NATIONAL OPTRONICS

The 2G Generator

User's Manual

Rev. 3.292

June 23, 2005

Warnings, Cautions, and Notes as Used in This Publication

Warning

Warning notices are used in this publication to emphasize that hazardous voltages, currents, temperatures, or other conditions that could cause personal injury exist in this equipment or may be associated with its use.

In situations where inattention could cause either personal injury or damage to equipment, a Warning notice is used.

Caution

Caution notices are used where equipment might be damaged if care is not taken.

Note

Notes merely call attention to information that is especially significant to understanding and operating the equipment.

This document is based on information available at the time of its publication. While efforts have been made to be accurate, the information contained herein does not purport to cover all details or variations in hardware or software, nor to provide for every possible contingency in connection with installation, operation, or maintenance. National Optronics assumes no obligation of notice to holders of this document with respect to changes subsequently made.

Revisions to This Manual

Software versions 3.xx and 4.xx reflect internal hardware differences that are transparent to the user; that is, screen appearance and machine operation is identical.

The Communications Screen changed in software versions 2.55 and 3.15. The fields are similar to those found on the NOP 6E and 4T. For more details, refer to the end of Chapter 4.

In Version 3.29, there are also changes on the both *Lens Material Screens* (formerly called the *Blank Materials Screens*), as well as a new screen, the *Lap Material Screen*.

In the 3.291 edition of the manual was released with Software Version 3.29. Future software upgrades do not necessarily affect the manual. Call Technical Support (434) 295-9126) if you feel you need a newer manual.

This edition of the manual (3.292) includes a "General Specifications" section in Chapter 1.

Related Publications

The Optronics 4T User's Manual

The Optronics 6E User's Manual

Contents

Chapter 1 Before You Begin

Before You Begin

The 2G is a state-of-the-art 3-axis toric generator manufactured by National Optronics, Inc. It will process Polycarbonate, Hi-index and CR-39 lenses with exceptional accuracy. A unique cutting tool is used to dry cut the back of plastic prescription lenses with no elliptical error. The removed material is drawn into a vacuum unit, allowing lenses to be generated without liquid coolant. Its fully automatic cutting operation can generate base and cross curves from +30 to -30 diopters in a nominal 45 to 90 second cutting cycle time. Prism power and direction are also computer executed, eliminating the need for prism blocking or prism rings. Collet adapters are available for all standard surface blocking systems.

For Further Assistance

If you should require any further assistance, National Optronics can be contacted directly between 8:30 AM and 5:00 PM ET Monday through Friday.

National Optronics
100 Avon Street
P.O. Box 1547
Charlottesville, Virginia 22902

Toll-free:(800) 247-9796
Tel:(434) 295-9126
Fax:(434) 295-7799
Parts Order Fax:(888) 239-0778

To Order Parts:

Please call our Customer Service Department at 800-247-9796 ext. 317.

Please know your part number, serial number of the machine and Customer Account Number.

If you do not know the part number of the part you need to order you will need to talk with Technical Assistance. The following guidelines for Technical Assistance will apply in that circumstance.

If you need to return a part, the Customer Service Department will issue a Return Authorization Number to you and explain the procedure for returning parts.

For Technical Assistance:

Please call our Technical Service Department at 800-247-9796 ext. 314 and know the serial number of your machine and Customer Account Number. If you purchased your equipment from National Optronics, there is no charge for telephone support. If, however, you purchased your Optronics equipment elsewhere, you will be charged for telephone support at the rate of $47.50 per half hour.

If you would like to schedule an on-site Technical Service visit, please call Technical Support at 800-247-9796 ext. 314. Please know the serial number of your machine and Customer Account Number for requesting a Technical Service visit. There is no charge for warranty service visits. If your machine is out of warranty, there is a charge of $55.00 per hour for travel to and from the equipment location and $125.00 per hour (two-hour minimum) for the Technician's time at the location. Any additional travel expenses incurred, such as airline tickets, hotel rooms, etc., are billed to the customer.

The rates published above may be subject to change without notice.

Requirements for Use

115 VAC 60 Hz 20A Electrical Supply

This is standard outlet power in the United States. The Optronics 2G generator should be on a dedicated circuit (no other electrical loads connected to the same circuit) to ensure a uniform, consistent power supply. The maximum continuous power consumption of the generator, including the vacuum, is 14.3 amps. The 2G must be properly grounded—do not use any adapter that will bypass the grounding plug.

Power fluctuations can adversely affect production and machine integrity. Please contact the factory if you have power glitches or questions about the power requirements.

Note

The 2G is available for 230V 50 Hz installations. It is also recommended for 230V units to be installed on a dedicated circuit.

Operating Conditions

The 2G is designed for indoor use only. The 2G is designed to operate safely at a temperature range of 5° C to 40° C, at altitudes up to 2000 meters.

General Specifications

Dimensions

Height: 19” (48cm)
Width: 30” (64cm)
Depth: 25” (64cm)
Weight: 110lbs. (50Kg)

Cutters

Carbide endmill. Two-fluted diamond.

Cutter Motor

20,000 RPM DC Brushless, ¾ Hp.

Vacuum

2.5 HP, 109 CFM (9A).

Lens Materials

CR-39, Polycarbonate, All High Index, Trivex, NO GLASS.

Certifications

ETL Conforms to UL Std 61010-1

CE Conforms to EN 61010-1 (Model 60124 only)

Statement Against Misuse

The 2G generator is designed to edge **plastic lenses only**. Any other use of the machine will compromise its safety protection features.

Caution

The 2G will edge ONLY PLASTIC LENSES. Under no circumstances should any attempt be made to process a glass lens on this unit!

Installation Procedures

Note

These procedures should be followed in sequence, as the proper completion of a given step may depend on the one previous to it. Tools are provided in the accessory kit (See Figure 1) to aid in both the installation and subsequent operation. The 2G Toric Generator is optionally shipped with a cabinet which is custom designed for the application. The laboratory can either: (1) Use the custom cabinet, or (2) Mount the generator on a standard workbench.

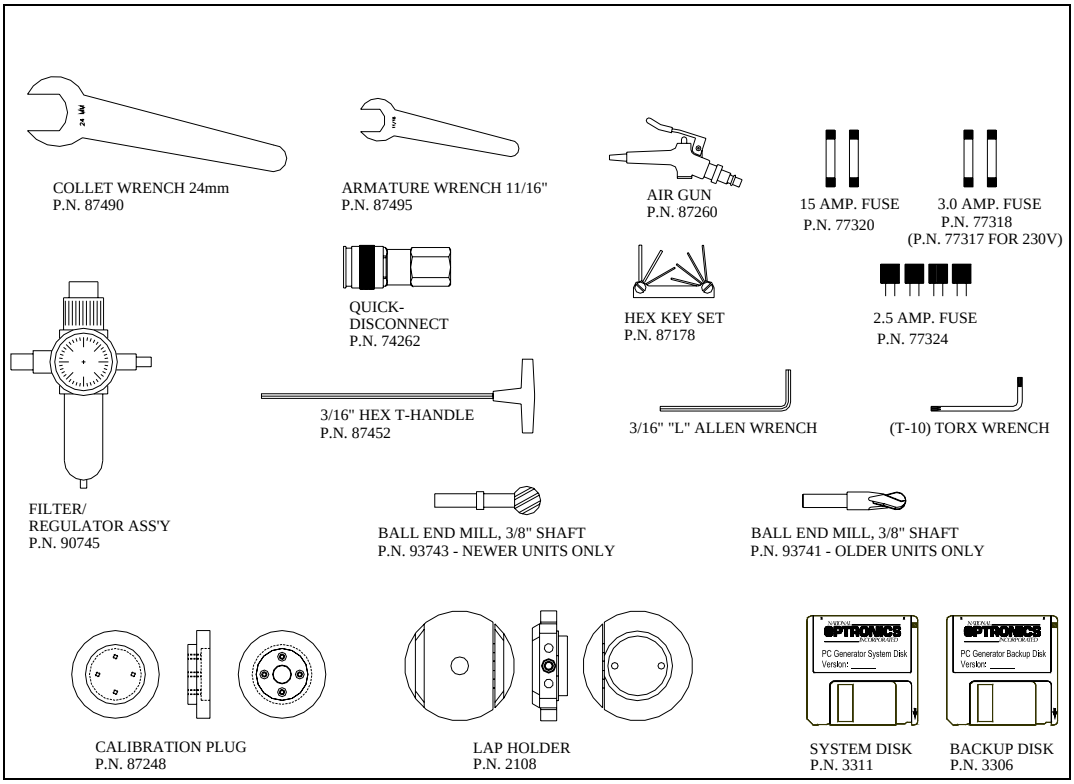


Figure 1 - Accessory Kit

1 - *Custom Cabinet Assembly*

Remove the cabinet and cabinet top from box. Place cabinet top white side down on floor. Place cabinet upside down on cabinet top with doors on same side as cutout in the cabinet top. Attach cabinet to cabinet top with screws provided. Proceed to Step 3.

2 - *Work Bench Preparation*

Prepare the bench surface to be used by cutting an opening for the vacuum hose and power cord per Figure 2.

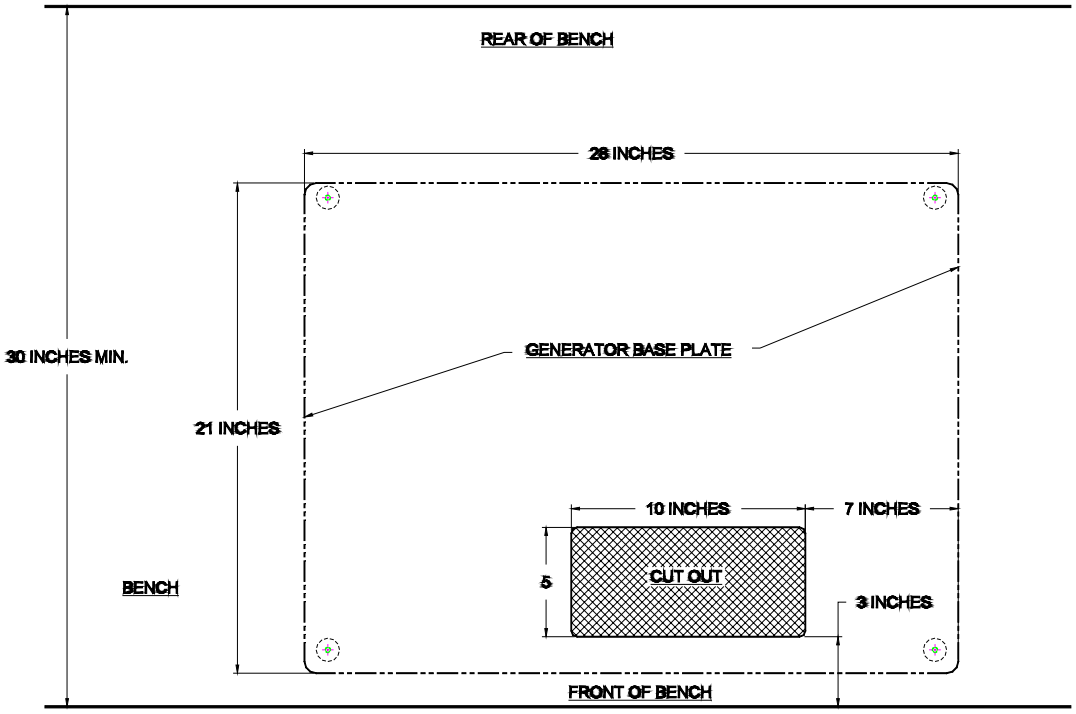


Figure 2 - Work Bench Cutout

3 - *Unpacking the Generator and Vacuum*

Remove the generator from its wooden shipping pallet by removing the two bolts found on the pallet's underside with a 13/16” box wrench.

Remove the vacuum unit from its carton. Remove the accessories from the inside of the canister and install the large vacuum bag. Place the vacuum under the workbench, aligning its inlet with the bench opening.

Feed the vacuum power cord through the bench opening and lay it towards the rear of the bench, as it will be plugged into the rear of the generator.

Turn the power switch on the vacuum to the “ON” position, as its cycling is automatically controlled by the 2G.

Place the generator on the bench/cabinet, aligning the vacuum coupler on the underside of the generator with the right side of the bench opening.

4 - *Removal of Shipping Bolts*

The cutter motor carriage and the lens drive carriage are secured for shipping. To release the lens drive carriage, remove the shipping bracket that is bolted to the base and the carriage plate. To release the cutter motor carriage, remove the bolt in the block on the right side of the carriage. After removing the bolt, remove the spacer between the block and cutter motor carriage. Leave the block in place, as it acts as a carriage stop during operation. (See Figure 3).

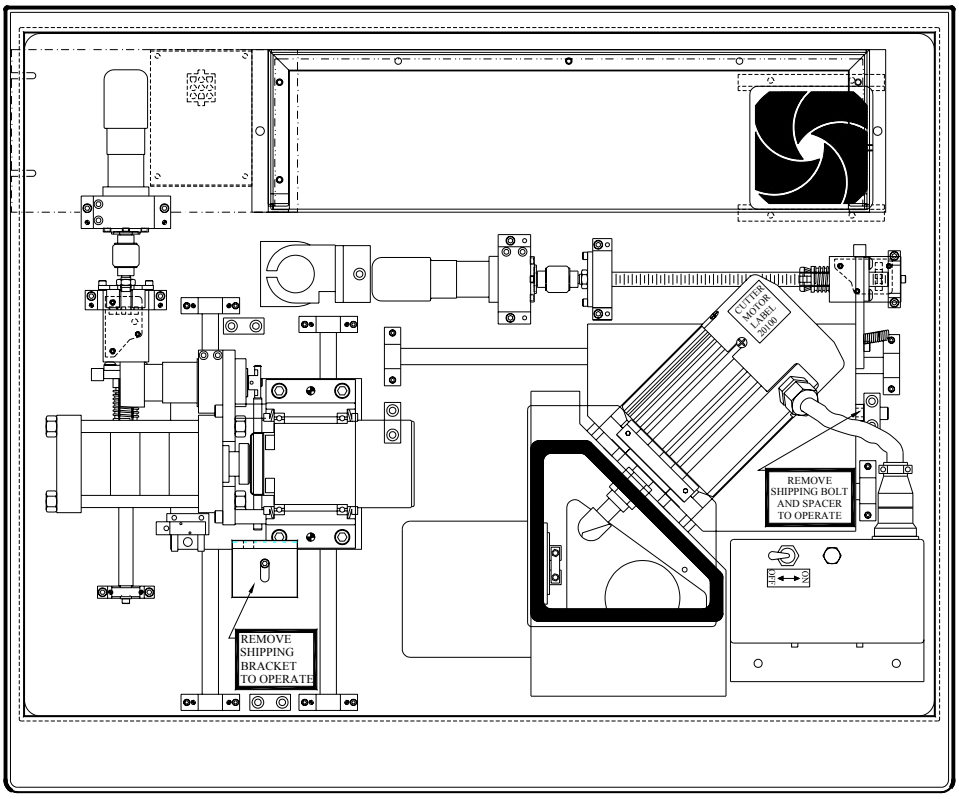


Figure 3 - Shipping Bolts

Warning

Attempting to operate the machine without removing the shipping bolts could cause significant damage.

5 - *Attaching the Vacuum System*

Insert the end of the 2½" flex vacuum hose into the coupler on the bottom of the generator from below the bench. This connects the hose to the chip chute.

Maintaining a gentle curve between the chip chute and vacuum, connect the other end of the 2½" hose to the vacuum inlet. Note: The vacuum inlet is the lower hole in the vacuum canister. The 2½" hose should be cut to the shortest length possible with a utility knife. The shorter the hose, the more effective the suction. The excess hose can be used to direct the heated exhaust of the vacuum away from the machine.

Connect the additional large hose from the outlet of the vacuum canister to the boot on the lower left side of the rear of the cabinet. This hose is used to exhaust the hot air from the cabinet.

To protect your hearing, ensure that the vacuum is either in a cabinet such as the one supplied by Optronics or that it is located at least one meter away from the operator's ears.

6 - *Attaching the Compressed Air Line*

The compressed air connection is on the left side of the generator towards the rear. Install the regulator/filter assembly, found in the accessory kit, by inserting it into the quick-connect bulkhead fitting. The assembly will snap in place.

Attach the quick disconnect onto the end of the air line to be used. The air line can then be pushed on the male fitting of the regulator/filter assembly.

Verify that the regulated line pressure is 80 psi, which is the necessary operating pressure for the collet. If the pressure is not 80 psi, adjust the knob on the top of the regulator/filter assembly.

7 - *Electrical Connections*

Plug the vacuum cord that was laid on the rear of the bench into the socket on the back of the generator.

Verify that all panel switches are in the out rather than the in position. Also, verify that the power switch on the right side of the control panel is in the OFF position.

Connect the power cord for the cabinet exhaust fan to a dedicated 115 VAC wall.

