

## Chapter 6. Maintenance & Troubleshooting

### Chapter Objectives

The information in this chapter will enable you to:

- Maintain the system's components to ensure smooth, efficient operation
- Isolate and resolve system hardware and software problems
- Use this chapter as a quick-reference tool for a description of system error codes

### Maintenance

This section describes Compumotor's recommended maintenance on the Model 500 system.

**Spare Parts Table** Table 6-1 is a list of recommended spare parts for the Model 500 system.

Description	Function	Part Number
4-Pin Connector	Power Connection	43-005560-01
9-Pin Connector	Programmable Output	43-008755-01
Battery	Maintains RAM memory	47-007709-01

Table 6-1. Spare Parts Table

### Battery

The non-volatile memory of the Model 500 is a Battery-Backed RAM (Random Access Memory). The battery is used to keep the RAM powered at all times. The life of this battery is approximately 10 years. When the battery runs low, the Model 500 will be unable to hold a program in nonvolatile memory. If the battery back up is not functioning properly, error 30 will be displayed when you cycle power. To verify that the battery is OK, type 1XC, then cycle power to the Model 500. If the battery is OK, Error 30 (Check Sum error) should be gone. If the message is still flashing after you issue 1XC and cycle power, replace the battery. Call your local distributor to order the battery.

### Battery Replacement

Use the following procedure to access and replace the battery (*be sure to have the replacement battery on hand before you begin this procedure*):

#### CAUTION

Use proper electro-static discharge (ESD) precautions.

- ① Remove the two screws in the back of the Model 500 enclosure and the four screws around the perimeter of the front panel.
- ② Slide the enclosure away from the front panel, exposing the PCB.
- ③ The battery is located on the left side of the circuit board (facing the front panel). It is located on the corner of the PCB nearest the LED Display. It is labeled BT1 and is the size of a U.S. quarter.
- ④ Remove the battery from the battery holder and replace it immediately with the new battery.
- ⑤ Replace the enclosure and retaining screws.

**Troubleshooting**

This section provides methods to identify and resolve possible indexer-related hardware and software problems. You should also refer to the drive's user guide for troubleshooting procedures specific to the drive you are using.

**Problem Isolation**

When your system does not function properly (or as you expect it to operate), the first thing that you must do is identify and isolate the problem. When you accomplish this, you can effectively begin to eradicate and resolve the problem.

The first step is to isolate each system component and ensure that each component functions properly when it is run independently. You may have to dismantle your system and put it back together piece by piece to detect the problem. If you have additional units available, you may want to use them to replace existing components in your system to help identify the source of the problem.

Try to determine if the problem is mechanical, electrical, or software-related. *Can you repeat or recreate the problem?* Do not attempt to make quick rationalizations about problems. Random events may appear to be related, but they are not necessarily contributing factors to your problem. You must carefully investigate and decipher the events that occur before the subsequent system problem.

You may be experiencing more than one problem. You must solve one problem at a time. Log (document) all testing and problem isolation procedures. You may need to review and consult these notes later. This will also prevent you from duplicating your testing efforts.

Once you have isolated the problem, take the necessary steps to resolve it. Refer to the problem solutions contained in this chapter. If your system's problem persists, contact Parker Compumotor's Applications Department at (800) 358-9070.

**WARNING**

**Be sure to remove power before disconnecting Model 500 system components or changing wiring.**

**CW, CCW & Home Switches**

If you are having problems using the Trigger (TR), Home (GE), CW, CCW and Sequence Select inputs, you must first check your wiring for proper installation. Use an Ohm meter for proper connection of the switches and inputs. If the hardware connection seems correct, you must use the Input Status (IS) command to report the hardware status of each input and see if the Model 500 recognizes the input change. You may do this by changing the input state manually and issue the IS command. If the status does not change, check the hardware settings.

**Remote Sequencing (BCD Inputs)**

If you are trying to run sequences from BCD interfaces, the first thing you must verify is the hardware interface. Use the Ohm meter to verify proper wiring. Then use the IS command to read the status of the inputs. Change the input setting and check the Input Status (IS) again to make sure that the Model 500 recognized the change in the sequence select input. Make sure that your BCD input is calling the proper sequences. Check Chapter 4, *Application Design*, for the Sequence Select Table. If you have a problem running a sequence from the remote input, try running the sequence using the XR command before attempting to run it using BCD input.

