

T-02b2: Set Up/Adjust Drive (DC Full Range GE-Valutrol)

SAFETY FIRST

- Follow all Caterpillar facility safety standards when performing this task.
- Dangerous voltage levels of AC and DC are present during setup.
- Spindle may need to be operated to calibrate the drive, causing a rotating machine hazard.

EQUIPMENT

- DVM
- basic Electrician hand tools
- manual tachometer

RESOURCES

- GE DC Drive maintenance manual with the setup procedure



Set Up/Adjust Drive (DC Full Range GE-Valutrol)

Note: This procedure is documented for a GE DC Full Range Drive.

Note: Use the following table as a reference to Potentiometer and Test Point abbreviations.



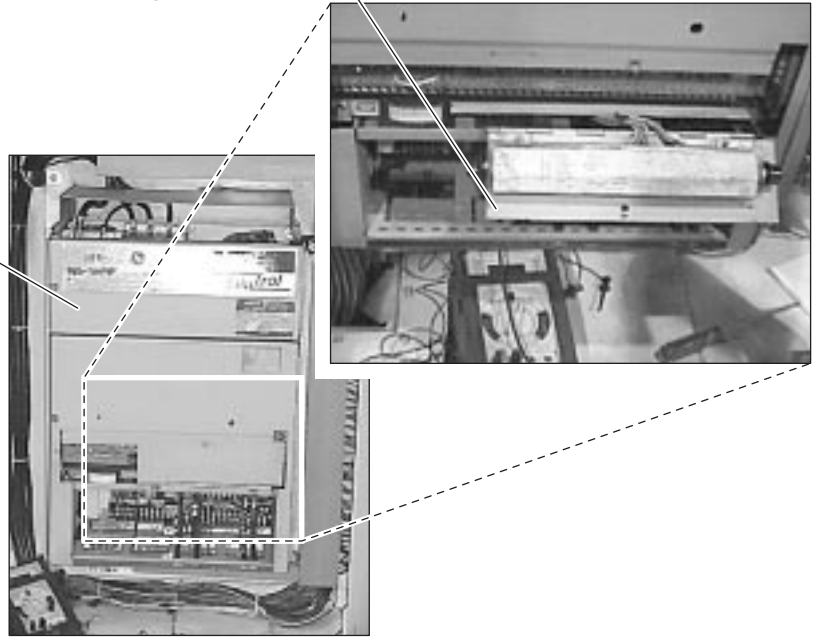
Potentiometers		Test Points	
F MAX	Field Maximum	CFB	Current Feedback
F MIN	Field Minimum	LR	Local Reference
F LOSS	Field Loss	FC	Field Current
S LIM	Speed Limit	COM	Common
LIN TIME	Linear Time	TR	Tachometer Reference
ALIGN	Alignment	CEMF	Counter Electromotive Force
S MET	Speed Meter	DR	Driver Reference
Max Speed	Maximum Speed	TA	Tachometer Alignment
Min Speed	Minimum Speed		
I MET	Current Meter		
R Stop	Regenerative Stop		
DAMP	Dampening Adjustment		
REF SCALE	Reference Scale		
ZERO ADJUST			

1. **Verify drive setup information.**
 - Check the drive type and number and the rated horsepower to compare settings with the manufacturer's settings.
2. **Press the red emergency stop at the Operator's control panel to turn off the machine.**
3. **If replacing a drive board, compare all settings between the old and new board.**
 - Make sure all jumpers match.

