VIEW Engineering, Inc.

VIEW Summit™ 800
Service Manual

VIEW™
VIEW Engineering, Inc.
A Quality Vision International Company

View Engineering, Inc.

VIEW Summit™ 800
Service Manual

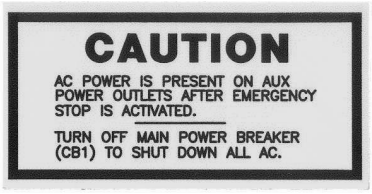
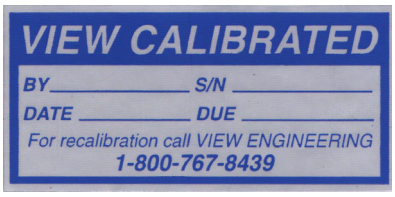
Part No. 3671884-1 US Rev A, 11/02

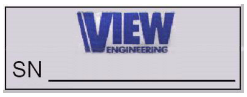
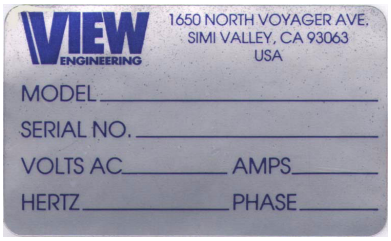
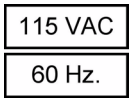
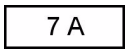
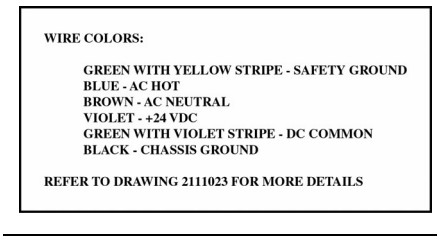
Table of Contents

Important System Labels

The following table summarizes the location and definition of important system labels.

Label:	Location:	Definition:
	Above the black Pushbutton on the Switch box behind keyboard	Emergency Stop Reset
	Above the green Pushbutton on the Switch box behind keyboard	System Power On.
	On each of three (3) amplifiers inside lower drawer. On each of two (2) power supply enclosures inside lower drawer. Above the terminal block at the upper-left side of the inside lower drawer. On front lower cabinet face.	Hazardous voltage present.
	Front of outer ring of Programmable Ring Light (PRL).	Possible pinch point. Do not place any part of body under PRL.

Label:	Location:	Definition:
	Top front of computer cabinet.	Installation of unauthorized software or hardware will void warranty.
	Rear connector panel.	AC power is present on auxiliary outlets even when Emergency Stop switch is pressed.
	Next to ground studs at right rear of lower cabinet (facing toward front of the Summit 800).	Chassis ground point.
	Next to ground studs at right rear of lower cabinet (facing toward front of the Summit 800).	Earth ground point.
	Next to ground studs at right rear of lower cabinet (facing toward front of the Summit 800).	Protective earth ground.
	Front of Summit 800, on granite below measuring stage.	Calibration record.

Label:	Location:	Definition:
	Bottom of joystick and bottom of keyboard.	Serial number of the computer.
	Rear of computer cabinet.	Model and serial number of the computer.
	Rear of Summit 800, on granite below measuring stage.	Main ID: Selected system parameters.
	Rear connector panel near auxiliary power connectors.	Auxiliary Power Electrical Rating: VAC (100, 115, 220, 230, or 240), and Hz (50 or 60).
	Rear connector panel near auxiliary power circuit breaker.	Auxiliary Power Electrical Rating: 7 A
	Top rear of computer cabinet.	Wire color identification.
	On rear of system and lower inside arch -- placed near moving parts.	Exercise caution when working around or near the moving parts.

Label:	Location:	Definition:
	Above key switch and latch, which locks/unlocks and latches/unlatches the lower front panel.	Exercise caution when removing the lower front panel.

About This Manual

Chapter 1

1.1 What This Chapter Contains

This chapter explains:

- lWho Should Read This Manual
- Required Knowledge
- What's in This Manual
- Where to Read More
- Where to Get Help

1.2 Who Should Read This Manual

Read this manual if you will be performing any of the following tasks on the Summit 800 System:

- Installation
- Installation of options
- Preventive maintenance
- Troubleshooting
- Service adjustments
- Parts replacement

For information on programming and configuring, refer to the *View Metrology Software User's Manual.*

1.3 Required Knowledge

To use this manual, you should be familiar with:

- How to maintain and service inspection or industrial automation equipment
- How to use, troubleshoot, and repair a PC
- Basic electrical and mechanical terminology and inspection equipment terminology

Note: The procedures in this manual may only be performed by View Engineering, Inc., trained and authorized personnel.

1.4 What's in This Manual

Chapter:	Title:	Contents:
2	General Description	Defines what the Summit 800 is and familiarizes you with the Summit 800 System's basic hardware components.
3	Safety	Describes the remote emergency stop and other safety issues.
4	Installation	Shows you how to: • choose an installation site • unpack, move and install the Summit 800 System system • start up the system, perform verification, and shut down
5	Principles of Operation and System Interconnections	Describes subsystems and the interconnections within the Summit 800 system.
6	Preventive Maintenance	Lists actions you should take to keep your Summit 800 System in good operating order.
7	Troubleshooting	Helps you identify the cause of possible problems with the Summit 800 System, the CPU, and the user components.
8	Service Adjustments	Shows you how to make adjustments to the Summit 800 System.
9	Parts Repair and Replacement	Shows you how to replace parts.

1.5 Where to Read More

For information about using the Summit 800 System, refer to the *Summit 800 Operator's Guide, View Metrology Software Manual, View Metrology Software Release Notes, and OEM Manuals that shipped with your system.*

1.6 Where to Get Help

If you are faced with a situation you cannot resolve using this manual, contact the View Engineering, Inc., Customer Support Department, at:

1650 N. Voyager Avenue
Simi Valley, CA 93063, USA

Phone: 805-578-5150
800-SOS-VIEW (Toll Free)

Fax: 805-578-5092

Email: viewhelp@vieweng.com

Web Site: www.vieweng.com

Please be prepared with the following information when calling:

- Model and serial number of your system
- Nature of problem
- Steps you have taken
- Your phone and fax numbers

General Description

Chapter 2

2.1 What This Chapter Contains

This chapter covers:

- What is the Summit 800?
- Summit 800 System Main Components
- X, Y, and Z Motion
- Coaxial Toplight, Programmable Ring Light, and Backlight
- Camera/Lens Components
- The Computer and User-Interface Components

2.2 What is the Summit 800?

The Summit 800 is a non-contact three-dimensional measurement system with a full range of vision-based measurement tools and software.

The standard configuration includes the complete range of View Engineering, Inc.'s proprietary edge-detection and image-acquisition tools. Standard features include: high accuracy optics, a coaxial top light, backlight illumination, and a patented autofocus for highly accurate Z-axis measurements.

No upgrades are necessary to achieve full automatic inspection.

2.3 Summit 800 System Main Components

The Summit 800 system is a floor standing machine; see ***Figure 2-1***. Parts are inspected by mounting them on the measuring stage. The computer is located inside the lower cabinet. A flat-panel display monitor is mounted on an adjustable support arm attached to the system. The support arm also holds the tray for the keyboard, trackball/mouse, and joystick. The red Emergency Stop Switch is on the Switch Box, within easy reach of the operator.

Figure 2-1 Summit 800 System Main Components

2.4 Coaxial Toplight, Programmable Ring Light, and Backlight

The coaxial LED Toplight, LED Programmable Ring Light (PRL), and LED Backlight assemblies are used to illuminate an item which has been placed on the stage for either inspection or viewing. The following table describes each feature:

Feature:	Description:
LED Coaxial Toplight (thru lens)	Projects the light straight down through the lens itself. It is also used in conjunction with the Ronchi grid. (The Ronchi grid is used to focus on very flat, non-textured objects.)
LED Programmable Ring Light	Allows you to control illumination via four quadrants at various angles.
LED Backlight	Projects the light upward through the glass and below the item being inspected or viewed.

2.5 Camera/Lens Components

The Summit 800 camera/lens assembly is configured from the factory with a high-magnification 6.6x lens. Figure 2-2 shows the components of the optics tower with the top cover removed.

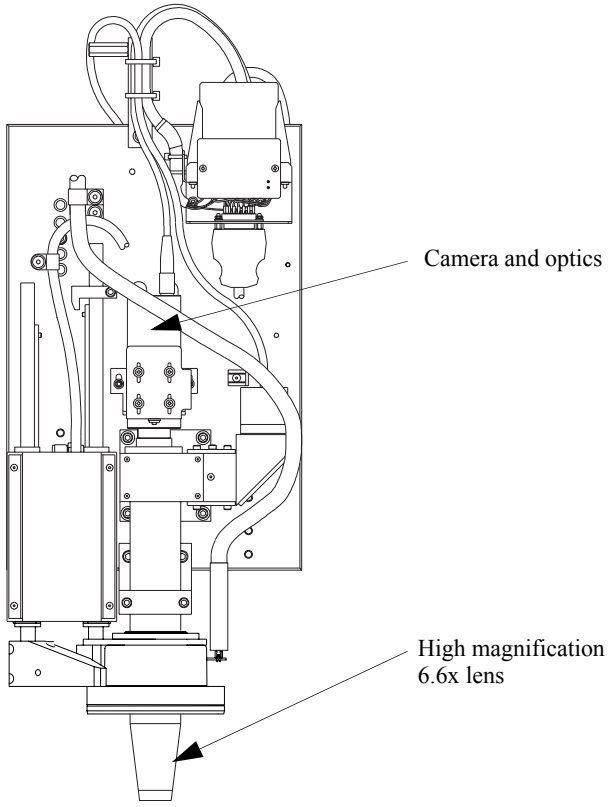


Figure 2-2 Optics Components

2.6 X, Y, and Z Motion

The Summit 800 System has a 762 x 812 x 152 mm (30 x 32 x 6 in) XYZ stage and offers a maximum travel speed of 10 inches per second (on the X and Y axes, and a maximum of 6 inches per second speed on the Z axis). The Y axis stage is mounted directly to a granite base for additional measurement stability. The X axis and the Z axis are supported by a granite gantry.

2.7 The Computer and User-Interface Components

The Summit 800 operates on an Intel-based Central Processing Unit (CPU) inside the Summit 800's computer. In addition, your system comes with a joystick, trackball/mouse, keyboard and monitor, and runs View Metrology Software on the Windows 2000 operating system. Following is a summary of additional information you should know about the CPU user-interface components provided as part of the Summit 800 System.

2.7.1 Trackball / Mouse

Unless specified otherwise, the left mouse button is used for most actions. The right mouse button is used for special actions (to open a pop-up menu when in a specific window, etc.).

2.7.2 Keyboard

- The [F1] key is usually reserved for Help and when depressed and released will signal the software to display the Help menu on the computer monitor.
- The [Tab] key will move the input focus from one field to another in a dialog box.
- In the Feature window of the Summit 800 frame, depressing the left mouse button and the [Ctrl] key will perform a move to where the cursor is in the Feature window.

2.7.3 Joystick

You use the joystick to move the:

- stage in the X and Y directions
- camera/lens assembly in the Z direction

To move:	You must:
the stage along the X axis	move the joystick left and right (east and west)
the stage along the Y axis	move the joystick forward and backward (north and south)
the camera/lens assembly along the Z axis	twist the knob of the joystick to the left and right. This will move the lens closer (clockwise) and further (counterclockwise) away from the stage

Safety

Chapter 3

3.1 What This Chapter Contains

This chapter describes the emergency stop circuitry in the Summit 800 System.

3.2 Emergency Stop

The emergency off (EMO) circuit is activated by pushing the red EMERGENCY STOP switch on the Switch Box located behind the keyboard; see ***Figure 3-1***.

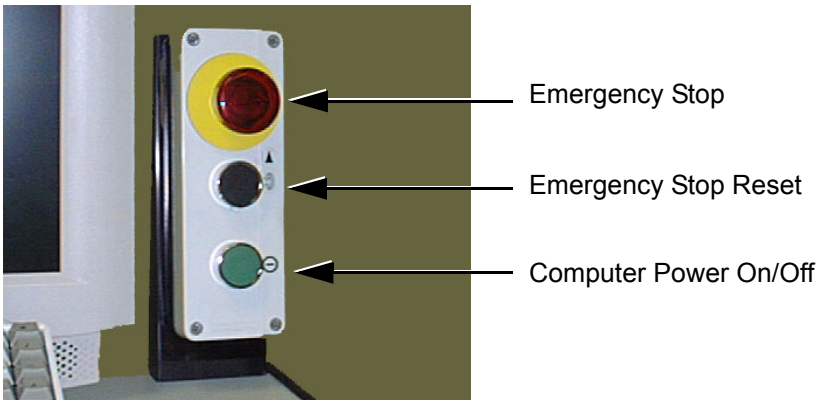


Figure 3-1 Emergency Stop Switch

The EMO circuit is responsible for disabling the system motion in case of emergency. The EMO circuit places the system into a safe (shutdown) condition, which shuts off all electrical power to the DGU unit except for the 24 VDC EMO control voltage.

The Emergency Stop switch is a push-pull type switch. In order to restore operation to the system after pressing the Emergency Stop switch, the operator must pull the switch button out, and then press the black Emergency Stop Reset pushbutton on the Switch Box.

Following the system reset you will be required to clear all EMO related errors from the Summit 800 screen and re-zero the stages. All data collected related to the component being inspected just before the EMO was pressed will be lost and that component must be reinspected.

3.3 AC Power Cable Outlet Lock-Out/Tag-Out Feature

The AC Power Cable Outlet Lock-Out/Tag-Out Feature allows the Summit 800 to be properly disconnected from the power source and prevented from being reconnected until it is safe to do so.

Warning: Use caution when working with power sources. Be sure all power is turned off when attempting to install or service any electrical apparatus. Electrical power systems should be serviced by qualified personnel only.

The System AC Power Cable Outlet (see ***Figure 3–2***) includes a lock-out/tag-out feature. The outlet is recessed, and there is a hole in the upper part of the hood. When the system power cable is unplugged, a lock or tag can be placed through the hole, blocking access to the outlet; preventing the power cable from accidentally or inadvertently being re-connected.

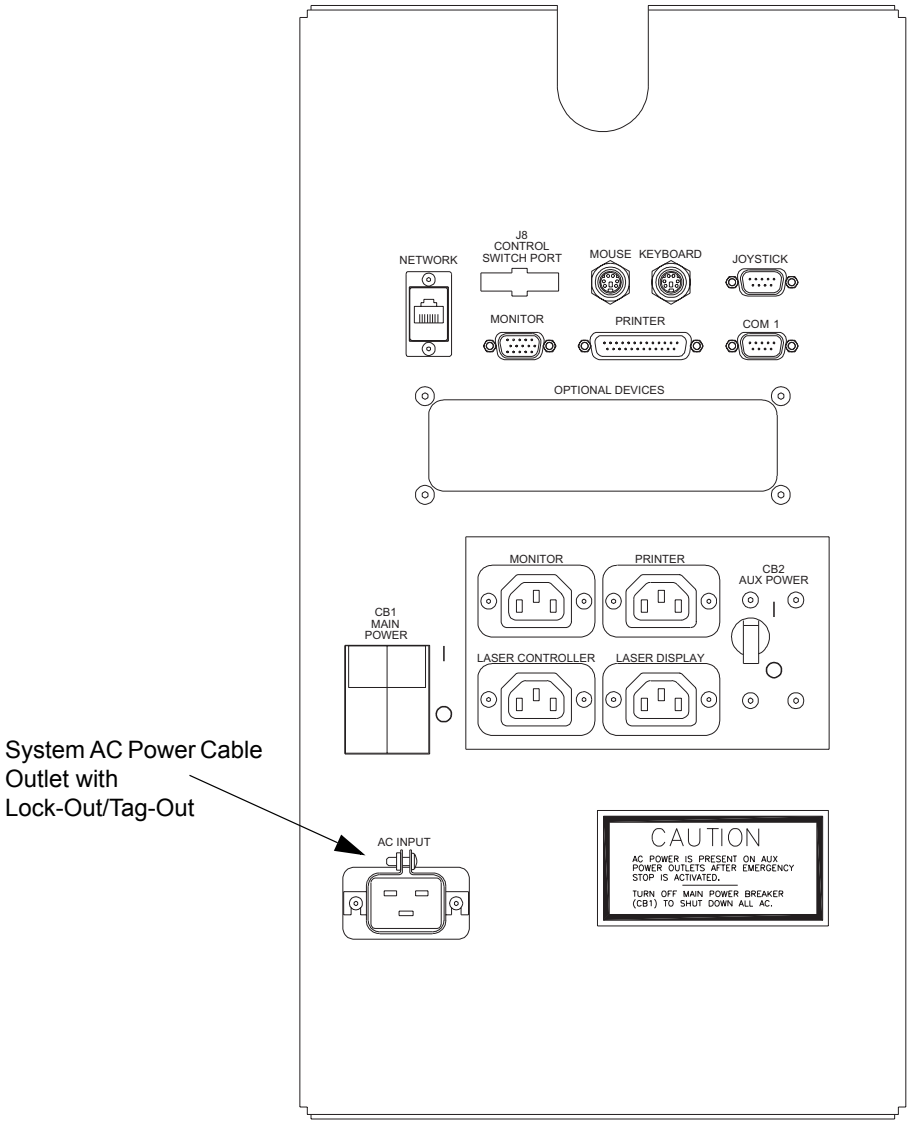


Figure 3–2 System AC Power Cable Outlet on Summit 800 Rear Panel

Most companies have a safety department and written procedures regarding this operation. These procedures typically have the following features as a minimum:

- Each operator, supervisor, and maintenance person who may be required to work on the machine shall have a key operable padlock.
- If more than one key exists for the padlock, the owner of the lock shall have possession of all of the keys.
- Each lock shall be labeled with the owner's name, or the owner shall be supplied with an identity tag that may be attached to the lock when it is applied to the machine.
- Turn power to the machine off by following the procedure outlined in ***Quitting the Software and Turning Off the Summit*** on page 24.
- Press the EMO switch.
- Set CB1, the MAIN POWER circuit breaker on the rear panel, to the OFF (0) position.
- Remove the power cord from its outlet at the power source and then from the outlet at the back panel.
- The power cord inlet has a bracket to hold the cord. This bracket is drilled to accept the padlock. Apply the padlock and tag before proceeding.
- Perform required maintenance.

Note: Each person performing maintenance or making adjustments to the Summit 800 should have their own lock attached to the power inlet. There are commercially available multi-lock devices to allow this.

- After all work is completed, each person removes their own padlock.
- When all padlocks are removed, the power cord may be plugged into the power inlet and then into the power source.
- Set CB1, the MAIN POWER circuit breaker on the rear panel, to the ON (1) position.
- On the Switch Box, pull the red Emergency Off switch out to its reset position.
- On the Switch Box, press the black Emergency Stop Reset switch.
- Turn power on by pressing the green System On switch on the Switch Box.
- Resume normal operation per ***Running a Part Inspection Program*** on page 22.

Installation

Chapter 4

4.1 What This Chapter Contains

This chapter explains:

- Choosing an Installation Site
- Receiving, Unpacking, and Inspecting Your Summit 800
- Moving and Installing the System
- Setting Up the System
- Starting Up the System
- Post Installation Checklist
- Shutting Down the System
- Attaching Shipping Clamps

4.2 Choosing an Installation Site

Before you begin setting up the Summit 800 system, choose a site that meets the following criteria:

Specification	Requirement:
Temperature	Recommended operating temperature range: 17° to 33°C.
Humidity	20% to 80% non-condensing. Condensation can cause corrosion.
Vibration	Do not locate the system close to production equipment susceptible to vibration (for example: stamping presses, mills, or lathes) in order to maintain system accuracy.
Weight	Crated: 3182 kg (7000 lbs) Uncrated: 2773 kg (6100 lbs)
Electrical	Power requirements are: • 115 / 230 VAC, 50/60 Hz, 1.2 KVA (see NOTE) • Four (4) IEC320 style outlets are provided on the machine back panel. These are for the monitor, optional printer, optional laser controller, and optional laser display. They should not be used for any other purpose. These outlets will be at the same voltage level as the input power and will be clearly labeled. NOTE: This is a maximum power rating based upon incandescent lighting full on and all stages in motion. It is offered to enable the user to size his power circuit. Actual power consumption will probably be lower. Units with LED lighting may have actual power consumption values as low as 500 VA.
Dimensions (WxDxH)	Summit: 1422 mm x 1884 mm x 1930 mm (56" x 74" x 76") Workstation: 762 mm x 762 mm x 889 mm (30" x 30" x 35") Make sure there is adequate space for an operator to spread out materials and use the system comfortably. The operator will also need a place to stage the parts that are ready for, and have completed inspection and the system workstation. See ***Figure 4-1*** on page 16 for a sample layout.
Service	Allow 610 mm - 914 mm (24” - 36”) on each side and in the rear of the Summit 800 for cables and service access. See ***Figure 4-1*** on page 16 for a sample layout.

The Summit 800 does not require water, air, steam, or exhaust. Vacuum and/or air may be required for special fixtures only.

4.3 Receiving, Unpacking, and Inspecting Your Summit 800

Tools Required

- Claw hammer
- Crow bar
- Large diagonal cutters
- 9/16” Socket wrench
- Adjustable crescent wrench
- Allen wrench set
- Blade screwdrivers
- Phillips screwdrivers
- Level
- Anti-static wrist strap

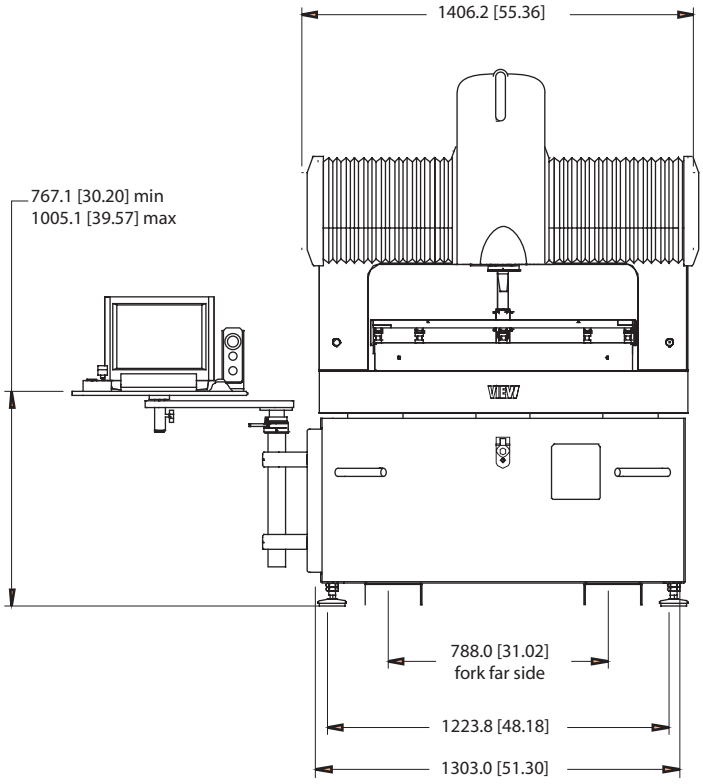
1. Inspect the shipping crate for damage; and carefully inspect all external panels for any signs of damage.
2. Note the condition of the shock sensor that is attached to the crate. If any damage is found, STOP! Contact the View Engineering, Inc., Customer Support Department (see ***Where to Get Help*** on page 3) before you continue.
3. Remove the outer panels of the crate.
4. Remove the four 9/16-inch bolts that secure the cross supports to the pallet base.
5. Remove the remaining outer packaging.
6. Using a forklift, remove the system from the pallet base; and discard the crate.

Note: Thoroughly inspect all crates and containers for miscellaneous items before discarding.

4.4 Moving and Installing the System

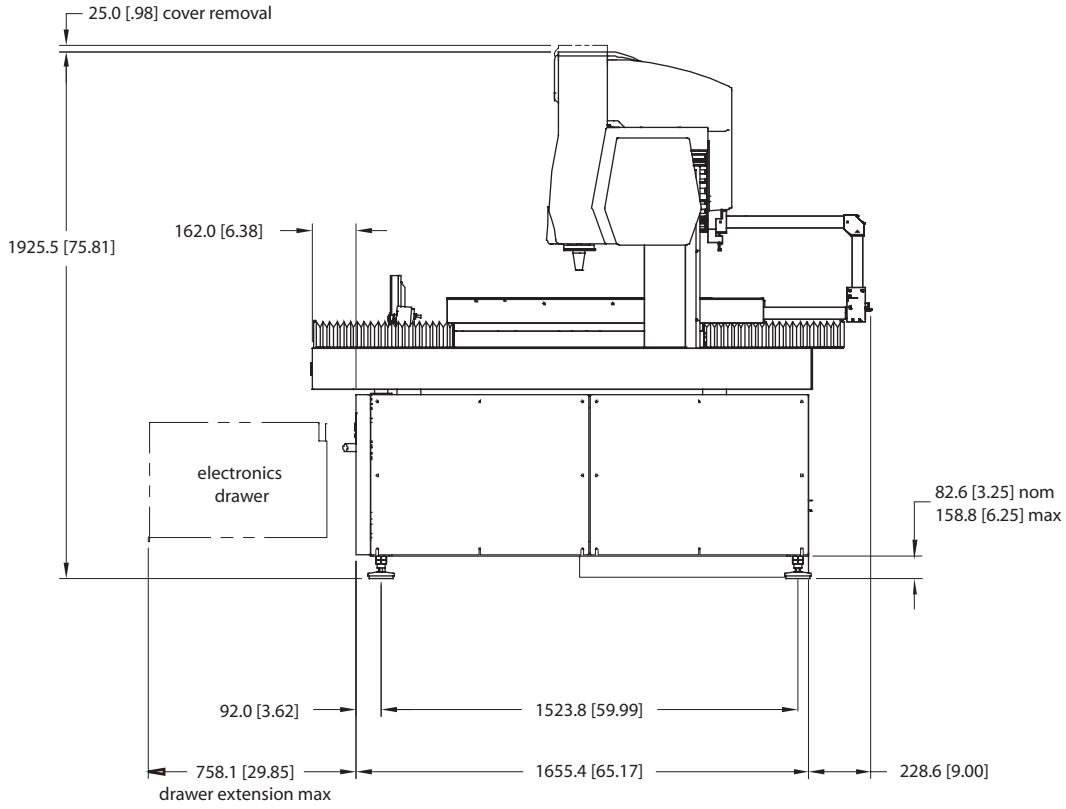
Depending on the site chosen, use either a 22-inch wide (maximum) pallet jack or a fork lift to relocate the system.

When positioning the system, be sure to allow for the additional service space of 24-36 inches (61.0-91.4 cm) on each side.



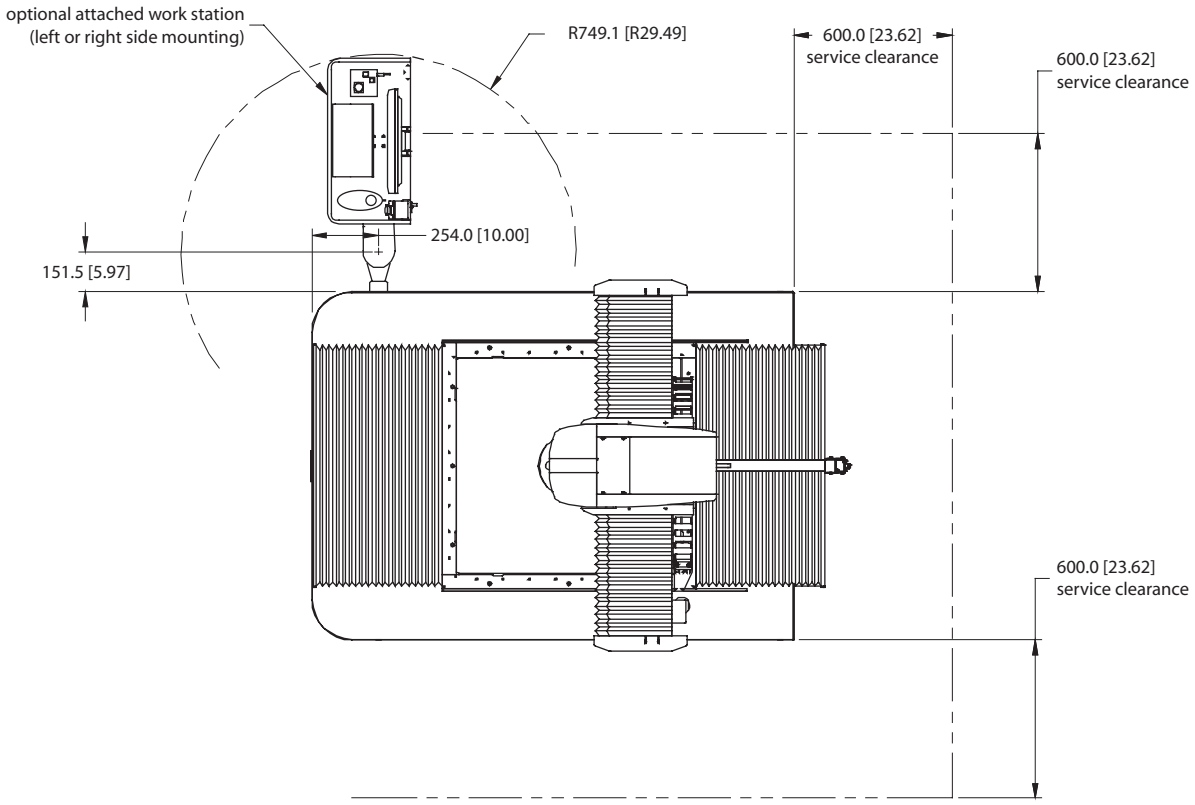
1. DIMENSIONS IN BRACKETS "[ ]" ARE INCHES.

Figure 4-1 Space Requirements (front view)



1. DIMENSIONS IN BRACKETS "[ ]" ARE INCHES.

Figure 4-2 Space Requirements (side view)



1. DIMENSIONS IN BRACKETS "[ ]" ARE INCHES.

Figure 4-3 Space Requirements (top view)

4.5 Setting Up the System

1. Once the system is in place, set a bubble level on the stage to determine if the system is level. If it is not, use an open-end wrench to adjust the four leveling pads until the system is level. Level in the Y direction first then the X. Turn the wrench clockwise to raise the system and counterclockwise to lower it.

Figure 4-4 Leveling the System

2. When the system is level and all pads are firmly touching the floor, tighten the jam nuts.

3. Depending on the options ordered, either install the monitor support arm or assemble the workstation.

4. If Shipping Clamps are present to prevent movement of the X-Y Stage, remove them (see ***Attaching Shipping Clamps*** on page 24). Save these clamps for future relocation needs.

5. Place the monitor, keyboard, trackball/mouse, and joystick in their respective areas.

6. Make all necessary data and electrical connections (see ***Summit 800 Schematic Diagrams*** on page 33).

4.6 Starting Up the System

Follow these steps to get your system running:

1. Make sure the power cord for the Summit 800 system is plugged into a power source, and the monitor is plugged into the outlet provided on the rear panel.

2. On the rear panel (refer to ***Figure 4-5***), check that CB1, the MAIN POWER Circuit Breaker, is set to the “1” or “up” (ON) position.

3. Make sure the red Emergency Stop switch on the Switch Box is pulled out.

4. Press the green System Power On switch on the Switch Box. This will apply power to the Summit 800 system’s computer, load the Windows operating system, and (if the software is configured to do so) start the View Metrology Software.

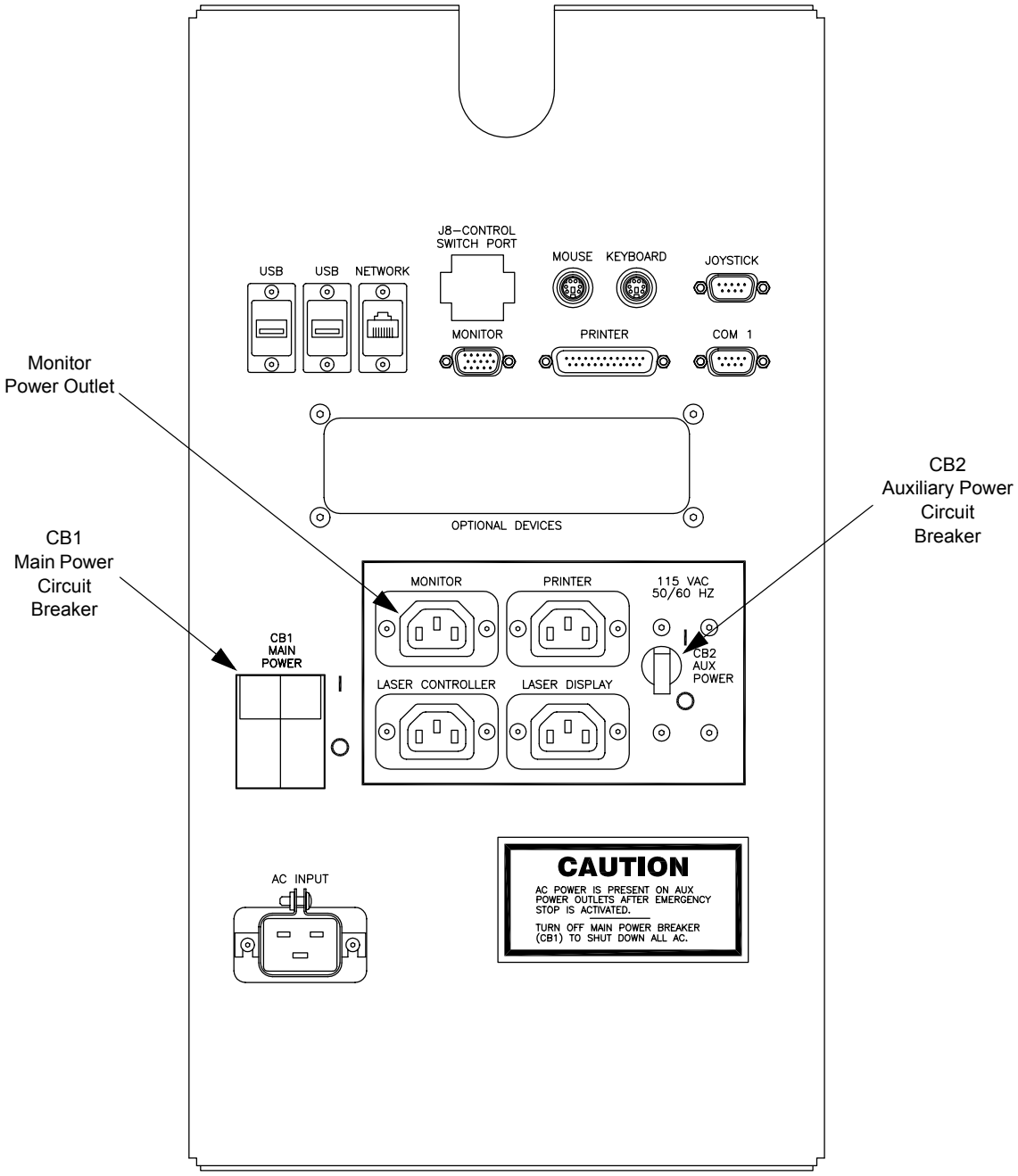


Figure 4-5 Rear Panel of Summit 800 System

4.7 Post Installation Checklist

1. Focus Comparison

Adjust the Surface Focus and Ronchi Focus to a minimum difference when the system is installed for the first time or when the camera or optics are removed or adjusted; refer to Section 6.9.

2. Lens Calibration

Create all related lens files and perform individual lens calibration as required; refer to Section 6.11.

3. System Certification

Perform a full X, Y, and Z axis system certification and verification; or contact the View Engineering, Inc., Customer Support Department (see ***Where to Get Help*** on page 3).

4. System Backup

Backup all important operating files used by the Summit 800 system. All files are backed up via an option within the Summit 800 program group.

4.8 Shutting Down the System

Warning: Before the Summit 800 system is turned off, the software must be shut down in an orderly fashion to prevent damage to your data.

To quit the View Metrology Software program:

1. Click on the X in the top right corner of the screen; or click File on the menu bar, and then select Exit.
2. This will return you to the Windows Desktop.

To quit Windows from the Windows Desktop and shut down the computer:

1. Click START, Shut Down, then select Shut Down The Computer from the dialog box and click on YES.
2. Wait for the message “It is now safe to turn off your computer” to appear.
3. Press the green System Power On switch on the Switch Box.
4. This will remove power to the Summit 800 system’s computer.

To turn off the Summit 800 system:

1. On the Rear Panel, set CB1, the MAIN POWER Circuit Breaker, to the “0” or down position.
2. This will turn off the Summit 800 system.

4.9 Attaching Shipping Clamps

If the Summit 800 is to be moved even a short distance, it is a good idea to attach the Shipping Clamps. These will prevent the stages from moving, reducing the chance of equipment damage.

Figure 4-6 shows the Shipping Clamp used with the Summit 800.

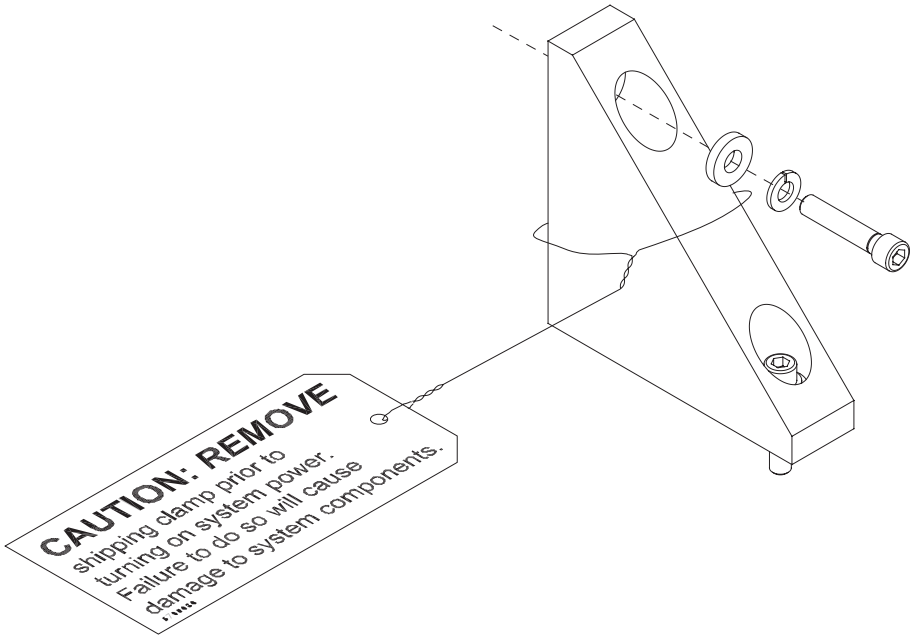


Figure 4-6 Shipping Clamp (two used on the X-axis stage and two used on the Y-axis stage)

Figure 4-7 shows the two Shipping Clamps in place on the X-axis stage.

1. Slide the X-axis stage to about the middle of its range.
2. Clamps are placed on both sides of the X-axis stage as shown, snug against the stage. (Rotate the tags out of the way as necessary, typically as shown in the figure.)
3. Use a 1/4-inch hex wrench to tighten the set screws in each clamp..

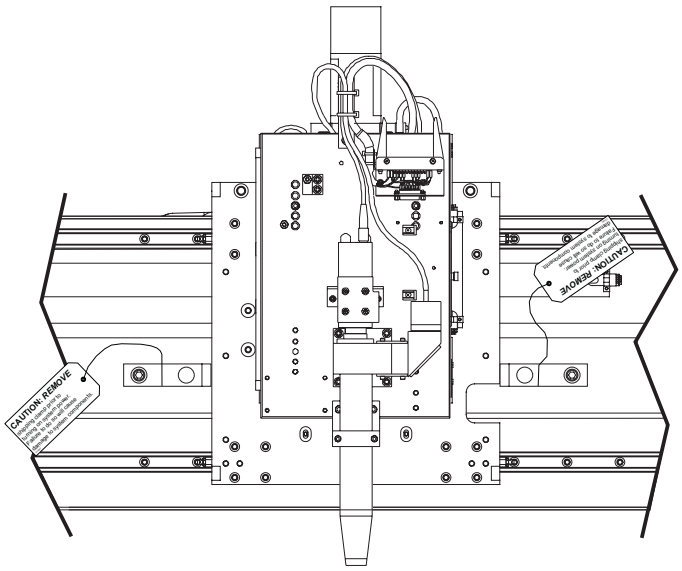


Figure 4-7 X-Axis Stage Shipping Clamps in Place

Figure 4-8 shows the two Shipping Clamps in place on the Y-axis stage.

1. Slide the Y-axis stage to about the middle of its range.
2. Clamps are placed on both sides of the Y-axis stage as shown, snug against the stage. (Rotate the tags out of the way as necessary, typically as shown in the figure.)
3. Use a 1/4-inch hex wrench to tighten the set screws in each clamp.

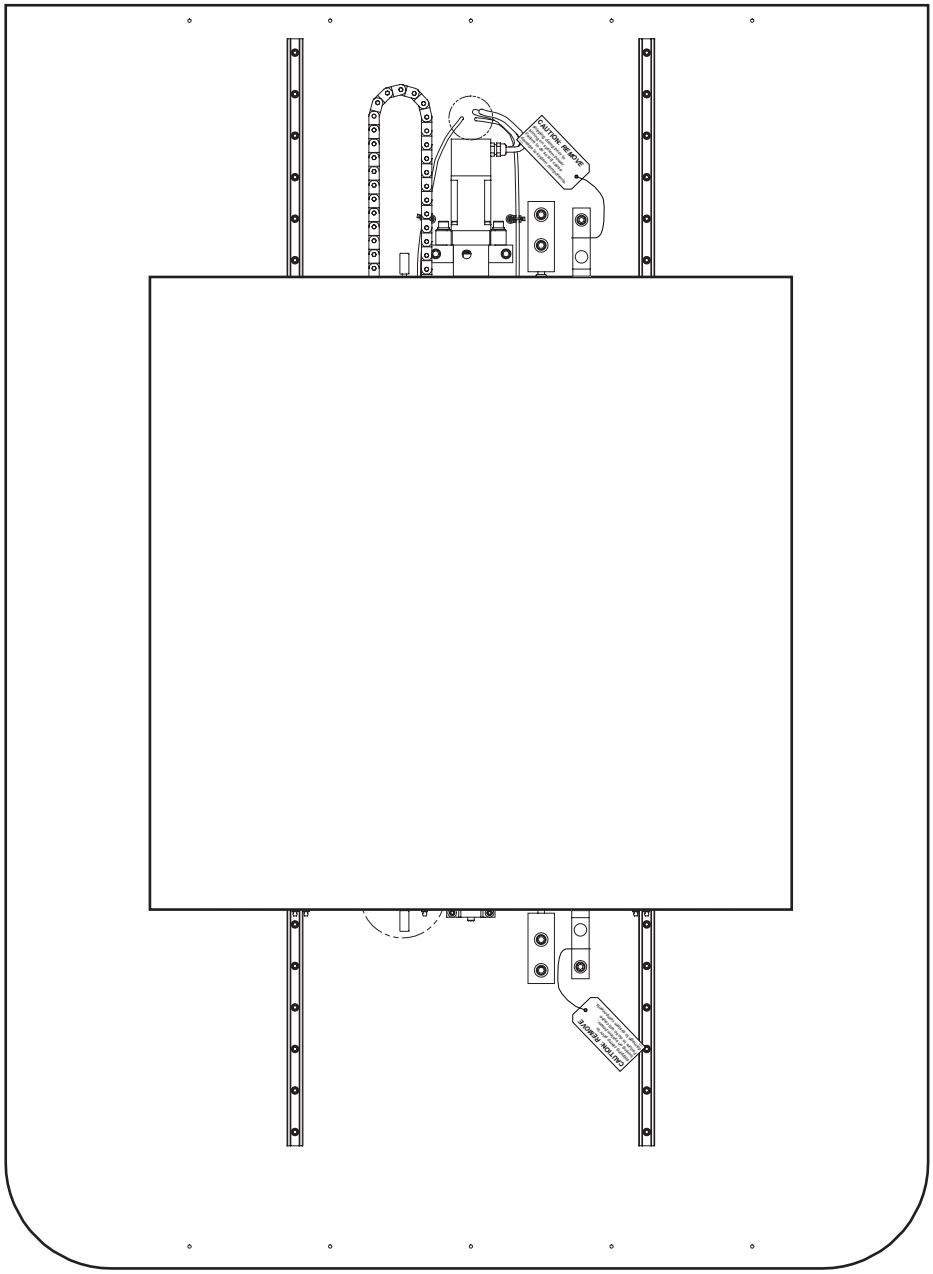


Figure 4-8 Shipping Clamps in Place

Principles of Operation and System Interconnections

Chapter 5

5.1 What this Chapter Contains

This chapter describes the subsystems and interconnections that make up the Summit 800 System as follows:

- Overview of Operation
- Image Acquisition, Processing, and Display (Matrox)
- Motion Control
- How the Lights and Ronchi Grid Work
- Zeroing the Stage
- Summit 800 Schematic Diagrams

5.2 Overview of Operation

When an operator creates a program to inspect a part, the resulting **part program** is actually a sequential list of instructions to the Summit 800 System.

The instructions include X, Y, and Z stage positions, lighting and their intensities, and tool parameters. The Summit 800 program moves the stage, sets the lights, and runs the tools. Measurements are made using finders and image processing software within the Summit 800 program.

The Summit 800 software then looks at the next part program step and continues to each step until complete. During the execution of a program, calculations are made and the resulting data is either stored, printed, or sent to another type of I/O device.

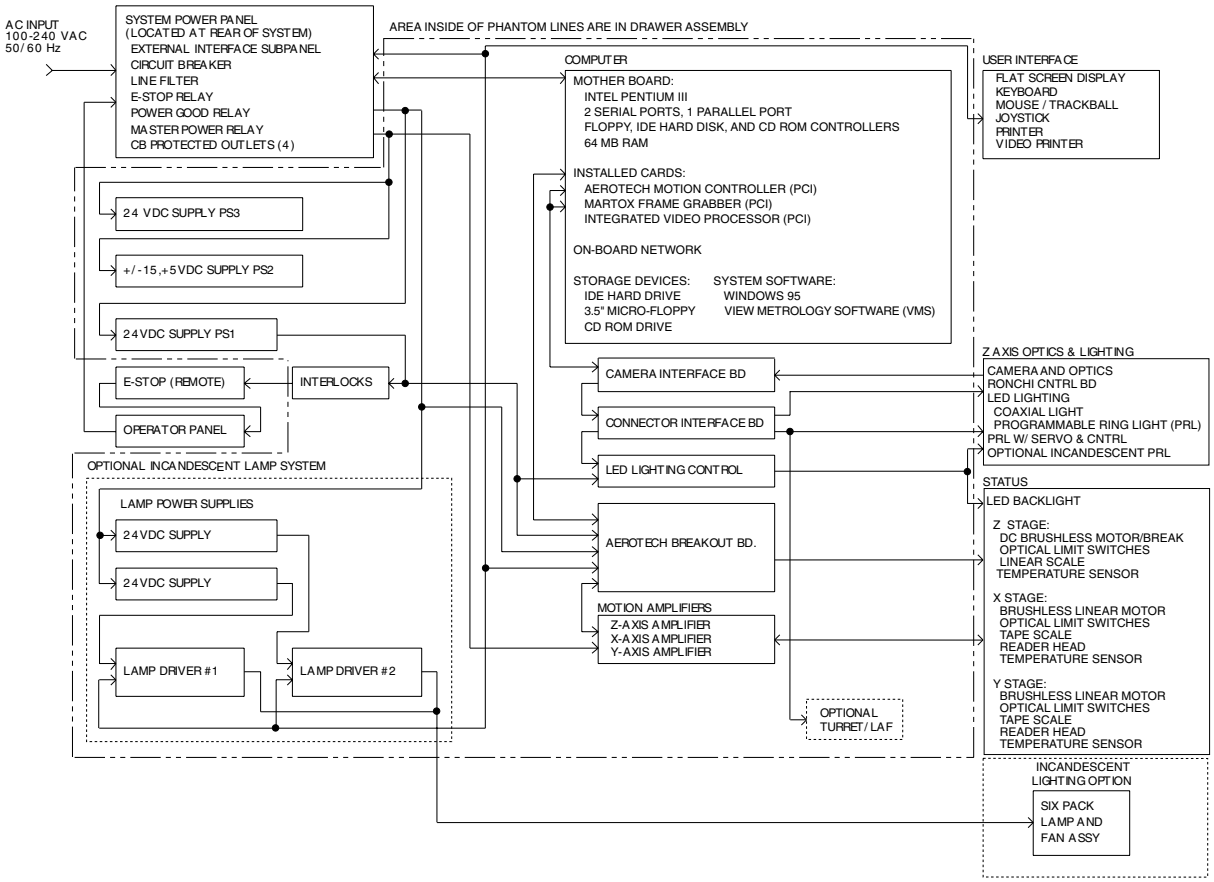


Figure 5-1 Summit 800 System Block Diagram

5.3 Image Acquisition, Processing, and Display (Matrox)

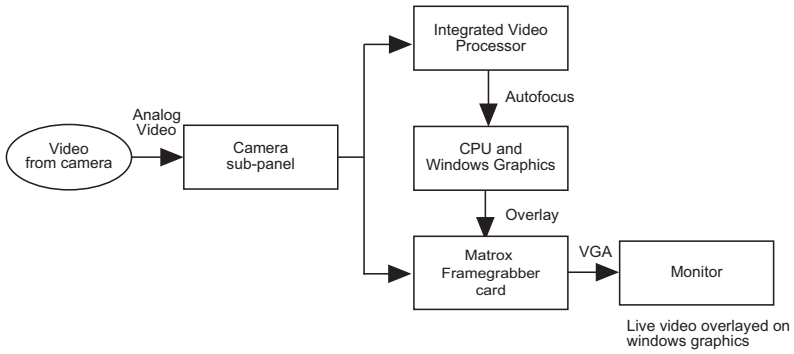


Figure 5-2 Image Acquisition (Matrox)

The following image acquisition, processing, and display hardware is pre-installed in the computer:

- Camera interface sub-panel
- Matrox Framegrabber card
- Integrated Video Processor (IVP)

Here is a description of each of these components and how they function in conjunction with other system elements to create images:

1. A CCD video camera mounted on the Z stage provides real-time video to the system.

2. A cable connects the camera's video output to the Camera interface sub-panel mounted on the back of the PC. The video is routed into both the Integrated Video Processor and the Matrox Framegrabber card via the camera interface subpanel.

3. Windows graphics are overlayed onto the live video by the Matrox Framegrabber card and sent out to the display monitor.

The Integrated Video Processor gets its video via the camera sub-panel. This video is used to control Z-axis focus processing and lighting control.

The IVP card is capable of performing two types of focus processing: Ronchi or Surface. Surface focus and Ronchi focus types are both very similar and work almost the same way.

When performing a surface focus, an out-of-focus image will be more gray than an in-focus image. The sharper image will have better contrast. The video signal is converted to a digital number so the host CPU can monitor each value. During an auto-focus, the CPU monitors these values and scale readings and keeps the scale value for the highest video value incurred.

When performing a Ronchi focus, a projected grid focus is used and a band-pass filter of the same frequency as the projected grid is placed in the circuit. The more in focus the grid is, the higher contrast value of the video.

5.4 Image Acquisition, Processing, and Display (Mutech)

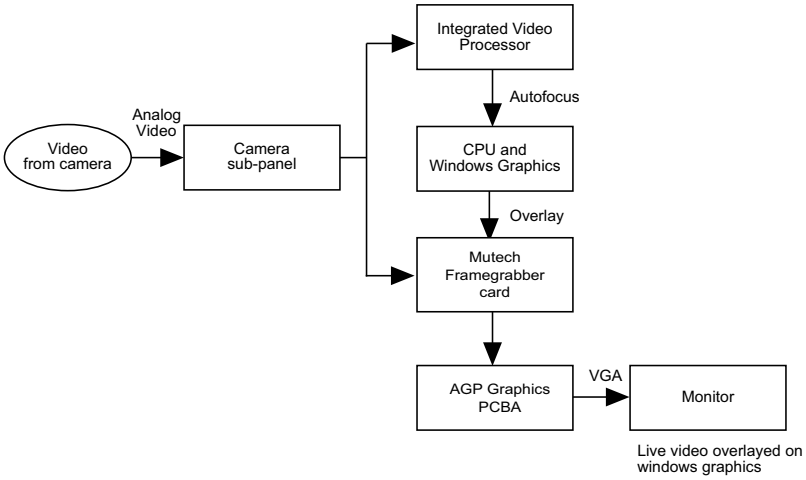


Figure 5-3 Image Acquisition (Mutech)

The following image acquisition, processing, and display hardware is pre-installed in the computer:

- Camera interface sub-panel
- Mutech Framegrabber card
- Integrated Video Processor (IVP)

Here is a description of each of these components and how they function in conjunction with other system elements to create images:

1. A CCD video camera mounted on the Z stage provides real-time video to the system.

2. A cable connects the camera's video output to the Camera interface sub-panel mounted on the back of the PC. The video is routed into both the Integrated Video Processor and the Mutech Framegrabber card via the camera interface subpanel.

3. Windows graphics are overlayed onto the live video by the Mutech Framegrabber card and sent out to the display monitor via the AGP Graphics PCBA.

The Integrated Video Processor gets its video via the camera sub-panel. This video is used to control Z-axis focus processing and lighting control.

The IVP card is capable of performing two types of focus processing: Ronchi or Surface. Surface focus and Ronchi focus types are both very similar and work almost the same way.

When performing a surface focus, an out-of-focus image will be more gray than an in-focus image. The sharper image will have better contrast. The video signal is converted to a digital number so the host CPU can monitor each value. During an auto-focus, the CPU monitors these values and scale readings and keeps the scale value for the highest video value incurred.

When performing a Ronchi focus, a projected grid focus is used and a band-pass filter of the same frequency as the projected grid is placed in the circuit. The more in focus the grid is, the higher contrast value of the video.

5.5 Motion Control

This section describes the subsystems used in motion control and the motion control process.

