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Application Note

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Introduction

This document gives a step by step guide to basic fault-finding for the Motion Coordinators MC2, MC204 and MC216. Due to the wide range of machine types which use Trio products, the suggestions given here cannot be deemed to be a fault finding guide for any particular machine and the guide should always be used in conjunction with the appropriate maintenance manual.

SAFETY

A control system should be treated with respect as careless or negligent operation may result in damage to machinery or injury to the operator. For this reason the testing of the system should not be rushed and a methodical approach should be used. It is assumed that the reader of this document is suitably qualified and experienced in the operation of machinery, especially with respect to the safety measures required.

Equipment Required

A) Basic fault finding.
Digital Volt Meter.

At this level, it will be possible to determine whether the Motion Coordinator has a critical error which requires return to the factory or that further investigation is required at level (B).

B) Level 2 fault finding.
Digital Volt Meter.
PC running Windows 95/98 with at least 1 serial port.
Motion Perfect – Trio configuration software.
PC to Motion Coordinator Serial Cable (P350)

At this level, it will be possible to isolate a fault and identify whether the fault is within the Motion Coordinator or external to it. (i.e. a faulty drive or sensor) It is assumed that the reader has a working knowledge of Motion Perfect or has access to the Motion Coordinator Technical Reference Manual.

Basic Fault Finding

This section details the probable reasons for various indications given by the front panel LEDs. If there are no lights on the controller and 24V dc power is present at the power terminals, the controller should be removed from the machine and tested on the bench with only the power terminals connected.

Follow the flow chart on page 2.

More information about the STATUS LED is given in Appendix 1. Note that on Motion Coordinators delivered prior to Jan 1999, the STATUS LED is marked “FAULT”. There was no functional change to this indicator.

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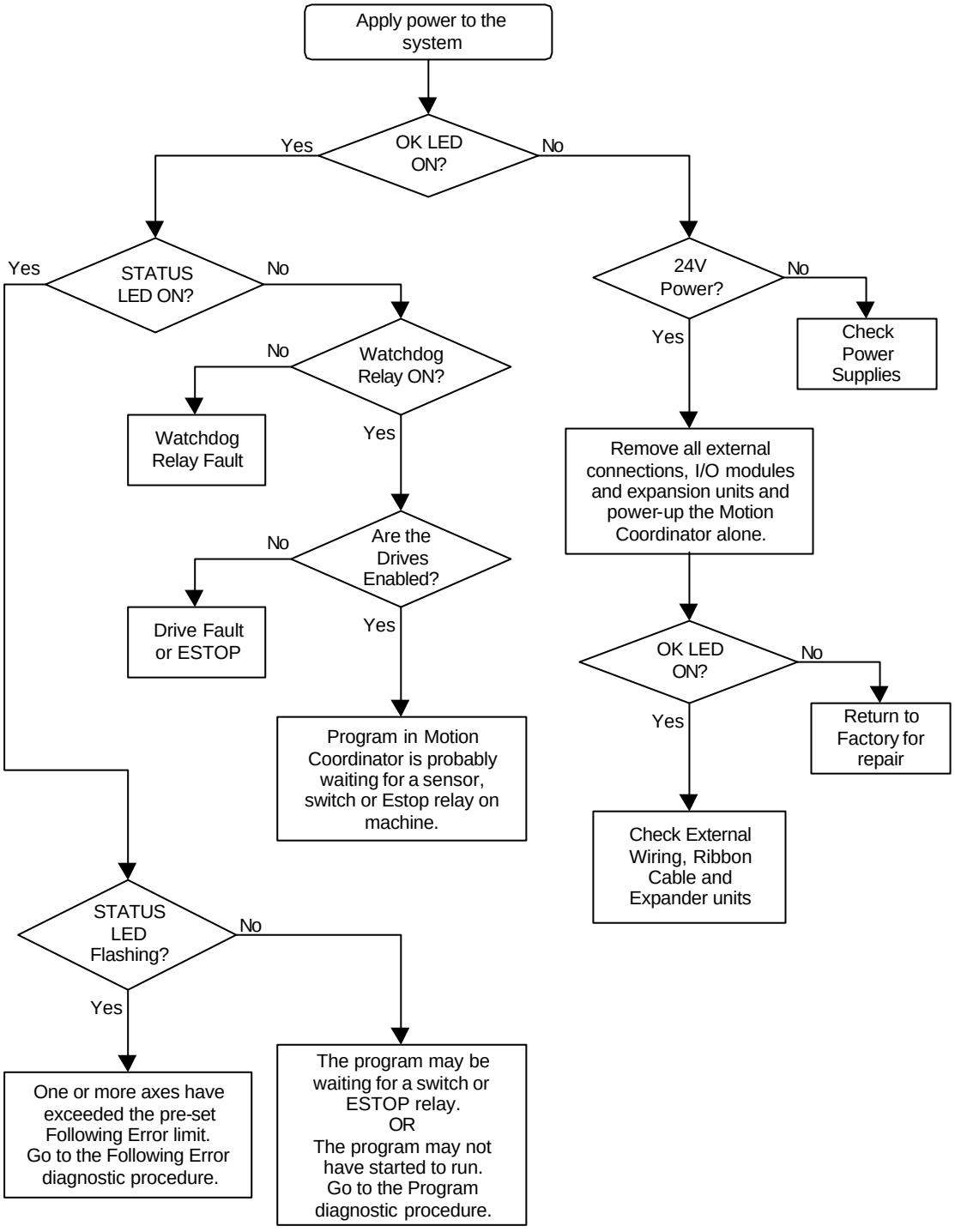
Flow Chart

