RELIANCE ELECTRIC

INSTRUCTION SHEET D2-3083
REPLACEMENT REGULATOR FOR THE 3/4 THROUGH 5 HP
General Purpose A-C V★S Controllers
1AC2075/1AC2175, 1AC2001 / 1AC2101, 1AC2002 / 1AC2102, 1AC2003 / 1AC2103, 1AC2005 / 1AC2105

WARNING
BEFORE INSTALLING AND/OR ADJUSTING THE REPLACEMENT REGULATOR BOARD, THE QUALIFIED ELECTRICAL MAINTENANCE PERSON WHO IS FAMILIAR WITH THIS TYPE OF EQUIPMENT AND THE HAZARDS INVOLVED SHOULD READ THIS ENTIRE INSTRUCTION SHEET. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY INJURY.

DESCRIPTION

This instruction sheet covers the removal and replacement of the regulator printed circuit board of the 3/4 through 5 HP, GP 1000 A-C V★S Controller.

All of the following removal and replacement procedures are to be performed with all power to the A-C V★S Drive disconnected.

INSTALLATION

1. Disconnect all power to the A-C V★S Drive before installing the replacement regulator board.
2. Remove the cover of the A-C V★S Drive Controller by loosening the screws at the corners of the cover.
3. Loosen the two screws on the left hand side of the Controller and move the slide down to free the hinged operator's panel.
4. Rotate the operator's panel forward.

DANGER
EQUIPMENT IS AT LINE VOLTAGE WHEN A-C POWER IS CONNECTED TO THE A-C V★S DRIVE CONTROLLER. ALL UNGROUNDED CONDUCTORS OF THE A-C POWER LINE MUST BE DISCONNECTED FROM THE CONTROLLER BEFORE IT IS SAFE TO TOUCH ANY INTERNAL PARTS OF THIS EQUIPMENT. AFTER POWER IS REMOVED USE A VOLTMETER AT TERMINALS 147 (+) AND 45(—) TO VERIFY THAT THE D-C BUS FILTER CAPACITORS ARE DISCHARGED BEFORE TOUCHING ANY INTERNAL PARTS OF THE CONTROLLER. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN FATAL INJURY.

5. Verify that the replacement regulator board has the same part number as the original board by referring to the part number near the lower right hand corner of the board. Refer to Figure 1. The 3/4 through 2 HP Controllers have a part number LHPI-1; the 3 through 5 HP Controllers have a part number LHPI-2.
6. Remove the regulator board connectors as indicated in Figure 1. The connectors should be removed by grasping the connectors to avoid pulling out the wire.
7. Remove the four screws located at the corners of the regulator board and set the screws aside. Remove the regulator board.
8. Mount the new regulator board in the controller using the four mounting screws which were removed.
9. Reconnect the connectors by matching the connector numbers stamped on the connectors with the connector number stamped on the regulator board and by referring to Figure 1. All the connectors are keyed and the wire colors are identified in Figure 1.

   Connector C (3CN), should be connected with its wire, D, twisted as shown in Figure 1.

   Note that connector E (5CN), is only used if the controller is equipped with a Digital Frequency Meter on the operator's panel.

REGULATOR BOARD ADJUSTMENT

The replacement regulator boards will be shipped with the adjustments set at the standard values as summarized in instruction manual D2-3064. Depending on the adjustments made at the original startup, the replacement board may have to be adjusted after installation in the controller to match the original settings. Initial adjustments should be made as follows:

1. Switch F (1SW), should be set at the same position as that of the original board. Refer to Figure 1 for switch F location.
2. Jumpers G and H should be in the same position as that of the original board. Refer to Figure 1 for the location of jumpers G and H.

3. Potentiometers 1P through 7P should be set at the same scale position as the original board. No adjustment should be done for potentiometers 8P and 9P.

   The accuracy of the potentiometers is 20% at the maximum setting. It may, therefore, be necessary to adjust the potentiometers further when the controller is started up.

4. Reapply power to the controller and verify that the controller adjustments are satisfactory by operating the unit. If readjustment is required, proceed to the "Final Startup Adjustments" below.

Final Startup Adjustments With Power ON.

If any of the following steps cannot be made because of a controller problem, go to "Section 4, Troubleshooting," in Instruction Manual D2-3064.

