OptiStep Hardware Manual

Document Revision D4
September 14, 2004

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1 OptiStep-PC

1.1 Features

The OptiStep Plus-PC is a high performance single plug-in card for the IBM-PC and compatible computers that provides control for up to 4 stepper motors. The control lines are optically isolated and provide step and direction signals for every axis as well as two current control lines that allow the selection of four power levels. The OptiStep controller can be used in conjunction with our OptiDriver^tm or with any third party driver product that accepts industry standard step and direction commands.

The features of OptiStep Plus-PC include:

- Complete isolation of driver board voltages and currents from the computer allows use of much higher motor voltage for improved speed.

- Operates interactively, i.e. no uploading or downloading of programs is required, as well as providing for keyboard control of such functions as JOG, PAUSE and ABORT.

- Programmable acceleration/deceleration.

- Built-in timer assures motor speed consistency regardless of the speed of the computer used.

- Programmable address selection via a dip switch allows coexistence with other cards that may otherwise cause address conflicts.

- Requires one slot for revisions G and earlier and two slots for revisions H and later (second slot is required if you are using the auxiliary inputs, ouputs 5 & 6, or feedrate override). All motor power and limit switch connections are routed to a separate driver board that can control high driving currents and voltages.

1.2 Feedrate Override Option

The OptiStep Plus-PC is available with feedrate override as an option (OptiStep Plus-FR). This version allows for adjustment of the output speed from approx. 35% to 120% of the commanded value using an external potentiometer (typically 5K ohms) attached to the DB-15 connector. See Appendix D.

1.3 Specifications & Requirements

Electrical Specifications

Step signals .... 4 opto-isolated open collector
Direction signals .... 4 opto-isolated open collector
Current level selection signals .... 2 opto-isolated open collector
Limit switch input signals .... 8 TTL compatible active low
Shield interrupt input signal .... 1 TTL compatible active low
Auxiliary input signals .... 6 TTL compatible active low
Auxiliary output signals .... 6 opto-isolated open collector
Maximum step rate .... 26,000 steps per second
Working temperature range .... (32°F ~ 104° F (0° C ~ 40° C)

OptiStep Plus PCB Layout Diagram
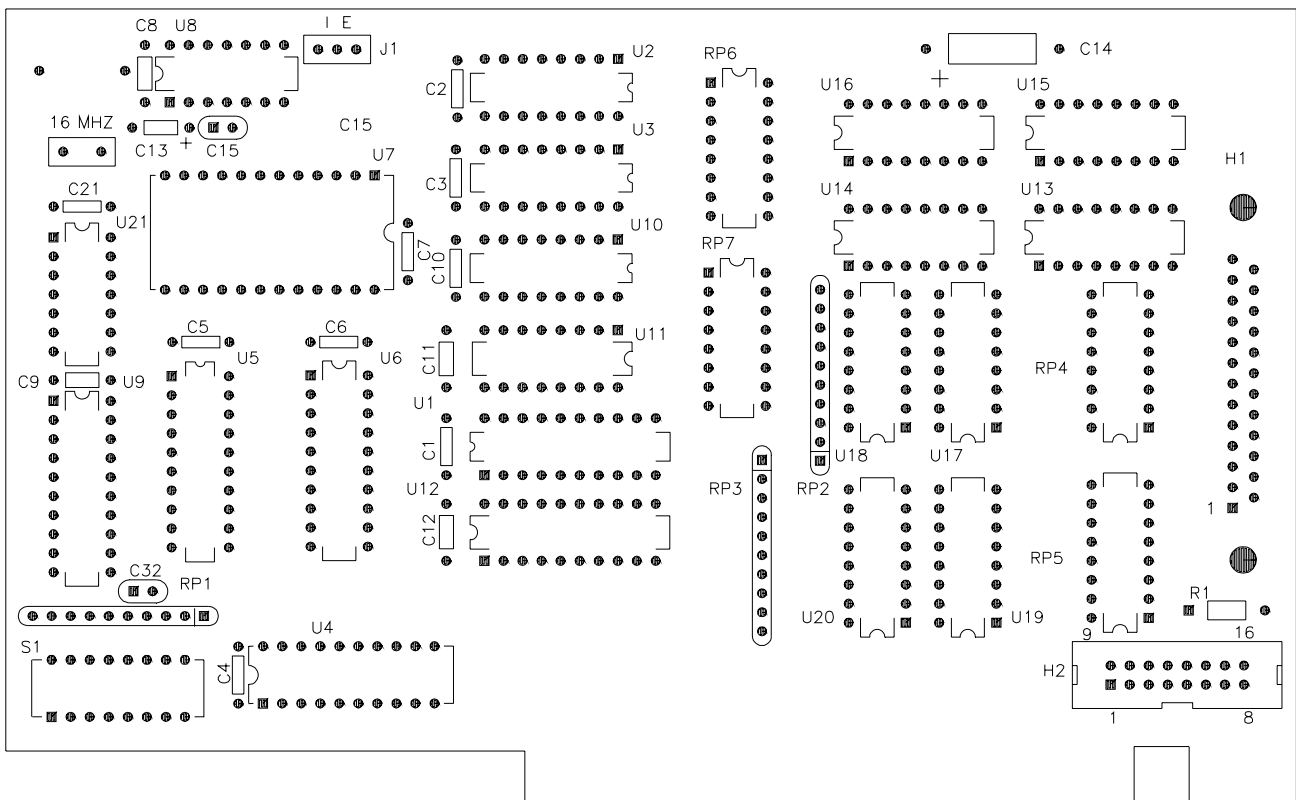
Requirements

