Rockwell Automation
Allen-Bradley

Bulletin 1334 30-50 HP Series A Troubleshooting

30-50 HP Diagnostic LED Display

Power ON - Indicates input power is connected when illuminated**.**

Momentary Overload Protection Circuit - When constantly illuminated indicates an overload condition exceeded (60) seconds - Momentarily illuminated whenever circuit is activated**.**

Under Voltage Protection - When illuminated indicates that the Drive has tripped **OFF** due to an input voltage that is less than 414 volts for a 460V Drive, 373 volts for a 415V Drive, or 342 volts for a 380V Drive**.**

Over Voltage Protection - When illuminated indicates that the Drive has tripped **OFF** due to the bus voltage exceeding 760V DC**.**

"A" Phase Protection Trip-When illuminated indicates either:
- An Overload Condition Greater Than 200%
- A Shorted "A" Phase Output Transistor
- Section "A" of the Driver Board is Malfunctioning

"B" Phase Protection Trip-When illuminated indicates either:
- An Overload Condition Greater Than 200%
- A Shorted "B" Phase Output Transistor
- Section "B" of the Driver Board is Malfunctioning

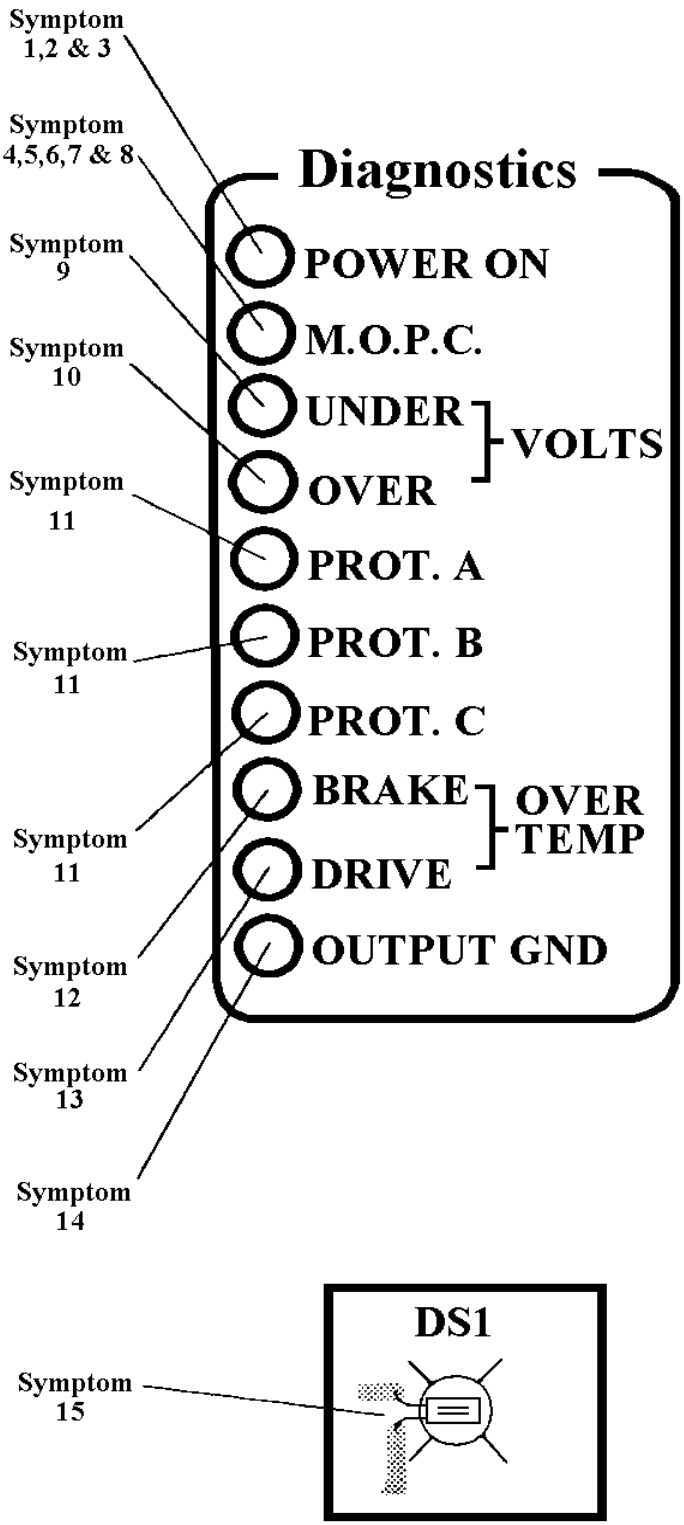
"C" Phase Protection Trip-When illuminated indicates either:
- An Overload Condition Greater Than 200%
- A Shorted "C" Phase Output Transistor
- Section "C" of the Driver Board is Malfunctioning

Brake Resistor Over Temperature Protection Trip-When illuminated indicates excessive brake resistor temperature**.**

Drive Over Temperature Protection Trip - When illuminated indicates that the heatsink temperature of the Drive has exceeded the maximum safe operating limit**.**

