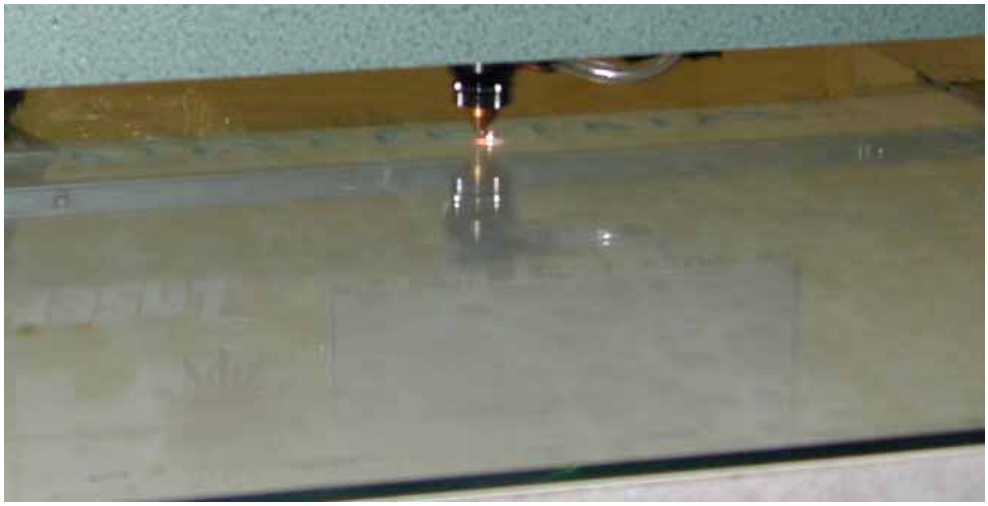
ALLEN DATAGRAPH

LE Series

Laser Engraving / Cutting System



Date of publication: May 20, 2004

This document is designed to be compatible with build 86 of the Engraver software. Other versions of Engraver software may show minor differences in menus.

Limited Warranty Agreement

ALLEN DATAGRAPH LE Series Laser Etching and Cutting System are warranted to be free of defects in both materials and workmanship. Should any part of this equipment be defective, it will be repaired or replaced, at the option of the manufacturer, at no charge for parts or factory labor for a period of one (1) year from the date of installation. All warranty services are performed at the Allen Datagraph factory. Replacement parts not installed at the factory will be billed to the customer at regular prices and credit will be issued when the defective parts are returned. The customer is responsible for freight on warranty parts and repairs.

This warranty is void if:

1. The equipment has been damaged by negligence, accident or mishandling, or has not been operated in accordance with the procedures described in the operating instructions;

or:

2. The equipment has been altered or repaired by other than an approved service station or factory service center, or adaptations or accessories have been attached to the equipment that shall have adversely affected the performance, safety, or reliability of the equipment.

NO OTHER WARRANTY, EXPRESSED OR IMPLIED, APPLIES to the equipment. Allen Datagraph does not assume any responsibility for consequential damages occasioned by the equipment, or inconvenience or interruption in operation.

In case of unsatisfactory operation, Allen Datagraph or its Dealer should be notified immediately.

Technical Support

Up to 4 hours of calls in technical support is available at no charge during the warranty period. Technical support is available during business hours based on Eastern Time Monday thru Friday. Technical support outside the limits stated will be billed at current rates.

For Technical support call: 603-893-1983

Installation

Site Preparation

The engraver should be installed on ground floor of a facility to minimize the effects of vibrations from people walking by, showing up in the image. There should be at least a 2-foot preferable 3-foot wide area around the machine to allow walking completely around the machine while it is in operation without contacting the machine. Touching the machine while it is running with wreck the image. The conveyer-mounting block in the engraving area should be built up 18-24 inches with a poured cement block so that when you are adjusting the leveling jacks you do not need to bend over all the way to the floor. If you are planning on engraving items weighing over 100 lb an overhead crane will be required to lift and move the objects being engraved. The model 4800 needs an area 15 ft x 11 ft of floor space. The model 6000 needs an area of 15 ft x 13 ft. The model 9600 needs 15 ft x 15 ft of floor space. The model 14400 needs an area of 15 x 19 ft of floor space. See appendix A for an example floor space layout.

Dedicated Computer Requirements

For best image quality and since the computer is intimately involved with the sending of the image no other program should be run on the computer while it is send the image to the engraver. This requires a dedicate computer tied to a network to allow preparation of images on another

computer. The minimum requirements for the dedicated computer is Pentium Processor at 500 Mhz with 256Mb Ram, 1GB free hard drive, serial port, running Windows 98, ME, 2000 or XP.

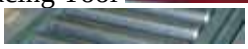
List of Parts Delivered

Engraver Frame with electronic box  Box with control boards and clamps, 2 power cords,

Arm  Laser  Compressor 

Allen wrenches, T square  Laser alignment tool  Lens 

Focus Spacing Tool  Leveling/Focusing scissor jacks (3) 

Conveyer 

4x4 blocks for build up (4 short and 4 long) 2x4 blocks for build up (10 pieces), 2 Plates/boards for top and bottom of build up

Socket for jacks

Ratchet wrench

Machine Assembly

- Install 2 circuit boards from separate box. Attach board clamps. Tighten clamp screw until boards no longer move.
- Bolt down frame to floor.
- Attach arm to frame and tighten Allen screws.
- Attach umbilical chain to arm with screws.
- Connect x motor power (2 wire) from arm to motor connection
- Connect power for x motor encoder transmitter. (3 wire)
- Connect optical cable xa to x motor encoder transmitter board xyoa
- Connect optical cable xb to x motor encoder transmitter board xyob
- Connect y motor power (2 wire) from arm to motor connection
- Connect power for y motor encoder transmitter. (3 wire)
- Connect optical cable ya to y motor encoder transmitter board xyoa
- Connect optical cable yb to y motor encoder transmitter board xyob
- Connect gas tube

- Do not attach laser yet.

Connect Power Cord

Some Allen Datagraph products require specialized installation in order for the limited warranty to remain in effect, ask your dealer or contact technical support at Allen Datagraph for details.

Unpack all accessories from the unit.

Power Connection

Important Note: Use of a HIGH QUALITY surge protector or uninterruptible power supply (600 watts) is REQUIRED by Allen Datagraph Systems. Failure to do so could affect your warranty coverage if a problem arises due to improper power connection.

CAUTION: The power cords are a three-conductor cable that incorporates a safety (earth) ground connection. For the machine to operate safely and correctly, the power cord *must* be plugged into an outlet that has an earth ground contact. *Never* plug the power cord into a two-prong outlet by using a 3=2 cord adapter.

Allen Products can be configured to operate from any of the following power sources:

115 VAC / 48-66 Hz or 230 VAC / 48-66 Hz

ALLEN DATAGRAPH products are normally factory preset for the power requirements of the destination country. The machine's configuration is indicated on the power input module as either 115V or 230V. To change the configuration:

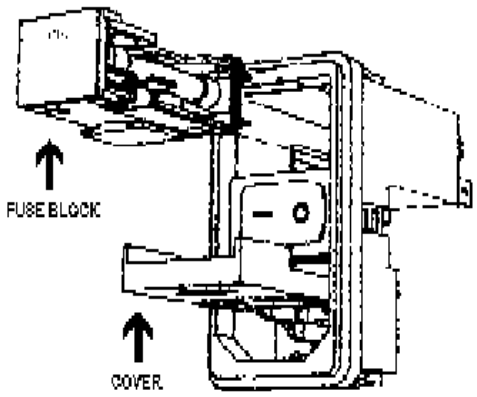
a. Disconnect the AC power cord from the fuse block on the power input end panel.

b. Open the fuse block cover with a small flat screwdriver.

c. Orient the fuse block so that the desired voltage appears in the fuse block cover.

d. Close the fuse block cover and verify that the desired voltage is showing.

There are two power entry modules on the Engraver. The top Power Entry is connected to the Control and the bottom is connected to the Laser. The control uses about 300-400 watts and the Laser uses about 700 watts of AC power.



POWER ENTRY MODULE

Computer Connection

System Interfacing

All Allen Datagraph products utilize serial (RS-232) interface or optionally USB (universal serial bus) interface. Use of the USB requires a USB to Serial converter. The recommended USB to serial converters are described in TSB Title: Recommended USB devices Web Site Copy / CD Copy on the technical support page of the Allen Datagraph web site.

The serial interface is factory preset for 9600-baud, no parity, 8 data bits, 1 stop bit. The Engraver, when used with the supplied plotter cable, automatically supports both HARDWIRE and XON / XOFF software handshaking.

Connect the plotter cable supplied with the Engraver to serial port and to the communications port on the host computer. A "null modem" cable may be used on serial XON / XOFF communications only and is available at computer supply stores.

Because of the bi-directional communications required by the Engraver system the use of the supplied communications cable and one of the com ports or a USB to Serial on the host computer.

