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Each model in the S Series control line is a complete packaged step motor drive, heat sink, power supply and line cord which can be ordered with a single model number.

S5001 DRIVE

The S5001 Drive is the lowest cost drive and is well suited for low thrust and speed applications. It accepts step and direction inputs and has a built-in motor jog feature. The S5001 will operate NS2 and RS2 Series cylinders only.

S5101 DRIVE

The S5101 is a microstepping drive providing selectable resolutions of 200 – 50,800 steps/rev and a maximum speed of 3,000 rpm. Optically isolated TTL Level inputs accept step and direction signals from our 851 Indexer or a user supplied control.

S5201 DRIVE

The S5201 drive/control is an S5101 Drive with an integral RS-232 compatible motion controller. 8K of non-volatile memory can store up to 100 different motion programs. It has twelve optically-isolated inputs for end-of-travel limits, home limit, program execution and user-defined inputs. With the additional four optically-isolated programmable outputs, the S5201 model can often function as a stand-alone control or operate as a basic machine controller.

S5851 DRIVE

The S5851 drive/control also combines a microstepping drive with a programmable motion controller. The S5851 has many of the same features as the S5201, but adds an integral keypad and LCD display for both programming and machine operation. The programmer simply enters the cylinder model number to automatically scale the position units to inches (or centimeters). The S5851 uses the same easy-to-use *IDEAL*™ programming language as Industrial Devices' DC Servo controllers (H3951, H3952 and H4951) and 851 Indexer. This reduces the experienced programmer's learning curve, makes operation and maintenance even more simple, and in the end saves time and money for the multi-cylinder user.

STEP MOTOR DRIVE COMPARISON

The following S Series drives and drive/controls are compatible with the TS Series cylinder.

	S5001 DRIVE	S5101 DRIVE	S5201 DRIVE/CONTROL	S5851 DRIVE/CONTROL
Resolution (steps/rev)				
Standard	200	25,000		25,000
Selectable	400	200, 400, 1000, 2000, 5000, 10000, 12800, 18000, 20000, 25400, 25600, 36000, 50000, 50800		
Max Speed (motor rpm)	1,000	3,000*	3,000*	3,000
Includes drive, power supply, heat sink, line cord	•	•	•	•
Compatible Cylinders	NS2, RS2	NS, RS, TS	NS, RS, TS	NS, RS
Integral programmable motion controller		(use 851 Indexer)	•	•
Operator Interface				Front Panel Keypad/LCD Display
Programmable Via...			RS232C	Front Panel, RS232C
Number of Programs			100	98
Number of Programable inputs/outputs			8/4	7/5
Number of dedicated system inputs/outputs			0/0	2/3
Manual jog function			•	•
Open-or closed-loop operation standard			•	•
Voltage source available for Hall-effect position sensors				12VDC
Power input-VAC	120/240	95-132	95-132	95-132
Motor Output Voltage	36	160	160	75
User-selectable motor Current range (amps)	1-2	0–6	0–6	1-7.1
Optically-isolated inputs		•	•	•
Phase-to-phase and phase-to-ground short circuit protected		•	•	•
Brownout and - overtemperature protected		•	•	•
Overall dimensions (inches)	6.5 x 5 x 3	9.5 x 6.9 x 3.2	9.5 x 6.9 x 4.2	9.7 x 6.3 x 5.5
For more details see	page 195	page 197	page 200	page 206

* Maximum speed will be lower for resolutions over 36,000 steps/rev (max step output frequency is 1.8 MHz).

The S5001 is a compact full step/half step drive offering reliable 100% duty cycle performance and economy for low power applications. Each model includes the drive, integral heat sink, power supply, power cord and operator's manual.

The S5001 Series operates directly from 120 or 240 VAC without an external transformer. The S5001 is compatible with all NS2T and RS2T Series cylinders. Thrust to 700 lbs. and speed to 5 inches per second are possible using the S5001.

A unique feature of the S5001 Drive is the built-in oscillator which allows the user to move the motor at low (300 rpm maximum) or high speeds (1,000 rpm maximum) in forward or reverse directions. This jog feature is accessed by wiring push buttons to the screw terminal connector on the drive. This feature can be combined with timers and position sensors to provide simple positioning.

FEATURES

- Compact package (6.5 x 5 x 3) with heat sink, integral power supply and line cord

- Built-in jog oscillator provides manual positioning and interface for simple positioning routines

- Operates directly from 120/240 VAC without external transformer

- Phase-to-phase short circuit protected

- User-selectable 200 or 400 step/rev resolution

- User-selectable motor current from 1-2 amps

- Two-part screw terminal connections allow quick disconnect

- Lowest cost step motor drive

- 100% duty cycle

COMPATIBLE WITH NS2T, RS2T

- Speeds to 5 ips, thrust to 700 lbs.

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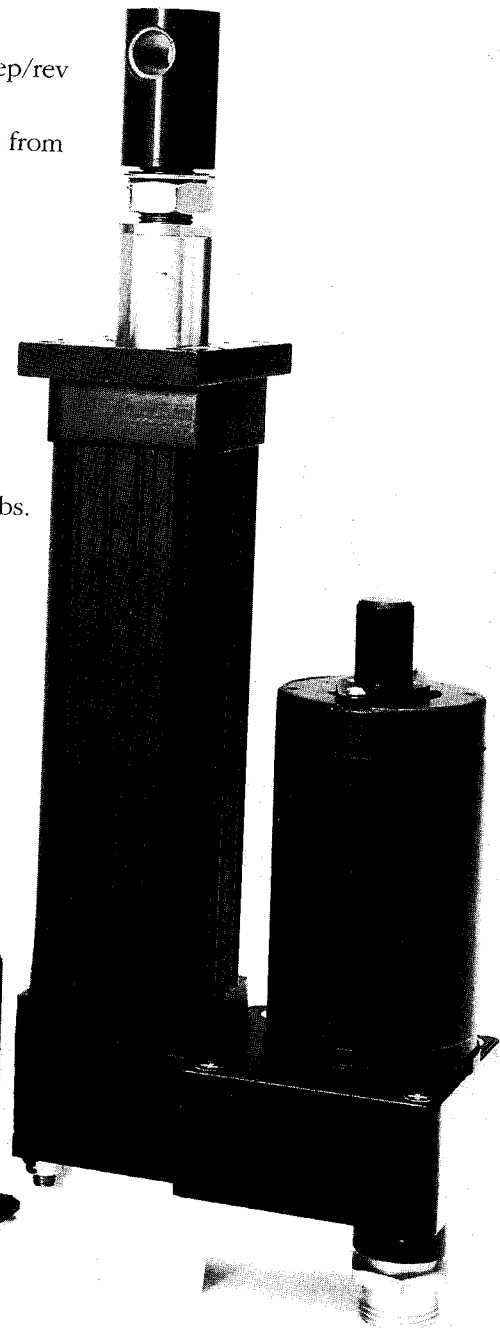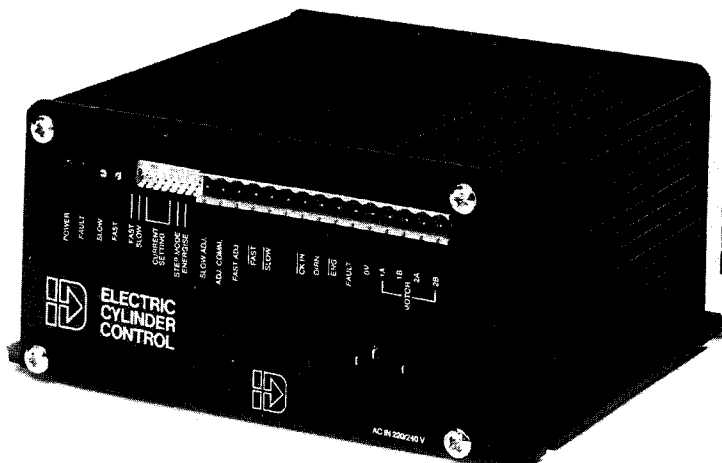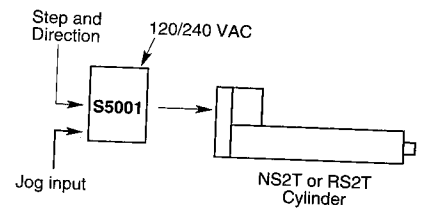
S5001 SPECIFICATIONS

