APEX-HPGL User's Manual

Controller Models HP2 and HP3

Revision 21

Newing-Hall, Inc.
2019 Monroe Street
Toledo, Ohio, 43624
NH Part # 3011001

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Chapter I – Installation

1.1 Upon Receipt of Shipment

Shipping Box

Check the shipping box for damage. If any damage is found, it is important, for insurance purposes, to indicate this on the freight company's bill of lading before accepting shipment. Call Newing-Hall's Customer Service at 1-800-521-2615 to report any damage.

Unpacking

Open shipping carton carefully and remove all boxes. DO NOT DAMAGE SHIPPING CARTONS! Items returned to the factory for service must be shipped in their original containers, and packed according to applicable instructions provided.

Check the packing list to see that all items have arrived. Call Customer Service if there is a discrepancy.

1.2 Installing the HPGL Controller

Assembly – For Tables without Pedestal

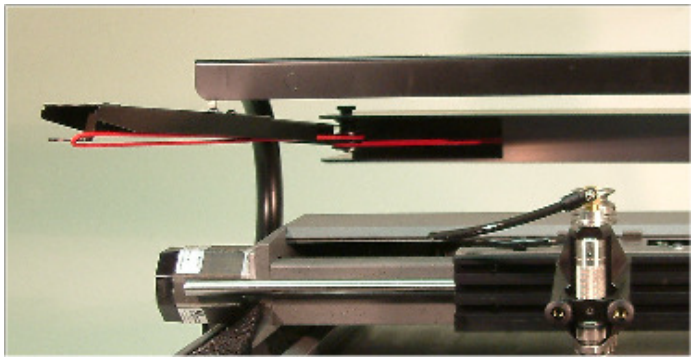
Procedure

1. Unpack the table and place on a secure surface. Remove the plastic tie straps and bridge block.
2. Unpack the controller from its carton.
3. Two 1-inch nylon set screws are installed diagonally on the controller. Using these setscrews as guides drop the guides through the controller screw holes on the bracket.

4. Attach two of the button head cap screws (10-32 x 3/8) to the controller and secure using the Allen wrench.

5. Remove both nylon set screws.
6. Attach the remaining button head cap screws (10-32 x 3/8) to the controller and secure using the Allen wrench.

NOTE: A small magnet is located on the left side of the controller bracket. This magnet is used to secure the rotary drive when not in use. When attaching the rotary drive use the screws located in the center of the front drive arm.

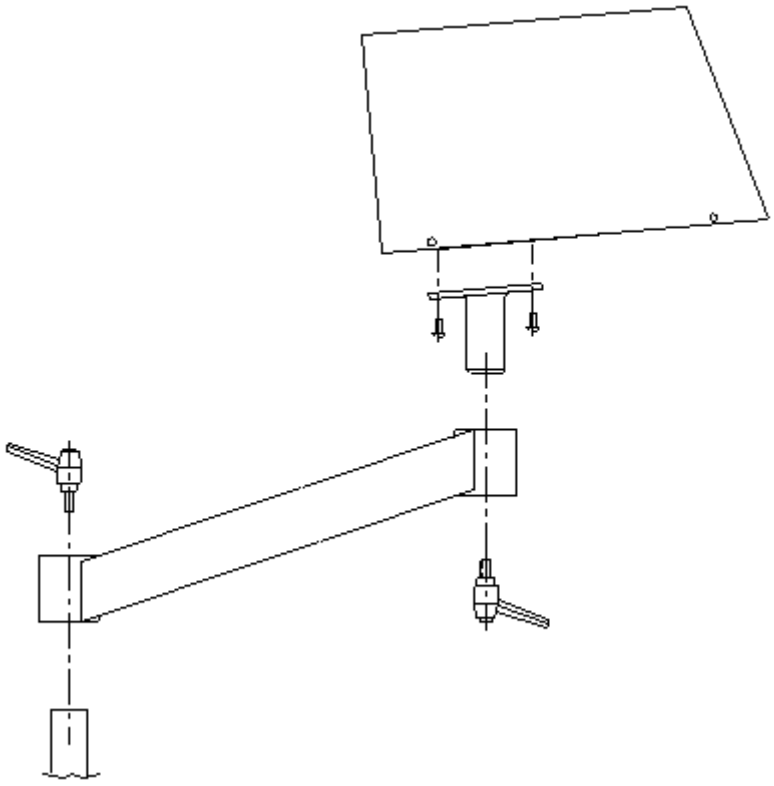


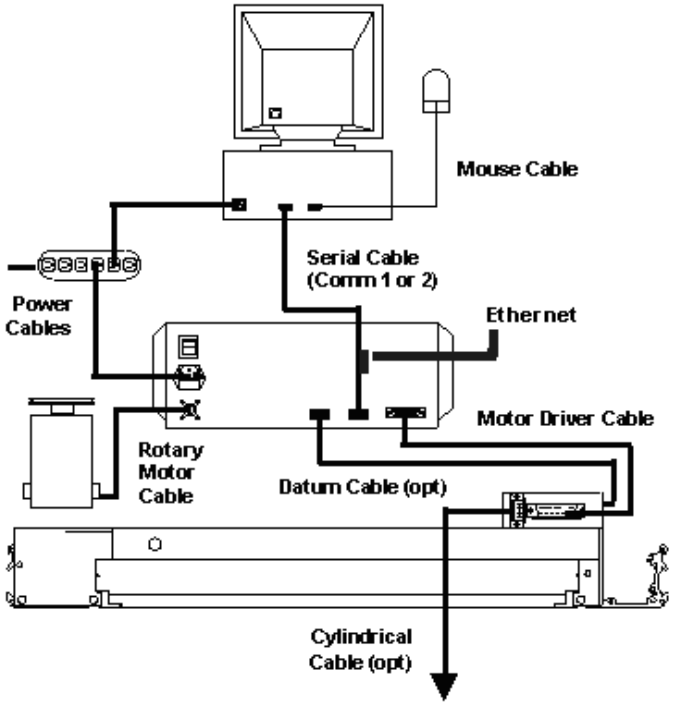
Assembly – For Tables with Pedestal (400 or 600)

Remove the APEX-HPGL controller from its carton and carefully place the controller upside down, facing you, on a stable, protected surface near the engraving table.

Locate the controller bracket and align the holes in the bracket with the four (4) tapped holes on the bottom of the controller. Secure the bracket to the controller making sure that the angle of the bracket post is toward the rear of the controller.

Assemble the controller arm to the mounting post located to the left rear of the pedestal and secure it with the lever knob. Attach the controller to the arm and secure it with the remaining lever knob.





Cable Connections

Be sure that the AC power to the HPGL controller and the host computer is OFF before connecting any cables. Connect the cables as follows:

1. Connect the 9-pin RS232 cable to the HPGL 9-pin serial port on the back of the controller or use a Ethernet cable to connect to your network or pc (if equipped with an Ethernet port on the HPGL controller).
2. Connect the remaining end of the 9-pin RS232 cable to the computer's serial port (COM 1 or COM2) if using serial.
3. Connect the 25-pin Motor Driver cable to the HPGL motor driver port on the back of the controller.
4. Connect the remaining end of the 25-pin Motor Driver cable to the NH engraving table.
5. Connect the free end connector on the end of the rotary motor power cord to the HPGL rotary motor power connector on the back of the controller.

Note: You can use serial or Ethernet for communications – you can not use both. THE HPGL CONTROLLER IS SUPPLIED WITH A CROSSOVER NETWORK CABLE. IF YOU PLAN ON USING THE HPGL CONTROLLER USING A NETWORK WITH A HUB OR SWITCH YOU MUST USE A STRAIGHT THROUGH NETWORK CABLE.

For tables with Datum sensors fitted …

6. Connect the 15-pin DATUM cable to the HPGL 15-pin DATUM port on the back of the controller.
7. Connect the remaining end of the 15-pin DATUM cable to the NH engraving table.

Note: On current production tables the LED's are powered through the datum cable.

The LAST step is to connect the standard AC power cord to the HPGL main power connector to the controller. Connect the remaining end of the power cable to a standard wall outlet.

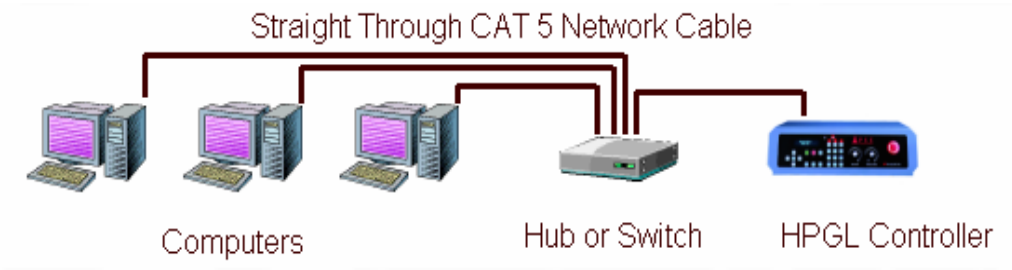
Installing and Configuring Ethernet

Requirements:

Controllers with Ethernet capability will have an external Ethernet connection on the back of the controller located above the serial port.

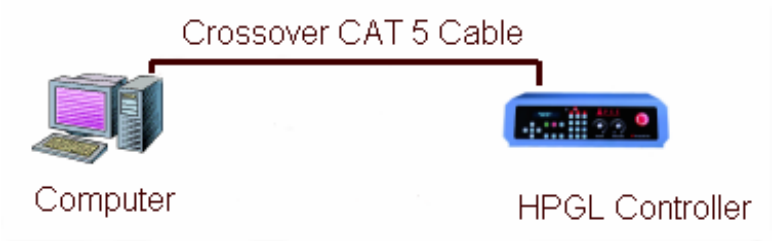
Network Setups:

Network setups can be very simple or complex. If you have a network administrator it will be advisable to seek their expertise. There are a number of ways to attach the HPGL controller to a network. The first setup uses a hub or switch. Every connection made on the network connects directly to the hub or switch. The wiring to the hub or switch is a straight through CAT 5 network cable. The diagram below will illustrate this.



(Using a Hub or Switch)

If a network is not present at the location an indirect connection from the computer to the HPGL controller is possible. This involves one network interface card in the computer or laptop and a special network cable called a crossover cable that plugs directly into the HPGL controller. A crossover cable is necessary if you connect two network devices without the use of a hub or switch. The diagram below will illustrate this:

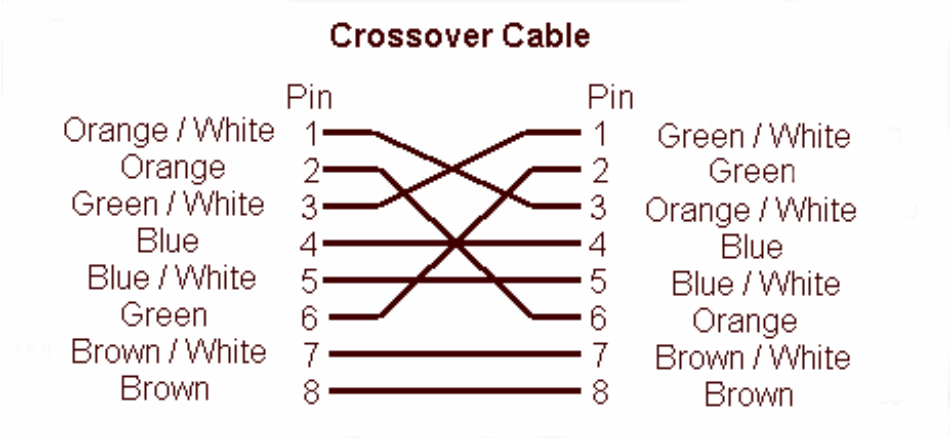


(Direct Connection)

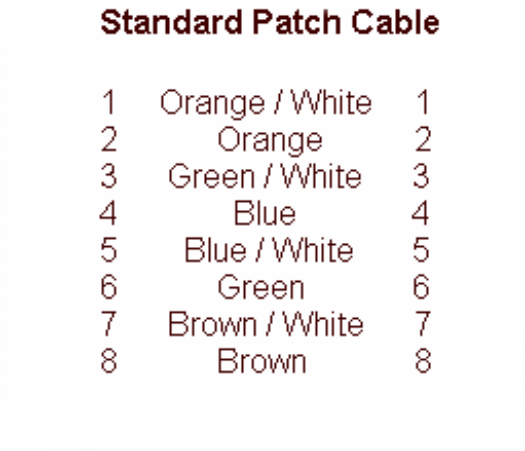
Cable Wiring:

Both types of network cables (crossover & straight though) can be purchased at computer supply locations. It is also possible to create your own cables if you have the supplies and equipment.

Below are the pin outs for the crossover & straight through cables:



Notes: Hold the RJ45 connector with the clip on the bottom. Have the opening facing you.



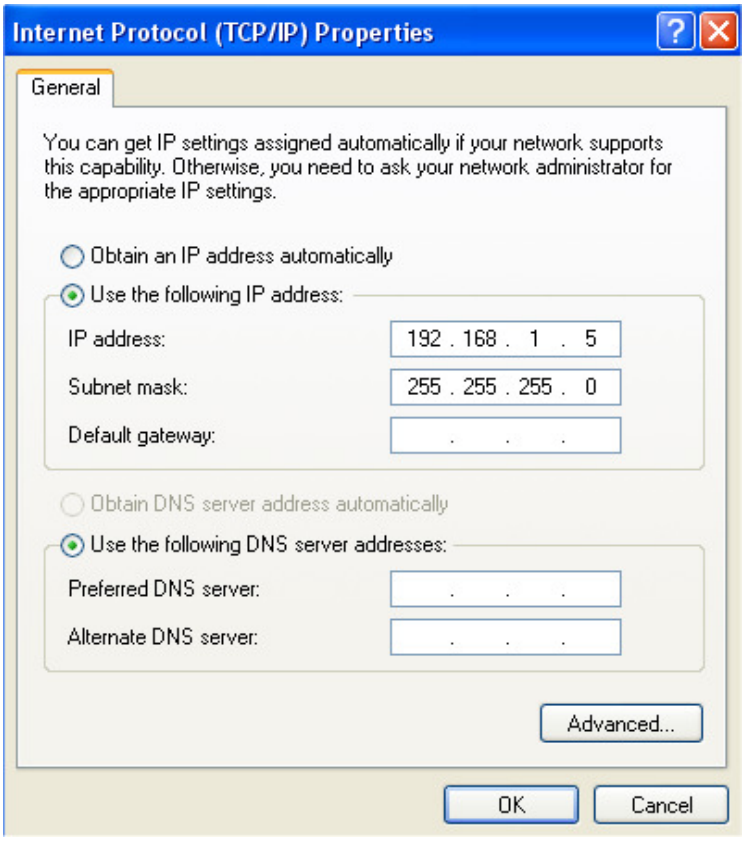
Software Setup:

Once the HPGL controller is physically connected to a HUB or directly to the controller using a crossover cable the software environment must be set. The following example uses a crossover cable directly connected to the pc and controller. NOT EVERY POSSIBLE CONFIGURATION IS SHOWN. Two Examples are provided below:

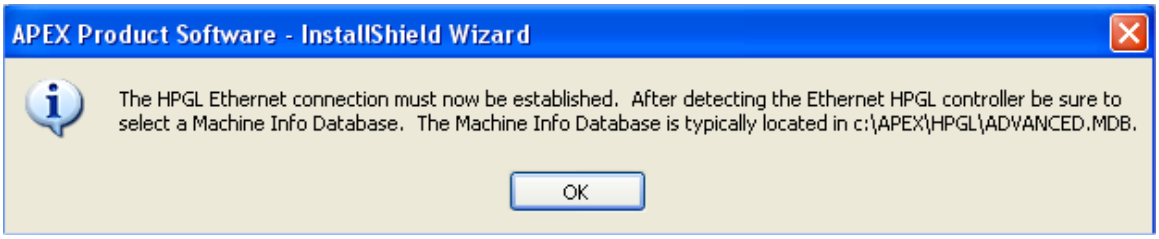
Example 1: Direct Connection Example Configuration Using the Supplied Crossover Network Cable (no network switch or hub)

1. Turn on the Computer and HPGL controller. Verify the Link light is on the PC or HUB.

2. Configure the network interface on the computer. Note: If you have network administrators seek their expertise.
3. Open the Control Panel.
4. Select the Network and Internet Connections link located in the control panel.
5. Next select Network Connections.
6. Right click Local Area Connection and select properties.
7. Double click TCP/IP in the text box.
8. Enter the following settings. These settings are generic and can not support every possible configuration: IP Address = 192.168.1.5 Subnet mask = 255.255.255.0



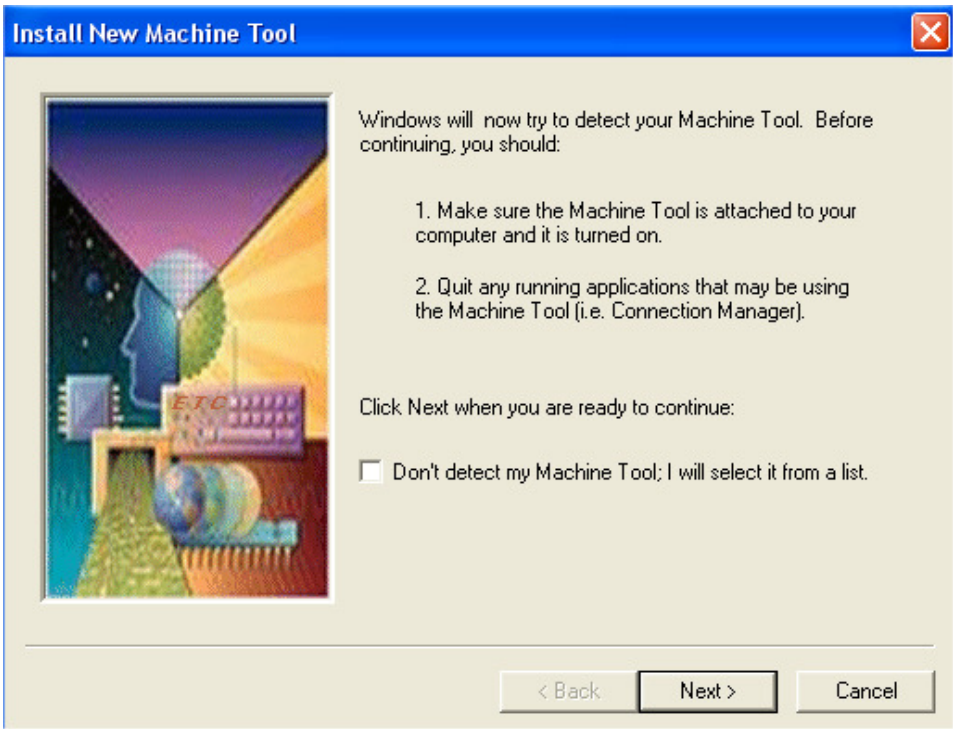
9. Press ok to dismiss the dialog box and save the settings.
10. Install APEX Product Software and Select the Ethernet Connection under HP3. (If APEX Product Software is already installed open the Machine Tools applet in the control panel to setup a machine connection.)
11. At the very end of the APEX Product Software installation a dialog box will pop up reminding you to select a DBI database once the Ethernet connection is made. The DBI database is typically located in the c:\apex\hpgl directory. The name of the file is advanced.mdb.



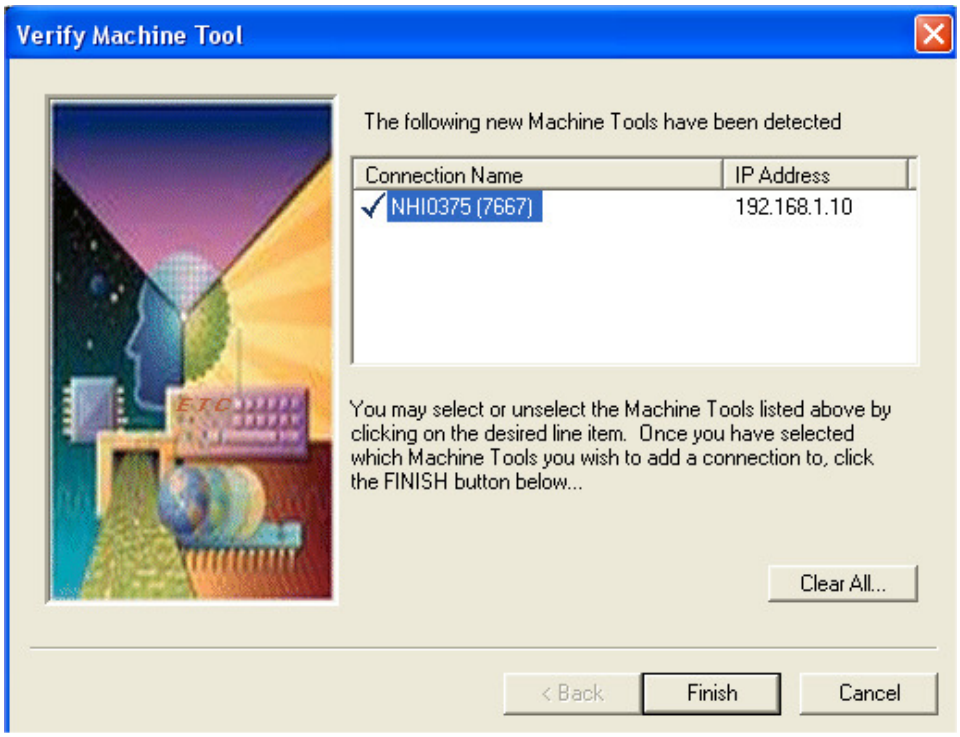
12. Press ok to dismiss the popup. If you see the following dialog press “Unblock” to allow the program to search the network.

