

# CHAPTER ⑦

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## ***Maintenance & Troubleshooting***

### Chapter Objectives

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The information in this chapter will enable you to:

- Maintain the system's components to ensure smooth, efficient operation
- Isolate and resolve system hardware problems
- Isolate and resolve system software problems

### Maintenance

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The following items are included with the SX Indexer/Drive.

<b>Part</b>	<b>Part Number</b>
13-Pin Phoenix Connector	43-011796-01
7-Pin for SX8	43-013575-01
8-Pin Phoenix (3)	43-007483-01
AC Power Cord	44-000054-01
Battery	47-011743-01
Mounting Bracket	53-006007-01

#### *Spare Parts List*

<b>Part</b>	<b>Part Number</b>
ESD Service Strap	58-011184-01

#### *Optional Equipment List*

### Battery Maintenance

The battery provided with the SX is a lithium battery which should last approximately 4-5 years. If a battery failure occurs, the battery may be replaced with a commonly available 3V, 500MAH, 24.5 x 5 mm lithium battery. Ensure that the battery clip maintains good contact with the battery after replacement. Some manufacturers and part numbers are:

Duracell - DL2450

Sanyo - CR2450

### Drive Maintenance

Ensure that the SX's heatsink is free of particles and has a free flow of air over its entire surface. Enclosures must be connected to earth ground through a grounding electrode conductor to provide a low-impedance path for ground-fault or noise-induced currents. All earth ground connections must be continuous and permanent.

## Motor Maintenance

You should inspect all mechanical parts of the motor regularly to ensure that no bolts or couplings have become loose during normal operation. This will prevent some minor problems from developing into more serious problems.

You should inspect the motor cable periodically for signs of wear. This inspection interval is duty-cycle, environment, and travel-length dependent. The cable should not have excessive force applied to it and should not be bent beyond a one-inch radius of curvature during normal operation. Tighten all cable connectors.

## Reducing Electrical Noise

For detailed information on reducing electrical noise in your system, refer to the current Compumotor Catalog.

## 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 resolve and eradicate 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.

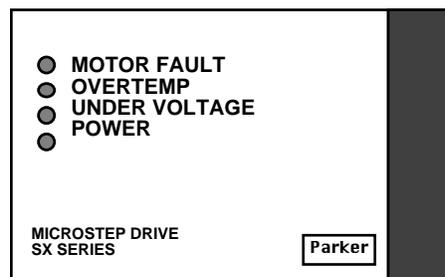
Determine if the problem is mechanical, electrical, or software-related. Can you repeat or re-create the problem? Do not make quick rationalizations about the problems. Random events may appear to be related, but they may not be contributing factors to your problem. Carefully investigate and decipher 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. 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 at 800-358-9070.

## Front Panel LEDs

There are four LEDs on the front panel of the SX (refer to the following figure).



*Bottom of SX Drive Front Panel*

- Motor short-circuit
- The interlock is broken (opened)

The **OVERTEMP** LED is **red** and turns on when the internal drive temperature exceeds 70°C.

The **UNDERVOLTAGE** LED is **red** and turns on when AC line voltage is below 85VAC.

The **POWER** LED is **green** and turns on when the internal bias supply is operating and providing +5V.

If all LED's are on, the board monitor alarm will be activated.

# Common Problems and Solutions

The following table contains common problems, probable causes, and solutions to the problems. It should help you eradicate most problems you might encounter.

