



TROUBLESHOOTING GUIDE

All of the products manufactured by Power Electronics have similar programming and similar diagnosing of problems so the fault codes are very similar across the Micro-Speed[®] Product Line.

The first thing to do is check the fuses for and open and fault codes on your unit! If the fuses are blown **do not just replace** them with new fuses. Just replacing them, may further a problem or damage the drive. Check for wiring or other shorts first.

If the fuses are okay and the drive can power up (display is on), check for a fault code to be displayed on the screen and check below for the description. If you do not have a fault code displayed check the "E" parameters for fault codes, which may have recently been displayed. To do this press and hold the "SCROLL" button *until* "E" is displayed, *then let go* of the "SCROLL" button. The "E1" will be displayed then replaced by the most recent fault code recorded. To get to previous fault codes (in order of occurrence), tap the scroll button to read the next three recorded fault codes. To get out of the "E" parameters press and hold the scroll button again until "cOFF" or "rOFF" is displayed then let go.

There are four "E" parameters, E1, E2, E3 and E4, on the older units and Micro-Speed[®] Smart-Move[™] units just one fault can be stored in each parameter, on the newer Version 2.1 units a number will proceed the fault, this number is the amount of occurrences of this fault codes occurrence (396 trips). **Fault codes do not necessarily mean that the unit has been damaged.**

When a problem arises, such as excessive current draw, the Micro-Speed[®] CX[™] or Micro-Speed[®] Smart-Move[™] will protect itself by shutting down, display and record a fault code. The fault code reveals information about the last condition or fault that occurred (see below).

■ How the Micro-Speed[®] CX[™] or Micro-Speed[®] Smart-Move[™] responds to a fault:

When a fault occurs, five events will happen:

1. The **Micro-Speed[®] CX[™] & Smart-Move[®] CX[™]** will shut down.
2. The brake outputs, B1 and B2, will open.
3. The fault error code will be displayed.
4. The fault error code will be stored at E1--if there was a previous fault it will be pushed to E2 and so on. If a fault was in E4 it will then be pushed out of memory.

■ Resetting after a fault

The method by which the Micro-Speed[®] CX[™] or Micro-Speed[®] Smart-Move[™] may be reset is determined by programming parameter L27 (on the CX units) or A27 (on the Smart-Move

units). Usually, the Micro-Speed® CX™ or Micro-Speed® Smart-Move™ is programmed to reset when the directional button on the pendant station is toggled (press-release). No matter what resetting of the Micro-Speed® CX™ or Micro-Speed® Smart-Move™ can always be accomplished by removing power from the drive and then wait for the charge light to go off, then turning on the line power feeding the drive.

■ Remembering faults

The Micro-Speed® CX™ or Micro-Speed® Smart-Move™ will remember the last four different faults. They are stored in the Diagnostics memory locations E1, E2, E3, E4. Memory location E1 contains the most recent fault code. These locations could help diagnosis a problem - including motor and other mechanical conditions.

■ Interpreting Fault Codes

When a fault occurs one of the following codes will be displayed, action should be taken to correct the cause. The following fault codes will explain each fault and give some possible causes. If the appropriate changes do not relieve the problem then please contact the factory for further assistance. 800-362-7959 . If calling have a complete list of the recorded fault codes available along with the model and serial number of the drive in question.

FAULT CODES

■ F0 -- NO FAULT

This value will be seen when checking the stored fault codes, if no fault was stored, or after the memory was cleared.

■ F1 -- CURRENT TRIP

Current has risen to over 300% of rated output current.

The CURRENT TRIP is the most common fault and has many causes. Observing how the Micro-Speed® CX™ or Micro-Speed® Smart-Move™ and the machine it is driving act at the moment the fault occurs will help the user in diagnosing the cause of the fault. If the drive trips out immediately when it receives a forward or reverse signal then the cause could be:

1. Cause: *Output semiconductor has been shorted out* . Disconnecting the motor leads from the drive and running the drive at some speed can test for an output semiconductor short. The drive will trip out with no motor attached if there is an output short.