See your computer documentation for proper set-up of the communications port.

Loading Allen Engraver Software

The Firmware Utility CD contains:

1. The Engraver Interface Utility program for communication with the Engraver.
2. A current revision of firmware.

   "Firmware" is software that controls the machine functions. ***The firmware on this disk is provided for update purposes only and should not be installed on new machines.***
3. Manual and sample jobs.

In order to use the Engraver, it is necessary to install the Remote Panel Utility Program.

To install and run the Remote Panel Utility program - Open Windows Explorer by right clicking on the Start Button. Find the CD-ROM drive and find the setup file SetupLaserBuildXX.exe (the XX reflects the numeric version number of the software and firmware e.g. SetupLaserBuildxx.EXE). Run the setup program by double clicking on the file. Follow the onscreen prompts.

Installing Firmware

The firmware on this disk is provided for update purposes only and should not be installed on new machines. In general you should not install a firmware update unless directed by a member of the technical support staff. *Firmware updates are available on the technical support page of the Allen Datagraph web site at http://www.allendatagraph.com.*

This procedure details the firmware upgrade procedure. Normally firmware is only sent to customers when a software problem is reported that has been fixed in a later version of the software.

From time to time Allen Datagraph will recommend that you upgrade your firmware in your Allen Datagraph Engraver. A file can be downloaded from the Allen Datagraph web site and saved to the desktop.

Before running the setup program be sure to exit the older version of the Remote Panel.

XP Instructions

The downloaded file is a .zip file. You can run the setup program just by double clicking on the *.zip file then double click on the setup *.exe file.

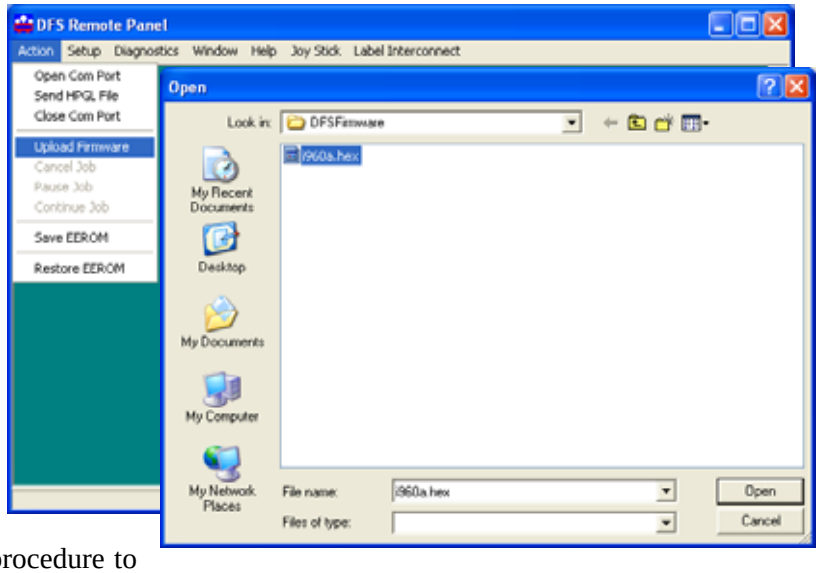
Other Windows Operating Systems

If you have not already installed Winzip on your computer, download and install the Winzip program from http://www.winzip.com. Then you can open the zip file by double clicking on it. Drag and drop the contents of the zip file to your desktop.

The setup program will run to install the Remote Panel and the firmware on your Windows computer. If instructed by the factory to upgrade your firmware, follow the firmware upgrade instructions below. If you were only instructed to upgrade to a new remote panel you have already completed this task and do not need to install the firmware.

Firmware Installation Instructions:

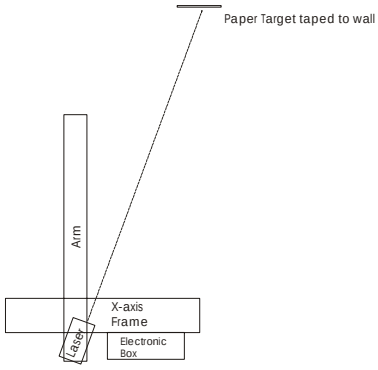
Do not use this section unless instructed to do so by Allen Datagraph.



Turn on the Allen Datagraph equipment to be upgraded and connect it to your computer with the supplied serial cable. Start the Remote Panel by clicking on start, All programs, Allen Datagraph, Laser Remote Panel. Click on Setup, Com Port and verify that the correct Com port has a check next to its name. Click on Setup, Other Parameters and select Menus Advanced, OK. Click on **Action, Upload Firmware**. Select I960a.hex file and click **Open**. If the upload fails, you will be given a backup procedure to follow on the computer screen.

Laser Pointer Alignment

The purpose of this procedure is to aim the laser pointer so that it hits the same spot as the laser. Since the laser is invisible it is important that we be able to know where the laser will fire without turning on the laser.



Before powering on machine with laser attached, turn on power to control and verify joystick on pendant can move the arm the complete length of travel and the mirror mount can be moved from the far end to the near end.

Power off machine and place laser on shelf at about 20° angle to the arm. Tape a piece of paper to the wall so that when the laser fires the laser will hit the piece of paper. See top view at right. Connect laser power connector to laser.

Turn on power to control and laser. Start the Laser Remote Panel. Enter the password to start the program. This password will be supplied in a separate document. Select the com port that the laser is connected to by selecting setup -> com port. Bring up main menu by selecting setup -> Main menu. You should see data in the version box indicating successful communication with engraver. If the boxes do not fill in verify the engraver is on, the communication cable is connected and you have selected the correct communication port.

Set the laser power to 2 watts. Click on OK.

Set the Align – Run switch to the Align position. While nothing is between the laser and the target press the fire button. This should create a black circle on the paper target. Turn on the

laser pointer. If the pointer does not point to the center of the black circle adjust the pointer alignment screws on the front head of the laser. Move the laser a bit and fire again. Repeat adjustment until laser pointer points to center of black dot.

Laser Alignment



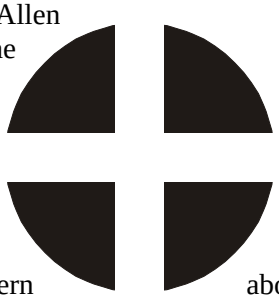
Screw the laser alignment tool into the front edge of the mirror assembly. Attach laser to arm with bolts. Do not tighten. Set all 4 laser alignment screws to their mid position Turn on laser pointer. Using the T-Square align front edge of mirror assembly perpendicular to the mirror mount. Adjust height to that red dot is with in 0.25 inch of the center cross hairs. Tighten mirror mount. . Joystick mirror assembly close to the laser. Use the laser alignment screws closest to the mirror assembly to get the laser pointer to point at the cross hairs.

Joystick mirror assembly to far end of arm. Using the laser alignment screws farthest from the mirror assembly next to the laser fan exhaust, point the laser pointer at the cross hair.

Repeat alignment near and far from laser until no adjustments are necessary.

Tighten nuts so that alignment screws do not turn. Snug up laser bolts. Do not tighten. Verify alignment did not change and laser pointer still points to center of target at the near and far end of the mirror travel.

Mirror Alignment



There are two, mirror alignment Allen screws with small access holes in the mirror assembly. One screw adjusts one axis of alignment and the other adjusts the other axis of alignment. Remove the laser alignment tool from the side closest to the laser and attach to side closest to media. The object is to create the burn pattern above when firing the laser through the laser alignment tool. Set the Align Run switch to the align position. Set up a target under the laser mirror by building up structure of crossed 4x4 near the mirror assembly. Use a piece of paper for the target. The laser power should still be set to 2 watts in the main menu from laser pointer alignment section. Press the fire button to fire the laser. Check the pattern. Adjust one of the mirror alignment screws. Move paper and fire again. Repeat Fire, Adjust, move target until 4 distinct areas of burn are seen.

Remove laser alignment tool and attach lens. Attach air hose to lens assembly.

Control Panel

The front control panel is the interface for the Engraver. It is used for Head positioning and aligning the engraver.

Fire

The fire button fires the laser and the wattage set by the main menu when the align/run switch is set to the align position. It has no effect when the switch is in the Run position.

Align/Run

This switch controls whether the computer turns on the laser or the fire button turns on the laser. If the Run position the computer controls the firing of the laser. In the Align position the fire button turn on the laser as long as the fire button is depressed.

Pause Stop/Run

The pause switch is interrogated at the beginning of each vector. If the pause position no vectors are processed. It the run position vectors are processed.

Led Pointer On/Off

The red led point can be turned off and on with this switch.

