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MARQUEE® ACON Ultra
Operation & Maintenance Manual



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Supplement History

- *1.2 (1/30/2006)*
  - *Incorporated Supplement # 79040-02, 79040-03.*

Conventions

NOTE:
- This format is for tips or additional notes, or suggestions

- Text indicating tip, or notes, or suggestions is encapsulated within a grayed text box
- Menu Selections are formatted as

  `This is menu text format`
- Control titles (window titles, button titles, checkbox titles, etc) are formatted as

  This is a window title, a button title, or a checkbox title format
- Text that prompts the user to action is formatted as

  `This is prompting text format`
- Physical keyboard keys, or buttons are formatted as

  This is a <button> and this is [another button]
- Names of projector settings or AU variables are formatted as

  This is an AU variable format

Section 1 ACON Ultra Camera/Server Installation Instructions

Please read these instructions in its entirety prior to installation

! Projector software version 6.0 or greater required to operate ACON Ultra

1.1 Contents of the MARQUEE™ ACON Ultra Kits

1.1.1 *ACON Ultra* Camera Kit (VDCDS P/N 69871-01)

Item	Part Description	Qty	U/M
1	Cable, Serial	2	EA
2	Shipping Box, Camera ACON Ultra	1	EA
3	Foam, Camera, ACON Ultra	1	EA
4	Screw 1/4-20 X 1 1/8"L SHCS Cres	4	EA
5	Washer, 1/4", Flt, SS, .035 Thk	4	EA
6	Spacer, .5 OD X 3/4"L X 1/4 Id Black Alum	4	EA
7	Cable Assy, BNC, 30' Male To Male	1	EA
8	Cable, Jumper AC Cord Set, 18”	1	EA
9	Warranty Registration Card	1	Ea.
10	Assy, Camera, ACON Ultra	1	EA

Table 1-1. *ACON Ultra* Camera Kit Contents

1.1.2 *ACON Ultra 2* Camera Kit (VDCDS P/N 69871-05)

Item	Part Description	Qty	U/M
1	Marquee Firmware, ACON Ultra	1	EA
2	Foam, ACON Ultra-S camera, Shipping	1	EA
3	Foam, ACON Ultra-S Electronics Box, Shipping	1	EA
4	Box, ACON Ultra-S Camera, Shipping	1	EA
5	Box, ACON Ultra-S Electronics Box Shipping	1	EA
6	Bag, 10 x 8 x 24 Gusseted 7”	2	EA.
7	Label, Blank Laser 2 5/8” x 2”	1	EA
8	Cable Assy, 40” 20 Pin ACON Ultra S	1	EA
9	Cable Assy 40” 13 Pin ACON Ultra S	1	EA
10	Wrench, Lens lock nut, ACON Ultra	1	EA
11	Assy, Head, ACON Ultra 2 Pc	1	EA
12	Assy, Electronics Box, ACON Ultra 2 Pc	1	EA

Table 1-2. *ACON Ultra 2* Camera Kit Contents

1.1.3 ACON Ultra Server Kit (VDCDS P/N 69871-02/ -06)

Item	Part Description	Qty	U/M
1	CD, ACON Ultra Server Software	1	EA
2	Pallet, CFIA (Bug Free)	1	EA
3	Cover Carton-TOP, BTM.	2	EA
4	Shipping Carton, Sleeve, VDC Marquee	1	EA
5	Tool, PLCC Extractor	1	EA
6	Manual, ACON ULTRA OPS/Install &Maintenance	1	EA
7	Computer, 3 GHz, 4U RK MNT	1	EA
8	UPS, 950W, Rack Mount	1	EA
9	Assy, Frame Grabber 1185-I	1	EA
10	Assy, Video Expansion Bd 1201-I	*	EA
11	Cable, Serial	1	EA
12	Hardware License Key	1	EA

* NOTE: Kit -02 has 2 item 10, Kit -06 has 1 item 10

Table 1-3. *ACON Ultra* Server Kit.

1.1.4 Contents of FLOLS Bracket Kit (VDCDS P/N 69871-10)

Item	Part Description	Qty	U/M
1	SHIPPING BOX, CAMERA ACON ULTRA	1	EA
2	SCR, 1/4-20 X 1/2"L, SHCS, SS	4	EA
3	SCR, 1/4-20 X 1 3/4"L,SHCS, SS	2	EA
4	SCR, #8-32 X 5/8"L SHCS S.S.	2	EA
5	WSHR, #8 FLT, SS	1	EA
6	WSHR, 1/4", FLT, SS, .035 THK	6	EA
7	BRACKET, MNTG,FLOLS,ACON ULTRA	1	EA
8	BRACE, MNTG, FLOLS, ACON ULTRA	1	EA
9	SPACER, FLOLS ACON ULTRA MTG	1	EA
10	Warranty Registration Card	1	EA
11	Cable, Jumper AC Cord Set, 3'	1	EA

Table 1-4. FLOLS Bracket Kit

1.2 MARQUEE™ ACON Ultra Reorder/Replacement P/N

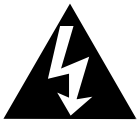
VDCDS P/N	Part Description
69871-08	Service Assy, Camera, ACON Ultra
81761S01	Service Assy, ACON Ultra-2 Head
81761S02	Service Assy, ACON Ultra-2 Electronics Chassis
81749S01	Service Assy, Server, ACON Ultra
81749S03	Service Assy, Server, ACON Ultra 2
Contact VDC DS	ACON Ultra Server Hard drive
59789S03	ACON Ultra Server Power Supply 300W ATX
81753S01	ACON Ultra Server Frame Grabber Expansion Board
81732S01	ACON Ultra Server Frame Grabber Board
81788S01	ACON Ultra Server 4-Port Serial Board
81751-01	UPS Rackmount

Table 1-5. ACON Ultra Reorder/Replacement P/N

1.3 Camera Installation Instructions

There are two camera installations, one on the projector front panel (section 1.4.3.1) and the other on a top mounted bracket (section 1.4.4.1). The standard installation is on the front panel. The camera is mounted on the top bracket if the line of sight between the camera in the standard position and the screen is blocked, for example if a FLOLS projector is installed.

WARNINGS



Installation must be performed by qualified MARQUEE series projector service personnel.

Always unplug the unit prior to disassembly. Un-insulated "dangerous voltages" may be exposed.

Static precautions must be observed.

1.3.1 Verify Factory Camera Settings

Tools & Equipment Required:

- Phillips screwdriver
- 3/16 Allen wrench
- 3/16 Nut Driver / small Crescent Wrench

On the backside of each camera are several DIP switches and controls. If these settings are not properly set, the camera will not properly operate. Verify the following factory settings; See Figure 1-1.

1. On the 10-postion DIP switch, verify that switches 8 (FR/FL) and 9 (γ) are in the "on" position and all other switches are off. Both the "High 75Ω" and "IN OUT" DIP switches are set to HD
2. Ensure the M GAIN control is fully clockwise (CW). In some situations, where the screen glare is very high, the M GAIN may not be set fully CW.

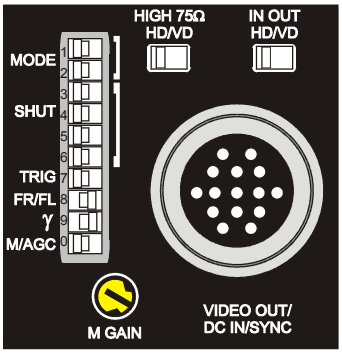


Figure 1-1. Camera Factory Settings

Camera Address Switch Location and Setting.

Each camera unit has an individual address or ID. This ID is used to communicate with the cameras' used in a network application or individually with the corresponding projector ID. Although when a camera unit is mounted on a projector, the projector address (ID) does not have to match that of the camera ID. *However, it is highly recommended that they do*. Refer to your relevant projector User's Guide for selecting and setting the projectors' address (ID).

NOTE: See Section 1.4.5 for logging in the relevant projector and AU system information.

1.3.1.1 *Setting the Camera Address (ID)*

1. Remove the camera assembly and hardware from the package.
2. Visually inspect the contents and each component carefully for any damage.
3. Access to the Motion Control Board 5-position DIP switch (S1) can be accomplished through either the top or front vent holes.
4. Locate S1 (Figure 1-2, on the ACON Ultra 2 split unit, S1 is located on the electronics chassis) and using a long flat head screwdriver to carefully set the switches to the desired positions.

NOTE: S1 positions 1(LSB) through 4 (MSB) are used to set the camera's ID and switch 5 is used to set either software or hardware address. Switch 5 is normally set to off.

		Switch 1 (S1) Position			
		4	3	2	1
Camera ID (Address)	0*	OFF	OFF	OFF	OFF
	1	OFF	OFF	OFF	On
	2	OFF	OFF	On	OFF
	3	OFF	OFF	On	On
	4	OFF	On	OFF	OFF
	5	OFF	On	OFF	On
	6	OFF	On	On	OFF
	7	OFF	On	On	On
	8	On	OFF	OFF	OFF
	9	On	OFF	OFF	On
	10	On	OFF	On	OFF
	11	On	OFF	On	On
*Not recommended to use address "0" unless required					

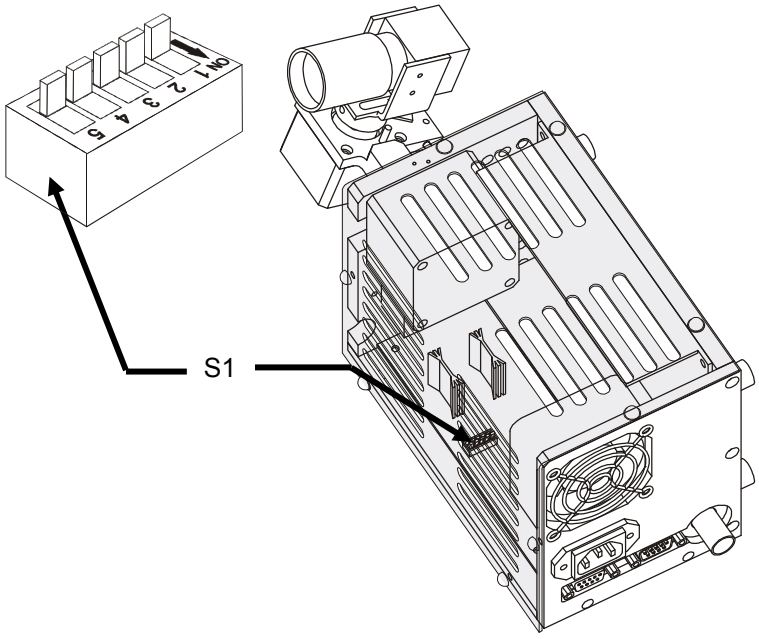


Figure 1-2. Camera Address Switches (Camera ID).

1.3.2 Mounting the Camera Assembly

There are two camera configurations, one mounted on the front panel (Section 1.4.3.1) and the other mounted on the top bracket (Section 1.4.3.2).

1.3.2.1 *Mounting the Camera Assembly on the Front Panel*

CAUTION: **DO NOT** hold the ACON Ultra assembly by the lens or camera. Only hold the assembly by its housing.

NOTE: Before proceeding and if required see Section 1.3.1.1 for setting the camera's ID

NOTE: For projector revision "D" and below a modified predrilled projector front panel (Item 9-included) is required.

NOTE: For projector revision "E" and above the front panel is already configured to accept the camera assembly.

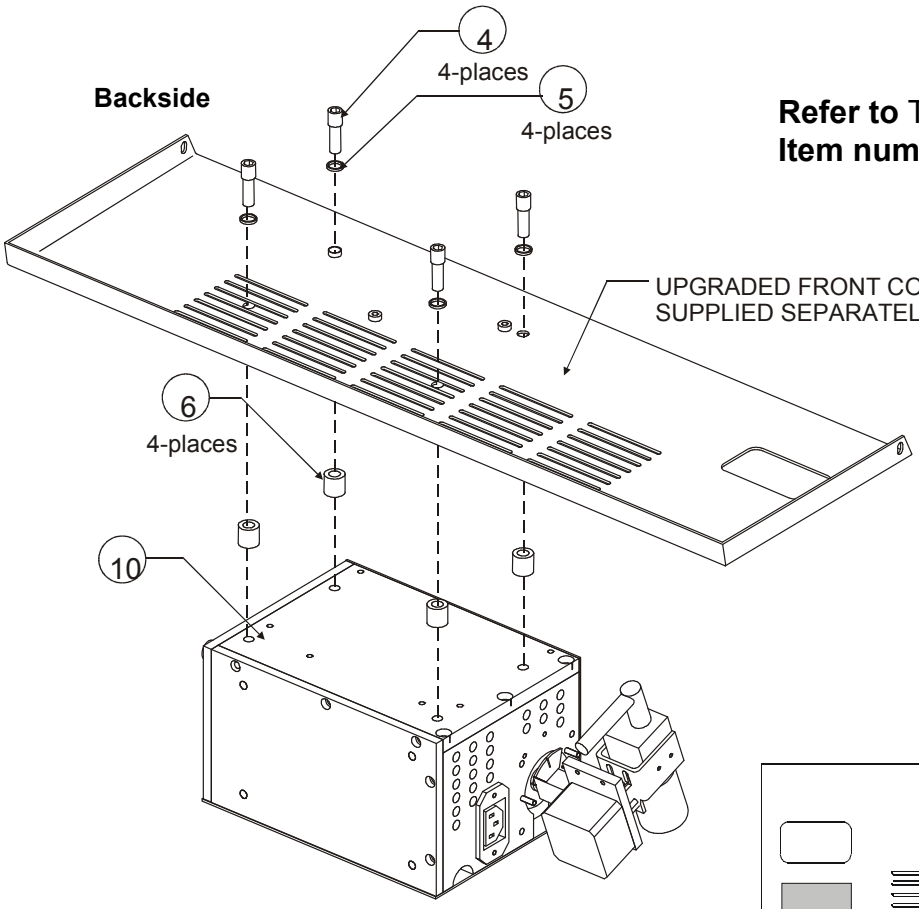
Mount the camera assembly on to the front panel of the Marquee series projector.

a) Remove the existing front panel by removing the 2 each Phillips screws as shown in Figure 1-4.
b) Place the camera assembly with the cover mounting surface facing up.
c) On the new or existing front panel, mount the camera assembly (Item 10) as shown in Figure 1-3.
d) On the projector, remove the lower front trim by removing the two (2) small Phillips screws. See Figure 1-4.
e) Remove the DB15 connector located on the lower front trim cover by removing the two-each 4-40 hex bolts and nuts. See Figure 1-4. Place and secure the cable assembly under the lenses.

NOTE: The lower front trim cover removed during Step 1.3.2, d) is not required and can be discarded if desired.

f) Replace the front panel on the projector with the AU camera assembly mounted.
g) On the front panel, place the corresponding manufacturing/serial number label of the projector under rework as shown in the illustration below.

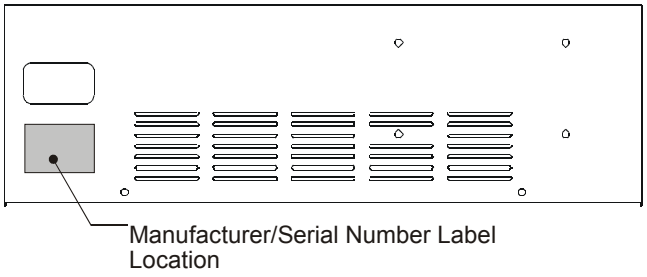
NOTE: Both projector revision levels D &E are now upgraded to revision Level F.



Refer to Table 1-1 **for Item number references**

Figure 1-3 AU Camera Mounting

Front side



Do not hold the ACON Ultra assembly by the lens or camera.

Use only the hardware supplied in the kit:

Screws that are too short will strip the holes in the camera.

Screws that are too long will short the ACON Ultra power supply.

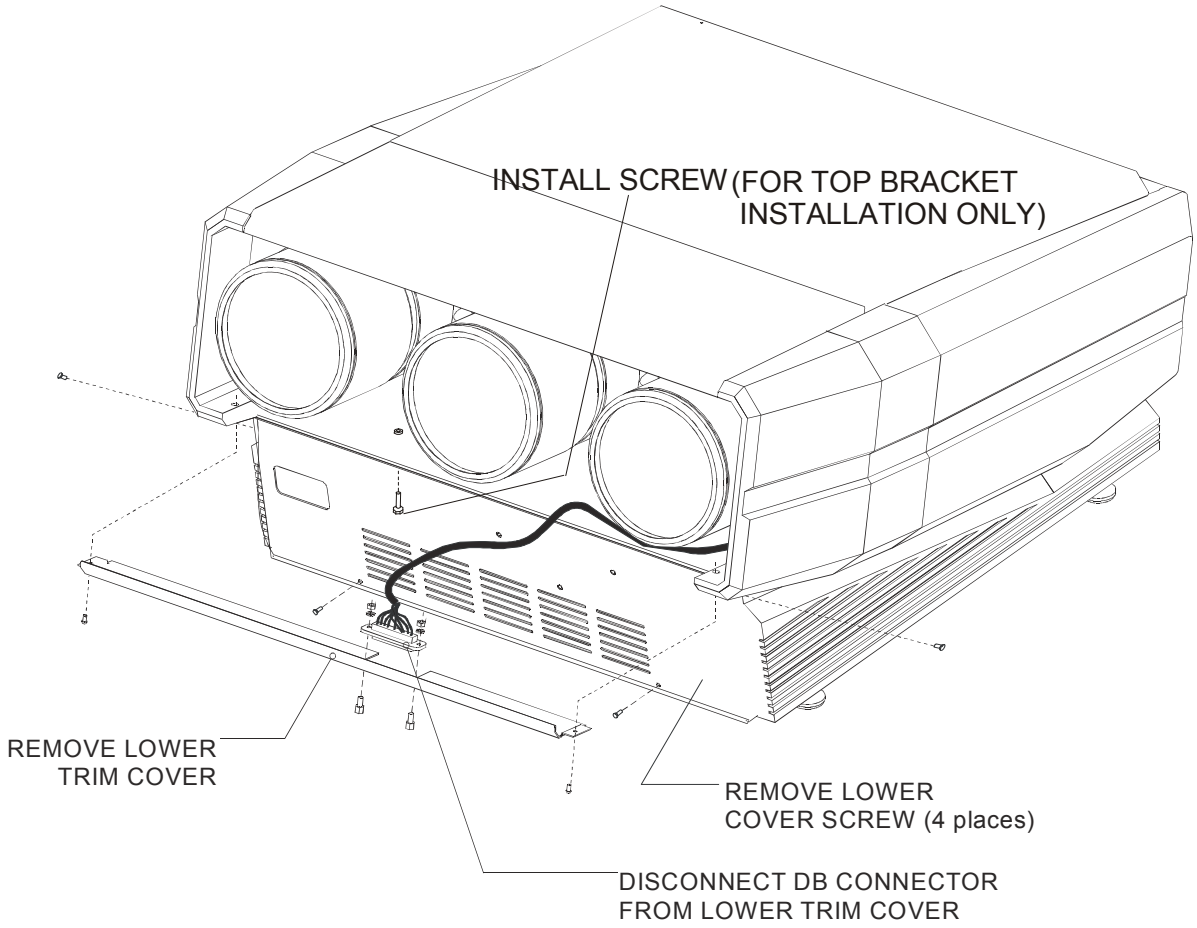


Figure 1-4. Front Lower Trim Cover Removal.

1.3.2.2 *Mounting the Camera Assembly on the Top Bracket*

Note: See section 1.4.2.1 to set camera ID.

1. Install brackets
    a) Pop the top cover off and set it aside.
    b) Remove the lens foam.
    c) Remove four screws securing the front cover and remove cover (Figure 1-4).
    d) From below, install one 8-32 X 5/8” screw through the pem nut located next to the LVPS and tighten.
    e) Install the bracket (round rod) on the 8-32 X 5/8” screw and tighten (Figure 1-5).
    f) Position the front cover and install four screws to secure (Figure 1-4).
    g) Remove the center two ¼-20 bolts from the top cross bar over the green CRT and discard (Figure 1-5).
    h) Position the spacer with the long end to the left (as you face the projector) and align two holes with the two holes in the cross bar.
    i) Position the bracket on top of the spacer and align the bracket holes with the spacer holes.
    j) Install two ¼-20X1 ¾” screws with washers through the bracket and spacer and into the cross bar. Do not tighten.
    k) Install an 8-32 X 5/8” screw with washer through the bracket and into the (round rod) bracket. Tighten to secure.
    l) Tighten two screws installed in Step j. to secure.
    m) Reinsert the foam piece around the lenses.

2. Install camera

Do not hold the ACON Ultra assembly by the lens or camera.
Use only the hardware supplied in the kit:
Screws that are too short will strip the holes in the camera.
Screws that are too long will short the ACON Ultra power supply.

n) Position the ACON Ultra camera against the bracket as shown.
o) From the rear, install four ¼-20 X ½ screws with washers through the bracket and into the camera. Tighten to secure

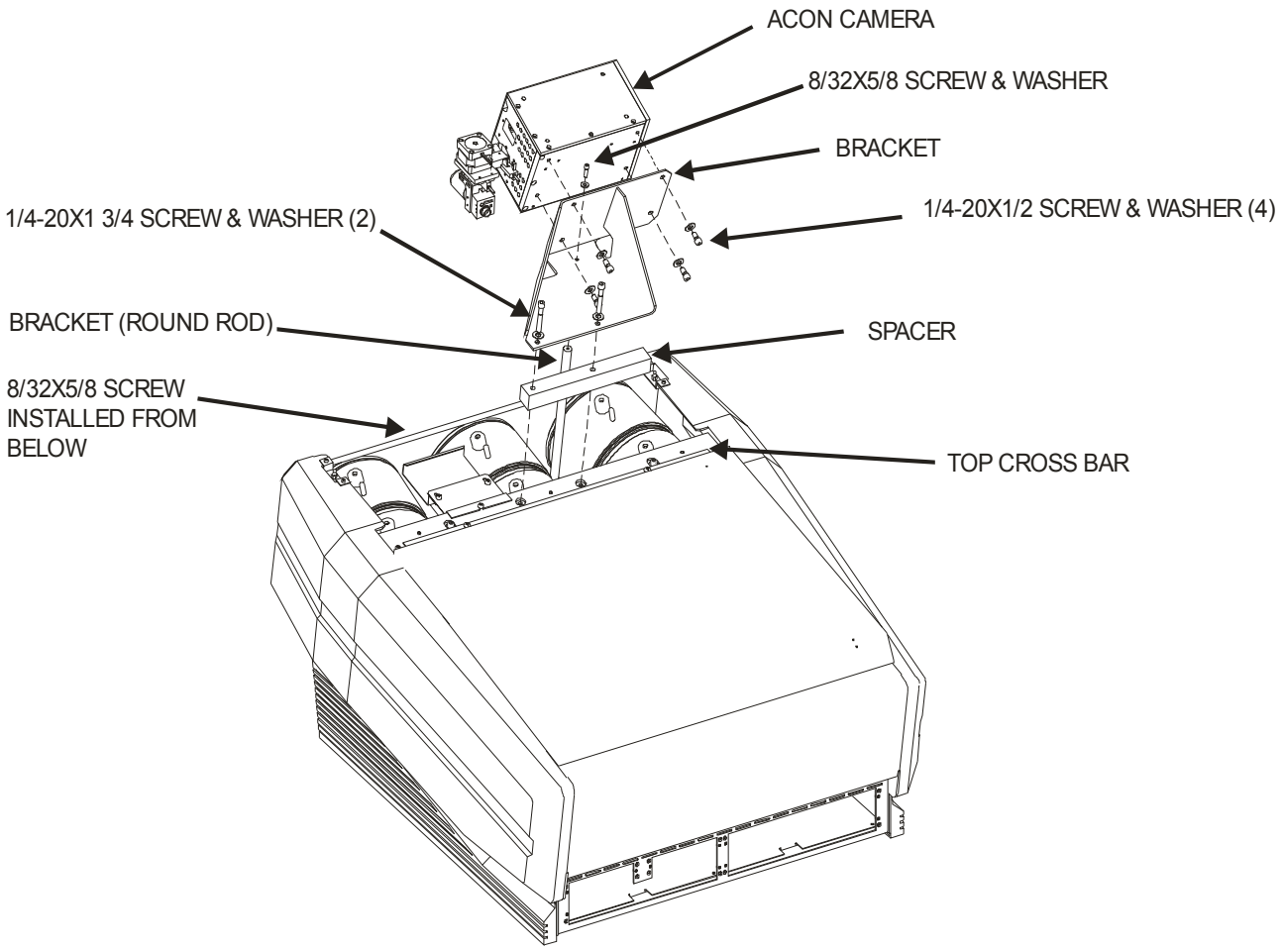


Figure 1-5 Top Bracket Installation

1.3.2.3 *Mounting the ACON Ultra 2 Camera Unit.*

The ACON Ultra 2 camera unit is divided into two physical cases: the Camera Head, and the Electronics Chassis. Each has a set of through holes to allow mounting to a customer designed bulkhead. Two 3' cables connect the Camera Head to the Electronics Chassis. Power for both modules is supplied through a single connection on the Electronics Chassis. The VIDEO Out signal from the camera comes from the rear of the Camera Head and is run directly to the ACON Ultra Server PC. Rs232 Control IN and OUT lines are located on the side of the Electronics Chassis.