1. **Make sure the motor power leads are disconnected and power is OFF.**
2. Set the voltmeter on the 500 VDC (1000 VDC) or a similar high voltage scale. Connect the voltmeter to terminals 147 (−) and 45 (—) on the D-C bus capacitor.

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3. Turn the Run/Jog switch on to RUN and the Auto/Man switch to MAN.
4. Turn the FWD/REV switch to FWD.
5. With the Speed pot in full counterclockwise position, turn the power ON. The voltmeter will read the D-C bus voltage as determined by the following formula:

   D-C bus voltage = 1.35 x (A-C input voltage)

   Therefore, it must read 310 VDC when the A-C input voltgae is 230 VAC.

6. Turn the power Off. Remove the voltmeter after confirming zero voltage. If you have another voltmeter, you can leave one voltmeter as it is, because you can use the other voltmeter for the next step.

   Set a voltmeter to a higher-than-250 VAC voltage scale, and connect to two of the three terminals, 601 (U), 602 (V) and 603 (W) at your option.

7. With the Speed pot in full counterclockwise position, turn the power ON and push the Start/Stop switch to START.
8. The Green RUN LED (2 LED in Figure 1) on the regulator board should come on. If the Min Hertz is at the zero setting, fully counterclockwise, the voltmeter must also be zero. If a different setting is required to obtain the original adjustment, proceed to Step 9. If a different setting is not required, proceed to Step.
9. V/Hz Adjustment:
   Since the output voltage of the PWM controller consists of the fundamental voltage plus all the harmonics, the harmonic content must be subtracted from the total RMS voltage reading measured, to obtain the true fundamental torque producing voltage.

   The fundamental output voltage equals the measured output voltage minus 40 volts.

   Since different measurement instruments yield different results the following test equipment is recommended.

   Triplett 630 or equivalent
   Fluke 8020 or equivalent

   The V/Hz setting can be adjusted by the following method.

   Note: Adjustment of the V/Hz pot should be done with the motor disconnected.

   - Observe the motor's rated voltage and rated frequency.
   - Turn the TBST pot (5P) fully CCW.
   - Turn the Min. Hz pot (4P) fully CW. (Frequency will equal approximately 35 hertz)
   - Turn the speed pot fully CCW.
   - Position of the Max. Hz pot need not be changed.
   - Press the start switch and allow the controller to reach its steady state speed. (After ramping up to this point under accel control)

- Adjust the V/Hz pot by measuring the voltage between terminals 601 (U) and 602 (V), then turning the V/Hz pot (7P) until the following voltage is reached.

$$\text{Voltage} = \frac{(\text{Motor's Rated Voltage})\ (35)}{\text{Motor's Rated Frequency}} + 40$$

Example: Motor rated 230 V at 60 Hz

Voltmeter reading =

$$\frac{(230)\ (35)}{60} + 40 = 174 \text{ Volts A-C}$$

The actural fundamental voltage = The voltmeter reading —40 volts

In the above example, the fundamental voltage =

174 — 40 = 134 volts

10. Min. Hz. Adjustment:
If the controller is equippec with a frequency meter, do the adjustment while watching the frequency meter.

If not equipped with the frequency meter, the following method is recommended.

DANGER

ALTHOUGH ZERO SET ADJUSTMENT ON THIS CONTROLLER ALLOWS FOR ADJUSTMENT DOWN TO ZERO SPEED, THIS ZERO SPEED SETTING MUST NOT BE USED WHERE THE OPERATOR MAY RELY ON A MAINTAINED ZERO SPEED. ELECTRICAL NOISE, IMPROPER WIRING, POWER LINE, OR MALFUNCTIONING COMPONENTS COULD CAUSE THE CONTROLLER TO TURN ON WHILE AT THE ZERO SPEED SETTING. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN FATAL INJURY.

With the frequency range jumper in the J1 position, turn the speed pot to its full counterclockwise position and adjust the Min. Hz Pot (4P). The pot scale is divided into 10 divisions from 0 to 10. The pot position 0 equals 0 hertz output frequency and position 10 equals approximately 35 hertz output frequency. Therefore, each division equals 3.5 hertz.

The pot position can be determined with the equation

$$\text{Min. Hertz Pot Position} = \frac{(\text{Desired Min. Hertz})}{35}(8) + 1$$

11. Max. Hz. Adjustment:
If the controller is equipped with a frequency meter, do the adjustment while watching the frequency meter.

Adjust the Max. hertz Pot (3P) after adjusting the Min. hertz Pot.