AMPLIFIER

Type	Bipolar chopper
Resolution	200/400 step/rev
Protection	Short circuit protected, phase to phase
Output current (2 phase on)	1-2A adjustable
Drive supply voltage	36 VDC
Standby current reduction	50%
Maximum stepping rate	200 step—16 rps
	400 step—16 rps

COMMAND INTERFACE

Command inputs are normally driven by open collector outputs and are internally pulled up to +12 volts

Step input	Active low pulse, 10 microseconds minimum width; maximum pulse rate is 20KHz
Direction	Logic High = CW rotation
	Logic Low = CCW rotation
Drive enable/disable	Logic high = amplifier disable
	Logic low = normal operation

INPUT POWER

|	
Volts	105-125VAC or 200-250VAC
Frequency	50/60 Hz

MOTORS

Type	2 phase hybrid permanent magnet 1.8 degree hybrid type
Number of leads	4, 6, or 8
Minimum inductance	1 mH (1-10 mH is suggested)

ENVIRONMENTAL

|	
Operating Temperature	32° to 122°F (0 to 50°C) maximum heat sink temperature is 185°F (85°C)
Motor Case Temperature	255°F (125°C) maximum
Storage Temperature	-40°F to 185°F (-40°C to 85°C)
Humidity	0 to 95% non-condensing

DIMENSIONS

2.95 (75)

Weight: 1.33 lbs (0.6 kg)

6.5 (166)

4.0 (102)

5.04 (128)

6.14 (156)
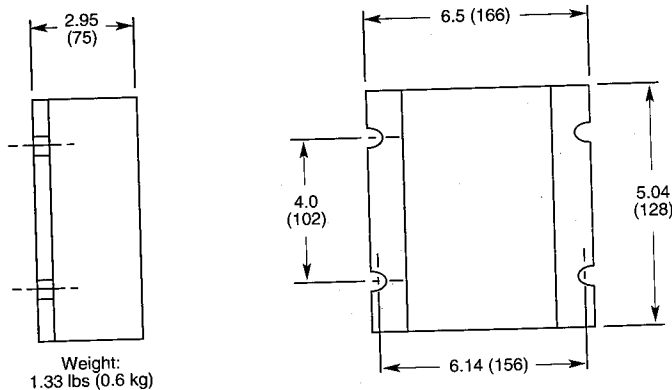
S5001 DRIVE CONNECTIONS

Screw Terminals

No.	Signal
1	Phase 2 B
2	Phase 2 A
3	Phase 1 B
4	Phase 1 A
5	0V (DC Ground)
6	Fault Output
7	Energize/Reset
8	Direction
9	Step (clock input)
10	Reserved
11	Jog: Slow (Select)
12	Jog: Fast (Select)
13	Jog: Fast Adjust
14	Jog: Adjust Common
15	Jog: Slow Adjust

Switches

No.	Settings
1	Energize: permanently energizes drive
2	Mode selector: 200 or 400 step/rev
3-6	Current settings: 1-2 amps
7	Slow: enables internalslow speed
8	Fast: enables internal fast speed potentiometer
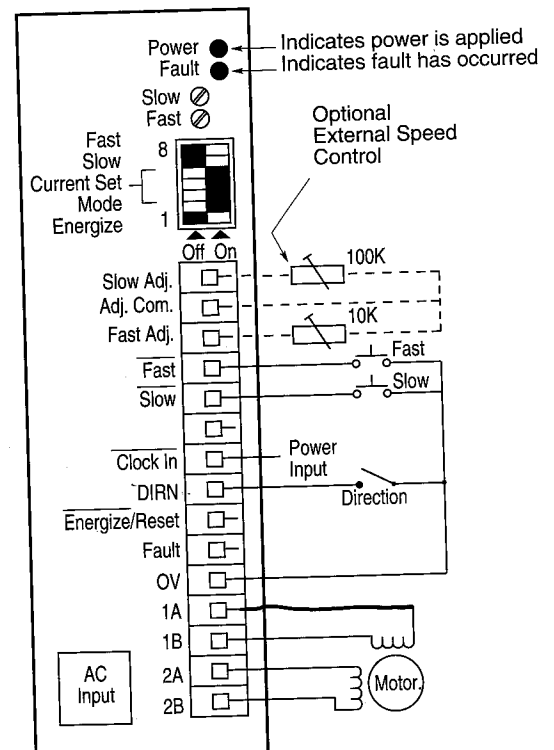
The S5101 Drive provides optimum speed and thrust performance with any NS, TS or RS Series cylinder. Designed for reliability, the S5101 is optically isolated, short circuit, brownout and over temperature protected to ensure reliable troublefree operation.

The S5101 Drive is designed to accept step and direction pulses from our 851 Indexer or any user-supplied computer, programmable controller, motion controller or other pulse source.

COMPATIBLE WITH
NS, RS

- Speed to 25 ips, thrust to 800 lbs

TS

- Speed to 40 ips, thrust to 2,400 lbs.

851 INDEXER

FEATURES

- Optically-coupled step and direction inputs for reliable operation

- Fully packaged, including power supply, heat sink, drive electronics and connectors in one enclosure

- Microprocessor-controlled microstepping drive (high resolution, smooth speed)

- 16 switch-selectable resolutions to match cylinder and to accomodate control

- Short-circuit, (phase-to-phase and phase to ground) brownout and over temperature protected

- 95-132VAC power input; no external transformer required

- Switch-selectable motor currents, 0-6 amps/phase; motor/drive matching made easy.
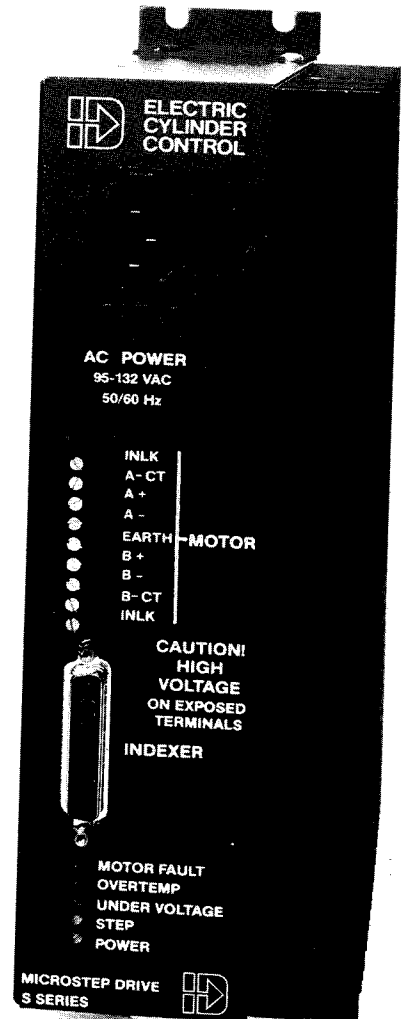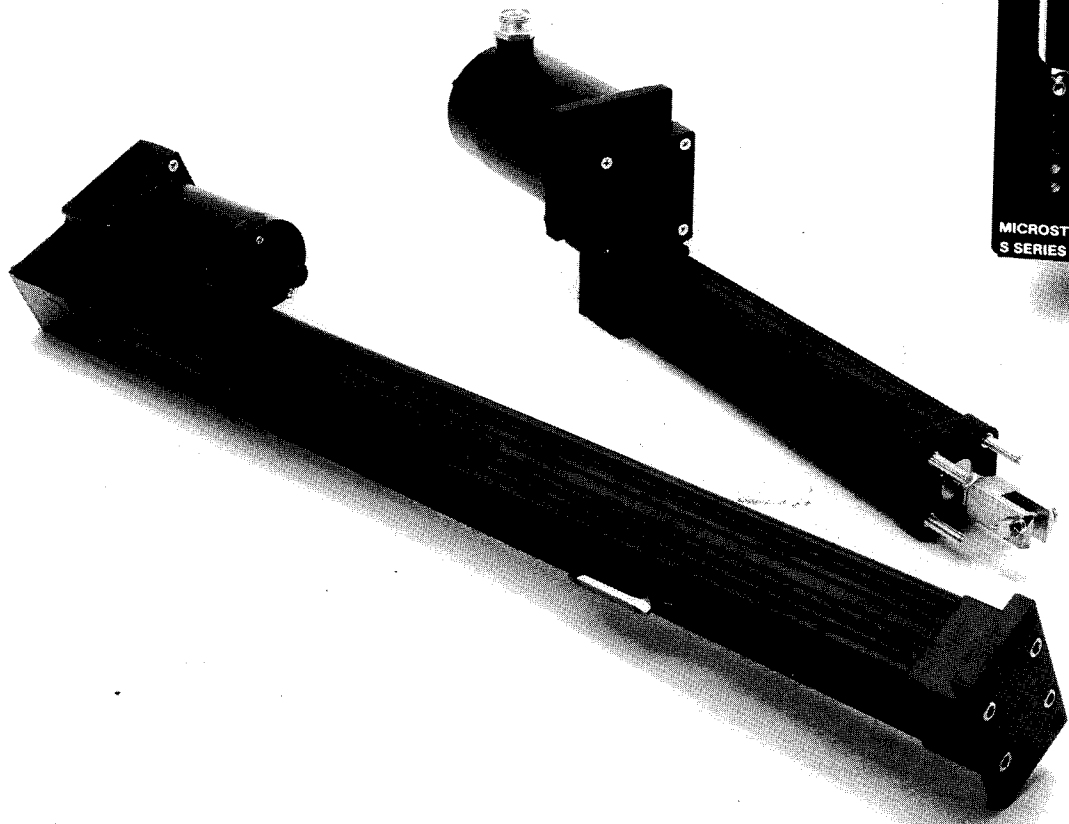
MODEL S5101 DRIVE SPECIFICATIONS

