

T-02b1: Setup/Adjust Drive (DC Full Range - Reliance)

SAFETY FIRST

- Follow all Caterpillar facility safety standards when performing this task.
- Work with caution, voltage must be on during parts of the setup.
- The spindle needs to be operated to calibrate the drive. Spindle operation creates a rotating machine hazard.

EQUIPMENT

- two digital volt-ohmmeters (DVMS)
- basic Electrician hand tools
- manual tachometer
- manufacturer's test board for the machine
- DC clamp-on amp probe

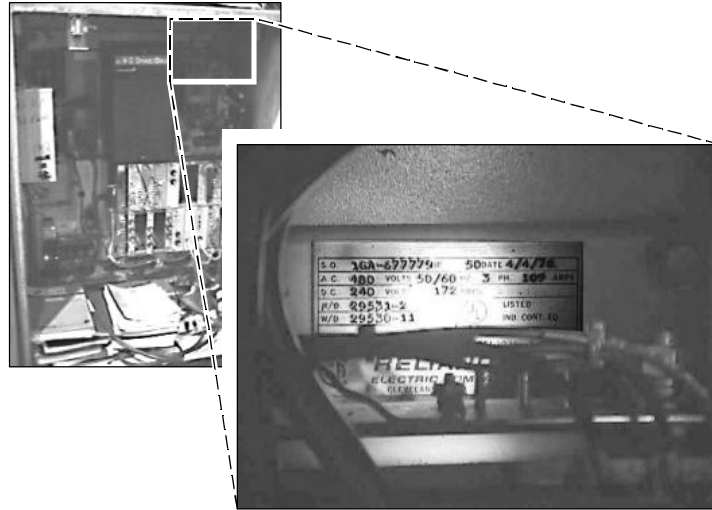
RESOURCES

- electrical prints
- motor nameplate data
- manufacturer's manual



Set Up/Adjust Drive (DC Full Range - Reliance)

1. Verify drive setup information.
 - Check the drive type, number, and the rated horsepower to compare settings with the manufacturer's settings.



Nameplate Data

2. Turn power off at the Operator's control panel.
 - Press the red emergency stop.
 - Press the control off located just above the E-stop.



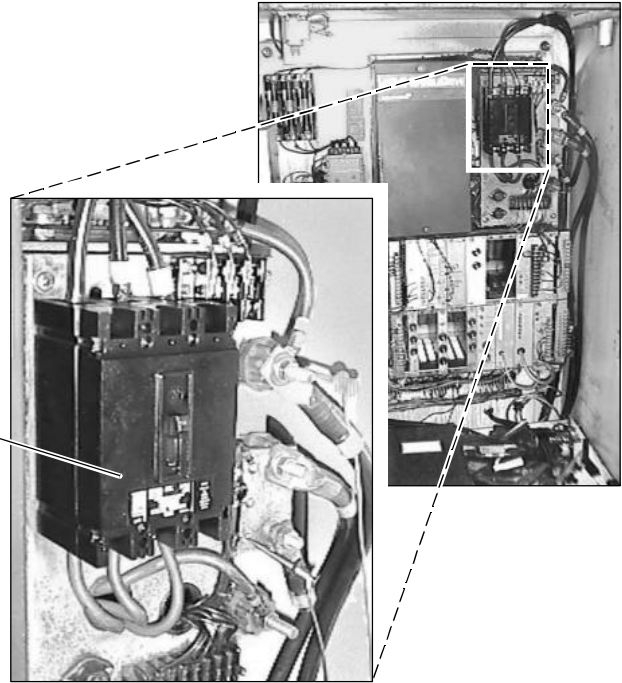
Operator's Control Panel

3. Turn off the main circuit breaker to the DC drive.

Warning: Hazardous motor field voltage is still present when the drive circuit breaker is opened.

