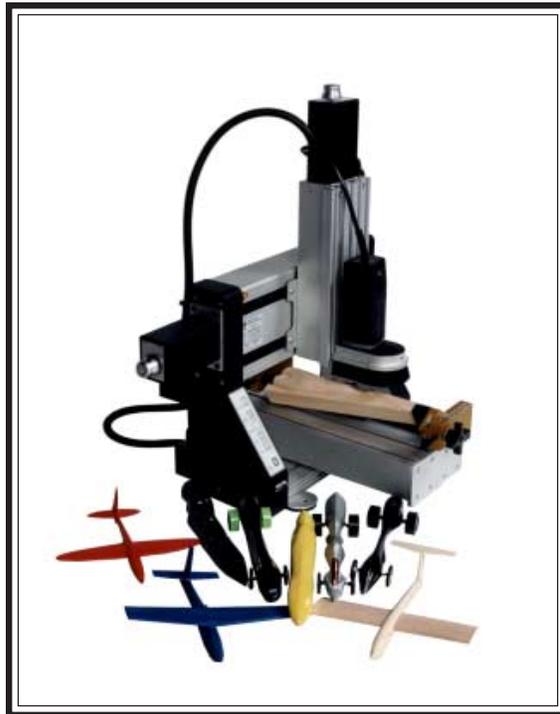


Techno **isel** ***Educational
DaVinci
Set-Up***



Techno-Isel

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Limited Warranty

Terms And Conditions For Limited Warranty And Repairs

WARRANTY

All Techno mechanical components are warranted against manufacturer's defects in material and workmanship for a period of six (6) months from the time of shipment from Techno facilities. All Techno electrical components are similarly warranted for a period of one (1) year from the time of shipment from Techno facilities. Techno's sole obligation under this warranty is limited to repairing the product or, at its option, replacing the product without additional charge, provided the item is properly returned to Techno for repair as described below. The provisions of this warranty shall not apply to any product that has been subjected to tampering, abuse, improper setup or operating conditions, misuse, lack of proper maintenance, or unauthorized user adjustment. Techno makes no warranty that its products are fit for any use or purpose to which they may be put by the customer, whether or not such use or purpose has been disclosed to Techno in specifications or drawings previously or subsequently provided, and whether or not Techno's products are specifically designed and/or manufactured for such a purpose.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED. ALL OTHER WARRANTIES, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WHETHER EXPRESSED, IMPLIED, OR ARISING BY OPERATION OF LAW, TRADE USAGE, OR COURSE OF DEALING, ARE HEREBY DISCLAIMED. THERE ARE NO WARRANTIES THAT EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF.

LIMITATION OF REMEDY

In no event shall Techno be liable for any incidental, consequential, or special damages of any kind or nature whatsoever. Techno is in no way liable for any lost profits arising from or connected to this agreement or items sold under this agreement, whether alleged to arise from breach of contract, expressed or implied warranty, or in tort, including, without limitation, negligence, failure to warn, or strict liability.

RETURN PROCEDURE

Before returning any equipment in or out of warranty, the customer must first obtain a return authorization number and packing instructions from Techno. No claim will be allowed nor credit given for products returned without such authorization. Proper packaging and insurance for transportation is solely the customer's responsibility. After approval from Techno, the product should be returned with a statement of the problem and **transportation prepaid**. If, upon examination, warranted defects exist, the product will be repaired or replaced at no charge, and shipped prepaid back to the customer. Return shipment will be by common carrier (i.e., UPS). If rapid delivery is requested by customer, then such transport is at the customer's expense. If an out-of-warranty situation exists, the customer will be notified of the repair costs immediately. At such time, the customer must issue a purchase order to cover the cost of the repair or authorize the product to be shipped back as is, at the customer's expense. In any case, a restocking charge of 20% will be charged on all items returned to stock.

FIELD SERVICE

Repairs are ordinarily done at Techno's New Hyde Park, New York facility, where all necessary instrumentation is available. This instrumentation is difficult to transport, so field service is severely limited, and will only be supplied at Techno's discretion. If field service is required and is performed at Techno's sole discretion, all relevant expenses, including transportation, travel time, subsistence costs, and the prevailing cost per hour (eight hour minimum) are the responsibility of the customer.

UNFORESEEN CIRCUMSTANCES

Techno is not liable for delay or failure to perform any obligations hereunder by reason of circumstances beyond its reasonable control. These circumstances include, but are not limited to, accidents, acts of God, strikes or labor disputes, laws, rules, or regulations of any government or government agency, fires, floods, delays or failures in delivery of carriers or suppliers, shortages of materials, and any other event beyond Techno's control.

ENTIRE AGREEMENT/GOVERNING LAW

The terms and conditions contained herein shall constitute the entire agreement concerning the terms and conditions for the limited warranty described hereunder. No oral or other representations are in effect. This Agreement shall be governed in all respects by the laws of New York State. No legal action may be taken by any party more than one (1) year after the date of purchase.

TECHNO RESERVES THE RIGHT TO CHANGE DESIGNS, SPECIFICATIONS, PRICES, AND ANY APPLICABLE DOCUMENTATION WITHOUT PRIOR NOTICE.