1.3.3 Camera Dimensions, Components and Inputs/Outputs

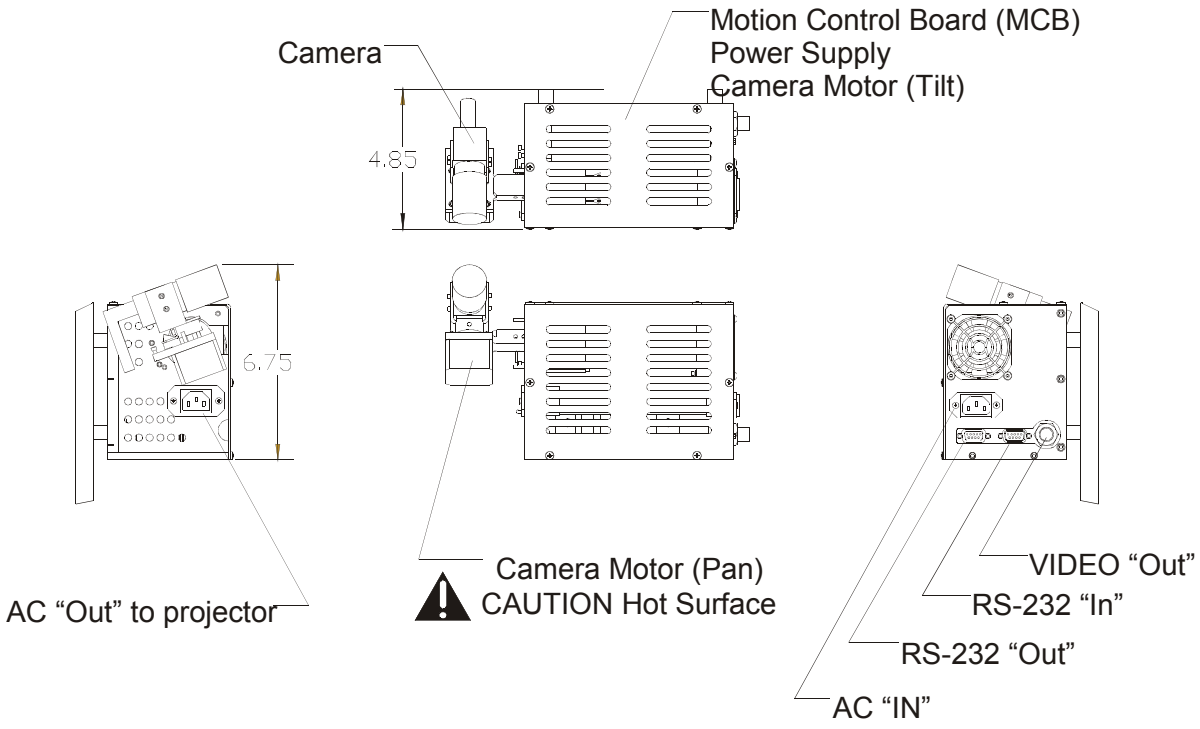


Figure 1-6. Camera Dimensions, Components, Inputs and Outputs

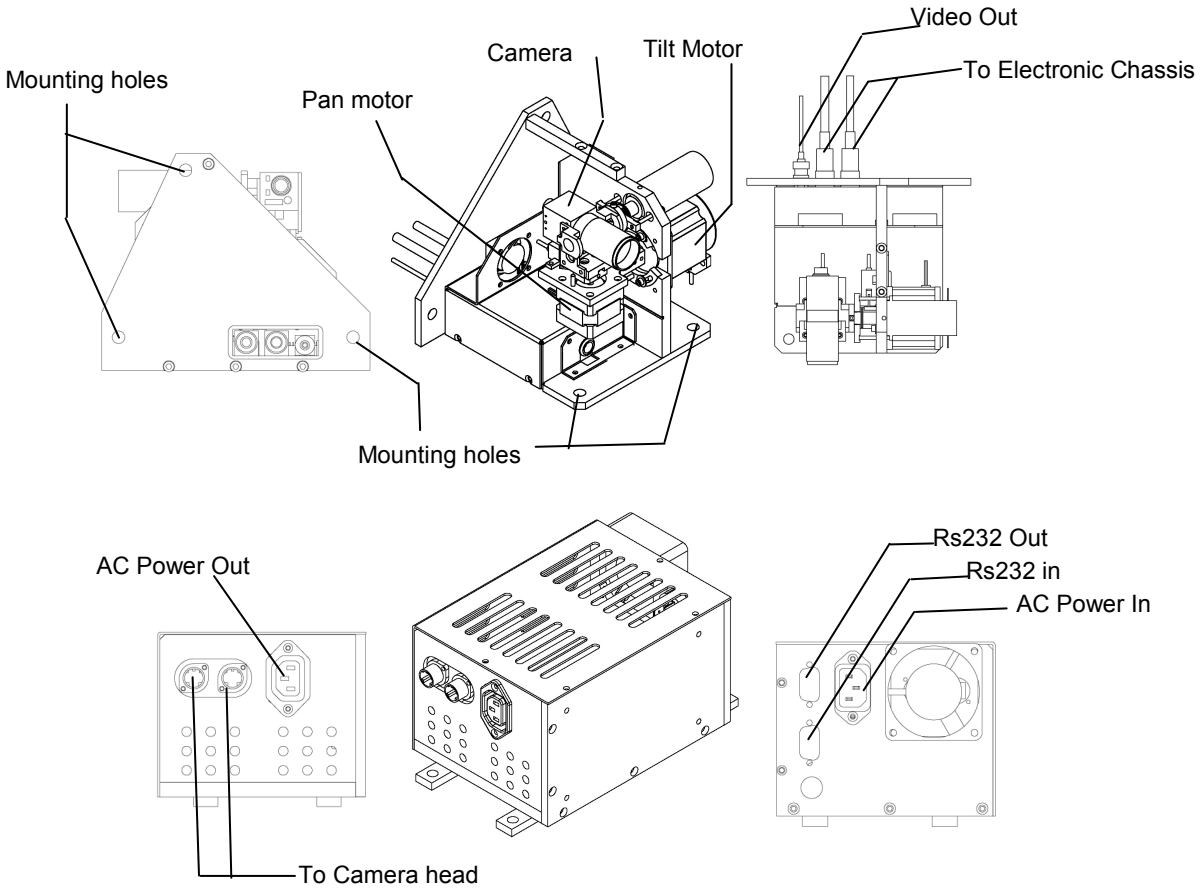


Figure 1-7. ACON Ultra 2 Camera Components, Inputs and Outputs

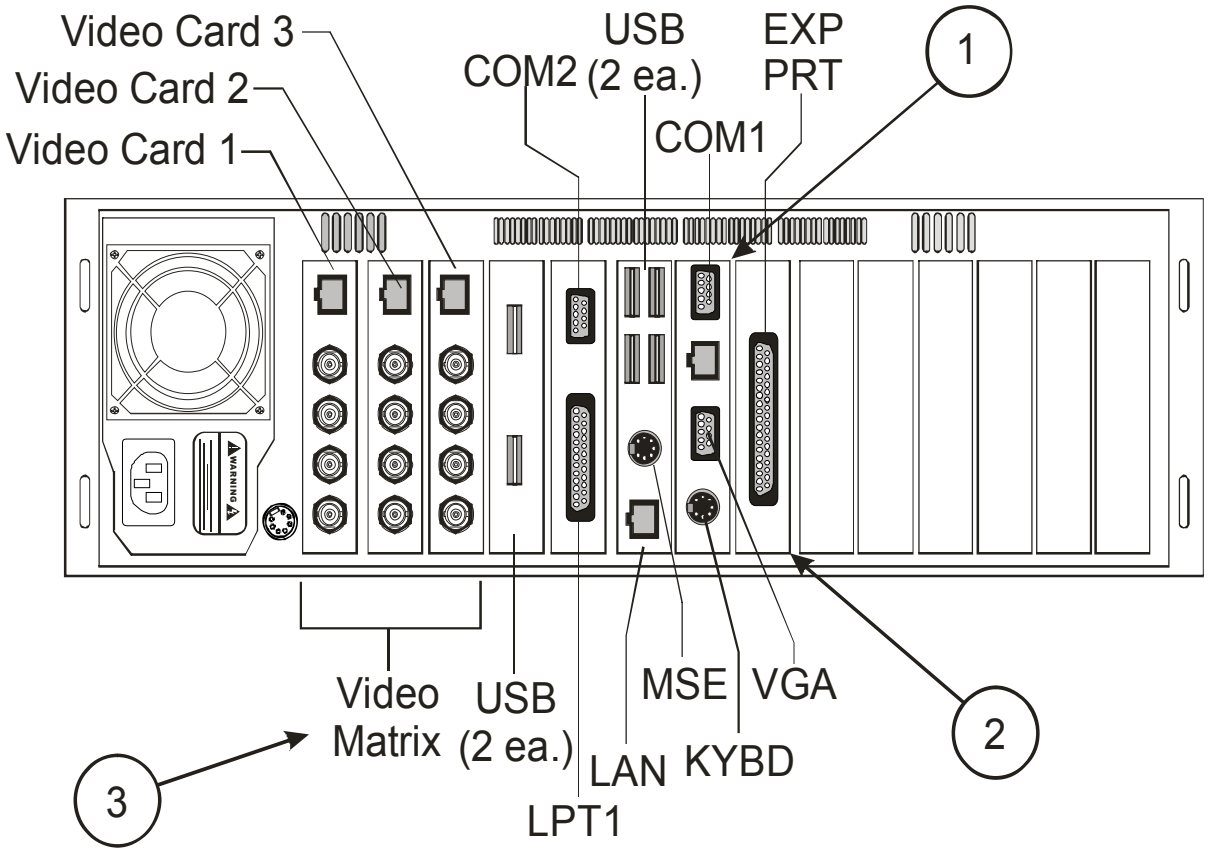
1.4 Server Connections and Operations

1.4.1 Server Rear Panel Connections / ID

On the rear of the AU Server is located all the interfacing boards and connectors of the system.

The Video Input Card(s) are used to interface the individual AU Cameras' to the AU Server. The input to the server is designated as the Video ID, which is a combination of the Board and Channel.

There are several USB ports which may be used for the various server peripherals in addition to the standard mouse (MSE) and keyboard (KYPD) connections. The server has two built-in communication ports and one expansion port. This expansion port can be used for four (4) additional serial com ports using the supplied adaptor (VDCDS P/N 81749-02). See Figure 1-8.



1 Single Board Computer (SBC)
2 Serial Expansion
3 The Video Matrix is composed of one Frame Grabber Card and two Frame Grabber Extension cards

Figure 1-8. Sever Rear Panel Configuration

1.4.2 ACON Ultra License Key Installation

AU operation requires that a valid, activated hardware license key be installed on the server. The license key contains the ACON Ultra options that have been added to the system. If the system has not been shipped with this key, the following, steps must be followed to install. See Figure 1-9.

a) Install software version 1.0.20051220.1 (or later).

b) Install license key P/N 69890-XX on parallel port LPT1.

c) Tighten two jackscrews to secure.

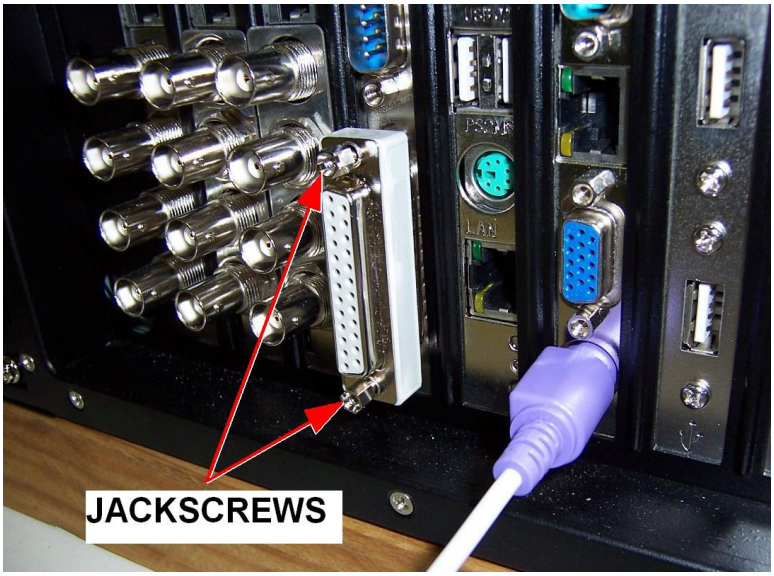


Figure 1-9. License Key Installation

1.4.3 Uninterruptible Power Supply (VDCDS P/N 81751-01)

The Uninterruptible Power Supply (UPS) is ready to operate. It must be connected to a source of power and to the server and then turned on. Refer to the User Manual supplied with the UPS for additional information.

1.4.4 System Communication and Camera Video Configuration

The AU systems can accommodate up to 12 projectors using one AU server. Each AU server incorporates 3 RS232 Serial Ports, which is expanded to 6 using the adaptor cable provided, and 12 Camera video inputs. The projector communication in this example uses 3 of the server 6 serial ports. The first projector in the group is looped to an additional two projectors. The camera communication is similar to that of the projector configuration, whereas, the first camera loops to the other two cameras in the group.

Each camera's video "out" is routed back to the server for processing using the 30 ft. BNC cable supplied. In Figure 1-12 the server video input is 9. The server incorporates a matrix of 3-video cards with each card having up to 4-channels. The following illustration represents the video input and its' specific input location. The location of the video input is a combination of first, the board number, followed by the specific channel number. This makes up the Video ID. For example, the output from Camera ID 1, Projector 1 is connected to the top left input (Board 1, Channel1) which is designated as Video ID: 1,1 and the output from Camera ID 9, Projector 9 is connected to the Board 3, Channel 3 and is designated as Video ID: 3,3. See Figure 1-10 and Figure 1-12.

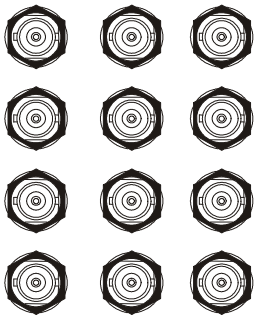


Figure 1-10. Video Boards Inputs. Video ID (Board, Channel)

Figure 1-12 illustrates a 9-projector installation. The projector IDs' are 1 through 9. The RS232 Serial port 1 from the AU Server is routed to Projector 001 (1). The RS232 loop-thru on Projector 1 is then routed to Projector 002 (2) then looped to Projector 003 (3). This continues for the next 2-groups (3-each projector) in the installation using AU Server serial ports 2 and 3. Port 3 is by way of the AU Server expansion port and cable adaptor P/N 81749-02.

The camera(s) communications is similar to that of the projector(s) communications. Whereas, RS232 port 4 in Figure 1-12 is connected to Camera ID 1, then looped to Camera ID 2, and then looped to Camera ID 3. Then RS232 port 5 to Camera ID 4, looped to Camera ID 5 looped to Camera ID 6. Leaving RS232 serial port 6 connected to Camera ID 7, looped to Camera ID 8, looped to Camera ID 9.

1.4.4.1 *Camera AC power Configuration:*

Main AC power is supplied to each camera assembly mounted on a projector, either on the front panel or top bracket. Then the AC "out" from each camera is applied to the relevant projector using the 3' Jumper AC Cord (Supplied).

Item	P/N	From	To
1	66650-01	ACON Ultra Camera AC "Out"	Projector AC "In"
2	34-001306-02	Camera RS232 "Out"	Next Camera RS232 "In"
3	34-001306-02	ACON Ultra Server	Camera RS232 "In"
4	N/A	Main Supply	Camera AC 'In"
5	66649-01	Camera Video "Out"	ACON Ultra Server Video Matrix

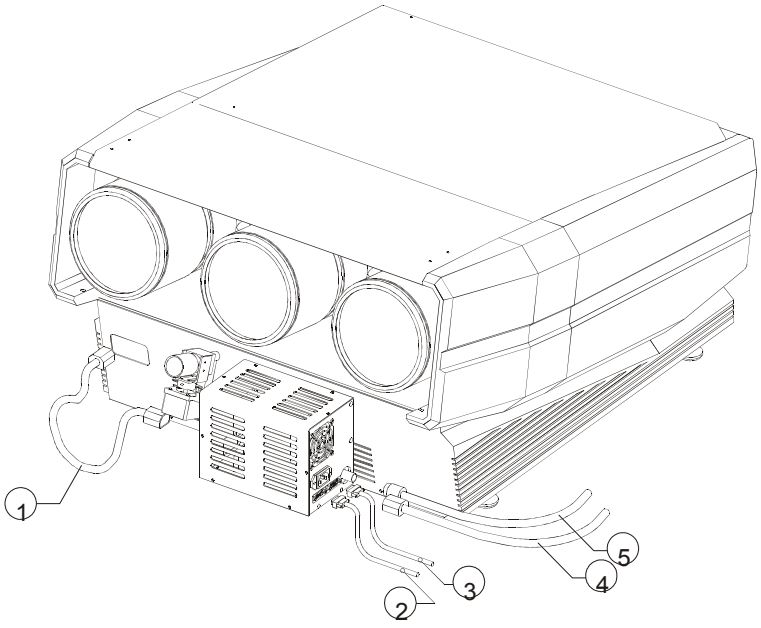


Figure 1-11. Camera/Projector Connections

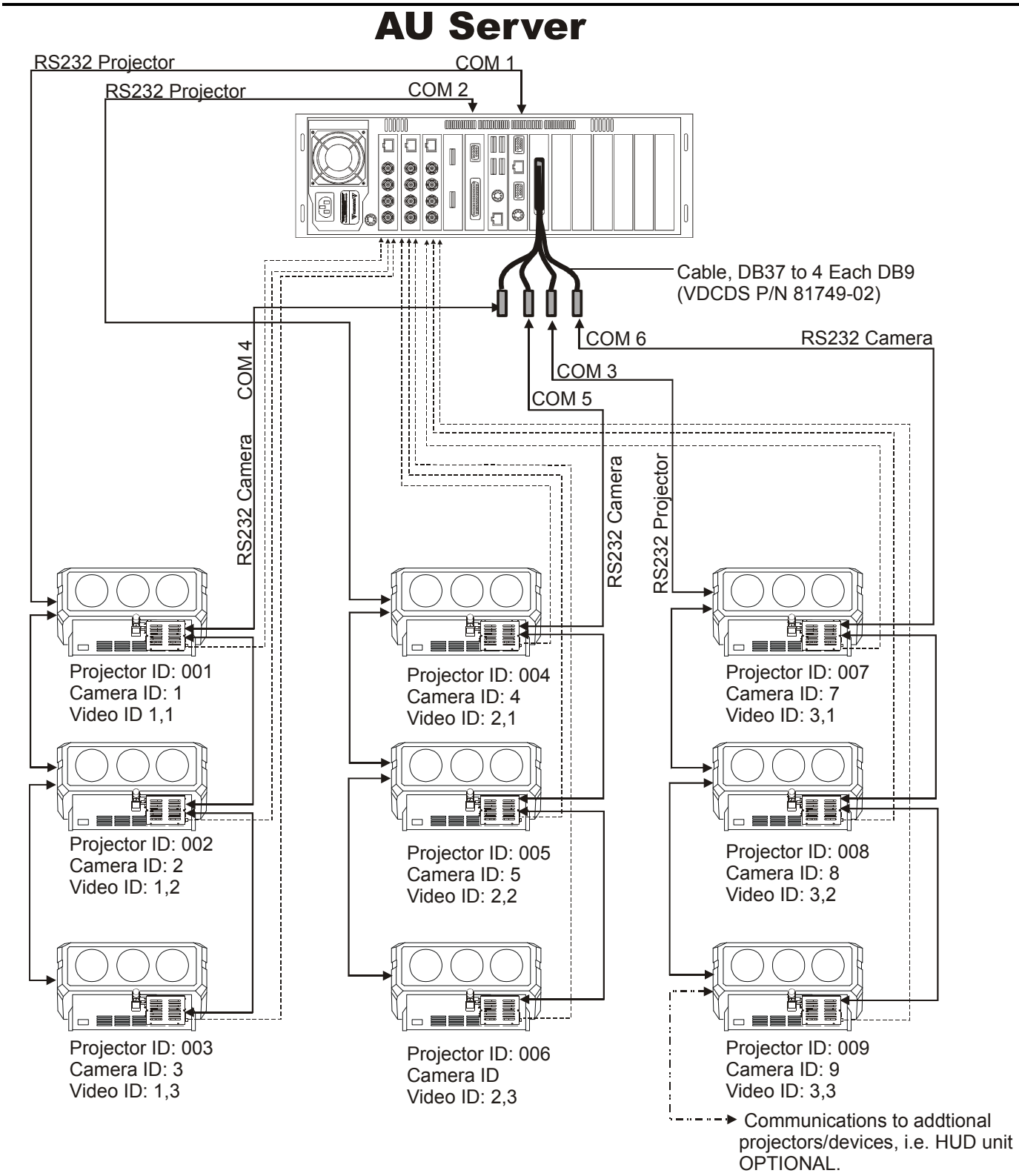


Figure 1-12. Server Serial Communication and Video Routing Example

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1.4.5 AU System Configuration Log

Use the table provided below to log the information relevant to the system setup i.e. projector data, AU camera data, video board and channel numbers assignments.

To validate the AU System and associated cameras, please fax this page, fully filled, in to the attention of VDCDS Technical Services at 321.784.6617.

Server S/N:		Site Location:							
Proj.	Projector			ACON Ultra Camera			Video ID		
	S/N	ID	RS232 Port	S/N	ID	RS232 Port	Board	Channel

Configuration Notes:_____

_____

_____

_____

_____

_____

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Section 2 AU User Controls, Settings and Operation

2.1 Introduction

ACON Ultra (AU) utilizes a non-calibrated grayscale camera to correct the geometry and convergence of a Marquee family projector. The system functions within several assumptions. The projector and the camera are both firmly mounted and do not physically move relative to the projection facet. The AU camera has the capability to index the camera position such that the entire projection facet is visible to the camera. AU utilizes a near-infrared CCD grayscale camera, thus ambient light levels must be minimal, and must be constant throughout the entire setup/memorization/correction process.

After the projector has been optimally setup (mechanically and electronically) AU can be used to memorize, and then later to correct for small changes in the geometry that occur on a day to day basis. Before memorization can take place, AU must be taught a series of test points – camera view points on the projection facet used for obtaining measurements. Each test point is configured with the camera indexer (motor) coordinates, expected image quality settings (projector and camera contrast and brightness type settings), and several flags indicating the state of the test point. The camera utilizes a stepper motor based indexer platform working on half-steps. This gives a very high level of repeatability when the camera is positioned at a specific location. This allows the location of the camera to be used as a physical constant by which to refer measurements.

The complete setup and calibration should only need to be done once in the lifetime of the AU configuration unless the physical relationship of the camera to the projector or to the projection facet changes; in which case the complete Setup and Calibration operations may need to be performed again. After observing AU perform several correction runs, it may be noticed that some test points are not performing optimally. Some of these Setup and Calibration operations can then be used to tweak AU performance.

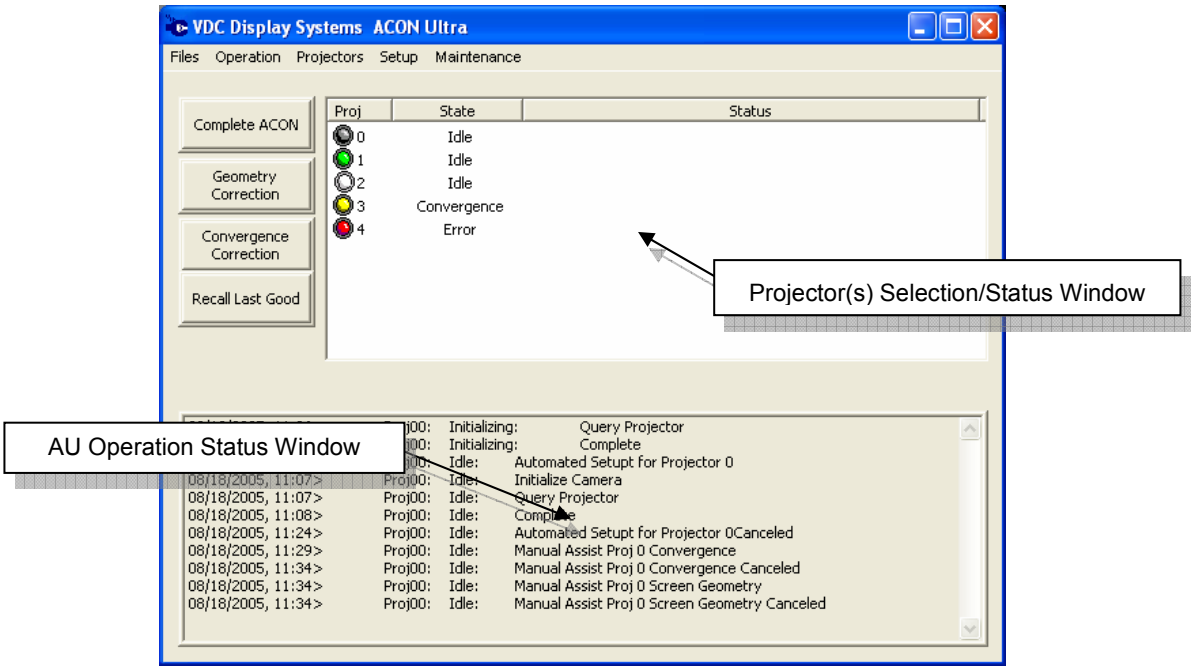
Before discussing actual system setup and calibration procedures, it is helpful to describe the AU tools that will be used. Section 2.2 discusses the ACON Ultra user interface. Included is a discussion of the AU main window, the maintenance windows (used in setup and calibration), and several other support interfaces. Descriptions of all control items are included. Section 2.3 provides a detailed explanation of the AU Setup process. This explanation covers initial setup and calibration procedures as well as procedures for day to day operations. Section 2.3 outlines and summarizes each step of the initial setup and configuration procedure.

2.2 User Interface for ACON Ultra

NOTE: This version of the manual (2.0), covers the implementation of software version 2.0. This software update includes significant changes to the user interface compared to manual version 1.3 and software version 1.0.

2.2.1 The Graphical User Interface (GUI)

The main part of this system is the operating software and the GUI. This section illustrates the GUI and explains the operation of each function.



2.2.1.1 *Main Screen:*

From the Main Screen level, you can select all functions of the AU operation.

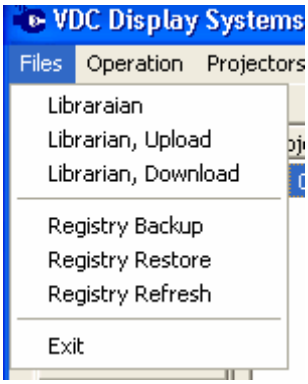
NOTE: No functions can be performed until one projector or a combination of projectors is selected in the system.

- `Complete ACON`*:* use this command to perform a complete setup which includes automatic Geometry and Convergence Correction.
- `Geometry Correction`*:* Performs just the automatic Geometric portion of the AU operation.
- `Convergence Correction`*:* Performs just the automatic Convergence portion of the AU operation.
- `Recall Last Good`: Use this function to load the geometry and convergence projector settings, prior to the last AU controlled action (*i.e.,* undo the last AU correction action).
- Projector(s) selection window:
  - Under the Proj column, select one or more projectors to perform the AU functions.
  - Select a single projector by simply pointing to a particular projector ID and pressing the left mouse button.
  - Select a combination of projectors by pointing and selecting a projector ID while holding down the control <*Ctrl*> or <*Shift*> key
  - Select all projectors by clicking on the Proj column header.
  - *Projector Status Indicators*: Next to the projector ID number is a status indicator. The color of the indicator will change based on the status of the projector.
    - Gray: Projector "off"
    - Green: Projector "on"
    - White: Projector is in "standby"
    - Yellow: Projector is under AU control
    - Red: Error/Alarm

- AU Operation Status Panel: This section of the main window displays the AU operation status indications.

2.2.2 Drop Down Menus

2.2.2.1 *`Files` menu:*

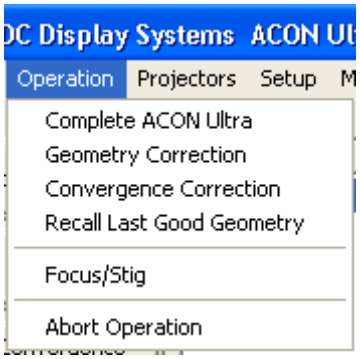


- `Librarian`: Future Feature
- `Librarian, Upload`: Future Feature
- `Librarian, Download`: Future Feature
- `Registry` Backup
- `Registry` Restore
- `Registry` Refresh
- `Exit`: Exit the AU program.

NOTE: Once the AU program is closed, all remote control functions within the projector's menu structure relating to the AU operations are disabled.

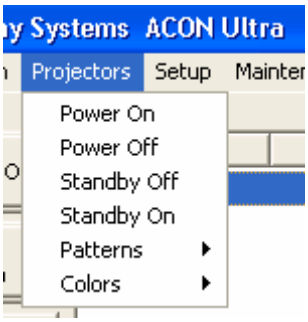
2.2.2.2 *Operation menu:*

NOTE: All functions under `Operation` will return the projector to its original state after the selected function has been completed, i.e., if the projector was in "standby" when the function was invoked, the projector will be returned to "standby" mode when completed.



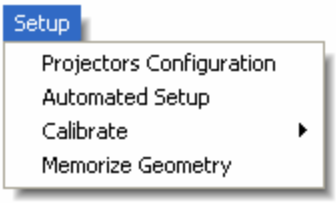
- `Complete ACON Ultra`: Performs both the automatic geometric and the convergence portions of the AU operation. Same as the Main screen command button.
- `Geometry Correction`: Performs just the automatic geometric portion of the AU operation. Same as the Main screen command button.
- `Convergence Correction`: Performs just the automatic convergence portion of the AU operation. Same as the Main screen command button.
- `Recall Last Good Geometry`: Use this function to load the geometry and convergence settings of the projector, prior to the last AU controlled action (*i.e.,* undo the last AU correction action). Same as the Main screen command button.
- `Focus/Stig`: Performs both the automatic Stig and Focus portions of AU correction operations.
- `Abort Operation`: This function can be used to stop the process of any one of the program functions or routines.

2.2.2.3 *Projectors menu:*

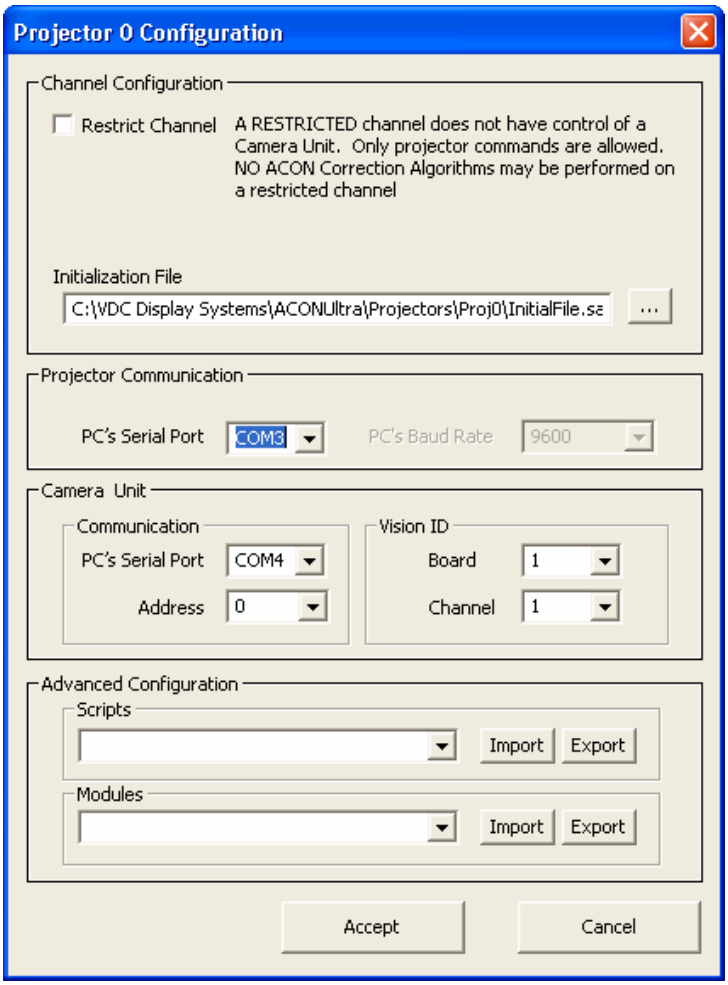


- `Power On`: power the projector(s) on.
- `Power Off`: power the projector(s) off
- `Standby On`: This explicit command places the selected projector or projectors in the "Standby" or "video mute" mode.
- `Standby Off`: This explicit command takes the projector(s) out of standby or video mute mode and displays the image on the screen(s).
- `Patterns`: Select display projector pattern
- `Colors`: Selects color of projection.

