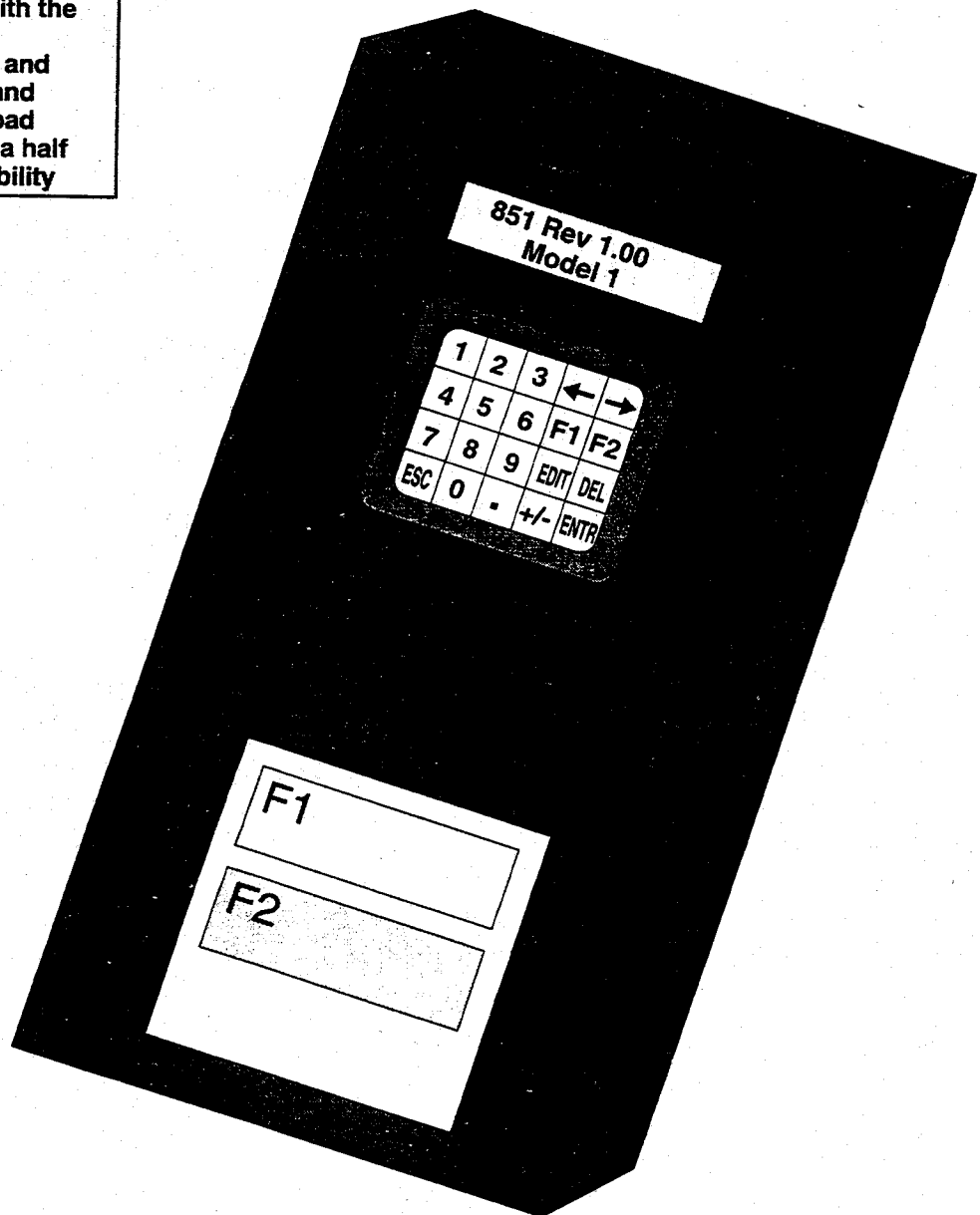# 851 Indexer

Operator's Manual

P/N PCW-4569   Rev. 1.00   3/94

This manual can be used with the
following IDC products:
851 — Indexer with step and
        direction output and
        integral LCD/keypad
852 — 851 with one and a half
        axis control capability

851 Rev 1.00
Model 1

1	2	3	←	→
4	5	6	F1	F2
7	8	9	EDIT	DEL
ESC	0	.	+/-	ENTR

F1

F2

**INDUSTRIAL
DEVICES
CORPORATION**

Table of Contents

851 Overview

The Control...
The 851 Indexer is a microprocessor based motion controller which combines in one package, an intelligent control, power supply, and easy-to-use LCD/keypad operator interface.

It is a single axis device designed to provide open or closed loop position control to a step motor or servo drive system accepting digital, TTL level step and direction command signals.

The Programming...
It uses the advanced (yet easy to use) IDEAL™ motion programming language accessed by the built in keypad /display or by an RS232C Serial link. Users can create and store up to 98 programs containing move profiles and functional operations. The total programming memory capacity is 7.5KBytes with individual programs allowing up to 1000 characters.

The Interface...
Each 851 has twelve inputs and ten outputs which offer a variety of I/O configurations, allowing the unit to stand alone or be easily interfaced with external devices such as computers, PLCs, or simple pushbutton operator stations.

The 851 is a powerful "front-end " controller that is:
- Easy to program
- Easy to install
- Easy to operate

852 Overview

The Control...
The 852 Indexer is a one and a half axis control which has all the features of the 851 with the additional ability to home two seperate axes one at a time. This allows for control of two axes by paralleling the step and direction connections to two drives.

It is used in applications requiring identical, concurrent motion from two axes or when two axes are needed and motion is required of only one axis at a time.

See Appendix C in CH8 for special wiring and programming information when using the 852

Chapter 1 System Installation and Requirements

1. Identify System Components

851 Indexer Package

(1) 851 Indexer, 851 Manual, 6ft AC Line Cord, 12ft Indexer Cable, and two adjustable mounting brackets.

Motor/Drive System

(2) Motor/Drive system accepting TTL level step and direction command signals. IDC Drives S5101, S5102, B7002, or User Suppled.

(3) 1 Home Switch - Normally Open Position Sensor IDC Part # RPS-1 (Reed Switch) or RP1 (Hall Effect) when using IDC Cylinder Systems

(4) 1 Encoder(or simulated output) - 500 line, 2000 PPR with quadrature, monitoring <u>motor position</u>.

Encoder feedback is optional and is used when Stall Detection or closed loop positioning is required

(5) 2 End of Travel " CW and CCW " Normally Closed Position Sensors
IDC Part # RPS-2 (Reed Switch) or RP2 (Hall Effect) when using IDC Cylinder Systems

CW (+) and CCW (-) End of Travel Position Sensors are Not Required for System Operation but are RECOMMENDED for Overtravel Protection.

851 Indexer Package

851 Manual

851 Indexer

(1)

F1
F2

12 ft Indexer Cable

6 ft AC Line Cord

Two Mounting Brackets (attached when shipped)

Motor/Drive System

HOME (3)   REOT EEOT (5)
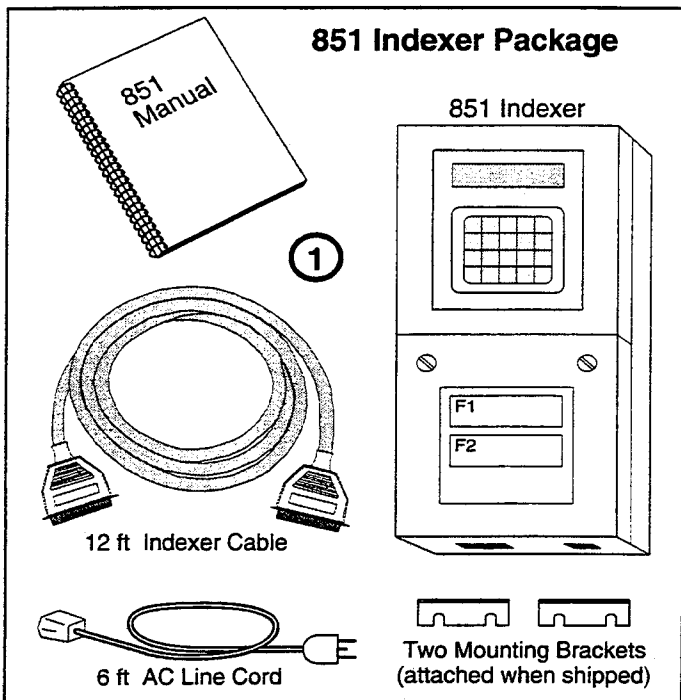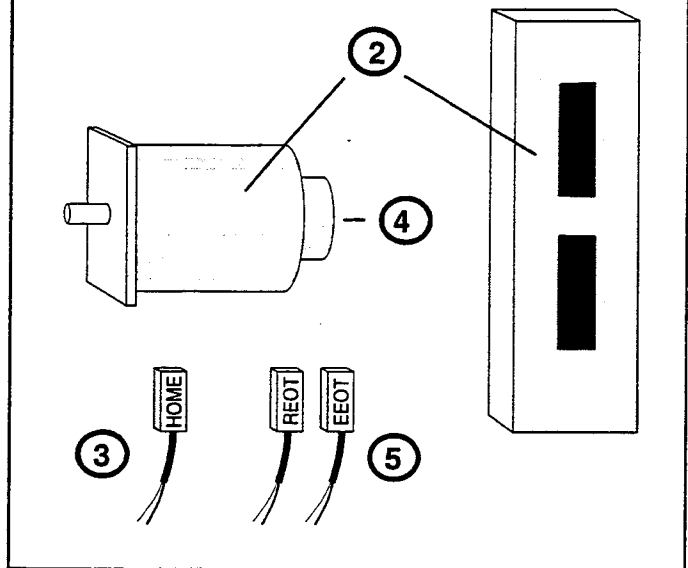
2. Identify Control Hardware Features

Removing the Detachable Cover of the 851 Indexer

Detachable Cover
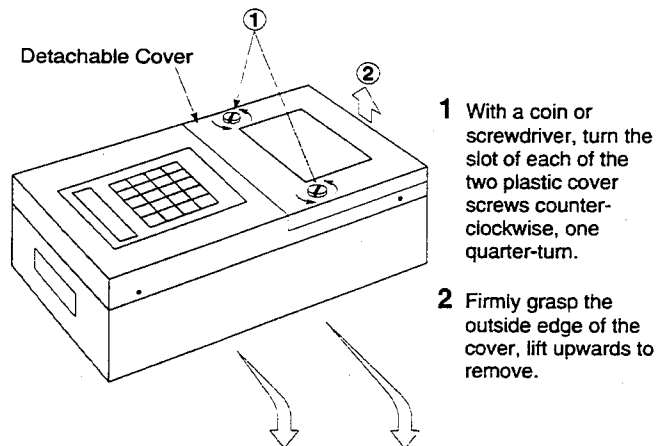
1 With a coin or screwdriver, turn the slot of each of the two plastic cover screws counter-clockwise, one quarter-turn.

2 Firmly grasp the outside edge of the cover, lift upwards to remove.

851

LCD Display and Keypad

Display Intensity Potentiometer

Dipswitches

DC Power LED

J1 44   J3 20   J2 30   31   CHA CHB 23   1   22

AC Power

Indexer (to drive)

Encoder channel indicators
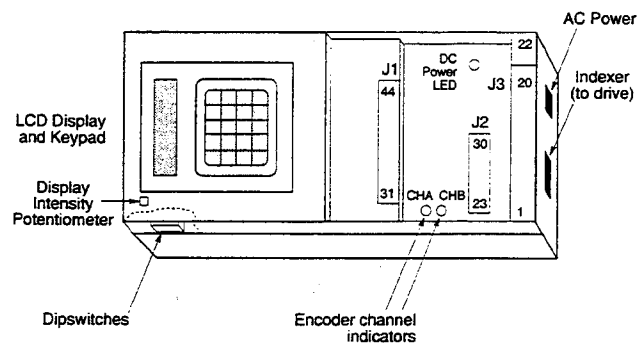
J1 Connector: I/O Interface–High Level Logic
J2 Connector: Encoder Interface
J3 Connector: I/O Interface–Low Level Logic

3. Basic Wiring to Operate Your Control

Figures 1-4 indicate the necessary interface wiring to operate your 851 Indexer. Wire the unit and proceed to step 4.

Fig. 1 System Block Diagram
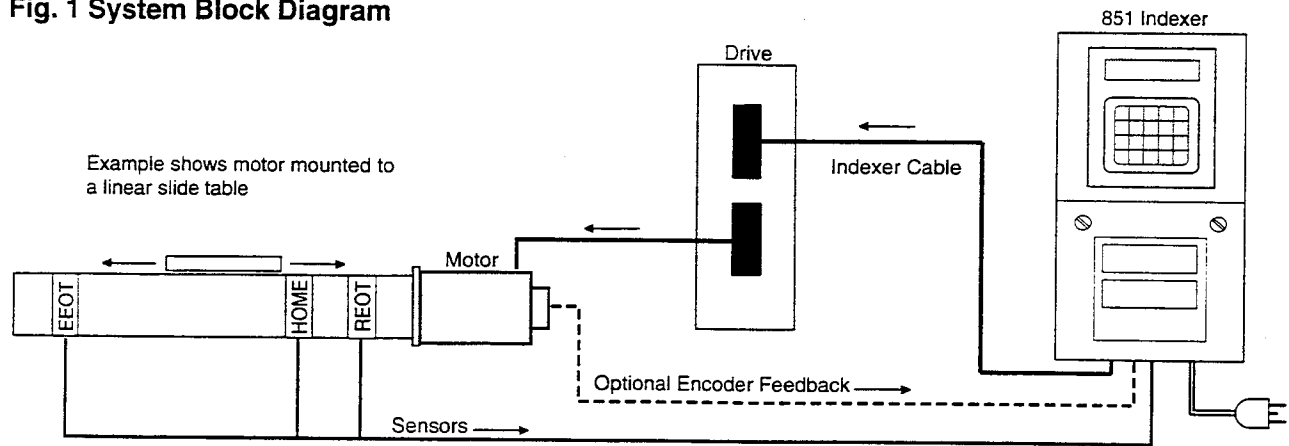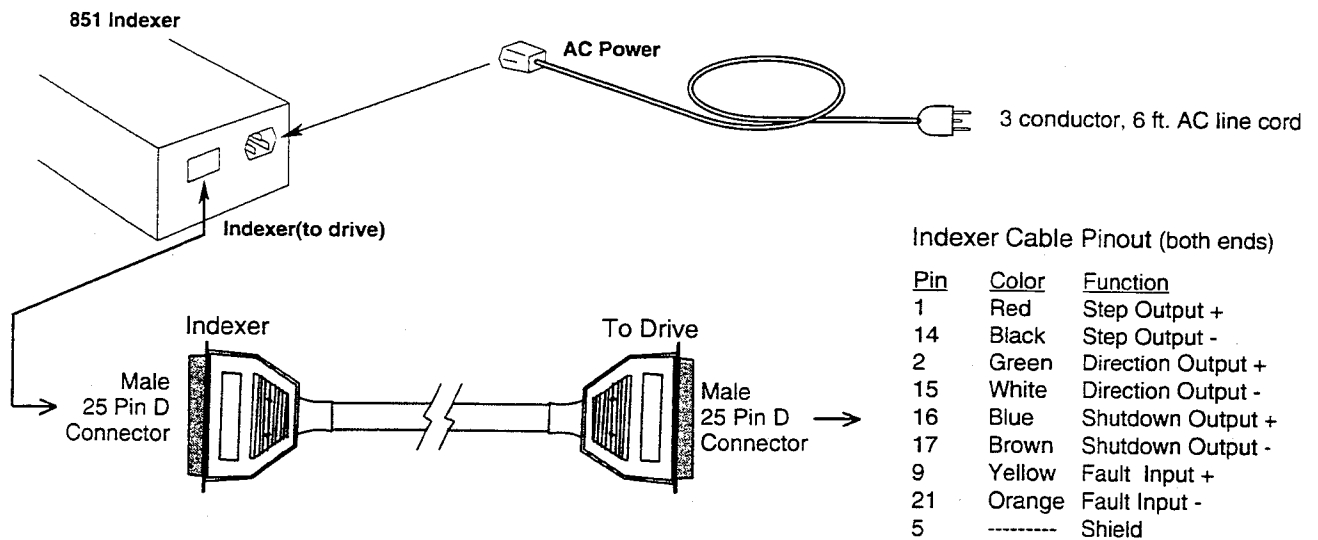
Example shows motor mounted to a linear slide table

851 Indexer

Drive

Indexer Cable

Motor

EEOT   HOME   REOT

Optional Encoder Feedback

Sensors

Fig. 2 Input Power and Indexer (to drive) Connections

851 Indexer

AC Power

3 conductor, 6 ft. AC line cord

Indexer(to drive)

Indexer

To Drive

Male 25 Pin D Connector

Male 25 Pin D Connector

Indexer Cable Pinout (both ends)

Pin	Color	Function
1	Red	Step Output +
14	Black	Step Output -
2	Green	Direction Output +
15	White	Direction Output -
16	Blue	Shutdown Output +
17	Brown	Shutdown Output -
9	Yellow	Fault Input +
21	Orange	Fault Input -
5	---------	Shield

Note: Based on drive connection requirements, it may be necessary to cut the Indexer Cable or make a custom cable. In each case, the shield connection (pin 5) should be terminated at one end ONLY.

Fig. 3 Encoder Option Wiring

J2

30	Ch Z+ (Yellow)
29	Ch Z- (Orange)
28	Ch B+ (Green)
27	Ch B- (Blue)
26	Ch A+ (Red)
25	Ch A- (Pink)
24	+5VDC (White)
23	GND (Black) / (Shield)

*Color code shown is for IDC Encoders

Fig. 4 Home and End of Travel Position Sensors

J3

20	GND
19	HOME
18	EEOT
17	REOT

Home Switch N.O. /N.C.
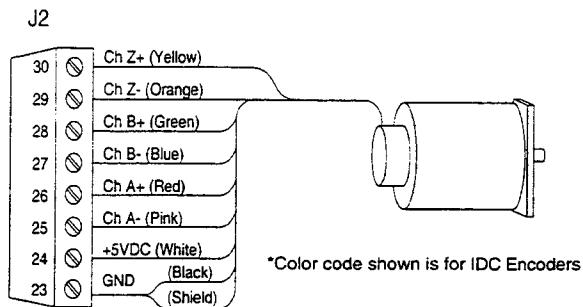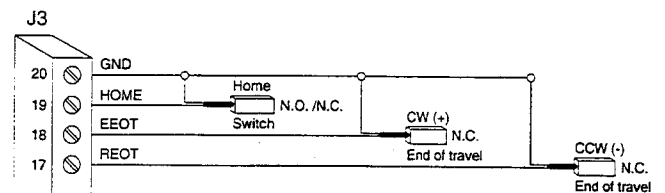
CW (+) N.C. End of travel

CCW (-) N.C. End of travel

Note: If no end of travel position sensors are used, inputs, REOT (+) and EEOT(-) must be jumpered to Ground (GND).

4. Applying Power to your unit and Identifying the Functions on your LCD display and keypad

1. Apply Power (115VAC) to your unit.

   After 2 seconds, the LCD screen will briefly flash the following display, indicating the Control Type, the Software EPROM Revision, and the Model Number configuration.

   Control Type ———————————— EPROM Revision

   ```
   851    Rev.1.00        Example
        Model 1           Screen
   ```

   Model Number
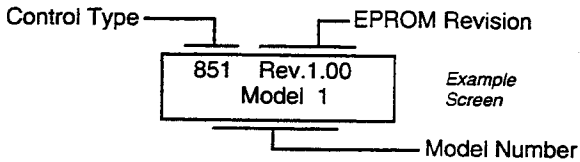
2. Identify functions on the RUN MODE Display

   Your unit will complete its power up cycle by entering into the Run Mode. The LCD screen will enter and remain in the Default Run Mode Display which indicates the motor position and I/O "ON/OFF" Status.

   DEFAULT RUN MODE DISPLAY

   Motor Position

   OUT 1 / OUT 2 / OUT 3 — User Programmable Outputs

   Relay 1 / Relay 2 — Relay Outputs

   ```
   +000.0000 000 00
   11 1111   111 100
   ```

   User Programmable Inputs — IN1 / IN2

   System Inputs — SI1 / SI2 / SI3 / SI4

   REOT / EEOT / HOME — Limit Inputs

   PRG3 / PRG2 / PRG1 — Program Select Inputs

LCD Display: Functional Description

Motor Position: Real-time position feedback report indicating motor position. The displayed position range is +/- 000.0000 to 999.9999 user defined units or +/- 0000000 to 9999999 step counts(determined by the Model Number). When the internal position counter is reset, the LCD position display sets itself to zero. This condition occurs upon power up, after a system reset, completion of a successful homing routine or when using the ZP(Zero Position) command.

INPUTS: LCD displays Input ON/OFF Status (0 or 1)
    0 = Input ACTIVATED(grounded low)
    1 = Input OFF (open circuit high)

OUTPUTS: LCD displays Output ON/OFF Status (1 or 0)
    1 = Output ON (Sinking to Ground)
    0 = Output OFF(Open Circuit)

LCD displays Relay Output ON/OFF Status(1 or 0)
    1 = Relay ENERGIZED (Contacts Active)
    0 = Relay DE-ENERGIZED (Contacts in Normal State)

Keypad: Functional Description

The keypad allows the user to easily enter and edit programs, execute operations, and enter run-time variables. Each of the 20 pushbutton keys (or sequence of keys pressed) is assigned a specific role in the different modes of operation.

1	2	3	←	→
4	5	6	F1	F2
7	8	9	EDIT	DEL
ESC	0	.	+/-	ENTR

20 Pushbutton Keypad

To configure the 851 to your Motor/Drive System, Shutdown/Fault Polarity(SF), the Motor Resolution (MR) and Model Number (MN) values must be set in System Parameters to allow proper system operation. Follow the three steps below to setup and test your system;

Step 1: Determine values for Shutdown/Fault Polarity, Motor Resolution and Model Number
Step 2: Enter the values (via keypad) for SF, MR and MN in System Parameters
Step 3: Run Test Program 99 to verify System Operation

Step 1: *Determine values for Shutdown/Fault Polarity, Motor Resolution and Model Number*

Determining the Shutdown/Fault Polarity(SF)

The Shutdown Output and Fault Input on the Indexer connector must be set active high or low to match the enable input and fault output of the external drive. The Shutdown/Fault Polarity command (SFmn) in System Parameters sets the polarity where m = Shutdown Polarity and n = Fault Polarity *Default SF:10*

m = 0 Shutdown Output state <u>active low</u>
   low(sinking to ground) when ON, high when OFF
 = 1 Shutdown Output state <u>active high</u>
   high when ON, low(sinking to ground) when OFF

n = 0 Fault Input state <u>active high</u>
   Normal Operation, input ON (sinking to ground)
   Fault Condition, input OFF(open circuit high)
 = 1 Fault Input state <u>active low</u>
   Normal Operation, input OFF(open circuit high)
   Fault Condition, input ON(sinking to ground)

<u>SF settings for IDC Systems</u>
S5101 or S5102 Drive: SF = 10
B7002 Drive: SF = 11

Determining the Motor Resolution(MR)

Motor Resolution configures the number of step pulses the drive requires to move the motor one revolution. Available values are 25000 or 5000.

<u>MR settings for IDC Systems</u>
S5101 or S5102 Drive: MR = 25000
B7002 Drive: MR = 5000

Determining the Model Number(MN)

Model Number configures how the distance and velocity units are scaled on the 851. Three configurations are available;

a. Step Counts   [Model 0]

b. User Defined Units   [Model 1]

c. IDC Cylinder Models   [Model xxx]

a. STEP COUNTS   MN:000

Description: Entering Model Zero (entered as 000) allows the user to directly program distances in step counts (rather than scaled units).

Distance Units: +/- 0000000 - 9999999 step counts
Velocity % Units: counts (steps) per second

Example: With an 851 configured for Model 000, what are the motor revs on two alternate drive systems, one with a Motor Resolution of 25000ppr and the other set at 5000ppr.

Program Distance	Drive #1 MR:25000	Drive#2 MR:5000
DI5000	1/5 rev	1 rev
DI25000	1 rev	5 revs
DI50000	2 revs	10 revs
DI100000	4 revs	20 revs

System Parameter Display

| Model #MN:000 |
| VE100=1250000cps |

Note: cps = counts (steps) per seconds, max value is dependent on motor resolution setting.

b. USER-DEFINED UNITS   MN:001

Description: Entering Model One (entered as 001) allows the user to program distances(and monitor on the display) in scaled units by setting up a ratio between the number of motor revolutions and a desired unit scale.

Distance Units: +/- 000.0000 - 999.9999 user-defined units
Velocity % Units: user-defined units per second

<u>Scaling Distance Units</u>
Three commands in system parameters are used, MN (to set the mode) and Ratio Variables RA and RB (to set the ratio).

1. Set the Model Number(MN) equal to one (MN:001).
2. Determine the total transmission ratio between the motor and the load.
   - How many motor revolutions equal one user unit ? [this is the RATIO]
3. Determine values for variables RA and RB by setting them up as a RATIO where...

$$RATIO = \frac{RA}{RB}$$ *Note: RA and RB must be whole numbers; RA up to 5 digits, RB up to 4 digits.*

Example: An 851 is configured to a motor drive controlling a linear feed system. Program distances are to be in feet, it has been determined that 5.36 motors revs is equal to one foot (one user unit) of travel.

1. Set the Model Number equal to one [MN:001]
2. Determine RATIO. Pre-determined that 5.36 motor revs equal one foot of travel.
3. Determine RA and RB

$$RATIO = 5.36 = \frac{RA}{RB} \quad let \; \frac{RA}{RB} = \frac{536}{100}$$

In System Parameters, set RA=536 and RB=100

With this setup, any distance programmed (or monitored on the LCD) will be in user units where a DA, DI, or DC of 1 will be equal to 1 ft or 5.36 motor revs.

System Parameter Display

| Model #MN:001 |
| VE100=xxx ups |

Note: ups = user units per second, max value is dependent on motor resolution setting.