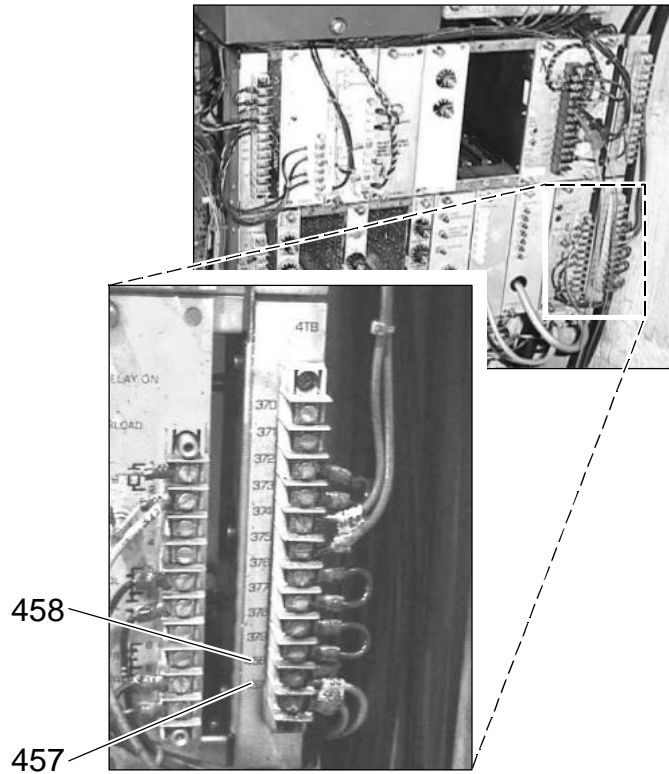


DC Drive Circuit Breaker



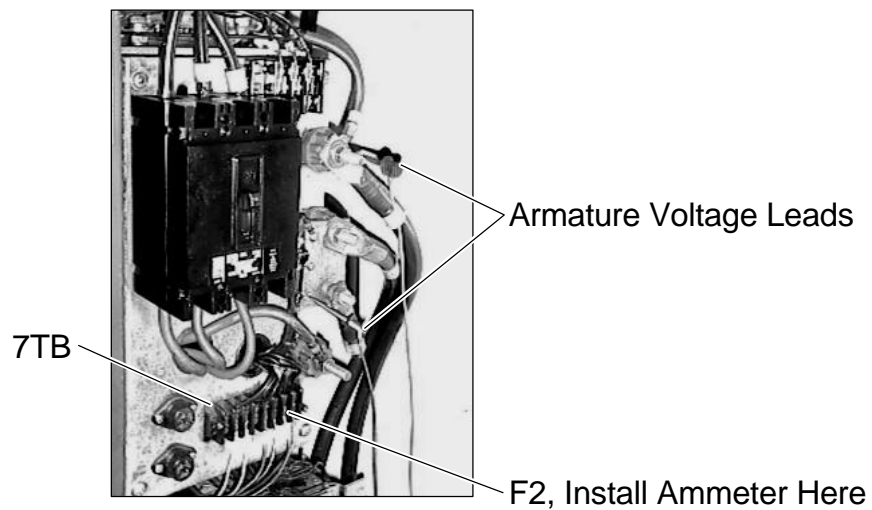
4. Check field voltage to the motor.
 - Turn off the main AC power.
 - Set all potentiometers (pots) according to manufacturer's initial settings chart in the machine manual in Appendix A on page 9.

- Install a jumper on terminal strip four (TB4), between wires 457 and 458 to enable full field voltage.



- Install a digital ammeter in series with the motor field.

