For internal use only

Humphrey Field Analyzer

II-*i* series

Service Manual

FOR QUALIFIED SERVICE PERSONNEL USE ONLY

ZEISS

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This service document contains detailed procedures and descriptions specially compiled for Carl Zeiss service staff. For understanding the contents and for the reliable performance of service work, it is essential that product-specific service training be completed with Carl Zeiss Meditec, Inc. or a training organization commissioned by Carl Zeiss Meditec, Inc.

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REVISION CONTROL LIST

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Listed at the bottom of each page is the part number of the service manual, along with the Revision letter and date for that page (for example, 2660021142868B0512). Subsequent revisions to a page will be noted by a corresponding change to the Revision letter and date.

Pages in this document are at Revision 'B' unless noted otherwise below.

Page	Revision	Page	Revision	Page	Revision	Page	Revision

- CSA 3rd Edition requirements have been added.
- Updates have been incorporated.

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Section 1 – General Information

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1.1 About This Manual

1.1.1 General Information

This manual is the field service reference for troubleshooting, repair, alignment, and calibration of the Models 720-*i*, 740-*i*, 745-*i*, and 750-*i* HFA II-*i* series Humphrey Field Analyzers. The manual is intended for use by Field Support Engineers who have completed Carl Zeiss Meditec service training on the Humphrey Field Analyzer II-*i* series.

The service manual is designed to support Level 1 of a two-level service strategy. Level 1 (on-site) field service employs modular replacement of printed circuit boards and other assemblies that are most effectively repaired at a central repair facility. This is the service strategy used in U.S. domestic field service, and presented in Carl Zeiss Meditec training classes. See Section 1.3 for additional information regarding the Humphrey Field Analyzer II-*i* series service strategy.

Carl Zeiss Meditec, Inc. will make available on request circuit diagrams, component part lists, descriptions, calibration instructions, or other information that will assist Product-specific Trained SERVICE PERSONNEL by Carl Zeiss Meditec, Inc. or a training organization commissioned by Carl Zeiss Meditec, Inc. to repair those parts of the EQUIPMENT that are designated by CZMI as repairable by SERVICE PERSONNEL.

For complete installation instructions, operation instructions, specifications, routine maintenance, and safety information, please refer to the user manual.

The procedures in this manual assume that the reader is familiar with operation of the instrument. Information presented in the user manual is not repeated in this service manual. The user manual can be ordered separately by standard Zeiss parts order. Refer to Section 7 in this service manual for user manual part number information.

Update revisions to this service manual will be issued by Field Service Bulletin, as required.

The general layout of the service manual is shown below. For greater detail, please refer to the Table of Contents.

Level 1 Service Manual Layout

Section 1 - General Information

Section 2 - PM & System Checkout

Section 3 - Parts Removal / Replacement

Section 4 - Adjustment / Calibration

Section 5 - Troubleshooting

Section 6 - Diagrams

Section 7 - Parts

Appendices

Humphrey Field Analyzer II-*i* series Service Bulletins

1.1.2 Conventions

The following conventions apply in this manual:

- *Front* and *Back* sides of the instrument is as viewed from the front (patient side) of the instrument, unless noted otherwise.
- All tool sizes for screws and nuts mentioned in the instructions are metric unless noted otherwise.

1.2 Service Bulletins

Field Service Bulletins are a vital element of service support. Bulletins are used to quickly convey technical information on a variety of field service topics, including:

- instrument design changes
- technical problems and corrections
- software updates
- new troubleshooting procedures
- problem alerts
- service manual revisions
- recommended spare parts
- new calibration or adjustment procedures
- upgrade announcements / procedures
- system checkout – checklist
- service disclaimer form

Your service bulletins should be filed in the back of this manual under the Service Bulletins tab, where easily accessible for quick reference.

NOTICE

Field Service Bulletins are Confidential and Proprietary, for the sole use of personnel employed by Carl Zeiss Meditec, Carl Zeiss Meditec affiliates, and authorized Carl Zeiss Meditec distributors.
Carl Zeiss Meditec has a well-deserved reputation for high quality, reliable instruments, unsurpassed in the industry.

As a Carl Zeiss Meditec employee, affiliate, or distributor you are required to handle your service bulletins as appropriate for proprietary and confidential information.

1.3 HFA II-*i* Service Strategy

1.3.1 Two-Level Service Strategy

A two-level service strategy is used for the HFA II-*i*:

- On-site service
- Repair Center service

On-site service employs modular replacement, wherein faulty circuit boards and certain other assemblies are replaced rather than repaired on-site. These faulty assemblies are shipped to a Carl Zeiss Meditec Repair Center for repairs. There are also certain procedures that require special equipment available only at a Carl Zeiss Meditec Repair Center.

Designated Carl Zeiss Meditec Repair Centers (currently Dublin, California and Jena, Germany) are the second level of service for the Humphrey Field Analyzer II-*i* series. The Carl Zeiss Meditec Repair Centers perform major circuit board troubleshooting and repair, plus any other service action that requires special equipment or procedures not available in the field.

Some of the circuit boards in the Humphrey Field Analyzer II-*i* are multilayer boards and use Surface Mount Technology (SMT) components. These boards require special equipment and techniques for troubleshooting and repair.

For Carl Zeiss Meditec U.S. domestic operations, the following Humphrey Field Analyzer II-*i* service procedures must be performed at a Carl Zeiss Meditec Repair Center. All other service procedures (including instrument calibration) can be performed in the field.

- Circuit board troubleshooting and component replacement
- Repair of floppy, tape, and hard drives.
- Alignment of projection carriage rails and first projection mirror (top turret mirror)
- Repair of power supply assembly
- Repair of camera assembly

1.3.2 Three Steps to Completing an HFA II-*i* Service Call

The basic approach to an HFA II-*i* service call is outlined below. This typical process includes collection of general instrument calibration data and light intensity data both *Before* service and again *After* service. The process is described in detail in Section 4.8.1. For guidelines, refer to Service Bulletin FA2i-026x.

1. **Obtain the *Before* Light Intensity instrument data (Section 4.8.1).**

   This step assumes that the HFA II-*i* is operable; that is, it will power up to the Main Menu without error. This data gives the Field Support Engineer a base from which to evaluate the light intensity operation of the instrument, and a point of comparison if recalibration is required.
   If a repair is required to render the instrument operable, and as long as the repair does not affect the original light intensity data, the repair can be performed and then the *Before* data can be acquired.

The following repairs will affect light intensity data:

- Hard Drive replacement or initialization;
- Cleaning or replacement of the ND wedges, color wheel*, or brightness detector;
- Replacement of the Motor Driver PCB.

** **Note** – Cleaning or replacing the color wheel will not affect the white/white Before light intensity data; it only affects the blue light intensity data.*

2. Perform the needed instrument service.

This step includes any parts replacement, adjustments, calibration, cleaning, etc. to repair, update and/or upgrade the instrument.

3. Obtain the *After* light intensity instrument data (Section 4.8.1) if the *Before* data was not within specifications, or if something was done during service that affects light intensity (see list in step 1).

When the instrument service has been fully completed (but before reinstalling the outer covers), a final evaluation of the instrument may be required (see Section 2.3, System Checkout). During this step, the *Before* and *After* light intensity data are compared (Calibration Shift Worksheet). If necessary, a Measurement Change Customer Letter is given to the customer.

1.3.3 HFA II-*i* Field Service Paperwork Requirements

For paperwork guidelines, refer to:

- Service Bulletin FA2i-026x (System Field Service Checklist)
- Customer Care Document CCD-006x (OS Field Service Paperwork Guide)

1.4 Configuration Parameters

Configuration parameters can be entered and stored in the system by the user. This data is stored on the hard disk. Calibration data also is stored on the hard disk. There is the possibility that this data may become altered or erased during servicing of the instrument.

To minimize the possibility of altering the calibration values, configuration parameters or doctor setups during service, the following practices should be observed.

- Whenever possible, when servicing a customer's instrument, backup the calibration values on disk or USB. This option is available via the Calibration Menu.
- Whenever possible, when servicing a customer's instrument, backup the customer-selected configuration. This option is available via the Setup and Additional Setup menus.
- When finished servicing the instrument, restore the customer's configuration selections.
- When applicable, ensure that you check for proper system licenses and networking configuration.
- Never intentionally alter the customer's existing doctor setups.

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1.5 Classification / Compliance

Class I Equipment – Protection against electrical shock.

Type B – Degree of protection against electric shock of applied part (chin, forehead, and patient button).

Ordinary Equipment (IPXO) – Degree of protection against ingress of liquids (none).

CAUTION: This instrument has no special measures to protect against harmful ingress of water or other liquids (classified IPXO – ordinary equipment).

Do not place containers of liquid on or near the instrument, and do not use aerosols on or near it.

Continuous Operation – Mode of operation.

- Not suitable in the presence of flammable anesthetic.

CE 0297 Complies with 93/42/EEC Medical Device Directive

Complies with US and Canadian medical electrical system safety requirements

1.6 System Electrical Information

Instrument Electrical Rating:

- 100 – 120V ~, 50/60 Hz, 4.0A
- 230V ~, 50/60 Hz, 1.8A

Fuse Rating:

- T4A, 250V; (100 – 240V ~)

WARNING: Always replace fuses with the same type and rating. Failure to do so may create a risk of fire.

Power Table Electrical Rating:

- HFA 120: 120V ~, 60 Hz, 8.0A
- HFA 230: 230V ~, 50 Hz, 6.0A

Power Outlet Ratings:

- HFA 120: 120V ~, 5A Max.
- HFA 230: 230V ~, 3A Max.

Fuse Rating:

- T8A, 125V; (HFA 120)
- T6.3A, 250V; (HFA 230)

WARNING: Always replace fuses with the same type and rating. Failure to do so may create a risk of fire.

Duty Cycle:

- Int. 0.8 min/21 min (HFA 120)
- Short-Time-Op 2 min, int. 1 min 19 min (HFA 230)

Load (Lift Mechanism):

- 1000N Push

Protection against ingress of liquid:

- IP20 (HFA 120)
- IP30 (HFA 230)

1.7 Safety Information

WARNING: Do NOT block the ventilation openings. These allow for the release of heat generated during operation. A buildup of heat due to ventilation opening blockage can cause failures which may result in a fire hazard.

WARNING: To prevent electric shock, the instrument must be plugged into an earth grounded outlet. Do not remove or disable the ground pin. Only an authorized Carl Zeiss Meditec service representative may install the instrument.

WARNING: Do not use the printer or the instrument or the power table with an extension cord or a power strip (multiple portable socket outlet). For additional safety, do not plug the printer and the instrument (or the power table) into the same wall outlet. Failure to observe this warning could result in electrical shock to the patient and/or examiner.

WARNING: Do not open the instrument covers. Opening the instrument covers could expose you to electrical and optical hazards.

WARNING: if the instrument is externally connected to non-medical peripheral devices (i.e. printer, storage devices, etc.), the complete system must comply with the system requirements in standard IEC 60601-1. This standard requires the usage of an Isolation Transformer to power the non-medical peripheral device(s) if located within 1.5 m from the patient. If the peripheral device is located outside the patient environment (beyond 1.5 m) and is connected to the HFA, a separation device must be used or there shall be no metal to metal connection between the non-medical peripheral device and the HFA.

The person or the responsible organization connecting additional devices or reconfiguring the system must evaluate the complete system to ensure compliance to the applicable IEC 60601-1 requirements.

The instrument operator must not attempt to touch the patient and the peripheral device simultaneously.

WARNING: Do not reconfigure system components on the table, nor add non-system devices or components to the table, nor replace original system components with substitutes not approved by Carl Zeiss Meditec. Such actions could result in failure of the table height adjustment mechanism, instability of the table, tipping and damage to the instrument, and injury to operator and patient.

WARNING: This instrument may cause ignition of flammable gases or vapors. Do NOT use in the presence of flammable anesthetics such as nitrous oxide, or in the presence of pure oxygen.

WARNING: Avoid tipping. Do not use the instrument on an uneven or sloped surface. Also, do not roll the table in deep pile carpet or over objects on the floor such as power cords. Failure to observe these precautions could result in tipping of the instrument and/or table and resulting injury to operator or patient and damage to the instrument.

CAUTION: The appliance coupler is the main disconnect device of the instrument. Position the instrument in such a way to have easy access to disconnect the appliance coupler in case of an emergency.

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1.8 Symbols and Labels

The following are the symbols (and their definitions) that MAY be found on the Humphrey Field Analyzer II-*i* System:

WARNING: Follow instructions for use. Failure to read and follow instructions may result in hazards that can lead to serious injury. Instructions may also describe potential serious adverse reactions and safety hazards.

WARNING

CAUTION

CAUTION: Hot Surface

Type B – Degree of protection against electric shock of applied part (chin and forehead rests).

~ Alternating Current

0 I Power Off / On

Stand By

Manufacturer

EC REP Authorized European Community Representative

SN Serial Number

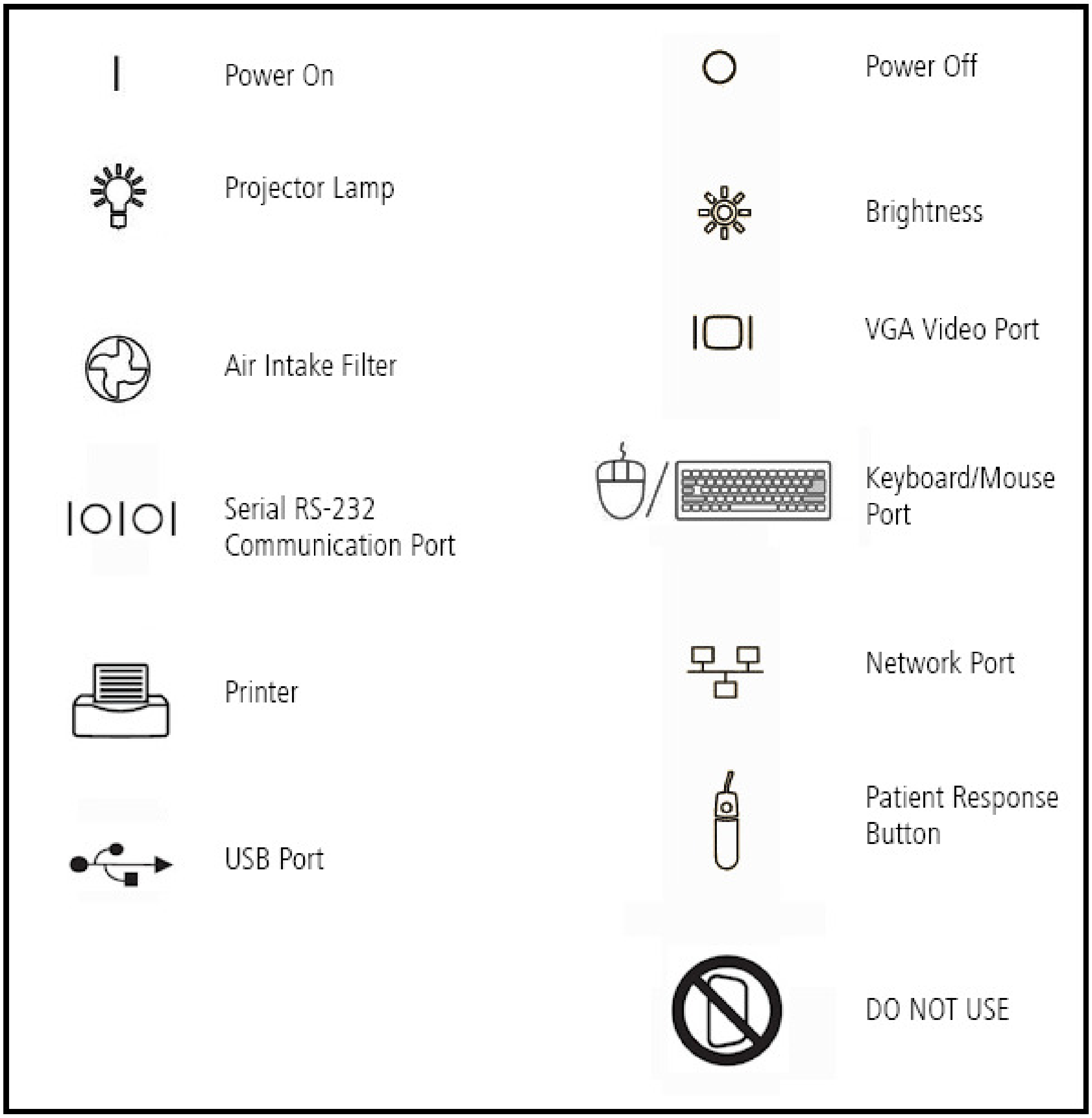
REF Catalog Number / Part Number

MODEL Model Number

Fuse

CE 0297 Complies with 93/42/EEC Medical Device Directive

Additional symbols appearing on the HFA II-*i*:



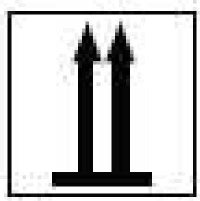
1.9 Protective Packing Information / Symbols

The protective packing symbols specify the handling requirements of the instrument.