The RA and RB variables must also be set (as determined above) in System Parameters when <u>Model Number 1</u> is selected.

c. IDC CYLINDER MODELS MN:xxx

Description: IDC Cylinder Models (See Charts Below) are pre-existing model numbers in the 851 which configure the unit to operate with an IDC Electric Cylinder System. It adapts to a specified cylinder's gear ratio and screw pitch, converting the step counts (of motor/drive) or encoder feedback pulses into inches of linear travel and the velocity into linear units of in/sec.

Note: Metric units for distance (cm) and velocity (cm/s) can be specified by enabling the Metric Units(MU) command in System Parameters.

Distance Units: +/- 000.0000 - 999.9999 inches or centimeters
Velocity % Units: in/sec or cm/sec

NS and RS Series Cylinders (with S5101 Drive)

Available Linear Speeds Model Number: 3 or 4 Digit Code

Cyl. Model	Eng. in/sec	Metric (cm/s)	Cyl. Model	Eng. in/sec	Metric (cm/s)	Cyl. Model	Eng. in/sec	Metric (cm/s)
102	25.00	(63.50)	105	10.00	(25.40)	108	6.25	(15.87)
152	16.66	(42.33)	155	6.66	(16.93)	158	4.16	(10.58)
202	12.50	(31.75)	205	5.00	(12.70)	208	3.12	(7.98)
—	—	—	255	4.00	(10.16)	258	2.50	(6.35)
352	7.00	(17.78)	355	2.80	(7.11)	358	1.75	(4.44)
992	25.00	(63.50)	995	10.00	(25.40)	998	6.25	(15.87)
			1205	.83	(2.11)	1208	.52	(1.32)
Ballscrew 2 pitch			**Acme/Ballscrew 5 pitch**			**Acme 8 pitch**		

TS Series Cylinders (with S5101 Drive)

Available Linear Speeds Model Number: 3 or 4 Digit Code

Cyl. Model	Eng. in/sec	Metric (cm/s)	Cyl. Model	Eng. in/sec	Metric (cm/s)	Cyl. Model	Eng. in/sec	Metric (cm/s)
101	50.00	(127.0)	104	12.50	(31.75)	106	8.33	(21.16)
151	33.33	(84.66)	154	8.33	(21.16)	156	5.55	(14.11)
201	25.00	(63.50)	204	6.25	(15.87)	206	4.16	(10.58)
501	9.78	(24.84)	504	2.44	(6.20)	506	1.63	(4.14)
1001	4.99	(12.67)	1004	1.24	(3.15)	1006	.83	(2.11)
991	50.00	(127.0)	994	12.50	(31.75)	996	8.33	(21.16)
Ballscrew 1 pitch			**Ballscrew 4 pitch**			**Acme 6 pitch**		

NB and RB Series Cylinders (with B7002 Drive)

Available Linear Speeds Model Number: 3 or 4 Digit Code

Cyl. Model	Eng. in/sec	Metric (cm/s)	Cyl. Model	Eng. in/sec	Metric (cm/s)	Cyl. Model	Eng. in/sec	Metric (cm/s)
102	40.00	(101.6)	105	16.00	(40.64)	108	10.00	(25.40)
152	26.66	(67.72)	155	10.66	(27.08)	158	6.67	(16.94)
—	—	—	255	6.40	(16.26)	258	4.00	(10.16)
992	40.00	(101.6)	995	16.00	(40.64)	998	10.00	(25.40)
Ballscrew 2 pitch			**Acme/Ballscrew 5 pitch**			**Acme 8 pitch**		

TB Series Cylinders (with B7002 Drive)

Available Linear Speeds Model Number: 3 or 4 Digit Code

Cyl. Model	Eng. in/sec	Metric (cm/s)	Cyl. Model	Eng. in/sec	Metric (cm/s)	Cyl. Model	Eng. in/sec	Metric (cm/s)
101	80.00	(203.2)	104	20.00	(50.80)	1061	3.33	(33.86)
151	53.33	(135.5)	154	13.33	(33.86)	156	8.89	(22.58)
201	40.00	(101.6)	204	10.00	(25.40)	206	6.67	(16.94)
501	16.00	(40.64)	504	4.00	(10.16)	506	2.67	(6.78)
1001	8.00	(20.32)	1004	2.00	(5.08)	1006	1.33	(3.38)
991	80.00	(203.2)	994	20.00	(50.80)	9961	3.33	(33.86)
Ballscrew 1 pitch			**Ballscrew 4 pitch**			**Acme 6 pitch**		

Note 1: Above speeds are max values based on the 851 step rate at the specified Motor Resolution settings, Final move speeds are LOAD, LENGTH, and MOTOR dependent. Review Cylinder Performance Curves in the IDC Main Catalog.

Identifying your IDC Cylinder Model Number and the Motor Mounting Configuration

<u>Identify Your Cylinder Model Number</u>

Example: Your Cylinder has this label attached
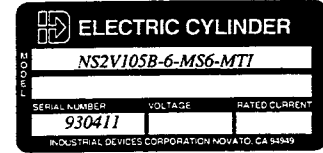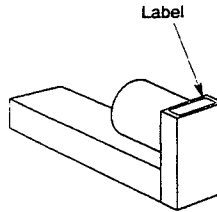
Label

ELECTRIC CYLINDER
MODEL NS2V105B-6-MS6-MT1
SERIAL NUMBER 930411 VOLTAGE RATED CURRENT
INDUSTRIAL DEVICES CORPORATION, NOVATO, CA 94949

Enter 105 as your Model #
(via Keypad or RS232)

System Parameter Display

Model # MN:105
VE100 = 10 in/s

<u>Identify Your Motor Mounting Configuration</u> from the table below. Cylinders with <u>Reverse/Parallel</u> mounts ONLY must denote an "R" (F2 Key) at the end of the 3 digit code when entering the System Model Number(MN).

Reverse/Parallel mounts require the control to reverse the motor polarity during moves so that a positive move Extends the cylinder.

Cylinder Motor/Mounting Configurations

<u>Rod Type Cylinder Configurations (N and T Series)</u>

Parallel Reverse/Parallel (N only) Inline

<u>Rodless Cylinder Configurations (R Series)</u>

Parallel Reverse/Parallel Inline

Ex. From the previous example, the NS2V105B-6-MS6-MT1-RM cylinder is configured with a Reverse/Parallel Motor Mount.

Specify Model Number & Reverse/Parallel Mount

Via RS232 Enter;

1 0 5 R

Via Keypad Enter;

1 0 5 F2

System Parameter Display

Model # MN:105R
VE100 = 10 in/s

For additional information on configuring your 851 to IDC Cylinder Systems, review the setup listings in the Appendices (CH 8).

System Parameters are a predefined menu of commands which can be entered by pressing the following key sequence;

F1 **EDIT** **ENTR** ┐

MNnnn *Model Number*	**Model # MN:102 VE100=30.00 in/s**
CSn *Coordinate System*	Coordinate Sys CS:0 (0 or 1)
DPn *Display Mode*	Display Mode DP:1 (1 or 2)
ECn *Echo*	Echo RS232 EC:1 1=ON/0=OFF
EMn *Encoder Mode*	Encoder Mode EM:0 (0, 1, or 2)
FEnnnnnnn *Following Error*	Fol Error (Stall) FE:0025000
HAmnx *Home Algorithm*	Home Algorithm HA(mnx):010
HO+/-nnn.nnnn *Home Offset*	Home Offset HO:+000.0000
JAnn.nn *Jog Acceleration*	Jog Accel time JA:00.10
JVnn *Jog Velocity*	Jog Velocity JV:10
MRnnnnn *Motor Resolution*	**Motor Resolution MR:25000**
MUn *Metric Units*	Metric Units MU:0 1=on/0=off
PUnn *Power Up Mode*	Power Up Mode PU:00
RAnnnnn *Ratio Variable A*	**Ratio Variable A RA:00001**
RBnnnn *Ratio Variable B*	**Ratio Variable B RB:0001**
SDnn.nn *Stop Decel Time*	STn decel time SD:00.10
SFmn *Shutdown/Fault Polarity*	**Shutdown/Fault SF(mn):10**
SImnxy *System Inputs*	System Inputs SO(mnxy):8800
SOmn *System Outputs*	System Outputs SO(mn):00
UNnn *Unit Number*	Unit Number UN:01
XPn *External Prog. Select*	Ext Prog Select XP:0 (0,1, or 2)

To enter values, scroll to the appropriate Command Dislay and enter desired values through numbers on the keypad and press enter.

F1
(Scrolls Up)

↑

ENTR
(Scrolls Down)

↓

ESC
(Returns to Run Mode and saves system parameters)

Reference: Detailed Command Descriptions See System Parameter Command List/ Descriptions

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With your 851 configured for your motor/drive, you can now test your system for proper operation by running test program 99.
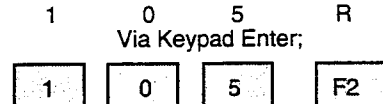
Program 99 is a permanent test program in memory and cannot be erased. The program commands the drive to move the motor clockwise 1 distance unit, pause, and then move counter clockwise 1 distance unit.

RUN MODE Default Display	+000.0000 000 00 11 1111 111 100

KEYPAD ENTRY	851 DISPLAY
F1	F1: Enter Run Mode Function
6	Enter Program to Run RN:__
9 **9** **ENTR**	Enter Program to Run RN: 99

Your motor should now rotate CW 1 distance unit, pause, and then rotate CCW 1 distance unit.

RUN MODE DISPLAY	+000.0000 000 00 11 1111 111 100	*Unit Returns to Run Mode Default Display*

YOUR SYSTEM IS OPERATIONAL

Note: If your motor did not perform the above move REVIEW STEPS 3-5. of this Chapter.

A. *IDEAL*™ Keypad Programming

Four modes of operation (Run Mode, Edit Mode, Execution Mode, and System Parameters) allow the user access to a powerful group of commands which easily configure and operate the 851 System to meet specific application needs. The following sections describe the functional operations within each of these four modes.

Operation Flowchart Diagram

Run Mode

Power Up Mode and Main Mode of Operation

Allows immediate OPERATIONAL & FUNCTIONAL CONTROL through the keypad

• EXECUTE the Run Mode functions available

• MONITOR Motor Position, I/O Status, and/or Function Status from the LCD Screen

• ACCESS to all other Modes of Operation

RS-232C

Allows user to communicate with the 851 via ASCII Characters over the RS-232 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

The RS232 Port will operate in the Run or Execution Modes.

How to Enter

| F1 | EDIT | ENTR |

How to Enter
"Edit a Program"

| EDIT | 1 | - | 9 | 8 | ENTR |

How to Enter
"Run a Program"

| F1 | 6 | 1 | - | 9 | 9 | ENTR |

System Parameters

A predefined menu of commands which allow the user to define the SYSTEM ENVIRONMENT and OPERATING LIMITS of the Indexer, drive, and motor system.

Edit Mode

The 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 a series of Edit Mode Commands denoting a Move Profile and/or a Functional Operation.

Execution Mode

851 state during program execution

• Displays motor position, I/O and program status

• Run-time operator prompt and data entry

How to Exit

| ESC |

How to Exit

| ESC |

How to Exit

| ESC |

Exit and Return to Run Mode

Program Execution is from the Run Mode via keypad, the external program select lines, or RS232. Program Operation is from the Execution Mode ONLY.

B. Multi-Function Keypad Definitions

The 851 Control assigns different functional abilities to keys in the four Modes of Operation. The following chart designates the Basic "Key" functions within each mode.

ESC RUN MODE	ESCAPE: Emergency Stop, Terminate Program Execution. <u>Immediately</u> stops any motion, time delay, loop, wait function, or scanning of the program select inputs currently being executed. The Escape key is also used to exit from other Run Mode Functions to the Run Mode Default Display and to jog the motor when pressed simultaneously with arrow keys.

| Selected Key	RUN Mode	System Parameters	EDIT Mode	Execution Mode
ESC	See Above	Exit & Save Parameters & then return to Run Mode	Exit the Edit Mode, Save the Program that was optional, & then return to Run Mode	Exit the Execution Mode(terminate program) and return to Run Mode
ENTR	Enter/Execute the specified Run Mode function.	Scroll forward to the next parameter display	Insert a "space" character in a program (acts as a Space Bar)	Enter data (complete data entry)
F1	Select a Run Mode function	Scroll backward to the previous Parameter Display	Select Edit Mode Command Function	——————
F2	Select a Run Mode function	Attaches "R" to Model# entry to indicate reverse mount on IDC Cylinder	Select Edit Mode Command Function	——————
EDIT	Select a Program to Edit or a Function Select Entry	——————	——————	——————
DEL	Select a Program to Delete or a Function Select Entry	Deletes the Character at the cursor in the Parameter Display Field	Deletes the character located at the cursor	Deletes the Character at the cursor in the Display Field
→	Pressed simultaneously with ESC Key to jog motor in the CW (+) direction	Move cursor to the right in the Parameter Display Field	Move cursor to the right on the Edit Mode Display Screen	——————
←	Pressed simultaneously with ESC Key to jog motor in the CCW (-) direction	Move cursor to the left in the Parameter Display Field	Move cursor to the left on the Edit Mode Display Screen	——————
+/-	——————	Toggle "sign" of entered numeric data	Toggle "sign" of entered numeric data	Toggle "sign" of entered numeric data
.	——————	Decimal point used with Numeric Data Entry	Decimal point used with Numeric Data Entry	Decimal point used with Numeric Data Entry
0 - **9**	Run Mode Fuction Selection & Alpha Numeric Data Entry	Alpha Numeric Data Entry	Edit Mode Command Function Selection or Alpha Numeric Data Entry	Alpha Numeric Data Entry

1. Operating in the RUN MODE

The Run Mode allows immediate manual & functional control of the 851 from the keypad interface using the Run Mode Function Set.

	Run Mode Monitor Display	
RUN MODE (851 Power Up &) (Operational Mode)	+000.0000 000 00 11 1111 111 100	(Default)

Run Mode Function Set			Function Display	Function
To select a function in Run Mode, press the correlating function keys (in order shown)			This is what your display should read.	Enter a variable or key specifier
		EDIT	Enter Program Number:__	Edit a Program __=1 to 98
		DEL	Enter Program to Delete:__	Delete a Program __ = 1 to 98
	F1	0	Bytes Remaining in EEPROM 7546	EEPROM Available Memory
	F1	5	OT00000 OUTPUTS nnnrr ACTIVE	Test Outputs (0 = OFF 1 = ON)
	F1	6	Enter Program to Run RN:__	Run a Program __= 1 to 99
	F1	7	Enter Source PRG # to Copy:__	Copy a Program __= 1 to 99
	F1	9	Disable Motor? YES=ENTR NO=ESC	Disable Holding Torque on Motor
	F1	EDIT	Alter Sys Params YES=ENTR NO=ESC	Enter System Parameters
F1	F2	ENTR	851 Rev 1.0 Model 1	Display EEPROM Revision & Model #
F1	F2	DEL	Original Config? YES=ENTR NO=ESC	Erase all Programs Restore all Default Parameter Values
F1	F2	1	Set Position to Zero ? YES=ENTR	Set current motor position to zero
F1	F2	3	Sending a string over RS232	Send an ASCII string to host device over RS232 Port
F1	F2	8	Restore Defaults YES=ENTR NO=ESC	Restore Default Values to Move & System Parameters
F1	F2	9	Reset System ? YES=ENTR NO=ESC	Issue a System Reset (Software Warm Boot)

Escape Key

Run Mode Monitor Display

ESC	+000.0000 000 00 11 1111 111 100	(Default)

Terminates all Program and Functional Operations in the Run Mode. After terminating the operaton, the unit exits to the Default Run Mode Monitor Display

ESC	&	→	+xxx.xxxx 000 00 11 1111 111 100	Jog Motor in the CW(+) Direction
ESC	&	←	+xxx.xxxx 000 00 11 1111 111 100	Jog Motor in the CCW(-) Direction

Reference: For Detailed Run Mode "Function" Descriptions See Run Mode Functions Command List/Description (Ch. 3).

Running a Program

All programs must be executed from the run mode where they can be run from the keypad, via RS232, or from the external program select lines.

Example Run Program 7

RUN MODE Default Display	+000.0000 000 00 11 1111 111 100	In Run Mode

KEYPAD ENTRY	851 DISPLAY	
F1	F1: Enter Run Mode Function	Select a Run Mode Function
6	Enter Program to Run RN:_ *Enter a Program Number (1 - 99) to execute.*	Select a program to run
7	Enter Program to Run RN:7	Select Program 7 to run
ENTR	+xxx.xxxx 000 00 11 1111 111 100	Execute Program 7

While any program is executing the screen will show the Run Mode Default Display which will monitor the motor position and I/O status.

Reference: To RUN Programs from the External Program Select Lines

See System Parameters: XP Command (external program select)
Hardware Reference: Wiring & specifications for the Program Select Low Level Inputs

2. Operating in System Parameters

System Parameters are a predefined command menu which allow the user to define the System Setup and Operating Limits.

+000.0000 000 00 11 1111 111 100	Run Mode Display	1. Enter System Parameters from the Run Mode by entering the following:

Your Display Reads

F1: Enter Run Mode Function	**F1**

Alter Sys Params YES=ENTR NO=ESC	**EDIT**—**ENTR**
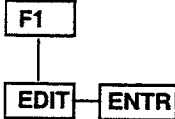
System Parameter Menu

MNnnn
Model Number
	Model # MN:102
	VE100=30.00 in/s

CSn *Coordinate System*	Coordinate Sys CS:0 (0 or 1)
DPn *Display Mode*	Display Mode DP:1 (1 or 2)
ECn *Echo*	Echo RS232 EC:1 1=ON/0=OFF
EMn *Encoder Mode*	Encoder Mode EM:0 (0, 1, or 2)
FEnnnnnnn *Following Error*	Fol Error (Stall) FE:0025000
HAmnx *Home Algorithm*	Home Algorithm HA(mnx):010
HO+/-nnn.nnnn *Home Offset*	Home Offset HO:±000.0000
JAnn.nn *Jog Acceleration*	Jog Accel time JA:00.10
JVnn *Jog Velocity*	Jog Velocity JV:10
MRnnnnn *Motor Resolution*	Motor Resolution MR:25000
MUn *Metric Units*	Metric Units MU:0 1=on/0=off
PUnn *Power Up Mode*	Power Up Mode PU:00
RAnnnnn *Ratio Variable A*	Ratio Variable A RA:00001
RBnnnn *Ratio Variable B*	Ratio Variable B RB:0001
SDnn.nn *Stop Decel Time*	STn decel time SD:00.10
SFmn *Shutdown/Fault Polarity*	Shutdown/Fault SF(mn):10

To enter values, scroll to the appropriate Command Dislay and enter desired values through numbers on the keypad and press enter.

F1
(Scrolls Up)

ENTR
(Scrolls Down)

ESC
(Returns to Run Mode and saves system parameters)

Reference:
Detailed Command Descriptions
See System Parameter Command List/ Descriptions

Menu Continued from previous column

SImnxy *System Inputs*	System Inputs SO(mnxy):8800
SOmn *System Outputs*	System Outputs SO(mn):00
UNnn *Unit Number*	Unit Number UN:01
XPn *External Prog. Select*	Ext Prog Select XP:0 (0,1, or 2)

Altering a System Parameter

Example: Configure the 851 for Display Mode 2, and for use in Encoder Mode 1.

Enter System Parameters from RUN MODE via keypad	+000.0000 000 00 11 1111 111 100	Run Mode Display

KEYPAD ENTRY	851 DISPLAY	
F1	F1: Enter Run Mode Function	Perform a Run Mode Function
EDIT	Alter Sys Params YES=ENTR NO=ESC	Do you wish to alter System Parameters

ENTR	Model # MN:102
	VE100=30.00 in/s
		Model # is first Parameter Display

ENTR	Coordinate sys CS:0 (0 or 1)	Scroll to next screen
ENTR	Display Mode DP:1 (1 or 2)	Display Mode screen
2	Display Mode DP:2 (1 or 2)	Select Mode 2
ENTR	Echo RS232 EC:1 1=ON/0=OFF	Scroll to next screen
ENTR	Encoder Mode EM:0 (0, 1, or 2)	Encoder Mode Display
1	Encoder Mode EM:1	Select Mode 1
ESC	Saving System Parameters	System Parameters have been Saved

RUN MODE	+000.0000 000 00 11 1111 111 100	Return to Run Mode Display

3. Operating in the Edit Mode

The 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.

Preliminary Programming Instructions

A program consists of a group of Edit Mode Commands denoting a move profile and/or a functional operation followed by the End of Program (EN) command. Each command is a group of ASCII characters of the form;

        ASCII   nn   <sp>
        [command][parameters] [delimiter]

where;   command   :is two upper-case ASCII letters (A-Z) denoting a specific EDIT MODE command.

         parameters :are command specific numbers denoting command value or function status.

         delimiter   :is a SPACE seperating commands.

Example: The following program demonstrates the proper command syntax. AC.5 DE.5 VE75 DA4 GO EN

EDIT MODE COMMAND LIST

F1		Function	Range of Parameter Values
1	DA	Distance Absolute	(± 000.0000-999.9999 units) or (± 0000000-9999999 steps)
2	DI	Distance Incremental	(± 000.0000-999.9999 units) or (± 0000000-9999999 steps)
3	DC	Distance to Change	(± 000.0000-999.9999 units) or (± 0000000-9999999 steps)
4	VE	Velocity	(0.0-100.0% of max speed)
5	OT	Outputs Set	(0=off, 1=on, 2=no change)
6	RN	Run Program #	(1-99)
7	TD	Time Delay	(.01-99999.99 sec.)
8	WT	Wait On Inputs	(0=grounded,1=open,2=ignore)
9	GO	Go - Make Move	
0	GH	Go Home	(1-100% of max speed)

F2		Function	Range of Parameter Values
1	AC	Acceleration Time	(.05 to 15 sec.)
2	DE	Deceleration Time	(.05 to 15 sec.)
3	IF	IF - THEN	(0=grounded,1=open,2=ignore)
4	LP	Loop	(0 to 99999)
5	EL	End of Loop	
6	ST	Stop On Input #	(1-4)
7	MC	Move Continuous	(+ or -)
8		Reserved	
9	EN	End of Program	
0	UV	User Variable	

F1/F2		Function	Range of Parameter Values
1	ZP	Zero Position	

Entering a "Program" is a 3 Step Process

Step 1   Enter the Edit Mode from the Run Mode and select a program to edit. The selected program number can be from 1 to 98.

Step 2   Enter a program by choosing commands from the Edit Mode Command List by selecting a function key (F1 and/or F2) followed by the digit corresponding to the desired command. Enter a numeric value following the command if needed.

Note 1:   Total available memory for programming is 7.5 KB with individual programs limited to 1000 characters (1 Byte = 1 Character)

Note 2:   A "space" is considered a character.

REVIEW OF EDIT MODE KEYPAD FUNCTIONS

Key	Function
F1 or F2	Enter command from Command Table
0 — 9	Numeric Data Entry & Function Selection
+/-	Toggle "sign" for Numeric Data
.	Decimal Point for data entry
—►	Move Cursor to the right
◄—	Move Cursor to the left
DEL	Delete Character at cursor
ENTR	Insert a "space" character
ESC	Save Program then exit to Run Mode

Step 3   Exit the Edit Mode, save your program, and return to the Run Mode.

Note 1: All programs are saved to non-volatile EEPROM memory.

Entering a NEW Program

Example: Enter the following command string into Program 7;
AC.5 DE.6 VE75 DA4 GO EN

Step 1 Enter the Edit Mode from the Run Mode and select Program 7 to edit.

RUN MODE Default Display	+000.0000 000 00 11 1111 111 100	Begin in Run Mode

KEYPAD ENTRY	851 DISPLAY	
EDIT	Enter Program Number:_	Select Edit Mode

Enter a Program Number (1-98) to edit.

KEYPAD ENTRY	851 DISPLAY	
7	Enter Program Number: 7	Select Program 7 to edit
ENTR	_	Edit Mode Display *(Program 7)*

Step 2 Enter Program 7 by choosing commands from the Edit Mode Command List by selecting a Function Key (F1 or F2) followed by the digit corresponding to the desired command. Enter a numeric value following the command if needed.

	_	Edit Mode

KEYPAD ENTRY	851 DISPLAY	
F2 1	AC_	Enter Acceleration Command (AC)
. 5 ENTR	AC.5_	Enter Acceleration Value
F2 2	AC.5 DE_	Enter Deceleration Command (DE)
. 6 ENTR	AC.5 DE.6_	Enter Deceleration Value
F1 4	AC.5 DE.6 VE_	Enter Velocity Command (VE)
7 5 ENTR	AC.5 DE.6 VE75_	Enter Velocity Value
F1 1	AC.5 DE.6 VE75 DA_	Enter Distance Absolute Command (DA)
4 ENTR	AC.5 DE.6 VE75 DA4_	Enter Distance Absolute Value
F1 9	AC.5 DE.6 VE75 DA4 GO_	Enter Go (execute) Command

Step 3 Exit the Edit Mode, Save Program 7, and Return to Run Mode.

KEYPAD ENTRY	851 DISPLAY	
ESC	Saving Program Number 07_	Save Program 7, Exit Edit Mode, & Return to Run Mode

Specified Program is Saved

Note: When the ESC key is pressed an EN (End of Program) command is automatically appended to the end of the program.

RUN MODE DISPLAY	+000.0000 000 00 11 1111 111 100	Returned to the Run Mode

Edit an Existing Program

Example: Edit Program 7 from the previous example. Change the entered velocity to 50 (%) and insert a Go Home Command (GH) of 30% in the CCW (-) direction after the GO command. Follow the same 3 Step Process as previously outlined.

Program 7 AC.5 DE.6 VE75 DA4 GO EN

Change   Insert New Command

Step 1 Enter the Edit Mode from the Run Mode and select Program 7 to edit.