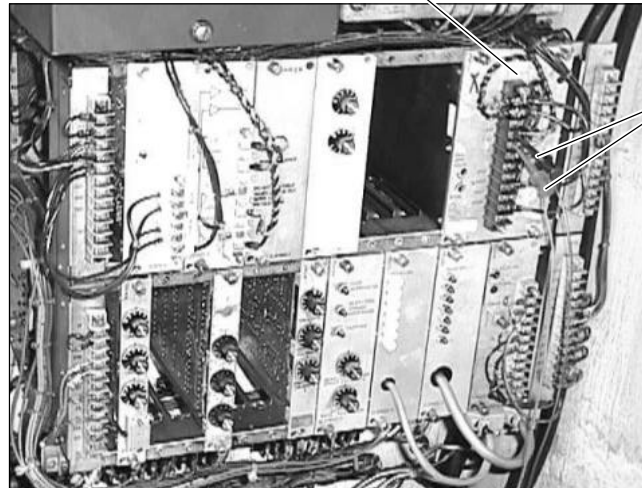
Caution: Be sure to install the digital ammeter securely or damage to the machine may result.



- Turn on the main AC power.

- ❑ Connect a DVM, set to read DC motor field current feedback, on terminals 57 and 235 on the FCCC board.

FCCC Board



DVM Leads

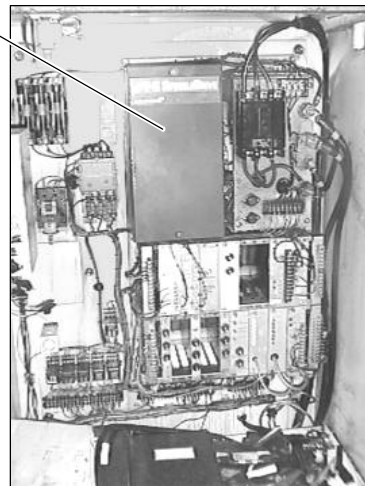
Note: A cold motor requires at least 30 minutes of warm-up.

- ❑ Compare your readings with the drive manufacturer's specifications.
- ❑ Turn off the main AC power.

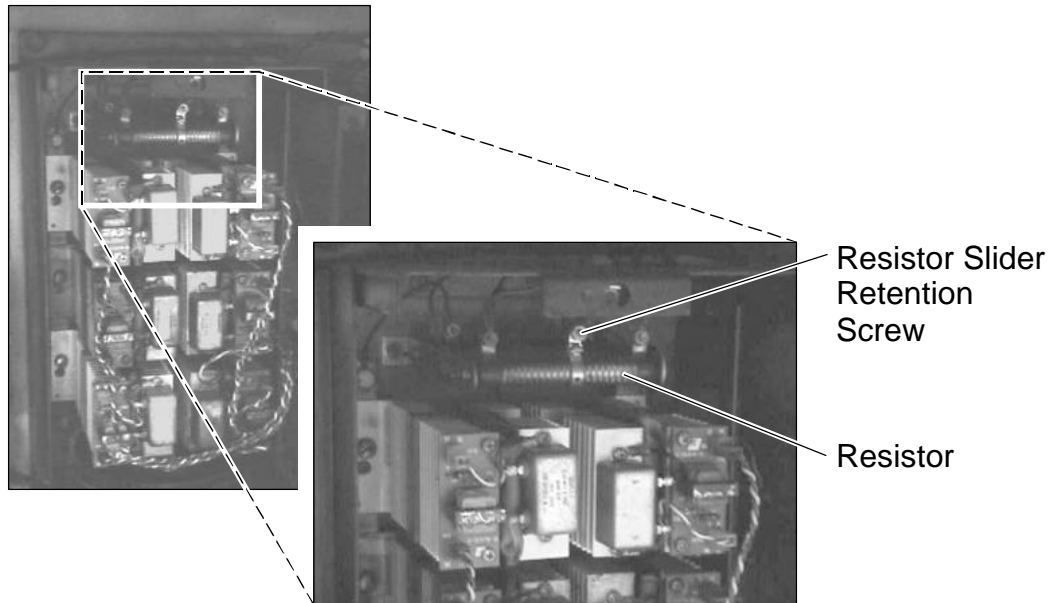
Warning: The next step requires removing the SCR cover and adjusting the resistor. Make sure the Main AC power is off or serious injury or death may result.