Technical Support

Please contact your local dealer or Techno for technical assistance with the Educational DaVinci. To reach Techno:

- ◆ *By Phone:* **Call us at (516) 328-3970, and specify that you need technical support. It is helpful if you fax us your question(s) and any necessary background information in detail before calling.**
- ◆ *By Fax:* **Send your questions and detailed background information to us by fax at (516) 358-2576. Please remember to include both your phone number and fax number on the transmittal.**
- ◆ *By E-mail:* **Send your questions and detailed background information to us by e-mail at support@techno-isel.com.**

Important Safety Instructions For DaVinci Operation

WARNING: The DaVinci must be operated with extreme caution in order to prevent personal injury and damage to the equipment.

Read All Instructions

- 1. DO NOT INSERT OBJECTS, INCLUDING FINGERS AND HANDS, INTO THE MACHINE WHILE POWER IS ON.** Inserting objects into the machine while the power is on can cause **SERIOUS PERSONAL INJURY** or **POSSIBLE DAMAGE TO THE MACHINE** if the machine or tool is moving or starts to move.
- 2. DISCONNECT POWER TO THE COMPONENTS.** Disconnect power to all components, including the machine, spindle, and any other tooling, when not in use, before servicing, and when changing accessories such as blades, bits, cutters, and fixtures. Do not loosen, remove, or adjust cables or machine parts while power is on.
- 3. AVOID UNINTENTIONAL STARTING.** Exercise care around the controls and keyboard to avoid accidental contact that might result in the unintentional starting of the machine.
- 4. CHECK FOR CORRECT VOLTAGE.** Before connecting the components to a power source (receptacle, outlet, etc.), make sure that the voltage supplied is the same as that specified on the components. A power source with improper voltage can result in **SERIOUS INJURY** to the user, as well as **SEVERE DAMAGE** to the system. **IF IN DOUBT, DO NOT PLUG IN THE COMPONENTS.**
- 5. GUARD AGAINST ELECTRIC SHOCK.** The machine and components are equipped with three pronged grounded plugs that

must be plugged into grounded outlets. Do not remove the grounding prong from the plug, and do not plug the grounded plug into an ungrounded extension cord.

6. **KEEP WORK AREA CLEAN.** Cluttered areas can result in accidents and injuries.
7. **CONTROL WORK AREA ENVIRONMENT.** Do not use the DaVinci in damp or wet locations, or in the presence of flammable liquids or gases. Keep work area well lit.
8. **KEEP OBSERVERS AWAY FROM EQUIPMENT WHEN OPERATING.** Make sure that observers stand a safe distance away from the machine when the power is on.
9. **DRESS APPROPRIATELY.** Do not wear loosely fitted clothing or jewelry. They can get caught in moving parts of the machine. Wear protective covering to contain long hair.
10. **USE SAFETY GOGGLES.** Also use a dust mask if the cutting operation creates dust.
11. **STAY ALERT.** Do not operate the machine when you are tired. Watch what you are doing at all times and use common sense.
12. **USE MACHINE PROPERLY.** Use the machine and tooling only for their intended purpose.
13. **DO NOT ATTEMPT TO EXCEED LIMITS OF MACHINE.** It will operate better and more safely at the rates for which it was intended.
14. **DO NOT MISTREAT CABLES OR CORDS.** Do not damage cables or cords by overstressing them, running them under other objects, or running them over work surfaces. Keep cables and cords away from heat, oil, and sharp edges.
15. **SECURE WORK.** Use the correct fixturing and clamping devices to hold work. **NEVER USE HANDS TO SECURE WORK.**

16. **DO NOT OVERREACH.** Maintain balance and proper footing at all times.
17. **MAINTAIN EQUIPMENT WITH CARE.** Keep cutting tools clean and sharp for safer and better performance. Lubricate and change accessories as instructed. Inspect cables and cords regularly, and if damaged, have repairs made by an authorized service facility. Keep all controls clean, dry, and free of oil and grease.
18. **CHECK FOR DAMAGED PARTS.** The DaVinci should be checked carefully to ensure proper operation and performance. Check for alignment of moving parts, binding or breakage of moving parts, mounting, and any other conditions that might affect operation. Damaged parts and defective switches should be repaired or replaced by an authorized service center.
19. **USE PROPER REPLACEMENT PARTS.** When servicing the DaVinci, use only identical or authorized replacement parts.
20. **REMOVE ADJUSTING KEYS AND WRENCHES.** Before turning power on to the components, including the machine and the tooling, check to make sure that keys and adjusting wrenches are removed.

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1

GENERAL SET-UP AND ASSEMBLY

General Instructions For Set-Up

The steps required to set up an Educational DaVinci are presented below. Each step is outlined briefly here, and explained in detail in subsequent sections of this manual.