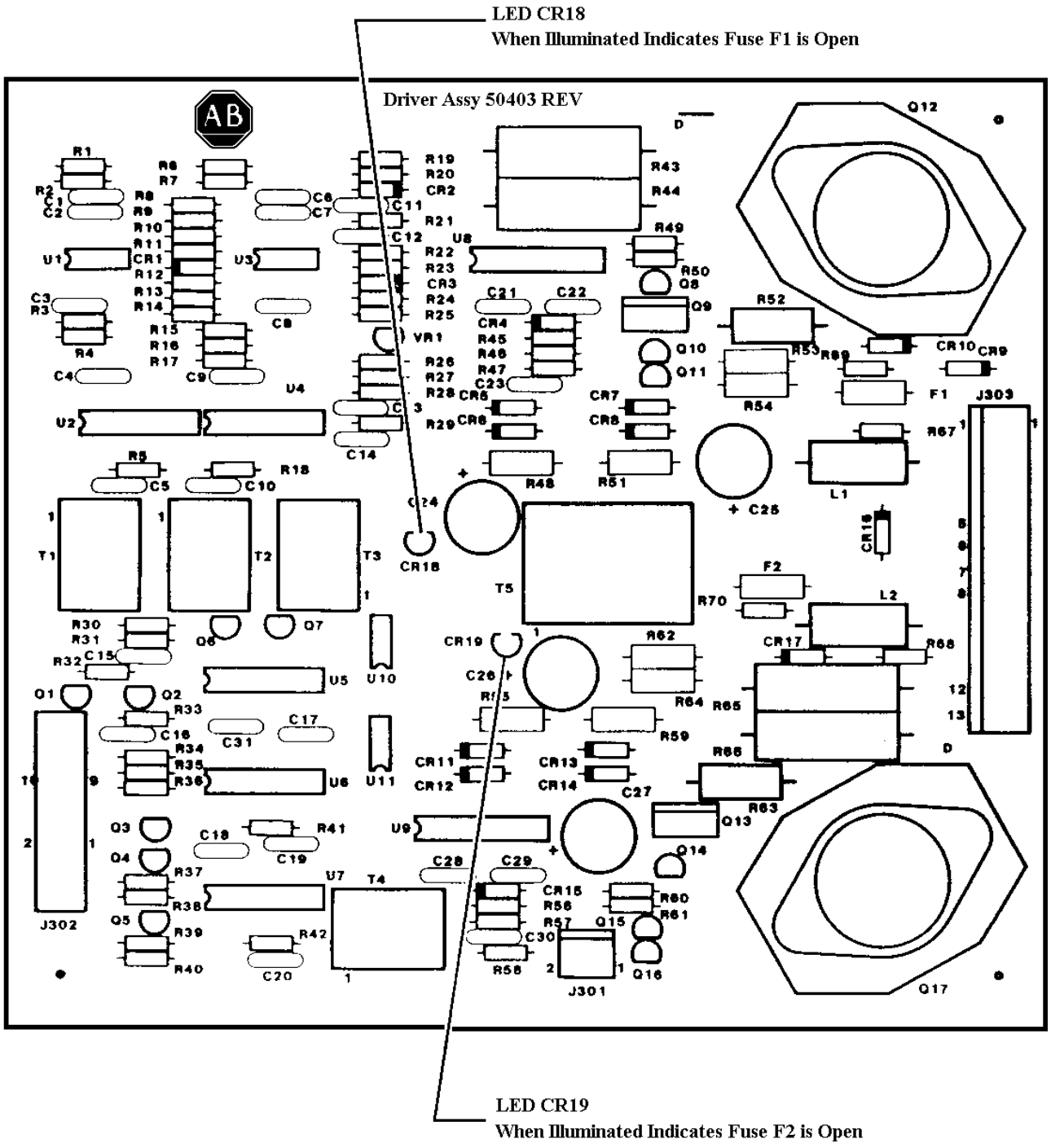
Output Ground Fault Protection Trip Indication - When illuminated indicates that the Drive circuitry has shorted to GROUND**.**

DS1 Located on the Bus Discharge Board A5 (or Dynamic Brake Board when installed) - When illuminated indicates that the bus potential is in excess of 42V DC



30-50 HP Driver Board LED Indication

There are no adjustment settings for Bulletin 1334 30-50 HP Driver Boards. Each Driver Board does however provide fuse status indication. Two LEDs, CR18 and CR19, indicate the status of fuses Fl and F2 on each Driver Board respectively. An illuminated LED means that its associated fuse has opened as described in Symptom 11 in the following troubleshooting procedures.



IMPORTANT

Drive Fault Trips

Before resetting any fault trip, refer to the following troubleshooting procedures to isolate and correct the fault. The location of boards & Drive components are illustrated in Appendix C on pages C-3 & C-4, of the 1334 instruction manual, publication # 1334.5.8. All voltage values & polarities referenced in the following troubleshooting procedures are shown in the Drive Schematics in Appendix I or the Modulator Logic Board Interconnection Diagram in Appendix J, of the 1334 instruction manual, publication # 1334.5.8.

WARNING

Hazardous voltage levels exist on some printed circuit boards and Drive components. If diagnostic LED(s) PROT. A, PROT. B, or PROT. C are lit, hazardous voltages can be present at the output terminals even though the STOP push-button has been depressed. If neon light DS1 on Bus Discharge Board A5 (or the Brake Board if installed) is lit, hazardous voltages are present in the Drive cabinet. To guard against personal injury when boards or wires are being disconnected or reconnected, or fuses are being replaced, always remove power to the Drive at the disconnect device, wait (5) seconds, and ensure that DS1 is not lit before servicing. Use a DVM to check for zero volts between terminals 1 (+ BUS) & 5 (- BUS) at terminal block 4TB on the Drive backpanel.

CAUTION

To Guard Against Equipment Damage When Troubleshooting the Drive, Before Pressing the START Push-button Always: Set the Speed Pot or speed reference to MINIMUM. Set the FWD/REV Switch (if present), to the proper position. Uncouple the motor from its mechanical load.

IMPORTANT

ESD Precautions

ESD (Electrostatic Discharge) generated by static electricity can damage the CMOS devices on various Drive boards. To guard against this type of damage, it is recommended that when circuit boards are removed or installed the following precautions be observed.

- Wear a wrist type grounding strap that is grounded to the Drive chassis.
- DO NOT remove the new circuit board from its conductive wrapper unless a ground strap is worn.
- When removing any circuit board from the Drive, immediately place it in conductive packing material.

Symptom 1 - Drive does not start. Amber POWER ON LED is not illuminated.