5.5.1 The Stage Assembly

The X, Y, and Z axis **motor/encoder** assemblies and reader heads are mounted directly on the Summit 800's stages. The motor/encoder assemblies position the stage. The feedback (from the **reader heads** and **tape scales**) aids in positioning the stage and holding the actual position once it has been achieved.

The tape scales (on the X and Y axes) have a separate index flag mounted away from the reader head to keep the stage coordinates the same each time the system is powered up and/or re-zeroed.

The tape scale and read heads produce digital pulses every 0.1 micron. The pulses are used by the motion controller to determine stage position. The read heads have LED indicators that are green when the read head is properly aligned to the tape scale. Once properly aligned, no further adjustments to the signals are required.

There are optical limit switches at each end of stage travel. The limit switches allow the operator to move the stage freely with the joystick without worrying about moving beyond the active measurement area of the system.

5.5.2 Brushless DC Motor Amplifier

Each of the three amplifiers receives signals from the motor encoders and the Aerotech motion controller card inside the computer. These signals drive each stage in a given direction and at a given speed. The amplifiers have temperature, current, and short circuit protection. Note that these amplifiers are non-adjustable.

5.5.3 Inside the Computer

The Aerotech controller card, which controls the amplifier and calculates all motion profiles, is pre-installed in the computer: The Aerotech controller card receives and buffers the X, Y, and Z axis scale data. This 0.1 micro-meter position data is then fed as a digital number to the motion controller card.

The Aerotech controller card receives:

- **current position** data from the reader heads
- **commanded position** data from the host CPU

It is continually working at all times to keep the error between these positions to zero.

The Aerotech controller card outputs a signal to the axis **amplifier**; thus it actively controls the stage during motion and at rest.

5.6 How the Lights and Ronchi Grid Work

The host CPU writes a number to a port on the integrated video processor card. The outputs of the port are D/A (digital to analog) converters. The analog signals (along with some digital on/off control) is sent to the **LED Power Supply PCBA** in the Summit 800 DGU assembly. The LED Power Supply PCBA controls the amount of voltage/current supplied to the lamps.

The **LED Backlight** should be aligned to be concentric with the camera optics.

The **LED Programmable Ring Light** (LED PRL) can be positioned up or down on the lens tube depending on the illumination angle required.

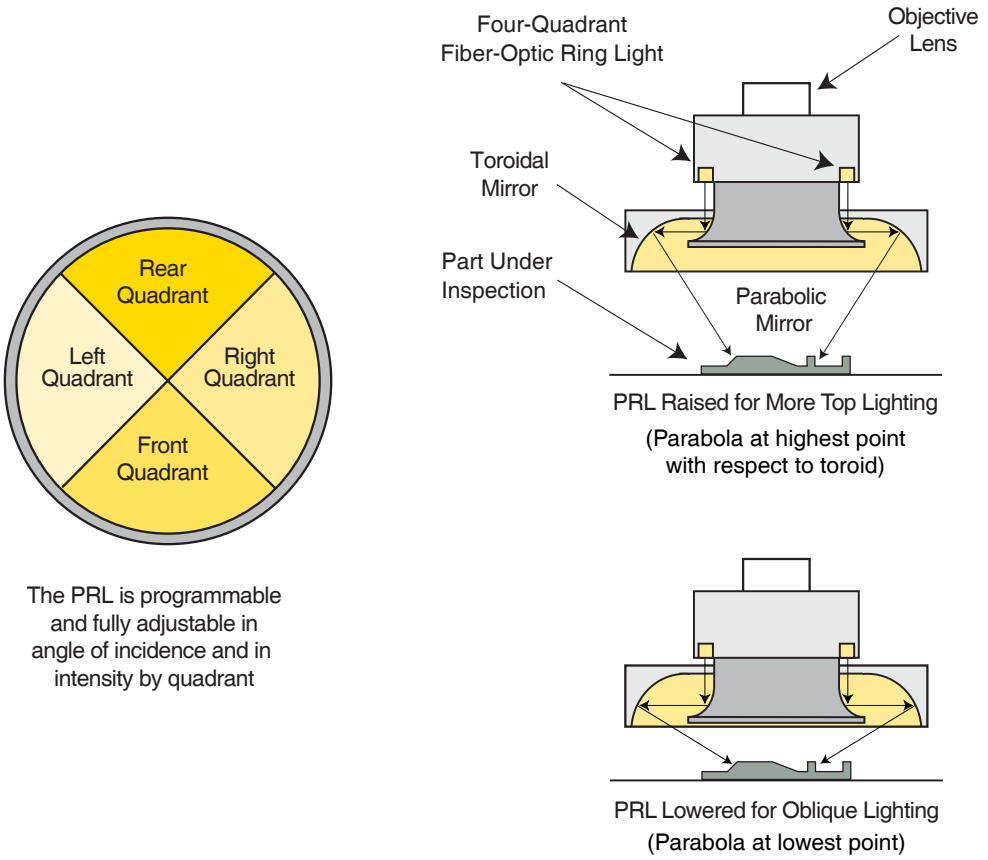


Figure 5-4 Video Path - PRL Optics

The **vertical illuminator (or coaxial LED lighting)** has a diffuser and a polarizer inside the housing where the LED is housed. The diffuser assists in making the light more evenly distributed across the field of view. The polarizer assists in situations by increasing the image contrast and sharpness. The vertical illuminator has a beam splitter which is placed in the optical path below the camera. The light from the vertical illuminator is added to the video path after passing through an LCD Ronchi grid.

The **Ronchi grid**, when turned on, will then project a shadow onto the point of focus. A filter is used to allow only this grid information to pass through to the video processor. When the grid is in focus, the output of the filter is maximum. The grid focus is aligned to be the same as the video focal plane.

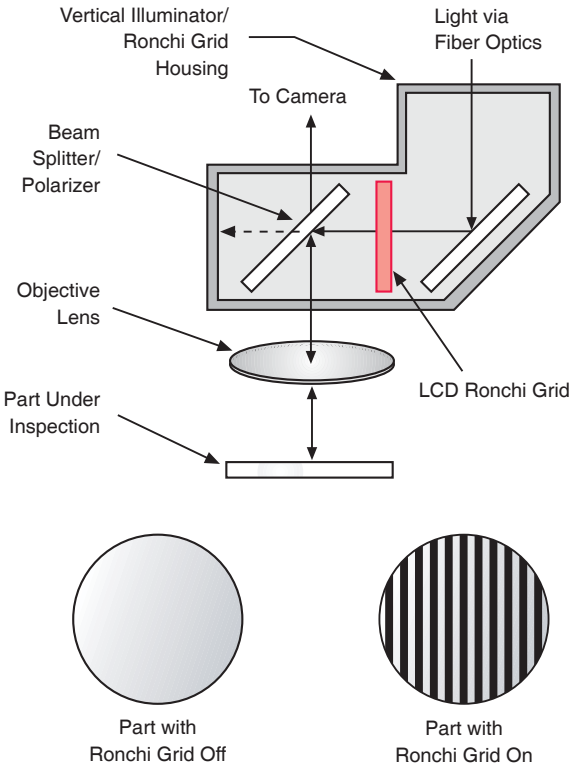


Figure 5-5 Video Path - Ronchi Grid Optics

5.7 Zeroing the Stage

When the stage is zeroed, each axis is driven to one side until the optical limit switch is triggered by a flag. The stage then reverses direction and finds the index pulse. At this index pulse the stage counter is set to zero. The stage is then set to the same location each time the system is reset or powered up.

5.8 Summit 800 Schematic Diagrams

Note: A copy of the latest revision of the system schematic is shipped with every machine. If there are any discrepancies between this section and the system schematic, always refer to the system schematic.

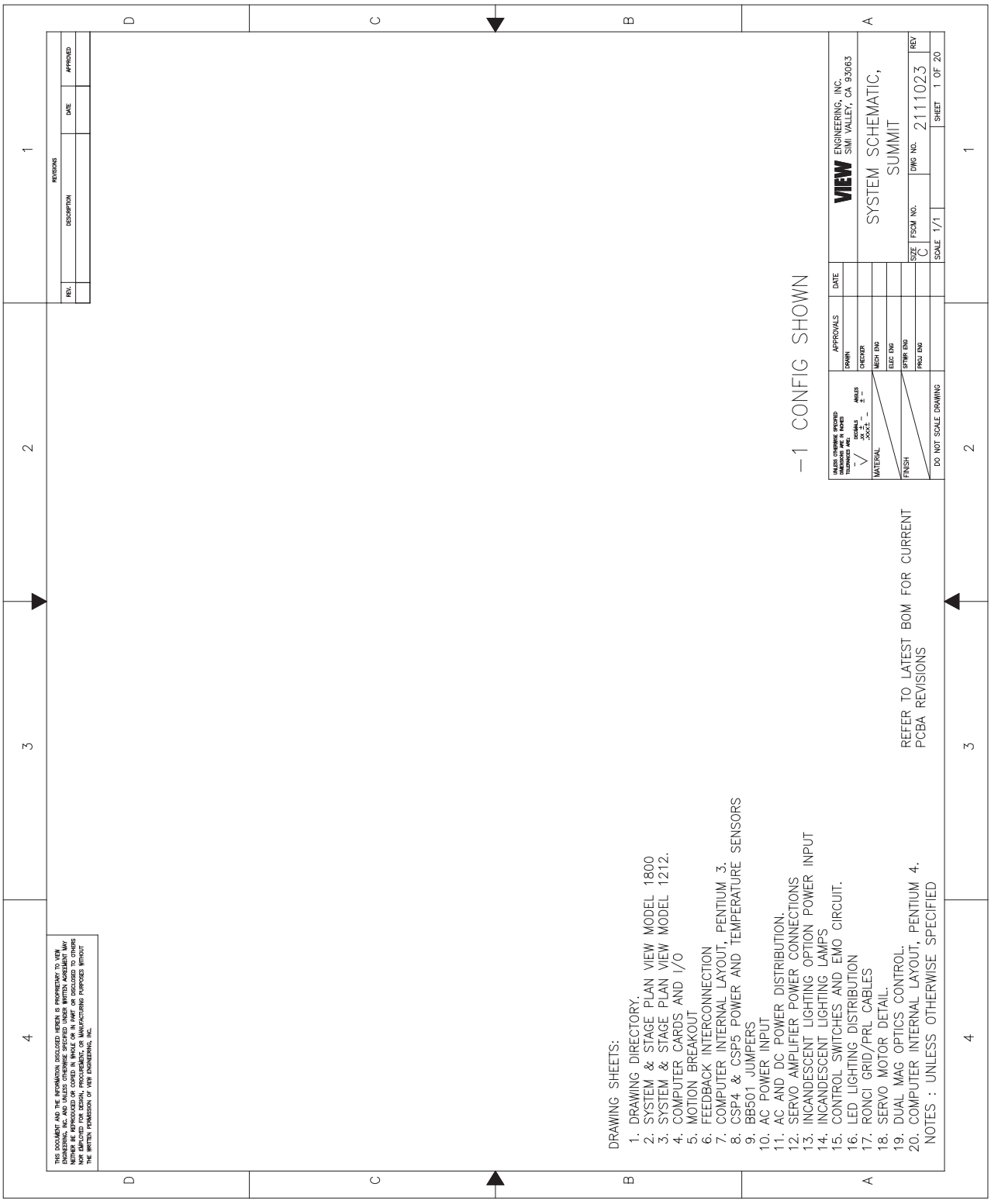


Figure 5-6 DRAWING DIRECTORY (Sheet 1)

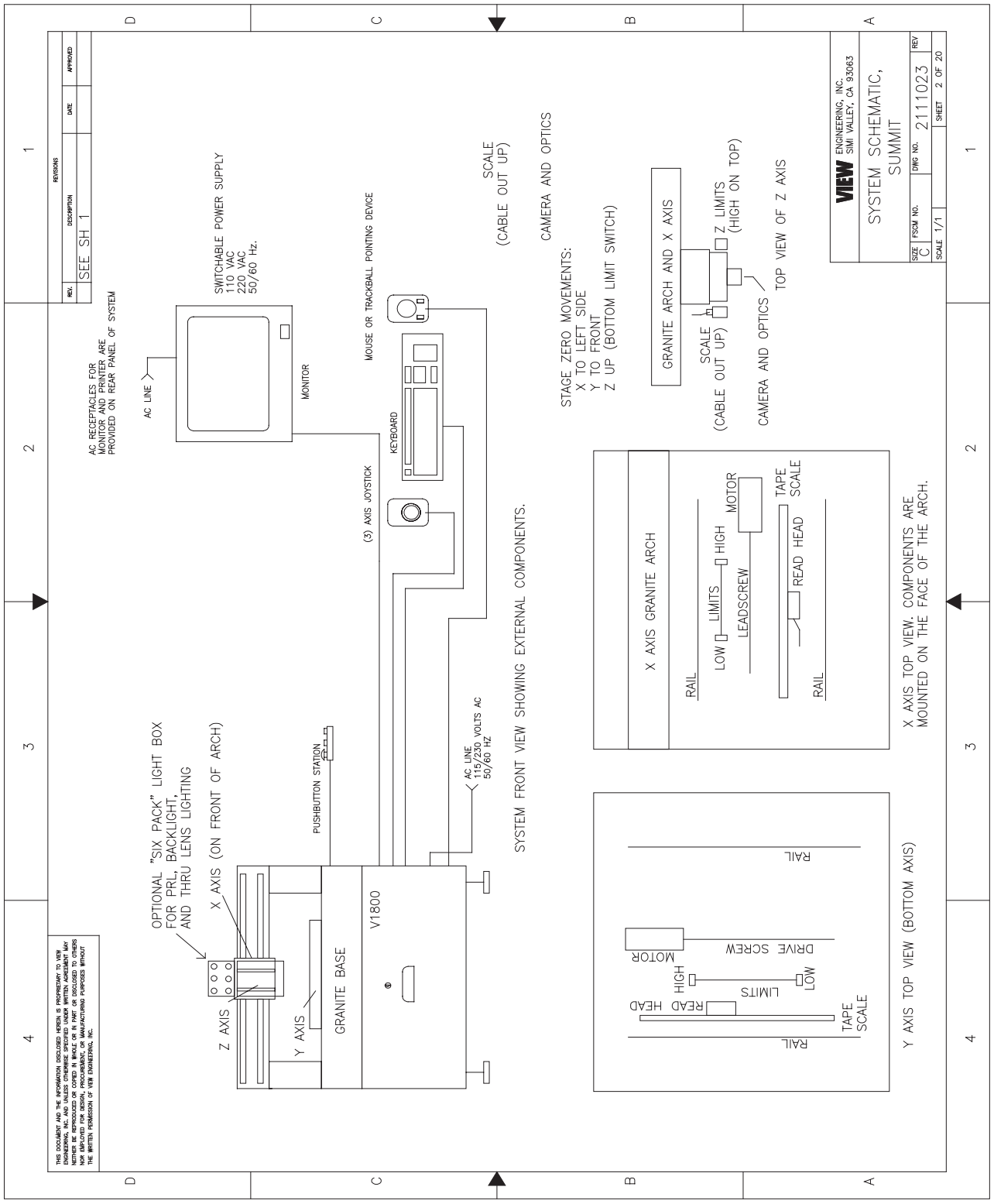


Figure 5-7 SYSTEM & STAGE PLAN VIEW MODEL 1800 (Sheet 2)

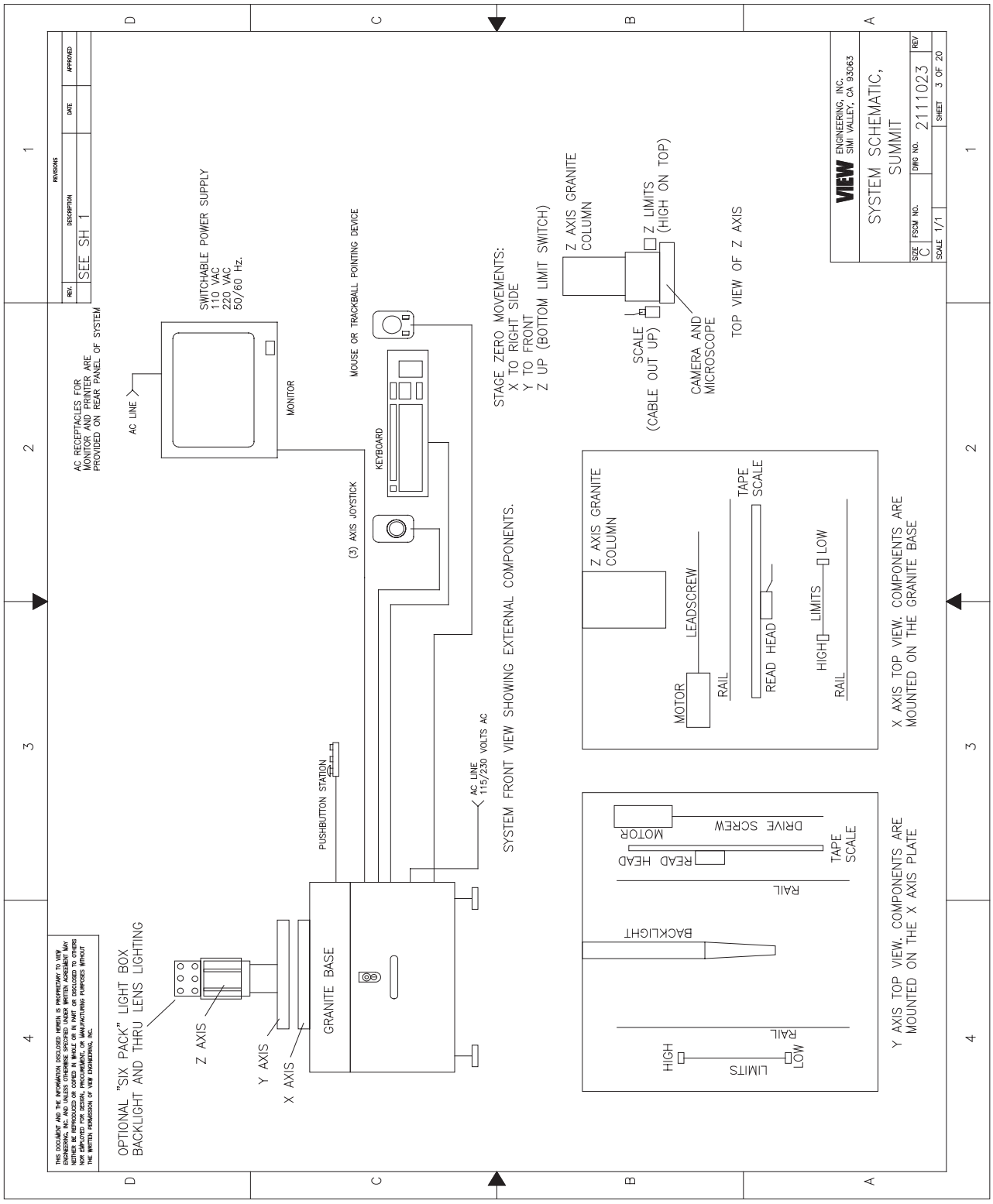


Figure 5-8 SYSTEM & STAGE PLAN VIEW MODEL 1212 (Sheet 3)

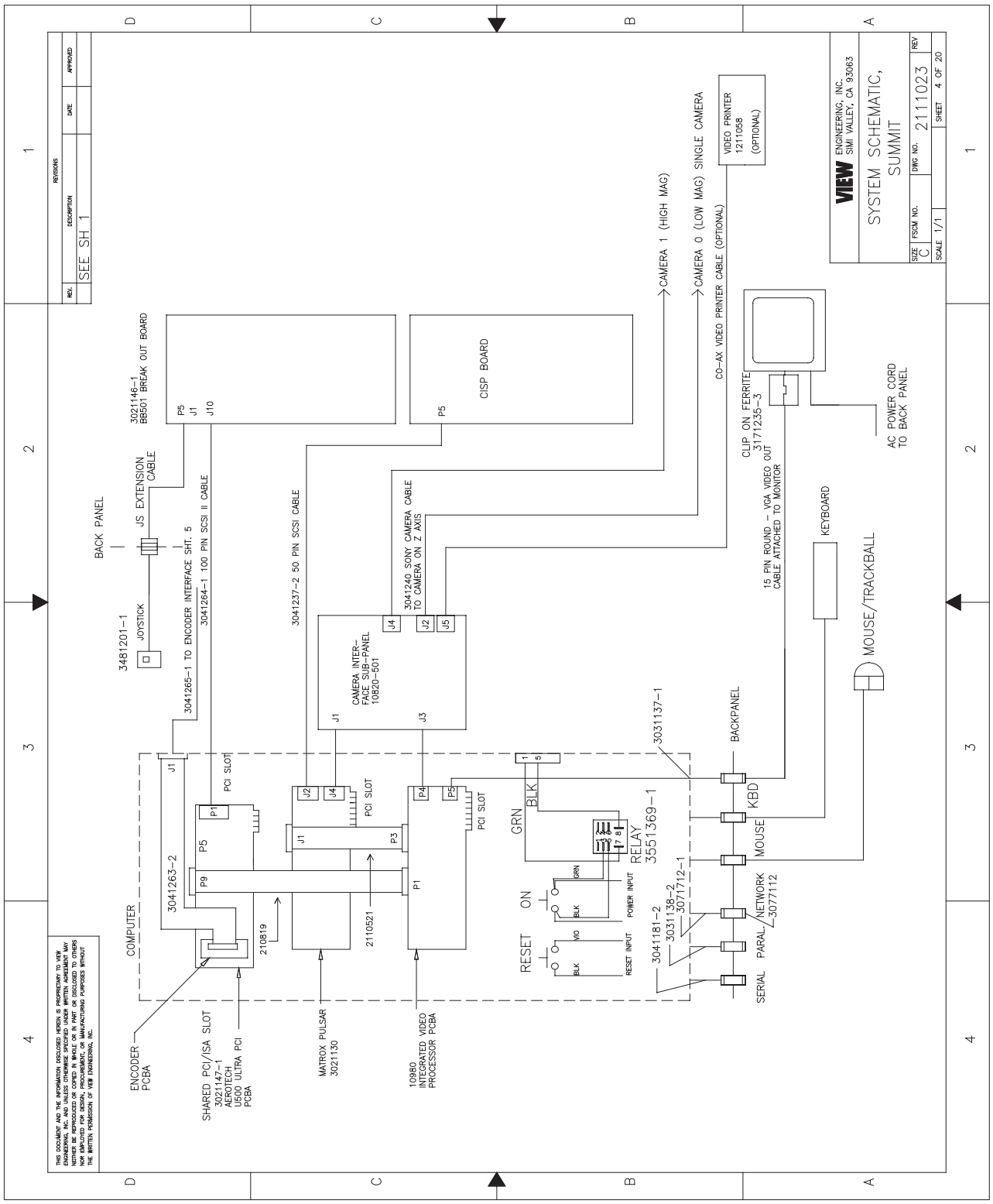


Figure 5-9 COMPUTER CARDS AND I/O (Sheet 4)

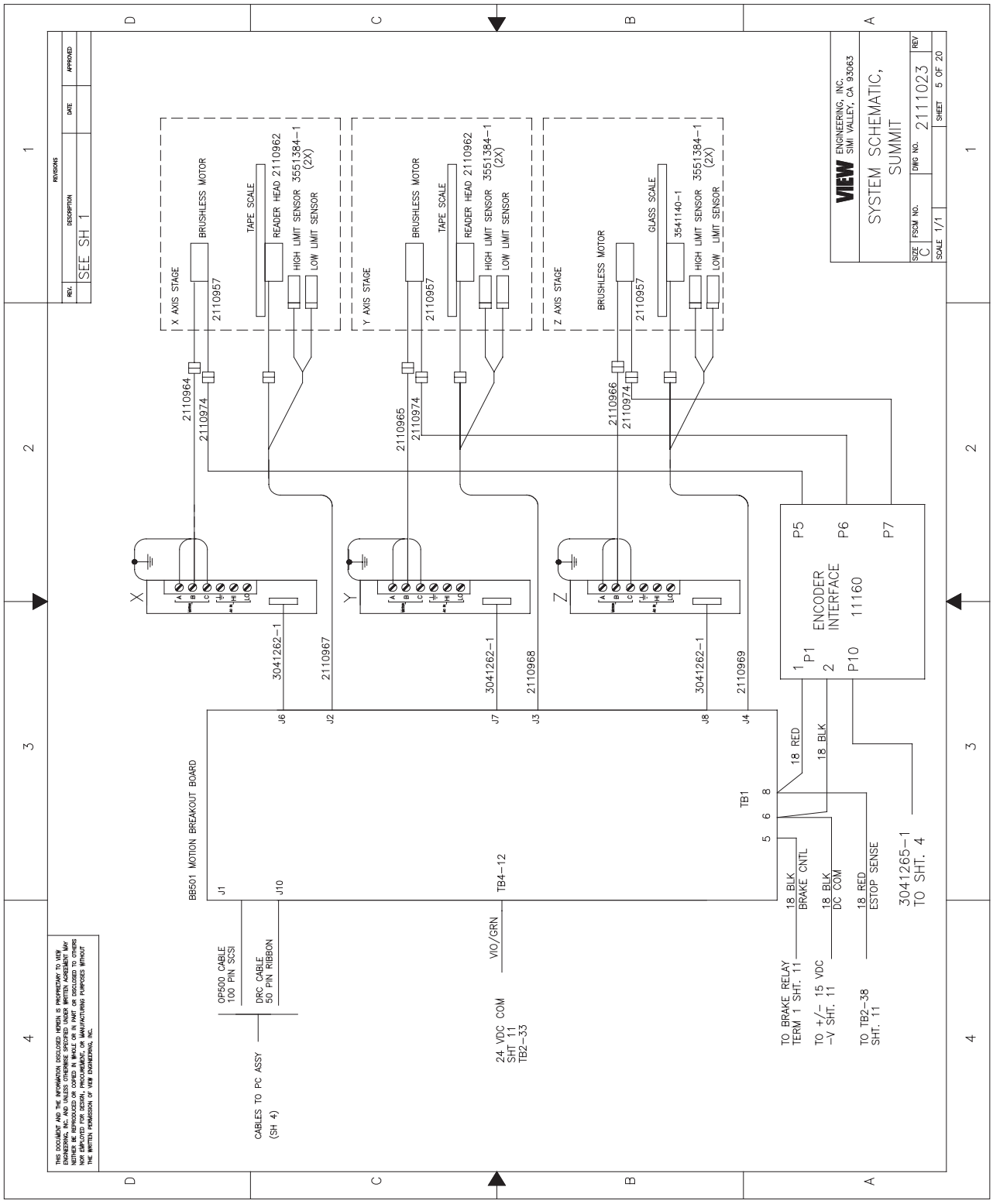


Figure 5-10 MOTION BREAKOUT (Sheet 5)

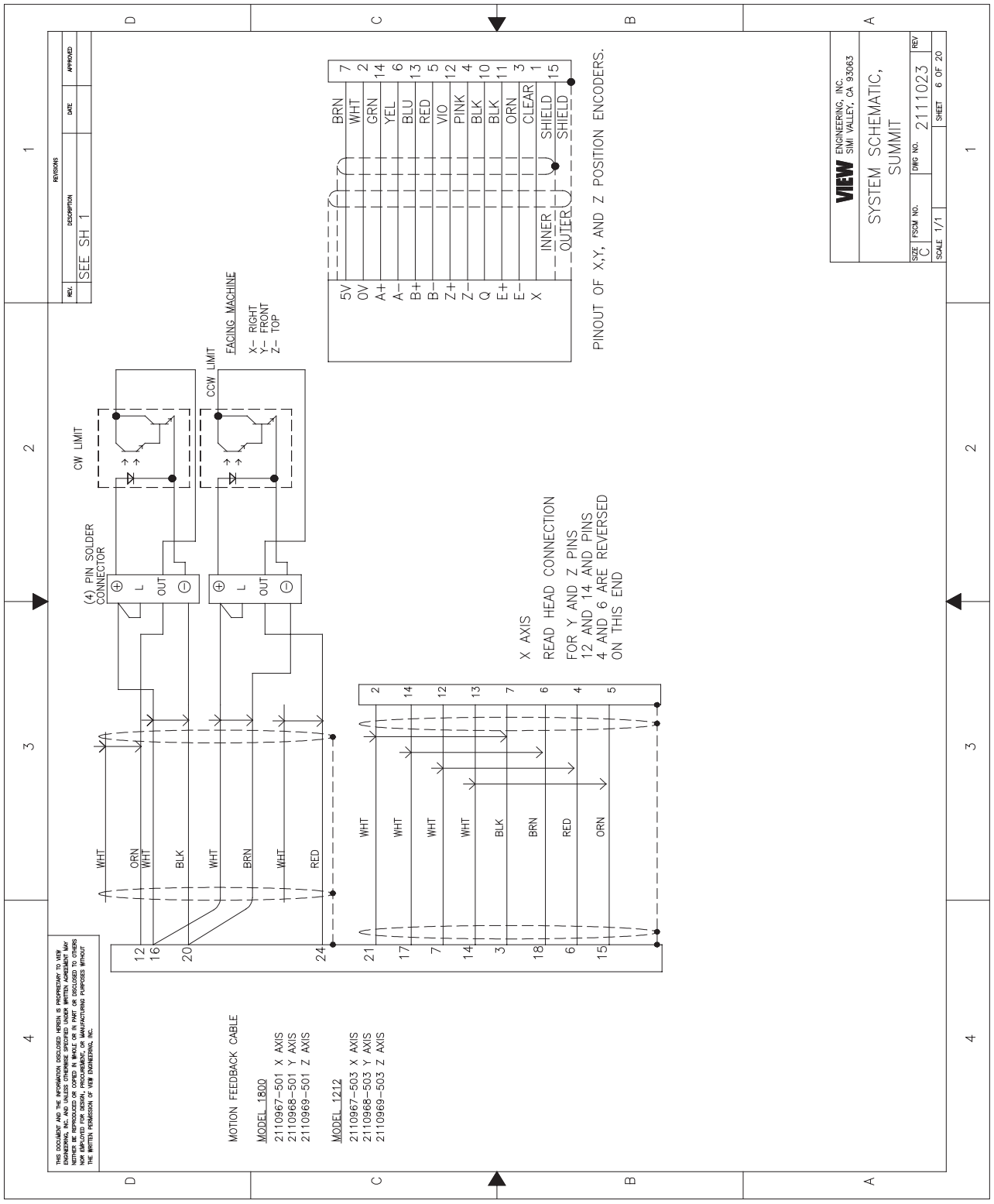


Figure 5-11 FEEDBACK INTERCONNECTION (Sheet 6)

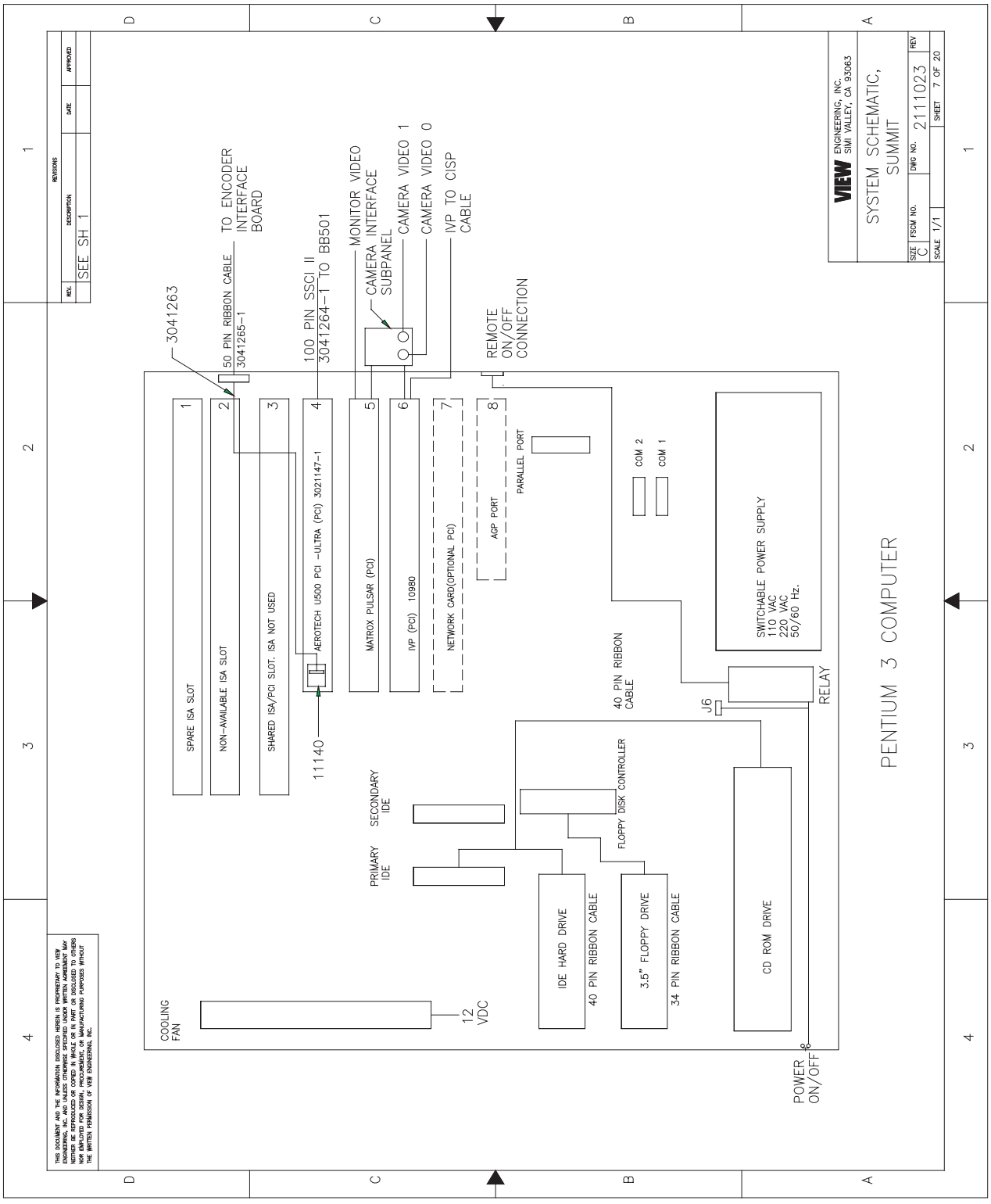


Figure 5-12 COMPUTER INTERNAL LAYOUT, PENTIUM 3 (Sheet 7)

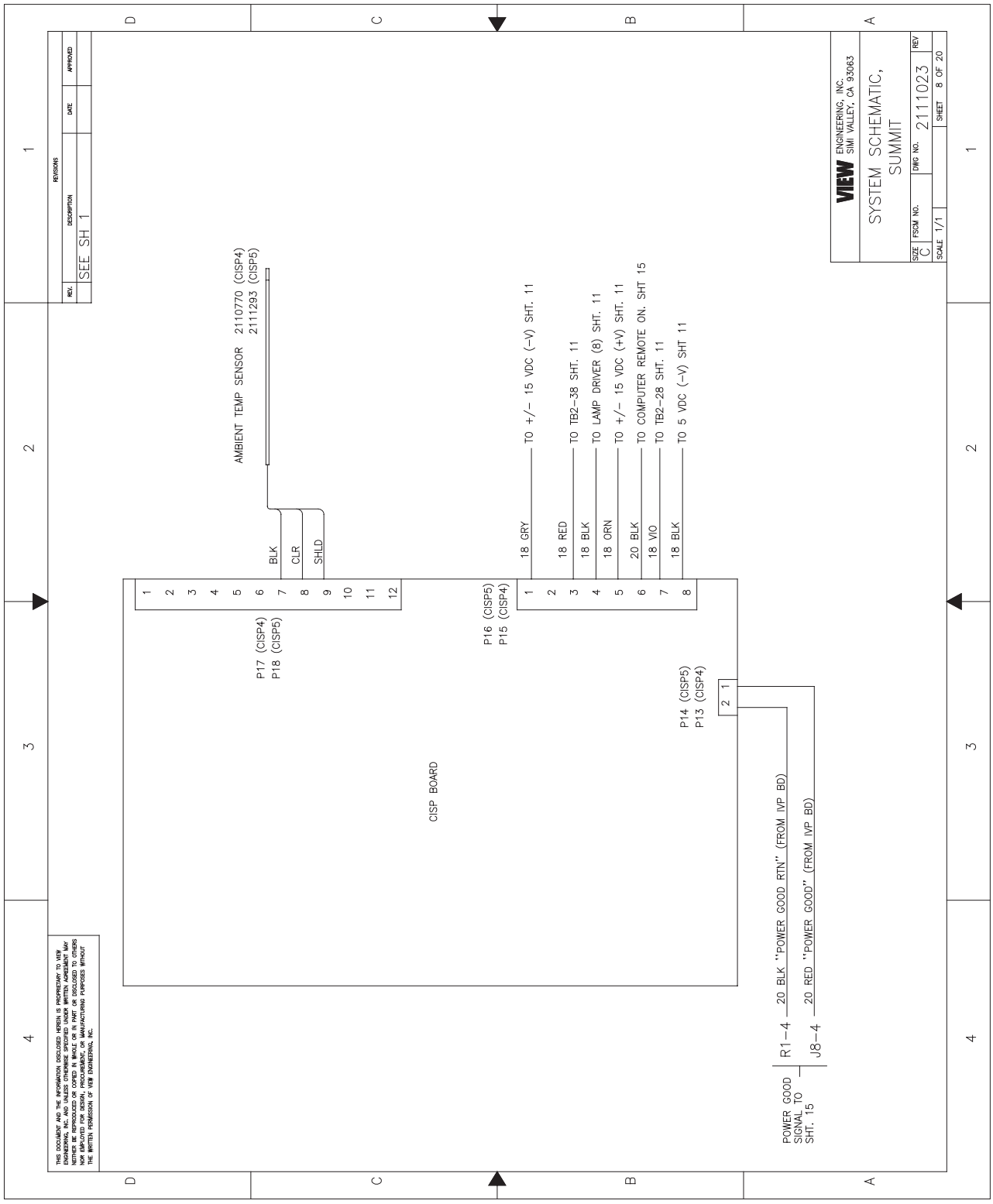


Figure 5-13 CSP4 POWER AND TEMPERATURE SENSORS (Sheet 8)

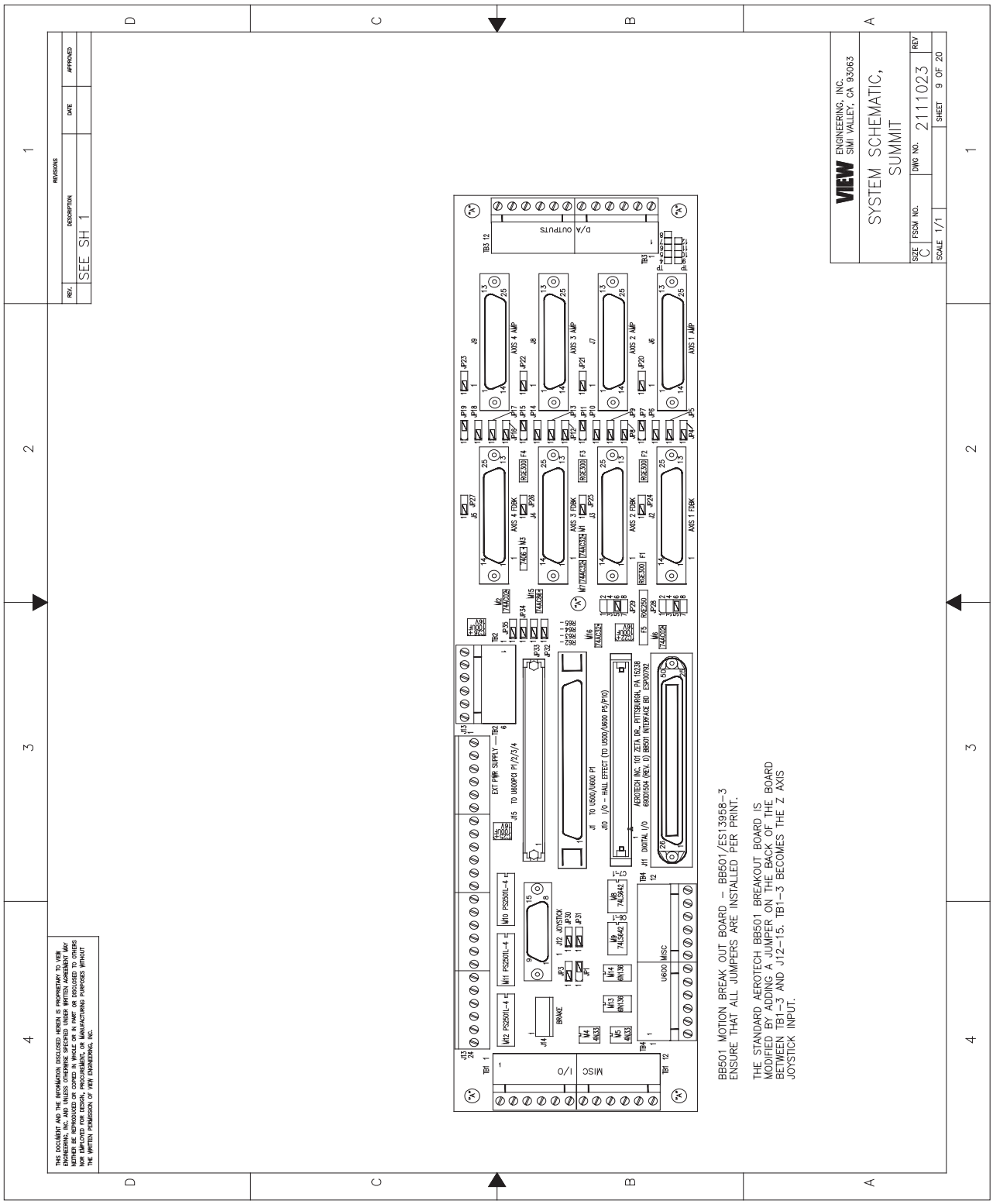


Figure 5-14 BB501 JUMPERS (Sheet 9)

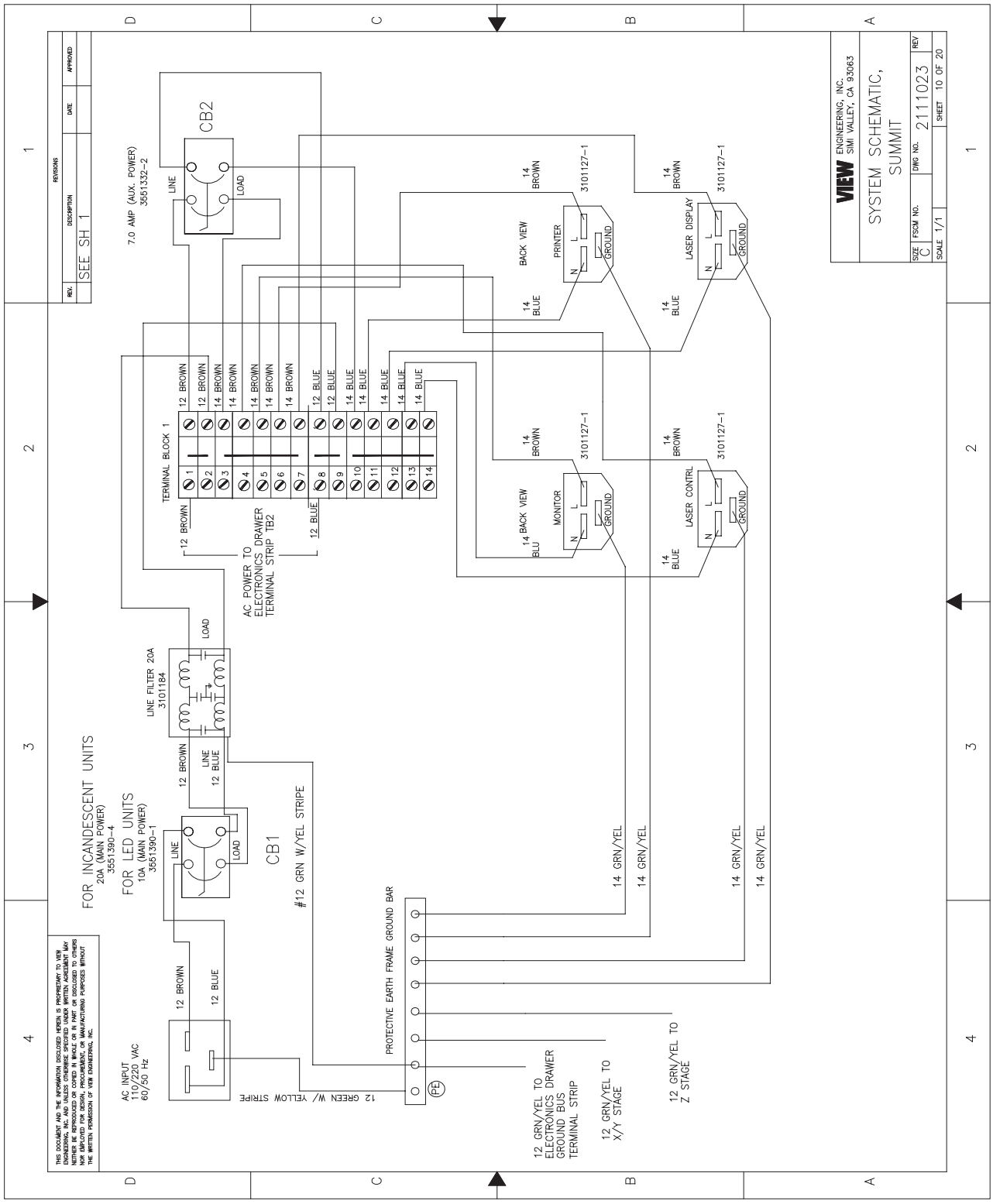


Figure 5-15 AC POWER INPUT (Sheet 10)

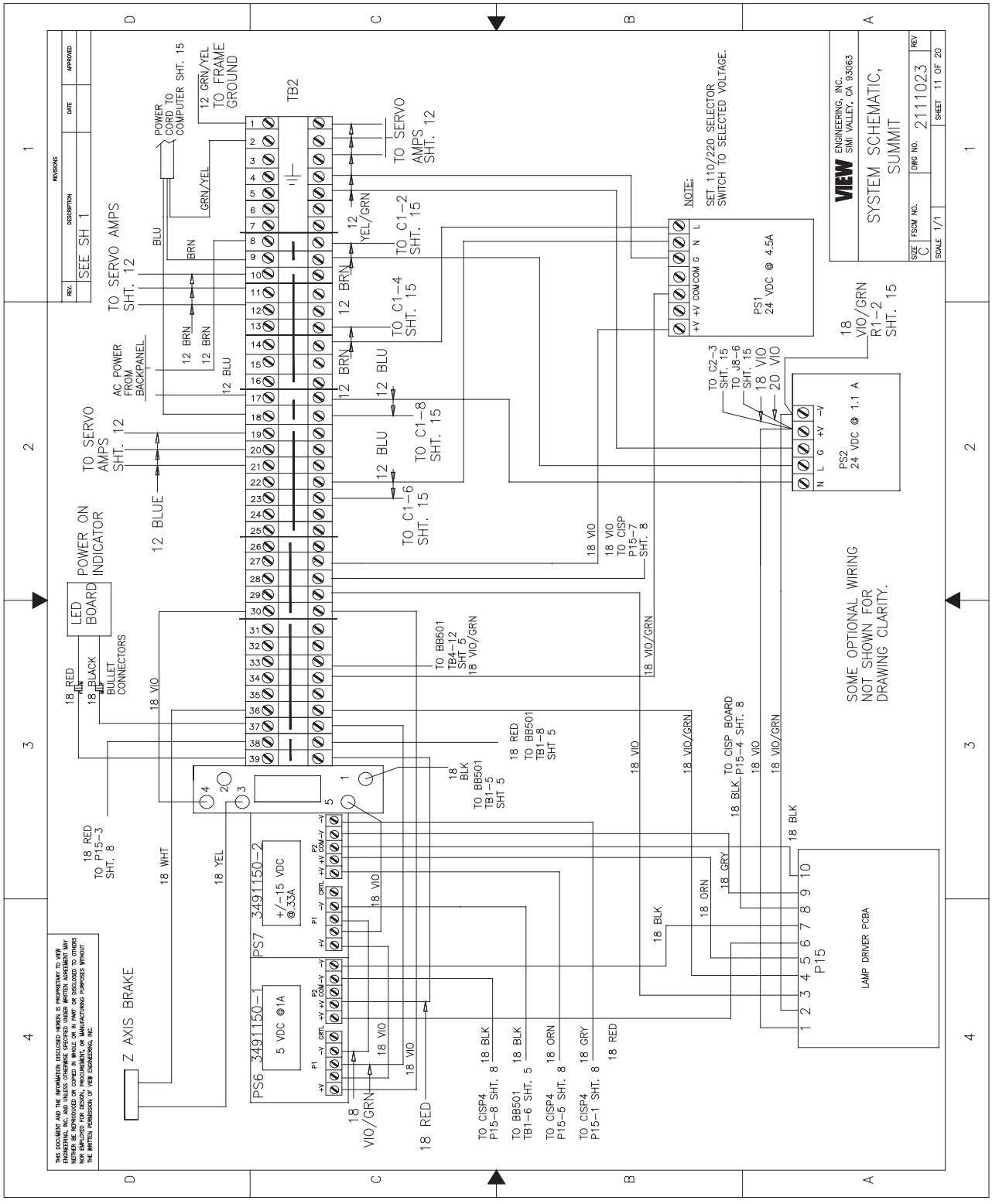


Figure 5-16 AC AND DC POWER DISTRIBUTION (Sheet 11)

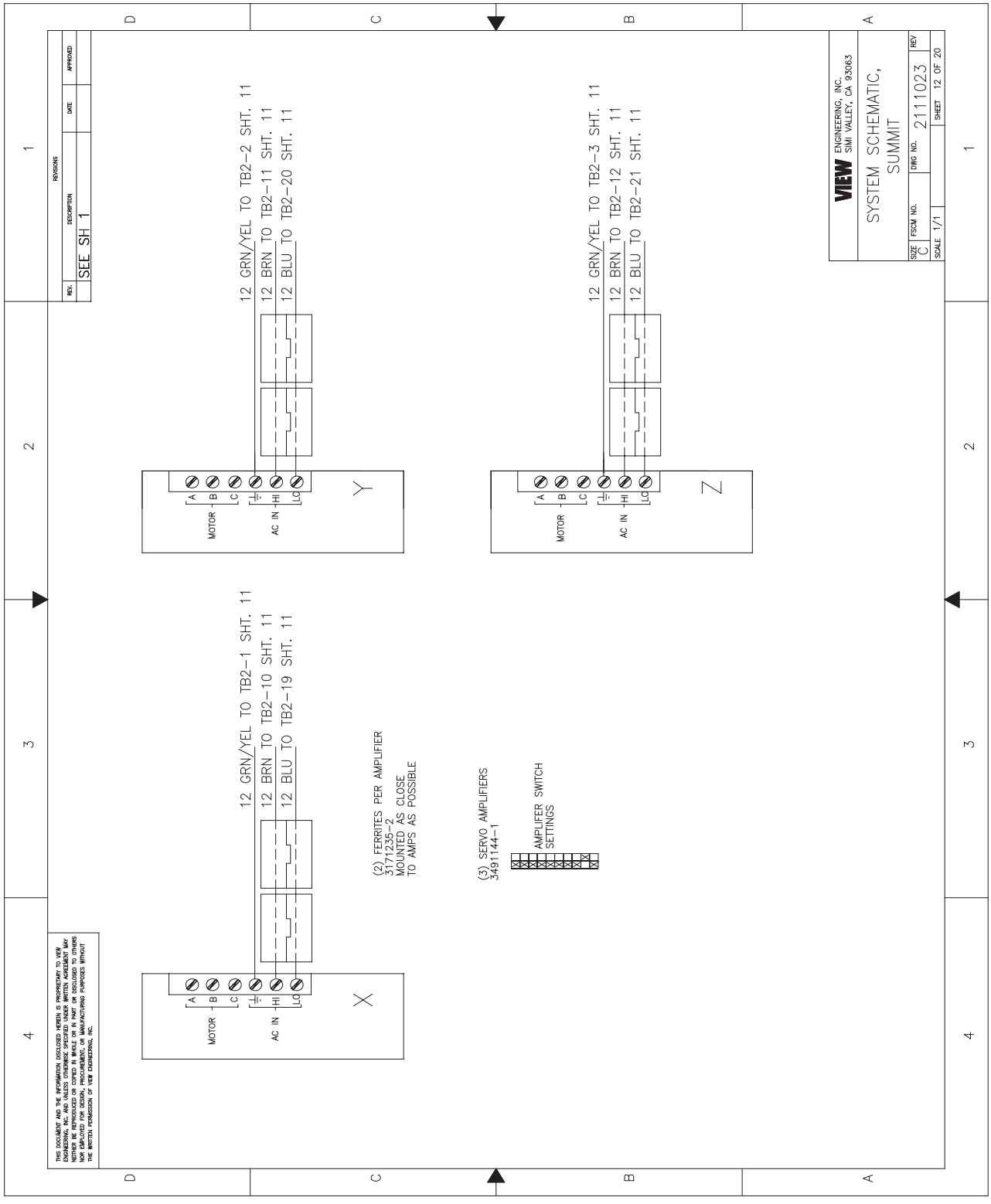


Figure 5-17 SERVO AMPLIFIER POWER CONNECTIONS (Sheet 12)