- ❑ Remove the SCR cover.

SCR Cover

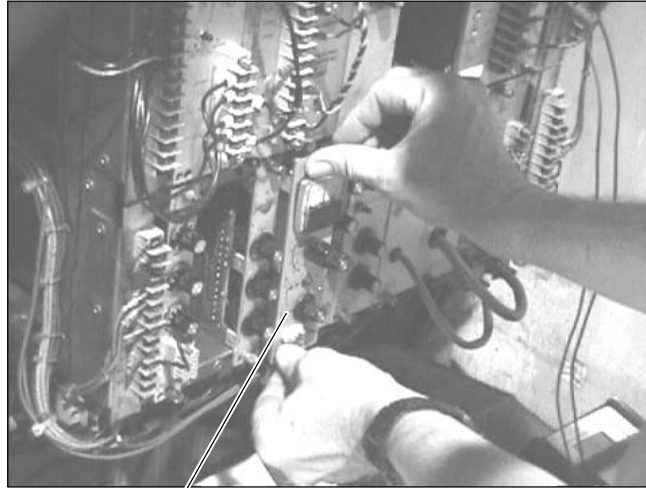


- Loosen the resistor's slider retention screw.



- Move the slider slightly left or right.
- Tighten the resistor's slider retention screw.
- Turn on the main AC power.
- The field current should agree with the current specified on the motor nameplate.
- Turn off the main AC power.
- Remove the jumper from TB4.
- Replace the SCR cover.

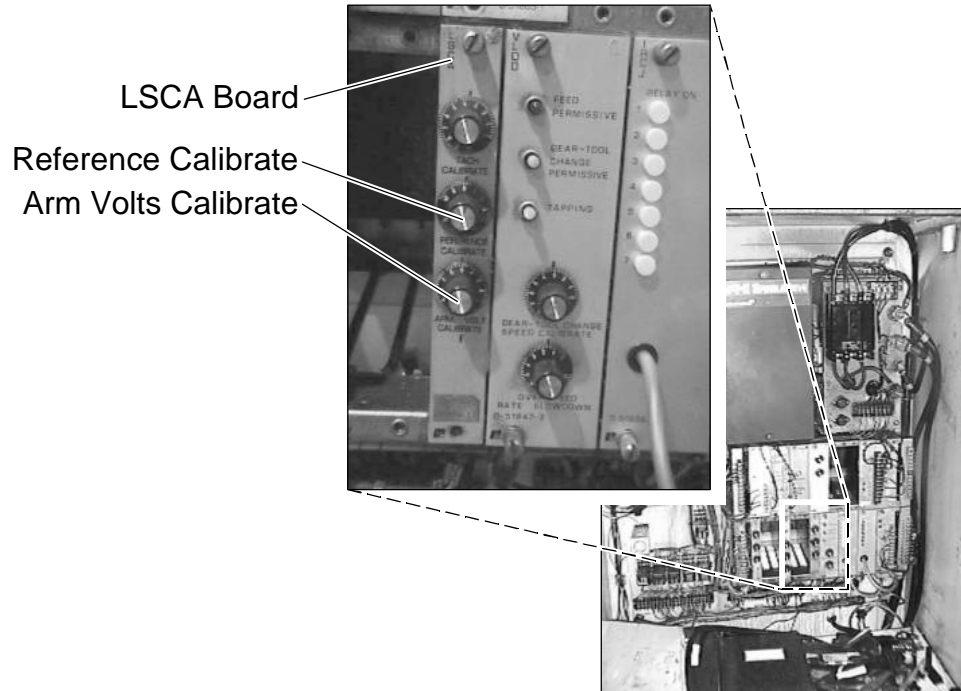
5. Install and set up the test board according to the manufacturer's setup specifications.