DIAGNOSTIC PROCEDURE

Check for possible loss of input line voltage by measuring line voltage between Ll, L2 and L3. If voltage is present, measure voltage across input line fuses 1FU, 2FU, and 3FU. Measure voltage across input primary fuse 4FU at transformer 1T. A voltage reading across any of these fuses indicates an open condition. Before replacing blown fuses complete STEPS 1, 2 and 3.

STEP 1 - Remove input power to the Drive. Before proceeding, wait (5) seconds. The Bus Indicator neon light on Bus Discharge Board A5 (or Brake Board if installed), should not be lit. Use a DC voltmeter to verify that the DC bus is fully discharged. Start with the voltmeter on its highest scale (x l000) and range downward to the lowest voltmeter scale.

STEP 2 - With an ohmmeter set on the x1 scale, check Rectifier Assembly 1 REC, 2 REC, 3 REC as follows:

OHMMETER		READING
+ LEAD	- LEAD	
BLACK (l REC+)	ORANGE (1 REC - AC1)	Infinite
BLACK (1 REC +)	YELLOW (2 REC - AC2)	Infinite
BLACK (1 REC +)	GREEN (3 REC - AC3)	Infinite
ORANGE (1 REC - AC1)	BLACK (l REC -)	Infinite
YELLOW (2 REC - AC2)	BLACK (1 REC -)	Infinite
GREEN (3 REC - AC3)	BLACK (l REC -)	Infinite

If any of the above readings are not as shown, replace Rectifier Assembly 1 REC, 2 REC, 3 REC.

IMPORTANT: When replacing the Rectifier Assembly clean all surfaces**.** Apply a thin layer of thermal grease (Dow Corning 340) to the back of the assembly**.** Torque mounting screws to 17-26 in-lbs max**.**

STEP 3 **-** With the ohmmeter set on the x100 scale, check Bus Capacitors for a shorted condition as follows**.**

(2C1-2, 3C1-2 for 30 HP Drives - 2C1-3, 3C1-3 for 40 & 50 HP Drives)

Remove the capacitor support block and (+) POSITIVE bus bars**.** Connect the (+) POSITIVE lead of the ohmmeter to the (+) POSITIVE terminal of the capacitor**.** Connect the (-) NEGATIVE lead of the ohmmeter to the (-) NEGATIVE capacitor bus bar**.** The ohmmeter should immediately read low, then slowly increase to approximately 20kΩ**.** A sustained low reading indicates a shorted capacitor that requires replacement**.**

After completing STEPS 1, 2 & 3, replace blown fuses and reapply input power**.**

Symptom 2 - Drive does not start**.** Amber POWER ON LED is illuminated**.** No red fault LEDs are illuminated**.**

DIAGNOSTIC PROCEDURE

Check for line out condition at fuse 3FU by measuring the AC line voltage from L3 to either L1 or L2**.** If voltage is present, measure voltage across 3FU**.** A voltage across 3FU indicates that it is open and must be replaced**.** Before replacing 3FU, perform STEPS 1, 2 & 3 in Symptom 1, then the following eleven steps**.**

STEP 1 **-** Check precharge circuit fuse 5FU for an open condition**.**

STEP 2 - With input power to the Drive removed at the disconnect device, check that all jumpers on Modulator Logic Board A1 are in their proper position, particularly the VCO/EXT-C jumper and the IFB/XFB jumper**.**

STEP 3 - With input power to the Drive removed at the disconnect device, check installed options, particularly those with AUTO/MAN or AUTO/OFF/MANUAL selection (both local and remote)**.** Depending upon the options installed the maximum speed pot adjustment R25, or the minimum speed pot adjustment R26, may be ineffective**.** Refer to section 5**.**3**.**1, of the 1334 instruction manual, publication # 1334**.**5**.**8, Minimum and Maximum Speed Adjust**.**

- If option N, N4, G2 or G4 is installed, ensure that:
  The AUTO/MAN switch on the card is set to the MAN mode**.**
  A 1kQ, 2W, linear taper speed pot has been properly connected to Terminal Block 1TB between terminals 14, 15 &16**.**
- If option G is installed, ensure that the 1kQ resistor included with the option kit has been installed at Terminal Block TB1 between terminals 14 & 16**.**
- If option K9 is installed, check for continuity across the Brake Over Temperature circuit at Terminal Block TB1 between terminals 17 & 18**.**
- If option T7, T8 or T9 is installed, check for continuity across the Motor Overload Relay contact circuit, terminals 10 & 11 at Terminal Block 1TB**.**

STEP 4 **-** Check for an open speed pot at Terminal Block 1TB**.** Measure the voltage at Terminal Block 1TB between terminals 14 & 16**.** There should be 3**.**2V DC**.** If voltage is 12V DC, the speed pot may be open or there may be an open wire between the speed pot and terminals 14, 15 & 16**.** Check for an inoperative speed pot by turning the pot from 0 to 100%**.** The voltage between terminals 15 & 16 should vary from 0 to 3**.**2V DC**.** Replace or correct as required**.**

STEP 5 **-** Check the voltage between terminals 9 & 11 at Terminal Block 1TB

- If standard START/STOP configuration is used, there should be 90V AC between terminals 9 & 11. If not, the START/STOP circuit is open. Check the START/STOP circuit connections to 1TB.

For a Standard Drive Without Factory Installed Options

- If field installed 2-wire, 90V AC, RUN/STOP control is used, there should be 90V AC between terminals 9 & 11. If not, the RUN/STOP circuit is open. Ensure that the circuit has been installed as specified in section 4.4.6 of the 1334 instruction manual, publication # 1334.5.8.

- If field installed 2-wire, 120V AC, RUN/STOP control is used, there should be 120V AC between terminals 9 & 11. If not, the RUN/STOP circuit is open. Ensure that the circuit has been installed as specified in section 4.4.5 of the 1334 instruction manual, publication # 1334.5.8.