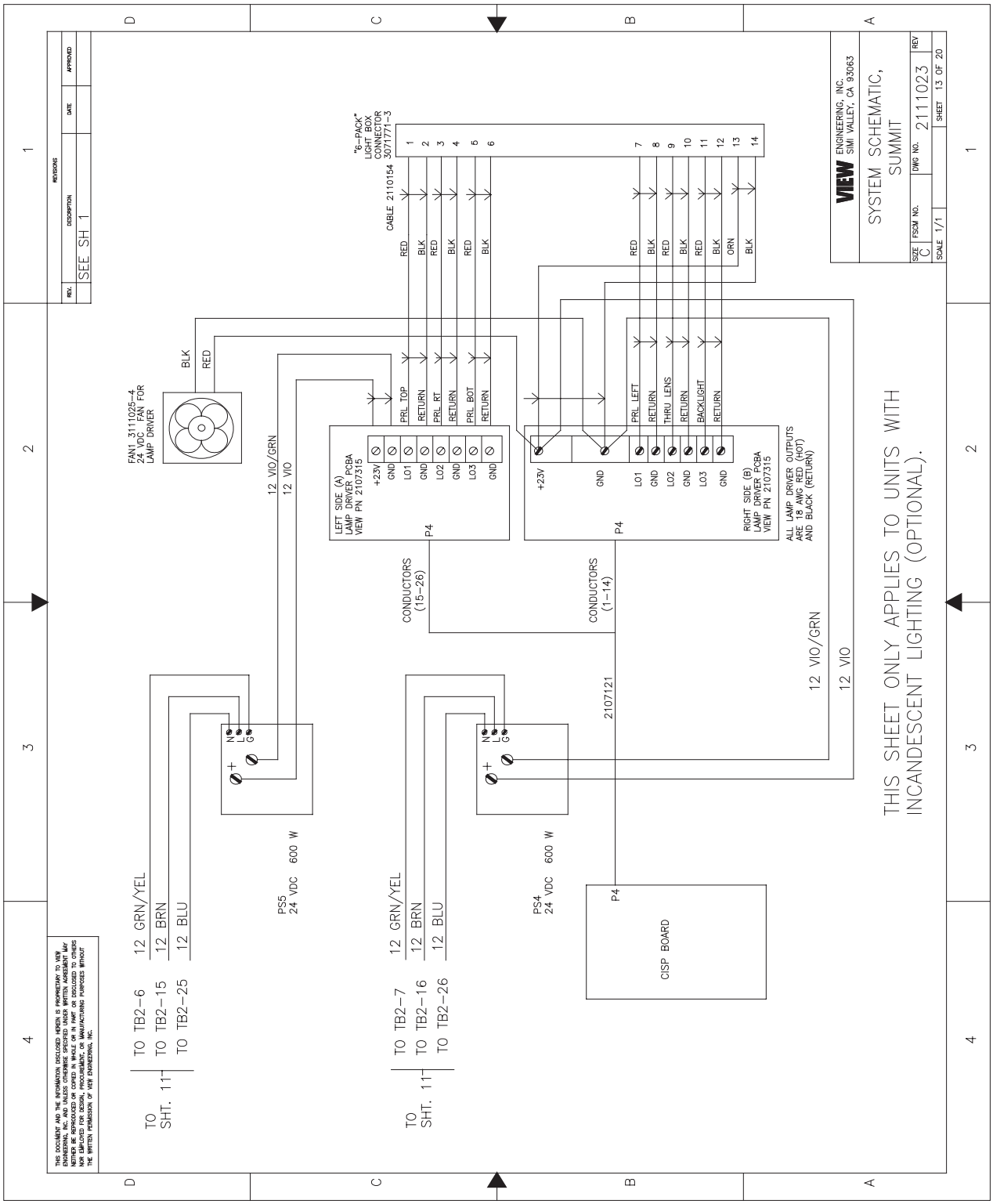


Figure 5-18 INCANDESCENT LIGHTING OPTION POWER INPUT (Sheet 13)

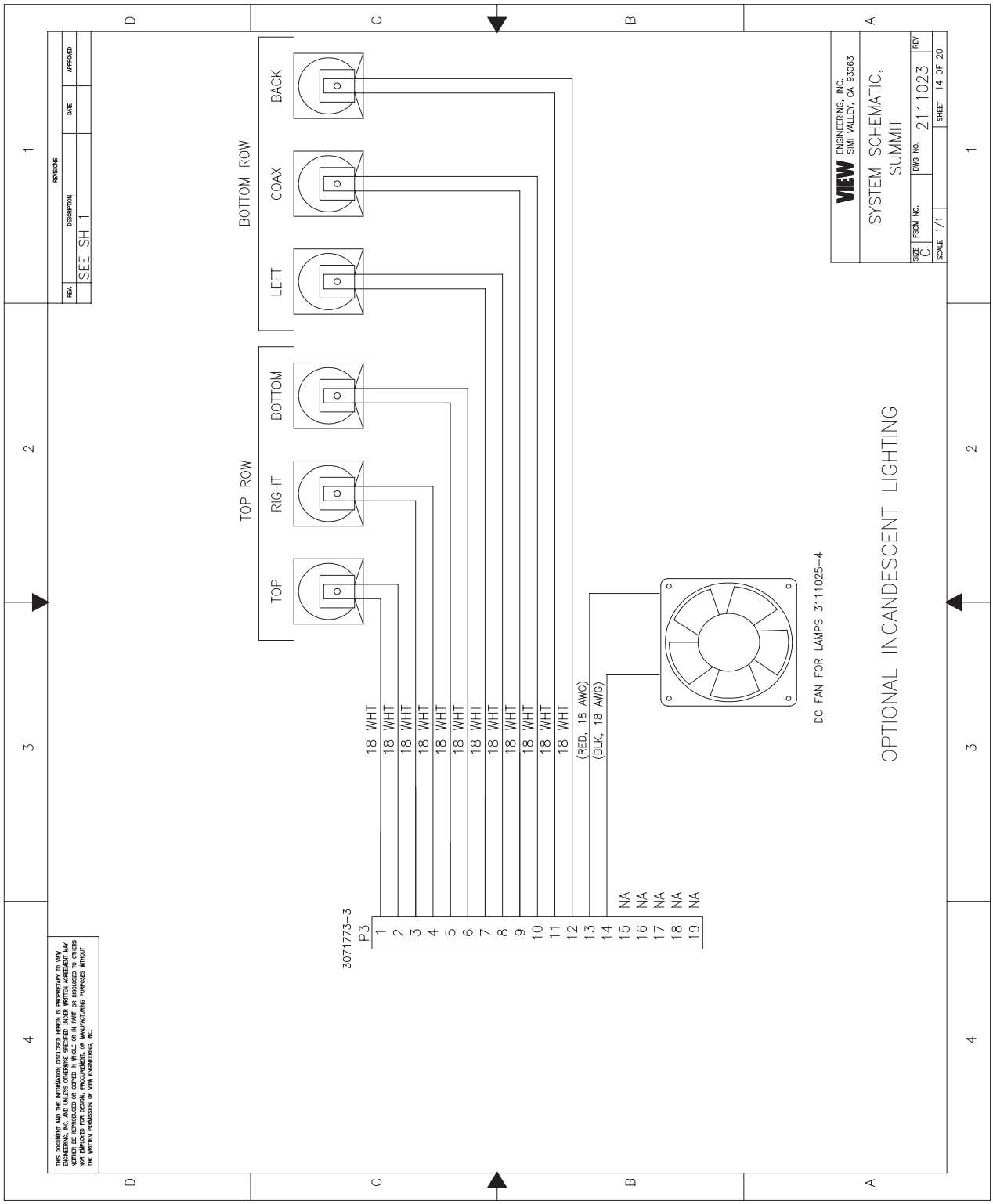


Figure 5-19 INCANDESCENT LIGHTING LAMPS (Sheet 14)

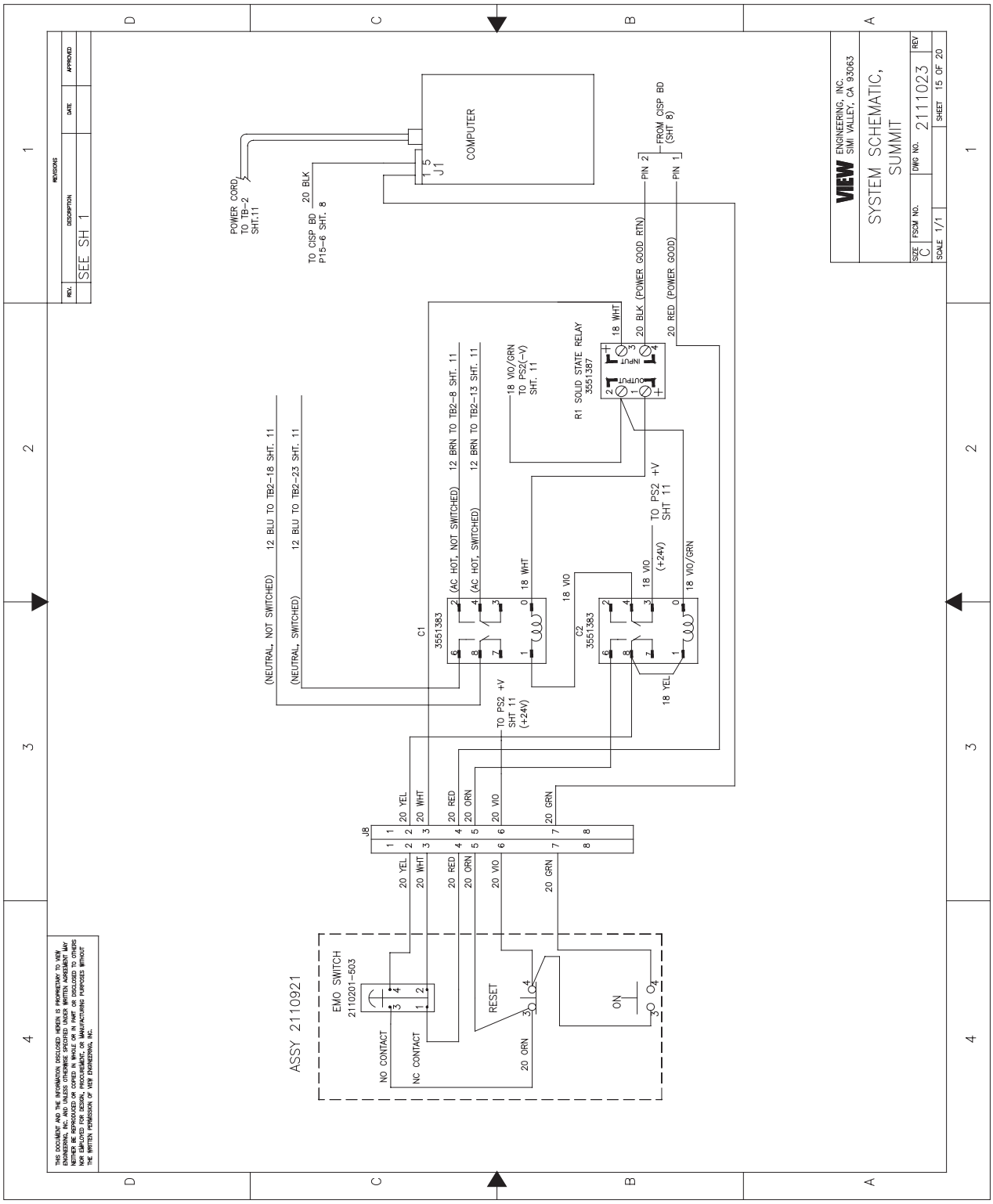


Figure 5-20 CONTROL SWITCHES AND EMO CIRCUIT (Sheet 15)

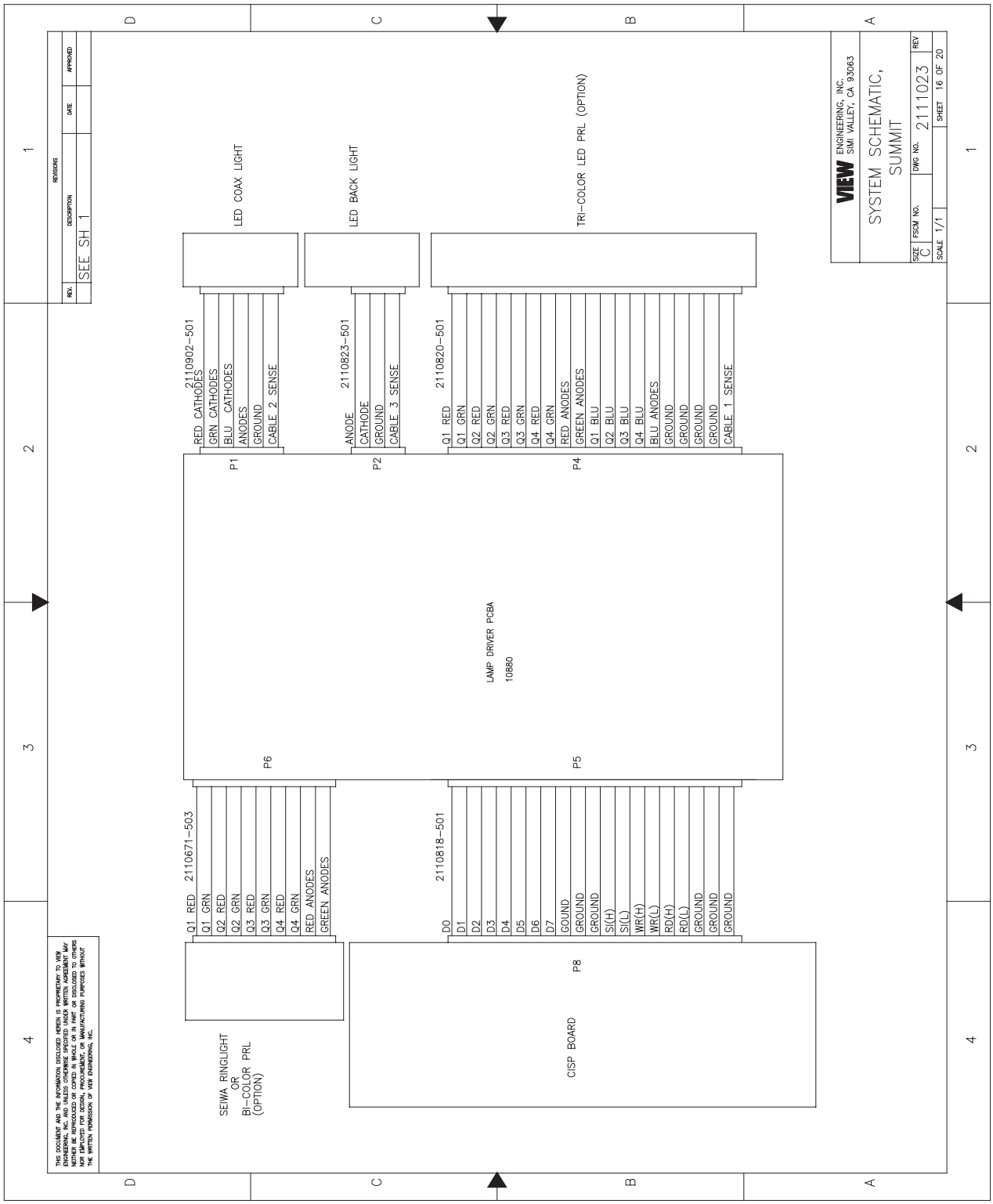


Figure 5-21 LED LIGHTING DISTRIBUTION (Sheet 16)

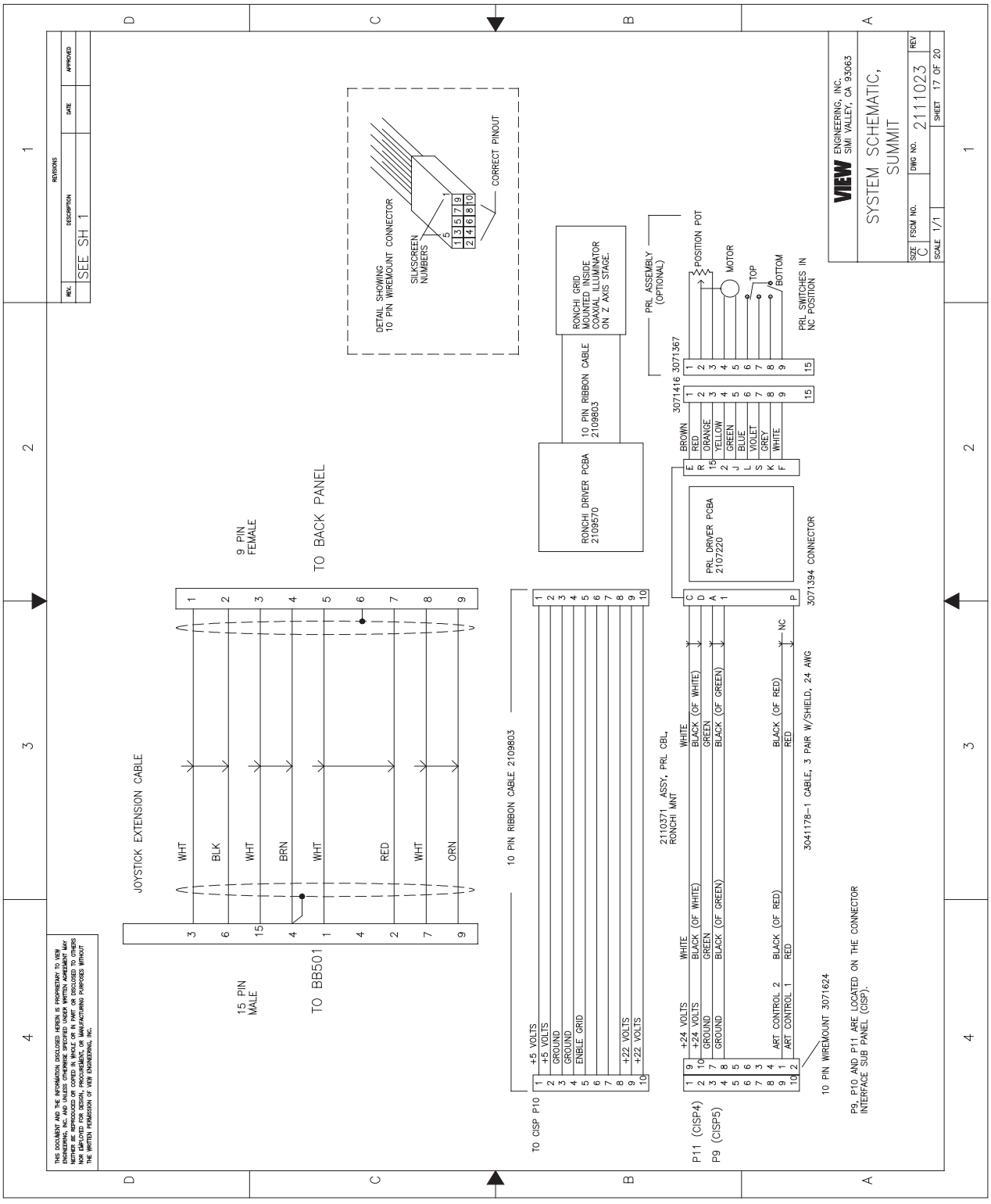


Figure 5-22 RONCI GRID/PRL CABLES (Sheet 17)

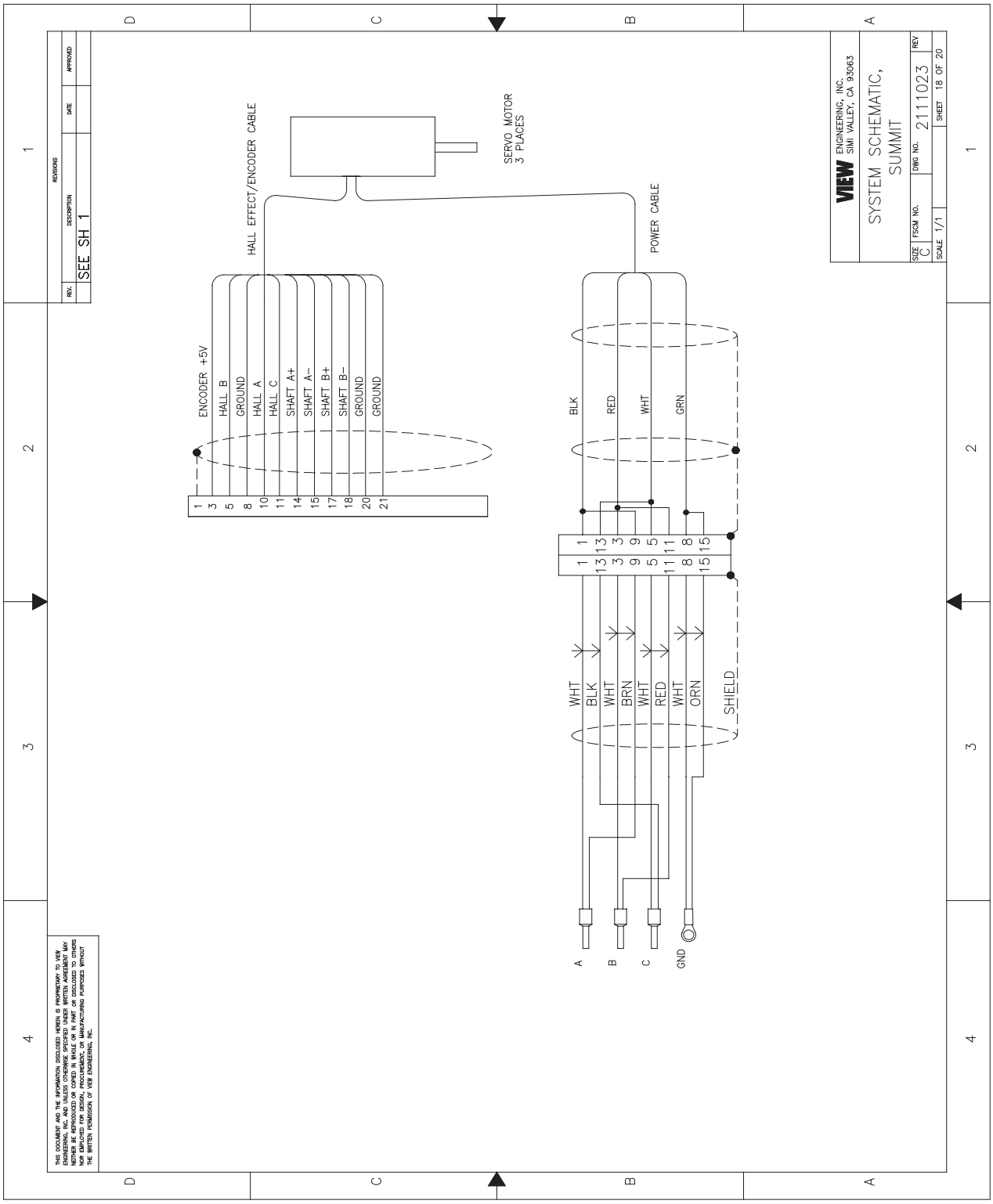


Figure 5-23 SERVO MOTOR DETAIL (Sheet 18)

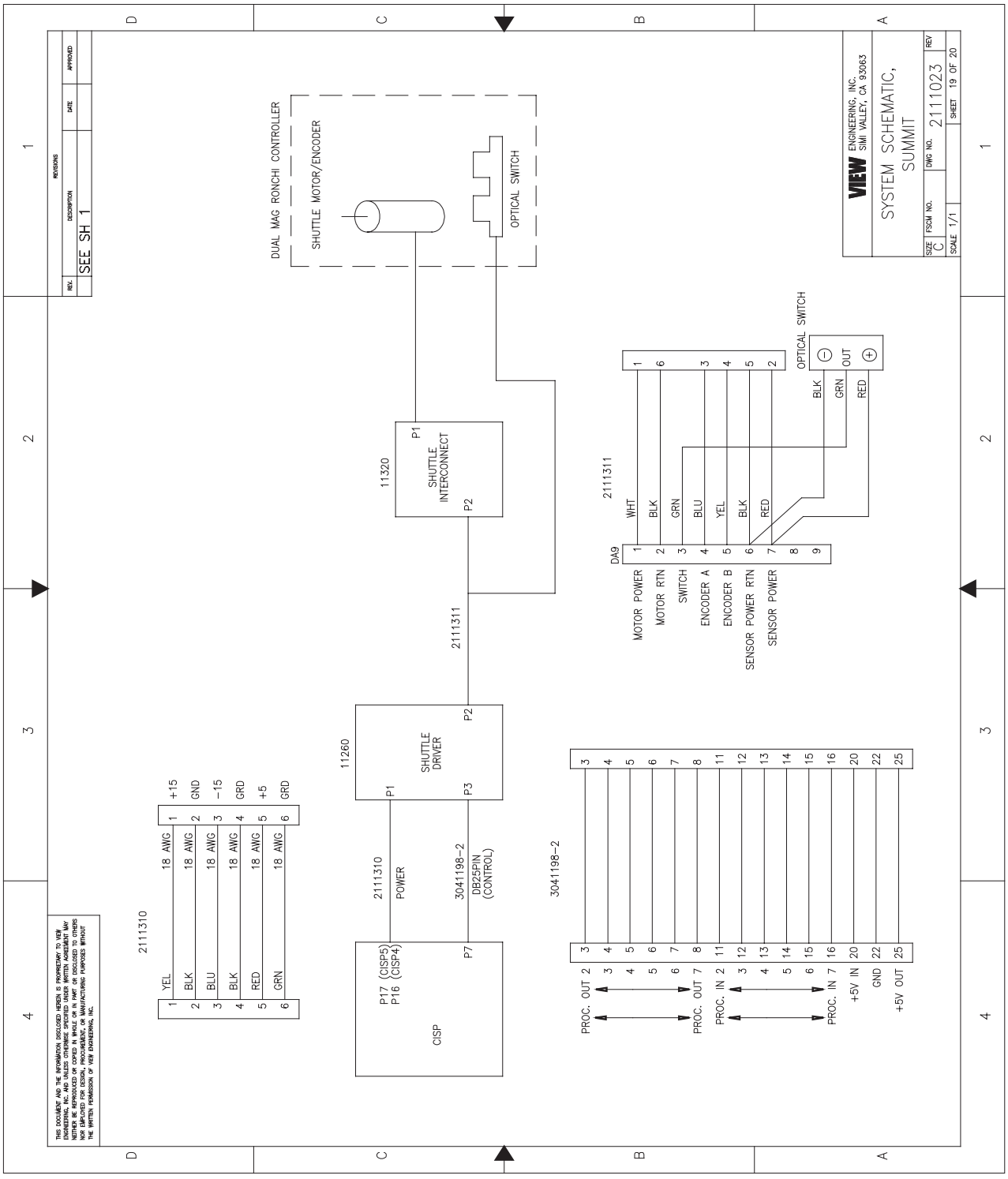


Figure 5-24 DUAL MAG OPTICS CONTROL (Sheet 19)

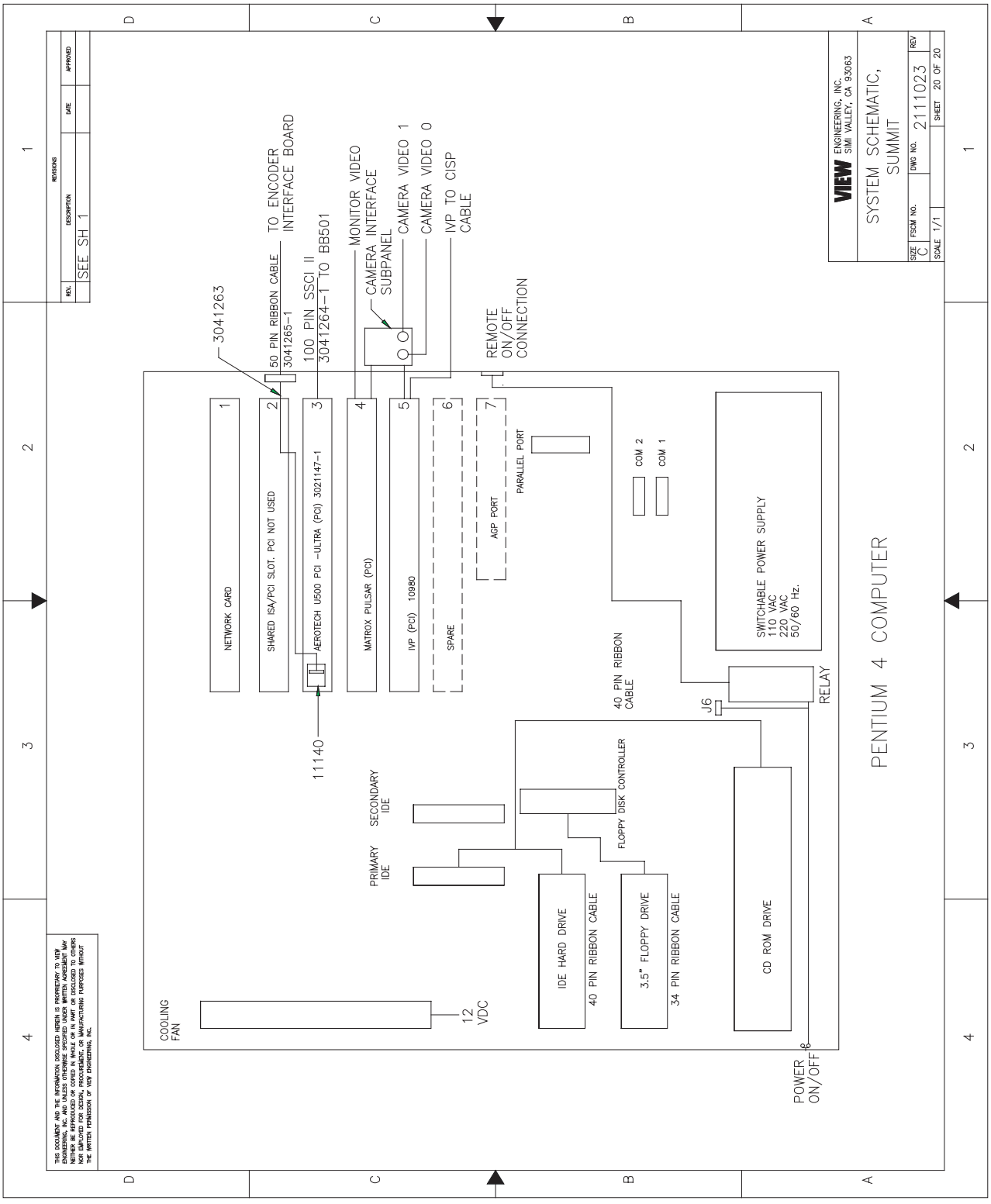


Figure 5-25 COMPUTER INTERNAL LAYOUT, PENTIUM 4 (Sheet 20)

Preventive Maintenance

Chapter 6

6.1 What This Chapter Contains

This chapter provides procedures you should follow to keep your Summit 800 System in good operating order. The procedures include:

- Tools Required to Perform Preventive Maintenance
- Preventive Maintenance Schedule
- Removing the Summit 800 Covers
- Cleaning All Assemblies
- Cleaning and Lubricating the Stage Guide Rails and Leadscrew
- Cleaning the Magnification Lens
- Cleaning the Optional LED Programmable Ring Light (LED PRL)
- Ronchi to Surface Comparison
- Reinstalling the Summit 800 Covers
- Calibrating the Lens
- Check System for Proper Function

Warning: Unless instructed otherwise, always turn off equipment and disconnect it from the main power supply while performing preventive maintenance (see ***AC Power Cable Outlet Lock-Out/Tag-Out Feature*** on page 10).

Warning: The risk of electrical shock is present any time the covers are removed from the stage. Never remove the covers from the monitor or system power supply, or you expose yourself to high voltage.

Caution: Protect your Summit 800 System from electrostatic damage. Perform these procedures at a static-safe workstation and wear a ground strap. If a ground strap is not available, follow these guidelines:

- Work in an uncarpeted area.
- Before you touch electronic components, discharge static electricity by touching a known-grounded object.
- Do not touch components on printed circuit boards, except as directed.

6.2 Tools Required to Perform Preventive Maintenance

- Shop Vacuum
- Non-linting Cotton Swabs
- Alcohol
- Screwdrivers (flathead and Phillips)
- Allen Wrench Set - English system (with extensions)
- White Lithium Grease
- Digital Voltmeter
- Oscilloscope - 60 MHz
- View Calibration Standards
- Soft Lint free cloth
- Starrett Oil
- Spanner Wrench

6.3 Preventive Maintenance Schedule

Here is a summary of the maintenance schedule you should follow in order. Preventive Maintenance should be performed semi-annually, in clean environments. However, if the environment becomes less clean, the frequency of the all maintenance tasks must be increased.

For Example:

Frequency of Use	Maintenance Schedule
3 shifts/day 7 days/week	quarterly
8 hours/day	twice/year

Contact the VIEW Engineering Inc., Customer Support Department (see ***Where to Get Help*** on page 3) for specific recommendations. Failure to perform preventive maintenance tasks may void warranty and additional support services may result in charges for those services.

Preventive Maintenance Task	Where to Find Procedure:
Remove All Covers	See ***Removing the Summit 800 Covers*** on page 58.
Clean All Assemblies	See ***Cleaning All Assemblies*** on page 61.
Clean and Lubricate Stage Guide Rails	See ***Cleaning and Lubricating the Stage Guide Rails and Leadscrew*** on page 63.
Verify Motion	See ***Motion Tuning and Adjustment*** on page 123.
Clean All Optics	See ***Cleaning the Magnification Lens*** on page 67.
Compare Ronchi to Surface Focus	See ***Ronchi to Surface Comparison*** on page 69.
Reinstall Covers	See ***Reinstalling the Summit 800 Covers*** on page 70.
Calibrate All Lenses	See ***Calibrating the Lens*** on page 73.
Verify LED PRL alignment	See ***PRL Polarizer Installation and Alignment Procedure*** on page 122.
Verify LED Backlight alignment	See ***Backlight Alignment*** on page 109.
Check system for proper function	See ***Check System for Proper Function*** on page 75.

6.4 Removing the Summit 800 Covers

6.4.1 Removing the Top Covers

1. *Remove the Front Cover.*

a. Loosen the two captured thumb screws (one per side).

b. Lift the Front Cover upward, away from the Summit 800; see ***Figure 6-1***.

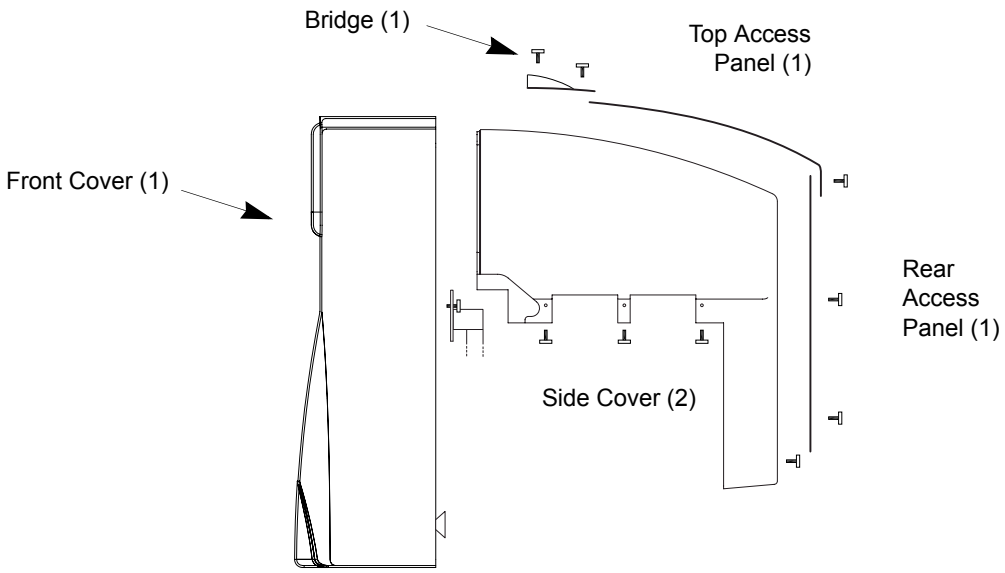


Figure 6-1 Removing the Top Covers

2. *Remove the two Side Covers.*

a. Remove the Bridge, the Top Access Panel, and the Rear Access Panel.

b. Remove the Side panels by removing the six side screws (three per side) and two back screws (one per side) that secure the covers in place; see *Figure 6-1*.

6.4.2 Detaching the X-Axis Bellows

Method 1

1. Loosen the four button-head screws (two on the top and two on the bottom) that hold the End Cover in place; see ***Figure 6-2***.

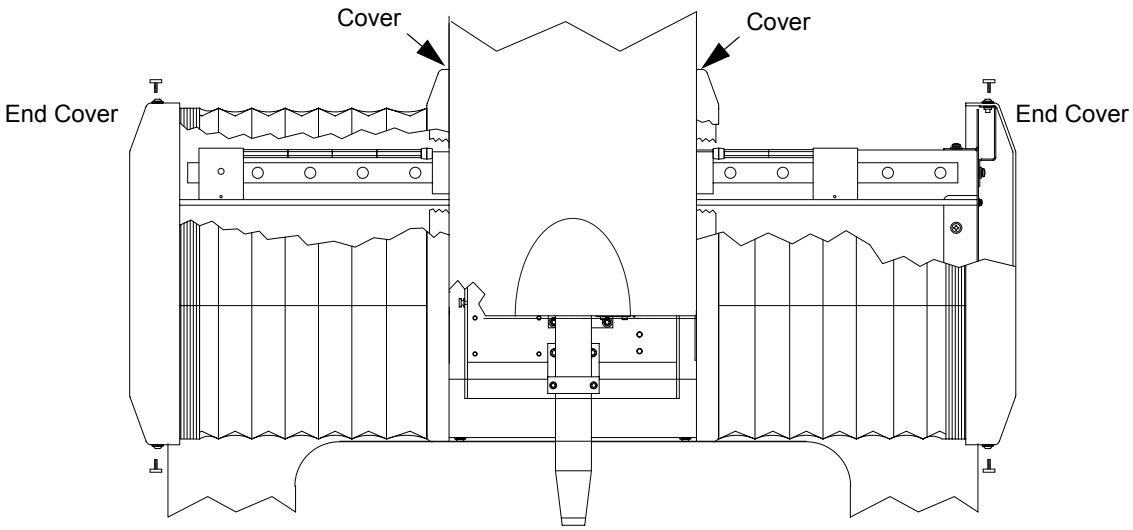


Figure 6-2 Detaching the X-Axis Bellows

2. Remove the Bellows End Cover.
3. Detach the bellows by removing the six clips that hold the bellows to the retaining plate.
4. Push the bellows toward the stage.

Method 2

1. Remove the Front Cover (see ***Removing the Top Covers*** on page 58).
2. Loosen the five button-head screws (three in front and two on the top) that hold the Cover in place; see ***Figure 6-2***.
3. Push the bellows and cover away from the stage.

6.4.3 Detaching the Y-Axis Bellows

1. The Y-axis bellows are attached using Velcro. To detach the bellows, simply pull the bellows away from the Y-axis stage plate.
2. Push the bellows out and away from the stage.

6.4.4 Removing the Lower Front Cover

1. Unlock the Front Cover by turning the key switch counter-clockwise; see ***Figure 6-3***.

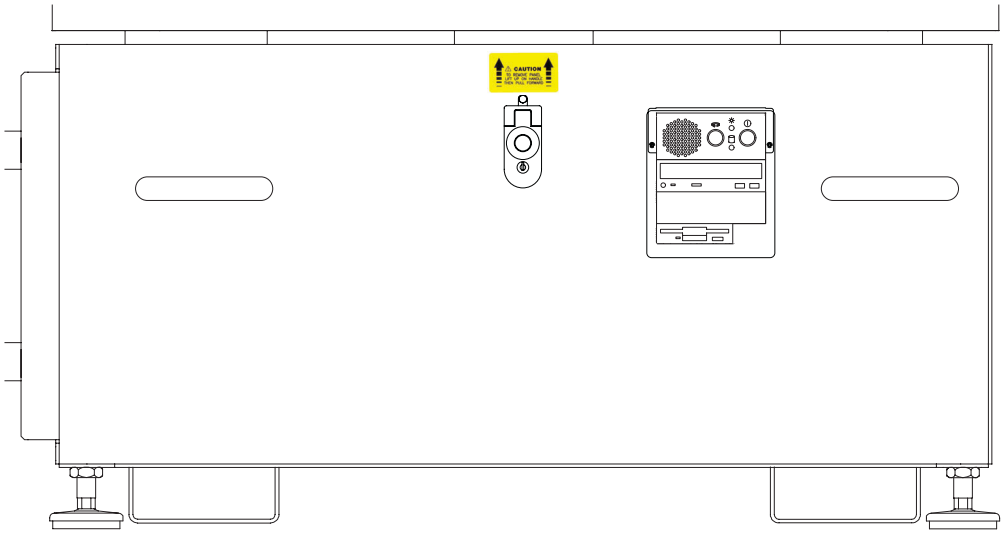


Figure 6-3 Summit 800 Key Switch and Latch

2. Press the button above the key switch to unlatch the Lower Front Cover.
3. Grasp the two handles, and carefully lift the Lower Front Cover straight up until it touches the bottom of the granite surface (to clear all slots), then pull it out toward you.
4. Set the Lower Front Cover aside.

6.4.5 Removing the Computer Cover

Note: On most models, the cables will not need to be disconnected when removing the case. Be sure to take care when sliding the cover up, so as not to disconnect the cables.

1. Make sure power is off to the system, and disconnect the power cord from the power source.
2. Remove the Lower Front Cover, and pull out the electronics drawer.
3. Loosen the thumbscrew holding the PC in the upright position, and lower the PC into the service (horizontal) position.
4. Remove the six thumbscrews that hold the cover in place.
5. Remove the top cover from the PC.

6.5 Cleaning All Assemblies

6.5.1 Cleaning Inside the Summit 800

1. Turn the system off.
2. Remove the Lower Front Cover (see ***Removing the Lower Front Cover*** on page 60).

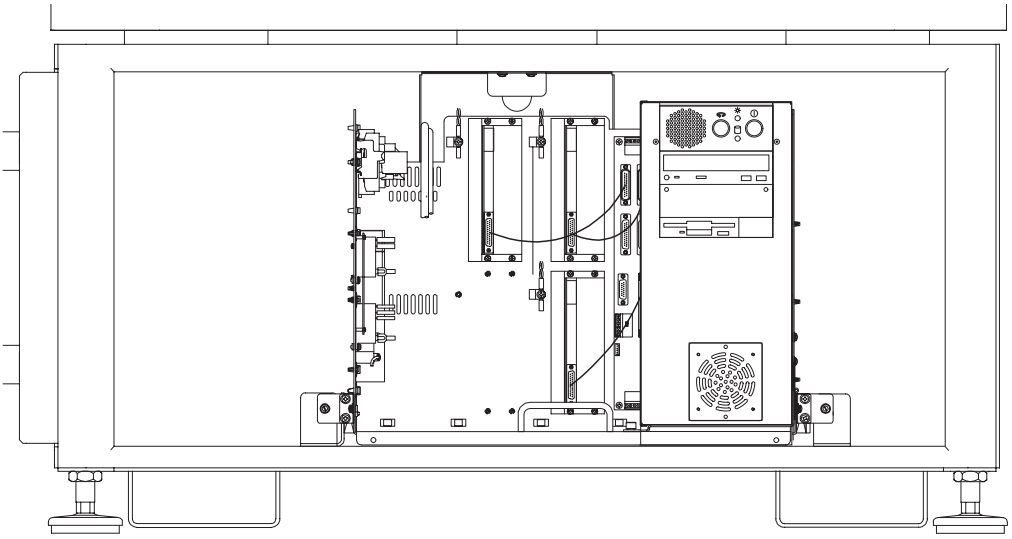


Figure 6-4 Sliding Out the Summit 800 Drawer

3. Using a shop vacuum, remove all dust from inside the Summit 800.

6.5.2 Cleaning the Computer

Warning: Wear goggles to protect your eyes from dust and other particles when using compressed air.

1. Turn the system off.
2. Remove the Lower Front Cover (see ***Removing the Lower Front Cover*** on page 60).
3. Remove the Computer Cover (see ***Removing the Computer Cover*** on page 60).
4. Using a shop vacuum or clean, dry brush, remove any dust from inside of the computer.
5. Take care to remove all dust from around the PC Board and power supply fans.
6. Check all cabling to PC boards to ensure that they are properly seated.

6.5.3 Cleaning the Observation Platform (Glass) and the Stage Area

Wipe all outside surfaces of the Summit 800 stage with alcohol and a damp cloth, then wipe dry with a clean dry lint free cloth. Glass surfaces may also be cleaned using a commercial glass cleaner.

6.5.4 Cleaning User Components

The user-interface components include:

- the joystick
- the keyboard
- the mouse or trackball
- the monitor

Caution: Performing these procedures improperly can damage your system.

6.5.4.1 Joystick

Remove buildup from the point where the stick enters the housing. This can be removed with alcohol or a water-based cleaner on swabs.

6.5.4.2 Trackball / Mouse

Using alcohol or a water-based cleaner, remove the buildup from the bottom of the mouse. Remove and clean the ball if needed.

6.5.4.3 Monitor

1. Vacuum the vent slots so they are free of dust.
2. Clean the screen with a non-solvent glass cleaner.

6.5.4.4 Keyboard

The keyboard is susceptible to dirt and contaminants.

1. Unplug the keyboard, and place it on a padded surface up-side down.
2. Pop the latches on the top surface of the keyboard with a flat-bladed screwdriver. (There may be some screws holding the case halves together on your particular keyboard.)
3. Carefully swing the rear cover up toward the space bar end, and lift off the rear cover.
4. Remove all the screws holding the circuit board to the upper keyboard assembly.
5. Lift the key contact circuit board, and turn it over.
6. Vacuum the exposed contacts and clean if necessary with alcohol.
7. Reassemble in reverse order.

6.6 Cleaning and Lubricating the Stage Guide Rails and Leadscrew

Note: It is important that you clean the rails and leadscrews to remove contaminants and grease buildup. It is also important that you apply the proper amount of lubricant; **do not over-lubricate**.

Lubricating the stages consists of two tasks, cleaning the stage guide rails and lead screws, and applying the lubricant in the prescribed manner.

Material Required:

- Methanol or similar cleaning solvent
- Starret Oil (or equivalent)
- Lint-free cleansing paper (Kimwipes 34155, coffee filters, or equivalent)
- Long stemmed, lint-free swabs

6.6.1 Clean / Lubricate X-Axis Stage Guide Rails and Leadscrew

Refer to ***Figure 6-5*** as you proceed through this section:

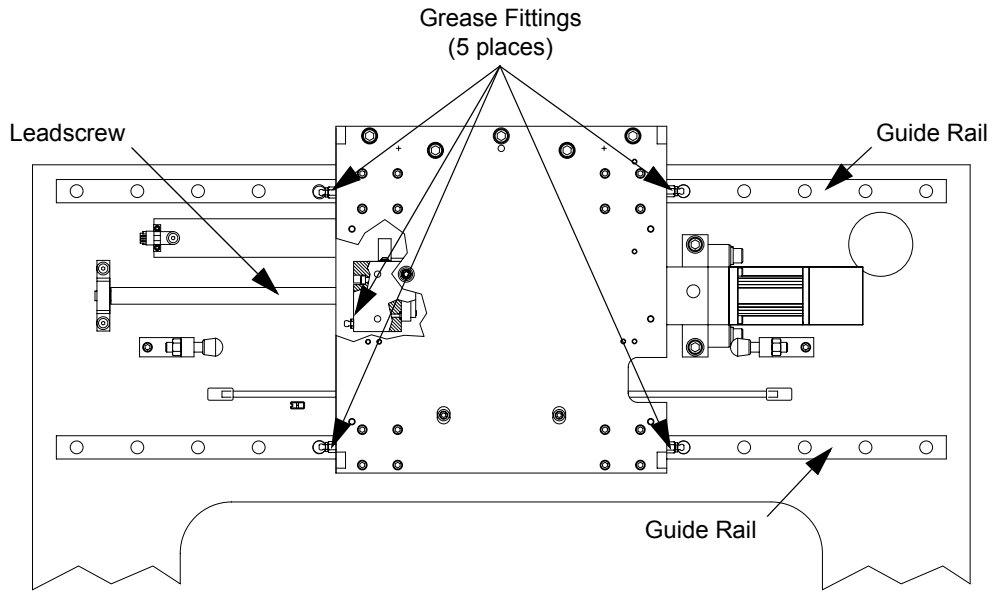


Figure 6-5 X-Axis Guide Rails

1. Detach the X-axis bellows (see ***Detaching the X-Axis Bellows*** on page 59).
2. Manually move the X-axis stage to the extreme *left* position.
3. Using a clean cloth or swab moistened with alcohol, remove contaminants and old lubricant from the exposed guide rails and leadscrew.
4. Using a clean cloth, wipe the guide rails and leadscrew to remove any remaining contamination and alcohol. Make sure guide-rail and leadscrew grooves are clean.
5. Manually move the X-axis stage to the extreme *right* position.
6. Using a clean cloth or swab moistened with alcohol, remove contaminants and old lubricant from the exposed guide rails and leadscrew.
7. Using a clean cloth, wipe the guide rails and leadscrew to remove any remaining contamination and alcohol. Make sure guide-rail and leadscrew grooves are clean.
8. Repeat steps 3 through 7 until the guide rails and leadscrew are clean.
9. Purge all old grease from the bearing car and leadscrew.
10. Apply new lubricant to the guide rails and leadscrew via the grease fittings; see ***Figure 6-5***.
11. Wipe off excess grease after lubrication is complete.
12. After proper operation has been verified, attach the X-axis bellows (see ***Attaching the X-Axis Bellows*** on page 71).

6.6.2 Clean / Lubricate Y-Axis Stage Guide Rails and Leadscrew

Refer to ***Figure 6-6*** as you proceed through this section:

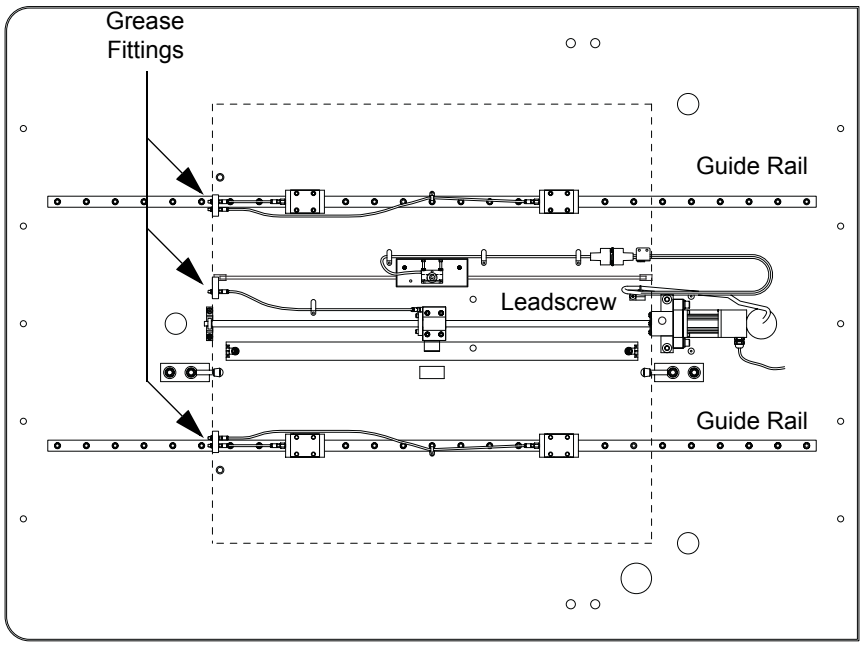


Figure 6-6 Y-Axis Guide Rails

1. Detach the Y-axis bellows (see ***Detaching the Y-Axis Bellows*** on page 59).
2. Manually move the Y-axis stage to the extreme *rear* position.
3. Using a clean cloth or swab moistened with alcohol, remove contaminants and old lubricant from the exposed guide rails and leadscrew.
4. Using a clean cloth, wipe the guide rails and leadscrew to remove any remaining contamination and alcohol. Make sure guide-rail and leadscrew grooves are clean.
5. Manually move the Y-axis stage to the extreme *forward* position.
6. Using a clean cloth or swab moistened with alcohol, remove contaminants and old lubricant from the exposed guide rails and leadscrew.
7. Using a clean cloth, wipe the guide rails and leadscrew to remove any remaining contamination and alcohol. Make sure guide-rail and leadscrew grooves are clean.
8. Repeat steps 3 through 7 until the guide rails and leadscrew are clean.
9. Purge all old grease from the bearing car and leadscrew.
10. Apply new lubricant for the guide rails and leadscrew via the grease fittings; see ***Figure 6-6***.
11. Wipe excess grease after lubrication is complete.
12. After proper operation has been verified, attach the Y-axis bellows (see ***Attaching the Y-Axis Bellows*** on page 71).

6.6.3 Clean / Lubricate Z-Axis Stage Guide Rails and Leadscrew

Refer to ***Figure 6-7*** as you proceed through this section:

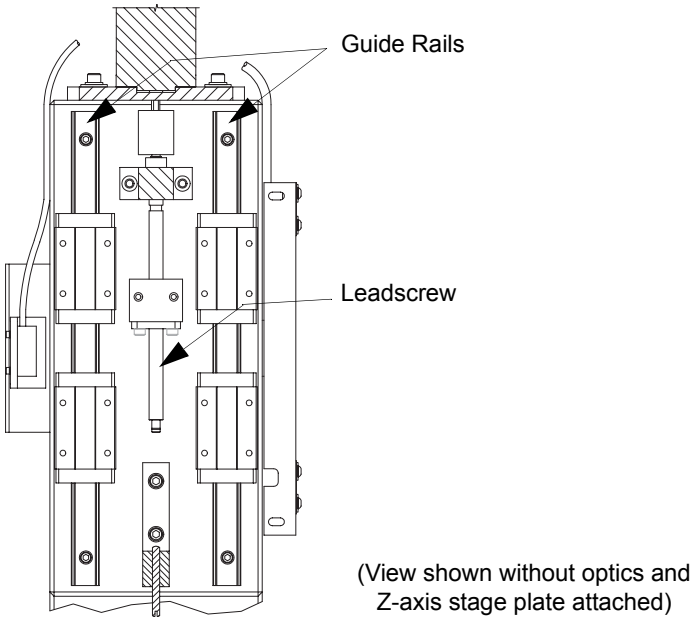


Figure 6-7 Z-Axis Guide Rails and Leadscrew

Warning: Do not, at any time, insert your fingers into the Z-axis mechanism. Clean screws and rails using swabs only.

