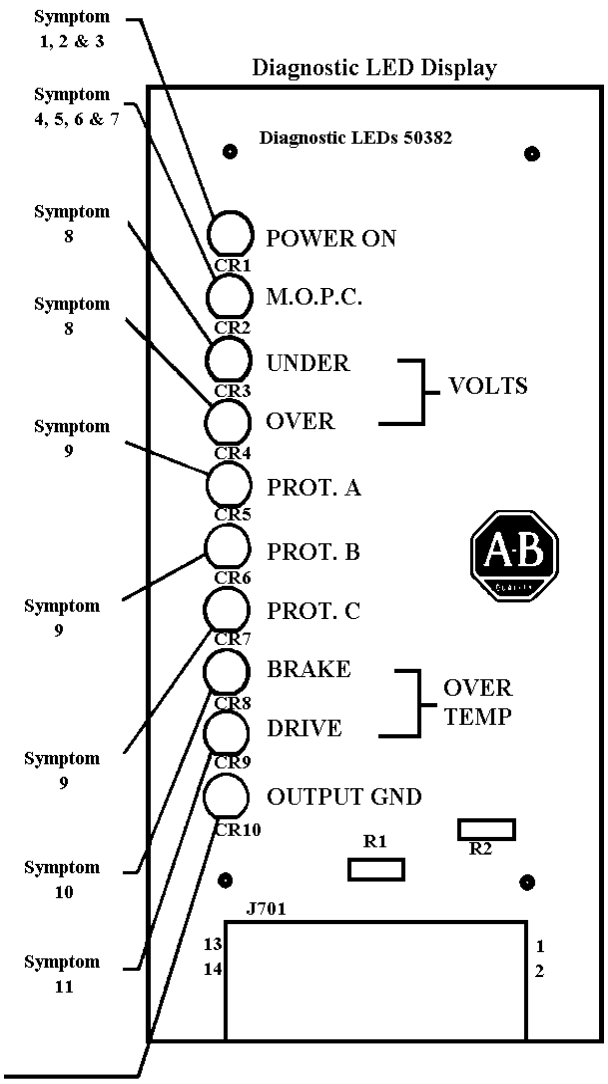
Rockwell Automation
Allen-Bradley

Bulletin 1334 Series A 5-10 HP
Troubleshooting Guide



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 400 volts for a 460V Drive, or 330 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
- A Malfunctioning "A" Phase Driver Board

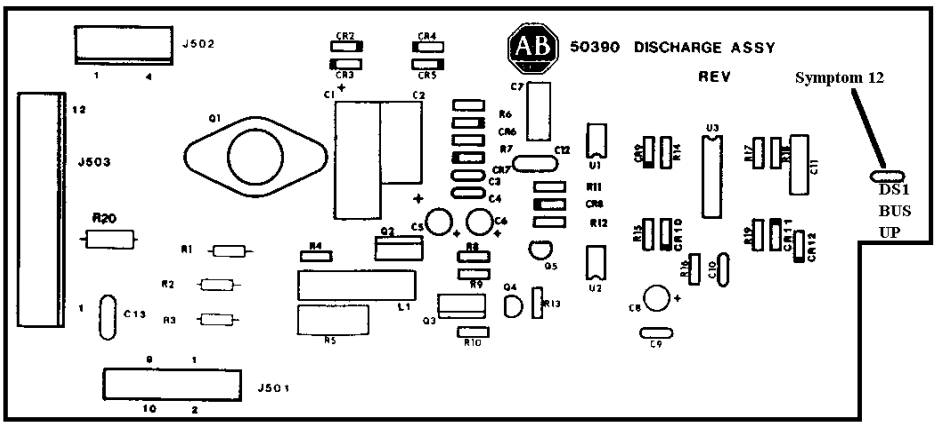
"B" Phase Protection Trip **-** When illuminated, indicates either:
- An Overload Condition Greater Than 200%
- A Shorted "B" Phase Output Transistor
- A Malfunctioning "B" Phase Driver Board