Handling Requirements

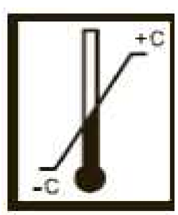
Fragile, Handle with Care

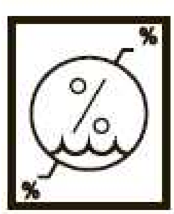
Keep Dry

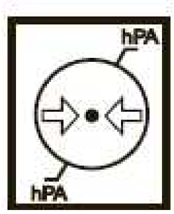


This End Up

1.10 Environmental Specifications







Operating Conditions

Operating Temperature: +10° C to +40° C

Relative Humidity: 30% to 75% excluding condensation

Atmospheric Pressure: 700 to 1060 hPa

Max wet bulb: 78°F (26°C)

Storage and Shipping Conditions

Storage Temperature: -40° C to +70° C

Relative Humidity: 10% to 100% including condensation

Atmospheric Pressure: 500 to 1060 hPa

1.11 Internal Layout

The parts drawings in Section 7 of this Service Manual illustrate the internal physical layout of the instrument. Diagrams in Section 6 illustrate the functional layout of the instrument.

1.12 Special Topics

1.12.1 Touch Screen

The HFA II-*i* uses a transparent, analog, resistive-membrane touch screen. It is constructed of two pieces of thin, highly linear, electrically conductive film (Indium Tin Oxide). The two pieces of film are separated by a small air gap. The air gap is maintained by small (.001"), dielectric spacer dots.

Each film sheet has a set of parallel bus bars applied along opposite edges of the film. The two sheets are oriented so that the bus bars on one sheet are perpendicular to those on the other sheet. Slight pressure will cause the conductive surfaces to come into contact. The location of the contact point can be detected by a logic circuit measuring the voltage found at that particular point.

The analog type of touch screen gives a "voltage divider" analog response that allows positional determination.

1.12.2 Gaze Tracking

The HFA II-*i* uses two systems for measuring patient fixation: the standard Heijl-Krakau blind-spot monitoring and the IR Gaze Tracking System. Both methods can be used, either together or alone, or they can both be turned off, as required. This description covers the IR Gaze Tracking System.

The direction of a patient's gaze is determined in two steps: first, a reflex marker is established on the corneal surface; and second, the location of the pupil center is determined.

Gaze tracking is initialized in the following manner when a selected test is first started:
The patient is asked to fixate on the central illumination LED. Gaze tracking turns on the reflex gaze IR LED located either just under the diamond fixation (new bowl) or to the left of the central illumination LED (older bowl) and turns off eye illumination briefly. Light from the LED is reflected off the cornea, and back to the IR sensitive camera (FIGURE 1.1). The majority of the cornea appears black except for the reflected spot. This image is digitized and stored in memory. The reflected spot is referred to as the reflex marker (FIGURE 1.2). Because the corneal surface is rounded, the reflex marker will move very little even if the patient's eye rotates, and thus the marker becomes a (relatively) stationary reference point.

ext, the system locates the pupil center by illuminating the entire eye with the two IR LEDs located either in the bottom of the bowl, or in the trial lens holder (when in the raised position). The iris appears bright with a dark pupil (FIGURE 1.3). This image is also digitized and stored in memory. It is the relationship between the location of the reflex marker on the cornea and the location of the pupil center that determines fixation (FIGURE 1.4).

Note **–** *When gaze tracking is being initialized, it appears as repetitive "strobing" when viewed by the operator via the video insert on the HFA II-i monitor.*

During a test, each time a spot is projected into the bowl, the locations of the reflex marker and the center of the pupil are compared to the initial images stored in memory.
If the patient is fixating correctly, the positional relationship between the reflex marker and the pupil center will be the same as that of the stored images (FIGURE 1.4). If the patient is off fixation, the positional relationship between the reflex marker and the pupil center will be different, as in FIGURE 1.5. The greater the misalignment, the higher the mark on the Gaze Graph (FIGURE 1.6).

Spikes that appear on the Gaze Graph (FIGURE 1.6) are analyzed as follows:

- Upward spikes indicate that the patient has lost fixation;
  - a spike that reaches the top horizontal line (or higher) indicates 10 degrees (or more) off fixation;
  - a spike that extends halfway to the top line indicates 5 degrees off fixation.
- Downward spikes indicate as follows:
  - a short spike downward indicates that the gaze at that time cannot be determined by the software.
  - a long spike downward indicates that the patient blinked at the time fixation was checked.

The absence of marks on the graph indicates proper fixation. Possible problems associated with the gaze tracking system are reflections from the trial lens, fingerprints on the trial lens, an improperly aligned trial lens holder, an improperly calibrated or aligned Gaze Tracking box, and excessive patient tearing.

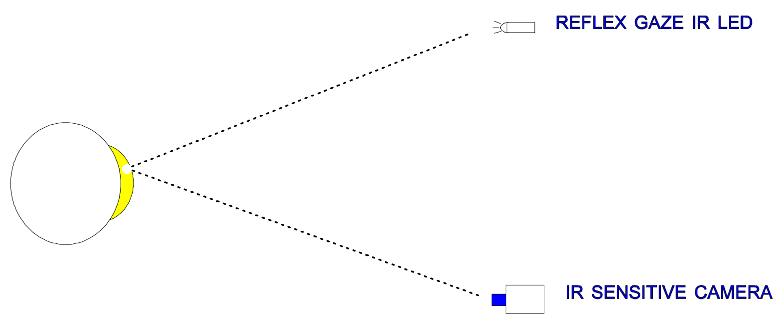


FIGURE 1.1. Location of Corneal Reflex Marker

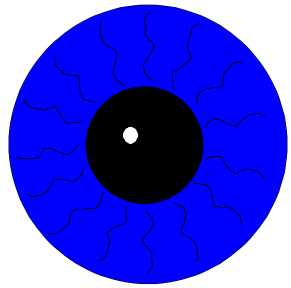


FIGURE 1.2. Corneal Reflex Marker Location Digitized and Stored in Memory

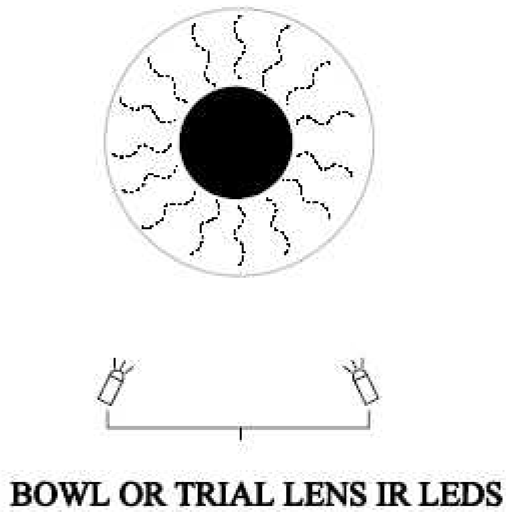


FIGURE 1.3. Determining the Pupil Center

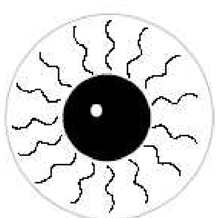


FIGURE 1.4. Patient Fixating – Corneal Reflex Marker and Pupil in Proper Relationship

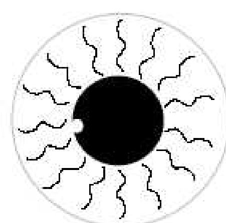


FIGURE 1.5. Patient *Not* Fixating – Corneal Reflex Marker and Pupil *Not* in Proper Relationship

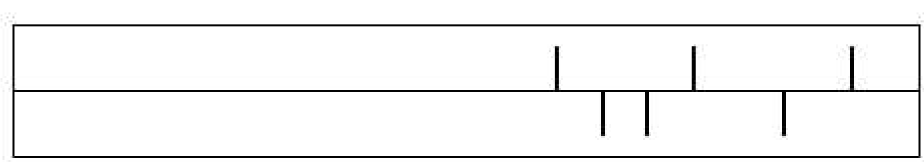


FIGURE 1.6. Gaze Graph

1.12.3 Head Tracking / Auto Pupil / Vertex Monitoring

These three features are dependent on the Gaze Tracking system. If Gaze Tracking has successfully initialized, any of these three features (750-*i* model only) can be utilized.

Head Tracking

The Head Tracking feature is designed to lessen the appearance of a trial lens artifact image when the patient's eye is off center in relation to the center of the trial lens holder. The intent is to reduce the possibility of inducing an arc-like defect or ring scotoma in the patient's field test results.

Note: *If Head Tracking is turned ON, do not adjust the patient alignment using the Chinrest button. This causes the software to lose its last known tracking position.*

Head Tracking is active when the trial lens holder is in the up position and Head Tracking has been set to ON in the setup menu. The Head Tracking feature will track the center of the eye in relation to the trial lens holder. If the patient's eye moves from the center of the trial lens holder by more than 3 mm for more than one consecutive sample, the head tracking feature will gently move the chinrest and headrest to automatically reposition the patient's eye in the center of the trial lens holder. The tracking will stop if the eye does not follow the correction. Tracking begins when the test is started. This feature will operate properly only if the patient properly rests on the chinrest.

Auto Pupil

When the Auto Pupil feature is set to ON in the setup menu, the gaze monitoring system will determine the size of the patient's pupil to the nearest 0.5 mm at the beginning of each test (during initialization of gaze tracking), and will automatically enter that information into the Patient Data information screen, marked Auto (*).

Vertex Monitoring

The Vertex Monitoring feature is designed to lessen the appearance of a trial lens artifact image when the patient's head moves backwards (away from) the trial lens holder. The intent is to reduce the possibility of inducing an arc-like defect or ring scotoma in the patient's field test results. Vertex Monitoring will alert the operator (via a double beep) if the patient's eye moves more than 7 mm away from its original position for any one measurement. (The sample rate is once every question.)

Vertex distance measurement is obtained during gaze initialization. During gaze initialization, the two IR LEDs on the trial lens holder appear as two dots of light on the corneal surface. (Refer to 1.12.2 Gaze Tracking for a complete description.) The distance between these two dots will decrease as the head moves away from its original position. If the distance exceeds the software limits, an alert will sound. The test continues, and a pop-up window appears allowing the user to reinitialize, continue without reinitializing, or turn off vertex monitoring.

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1.12.4 HFA II-*i* Light Intensity Fundamentals

The HFA II-*i* uses one detector mounted at the end of the turret to measure both spot and bowl intensities. The projection lamp voltage is controlled by software to set maximum stimulus brightness. This means that the lamp can be operated at a lower voltage when the lamp is new; and as it ages, more voltage is applied in order to maintain the same level of brightness. This increases lamp life expectancy and reduces power consumption.

During light intensity calibration, the projection calibration value is stored in memory and set as close as possible to obtain 929 Ft-L or 10,000 asb of light output. The background lights are fluorescent and the calibration values are set as close as possible to obtain 2.92 Ft-L or 31.5 asb. During calibration, light attenuation is measured at 175 different points on each of the two ND wedges, and the results are stored in memory. The two ND wedges are used in combination to obtain the desired brightness of the projected spot. The duration of the spot is 200 ms and is controlled by the software operating the shutter, located between the projection lamp and the ND wedges.

During the power-on sequence, the bowl intensity is set to the calibrated value (2.92 Ft-L or 31.5 asb). The brightness detector is then pointed at a black patch located on the inside of the front cover, the shutter is closed, and a measurement is made by the detector. This establishes the zero asb reference. Next, the shutter is opened, and a spot projected on the bowl approximately 35° above center is measured by the detector. The projection voltage is adjusted to match the calibration value stored in memory. This measurement sets the maximum brightness level (10,000 asb or 0 dB). These two measurement points determine the slope of the light from dark to maximum brightness.

If the measured intensity varies from that stored during calibration, the lamp voltage is adjusted and measured again. This continues until the stored intensity and measured intensity match. If the voltage is adjusted above 10V, the test will fail and a projection lamp error message will appear on the screen. If the test does not fail, ten different points on each ND wedge are measured and compared with their stored values. If these values deviate more than ±0.5 dB from the stored values, the test will fail and a wedge failure error message will be displayed.

1.12.5 Comparing the HFA II and HFA II-*i*

Hardware

The HFA II-*i* version 5.1 and greater differs from the prior production version, the HFA II, in that significant upgrades have been made.

Version ≤5.0 CPU PCB

The HFA II-*i* Version ≤5.0 uses an off-the-shelf CPU PCB featuring an Intel Celeron 433 MHz processor, while the HFA II uses a 20 MHz Motorola 68020-based processor. The Version ≤5.0 CPU PCB dramatically decreases the test processing time resulting in significant overall test time reduction. The HFA II-*i* CPU PCB contains 64 megabytes of DIMM memory while the HFA II has 4 megabytes of memory on the current CPU.

Version ≥5.1 CPU PCB

The HFA II-*i* Version ≥5.1 CPU PCB is an ADLink Computer Board Model "NuPRO-935A/DV".

Computer Board: The computer board is a PICMG® 1.0 Core™2 Quad/Duo Single Board Computer, Q35/ICH9, TPM, Dual GbE/ SATA II/ IDE/ Floppy.