Symptoms	Probable Causes	Solutions
The power LED is not on (illuminated).	<ul style="list-style-type: none"> <li>The drive is not receiving AC voltage.</li> </ul>	<ul style="list-style-type: none"> <li>Verify that the connector on the SX is fully seated</li> <li>Verify that there is AC voltage at the AC outlet that the drive is plugged into</li> <li>Verify that there is AC voltage at the drive at the AC power connector</li> </ul>
The power LED is flashing.	<ul style="list-style-type: none"> <li>AC Line voltage is too low.</li> <li>There is insufficient load regulation on the AC line.</li> </ul>	<ul style="list-style-type: none"> <li>Check AC line voltage (90VAC minimum).</li> <li>Increase the AC line wire size. Increase the isolation transformer size (if used).</li> </ul>
Little or no holding torque. Power LED is on, motor fault LED is off.	<ul style="list-style-type: none"> <li>The motor current is set too low.</li> <li>The motor winding or cable is open.</li> <li>The Auto Standby function is enabled.</li> <li>Amplifier shutdown is enabled.</li> </ul>	<ul style="list-style-type: none"> <li>Check the current select switches and verify that the current is set correctly.</li> <li>Check motor and cable with an ohmmeter.</li> <li>Disable Auto Standby function if this function does not allow enough holding torque.</li> <li>Use the RSE command to inform you if the drive has been disabled and the reason.</li> </ul>
The motor fault LED is on.	<ul style="list-style-type: none"> <li>The motor cable is disconnected or not fully seated at the drive.</li> <li>The motor connector interlock jumper is missing or is disconnected.</li> <li>The SX has detected a motor/wiring short circuit.</li> </ul>	<ul style="list-style-type: none"> <li>Check the motor cable.</li> <li>Check the interlock jumper.</li> <li>Check the motor and cable wiring.</li> </ul>
Overtemperature LED is on.	<ul style="list-style-type: none"> <li>The internal drive temperature is greater than 70 C.</li> </ul>	<ul style="list-style-type: none"> <li>Remove fin cooling obstructions or add fan cooling to the SX (Compumotor offers a fan kit).</li> </ul>
The undervoltage LED is on.	<ul style="list-style-type: none"> <li>AC line voltage is less than 85VAC.</li> </ul>	<ul style="list-style-type: none"> <li>Provide a minimum of 90VAC underload.</li> </ul>
Motor fault, overtemperature, and undervoltage LEDs are on.	<ul style="list-style-type: none"> <li>The internal Indexer monitor has reset the Indexer.</li> </ul>	<ul style="list-style-type: none"> <li>Excessive electrical noise. Verify the drive case is properly grounded.</li> </ul>
The motor moves erratically at low speeds.	<ul style="list-style-type: none"> <li>Motor current is set incorrectly.</li> <li>One motor phase open.</li> <li>Motor resolution is set for 200 or 400 steps per revolution.</li> </ul>	<ul style="list-style-type: none"> <li>Check the current select switches and verify that the current is set correctly.</li> <li>With motor connector removed from the SX, use an ohmmeter to measure continuity of motor windings.</li> <li>Full and half step modes will cause the motor to run roughly at low speeds.</li> </ul>
The motor stalls at high speeds.	<ul style="list-style-type: none"> <li>Motor current is not set correctly.</li> <li>Motor is undersized for the application.</li> </ul>	<ul style="list-style-type: none"> <li>Check DIP switches verify that motor current is set correctly.</li> <li>Verify that the motor is sized correctly.</li> </ul>

Symptoms	Probable Causes	Solutions
The motor stalls during acceleration.	<ul style="list-style-type: none"> <li>Motor current is not set correctly.</li> <li>The acceleration is set too high.</li> <li>There is insufficient rotor inertia.</li> <li>Motor is undersized for the application.</li> </ul>	<ul style="list-style-type: none"> <li>Check the current select switches and verify that the current is set correctly.</li> <li>Decrease the acceleration.</li> <li>Add inertia to the motor shaft.</li> <li>Verify that the motor is sized correctly.</li> </ul>
The motor (unloaded) stalls at nominal speed.	<ul style="list-style-type: none"> <li>There is insufficient rotor inertia.</li> </ul>	<ul style="list-style-type: none"> <li>Add inertia to the motor shaft.</li> </ul>
The motor does not move the commanded distance.	<ul style="list-style-type: none"> <li>The motor resolution is set incorrectly.</li> </ul>	<ul style="list-style-type: none"> <li>Ensure that the SX's indexer and drive resolution settings are the same.</li> </ul>
The drive moves the motor in the wrong direction.	<ul style="list-style-type: none"> <li>The motor is not wired to the drive properly.</li> </ul>	<ul style="list-style-type: none"> <li>Verify motor connections. Swapping motor leads A+ and A- at the drive connector to change direction if necessary.</li> </ul>
A SX move is commanded and no motion occurs.	<ul style="list-style-type: none"> <li>Following mode may be enabled when you are trying to make a move as an Indexer.</li> <li>A limit may be enabled and active.</li> <li>You may be in Absolute mode and are already at the position you are commanding the motor to move to.</li> </ul>	<ul style="list-style-type: none"> <li>Check your configuration and motion settings.</li> </ul>
A following move is attempted and no motion occurs.	<ul style="list-style-type: none"> <li>The SX may not be in the Following mode (FSI).</li> <li>Limits are enabled, you may be in the absolute mode and are already at the position you are commanding the motor to move to.</li> </ul>	<ul style="list-style-type: none"> <li>Set the SX to Following mode. Check your configuration and motion settings.</li> </ul>
The unit may appear to not be responding to commands.	<ul style="list-style-type: none"> <li>If you defined a sequence and never issued XT, the SX still thinks you are defining a sequence.</li> </ul>	<ul style="list-style-type: none"> <li>Issue an XT command at the end of the sequence to end sequence definition.</li> </ul>