Connect the power cord supplied from the back of the generator to a dedicated 115 VAC wall receptacle of at least 15 amp capacity.

Note

Proper operation requires that no other equipment be on the same power feed/circuit breaker, as it could cause nuisance drop-outs of the processor.

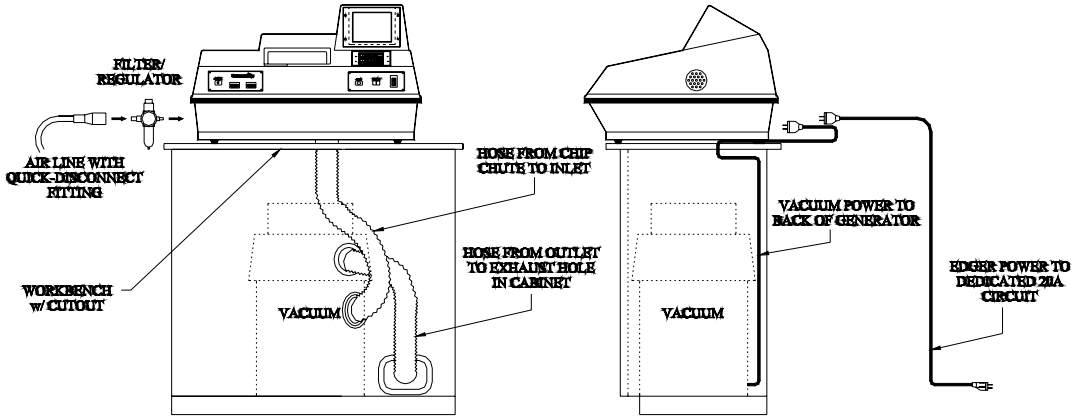


Figure 4 - Setup Diagram

THE GENERATOR IS NOW SET-UP TO OPERATE

2G Boot-Up Sequence

During the boot-up process, the 2G will perform a series of self-diagnostic tests that can prove valuable in troubleshooting problems. The following steps are performed during boot-up.

First, the 2G will sound a series of 4 beeps, and then two short beeps. If the 2G continuously sounds a short beep, it indicates a problem in the Electronics Enclosure. This problem has many possible causes, including low voltage. Contact the factory for further assistance in diagnosing this problem.

The 2G will display a series of short messages indicating a normal boot-up process; for example, it will display, "Loading Setup Values," "Loading Statistics," "Loading Menus," and "Install Serial Ports."

Next, the 2G will check for internal LAN communications, which requires optional specialized hardware. It will set the LAN ID as specified in the *Communications Screen*. The message "Network LAN ID: XX" will appear on the bottom line of the display, where XX is the LAN ID. The type of ARCNet card will also be identified. If there is no ARCNet card in your 2G (or if the ARCNet card is nonfunctional), the 2G will display the words, "No ARCNet Card found. Unable to Initialize ARCNet."

After the 2G checks for a network and installs Servo software, it will give the option of immediately going to the *Diagnostics Screen*. The message "Press any key for Immediate Diagnostics" will appear at the bottom of the screen. If the 2G will not complete its boot-up due to a problem, press any key at this time to enter the *Diagnostics Screen*.

The First Time After a Black Box Is Installed

All of the above occurs plus the following: A message "Remove lens if present and press READY." will appear. After removing a lens, if present, from the chuck, press the READY key. The 2G now will display the message "Discovering Limits," and move its carriages to determine its full range of motion. First, the radius carriage will come forward, and the depth carriage will move to the left.

Caution

It is very important that no lens is present in the chuck when the 2G is discovering its limit. If a lens is present, it could cause permanent damage to the cutter.

The carriages will then move to home and the *Job Screen* will be displayed signaling that power-up is complete.

It is also very important not to drop the 2G as it is not built to withstand dropping.

Chapter 2 Entering a Job

Process Overview

The steps in generating a lens are as follows:

1. Enter a job.
2. Generate a lens (covered in Chapter 3).
3. Cut a matching lap for polishing if you do not have one (covered in Chapter 3).

There are two ways of entering a job: (1) from a host computer or Optronics server described on this page, or (2) by entering data directly into the fields on the *Job Screen* (described on the following page). The process is slightly different depending on which approach you are using.

Entering a Job

The 2G is designed to provide easy job data entry for lens generation.

Entering a Job from a Host Computer/Server

1. Type in the number or use the barcode reader to enter a number into the *Job Number* field.
2. Verify the information on the screen. **Pay close attention to the *Block Diameter* field. An incorrect Block Diameter could lead to a situation where the cutter crashes into the block, which might ruin the cutter blade. This parameter refers to the physical diameter of the block, not the Sag diameter.**
3. Press the *READY* key to orient the collet, so that you can mount the lens.
4. Properly mount the lens. (Refer to the "Mounting the Lens Blank" section of Chapter 3, "Generating a Lens," for directions on mounting the lens.)
5. Close the 2G's lid.
6. Press the *Start* button.
7. After removing the lens, move the cursor down to the *Cut Matching Lap* field and press *Ready* key to begin the process of cutting a lap. (Refer to the "Lap Cutting" section of Chapter 3, "Generating a Lens," for information about this part of the process.)

Entering a Job Direct (without a Host Computer/Server)

1. Enter data for each field—refer to *Job Screen* field descriptions that follow. **Pay close attention to the *Block Diameter* field. An incorrect Block Diameter could lead to a situation where the cutter crashes into the block, which might ruin the cutter blade. This parameter refers to the physical diameter of the block, not the Sag diameter.**
2. Press the *READY* key to orient the collet, so that you can mount the lens.
3. Properly mount the lens. (Refer to the "Mounting the Lens Blank" section of Chapter 3, "Generating a Lens," for directions on mounting the lens.)
4. Close the 2G's lid.
5. Press the *Start* button.
6. After removing the lens, move the cursor down to the *Cut Matching Lap* field and press *Ready* key to begin the process of cutting a lap. (Refer to the "Lap Cutting" section of Chapter 3, "Generating a Test Lens," for information about this part of the process.)

Job Screen

Input of data on the *Job Screen* is required for each lens to be generated. The *Job Screen* will display two jobs. The job on the right-hand side is either the one currently being generated or the job that has just finished. The job on the left-hand side is the next lens to be run. The data for the next job can be entered while the machine is running. A representation of the *Job Screen* is shown below:

```
                Job Screen

Job Number:
                    Next
Base Curve:       -  0.000   -  0.000
Cross Curve:      -  0.000   -  0.000
Center Thickness: +    0.0   +    0.0
Crib Diameter:    Off         Off
Pin Bevel:        Off         Off
Layout Axis:      +      0    +      0
Prism:            +  0.000   +  0.000
Prism Axis:       +      0    +      0
Prism Direction:  Up          Up

* Blank Data *
Front Curve:      +   0.00    +   0.00
Back Curve:       -   0.00    -   0.00
Edge Thickness:   +      0    +      0
Diameter:         +      0    +      0
Material:         CR-39       CR-39
Block Diameter:   +     50    +     50
Cut Matching Lap:                 READY


Barcode or Enter Job Number
```

The data is shown line-by-line as entered. The following is a description of each entry.

Job Number

This field is used in installations where the job entry data is entered at a remote location. By typing in the Job Number (or Tray #), and pressing down arrow <↓> or the READY key, the complete job entry data is automatically downloaded to the generator.

Caution

After pulling down a job from a server or host computer, verify all entries before pressing the Ready key. Pay close attention to the *Block Diameter* field—using the wrong block diameter could ruin your blade!

HELPFUL HINT

Should the next lens to be generated be similar to the one running, the operator can move the cursor to the upper-most field (Job Number), and enter "0" as the job number. When the cursor is moved down (↓) to store the entry, or the READY key is pressed, the data fields on the right side will automatically be duplicated on the left. Then, only the fields that need to be changed must be re-entered.

Barcode Reader Users

The 2G will interface with most barcode readers to provide fast job data entry into the *Job Screen*. Contact the factory for interface specifications and compatible product recommendations.

The first 4 data fields relate to the base curve, cross curve, center thickness, and crib diameter of the finished lens.

Base Curve

Enter the desired base curve in diopters. The entry must be between +6.00 and -30.00 diopters. This field requires the entry of two decimal place values. For example, to enter a curve of 6.125, enter the sequence 6, 1, 2, or to enter a curve of 6.00, enter the sequence 6, 0, 0. See the note below on how this number is rounded.

Note

This value will be rounded to the either nearest eighth of a diopter (ex: 0.125, 0.250, …), or the nearest sixteenth of a diopter (ex: 0.0625, 0.1875, …). If a value is entered in tenths (ex: 0.10, 0.20, …), the value will be left as entered. Since only two decimal places may be entered, to enter 6.1875, enter the sequence 6, 1, 8. To enter a diopter value of 6.20, enter the sequence 6, 2, 0.

Cross Curve

Enter the desired cross curve in diopters. The entry must be between +6.00 and -30.00 diopters, and must have greater curvature than the base curve. For more information, refer to the "Saddle Back Lenses" section of Appendix D, "Specialty Lenses." The above note on rounding will also apply to the cross curve.

Center Thickness

Enter the final center thickness, before fining and polishing, in millimeters. One decimal place value must be entered in this field. For example, to enter a center thickness of 2.5, enter the sequence 2, 5, or to enter 2.0, enter 2, 0.

Crib Diameter

Enter the desired crib diameter in millimeters. A value of "0" in this field will set crib diameter to "Off." Valid crib diameters are whole numbers between +50 and +80 mm. If this value is smaller than the *Block Diameter* (Page 6), the 2G will automatically crib the lens 2 mm larger than the *Block Diameter*.

The next 4 data fields specify information about the prism to be generated. The 2G's software automatically programs the cutter to generate prism, eliminating the need for prism rings or blocking.

Note

Center blocking is the recommended blocking method for the 2G. Care must be taken when using any other method of blocking. Prism is always entered as actual rather than compensated, as no compensation is necessary due to the accuracy of the 2G's cutting action.

Pin Bevel:

This value will toggle between "Off" and "On" and tells the 2G if it should place a bevel on the lens (to reduce the possibility of cutting your fingers when handling the lens, and to increase coolant flow between the lens and the lap during fining).

Layout Axis

Enter the axis from the seg line to the cylinder line in degrees. Depending on lab convention, this may be referred to as cylinder axis.

Prism

Enter the actual (uncompensated) prism power in diopters. This field will require entry of three decimal place values. For example, to enter a prism amount of 2.000 prism diopters, the sequence 2, 0, 0, 0 must be entered, or to enter 1.750 diopters, the sequence 1, 7, 5, 0 must be entered. The amount of prism must be between +0.00 and +20.00 prism diopters. This value will be rounded using the same method explained above, under the description of *Base Curve*.

Prism Axis

Enter the orientation of the prism power in degrees, referenced from the layout (0-180) axis.

Prism Direction

This is used in conjunction with the prism axis to determine the direction of prism. This parameter is used for labs using a 0-180 degree, up and down notation. Labs using a 0-360 degree notation will always leave this parameter "UP."

The next 5 data fields describe the physical characteristics of the lens blank being used. These parameters allow the machine to calculate the number of passes required for efficient material removal and the distance the cutter should sweep in order to completely cover the lens face.

Front Curve

Enter the blank's true front curve in diopters. Two decimal place values are required in this field. For example, to enter a front curve of 6.12 diopters, enter the sequence 6, 1, 2. The front curve must be between -30.00 and +30.00 diopters. This value will NOT be rounded. It is very important that this number be accurate, since any error will cause an error in the center thickness.

Back Curve

Enter the back curve in diopters. In this field, two decimal places are required. For example, to enter a back curve of 6.25, enter the sequence 6, 2, 5. The back curve must be between -30.00 and +30.00 diopters. This value will NOT be rounded.

Edge Thickness

Enter the initial blank edge thickness in millimeters. Only whole number values are accepted. This value must be between +1 and +30 mm.

Note

This is NOT the final edge thickness that might be indicated on the lab ticket.

Diameter

Enter the blank diameter in millimeters. A whole number value between +25 and +99 must be entered in this field. If cribbing is desired, the maximum value for this field is 81 mm, due to the physical characteristics of the 2G, and the cutting tool.

Material

Select the material type. This selection determines the axis speed, spiral separation and index from the *Lens Material Screen* (refer to parameters). The field will automatically default to the same material as the previous job. To change the material, press the <+/-> key. The unit is initially configured with three lens materials: CR-39, POLY and HI-IDX (High-Index). Depending on lab preference, you can add up to seven additional materials (see *Lens Material Screen* section of Chapter 4).

Block Diameter

This is the outside diameter of the lens block. The valid range is +40 to +99 mm, and must be a whole number. The default value is +50 mm. This number is used to determine if a cutter crash will occur.

Note

The software is programmed to handle unreasonable data entry to prevent the cutter from cutting into the block! This protection can be overridden, but a warning will be given to the operator. The protection parameters depend on the accuracy of the *Block Diameter* settings and the center thickness calibration, discussed above.

Cut Matching Lap

Press the *READY* key to take you to the *Lap Screen*. Refer to the "Lap Screen" section of Chapter 3, "Generating a Lens," for field definitions.

Chapter 3 Generating a Lens

Process Overview

The steps in generating a lens are as follows:

1. Enter a job (covered in Chapter 2).
2. Generate a lens.
3. Cut a matching lap for polishing if you do not have one.

Generating a Lens

Blocking

Center blocking is the recommend blocking method for use in the 2G. Prism rings should not be used with the 2G, since it is capable of automatically generating prism.

Setup Screen

During final testing at the factory the 2G was fully calibrated with machine specific entries. Unless the parameters must be changed, the operator need only work with the *Job Screen* to begin generating lenses. If changes are necessary, see instructions in the *Setup Screen* section.

Job Input

You must enter job data on the *Job Screen* as the initial step. (Refer to Chapter 2, "Entering a Job," if you need to review that part of the process or for an explanation of each field.) After entering the data, move the cursor to the next field by pressing the up arrow <↑> key or down arrow <↓> key, which will automatically store the data in the previous field. If the data is out of the allowable range, an "Invalid Value" message will be displayed at the bottom of the screen.

After entering the data on the *Job Screen*, press the READY key to load the data. The data will transfer to the right column, and the job will be ready to run. If prism has been entered, the chuck will automatically orient itself as defined in *Prism Arrow Location* (refer to the "Prism Arrow Location" section of Chapter 4, "Setup Screens," for more information): If no prism is entered, pins will rotate to a vertical position.

Mounting the Lens Blank

1. Mount the lens with your right hand while depressing the CHUCK button with the left.
2. Make sure the lens is pushed as far into the chuck as possible and is properly located on the two pins and seated on the collet face.
3. Press the CHUCK button.

Note

Center blocking is the recommend blocking method for use in the 2G. Prism rings should not be used with the 2G, since it is capable of automatically generating prism.

Running a Lens

After mounting the lens, close the Plexiglas lid and depress the start button. The 2G will automatically generate the lens.

After completion of the cycle, the operator should lift the Plexiglas shield, and holding the lens in the right hand, release the CHUCK button with the left. The chuck will not release until the lens collet carriage returns to its home position.

<u>NOTES AND HINTS</u>

The software is configured so the operator can input the next job to be run in the left column while the machine is running. After the cycle is completed, the READY key can then be pressed to transfer the new job over, so that it can be generated. The machine will then be ready to accept new data in the left column.

Should the next lens be similar to the one running, the operator can move the cursor to the upper most field (*Job Number*), enter "0" in the field and press arrow down (↓). This procedure will duplicate the data fields of the right side into the left side, so that any necessary changes can be made from the previous job. This can also be done while a lens is running.

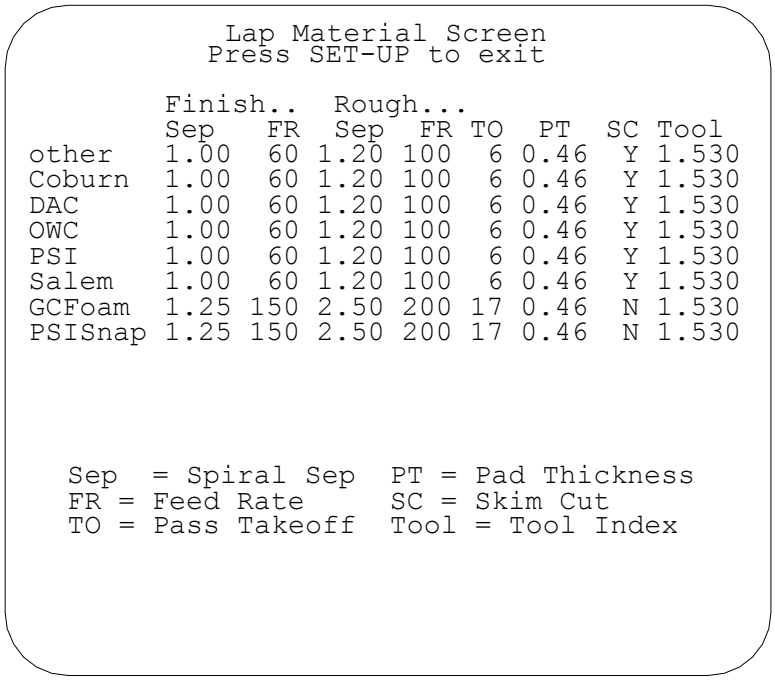
Lap Cutting

Process Overview

1. Fill in data on the *Lap Screen*.
2. Press the *Ready* key to position the collet preparatory to loading the lap.
3. Place the lap into the lap holder, and tighten the bolt with a small amount of pressure. Overtightening can cause the lap to deform, producing inaccurate curves.
4. Load the lap into the Chuck.
5. Press the CHUCK button to grip the lap holder.
6. Press the START button to begin cutting the lap.