13. In the Machine Tool Properties (also located in the control panel) press Add to add a new Ethernet connection.

14. After you press the Add button, a search dialog box will be displayed.



15. Press Next to discover the HPGL controller.
16. After scanning the network it will display the HGPL controllers located on the network.

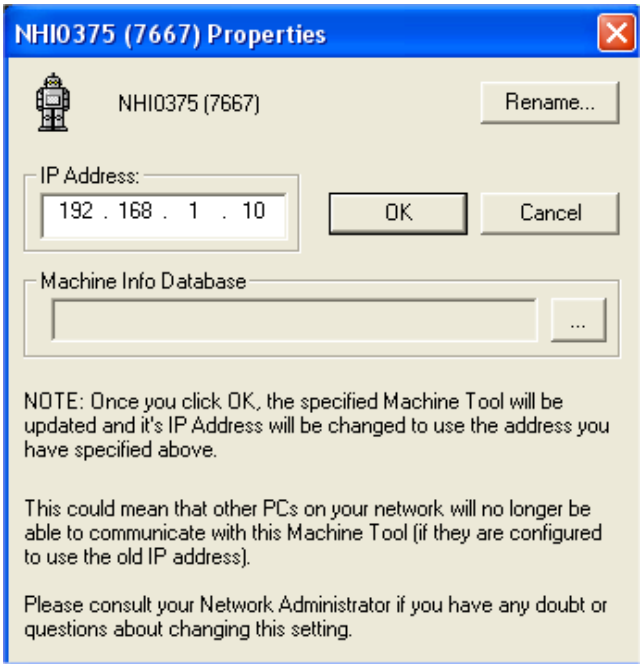


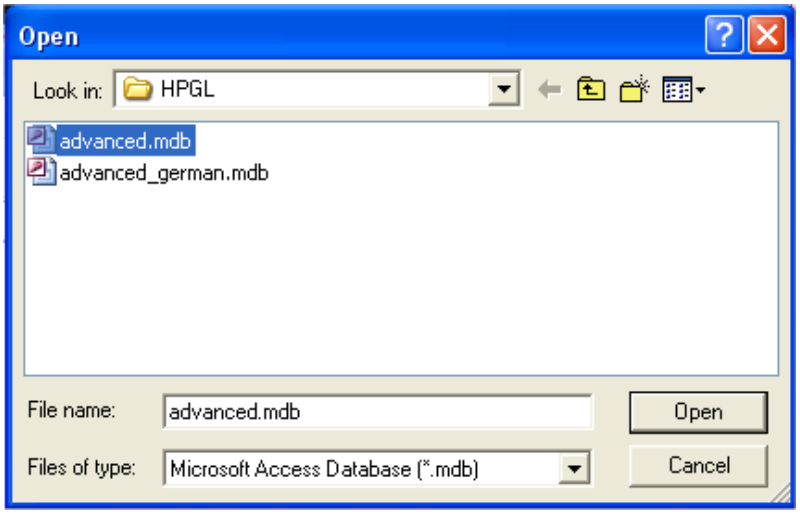
17. Highlight the controller and press Finish. Note: Every controller has a unique number. This number is the last four digits of the controller's serial number.

Note: The controllers IP address can be set by DHCP or manually. If the IP address is set manually the user can set the IP address from the controllers menu. Otherwise the IP address will be set at the time of installing a new machine tool.

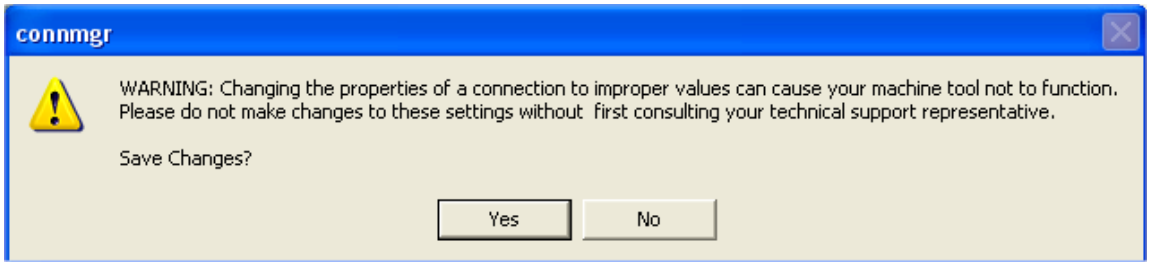
18. Highlight the newly made connection and select properties.

19. Select the Machine Info Database for this connection. The Machine Info Database is called advanced.mdb and is typically located c:\apex\hpgl.





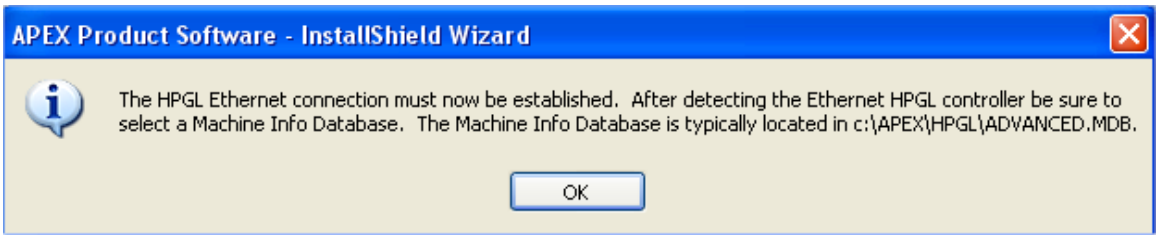
20. A dialog box will prompt you if you want to save changes – select Yes.



21. The HPGL controller is now configured with an IP address and now is ready to be used by Job Server. For information regarding Job Server consult the online help.

Example 2: Network Connection Example Configuration (using a switch or hub, DHCP enabled)

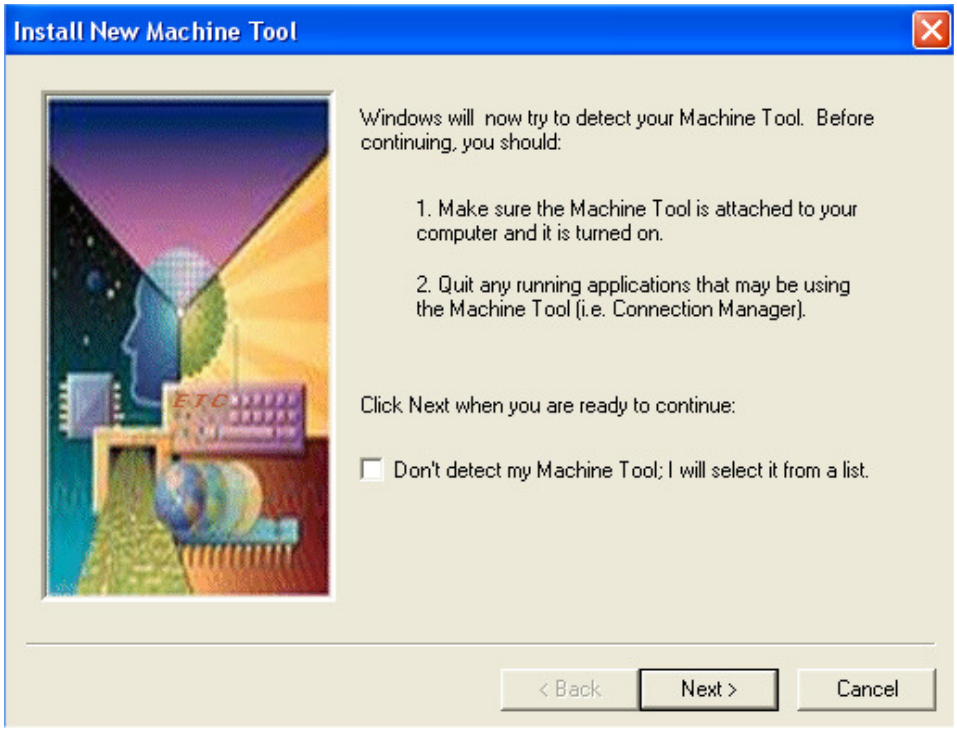
1. Turn on the Computer and HPGL controller. Verify the Link light is on the PC or HUB.
2. If DHCP is enabled the controller will have received an IP address from the DHCP server. To verify this select [Enter] from the controller followed by Ethernet Settings. Select Display IP – If the controller received an IP address it will be shown. Press [Cancel] three times to exit the menu system.
3. Install APEX Product Software and Select the Ethernet Connection under HP3. (If APEX Product Software is already installed open the Machine Tools applet in the control panel to setup a machine connection.)
4. At the very end of the APEX Product Software installation a dialog box will pop up reminding you to select a DBI database once the Ethernet connection is made. The DBI database is typically located in the c:\apex\hpgl directory. The name of the file is advanced.mdb.



5. Press ok to dismiss the popup. If you see the following dialog press "Unblock" to allow the program to search the network.

6. In the Machine Tool Properties (also located in the control panel) press Add to add a new Ethernet connection.

7. After you press the Add button, a search dialog box will be displayed.



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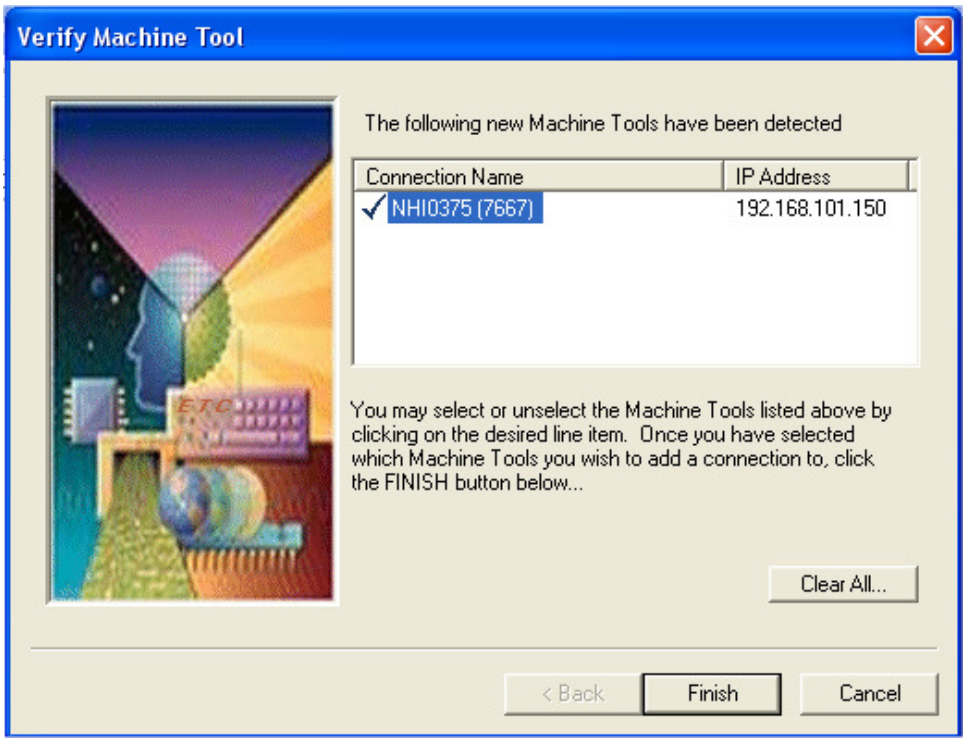

10. Highlight the controller and press Finish. Note: Every controller has a unique number. This number is the last four digits of the controller's serial number.

    Note: The controllers IP address can be set by DHCP or manually. If the IP address is set manually the user can set the IP address from the controllers menu. Otherwise the IP address will be set at the time of installing a new machine tool.

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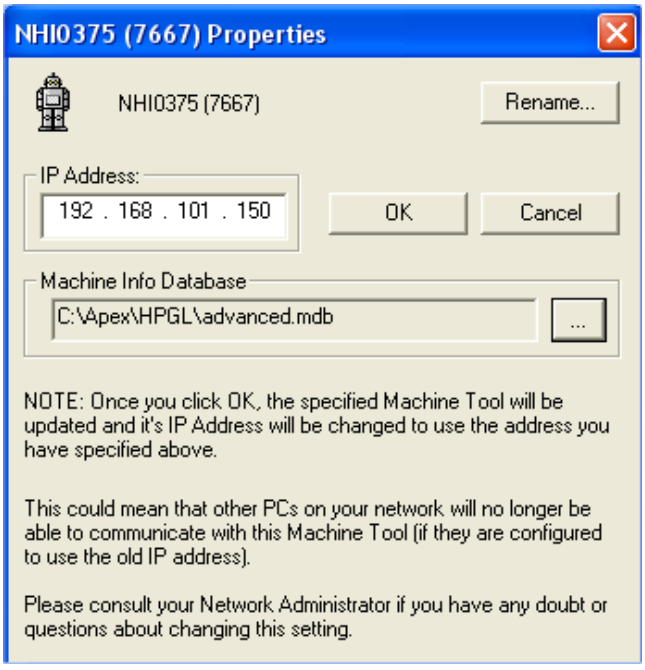
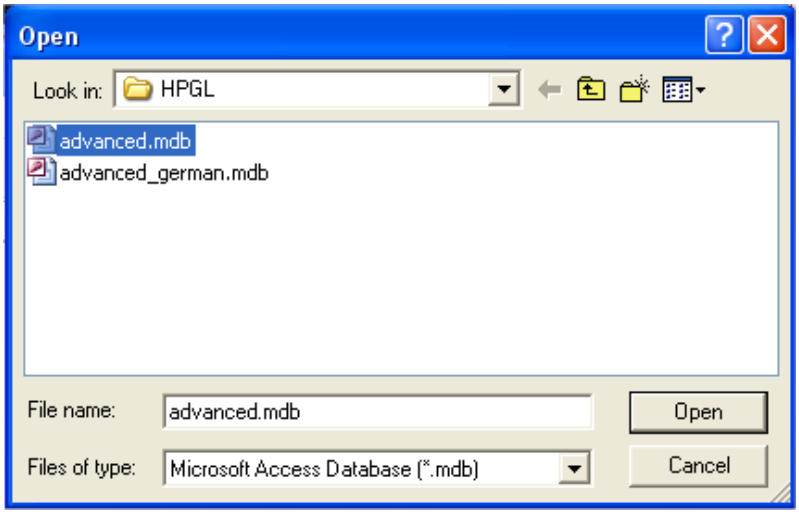
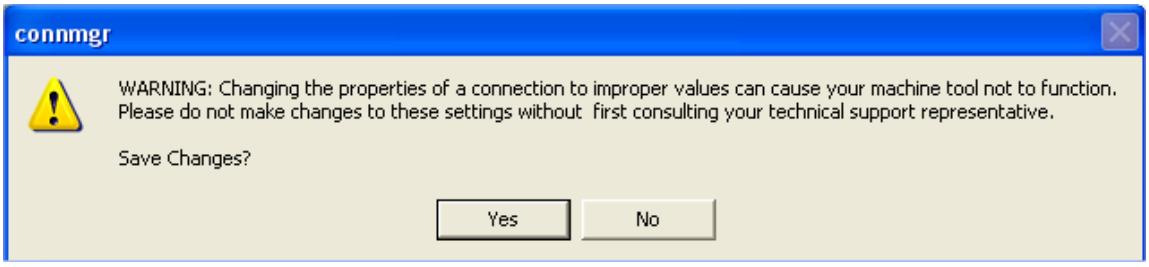




13. A dialog box will prompt you if you want to save changes – select Yes.



14. The HPGL controller is now configured with an IP address and now is ready to be used by Job Server. For information regarding Job Server consult the online help.

Controller Test

To verify that the controller is in working order:

1. Turn on the POWER switch on the rear of the HPGL controller. The START light will blink when the HPGL completes its power-on self-test diagnostics. If the datum cable is plugged in the LED's should be on, which are located under the T-slot of the table.
2. Press the [Drives] button to activate the motors.
3. Press the [Datum] button to datum the machine (if datum switches are fitted/enabled on your machine).
4. Press the jog ([⇧], [⇩], [⇦], [⇨]) keys on the left side of the HPGL front panel. The bridge should move accordingly. If there is no movement, check to see if the Emergency Stop button is depressed. Rotate lightly to disengage the Stop button if activated, and then go back to step 2. Also check for loose cable connections.
5. To test the rotary spindle motor, press the [SPDL] button. Rotate the "Spindle Speed" knob from 0% to 100%. The rotary motor should rotate accordingly. If it does not, check the cable connections.
6. To test the controlled Z-axis spindle actuation (if fitted):

- Place a piece of scrap plastic material under the nose of the spindle to act as a cushion and protect against cutter damage.

- Press the [Digitize] button.
- Press [⇧] and [⇩] repeatedly to jog the tool up and down, and then jog the tool down until it just touches the material surface.
- Press the [Digitize] button again to set the surface. The tool will retract after the surface is set.

7. To test the pneumatic spindle actuation (if fitted):

    - Place a piece of scrap plastic material under the nose of the spindle(s) to act as a cushion and protect against cutter damage.
    - Press the [Test Sol] button.
    - Press [AUX1/L] repeatedly to actuate the (L)eft spindle.
    - Press [AUX2/R] repeatedly to actuate the (R)ight spindle.
    - During testing, turn the adjustment screw on the top of the spindle air cylinder to adjust the down travel speed (see Chapter 1 in the JLS User's Manual for more detail).
    - Press the [Test Sol] button again to exit the test mode.

1.3 Installing the APEX Product Software

The APEX Product Software is distributed on a single CD. It has an automated installation process that makes installation fast and easy. It is also possible to download the APEX Product software of other components via the Newing-Hall web site at the following address www.newing-hall.com.

To install the APEX Product Software:

1. Start the host computer, and then start Windows™.
2. Insert the CD into the CD-ROM drive. The remaining instructions assume that the CD-ROM is **drive d:** but you can substitute any other drive designation.
3. In Windows™ 9x, Windows™ NT 4.x, Windows 2000 and Windows XP from the start menu select 'RUN'. Note: If installing on Windows™ NT it may be required that the administrator install the APEX Product Software depending on user rights.
4. Select the RUN command. In the space provided type: **d:\setup** [Enter].
5. After a short pause - Install Shield® will guide you through the installation process. Note: The installation process is 32-bit and will not install on Windows™ 3.x.
6. Enter/accept the default destination path. It is recommended to use the default destination path c:\APEX.
7. Read the README file at the start of the procedure to get additional information about the version of APEX Product Software that you are installing.
8. Answer the questions prompted by Install Shield®.
9. When completed, Install Shield® will prompt to reboot the computer if necessary.

NOTE: Install Shield auto configures all software during the installation - no other configuration should be necessary.

Chapter II – Quick Start

2.1 Turning on System Power

CAUTION: Please refer to Chapter I - Installation for instructions to assemble the system and connect the cables before turning on the power to the APEX-HPGL controller.

The power switch is located on the back of the controller, on the left side (when viewed from the back). Press the switch to turn on the power. After a few moments the "POWER" LED will light, and the "START" LED will flash, indicating that the HPGL controller is ready.

2.2 System Checkout

To verify that the system is operating correctly:

1. Verify all cable connections, as described in the previous chapter.
2. Turn the controller ON and wait for the "START" LED to blink.
3. Gently rotate the Emergency Stop button clockwise to disengage it.
4. Press the [Drives On] button to enable motion on the table.
5. Press the Jog keys, moving the carriage in all directions in order to verify system operation.
6. **If the table has Datum's** fitted, press the [Datum] key. The system should move to Datum and park.

2.3 JLS Software Setup

The following text assumes that the APEX Product Software (CD-ROM) has been installed on the host PC. If this has not been done, please refer to Chapter 1.

To setup APEX-JLS software to drive the HPGL, consult Chapter 6 - "Machine Configuration", in the APEX Reference Manual. The following is a brief summary:

1. Select the Setup command from the Execute menu.

2. If necessary, create an HPGL driver:

    1. Click on the [Add] button.
    2. Enter a "group name", such as "HP2" or "HP3" and click [OK].
    3. Click on the [Setup] button.
    4. Set the parameters:

Parameter	Setting
COMM	COMM 1 or COMM 2, as desired
Baud Rate	57600
Parity	Even
Data Bits	8
Stop Bits	1
Flow Ctrl	Hardware
Resolution	1/1000"

    5. Enter any desired HPGL command codes that should follow after the completion of EACH work file in the Send after edit window (usually none).
    6. Click on [OK] to complete the definition.

3. Click on the [Set as Default Machine] button.

4. Click on the [Close] button to complete the process.

2.4 Creating the Work File

Consult the APEX Reference Manual for details on operating the JLS software. The following is a summary of how to create a simple job:

1. Select the New command from the File menu.
2. Enter the desired Plate size (Height and Width).
3. Click on the [Simple Job] button.
4. Select the desired font (if necessary).
5. Click in the Text window, and enter the desired text. A new line will be created each time you press the Enter key.
6. Select the Tool Box command from the Execute Menu.
7. **If using a controlled-Z spindle, be sure to carefully set the appropriate depth.**
8. Verify all the toolbox settings and click [OK].
9. Click on [OK] to complete the process.

2.5 Executing the Work File

To begin engraving the work file:

1. Position a piece of material on the table (appropriate size).
2. Jog the tool into position over the upper-left portion of the material.
3. In JLS, select the Machine command from the Execute Menu.
4. Click on the [OK] button to transmit the work file for engraving.
5. When the "START" LED flashes, press the [Start] button
6. **If using a controlled-Z spindle**, set the material surface:

- Verify that the controller menu shows "Digitize Surface"
- Hold the central "Z" key, and carefully jog the tool down until the point just touches the material surface.
- Press the [Digitize] key.