RUN MODE Default Display	+000.0000 000 00 11 1111 111 100	Begin in Run Mode

KEYPAD ENTRY	851 DISPLAY	
EDIT	Enter Program Number:_	Select Edit Mode
7	Enter Program Number: 7	Select Program 7 to edit
ENTR	AC.5 DE.6 VE75 DA4 GO EN	Edit Mode Display *(Program 7)*

Step 2 Insert and make program changes
   1. Change VE75 to VE50
      a. Move Cursor b. Delete old value c. Enter new value

a.	→	AC.5 DE.6 VE75 DA4 GO EN	Move cursor to the right

Use arrow keys to move the cursor to the character you wish to delete

b.	DEL DEL	AC.5 DE.6 VE_ DA4 GO EN	Delete character at cursor

Press the delete key twice to delete the 7 and the 5. The command string will shift one space to the left as each character is deleted.

c.	5 0	AC.5 DE.6 VE50 DA4 GO EN	Enter new value

   2. Insert the Go Home Command (GH-30) after the GO

→	AC.5 DE.6 VE50 DA4 GO EN	Move cursor to the right

Move the cursor with the arrow keys to the position where you would like to insert a command.

KEYPAD ENTRY	851 DISPLAY	
F1 0	AC.5 DE.6 VE50 DA4 GO GHEN	Enter GH Command
+/- 3 0	AC.5 DE.6 VE50 DA4 GO GH-30EN	Enter GH Value
ENTR	AC.5 DE.6 VE50 DA4 GO GH-30 EN	Insert a Space

Step 3 Exit the Edit Mode, Save Program 7, and Return to Run Mode.

KEYPAD ENTRY	851 DISPLAY	
ESC	Saving Program Number 07_	Save Program 7, Exit Edit Mode, & Return to Run Mode

RUN MODE DISPLAY	+000.0000 000 00 11 1111 111 100	Returned to the Run Mode

New Program 7   AC.5 DE.6 VE50 DA4 GO GH-30 EN

```
 1 • Escape, Terminate Program Execution
 2 • Enter Edit Mode, Edit Program
 3 • Delete Program
 4 • Available Memory Request
 5 • Test Outputs
 6 • Run Program
 7 • Copy Program
 8 • Motor Shutdown
 9 • Enter System Parameters
10 • Display EEPROM Software Revision
11 • Set to Original Configuration
12 • Zero Current Position
13 • Transmit RS232 String
14 • Restore Default Values
15 • System Reset
16 • Jog Extend
17 • Jog Retract
```

RUN MODE DEFAULT DISPLAY	+000.0000 000 00 11 1111 111 100

Function
Keys Selected   Function Descripition

1.   **ESC**   ESCAPE: Emergency Stop, Terminate Program Execution. Immediately stops any motion (at a rate set by the SD command in System Parameters), time delay, loop, and/or a wait input currently being executed. The Escape key is also used to exit from other Run Mode Function Displays to the Run Mode Default Display and used to jog the motor if pressed simultaneously with arrow keys.

2.   **EDIT**   EDIT: Enter EDIT MODE. Prompts the user to select a program to edit or create. The program number can be from 1 to 98. ESC returns to the Run Mode.

Enter Program Number:_	RUN MODE FUNCTION DISPLAY

Reference: "Operating in the Edit Mode" Section in Ch. 2 for detailed operating information in this mode.

3.   **DEL**   DELETE: Prompts the user to select a program to delete.
The program number can be 1 to 98.

Enter Program to Delete:_	RUN MODE FUNCTION DISPLAY

4.   **F1**   **0**   AVAILABLE MEMORY REQUEST: Displays the available memory remaining for programming. Starting available memory is 7.5-7.7K Bytes where one ASCII character equals one byte of memory.

Bytes Remaining in EEPROM 7691	RUN MODE FUNCTION DISPLAY

5.   **F1**   **5**   TEST OUTPUTS: Prompts the user to test the interface for the User Programmable and Relay Outputs by allowing the outputs to be manually turned ON or OFF.

OT10110 OUTPUTS nnnrr ACTIVE	RUN MODE FUNCTION DISPLAY

Move the cursor with the arrow keys to the desired output digit where a 1 or 0 can be entered to turn the output on or off. NOTE: nnn refers to User Programmable Outputs 1, 2, and 3, respectively, and rr refers to Relays 1 and 2. Once turned ON, an Output remains set until changed by the Test Output Function, an Edit Mode Output (OT) command, a System Reset, or Power is Cycled.

```
OT  n     n     n      r       r
   OUT1  OUT2  OUT3  RELAY1  RELAY2
```

n = 1 Output ON (Sinking to Ground)
n = 0 Output OFF (Open Circuit)

r = 1 Relay ON (Contacts in Active State)
r = 0 Relay OFF (Contacts in Normal State)

6.   **F1**   **6**   RUN PROGRAM: Prompts the user to select a program to execute. The Program Number can be 1 to 99.

Enter Program to Run RN:_	RUN MODE FUNCTION DISPLAY

7.   **F1**   **7**   COPY PROGRAM: Prompts the user to select a source program to copy and its destination location. The Program Number can be 1 to 99.

Enter Source Prg. # to Copy:_	RUN MODE FUNCTION DISPLAY

After entering the Source Program the unit will prompt the user to enter the destination program location. The Program Number can be 1 to 99.

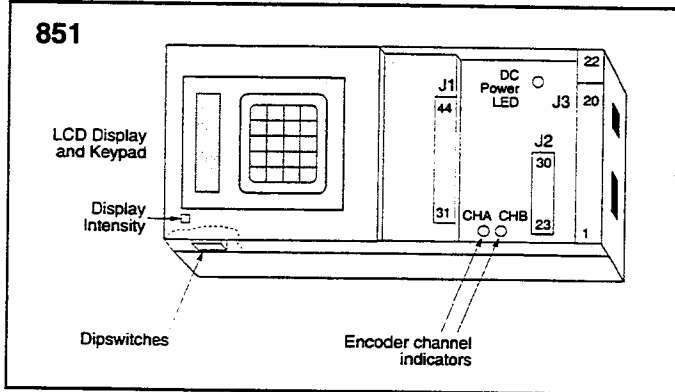| Enter Destination Prg. #:_	RUN MODE FUNCTION DISPLAY

Notes: 1. After a program is copied, the contents of the source program will still exist in the original program location.

2. If a program exists in a destination location when attempting to copy, the unit will prompt the user to overwrite or to abort.

Chapter 6 Hardware Reference

A. Functional Interface

851

1. LCD Display and Keypad
2. LED Indicators
3. Dipswitches (1-8)

Note 1: Detachable cover must be removed to expose the LED Indicators
Note 2: Main cover must be removed to expose the Dipswitches

1. LCD Display and Keypad

Function:

Keypad — 20 multi-function keys which allow for program entry and manual operation of the 851 control.

LCD Display — 32 character (16x2) Liquid Crystal Display which displays software entry via keypad or RS232 Serial Communication.

Display Intensity Control — Single turn potentiometer used to control the intensity of the LCD Display.

CW rotation decreases display intensity
CCW rotation increases display intensity

2. LED Indicators

Function:

DC Power LED — LED "ON" when the main logic board is being supplied DC power (12-16 VDC) also, the DC power is internally connected to pins 21(PWR) and 22(GND), on connector J3.

CHA (encoder) — LED "ON" when encoder channel A is active.

CHB (encoder) — LED "ON" when encoder channel B is active.

Note 1: CHA and CHB LED's active only when the Encoder Option is used.
Note 2: Both encoder LED's will pulsate at low intensity levels during any motor motion, indicating both encoder channels are active.
Note 3: At rest, the encoder LED's will cease pulsating, locking into a binary pattern indicating that the motor is stationary (no drift).

The detachable cover must be removed to expose the LED Indicators.

3. Dipswitches (1-8)

Function: 8 Dipswitches allow the user to disable specific keys on the keypad (Default: All Switches are off)

Note: Dipswitch functions are enabled on power up or system reset ONLY.
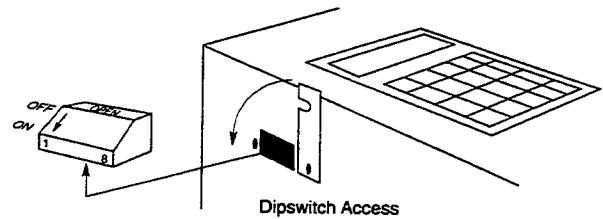
Dipswitches

Switch	Function
1-5	Reserved
6-8	Keypad Access

Keypad Access

Function	#6
Normal Keypad Operation	off
Disables Edit & Del Keys	on

Function	#7	#8
Normal Keypad Operation	off	off
Reserved	on	off
All keys disabled except ESC	off	on
All keys are disabled	on	on

Note 1: When keypad is disabled, control operation is through external I/O interface or RS232 Link.

B. Electrical Interface/Pinouts
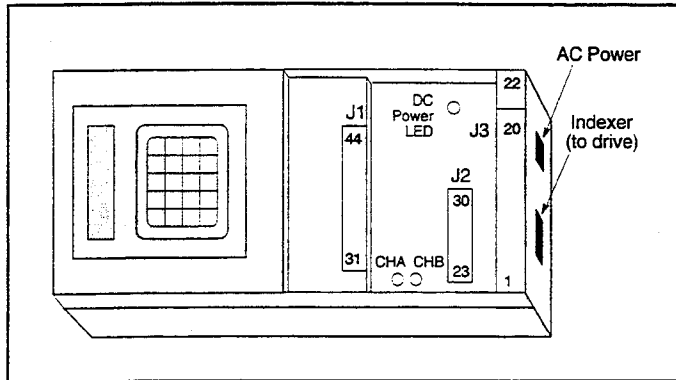
Terminal/Connector Pinouts

1. Indexer Output/Power Input Interface
   851: AC PWR   3 Conductor AC Line
       Indexer Output   Male 25 Pin D Connector
2. J1 I/O Interface: High Level Logic 14 Pin Phoenix Connector
3. J2 Encoder Interface   8 Pin Phoenix Connector
4. J3 I/O Interface: Low Level Logic 20 Pin Phoenix Connector
                         2 Pin Phoenix Connector

1. Power and Indexer Interface

AC Power Input

*3 Conductor, 6ft AC Power Plug

Indexer (to drive) Output

Pin	Description
1	Step Output +
2	Direction Output +
9	Fault Input +
14	Step Output -
15	Direction Output -
16	Shutdown Output +
17	Shutdown Output -
21	Fault Input -
5	Shield

2. 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

3. J2 Encoder Interface

Term.	Label	Description
30	ChZ+	Channel Z,
29	ChZ-	Channel Z Not,
28	ChB+	Channel B,
27	ChB-	Channel B Not
26	ChA+	Channel A,
25	ChA-	Channel A Not,
24	5V	5 Volts DC (regulated)
23	GND	DC Ground

4. J3 I/O Interface: Low Level Logic

| Term.	Label	Description
22	GND	DC GROUND
21	PWR	12 VOLTS (unregulated)
20	GND	DC GROUND
19	HOME	Home Limit Switch
18	EEOT	CW (+) End-of-Travel Limit
17	REOT	CCW (-) 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	RS232 Transmit
2	RX	RS232 Receive
1	GND	Ground

4. DEnn.nn

Command: Deceleration
Range: .05 sec to 15 sec (Default .3 seconds)
Syntax: F2 2
Description: Ramp time corresponding to any change in velocity from a higher speed to a lower speed. Once specified it is used in all subsequent moves until it is re-specified.

EX.   AC.05 DE.3 VE50 DA6 GO

Within an absolute motion profile. Ramp Down from 50% max speed to 0% speed in .3 seconds.

Deceleration
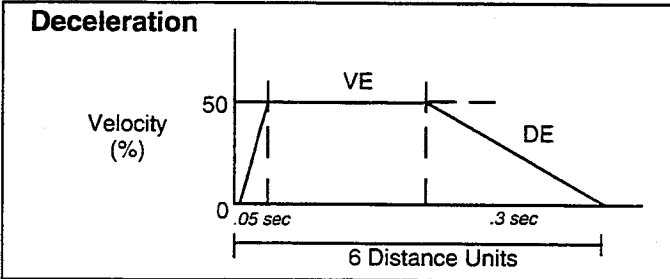
5. DI(+/-)nnn.nnnn

Command: Distance Incremental
Range: (+/-) 0000000 to 9999999 step counts (MN = 0)
        (+/-) 000.0000 to 999.9999 user units (MN = 1)
        (+/-) 000.0000 to 999.9999 inch/cm (MN = xxx)
Syntax: F1 2
Description: Sets position profiles to incremental. All move distances are referenced to the starting position of each move. Distance units are determined by the Model Number(MN) setting in System Parameters.

EX.   AC.1 DE.1 VE60 DI2 GO DI2 GO VE100 DI-4 GO

At 60% speed, increment 2 units extend, stop, increment 2 more units extend, stop, and then retract 4 units at 100% speed.

Distance Incremental
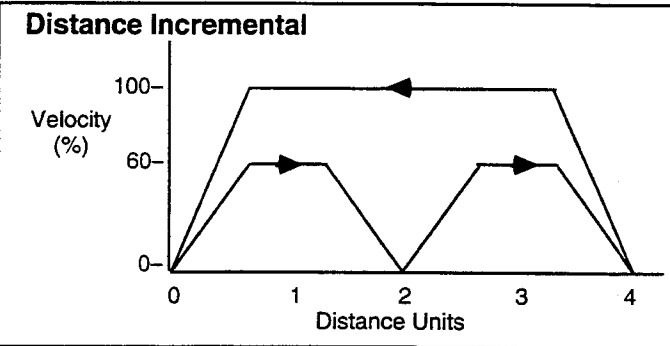
6. EL

Command: End Loop
Range: Not Applicable
Syntax: F2 5
Description: EL marks the end of a loop. Used in conjunction with the LP command which allows all commands between LP and EL to be repeated the number following LP.

EX.   AC.08 DE.08 VE25 LP2 DI3 GO TD.1 EL OT10000

Execute two incremental moves of 3 units and then turn on output 1.

7. EN

Command: End of Program
Range: Not Applicable
Syntax: F2 9
Description: Program terminator which flags the end of a program.

Note: An EN command is automatically appended to the end of a program when it is saved using the ESC key.

EX.   AC.05 DE.05 VE80 DA5 GO EN

EN marks the end of the absolute motion program indicating a 5 unit move at 80% speed.

8. GH(+/-)nn

Command: Go Home
Range: 1 to 99
Syntax: F1 0
Description: This command will initiate the Homing Routine which will seek and establish the home reference position used by the control. The homing routine is executed in three stages.

Stage 1: Upon execution of the Go Home Command, the 851 will seek the activation of the HOME Input (J3 Pin #19) by the specified edge of the home switch. Simultaneously, the unit will initiate the home move, commanding the motor to seek the home switch in a specified direction at a specified speed.

GH(+/-)nn   + = CW(+) direction
             - = CCW(-) direction
             nn = available speed (%)

Stage 2: Once the input is triggered by the specified switch edge(CW or CCW), the unit will ramp down and reverse direction, seeking the designated switch edge at 1% available speed.

Stage 3: When the desired edge of the switch edge is found, the unit will verify the final approach direction(it will reverse direction if not correct) and then, for. . .

Open Loop Systems (no Encoder EM=0), the unit will immediately stop motion and reset the position counter to zero.

Closed Loop Systems (using Encoder EM=1 or 2), velocity reduces to a creep speed and scans for the Z Marker Pulse on the encoder wherein the unit will stop motion and reset the position counter to zero. (marker pulse occurs once per motor revolution)

Note 1: The control will reverse direction if an End of Travel limit switch (wired to REOT or EEOT input) is encountered while searching for Home. If the second End of Travel switch is encountered in the new direction, the unit will abort the Go Home move and generate a fault condition.

Note 2: The acceleration and deceleration ramps for the Go Home move are generated by the same AC and DE Commands used in normal move profiles.

Note 3: To specify which edge of the home switch to activate the home input, configure your home switch to be Normally Open or Normally Closed, or set the final approach direction, the Home Algorithm command, HA(mnx), in System Parameters is used.

HA(mnx) = 010   where
  m=0 CCW (-) edge   n=0 Switch/N.C.   x=0 Direction(-)
  m=1 CW (+) edge   n=1 Switch/N.O.   x=1 Direction(+)
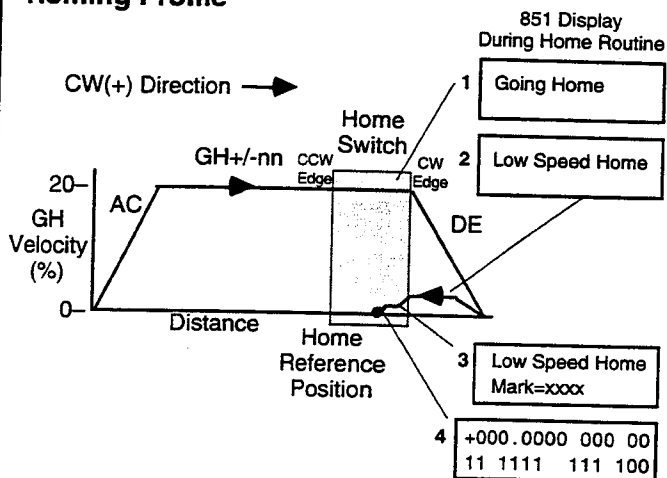
Homing Routine Example - Closed Loop

Example   AC.05 DE.05 GH+20   with HA(mnx) = <u>110</u>

Homing Program: Unit will <u>seek</u> home in the CW(+) direction at 20% of the available speed, referencing the CW(+) edge of a Normally Open Home Switch. The <u>final</u> approach direction will be in the CCW(-) direction.

Homing Profile

1. Stage 1: Unit seeking home in the specified direction and speed determined by GH(+/-)<u>nn</u>.

2. Stage 2: Home input has been triggered, unit is now approaching home at low speed from the opposite direction. (low speed = 1%)

3. Stage 3: Specified edge of home switch has activated the home input at low speed, motor motion reduced to creep speed and is scanning for the encoder marker pulse. The encoder count <u>from</u> the marker pulse is shown on the LCD Display.

4. Motor stopped and the position counter set to zero.

Reference: Overview of Homing Profiles
See System Parameters Home Algorithm (HAmnx) Command

9. GO

Command: GO (Execute a Move Profile)
Range: Not Applicable
Syntax: F1 9
Description: Executes a move profile as defined. Execution response time is proportional to the number of commands there are to be processed in the profile to be executed.

EX.   AC.05 DE.05 VE50 DI5 <u>GO</u>

GO initiates calculation of a move profile using buffered parameters (.05 second Accel and Decel Ramp, 50% speed, 5 unit incremental move) and then executes it.

10. GO(n)

Command: Load and Go
Range: 1-4
Syntax: F1 9
Description: Calculates a move profile in advance and waits for input n to be activated before execution. n is 1-4 user programmable input IN1, IN2, IN3 or IN4 respectively. This command allows for immediate execution of a move.

*Note: *IN3 & IN4 are defined by configuring two System Inputs (SI1-SI4) to be additional user programmable inputs by the SI Command (Configuration 8) in System Parameters.*

If NO SI inputs are configured as additional user programmable inputs (IN) the digit assigned for IN3 or IN4 is ignored when using the GO(n) Command in a program.

EX.   AC.05 DE.05 VE50 DI5 <u>GO2</u>

When input 2 is activated, immediate execution of the motion calculation already in the buffer is performed.
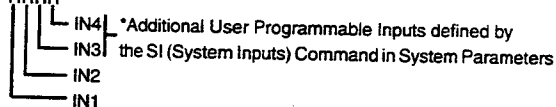
11. IFnnnn

Command: IF-THEN
Range: 0, 1, or 2
Syntax: F2 3
Description: If the user programmable inputs match the configuration indicated by nnnn, then execute the next command in the program. If the inputs do not match, skip the next command in the program.

where   IFnnnn

- IN4 *Additional User Programmable Inputs defined by
- IN3 the SI (System Inputs) Command in System Parameters
- IN2
- IN1

Note 1: IN3 & IN4 are defined by configuring two of the 4 System Inputs (SI1-SI4) to be additional user programmable inputs by the SI Command (Configuration 8) in System Parameters. If no SI inputs are configured as additional user programmable inputs (IN) the digits assigned for IN3 & IN4 are ignored when using the IF Command in a program.
Note 2: Ignore Input (n=2) should be used in the digit(s) of an "IF" statement which are being simultaneously used by a WT, GO(n), or ST(n) command or when not being used.

n = 0 input on (grounded)
n = 1 input off (open circuit)
n = 2 ignore input state

EX.   LP <u>IF0112</u> RN10 <u>IF1012</u> RN20 <u>IF1102</u> RN30 EL
This program continuously loops until one of 3 inputs is activated. Activating input 1 runs Program 10, activating input 2 runs Program 20, and activating input 3 runs Program 30 (input 4 is ignored).
Note: Two System Inputs have been configured for additional User Programmable Inputs (IN3 & IN4)

12. LPnnnnn

Command: Loop
Range: 1 to 99999
Syntax: F2 4
Description: Used in conjunction with the EL (end loop) command. The LP command will cause all commands between LP and EL to be repeated nnnnn times. If LP is entered with no number following it or 0, the loop will be repeated continuously

Note 1: Up to 50 nested loops (one inside the other) are allowed, each LP command must have a corresponding EL command to end the loop.
Note 2: An RN command within a loop will terminate the loop and jump to a new program.

EX.   AC.09 DE.09 LP3 VE30 DI1 GO EL VE75 DI-3 GO

The motor will perform an incremental CW 1 unit move at 30% speed three times and then a CCW 3 unit move at 75% speed .

Loop
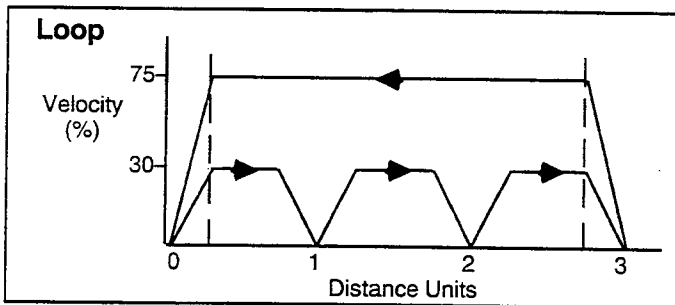
13. MCn

Command: Move Continuous   (Software Rev 3.00 or >)
Range: + or -
Syntax: F2 7
Description: Sets move profiles to continuous mode, utilizing ramp times and velocity move parameters. Once a "move continous" segment is activated, it will continue to move at a speed specified by VE until the Escape Key is pressed, an EOT or Kill Motion Input is activated, or a velocity of zero is commanded.

    n = +   Move Continuous in CW (+) Direction
   n = -   Move Continuous in CCW (-) Direction

Note 1: Each "Move Continuous" segment must contain an MC command accompanied by a GO command.
Note 2: If no velocity is specified for a continuous move, it will use the last specified VE value or the default.
Note 3: All edit mode commands are valid within an MC segment except Stop on Input(ST) and Distance Commands(DA, DC, & DI).

EX.   AC.1 DE.2 VE50 MC+ GO WT0111 VE0 MC+ GO

Accelerate to a velocity of 50%, move continuously CW(+) until an input is activated and then decelerate to 0% speed.

Move Continuous
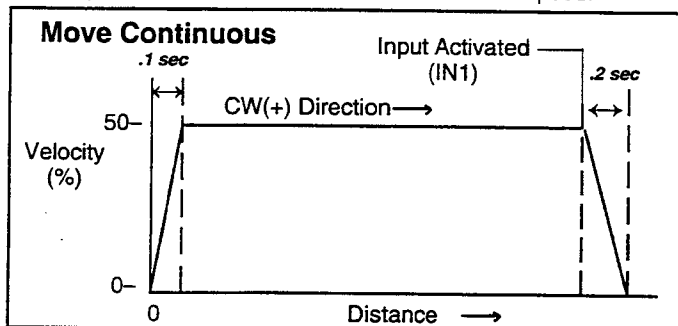
14. OTnnnrr

Command: Output Command
Range: 0, 1, 2
Syntax: F1 5
Description: Sets the 3 sinking outputs and 2 output relays on or off.

OTnnnrr is assigned as follows;
| n | n | n | r | r |
Out 1 Out 2 Out 3 Relay 1 Relay 2

n = 0   Sets sinking output off (open collector)
n = 1   Sets sinking output on (sinking to ground)
n = 2   Output remains unchanged, previous state of the output is retained.

r = 0   Sets relay off (contacts in inactive state)
r = 1   Sets relay on (contacts in active state)
r = 2   Relay remains unchanged, previous state of the contacts is retained.

Note 1: Once an output is turned on, it will remain set until changed by another output command, a system reset (software warm-boot) is issued, or power is cycled.
Note 2: All outputs are set off upon power up or during a system reset(software warm-boot).

EX. AC.05 DE.05 VE100 DA6 GO OT10000 TD.5 OT00000

After completing an absolute move of 6 units, activate output 1 for .5 seconds and then turn it off.

15. RNnn

Command: RUN Program
Range: 1-99
Syntax: F1 6
Description: Program number nn will be loaded into the command buffer and executed.

Note 1: This command is used within a program to start another. Upon execution, all subsequent commands in the first program are ignored while the program number following RN__ is executed. (This command acts similar to a GOTO command, NOT A GOSUB.)
*Note 2: RN99 is reserved for test verification of the product. It is stored in ROM and cannot be modified.*

Program 99   VE25 DI1.0 TD.5
                DI-1.0 GO EN

EX. Program 13   AC1 DE1 VE5 DA6 GO RN1 EN

        Program 01 GH-30 OT10000 TD.3 OT00000 EN

Executing program 13, move to absolute position 6 units. After the move is complete, run program 1 which commands the motor to return home at 30% speed.