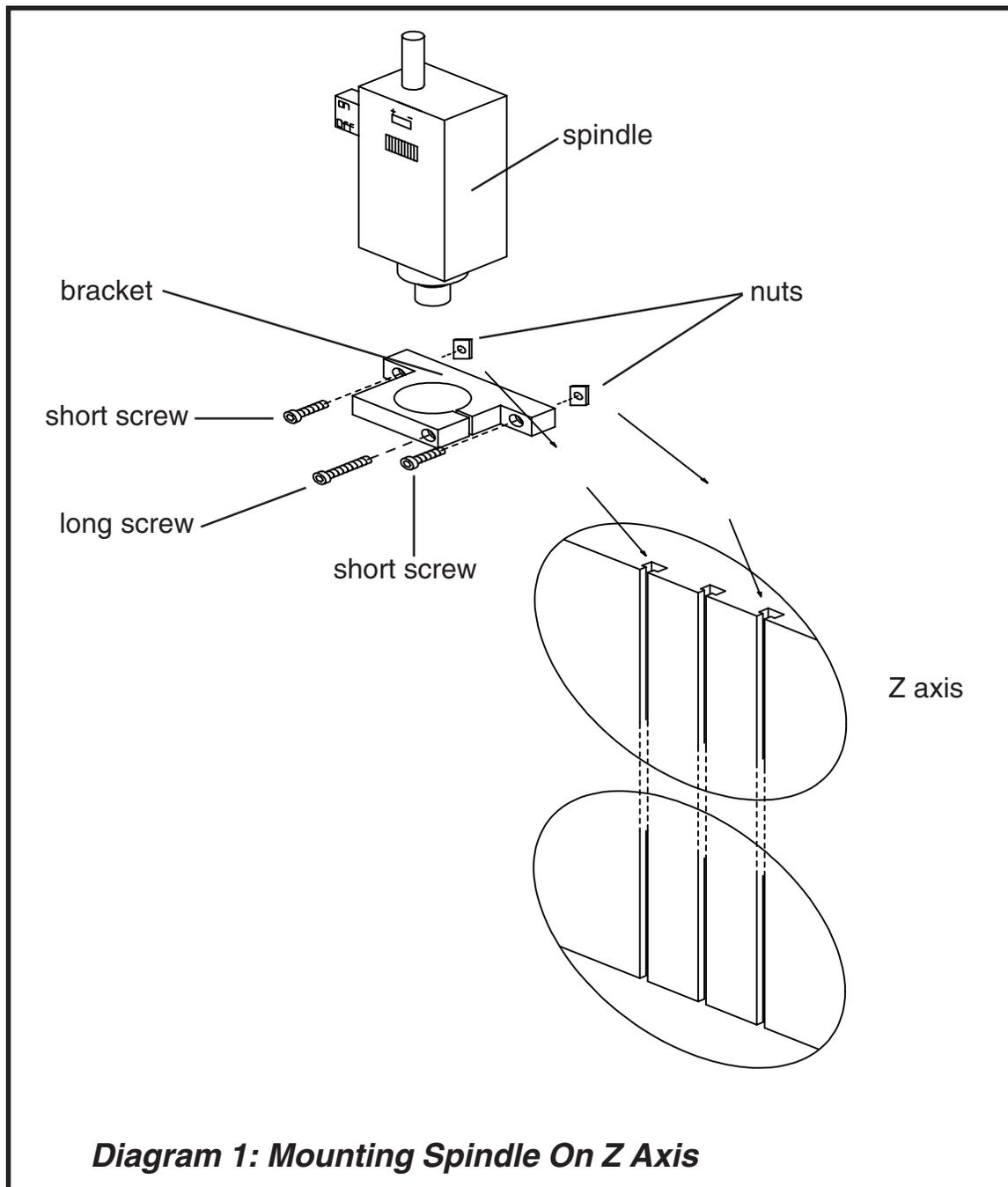
1. Remove the contents from the crate, and check each item against the Materials Checklist.
2. Install the spindle mounting bracket and the spindle. (The 8'x8' DaVinci comes with these already installed.)
3. Mount the CAM clamps and the clamp bars.
4. Set up the electronics:
 - Connect the serial cable from the PC to the DaVinci.
 - Connect the spindle to the DaVinci.
 - Attach the power cord.
5. Install the safety cover.
6. Load the software.
7. Perform a self-test.

Materials Checklist

The following items are included as part of the educational DaVinci package. Contact Techno immediately if any item is missing.

- (1)DaVinci controller (#EP1090)
- (1)Kress spindle (installed on 8'x8' DaVinci)
- (1)spindle mounting bracket (installed on 8'x8' DaVinci)
- (3)dampers (black knobs installed on rear shaft of motors)
- (1)6mm collet (installed on spindle)
- (1)1/8" collet
- (1)1/4" collet
- (1) 3/4" - 1/4" adapter sleeve
- (2)collet wrenches
- (2)CAM clamps with mounting hardware
- (2)clamp bars with mounting hardware
- (8)oval T-nuts
- (8)large T-nuts
- (3)hex keys
- (1)9 - 9 pin RS232 serial cable
- (1)power cord
- (1)safety cover
- (1)Techno G-Code Interface disk
- (1)Educational DaVinci Set-Up manual
- (1)G-Code Interface manual
- Binder for manuals

Mounting The Spindle



The spindle should be mounted on the Z axis. Follow the mounting instructions below.

1. Attach the spindle mounting bracket as shown, using the two short screws provided.
2. Mount the spindle on the bracket. Secure the spindle in the bracket by tightening the long screw provided.

