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Compumotor

AX/SX
Comparison and Compatibility
User Guide

Compumotor Division
Parker Hannifin Corporation
p/n 88-011976-01 A

Parker

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Chapter 1. Replacing The AX With The SX

Chapter Objectives

The information in this chapter will enable you to:

- Recognize S/SX's performance and reliability superiority (vs. the A/AX)
- Recognize the hardware differences between the A/AX and S/SX
- Configure the S/SX into your application to replace the A/AX

How To Use This User Guide

This document describes the hardware and software differences between Compumotor's AX Indexer/Drive and the SX Indexer/Drive. These changes also apply to replacing the A Drive with the S Drive. The S/SX products represent dramatic reliability and performance improvements (when compared to the A/AX).

Follow the step-by-step procedures in this user guide to replace the A Drive or AX Indexer/Drive with the S Drive or SX Indexer/Drive in your application. Instructions and explanations on how to emulate the A/AX's functionality with the S/SX are also provided.

This user guide is a supplement to the S/SX user guides.

- ❑ ***S Drive User Guide*** (in S Drive ship kit)
- ❑ ***SX Indexer/Drive User Guide*** (in SX Indexer/Drive ship kit)
- ❑ ***SX Indexer/Drive Software Reference Guide*** (in SX Indexer/Drive ship kit)

Refer to these user guides for complete hardware and software information on these products.

AX/SX Compatibility

There are several issues that you must consider when replacing an AX with an SX—wiring, number and function of I/O, and differences in software commands. *Chapter 2, Software Reference* provides a complete explanation of the software differences between the products.

Configuring the Drive

This user guide will help you configure the S or SX into your application. You must complete the following steps to replace your A Series unit with an S Series unit and ensure a trouble-free transition:

① Set Motor Current
② Set Auto Test
③ Wire Motor
④ Apply Power
⑤ Wire RS-232C
⑥ Set Indexer Address
⑦ Set Current Waveform (Optional)
⑧ Set Motor Resolution
⑨ Wire Inputs and Outputs
⑩ Test RS-232C

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Figure 1-1 shows the A Drive and S Drive.

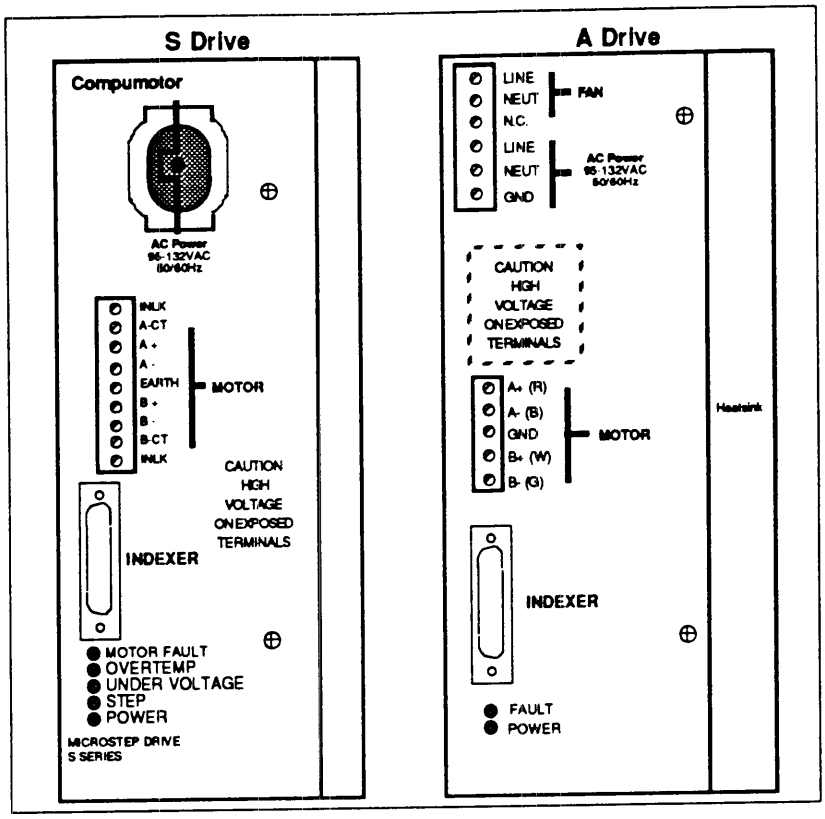


Figure 1-1. S Drive and A Drive Front Panels

Figure 1-2 shows the AX Indexer/Drive and SX Indexer/Drive.

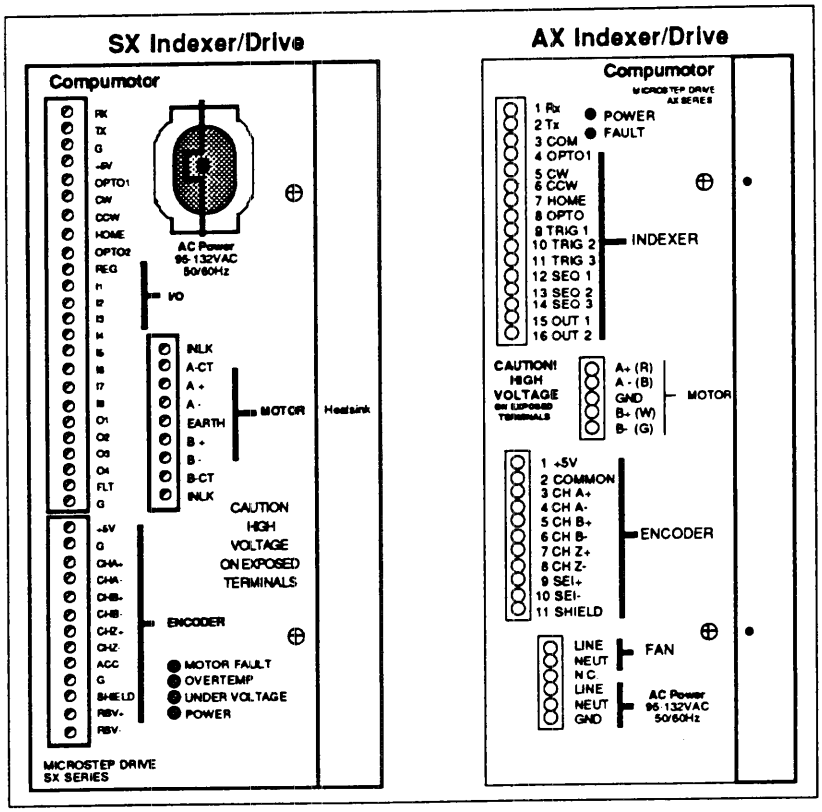


Figure 1-2. SX and AX Front Panels

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DIP Switches

The DIP switches for the A Series and S Series have different numbers of DIP switches and different functions for these switches. Figures 1-3 and 1-4 show the location of each units DIP switches and summarizes their functions.

The DIP switches on the S and SX are only read during power up. Changes made to the DIP switch settings while power is on will have no affect. You must modify DIP switches while power is off (and then power up the unit) or cycle power after changing DIP switches while power is on.