Notes: During job transmission, the "START" LED will blink at medium speed.

Motion Mechanic must be closed if APEX-JLS is used to direct drive the APEX-HPGL controller.

Chapter III – Operations

3.1 Control Panel Operations

This section details the **control panel operations** for the HPGL controller. Some control panel keys have dual function, based on the current mode of operation when the key is pressed.

Numeric Data Entry

Entering numbers for the purpose of defining operating characteristics of the controller is achieved by pressing the appropriate number keys on the numeric keypad (supported on HP3 controllers only). These keys are dual-function, which means that they act as numeric keys (during numeric data entry modes) in addition to their normal functions. The controller switches to "numbers" instead of "functions" as appropriate.

When prompted to enter a number, simply press the corresponding numeric key sequences, followed by the [Enter] key. For example, entering the number "3.14" (e.g. feed rate) is done like this:

1. Press [3] *(shares the [DATUM] key)*
2. Press [.] *(Shares the [+VST] key)*
3. Press [1] *(shares the [SET HOME] key)*
4. Press [4] *(shares the [TEST SOL] key)*
5. Press [Enter]

To change the sign of a number, press [+/-]. Press [+/-] again to change to the opposite sign.

To abandon the current entry, press [Cancel].

Numeric data entry (and its corresponding keys) is not supported on HP2 controllers. This means that HP2 does not recognize the following keys:

- Numeric keys [0]-[9]
- [Enter] Key
- [+/-] Key
- [.] Key

Jog Keys

The Jog keys are the four arrow keys at the left side of the control panel. These keys are used to move the tool manually.

- [⇧] Causes the tool to move toward the back of the table.
- [⇩] Causes the tool to move toward the front of the table.
- [⇦] Causes the tool to move to the left.
- [⇨] Causes the tool to move to the right.
- [**Z**] Causes the [⇧] and [⇩] keys to move the Z spindle up and down, respectively (HP3 controllers only).

On HP3 controllers, the Jog Keys also navigate the on-board menu system. See the next section for details.

Jog Turbo Key

Pressing [Jog Turbo] while holding one of the directional jog keys causes the tool to move much faster than the normal jog rate. This is useful for traversing a large distance over the work material.

Start Key

Pressing the [Start] key causes the APEX-HPGL to begin executing the program in memory. The [Start] key can be used to start a job from the beginning, or to re-start the job from its current position after stopping (see below).

Stop Key

Pressing the [Stop] key causes tool motion to stop. Stopping is controlled, and so positional accuracy, and Home is retained. Press the [Start] key to resume motion.

Cyl/Flat Key

Pressing the [Cyl/Flat] key causes the APEX-HPGL to switch internally between its standard flat x-axis and its rotary axis. After pressing the [Cyl/Flat] key, the cylindrical LED will light - indicating that the controller is in cylindrical mode. Pressing it again switches the controller back to flat mode, and the light is disabled.

Cancel Key

The Cancel key removes the current program from the APEX-HPGL's memory*. This does not reset or erase its HOME position, so the [Go To Home] key can still be used after the job is cancelled.

*After canceling a job, pressing the [Start] key results in no movement, and all remnants of previous programs are erased.

The [Cancel] key also abandons a selection or numeric entry (HP3 only).

*Note: If the job engraves successfully then it is retained in memory. This is useful if the job needs to be engraved again without re-transmitting the job to the controller. To completely clear the memory press [Cancel] twice to purge the job.

Enter Key

On HP3 systems, pressing the [Enter] key accepts the selected item in the on-board display (see next section, HP3 Menu, for details).

Note: The [Enter] key is not supported for HP2.

SPDL (7) Key

Pressing this key energizes the rotary spindle motor circuit based on the current setting of the Spindle Speed Control causing the rotary spindle motor to turn. Simultaneously adjusting the Spindle Speed Control will allow you to tune the motor to the desired RPM's before engraving.

Aux1 (8) / Aux2 (9) Keys

Pressing the [Aux1] and [Aux2] keys enable user-outputs Auxiliary 1 and Auxiliary 2, respectively. These auxiliary outputs can be connected to control external functions, such as chip removal and cutting fluid application.

Test Sol (4) Key

This key is used in conjunction with AUX1/L and AUX2/R to actuate the solenoid circuitry for the left and right (pneumatic) spindles, respectively.

To actuate a pneumatic spindle:

1. Press and HOLD the [Test Sol] key.
2. To actuate the Left spindle, press the [Aux1/L] key.
3. To actuate the Right spindle, press the [Aux2/R] key.

DNC (5) Key

The Direct Numeric Control (DNC) function allows the user to select from available job files on the host computer.

To use DNC:

1. Press [DNC].
2. Scan the list of displayed jobs using the arrow keys.
3. Highlight the desired job.
4. Press [Enter] to load the job, or [Cancel] to abort.

Digitize (6) Key

Pressing the [Digitize] key establishes the material surface (HP3 only). This is necessary in order to establish an accurate depth of cut for systems with a stepper-controlled Z-axis. To "digitize the surface", use the following method:

1. Insert the cutting tool into the Z-spindle and tighten.
2. Press the [Digitize] key.
3. Jog the tool down until the point of the tool barely touches the material surface.
4. Press the [Digitize] key again. The tool will retract to the Home position.

If the material surface is undefined when the user presses [Start], the HP3 automatically prompts the user to digitize the surface.

Set Home (1) Key

Pressing the [Set Home] key causes the system to reset its origin to the current position of the tool. The new origin, or (0, 0) position is established, and all movement is relative to the new origin. See section 6.9 for more on the HOME position.

Go Home (2) Key

The [Go Home] key causes the system to move to its previously established (0,0) position. This Home is established using the [Set Home] key, above. See section 6.9 for more on the HOME position.

Datum (3) Key

The [Datum] key is used to drive the tool to its physical origin, or Datum point. This function is only applicable for engraving tables with datum sensors fitted (either integral or add-on).

Drives Key

The [Drives] key activates the internal power circuitry, which delivers power to the internal stepper motor drives, the rotary spindle drive, and the solenoids.

The [Drives] key must be pressed immediately after power-on and after using the Emergency Stop button in order to re-activate power to the system to allow it to engrave.

VST (0) Key

The [VST] key activates the HPGL controller's Vector Search Technology in order to backup or skip through a job. This function searches for the nearest vector/point in the job and re-starts engraving at that point. To use the VST, follow this procedure while running a job:

1. Press [Stop]. The START LED blinks slowly.
2. Jog the tool to the desired restart location.
3. Press the [VST] key.

4. **If the search was successful**, the tool will snap to the new vector, the START LED will resume a slow blink, indicating that a vector was found, and the controller is ready.
5. Press [Start] to resume execution at the new point.

See section 3.4 "Vector Search Technology" for details.

+VST (.) Key

This key has two functions. The first function:

The [+VST] key re-activates the HPGL controller's Vector Search Technology if the initial search was unsuccessful. To use the [+VST], follow this procedure while running a job:

1. Press [Stop]. The START LED blinks slowly.
2. Jog the tool to the desired restart location.
3. Press the [VST] key.
4. **If the search was unsuccessful**, the controller will issue a fast blink sequence, and then stop blinking altogether.
5. Press [Start] to resume the search from another position.
6. Press [+VST].
7. Go back to step 2.

This key will delete Local DNC jobs while in the Local DNC menu. To delete a job in the controllers flash memory Enter Local DNC by pressing DNC on the controllers front panel. Using the curser select the job you wish to delete. Pressing the [+VST] key will delete the job. A confirmation will be displayed to verify deletion of the selected job. Press Enter to delete or Cancel to abort.

Feed Rate Control

The Feed Rate control is a rotary dial that establishes the maximum feed rate for engraving. Turning the dial counter-clockwise reduces the feed rate, and turning the dial clockwise increases the feed rate.

The Feed Rate control may be operated during motion to fine-tune the tool speed for optimal engraving.

Spindle Speed Control

The Spindle Speed control is a rotary dial that establishes the RPM speed of the rotary motor. Turning the dial counter-clockwise reduces the RPM (all the way to full stop at the extreme counter-clockwise position). Turning the dial fully clockwise sets the RPM to maximum speed.

The Spindle Speed control may be operated during motion to fine-tune the spindle speed for optimal engraving.

Emergency Stop Button

The Emergency Stop button immediately stops all motion by removing power from the system. This action disables the system for emergency purposes, meaning the drive power can only be restored by pressing the [Drives On] key (see above).

Note: Emergency Stop button must be disengaged by lightly rotating it clockwise before [Drives On] will function.

CAUTION: This button should be used for emergency stopping ONLY, since it will cause the system to lose its home position, which does not allow recovery by pressing the [Start] key.

LED's

The LED indicators monitor the operating status of the HPGL controller.

LED	Function
START	ON during system operation. See below for details.
STOP	ON when the system is paused (stopped).
CYL/FLAT	ON when the system is in CYLINDRICAL mode.
KEY	ON when a key is pressed.
POWER	ON when the controller (power) is ON.
SPDL	ON when rotary spindle drive motor is energized.
AUX1	ON when AUX1 is enabled.
AUX2	ON when AUX2 is enabled.

The APEX-HPGL controller reports the following conditions via LED:

START LED	Condition
Steady Off	**No action/error.**
Slow Blink	**Engraving Paused** - Press [Start] to resume.
Medium Blink	**Ready To Start** - Press [Start] to begin.
Fast Blink (After pressing [Start])	**No Job Available** to execute.
Fast Blink (at power-up)	**Drives Disabled** – Check cabling, pullout E-Stop switch, Press [Drives On].
Steady On	**Executing/Running**.

3.2 HP3 Controller Menu

The HP3 controller has an **operating menu** that provides access to additional features. (The menu is not supported on HP2 controllers.)

Jog Keys (Up/Down)

The up/down jog keys, [⇧] [⇩], are used to select menu frames in the menu system.

The **[⇩]** key moves from the currently selected menu item/function to the **next** item/function.

The **[⇧]** key moves from the currently selected menu item/function to the **previous** item/function.

Jog Keys (Left/Right)

The left/right jog keys, [⇦] [⇨], are used to select menu items in the menu system.

The **[⇦]** key moves from the currently selected menu item/function to the **previous** item/function. Pressing the [⇦] key at the beginning of a menu frame will invoke the previous menu frame.

The **[⇨]** key moves from the currently selected menu item/function to the **next** item/function. Pressing the [⇨] key at the end of a menu frame will invoke the next menu frame.

Enter

The [Enter] key accepts the currently selected item displayed on the LCD. It is most common uses are:

1. To invoke the controller's menu system from the main "Newing-Hall" display. (Pressing [Enter] at the main screen will recall the previously visited menu frame.)
2. To activate/initiate the currently selected menu item/command.
3. To accept/confirm the currently displayed number during numeric data entry.

Cancel

The [Cancel] key abandons the currently selected item.

HP Menu Options (not all options are available to all models of HP3 controllers)

Cut Speed

The Cut Speed parameter is the feed rate for the X/Y-axis movements during cutting (this is the maximum feed rate – the controller may slow the movement down temporarily in order to navigate turns). This value can also be modified by the SF command in the HPGL command stream.

Note: The non-cutting (tool-up) feed rate is executed at Vmax for each axis, and is not affected by the current Cut Speed.

Move XY Axes

The Move command allows the user to program a specific X/Y move from the controller keypad. To execute a Move, follow these steps:

1. Select the Move command, and then press [Enter].
2. Enter the desired (absolute) X-axis coordinate (relative to HOME), then press [Enter].
3. Enter the desired (absolute) Y-axis coordinate (relative to HOME), then press [Enter].
4. Press [Enter] to execute the Move, or [Cancel] to abort.

Jog XY Axes

The Jog command allows the user to move the tool randomly from the controller keypad, while tracking its position (relative to HOME). To execute a Jog, follow these steps:

1. Select the Jog command, and then press [Enter].
2. Use the [⇩] [⇧] [⇨] [⇦] keys to move the tool, while observing the X/Y position.
3. Repeat step 2. Until the desired position is attained.
4. Press [Cancel] to exit.

Note: pressing the [Turbo] button after pressing and holding any of the jog keys will cause the system to jog at maximum speed.

Clear Home

The Clear Home command abandons the current HOME position, leaving it undefined. To clear the HOME position, follow these steps:

1. Select the Clear Home command, and then press [Enter].

Display Job Time

The Display Job Time command displays the run-time of the previously executed job (in minutes and seconds). To display the job time, follow these steps:

1. Select the Job Time command, and then press [Enter].
2. Press [Cancel] to exit.

Select Interface

The Select Interface command provides selection between available interface formats for the controller:

1. Select the Select Interface command, and then press [Enter].

2. Use the [⇦] and [⇨] keys to select between options:

    - HPGL
    - G&M

3. Press [Enter] to set the (new) interface.

Parking

The Parking command provides selection between available options for tool/spindle position at the end of the job:

1. Select the Parking command, and then press [Enter].
2. Use the [⇦] and [⇨] keys to select between options:

    - NONE - Leaves the tool at the "end of job" position.
    - PARK - Drives the tool to (x=0,y=Y-max) at end of job.
    - HOME - Drives the tool to HOME after end of job.

3. Press [Enter] to select the parking mode.

Purge Job

The Purge Job command clears the current job buffer and readies the controller for a new job:

1. Select the Purge Job command, and then press [Enter].
2. Use the [⇦] and [⇨] keys to select between options:

    - PURGE - Clear job buffer.
    - CANCEL - Abandon this command.

3. Press [Enter] to activate the selected option.

Run Self Test

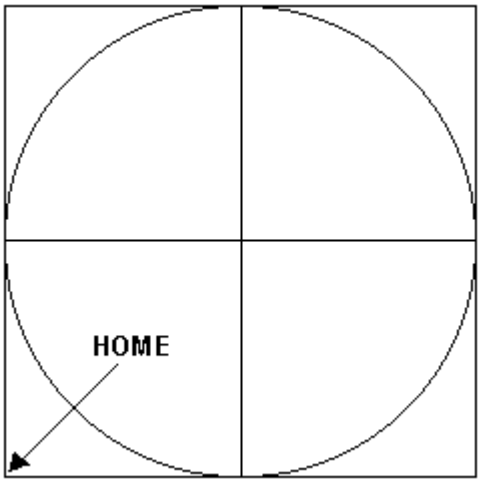
The Run Self Test command executes the built-in self-test in order to test the motion operation(s):

1. Jog the tool into the lower left corner of the table bed.
2. Press [Set Home].
3. Select the Self Test command, then press [Enter].
4. Use the [⇦] and [⇨] keys to select between options:

    - YES – Start job.
    - NO – Abandon this command.

5. Press [Enter] to activate the selected option.

The self-test pattern is 10" square, with HOME at the lower-left corner:



Set Dwell Up

The Set Dwell Up command allows the user to override the default up-dwell setting from the control panel. Recall that up-dwell is a machine pause that allows enough time for the pneumatic spindle to fully retract out of the material surface prior to XY motion. To set the up-dwell:

1. Select the Set Dwell Up command.
2. From the numeric keypad, enter the new dwell (delay) for up-dwell, in milliseconds.
3. Press [Enter].

Set Dwell Down

The Set Dwell Down command allows the user to override the default down-dwell setting from the control panel. Recall that down-dwell is a machine pause that allows enough time for the pneumatic spindle to achieve its full cutting depth prior to XY motion. To set the down-dwell:

1. Select the Set Dwell Down command.
2. From the numeric keypad, enter the new dwell (delay) for up-dwell, in milliseconds.
3. Press [Enter].

Define Pre-Set Home

This command is available only if datum's are fitted/configured on the system. It allows the user to establish a "pre-set" at the current tool position, to be saved in the controller's non-volatile memory for use at a later date. Nine independent positions are available.

Load Pre-Set Home

This command is available only if datum's are fitted/configured on the system. It allows the user to load one of 9 previously defined Home positions and drive the tool immediately to that position.

More detail regarding the pre-set Home positions is presented in the "Home Positions" section, at the end of this chapter.

POS After Datum

This command is available only if datum's are fitted/configured on the system. It allows the user to establish a origin after datuming the controller via the controller's front panel.

Note: Unlike other menu commands POS After Datum makes changes to the NVRAM file making it permanent in the controller's memory. This is useful on power up so that POS After Datum does not have to be repeated on every power up.

Additional Z-axis Menu Options

Z Cut Depth

The Z Cut Depth parameter is the (total) depth of cut, or the distance that the tool penetrates past the surface of the material. (See below for description of Z Delta.) *Note: Drive power must be enabled to access this parameter.*

Z Axis Speed

The Z Axis Speed parameter is the down travel feed rate for the Z-axis movements. (Z-axis up travel occurs at max Z speed.)

Z Delta

The Z Delta parameter is specified to allow multiple pass execution of jobs. This parameter causes the controller to make multiple passes of equal increments (MP Depth Increment) to achieve the total depth specified by the Z Depth parameter (see above). To set the Z Delta parameter, follow these steps:

1. Select the Z Delta command, and then press [Enter].
2. Enter the "MP Depth Increment", and then press [Enter].

If a non-zero Z_Delta is specified, the controller will repetitively execute command sequences starting with PU; and ending with PD; until the desired total depth is achieved.

Z Lift Height

The Z Lift Height parameter is the distance that the tool will retract (above the material surface) in order to traverse the engraving material to the next figure in the job. This parameter allows the user to specify sufficient lift for the tool to clear the material surface (and jigging, etc.), and yet maintain the tool in the lowest possible position during a traversal in order to achieve optimal job performance. To set the Z Lift Height parameter, follow these steps:

1. Select the Z Lift Height command, and then press [Enter].
2. Enter the "Tool Lift", and then press [Enter].

Pocket Milling

Pocket Milling allows the user to machine jobs within a deep pocket (up to the length of stroke on the spindle).

To operate in Pocket Milling mode:

1. Turn the HP3 controller ON.
2. Press [Drives On].
3. Press [Datum].
4. Press [Enter] to access the menu and enable Pocket Milling mode…
    - Scroll the menu and select “Pocket Milling”.
    - Use the left (jog) arrow key to select “ON”.
    - Press [Enter] to accept the new status.
5. Establish any other parameters (cut depth, clearance, etc.).
6. Select [Esc] to exit the menu.
7. Load the first work piece.
8. Position the tool over the local home (within the pocket) and press [Set Home], or..
   …select from one of the previously defined Pre-Set Home positions.
9. Press [Digitize] and define the material surface.
10. Send a job to the HP3 controller (unless the desired job is already loaded).
11. Press [Start] to begin job execution. The job will complete and then “datum”.
12. Unload the work piece and load another work piece, as desired.
13. Repeat from #9, as desired, until the run is complete.

Note: The Park feature must be disabled, or OFF for Pocket Milling to operate properly.

Batching

Aids the user running a set number of the same job a preset number of times.

To operate Batching:

1. Select the Batching command, and press [Enter].
2. Enter the desired amount of times to re-run the same job and press [Enter].
3. Exit the menu by pressing [Cancel].

Configuration Sub-Menu

Display Units

Allows the user to set the desired units, Metric or Imperial.

1. Select the Display Units command, and press [Enter].
2. Select Imperial or Metric by pressing the left/right arrow keys followed by [Enter].
3. The controller will convert the units and reboot.

DNC_Mode

There are mainly two modes of operation, local DNC and Remote DNC. Remote DNC stores the job files on a remote PC. Local DNC is a new feature that allows users to store job files in flash memory of the HP3 controller. This allows users the ability to keep jobs in the controller between power cycles. Since the job files are stored in flash memory no batteries are required to maintain the files in the controller when power is off. The default value is set to ELAB. This allows the user to re-run the job after it successfully engraves by simply pressing Start again on the controller. Therefore it is not necessary to re-transmit the job from Engrave Lab via Ethernet communications.

Enabling Local DNC

1. Turn on the HP3 controller.
2. Enter the menu on the HP3 controller by selecting ENTER -> CONFIGURATION -> DNC_MODE.
3. Select Local and press ENTER.
4. Exit out of the menu by pressing CANCEL.

X Limit

Allows the user to Enable or disable the X datum.

1. Select the X Limit command and press [Enter] to toggle the datum on or off.

Y Limit

Allows the user to Enable or disable the Y datum.

1. Select the Y Limit command and press [Enter] to toggle the datum on or off.

Z Limit

Allows the user to Enable or disable the Z datum.

1. Select the Z Limit command and press [Enter] to toggle the datum on or off.

Ethernet Sub-Menu

Specify IP

Allows the user to manually set the IP address to be used by the controller or use DHCP.

1. Select the Specify IP command and press [Enter].
2. Select [Enter] to use DHCP or [Cancel] to specify IP and subnet mask.
3. Enter the IP address if you selected Specify IP. Enter each octet of the IP address and press the Enter key [Enter].

4. Enter the Subnet mask if you selected Specify IP. Enter each octet of the subnet mask and press the Enter key [Enter].

Display IP

Displays the values of IP and subnet mask currently in use by the controller.

1. Select the Display IP command and press [Enter].
2. The current IP and subnet mask values are displayed.
3. Press the [Cancel] key to exit.

Display Host

Displays the value of the IP address used by the host computer running Job Server.

1. Select the Display Host command and press [Enter].
2. The current IP of the host computer is displayed. If no host is present or if no link is present an appropriate error message will be shown.
3. Press the [Cancel] key to exit.