4. Open the diagnostic panel on the DC Drive.

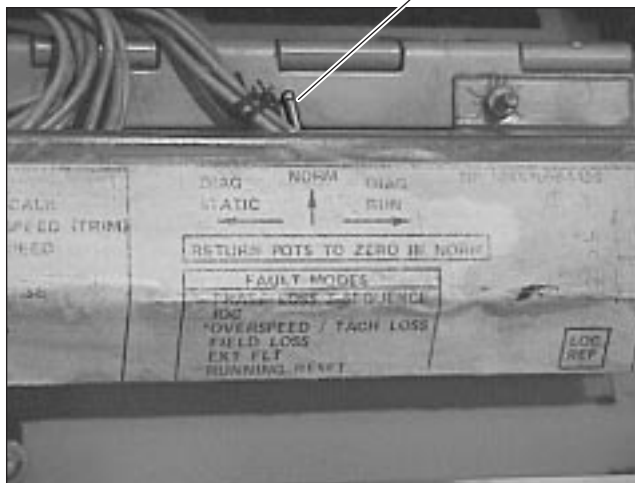
Diagnostic Panel

GE DC Full Range Drive

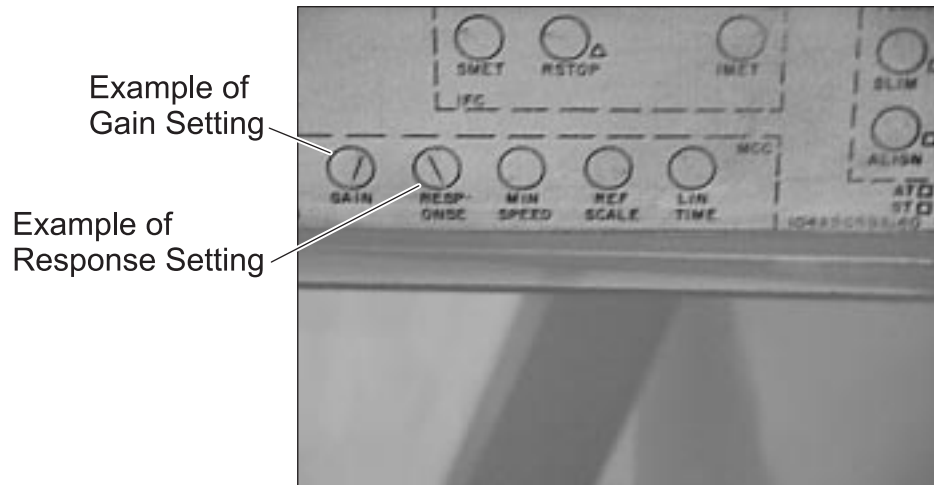


5. Change the diagnostic switch to the Static position.

Diagnostic Switch in Static Position



6. If replacing the drive, place all potentiometers (pots) in the positions shown in the following chart.

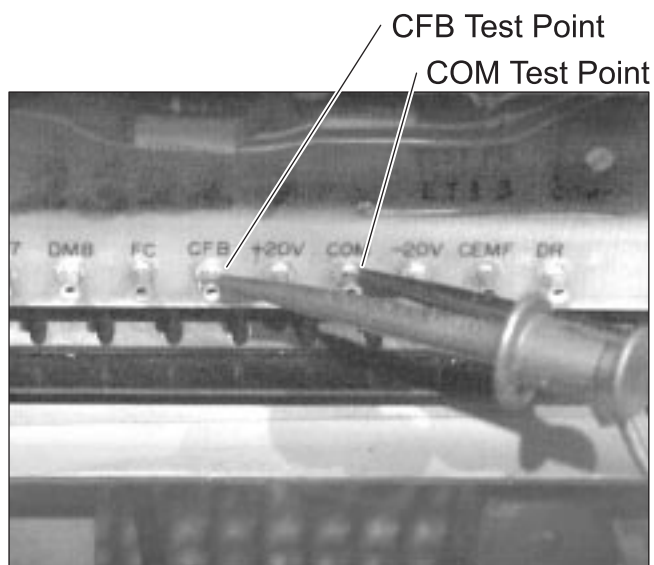


Caution: Pay attention to the Positive (+) and Negative (-) voltages and directions indicated in these steps. Damage to the machine or injury to personnel could result from failure to set the correct direction or voltage.

