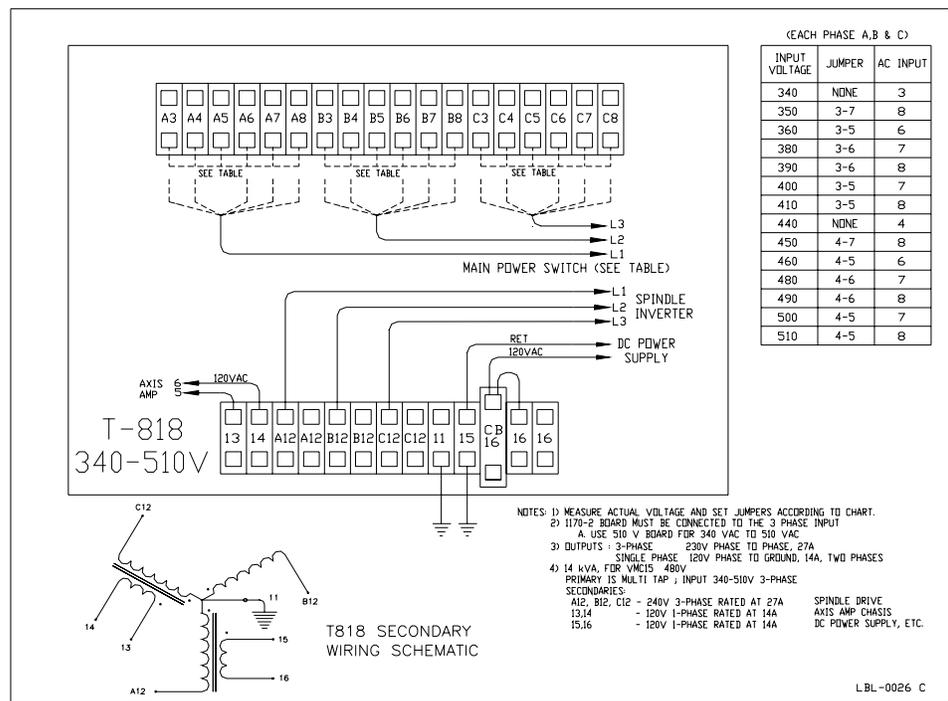


Figure 3-5

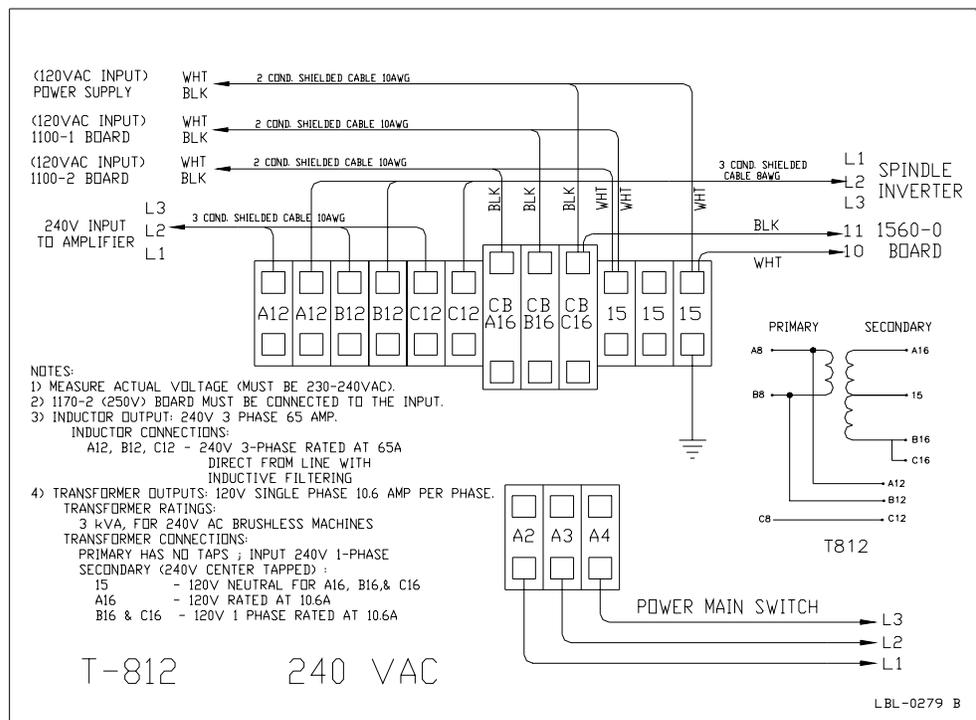


Figure 3-6

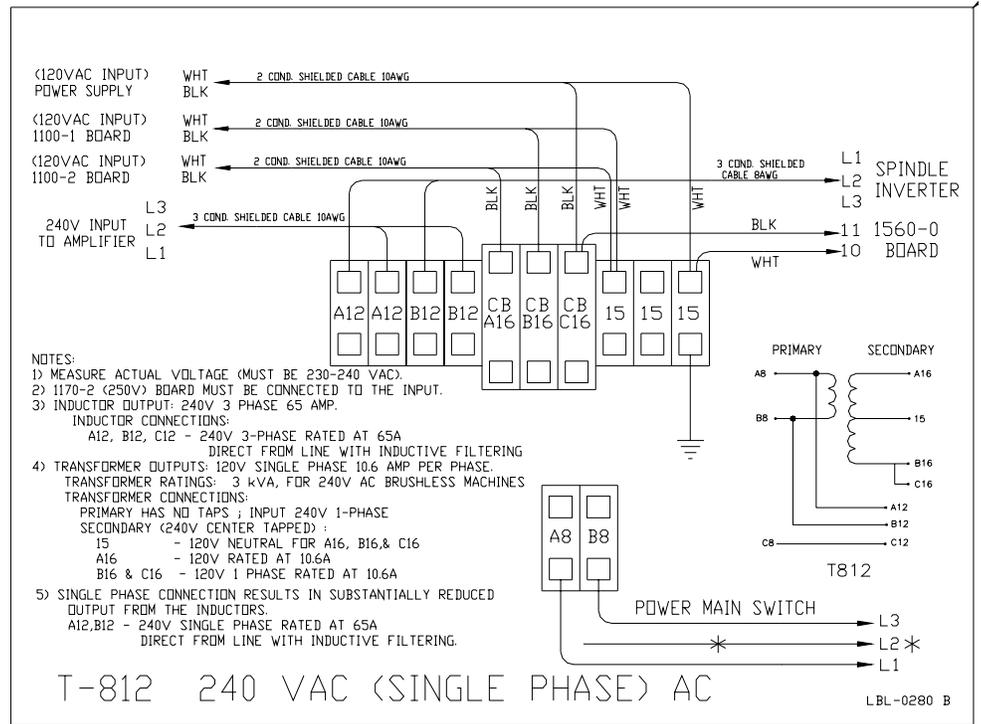


Figure 3-7

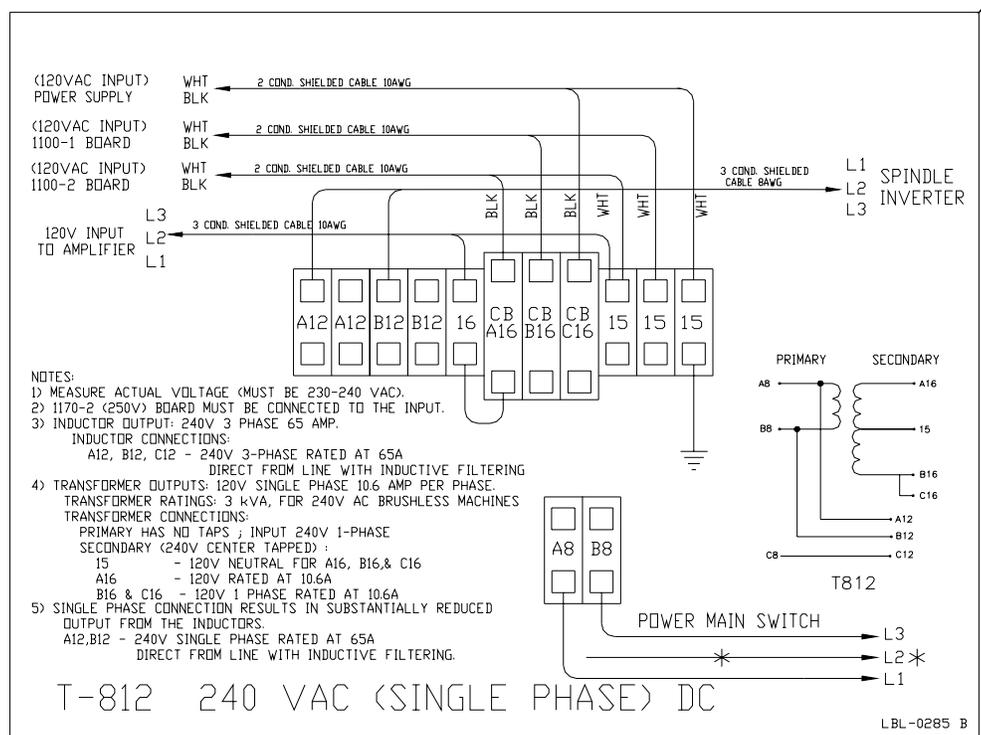


Figure 3-8

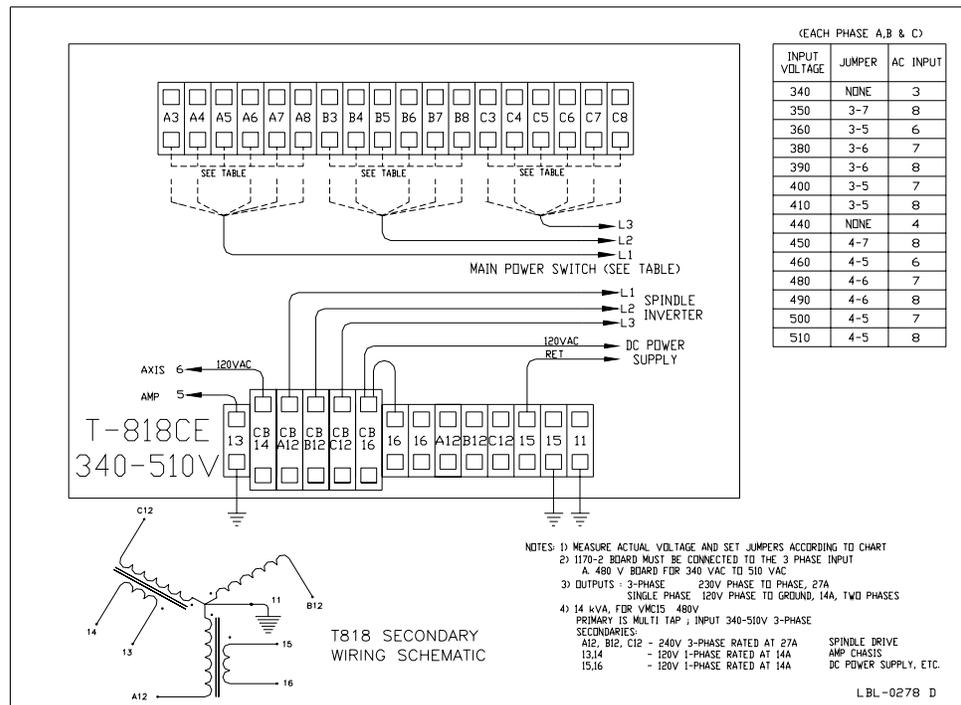


Figure 3-9

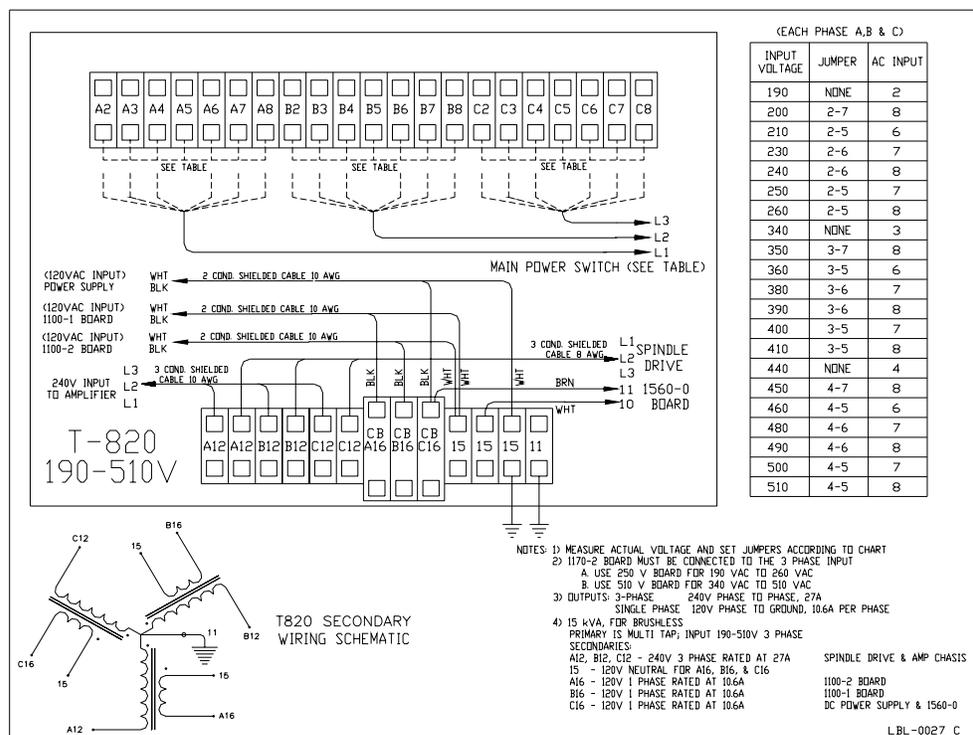


Figure 3-10

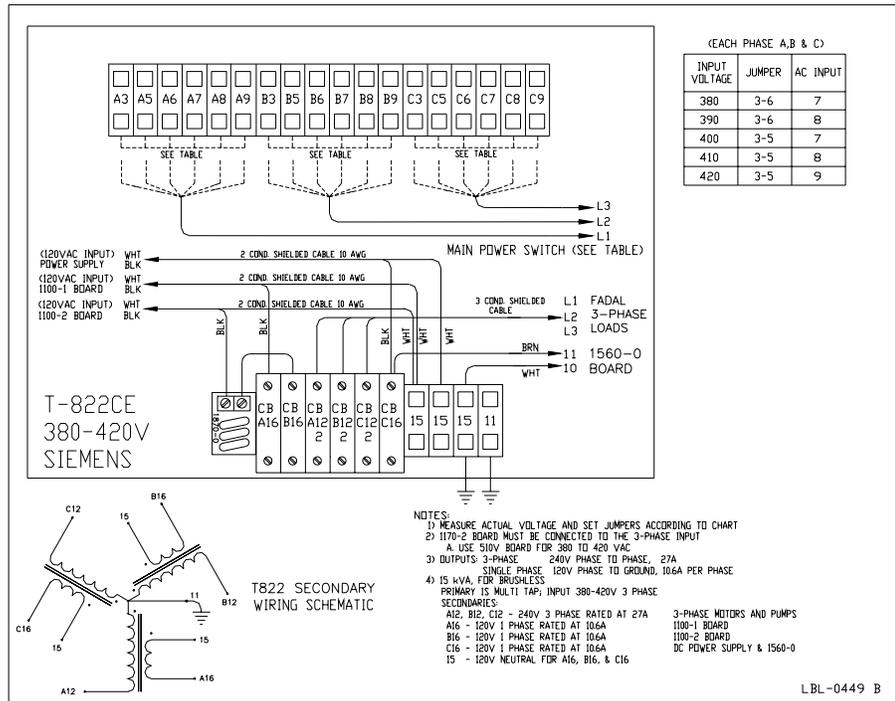


Figure 3-11

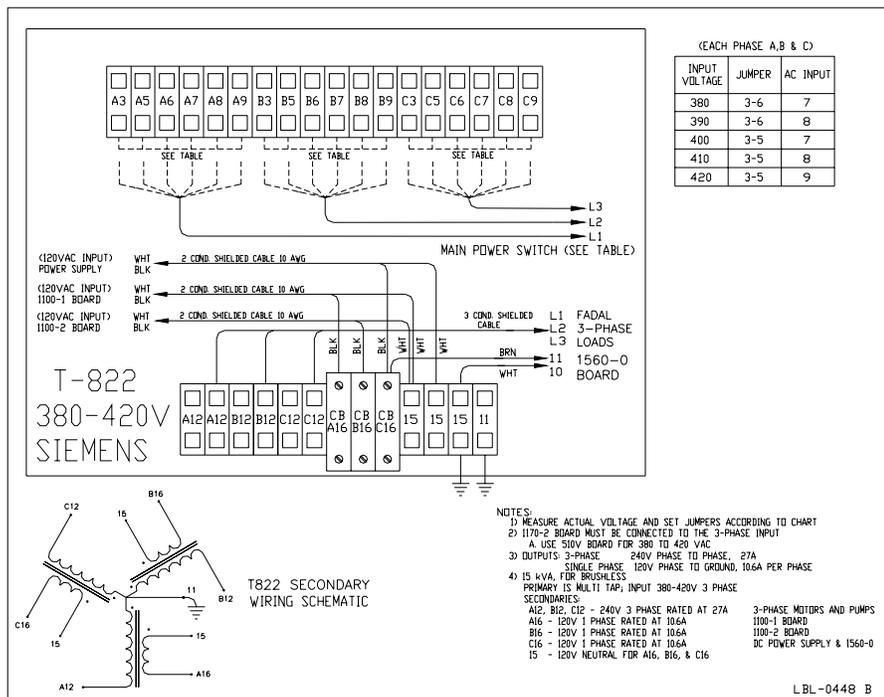


Figure 3-12

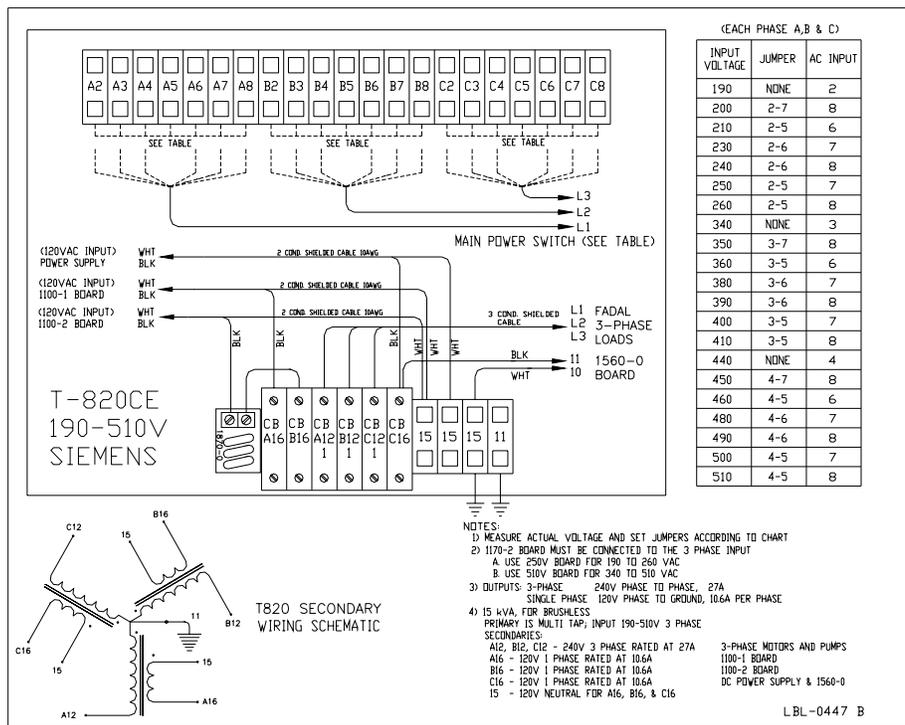


Figure 3-13

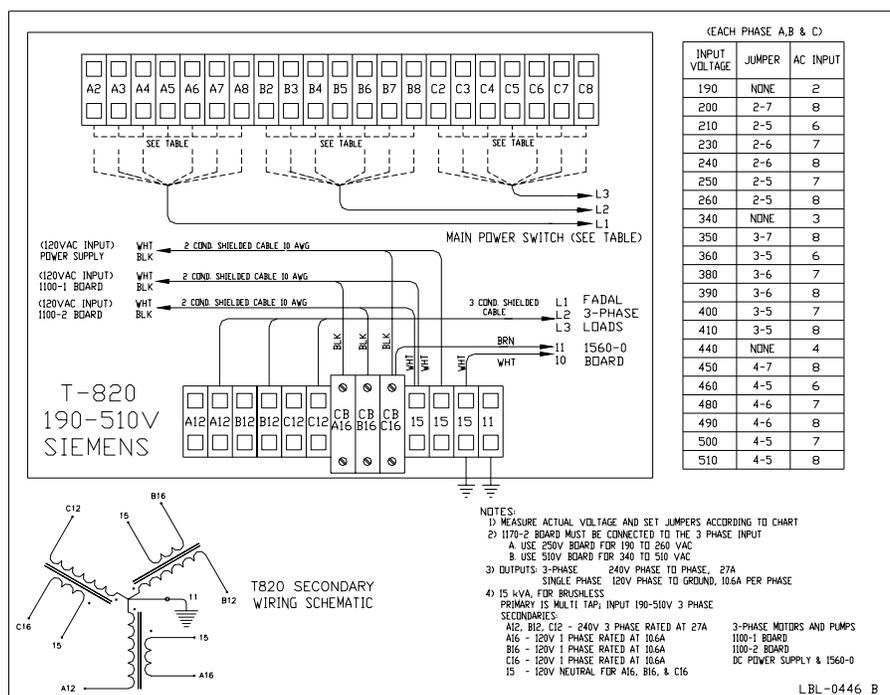


Figure 3-14

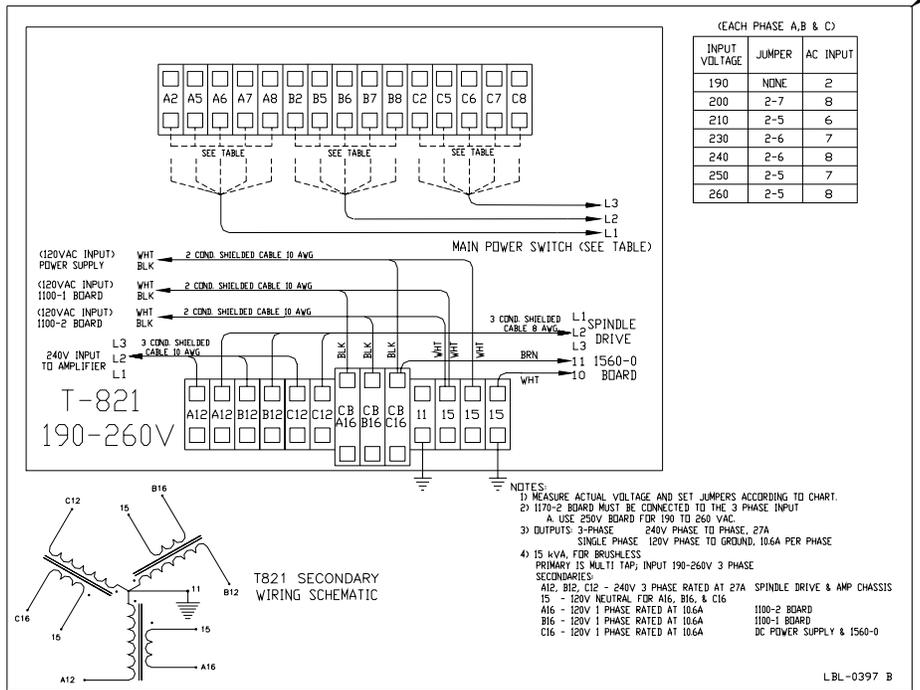


Figure 3-15

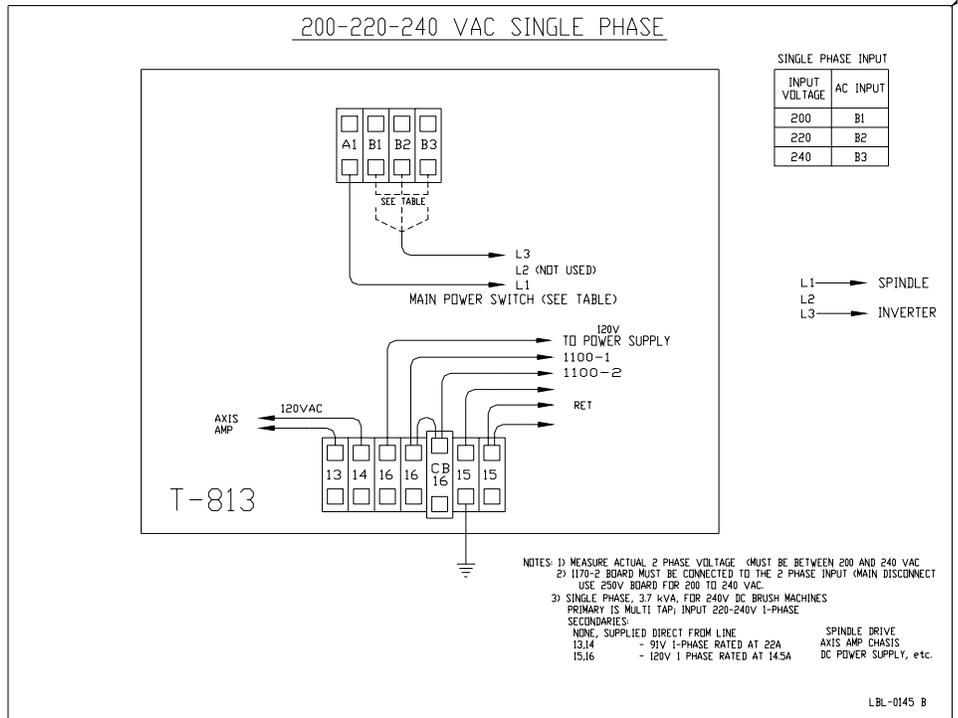


Figure 3-16

- 3) Subtract **step (A3.2.6-7) from step (A3.2.6-2)**.

EXAMPLE:

measure voltage=	240 L1-L2	245 L1-L3	242 L2-L3
voltage setting=	240 A	240 B	240 C
difference=	0	5	2

- If the difference is less than 10, continue.
- If the difference is greater than 10, adjust the voltage settings using either figure 9 (3 phase) or figure 10 (single phase) to match the measured voltage.