Mounting The CAM Clamps And Clamp Bars

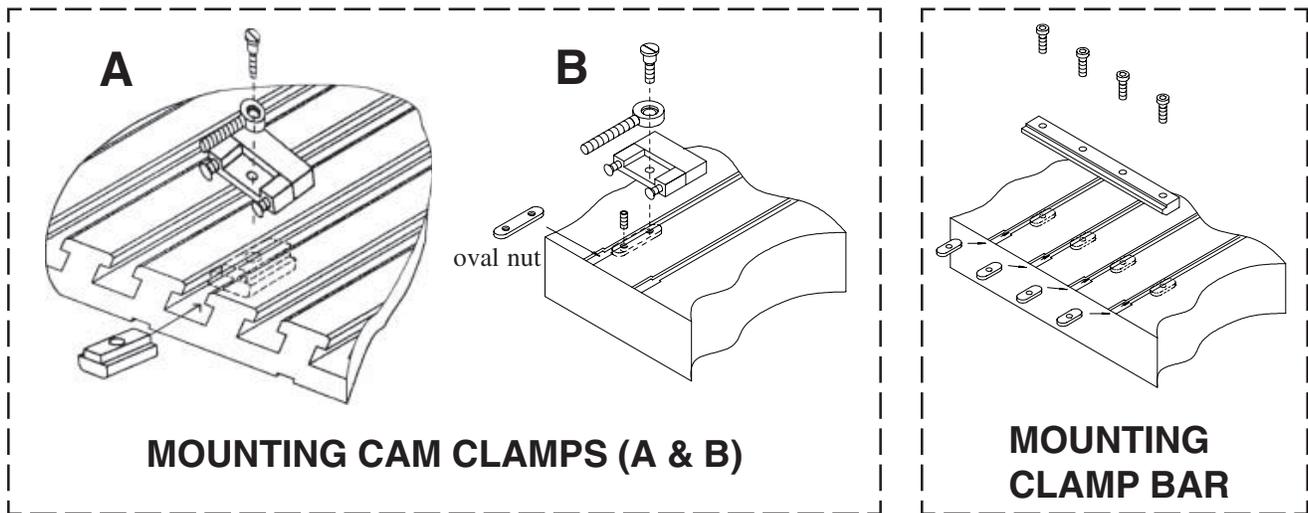


Diagram 2: Mounting CAM Clamps And Clamp Bars

Mounting The CAM Clamps

To mount the CAM clamps, follow the instructions below.

Diagram A: For large T-slot surface on 8x12 DaVinci.

1. Place the large T-nut in the desired T-slot.
2. Bolt the CAM clamp to large T-nut as shown.

 **Use the large T-nut only. Do not use the oval nut on any large T-slot extrusion table model. If you remove the large T-slot table from the 8x12 DaVinci, then you will need to refer to Diagram B.**

Diagram B: For 8x8 and 8x10 DaVinci models.

1. Place the oval nut in the desired T-slot.
2. Bolt the CAM clamp to oval nut, as shown.

 **Use the oval nut only. Do not use the large T-nut on the 8x8 or 8x10 DaVinci models. The large T-nut should only be used to mount components on surfaces with large T-slots.**



Mounting The Clamp Bars

To mount the clamp bars, follow the steps outlined below.

1. Mount each clamp bar by sliding four oval nuts into separate T-slots.
2. Attach the bar to the nuts with the screws provided.

Initial Electrical Set-Up

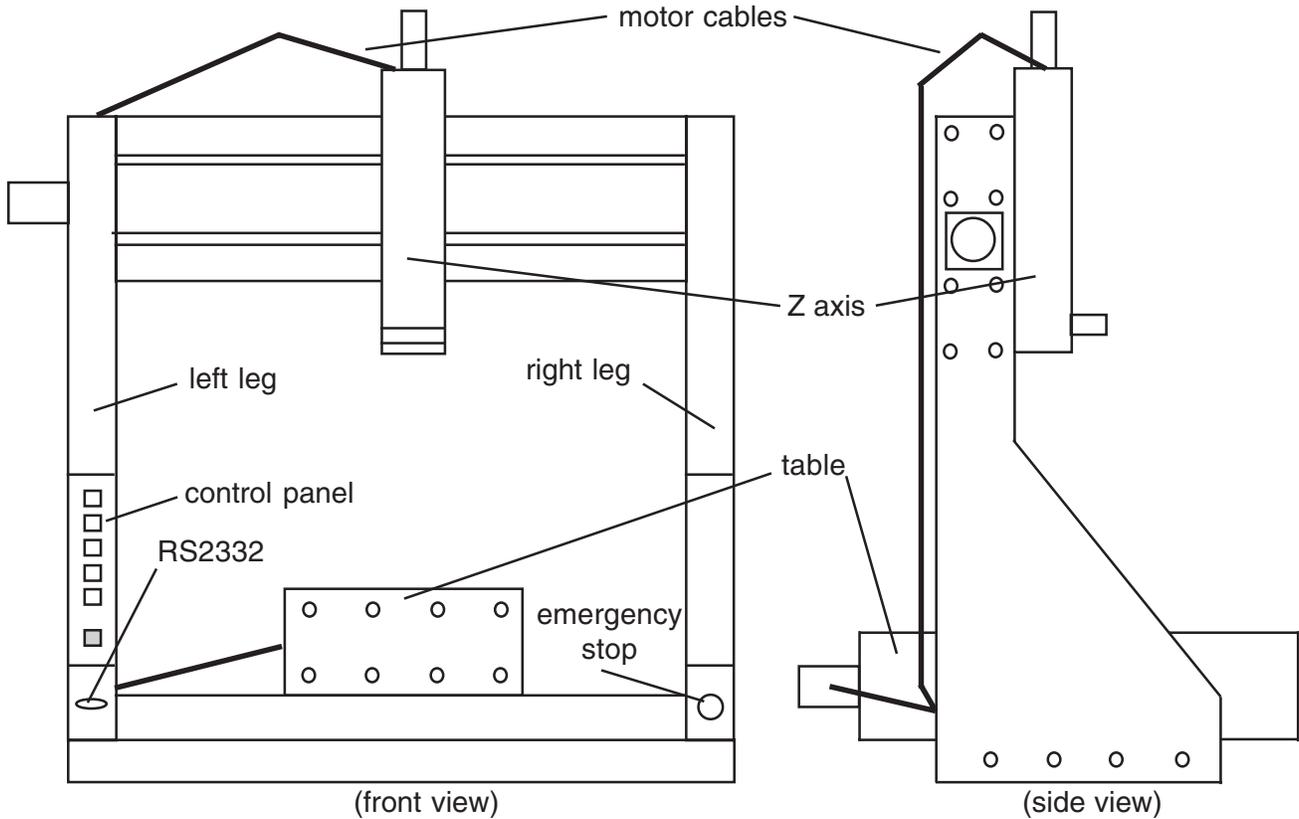


Diagram 3: Educational DaVinci

To make the necessary electrical connections and adjustments on the DaVinci system, follow the steps below.