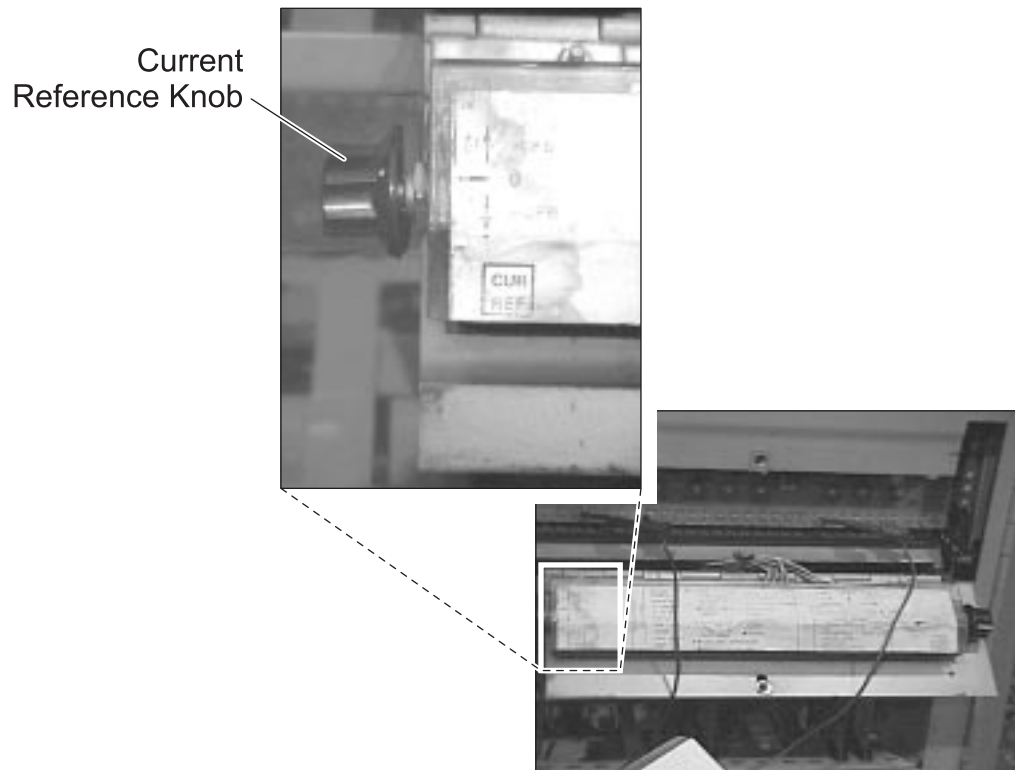
Note: All voltage is DC unless otherwise specified.

7. Set the current reference to zero (0) volts (VDC).

□ Connect the DVM to the CFB test point and common (COM).



- Adjust the current reference knob until the DVM displays 0V.

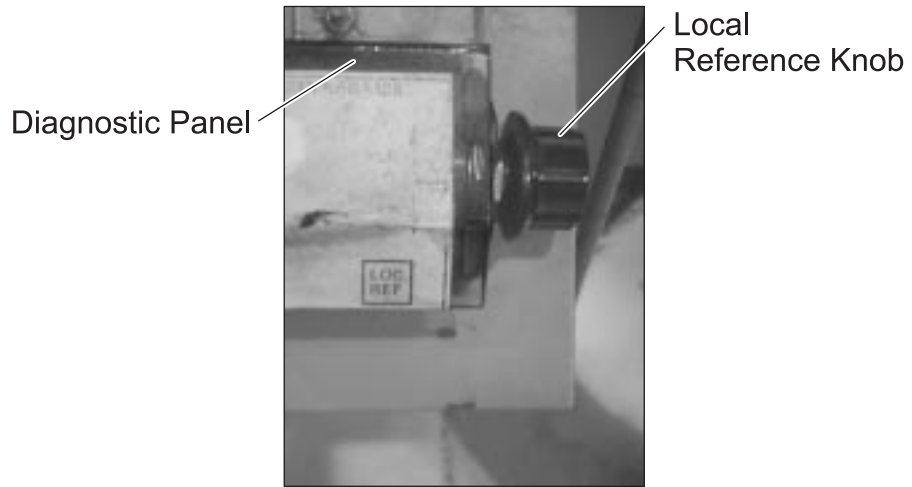


Note: The voltage levels in steps 8 and 9 are proportional to field current.

8. Set the Maximum Field Current.

- Connect the DVM to the LR test point and COM.

- Adjust the local reference knob, in the negative direction, until the DVM displays -1V.