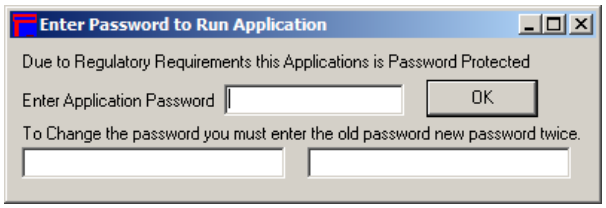
Joystick

The analog joystick labeled (left, right, in, out) allows the head to be moved in the direction of the deflection of the joystick while facing the mirror assembly. Small deflections move the mirror assembly slowly; large deflections move the mirror assembly faster.

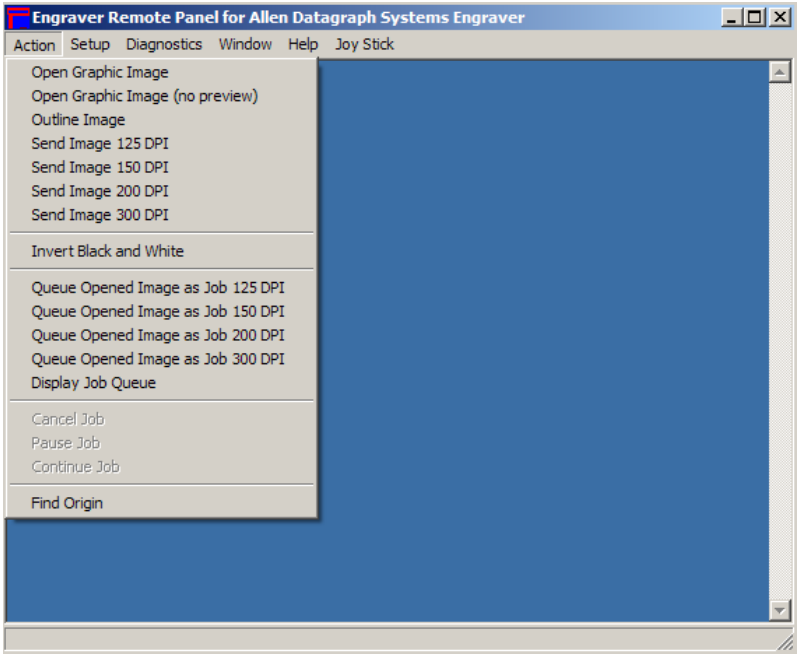
Remote Panel

The Remote Panel program is used to address all engraver functions. It should be loaded onto the computer that is directly connected to the engraver. It can be run in the background with most cad programs.

Remote Panel Functions



To start the remote panel double click on the icon on the desktop or click on Start -> All Programs-> Allen Datagraph -> Laser Remote Panel. The remote panel is password protected to keep untrained personnel from running the laser. The Default password is transmitted in a separate document.



Action menu

Open Graphic Image

This allows opening an image and displays a preview of the image on the screen.

Open Graphic Image (no preview)

This removes the preview option from the open file box and runs faster but without the preview in open dialog box.

Outline Image

This function moves the mirror around the edge of the image. It is used to verify placement of the image before it is burned.

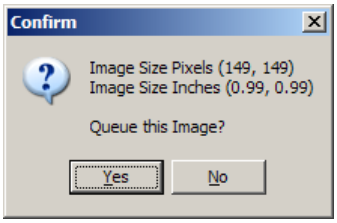
Send Image 125/150/200/300 DPI

These menu items send the currently opened image to the laser engraver.

Invert Black and White

Normally the image burned is mostly black and only the white pixels are burned. If the image is not mostly black you can invert the black and white.

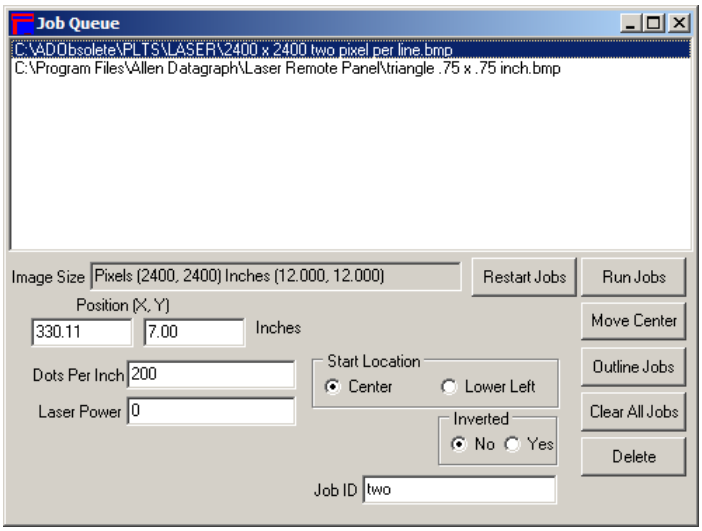
Queue Opened as job 125/150/200/300 DPI



You can queue up multiple jobs to be burned. The program display this size of the image as well as the number of pixels in the x and y axes. Click yes adds the opened image to the job queue where the mirror assembly is currently positioned.

Display Job Queue

The display job queue on the action menu displays a list of jobs in the queue. Clicking on the job name in the list at the top displays the parameters for that job.



Restart Jobs

If the power fails during a job you can restart the job if you have found origin before you queue any jobs. After the power is restored you can find origin again and click on restart jobs. The image will start where it left off burning.

Run Jobs

Clicking on Run Jobs, runs all the queued jobs.

Move Center

After selecting a job in the list you can click on move center to move the mirror assembly to the center of the selected job.

Outline Jobs

Outline jobs, moves the mirror assembly around each queue job.

Clear All Jobs

Removes all queued jobs from the queue.

Delete

To delete a job select the job to delete in the top list and click on delete to delete that job.

Image Size

Displays the size of the selected image in pixels and the selected units.

Position

The location of the job from power up or last find origin. This value can be changed by clicking on the job that you want to change. Changing the value. Then click on another job or this job.

Dots Per Inch

Resolution of the burned image. Acceptable values are 125, 150, 200, or 300. This value can be changed by clicking on the job that you want to change. Changing the value. Then click on another job or this job.

Laser Power

Number of watts of laser power for this job. This value can be changed by clicking on the job that you want to change. Changing the value. Then click on another job or this job.

Start Location

Most jobs will use center positioning. Lower left position can be used if the center of the job cannot be found. This value can be changed by clicking on the job that you want to change. Changing the value. Then click on another job or this job.

Inverted

The image will be inverted from the file if yes is select. No change if no is selected. This value can be changed by clicking on the job that you want to change. Changing the value. Then click on another job or this job.

Job ID

This is an optional field if you turn on job id's on the option menu.

Cancel, Continue, Pause Job

These commands will cancel, continue, or pause a job being sent. You can also use the pause switch on the pendant to pause the job. Note: pausing a job can cause a discontinuity in the image.

Find Origin

When you power up the engraver it does not know where the x-axis is positioned. You use this command once after you power up the engraver to find the x-axis zero point. Early versions (model 201) of the engraver do not support the Find Origin command. Use this with the restart jobs button on the job queue to restart a job after a power failure.

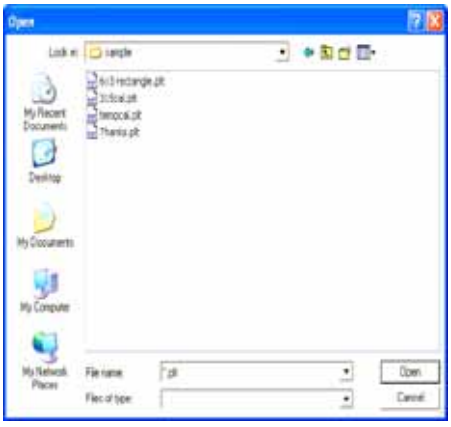
Advanced menu items (These menu items appear if you select the advanced menu on the Setup Other Parameters menu)

Open Com Port

Will initialize the communications port.

View HPGL file

The laser operates in two modes. One is the raster mode, the other is the vector mode. The view HPGL file allows viewing a vector file.



Send HPGL file

Send HPGL File will send a HPGL plotter file directly to the engraver. Typical origins HPGL files include the Allen Driver, CorelDraw or some other design software. To send a HPGL file from the remote panel program click the Send HPGL File menu item to open the select file window. Select the files desired and click the Open button. This will send the file directly to the engraver in vector mode. Instead of burning a raster image this will burn the edges or outlines of the image. Only slower speeds (< 2 cm/sec) are supported by this command due to the cantilevered design.

Close Com Port

Closes the communications port so that other programs can use the port. The remote panel program will automatically close the port in most instances when it is not actively communicating with the engraver.

Half Speed

This option delivers twice as much power to each pixel of an engraved image and runs at half speed.

Quarter Speed

This option delivers four times as much power to each pixel of an engraved image and runs at ¼ speed.

Eighth Speed

This option deliver eight times as much power to each pixel of an engraved image and runs at 1/8 speed.

Convert Gray Scale Image to B and W

This command will use the select gray scale level to set each pixel to either black or white. The resultant preview will be displayed.

Upload Firmware

Should your firmware ever need to be updated, this command will locate the firmware file and send it to the engraver.

