
CHAPTER 5: POSITION SYNCHRONIZED OUTPUT OPTION (PSO)

The PSO option is a programmable, DSP based, Position Synchronized Output control card that precisely coordinates the functioning of a peripheral device with the motion initiated by the Unidex 21 Controller.

The PSO provides both digital and analog outputs. Variable output spacing, multiple pulse firing, pulse width, analog range, ramping functions, safe zone, and power level adjustment are all coordinated by transducer feedback.

SECTION 5-1: HARDWARE CONFIGURATION

5-1-1 JUMPERS AND SWITCHES

The PSO Card contains several jumpers and one eight position DIP Switch that must be appropriately configured prior to operation. (See Figure 5-1 for relative locations of the Switch and Jumpers.)

The PSO Card DIP Switch provides the VME Bus address and should be configured as follows:

SWITCH	POSITION	CONDITION
1	0	OFF
2	1	ON
3	0	OFF
4	1	ON
5	1	ON
6	0	OFF
7	1	ON
8	1	ON

The following is a list of the Jumpers on the PSO Card and an explanation as to their function:

- | | | |
|------------|-----|---|
| JP1 | 1-2 | High Speed Interrupt using a HCPL2601 Opto Coupler in the M9 location. |
| | 2-3 | High Speed Interrupt using a HP6N136 Opto Coupler in the M9 location. (Default) |
| JP2 | 1-2 | Opto Isolated User Input using a HCPL2601 Opto Coupler in the M10 location. |
| | 2-3 | Opto Isolated User Input using a HP6N136 Opto Coupler in the M10 location. (Default) |
| JP3 | 1-2 | Opto Isolated User Input using a HCPL2601 Opto Coupler in the M11 location. |
| | 2-3 | Opto Isolated User Input using a HP6N136 Opto Coupler in the M11 location. (Default) |
| JP4 | 1-2 | Opto Isolated User Input using a HCPL2601 Opto Coupler in the M12 location. |
| | 2-3 | Opto Isolated User Input using a HP6N136 Opto Coupler in the M12 location. (Default) |
| JP5 | 1-2 | Opto Isolated User Input using a HCPL2601 Opto Coupler in the M13 location. |
| | 2-3 | Opto Isolated User Input using a HP6N136 Opto Coupler in the M13 location. (Default) |
| JP6 | 1-2 | Opto Isolated Output using either a 4N33 or HP6N136 Opto Coupler in the M14 location. (Default) |
| | 2-3 | Opto Isolated Output using a HCPL2601 Opto Coupler in the M14 location. |

JP7	1-2	Opto Isolated Output using either a 4N33 or HP6N136 Opto Coupler in the M15 location. (Default)
	2-3	Opto Isolated Output using a HCPL2601 Opto Coupler in the M15 location.
JP8	1-2	Opto Isolated Output using either a 4N33 or HP6N136 Opto Coupler in the M16 location. (Default)
	2-3	Opto Isolated Output using a HCPL2601 Opto Coupler in the M16 location.
JP9	1-2	Opto Isolated Output using either a 4N33 or HP6N136 Opto Coupler in the M17 location. (Default)
	2-3	Opto Isolated Output using a HCPL2601 Opto Coupler in the M17 location.
JP10		Factory use only.
JP11		Factory use only.
JP12		Factory use only.
JP16	1-2	Internal or external Battery Back-Up.
	2-3	No Battery Back-Up. (Default)
JP17	1-2	Internal or external Battery Back-Up.
	2-3	No Battery Back-Up. (Default)
JP18	1-2	External Battery Back-Up.
	2-3	No Battery Back-Up. (Default)

JP19	1-2	External Battery Back-Up.
	2-3	No Battery Back-Up. (Default)
JP20	1-2	Internal or external Battery Back-Up.
	2-3	No Battery Back-Up. (Default)
JP21	1-2	Internal or external Battery Back-Up.
	2-3	No Battery Back-Up. (Default)
JP22		Factory Set
JP23		Factory Set
JP24		Factory Set
JP25		Factory Set
JP26		Factory Set
JP27	1-2	Active Low Polarity for either Opto or TTL Main Output. (Default)
	2-3	Active High Polarity for either Opto or TTL Main Output.
JP28	1-2	Active Low Polarity for either Opto or TTL AUX2 Output. (Default)
	2-3	Active High Polarity for either Opto or TTL AUX2 Output.
JP29	1-2	Active Low Polarity for either Opto or TTL AUX3 Output. (Default)
	2-3	Active High Polarity for either Opto or TTL AUX3 Output.

- JP30** 1-2 Active Low Polarity for either Opto or TTL AUX4 Output. (Default)
2-3 Active High Polarity for either Opto or TTL AUX4 Output.
- JP31** 1-2 Provides TTL Output for the AUX4 signal.
2-3 Provides Opto Output for the AUX4 signal. (Default)
- JP32** 1-2 Provides TTL Output for the AUX3 signal.
2-3 Provides Opto Output for the AUX3 signal. (Default)
- JP33** 1-2 Provides TTL Output for the AUX2 signal.
2-3 Provides Opto Output for the AUX2 signal. (Default)
- JP34** 1-2 Provides TTL Output for the MAIN signal.
2-3 Provides Opto Output for the MAIN signal. (Default)