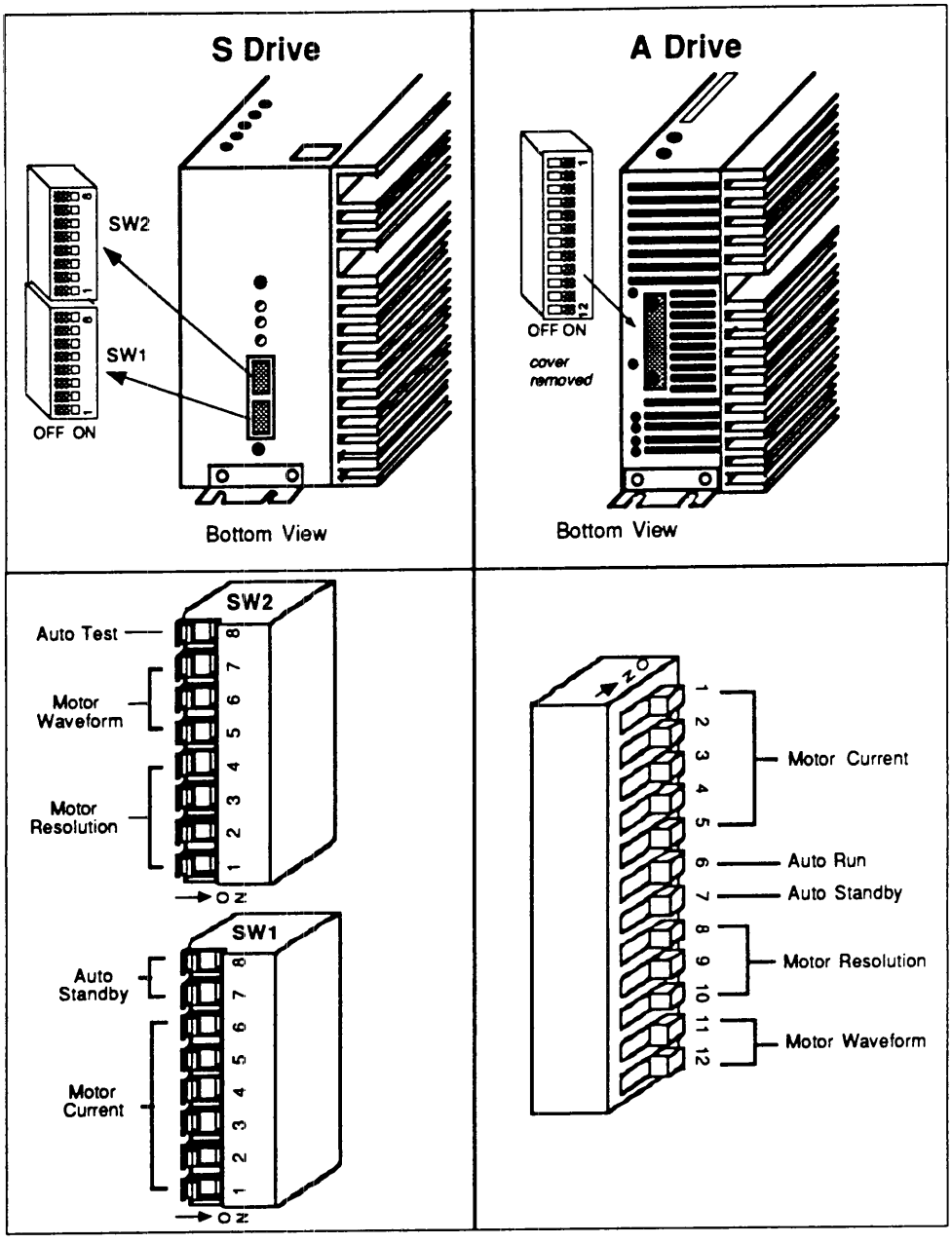


Figure 1-3. A & S Drive DIP Switches and Functions

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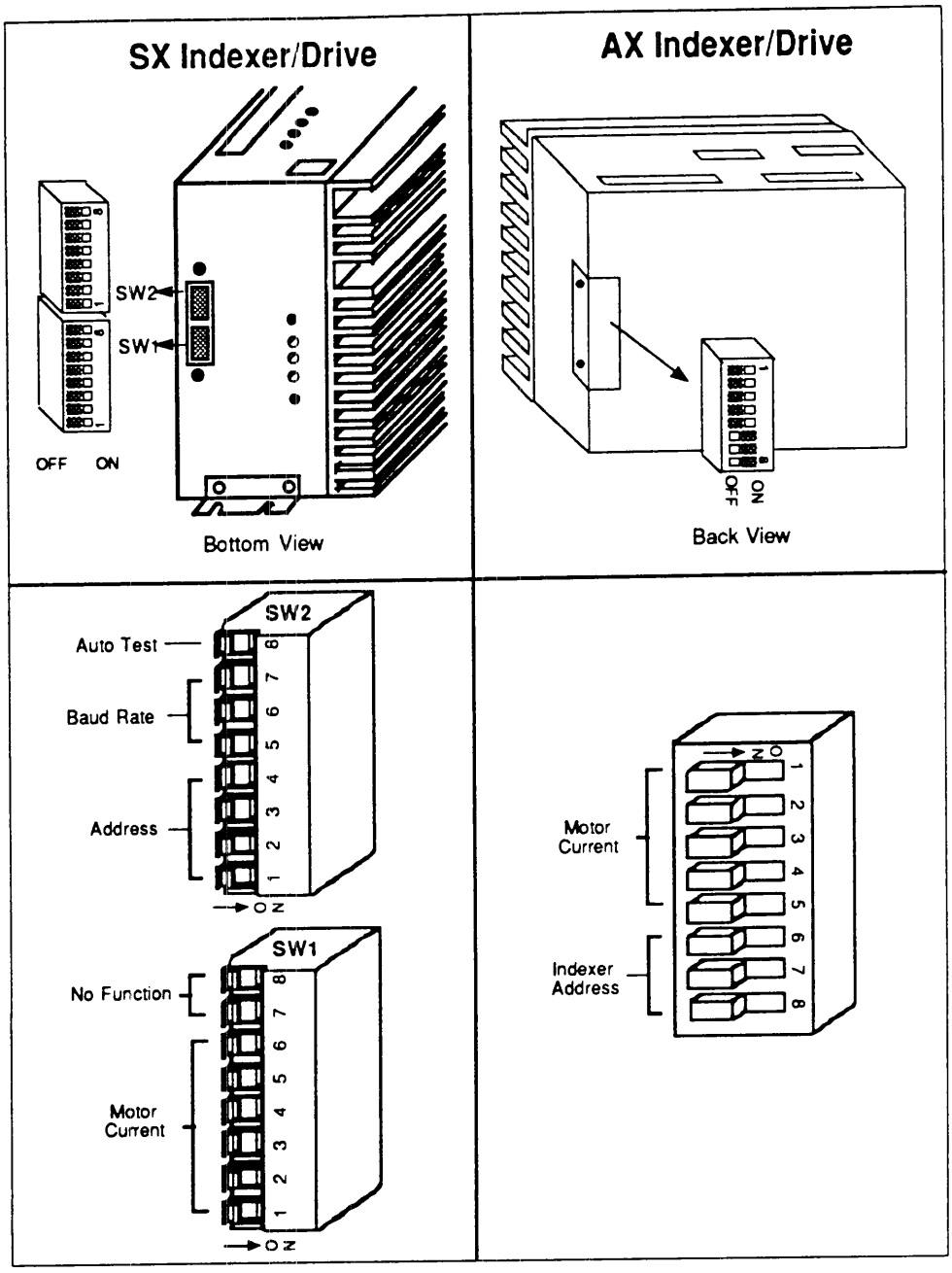


Figure 1-4. AX & SX Indexer/Drive DIP Switches and Functions

① *Set Motor Current*

The AX has 5 DIP switches for setting the motor current. The SX has 6 DIP switches for setting motor current. To set motor current:

① Be sure that power is not applied to the unit.
② Remove the panel that covers the DIP switches (refer to Figure 1-2).
③ Set the motor current for your Compumotor motor using Table 1-1. `SW1-#1` thru `SW1-#6` control motor current (refer to Figure 1-2). Adjust the DIP switches for motor current to match the drive and motor that you are using.

The SX offers many motor performance improvements over the AX.

- ❑ The SX offers a greater speed/torque ratio (refer to the speed/torque curves in *Chapter 3, AX/SX Performance Specifications*)
- ❑ The SX offers greater smoothness at all speeds (when used with S/SX motors)
- ❑ The SX can support a wider range of motors

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*To obtain **all** of these advantages, Compumotor recommends that you replace the AX Indexer/Drive and motor with the SX Indexer/Drive and motor.*

Drive/Motor Size The SX and AX offer low-power and high-power versions. Table 1-1 shows motor current settings for low-power versions of the S/SX (S6 and SX6) and A/AX (AL and AXL) when used with A and S Series motors. The low-power drives are intended to run 57- and 83-size hybrid stepping motors. The high-power drives are designed to run the 106-size hybrid stepping motors. Tables 1-1 and 1-2 show motor current settings for low- and high-power versions of the S/SX and A/AX when used with A and S Series motors. If you are replacing the drive, motor, or both, use these tables to set motor current correctly.

Motor Inductance The A Series uses 2-state amplifiers and is designed to operate high-inductance motors. The S Series uses 3-state amplifiers and is designed to operate low-inductance motors. Low-inductance motors can improve system performance at high speeds. Low-inductance motors also generate less heat than high-inductance motors when they are used with a three-state amplifier.

-RES Option The S Series' amplifier was designed to operate low-inductance motors. The drive can run high-inductance A Series motors without incurring any damage, but system performance may be adversely affected. Compumotor offers a -RES option with the S6 and SX6 (low-power versions). The -RES option allows the S6 and SX6 to run 57- and 83-size A Series motors (which have higher inductances than S Series motors). The S8 and SX8 (high-power versions) can run the 106-size A Series motor's without degrading system performance.

CAUTION

Never attempt to run an S Series motor with an A Series Drive. System damage is likely to occur

	S6/SX6 (S Series Motor)						S6/SX6 (A Series Motor)						AL/AXL (A Series Motor)				
Motor	**#1**	**#2**	**#3**	**#4**	**#5**	**#6**	**#1**	**#2**	**#3**	**#4**	**#5**	**#6**	**#1**	**#2**	**#3**	**#4**	**#5**
57-51S	off	off	on	on	off	off	off	off	off	off	on	on	off	off	off	on	on
57-51P	off	on	on	off	off	off	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
57-83S	off	on	off	off	off	off	off	off	off	on	off	on	off	off	on	off	off
57-83P	on	off	off	off	off	off	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
57-102S	off	on	off	off	on	off	off	off	off	off	on	off	off	off	on	on	on
57-102P	on	off	off	on	off	off	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
83-62S	off	on	off	on	on	on	off	off	on	off	off	on	off	on	off	off	off
83-62P	on	off	on	on	on	off	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
83-93S	off	on	on	on	on	off	off	off	on	on	on	off	off	on	on	on	off
83-93P	on	on	on	off	on	on	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
83-135S	on	off	off	on	off	off	off	on	off	on	off	on	on	off	on	off	off
83-135P	on	on	on	on	on	on	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

S: Series Configuration P: Parallel Configuration

Table 1-1. Setting Motor Current for Low-Power Drives (Compumotor Motors)

	S8/SX8 (S Series Motor)						S8/SX8 (A Series Motor)						AH/AXH (A Series Motor)				
Motor	**#1**	**#2**	**#3**	**#4**	**#5**	**#6**	**#1**	**#2**	**#3**	**#4**	**#5**	**#6**	**#1**	**#2**	**#3**	**#4**	**#5**
106-120S	NA	NA	NA	NA	NA	NA	off	on	off	on	off	off	off	on	off	off	on
106-120P	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
106-178S	on	off	on	on	on	on	on	off	on	off	off	on	on	off	on	off	on
106-178P	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on
106-205S	off	on	on	on	off	off	off	on	on	on	off	off	on	on	on	on	on
106-205P	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on	on
106-250S	on	off	on	on	on	on	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
106-250P	on	on	on	on	on	on	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

S: Series Configuration P: Parallel Configuration

Table 1-2. Setting Motor Current for High-Power Drives (Compumotor Motors)

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② *Set Auto Test*

Turn DIP switch **SW2-#8** on to enable the Automatic Test function (refer to Figure 1-2). This function rotates the motor in an Alternating mode approximately 6 revolutions at 1 rps as soon as power is applied. ***Do not apply power at this time.***

After you have properly set motor current (**SW1-#1** thru **SW1-#6**) and the Automatic Test function (**SW2-#8**), **do not change any other DIP switch settings**. All other DIP switch settings will be discussed later.

③ *Wire Motor*

The SX's motor connector is different than the AX's motor connector. The SX has a 9-pin phoenix connector (*the first S Drive release had a 7-pin connector, the S Drive now uses the 9-pin connector*). The AX has a 5-pin phoenix connector (see Figure 1-3). When wiring an AX motor to an SX, replace the 5-pin phoenix connector with a 9-pin connector. All of the connections on the A Series 5-pin connector are available on the S Series 9-pin connector. The additional connections are explained below.

Motor/Drive Protection

The S Series' additional terminals are for a hardware interlock (**INLK**). The interlock protects the connector from damage if the motor is accidentally disconnected while power is applied. The SX also provides complete motor short-circuit protection. *A rubber safety boot is provided to protect the motor's screw terminal connections* (the AX does not offer these features).

Series and Parallel Wiring

Compumotor ships all SX systems in series configurations*, but all S Series motors can be wired in series and parallel configurations with the S/SX. Only the A Series 106 type motors can be wired in series and parallel (all other A Series motor types must be wired in series configurations).* The S Series center tap terminals (**A-CT** and **B-CT**) make it easy for you to change your wiring configuration from series to parallel. The ability to choose a series or parallel configuration allows you to select from a variety of performance options that are not possible with series-only configurations (which the A/AX provide). Refer to the ***SX Indexer/Drive User Guide*** for specific motor configuration instructions.