If not equipped with a frequency meter, the following method is recommended.

Since the Max. Hz. equals the speed pot setting plus the Min. Hertz setting, use the following relationship to approximate the position of the Max. Hertz pot (3P)

$$\text{Max. Hertz Pot Position} = \left(1.2 \cdot \frac{18}{Fo}\right)(8) + 1$$

Where Fo equals the desired Max. Hz. minus the desired Min. Hz.

Example: If the desired Min. Hertz = 30 (4P set to 7.9 by Step 14) and the desired Max. Hz. is to be 60 Hz., the Max. Hz. pot position is as follows:

Max. Hz Pot Position =

$$\left(1.2 \cdot \frac{18}{60 - 30}\right)(8) - 1 = 5.8$$

The Max. Hz. controls may have to be readjusted to the actual application.

12. Set the FWD/REV switch to REV. The voltmeter reading should decrease to zero once and then increase back. If the FWD/REV switch is disabled no change should appear in the voltmeter reading.
13. Switch the FWD/REV switch to FWD.
14. Switch the AUTO/MAN switch to AUTO. The speed reference will be changed to a 4 — 20 mA (or 0 — 10 VDC) signal instead of the Speed pot. If the AUTO/MAN switch is disabled go to Step 20. The voltage reading will not change.
15. Switch the AUTO/MAN switch to MAN.
16. Turn the Speed pot to zero, and push the Start/Stop switch to STOP. Turn the input power OFF after confirming that the voltmeter reads zero. Don't proceed to the next step before confirming that the D-C Bus Voltage at terminals, 147 (+) and 45 (—) is zero.
17. **Connect the motor power leads to the Controller.**
18. Turn the power ON and push the Start/Stop switch to START.

19. Turn the Speed pot slowly clockwise and the motor will start to rotate. If the shaft rotation is incorrect, push the Start/Stop switch to STOP and wait until the motor has completely stopped. Turn the input power OFF.

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Reverse any two of the three motor power leads.

20. If the motor leads were reversed in Step 19, turn the power ON and push the Start/Stop switch to START.

21. With the drive coupled to the machine, the voltage boost still may not be high enough to break away or accelerate the load within the current limit of the drive. The voltage boost should then be increased until either the motor performs properly or current limit is reached. If satisfactory adjustment can not be reached, contact your Reliance Electric Sales Office.

22. The current limit is preadjusted for 110% of the motor sine wave current rating. To adjust current limit between the range of 50% (fully counterclockwise) and 150% (fully clockwise), turn the Current Limit pot as necessary.

23. Turn the Speed pot to the maximum clockwise position and the motor will accelerate slowly to maximum speed (60 Hertz). If 60 Hertz is not reached, this may be due to Current Limit. The Controller is not designed to supply 150% of the current rating for more than one minute. Contact your Reliance Electric Sales Office, if satisfactory adjustment can not be reached.

24. Turn the Speed pot to zero and the motor will decelerate to minimum speed according to the Min Hz pot.

25. With the Speed pot at zero, quickly turn the Speed pot fully clockwise. If the acceleration time is too long, turn the Acceleration Rate pot (1P) a quarter turn clockwise and accelerate the motor again. Repeat the motor acceleration process until the desired acceleration time is achieved.

NOTE: *The shortest acceleration time is limited by the current limit circuit. When the Acceleration Rate pot no longer has any effect, the acceleration rate is at its maximum for the application. When the motor is in acceleration while the current is limited, the acceleration will not be smooth. To avoid this, turn the Acceleration pot (1P) slightly counterclockwise.*

26. Turn the Speed pot fully clockwise and wait until the motor reaches top speed. Quickly turn the Speed pot to zero. If the deceleration time is too long, turn the Deceleration Rate pot a quarter turn clockwise and decelerate the motor again. Repeat the motor deceleration process until the desired deceleration time is achieved.

NOTE: *The shortest deceleration time is limited by the voltage limit circuit. When the deceleration Rate pot no longer has any effect, the deceleration rate is at its maximum for the application. When the motor is in deceleration while the D-C bus voltage is limited, the deceleration will not be smooth. To avoid this condition turn the DEC pot (2P) slightly counterclockwise.*

27. Turn the Speed pot counterclockwise and wait until the motor speed comes to zero. Then set the Run/Jog switch to JOG.