Resolution
: 16 DIP switch selectable choices: 200, 400, 1000, 2000, 5000, 10000, 12800, 18000, 20000, 21600, 25000, 25600, 36000, 50000, 50800

MOTOR COMPATIBILITY

Type
: 2 phase hybrid permanent magnet. Normally 1.8° type.

Breakdown voltage (HIPOT)
: 750 VAC minimum

Number of leads
: 4, 6 or 8

Accuracy Grade
: 3%

Inductance
: 0.5 mH minimum; 5.0 to 50.0 mH recommended range; 80.0 mH max
(S2 motor = 29.9 mH, S3 motor = 16.6 mH)

AMPLIFIER

Type
: 20 kHz fixed frequency, variable duty cycle PWM (pulse width modulated). Current controlled, bipolar type, MOSFET, IGBT construction.

Number of phases
: 2

Protection*

Short Circuit
: Phase-to-phase, phase-to-ground

Brownout
: If AC supply drops below 85 VAC

Over-temperature
: Internal air temperature exceeds 158°F (70°C)

Autostandby
: Switch selectable. If selected, motor current ramps to 75%, 50% or 25% of preset value if no step pulses are received for 1 second. Rated current levels are resumed upon receipt of next step pulse.

Self-test
: Switch selectable. This feature (used primarily for testing and verification of correct wiring) rotates the motor at approximately 1 revolution/second for 6 revolutions in the CCW direction and 6 revolutions in the CW direction.

*Drive shuts down upon any of the above conditions. Power must be cycled to resume operations.

POWER INPUT

90-132 VAC, 50/60Hz

ENVIRONMENTAL

Operating Temperature

Drive
: 32° to 122°F (0° to 50°C)
Maximum allowable ambient temperature is 122°F (50°C). Fan cooling may be required if airflow is restricted.

Motor
: 212°F (100°C) maximum. Actual temperature rise duty cycle dependent

Storage Temperature
: -40°F to +185°F (-40°C to +85°C)

Humidity Temperature
: 0 to 95% non-condensing

COMMAND INTERFACE

Step
: High going pulse, 200 nsec min width. max pulse rate is 2 MHz

Direction
: Logic High = CW rotation (200µ delay required after last step pulse and before next pulse for each direction change)
Logic Low = CCW

Shutdown
: Logic High = amplifier disable
Logic Low = normal operation

The step, direction, shutdown require a TTL type signal to operate >3.5 VDC high, <0.8 VDC. User supplied signal source must be capable of providing a minimum of 15 ma.
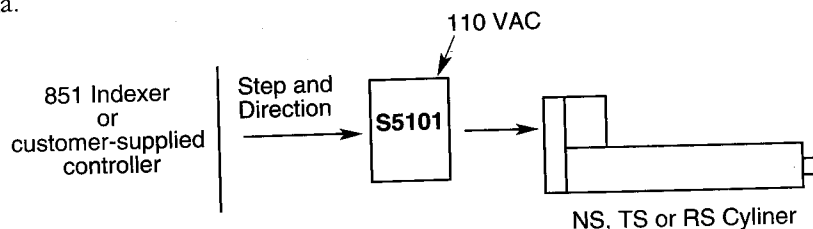
S5201 DRIVE CONNECTIONS   DIMENSIONS

Indexer
25 Pin D Connector

No.	Signal
1	+Step
2	+Direction
9	Fault output-collector
11	+Zero phase
14	-Step
15	-Direction
16	+Shutdown
17	-Shutdown
21	Fault output-emitter
23	-Zero phase
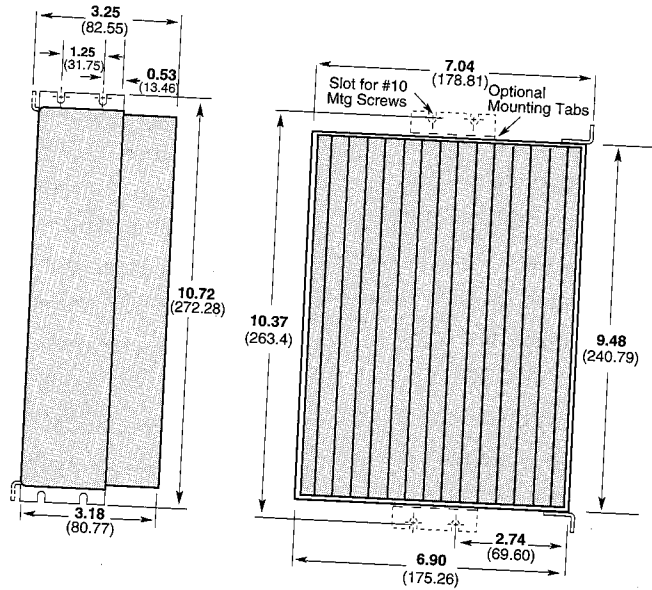
Motor
Screw Terminal Connector

No.	Signal
1	Interlock
2	A–CT
3	A+
4	A-
5	Gnd
6	B+
7	B–
8	B-CT
9	Interlock

Power
AC plug with retainer spring

STEP AND DIRECTION SIGNAL SPECIFICATION

The inputs are optically isolated and may be driven (activated) by providing a positive pulse to the plus input with respect to the minus input. These inputs may also be differentially driven. The input drive must provide a minimum of 6.5 ma (15 ma max.)
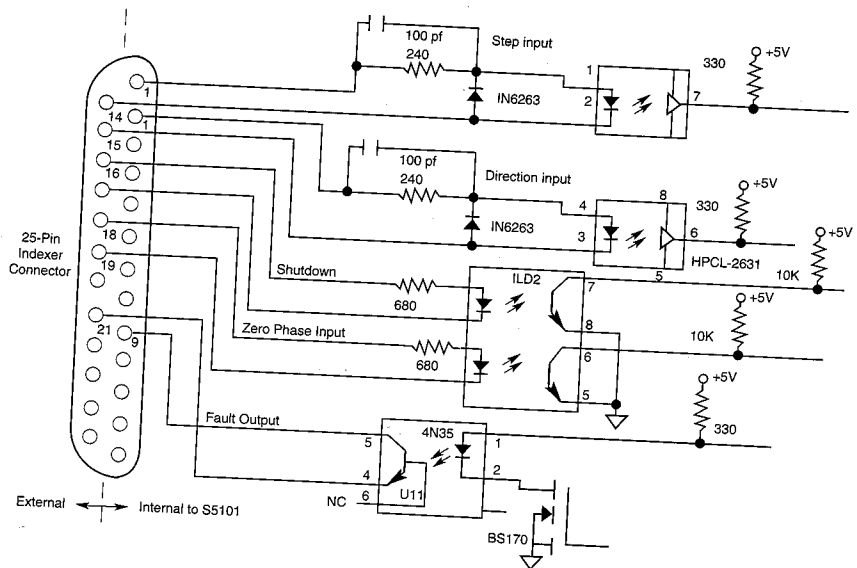
MODEL S5201 CONTROLLER

The S5201 is an S5101 Drive combined with an RS-232 compatible motion controller in the same enclosure. Each S5201 includes the power supply, heat sink, drive electronics, programmable motion controller, and connections in a single enclosure operating on 120 VAC. All connectors are made via screw terminals. The S5201 is a microstepping system (default resolution of 25000 steps/rev).