Run Program
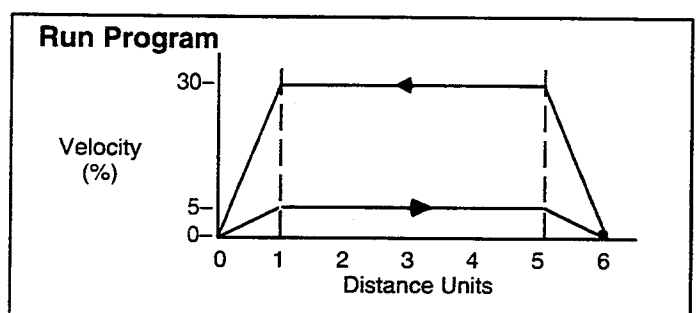
16. | **STn** |

Command: Stop on Input
Range: 0-4
Syntax: F2 6
Description: Stop Move Execution on the input specified by n, where n may be (1-4) user programmable input IN1, IN2, IN3, or IN4 respectively*

Note 1: IN3 & IN4 are defined by configuring two of the four System Inputs (SI1-SI4) to be additional user programmable inputs by the SI Command (Configuration 8) in System Parameters. If no SI inputs are configured as additional user programmable inputs (IN) the digit assigned for IN3 or IN4 is ignored when using the ST command in a program.

n = 0   Disables/turns off the STn command

n = (1-4) Upon execution, the specified input is monitored during every "move profile" encountered. If the input is activated, the current "move in progress" is terminated, stopping all motion and program execution until the input is deactivated or ST0 is issued. Immediately following deactivation (release) of the input, the next move profile or functional command is instantaneously executed.

Note 1: The motor is stopped upon command execution at the deceleration rate specified by the System Parameter, SDnn.nn(Stop Decel Rate: Default 0.1).
Note 2: Once issued, Stop on Input remains active until it is turned off by the ST0 command, a system reset (software warm-boot) is issued, or power is cycled.

EX.   ST1 AC1 DE1 VE25 DA6 GO VE50 DA0 GO EN

At 25% max speed, move to absolute position 6 units. If input 1 (IN1) is activated while moving, Stop Motion. When the input is deactivated, immediately execute the next move profile which is to move to the absolute zero position at 50% speed. (Note: If input 1 is not activated the motor would complete its 6 unit move before executing the absolute zero move).

Ideal Move Profile

Profile if input 1 activated at 3 units
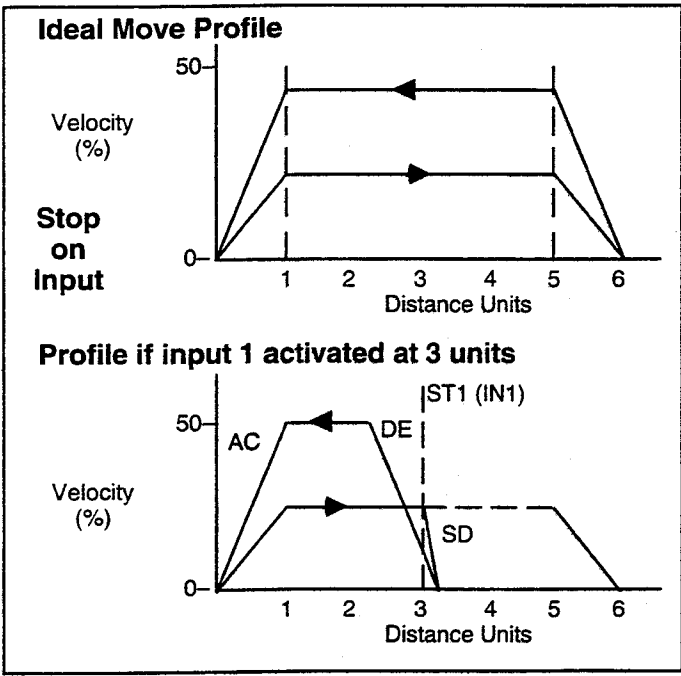
17. | **TDnnnnn.nn** |

Command: Time Delay
Range: .01 to 99999.99 seconds
Syntax: F1 7
Description: Time Delay between motion profiles or command functions. Not valid while the motor is moving.

Note: The time delays real time count can be shown on the 851 LCD Display when Display Mode 2 is activated in System Parameters (DP Command).

EX.   AC.05 DE.05 VE50 DI4 GO OT11000 TD.5 OT00000

Move 4 units, turn outputs 1 and 2 on, delay .5 seconds, and then turn outputs 1 and 2 off.

18. | **UVnnn** |

Command: User Variable
Range: Not Applicable
Syntax: F2 0
Description: Allows individual Edit Mode Commands within a program to "prompt" the user to enter a numerical variable via the LCD/Keypad when executing a program.

Note 1: User variables can be assigned to the following Edit Mode Commands; AC, CL, CT, DA, DC, DE, DI, LP, RN, TD, and VE.
Note 2: A single program can contain a maximum of 8 User Variables
Note 3: Variable names ONLY are saved as part of a program, variable values are lost if power is cycled, a system reset is issued, a program is modified, or each time a new program is executed.

EX. 1   AC.1 DE.1 VE10 DA_UV_POS GO EN
For the basic absolute move profile, the absolute distance command (DA) is assigned a user variable (whose prompt is POS).

EX. 2   AC_UV_ACC DE_UV_ACC DA_UV_DIS GO
         DI_UV_DIS GO EN
The above program string would prompt the user for two variables ACC and DIS, both of which are used multiple times with different command.

EX. 3   AC.1 DE.1 LP10 VE_UV_VEL
         DI2 GO EL EN
The above program would prompt the user once to enter in a Velocity Value VEL before executing a 2 unit incremental move 10 times.

Run Time Operation of User Variables in the Execution Mode

When a program is executed and a UV fuction is detected, the LCD Display will "prompt" the user to enter the desired variable.

Typical "Prompt"
Display

```
Enter Variable
XXX:_
```

Assigned 3   Cursor
Character Code
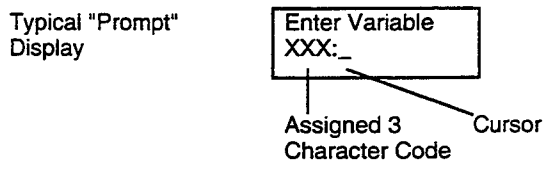
Keying in the requested data and pressing Enter (ENTR) will download the information to the program.

Note 1: When a progam is executed, the 851 scans the program for any UV commands. If any are detected, the user is prompted to enter all the UV data PRIOR to executing any commands in the program. If multiple user variables are in a program, the UV prompts will occur in the order detected.
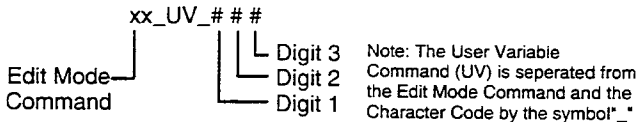*Note 2: User variable values can contain six digits with a decimal.*

User Variable Programming

Entering A User Variable: A 2 Step Process

1. Assign a User Variable to an EDIT MODE COMMAND

In the Edit Mode after entering a command, press the User Variable Key Sequence (F2 0) which will append _UV_ to the command.

```
         xx_UV_# # #
                  └─ Digit 3
Edit Mode─┘       ├─── Digit 2
Command           └──── Digit 1
```

Note: The User Variable Command (UV) is seperated from the Edit Mode Command and the Character Code by the symbol "_"

2. Assign a Character Code for the user "Prompt"

The keypad functions are now changed to allow the user to assign a 1 to 3 character code to the user variable per the chart shown below. This character code will be displayed by the LCD when prompting the User to enter a variable during program execution.

Character Chart

KEY	Character	KEY	Character
1	A B C	6	P Q R
2	D E F	7	S T U
3	G H I	8	V W X
4	J K L	9	Y Z -
5	M N O	0	< > %

Using the right & left arrow keys will allow the user to position the cursor to 1 of the 3 digit locations. While at a location, pressing one of the listed keys (above) a specific number of times will allow you to select the desired characters. For example, pressing the "1" key will display an A in the selected character location, pressing twice will display a B, and so on. After the characters are selected, pressing the Enter Key (ENTR) will complete the entry.

19. | VEnnn.n |

Command: Velocity
Range: 0.0 to 100.0%   (default 25%)
Syntax: F1 4
Description: Percentage designating the maximum speed for a given move profile. Once velocity is specified, it is used in all subsequent moves until it is respecified.
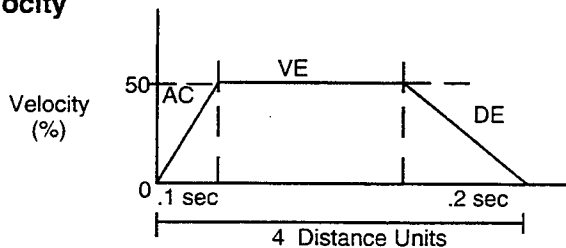
Note 1: Velocity resolution is 1000:1 from .1 to 100.0
Note 2: When entering Model Numbers for IDC Cylinder systems, the velocity units are pre-determined and shown on the LCD screen. For more information, review the appendices (CH8) for configuring the 851 to IDC Cylinders.

EX.   AC.1 DE.2 VE50 DA4 GO
Move to absolute position 4 units at 50% max speed.

Velocity

Velocity and Step Output

The velocity percentage is directly proportional to the output frequency of the step output on the Indexer connector where ...

Step Output Frequency
VE100 = 1.25MHz (@MR:25000)
396,625Hz(@MR5000)
50,000Hz(@MR1000)
20,000Hz (@MR400 or MR200)

Note 1: The max output frequency is dependent on the Motor Resolution (MR) setting in System Parameters.
Note 2: By knowing the Motor/Drive resolution,the speed of the motor can be determined from the frequency of the step output.

$$\text{Motor Speed} = \frac{\text{Step Output (pulses per sec)}}{\text{Motor Resolution (pulses per rev)}}$$
(revs per sec)

Example: An 851 is configured to a motor/drive system with a Motor Resolution of 25000 pulses per rev (MR:25000). What is the step output frequency and corresponding motor speed at different VE settings.

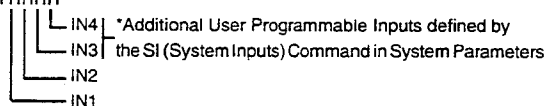| VE Setting		Step Output	Motor Speed
VE100	=	1,250,000pps	50 RPS
VE50	=	625,000pps	25 RPS
VE.1	=	1,250pps	.05 RPS

20. | WTnnnn |

Command: Wait on Inputs
Enter Range: 0, 1, or 2
Syntax: F1 8
Description: Wait for the inputs to match the configuration indicated by nnnn before continuing execution of a program. where WTnnnn

```
         └─ IN4 ┐ *Additional User Programmable Inputs defined by
         └── IN3 ┘ the SI (System Inputs) Command in System Parameters
         └─── IN2
         └──── IN1
```

Note 1: IN3 & IN4 are defined by configuring two of the 4 System Inputs (SI1-SI4) to be additional user programmable inputs by the SI Command (Configuration 8) in System Parameters. If no SI inputs are configured as additional user programmable inputs (IN) the digits assigned for IN3 & IN4 are ignored when using the WT Command in a program.
Note 2: Ignore Input (N=2) should be used in the digit(s) of an "WI" statement which are being simultaneously used by an IF, GO(n), or ST(n) command.

n = 0 input on (grounded)
n = 1 input off (open circuit)
n = 2 ignore input state

EX.   AC.07 DE.07 VE40 DA3 GO WT0112 VE60 DA5 GO
Move to an absolute position of 3 units. Stop and wait until the input pattern (Input 1 ON (grounded), Inputs 2 and 3 off (open circuit), and Input 4 ignored) is matched before moving to absolute position of 5 units at 60% speed.
Note: Two System Inputs have been configured for additional User Programmable Inputs (IN3 & IN4)

21. | ZP |

Command: Zero Position
Range: Not Applicable
Syntax: F1 F2 1
Description: This command resets the position counter to zero when executed (at a specified point) in a program. Not valid while the motor is moving.
Note 1: After ZP is executed, all absolute distance moves which follow are now referenced from the new zero position.

EX.   ZP AC.5 DE.5 VE50 DA4 GO

Zero position, execute a 4 unit absolute move from that point.

1.	MN	Model Number
2.	CS	Coordinate System
3.	DP	Display Mode
4.	EC	Echo on/off RS232
5.	EM	Encoder Mode
6.	FE	Following Error
7.	HA	Home Algorithm
8.	HO	Home Offset
9.	JA	Jog Acceleration
10.	JV	Jog Velocity
11.	MR	Motor Resolution
12.	MU	Metric Units
13.	PU	Power Up Mode
14.	RA	Ratio Variable A
15.	RB	Ratio Variable B
16.	SD	Stop Decel Rate
17.	SF	Shutdown/Fault Polarity
18.	SI	System Inputs
19.	SO	System Outputs
20.	UN	Unit Number (Device Address)
21.	XP	External Program Select

1. | MNnnn |

Parameter: Model Number
Range: See Models Below
Description: The model number determines how the distance and velocity units are scaled in the 851 indexer. Three configurations are available;

a. Step Counts	[Model 0]
b. User Defined Units	[Model 1]
c. IDC Cylinder Models	[Model xxx]

Note 1: Model Number is used in conjunction with Motor Resolution (MR Command) which determines the number of step counts equal to one motor revolution.

a. STEP COUNTS   MN:000

Description: Entering Model Zero (entered as 000) allows the user to directly program distances in step counts (rather than scaled units).

Distance Units: +/- 0000000 - 9999999 step counts (DA, DC, & DI)
Velocity % Units: counts (steps) per second

Example 1: With an 851 configured for Model 000, what are the motor revs on two alternate drive systems, one with a Motor Resolution of 25000ppr and the other set at 5000ppr.

Program Distance	Drive #1 MR:25000	Drive#2 MR:5000
DI5000	1/5 rev	1 rev
DI25000	1 rev	5 revs
DI50000	2 revs	10 revs
DI100000	4 revs	20 revs

System Parameter Display

| Model #MN:000 |
| VE100=1250000cps |

Note: cps = counts (steps) per seconds, max value is dependent on motor resolution setting.

b. USER-DEFINED UNITS   MN:001

Description: Entering Model One (entered as 001) allows the user to program distances(and monitor on the display) in scaled units by setting up a ratio between the number of motor revolutions and a desired unit scale.

Distance Units: +/- 000.0000 - 999.9999 user-defined units (DA, DC, & DI)
Velocity % Units: user-defined units per second

Scaling Distance Units
Three commands in system parameters are used, MN (to set the mode) and Ratio Variables RA and RB (to set the ratio).

1. Set the Model Number(MN) equal to one (MN:001).
2. Determine the total transmission ratio between the motor and the load.
   - How many motor revolutions equal one user unit ?
   [this is the RATIO]
3. Determine values for variables RA and RB by setting them up as a RATIO where...

$$RATIO = \frac{RA}{RB}$$ *Note: RA and RB must be whole numbers; RA up to 5 digits, RB up to 4 digits.*

Example 1: An 851 is configured to a motor drive controlling a linear feed system. Program distances are to be in feet, it has been determined that 5.36 motors revs is equal to one foot (one user unit) of travel.

1. Set the Model Number equal to one [MN:001]
2. Determine RATIO. Pre-determined that 5.36 motor revs equal one foot of travel.
3. Determine RA and RB

$$RATIO = 5.36 = \frac{RA}{RB} \qquad let \ \frac{RA}{RB} = \frac{536}{100}$$

In System Parameters, set RA=536 and RB=100

With this setup, any distance programmed (or monitored on the LCD) will be in user units where a DA, DI, or DC of 1 will be equal to 1 ft or 5.36 motor revs.

System Parameter Display

| Model #MN:001 |
| VE100=xxx ups |

Note: ups = user units per second, max value is dependent on motor resolution setting.

c. IDC CYLINDER MODELS MN:*xxx*

Description: IDC Cylinder Models (See Charts Below) are pre-existing model numbers in the 851 which configure the unit to operate with an IDC Electric Cylinder System. It adapts to a specified cylinder's gear ratio and screw pitch, converting the step counts (of motor/drive) or encoder feedback pulses into inches of linear travel and the velocity into linear units of in/sec.

Note: Metric units for distance (cm) and velocity (cm/s) can be specified by enabling the Metric Units(MU) command in System Parameters.

Distance Units: +/- 000.0000 - 999.9999 inches or centimeters (DA, DC, & DI)
Velocity % Units: in/sec or cm/sec

NS and RS Series Cylinders (with S5101 Drive)

Available Linear Speeds   Model Number: 3 or 4 Digit Code

Cyl. Model	Eng. in/sec	Metric (cm/s)	Cyl. Model	Eng. in/sec	Metric (cm/s)	Cyl. Model	Eng. in/sec	Metric (cm/s)
102	25.00	(63.50)	105	10.00	(25.40)	108	6.25	(15.87)
152	16.66	(42.33)	155	6.66	(16.93)	158	4.16	(10.58)
202	12.50	(31.75)	205	5.00	(12.70)	208	3.12	(7.98)
—	—	—	255	4.00	(10.16)	258	2.50	(6.35)
352	7.00	(17.78)	355	2.80	(7.11)	358	1.75	(4.44)
992	25.00	(63.50)	995	10.00	(25.40)	998	6.25	(15.87)
			1205	.83	(2.11)	1208	.52	(1.32)
Ballscrew 2 pitch			Acme/Ballscrew 5 pitch			Acme 8 pitch		

TS Series Cylinders (with S5101 Drive)

Available Linear Speeds   Model Number: 3 or 4 Digit Code

Cyl. Model	Eng. in/sec	Metric (cm/s)	Cyl. Model	Eng. in/sec	Metric (cm/s)	Cyl. Model	Eng. in/sec	Metric (cm/s)
101	50.00	(127.0)	104	12.50	(31.75)	106	8.33	(21.16)
151	33.33	(84.66)	154	8.33	(21.16)	156	5.55	(14.11)
201	25.00	(63.50)	204	6.25	(15.87)	206	4.16	(10.58)
501	9.78	(24.84)	504	2.44	(6.20)	506	1.63	(4.14)
1001	4.99	(12.67)	1004	1.24	(3.15)	1006	.83	(2.11)
991	50.00	(127.0)	994	12.50	(31.75)	996	8.33	(21.16)
Ballscrew 1 pitch			Ballscrew 4 pitch			Acme 6 pitch		

NB and RB Series Cylinders (with B7002 Drive)

Available Linear Speeds   Model Number: 3 or 4 Digit Code

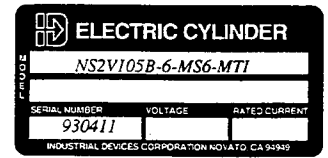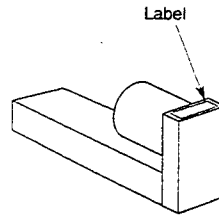| Cyl. Model	Eng. in/sec	Metric (cm/s)	Cyl. Model	Eng. in/sec	Metric (cm/s)	Cyl. Model	Eng. in/sec	Metric (cm/s)
102	40.00	(101.6)	105	16.00	(40.64)	108	10.00	(25.40)
152	26.66	(67.72)	155	10.66	(27.08)	158	6.67	(16.94)
—	—	—	255	6.40	(16.26)	258	4.00	(10.16)
992	40.00	(101.6)	995	16.00	(40.64)	998	10.00	(25.40)
Ballscrew 2 pitch			Acme/Ballscrew 5 pitch			Acme 8 pitch		

TB Series Cylinders (with B7002 Drive)

Available Linear Speeds   Model Number: 3 or 4 Digit Code

Cyl. Model	Eng. in/sec	Metric (cm/s)	Cyl. Model	Eng. in/sec	Metric (cm/s)	Cyl. Model	Eng. in/sec	Metric (cm/s)
101	80.00	(203.2)	104	20.00	(50.80)	1061	3.33	(33.86)
151	53.33	(135.5)	154	13.33	(33.86)	156	8.89	(22.58)
201	40.00	(101.6)	204	10.00	(25.40)	206	6.67	(16.94)
501	16.00	(40.64)	504	4.00	(10.16)	506	2.67	(6.78)
1001	8.00	(20.32)	1004	2.00	(5.08)	1006	1.33	(3.38)
991	80.00	(203.2)	994	20.00	(50.80)	9961	3.33	(33.86)
Ballscrew 1 pitch			Ballscrew 4 pitch			Acme 6 pitch		

Note 1: Above speeds are max values based on the 851 step rate at the specified Motor Resolution settings, Final move speeds are LOAD, LENGTH, and MOTOR dependent. Review Cylinder Performance Curves in the IDC Main Catalog.

Entering your Cylinder Model Number is a 2 Step Process

STEP 1 Identify & Enter Your Cylinder 3 or 4 Digit Code
Ex. Your Cylinder has this label attached

Label

ELECTRIC CYLINDER
NS2V105B-6-MS6-MTI
SERIAL NUMBER   VOLTAGE   RATED CURRENT
930411
INDUSTRIAL DEVICES CORPORATION NOVATO, CA 94949

Enter 105 as your Model #
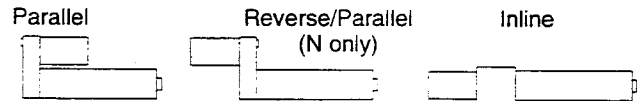(via Keypad or RS232)

System Parameter Display

Model # MN:105
VE100 = 10 in/s

STEP 2 Identify Your Motor Mounting Configuration from the table below. Cylinders with Reverse/Parallel mounts ONLY must denote an "R" (F2 Key) at the end of the 3 digit code when entering the System Model Number(MN).
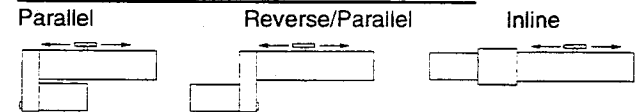
Reverse/Parallel mounts require the control to reverse the motor polarity during moves so that a positive move Extends the cylinder.
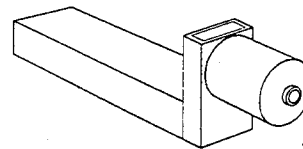
Cylinder Motor/Mounting Configurations

Rod Type Cylinder Configurations (N and T Series)

Parallel	Reverse/Parallel (N only)	Inline

Rodless Cylinder Configurations (R Series)

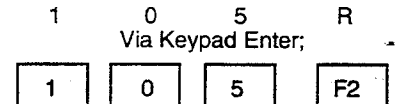| Parallel	Reverse/Parallel	Inline

Ex. From the previous example, the NS2V105B-6-MS6-MT1-RM cylinder is configured with a Reverse/Parallel Motor Mount.

Specify Model Number & Reverse/Parallel Mount

Via RS232 Enter;
1   0   5   R

Via Keypad Enter;
1   0   5   F2

System Parameter Display

Model # MN:105R
VE100 = 10 in/s

For additional information on configuring your 851 to IDC Cylinder Systems, review the setup listings In the Appendices (CH 8).

2. CSn

Parameter: Coordinate System
Range: 0 or 1
Description: Defines Direction for Positive Moves. Controlling the polarity of the Direction Output (pins 2 and 15) on the indexer connector.

n = 0   Positive (+) moves command CW motor rotation (low signal on direction output)
       Negative (-) moves command CCW motor rotation (high signal on direction output)

n = 1   Negative (-) moves command CW motor rotation (low signal on direction output)
       Positive (+) moves command CCW motor rotation (high signal on direction output)

Note 1: Coordinate System directly affects Jog Mode Direction and the following edit mode commands; Distance Absolute(DA), Distance Incremental(DI) and Go Home(GH).
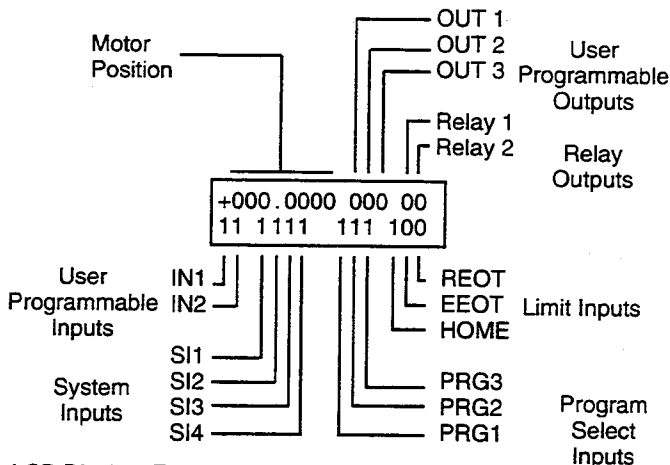
System Parameter Display

Ex.
Coordinate Sys
CS:1

Default 0

Positive moves will command CW motor rotation (low signal on the direction output)

3. DPn

Parameter: Display Mode
Range: 1 or 2
Description: Defines the Run Mode Display

n = 1   RUN MODE DISPLAY 1

LCD Display: Functional Description

Motor Position: Real-time feedback report indicating motor position. The displayed position range is +/- 000.0000 to 999.9999 user defined units or +/- 0000000 to 9999999 step counts(determined by Model Number). When the internal position counter is reset, the LCD position display sets itself to zero. This condition occurs upon power up, after a system reset, completion of a successful homing routine or when using the ZP(Zero Position)command.

INPUTS : LCD displays Input ON/OFF Status (0 or 1)
0 = Input ACTIVATED (grounded low)
1 = Input OFF (open circuit high)

OUTPUTS: LCD displays Output ON/OFF Status (1 or 0)
1 = Output ON (Sinking to Ground)
0 = Output OFF (Open Circuit)

LCD displays Relay Output ON/OFF Status (1 or 0)
1 = Relay ENERGIZED (Contacts Active)
0 = Relay DE-ENERGIZED (Contacts in Normal State)

INPUT/OUTPUT Location and Description

Input	Connector	Pin #	Description
IN1	J3	13	User Programmable Input #1
IN2	J3	12	User Programmable Input #2
SI1	J1	44,43	System Input #1
SI2	J1	42,41	System Input #2
SI3	J1	40,39	System Input #3
SI4	J1	38,37	System Input #4
PRG1	J3	16	Program Select Input #1 (LSB)
PRG2	J3	15	Program Select Input #2
PRG3	J3	14	Program select Input #3 (MSB)
HOME	J3	19	Home Limit Input
EEOT	J3	18	Extend(+) End of Travel Limit Input
REOT	J3	17	Retract(-) End of Travel Limit Input
Output	**Connector**	**Pin #**	**Description**
OUT1	J3	11	User Programmable Output #1
OUT2	J3	10	User Programmable Output #2
OUT3	J3	09	User Programmable Output #3
Relay 1	J1	33	COM1 Common Terminal
		32	NC1 Normally Closed Terminal
		31	NO1 Normally Open Terminal
Relay 2	J1	36	COM2 Common Terminal
		35	NC2 Normally Closed Terminal
		34	NO2 Normally Open Terminal

n = 2   RUN MODE DISPLAY 2
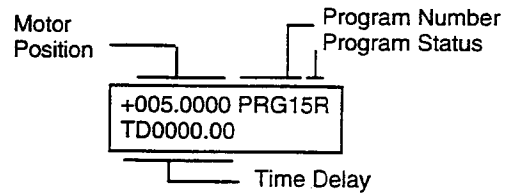
LCD Display: Functional Description

Motor Position: Real-time feedback report indicating motor position. The displayed position range is +/- 000.0000 to 999.9999 user defined units or +/- 0000000 to 9999999 step counts(determined by Model Number). When the internal position counter is reset, the LCD position display sets itself to zero. This condition occurs upon power up, after a system reset, completion of a successful homing routine or when using the ZP(Zero Position)command.