"C" Phase Protection Trip**-**When illuminated, indicates either
- An Overload Condition Greater Than 200%
- A Shorted "C" Phase Output Transistor
- A Malfunctioning "C" Phase Driver Board

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

Output Ground Fault Protection Trip Indication **-** NOT Utilized ON 5-10 HP DRIVES

Drive Over Temperature Protection Trip **-** When illuminated, indicates that the heatsink temperature of the Drive is approaching the maximum guideline temperature of the components**.**



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

Troubleshooting Procedures

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 the BUS UP neon light on Bus Discharge Board A5 (or the Brake Board) is lit, hazardous voltages are present in the Drive cabinet. To guard against personal injury, always remove power to the Drive at the disconnect device when boards or wires are being disconnected or reconnected, or fuses are being replaced.

CAUTION: To Guard Against Equipment Damage When Troubleshooting the Drive, Before Pressing the START Push-button Always Ensure: that the Speed Pot is set to MINIMUM (fully CCW), that the FWD/REV Switch (if present), is in the proper position, that the motor is uncoupled from its mechanical load.

Drive Fault Trips

IMPORTANT: Before resetting any fault trip, refer to the following troubleshooting procedures to isolate and correct the fault. With the exception of a ground fault, fault trips are reset by first pressing the STOP push-button, then the START. To reset a ground fault trip, input line power must be removed from the Drive and reapplied before pressing the START push-button.

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 L1, L2 and L3. If voltage is present, measure voltage across Input Line Fuses 1FU, 2FU, and 3FU. Measure voltage across Input Primary Fuse 4FU. 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, use a DC voltmeter to verify that the DC bus is fully discharged. Start with the voltmeter on its highest scale (x 1000) and range downward to the lowest voltmeter scale.

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

OHMMETER		READING
+ LEAD	- LEAD	
1 REC (+)	1 REC phase A	Infinite
1 REC (+)	1 REC phase B	Infinite
1 REC (+)	1 REC phase C	Infinite
1 REC phase A	1 REC (-)	Infinite
1 REC phase B	1 REC (-)	Infinite
1 REC phase C	1 REC (-)	Infinite

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

STEP 3 - With the ohmmeter set on the x100 scale, check Bus Capacitors 2C & 3C for a shorted condition as follows. Connect the (+) POSITIVE lead of the ohmmeter to the (+) POSITIVE terminal of the capacitor. Connect the (-) NEGATIVE lead of the ohmmeter to the (-) NEGATIVE terminal of the capacitor. 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 and 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 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 seven steps.

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

STEP 2 - With input power removed, check for an improperly connected or missing VCO/EXT-C jumper on Modulator Board A1.

STEP 3 - Check for 90V AC at Terminal Block 1TB between terminals 9 & 11. If voltage is absent, check START/STOP circuit and all connections to 1TB.

STEP 4 - Check for an open speed pot at Terminal Block 1TB. There should be 3.2V DC between terminals 14 & 16. 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 if required.

STEP 5 - Measure the output voltages in the secondary circuits of Transformer 1T. If any one voltage is absent, remove input power and check all connections to 1T. If all connections are correct, replace Transformer 1T.

STEP 6 - Go to Power Supply Board A6 and measure all output voltages. The following voltages should be present with respect to Drive common, J601 Pin 1. If any one voltage is absent, replace Power Supply Board-A6.

J601 Pin 2..... 14V AC
J601 Pin 3..... + 17V DC
J601 Pin 5..... + 9 to + 15V DC
J601 Pin 6..... + 9 to + 15V DC
J601 Pin 9..... -17V DC

STEP 7 - Measure the output voltage between pins 5 & 12 at J114 on the Modulator Logic Board. If 11V DC is measured, Precharge Relay 1CR may be inoperative. Replace if required.

If the problem cannot be found after completing STEPS 1-7, replace Modulator Logic Board A1.