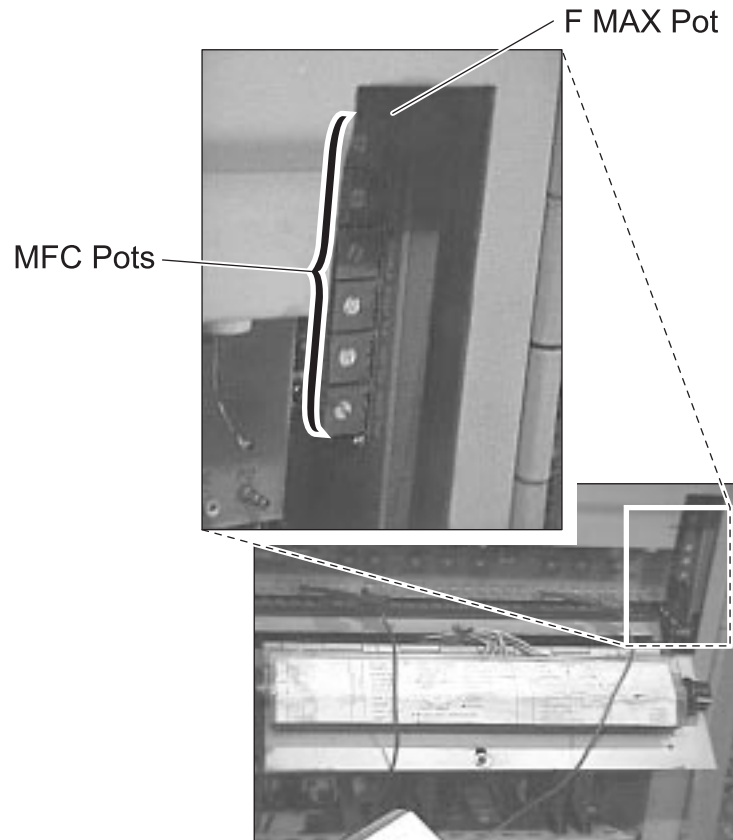


- Connect the DVM to the FC test point and COM.

Caution: Adjusting the F Max pot changes the field current and can damage the motor if not correctly adjusted. Verify that the correct test data sheet value is used.

TEST DATA (ALL DATA ±5% EXCEPT WHERE NOTED)		ADJUSTMENT
STEPS		
VFB	: - _____ VOLTS AT + _____ MOTOR VOLTS	NONE
CEMF	: - _____ VOLTS AT + _____ NO LOAD MOTOR VOLTS	NONE
MAX FIELD	: 1 _____ AMPS, FC = _____ VOLTS (DIAG STATIC)	FMAX
MIN FIELD	: 2 _____ AMPS, FC = _____ VOLTS (DIAG STATIC)	FMIN
FIELD LOSS	: 3 _____ AMPS, FC = _____ VOLTS (DIAG STATIC)	FLOSS
OVERSPEED	: 4 _____ % SFB = _____ VOLTS (DIAG STATIC)	SLIM
CROSSOVER	: CEMF = - _____ VOLTS (NORMAL) OR LR = - _____ VOLTS (DIAG STATIC)	CROSS
IR COMP	: 6 CFB = 5 VOLTS AT CEMF = _____ VOLTS (DIAG STATIC)	COMP
CURRENT LIMIT	: 7 _____ AMPS ± 10%, CFB = _____ VOLTS	CUR LIMIT
LINEAR TIME	: 5 _____ SECONDS, ZERO TO 10 VOLTS AT TR (DIAG STATIC)	LIN TIME
CFB	: - _____ VOLTS AT _____ MOTOR AMPS ± 10%	NONE
SFB (BASE)	: + _____ VOLTS AT 5 VOLTS CEMF (DIAG RUN)	MAX SPEED
CEMF AT LIMIT	: 8 - _____ VOLTS AT + _____ MOTOR VOLTS (NO LOAD) (±3%) (DIAG RUN)	CEMF LIMIT Δ
SFB (TOP)	: +10 VOLTS AT _____ TOP SPEED RPM	MAX SPEED
TR	: -10 VOLTS AT _____ VOLTS MAXIMUM REF. AT SR	REF SCALE
IOC TRIP	: _____ % SFB = - _____ VOLTS (DIAG STATIC) ±10%	SELECT
<p> <input type="checkbox"/> NOT SUPPLIED ON DRIVES WITH A MFE CARD <input type="checkbox"/> ONLY ON FULL WAVE REGENERATIVE DRIVE <input type="checkbox"/> NOT SUPPLIED ON NON REGENERATIVE DRIVES </p>		
<p> (NOT VISIBLE FROM FRONT) </p>		<p> MFC <input type="checkbox"/> FMAX <input type="checkbox"/> CROSS <input type="checkbox"/> FMIN <input type="checkbox"/> FLOSS <input type="checkbox"/> SLIM <input type="checkbox"/> ALIGN <input type="checkbox"/> </p>
<p> DAMP CUR LIMIT COMP CEMF LIMIT MAX SPEED GAIN RESP-ONSE MIN SPEED REF SCALE LIN TIME </p>		<p> MCC <input type="checkbox"/> AT <input type="checkbox"/> ST <input type="checkbox"/> </p>

- Adjust the F Max pot until the DVM displays the expected test data as shown on the test data sheet DC drive panel.



9. Set the Minimum Field Current.

- Verify the current reference is set to zero at test points CFB and COM.
- Connect the DVM to test point LR and COM.
- Adjust the local reference knob in the negative direction until the DVM displays $-7V$.
- Connect the DVM to test point FC and COM.
- Adjust the F MIN pot until the DVM displays the expected test data for the minimum field voltage.