3.3 APEX-HPGL Data Cables

Serial Cable Logic

Pin out configuration for the serial cable (#1061919):

Pin# - DB9F	Pin# - DB9M	Signal
2	2	TX
3	3	RX
4	4	DTR
5	5	GND
6	6	DSR
7	7	RTS
8	8	CTS

Datum Cable Logic

Pin out configuration for the datum cable (#2500703):

DB-15 Plug	DB-9 Receptacle	DB-9 Plug (Table)	Signal	Wire
Pin 6	Pin 2,3,5	Pin 9 (+V LED)	+VCC	Red
Pin 7	Pin 1	Pin 1	Y Datum Input	Brown
Pin 9	Pin 6	Pin 6 (-V LED)	0 VI	Green
Pin 14	Pin 4	Pin 4	X Datum Input	Blue
Pin 15	Pin 7	Pin 7	Z Datum Input	Black

Motor Driver Cable Logic

Pin out configuration for the Motor Driver cable (#2500022):

Pin# - DB25M	Pin# - DB25 F	Signal
1	14	CYL Phase A+
2	16	CYL Phase A-
3	17	CYL Phase B+
4	19	CYL Phase B-
5	13	Shield (Earth)
6	20	Y Phase A+
8	22	Y Phase A-
9	25	Y Phase B+
10	23	Y Phase B-
11	N/C	E-Stop+
12	N/C	E-Stop-
13	3	X Phase A+
14	1	X Phase A-
15	4	X Phase B+
16	6	X Phase B-
17	7	LSPDL-
18	8	LSPDL+
19	9	RSPDL-
20	10	RSPDL+
21	12	Z Phase A+
22	11	Z Phase A-
23	2	Z Phase B+
24	24	Z Phase B-
25	14	CYL Phase A+

3.4 Vector Search Technology

Vector Search Technology (VST) is a feature of the HPGL controller that allows the user to **backup or skip through an executing job**. This process stops the machine during engraving, while the user jogs the tool to the point in the job where it is desired to restart, and then resumes engraving at the new location simply by pressing [Start].

The controller auto-detects the position of the tool and resumes engraving from that location. This feature is configured in the Machine Parameters software prior to the start of engraving.

Setup

The VST is easily configured using Machine Parameters. It simply involves establishing the Restart Tolerance. This tolerance is the diameter of a circular "search area", centered at the tool point when the [VST] key is pressed.

1. Start Machine Parameters.
2. Select the Table Parameters located on the left pane.
3. Locate the Restart Tolerance field.
4. Enter the new restart tolerance, in inches (i.e. 0.125 inches)
5. Exit Machine Parameters (save changes to disk and to the controller).

Usage

While running a job, depress the [Stop] key. This causes the START LED to blink slowly, indicating that the HPGL controller is ready...

1. Jog the tool into position over the desired restart location. The START LED blinks slowly during the normal "jog" mode. The controller uses a double-blink pattern during jogging after a [+VST] (see below).
2. After positioning the tool at the desired restart point, press the [VST] key.
3. The controller searches for the closest matching point in the job. (If the work file is long, this may take a while.)
4. If a matching point is found, the controller will immediately move the tool to the precise restart location, and the START LED will revert to a slow blink. Do **ONE** of the following...

    - Press [Start] to **start from the current location**. The LED will go on steady and engraving will begin from the new start point.
    - Press the UP arrow jog key to search for the **next matching location** within the search area.
    - Press [Job Cancel] to **abort** the vector search.
    - Press [+VST], jog the tool to a **new search position**, and then go to step 2, above.

5. If a matching point is NOT found, the START LED will issue a fast blink sequence and then go out. At this point, do **ONE** of the following:

- To initiate a **new search**, press [Start], followed by [+VST] Then jog the tool to the next search position and go to step 2, above.
- To **restart from the beginning of the job**, press [Start] (to recall the job) and then press [Start] again (to restart the job from the beginning).

3.5 Tool Changes

The HPGL controller supports the option of either **automatic tool offsets OR pausing for manual tool changes**. This is configured via Machine Parameters prior to the start of engraving.

Setup

To configure the HPGL for a specific spindle mode:

1. Start Machine Parameters.
2. Select the Input/Output Parameters located on the left pane.
3. Locate the Spindle Tool Change Mode field and set it appropriately:

    - Automatic – using defined X/Y Tool Offsets.
    - PAUSE – machine pauses for manual tool change.

Note: If PAUSE is selected the spindle type must be single pneumatic in order to have the controller pause during the engraving of the job.

Operation in Automatic Mode

1. Setup the job in the host software, with Left, Right, or Both spindles (see software manual for details).
2. Send the work file and press the [Start] button.
3. The HPGL controller will automatically change spindles using the Spindle Offsets identified in the HPGL Setup.

Operation in PAUSE Mode

1. Setup the job in the host software, with text/graphics defined as "left", "right", or "both" spindles. JLS supports the following tool/pen definitions:

    - Text/graphics defined as "left" spindle: SP1
    - Text/graphics defined as "right" spindle: SP2
    - Text/graphics defined as "both" spindles: SP3

(Users who are NOT using JLS merely select SP1, SP2..SP8).

During engraving the HPGL controller will ONLY ACTUATE THE LEFT SPINDLE for engraving, but will pause and prompt for a manual tool change upon encountering anything defined for the "right" or "both" spindles.

2. Send the work file and press the [Start] button.
3. THERE IS NO PROMPT TO INSERT THE FIRST TOOL. It is assumed that the first tool (SP1) is installed prior to pressing [Start]. Thus, engraving begins immediately.
4. Each time a tool (pen) change is encountered thereafter, the START LED blinks repetitively according to the appropriate pen index.

- for *example, when changing to SP2 (defined as "right" in the JLS software), the machine will pause, and the START LED will repeat a two-blink pattern (for SP2).*

5. Insert the correct cutting tool into the (Left) spindle.
6. Press [Start] to resume engraving with the new tool.
7. Repeat from step 4. Until the job is complete.

3.6 Job Server

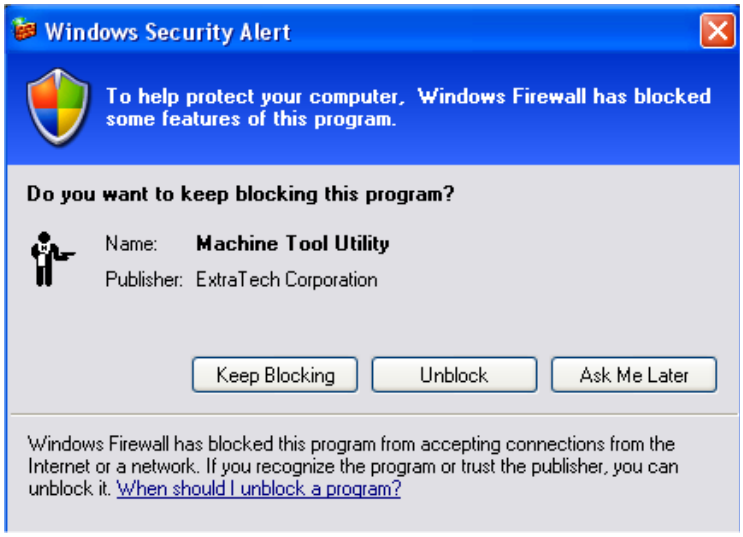
Job Server provides the main connection between the computing resources of your PC workstation and the motion controller that drives your automated machine tool. Job Server is designed to stay out of your way as you use your PC workstation for other applications. During normal operation it sets unobtrusively in the Windows System Tray. When you are ready to perform machine tool management tasks a click of the mouse on that icon brings up a menu of options to access the various operations.

Job Server Icon

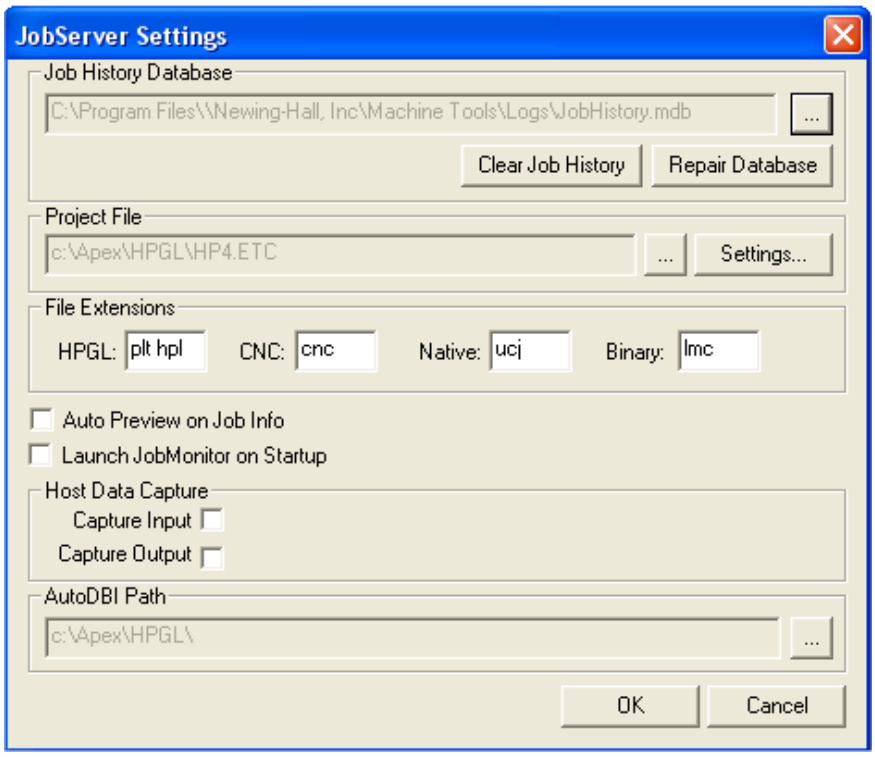
Job Server icon in the system tray

The Job Server Program Settings dialog can be found by right clicking on the Job Server icon in the Windows System Tray.

During initial setup Windows XP with SP2 may display one or more of the following firewall messages.



Select Unblock to dismiss the dialog box.



The Job History Database is used by all the components of Job Server to record job related activity. When a job runs, the file name, start and finish date and time, the length of time it actually ran, and the outcome are all recorded in this database. Job completed, cancelled, or if another type of error happened is also recorded in this file. The database is in Microsoft Access (.MDB) format.

When the database becomes very large it is sometimes necessary to perform maintenance to speed it up. This can be done with the Repair Database button.

The complete job history can be permanently removed (deleted) by clicking on the Clear Job History button.

The Project File is used to store information for the set-up of the host PC applications in relation to the controller and machine configuration. Data such as M Codes, language specific settings for CNC and HPGL, and machine size and speed is stored in the Project File. Selecting the settings button next to the project file name can do creating a new Project File or changing values in an existing one.

The File Extensions section determines which files Job Server will consider to be executable jobs. File extensions as well as their associated languages are displayed. In DNC, the pendant (keypad and display) will only display job files corresponding to the file extensions shown in this section. Hot Watch will only detect and run files corresponding to these file extensions.

Users can customize the file extensions for each language by typing in the extensions in the associated edit box. Separating extensions with a space will specify multiple file extensions for a given language.

One type that needs explanation is Binary. When sending a job with the extension listed in the Binary box to the controller, the job is sent in binary format and no processing will be done with it before it is sent. This is useful for Raster jobs, which contain binary information.

The Host Data Capture section is provided for diagnostics. Input and Output can be independently selected. If one or both of the check boxes is clicked, a dialog box will pop up requesting a file name. This is where data that is captured will be stored until the check boxes are unchecked. The file will be used exclusively by Job Server (cannot be opened by any other program) until the check box is unchecked. This option should only be used for diagnostic purposes – i.e. don't just leave it on for normal running.

The port must be available to the particular session of Job Server the user wants to monitor. If the Job Server icon in the System Tray (associated with the session to be monitored) has the red line through it, then the port is not available and setting these options will not work.

The AutoDBI Path . . . sets the location and filename of the DBI (Database Interface) File where information relating to the set up and function of the host PC and controller software is stored.

The Show Job Monitor every time a job executes option brings up the Job Monitor component so the user can watch the machine's progress on a graphical display of the job being performed. See the Job Monitor section of this help file for more information.

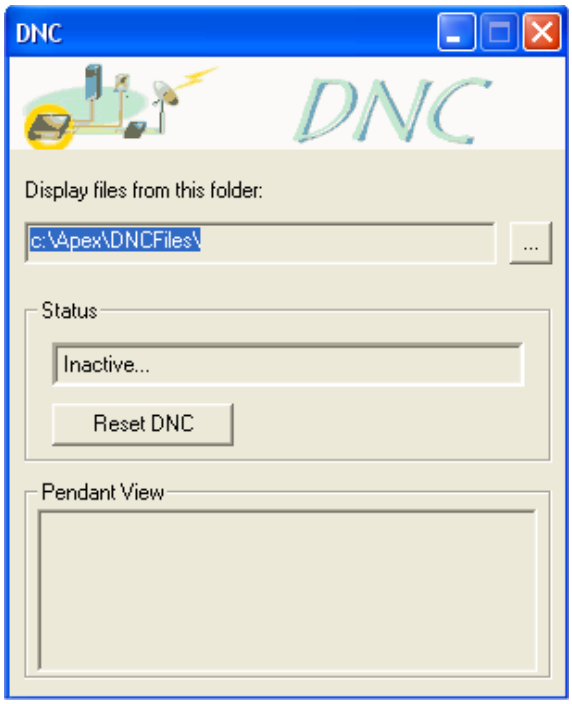
3.7 Distributed Numerical Control (DNC) – Local and Remote

Remote DNC

The HP3 controller features a DNC mode that **allows the user to load jobs stored on the host computer**, directly from the controller's front panel. To use the DNC feature:

1. Start Job Server by clicking on its icon in the APEX Product Software window.
2. Right mouse click the Job Server icon in the system tray, then select DNC.

Note: It is not necessary to have the DNC open during the usage of the DNC component. It is mandatory Job Server is running in the system tray.



3. On the HP3 controller, press [DRIVES].
4. Jog the tool to the Home position, then press [Set Home].
5. On the HP3 controller, press [DNC].
6. Use the [⇧] and [⇩] keys to select the desired job file name.
7. Press [Start] to begin the job (or [Enter] to view the job file stats).

Local DNC

Local DNC is a new feature that allows users to store job files in flash memory of the HP3 controller. This allows users the ability to keep jobs in the controller between power cycles. Since the job files are stored in flash memory no batteries are required to maintain the files in the controller when power is off.

Local DNC functions similar to the original DNC or Remote DNC, a number of requirements must be met to use Local DNC.

Local DNC Requirements

1. Current HP3 Controllers with a K520 CPU board. (Ethernet port on the back of the controller.)
2. APEX Product Software Release 01.03.06.
3. Job Server version 3.9.28.0 or higher. (Installed with APEX Product Software 01.03.06)
4. HP3 Firmware k3c444g.bin or higher. (Installed with APEX Product Software 01.03.06)
5. INIT file version 3.28 or higher. (Installed with APEX Product Software 01.03.06)

Note: It will be mandatory to check the versions of firmware and INIT files in the HP3 controller to determine if flashing is necessary. Contact Newing-Hall support for details.

Limitations

1. 3MB flash space for user files.
2. No file size checking exists before storing a job in flash memory. The side effect can be lost memory space if a file is larger than available memory space. If flash memory space is lost, it can be reclaimed by formatting files.

Operation

Enabling Local DNC

1. Turn on the HP3 controller.
2. Enter the menu on the HP3 controller by selecting [Enter] -> CONFIGURATION -> DNC_MODE.
3. Select Local and press [Enter].
4. Exit out of the menu by pressing [Cancel].

Saving a job into Flash Memory

1. Make sure Job Server is running on a PC connected via a serial cable or Ethernet cable.
2. Press DNC on the controller. This will open local DNC mode. The top line will display:

   < Load Job from PC >

3. Place the curser using the arrows keys on line one and press [Enter]. The controller briefly displays the number of bytes available in the controller flash memory.
4. The next menu displays the jobs via Remote DNC. These jobs are located on the computer running Job Server. Select the job and press [START]. This will save the job into flash memory. Pressing [Enter] will display the job file size and date. Press [Cancel] to exit.
5. Once all the job(s) are saved to the controller press [Cancel]. The menu will display the Local DNC menu. To exit from Local DNC press [Cancel] to exit the menu system.

Note: For example, if the file that needs to be saved to flash memory is 2.8MB. The time it takes to save the file to flash memory depends if serial or Ethernet communications is used. Ethernet is much faster compared to serial communication. Looking at the table below a 2.8 MB file will take 10 minutes to load at 57600 bps!

	Ethernet	Serial
2.8MB File	2:40	10:00

Running a job from Local DNC

1. Press DNC on the controller.
2. Select the job using the arrow keys and press START on the controller. If you would like to see the number of bytes the job is using in the flash memory, press [Enter] on the controller. To exit press [Cancel].

Deleting a job from Local DNC

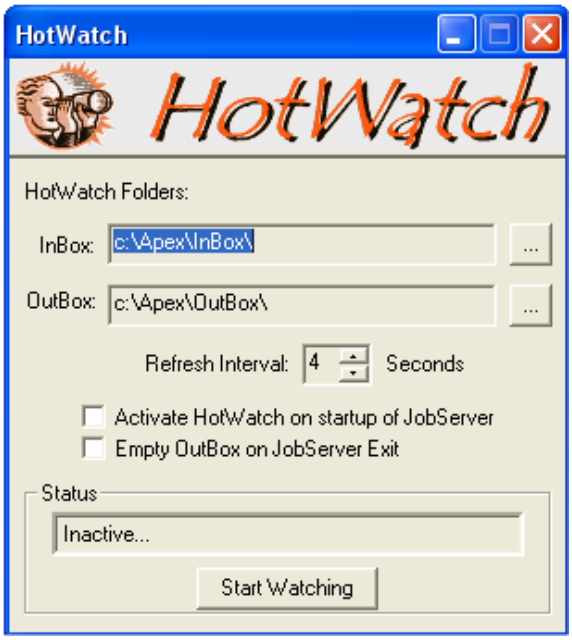
1. Press [DNC] on the controller.
2. Select the job using the arrow keys and press the DECIMAL key. The DECIMAL key is also [+VST] key.
3. A confirmation will appear. To delete the file press [Enter], to cancel press [Cancel].

Note: Deleting a file from flash memory can take up to a minute.

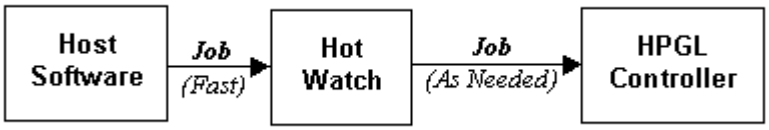
IMPORTANT NOTE: Local DNC mode was mainly intended to be used with Ethernet Communications. Although it will work via serial saving a job file into flash memory requires much more time.

3.8 Hot Watch

The Hot Watch feature available with Job Server is a general spooling application that **allows jobs to be quickly sent from the host software**, thus minimizing the downtime associated with transmitting jobs.

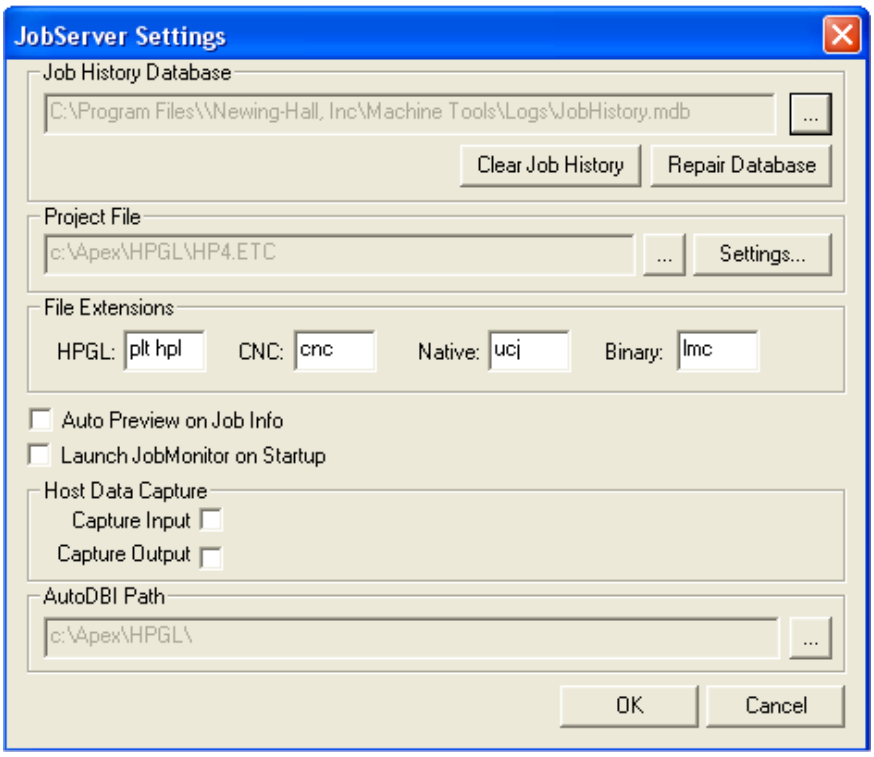


The Hot Watch applet acts as a mediator between the host software and host computer, by quickly buffering a job sent to it from the host software (which allows the host software to resume other tasks) and then transferring the job to the controller in the background, at a (lower) rate appropriate for the controller.



