

Demonstrating the Sigma II Indexer JUSP-NS600

Yaskawa part # DEMO4602



## Table of Contents

1) <a href="#">How to Demonstrate</a> .....	
<a href="#">Getting Started</a>	
<a href="#">Program Table Selection and Execution</a>	
<a href="#">Jog Speed Table Selection and Execution</a>	
<a href="#">Homing Operation (incremental encoder only)</a>	
<a href="#">Serial Mode Demonstration</a>	
2) <a href="#">Functional Description of Indexer</a> .....	
3) <a href="#">Functional Description of Indexer Demo Case</a> .....	
4) Bill of Material for DEMO4602.....	
5) HMI Demo Program.....	
6) HMI Demo Program Flow Chart.....	
7) HMI Code Description.....	
8) HMI Wiring Diagram.....	

## How to Demonstrate

### **Getting Started:**

3. Download the DemoCase.spj file into the Indexer using IndexWorks software. This file may already be installed in the Indexer demo unit. The DemoCase.spj file is available on the Yaskawa ftp site, <ftp://ftp.yaskawa.com/public/development/Servo>.
  - a. To download the file into the Indexer, open the DemoCase.spj file while in IndexWorks or double-click on the DemoCase.spj file to launch IndexWorks.
  - b. Select Tools...Online. Make sure the YS-12 cable is connected to CN6.
  - c. Once online (indicated by a green LED at the bottom right corner of the IndexWorks window), select Tools...Download...Download All.
4. Set all input switches in the Indexer demo case to their starting positions as indicated by the arrows in the [drawing](#). (UP position – MAIN POWER, CONTROL POWER, P-OT and N-OT switches, and JOG FWD/JOG REV rotary switch; LEFT position - MODE switch; DOWN position - All remaining switches)

### **Program Table Selection and Execution:**

5. Turn the over travels OFF: The P-OT and N-OT input switches should be in the UP position in order to turn off the over travels.
6. Turn the Servo ON: Flip the /S-ON input switch to the UP position.
7. Set the Indexer to Program Table Mode (Mode 0): Flip the MODE input switch to the LEFT position.
8. Select a program step: Select the appropriate number on the PRGM NO. (00-31) thumbwheels.

<b>DemoCase.spj Program Summary</b>	
<b>Program Step</b>	<b>Summary</b>
<b>0</b>	Relative index with registration.
<b>1</b>	Relative index with fast registration.
<b>2-3</b>	2 looped and linked relative indexes each with registration.
<b>4-6</b>	3 linked absolute indexes demonstrating zone signal outputs.
<b>7-11</b>	4 linked jogs (infinite moves) each at a different speed and time of jog. Step 11 is the stop jog command.
<b>12-13</b>	Jog (infinite move) with registration. Step 13 is the stop jog command.
<b>14-19</b>	5 looped and linked relative indexes.
<b>20</b>	Relative index. Demonstrates output turning on when in-position. Step is linked to steps 47-48.
<b>21</b>	Relative index. Demonstrates output turning on during positioning. Step is linked to steps 49-50.
<b>22</b>	Relative index. Demonstrates outputs on during move only. Step is linked to step 48.
<b>23,24</b>	Absolute indexes with registration.
<b>25-30</b>	6 fast, looped and linked relative indexes. Step 30 is a relative index with registration.
<b>30</b>	Relative index with registration.
<b>31</b>	Start of several linked steps (31-46) demonstrating jogs (infinite moves), relative indexes, and turning on and off outputs.

9. Start the program: Flip the PRGM START-STOP input switch to the UP position to begin execution of the program. This switch must remain in the UP position until program operation is complete; otherwise it acts as a feed-hold. To stop the program at any time, flip the PRGM START-STOP input switch to the DOWN position. If program operation is stopped before it has completed, program operation is held. To resume program operation, flip the PRGM START-STOP input switch to the UP position. To cancel a program while in a feed hold, press the PRGM RESET input button. A new program step can be selected and executed only when original program operation has completed or canceled.
10. To start a registration move, toggle the registration, /RGRT, input switch during program execution. A registration speed and distance must be programmed for the specific

program step in execution. A second registration input will be ignored if switched during the same program step or while a registration move is already in progress.