1. Remove the top covers; (See ***Removing the Top Covers*** on page 58).
2. Use the joystick to move the Z-axis stage to the *full up* position; (See ***Motion Tuning and Adjustment*** on page 123) for details.
3. Using a swab moistened with alcohol, remove contaminants and old lubricant from the exposed guide rails and leadscrew.
4. Use the joystick to move the Z-axis stage to the *full down* position.
5. Using a swab moistened with alcohol, remove contaminants and old lubricant from the exposed guide rails and leadscrew.
6. Repeat steps 3 through 5 until the guide rails and leadscrew are clean.
7. Apply a light coat of Starret oil to the lead screw only. Be sure to cycle the Z-axis stage up and down to ensure the lead screw is completely lubricated.
8. After proper operation has been verified, reinstall the top covers (see ***Reinstalling the Top Covers*** on page 70).

6.7 Cleaning the Magnification Lens

Material Required:

- Non-solvent lens cleaner
- Clean cloths

Refer to the ***Figure 6-8*** as you proceed through this section:

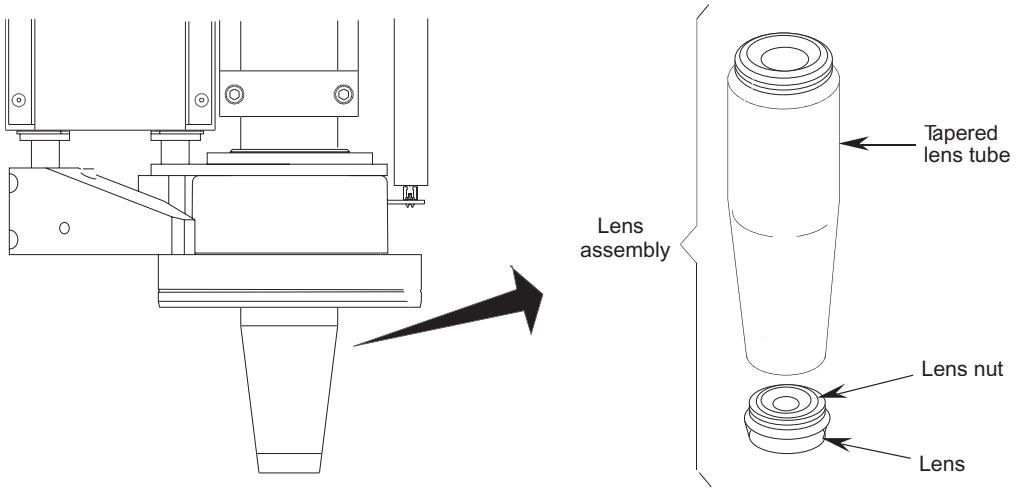


Figure 6-8 Summit 800 Lens Assembly

1. To gain access to magnification lens, set the ring light (if available) to the 0 setting.
2. Unthread the lens tube assembly from the **system** (see ***Figure 6-8***), using caution not to touch the plated surface of the light ring.
3. Check for a loose lens nut by gently shaking the lens. If you hear a slight noise, unthread the lens from the bottom of the tapered lens tube and tighten the loose nut. You will need a spanner wrench to tighten the nut. When you've tightened the nut, wipe the inside of the lens clean using a cotton swab moistened with non-solvent lens cleaner. Then thread the lens back onto the bottom of the tapered lens tube and continue with cleaning.
4. Thread the lens assembly into the lens tube, being careful not to touch the plated surface of the ring light.
5. Using a cotton swab, lightly moisten the lens with non-solvent lens cleaner. Make sure the lens cleaner does not enter the lens assembly.
6. Wipe lens to remove any residual dirt, starting from the center of the lens and working toward the edges. Repeat as necessary until lens is clean.
7. Similarly check and clean all other lenses.

6.8 Cleaning the Optional LED Programmable Ring Light (LED PRL)

If your system has a LED PRL, use this procedure to clean it. Refer to the illustration below as you proceed through this procedure:

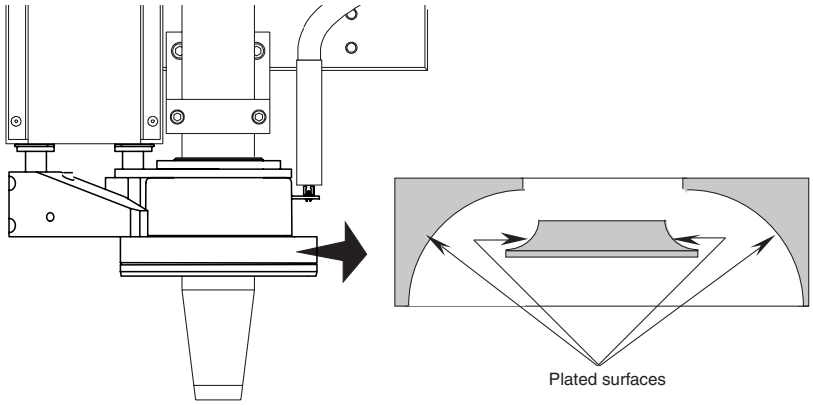


Figure 6-9 Plated Surfaces of the LED Programmable Ring Light

1. Unthread and remove the lens tube.
2. Using a clean cloth moistened with lens cleaner, wipe the plated surfaces. Wipe ring dry.
3. Being careful not to touch cleaned surfaces of the ring light, thread the lens assembly into the lens tube.

6.9 Ronchi to Surface Comparison

1. Place a shiny object on the Summit 800 inspection platform.
2. Using the joystick, lower the Z-axis; and manually focus on the shiny object.
3. In the VIEW Metrology Software window, select the Autofocus finder in the Video (Live) window toolbar.

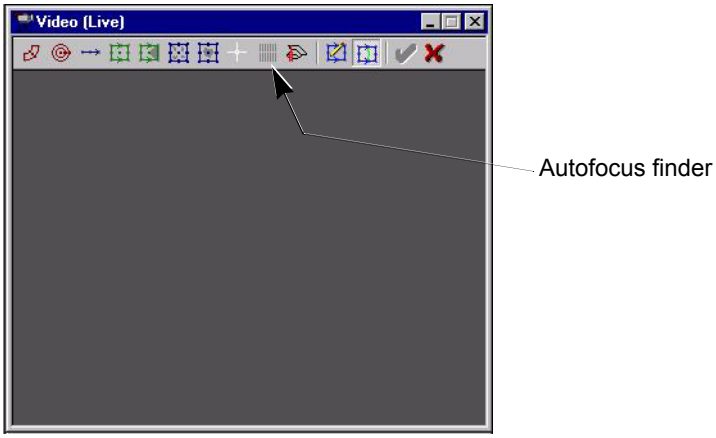


Figure 6-10 Video (Live) Window

4. Using textured surface in Auto-Focus, run an autofocus on the shiny surface.

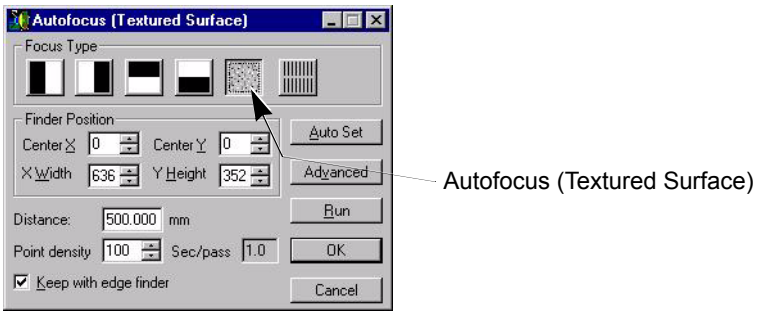


Figure 6-11 Auto-Focus Menu

5. Zero the DRO by pressing the right mouse button in the DRO window and selecting the Zero DRO option.
6. Using Smooth (project grid) in Autofocus, run a Ronchi focus.
7. The change in the DRO should be zero or very close to zero. If the change is more than a couple of microns (i.e., 0.0002"), then perform a camera height adjustment. See ***Camera Height Adjustment*** on page 90.

6.10 Reinstalling the Summit 800 Covers

6.10.1 Reinstalling the Top Covers

1. *Reinstall the two Side Covers*

a. Reinstall the Side Covers using the six side screws (three per side) and two back screws (one per side) that secure the covers in place; see *Figure 6-12*.

b. Reinstall the Bridge, the Top Access Panel, and the Rear Access Panel.

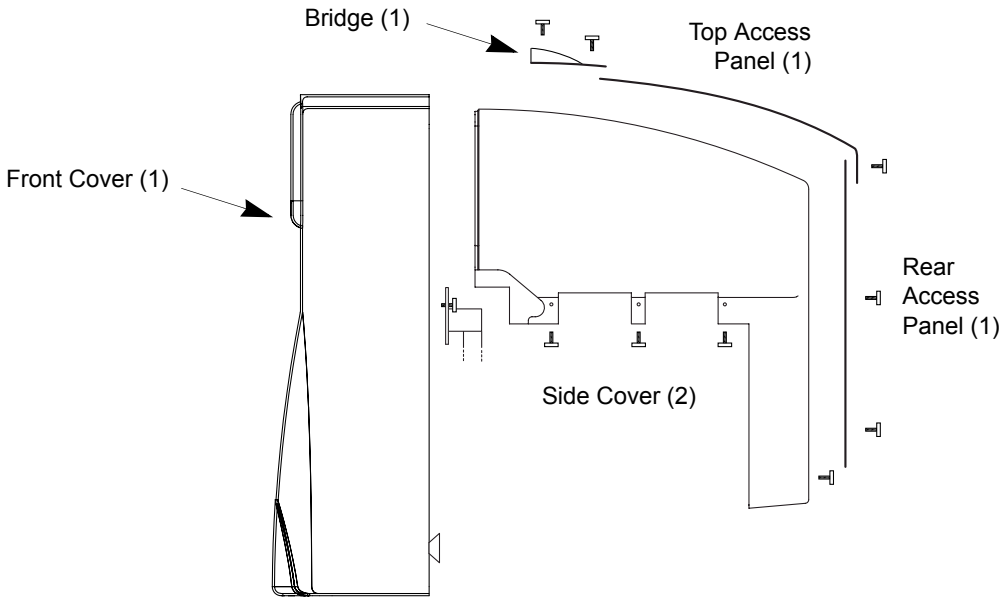


Figure 6-12 Replacing the Covers

2. *Reinstall the Front Cover.*

a. Set the Front Cover in place; i.e., downward, toward the Summit 800; see *Figure 6-12*.

b. Tighten the two captured thumb screws (one per side).

6.10.2 Attaching the X-Axis Bellows

Method 1

1. Push the bellows in place; see ***Figure 6-13***.

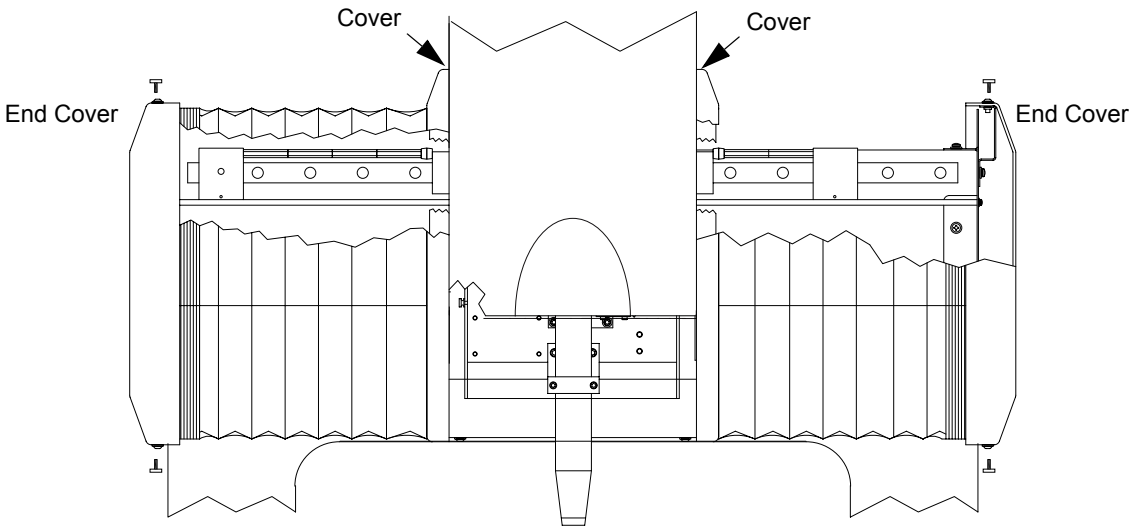


Figure 6-13 Attaching the X-Axis Bellows

2. Attach the bellows to the retaining plate with the six bellows clips.
3. Reinstall the bellows End Cover.
4. Tighten the four button-head screws (two on the top and two on the bottom) that hold the bellows End Cover in place.

Method 2

1. Push the bellows and bellows Cover in place.
2. Tighten the five button-head screws (three in front and two on the top) that hold the bellows Cover in place; see ***Figure 6-13***.
3. Reinstall the Front Cover (see ***Reinstalling the Top Covers*** on page 70).

6.10.3 Attaching the Y-Axis Bellows

1. Push the bellows back in place.
2. To attach the bellows, simply push the bellows towards the Y-axis stage plate. The Y-axis bellows are attached using Velcro.

6.10.4 Reinstalling the Lower Front Cover

1. While holding the two handles, carefully set the Lower Front Cover in place with the top touching the granite (see ***Figure 6-14***).

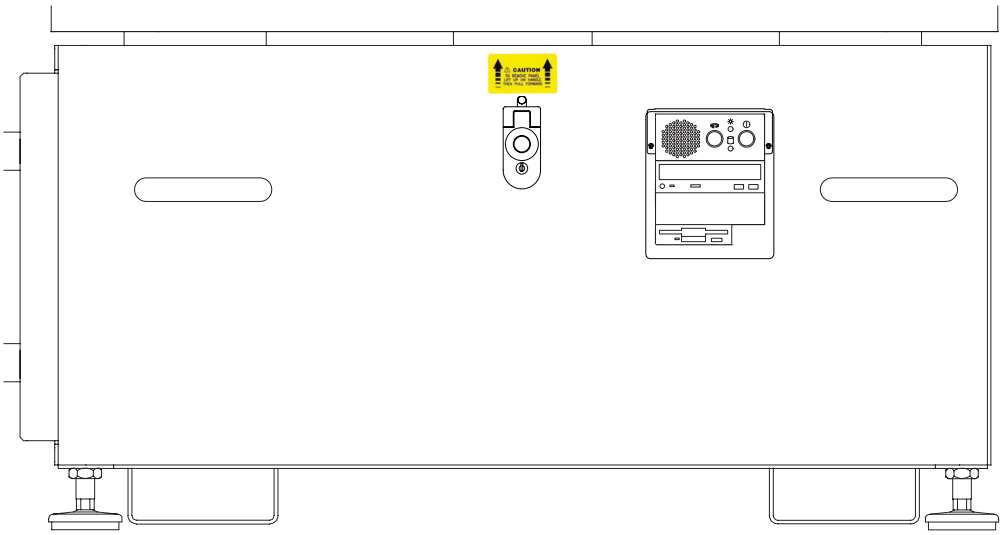


Figure 6-14 Replacing the Front Panel

2. Lower the Front Cover so the two bottom tabs slide into the two slots located on the frame.
3. Once in the bottom slots, the top latch slot of the panel should fit over the tab on the frame.
4. Press the button above the key switch to latch the Lower Front Cover.
5. Lock the Lower Front Cover by turning the key switch clockwise.

6.10.5 Reinstalling the Computer Cover

1. With the PC in the service (horizontal) position, set the cover on the PC.
2. Install the six thumbscrews that hold the cover in place.
3. Raise the PC into the upright position, and tighten the thumbscrew.
4. Push in the electronics drawer.
5. Reinstall the Lower Front Cover.

6.11 Calibrating the Lens

Tools Required:

Tool	Part No.
High-Accuracy Calibration Standard	2008509-505

Note: All optics should be aligned before performing this procedure.

Procedure:

1. Select **Setup**/**Calibration** from the menu, the *Lens Calibration* dialog box is displayed; refer to ***Figure 6-15***.

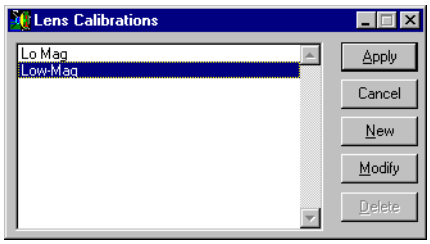


Figure 6-15 Lens Calibration

2. Select **New** or **(Modify** to re-calibrate an existing lens) in the *Lens Calibration* dialog box, the *Circle Calibration* dialog box is displayed; see ***Figure 6-16***.

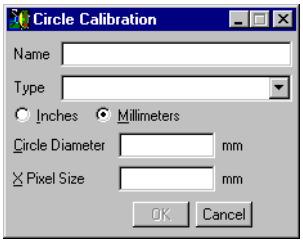


Figure 6-16 Circle Calibration

3. Select the type of lens being calibrated. Enter a descriptive name for the lens you are calibrating in the Lens Name text box (optional). Typically, a descriptive name for lens calibration is based on the magnification level of the lens, for example, 10x Magnification.

4. Select the appropriate unit of measurement in the Calibration dialog box, based on the unit of measurement of the calibration standard. Calibration standards supplied by VIEW Engineering are based on inches.

Note: If you plan to measure parts that are based on metric measurements, you still need to calibrate the lens based on the unit of measurement of the calibration standard. Then, when you measure in metric units, VMS will convert the lens calibration data to metric.

5. Clean the calibration standard with a soft cloth, and place the standard on the stage.

6. Turn on the backlight (usually 1 for the Lo Mag lens). Use the Autofocus Finder (refer to ***Figure 6-17***) in edge mode to focus the lens on the target.

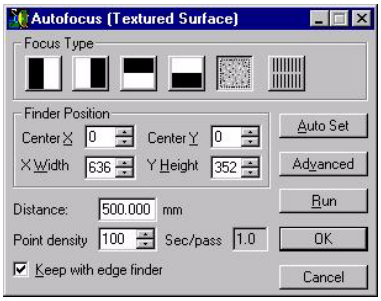


Figure 6-17 Autofocus Finder

7. Move the joystick so that the "target" on the calibration standard is centered in the *Video (Live)* window.

8. Place the mouse pointer over the handle on the outer circle of the red-colored Circle Finder. Click, and hold down the left mouse button; and drag the handle to enlarge the outer circle. The calibration standard's target includes several concentric circles.

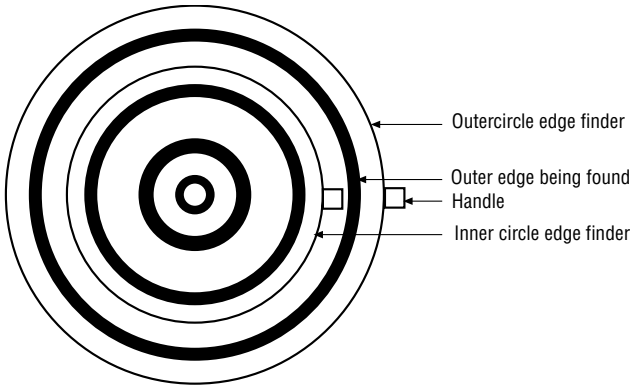


Figure 6-18 Using the Circle Finders

9. Place the outer circle of the Circle Finder around the target's largest circle that is *entirely visible* in the *Video* window. If the largest circle is partially outside the *Video* window, use the next largest circle. The inner circle should be large enough so that it doesn't include smaller calibration circles. If you need more information on manipulating Finders.

10. Double-click the left mouse button on one of the Circle Finder control handles. The *Circular Edge Finder* dialog box is displayed:

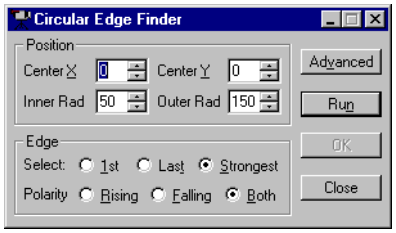


Figure 6-19 Circular Edge Finder

The Finder needs to find the *outer* edge. As the Finder scans outward, the outer edge will be a "falling" edge (from light to dark), since the calibration circle is on a white background.

11. Click the *Falling* box under Polarity. Some calibration standards may be a black circle on a white background; for these, you would choose *Rising*.

12. Click the **Close** button.

13. In the *Calibration* dialog box, enter the nominal value of the circle you're focusing on in the Circle Diameter text field. A number (e.g., .08) is visible next to the circle in the *Video* window. Find this circle's number on the specification sheet that accompanies your calibration standard, and the nominal value (e.g., .08001) will be next to it.

14. Double-click on an open area in the *Video* window to run the Finder. Make sure it found the edges around the outside of the circle, cleanly. Re-adjust the light level and/or Finder attributes if necessary.

15. Click on the green **Check Mark** in the *Video* window toolbar. VMS calculates X pixel size and inserts this value in the *Calibration* dialog box.

16. Check the value in the X Pixel Size text box to make sure it seems reasonable.

The value should be close to:

Lo Mag	.00026
Med Mag	.00013
Hi Mag	.000065

6.12 Check System for Proper Function

Run a customer inspection program on the system to ensure that it is functioning properly. If it is not, proceed to troubleshooting.

Troubleshooting

Chapter 7

7.1 What This Chapter Contains

This chapter helps you identify the cause of possible problems with the Summit 800 and Intel-based central processor and user-interface components. Use this chapter only to **diagnose** problems. Refer to chapters 8 and 9 to make required adjustments and to replace parts.

7.2 Before You Begin

Warning: Unless instructed otherwise, always turn off equipment and disconnect it from the main power supply while troubleshooting (see ***AC Power Cable Outlet Lock-Out/Tag-Out Feature*** on page 10).

Warning: The risk of electrical shock is present any time the covers are removed from the stage. Never remove the covers from the monitor or system power supply, or you expose yourself to high voltage.

Caution: Protect your Summit 800 System from electrostatic damage. Perform these procedures at a static-safe workstation and wear a ground strap. If a ground strap is not available, follow these guidelines:

- Work in an uncarpeted area.
- Before you touch electronic components, discharge static electricity by touching a known-grounded object.
- Do not touch components on printed circuit boards, except as directed.

Before you begin troubleshooting, note that:

- If you find a problem you cannot address on your own, contact the View Engineering, Inc., Customer Support Department (see ***Where to Get Help*** on page 3).
- The phrase “not plugged in” can signify that the connector is not fully seated. A wire can be broken inside its insulator due to crimping, pinching, or over-flexing.
- **This manual does not provide information on the repair of faulty PCBAs, and we strongly suggest that you do not attempt to repair them.** Call View Engineering, Inc., Customer Support Department for replacement boards.

7.3 Identifying Problems With the Summit 800 System

This section in intended to assist in solving problems that may arise while you are using the Summit 800 system.

It is only intended as reference, and it is recommended that the steps taken to resolve the problem be performed by a factory trained individual within your facility.

Please contact the View Engineering, Inc., Customer Support Department (see ***Where to Get Help*** on page 3) for assistance and/or training information.

7.3.1 Start-Up

Symptom:	Possible causes:	Possible Solutions:
The stage and fans are OK, but the lights do not operate.	The integrated video processor card has faulted or connections have been compromised.	Verify all connections between the DGU and CPU assemblies. If connections appear secure, open the PC and check the IVP card for bad connections. Replace the IVP card if needed.
	LED control PCBA has failed.	Assuming the incoming power is present, replace the LED control PCBA.
	Cable to LED PCBA is disconnected.	Check and secure all connections.
	System not configured correctly.	Use the Setup/Options/System screen. Verify that all options are correct.
The lights and fan are OK, but there is no stage movement.	The joystick and/or related cables may have become loose and/or are not connected.	Check that the joystick and all related cables are connected properly.
	Amplifiers have faulted.	Check amplifiers and replace if necessary.
	Burnt or defective motor.	Replace the defective motor.
	The Aerotech Motion PCBA has faulted.	Verify the Aerotech Motion PCBA by using the U5OO MMI program located on the hard drive.
	Burnt or defective brake.	Remove brake assembly, and attempt to zero stages. If the stage zeros, replace the defective brake assembly.
The fan, lights, and stage do not operate.	Make sure the DGU is plugged in and the power switch is on.	
	EMO is depressed.	Reset EMO circuit breaker.
	EMO is not plugged in.	Restore EMO connection at rear panel.
	CB1, the MAIN POWER circuit breaker on the rear panel, is tripped.	Reset CB1.
	Poor connection between CPU and DGU units.	Restore and/or repair connections.

7.3.2 Lights

Symptom:	Possible causes:	Possible solutions:
Dim or no lights.	Dirty optics.	Clean the optics. See ***Cleaning the Magnification Lens*** on page 67.
	Check for burnt out LEDs.	Replace the bulb. See ***Replacing a Light Bulb (Optional Six-Pack)*** on page 177.
	Improper voltages being supplied to LED control PCBA.	Adjust voltages if necessary.
	Blown LED control PCBA.	Replace and adjust the LED control PCBA
No PRL, coaxial (thru lens), or backlight.	Check for burnt LEDs.	Replace the LED PCBA.
	Check that all cables are securely connected to the LED control module and all interconnect cables are secure.	Reconnect or replace disconnected or damaged cables.
	Blown LED control PCBA.	Replace and adjust as needed.
Ronchi grid does not operate.	Loose or incorrect cabling between CPU and DGU units.	Restore and/or replace defective connections.
	No +5VDC at Ronchi Driver PCBA.	Check all cable connections. Verify +5VDC at the Ronchi Driver PCBA and Energy Conversion PCBA. If the voltage is not correct, verify output at supply; replace supply if necessary. If the voltage is correct, replace the Ronchi Driver PCBA.

7.3.3 Motion

Symptom:	Possible causes:	Solution:
Joystick causes wrong or multiple axes to move.	Summit 800 and another program are placed in the Start-up menu together.	Do not put the Summit 800 and another program in the Start-up menu.
	Joystick defective or poor cable connection	Verify all motion-related cable connections; correct problem or replace defective joystick.
Axis drifts on power up.	The motor wires on the amplifier may not have solid contact.	Verify motor contacts are solid.
	The signal wires on the amplifier may not have solid contact.	Verify that all connections at servo amp are solid.
	The scale or reader head cable is not connected.	Check all related scale or reader head connections. Verify all connections between the DGU and the PC.
All axes will not initialize.	EMO circuit may be tripped.	Reset the EMO switch and re-zero the stages.
One axis will not initialize.	Axis may be stuck at the end of travel.	1. Press E-Stop. 2. Manually position the stage back to its center position. Be sure to move the stage by applying pressure at the middle of the stage plate and not the outer edges. 3. Reset the E-Stop. 4. Reset the EMO switch and re-zero the stages.
	Loose or improper connections made at the breakout board or Aerotech Motion PCBA.	Verify cable connections are secure.
	Incorrect or corrupt parameter file.	Reload current parameter file using MMI. See ***Motion Tuning and Adjustment*** on page 123.
	Defective or damaged limit switch.	1. Using the U5OO MMI program, verify limit switch operation. 2. When the limit is blocked by the flag, the program will show a “0” if there is no problem. 3. If a “1” is showing, move the flag out of the limit switch and use a small screwdriver to block the limit switch signal. If it shows a 1, the flag is bent or misaligned. If it shows a zero, the limit switch is defective or damaged. 4. If needed, replace the limit switch See ***Replacing the Limit Switches*** on page 150.
	Amplifier may be defective.	If needed, replace the amplifier. Verify bad linear amp by swapping it with another axis and verify movement. See ***Replacing the X-, Y-, or Z-Axis Amplifier PCBA*** on page 188.
	Blown or burnt motor.	Replace the motor if needed. See ***Replacing a Motor / Encoder Assembly*** on page 162.

Symptom:	Possible causes:	Solution:
Axis runs to a hard stop and inhibits amplifier.	Blown limit switch.	Check the limit switches. 1. Using the U5OO MMI program, verify limit switch operation. 2. When the limit is blocked by the flag the program will show a “0” if there is no problem. If a “1” is showing, move the flag out of the limit switch and use a small screwdriver to block the limit switch signal. If it shows a 1, the flag is bent or misaligned. If it shows a zero, the limit switch is bad. Repair the flag or replace the limit switch. See ***Replacing the Limit Switches*** on page 150.
	Incorrect or corrupt parameter file.	Reload current parameter file using MMI. See ***Motion Tuning and Adjustment*** on page 123.
Axes “run away” at power up.	Loose connections or bad cables on the scales interface board.	Reconnect or replace cables as needed.
	Scales not functioning properly.	Check the functionality of the scales using the Motion/ Setup program and replace the scale if necessary.
	Aerotech motion PCBA is not seated properly.	Reseat the Aerotech motion PCBA and retest. Replace the PCBA if necessary.
	Wiring at the axis and/or amplifier is loose.	Verify and secure the wiring at the axes and amplifier as needed.
Squealing, knocking, or hard clicks.	Tuning parameters may be bad or the acceleration set too high.	Adjust the tuning parameters. See ***Motion Tuning and Adjustment*** on page 123.
	Loose axis hardware or damaged leadscrew.	Remove z-axis cover and check for loose hardware or defective leadscrew.
	Defective or damaged z-axis leadscrew	See ***Replacing the Z-Axis Leadscrew*** on page 173.
	Incorrect or corrupt parameter file.	Reload current parameter file using MMI. See ***Motion Tuning and Adjustment*** on page 123.
Does not finish moves or hesitates when finishing move.	Motion not tuned.	Using U5OO MMI program, verify motion.
	May be bad reader heads on the affected axis.	Replace the reader head. See ***Replacing the Scale Reader Heads*** on page 155.
Oscillations.	Loose or defective motor.	Secure and/or replace motor.
	Damaged flex coupling.	
	May be bad reader heads on the affected axis.	Replace the reader head. See ***Replacing the Scale Reader Heads*** on page 155.
	Incorrect or corrupt parameter file.	Reload current parameter file using MMI. See ***Motion Tuning and Adjustment*** on page 123.

7.4 Identifying Problems With Illumination

Symptom:	Possible causes:	Possible Solutions:
No live video, but menus OK.	Check for loose or broken video and camera cables.	Reconnect or replace the cables.
	Possible corrupted Summit 800 program file.	Reload Summit 800 operating program.
	Camera may be defective.	Replace the camera. See ***Replacing the Camera (Standard Optics)*** on page 146.
	Defective Frame Grabber PCBA.	Replace Frame Grabber PCBA.
No live video or menus.	If the system boots up on power, check for defective monitor.	Replace the monitor. See ***Replacing the Monitor*** on page 144.
	Check for defective monitor cables.	Replace cables.
	Defective Frame Grabber PCBA.	Replace Frame Grabber PCBA.
Live video but no stored video.	Defective Frame Grabber PCBA.	Replace Frame Grabber PCBA.
No focus - edge/surface or Ronchi.	Loose cable or poor connection.	Replace the defective cable or restore its connection.
	Defective or damaged integrated video processor (IVP) board.	Replace IVP board.
Autofocus too weak or too strong.	Loose cable, poor or incorrect connection.	Replace the defective cable and/or verify that all connections are correct and secure.

7.5 Identifying Problems with the CPU and User-Interface Components

Before you suspect a serious problem with the CPU, remember that adding hardware and/or software can affect the existing system. Recheck any installations you may have recently performed.

7.5.1 Start-Up and General Performance

Symptom:	Possible causes:
The CPU turns on (i.e., the internal fan and disk drives spin up), but no video or hard disk boot seek.	• Re-seat all cards inside the PC. • Remove all cards from PC except the Defective Frame Grabber PCBA, and reboot PC. In some instances the PC may not be booting because it is being loaded down by a faulty board. • Check the CPU power supply. • Check for CPU logic board failure.
Does not boot from floppy.	• Check associated cables and verify power to the drive. Replace floppy drive if needed.
Does not boot from hard drive.	• Check for data corruption on hard drive. • Check the power and data connections to the hard drive.
Erratic operation after booting.	• Check for dirty edge connectors on cards inside the PC. Clean edge connectors and reseat all cards, and cables. • Monitor power supply and check for sags in voltage. Measure supply voltages with all cards plugged in.
Does not read floppy disk.	• Suspect floppy disk damaged. Reformat disk or try new disk. • Check cabling to drive in PC. Replace floppy drive if needed.

7.5.2 Communications

The serial ports rarely have hardware problems. Almost all problems are external wiring or software issues.

Symptom:	Possible causes to check:
Serial port does not seem to operate.	• Test communications to a second CPU or terminal. • Test com port using Windows 2000 system device menu.
Cannot communicate on network.	• Check for appropriate software drivers. • Check cable termination and length. • Check network card/software configuration. • Check memory allocation.

7.5.3 Joystick

Symptom:	Possible causes:
No movement.	• Check joystick cabling. Replace joystick if needed. • Check stage for holding torque. Stage may be faulted.
Stage moves without input.	• Joystick is out of calibration. Try to move the joystick a small amount to stop the stage motion. Recalibrate and/or replace the joystick.

7.5.4 Keyboard

Symptom:	Possible causes:
No response.	• Check keyboard cabling. Replace keyboard if needed. • Make sure CPU is operating.
Some keys do not work or stick.	• Clean all internal surfaces of keyboard.

7.5.5 Monitor

Symptom:	Possible causes:
No video.	• Make sure the monitor is powered on. • Check the video acquisition and memory cards for failure. • Make sure the CPU is booting and cables are connected properly.
No video, or high pitched squeal and no video.	• Internal circuit or high-voltage breakdown.
Color shift or image not straight.	• Degauss the monitor. • Reduce proximity to nearby magnetic field.
Noise in image or noisy (floating) image.	• Reduce proximity to nearby electric field, including a second monitor. • Screen adjustment pots could be dirty. Turn all pots several times from end to end to clean wipers.
Fixed bars or striped pattern on screen (live video window).	• Reinstall *ini* files from backup diskette. • Confirm that all display settings and drivers are correct.
No live video (Summit 800 program running and lights on).	• See if lights are turned off or if lighting is too low for the part. • Check for broken camera cable.

Service Adjustments

Chapter 8

8.1 What This Chapter Contains

This chapter shows you how to make service adjustments to your Summit 800 system:

Warning: Unless instructed otherwise, always turn off equipment and disconnect it from the main power supply while performing adjustments (see ***AC Power Cable Outlet Lock-Out/ Tag-Out Feature*** on page 10).

Warning: The risk of electrical shock is present any time the covers are removed from the stage. Never remove the covers from the monitor or system power supply, or you expose yourself to high voltage.

Caution: Protect your Summit 800 System from electrostatic damage. Perform these procedures at a static-safe workstation and wear a ground strap. If a ground strap is not available, follow these guidelines:

- Work in an uncarpeted area.
- Before you touch electronic components, discharge static electricity by touching a known-grounded object.
- Do not touch components on printed circuit boards, except as directed.

8.2 Summit 800 Service Adjustments

The following is a list of service adjustments that should be completed on the VIEW Summit 800 if components are repaired or replaced.

Service Adjustment	Purpose	Where to Find Procedure
Monitor	Perform to optimize image.	See ***Adjusting the Monitor*** on page 87.
Camera Rotation Adjustment	Perform if image displayed on system's monitor is not horizontally accurate.	See ***Camera Rotation Adjustment*** on page 88.
Camera Height Adjustment	Perform if a camera tube polarizer has been installed or when the Ronchi focus and Surface focus difference is not within the specified range.	See ***Camera Height Adjustment*** on page 90.
Dual Magnification Optical System Adjustment	Perform on-system alignment.	See ***Dual Magnification Optical System Adjustment*** on page 93.
Ronchi Focus	Perform whenever a critical component within the optical path has been removed and/or replaced.	See ***Ronchi to Surface Comparison*** on page 69.
Ronchi Alignment	Perform when a new Ronchi grid is installed on the system.	See ***Aligning the Ronchi Grid*** on page 102.
Polarization Adjustment	This adjustment may be required depending upon the application being measured. Often the initial adjustment is not satisfactory for some items when the are viewed.	See ***Coaxial Polarizer Alignment*** on page 104.
Autofocus Textured Surface Adjustment	Perform when an auto-focus too weak or too strong message occurs.	See ***Integrated Video Processor (IVP) Adjustment*** on page 105.
Backlight Adjustments	Perform whenever image appears to shift during Z-axis movement or whenever image does not appear evenly illuminated across the field of view.	See ***Backlight Alignment*** on page 109.
LED Lighting Adjustments	To ensure proper light output and concentricity with the system optics. Perform after Z certification or installation of a new PRL.	See ***Adjusting the LED Programmable Ring Light (PRL)*** on page 113.
Motion and Tuning Adjustment	Perform as part of Preventive Maintenance, or when the servo amps, scales, or lead screws are replaced. This adjustment provides smooth stage motion with minimized positioning delays.	See ***Motion Tuning and Adjustment*** on page 123.

8.3 Adjusting the Monitor

To obtain the best display results from the monitor.

1. The monitor control panel is located on the bottom front of the monitor.
2. Press any key on the control panel to activate the On-Screen-Display (OSD).
3. Use the select up or down keys to move up or down through the menu. The parameter will be highlighted when selected. Use the + or – keys to increase or decrease the value of the parameter, or make a selection between different options.
4. Using the OSD, set the horizontal, vertical, brightness, contrast and phase to optimal levels.
5. To quit the OSD screen at any time, press select up and down keys simultaneously. If no keys are pressed for a period of time, the OSD automatically disappears.

8.4 Adjusting the Operator Control Station

The Operator Control Station can be adjusted to your preferred height and rotation. The height and rotation of the Operator Control Station can be adjusted to accommodate either a standing or a sitting position.

Operator Control Station -- height:

1. Loosen the locking knob located on the mount.
2. Adjust the control station to the desired height.
3. Tighten the locking knob.

Operator Control Station -- rotation:

1. Loosen the locking knob located under the monitor/keyboard tray.
2. Rotate the tray to the desired rotation.
3. Tighten the locking knob.

8.5 Camera Rotation Adjustment

Tools Required	Part No.
Allen wrench set	N/A
Straight edge	N/A

The camera rotation adjustment is accomplished by first aligning a straight edge parallel to the travel of the X axis stage and then aligning the camera to the line established by the straight edge.

8.5.1 Aligning a Straight Edge to the MCS

1. Start the Summit 800 software, and zero all stages.
2. Place a straight edge horizontally across the inspection platform.
3. Using the joystick, move the Z-axis downward; and manually focus on the straight edge.
4. In the Summit 800 Stage and Lights menu, adjust the backlight setting to a value that allows you to locate and focus on the edge of the straight edge.
5. Select the crosshair finder, and align the finder to the edge chosen on the straight edge.
6. Using the joystick, move the stage back and forth across the entire travel of the X axis and note the position of the straight edge relative to the cross hairs. Adjust the straight edge position until the edge stays perfectly aligned with the cross hairs while moving across the entire X axis travel.
7. When the straight edge is parallel to the travel of the X axis, secure the straight edge in place. Modeling clay is often used in this procedure.

8.5.2 Aligning the Camera to the Straight Edge

1. Align a straight edge parallel to the travel of the X axis stage (see ***Aligning a Straight Edge to the MCS*** on page 88).

1. Remove the top cover (see ***Removing the Top Covers*** on page 58).

2. Loosen the two L-shaped clamps that secure the threaded camera tube onto the illuminator housing; see ***Figure 8-1***.

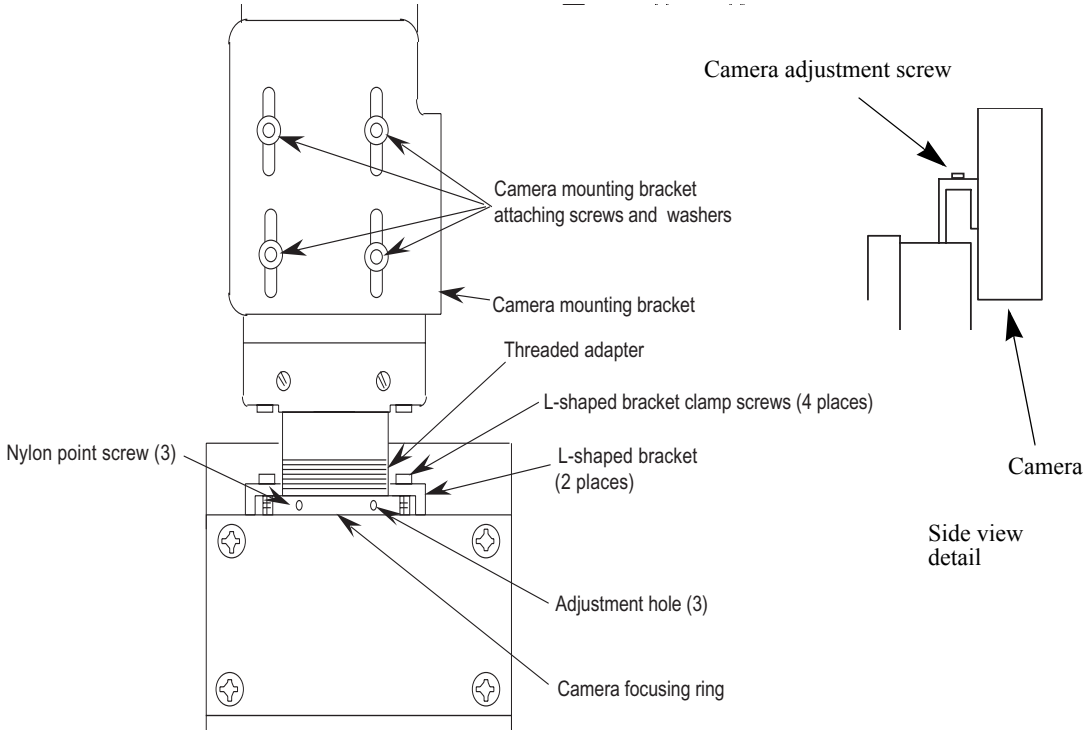


Figure 8-1 Front View of Camera Optics Assembly

3. Loosen, but do not remove, the camera adjustment screw.

4. Rotate the camera until the cross hairs are parallel to the line created by the straight edge.

Note: Do not move the straight edge.

5. Tighten (lightly) the camera adjustment screw, and begin tightening the screws that hold the L-shaped brackets in place. At the same time, visually monitor the image; and ensure that the adjustment is correct until you have secured all hardware.

6. Re-install the top cover (see ***Reinstalling the Top Covers*** on page 70).

Note: Once you complete this procedure, perform the ronchi-to-surface comparison; and make all necessary adjustments; see ***Ronchi to Surface Comparison*** on page 69.

8.6 Camera Height Adjustment

Tools Required	Part No.
High-magnification lens (6.6x)	2107662-501
Allen wrench set	N/A
Part with a flat textured surface	N/A

Note: Always perform the Camera Height Adjustment before aligning the Ronchi and the optics. Any changes to the internal collimating lens will affect the Ronchi and optical alignments.

1. Install the high-magnification lens (6.6x).
2. Turn on the Summit 800 software.
3. Loosen the four (4) camera attaching screws.

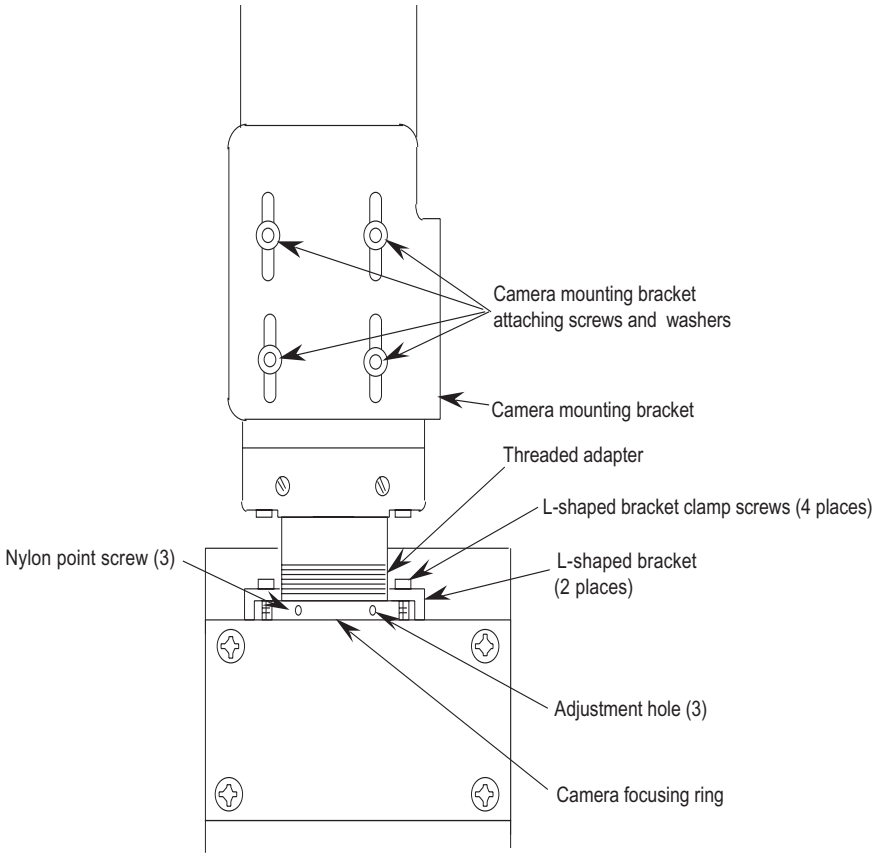


Figure 8-2 Locating the Camera Hardware

4. Loosen one (1) screw on each L-shaped bracket.
5. Loosen a point screw (set screw) in the focusing ring.
6. Place a flat textured surface on the inspection platform.
7. Set the thru lens to a value of 60 in the Summit 800 **Stage and Lights** menu.
8. Select the Autofocus finder.

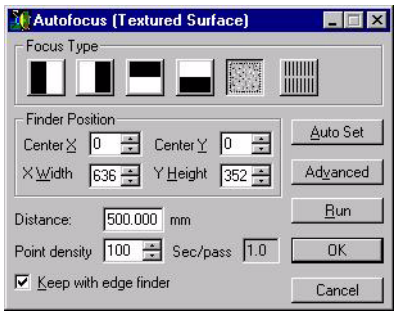


Figure 8-3 Running a Textured Surface Autofocus

9. In the Autofocus menu, select and run the Textured Surface focus.
10. In the DRO window, click the right mouse button, and select Zero DRO from the pop-up.

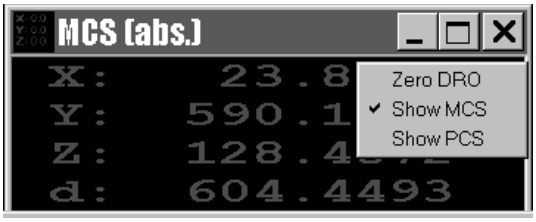


Figure 8-4 The DRO Pop-up Menu

11. In the Autofocus menu, select and run Smooth (project grid) focus; i.e., Ronchi focus.
12. Note the new Z value in the DRO window.
    - If the Z value is *negative* the camera height needs to be raised. Adjust the camera height by rotating the adjustment ring.
    - If the Z value is *positive*, lower the camera height.
13. After the camera height adjustment, run another textured surface auto-focus, zero the DRO, and then run another ronchi focus. If needed, adjust the camera height again. Continue this process until a Z value of less than 0.0002" is achieved in the DRO window.

    Note that small positive value for Z is preferred since the camera height will decrease slightly when the L-clamp screws are tightened.

14. When a value of less than 0.0002" is achieved, first tighten the two (2) L-clamp screws; then tighten the four (4) camera screws.

15. Remove the lens, and set a flat, shiny-surface block under the optics.

16. Turn on the Ronchi, and see if it is sharply focused.

17. If the Ronchi is *not* sharply focused.

a. Loosen the three set screws on the optics tube.

b. Using a small Allen wrench, rotate the internal collimating lens (within the optics tube) until the grid is sharply focused.

c. Gently tighten the three set screws.

d. Install the low-magnification lens (1.6X).

18. Repeat ***Steps 9*** through ***17*** until both the delta Z value is less than 0.0002 inches and the grid looks sharp without a lens.

8.7 Dual Magnification Optical System Adjustment

The Dual Magnification Optical System uses two monochrome cameras on two separate optical paths to provide instant magnification switching under software control. A third optical path is included to provide coaxial (through the lens) illumination and (Ronchi) grid pattern projection for autofocus. This section provides the procedures for on-system alignment of the Dual Magnification Optical System.

8.7.1 Component Location

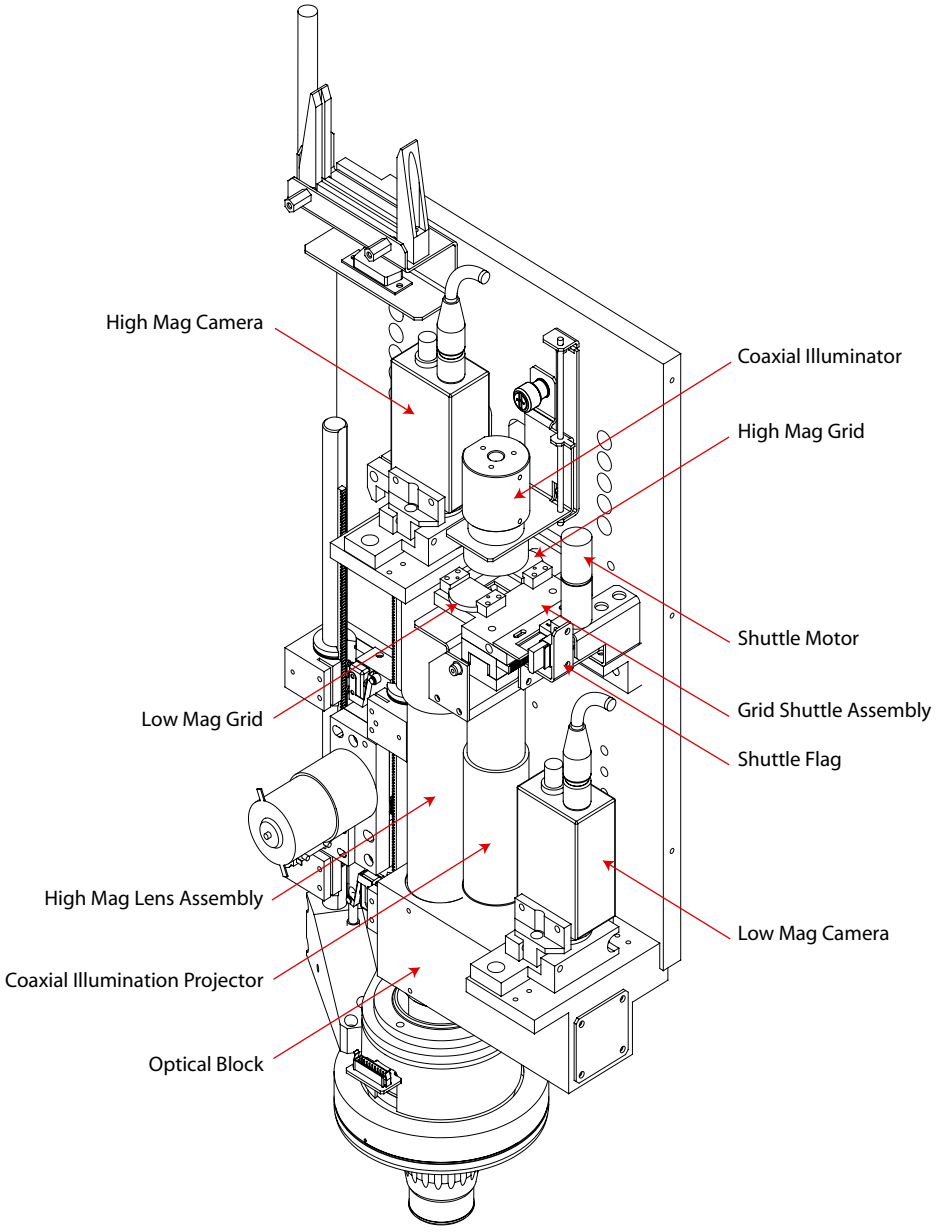


Figure 8-5 Dual Magnification Optical System

8.7.2 Adjustment

1. Set the focus of both cameras. This is a preliminary setting; a more exact focus setting will be performed later.

   a. Place a mirror beneath the lower lens tube of the Dual Magnification Optical System. Do not install an objective lens.

   b. Manually move the Ronchi Shuttle so that the High Mag Ronchi grid is in the optical path (directly beneath the coaxial illuminator). Using the "Stage and Lights" dialog box, turn on the coaxial illuminator; and select the High Mag camera. You should now see the diagonal Ronchi grid in the video window.

Note: The Camera Clamp screw for the High Mag camera is a left-hand thread screw; i.e., turn clockwise to loosen, counterclockwise to tighten.

   c. Adjust the focus of the High Mag camera until best focus is achieved -- loosen the Camera Clamp, and adjust the Focus Set Screw as shown in ***Figure 8-6***.

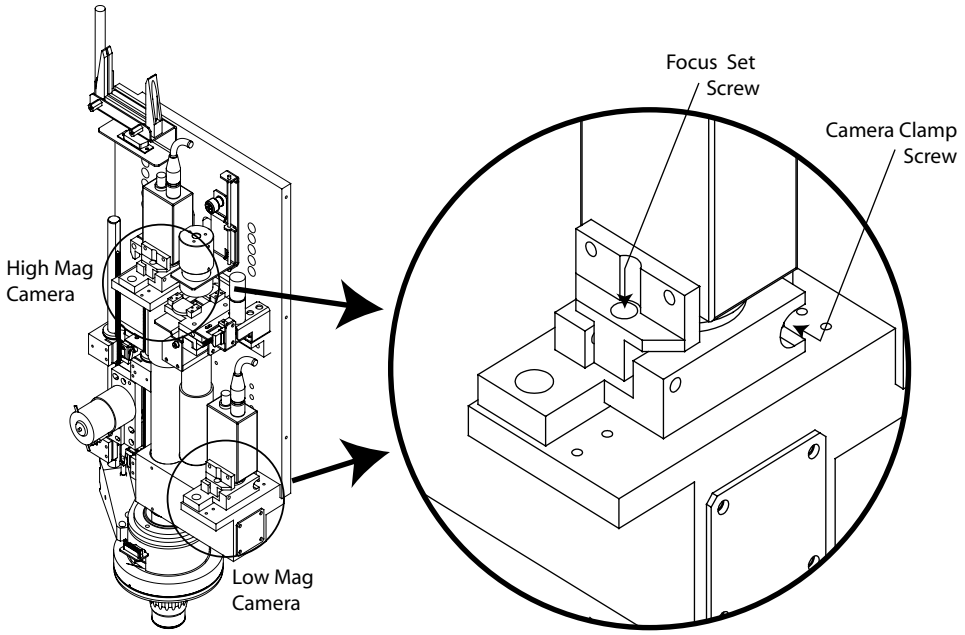


Figure 8-6 Camera Focus Adjustment

   If necessary, find the two focus settings where the image goes out of focus; and set the focus adjustment mid-way between them.

   d. Manually move the Ronchi Shuttle so that the Low Mag Ronchi grid is in the optical path, and switch the video to the Low Mag camera.

   e. Adjust the focus of the Low Mag camera until best focus is achieved -- loosen the camera clamp, and adjust the Focus Set Screw as shown in ***Figure 8-6***. If necessary, find the two focus settings where the image goes out of focus; and set the focus adjustment mid-way between them.