Setup Menu

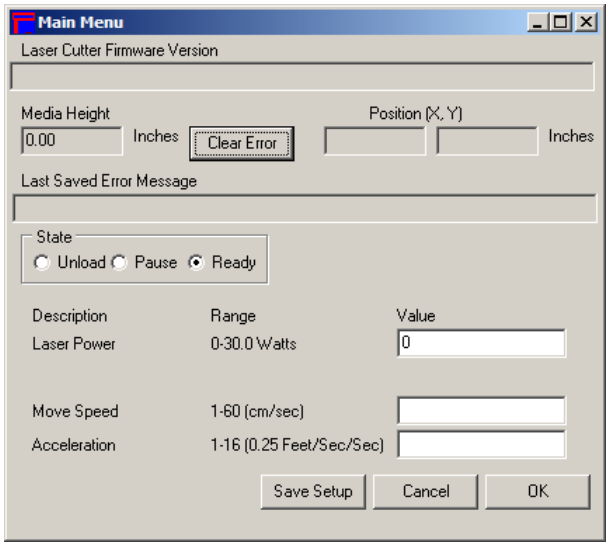
Main Menu

Firmware Version

Displays the model number, software part number and software version of the firmware loaded into the engraver. It should match the version displayed when you start the Laser Remote Panel.

Media Height

This is the length of the rail.



Position

Displays the current position of the mirror assembly.

Last Saved Error Message

If an error is detected that causes the system to shut down you can power off the engraver and power it back on and the error that occurred will be displayed here. This error message can be very old as it is saved until the next error message occurs.

Clear Error

Pressing the Clear Error button will clear the currently saved error message. This allows knowing that a displayed error occurred since the Clear Error button is pressed.

State

Pausing a job with the Action -> Pause will change the state to Pause state. You can resume the job with either Action -> Continue or bringing up the main menu, selecting ready and clicking on OK.

Laser Power

Allows controlling the amount of power delivered to each pixel. Use power based on the image type and material being burned.

Image Type	Laser Power
Photo	7-9
Lettering	9-11

Move Speed

This is the speed at which the arm moves while moving between jobs or doing y only moves while burning a job. Suggested value is < 3 cm/sec

Acceleration

This parameter controls how fast the vector reach final velocity. Suggested value 1

Save Setup

Clicking on Save Setup will save changes in parameters so that when you power on the machine the parameter will be remembered.

Cancel

Changes made to values are ignored and the menu is closed.

OK

Changes made to values are saved in the engraver until the engraver is powered off.

Advanced Settings

Draw Speed

Used when sending hpgl files containing outlines of shapes this is the max speed the mirror assembly moves in relation to the media. Max value is 3 cm/second due to cantilevered design.

Speed Resolution

Setting the speed resolution to mm/second allows finer resolution of the speed

Cad Override

The **CAd Override** radio buttons enables or disables the CAD override function. With the function **On,** the cutter will ignore some of the HPGL control commands sent from the cutting software. With the function **Off,** the software can control these HPGL functions. Some CAD systems will work correctly only when this feature is set to on. This features has no effect on engraved images.

These commands include:

AS	set acceleration
FS	set force
KA	set minimum angle
KN	set knife offset
IP	input P1/P2
RO	rotate
SC	set scale
SP	select pen
ST	select tool
UV	up velocity (move speed)
VS	down velocity (cut speed)

Dynamic Power

The Dynamic Force radio buttons engages the dynamic force function, which instantaneously adjusts the force on the fly based on the actual velocity of the mirror assembly with relation to the media. The engraver must accelerate and decelerate as they cut around corners. Some medias require different power settings for different speeds. This parameter allows for building a database for these materials and when enabled will greatly improve the cutting on these materials. (See the Dynamic Force Section for more details).

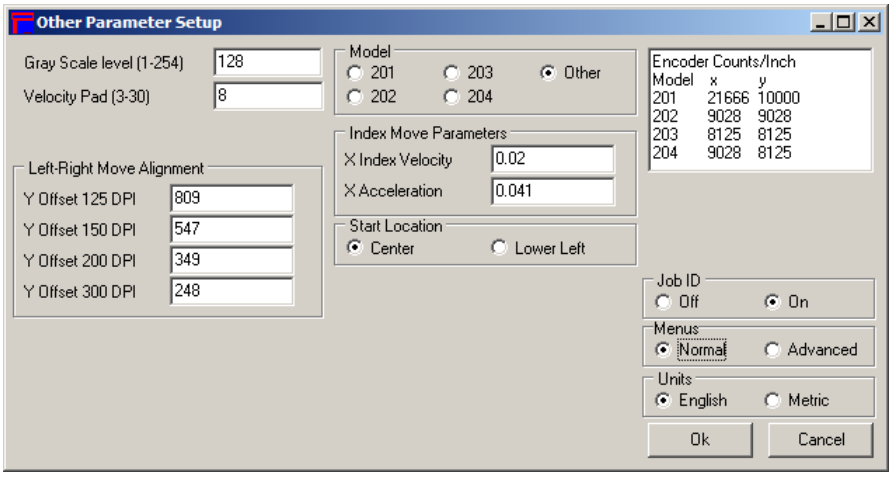
Other Parameters Menu

Gray Scale Level

If a gray scale image is opened this value determines whether the pixel is black or white. Pixel values > 128 are white.

Velocity Pad

While accelerating to perform a vector scan the velocity takes several milliseconds to stabilize the velocity to obtain a good image. A value of 8 waits 32 milliseconds after the acceleration phase before starting the raster scan.



Left-Right Move Alignment

Raster scans going left and right need a fudge factor so they appear in the same place. Double clicking the value with perform a small 2 inch by 2 raster line job with the laser off and will

automatically calculated the correct left-right move alignment. This value changes for each dpi and for half, quarter, and eighth speed.

Model

Model 201 machines are among this first machines shipped. They have smaller motors and a linear amplifier. These machines do not support find origin.

Model 202 were shipped with larger motors and a PWM amplifier with a gear ration.

Model 203 are currently being shipped and have a PWM amplifier with a different gear ration.

Model 204 are hybrid machines with model 202 x motors and 203 y motors.

Index Move Parameter Velocity/Acceleration

To draw very good pictures the acceleration and velocity between rows in the x-axis must be less than 1. Start with 0.2 for both values and reduce values to slow x moves between rows and increase to time between rows.

Start Location

Choose center if you position your job using the center of the media. Choose lower left if you cannot use the center of the media to set up the job.

Job ID

Job ID on will ask for a job id for each image opened.

Menus

Some items on the menu are normally not used and can complicate the learn process of the machine. Setting menus to normal will hide menu items that are normally not used.

Units

Setting units to metric will display sizes in cm. Setting units to English will display sizes in inches.

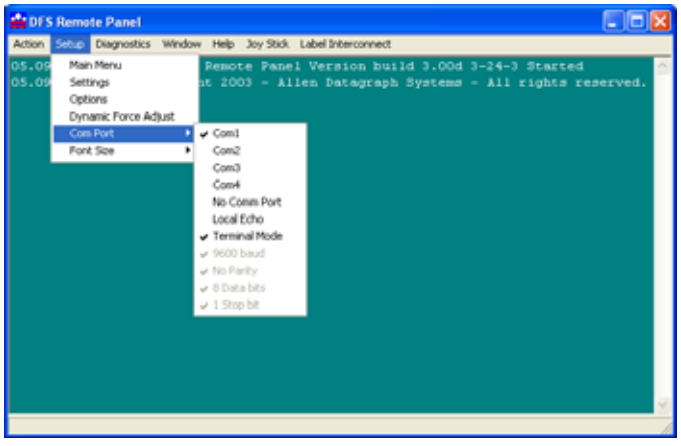
Advance Parameters

Index Location

The index locations are the values returned from the encoder after a Find Origin command. They are normally between 200 and 1800 encoder counts.

Laser Setup

Laser setup are parameter used to convert the laser watts on the main menu to the amount of power output to the laser. There should be no reason to change these values from their default values of 30, 50, and 550.



End Point

This is the location of mirror assembly goes to after a job. It is normally not necessary to change this from Center.