The VMC is Ready for the Initial Power on Procedure

- Move the main disconnect switch to the ON (up) position. DO NOT PRESS THE GREEN CNC POWER BUTTON.
- Measure the voltage at the transformers secondary between A12-B12, A12-C12, B12-C12.
- For single phase measure across A8-C8. The voltage should be between 230-240 VAC, correct if necessary.
- Push the EMERGENCY STOP switch to disable the axes, then push the CNC POWER button.
- Check the voltages on the D.C. power supply, i.e. 5, + 12, -12 VDC.
- Reset the EMERGENCY STOP switch.
- Unbolt and remove the support between the table and the head.
- Unbolt and remove the counterweight bars from the column, located next to the main disconnect box.
- Jog the axis to the cold start indicators and cold start the VMC.

Transformer Tapping

- With the machine main power switch turned OFF, verify that the chart on the door of the cabinet is the one for the transformer in the machine.
- Measure the input voltage to the machine on the chart (Measure leg to leg the input power lines to the machine.).
- Next to the voltage on the chart will be a "jumper" number such as 3-6 and a "AC Input" number such as 7.

- 4) Each phase has a group of terminals such as A3 to A8 for phase 1 and B3 to B8 for phase 2. Place a jumper between the two terminals listed on the chart for each phase. Using the same example place jumper from A3 to A6 for phase 1, B3 to B6 for phase 2 and one from C3 to C6 for phase 3.
- 5) Place the input tap wire in the proper terminal, as in example A7 for phase 1, B7 for phase 2 and C7 for phase 3.
- 6) Turn ON the main power switch.
- 7) Measure the input voltage to the spindle drive, usually labeled L1, L2 & L3, leg to leg. Should be about 230 VAC with the range being from 220 to 240 VAC. If the difference between 230 and the measured voltage is greater than ten (10) volts then power down. If the voltage is too high then select the next higher voltage on the chart and change the jumper and / or input tap and recheck. If the voltage is too low then select the next lower voltage and change and check.

Note: It is acceptable to have the legs tapped differently by one voltage tap position. There should be no more than one position.

Single Phase Input Power

The Fadal VMC line is designed for three phase input power. However, three-phase power is not always available. If this is the case, Fadal offers a single-phase input power option. All Fadal machines are capable of operating on single-phase line input. The torque ratings will be at 60% of the published performance. The rapid traverse rate is reduced to not more than 700 IPM for machines with higher speed capability. This is because as the DC bus capacitors are drained and the bus voltage drops, the single-phase input can not recharge the capacitors as fast as the three-phase. Lower bus voltage equals lower speed and more current. Single-phase requires 73% more current to maintain the same performance (square root of 3). The main limitation is the spindle drive. It will not draw more than its rated current. The current rise is steeper in single-phase and will therefore trip sooner.

Fadal does not recommend single-phase power for the High torque or the 6535, 6030 and 8030 machines and cannot be used with VHT. This option can be ordered on a new machine and can be installed in the field. Some wiring changes are also necessary. Please see the single-phase transformer charts and wiring instructions.

Phase Converter Rotary

The Normal Fadal VMC requires three phase-input power. The machines are also configured in a single-phase power configuration when requested. Some customers prefer to use rotary phase converters, however Fadal does not recommend the use of rotary phase converters.

Rotary phase converters input single-phase 208 to 230 VAC and output three phase 230 VAC. For a VMC close to a 5% voltage balance between legs would be desired, in reference to the voltage differences of each phase. Most CNC machines would require the output power to be 1-1/2 to 2 times larger than the spindle motor (for a Fadal output must be at or higher than the minimum of the required input; see specifications). A Voltage Stabilizer may also be required. The stabilizer's function is to maintain a consistent voltage level of the three phases during light or no load conditions.

Transformer Sensor

An improvement to transformer design has been developed and it can be retrofitted to existing machines originally fitted with T820, T821, or T822 transformers. This improvement is designed to interrupt the Emergency Stop circuit when the machine is used beyond its designed peak performance for an extended period of time, and transformer temperature approaches its rated limits.