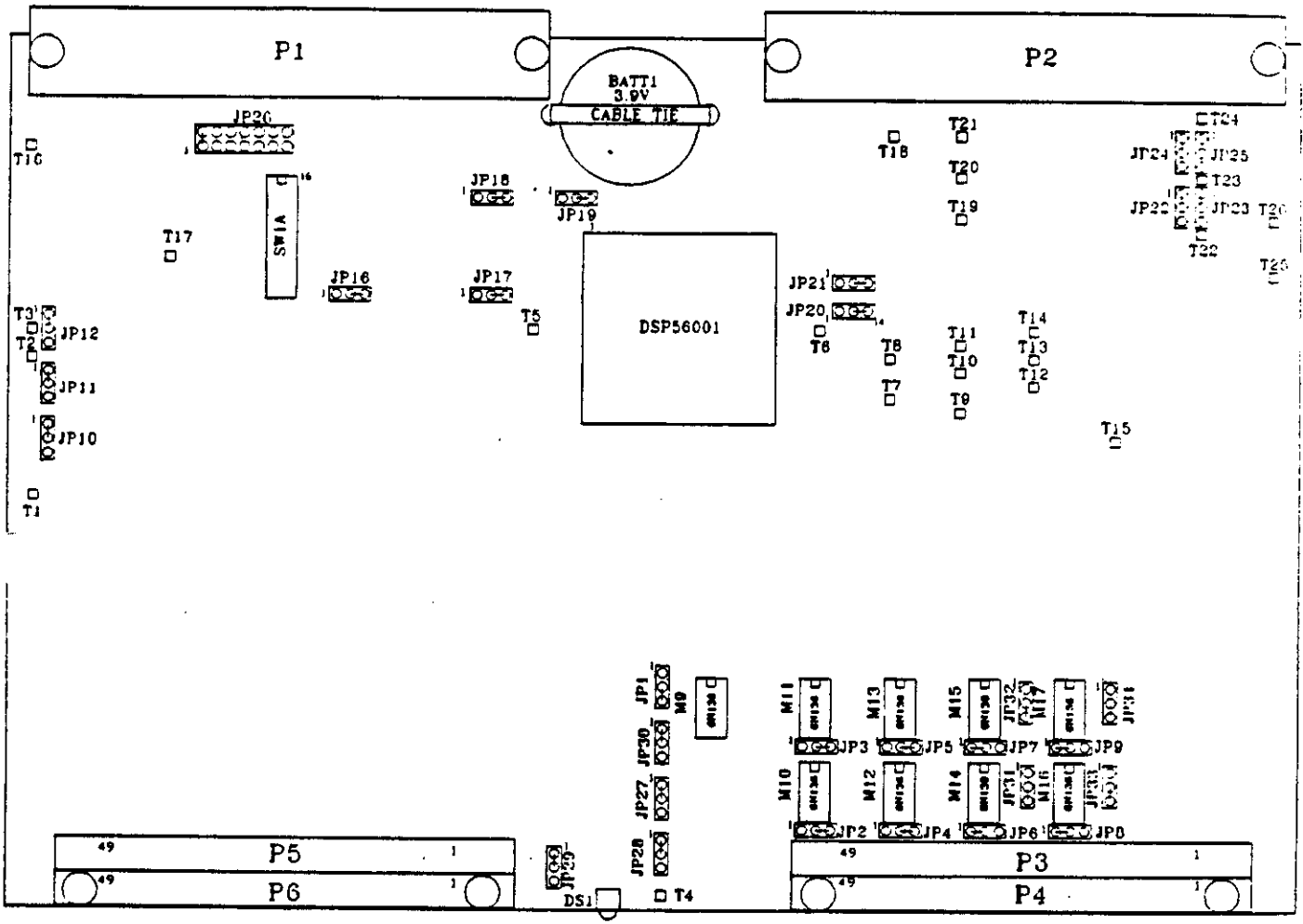


Figure 5-1: PSO Card - Jumpers and Switches

5-1-2 PSO INTERFACE

The PSO Card is interfaced at Connectors P51 and P52 on the Rear Panel of the Uni-
dex 21 Controller. Details of the connectors are shown in Figures 5-2 and 5-3. Electrical
characteristics of the connectors are illustrated in Figure 5-4.

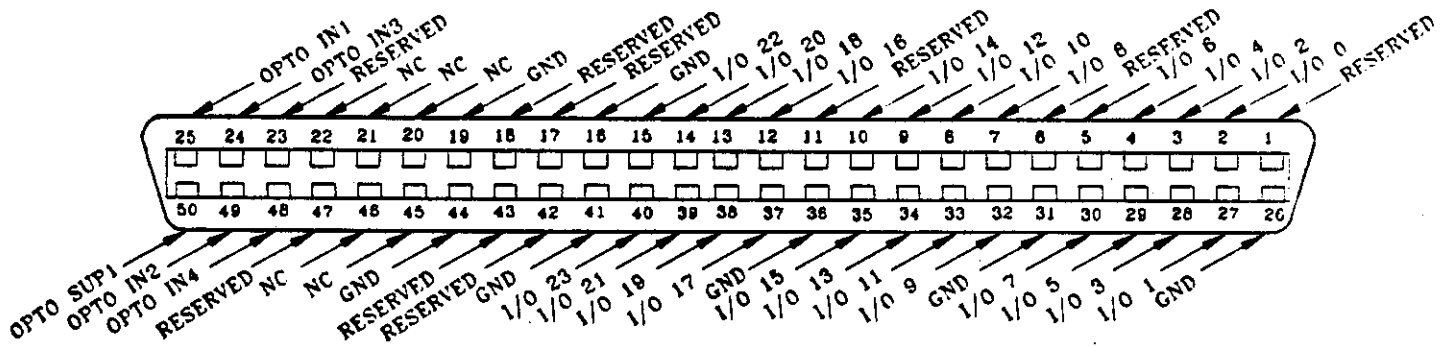


Figure 5-2: PSO Connector J51



PIN	DESCRIPTION
18	Reserved
19	Common
20,21,22	Not Connected
23	Positive Opto Input
24	Opto Input 3
25	Opto Input 1
26	Common
27	I/O Bit 1 (TTL)
28	I/O Bit 3 (TTL)
29	I/O Bit 5 (TTL)
30	I/O Bit 7 (TTL)
31	Common
32	I/O Bit 9 (TTL)
33	I/O Bit 11 (TTL)
34	I/O Bit 13 (TTL)
35	I/O Bit 15 (TTL)
36	Common
37	I/O Bit 17 (TTL)

5-1-2-1 J51 - CONNECTOR

PIN	DESCRIPTION
1	Reserved
2	I/O Bit 0 (TTL)
3	I/O Bit 2 (TTL)
4	I/O Bit 4 (TTL)
5	I/O Bit 6 (TTL)
6	Reserved
7	I/O Bit 8 (TTL)
8	I/O Bit 11 (TTL)
9	I/O Bit 12 (TTL)
10	I/O Bit 14 (TTL)
11	Reserved
12	I/O Bit 16 (TTL)
13	I/O Bit 18 (TTL)
14	I/O Bit 20 (TTL)
15	I/O Bit 22 (TTL)
16	Common
17	Reserved