10. Set the Field Loss.

- Verify the current reference is set to zero.
- Connect the DVM to test point FC and COM.
- Adjust the local reference knob in the positive direction until the DVM equals the expected test data for Field Loss.
- Adjust the F LOSS pot until the Ready to Run light turns off.
- Place the local reference knob in the center position (0V).
- Press the Control Reset button to turn the Ready to Run light back on.
- Test the F LOSS operation by adjusting the local reference knob until the Ready to Run light turns off.
- Reset the Ready to Run light.

11. Set the speed limit (overspeed fault).

- Verify the current reference is set to zero.
- Connect the DVM to test point SFB and COM.
- Adjust the local reference knob in the negative direction until the DVM value equals the expected test data for Overspeed.
- Adjust the S LIM pot until the Ready to Run light turns off.
- Place the local reference knob in the center position (0V).
- Press the Control Reset button to turn the Ready to Run light back on.
- Test the S LIM operation by adjusting the local reference knob until the Ready to Run light turns off.
- Turn the local reference knob to 0V and reset the Ready to Run light.

12. Set the linear time.

- Verify the current reference is set to 0V.
- Connect the DVM to test point TR and COM.
- Set the diagnostic switch to normal.
- Prepare to monitor the time with a watch with a second hand as the voltage ramps from 0VDC to 10VDC.
- Turn the local reference pot in the positive direction from 0V to maximum.
- Switch the diagnostic switch to static and observe the time while the voltage ramps up.
- Check your readings against the expected test data time.



- Adjust the LIN Time pot until the time on the test data sheet is read.
- Turn the local reference knob to 0V and reset the Ready to Run light (if necessary).

13. Set the IR Comp (current reference compensation).

- Connect the DVM to test point LR and COM.
- Adjust the local reference knob until 0V is read on the DVM.
- Connect the DVM to test point CFB and COM.
- Move the current reference knob in the positive direction until +5V displays on the DVM.
- Connect the DVM to test point CEMF and COM.
- Adjust the COMP pot until the DVM displays the expected test data value for CEMF (approximately -1.5VDC).
- Turn the current reference knob to 0V and reset the Ready to Run light (if necessary).

14. Set the current limits.

- Set the local reference to 0V.
- Turn the current reference knob fully clockwise.
- Connect the DVM to test point CFB and COM.
- Adjust the current reference knob until the DVM displays the expected test data value for CFB.
- Connect the DVM to test point DR and COM.
- Adjust the current limit pot counterclockwise (CCW) until the DVM displays a rapid change from 0V.
- Connect the DVM to CFB and COM.
- Return the current reference to zero (0V).

15. Set the CEMF limit.

- Set the diagnostic switch to Run.
- Turn the current reference knob to the center position (0V).
- Turn the local reference knob to the full positive direction position.
- Connect the DVM to test point CEMF and COM.
- Adjust the CEMF Limit pot until the DVM displays 5.7VDC.
- Check voltage between terminal points A1 and A2, expect to read 250VDC.



- Adjust the CEMF Limit pot to fine-tune the armature voltage until the DVM displays 250V (for a 240V motor).
- Return the local reference pot to 0V.

16. Set up to align the tachometer.

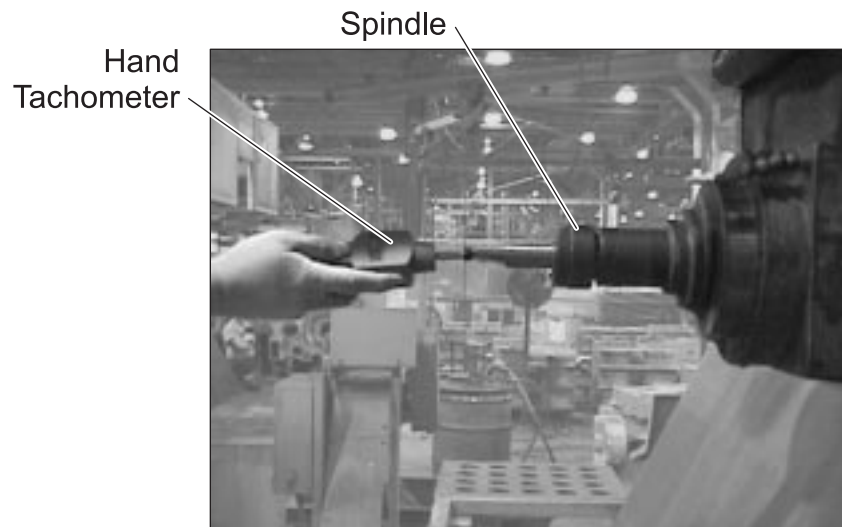
- Turn the current reference knob to the center position (0V).
- Connect the DVM to test point CEMF and COM.
- Adjust the local reference knob until the DVM displays +5V.
- Connect the DVM to test point TA and COM.
- Adjust the Align pot until the DVM displays 0V +/- 0.1 volts.
- Turn the local reference knob to 0V and reset the Ready to Run light (if necessary).
- Set the diagnostic switch to Normal.
- Ask an Operator or experienced Electrician to Turn On and Start the machine.