Com Port

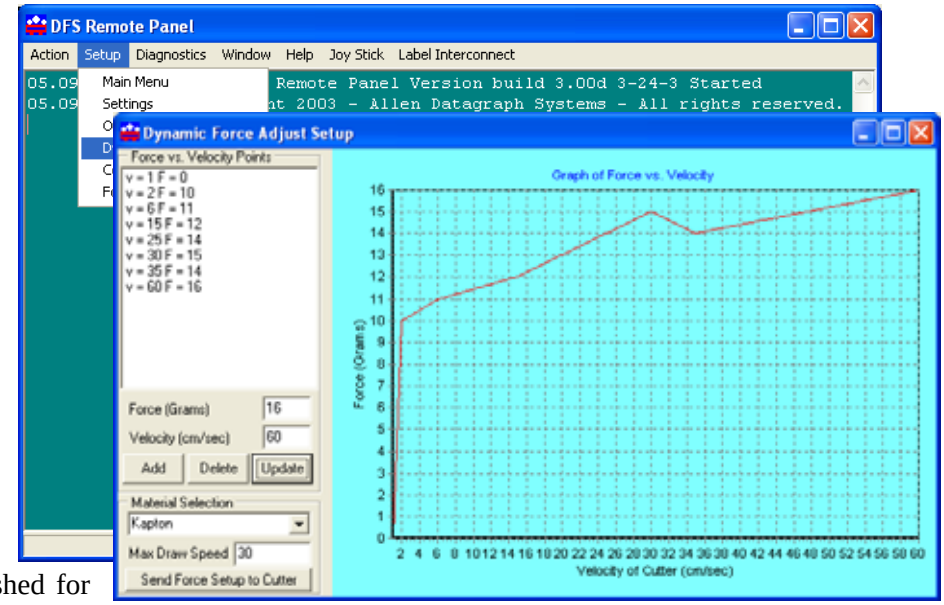
The Com Port menu is used to set the

communications port to the Remote Panel only. It does not set the communications port for the design software or Allen Windows Driver. The **Local Echo** mode is used in communicating directly from the remote panel while in **Terminal Mode**.

Font Size

Sets the font size for the Remote Panel Program.

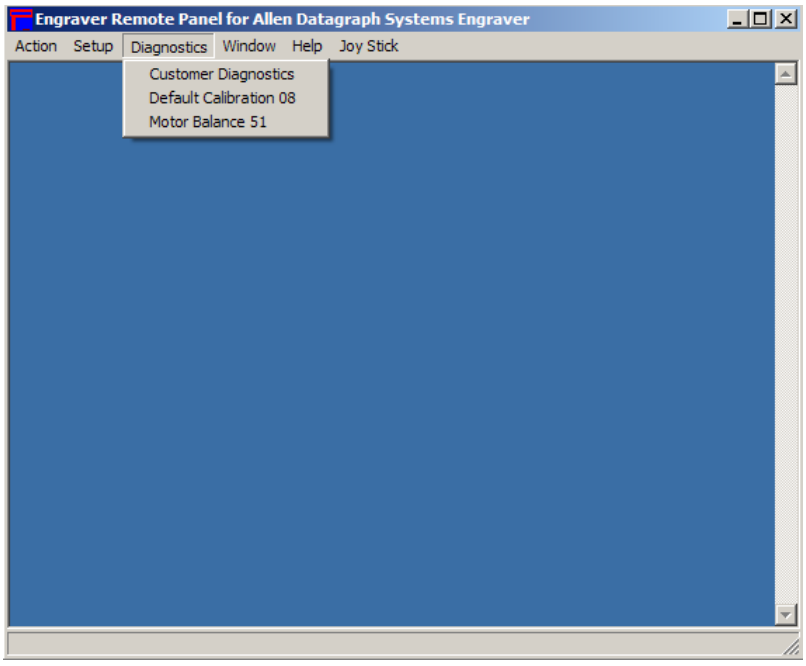
Dynamic Power Adjust



This feature is considered an advanced feature and does not appear on the Setup menu unless the menu is set to advanced on the other parameter page. Dynamic Power Adjust sets up the dynamic power parameters and database. To establish a new material database type in the name of the new material in the **Material Selection** box and click **Add**. In the Force and Velocity Window, type in the desired power vs. velocity that you have established for the material. The recommended method for establishing the various power vs. velocity numbers is to run the test cut at various velocities and record the results for entry here.

Enter the Maximum cut speed for the media in the **Max Draw Speed** window. This should be 3 or less for the engraver.

Before using Dynamic Power Adjust, it is necessary to send the power setup to the engraver memory by clicking the **Send Power Setup to Engraver** button. This needs to be done after each time the cutter is loaded or reset.

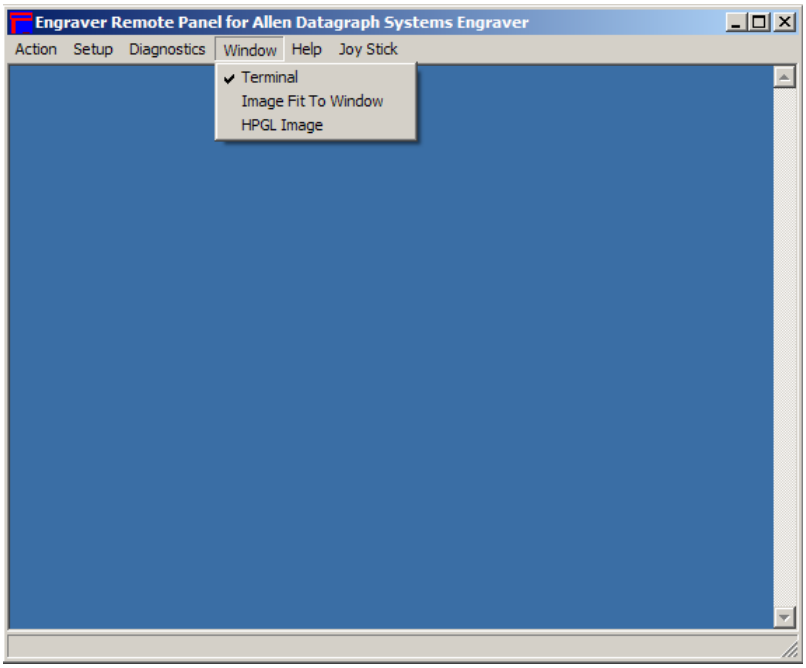


Diagnostics

See the diagnostics section of this manual. Additional diagnostics are available if advanced menus are used.

Window

This menu allows selection between the three different communication windows to the engraver.



Terminal

The terminal window allows typing commands directly to the engraver and seeing the response. You can also monitor the communications between the engraver and the remote panel if you have enabled the debug log.

Image Fit To Window

This window is used to display a preview of the image that is currently opened.

HPGL Image

This window is used to display a preview of an Hpgl image using the action view Hpgl file command.

Help

About

Displays the version of the remote panel loaded on the computer.

Clear Log

Clears the terminal window.

Advanced items

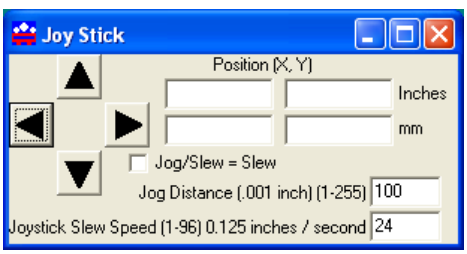
Enable Debug Log

Turn on communication monitoring for the remote panel. Communications between the remote panel and the engraver are displayed in the terminal window.

Enable Character Log

Turn on detailed communication monitoring for the remote panel.

Joy Stick



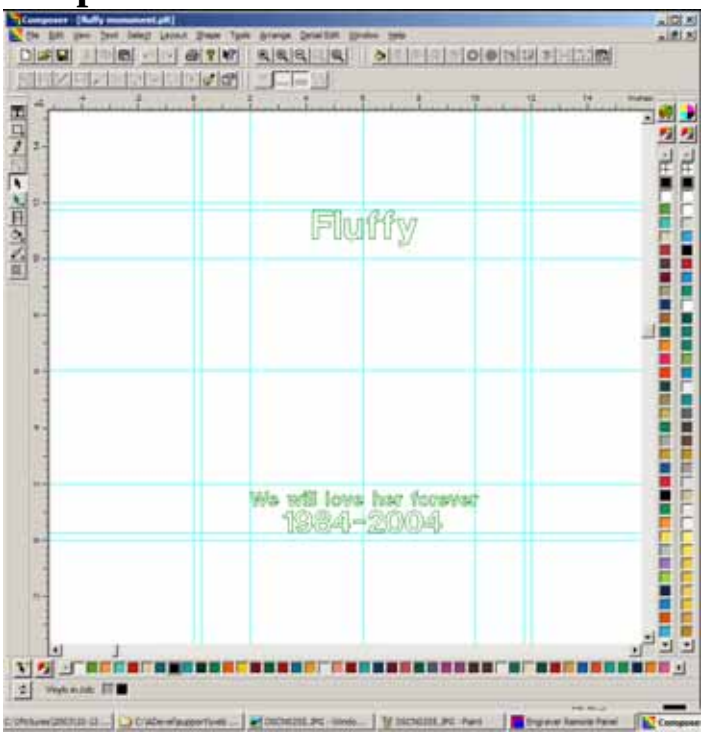
JOYSTICK The joystick is used for positioning the mirror assembly.

The four **ARROW KEYS** are used to jog the arm or mirror assembly. With the Jog/Slew box unchecked so that Jog/Slew = Slew, the joystick speed will be the speed set in the Joystick Speed Window. Left Click and hold the arrow button to move the mirror. With the

Jog/Slew box checked so that Jog/Slew = Jog, the arrow buttons will jog the mirror that fixed distance each time the button is clicked.