Test Board

- Turn the tachometer calibration pot clockwise (cw).
- Install the test board into position three (3) in the lower rack.
- Connect the DVM to the test board.
- Set the test signal on the test board to zero (0).
- Turn the tester switch on the test board to position one (1).
- Turn on the main AC power.
- Close the main drive circuit breaker.
- Verify that the readings for position 1 are +6 volts DC (+/- .030V).
- Turn the tester switch to position two (2).
- Verify that the readings for position 2 are -6 volts DC (+/- .030V).
- Check the power supply if the readings are not accurate.

6. Calibrate the armature voltage.



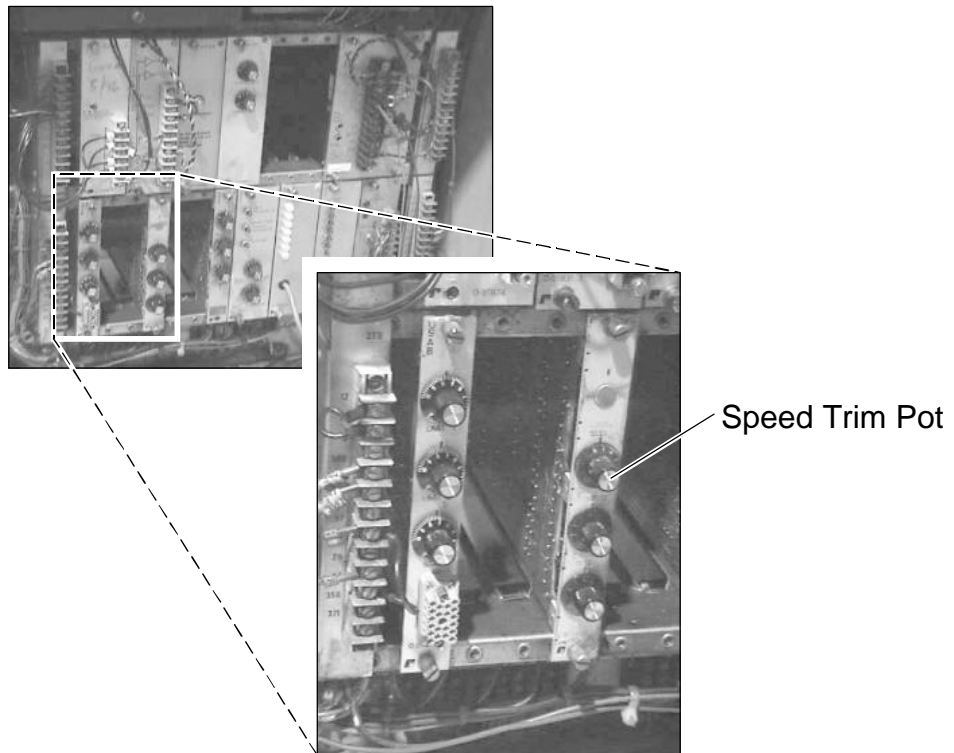
- Set the Arm Volts Calibrate pot on the LSCA board to 50%.
- Turn the Reference Calibrate pot on the LSCA board fully counterclockwise (ccw).
- Ask the Operator to set the spindle speed override on the control panel to 100%.
- Ask the Operator to program a low speed in the manual mode, start the drive, and slowly step up the speed until it reaches the maximum speed.

Note: The actual spindle rpm will be well below the programmed speed.

- Turn the tester switch on the test board to position 8.
- Slowly increase the reference calibration on the LSCA board until the DVM reads 6 volts DC. The reference calibration pot is very sensitive around 70 to 90 percent, start adjustment at 50 percent.
- Verify six volts in positions 9 and 10 on the test board.
- Verify that the maximum spindle speed is not exceeded at the Operator's panel.

Note: The actual speed should still be less than the programmed speed.