- PICMG® 1.0 SBC with Intel® Q35 Chipset, VGA, SATA II, Dual GbE, USB, IDE, FDD
- Intel® Core™2 Duo/Quad processors
- Intel® Celeron® 440 Processor (512 Cache, 2.0 GHz, 800 MHz FSB)
- Trusted Platform Module
- Dual Intel® Gigabit Ethernet controllers
- 1-GB DDR2 800 Memory Module

Backplane Board

The Backplane board interfaces to the computer board through the ISA Bus. The Backplane Board provides the following functionality.

1. 5V and 12V power to the computer board. The power pins of the ISA Bus and the PCI Bus are used.
2. ISA Bus interface to the Computer Board. The PCI connector on the backplane is used only for mechanical support and supplying power to the computer board.
3. Communication channel from the Computer board to the Motor Board. The ISA Bus addresses specific to the Motor Board are decoded and the data routed from and to the Motor Board.
4. Touch Screen interface. Touch Screen calibration is facilitated by the backplane firmware and touch coordinates are sent to the application software running on the computer board via the ISA Bus.
5. Patient Button interface. Button clicks are reported to the application software via the ISA BusEye Monitor Camera image overlay on the screen. The VGA out from the computer is connected to the backplane. The camera image is sampled synchronous to the VGA pixel clock and inserted into the video stream in real time.
6. Motor Board Interface to the computer board.
7. VGA output to the screen. The camera image is inserted at the required XY location and scaling in the video frame and sent to the screen.

Many of the unique functions that the HFA II CPU PCB supported are now included in the HFA II-*i* Backplane PCB. The functions of the Backplane PCB include; the patient switch, touch screen, camera frame grabber, and video.

For EMI considerations, the HFA II-*i* CPU PCB and Backplane PCB are housed in a metal enclosure. The enclosure is bolted to the chassis in the location of the HFA II CPU PCB.

To accommodate the enclosure, the rear cover was redesigned for use on the HFA II-*i*. The rear cover does not make use of 1/4 turn fasteners.

External Interfaces

Refer to the NuPRO-935A data sheet for details on the computer board. The following external user interface connectors are provided by the computer board.

1. Four USB 2.0 ports using the standard Type-A receptacles. One port is on the I/O panel of the board. Two are adjacent to the computer board on the EMI Box. The last two are on the front panel of the Drive Bay. Each of the USB ports will source 0.5A at 5V for use by devices connected to the port.
2. One Gigabit Ethernet port (10/100/1000 base-T) on the I/O panel using the standard Category 5 RJ-45 connector labeled as “Network”.
3. Two RS232 serial ports capable of 115200bps on the EMI Box using the 9-pin D-Sub connector. One port designated as “Data Transfer” is used for transferring data from and to the HFA and to connect with peripherals such as an external modem. The second port as “Auxiliary” may be used for software debugging and diagnostics.
4. One Parallel Port using the 25 pin female D-Sub connector to communicate with standard printers.
5. One PS/2 Keyboard/Mouse combination port via a Mini-Din 6 pin connector. The PS/2 Y cable is used to connect a keyboard and a mouse.
6. The VGA output (15 contact high density receptacle) from the computer is connected to the backplane board. The output VGA connector from the backplane is connected to the screen.

Motor Board

The Motor Board controls all the internal peripheral components such as the stepper motors, light sources, the stimulus projection sub-system and the patient support.

Power Supply

The HFA II-*i* has a larger capacity power supply than the HFA II to provide the additional Vcc power required for the HFA II-*i*. The HFA II-*i* is designed with a power supply that provides:

- 14A nominal at 5V DC
- 8A nominal at 12.5V DC
- 0.5A nominal at –12V DC
- 3A nominal at 24V DC

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Hard Disk Drive

The HFA II-*i* has an IDE hard drive, while the HFA II uses a SCSI hard drive. Note that the two drives are not interchangeable.

The Version ≥5.1 hard drive operates at a spindle speed of 5400 RPM. It is SATA-2 compliant. The minimum capacity is 160-GB.

Mass Storage

The DAT streamer tape of the HFA II has been replaced with a magneto-optical medium reader in the HFA II-*i* Version ≤5.0. The new HFA II-*i* drive provides greater long-term storage of large patient files.

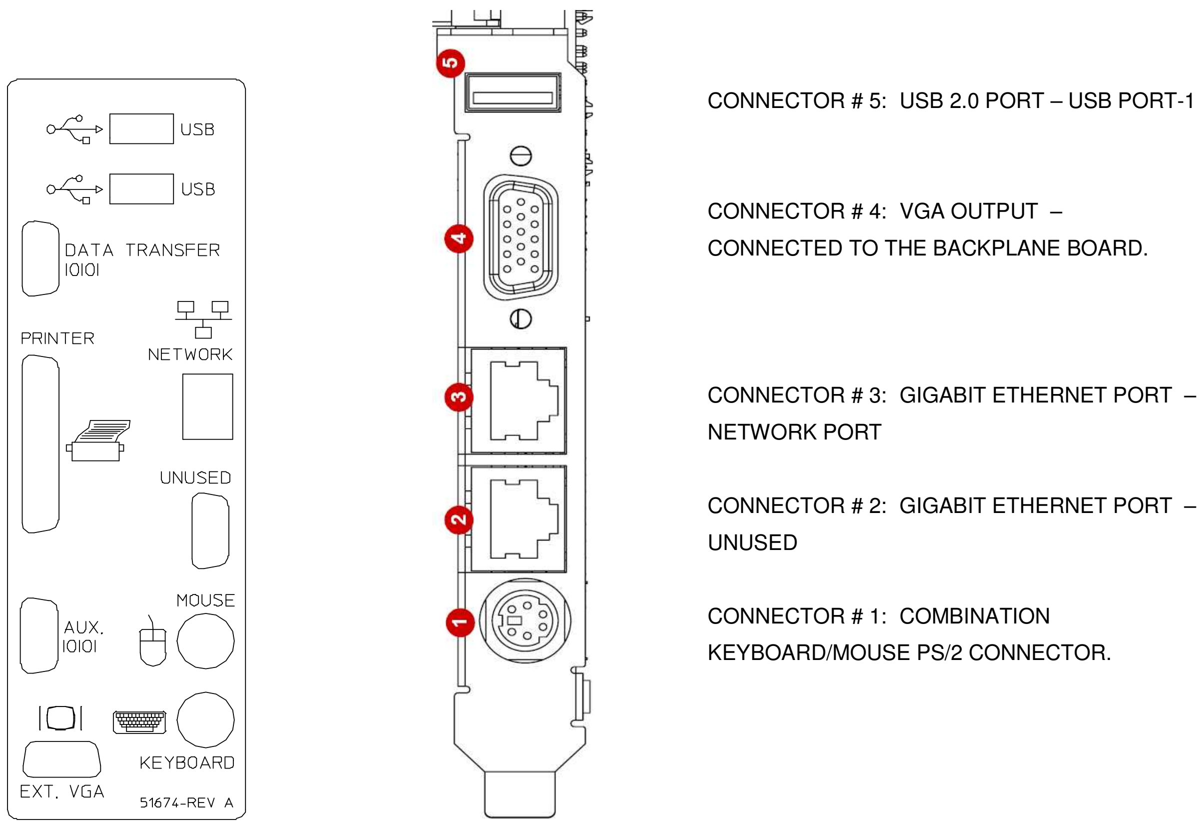

FIGURE 1.7. HFA II-*i* Version ≤5.0 & Version ≥5.1 Interconnects

The external connections to the HFA II-*i* are considerably different from those of the HFA II. Two USB and a network port have been added to the ≥5.1 HFA II-*i*. While the HFA II had three serial ports, the HFA II-*i* has only one functional serial port.

Service Changes

Calibration of the HFA II-*i* will differ from the HFA II only in the fact that the calibration data will be stored differently. In the HFA II the calibration data is stored in the EEPROM, located on the CPU PCB. In the HFA II-*i*, the calibration data is stored in a file on the hard drive. An additional copy of the calibration data is stored on a diskette / USB, stored behind the rear cover door of the instrument. In cases where the calibration file on the hard drive becomes damaged, the calibration data can be loaded back onto the hard drive via the main calibration menu.

Unlike the HFA II, the HFA II-*i* has a BIOS that can be modified as needed with future updates. See Appendix E for BIOS Configuration.

A significant difference between the HFA II and the HFA II-*i* is that the HFA II operating system would allow low level formatting of the floppy drives (formatting a previously unformatted diskette). This is not possible with the HFA II-*i*. **The HFA II-*i* will only allow a preformatted diskette to be reformatted. The HFA II-*i* will not format unformatted floppy diskettes.**

Operational Changes

Startup screen information, such as the model number, hard option code, soft option code, motor board code and CPU board code, will not be displayed during the bootup process. This information will be displayed on the "*i*" screen. The model, serial number, operating system revision, language revision, and hardware option code are found on the "*i*" screen. See the sample "*i*" screen printout in Appendix J.

In all other aspects, field operation of the HFA II-*i* is essentially identical to the HFA II.

Section 2 – PM and System Checkout

Notes:

2.1 Preventive Maintenance

For U.S. domestic Field Service, an annual preventive maintenance (PM) visit is required for every HFA II-*i* instrument under service contract. The PM visit can be combined with a regular service visit if the timing is suitable. The HFA II-*i* System Checkout (Section 2.3) details the checks and measurements required to complete a PM.

In addition to the System Checkout, the following points should be checked during a PM or service call.

- Check that all external cable and cord connections are secure.
- Check that the instrument is being powered from a properly grounded AC outlet (use an AC circuit tester).
- Observe the ambient conditions in which the instrument is operating:
  - Are the cooling vents on the instrument unobstructed?
  - Are there any ambient conditions present that may cause static generation (carpeted floors, dry winter weather, etc.)?
- Check whether the instrument operator(s) have any questions/comments regarding performance of the instrument.
- Any customer complaints noted during the PM or service call must be documented in the call details.

2.1.1 HFA II-*i* Preventive Maintenance Procedure

1) Obtain the ***Before*** instrument data as prescribed on the Light Intensity worksheets detailed in Section 4.8.1.

2) Apply a ***very thin*** film of clock oil [P/N 266010-0002-534 (02534)] to the projection assembly rails. The recommended method is to place one drop of oil on your fingertip and lightly wipe it along the length of the top of the rail. Do this once for each rail.

CAUTION: *Apply the oil sparingly. Excessive oil on the rails will migrate to other assemblies and cause problems.*

3) After the oil has been applied, proceed to the Motor Exerciser (Section 5) and exercise the F motor (focus/carriage motor). Exercise the focus motor 20 times to distribute the oil on the rails.

4) Check the rail ends and directly beneath the projection assembly for any excess oil. Carefully wipe up any excess oil.

5) Clean the optics path. Refer to Appendix Q – Care and Cleaning of Optics, for general guidelines.

   Note - *Cleaning certain elements in the optics path will affect the light intensity readings of the instrument and thus necessitate recalibration.*

6) Clean the top and bottom air intake filters and the power supply fan:

   Bottom Filter — It is recommended that this filter be replaced. However, it can be cleaned under running water, dried, and then reinstalled, if necessary. Ensure that the filter is completely dried before reinstalling.

   Power Supply Fan — Gently brush, vacuum, or blow any accumulated dust and debris off the power supply fan and surrounding assembly. Use care to avoid getting dust or debris on the instrument optics or bowl.

   EMI Box Fan — Gently brush, vacuum, or blow any accumulated dust and debris off the EMI Box fan and surrounding assembly. Use care to avoid getting dust or debris on the instrument optics or bowl.

   CPU Fan — Open the CPU enclosure and gently brush, vacuum, or blow any accumulated dust and debris off the EMI Box fan and surrounding assembly. Use care to avoid getting dust or debris on the instrument optics or bowl.

7) Clean the bowl (see User Manual).

8) Check all belts, and replace as required.

9) Update the system software to the latest revision that the customer is entitled to.

10) With the covers still off, perform the System Checkout (2.3).

    Note: *Check the CPU battery voltage (in circuit). If the voltage is below 3.0 volts, replace the battery and verify that the CMOS settings are correct as per Appendix E.*

2.2 Operator Maintenance Tasks

Data Storage - Backup

All data stored on the hard disk and any external media are the Purchaser's records, and it is his or her responsibility to preserve the integrity of these files. Carl Zeiss Meditec is not responsible for the loss of patient files stored on the hard disk or external media. The Purchaser assumes the responsibility for the installation, use, and results obtained from the instrument and programs.

Cleaning the Forehead / Chin Rest

The forehead / chin rest can be cleaned with a disinfectant such as isopropyl alcohol.

***WARNING** – Strong solvents such as Acetone or Methyl Alcohol will damage the forehead / chin rest.*

Miscellaneous Maintenance

Other than occasionally cleaning the forehead / chin rest, the system requires no regular physical maintenance other than periodic cleaning and dusting of the LCD flat screen. The screen should be wiped with a soft, non-linting cloth. Do not use any cleaning agent on the screen.

2.3 System Checkout

The Humphrey Field Analyzer II-*i* system checkout procedure is used to verify that the instrument is operating properly within specifications. The system checkout should be performed at the completion of every installation and service call on the instrument. If an error is detected during system checkout, troubleshoot and repair the instrument; then start the system checkout again from the beginning. The entire system checkout must be performed from start to finish without any problems occurring.

The Humphrey Field Analyzer II-*i System Field Service Checklist* is a shortened version of the System Checkout Procedure and is used as a checkout guide for the Field Support Engineer. The *System Field Service Checklist* is used to record the results of the system checkout procedure. The *System Field Service Checklist* must be filled out during completion of each Humphrey Field Analyzer System service call (including software upgrades).

Attach the completed *System Field Service Checklist* in the “Attachments” Assignment Block of the Service Confirmation.

Notes:

- *Refer to Service Bulletin FA2i-026x for the Humphrey Field Analyzer II-i System Field Service Checklist.*
- *An E-copy with writeable fields of the Humphrey Field Analyzer II-i System Field Service Checklist is located in Lotus Notes in the Service Bulletin folder under System Field Service Checklists.*
- *The System Field Service Checklist is provided for U. S. Domestic Field Support Engineers only.*

Notes:

1. *Following any calibration procedure that has calibration values stored, proper storage of the new values must be verified by cycling the power off-on before you perform final system checkout. If values obtained by the HFA II-i during calibration are not within an expected range, those values are held only in temporary storage and not permanently stored. When power is turned off, these values are erased and calibration reverts to its old status.*
2. *As part of the system checkout, you are asked to write, read, and delete patient files from various media. To prevent accidental damage to patient files, it is recommended that you make up a test media with your own patient data*

HFA II-*i* Configuration

One of the steps during system checkout is to read and record the instrument configuration information and hardware levels. Current revision levels of the Model, Serial Number, Operating System, Language, Backplane Version, Motor Board Version, Available Memory, Software Options and Hard Option Number are displayed on the Unit Configuration Screen ("*i*" screen).

The individual version numbers are displayed on the configuration screen in the formats shown below where **XX** is the revision level.

Model .... **XXX***i*
Serial Number .... **XXX-XXXX**
Operating System .... Rev **XX**
Language .... **XX**
Backplane Version... **XX**
Motor Board Version .... **XX:XX:XX:XX:XX:XX**
Available Memory .... **XX** MB
Hardware Options .... 00000000 **- XXXXXXXX**
Software Options... **XXXXXXXX**

You can view/print this information from the Main Menu. Select the "*i*" icon. The configuration data appears on the screen. Select *Print/Save* to capture the configuration data.