STEP 6 - Measure the output voltages in the secondary circuits of Transformer 1T.
The following voltages should be present at Power Supply Board A6.

molex connector J602 between pins 4 & 1 .....14V AC
molex connector J602 between pins 2 & 1 .....14V AC
molex connector J602 between pins 5 & 6 .....15V AC

The following voltage should be present at terminal block 1TB.

between terminals 1 & 11 ..... 90V AC

If any one voltage is absent, remove input power and check all connections to 1T. If all connections are correct, replace Transformer 1T

STEP 7 - Go to Logic Power Supply Board A6 and measure all output voltages. The following voltages should be present at molex connector J601 with respect to Drive common, J601 Pin 1. If any one voltage is absent, replace A6.

J601, pin 2 ..... 14V AC
J601, pin 3 ..... + 17V DC
J601, pin 5 ..... + 9 to + 15V DC (nominal)
J601, pi n 6 ..... + 9 to + 15V DC (nominal)
J601, pin 9 ..... -17V DC

STEP 8 - Measure the output voltage across the secondary circuit of Transformer 2T, pins 5 & 6. If 17V AC is absent, replace 2T.

STEP 9 - If 2T checks out, Contactor Interface Board A9 may be inoperative The following voltages should be present with respect to Drive common, J901 Pin 1.

J901, pin 4 ..... + 24V DC
J901, pin 6 ..... 0V DC (nominal)
J901, pin 7 ..... 0V DC (nominal)
J901, pin 8 ..... + 11V DC

STEP 10 - If Transformer 2T and Contactor Interface Board A9 check out, measure the control voltage at contactor 1CON. There should be +24V DC between points C1 & C2 at the contactor. If + 24V DC is measured and 1CON is not picked-up, the contactor may be inoperative. Replace if required.

If the problem cannot be found after completing STEPS 1 - 10, replace Modulator Logic Board A1.

Symptom 3 - Precharge cycle excessively long or not complete**.** Amber POWER ON LED may or may not be illuminated**.**

DIAGNOSTIC PROCEDURE

The DC bus precharge cycle should be completed within (5) seconds after input line power is applied to the Drive**.** Check precharge circuit fuse 5FU for an open condition first, then perform the following three steps**.**

STEP 1 **-** Check Rectifier Assemblies and Bus Capacitors as specified in STEPS 1, 2 & 3, symptom 1**.**

STEP 2 **-** Check Precharge Contactor Interface Board A9 The following voltages should be present at connector J901 on the Contactor Interface Board**.** Replace if required**.**

Transformer 2T secondary voltage	17V AC between pins 2 & 3
Contactor 1CON control voltage	+ 24V DC between pins 4 & 6
	+ 11V DC between pins 7 & 8

If the problem cannot be found after completing STEPS 1 & 2, replace Modulator Logic Board Al

Symptom 4 - Drive trips just after input line power is applied before START command is given**.** Red M**.**O**.**P**.**C**.** fault LED is illuminated**.**

DIAGNOSTIC PROCEDURE

IMPORTANT: If the Drive will not restart or reset after a fault trip, always check fuse 5FU for an open condition**.** Replace if necessary**.**

An illuminated M**.**O**.**P**.**C**.** LED indicates that there may be a loss of input power to the Driver Boards**.** Check the power supply at all three Driver Boards**.** Approximately 16V AC should be measured between pins 1 & 2 at each J301 connector**.** If not, check fuse Fl on Driver Power Supply Board A10**.** If the fuse is open, replace Driver Power Supply Board A10**.** If voltage is present, perform the diagnostic procedure in Symptom 5**.**

Symptom 5 - Drive trips on momentary overloads causing phase protection indication**.** M**.**O**.**P**.**C**.** circuit not functioning properly**.** Red M**.**O**.**P**.**C**.** fault LED is not illuminated**.**

DIAGNOSTIC PROCEDURE

IMPORTANT: If the Drive will not restart or reset after a fault trip, always check fuse 5FU for an open condition**.** Replace if necessary**.**

With the motor rotor locked and boost set to zero, adjust the ACCEL RATE setting, switch S1 on Modulator Logic Board A1, to 1**.**2 Hz/Sec**.** Set the operator speed pot or speed reference to zero**.** After completing the above, start the Drive and slowly increase the speed while monitoring the output motor current on any phase using a true RMS reading clamp on ammeter**.** The M**.**O**.**P**.**C**.** LED should light when the current reaches a nominal value of 150%**.** If the M**.**O**.**P**.**C**.** LED does not light, use an oscilloscope to check for a pulsed waveform at the following pins on connector J113 of the Modulator Logic Board with respect to Drive common**.**

Pin 5 - ϕA Driver Signal
Pin 16 - ϕB Driver Signal
Pin 27 - ϕC Driver Signal

If pulse signals that go to a TTL level “0” are not present, replace the Driver Board in question**.** If pulse signals are present on all (3) Driver Boards, replace Modulator Logic Board A1**.** Return the boost and accel rate adjustments to their normal settings**.**

Symptom 6 - Drive starts momentarily then trips off or Drive trips off during normal operation**.** Red M**.**O**.**P**.**C**.** fault LED is illuminated**.**

DIAGNOSTIC PROCEDURE

IMPORTANT: If the Drive will not restart or reset after a fault trip, always check fuse 5FU for an open condition**.** Replace if necessary**.**

An illuminated M**.**O**.**P**.**C**.** LED indicates that the Drive has tripped off due to a nominal 150% overload condition which has exceeded the (60) second time period**.**

IMPORTANT: During acceleration or start-up (breakaway), it is normal for the M**.**O**.**P**.**C**.** LED to illuminate momentarily**.** This merely indicates that a momentary overload current of 150% has been sensed and that the M**.**O**.**P**.**C**.** circuit has been activated**.** The LED will also flash momentarily when AC line power is first applied**.**