**Front Panel LEDs**

This section describes the functionality of the front panel LEDs.

**POWER**

The **POWER** LED will be green if you power up the Model 500 and the power supply is functioning properly.

**CPU READY**

The **CPU READY** LED will be green if the microprocessor and its peripherals are functioning properly. If this LED is off, the microprocessor has faulted and the Model 500 watchdog timer has latched the unit in a reset condition. The error will cause all communications to be lost and the front panel will not be operable.

To clear the CPU ready fault you must cycle the power to the unit. If the green **CPU READY** LED again goes out, then you probably have a noise-related problem. *It is important to ensure that you have properly grounded your Model 500 to earth ground.* The noise can often be transmitted through the inputs or outputs from poorly wired or grounded I/O wiring.

To verify where the noise is coming from, disconnect one interface at a time from the Model 500 until the **CPU READY** LED no longer goes out. If you have only the power and the Motor/Driver cable attached and the problem persists, then consult the factory.

**FAULT**

The **FAULT** LED will be off under normal operations. If a hardware or software error exists or if the shutdown output is active, this LED will turn red. Refer to the *Diagnostic Codes* section in this chapter for a listing of related codes that will flash on the two-digit display.

**Diagnostic Codes Table**

The two-digit LED flashes an error code if any type of error occurs. You can also light the LEDs with the **LED** command.

The following table lists the error codes and the explanation of each error code. The symptoms and solutions table shows how you can try to correct these error conditions.

CONDITION	LED DISPLAY CODE
BLANK	NO ERRORS
16	AMPLIFIER OFF
20	EXCESSIVE POSITION ERROR
30	BBRAM CHECKSUM ERROR
41	CW LIMIT SWITCH ENGAGED
42	CCW LIMIT SWITCH ENGAGED
43	CW SOFTWARE LIMIT ENGAGED
44	CCW SOFTWARE LIMIT ENGAGED
60	COMMANDED SHUTDOWN
66	USER FAULT
71	ABSOLUTE ENCODER IS DISCONNECTED
72	BAD ABSOLUTE ENCODER READS

Table 6-2. Diagnostic Codes Table

**Error Code 30**

Error code 30 is caused by having the checksum that is calculated on a reset or from cycling power not match the previous checksum that was calculated by the 500. The Checksum error 30 will occur if you are changing PROMS, if you are in the middle of defining a sequence but have not issued an **xT** command yet, and if power is cycled or a reset is issued. If memory is corrupted at any time during operation or during the time the unit is powered down an error 30 will occur. If the battery fails then the memory cannot be saved and an error 30 will occur every time the power is cycled or a reset is issued.

In most cases you can simply issue the **xc** (create Checksum) command and the error 30 will be cleared. Then issue the **oN** command to clear the error 16. If the error persists and occurs each time you power up your unit, then you should consult the factory.

**Error Code 16** Error 16 is caused by the drive fault line coming back to the Model 500. It indicates that the step and direction output have been disabled by the software. To clear the error simply type an ON command. If the error persists then toggle the drive fault enable software switch. This is done by typing `SSQ1` or `SSQ0` depending on the present state of the `SSQ` bit.

### RS-232C Problems

If you are having problems communicating with the Model 500, try the following procedure to troubleshoot the communications interface.

- ① Power-up your computer or terminal *and then* power-up the Model 500.
- ② The serial port of your computer/terminal may require handshaking. If so, you must disable handshaking with your terminal emulator software package. You can also disable handshaking by connecting the computer's/terminal's RTS to CTS (usually pins 4 and 5) and DSR to DTR (usually pins 6 to 20).
- ③ Verify that the computer/terminal and 500 are configured to the same baud rate, number of data bits, number of stop bits, and parity.
- ④ Check to make sure you are using DC common or signal ground as your reference, *not* earth ground.
- ⑤ Cable lengths should not exceed 50 ft. unless you are using some form of line driver, optical coupler, or shield. As with any control signal, be sure to shield the cable to earth ground at one end only.
- ⑥ Press the space bar several times. The cursor should move one space each time you press the space bar. If your terminal displays garbled characters, check the terminal's protocol set-up. The baud rate setting probably does not match the Model 500's setting.
- ⑦ If the terminal does not display garbled characters, press the space bar several times. If the cursor does not move, disconnect the RS232 plug from the 500 and measure the cable's continuity. If you do not measure  $> -3V$  on Pin 1 (Rx) to Pin 3 (GND), your cable is wired incorrectly or your terminal is broken. If you measure  $> -3V$  on Pin 2 (Tx) to Pin 3 (GND), then switch the Model 500's transmit (Tx) and receive (Rx) wires and try this test again.
- ⑧ Once you are able to make the cursor move, enter some characters. These characters should appear on the computer or terminal display. If each character appears twice, your host is set to half-duplex. It should be set to full-duplex.