2.2.2.4 *Setup menu:*

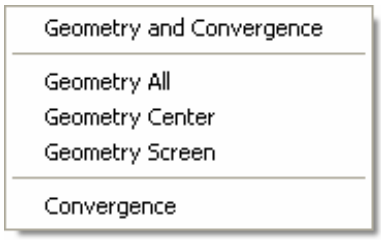


- `Projectors Configuration`



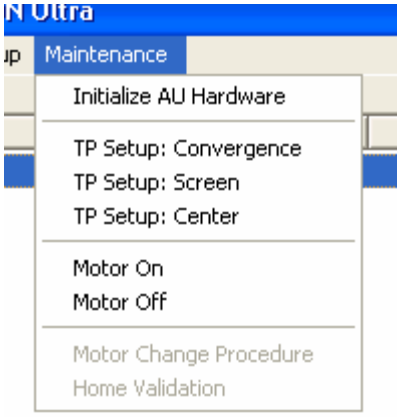
- Projector
  - PC's Serial Port; use this function to indicate and sync the communication port that the projector is using.
  - PC's Baud Rate; Ensure that 9600 baud is selected.
- Camera
  - PC's Serial Port; use this function to indicate and sync the communication port that the camera is using. See Section 1.4.4
  - ID: use this function to indicate the relevant Camera ID (communication address). This number must match the ID set in the particular camera. See Section 1.3.1.1
- Vision ID: Use this function to indicate the Vision ID assigned to this particular camera. The Vision ID is a combination of the board and channel number. See (see Section 1.4.4).
- Initialization File: This particular function is used to configure the location of the file containing the configuration / settings parameters of the selected projector. All projectors must have a configuration file, and must have the correct location of that file properly configured via this function. Use the browse button ... to select the file location.
- Advanced Configuration: These functions allow the user to import and export various script files and modules into the current configuration file. See Section 2.3.8.1Appendix C for a discussion of AU script files.

- `Automated Setup`: This function carries the user through a guided setup of the required prerequisites for AU to operate effectively and correctly.
- `Calibrate`: Once the `Automated Setup` or any one of the Maintenance convergence or geometry functions are completed, use this function to allow AU to perform and automatically "fine-tune" the projector-camera relationship and scale the AU operation appropriately.



- `Geometry and Convergence`*:* Calibrates both the geometry and convergence test points and scaling.
- `Geometry All`*:* Calibrates the center and screen geometry test points and scaling.
- `Geometry Center`*:* Calibrates only the center geometry test points and scaling.
- `Geometry Screen`*:* Calibrates only the screen geometry test points and scaling.
- `Convergence`*:* Calibrates the convergence test points.

2.2.2.5 *Maintenance menu*



- `Initialize AU Hardware`*:* This function is used to re-sync or reboot the system – projector – camera communication. This function must be performed to establish the communication link and operation verification. If the AU hardware is not initialized, the `Convergence`, `Screen Geometry` and `Center Geometry` menu selections are disabled (grayed-out). This function typically takes 1-2 minutes per projector to perform.

NOTE: After selecting `Initialize AU Hardware`, it may be necessary to re-select the desired projectors in order to activate some menu items.

- `Home Validation`: Future Function
- `Convergence`*:* This function allows the user to directly access the Convergence Test Point set which is used during the Convergence Correction operation and the third pass of the Geometry Correction operation. Section 2.3.4 details the configuration of the three test point sets.
- `Screen Geometry`*:* This function allows the user to directly access the Screen Geometry Test Point Set, which is used during the second pass of the Geometry Correction operation. Section 2.3.4 details the configuration of the three test point sets.
- `Center Geometry`*:* This function allows the user to directly access the mapping of the Center Geometry Test Point set, which is used during the first pass of the Geometry Correction operation. Section 2.3.4 details the configuration of the three test point sets.
- `Patterns`: This selection includes an additional fly-out menu to select either the externally generated pattern or utilize the built-in projector test patterns, which are genlocked to the external source frequencies.
- `Motor On`*:* This is an explicit command to turn the camera motor on. All operations, but the Maintenance Windows implicitly execute the `Motor Off` command before beginning operations.
- `Motor Off`*:* This is an explicit command to turn the camera motor off. If the user has explicitly

issued a `Motor On` command or an `Initialize AU Hardware` *command* and does not plan to perform another AU operation, this command should be used.

NOTE: If the camera motor has been explicitly turned "off", any one of the AU operations, geometry or convergence functions will automatically power the motor back on.

NOTE: All AU operations, except the Maintenance Windows implicitly power OFF the motors after operation completion.

2.2.3 Additional Menus and Dialogs:

There are additional menus and dialogs used in conjunction with the setup of the AU system and program. The additional menus and items which are commonly used with the setup functions are explain below.

2.2.3.1 *Automated Setup*

The Automated Setup dialog contains the controls and information necessary to perform the initial setup of the ACON Ultra software. There are four regions of interest within the window.

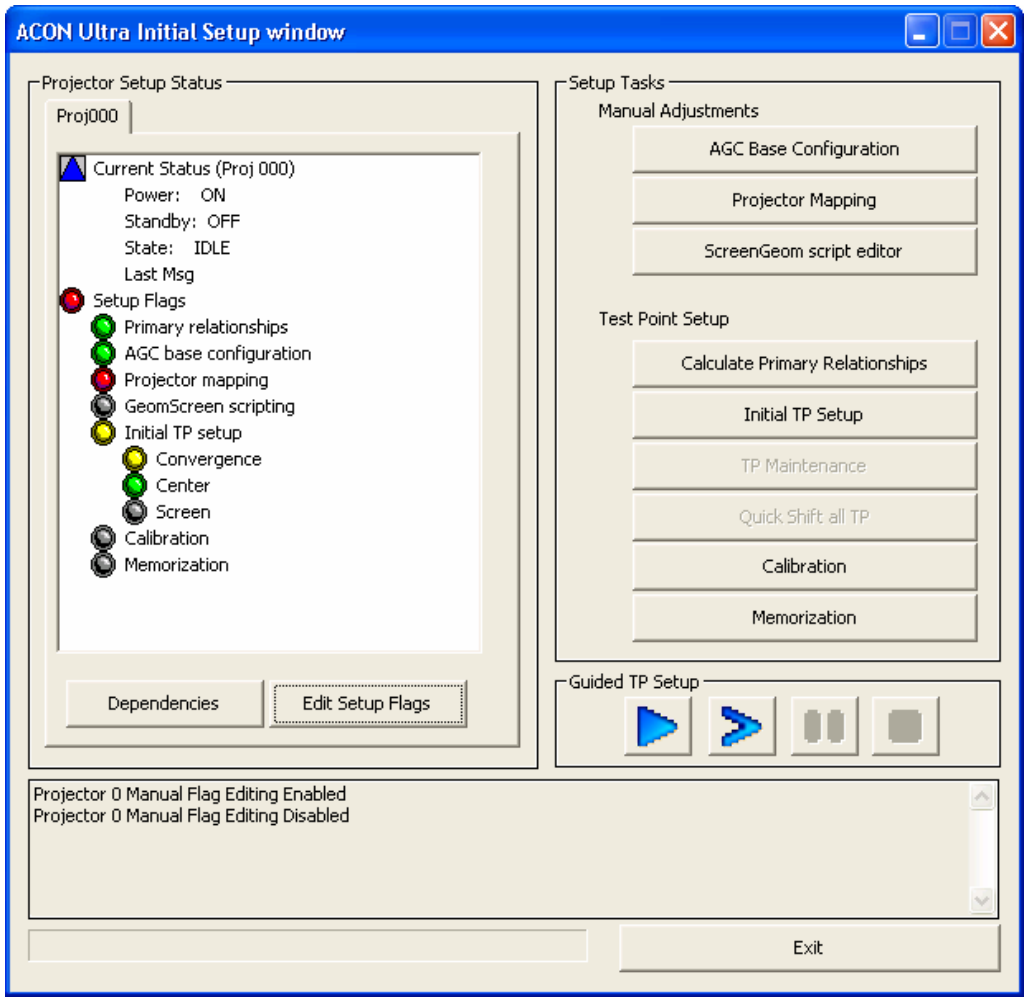
- Projection Setup status
- Setup Tasks
- Guided Test Point setup
- Message window

Each of these regions will be described in the following sections.

The *Projector Setup Status* panel holds current setup information on each channel in the system. The tabs contain the ID of the projector. Selecting a tab displays that channel's setup information.

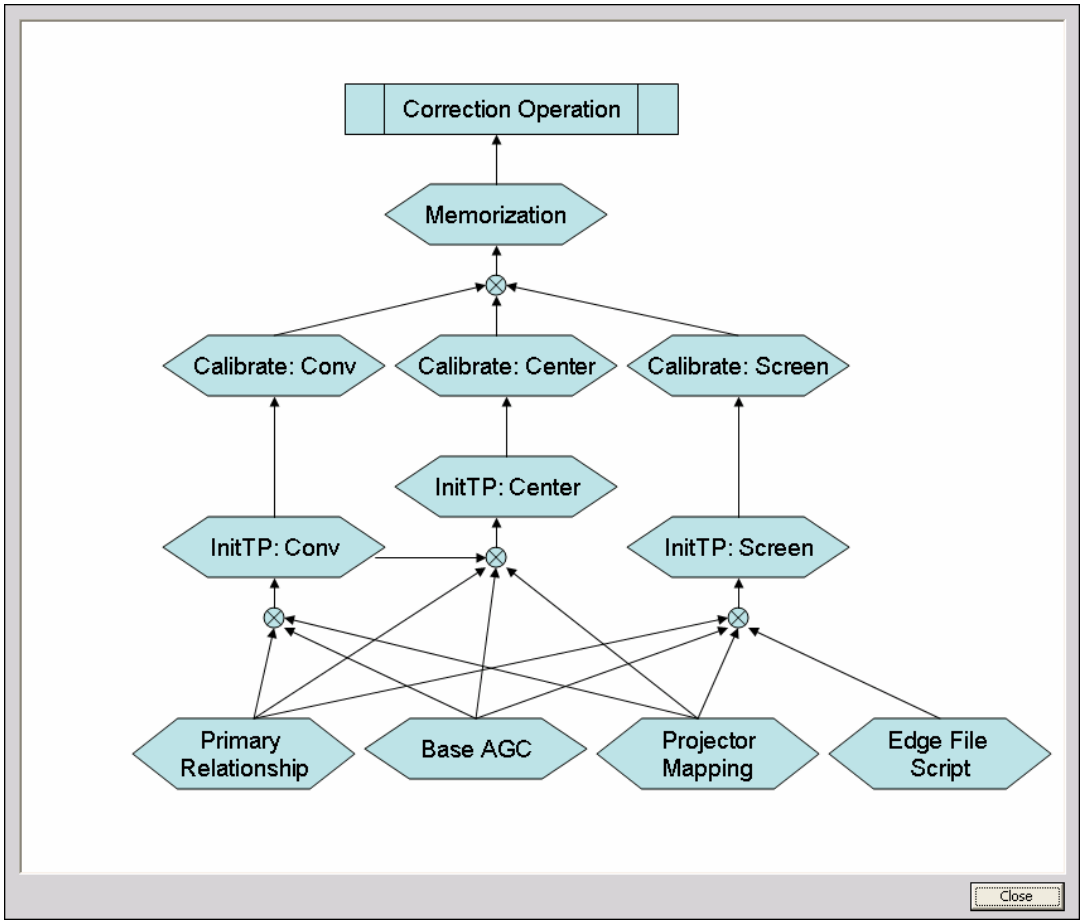
The Information displayed for each channel includes the current state of the projector, including Power status, Standby status, current operational State, and the Last Message posted to the channel. Also displayed for each channel is the current progress towards completing the initial setup of the channel.

- The seven categories of setup flags are listed, with two of these categories having a further break down (to separately list progress with each of the three test point sets).
- The colored indicator next to each of these entries indicates the level of completion of that item. GREEN indicates a completed process, YELLOW indicates an incomplete process, GRAY indicates a process that has not been started, and RED indicates a process that encountered an error.


ACON Ultra Initial Setup window
Projector Setup Status
Proj000
Current Status (Proj 000)
Power: ON
Standby: OFF
State: IDLE
Last Msg
Setup Flags
Primary relationships
AGC base configuration
Projector mapping
GeomScreen scripting
Initial TP setup
Convergence
Center
Screen
Calibration
Memorization
Dependencies
Edit Setup Flags
Setup Tasks
Manual Adjustments
AGC Base Configuration
Projector Mapping
ScreenGeom script editor
Test Point Setup
Calculate Primary Relationships
Initial TP Setup
TP Maintenance
Quick Shift all TP
Calibration
Memorization
Guided TP Setup
Projector 0 Manual Flag Editing Enabled
Projector 0 Manual Flag Editing Disabled
Exit

2.2.3.1.1 *Dependencies*

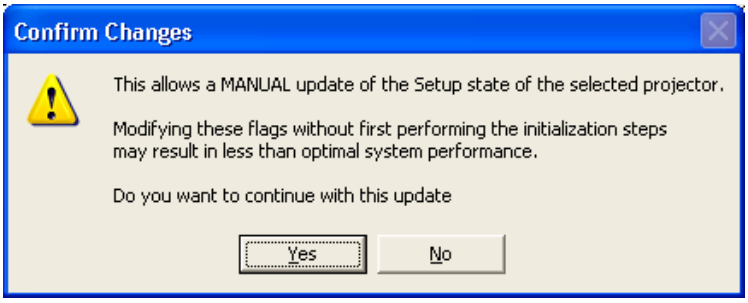
The setup tasks in the flow chart show which tasks must be completed before others can be started. If there are arrows from a task pointing to a task on a higher row, the lower task must be completed before the upper row task can be started.



2.2.3.1.2 *Edit Setup Flags*

Utilizing the automated operations controlled via the *Setup Tasks* pane in this window, the Setup Flags are updated and progress is shown. In some instances, the user may wish to manually alter the state of the flags. For instance, if upgrading an existing ACON system from software version 1.0 to version 2.0, it is not desirable to repeat the entire setup process. In this case, it is justified to manually set the Setup Flags.

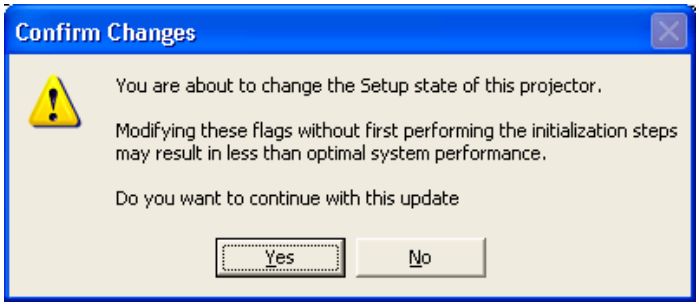
When the button is first pressed, a warning message appears indicating that altering the state of the setup flags without properly completing the correlating procedure may produce unstable results.



If the user chooses to continue with the editing operation, a message appears that gives editing instructions.



When editing the flags is complete, pressing the *Edit setup Flags* commits the changes to memory. Before the changes are stored, the user is given another warning and prompted to verify the changes.



If upgrading the software from version 1.0 it is advisable NOT to manually change the *Projector Mapping*, *AGC Basic Configuration*, and the *Primary Relationship* flags as these are new features introduced in version 2.0. If a version 1.0 system has already been through the complete setup operation, all other flags are relatively safe to manually adjust.

2.2.3.1.3 *AGC Base Configuration*

The *AGC Base Configuration* button activates the *Auto Gain Control Dialog* covered in paragraph 2.2.3.1.2.3. The default AGC configuration will be used during the AGC calibration procedures for both convergence and geometry.

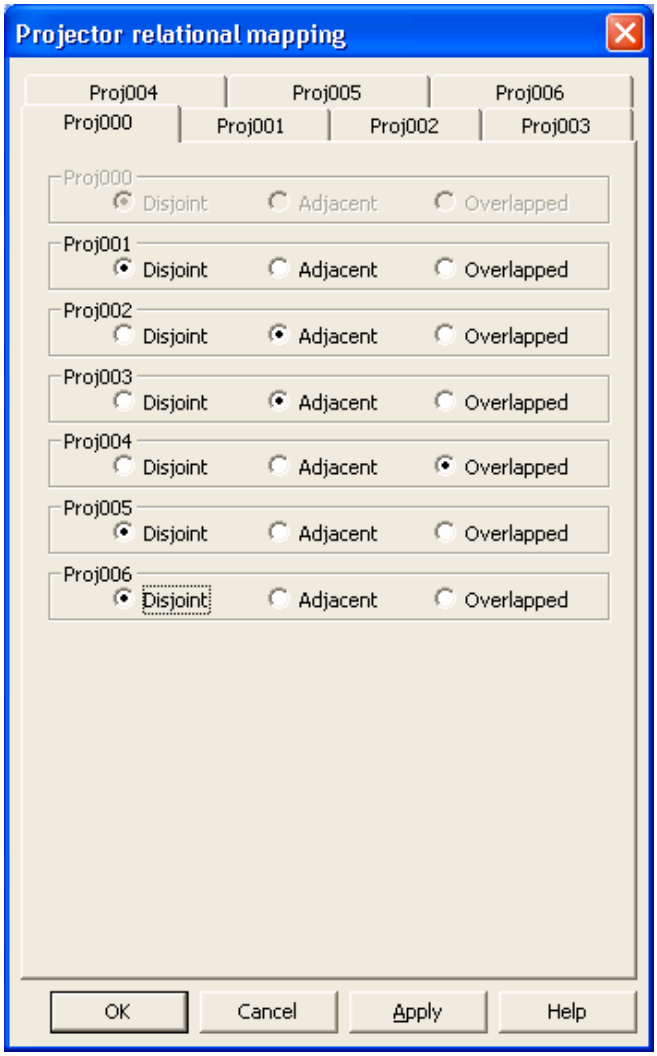
2.2.3.1.4 *Projector Mapping*

The Projector Mapping dialog allows a manual mapping of the physical relationship of the projectors in the system.

Choose "*Overlap*" for channels whose projections are intersecting or overlapped.

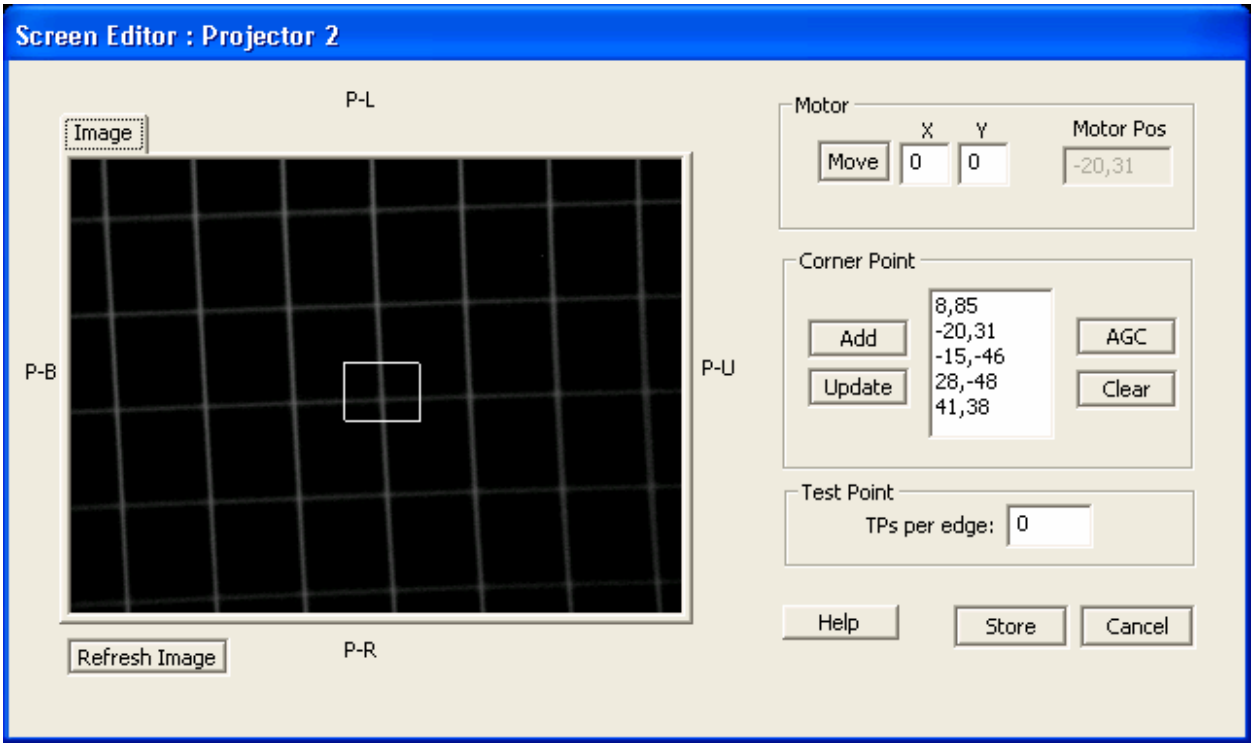
Choose "*Adjacent*" for channels whose projections are adjacent, but do not intersect or overlap.

Choose "*Disjoint*" for channels whose projections neither overlap nor are adjacent.



2.2.3.1.5 *ScreenGeom editor*

The screen geometry script editor is used to define the shape of the screen, edge by edge, so that the automated routine can correctly position the Screen Geometry test point set. Each corner of the screen is defined by selecting a valid intersection near the actual screen corner. These defined corner points MUST be selected in either a clockwise or a counter-clockwise direction. The number of additional test points per screen edge is also defined.



The steps to be followed to complete the process are listed below.

1. Define the corner point list.
    a. MOVE: Move the camera's field of view by either double clicking on the image in the appropriate region (i.e. clicking on the image closer to the "P-B" tag, shifts the view in that direction. Alternatively, type in new coordinates in the X and Y edit boxes and press the Move button to move to a known location.
    b. SELECT: Select an existing point, and move the motor to its coordinates by clicking on an existing corner point in the list.
    c. ADD: Add new points to the list by moving the view finder to the appropriate test point on the screen, Click the Add button to add the location to the list as a new point.
    d. UPDATE: Select an existing point, and re-position the motor. Click the Update button to change the selected point.
    e. CLEAR: Click the Clear button to erase the existing point list and start over.
    f. HELP: Click the Help button to display help text similar to this summary.
    g. If the need arises, click the AGC button to make sure that the pattern is visible in the camera field of view.
2. Specify an integer for "TPs per edge". This determines the number of test points to be found along that edge by the automated routine during "Init TP Setup" step. Typical installations will use "4" TPs per edge. For a four sided screen, this will create 20 test points (4 test points per edge plus one for each of the user selected corners).

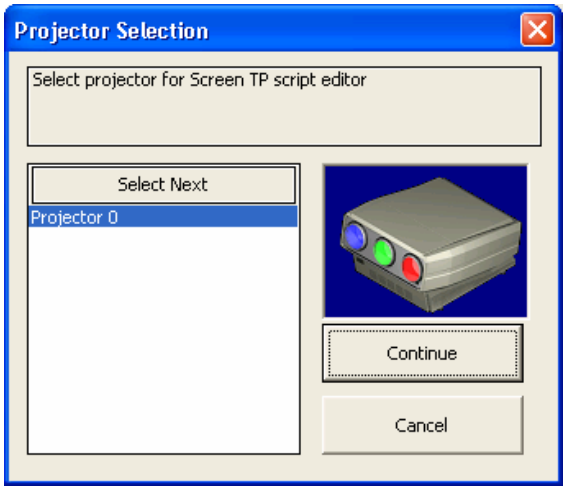
3. Click on the Store button to save the information.

2.2.3.1.6 *Calculate Primary Relationships*

The *Primary Relationships* operation is to be completed once per projector channel. All channels may perform this operation simultaneously. After pressing the button, the Projector Selection Dialog appears, prompting selection of the channels on which the Primary Relationships operation is to be performed. Multiple projectors may be selected.

Later in the process it will be necessary to change the test pattern between the sparse and dense patterns.

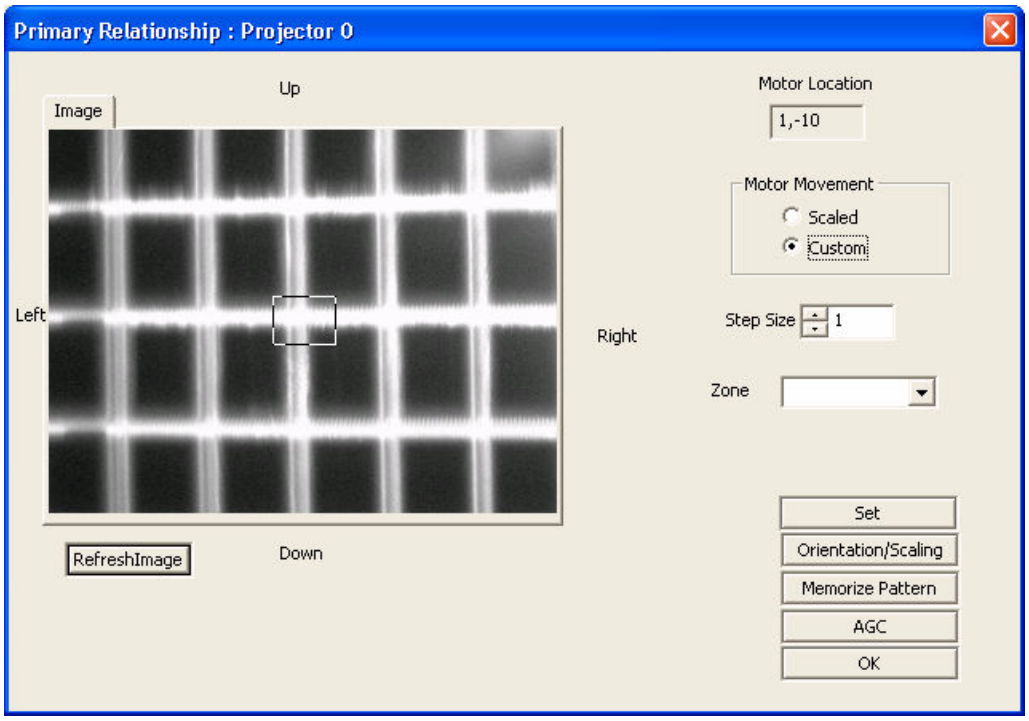
> **NOTE:** For more rectangular shaped screens, it is possible that a single test pattern may be used for both geometry and convergence correction. In this instance, the same test pattern is presented when the process requests the test pattern.



Primary Relationship Manual Dialog

If the automated primary relationship operation does not complete successfully, the user may choose to retry the automated process. Or the user may choose to perform the operations manually. The following dialog is used to establish primary relationship which comprises

- Memorizing test pattern grid densities.
- Calculation of motor step size to camera pixel size.



Steps to follow:

1. Choose a zone (Center, North, or West) from the Zone list. The projector will display a rectangular cursor in the corresponding zone.
2. Change the camera field of view to center the intersection closest to the displayed cursor. If "Motor Movement" is of type "Scaled" double click on the image window to move the field of view; if of type "Custom" specify the motor movement step in the Step Size box and then double click on the image window.
3. For each zone, move to the appropriate intersection and click on the Set button to save the information. As each zone is set, text will appear in the lower left corner of the screen indicating completion.
4. Once this is done for all three zones (Center, West, and North) click on the Orientation/Scaling button.
5. Click on the Memorize Pattern button for memorizing the test patterns. The user may be prompted to display a dense pattern followed by a sparse pattern. If just one pattern is available, use the same for both options.
6. Click on the OK button to save the results and exit the dialog.