PIN	DESCRIPTION
38	I/O Bit 19 (TTL)
39	I/O Bit 21 (TTL)
40	I/O Bit 23 (TTL)
41	Common
42,43	Reserved
44	Common
45,46	Not Connected
47	Reserved
48	Opto Input 4
49	Opto Input 2
50	User supplied Input Opto Voltage

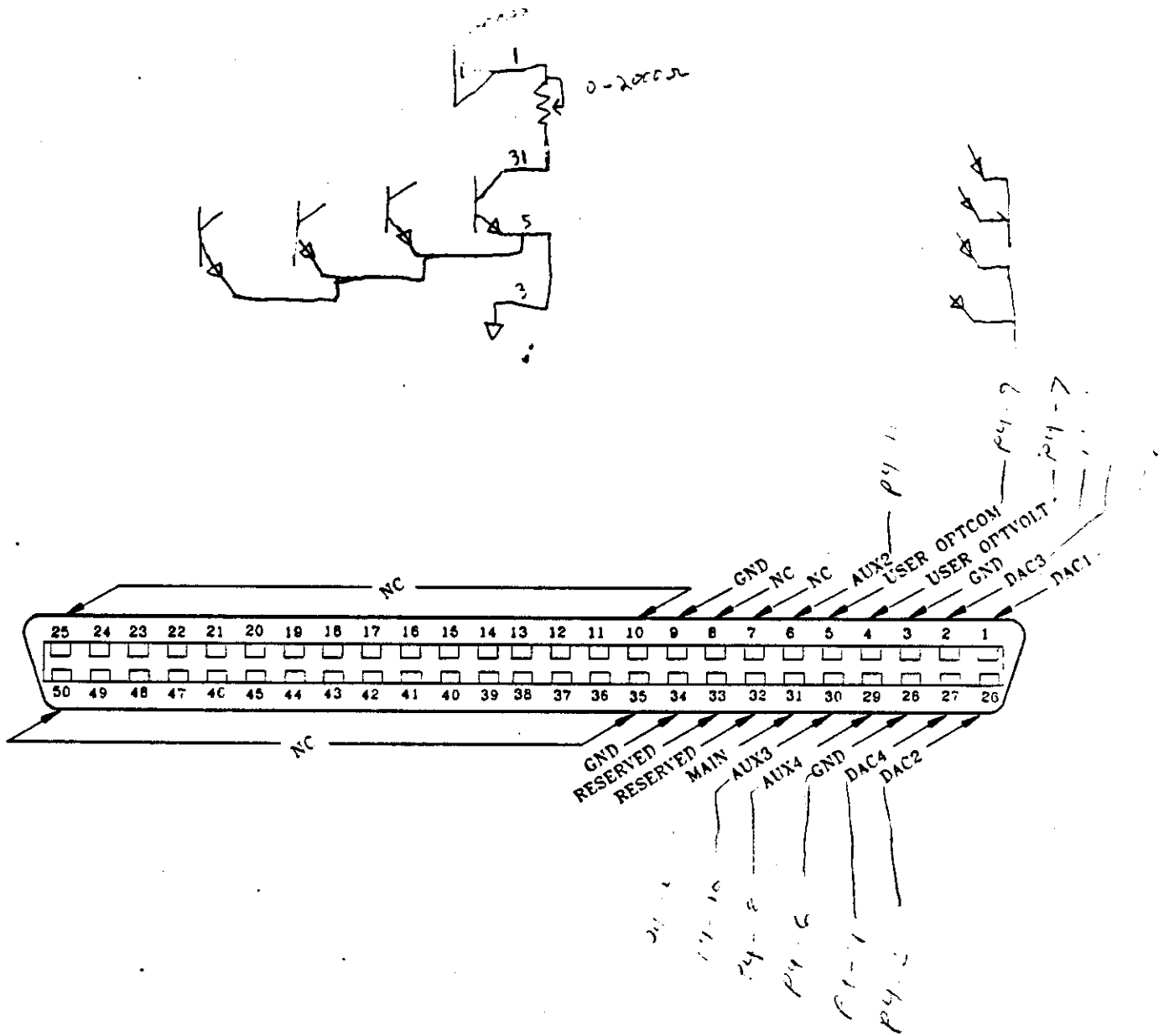


Figure 5-3: PSO Connector J52

PIN	DESCRIPTION
1	Digital to Analog Converter Output - 1 (+/- 10V @ 100 mA)
2	Digital to Analog Converter Output - 3 (+/- 10V @ 100 mA)
3	Common
4	User supplied Output Opto Voltage, +5V (Required with 6N or HCP only)
5	User supplied Output Opto Voltage Common
6	AUX2 Output
7,8	Not Connected
9	Common
10 thru 25	Not Connected
26	Digital to Analog Converter Output - 2 (+/- 10V @ 100 mA)
27	Digital to Analog Converter Output - 4 (+/- 10V @ 100 mA)
28	Common
29	AUX4 Output
30	AUX3 Output

PIN	DESCRIPTION
31	MAIN Output
32	Reserved
33	Reserved
34	Common
35 thru 50	Not Connected