If the M**.**O**.**P**.**C**.** LED is constantly activated during start-up (breakaway), or if there is excessive LED activity at low frequency operation, less DC boost must be used**.** Refer to the DC Boost Adjustment, section 5**.**3**.**3 and V/Hz Jumper Setting in section 5**.**3**.**2 of the 1334 instruction manual, publication # 1334**.**5**.**8**.** If Option L, the Function Expander Card is installed, REFER TO THE OPTION KIT INSTRUCTIONS FOR CORRECT SETUP PROCEDURES**.**

Symptom 7 - Motor does not return to full set speed after stalling**.** Red M**.**O**.**P**.**C**.** fault LED is illuminated**.**

DIAGNOSTIC PROCEDURE

The load torque is exceeding the torque capability of the Drive**.** Check for problems with the mechanical load**.** If the mechanical load checks out, try increasing the DC boost as outlined in section 5**.**3**.**3 of the 1334 instruction manual, publication # 1334**.**5**.**8**.** If this does not correct the condition, consult your nearest Allen-Bradley Area Sales/Support Center for application assistance**.**

IMPORTANT: If a continuous overload current demand exists, the motor will ramp down to a stalled condition and remain there until the overload condition no longer exists**.** If however the overload condition is sustained for (60) seconds, the Drive will trip and illuminate the M**.**O**.**P**.**C**.** LED on the Diagnostic Display Panel**.**

Symptom 8 - Red M**.**O**.**P**.**C**.** fault LED is illuminated during DECEL or at (0) Hz**.**

DIAGNOSTIC PROCEDURE

Boost voltage set too high**.** Decrease the boost voltage by setting the DC boost switch lower and/or set the Decel switch to provide a slower ramp (Refer to DC Boost Adjustment, ACCEL/DECEL Rate Adjustments, section 5**.**3**.**3 of the 1334 instruction manual, publication # 1334**.**5**.**8**).**

Symptom 9 - Drive starts momentarily then trips off or Drive trips off during normal operation**.** Red UNDER VOLTS fault LED is illuminated**.**

DIAGNOSTIC PROCEDURE

IMPORTANT: If the Drive will not restart or reset after a fault trip, always check fuse 5FU for an open condition**.** Replace if necessary**.**

An illuminated UNDER VOLTS LED indicates that Drive has tripped off due to an input line voltage that is less than 414V AC at the 460VAC Tap on Transformer 1T

- 414V AC at the 460V AC Tap on Transformer 1T
- 373V AC at the 415V AC Tap on Transformer 1T (50 Hz Input Power)
- 342V AC at the 380V AC Tap on Transformer 1T (50 Hz Input Power)

STEP 1 **-** Check input primary fuse 4FU for an open condition**.**

STEP 2 - Measure the input voltage to Transformer 1T. If proper voltage is present, replace Modulator Logic Board A1.

Symptom 10 - Drive starts momentarily then trips off or Drive trips off during normal operation or deceleration. Red OVER VOLTS fault LED is illuminated.

DIAGNOSTIC PROCEDURE

An illuminated OVER VOLTS LED indicates that the Drive has tripped off due to a bus voltage greater than 760V DC. Three conditions can cause an over voltage trip

- Excessively High Input Voltage
- DC Boost Set too High
- Deceleration Rate too High for the Motor/Load Inertia

STEP 1 - Check the input line voltage across each phase at L1, L2, and L3. The voltage should not be greater than 506V AC.

STEP 2 - If trip occurred during deceleration, check the position of the NORM/DEC HOLD jumper on the Modulator Logic Board The jumper should be set to the DEC HOLD position. Monitor LED CR53 FREQ HOLD on the Modulator Logic Board During deceleration, with the NORM/DEC HOLD jumper in the DEC HOLD position, the LED should light before an overvoltage trip occurs. If the LED lights, decrease the DECEL RATE, the DC BOOST, or both. Refer to the Modulator Logic Board Switch Settings in section 5.3.3 of the 1334 instruction manual, publication # 1334.5.8. If the LED does not light, replace the Modulator Logic Board.

STEP 3 - If the Drive trips out on over voltage during deceleration and a slower decel ramp is not acceptable, consult your nearest Allen-Bradley Area Sales/Support Center.

Symptom 11 - Drive starts momentarily then trips off or Drive trips off during normal operation. Red PROT. A, PROT. B, or PROT. C fault LED is illuminated.

DIAGNOSTIC PROCEDURE

IMPORTANT: If the Drive will not restart or reset after a fault trip, always check fuse 5FU for an open condition. Replace if necessary.

An illuminated A, B or C phase protection LED indicates:

- An output overcurrent condition greater than 200% due to either:

  1.) An output phase-to-phase short (Drive output, motor windings, or wiring to the motor).

  2.) An output overcurrent condition greater than 200% due to an output phase-to ground short.

  In either case, remove input power to the Drive at the disconnect device. Disconnect the motor leads from the Drive at Terminal Block 2TB. Reapply power to the Drive and give the Drive a START command. If the Drive can be operated without a phase protect trip occurring, the problem is in either the wiring to the motor or the motor itself. A ground fault can be found using an ohmmeter between the wiring to the motor and ground. Find the cause and correct it before reconnecting the motor leads to the Drive and reapplying power. A shorted motor winding is harder to detect because of the low resistance of the motor windings. Substitute a known, good motor for the suspected bad motor. Connect the substitute motor to the Drive output terminals and try running the Drive. If successful operation of the Drive and substitute motor is achieved, then the problem most likely is the motor originally connected to the Drive.

- Deceleration of an inertia type motor load at too high a value of DC boost or too fast a DECEL rate.