Image Preparation

Image Selection



Images with a lot of contrast burn better than images that are mostly white or mostly black. Particularly difficult are baldheads and white wedding dresses as large areas are completely white. Adjust the contrast/brightness so that you have a darker image that would be desirable for a photograph.

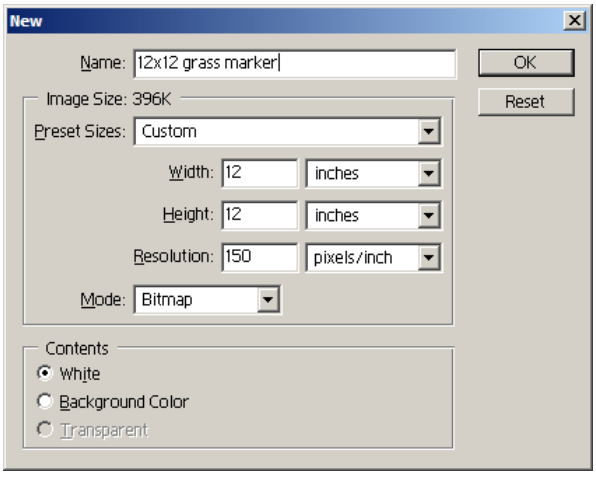
Layout Stone

Using a program such as Gerber Omega, Corel Draw or Adobe Illustrator layout the text and the outline of the image you are creating. In this example I will layout a 12x12 grass marker using Gerber Omega with a photo engraved in the center. I will use 150 dpi for this example. I have used construction lines to mark the edges, margins, and location of the 6 x 6 photo of fluffy. If you do not need cut lines for rubber cutting and sand blasting you can layout the monument directly in Photoshop.

Export as tiff

Use File -> Export, Select export all, Select Save as type = TIF – Tagged Image file format. Select location to save file and click on save. Change color to black and white, Change resolution to 150 dpi and select compressed image. Click on OK.

Open Tiff file with Photoshop



Create a new document with photo shop. Select a 12x12 image with 150 dpi in bitmap mode. Open tiff file created with Gerber Omega and copy and paste it to the new image. View rulers and add same construction lines as in Gerber Omega. To calculate the minimum required resolution of a scanned photo you take the size of the desired area in the layout for the photo horizontally in inches and multiply by the burn resolution. 150 dpi * 8 inches. This is 1200 pixels horizontally. Now measure across the width of the area of the photo that you wish to scan. Suppose this width is 3 inches. Divide the number of pixels required for your image by the size to get the minimum horizontal scan resolution. 1200 / 3 = 400 dpi. Repeat for vertical measurements. Scan image at the larger resolution. If you have a digital photo you must have at

least the number of pixels across the image as are required for your monument area at the dpi you are using (1200 pixels in this example). If your digital image is much smaller that this you will not get good results. You can normally shrink images without problem but increasing sizes of images is usually not successful.

Scan Image at Calculated DPI

In the previous section we calculated we needed a 400 dpi image for our 3 inch photo or 1200 pixels across for a digital photo. Scan the photo at 400 dpi using your color scanner.

Open the scanned image in Photoshop. Set background color to black and increase canvas size to 9 in by 9 in to add a black border

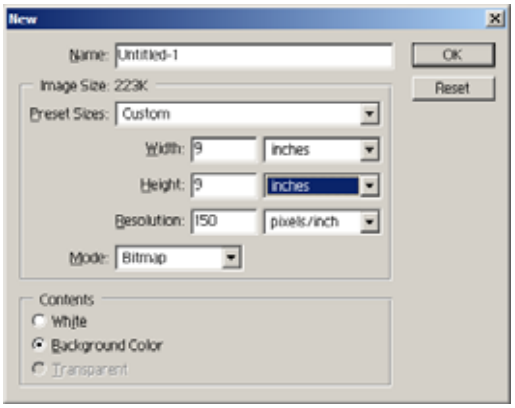
Cutout Image

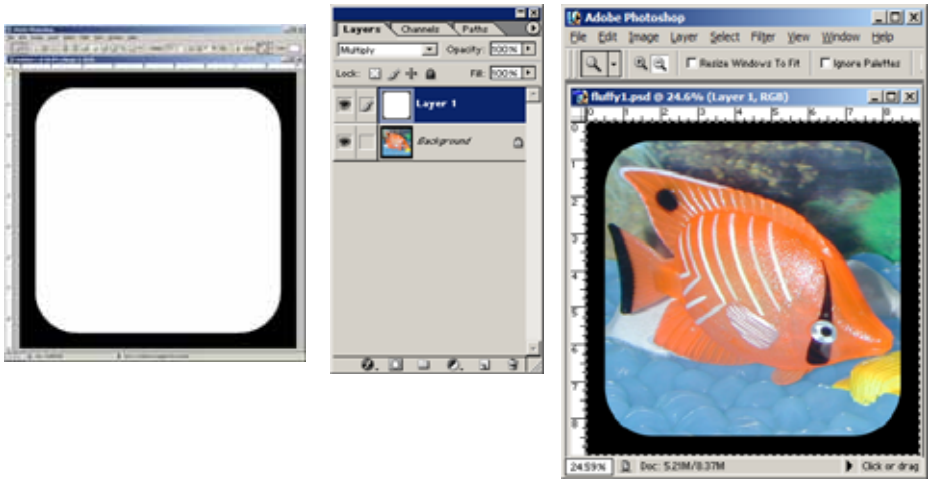
If you are using a oval/elliptical image on the final layout you can simply choose the elliptical marquee tool and select the area of the photo you want to burn. Edit -> copy, create new image 9 in x 9 in at 150 dpi RGB and paste selection into new image.

For more complex cutouts you have to create a multiply mask. Select black for background color. You start with a new image 9 in x 9 in at 150 dpi. Choose background color for contents. In my case I will use the rounded rectangle tool to create the multiply mask. I chose a radius for the rounded rectangle as 200 px. I drew the rounded rectangle 8 inches square centered.

Select Layer flatten image. I then saved the multiply mask for future use.

On the image create a new layer with layer -> new -> layer. Copy the multiply mask into the new layer. Select multiply for the layer-blending mode. This adds a rounded rectangle as the image cutout shape .





Feather edge 20-50 pixel

Select the magic wand tool and set the tolerance to 1. Draw a small square anywhere in the black border. This selects the black border as the image. Next right click and invert the selection, which will select the rounded rectangle image. Select -> modify -> border and select 20 pixels for the range of the blur. Select Filter -> blur -> Gaussian Blur. Select 20 pixels and click on OK. This will fade the edge of the image to black.

Discard color

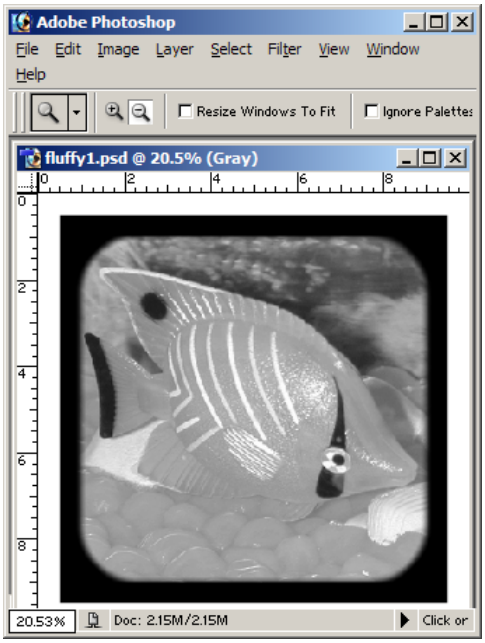
Image mode gray scale.

Add a white border for complete range of white to black

In order for PhotoGraV to see a complete range of white to black we need to have a white border.