Follow this chart if the Motion Coordinator appears to do nothing when power is applied.



Following Error diagnostic procedure

If the STATUS LED is flashing this indicates there is a critical motion error on one or more axes. Normally the critical error is caused when the "following error" of an axis exceeds the pre-programmed limit.

A following error can be caused as a result of:

1. A wiring problem to the Motion Coordinator; Encoder cable or reference (V+,V-).
2. Wiring problem between motor and drive; Motor resolver/power connections, power supply and fuses.
3. The encoder simulation in the drive not working.
4. A fault with the servo amplifier; Check servo amplifier manual.
5. The servo amplifier not enabling, check emergency stops and limits.
6. A mechanical fault; check that shafts, couplings and bearings are not seized or loose.

On a multi axis machine it is necessary to determine which axis caused the following error. In order to do this, connect a PC to the top serial port and start Motion Perfect. When connection is established, open terminal window channel 0 and type the following sequence:

↵ ' This symbol means press the enter key.
>> ' If the connection to the Motion Coordinator is good it will return this symbol.

```
>>? MOTION_ERROR↵
1.0000              ' 1 shows an error has occurred, 0 means no error.
>>? ERROR_AXIS↵
2.0                 ' Axis 2 caused the following error.
                    (note: axis numbering starts at zero)
```

Program diagnostic procedure

A program error will usually result in the machine refusing to start. If the machine starts up, stops at a certain point and refuses to go on, this is indicative of an external problem such as a faulty sensor or switch.

To check the integrity of the program, connect a PC to the top serial port and start Motion Perfect.

If Motion Perfect will not "connect", it may be because the controller's memory is corrupted. Open a terminal window and type: **DIR↵**
The project directory should be displayed. If random characters are displayed instead or the project listing looks incomplete, then the memory will need to be cleared and the project re-loaded.