2. Check for dirt in the images of both cameras.

a. Move the Ronchi Shuttle to the center position (between grids).

b. Install a "View 1X" objective lens, and focus on the mirror (dirt or scratches).

c. Set the light level for a reasonably light image, and look for "dark blobs" caused by dust in the optical system. Use the following rules to locate the dust:

- If the dust moves when you move the stage in X and Y, the dust is on the mirror.
- If the blobs do not go out of focus when you move in Z, they are on the camera sensor. You must remove the cameras in a dust-free environment, clean them, and go back to Step ***1***.
- By moving in Z below the focus position, you will be able to focus on dirt on the Coaxial Illuminator (above the shuttle). Clean the illuminator, if necessary.
- By moving in Z above the focus position, you will be able to focus on dirt on the Coaxial Illumination Projector lens. If it is on the upper surface, blow clean air inside the tube to get rid of it.

3. Roughly set X and Y of both cameras, Par-center

a. Par-center the High Mag Camera using a 50x lens and a "View 1X" objective lens. Install a 50X objective lens. Switch to the High Mag camera. Focus on a chrome-on-glass calibration target using Coaxial Illumination. (Do not use the Backlight.)

b. Use X/Y stage motion to center the concentric circles on the target with a circle finder. You can change the diameter of the circle finder, but make certain that the center is at the "X = 0, Y = 0" location.

c. Without moving the calibration target, very carefully switch to the "View 1X" objective lens. Loosen the camera position lock-down screws, and adjust the X and Y direction set screws until the concentric circles are centered again with the circle finder.

d. Repeat Steps a, b, and c above until the concentric circles are centered with both lenses without moving the calibration target. Ensure that the camera position lock-down screws are tightened when finished.

e. Par-center the High Mag Camera to the Low Mag Camera with the "View 1X" objective lens in place and the calibration target still in the same position as in the previous steps. Switch to the Low Mag camera. Loosen the Low Mag camera's lock-down screws, and adjust the X and Y direction set screws until the circles are again centered on the circle finder graphics. (Change the diameters of the finder to aid in centering the circles.) Tighten the camera position lock-down screws when finished.

4. Fine adjust the rotation of both cameras.

   a. With the "View 1X" objective lens in place, obtain a chrome-on-glass scale which is longer than the X length of travel of the system. Switch to the High Mag camera. Position the scale horizontally on the stage, and focus on it using Coaxial Illumination. Display a manual crosshair. Adjust (tram in) the rotation of the scale until no vertical movement can be observed in the video when the stage is moved over the entire X length of travel.

Note: The Camera Clamp Screw for the High Mag Camera is a left-hand thread screw; i.e., turn clockwise to loosen, counterclockwise to tighten.

   b. Once the linear scale has been trammed in and the video is displaying a manual crosshair, loosen the High Mag camera clamp; and adjust the Rotation Set Screws (see ***Figure 8-7***) until there is no observable rotation between the crosshair graphics and the glass scale. Tighten the Camera Clamp when finished.

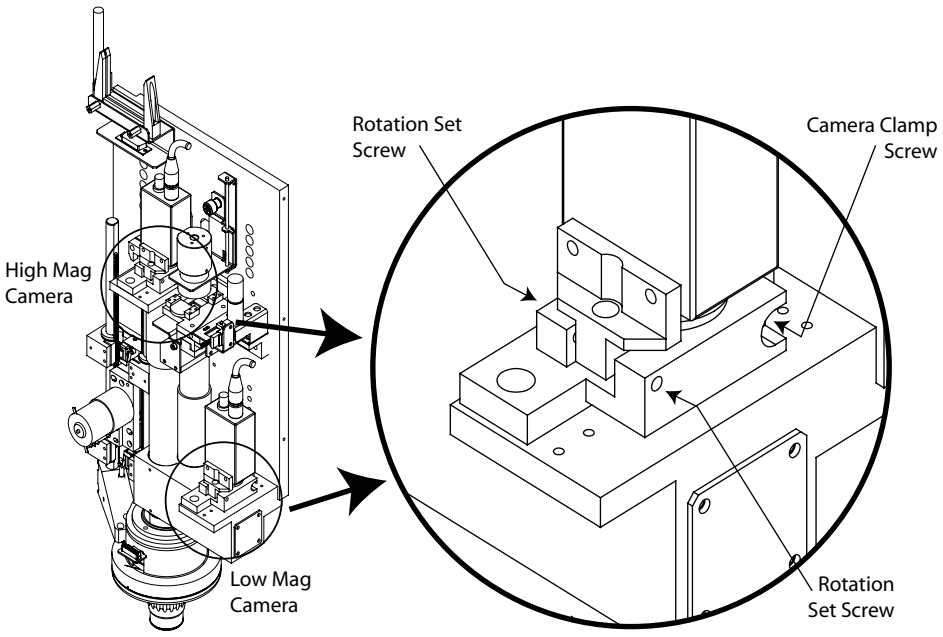


Figure 8-7 Camera Rotation Adjustment

   c. Once the linear scale has been trammed in and the video is displaying a manual crosshair, loosen the Low Mag camera clamp; and adjust the Rotation Set Screws (see ***Figure 8-7***) until there is no observable rotation between the crosshair graphics and the glass scale. Tighten the Camera Clamp when finished.

5. Fine adjust of Low Mag camera's X and Y offset.

a. Install a "View 1X" objective lens, and switch to the High Mag camera. Focus on the chrome-on-glass calibration target using coaxial illumination, similar to Step ***3***. Use X/Y stage motion to center the concentric circles on the target with a circle finder graphic.

b. Switch to the Low Mag camera. Loosen the Low Mag camera position lock-down screws, and adjust the X and Y Direction set screws until the concentric circles are centered again with the circle finder. Switch back and forth between cameras if necessary to ensure that there is no visible X/Y offset between the centers of the two camera images. Tighten the camera position lock-down screws when finished.

6. Changing camera rotation affects camera centering, and vice versa; repeat Steps ***4*** and ***5*** until there are no visible offsets.

7. Inspect/adjust coaxial illuminator, and shuttle window position.

Warning: Adjusting the Ronchi Shuttle requires you to be performing adjustments on powered parts. When the shuttle is powered up, be careful where you place your fingers, and do not allow anyone to move the shuttle (or even use an Autofocus Finder) or access the shuttle electronics or cabling while anyone's fingers are near the shuttle.

a. Using a "View 1X" objective lens, the Low Mag camera, and Coaxial Illumination, manually focus on a mirror. (Dust or scratches help!) If necessary, manually move the Ronchi Shuttle so that the grids are not visible in the image.

b. Inspect the image to see if the Ronchi Shuttle is blocking the light on the left or right sides. If it is, loosen the two shuttle mounting screws, and slide it horizontally to a position where it does not block the Coaxial Illumination. Make certain that the Shuttle assembly remains vertically touching the two precising pins that keep it at a calibrated Z position. Lock down the shuttle mounting screws when finished.

c. Inspect the Low Mag camera image for dark corners (vignetting). (This will be more evident when using a 2/3" camera in the Low Mag optical path.) If the corners are dark, they should at least be equally dark in all four corners. If they are not, try adjusting the X/Y position of the coaxial illuminator by unscrewing the upper and lower halves and repositioning the assembly. If this does not work, either the cameras are not on the optical centerline (try repeating Step ***3***) or there is an internal problem in the optical block assembly.

8. Adjust Shuttle Opto Switch flag and end limits.

a. Using a "View 1X" objective lens, the Low Mag camera, and Coaxial Illumination, manually focus on a mirror again. Manually move the Ronchi Shuttle so that the Low Mag grid is visible in the image.

b. Adjust the Low Mag end limit set screw on the Ronchi Shuttle so that when it contacts the Z back plate, the diagonal Ronchi Grid pattern covers the entire video image without any obstruction.

c. Check to make sure that the Ronchi Shuttle Opto Switch is connected to the Ronchi Shuttle Controller cable. If not, press *E-Stop*, connect it, then reset the *E-Stop* condition. Do NOT connect the Ronchi Shuttle motor yet.

d. Move the shuttle in and out of the Low Mag grid position. The red light on the opto switch should go out when the shuttle is within 3 to 4 millimeters of touching the end limit. If it does not, adjust the opto switch flag.

e. Press *E-Stop*, and connect the motor. Reset the *E-Stop* condition, and watch the shuttle. The shuttle should quickly move to the low-mag grid position, sense the opto switch, then move to the center position.

f. Look at the Low Mag camera image in the View Metrology Software (VMS) video window, and check to see if either of the grids is partially visible at the top or bottom of the screen. Gently push the shuttle back and forth within its center position *dead band*. If you can see either grid starting to enter the video window, adjust the shuttle flag position; see ***Figure 8-8***.

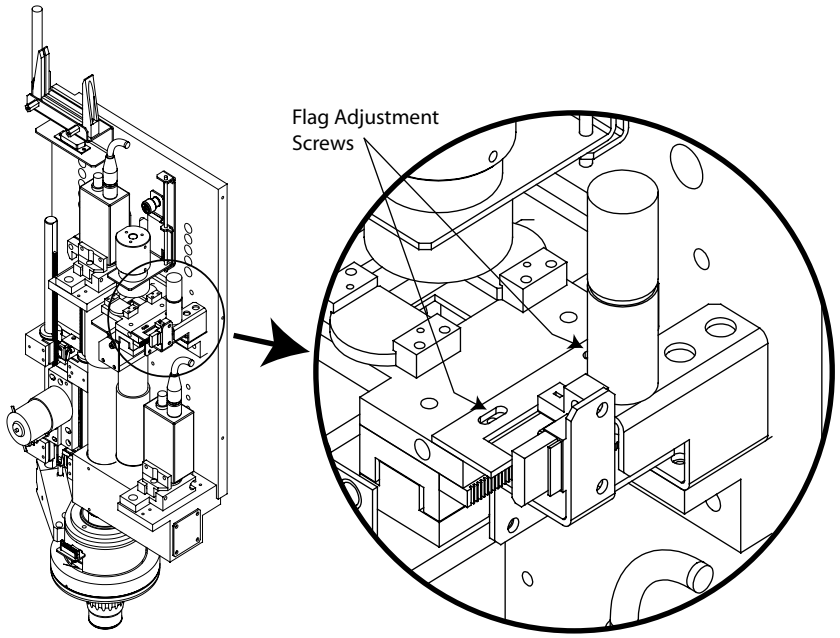


Figure 8-8 Flag Adjustment

g. To adjust the flag position, press *E-Stop*, move the flag, then reset *E-Stop*. The shuttle will re-zero itself. (The shuttle only reacts to the new flag position after moving to the Low Mag grid position, which it does automatically when it powers up.)

h. Select a “Focus Finder” from the VMS video window. Press the “grid” focus button. Verify that the grid is displayed properly. Press the “texture” focus button. Verify that there are no obstructions in the image from the grid shuttle.

i. Switch to the High Mag camera, and press the “grid” focus button. The shuttle should move to the High Mag position. (You may need to move in Z to manually focus the grid image.) Adjust the High Mag grid end travel limit so that it lightly touches the shuttle as it coasts to a stop. When done, there should be a 3 mm to 4 mm dead band.

j. Switch to Ronchi Focus and run autofocus again. The difference between the texture and Ronchi focus positions should be less than 10 microns. If not, unlock the camera clamp on the High Mag camera, adjust the camera focus adjust set screw, and re-run Ronchi autofocus until this measurement is repeatably less than 10 microns.

9. Adjust Ronchi Grid Rotation for Both Grids.

a. The system should be focused on a mirrored surface, displaying the High Mag camera's image with the Ronchi Grid in focus from the previous step.

b. Exit VMS, and start the IVP Diagnostics (version 2.6 or later). Press the "grid" button on the toolbar. When the grid focus utility starts up, select the High Mag camera and press the "Lights…" button. The light will automatically be set to the optimum level for High Mag grid calibration. Exit the "Lights" dialog box when finished.

c. Now select the Low Mag camera, and press the "Lights" button again. The light will then find the calibrated position for Low Mag grid calibration.

d. Unscrew the Coaxial Illuminator anchor screw and lift/swing the Illuminator out of the way for accessing the "Grid Mounting Screws." Loosen all eight screws (four per grid, see ***Figure 8-9***), and move the Coaxial Illuminator back to its functional position.

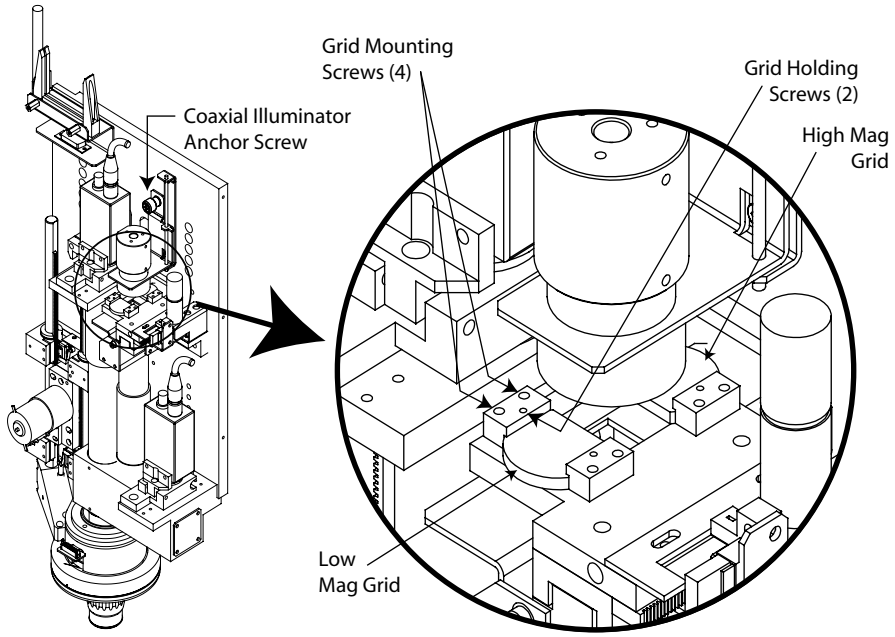


Figure 8-9 Ronchi Grid Adjustment

e. Select the High Mag camera, and while watching the bar graph on the Ronchi diagnostic software, rotate the grid to the position that produces the highest output. When achieved, carefully lock down the grid mounting screws. Check the bar graph position after locking the grid down to ensure they did not move during tightening.

f. Select the Low Mag camera, and while watching the bar graph on the Ronchi diagnostic software, rotate the grid to the position that produces the highest output. When achieved, carefully lock down the grid mounting screws. Check the bar graph position after locking the grid down to ensure they did not move during tightening.

g. Switch between the two cameras and notice the position of the bar graph for each camera. Adjust R34 on the Integrated Video Processor (IVP) so that the half way point between the two levels is centered at the green "good" position on the bar graph. Exit IVP Diagnostics software when finished.

10. Fine adjust High Mag Camera Z. (High Mag Ronchi to High Mag Texture)

a. Start up VMS software, and zero the stage. Calibrate the "View 1X" objective lens using the View Lens Calibration Standard, Model 906 (2110546-1). Calibrate the lens for both the High Mag and Low Mag paths. If using the View 2.5X and View 5X lens, calibrate them also.

b. Using a "View 1X" objective lens and the High Mag camera, do a texture autofocus on the texture on the side of a gauge block. (The grain of the texture should be oriented vertically, and the light should be set to provide good contrast without saturating the video.) Zero out the DRO, and autofocus several times to ensure good repeatability.

11. Fine adjust Low Mag camera Z. (Low Mag Ronchi to High Mag Ronchi)

a. Focus the High Mag camera on a mirrored surface using Ronchi focus. Zero out the DRO, switch to the Low Mag camera, and run Ronchi focus again. This difference should be less than 10 microns.

b. If the difference is greater than 10 microns, unlock the camera clamp on the Low Mag camera, adjust the camera focus adjust set screw, and re-run Ronchi autofocus until this measurement is repeatably less than 10 microns.

12. Re-check the Low Mag Camera's X and Y Offset.

Unfortunately, unlocking the camera clamp and adjusting focus position can affect the X/Y offset between cameras. Check the X/Y centering using the procedure described in Step7. If an adjustment has to be made, you will have to re-run the following steps until all are correct:

Step 4. ***Fine adjust the rotation of both cameras.***
Step 5. ***Fine adjust of Low Mag camera's X and Y offset.***
Step 10. ***Fine adjust High Mag Camera Z. (High Mag Ronchi to High Mag Texture)***
Step 11. ***Fine adjust Low Mag camera Z. (Low Mag Ronchi to High Mag Ronchi)***

13. Inspect/Adjust Backlight

See ***Backlight Alignment*** on page 109.

8.8 Aligning the Ronchi Grid

Tools Required	Part No.
Low-magnification lens (1.6X)	
Allen wrench set	N/A
Small Phillips screwdriver	N/A
A smooth, ground, reflective surface	N/A

1. Remove the top cover (see ***Removing the Top Covers*** on page 58).
2. Install the low-magnification lens (1.6X).
3. Place a smooth, ground, reflective surface on the stage.
4. Using the joystick, move the Z-axis downward; and manually focus on the reflective surface
5. Select the Autofocus Tool.
6. In the Autofocus menu, select Smooth (project grid) focus; i.e., Ronchi focus.
7. Place a jumper across J1 on the Ronchi Driver PC board (see ***Figure 8-10***) to turn on the Ronchi grid; then select the Crosshair finder.

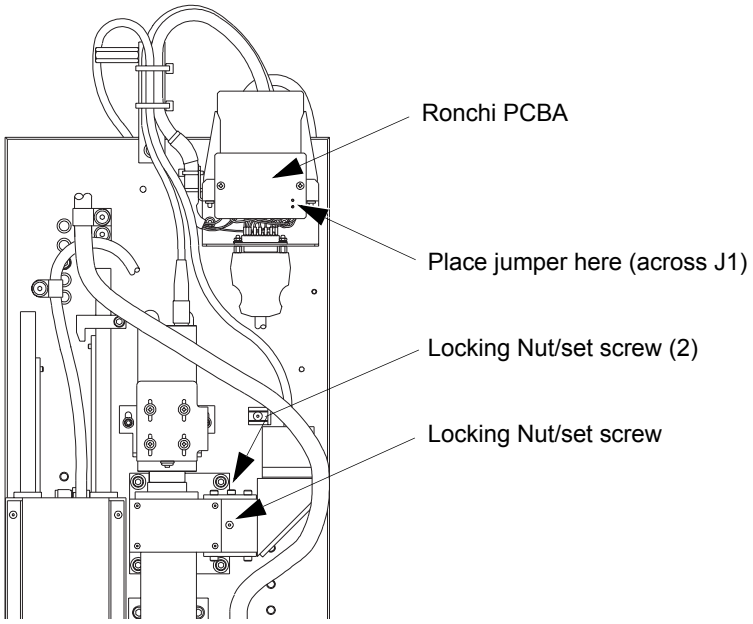


Figure 8-10 Location of the Ronchi Alignment Nut and Screw Assemblies

8. Loosen the three locking nuts -- two on top and one in front; see ***Figure 8-10***.

9. Carefully adjust the set screws so that the notches within the Ronchi grid appear square and centered with the Crosshair finder in the Video (Live) window.

10. Tighten the nuts, and verify that the grid is still square and centered in the Video (Live) window; if not, repeat steps 6 thru 8.

11. Remove the lens, and make sure that the reflective surface is in the field of view and is *flat*.

12. The Ronchi image should be centered in the crosshairs as it was when the lens was installed. If not, the entire optics assembly must be physically aligned by loosening its mounting bolts and moving the optics tube until the Ronchi is properly aligned; see ***Figure 8-11***.

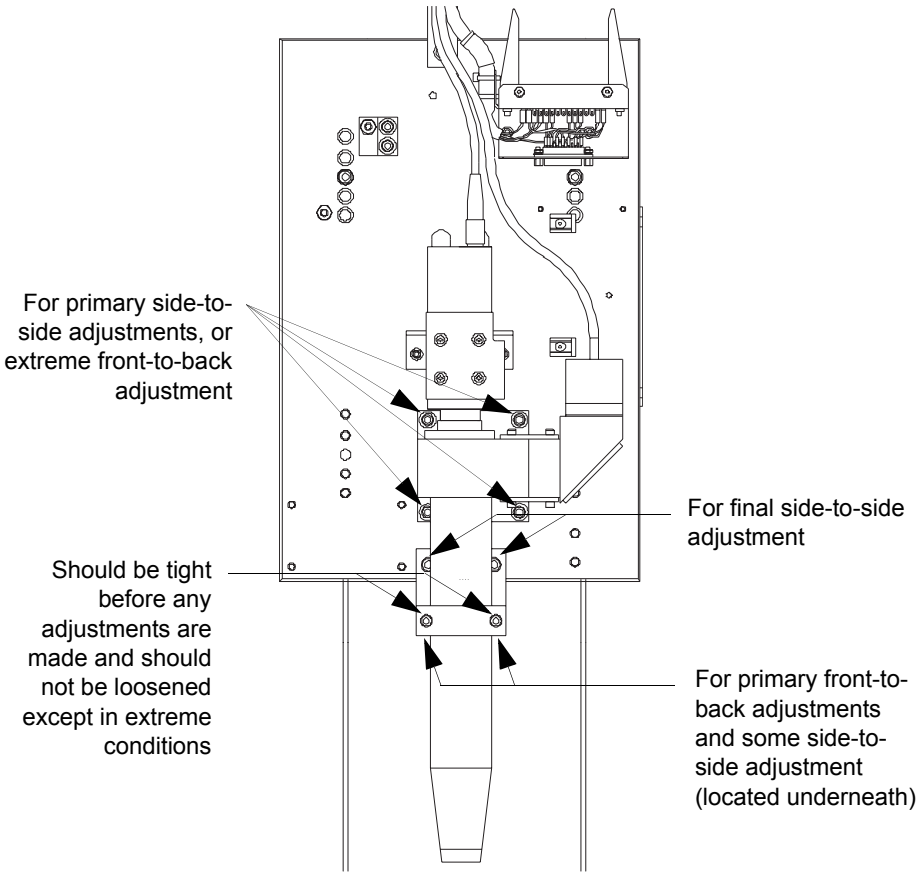


Figure 8-11 Optics Assembly Alignment

13. Once the Ronchi alignment is properly adjusted and looks good without the lens installed, replace the low-magnification lens (1.6X).

14. Repeat ***Step 10*** to recheck the alignment.

15. Re-install the top cover (see ***Reinstalling the Top Covers*** on page 70).

8.9 Coaxial Polarizer Alignment

Tools Required	Part No.
Low-magnification lens (1.6X)	
Allen wrench set	N/A

1. Remove the top cover (see ***Removing the Top Covers*** on page 58).
2. Start the Summit 800 software, and assure the stages are zeroed.
3. Set the Coaxial light to a value of 100, and turn all LED colors on.
4. Place a reflective part on the stage, and manually focus on the part.
5. Adjust the gain value within the Stage and Lights menu until the image is not saturated.
6. Turn on the Ronchi Grid Focus, and focus on the part.
7. Loosen the 0.05-inch set screw that secures the Coaxial Light housing; see ***Figure 8-12***.

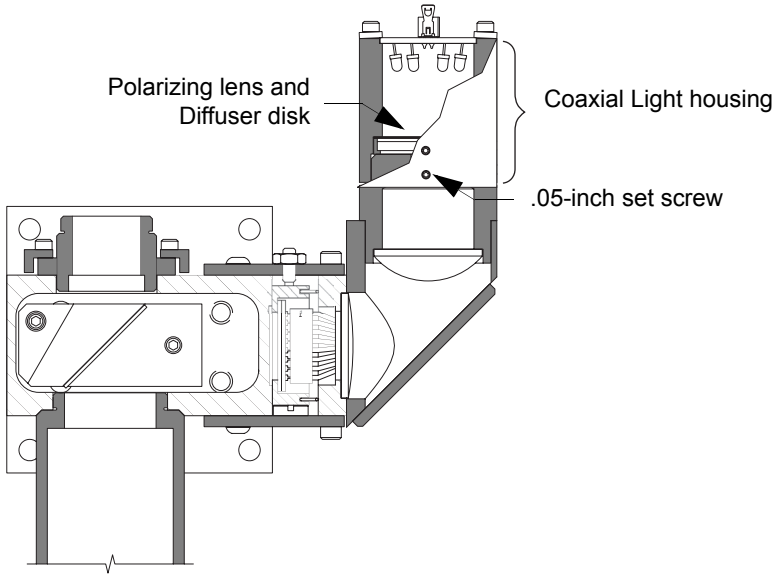


Figure 8-12 Coaxial Polarizer Alignment

8. Rotate the Coaxial Light housing to achieve the highest light intensity while also achieving optimum video image contrast.
9. Tighten and secure the 0.05-inch set screw.
10. Re-install the top cover (see ***Reinstalling the Top Covers*** on page 70).

8.10 Integrated Video Processor (IVP) Adjustment

Tools Required	Part No.
Smooth, shiny part	N/A
Trimpot adjustment tool	N/A

1. Remove the Lower Front Cover, see ***Removing the Lower Front Cover*** on page 60
2. Remove the Computer Cover; see ***Removing the Computer Cover*** on page 60.
3. Locate the IVP PCBA, and note the position of R34 and R37; see ***Figure 8-13***.

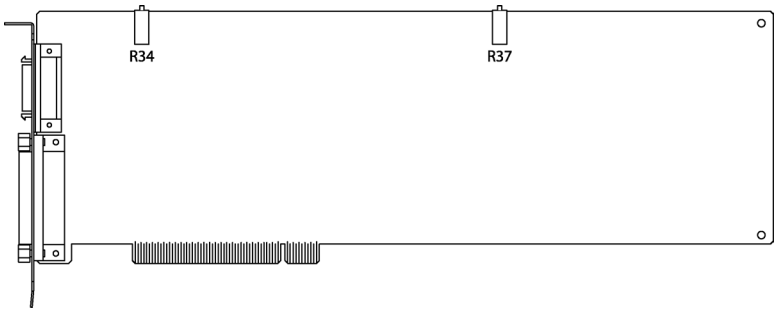


Figure 8-13 IVP PCBA

4. In the Stage and Lights menu, set the thru lens to 100.
5. Place the smooth, shiny part on the inspection platform.
6. Select the Autofocus finder; and in the Autofocus menu, select the Smooth (project grid) focus; see ***Figure 8-14***.

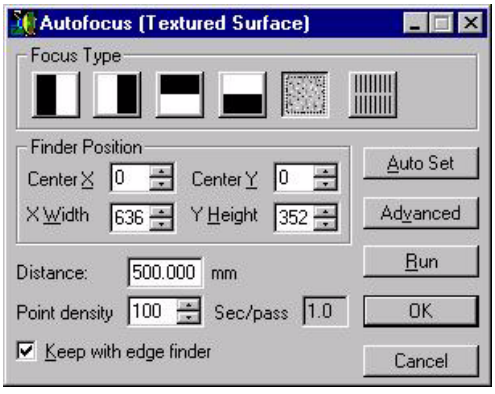


Figure 8-14 The Autofocus Menu

Note: It is assumed that the IVP Diagnostic software has been loaded onto the test system and a 'shortcut' has been created on the desktop to access the diagnostic

7. Run the diagnostic by double-clicking on the IVPDIAG shortcut icon on the desktop.

8. When the Main Screen appears, click on the Select Test button in the toolbar; and observe the Test Selection window; see ***Figure 8-15***.

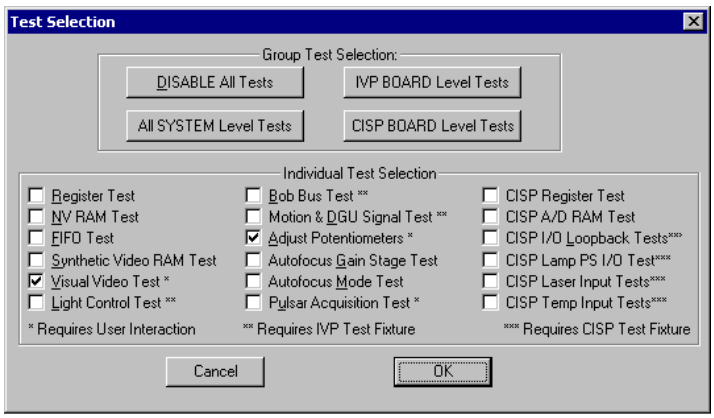


Figure 8-15 IVP Test Selection Window

9. In the Test Selection window, click on the Visual Video Test checkbox and the Adjust Potentiometers checkbox (checkmark = selected).

10. Ckick on OK.

11. Click on the RUN button.

12. Perform Visual Video Test #1.

    a. The program will display a dialog box asking about the presence and quality of a displayed image; see ***Figure 8-16***.

Figure 8-16 Visual Video Test #1 Window

    b. Check for any anomalies such as bad synchronization, poor contrast, etc.

    - If the image visually has no problems, press the Looks Great! button.
    - If the image has a problem, press the Less than Perfect button.

13. Perform Visual Video Test #2.

a. The program will display a dialog box asking about the presence and quality of a displayed image; see ***Figure 8-17***.

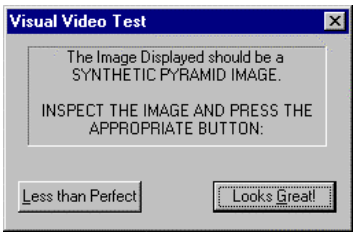


Figure 8-17 Visual Video Test #2 Window

b. The image displayed will be a synthetic image of a pyramid starting with the lowest gray level (black) at the pyramid base and increase in gray levels as you move up to the top of the pyramid until you have the largest gray scale at the top (white).

c. The gray levels should appear uniform and without jumps or steps.

- If the image visually has no problems, press the Looks Great! button.
- If the image has a problem, press the Less than Perfect button.

14. Perform the Adjust Potentiometers test.

There are two trim potentiometer adjustments that must be made during the course of testing the IVP. The tests will show a meter window to allow you to make these adjustments. You do not have to find a voltmeter or hook up any probes, just turn the necessary trim pot the direction the software says to on the screen until it tells you the adjustment is successful.

a. The first adjustment is for the Video Level; see ***Figure 8-18***.

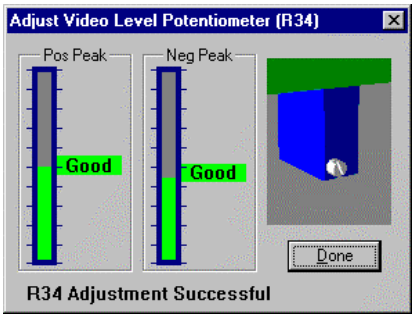


Figure 8-18 Adjust Video Level Potentiometer (R34) Window

Turn Potentiometer R34 in the specified direction until the message “R34 Adjustment Successful” is displayed; and then press the Done button.

b. Click on Continue when the dialog box shown in ***Figure 8-19*** appears.

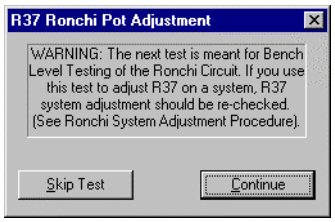


Figure 8-19 R37 Ronchi Pot Adjustment Dislog Box

c. The second adjustment is for the Ronchi Grid; see ***Figure 8-20***.

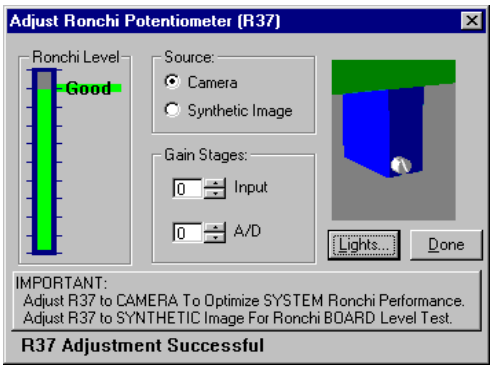


Figure 8-20 Adjust Ronchi Potentiometer (R37) Window

Set the Source to Camera (click on the Camera radio button), and set both Gain Stages to 0. Turn Potentiometer R37 in the specified direction until the message "R37 Adjustment Successful" is displayed; and then press the Done button.

15. Reinstall the Computer Cover, see ***Reinstalling the Computer Cover*** on page 72.

16. Reinstall the Lower Front Cover, see ***Reinstalling the Lower Front Cover*** on page 72.

8.11 Backlight Alignment

Tools Required	Part No.
High-magnification lens (6.6x)	2107662-501
Allen wrench set	N/A
Backlight Alignment Tool	
Piece of white copier paper (used for verification method only)	N/A

8.11.1 Backlight Adjustment

Refer to the following illustration as you proceed through this section:

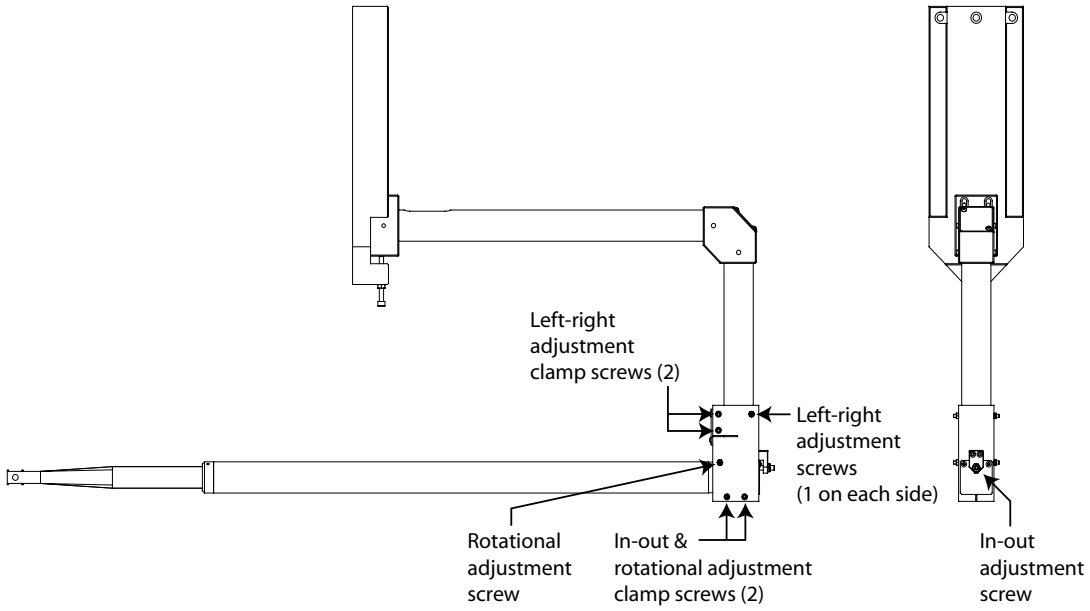


Figure 8-21 Adjusting the Backlight

Note: If the backlight is not properly adjusted, it is probably because its tube has been knocked out of alignment or a screw securing the support bracket is loose. The backlight can only be adjusted for rotation, in-out, and left-right offset errors.

1. Visually check that the backlight is held securely in the bracket. If the tube is loose, tighten the corresponding screw.
2. Install the high-magnification (6.6X) lens.
3. Turn on the Summit 800 system.
4. In the Stage and Lights menu, zero all stages using the Zero Stage command; set the Thru lens and Backlight to 50.
5. Using a piece of white paper and a small pin, make a hole in the center of the piece of paper; and place it on the observation glass.
6. Check that the coaxial light and the backlight are aligned by focusing on the paper.
7. Move the paper to place the pinhole at the very center of the field of view. Ideally, the inner circle (coaxial light) and the outer circle (backlight) should be concentric around the pinhole.

8. Check and assure that there are no offsets in any direction. An offset in any direction indicates that an adjustment is needed.

9. If the backlight is not adjusted properly, you can correct the offset by adjusting the appropriate screws shown in ***Figure 8-22***. Note: loosen the appropriate clamp screws, make to adjustment, and then tighten the clamp screws.

Figure 8-22 Possible Types of Offsets

10. Make all required adjustments by either rotating the backlight tube left or right, or by positioning the backlight tube more toward the front or rear of the system. The vernier adjustment screw is used for adjusting the front-to-back angle of the backlight.

11. When you have finished adjusting the offset and the backlight is adjusted properly, be sure all related hardware is secure; and recheck alignment.

8.11.2 Backlight Verification

1. Start the Summit 800 program.
2. Zero all stages using the Zero Stage command within the Stage and Lights menu.
3. Install the high-magnification (6.6x) lens, and apply its calibration values by choosing the high-magnification lens via the Setup → Lens Calibration menu selections.
4. Using a piece of white paper and a small pin, make a hole in the center of the piece of paper and place it on the observation glass.
5. Using the Stage and Lights menu, set the Coaxial light to a value of 100, and the Backlight to value of 100.
6. Position the X, Y, and Z-axis over the piece of paper and focus on the small pinhole located in its center. Using the crosshair tool often makes centering a bit easier.
7. After focusing and centering on the pinhole look at the pattern displayed on the paper. The inner circle (coaxial light) and the outer circle (backlight) should be concentric as shown in ***Figure 8-23***.

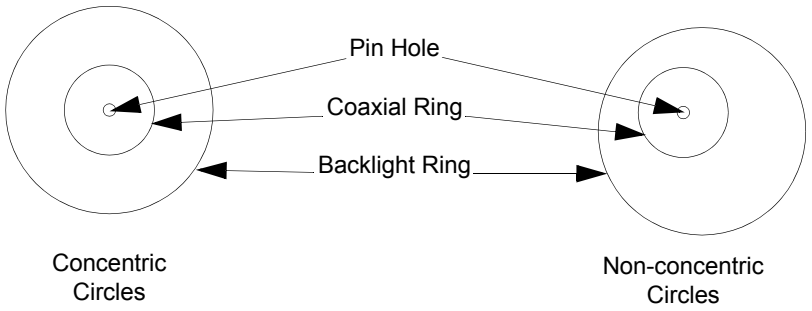


Figure 8-23 Backlight Pattern (paper)

8. If these two circles are not concentric, you will need to perform the backlight alignment procedure (see ***Backlight Adjustment*** on page 110).

8.12 Adjusting the LED Programmable Ring Light (PRL)

This section only applies if your System includes the LED Programmable Ring Light.

Tools Required	Part No.
Allen wrench set	N/A
High-magnification (6.6x) lens	2107662-501
Clean, flat sheet of lined white paper	N/A
1/8” thick plate, 12” square or larger	N/A
Small, flat-bladed screwdriver	N/A

8.12.1 Travel Adjustment

Warning: To avoid injury caused by PRL microswitch triggers, do not operate a microswitch with your finger. Use a small, flat-bladed screwdriver or similar tool to operate microswitches.

This section is used to set the total travel and the upper and lower microswitches of the PRL; refer to ***Figure 8-24*** for component locations.

1. In the Stage and Lights menu, set the PRL to 13. The PRL will be retracted.
2. With the PRL retracted, adjust the bottom microswitch trigger by loosening the set screw and then turning the adjustment screw until the trigger just touches the microswitch.
3. Tighten the set screw.

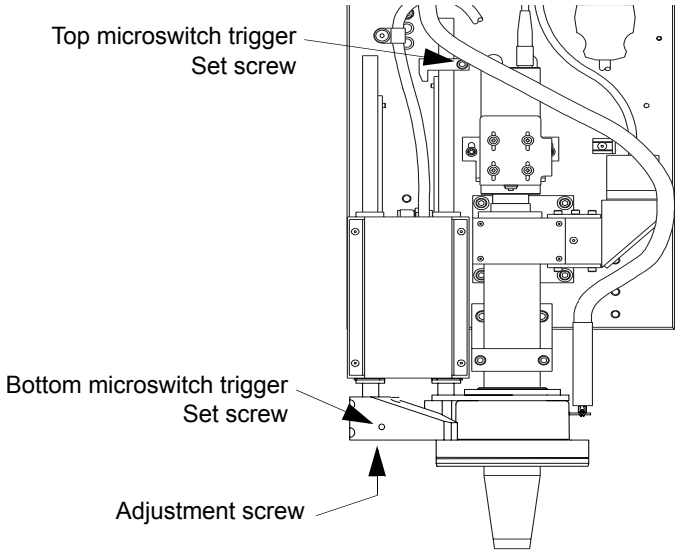


Figure 8-24 Travel Adjustment Set Screw and Adjustment Screw

4. In the Stage and Lights menu, preset the PRL to 164; then set the PRL to 165. At 165, the PRL should oscillate in and out of the top microswitch.
5. If oscillation does not occur:
   a. With the PRL extended (PRL set 165), adjust the top microswitch trigger by loosening the set screw and then positioning the trigger until it just touches the microswitch.
   b. Continue to adjust the top microswitch trigger until the PRL oscillates indefinitely, in and out of the microswitch.
   c. Retract the PRL, and tighten the set screw.
6. Test this setting for oscillation several times (if necessary, repeat step 5).
7. Make sure that the rings do not bind or rub at any position of the PRL.

8.12.2 Height Adjustment

This section sets the absolute height of the PRL rings in relation to the inspection surface.

1. If installing a replacement unit, make sure that the PRL fixture is mounted in the uppermost position allowed by the mounting slots.
2. In the Stage and Lights menu, set the PRL to 164. The PRL will be lowered.
3. Focus the high-magnification (6.6x) lens on the glass surface (Ronchi grid in focus).
4. Place a 1/8-inch thick plate on the glass inspection surface below the lens.
5. Loosen the mounting screws, and lower the entire PRL assembly on the mounting slots until the rings are resting LIGHTLY on the 1/8-inch thick plate (see ***Figure 8-25***). This is to ensure that the PRL rings are parallel to the inspection surface.

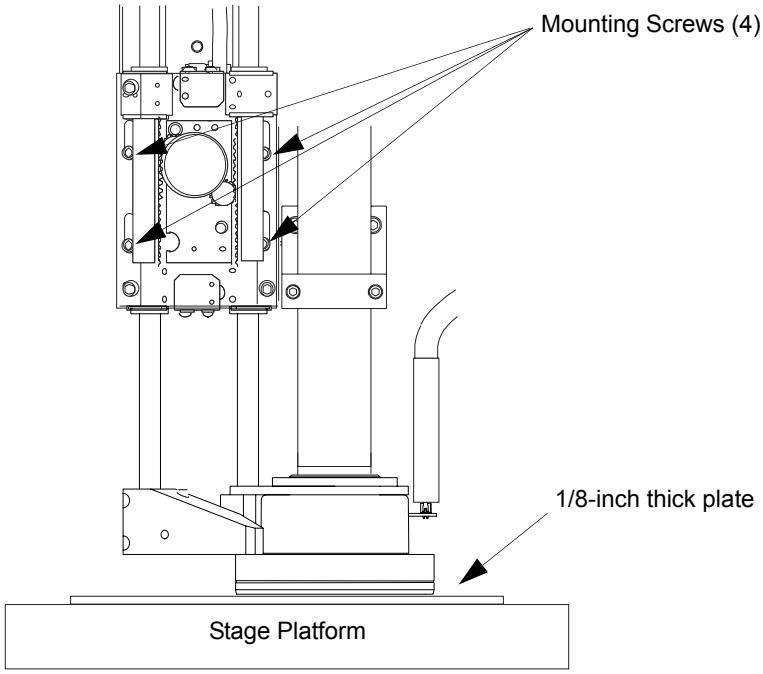


Figure 8-25 Height Adjustment

8.12.3 Ring Alignment

This procedure adjusts the rings in relation to each other and the lens assembly. This is done by looking at the projection of each PRL light on a sheet of paper.

Most PRL assemblies will require only a minor adjustment of the inner ring. Make sure that the rings do not rub or bind.

1. Place a piece of lined white paper to the inspection platform glass.
2. Set the coaxial light color to all.
3. Focus the high-magnification (6.6x) lens on one of the lines on the paper.
4. Set the DRO to zero.
5. Using the manual crosshair, adjust the paper as necessary so that one of the lines on the paper appears in the center of the Video (Live) window and is aligned parallel with the X axis.
6. In the Stage and Lights menu, set the PRL to a position between 13-20.
7. Adjust all four quadrants of the PRL to identical values (above 130 and color set to green).
8. Turn off the coaxial light.
9. Observe the light projection on the paper. The projection of all four quadrants should be symmetrical; if not, center the PRL; see ***Centering the PRL*** on page 117.
10. Turn off the top and bottom quadrants.
11. The light projection resulting from only the left and right quadrants being enabled will cause a shadow in the shape of the intersecting lines (light rings) shown in ***Figure 8-26***.

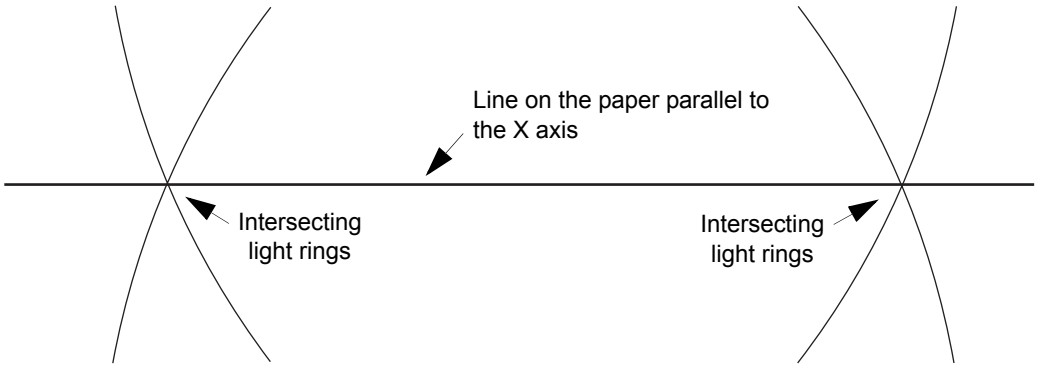


Figure 8-26 PRL Light Projection on Paper

12. Align the “points” of the intersecting light rings on the line on the paper parallel to the X axis. This is accomplished by loosening the inner and outer locking screws and rotating the light assembly; refer to ***Figure 8-27***.

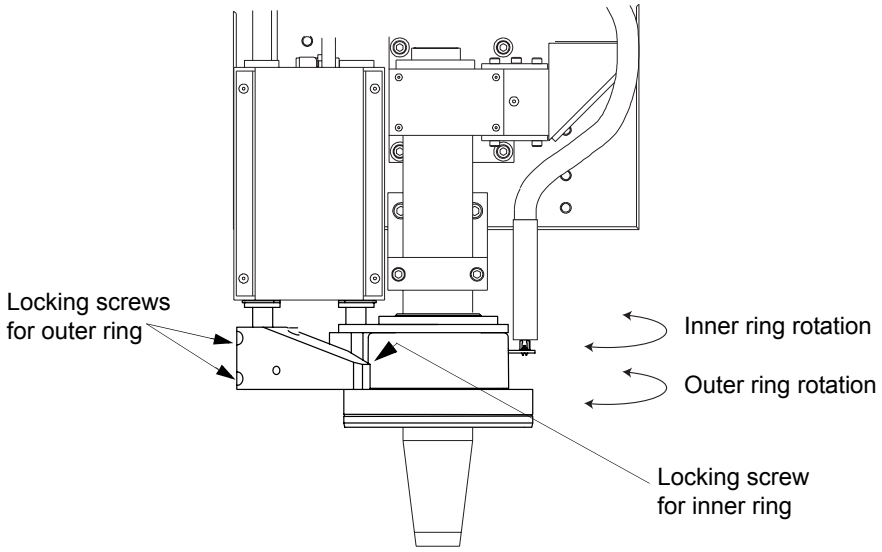


Figure 8-27 Light Assembly Adjustments

13. Set the PRL position to 30.

14. Move the Z axis up at least 6 inches, and remove the lens.

15. Move the Z axis down to the “zero” position (±1 mm)

16. In the Stage and Lights menu, set the PRL position to 164.

17. Adjust all four quadrants of the PRL to identical values (above 130 and color set to red).

18. Observe the light projection on the paper. The center circle of light should be about 2.5 inches in diameter and evenly lit. There should be no “hot” or “cold” spots within this inner circle. If necessary adjust the height of the inner (parabola) ring by loosening the locking screw for the inner ring and moving the ring up or down; see ***Figure 8-27***.

19. Ensure the initial adjustments have not changed by repeating ***Steps 1*** through ***12***.

20. When all adjustments are complete and the desired results obtained, replace all covers and hardware.

8.12.4 Centering the PRL

This section ensures that the PRL rings are centered.

1. In the Stage and Lights menu, set the PRL to 100.

2. Ensure that the toroid and parabolic rings are centered around the lens tube.

8.13 Adjusting the (Optional) Incandescent Programmable Ring Light

This section only applies if your Summit 800 System uses the (optional) incandescent Programmable Ring Light.

Tools Required	Part No.
Allen wrench set	N/A
High-magnification (6.6x) lens	2107662-501
Clean, flat sheet of lined white paper	N/A
1/8” thick plate, 12” square or larger	N/A
Small, flat-bladed screwdriver	N/A

8.13.1 Travel Adjustment

Warning: To avoid injury caused by PRL microswitch triggers, do not operate a microswitch with your finger. Use a small, flat-bladed screwdriver or similar tool to operate microswitches.

This section is used to set the total travel and the upper and lower microswitches of the PRL; refer to ***Figure 8-28*** for component locations.

1. Using the joystick, position the Z axis at mid-travel to allow for movement of the PRL.
2. In the Stage and Lights menu, set the PRL to 13. The PRL will be retracted.
3. With the PRL retracted, adjust the bottom microswitch trigger by loosening the set screw and turning the adjustment screw until the trigger just touches the microswitch; then tighten the set screw.

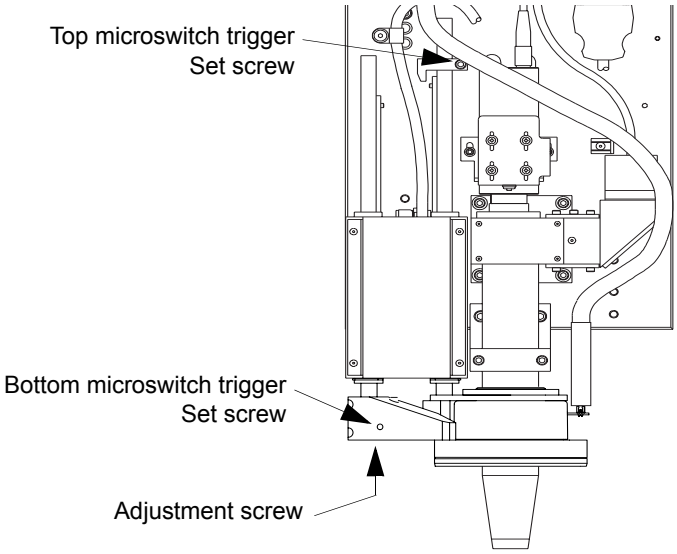


Figure 8-28 Programmable Ring Light (PRL) Adjustment

4. In the Stage and Lights menu, preset the PRL to 164; then set the PRL to 165. At 165, the PRL should oscillate in and out of the top microswitch.
5. If oscillation does not occur:
   a. With the PRL extended (PRL set 165), adjust the top microswitch trigger by loosening the set screw and then positioning the trigger until it just touches the microswitch.
   b. Continue to adjust the top microswitch trigger until the PRL oscillates indefinitely, in and out of the microswitch.
   c. Retract the PRL, and tighten the set screw.
6. Test this setting for oscillation several times (if necessary, repeat step 5).
7. Make sure that the rings do not bind or rub at any position of the PRL.

8.13.2 Height Adjustment

This section sets the absolute height of the PRL rings in relation to the inspection surface.

1. Focus the hi-magnification lens on the glass surface (Ronchi grid in focus).
2. Place a 1/8-inch thick plate on the glass inspection surface below the lens.
3. Loosen the mounting screws and raise the entire PRL assembly, and lightly secure the PRL in the upper position.
4. Using the Stage and Lights menu, lower the PRL to a value of 165.
5. Loosen the mounting screws once again, this time lowering the PRL until the rings of the PRL are resting lightly on the 1/8-inch plate.

   This will ensure that the PRL is parallel to the inspection surface and is safely positioned above the stage platform when positioned at its lowest position of travel.
6. Secure all PRL mounting hardware, and verify clearance without plate in place.
7. Readjust as necessary until there is a 1/8-inch clearance between the parabolic ring and the stage platform at the lowest PRL position.

Caution: Do not push down on the rings; they will bend.

8.13.3 Ring Alignment

This procedure centers the rings in relation to each other and the lens assembly. This is done by looking at the projection of each PRL light on a sheet of paper. Most PRL assemblies will require only a minor adjustment of the inner ring.

Make sure that the rings do not rub or bind.

1. Set the intensity of each of the 4 PRL quadrants to 120; and set the PRL position in the **Stage and Lights** menu to 13.
2. Tape a piece of white paper to the inspection platform glass.
3. Set the coaxial light to a value of 120, and focus on the paper.
4. Draw a 1/16 inch diameter circle around the projection of the coaxial light.
5. Turn off the coaxial light.
6. Observe the light projection; and move the outer ring until the reflected shadow is symmetrical within and around the drawn circle; see ***Figure 8-29***.

   Note that to gain the proper position, it may be necessary to loosen the screws that secure the outer ring to the assembly. Be sure to tighten these screws following adjustment.