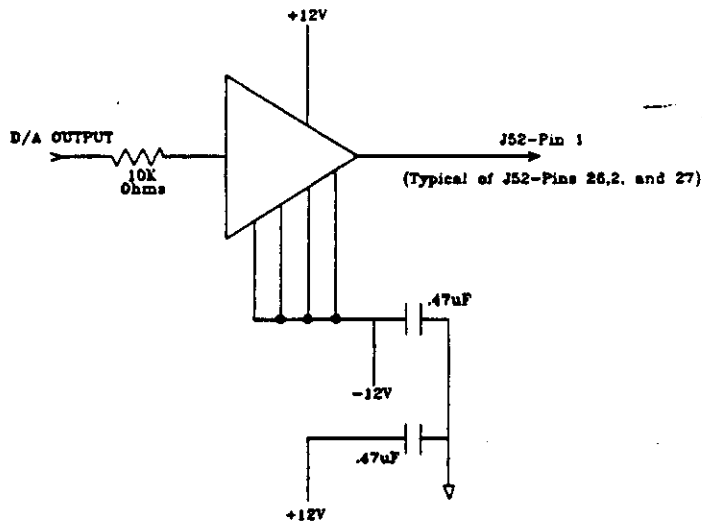
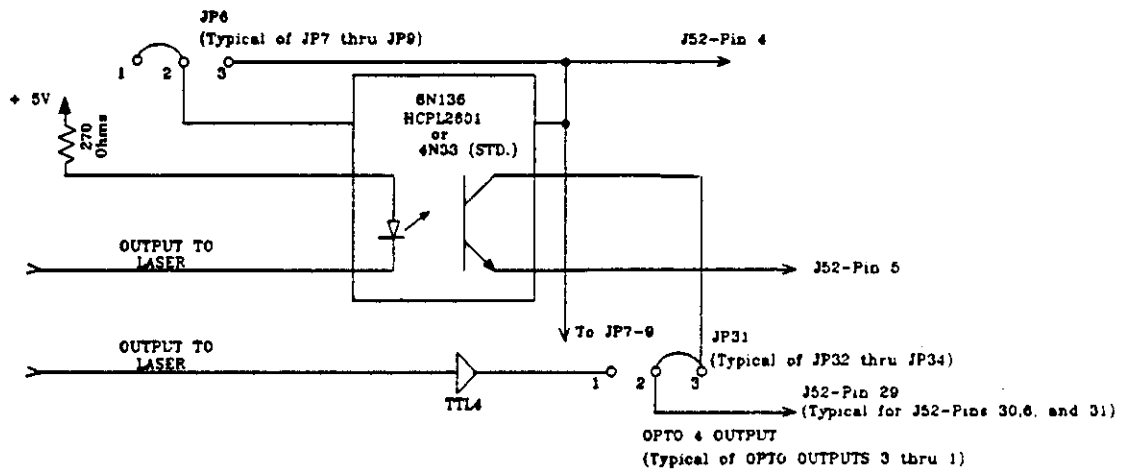
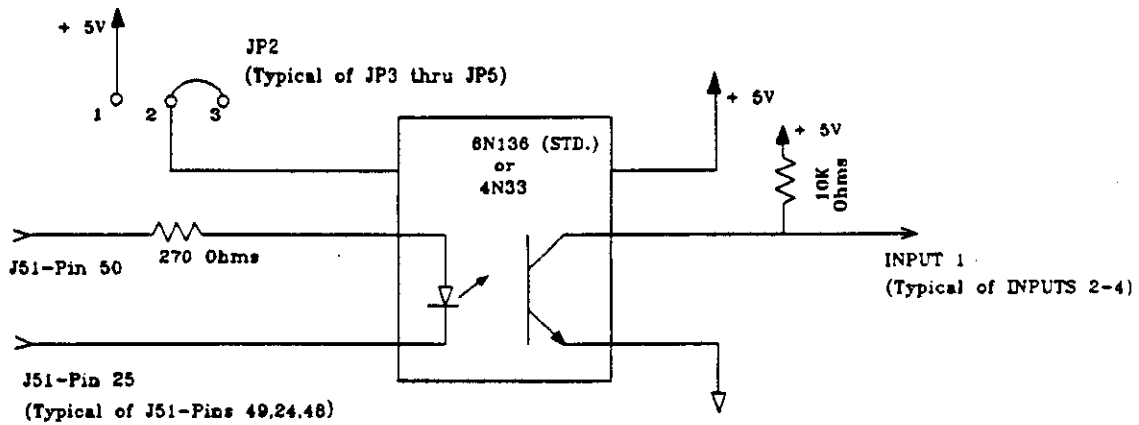


Figure 5-4: Electrical Characteristics of the PSO Interface Connectors (J51 and J52)

SECTION 5-2: USING THE PSO BOARD

The Position Synchronized Output Board provides a variety of Outputs that may be used to synchronize control with motion, it is most commonly used for the control Laser firing. With the use of a variety of commands the PSO Board may be instructed to activate up to four firing outputs with analog level controls and various types of single-shot or pulse train outputs.

The Position Synchronized Output Board is activated through either a parts program or from the MDI Mode. The following sections provide the commands related to PSO function:

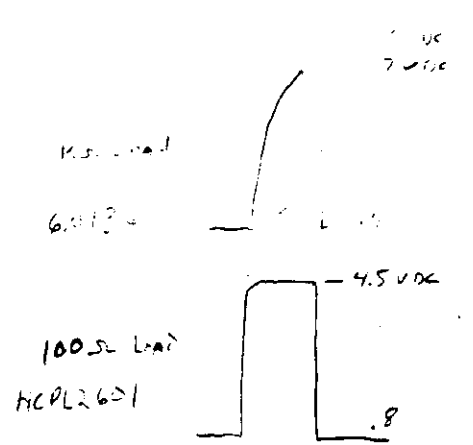
```

M14 G00 INPUT 1
M15 G00 INPUT 2
M16 G00 INPUT 3
M17 G00 INPUT 4
G00 G1-2
HCP2601 2-3

-----

M14 G00 AUX 1
M15 G00 AUX 3.
M16 G00 AUX 2
M17 G00 NO OUTPUT
G00 G1-2
HCP2601 2-3
    
```

500V 500
 300V 500
 400V 500
 60136 8MA 15VDC 50 625u
 HCP2601 5VDC 50 200u



50 Pin Channel Amplifier #57-30500 ECK 5/12 #2800

PSOC

EXAMPLES (CON'T):

For the same example, the Output Bits will be:

Bits 4, 5, 10 and 11 are driven high.

Bits 6 through 9 are driven low.

Bits 0 through 3 and 12 through 15 are not changed.

NOTE: This example assumes that a (PSOC,4,1,2) command has been previously issued.

(PSOC,4,i,o) ; Configuration of the 24 Bit I/O Bus to determine the number of Input and Output lines assigned. (Inputs are justified to the Least Significant Bit.) Following are the available configurations of the I/O Bus:

If

i = 0, and o = 3 Bits 0-23 are configured as Outputs

i = 1, and o = 2 Bits 0-7 are configured as Inputs, Bits 8-23 are configured as Outputs

i = 2, and o = 1 Bits 0-15 are configured as Inputs, Bits 16-23 are configured as Outputs

i = 3, and o = 0 Bits 0-23 are configured as Inputs

For instance (PSOC,3,xx1x0101,xxxx11000011xxxx) would be (PSOC,4,1,2).

NOTE: The sum of the value of "i" and "o" must be equal to 3.

NOTES:

The PSOC commands are modal.