Solution: Send drive back to factory for repair.

2. Cause: *Motor problems*. Specifically, a short in the motor, motor leads shorted together, motor leads shorted to ground, the motor windings are wired wrong, the motor is the wrong voltage, the motor may be single phasing, or the current rating of the motor is too large for the drive. Also, some motors have internal brakes that

receive power from the three motor leads -- this type motor should not be used with invertors unless the brake power leads can be brought out separately and powered from the line and not the drive.

Solution: Check motor and wiring, repair or replace if necessary. The drive may still be operating correctly. These motor problems may damage the drive if not repaired.

3. Cause: *Mechanical brake not operating properly.*

Solution: Make sure that any mechanical brake that is used is releasing cleanly without any dragging. Some motors have internal brakes make sure these are also operating. Sticking or dragging brakes may cause high current draws.

4. Cause: *Large current draw when accelerating.* The voltage boost setting A8 may be too high **and/or** if the ramp down option is off, then the pulse start boost setting (L31 on the CX or A31 on the Smart-Move) may be too high.

Solution: Lower these settings as needed.

5. Cause: *The motor is slipping* so excessively that enough torque is not efficiently produced when starting. If the fault occurs while the motor is accelerating, then it is suggested to increase the acceleration time. If increasing the time is unacceptable or does not work, try increasing the voltage boost (A8). Increase it gradually in steps of about .5%. If raising the voltage boost helped but didn't completely solve the problem, try gradually lowering the voltage peak function (L21 on the CX, or A21 on the Smart-Move). Do not lower the voltage peak function to less than 90% of its nominal rating. Recall that the nominal voltage peak setting is (Incoming Line Voltage) x (full Hz of motor) / (full motor voltage). See item 16.

6. If the fault occurs while the *motor is decelerating*, then it is suggested to first observe whether the trip occurs when decelerating between speed(A4), decelerating to a stop (A5), or decelerating during a reverse plug condition(A6). Increasing the appropriate parameter(s) may alleviate the problem. One could also set A5 and A6 to their maximum value and just increase A4 gradually to obtain a setting that will work. If increasing the time is unacceptable or does not work, try changing the voltage boost A8.

7. If the fault occurs while the motor is running at a constant speed then the *load on the hook may be swinging*. Increasing the acceleration and deceleration times may also help reduce the swinging which may be causing motor problems.

8. In the case where the motor does not turn but the drive ramps up in frequency (Hz) and then trips out, one should first check that any mechanical brake that is used is releasing cleanly, that there is no *mechanical binding* in the entire system, and that the motor is wired properly and not single phasing. If these check out, increasing the voltage boost A8 and the voltage peak functions may help. Try changing the voltage boost gradually by first increasing it's value and if that does not work then by decreasing. Then try lowering the voltage peak function and see how the machine works. Do not lower the voltage peak function to less than 90% of its nominal rating. Recall that the nominal voltage peak setting is (Incoming Line Voltage) x (full Hz of

motor) / (full motor voltage). Try increasing and decreasing the voltage boost again for best results. If the ramp down option is off (such as use in a hoist operation), then one may try the pulse start option to jar the mechanism loose.

On a HOIST, sometimes the *load brake will stick* and cause the motor to lockup. The drive seems to ramp up and then trip out. In this case, try the pulse start option first (L31, L32 on the CX or A31, A32 on the Smart-Move), and then try the voltage boost and voltage peak functions.

The Proper Hoist load brake functioning should always be checked prior to continued operation.

9. Cause: Some *mechanical binding* is occurring.

Solution: Investigate source of binding and fix.