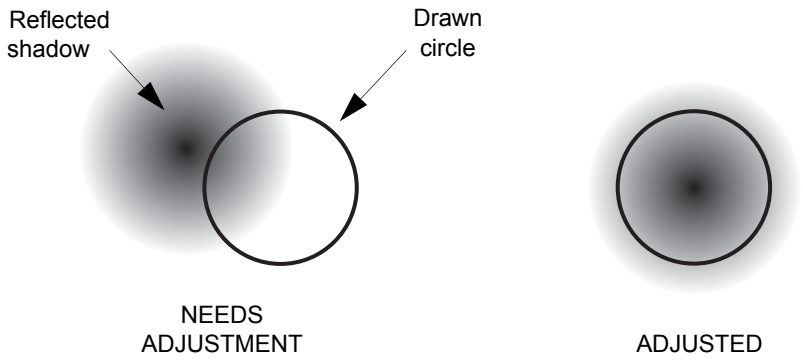


Figure 8-29 Preferred Light Patterns for PRL Alignment

7. If any adjustment of the PRL rings does not give the desired results, check to see that the two rings are parallel to each other and the stage.
8. After any adjustment, ensure that the rings do not bind along the travel of the PRL.
9. When all adjustments are complete, and the desired results obtained, reinstall all hardware and covers.

8.14 PRL Polarizer Installation and Alignment Procedure

1. Install the high-magnification lens (6.6x).
2. Place a piece of white paper on top of the observation platform.
3. Set the ring light to an intensity of 200, and set the color to all.
4. Manually focus on the paper.
5. Set the ring light position to 140, and adjust the camera gain as needed.
6. Run an Autofocus tool.
7. Snap the Polarizer onto the bottom of the PRL assembly, making sure that you do not twist the PRL.
8. Rotate the Polarizer until the intensity is at its brightest.
9. Install the vernier tape such that the center line is just below the dimple on the outside of the PRL mirror; see ***Figure 8-30***.

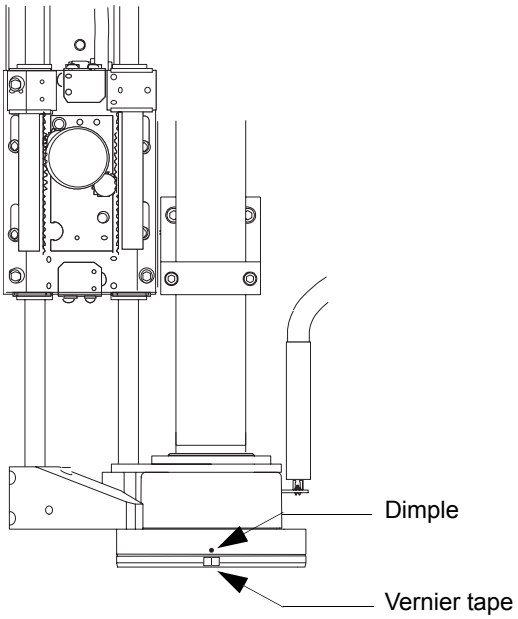


Figure 8-30 Picture of the Front of the PRL

8.15 Motion Tuning and Adjustment

8.15.1 Overview of the Aerotech, UNIDEX 500 Control System

The UNIDEX 500 (U500) system is a combination of the U500 PC bus-based motion control card, the Windows-based Toolkit or MMI interface software, *and various system accessories*. The U500 system provides the control interface with amplifiers, stages, and these accessories to support the View Engineering metrology system.

8.15.1.1 The Aerotech U500 Controller Board

The View Engineering version of the U500 control card uses the PCI bus. This control card is identified with a small label that located on the component side of the board. This label shows the model of the U500 board.

Warning: The following two sections (***8.15.1.2*** and ***8.15.1.3***) apply wherever a **Warning** symbol appears within this manual. Failure to observe these precautions could result in serious injury to those performing the procedures and/or damage to the equipment.

8.15.1.2 Safety Procedures and Warnings

To minimize the possibility of electrical shock and bodily injury, make certain that all electrical power switches are in the off position prior to making any electrical connections. To minimize the possibility of electrical shock and bodily injury when any electrical circuit is in use, ensure that no person comes in contact with the circuitry. When this controller is functioning within a system, mechanical motion will occur. Care must be exercised that all personnel remain clear of any moving parts. To minimize the possibility of bodily injury all electrical power switches should be de-energized prior to making any mechanical adjustments.

8.15.1.3 Handling of the Controller System Electronic Boards

Before touching any View Engineering systems electronics board, be sure to observe the electrostatic discharge precautions listed below. Several components on these boards are sensitive to static electricity. To greatly reduce the possibility of board damage due to electrostatic discharge, adhere to the following precautions.

- Make certain that anyone handling any system board (or any associated components) uses a properly grounded static strap.
- Handle all system boards, by their edges and/or mounting brackets. Avoid touching board components and edge connectors.
- Do not slide any system board over any surface.
- Avoid plastic, Styrofoam, or vinyl in the work area.
- Static charge buildup should be removed from an object by touching the object to a properly grounded piece of metal.

8.15.2 Introduction

This chapter explains how to install and run the MMI software for the View Engineering metrology system. It also discusses preliminary considerations prior to enabling an axis, identifies a necessary set of safe machine operating parameters and provides servo control loop gain parameters sufficient for normal machine operation. Important software configuration information is included.

The main U500 MMI/Toolkit screen is the primary interface between the user and the controller for the stages of the machine.

Figure 8-31 illustrates the main U500 MMI/Toolkit screen. Reference to this figure is made throughout this manual.

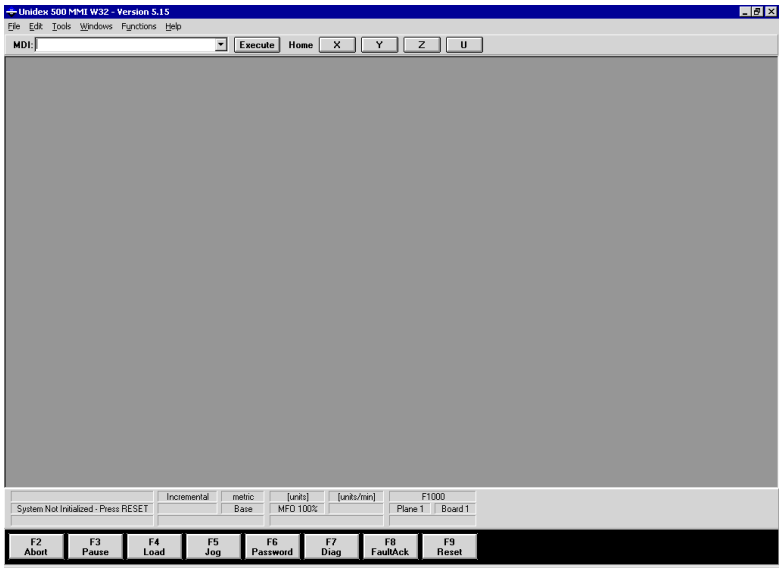


Figure 8-31 Menu of the initial U500 MMI/Toolkit screen.

8.15.2.1 Standard Installation Using Windows

To properly install the MMI software, the operator must follow the steps listed below:

1. Start Microsoft Windows NT 4.0 or 2000 Professional.

2. Place the MMI program CD in your CD-ROM drive.

3. Select Run from the Start menu.

4. Run the setup program (setup.exe) from the WINNT subdirectory on the CD-ROM.

5. Verify that PCI installation is selected from list when prompted. The program group called U500 MMI is created.

6. Power down the PC and insert the U500 card if not already in place.

The MMI CD-ROM disk also contains additional files such as machine specific parameter (*.PRM) files, firmware code files (*.JWP), and GUI setup (*.PRG) files. Refer to ***Table 8-1*** for the correct machine specific file for the installation. The installation program automatically creates a default project (named *.PRJ) file that captures necessary file names and locations required when using the U500 MMI program to interface with the machine.

Once the device driver is properly configured, start the U500 MMI software. All Aerotech controlled machines require the use of MMI version 5.15 files. Use of versions prior to version 5.15 will not function properly.

Verify that the correct MMI version, project file, parameter file, firmware file and current directory agrees with the U500 MMI "Help – About" screen shown in ***Figure 8-32***. To access this screen, click the "Help" button of the main U500 MMI/Toolkit screen, ***Figure 8-31***, followed by clicking the "About" button of the pull-down menu.

Project and Parameter files must agree with those in ***Table 8-1***.

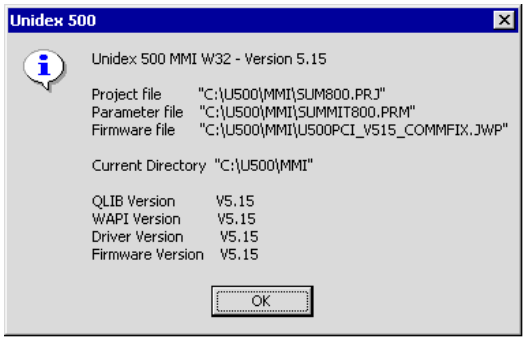


Figure 8-32 U500 MMI "Help – About" Screen

8.15.2.2 Verifying Proper MMI Program Setup

Before resetting the U500 card, make sure the project file is set up correctly.

1. Select "Project" from the "Edit" menu of the main U500 MMI/Toolkit screen, ***Figure 8-31***.
2. Observe the Edit Project File window; see ***Figure 8-33***.

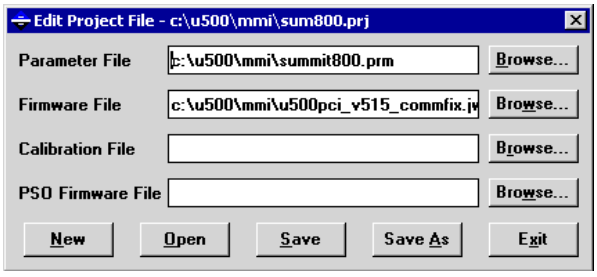


Figure 8-33 The Edit Project File Popup

3. Ensure that the parameter file defaults to the Project and Parameter files listed in ***Table 8-1***. .

Table 8-1 Project and Parameter Filenames for Summit 800

Project Filename	Parameter Filename
C:\U500\MMI\SUMMIT800.PRJ	C:\U500\MMI\SUMMIT800.PRM

4. Make any corrections necessary and save the project file.

5. Next hit the F9-Reset key. This downloads the software to the U500 board and the card should be ready for use. Following a Reset, the software should display the Axis Position window, as shown in ***Figure 8-34***.

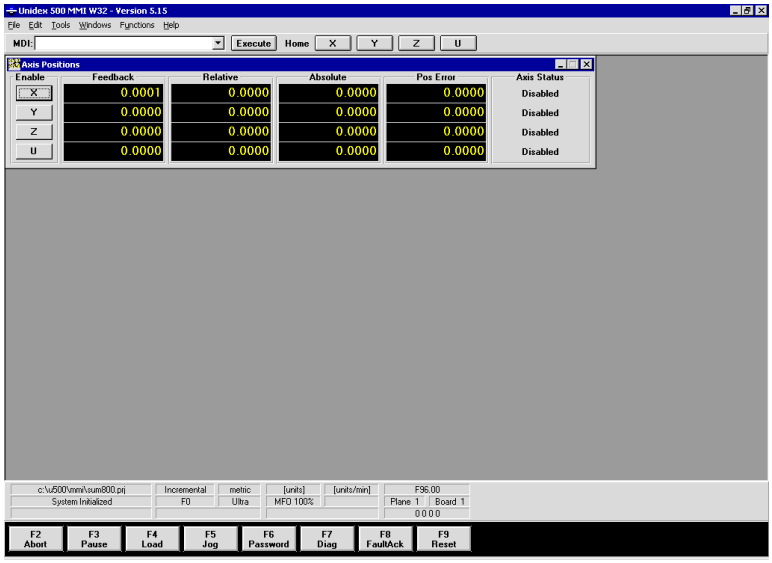
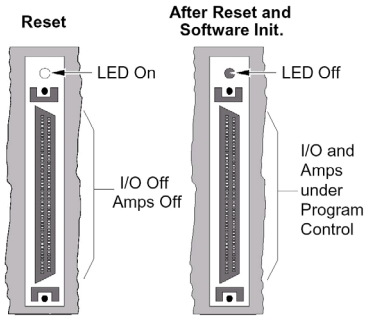


Figure 8-34 The Axis Position Window



A green LED above the PCI board connector, when illuminated, indicates that the controller is running. When off, the controller is in the reset state. If the LED does not come ON or if it stays ON following software initialization, the device driver is not running or the incorrect firmware file has been specified. Also insure that the board is seated properly in the PC and the installation procedure was followed correctly.

If the LED does not come ON or if it stays ON following software initialization, the I/O address is probably not set correctly. Refer to the Troubleshooting section of this manual for help.

8.15.2.3 Feedback Verification Process

Prior to enabling any axis, the feedback from the motors may be verified using MMI diagnostics. The U500 PCI card must be initialized. Display the diagnostic screen by selecting the Diagnostics option from the Tools drop down menu (See ***Figure 8-35*** and ***Figure 8-36***).

For Summit series machines a second diagnostics screen is accessed from the "File" menu drop down. Refer to the Axis Position display in the lower left corner of the diagnostics screen(s). The tracking display should be stable while the axis is stationary. Slight variations with high-resolution systems are normal.

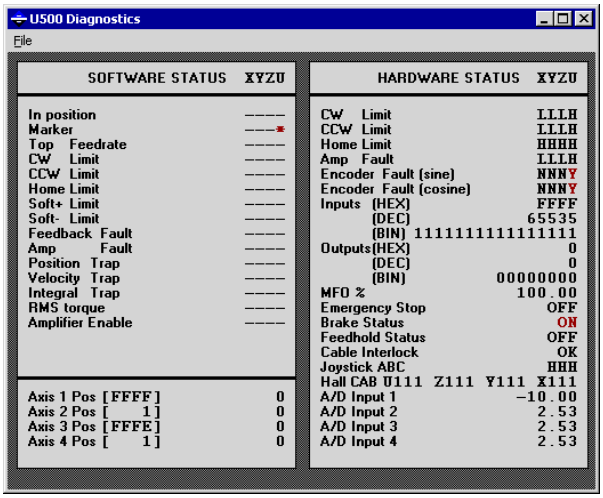


Figure 8-35 Diagnostics Screen I.

Feedback phasing may be verified by manually moving the motor rotor (or linear forcer) with respect to ground. Clockwise/counterclockwise rotation should produce an increasing/decreasing display in the diagnostic window. If not, feedback phasing is incorrect. Motor direction (clockwise or counter-clockwise) is referenced by "looking into" the shaft end of the motor. For linear motors, motion away from the motor wires should result in increasing feedback.

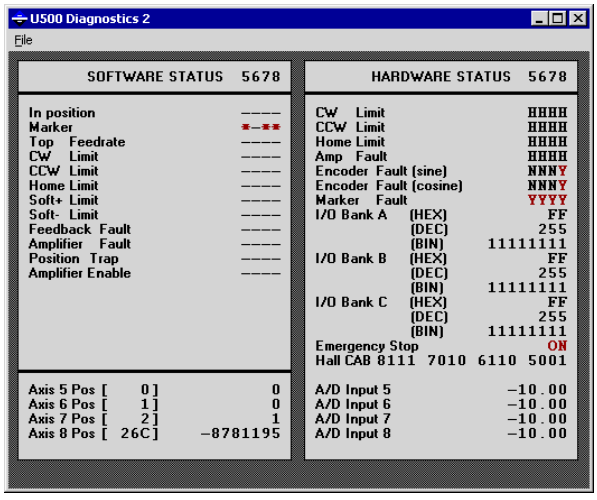


Figure 8-36 Diagnostics Screen II (Used with Summit Series).

8.15.2.4 Stage Limit Verification

Warning: To prevent the possibility of personal injury or possible damage to the equipment, do not enable the axes until the limits are working properly.

Limit verification is extremely important in the startup of the U500 system. Improperly configured limits can cause damage to system components and can pose safety hazards to operators and others. Limit verification requires disabling the axis, manually engaging each limit, and then checking the state of that limit input using in diagnostic window; see ***Figure 8-35*** and ***Figure 8-36***.

The diagnostic window will display the state of limit inputs as either an H (for “high”) or an L (for “low”). Normally closed limit switches go from low to high when activated. Normally open limit switches go from high to low when activated. If no change is observed, the limit system is faulty.

8.15.2.5 Preliminary Servo Loop Setup

In the most general sense, control loops are systems that create output signals based on input signals and a series of servo gains that define the output over a variety of input criteria. These gains are tailored to each machine series. Modifications to the servo control loop gain parameters should not be required under normal machine conditions. All View Engineering systems use standard servo gain parameter settings recorded in the appropriate parameter file for the machine. Any change to these standard machine parameters requires coordination with View Engineering Inc.

In the U500 MMI system, there are five tuning parameters associated with each axis. Verify that the servo tuning parameters are properly configured prior to enabling the axis. ***Table 8-2*** lists the standard servo loop tuning parameters by both View Model and axis.

Table 8-2 Standard Control Loop Gain Settings for Summit 800

Axis	Position Loop Gain K_{pos}	Integral Gain K_i	Proportional Gain K_p	Velocity Feed Forward V_{ff}	Acceleration Feed Forward A_{ff}
X	150	1800	42000	10320	150
Y	190	1600	32000	10320	200
Z	33	2200	17000	102	0

8.15.2.6 Error and Trap Mechanism Settings

Error Limit and Trap parameters are a part of the U500 error checking and safety monitoring system. The Error Limit parameters define limits to real time measurements required to provide safe machine operations. With the “Fault Tab” settings, given in ***Table 8-4***, machine operation is restricted to dynamic operations falling within the limits given in ***Table 8-3***. Verify that both the Error Limit parameters and the Fault Tab settings are properly implemented prior to releasing the machine for use.

Table 8-3 Error Limit Parameters for Summit 800

Param #	Description	Axis	Summit	Notes
118	Maximum Velocity Error [a]	X	1016	Limits difference between actual stage velocity and program velocity
218		Y	1016	
318		Z	508	
119	Maximum Position Error [a]	X	6350	Limits difference between actual stage position and program position
219		Y	6350	
319		Z	6350	
148	RMS Current Trap [b]	X	60	Sets an RMS current level limit for the time interval setting given
248		Y	60	
348		Z	60	
149	RMS Current Sample Time [b]	X	1000	Sets the time interval use to establish the RMS current level
249		Y	1000	
349		Z	1000	
153	Clamp Current Output [c]	X	70	Limits the magnitude of the command voltage to the drive amplifier
253		Y	70	
353		Z	50	

a. These parameters set error flags for machine motions that fall well outside of normal machine operation. With the “Fault Tab” parameters set, see ***Table 8-4*** “Fault Tab Settings”, stage motion will halt.

b. Servo control loop commands that would generate drive current levels exceeding the RMS current level settings indicate degradations in stage performance. With the “Fault Tab” parameters set, see ***Table 8-4*** “Fault Tab Settings”, stage motion will halt.

c. Servo control loop commands that would generate drive current levels exceeding the peak current level setting are clipped to the level specified by this parameter. This action may result in errors limits for type errors.

Fault Tab parameters define the actions resulting from exceeding the values set by the Error Limit parameter settings. The Fault Tab parameter settings given in ***Table 8-4***, “Fault Tab Settings”, may be modified for purposes of diagnosing abnormal machine behavior, machine repair and maintenance or initial machine start-up.

Release of the system for use requires that both the Error Limit parameters and the Fault Tab Setting parameters are identical to those shown in the tables. View Engineering software will not function if either set of parameters is incorrect.

Table 8-4 Fault Tab Settings for Summit 800

Param #	Description	Axis	Summit	Notes
155	Global Fault Mask	X	FFFFFFF170FF	Enables or disables detection of all error conditions
255		Y	FFFFFFF270FF	
355		Z	FFFFFFF420FA	
156	Disable Axis	X	FFFFFFF0EE87	Disables the axis amplifier and the servo control loop
256		Y		
356		Z		
160	Abort Motion	X	FFFFFFF18E78	Decelerates the axis to a stop
260		Y		
360		Z	FFFFFFF48E78	
161	Enable Brake	X	FFFFFFF00000	Activates the brake circuitry function
261		Y		
361		Z	FFFFFFF04080	

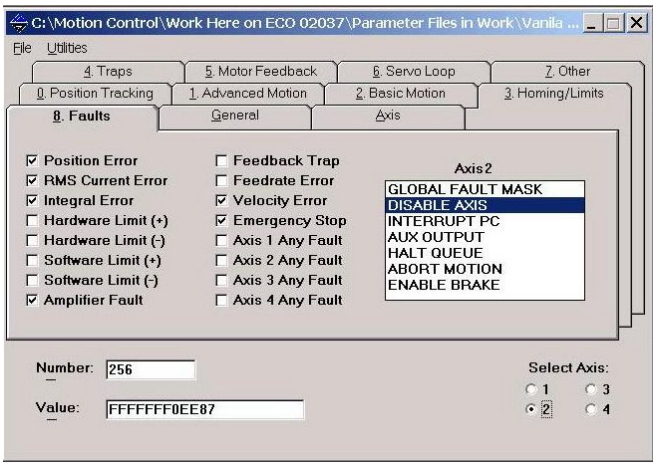
Figure 8-37 through ***Figure 8-40*** show the U500 MMI parameter editing tool screens for the FAULT TAB parameters as required in a delivered View Engineering machine. These figures are included to facilitate verification of these parameters.

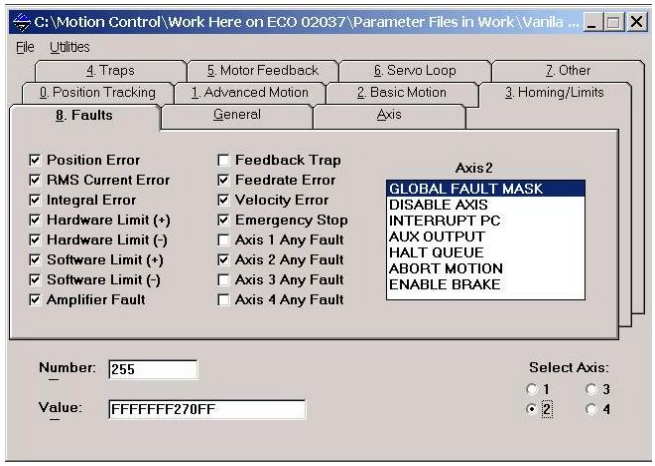
General parameter number 99 configures the system to use the correct Hall device and encoder input channels according to the type of control used for the system. This parameter must be set to “8” for the Summit series of View Engineering machines.

The axis specific parameters for “Servo Loop Type” must be set according to ***Table 8-5***.

Table 8-5 Servo Loop Type Parameters for Summit 800

Param #	Description	Axis	Summit	Notes
178	Servo Loop Type	X	4	Controls servo loop configuration for velocity feed forward (V_{ff}) sensitivity
278		Y	4	
378		Z	0	





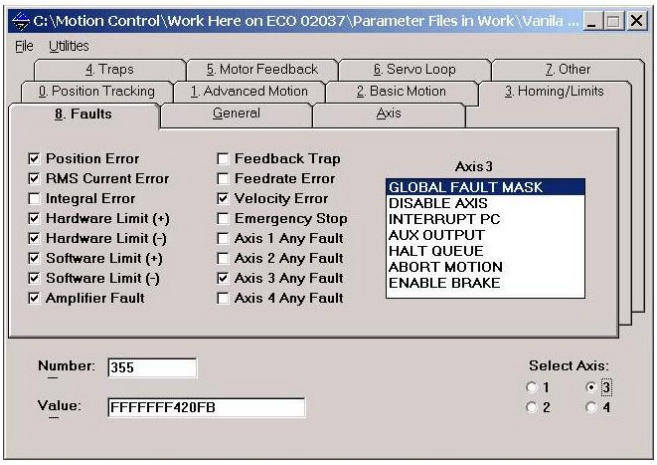


Figure 8-37 Global Fault Mask Settings

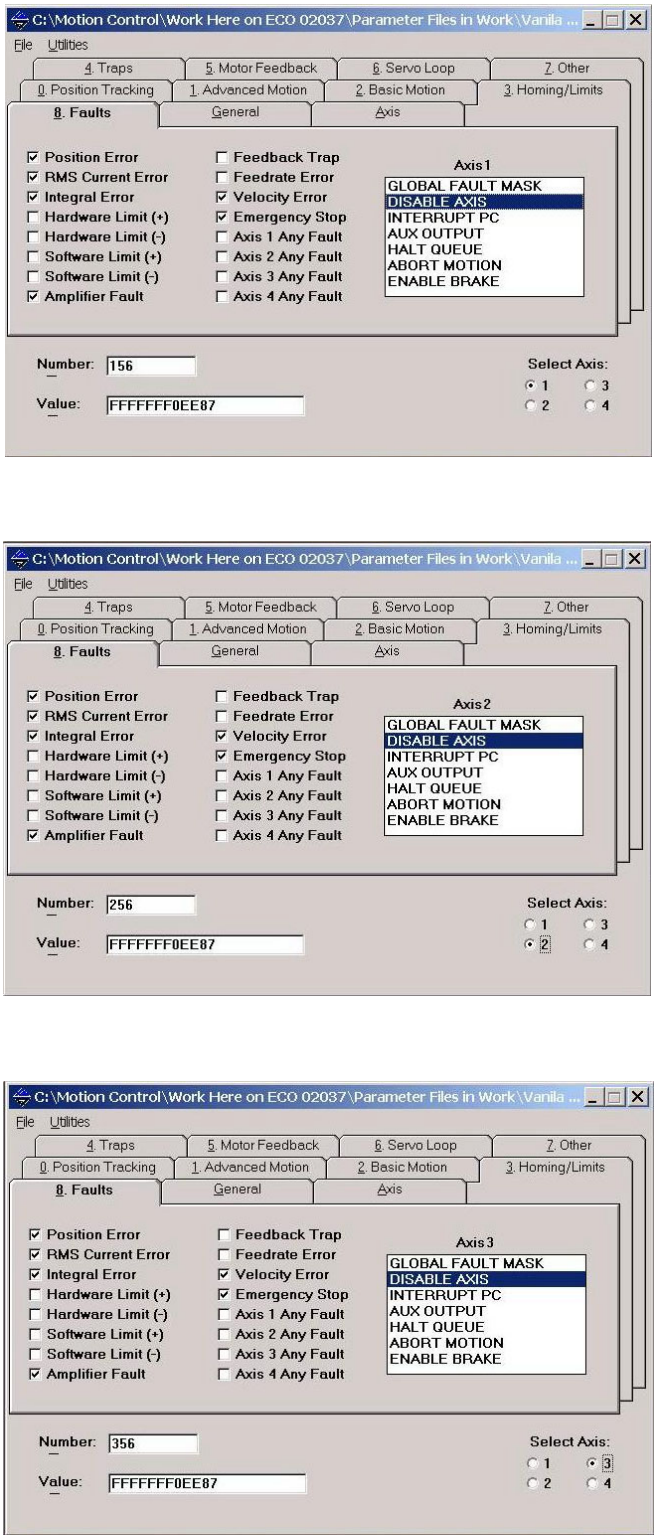


Figure 8-38 Disable Axis Parameter Settings

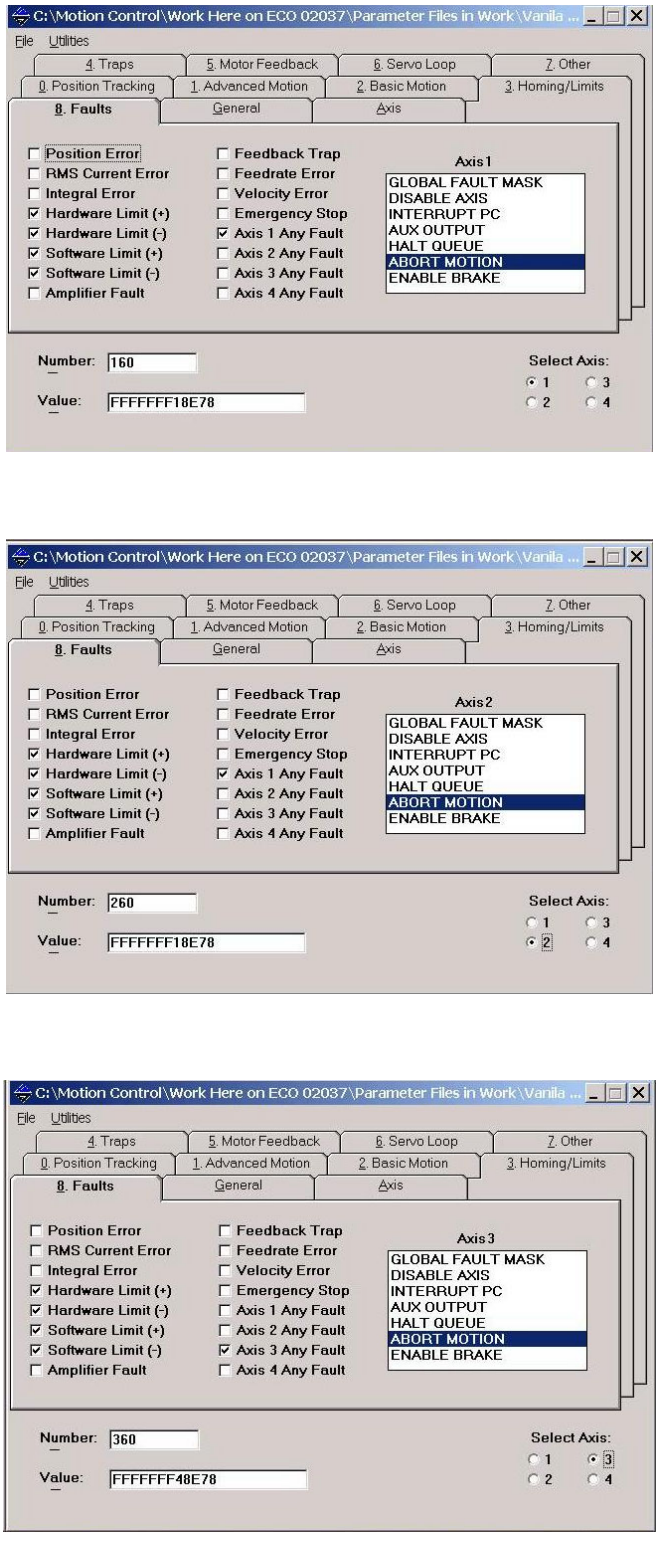


Figure 8-39 Abort Motion Parameter Settings

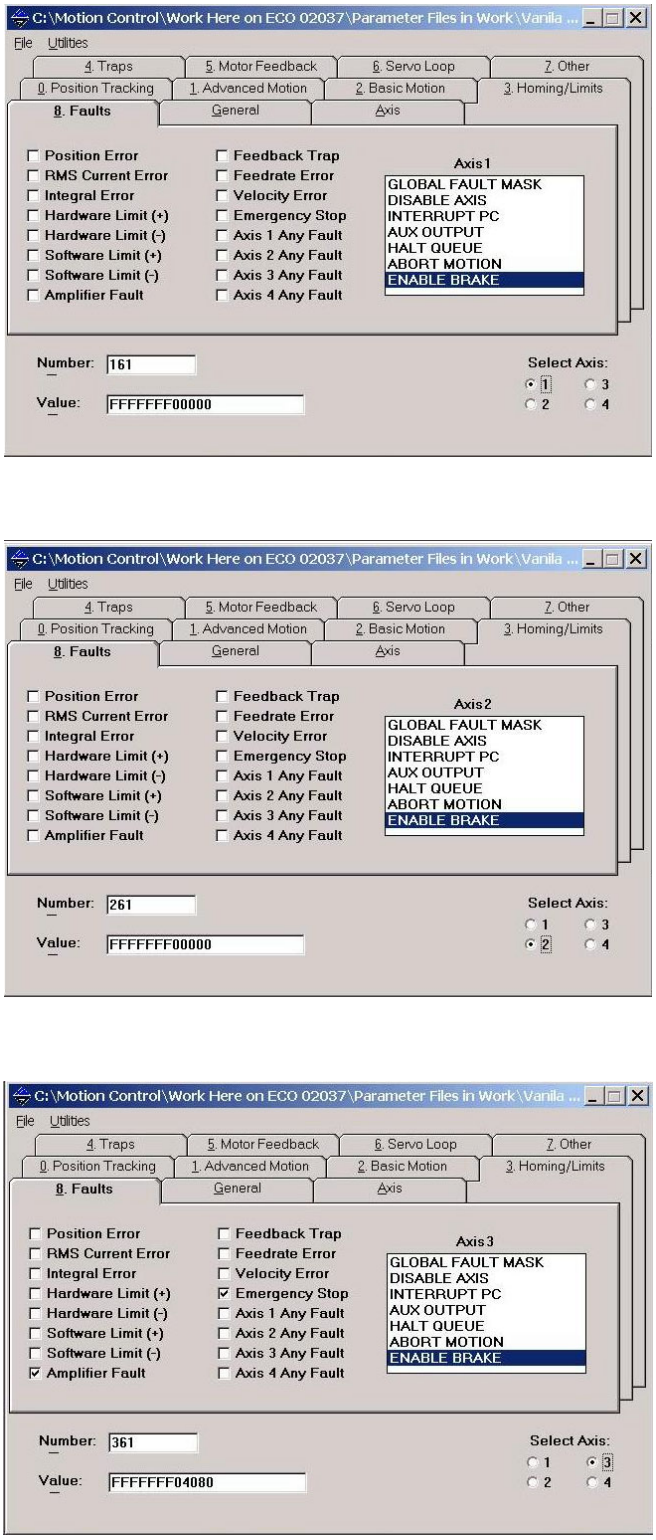


Figure 8-40 Enable Brake Parameter Settings

8.15.3 Machine Performance Verification

All servo control loop parameters are optimized for the specific View model by axis. These parameters are shipped with the specific machine and should not require modification. Degradation in machine performance or modifications to components within a specific machine may necessitate changes to the parameters defined in ***Table 8-2***. Any modification to these parameters requires coordination with View Engineering's Service Department.

8.15.3.1 Introduction to the U500 MMI Diagnostics

Machine performance may be monitored using the U500 MMI controller software. The Axis Tuning utility, accessed through the "Tools" pull-down menu option "Axis Tuning", contains an overabundance of tools that aid in the assessment of system performance. This set of tools provides a means of quantifying system performance changes and communicating specifics about the machine performance with View Engineering Support.

The main user interface for this set of tools is shown in ***Figure 8-41***.

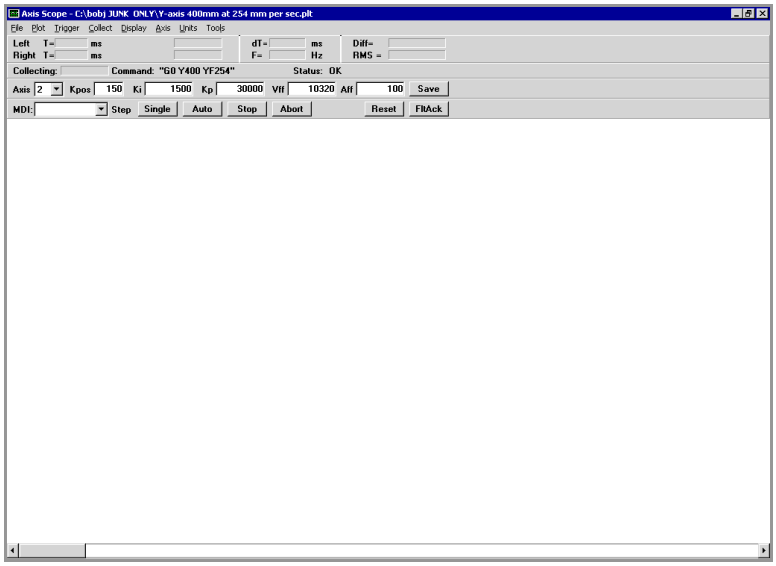


Figure 8-41 The MMI Axis Tuning Window

Servo control loop gain parameters are shown in the GAIN Toolbar for the specific Axis indicated in the left-most, pull-down box of this toolbar. The values for K_{pos}, K_i, K_p, V_{ff}, and A_{ff} are displayed for the axis indicated and should agree with ***Table 8-2***.

- The CONTROL Toolbar provides the means to interface with the machine and capturing dynamic information during stage motions.
- The STATUS Toolbar provides information about the machine status, axis motion command initiated and displays progress in collecting the dynamic data used for display purposes.
- The CURSOR Toolbar displays data at two separate cursor location and calculated information associated with the two user selected cursor positions.

8.15.3.2 General Usage of the Axis Tuning Tools

The pull-down menus of the Axis Tuning tool are used to:

1. File – Perform most standard file type operations;
2. Plot – Select data to be displayed in the plot window;
3. Trigger – Determine the action that initiates collection of data;
4. Collect – Set the number of data points to collect;
5. Display – Set the number of data points to display;
6. Axis – Select the axes to display in the plot window;
7. Units – Set the vertical scale units in the plot window; and
8. Tools – Controls the various tools available.

8.15.3.3 Setting up the Axis Tuning window

Machine performance evaluation requires setting up the Axis Tuning window to display data using Machine Steps and Seconds/1000. Verify that these selections are marked in the **Units** pull-down menu. Both the **Collect** and **Display** pull-downs should have the 2500 points selection checked. These selections define the number of data points collected and displayed, respectively. In the **Trigger** pull-down menu, left-click the **Sample Rate** selection and verify that the sample time base is set at 1 millisecond.

The display window of Axis Tuning Tool can be customized to display up to seven data sets per axis. Typically, Velocity Feedback, Velocity Error, Position Error and Torque should be selected when evaluating machine performance. Set the **Axis** pull-down to display with the axis being tested. Axis numbers refer to the X, Y and Z stages as Axis 1, Axis 2 and Axis 3, respectively.

Entering specific axis displacement, velocity and direction information into the Forward Motion and Reverse Motion popup windows specifies the stage motions during the data collection period. ***Figure 8-42*** shows the commands necessary to drive the X-Axis in the positive and negative directions. The Forward Motion Command shown tells the controller to move a positive 400 mm (x400) distance at a rate of 250 mm/sec (xf250). The Reverse Motion Command tells the controller to move a negative 400 mm (X-400) distance. Omission of a velocity command defaults to the last velocity command issued for the axis.

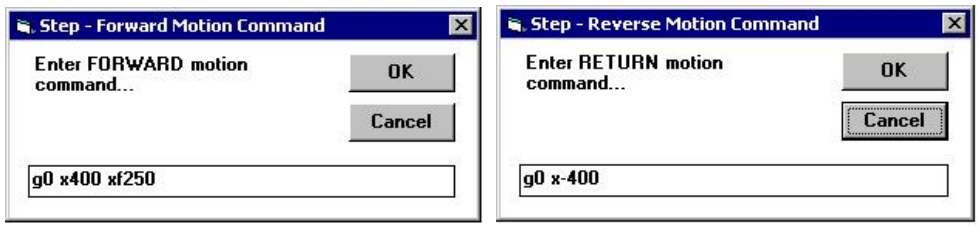


Figure 8-42 Forward and Reverse Motion Command Popup Windows

Table 8-6 provides a standard set of motion commands for evaluation of machine performance. Any variation from these motion commands should be within the physical dimensional and dynamic limits of the machine to preclude damage to the machine.

Table 8-6 Standard Motion Control Commands for Machine Evaluation

Machine Model	Motion Command	X-Axis	Y-Axis	Z-Axis
Summit 800	Forward	g0 x400 xf254	g0 y400 yf254	g0 z100 xf100
	Reverse	g0 x-400	g0 y-400	g0 z-100

This process defines an acceptable MMI Axis Tuning Window setup that allows the capture of a standardized set of test data from the machine.

8.15.3.4 Precautions Associated With Issuing Commands Through MMI

Warning: Before any motion commands are issued to the system the following set of precautions should be observed. Most inadvertent stage motions can be avoided by observing these precautions.

- Verify that the axis under test is enabled. This should occur when the RESET button is invoked. If not each axis can be enabled with the ENABLE X, Y, Z, or U buttons. Visual confirmation is given in the column labeled “Axis Status”.
- Start all axis motion tests from the hardware HOME position for the axis under test. This can be accomplished from the Axis Position Window (*Figure 8-34*) by using the HOME X, Y, Z or U buttons. Individual axes can also be sent to their HOME position by typing a home axis command in the MDI box of either the Axis Position Window or the Axis Tuning Window and pressing ENTER.
- Verify the motion commands entered by reviewing the contents of both the Step Forward Motion and Step Reverse Motion Command screens.
- When in doubt about the position of the stage and/or the status of the step commands, HOME the axis and press the ABORT button on the Axis Scope Screen. The ABORT button insures that the next step command issued will be a Step Forward Motion Command.

Note: The Auto Tune, Frequency Response and FFT selections in the Tools pull-down menu should not be used.

8.15.3.5 Evaluation of Stage Performance

The process of gathering dynamic axis data is straight forward, once the preceding steps are accomplished. Selecting the “Single” push button in the Control Toolbar issues the next command to the controller. Data gathered during the stage move is displayed in the Axis Tuning Window. An Example is shown in ***Figure 8-43***.

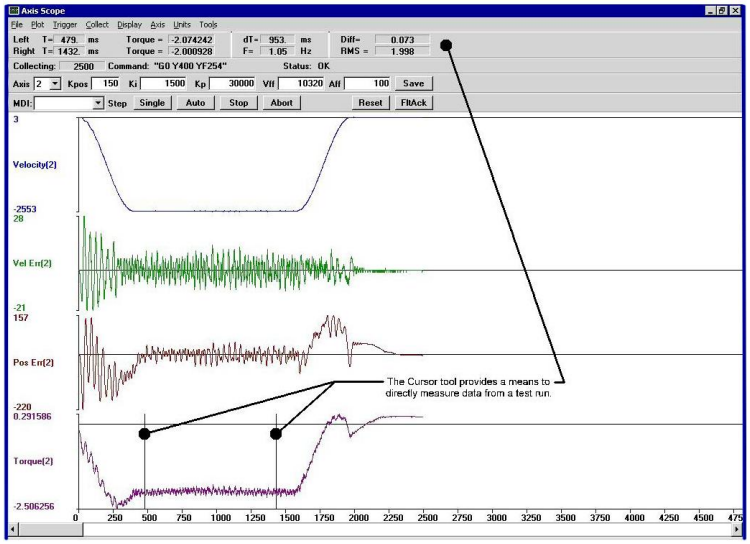


Figure 8-43 Typical Axis Tuning Window Motion Data Plot

This figure also points out the CURSOR Toolbar. This Toolbar is initially blank immediately after a data plot. By placing the mouse cursor at a point of interest in a plot and clicking either the left or right mouse select buttons the time and magnitude data for the plotted data point is shown in the Toolbar. If two points are selected using the left and right mouse select buttons, the difference in both time and magnitude for the two selected points is shown along with the frequency corresponding to the time difference and the RMS of all data between the two points.

Selecting the **File** pull-down menu option **Save** provides a means to save all data taken during the stage move. This option saves the data measured for all axes along with the move command, all axes gains, the sample time and number of data points. The saved file can then be used to record the present operating characteristics for the stage motion tested.

The data plots shown in ***Figure 8-43*** are in machine steps. Plot scales are shown to the left of the data plots and is automatically scaled to the maximum and minimum values in the data set for the plotted quantity. In this figure:

- Velocity of the stage is between 0.0003 µm/msec and –2.553 µm/msec (-255.3 mm/sec)
- Velocity Error ranges between 2.8 µm/msec and –2.1 µm/msec
- Position Error is between 15.7 µm and –22.0 µm
- Torque is actually given in amperes

Attention must be given to the scaled values. It is easy to judge the axis performance incorrectly by comparing the form of the plot alone.

Parts Repair and Replacement

Chapter 9

9.1 What This Chapter Contains

This chapter shows you how to replace components in the Summit 800 system. Refer to the Summit 800 Illustrated Parts List and the Spare Parts Price List for part ordering information.

Warning: Unless instructed otherwise, always turn off equipment and disconnect it from the main power supply while troubleshooting; see ***AC Power Cable Outlet Lock-Out/Tag-Out Feature*** on page 10.

Warning: The risk of electrical shock is present any time the covers are removed from the stage. Never remove the covers from the monitor or system power supply, or you expose yourself to high voltage.

Caution: Protect your Summit 800 System from electrostatic damage. Perform these procedures at a static-safe workstation and wear a ground strap. If a ground strap is not available, follow these guidelines:

- Work in an uncarpeted area.
- Before you touch electronic components, discharge static electricity by touching a known-grounded object.
- Do not touch components on printed circuit boards, except as directed.

9.2 Repairing and Replacing Parts on Your System

The following is a list of the most commonly replaced parts on the Summit 800 System. Contact the View Engineering, Inc., Customer Support Department (see ***Where to Get Help*** on page 3) for the latest part revisions.

Part to Replace	Where to Find Procedure
DGU Top Cover	See ***Removing the Top Covers*** on page 58.
Lower Front Cover	See ***Removing the Lower Front Cover*** on page 60.
X-axis Bellows	See ***Detaching the X-Axis Bellows*** on page 59.
Y-axis Bellows	See ***Detaching the Y-Axis Bellows*** on page 59.
Monitor, 17 inch	See ***Replacing the Monitor*** on page 144.
Joystick, 3-axis, 2 Button	See ***Replacing the Joystick*** on page 144.
Lens Tube Assy 6.6	See ***Replacing the Lens Tube Assembly (Standard Optics)*** on page 145.
Camera Assy	See ***Replacing the Camera (Standard Optics)*** on page 146.
Camera Assy	See ***Replacing the Camera (Dual Mag Optics)*** on page 148.
PRL Assy	See ***Replacing the Programmable Ring Light (PRL)*** on page 175.
Lamp, (Bulb)	See ***Replacing a Light Bulb (Optional Six-Pack)*** on page 177.
X-Axis Reader Head	See ***Replacing the X-Axis Reader Head*** on page 156.
Y-Axis Reader Head	See ***Replacing the Y-Axis Reader Head*** on page 158.
Z-axis Reader Head	See ***Replacing the Z Scale Assembly*** on page 160.
Limit Switch	See ***Replacing the Limit Switches*** on page 150.
Leadscrew, Z-axis	See ***Replacing the Z-Axis Leadscrew*** on page 173.
Linear Motor, X-axis	See ***Replacing the X-Axis Motor / Encoder Assemblies*** on page 163.
Linear Motor, Y-axis	See ***Replacing the Y-Axis Motor / Encoder Assemblies*** on page 164.
Brushless Motor, Z-axis	See ***Replacing the Z-Axis Motor / Encoder Assembly*** on page 166.

Part to Replace	Where to Find Procedure
PCBA, Subpanel, PCI	See ***Replacing the Camera Interface Sub-Panel*** on page 180.
PCBA, Aerotech Motion Control	See ***Replacing the Aerotech PCBA*** on page 181.
PCBA, Frame Grabber (Matrox)	See ***Replacing the Matrox Frame Grabber PCBA*** on page 182.
PCBA, Frame Grabber (Mutech)	See ***Replacing the Mutech Frame Grabber PCBA*** on page 183.
PCBA, IVP PCI	See ***Replacing the Integrated Video Processor (IVP) PCBA*** on page 184.
PCBA, AGP Graphics	See ***Replacing the AGP Graphics PCBA*** on page 185.
PCBA, Breakout	See ***Replacing the Breakout PCBA*** on page 186.
PCBA, CISP	See ***Replacing the Connector Interface Subpanel (CISP) PCBA*** on page 187.
PCBA, X-, Y-, or Z-Axis Amplifier	See ***Replacing the X-, Y-, or Z-Axis Amplifier PCBA*** on page 188.
PCBA, LPS3	See ***Replacing LED Power Supply (LPS3) PCBA*** on page 189.
PCBA, Coaxial LED	See ***Replacing the Coaxial LED PCBA*** on page 190.
PCBA, LED PRL	See ***Replacing the LED PRL PCBA*** on page 191.

Refer to the following two illustrations while performing the procedures in this section.

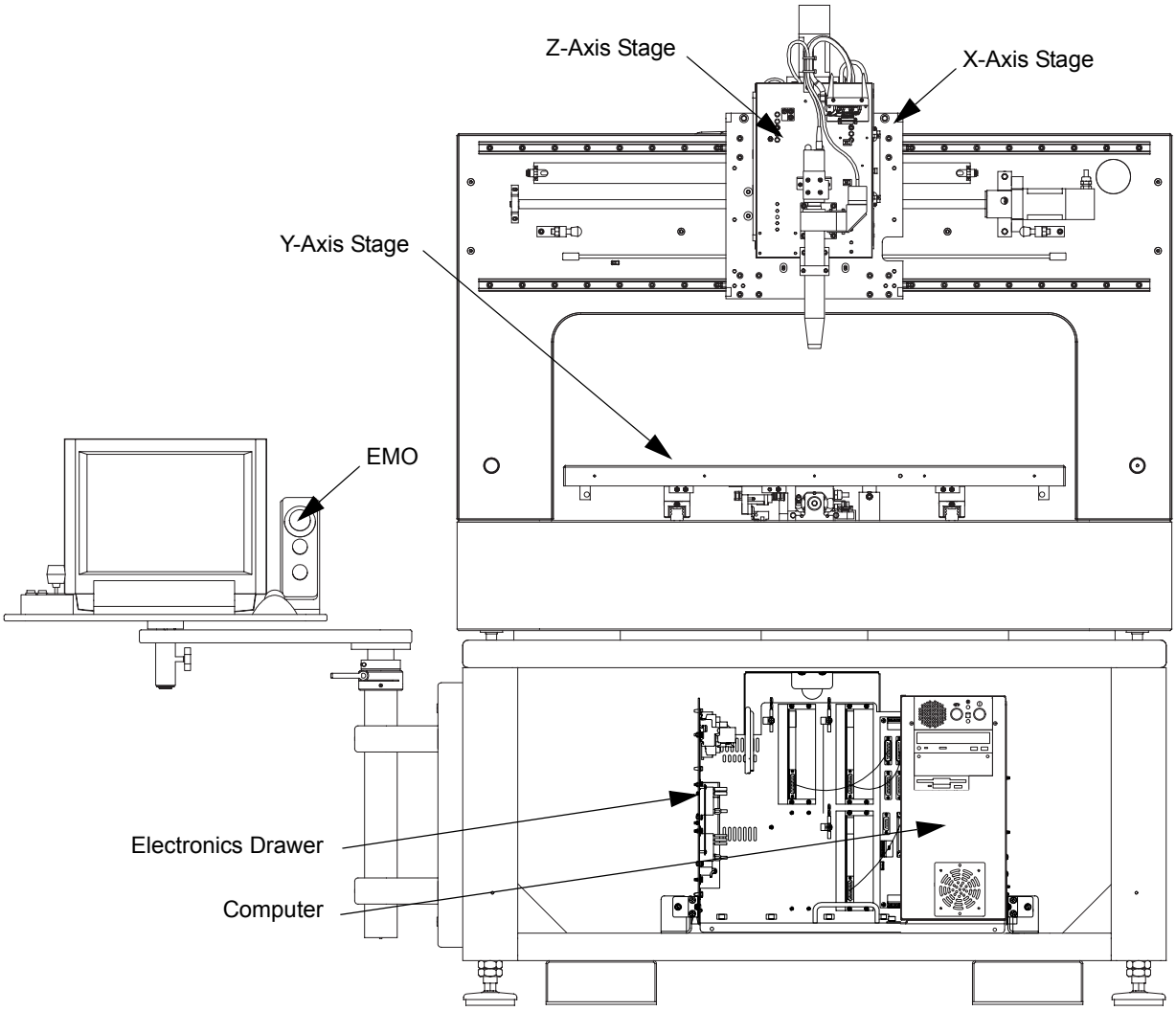


Figure 9-1 DGU Assembly - Front View

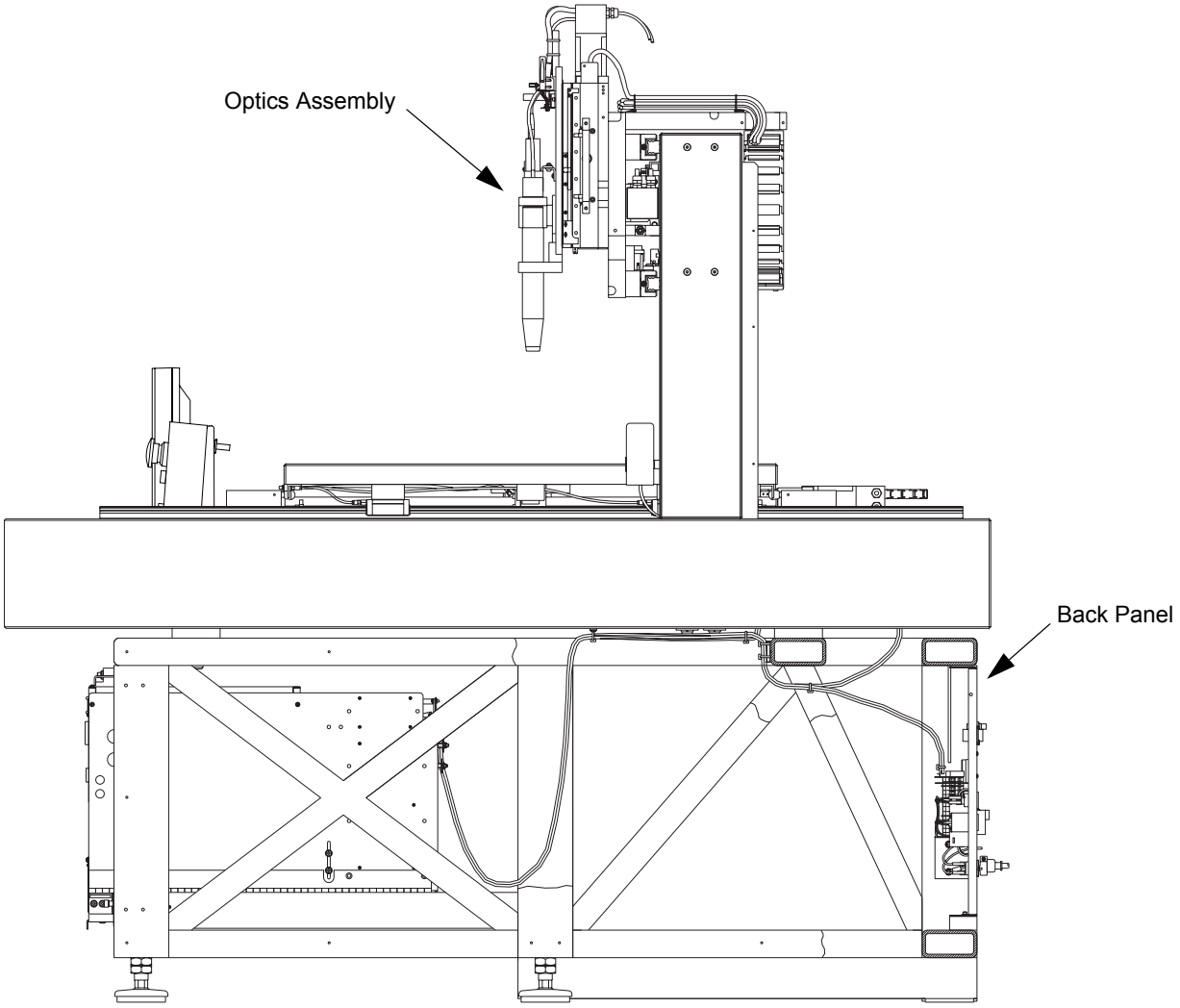


Figure 9-2 DGU Assembly - Side View

9.3 Replacing the Monitor

Tools Required	Part No.
7/64-inch socket head screwdriver	N/A

1. Disconnect the AC adapter and Monitor video cable from the back panel of the Summit 800. Remove the Monitor video cable from the cable trunk.
2. Unplug the AC adapter from the back of the monitor. Remove the AC adapter cable from the cable trunk.
3. Locate the plastic side cover that hides the monitor cables. Remove it by pressing firmly on the center button while sliding the cover toward the rear.
4. Remove the cable clamp securing the monitor cables.
5. Using a 7/64 Allen wrench, remove the four screws connecting the monitor mounting plate to the monitor stiffener plate, and remove the monitor.
6. Using a 7/64 Allen wrench, remove the two screws holding the stiffener plate to the old monitor, and remove the plate.
7. Re-install the stiffener plate onto the new monitor.
8. Re-install the new monitor, following the above steps in reverse.