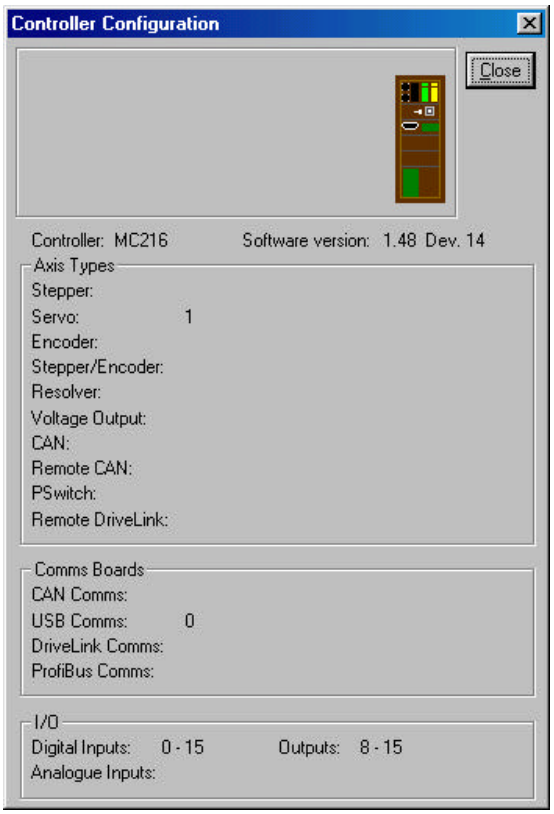
If Motion Perfect connects or the directory as described above is intact, then check that the correct programs are set to run at power-up. See the example directory listing.

One or more programs must be set to run at power-up. i.e. they must have the Auto(n) runtype set. "n" may be any number between 1 and 14 or –1 depending on the program operation. See the machine maintenance manual for details of the correct configuration.

```
DIR↵
Power up from: RAM
Memory available: 403347
Selected program: STARTUP
Directory is unprotected
Program          Source Code   Type
---------------- ------ ------ --------
HEATER            15899   6739 Manual
TASK1LHS           9133   3310 Manual
TASK2LHS           8048   3021 Manual
TASK3LHS           7005   2747 Manual
MAIN_LHS          14486   5868 Manual
INFEED_LHS         7673   2997 Manual
STARTUP            7683   3537 Auto( 1)
QUICKY              421    322 Manual
TABLE                 0  20004 Table
>>
```

Example Directory Listing

Controller Configuration



The controller's hardware status can be checked by clicking on the pull-down menu "controller + controller configuration". Information about the axes and I/O that have been recognised by the Motion Coordinator will be displayed in the window. This should agree with the actual configuration of the system.

For example, if 2 CAN I/O units are fitted, the Outputs should report Outputs 8 – 48 and the CAN I/O modules will be shown pictorially at the top of the window.

The numbers against each Axis type are the Axis numbers that have this type of daughter board fitted. Axis 0 is the top slot on the Motion Coordinator, Axis 4 is the top slot of the first axis expander module etc.

Axis Monitor

The Encoder value and status information of each axis can be monitored by opening the Axis Parameters window. Click on "Tools + Axis Parameters".

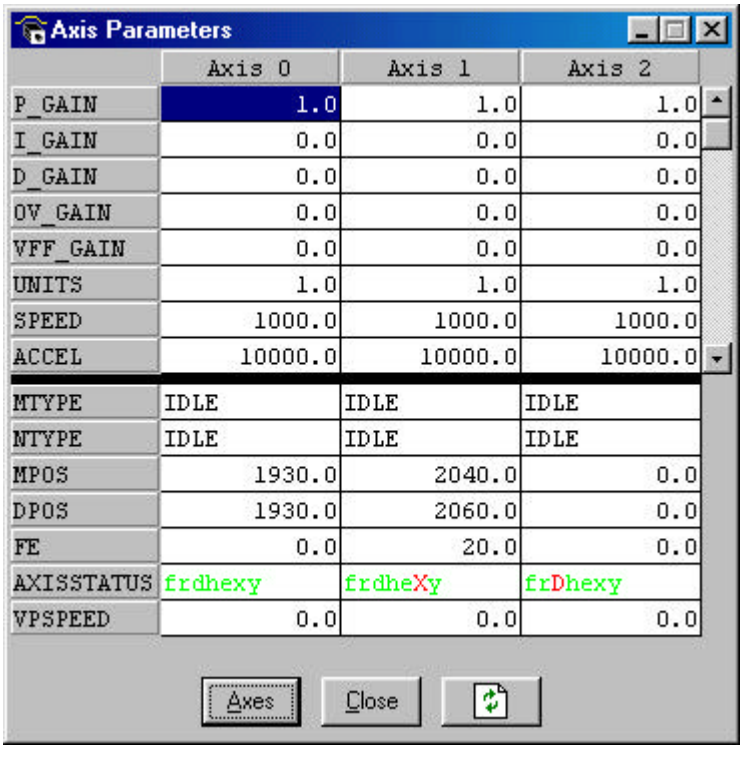
The area below the bold black line shows the axis information and is updated once every half second.

