

C H A P T E R 7

Troubleshooting

When a problem occurs in your system, use the following strategy to isolate and identify the problem:

- Check Light Emitting Diodes (LEDs) and the Fault Output for an indication of the cause of the problem.
- Check other possible causes.

When we refer to LEDs,

- **ON** means *illuminated*.
- **OFF** means *not illuminated*.

When we refer to the Fault Output,

- **HIGH** means +5VDC to +24VDC (depending upon what DC voltage you use for the pullup resistor, when you connect the fault output to your controller).
- **LOW** means ground, or 0VDC to 0.8VDC.

The next table summarizes LED & Fault Output information. The table after that summarizes other possible sources of problems. Detailed troubleshooting procedures follow the tables.

CHECK LEDES FIRST!

If you encounter problems, you may be able to quickly identify the problem by looking at the LEDs and the fault output. The next table summarizes possible LED and fault output states.

| LEDs and FAULT OUTPUT | | | |
|-----------------------|---------|--------------------|--|
| GREEN LED | RED LED | FAULT OUT | CONDITION |
| OFF | OFF | HI | No Power |
| ON | OFF | LO | Normal operating condition |
| ON | INT | LO | Foldback |
| ON | ON | LO | (OEM770T only: Red LED turns off within 10 seconds if command input is reduced to 0V) |
| ON | INT | INT | Normal condition while drive is powering up, or turning off; or, Weak power supply, VDC is too low for operation |
| ON | ON | HI | OEM770T only: Power supply undervoltage; or, OEM770T only: No enable |
| | ↑ | NOT LATCHED | Can recover from above conditions without cycling power. |
| | ↓ | LATCHED | Cycle power to reset drive, and recover from conditions below. |
| ON | ON | HI | Overvoltage from regeneration; or overtemperature; OEM770SD only: no enable, or power supply undervoltage |
| OFF | ON | HI | Short circuit in load or cables; or bad Hall state (all high or low); or, Power supply fault (typically, a transient undervoltage) |
| Legend | | | |
| | | | ON = LED is ON (Illuminated); or, |
| | | | HI = Fault Output is HIGH (+5VDC to +24VDC) |
| | | | OFF = LED is OFF (Not Illuminated); or, |
| | | | LO = Fault Output is LOW (0VDC, or Ground) |
| | | | INT = LED turns ON, then turns OFF; or, |
| | | | INT = Fault Output goes LOW, then goes HIGH |

For a detailed description of the various fault conditions, see the basic troubleshooting procedure below.

OTHER POSSIBLE PROBLEMS

If the drive is powered up, enabled, and operating properly:

- The green LED is ON
- The red LED is OFF
- The fault output is LOW

These conditions indicate that the OEM770 is probably not the source of the problem. The next table summarizes other possible sources of problems.

| TROUBLESHOOTING TABLE | |
|-----------------------------------|---|
| <i>Possible Source of Problem</i> | <i>SOLUTION</i> |
| CONTROLLER (INDEXER) | Verify that controller delivers proper command input voltage. (OEM770SD: cycle power to clear fault latch. Verify step pulses at 25 pin D-connector.) |
| MOTOR | Check for motor problems. Check motor coils for continuity, shorts, proper resistance. Check Hall and Phase wiring. |
| MECHANICAL SYS. | Check for jams, binds, increased friction, etc. |
| WIRING | Check motor wiring: Phases, Hall Effects. Check power supply wiring. Check controller wiring. (OEM770SD: check indexer wiring, enable input.) |
| OVERHEATING | Verify that drive's heatplate has good thermal contact with heatsink. Check mounting screws. Provide sufficient ventilation. |
| POWER SUPPLY | Verify power supply delivers enough power during entire move, without undervoltage, or overvoltage caused by regeneration. |
| MOVE PROBLEMS | Check speed/torque limitations. Check for excessive friction, regeneration, problems with gravity, transient undervoltage, etc. |
| ELECTRICAL NOISE | Check for problems caused by electrical noise. Consult Compumotor's <i>EMC Installation Guide</i> for possible solutions. |

Details on these problems are discussed after the next section.

BASIC TROUBLESHOOTING METHOD

To identify the cause of a problem, find the condition below that matches your situation. Then follow the detailed procedure listed under that condition.

ARE BOTH LEDs OFF?