  Under the right conditions, the motor can appear as a short circuit to the Drive. With excessive DC boost applied, the motor can saturate, resulting in a peak current in excess of 200% causing a phase protect trip. Decrease the DC BOOST, the DECEL RATE

or both. Refer to section 5.3.3, of the 1334 instruction manual, publication # 1334.5.8, DC Boost Adjustment, ACCEL/DECEL Rate Adjustment for additional information.

- Excessive DC boost causing a phase protection trip during acceleration.

  Excessive DC boost can cause a phase protection trip to occur during acceleration of the Drive and motor due to saturation of the motor windings. If reducing the DC boost setting eliminates the phase protection trip but does not produce sufficient torque to enable the motor to accelerate the load, consult your nearest Allen-Bradley Area Sales/Support Center for application assistance.

Reset the Drive by giving it a STOP command followed by a START command. If proper operation cannot be obtained without the reoccurrence of a phase protect trip and you have eliminated the preceding possibilities, the problem is most likely caused by one of the following.

- A shorted output transistor in one of the Power Switching Modules.
  Phase "A" 1Q1, 1Q2
  Phase "B" 2Q1, 2Q2
  Phase "C" 3Q1, 3Q2

Perform the following four steps to isolate and correct the problem.

- A malfunctioning Driver Board.
  Phase "A" A3A
  Phase "B" A3B
  Phase "C" A3C

Perform the following four steps to isolate and correct the problem.

- A malfunctioning Driver Board causing an output power Switching Module to be ON when it shouldn't be.
  Phase "A" A3A
  Phase "B" A3B
  Phase "C" A3C

Perform the following four steps to isolate and correct the problem.

- A malfunctioning Modulator Logic Board causing an abnormal Drive output voltage waveform.

Perform the following four steps to isolate and correct the problem.

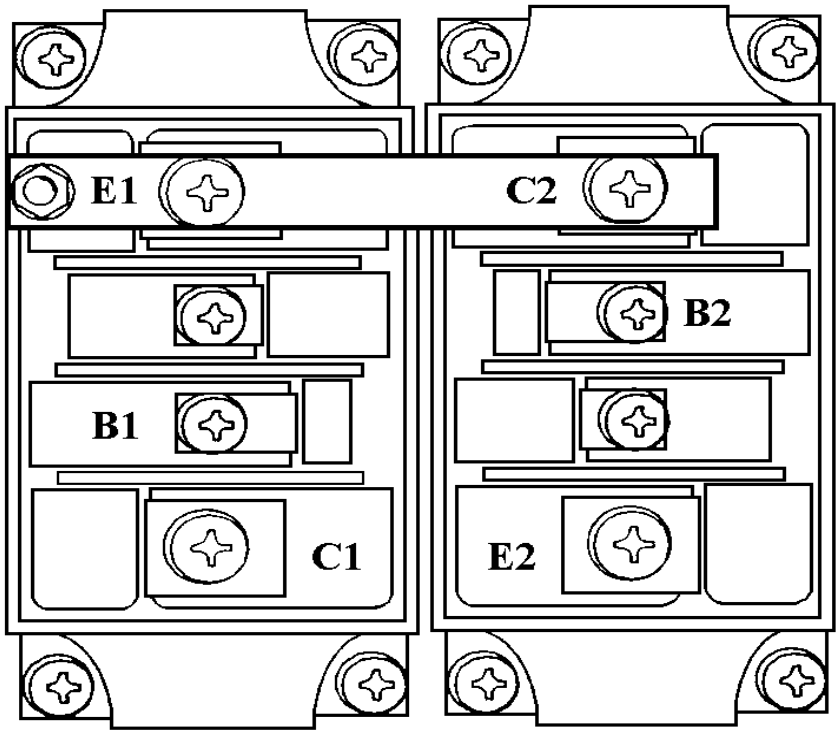
STEP 1 - Remove input power to the Drive. Before proceeding, wait (5) seconds. DS1, the bus charged neon light on Bus Discharge Board A5 (or Brake Board if Installed), should not be lit. Use a DC voltmeter to verify that the DC bus is fully discharged by measuring the voltage at connector J402 between pins 5 (+ BUS) and 1 (- BUS) on Voltage Sensing Board A4. Start with the voltmeter on its highest scale (x 1000) and range downward to the lowest voltmeter scale.

Connections Listed in Step 2 are shown in detail on pages C4-C6 of the 1334 instruction manual, publication # 1334.5.8.

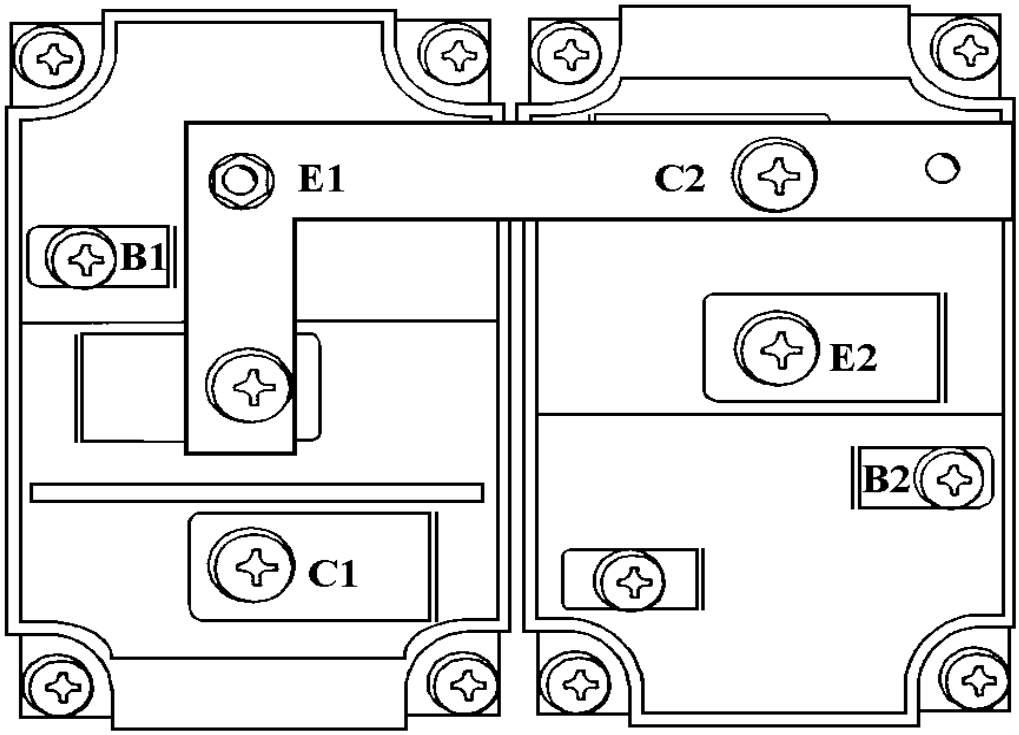
STEP 2 - Check for a shorted output transistor module for the indicated phase as follows
Disconnect all leads to C1 at the Power Switching Module.
Disconnect all leads to E2 at the Power Switching Module.
Unplug the molex connector for the indicated phase at the Driver Board (J303A, B, or C).