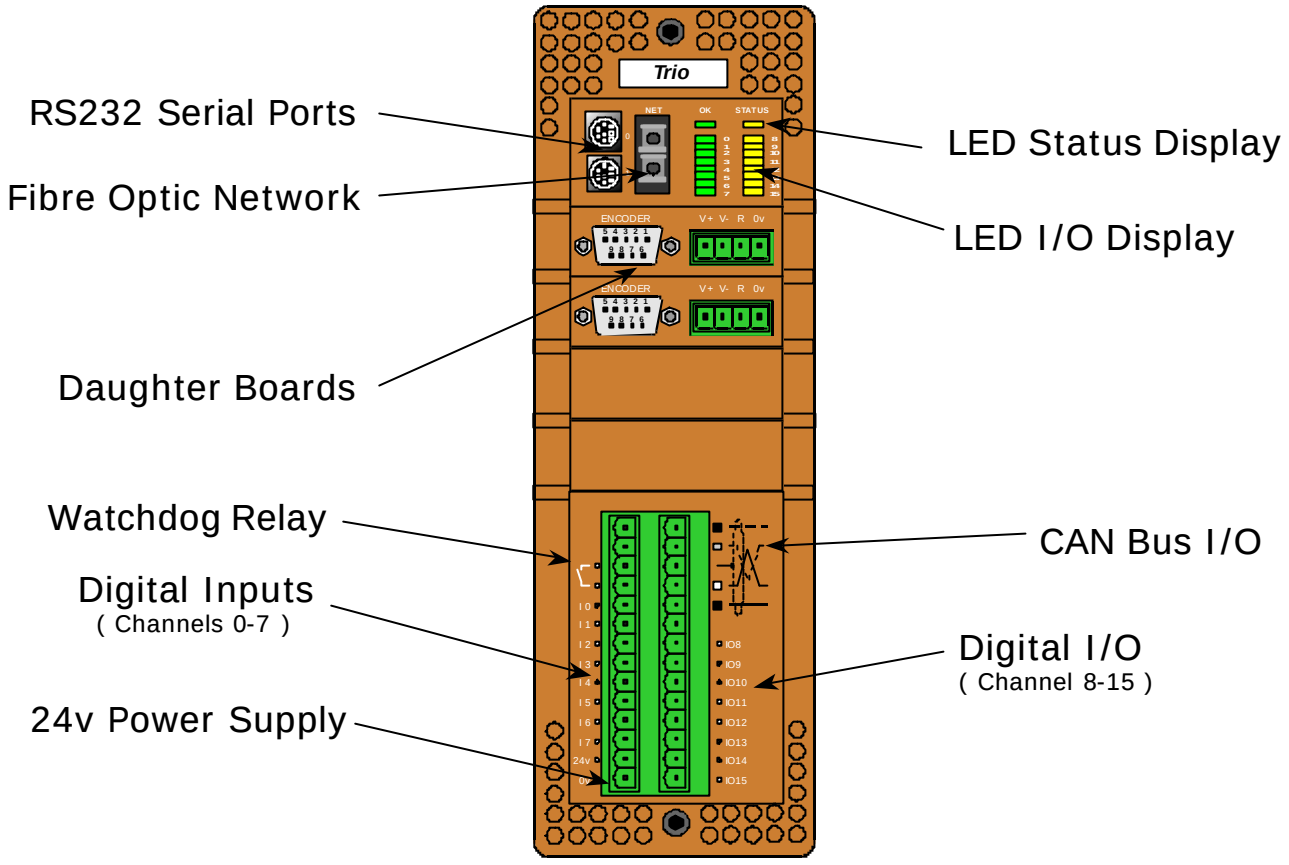
MPOS = Encoder value.
DPOS = Demand position.
FE = Following Error.