Select white background color

Increase Image -> Canvas Size to 10" x 10"



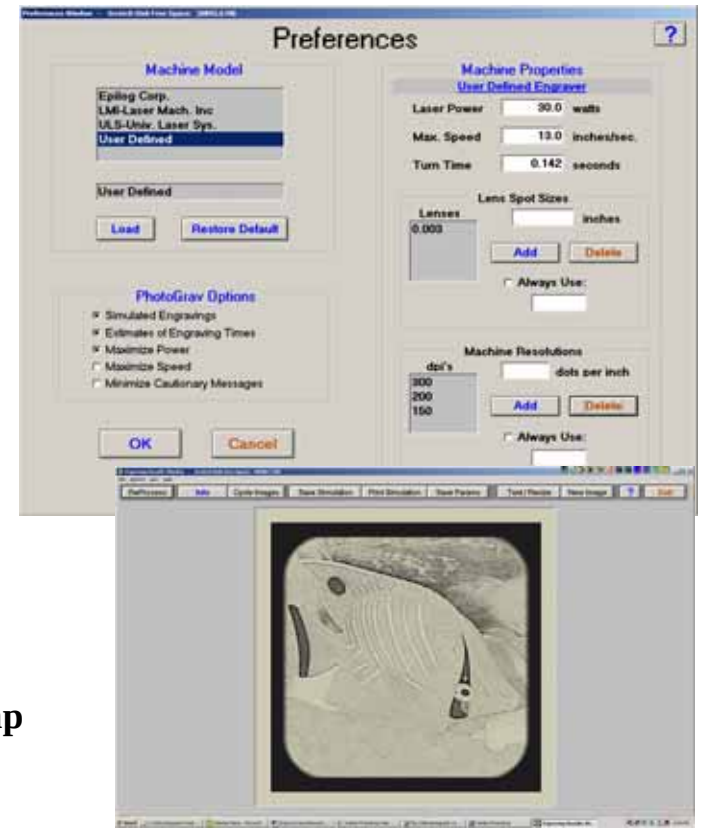
Save Image as Uncompressed BMP

File -> Save as. Change file type to BMP.

Open Image in PhotoGraV (www.photograv.com)

PhotoGraV is a program that converts a gray scale image to a black and white image. There are more white pixels in the area where the image is lighter and more black pixels where the image is darker.

The first time you start PhotoGraV select user defined and click on load. Set max laser power to 30 and max speed to 13 in/sec. Add lens size of 0.003 and 3 dpi selections of 150, 200, and 300 dpi. To process an image open the image by clicking on open image and load the BMP file saved from photo shop.



Select material anodized aluminum

Select material Anodized Aluminum (Black) and click on OK.

Auto process

Click on Auto Process

Save engraved images as bmp

Click on file Save Engraved Image

Back in Photoshop Open the PhotoGraV Image

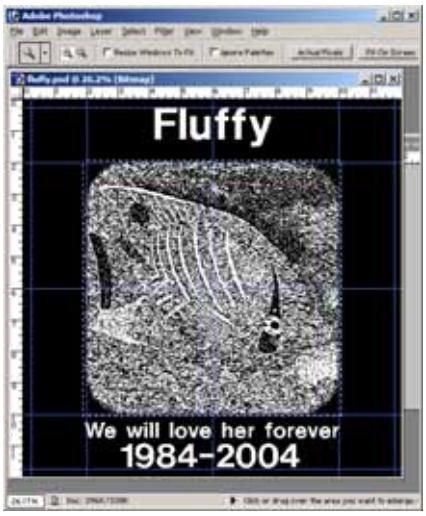
File Open

Invert image

Image -> Adjustments -> Invert

Put two images together

Select the area of the image using the rectangle tool and paste it into the monument layout.

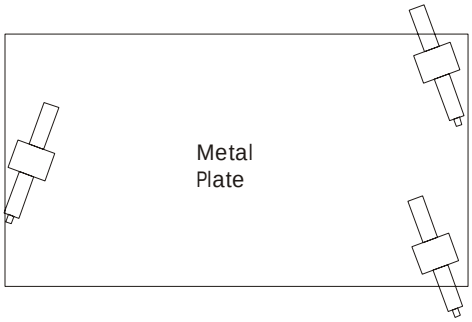


Flatten Image and Save it.

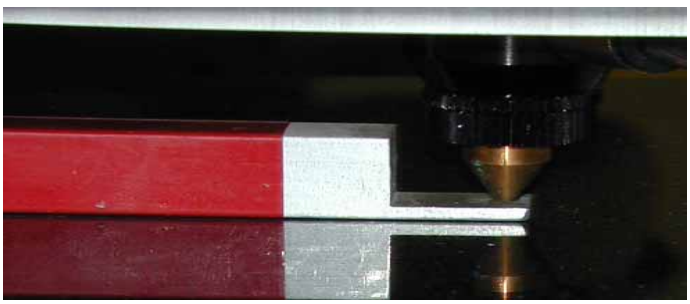
If you have multiple layers use the Layer -> Flatten image and then save the image to be burned.

Media Leveling Setup Loading Instructions

The purpose of this section is to set the distance between the end of the lens and the media to be engraved to be level with respect to the arm at the focal distance of the lens.



To perform this operation we will use the, Focus Spacing Tool, Leveling/Focusing scissor jacks, and the 4x4 and 2x4 blocks to build a stable tower to place the media to be engraved. Place the metal plate directly on the conveyor. Build up a stack of 4x4 and 2x4 top plate and media to be engraved so that it is 0.5 to 2 inches below the lens.



Next with the laser pointer on align the edged of the media with axis of the engraver so that the laser tip when moved with the joystick follows the edge of the media.

Place the three leveling jacks under the metal plate as shown. Using the ratchet

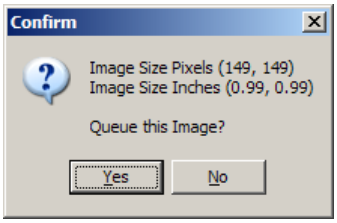
wrench adjust the height of the plate so that the Focusing Spacing tool will just fit between the media to be engraved and the lens tip.

Using the joystick position lens over each jack and adjust height/focus with the jack below it. Changes in the height of one jack may slightly change the height at another jack so you must repeat each height adjustment for each jack.

If you are running more than one job at a time you will need a set of jacks, two plates and additional lumber pieces for each addition engraved piece.

Burning a Raster Image

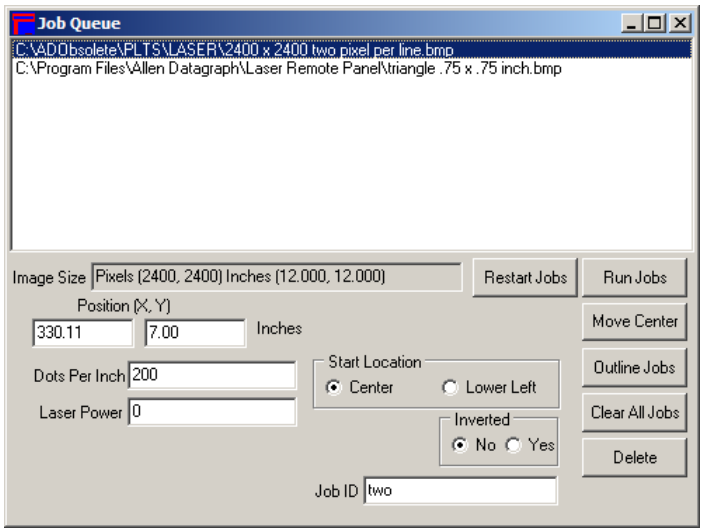
Most images must be centered on the media that is to be engraved. To position the engraver above the image use a ruler to find the center for each axis and move the mirror assembly with the joystick so the brass tip is at the center of the media.



Use Action -> Open Graphic Image in the Laser Remote Panel to open the image to be engraved. Then use Action -> Queue Opened Image as Job 150 DPI. (The DPI chosen must match the DPI setting for the design.) This will read the current position as the center of the engraving. The program will then display the size of the image to be burned in pixels and inches/cm. Answering yes will add the job to the queue.

Using the Job Queue

To open the job queue Use Action -> Display Job Queue. Click on the job queued above and set the wattage for the laser for the job. You can split the job into two pieces if you want to use a different wattage for text and graphics. You can queue up the two layers and set the wattage for each layer separately.



Remember to save the changes made in any parameters by clicking on a job in the queue.

After all jobs are setup you can start running the jobs by turning on the air supply and clicking on Run Jobs button.

Maintenance

Cleaning

The regularity with which the plotter needs to be cleaned is dependent on the usage, as well as the climate and contaminants in the plotter's environment. It is recommended that the following cleaning steps be done at least as often as indicated for each procedure:

1. Weekly, the lens should be removed or if you forget to turn on the air and burn an image without the air running.
2. Monthly, the 3 motor belts should be inspected for wear. New belts should be obtained and installed when belt teeth are missing or worn.
3. Bi-Monthly open electronic box and blow out dust.

Mechanical Adjustments

Belt Tension

The engraver servomotors use timing belts to control the arm (X axis) and mirror assembly (Y axis) positions. The belt tension and wear should be inspected if engraving quality deteriorates. To inspect the belts, remove the metal cover over the y motor. To remove the covers remove 2 large screws on the cover.

Y-Axis

The Y-axis short belt runs between the Y-axis servomotor and a gear assembly. To adjust the tension of this belt, it is necessary to reposition the motor bracket.

1. Depress belt half way between pinion gear on motor and drive gear with about 10 oz (300 grams) of sideways force. The belt should move 3/16 of an inch or 0.5 cm. To adjust tension loosen the Phillips head motor bracket screws and apply hand pressure to tighten the belt.
2. When the belt is tight and the motor shaft is **parallel** to the bearing shaft, tighten the three Phillips head motor bracket screws. *Premature belt failure will occur if these two shafts are not parallel.*
3. Verify tension.