The programming language of the S5201 consists of easy-to-use ASCII characters. Compatibility with any RS-232C device allows the user to easily interface the S5201 to computers, most programmable controllers and a variety of programming terminals. Both simple and complex motion profiles can be developed and stored in the S5201's 8,000 character, non-volatile (battery-backed) RAM memory. Programs stored in the Model S5201 can be executed remotely from switch closures, programmable controllers or computers.

The Model S5201 has 12 optically-isolated inputs that can be used for end-of-travel limits, home position, registration and user-defined inputs for program interaction.

The four optically-isolated outputs are user-defined to activate other machine or process functions. An additional feature of the S5201 is compatibility with most two-channel quadrature incremental encoders permitting closed loop operation.

The S5201's choice of input devices, easy-to-use command language, low initial cost, small package size, digital technology, and high performance all add up to the most convenient, versatile programmable step motor control system available.

COMPATIBLE WITH NS, RS

- Speed to 25 ips, thrust to 800 lbs.

TS

- Speed to 40 ips, thrust to 2,400 lbs.

S5201 SYSTEM DIAGRAM
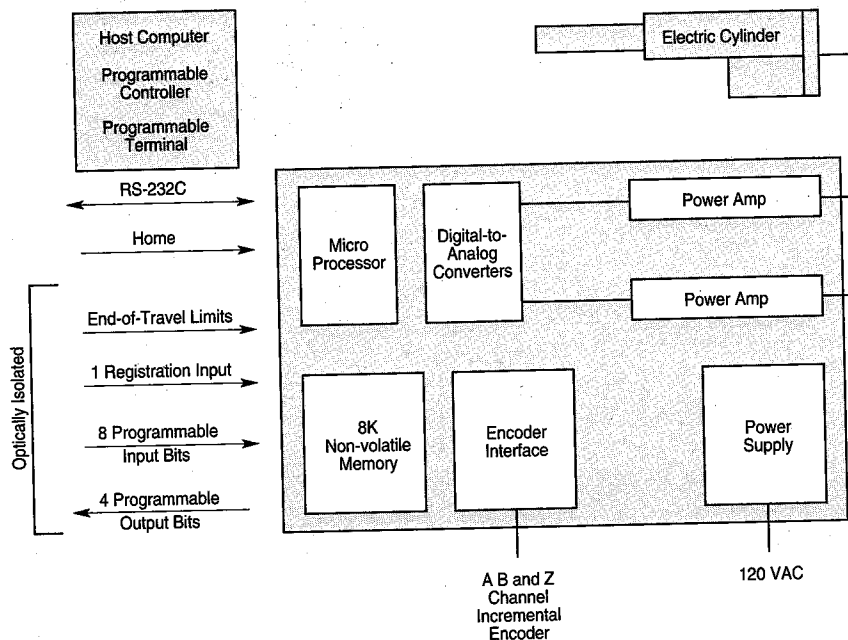
MODEL S5201 CONTROLLER

FEATURES

- Fully packaged with integral power supply and heat sink
- Motor and drive matching not required; selectable motor currents from 0-6 amps/phase
- Short-circuit (phase-to-phase and phase-to-ground), brown-out and over-temperature protected
- 95-132 VAC power input
- RS-232C command interface
- 1 to 16 devices can be daisy-chained on a single RS-232C port
- 8,000 characters of non-volatile program memory for storing up to 100 programs

- Incremental encoder interface for closed-loop operation standard
- Four optically-isolated programmable outputs
- 8 Programmable optically-isolated inputs; and 4 additional limits, home, and registration functions.
- Automatic execution of motion programs on power-up
- Program execution initiated by external switches, computer, or PLC
- Conditional branching commands
- Math and logic functions
- Registration input

S5225 FOLLOWING CONTROL

- Software option for S5201
- Allows actuator to follow speed and position of a master axis encoder
- Makes moves at a ratio of the master axis speed
- Contact factory for more information
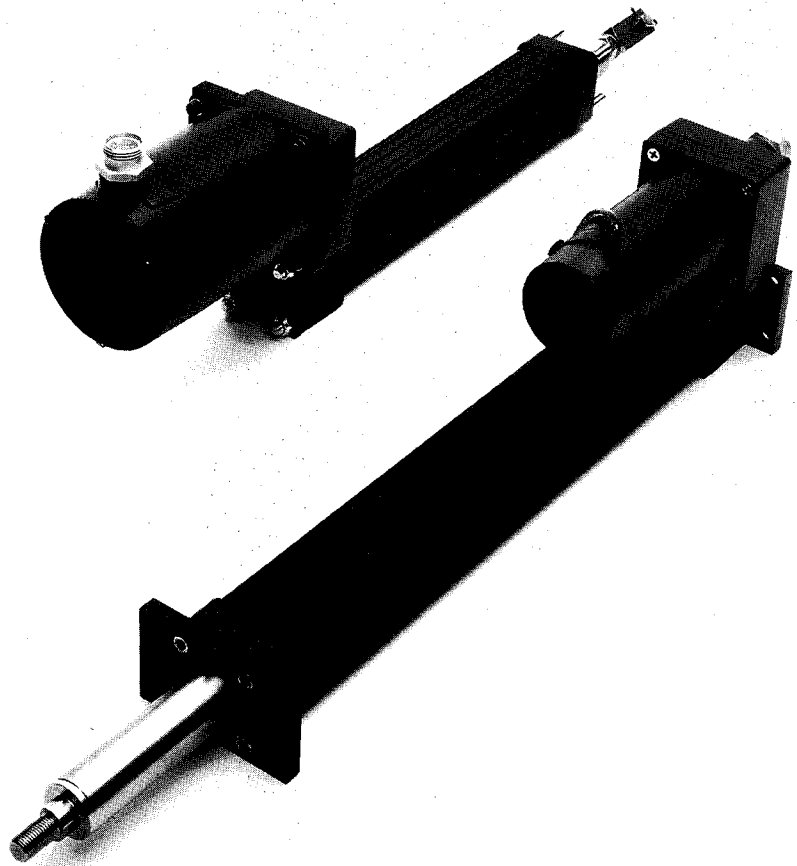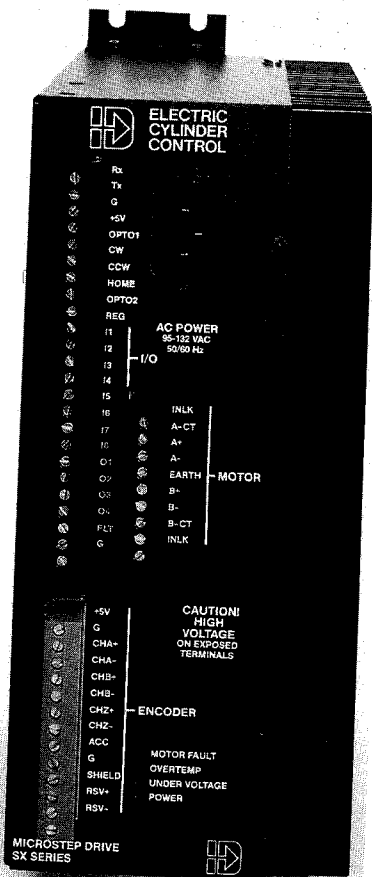
SPECIFICATIONS

PERFORMANCE

Stepping Accuracy
Velocity Accuracy
Velocity Repeatability
Motor Resolutions

Position Range
Velocity Range (motor)
Acceleration Range

±0 steps from preset total
±0.02% of max rate above 1 rps
±0.02% of max rate
200, 400, 1000, 2000, 5000, 10000, 12800, 18000, 20000, 21600, 25000, 25400, 25600, 36000, 50000, 50800 steps/rev
±0–99,999,999 steps
0.00001 to 50.0 rps, 0.00001 to 35.0 rps (50,800 step/rev)
0.01 to 9999.99 rps^2

MOTORS

Type
Breakdown voltage
  (HIPOT)
Number of leads
Inductance

2-phase hybrid permanent magnet. 1.8° hybrid type
750 VAC minimum

4, 6 or 8
0.5 mH minimum; 5.0 to 50.0 mH recommended range; 80.0 mH max (S2T=8mH, S2V=2mH, S3T=6.2mH, S3V=1.5mH)

AMPLIFIERS

Type

Number of phases
Protection*
  Short Circuit
  Brownout
  Overtemperature
Autostandby

Self test

20 kHz fixed frequency, variable duty cycle PWM (pulse width modulated). Current controlled, bipolar type. MOSFET construction.
2

Phase-to-phase, phase-to-ground
If AC supply drops below 85 VAC
Internal air temperature exceeds 158° (70°C)
If selected, motor current ramps to 75%, 50% or 25% of preset value if no step pulses are received for 1 second. Rated current levels are resumed upon receipt of next step pulse (software selected).
This feature (used primarily for testing and verification of correct wiring) rotates the motor at approximately 1 revolution/second for 6 revolutions in the CCW direction and 6 revolutions in the CW direction (initiated with a software command).