1. Connect the 9-9 pin RS232 serial cable from the 9 pin PC COM port to the RS232 port on the DaVinci. Use only the specially wired RS232 serial cable provided. (See the Appendix A for more information.)



CONNECT THE END OF THE RS232 SERIAL CABLE MARKED PC/AT TO THE PC. DO NOT SUBSTITUTE A STANDARD SERIAL CABLE FOR THE SPECIALLY WIRED RS232 SERIAL CABLE. DOING SO MAY RESULT IN DAMAGE TO THE DAVINCI AND/OR PC.

2. For automatic powering of the spindle by the DaVinci, plug the spindle power cord into the socket-ended relay cord (located on the back of the DaVinci). Then, place the plug-ended relay cord (also located on the back of the DaVinci) into a wall outlet. Turn the spindle on. To test the automatic powering, press the Output button at the top of the DaVinci control panel several times, turning the spindle on and off.
3. Plug one end of the DaVinci power cord into the power connector on the rear of the right leg of the machine. Plug the other end into a 120VAC outlet.

2

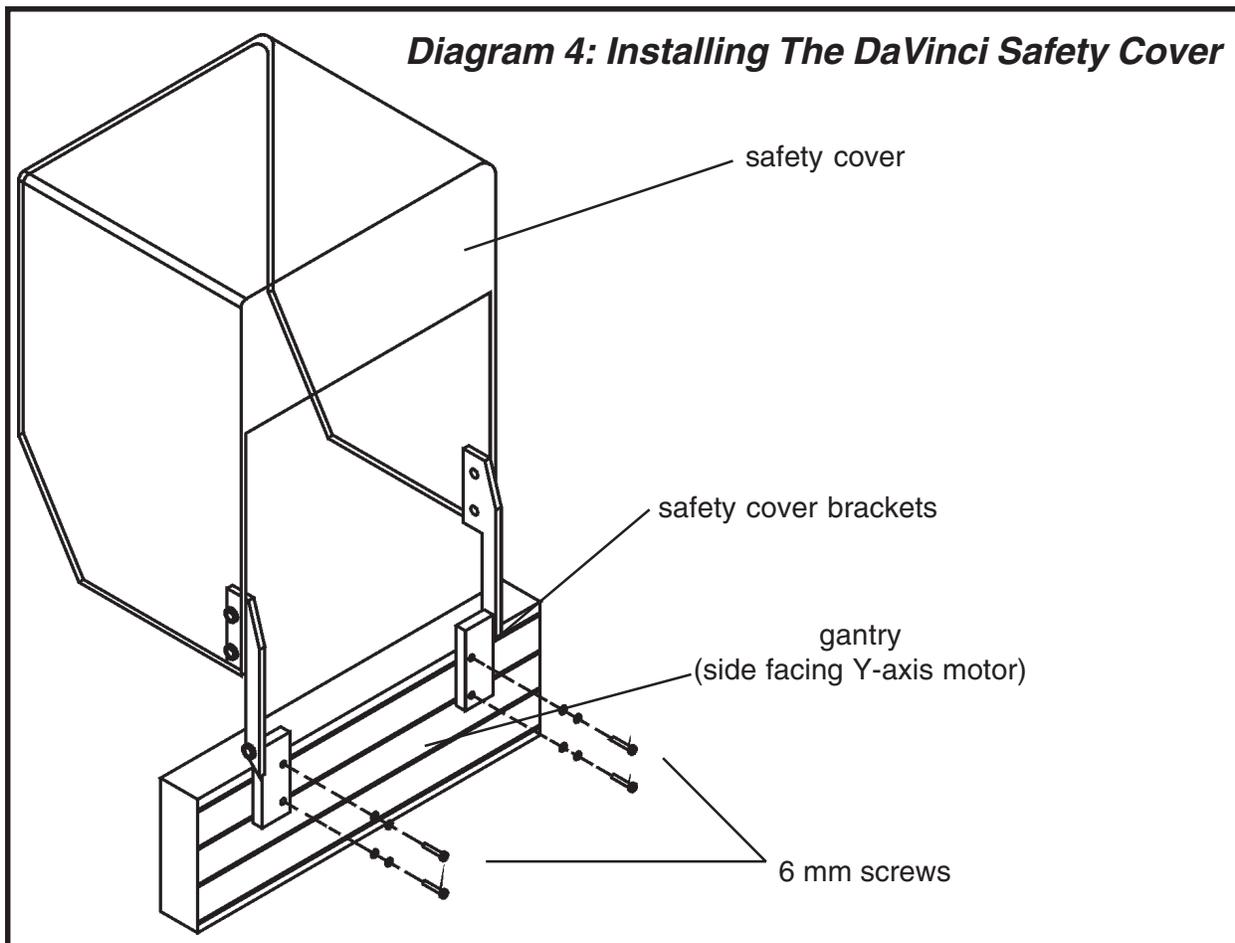
SAFETY COVER INSTALLATION

Installing The Safety Cover

1. Insert two 6 mm. square nuts into the top slot of the of the gantry on the side facing the Y-axis motor. Slide one nut to the gantry's left side, and the other nut to its right side.
2. Repeat step 1 with the two remaining 6 mm. square nuts, inserting these nuts into the second slot (directly under the top slot). Slide these nuts to line up with the nuts in the top slot.
3. Place the safety cover assembly over the gantry so that the body of the cover hangs over the gantry on the side opposite the Y-axis motor and the brackets hang over the gantry on the side facing the Y-axis motor.
4. Center the safety cover assembly on the gantry and line up the square nuts with the holes in the brackets.
5. Place two 6 mm. washers on each of the four 6 mm. screws. Insert the screws through the bracket holes and into the square nuts. Tighten the screws until the safety cover is secure.



DO NOT OPERATE THE DAVINCI IF THE SAFETY COVER IS NOT INSTALLED.



3

SOFTWARE INSTALLATION

Installing The Software

1. Install the Techno G-Code Interface software. For installation instructions, refer to Chapter 2: *Getting Started* in the interface software manual. The *Installing The Interface Program* section contains complete instructions for loading your interface software.
2. Walk through the tutorials for the interface program. Refer to the interface software manuals for tutorial instruction.

 ***FOR THOSE WHO DO NOT READ MANUALS, THE TUTORIALS PROVIDE A QUICK WALK THROUGH THE PROGRAM.***

4

SYSTEM OPERATION

Powering Up The DaVinci

1. Turn on the power by pressing the power switch on the rear of the right leg of the unit, next to the power connector.

If the power does not turn on, release the red emergency stop button on the front of the right leg of the DaVinci by turning it clockwise. Activating the emergency stop button, by pushing it in, immediately cuts power to the machine.



MAKE SURE ALL THE AXES ON THE DAVINCI ARE AT LEAST 1/2 INCH AWAY FROM THEIR ENDS OF TRAVEL BEFORE TURNING ON POWER TO THE UNIT. TO MOVE AN AXIS OFF ITS HOME SENSOR WHILE THE POWER IS OFF, TURN THE BLACK KNOB (DAMPER) AT THE END OF THE MOTOR UNTIL THE AXIS HAS MOVED AWAY. NO AXIS MAY BE IN CONTACT WITH ITS HOME SENSOR WHEN ATTEMPTING TO RUN A PROGRAM.



MAKE SURE THE SAFETY COVER IS INSTALLED BEFORE TURNING POWER ON TO THE DAVINCI. THE DAVINCI SHOULD NOT BE OPERATED IF THE SAFETY COVER IS NOT ON.

2. Start the software. Refer to the software manual for these instructions .