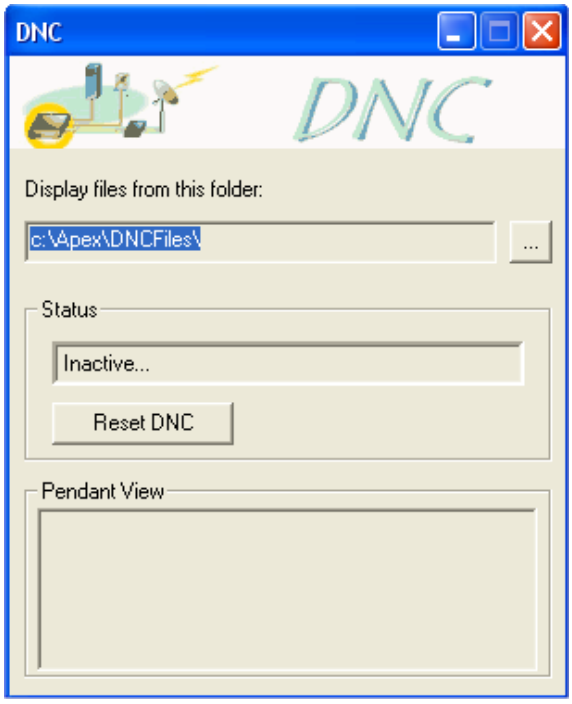
Setup

1. Start Job Server.
2. Right mouse click the Job Server icon in the system tray then select DNC. Verify that the settings match the following:



Note: All **extensions** must be lower case

3. After making changes close the dialog by selecting OK.
4. Right mouse click the Job Server icon in the system tray then select DNC. Verify the path is correct:



5. Close the DNC dialog. The settings will be saved.

6. Right mouse click Job Server located in the system tray and select Hot Watch. Verify Hot Watch settings:

The **Refresh Interval** is the maximum amount of time (milliseconds) that Hot Watch will wait for the completion of a job file transfer from the host software. This value may need to be increased if the job files are being moved across a busy local area network.

Activate Hot Watch on startup of Job Server - The next time Job Server is started, the Hot Watch component will automatically begin watching for files.

Empty Outbox On Exit causes the file to be deleted after it has been transmitted to the controller.

Running Hot Watch

To run the Hot Watch applet, follow these steps:

1. Start Job Server.
2. Right mouse click the Job Server icon located in the system tray and select Hot Watch.
3. Select Start Watching.

Hot Watch is now running in the background, ready for a host software application to place a job file in the "inbox" directory.

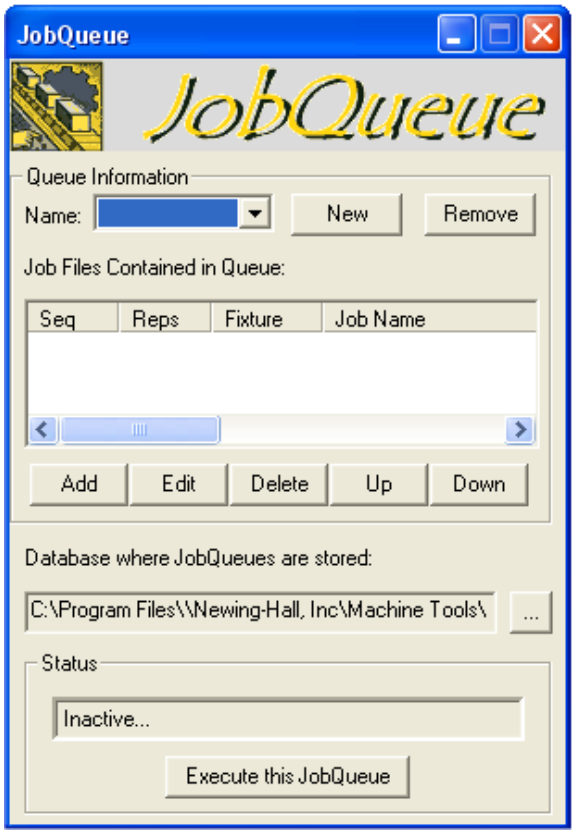
When a job file is detected by Hot Watch to be resident in the "inbox" directory, Hot Watch will send it to the controller. After the file as been transmitted to the controller, Hot Watch will move the file from the inbox directory to the outbox directory.

From time to time, it is necessary to review the contents of the outbox directory, as it will become cluttered with past job files (unless 'Empty Outbox on Exit' is enabled – see above).

Note: When Job Server is started it is important to consider if Hot Watch is currently running in the background if the **Activate Hot Watch on startup of Job Server** check box is checked.

3.9 Job Queue

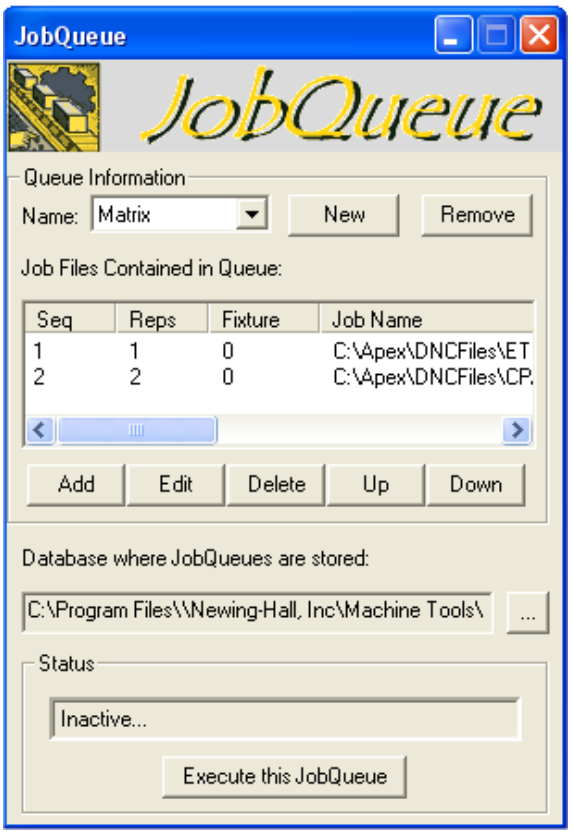
The Job Queue component allows the user to create and name job batches and control their execution. The operator is prompted to start each job as it is sent to allow time to load/unload material, move home, etc.



Note: The motion controller must have Firmware Version 3.41 or greater installed to utilize this component.

Job Queue Window

Opposite from the DNC feature, Job Queue is driven from the host PC. A predefined list of job files is "pushed" to the controller from the host PC, via the Job Queue window.



Queue Name

This field **displays the active job queue**, and allows the user to select from the existing list of available, previously defined job queues.

Execute this Job Queue

Sends the currently selected Job Queue File to the controller. Depending on the controller configuration and Job Queue File format, a queue of jobs will be displayed from the pendant (keypad with display). Once this button is clicked, the machine operator is all set to execute the displayed jobs from the pendant.

Add

Add opens a Job Queue Item dialog box. Click Add. Input the # Repetitions the newly added job file will execute. If your machine uses Fixtures, enter the fixture number you want the job to be run with, or leave it as 1. Input the path and job file, including extension, in the Job Name edit box…OR…click the browse button to the right of the Job Name edit box. This will open the Job File dialog box. The user can browse the host PC's drives with the combo box at the top of the dialog box or use the "up-folder" icon to proceed up the file system hierarchy.

There is a "file filter" combo box located at the bottom of the dialog box that controls the type of files to be displayed in the dialog box. By default all files (*.*) will display. Once the appropriate file has been located, select the file and click Open or double-click the filename to open it. Click OK. That job file is now added to Queue Items.

Delete

Delete removes a particular Job File from the Queue Items display. Select the Job File to be deleted. Click Delete. Click Yes or No as appropriate. The Job File record is removed.

Note: The Delete option will REMOVE a Job File from the Job Queue File. It does not delete the Job File from the host PC.

Sequence

'Sequence' is maintained by the application solely, and is not available to the operator. The number associated with each Job File will vary as job files are added, removed or moved within the queue. There should be no repetition of sequence number, but it is likely that some numbers may be missing or that the sequence doesn't start at one (1).

Job Name

'Job Name' displays the path of each job file name in the current job queue.

Reps

'Reps' displays the number of times the associated job file will be executed.

Edit

'Edit' opens the Job Queue Item dialog box. Select the Job File record for editing. Click Edit. Edit the entry as necessary. Click OK.

Move Up/Down

[Move Up] and [Move Down] relocate a selected Job File within the established Sequence. Select the Job File you wish to re-sequence. Click Move Up or Move Down as appropriate. The Job File will move one place at a time.

Running Job Queue

To run the Job Queue component, follow these steps:

1. Start Job Server.
2. Right click Job Server in the system tray and select Job Queue.
3. Select the desired job queue, or create a New one.
4. Click [Execute this Job Queue] to begin the job transmission.
5. On the machine, position the material, set home, etc.
6. When ready, press the [Start] button.
7. Repeat steps 5-6 as needed to complete the entire job queue.

3.10 Home Positions

HP2 and HP3 controllers store the system HOME in non-volatile memory in order to preserve the HOME position after a power loss. This section describes use of the non-volatile HOME, and also multiple pre-set HOME positions (HP3 only).

Defining Home

Home is defined as the position (X, Y) that the controller currently recognizes as Home. Home can only be defined by pressing the [Set Home] key.

The [Datum] function drives each axis to its hardware-defined datum point, and zeroes the position counters**. Any pre-existing Home position is preserved** but is now relative to the new (re-defined) datum position.

The [Set Home] function updates the Home position defined in the controller to the current position of the tool. If Preserve Home = "Yes" in the HPGL Setup, then the HPGL controller also loads the current Home position into non-volatile memory each time [Set Home] is pressed. This allows the Home position to be preserved after the controller is switched OFF (or in the event of a power loss). Setting this value to "No" causes the HP3 to power-up with an "undefined" home position –see below).

The [Go Home] function causes the tool to be moved from its current position to the currently defined Home position. If Home is undefined, then no movement is made.

Restoring the Home Position after Power Loss

The HP3 controller stores the current Home position (X, Y) in non-volatile memory each time the user presses the [Set Home] button. This is to guard against losing Home in the event that power is lost, or the Emergency Stop button is depressed. Home is reset to this previously stored position (X, Y) on power-up if Preserve Home = "Yes" in the HPGL Setup (see Chapter 6 for further details).

Operation in Cylindrical vs. Flat Mode

The HP3 controller maintains separate position registers for "flat" and "cylindrical" mode HOME's. This is because the X-axis mechanical properties of the machine are different in each mode.

The [Datum] function re-datum's ALL axes, including the cylindrical mode x-axis. This function zeroes the position references for ALL axes, and leaves the controller in the mode that was active when the [Datum] button was pressed. The datum order is Z-X/Y (flat)-X (Cyl).

Note: In order to get the X (Cyl) axis to datum, it is necessary to enable the datum function on the cylindrical axis. See discussion of 'Limit Mask' in Chapter 6 for more details.

When in FLAT mode, the [Set Home] function records the current FLAT mode HOME position, and does NOT ALTER the cylindrical mode Home position. Logically, the [Go Home] function

in FLAT mode goes to the previously saved FLAT mode Home, ignoring the CYL mode entirely.

Conversely, when in CYL mode, the [Set Home] function records the current CYL mode HOME position, and does NOT ALTER the FLAT mode Home position. Logically, the [Go Home] function in CYL mode goes to the previously saved CYL mode Home, ignoring the FLAT mode entirely.

The controller automatically maintains home positions when the user switches between FLAT and CYL modes.

Preset Home Positions

Nine home position "pre-sets" can be defined **in the HP3 controller**.

To define a "pre-set", access the HP3's menu system, as follows:

1. Press [Enter] to activate the menu system.
2. Scroll the menu to select the 'Define Preset Home' command, and press [Enter].
3. Scroll the list of pre-sets to highlight the desired position.
4. Press [Enter] to select the desired pre-set.
5. Jog the tool to the desired home location (if necessary), watching the LCD for precise coordinates.
6. Press [Set Home] to define and select the desired pre-set.
7. Press [Cancel] to exit the menu system.
8. Press [Go Home] to drive the tool to the new Home position.

If a "pre-set" has not been defined specifically, it defaults to (0,0,0), or the DATUM position.

To use a "pre-set", access the HP3's menu system, as follows:

1. Press [Enter] to activate the menu system.
2. Scroll the menu to select the 'Load Preset Home' command, and press [Enter].
3. Scroll the list of pre-sets to highlight the desired position.
4. Press [Set Home] to load the new Home position.
5. Press [Cancel] to exit the menu system.
6. Press [Go Home] to drive the tool to the new Home position.

These "pre-set" menu functions are only available if X&Y DATUMS are defined on the controller, and if the user is NOT in cylindrical mode.

Chapter IV – Software Setup

4.1 Using APEX-JLS

APEX-JLS is the very good software package for driving the APEX-HPGL as an engraving controller. This is because it has the following features built-in specifically for engraving:

- Matrix
- Variable Text
- Serialization
- Cylindrical (diameter-based scaling)
- Rotary spindle motor control (enable/disable)
- Tool diameter offsets (for properly digitized graphics)
- Spindle selection

To setup JLS for use with the APEX-HPGL, follow the guidelines in section 2.3 to 2.5 in Chapter 2.

Note: When using software other than APEX-JLS, it is required that all HPGL files transmitted to the controller have the IN; command as the first command in the list, and the SP0; command as the last command in the list.

4.2 Using CorelDraw™

1. To add the HP7475A driver to Windows 95™:
2. Click on [Start], to Settings, and then click on the Printers icon.
3. Click on Add Printer.
4. Select the Local Printer option, and then click [Next].
5. Under the Manufacturer list box, scroll down to HP, and then click on HP7475A.
6. Select either COMM Port 1 or COMM Port 2 (as desired).
7. Click on [Configure Port].
8. Set the port parameters as follows:

    - Bits per second – 57600
    - Data bits – 8
    - Parity - Even
    - Stop bits – 1
    - Flow Control – Hardware

9. Click on [Next], and then click on [No] to disable printing to DOS based programs.

Select the "No" option to decline a test page, and then click [Finish].

To setup CorelDraw ™ for use with the APEX-HPGL, follow these steps:

1. Connect the APEX-HPGL.
2. Turn on the host computer and APEX-HPGL.
3. Start CorelDraw ™.
4. From the File menu, select the Print Setup command.
5. Set the Specific Printer to HP7475A.
6. Design the drawing.
7. In CorelDraw ™, select the Print command from the File menu.
8. On the APEX-HPGL, press the [Start] button.

4.3 Using CASMate ™ (for Windows ™)

To setup CASMate ™ for use with the APEX-HPGL, follow these steps:

1. Connect the APEX-HPGL.
2. Turn on the host computer and APEX-HPGL.
3. Start Microsoft Windows ™.
4. Start CASMate ™.
5. From the misc. menu, select the Setup command.
6. Choose the specific driver, APEXHP2D or APEXHP3D.
7. Configure the driver as follows:

    - COMM Port 1 or 2 (as desired)
    - Baud Rate: 57600
    - Parity: Even
    - Data Bits: 8
    - Stop Bits: 1
    - Hex Hardware Interrupt 4
    - Hardware Handshake: [X] RTS [X] CTS

8. Set the Resolution to 1000, and then click on [OK] to complete the configuration.
9. Design the drawing.
10. In CASMate ™, print/plot the drawing by clicking on the Plot icon.
11. On the APEX-HPGL, press the [Start] button.

Note: On some versions of CASMate the drivers will not communicate at 38400. It may be necessary to contact CASMate (800-866-6227) to update the driver or call Newing-Hall customer service to change the baud rate on the controller (HP2/HP3 ONLY).

Note: CASMATE™ fixes the HOME position at the lower-left corner of the job.

4.4 Using SignLab ™ v3.2 (for Windows ™)

To setup SignLab ™ for use with the APEX-HPGL, follow these steps:

1. Connect the APEX-HPGL.
2. Turn on the host computer and APEX-HPGL.
3. Start Microsoft Windows ™.
4. Start SignLab TM.
5. From the Cut menu, select the Plotter Setup command.
6. Select the Newing-Hall APEX-HPGL Controller driver
7. Set the parameters as follows:

    - Port Location - Com 1 or 2(as desired)
    - End Point - Origin
    - Origin - Lower Left
    - Click on [OK] to complete the configuration

8. From the File menu, select the Control Panel command.
9. Setup the port as follows

    - Baud Rate - 57600
    - Parity - Even
    - Data Bits - 8
    - Stop Bits - 1
    - Flow Control - Hardware

10. Click on [OK] to complete the configuration
11. Design the drawing.
12. In SignLab ™, plot the drawing.
13. On the APEX-HPGL, press the [Start] button.

4.5 Using EngraveLab ™ (for Windows ™)

To setup EngraveLab 7™ for use with the APEX-HPGL, follow these steps:

1. Connect the APEX-HPGL.
2. Turn on the host computer and APEX-HPGL.
3. Start Microsoft Windows ™.
4. Start EngraveLab 7 ™.
5. From the Engrave menu, select the Engraving Defaults command.
6. Select the Newing-Hall APEX-HPGL UpperLeft Controller driver.
7. Press the Setup command button to configure the port followed by the Port tab.
8. Set the parameters as follows (to edit the ports select the edit checkbox on the Current COMM settings):

    - Port Location - Com 1 or 2(as desired) or TCPIP raw (Ethernet)
    - If using Ethernet, the Port number is 23
    - Baud Rate - 57600
    - Parity - Even
    - Data Bits - 8
    - Stop Bits - 1
    - Flow Control – Hardware

9. Click on [OK] to complete the configuration.
10. Design the drawing.
11. In EngraveLab 7™, plot the drawing.
12. On the APEX-HPGL, press the [Start] button.

4.6 Using AutoCAD™

To setup AutoCAD™ for use with the APEX-HPGL, follow these steps:

1. Connect the APEX-HPGL.
2. Turn on the host computer and APEX-HPGL.
3. Start Microsoft Windows ™.
4. Start AutoCAD ™.
5. From the File menu, select the Print Setup command.
6. Set the Specific Printer to HP7475A, and configure (see section 4.2).
7. Design the drawing.
8. In AutoCAD ™, print/plot the drawing.
9. On the APEX-HPGL, press the [Start] button.

Note: Depending on the version of AutoCAD it may be necessary to download the latest drivers at www.autodesk.com.

5.1 HPGL Commands

There are many different forms of HPGL. The APEX-HPGL controller command set is an excerpt that consists of the most common commands, and does not conform to any complete HPGL specification entirely. It is most similar to the HP7475 command set. The following is a description of supported commands.

Arc Absolute (AA)

The AA command draws an arc using absolute coordinates, from the current position of the tool, around the specified center.

Syntax: AA <<x>>, <<y>>, <<arc angle>>;

The <<x>> and <<y>> parameters define the absolute coordinates of the center of the arc (in plotter units).

The <<arc angle>> parameter defines the angle of rotation (in degrees). A positive angle produces an arc in the counterclockwise direction, and a negative angle produces a clockwise arc.

Arc Relative (AR)

The AR command draws an arc using relative coordinates, from the current position of the tool, around the specified center.

Syntax: AR <<x>>,<<y>>, <<arc angle>> ;

The <<x>> and <<y>> parameters define the relative coordinates of the center of the arc (in plotter units).

The <<arc angle>> parameter defines the angle of rotation (in degrees). A positive angle produces an arc in the counterclockwise direction, and a negative angle produces a clockwise arc.

Initialize (IN)

The IN command resets the controller to its default settings.

Syntax: IN;

Plot Absolute (PA)

The PA command places the controller in absolute plotting mode and moves the tool to the specified absolute coordinates using the current tool position.

Syntax: PA <<x>>, <<y>>;

Or PA; (which places controller in absolute plot mode)

The <<x>> and <<y>> parameters define the absolute coordinates of the destination for the move(s) (in plotter units). More than one (X, Y) pair may be specified before the colon for execution in sequence. If no coordinate pairs are specified, the controller is placed in absolute plotting mode but no movement is generated.

Pen Down (PD)

The PD command causes the controller to lower the current tool (pen) into the down position, then moves the tool to the specified coordinates.

Syntax: PD <<x>>, <<y>>;

Or PD; (which merely lowers the tool)

The <<x>> and <<y>> parameters define the coordinates of the destination for the move(s) (in plotter units). More than one (X, Y) pair may be specified before the colon for execution in sequence. If no coordinate pairs are specified, the tool is lowered, but no movement is generated. (Either absolute or relative coordinates may be used, and are enabled by the previous PA or PR command.)

Plot Relative (PR)

The PR command places the controller in relative plotting mode and moves the tool to the specified relative coordinate using the current tool position.

Syntax: PR <<x>>, << y>>;

Or PR; (which places controller in relative plot mode)

The <<x>> and <<y>> parameters define the relative coordinates of the destination for the move(s) (in plotter units). More than one (X, Y) pair may be specified before the colon for execution in sequence. If no coordinate pairs are specified, the controller is placed in relative plotting mode but no movement is generated.

Pen Up (PU)

The PU command causes the controller to raise the current tool (pen) into the retracted position, then moves the tool to the specified coordinates.

Syntax: PU <<x>>, <<y>>;

or PU ; (which merely retracts the tool)

The <<x>> and <<y>> parameters define the coordinates of the destination for the move(s) (in plotter units). More than one (X, Y) pair may be specified before the colon for execution in sequence. If no coordinate pairs are specified, the tool is raised, but no movement is generated. (Either absolute or relative coordinates may be used, and are enabled by the previous PA or PR command.)

Set Max Feed (SF)

The SF command sets the max feed rate for the controller (see also VS).

Syntax: SF <<f>>;

The <<f>> parameter is the feed rate in mm/sec.

Select Pen (SP)

The SP command activates the specified pen to be used for engraving. This actually causes the controller to use the left, right, or both solenoids to actuate the spindles.