Symptom 3: Precharge cycle excessively long or not completed. 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. First check Precharge Circuit Fuse 5FU for an open condition. If 5FU checks out, Precharge Relay 1CR may be inoperative. Measure the output voltage between pins 5 & 12 at J114 on the Modulator Logic Board. If 11V DC is measured, 1CR may be inoperative. Replace if required. If the problem cannot be found after completing the above, replace Modulator Logic Board A1.

Symptom 4: Drive trips on momentary overloads causing phase protection indication. M.O.P.C. circuit not functioning properly. Red M.O.P.C. LED is not illuminated.

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.

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/second. Set the operator speed pot to zero. After completing the above, start the Drive and slowly increase the frequency by turning the operator speed pot 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 approximately 150%. If the M.O.P.C. LED does not light, check for low pulsating volts 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 logic "0" level are not present, replace the Driver Board. 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 5: 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 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 an overload condition of 150% exceeding the (60) second time rating.

IMPORTANT: During acceleration or start-up (breakaway), it is normal for this 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 of AC line power is first applied.

If the Drive trips off during DECELERATION with the M.O.P.C. LED illuminated, the motor regenerative current is greater than 150%. A slower DECEL rate must be used. 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.

Symptom 6: Drive does not return to full speed after stalling. Red M.O.P.C. fault LED is illuminated.

DIAGNOSTIC PROCEDURE:

Increase the boost voltage setting to provide higher torque capability at the stall condition.

IMPORTANT: If a 150% continuous 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 7: Red M.O.P.C. fault LED is illuminated during DECEL or at (0) Hz.

DIAGNOSTIC PROCEDURE:

Boost voltage set to high. Decrease the boost voltage by setting the DC boost switch lower and/or set the Decel switch to provide a slower ramp.

Symptom 8: Drive starts momentarily then trips off or Drive trips off during normal operation. Red UNDER or OVER VOLTS fault LED is illuminated

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 UNDER VOLTS LED indicates that Drive has tripped off due to an input line voltage that is less than:

400V AC at the 460V AC tap on Transformer 1T.
361V AC at the 415V AC tap on Transformer 1T (50 Hz input power)
330V AC at the 380V AC tap on Transformer 1T (50 Hz input power).

Measure input voltage at Transformer 1T. If proper voltage is present, replace Modulator Logic Board A1. An illuminated OVER VOLTS LED indicates that the Drive has tripped off due to a bus over voltage condition. (3) conditions can cause an over voltage trip.

1. Excessively high input voltage.
2. Deceleration rate too high for the motor/load inertia.
3. DC boost set to high.

First, check the input line voltage across each phase at L1, L2, and L3. The voltage should not be greater than 506V AC for a 460V AC input line. If trip occurred during deceleration or a rated stop condition, decrease the DECEL RATE, the DC BOOST or both. If the Drive trips out on over voltage during deceleration and a slower decel ramp is not acceptable, then the Dynamic Brake Option should be installed. Consult your nearest Allen-Bradley Distributor or Sales Office.

Symptom 9: 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 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 either:

- An output overcurrent condition greater than 200% due to a phase-to-phase short, phase-to-ground short, or high motor current.

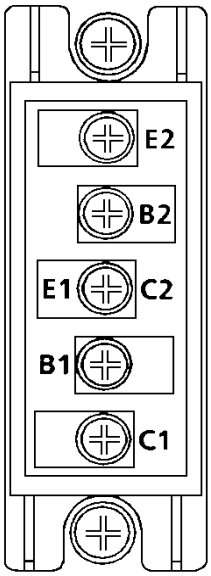
- A shorted output transistor in one of the Power Switching Modules.
  Phase "A" 1Q
  Phase "B" 2Q
  Phase "C" 3Q

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

- Excessive braking, causing the motor load to momentarily appear as a short circuit to the Drive.
- Excessive DC boost causing the motor to saturate.

Reset by pressing the STOP push-button, then the START push-button. If trip occurs again, proceed as follows.

STEP 1 - Remove input power to the Drive. Disconnect motor from the Drive. Apply input power and verify if a protective trip occurs when the Drive is started. If trip does not occur, test for a possible malfunctioning motor. If trip does occur and motor is not malfunctioning, remove input power to the Drive and proceed to STEP 2.