*Drive shuts down upon any of the above conditions. Power must be cycled to resume operations.

POWER INPUT

90-132 VAC 50/60 Hz

ENVIRONMENTAL

Operating Temperature
  Drive

  Motor

Storage Temperature
Humidity

32° to 122°F (0° to 50°C)
Maximum heat sink temperature is 122°F (50°C). Fan cooling may be required if airflow restricted.
212°F (100°C) maximum motor case temperature. Actual temperature rise duty cycle dependent
-40°F to 185°F (-40°C to 85°C)
0 to 95% non-condensing

MODEL S5201 CONTROLLER

INPUTS

Command Interface

Type

RS-232C serial type, 3 wire implementation (Tx, Rx, Gnd)

Parameters

Selectable baud rate (300, 600, 1200, 2400, 4800, 9600) 8 data bits, 1 stop bit, no parity

Configuration

Up to 16 indexers may be controlled from a single host RS-232C port in a daisy chain configuration

Programmable Inputs

Eight inputs may be used for BCD recall of motion programs and for interactive machine control. Optically isolated, 5 VDC

Limits, Home Enable

TTL Levels, optically isolated, 5 VDC

ENCODER A, B, AND Z CHANNEL

Differential or single ended, active high, <0.5 VDC low, >3.0 VDC high 4.5 mA sink

Max Frequency

160 KHz (pre-quadrature)

Minimum Pulse Width

500 nanoseconds

OUTPUTS

Fault Output

5 to 30 volts, maximum

Programmable Outputs

Five open collector, sink current of 35 mA

MOTION PROGRAMMABLE

Memory Storage

8 kbytes battery backed RAM

Number of Programs

100 sequences, dynamically allocated to 8K

RS-232C Execution

Program execution may be initiated from the RS-232C interface with RUN command (XR)

BCD Input Execution

Sequence select BCD inputs using thumbwheels

Power-up Auto Run

Sequences may be automatically executed (#100) on power-up.

DIMENSIONS
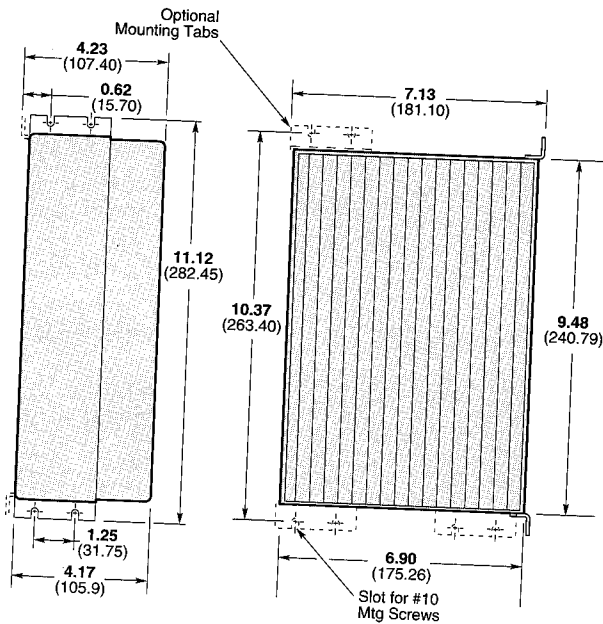
CONNECTIONS

Motor
Screw Terminal

No.	Signal
1	Interlock
2	A-CT
3	A+
4	A-
5	Earth
6	B+
7	B-
8	B-CT
9	Interlock

Encoder
Screw Terminal

No.	Signal
1	+5VDC
2	GND
3	CHA+
4	CHA-
5	CHB+
6	CHB-
7	CHZ+
8	CHZ-
9	ACC
10	GND
11	Shield
12	RSV+
13	RSV-

Inputs and Outputs
Screw Terminal

No.	Signal
1	Rx-RS-232C
2	Tx-RS-232
3	GND-RS232
4	+5V
5	Opto 1
6	CW limit
7	CCW limit
8	Home
9	Opto 2
10	Registration
11	Input 1
12	Input 2
13	Input 3
14	Input 4
15	Input 5
16	Input 6
17	Input 7
18	Input 8
19	Output 1
20	Output 2
21	Output 3
22	Output 4
23	Fault
24	GND

S

CONTROLLER PROGRAMMING

The Model S5201 provides a high level programming language. Software structures include IF THEN–ELSE statements, WHILE loops, REPEAT UNTIL loops, subroutines and GOTO statements. Math functions with variables can be performed along with complex decision making. Multiple expressions can be evaluated in the IF, Repeat and While statements. Up to 100 sequences can be defined and executed using several methods. The trace mode allows the user to trace stepping through the sequences to test their application and debug any potential problems. User friendly messages can be custom programmed to prompt the user. In addition, a fault sequence is available which will execute a sequence based on a number of different error conditions. I/O activation can be simulated to test program interface with the machine.

COMMAND SUMMARY

STATUS REQUEST COMMANDS

Command	Description
BS	Buffer status report
DPA	Display position actual
DPE	Display position error
DPS	Display setpoint position
DR	Display parameters
FS	Encoder function report
IS	Input status report
OS	Function setup report
PR	Absolute position report
PX	Report encoder position
R	Indexer status report
RA	Limit switch status report
RB	Loop, pause, shutdown, Trigger status report
RG	Go home status report
RS	Sequence execution report
RV	Revision level report
RSE	Report servo errors
SS	Function setup report
TS	Trigger input status
TM	Time of last motion

HOMING MOTION

Command	Description
GH	Go home
GHA	Go home acceleration
GHAD	Go home deceleration
GHF	Go home final velocity
GHV	Go home velocity

MOTION COMMANDS

Command	Description
A	Acceleration
AD	Deceleration
BL	Backlash
D	Distance
DP	Distance point
G	Go
H	Set direction
HALT	Halt
IV	Immediate velocity
ID	Immediate distance
JA	Jog acceleration
JAD	Jog deceleration
JVL	Jog velocity (low)
JVH	Jog velocity (high)
K	Kill
GD	Go predefined move
GDEF	Configure predefined move
LAD	Limit deceleration
LD	Limit disable
MA	Mode alternate
MC	Mode continuous
MN	Mode normal
MPA	Mode position absolute
MPI	Mode position incremental
MPP	Mode position profile
MV	Maximum correction velocity
NG	End position profile
PU	Configure square wave
PUL	Activate square wave
SL	Software limits
SLD	Software limit disable
ST	Shutdown
STOP	Stop
Q0	Exit velocity profiling mode
Q1	Enter velocity profiling mode
REG	Configure registration move
RM	Rate multiplier in velocity streaming mode
S	Stop
Y	Stop loop
V	Velocity
VS	Start/stop velocity

SET UP COMMANDS

Command	Description
CPE	Configure position error
CPG	Configure proportional gain
CPM	Configure proportional maximum
DW	Deadband window
ER	Encoder resolution
E	Enable RS-232C communication interface
F	Disable RS-232C communication interface
MR	Motor resolution
RIFS	Return indexer to factory settings
PZ	Set absolute counter to zero
SP	Set position absolute

NON-VOLATILE MEMORY AND SEQUENCE CONTROL COMMANDS

Command	Description
#	Step sequence
GOSUB	Gosub sequence
GOTO	Goto sequence
XBS	Report sequence memory available
XC	Sequence checksum report
XD	Sequence definition
XDIR	Sequence directory
XE	Sequence erase
XFK	Set fault or kill sequence
XG	Goto sequence
XQ	Sequence interrupted run mode
XR	Run sequence
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

I/O AND PROGRAM CONTROL COMMANDS

Command	Description
LF	Line feed
CR	Carriage return
^H	Backspace
PS	Pause
C	Continue
U	Pause and wait for continue
DIN	Disable inputs
DOUT	Disable outputs
IN	Set input functions
INL	Set active input level
IO	Immediate output
O	Output
OUT	Set output functions
OUTL	Set active output level
OUTP	Output on position
SN	Scan delay time
STR	Set strobe output delay time
IF	If
ELSE	Else
NIF	End of IF commands
L	Loop
N	End of loop
REPEAT	Repeat
UNTIL	Until
WHILE	While
NWHILE	End of while
WHEN	When
RSIN	Read variable
SFL	Set user flag
T	Time
TR	Wait for trigger
"	Quote command
OFF	Off
ON	On
Z	Reset

THUMBWHEEL COMMANDS (VIA PARALLEL I/O)

Command	Description
DRD	Read distance via parallel input/output
LRD	Read loop count via parallel input/output
TRD	Read time delay from parallel input/output
VARD	Read variable from parallel input/output
VRD	Read velocity from parallel input/output
XRD	Read sequence via parallel input/output

FOLLOWING COMMANDS (MODEL S5225 ONLY)

Command	Description
FBS	Following base count
FIN	Following increment
FOR	Following ratio
FOL	Following percent
TF	Set following time
FAC	Following acceleration
FEN	Following encoder count

The S5851 Control is a complete step motor controller containing a power supply, amplifier, programmable motion controller and operator interface all in one package.