### **Jog Speed Table Selection and Execution:**

11. Set the Indexer to Jog Speed / Homing Mode (Mode 1): Flip the MODE switch to the RIGHT position.
12. Select a jog speed: Select the appropriate number on the JOG SPD (0-15) thumbwheel.
13. Start jogging: Set the JOG direction rotary switch to JOG FWD or JOG REV. The jog speed can be changed on the fly.

### **Homing Operation (incremental encoder only):**

14. Set the Indexer to Jog Speed / Homing Mode (Mode 1): Flip the MODE switch to the RIGHT position.
15. Start homing operation: Flip the HOME switch to the UP position. This switch must remain in the UP position until homing is complete; otherwise it acts as a feed-hold. The Indexer is capable of three homing routines. The DemoCase.spj file sets the Indexer to home to a limit (/DEC) and then to a specified distance from the C-phase pulse.
16. Start homing deceleration: Flip the /DEC switch UP to decelerate the motor to a homing approach speed. Flip the /DEC switch DOWN to decelerate the motor to the homing creep speed and finally to a stop at the specified distance from the C-phase pulse.

### **Serial Mode Demonstration:**

17. Demonstrate the Serial Mode operation of the Indexer using IndexWorks (or HyperTerminal): while online in IndexWorks, select Module...Monitoring & Troubleshooting, and then select Tools...Terminal.

18. Enter the following index commands:

<axis address>SVON<enter>	servo ON
<axis address>SPD40000<enter>	speed reservation
<axis address>POS1500000<enter>	relative position reservation
<axis address>ST<enter>	positioning start

Note: position units are in [reference units]  
speed units are in [x1000 reference units/min]

Change acceleration and deceleration.

<axis address>ACC100<enter>	temporary acceleration reservation
<axis address>DEC150<enter>	temporary deceleration reservation
<axis address>ST<enter>	positioning start

Note: acceleration and deceleration units are in [x1000 reference units/min/ms]

19. Enter the following Program Table Execution commands:

<axis address>STARTxxx<enter>	program table start where xxx=0-127
<axis address>STOP<enter>	program table stop
<axis address>PGMRES<enter>	program table reset

20. Enter the following Monitor commands:

<axis address>MON1<enter>	current position monitor
<axis address>POUT<enter>	status of programmable outputs

21. Refer to chapter 6 of the Sigma II Indexer User's Manual for more information regarding serial commands.

## JUSP-NS600 Functional Description

The Sigma II Indexer Application Module (JUSP-NS600) expands the Sigma II servo system functionality to include powerful single-axis point-to-point positioning with registration. The Indexer interfaces to a PLC or PC-based controller via discrete I/O or serial RS-232/RS-422/RS-485 link (baud rate up to 38,400). The I/O interface includes hardware over travel and home limit switch inputs, and permits selection and execution of 32 motion and I/O commands (program steps). The 32 addressable commands are part of a memory table containing up to 128 commands. The commands in the table may be linked together for sequential execution, providing versatility desirable for many applications. The serial interface supports 16 Indexers per link. The Indexer interprets and executes motion commands received on its serial interface. The serial interface also allows selection and execution of all 128 commands stored in the memory table.

Each command (program step) set in the program table can index a specified relative or absolute position reference at a specified speed, reserve a registration distance and speed, enable or disable any of five programmable outputs, repeat itself a set number of times, and call another command upon completion. Several different conditions including timers, in-positions, and inputs may be used to start another command. The five programmable outputs can also be used as zone signals. Up to 32 zones can be defined to enable or disable the outputs based on position. These outputs can be used to trigger external events based on position.

A jog table allows for the selection and execution of up to 16 pre-set speeds. Jog speeds can be changed on the fly.

There are three homing routines available to the Indexer: home to a limit switch and then to a specified distance from the C-phase pulse, home to a specified distance from the limit switch, and home to a specified distance from the C-phase pulse.

The Indexer demo case can be used to demonstrate all of these functions described above.

## Demo Case Functional Description

Refer to the demo case [drawing](#) on page 10.