Syntax: SP <<n>>;

The <<n>> is a pen index, as follows:

Index	Spindle (pen) Enabled
1	Left Spindle (solenoid)
2	Right Spindle (solenoid)
3	Both Spindle (solenoid)

Note: The APEX-HPGL requires that the HPGL file transmitted for engraving begin with the IN; command and end with the SP0 command. IN is interpreted as "begin job" and "SP0" is interpreted as "end of job". Jobs transmitted from APEX-JLS software are automatically configured to this standard and need not be modified.

Velocity Select (VS)

The VS command sets the max feed rate for the controller (see also SF).

Syntax: VS <<f>>;

The <<f>> parameter is the feed rate index, from 1 to 60. 60=100%

Index Relative (ZO120)

The ZO120 command rotates the indexing head by a relative offset.

Syntax: ZO120, <<r>>;

The <<r>> parameter defines the relative offset from the current position of the indexing head (in plotter units).

This command automatically performs an indexing sequence using the cylindrical mode. The sequence is defined as:

- De-energize Solenoid 1 (auxiliary)
- Switch into CYL mode
- Index CYL axis by <<r>> plotter units FROM THE CURRENT POSITION
- Switch back into FLAT mode
- Energize Solenoid 1 (auxiliary)

This command is best used for general indexing within the job.

Index Absolute (ZO121)

The ZO121 command rotates the indexing head to an absolute coordinate.

Syntax: ZO121, <<a>>;

The <<a>> parameter defines the (new) absolute coordinate position of the indexing head (in plotter units).

This command automatically performs an indexing sequence using the cylindrical mode. The sequence is defined as:

- De-energize Solenoid 1 (auxiliary)
- Switch into CYL mode
- Index to absolute position <<a>> on CYL axis
- Switch back into FLAT mode
- Energize Solenoid 1 (auxiliary)

This command is best used for homing and parking the indexing head.

Note: The correct I/O Parameter Settings in MACHINE PARAMETERS must be established in order to use the ZO commands, above. Consult Chapter 6 for further details.

5.2 G&M Code Commands (EIA-274D)

The following is a summary of the supported G&M code command set for the **APEX-HPGL** controller.

Notes on Command Syntax

- Motion is assumed to be in the upper, right quadrant, with a conventional ORIGIN at (0,0) – in the lower left corner of the work piece.
- Positive X-motion is to the RIGHT; negative X- motion is to the LEFT.
- Positive Y-motion is BACK. Negative Y-motion is FORWARD.
- Positive Z-motion is DOWN. Negative Z-motion is UP.
- Positive angles indicate anti-clockwise motion. Negative angles indicate clockwise motion.
- All angles, coordinates, and displacements are signed.
- Parameters within brackets [] are optional.
- Fields represented by "d.d" are signed decimal numbers.
- Fields represented by "d" are **positive** integer numbers.
- Unsupported commands should not be inserted in the motion stream.
- Argument mnemonics are defined as follows:

Mnemonic	Meaning
C	Tool change operator message;
D	Peck drill delta; Port data;
F	Feed rate; Dwell;
G	Preparatory function;
I	Circular interpolation value in X-axis;
J	Circular interpolation value in Y-axis;
K	Circular interpolation value in Z-axis;
M	Miscellaneous function;
N	Sequence number;
P	Port number;
R	Beginning Z motion dimension;
S	Spindle RPM;
T	Tool change;
X	X-axis dimension;
Y	Y-axis dimension;
Z	Z-axis dimension;

Supported G&M Code Commands

Command	Syntax
Traverse	G00 [Xd.d] [Yd.d] [Zd.d] [Fd.d] [Td.d] [Ctext string]
Linear Move	G01 [Xd.d] [Yd.d] [Zd.d] [Fd.d]
2D Arc (clockwise)	G02 [Xd.d] [Yd.d] [Zd.d] [Id.d] [Jd.d] [Kd.d] [Fd.d]
2D Arc (counter-clockwise)	G03 [Xd.d] [Yd.d] [Zd.d] [Id.d] [Jd.d] [Kd.d] [Fd.d]
Dwell (seconds)	G04 Fd.d
XY plane for helical	G17
XZ plane for helical	G18
YZ plane for helical	G19
Go Home	G37
Clear (soft) Home	G62
Imperial Units (inches)	G70
Metric Units (mm)	G71
3D Arc (clockwise)	G72 [Xd.d] [Yd.d] [Zd.d] [Id.d] [Jd.d] [Kd.d] [Fd.d]
3D Arc (counter-clockwise)	G73 [Xd.d] [Yd.d] [Zd.d] [Id.d] [Jd.d] [Kd.d] [Fd.d]
Relative Mode – 2D arcs	G74
Use G90/G91 Mode – 2D arcs	G75
Peck Drill	G83 Rd.d Zd.d Dd.d [Fd.d]
Absolute Coordinate Mode	G90
Relative Coordinate Mode	G91
Set (soft) Home	G92 [Xd.d] [Yd.d] [Zd.d]
Set Spindle Speed (rpm)	G97 Sd
Set Virtual Port	G98 Pd Dd
Program Pause	M00
Optional Pause	M01
Program End	M02
2D Device ON	M11
3D Device ON	M12
2D Device OFF	M21
3D Device OFF	M22
Program Start	M90
Program Replay	M91
Exit CNC Interpreter	M99

The Machine Parameters application provides a user-friendly interface for setting the parameters governing machine operation. The Machine Parameters program uses new technology to present the data to the end user. Instead of the proprietary scripting language, this version uses HTML to format the parameter input display. Multiple screens can be implemented using links between multiple HTML files or by using HTML frames. JavaScript or VBScript can also be embedded into the HTML to perform sophisticated manipulation of the screen or data.

NOTE: Machine Parameters uses MS Internet Explorer™ to present HTML. Microsoft Internet Explorer version 5 or higher is required for Machine Parameters to function properly.

To start Machine Parameters make sure the controller is on and click on the Machine Parameters icon.

Note: When Machine Parameters starts it loads all parameters from the controller.

6.1 Table Parameters Menu

To access the Table Parameters, click on the Table Parameters located in the left pane of Machine Parameters. These parameters are established according to the specific mechanical properties of the table used, specifically using a stepper-driven Z-axis spindle.

X Table Size

This option sets the amount of available travel in the X-axis, from the DATUM position to the absolute limit of the tool in the X-axis. This value is INCHES or MM, according to the "measurement units" defined below. *Default is the width of the available engraving area.*

Y Table Size

This option sets the amount of available travel in the Y-axis, from the DATUM position to the absolute limit of the tool in the Y-axis. This value is INCHES or MM, according to the "measurement units" defined below. *Default is the depth of the available engraving area.*

Z Stroke Size

This option sets the amount of available travel in the Z-axis, from the DATUM position to the absolute limit of the tool in the Z-axis. This is typically the distance from the tool point at DATUM to the surface of the XY table (NOT the surface of the work piece). This value is INCHES or MM, according to the "measurement units" defined below. *Default is 1.00 in. / 26 mm.*

X Negative Stroke

This option will set the distance which the tool is permitted to move beyond the machine ORIGIN, into the negative X-axis, in INCHES or MM, according to the "measurement units" defined below. (This is normally done to account for the X Limit Offset. *Default is the width of the available engraving area.*)

Y Negative Stroke

This option will set the distance which the tool is permitted to move beyond the machine ORIGIN, into the negative Y-axis, in INCHES or MM, according to the "measurement units" defined below. (This is normally done to account for the Y Limit Offset. *Default is the depth of the available engraving area.*)

Z Negative Stroke

This option will set the distance which the tool is permitted to move beyond the machine ORIGIN, into the negative Z-axis, in INCHES or MM, according to the "measurement units" defined below. (This is normally done to account for the Z Limit Offset. *Default is –1.00 in. / -26 mm*)

Self-Test Mode

These checkbox options set the method(s) used for internal self-test diagnostics:

- Perform KDM Test (Keypad operation)
- Perform Cartesian Motion Test (X/Y movement)
- Perform Origin Test (Homing/datum)
- Perform Spindle ON/OFF Test (Spindle actuation)

Controller Language Boot Mode

This option sets the language/protocol for transmitted jobs. Options are:

- uCito native protocol
- HPGL protocol *(default)*
- CNC (G&M code) protocol

Enable Talk_Back in uCito

This option enables Talk_Back - Enabling the Talk_Back option for uCito jobs will allow the terminal to display the job code as it is being run. This is turned off by default so that code will not be shown while running a uCito (Native) job.

Feed Rate Factor

This option sets the scale factor for velocities entered from the keypad:

Feed Rate Factor	Meaning
1	Inches/mm PER SECOND *(default)*
60	Inches/mm PER MINUTE

Enable Feed Rate

This checkbox option enables/disables the feed rate override knob on the controller front panel. *(Default is enabled)*

Enable VS Command

Enabling the VS command allows VS in HPGL. VS allows changes to the cut speed programmatically. Values set in jobs are reset when a new job starts. VS60 is considered to be 100% of cut speed.

Note: This option is useful if it is preferred to use the toolbox in APEX-JLS to control the feed rate.

Restart Tolerance

This field establishes the radius of the area (centered on the tool) that will be searched for a point on the profile, when using the VST feature. *(Default is 0.1 in. / 2.54 mm)*

Job Start Confirmation

This option configures the method used to initiate the job after it is transmitted to the controller. Options are:

- Pendant - Must press [Start] on keypad to begin
- None - Job starts immediately

(Default is *Pendant*)

Cylindrical Mode Translation

Enabling this command will enable Cylindrical Mode Translation - If this flag is set, then when switching to cylindrical mode, the pendant will ask for a diameter and apply that diameter during engraving. This allows "flat-mode" jobs to be accurately transferred to a cylindrical surface.

This option is useful if a program other than APEX-JLS is used to engrave in cylindrical mode. The controller will calculate the amount of rotation based on the cylindrical diameter making it possible to engrave the image on a curved surface without distorting the image.

WARNING: This feature is NOT supported by APEX-JLS software, or on controllers without a front-panel display. Enabling this feature in these cases can cause the system to become inoperative in cylindrical mode.

6.2 Datum Parameters Menu

To access the Datum Parameters, click on Datum Parameters located in the left pane of Machine Parameters. These parameters are related to the operation of the datum (limit) sensors.

X Limit Offset

This option sets the location of the physical (machine) ORIGIN, with respect to DATUM, in the X-axis, in INCHES or MM, according to the "measurement units" defined below. After a DATUM operation, the tool is automatically moved to the ORIGIN. *(Default is 0 unless set at factory)*

Y Limit Offset

This option sets the location of the physical (machine) ORIGIN, with respect to DATUM, in the Y-axis, in INCHES or MM, according to the "measurement units" defined below. After a DATUM operation, the tool is automatically moved to the ORIGIN. *Default is 0)*

Z Limit Offset

This option sets the location of the physical (machine) ORIGIN, with respect to DATUM, in the Z-axis, in INCHES or MM, according to the "measurement units" defined below. After a DATUM operation, the tool is automatically moved to the ORIGIN. *(Default is -0.05 in. / -1.27 mm)*

Limit Mask

This option sets the "limit mask", which is a value describing which (table) limits are active on the machine, and which are not. Typical values are additive:

Limit Mask Setting	Meaning
0	No limits active
1	X-axis limit only
2	Y-axis limit only
4	Z-axis limit only
8	X Cyl limit active
64	Over travel

Example: To enable limits for X, Y, and Z, Limit Mask = 1+2+4 = 7.

If the limit mask shows that a particular axis limit is ACTIVE, then bounds checking is enabled for that axis, otherwise, bounds checking is not enabled (see "Negative Stroke" and "Table Size", above).

Limit Switch Type

This option sets the type of limit switches installed in the table. Options are:

- Normally Open *(default)*
- Normally Closed.

XY Datum High Speed

The datum move is done at high speed until the datum sensor is found, and then at a lower speed to precisely determine the datum position. This option defines the high-speed datum velocity for X- and Y- axes. *(Default is –1.00 inches/sec / -25 mm/sec)*

XY Datum Low Speed

This option defines the low-speed datum velocity for X- and Y- axes. *(Default is 0.10 inches /sec / 2.54 mm / sec)*

Z Datum High Speed

This option defines the high-speed datum velocity for the Z-axis. *(Default is -0.50 inches/sec - 12.7 mm/sec)*

Datum Y First

If this checkbox is selected Datuming a machine the Y-axis will find home before the X-axis. Otherwise X is first.

Preserve Home

This option specifies whether the controller saves the Home position between power cycles. When enabled, this option saves the current home position each time [Set Home] is pressed. After the controller is powered down and re-started, pressing [Go Home] will drive the tool to the previous home position (datum's/limits required). *(Default is ENABLED)*

Datum at Start of Job

If the Datum at start of job check box is set, the machine will find it's home location each time a job is run, before the job is actually executed. (Default is DISABLED)

6.3 Input/Output Parameters Menu

To access the Input/Output Parameters, click Input/Output Parameters in the left pane of Machine Parameters. These parameters are related to the operation of the rotary spindle drive system, or auxiliary outputs.

Fourth-Axis Indexing

This option enables a four-axis system to use the fourth axis as a rotary indexing head – not a cylindrical axis. See "Link Solenoid 1 To Cylindrical" option, below. (*Default is disabled)*

Spindle Setup

This option sets what type of spindles is fitted on the machine. Options are:

- Single Pneumatic
- Dual Pneumatic *(default)*
- Single Controlled
- Controlled + Pneumatic

Z-Axis Configuration

This option determines how the Z-axis will function during engraving. Options are:

- Independent Z (*Default)*
- Follow X-axis
- Follow Y-axis

Spindle Device Code

This option sets which auxiliary output enables the rotary spindle motor.

- Not Used
- Relay 1 *(default)*
- ISO2
- Solenoid 1
- Solenoid 2

Spindle Mode

This option sets which auxiliary output enables the rotary spindle motor.

- Automatic - Offset to 2nd spindle for auto tool change. *(Default)*
- Pause - Pause for manual tool change (single spindle only).

Spindle Delay (Rotary Motor Power-Up Dwell)

This option sets the delay, in milliseconds, employed to allow the rotary spindle drive system to achieve its desired velocity (from stop) OR decelerate to a complete stop (from operating speed). No X/Y motion is executed during this delay. *(Default is 2000 msec.)*

Aux1 Device Code

This option sets the "device code" for AUX1, which is the physical device controlled by the AUX1 button on the control panel. Options are:

- Not Used
- Relay 1
- ISO2
- AUX 1 *(default)*
- AUX 2
- Solenoid 1
- Solenoid 2

Aux1 Device Mode

This option sets the "device mode", or method of operation, for the device attached to the AUX1 auxiliary output channel. Options are:

- Manually Activated
- Automatic - Active During Job *(default)*
- Automatic - Inactive During Pen Up, Active During Pen Down

Aux2 Device Code

This option sets the "device code" for AUX2, which is the physical device controlled by the AUX2 button on the control panel. Options are:

- Not Used
- Relay 1
- ISO2
- AUX 1
- AUX 2 *(default)*
- Solenoid 1
- Solenoid 2

Aux2 Device Mode

This option sets the "device mode", or method of operation, for the device attached to the AUX2 auxiliary output channel. Options are:

- Manually Activated
- Automatic - Active During Job *(default)*

- Automatic - Inactive During Pen Up, Active During Pen Down

Link Solenoid 1 to Cylindrical

This option, when enabled, causes Solenoid 1 to switch in synchronization with the [Flat/Cyl] key on the controller's keypad. Thus, the user may control an external operation/event along with the Flat/Cyl status. This is particularly useful when actuating a clamp or brake (etc.) when the system is in indexing mode (see 'Fourth Axis Indexing', above). *(Default is disabled)*

Delay When Switching

This option sets the delay, in milliseconds, employed to allow the flat/Cyl axis to switch, and any associated operations (clamping, braking) to complete. *(Default is 0 ms.)*

Solenoid ON Delay (Down Dwell)

This option sets the Down Dwell (delay), in milliseconds, employed to allow the (pneumatic) spindle to cut down to depth before proceeding. No X/Y motion is executed during this delay. *(Default is 250 msec)*

Solenoid OFF Delay (Up Dwell)

This option sets the Up Dwell (delay), in milliseconds, employed to allow the (pneumatic) spindle to retract to full clearance before proceeding. No X/Y motion is executed during this delay. *(Default is 100 msec)*

Aux ON Delay

This option sets the delay, in milliseconds, employed to allow the AUX outputs to turn ON and begin operating. No X/Y motion is executed during this delay. *(Default is 0 msec)*

Aux OFF Delay

This option sets the delay, in milliseconds, employed to allow the AUX outputs to turn OFF and cease operating. No X/Y motion is executed during this delay. *(Default is 0 msec)*

Tool Cut Speed

This option sets the base feed rate **during cutting**. Units are user units per second (in/sec or mm/sec). *(Default is 4.0 inches/sec 102 mm/sec)*

Tool Cut Depth

This option sets the depth of cut **below the established material surface**. Units are user units (in or mm). *(Default is 0.01 inches / 0.25 mm)*

Tool Plunge Speed

This option sets the base feed rate for the Z-axis **down travel**. This is usually set at a slower rate because of the need to cut down through the work piece to establish the full Tool Cut Depth. Units are user units per second (in/sec or mm/sec). *(Default is 0.25 inches/sec / 6.3 mm/sec)*

Tool Lift Speed

This option sets the base feed rate for the Z-axis **up travel**. This is usually set at a faster rate because there is no need cut into the work piece on the up-stroke. The tool is raised from the Tool Cut Depth position to the Tool Lift Height position (see below). Units are user units per second (in/sec or mm/sec). *(Default is 2.0 inches/sec / 51 mm/sec)*

Tool Lift Height

This option sets the height above the material surface to which the Z-axis will raise the tool, when it lifts out of the work piece (during the course of the job). Units are user units (in or mm). This parameter allows the user to optimize system performance by restricting the up-travel to a minimum, while specifying sufficient height to clear the work piece and jigging. *(Default is 0.10 inches / 2.54 mm)*

X Tool Offset

This option sets the distance between Tool 1 and Tool 2 in the X-axis (used with dual spindles). *(Default is 0)* See "Spindle Mode", above.

Y Tool Offset

This option sets the distance between Tool 1 and Tool 2 in the Y-axis (used with dual spindles). *(Default is 0)* See "Spindle Mode", above.

Auto Park Position

This option sets the status of the Auto Park feature. This option defines where the tool will be positioned after completing a job. Options are:

- None (tool left at end of last move)
- Park (X=0, Y=Y-max)
- Go Home (X=0, Y=0)

Datum at Start of Job

This option determines if the machine will datum at the start of every job. This feature is useful if a pre-defined origin is set.

Note: If Datum at Start of Job is set the controller will ignore table limits.

6.4 Machine Resolution / Motion Params Menu

To access the Machine Resolution / Motion Parameters, click on Machine Resolution / Motion Parameters located in the left pane of Machine Parameters. These parameters are related to the machine's resolution.

X Resolution

This option sets the resolution of the X-axis in steps per user unit (steps/in or steps/mm). (*Default is –16000.0 per inch / -630 per mm 5:1 Ball screw / Leadscrews are -12,800 per inch / --504 per mm 4:1)*

Y Resolution

This option sets the resolution of the Y-axis in steps per user unit (steps/in or steps/mm). (*Default is 16000.0 per inch / 630 per mm 5:1 Ball screw / Leadscrews are 12,800 per inch / 504 per mm 4:1)*

Z Resolution

This option sets the resolution of the Z-axis in steps per user unit (steps/in or steps/mm). *(Default is 12800.0 per inch / 504 per mm)*

HPGL XY Scale

This option sets the scale factor for transforming HPGL commands from the host software into real-world motion on the current machine. Units are HPGL plot units per user unit (pu/in or pu/mm), and refer to the X and Y-axes. *(Default is 1000.0 inches / 40 mm)*

For example, a system with an XY scale factor defined as 1000 means that the controller will expect the host software to send HPGL commands with 1000 plotter units per linear inch. Thus, to drive this system 4 inches in the X-axis, the host software would issue the HPGL command:

PA4000, 0,0;

HPGL Z Scale

This option sets the scale factor for transforming HPGL commands from the host software into real-world motion on the current machine. Units are HPGL plot units per user unit (pu/in or pu/mm), and refer to the Z-axis ONLY. *(Default is 1000.0 / 40 mm)*

For example, a system with a Z scale factor defined as 1000 means that the controller will expect the host software to send HPGL commands with 1000 plotter units per linear inch. Thus, to drive this system 4 inches in the Z-axis, the host software would issue the HPGL command:

PA0, 0,4000;

Contouring Acceleration

This option sets the acceleration, A, **during cutting** for ALL axes. Units are in user units per second per second (in/sec^2 or mm/sec^2). It is typically lower than the traversing rate (see also, "Acceleration", below) to give smoother motion, and therefore, better image quality.