7. Set the maximum forward and reverse speeds.
- With the machine still operating at maximum speed, ask an assistant to monitor the speed at the control panel, alerting you when the speed reaches maximum.
 - Slowly decrease the Tach Calibrate pot on the LSCA board.
 - Listen for signs of trouble from the machine and any indications from your assistant.
 - Stop adjusting the Tach Calibrate pot when your assistant alerts you that the spindle is running at maximum speed.
 - Ask the Operator to stop the spindle then set the spindle direction to reverse.
 - Adjust the Speed Trim Pot on the custom component board until the reverse maximum speed matches the forward maximum speed.

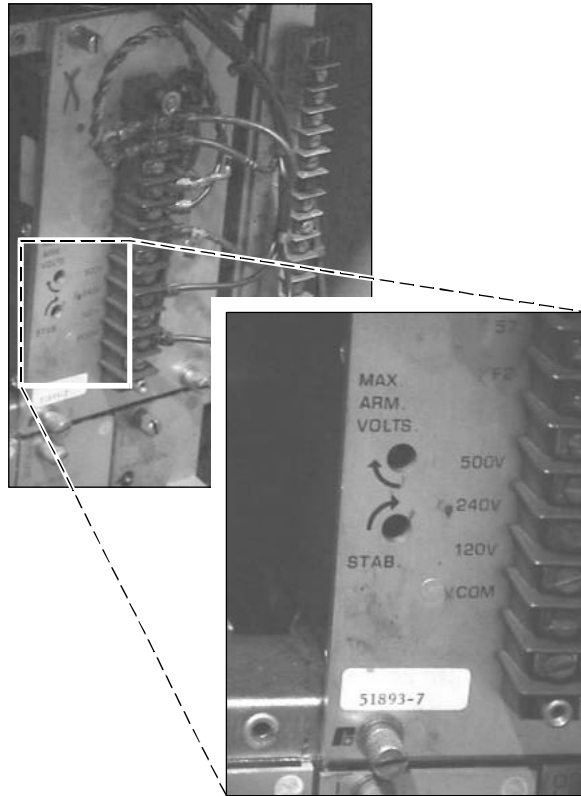


- Ask the Operator to stop the spindle.

8. Set the maximum armature voltage.

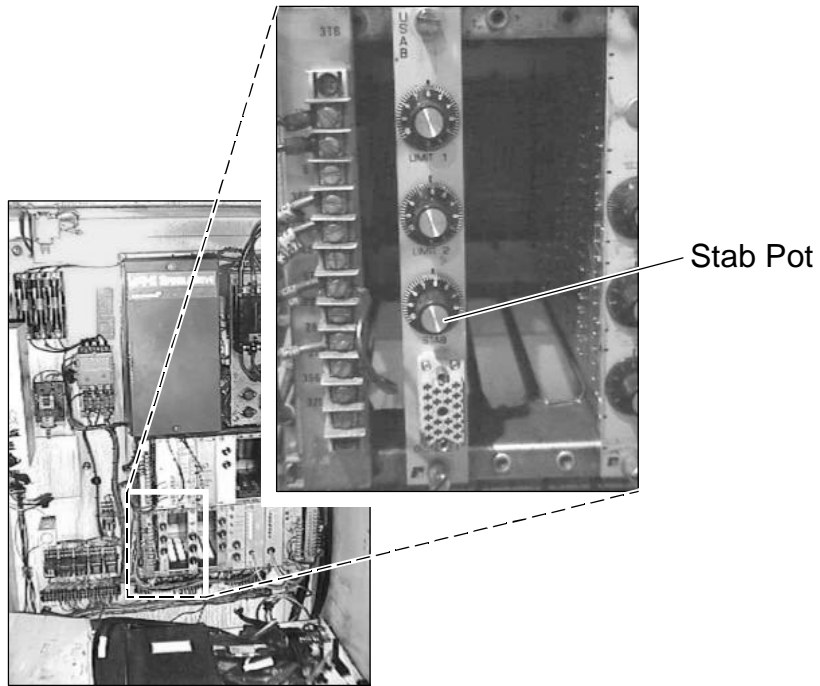
Warning: Motor lead voltage is 240 volts DC. Work carefully.