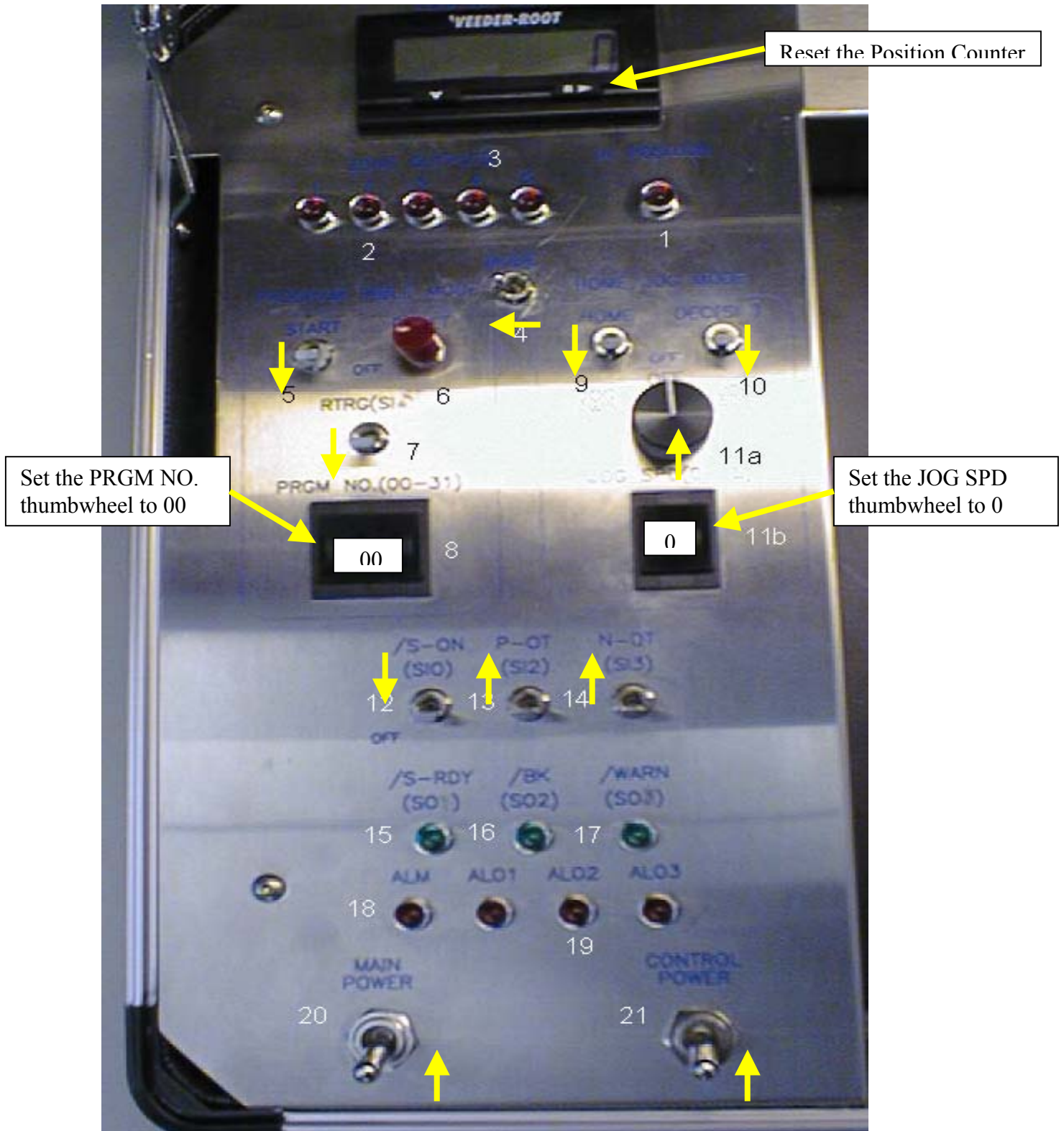
Note the input and output signal names are provided in the parentheses.

1. In-Position Output LED (/INPOSITION).
2. Five Programmable Output or Zone Signal LEDs (/POUT0~/POUT4).
3. Position Counter (set to 100 pulses per revolution, PG Divider Pn201=100).
4. Mode Select Input Switch (/MODE 0/1). Switch between Program Table Mode 0 and Jog Table/Homing Mode 1.
5. Program Step Start-Stop Input Switch (/START-STOP). Program start – Input switch is in the up position. Program stop – input switch is in the down position. If a program is stopped before it has completed, flip the start switch and the program will resume. To cancel this program feed hold, press the Program Reset Input button and either choose a new program or run the same one over. Flip the switch to the Start position and the program will start from the beginning.
6. Program Reset Input Button (/PGMRES), Press to cancel the program after it has been stopped.
7. Registration Input Switch (/RGRT). Switch to start registration.
8. Program Step Selection Thumbwheels (/SEL0~/SEL4)
9. Home Start Input Switch (/HOME)
10. Home Limit Input Switch (/DEC)
11. a. Jog Direction and Start Input Rotary Switch (/JOGP and /JOGN)  
b. Jog Speed Table Selection Thumbwheel (/JOG0~/JOG3)
12. Servo ON Input Switch (/S-ON)