Program Number: Indicates the number of the program currently running or, if no program is running, the last program run.

Program Status: Flags indicate the status of the program running or, if none are running, the last program executed.
Status Flags
   R = Program RUNNING
   E = Program ENDED, completed successfully
   S = Program STOPPED by ESC key or System Input activation(configured as Stop)
   F = Program terminated by a FAULT condition
   none = No program is running

Time Delay: Indicates real-time Time Delay Count. The display counts down time in seconds when the timer (TD command) is active in a program.

System Parameter Display

Ex.
Display Mode
DP:1 (1 or 2)

Default 1

Control set for RUN MODE DISPLAY 1

4. ECn

Parameter: Echo Command
Range: 0 or 1
Description: Turns the RS232 Echo on or off where 0 is echo off and 1 is echo on. An echo is where the 851 retransmits the character it receives back to the host device (or the next device on a Daisy Chain link).

Note: ECHO ON is required for RS232 Daisy Chaining (Multiple controls along the RS232 Link)

System Parameter Display

Ex.
| Echo RS232 |
| EC:1 1=on/0=off | Default 1

RS232 Echo Set On

5. EMn

Parameter: Encoder Mode
Range: 0, 1, or 2
Description: Enables/disables encoder operation and functions

n = 0   MODE 0: No Encoder, sets the 851 control to operate open loop, encoder feedback monitoring is disabled. All programmed moves, using user defined units or step counts, are based on the Motor Resolution (MR) setting in System Parameters.

n = 1   MODE 1: Stall Detection, sets the 851 Control to operate closed loop where encoder feedback is used for detecting a stall condition. Following error is set by the FE Parameter.

n = 2   MODE 2: Closed Loop Positioning, sets the 851 control to operate closed loop where encoder feedback is used for positioning. All programmed moves, using user-defined units or step counts, are based on encoder pulses (of 2000 Pulse Per Rev).

Note 1: Stall detection is also enabled during this mode.
Note 2: Positioning resolution becomes 2000 ppr when in this mode.

System Parameter Display

Ex.
| Encoder Mode |
| EM:0 (0, 1, or 2) | Default 0

6. FEnnnnnnn

Parameter: Following Error
Range: 0-9999999 step counts
Description: Defines the maximum position following error allowed during motion when the 851 Indexer System is used in closed loop operation utilizing encoder feedback for stall detection.

Note 1: Active ONLY when the 851 System is used in closed loop operation. (System Parameter: Encoder Mode (EM) is set for 1 or 2)

System Parameter Display

Ex.
| Fol Error (Stall) |
| FE:0025000 | Default 25000

Stall Detection for EM and FE Commands
Encoder Mode 1 and Mode 2

A stall condition occurs when the 851 Indexing System is used in closed loop operation and the position Following Error (Set by the FE Command in System Parameters) exceeds its set value during a move.

The 851 Indexer commands moves based on the Motor Resolution (MR) setting in System Parameters. When in encoder mode 1 or 2, encoder feedback (equivalent to 2000 Pulses per Rev) is compared to the commanded signal during any motion. If an error between the commanded and feedback signal exceeds the step count equivalent set by FE, the indexer will enter a fault state where. . .

• Any motion or program executed is immediately terminated.
• The LCD Display will indicate "Motor Stall"
• A fault output will be generated by a SYSTEM OUTPUT (S01 or S02) if defined as a "Stall" or "General" Fault.
• The Shutdown Output will be activated on the indexer connector.

7. `HAmnx`

Parameter: Home Algorithm
Range: 0 or 1
Description: Used to configure the homing routine, defining the type of home switch to be used, which edge of the home switch to reference, and the final approach direction. Used with the edit mode Go Home (GH) command.

HA(mnx) m = 0 CCW(-) Edge
m = 1   CW(+) Edge

n = 0 Normally Closed Switch
n = 1 Normally Open Switch

x = 0 CCW(-) Final Approach Direction
x = 1   CW(+) Final Approach Direction

System Parameter Display

Ex.
| Home Algorithm |
| HA(mnx):010 |

Default 010

Home input activated by the CCW(-) edge of a Normally Open home switch. Final approach direction is CCW(-).

8. `HO(+/-)nnn.nnnn`

Parameter: Home Offset
Range: (+/-) 0000000 to 9999999 step counts (MN = 0)
(+/-) 000.0000 to 999.9999 user units (MN = 1)
(+/-) 000.0000 to 999.9999 inch/cm (MN = xxx)
Description: When the home reference position is established following a successful homing routine, this command sets the zero position counter to an offset value from the home reference position where "+" is the CW direction ahead of home and "-" is the CCW direction behind home.

System Parameter Display

Ex.
| Home Offset |
| HO+001.0000 |

Default 000.0000

When the 851 finds the home reference position, it sets the position counter to 1.0 distance unit. The Absolute Zero position is now located 1 unit behind the mechanical home. All absolute moves will be referenced from this position.

Reference: Model Number(MN) in system parameters to determine distance units.
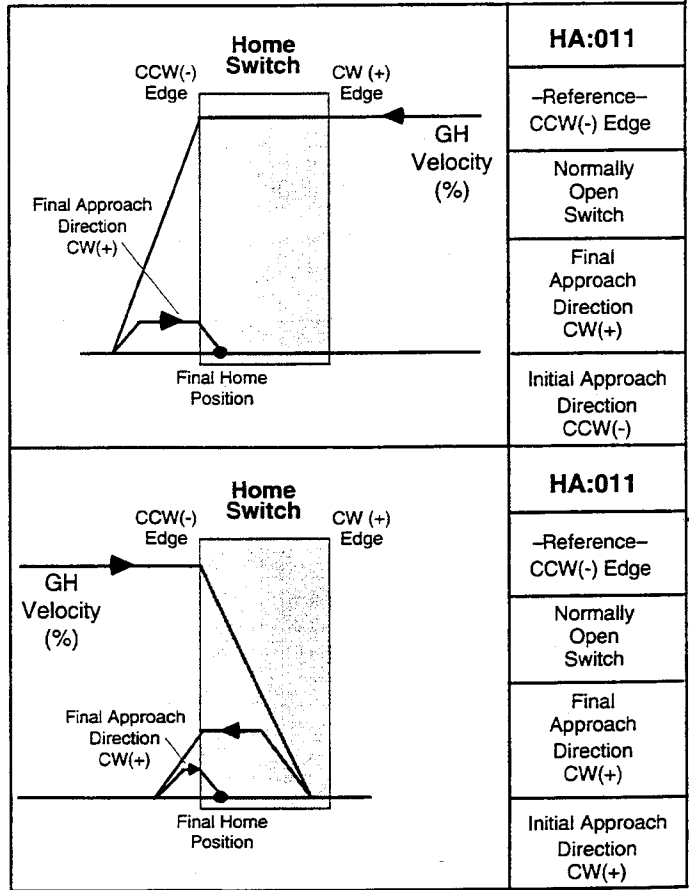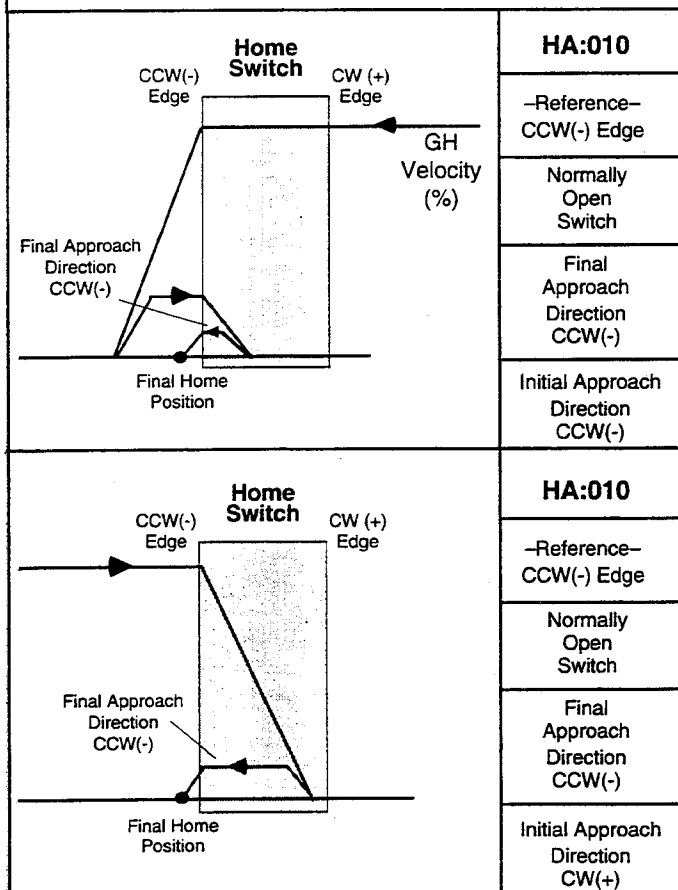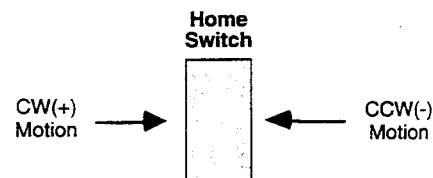
Homing Routine Profiles
(using the Home Algorithm Parameter, HA).

Example homing profiles show resulting move routine when using alternate final and initial approach directions.

Note: Homing Profiles are the same for both, Normally Open and Normally Closed Home Switches

Home Switch Orientation

	HA:010
	−Reference− CCW(-) Edge
	Normally Open Switch
	Final Approach Direction CCW(-)
	Initial Approach Direction CCW(-)

	HA:011
	−Reference− CCW(-) Edge
	Normally Open Switch
	Final Approach Direction CW(+)
	Initial Approach Direction CCW(-)

	HA:010
	−Reference− CCW(-) Edge
	Normally Open Switch
	Final Approach Direction CCW(-)
	Initial Approach Direction CW(+)

	HA:011
	−Reference− CCW(-) Edge
	Normally Open Switch
	Final Approach Direction CW(+)
	Initial Approach Direction CW(+)

9. JAnn.nn

Parameter: Jog Acceleration
Range: .05 sec to 15 sec
Description: Defines the time it takes the motor to ramp up from zero speed to the specified Jog Velocity(JV) when a Jog Input or Jog Key is activated.

Note: The time entered also specifies the deceleration time for the unit to go from the Jog Velocity to zero speed after a Jog Input or Jog Key is released.

System Parameter Display

Ex.
| Jog Accel time |
| JA:00.10 | Default .1

Jog Acceleration & Deceleration
Ramp Times are .1 second each.

10. JVnn .n

Parameter: Jog Velocity
Range: .1 to 99.9
Description: Defines the jog mode velocity used when maintaining the Keyboard Jog Keys or Jog Inputs during Operation. Where nn is a percentage (.1 to 99.9%) directly proportional to the step output frequency. See VE command in Chapter 4 for determining the percentage value vs step output.

Keyboard Jog Keys: ESC & Right Arrow   Jog CW (+)
                   ESC & Left Arrow   Jog CCW (-)

Jog Inputs: System Inputs (SI Command)
        Configuration 1   Jog CW (+)
        Configuration 2   Jog CCW (-)

System Parameter Display

Ex.
| Jog Velocity |
| JV:30 | Default 10

Jog Velocity set for 30% Speed

11. MRnnnnn

Parameter: Motor Resolution
Range: 25000, 5000
Description: Command used to configure the number of step pulses the drive requires to move the motor one revolution. The value determines the step count and step frequency based on the entered values and units for distance, velocity, acceleration, and deceleration used in creating move profiles.

System Parameter Display

Ex.
| Motor Resolution |
| MR:25000 | Default 25000

Motor/Drive Resolution set at 25000 step counts

12. MUn

Parameter: Metric Units
Range: 0 or 1
Description: Defines the units of scale for position and velocity in terms of English or Metric units. Used **ONLY** when an 851 is configured (using a 3 digit Model Number, MN:xxx) for an IDC cylinder system.

n = 0   English Units, where distance is measured in "in" (inches) and velocity "in/s" (inches per second)

n = 1   Metric Units, where distance is measured in "cm" (centimeters) and velocity "cm/s" (centimeters per second)

Note 1: Distance values already stored in programs are not converted from English to Metric Units (or viceversa) when changing between units.
Note 2: Edit Mode Commands affected by MU: DA (Distance Absolute), DI (Distance Incremental), DC (Distance to a Change)
Note 3: System Parameter Commands affected by MU: MN (Model Number), DP (Display Mode), HO (Home Offset)

System Parameter Display

EX.
| Metric Units |
| MU:0 1=on/0=off | Default 0

Metric Units are Disabled, Using English Unit

Reference: See Model Number (MN) Command listed in System Parameters in Chapter 5.

13. PUnn

Parameter: Power-Up Mode
Range: 0 to 99
Description: This command will cause a single program to be executed on power up or system reset.

Note 1: For nn=00, no program will be executed on Power Up.
Note 2: If the scanning of the program select lines is also active (System Parameter Command XP:1 or 2), the unit will first execute the program designated by PU:nn on power up or after a system reset, and then will initiate the scanning operation of the program select lines.

System Parameter Display

EX.
| Power Up Mode |
| PU:13 | Default 00

Program 13 is executed on Power Up

14. RAnnnnn

Parameter: Ratio Variable A
Range: 0 - 99999
Description: Variable used in conjunction with Ratio Variable B (RB) to set up a ratio to define user scaled distance units.

Note 1: RA is used only when Model Number 1 (User Units) is selected in System Parameters.
Note 2: RA must be a whole number (NO decimal point)

System Parameter Display

Ex.
| Ratio Variable A |
| RA:00001 | Default 00001

Reference: Model Number (MN) Command in System Parameters for details on setting up User Scaling with the RA and RB variables.

15. `RBnnnn`

Parameter: Ratio Variable B
Range: 0 - 9999
Description: Variable used in conjunction with Ratio Variable A (RA) to set up a ratio to define user scaled distance units.

Note 1: RB is used only when Model Number 1 (User Defined Units) is selected in System Parameters.

Note 2: RB must be a whole number (NO decimal point)

System Parameter Display

Ex.

Ratio Variable B	
RB:0001	Default 0001

Reference: Model Number (MN) Command in System Parameters for details on setting up User Scaling with the RA and RB variables.

16. `SDnn.nn`

Parameter: Stop Decel Time (100% Speed Decel Time)
Range: .05 to 15 sec
Description: The time entered determines the DECELERATION RATE for your motor given any speed when the Stop on Input (STn command) is activated or when a Stop (S) command is issued via RS232.

1. Specifically, the time entered will represent the time your motor takes to ramp down from a maximum reference velocity of 100% to 0% speed.

2. The constant DECELERATION RATE can be determined from this knowing the change in velocity (100%) over the change in time(SD time entered).

3. Knowing the constant Deceleration rate, you can now determine the actual TIME TO STOP for any given speed when the stop on input is activated.

System Parameter Display

Ex.

STn Decel time	
SD:01.00	Default 1.0

Time entered is 1 second

Example: Using an 851 configured to a motor/drive system where VE100= 50 RPS and using the default SD time of 1 second.

1. Determine the Stop Decel Rate for the motor
2. Calculate the "Time to Stop" for various Velocities in which a Stop on Input may be used.

1. $\text{DECEL RATE} = \text{v(revs/sec)} = \dfrac{\text{Maximum Speed}}{\text{SD time}} = \dfrac{50 \text{ revs/sec}}{1\text{sec}} = 50 \text{ revs/sec}^2$
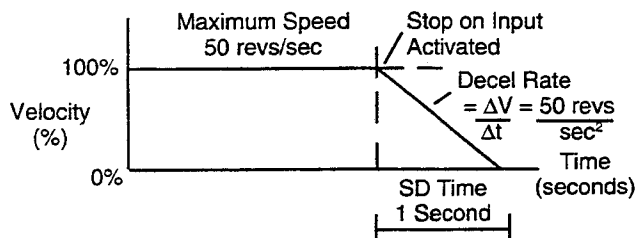
2. The Time to Stop once the STn input is activated is a function of the SD time and the Move Velocity of the motor at the time the STn input is activated.

$$\frac{\text{Time to Stop}}{\text{Move Velocity}} = \frac{\text{SD time (100\% speed decel time)}}{100\% \text{ Velocity}}$$
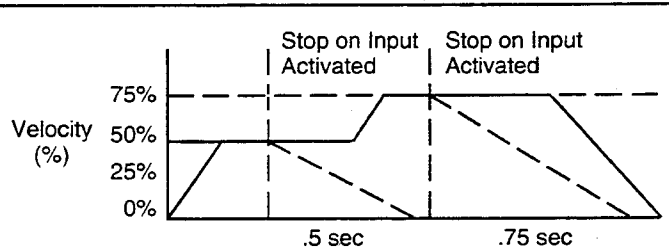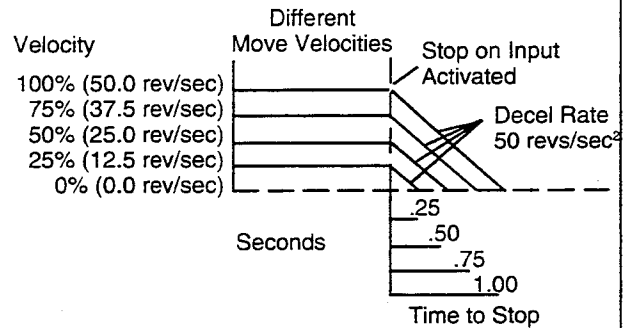
$$\text{Time to Stop} = \text{SD} \times \frac{\text{Move Velocity}}{100\% \text{ Velocity}} = (\text{SDnn.nn}) \times \frac{(\text{VEnn})}{\text{VE100\%}}$$

Velocity
VE100% Time to Stop = (1 sec) x $\dfrac{(100\%)}{100\%}$ = 1sec x 1 = 1.00sec

VE75% Time to Stop = (1 sec) x $\dfrac{(75\%)}{100\%}$ = 1sec x .75 = .75 sec

VE50% Time to Stop = (1 sec) x $\dfrac{(50\%)}{100\%}$ = 1sec x .50 = .50 sec

VE25% Time to Stop = (1 sec) x $\dfrac{(25\%)}{100\%}$ = 1sec x .25 = .25 sec

The Move Profile displays the Deceleration Ramps for the example motor/drive system if a Stop on Input is activated during move execution at the speeds of 50 or 75%.

17. SFmn

Parameter: Shutdown/Fault Polarity
Range: 0 or 1
Description: Defines the active polarity (active high or low) state of the Fault Input and Shutdown Output on the indexer connector where

m = Shutdown Output (pins 16 and 17 on indexer)
n = Fault Input (pins 9 and 21 on indexer)

m = 0 Shutdown Output state <u>active low</u>
low(sinking to ground) when ON, high when OFF
1 Shutdown Output state <u>active high</u>
high when ON, low(sinking to ground) when OFF

n = 0 Fault Input state <u>active high</u>
Normal Operation, input ON (sinking to ground)
Fault Condition, input OFF(open circuit high)

1 Fault Input state <u>active low</u>
Normal Operation, input OFF(open circuit high)
Fault Condition, input ON(sinking to ground)

System Parameter Display

Ex.

Shutdown/Fault	
SF(mn):10	Default 10

Shutdown Output active high, Fault Input active low

Reference: See Hardware Reference (CH6) for Wiring and Specifications of Fault Input and Shutdown Output.

18. SImnxy

Parameter: System Inputs
Range: 0-8
Description: Defines the System Inputs to be configured as follows,
m = System Input 1 (SI1)   x = System Input 3 (SI3)
n = System Input 2 (SI2)   y = System Input 4 (SI4)

<u>m or n defined as</u>
0 Not Used
1 Jog CW (+) (Same as ESC & Right Arrow Key)
2 Jog CCW(-) (Same as ESC & Left Arrow Key)
3 Kill Motion
4 Disable Keyboard
5 Warm boot—System reset
6 Additional Program Select Inputs (PRG): Binary or BCD
7 Motor Shutdown
8 Additional User Programmable Inputs (IN)
9 Interrupt

System Parameter Display

Ex.

System Inputs	
SI(mnxy):6635	Default 8800

System Input 1 and 2 are used as Additional Program Select Lines (PRG4 and PRG5), System Input 3 is used to Kill Motion, and System Input 4 is used to issue a System Reset

Reference: See Hardware Reference for Wiring and Specifications regarding System Inputs (SI1-SI4).

System Inputs: Function Descriptions

1. **Jog CW(+):** When activated the motor will Jog in the CW (+) direction at a velocity determined by the JV System Parameters Command. When the input is released, motion stops. (Same as Run Mode: ESC & Right Arrow Key)

2. **Jog CCW(-):** When activated the motor will Jog in the CCW (-) direction at a velocity determined by the JV System Parameters Command. When the input is released, motion stops. (Same as Run Mode: ESC & Left Arrow Key)

3. **Kill Motion:** When activated, any program execution or functional operation is immediately stopped. This includes any motion, time delays, loops, faults, and scanning of the Program Select/User Programmable Inputs.

4. **Disable Keypad:** When activated, keypad is disabled allowing NO user access. Keypad resumes normal operation when input released.

5. **Warm Boot—System Reset:** When activated, resets the 851 software, clearing the RAM Buffer, and resetting the control to its power up state. (Programs & Parameters are NOT ERASED). This is typically used to restart system when a fault condition occurs.

6. **Additional Program Select Inputs (PRG): Binary or BCD Format** One to four additional program select lines may be added to allow user to select more programs. Used in conjunction with the XP command in System Parameters which enables the scanning process and selects the Binary or BCD format.
   System Input 1 = PRG4 Input
   System Input 2 = PRG5 Input
   System Input 3 = PRG6 Input
   System Input 4 = PRG7 Input

   See Binary and BCD Decoding tables on next page.

7. **Motor Shutdown**
   When activated, the Shutdown Output (pins 16 and 17) on the Indexer connector will activate. Typically this output will be wired to the "enable" input on the drive system which enables and disables holding torque on the motor.

8. **Additional User Programmable Inputs (IN)**
   One to two additional user programmable inputs may be added to allow user more I/O Logic interaction within a program. "IN" inputs are used with the Edit Mode Commands WT (Wait On Input), IF (If-Then), GOn (Go on Input), & ST (Stop on Input). The first additional input defined is IN3 and the second is IN4.

9. **Interrupt**
   When activated, any executing program or functional operation is terminated and PROGRAM 98 (interrupt program) is immediately executed. After Program 98 is complete, the unit resumes scanning of the program select lines.

Note 1: If a move is executing when the interrupt is activated, the move is terminated (decelled at a rate determined by the SD command in System Parameters).
Note 2: If no commands are listed in program 98, the unit will go to Run mode and immediately begin scanning program select lines. The XP Command must be active for the Program Select Lines to be scanned.

System Inputs as Program Select Lines

The System Parameter XP:n Command must be set to 1 (Binary Format) to initialize the program select lines in order for the system inputs to be used as additional program select lines. XP=External Program Select

Binary Decoding Table: XP:1

Program #	MSB SI4	SI3	SI2	SI1	PRG3	PRG2	LSB PRG1
0	1	1	1	1	1	1	1
1	1	1	1	1	1	1	0
2	1	1	1	1	1	0	1
3	1	1	1	1	1	0	0
4	1	1	1	1	0	1	1
5	1	1	1	1	0	1	0
6	1	1	1	1	0	0	1
7	1	1	1	1	0	0	0
8	1	1	1	0	1	1	1
9	1	1	1	0	1	1	0
10	1	1	1	0	1	0	1
11	1	1	1	0	1	0	0
12	1	1	1	0	0	1	1
13	1	1	1	0	0	1	0
14	1	1	1	0	0	0	1
15	1	1	1	0	0	0	0
16	1	1	0	1	1	1	1
17	1	1	0	1	1	1	0
18	1	1	0	1	1	0	1
19	1	1	0	1	1	0	0
20	1	1	0	1	0	1	1
21	1	1	0	1	0	1	0
22	1	1	0	1	0	0	1
23	1	1	0	1	0	0	0
24	1	1	0	0	1	1	1
25	1	1	0	0	1	1	0
26	1	1	0	0	1	0	1
27	1	1	0	0	1	0	0
28	1	1	0	0	0	1	1
29	1	1	0	0	0	1	0
30	1	1	0	0	0	0	1
31	1	1	0	0	0	0	0
32	1	0	1	1	1	1	1
33	1	0	1	1	1	1	0
34	1	0	1	1	1	0	1
35	1	0	1	1	1	0	0
36	1	0	1	1	0	1	1
37	1	0	1	1	0	1	0
38	1	0	1	1	0	0	1
39	1	0	1	1	0	0	0
40	1	0	1	0	1	1	1
41	1	0	1	0	1	1	0
42	1	0	1	0	1	0	1
43	1	0	1	0	1	0	0
44	1	0	1	0	0	1	1
45	1	0	1	0	0	1	0
46	1	0	1	0	0	0	1
47	1	0	1	0	0	0	0
48	1	0	0	1	1	1	1
49	1	0	0	1	1	1	0
50	1	0	0	1	1	0	1

1 = off (open circuit)   0 = on (grounded)

Addition Program Select Lines: Binary Format

Configuration	# of programs allowed
SI XXXX	7
SI 6 XXX	15
SI 66 XX	31
SI 666 X	63
SI 6666	99

X = Any other System Input Configuration

Program #	MSB SI4	SI3	SI2	SI1	PRG3	PRG2	LSB PRG1
51	1	0	0	1	1	0	0
52	1	0	0	1	0	1	1
53	1	0	0	1	0	1	0
54	1	0	0	1	0	0	1
55	1	0	0	1	0	0	0
56	1	0	0	0	1	1	1
57	1	0	0	0	1	1	0
58	1	0	0	0	1	0	1
59	1	0	0	0	1	0	0
60	1	0	0	0	0	1	1
61	1	0	0	0	0	1	0
62	1	0	0	0	0	0	1
63	1	0	0	0	0	0	0
64	0	1	1	1	1	1	1
65	0	1	1	1	1	1	0
66	0	1	1	1	1	0	1
67	0	1	1	1	1	0	0
68	0	1	1	1	0	1	1
69	0	1	1	1	0	1	0
70	0	1	1	1	0	0	1
71	0	1	1	1	0	0	0
72	0	1	1	0	1	1	1
73	0	1	1	0	1	1	0
74	0	1	1	0	1	0	1
75	0	1	1	0	1	0	0
76	0	1	1	0	0	1	1
77	0	1	1	0	0	1	0
78	0	1	1	0	0	0	1
79	0	1	1	0	0	0	0
80	0	1	0	1	1	1	1
81	0	1	0	1	1	1	0
82	0	1	0	1	1	0	1
83	0	1	0	1	1	0	0
84	0	1	0	1	0	1	1
85	0	1	0	1	0	1	0
86	0	1	0	1	0	0	1
87	0	1	0	1	0	0	0
88	0	1	0	0	1	1	1
89	0	1	0	0	1	1	0
90	0	1	0	0	1	0	1
91	0	1	0	0	1	0	0
92	0	1	0	0	0	1	1
93	0	1	0	0	0	1	0
94	0	1	0	0	0	0	1
95	0	1	0	0	0	0	0
96	0	0	1	1	1	1	1
97	0	0	1	1	1	1	0
98	0	0	1	1	1	0	1
99	0	0	1	1	1	0	0

Note 1: For the configurations SIX666, SI6X66, SI66X6, SI666X, SI66XX, SI6X6X, SI6XX6, SIX66X, SIX6X6, SIXX66, SI6XXX, SIX6XX, SIXX6X, & SIXXX6 where X is any other configuration number, the missing Program Select Input in the above table defaults to a binary 1.