If the need arises, use the AGC button to make sure that the pattern is visible in the camera field of view.

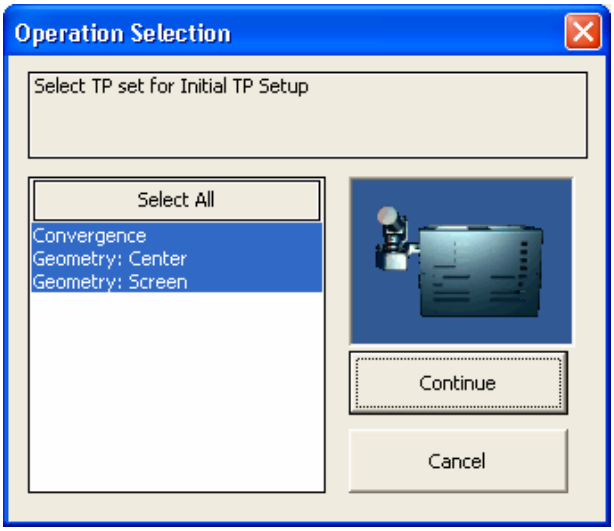
2.2.3.1.7 *Initial TP Setup*

The Initial TP setup routines calculate an estimated position of the test points for each of the test point sets. After pressing the button, the *Operation Selection* Dialog appears prompting the selection of the Test point Set on which to perform the operation. Any combination of the selections may be selected.

> **NOTE:** Depending on the selection, the displayed test pattern may need to be changed during the completion of the routines.

After the operation is selected, the *Projector Selection* Dialog will appear prompting the selection of the channels on which the setup process is to be performed. Multiple projectors may be selected.

NOTE: If projectors are overlapped, they will be scheduled to operate sequentially to prevent interference.



2.2.3.1.8 *Calibration*

The Calibration routines may be run only after the initial TP setup has been completed for the test point set. After pressing the button, The *Operation Selection* dialog appears prompting the selection of the Test Point set on which the calibration operation is to be performed. Any combination of the selections may be selected.

NOTE: Depending on the selection, the displayed test pattern may need to be changed during the completion of the routines.

After the operation is selected, the Projector Selection Dialog appears prompting the selection of the channels on which the calibration process is to be performed. Multiple projectors may be selected.

NOTE: If projectors are overlapped, they will be scheduled to operate sequentially to prevent interference.

NOTE: If Convergence Calibration is being run, only three projectors will be scheduled to perform the calibration procedure at a time.

2.2.3.1.9 *Memorization*

After calibration of all three test point sets has been completed, memorization may be performed.

After pressing the button, The *Projector Selection* dialog appears prompting the selection of the channels on which the memorization process is to be performed. Multiple projectors may be selected.

NOTE: The displayed test pattern will need to be changed during the completion of the routines.

2.2.3.1.10 *Guided TP Setup*

- Play: This button is included for future releases.
- Forward: This button is included for future releases.
- Pause: This button will cause the process to wait until the current batch of projectors finish their operations, then abort the remaining projectors.
- Stop: This button will issue an ABORT to all projectors currently operating, and will cancel any outstanding requests to perform operations on other projectors. Future requests for action are not affected (unless the Stop button is pressed again).

2.2.3.1.11 *Message Display*

The Message display region displays operational messages as they occur during procedure execution.

Older messages may be viewed by scrolling the window. Placing the cursor at the end of the very last message in the window allows automatic scrolling as new messages are placed in the window.

2.2.3.2 *Maintenance Dialogs*

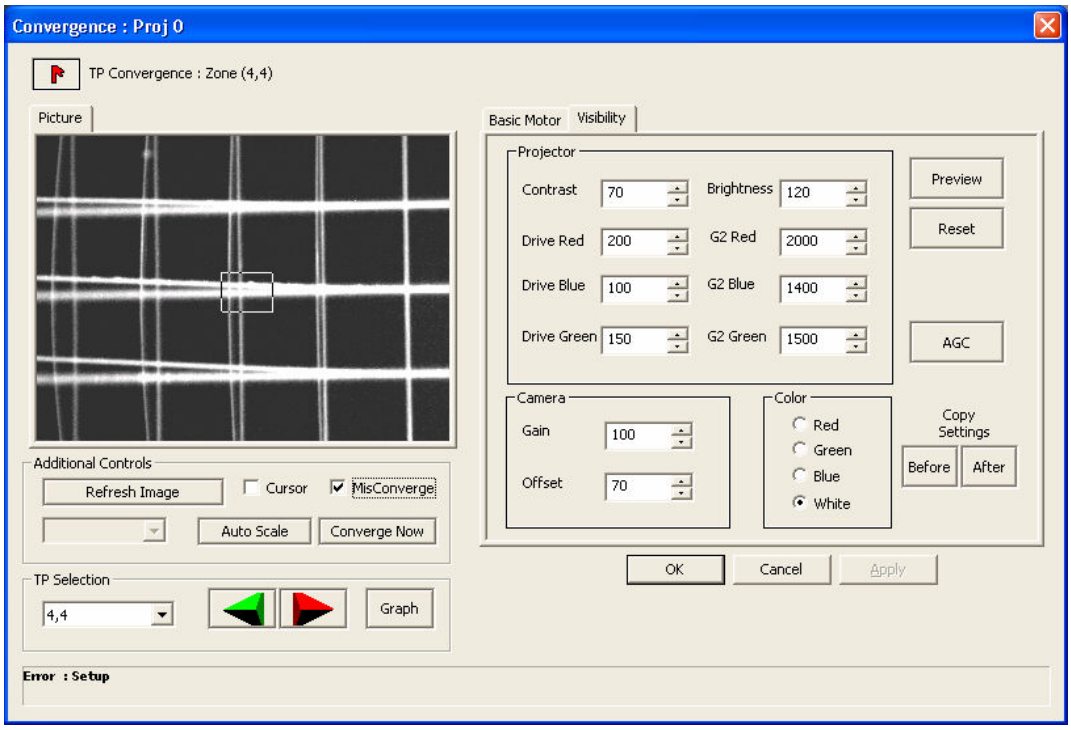
The maintenance dialogs are used mostly during the initial setup process to establish the original sets of test points used by AU for its correction operations. After the initial setup process is complete, periodic maintenance of the AU configuration uses the same controls. The title bar of the window indicates the test point set being edited and the projector channel being configured.

- TP Convergence: This flag is shown red if the selected test point is in error, or green for a good test point. The error could be in Setup, Scale or Visibility. The test point set, individual test point and the error are displayed on the dialog window. This test indicates the test point set and the test point that is selected for editing. The three test point sets are Convergence, Center Geometry, and Screen Geometry.

2.2.3.2.1 *Test Point Selection*

During initial setup and during routine upkeep, it is necessary to access the individual test points contained within the three test point sets. The Maintenance Dialogs provide this access. The maintenance dialog provides three methods for selecting the active test point for editing: the dropdown list box, the directional arrows, and the graph dialog.

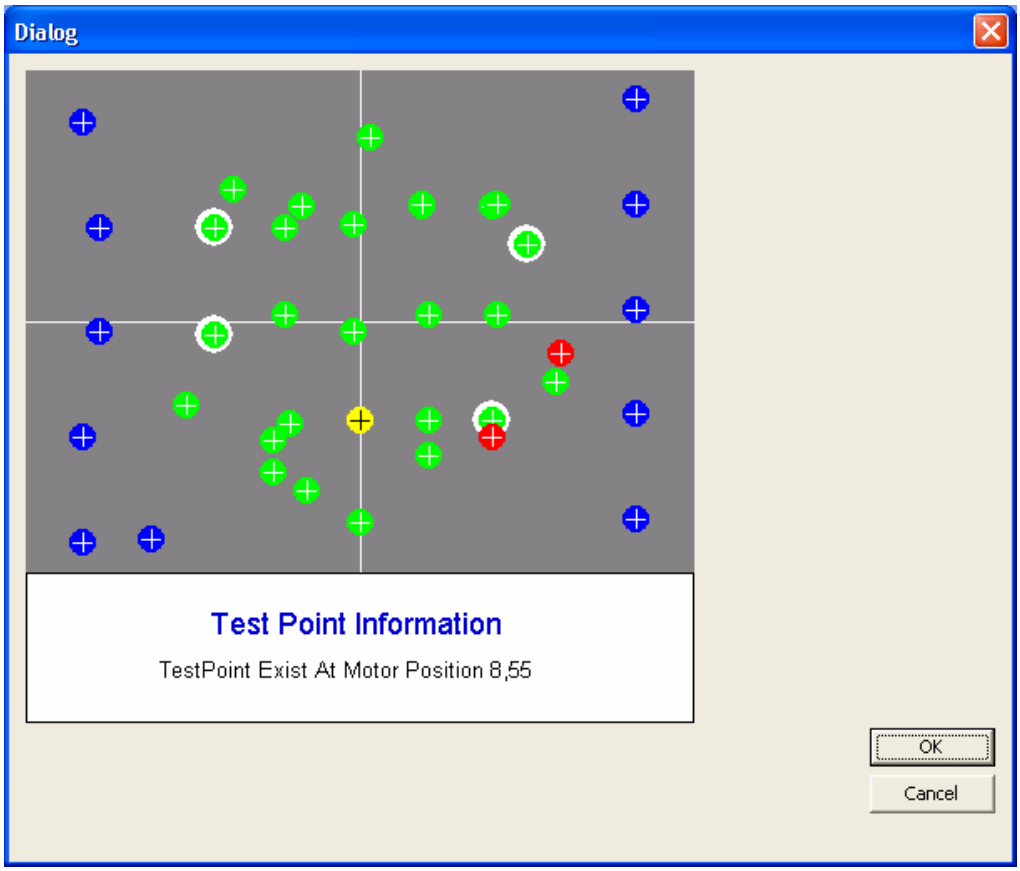
NOTE: The camera field of view is displayed in the image on the Picture Tab. The maintenance dialogs in no way influence the display from the projector; it simply changes the location to which the ACON camera points.



- Graph: This button will display the Graph Page dialog.

2.2.3.1.1.1 *Graph Page Dialog*

The graph dialog displays all of the active test points in the current set. Clicking on a test point selects that test point for editing. Test points are shown in different colors to indicate the error state of each test point.



- Red Circle: Test point with an error.
- Green Circle: Test point that is OK.
- Blue Circle: Test point is unused.
- Yellow Circle: Current selection.
- White Ring: Indicates multiple test points at the same location.

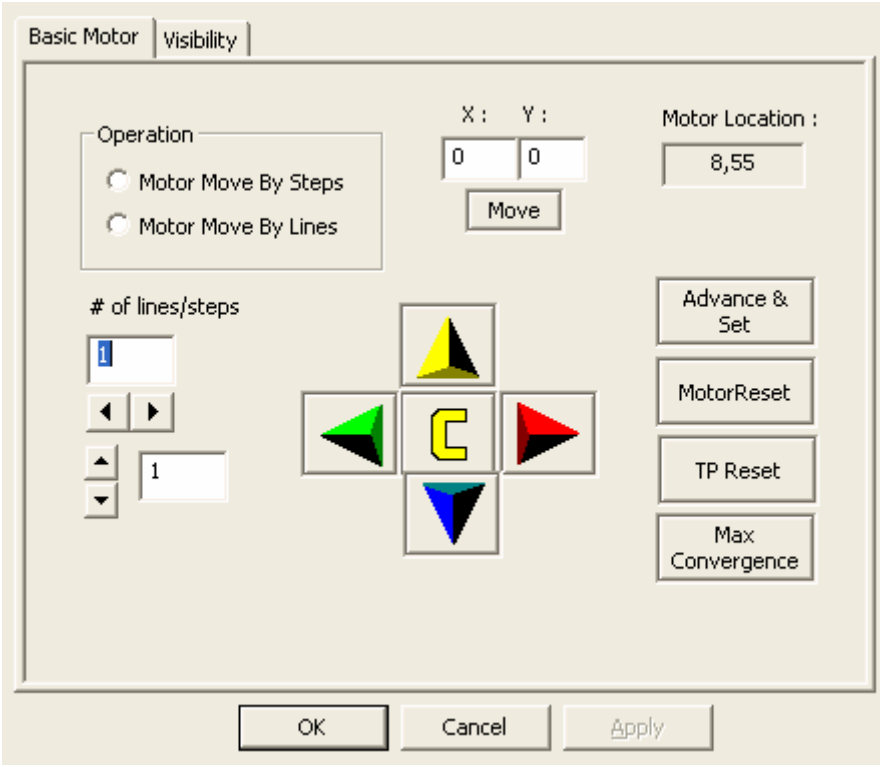
2.2.3.2.2 *Tabbed Property Sheets*

Most of the *Maintenance Dialog* controls are accessible through tabbed property sheets: Basic Motor Control, and Visibility. The properties of the current test point set are displayed and edited through these tabbed property sheets. Select the appropriate sheet by clicking on the tab, then edit the properties as desired. When finished editing, press Apply button to commit the changes.

2.2.3.1.2.1 *Basic Motor Dialog*

This dialog, which allows the user to position the camera field of view for the active test point, is used inside all Maintenance Dialogs.

As shown below there are several functions associated with this dialog. Refer to the illustration for additional information. After the correct test point location is found, press the Apply button to save the changes.

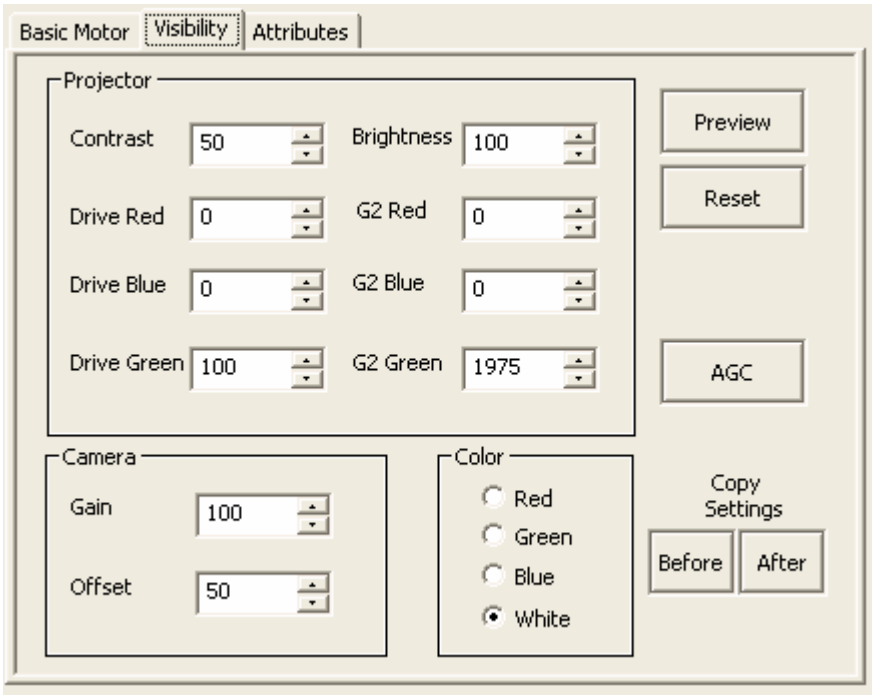


- Operation: This command will select Steps or Lines to move the camera by the specified number of motor steps or the specified number of projector lines.
- # of lines/steps: This box allows you to enter the number of steps or lines the camera will move for each push of the keypad arrows. The direction of the spin control indicates whether horizontal or vertical step amounts are being altered.
- Motor Location: This displays coordinates of the current motor location.
- Move: This button allows you to enter coordinates of the desired motor location.
- Advance & Set: This button changes the active test point to the next point and stores the current motor coordinates.
- MotorReset: This button will perform initial motor setup, e.g., homes the motor and moves the motor to location 0,0.
- TP Reset: This button will position the motor at the current test point's last saved motor location.
- Max Convergence: This button changes the camera field of view so the intersection of maximum convergence distortion is in the center of the field of view. Before pressing the button, the center-most intersection must display some convergence distortion when the Misconverge box is checked.
- Keypad: Use the keypad to reposition the camera field of view. Camera motion is relative the AU camera. For example, selecting the left arrow ( ) will swing the displayed field of view to the left.
- "C" button: This button, inside the keypad, will find the intersection that is nearest the center of

the image and move the motor to position that intersection at the center of the screen.

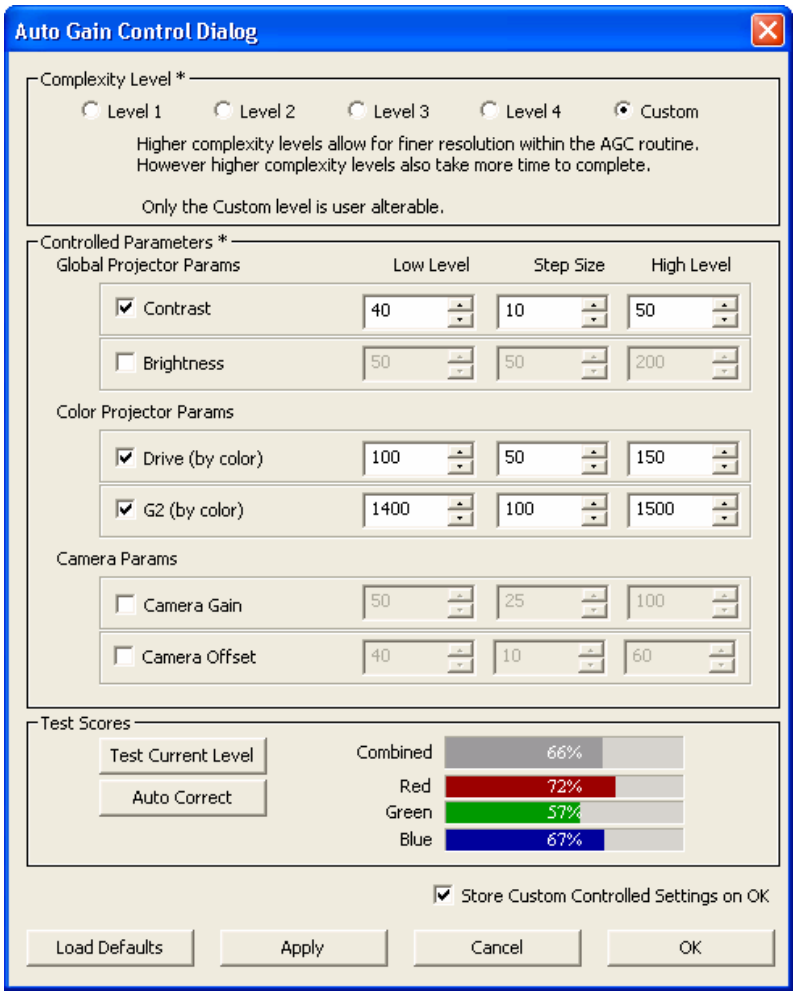
2.2.3.1.2.2 *Visibility Dialog*

The *Visibility Dialog* allows the user to set the image quality (or visibility settings) without affecting the actual user's settings. These settings are used to optimize what the camera sees. The more nearly the image quality matches the camera's requirements, not too bright or too dark, the more easily the camera can process the image.



- Projector: Includes brightness, contrast, drive and G2. These settings are used to optimize the camera image for an evenly distributed image level.
- Camera: Includes Gain and Offset. The settings are usually adjusted as follows: Gain at maximum and Offset at midrange.
- Color: Depending on the actual function or step in the process, select Green, Blue, Red or White (all on).
- Preview: This button will upload displayed settings to the projector.
- Reset: This button will restore the active test point's last saved settings.
- AGC: This button will perform automatic gain control (AGC) calibration on the current test point.
- Before/After: These buttons will copy settings from the previous (Before) test point or the next (After) test point.

2.2.3.1.2.3 *Auto Gain Control Dialog*



Controlled Parameters establish nested loops, or ranges, over which AGC searches to obtain optimum visibility settings. It enables the desired parameters and selects the range of the search. Ranges are inclusive, so in the above dialog, *Contrast* would have two steps during a search: 40 and 50.

Controls

- Enable (checkbox),
- low level,
- high level,
- step size

Parameters

- Global Projector Params (color independent)
  - Contrast
  - Brightness
- Camera Params (color independent)
  - Gain
  - Offset
- Color Projector Params (color dependent)
  - Drive
  - G2

Complexity Level

- AGC routines contain 4 pre-defined sets of parameters Level 1 – Level 4. Level 1 allows the least complex search pattern. The complexity of the search increases with each higher level. Any user defined settings are placed in the custom level.
- Default Complexity Level and Controlled Parameters are set for each projector with the "Base AGC" operation from the "Auto Setup Dialog"

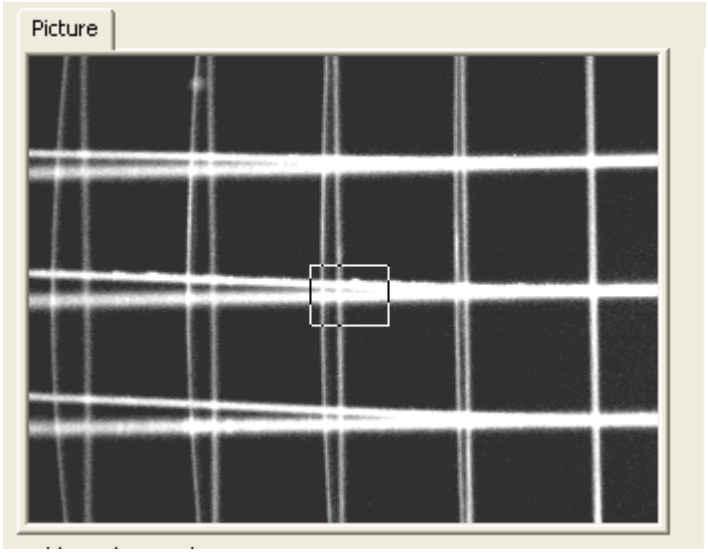
Test Scores

- Test Current Level button performs a test using the settings that are currently active in the projector. The results of the test are displayed on the four result graphs
- Auto Correct button performs the search operation using the selected Complexity Level and Control Parameters. If either has been edited and the changes not Applied, the user is prompted to apply the changes (or discard them) before the search is performed. After the search is complete, the results are displayed on the four result graphs.
- Result Graphs. A combined or comprehensive score is displayed on the topmost graph. Each color's contribution to the score is displayed below. Any score – either an individual color, or the comprehensive score – below 50% indicates a failure condition for the AGC. Higher scores are desirable.

2.2.3.2.3 *Picture Window*

The picture window displays the ACON camera's current field of view. This field of view can be changed, either through the Basic Motor tab, the Advanced Motor tab, or by double clicking the picture itself.

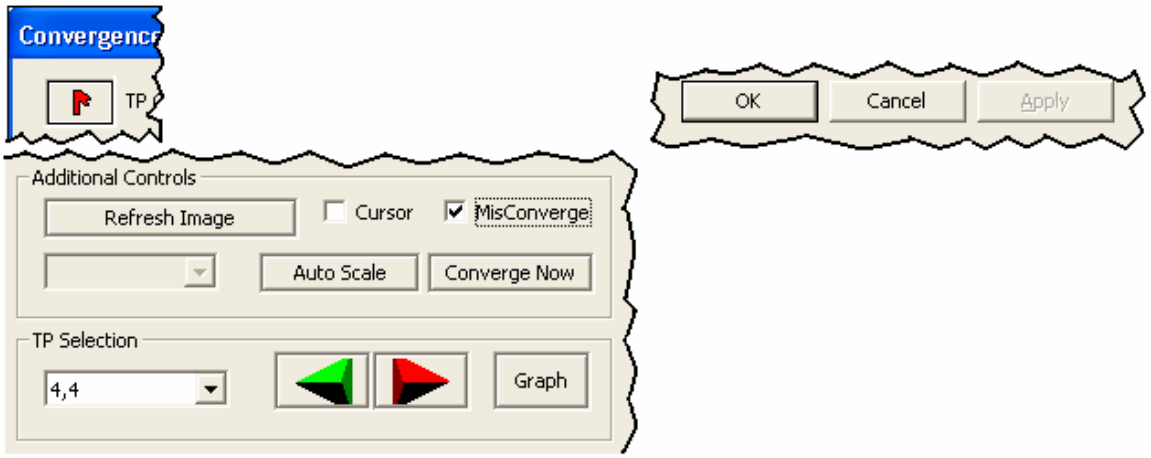
A double click on the picture will move the point of the click to as close to the center of the field of view as possible.



- Picture: Double click on the image. This will move the clicked point to the center of the image.

2.2.3.2.4 *Additional Controls*

Additional controls provide specific functionality that facilitates editing the test point information.



- Error Flag: This flag is shown red if the selected test point is in error, or green for a good test point.
- OK: This button will "press" Apply and close the window.
- Cancel: This button cancels any changes since the last time Apply was pressed.
- Apply: This button will accept any changes made on the window.
- Refresh Image: This button will take a new picture.
- Cursor: When this box is checked, the zone reference cursor is displayed. It is used to align the camera and the zone center.
- MisConverge: When this box is checked, AU will force a misconvergence of the projected image for reference and verification that the field of view selected is the optimum test point location. When the test point is no longer current, the misconvergence is removed from the projection.
- Converge Now: This button performs convergence on current test point.

2.2.4 AU Remote Control Operation

The AU Geometry and Convergence Operations can be performed using the standard Marquee remote control. Operations can be performed on either a single unit (local) or all units (global) simultaneously. The selection of combinations of channels is not available through the IR Remote Control.

Convergence

1. Guided
2. Interpolated
3. Random Access
4. ACON (not installed)
5. Service
6. ACON Ultra

During adjustments press <#> to cycle to external image.

NOTE: The AU program must be running to operate the AU functions from the remote control. If the AU program is closed, all remote control functions within the projector's menu structure relating to the ACON Ultra operations are disabled.

NOTE: If the AU operation is started within the program, the remote control will be disabled until the AU operation has been completed.

1. Press the [**CONV**] button on the remote control.
2. Select **[6]**; "ACON Ultra"

NOTE: If the AU program is not running or if the AU firmware is not installed or if the AU communication link between the server and projector is not present, then "not installed" will be present next to selection **[6]** similar to that shown in selection **[4]**.

ACON ULTRA

1. Local
2. Global

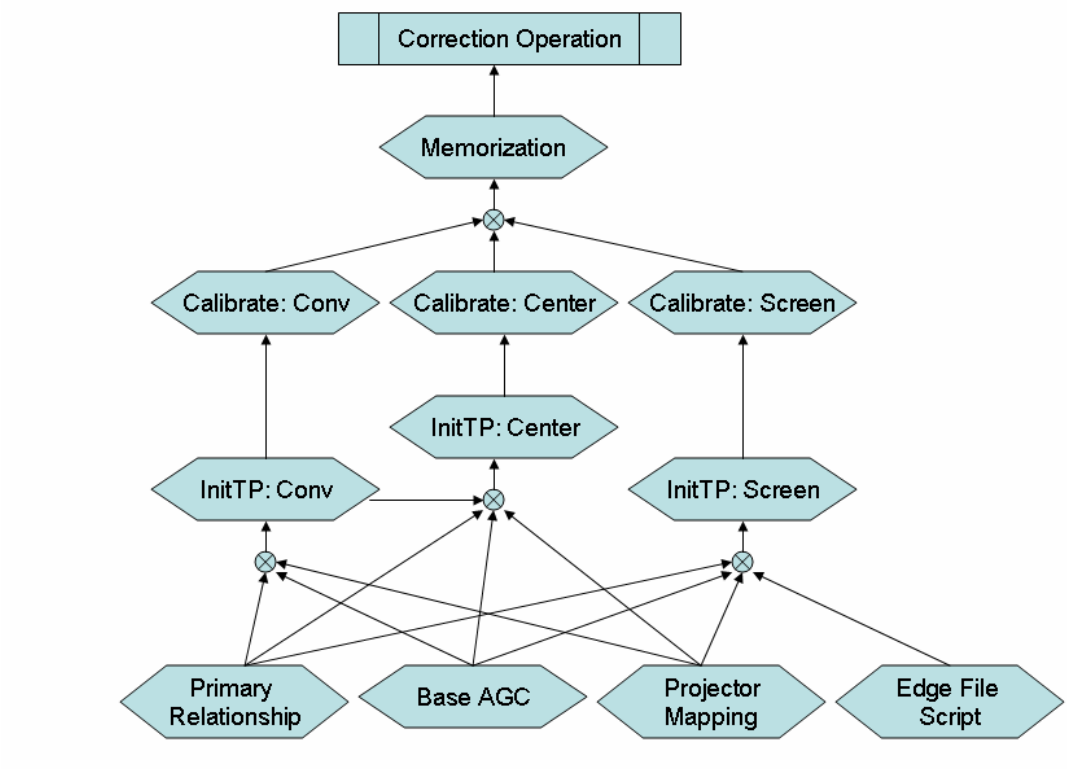
Select **[1],** "Local", for single unit operation on the current projector. Select **[2]**, "Global", for operation on all projectors in the system. With either of

the above selections, both the geometry and convergence functions will be performed.