Lap Screen

Enter the *Lap Screen* from the *Job Screen* by pressing the READY key from the *Cut Matching Lap* field. See the figure shown below for the layout of the *Lap Screen*.



The following is a description of the fields used when cutting a lap.

Base Curve

Enter the base curve of the lap to be generated. The allowable range for this value is between -6.000 and +30.000. See the following note.

Note

The 2G expects a base and cross curve value of three (3) decimal places, and will not round off any entered values. For example, to enter a base curve of 6.500, enter the series 6, 5, 0, 0.

Cross Curve

Enter the cross curve of the lap to be generates. The allowable range for the cross curve is -6.000 to +30.000. See note above on rounding.

Pad Thickness

If laps are used that are compensated, enter the amount of compensation in mm. The allowable range for the pad thickness is between 0.00 and +3.00 mm. Two decimal place values are required in this field. The following chart shows some common pad compensation values.

Inches	Millimeters
0.018	0.45
0.022	0.55
0.028	0.70
0.032	0.80

Lap Manufacturer

Select the manufacturer for the lap you are using. Every time a lap is to be cut, the 2G will select the chosen manufacturer's best fit lap to cut the desired curves. The 2G will use the cutting parameters as defined on the Lap Material Screen for that manufacturer.

Lap Type

Shows the recommended lap for the manufacturer selected in the *Lap Manufacturer* field. This lap type recommended is the lap that requires the least amount of stock removal to be able to cut the curves specified in the *Base Curve* and *Cross Curve* fields.

Blank Base Curve

Enter the existing base curve of the lap to be used in diopters. Two decimal place values are expected in this field. For example, to enter a blank base curve of 6.25, enter the sequence 6, 2, 5. This entry must be between -30.00 and +30.00

Blank Cross Curve

Enter the existing cross curve of the lap to be used in diopters. Two decimal place values are required. This entry must be between -30.00 and +30.00.

Diameter

Enter the diameter of the lap in mm. A whole number value between +20 and +100 is required for this field.

Center Thickness

Enter the actual center thickness of the lap. A whole number value between +10 and +100 must be entered in this field.

NOTE

It is very important that the center thickness be measured from the very base of the lap to the top of the lap. See Figure 1 for further instructions on measuring the center thickness.

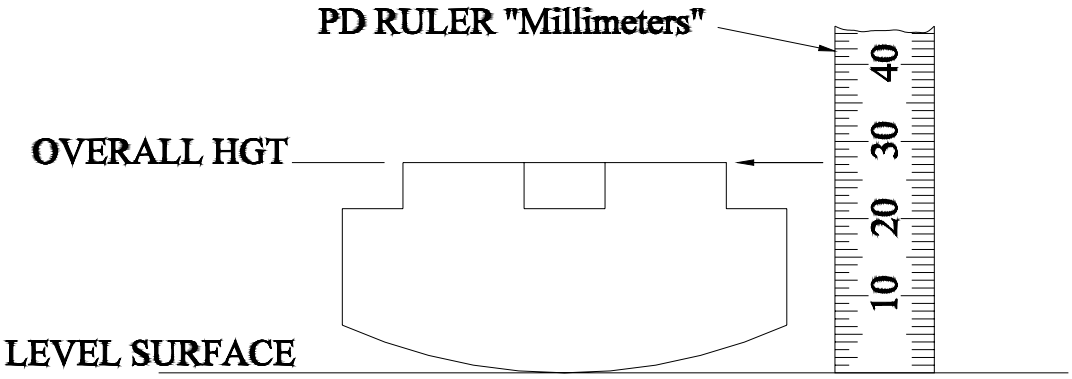


Figure 1 - Measuring a Lap

Center Removal

Enter the desired amount of removal of material from the center of the lap. Usually this number is small, 1-2 mm. This field expects one decimal place value to be entered. For example, for a center removal of 1.0 mm, enter the sequence 1, 0. This can be supplied automatically by the 2G software when you enter data in the *Lap Manufacturer* field and either change or accept the recommended lap type in the *Lap Type* field. The removal measurement here may be rounded up slightly from the amount shown in the *center removal* field discussed below to prevent overcutting.

"center removal" and "edge removal" at bottom

Display-only fields that show the values calculated by the 2G software based on the manufacturer and type specified in the in the *Lap Manufacturer* and *Lap Type* fields. Center removal is always 1.0 mm or more.

Cutting a Lap

When the required data is entered, press the READY key to load the data. Place the lap into the lap holder, and tighten the bolt with a small amount of pressure. Overtightening can cause the lap to deform, producing inaccurate curves. At this point, the lap is ready to be mounted inside the 2G. To start cutting the lap, press the START button.

HELPFUL HINT

Should the next lap to be cut be similar to the one currently running, the operator can move the cursor to the *Repeat Last Lap* line on the top of the screen, and press the READY key. This will recall the data from the previous job, so that only the fields to be changed need to be reentered.

Chapter 4 Setting Up the 2G

Setup Screen

Calibration of the 2G generator is accomplished through variables in the software accessed via the unit's *Setup Screen*. The 2G is designed to retain all the set-up data when the power to the unit is switched off. This allows the generator to be ready to run when turned on.

Figure 1 illustrates the layout of the *Setup Screen*. This is an example only; not all values will be the same for all machines.

```
            Setup Screen
         Press SET-UP to exit
       Software Version:  3.29

Calibration Screen:                READY
Servo Screen:                      READY
Lens Material Screen:              READY
Lap Material Screen:               READY
Diagnostics Screen:                READY
Servo Burn-In Screen:              READY
Move Carriages for Cleaning:       READY
Communications Screen:             READY
Statistics Screen:                 READY

Block Brand:                  COBURN ALUM
Block Diameter for Sag:             50.0
Block Thickness:                     9.0
Blade Radius:                     10.200
End Mill Flute Length:               20
Prism Arrow Location:             None
Default Pin Bevel:                Last


Press READY to enter menu
```

Figure 1 - Setup Screen

To access this screen from the *Job Screen*, press the SET-UP key on the keypad. Please ensure that all *Setup Screen* entries are correct before proceeding to any subsequent screens.

The first section of the *Setup Screen* provide access to additional screens. To access any of these additional screens, move the cursor (using <↑> or <↓>) to the line which denotes the screen you want to access, and press the READY key. The flowchart on the following page is provided for easy reference and clarification of the various screens. The second section of the *Setup Screen* contains data pertinent to the proper operation and calibration of the 2G. Once set, changes to this section should rarely, if ever, need to be made.

Setup Screen Field Descriptions

Block Brand

Select the type of blocking system being used. To change the value in this field, press the +/- key to scroll through the list of common block types. Any changes to this value may also change the *Block Diameter for Sag* and *Block Thickness* values.

Block Diameter for Sag

This is the diameter in mm of the surface blocks or blocking ring being used. This information is only used in calculating center thickness. The accuracy or this value is critical for obtaining accurate center thickness. The allowable range of this parameter is +25 to +75 mm. The factory default value is +50 mm. The follow table shows common *Block Diameter for Sag* values.

Brand	Block Diameter for Sag
Coburn	50
PSI	50
Optek	58 (may vary)
Others	Contact Factory

Blade Radius

This is the blade radius of the tool being used. It is changed only during calibration if a different size cutting tool is installed. For the ½" diameter carbide cutting tool the setting is +6.350 mm. For diamond cutters, refer to the accompanying tag (usually, this value will be around +10.000 mm).

End Mill Flute Length

This is the length of the cutting surface on the cutting tool. For the standard ½" diameter carbide endmill cutter the setting is 26 mm (for a 6-fluted carbide ball 17 mm), and an extended flute diamond cutter is 22 mm. If in doubt, measure the flute length from the tip to the very back of the cutting flute.

Prism Arrow Location

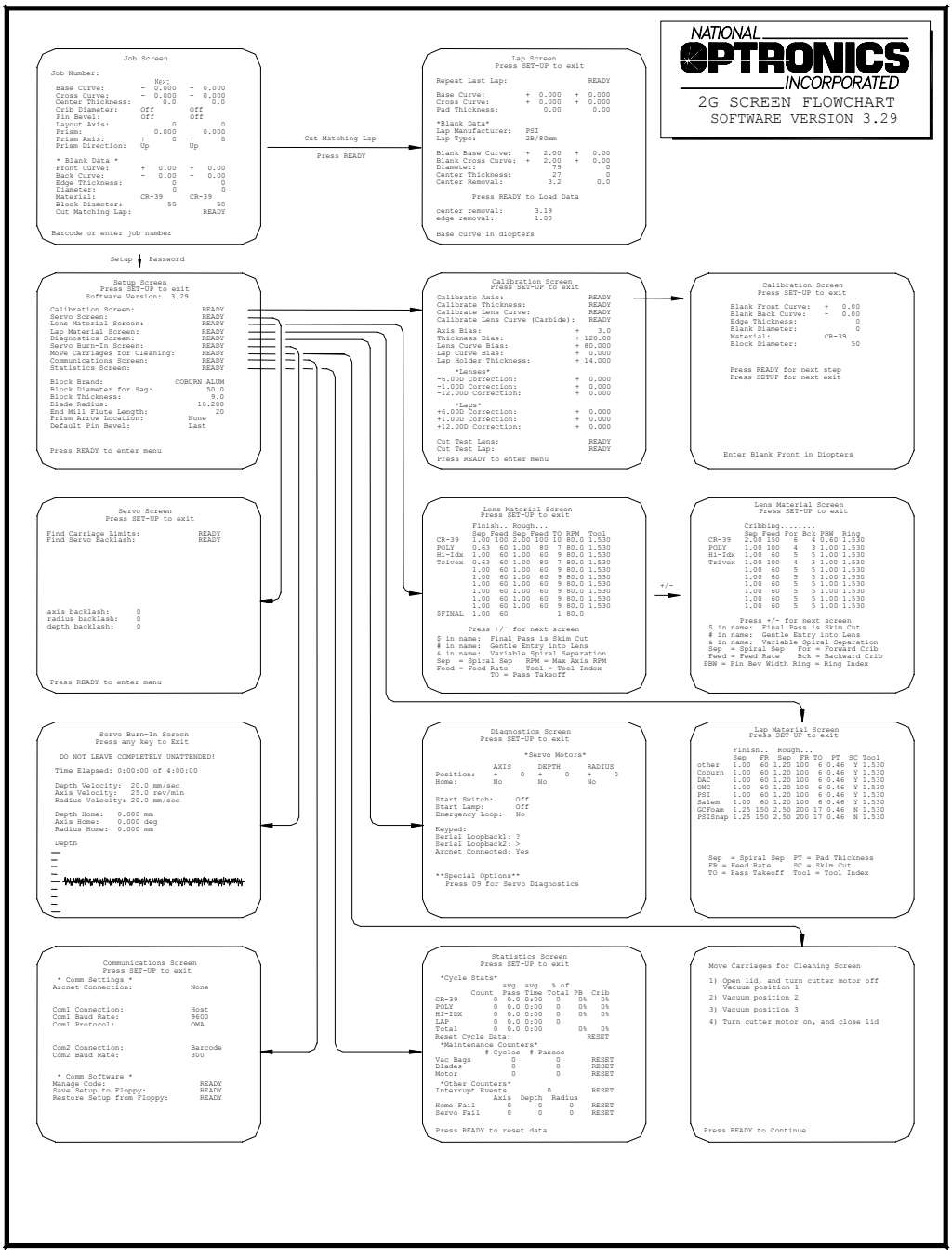
By individual lab preference, either the apex or the base direction of the prism arrow is marked during surface layout. This entry allows a lab to configure the generator to its particular convention. Utilizing this parameter, the generator will automatically orient the collet for the labs method of marking prism. Three choices are valid in this field: "Base", "Apex", and "None". With "Base", the prism base will always be up. With "Apex" selected, the prism apex will always be up. With "None" selected, the bifocal will always be down, which eliminates the need to mark lenses.

Default Pin Bevel

This sets the Pin Bevel field on the *Job Screen* default to On, Off or the same as the value for the last job. The default can be overridden by a host computer or the operator.

Screen Flowchart

Refer to the screen flowchart on the following page for an overview of the different patterns of screen access when using the 2G software.



Calibration Screen

This screen contains values for the *Axis Bias*, *Thickness Bias*, *Lens Curve Bias*, *Lap Curve Bias, Lens Range Correction*, and *Lap Range Correction*. See Chapter 5, "Calibration" for more a more detailed discussion of how to set the following values. This screen can be accessed from the *Setup Screen* by moving the cursor to the *Calibration Screen* line and pressing the READY key.

Figure 2 illustrates the layout of the *Calibration Screen*, followed by an outline of each entry.

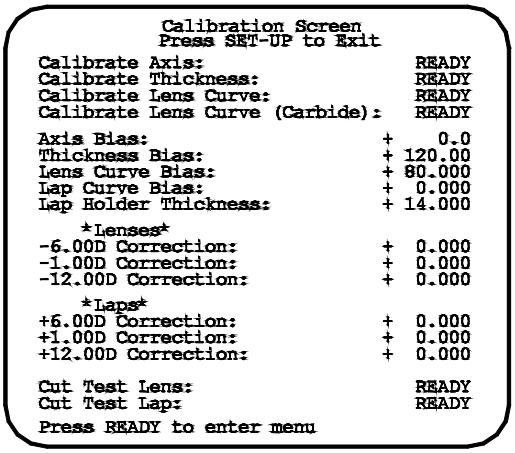


Figure 2 - Calibration Screen

Note

These are default values. Each machine will have unique values for proper calibration, which will not necessarily match the above values.

The *Cut Test Lens* feature will automatically "bounce" between the *Calibration Screen* and the *Job Screen* during the fine tuning of curves, center thickness, etc.

The *Cut Test Lap* feature will automatically "bounce" between the *Calibration Screen* and the *Lap Screen* during the fine tuning of curves, center thickness, etc.

Special Note

The values on the *Calibration Screen* are only temporarily saved during this procedure while the operator is fine-tuning. It is necessary to press the SET-UP key once to exit the *Calibration Screen* and again to exit the *Setup Screen* and return to the *Job Screen* to permanently save the calibration values.

Axis Bias

This controls the relative angular position of the rotating chuck assembly. It is used during calibration to adjust axis position. The units are degrees. Normally, this value is between 0.0 and +5.0. Once set at the factory, the only time that this number should change is when a new home switch, or a collet assembly is installed.

Thickness Bias

This is the distance from the initial home position of the cutter to the plunge depth of the cutter into the lens on the final pass. The units are in millimeters. It is used during calibration to set center thickness.

Lens Curve Bias

This is initially set using the *Calibrate Lens Curve*. It controls the relative position of the lens drive table to the depth carriage. This aligns the cutter blade with the center of the lens. The units are in millimeters.

Lap Curve Bias

This is a corrective offset to the *Lens Curve Bias* used to ensure true curves when cutting laps.

Lap Holder Thickness

This is the thickness of the lap holder used to ensure accurate stock removal when cutting laps. This number will always be a positive number.

-6.00D Correction

This is used to adjust the curves for accuracy at -6.00D (the approximate mid-point for the most commonly cut lenses).

+6.00D Correction

This is used to adjust the curves for accuracy at +6.00D (the approximate mid-point for the most commonly cut laps).

Range Calibration

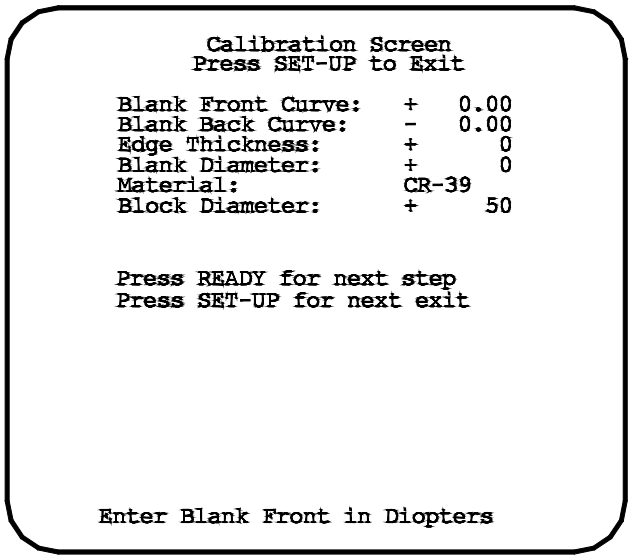
The curves can also be adjusted at ±1.00D and ±12.00D if the operator needs to compensate at these extremes. See "Adjusting the Curves" in Chapter 5, "Calibration," for proper calibration techniques. The units are in millimeters.