System Inputs as Program Select Lines

The System Parameter XP:n Command must be set to 2 (BCD Format) to initialize the program select lines in order for the system inputs to be used as additional program select lines. XP=External Program Select

BCD Decoding Table: XP:2

Program #	MSB SI4	SI3	SI2	SI1	PRG3	PRG2	LSB PRG1
0	1	1	1	1	1	1	1
1	1	1	1	1	1	1	0
2	1	1	1	1	1	0	1
3	1	1	1	1	1	0	0
4	1	1	1	1	0	1	1
5	1	1	1	1	0	1	0
6	1	1	1	1	0	0	1
7	1	1	1	1	0	0	0
8	1	1	1	0	1	1	1
9	1	1	1	0	1	1	0
10	1	1	0	1	1	1	1
11	1	1	0	1	1	1	0
12	1	1	0	1	1	0	1
13	1	1	0	1	1	0	0
14	1	1	0	1	0	1	1
15	1	1	0	1	0	1	0
16	1	1	0	1	0	0	1
17	1	1	0	1	0	0	0
18	1	1	0	0	1	1	1
19	1	1	0	0	1	1	0
20	1	0	1	1	1	1	1
21	1	0	1	1	1	1	0
22	1	0	1	1	1	0	1
23	1	0	1	1	1	0	0
24	1	0	1	1	0	1	1
25	1	0	1	1	0	1	0
26	1	0	1	1	0	0	1
27	1	0	1	1	0	0	0
28	1	0	1	0	1	1	1
29	1	0	1	0	1	1	0
30	1	0	0	1	1	1	1
31	1	0	0	1	1	1	0
32	1	0	0	1	1	0	1
33	1	0	0	1	1	0	0
34	1	0	0	1	0	1	1
35	1	0	0	1	0	1	0
36	1	0	0	1	0	0	1
37	1	0	0	1	0	0	0
38	1	0	0	0	1	1	1
39	1	0	0	0	1	1	0
40	0	1	1	1	1	1	1
41	0	1	1	1	1	1	0
42	0	1	1	1	1	0	1
43	0	1	1	1	1	0	0
44	0	1	1	1	0	1	1
45	0	1	1	1	0	1	0
46	0	1	1	1	0	0	1
47	0	1	1	1	0	0	0
48	0	1	1	0	1	1	1
49	0	1	1	0	1	1	0
50	0	1	0	1	1	1	1

1 = off (open circuit) 0 = on (grounded)

Addition Program Select Lines: BCD Format

Configuration	# of programs allowed
SI XXXX	7
SI 6 XXX	9
SI 66 XX	19
SI 666 X	39
SI 6666	79

X = Any other System Input Configuration

Program #	MSB SI4	SI3	SI2	SI1	PRG3	PRG2	LSB PRG1
51	0	1	0	1	1	1	0
52	0	1	0	1	1	0	1
53	0	1	0	1	1	0	0
54	0	1	0	1	0	1	1
55	0	1	0	1	0	1	0
56	0	1	0	1	0	0	1
57	0	1	0	1	0	0	0
58	0	1	0	0	1	1	1
59	0	1	0	0	1	1	0
60	0	0	1	1	1	1	1
61	0	0	1	1	1	1	0
62	0	0	1	1	1	0	1
63	0	0	1	1	1	0	0
64	0	0	1	1	0	1	1
65	0	0	1	1	0	1	0
66	0	0	1	1	0	0	1
67	0	0	1	1	0	0	0
68	0	0	1	0	1	1	1
69	0	0	1	0	1	1	0
70	0	0	0	1	1	1	1
71	0	0	0	1	1	1	0
72	0	0	0	1	1	0	1
73	0	0	0	1	1	0	0
74	0	0	0	1	0	1	1
75	0	0	0	1	0	1	0
76	0	0	0	1	0	0	1
77	0	0	0	1	0	0	0
78	0	0	0	0	1	1	1
79	0	0	0	0	1	1	0

Note 1: For the configurations SIX666, SI6X66, SI66X6, SI666X, SI66XX, SI6X6X, SI6XX6, SIX66X, SIX6X6, SIXX66, SI6XXX, SIX6XX, SIXX6X, & SIXXX6 where X is any other configuration number, the missing Program Select Input in the above table defaults to a binary 1.

19. SOmn

Parameter: System Outputs
Range: 0 - 6
Description: Defines the function of the two System Definable Outputs; configured as follows where
m = System Output 1 (SO1)
n = System Output 2 (SO2)

m or n
0 Not used
1 Direction of Motor Motion
CW (+) = Output Off (Open Collector High)
CCW (-) = Output On (Sinking to Ground)

Output remains set until motion begins in reverse direction.

2 Direction of Motor Motion
CCW (-) = Output Off (Open Collector High)
CW (+) = Output On (Sinking to Ground)

Output remains set until motion begins in reverse direction.

3 Motion
Any Motion = Output On (Sinking to Ground)
No Motion = Output Off (Open collector High)

4 General Fault: Output set ON (Sinking to Ground) during any fault condition. Fault conditions are listed as follows;
"Amplifier Fault"   "ENCODER Fault"
"Current Overload"   "ERROR finding Home"
"EEPROM Check Sum   "Hit A Limit"
Error"   "Motor Stalled"

5 Amp Fault: Output set on (Sinking to Ground) during an amplifier fault.

6 Stall Fault: Output set on (Sinking to Ground) during a stall fault. (Active only during closed loop operation, EM:1 or 2)

Note: For Fault outputs, the output will remain set until the power is cycled or a system reset is issued.

System Parameter Display

Ex.
System Outputs
SO(mn):13   Default 00

System Output 1: set on when the motor moves CCW (-) and off when CW(+).
System Output 2: set on during any motor motion and is off when stopped.

Reference: See Hardware Reference for Wiring and Specifications regarding System Outputs (SO1 & SO2).

20. UNnn

Parameter: Unit Number
Range: 1 - 98
Description: RS232 Device Address, used primarily for daisy-chain operation of multiple controls along the serial communication link.

System Parameter Display

Ex.
Unit Number
UN:01   Default 01

Reference: Operating in RS232 Serial Communication

21. XPn

Parameter: Execute Programs from Program Select Lines
Range: 0, 1, or 2
Description: Tells unit to scan the program select inputs, PRG1, PRG2, and PRG3, and execute the program whose Binary or BCD number pattern appears.

XP:0 Disables the scanning operation, ignoring the program select inputs.

XP:1 Enables the scanning of the program select inputs at the end of each program and executes the next BINARY program number that appears. Power must be cycled or a system reset must be issued to begin scanning operation.

XP:2 Enables the scanning of the program select inputs at the end of each program and executes the next BCD program number that appears. Power must be cycled or a system reset must be issued to begin scanning operation.

PROGRAM SELECT INPUTS	MSB PRG3	PRG2	LSB PRG1	
	1	1	1	NO Program Executed
	1	1	0	Execute Program 1
	1	0	1	Execute Program 2
0 = input grounded	1	0	0	Execute Program 3
1 = open circuit	0	1	1	Execute Program 4
	0	1	0	Execute Program 5
	0	0	1	Execute Program 6
	0	0	0	Execute Program 7

Note: While enabled(XP:1 or XP:2), the program inputs are continually scanned until one of the following occurs;

1. The ESC key is pressed on the keypad.
2. An end of travel limit is encountered.
3. A System Input (SI1 or SI4) is activated when set for Configuration 3: Kill Motion.
4. An RS232 "K" Kill Command is issued.

To start or resume scanning, execute one of the following;
1. Cycle the power
2. Perform a System Reset
   via Run Mode Keypad press F1-F2-9, in that order
   via RS232 enter <a>ZZ, <a>=device address
   via System Input (SI1-SI4) Activation when set for Configuration 5: Warm Boot.

System Parameter Display

Ex.
Ext Prog Select
XP:0 (0, 1, or 2)   Default 0

Scanning Operation Off

Reference: Additonal Program Select Lines See System Parameters: SI Command (System Inputs)

8. [F1] [9] MOTOR SHUTDOWN: Prompts the user to remove Holding Torque from the Motor. Activating this command will activate the Shutdown Output (pins 16 and 17) on the Indexer Connector. Typically this output will be wired to the "enable" input on the drive system.

Disable Motor? YES=ENTR NO=ESC	RUN MODE FUNCTION DISPLAY

Note: Once disabled, the LCD will prompt the user to hit the ESC Key to re-enable motor.

9. [F1] [EDIT] SYSTEM PARAMETERS: Alter System Parameters. Prompts the user to Enter System Parameters to alter parameter values. Press ESC to return to Run Mode.

Alter Sys Params YES=ENTR NO=ESC	RUN MODE FUNCTION DISPLAY

Reference: "Operating in System Parameters" Section in Ch. 2 for detailed operating information in this mode.

10. [F1] [F2] [ENTR] DISPLAY SOFTWARE REVISION: The LCD Screen displays the 851 EEPROM Software Revision and Model Number Configuration.

851 REV 1.00 Model 1	RUN MODE FUNCTION DISPLAY

11. [F1] [F2] [DEL] ORIGINAL CONFIGURATION: Sets the EEPROM to its original default state as if the control were a new unit. The buffer is cleared, all programs are erased, and all commands are set to their default values.

ORIGINAL CONFIG. YES=ENTR NO=ESC	RUN MODE FUNCTION DISPLAY

12. [F1] [F2] [1] ZERO POSITION: Resets the current position to zero. All absolute moves are now referenced from this point.

SET POSITION TO ZERO ? YES=ENTR	RUN MODE FUNCTION DISPLAY

13. [F1] [F2] [3] TRANSMIT RS232 STRING: Tests RS232 Serial Communication setup by sending an ASCII string from the control to a Host Device connected to the RECEIVE, TRANSMIT, and GROUND terminals on the RS232 Port. The transmitted string contains the EEPROM software revision and the Model Number Configuration for your 851.

ex. 851 REV 1.00 Model 1 (Sent to host)

Sending a String over RS232	RUN MODE FUNCTION DISPLAY

14. [F1] [F2] [8] RESTORE DEFAULT VALUES: Restores all EDIT MODE and SYSTEM PARAMETER commands to their default values except for the System Parameter Model Number command. This function does not modify or erase any programs.

Restore Defaults Yes=ENTR No=ESC	RUN MODE FUNCTION DISPLAY

15. [F1] [F2] [9] SYSTEM RESET: (Software Warm Boot) resets the 851 Software, clearing the buffer, and resetting the control to its power up state (equivalent to cycling power). The reset cycle will disable the controller for approximately 5 seconds before entering Run Mode. (Programs and Parameter Settings are NOT erased)

Reset System ? Yes=ENTR No=ESC	RUN MODE FUNCTION DISPLAY

16. [ESC] & [→] JOG EXTEND: Simultaneously pressing both keys jogs the motor in the CW (+) direction at a velocity determined by the JV System Parameters Command. When the keys are released, motion stops. The cylinder position will be shown on the LCD display at all times.

+xxx.xxxx 000 00 11 1111 111 100	RUN MODE FUNCTION DISPLAY

17. [ESC] & [←] JOG RETRACT: Simultaneously pressing both keys jogs the motor in the CCW (-) direction at a velocity determined by the JV System Parameters Command. When the keys are released, motion stops. The cylinder position will be shown on the LCD display at all times.

+xxx.xxxx 000 00 11 1111 111 100	RUN MODE FUNCTION DISPLAY

Reference: Setting Jog Velocity or Jog Acceleration
See System Parameters:JV (Jog Velocity) &
JA (Jog Acceleration) Commands

1.	AC	Acceleration
2.	DA	Distance Absolute
3.	DC	Distance to a Change
4.	DE	Deceleration
5.	DI	Distance Incremental
6.	EL	End Loop
7.	EN	End Program
8.	GH	Go Home
9.	GO	GO(execute a move profile)
10.	GO(n)	Go on Input
11.	IF	IF-Then
12.	LP	Loop
13.	MC	Move Continuous
14.	OT	Output Set
15.	RN	Run Program
16.	ST	Stop on Input
17.	TD	Time Delay
18.	UV	User Variable
19.	VE	Velocity
20.	WT	Wait on Input
21.	ZP	Zero Position

1. ACnn.nn

Command: Acceleration
Range: .05 sec to 15 sec
Syntax: F2 1
Description: Ramp time corresponding to any change of velocity from a lower speed to a higher speed. Once specified it is used in all subsequent moves until it is re-specified. (Default is .3 seconds)

EX.   AC.05 DE.1 VE50 DA3 GO

For an absolute move profile of 3 distance units, ramp up to 50% max speed in .05 seconds.
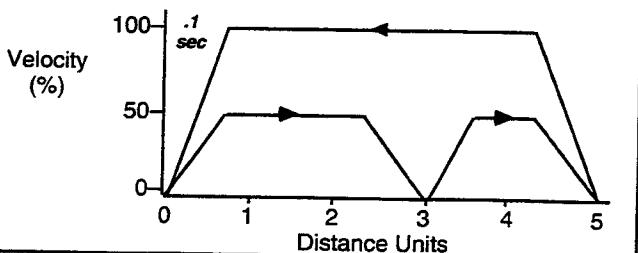
Acceleration
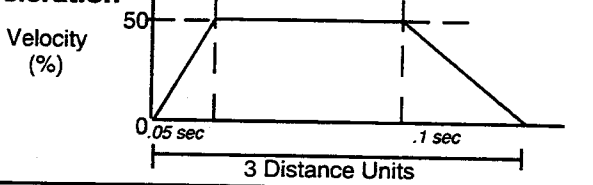
2. DA(+/-)nnn.nnnn

Command: Distance Absolute
Range: (+/-) 0000000 to 9999999 step counts (MN = 0)
         (+/-) 000.0000 to 999.9999 user units (MN = 1)
         (+/-) 000.0000 to 999.9999 inch/cm (MN = xxx)
Syntax: F1 1
Description: Sets position profiles to absolute. All move distances are referenced to/from absolute zero. Distance units are determined by the Model Number(MN) setting in System Parameters.

Distance Absolute

Ex.   AC.1 DE.1 VE50 DA3 GO DA5 GO VE100 DA0 GO

Move to absolute position 3 inches at 50% speed, stop.
Move to absolute position 5 inches at 50% speed, stop.
Move to absolute position 0 inches at 100% speed, stop.

3. DC(+/-)nnn.nnnn

Command: Distance to a Change
Range: (+/-) 0000000 to 9999999 step counts (MN = 0)
         (+/-) 000.0000 to 999.9999 user units (MN = 1)
         (+/-) 000.0000 to 999.9999 inch/cm (MN = xxx)
Syntax: F1 3
Description: Defines a distance at which a change(in velocity or acceleration) or command insertion(turning on an output) occurs within a move profile. Distance units are determined by the Model Number(MN) setting in System Parameters.

Note 1: The DC command cannot be issued prior to the DA or DI command.
Note 2: A maximum of 20 DC commands may be inserted within a move profile.
Note 3: The DC command is specified in absolute or incremental units depending on the initial move specification (DA or DI). When used as incremental, DC is always specified as a positive number.

EX. 1   AC.05 DE.05 VE10 DA4 DC1 OT10000 DC2 OT01000 DC3 OT00100 GO

While moving to an absolute position of 4 units turn on output 1 at 1 unit, output 2 at 2 units and output 3 at 3 units.

EX. 2   AC.05 DE.09 VE100 DA6 DC3 VE50 GO

Move to absolute position 6 units with a starting speed of 100%. At 3 units, reduce speed to 50% (change on Fly) and complete move.

Distance to a change

EX. 3   AC.05 DE.15 VE50 DI4 DC3 VE10 GO

At a starting speed of 50%, begin moving an incremental distance of 4 units. After 3 units, ramp down to 10% speed and continue until the final position is reached.

Distance to a change

C. Basic Wiring to Operate Your Control

Figures 1-4 indicate the necessary interface wiring to operate your 851 Indexer.
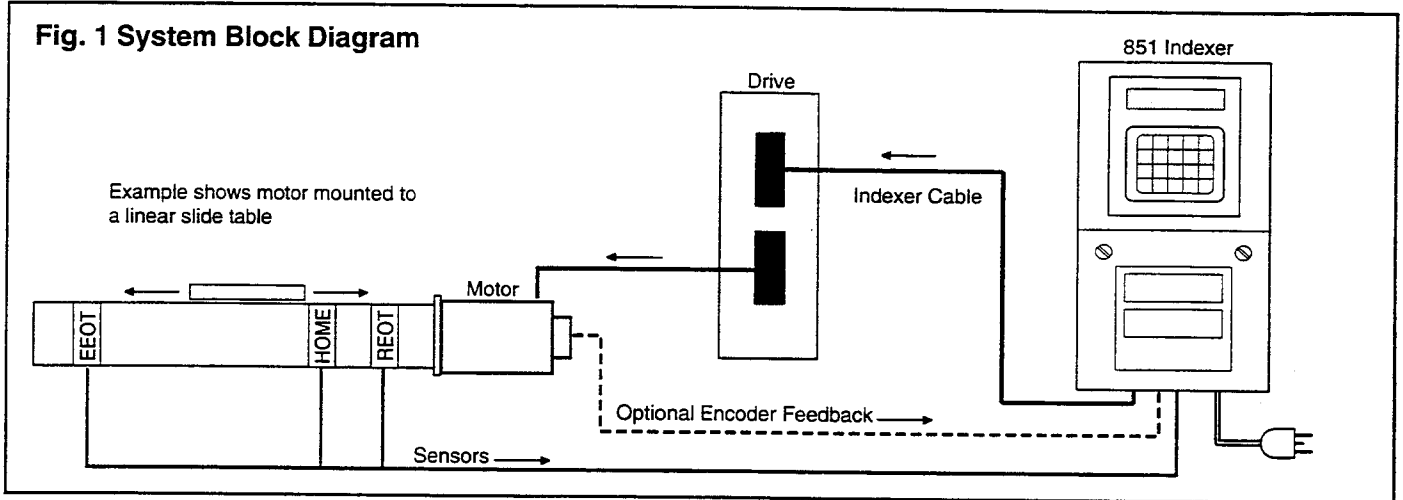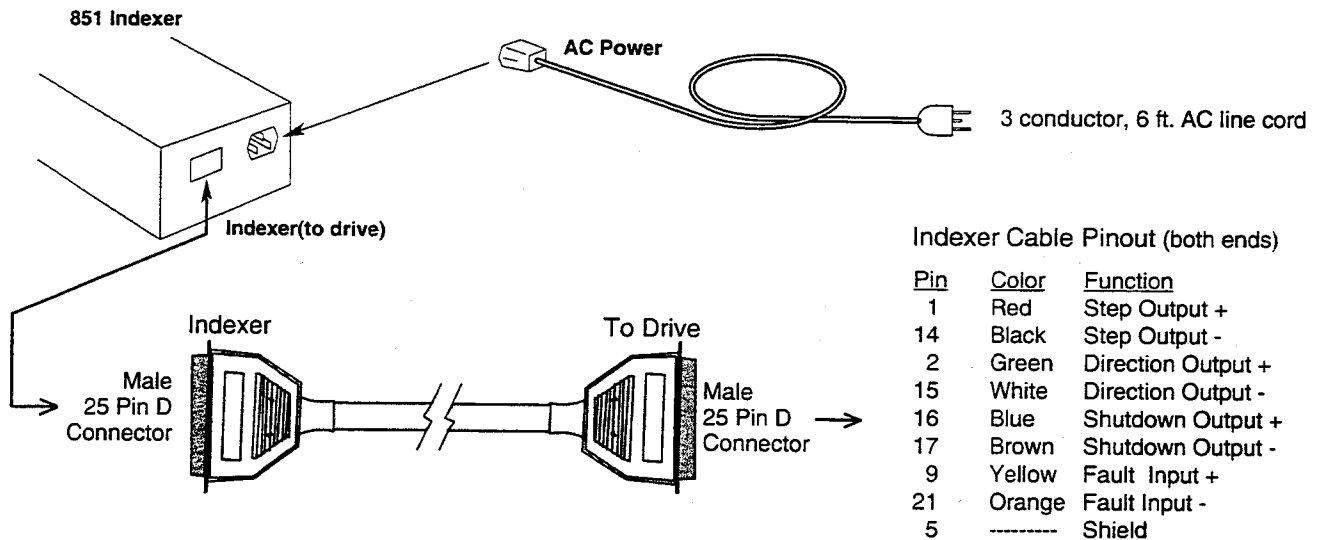
Fig. 1 System Block Diagram

851 Indexer

Drive

Indexer Cable

Example shows motor mounted to a linear slide table

Motor

Optional Encoder Feedback

Sensors

EEOT   HOME   REOT

Fig. 2 Input Power and Indexer (to drive) Connections

851 Indexer

AC Power

3 conductor, 6 ft. AC line cord

Indexer(to drive)

Indexer

To Drive

Male 25 Pin D Connector

Male 25 Pin D Connector

Indexer Cable Pinout (both ends)

Pin	Color	Function
1	Red	Step Output +
14	Black	Step Output -
2	Green	Direction Output +
15	White	Direction Output -
16	Blue	Shutdown Output +
17	Brown	Shutdown Output -
9	Yellow	Fault Input +
21	Orange	Fault Input -
5	---------	Shield

Note: Based on drive connection requirements, it may be necessary to cut the Indexer Cable or make a custom cable. In each case, the shield connection(pin 5) should be terminated at one end ONLY.

Fig. 3 Encoder Option Wiring

J2

30	Ch Z+ (Yellow)
29	Ch Z- (Orange)
28	Ch B+ (Green)
27	Ch B- (Blue)
26	Ch A+ (Red)
25	Ch A- (Pink)
24	+5VDC (White)
23	GND (Black) (Shield)

*Color code shown is for IDC Encoders

Fig. 4 Home and End of Travel Position Sensors

J3

20	GND
19	HOME
18	EEOT
17	REOT

Home Switch N.O. /N.C.
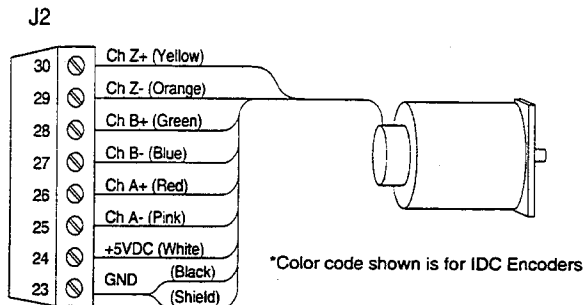
CW (+) N.C. End of travel
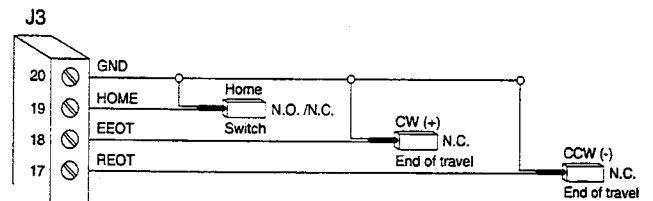
CCW (-) N.C. End of travel

Note: If no end of travel position sensors are used, inputs, REOT (+) and EEOT(-) must be jumpered to Ground (GND).

Inputs

Fig. 5a Low Level Inputs: Program Select Lines and User Programmable Inputs

Input activation via pushbutton or contact closure

Use a strobe switch with the external program select lines to allow for simultaneous activation of inputs.
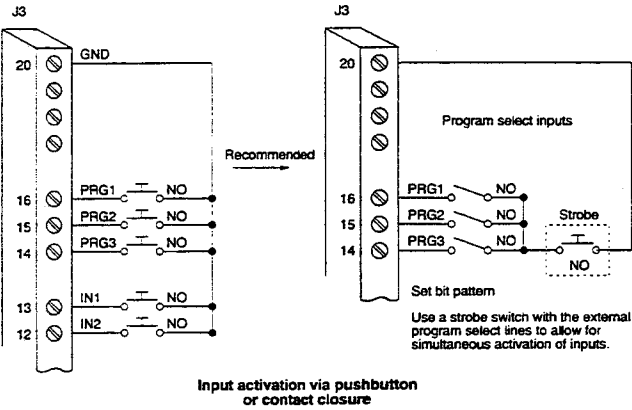
Note: Above inputs can be interfaced to a device such as a PLC or PC Output Card with a sinking output capable of sinking 20mA per input at 12 VDC configuration below.