2.3 The Setup and Calibration Process

2.3.1 Setup and Calibration Overview

Before the ACON Ultra system can be used to perform its correction operations, the system must be aligned and configured to work properly with the installed hardware system (including the projector, camera mounting, projection facet, etc). The system configuration is directly related to the physical relationships of these hardware components; thus, if any of the components of the hardware system are moved, portions of the AU initial alignment and configuration must be repeated.



The lower levels of the diagram represent initial setup operations to perform. As these lower levels are completed, their higher level dependencies may also be completed until the test point sets are built, calibrated and finally, memorized.

As indicated in the previous table, the initial Alignment and Configuration process involves several steps – some of which may have to be repeated during the complete configuration process. The remaining sections of this chapter detail the process.

2.3.2 ACON Ultra prerequisite tasks

AU performs its geometry correction operations against a pre-established projector geometry layout. Because of this, the projector must be properly mounted and the projector's mechanical and electrical geometry must be aligned as desired before the AU system can be configured and the appropriate relationships built. Among other settings, proper alignment includes: picture settings, geometry settings, color convergence, and color and image quality settings.

NOTE: The initial projector Alignment is accomplished in the methods detailed under the installation's standard operating procedures. If a customized method is unavailable, a guide to setting up projector geometry is contained within the projector's user manual.

Additionally, it is important that the AU camera is suitably mounted and cables appropriately connected to allow communication with each of the projectors and each of the cameras in the complete system. Ensure that the instructions from Chapter 1 have been properly followed and that the hardware is properly installed and connected to the AU Server before proceeding to the initial setup and calibration of the AU system.

There are two (2) test patterns used for the AU functions: the geometry and the convergence test patterns. The geometry test pattern is used by AU to establish the projectors' basic horizontal and vertical size and shape. The convergence test pattern is used by AU to perform a more precise arrangement of all three colors. The database used to generate the test patterns should be present and accessible before attempting to perform AU initial setup and calibration.

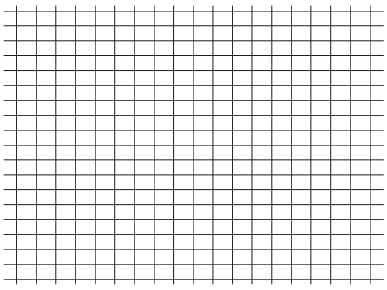
2.3.3 Primary Relationships

The Primary Relationships build basic physical relationships between the AU camera and the Projection Facet. These relationships include:

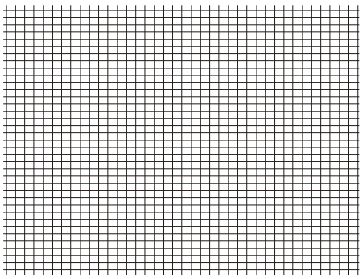
1. Grid densities of the different test patterns used by AU
2. Motor step to camera pixel conversion factors
3. Motor location for the center of the projected raster

The AU software only allows modification of these Primary relationships through the `Auto Setup` operation. While establishing the Grid intensities for the test patterns, the user will be requested to change the image generator (IG) pattern to the pattern that is being learned.

ACON Ultra performs its Geometry and Convergence correction operations against the location of an intersection of a projected grid pattern. For Geometry, the corrections compare the location of the grid intersection presented during memorization with the currently sampled location of the grid intersection. For Convergence, the correction compares the location of the intersection of the Green CRT with the location of the corresponding intersection of the Red and Blue CRT.



Geometry Test Pattern



Convergence Test Pattern

The AU software limits the amount of distortion (geometric or convergence) capable of being corrected to one-half the distance between two lines of the test pattern's grid (maximum observable distortion is also limited by the field-of-view of the ACON Ultra camera). A sparser test pattern allows for a larger maximum limit of observable distortion, but provides for fewer test points (so the resolution of the corrections may become limited). While a denser test pattern allows a higher resolution of correction, but limits the maximum observable distortion. Thus, the spacing of the test pattern should be selected to allow for a maximum amount of observable distortion, while providing enough correction resolution to be able to have test points at all points of the screen that can be

corrected. For example, a screen that is not rectangular will conceal some convergence zones from view. However, some of these zones may still have a small area of the screen that would be affected by a drift or change. If the test pattern being used does not provide an intersection within this small area of the screen affected, the resolution of the corrections is too large, and the corrections from ACON Ultra are not optimum (if they are able to be performed at all).

The test patterns used for the initial setup and calibration process must be identical to the patterns used for correction operation. If the pattern is changed, the test point settings may be incorrect, mandating a new setup and calibration.

The ACON Ultra software does not have any interfaces to external IG; therefore, it must rely upon a user to load the proper test pattern into the IG at the appropriate time. ACON Ultra has been provided with a set of test procedures to verify that the presented test pattern is indeed the test pattern that is required. When ACON Ultra begins an operation that requires an external test pattern, it verifies that the presented test pattern is the one required. If it immediately finds the correct test pattern, it continues the operation. If the correct test pattern is not identified, the commanded operation is suspended until ACON Ultra identifies that the correct test pattern has been presented.

External Test Pattern Verification. When ACON Ultra relies on an external image generator to supply the test pattern(s) used for the correction operations, the software performs a verification check to ensure the correct test pattern has been loaded. When the software reaches the point when it needs a specific test pattern, a verification check is performed. If the verification check passes, program execution continues uninterrupted; however, if the verification check fails the software prompts the user through a projected menu message, and through the status field on the GUI. The software will continue testing for the correct test pattern for approximately 45 minutes. During this time, the software alternates between the three CRTs to attempt to isolate any possible glare from the CRT. If the correct test pattern is not identified during this 45 minute period, the software will abort the commanded operation.

The verification that is being performed is a check against the density of the test pattern's grid. During the Auto Setup routine, the user is prompted to present first the Convergence or Dense Test Pattern (Step 7), and later the Geometry or Sparse Test Pattern (Step 19). When the user confirms that the correct test pattern is being projected, the ACON Ultra software moves the camera location to that of the Test Point for Convergence Zone42 (the static convergence zone). The density of the grid lines for the test pattern is sampled and the measurement recorded into the projector's configuration file (the ".SAV" file).

In the future, when the ACON Ultra software requests the external test pattern, again, the camera is positioned over the Static Convergence Zone (using the convergence test point for Zone42) and the density of the presented pattern is sampled. If the sampled density matches, within a specified limit, the memorized measurement for the test pattern the software determines that the presented test pattern is correct and the commanded operation is allowed to continue.

If the sampled measurement does not compare favorably to the memorized measurement, the software switches the color being projected, waits for a short period, and then samples the grid density again. The test pattern in green is tested first, then red, followed by blue. The ACON Ultra software rotates through the different colors to attempt to minimize the impact of CRT glare. When the projectors (and ACON Ultra camera) are to the rear of the screen, the CRTs create a glare in one location of the screen – each color in a different location. If the Test Pattern Identification measurement fails, the ACON Ultra software changes the CRT being used, in case the failure is a result of the glare from the CRT. The ACON Ultra Camera looks in the same location for each of the measurements, and since the glare from each CRT is in a different location; if one color fails because of one CRT's glare, the glare from at least one of the other CRT's will be outside the measurement field of view.

The location of the measurement, both for the memorized value during Auto-Setup and for the

sampled measurement during an ACON Ultra operation, is determined by the current placement of Zone42 of the Convergence Test Point Set. Further, the "Visibility Settings" used during the measurement are the current settings for Convergence Zone42. If the ACON Ultra software is having problems correctly identifying a test pattern, the settings for Zone42 should be adjusted. For instance, the current location of Zone42 may place the field of view too close to the CRT glare (or some other glare) for the test pattern measurements to be taken. In this instance, the test point should be moved further away from the glare. If the current visibility settings of Zone42 are too high to allow the test pattern measurements to be taken, the controls should be changed to lower the peak intensity of the projection for the zone.

Similar Installations. The primary relationships are built within the first 19 steps of the Auto Setup procedure. After these steps have been performed, unless major changes are made to the hardware relationships, the Primaries do not need to be re-calculated. If a system configuration (contained within the ".SAV" file) has been completed, then that system configuration can be copied onto a similar projector system and the primaries do not have to be recalculated. Consider the following two examples.

Example 1. If a company first assembles a simulator in a laboratory environment and completely configures the AU system then the simulator is later re-assembled at a customer's site, the values for the Primary relationships should not have to be re-calculated.

Example 2. If a company completely configures the AU system on a specific installation of a simulator, that system configuration (contained within the ".SAV" file) can be copied to the next installation and, assuming the mechanical components of the simulator are equivalent (under normal manufacturing specs), the Primary relationships should not have to be recalculated.

There are boundaries to the amount of variation that is acceptable although there are no numerical limits attached to the acceptable variation which defines a "similar installation". If a system is believed to be similar, copy the system configuration from the initial installation and if the system is capable of identifying the two test patterns (performed as the first step in any of the Calibration tasks, the Memorize task, and any Correction tasks), then the two installations are "similar". If the attempts to identify the test patterns fail, the two installations are not similar, and the system will not be able to progress past identification of the correct test pattern.

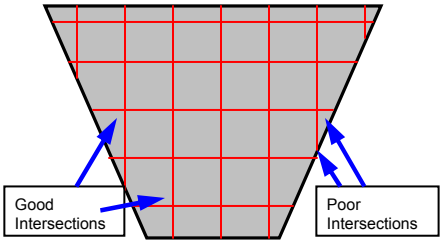
NOTE: Running the Auto Setup Procedure will reposition all convergence test points and all Center and Screen test points. If the test point locations have already been configured, the settings should be exported to script files then imported back after the Auto Setup routine has rebuilt the Initial TP setups.

2.3.4 Test Point Locations

After a projector has been optimally setup (physically and electronically), AU can be used to memorize, and then later to correct for small changes in the geometry and convergence that occur on a day to day basis. Before a memorization can take place, AU must be taught three sets of test points.

For each list, two vital points of information must be established before any meaningful measurements can be taken: the motor coordinates and the Image quality settings of the Test Point. The motor coordinates are the X, Y pair indicating the specific setting of the indexer pan and tilt motors. This establishes the camera field of view within a desired region of the projected raster (as observed on the facet).

When AU takes a measurement from any test point, the camera is indexed to the established coordinates, and a routine determines the intersection that is closest to the center of the captured camera field of view. If the measurement type is an *Intersection* type, the X and Y position of this intersection is the reported measure. If the measurement type is a *Linearity* type, the spacing of the grid line – both horizontal and vertical – is reported.



Each of the passes of Geometry Correction (Center, Screen and Edge maintains a separate list of test points from which to make observations as to the quality of the current projector geometry. Convergence uses the test point set from the third Geometry pass.

2.3.4.1 *Choosing Good Intersections*

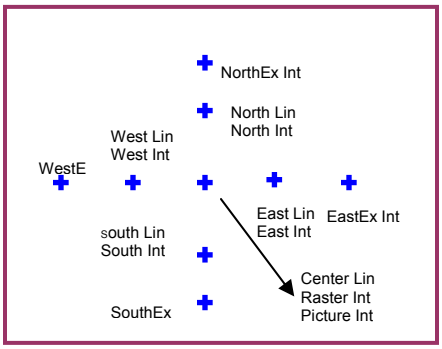
AU utilizes the intersection of horizontal and vertical grid lines as measurement centers for all of the tested observations. The process of correctly positioning test points is not completely automated. The Auto Setup routine will give a "best guess" as to the location of the Convergence and Center Geometry test points, but it is necessary to visit the automatically set test points to verify that the position is optimal. Screen Geometry test points have no automated setup procedure.

When positioning a test point, the intersection should be completely visible on the facet and un-obstructed by glare. Generally, a good test point is one whose lines are all at least as long as ½ the size of a full grid box. In some irregularly shaped screens, some convergence zones may have an area of effect that shows up only on one intersection of the test pattern. Even if this intersection would otherwise be considered a poor juncture, this point must be chosen to allow AU to make corrections to this zone.

A poor intersection is most at risk of dropping off the facet edge due to drift or otherwise becoming unrecognizable by the AU software. If this happens, the AU correction routines may fail to make the required corrections to the area, or in the worst case, make the errors even worse.

2.3.4.2 *The Center Geometry Test Point set*

For the Center Geometry Test Point Set (the first pass of geometry correction), the test points are arranged along the cardinal points of the compass. Each test point reports both a horizontal and a vertical measurement. There are 15 test points in the Center Geometry Set: three test points in the center of the screen, and three in each of the different compass directions: north, south, west, and east of center. The test points at the center of the screen take a linearity measure, and an intersection measure of the picture (external test pattern), and an intersection measure of the raster (internal test pattern). The name of the test point, as seen in the Maintenance Dialog Window – and shown in the adjacent diagram – indicates the type of measurement being taken as well as the position of the test point. For example:

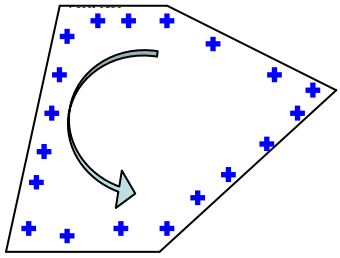


Example 1. The North Int test point is located above the center of the raster and an *Intersection* style measurement is being taken.

Example 2. The West Lin test point is located to the left of the center of the raster and a *Linearity* (or line density) measurement is being taken.

Example 3. The South Ex **Int** test point is located to the *extreme* bottom of the raster and an *Intersection* style measurement is being taken.

2.3.4.3 *The Screen Geometry test point set*



The Screen Geometry test point set is arranged at regular intervals around the outside edges of the screen. The geometries that are controlled during this pass affect the entire screen, so the density of the test points should be sufficient to observe any shifts in these geometries. Each test point includes a horizontal and a vertical measurement of the intersection location. This section will first detail the long method of creating a valid Screen Geometry test point set and then will give details on how to perform the same setup steps using software routines introduced with the software version 2.0.

2.3.4.3.1 *Using a build pattern (the long method)*

To initially obtain the locations of the Screen Geometry test point set, first pick a screen vertex, or other identifiable edge feature, then trace a regular pattern – the build pattern – around the edge of the screen. The choice of initial feature needs to allow the user to readily position the camera field of view. The exact pattern may change as long as sufficient points are obtained to observe all screen based geometry changes. All test points should be located close to the edge of the facet. A build pattern chosen could be “every other horizontal line gets a new test point”; or “every third vertical line gets a new test point”. The adjacent drawing indicates a counter-clockwise pattern direction; however, the direction chosen is irrelevant to the test point set.

A build pattern typically used for initially establishing Screen Geometry test points is to select the intersection nearest the center top of the facet as the first test point; then, in a clockwise or counter clockwise direction outline the edges of the facet by placing a test point on every other horizontal line. When tracing a horizontal facet edge, place a point on every other vertical line. Always position the test points near to the edge of the screen. If either line of a desired intersection is less than ½ the length of a complete grid box from the edge of the screen, the intersection is too close to the edge of the screen and should be repositioned further from the perimeter.

While following the build pattern a collection of controls from the Screen Geometry Maintenance Window are provided to facilitate creating the test points. This window allows the user to view and modify a single test point at a time. One of three selection controls allow different test points to be viewed – the test point being viewed is considered the active test point. When the control advances the active test point, the camera is indexed to that test point’s location and that test point’s visibility settings are sent to the projector.

From within the Screen Geometry Maintenance Window, start at a recognizable feature of the facet and set the first point based on this feature. Choose an intersection close to the feature and store the motor coordinates into the first test point in the set. Using the *Motor Control Tab,* index the camera to the intersection indicated by the build pattern to be next (e.g. move the field of view two horizontal lines down, and one line left). Press the Advance and Set button to store the current motor coordinates into the next active test point. If the current test point is the last in the set, this button will create a new test point (up to a total of 50 points), set that point as the active point, and then store the current motor coordinates. Once the entire screen has been traced, any additional test points in the set (that have not been used), should be removed from the set with the *Delete* button.

The number of test points chosen for the Screen Geometry test point set affects several operational characteristics. If the number of test points is insufficient, the Calibration routines will not have enough information to be able to recognize some or all of the projector geometries to be corrected. After completion of the calibration routine, AU will issue any warnings concerning invalid geometry models. If these warnings are presented, test points may be insufficient in number or placement. On the other hand, AU can only make one geometry correction after testing ALL of the points in the set. Therefore, extra test points in the set may unnecessarily prolong the completion of the Geometry Correction operation. Typically, 20-25 test points have been sufficient to trace all edges of the screen and provide complete information for the correction algorithms. The Screen Geometry test point set can have a maximum of 50 test points. The "Add" and "Remove" buttons on the Screen Geometry Maintenance Window allow the user to add or remove test points to the end of the test point set.

2.3.4.3.2 *Using the Script Editor (the short method)*

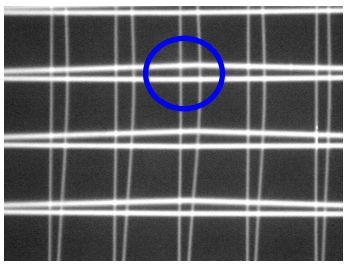
The Screen Geometry Script Editor allows the user to quickly establish most of the test points needed for a complete Screen Geometry test point set. From a separate dialog window, all of the corners of the screen are identified. Each corner is identified with a valid test point intersection that is closest to the corner. After the entire screen is outlined by these test point intersections, the *Initial TP: Screen* routines extrapolate a specified number of test points between each corner. For example, a rectangular shaped screen would have its four corners matched with a test point intersection in the corners, and the user selects to add 3 more test points per edge. After the *Initial TP: Screen* routines complete, a total of 16 test points would be in the set – one for each corner then three more for each of the four edges.

This method operates in a very quick and reliable way and provides a fairly good estimate of test point positions. However, if the screen contains some irregularities (e.g. a cockpit cutout) the Screen Geometry Maintenance Window may still have to be visited to reposition the effected test points outside the irregularity.

2.3.4.4 *The Convergence Test Point set*

Both Convergence Correction and the third Geometry pass use the Convergence test point set. Typically, the test pattern that is used for these correction passes has a denser grid pattern than that used for the Screen and Center Passes. When the Geometry algorithms use this test point set, static and dynamic green convergence are used to align the points of the image compared to the memorized intersection locations. When geometry is using these points for correction, it has already performed as much geometry correction as it can with the screen-wide Geometry and Picture settings. When the Convergence algorithms use this test point set, static and dynamic convergence are used again, however it is the red and the blue CRTs that are being aligned to the green raster.

The *Marquee* projector has 45 convergence control points (9 columns of 5 rows). If the projection facet covers the entire raster, then all 45 of the projector's convergence zones will require an active test point. If the facet shape occludes some of the convergence zones, then some test points may be marked "Unused"; it is important to check carefully before disabling a test point to make sure the zone truly has no effect on the facet. Even if the actual control point falls off of the facet, it still may affect the visible portion of the raster. If the convergence zone is outside the facet shape but still affects a facet area, one must choose an intersection on the effected area. The process of establishing the convergence test point set involves finding, on the facet, the area of maximum control – as indicated by the area of maximum misconvergence.



The Convergence Maintenance Dialog provides a mechanism to do this. When checked, the checkbox entitled "Show Misconvergence" introduces a set amount of misconvergence into the projector (This misconvergence is removed when the dialog leaves the selected test point). While this

misconvergence is visible, use the *Motor Control Tab* to reposition the camera location until the center intersection shows the most misconvergence. In the corresponding picture, a blue circle is shown around the intersection that should be positioned at the center of the image.

NOTE: When Show Misconvergence is checked, the displayed image does not automatically update. At any time, the displayed image may be updated with a single click on the Picture Tab.

NOTE: When setting the location of a test point, the green intersection should be the one centered in the Picture Tab. It is sometimes difficult to distinguish the misconverged color line with the green lines. Clicking the Apply button on the Basic Motor Tab will temporarily remove the induced misconvergence allowing the truen location of the green intersection to be viewed.

NOTE: If it is difficult to choose which is best between a number of intersections, any would work with approximately equal efficiency.

2.3.5 Calibration

Once the locations of the test points in all sets are finalized, AU needs to perform a calibration operation to finalize a series of relationships. The calibration process is used to build relationships between the projector and the specific test point or test point set being calibrated. While AU allows the option of calibrating all three sets of test points in one operation, it is advisable to perform the convergence calibration first, and then perform calibration on the Screen and Center Geometry test point sets.

When performing Convergence calibration, at most three projectors in an installation should be chosen at a time. Part of the calibration process involves moving the G2 and Drive settings of the projector through the entire available range. If too many projectors are doing this at once, the ambient light levels skew the calibration results to the lower end of the available range; giving less than optimum results. Geometry calibration can be performed safely on all projectors in the installation.

2.3.5.1 *Visibility Settings and Automated Gain Control calibration*

With the AU camera set to the location of the current test point, a group of projector and camera settings is calibrated to provide the best image quality for the ACON Ultra measurement tools. This automated Gain Control (AGC) is performed in all of the calibration operations – Convergence, Center Geometry, and Screen Geometry.

All test points must have the image quality (visibility) settings optimized to allow the AU correction routines to perform at the highest level. The correction routines support a range of image quality settings and the optimum setting places the test point's image quality at the top of this range. The visibility settings include projector contrast, brightness, G2 and drive settings as well as camera offset and camera gain settings.

The *Vision Control Tab* is present on all of the Maintenance Dialogs. This tab provides part of the interface necessary to manually prepare the test point for the AGC operation. The AGC operation can be configured to find the best settings for any of the image quality settings; however, the more parameters the AGC search has to cover the longer it takes to complete. Typically, only three or four of the parameters are needed to obtain optimum levels. The user will manually select levels for all parameters not covered in the AGC search. Better performance has been observed if the CRTs are driven to as low a level as possible; therefore it is suggested to position the Camera gain at the maximum level (100%) and the Camera offset at mid range (50%).

If manual setting is desired, the range of control allowed with the projector contrast parameter is much

wider than that of the projector brightness parameter. When beginning the process of adjusting test point visibility settings, Set the two camera parameters as discussed previously (gain at 100%, offset at 50%) and then set the projector brightness at mid range (total brightness range is 0-255, so midrange is 127). Adjust the projector contrast to obtain appropriate levels. After the results have been calibrated, if minor adjustments are needed, the projector brightness can then be used to fine tune the settings. Use the Test Current Level button to command AU to perform tests of the current settings. After the current levels are tested, a score (0% - 100%) is generated for each color and a composite score. Each of these scores must be above 50% for the current levels to be deemed acceptable. Higher scores are preferred.

NOTE: During initial attempts to set the visibility settings, it is not necessary to achieve perfect results; the visibility settings will be refined throughout the entire setup and calibration process. A typical approach for the initial attempt is to use manual settings combined with the AGC results and the Test Current Level button to make one test point as good as possible. Then copy these settings to all other test points in the set.

The Automated Gain Control algorithm (or AGC) sweeps the enabled parameters through a defined range to use a brute force method of identifying the best set of parameters. When sweeping through multiple parameters, the sweeps are nested. Every step of the secondary parameters must be examined at every step of the primary parameter.

For example: Consider an AGC calibration where only Contrast is enabled. The low and high ranges are 40 and 50 respectively, and the step size is 10. AGC will analyze the images of the two settings and be finished. Now consider that Camera Gain is enabled with its step size, low and high ranges at 25, 50 and 75 respectively. Now the AGC has four images to analyze as shown in the following table

Step	Contrast	Gain
1.	40	50
2.		75
3.	50	50
4.		75

Now consider enabling G2 for all three colors the following table indicates the number of steps required of AGC. The settings for G2 we will use are 100, 1600, 1700 respectively for step size, low and high range. The number of steps required to complete AGC has risen by the number of steps of the new parameter times the number of colors required (2 steps * 3 colors) so now instead of 4 steps to complete AGC, 24 are needed.

Step	Contrast	Gain	G2
1.	40	50	(R) 1600
2.			1700
3.			(G) 1600
4.			1700
5.			(B) 1600
6.			1700
7.		75	(R) 1600
8.			1700
9.			(G) 1600
10.			1700
11.			(B) 1600
12.			1700
13.	50	50	(R) 1600
14.			1700
15.			(G) 1600
16.			1700
17.			(B) 1600
18.			1700
19.		75	(R) 1600
20.			1700
21.			(G) 1600
22.			1700
23			(B) 1600
24.			1700

Additional steps are beneficial to determining the best set of visibility settings, but requiring AGC to search across too wide a range of parameters may result in very long execution times.

AGC has four default levels of complexity; these levels are set at the factory and are not editable in the field. Level 1 requires the least amount of steps for AGC to complete its search – Level 4 requires the most amount of steps from AGC. Typical AGC calibration starts a Level 1 complexity and will successfully calibrate about 90% of all test points. Level 2 will typically calibrate 9% of the remaining points. It is suggested when first calibrating the AGC for a test point set to start at Level 1 complexity and to elevate the complexity for each test point that fails at that level. If none of the four pre-defined complexity levels calibrate a test point, the AGC interface allows the user to create a custom search pattern.

After the Calibration Operation has been performed, AU provides feedback indicating which test points will need further manual adjustments. Return to the Maintenance Dialog and adjust the test visibility settings for the indicated test points.

2.3.5.2 *Calibration of the Convergence relationships*

The second item that is calibrated in each of the test point sets is the relationship between a step of the controlled projector variable (convergence, keystone, static shift, etc) and the amount of observable change in the camera image. For the Convergence test point set, a simple scale factor is established

that allows a conversion from camera pixels, to convergence steps. This is done on a test point by test point basis. If the automated *Convergence Calibration* routine has been completed and indicates some inadequate results in test points, revisit those test points via the Convergence Maintenance Window and adjust the settings. The automated Convergence calibration routine does not need to be performed again. If a scale factor is insufficient, use the Auto Scale button. If the Visibility Settings are insufficient, use the settings in the *Vision Control Tab* and the Auto G2 and Drive button to correct.

Use the AGC button to have AU test the image quality of each of the pertinent colors. A test score above 50% for all colors indicates acceptable settings. Higher scores are desirable. To further verify the correct settings, press the Run Convergence button. AU will try to run the Convergence correction algorithms on the active test point. If success is indicated, the settings are satisfactory.

NOTE: All the scaling factors for a convergence set point should have scale factor numbers with the same sign.

NOTE: Test points that display equivalent amounts of misconvergence in response to the Show Misconvergence checkbox should have equivalent scale factor magnitudes.

2.3.5.3 *Calibration of the Geometry relationships*

An isolated test point means little when dealing the Center and Screen Geometry passes. The corrections from both of these passes influence the entire screen; thus, one test point out of alignment may not necessitate changes. The calibrated relationships here use an evaluation of the entire set of test points; and – unlike *Convergence Calibration* – if changes are made to test points after calibration, the automated calibration routine must be performed again.

NOTE: If changes are made to Center and Screen Geometry test points after Calibration, the automated calibration routine (the appropriate Setup > Calibration > Geometry menu is chosen based on the test point set(s) altered) must be performed again.

To explain further, consider the Skew geometry adjustment. When Vertical Skew is changed, the measured Screen Geometry test points should show little change in the horizontal reading and positive or negative change in the vertical direction. The vertical change is proportional to the direction of the Skew change and the vertical distance from the center. Note that direction is relevant. The test points on one side of the center will move towards the left of the projector, the test points on the other side of center will move towards the right of the projector. The waveform shown in this figure shows the test point error readings measured on a facet after Vertical skew has been introduced. In this waveform, there are 24 test points in the set. The first 24 measures are the horizontal readings; the second 24 measures are the vertical measures.

During the second stage of the Geometry calibration (first stage is AGC calibration); AU introduces a known amount of distortion of the tested projector geometry. After measuring the entire test point set, the generated waveform is stored as part of the calibration data. This waveform is used during the calibration to configure and proportion an *Expert Knowledge Rule Base*. This *Rule Base,* along with the generated set of waveforms – one waveform for each projector geometry –is used during further correction operations to identify the correct projector geometry and to calculate the magnitude of the necessary changes.

At the conclusion of the Calibration operation, any insufficient results are stored in a text file and displayed in a separate notepad window. Each projector with insufficient results generates a separate file. The contents of the text file describe the specific instances and the test points that may require additional adjustment. VDC document number 79041-01 FMEA worksheet includes, among other items, all of the messages that may appear in this text file. Associated with each of these setup failure conditions, are suggested causes, and possible courses of action to correct the issues.