Note: There will always be some value of following error, which increases as the axis moves.

AxisStatus letters correspond to:

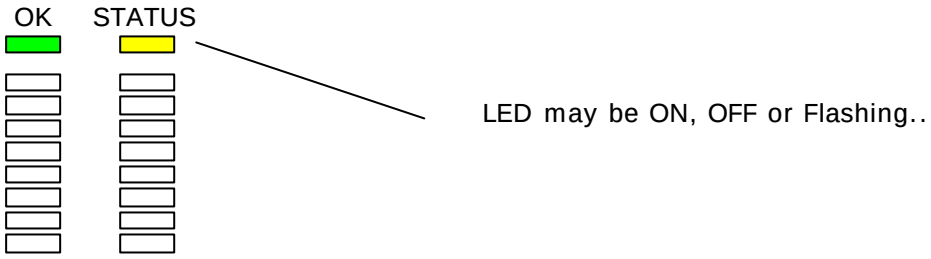
F = Forward limit switch
R = Reverse limit switch
D = Datum input active
H = Feedhold input active
E = Following Error limit exceeded
X = Forward software limit reached
Y = Reverse software limit reached




RS232 Serial Ports
Fibre Optic Network
Daughter Boards
Watchdog Relay
Digital Inputs
(Channels 0-7)
24v Power Supply
LED Status Display
LED I/O Display
CAN Bus I/O
Digital I/O
(Channel 8-15)
Trio
NET
OK
STATUS
ENCODER
V+ V- R 0v
IO8
IO9
IO10
IO11
IO12
IO13
IO14
IO15
24v
0v

Appendix I

The STATUS LED is ON. Do I have a Problem?



If the OK LED is ON (Green), the Motion Coordintator's processor is working.

IF the STATUS LED is OFF.

The Watchdog (WDOG) is ON. Your Program has turned it on, or you have turned it on manually using Motion Perfect. The volt-free WDOG relay contact will be closed. If this is wired to the enable circuits of your axis controllers they will be enabled.
However, the position SERVOS may not be enabled.
It does not mean that there are no faults. Your program may have halted or your servo or axis controllers may be waiting for an external event that will never happen and the controller has no way of knowing this.

IF the STATUS LED is ON.

This does not mean there is a fault.
The Watchdog (WDOG) is OFF because your Program has turned it off or you have turned it off manually.
It is also possible that your program has not **started**, it has **halted** prematurely or is **waiting** for an external event.

The STATUS LED is FLASHING.

You have a fault, most likely the Following Error has exceeded the maximum set value. The Motion Perfect axis status screen will show a red 'E' for the effected axis. Note that this fault will trip the WDOG relay and so ALL the axis may show a 'E' following error. To find out which caused the first problem open a terminal window and type "? ERROR_AXIS". This will display the number of the first axis that tripped.

A summary of possible reasons follows:-

There is a wiring problem. Check encoder cable, reference (V+,V-), Motor connections, motor tacho / resolver connections, power supply and fuses.
The encoder may not be working.
There may be a fault with the servo amplifier. Check servo amplifier manual.
The servo amplifier is not enabling, check emergency stops and limits.
Check the mechanical shafts, couplings or bearings are not seized or loose. Encoder couplings?

Note: on Motion Coordinators delivered before the end of 1998, the STATUS led was marked "FAULT". The function of the led on these controllers is the same as described here.