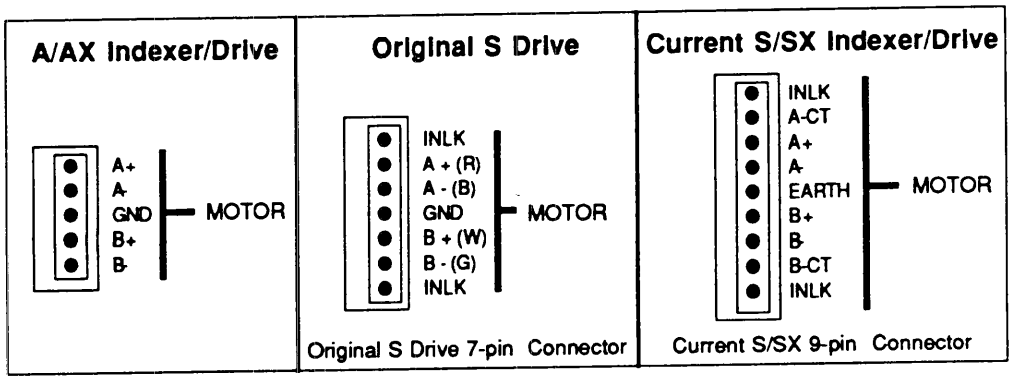


Figure 1-5. AX/SX Motor Connectors

	8 Lead (Series)*	8 Lead (Parallel)	4 Lead (S & P)
Pin	Color	Color	Color
A+	Red	Red & Blue	Red
A-	Black	Black & Yellow	Black
GND	Shield	Shield	Shield
B+	White	White & Brown	White
B-	Green	Green & Orange	Green
	Jumper INLK to INLK	Jumper INLK to INLK	Jumper INLK to INLK

Compumotor ships all SX systems in series configurations
*** To wire the 8-lead motor in series, tie the Yellow and Blue wires together and insulate, tie the Orange and Brown wires together and insulate.***

Table 1-3. Color Code—7-Pin S Drive Motor Connector

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	8 Lead (Series)	8 Lead (Parallel)	4 Lead (S & P)
Pin	Color	Color	Color
A-CT	Yellow & Blue	N.C.	N.C.
A+	Red	Red & Blue	Red
A-	Black	Black & Yellow	Black
EARTH	Shield	Shield	Shield
B+	White	White & Brown	White
B+	Green	Green & Orange	Green
B-CT	Orange & Brown	N.C.	N.C.
	Jumper INLK to INLK	Jumper INLK to INLK	Jumper INLK to INLK

Compumotor ships all SX systems in series configurations

Table 1-4. Color Code—9-Pin SX Motor Connector

Pin	Color
A+	Red
A-	Black
GND	Shield
B+	White
B-	Green

Table 1-5. Color Code—5-Pin A/AX Motor Connector

④ *Apply Power*

The load should not be connected to the motor. If the load is connected, disconnect it from the motor. Plug the molded AC cable into the power connector on the SX. *The metal power cable retainer that fits over the power cable prevents accidental power losses.* Plug the other end of the cable into a 115VAC power source. The motor should rotate in an Alternating mode approximately 6 revolutions at 1 rps. The green power LED should be on. **To stop the motor, unplug the power cable from the power source. The motor may continue to run for a few seconds after you remove power.**

DIP switch settings only take effect upon power-up. Changing DIP switch settings with power applied will not have any effect. Compumotor recommends that you change settings with power off. If you do change the settings with power applied, you must cycle power to apply the new setting.

⑤ *Wire RS-232C*

The wiring for RS-232C serial communications is the same for the AX and the SX. Refer to the *Chapter 3, Installation* in the ***SX Indexer/Drive User Guide*** for the specific three-wire configuration.

⑥ *Set Indexer Address*

On the SX, switches `SW2-#1` thru `SW2-#4` control the device address (refer to Table 1-6). Each SX is factory set to device address 1. *If you are using multiple units, each SX must have a unique device address.*

	SX DIP Switches				AX DIP Switches		
Address	SW2-#1	SW2-#2	SW2-#3	SW2-#4	#6	#7	#8
*1	off	off	off	off	on	on	on
2	on	off	off	off	off	on	on
3	off	on	off	off	on	off	on
4	on	on	off	off	off	off	on
5	off	off	on	off	on	on	off
6	on	off	on	off	off	on	off
7	off	on	on	off	on	off	off
8	on	on	on	off	off	off	off
9	off	off	off	on			
10	on	off	off	on			
11	off	on	off	on			
12	on	on	off	on			
13	off	off	on	on			
14	on	off	on	on			
15	off	on	on	on			
16	on	on	on	on			

* Default Setting

Table 1-6. Indexer Address Settings

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⑦ Set Motor Waveform

Modifying your motor waveform can help you overcome resonance problems and promote smooth motor operation. The A/AX and S/SX handle waveform selection differently.

- ❑ The AX does not allow you to control the motor waveform via DIP switches (you must use the Select Waveform [WV] software command).
- ❑ The SX does not allow you to control the motor waveform via DIP switches (you must use the Motor Waveform [MW] software command).

AX —Select Waveform (WV) Command		SX—Motor Waveform (MW) Command	
WV1	-8% 3rd Harmonic	MW1	0% 3rd Harmonic
WV2	-6% 3rd Harmonic	MW2	-2% 3rd Harmonic
WV2	-4% 3rd Harmonic	MW3**	-4% 3rd Harmonic
WV3	-2% 3rd Harmonic	MW4	-6% 3rd Harmonic
WV4	0% 3rd Harmonic	MW5	-10% 3rd Harmonic
WV5*	+2% 3rd Harmonic		
WV6	+4% 3rd Harmonic		
WV7	+6% 3rd Harmonic		
WV8	+8% 3rd Harmonic		

* Default AX Motor Waveform Setting
** Default SX Motor Waveform Setting

Table 1-7. AX/SX Motor Waveforms

- ❑ DIP switches #11 and #12 control the motor waveform on the A Drive.
- ❑ On the SX, DIP switches SW2-#5 thru SW2-#7 control the waveform shape (refer to Table 1-8). This function will not operate when 200- and 400-step motor resolutions are used.
- ❑ On the S/SX, you can change the waveform *on-the-fly* (without cycling power)

	S Drive DIP Switches				A Drive DIP Switches	
Motor Waveform	SW2-#5	SW2-#6	SW2-#7	Motor Waveform	#11	#12
Pure Sine	on	on	off	Pure Sine	on	on
-2% 3rd Harmonic	on	off	on	+4% 3rd Harmonic	on	off
*-4% 3rd Harmonic***	off	off	off	-4% 3rd Harmonic	off	on
-4% 3rd Harmonic	on	on	on	*Pure Sine**	off	off
-4% 3rd Harmonic	on	off	off			
-6% 3rd Harmonic	off	on	on			
-8% 3rd Harmonic	off	on	off			
-10% 3rd Harmonic	off	off	on			

* Default A Drive Motor Waveform Setting
** Default S Drive Motor Waveform Setting

Table 1-8. A Drive/S Drive Motor Waveforms

⑧ Set Motor Resolution

To configure the SX like the AX (resolution 12800 steps/rev), you must issue a Set Motor Resolution (MR7 or MR128ØØ) command to set the SX's motor resolution to 12800 steps/rev. MR automatically shuts down the SX while it changes resolutions. The SX is re-enabled after the resolution is changed. *The S Series offers twice as many motor resolution options as the A Series.*

A	200, 400, 2000, 5000, 10000, 18000, 20000, ***25000****
AX	12800 (*Fixed*)
S/SX	200, 400, 1000, 2000, 5000, 10000, 12800, 18000, 20000, 21600, ***25000****, 25400, 25600, 36000, 50000, 50800

*Default Settings

Table 1-9. Motor Resolutions

⑨ Wire Inputs and Outputs

The phoenix connections for OPTO1, OPTO2, Limits, (CW, CCW and Home) and the encoder are all functionally the same for the SX and AX. The SX, however, offers several significant I/O improvements and features:

- ❑ The AX's 6 trigger and sequence inputs have been replaced by 8 programmable inputs on the SX (refer to Figure 1-6).

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- The SX's OPTO1 and OPTO2 terminals can handle 5 - 24VDC, while the AX's only accepts 5 - 12VDC.
- The AX's 2 open *emitter* outputs have been replaced by 4 programmable open *collector* outputs on the SX (refer to Figure 1-6).
- The SX can be programmed to emulate the AX's trigger and sequence capabilities. You must use the following Set Input Function (IN) commands: IN1A IN2A IN3A IN4B IN5B IN6B. These commands set SX inputs 1-3 as trigger inputs, and inputs 4-6 as sequence select inputs (just like the AX). Refer to the ***SX Software Reference Guide*** for more about these commands.
- The S/SX offers a Zero Phase Input. Since the S/SX can operate linear motors, the Zero Phase Input can be used to align and reset gantry systems.
- The S/SX offers a Fault output that can alert a terminal or computer if a critical error occurs within the drive.

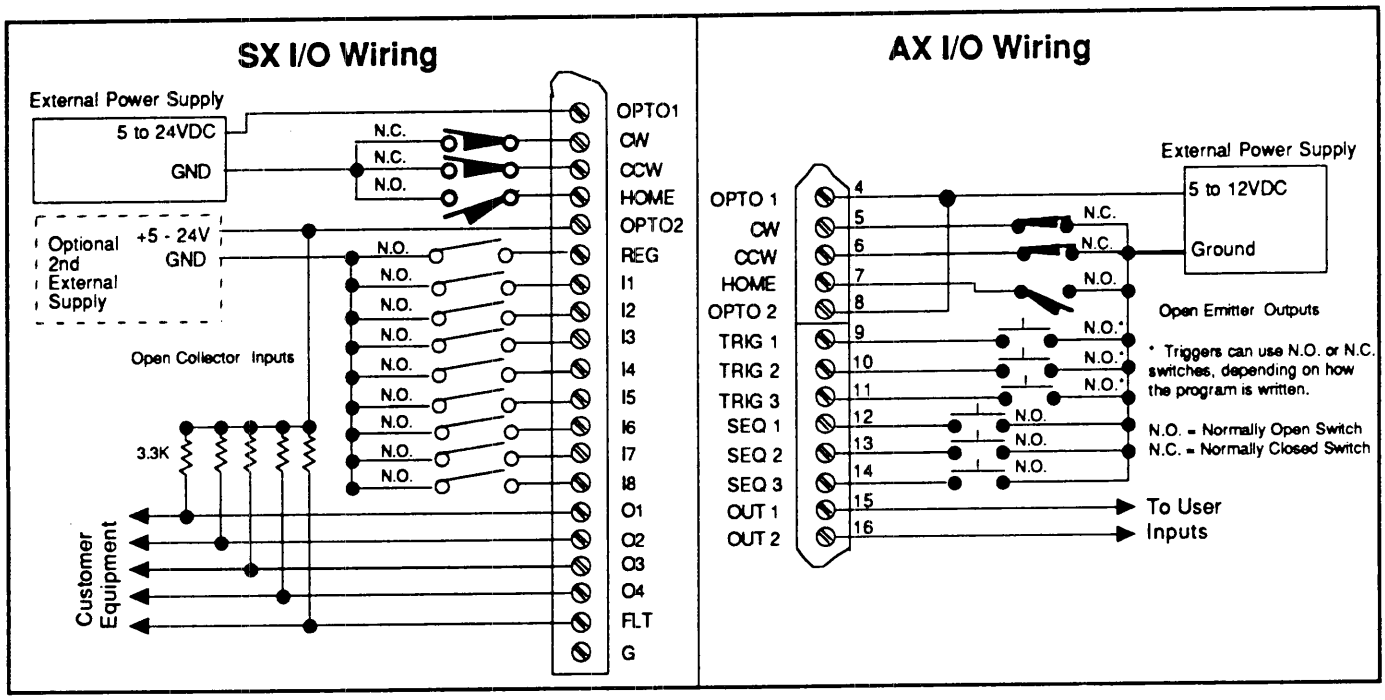


Figure 1-6. SX and AX I/O Wiring Diagrams

If you have problems configuring the SX's I/O to match the AX, refer to the following commands in the ***SX Software Reference Guide***.