Performing The DaVinci Self-Test

Follow the directions below to test operation of the DaVinci.

1. With the GCODE Interface running on your PC, hit Function Key 8 (F8) to open the Communications screen.
2. Turn off power to the DaVinci.
3. Press and hold down the Start button on front panel. While holding it down, turn on the power by flipping the power switch on the rear of the right leg of the machine, next to the power connector. Release the start button several seconds after power turns on. The X and Y axes should move back and forth slightly. The Z axis may or may not move, depending on which version of the internal EPROM program is used.
4. If the DaVinci and the PC are communicating properly, the DaVinci will display a self-test message on the computer screen. The self-test message consists of a character stream, which continues until the space bar is pressed. After the space bar is pressed, any characters typed on the computer will appear on the computer screen and will be sent as a message to the DaVinci. When the message is received by the DaVinci, it will send the same character back to the computer. That character will appear on the computer screen twice - once after being typed in, and once after being sent back from the DaVinci.
5. If the test is successful, press the Reset button on the DaVinci, and proceed to the program you are going to use to make your part.

The Display Panel

The display panel, which is located on the front of the left leg of the machine, contains the control buttons that operate the DaVinci. A status window is also located on the panel. The function of each of the display panel elements is described below.

<u>Name</u>	<u>Type</u>	<u>Function</u>
Output	Button	Turns the output on and off.
μ -Reset	Button	Resets the DaVinci as if it had been turned off and then on again.
Status	Button	Reveals the status of the machine in the status window. (See function of <i>status window</i> below.)
Stop	Button	Stops a program from running. If a motion is being performed when the button is pressed, a deceleration ramp is inserted into the file, and the machine decelerates to a stop before the program is stopped. Pressing the <i>start button</i> resumes the interrupted program. (A program can also be stopped from the PC by typing in the command @0 δ [δ = ASCII235].)
Start	Button	Starts the execution of a program if the program is in memory. (A program can also be started from the PC by typing the command @0S or @0s.)
Status	Window	Displays a code indicating the existence or absence of an error. If an error exists, the code specifies the type of error. (A list of the codes can be found in the <i>Error Codes</i> section below.)

Error Codes

<u>Error Code</u>	<u>Error</u>
0	No error
1	Command cannot be interpreted
2	Limit switch encountered
3	Illegal number of axes
4	Axis not defined
5	Syntax error
6	Out of memory
7	Illegal parameters
8	Illegal branch
A	Impulse command parameter must be between 1 - 6.
B	Communication error
C	Carriage return expected
D	Illegal speed specified
E	Loop error; no forward loops are allowed
F	User has pressed stop button
H	Improper data/parameter
=	Unexpected carriage return received

For some error codes, if the Status button is pressed after the error code appears, the axis with the error will be identified by number in the Status window. The axes are represented by the following numbers: X=1 Y=2 Z=3

👉 The system must be reset by pressing the μP -Reset button after hardware errors are corrected. Operation will automatically resume after the correction of software errors.