Note

Range Calibration is optional and may not be necessary to adjust for proper operation. Many operators will find that the *-6.00D Correction* and *+6.00D Correction* will bring in all curves with sufficient accuracy. A negative number will produce a steeper curve and a positive value will produce a weaker curve. If in doubt about how to use these values or whether you need to, leave them at the factory settings.

Axis Calibration Screen

When you press the *READY* key while on the *Calibration Axis* field, you go to the *Axis Calibration Screen*:



The fields are self-explanatory. For instructions on calibrating the axis, refer to Chapter 5, "Calibration."

Lens Material Screen

This screen allows the adjustment of the cutting parameters, including *Spiral Separation*, *Feed Rate, Takeoff*, *Axis Velocity,* and *Tool Index* for various materials.

The *Lens Material Screen* (see Figure 3) can be accessed from the *Setup Screen* by pressing the READY key when the cursor is on the *Lens Material Screen* line. The parameters entered in the fields control the speed and surface finish during the generating cycle and can be changed within specific limits. To exit the *Lens Material Screen* and return to the *Setup Screen*, press the SET-UP key.

```
          Lens Material Screen
         Press SET-UP to exit

         Finish.. Rough...
         Sep Feed Sep Feed TO RPM  Tool
CR-39    1.00 100 2.00 100 10 80.0 1.530
POLY     0.63  60 1.00  80  7 80.0 1.530
Hi-Idx   1.00  60 1.00  60  9 80.0 1.530
Trivex   0.63  60 1.00  80  7 80.0 1.530
         1.00  60 1.00  60  9 80.0 1.530
         1.00  60 1.00  60  9 80.0 1.530
         1.00  60 1.00  60  9 80.0 1.530
         1.00  60 1.00  60  9 80.0 1.530
         1.00  60 1.00  60  9 80.0 1.530
         1.00  60 1.00  60  9 80.0 1.530
$FINAL   1.00  60            1 80.0

       Press +/- for next screen
$ in name:  Final Pass is Skim Cut
# in name:  Gentle Entry into Lens
& in name:  Variable Spiral Separation
Sep  = Spiral Sep   RPM = Max Axis RPM
Feed = Feed Rate    Tool = Tool Index
            TO = Pass Takeoff
```

Figure 3 - Lens Material Screen—Finish and Rough

The *Lens Material Screen* has two forms: the one shown above for Finish and Rough material settings and one for Cribbing. The Cribbing form is discussed after the Finish and Rough form—and can be accessed by pressing the +/- key.

The following is a description of each entry.

Lens Material Screen (Finish and Rough)

Material

This is a description of the material being processed (that is, CR-39, POLY, etc.) and will appear in the *Material* field on the *Job Screen*. The first two lines are reserved for CR-39 and POLY (Polycarbonate) and cannot be erased, but can have a suffix added. The third line defaults to Hi-Idx (high index), the fourth to Trivex, but can be erased or modified. The remaining lines may be customized with any names and feed rates.

To create a custom material, place the cursor in a blank material field and press the CLEAR key. The cursor will move just to the right of the field name; press the <1> key to scroll up through upper and lower case letters and symbols (if the desired letter or symbol is bypassed the <2> key will scroll back down through the available characters). After the appropriate character has been selected press the <3> key to move to the next character position. Select the next character of the name with the <1> and <2> buttons. Press the <↑> or <↓> Arrow key to end the entry. To erase an existing custom entry, move the cursor to the desired entry location and press the CLEAR key, followed by the <↑> or <↓>.

If one of the following ASCII characters ($, #, or &) is anywhere in the material name, the software will automatically add the associated feature(s). These characters can be scrolled to with the <1> or <2> key as described above. They may even be added to the CR-39 and POLY settings: press the CLEAR key while in one of these fields, and the cursor will jump to the end without deleting the name. The operator may then add the custom feature.

Sep (Finish & Rough)

This parameter determines the distance between each sequential circular sweep of the tool as it moves across the lens during the cutting pattern. The smaller the spiral separation, the smoother the surface finish. Reducing the spiral separation, though, will increase the cycle time as the cutter requires more time to sweep the lens. Also, the increased time that the cutter is in contact with the lens can cause premature wear of the cutter. The boundaries of this parameter are 0.32 mm to 2.54 mm.

Feed (Finish & Rough)

This parameter controls the lens feed rate, which in turn defines the surface cutting speed of the cutter. The larger the feed rate, the faster the cycle time. Increasing feed beyond the cutter's ability to cleanly remove material, though, could result in an unacceptable finish. This should be set, taking into account both surface finish and the cycle time. The boundaries of this parameter are 1 mm/sec to 200 mm/sec.

Note

The feed rate is the most important setting that affects cycle time and thus should be maximized.

TO

This is the maximum depth of material that can be taken off (TO=Take Off) in one pass. The valid range is 1 to 17 mm. This value, along with the *End Mill Flute Length* on the *Setup Screen* will determine the amount of material removed in a single pass.

RPM

Maximum RPM for the Axis. This is generally set to 80 rpm, but may be slowed to 60 if you notice pitting toward the center of the lens.

Tool (Tool Index)

This is the Index of Refraction that was used as the basis for cutting the laps being used for fining and polishing. It should be set to the lap manufacturer's specifications and should be in agreement with the Tool Index in the Rx calculation software.

$ - Final Pass Is Skim Cut

This feature will allow the cutter to rough cut a lens and finish up with a light, smooth pass. It is invoked by including a dollar symbol "$" as any character in the material name on the *Lens Material Screen*. When the material with the "$" symbol is chosen, all but the final pass will run at the settings for that material. The final pass will be cut at the "$FINAL" settings. The final pass can be used on any material and the "$" may be anywhere in the name. This can be configured for a final pass takeoff of 1 or 2 mm under the "$FINAL" material settings.

Note

This feature will increase cycle time for those lenses that are currently being generated with a single pass, since this feature requires a second pass.

- Gentle Entry into Lens

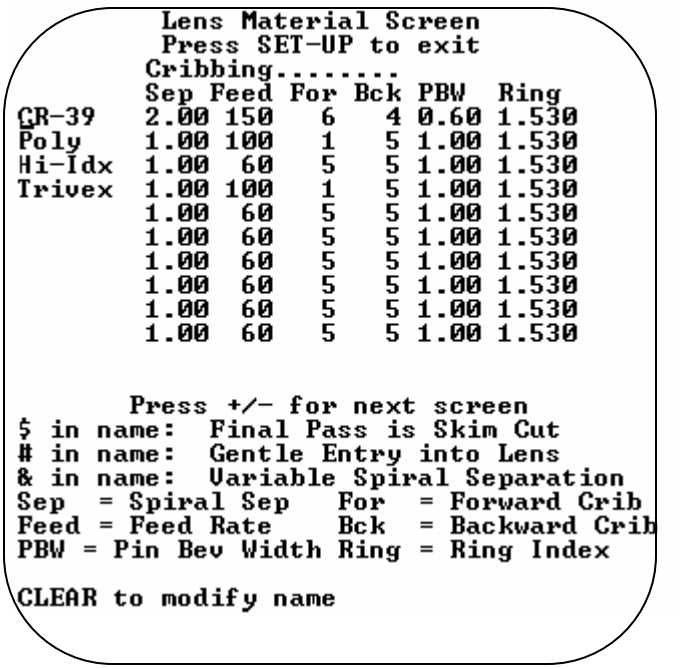
This will provide an especially gentle entry in the lens at the beginning of the cut. It is useful for thick polycarbonate or maintaining sharp knife edges. The feature is invoked by including a pound symbol "#" as any character in the material name (POLY#, for instance).

& - Variable Spiral Separation

This option will increase Spiral Separation up to 2.50 mm at the center of the lens.

Lens Material Screen (Cribbing)

The *Sep* and *Feed* fields are the same as defined above, only applied to the Cribbing part of the process. The other fields are defined below:



For

This is the maximum number of millimeters the 2G can crib while moving forward into the lens.

Bck

This is the maximum number of millimeters that the 2G will go for each pass while moving backwards.

PBW

This is width (in mm) of the Pin Bevel.

Ring Index

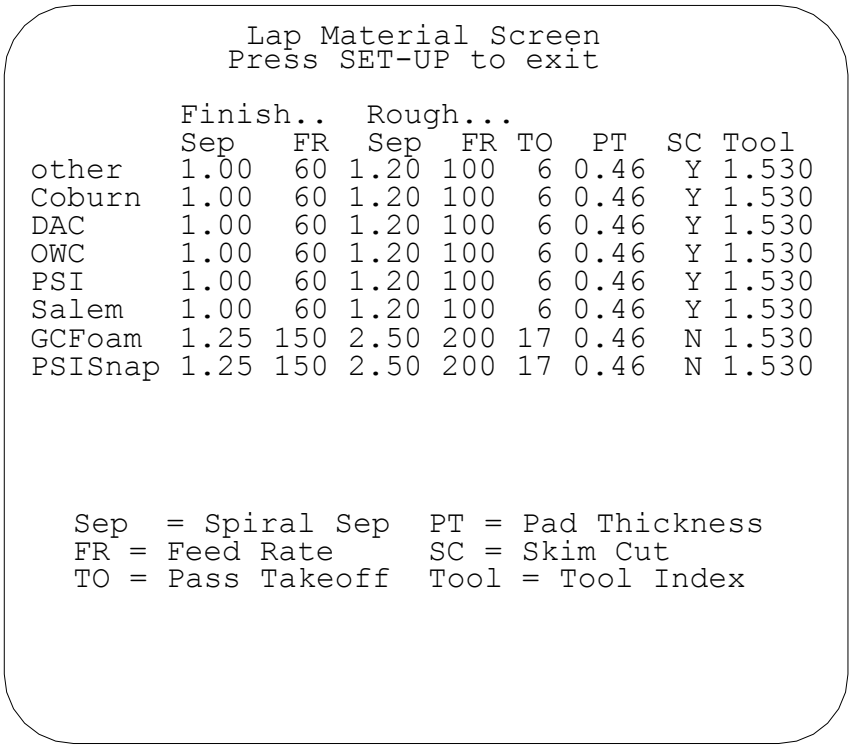
This is the index of refraction on which the Rx computer prism calculations are based. It should be set to the same index upon which your prism rings are based (if you are using rings for other generators) and should be in agreement with the ring index in the Rx calculation software.

Note

Ring Index is for calculation only; it is not recommended to use prism rings with the 2G Generator.

Lap Material Screen

This screen allows the adjustment of the cutting parameters, including *Spiral Separation*, *Feed Rate, Takeoff, Pad Thickness*, *Skim Cut*, and *Tool Index* for various materials.



```
          Lap Material Screen
        Press SET-UP to exit

        Finish..  Rough...
        Sep   FR  Sep  FR TO  PT  SC Tool
other   1.00  60 1.20 100  6 0.46  Y 1.530
Coburn  1.00  60 1.20 100  6 0.46  Y 1.530
DAC     1.00  60 1.20 100  6 0.46  Y 1.530
OWC     1.00  60 1.20 100  6 0.46  Y 1.530
PSI     1.00  60 1.20 100  6 0.46  Y 1.530
Salem   1.00  60 1.20 100  6 0.46  Y 1.530
GCFoam  1.25 150 2.50 200 17 0.46  N 1.530
PSISnap 1.25 150 2.50 200 17 0.46  N 1.530




  Sep  = Spiral Sep  PT = Pad Thickness
  FR = Feed Rate     SC = Skim Cut
  TO = Pass Takeoff  Tool = Tool Index
```

Sep (Finish & Rough)

This parameter determines the distance between each sequential circular sweep of the tool as it moves across the lap during the cutting pattern. The smaller the spiral separation, the smoother the surface finish. Reducing the spiral separation, though, will increase the cycle time as the cutter requires more time to sweep the lap. Also, the increased time that the cutter is in contact with the lap can cause premature wear of the cutter. The boundaries of this parameter are 0.32 mm to 2.54 mm.

Feed Rate

This parameter controls the lap feed rate, which in turn defines the surface cutting speed of the cutter. The larger the feed rate, the faster the cycle time. Increasing feed beyond the cutter's ability to cleanly remove material, though, could result in an unacceptable finish. This should be set, taking into account both surface finish and the cycle time. The boundaries of this parameter are 1 mm/sec to 200 mm/sec.

Note

The feed rate is the most important setting that affects cycle time and thus should be maximized.

Take Off

This is the maximum depth of material that can be taken off (TO=Take Off) in one pass. The valid range is 1 to 17 mm. This value, along with the *End Mill Flute Length* on the *Setup Screen* will determine the amount of material removed in a single pass.

Pad Thickness

If laps are used that are compensated, enter the amount of compensation in mm. The allowable range for the pad thickness is between 0.00 and +3.00 mm. Two decimal place values are required in this field. The following chart shows some common pad compensation values.

Inches	Millimeters
0.018	0.45
0.022	0.55
0.028	0.70
0.032	0.80

Skim Cut

When set to "Y" this will provide a final skim pass on all laps being surfaced ensuring the best possible surface finish and curve accuracy.

Tool (Tool Index)

This is the Index of Refraction that was used as the basis for cutting the laps being used for fining and polishing. It should be set to the lap manufacturer's specifications and should be in agreement with the Tool Index in the Rx calculation software.

Diagnostic Screen

On this screen the 2G performs a series of tests to its hardware with readouts to the operator. Figure 4 illustrates the layout of the *Diagnostic Screen*. The *Diagnostic Screen* can be accessed from the *Setup Screen* by pressing the READY key when the cursor is on the *Diagnostic Screen* line.

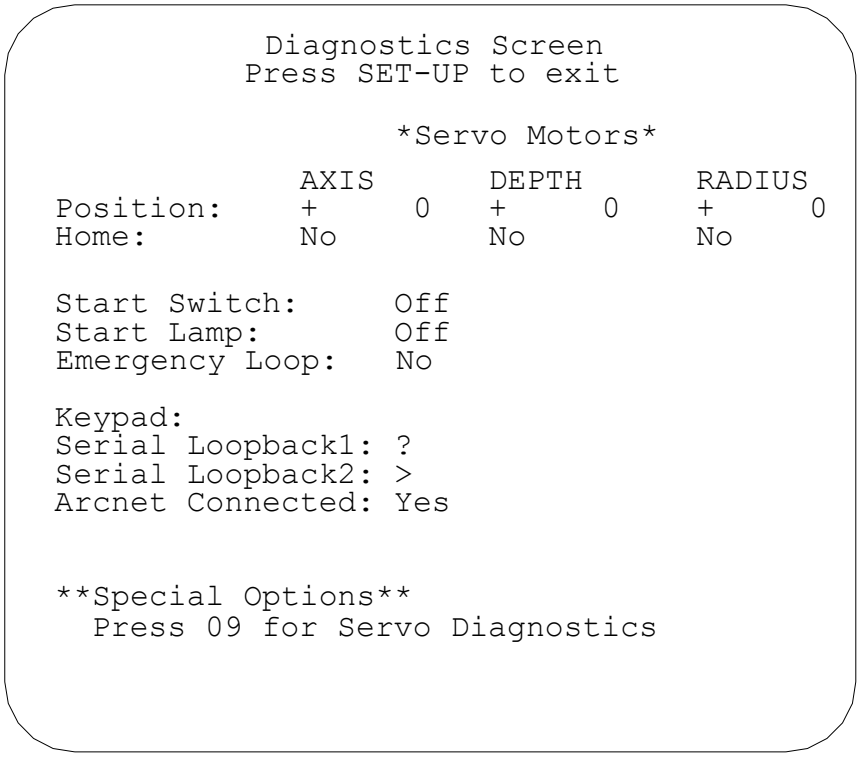


Figure 4 - Diagnostic Screen

This screen will initiate a continuing series of steps to check the functioning of the various electronic controls and sensing devices in the machine.

Axis/Depth/Radius

The Axis, Depth and Radius Carriages are static. This allows the operator to move the carriages and check for varying position, rate (speed) and home switch operation. The corresponding home switch should indicate "YES" when the operator moves any carriage into its home position, and "NO" when the carriage is away from its home position. The number of the counts is relatively unimportant, but the count should move smoothly when a coupler is rotated, without any large jumps.

These can be jogged by pressing 0 then 9 and following the instructions.

Start Switch

This should say "ON" when the green start switch is depressed, otherwise, it should read "OFF."

Start Lamp

The reading here should correlate with the start switch lamp.