### Reducing Electrical Noise

Try to eliminate sources of possible noise interference. Potential noise sources include inductive devices such as solenoids, relays, motors, and motor starters operated by a hard contact.

For more information on identifying and suppressing electrical noise, refer to the Technical Data section of the *Compumotor Programmable Motion Control Catalog*.

### Software Debugging Tips

This section offers some helpful tips for debugging your programs. The Model 500 has several software tools (listed below) that to aide you in identifying a problem in the system design.

<u>Software Tool</u>	<u>Command to Use</u>
Trace Mode	XTR
I/O Simulation	DIN, DOUT
Single Step	XST
Sequence Execution status	XS
Display indexer status	DFX
Display state of the Indexer	DR
Display interface option status	FS
Display indexer status options	SS
Display Homing/Jog status	OS

**Trace Mode**

The trace mode is used to display what is occurring as you execute your sequence. **XTR1** enables the trace mode, **XTR0** disables it. When enabled you can execute sequences using the **XR** command. As the sequence is running, the commands are displayed on the screen. If the program stops running, you can see what command was last executed.

The interactive mode (**SSI**) is also helpful as a way to find commands that the indexer may not recognize.

Refer to the *Sequence Debugging Tools* section in Chapter 4 for a more thorough explanation of the trace mode.

**I/O Simulation**

Using the **DIN** and **DOUT** commands, you can perform I/O simulation without actually physically toggling the inputs or outputs. Use these commands to simulate the input or output state you desire so that you can test portions of your sequences and program. Refer to the *Sequence Debugging Tools* section in Chapter 4 for a more thorough explanation.

**Displaying Model 500 Status**

The Model 500 provides several commands which should be checked when you are experiencing difficulties while programming the Model 500. You can report back the value or setting of almost all of the Model 500 commands by typing the device address followed by the command, then a carriage return or a space bar. In this manner you can find out what values you have entered in different commands.

In addition you can use the **DR** command to report the current state of the Model 500. Use this to verify that the unit is configured the way you want it.

Four other report back commands can be used to tell you the state of the Model 500. These commands report back a binary number. Each bit of the response corresponds to different functions or modes that the Model 500 could be in. A quick-reference section is provided here to help you determine what state your Model 500 is in.

**DFX Command Report Back**

The **DFX** command reports the 500's current states and conditions

```
32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
*0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
```

Bit representations 25-32,13 are reserved

**Bit**

- 24 Mode Profile: no = 0; yes = 1
- 23 Mode alternate: no = 0; yes = 1
- 21 Hit a software CCW limit: no = 0; yes = 1
- 20 Hit a software CW limit: no = 0; yes = 1
- 19 Home limit: not found = 0; found = 1
- 18 Jogging: no = 0; yes = 1
- 17 Queued for RM mode: no = 0; yes = 1
- 16 Run sequence on power up: no = 0; yes = 1
- 15  $\nu$  command: 0 = not waiting; 1 = waiting for continue
- 14 Waiting for a trigger: no = 0; yes = 1
- 12 Back up to home limit: 0 = no; 1 = yes
- 11 High-speed portion of home move: no = 0; in process = 1
- 10 Execute a sequence: no = 0; yes = 1
- 9 Wait on a timer: no = 0; yes = 1
- 8 Hit a CCW limit: no = 0; yes = 1
- 7 Hit a CW limit: no = 0; yes = 1
- 6  $\nu$  command: 0 = not waiting; 1 = waiting for continue
- 5 Absolute move direction: 0 = CW; 2 = CCW
- 4 Incremental/absolute: 0 = MPI; 1 = MPA
- 3 Mode: preset = 0; Continuous = 1
- 2 Commanded move direction: 0 = CW; 1 = CCW
- 1 Preset move in progress: 0 = not moving; 1 = moving
- 0 Continuous move: 0 = not moving; 1 = moving

**SS, FS, & OS  
Report Back  
Commands**

The **FS** command reports back a binary word which has the various interface options associated with each bit. The **OS** command reports back the Homing options and the Jog enable option. The **SS** command reports back various indexer software options. A reference is provided below along with the function of each bit location. If a 1 is in the bit location the feature or mode is enabled.