<a>DIN Provides information on the state of the inputs (active, inactive, enabled). The inputs should be enabled (DINEEEEEEEEEEEEE).

<a>DOUT Provides data on the state of the outputs (active, inactive, enabled). The outputs should be enabled (DOUTEEEEEEEEEEEE).

<a>INL Provides data on the active level of the inputs (high, low).

<a>IN Provides information on the status of the input functions.

<a>IS Provides information on the state of the inputs.

⑩ *Test RS-232C* To ensure that your SX configuration is wired properly, complete the procedures in *Chapter 2. Getting Started* in your ***SX Indexer/Drive User Guide***. The successful completion of these procedures indicates that you have wired the SX properly and correctly set the DIP switches.

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AX/SX Mounting

For your convenience, the SX was designed to be mounted in the same minimum-width and minimum-depth configurations as the AX. No additional mounting issues require consideration (*e.g., heat dissipation: the S and SX run cooler than the A and AX*). For specific dimension information, diagrams, or mounting procedures, refer to the Compumotor's current ***Programmable Motion Control Catalog*** or the user guides for the respective products.

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Chapter 2. Software Reference

Chapter Objective

The information in this chapter will enable you to:

- Recognize the software differences between the AX and SX
- Use practical programming examples to modify your AX programs for SX use
- Understand programming issues associated with using Compumotor's Model 72 and TM8 Thumbwheel Modules with the AX and SX

AX/SX Software Differences

The following tables list of AX commands and their SX functional differences. Not all of the SX commands are included. For a complete list of all SX commands and descriptions, refer to the ***SX Indexer/Drive Software Reference Guide***.

Common AX/SX Commands

The following commands are functionally the same in the AX and SX. *The command parameters and ranges may vary between products.*

- ❑ A—Acceleration
- ❑ B—Buffer Status Report
- ❑ BS—Buffer Size Status
- ❑ C—Continue
- ❑ CR—Carriage Return
- ❑ D—Distance
- ❑ E—Enable RS-232C Communication Interface
- ❑ ER—Encoder Resolution
- ❑ F—Disable RS-232C Communication Interface
- ❑ FSB—Enable/Disable Encoder Step Mode
- ❑ FSC—Enable/Disable Position Maintenance
- ❑ FSD—Enable/Disable Stop on Stall
- ❑ G—Go
- ❑ ^H—Backspace
- ❑ H—Change Direction
- ❑ K—Kill
- ❑ L—Loop
- ❑ LD—Limit Disable
- ❑ LF—Line Feed
- ❑ MC—Mode Continuous
- ❑ MN—Mode Normal
- ❑ MPA—Set Indexer to Absolute Position Mode
- ❑ MPI—Set Indexer to Incremental Position Mode
- ❑ N—End of Loop
- ❑ O—Output
- ❑ OSB—Backup to Home Switch
- ❑ OSC—Define Active State of Home Switch
- ❑ OSH—Reference Edge of Home Switch
- ❑ PR—Absolute Position Report
- ❑ PS—Pause
- ❑ PX—Report Encoder Position
- ❑ PZ—Set Absolute Counter to Zero
- ❑ "—Quote Command
- ❑ Q0—Exit Velocity Profiling Mode
- ❑ Q1—Enter Velocity Profiling Mode
- ❑ R—Request Indexer Status
- ❑ RA—Limit Switch Status Report
- ❑ RB—Loop, Pause, Shutdown, Trigger Status Report
- ❑ RM—Rate Multiplier in Velocity Streaming Mode
- ❑ RS—Report Sequence Execution
- ❑ RV—Revision Level Report
- ❑ S—Stop
- ❑ SN—Scan
- ❑ SSA—RS-232 Echo Control
- ❑ SSD—Alternate Stop Mode
- ❑ SSG—Clear/Save the Command Buffer on Limit
- ❑ SSH—Clear/Save the Command Buffer on Stop
- ❑ ST—Shutdown
- ❑ T—Time Delay
- ❑ TEST—System Test
- ❑ TR —Wait for Trigger
- ❑ TS—Trigger Input Status
- ❑ V—Velocity
- ❑ W1—Signed Binary Position Report
- ❑ W3—Signed (±) Position Report
- ❑ XC—Sequence Checksum Report
- ❑ XD—Sequence Definition
- ❑ XE—Sequence Erase
- ❑ XQ—Sequence Interrupted Run Mode
- ❑ XR—Sequence Run
- ❑ XRP—Sequence Run with Pause
- ❑ XT—Sequence Termination
- ❑ XU—Upload Sequence
- ❑ Y—Stop Loop
- ❑ Z—Reset

Unique AX Commands

The following commands are only available with the AX:

- ❑ AC—Acceleration Change
- ❑ CA—Change Acceleration
- ❑ CBC—Clear Buffered Commands
- ❑ CG—Correction Gain)
- ❑ CL—Continuous Velocity Loop
- ❑ CN—Continuous Mode End Loop
- ❑ CO—Continuous Mode Output
- ❑ CTM—Continuous Mode Time Delay
- ❑ CTR—Constant Velocity Wait for Trigger
- ❑ DB—Dead Band
- ❑ FR—Encoder Functions Report
- ❑ FSG—Turn on Output 2 when within Dead Band
- ❑ OR—Report Homing Function Set-up
- ❑ OSD—Define Active State of Z Channel Input
- ❑ RC—Closed Loop Status
- ❑ SC—Standby Current
- ❑ SV—Servoing Parameter
- ❑ XSP—Sequence Status Power-up
- ❑ XZ—Set Power-up Sequence to Zero
- ❑ VC—Change Velocity in Continuous Mode
- ❑ WV—Select Waveform
- ❑ XP—Set Power-up Sequence Mode

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Unique SX Commands

The following commands are only available with the SX:

- #—Sequence
- ;—Comment Field
- AD—Deceleration
- BCPE—Buffered Configure Position Error
- BCPG—Buffered Configure Proportional Gain
- BCPM—Buffered Configure Proportional Max.
- BL—Backlash
- CPE—Configure Position Error
- CPM—Configure Position Maximum
- CPG—Correction Proportional Gain
- DFS—Display Controller Status
- DFX—Display Indexer Status
- DIN—Disable Inputs
- DOUT—Disable Outputs
- DP—Distance Point
- DPA—Display Position: Actual
- DPE—Display Position Error
- DPS—Display Setpoint Position
- DR—Display Parameters
- DRD—Read Distance Via Parallel I/O
- DVA—Display Velocity: Actual
- DVS—Display Velocity Setpoint
- DW—Dead Band Window
- ELSE—Else
- FBA—Incremental/Absolute Position Selection
- FBS—Following Base Count
- FC—Following Encoder Expected Count
- FIN—Following Increment
- FOL—Following Percent
- FOR—Following Ratio Motor/Encoder
- FP—Following Encoder Distance Point
- FRD—Read Following Via Parallel I/O
- FSI—Enable/Disable Following Mode
- FSK—Enable/Disable Following Learn Mode
- FSL—Enable/Disable Self-Synchronization
- FSM—Set Absolute Encoder
- FSN—Set Pulse Following
- FSO—Set System Recovery
- FSP—Set Tracking Mode
- GD—Go Predefined Move
- GDEF—Configure Predefined Move
- GHA—Go Home Acceleration
- GHAD—Go Home Deceleration
- GHF—Go Home Final Velocity
- GHV—Go Home Velocity
- GOSUB—GOSUB Sequence
- GOTO—GOTO Sequence
- HALT—Halt
- ID—Immediate Distance
- IF—If
- IN—Set Input Functions
- INL—Set Active Input Level
- INR—Enable/Disable Registration Input
- IO—Immediate Output
- JA—Jog Acceleration
- JAD—Jog Deceleration
- JVH—Jog Velocity (High)
- JVL—Jog Velocity (Low)
- LAD—Limit Deceleration
- LRD—Read Loop Count via Parallel I/O
- MPP—Set Indexer to Profile Position Mode
- MR—Select Motor Resolution
- MW—Set Motor Waveform
- NG—End Position Profile
- NIF—End of IF
- NWHILE—End of While
- OFF—Off
- ON—On
- OS—Function Set-Up Report
- OSE—Jog Enable
- OSG—Final Homing Direction
- OUT—Set Output Functions
- OUTL—Set Active Output Level
- OUTP—Output on Position
- PF—Follower Position Report
- PFZ—Set Follower Position to Zero
- PHZ—Zero Motor Phase
- PU—Configure Square Wave
- PUL—Activate Square Wave
- REG—Configure Registration Move
- REPEAT—Repeat
- RG—Go Home Status Report
- RIFS—Return Indexer to Factory Settings
- RSE—Report Indexer Errors
- RSIN—Read Variable
- SCR—Set Standby Current Reduction
- SFL—Set User Flag
- SL—Software Limits Enable
- SLD—Software Limits Disable
- SP—Set Position Absolute
- SSI—Enable/Disable Interactive Mode
- SSJ—Enable/Disable Continuous Scan Mode
- SSL—Enable/Disable Resume Execution
- SSN—Message Mode
- SSR—Enable/Disable Fault On Shutdown
- STOP—Stop
- STR—Set Strobe Output Delay Time
- TDR—Set Registration Debounce
- TF—Set Following Time
- TM—Time of Last Motion
- TRD—Read Timer from Parallel I/O
- TW—Thumbwheel Inputs
- UNTIL—Until
- VAR—Variables
- VARD—Read Variables from Parallel I/O
- VRD—Read Velocity from Parallel I/O
- VS—Start/Stop Velocity
- W2—Hexadecimal Position Report
- WHEN—Signed Binary Position Report
- WHILE—Signed Binary Position Report
- XBS—Report Sequence Memory Available
- XDIR—Sequence Directory
- XEALL—Erase All Sequences
- XFK—Set Fault or Kill Sequence
- XG—GOTO Sequence
- XRD—Read Sequence via Parallel I/O
- XS—Sequence Execution Status
- XST—Single Step Mode
- XTR—Set Trace Mode
- XWHEN—When Sequence