9.4 Replacing the Joystick

1. Unplug the joystick from the back panel of Summit 800. Remove the joystick cable from the cable trunk.
2. Locate the plastic side cover that hides the joystick cable. Remove it by pressing firmly on the center button while sliding the cover toward the rear.
3. Remove the cable clamp securing the joystick cable.
4. Remove the old joystick, and replace with the new joystick.
5. Reassemble, following the above steps in reverse.

9.5 Replacing the Lens Tube Assembly (Standard Optics)

Lenses are installed on the lens tube by screwing the lens into the threaded lens tube. For systems equipped with the Programmable Ring Light (PRL), the PRL should be lowered to gain access to the lens and lens tube (you will not need to move the PRL to remove a high-mag lens).

1. If your system has a PRL installed, press the **Stage & Lights** key to bring the **Stage and Lighting Control** menu on screen.

Caution: Make sure that no part is located on the stage below the ring light.

2. Using the joystick, lower the PRL.
3. Remove the existing lens tube assembly, and install the replacement lens tube assembly; refer to ***Figure 9-3***.

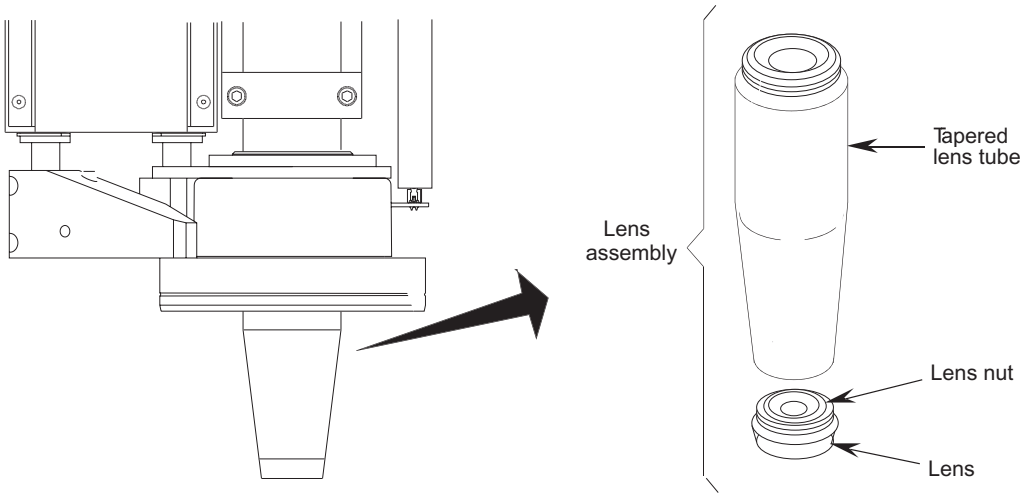


Figure 9-3 Optics Assembly

4. Using the joystick, raise the PRL to the full up position.

9.6 Replacing the Camera (Standard Optics)

Tools Required	Part No.
Small phillips head screwdriver	N/A
3/32-inch Allen wrench screwdriver type	N/A

1. Turn off the system, and unplug the power cable from the back of the system.
2. Remove the top cover; see ***Removing the Top Covers*** on page 58.
3. Disconnect the coaxial cable from the camera by pulling up on the ends of the connector; refer to ***Figure 9-4***.
4. Remove the camera mounting screws and washers from the camera mounting bracket using a small Phillips screwdriver. Save the hardware.
5. Remove the L-bracket clamp screws (4 places) using a 3/32-inch Allen wrench. Then remove the two L-brackets.
6. Slide the camera and the threaded adapter out of the mounting bracket.
7. Unscrew the camera from the threaded adapter, and screw in the replacement camera.
8. Place the new camera and threaded adapter into the camera mounting bracket.
9. Replace all hardware.
10. Perform the camera adjustment procedures; see ***Camera Rotation Adjustment*** on page 88. and see ***Camera Height Adjustment*** on page 90.
11. Reinstall the covers; see ***Reinstalling the Top Covers*** on page 70.

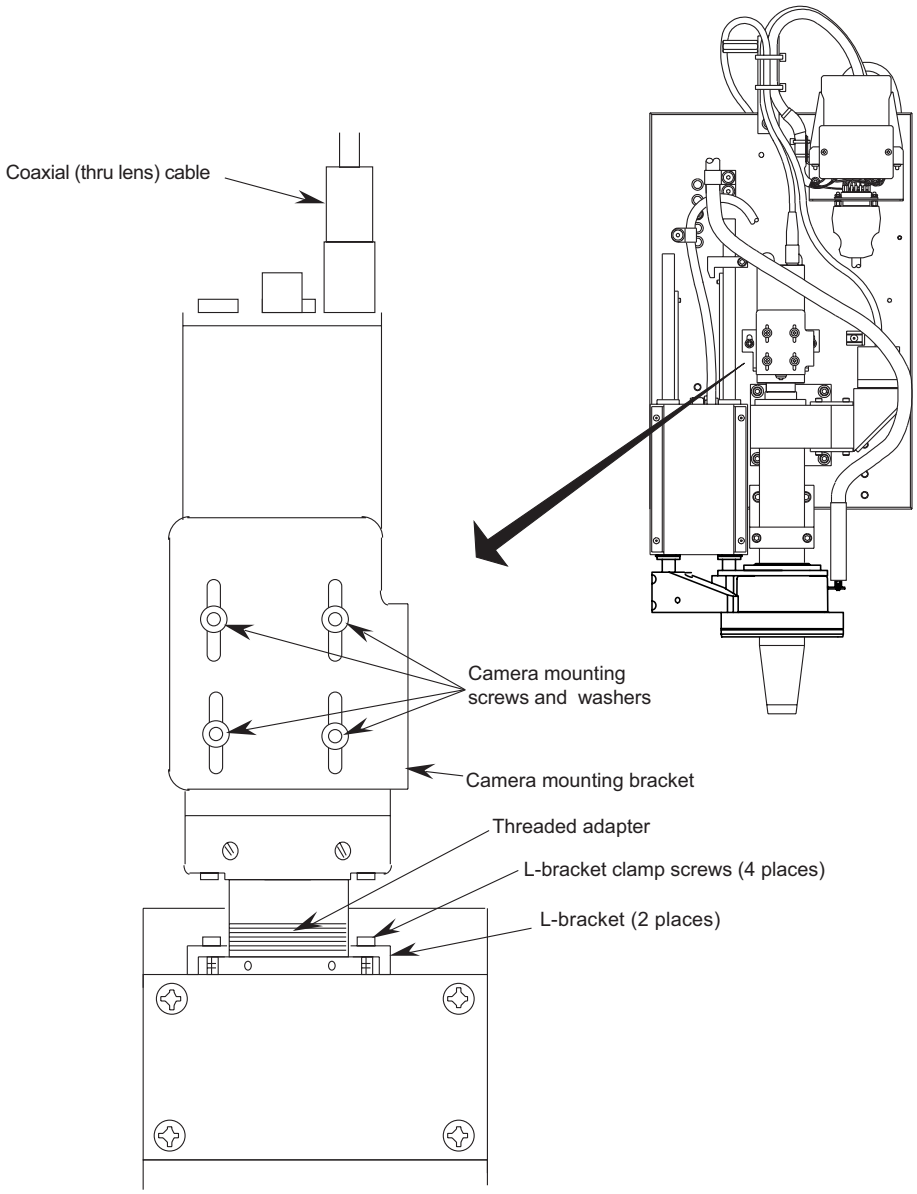


Figure 9-4 Replacing the Camera (Standard Optics)

9.7 Replacing the Camera (Dual Mag Optics)

Tools Required	Part No.
Small phillips head screwdriver	N/A
3/32-inch Allen wrench screwdriver type	N/A

1. Remove the top cover; see ***Removing the Top Covers*** on page 58.
2. Disconnect the coaxial cable from the camera by pulling up on the connector; see ***Figure 9-5***.

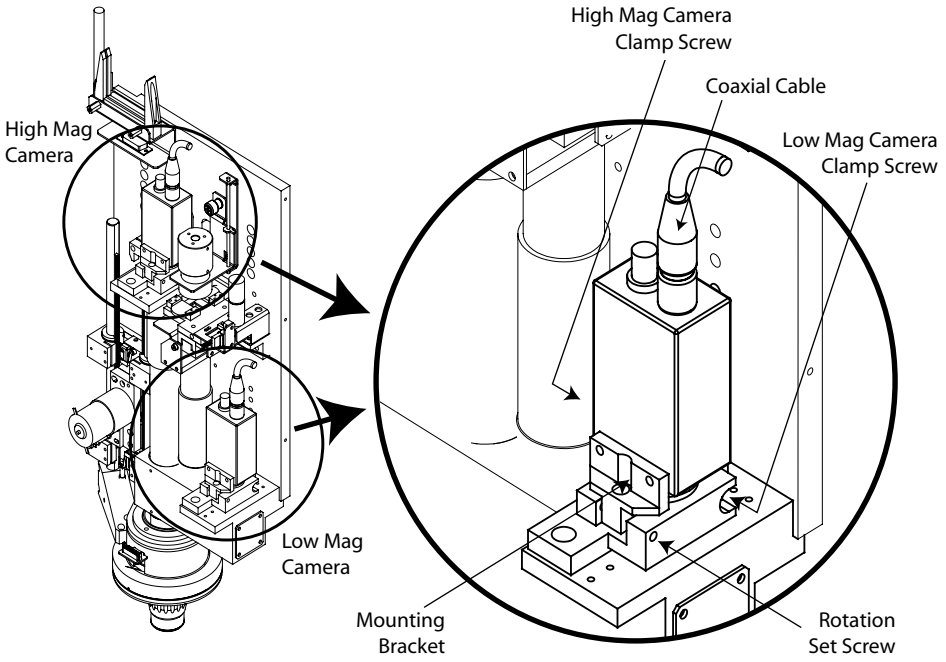


Figure 9-5 Replacing the Camera (Dual Mag Optics)

Note: the high mag camera clamp is accessed from the left, with a *left-hand thread set screw*; i.e., turn CW to loosen, CCW to tighten.

3. Loosen the camera clamp set screw.
4. There are two rotation set screws, one on each side of the mounting plate. Loosen either one, but not both; this will ensure that original camera alignment is maintained.
5. Lift the camera (with threaded adapter tube and mounting bracket) out of the camera assembly.

6. Remove the camera mounting screws and washers from the camera mounting bracket. Save the hardware.

7. Slide the camera and threaded adapter tube out of the mounting bracket.

Caution: Carefully remove and install threaded adapter tubes on the cameras *in a dust-free environment.*

8. Unscrew the camera from the threaded adapter tube.

9. Screw the threaded adapter tube (removed in Step 8) into the replacement camera. Note that these tubes are *not* interchangeable.

10. Put the replacement camera and threaded adapter into the camera mounting bracket, and replace all hardware.

11. Set the camera (with threaded adapter tube and mounting bracket) in place. Make certain that the proper camera is installed on the proper path.

12. Tighten the rotation set screw and the camera clamp set screw.

13. Connect the coaxial cable to the camera.

14. Perform the camera adjustment procedures; see ***Dual Magnification Optical System Adjustment*** on page 93.

15. Reinstall the top cover; see ***Reinstalling the Top Covers*** on page 70.

9.8 Replacing the Limit Switches

Tools Required	Part No.
Soldering gun or iron	N/A
Solder	N/A
Heat gun or other heat source	N/A
3/32-inch Allen wrench	N/A
Wire stripper	N/A
2.5 mm wrench	N/A

When replacing a limit switch, be sure you do not reverse the positions of the high and low limit switches. The stage will not operate properly if the high and low limits are reversed.

9.8.1 Replacing the X-Axis Limit Switch

There are two limit switches for the X-axis: CW limit and CCW limit. Refer to ***Figure 9-6*** for the location of the X-axis limit switches.

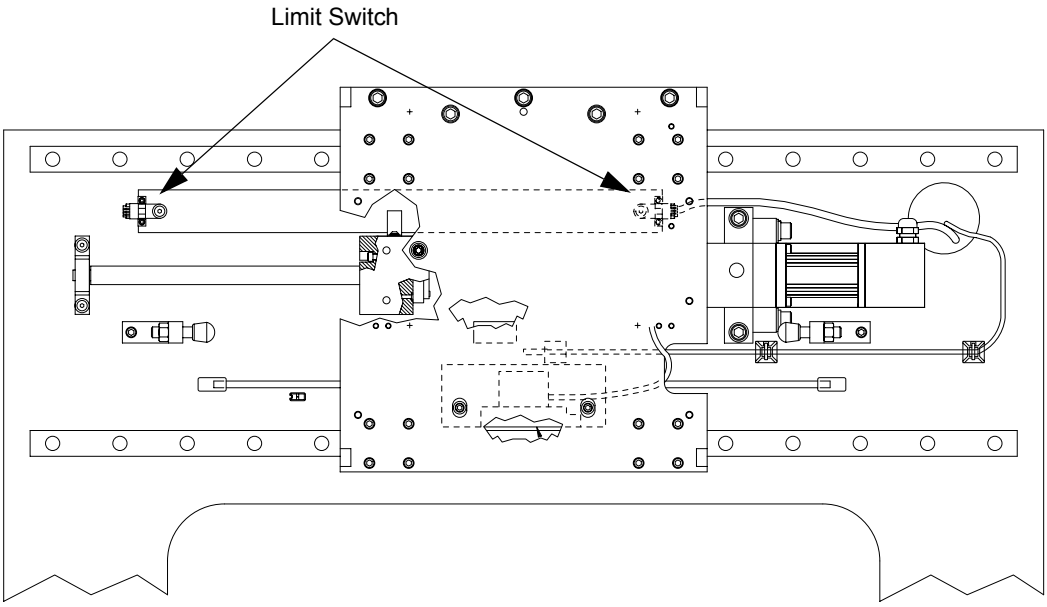


Figure 9-6 X-Axis Limit Switch Locations

1. Turn off the system, and unplug the power cable from the back of the system.
2. Push the X axis away from the limit switch to be replaced, then move the bellows out of the way; see ***Detaching the X-Axis Bellows*** on page 59.
3. Disconnect limit switch connector at the faulty limit switch.
4. Use an 1/16 Allen wrench to remove the faulty switch; it is secured to the limit switch mounting plate with two screws.
5. Install the new limit switch onto the mounting plate.
6. Connect the limit switch connector. It is keyed to ensure a proper connection.
7. Cycle the stage by hand in the X-axis to ensure that the limit switch is properly aligned with the limit flags.
8. Re-connect power to the Summit 800. Power-on the system.
9. Start the U500 MM1 software.
10. Press the F7 key to bring up the Diagnostic Window. In the Hardware Status block, observe the display. For each axis, the CW limit is the positive limit and the CCW limit is the negative limit. Place a screwdriver between the sensors on the newly installed limit switch and verify that the correct switch toggles on the display.
11. After proper operation has been verified, attach the X-axis bellows; see ***Attaching the X-Axis Bellows*** on page 71.

9.8.2 Replacing an Y-Axis Limit Switch

There are two limit switches each for the Y-axis: CW limit and CCW limit. Refer to ***Figure 9-7*** for the location of the Y-axis limit switches.

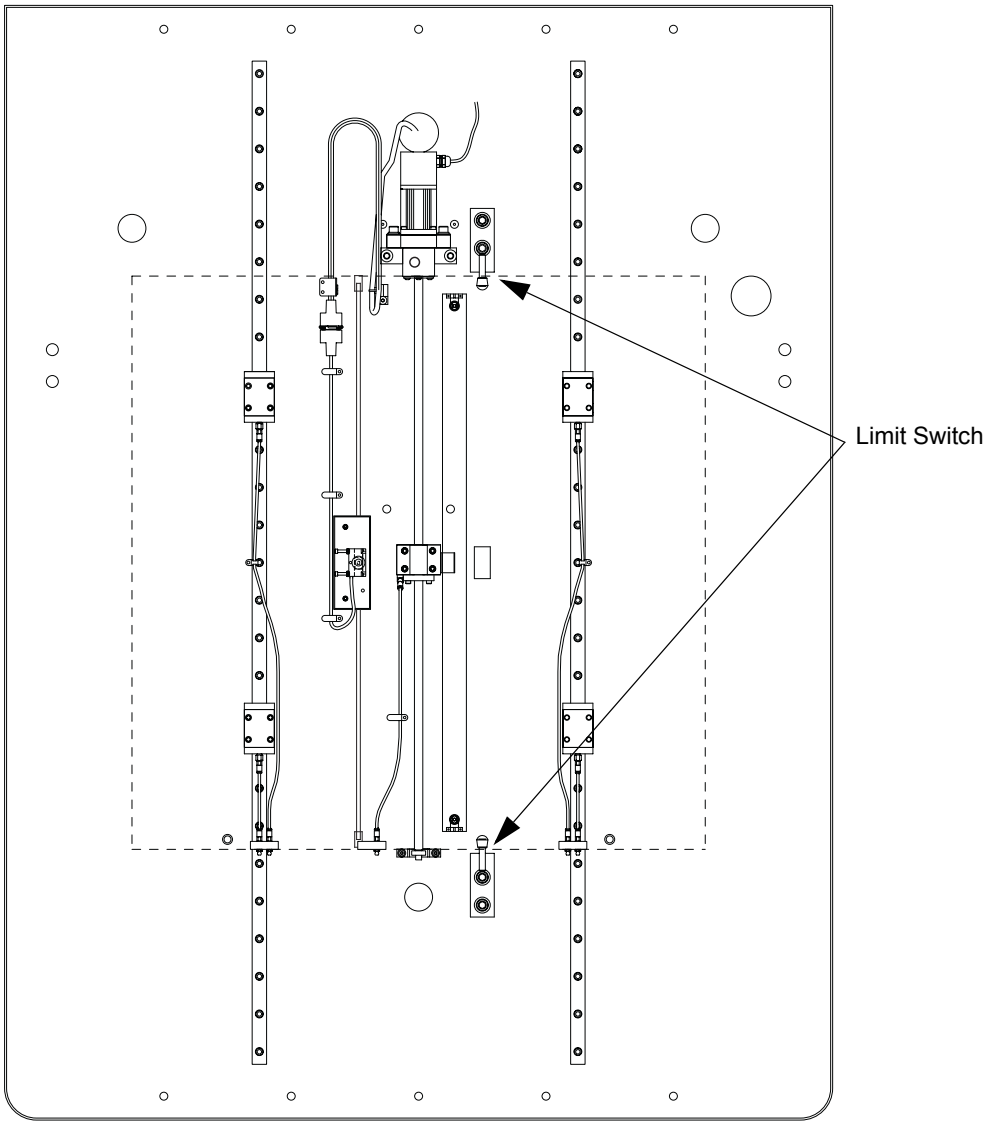


Figure 9-7 Locating the Y-Axis Limit Switches

1. Turn off the system, and unplug the power cable from the back of the system.
2. Detach the Y-axis bellows (see ***Detaching the Y-Axis Bellows*** on page 59)
3. Disconnect limit switch connector at the faulty limit switch.
4. Use an 1/16 Allen wrench to remove the faulty switch; it is secured to the limit switch mounting plate with two screws.
5. Mount the new limit switch onto the mounting plate.
6. Connect the limit switch connector. It is keyed to ensure a proper connection.
7. Cycle the stage by hand to ensure that the limit switch is properly aligned with the limit flags.
8. Re-connect power to the Summit 800. Power-on the system.
9. Start the U500 MM1 software.
10. Press the F7 key to bring up the Diagnostic Window. In the Hardware Status block, observe the display. For each axis, the CW limit is the positive limit and the CCW limit is the negative limit. Place a screwdriver between the sensors on the newly installed limit switch and that the correct switch toggles in the display.
11. After proper operation has been verified, attach the Y-axis bellows; see ***Attaching the Y-Axis Bellows*** on page 71.

9.8.3 Replacing a Z-Axis Limit Switch

There are two limit switches each for the Z-axis: CW limit and CCW limit. Refer to ***Figure 9-8*** for the location of the Z-axis limit switches.

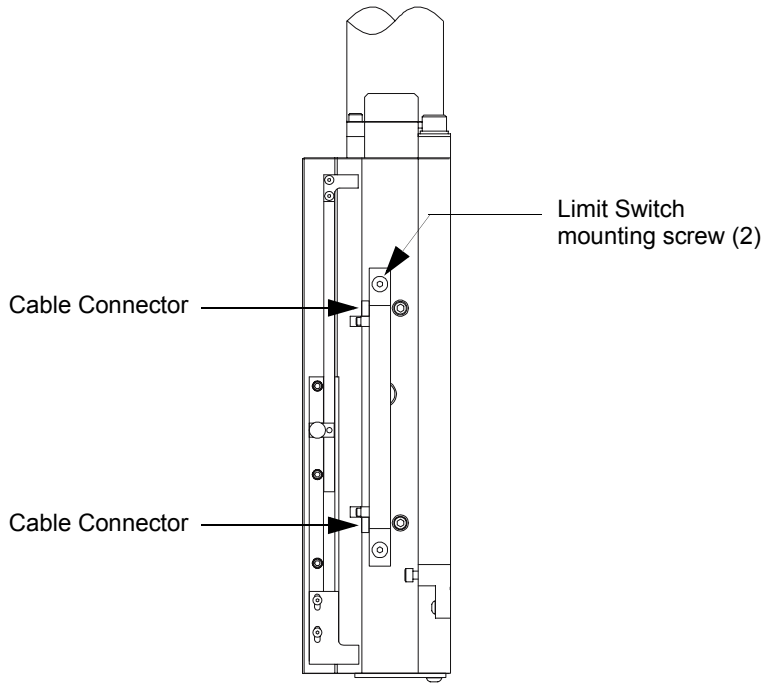


Figure 9-8 Z-Axis Limit Switch Locations

1. Turn off the system, and unplug the power cable from the back of the system.
2. Remove the top cover; see ***Removing the Summit 800 Covers*** on page 58.
3. Disconnect limit switch cable connectors at the faulty switch.
4. Use a 1/16-inch Allen wrench to remove the faulty switch; it is secured to the limit switch mounting plate with two screws.
5. Mount the new limit switch onto the mounting plate, and connect the limit switch cables. They are keyed to ensure a proper connection.
6. Re-connect power to the Summit 800. Power-on the system.
7. Start the U500 software; press the F7 key to bring up the Diagnostic Window; and in the Hardware Status block, observe the display.
8. For each axis, the CW limit is the positive limit; and the CCW limit is the negative limit. Place a screwdriver between the sensors on the newly installed limit switch, and ensure that the correct switch toggles in the display.
9. Reinstall the top covers; see ***Reinstalling the Summit 800 Covers*** on page 70.

9.9 Replacing the Scale Reader Heads

Tools Required	Part No.
0.8 mm Spacing tool	2110329-1
Masking tape	N/A
Flat blade screwdriver	N/A
9/64-inch Allen wrench	N/A
9/64-inch ball nut screwdriver	N/A
Screwdriver type or extension	N/A
Flashlight	N/A

9.9.1 Replacing the X-Axis Reader Head

1. Turn off the system, and unplug the power cable from the back of the system.
2. Push the X axis away from the reader head to be replaced, then move the bellows out of the way; see ***Detaching the X-Axis Bellows*** on page 59.
3. Disconnect the X-axis reader head cable. The connector is located on the right hand side behind the X-stage and next to the lamp box; see ***Figure 9-9***.

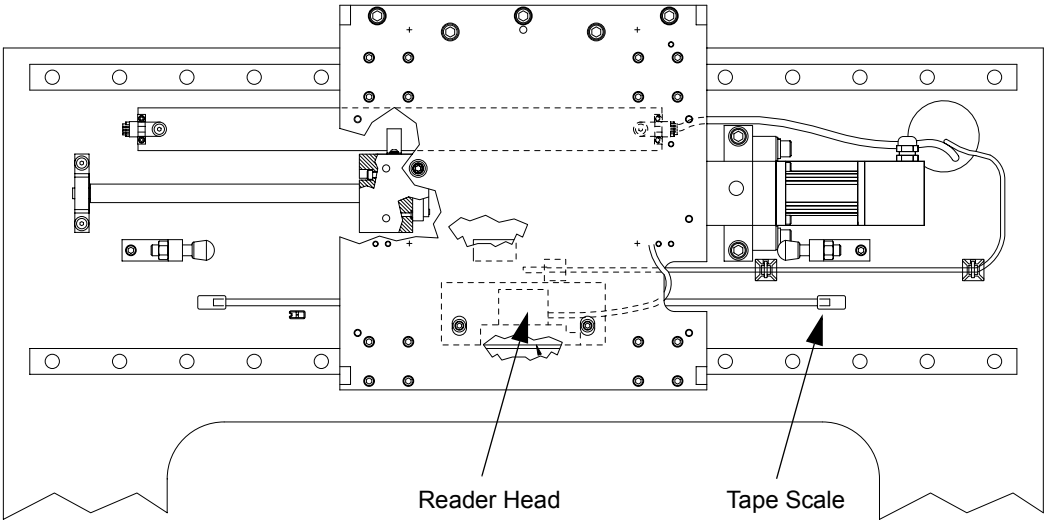


Figure 9-9 X-Axis Scale and Reader Head

4. Cut any tie-wraps securing the reader mount cable.
5. Position the plate so that you can access the reader head screws from the through holes.
6. Using a 9/64 Allen wrench with an extension, remove the two reader head mounting screws.
7. Carefully raise the reader head assembly out of the mounting slot, and slide the assembly and cable along the X-stage until it is removed.
8. Using a 9/64 Allen wrench, loosen the two screws on the reader head block assembly; and replace the old reader head with the new one.
9. Make sure the reader head block and reader head are flush before replacing and tightening the screws.
10. Wipe the tape scales with a clean cloth, to remove any grease or dust that may be present.
11. Push the reader head cable and assembly along the X-stage. Feed the cable and connector up behind the optics assembly.
12. Slide the reader head assembly back into the slot on the reader head mount.
13. Replace the screws on the bottom of the mount, but do not tighten them.

Caution: Be careful not to scratch the tape scale when inserting or removing the spacer tool.

14. Insert the 0.8 mm spacing tool between the reader head and the tape scale. Using masking tape, tape the spacing tool to the X-stage to hold it in position.

15. Gently push the reader head towards the tape scale by placing a flathead screwdriver in the gap between the reader head and the reader head mount. This will ensure that the reader head is parallel to, and spaced exactly 0.8 mm from the tape scale. Tighten the reader head mounting screws.

16. Remove the masking tape from the spacer. To remove the spacer, push the X stage to the far right while gently pulling on the spacer.

Caution: Pulling the spacer abruptly may cause the spacer head to break off.

17. Reconnect the reader mount cable, and zip tie the tie mounts prior to laying the cable down.

18. Re-connect power to the Summit 800. Power-on the system.

19. Start the U500 software.

20. Verify proper operation by pressing the F5 key to bring up the Jog Window. Alternately click on the +X and –X buttons to cycle the stage. Observe the LED indicator through the reader head and scale body assembly. It should stay green throughout the entire range of travel, except when passing over the index mark. If not, loosen the scale body adjustment screws; and recheck the 0.8 mm spacing of the reader head.

21. Reattach the bellows (see ***Attaching the X-Axis Bellows*** on page 71).

9.9.2 Replacing the Y-Axis Reader Head

1. Turn off the system, and unplug the power cable from the back of the system.
2. Push the Y axis away from the reader head to be replaced, then move the bellows out of the way; see ***Detaching the Y-Axis Bellows*** on page 59.
3. Disconnect the Y reader head cable. The connector is located on the right hand side of the Y stage on the system; see ***Figure 9-10***.

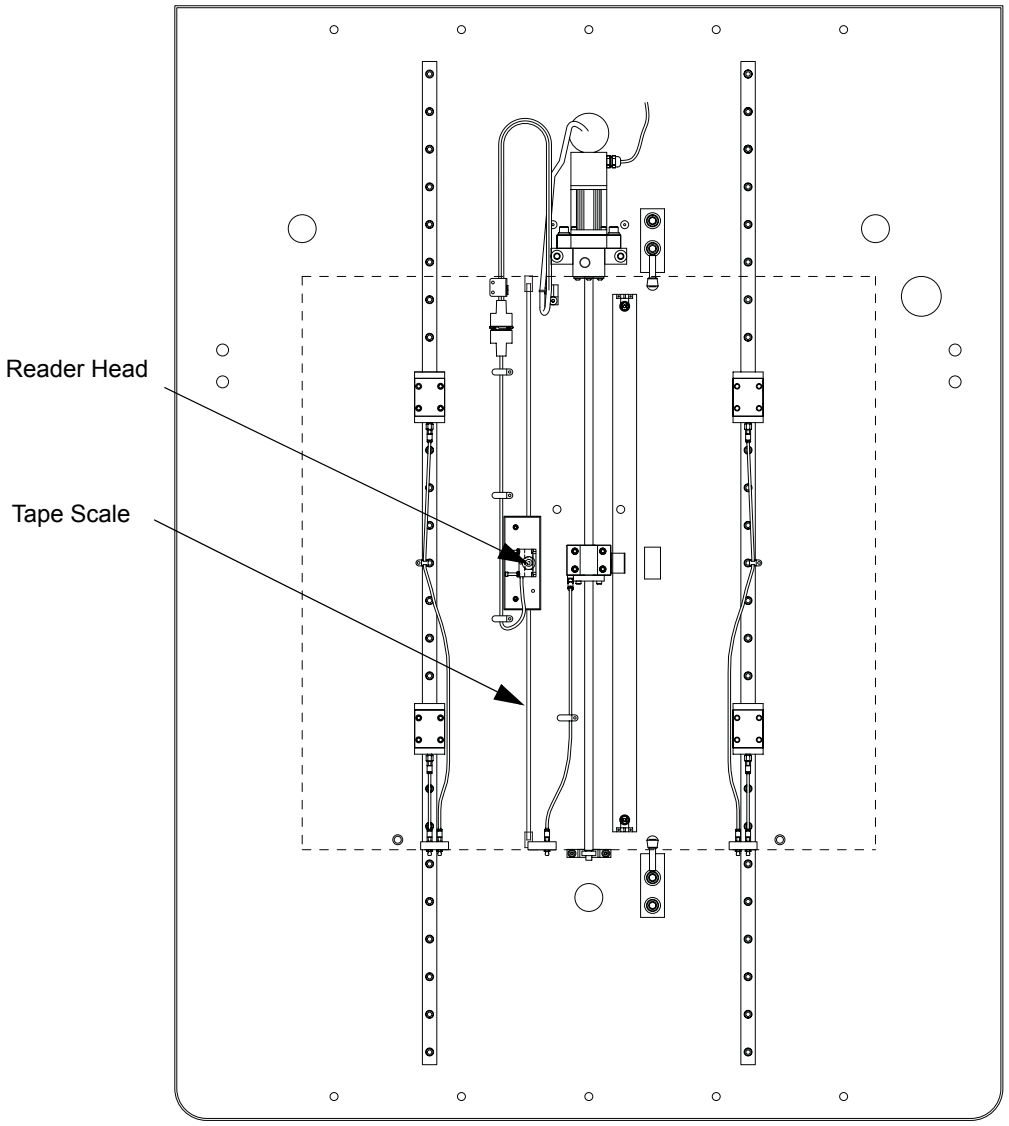


Figure 9-10 Y-Axis Scale and Reader Head

4. Remove the skirts from the sides of the Y stage. Use a 5/64-inch Allen wrench to loosen the two screws holding the bellows to the retaining plate, then slide the skirts forward. As you slide the right skirt forward, push the read mount cable through the slot.

5. The reader head is located on the left side of the stage. Using a 9/64 Allen wrench with an extension, unscrew the two reader head mounting screws.

6. Slide out the reader head assembly. Be sure to feed the reader head cable over the dust cover guide rails.

7. Remove the old reader head from the reader head assembly, and replace it with the new one. Align the new reader head so that it is flush with the reader head block.

8. Feed the reader head cable over the dust cover guide rail, and place the reader head assembly into the slot in the reader head mount.

9. Use a 9/64 Allen wrench with extension to replace the two reader head mounting screws, but do not tighten them.

10. Place the 0.8 mm spacer between the reader head and tape scale.

11. Using a flat head screw driver as a wedge, press against the reader head so that it rests squarely on the spacing tool. Make sure it is completely flush against the surface, then tighten the screws starting with the left screw first.

12. To remove the spacer, push the Y stage back while gently pulling on the spacer.

Caution: Pulling the spacer abruptly may cause the spacer head to break off.

13. Replace the skirts and all hardware, and replace all plugs.

14. Attach the Y-axis bellows (see ***Attaching the Y-Axis Bellows*** on page 71).

15. Re-connect power to the Summit 800. Power-on the system.

16. Start the U500 MM1 software.

17. Verify proper operation by pressing the F5 key to bring up the Jog Window. Alternately click on the +Y and –Y buttons to cycle the stage. Observe the LED indicator through the reader head and scale body assembly. It should stay green throughout the entire range of travel, except when passing over the index mark. If not, loosen the scale body adjustment screws; and recheck the 0.8 mm spacing of the reader head.

9.10 Replacing the Z Scale Assembly

Tools Required	Part No.
3/32-inch Allen wrench	N/A
.040-inch spacer tool	2110505-1

1. Turn off the system, and unplug the power cable from the back of the system.
2. Remove the top covers; see ***Removing the Top Covers*** on page 58.
3. Unplug the Z-reader head cable, cut any tie-wraps holding the scale cable down, and remove the clamp using a 3/32-inch Allen wrench; see ***Figure 9-11***.

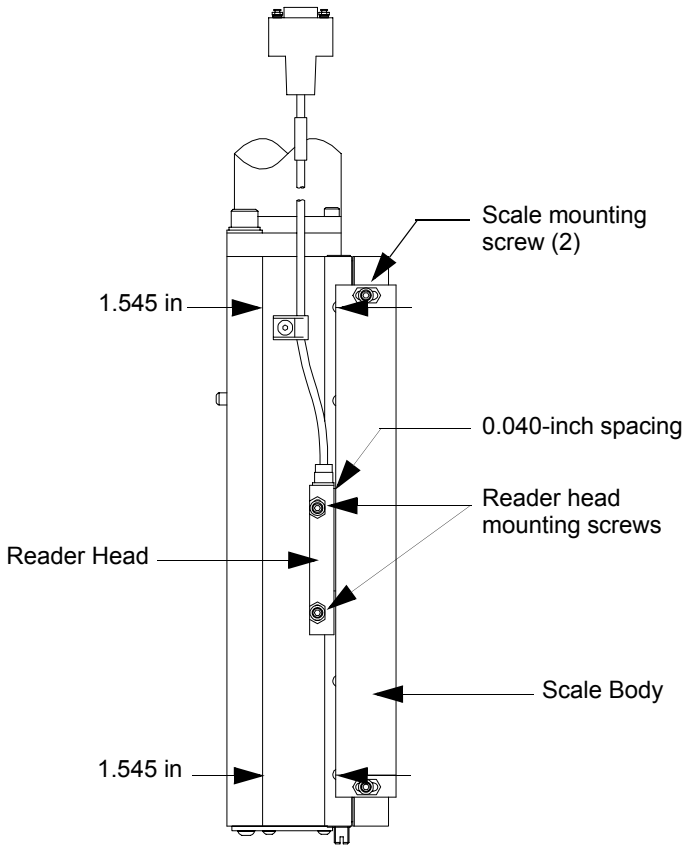


Figure 9-11 Z-Axis Scale and Reader Head

4. Remove the two scale body and two reader head mounting screws. Make sure you hold the assembly to prevent it from falling.
5. Mount the assembly (scale body), but do not tighten the reader head or scale body mounting screws.

6. Gently push the reader head towards the scale body, and tighten the reader head screws.
7. Manually move the stage to one end of scale travel.
8. Using a 0.040-inch spacer, push the scale body towards the reader head; then lightly tighten the screw.
9. Move the stage to the opposite end of travel.
10. Using the 0.040-inch spacer, push the scale body towards the reader head; and tighten the screw.
11. Move the stage back to the starting end, and check the spacing. If still at 0.040 inches, completely tighten the screw. Make sure to remove the spacer.
12. Route the cable, and plug it in to the connector. Use tie-wraps to keep the cable away from motion or cover pinch points.
13. Re-connect power to the Summit 800. Power-on the system.
14. Start the U500 software.
15. Verify proper operation by pressing the F5 key to bring up the Jog Window. Alternately click on the +Z and –Z buttons to cycle the stage up and down. Observe the LED indicator through the reader head and scale body assembly. It should stay green throughout the entire range of travel, except when passing over the index mark. If not, loosen the scale body adjustment screws; and recheck the 0.040-inch spacing of the reader head.
16. Reinstall the covers; see ***Reinstalling the Summit 800 Covers*** on page 70.

9.11 Replacing a Motor / Encoder Assembly

Tools Required	Part No.
Allen wrench set	N/A
Phillips screwdriver	N/A

9.11.1 Replacing the X-Axis Motor / Encoder Assemblies

1. Turn off the system, and unplug the power cable from the back of the system.
2. Push the X axis completely to the left side of the system, then move the bellows out of the way; see ***Detaching the X-Axis Bellows*** on page 59.
3. Turn the leadscrew stop until the coupler screw is visible through the access hole in the bearing block; see ***Figure 9-12***.

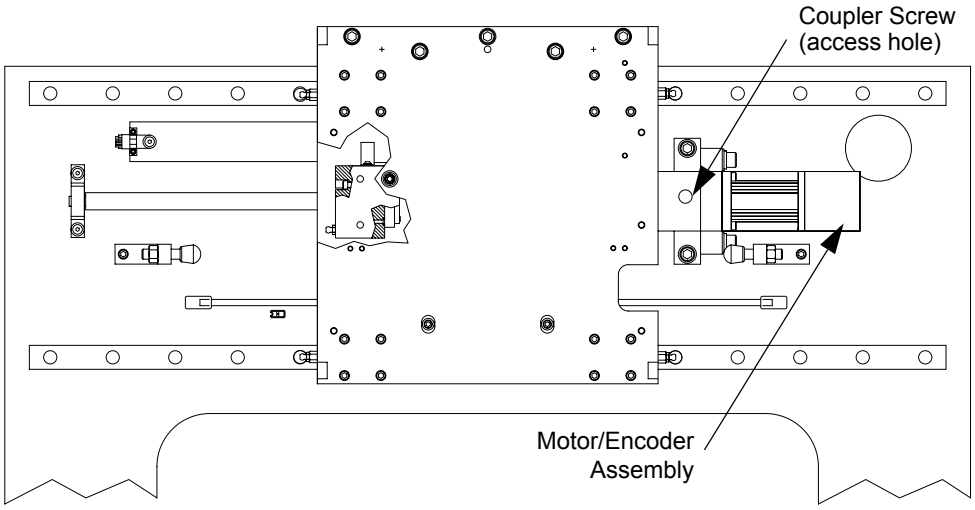


Figure 9-12 X -Axis Motor Assembly

4. Loosen, but do not remove, the coupler screw.
5. Remove the cable channel cover plate; then disconnect and pull out the two motor/encoder cables.
6. Using a 5/32-inch Allen wrench, remove the four screws that hold the motor/encoder assembly to the bearing block. Detach the assembly, and then remove the coupler.

Note the location of the coupler on the motor shaft. The coupler must be installed at the same location on the new shaft. Leaving too much space between the coupler and the motor assembly may cause damage to the drive train.

7. Place the coupler on the replacement motor/encoder assembly.
8. Mount the X-axis motor/encoder assembly to the bearing block with the four screws removed in Step 6. Make sure that the flex coupler does not touch the threads of the lead screw.
9. Tighten the coupler screw in the bearing block slot.
10. Connect the two motor/encoder cables.
11. Check for binding and wire routing, tie wrap any loose wires, then attach the X-axis bellows; see ***Attaching the X-Axis Bellows*** on page 71.
12. Reconnect the power cord, turn on system power, and verify proper operation.

9.11.2 Replacing the Y-Axis Motor / Encoder Assemblies

1. Turn off the system, and unplug the power cable from the back of the system.
2. Detach the Y-axis bellows; see ***Detaching the Y-Axis Bellows*** on page 59.
3. Push the Y axis completely forward.
4. Turn the leadscrew stop until the coupler screw is visible through the access hole in the bearing block; see ***Figure 9-13***.

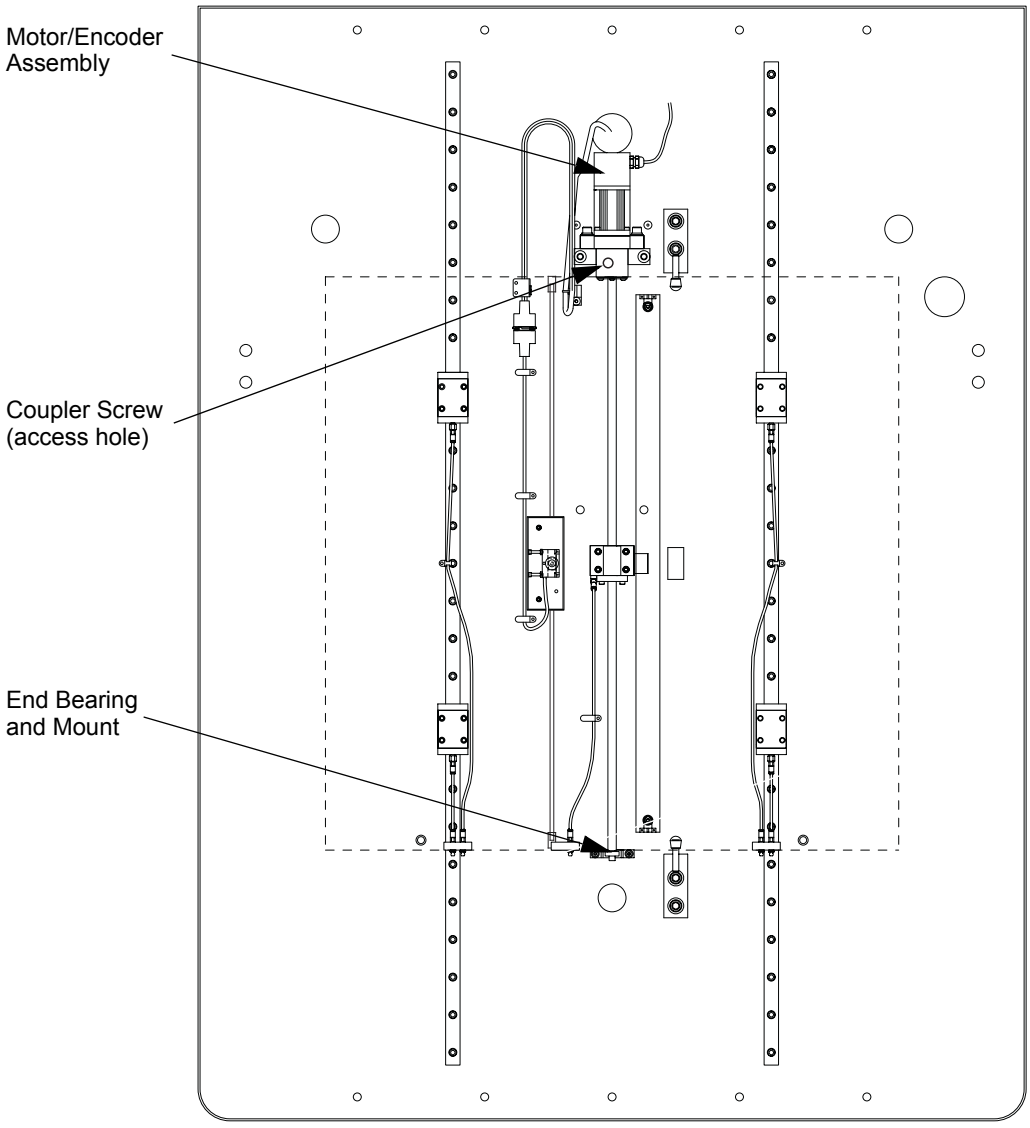


Figure 9-13 Y-Axis Motor Assembly

5. Loosen, but do not remove, the coupler screw.
6. Disconnect the two motor/encoder cables.

7. Using a 5/32-inch Allen wrench, remove the four screws that hold the motor/encoder assembly to the bearing block. Detach the assembly, and then remove the coupler.

Note the location of the coupler on the motor shaft. The coupler must be installed at the same location on the new shaft. Leaving too much space between the coupler and the motor assembly may cause damage to the drive train.

8. Place the coupler on the replacement motor/encoder assembly.

9. Mount the Y-axis motor/encoder assembly to the bearing block with the four screws removed in Step 7. Make sure that the flex coupler does not touch the threads of the lead screw.

10. Tighten the coupler screw in the bearing block slot.

11. Connect the two motor/encoder cables.

12. Check for binding and wire routing, tie wrap any loose wires, then attach the Y-axis bellows; see ***Attaching the Y-Axis Bellows*** on page 71.

13. Reconnect the power cord, turn on system power, and verify proper operation.

9.11.3 Replacing the Z-Axis Motor / Encoder Assembly

1. Turn off the system, and unplug the power cable from the back of the system.
2. Remove the top cover; see ***Removing the Top Covers*** on page 58.
3. Move the Z stage down.
4. Locate the coupler screw, which is visible through the access hole in the bearing block:

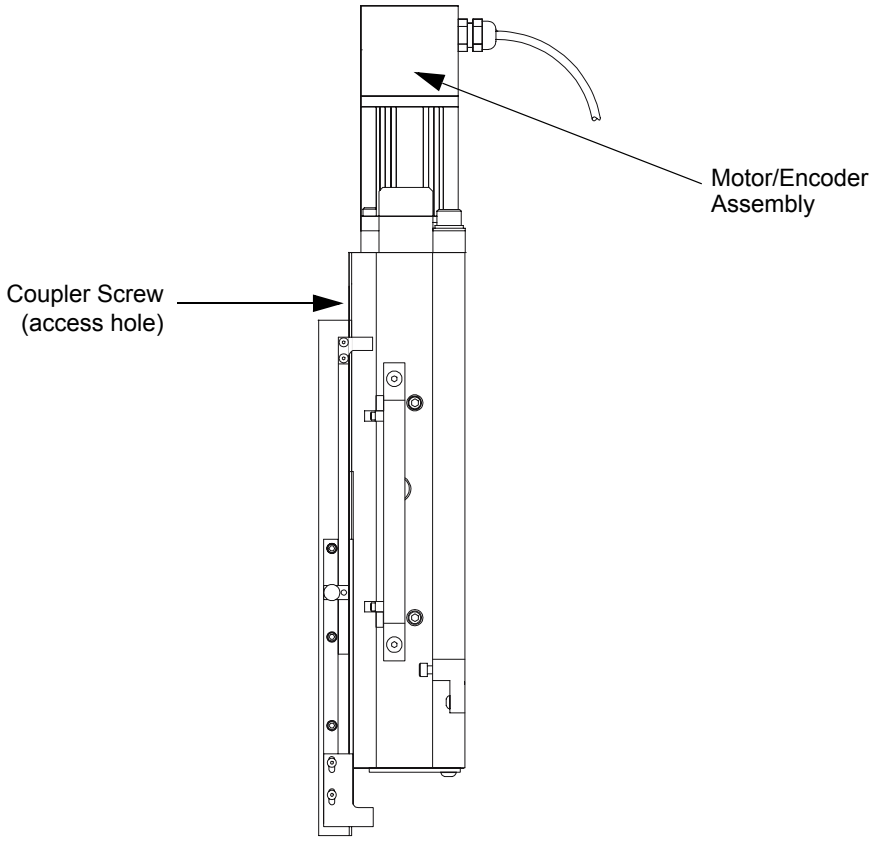


Figure 9-14 Z-Axis Drive Train

5. Loosen, but do not remove, the coupler screw.
6. Disconnect and pull out the two motor/encoder cables.
7. Using a 5/32-inch Allen wrench, remove the four screws that hold the motor/encoder assembly to the bearing block. Detach the assembly, and then remove the coupler.

Note the location of the coupler on the motor shaft. The coupler must be installed at the same location on the new shaft. Leaving too much space between the coupler and the motor assembly may cause damage to the drive train.

8. Place the coupler on the replacement motor/encoder assembly.

9. Mount the replacement motor/encoder assembly to the bearing block with the four screws that were removed in Step 7. Make sure that the flex coupler does not touch the threads of the lead screw.

10. Tighten the coupler screw in the bearing block slot.

11. Connect the two motor/encoder cables.

12. Check for binding and wire routing, tie wrap any loose wires, then reinstall the top cover; see ***Reinstalling the Top Covers*** on page 70.

13. Reconnect the power cord, turn on system power, and verify proper operation.

9.12 Replacing Leadscrews

Tools Required	Part No.
Allen wrench set (english)	N/A
Phillips screwdriver	N/A

Retain all hardware.

9.12.1 Replacing the X-Axis Leadscrew

1. Turn off the system, and unplug the power cable from the back of the system.
2. Detach the X-axis bellows; see ***Detaching the X-Axis Bellows*** on page 59.
3. Remove the top covers; see ***Removing the Top Covers*** on page 58.
4. Manually push the X-axis stage toward the left side until you have access to the motor/ encoder assembly.
5. Turn the leadscrew until the coupling screw is visible through the access hole in the motor mount; see ***Figure 9-15***. Using a 7/64-inch Allen wrench, loosen (do not remove) the coupling screw.

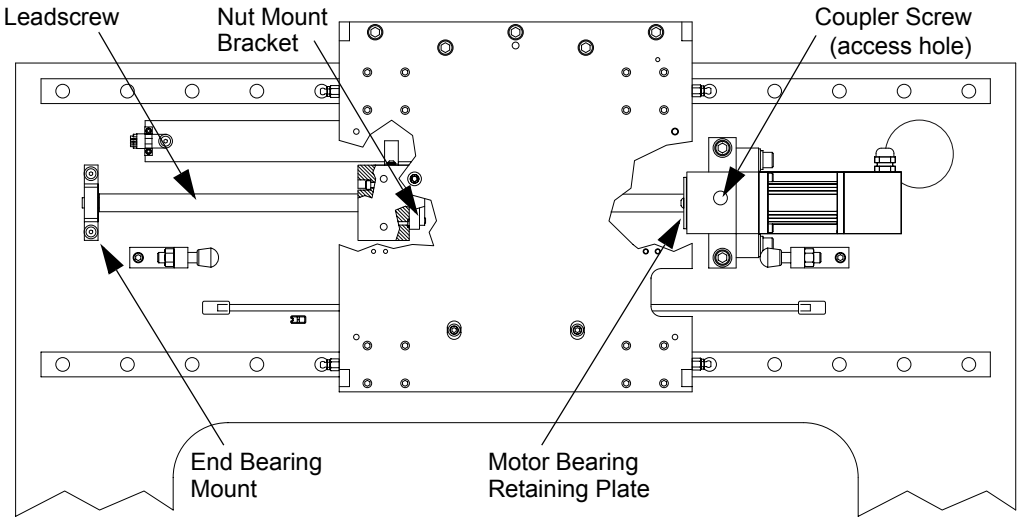


Figure 9-15 X -Axis Leadscrew Assembly

6. Using a 1/8 Allen wrench, remove the two screws that hold the leadscrew end bearing and mount in place.
7. Using a 1/8-inch Allen wrench, remove the three button head screws that secure the motor bearing retaining plate to the motor housing.
8. Gently push the X-axis stage assembly towards the left side of the system. The leadscrew motor bearings should dislodge from the motor mount housing.

Caution: The screws referenced in Step 9 actually attach to a bracket that is located behind the nut mount. Be sure to hold this bracket while removing these screws to avoid damage to the glass observation platform.

9. Using a 5/32-inch Allen wrench, remove the four screws that secure the X-axis leadscrew nut to its mount.
10. Remove the leadscrew by pulling it towards the right side of the system.

11. Remove the grease fitting from the old leadscrew, and install it on the new leadscrew.

12. Install the new leadscrew assembly via the right side of the system. Insert the leadscrew nut into the X-axis nut mount. Using a 5/32-inch Allen wrench, install the nut mount bracket and the four screws that secure the bracket and nut in place. Carefully push the X-axis stage towards the right.