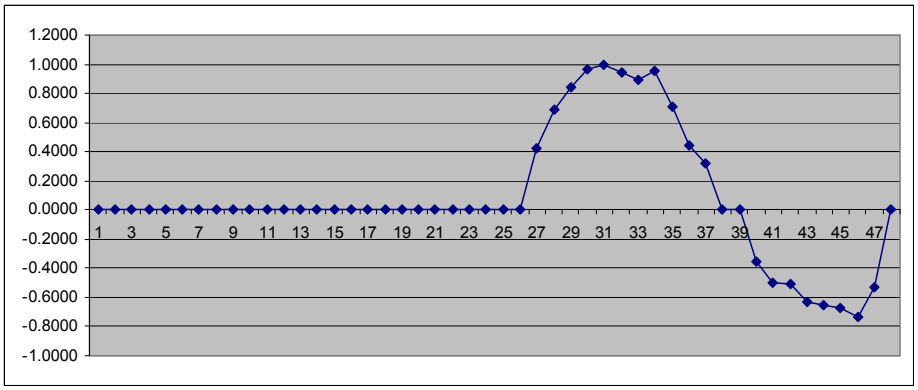
2.3.6 Memorization

Once the *Calibration* operation is successful, the system is ready to memorize the current geometry of the projector. Two sets of data are acquired during memorization. The first is the set of electronic settings which establish the projector's existing geometry and convergence information. The second set of information is the measured values of all the Test Points. When the Geometry correction algorithm routines are needed to perform corrections, this initial, memorized set of test point observations is compared against the current sampled set of observations to calculate an error for each valid test point. These error calculations are used to calculate two different pieces of information: the desired amount of change for geometry (center as well as screen), and the priority of the particular geometry. Thus, the *Rule Base* of a particular geometry may calculate that a large change is needed; however, a different geometry with a smaller change may be determined to have higher priority. The geometry change with the highest priority will get implemented first. In the Center and the Screen passes of the Geometry correction algorithm, a single projector geometry is changed at a time. In the Edge pass of the Geometry correction algorithm, multiple changes may be made in a single pass.

During the *Memorization* process, AU compiles statistical information from repeated measurements of the same test point. When the memorization operation is complete, if the results are questionable, a notepad is opened displaying a text document with each warning message. This information may indicate that there are still some insufficiencies within the calibration of the test points. These warnings are treated in the FMEA style diagnostic worksheet (VDC D/N 79041-01). The document is organized as a chart with failure modes followed by possible effects and possible corrective actions. Work through this chart to identify what, if any, corrective action is required to facilitate a successful memorization.

2.3.7 Correction Operations

After AU has been calibrated and memorized, it can be used to correct for small amounts of drift in the projector's convergence and memorized geometry. Select the group of channels (projectors) that will perform the operation and then select the operation to perform. The AU software will first initialize



the camera of each channel selected, then attempt to identify the presented test pattern. If the correct test pattern is present, AU continues with the correction operation. If the correct test pattern is not present, the channel's projector displays a warning message and the AU status window displays a message signaling that it is waiting for the correct test pattern. If AU initially fails to identify the test pattern, it cycles through the other CRTs of the projector to attempt to eliminate issues caused by the CRT glare seen on the rear of the facet. Once the test pattern has been identified by AU, the requested correction operation continues. Both the Geometry and Convergence correction operations provide feedback through the GUI's status window. Messages from a channel have the ID of the associated projector attached for ease of association.

The *Geometry Correction* operation performs three different testing passes; the first testing pass corrects the projector's static positioning as well as the linearity of the projection. The second pass of

the Geometry operation corrects the projector's geometry settings that are mainly observed around the edge of the projection (e.g. skew, bow, pincushion, etc). The third pass of Geometry operation uses green convergence to perform a point-to-point correction across the entire screen.

While performing the Center (first pass) or Screen (second pass) Geometry corrections, AU first samples all test points in the appropriate set, then calculates which, if any, projector geometry needs modifications. Only one projector geometry is corrected per measurement sample (all test points must be observed during a measurement sample). If a correction is made after a measurement run, another sampling of all points in the set is gathered before further corrections are made.

Edge Geometry (third pass) corrections position the camera at a test point and attempt to position the appropriate intersection at the memorized coordinates. Up to ten correction iterations are made before the next test point is attempted. If a test point fails to correct in these ten iterations, the point is flagged (the AU status window displays an "`Incomplete`" or a "`Dropout`" message associated with the projector and the particular test point). The AU correction routine re-tries to fix the point after it has completed the rest of the points in the set; up to five such passes of all test points are made during the Edge Geometry correction phase. Convergence correction operates in an identical manner to the Edge Geometry operation, except the Blue and Red intersections are compared to the current Green intersection.

After all commanded correction operations have completed, the AU software presents any setup failure messages it has. For each projector, if any setup failures are detected during the correction operation, a text document, which contains the feedback messages, is created, and displayed. Messages typically indicate that a test point partially or totally failed to complete the necessary corrections. The FMEA worksheet helps to determine if any corrections are needed, and if so, are they visibility, test point positioning, or scale factor type settings.

In convergence, especially, if it is noted that enough corrections are not being made in a region or zone, it maybe necessary to re-locate one or more test points to better view the region in question. Refer to the previous section and the FMEA worksheet to determine if this necessitates re-running the Calibration or Memorization operations. Before calling an AU installation complete, it is advisable to run the correction operations several times and observe any setup failures as well as the actual results on the screen.

2.3.8 Procedure Outlines

2.3.8.1 *AU Initial Setup*

The following presents an outline of the method for initializing a new AU installation. The outlined method is structured to attempt to minimize the total required setup and configuration time. If this is not a new installation, some of these steps may be skipped or modified as indicated below.

> **NOTE:** A "note step" with a software version included (e.g. NOTE: s/w 1.0.20061220.1) indicates a step or an action that should be taken for that version of the software only. It usually indicates a workaround for a known limitation of that version of the software.

1. **Prerequisite Tasks.** ACON Ultra software setup should not be initiated until all of the following tasks have been completed.
    1) The projector is rigidly and properly mounted.
    2) The AU hardware is properly secured to the mounting brackets.
        a. With the camera power off, the AU camera bracket should be able to be moved through its entire range of motion without knocking the mounting bracket or the projector and without binding the wire harness.
        b. All communication and video cables have been properly connected and secured.
        c. All lens covers should be removed from the front of the camera.
        d. The "AU System Configuration Log" has been completed and sent to the appropriate VDC contact.
    3) The Marquee projector is running at least version 6.0 firmware. If a firmware upgrade is required and if the projector has already been setup, it is advisable to download the memory of each projector with the *VDC Marquee Loader* program prior to upgrading the firmware.
    4) The mechanical and electrical setup of the projector has been completed and all settings are satisfactory (e.g., scheimpflug, beam centering, electrical geometry settings, mechanical and electrical convergence settings, color temperature, etc.).
        a. Consult the projector's manual or other provided SOP concerning projector configuration and setup.
        b. After the completion of the projector setup, it is advisable to utilize the VDC Marquee Loader program to download each projector's memory to the AU server.
    5) The system's Image Generator (IG) has loaded the appropriate databases containing the Geometry and Convergence test patterns. An interface must be available at the IG to switch between the two patterns during/between AU operations.
2. ***Primary Relationships and Test Point Location.*** Perform the steps on ALL projectors in the system before continuing to the Calibration Operation step. If desired, the Convergence test point set can be established on all projectors first, and then the Geometry test point sets can be established on all projectors.
    1) Run the Base AGC Configuration process. Choose the AGC Complexity level that best suits the majority of the projectors in the system. If the best level is unknown, select Complexity Level 1 (default).

        > **NOTE:** Note; It is highly recommended that complexity level 1 always be chosen as the base AGC level.

    2) Perform the Projector Mapping process. For each projector in the system, select the relationship for all other projectors in the system. Choose "Overlapped" if the projection regions intersect. Choose "Adjacent" if the projection regions touch but do not overlap. Select "Disjoint" if the projection regions are neither overlapped nor adjacent.

NOTE: (s/w 2.0.20060721): When switching to a projector's relationship mapping page for the first time, some projectors may already appear to be setup because of earlier choices made. The software does not always recognize that a selection has been made even if it is shown. To prevent this, when switching to a projector's relationship mapping page for the first time, select – or reselect – the relationship for ALL projectors in the system, not just the ones that do not appear to have the correct selection.

3) For each projector in the system, run the Primary Relationships process. During this process, the IG must be set to display first the Convergence test pattern, and then the Geometry test pattern. If only a single test pattern is being used, present the same test pattern when prompted.

NOTE: (s/w 2.0.20060721): The automated Primary Relationships routine can sometimes fail to correctly calibrate its parameters and still set the setup flag to complete (green). If a channel has problems identifying the correct test pattern, or doesn't move the motor as expected upon a commanded move, manually change the "*Primary Relationship*" setup flag to error (red) and perform *Manual Primary Relationship* as indicated in the following steps.

a. If the Primary Relationships process fails (setup flag is red), the next time the operation is selected, the user is prompted to choose between re-running the automated process, and performing the process manually. If the manual process is selected, perform the following steps to manually complete Primary Relationships. Otherwise re-run the automated process until success is indicated (setup flag is green).

a) On the Manual Primary Relationships (MPR) window, find the location of the Center zone
- From the zone dropdown selector, select the "Center" zone.
- Double click on the image to move the camera's field of view until the rectangular cursor (currently positioned over the center zone) is centered in the image. Press the "Set" button to store this location

b) On the MPR window, find the location of the North Zone.
- From the zone dropdown selector, select the "North" zone.
- Double click on the image to move the camera's field of view until the rectangular cursor (currently positioned over the north zone) is centered in the image.
- Press the "Set" button to store this location.

c) Move the camera field of view back to the Center Zone to facilitate finding the next zone.
- From the zone dropdown selector, select the "Center" zone.
- Double click on the image to move the camera's field of view until the rectangular cursor (currently positioned over the center zone) is centered in the image.

d) On the MPR window, find the location of the West Zone.
- From the zone dropdown selector, select the "West" zone.
- Double click on the image to move the camera's field of view until the rectangular cursor (currently positioned over the west zone) is centered in the image.
- Press the "Set" button to store this location.

e) Press the "Orientation/Scaling" button to perform the calculations.

f) Memorize the test patterns.

- Move the field of view to the center of the facet.
    i. From the zone dropdown selector, select the “Center” zone.
    ii. Double click on the image to move the camera’s field of view until the rectangular cursor is centered in the image.
    iii. The routine that memorizes the test patterns needs to see the centered intersection, plus one grid above, below, left and right of the center intersection. If the camera’s field of view has glare in the image or these central grid lines are otherwise obstructed, move the field of view.
- Press the “AGC” button to bring up the “Auto Gain Control” dialog. Press the “Auto Correct” button to perform AGC correction on the current location. If necessary elevate the complexity level or otherwise adjust the AGC parameters until a successful “Auto Correct” is achieved.
- Press the “Memorize Pattern” button and follow the on-screen prompts to memorize the test pattern(s) being used.
    i. ACON Ultra typically utilizes separate coarse and dense patterns to optimize the corrections. If a single pattern is being used, the pattern must be presented when prompted for a specific test pattern.

4) For each projector in the system, run the Initial TP Setup: Convergence routine. If a similar configuration file is being used that already has performed the setup process to this point, this step may be skipped.

> **NOTE:** If using a test point set that was previously established on this projector, it is suggested that you NOT perform the `InitialTP Setup: Convergence` process. Instead, manually change the `InitialTP Setup: Convergence` flag to indicate complete (green color) and move to step 2.5.

a. From the Automated Setup Dialog, press the “InitialTP” button.
b. When prompted, click on the presented options until only the “Convergence” option is selected. Press the “Continue” button
c. Choose the projectors on which to run the operation and press the “Continue” button.

5) Enter the Convergence Maintenance Window and adjust each error test point to center the intersection of maximum convergence. If any test points were not correctly set during the automated routine, the title bar of the window will list Initial TP Setup as “Incomplete” or “Error” (These messages will not be valid if a similar configuration file has been copied and step 2.d. has been skipped). Adjust the location of any error test points until the Initial TP Setup is complete (as reflected in the title bar).

a. Select Show Misconvergence
b. Use the Basic Motor tab to position the intersection which displays the most misconvergence at the center of the displayed image. Press the Apply button when complete.
    a) Alternately, double-click on the intersection in the Picture window to center the clicked location in the AU camera field of view. The Apply button still must be pressed to accept changes made in this fashion.
c. Use the Visibility tab to adjust the visibility settings. The calibration routine will fine tune the Visibility (or AGC calibration) for all test points in the set, so this step may be skipped if desired.
    a) For the first test point, perform the AGC calibrate routine until acceptable

test scores are obtained. If necessary, some of the visibility parameters may be manually adjusted, or the complexity level of the AGC operation may be elevated until AGC completes successfully. All scores from a test must be above 50% to achieve a successful completion.

NOTE:	If manually adjusting the visibility parameters, it is desirable to drive the projector's contrast and G2 as little as possible. It is therefore better to increase the Camera Gain parameter before attempting to increase the projector contrast or G2 levels.

b) Subsequent test points can be set to the same levels as the initial test point (Use the Copy Before and Copy After buttons). It is not necessary to perform the AGC calibration on every point. This will happen automatically in the calibration process.

6) Change the IG to display the Geometry test pattern and return to the Automatic Setup dialog. If a configuration file that contains a valid Center TP set is being used, skip to step 2.7.

a. Run the *Initial TP setup* for the *Center Geometry* test point set.

7) Enter the *Center Geometry Maintenance Window*, and if necessary, re-locate the test points close to the displayed rectangular cursor.

a. Use the Basic Motor tab and position each of the test points on a valid intersection close to the displayed rectangular cursor (check "Cursor" to force the Maintenance Window to display the cursor). **IMPORTANT:** The test point should be centered on the closest intersection to the cursor, not necessarily on the cursor itself.

b. Use the Visibility tab to adjust the visibility settings. The calibration routine will fine tune the Visibility (or AGC calibration) for all test points in the set, so this step may be skipped if desired.

a) For the first test point, perform the *AGC calibrate* routine until acceptable test scores are obtained. If necessary, some of the visibility parameters may be manually adjusted, or the complexity level of the AGC operation may be elevated until AGC completes successfully. All scores from a test must be above 50% to achieve a successful completion.

NOTE:	If manually adjusting the visibility parameters, it is desirable to drive the projector's contrast and G2 as little as possible. It is therefore better to increase the Camera Gain parameter before attempting to increase the projector contrast or G2 levels.

b) Subsequent test points can be set to the same levels as the initial test point (Use the *Copy Before* and *Copy After* buttons). It is not necessary to perform the AGC calibration on every point as this will happen automatically in the calibration process.

NOTE:	(s/w 2.0.20060721) After exiting the Center Geometry Maintenance Window, it may be necessary to enter the Automated Setup Dialog and manually change the setup flag for Initial `TP Setup > Center` to indicate a completed operation (green color).

8) Return to the Automatic Setup and run the ScreenGeom script editor (make sure the Geometry test pattern is still set in the IG). Wait for the screen editor window to initialize and the window buttons to activate.

a. Double click the mouse pointer in the display window to adjust the camera position in one direction. Repeat this step until you reach the edge of the facet. Then double click on the window following the edge of the display facet until you locate a corner of the facet.

b. Locate the valid test point (as defined in section 2.3.4.1) closest to the facet corner and double click on it to center it in the window. Then press the ">>" button.

c. Now, double clicking on the view window in either a clockwise or counter-clockwise direction until you locate another facet corner. Repeat steps *b* and *c* until you have chosen a valid intersection in every corner of the facet. (You do not have to return to the original corner, as long as every corner has one test point stored.)

> **NOTE:** Every time an intersection is chosen the system checks the acceptability of the point. If the intersection is sub-par, the system will display a prompt asking if you still want to add the point. If there is no other acceptable intersection in that facet corner choose "yes" and continue, otherwise please choose another intersection.

d. Once you have an intersection chosen in every corner, choose a value for the `TPs per edge` box. This number will be the intervening test points the system will automatically add between the chosen corner intersections. (i.e. Each facet edge will have this number of test points, plus the points for the corners, used in the screen test point set; so a rectangular screen with 5 test points per edge would have a total of 24 test points in the screen geometry set [5 tp/edge x 4 edges + 4 corner points].) Choose a number so the final test point count in the geometry set is between 20 and 30.

e. Choose the `Store` button. You will be prompted about storing your test point set. Choose yes. Next, choose the `Initial TP Setup` button in the Automated Setup window, and choose the `screen geometry` option to setup.

f. Enter the *Screen Geometry Maintenance Window*, and if necessary, re-locate the test points close to the displayed rectangular cursor. If the initial TP setup completes successfully – and the test points look to be well placed – go to section **3. Calibration**, otherwise go on to step 9 to perform the manual screen geometry setup.

9) Enter the *Screen Geometry Maintenance Window* and position the test points in a regular pattern around the edge of the facet. If you have a valid screen geometry test point set, in the *Screen Geometry Maintenance Window* skip to step 2.8e.

a. Use the `Basic Motor tab` to position the first test point on a valid intersection located near one of the screen's vertices.

a) Use the directional Arrow controls to position the camera field of view such that a valid intersection is at the center of the camera's field of view.

b) Press the `Apply` button to store the motor location.

b. Use the `Basic Motor tab` and follow the build pattern (see manual section 2.3.4.3) to position the next test point in the set.

c. Press the `Apply and Set` button to allow the Maintenance Window to copy the current motor location into the next test point and set the active test point in the window to the next point in the set.

> **NOTE:** `Apply and Set` will add an extra point to the test point set if the active point is the last in the set.
>
> **NOTE:** (s/w 2.0.20060721): after pressing the `Apply and Set` button, the `APPLY` button must also be pressed to store the new test point's motor coordinates.

d. Perform Steps *b* and *c* until all edges of the screen have been mapped with test points.

e. Manually step through all test points in the set to validate that they are centered on a valid intersection and not located in or too close to glare.

a) Optimally, an intersection should have at least one complete intersection between it and any glare in the camera's field of view.

b) A valid intersection is completely defined in section 2.3.4 of the ACON Manual.

f. If the current visibility settings do not allow the projected intersections to be viewed use the `Visibility tab` to adjust the visibility settings

a) Perform the `AGC calibrate` routine until acceptable test scores are obtained. If necessary, some of the visibility parameters may be manually adjusted, or the complexity level of the AGC operation may be elevated until AGC completes successfully. All scores from a test must be above 50% to achieve a successful completion.

NOTE: (s/w 2.0.20060721): After exiting the Screen Geometry Maintenance Window, it may be necessary to enter the Automated Setup Dialog and manually change the setup flag for `Initial TP Setup > Screen` to indicate a completed operation (green color).

3. **Calibration Operation**

1) Set the IG to the Convergence test pattern and run Convergence Calibration from the Automated Setup Window.

a. Alternatively, calibration can be run from the main window. Select `Setup > Calibration > Convergence`. *Convergence Calibration* can be performed safely on at most three projectors at a time.

2) Based on program feedback, revisit the test point settings of each test point that requires further maintenance. AU program feedback indicates the type of maintenance required and the specific test point that requires the additional maintenance (consult the FMEA worksheet).

a. From within the Convergence Maintenance Window, use the *Basic Motor Tab* to adjust test point location, and the *Visibility Tab* to adjust visibility settings, and scale factors as necessary to calibrate each individual test point (as indicated by program feedback).

a) If the test point had an error during the calibration routine, the error flag (located in the upper left hand corner of the Maintenance Window) will be red. Pressing this button will indicate what type of error was encountered:

- InitialTP: The automated Initial TP Convergence process was unable to identify the optimum position for the test point. It may be necessary to change the field of view (motor coordinates) for the test point.
- Visibility: The AGC calibration performed during the automated Convergence Calibration routine did not return successfully. Escalate the Complexity Level of the AGC routine, and re-run the AGC calibration until success is indicated (all scores above 50%).
- Scaling: The Scale Factor calibration performed during the automated Convergence Calibration routine did not return successfully. Rerun the Scale Factor calibration. Repeated failure may indicate that no convergence is visible at the current location moving the point or marking the point “Unused” may be required to resolve the error.

NOTE: It is not necessary to rerun the automated *Convergence Calibration* if all convergence test points are manually adjusted via the Maintenance Dialog.

3) Set the IG to the Geometry test pattern and run `Center Geometry Calibration` and `Screen Geometry Calibration` from the Automated Setup Window.

a. Alternatively, calibration can be run from the main window. Select `Setup > Calibration > All Geometries`.

b. *Geometry Calibration* can be performed safely on all projectors in the system simultaneously.

4) Based on program feedback, revisit the test point settings of each test point which requires further maintenance (consult FMEA worksheet).

> **NOTE:** (s/w 2.0.20060721): The Error Flag indicator in the Maintenance Window for both Geometry test point sets does not print an error message in the status region of the window as it does in the Convergence Maintenance window.

   a. From within the Maintenance Window, use the `Basic Motor Tab` to adjust test point locations, and the `Visibility Tab` to adjust visibility settings as necessary to calibrate each individual test point (as indicated by program feedback).
   b. Screen Geometry may have to add test points to observe all geometry changes.

5) Return to step 3.3 until there is no Calibration feedback that requires intervention.

4. **Memorization Operation.**

1) Set the IG to the Geometry test pattern and select `Setup > Memorization`.
   a. *Memorization* can be executed simultaneously on all projectors in the system.
   b. Partway through the operation, the IG will need to be changed to the Convergence test pattern.
2) If there is feedback indicating test points that need further maintenance, correct the issues through the Maintenance windows, and repeat the `Memorization Operation` (step 4a), if necessary, (singular AGC warnings do nor merit rerun of *Memorization*).

5. **Correction Operation.** Set the IG to the Geometry test pattern and select `Operation > Complete ACON Ultra` operation (corrects both geometry and convergence).

1) If there is feedback indicating AU cameras that need further maintenance, correct the issues through the Maintenance windows and return to step 4a (or 3c if test points have been moved).

Appendix A **Firmware Upgrade**

This section provides instructions for upgrading the projector to include the latest version firmware. Upgrade kits are available from VDCDS. A typical firmware version upgrade requires that IC U35 on the Control Board (the main board of the Control Module) be replaced.

Tools & Equipment Required:

- Phillips screwdriver
- Slotted screwdriver
- PLCC 20-128 pin extraction tool
- PC with CD Drive

Step 1. Save Existing Settings using *Marquee Loader* (optional). Replacement of the firmware IC will cause a Complete Projector Initialization to occur. This erases all stored setups and display settings. Using *Marquee Loader* software (available from VDCDS) with a computer and serial cable, you can easily copy the projector's settings to the computer before you change the firmware ICs, and then restore the settings once firmware installation is complete. To do this, refer to the *Marquee Loader* user's manual (provided with *Marquee Loader* software) for details.

Step 2. Turn Power Off and unplug the Projector.

Step 3. Remove the Control Module (CLM) by loosening the two retaining-type screws securing the CLM to the projector.



Step 4. Remove the Stigmator Waveform Board (SWB).

a) Locate the SWB mounted to the CLM. See Figure A-1. Remove the three securing screws as shown.

d) After removing the three screws, carefully and slowly lift the SWB off the CLM. A header at the rear bottom face of the SWB connects to a mating connector on the CLM. When lifting the board, hold it at the front and back ends, making sure that it remains parallel to the Control PCB until it is free.



PLCC 20-128 pin extraction tool

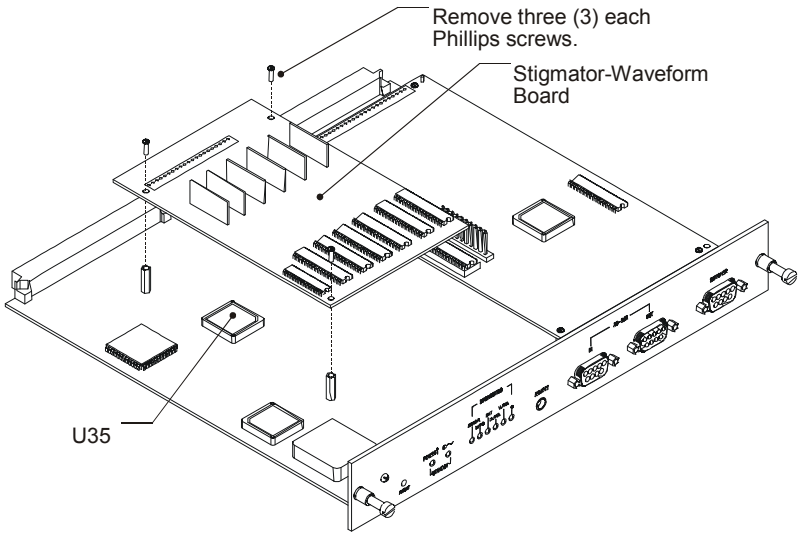


Figure A-1. U35 Location/Removal

Step 5. Replace U35; locate U35 ensuring the proper location and orientation of the IC.

IMPORTANT ! : Many ICs on the Control PCB appear similar. Make sure you properly identify the IC before replacing it.

IMPORTANT ! : Use a PLCC 20-128 pin extractor when removing U35, DO NOT use a screw driver to remove ICs.

Step 6. Install the SWB: Carefully place the SWB back into its original position then secure it with the three screws.

Step 7. Reinstall the CLM.

a) Slide the CLM back into the projector, ensuring that the card edge connectors insert fully into the sockets on the projector's backplane motherboard. Tighten the securing screws to secure the module.

b) Plug in the projector. The amber LED on the back panel should be lighted. If it is not, unplug the projector then check the installation of U35. Make sure it is fully inserted and in the correct socket. Also, check for bent socket pins. Make sure that no pins are shorted and that all pins make proper contact.

c) If the amber LED lights after the projector is plugged in, press [**POWER**] to turn the projector on. The green LED labeled POWER should be on and the projector should automatically begin a Complete Projector Initialization. If the projector does not initialize, force an initialization by selecting Projector Initialization > `Reset Everything` - from presentation level, press [**UTIL**] [**9**] < Service Password > [**4**] [**3**] [◄] [**ENTER**].

IMPORTANT ! : If after power-up the display appears too dark, the contrast level may be set too low for the current room lighting; increase the contrast level.

B.1 ACON Ultra *Camera Maintenance*

The ACON Ultra camera needs little or no maintenance with the exception of periodically cleaning the camera lens. A small amount of dust will not affect the actual operation of the system. However, oil or finger prints may result in unwanted effects. In the event the lens requires cleaning, follow the procedure below.

1. Use a lens cleaning solution with a soft tissue and starting in the center of the lens, CAREFULLY and GENTLY work towards the outer edge of the lens until the lens is cleaned.

B.2 *Server Maintenance*

Like the ACON Ultra camera, the server requires minimum maintenance. The only maintenance required is to ensure that the filter employed at the front of the PC is periodically checked and cleaned as required. In the event the filter does require cleaning, perform the following steps and refer to Figure B-1.

1. The filter media for the PC is located directly behind the front panel air vents.
2. On the front of the server (PC) using the key, open the front access door where the CD-ROM, Floppy Drive, etc. are located.
3. On the left side of the access opening, gently pull the tab labeled "OPEN–PULL" towards you and slide the filter media out.
4. The filter may be cleaned by either shaking or blowing the debris out or in severe cases; the filter media may be washed.

CAUTION: If the filter is washed, allow to dry fully before reinstalling.