The hardware options number corresponds to the model number of the instrument and is stored in the instrument's configuration file on the Hard Drive. If the hardware options number is set as a Model 750-*i*, all software features are enabled. If set for a Model 745-*i*, only those features intended for the 745-*i* are enabled. The same is true for a Model 740-*i* and 720-*i* models.

The hardware options number should be verified during the system checkout procedure. Refer to Appendix G for specific hardware options numbers.

The hardware options number also appears on the System Log printout and the Cal/Wedge printout. You can print this information using the following procedures:

For the System Log –

- From the main menu, select *System Setup*; then select *Print/Save System Log*. The hardware options number and instrument serial number are printed on the line titled *Machine ID*, at the beginning of the printout.

For the Cal/Wedge printout –

- From the Calibration main menu, select *Print/Save Cal Values*. The hardware options number and instrument serial number are visible on the line titled *Machine ID*, near the beginning of the printout.

  ***Note**: Check the CPU battery voltage (in circuit). If the voltage is below 3.0 volts, replace the battery and verify that the CMOS settings are correct as per Appendix E.*

2.3.1 HFA II-*i* System Checkout Procedure

***Note:** Following any calibration procedure that has calibration values stored in the Cal/Config Data, storage of the new values must be verified by cycling the power off-on **before you perform final system checkout**. If values obtained by the HFA II-i during calibration are not within an expected range, those values are held only in temporary storage and not written to the Cal/Config Data. When power is turned off, these values are erased and calibration reverts to its old status.*

The HFA II-*i* System Checkout Guidelines —

- **Part I --** The items described in Part I must be completed for *All* service calls.

- **Part II --** The items described in Part II *Must* be completed when any of the following service conditions apply:
  - Performing an instrument PM
  - Recalibrating either the White/White or Blue/Yellow light intensities
  - Replacing/initializing the Cal/Config Data
  - Cleaning/replacing the brightness detector, ND wedges, or the color wheel
  - Replacing the Motor Driver PCB

This checkout assumes that all required service has been performed on the HFA II-*i*. Place a checkmark next to each item when completed. If an item does not apply to the HFA II-*i* under service, indicate N/A (not applicable).

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Part I -- For All Service Calls (Refer to the above System Checkout Guidelines.)

___ 1) If a repair has been performed, verify that all required adjustments/checks have been performed per Table 3-1.

___ 2) Acquire and print the results of your foveal test. Check that the foveal value obtained is within ±2 dB of your known foveal value. (4.8.1.1)

___ 3) Print the Cal/Wedge printout. Verify that all values are within specification. (Appendix H)

___ 4) Print the Unit Configuration printout. Verify that all entries are accurate, based on instrument serial number and model. (Appendix J).

___ 5) Print the System Log printout and then clear the log. Verify that all reported error conditions have been evaluated / corrected. (Appendix J)

Part II -- (Refer to the above System Checkout Guidelines.)

Calibration Checks —

___ 6) Verify that the white/white light intensities are within the specified tolerances.

___ 7) Verify that the blue/yellow light intensities are within the specified tolerances.

___ 8) Using the tool stand and fake eye, ensure that the camera is aligned and centered to the trial lens holder.

___ 9) Using the tool stand and fake eye, verify that the gaze tracking box is within tolerance.

___ 10) Using the tool stand and fake eye, ensure that all five IR LEDs are functional. Start a test and initialize gaze tracking. Observe that the three IR LEDs can be seen on the video image of the fake eye when the trial lens holder is in the down position (reflex and bowl IR LEDs) and in the up position (reflex and trial lens holder LEDs).

___ 11) Check that the touch screen response is within tolerance. Verify that patient data can be entered easily and without error.

___ 12) Verify that the CRT image is within specified tolerances.

___ 13) Enter Calibration > Verification > Exerciser Tests. Run the 30/60 mixed tests for 5 minutes. No errors should be reported. While the test is running, verify that there is no shutter noise. Look into the bowl and ensure that there is no shutter streaking.

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Operational Checks —

___ 14) Check the CPU battery voltage (in circuit). If the voltage is below 3.0 volts, replace the battery and verify the CMOS settings are correct as per Appendix E.

___ 15) Verify that the power table moves up and down and that the table top or slider slides freely in and out. Ensure that the slider is securely fastened to the table top.

___ 16) Check that the external brightness knob moves freely and has additional brightness range.

___ 17) Check that the patient chinrest and headrest move smoothly and completely up/down and left/right. (Noise will be heard at the end of each motor limit.)

___ 18) Observe the bowl for dirt or other cosmetically unacceptable spots. Clean as needed.

___ 19) Check the operation of the rear fan, and clean the filter.

___ 20) Check that the date is correct and that the time is correct within 2 minutes.

___ 21) Select a patient test. Change parameters. Verify that the central fixation LED, inner diamond, and outer diamond all function.

___ 22) Turn foveal threshold on (except Model 720-*i*). Select size III. Start the test. Verify that the size III spot is in the center of the inner fixation diamond. Ensure that the spots are sharply focused and no halo is visible. Test the patient button for operation.

___ 23) Recall a test from the hard disk. Display and print the test.

___ 24) Recall a patient test from your test media. Display and print the test.

___ 25) Duplicate a patient test from your test media to a formatted floppy / USB drive. Display the copied test.

___ 26) Copy a patient test from your test media to the hard drive. Delete that test from the hard disk.

___ 27) Perform a backup using the Magneto-Optical drive / USB drive to verify the backup/restore procedure.

___ 28) Turn power off/on and wait for the Main Menu. No errors should be reported.

Section 3 – Parts Removal/Replacement

Notes:

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3.1 General Instructions

__CAUTION —__ It is essential that you use proper ElectroStatic Discharge (ESD) precautions when disassembling or handling the instrument circuitry or circuit boards. Many components in the instrument are highly susceptible to static discharge damage. The Field Service Static Protection Kit, described in Appendix A, must be used for ESD protection during service of the instrument.

- ***NOTICE — BEFORE** beginning disassembly of the HFA II-i, be sure that you have had the customer read and sign the HFA II-i Disclaimer form regarding possible loss of stored data during servicing of the instrument.*
- Table 3-1 is the single source of reference for Removal / Adjustment requirements. Whenever a removal procedure is performed, refer to Table 3-1 to determine which follow-up checks/adjustments are required.
- System interconnect diagrams for the instrument are contained in Section 6. Note that this diagram contains all the cable part numbers.
- In addition to the drawings in this section, the parts drawings in Section 7 provide useful reference for parts identification and relative locations during removal/ replacement procedures.
- References from one procedure to another are shown in the form "(x.x)."
  EXAMPLE: In the CRT Removal/Replacement procedure, one of the steps is to “Remove the operator panel (3.4)." If you need further details for removing the operator panel, you can refer to Section 3.4, and then return to the CRT removal procedure for the next step.
- Step-by-step procedures are provided when needed; but, when adequate, only essential replacement notes are given. Simple removals that are clearly obvious are not described in this manual.
- Unless noted otherwise, the steps for replacement (reassembly) are simply the reverse order of the steps for removal, and are not listed. Replacement (reassembly) notes are included as needed.
- All screws and nuts mentioned in the instructions are metric unless noted otherwise.
- In this manual, the terms left, right, front and rear of the instrument are as viewed from the patient position, unless noted otherwise.
- To facilitate later reassembly of the instrument, consider labeling each connector during disassembly.

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- Because the covers interlock with each other, the required sequence for cover removal is:
  1. Front cover
  2. Rear cover
  3. Operator panel

  The covers must be reinstalled in exactly the reverse sequence. Successful reassembly requires careful attention to the interlocking points on the covers.

- Some of the motor pulleys are installed with the collar outward, and some with the collar inward (next to the motor body). Be sure to make note of the correct position of the collar before removing the pulley.

- When reinstalling motor pulleys, ensure that there is proper clearance between the pulley and motor body. When reinstalling the belt, ensure that the motor belt teeth are properly meshed with both pulleys.

- The appearance and condition of the bowl's inner surface are critical to the functionality of the HFA II-*i*. Work carefully to avoid damaging or dirtying the bowl. Do not touch the inside of the bowl unnecessarily.

- Whenever you will be working on the projection assembly with it installed in the instrument, place a sheet of paper or clean cloth under the projection assembly to catch any small hardware that you may drop.

- Some of the cable connectors in the instrument may not be keyed. To facilitate later reassembly of the instrument, consider labeling each connector during disassembly.

- Proper cable and wire routing is important. Before disassembly, observe the cable routing and locations of the cable ties; then be sure to route the cables exactly the same during reassembly. Be sure to replace all cable ties removed during disassembly.

- Be sure to reconnect all ground wires disconnected during disassembly. ***Failure to do so can cause the instrument to malfunction.***

- Certain screws on the projection assembly secure critical alignment of the optical path. ***It is essential that you NOT LOOSEN these screws (see FIGURE 3.1)***. Alignment of the projection assembly can only be done at the factory using special equipment.

- After replacement of parts or an assembly, perform a limited operational check of the associated functions before complete reassembly of the instrument. After complete reassembly, perform the full System Checkout (Section 2.3).

- **Special Tools / Equipment –**

  Any special tools or equipment required for a procedure are listed at the beginning of the procedure.

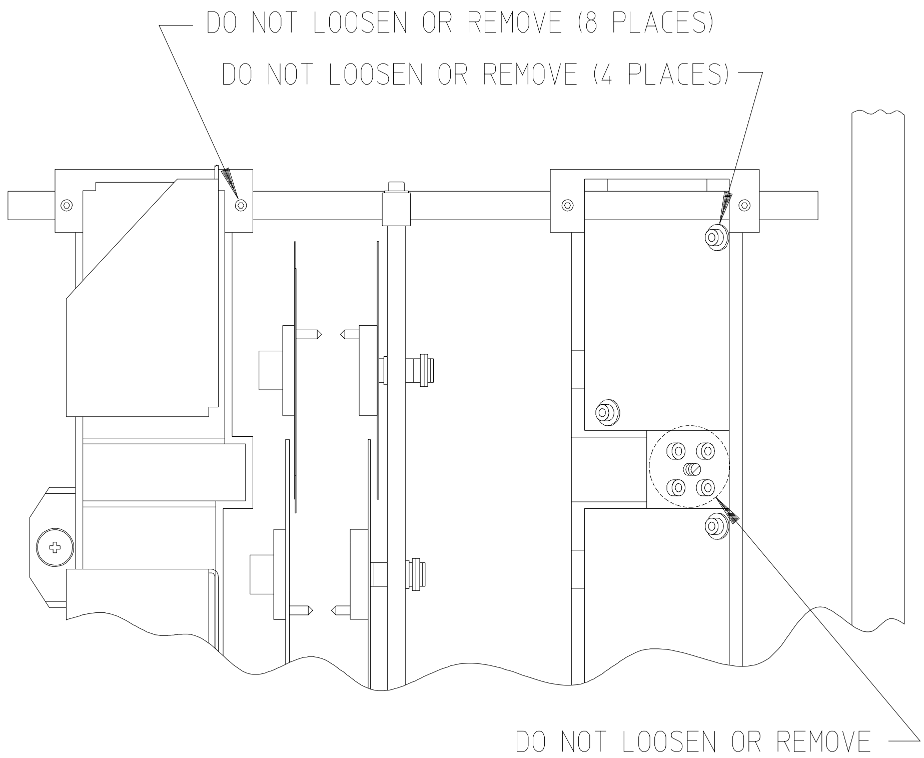

FIGURE 3.1. Screws Securing Projection Assembly Alignment

- **Equipment Return Procedures**

When equipment needs to be returned to Carl Zeiss Meditec for repair, it is important that it is properly packed for shipment, and that authorization for return is obtained before the equipment is shipped.

When equipment is received, the original packing materials should be preserved for possible later use. ***Costs to repair equipment damage caused by improper packing for shipment to Carl Zeiss Meditec become the responsibility of the sender.***

Authorization must be obtained from Carl Zeiss Meditec before equipment is returned for repair. A Return Materials Authorization (RMA) number is required on each return shipment to Carl Zeiss Meditec. The procedure for obtaining an RMA number varies, depending on your area of operation. Use the procedure that has been established by Carl Zeiss Meditec for your operating organization.

3.1.1 Table 3-1

Adjustment / Calibration Requirements Following Replacements

This table identifies checks/adjustments that must be made following removal/replacement procedures. The numbers listed under ***Follow-ups Required*** are keyed to the ***Follow-up Actions*** listed in the second column. For each ***Assembly Replaced***, the follow-up numbers are listed in the order in which they should be performed, not necessarily in numerical sequence.

Items marked with an asterisk (*) only need to be performed if the assembly is actually being replaced, not just removed and reinstalled. All other items need to be performed whether the assembly is replaced, or simply removed and reinstalled.

Assembly/Part Replaced	Follow-ups Required
• Projection Lamp[1]	3, 8, 10, 9, 19, 21, 22, 23, 40
• Front Cover Assy	40
• Rear Cover Assy	40
• Operator Panel Assy	40
• Drive Housing Assy	40
• CPU PCB - battery	40, 41
• Hard Drive [2]	29, 26, 27, 28, 7, 8, 3, 10, 9, 12, 11, 13, 16, 17, 15, 18, 19, 20, 21, 22, 23, 40
• CPU/Backplane	7, 40
• Flash Prom MDB	29, 40
• Motor Driver PCB	29, 18, 19, 20, 21, 22, 23, 16, 17, 40
• Power Supply	40
• CRT PCB	2*, 7*, 40
• Touch Screen	7, 40
• Fixation Interconnect PCB	5, 16, 17, 15, 11, 13, 40
• CCD Camera	14, 5, 16, 17, 40
• Central Fixation LED Assy	14, 5, 16, 17, 40
• Projection Assy	8*, 3*, 10*, 9*, 12*, 11, 13, 19*, 21*, 22*, 23*, 40
• Projection Interconnect PCB	40
• Film Wedge/Motor	8, 22*, 23*, 40
• Glass Wedge/Motor	8, 22*, 23*, 40
• Color Wheel / Aperture Wheel	10, 9, 11, 13, 19*, 21*[3], 40
• Carriage (Focus) Motor	24, 12, 11, 13, 40
• Shutter	8, 40
• Shutter Motor	8, 11, 13, 40

Assembly/Part Replaced	Follow-ups Required
• Carriage (Focus) Motor Belt	24, 40
• Horizontal (X-axis) Turret Motor	24, 11, 13, 40
• Horizontal (X-axis) Turret Motor Belt	24, 11, 13, 40
• Vertical (Y-axis) Turret Belt/Motor	24, 11, 13, 40
• Brightness Detector (PCB) Green Filter / Blue Filter	4, 11, 13, 18*, 19*, 20*, 21*, 22*, 23*, 40
• Lower Turret	24, 11, 13, 40
• Turret Cable Assy	11, 13, 40
• Chinrest/Headrest Switch Assy	40
• Chinrest Y-axis Belt/Motor	24, 40
• Patient Support Horizontal (X-axis) Belt/Motor	24, 40
• Chinrest Vertical Slide and Lead Screw	24, 40
• Chinrest Horizontal Slide	24, 40
• Trial Lens Holder Assy	5, 16, 17, 15, 40
• Top Fan	40
• Bowl IR LED Assy	6, 15, 40
• Blue-Yellow Module / Bowl Plug	11, 13, 20*, 40
• Bowl	11, 13, 5, 6*, 16, 17, 15*, 18*, 19*, 20*, 21*, 22*, 23*, 40
• Reflex Gaze LED	5, 16, 17, 15, 11, 13, 40
• Bowl Lamp Assy	18, 11[4], 13[4], 40
• IR Bowl Plug	40