This parameter is particularly influential for long, straight motion sequences and intense vector sequences, such as high-resolution HPGL jobs. *(Default is 15.0 inches/sec^2 / 508 mm/sec$^{2)}$*

X-Cyl Max Velocity

This option sets the maximum velocity of the X-axis in Cylindrical mode (Cylindrical device fitted). *(Default is 4.0 per inch / 254 per mm)*

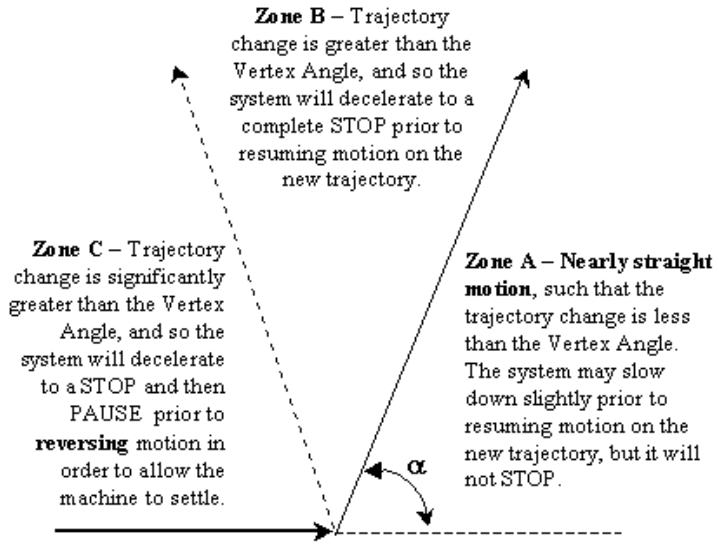
Arc Resolution (SET_RES Parameter)

This option sets the smoothness to which internal arc commands are evaluated. The numeric value represents the maximum deviation of the actual (stepwise) path from the "true path" of the arc segment, along its length. *(Default is 0.0010 inches / 0.254 mm)*

Vertex Angle

This option sets the Vertex Angle factor, F_M, a coefficient (multiplier) which controls the critical angle above which the system will slow down to a STOP as it negotiates significant turns in the path. Increasing this factor will increase the critical angle, thus forcing the system to negotiate more radical turns without stopping. (See Vertex Acceleration B parameter in the next section.)

This parameter is particularly useful for tuning the transitions through polygons and splines.



Vertex Angle, α (*Default is 0.2500)*

6.5 Rates Menu

To access the Rates Parameters, click on Rates Parameters located in the left pane of Machine Parameters. These parameters are established for each axis in the system.

WARNING: The following settings are the recommended settings for use with Newing-Hall systems. Any variation may cause stalling and could effect the operation and longevity.

(Defaults are listed in the form X / Y / Z)

Minimum Velocity

This option sets the minimum velocity, V_m, (cutting or traversing) for the current axis. Units are in user units per second (in/sec or mm/sec).

(Default is 0.100/0.100/0.100 inches/sec / 7.62/7.62/2.54 mm/sec)

Maximum Velocity

This option sets the maximum velocity, V_M, (cutting or traversing) for the current axis. Units are in user units per second (in/sec or mm/sec).

(Default is 4.00/4.00/1.00 inches/sec 102/102/25 mm/sec)

This parameter is particularly influential for long, straight motion sequences.

Acceleration

This option sets the acceleration, A, **during traversing** (tool-up) for the current axis. Units are in user units per second per second (in/sec^2 or mm/sec^2). (See also "Contouring Acceleration", above.)

(Default is 30.0/30.0/20.0 inches/sec^2 / 1270/1270/508mm/sec^2)

This parameter is particularly influential for long, straight motion sequences and intense vector sequences, such as high-resolution HPGL jobs.

Vertex Acceleration

This option sets the Vertex Acceleration factor, F_V, a coefficient (multiplier) which controls how much the system will slow down through minor turns (nearly straight motion). Increasing this factor will increase the speed through the minor turns. Decreasing it will decrease the speed through the minor turns. (See Vertex Angle in the previous section.)

(Default is 1.0/1.0/30.0 inches / 645/6450/19355 mm)

This parameter is particularly influential for transitions through polygon and spline sequences.

Reverse Percentage

This option sets the Reverse Percentage factor, F_R, a coefficient (multiplier) which controls when the system must decelerate to a complete STOP **and pause** to let the machine settle before continuing on. This occurs when reversing direction, such as executing the character 'N'. Increasing this factor will decrease potential for a complete stop with pause when reversing direction. (See Vertex Angle parameter in the previous section.)

Reverse Percentage	Meaning
1.0	Pause on 180^0 turns ONLY
0.5	Pause on 135^0 – 180^0 turns
0.0	Pause on 90^0 – 180^0 turns

(Default is 0.60/0.60/1.00)

Minimum Jog Velocity

This option sets the minimum velocity for jogging, for the current axis. Units are in user units per second (in/sec or mm/sec).

(Default is 0.10/0.10/0.10 inches/sec / 7.62/7.62/5 mm/sec)

Maximum Jog Velocity

This option sets the maximum velocity for jogging, for the current axis. Units are in user units per second (in/sec or mm/sec).

(Default is 50.0/60.0/20.0 inches/sec / 102/102/25.4 inches/sec)

Jog Acceleration

This option sets the acceleration for jogging, for the current axis. Units are in user units per second per second (in/sec^2 or mm/sec^2).

(Default is 30.0/30.0/2.0 inches/sec^2 / 1270/12700/51 mm/sec^2)

Reverse Delay

This option sets the dwell time in milliseconds that the system delays at vertices that extend the criteria given in the Reverse Percentage Parameters.

6.6 Machine Limits Terminology

Systems with a controlled Z-axis and/or datum's specify tool position relative to three distinct references. The following text explains these references.

Datum

When referencing **DATUM**, the datum point is established by fixed sensors in the mechanics, and is located as follows:

Datum	Location
X Datum	Extreme left, with positive values to the right
Y Datum	Extreme rear, with positive values going back
Z Datum	Extreme top, with positive values going down

Origin

When referencing ORIGIN, the **"machine" origin** (0,0,0) position is initialized to the datum point, and then updated by the X, Y, Z Limit Offsets:

(Machine) Origin	Location
X axis	X-axis DATUM + X Limit Offset
Y axis	Y-axis DATUM + Y Limit Offset
Z axis	Z-axis DATUM + Z Limit Offset

Home

When referencing **HOME**, the home position is initialized to the machine origin, and can be reset at any time by jogging the tool (3-axis) to the desired HOME position and pressing [Set Home]:

Home	Location
X axis	As specified by [Set Home], with positive values to the right
Y axis	As specified by [Set Home], with positive values going back
Z axis	As specified by [Set Home], with positive values going down

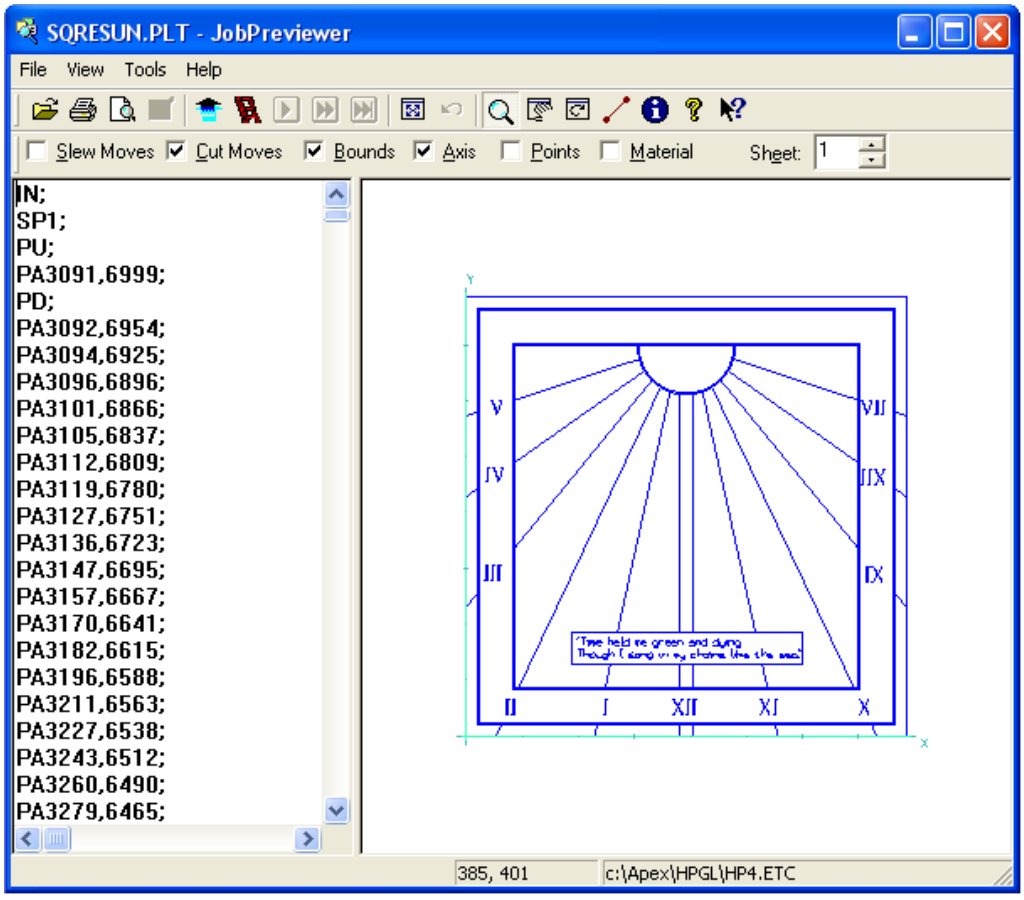
HOME is assumed to be the start point of the job. APEX-JLS users may specify HOME relative to several places on the job. All other software assumes HOME to be located at the LOWER LEFT corner.

Note: The HOME position is actually a "soft" ORIGIN (0,0,0) reference point. **It is this "soft" origin that is referenced by the motion program (HPGL/CNC)**. As such, ALL jobs are executed relative to this position – regardless of the actual position on the table bed. Thus, the user should ALWAYS [Set Home] prior to sending a job.

Chapter VII – Previewer

Job Previewer enables the user to graphically preview job files before the machine executes them. Job files can be in one of several formats: HPGL (Hewlett Packard Graphics Language), CNC (Computer Numerical Control), UCJ (uCito Job – native format), and Raster files (of limited types).

The first time Job Previewer runs it checks the Program Settings for file extensions that have been associated with it at the Windows system level. If the extension on the file that the user wants to open is not associated with Job Previewer, it will ask if the user wishes to associate the extension. If this option is accepted, Windows will place Job Previewer icons along side the file names that have the selected extension. The user will then be able to double click on a job file and have Job Previewer come up with the job displayed automatically. There is a check box labeled "Don't ask me this again" that can be selected to disable checking of file extensions when starting the program. To restore checking of file extensions, see the Supplemental Information page.



7.1 Operation Overview

Job Previewer provides the capability to preview jobs in detail before the commitment is made to cut material on the real machine. In production environments where new untested job files are being created on a regular basis, this can be valuable in saving time, expensive materials, and wear and tear on machines. A large portion of the development and testing cycle for new job files can be performed using Job Previewer. This application can simulate the execution of a job file and generate a clear picture of how the real part will turn out.

The three-dimensional graphics display gives the user a realistic view of the finished part. Special graphical functions provide the ability to zoom in, change the angle of view, and see the individual movements of the machine tool. Both cut and slew moves can be seen clearly. Individual geometric elements (lines, arcs, splines, etc.) can be clearly viewed and identified.

The text display lists the actual content of the file (motion control language code) along side of the picture. A special step mode highlights motion codes and geometric elements in sync, step-by-step, in the order of execution. This provides for detailed analysis of machine tool motion. Job Previewer also has an edit mode that enables the user to make changes directly to the motion code. These capabilities make Job Previewer suitable for motion code troubleshooting and development.

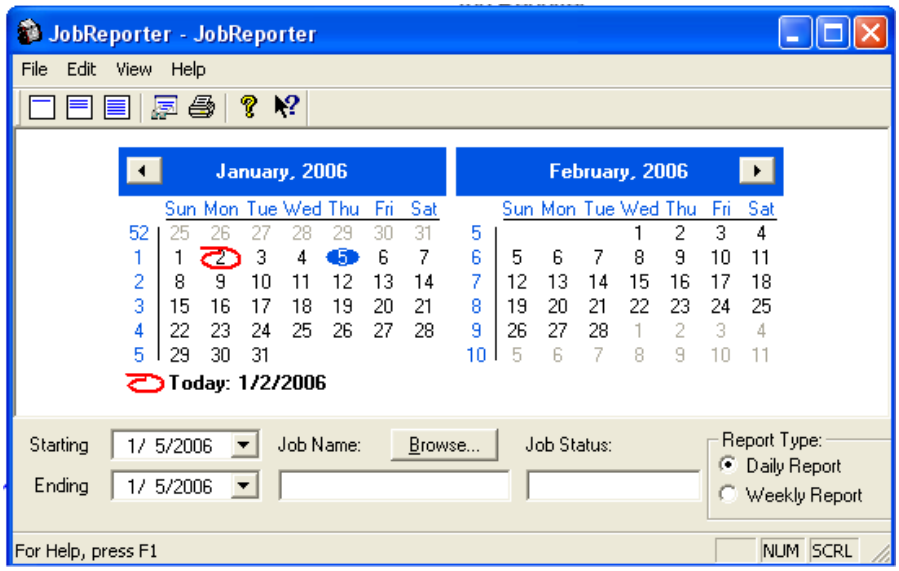
The supported formats for job files are: HPGL (Hewlett Packard graphics language), CNC (computer numerical control), UCJ (uCito job - native control language), and Raster (bit mapped image).

Each time Job Previewer runs it compares the file extensions (types) in the program settings with those that have been associated with it at the Windows system level. For any extensions listed in the program settings that are not associated with Job Previewer, the file extension association dialog box will pop up with the option to associate the extensions. If accepted, Windows will place Job Previewer icons beside the file names that have the extensions specified in the program settings. The user will then be able to double-click on a job file name that has one of the specified extensions and Job Previewer will start and load the job file automatically.

For more detailed information please see the Job Previewer online help.

Chapter VIII – Job Reporter

Job Reporter displays and prints reports of historical job information. The DNC component of Job Server keeps a log of job information in the Job History Database. The database is in Microsoft Access® format (.MDB). Job Reporter uses the Seagate Crystal Reports application to generate professionally formatted previews and printed reports of recorded job data.



8.1 Operation Overview

The primary function of Job Reporter is to create professionally formatted reports of job data that has been collected by the DNC component of Job Server. A report can be viewed on-screen through the Print Preview feature, or it can be printed out like any normal Windows® document. The steps in the process of creating a report are presented below:

1. Collect the data - When jobs are run on a machine tool, the DNC component of Job Server records many items of information about every job that runs. Once some history of executed jobs is generated, then Job Reporter can be used to review and/or report that history.
2. Enter the Program Settings - In the File Menu select the Settings option (File => Settings). The Shift Information needs to be set to match the time frame of your company's operation cycles. The Report Settings need you to specify three important items: the folder/directory where the template report files that Job Reporter uses to format the reports are kept, the name and folder/directory of the Job History Database log file,

and the Report Title that will appear at the top of every report. See the Program Settings section for additional information.

3. Specify the Report Criteria - The Report Options just below the Calendar Control provide for the input and display of the Criteria used in gathering information from the Job History Database. The time range shown in the Starting and Ending input boxes can be input in any of three ways: use the Calendar Control, type the dates directly in, or click on the small buttons on the right side of the Starting and Ending input boxes to reveal another calendar (click on the date). The Job Name input box is used as a filter for the file names of the jobs that will be included for reporting. **Wild-card characters are not allowed**. It is intended to simply include whatever is entered as part of every job file name to be included. The Report Type specifies the time interval that data will be grouped and summarized by (daily, weekly, monthly, or yearly). See the Report Options section for additional information.
4. Generate and Preview the report - Reports can be quite long depending on the criteria. Print Preview is the way to make sure you have what you really want before using a lot of paper. In many cases you may not want to actually print the report, but you just want to review the information right on the computer screen. From the File Menu select Print Preview (click on File => Print Preview). See the Print Preview section for additional information.
5. Optional step, print the report - Once you are comfortable with the content of the report, then proceed with generating the hard copy. The print function in Job Reporter normally sends the report to the default Windows® printer. To change the selected printer, use the Print Setup option in the File Menu (click on File => Print Setup). See the Print option in the Main Menu section for additional information.

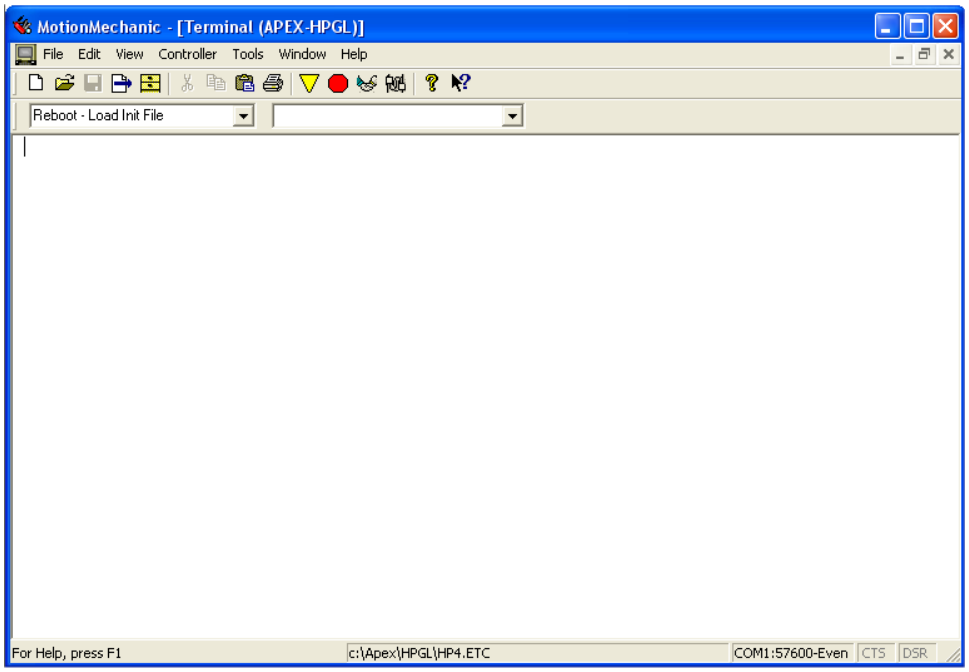
For more information please see the Job Reporter online help.

Chapter IX – Motion Mechanic

The Motion Mechanic application gives the user advanced technical control over the use and setup of the motion controller from a host PC.

Components available within Motion Mechanic:

1. Terminal Emulator – Provides direct access to the controller for development, diagnostics or troubleshooting.
2. Text File Editor – Editing or development of files related to the controller can be worked without another application.
3. Session Log – Keeps a record of communication error statistics. Stored between sessions of Motion Mechanic. Can be used for troubleshooting communication problems.



9.1 Operation Overview

This tool is provided for troubleshooting and updating the HPGL controller. Updating the controller with new files such as Firmware and INIT files can increase the functionality and/or fix problems in the HPGL controller. Usage of this tool is typically used in conjunction with Newing-Hall Customer Support giving instructions to the user.

Using this tool is not recommended unless instructed by Newing-Hall Support Technicians. Improper use of this tool can render the HPGL controller unusable.

Monthly Maintenance Procedures

CAUTION: To reduce the risk of injury, DISCONNECT ALL POWER to the engraving system prior to performing any maintenance.

Cleaning and Lubricating the NH-300/400/600 Table

Remove the Table Plates and clean the channels. If your machine is equipped with a T-slot or vacuum table, clean them in place. Use the jog keys to expose all sections and vacuum the Y-rail and X-bridge extrusions. If the machine is under heavy use, then clean these areas more often.

Clean the lead screws, V-wheels and V-wheel rods with a clean lint-free cloth.

Using the jog keys, apply a light coat of Christo-lube or Newing-Hall RED X over the entire length of each lead screw so that there is a 1/16" bead at the actuator when the machine is running.

Do not use petroleum-based lubricants (such as 3-in-1 Oil or WD40) or any other type of lubricant on the lead screws. Use of other lubricants could cause an excessive wear of the actuator nuts.

Note: If the lead screw is over-lubricated, it may allow debris to collect on the lead screw and cause undue wear to the actuator and lead screw.

Note 2: Ballscrews are to be lubricated only with Newing-Hall RED X. Using Cristo-lube will damage the ballscrews and void the warranty.

Wipe no more than one drop of 3-in-1 Oil on the ½" rod which runs horizontally along the bridge. Do the same to the ¼" rods and V-wheels inside the bridge and Y-rails. Use the jog keys to expose the entire rod for complete lubrication.

Quarterly Maintenance - 300/400/600

CAUTION: To reduce the risk of injury, DISCONNECT ALL POWER to the engraving system prior to performing any maintenance.

Linear Bearing Adjustment

Move the carriage to the center of the x-bridge and the x-bridge to the front of the table.

Grasp the right side of the carriage with your hand and attempt to move the carriage up and down.

If there is play evident, locate the right linear bearing adjustment set screw (see fig. D-3) and turn clockwise with a 5/64 Allen wrench only until movement is gone. Do not over-tighten or the carriage may bind.

Repeat the above two steps for the left linear bearing.

Bearing Cell Plate Inspection

Move the carriage to the left of the x-bridge and the x-bridge to the rear of the table.

Remove the left and right nosepieces from the y-rails by using a 3/32 Allen wrench. Slide the left and right brush covers forward and remove for accessibility.

Clean the brush covers using an ordinary degreaser. Dry them thoroughly before re-installing.

To check for play in the y-axis bearing cell plate, grasp the x-bridge and attempt to move it front to back of the table while touching the bearing cell plate. If there is any play evident in the bearing cell plate, contact Customer Service at 1-800-521-2615 for replacement. Do not attempt to adjust the bearing cell plate. It is preset and cannot be adjusted.

Actuator Inspection

A sign of actuator wear is usually best shown during engraving. Circular letters or graphics are a good test for checking actuator wear. Actuator wear is evident when the starting and ending points of engraved circular letters or graphics do not meet. If they do not meet at the top, then there is actuator play in the y-axis actuator(s). If they do not meet at the sides, then there is play in the x-axis actuator. The NH-600 table contains 2 y-axis actuators.