RELATED COMMANDS:

(PSOF,3) (PSOF,4) (PSOF,5)

PSOC**NAME:**

Position Synchronized Conditional Output

FUNCTION:

Tracking is enabled, based on the Input Bit or Word.

FORMAT:

(PSOC,condition)

EXAMPLE:

(PSOC,0) ; Input signal conditions are ignored (Default).

(PSOC,1,i,n) ; Position Tracking is enabled only when an Input "i" (0 through 23) is "High" (n does not equal zero) or "Low" (n equals zero). (Refer to the (PSOC,4) command.) When the Position Counter is disabled, Counter data is retained.

(PSOC,2,i,n) ; Position Tracking is enabled only when an Input "i" (0 through 23) is "High" (n does not equal zero) or "Low" (n equals zero). (Refer to the (PSOC,4) command.) When the Position Counter is disabled, Counter data is reset to zero.

PSOC,3,xx1x0101,xxxx11000011xxxx) ; Position Tracking enabled only when Input Bits 0-7 are configured as shown (0 = Low, 1 = High, x = Not Checked).

For the above example Tracking is enabled when:

Bits 0, 2, and 5 are High.

Bits 1 and 3 are Low.

Bits 4, 6, and 7 are not checked.

If the Input Bits are not configured as indicated above for this example, Tracking is disabled and the Output Bits will be configured as established.

PSOD

NAME:

Position Synchronized Output Distance

FUNCTION:

Establishes the number of machine steps traveled before synchronized output occurs. This command is used in conjunction with the (PSOF,3,..) command only.

FORMAT:

(PSOD,case,distance)

EXAMPLE:

(PSOD,0,n) ; The Pulse Output will occur at a fixed incremental distance "n".

(PSOD,1,ary <n> , + m) ; The Pulse Output will occur at incremental distances as defined in "ary <n>" (array name) starting at array set number "n" and continuing "+/- m" number of array sets.

(PSOD,2,ary <n> , + m) ; The Pulse Output will occur at absolute distances as defined in "ar1" (array name) starting at array set number "n" and continuing "+/- m" number of array sets.

RELATED COMMANDS:

(PSOF,3)

PSOF

NAME:

Position Synchronized Output Firing

FUNCTION:

Activates or Deactivates the Pulse Train Output and Tracking.

FORMAT:

(PSOF,case,condition)

EXAMPLE:

- (PSOF,0) ; Output Firing Pulse Train and Tracking Disabled. (Default)
May also be used to abort a previously activated Pulse Train.
- (PSOF,1) ; Activates the Output Firing Pulse Train as established by the
(PSOP) Command. The Pulse Train will continue until disabled
by the (PSOF,0) command. No position Tracking.
- (PSOF,2,n) ; Activates the Output Firing Pulse Train (established by the
(PSOP) command) "n" number of times. If n = zero the Output
Firing Pulse Train will not be activated until the Previous Output
Firing Pulse Train is complete. No position Tracking.
- (PSOF,3,X,Y) ; The Output Firing Pulse Train (established by the (PSOP)
command) is activated. Position Counters will "lock on" the
motion of the X and Y Axes (See NOTES). Output firing will
occur at distances as established by the (PSOD) command. A
maximum of three (3) axes may be "locked on" simultaneously.
- (PSOF,4,n,X,Y,Z) ; Activates the Output Firing Pulse Train and locks the Position
Counters onto Axes X, Y, and Z (See NOTES). A maximum of
three (3) axes may be "locked on" simultaneously. The Firing
Pattern is determined by "Bit Mapping" as established by the
(PSOM) command.
If Bit = 1, the Output will go/remain high.
If Bit = 0, the Output will go/remain low.

PSOF

EXAMPLES (CONT)

The Pulse Output will occur at a fixed incremental distance "n". If "n" is positive, the Bit Pattern will be run in a forward direction. If "n" is negative, the Bit Pattern will be run in reverse.

(PSOF,5,n,X) ; Activates the Output Firing Pulse Train and locks the Position Counter on the X Axis (See NOTES). A maximum of three (3) axes may be "locked on" simultaneously. The Firing Pattern is determined by "Bit Mapping", established by the (PSOM) command.

If Bit = 1, the Output will be 1 Pulse Train.

If Bit = 0, there will be no Output.

The Pulse Output will occur at a fixed incremental distance "n". If "n" is positive, the Bit Pattern will be run in a forward direction. If "n" is negative, the Bit Pattern will be run in reverse.

NOTES:

The Position Counters translate the value of the Firing Distance "n", as follows:

For a single axis: $n = \text{Counter 1}$

For two axes: $n = \sqrt{\text{Counter1}^2 + \text{Counter2}^2}$

For three axes: $n = \sqrt{\text{Counter1}^2 + \text{Counter2}^2 + \text{Counter3}^2}$

RELATED COMMANDS:

(PSOC), (PSOD), (PSOM), (PSOP), (PSOR), (PSOT), (PSOT)

PSOM**NAME:**

Position Synchronized Pulse Output using Bit Mapping.

FUNCTION:

Establishes a condition such that the Pulse Train Output will occur in accordance with a bit pattern located in a previously established array .

FORMAT:

(PSOM,case,array name < starting byte number > , +/- number of bits to process)

EXAMPLE:

(PSOM,0,ary < n > ,m) ; The Pulse Output will occur in accordance with Bit Mapping defined in "ary < n > " (array name) starting at array set number "n" and continuing "+/- m" number of bytes.

(PSOM,1,\$POT < n > ,m) ; The Pulse Output will occur in accordance with Bit Mapping sent from the RS-232 buffer. Data will be retrieved from the "n"th set and continue "m" number of sets.

RELATED COMMANDS:

\$POT, (PSOC), (PSOD), (PSOF), (PSOF), (PSOP), (PSOR), (PSOS), (PSOT)

PSOP

NAME:

Position Synchronized Output Pulse Train

FUNCTION:

Configuration of the Pulse Output Train.