Follow-up Actions

1 - Obtain *Before* and *After* Light Intensity and Calibration Values (4.8.1 **+**)
2 - CRT Adjustments (4.9.5)
3 - Lamp Filament Position Adjustment (4.8.2.1)
4 - Detector Position Adjustment (4.8.2.8)
5 - Trial Lens Holder Alignment (4.9.6)
6 - Bowl IR LED / Cold Mirror Adjustment (4.9.8)
7 - Touch Screen Calibration (4.9.4)
8 - Shutter Calibration (4.8.2.2)
9 - Aperture I - V Calibration (4.8.2.3)
10 - Color Wheel Calibration (4.8.2.4)
11 - Left/Right Home Position Calibration (4.8.2.5)
12 - Focus Calibration (4.8.2.7)
13 - Offset Fixation Calibration (4.8.2.6)
14 - Camera Focus (4.9.7)
15 - Camera Intensity Calibration (4.8.6.3)
16 - Camera Position/Size Calibration (4.8.6.1)
17 - Gaze Monitor Position/Size Calibration (4.8.6.2)
18 - White Bowl Intensity Calibration (4.8.3.3.1 **+**)
19 - White Projector Intensity Calibration (4.8.3.1.1 **+**)
20 - Yellow Bowl Intensity Calibration (4.8.3.3.2 **+**)
21 - Blue Projector Intensity Calibration (4.8.3.1.2 **+**)
22 - Wedge Calibration (4.8.3.5)
23 - Blue Correction (4.8.3.6)
24 - Belt Tension Adjustment (4.9.2)
25 - Patient Support Horizontal Leadscrew Adj. (4.9.1)
26 - Transfer Calibration Constants (Appx. G.1)
27 - ID CPU (Appx. G.2)
28 - Configure Hardware (Appx. G.3)
29 - Reload Software (Appx.M)

40 - System Checkout (2.3)
41 - Verify CMOS settings (5.11)

Notes -

1. *Adjustment/calibration not required when projection lamp is replaced by customer.*
2. *Only if the Calibration constants diskette is not restorable.*
3. *Only blue calibration required if color wheel is replaced. Both white and blue projector calibration required if aperture wheel is replaced.*
4. *For Bowl Lamp Replacement, actions 11 and 13 are required only if projection assy had to be removed for replacement of bowl lamp(s) equipped with early style baffles.*

+ According to the Light Meter used:

- 4.8.3.1.1 or 4.8.3.2.1
- 4.8.3.1.2 or 4.8.3.2.2
- 4.8.3.3.1 or 4.8.3.4.1
- 4.8.3.3.2 or 4.8.3.4.2
- 4.8.1.1 or 4.8.1.2

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3.1.2 Removal of the HFA II-*i* from the Power Table

A number of parts removal and assemblies will require that the HFA II-*i* instrument be removed from the power table top prior to accomplishing further removals and assemblies.

Note: *If the slider is not present, only screws at locations A and B are accessed/removed beneath the table via through holes.*

1) Remove the patient switch jack from the patient switch connector, located on the bottom left of the disk drive panel.
2) Lower the power table to its lowest position.
3) Remove the three screws that secure the cover plate to the rear of the slider assembly.
4) Remove the cover plate.
5) Pull the slider handle out and position the slider assembly such that the hole in line with the rail on the left side of the slider (as seen from the front of the HFA II-*i*) aligns with the hole in the left rear HFA II-*i* foot.
6) Loosen and remove the screw (B) securing the left rear foot of the HFA II-*i*.
7) Position the HFA II-*i* such that the front end of the slider is just beyond an inch (2.54 cm) from the edge of the table top. Do not move the slider assembly beyond this position.
8) Loosen but do not fully remove the captive screw (A) securing the front right foot of the HFA II-*i*. Access to the screw is from the hole on the bottom of the slider assembly.

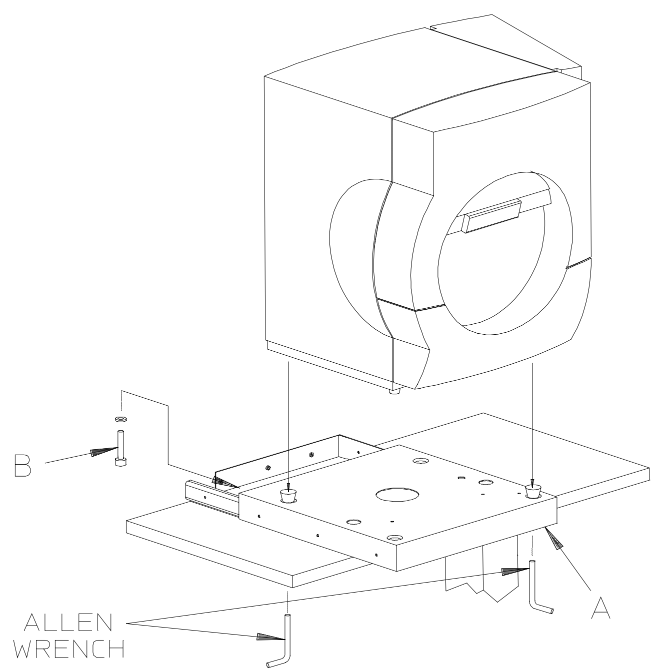

FIGURE 3.2. Removal from Slider

3.2 Front Cover Assembly Removal

***Note** — As described below, the front cover assembly must first be partially removed to allow an internal cable and ground wire to be disconnected (step 3) before the cover can be removed completely.*

1) Loosen the two captive 1/4-turn fasteners located along the bottom front of the front cover assembly.

2) Pull the bottom of the front cover assembly out slightly; then gradually lift up on the front cover assembly while pulling out from the top. This will free the front cover assembly from the rest of the instrument.

3) While holding onto the front cover assembly, disconnect the ribbon cable from the Patient Support Interconnect PCB and disconnect the ground wire from the chassis.

4) Remove the front cover assembly from the instrument.

Replacement Notes:

- Do not over tighten the 1/4-turn fasteners.
- Be sure to reconnect the ground wire to the chassis and the ribbon cable to the Patient Support Interconnect PCB before attaching the front cover assembly. Guide the cover on carefully to avoid pinching the ground wire or the forehead rest drive belt between cover and chassis.

Follow-up Checks/Adjustments:

See Table 3-1.

3.3 Rear Cover Assembly Removal

1) Remove the front cover assembly (3.2).

2) Remove the projection lamp access cover.

3) Remove the fan filter door completely (to avoid interference during rear cover removal).

4) Remove the cables and cords from connector on the back panel.

5) Remove the two screws located near the top of the rear cover assembly.

6) Remove the two screws that were exposed by removing the fan filter door.

7) Remove the four screws located along the bottom and side of the rear cover assembly.

***CAUTION** — While the cover assembly is being manipulated in the next step, be very careful to avoid damaging the neutral density wedges which are located very close to the top of the cover. The projection lamp cable and the heatsink on the CRT PCB also are very close to the cover.*

8) Pull the rear cover assembly part way out, disconnect the fan connector, and then remove the rear cover assembly.

Replacement Notes:

- Remember to reconnect the fan before reinstalling the rear cover.
- Work carefully to avoid damaging the projection assembly by contact with the cover assembly.
- Be careful of the routing of various cables to prevent them from being damaged by being pinched between the rear cover assembly and the frame.
- After the unit is reassembled and power is applied, check that the fan is operating.
- Ensure that the brightness potentiometer moves freely.

Follow-up Checks/Adjustments:

See Table 3-1.

3.4 Operator Panel Assembly Removal

1) Remove the front cover assembly (3.2).
2) Remove the rear cover assembly (3.3).
3) Remove the patient button assembly from the disk drives panel.
4) Remove the drive housing assembly (3.5).
5) Remove the three screws that secure the CRT bracket clamp.
6) Disconnect:
    - the large edge connector on the CRT PCB;
    - the brightness control potentiometer connector;
    - the chinrest switch flex-cable connector from the Motor Driver PCB;
    - remove the CPU enclosure lid and then disconnect the touch screen ribbon cable from connector JTS on the Backplane PCB.

7) Remove the disk/MO/USB drive cables from their clip(s) on the inside of the operator panel assembly.

8) Remove the two screws located at the two bottom corners on the backside of the operator panel assembly (FIGURE 3.3). These two screws secure the bottom of the operator panel to the instrument chassis.

9) Loosen the two captive screws, behind the top of the CRT, which are securing the CRT PCB support bracket to the instrument chassis. (Hold onto the operator panel assembly as you loosen the screws, to prevent it from falling.)

10) Remove the operator panel assembly by manipulating it up slightly and to the left while pulling straight out.

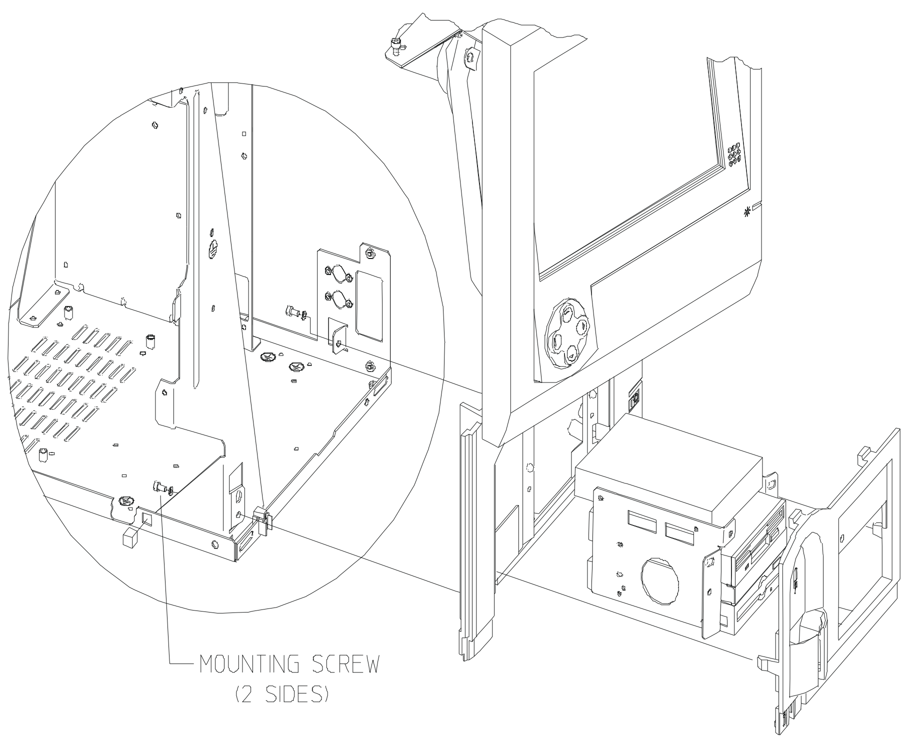

FIGURE 3.3. Operator Panel Bottom Mounting Screws

Replacement Notes:

- Be sure to slide the ribbon cables back into their clips.
- Make sure that the patient response button connector module is mounted in the bottom pan, ***with its contacts positioned upward***, before you reinstall the operator panel assembly.

Follow-up Checks/Adjustments:

See Table 3-1.

3.5 Drive Housing Assembly Removal

1) Remove the patient switch jack from the patient switch connector located on the bottom left of the disk drive panel.

2) Lower the power table to its lowest position.

3) Perform step 3 or step 4 as required.

   a) Using both hands, place your fingers along the bottom edge of the drive housing front panel.

   b) Attempt to pull both outward and upward to remove the panel. If the panel can be removed in this manner, proceed to step 5 below.

4) Remove the front panel from around the drive housing assembly in the following manner:

CAUTION — *This step must be performed* ***carefully*** *to avoid possible damage to the circuit board on the bottom drive.*

   a) From below the instrument, insert a small diameter tool (such as a hex ball driver — preferably with handle) ***straight up*** through the small hole located in the bottom of the instrument, approximately 1.75" back from the front edge of the bezel (FIGURE 3.4). Insert the tool until it touches the plastic tab securing the bottom edge of the bezel.

CAUTION — *If the tool is inserted with the tip tilted rearward, it may contact and damage the bottom drive circuit board.*

To unlatch the bezel, push the tip of the tool against the latch as you move the handle of the tool rearward (FIGURE 3.4).

b) Pull out on the bottom edge of the drive bezel until it separates from the operator panel.

5) Remove the three screws (two at the top, one at the bottom) that hold the drive housing assembly in place.

6) Pull the drive housing assembly straight out until the cable connections at the back are accessible.

7) Disconnect the cables and power connectors from the drives.

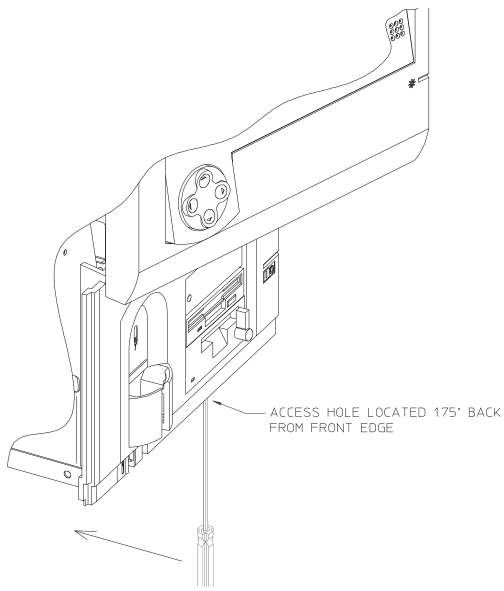

FIGURE 3.4. Unlatching the Drive Housing Bezel

Replacement Notes:

- Before installing a new drive, verify that it is strapped correctly [Refer to Service Bulletin FA2i-003x].
- Reconnect the cables to the drives before reinstalling the drive housing assembly.
- Replacement hard disks are preformatted. You will need to load the application software, and restore configuration and calibration data. If the calibration backup diskette is not available, a complete system calibration is required. Patient data will need to be restored, preferably by the customer.
- If it becomes necessary to reformat a hard drive, refer to Appendix L for instructions.

Follow-up Checks/Adjustments:

See Table 3-1.

3.6 CPU / Backplane Enclosure Removal

1) Disconnect the printer, COM1, COM2, keyboard, mouse, external VGA, Ethernet and USB connections from the connectors located on the outside of the CPU/Backplane Enclosure right side.

2) Remove the three 2.50 mm screws and washers that secure the top left bracket to CPU/Backplane Enclosure and to the chassis.

3) Remove the four 2.50 mm screws and washers from the enclosure lid.

4) Remove touch screen cable connector and patient switch cable connector from the left side of the Backplane board.