	A	B	C	D	_	E	F	G	H	_	I	J	K	L	_	M	N	O	P	_	Q	R	S	T	
SS	*0	0	0	0	_	0	0	0	0	_	0	0	0	0	_	0	0	0	0	_	0	0	0	0	
FS	*0	0	0	0	_	0	0	0	0	_	0	0	0	0	_	0	0	0	0						
OS	*0	0	0	0	_	0	0	0	0																

<u>Command</u>	<u>Function</u>
SSA	RS232 Echo: 0 = Echo on 1 = Echo off
SSD	Alternate Mode Stop: 0 = end of cycle 1 = immediately
SSG	Clear/Save buffer on limit: 0 = clear 1 = Save
SSH	Clear/Save buffer on stop: 0 = clear 1 = Save
SSI	Enable/Disable Interactive Mode
SSJ	Enable/Disable Continuous scan mode
SSL	Resume execution enable
SSN	Enable error message mode
SSO	Enable Sequence Select via front panel
SSP	Enable ratio select via front panel
SSQ	Enable Drive Fault indicator

<u>Command</u>	<u>Function</u>
FSB	Enable Indexer to Motor/Encoder step Mode 1=Encoder
FSC	Enable/Disable Position Maintenance
FSD	Enable/Disable Stop on Stall
FSE	Enable/Disable Following
FSJ	Select Encoder input Function: 0 = ABS/INC for position INC for following 1 = ABS/INC for following INC for position
FSK	Enable following learn mode
FSL	Enable following self correction mode
FSM	Select Absolute or Incremental encoder 1=Absolute
FSN	Enable Pulse and Direction following
FSO	Enable "lights out" or system recovery from power failure
FSP	Enable position tracking

<u>Command</u>	<u>Function</u>
OSB	Enable back-up to home switch
OSC	Define Active edge of Home switch 1=Active high signal
OSD	Enable Encoder Z channel Input for Homing
OSE	Enable Jogging
OSG	Define Final Home approach direction 1=CCW
OSH	Define Active edge of home switch to stop on 1=CCW

**Common  
Programming  
Mistakes**

This section describes common mistakes made while using the X language.

An indexer move is commanded and no motion occurs: The following mode may be enabled when you are trying to make a move as an Indexer, a limit may be enabled and active, or you may be in the absolute mode and are already at the position you are commanding the motor to move to.

A following move is commanded and no motion occurs: The unit may not be in the following mode (FSI), the wrong encoder interface has been selected (FSJ), limits are enabled, or you may be in the absolute mode and are already at the position you are commanding the motor to move to.

If motion is jittery in the following mode you can smooth it out by decreasing the sampling of the encoder interface (increase **TF**).

If a sequence that was entered, the backspace (^B) command may cause misinterpretation of a Quote command.

The unit may appear to not be responding to commands. If you were defining a sequence and never issued an **XT** command, then the Model 500 still thinks you are defining a sequence.

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## Returning the System

If you must return your Model 500 system to affect repairs or upgrades, 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 by the manufacturers to be out of warranty.
- ② Before you return the unit, have someone from your organization with a technical understanding of the Model 500 system and its application include answers to the following questions:
  - What is the extent of the failure/reason for return?
  - How long did it operate?
  - Did any other items fail at the same time?
  - What was happening when the unit failed (i.e., installing the unit, cycling power, starting other equipment, etc)?
  - How was the product configured (in detail)?
  - What, if any, cables were modified and how?
  - With what equipment is the unit interfaced?
  - What was the application?
  - What was the system environment (temperature, enclosure, spacing, unit orientation, contaminants, etc.)?
  - What upgrades, if any, are required (hardware, software, user guide)?
- ③ In the USA, call Parker Compumotor for a Return Material Authorization (RMA) number. Returned products cannot be accepted without an RMA number. The phone number for Parker Compumotor Applications Department is (800) 358-9070.

Ship the unit to: Parker Hannifin Corporation  
Compumotor Division  
5500 Business Park Drive, Suite D  
Rohnert Park, CA 94928  
Attn: RMA # xxxxxxx

- ④ 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

- ⑤ Elsewhere: Contact the distributor who supplied the equipment.