5. Reinstall the filter media and close/lock the front access door.

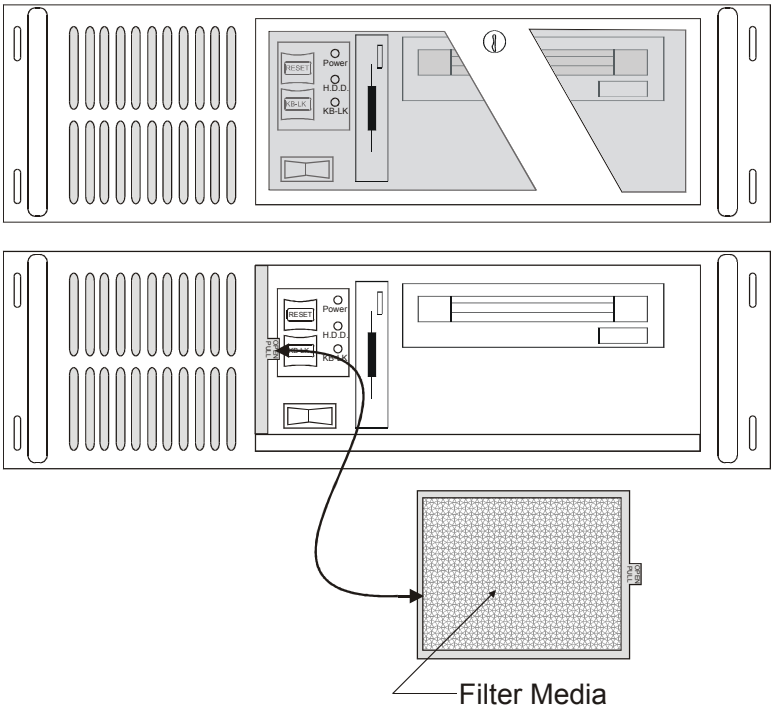


Figure B-1. Server (PC) Air Filter Location, Removal and Cleaning

ACON Ultra Diagnostic Report for O&M manual

1. Site Information (person, location, contact info)

2. ACON Ultra version (as appears on splash page, or from About Box)

3. Number of projectors in system

4. Operation (check one)
   a. Hardware ☐
   b. Auto Setup ☐
   c. Maintenance Dialogs
      i. Convergence ☐
      ii. Center Geometry ☐
      iii. Screen Geometry ☐
   d. Calibration
      i. Convergence ☐
      ii. Center Geometry ☐
      iii. Screen Geometry ☐
   e. Memorization ☐
   f. Correction
      i. Convergence ☐
      ii. Center Geometry ☐
5. Report type(check one)
   a. Bug/Defect ☐
   b. Requested feature ☐

6. Comments (include projector number if applicable, attach appropriate sections of ".LOG" file if reporting software bug)

Appendix C **Script Files in ACON Ultra**

C.1 ***Script Files.***

> **NOTE:** The script files are for information only and require no action on the part of the user.

It is sometimes desirable to view one of the test point sets in a tabular format. The Script files provide a mechanism within the AU framework to view this information. Script files are advanced features of ACON Ultra that allow the different sets of test points to be extracted from the projector's configuration file in a format that is readable, and editable, by a user. The script files contain information such as active/inactive test points, test point motor coordinates, test point visibility settings.

The information is either extracted (export) from the projector's configuration file (".SAV" file) or written into (import) the projectors configuration file. Once the operation has been completed, the information contained within the script file is a separate entity. Changes to the script file do not impact the configuration file settings, until they are imported back into the system. Conversely, changes made to the configuration file are not reflected in the script file unless the original file is overwritten.

When exported from the ACON Ultra GUI, the files are automatically saved with a ".TXT" extension; however, each of the fields for a test point uses a comma (",") as the record separator. A single test point is stored on a single line. These files can be imported into Microsoft Excel, or any other spreadsheet environment that handles comma delimited text files (".CSV" files).

1. Importing and Exporting files from *ACON Ultra* user interface.

   To Import or Export a script file from the AU user interface, perform the following steps:

   a. Select a projector
   b. Select "Setup `> Projectors Configuration`"
   c. From the Projector Configuration dialog, select `Convergence Order`, `TPGeom Center`, or `TPGeom Screen` from the Scripts listbox. Except for the "`FModel Geom Seed`" option, all other options are future features.
   d. Press the adjacent Import or Export button
   e. Select or type the desired filename

   - Each of the three Test Point Script files contains slightly different information; however, each defines the test point set completely. Each contains a unique identification tag for each test point listed. Each also contains data fields that allow configuration of the motor coordinates as well as the visibility settings for the test point.

   - In the two Geometry Test Point script files, there should be two records (lines) for each configured test point – this pair is always stored in the script file sequentially. The first record holds the measurements for the horizontal readings of the test point and the second record holds the measurements for the vertical readings of the test point. The record that holds the horizontal test point also configures the motor coordinates and the visibility settings for the test point. The record that holds the vertical test point relies on the location information from the previous horizontal record.

Below are sample files for the two geometry test point scripts and the convergence script files.

2. Convergence Test Point scripts

   - The test points in the Convergence test point set are referenced by their related convergence zone. Zone 4, 2 is the center of the raster and is the Static Convergence zone (all other zones are labeled Dynamic Convergence zones). The next column

indicates the type of the zone: Static, Used, or Unused. The next column gives the x-y coordinates of the motor position. The region of interest (ROI) Offset provides information that helps AU locate the intersection in question. The Scale Factor is the result of the Scaling calibration routine discussed in the next section. The Intersection columns help AU locate the intersection in question. The last 10 columns contain the visibility settings: Contrast, Brightness, Red Drive, Green Drive, Blue Drive, Red G2, Green G2, Blue G2, Camera Gain, Camera offset.

- The order that the test points appear in the script file is the order that AU will process them during Convergence correction operations. If the order were changed in the file, or if a test point were deleted from the file, then the file imported into the AU software, the new processing order would be as defined in the newly loaded script file. After exiting the Projector Configuration window, the test point set is stored in the projector's configuration file, and the script file is no longer needed.

Zone		Type	Motor		ROI Offset			Scale Factor			Intersection		Visibility Settings									
4	2	STATIC	8	-5	-20	20	0	6.95754	5.44863	0	320	240	65	129	150	100	100	1750	1700	1400	100	50
4	1	USED	8	-46	-20	-20	0	1.53383	1.325	0	320	240	65	129	160	100	110	1750	1775	1700	100	50
6	1	USED	-16	-42	-20	-20	0	1.81061	1.57986	0	320	240	65	129	140	100	130	1750	1775	1750	100	50
6	0	UNUSED	-14	-85	-20	-20	0	0	0	0	320	240	75	120	200	200	80	1800	1650	1500	100	50
7	1	USED	-25	-30	20	20	0	4.37084	3.79751	0	320	240	65	129	150	100	150	1750	1775	1750	100	50
8	1	UNUSED	-36	-52	-10	-10	0	0	0	0	320	240	75	120	200	100	80	1800	1800	1700	100	50

3. Center Geometry Test Point scripts

The ordering in this script file is unimportant as each test point is mapped to a specific name. The names stored in the script file are similar, but not identical to those viewed in the Maintenance Window. One test point in the Maintenance Window maps to two lines in the script file. One line is for the horizontal measure of the point; the second line is for the vertical measure of the point. The next two columns, if on the horizontal measure, give the motor coordinates for the test point followed by a "-1" indicating that the line of the script file describes a horizontal measure. Three zeros ("0") in the Motor columns indicate the description of a vertical measure. The next 6 columns establish the Green visibility (image quality) settings for the test point. A vertical measure relies on the settings established in the horizontal measure. The final column describes how the AU geometry routines are to calculate the error measurement used for corrective purposes.

Test Point Name	Motor			Visibility Settings						
CntrTP_NorthHor	7	-48	-1	75	129	100	50	140	1650	MV/
CntrTP_NorthVer	0	0	0	0	0	0	0	0	0	MV/
CntrTP_SouthHor	3	24	-1	75	100	100	50	150	1500	MV/
CntrTP_SouthVer	0	0	0	0	0	0	0	0	0	MV/
CntrTP_WestHor	26	-13	-1	75	100	100	50	100	1550	MV/
CntrTP_WestVer	0	0	0	0	0	0	0	0	0	MV/
CntrTP_EastHor	-16	-13	-1	75	120	100	50	140	1650	MV/
CntrTP_EastVer	0	0	0	0	0	0	0	0	0	MV/
CntrTP_CenterHor	7	-5	-1	65	129	100	50	90	1350	MV/
CntrTP_CenterVer	0	0	0	0	0	0	0	0	0	MV/

4. Screen Geometry Test Point scripts

The ordering in this script file is also unimportant as each test point is mapped to the specific name. Each measure is identified by a unique number followed by a "Hor" or "Ver" indicator to indicate horizontal measure or vertical measure. As with the Center Geometry Test Point script, the motor and visibility settings for a vertical measure are taken from the equivalent horizontal measure. The Motor columns describe the motor coordinate and differentiate horizontal and vertical measure as described in the previous section. The Visibility Settings columns indicate the green visibility (image quality) settings for the test point. The final column describes how the AU geometry routines are to calculate the error measurement used for corrective purposes.

Test Point name	Motor		Visibility Settings							
ScreenTP01Hor	19	-58	-1	75	120	100	50	80	0	MV/
ScreenTP01Ver	0	0	0	0	0	0	0	0	0	MV/
ScreenTP02Hor	27	-50	-1	75	120	100	50	80	1900	MV/
ScreenTP02Ver	0	0	0	0	0	0	0	0	0	MV/
ScreenTP03Hor	38	-35	-1	75	120	100	50	80	1900	MV/
ScreenTP03Ver	0	0	0	0	0	0	0	0	0	MV/
ScreenTP04Hor	38	-20	-1	75	120	100	50	80	1900	MV/
ScreenTP04Ver	0	0	0	0	0	0	0	0	0	MV/
ScreenTP05Hor	37	-5	-1	75	120	100	50	80	1900	MV/

5. Geometry Seed File scripts

```
$Edge
#5
S2SR=C:\VDC Display Systems\ACONUltra\Projectors\SeedFiles\Seed2_StrongRight.fcl
S2SL=C:\VDC Display Systems\ACONUltra\Projectors\SeedFiles\Seed2_StrongLeft.fcl
S3SR=C:\VDC Display Systems\ACONUltra\Projectors\SeedFiles\Seed3_StrongRight.fcl
S3SC=C:\VDC Display Systems\ACONUltra\Projectors\SeedFiles\Seed3_StrongCenter.fcl
S3SL=C:\VDC Display Systems\ACONUltra\Projectors\SeedFiles\Seed3_StrongLeft.fcl

$Screen
#4
ZPM=C:\VDC Display Systems\ACONUltra\projectors\SeedFiles\ScrnGeom_ZPM.fcl
PM=C:\VDC Display Systems\ACONUltra\projectors\SeedFiles\ScrnGeom_PM.fcl
ZP=C:\VDC Display Systems\ACONUltra\projectors\SeedFiles\ScrnGeom_ZP.fcl
ZM=C:\VDC Display Systems\ACONUltra\projectors\SeedFiles\ScrnGeom_ZM.fcl

$Center
#8
STTH=C:\VDC Display Systems\ACONUltra\projectors\SeedFiles\SwCntrGeom_HStatic.fcl
STTV=C:\VDC Display Systems\ACONUltra\projectors\SeedFiles\SwCntrGeom_VStatic.fcl
PHAH=C:\VDC Display Systems\ACONUltra\projectors\SeedFiles\SwCntrGeom_HPhase.fcl
PHAV=C:\VDC Display Systems\ACONUltra\projectors\SeedFiles\SwCntrGeom_VPhase.fcl
CLIH=C:\VDC Display Systems\ACONUltra\projectors\SeedFiles\SwCntrGeom_CLinH.fcl
CLIV=C:\VDC Display Systems\ACONUltra\projectors\SeedFiles\SwCntrGeom_CLinV.fcl
SLIH=C:\VDC Display Systems\ACONUltra\projectors\SeedFiles\SwCntrGeom_SLinH.fcl
SLIV=C:\VDC Display Systems\ACONUltra\projectors\SeedFiles\SwCntrGeom_SLinV.fcl
```

The Geometry Seed File Definitions script loads important information for the calibration of each projector. Each projector's configuration file must have the location of all the Rule Base seed files loaded before the geometry (center or screen) is calibrated. A single script file per projector is imported to load the file locations for both center and screen Geometry Rule Base seed files. From within the ACON Ultra GUI:

a. Select a projector.
b. Select "`Setup > Projectors Configuration`"
c. Under the "Advanced Configuration" section of the Projector Configuration dialog, from the "Scripts" list box, select "`FModel Geom Seeds`"
d. Press the adjacent "Import" button.
e. Select or type the desired filename (typically "`C:\VDC DisplaySystems\ACONUltra\Projectors\SeedFiles\SeedFileDefs.txt`")

This imported script contains three sections, one for each of the geometry passes. Each of the three sections contains a number of Rule Base Seed Files that are used during the geometry calibration operation. This script file tells the calibration operation where to look for each specific file. Before importing this file into a projector configuration, the presence and location of the files listed should be verified.

Appendix D **Subassembly Removal and Installation**

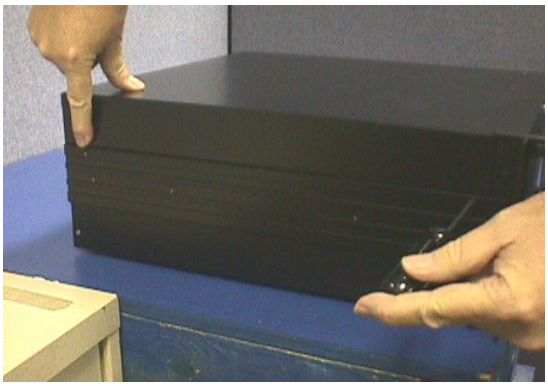
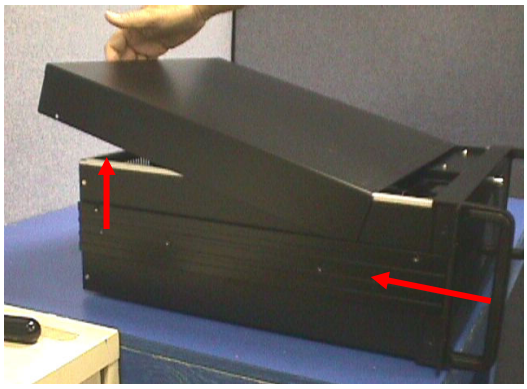
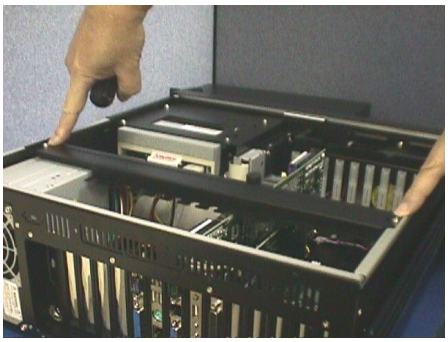
Caution:

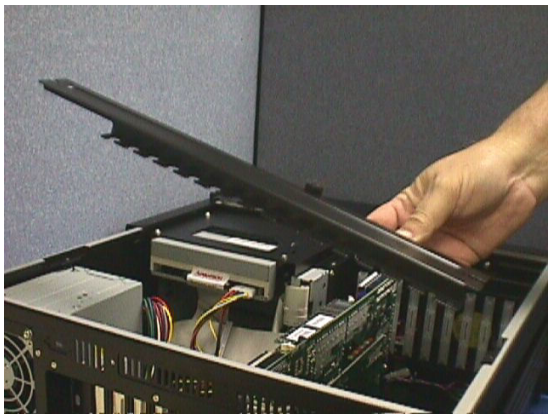
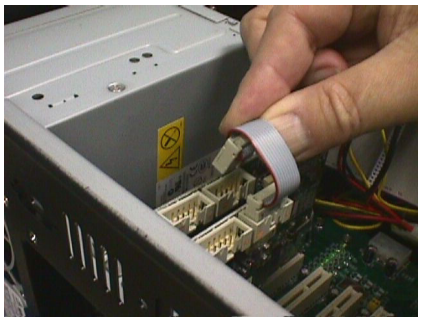
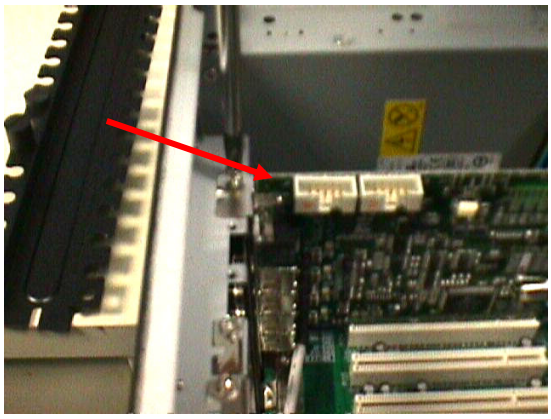
This equipment is **ESD** sensitive.

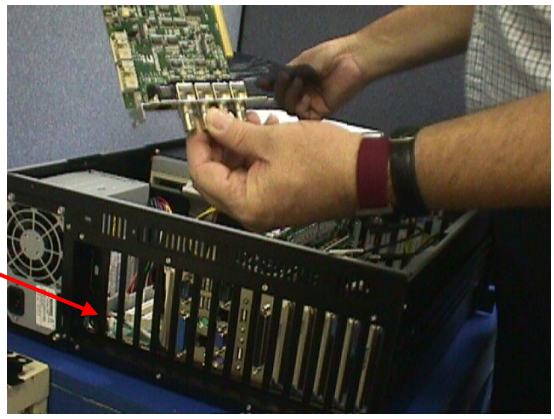
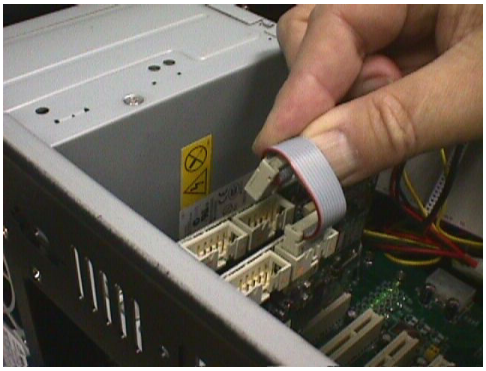
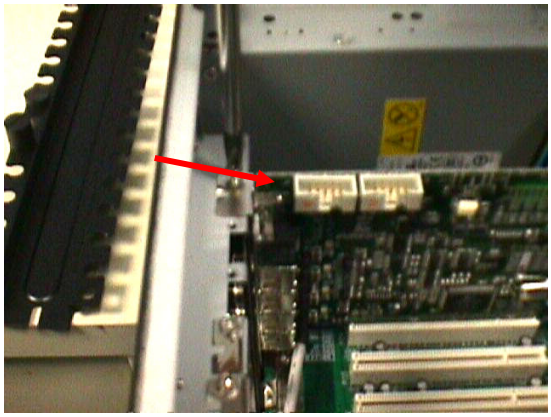
Put on an ESD wrist strap and clip the ground strap to an unpainted spot on the chassis before handling any PCBs.

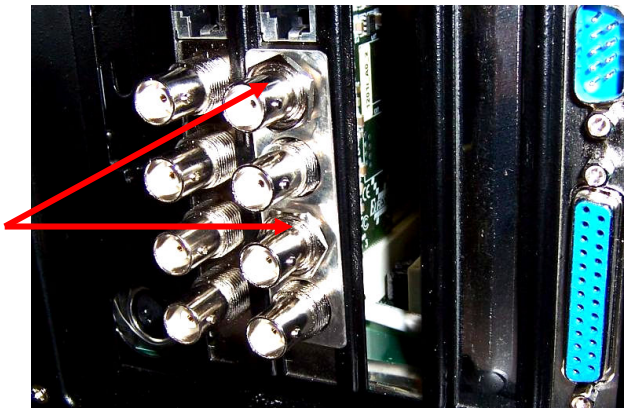
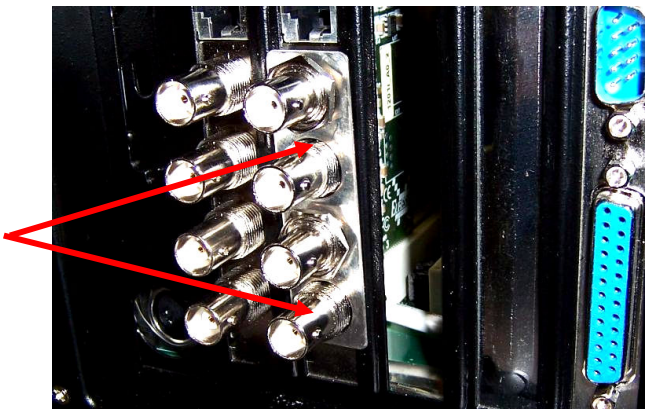
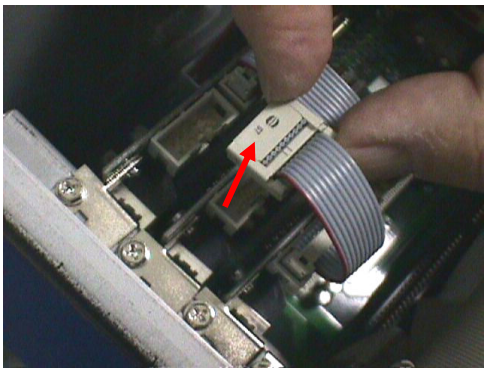
Note: This procedure includes cover removal and installation, and the removal and installation of several subassemblies. It is suggested that you remove the cover, locate the steps covering the removal and installation of the faulty subassembly, replace that subassembly, then replace the cover. Do only the steps required for whatever subassembly has failed.

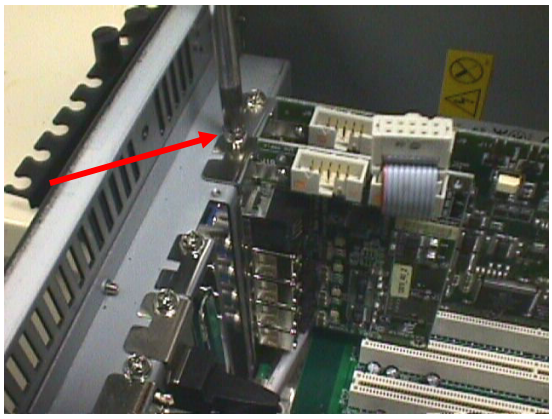
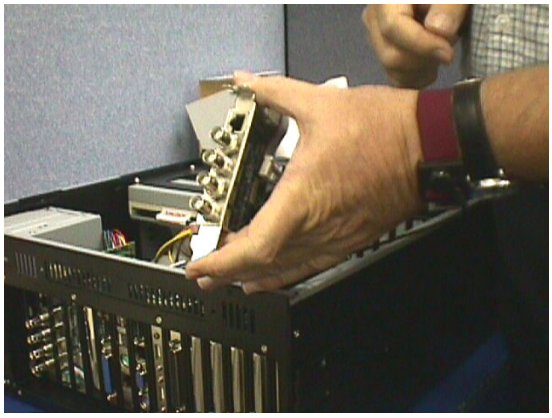
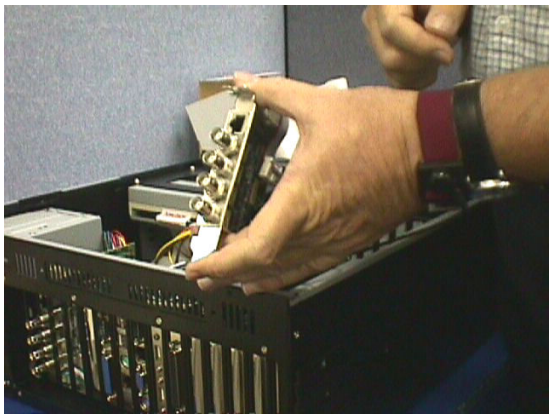
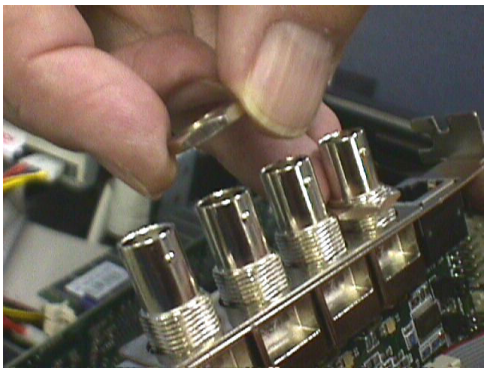
1.	**To replace the hard drive:**	
2.	Ensure that power to the server is OFF. Put the key in the hard drive lock. Turn the key counter-clockwise.	
3.	Lift the handle and pull the drive out.	
4.	Hard drive bay, drive removed.	
5.	Slide the hard drive into the bay.	

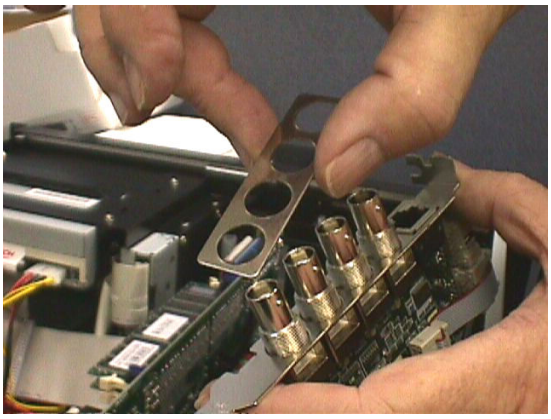
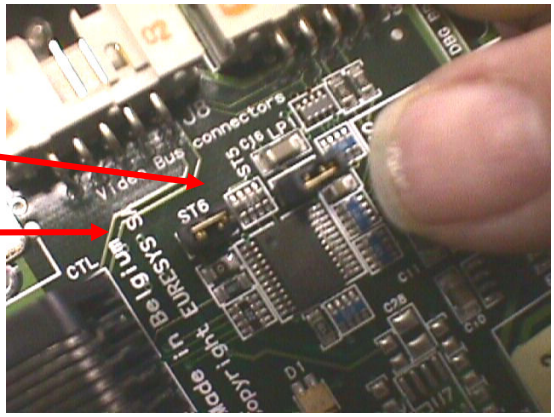
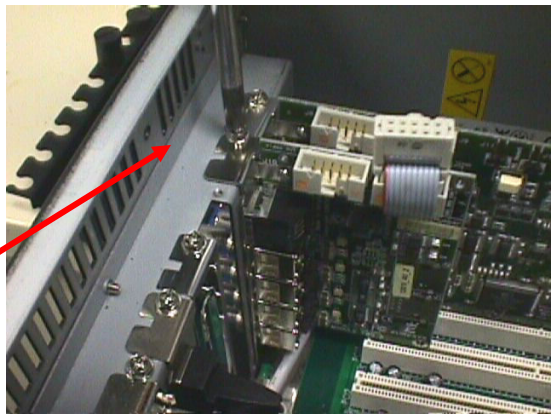
6.	When the drive is in all the way, press the handle down to latch the drive in the bay. Turn the key clock-wise. Apply power to the server and look for a green power indicator light on the lower right.	
7.	**For access to the internal subassemblies:**	
8.	Remove the 4 screws holding the top cover (2 each side).	
9.	Slide the cover to the rear and lift up. Note that front edge is under a lip.	
10	Remove two screws that secure the support bar.	

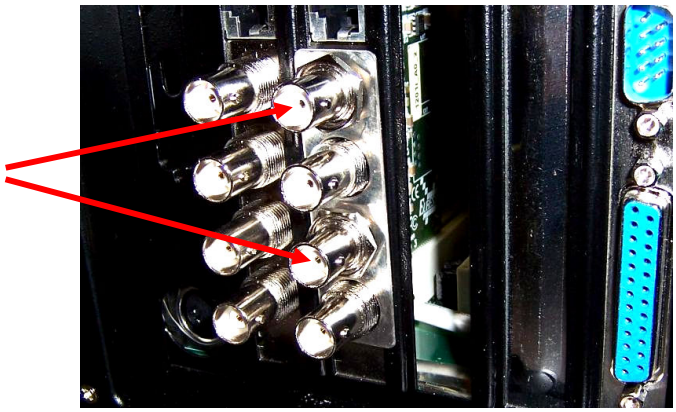
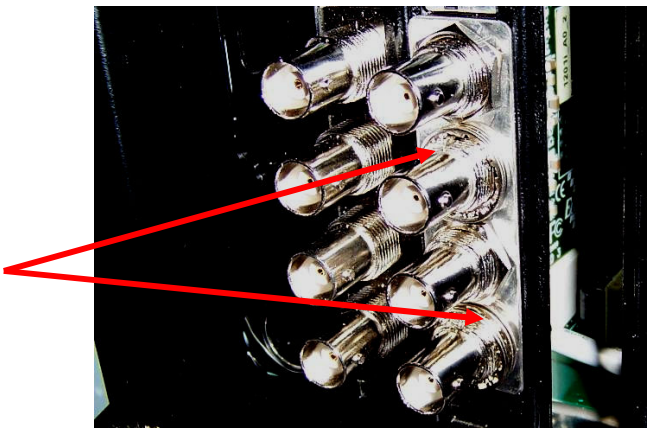
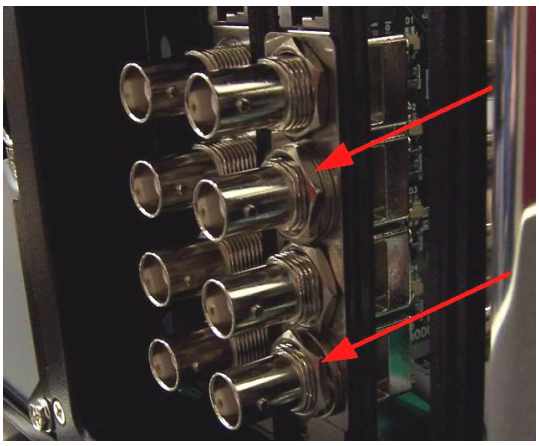
11	Remove the support bar and set it aside.	
12	**To replace the frame grabber PCB in slot number 1:**	
13	Locate the ribbon cable from the second PCB to the first PCB. Disconnect the cable from the first PCB.	
14	Remove 1 screw from the PCB.	
15	Carefully remove the frame grabber PCB from the first slot.	