5) Remove the drive lamp LED connector from the bottom of the J12 connector on the CPU board. Note that the two wires connect to the bottom two pins of the connector.

6) Slip the touch screen and patient switch cables from the wire clamp on the left inside wall of the CPU/Backplane Enclosure.

7) Slightly compress and remove the snap bushing from the top left corner of the CPU/Backplane Enclosure.

8) Slide the touch screen and patient switch cables out of the CPU/Backplane Enclosure through the slot.

9) Remove the CRT and POWER connectors from the backplane board.

10) Remove the JXVID and JMPS connectors from the backplane board.

11) Remove the two 2.50 mm screws and cable clamp that secure the IDE/SATA/USB/ Floppy and video cables to the top of the CPU/Backplane Enclosure.

12) Remove the inner front screw of the top fan assembly and the Ferrite clamp screw that secure the ferrite clamp to the top of the CPU/Backplane Enclosure.

13) Remove the Floppy drive and IDE/SATA cable connectors from the top ride side of the CPU board.

14) Remove the ferrite clamp and attached cables from the CPU/Backplane Enclosure

15) Loosen and release the captive screw on the left side of the bottom CPU/Backplane Enclosure bracket.

16) Loosen the captive screws on the right side of the bottom bracket.

17) Loosen the M3 screw that secures the right side bracket to the CPU/Backplane Enclosure.

18) Loosen and disconnect the 1/4 turn fastener from the retainer at the top of the CPU/Backplane Enclosure.

19) Disconnect the brightness pot cable from the brightness pot assembly.

20) Swing the CPU/Backplane Enclosure out from the chassis just enough to allow access to the wire saddles on the back of the CPU/Backplane Enclosure.

21) Remove the brightness pot cable from the wire saddle located on the back side of the CPU/Backplane Enclosure.

22) Remove the patient switch cable from the two wire saddles on the back of the CPU/Backplane Enclosure and place the cables free of the CPU/Backplane Enclosure.

23) While supporting the weight of the CPU/Backplane Enclosure, loosen and remove the right side captive screw on the bottom bracket.

Follow-up Checks/Adjustments:

See Table 3-1.

3.7 CPU / Backplane Removal

***Note** - Only replace the complete CPU Enclosure.*

1) Remove the front cover assembly (3.2).

2) Remove the rear cover assembly (3.3).

3) Remove the CPU/Backplane Enclosure from the Chassis (3.6).

4) Remove the three M3 screws that secure the external CPU PCB clamp to the outside of the CPU/Backplane Enclosure.

5) Remove the external CPU PCB clamp from the CPU/Backplane Enclosure.

6) Disconnect the two serial port connections from the J9 and J10 connectors on the CPU PCB.

7) Disconnect the parallel port connection from the J7 connector on the CPU PCB.

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8) Disconnect the USB cable connector from the J16 connector of the CPU PCB.

9) Remove the two M3 internal CPU PCB clamp screws.

10) Remove the clamp up through the top corner hole of the CPU/Backplane Enclosure.

11) Remove the five M3 screws that secure the Backplane board to the bottom of the CPU/Backplane Enclosure.

12) Remove the upper fan connector.

13) Remove the CPU PCB and Backplane board as a unit from the CPU/Backplane Enclosure.

Follow-up Checks/Adjustments:

See Table 3-1.

3.8 Motor Driver PCB Removal

1) Remove the front cover assembly (3.2).

2) Remove the rear cover assembly (3.3).

3) Disconnect the camera cable connector from the P14 connector located in the lower left side of the Motor Driver Board (MDB).

4) Disconnect the chinrest motor cable connector from the P5 connector located at the upper left corner of the MDB.

5) Disconnect the Projection Interconnect cables from the P1 and P2 connectors located at the top of the MDB.

6) Disconnect the projection lamp cable and the yellow lamp cable connectors from the P3 and P4 connectors located on the top right side of the MDB.

7) Disconnect the Fixation Interface Board cable connector at the P7 connector located in the top right corner of the MDB.

8) Disconnect the Chinrest Interface Board cable connector at the P10 connector located on the top right side of the MDB.

9) Disconnect the JXVID ribbon cable connector at the P13 connector located in the lower right side of the MDB.

10) Remove the three screws and right side bracket that secure the CPU/Backplane Enclosure to the chassis.

11) Disconnect the DC Distribution cable from the bottom of the backside of the MDB.

12) Remove the six 3.0 mm screws securing the Motor Driver PCB to the chassis.

13) Slide the MDB to the right and disconnect the JMPS ribbon cable connector at the P15 connector located in the bottom of the middle of the MDB.

14) Remove the Motor Driver PCB.

Replacement Notes:

- Reconnect the cable to the back of the Motor Driver PCB before reinstalling the PCB.

Follow-up Checks/Adjustments:

See Table 3-1.

3.9 Separation of the CPU from the Backplane

Note *– Replace the Complete CPU/Backplane Enclosure!*
Improper attempts at separation of the Backplane board and Processor board can result in irreparable damage to the backplane board or processor board.

3.10 Power Supply Removal

***Note** — The power supply used on the HFA II-i is different from that of the HFA II. Do not remove the keys found in the power supply output cables. Do not attempt to use the HFA II power supply.*

1) Lower the power table to its lowest position and lock the table top in its center position.

2) Remove the front cover assembly (3.2).

3) Remove the rear cover assembly (3.3).

4) Ensure that the power cord is disconnected.

5) Disconnect the two large connectors from the power supply.

6) Remove the two 3.0 mm screws securing the power supply assembly.

7) Lift the power supply and carefully maneuver the power supply out of the side opening in the chassis. (Watch out for the Fixation Interconnect PCB mounted on the bowl.)

8) With a screwdriver, unfasten the two AC supply lines and ground wire attached to the power supply.

9) Remove the power supply.

Replacement Notes:

- Reconnect the three input wires before reinstalling the power supply assembly.

Follow-up Checks/Adjustments:

See Table 3-1.

3.11 CRT PCB Removal

1) Remove the operator panel assembly (3.4).

2) Carefully discharge the CRT high voltage to ground and disconnect the high voltage lead from the CRT.

3) Disconnect:
   - the yoke connector from the CRT PCB.
   - the connector on the end of the CRT neck.

4) Release and remove the CRT PCB from its four plastic standoffs.

Replacement Notes:

- The CRT anode lead must be routed over the top of the CRT neck. If the lead passes under the neck of the CRT, it lies next to the bowl and the electrostatic field around the lead will attract dust to the inside of the bowl.

Follow-up Checks/Adjustments:

See Table 3-1.

3.12 CRT Removal

1) Remove the operator panel (3.4).

2) Carefully discharge the CRT high voltage to ground and disconnect the high voltage lead from the CRT.

3) Disconnect:
   - the yoke connector from the CRT PCB.
   - the connector at the end of the CRT neck.

4) Remove the 3.0 mm screw (item 1, FIGURE 3.5) at each corner of the CRT bracket.

5) Remove the CRT assembly from the operator panel.

6) Remove the four 3.0 mm screws (item 2, FIGURE 3.5) securing the CRT to the bracket. Be careful not to lose the washers, and make note of how many washers are used on each screw. (The washers adjust the mounted position of the CRT.)

Replacement Notes:

- Anytime the CRT or touch screen is disassembled from the foam gaskets, the CRT and touch screen viewing surfaces should be carefully cleaned before reassembly.
- Ensure that the foam gaskets for the CRT and touch screen are sealing properly, with no gaps between them.
- Tighten the CRT mounting screws enough to compress the foam gaskets slightly for a good seal but DO NOT OVER TIGHTEN. If the gaskets are over compressed, the touch screen surface will be pressed against the operator panel bezel and the instrument will malfunction.

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- Check for adequate clearance by sliding the edge of a business card between the touch screen surface and the edge of the bezel along the entire perimeter of the bezel. If necessary, loosen the two top CRT mounting screws slightly to obtain adequate clearance.
- Be sure that all of the washers (spacers) are in place on the mounting screws before securing the CRT to the bracket.
- The CRT must be mounted with its anode connector downward, and the CRT anode lead routed over the top of the CRT neck. If the lead passes under the neck of the CRT, it lies next to the bowl and the electrostatic field around the lead will attract dust to the inside of the bowl.
- The connector at the end of the CRT neck is not keyed, be careful to position it correctly. The key-notch in the connector should be located in the gap between pins 1 and 7 on the tube.

Follow-up Checks/Adjustments:

See Table 3-1.

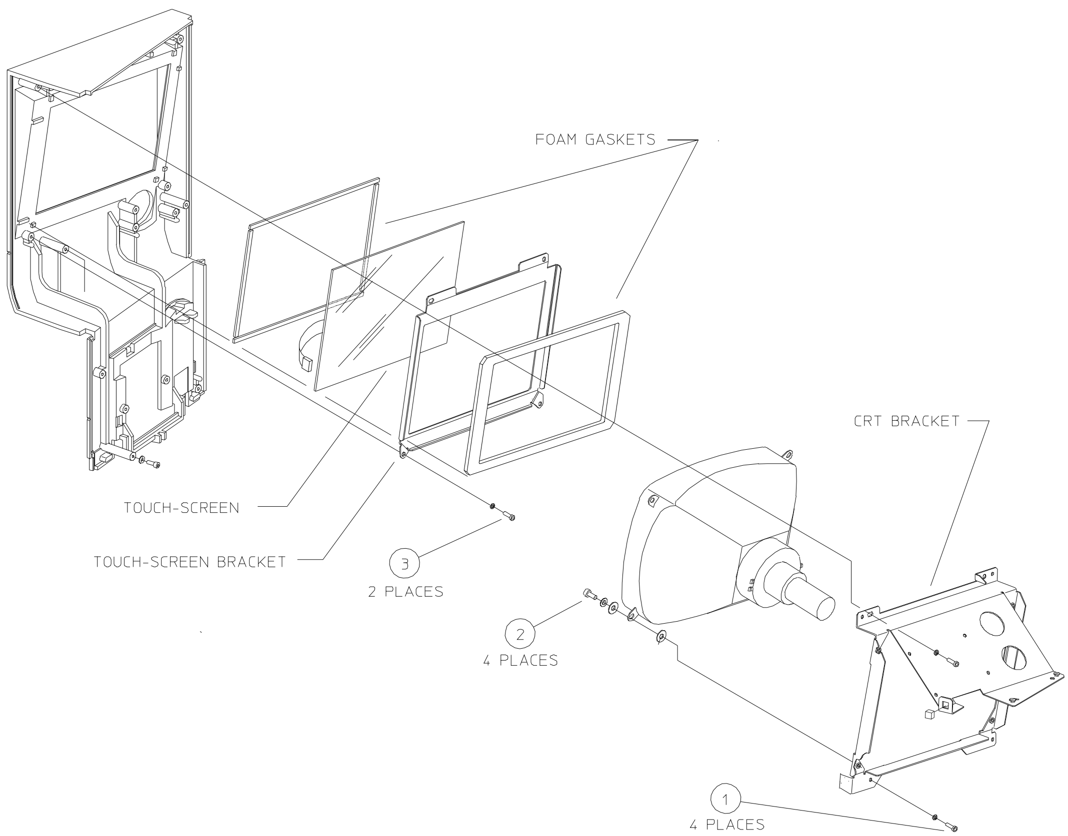


FIGURE 3.5. CRT / Touch Screen Removal

3.13 Touch Screen Removal

1) Remove the operator panel (3.4).

2) Carefully discharge the CRT high voltage to ground.

3) Remove the screw (item 1, FIGURE 3.5) at each corner of the CRT bracket.

4) Remove the CRT assembly from the operator panel.

5) Remove the two 3.0 mm screws (item 3, FIGURE 3.5) holding the touch screen bracket and remove the bracket.

6) Remove the touch screen.

Replacement Notes:

- Anytime the CRT or touch screen is disassembled from the foam gaskets, the CRT and touch screen viewing surfaces should be carefully cleaned before reassembly.
- Make sure that the touch surface is facing outward when mounting the touch screen. (The touch surface is a thin film laminated to one side of a glass plate. This is easily observed by looking at the point where the flex cable exits the touch screen.)
- Ensure that the foam gaskets for the CRT and touch screen are sealing properly, with no gaps.
- The CRT anode lead must be routed over the top of the CRT neck. If the lead passes under the neck, it lies next to the bowl and the electrostatic field around the lead will attract dust to the inside of the bowl.

Follow-up Checks/Adjustments:

See Table 3-1.

3.14 CCD Camera Removal

1) Remove the front cover assembly (3.2).

2) Remove the rear cover assembly (3.3).

3) Remove the camera cable from the P14 connector of the motor driver board.

4) Loosen the two captive screws securing the camera to the Camera Mount.

5) Make note of the lens setting, for reference during reassembly.

6) Remove the camera from the Camera Mount.

Replacement Notes:

- Before installing the camera, adjust the lens to the setting noted during camera removal, but DO NOT secure the lens in position yet with RTV. (If the original setting was not noted, or if a new camera is being installed, set the mark on the lens to align with number 2.) When the HFA II-*i* has been reassembled to the point where it can be operated, check/adjust and secure the camera focus as described in 4.9.7, Camera Focus.

Follow-up Checks/Adjustments:

See Table 3-1.

3.15 Fixation Interconnect PCB Removal

1) Remove the front cover assembly (3.2).

2) Remove the rear cover assembly (3.3).

3) Remove the camera assembly (3.14).

4) Remove the bowl lamp connectors from P1 and P2 of the fixation interconnect PCB.

5) Remove the IR LED connectors from P3 and P4 of the fixation interconnect PCB.

6) Remove the ribbon cable from P5 connector of the fixation interconnect PCB.

7) Press the tabs outward on each side of the PCB to release it from the Camera Mount.

8) Remove the Central Fixation LED from the Camera Mount by gently pressing down on the holding tab with a small Allen wrench, while pulling out the LED by the cable.

9) Loosen the 3.0 mm screw at the top of the Camera Mount and remove the two 3.0 mm screws at the bottom. If the bowl is still in the instrument, the camera will need to be removed to access the top screw.

10) Maneuver the Reflex LED holder through the opening in the Camera Mount. If you are replacing the Fixation PCB, you must cut the tie-wrap and remove the Reflex LED from the Reflex LED holder.

Replacement Notes:

- When re-inserting the Central Fixation LED, you must line up the notch on the LED with the flat portion of the holder. You will hear a click when the LED moves into position.
- The Reflex LED holder will be re-used with the new Fixation PCB. Make sure that you tie-wrap the new Reflex LED to the Reflex LED holder.

Follow-up Checks/Adjustments:

See Table 3-1.

3.16 Central Fixation LED / Beamsplitter Removal

1) Remove the CCD camera (3.14).

2) Remove the Central Fixation LED from the Camera Mount by gently pressing down on the holding tab with a small Allen wrench, while pulling out the LED by the cable.

3) Press a small screw driver against the flat side of the beamsplitter clip and lift the clip upwards.

4) Remove the beamsplitter from the mount. When working with the beamsplitter, make sure that you do not get fingerprints on its surfaces.

Replacement Notes:

- To secure the beamsplitter in place, place the hooks, on the open side of the beamsplitter clip, in the slots and press down on the flat side of the clip.
- When re-inserting the Central Fixation LED, you must line up the notch on the LED with the flat portion of the holder. You will hear a click when the LED moves into position.
- Refer also to the camera replacement notes in Section 3.12.