*Problems & Solutions Table*

## Motor

If the motor fails to move, you should test the motor with an *ohmmeter* to examine the resistance between the motor connections. If the motor is not malfunctioning, the source of the problem is probably within the drive. If you operate a faulty drive with a reliable motor, you may damage the motor. If you find that the motor is not faulty, remove power, and remove the motor from the drive. Use the following steps to test the motor.

- ① Remove power from the system. Detach the motor from the drive.
- ② With the motor detached from the system, use an ohmmeter to check the resistance across Phase A. **It should be approximately 2 ohms.**
- ③ Now use the ohmmeter to check the resistance across Phase B. **It should be approximately 2 ohms too (the resistance across Phase A and Phase B should be nearly identical).**
- ④ Use the ohmmeter to check the resistance between Phase A and Phase B. **It should be infinite.**
- ⑤ Use the ohmmeter to check the resistance between Phase A and Earth (the motor case shaft). **It should be infinite.**

- ⑥ Use the ohmmeter to check the resistance between Phase B and Earth (the motor case shaft). **It should be infinite.**
- ⑦ Turn the shaft manually. **There should not be any torque.**

If the motor responds as described to each of these steps, it is probably functioning properly (it may still fail when connected to the drive because of the high motor voltage). The source of the problem is probably within the drive.

## RS-232C Problems

Use the following procedure to troubleshoot communication problems that you may have with the SX.

- ① Be sure the host computer's transmit (**Tx**) wire is wired to the peripheral's receive (**Rx**) connection, and the host computer's receive (**Rx**) wire is wired to the peripheral's transmit (**Tx**) connection. Switch the receive and transmit wires on either the host or peripheral if the problem persists.
- ② Confirm that the host and peripheral are configured for the same baud rate, 8 data bits, 1 stop bit, and no parity.
- ③ If you receive double characters, for instance typing **A** and receiving **AA**, the computer is set for half duplex mode. Change the setup to full duplex mode.
- ④ **Use DC common or signal ground as a 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 To test the terminal or terminal emulation software and the RS-232C cable for proper three-wire communication, unhook the SX and enter a character. You should not receive an echoed character. If you do, you are in half duplex mode. Connect the host's transmit and receive lines together and send another character. You should receive the echoed character. If not, consult the manufacturer of the host's serial interface for proper pin outs.

## Software Debugging Tips

This section offers some helpful tips for debugging your programs or to understand why something may be happening. The SX has several tools that can be used to aid in the determination of a problem in the system design. The software tools are listed below:

<b>R</b>	Report Indexer Status
<b>XTR</b>	Trace Mode
<b>DIN, DOUT</b>	I/O Simulation
<b>XST</b>	Single Step
<b>XS</b>	Sequence Execution Status
<b>DF</b>	Displays Indexer Status
<b>X</b>	Displays state of the Indexer
<b>DR</b>	Displays Interface Option Status
<b>FS</b>	Displays Indexer Status Options
<b>OS</b>	Displays Homing/Jog Status
	Report backs
<b>IS</b>	Display inputs

### Trace Mode

Trace mode is used to display what is occurring as you execute your sequence. By running the trace mode you can see what commands are being executed and if the program stops running you can see what command was last executed. The trace mode along with the interactive mode (**SSI**) will help you to find commands that the Indexer may not recognize. Trace mode is enabled and disabled with the **XTR** command. When enabled, you will execute sequences as you normally would using **XR**. As the sequence is running, the commands are displayed on the screen. **XTR1** enables the Trace mode, **XTR0** disables it.

## I/O Simulation

I/O simulation can be done without actually physically toggling the inputs or outputs using the **DIN** and **DOUT** commands. These commands can be used to your sequences and program.