For 40 & 50 HP Drives, disconnect one end of the jumper bar that is connected between terminals E1, C2 on the two Power Switching Modules. This will enable you to check each transistor independently.

CAUTION: To avoid damage to the Drive, modules connected in parallel must use the same part number**.** This may require changing both modules in a phase even though only one module needs to be replaced**.**

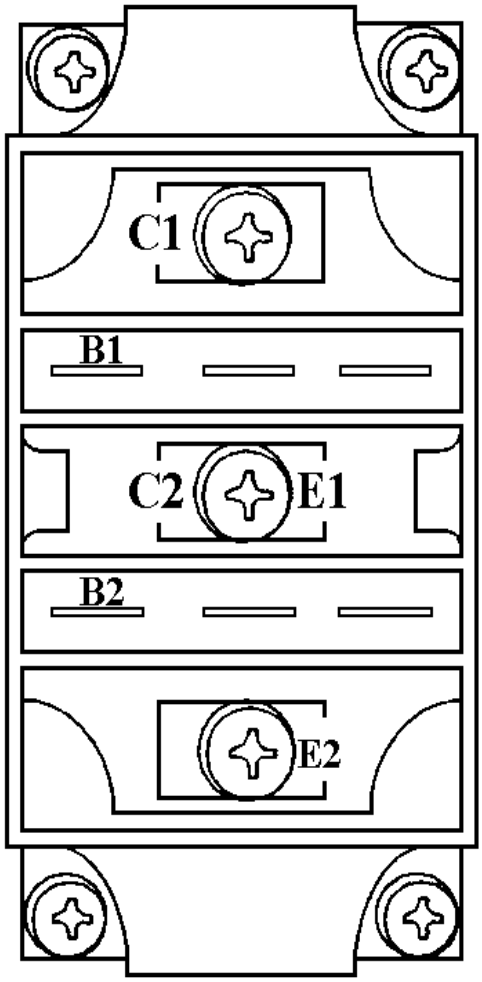


Power Switching Module Arrangement - P/N 201411



Power Switching Module Arrangement - P/N 120784

For 30 HP Drives, check both upper and lower transistors**.**



With an ohmmeter set on the x1 scale, measure the resistance between the collector and emitter of each module as follows**.**

OHMMETER		READING
+ LEAD	- LEAD	
C1	E1	INFINITE
C2	E2	INFINITE

With an ohmmeter set on the x1 scale, measure the resistance between the collector and base of each module as follows**.**

OHMMETER		READING
+ LEAD	- LEAD	
C1	B1	INFINITE
C2	B2	INFINITE

If a short is found, replace the module and check the following**.**

IMPORTANT: When replacing power switching modules clean all surfaces**.** Apply a thin layer of thermal grease (Dow Corning 340) to the back of each module**.** Torque mounting screws to 17-26 in-lbs max**.**

- DC Bus Fuse 8FU for an open condition.
- Fuse Fl on Driver Power Supply Board A10. If fuse F1 is open, replace the board.
- Fuses F1 & F2 on the Driver Board for the indicated phase. If either fuse is open or it was noted that with input power applied either LED on the Driver Board was illuminated, replace the Driver Board. An illuminated LED indicates an open fuse which usually indicates failed components on the Driver Board.

STEP 3 - Before reconnecting the motor, reapply input power to the Drive and ensure that the Drive operates properly in the manual operating mode. Depending upon the options installed, switch to MANUAL control if required. No diagnostic LEDs should be illuminated. If satisfactory operation is achieved, reconnect the motor and check operation again. If satisfactory operation is not achieved, perform STEP 5 below.

STEP 4 - Once proper operation is achieved in the manual mode, depending on the options installed, check operation in the auto or normal operating mode. If Drive is not functioning properly in the normal mode, check all Modulator Board jumper settings and input signals to the option cards. If satisfactory operation is not achieved, perform STEP 5 below.

(REFER TO THE OPTION KIT INSTRUCTIONS FOR CORRECT SETUP PROCEDURES)

STEP 5 - Check for proper operation of the current sensing circuits on the Modulator Logic Board and the Driver Board for the indicated phase. With the motor rotor locked and boost set to zero, adjust the ACCEL RATE setting, switch S1 on Modulator Logic Board A1, to 1.2 Hz/Sec Set the operator speed pot or speed reference to zero. After completing the above, start the Drive and slowly increase the speed while monitoring the output motor current on any phase using a true RMS reading clamp on ammeter. The M.O.P.C. LED on the Modulator Logic Board should light when the current reaches a nominal value of 110%. If the M.O.P.C. LED does not light, use an oscilloscope to check for a pulsed waveform at the following pins on connector J113 of the Modulator Logic Board with respect to Drive common.