Emergency Loop

This field will display the state of the Emergency loop. This will read "Yes" when the lid is down, the Chuck is pressed and the STOP is released.

Keypad

This field will indicate the last key (or button) pressed. The number keys are indicated as numbers, and the other key are denoted as follows:

SETUP s $^{+}/_{-}$ (plus/minus)p

READY r ↑ (up arrow)u

CLEAR c ↓ (down arrow)d

Serial Loopback

The continually changing series of letters, numbers, and symbols indicates what is being sent out of the serial ports. The serial ports can be tested by placing a jumper across pins 2 & 3 of the serial port connection on the back of the 2G for COM1. For COM2, place a jumper across pins 1 & 14 of the serial port connection on the back of the 2G. If the serial port is working properly, the display should change from a single character to the same character being printed twice. For example, the display should change from {A, B, C, …} to {AA, BB, CC, …} if the serial port is working properly.

ARCNet Connected

This will indicated whether or not the 2G is connected to a network. If this reads "NO," but the 2G is physically connected to a network, it indicates a problem with the network. Possible causes are a bad co-axial (coax) cable, or a duplicate LAN ID, or no Arcnet card present.

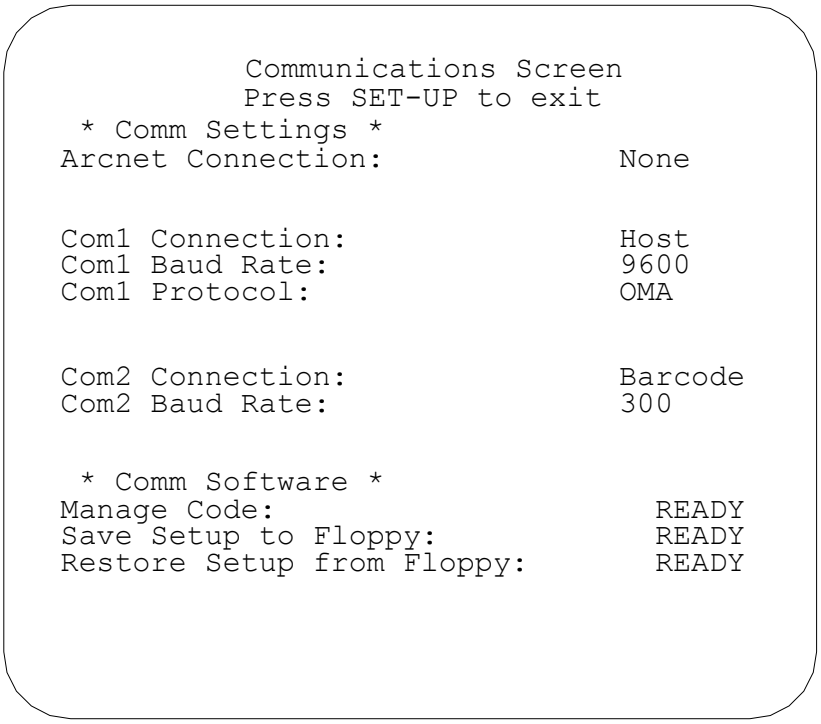
To exit the *Diagnostic Screen*, press the SET-UP key.

IF THE UNIT WILL NOT BOOT UP

The operator may get to this screen by pressing and holding down the any key while turning the machine on. The machine will go directly to this screen without going through the usual boot-up procedures.

Communications Screen

Use the *Communications Screen* to set up communications to a host computer or a barcode scanner.



Comm Settings:

Arcnet Connection: (Requires optional equipment) Specifies the type of Arcnet connection (Host or None).

Arcnet Node ID: (This field disappears when Arcnet Connection is set to **None**.) Specifies the Node ID of the Arcnet connection. The value can be 1-249.

Arcnet Protocol: (This field disappears when Arcnet Connection is set to **None**.) NOP is the only protocol selection.

Com1 Connection: Specifies the device connected to from the COM 1 port; choices are Host, Barcode, or None.

Com1 Baud Rate: Specifies the baud rate used for communications to the COM 1 device. If the Com1 Connection field is set to None, this field will not appear.

COM1 Protocol: Under Com1Baud Rate ONLY when Com1 Connection is "Host"—This field only appears when Arcnet Connection is set to "None" and Com1 has a Host configured.) OMA is the only selection.

Com2 Connection: Specifies the device connected to from the COM 2 port; choices are Host, Barcode, or None.

Com2 Baud Rate: Specifies the baud rate used for communications to the COM 2 device. If the Com2 Connection field is set to None, this field will not appear.

COM2 Protocol: Under Com2 Baud Rate ONLY when Com2 Connection is "Host"—This field only appears when Arcnet Connection is set to "None" and Com2 has a Host configured.) OMA is the only selection.

Comm Software:

Manage Code Allows you to load the new code from a floppy drive.

Save Setup to Floppy Saves all calibration, setup numbers, and statistics (all data saved across power cycles) to disk for future retrieval with the *Restore Setup from Floppy* feature.

Restore Setup from Floppy Restores from floppy all the numbers saved to floppy with the *Save Setup to Floppy* feature.

Statistics Screen

Use the *Statistics Screen* to review various types of machine cycles. Also, when you change the vacuum bag, cutter blade or motor, reset the cycles to zero counts.

```
          Statistics Screen
        Press SET-UP to exit

 *Cycle Stats*
                avg  avg    % of
        Count  Pass Time Total PB  Crib
CR-39       0  0.0 0:00   0    0%   0%
POLY        0  0.0 0:00   0    0%   0%
HI-IDX      0  0.0 0:00   0    0%   0%
LAP         0  0.0 0:00   0
Total       0  0.0 0:00        0%   0%
Reset Cycle Data:                 RESET
 *Maintenance Counters*
           # Cycles  # Passes
Vac Bags          0         0       RESET
Blades            0         0       RESET
Motor             0         0       RESET
 *Other Counters*
Interrupt Events          0         RESET
             Axis  Depth  Radius
Home Fail       0      0       0    RESET
Servo Fail      0      0       0    RESET

Press READY to reset data
```

Cycle Stats

Displays the relevant statistics pertaining to each of the different types of lens generated.

Maintenance Stats

Displays the number of cycles and passes since the last (vacuum bag, blade or motor) change. When you change one of these parts, come into this screen; move the cursor down to the appropriate field, and press the READY key to reset the statistics.

Servo Burn-In Screen

Here the 2G operates its servo motors for break-in and test. Figure 5 illustrates the layout of the *Servo Burn-In Screen*. The *Servo Burn-In Screen* can be accessed from the *Setup Screen* by pressing the READY key, after moving the cursor to the *Servo Burn-In Screen* line.

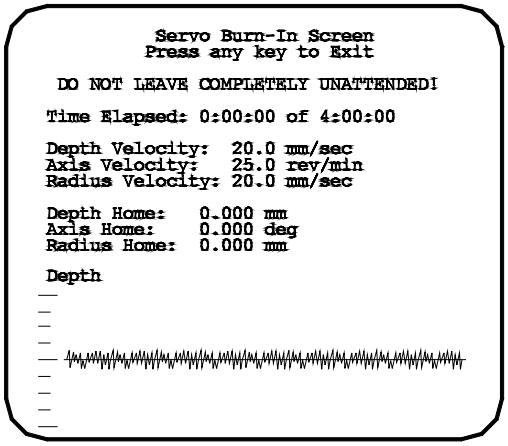


Figure 5 - Servo Burn-In Utility

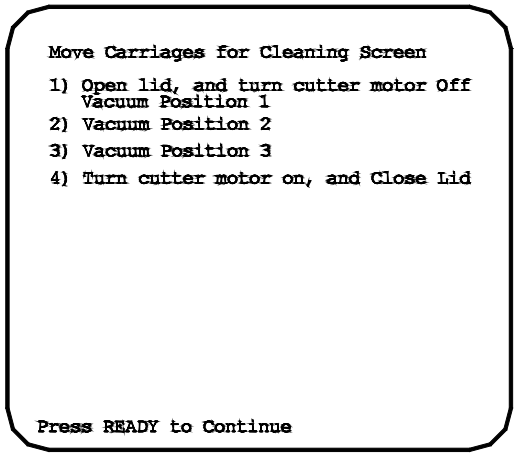
Entering the *Servo Burn-In Screen* begins a series of exercises that measure servo velocities and tests the home switches. This exercise is primarily for factory burn-in but may be used as a diagnostic procedure. Acceptable values for the servo velocities are 15 to 30. If any of the values fall outside this range, it may indicate problems that would require factory assistance.

The home switch tests indicates the change from the baseline home position to the home position of the current pass. The difference should be small. Consult the factory if this is not the case.

The *Servo Burn-In Utility* will continue until time has expired (four hours), or when the operator holds any key to exit.

Move Carriages for Cleaning

When you activate this procedure from the *Setup Screen*, the screen shown below appears. Follow the steps shown on the screen. The carriages will move to a cleaning position and then remain stationary until you press the READY key. (This allows for a more thorough cleaning behind the carriages.) Cleaning is a very important maintenance procedure that should be performed on a regular basis.



IMPORTANT NOTE

To store any changes made in any of the screens discussed in this chapter, the SET-UP key must be pressed while in the *Setup Screen*. This will store the changes in the 2G's internal storage device. When the *Job Screen* returns, this will be your indication that the values were completely stored.

Chapter 5

Calibration

Calibration

To Calibrate the 2G:

1. Press the SET-UP key.
2. Once in the *Setup Screen*, verify that all entries in the lower half of the screen are correct (refer to Chapter 4, "Setting Up the 2G" for more detail).
3. Then move the cursor to the line titled *Lens Material Screen* and press the READY key.
4. After entering the *Lens Material Screen*, change the spiral separation for CR-39 to a setting of 0.63; this will provide a smooth surface for taking measurements (note the original setting so it can be reset after calibration). Alternatively, all lenses generated during the calibration process could be cut using the "POLY" setting.

Note

Remember, after you have set or verified the numbers in the first *Lens Material Screen* (Finish and Rough), press the +/- key to go to the next *Len Material Screen* (Cribbing).

5. Once the change is made, press the SET-UP key once to return to the *Setup Screen*. Move the cursor to the line titled *Calibration Screen* and press the READY key.

Lenses: Lens Curve Bias

Note

The *Calibrate Lens Curve* procedure ***WILL NOT*** need to be performed with each cutter change. The Lens Curve Calibration procedure will need to be performed when:

- A new cutter motor is installed
- The RADIUS home switch is replaced

The *Calibrate Lens Curve* function automatically calibrates the *Lens Curve Bias*. The *Lens Curve Bias* setting is the relative position of the lens drive table to the cutter. It is used to align the center of the cutter with the center of the lens. The units are millimeters. The following steps appear sequentially on the screen. To proceed to the next step, press the READY key.

Note

After each of the following steps, press the READY key to proceed to the next step. Think of the READY key as a way of saying that this step is done and you are ready for the next step.

Calibrate Lens Curve Procedure

As mentioned in the Note above, press the READY key between steps. The following steps are the same as what displays on the screen:

1. Open Lid and Turn Cutter Motor Off

2. Insert Calibration Plug into Chuck

(After Step 2, the depth carriage will move to the left, and the radius carriage will move forward.)

3. Manually Turn Servos to Insert Cutter into Calibration Plug

Note on Step 3

Manually advance the cutter by rotating the rubber coupler on the depth carriage lead screw assembly. If necessary, rotate the rubber coupler on the radius carriage until the cutter is aligned to go into the circular cut out in the center of the calibration plug. Completely center the cutting tool in the calibration plug cutout by rotating the rubber couplers on both the radius and depth carriages lead screw assemblies. If you are using a diamond cutter, be careful not to nick the cutter edge on the calibration plug. (Try moving the radius coupler back and forth while moving the depth carriage forward until making full contact inside the calibration plug, then center the play remaining in the radius coupler). Manually spin the collet nut in the direction of normal cutting (backing the cutter around may damage the diamond edge) to check cutter clearance.

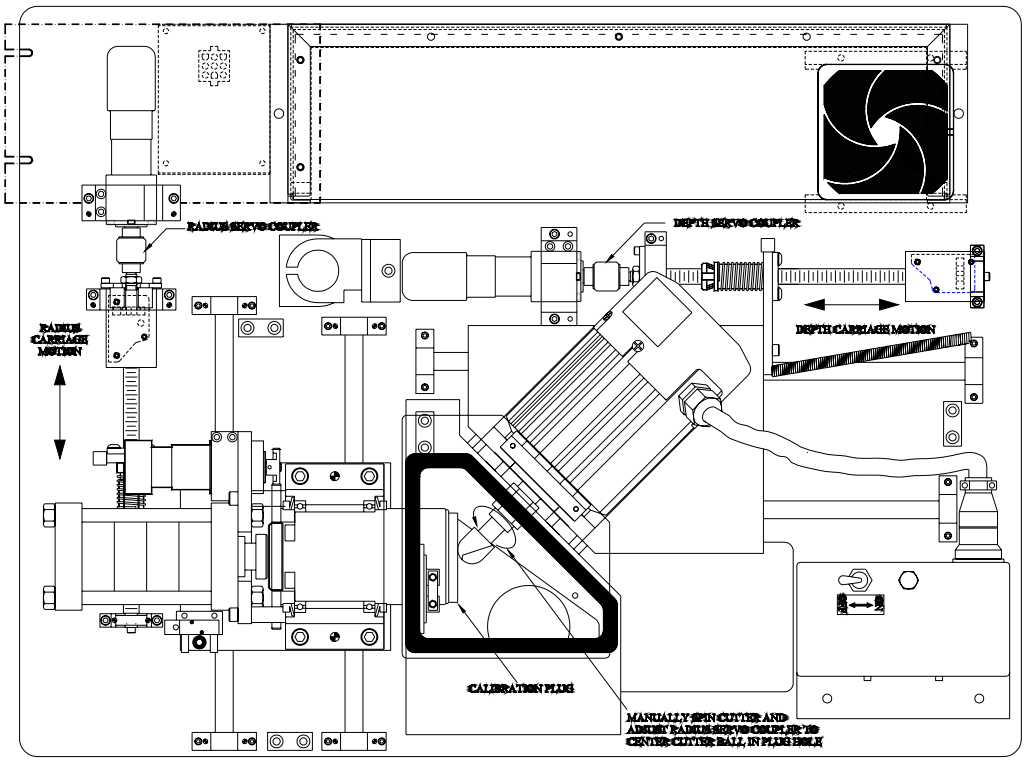


Figure 1 - Setting Lens Curve Bias

4. Remove Calibration Plug
5. Turn Cutter Motor Back On
6. Press the READY key to return the unit to the Calibration Screen.

Verify the Lens Curve (Carbide) Setting

1. Go to the *Calibration Screen* and move cursor to *Calibrate Lens Curve (Carbide)*; then press the *READY* key.
2. Select a blank lens.
3. Enter the information as prompted and press the *READY* key.
4. Chuck the lens.
5. Push the *START* button and wait until the 2G stops. Then remove the lens.
6. Using calipers, measure the diameter and enter that measurement on the screen in the blank provided.
7. Press the *READY* key and wait. The 2G will adjust itself, and it will display the message "Lens curve bias adjusted." If you wish to verify that the 2G has now adjusted itself, repeat steps 1 through 7.

Note

It should crib on all sides. If it does not, repeat steps 1 through 7 with a smaller diameter.

Verify the Lens Curve Bias Setting

1. Change the *-6.00D Correction* to a setting of + 0.00.

2. In the *Calibration Screen*, select the *Cut Test Lens* option.

3. Cut a -6.00D sphere curve on the back of a lens. When the cycle is complete, the unit will return to the *Calibration Screen*.

4. Using a sag gauge measure the curve for variances from center to within 5 mm of the edge.

If the curve varies from center to edge, change the *Lens Curve Bias* setting to correct any inconsistencies.

- If the lens measures flatter in the center, make the *Lens Curve Bias* setting more positive to remove the high spot.

- If the lens measures steeper in the center, make the *Lens Curve Bias* setting more negative to remove the low spot.

- Initial adjustments should be made in increments of ±0.02 mm.

If the 2G will be utilized for lap cutting, the following procedure should be followed to ensure accurate plus curves.

Lap Curve Bias

The *Lap Curve Bias Correction* creates an offset to the *Lens Curve Bias* to produce accurate laps as well as lenses.

1. In the *Calibration Screen*, select the *Cut Test Lap* option.

2. At the *Lap Screen*, cut a +6.00D sphere lap. When the cycle is complete, the unit will return to the *Calibration Screen*.

3. Using a sag gauge measure the curve for variances from center out.

If the curve varies from center to edge, change the *Lap Curve Bias* setting to correct any inconsistencies.

- If the lap measures flatter in the center, make the *Lap Curve Bias* setting more positive to remove the flat spot.

- If the lap measures steeper in the center, make the *Lap Curve Bias* setting more negative to remove the high spot.

- Initial adjustments should be made in increments of ±0.02 mm.