Spindle Control Module

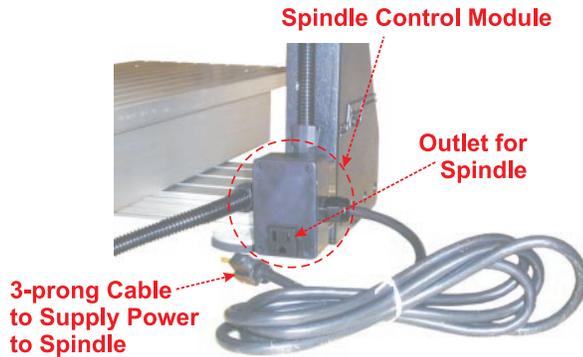


Diagram 4: Spindle Control Module

👉 DO NOT LOAD THE OUTPUT PORT WITH MORE THAN 10A. DOING SO COULD RESULT IN DAMAGE TO THE DAVINCI.

👉 When the spindle control module is ON, a dot appears in the lower left corner of the digital display.

Manual Operation Of Spindle Control

Pressing the Output button toggles the state of the relay; i.e., if the relay is off, pressing the button turns it ON or if the relay is on, pressing the button turns it OFF.

Software Operation Of Spindle Control

PAL: To activate spindle control from PAL, use the SET PORT commands listed below.

To turn the relay ON: `set_port 65529,128=1`

To turn the relay OFF: `set_port 65529,128=0`

DIRECT PROGRAMMING

♦To activate spindle control from the ASCII commands in the *direct*, or DNC, mode:

To turn the relay ON: `@0B65529,1`

To turn the relay OFF: `@0B65529,0`

♦To activate spindle control in the *program*, or CNC mode:

To turn the relay ON: `p65529,1,1`

To turn the relay OFF: `p65529,1,0`

5

APPENDICES

Appendix A: Wiring & Switch Settings

Wiring Connections

The proper connections between the DaVinci and the PC are made when the enclosed specially wired RS232 serial cables are used. The following diagram illustrates this wiring set-up.

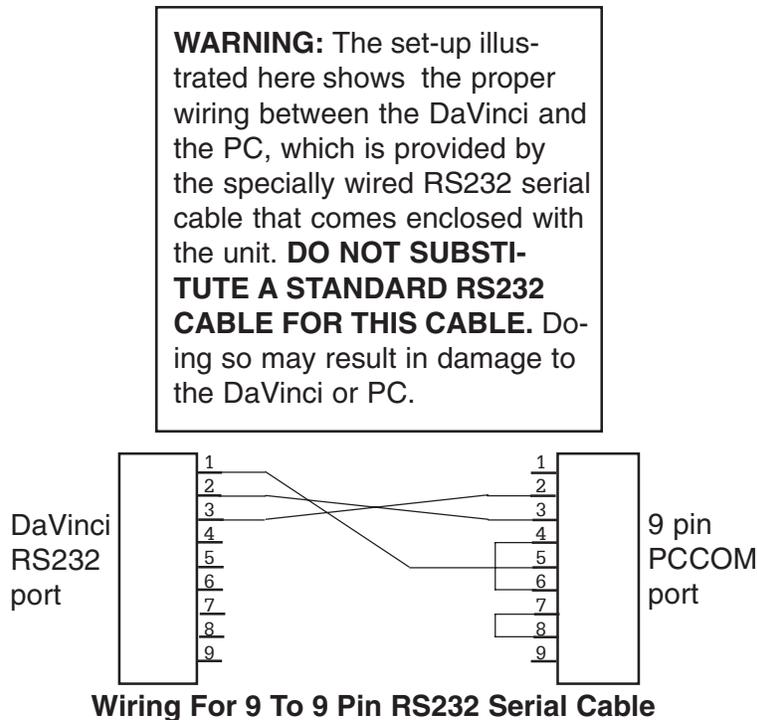


Diagram 5: Wiring Set-Up Between DaVinci And PC

The DaVinci uses a three-wire serial communication system (transmit, receive, ground). Jumpers between pins 4 and 5, and between 6 and 20, can be used to disable hardware handshaking. The Techno controller card is configured as a DTE system and the computer (PC) host is assumed to be a DCE system (i.e., pin 2 sends information and pin 3 receives information). The serial controller makes use of standard circuits and will operate with most PC's. The PC should be configured as a DCE device.

The communication parameters require the following settings:

- 9600 Baud
- 8 Bits
- 1 Stop bit
- No Parity

Switch Settings

Switch settings for the baud rate and the acceleration rate may be changed, if necessary. There are two switches for the baud rate, and two for the acceleration rate. All four switches are found on the same DIP switch, which is located on the left leg of the DaVinci, behind the panel. (See diagram 6 below.)