STEP 2 - Before proceeding, use a DC voltmeter to verify that the DC bus is fully discharged. Start with the voltmeter on its highest scale (x 1000) and range downward to the lowest voltmeter scale. Check if an output transistor module has shorted. With an ohmmeter set on the x1 scale, measure the resistance between the collector and emitter of both upper and lower power switching transistors.

IMPORTANT: Resistance measurement taken with (-) NEGATIVE lead of ohmmeter to the emitter.

If a shorted condition is found in either power switching transistor, replace the module.

STEP 3 - Before reconnecting the motor, reapply input power to the Drive and ensure that the Drive operates properly. No diagnostic LEDs should be illuminated. If satisfactory operation is achieved, reconnect the motor and check operation again.

IMPORTANT: When replacing power switching modules clean all surfaces and 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.

Symptom 10: 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. If neither of the above is true, check for:

- Open Precharge fuse 5FU and/or Shorted Brake Transistor 4Q
- Malfunctioning Temperature Sensor (lTAS on brake resistor assembly)
- Poorly ventilated resistor enclosure

Check and replace as required.

Symptom 11: 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 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 Drive to cool down for approximately (15) minutes before restarting. After restarting, if over temperature condition occurs again, check for the following conditions.

- Ambient temperature that exceeds the Drive rating.
- Heat flow obstruction within the heat sink assembly. Visually inspect for unobstructed spacing between fins. Clean if necessary.
- Thermal overloading caused by duty cycle demands exceeding 100% of current over an extended period of time. Using an AC clamp on 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 1TAS, clean all surfaces and apply a thin layer of thermal grease (Dow Corning 340) to the back of the sensor. Torque mounting screws to 17-26 in-lbs Max.

Symptom 12: Bus voltage does not discharge when input power is removed. BUS DISCHARGE BOARD neon light is illuminated.

DIAGNOSTIC PROCEDURE:

After input power is removed, the bus voltage should discharge to 42 volts in approximately (5) seconds. If the discharge cycle is not taking place, first check to see if either Fuse 6FU or Resistor 4R has opened. If neither the fuse nor the resistor is open, reapply power and measure the voltage between pins 1 and 2 at J501 on Bus Discharge Board A5. The voltage should be approximately + 12V DC If voltage is present, replace Bus Discharge Board A5. If voltage is not present, replace Control Transformer 1T. If either the fuse or resistor is open, replace and reapply input power. Check for proper bus discharge cycle. Measure the voltage between pins 2 and 1 at J501 on Bus Discharge Board A5 After a 50mS delay, the voltage should be approximately (0) volts. If discharge cycle is still not taking place and/or Fuse 6FU opens again, replace Discharge Board A5.

Symptom 13: Drive starts but the motor will not turn. No fault LEDs are illuminated.

DIAGNOSTIC PROCEDURE:

Remove input power to the Drive and disconnect the motor from the Drive. Reapply input power. Start the Drive and measure the output voltage at Terminal Block 2TB across each phase. The output voltage should be approximately equal to the input voltage with the speed pot turned fully CW. If the output voltage is zero check:

- That all jumpers on Modulator Logic Board A1 are in the proper position, particularly the VCO/EXT-C jumper.
- For 90V AC between terminals 9 & 11 at terminal block 1TB. If not present, the START/STOP circuit is open (standard START/STOP configuration).
- Installed options, particularly those with AUTO/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.
- For continuity across the Motor Overload Relay contact circuit, terminals 10 & 11 at Terminal Block 1TB
- For continuity across the Brake Over Temperature circuit, terminals 17 & 18 at Terminal Block 1TB.
- For an open speed pot or an open 1KΩ resistance between terminals 14 s 16, Terminal Block 1TB.

If the Drive output voltage is still zero after checking the preceding, replace Modulator Logic Board A1. If Drive output voltage is present, check for open motor windings, a malfunctioning motor overload relay, or a malfunctioning motor.