Move the carriage to the center of the x-bridge and the x-bridge to the center of the table.

Remove the nose piece(s) and brush cover as previously explained, if not already removed.

Grasp the x-bridge and attempt to move it front to back feeling for any play in the actuator(s). Do the same to the carriage and attempt to move it left to right.

If there is any play evident, contact Customer Service at 1-800-521-2615 or contact your Newing-Hall sales representative. Do Not attempt to adjust the actuators. They have to be adjusted to a **specific** torque setting using special equipment.

Note: Ballscrews do not require any adjustments. The only maintenance required is to keep them clean and lubricated with Newing-Hall RED X.

Inspect Motor Drive Belts

Remove the belts to check for excessive wear or fraying. On NH-300 and NH-400 models the belts are 39" on the front and 41" on the rear.

The NH-600 model belts are 52" on the front and 50 1/8" on the rear.

Inspect Motor Brushes

First, **UNPLUG THE MOTOR!** The motor connector is located on the back of the controller.

Remove the motor brushes, which are located near the bottom of the motor. Excessive brush wear is indicated if the brush is worn to the notch. Replace both brushes if either brush exhibits excessive wear.

Replace the motor connector on the back of the HPGL controller, and test using the Spindle key on the front panel. Run the spindle motor for 10 minutes at 100% to seat the brushes.

Warning: Newly installed brushes that are not seated properly may cause damage to the motor and malfunction of the controller.

Check Diamond Spindle Insert

Check the diamond insert to make sure it has not worn, by engraving a sample plate. Use a new insert to engrave the same sample and compare quality.

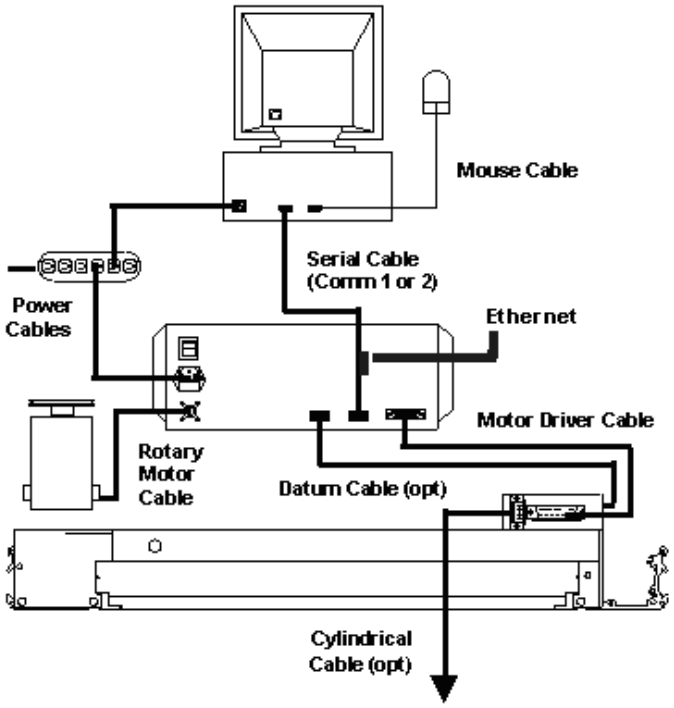
Check V-wheel Adjustment

There are four V-wheels located inside the Y-rails of the engraving table and one V-wheel located inside the bridge.

Check the two V-wheels on the right side of the machine by holding the V-wheel between thumb and forefinger. If any of the V-wheels can be turned, then they are in need of adjustment. Contact Newing-Hall, Inc. Customer Service for instructions regarding V-wheel adjustment.

Do not attempt to adjust the V-wheel without first consulting Newing-Hall, Inc. Customer Service or the table will become out of square.

Appendix B – Cable Connection



Appendix C - Troubleshooting

Symptom: Cannot communicate with controller.

This can be caused by a number of factors:

- Controller not turned on via the main power switch.
- Controller E-Stop button engaged.
- Serial cable (9-pin) not connected.
- COMMs parameters in the JLS or other engraving software do not match the controller.

Communication Parameters

Controller	HP1	HP3
Baud Rate	19200	57600
Parity	Even	Even
Stop Bits	1	1
Data Bits	8	8
Handshake	Hardware	Hardware

- Conflict in host computer communications port setup.
- Defective communications port hardware (PC or controller).

To correct this problem, resolve the connection/power causes (above) and try again. If this does not correct the problem, consult the host software (e.g. JLS) communications setup parameters as described in Chapter 4.

If the setup parameters are correct, then review the host PC for port conflicts. This is especially problematic for computers with many serial devices connected, such as modems, FAXes, serial mice, power savers, 3rd party screen savers, etc. Resolve any of these conflicts before proceeding.

Checking The Communications Circuit using the Mouse

In order to check the communications circuitry, turn the PC off and swap the serial cable and (serial) mouse cable connections. Reboot the PC and try the mouse. If the mouse does not work, then the problem is likely to be an error on the host PC's COMM port. Otherwise, turn the PC off, swap the cables back, reboot the PC and continue.

Note: If the mouse does work this still may not eliminate the port or the PC as the mouse and controller use different pins on the connection.

Symptom: Drives will not turn ON when pressing [Drives].

This is typically caused by a connection problem in the power circuit:

- Controller not turned on via the main power switch.

- Motor Driver cable (25-pin) not connected and secured.
- Emergency Stop button engaged.
- Loose wiring inside the controller on the Emergency Stop button.

To correct this problem, resolve the common causes (above) and try again. If the problem persists, contact NHI Customer Service.

Symptom: Table does not datum when pressing [Datum].

This is typically due to the datum's not being enabled in the machine setup.

To correct this problem, start Machine Parameters, locate the Datum Parameters, and set the Limit Mask to "3" for X/Y sensors, or "7" for X/Y/Z sensors.

If the Z travels in the wrong direction - Power off and switch the Z Datum connection on the spindle.

Symptom: Table does not engrave when pressing [Start].

This can result from a number of factors:

- No job has been sent from the host software.
- The job was previously cancelled.
- The job is too large to restart.

To correct this problem, verify that a job has actually been sent from the host PC. Pressing [Start] when no valid job is available causes the system to flash the START LED rapidly for several seconds.

Also, canceling a job requires that it be re-transmitted from the host PC to run again. Pressing [Start] immediately after canceling a job will cause the START LED to flash rapidly for several seconds, as above.

Finally, large jobs that do not fit entirely in the controllers RAM memory, cannot be restarted without re-transmitting them from the host PC.

Symptom: Table does not park after the end of a job.

This is typically due to the Auto Park feature not being enabled.

To correct this problem, start Machine Parameters and enable Auto Park in the Input/Output Parameters.

Symptom: Z-axis stepper does not operate or jog.

This is typically a setup problem, in which the system is defined for a 2-axis system instead of a 3-axis system.

To correct this problem, start Machine Parameters and properly configure the Spindle Setup and Z-axis Configuration fields in the Input/Output Parameters. If the problem persists, contact NHI Customer Service.

Symptom: Controller does not start...

This is typically the result of a blown mains fuse.

To correct this problem:

- Disconnect all power from the controller.
- Remove the fuse holder module from the mains switch.
- Note the voltage orientation of the module when it is removed.
- Check and replace any defective fuse.
- Replace the fuse holder module in the proper voltage orientation.
- Re-connect power.

If the problem persists, contact NHI Customer Service.

Symptom: Controller does not respond – loss of FLASH…

This problem is characterized by complete shutdown of ALL operations and loss of communication with the host computer.

To correct this problem, the controller must be re-Flashed using Motion Mechanic. Contact NHI Customer Service for further details.

Symptom: LED's are not powered on the table…

Check to make sure the controller is on.

Is the table equipped with LED's?
Is the datum cable plugged in at the controller and table? The power for the LED's are delivered via the datum cable.

Re-Flashing the HP2/HP3 Controller

The following instructions are organized in stages, or "levels" in order to provide appropriate updates for typical situations, without requiring the operator to endure the risk and hassle of a complete controller re-FLASH if it is not needed.

Note that **simply re-Flashing the controller is not always the best course of action**. Problems can result from a hardware component failure or procedural error, and in these cases, re-Flashing

will only complicate matters. If you have any questions about the appropriate course of action, TELEPHONE NHI CUSTOMER SERVICE for advise immediately. Re-Flashing the controller can be effective, but it can also cause problems if the wrong diagnosis is made or the stepwise procedure is not followed diligently.

Once it is decided to undertake an update procedure, use the following guide to determine what kind of update should be done:

Symptom/Condition	Update	Comments
Product refinement or bug fix, including a new firmware version (e.g. h4k428f.bin).	Level 1	**Level 1 is the MOST extensive re-FLASH operation, and is potentially UNRECOVERABLE** – use EXTREME CAUTION.
Product refinement or bug fix, consisting of a new INIT file (e.g. HP4INI 3.xx – K529.UC).	Level 3	Level 3 is the most common controller upgrade, and involves only replacing the INIT file.
Re-instate default machine parameters or machine setup.	Level 2	Level 2 involves restoring a previous version of the machine setup file (e.g. HP0DRAM.UC) and/or the INIT file (e.g. HP4INI.UC). The Self-Test file, HP4 Units and the language file may also be restored (optional).
Controller will not boot-up reliably.	Level 2	
Controller boots, but cannot enable drive power.	Level 2	

Update Process

Verify that the controller is connected to the host PC and turned ON. Then start Motion Mechanic by double-clicking on the Motion Mechanic icon. Follow these steps to update the controller:

Level 1

1. Verify that the **Terminal applet is running** ("Motion Mechanic – Terminal" displayed in title bar). If it is not running, select the Terminal command from the Tools Menu
2. **It is important to determine the Model and revision of the processor board in the HPGL controller before flashing. Flashing the wrong firmware to the wrong controller board may render the HPGL controller inoperable.** To determine the model and revision press the **[F9]**. This should place a prompt. At the prompt type ".version". This command will display version information about the controller. The line that is of importance is the "Model" line.

The following table will show what firmware must be used with the particular model and version of the processor board.

Model K520 Rev x = k3c444g.bin. The Model K520 board firmware must start with k2xxxxx.bin. **If this is your model proceed to step 7.**

Model H971 Rev 4x = h4k428f.bin. The Model H971 Rev 4x firmware must start with h4xxxxx.bin. **If this is your model proceed to step 3.**

Model H971 Rev 3 = HTK354B.BIN. The Model H971 Rev 3 firmware must start with HTxxxxx.bin. **If this is your model proceed to step 3.**

3. Strike the **[F4] key on the keypad, then type "147"** and press [Enter] to invoke the "monitor mode". The terminal should respond with instructions that it you have "Entered H971 Monitor " and then the terminal should issue the "**:**" prompt.
4. Type "**e m** " and press [Enter]. This command will erase the controller's FLASH memory. The terminal should respond with instructions that it is "Erasing Firmware at Location 2000…" and so on. Watch the status bar for the progress indicator during the erase procedure.
5. Type "**e 3** " and press [Enter]. This command will erase the INIT file.
6. Using the mouse, **click the "File Cabinet" button** on the toolbar to invoke the Store File dialog box.
7. **In the Controller Location field, select "F-Firmware".** Locate and select the desired firmware (.BIN) file, such as h4k428f.bin, and click [Open]. Watch the status bar for the progress indicator during the download.
8. When finished, the controller will have new firmware loaded, but no control files and no machine setup parameters (this is equivalent to running the "update.bat" utility in the previous DOS tools). Go on to Level 2.

Important: The latest HPGL K520 board no longer lets the user delete the firmware. The controller deletes firmware internally only when it receives its new firmware in memory and verifies its checksum.

Level 2

1. Verify that the **Terminal applet is (still) running** ("Motion Mechanic – Terminal" displayed in title bar). If it is not running, select the Terminal command from the Tools Menu
2. Strike the **[F4] key on the keypad, then type "145"** and press [Enter] to initiate a controller re-boot (without INIT file). Record any error messages displayed during the boot sequence, for use later.
3. From the keyboard, type "**format_files**" and press [Enter]. This will erase any control files currently resident in the system.
4. From the keyboard, type "**format_params**" and press [Enter]. This will erase any machine setup parameters currently resident in the system.
5. Using the mouse, **click the "File Cabinet" button** on the toolbar.
6. **In the Controller Location field, select "P - Machine Parameters".** Locate and select the desired machine setup (.UC) file, such as H0DPRAM.UC, and click [Open]. Machine Setup files always have "RAM" in their name. Watch the status bar for the progress indicator during the download. The following standard setup files are supplied:

    - H0DPRAM.UC- Models 240/300/400/600, no Datum's, Pneumatic spindle(s)
    - H2DPRAM.UC- Models 240/300/400/600, X/Y Datum's, Pneumatic spindle(s)
    - H3DZRAM.UC- Models 240/300/400/600, X/Y/Z Datum's, controlled-Z spindle

- 53DZRAM.UC- Model 500, X/Y/Z Datum's, controlled-Z spindle
- 73DZRAM.UC- Model 700, X/Y/Z Datum's, controlled-Z spindle

7. When finished, the controller will have the new machine setup (parameters) file loaded, but no control files. Go on to Level 3.

Level 3

1. Using the mouse, **click the "File Cabinet" button** on the toolbar.
2. **In the Controller Location field, select "1 – SelfTest File".** Locate and select the desired self-test (.UC) file, such as HP4SELF.UC, and click [Open]. Self-test files always have "SELF" in their name. Watch the status bar for the progress indicator during the download.
3. Using the mouse, **click the "File Cabinet" button** on the toolbar.
4. In the Controller Location field, select "20- File Location 20". Locate and select the file "HP4UNITS.UC", and click [Open]. This file is used to convert the units via the pendant. Watch the status bar for the progress indicator during the download.
5. Using the mouse, **Click the "File Cabinet" button** on the toolbar.
6. **In the Controller Location field, select "U - User Init File".** Locate and select the desired user INIT (.UC) file, such as HP4INI 3.28 – K520.UC, and click [Open]. Init files always have "INI" in their name. Watch the status bar for the progress indicator during the download.

   NOTE: The INIT file must match the firmware and revision of the board inside the controller.

   H971 rev 3 = HP4INI 2.80 – H971 rev 3.UC
   H971 rev 4B = HP4INI 3.16 – H971 rev 4B.UC
   K520 rev 1-5 = HP4INI 3.28 – K520.UC

7. When finished, the controller will re-boot with the new control files loaded. Go on to the Exit procedure.

Exit / Power On Self Test

1. Watch the Terminal window to observe the boot-up sequence. This consists of a number of statements, including the firmware version number, available RAM memory, etc. This display completes with the "HPGL" command, which is an indication that the controller is now going into HPGL mode – no further messages should display. If the boot-up sequence displays errors, then one of the steps, above was not successful, or there is a mismatch between versions of the programmed files.
2. During the power-on-self-test (POST), the controller's LED indicators begin lighting with the right-most LED, and proceeding to the left. At the end of the POST, all the LED's will go out, and the Running LED should blink. This indicates that the controller is ready for operation, and the user should now be able to turn on drive power by pressing the [Drives] key.

Symptom: One or more axes spontaneously reversing…

This is typically caused by a component failure on the motor-driver circuit board. "Chattering" can also manifest it – especially when the machine is idle.

Replacing the board or repairing the board at the factory can only remedy this problem. Contact NHI Customer Service for further direction.

Symptom: Table spontaneously stops amid job…

This problem can be caused by a broken connection in the communication (serial) cable or by a corrupted work file (.WRK) from the JLS engraving software. Review these first when troubleshooting this problem.

Otherwise, this problem can be caused by a component failure on the CPU circuit board. If so, the problem can only be remedied by replacing the board or repairing the board at the factory. Contact NHI Customer Service for further direction.

Symptom: Spindle motor spontaneously stops amid job…

This is typically caused by a component failure on the KBLC speed control – usually a blown fuse.

Checking and replacing the fuses on the KBLC speed control board can remedy this problem. Contact NHI Customer Service for further direction.

Symptom: LED's on front panel blinking…

Consult Chapter 3 for complete details on condition LED's. The following is a summary:

START LED	Condition
Steady Off	**No action/error.**
Slow Blink	**Engraving Paused** - Press [Start] to resume.
Medium Blink	**Ready To Start** - Press [Start] to begin.
Fast Blink **(After pressing [Start])**	**No Job Available** to execute.
Fast Blink (at power-up)	**Drives Disabled** – Check cabling, pullout E-Stop switch, Press [Drives On].
Steady On	**Executing/Running**.

Symptom: Spindle moves after pressing [Drives] …

This typically happens on older HP2 controllers because datum's (limits) have been enabled in the setup. If datum's are enabled, pressing [Drives] on older HP2 controllers causes the system to datum.

To correct this problem, start MACHINE PARAMETERS, access the Datum Parameters, and set the Limit Mask to "0" to disable datum sensors.

Symptom: Cannot repeat VST search …

This is typically due to pressing the [VST] key to repeat the search, instead of using the proper key sequence.

To correct this problem, use the proper key sequence, which varies depending on the current search operation. See Chapter 3 for details.

Symptom: Spindle/bridge makes a small jerk when idle …

This is caused by a built-in power saver feature in the HPGL controller, and is NOT an error. The original tool position is restored immediately prior to jogging or executing the next work (.WRK) file – no positioning is lost.

Symptom: Cannot digitize the material surface …

This problem can occur if [Enter] or [Cancel] is pressed immediately after positioning the tool, instead of pressing the [Digitize] button.

Alternatively, this error may occur if one attempt to define the material surface is outside of the specified machine limits (for the Z-axis). To correct this problem, revise the Z-axis machine limits to match the application.

See the Z Spindle manual for details on Z-axis operation.

Symptom: Short Circuit Detect on XY…

Depending on the revision of the motor drive board this error message if displayed is indicating the controller has detected a short circuit on the table. Disconnect the motor drive cable and inspect the cable for damage. If no damage on the motor drive cable inspect the wiring on the table.

Warranty Information

Stop! Read the following and fill out the Registration Card at the back of this section before you go any further.

Basic Warranty

Newing-Hall, Inc. (the company) warrants new machines, software and accessories that are manufactured by Newing-Hall, to be free of defects in materials and workmanship for a period of one year beginning on the day the product is shipped. This warranty does not cover products that have been abused or used for purposes for which they were not intended or designed. Consumable items including, but not limited to, belts, brushes, vacuum table covers and cutters are not covered under this warranty. Spindle bearings are covered for ninety days. Accessories not manufactured by Newing-Hall including but not limited to personal computers (PC's), air compressors and digitizer tablets are covered by warranties from the companies that manufacture these products and are not covered under warranty by Newing-Hall. Separate warranty information is packed with these products and it is the customer's responsibility to follow each company's policy.

Field Service Units

Field Service Units (FSU) are Controllers and/or Flatbed Tables. They are available for temporary use by customers when it is necessary to return their unit to the Customer Service Department for repair. During the warranty period there is no charge for this service. There is a One Hundred Fifty Dollar ($175.00) charge per repair event for non-warranty customers. Availability of FSU's cannot be guaranteed, but the company will provide FSUs as they are available. After the customer's unit has been repaired and returned it is the customer's responsibility to return the company's FSU's by surface UPS, at the customer's expense. The customer must ship the FSU within two business days after receiving their repaired unit. Prompt return of FSU's is necessary to insure that FSU's are available for all customers. Customers who fail to adhere to this policy will have rental charges assessed.

Freight Charges

For repairs covered under warranty, the company will be responsible for surface UPS freight charges from Customer Service to the customer's location. The customer is responsible for all freight charges from their facility to Customer Service. The customer is responsible for the difference in freight charges for delivery by means other than surface UPS.

Shipping Cartons

Because of possible rough handling by the various shipping companies, the Newing-Hall shipping cartons have been specially designed to protect the equipment that they hold. There is a fee for replacement of shipping cartons. Newing-Hall is NOT responsible for equipment damaged in shipping. It is suggested that all equipment be returned in an authorized factory carton to insure proper handling during shipment.

Return Authorization

It is necessary to obtain a Return Materials Authorization (RMA) number from the Customer Service Department. Merchandise returned without an RMA number MARKED ON THE OUTSIDE OF THE SHIPPING CARTON will be REFUSED.

Telephone Assistance

Telephone assistance is provided by the Customer Service Department. This department will provide assistance for questions concerning the operation of our equipment including software set-up, machine adjustments, and equipment malfunctions. Services are available from 8:00 AM to 6:00 PM Eastern Standard Time, Monday through Friday, except for holidays. To reach this service call 1-800-521-2615 from within the continental United States or 1-419-255-8804 outside the continental United States.

Extended Warranty

An Extended Warranty is available for the controller after the expiration of the Basic Warranty. The Extended Warranty provides the same coverage on the Controller as the Basic Warranty. The current cost is Eight Hundred Dollars ($1000.00) per year. An Extended Warranty is not available on any other piece of equipment. Proper preventive maintenance of the other components will minimize the need for repair service. To implement an Extended Warranty, it must be ordered prior to the expiration of the previous warranty period, if the unit is so covered.

Non-Warranty Service

Repair service work not covered under warranty will be performed with charges for labor and parts. The labor charge is Seventy-Five Dollars ($80.00) per hour with a two-hour minimum labor charge. All freight charges for both Field Service Controllers and customer controllers are the responsibility of the customer for all NON-warranty repairs. Charges for Field Service Units are payable in advance or COD. Priority is given to customers covered under Warranty if sufficient Field Service Units are not available to meet demand.