10. Cause: Sometimes *electrical noise* can be induced on the motor leads from other wires that run along side them, such as brake leads. When the brake operates, the noise from the arcing in the brake contactor can trip out the drive. This failure can be ruled out if the drive does not fault out at the instant the brake contactor switches (this may be intermittent)

Solution: Run motor leads in a conduit separate from other leads or separate festooning.

11. Cause: *Starting into a moving motor*.

Solution: Don't start into a moving motor. If the motor is moving because the brake is setting slow, (such as the case in some external DC braking systems) then use the dead time parameter (L26 in the CX or A26 in the Smart-Move) to increase amount of time to a (+) the brake has to set before the drive will start again.

12. A *slow mechanical brake* on a HOIST may not be able to stop the motor before the Micro-Speed® CX™ or Micro-Speed® Smart-Move™ is signaled to begin powering the motor again. This effectively causes the Micro-Speed® CX™ or Micro-Speed® Smart-Move™ to start into a moving motor. Increase the dead time parameter to increase amount of time the rotor has to lose its magnetic field. Usually 1.5 seconds is more than sufficient.

13. Cause: *Residual magnetic field in rotor*. The drive may trip out if the drive begins to power the motor too soon after it has stopped. (this cause is rare).

Solution: Increase the dead time parameter to increase amount of time the rotor has to lose its magnetic field. Usually 1.5 seconds is more than sufficient. See item 11.

14. Cause: Some *mechanical device in the drive train is not made for use with a variable frequency drive*. For instance, some mechanical soft-starting devices or clutches will not operate when driven at less than full speed. On a hoist, sometimes the load brake may be installed incorrectly.

15. Cause: *The load is too large.*

Solution: Reduce load or increase motor and drive capacity.

16. Certain kinds of Nema type D motors produce a lot of *slip at low frequencies* and may not budge a load until it ramps up to a fairly high frequency, sometimes 30 Hz or more, at which point the drive will trip out. This slip cannot be completely eliminated but it can be reduced. First try lowering the voltage peak function (L21 on the CX or A21 on the Smart-Move) and see how the machine works. Do not lower the voltage peak function to less than 90% of its nominal rating. Recall that the nominal voltage peak setting is $(\text{Incoming Line Voltage}) \times (\text{full Hz of motor}) / (\text{full motor voltage})$. Then try changing the voltage boost gradually, first by increasing and if that does not work then by decreasing (increasing is usually the most effective method in this case).

■ F3 -- BRAKING RESISTOR IS ON TOO LONG

The braking resistor has been on too long.

1. Cause: The *resistance of the external braking resistor may be too large.*

Solution: The resistance of the braking resistor is considered too large if it more than 110% of the value listed in the BRAKING RESISTOR section of this manual. If this is the case, replace the resistor with one that agrees from Power Electronics with this specification Never use a resistor that has less ohms than the specification call factory for further information.

2. Cause: *Line voltage too high.* Make sure incoming line voltage is within specification

3. Cause: *Transistor shorted in drive.* To check this, disconnect power to the drive, after the charge light has been extinguished, detach the motor leads from the T1, T2, and T3 terminals on the drive connect power to the drive and run the drive at any speed and check the DC voltage across the open resistor (be careful here, as much as 800 volts may be present). There should be only a few volts present at most. If not, return the drive to the factory for repair. **Be very cautious, high voltage could be present.**

4. On a hoist, this fault may indicate that the load brake is slipping excessively or that it has failed completely. REPAIR THE LOAD BRAKE/HOIST.

■ F4 -- LOW BUSS VOLTAGE

The voltage across the main buss capacitors has dropped below a preset level. This event is a normal occurrence every time power is remove from the Micro-Speed® CX™ or Micro-Speed® Smart-Move™. The F4 will display during the shut down of the drive. The power shut down event is not saved in the diagnostic memory E1-E4. The F\$ fault code will be stored upon the condition existing during other times of drive usage.