13. Positive Over-Travel Input Switch (P-OT)
14. Negative Over-Travel Input Switch (N-OT)
15. Servo-Ready Output LED (/S-RDY). Output ON when main and control power are on and when no alarms are present.
16. Brake Output LED (/BK). Used for control of holding brake.
17. Warning and Error Output LED (/WARN). Warning for overload, regenerative overload, and low absolute encoder battery. Errors for command and program execution errors.  
  
/WARN output ON for 2 seconds only when Error occurs, otherwise output ON continuously during a Warning status.
18. Alarm Output LED (ALM)
19. Alarm Code Output LEDs (ALO1~ALO3)
20. Main Power Switch
21. Control Power Switch

The following is a picture of the Indexer demo case control panel. The arrows indicate the recommended starting positions.



## Bill of Material for 4602 Demo Unit

<u>Part</u>	<u>Manufacturer/Part Number</u>	<u>Quantity</u>
1. 7101 tzqe switch SPDT BIG STYLE	C&K 7101TZQE	2
2. C&K Thumbwheel	C&K S2F-021-C-0-2	2
3. C&K Thumbwheel Switch	C&K S2F-057-C-0-1	1
4. Rotary Switch 6 position 2-pole switch	GRAYHILL 51CD30-01-2-AJN	1
5. Digital Readout Meter	VEEDERROOT A103-002	1
6. Spdt Switch On-none-On flatted toggle	C&K 7101P3YZQE	7
7. 3DPT Switch On-none-On flatted toggle	C&K 7301P3YZQE	1
8. Spdt Switch On-Pushbutton switch	C&K 8168SHZGE2	1
9. LED 6V green indicator 7mm mounting hole	DIALIGHT 607-2212-120	3
10. Red Pushbutton cap	AUGAT/ALCO C-22	1
11. LED 6V red indicator 7mm mounting hole	DIALIGHT 607-2112-120	10
12. Power cord 7'6" unshielded pvc jacket	BELDEN 17250 BLACK	1
13. 3 Position Connector	AMP 09503031	1
14. 6 Position Housing	AMP 09503061	1
15. 6 position free hanging female housing	AMP 1-480270-0	1

<u>Part</u>	<u>Manufacturer/Part Number</u>	<u>Amount Used</u>
16. 6 position free hanging male housing	AMP 1-480340-0	1
17. 24V Relay single pull	OMRON G2R-1-S-DC24	1
18. Aluminum briefcase with twill lining	Manufacturing Solution 402AT	1
19. 470 Ohm ¼W Resistor		5
20. SGMAH Sigma II Servo motor	Yaskawa SGMAH-01B1F41	1
21. SGDH Sigma II Servo Pack	Yaskawa SGDH-01BE	1
22. Sigma II metal work set		1
23. Shield Spinner	SGDA Demo	1
24. Power entry module fused W/switch	CORCOM 6VM1S	1
25. 7201 tzqe switch SPDT BIG STYLE	C&K 7101TZQE	1
26. 1K ¼ Watt Resistor		4
27. 2 position free hanging male housing	AMP 1-480319-0	1
28. 2 position free hanging female housing	AMP 1-480318-0	1
28. Black knob	AUGAT/ALCO KLN-700B ¼	1
29. Power supply, universal output	CONDOR GSC25D	1
30. Switch bushing	AUGAT/ALCO KR-1	1
31. Motorola semiconductor 4-bit binary adder	MOTOROLA MC14008BCP	1

<u>Part</u>	<u>Manufacturer/Part Number</u>	<u>Amount Used</u>
32. Dual general purpose IC PC board	RADIO SHACK 276-159B	2
33. Pin Reel 7000 Strip .125-.156 Loose Pins	AMP 08500115  08-05-0116	5
34. 2 Amp Fuse 250V max.	313002	1