An advanced amplifier design utilizes the latest microstepping technology to obtain high resolution (25000 steps per motor rev), smooth motion and high positioning repeatability.

The S5851 uses Industrial Devices' advanced, yet easy-to-use *IDEAL*™ motion programming language. It can be programmed via the keypad/ LCD display or RS-232C Serial Communication to create up to 98 programs containing move profiles and functional operations.

Each unit has twelve inputs and ten outputs which allow it to stand alone or be interfaced with external devices such as computers, PLCs, or simple push-button operator stations.

COMPATIBLE WITH NS, RS

- Speeds to 25 ips, thrust to 800 lbs
- 23 and 34 frame step motors

EASY INTERFACE

- *Single package* contains indexer, drive, power supply, and operator interface
- *Simple programming* via LCD/ keypad or RS-232C interface
- Utilizes *Industrial Devices' IDEAL*™ motion programming
- Display allows *real-time monitoring* of position, I/O and program status.

- Dipswitch *selectable current* to match control with motor
- *Test Program* verifies operation
- *Diverse program execution* via LCD/keypad, RS-232, or inputs (Binary or BCD)
- *Automatic execution* of programs allowed on power-up
- *Daisy chain* multiple controls over an RS-232C serial link

VERSATILE PROGRAMMING

- IF-THEN and WAIT ON INPUT statement programming
- User variables allow "Run Time" prompting of operator for data entry
- "Teach Position" programming
- Large memory capacity
  —Store up to 98 programs
  —7.5K bytes of user program memory
- Programmable time delays, inputs, and outputs for synchronization with external devices
- Copy function (copy existing programs to another location
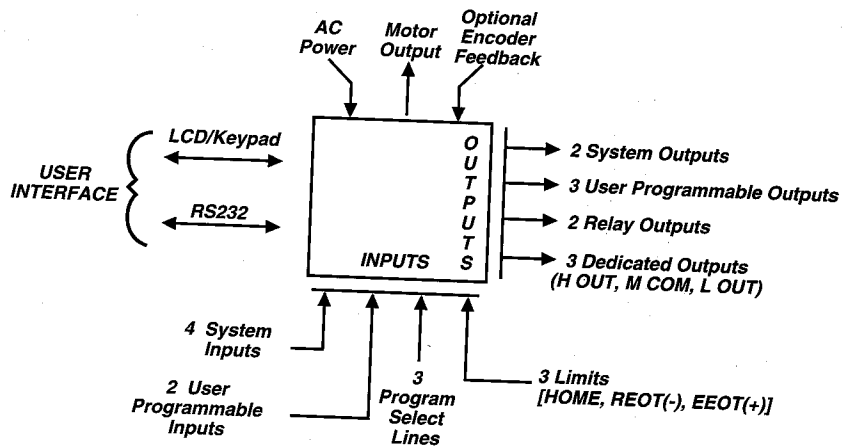
MOTION CONTROL

- Absolute or incremental positioning
- Velocity, Accel/Decel, or Output state can be changed on-the-fly
- Scaling feature allows users to program moves in their own units
- Built-in Jog operation using keypad or system input
- Move continuous operation
- Multi-axis control via RS-232C daisy chain

- Wide stable speed range
- Motor resolution of 25,000 microsteps per revolution
- Optional encoder interface for stall detection and closed loop positioning if desired
- Ability to hold position (stationary holding torque on motor)

RELIABILITY

- Short circuit protection -Phase-to-phase, phase-to-ground
- Drive over-temperature detection
- Optically isolated inputs and outputs
- Status and fault outputs to verify proper operation

SYSTEM COMPONENTS

1. S5851 Control

2. NS or RS Series electric cylinder

3. Home Switch—normally open position sensor

   RPS-1: Reed Switch

   RP1: Hall Effect Switch

4. End-of-travel Switches—Normally closed position sensors

   RPS-2: Reed switch

   RP2: Hall Effect switch

Optional

5. 500 line encoder—cylinder -EM option. For stall detection and closed loop positioning.

IDEAL™ MOTION PROGRAMMING LANGUAGE

Run Mode

Power Up Mode and Main Mode of Operation

Allows immediate OPERATIONAL and FUNCTIONAL CONTROL through the LCD/keypad:

* Execute Run Mode functions

* MONITOR Cylinder Position, I/O, and/or Function Status from the display

* ACCESS to all other Modes of Operation

RS-232C Interface

Allows user to communicate with the S5851 over the RS232 Port from a remote host device such as a computer or PLC to:

* UPLOAD & DOWNLOAD program strings and parameter values
* EXECUTE Programs and Functional Operations
* MONITOR Position and I/O Status

System Parameters

A predefined menu of commands which allow the user to define the SYSTEM ENVIRONMENT and OPERATING LIMITS of the Control and Cylinder System.

Edit Mode

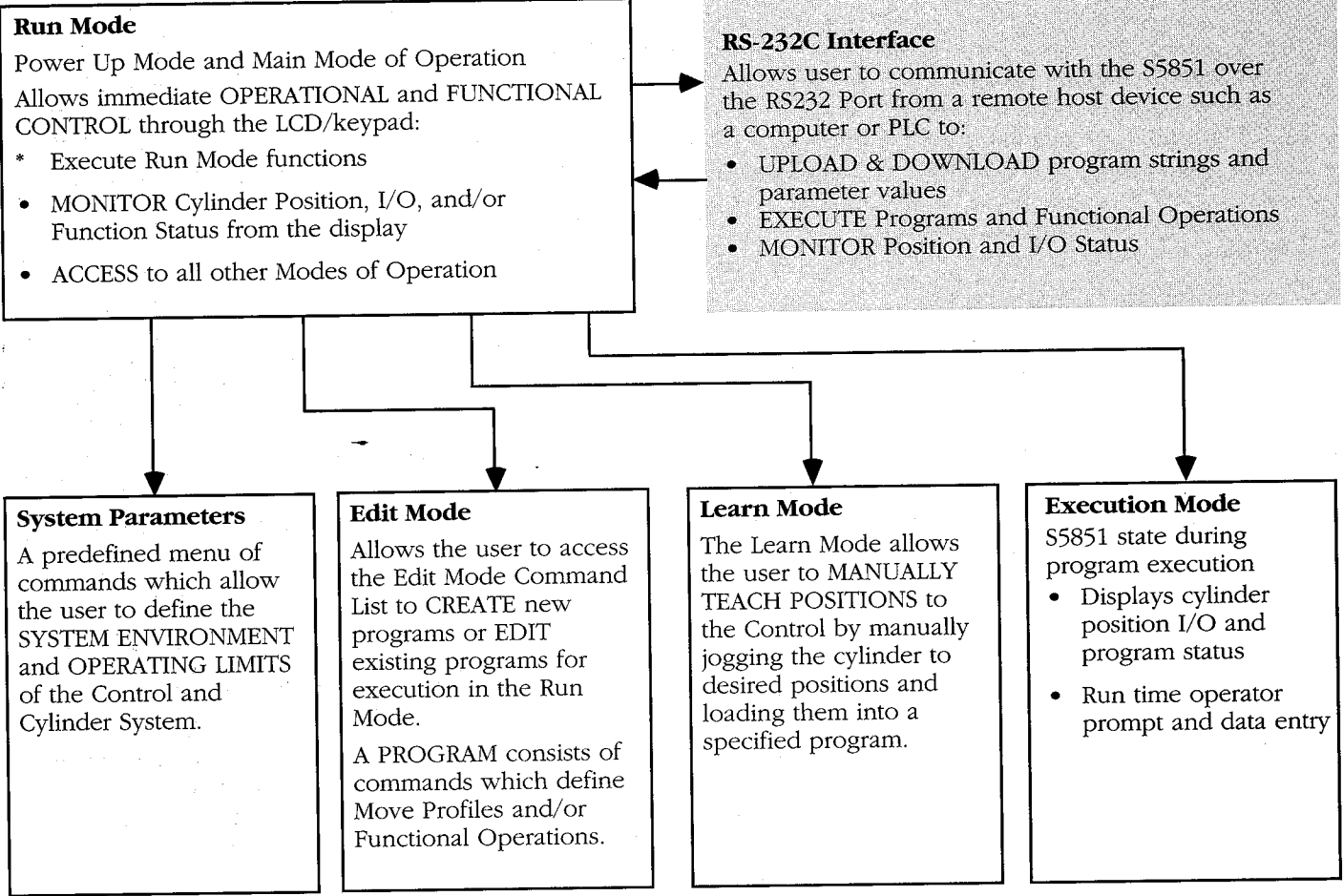Allows the user to access the Edit Mode Command List to CREATE new programs or EDIT existing programs for execution in the Run Mode.