13. Guide the motor mount bearings into the motor mount.

14. Using a 1/8-inch Allen wrench, install the three screws that hold the motor bearing retaining plate to the motor housing.

15. Install the leadscrew end bearing and mount by installing the mount over the end of the X-axis leadscrew and installing the two screws using a 1/8-inch Allen.

16. Turn the leadscrew until the coupling screw is visible. Using a 7/64-inch Allen wrench, tighten the coupling screw.

17. Re-connect power to the Summit 800. Power-on the system.

18. Verify proper operation using the U500 software.

19. Lubricate the X-axis leadscrew; see ***Clean / Lubricate X-Axis Stage Guide Rails and Leadscrew*** on page 64.

20. Check for binding and wire routing, tie wrap any loose wires, then attach the X-axis bellows; see ***Attaching the X-Axis Bellows*** on page 71.

21. Check for binding and wire routing, tie wrap any loose wires, then reinstall the top cover; see ***Reinstalling the Top Covers*** on page 70.

9.12.2 Replacing the Y-Axis Leadscrew

1. Turn off the system, and unplug the power cable from the back of the system.
2. Detach the Y-axis bellows; see ***Detaching the Y-Axis Bellows*** on page 59.
3. Remove the glass plate on the inspection platform by backing out the two rotational alignment screws in the front and on one side of the plate.
4. Using a 3/16-inch Allen wrench, remove the four screws that secure the nut mount block in place at the center of the Y stage; see ***Figure 9-16***.

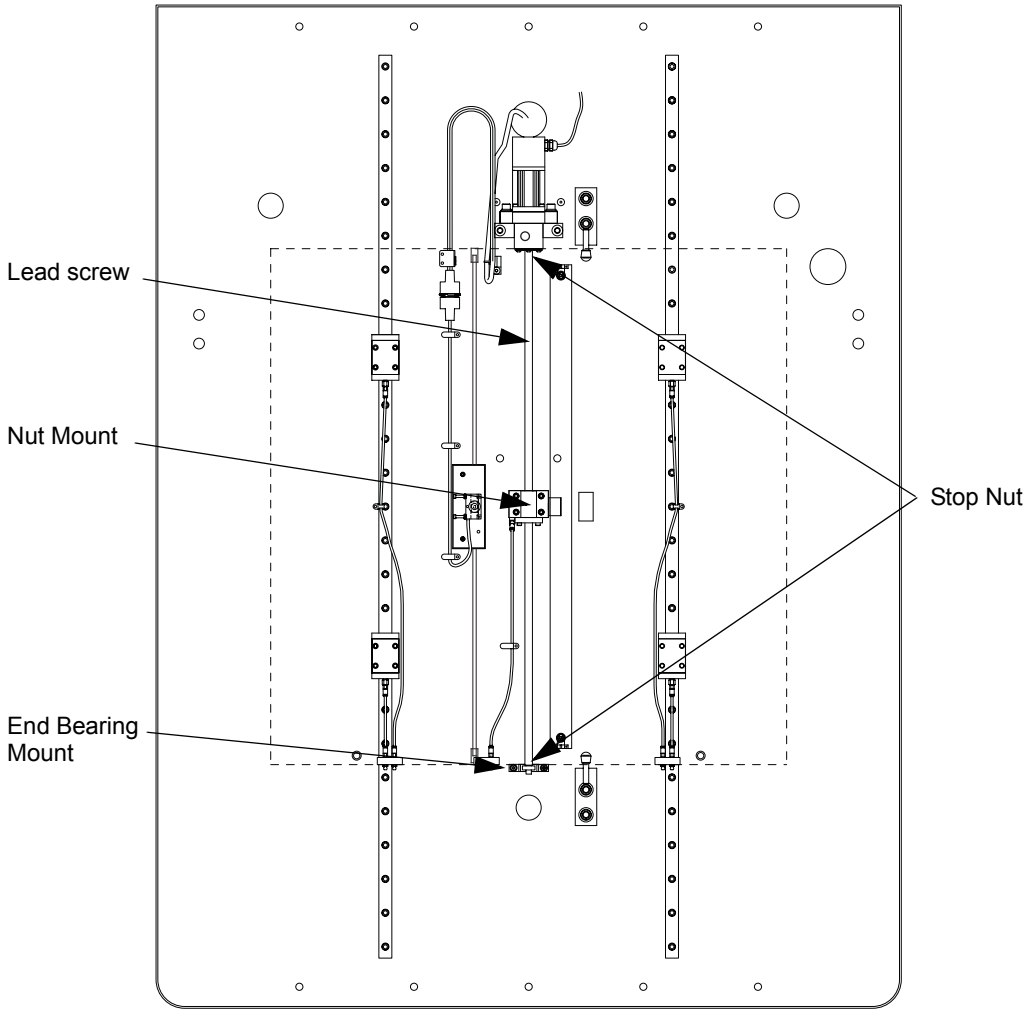


Figure 9-16 Y Stage - Top View

5. In the front of the system, press the red plastic fitting; and pull on the grease tube to release it.
6. Turn the leadscrew until the coupling screw is visible through the access hole in the motor mount. Using a 7/64-inch Allen wrench, loosen (do not remove) the coupling screw.

7. Using a 1/8 Allen wrench, remove the two screws that hold the leadscrew end bearing and mount in place.

8. Using a 1/8-inch Allen wrench, remove the three screws that secure the motor bearing retaining plate to the motor housing.

9. Carefully remove the Y-axis leadscrew assembly from the system.

Caution: When pulling out the leadscrew assembly be very careful not to damage the tape scale.

After the leadscrew is removed, slide the stage back and forth at an even speed across the full length. If the stage feels bumpy as it moves, the rails may be damaged and need to be rebuilt.

10. Using a 5/32-inch Allen wrench, transfer the Y-axis leadscrew nut mount by removing the four nut mount screws.

11. Remove the grease fitting from the old leadscrew assembly, and install the grease fitting on the new leadscrew assembly.

12. Position the nut mount block on the new leadscrew in the center of its travel by rotating the nut mount block until it is half-way up the leadscrew.

13. Carefully install the new leadscrew assembly by sliding it under the Y-axis stage plate.

14. Guide the motor mount bearings into the motor mount.

15. Using a 1/8-inch Allen wrench, install the three screws that hold the motor bearing retaining plate to the motor housing.

16. Install the leadscrew end bearing and mount by installing the mount over the end of the X-axis leadscrew and installing the two screws using a 1/8-inch Allen wrench. *Do not tighten these screws.*

17. Position the Y-axis stage plate over the nut mount block; and using a 3/16 Allen wrench, install the four screws. *Do not tighten these screws at this time.*

18. Push the Y-axis stage towards the rear of the system. Stop at about one inch before the motor bearing mount assembly.

19. Using a 7/32 Allen wrench, tighten the four screws holding the nut mount block in place.

20. Using a 1/8 Allen wrench, tighten the two screws that secure the end mount in position.

21. Turn the leadscrew until the coupling screw is visible. Using a 7/64 Allen wrench, tighten the coupling screw.

22. Re-connect power to the Summit 800. Power-on the system.

23. Verify proper operation using the U500 software.

24. Lubricate the Y-axis leadscrew; see ***Clean / Lubricate Y-Axis Stage Guide Rails and Leadscrew*** on page 65.

25. Check for binding and wire routing, tie wrap any loose wires, then attach the X-axis bellows; see ***Attaching the Y-Axis Bellows*** on page 71.

9.12.3 Replacing the Z-Axis Leadscrew

1. Turn off the system, and unplug the power cable from the back of the system.
2. Remove the top cover, see ***Removing the Top Covers*** on page 58.

Caution: Once the brake has been removed, the Z-axis stage may drift downwards. Allow the Z-axis stage to drift downwards *slowly* until it reaches its hard stop.

3. Using a 1/8 Allen wrench, remove the two screws that hold the brake assembly in place. These screws are located under the Z-axis stage; see ***Figure 9-17***. The brake assembly will fall away from the Z-axis leadscrew and will hang freely by the two motor wires.

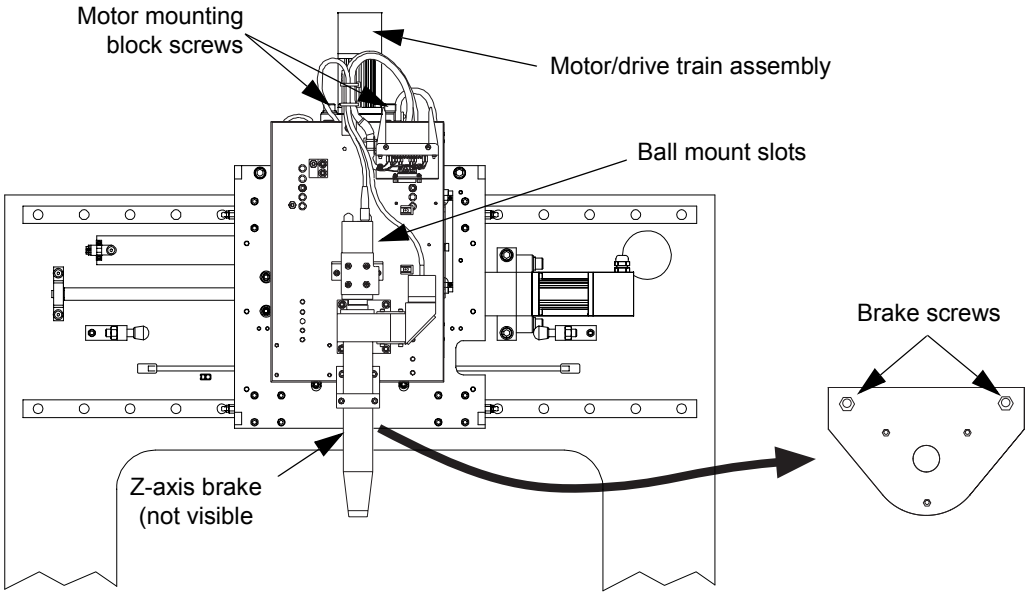


Figure 9-17 Removing the Z Leadscrew

4. Using a 5/32 Allen wrench, remove the four screws that secure the Z-axis nut mount in place. Note that the screws are accessed via the slots in the optics mount behind the camera.
5. Label and disconnect the two motor/encoder cables.
6. Using a 5/16 Allen wrench, remove the two Z-axis motor mounting block screws.
7. Carefully lift the drive train out of the Z stage.
8. Using a 3/32 Allen wrench, Loosen the Z-axis coupler.
9. Using a 1/8 Allen wrench, remove the three screws that secure the Z-axis motor bearing retaining plate.
10. Pull the old leadscrew assembly from within the motor mount housing, and install the new leadscrew assembly by gently sliding the bearing end into the motor mount housing.

11. Using a 1/8 Allen wrench, install the three screws that hold the Z-axis motor bearing retaining plate in place.

12. Using a 3/32 Allen wrench, tighten the motor to the leadscrew coupler.

13. Transfer the nut mount block and brake coupling from the old leadscrew assembly to the new assembly. Manually rotate the nut mount until it is approximately one inch away from the motor mount bearings.

14. Carefully install the new leadscrew assembly by inserting it via the top area of the Z stage.

15. Using a 5/32 Allen wrench, install the two screws that secure the motor mounting block in place.

16. Reconnect the two motor/encoder cables.

17. Using a 5/32 Allen wrench, install the four screws that hold the Z-axis nut mount in place. Note that the screws are accessed via the slots in the optics mount.

18. Install the brake assembly. You may need to rotate the leadscrew and/or adjust the height of the brake coupler to assure the two are meshed properly.

19. Re-connect power to the Summit 800. Power-on the system.

20. Verify proper operation using the U500 software. Adjust the leadscrew as needed for smooth operation.

21. Reinstall the top cover, see ***Reinstalling the Top Covers*** on page 70.

9.13 Replacing the Programmable Ring Light (PRL)

Tools Required	Part No.
Allen wrench set	N/A

1. Move the Z axis to the upper limit of travel.
2. Turn off the system, and unplug the power cable from the back of the system.
3. Remove the top covers; see ***Removing the Top Covers*** on page 58.

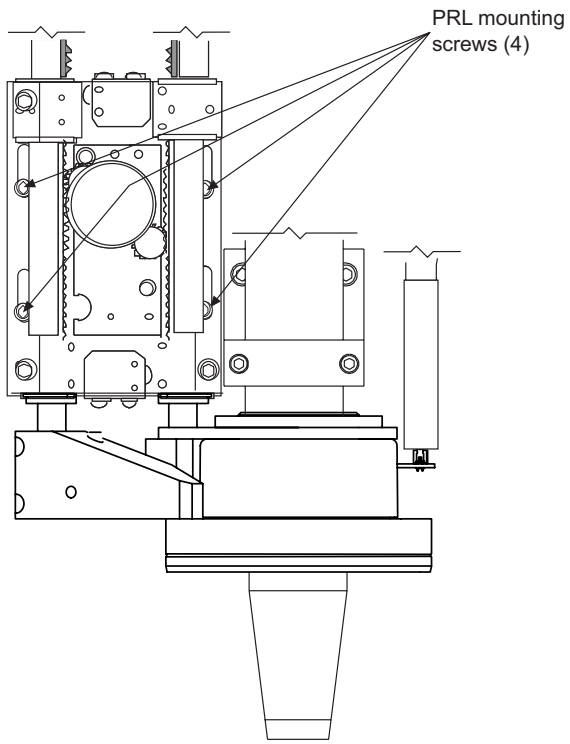


Figure 9-18 Replacing the Programmable Ring Light

4. Remove all tie wraps, and unscrew all cable clamps that secure the PRL control cable and fiber bundles to the Z-axis assembly.
5. Unplug the control cable at the PRL Servo Control PCBA.
6. Detach the four fiber bundles at the lamp house.
7. Using a 5/32 Allen wrench, remove the four screws that secure the PRL assembly cover.
8. Using a 5/32 Allen wrench, install the new PRL assembly by installing the four screws. Mount the PRL at the highest position allowed by the mounting slots.

9. Connect the PRL control cable to the PRL servo control assembly, and fasten the connector locking screws.

10. Each of the four fiber-optic bundles is marked. Put the bundle ends into the lamp box at each correct lamp and securely tighten each bundle clamping screw. If the light fiber bundles do not have protective wrapping, remove the wrapping from the old bundles and place it on the new ones.

11. Install a high-magnification (6.6X) lens on the camera lens tube.

12. Re-install all cable clamps, and secure all fiber bundles and cables.

13. Re-connect power to the Summit 800. Power-on the system.

14. Perform PRL height and travel adjustment; see ***Adjusting the LED Programmable Ring Light (PRL)*** on page 113.

15. Reinstall the top cover, see ***Reinstalling the Top Covers*** on page 70.

9.14 Replacing a Light Bulb (Optional Six-Pack)

Note: Do not touch the reflector with fingers -- oil from the skin will contaminate the reflector. If necessary, clean a smudged reflector with alcohol.

1. Turn off the system, and unplug the power cable from the back of the system.
2. Remove the Top Cover; see ***Removing the Top Covers*** on page 58.
3. Using a 3/32-inch Allen wrench, remove the screws and washers. Lift and slide the top of the lighting system off to expose the lamp box.
4. Loosen the light box cover fasteners, and remove the cover; see ***Figure 9-19***.

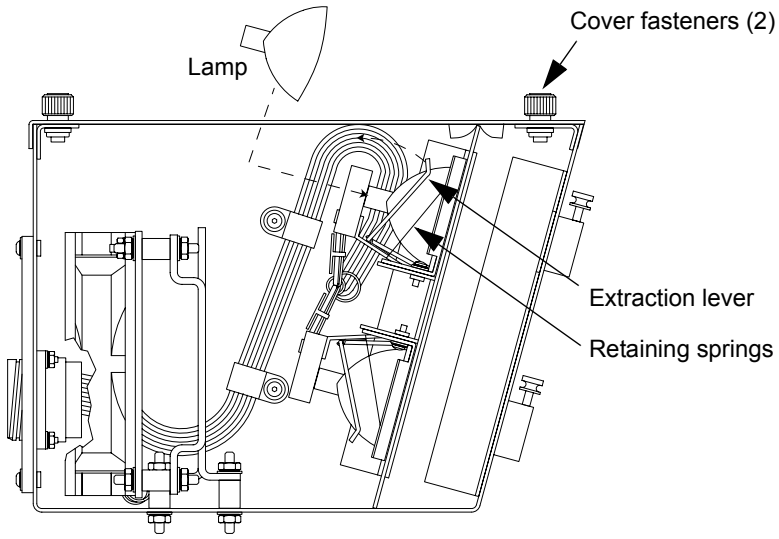


Figure 9-19 Replacing a Light Bulb

5. To replace bad bulb, pull up and back on the extraction lever then lift the bulb out of its socket; then push the extraction lever down and forward until it seats. Note that the bottom three sockets are inverted with respect to the top three sockets.

Caution: Do not touch new bulbs with bare hands. Oils from the skin will dramatically shorten the life of your new bulb. Use latex gloves during the installation process whenever possible.

6. Align the pins on the replacement bulb with the socket guideways, and push the bulb straight down under the retaining springs until the bulb is seated.
7. Reinstall the light box cover, and secure it with the cover fasteners.
8. Reinstall the Top Covers, see ***Reinstalling the Top Covers*** on page 70
9. Reconnect the power cord, turn on system power, and verify proper operation.

9.15 Replacing the Lamp Power Supply

Tools Required	Part No.
Phillips screwdriver	N/A

The Lamp Power Supply PCBA on the left drives the backlight, coaxial light, and the left quadrant PRL light. The Lamp Power Supply PCBA on the right drives the top, right, and bottom PRL lights.

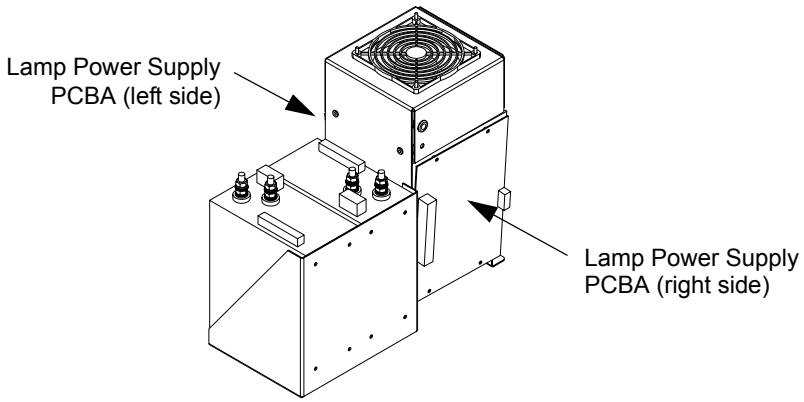


Figure 9-20 Replacing the Lamp Driver Cards

1. Turn off the system, and unplug the power cable from the back of the system.
2. Remove the Lower Front Cover, see ***Removing the Lower Front Cover*** on page 60, and pull out the electronics drawer.
3. Loosen the thumbscrew holding the PC in the upright position, and lower the PC into the service (horizontal) position.
4. Tag the electrical wires for aid during reassembly.
5. Disconnect the electrical wires and connector from the Power Supply PCBA.
6. Remove the two screws holding the Power Supply PCBA in place.
7. Remove the old Power Supply PCBA, and replace it with the new Power Supply PCBA.
8. Secure the replacement Power Supply PCBA with the screws removed in Step 6.
9. Reconnect the electrical wires to the Power Supply PCBA. Remove the tags if used.
10. Adjust the Power Supply as needed.
11. Raise the PC into the upright position, and tighten the thumbscrew.
12. Push in the electronics drawer, and reinstall the Lower Front Cover, see ***Reinstalling the Lower Front Cover*** on page 72.
13. Reconnect the power cord, turn on system power, and verify proper operation.

9.16 Replacing PCBAs

Tools Required	Part No.
Phillips screwdriver	N/A
1/4-inch nut driver	N/A
PRL Spanners	VIEW P/N T-2107495

Caution: Protect your Summit 800 from electrostatic damage. Perform these procedures at a static-safe workstation and wear a ground strap, if one is available; otherwise, follow these guidelines:

- Work in an uncarpeted area.
- Before you touch electronic components, discharge static electricity by touching a known-rounded object.
- Do not touch components on printed circuit boards assemblies (PCBAs), except as directed.

Note: For each new PCBA that you install, record the jumpers installed, switch positions, PCBA revisions, and firmware revisions. You might want to put a sticker on the new PCBAs so you do not get them mixed up with old ones.

Note: Before removing any cables or PCBAs, take note of cable connections and routing.

9.16.1 Replacing the Camera Interface Sub-Panel

1. Turn off the system, and unplug the power cable from the back of the system.
2. Remove the Lower Front Cover; see ***Removing the Lower Front Cover*** on page 60.
3. Remove the Computer Cover; see ***Removing the Computer Cover*** on page 60.
4. Note the orientation of all cables prior to their removal; see ***Figure 9-21***.

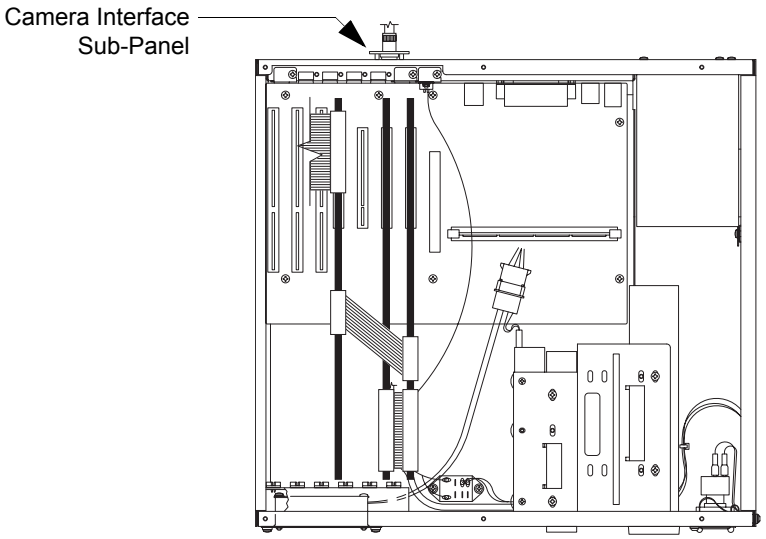


Figure 9-21 Location of the Camera Interface Sub-Panel

5. Disconnect the camera cable connector(s) at the Camera Interface Sub-Panel.
6. Remove the four screws that anchor the Camera Interface Sub-Panel to the PC assembly.

Note: The Camera Interface Sub-Panel connects to *both* the Frame Grabber PCBA and the Integrated Video Processor (IVP) PCBA.

7. Remove the Camera Interface Sub-Panel.
8. Replace the old Camera Interface Sub-Panel with the new Camera Interface Sub-Panel.
9. Reinstall the four screws that anchor the Camera Interface Sub-Panel to the PC assembly.
10. Reconnect he camera cable connector(s) that were previously removed.
11. Reinstall the Computer Cover, see ***Reinstalling the Computer Cover*** on page 72.
12. Reinstall the Lower Front Cover, see ***Reinstalling the Lower Front Cover*** on page 72.
13. Reconnect the power cord, turn on system power, and verify proper operation.

9.16.2 Replacing the Aerotech PCBA

1. Turn off the system, and unplug the power cable from the back of the system.
2. Remove the Lower Front Cover, see ***Removing the Lower Front Cover*** on page 60
3. Remove the Computer Cover; see ***Removing the Computer Cover*** on page 60.
4. Note the orientation of all cables prior to their removal; see ***Figure 9-22***.

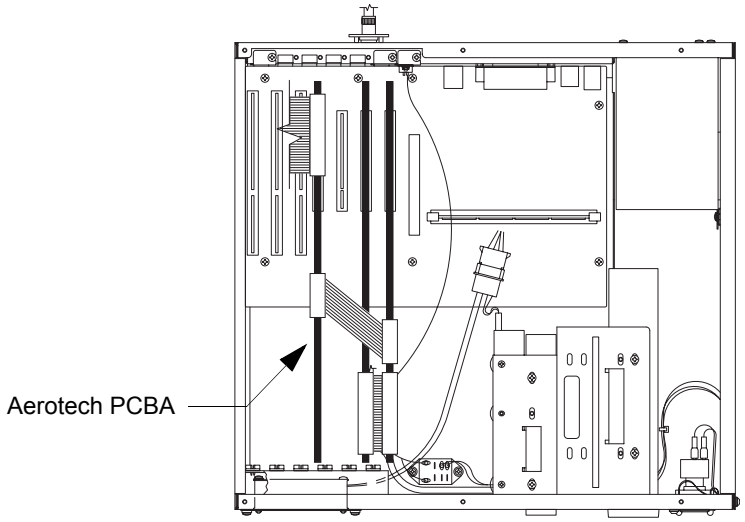


Figure 9-22 Location of the Aerotech PCBA

5. Disconnect the 100-pin SCSI II cable from the outside back of the Aerotech PCBA.
6. Disconnect the 50-pin ribbon cable connecting the Aerotech PCBA to the back panel.
7. Disconnect the 26-pin ribbon cable connecting the Aerotech PCBA to the IVP PCBA.
8. Remove the screw that anchors the Aerotech PCBA to the computer's chassis.
9. Replace the old Aerotech PCBA with the new Aerotech PCBA.
10. Reinstall the screw that anchors the Aerotech PCBA to the computer's chassis.
11. Reconnect all the cables that were previously removed.
12. Reinstall the Computer Cover, see ***Reinstalling the Computer Cover*** on page 72.
13. Reinstall the Lower Front Cover, see ***Reinstalling the Lower Front Cover*** on page 72.
14. Reconnect the power cord, turn on system power, and verify proper operation.

9.16.3 Replacing the Matrox Frame Grabber PCBA

1. Turn off the system, and unplug the power cable from the back of the system.
2. Remove the Lower Front Cover, see ***Removing the Lower Front Cover*** on page 60
3. Remove the Computer Cover; see ***Removing the Computer Cover*** on page 60.
4. Note the orientation of all cables prior to their removal; see ***Figure 9-23***.

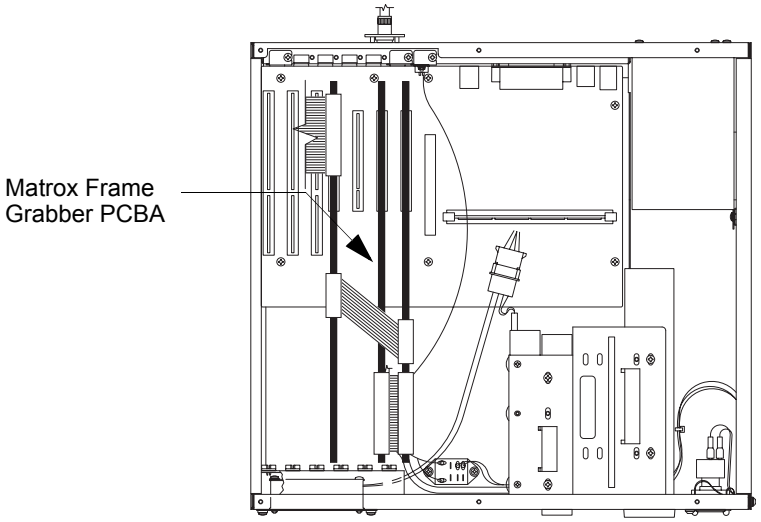


Figure 9-23 Location of the Matrox Frame Grabber PCBA

5. Remove the Camera Interface Sub-Panel; see ***Replacing the Camera Interface Sub-Panel*** on page 180.
6. Disconnect the 15-pin monitor cable from the outside (back) of the Frame Grabber PCBA.
7. Disconnect the 50-pin ribbon cable connecting the Frame Grabber PCBA to the IVP PCBA.
8. Disconnect the 26-pin ribbon cable connecting the IVP PCBA to the Aerotech PCBA.
9. Remove the screw that anchors the Frame Grabber PCBA to the computer's chassis.
10. Replace the old Frame Grabber PCBA with the new Frame Grabber PCBA.
11. Reinstall the screw that anchors the Frame Grabber PCBA to the computer's chassis.
12. Reconnect all the computer cables that were previously removed.
13. Reinstall the Camera Interface Sub-Panel (see ***Replacing the Camera Interface Sub-Panel*** on page 180).
14. Reinstall the Computer Cover, see ***Reinstalling the Computer Cover*** on page 72.
15. Reinstall the Lower Front Cover, see ***Reinstalling the Lower Front Cover*** on page 72.
16. Reconnect the power cord, turn on system power, and verify proper operation.

9.16.4 Replacing the Mutech Frame Grabber PCBA

1. Turn off the system, and unplug the power cable from the back of the system.
2. Remove the Lower Front Cover, see ***Removing the Lower Front Cover*** on page 60
3. Remove the Computer Cover; see ***Removing the Computer Cover*** on page 60.
4. Note the orientation of all cables prior to their removal; see ***Figure 9-24***.

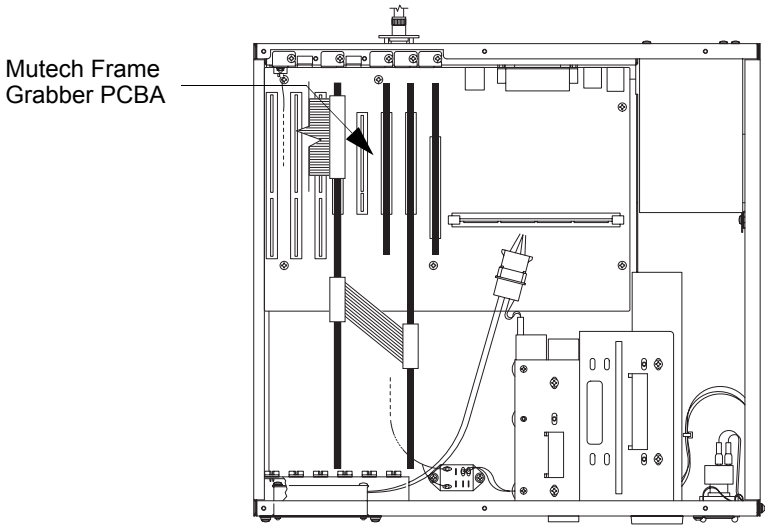


Figure 9-24 Location of the Mutech Frame Grabber PCBA

5. Remove the Camera Interface Sub-Panel; see ***Replacing the Camera Interface Sub-Panel*** on page 180.
6. Remove the screw that anchors the Frame Grabber PCBA to the computer's chassis.
7. Replace the old Frame Grabber PCBA with the new Frame Grabber PCBA.
8. Reinstall the screw that anchors the Frame Grabber PCBA to the computer's chassis.
9. Reinstall the Camera Interface Sub-Panel; see ***Replacing the Camera Interface Sub-Panel*** on page 180.
10. Reinstall the Computer Cover, see ***Reinstalling the Computer Cover*** on page 72.
11. Reinstall the Lower Front Cover, see ***Reinstalling the Lower Front Cover*** on page 72.
12. Reconnect the power cord, turn on system power, and verify proper operation.

9.16.5 Replacing the Integrated Video Processor (IVP) PCBA

1. Turn off the system, and unplug the power cable from the back of the system.
2. Remove the Lower Front Cover, see ***Removing the Lower Front Cover*** on page 60
3. Remove the Computer Cover; see ***Removing the Computer Cover*** on page 60.
4. Note the orientation of all cables prior to their removal; see ***Figure 9-25***.

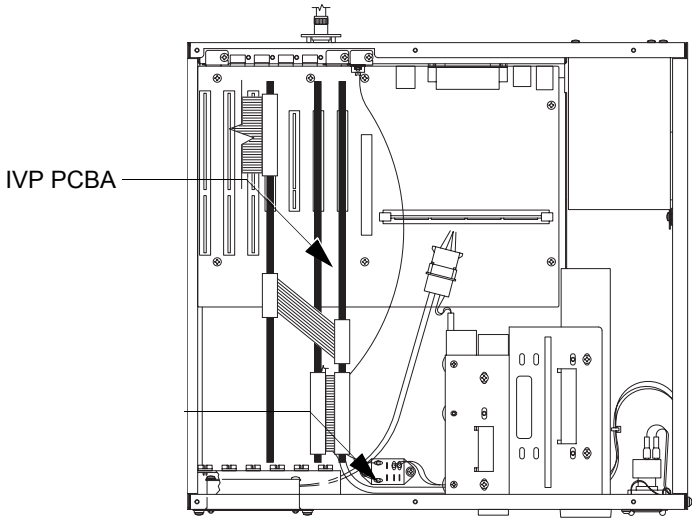


Figure 9-25 Location of the IVP PCBA

5. Remove the Camera Interface Sub-Panel; see ***Replacing the Camera Interface Sub-Panel*** on page 180.
6. Disconnect the 26-pin ribbon cable connecting the IVP PCBA to the Aerotech PCBA.
7. Disconnect the 50-pin ribbon cable that connects the IVP PCBA to the Matrox PCBA.
8. Remove the screw that anchors the IVP PCBA to the computer's chassis.
9. Replace the old IVP PCBA with the new IVP PCBA.
10. Reinstall the screw that anchors the IVP PCBA to the computer's chassis.
11. Reconnect all the computer cables that were previously removed.
12. Reinstall the Camera Interface Sub-Panel; see ***Replacing the Camera Interface Sub-Panel*** on page 180.
13. Reinstall the Computer Cover, see ***Reinstalling the Computer Cover*** on page 72.
14. Reinstall the Lower Front Cover, see ***Reinstalling the Lower Front Cover*** on page 72.
15. Reconnect the power cord, turn on system power, and verify proper operation.

9.16.6 Replacing the AGP Graphics PCBA

1. Turn off the system, and unplug the power cable from the back of the system.
2. Remove the Lower Front Cover, see ***Removing the Lower Front Cover*** on page 60
3. Remove the Computer Cover; see ***Removing the Computer Cover*** on page 60.
4. Note the orientation of all cables prior to their removal; see ***Figure 9-26***.

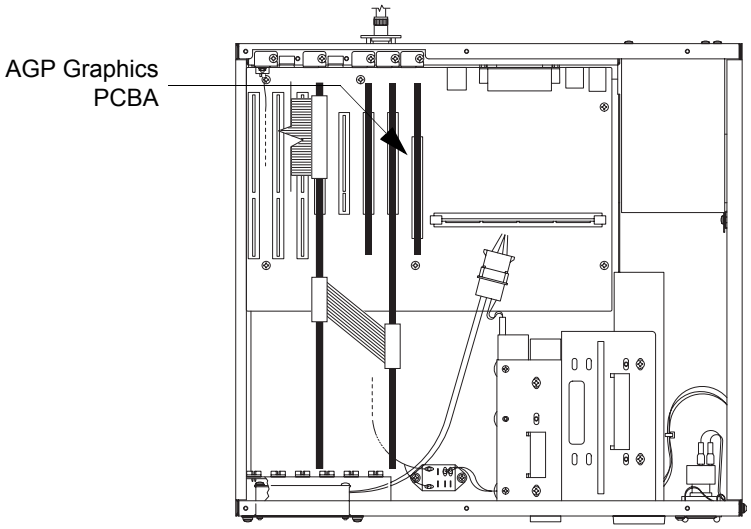


Figure 9-26 Location of the AGP Graphics PCBA

5. Disconnect the 15-pin monitor cable from the outside (back) of the AGP Graphics PCBA.
6. Remove the screw that anchors the AGP Graphics PCBA to the computer's chassis.
7. Replace the old AGP Graphics PCBA with the new AGP Graphics PCBA.
8. Reinstall the screw that anchors the AGP Graphics PCBA to the computer's chassis.
9. Reinstall the 15-pin monitor cable to the outside (back) of the Frame Grabber PCBA.
10. Reinstall the Computer Cover, see ***Reinstalling the Computer Cover*** on page 72.
11. Reinstall the Lower Front Cover, see ***Reinstalling the Lower Front Cover*** on page 72.
12. Reconnect the power cord, turn on system power, and verify proper operation.

9.16.7 Replacing the Breakout PCBA

1. Turn off the system, and unplug the power cable from the back of the system.
2. Remove the Lower Front Cover, see ***Removing the Lower Front Cover*** on page 60
3. Pull out the electronics drawer.
4. The linear Breakout PCBA is located on the back wall of the drawer; see ***Figure 9-27***.

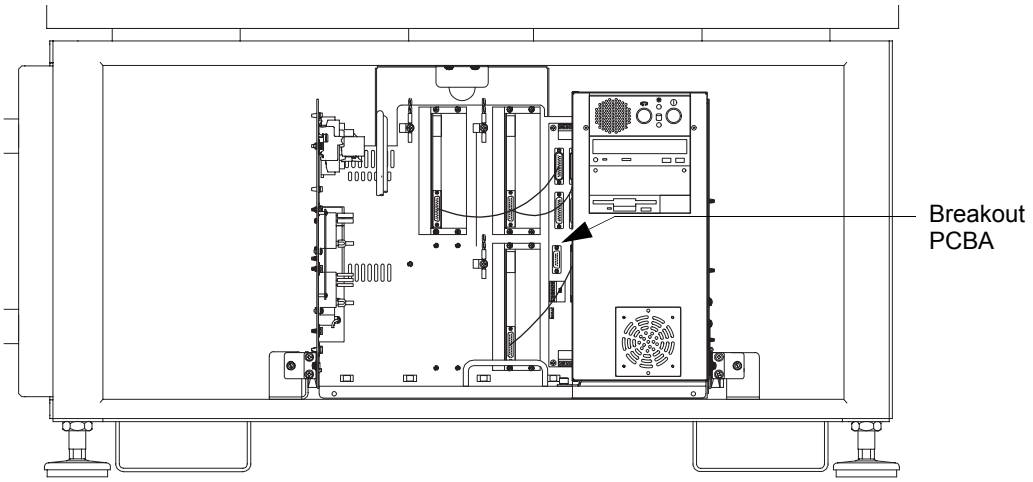


Figure 9-27 Location of the Breakout PCBA

5. Disconnect all connectors from the Breakout PCBA. You may wish to label the connectors to aid in re-installation.
6. Remove the five screws mounting the Breakout PCBA to the drawer. Retain all the hardware.
7. Replace the old Breakout PCBA with the new Breakout PCBA.
8. Reinstall the five screws that mount the Breakout PCBA to the drawer.
9. Reconnect all the cables that were previously removed.
10. Close the electronics drawer.
11. Reinstall the Lower Front Cover, see ***Reinstalling the Lower Front Cover*** on page 72
12. Reconnect the power cord, turn on system power, and verify proper operation.

9.16.8 Replacing the Connector Interface Subpanel (CISP) PCBA

1. Turn off the system, and unplug the power cable from the back of the system.
2. Remove the Lower Front Cover, see ***Removing the Lower Front Cover*** on page 60
3. Pull out the electronics drawer.
4. The CISP PCBA is located on the right side wall of the drawer; see ***Figure 9-28***.

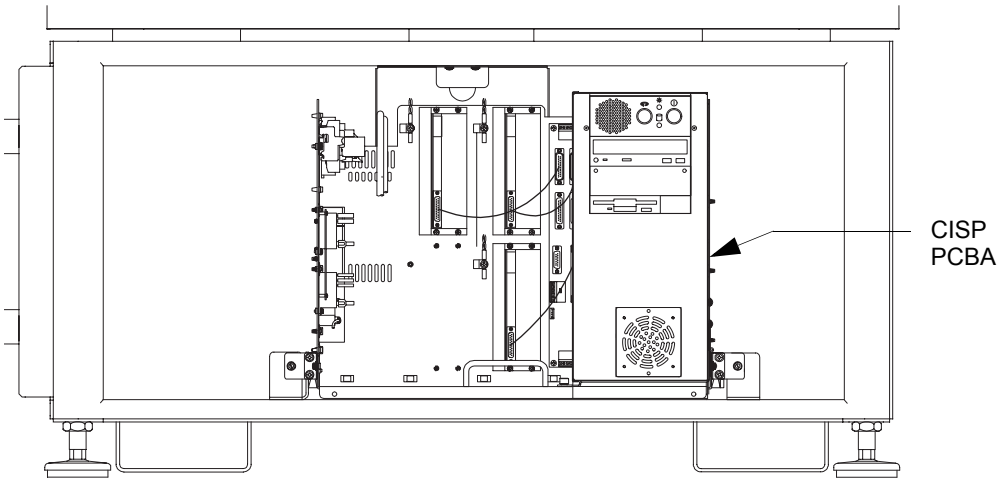


Figure 9-28 Location of the Connector Interface Subpanel (CISP) PCBA

5. Loosen the thumbscrew holding the PC in the upright position, and lower the PC into the service position to better access the CISP PCBA.
6. Disconnect all connectors from the CISP PCBA. You may wish to label the connectors to aid in re-installation.
7. Remove the six screws mounting the old CISP PCBA to the drawer. Retain all the hardware.
8. Replace the old CISP PCBA with the new CISP PCBA.
9. Reinstall the six screws that mount the CISP PCBA to the drawer.
10. Reconnect all the cables that were previously removed.
11. Close the electronics drawer.
12. Reinstall the Lower Front Cover, see ***Reinstalling the Lower Front Cover*** on page 72
13. Reconnect the power cord, turn on system power, and verify proper operation.

9.16.9 Replacing the X-, Y-, or Z-Axis Amplifier PCBA

1. Turn off the system, and unplug the power cable from the back of the system.
2. Remove the Lower Front Cover, see ***Removing the Lower Front Cover*** on page 60
3. Pull out the electronics drawer.
4. The Amplifiers are located on the back wall of the drawer; see ***Figure 9-29***.

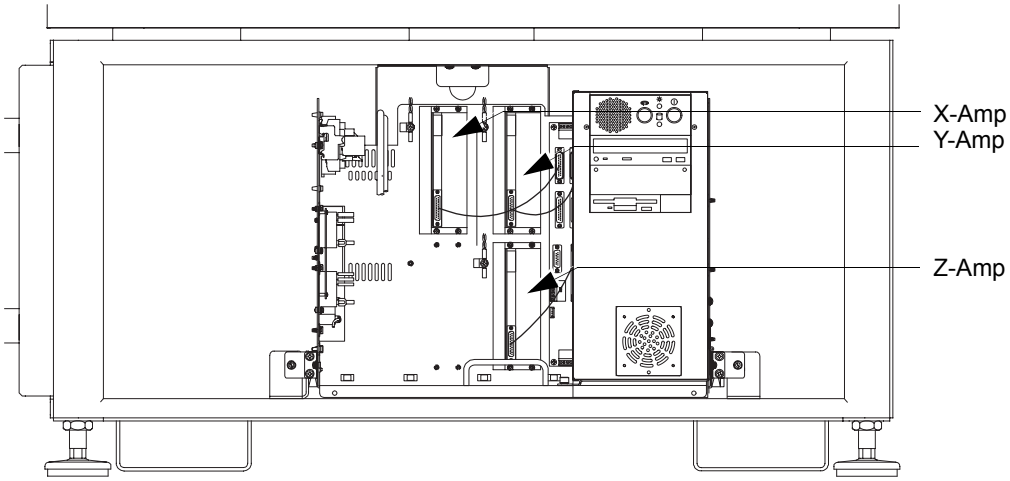


Figure 9-29 Location of the X-, Y-, and Z-Axis Amplifiers

5. Disconnect all connectors from the amplifier being replaced. You may wish to label the connectors to aid in re-installation.
6. Remove the four screws mounting the old amplifier to the drawer. Retain all the hardware.
7. On the new amplifier, set SW9 to the *PWR* position. All other switches must be set to *ENB*.
8. Replace the old amplifier with the new amplifier using the saved hardware.
9. Reinstall the four screws that mount the amplifier to the drawer.
10. Reconnect all the cables that were previously removed.
11. Close the electronics drawer.
12. Reinstall the Lower Front Cover, see ***Reinstalling the Lower Front Cover*** on page 72
13. Reconnect the power cord, turn on system power, and verify proper operation.

9.16.10 Replacing LED Power Supply (LPS3) PCBA

1. Turn off the system, and unplug the power cable from the back of the system.
2. Remove the Lower Front Cover, see ***Removing the Lower Front Cover*** on page 60
3. Pull out the electronics drawer.
4. The LPS3 PCBA is centered on the left side wall of the drawer next to relays C1 and C2; refer to ***Figure 9-30***.

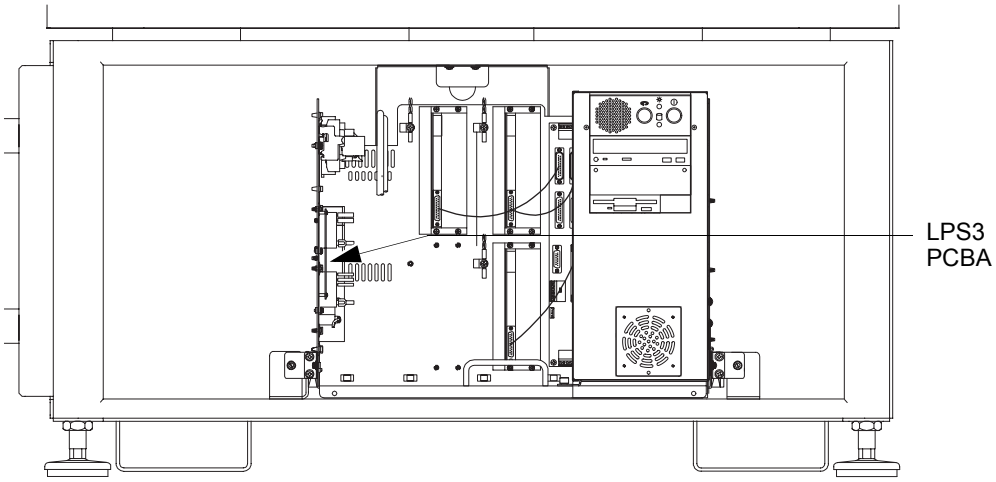


Figure 9-30 Location of the LED Power Supply (LPS3) PCBA

5. Disconnect all connectors from the LPS3 PCBA. You may wish to label the connectors to aid in re-installation.
6. Remove the four screws mounting the LPS3 PCBA to the drawer. Retain all the hardware.
7. Replace the old LPS3 PCBA with the new LPS3 PCBA using the saved hardware.
8. Reinstall the four screws that mount the LPS3 PCBA to the drawer.
9. Reconnect all the cables that were previously removed.
10. Close the electronics drawer.
11. Reinstall the Lower Front Cover, see ***Reinstalling the Lower Front Cover*** on page 72
12. Reconnect the power cord, turn on system power, and verify proper operation.

9.16.11 Replacing the Coaxial LED PCBA

1. Turn off the system, and unplug the power cable from the back of the system.
2. Remove the top cover; see ***Removing the Top Covers*** on page 58.
3. At the coaxial light assembly, slide the vinyl boot up enough to access the three hold-down screws and connector.
4. Disconnect the cable from the Coaxial LED PCBA; see ***Figure 9-31***.

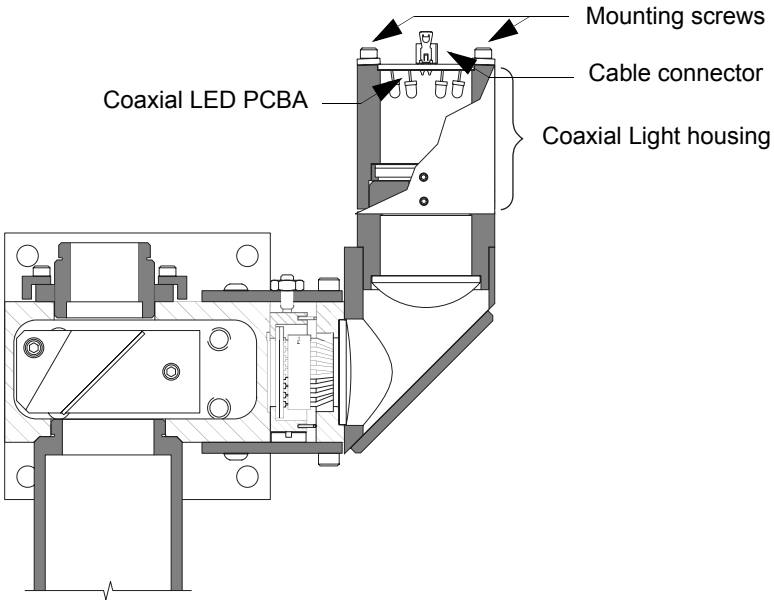


Figure 9-31 Coaxial LED PCBA Location

5. Remove the three screws holding the Coaxial LED PCBA in place. Retain all the hardware.
6. Replace the old Coaxial LED PCBA with the new Coaxial LED PCBA.
7. Reinstall the three screws holding the Coaxial LED PCBA in place.
8. Reconnect the cable to the Coaxial LED PCBA.
9. Reinstall the vinyl boot.
10. Verify and adjust the intensity and uniformity of the new assembly running the LED uniformity test.
11. Reinstall the Top Covers; see ***Reinstalling the Top Covers*** on page 70.
12. Reconnect the power cord, turn on system power, and verify proper operation.

9.16.12 Replacing the LED PRL PCBA

1. In the Stage and Lights menu, set the PRL to 164. The PRL will be lowered to the lower limit.
2. Turn off the system, and unplug the power cable from the back of the system.
3. Remove the top cover; see ***Removing the Top Covers*** on page 58.
4. Disconnect the PRL LED Cable at the PCBA.
5. If an LED Polarizer is installed, remove it by sliding it down and off the outer LED ring.
6. Using the PRL spanners, loosen and remove the parabola attaching nut from the parabola. The Parabola, LED PCBA Cover, and LED PCBA can now be lowered out of the toroid; refer to ***Figure 9-32***.

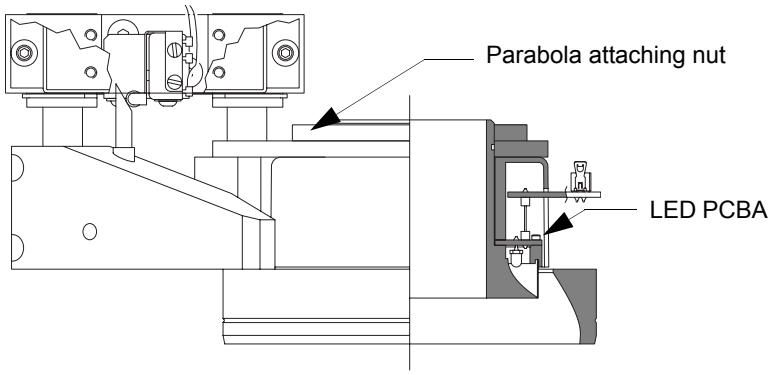


Figure 9-32 PRL Assembly

7. Remove the LED PCBA Cover.
8. Remove the old LED PCB, and install the new LED PCB.
9. Reinstall the LED PCBA Cover.
10. Place the Parabola, LED PCBA Cover, and LED PCBA into the toroid; then, using the PRL spanners, reinstall and tighten the parabola attaching nut to the parabola.
11. Reconnect the PRL LED Cable to the PCBA.
12. Reinstall the Top Covers, see ***Reinstalling the Top Covers*** on page 70
13. Reconnect the power cord, and turn on system power.
14. Perform the LED PRL alignment procedure (see ***Adjusting the LED Programmable Ring Light (PRL)*** on page 113), and verify proper operation.

9.17 Hard Drive Replacement

1. Turn off the system, and unplug the power cable from the back of the system.
2. Remove the Lower Front Cover, see ***Removing the Lower Front Cover*** on page 60
3. Remove the Computer Cover; see ***Removing the Computer Cover*** on page 60.
4. Disconnect the power and data connections at the rear of the drive; see ***Figure 9-33***.

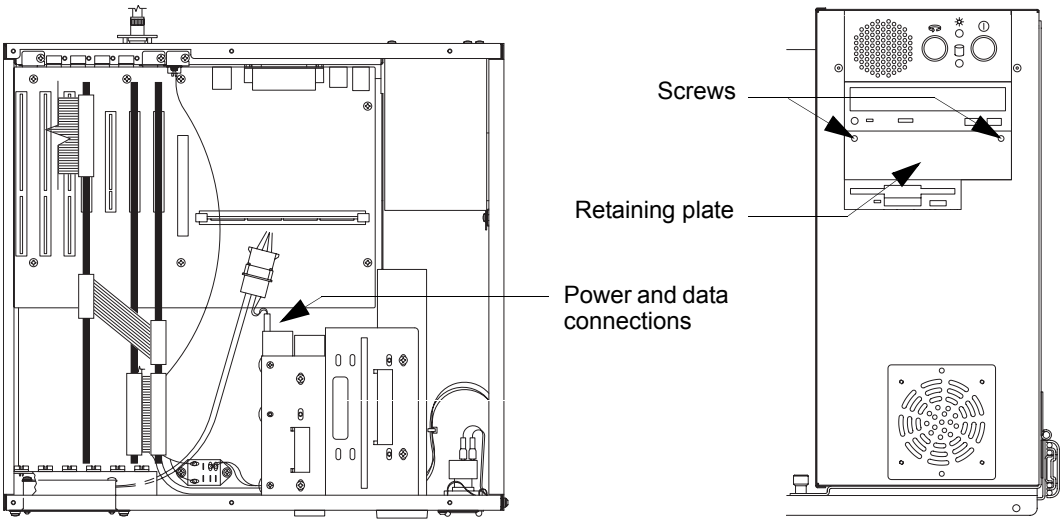


Figure 9-33 Location of the Hard Drive

5. Remove the two screws holding the hard drive retaining plate in place, and remove the retaining plate.
6. Gently slide the old hard drive forward and out of the hard drive bay.
7. Remove the mounting bracket from the old drive, and install it on the new hard drive.
8. Slide the new hard drive into the hard drive bay.
9. Reinstall the retaining plate, and secure it in place with the two screws removed in Step 5.
10. Reconnect the power and data connections.
11. Reinstall the Computer Cover, see ***Reinstalling the Computer Cover*** on page 72
12. Reinstall the Lower Front Cover, see ***Reinstalling the Lower Front Cover*** on page 72
13. Reconnect the power cord, turn on system power, and verify proper operation.
14. Contact the View Engineering, Inc., Customer Support Department (see ***Where to Get Help*** on page 3) for assistance with the software loading process.

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