Follow-up Checks/Adjustments:

See Table 3-1.

3.17 Projection Assembly Removal

***CAUTION —** The aperture wheel and ND wedges on the projection assembly are delicate and easily damaged — **work carefully!** Any fingerprints or contamination on the optical area of the film wedge may necessitate replacement of the wedge; it cannot be cleaned, other than to blow off any dust.*

1) Remove the front and rear covers (3.2, 3.3).

2) Loosen the M3 screw holding the finger guard/baffle plate just behind the film wedge [as required] (FIGURE 3.6). Easiest access to the screw is through the hole in the film wedge.

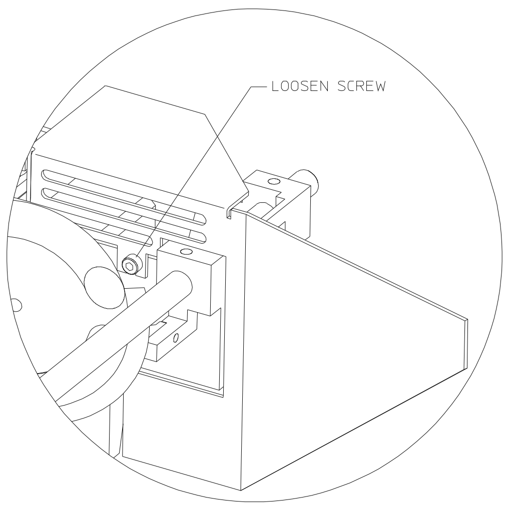


FIGURE 3.6. Removing the Finger Guard / Baffle Plate

3) Disconnect the cable from the projection lamp.

4) Disconnect the two ribbon cables from the Projector Interconnect PCB.

5) Loosen the chassis-mounted, quarter-turn fastener that secures the projection assembly at its end closest to the CPU PCB.

6) Remove the two M4 screws located at the top front of the bowl assembly.

7) Rotate the turret assembly to position the turret Y-motor towards the front.

8) Move the aperture wheel/color wheel carriage all the way forward, towards the first projection mirror.

   Note *– Before lifting the projection assembly out of the instrument, ensure that your projection mount tool is set up to match the diameter of the carriage rails (3/8") on the projection assembly.*

9) Lift the projection assembly up and out as you maneuver the turret through the hole in the bowl assembly.

10) Install the projection assembly on the projection mount tool.

Replacement Notes:

- Check/clean the optics as necessary before reinstalling the projection assembly.

Follow-up Checks/Adjustments:

See Table 3-1.

3.18 Projection Interconnect PCB Removal

1) Remove the front and rear covers (3.2, 3.3).

2) Disconnect all cables connected to the Projection Interconnect PCB.

3) Remove the finger shaft guard (two screws), which mounts to two standoffs on the Projection Interconnect PCB.

4) Remove the two M3 screws and two standoffs securing the Projection Interconnect PCB, and remove the board.

Replacement Notes:

- When reinstalling the PCB, loosely install the two PCB mounting screws and leave off the two standoffs temporarily. Position the PCB for proper clearance between the flag and edge detector on the bottom side of the Projection Interconnect PCB then tighten the screws and install the standoffs.

Follow-up Checks/Adjustments:

See Table 3-1.

3.19 Film Wedge / Motor Removal

***CAUTION —** The aperture wheel and ND wedges on the projection assembly are delicate and easily damaged — **work carefully!** Any fingerprints or contamination on the optical area of the film wedge may necessitate replacement of the wedge; it cannot be cleaned, other than to blow off any dust.*

---

1) Remove the front and rear covers (3.2, 3.3).

2) Remove the M3 screw securing the bracket that covers the film wedge motor.

3) Remove the two M3 screws securing the film wedge to the film wedge motor shaft, and remove the wedge.

4) Disconnect the "Right" (P4) cable from the Projector Interconnect PCB.

5) Remove the four M3 screws securing the film wedge motor to the projection assembly.

   ***Note –** If washers between the motor and the frame are present they must be reinstalled.*

6) Remove the film wedge motor.

Replacement Notes:

- After installing the film wedge on the motor shaft, rotate the wedge and check for proper clearance of the wedge in the film wedge edge detector.

Follow-up Checks/Adjustments:

See Table 3-1.

3.20 Glass Wedge / Motor Removal

1) Remove the front and rear covers (3.2, 3.3).

2) Remove the two M3 screws and standoffs that mount the finger guard bracket to the Projector Interconnect PCB.

3) Disconnect all cables from the Projector Interconnect PCB.

4) Remove the two remaining M3 screws securing the Projector Interconnect PCB and remove the board.

5) Remove the projection lamp assembly.

6) Remove the film wedge.

7) Remove the M3 screw holding the edge detector for the glass wedge. Push the edge detector down and away from the glass wedge.

8) Loosen the two M3 setscrews holding the glass wedge to the motor shaft, and remove the wedge.

9) Remove the four M3 screws securing the glass wedge motor, and remove the motor.

Note *– If washers between the motor and the frame are present they must be reinstalled.*

Replacement Notes:

- Route the cable from the glass wedge motor away from the carriage drive pulley under the Projector PCB to avoid possible contact with the pulley.

Follow-up Checks/Adjustments:

See Table 3-1.

3.21 Color Wheel / Aperture Wheel Removal

Note *– The aperture wheel can be removed only after the color wheel is removed.*

1) Remove the front and rear covers (3.2, 3.3).

2) Disconnect the two large ribbon cable connectors from the Projection Interconnect PCB.

3) Remove the two socket head M3 screws holding the carriage assembly to the carriage rail block (FIGURE 3.7). Carefully remove the carriage and place it on a padded work surface that will support the color wheel/aperture wheel without damage to the wheels.

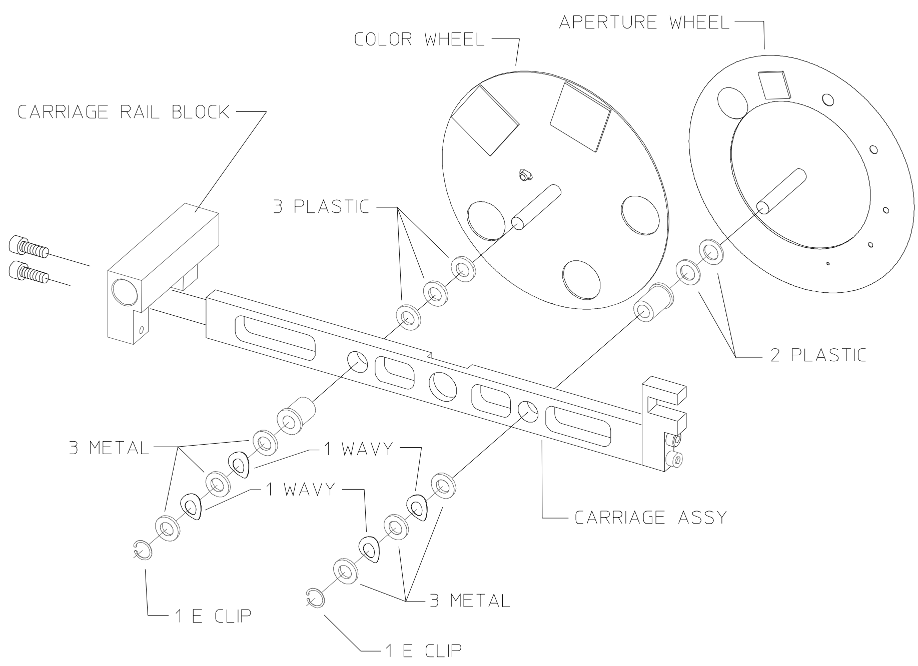


FIGURE 3.7. Color Wheel / Aperture Wheel Removal

CAUTION — *In the next steps, several wavy washers and flat washers will be released. Note their relative positions so that you will be able to reinstall them in the same order as removed.*

4) Remove the retaining ring (E-clip) securing the shaft of the color wheel to the carriage. Carefully remove the washers, and remove the color wheel.

Aperture Wheel Removal:

5) Remove the retaining ring (E-clip) securing the shaft of the aperture wheel to the carriage. Carefully remove the washers, and remove the aperture wheel.

Replacement Notes:

- Ensure that the washers are reinstalled on the shaft(s) in the same order as removed (FIGURE 3.7).

Follow-up Checks/Adjustments:

See Table 3-1.

3.22 Carriage Motor Removal

1) Remove the Projection Interconnect PCB (3.18).

2) ***Loosen*** the four M3 screws securing the carriage motor to the projection assembly.

3) Remove the projection assembly, using all necessary precautions (3.17).

4) Cut any cable ties securing the carriage motor cable.

5) Remove the four loosened M3 screws holding the motor in place, and remove the motor.

6) Loosen the two M3 setscrews on the carriage motor pulley, and remove the pulley from the shaft.

Replacement Notes:

- The replacement cable tie(s) for the motor cable must be installed before reinstalling the projection assembly in the instrument.
- Adjust the belt tension (Section 4).

Follow-up Checks/Adjustments:

See Table 3-1.

3.23 Shutter Removal

***CAUTION** — Handle the shutter carefully! It is delicate and easily deformed or damaged.*

1) Switch ON the HFA II-*i*. Proceed to the shutter calibration menu. Select OPEN shutter. Do not make any other selections.

2) Remove the front and rear covers (3.2, 3.3).

3) Loosen the two M3 setscrews holding the ND film wedge to its shaft, and remove the wedge. (Use care to not bend the film wedge and to not get fingerprints or marks on the film surface.)

4) Observe the current position of the shutter. The shutter should later be installed at the same position — ***this is very important!***

5) Loosen the M3 setscrew that secures the shutter to the motor shaft. Gently angle the shutter, and remove it from the shaft.

Replacement Notes:

- Position the shutter for adequate clearance between the glass wedge and the projection casting. Gently bend the shutter, if necessary.
- Put the shutter in the same position you observed during removal, before securing it to the motor shaft.

Follow-up Checks/Adjustments:

See Table 3-1.

3.24 Shutter Motor Removal

1) Remove the projection assembly and install it on the projection mount tool (3.17).

2) Disconnect the shutter cable (P6) from the Projector Interconnect PCB (cut the cable ties if necessary).

3) Remove the two M3 screws securing the shutter motor to the projection assembly, and remove the motor.

4) Loosen the M3 setscrew securing the hub and shutter to the motor shaft, and remove them from the shaft.

Replacement Notes:

- Position the shutter for adequate clearance between the glass wedge and the projection casting. Gently bend the shutter, if necessary.

Follow-up Checks/Adjustments:

See Table 3-1.

3.25 Carriage Motor Belt Removal

1) ***Loosen*** the four M3 screws securing the carriage motor to the projection assembly.

2) Remove the two small M3 screws securing the belt plate against the belt.

3) Remove the belt.

Replacement Notes:

- Adjust the belt tension (Section 4).

Follow-up Checks/Adjustments:

See Table 3-1.

3.26 Horizontal (X-axis) Turret Motor Removal

1) Remove the front and rear covers (3.2, 3.3).

2) Disconnect the "X-Axis" 6-pin connector (P10) from the Projection Interconnect PCB.

3) Remove the projection assembly and install it on the projection mount tool (3.17).

4) Remove the four M3 screws securing the X-axis turret motor to the projection assembly.

5) Remove the belt from the motor pulley; then remove the motor.

6) Loosen the two M3 setscrews on the hub/pulley and remove it from the motor shaft.

Replacement Notes:

- Adjust the belt tension (Section 4).

Follow-up Checks/Adjustments:

See Table 3-1.

3.27 Horizontal (X-axis) Turret Motor Belt Removal

1) Remove the projection assembly and install it on the projection mount tool (3.17).

   Note *– Before lifting the projection assembly out of the instrument, ensure that your projection mount tool is set up to match the diameter of the carriage rails (3/8") on the projection assembly.*

2) Carefully slide the X-axis turret motor belt off the large gear at the top of the turret.

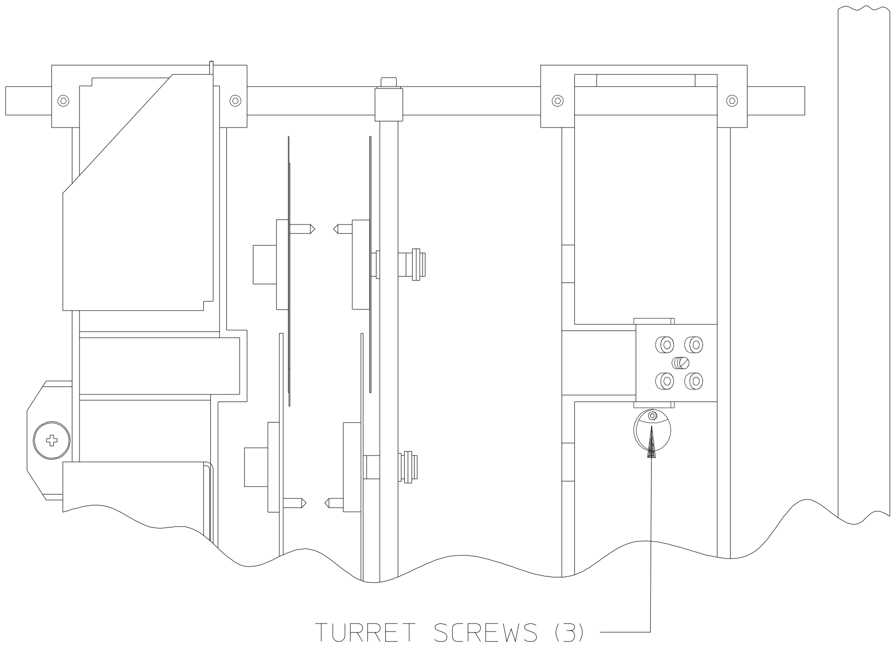


FIGURE 3.8. Turret Removal

3) From the top side of the assembly, locate the hole in the casting that provides access to the top edge of the turret. Through this hole, one by one, remove the three screws that hold the turret in place (FIGURE 3.8).

   (As the screws are removed, the X-axis edge detector flag on the turret becomes loose. Check that the loosened flag does not hit the edge detector and block rotation of the turret for access to the third screw.)

4) Carefully pull the turret out of its top bearing.

   Note *– Be careful to prevent dust or debris from reaching the internal optics of the turret while the turret is open.*

5) Remove the turret motor belt.

Replacement Notes:

- Check/adjust the horizontal (X-axis) edge detector on the turret before reinstalling the projection assembly into the instrument.
- Adjust the belt as necessary (see Section 4).
- When the three turret screws have been tightened, secure each one with a small dab of Loctite® No. 222 (see Appendix A for part number).

- When reassembled, manually rotate the turret to check for smooth movement throughout its normal range.

Follow-up Checks/Adjustments:

Clean the optics. See Table 3-1.

3.28 Vertical (Y-axis) Turret Belt / Motor Removal

CAUTION *— Be careful not to damage or dirty the bowl.*

1) Remove the Y-axis turret belt from the large pulley.

2) Remove the Y-axis turret belt from the small pulley.

Motor Removal:

3) Remove the two M3 screws securing the Y-axis motor cable bracket.

4) Disconnect the motor cable at the connector.