A PROGRAM consists of commands which define Move Profiles and/or Functional Operations.

Learn Mode

The Learn Mode allows the user to MANUALLY TEACH POSITIONS to the Control by manually jogging the cylinder to desired positions and loading them into a specified program.

Execution Mode

S5851 state during program execution
* Displays cylinder position I/O and program status

* Run time operator prompt and data entry

KEYPAD OPERATION

The keypad and display allows the user to easily enter and edit programs, view status messages and enter run time program variables. Each of the 20 push-buttons on the keypad has been assigned a specific role in developing or running a program.

SOFTWARE/PROGRAMMING SPECIFICATIONS

|	
Memory	7.5K Bytes non-volatile EEPROM
Programs	Stores up to 98 motion programs, allowing up to 1,000 characters per program (not to exceed 7.5K total memory)
Command Format	2 character upper-case ASCII
Program Entry	Keypad or RS232 Serial Interface
Program Execution	Keypad, RS232 Serial Interface, External I/O (Binary or BCD)

IDEAL™ KEYPAD COMMAND SUMMARY

Run Mode Functions

Key(s)	Description
ESC	Immediately Stop Motor or Program Operation
EDIT	Select Program to Edit
ENTR	Enter Data or Initiate Command
DEL	Select Program to Delete
F1-0	Display Available Memory
F1-5	Test Outputs
F1-6	Select Program to Run
F1-7	Select Program to Copy
F1-9	Motor Shutdown
F1-Edit	Enter System Parameters
F2-Edit	Enter Learn Mode
F1-F2-1	Reset Current Position to Zero
F1-F2-3	Send String Over RS-232
F1-F2-8	Restore Default Values
F1-F2-9	System Reset
F1-F2-ENTR	Display Software Revision
F1-F2-DEL	Original Configuration: Erase Memory
ESC & --->	Jog Motor in + direction
ESC & <---	Jog Motor in - direction

Edit Mode Commands

F1	Command	Function
1	DA	Distance Absolute
2	DI	Distance Increment
3	DC	Distance to Change
4	VE	Velocity
5	OT	Outputs
6	RN	Run Program
7	TD	Time Delay
8	WT	Wait On In
9	GO	Go-Move
0	GH	Go Home

F2	Command	Function
1	AC	Acceleration
2	DE	Deceleration
3	IF	IF-THEN
4	LP	Loop
5	EL	End of Loop
6	ST	Stop On Inp
7	MC	Move Continuous
8	—	Reserved
9	EN	End of Program
0	UV	User Variable

F1-F2	Command	Function
1	ZP	Zero Position

System Parameters

Parameter	Description
MN	Model Number
CS	Coordinate System
DP	Display Mode
EC	Echo RS-232
EM	Encoder Mode
ER	Encoder Resolution
FE	Following Error
HA	Home Algorithm
HO	Home Offset
JA	Jog Acceleration
JV	Jog Velocity
PU	Power-up Mode
RA	Ratio Variable A
RB	Ratio Variable B
SD	Stop, Decel Rate
SI	System Inputs
SO	System Outputs
XP	External Prog. Select
UN	Unit Number (RS232)

Execution Mode Functions

Key(s)	Description
ESC	Stop motor and terminate program
1-9	Operator data entry
ENTR	End data entry

RS-232C PROGRAMMING

Communication Interface: Daisychaining Multiple Devices
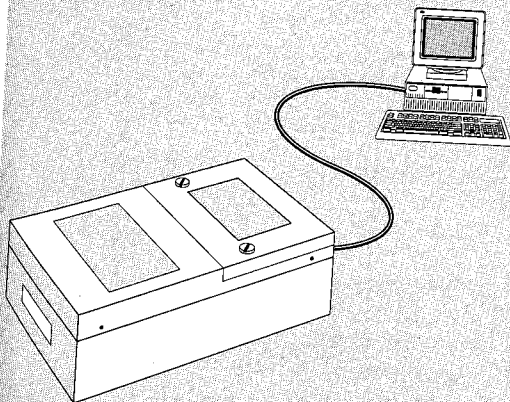
The RS-232C port allows the S5851 to communicate to a host device (such as a Computer or PLC) via a 3 wire Serial Interface to UPLOAD and DOWNLOAD programs and parameters, in addition to "real-time" execution and termination of programs.
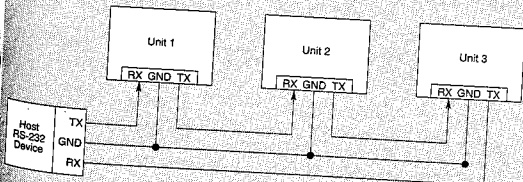
Users can upload and download all Edit Mode Commands and System Parameters (both listed above) in addition to an RS232 Command set which allows *real time* interaction with the host device.

RS232 COMMAND SUMMARY

Commands utilized only in RS232 Mode which provide Program and Operational Control of the S5851 via the host device.

DL	DOWNLOAD PROGRAM
DR	DOWNLOAD PROGRAM TO RAM
ER	ERASE PROGRAM
K	KILL PROGRAM
OC	ORIGINAL CONFIGURATION
S	STOP PROGRAM (Controlled Decel)
SR	SOFTWARE REVISION
RN	RUN PROGRAM
TD	TELL DISTANCE (Position)
TI	TELL INPUTS
TO	TELL OUTPUTS
TP	TELL PARAMETERS
UL	UPLOAD PROGRAMS
ZP	ZERO POSITION
ZZ	SYSTEM RESET

S

SPECIFICATIONS
MOTOR/POWER

Input Power	95 to 132 VAC @ 50/60 Hz; 8.0 amps max
Motor Output	75VDC @ 1-7.5 amps (adjustable via dipswitch)
Amplifier	20 kHz PWM; MOSFET, bipolar 2 phase
Logic Power Output	12 VDC unregulated at 500 ma
	(250 ma available to power external devices)

PERFORMANCE

Positioning
Range	±0-999.9999 inches or cm
Resolution	25,000 µsteps per motor revolution
Repeatability	±0.0005 inches
Step Accuracy	±0 µsteps from preset total

Velocity
Range	0.05 to 50 rps (linear speed is cylinder dependent)
Resolution	1,000 programmed increments
Repeatability/Accuracy	±0.02% of max rate

Acceleration
Range	0.05 to 15 sec

INPUTS

High Level Inputs	(±)SI1, (±)SI2, (±)SI3, (±)SI4
Operation	Optically isolated Sinking or Sourcing Inputs
Power Requirement	VDC 10 to 30 VDC at 44 ma max
Low Level Inputs	HOME, EEOT, REOT, PRG1, PRG2, PRG3, IN1, IN2
Operation	Optically isolated, sinking inputs
Rating	Draws 20 ma @12 VDC (10-16 VDC isolated voltage range)
	All Inputs must be stable for a minimum of 10ms to be recognized

OUTPUTS

|	
Relay Outputs	(COM2, NC2, NC1) and (COM1, NC1, NO1)
Operation	SPDT normally open/normally closed contacts
Contact Ratings	2 amps at 30 VDC resistive, 2 amps at 125 VAC resistive
Low Level Outputs	OUT1, OUT2, OUT3, SO1, SO2, HOUT, LOUT, MCOM
Operation	Optically Isolated NPN Open Collector Sinking Outputs
Ratings	ON Sinking to ground, 250 ma @1.5VDC
	OFF Open circuit high, 2ma @12VDC