Fig. 5b

Single input example
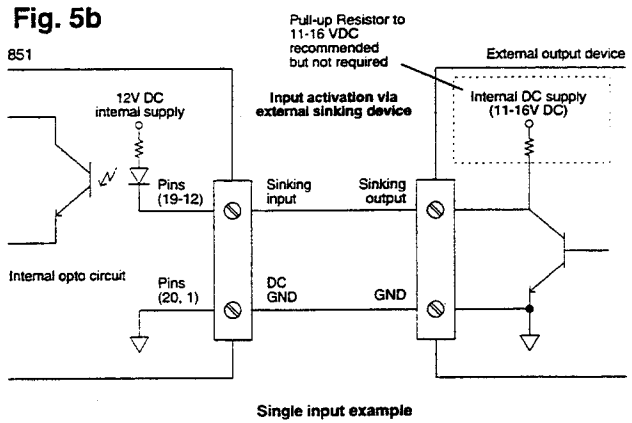
Fig. 6a High Level Inputs: System Inputs
Electrical "Sinking" Configuration: Activation via Pushbutton/Contact Closure
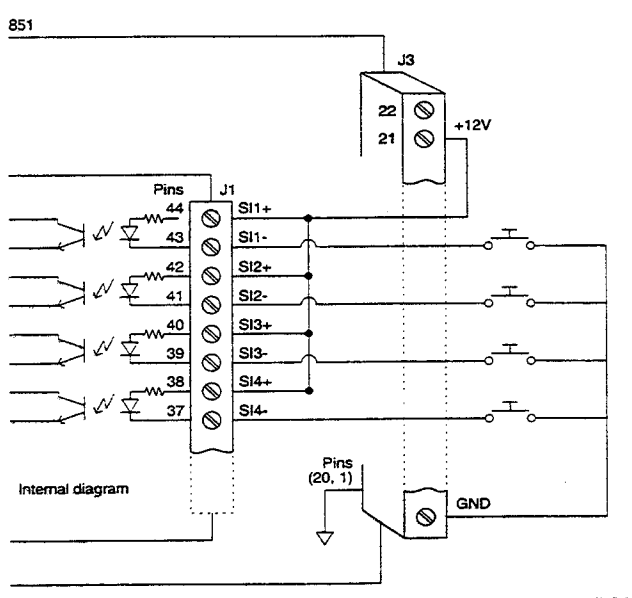
Fig. 6b High Level Inputs: System Inputs
Sinking Configuration Input: Activation via External "Sinking" Device

Single input example
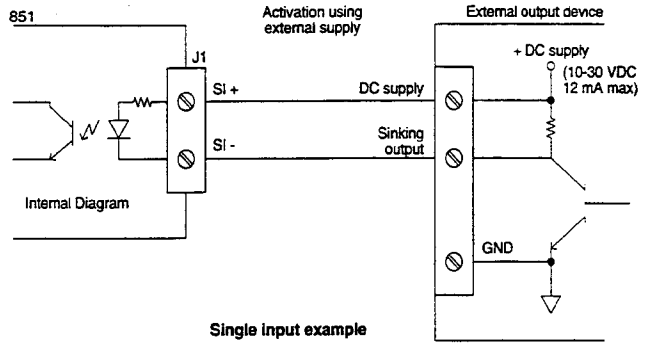
Fig. 6c High Level Inputs: System Inputs
Sinking Configuration Input: Activation via External "Sinking" Device

Single input example
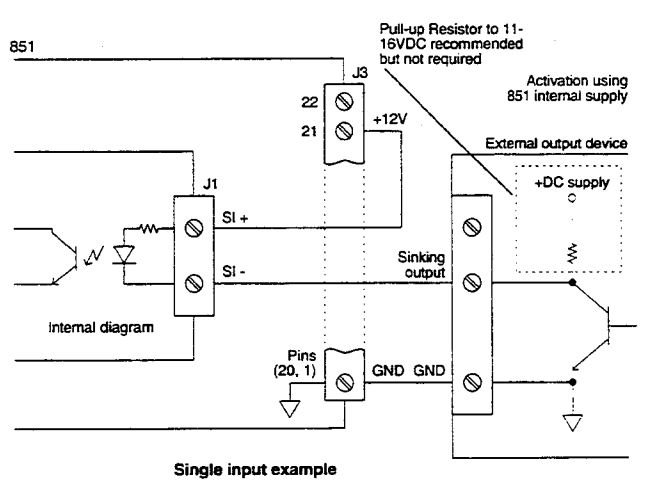
Fig. 6d High Level Inputs: System Inputs
Sourcing Configuration: DC Voltage Activation

Single input example
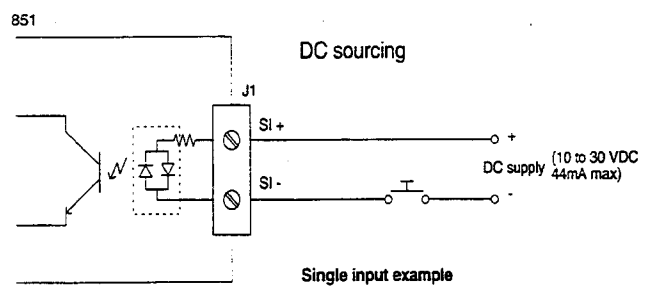
Fig. 7a Low Level Outputs: User Programmable, System, and Dedicated Outputs

J3

Pin	Label
11	OUT1
10	OUT2
9	OUT3
8	SO-1
7	SO-2
6	H OUT
5	L OUT
4	M COM

Sinking outputs

Any of the 851 low level outputs can be used in either of the wiring configurations shown below

20,1 — GND

Fig. 7b Low Level Outputs

851

Internal 12V supply

Pins (11-4)

J3 Sinking output

Sinking an external load circuit

DC relay coil

DC supply under 30V DC

Pins (20, 1) — GND

Internal diagram

Single output example

Fig. 7c Low Level Outputs

851

Internal 12V supply

Pins (11-4)

J3 Sinking output

Interfaced to sinking input

External device with sinking input

Internal DC supply

Sinking input

Pins (20, 1) — GND

Internal diagram

GND

PLC, I/O card, etc.

Single output example

Fig. 8 High Level Outputs: Relays 1 & 2

PLC external I/O device

Wiring examples

Internal supply

851

Internal Diagram

Pins	J1	
36	COM2	Sinking input
35	NC2	...... or
34	NO2	GND
33	COM1	
32	NC1	...... or
31	NO1	Load

Relay 2 coil

Relay 1 coil

AC or DC supply

NC = Normally closed contact
NO = Normally open contact
COM = Contact common

Note:
Inductive Loads are not supported by the output Relay Contacts.
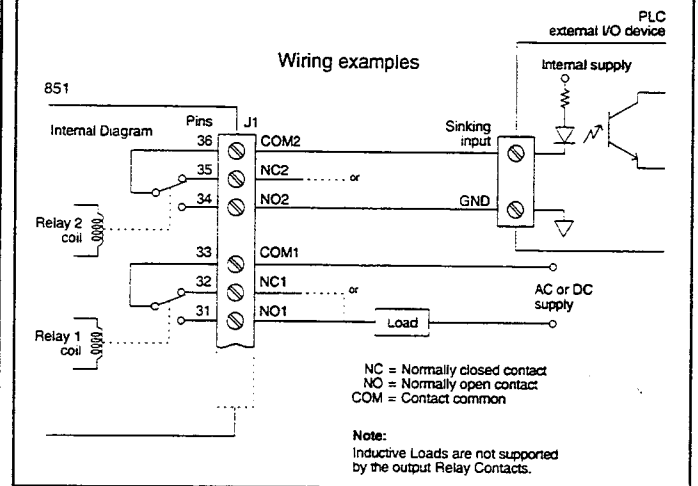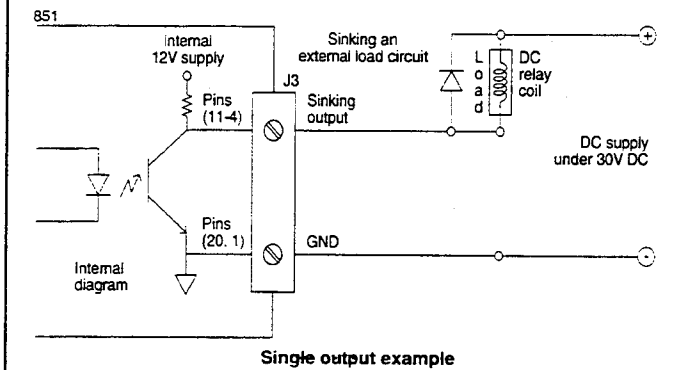
Fig. 9 RS232 Communication Interface: Single Device

J3

RS-232 Host Device

Pin				Pin	
3	TX (Transmit)	(Transmit)	TX	2	Transmit Data
2	RX (Receive)	(Receive)	RX	3	Receive Data
1	GND		GND	7	Ground

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RTS	4	Request to Send
CTS	5	Clear to Send
DSR	6	Data Set Ready
DCD	8	Carrier Detect
DTR	20	Data Terminal Ready
RI	22	Ring Indicate

RS-232 Handshaking is not supported by the 851 Indexer. With some software packages it may be necessary to jumper handshaking lines together on the host's device serial port to "fool" the host into thinking that handshaking is taking place.

Standard RS-232 Pinout (25 Pin D Connector)

Serial RS-232 communication link

Fig. 10 RS232 Communication Interface: Daisy Chaining Multiple Devices

851 Unit 1	851 Unit 2	851 Unit 3
RX GND TX	RX GND TX	RX GND TX

Host RS-232 Device

TX
GND
RX

Up to 98 controls may be daisychained together

Note:
Handshaking lines on the host device should be jumpered in accordance with the single device hookup shown in Figure 9.

Chapter 6 Hardware Reference

D. Specifications

1. Performance

Position

Range:	Model 0 +/- 0-9999999 step counts
	Model 1 +/- 0-999.9999 user units
Resolution	25000, 5000 PPR
Step Accuracy	+/- 0 counts from preset total
Positioning	Absolute or Incremental Coordinates

Velocity

Range	50 RPS @ MR: 25000
	80 RPS @ MR: 5000
Resolution	1000 increments (0.0 - 100.0)
Accuracy/	
Repeatability	+/- .02% of max frequency

Accel/Decel

Range:	.05-15 sec.

2. Power Input

Input Power: 95 to 132 VAC at 50/60 Hz., 3.0 amps max.

3. Indexer Connections

<u>Fault Input</u>

Operation	Sinking input(4.7KΩ pullup to 5vdc)
Rating	TTL, Level Sensitive, Active Low (default)
	Low Signal <.8 VDC, High >3.5, +/- 60ma
Indexer	Fault+ (9)
Connector	Fault- (21)

Fault +/-   Fault Input: when activated will disable(and prevent) the 851 from executing any operations. Typically wired to motor/drive system fault output. Active state is set by the SF Command in system parameters.

<u>Step, Direction, and Shutdown Outputs</u>

Operation	Differential line driver output
Rating	TTL, Level Sensitive, Active High (default)
	Low Signal <.8 VDC, High >3.5, +/- 60ma
Indexer	Step+ (1) Direction+ (2) Shutdown+ (16)
Connector	Step- (14) Direction- (15) Shutdown- (17)

Step +/-   Step Output: TTL level pulse output sent to the drive system to control motor position and speed by varying the step count and frequency. The pulse output is determined by Motor Resolution, Model Number and move profile settings.

Step Output Frequency	Motor/Drive Resolution	Pulse Width
1.25MHz	25000	.375μs
396,625Hz	5000	1.25μs

Direction +/-   Direction Output: set low(sinking to ground) when the motor/drive is commanded to move in the CW (+) direction and high, when in the CCW (-) direction.

Shutdown +/-   Shutdown Output: set(sinking to ground) when "motor shutdown" is activated via the keypad or system input. Typically wired to the "motor enable" input on the drive system. Active state is set by the SF Command in system parameters.

4. Inputs

High Level Inputs

Operation:	Optically isolated Sinking or Sourcing Inputs DC Voltage Activation
Power Requirement:	VDC 10 to 30 VDC at 44 ma max
Connector J1:	SI1+ (44), SI2+ (42), SI3+ (40), SI4+ (38)
	SI1- (43), SI2- (41), SI3- (39), SI4- (37)

Input Functions
SI1-SI4   System Inputs: defined by the SI Command in System Parameters allowing for remote functional control of the unit. The inputs can be defined to execute the following;

- Jog Extend
- Jog Retract
- Kill Motion(Terminate Program)
- Disable Keypad
- Warm Boot—System Reset
- Additional Program Select Lines (BCD or Binary)
- Motor Shutdown
- Additional User Programmable Inputs (IN)
- Interrupt (Jump to Program 98)

Low Level Inputs

Operation:	Optically isolated sinking inputs
Rating:	Draws 20 ma at 12VDC (10-16VDC isolated voltage range)
Connector J3:	HOME(19), PRG1(16), IN1(13)
	EEOT (18), PRG2(15), IN2(12)
	REOT (17), PRG3(14)

HOME: Home Limit: used to terminate the home routine cycle initiated by the GH (Go Home) Edit Mode Command executed in a program. The input can be configured for normally open or normally closed position sensors by the System Parameters HA (Home Algorithm) Command.

EEOT, REOT: CW (+) and CCW (-) End of Travel: optional, normally closed end of travel position sensor inputs for overtravel protection. If a connection is broken, motion will come to an immediate stop and a fault condition will exist. If end of travel limits are not used, EEOT and REOT must be jumpered to ground (GND)

PRG1-PRG3:   Program Select Lines: allow for program selection through external I/O via matching Binary or BCD patterns. Scanning of the inputs is activated by the System Parameters XP command.

IN1 & IN2:   User Programmable Inputs: defined within a program by the Edit Mode Commands WT, IF, GO(n), and ST(n) to allow program interaction with external I/O logic.

All inputs must be stable for a minimum of 10ms to be recognized.

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5. Outputs
Relay Outputs

Operation: SPDT normally open/normally closed contacts

Contact Ratings: 2 amps at 30 VDC resistive
2 amps at 125 VAC resistive

Connector J1: COM2 (36), COM1 (33)
NC2 (35), NC1 (32)
NO2 (34), NO1 (31)

Relay 1 & 2: User Programmable Output Relays: activated within a program by the Edit Mode Command OT (Output). Once activated, a relay will remain set until it is changed with another output command, a software reset is issued, or power is cycled.

Low Level Outputs

Operation: Optically Isolated NPN Open Collector Sinking outputs

Ratings: ON Sinking to ground, 250 ma at 1.5VDC
OFF Open circuit high, 2ma at 12VDC

Connector J3: OUT1 (11), SO-1 (8), HOUT (6)
OUT2 (10), SO-2 (7), LOUT (5)
OUT3 (9), MCOM (4)

Output Function
OUT1-OUT3: User Programmable Outputs: activated within a program by the Edit Mode Command OT (Output). Once Activated (sinking to ground), an output will remain set until it is changed with another output command, a software reset is issued, or power is cycled.

SO1 & SO2: System Outputs: defined by the SO Command in System Parameters, providing an output signal to an external device when pre-defined function states exist within the 851 control system. The following are the predefined states;

- Direction of Motor Motion
  (RTR(-)=On, EXT(+)=Off)
- Direction of Motor Motion
  (EXT(+)=On, RTR(-)=Off)
- At Motion (Any Motion=On, No Motion=Off)
- General Fault (Any Fault=On, No Fault=Off)
- AMP Fault (Amp Fault=On, No Fault=Off)
- Stall Fault (Stall Fault=On, No Fault=Off)

HOUT: Home Output: set (sinking to ground) when the homing routine has successfully been completed. The output will remain set until the next move is initiated.

LOUT: Limit Output: set (sinking to ground) when an end of travel limit input (EEOT or REOT) is broken. Output remains set until motion begins in the opposite direction or a system reset is issued.

MCOM: Move complete: set (sinking to ground) when a move (initiated by a GO Command) within a program is successfully completed. The output will remain set until a new move begins.

6. Logic Power Supply (Isolated)
Rating: 12 VDC unregulated at 500 ma
250 ma available to power external devices
Connector J3: GND(22), PWR(21)

7. Encoder (Option)
Power Available: 5 VDC, 200ma
Compatible Input: Incremental A, B, and Z channels, dual channel quadrature, single ended or differential line driver, open collector TTL compatible
Resolution: 500 lines with quadrature(2000PPR)
Input Frequency: 100 khz pre-quadrature
Connector J2: CHZ+(30), CHB+(28), CHA+(26), 5V (24)
CHZ- (29), CHB- (27), CHA- (25), GND(23)

8. Communications
Operational: Serial RS232 Communication
RS232C Setup: 9600 baud, 8 data bits, no parity, 1 stop bit
Three wire implementation (no handshaking).
Connector J3: TX (3), RX (2), GND(1)

9. Software/Programming
Memory: 8K Non-Volatile EEPROM
(7.5K available for programming)
Programs: Up to 98 Motion Programs
Up to 1000 Characters per program
(not to exceed 7.5K of total available program memory)
Command
Format: 2 character upper-case ASCII
Program Entry: Keypad or RS232 Serial Interface
Prog. Execution: Keypad, RS232, or External I/O Interface

10. Enviromental Specifications
Temperature
Operating: 32 F to 122 F (0 to 50 C)

Storage: -40 to 185 F (-40 to 85 C)

Humidity: 0 - 95 % Non Condensing

RS232 Serial Interface

A. Summary: RS232 Programming

The RS232 port allows the 851 Indexer to communicate to a host device (such as a Computer or PLC) via a 3 wire Serial Interface to UPLOAD, DOWNLOAD, & EXECUTE Programs, Parameters, and Functional Operations.

Four ASCII Command Sets are supported by the 851 and are available to any host device supporting RS232 Serial Communication. These commands provide RS232 Communication support and denote program and parameter information.

The Command Sets are as follows;
RS232: Edit Mode Commands
Used to Create & Edit Programs

RS232: System Parameter Commands
Used to Configure Parameter Functions

RS232: Operational Command Set
Used to upload & download programs and initiate software control functions.

All 851 commands used in the RS232 Command Sets are upper case ASCII characters of the form:

      <a>   ASCII   nnn   <sp>
[device address] [command] [parameters] [delimiter]

<a> device address	is the unit number of the control from 1 to 99. The 851 assumes a default address of 1 if no address is entered.
ASCII command	is two upper-case ASCII letters (A-Z) denoting an 851 Command function.
nnn parameters	are optional command specific numbers
<sp> delimiter	is a SPACE, CARRIAGE RETURN and/or LINE FEED.

B. Setting Up RS232 Communications: 3 Steps

1. CONNECT the 851 RS232 Port to the Host Device Serial Port per the following diagram;

Serial RS232 Communication Link

Serial RS-232 communication link

2. SETUP the Serial Communication Port on the Host Device for 9600 baud, 8 data bits, no parity, and 1 stop bit.

3. TEST the communication link between the 851 (in RUN MODE) and the Host Device (acting as a dumb terminal). This is done by sending a command string from the control to the host with the following keypad entry;

Enter on Keypad

| F1 | F2 | 3 |
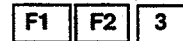
Your 851 LCD Display will read

| Sending a string over RS232 |
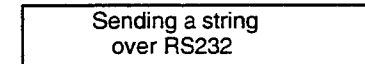
The Host Device Screen will display the transmitted String

851 REV1.00 MODEL 1
        EEPROM   MODEL
        REVISION NUMBER

Note: If no character string appears on your host device review steps 1 and 2. Typically the receive(Rx) and transmit(Tx) lines need to be reversed.

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Sending Commands from the HOST to the Control

After establishing communications you are now ready to download commands from the Host Device using the three RS232 Command Sets defined earlier. Each RS232 Command sent over the serial port will be read on the RUN MODE display as follows;

Run Mode Display

```
RS232 PROCESSING
      XXXX
```

where xxxx is the Command received by the 851.

*Pressing the ESC key on the 851 during RS232 Processing will abort the operation. The program or command being downloaded will be lost.

Programming Examples

Example 1: DOWNLOAD A PROGRAM from the RS232 port into Program Number 13 on Device 1 denoting an absolute move of 5 distance units at 70% speed. With the Host Device in Dumb Terminal Mode enter the following command string;

1DL13 AC.05 DE.09 VE70 DA5 GO EN

NOTE: A DELIMITER must seperate each command.

Command Description Entered Via Host Device		What your 851 Display will read
RUN MODE Default Display		+000.0000 000 00 11 1111 111 100

When no commands are being processed, the 851 will revert to its RUN MODE default display.

1DL13	To Device 1, begin Downloading Program 13	RS232 PROCESSING 1DL13
AC.05	Load a move acceleration of .05 seconds	RS232 PROCESSING AC.05
DE.09	Load a move deceleration of .03 seconds	RS232 PROCESSING DE.09
VE70	Load a move velocity of 70% speed	RS232 PROCESSING VE70
DA5	Load an absolute move of 5 distance units	RS232 PROCESSING DA5
GO	Load a move GO Command	RS232 PROCESSING GO
EN	End Program String 13 Save Program	RS232 PROCESSING saving program13

To confirm the Download has been successful, Upload the contents of Program 13 to the host screen by entering 1UL13.

AC.05 DE.09 VE70 DA5 GO

Example 2: DOWNLOAD SYSTEM PARAMETERS from the host device to the 851. Configure your indexer (Unit 2) for a motor resolution of 5000 and set the Jog Velocity to 25% speed. Enter the following string;

2MR5000 2JV25

RS232 Daisy Chain Operation

When multiple units are daisy chained along the serial link, two System Parameter Commands must be set to insure proper RS232 Operation.

Unit Number (UNnn):   must be used to define the device address for each control along the daisy chain where nn is a number from1 to 99. (default address = 1)

ECHO (ECn):   must be turned ON (n=1) to allow controls along the serial link to retransmit (echo) the received characters to the next device on the RS232 daisy chain. (default = 1)

Communication Interface: Daisychaining Multiple Devices
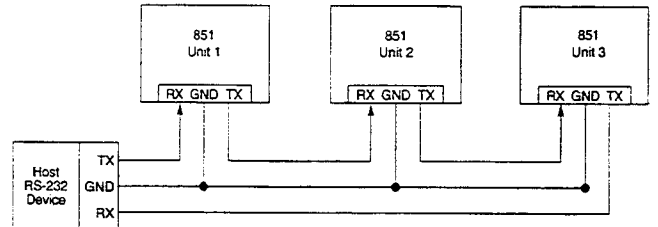
Up to 98 controls may be daisychained together

Note:
Handshaking lines on the host device should be jumpered in accordance with the single device hookup shown on the previous page.

C. Software Command List

1. RS232: EDIT MODE COMMAND LIST

Commands previously defined by the Edit Mode which are utilized in the RS232 Mode to create the programs to Download. The Edit Mode commands are entered through a command string (a program) which MUST be preceded by the Download Command (DL & DR) from the RS232 Operational Command Set and ended with the EN Command to SAVE the string. A delimiter should follow every command entered and a Device Address should be affixed to the download command ONLY.

ACnn<sp>	Acceleration
DAnnn.nnn<sp>	Distance Absolute
DCnnn.nnn<sp>	Distance to a Change
DEnn<sp>	Deceleration
DInnn.nnn<sp>	Distance Incremental
EL<sp>	End Loop
EN<sp>	End Program
GH(+/-)nn<sp>	Go Home
GO<sp>	GO (execute a move profile)
GO(n)<sp>	Go on Input
IFnnnn<sp>	IF-Then
LPnn<sp>	Loop
MCn<sp>	Move Continuous
OTnnnrr<sp>	Output Set
RNnn<sp>	Run Program
STn<sp>	Stop on Input
TDnnnnn.nn<sp>	Time Delay
_UV_###<sp>*	User Variable
VEnnn<sp>	Velocity
WTnnnn<sp>	Wait on Input
ZP<sp>	Zero Position

*Must include underline space bar when downloading
= 3 character user prompt

2. RS232: SYSTEM PARAMETERS COMMAND LIST

Commands previously defined in System Parameters which can be used in the RS232 Mode to configure the 851 system functions. Each command must be preceded by the device address and followed by a delimiter. Commands are automatically saved upon 851 reception.

<a>MNnnn<sp>	Model Number
<a>CSn<sp>	Coordinate System
<a>DPn<sp>	Display Mode
<a>ECn<sp>	Echo on/off RS232
<a>EM<sp>	Encoder Mode
<a>FE<sp>	Following Error
<a>HAnnn<sp>	Home Algorithm
<a>HOnnn.nnn<sp>	Home Offset
<a>JAnn<sp>	Jog Acceleration
<a>JVnn<sp>	Jog Velocity
<a>MRnnnnn<sp>	Motor Resolution
<a>MUn<sp>	Metric Units
<a>PUnn<sp>	Power Up Mode
<a>RAnnnnn<sp>	Ratio Variable A
<a>RBnnnn<sp>	Ratio Variable B
<a>SDnn<sp>	STOP, Decel Rate
<a>SFnn<sp>	Shutdown/Fault Polarity
<a>SInnnn<sp>	System Inputs
<a>SOnn<sp>	System Outputs
<a>UNnn<sp>	Unit Number (Device Address)
<a>XPn<sp>	External Program Select

3. RS232: OPERATIONAL COMMAND LIST

Commands utilized only in RS232 Mode which provide Program and "Real-Time" Operational Control of the 851 via the Host Device. Each Command must be preceded by a device address and followed by a delimiter.

<a>DLnn<sp>	DOWNLOAD PROGRAM
<a>DRnn<sp>	DOWNLOAD PROGRAM TO RAM
<a>ERnn<sp>	ERASE PROGRAM
<a>K<sp>	KILL PROGRAM
<a>OC<sp>	ORIGINAL CONFIGURATION
<a>RNnn<sp>	RUN PROGRAM
<a>S<sp>	STOP PROGRAM (Controlled Decel)
<a>SR<sp>	SOFTWARE REVISION
<a>TD<sp>	TELL DISTANCE
<a>TI<sp>	TELL INPUTS
<a>TO<sp>	TELL OUTPUTS
<a>TP<sp>	TELL PARAMETERS
<a>ULnn<sp>	UPLOAD PROGRAM
<a>ZP<sp>	ZERO POSITION
<a>ZZ<sp>	SYSTEM RESET

Definitions (Operational Command List)

<a>DLnn<sp>   DOWNLOAD: load a program from the host device to the 851 EEPROM Memory, where nn is program number 1 - 98.