8 or 16 bit IBM PC / AT expansion slot
5 to 7 volts D.C. external power supply to power opto-isolation capable of at least 450mA

2 Installation

2.1 Installation & Wiring

Follow these instructions for proper installation:

1) Turn off the computer.

2) Set the dip switches on the card so that the selected I/O address does not conflict with other cards in the system (The default setting is usually acceptable). Refer to Appendixes A & B for more information.

3) Remove a back plate from the rear of the computer and insert the OptiStep-PC card into the standard 8 or 16 bit slot and install the retaining screw.

6) Attach the DB-25 cable to the DB-25 connector on the back of the card. **Note: Do not plug any security keys into the OptiStep.**

5) For revision H cards and later the DB-15 connector for the auxiliary inputs is separate from the card. To install the cable, if needed, remove the backplate to the right of the OptiStep card. Attach the dual row connector on the ribbon cable to the header H2 on the OptiStep (make sure the notch on the connector is towards the bottom of the card). Install the plate with the DB-15 connector in the opening and install the retaining screws.

6) If you are using the Feedrate Override option plug the DB-15 on the Feedrate Override cable into the DB-15 on the OptiStep card.

6) Turn on the power.

2.2 System Wiring Diagram

A BreakOut-25 screw terminal adaptor is available for ease of wiring. While you may wire directly to the DB-25 connector, the wiring for the BreakOut-25 is shown here for convenience.
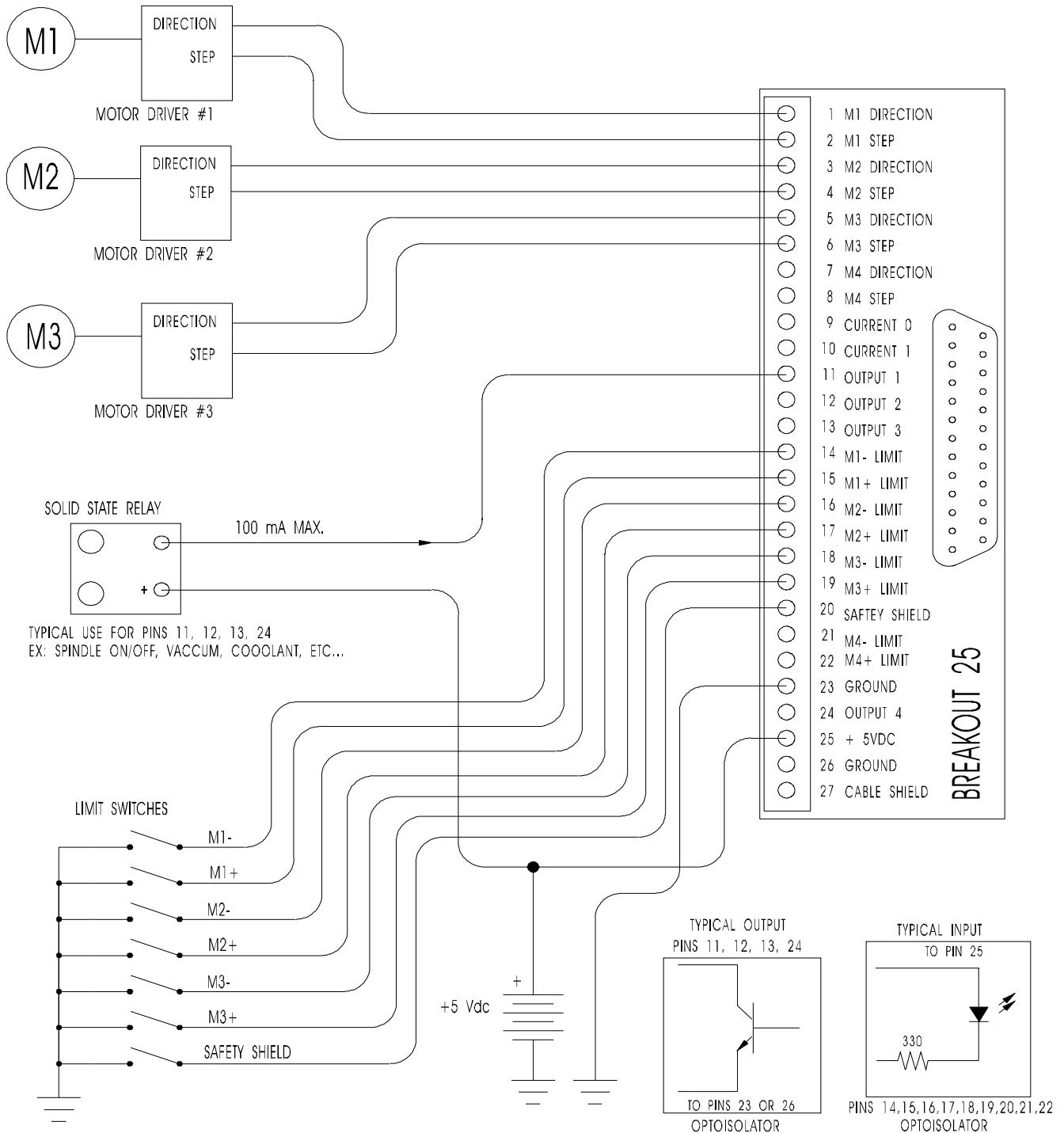
3 Technical Support

Should you need help in identifying and correcting a problem, the MicroKinetics engineering staff is ready to assist you during business hours. You should refer to the documentation and verify any described adjustments before calling. Be prepared to supply the model number of all components and any software and/or dip switch or jumper settings.

3.1 How to Obtain Technical Support

Technical support is available as follows:

<u>Via Email</u>
Email MicroKinetics with a description of problem symptoms to engineering@microkinetics.com where it is reviewed and answered daily.

<u>Via Fax</u>
Fax a detailed description of the problem to 770-422-7854 including your fax and voice number. An engineer will call to help you.

<u>Via Telephone</u>
Call our main line directly and request Hardware Tech Support. The number is 770-422-7845.

3.2 Product Return Procedure

The technical support staff can determine if the problem requires returning the product for testing and can give you an RMA (Return Merchandise Authorization) number to write on the outside of the package for proper routing. This improves repair turnaround time.

When returning an electronic product, always pack in the original antistatic bag. If original packaging is not available, wrap in aluminum foil and place in container to withstand shipping and handling. Always insure product with shipping company for full value.

If a product is returned to us for repair, is tested and found to operate within the rated specifications, a nominal testing fee will apply. Please inquire as to the testing charge at the time you obtain the RMA number.