FORMAT:

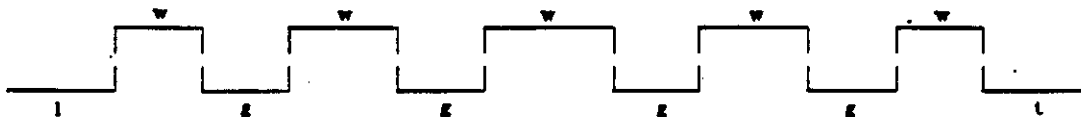
(PSOP,case,condition)

EXAMPLES:

(PSOP,0,w) ; Establishes the width, "w" of a single pulse output in milliseconds
(See illustration below)

(PSOP,1,l,w,t) ; Establishes a Pulse Train with the following characteristics:
 l = pulse lead in milliseconds
 w = pulse width in milliseconds
 t = pulse trail in milliseconds
 (See illustration below)

(PSOP,2,l,w,t,r,g) ; Establishes a Pulse Train with the following characteristics:
 l = pulse lead in milliseconds
 w = pulse width in milliseconds
 t = pulse trail in milliseconds
 r = ramp up and down time in milliseconds
 g = interval between ramps in milliseconds
 If the interval is set at "0" the interval will be the same as the Pulse Train width (w).
 (See illustration below)



w increases with r
g does not equal zero

PSOP

EXAMPLES (CON'T):

(PSOP,3,ary < n > ,m) Establishes a Pulse Train with the following characteristics:
off ary < n > milliseconds, + on ary < n + 1 > milliseconds
+ off ary < n + 2 > milliseconds, + on ary < n + 3 > milliseconds
+ milliseconds, + off ary < n + -m > milliseconds

(PSOP,4,w) ; Establishes the width, "w" of a single pulse output in micro seconds

(PSOP,5,) ; Toggles between:
An odd event (1,3,5,.....) enables a pulse output
An even event (2,4,6,.....) disables a pulse output

RELATED COMMANDS:

(PSOC), (PSOD), (PSOF), (PSOM), (PSOR), (PSOS), (PSOT)

PSOR

NAME:

Position Synchronized Output with Real-Time Control

FUNCTION:

Provides various configurations of the PSO Board's Position Counter.

EXAMPLES:

- (PSOR,0) ; Clears all previous real-time control data from counter
- (PSOR,1) ; Stops Position Counter from recording new data, retains current data under Operator command.
- (PSOR,2,i,n) ; Stops Position Counter from recording new data, retains current data. Activated by User selected Interrupt.
If i = 1 INT1
i = 2 INT2
If n is not zero, this function is enabled
If n = 0, this function is disabled

NOTE: The (PSOR,2,i,n) command is used in conjunction with INT1/2, option 3 only.

- (PSOR,3) ; Stops Position Counter from recording new data, returns Counter to zero
- (PSOR,4,i,n) ; Stops Position Counter from recording new data, returns Counter to zero. Activated by User selected Interrupt.
If i = 1 INT1
i = 2 INT2
If n is not zero, this function is enabled
If n = 0, this function is disabled

NOTE: (PSOR,4,i,n) is used in conjunction with INT1/2, option 3 only.

RELATED COMMANDS:

INT1/INT2,3,xxxx

PSOT**NAME:****PSOT - Position Synchronized Output, Digital or Analog****FUNCTION:**

Provides the User the ability to configure the four D/A outputs or Binary output bits.

FORMAT:**(PSOT,case, condition)****EXAMPLES:**

(PSOT,0,b,n,b,n,.....) ; Sets output bit "b" either high or low "n".
If "n" is not 0, the output will be high.
If "n" = 0, the output will be low.

(PSOT,1,n) ; Sets number of outputs in accordance with Hex Data "n"

(PSOT,2,d,n,d,n,.....) ; Establishes output configuration for a Bipolar (11bit + 1sign) DAC. (Default)
d = DAC output line (0-3)
n = -10V to + 10 V output voltage
The output voltage has a minimum step size of 4.88mV.

(PSOT,3,d,n,d,n,.....) ; Establishes output configuration for a Unipolar 12 Bit DAC.
d = DAC output line (0-3)
n = 0 to +10V output voltage
The output voltage has a minimum, step size of 2.44mV.

RELATED COMMANDS:**(PSOC)**

5-3: BIT MAPPING - APPLICATION AND EXAMPLE

Bit Mapping is the process in which Bit Patterns are input to the Unidex 21 Controller, and then used to establish a Pulse Train Output pattern. The (PSOM) command is used in conjunction with Bit Mapping. Prior to using a (PSOM) command the following set up procedures are necessary:

NOTE: The procedures provided below need not occur in the order presented.

- 1) Use the (MALC,3,n) command to allocate memory for RS-232 data collection.
- 2) Use the (PORT,A) or (PORT,B) command to designate an RS-232 Port to be used for data collection if a Remote Controller is being used.
- 3) Define the Setup and Feedback Arrays. The Array command format must be as follows:
(DARY,SET < dimension > ,FBK < dimension >)

SETUP ARRAY

The Setup array provides the parameters necessary for the Unidex 21 to receive Bit Mapping data. The Setup Array must be in the following format:

NOTE: All data is in Hex format unless otherwise specified

- <0> = H,1
 - <1> = Initiates a 1 byte start code, a 0 initiates no preference
 - <2> = Number of bytes of Line Header, STX + Type
 - <3> = 1 byte Acknowledge code
 - <4> = 1 byte Line Header code
 - <5> = 1 byte Line Description code
 - <6> = 1 byte End Code (must be the same number of bytes as the Header code)
 - <7> = X Axis conversion factor, machine step/pixel
 - <8> = Y Axis conversion factor, machine step/pixel
 - <9> = Left pixel limit of horizontal scan
 - <10> = Right pixel limit of horizontal scan
 - <11> = Bottom pixel limit of vertical scan
 - <12> = Upper pixel limit of vertical scan
 - <13> = Feedrate (Floating Point Format)
-

- < 14 > = X Axis Machine Step/Programmed Unit (Floating Point Format)
- < 15 > = Y Axis Machine Step/Programmed Unit (Floating Point Format)

- < 20 > = 1 Bit "not acknowledged" code + 1 Bit Time Out Error
- < 21 > = 1 Bit "not acknowledged" code + 1 Bit Block Size Error
- < 22 > = 1 Bit "not acknowledged" code + 1 Bit Invalid Block Type
- < 23 > = 1 Bit "not acknowledged" code + 1 Bit XOR Check Fail
- < 24 > = 1 Bit "not acknowledged" code + 1 Bit SUM Check Fail
- < 25 > = 1 Bit "not acknowledged" code + 1 Bit Not Enough Memory
- < 26 > = 1 Bit "not acknowledged" code + 1 Bit Line Contains Too Many Characters
- < 27 > to < 29 > Reserved for additional General Errors