Adjusting the Lens Curves

1. In the *Calibration Screen*, select the *Cut Test Lens* option.

2. Cut a -6.00D sphere curve on the back of the lens. When the cycle is complete the unit will return to the *Calibration Screen*.

3. Using a sag gauge measure the curve.

If the curves are incorrect, use the *-6.00D Correction* to adjust the curves for accuracy as follows:

- If the curve measures too flat, make the *-6.00D Correction* value more negative.
- If the curve is too steep, make the *Correction* value more positive.
- The initial adjustment should be no more than ±0.01 mm.

Note

By depressing the key marked <+/_>, the value can be changed from a positive to a negative value.

EXAMPLE 1:		**EXAMPLE 2:**	
Desired curve:	-6.00	Desired curve:	-6.00
Measured curve:	-5.92	Measured curve:	-6.10
Present *Correction*:	-0.000	Present *Correction*:	+0.002
Setting after initial adjustment:	-0.010	Setting after initial adjustment:	+0.012

Repeat the above procedure until the curves are correct.

Repeat the above procedure (Adjusting the Curves) for -1.00D and -12.00D curves utilizing the *-1.00D Correction* and *-12.00D Correction* to adjust the curves for accuracy. It is very important that the *-6.00D Radius* be set accurately first, since the curve corrections are adjustments from this number.

Adjusting Lap Curves

If the 2G will be utilized for lap cutting, use the following procedure adjust the lap curves for accuracy.

1. In the *Calibration Screen*, select the *Cut Test Lap* option.

2. Cut a +6.00D sphere lap. When the cycle is complete, the unit will return to the *Calibration Screen*.

3. Measure the curve with a sag gauge.

If the curves are off, use the *+6.00D Correction* to adjust the curves for accuracy as follows:

- If the curve measures too flat, make the *+6.00D Correction* value more negative.

- If the curve measures too steep, make the *+6.00D Correction* value more positive.
- The initial adjustment should be no more than ±0.01 mm.

Repeat the procedure until the curves are correct.

Repeat the above procedure for +1.00D and +12.00D laps utilizing the *+1.00D Correction* and *+12.00D Correction* to adjust the curves for accuracy, if so desired. The *+6.00D Correction* must be set accurately first, since the curve corrections are adjustments from this number.

Thickness

From the *Calibration Screen*, move the cursor to *Calibrate Thickness* and press the READY key.

To Calibrate the Thickness:

As mentioned in a previous Note, press the READY key between steps. The following steps are the same as what displays on the screen:

1. Open Lid and Turn Cutter Motor Off
2. Insert Calibration Plug into Chuck

(After Step 2, the depth carriage will move to the left, and the radius carriage will move forward.)

3. Manually Turn Servos so that Blade Just Touches Nylon Insert

Note on Step 3

Move the servos in similar manner to what is described in the Note on page 5-2.

4. Remove Calibration Plug
5. Turn Cutter Motor Back On

Calibrating the Axis

To calibrate the axis:

1. Go to the *Axis Calibration Screen* from the *Calibration Screen*.
2. Enter appropriate data for the blank.
3. Chuck the lens.
4. Press the *START* button.
5. When prompted, mark the vertical axis with a Magic Marker or other permanent marker.
6. Press the *READY* key.
7. Wait until prompted to proceed.
8. Remove the lens and visually inspect the axis. Adjust *Axis Bias* if needed.
9. Press a key to return to the *Calibration Screen*.

Chapter 6

Periodic Maintenance and Troubleshooting

Periodic Maintenance

Daily

Cleaning the Interior

The interior of the 2G should be cleaned on a daily basis using the vacuum to remove debris that escapes the chip chute during normal operation. A 1½" x 6' flexible hose and crevice tool are provided with the vacuum for this purpose.

To clean the interior:

1. Enter the *Set-Up Screen*, and select the *Move Carriages for Cleaning* option.
2. Remove the 2½-inch hose from the vacuum canister's inlet and install the 1½-inch hose fitted with the crevice tool.
3. Move the toggle switch on the back left corner of the 2G to the down position. This will turn on the vacuum, independent of the 2G's operation.
4. Vacuum the debris from the inside of the 2G with the crevice tool, being careful not to disturb the control wiring.
5. When ready to move on to the next stage of cleaning, press the *READY* key to move the carriages.
6. Reverse steps 2 and 3 to return the vacuum to normal operation.

The exterior may be cleaned with a mild, non-abrasive detergent.

Drain the Air Filter

The filter/regulator assembly is located on the left side of the 2G towards the rear of the machine. Any moisture that has accumulated should be drained by pressing up on the valve stem located at the bottom of the bowl.

Check the Air Pressure

The 2G depends on air pressure to open the chuck. The gauge on the regulator should be maintained at 80 psi for proper operation.

Every 200 to 300 Cycles

Change the Vacuum Bags

Both the large collection bag and the small filter bag should be changed together. To insure proper operation, the bags should be changed when the large collection bag has reached two-thirds of its capacity. While the white filter bag is removed inspect the foam filter sleeve located beneath the white bag. Clean or replace if necessary.

To change the bags:

1. Remove the head of the vacuum unit by releasing the three restraining clips.
2. Slide the old collection bag off of the inlet fitting and dispose of properly.
3. Slide the fresh collection bag's rubber hole guard over the inlet fitting inside the canister.
4. Expand the bag around the inside of the canister.
5. Squeeze the ends of the spring clamp securing the white filter bag to the inlet cage on the underside of the vacuum head and slide it off the inlet cage.
6. Remove the white filter bag from the inlet cage and dispose of properly.
7. Inspect the foam filter sleeve for tears or holes. Clean or replace as necessary.
8. Place a fresh filter bag completely over the foam filter on the inlet cage to the vacuum motor.
9. Slip the spring clamp over the inlet cage completely to secure the filter bag in place.
10. Place the head of the vacuum back on the canister, aligning the exhaust port on the head with the inlet of the canister. Secure the three clamps to attach the head to the base.

Every Two Weeks

Clean the Collet Assembly and Cutter Motor

Using the safety air gun supplied in the accessory kit, thoroughly blow out the vents in the collet drive and cutter motor.

Clean the Electronics Enclosure Fan Filter

The Electronics Enclosure fan pulls fresh air into the Electronics Enclosure to help protect the components from over heating. The filter prevents dirt from being pulled in with the fresh air. Failure to clean the filter will affect the fan's performance.

The filter which is located under the right rear corner of the unit can be removed by lifting the right side of the machine one to two inches and sliding the filter towards the right. Cleaning can be accomplished using the safety air gun provided in the accessory kit shipped with the machine.

As Needed

Change the Cutting Tool

The need to change the cutting tool will be indicated by a deterioration in the surface quality of the lens. The tool should be changed when surface finish requires extended fining times.

Caution

Extreme care should be exercised when changing the cutting tool. Turn the cutter motor "OFF" before proceeding. Read the directions completely before proceeding and follow them step by step. The carbide cutter is sharp and may cause hand and finger lacerations if not handled carefully. The diamond cutter's edge is sharp and is fragile; handle with great care.

To change the cutting tool:

1. Open the lid and switch the cutter motor contoller's toggle switch to the "OFF" position.
2. Using the wrenches provided, loosen the collet nut and carefully remove the cutter.
3. Remove the collet nut and collet and clean thoroughly (see the section titled 'Clean the Collet and Collet Nut,' below), reinstall the collet and collet nut.
4. Insert the exposed cutter shank into the cutter motor until the collar "bottoms out" against the collet nut.
5. Tighten the nut with the wrenches provided in the accessory kit. Make sure that the cutter nose is still projecting 38 mm from the collet nut for a carbide end mill cutter, and at 43 mm for a diamond two-fluted or carbide cutter.
6. The cutter position should be close to the old cutter position. It is advised, however, to perform a full calibration, setting the curves and thickness. Proceed to the section on Calibration (Page 5).

Every Cutter Change

Clean the Collet and Collet Nut

While the cutter has been removed, also remove the collet nut and collet from the nose of the motor. Clean with alcohol or acetone, and dry with the air gun before reinstalling.

Changing the Electronics Enclosure Fuse

Change the fuse after a sudden power loss that is not related to the power supply or the power source.

To change the fuse:

1. Turn the power switch to "OFF," unplug the 2G, and open the case top.

2. Using a 5/16-inch nut driver or an adjustable wrench, remove all acorn nuts and screws securing the Servo Motor Cover and the Electronics Enclosure Cover. Then remove the Servo Motor Cover and the Electronics Enclosure Cover,

3. There will be a small plastic bag with fuses clipped to the base plate (2 AMP 250 Volt Time Delay fuses, Part Number 77327 for the 230V 2G and 3 AMP 250 Volt Fast-Acting fuses Part Number 77318 for the 115V 2G). Remove one of those fuses and return the bag with extra fuses to the clip.

4. The fuse holder is on the side of the Electronic Enclosure below the ribbon cable labeled "Line Power." The fuse holder is also labeled. For the 115 Volt 2G, use your hands to twist off the fuse. For the 230 Volt 2G, use a flat-head screwdriver to press in and loosen the fuse-holder top. The fuse will probably fall out. If not, pull the fuse-holder top out; then remove and discard the old fuse.

5. Place the new fuse in the fuse holder and tighten the fuse-holder top.

6. Replace the Servo Motor Cover and the Electronics Enclosure Cover and reinstall the nuts and screws securing them.

7. Plug the 2G back in, close the case top and turn the power switch to "ON" to determine if replacing the fuse fixed the problem.

Troubleshooting

Quick Reference

Following is a quick reference of the most commonly encountered problems. The next sections contain more detailed descriptions of problems.. If you have any further questions with a service issue, please contact the National Optronics' Service Department.

Problem	Suggested Action
Unit does not boot up	Check line voltage for 120V. Verify that unit is on a dedicated circuit. Check Electronics Enclosure indicator lights. Check board voltages. Check cable connections inside machine.
Cycle will not start	Verify position of mercury switches. Verify correct operations of home switches and servo encoders.
Carriages stop mid-cycle	Check Electronics Enclosure indicator lights. Check power supply fuses. Verify that servo encoders and home switches operate properly.
Unit resets mid-cycle	Check line voltage. Verify that unit is on a dedicated circuit. Check board voltages and power supply fuses. Check mercury switch position.
Curves incorrect	Check *Lens Cuve Bias* setting. Check *Compensation Radius -6.00D* setting. Check *Curve Correction -1.00D* and *-12.00D* values. Clean and check home switches. Verify that servo encoders count properly. Clean support rods and lead screws.
Thickness incorrect	Check *Depth Bias* setting. Check *Block Diameter for Sag* setting. Verify that *Front Curve* value is accurate. Clean support rods and lead screws.
Axis incorrect	Check *Axis Bias* setting. Clean and check axis home switch. Check axis servo encoder.

Lens Quality

Before taking lens measurements, the *Spiral Separation* for CR-39 should be changed to a setting of 0.63, this will provide a smoother surface for measuring with a gauge. Alternatively, all lenses generated during testing could be run on the "POLY" setting. Once measurements are satisfactory, a lap to lens curve comparison should be made. This is performed by cutting a test lens and fining for approximately 15 seconds, after which the lens is examined to ensure it is being fined consistently throughout its entire surface. If not, minor calibration adjustments should be made until this is accomplished.

Note

Recommendations made in this section are done under the assumption that the cylinder machines have been checked for correct axis and pressure and that the laps have been checked for curve accuracy.

Unfined or gray areas toward the outside edge of the lens

Curves are too flat, fining from the inside out.

Unfined or gray areas at the center of the lens

Curves are too steep, fining from outside in.

Unfined area resembling an hour glass or off axis condition

1. Incorrect *Axis Bias* setting. Follow the procedures in Chapter 5, “Calibration” for setting the *Axis Bias*.

2. Incorrect *Lens Curve Bias* setting. Follow the procedures in Chapter 5, “Calibration” for setting the *Lens Curve Bias*.

Hump or depression at or near the center of the lens

Incorrect *Lens Cuve Bias* setting. Follow the in Chapter 5, “Calibration” for setting the *Lens Cuve Bias*.

Excessive chatter

This is indicated by large pit marks or a tearing away of the lens material, requiring prolonged fine times.

1. Incorrect *Lens Material Screen* settings. Ensure that the *Spiral Separation* and *Axis Speed* are set within the acceptable ranges for the material being surfaced.

2. Dull cutting tool. Follow the procedures on Page 3 for changing the cutter tool.

3. Motor bearing failure. Wear in the cutter motor bearing will cause the cutting tool to vibrate against the lens producing excessive chatter. Follow the procedures on Page 17 for changing the cutter motor.

Center thickness is inconsistent

1. Incorrect *Block Diameter for Sag*. Ensure the *Set-Up Screen* entry for *Block Diameter for Sag* is correct for the type of blocking system being used (see Chapter 5, “Calibration”).

2. Incorrect blank *Front Curve*. Verify that the value entered for the *Front Curve* on the *Job Screen* is accurate and correct.

3. Loose or damaged depth servo coupler. Ensure the four set screws securing the coupler to the servo motor and lead screw are tight and the coupler is intact. Replace the coupler if necessary.

Prism direction incorrect

Incorrect prism arrow location. Ensure the *Set-Up Screen* entry for *Prism Arrow Location* is set in accordance with lab procedures for locating prism (see Chapter 5, “Calibration”).

Prism amount incorrect

1. Incorrect *Ring Index*. Ensure the *Lens Material Screen* entry for *Ring Index* is set in accordance with the lab's Rx calculation computer. This can be verified through your system manager.

2. Lens blocked off center. Ensure lenses are blocked on geometric center.

Job Entry Screen

Screen entries are barely visible

1. Contrast control out of adjustment. Adjust the contrast knob, located on the keyboard cover inside the case top, for best clarity.

2. Loose connection on the interface board. Check the wire connections on the interface board, mounted on the back of the keypad under the keypad cover.

3. Contrast control malfunction. Contact the factory for service.

"Invalid Value" message appears at the bottom of screen

Job Entry Screen data must fall within certain parameters for each entry. An "Invalid Value" message at the bottom of the screen indicates that one or more of the entries are outside of these parameters. The cursor will move to the entry in question.

Cross Curve

1. Incorrect *Cross Curve* entry. The entry for the lens *Cross Curve* must be equal to or of a greater minus value than the *Base Curve*.

2. Incorrect *Blade Radius* entry. Ensure the *Set-Up Screen* entry for *Blade Radius* is set in accordance with the tool being used.

Center Thickness

1. Incorrect *Center Thickness* entry. The entry for *Center Thickness* must be greater than 1.0 mm. There is no provision for entering the decimal point on the keypad, the decimal point is an automatic entry. Therefore if a center thickness of 2.0 mm is desired a 2 would be entered followed by a 0.

2. Incorrect lens blank data. The 2G's software uses the entries in the lens blank data area to determine if the requested center thickness can be obtained. An entry error in the lens blank data can result in a correct *Center Thickness* entry as being deemed invalid.

Edge Thickness

Incorrect *Edge Thickness* entry. This is the edge thickness of the lens blank to be surfaced and is a whole number (there is no provision for a decimal point). Therefore, if the edge thickness measures 8.5 the entry should be rounded to 9 mm, an entry of 85 would be seen as invalid.

Cycle Irregularities

Job entry data is accepted, however, cycle won't start

Main mercury switch malfunction. The main mercury switch is part of the 2G's control loop circuitry, a malfunction of the mercury switch will disable the cycle start switch.

1. Check the position of the switch. The mounting collars tab should be aligned in the cut-out of the plexiglas shield stop bracket and secured with the mounting screw and nut.

2. Inspect the switch leads for breaks and the connector to ensure it is firmly in place.

3. Verify the switch operation by unplugging the switches amp-style connector and placing a jumper wire across its wiring harness receptacle. If the 2G cycles normally, replacement of the mercury switch is required.

Note

Bypassing the mercury switch is performed solely for diagnostic purposes and is **NOT** intended for operation. **SERIOUS INJURY** could result from operating the 2G in this manner.

Collet appears to stutter or stall during the cutting cycle

1. Low servo voltage. Follow the procedures on page 6-15 for checking and setting the 20 Volts DC Processor Board voltage.

2. Material removal is too aggressive. Check the *Lens Material Screen* settings (spiral separation, feed rate, and takeoff).

Cycle times too long

1. Incorrect *Lens Material Screen* settings. Verify that the *Lens Material Screen* settings (*Spiral Separation*, *Axis Speed*, *Pass Depth*) are set to minimize cycle time for the materials to be processed. See *Lens Material Screen* field descriptions in Chapter 4.

2. Incorrect blank data. Verity that the actual lens blank data for the lens being processed is being entered in the blank data area of the *Job Screen*.

3. Incorrect *End Mill Flute Length*. Verify that the entry for *End Mill Flute Length* in the *Set-Up Screen* is correct for the cutting tool being used. Use a PD stick to measure from the tip of the cutter to the end of the cutting flutes.