Possible Problem:

- No power from power supply

Procedure

1. Remove power. Disconnect all wiring except VDC+ and VDC-. Reapply power. Verify that power supply voltage is in the 24VDC – 75VDC range. Is the green LED now on?
2. If the green LED is still off, return the drive to Compu-motor.

IS THE GREEN LED OFF, AND RED LED ON?

Possible problem:

- Short circuit in motor or cabling

Procedure

1. Remove power.
2. Disconnect all wiring except VDC+ and VDC-.
3. Reapply power.
4. Green LED should now be on, and red LED should be off. This indicates the problem is a short circuit in the cabling or motor.
5. Fix the short, and cycle power.

Possible problem:

- Bad Hall state (all three HIGH or all three LOW)

Procedure

1. Remove power.
2. Disconnect all wiring except VDC+ and VDC-.
3. Connect a jumper wire from any Hall input to HALL GND.
4. Apply power. The green LED should now be on.
5. Next, remove power again. Connect Hall wires to motor (Hall 1, Hall 2, Hall 3, Hall GND, Hall +5). *Do not connect motor phase wires.*
6. Apply power.
7. If green LED is off, and red LED is ON, then problem is a bad Hall state (all three HIGH or all three LOW). Possible causes are Hall miswiring, a damaged motor, or a short in Hall or encoder power wiring. Check Hall wiring, and voltage levels at Hall terminals. Check motor for faulty Hall sensors.
8. Measure HALL +5V with respect to HALL GND. If there is no HALL +5V, disconnect Encoder +5V and cycle power. If HALL +5V returns after you cycle power, then the encoder power wiring is bad (possibly a short on Encoder +5V wiring).

Possible problem:

- Power supply undervoltage during move

Procedure

1. Cycle power. Green LED should now be on, red LED off.
2. Make the move.
3. If the move causes a fault, the problem is probably a power supply undervoltage during the move. Try a larger power supply.

IS GREEN LED ON, RED LED OFF—BUT NO MOTION?

These conditions indicate that the OEM770 is powered up, enabled, and operating properly. It is probably not the source of the problem. Look for the cause of the problem elsewhere in your system.

Possible problems:

- No command voltage from controller to OEM770T (controller problem)
- Indexer issued shutdown to OEM770SD
- Wrong motor phase wiring
- Wrong motor Hall effect wiring
- Mechanical jam

Procedure

1. OEM770T: Measure the command input voltage. If it is near 0VDC, then the controller is not commanding a move, or has very low gains. Adjust your controller. Check for possible RS-232 problems (consult your controller manual).

OEM770SD: Measure the step input. If there are no step pulses, then the indexer is not commanding a move. Adjust your indexer. Check for possible RS-232 problems (consult your indexer manual).

2. With a proper command input signal (a nonzero voltage for the OEM770T; step pulses for the OEM770SD), try to rotate the shaft manually. If you can, then the motor phases are probably miswired. Or, the motor may be damaged—check its phases for proper resistance, continuity, shorts, shorts to the case, etc.
3. If you cannot rotate the shaft, disable the drive. Try to rotate the shaft manually.
4. If you can rotate the shaft, then Hall wires are probably miswired. Check them, and check the motor temperature. (Without proper Hall inputs, the drive may command maximum current and overheat the motor—but no motion will result.)
5. If you cannot rotate the shaft, the machine is mechanically jammed.

ARE GREEN AND RED LEDs BOTH ON?

Possible problems:

- Not Enabled
- Foldback
- Power Supply problem
- Overvoltage
- Overtemperature

Procedure

1. Check the enable input to see if it is low (grounded). If not, then the drive is not enabled.
2. With the drive enabled, reduce command input to \emptyset VDC (OEM770SD: stop sending step pulses from your indexer). If the red LED goes out within 10 seconds, then foldback was the problem. Check motor temperature. Check for a mechanical jam in your system.

(NOTE: The fault output stays LOW during foldback. Foldback is the only condition that turns the red LED ON, but keeps the fault output LOW)

3. If red LED is still on (with a \emptyset VDC command input; or no step pulses), measure power supply voltage at the drive terminals, VDC+ and VDC-. It should be in the 24VDC – 75VDC range. If not, there is a power supply or power cabling problem.
4. With proper power supply voltage at the drive, measure the temperature of the drive's heatplate. Is it hot? If so, the problem could be an overtemperature shutdown. Wait 30 minutes for the drive to cool. Check for proper drive mounting and heatsinking. Check for a mechanical jam. When the drive has cooled, cycle power to resume operations. If overheating persistently causes shutdowns, you can try several remedies: change move profile or duty cycle; improve drive mounting or heatsinking; reduce drive ambient temperature; add forced air cooling.
5. With proper power supply voltage at the drive, and if the drive is not hot, the problem could be an overvoltage

fault. Regeneration during deceleration could have caused the overvoltage fault. Cycle power to resume operations. If regeneration repeatedly causes overvoltage faults, you can try several remedies to solve the problem: reduce deceleration rate; reduce bus voltage; add bus capacitance; add power dump circuitry.