The DL Command initializes the beginning of a program string made up of Edit Mode Commands. To complete a program string, it MUST end with an EN command to be SAVED by the 851.

The DL command will not be saved with the contents of the program in the control. It is only a pointer to identify where the program is to be stored.

The Edit Mode Commands between the DL and the EN commands do not require a device address.

<a>DRnn<sp>   DOWNLOAD TO RAM (Memory): load a program from the host device to the 851 RAM Memory where nn is program number 1 - 98.

The DR Command initializes the beginning of a program string made up of Edit Mode Commands. To complete a program string, it MUST end with an EN command.

The programs downloaded with the DR command will NOT be saved when power is removed from the control.

The Edit Mode Commands between the DR and the EN commands do not require a device address.

The DR command is typically used in applications where the 851 is operated exclusively through RS232 via a Host Device which is constantly downloading NEW programs to the control.

This reduces the number of times the EEPROM is "written" to which increases its usable life.

<a>ERnn<sp> ERASE PROGRAM: erase the desired program, where nn is program number 1 - 98.

<a>K<sp> KILL PROGRAM: Emergency Stop, Terminate Program Execution. Immediately stops any motion, operational function, or scanning of the program select inputs currently being executed.

<a>OC<sp> ORIGINAL CONFIGURATION: Resets the EEPROM to its original default state as if the control were a new unit. The buffer is cleared, all programs are erased and all commands are set to their default values.

<a>RNnn<sp> RUN PROGRAM: Run the desired program, where nn is program number 1 - 98.

<a>S<sp> STOP PROGRAM: Stops any motion, operational function, or scanning of the program select inputs currently being executed. If a move is in progress, it will ramp down (Controlled Decel) at a rate determined by the System Parameter SD (Stop Decel Time) Command.

<a>SR<sp> SOFTWARE REVISION: uploads the 851 EEPROM software revision level to the host device display screen. The following characters should appear on the host screen;

851 REV 1.00   MODEL 1
            | |
        EEPROM   MODEL
        REVISION   NUMBER

<a>TD<sp> TELL DISTANCE: Uploads the present motor position from the 851 to the Host Device.

Ex. 1TD
    (+)000.0000

<a>TI<sp> TELL INPUTS: Uploads present status of all Logic Inputs on the 851. Status will be a 0 or 1 where 0=Input Activated and 1=Input Not Activated.

Ex. 1TI
    1 1   1111   111   111   (all inputs inactive)

IN1 IN2 | SI1 SI2 SI3 SI4 | PRG1 PRG2 PRG3 | HOME EEOT REOT

<a>TO<sp> TELL OUTPUTS: Uploads present status of all Logic Outputs on the 851. Status will be a 0 or 1 where 0=Output On (Sinking to Ground) and 1=Output Off (Open Circuit High)

Ex. 1TO
    000   00   00   000   (all outputs off)

OUT1 OUT2 OUT3 | Relay 1 Relay 2 | SO1 SO2 | HOUT LOUT MCOM

<a>TP<sp> TELL PARAMETERS: Uploads all System Parameters and their current values from the 851 to the host device.
Ex. 1TP

MN102	MU0
CS0	PU00
DP1	RA1
EC1	RB1
EM0	SD.1
FE25000	SF10
HA010	SI8800
HO+000.0000	SO00
JA.1	UN01
JV10	XP0
MR25000	

Complete list of Parameters and their current values sent to host display screen.

<a>ULnn<sp> UPLOAD: load a program from the 851 to the host device, where nn is program number 1 - 99. An asterisk (*) is the response if the program is blank. The final ASCII characters sent following the program are a carriage return and a line feed.

<a>ZP<sp> ZERO POSITION: Sets the current cylinder position to zero (+000.0000).

<a>ZZ<sp> SYSTEM RESET: resets the 851 Software (Warm-boot), clearing the RAM Memory (including fault states) and resetting the control to its power up state (equivalent to cycling power). The reset cycle will disable the controller for approximately 5 seconds before entering RUN MODE. (Programs and Parameter settings are NOT erased)

Chapter 8 Appendices

Appendix A: Configuring the 851 to a B7002 Drive

The 851 Indexer can be set up to interface with the IDC B7002 Brushless Servo Drive used to control NB, RB, and TB Series Electric Cylinders. The following information provides the basic software setup and hardware wiring to interface the two units.

Software Setup

The listings below show the System Parameter Settings for the 851 and DPM(Digital Personality Module) settings for the B7002 which are needed to ensure proper operation.

851: Parameters
MN:xxx (see chart below)
MR:5000
SF:11

B7002: DPM Settings
BLKTYPE = 2
ENC.OUT = 500
GEARING = 1
PULSEGEAR = 1
PULSES.IN = 5000
PULSES.OUT = 2000
STEPDIR = 1

Cylinder Model Numbers - MN:xxx
where xxx can be any of the 3 or 4 digit numbers below

NB and RB Series			TB Series		
102	105	108	101	104	106
152	155	158	151	154	156
—	—	—	201	204	206
—	255	258	1001	1004	1006
992	995	998	991	994	996

Hardware Wiring

The connections below show the basic interface wiring between the 851 and the B7002 Drive/Cylinder System. The indexer cable shipped with the 851 must be cut or extended(at the drive end) to allow connections to the B7002.

851 Indexer Cable - Cut end

25 Pin D Male Connector
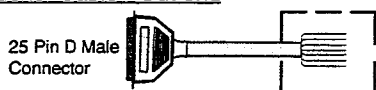
851 Indexer Cable - Extended
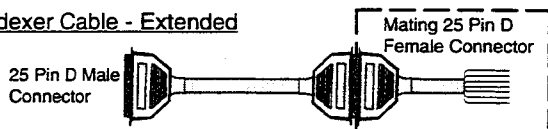
25 Pin D Male Connector

Mating 25 Pin D Female Connector

851 Indexer
Connector: Indexer(to drive)

Pin#	Label	Color Code
1	Step+	Red
14	Step-	Black
2	Dir+	Green
15	Dir-	White
16	Shutdown+	Blue
17	Shutdown-	Brown
9	Fault IN+	Yellow
21	Fault IN-	Orange

B7002 Drive
Connector: J32(on DPM)

Pin#	Label
1	Step+
2	Step-
3	Dir+
4	Dir-
Connector: J22	
4	Enable
9	Common
Connector: J23	
1	Fault Out
6	Common

An alternate wiring configuration for the B7002 to the 851 is to wire Fault 0, 1, & 2 (Pins 6, 7, & 8 on J22: B7002) to Fault+ (Pin 9: 851) and Common(pin 9 on J22: B7002) to Fault-(Pin 21: 851)

Appendix B: Configuring the 851 to an S5101 Drive

The 851 Indexer is set up to directly interface to the IDC S5101 Step Motor Drive used to control NS, RS, and TS Series Electric Cylinders. The following information provides the basic software setup and hardware wiring to interface the two units.

Software Setup

The listing below shows the System Parameter Settings for the 851 and the switch settings for the S5101 which are needed to ensure proper operation.

851: Parameters
MN:xxx (see chart below)
EM:0 (1 or 2 if encoder used)
FE:25000 (if encoder used)
MR:25000
SF:10

S5101 Settings(Set by Dipswitch)
Set Motor Resolution of 25000
SW2 - 1   OFF
SW2 - 2   OFF
SW2 - 3   OFF
SW2 - 4   OFF

Cylinder Model Numbers - MN:xxx
where xxx can be any of the 3 or 4 digit numbers below

NS and RS Series			TS Series		
102	105	108	101	104	106
152	155	158	151	154	156
202	205	208	201	204	206
—	255	258	1001	1004	1006
352	355	358	991	994	996
992	995	998			
—	1205	1208			

Hardware Wiring

The connections below show the basic interface wiring between the 851 and the S5101 Drive/Cylinder System. For ease of installation, the indexer cable shipped with the 851 is designed to plug directly into the mating indexer connector on the S5101.

851 Indexer Cable
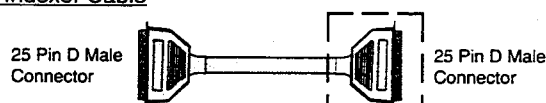
25 Pin D Male Connector

25 Pin D Male Connector

851 Indexer
Connector: Indexer(to drive)

Pin#	Label	Color Code
1	Step+	Red
14	Step-	Black
2	Dir+	Green
15	Dir-	White
16	Shutdown+	Blue
17	Shutdown-	Brown
9	Fault IN+	Yellow
21	Fault IN-	Orange

S5101 Drive
Connector: Indexer

Pin#	Label
1	Step+
14	Step-
2	Dir+
15	Dir-
16	Shutdown+
17	Shutdown-
9	Fault OUT+
21	Fault OUT-

851 Indexer
Connector: J2 Encoder

Encoder(mounted to Motor)
Connector: Encoder Cable

Pin#	Label	Color Code
30	Z+	Yellow
29	Z-	Orange
28	B+	Green
27	B-	Blue
26	A+	Red
25	A-	Pink
24	+5vdc	White
23	GND	Black

851 Indexer

Chapter 8 Appendices

Appendix C: Configuring the 852

Description: The 852 is an 851 Indexer which commands control of two axes of motion by paralleling the step and direction connections to two drives. An additional home input permits independent homing of each axis. This allows the unit to interface to the IDC two axis S5102 Drive, two IDC single axis S5101 or B7002 drives, or two user supplied drives.

It can be used in applications requiring identical, concurrent motion from two axes or when two axes are needed and motion is required of only one axis at a time.

Note: In order to move each axis independently, the 852 disables one amplifier at a time. Consequently care must be taken when specifying it in systems where a loss of holding torque may be a problem. This is especially true for linear systems used in vertical orientations with a backdriving load.

Drive Control - Programmable Outputs 1 & 2 (OUT1 & OUT2) should be connected to the shutdown or enable input on drive axes #1 and #2 respectively. The OT command sets the outputs 1 and 2 to energize and de-energize the drives. When Output 1 is high (on), axis 1 is activated. When Output 2 is high(on), axis two is activated. (The active state of the enable input may vary with different drives.)

Positioning - The 852 does not keep track of both axes, allowing independent open loop control to the second axis only. Move distances should be programmed incrementally (DI command) using the OT command to enable the axis you wish to move prior to executing the move. Axes can be commanded to move simultaneously when the program distances are identical and both drives are enabled.

Homing - A second home input allows repeatable, independent homing of a second axis. When Output 1 is ON(OT10nrr), the 852 uses the standard HOME input(Pin 19 on J3 Connector). When Output 1 is OFF (OT01nrr), IN1(Pin 13 on J3 Connector) becomes the home input.

EOT Limits - Both CW(+) end-of-travel limits should be wired in series, as should both CCW(-) limits.

Software Setup
The setup for IDC Drive Systems used with the 852 Indexer are identical those listed for the 851 on the previous page (Appendix A and B) except for the SF command which is set to SF:10 for all configurations.

Programming Example

Syntax	Description
AC.1	Accelerate in .1 sec
DE.1	Decelerate in .1 sec
VE6	Velocity at 6%
OT10nrr	Enable axis1
GH+10	Home axis 1 at 10% speed
OT01nrr	Enable axis 2
GH+10	Home axis 2 at 10 % speed
LP1000	Loop 1000 times
OT01nrr	Enable axis 2
DI-6	set CCW move of 6 distance units
GO	Execute move(axis 2)
OT10nrr	Enable axis 1
GO	Execute move(axis 1)
OT01nrr	Enable axis 2
DI+6	Set CW move of 6 distance units
GO	Execute move(axis 2)
OT10nrr	Enable axis 1
GO	Execute move(axis 1)
EL	End loop

Hardware Wiring
Wiring using the 852 indexer cable is shown below. Drive connections to each axis can be made directly to the mating connectors on the S5101 and S5102 Drives. The B7002 drive requires cable extensions and connections to each axis(as shown on previous page).

852 Indexer(to drives) Cable

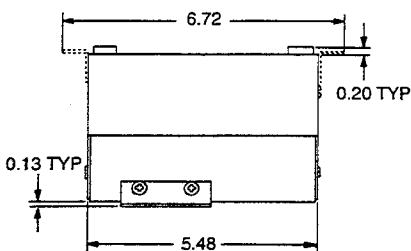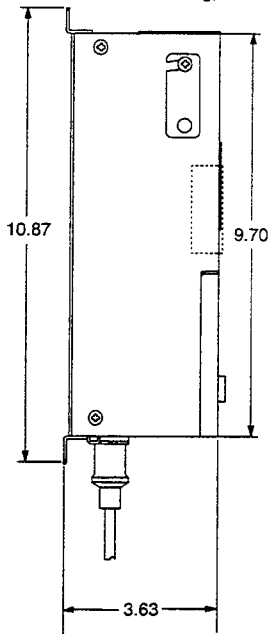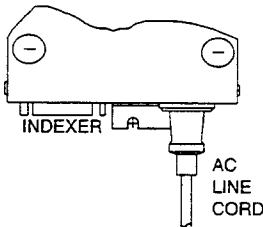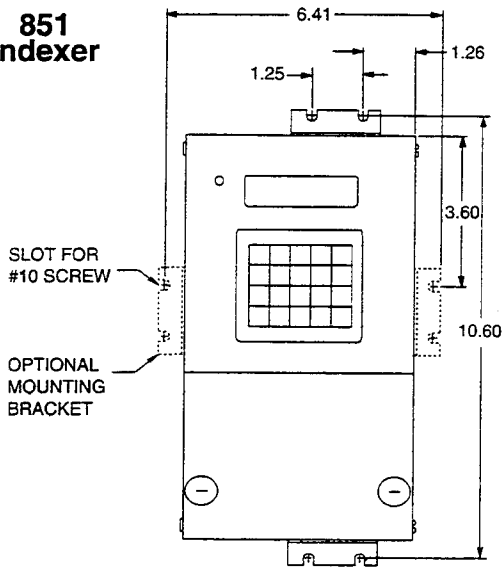Three 25 Pin D Male Connectors

852 Indexer Cable Pinout

Fault Input Wiring
To interface two fault signals(one from each drive) to one Fault Input on the 852, it is recommended to use the following wiring configurations;
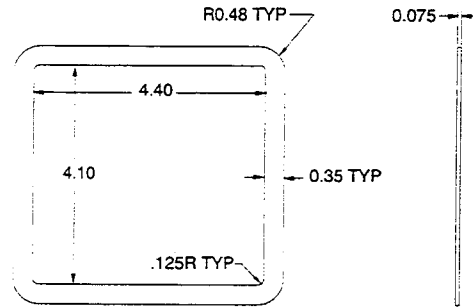
Chapter 8 Appendices
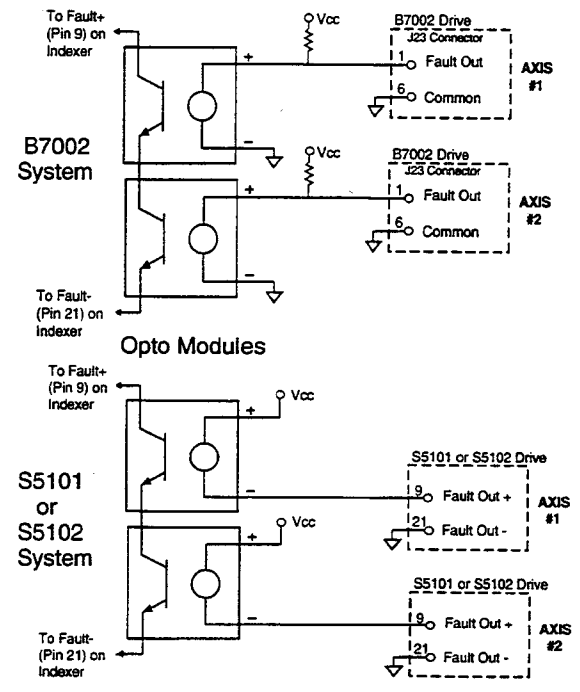
Appendix D: Dimensions and Mounting

851 Indexer

SLOT FOR #10 SCREW

OPTIONAL MOUNTING BRACKET

6.41
1.25
1.26
3.60
10.60

INDEXER

AC LINE CORD

10.87
9.70

3.63

6.72
0.20 TYP
0.13 TYP
5.48
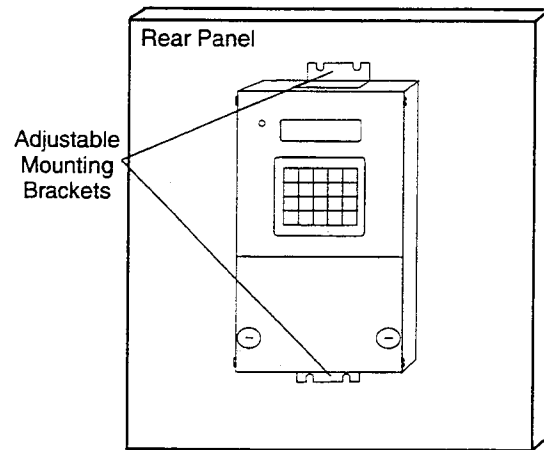
Gasket (for Front Panel Mount)
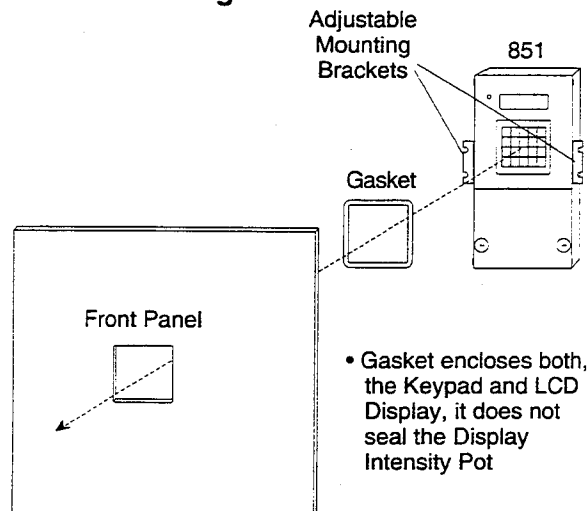

R0.48 TYP
0.075
4.40
4.10
0.35 TYP
.125R TYP

• Allows for flush face mounting 851 to Nema 12 standard
• Closed cell, low density, adhesive backed foam rubber

Mounting your 851 Indexer

Rear Mounting

Rear Panel

Adjustable Mounting Brackets

Front Mounting

Adjustable Mounting Brackets

851

Gasket

Front Panel

• Gasket encloses both, the Keypad and LCD Display, it does not seal the Display Intensity Pot

Chapter 8 Appendices

Appendix E: Troubleshooting Guide (Symptom - Cause - Remedy)

Symptom	Cause	Remedy
"Amplifier Fault" (Error Code on LCD Display)	1. Shutdown Input(pins 16 & 17) on Indexer Connector activated 2. Short detected in power supply	1. Check Motor/Drive for fault signal 2. Return to IDC for Repair
"EEPROM CheckSum Error" (Error Code on LCD Display)	1. Data in EEPROM Corrupted 2. An error or malfunction has been detected in the control EEPROM chip.	1. Reformat EEPROM Press keys in order (not simultaneously) [.] [>] [DEL] Reformat (All Programs ERASED/Parameters Reset) 2. Replace EEPROM
"Encoder Fault" (Error Code on LCD Display)	1. Encoder Signal is faulty 2. Defective Encoder	1. Check Encoder wiring to control 2. Replace Encoder
"Error Finding Home" (Error Code on LCD Display)	1. Homing Routine was NOT successfully completed where both "end of travel limits" were reached without detecting any Home Input.	1. Check for proper operation of Home Switch and verify signal connections to the Home Input.
"Hit a Limit" (Error Code on LCD Display)	1. A Normally Closed "End of Travel" Connection(EEOT or REOT) to Ground (GND) is broken (open circuit).	1. Check for End of Travel Switch Activation or check EEOT and REOT connections for a loose or broken wire.
"Motor Stalled" (Error Code on LCD Display)	STALL DETECTION: Occurs when the 851 is used in closed loop operation and the position following error (Set by the FE Command in System Parameters) exceeds its set value during a move. This condition can occur during the following; 1. Encoder Disconnected 2. Encoder or Motor MISWIRED 3. Accel/Decel Rates too high for given load 4. Velocity set too high for given load 5. Motor or Load is Binding	 1. Check Encoder Connections 2. Verify Encoder and Motor Wiring 3. Increase AC or DE Time Setting (this reduces the Rate) 4. Reduce VE setting 5. Check unloaded motor operation and mechanical mounting of load
Garbled Characters in LCD Display	1. Data in EEPROM Corrupted	1. Reformat EEPROM Press keys in order (not simultaneously) [.] [>] [DEL] Reformat (All Programs ERASED/Parameters Reset)
Blank Display	1. No AC power 2. Internal Power supply damaged	1. Check AC power connections 2. Return to IDC for repair
Continuous Creep Speed during Home Routine	1. Control cannot detect Z Marker Pulse of Encoder during Final Stage of Homing Routine	1. Replace Encoder

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Warranty and Service Coverage

Industrial Devices Corporation warrants all products to be free of defects in workmanship for a period of one year from the date of shipment to the end user. Products returned prepaid to the factory will be repaired or replaced at our option at no charge, and returned prepaid to the user.

Products that have expended their useful life in less than one year or have been improperly used or damaged, in the opinion of the company, are not subject to the terms of this warranty.

Technical Support

Industrial Devices offers technical support through its factory authorized and trained Distributors, and through its factory-based Applications Engineering and Inside Sales department.

If an application problem exists or if the product has failed, contact your Distributor or Industrial Devices for technical assistance. Contact our factory at 800-747-0064, outside the U.S. at 415-883-3535.

Repair Service

Product repairs are performed at our factory in Novato, California. Prior approval by Industrial Devices is required before returning a product for any reason. All return packages must be accompanied by an Industrial Devices supplied RMA(Return Material Authorization) number.

In Case of Failure

1. Get the Model and Serial number of the defective unit, and document the nature of the failure using the RMA Data Form to help us repair the unit..
2. Prepare a purchase order for the repair cost in case the unit is out of warranty.
3. Contact your IDC Distributor or Industrial Devices Corporation (at 1-800-747-0064) for a Return Material Authorization RMA#. —Provide information describing the nature of the failure.
4. Ship the unit prepaid, with the RMA number and documentation to:

> Industrial Devices Corporation
> 64 Digital Drive
> Novato, CA 94949
> Attn: RMA # _____

Note: All units are fully tested at the IDC factory, programs and parameter values may be erased. It is recommended to save a copy of all program and parameter values prior to shipping to IDC.

For More Information

If you require further information on the 851 or another Industrial Devices product, please call your local IDC Distributor or Industrial Devices.

Local IDC Distributor

Company: _____

Contact: _____

Phone #: _____

To get quick response to specific information when calling Industrial Devices, ask for the area of expertise that relates to your question:

Technical Support?
Ask for Applications Engineering

Product Information, Availability, or Repairs?
Ask for Inside Sales

IDEAL™ PROGRAMMING: QUICK REFERENCE CHART

RUN MODE COMMANDS

Keys	Command
[ESC]	Escape, Stop Motor
[EDIT]	Enter Edit Mode
[ENTR]	Enter Data/Initiate Command
[DEL]	Delete Program
[F1] [0]	Display Memory
[F1] [5]	Test Outputs
[F1] [6]	Run Program
[F1] [7]	Copy Program
[F1] [9]	Shutdown Motor
[F1] [EDIT]	Enter System Parameters
[F2] [EDIT]	Enter Learn Mode
[F1] [F2] [EDIT]	Enter PID Parameters
[F1] [F2] [1]	Zero Position
[F1] [F2] [3]	RS232 Test String
[F1] [F2] [8]	Restore Default Values
[F1] [F2] [9]	System Reset
[F1] [F2] [ENTR]	Software Revision
[F1] [F2] [EDIT]	Original Configuration
[ESC] & [→]	Jog Extend (+)
[ESC] & [←]	Jog Retract (-)

EDIT MODE COMMANDS

Keys		Command
[F2] [1]	AC	Acceleration
[F1] [1]	DA	Distance Absolute
[F1] [3]	DC	Distance to Change
[F2] [2]	DE	Deceleration
[F1] [2]	DI	Distance Incremental
[F2] [5]	EL	End Loop
[F2] [9]	EN	End Program
[F1] [0]	GH	Go Home
[F1] [9]	GO	Go, Execute Move
[F2] [3]	IF	If - Then
[F2] [5]	LP	Loop
[F2] [7]	MC	Move Continuous
[F1] [5]	OT	Output
[F1] [6]	RN	Run Program
[F2] [6]	ST	Stop on Input
[F1] [7]	TD	Time Delay
[F2] [0]	UV	User Variable
[F1] [4]	VE	Velocity
[F1] [8]	WT	Wait on Input
[F1][F2][1]	ZP	Zero Position

RS232 COMMANDS

DL	Download Program	TO	Tell Outputs
DR	Download Program to RAM	TP	Tell Parameters
ER	Erase Program	UL	Upload Program
K	Kill Program	ZP	Zero Position
OC	Original Configuration	ZZ	System Reset
RN	Run Program		
S	Stop Program (Decel)		
SR	Software Revision		
TD	Tell Distance		
TI	Tell Inputs		

SYSTEM PARAMETERS

MN	Model Number	MR	Motor Resolution
CS	Coordinate System	MU	Metric Units
DP	Display Mode	PU	Power Up Mode
EC	Echo(RS232)	RA	Ratio Variable A
EM	Encoder Mode	RB	Ratio Variable B
FE	Following Error	SD	Stop Decel Rate
HA	Home Algorithm	SI	System Inputs
HO	Home Offset	SO	System Outputs
JA	Jog Acceleration	XP	Ext Program Select
JV	Jog Velocity	UN	Unit Number

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