APPENDIX A

Dip Switch Settings

SW1	SW2	SW3	SW4	SW5	Hex	Dec
ON	ON	ON	ON	ON	200	512
ON	ON	ON	ON	OFF	210	528
ON	ON	ON	OFF	ON	220	544
ON	ON	ON	OFF	OFF	230	560
ON	ON	OFF	ON	ON	240	576
ON	*ON*	*OFF*	*ON*	*OFF*	*250*	*592 **
ON	ON	OFF	OFF	ON	260	608
ON	ON	OFF	OFF	OFF	270	624
ON	OFF	ON	ON	ON	280	640
ON	OFF	ON	ON	OFF	290	656
ON	OFF	ON	OFF	ON	2A0	672
ON	OFF	ON	OFF	OFF	2B0	688
ON	OFF	OFF	ON	ON	2C0	704
ON	OFF	OFF	ON	OFF	2D0	720
ON	OFF	OFF	OFF	ON	200	736
ON	OFF	OFF	OFF	OFF	2F0	752
OFF	ON	ON	ON	ON	300	768
OFF	ON	ON	ON	OFF	310	784
OFF	ON	ON	OFF	ON	320	800
OFF	ON	ON	OFF	OFF	330	816
OFF	ON	OFF	ON	ON	340	832
OFF	ON	OFF	ON	OFF	350	848
OFF	ON	OFF	OFF	ON	360	864
OFF	ON	OFF	OFF	OFF	370	880
OFF	OFF	ON	ON	ON	380	896
OFF	OFF	ON	ON	OFF	390	912
OFF	OFF	ON	OFF	ON	3A0	928
OFF	OFF	ON	OFF	OFF	3B0	944
OFF	OFF	OFF	ON	ON	3C0	960
OFF	OFF	OFF	ON	OFF	3D0	976
OFF	OFF	OFF	OFF	ON	300	992
OFF	OFF	OFF	OFF	OFF	3F0	1008

* Default Setting

Interrupt Selection (currently unused)

SW6	SW7	SW8	INTERRUPT SELECTION
OFF	*OFF*	*OFF*	*NO INTERRUPTS (DEFAULT)*
ON	OFF	OFF	INTERRUPT #3 SELECTED
OFF	ON	OFF	INTERRUPT #4 SELECTED
OFF	OFF	ON	INTERRUPT #7 SELECTED

APPENDIX B

Avoiding I/O Address Conflicts

In setting the address dip switches on the controller card you must choose an address that is not in conflict with another card in your system. The following table lists I/O port addresses used by standard devices in the IBM PC. Select an address that avoids the ones used in the table below as well as avoiding any addresses used by any special hardware that might be in your system such as tape backup hardware, video digitizers, scanners, networking cards etc..

I/O Address	I/O Channel
1F0-1F8	AT fixed disk
200-20F	Game I/O adapter
210-217	Expansion unit
220-24F	Reserved
250-277	Not used
278-27F	Second parallel printer interface (LPT2)
280-2EF	Not used
2F0-2F7	Reserved
2F8-2FF	Second 8250 serial UART interface (COM2)
300-31F	Prototype card
320-32F	XT hard disk
330-377	Not used
378-37F	First parallel printer interface (LPT1)
380-38C	SDLC or secondary binary synchronous interface
390-39F	Not used
3A0-3AF	Primary binary synchronous
3B0-3BF	Monochrome display and first parallel printer
3C0-3CF	Reserved
3D0-3DF	Color/graphics display adaptor
3E0-3EF	Reserved
3F0-3F7	5-1/4 floppy disk drive controller
3F8-3FF	First 8250 serial UART interface (COM1)

APPENDIX C

## OptiStep Plus-PC

CONNECTOR PIN DESCRIPTIONS

PIN#	DB-25 DESCRIPTION	PIN#	DB-15 DESCRIPTION
1	MOTOR #1 DIRECTION	1	AUX 3 INPUT
2	MOTOR #1 CLOCK	2	AUX 4 INPUT
3	MOTOR #2 DIRECTION	3	AUX 5 INPUT
4	MOTOR #2 CLOCK	4	AUX 6 INPUT
5	MOTOR #3 DIRECTION	5	OUTPUT 6
6	MOTOR #3 CLOCK	6	OUTPUT 5
7	MOTOR #4 DIRECTION	7	N.C.
8	MOTOR #4 CLOCK	8	N.C.
9	CURRENT 0	9	AUX 1 INPUT
10	CURRENT 1	10	AUX 2 INPUT
11	OUTPUT 1	11	FEEDRATE OVERRIDE 1
12	OUTPUT 2	12	FEEDRATE OVERRIDE 2 (CT)
13	OUTPUT 3	13	EXTERNAL GROUND
14	MOTOR #1 NEG LIMIT INPUT	14	FEEDRATE OVERRIDE 3
15	MOTOR #1 POS LIMIT INPUT	15	EXTERNAL + 5 VOLTS
16	MOTOR #2 NEG LIMIT INPUT		
17	MOTOR #2 POS LIMIT INPUT		
18	MOTOR #3 NEG LIMIT INPUT		
19	MOTOR #3 POS LIMIT INPUT		
20	SHIELD INPUT		
21	MOTOR #4 NEG LIMIT INPUT		
22	MOTOR #4 POS LIMIT INPUT		
23	EXTERNAL GND		
24	OUTPUT 4		
25	EXTERNAL +5 VOLTS DC		