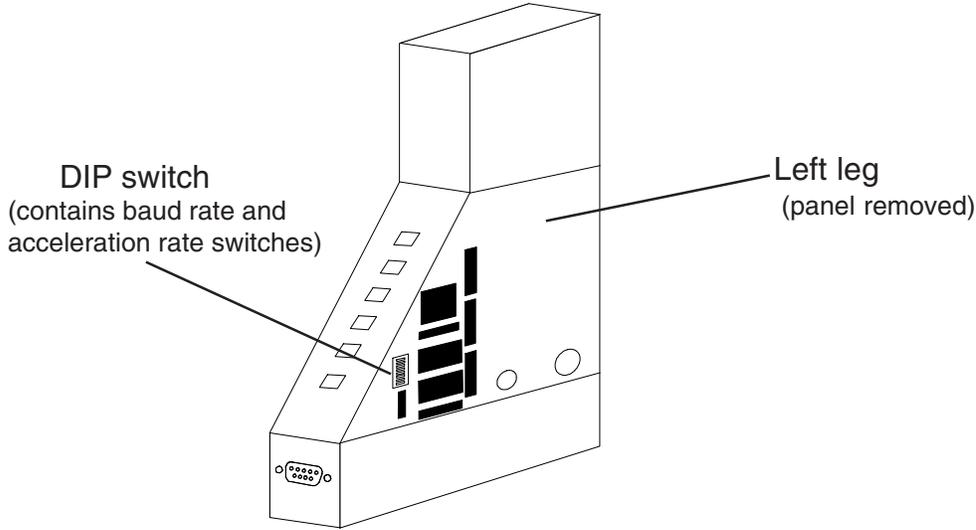


Diagram 6: DIP Switch For Baud And Acceleration Rates

The DIP switch contains eight switches: 1 and 2 set the baud rate, 3 and 4 set acceleration, and switches 5 through 8 are non-functional.

Adjusting The Baud Rate

The position of switches 1 and 2 determine the communication speed, or *baud rate*. For the default setting of 9600 baud, switch 1 is OFF, and switch 2 is ON. A setting of 4800 baud requires switch 1 to be ON, and switch 2 to be OFF. (Refer to Diagram 7 below.)

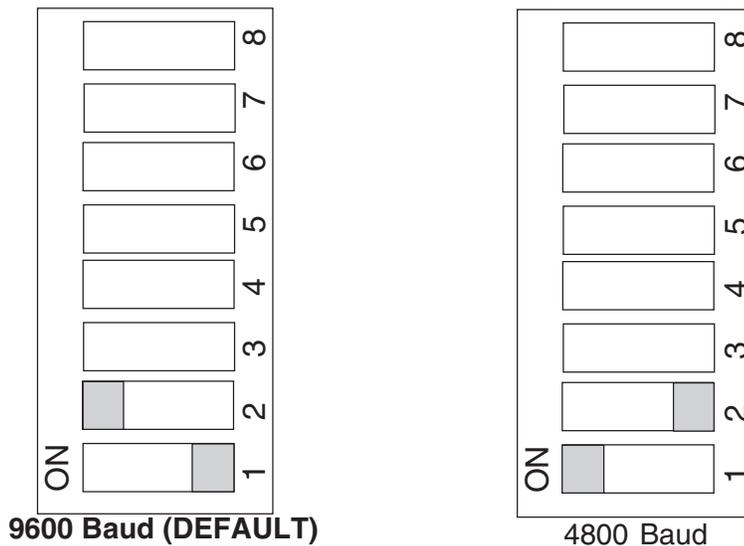


Diagram 7: Baud Rate Settings

Adjusting The Acceleration Rate

The position of switches 3 and 4 determine the *acceleration rate* for all motors. For the default setting of 75 Hz/ms, switch 3 is ON and switch 4 is OFF. Other acceleration rate settings require different combinations of switch positions. (Refer to *Diagram 8* below.)

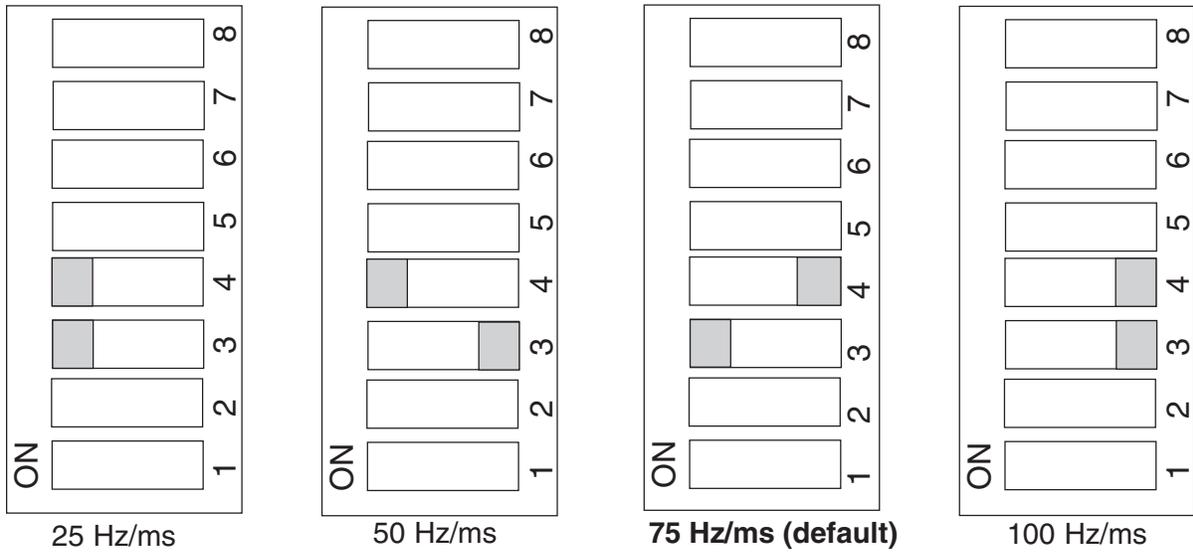


Diagram 8: Acceleration Rate Settings