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Complete AX Command List

"—Quote

A—Acceleration
AC—Acceleration Change

B—Buffer Status Report
BS—Buffer Size Status

C—Continue
CA—Change Acceleration
CBC—Clear Buffered Commands
CG—Correction Gain)
CL—Continuous Velocity Loop
CN—Continuous Mode End Loop
CO—Continuous Mode Output
CR—Carriage Return
CTM—Continuous Mode Time Delay
CTR—Constant Velocity Wait for Trigger
CV—Change Velocity

D—Distance
DB—Dead Band
DW—Dead Band Window

E—Enable Communications
ER—Encoder Resolution

F—Disable Communications
FR—Encoder Functions Report
FSA—Set Indexer to Incremental/Absolute Mode
FSB—Set Indexer to Motor/Encoder Mode
FSC—Enable/Disable Position Maintenance
FSD—Stop on Stall
FSE—Turn on Output 1 on Stall
FSF—Kill Motion on Trigger 3
FSG—Turn on Output 2 when within Dead Band
FSH—Stall Detection

G—Go
GH—Go Home

^H—Delete
H—Set Direction

IS—Input Status

K—Kill

L—Loop
LD—Limit Disable
LF—Line Feed

MC—Mode Continuous
MN—Mode Normal
MPA—Mode Position Absolute
MPI—Mode Position Incremental

N—End of Loop

O—Output
OR—Report Homing Function Set-up
OSB—Back up to Home Switch
OSC—Define Active State of Home
OSD—Define Active State of Z Channel Input
OSH—Reference Edge of Home Switch

PR—Position Report
PS—Pause
PX—Report Absolute Encoder Position
PZ—Position Zero

Q0—Exit Velocity Profiling Mode
Q1—Enter Velocity Profiling Mode

R—Request Indexer Status
RA—Limit Switch Status Report
RB—Loop, Pause, Shutdown, Trigger Status Request
RC—Closed Loop Status
RM—Rate Multiplier in Velocity Streaming Mode
RS—Status of Sequence Execution
RV—Revision

S—Stop
SC—Standby Current
SCA—Standby Current Automatically
SN—Scan
SSA—RS-232C Echo Control
SSD—Stop on Limit Input
SSG—Clear/Save the Command Buffer On Limit
SSH—Clear/Save the Command Buffer on Stop
ST—Shutdown
SV—Servoing Parameter

T—Time Delay
TEST—System Test Routine
TR —Wait for Trigger
TS—Trigger Input Status

U—Pause and Wait for Continue

V—Velocity
VC—Change Velocity in Continuous Mode

W1—Signed Binary Position Report
W3—Hexadecimal Position Report
WV—Select Waveform

XC—Sequence Checksum
XD—Sequence Definition
XE—Sequence Erase
XP—Set Power-up Sequence Mode
XQ—Sequence Interrupted Run Mode
XR—Sequence Run
XRP—Sequence Run with Pause
XSD—Sequence Download Status
XSP—Sequence Status Power-up
XSR—Sequence Run Status
XSS—Sequence Status
XT—Sequence Termination
XU—Sequence Upload
XZ —Set Power-up Sequence to Zero

Y—Stop Loop

Z—Reset

Complete SX Command List

"—Quote Command
#—Sequence
;—Comment Field

A—Acceleration
AD—Deceleration

B—Buffer Status Report
BCPE—Buffered Configure Position Error
BCPG—Buffered Configure Proportional Gain
BCPM—Buffered Configure Proportional Max.
BL—Backlash
BS—Buffer Status Report

C—Continue
CPE—Configure Position Error
CPM—Configure Position Maximum
CPG—Correction Proportional Gain
CR—Carriage Return

D—Distance
DFS—Display Controller Status
DFX—Display Indexer Status
DIN—Disable Inputs
DOUT—Disable Outputs
DP—Distance Point
DPA—Display Position: Actual
DPE—Display Position Error
DPS—Display Setpoint Position
DR—Display Parameters
DRD—Read Distance Via Parallel I/O
DVA—Display Velocity: Actual
DVS—Display Velocity Setpoint
DW—Dead Band Window

E—Enable RS-232C Communication Interface
ELSE—Else
ER—Encoder Resolution

F—Disable RS-232C Communication Interface
FBA—Incremental/Absolute Position Selection
FBS—Following Base Count
FC—Following Encoder Expected Count(Synchronization)
FIN—Following Increment
FOL—Following Percent
FOR—Following Ratio Motor/Encoder

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FP—Following Encoder Distance Point
FRD—Read Following Via Parallel I/O
FS—Encoder Function Report
FSB—Enable/Disable Encoder Step Mode
FSC—Enable/Disable Position Maintenance
FSD—Enable/Disable Stop on Stall
FSI—Enable/Disable Following Mode
FSK—Enable/Disable Following Learn Mode
FSL—Enable/Disable Self-Synchronization
FSM—Set Absolute Encoder
FSN—Set Pulse Following
FSO—Set System Recovery
FSP—Set Tracking Mode

G—Go
GD—Go Predefined Move
GDEF—Configure Predefined Move
GH—Go Home
GHA—Go Home Acceleration
GHAD—Go Home Deceleration
GHF—Go Home Final Velocity
GHV—Go Home Velocity
GOSUB—GOSUB Sequence
GOTO—GOTO Sequence

H—Change Direction
^H—Backspace
HALT—Halt

ID—Immediate Distance
IF—If
IN—Set Input Functions
INL—Set Active Input Level
INR—Enable/Disable Registration Input
IO—Immediate Output
IS—Input Status Report
IV—Immediate Velocity

JA—Jog Acceleration
JAD—Jog Deceleration
JVH—Jog Velocity (High)
JVL—Jog Velocity (Low)

K—Kill

L—Loop
LAD—Limit Deceleration
LD—Limit Disable
LF—Line Feed
LRD—Read Loop Count via Parallel I/O

MC—Mode Continuous
MN—Mode Normal
MPA—Set Indexer to Absolute Position Mode
MPI—Set Indexer to Incremental Position Mode
MPP—Set Indexer to Profile Position Mode
MR—Select Motor Resolution
MW—Set Motor Waveform

N—End of Loop
NG—End Position Profile
NIF—End of IF Command
NWHILE—End of While

O—Function Set-Up Report
OFF—Off
ON—On
OS—Function Set-Up Report
OSB—Backup to Home Switch
OSC—Define Active State of Home Switch
OSD—Enable Encoder Z Channel Input
OSE—Jog Enable
OSG—Final Homing Direction
OSH—Reference Edge of Home Switch
OUT—Set Output Functions
OUTL—Set Active Output Level
OUTP—Output on Position

PF—Follower Position Report
PFZ—Set Follower Position to Zero
PHZ—Zero Motor Phase
PR—Absolute Position Report
PS—Pause
PU—Configure Square Wave
PUL—Activate Square Wave
PX—Report Encoder Position
PZ—Set Absolute Counter to Zero

Q0—Exit Velocity Profiling Mode
Q1—Enter Velocity Profiling Mode

R—Request Indexer Status
RA—Limit Switch Status Report
RB—Loop, Pause, Shutdown, Trigger Status Report
REG—Configure Registration Move
REPEAT—Repeat
RG—Go Home Status Report
RIFS—Return Indexer to factory Settings
RM—Rate Multiplier in Velocity Streaming Mode
RS—Report Sequence Execution
RSE—Report Model 500 Errors
RSIN—Read Variable
RV—Revision Level Report

S—Stop
SCR—Set Standby Current Reduction
SFL—Set User Flag
SL—Software Limits Enable
SLD—Software Limits Disable
SN—Scan Delay Time
SP—Set Position Absolute
SS—Function Set-Up Report
SSA—RS-232 Echo Control
SSD—Alternate Stop Mode
SSG—Clear/Save the Command Buffer on Limit
SSH—Clear/Save the Command Buffer on Stop
SSI—Enable/Disable Interactive Mode
SSJ—Enable/Disable Continuous Scan Mode
SSL—Enable/Disable Resume Execution
SSN—Message Mode
SSR—Enable/Disable Fault On Shutdown
ST—Shutdown
STOP—Stop
STR—Set Strobe Output Delay Time

T—Time
TDR—Set Registration Debounce
TEST—System Test
TF—Set Following Time
TM—Time of Last Motion
TR—Wait for Trigger
TRD—Read Timer from Parallel I/O
TS—Trigger Input Status
TW—Thumbwheel Inputs

U—Pause and Wait for Continue
UNTIL—Until

V—Velocity
VAR—Variables
VARD—Read Variables from Parallel I/O
VRD—Read Velocity from Parallel I/O
VS—Start/Stop Velocity

W1—Signed Binary Position Report
W2—Hexadecimal Position Report
W3—Signed (±) Position Report
WHEN—Signed Binary Position Report
WHILE—Signed Binary Position Report

XBS—Report Sequence Memory Available
XC—Sequence Checksum Report
XD—Sequence Definition
XDIR—Sequence Directory
XE—Sequence Erase
XEALL—Erase All Sequences
XFK—Set Fault or Kill Sequence
XG—GOTO Sequence
XQ—Sequence Interrupted Run Mode
XR—Run Sequence
XRD—Read Sequence via Parallel I/O
XRP—Sequence Run with Pause
XS—Sequence Execution Status
XSD—Sequence Status Definition Report
XSR—Sequence Status Run Report
XSS—Sequence Status Report
XST—Single Step Mode
XT—Sequence Termination
XTR—Set Trace Mode
XU—Upload Sequence
XWHEN—When Sequence

Y—Stop Loop

Z—Reset

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Functional Differences—AX vs. SX

The following commands are available in both the AX and SX. The functional differences (range, default, etc.) are defined in this section.