Figure 3-17 Transformer sensor kit

To determine if the machine has this circuit, look on the left side of the transformer connector rail for a mechanical relay. If the transformer sensor circuit is installed and an Emergency Stop occurs, check the mechanical relay. If the relay is activated (LED lit) then this circuit is not involved but if the relay is not activated then the transformer is overheated. In this case power down the machine and allow the transformer to cool. If the condition persists, then there is a problem that requires investigation.

Leveling

Leveling is an important first step in setting up the VMC. All calibration and squareness performed on the assembly line is done with the machine leveled. It is important to follow the sequence below precisely to ensure proper results.

Tools Required

Precision Level, such as the Starrett 12", P/N 199Z

IMPORTANT

Verify that the scale reads the same when rotated 180 degrees.

If using a flashlight to see the bubble, do not place the flashlight on the level, as it will warm the bubble and give an incorrect reading.

For All VMCs

- 1) The VMC should be positioned on one solid concrete slab (see PRE-INSTALLATION section). Do not straddle any cracks or seams.
- 2) Center the leveling pads under the leveling screws.

Note: Use leveling pad SHP-0002 (PLC-0063 for slant sheet metal machines, or machines equipped with the HydroSweep option) for placing the machine.

- 3) Level the VMC as close as possible to the leveling pads. The leveling screws should be extended as little as possible to reduce vibration through the sheet metal.

IMPORTANT

Make sure that machines with the chip conveyor option are raised high enough so that the chip conveyor tank fits under the sheet metal of the VMC. See section 13 for more information on installing the chip conveyor.

- 4) Verify the Cold Start indicators, then cold start the VMC.
- 5) Clean the level with alcohol.

Box Way VMCs

- 1) Jog the Y axis to the Y+ limit.
- 2) Clean the outer base ways with alcohol.
- 3) Place the level on the right hand way (the outer right hand way on the 6535) of the base with the small bubble towards the column. Take an accurate reading. See figure 3-18.

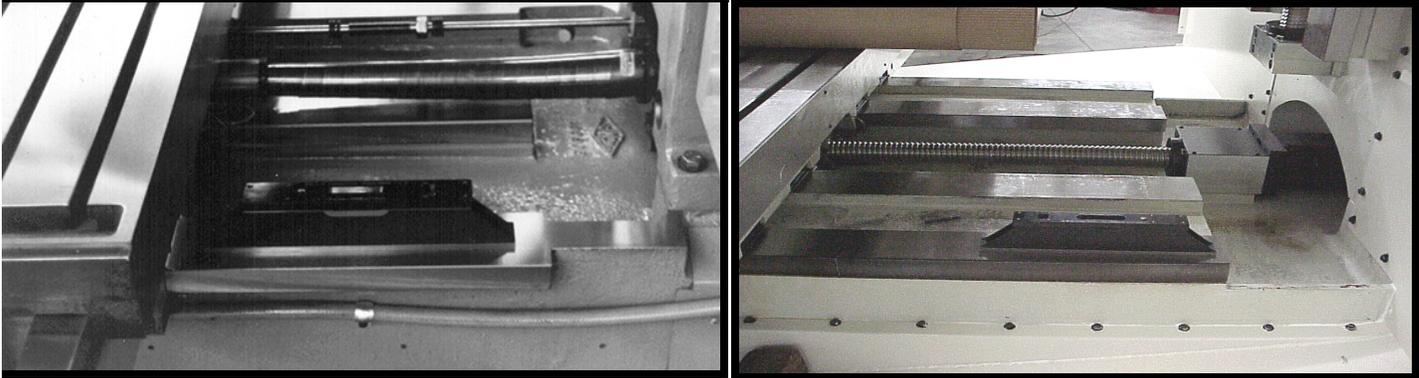


Figure 3-18 Leveling Box Way (6535 on right).

- 4) Now put the level on the left hand way (the outer left hand way on the 6535) of the base with the level pointing in the same direction as on the right hand way.
- 5) Adjust the leveling screws on the machine until the left hand way and the right hand way are level and even.
- 6) The level will have a front to back bubble and a side to side bubble. Level the machine from front to back first and then from side to side. When adjusting the side to side, adjust both leveling screws of one side only.
- 7) If leveling larger machines, such as the 6535, 6030 or 8030 models, the center four leveling screws must not be touching the leveling pads during the leveling procedure. After the machine has been leveled, lower the four screws to the pad, then check the level and tram readings to ensure they have not changed.
- 8) Verify the spindle tram and, if necessary, adjust by slightly changing *only* the two front leveling screws.

Linear Way VMCs

- 1) Place leveling pads beneath the six leveling screws.

Note: Use only leveling pad (SHP-0002) (PLC-0063 for machines equipped with the HydroSweep option) for placing the machine. Any other pad may cause damage to the machine.

- 2) Drive down the four corner leveling screws to create a minimum of 1/2" gap between the bottom of the base and the top of the leveling pads.



Figure 3-19 Drive Down Corner Leveling Screws

Note: Verify that the leveling pads are seated properly on the pad center depressions.