Pin 5 - ϕA Driver Signal
Pin 16 - ϕB Driver Signal
Pin 27 - ϕC Driver Signal

If pulse signals that go to a TTL level “0” are not present, replace Driver Board A3.

If pulse signals are present on all (3) sections of the Driver Board, replace Modulator Logic Board A1. Return the boost and accel rate adjustments to their normal settings.

Symptom 12 - Drive starts momentarily then trips off or Drive trips off during normal operation. Red BRAKE OVER TEMP. fault LED is illuminated. (Used only when equipped with the Dynamic Brake Option).

DIAGNOSTIC PROCEDURE

IMPORTANT: If Drive will not restart or reset after a fault trip, always check fuse 5FU for an open condition. Replace if necessary.

An illuminated BRAKE OVER TEMPERATURE LED indicates an excessive brake resistor assembly temperature. This condition is normally caused by either excessive braking or a deceleration rate too high for the motor/load inertia. When the Dynamic Brake Option is used, it is recommended that the NORM/DEC HOLD jumper be set to the DEC HOLD position. If neither of the above is true, check for:

- Open Precharge Fuse 5FU and/or Shorted Brake Transistor 4Q
- Malfunctioning Brake Resistor Thermal O.L. (2TAS on Brake Resistor Assembly)
- Poorly Ventilated Resistor Enclosure

Check and repair as required.

IMPORTANT: To reset a Brake Over Temperature Trip:

1. Remove input power to the Drive at the disconnect device.
2. Wait a few minutes to allow the O L heater and brake resistor to cool down.
3. Open the conduit box on the resistor cage assembly. Manually reset Thermal O.L. Relay 2TAS by depressing the plunger until a reset "click" is either heard or felt.
4. Reapply power to the Drive at the disconnect device.
5. Reset the Drive by giving it a STOP command followed by a START command.

Symptom 13 - Drive starts momentarily then trips off or Drive trips off during normal operation. Red DRIVE OVER TEMP. fault LED is illuminated.

DIAGNOSTIC PROCEDURE

IMPORTANT: If the Drive will not restart or reset after a fault trip, always check fuse 5FU for an open condition. Replace if necessary.

An illuminated DRIVE OVER TEMPERATURE LED indicates that the Drive has tripped off due to an over temperature condition. Allow the Drive to cool down for approximately (15) minutes before restarting. After restarting, if an over temperature condition occurs again, check for the following conditions.

- Ambient Temperature that Exceeds the Drive Rating. Measure the ambient temperature surrounding the Drive per the Specification Table, Chapter 3 of the 1334 instruction manual, publication # 1334.5.8.
- Heat Flow Obstruction within the Heat Sink Assembly. Visually inspect for unobstructed spacing between fins. Clean if necessary.
- Drive Fan Obstruction, Open Fan Fuse 7FU or Malfunctioning Fan. Check and replace as required.
- Open Winding or Connection to Transformer 3T. Check for 115V AC between terminals 5 & 6 on transformer 3T. Replace if required
- Thermal Overloading Caused by Duty Cycle Demands Exceeding 100% of Current Over an Extended Period of Time. Using an AC clampon ammeter, measure the motor current over an extended period of time.

IMPORTANT: Clamp on type amp probes and current transformers are frequency sensitive. Inaccurate current readings at frequencies other than 60 Hz may be observed. It is recommended that a true RMS reading clamp on ammeter be used.

- Malfunctioning Temperature Sensor 1TAS. If all of the above conditions have been checked and the problem still remains, replace Temperature Sensor 1TAS.

IMPORTANT: When replacing Temperature Sensor ITAS clean all surfaces. Apply a thin layer of thermal grease (Dow Corning 340) to the back of the sensor. Torque mounting screws to 2.6-3.0 in lbs max.

Symptom 14 - Drive starts momentarily then trips off or Drive trips off during normal operation. Red OUTPUT GND fault LED is illuminated.

DIAGNOSTIC PROCEDURE

IMPORTANT: If the Drive will not restart or reset after a fault trip, always check fuse 5FU for an open condition. Replace if necessary.

An illuminated OUTPUT GROUND LED indicates that the Drive circuitry has shorted to ground or there is a malfunctioning Output Ground Sensor Board A8**.** Remove input power to the Drive and disconnect the motor from the Drive**.** Reapply input power and start the Drive**.** If the Drive does not trip, check the motor for a grounded phase condition**.** Replace or repair the motor if required**.** If the Drive trips with the motor disconnected, check wire insulation and terminal connections on the Drive Chassis for shorts to ground**.** If the problem still cannot be located, replace Output Ground Sensor Board A8**.**

Symptom 15 - Bus voltage does not discharge within (5) seconds when input power is removed**.** Neon light DS1 on Bus Discharge Board A5 (or Brake Board if installed) is illuminated**.**

DIAGNOSTIC PROCEDURE

After input power is removed the bus voltage should discharge to 42V DC in approximately (5) seconds if the discharge cycle is taking place If the discharge cycle is not taking place, check to see if fuse F1 or resistor R13 on Bus Discharge Board A5 has opened**.**

STEP 1 **-** If neither the fuse nor the resistor is open, measure the AC voltage at Bus Discharge Board A5, connector J502, between pins 1 & 4**.** The voltage should be approximately 12V AC**.** If voltage is present, replace Bus Discharge Board A5

STEP 2 **-** If resistor R13 is open replace Bus Discharge Board A5 and reapply input power**.** If fuse F1 is open, replace and reapply input power**.** Check for proper bus discharge cycle by measuring the DC Bus voltage at Bus Discharge Board A5, connector J503, between pins 1 (+ BUS) and 11 or 12 (- BUS)**.** After approximately (5) seconds the voltage should be below 42V DC**.** If discharge cycle is still not taking place and/or either the fuse or resistor opens again, replace Bus Discharge Board A5**.**