- < 30 > = 1 Bit "not acknowledged" code + 1 Bit Header Block Unspecified Error
- < 31 > = 1 Bit "not acknowledged" code + 1 Bit Header Block Position Outside of Boundary
- < 32 > = 1 Bit "not acknowledged" code + 1 Bit Header Block Unspecified Error
- < 33 > to < 39 > Reserved for additional Header Block Errors

- < 40 > = 1 Bit "not acknowledged" code + 1 Bit Line Description Block Unspecified Error
- < 41 > = 1 Bit "not acknowledged" code + 1 Bit Line Description Block's Header Block Not Received
- < 42 > = 1 Bit "not acknowledged" code + 1 Bit Line Description Block Length does not Match Number Specified in Header Block
- < 43 > to < 49 > Reserved for Additional Line Description Errors

- < 50 > to < 59 > Reserved for Unidex 21

FEEDBACK ARRAY

The Feedback Array provides Feedback of the Parameters requested by the Unidex 21. Two sets of Feedback Arrays are created to provide continuous information processing. The Feedback Array will be returned in the following format:

NOTE: All data in the two sets of Feedback Arrays must be in Hex format unless otherwise specified

Data Set 1

- <0> = "xxx0" No data available at this time
- "xxx1" END
- "xxx2" Data is ready , waiting for output of last byte, Indexing Mode
- "xxx3" Data is ready, waiting for output of last byte, Auto Positioning Mode
- <1> = 1 byte feedback to remote controller
- <2> = Horizontal axis position (floating point format)
- <3> = Vertical axis scan distance (floating point format)
- <4> = Horizontal axis scan distance (floating point format)
- <5> = Number of bytes of Bit Mapping data (floating point format)
- <6> = Scan firing distance and direction (floating point format)
- <7> = Horizontal axis position freerun, one Output Pulse (floating point format)
- <8> = Horizontal axis position freerun, one Output Pulse (floating point format)
- <9> = Vertical axis position freerun, one Output Pulse (floating point format)
- <10> = Vertical axis feedrate freerun, one Output Pulse (floating point format)
- <11> = Horizontal axis scan freerun, one Output Pulse (floating point format)
- <12> = Horiz. axis scan feedrate freerun, one Output Pulse (floating point format)
- <13> to <19> Spare
- <20> = Bit mapping data starts here
- <n> = Bit mapping data ends here

Data Set 2

- <n+1> = "xxx0" No data available at this time
- "xxx1" END
- "xxx2" Data is ready , waiting for output of last byte, Indexing Mode
- "xxx3" Data is ready, waiting for output of last byte, Auto Positioning Mode
- <n+2> = 1 byte feedback to remote controller
- <n+3> = Horizontal axis position (floating point format)
- <n+4> = Vertical axis scan distance (floating point format)
- <n+5> = Horizontal axis scan distance (floating point format)
- <n+6> = Number of bytes of Bit Mapping data (floating point format)
- <n+7> = Scan firing distance and direction (floating point format)
- <n+8> = Horizontal axis position freerun, one Output Pulse (floating point format)
- <n+9> = Horizontal axis position freerun, one Output Pulse (floating point format)
- <n+10> = Vertical axis position freerun, one Output Pulse (floating point format)
- <n+11> = Vertical axis feedrate freerun, one Output Pulse (floating point format)
- <n+12> = Horizontal axis scan freerun, one Output Pulse (floating point format)
- <n+13> = Horizontal axis scan feedrate, free one shot (floating point format)
- <n+14> to <n+20> Spare
- <n+21> = Bit mapping data starts here
- <2n-1> = Bit mapping data ends here

SAMPLE PROGRAM

```

(MALC, < 3,512 > )           ;Allocate 512 Bytes for RS232
(DARY,SET < 60 > ,FBK < 100 > ) ;Setup Case 2 & Feedback Array
SET < 0 > = H,1              ;Set to Case 1, Bit Map
SET < 1 > = H,2              ;STX Code
SET < 2 > = H,8              ;Line Header STX + TYPE + 2X + 2Y + 2SIZE
SET < 3 > = H,06            ;Acknowledge
SET < 4 > = H,10            ;Line Header Type
SET < 5 > = H,20            ;Line Description Type
SET < 6 > = H,30            ;End Operation
SET < 7 > = H,22            ;1 Pixel = X Axis Machine Steps
SET < 8 > = H,22            ;1 Pixel = Y Axis Machine Steps
SET < 9 > = H,0              ;X Left Pixel Limit
SET < 10 > = H,6280         ;X Right Pixel Limit
SET < 11 > = H,0            ;Y Bottom Pixel Limit
SET < 12 > = H,6280         ;Y Upper Pixel Limit
SET < 13 > = 300.          ;Feedrate
SET < 14 > = 10000.        ;X Machine Step/Program Unit Factor
SET < 15 > = 10000         ;Y Machine Step/Program Unit Factor
SET < 20 > = H,1501        ;Time Out Error
SET < 21 > = H,1502        ;Block Size Error
SET < 22 > = H,1503        ;Invalid Block Type
SET < 23 > = H,1504        ;XOR Check Error
SET < 24 > = H,1505        ;Sum Check Error
SET < 25 > = H,1506        ;Insufficient Memory
SET < 26 > = H,1507        ;Line Too Long for Memory Allocated in Buffer

SET < 30 > = H1510         ;Unspecified Header Error
SET < 31 > = H,1511        ;Position Out of Bounds
SET < 32 > = H,1512        ;Out of Memory

SET < 40 > = H,1520        ;Unspecified Header Error
SET < 41 > = H,1521        ;Header Not Received
SET < 42 > = H,1522        ;Header Length Does Not Match Specified Size

```



```

SET < 50 > = 0           ;No Line Description
SET < 51 > = 0           ;No Line Description Buffer
SET < 52 > = 0           ;Currently X and Y at Zero

```

```

G4 F1.
(UMFO,1,100)