- 3) Jog the saddle to its maximum positive Y position. Disconnect the rear Y axis way cover from the saddle and slide it back to the vertical column.
- 4) Using a clean lint free rag and solvent, wipe the four level tabs and the way base clean of oil and grime. Wipe the bottom of the level clean. Feel for burrs after cleaning the base; remove them with a flat stone if needed.



Figure 3-20 Clean the Ways

- 5) Place the level on the leveling tabs.500” away from the linear guide way. Situate the level so that the small level gauge is towards the column. All leveling measurements will be taken with the level in this orientation.

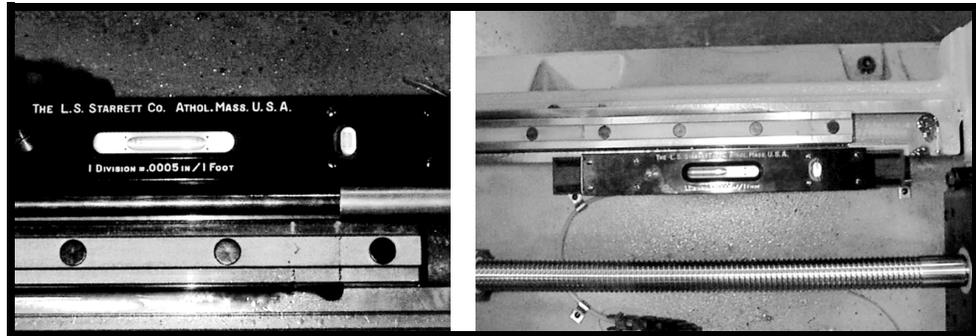


Figure 3-21 Take Leveling Measurements (6535 on right).

Note: Verify that the level is firmly seated by trying to rock it from side to side. Rough in the level by applying pressure to the screws until the level on both gauges is even.

- 6) Allow approximately three minutes before adjusting the level to ensure that the level is at the same temperature as the machine. Adjust the base using the leveling screws. Adjust the screws until the bubble is at the center of the large leveling gauge. Use care to avoid shining the flashlight onto the bubble or otherwise adding heat to the bubble fluid which will distort the results.
- 7) Repeat the above steps for the opposite way.

Note: Maintaining the same orientation is important when setting the level on a base way.

- 8) After the large bubble is centered on both ways, level the small bubble on both ways using both leveling screws on one side only.
- 9) Both ways will have the same reading when the machine is leveled.

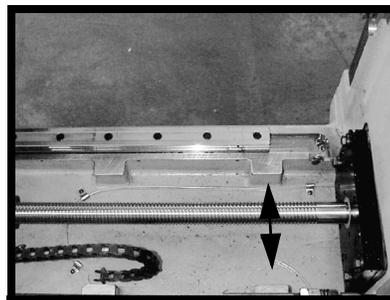


Figure 3-22 Ways Have Same Reading When Leveled

- 10) After the base leveling is completed, seat the two middle leveling screws on the leveling pads.

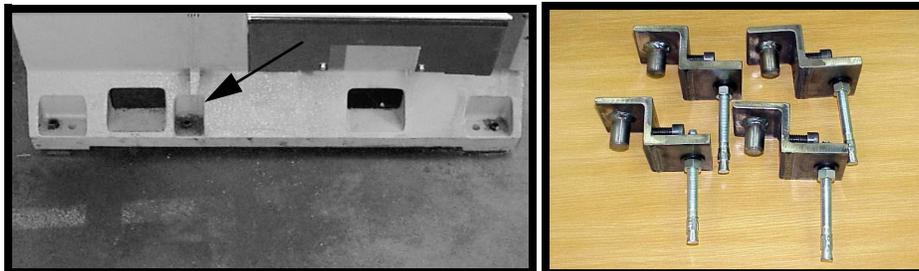


Figure 3-23 Left: Seat Middle Leveling Screws on Leveling Pads. Right: Hold Down Clamps.

- 11) Recheck the level of the base to verify that it has not been disturbed, after the middle screws are seated.

IMPORTANT



The level of the machine should be checked periodically until the concrete supporting the machine has settled.

Hold Down Clamps

Larger machines may vibrate, bump on reversals, and degrade floor finish. This may indicate that the base casting needs to be clamped to floor.

Larger machines need to be clamped to the floor to prevent movement between the machine and the floor, and clamping holes are provided on all base castings for this purpose. In the Parts Manuals, there are drawings indicating the locations of these holes so that machines may be moved, studs installed in the concrete floor, and machines reinstalled onto them.

The kit SHP-0116 (see figure 3-23) has been developed to mount the machine to the floor without moving it.

- 1) The Clamp is first mounted into the clamping hole in the base.
- 2) The position is marked on the floor for drilling a 1/2" hole into the concrete.
- 3) The RedHead stud is mounted in the floor with one nut and washer on it.
- 4) The Clamp is mounted over the stud and then the two 1/2 inch Socket Cap screws are tightened, pinching the flange of the base casting.
- 5) The second washer and nut are tightened onto the stud, inhibiting any flexing up or down of the base casting.
- 6) Recheck machine level.

Hilti (mfg in Liechtenstein) makes a Right-Angle Hammer Drill, model TE-5, with a model TE-AC Right Angle Head attachment, that works very well in this application.