Control Panel

- Ask the Operator or experienced Electrician to start the spindle with half speed in Lo Clutch.
- Ask the Operator or experienced Electrician to slowly bring the spindle to full speed.

- Verify the spindle speed with a hand tachometer.



- If the hand tachometer does not match the set spindle speed, ask an assistant to monitor the spindle speed while you adjust the MAX SPEED pot.
 - Connect the DVM to test point TR and COM.
 - Adjust the REF SCALE pot until the DVM displays +10V.
 - Readjust the MAX SPEED pot for proper rpm, if necessary.
- 17. Reset the ALIGN pot if MAX SPEED was off by more than 5 percent.**
- Stop the drive and put the diagnostics switch in the Run position.
 - Connect the DVM to test point CEMF and COM.
 - Adjust the local reference knob until the DVM displays +5V.
 - Connect the DVM to test point TA and COM.
 - Adjust the Align pot until the DVM displays 0V within 0.1 volts.
 - Return the local reference pot to 0V.
 - Set the diagnostics switch to the normal position.
- 18. Set the Crossover.**
- Ask an Operator or experienced Electrician to Turn On and Start the machine.
 - Ask the Operator or experienced Electrician to slowly bring the spindle to full speed.

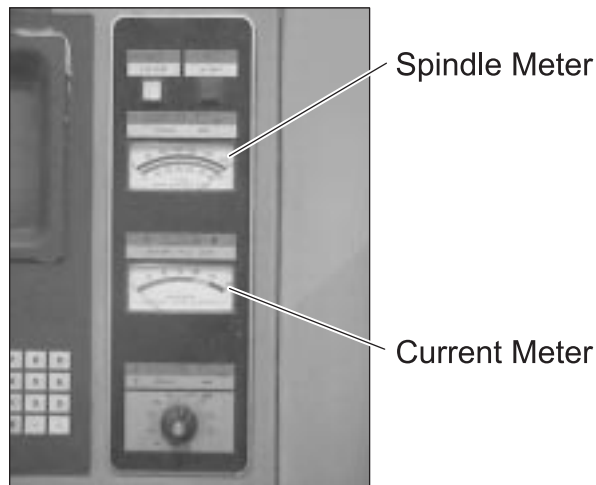
- Measure voltage between terminal points A1 and A2.
- Adjust the Crossover pot until the voltage observed is 217VDC (on a 240VDC motor).
- Check maximum speed and readjust as shown in step 16, if necessary.
- Repeat step 17 if necessary.

19. Set the Gain and Response.

- Adjust the Gain and Response pots, as indicated by the drawing on the Test Data chart.
- Both pots should be set approximately to the one o'clock position.

20. Set the Spindle Meter (S MET) pot on the Interface card.

- Adjust this only if the Spindle Meter is not reflecting actual spindle speed.



21. Set the Current Meter (I Met) pot on the Interface card.

- Adjust this only if the Current Meter is not reflecting actual current.

22. Set the Zero Adjust pot on the Main Control Card (MCC).

- This adjustment is only used to fine tune and balance the forward and reverse spindle speeds. Adjusting this pot will not compensate for large imbalances.



23. Set the R-Stop pot if the MA contactor fails to drop out when the spindle stops.

- This adjustment is usually only done when the interface card is replaced.

24. Verify and adjust Minimum Speed.

- Normally the Minimum Speed pot is turned completely CCW.
- If necessary, call for the Minimum reference signal and adjust the Min Speed pot for the desired speed.

25. Verify and adjust Damp settings.

- Normally set all the way CCW.
- This pot is used to damp out current oscillations in the motor circuit. If turned more than 1/4 turn CW, the drive may kick out.

26. Follow any machine specific instructions found in the card cage to finish setting up the drive.



Card Cage

27. Pick up any tools and close the drive access doors.