Carriages move into cutting position, however neither cutter motor nor vacuum operate

Mercury Relay not functioning.

A. Using a voltmeter verify the output voltage of the relay by attaching one lead of the meter to the white/violet wire at the top of the relay and the other lead to any large white neutral wire, close the case top and cycle the 2G. When cycled 110 Volts AC (230 VAC where applicable) should be read at the meter, if so check the white/violet output wires for breaks.

B. Check the input voltage by attaching one meter lead to the red wire at the base of the relay and the other lead to any large white neutral wire, 110 Volts AC (230 VAC where applicable) should be present as soon as power is switched on (it is not necessary to cycle the 2G to check input power), if no voltage is present check the red wire for breaks.

C. If input voltage is present check the DC trigger voltage to the relay by attaching one meter lead to the orange wire at the base of the relay, the other meter lead to the white/orange wire also at the base of the relay, close the case top and cycle the 2G. When cycled 18 Volts DC should be read at the meter. If no voltage is present check both wires for breaks and loose connectors. If both input and trigger voltages are present and no output voltage is measured, replacement of the mercury relay is required.

Cutter Motor

Motor does not run

1. Cutter motor mercury switch malfunction. The cutter motor mercury switch is located inside the case top secured to the right hand side near the wiring harness.

   A. Ensure the switch is tied securely to the inside of the case and is parallel with the case top.

   B. Inspect the switch leads for breaks and make sure the connector is firmly in place.

   C. Verify the switch operation by unplugging the switches amp-style connector and placing a jumper wire across its wiring harness receptacle. If the motor runs when the 2G is cycled, replacement of the mercury switch is required.

   Note

   Bypassing the mercury switch is performed solely for diagnostic purposes and is **NOT** intended for operation. **SERIOUS INJURY** could result from operating the 2G in this manner.

2. Motor, or Controller failure. Using a voltmeter verify the motor controller supply voltage by attaching one lead of the meter to the white wire and the other lead to the white/orange wire at the motors amp-style connector. Close the case top and cycle the 2G. When cycled 110 Volts AC (230 VAC where applicable) should be read at the meter.

   If no voltage is present check the wiring harness leads for breaks. If 110 Volts AC (230 VAC where applicable) is present at the connector replacement of the cutter motor and/or the controller is required. Follow the procedures on page 6-17 for changing the cutter motor/controller.

Motor is Noisy

Nose bearing failure. If the motor is making a grinding, squealing sound it is an indication the nose bearing is going bad. Follow the procedures on page 6-17 for replacing the cutter motor.

Processor Initialization Failure (Start Up Failure)

When the power switch is first turned "ON," the 2G performs a series of system checks. A failure of any of the checks will prevent the 2G from continuing the initialization process. The screen freezes at this point, and you will not be able to exit by pressing the SETUP key.

Blown 20 Volt Power Supply Fuse

Two fuses are used on the power supply board inside the electronics enclosure to prevent electrical damage to the processor board. A blown 20 volt fuse would be indicated by the +M20VDC light NOT being illuminated on the power supply LEDs (see Figure 1, below). To check the fuse perform the following steps:

1. Turn the 2G's power switch to the "OFF" position.

2. Remove the acorn nuts from the Electronics Enclosure, and remove the cover. The power supply board will be on the right hand side of the box.

3. Locate the fuse labeled "F2" (item 16), and remove it from the socket.

4. Using an ohmmeter, test for continuity through the fuse.

5. Reversing steps 1 through 3, either replace the blown fuse, or return the good fuse into the socket labeled "F2," ensuring that the pins on the fuse properly line up with the socket.

Note: The 20 Volt LED is the Top LED, which may or may not be labeled correctly on your box.

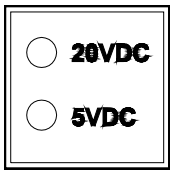


Figure 1 - LEDs

Home Switch Malfunction

1. Failure in the closed mode. Open the case top and examine the carriages, if one of the carriages is slowly creeping forward, locate the corresponding home switch

   A. Check the switches connector to ensure it is firmly in place.

   B. Using a soft, dry cloth, or the air gun supplied in the accessory kit, clean the opening in the switch.

   C. If the switch still malfunctions, replacement of the switch is required.

2. Failure in the open mode. If the switch fails in the open mode, the corresponding carriage will run past the home position and bottom out against its stop plate. This can be detected by a humming of the servo motor or a twitching of the servo motor coupler. If the axis home switch fails in the open mode, the collet will begin rotating and not stop. When a switch fails in the open mode, switch replacement is required.

Servo Motor Encoder Malfunction

The servo motor encoders are an integral part of the servo motors themselves. Failure of an encoder would require replacement of the entire servo motor. The servo encoders report the exact position of the radius and depth carriages and axis location of the lens chuck to the main processor. The blue ribbon cable extending from the rear of the motors carry the encoder signals.

Depth or radius carriage encoder failure will be indicated by the corresponding carriage running forward at a rapid rate. If the axis encoder fails the 2G will initialize normally, however, once a job is entered and the <READY> key is pressed, the collet will begin rotating at a rapid rate and not stop.

Locate the appropriate cable and ensure its connectors are firmly in place. If so, replacement of the servo motor is required.

Blown 5 Volt Fuse

If the 2G does not go through its normal boot-up routine, and no text is present on the display, The 5 volt power supply fuse may be blown. A blown 5 volt fuse would be indicated by the +5VDC light NOT being illuminated on the power supply LEDs, which are located on the front of the electronics enclosure (See Figure 1). The 5 volt fuse can be found on the power supply board inside the Electronics Enclosure. It will be labeled "F1." The following steps should be followed to check the fuse.

1. Turn the 2G's power switch to the "OFF" position.

2. Remove the acorn nuts from the Electronics Enclosure cover, and then remove the cover. The power supply board will be on the right hand side of the box.

3. Locate the fuse labeled "F1", and remove it from the socket.

4. Using an ohmmeter, test for continuity through the fuse.

5. Reversing steps 1 through 3, either replace the blown fuse, or return the good fuse into the socket labeled "F1," ensuring that the pins on the fuse properly line up with the socket.

Encoder and Home Switch Diagnostics

A further diagnostics of the encoders and home switches can be performed through the 2G's software. To access the *Diagnostic Screen*, switch the power to the 2G to the "OFF" position. After waiting 10 seconds, switch the power back "ON". When the message "Press any key for Immediate Diagnostics" appears at the bottom of the screen press and hold the <1> key until the *Diagnostic Screen* is accessed (see field descriptions in Chapter 4).

Rotating the depth or radius carriage servo motor couplers so that the carriage moves forward (away from the home position) the corresponding encoder should count upwards (or positively) and *HOME* should read "NO" when the carriage is moved away from the home position. When the coupler is rotated so as to move the carriage towards the home position the encoder should count downwards (or negatively), and once back in the home position, *HOME* should read "YES". Rotating the collet towards the front of the 2G (the chuck must be closed) the encoder should count upwards (or positively) and *HOME* should change from "NO" to "YES" each time the actuator vane passes through the switch. Rotating the collet towards the rear of the 2G, the encoder should count downwards (or negatively).

Servo Motor Malfunction

Failure of a servo motor can be attributed to 1 of 3 things. The servo motor itself, the power supply, or the servo motor driver chips.

If failure of a servo motor is suspected, it can be isolated as follows:

1. Switch the power to the "OFF" position.

2. Rotate the servo's couplers and collet so as to move all three carriages away from their home position.

3. Observing the carriages and collet, switch the power "ON."

During the initialization process the servos will search for their home position. Failure of one of the carriages or collet to find its home position will indicate the location of the malfunction.

1. Servo motor connector. Locate the corresponding servo motor power connector and ensure that it is firmly in place.

2. 20 Volt DC Supply Voltage. Follow the procedures on Page 14 Checking and Adjusting Voltages.

   A. If voltage is less than 20 Volts DC, adjust according to the instructions on Page 15.

   B. If voltage is greater than 20 Volts DC by a margin of more than 10% (i.e., 22 Volts DC) damage to the driver chips may have occurred. If voltage cannot be adjusted to within acceptable limits replacement of the power supply is required. Excessively high voltages may cause damage to the processor board in which case replacement of the Electronics Enclosure may be necessary.

Checking and Adjusting Voltages

Caution

Extreme care should be exercised when checking and adjusting voltages. 115 VOLTS AC (230 VAC where applicable) is present at the transformer. Remove all jewelry and use insulated tools and test equipment. DO NOT LET HANDS COME INTO CONTACT WITH ELECTRICAL COMPONENTS.

For accuracy, it is recommended that a good quality digital voltmeter be used for measuring voltages.

Preparation

1. Switch the power to the "OFF" position.
2. Remove the electronics enclosure cover.
3. Inspect the wires within the electronics enclosure for breaks and loose connections.
4. Close the case top.
5. Switch the power to the "ON" position.

Checking and Adjusting the 5 Volt DC Processor Voltage

1. Locate the 5 Volt DC test points.
2. Ensure that the meter is set to the DC voltage scale and place the red meter lead on the red wire and the black meter lead on the black wire on the back plane.
3. Read the voltage from the meter, when properly adjusted the meter should read between 4.95 and 4.99 volts DC.
4. If adjustment is needed, locate the 5 Volt DC adjustment potentiometer and using a small insulated screwdriver, adjust until the voltage is within the limits specified above.

Checking and Adjusting the 20 Volt DC Processor Voltage

1. Locate the 20 Volt DC test points.
2. Ensure that the meter is set to the DC voltage scale and place the red meter lead on the white/orange wire and the black meter lead on the white/yellow wire on the I/O board.
3. Read the voltage from the meter, when properly adjusted the meter should read between 19.95 and 20.10 volts DC.
4. If adjustment is needed, locate the 20 volt DC adjustment potentiometer and using a small insulated screwdriver, adjust until the voltage is within the above limits

Checking the Power Supply Input Voltages

The power supply input voltages are provided by the transformer. Three separate voltages are supplied to the power supply. Voltage measurements can be made either at the transformer or the power supply connector.

Note

Output of the transformer to the power supply is the side of the transformer with 6 wire leads, the input side of the transformer has 2 wire leads.

Transformer Supply Voltage

In order for the transformer to supply the correct voltages to the power supply, the correct input voltage must be present. The transformer supply voltage can be measured across the white and red wires on the input side of the transformer. Ensure the meter is set to the AC voltage scale and place one lead on the red wire and the other lead on the white wire. The meter should read approximately 115 volts AC (230 VAC where applicable).

24 Volt AC 4 AMP, Output

The 24 volt, 4 amp supply voltage can be measured across the violet and the white/violet wires. Ensure the meter is set to the AC voltage scale and place one meter lead on the violet wire and the other lead on the white/violet wire. The meter should read 24 volts AC (±10 volts AC).

8 Volt AC, Output

The 8 volt supply voltage can be measured across the red and blue. Ensure the meter is set to the AC voltage scale and place one meter lead on the red wire and the other lead on the blue wire. The meter should read 8 volts AC (±10 volt AC).

24 Volt AC, 0.2 AMP Output

The 24 volt, 0.2 amp supply voltage can be measured across the orange and white/orange wires. Ensure the meter is set to the AC voltage scale and place one meter lead on the orange wire and the other meter lead on the white/orange wire. The meter should read 24 volts AC (±10 volts AC).

Parts Replacement

Replacing the Cutter Motor

1. Switch the POWER to the 2G to the "OFF" position.
2. Remove the cutting tool from the motor.
3. Unplug the motor's power connection.
4. Remove the three screws securing the chip chute and spacer to the front motor bracket.
5. Loosen four (4) ¼-20 inch socket head screws on the motor bracket. (Three of these are ¼-20 x ¾ inch; one of them is shorter and goes into the counterbore. **Make sure that you reinstall the shorter screw in the top hole from where it came.**)
6. Slide the motor out.
7. Place the new motor in and reverse the steps described above.

Replacing the Cutter Motor Controller

1. Turn the power to the 2G OFF.
2. There are the two (2) ¼-20 x ¾ inch socket head screws on the controller with two (2) ¼ inch hi-collar lock washers holding them in place. Remove those two screws.
3. Disconnect the controller from the cutter motor.
4. Disconnect the power to the controller.
5. Remove the old controller.
6. Mount the new controller into the space from which the old controller was removed. (The controller can only mount one way.
7. Reverse the process of removing the controller; that is, replace the screws, reconnect power, etc.

Replacing the Electronics Enclosure

1. If possible, use the Save Setup to Floppy option on the *Communications Screen* to record the entries from each of the setup screens. If not possible, manually record the entries from the each of the setup screens.

2. Switch the power to the 2G to the "OFF" position and disconnect the power plug from the rear of the machine.

3. Disconnect all the leads from the left side of the Electronics Enclosure.

4. Remove the mounting screws and washers from the tabs at each end of the electronics enclosure.

5. Carefully remove the Electronics Enclosure from the 2G.

6. Place the new electronics enclosure into place in the 2G taking care not to trap any wires beneath the enclosure.

7. Install the mounting screws and washers.

8. Reconnect the leads to the left side of the electronics enclosure.

9. Insert the power plug at the rear of the 2G and switch the power to the "ON" position.

10. If you used the Save Setup to Floppy option on the *Communications Screen*, use the Restore Setup from Floppy to recover the Setup numbers. If the *Set-Up Screen* entries were recorded in step 1 re-enter the values at this time. If it was not possible to record these entries and they were not previously recorded in the manual refer to Chapter 5 for settings and calibration.

11. Cut a test lens and calibrate as necessary.

Replacing a Servo Motor

1. Switch the power to the 2G to the “OFF” position.
2. Loosen the 2 set screws securing the servo motor's shaft to the servo motor coupler. (Omit this step for the axis servo motor.)
3. Disconnect both the power and the encoder plugs.
4. Loosen the two clamping screws securing the motor in its mount.
5. Slide the new motor into the mount, taking care to align the flat on the motor’s shaft with one of the set screws on the servo motor coupler. (For the axis servo take care to align the teeth of the Delron gear with the gear at the rear of the chuck assembly.)
6. Tighten both set screws securing the motor to the coupler.
7. Tighten the clamping screws securing the motor in its mount. Do not over tighten, as this could bind the motor.
8. Reconnect both the power and the encoder plugs.
9. Follow the procedures beginning on Chapter 5 to recalibrate the 2G.

Replacing the Home Switches

1. Locate the wiring connector, and taking note of its orientation, disconnect it from the switch.
2. Remove the 2 screws securing the rectangular switch cover.
3. Remove the 3 screws securing the switch to its mount.
4. Taking care to align the switch with its vane, mount the new switch using all 3 screws (Do Not Overtighten).
5. Remount the switch cover.
6. Reconnect the wiring connector.
7. Cut a test lens and calibrate as necessary.

Replacement Parts List

Chip Chute

Item #	Description
90231	Chip Chute Assembly
2257	Chip Chute Cutter Shield
2254	Top Cutter Shield Hinge
2259	Top Cutter Shield Latch
2263	Chip Chute Gasket

Case Top

Item #	Description
9080	Control Panel - Left
9085	Control Panel - Right
77204	On/Off Switch Circuit Breaker
77675	Switch Bulb
3005	Keypad
3015	Display
3035	Display/Monitor Board
9055	Plexiglas Shield Assembly
82122	Shield Hinge
77270	Mercury Switch
77350	Light Bulb - Straight Lamp
77355	Light Bulb - “U” Lamp

Pneumatic

Item #	Description
74203	Filter/Regulator
74302	Bulkhead Fitting - Female
74305	Bulkhead Fitting - Male
7005	Collet Cylinder
7010	Solenoid Valve
74075	Muffler

Electrical

Item #	Description
9052	Power Cord
77305	Vacuum Toggle Switch
77416	Mercury Relay
77322	Fuse (Electronics Enclosure)
77324	Fuse (Power Supply)
3034	Power Supply Board

Cutter Motor

Item #	Description
80420	Cutter Motor (110 V)
48420	Cutter Motor (220 V)
80165	½" Collet
90285	Collet Wrench Set

Vacuum

Item #	Description
87120	Vacuum 12 Gallon (110 V)
87122	Vacuum 12 gallon (220 V)
80212	Replacement Motor (110 V)
48130	Replacement Motor (220 V)
87150	Foam Filter Sleeve
87170	Vacuum Spring Clip
87175	Vacuum Crevice Tool
87164	Vacuum Hose 2½" X 6'
87155	Vacuum Hose 1½" X 12'

Motion Control

Item #	Description
9035	Lead Screw Assembly (Radius)
9036	Lead Screw Assembly (Depth)
90723	Servo Motor
7230	Flex Coupler
3050	Home Switch
2291	Home Switch Cover
2024	Lead Screw Anti-Backlash Nut

Accessories

Item #	Description
87178	Hex Key Set
87260	Safety Blow Gun
87248	Calibration Plug
2108	Lap Holder Assembly

Cutters

Item #	Description
93743	6 Flute Carbide Cutter
93761	Polycrystalline Diamond Cutter

Collet Assembly

Item #	Description
9017	Collet Insert Assembly
2145	Collet Locating Pin
2030	Collet Adapter Plate
9018	Collet Insert Assembly - LOH

Appendix A

Control Panel & Monitor Descriptions

Control Panels

There are two front control panels on the 2G: the right side and the left side (see Figure 1).