CMD	Model	Functional Differences
A	AX:	Range = 0.00 - 999.99 rps^2 default = 0 rps^2
	SX:	Range = 0.00 - 9999.99 rps^2 default = 10 rps^2
AC	AX:	Range = 0.00 - 999.99 rps^2 default = 0 rps^2
	SX:	Not needed, see Mode Continuous example #2.
B	AX:	Buffer is 512 bytes.
	SX:	Buffer is 2000 bytes.
BS	AX:	Range = 0 - 512 bytes remaining
	SX:	Range = 0 - 2000 bytes remaining
CG	AX:	Range = 1 - 8, default = 8.
	SX:	Must use CPM and CPG.
CL	AX:	Range = 0 - 65535 default = 0 (infinite)
	SX:	Must be in MPP mode and use L command. Range = 0 - 99,999,999.
CN	AX:	
	SX:	Must be in MPP mode and use N command.
CO	AX:	
	SX:	Must be in MPP mode with O or IO command.
CTM	AX:	Range = 0.01 - 999.99 seconds.
	SX:	Must be in MPP mode and use T command. Range = 0.001 - 999.999 seconds.
CTR	AX:	Three trigger inputs.
	SX:	Must be in MPP mode. Use TR—Possibility for 8 trigger inputs.
CV	AX:	Range = 0.001 - 50.000 rps.
	SX:	Must use IV, or be in MPP mode and use V command. Range = 0.0000 - 50.0000 rps.
D	AX:	Range = 0 - 1,999,999,999 steps. Default = 0 steps.
	SX:	Range = 0 - 2,147,483,647 steps. Default = 25000 steps.
DB	AX:	Range = 0 - 999,999 motor steps. Default = 0 steps.
	SX:	Must use DW command. Range = 0 - 65535 motor steps. Default = 0 steps.
DW	AX:	Range = 0 - 999,999 motor steps. Default = 0 steps.
	SX:	Must use CPE. Range = 0 - 336,544,320 motor steps. Default = 4000 steps.
ER	AX:	Range = 1 - 50000 counts per rev. Default = 4000.
	SX:	Range = 0 - 65536. Default = 4000.
FR	AX:	Response: 11000000.
	SX:	Must use FS. Response: 1100 0000 0000 0000
FSA	AX:	
	SX:	Must use MPA & MPI commands.
FSE	AX:	
	SX:	Must set output 1 to be a stall output. Use OUT1L command.
FSF	AX:	
	SX:	Must set up input 3 to be a stop input. Use IN3D.

CMD	Model	Functional Differences
FSH	AX:	
	SX:	Stall detection is always enabled.
GH	AX:	Range = +0.001 - +50.000 rps. Default = 0 rps.
	SX:	Could use GHV. Range = +0.0001 ± 99.999 rps. Default = 1 rps.
IS	AX:	Response format:: nnnnnnnnnn
	SX:	Response format: nnnn nnnn nnnn
L	AX:	Range = 0 - 65535
	SX:	Range = 0 - 999,999,999
O	AX:	
	SX:	Outputs used must be configured as programmable outputs (OUTnA).
OR	AX:	
	SX:	Must use OS command.
SCA	AX:	8 selections for percentage of current. Occurs after every move.
	SX:	Must use SCR 4 selections for % of current.
SN	AX:	Range = 1 - 1000 ms. Default = 50.
	SX:	Range = 1 - 1000 ms. Default = 50.
SSD	AX:	
	SX:	Limits must be wired to an input that is set up as a Stop input (INnD).
SV	AX:	
	SX:	No equivalent.
T	AX:	Range = 0.01 - 999.99 seconds.
	SX:	Range = 0.001 - 999.999 seconds.
TR	AX:	
	SX:	Inputs must be set up as trigger inputs (INnA).
TS	AX:	Response format nnn
	SX:	Response: xxxx nnnn nnnn
V	AX:	Range = 0.001 - 50.000 rps. Default = 0 rps.
	SX:	Range = 0 0001 - 50.0000 rps. Default = 1 rps.
VC	AX:	Range = 0.001 - 50.000 rps. Default = 0 rps.
	SX:	Must use IV, or must be in MPP mode and use V. Range = 0.0001 - 50.0000 rps. Default = 1 rps.
WV	AX:	9 different waveforms.
	SX:	Must use MW command. 5 different waveforms.
XD	AX:	7 sequences
	SX:	100 sequences
XP	AX:	Ø indicates no power-up sequence, 1-7 indicates executing the corresponding sequence, 8 indicates scanning sequence select inputs once, 9 indicates continuously scanning sequence select inputs.
	SX:	Sequence #100 is always the power-up sequence. SSJ1 in sequence #100 acts the same as XP9. XGn, where n is any sequence number, in Sequence #100 acts the same as XP1 - XP7.
XR	AX	
	SX	XG or XR commands.

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Programming Examples

This section contains information that you should consider and evaluate when designing and developing your application.

Mode Continuous

The AX has many different commands for modifying parameters in Continuous mode. The SX has less commands, but can accomplish many of the same functions. The AX provides commands for use in Continuous mode that are different from the commands used in Preset mode. These commands modify acceleration, velocity, loops, time delays, outputs, and triggers. The SX uses three different commands to change distance, outputs, and velocity on-the-fly (Immediate Distance [ID], Immediate Velocity [IV], and Immediate Output [IO]). To create a continuous profile using triggers, outputs, and time delays, you must use the Motion Profiling Mode (MPP) command.

Example #1

AX		SX	
Command	**Description**	**Command**	**Description**
		IN1A	Input 1 set as trigger input
		IN2A	Input 2 set as trigger input
		IN3A	Input 3 set as trigger input
		OUT1A	Output 1 set as general output
		OUT2A	Output 2 set as general output
MC	Set Continuous mode	MC	Set Continuous mode
A25	Set acceleration to 25 rps^2	A25	Set acceleration to 25 rps2
		AD25	Set deceleration to 25 rps2
V5	Set velocity to 5 rps	V5	Set velocity to 5 rps
		MPP	Motion Profile mode
		G	Begin Motion Profile move
CDW5	Dwell 5 sec. after reaching constant velocity	T5	Dwell 5 sec. after reaching constant velocity
CL1Ø	Loop 10 times	L1Ø	Loop 10 times
CO1X	Output 1 on, Output 2 unchanged	O1X	Output 1 on, Output 2 unchanged
CDW1	Dwell 1 second	T1	Dwell one second
CO0X	Output 1 off, Output 2 unchanged	O0X	Output 1 off, Output 2 unchanged
CDW1	Dwell 1 second	T1	Dwell 1 second
CN	End loop	N	End loop
VC1	Ramp using last decel to 1 rps	V1	Ramp using last accel to 1 rps
CTRJOG1	Wait for trigger 3 to go high before continuing	TRJOG1	Wait for trigger 3 to go high before continuing
VCØ	Ramp at last decel to 0 rps	VØ	Ramp using last accel to 0 rps
G	Execute the move	MG	Exit Motion Profile mode

The SX has no corresponding command for the AX's Change Acceleration (CA) command. The AX uses separate commands for changing Continuous Mode acceleration and velocity in a sequence. The SX's Continuous Mode commands will not change. The AX provides commands for changing Continuous Acceleration mode (Acceleration Change [AC]) and Continuous Velocity mode (Velocity Change [VC]).

Example #2

AX		SX	
Command	**Description**	**Command**	**Description**
XD1	Define sequence 1	XD1	Define sequence 1
		IN1A	Input 1 set as trigger input
		IN2A	Input 2 set as trigger input
		IN3A	Input 3 set as trigger input
		OUT1A	Out 1 set as general output
		OUT2A	Out 2 set as general output
MC	Set to Continuous mode	MC	Set mode to Continuous
A25	Set acceleration to 25 rps	A25	Set acceleration to 25 rps
		AD25	Set deceleration to 25 rps
V5	Set velocity to 5 rps	V5	Set velocity to 5 rps
		MPP	Motion Profile mode
		G	Begin move
CDW5	Dwell 5 sec.after reaching constant velocity	T5	Dwell 5 sec.after reaching constant velocity
CL1Ø	Loop 10 times	L1Ø	Loop 10 times
CO1X	Output 1 on, Output 2 unchanged	O1X	Output 1 on, Output 2 unchanged
CDW1	Dwell 1 second	T1	Dwell 1 second
CO0X	Output 1 off, Output 2 unchanged	O0X	Output 1 off, Output 2 unchanged
CDW1	Dwell 1 second	T1	Dwell 1 second
CN	End loop	N	End loop
CV1	Ramp at last decel to 1 rps	V1	Ramp at last accel to 1 rps
CTRJOG1	Wait for trigger 3 to go high before continuing	TRJOG1	Wait for trigger 3 to go high before continuing
CVØ	Ramp at last decel to 0 rps	VØ	Ramp using last accel to 0 rps
G	Execute the move	MG	Exit Motion Profile mode
XT	End sequence definition	XT	End sequence definition

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Encoder Functions

Most of the AX and SX's encoder commands are common to both products. The following AX commands are not implemented in the SX:

- The AX command FSE turns on output #1 on a stall. You can perform this function with the SX by establishing output #1 as a stall output (OUT1L).
- The AX's FSG command does not have a similar SX counterpart.
- The AX's FSH command enables stall detect. Stall detect is always enabled in the SX. To disable stall detect in the SX, enter a larger Configure Position Error (CPE) value.
- To perform a position maintenance move with the AX., the following move commands would be required.

Example #3

AX		SX	
Command	**Description**	**Command**	**Description**
MR9	Set Motor Resolution to 20,000 steps/rev	MR9	Set Motor Resolution to 20,000 steps/rev
ER4ØØØ	Encoder resolution equals 4,000 pulses/revolution	ER4ØØØ	Encoder resolution equals 4,000 pulses/revolution
DW1ØØ	Set stall detect dead band window to 100 motor steps	CPE1ØØ	Configure position error to be 100 motor steps before a stall is detected
DB1Ø	Set position maintenance (50 motor steps = 10 encoder steps)	DW5Ø	Set position maintenance (deadband to 10 encoder steps—50 motor steps)
FSB1	Set to Encoder mode	FSB1	Set to Encoder mode
FSH1	Enable stall detect		
FSD1	Enable stop on stall	FSD1	Enable stop on stall
FSC1	Enable position maintenance	FSC1	Enable position maintenance
A1Ø	Acceleration 10 rps^2	A1Ø	Acceleration 10 rps^2
V1	Velocity 1 rps	V1	Velocity 1 rps
D8ØØØ	Distance 8000 encoder steps	D8ØØØ	Distance 8000 encoder steps
G	Execute the move	G	Execute the move

Homing

Every homing function that the AX provides is also supported in the SX. Only two homing commands have minor functional differences—Stop on Stall (FSD) and Go Home (GH).

- FSD in the AX defines the active state of the Z Channel input. FSD enables or disables the use of the Z Channel in the SX. If you need to change the active state of the Z Channel input on the SX, rewire the Z Channel input by swapping Z+ and Z-.
- In the AX, GH requires a velocity value (e.g., GH3). GH works in the SX, however, the homing sequence can also be initiated with GH alone. In the second case, the velocity must be specified with the Go Home Velocity (GHV) command. The AX's final homing velocity, or creep velocity is fixed at 0.1 rps. You can modify the SX's final homing with the Go Home Final Velocity (GHF) command.

AX		SX	
Command	**Description**	**Command**	**Description**
OSBØ	Do not backup to home	OSBØ	Don't back up to home switch
OSCØ	Define active state of home input	OSCØ	Define active state of home input
OSD1	Define active state of encoder Z channel to be high	OSD1	Enable Z channel home referencing
OSH1	Reference edge of home switch	OSH1	Reference edge of home switch
FSB1	Must be in encoder step mode to force Z channel homing		
A1Ø	Homing acceleration	GHA1Ø	Homing acceleration
		GHAD1Ø	Homing deceleration
		GHV5	Homing velocity
		GHF.1	Homing final velocity
GH5	Go home at 5 rps	GH	Go home at GHV velocity

GH and GHV5 could be replaced by GH5.