## HMI Demo Program

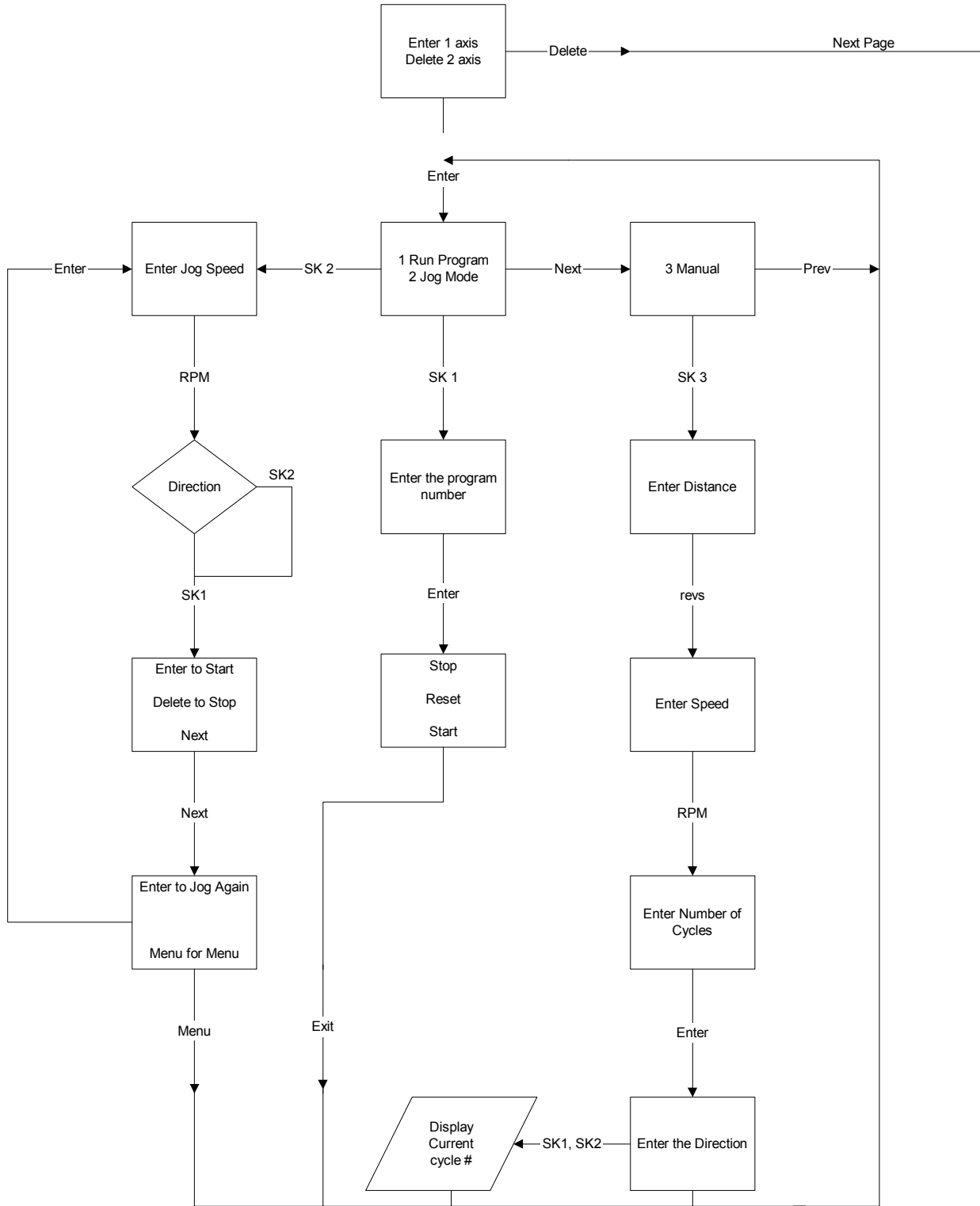
The following is an example of how an HMI unit can be used to help demonstrate the Sigma II Indexer. The HMI used in this example was a Red Lion Paradigm CL-05. Some features required are:

1. Serial communication capability, either RS232, RS422, or RS485
2. Programming software
3. Wiring compatibility with the indexer and a PC

\*\*This HMI unit is not included with the DEMO4602

This example shows both single and two-axis control. The wiring shown is for RS422. Further information about wiring the indexer is available in the manual. The original IndexWorks project file can be modified to demonstrate two-axis control.