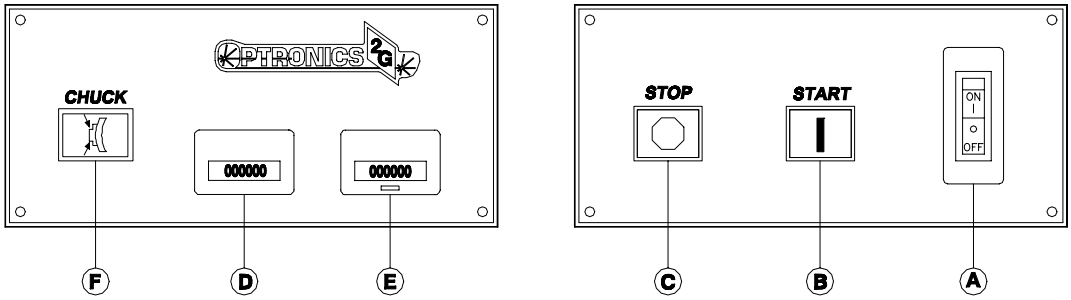


Figure 1 - Control Panels

Right Side panel

Ⓐ On/Off Switch with Internal Circuit Breaker:
This switch controls line power to the generator and vacuum. It contains an integral 20 amp resettable circuit breaker for overload protection.

Ⓑ Start Button (Green):
This button begins the generating cycle.

Ⓒ Stop Button (Red):
This is a "Panic Button." Pressing this button at any time will abort the cycle and return the carriages to their start positions.

Left Side panel

Ⓓ Cumulative Cycle Counter:
The first counter will register the total number of cycles on the generator. It should initially read 20-100 cycles, as the generator was tested prior to shipment. This counter will count the total number of lenses generated, NOT the number of jobs.

Ⓔ **Resettable Cycle Counter:**
The next cycle counter is resettable, similar to a trip odometer in an automobile. The counter is provided for scheduling maintenance or measuring operator performance. To prevent accidentally resetting it during operation, you can insert a small pin, wire, or nail in the hole in the reset button.

Ⓕ **Chuck Button (Blue):**
This button opens and closes the chuck which holds the lens block.

Keypad

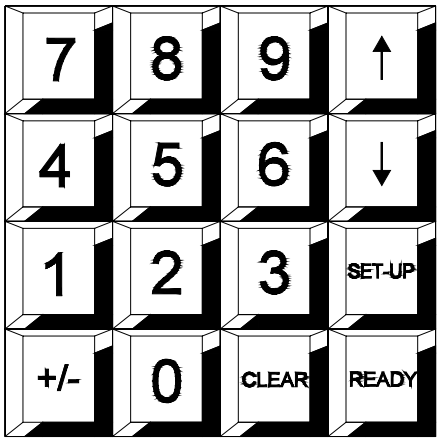


Figure 2 - Keypad

The keypad on the right side of the generator controls the data input for the lens being generated. See Figure 2 for the layout of the keypad.

<↑>, <↓> -- The "up arrow" and "down arrow" keys are used to move the cursor on the screen.

SET-UP -- The SET-UP key is used to transfer between the *Set-Up Screen* and the *Job Screen*. To transfer to the *Set-Up Screen*, the operator will be asked to enter a 6-digit security code number.

READY -- The READY key is used to accept the complete job data and prepare the machine to cycle. This key is also used to enter various screens from the *Set-Up Screen*.

CLEAR -- The CLEAR key is used to erase data on a line to re-enter new data.

<+/-> -- This key is used to change the sign on any of the data fields. It is also used to scroll though a set of predefined choices in the appropriate fields.

Monitor

The monitor mounted in the case top on the right is used to display the various screens associated with the 2G generator. There are multiple screens available.

1. The *Job Screen* is used to enter the data necessary to generate a desired lens. This is the only screen needed for routine operation when no calibration or set-up is required.

2. The *Set-Up Screen* is used for system calibration and configuration. All of the five remaining screens are accessed directly from the *Set-Up Screen*.

3. The *Calibration Screen* allows the operator to calibrate the 2G for proper curves, axis, and center thickness. Also, a test lens can be generated from this screen to test settings.

4. The *Servo Screen* allows you to find the carriage limits.

5. The *Lens Material Screen* contains information to configure the generator for different lens materials.

6. The *Lap Material Screen* contains information to configure the generator for different lap materials.

7. The *Diagnostic Screen* initiates a series of system checks on the generator.

8. The *Servo Burn-In Screen* "exercises" the 2G servo motors for break in, warm-up, and test.

9. The *Move Carriages for Cleaning Screen* will help simplify the cleaning process.

10. The *Communications Screen* allows you to set you communications options, usually performed during initial setup only.

11. The *Statistics Screen* allows you to check various counts and cycles. You can also reset cycle information after replacing vacuum bags, blades, etc.

Note

Cleaning the 2G is an essential part of the maintenance process, and should be performed on a regular basis.

Monitor Contrast Control

The monitor contrast can be adjusted by turning the knob that is mounted on the inside of the unit, on the left-hand side of the monitor/keypad dust cover. The monitor is configured for white lettering on a blue background.

Appendix B

Summary of Calibration Process

Calibration Summary

Pre-calibration Checklist:

- Correct Blade Radius
- Review Blank Material Screen
- Depth Carriage Stop Set
- End Mill Flute length

LENSES

1. **Center Cutter with the Calibrate Lens Curve Procedure**
   a. Use the Calibrate Lens Curve procedure (refer to Chapter 5 for details) to "Rough-in" the Lens Curve Bias
   b. Cut a -6.00 lens and check sag consistency across entire surface
      - + adjustment to Lens Curve Bias if lens is flat in the center
      - - adjustment to Lens Curve Bias if lens is steep in the center
      - Adjust in increments of 0.010 mm and re-cut 0.5 mm thinner to check
      - Perfect sag not necessary; adjust to get curve consistent.

2. **Calibrate Curves with the Compensation Radius and the Curve Corrections**
   a. Bring a -6.00 lens to the proper sag with the -6.00D Correction
      - + adjustment to -6.00D Correction if curve is steep
      - - adjustment to -6.00D Correction if curve is flat
      - Adjust in increments of 0.010 mm and re-cut 0.5 mm thinner to check
   b. Bring a -12.00 lens to the proper sag with the -12.00D Correction
      - + adjustment if too steep, - adjustment if too flat
   c. Bring a -1.00 lens to the proper sag with the -1.00D Correction
      - + adjustment if too steep, - adjustment if too flat

3. **Calibrate thickness with the Depth Bias**
   a. Use the Calibrate Thickness procedure (refer to Chapter 5 for details), then verify that the correct Block Diameter for Sag is entered
   b. Cut a -6.00 lens and check cut thickness against desired thickness
      - + adjustment to Depth Bias if lens is too thick
      - - adjustment to Depth Bias if lens is too thin
   c. Re-cut -6.00 lens until thickness is correct; verify with another curve

4. **Check axis with Axis Bias (set at factory; should not vary)**
   a. Cut a high-cylinder lens for which you have an accurate lap
   b. Fine the lens for 20 seconds; pull off and check for off-axis marks
   c. If marks exist, adjust Axis Bias if necessary (also verify cylinder machine axis)

LAPS (optional)

1. **Verify lap thickness (adjust with the Lap Holder Thickness)**
   a. Verify that the correct Lap Holder Thickness is entered
   b. Cut a +6.00 lap and check thickness
      - + adjustment to Lap Holder Thickness if lap is too thick
      - - adjustment to Lap Holder Thickness if lap is too thin

2. **Achieve lap consistency with the Lap Curve Bias**
   a. Cut a +6.00 lap and check sag consistency across lap
      - + adjustment to Lap Curve Bias if lap is flat in the center
      - - adjustment to Lap Curve Bias if lap is steep in the center
      - Adjust in increments of 0.01 mm and re-cut 0.5 mm thinner to check
      - Perfect sag not necessary; adjust to get curve consistent.

3. **Calibrate Curves with the Curve Corrections**
   a. Bring a +6.00 lap to the proper sag with the -6.00D Correction
      - + adjustment to -6.00D Correction if curve is steep
      - - adjustment to -6.00D Correction if curve is flat
      - Adjust in increments of 0.010 mm and re-cut 0.5 mm thinner to check
   b. Bring a +12.00 lap to the proper sag with the -12.00D Correction
      - + adjustment if too steep, - adjustment if too flat
   c. Bring a +1.00 lap to the proper sag with the -1.00D Correction
      - + adjustment if too steep, - adjustment if too flat

Appendix C Error Codes

Job Data Errors

Legal Range	⇒ This indicates that the value entered for a field is outside the allowable range for that field. The legal range of values will follow the words "Legal Range."
Invalid Value	⇒ This indicates that the job contains some invalid data. A value in one or more of the fields will cause the lens to not be cut properly. The cursor will return to the suspect field, so that it can be re-entered.
WARNING! **Blade will contact the block!**	⇒ This message indicates that the blade will cut into the block holding the lens. NOTE: The 2G will still allow the lens to be cut with the entered values if this message appears.
WARNING! **Blade will be within 0.5mm of block! Proceed with caution**	⇒ The indicates that the blade will cut to within 0.5 mm of the block. NOTE: A job can still be run if this warning appears.
Setup numbers are invalid. **Please verify and correct**	⇒ This indicates that a value entered in one of the *Setup Screens* is out of range.

Communication Errors

LAN Hardware Failure	⇒ **ARCNet hardware failure**. No reconfigurations were detected. Normally when a machine joins a network, it causes a network reconfigurations so it will be included in the network. If no reconfiguration is detected then the Server Down 1 message is displayed. A possible cause of this condition is the ARCNet Hybrid driver located on the controller board no responding to the ARCNet controller chip. A defective hybrid driver chip, or the power supply's -12 Volt could cause this problem.
Duplicate LAN ID	⇒ **Duplicate ID Detected**. If changing the ID doesn't fix this problem then there may be a hardware failure with the ARCNet controller.
LAN Receive Error	⇒ **Code mismatch**. Wrong information was received from what seemed the correct source.
	⇒ **Scrambled data in the ARCNet packet**. Try downloading again. If the problem persists then there may be a hardware failure.
	⇒ **LAN Receive Error**. If a packet was received from a node ID that doesn't math the one contained in the packet then this error occurs.
LAN Transmit Timeout	⇒ **Transmit packet failure**. This is caused by an ARCNet packet time-out. This indicates that the Server could not be reached.
LAN Receive Timeout	⇒ **Receive packet failure**. This is caused by an ARCNet packet time-out. This indicates that the Server heard, but did not respond correctly to the request in time.

Appendix D

Specialty Lenses

Bi-Concave Lenses

Bi-concave lenses are produced by cutting a concave curve on both sides of a lens. To cut this type of lens, both surfaces need to be finished independently. Normally, the surface to be used on the front of the lens is finished first. If cylinder power is desired on the front of the lens, it is suggested that the back surface be finished first. The following is the recommended procedure for cutting bi-concave lenses:

- Determine the front curve you wish to produce. Some experimentation with your R_X calculation software may be required to determine the curves that will provide a cosmetically appealing lens.
- Select the best lens blank to cut the curves. This will be a judgment call, based on the lenses available in stock.
- Block the lens on the convex side, and generate the new front curve first. Remove only enough material to finish the lens across its entire surface. Fine, polish, and inspect the lens for defects.
- Produce a work ticket, indicating the newly cut front curve as the true front, or base curve of the lens.
- Change the *Block Diameter for Sag* on the *Set-Up Screen* to represent the outside diameter of the block or ring being used. This value can be measured with a PD stick.
- Mark, tape, and block the lens on the concave surface as indicated by the job ticket.
- Enter the surfacing data into the 2G as usual. No other adjustment are needed, assuming that the following data is entered correctly.
  - The *Block Diameter for Sag* corresponds to the outside diameter of the block or fiber ring.
  - The *Front Curve* is set to the correct minus value.
  - The *Back Curve* is set to the correct plus value.
  - The *Block Diameter* on the *Job Screen* corresponds with the *Block Diameter for Sag*.

Lenticular

Two main factor must be considered when cutting lenticulars.

1. The type of blocking system.
2. The R_X calculation software.

Because of multiple combinations of the above factors, the following guidelines will only cover precautions to take to prevent inaccuracies.

- Ensure that the R_X calculation software is properly setup for the type of surfacing blocks being used.
- Verify that accurate data regarding bowl diameter and carrier base is entered into the R_X calculation computer.
- Determine the appropriate *Front Curve* entry on the *Job Screen*. This should be between the true curve of the bowl or carrier. This value is critical for accurate center thickness.
- Enter the data from the job ticket as indicated. There should be no need to make any adjustments to the center thickness.

Myodisc

Myodisc lenses are produced by cutting two independent sets of curves on the back of the lens. This type of lens is used in the case of a very high minus prescription. This procedure is done to create a more cosmetically appealing lens, to simplify fitting into the frame, and to prevent the lens from contacting the patient's face. When lenses of a very high minus power are produced, usually the curves required are of a lesser diameter then the lens blank. Due to this, the unfinished portion of the lens will be 14 to 18 millimeter in thickness. The following outlines the procedure for producing a myodisc:

- Using your R_X calculation software, determine the correct curves for power. Block and generate the necessary curves. Do not complete the fining and polishing at this time.
- Determine the secondary curve that will produce the desired edge thickness.
- Generate the secondary curve on the lens. If a minus lens is used for this purpose, care should be taken to not destroy the curves required to obtain the proper power.
- Fine and polish the secondary curve before the power curves. This will ensure that the finished power curves are not damaged during the fining and polishing process.
- Care must be taken during the fining and polishing process not to mar the finished surfaces, or to tear the fine and polish pads.

Off-Center Blocking

Although this method of blocking is not recommended, certain precautions must be taken when attempting to cut a lens using a method of blocking which places the block in a location different than the geometric center of the lens. Adjustments must also be made to the blank *Diameter*, and the *Crib Diameter* (if cribbing is desired).

The new *Diameter* should be adjusted by adding two times the decentration to the physical diameter of the lens. For example: A 70 mm blank, decentered by 5 mm, should have an entered *Diameter* value of 80 mm (70 + 2 * 5). The *Crib Diameter* must also be adjusted in a similar fashion.

Progressive

With the accuracy of the 2G generator and today's R_X calculation programs, progressive lenses can be blocked on geometric center to be cut accurately. During cutting, the 2G will accurately move the OC from the geometric center of the lens to the MRP. This is done by using the prism calculated by the R_X calculation software.

Saddle Back

Saddle backs are produced by simultaneously producing both a minus and a plus curve on the back of a lens. A saddle back is usually produced due to a limited availability of lenses in stock, or for cosmetic reasons. The 2G generator will produce saddle back curves in combinations from +6.00D to -6.00D. Laps can also be produced for fining and polishing saddle backs. The following outlines the recommended procedure for generating such a lens.

- Mark, tape, and block the lens as usual.
- Enter the surfacing data into the 2G *Job Screen*.
- Change the *Block Diameter* on the *Job Screen* to match the outside diameter of the surfacing block or fiber ring. There is no need to change the *Block Diameter for Sag* on the *Set-Up Screen*.
- Generate the lens.
- If desired, enter the *Lap Screen*, and surface the desired tool in a similar fashion.
- If a knocking or banging sound is produced during fining and polishing, set the cylinder machines to low speed (if available), and increase fining times slightly.

Appendix E Warranty

Statement of Warranty

National Optronics, Inc. warrants the 2G Generator to be in good and serviceable condition upon shipment from the plant in Charlottesville, VA. The customer's sole remedy is to have defective parts replaced or repaired according to the following General Warranty:

> For a 1-year period from the date of shipment, National Optronics, Inc. will replace or repair all defective parts. Replacement parts supplied under this Warranty will be covered for the remainder of the initial warranty period.

Exempted from this General Warranty are perishable tools and wear parts, specifically covering, but not limited to cutting tools. These tools are warranted to meet normal operating specifications when shipped; they will be replaced or a credit issued if found to be defective upon return to the plant.

These warranties set forth are made in lieu of all other warranties, including merchantability, expressed or implied.

The liability of National Optronics, Inc., to the customer is limited to the exclusive remedies set forth. National Optronics, Inc., will not be held responsible for loss of use or any indirect or consequential damage.

As a general condition to recover in the General Warranty, the customer must establish that:

1. He is the original purchaser of the machine or part;
2. The unit was maintained in accordance with the instructions in the Manual provided with the unit;
3. The unit was operated under normal conditions; and,

National Optronics, Inc. was notified of the defect within two weeks of the date of discovery.

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