## Displaying SX Status

There are several commands that you can use to check the SX's status. You can report back the value or setting of almost all of the SX commands by typing the device address followed by the command then a carriage return or a space bar. In this way, you can find out what values you have entered in different commands. The **DR** command reports the current state of the SX. Use this to verify that the SX is configured as you want it. You can use four other report back commands to determine the unit's state. These commands report a binary number. Each bit of the report corresponds to different functions or modes that the SX could be in.

## DFX Command Report Back

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

```

32 31 30 29 23 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 0_0 0 0 0 0 0

```

Bit representations —25-32,13 reserved

### Bit

- |   |  |
|---|--|
| 24 Mode Profile: no = 0, yes = 1                | 10 Execute a sequence: no = 0; yes = 1                 |
| 23 Mode Alternate: no = 0, yes = 1              | 9 Wait on a timer: no = 0, yes = 1                     |
| 21 Hit a software CCW limit: no = 0, yes = 1    | 8 Hit a CCW limit : no = 0, yes = 1                    |
| 20 Hit a software CW limit: no = 0, yes = 1     | 7 Hit a CW limit : no = 0, yes = 1                     |
| 19 Home limit not found = 0, found = 1          | 6 <b>PS</b> (Pause): not waiting = 0, waiting = 1      |
| 18 Jogging: no = 0, yes = 1                     | 5 Abs. move direction: CW = 0, CCW = 1                 |
| 17 Queued for <b>RM</b> mode: no = 0, yes = 1   | 4 Incremental/absolute: <b>MPI</b> = 0, <b>MPA</b> = 1 |
| 16 Run sequence on power up: no = 0, yes = 1    | 3 Mode preset = 0; Continuous = 1                      |
| 15 <b>U</b> command: not waiting =, waiting = 1 | 2 Move direction: CW = 0, CCW = 1                      |
| 14 Waiting for a trigger: no = 0, yes = 1       | 1 Preset move: not moving = 0, moving = 1              |
| 12 Back up to home limit: no = 0; yes = 1       | 0 Continuous move: not moving = 0, moving = 1          |
| 11 Home move—High-speed: no = 0; in process = 1 |  |

**FS** reports a binary word that has various interface options associated with each bit. **OS** reports the homing options and the Jog enable option. **SS** reports various Indexer software options. If **1** is in the bit location, the feature or mode is enabled. Refer to the example below.

```

      A B C D_E F G H_I J K L_MNOP_QRST
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

SSA  RS232 Echo: Echo on = 0, Echo off = 1
SSD  Alternate Mode Stop: end of cycle = 0, immediately = 1
SSG  Clear/Save buffer on limit : clear = 0, Save = 1
SSH  Clear/Save buffer on stop: clear = 0, Save = 1
SSI  Enable/Disable Interactive Mode
SSJ  Enable/Disable Continuous scan mode
SSL  Resume execution enable
SSN  Enable Error Message mode
SSQ  Enable Drive Fault indicator

FSD  Enable/Disable Stop on Stall
FSI  Enable/Disable Following
FSK  Enable Following Learn mode
FSL  Enable following Self Correction mode
FSN  Enable Pulse and Direction following
FSP  Enable Position Tracking

```

- OSA Define Active Level of Limit Switches 1 = Active Low (N.O.)
- OSB Enable back-up to home switch
- OSC Define Active Level 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

## Returning the System

If your SX system is faulty, you must return the drive and motor for replacement or repair. A failed drive can damage motors. If you must return your SX to effect repairs or upgrades, use the following steps:

### Step ①

Get the serial number and the model number of the defective unit(s), and a purchase order number to cover repair costs in the event the unit is determined by Parker Compumotor to be out of warranty.

### Step ②

Before you ship the drive to Parker Compumotor, have someone from your organization with a technical understanding of the SX Indexer/Drive and its application include answers to the following questions:

- What is the extent of the failure/reason for return?
- How long did it operate?
- How many units are still working?
- How many units failed?
- 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 sizing (speed, acceleration, duty cycle, inertia, torque, friction, etc.)?
- What was the system environment (temperature, enclosure, spacing, unit orientation, contaminants, etc.)?
- What upgrades, if any, are required (hardware, software, user guide)?

### Step ③

Call Parker Compumotor's Applications Engineering Department [(800) 358-9070] for a Return Material Authorization (RMA) number. Returned products cannot be accepted without an RMA number.

### Step ④

Ship the unit to:

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