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Sequence Selection

Defining, erasing, uploading, and running a sequence are the same in both products; however, sequence select inputs and power-up sequences are different in the AX and SX. The SX's BCD logical inputs are a major improvement over the AX's sequential inputs. The SX's inputs offer more flexibility and programming possibilities. The SX's Set Input Functions (IN) command allows you to set the eight inputs to more than 20 different functions (refer to the IN command description in ***SX Indexer/Drive Software Reference Guide***).

The AX dictates which sequence will be a power-up sequence with the Set Power-Up Sequence Mode (XP) command. XP determines which sequence (#1 - #7) will be run on power up. XPØ specifies no sequence. Sequence #100 is always the power-up sequence in the SX. *If you do not want a power-up sequence, erase sequence #100.*

To use the sequence select inputs with the AX, the proper XP command must be entered. XP8 instructs the AX to read the sequence select inputs once during power up and then run the selected sequence. XP9 instructs the AX to continuously read the sequence select inputs and execute the selected sequence. To get this same functionality with the SX, place the Enable/Disable Continuous Scan Mode (SSJ1) command in Sequence #100 (this replaces XP8 and XP9 mode). Put a STOP command or SSJØ at the end of each sequence. After wiring is complete, perform the following steps:

① Set up the SX inputs to operate as sequence select inputs by issuing the appropriate number of Set Sequence Select Input (INnB) commands.

② After completing this, sequences can be selected and run from the sequence select inputs (if you have issued an SSJ1 command).

③ The AX sequence select inputs are active low. The SX inputs can be configured either active low or active high (Set Active Input Level [INL]). The default is INLØ, active low.

	AX Sequence Inputs			SX Inputs		
	Seq 1	Seq 2	Seq 3	IN 1	IN 2	IN 3
Sequence 1	On	On	On	On	Off	Off
Sequence 2	Off	On	On	Off	On	Off
Sequence 3	On	Off	On	On	On	Off
Sequence 4	Off	Off	On	Off	Off	On
Sequence 5	On	On	Off	On	Off	On
Sequence 6	Off	On	Off	Off	On	On
Sequence 7	On	Off	Off	On	On	On
No Sequence	Off	Off	Off	Off	Off	Off

AX sequence inputs	OFF = Open switch (not pulled to GND)
	ON = Closed switch (pulled to GND)
SX inputs	OFF = Open switch
	ON = Closed switch
SX command setup	IN1B IN2B IN3B INLØ

Using Thumbwheels

You can use Compumotor's Model 72 I/O Interface with the AX. The SX can be operated with the TM8 Thumbwheel Module. *The Model 72 cannot be used with the SX and the TM8 cannot be used with the AX.* Multiple Model 72s can be configured with the AX, and multiple TM8s can be configured with the SX. The Model 72 has 7 thumbwheels and the TM8 has 8 thumbwheels (both products have 1 direction thumbwheel [+ or -]). The chart below shows Model 72/AX command examples and their SX counterparts.

Value displayed on Model 72 thumbwheel = +ØØ25ØØØ
Value displayed on TM8 thumbwheel = +ØØØ25ØØØ

Model 72 Command		SX Command Equivalent
D(1,4-8,Ø)	Distance read = 25000 steps	DRD48Ø

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Value displayed on Model 72 thumbwheel = +12ØØØ55
Value displayed on TM8 thumbwheel = +12ØØØØ55

Model 72 Command		SX Command Equivalent
V(1,2-3,2)	Velocity read = 12 rps	VRD125
A(1,7-8,2)	Acceleration read = 55 rps≤	VARD1,782
		A(VAR1)

Value displayed on Model 72 thumbwheel = +3333ØØ
Value displayed on TM8 thumbwheel = +3333Ø9ØØ

Model 72 Command		SX Command Equivalent
T(1,2-5,Ø)	Time delay read = 33.33 secs	TRD14Ø
L(1,6-8,Ø)	Loop count read = 900 counts	LRD68Ø

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Chapter 3. AX/SX Performance Specifications

Chapter Objective

The information in this chapter will enable you to:

- Use this chapter as a quick-reference tool for AX/SX performance specifications

Drive Information

Dimensions

The mounting specifications for the A Series and S Series are identical (*i.e., an S Drive can be mounted in the same location and position as an A Drive*). The dimensional variances are listed below. Refer to the specific product user guides for complete dimensional drawings and specifications.

	Height	Width	Depth
A	9.50	3.23	6.73
S	9.48	3.18	6.90
AX	9.50	4.13	6.73
SX	9.48	4.17	6.90

Power Input

A/AX 95-130 VAC
S/SX 90-132 VAC

Protection

	Short Circuit	Brownout
A/AX	Phase to Phase	95 VAC or below
S/SX	Phase to Phase, Phase to GND	85 VAC or below

LED Indicators

Product	LED Indicator	Latched
A/AX	Generic Fault LED	NO
	Power LED	NO
S	Step Pulse LED	NO
S/SX	Power LED	NO
	Overtemp LED	YES
	Motor Fault	YES
	Undervoltage LED	NO

Operating Temperature

A/AX	32°F to 104°F (0°C to 40°C)
S6/S8	32°F to 131°F (0°C to 50°C)
SX6/SX8	32°F to 122°F (0°C to 45°C)

Motor Inductance Requirements

A/AX Minimum 20mH Maximum 160mH
S/SX Minimum 0.5mH Maximum 80.0mH (*Recommended Range = 5.0-50mH*)

Sequence Storage

AX	2048 Bytes	EEPROM
SX	8000 Bytes	Battery Backed RAM

Inputs

	Inputs	Type	Max.Current	Voltage Range
AX	6 (3 Trig/3 Seq)	Diode Cathode	20 ma (source)	5-12 VDC
SX	8 (Programmable)	Diode Cathode	40 ma (source)	5-24 VDC (6.5 mA min.)
	1 (Registration)	Diode Cathode	40 ma (source)	5-24 VDC (6.5 mA min.)

Outputs

	Outputs	Type	Max. Current	Voltage Range
AX	2 (Programmable)	Open Emitter	12 ma (source)	5-12 VDC
SX	4 (Programmable)	Open Collector	35 ma (sink)	5-24 VDC
	1 (Fault)	Open Collector	35 ma (sink)	5-24 VDC

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Powering I/O

AX: 5-12 VDC applied to Opto 1 to power CW limit, CCW limit, and Home
5-12 VDC applied to Opto 2 to power other I/O
Current rating for power supply must be > 500 mA

SX: 5-24 VDC applied to Opto 1 to power CW limit, CCW limit, and Home
5-24 VDC applied to Opto 2 to power other I/O
Current rating for power supply must be > 250 mA

Motor Information

AX Data - Top
***SX** Data - Bottom*

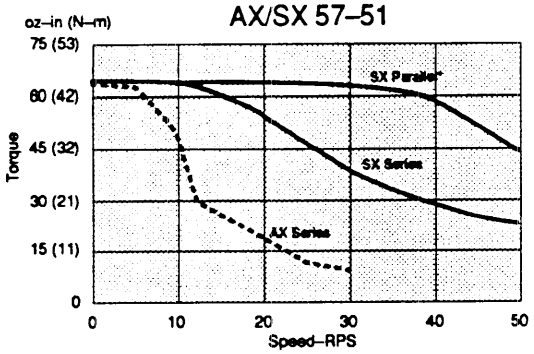
	57-51	57-83	57-102	83-62	83-93	83-135	106-120	106-178	106-205	
Static Torque	60 *65*	80 *100*	120 *125*	140 *160*	260 *300*	380 *400*	450	950 *1000*	1600 *1900*	**oz/in**
Rotor Inertia	0.48 *1.48*	1.28 *1.28*	1.75 *1.75*	3.50 *3.50*	6.70 *6.70*	10.24 *10.24*	21.5	44.0 *44.0*	52.0 *52.0*	**oz/in2**
Thrust Load	25 *25*	25 *25*	25 *25*	50 *50*	50 *50*	50 *50*	50	50 *50*	50 *50*	**lb**
Radial Load	15 *15*	15 *15*	15 *15*	25 *25*	25 *25*	25 *25*	25	25 *25*	25 *25*	**lb**
End Play	0.005 *0.005*	0.005 *0.005*	0.005 *0.005*	0.005 *0.005*	0.005 *0.005*	0.005 *0.005*	0.005	0.005 *0.005*	0.005 *0.005*	**in**
Weight (net)	1.6 *1.6*	2.4 *2.4*	3.2 *3.2*	3.8 *3.8*	5.1 *5.1*	8.3 *8.3*	8.5	19.1 *19.1*	23.4 *23.4*	**lb**
Ship Weight	12.7 *10.7*	13.5 *11.4*	14.3 *12.3*	14.9 *13.0*	16.2 *14.2*	19.4 *17.4*	19.5	30.2 *28.2*	34.5 *32.5*	**lb**
Motor Wound	Series *Series*	Series *Series*	Series *Series*	Series *Series*	Series *Series*	Series *Series*	Series	Series *Series*	Series *Series*	**Ser/ Parr**
Resistance/ ph	41.8 *3.98*	21.7 *3.95*	14.0 *3.25*	6.5 *1.47*	4.4 *1.2*	2.2 *1.08*	1.1	0.6 *0.84*	0.9 *0.9*	**ohm**
Inductance	130 *17.8*	100 *18.5*	74 *17.0*	64 *10.0*	39 *10.5*	29 *9.2*	6	7 *8.0*	7 *7*	**mH**

Speed/Torque & Power Curves

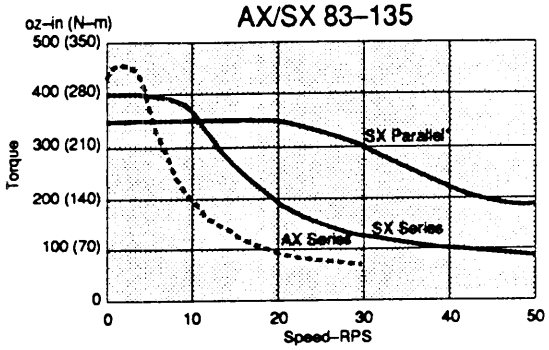
The following graphs depict the comparative speed/torque (first graphic) and power performance ratings (second graphic) of the various AX/SX motors.