28. Turn the Speed pot a quarter turn clockwise and push the Start/Stop switch to the Start position. The motor will rotate while the Start/Stop switch is held in the Start position. The speed depends on the Speed pot setting.

29. Turn the Speed pot counterclockwise, and turn the Run/Jog switch back to RUN.

30. Push the Start/Stop switch down to STOP and turn the input power OFF.

This completes the final startup adjustments.

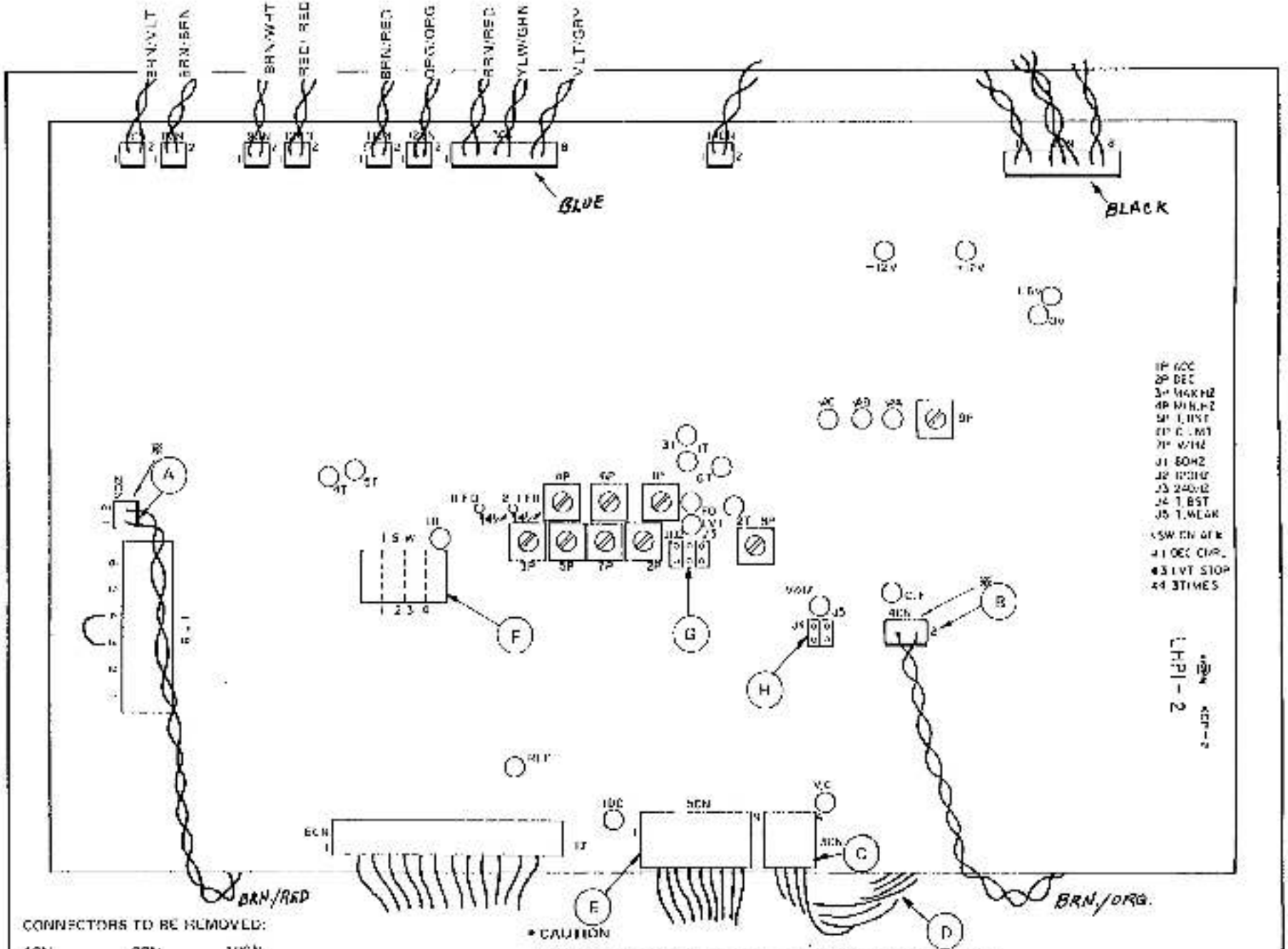

Figure 1. Regulator Board (Front View)

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Printed in U.S.A. Instruction Sheet D-3260 Part 1 Code1