1. Cause: *Line Voltage is too low.* If the Micro-Speed® CX™ or Micro-Speed® Smart-Move™ has just been installed and this fault is displayed, the unit is probably set for use with

a higher 3-phase line voltage than what it is presently wired to.

Solution: Supply the correct line voltage or replace the misapplied drive with the proper voltage Micro-Speed® CX™ or Micro-Speed® Smart-Move™.

2. Cause: *Damage* to the Micro-Speed® CX™ or Micro-Speed® Smart-Move™.

Solution: Return the drive to the factory for repair. In this event the F4 fault code will always be displayed every time the unit is powered up.

■ F5 -- OVER VOLTAGE TRIP

The voltage across the main buss capacitors has increased above a preset level.

1. Cause: If the Micro-Speed® CX™ or Micro-Speed® Smart-Move™ has just been installed and this fault is displayed, the *voltage supplied may be too high*.

Solution: Supply the correct line voltage or replace the misapplied drive with the proper voltage Micro-Speed® CX™ or Micro-Speed® Smart-Move™.

2. Cause: *Drive is decelerating too fast*.

Solution: Increase the times in decelerating between speed (A4), decelerating to a stop (A5), or decelerating during a reverse plug condition (A6) depending on when during the deceleration the fault condition occurs. You may only need to increase the shorter of these times to get drive to function properly. It is usually easier to start by increasing both A5 and A6 incrementally and then gradually increasing A4 to get proper operation.

3. Cause: *Drive has started into a moving motor*.

Solution: Make sure motor has stopped before is allowed to power motor. Such as re-starting a hoist motion in the down direction before the hoist has stopped from a previous down direction command or if the brake has not pulled in. If the motor is moving because the brake is setting slow, (such as the case in some external DC braking systems) then use the dead time parameter (L26 in the CX or A26 in the Smart-Move) to increase amount of time to a (+) the brake has to set before the drive will start again. If the problem occurs on a load brake hoist then the load brake may be bad and should be checked. Use of a regen resistor in this case may be inappropriate and mask the true load brake problem until total failure of the hoist load brake. **FIX THE HOIST LOAD BRAKE!**

4. Cause: The *external braking resistor may be wired wrong*, open, missing, or its resistance value may be too large.

Solution: The resistance of the braking resistor is considered too large if it more than 110% of the value listed in the BRAKING RESISTOR section of the manual. If this is the case, replace the resistor with one that agrees with this specification. **Never use a resistor that has fewer ohms than the specification calls for.**

If no braking resistor is used you will probably need to add one. See the BRAKING RESISTOR section of the manual. If the braking resistor is open, one must try to identify its cause. Follow the following steps always making sure the power is off to the control panel during wire checks:

- I) Check that the external resistor (s) are wired properly.
- II) Check to see if anything could have touched one of the wires feeding the resistor to create a short. If you find this is the case we recommend that the drive be shipped back to the factory--even if it appears to function properly.
- III) Check to see if the resistor had at least as many watts as the specification calls for (see the BRAKING RESISTOR section in the operation manual). If not, replace the resistor with one that agrees with this specification. In rare instances, even the watt rating in this specification will not be high enough (perhaps the duty cycle of the machine is very high). In this case, increase the wattage rating. Call the factory for help if needed.
- IV) It is possible that the transistor in the drive that powers the resistor has been shorted. Return the drive to the factory for repair.
- V) A hoist is a special case, an open resistor may be a sign that no load brake is present, or it is slipping or broken and should be checked/repared.

Some types of hoists, such as some worm gear types, have enough friction to hold a full load even if the mechanical brake is held open. These types may use external regeneration resistors.

Occasionally, one will find load brakes that will not stop a moving load, but only insure a safe controlled lowering of the load in case of failure. Such types will usually require the watt rating of the resistor to be increased. In such a case, call the factory. Most often, a load brake will produce enough friction to stop a moving load. However, even these types may wear and begin to slip or even break. If the load brake is broken it should be fixed. If it is just worn and slipping, it is still best to have it fixed, but the wattage rating of the resistor can be increased, if needed, to help out temporarily. In such cases, call the factory.