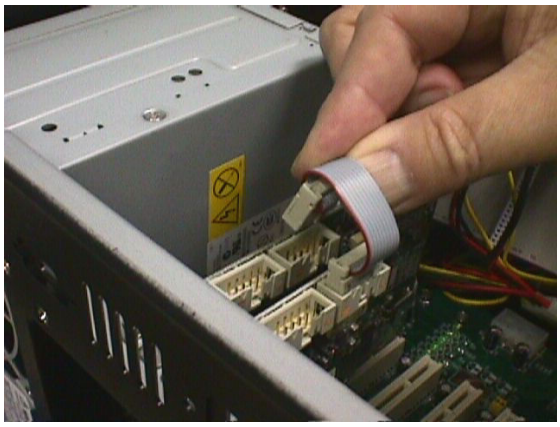
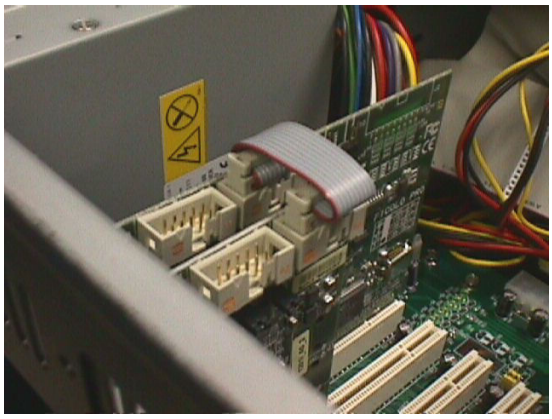
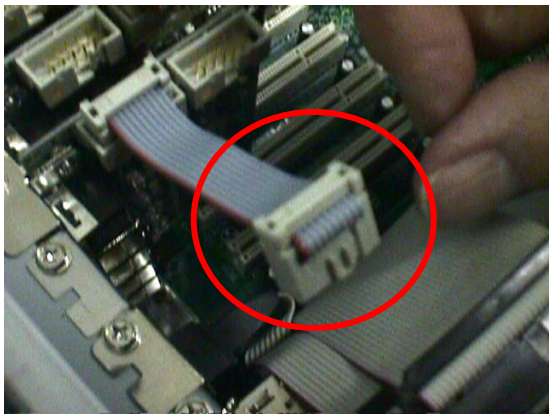
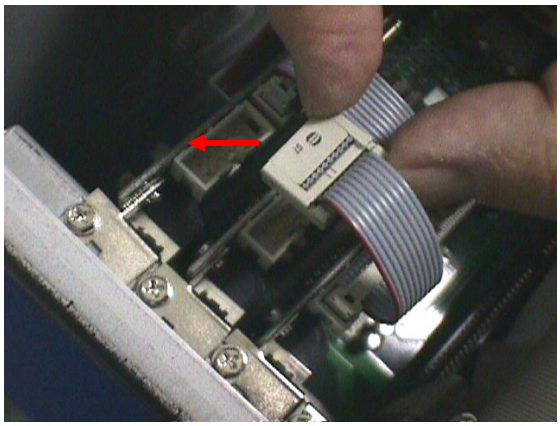
16	Remove the new PCB 81752-01 (frame grabber) from the package and record its serial number. Install the PCB in the first slot.	
17	Slide the PCB into the slot and press firmly to seat.	
18	Connect the ribbon cable from the second PCB to the first PCB.	
19	Install 1 screw to secure.	

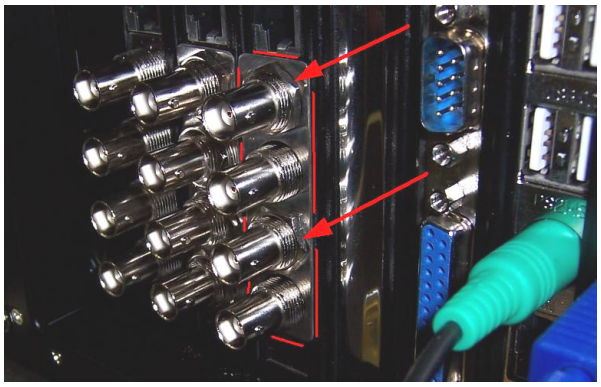
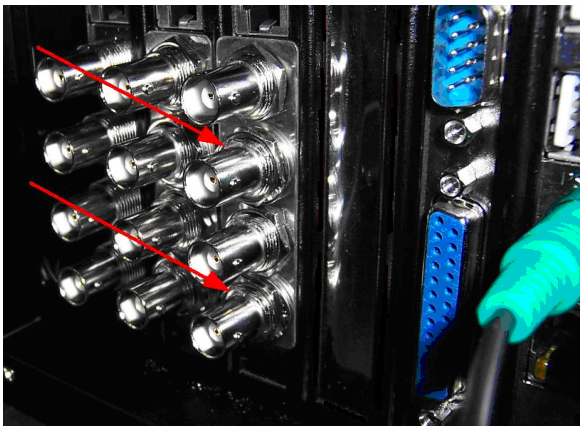
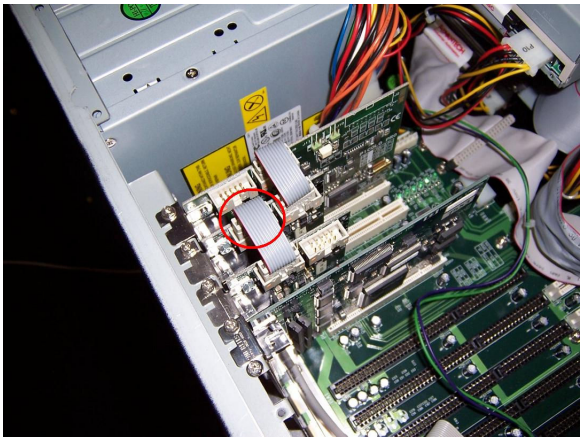
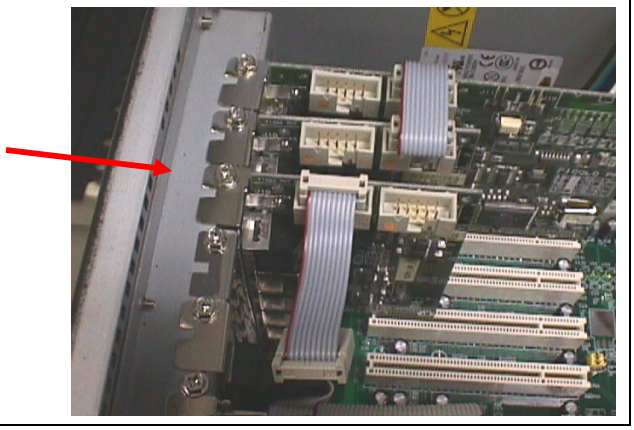
20.	**To replace the frame grabber PCB in slot number 2:**	
21.	From the second PCB, remove the nuts from BNCs 1 and 3. Keep the nuts for installation. Note: A 14mm or 9/16in deep socket fits in the space available.	
22.	Remove the nuts and washers from BNCs 2 and 4. Keep the nuts and washers for installation. Note: A 14mm or 9/16in deep socket fits in the space available.	
23.	Remove the bezel from the BNCs on the second PCB.	
24.	Locate the ribbon cable from the PCB in slot number 3 to the PCB in slot number 2. Disconnect the connector from the PCB in slot number 2.	

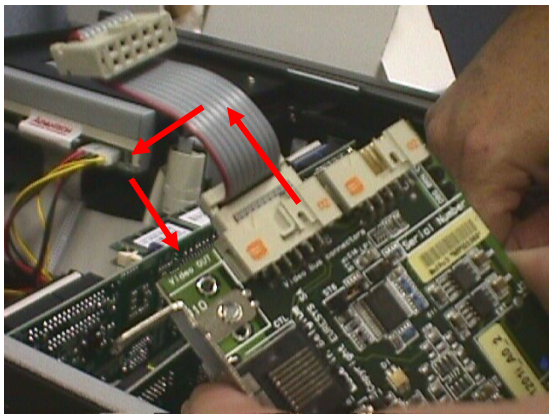
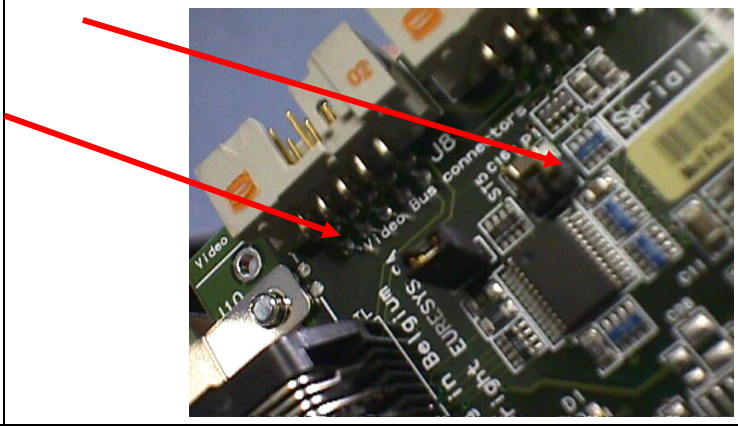
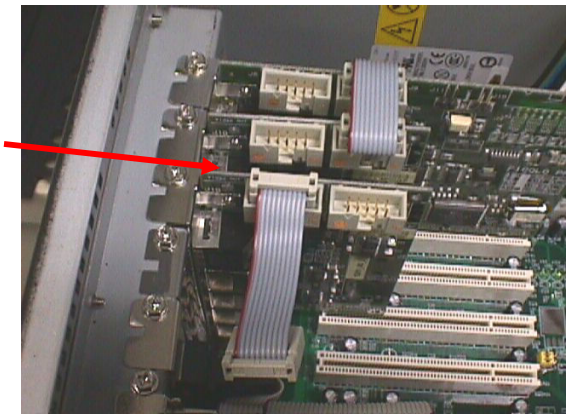
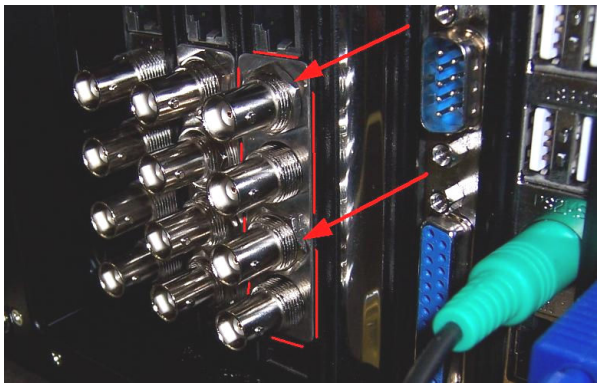
25.	Remove the screw securing the PCB in the second slot.	
26.	Carefully remove the video expansion PCB from the second slot.	
27.	Remove the new PCB (81753-01) from the package and record its serial number.	
28.	Remove 2 nuts from the BNC connectors.	

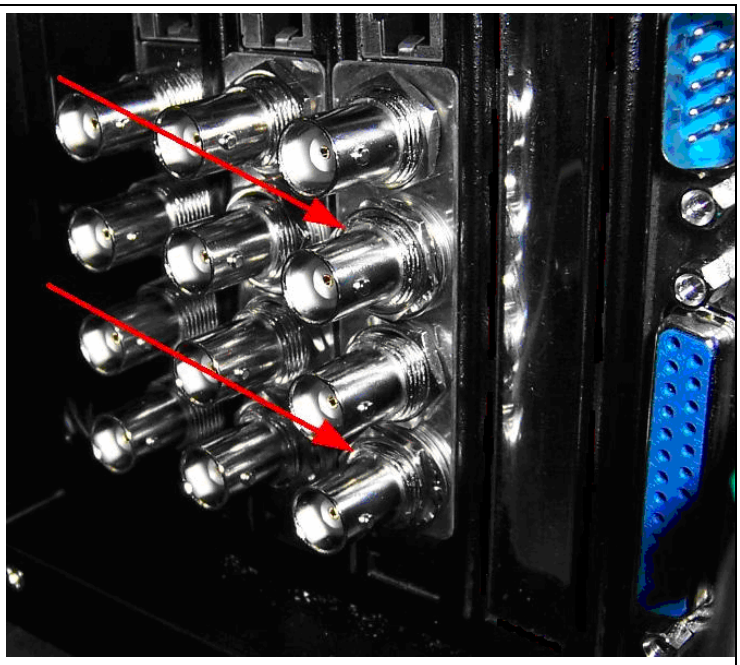
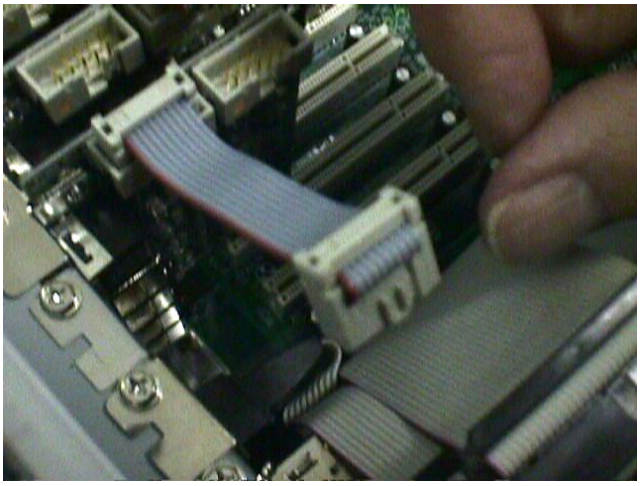
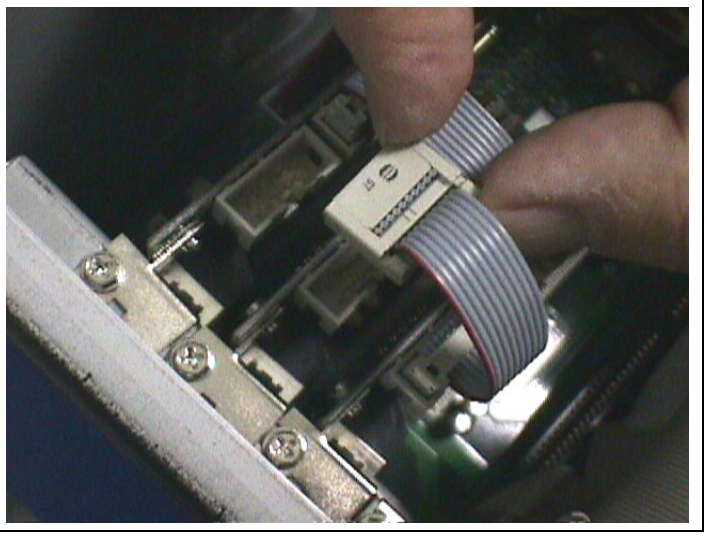
29.	Remove the bezel.	
30.	Ensure that there are shunts on ST5 and ST6. ST5 ST6	
31.	Install PCB in the second slot, press firmly to seat. Install 1 screw and tighten to secure.	
32.	Install the bezel over the BNCs on the second PCB.	

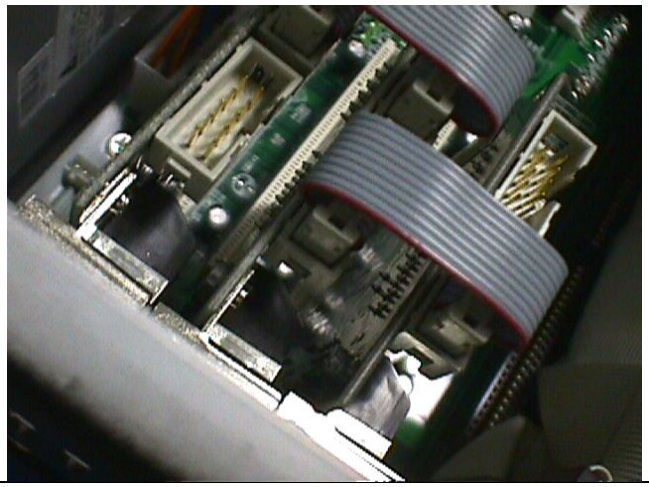
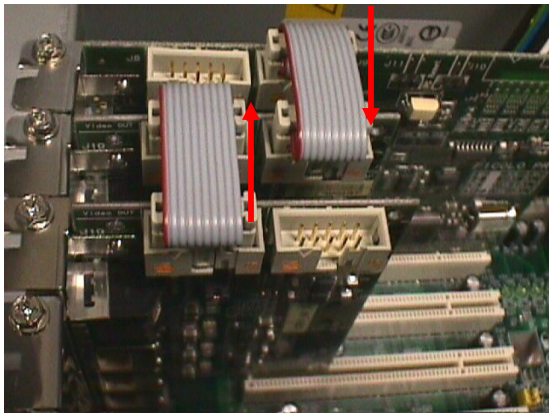
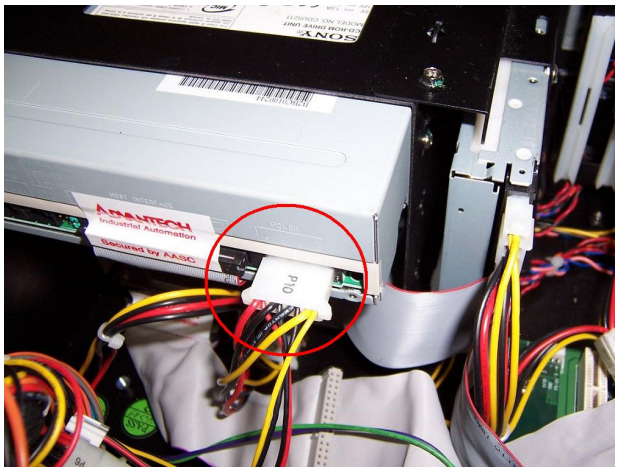
33.	**CAUTION: The nuts and BNCs must not be crossthreaded.** On the second PCB, install a nut on BNCs 1 and 3, and tighten nuts. Note: A 14mm or 9/16in deep socket fits in the space available.	
34.	54011 Nut 1/2" x 13 Qty 2 53027 Lockwasher, internal tooth 1/2" Qty 6	
35.	Install 3 washers each on BNCs 2 and 4.	
36.	**CAUTION: The nuts and BNCs must not be crossthreaded.** On the second PCB, install a nut on BNCs 2 and 4, and tighten nuts. Note: A 14mm or 9/16in deep socket fits in the space available.	

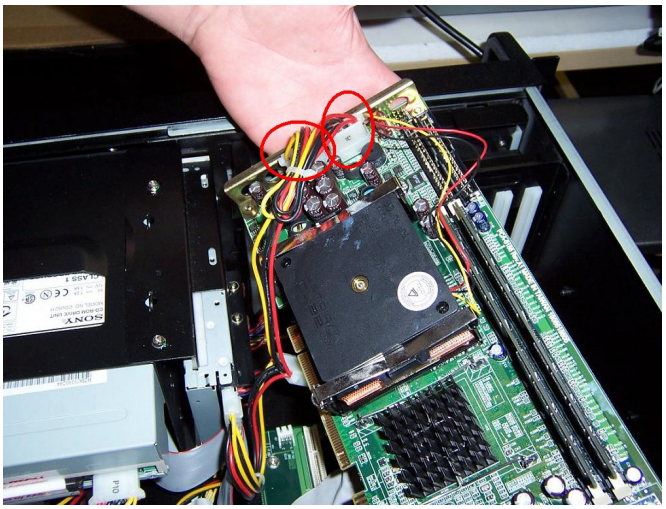
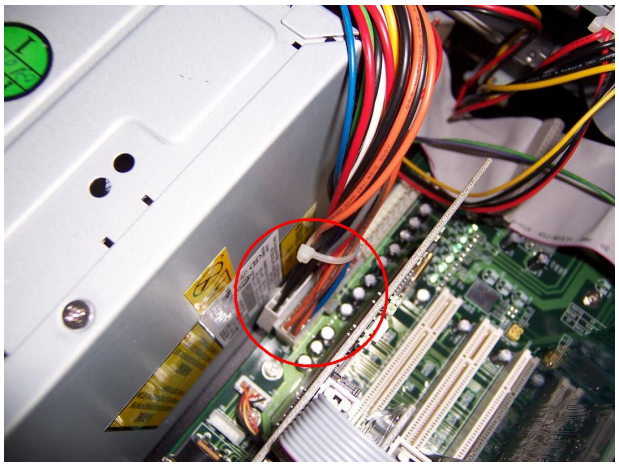
37.	Locate the ribbon cable on the PCB in the second slot.	
38.	Connect the ribbon cable to the first PCB, as shown.	
39.	If the video expansion PCB in slot number 2 is not to be replaced immediately, locate the ribbon cable connector on the PCB in slot number 3.	
40.	Plug the connector into the first PCB Press firmly to seat.	

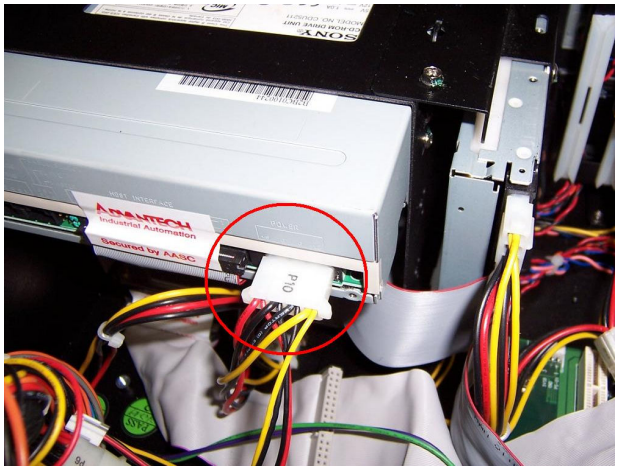
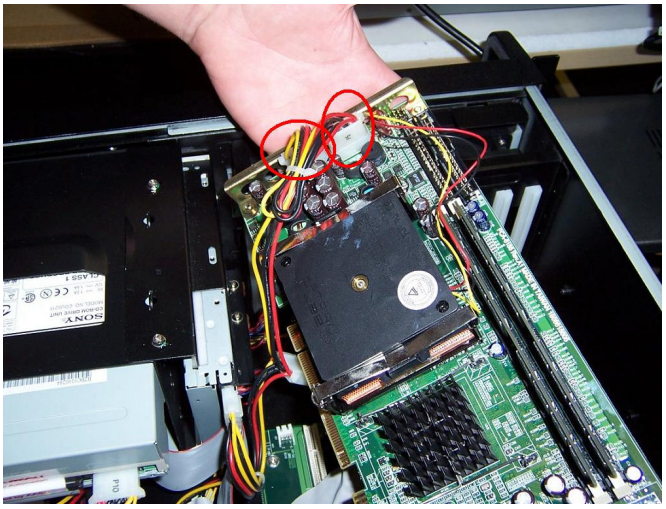
41.	**To replace the frame grabber extension PCB in slot number 3:**	
42.	On the PCB in slot number 3, remove the nuts from BNCs 1 and 3. Keep the nuts for installation. Note: A 14mm or 9/16in deep socket fits in the space available.	
43.	Remove a nut and 3 washers each from BNCs 2 and 4. Keep the nuts and washers for installation. Remove the bezel.	
44.	Locate the ribbon cable from the PCB in slot number 3 to the PCB in slot number 2. Disconnect the connector from the PCB in slot number 2.	
45.	Remove 1 screw, and carefully remove the PCB from the slot.	

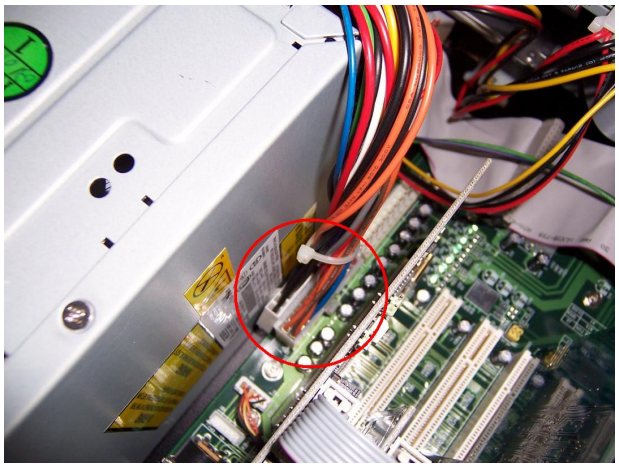
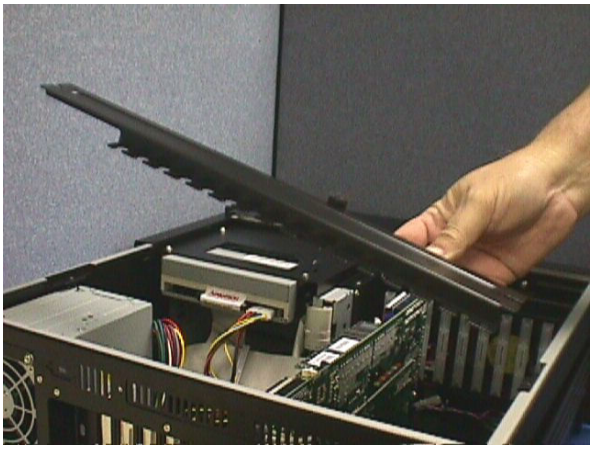
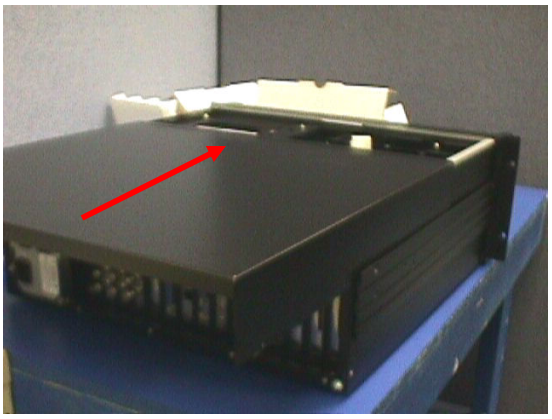
46.	Take the second 81753-01 PCB (to be installed in 3rd slot) from the package and record its serial number. Remove 2 nuts and the bezel. Disconnect the ribbon cable, shift it to the left and connect it as shown. Press firmly to seat.	
47.	Remove the shunt from ST5 (bare pins are exposed). Ensure there is a shunt on ST6.	
48.	Install PCB in the third slot and install 1 screw to secure.	
49.	Install a bezel over the BNCs on the third PCB. **CAUTION: The nuts and BNCs must not be crossthreaded.** Install a nut on BNCs 1 and 3, and tighten nuts. Note: A 14mm or 9/16in deep socket fits in the space available.	

50.	Install 3 washers each on BNCs 2 and 4. **CAUTION: The nuts and BNCs must not be crossthreaded.** Install a nut on BNCs 2 and 4 and tighten nuts. Note: • A 14mm or 9/16in deep socket fits in the space available. • PCBs in 2ed and 3rd slots must have identical bezel hardware.	
51.	Position the connector from the third PCB as shown.	
52.	Plug the connector into the second PCB.	

53.	Press firmly to seat.	
54.	Note: PCB number 1 plugs into PCB number 2. PCB number 3 plugs into PCB number 2.	
55.	**To replace the power supply:**	
56.	Inside the chassis, disconnect power supply (PS) cable from the hard drive.	

57.	Disconnect 2 PS cables from the single-board computer (SBC).	
58.	Disconnect PS cables as shown.	
59.	From the rear panel, remove 4 screws. Keep screws for installation. Carefully remove the PS from the chassis.	

60.	Install the new PS in the chassis. Install 4 screws and tighten to secure.	
61.	Inside the chassis, connect PS cable to the hard drive.	
62.	Connect 2 PS cables to the SBC.	

63.	Connect PS cables as shown.	
64.	**To close the server after subassembly replacement:**	
65.	Install support bar in the chassis.	
66.	Install 2 screws to secure.	
67.	Install top cover. Slide the cover under lip on top.	

68.	Install 4 cover screws and tighten to secure. End of procedure.	

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