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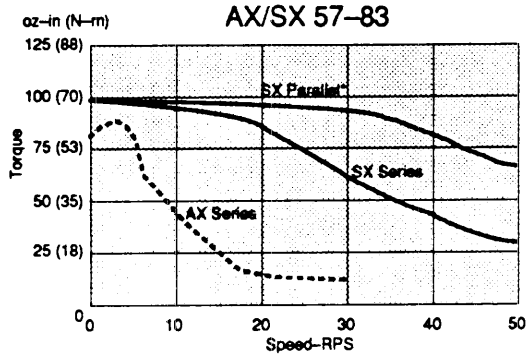
AX/SX 57–51



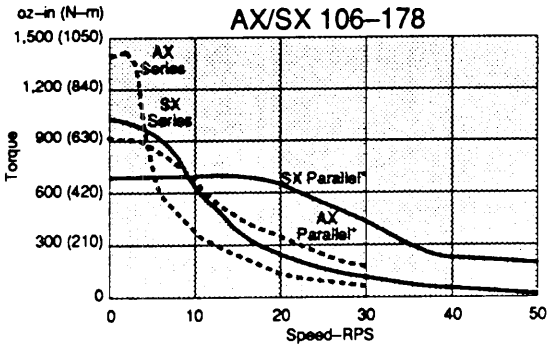
AX/SX 83–135



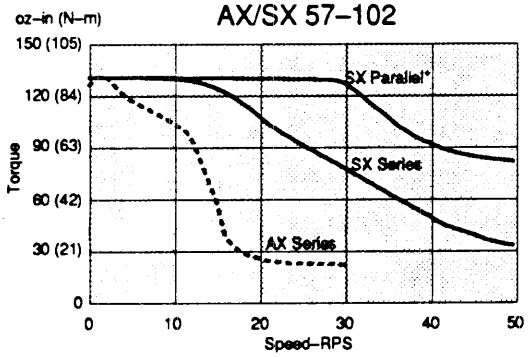
AX/SX 57–83



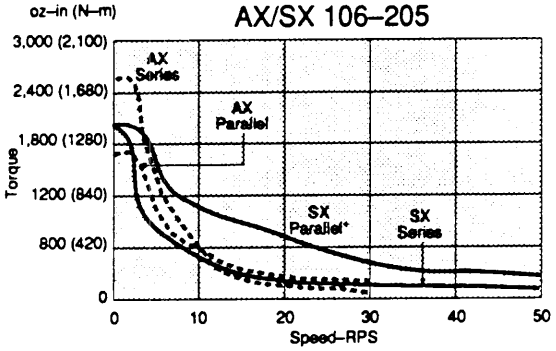
AX/SX 106–178



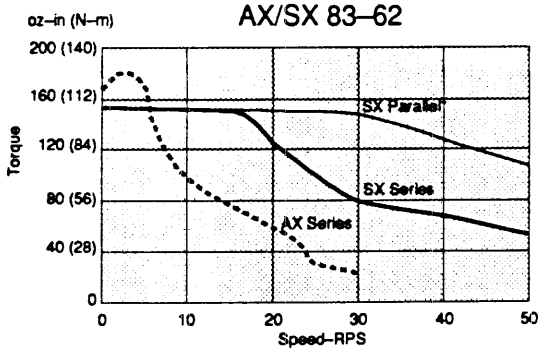
AX/SX 57–102



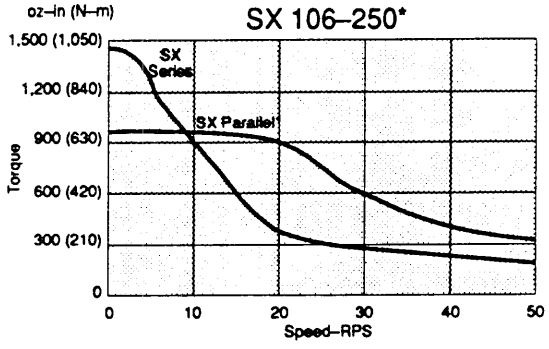
AX/SX 106–205



AX/SX 83–62

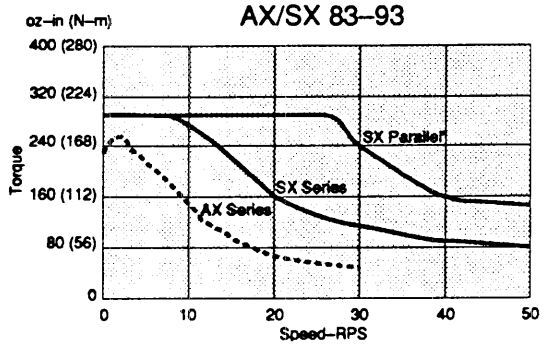


SX 106–250*



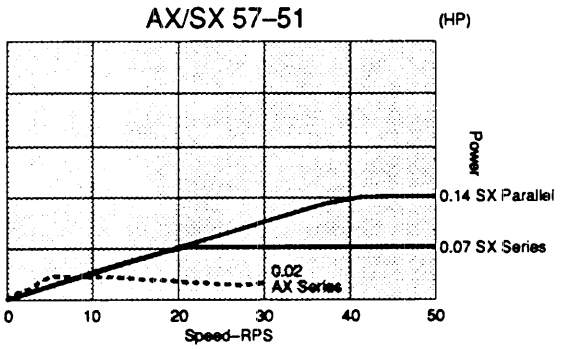
** The AX cannot run 106-250 series motors. The SX does not support 106-120 series motors (not shown). The AX does support the 106-120 series motors.*

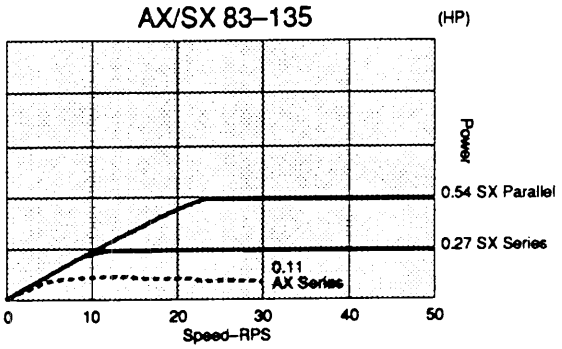
AX/SX 83–93

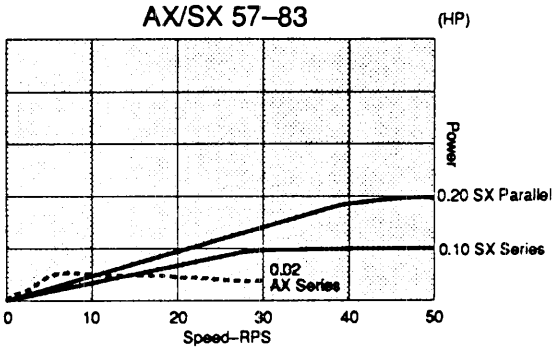


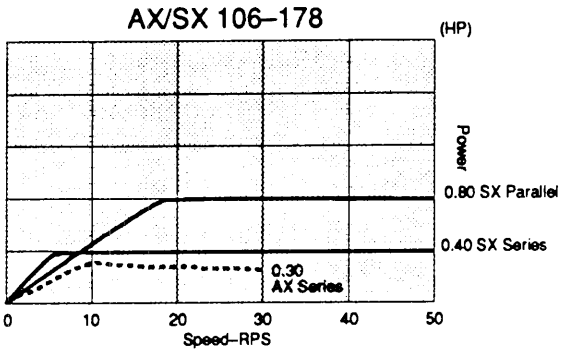
*Parallel connected motors are limited to 50% duty cycle when operated above 5 rps. For greater than 50% duty cycle above 5 rps, you must connect the motor in series. Fan cooling the motor will increase duty cycles above 5 rps.

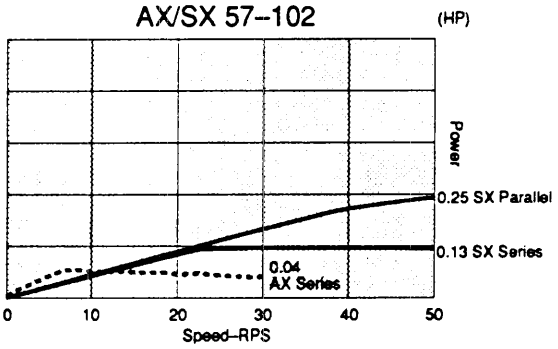
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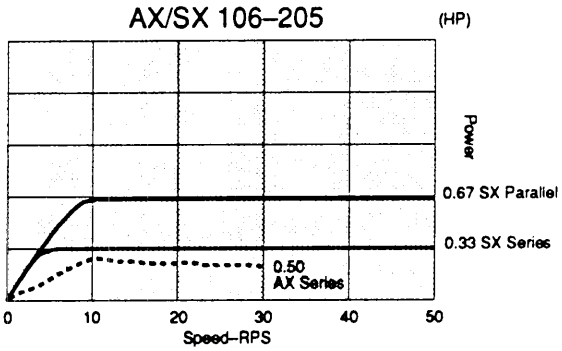


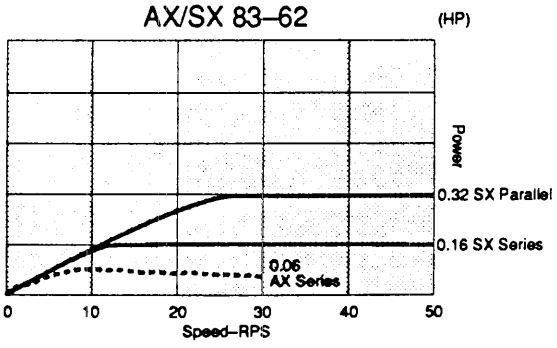


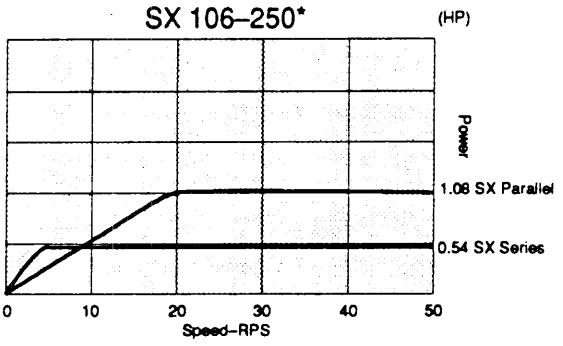


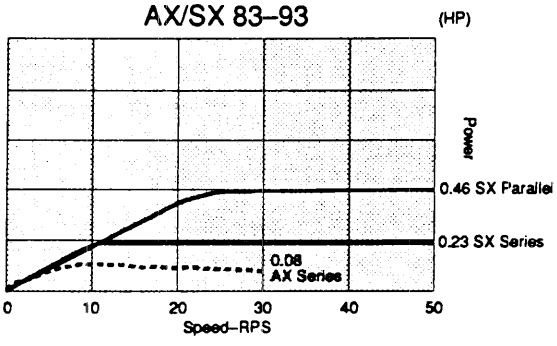












** The AX cannot run 106-250 series motors. The SX does not support 106-120 series motors (not shown). The AX does support the 106-120 series motors.*

*Parallel connected motors are limited to 50% duty cycle when operated above 5 rps. For greater than 50% duty cycle above 5 rps, you must connect the motor in series. Fan cooling the motor will increase duty cycles above 5 rps.

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