- Connect the DVM across A1 and A2.
- Ask the Operator to run the drive at maximum speed.
- Check the voltage readings on the DVM, and adjust the Max. Arm. Volts on the FCCC board until the readings reach the maximum allowable volts listed on the motor nameplate data.

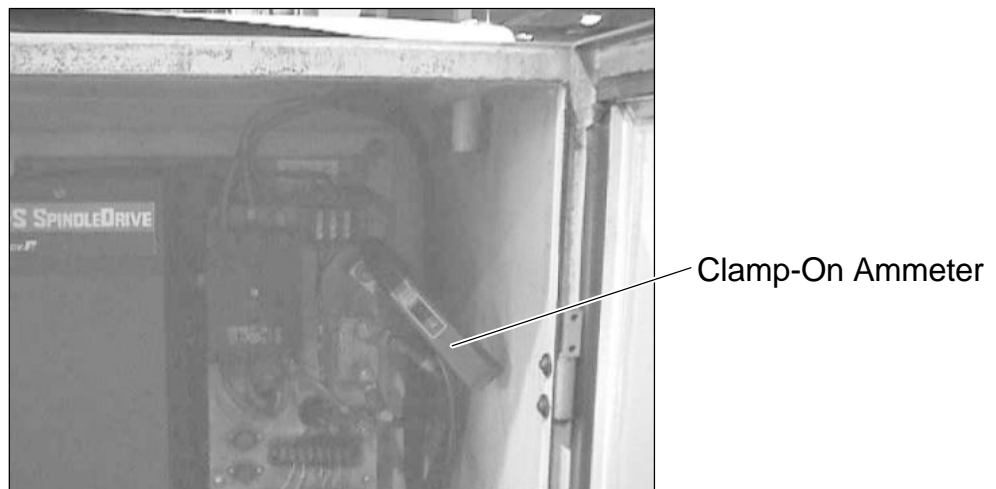


Maximum Armature Voltage Setting

- Adjust the Stab (stability) setting cw on the USAB board if the voltage readings are not stable.



- Ask the Operator to stop the spindle.
9. Verify and adjust the maximum forward and reverse speeds, as shown in step 7, if a substantial change was required in the armature voltage.
 10. Set the acceleration/deceleration current limits.
 - Attach a DC clamp-on ammeter to one of the armature leads.





- Observe the ammeter and ask the Operator to start the drive in forward and in reverse.
- Readings on the ammeter should be 150% of the maximum rated current (e.g. 170 rated: expect to see 255 amps).
- Adjust Limit One (1) on the USAB board, if the drive is in forward, until the current during acceleration is 150% of the rated current.
- Adjust Limit Two (2) on the USAB board, if the drive is in reverse, until the current during acceleration is 150% of the rated current.

11. Set the overspeed rate slowdown on the VLDD board.

- Turn the overspeed rate slowdown fully ccw.
- Ask the Operator to start and stop the drive.
- Turn the overspeed rate slowdown pot until the drive does not fault during speed changes or starting and stopping.

12. Set the gear-tool change speed.

- Attach a hand tachometer to the tachometer end of the spindle motor.

Spindle Motor



- Ask the Operator to program the spindle until the motor runs at the rpm specified in the machine manual for tool change.

- With the drive still running, turn the gear-tool change speed pot on the VLDD board until the Gear-Tool Change Permissive Light just turns off.



Gear-Tool Permissive Light



13. Adjust the Stab pot (on the USAB board) ccw, if the machine goes into feed hold during a cut.
14. Turn off the machine power, open the circuit breaker, and turn off the main AC power.
15. Clean up the work area.
 - Remove all test equipment.
 - Make sure no tools or equipment are left on or around the DC drive.
16. Remove the test board.
17. Restore power.
18. Ask the Operator to cycle the machine to confirm proper drive operation.