* Feedrate override signals are available on OptiStep-FR models only

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APPENDIX D

Feedrate Override Option Details

The Optistep Plus - PC must be purchased with the feedrate override option installed at the factory. In the upper lefthand corner of the Optistep Plus - PC there is a jumper block labeled J1 (see figure below).
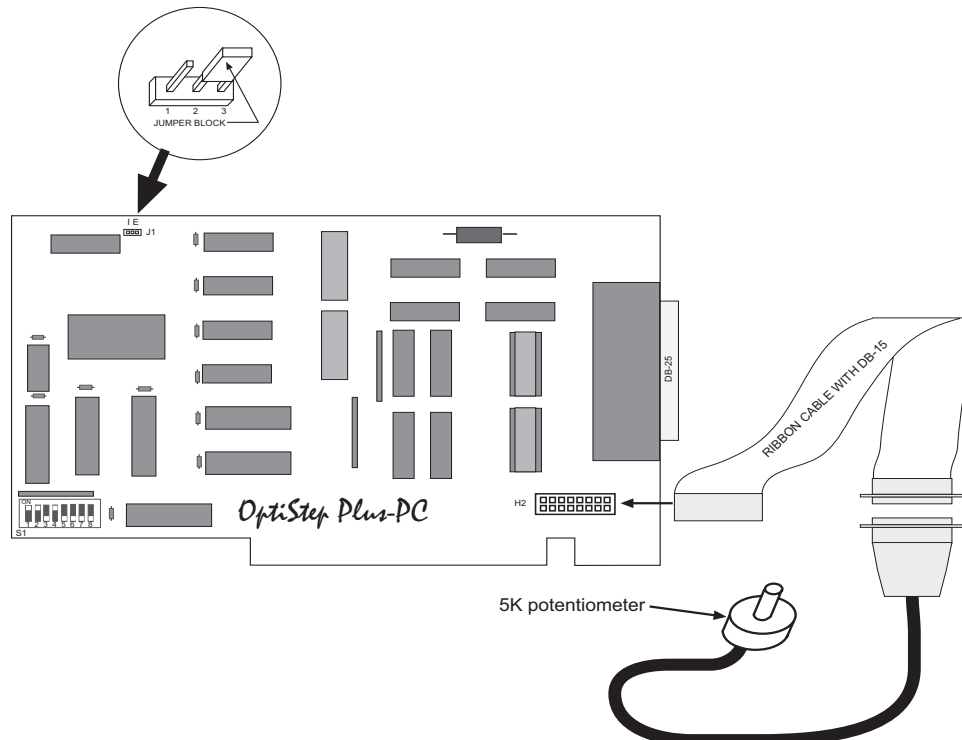
Place the jumper block in the "I" position (between pins 1 and 2) for standard operation.

Place the jumper block in the "E" position (between pins 2 and 3) to use the feedrate override option. Connect the external speed control assembly to the DB15 connector on the ribbon cable and plug the other end of the ribbon cable into connector H2 on the OptiStep Plus - PC card.

Make sure you set the potentiometer to its max setting (130%) when you start the software. If you get a "Card not Found" error message, this is most likely the reason.

CAUTION: Power to the computer *MUST BE OFF* before the jumper is moved.

Use the external speed control knob to adjust the velocity of the cutting move. The adjustment range is approximately 35% to 120% of the standard operating speed.
Example: If an axis is programmed to move at 1000 steps per sec, then the adjustment range would be approximately 350 to 1200 steps per sec.