5. Cause: The *hoist unit may be set to ramp down to a stop* and not coast to a stop. In this case a "rOFF" would be displayed instead of "cOFF" when idle.

Solution: On the CX (Version 2.1) units, change the "U1" parameter to "OFF", on the non Version 2.1 or Smart-Move units, set the "L8" parameter to "OFF".

■ F6 -- AUXILIARY 1 (AX1) TRIP (Micro-Speed® CX™ only)

Terminal AX1 is indicating an external fault.

Cause: An *external device (overload, limit switch, etc.) has tripped* sending a signal to the AX1 terminal triggering the Micro-Speed® CX™ to fault out.

Solution: Determine reason for fault and repair if necessary. If fault occurs during

installation, double check wiring and operation of attached devices also check that Auxiliary Trip Mode "L28" is set appropriately (see the operation manual for modes). The Micro-Speed® CX™ can be set to trip-out when power is removed or when power is applied to the auxiliary terminal.

■ F7 -- AUXILIARY 2 (AX2) TRIP (Micro-Speed® CX™ only)

Terminal AX2 is indicating an external fault.

Cause: An *external device (overload, limit switch, etc.) has tripped* sending a signal to the AX2 terminal triggering the Micro-Speed® CX™ to fault out.

Solution: Determine reason for fault and repair if necessary. If fault occurs during installation, double check wiring and operation of attached devices also check that Auxiliary Trip Mode "L28" is set appropriately (see the operation manual for modes). The Micro-Speed® CX™ can be set to trip-out when power is removed or when power is applied to the auxiliary terminal.

■ F8 -- "A" PARAMETERS OUT OF SPECIFICATION

Memory used by Micro-Speed® CX™ or Micro-Speed® Smart-Move™ has *lost data*. Try reprogramming the "A" parameters individually or by a Gang-set®. This can be caused by static charges. If this procedure fails, return to factory for repair.

■ F9 -- CPU ERROR

Failure of CPU This can be caused by static charges.

Solution: Return unit to factory for repair.

■ F10 -- MEMORY ERROR

PARAMETER MEMORY ON LOGIC BOARD IS NOT HAS BEEN DAMAGED.

Solution: Try reprogramming the "A" parameters individually or by a Gang-set®. This can be caused by static charges. If this procedure fails, return to factory for repair.

■ F11 -- TIMER

Motor has run for a time longer than that allotted by the timer (L24 parameter on the CX, or A24 parameter on the Smart-Move).

1. Cause: Unattended *motor driven device stalled* or jammed.

Solution: Investigate why motor stalled and correct problem. Perhaps the load was heavy enough to cause the motor not to turn in low speed due to excessive slip.

2. Cause: *Programmer accidentally enabled the timer*.

Solution: Disable timer by setting to zero.

3. Cause: *Timer set for too short of a period*.

Solution: Increase time set.

■ F13 – OVERLOAD

Overload device has tripped disconnecting the ST terminal from the common of the control voltage. If no overload device is used in your application, it is necessary to install a jumper connecting the COM terminal to the ST terminal.

1. Cause: *Overload device has tripped.*

Solution: Investigate why overload tripped and correct the problem. Reset the overload, if it doesn't reset automatically, and reset the Micro-Speed® CX™ or Micro-Speed® Smart-Move™. Refer to the "Resetting after a fault" paragraph near the top of the page. The Micro-Speed® CX™ or Micro-Speed® Smart-Move™ will not reset until the overload device has reset.

For further assistance, please call Toll Free 800-362-7959 during business hours (8:00am to 4:30pm CST Monday--Friday).

The above information are brief trouble shooting ideas/steps and may not be the solution for every application and is not warranted by Power Electronics. Power Electronics is not responsible for any errors or exclusions in this material.