RS-232C COMMUNICATIONS

Operation	9600 baud, 8 data bits, no parity, 1 stop bit
	Three wire implementation (no handshaking).
Daisy Chaining	Single host RS-232C port can control 98 units

ENVIRONMENTAL

Operating Temperature	32°F to 130°F (0 to 55°C) Note: An internal thermostat will shut down the drive it the internal air temperature exceeds 160°F (71°C)
Heat Sink Temperature	212°F (100°C)
Storage Temperature	-40° to 185°F (-40° to 85°C)
Humidity	0-95% non-condensing

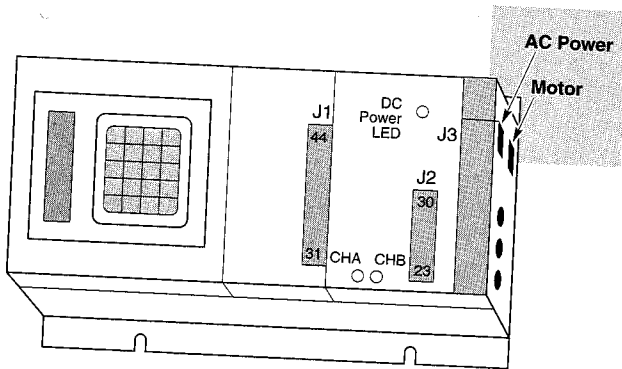## DIMENSIONS
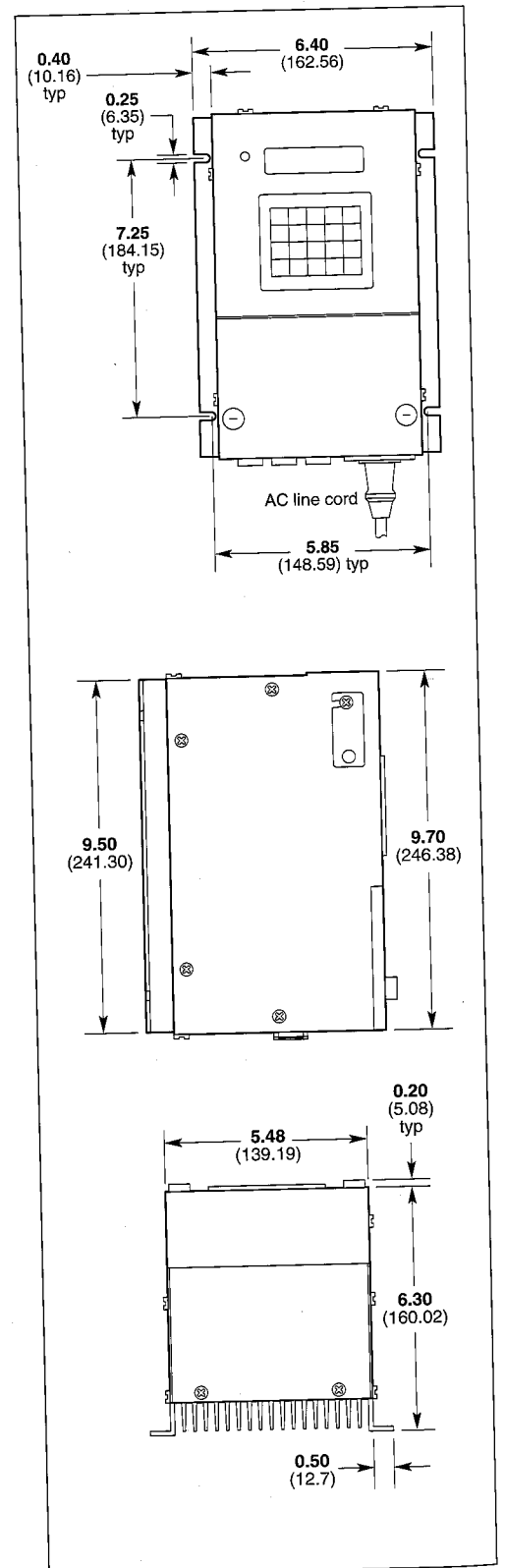
-EM ENCODER OPTION

Operation	Dual channel TTL level feedback
Power Requirement	5VDC @ 90ma
Pulses per rev	500 lines with quadrature (2000PPR)
Interface	Differential Line Driver
Cabling	8-wire shielded cable with twisted pair maximum length 200 ft. (22AWG).

Note: Unit comes with 12 ft cable

MOTOR COMPATIBILITY

Type	2 phase hybrid 1.8° permanent magnet step motors
	Nema 23 and 34 frame sizes
Number of leads	8 (will accept 4, 6, or 8 lead motors)
Inductances	0.5-25mH recommended range (ideal <10 mh)

TERMINAL LISTINGS

MOTOR/POWER INTERFACE

Term.	Label	Description
1	A+	Motor Phase A+
2	A-	Motor Phase A-
3	B+	Motor Phase B+
4	B-	Motor Phase B-
5	GND	Motor Case Ground

AC Power — 3 conductor AC power plug

J1 I/O INTERFACE: HIGH LEVEL LOGIC

Term.	Label	Description
44	SI1+	System Input 1+
43	SI1-	System Input 1-
42	SI2+	System Input 2+
41	SI2-	System Input 2-
40	SI3+	System Input 3+
39	SI3-	System Input 3-
38	SI4+	System Input 4+
37	SI4-	System Input 4-
36	COM2	RELAY 2 Common
35	NC2	RELAY 2 Normally Closed
34	NO2	RELAY 2 Normally Open
33	COM1	RELAY 1 Common
32	NC1	RELAY 1 Normally Closed
31	NO1	RELAY 1 Normally Open

J2 ENCODER (USE OPTIONAL)

Term.	Label	Description
30	ChZ+	Channel Z +
29	ChZ-	Channel Z -
28	ChB+	Channel B +
27	ChB-	Channel B -
26	ChA+	Channel A +
25	ChA-	Channel A -
24	5V	5 Volts DC encoder power
23	GND	DC Ground

J3 I/O INTERFACE: LOW LEVEL LOGIC

Term.	Label	Description
22	GND	DC GROUND
21	PWR	12 VOLTS Logic Power
20	GND	DC GROUND
19	HOME	Home Limit Switch
18	EEOT	Extend (+) End-of-Travel Limit
17	REOT	Retract (-) End-of-Travel Limit
16	PRG1	Program Select Input 1 (LSB)
15	PRG2	Program Select Input 2
14	PRG3	Program Select Input 3 (MSB)
13	IN1	Input 1, User programmable
12	IN2	Input 2, User programmable
11	OUT1	Output 1, User programmable
10	OUT2	Output 2, User programmable
9	OUT3	Output 3, User programmable
8	SO-1	System Output 1
7	SO-2	System Output 2
6	HOUT	At Home
5	LOUT	At an End-of-Travel Limit
4	MCOM	Move Complete
3	TX	RS-232 Transmit
2	RX	RS-232 Receive
1	GND	Ground

Industrial Devices' 851 Indexer is a stand-alone programmable motion controller with an operator interface and step and direction outputs to control position.

COMPATIBLE WITH

- NS, RS and TS Series cylinders using the S5101 microstepping drive
- Step and direction input drives from other manufacturers

FEATURES

- Single-axis motion controller, operator interface, and power supply package
- IDEAL programming capabilities include:
  - -conditional branching
  - -interrupts
  - -programmable I/O and time delays
  - -up to 98 programs, 7.5K user program memory
  - -learn mode
- Real time display of position, I/O and program status
- Diverse program selection via front panel, RS-232C, inputs, or execute on power up
- Run time operator prompts and data entry
- Motion capabilities include:
  - -absolute or incremental positioning
  - -velocity, accel/decel or output changes on the fly
  - -user scaling to preferred linear position units
  - -jog operation
  - -open or closed loop operation (with encoder)
  - -adjustable motor/drive and encoder resolutions
  - -up to 1.25 MHz step output

PACKAGING

- Supplied with indexer/drive cable and AC power cord
- Panel or face mounting
- Dimensions 5.5 x 10 x 3.6 inches

INPUTS AND OUTPUTS

- Drive step, direction and shutdown outputs, drive fault input
- End-of-travel and home inputs
- Dedicated and programmable inputs (9), and outputs(10)
- Encoder A, B and Index
- 5 VDC encoder and 12 VDC auxiliary power available

CONNECTIONS

- Removable screw terminals for all logic I/O and encoder
- 25 pin D for Drive
- Molded AC power plug

FOR COMPLETE SPECIFICATIONS

- Ask for our 851 Indexer brochure