The long belt is adjusted using a lead screw located behind the control panel. To set the long belt's tension:

1. Position the carriage 12 inches from the end. Pluck the belt like a guitar string. The pitch should sound about the same as the bass string of a guitar.
2. Remove the rail cover housing
3. Loosen the lead screw lock num
4. Adjust the lead screw so to tighten or loosen the belt
5. Set the lead screw lock nut.
6. Verify belt path and tension.
7. Replace the rail cover housing

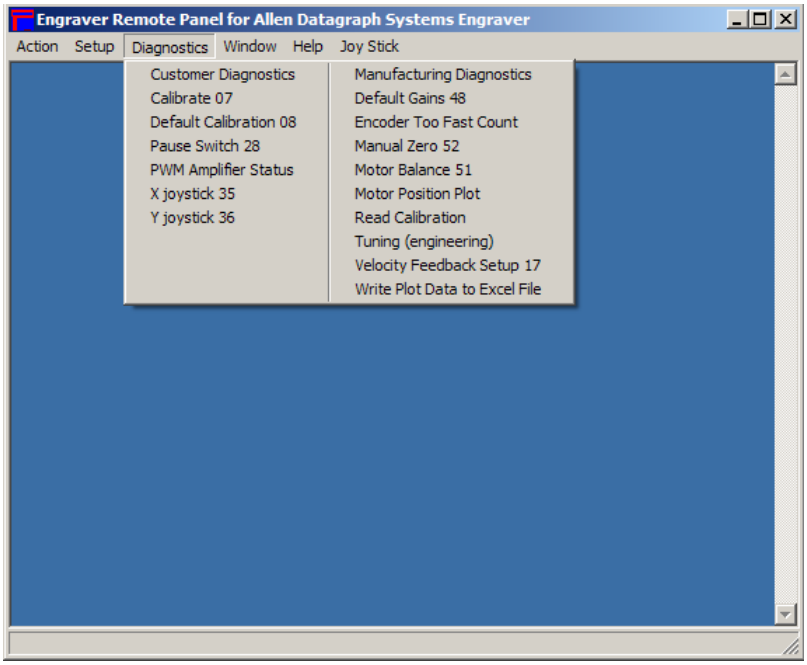
X-Axis

The belt along the frame allows the x motor to move along the frame. To test the tension move the arm to 12 inches from the end of the x-axis travel. Pluck the belt like a guitar string. The pitch should sound about the same as the bass string of a guitar.

1. To adjust the tension loosen the lead screw lock nut. To tighten turn screw clockwise.
2. Tighten the lead screen lock nut.

Diagnostics

The engraver firmware contains a set of resident diagnostics. When the engraver is powered up, it automatically performs a self-test program to check all operating parameters. If a malfunction is detected, the mirror assembly will not initialize to the far end. If the remote panel is open and the com port is opened



and reason for the failure will be output on the screen. Typing the letter E enter will also display the error message an start the ASCII remote panel

The fail-safe system is designed to detect failures in the operation of the electromechanical system in the engraver and to prevent such failures from causing other damage. The engrave contains circuits that continuously monitor power supply voltages and the microprocessor system clock. The engraver will go to a hardware-reset condition if these voltages are not within normal limits. Over current conditions on X and Y-axis drive motors are also monitored. An over current condition will cause a relay to open, cutting off power amplifiers from the drive motors. In addition, a number of internal sensors are continually checked. If any potentially damaging errors are detected, the system will cause the fail-safe circuits to open the relay and place the engrave in the error state. The error message will appear in the serial.log file in directory C:\Program Files\Allen Datagraph\Laser Remote Panel. They will also be displayed in the Setup -> Main Menu if the engraver is reset and the main menu is displayed.

Diagnostic Operation

The diagnostics in the engraver exist at several levels:

1. POWER-ON
2. CONTINUOUS HARDWARE AND SOFTWARE MONITORING
3. OFF-LINE

The **POWER-ON** diagnostics are performed at power-on or reset of the microprocessor and test the microprocessor, memory, servo analog and digital hardware, and some of the testable sensors.

After initialization, **CONTINUOUS HARDWARE AND SOFTWARE MONITORING** check the sensors and fail-safe monitors for machine malfunctions. If a malfunction is detected, an error message is output to the serial port, the protection relay is opened and the engraver ceases operation.

OFF-LINE testing is used for manufacturing and field service testing and for making certain adjustments to the engraver such as motor balance.

To Run Diagnostics if the engraver unit is stopped due to an error, Display the terminal window, clear the log file, and press E enter to display the error message and enter the ASCII front panel mode.

All diagnostics are run from the remote panel, most of which require the advance menu option on the other parameter page. To run the customer diagnostics from the remote panel program:

Open the remote panel

Click on the Diagnostics Menu

Customer Diagnostics

Calibrate 07

Normally the engraver does not need any calibration as none of the mechanical components have a tolerance. Use the default calibration to set the calibration constants. Calibration is used to set the size of a pixel so that a 150 x 150 pixel square engraved at 150 dpi engraves a 1-inch square.

Default Calibration 08

Sets the calibration constants back to the factory defaults prior to initial calibration. A

Pause Switch 28

Running this diagnostic will display 000 or 111 depending on the state of the pause switch on the pendant.

PWM Amplifier Status

This displays the power amplifier status if the PWM power amplifier is installed.

X Joystick 35

Display the value from the ADC from the x-axis joystick on the display. Deflecting the joystick in the x-axis to their extremes will vary the displayed value from about 008 to 0FC. The center home position should display a value from 78-98.

Y Joystick 36

Display the value from the ADC from the y-axis joystick on the display. Deflecting the joystick in the y-axis to their extremes will vary the displayed value from about 008 to 0FC. The center home position should display a value from 78-98.

Manufacturing Diagnostics

It is not recommended that the Manufacturing Diagnostics be run unless instructed by direct contact with Allen Datagraph Technical support. Damage to the system is possible.

Trouble Shooting

Problem	Solutions
	•

Error Codes

If the internal microprocessor detects an error condition, the letter E0 and a 2 digit code will be displayed on the control panel. Any key pressed after the error is displayed will place the machine in the diagnostic mode, indicated by a flashing "D" on the control panel. Recommended diagnostic procedures (D##) are listed in the error description.

- NONE One or more of the 7 LEDs on motherboard are off - check PCBs loose in socket, fuses in power entry module blown, 115/230 VAC switch in wrong position, front panel PCB disconnected, loose cable from power supply to motherboard PCB, Missing $\pm$ 5 volts, $\pm$ 15 volts, $\pm$ 32 volts, micro PCB dead.

- bad calibration constants. Must run diagnostic D008, then calibrate engraver.
- collision sensor tripped
- escape command parameter out of limits
- eerom initialized to default settings
- escape command not implemented
- EPO latch failure check seating of servo and CPU Board
- EPO latch or EPO reset failure check seating of servo and CPU Board
- excessive position error x axis or excessive position error y axis. This can be caused by speed or acceleration too high, obstruction in way of machine, bad calibration constants, power surge, servo motor / encoder failure, servo PCB failure, power amplifier pcb failure, relay on motherboard.
- buffer overflow
- hpgl compatible command parser error
- initial move positioning error; carriage didn't move
- invalid character in escape command
- joystick disabled
- motor over-current, DAC or analog failed check seating of servo and CPU Board
- motor over-current - power amp failed check seating of servo and CPU Board
- pause switch on
- Relay opened. No reason given
- rs232 device overrun (broken cable, wrong handshake, broken serial hardware in computer/engraver)
- rs232 framing error Engraver communications default for serial port is 9600,n,8,1. Data received from serial port does not appear with these parameters
- rs232 parity error
- servo interface bus error
- servo motor over current Normally caused by motor jam. Check servo pot adjustment.
- servo motor over-current sensor failure check seating of servo and CPU Board
- servo motor over current sensor failure
- servo timeout Cutter software error or servo PCB failure - D10. Check earth ground. Prevent electrostatic discharge.
- timeout latch failure check seating of servo and CPU Board
- too many parameters in escape command
- unexpected arithmetic fault
- unexpected constraint fault
- unexpected nmi interrupt
- unexpected machine fault
- unexpected operation fault
- unexpected parallel interrupt
- unexpected protection fault
- unexpected real arithmetic fault
- unexpected reserved fault

- unexpected servo interrupt
- unexpected trace fault
- unexpected type fault
- unexpected interrupt
- waiting for first vector to complete
- x axis encoder detector failed
- X-axis encoder failed check seating of servo and CPU Board
- X-axis position counter failed check seating of servo and CPU Board
- X-axis encoder detector failed check seating of servo and CPU Board
- Y-axis encoder failed check seating of servo and CPU Board
- Y-axis position counter failed check seating of servo and CPU Board
- Y-axis encoder detector failed check seating of servo and CPU Board

Appendix A Floor Space Layout

Web Site Copy / CD Copy