```

```

(PORT,A,SET,FBK)
(COMM,A,#C:< SET < 3 > .LSL4.H,10 > .OR2.$INP) ; We Are Ready, Show Input Line
G1 G23 F = SET < 13 >           ; Set Feedrate
(MSG, PO RUNNING)
(SIOC,1)
(DVAR,INDX,OFST,TIM1,TIM2,TIM3,TIM4)
INDX = 0 OFST = 50             ; Start From First Set
FBK < 0 > = "ENT0" FBK < OFST > = "ENT0"
TIM1 = $TOD < m > TIM2 = $TOD < S > ; Start Time
(DENT,ENT0)
(JUMP,#FBK < INDX > )
(DENT,ENT1)
FBK < INDX > = 0
(PORT,0)
TIM3 = $TOD < m > TIM4 = $TOD < S >
(MSG, ALL DONE, #TIM1 #TIM2 #TIM3 #TIM4)
M2
(DENT,ENT2)
(COMM,A,#C:FBK < INDX + 1 > )
FBK < INDX > = "ENT0"
X = FBK < INDX + 2 > Y = FBK < INDX + 3 >
(PSOM,0,FBK < INDX + 20 > ,FBK < INDX + 5 > )
(PSOF,4,FBK < INDX + 6 > ,X)
X = FBK < INDX + 4 >
INDX = INDX + OFST OFST = -OFST
(JUMP,ENT0)

(DENT,ENT3)
(COMM,A,#C:FBK < INDX + 1 > )

```

FBK < INDX > = "ENT0"
X = FBK < INDX + 3 >
(PSOM,0,FBK < INDX + 20 > ,FBK < INDX + 5 >)
(PSOF,4,FBK < INDX + 6 > ,X)
(FREE,X = 2,F = FBK < INDX + 8 > ,D = FBK < INDX + 7 > ,Y = 2,F = FBK < INDX +
10 > ,D = FBK < INDX + 9 >)
X = FBK < INDX + 4 > Y = FBK < INDX + 3 >
INDX = INDX + OFST OFST = -OFST
(JUMP,ENT0)

PSO PROGRAM FLOW

(PSOP,...)

SETUP FIRING OUTPUT MODE

(PSOS, . . .)

Scaling

(PSOD,...)

SETUP FIRING DISTANCE

(*PSO OPTIONAL FIRING CONTROL
AND/OR OUTPUT CONTROL*

(PSOF,...)

ENABLE FIRING OUTPUT AND POSITION TRACKING

MOTION PROGRAM

.
. .
. .

(PSOF,0)

DISABLE FIRING

TO: UNIDEX 21 PSO USERS
FROM: Ron Rekowski
DATE: December 9, 1991
SUBJECT: New PSO Functions

Four new laser firing functions have been added to the UNIDEX 21 Position Synchronised Output Card (PSO). These new functions provide an output voltage proportional to the vector displacement and/or velocity of the user specified axis. Following is a listing of the command syntax for each of the functions along with a brief example of their operation.

Analog Output - Velocity Ramping - Bipolar DAC
(PSOT,4,n,d,m,v)

- n* D/A channel, $0 \leq n \leq 3$
- d* Analog output voltage at zero velocity, $-10 \leq d \leq 10$
- m* Maximum analog output voltage at target velocity, $-10 \leq m \leq 10$
- v* Target velocity, $-2^{23} \leq v \leq 2^{23} - 1$ (in $\frac{\text{machine steps}}{\text{msec}}$)

Analog Output - Velocity Ramping - Unipolar DAC
(PSOT,5,n,d,m,v)

- n* D/A channel, $0 \leq n \leq 3$
- d* Analog output voltage at zero velocity, $0 \leq d \leq 10$
- m* Maximum analog output voltage at target velocity, $0 \leq m \leq 10$
- v* Target velocity, $-2^{23} \leq v \leq 2^{23} - 1$ (in $\frac{\text{machine steps}}{\text{msec}}$)

NOTES:

- The user must specify a firing distance and pulse output mode along with the analog ramping output to enable tracking of the desired axis encoder feedback. The firing and pulse modes specified in the example program can be replaced by any valid PSO firing or pulse mode commands.
- The velocity ramping mode and the position ramping mode may both be active at the same time. Setting the position and velocity mode outputs for the same D/A channel will result in the summation of the two signals at the specified output.
- The analog ramping modes can be disabled by two methods:
 1. By executing a (PSOF,0) command which disables the tracking of the encoder feedback and results in zero volts output for the position and/or velocity ramping outputs.
 2. By executing a (PSOT,1, n , d) command , where n is the channel of the position/velocity output to be disabled, and d is a user specified voltage.
- Once a position and/or velocity ramping mode has been disabled, the ramping mode can only be re-enabled by issuing a new (PSOT,4/5/6/7,...) command followed by a new (PSOF, n) command.

PSOF2.DOC

```

;*****
;PSO OUTPUT POLARITY MAY BE CHANGED BY CHANGING JP27
;USING PSO CONNECTOR ON BACK OF U21 LABELED P52
;MAIN OUTPUT IC ON PSO CARD IS M17,AUX2=M16,AUX3=M15,AUX4=M14 4N33 IS STANDARD
;INPUT 1 IC ON PSO CARD IS M10,IN2=M11,IN3=M12,IN4=M13      6N136 IS STANDARD
;WHEN USING 6N136 / HCPL2601 FOR OUTPUTS YOU MUST SUPPLY +5VDC TO J52 PIN4
;RECOMMENDED LOAD FOR 6N136 IS 1000 OHM, FOR HCPL2601 IS 100 OHM AT 5 VDC MAX
;RECOMMENDED LOAD FOR 4N33 IS 200 OHM ,WHEN USING 5VDC.
;J52 CONNECTOR WIRING INFO: CONNECT J52-3 TO J52-5,J52-31 TO RESISTOR LOAD
;J52-31 TO RESISTOR LOAD , +5VDC OR DAC OUTPUT TO OTHER END OF RESISTOR LOAD
;DAC2 OUTPUT IS PIN 26 ON J52 CONNECTOR
;ecs100=4n33,ecs101=6n136,ecs119=hcpl2601,eck572=50pin mate
;*****
;THIS IS SAMPLE PROGRAM FOR U21 PSO CARD
G1 G90 F1.0
(PSOT,2,0,5)          ;DAC0 MAIN OUTPUT,DAC3 IS FOR 6N136/HCPL2601 POWER
(PSOP,1,50,50,0)     ;PULSE WIDTH IS 5MSEC
(PSOF,2,1000)        ;FIRE 1000 PULSES
M47

```