## HMI Demo Program Flowchart



## Code description for NS600 HMI program

This document is to give the steps taken in programming the HMI interface used with this demo. The HMI used is a Red Lion Controls Paradigm CL-05. The software used to program it was Edict 97, which supports code similar to that of C++ and Java. This document will go into detail about two of the programs written for the HMI, the Manual option and the Time delay Jog option.

Edict 97 is an event driven software package. Most display changes are due to a certain key being pressed. These are done in the page tables of the software. Variables can be placed on these pages for reading or writing purposes. Upon pressing a key a program can also be run. This is how all of the programs written here are run.

The Manual program is for a single axis and goes as follows:

1. Turn servo on through serial commands (svon)
2. Reserve the speed (spdxxxxxxx)
3. Reserve the distance (posxxxxxxx)
4. Save the entered number of repetitions
5. Set a counter equal to zero
6. First while loop begins only exiting when the counter and the number of reps are equal
7. Increment the counter
8. Start the servo (st)
9. Enter the second while loop exiting when the servo is in position
10. Continuously poll the servo for the in position bit (sts)
11. Run another program which masks off the byte containing the in position data
12. Set a flag which exits the while loop



13. Exit second loop
14. Exit first loop
15. Turn servo off (svoff)

The Time delay Jog option uses the same looping as the manual program, but it uses two different programs, Jogstart and Jogstop. A variable can be incremented every second in the Global Events menu. This is designed for 2-axis control.

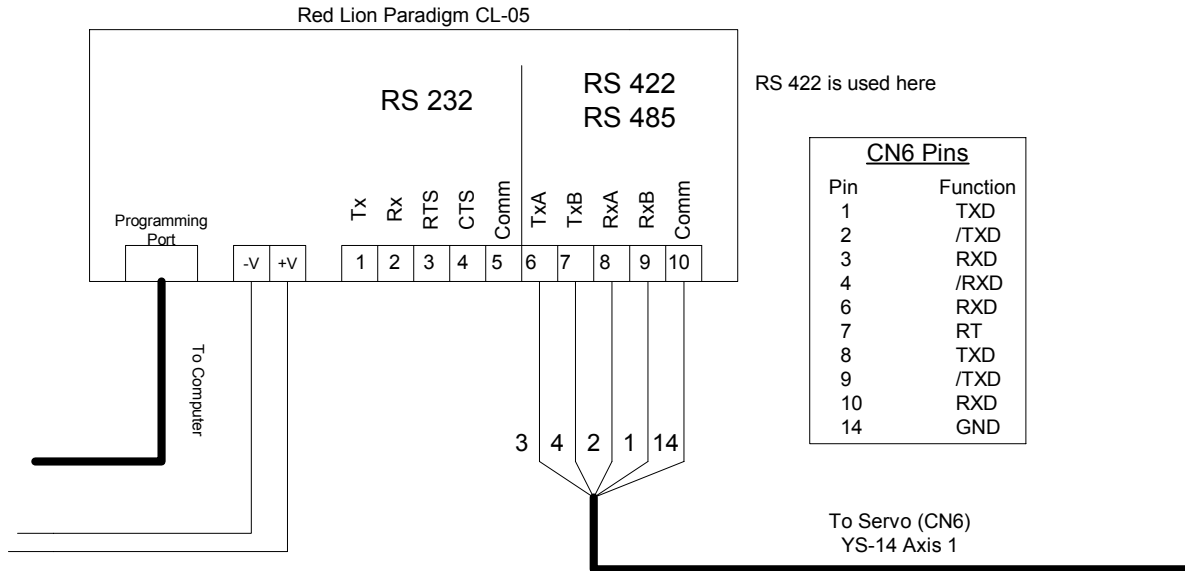
Jogstart:

1. Turn axis 1 on (svon)
2. Start jogging axis 1 in the chosen direction (jogp or jogn)
3. Set a variable equal to the current time plus the delay
4. Enter a while loop exiting when the current time equals the above variable
5. Turn axis 2 on (svon)
6. Start jogging axis 2 in the chosen direction (jogp or jogn)
7. Exit the loop

Jogstop:

1. Turn axis 1 off (svoff)
2. Set a variable equal to the current time plus the delay
3. Enter a while loop exiting when the current time equals the above variable
4. Turn axis 2 off (svoff)

## HMI Wiring Diagram



For 2 axis wire same as above  
with these additions