NOTE: Overvoltage and overtemperature faults both have identical indicators: red and green LEDs both ON; fault output HIGH; fault condition is *latched*. To distinguish between the two faults, monitor conditions while the drive runs. Monitor heatplate temperature to see if it gets too high, which could cause an overtemperature fault. Monitor power bus voltage, to see if it gets too high, particularly during deceleration. This could cause an overvoltage fault.

MISCELLANEOUS PROBLEMS

The basic troubleshooting procedure, presented above, will identify most problems, particularly those that affect the LEDs or the fault output. Some problems, however, occur transiently during a move, or do not affect the LEDs. Others may be due to wiring mistakes, or failure of other components in the system (controller, encoder, motor, etc.). The sections below will help you identify such problems.

PROBLEMS DURING MOVE

Speed/Torque Limitations

Make sure that you are not commanding a move that requires the motor to go faster than it can, or use more torque than it can produce. Check the motor's speed/torque curve for your operating voltage.

Weak Power Supply

A weak power supply may not produce sufficient power during all parts of the move. It can cause an undervoltage problem. Undervoltage can affect the drive in two ways:

- Temporary Fault – for the OEM770T, the red LED will turn ON and the fault output will go HIGH during the undervoltage condition. The fault is *not latched*, and will

disappear when the voltage goes above approximately 24VDC.

For the OEM770SD, any undervoltage fault is latched by the controller.

- **Latched Fault**—The undervoltage trips the short circuit protection. The green LED is turned off, the Red LED is turned ON, and the fault output goes HIGH. This is a *latched* condition.

For a full description of faults caused by a weak power supply, see the section on *Undervoltage*, and the section on *Short Circuit Protection*, in *Chapter 4 Special Internal Circuits*.

Excessive Friction

Too much friction in your system might cause move problems. Excessive friction can cause trouble when mechanical components in a system age. As friction increases, problems may occur in a system that had previously been working well.

MECHANICAL PROBLEMS

Check for binds, jams, increased friction, or other problems in the mechanical system. If a system was working properly, but then suddenly develops new problems, check for changes in the mechanical system that could be causing the problems.

ENCODER PROBLEMS

Encoders that are miswired or malfunctioning can cause problems during a move. Check wiring from the encoder to the controller (or to the OEM770SD). To isolate a malfunctioning encoder, rotate the motor shaft a known distance, and check the encoder readout.

ELECTRICAL NOISE PROBLEMS

Electrical noise can cause problems, depending on the application and the sensitivity of equipment in the system. For more information on identifying problems caused by electrical noise, and solutions to those problems, consult the technical section in Compumotor's *EMC Installation Guide*.

PRODUCT RETURN PROCEDURE

If you must return the OEM770 for repairs, use the following steps:

1. Get the serial number and the model number of the defective unit, and a purchase order number to cover repair costs in the event the unit is determined to be out of warranty.
2. In the USA, call your Automation Technology Center (ATC) for a Return Material Authorization (RMA) number. Returned products cannot be accepted without an RMA number. If you cannot obtain an RMA number from your ATC, call Parker Compumotor's Customer Service Department at (800) 722-2282.

Ship the unit to:

Parker Hannifin Corporation
Compumotor Division
5500 Business Park Drive, Suite D
Rohnert Park, CA 94928
Attn: RMA # xxxxxxxxxx

3. In the UK, call Parker Digiplan for a GRA (Goods Returned Authorization) number. Returned products cannot be accepted without a GRA number. The phone number for Parker Digiplan Repair Department is 0202-690911. The phone number for Parker Digiplan Service/Applications Department is 0202-699000.

Ship the unit to:

Parker Digiplan Ltd.
21, Balena Close,
Poole, Dorset,
England. BH17 7DX

4. Elsewhere: Contact the distributor who supplied the equipment.