5) Loosen the two M3 setscrews on the motor pulley and remove it from the shaft.

6) Remove the four M3 screws securing the Y-axis motor to the turret assembly.

7) Remove the Y-axis motor.

Replacement Notes:

- Adjust the belt tension (Section 4).

Follow-up Checks/Adjustments:

See Table 3-1.

3.29 Brightness Detector (PCB) Replacement

Note – *Variations to Figure 3.9 may be seen. This figure depicts the ideal configuration. Refer to service bulletins for variation.*

1) Remove the front cover (3.2).

2) Rotate the turret to expose two screws securing the Brightness Detector PCB to the detector assembly (FIGURE 3.9).

***CAUTION —** Do Not loosen or remove the screws that secure the detector housing to the turret. If you do, it will be necessary to perform the detector alignment procedure.*

3) Disconnect the detector from its flex cable.

4) Remove the two M3 screws exposed in step 2 (see FIGURE 3.9).

***CAUTION —** Once the Brightness Detector PCB is removed in the next step, use care to not invert the detector housing, otherwise the small optics may fall out.*

5) Remove the Brightness Detector PCB.

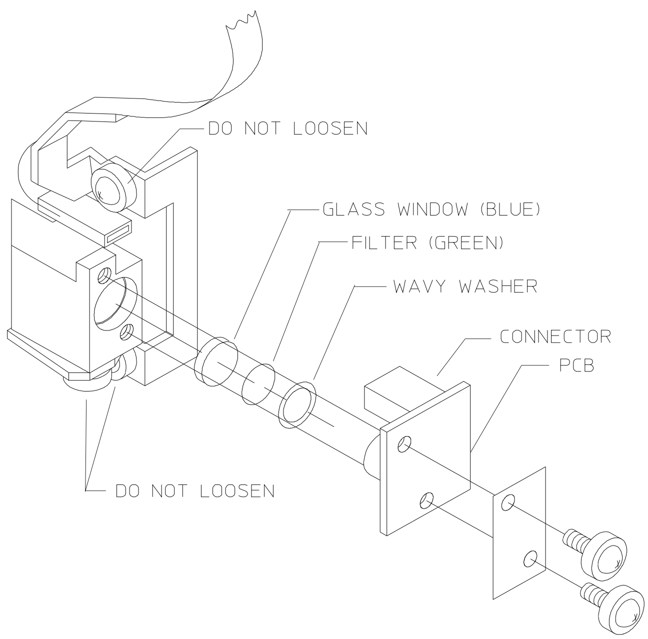


FIGURE 3.9. Brightness Detector Removal

Replacement Notes:

- Use care to not get dirt or fingerprints on the detector optics or on the turret lens.
- If any of the small optics have fallen out of the housing, make sure they are clean before reinstalling them, and that they are installed in the correct order (FIGURE 3.9).

Follow-up Checks/Adjustments:

See Table 3-1.

3.30 Lower Turret Removal

1) Remove the front cover (3.2).

2) Remove two M4 screws on the side of the lower turret pulley to detach the lower turret assembly.

   Carefully let the lower turret assembly hang by its cable.

Replacement Notes:

- Adjust the belt tension (Section 4).
- Check clearances of Y-motor edge detector.

Follow-up Checks/Adjustments:

See Table 3-1.

3.31 Turret Cable Assembly Removal

Replacement Notes:

- If a turret cable requires replacement, all three cables must be replaced as an assembly.

⚠ ***CAUTION —*** *Before removal of the old cable assembly, carefully note cable routing and taping. Failure to properly install the turret cable assembly will cause turret binding and turret noise.*

Follow-up Checks/Adjustments:

See Table 3-1.

3.32 Chinrest / Headrest Switch Assembly Removal

1) Remove the operator panel (3.4).

2) Remove the three M4 screws securing the chinrest switch assembly bracket.

3) Remove the chinrest switch assembly.

Replacement Notes:

- None

Follow-up Checks/Adjustments:

See Table 3-1.

3.33 Chinrest Y-axis Belt / Motor Removal

Belt:

1) Remove the front cover (3.2).

2) Remove the four M4 screws securing the chinrest motor to the bracket.

3) Slip the belt off over the lip of the chinrest motor pulley.

4) Slip the belt off over the lip of the chinrest pulley.

Motor:

1) Remove the front cover (3.2).

2) Make note of the cable ties holding the cable to the chinrest motor, then cut the cable ties. Disconnect the cable at the connector.

3) Remove the four M4 screws securing the chinrest motor to the bracket.

4) Slip the belt off over the lip of the chinrest motor pulley, and remove the motor.

Replacement Notes:

- Adjust the belt tension (Section 4).
- Be sure to secure the connector to the motor body with a cable tie.
- Reattach the ground wire under the motor mounting screw.

Follow-up Checks/Adjustments:

See Table 3-1.

3.34 Patient Support Horizontal (X-axis) Belt / Motor Removal

Note *— The headrest drive belt drives the headrest horizontally in sync with the chinrest. Anytime the headrest belt is off, if either the headrest or chinrest lead screw is rotated independently, the headrest and chinrest will become misaligned.*

- Remove the front cover (3.2).
- Pull the headrest drive belt (long belt) to move the chinrest horizontal lead screw nut up against its limit nearest to the X-motor. (Since the chinrest and headrest horizontal lead screws are linked by the belt, both lead screws will rotate when the belt is pulled.)

Belt Removal:

1) Remove the four screws securing the chinrest assembly to the front cover assembly (FIGURE 3.10).

2) Lift the chinrest assembly away from the front cover assembly and remove the belt from the X-motor pulley.

3) Maneuver the belt downward between the headrest pulley and the front cover assembly until the belt is free.

Motor Removal:

1) Remove the four M4 screws securing the chinrest assembly to the front cover assembly (FIGURE 3.10).

2) Remove the chinrest assembly.

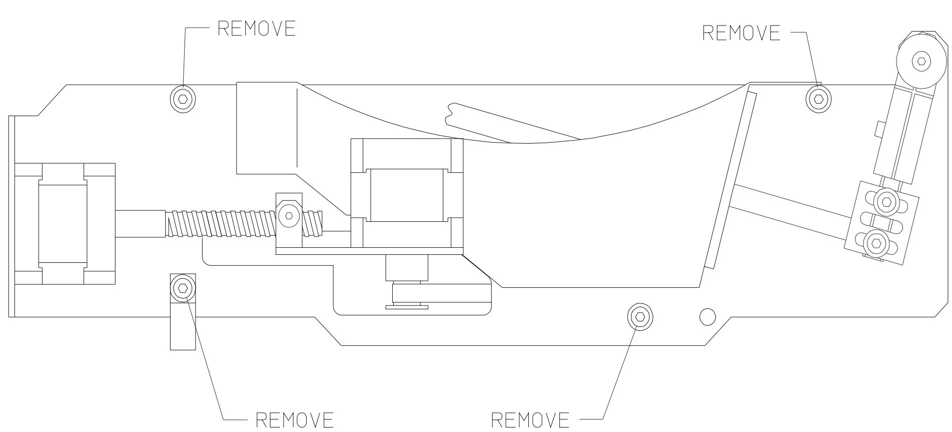


FIGURE 3.10. Removing the Chinrest Assembly

3) Disconnect the "X-MOTOR" cable (P4) from the Patient Support Interconnect PCB. Cut any cable ties holding this cable to the Patient Support Interconnect PCB.

4) Rotate the motor shaft to position the lead screw nut close to the X-motor (FIGURE 3.11).

5) Loosen the M3 setscrews holding the lead screw to the motor shaft.

6) Grasp the chinrest and move it away from the X-motor until the lead screw disengages from the motor shaft.

7) Remove the four M4 screws securing the X-motor to the bracket, and remove the motor.

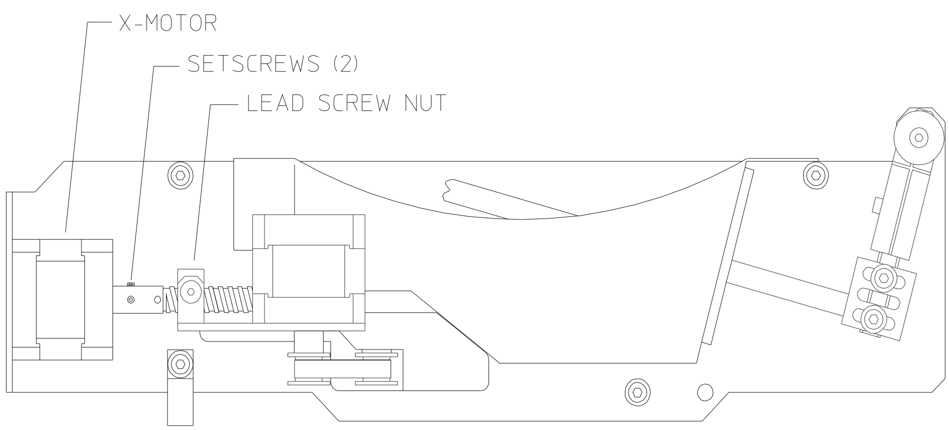


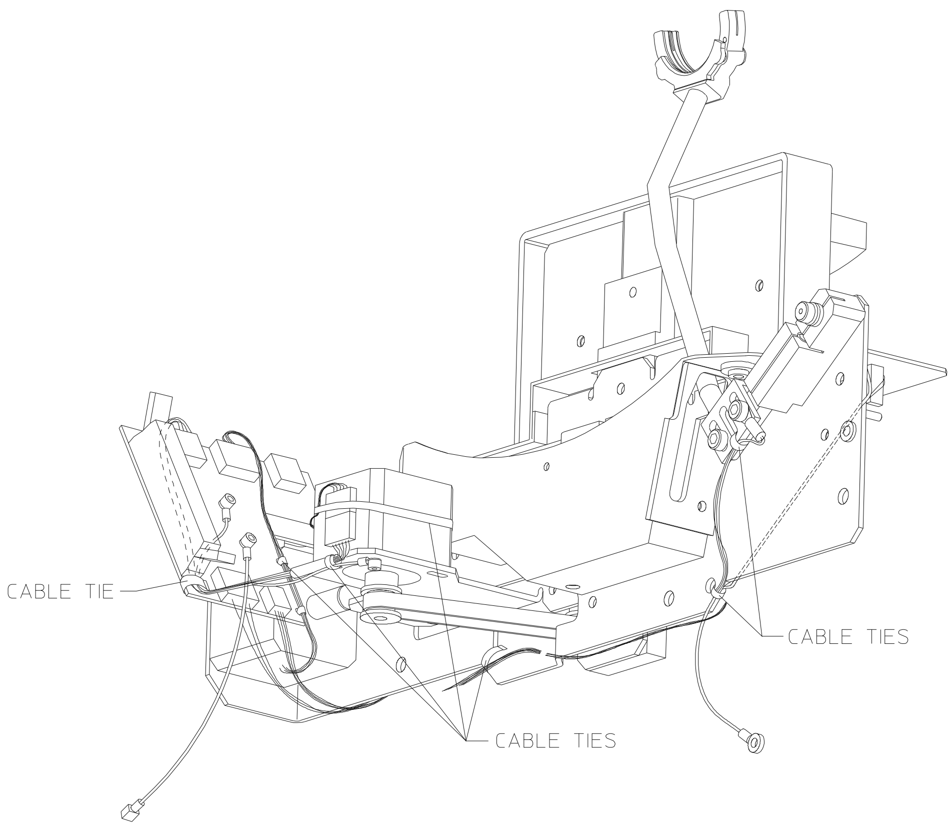
FIGURE 3.11. Disconnecting the X-Motor Lead Screw from the Motor Shaft

Replacement Notes:

- Be sure to reinstall a nylon washer on the motor shaft before attaching the lead screw. The lead screw should be seated on the motor shaft all the way up to the motor body before tightening the setscrews.
- Before installing the belt:
  After the lead screw is secured to the motor shaft, rotate the shaft to position the lead screw nut up against its limit nearest to the motor. Then set the headrest horizontal lead screw nut to the same relative position (check for the same amount of thread showing on both lead screws).
- Adjust the drive belt (Section 4).
- Be sure to reinstall the wire clamp and carefully position the wires to prevent contact with any of the moving chinrest mechanism (see FIGURE 3.11 for routing of cables and locations of cable ties).

Follow-up Checks/Adjustments:

See Table 3-1.



Note: *Dotted line indicates cable lies behind object shown in foreground.*

Note: *The cable emerging from base of trial lens holder must have adequate slack for lowering the trial lens holder.*

FIGURE 3.12. Trial Lens Assembly Cable Routing and Cable Ties

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3.35 Chinrest Vertical Slide and Lead Screw Removal

1) Remove the front cover (3.2).

2) Remove the four M4 screws securing the chinrest assembly to the front cover (FIGURE 3.10), and remove the assembly.

3) Remove the plastic chinrest (2 - M4 screws).

4) Remove the chinrest cover bracket (2 - M4 screws).

5) Turn the pulley on the chinrest X-axis motor to move the chinrest assembly left or right to gain access to the screws holding the vertical lead screw and vertical slide.

Replacement Notes:

- Before installing the headrest drive belt, set the chinrest and headrest horizontal lead screw nuts both to the same relative position (check for the same amount of thread showing on the same side of the lead screws).
- Adjust the drive belt (Section 4).

Follow-up Checks/Adjustments:

See Table 3-1.

3.36 Chinrest Horizontal Slide Removal

1) Remove the front cover (3.2).

2) Remove the four M4 screws securing the chinrest assembly to the front cover (FIGURE 3.10).

3) Remove the two M4 screws holding the trial lens trap.

4) Remove the two M4 screws holding the stationary part of the horizontal slide.

5) Remove the two M4 screws holding the moving part of the horizontal slide.

6) Remove the entire slide assembly out from between the stationary bracket and the movable bracket of the chinrest assembly.

Replacement Notes:

- Check the tension of the vertical (Y-axis) and horizontal (X-axis) drive belts (Section 4).

- Straighten the bristles on the trial lens trap brush to position them to the inside of the slot in the trap.
- Before installing the headrest drive belt, set the chinrest and headrest horizontal lead screw nuts both to the same relative position (check for the same amount of thread showing on the same side of the lead screws).

Follow-up Checks/Adjustments:

See Table 3-1.

3.37 Trial Lens Holder Assembly Removal

1) Remove the front cover (3.2).

2) Disconnect the "TRIAL LENS LEDS" cable (P5) from the Patient Support Interconnect PCB. Cut any cable ties securing this cable.

3) Remove the two M4 screws that secure the trial lens holder assembly to the pivot shaft.

4) Cut the cable tie that secures the ground wire and trial lens LED wires to the trial lens holder assembly. (The same ground wire will be used with the replacement trial lens holder.)

5) Carefully manipulate the lower end of the trial lens holder and attached cable out through the slot in the trial lens trap.

If the pivot block removal is also required, continue as follows:

⚠ ***CAUTION —** A captive steel ball and compression spring will fall loose as the pivot block is removed (FIGURE 3.13).*

6) Hold the pivot block against the main patient support bracket, and remove the pivot screw from the trial lens holder (FIGURE 3.13).

7) Once the pivot screw has been removed, slowly raise the pivot block and catch the steel ball and compression spring as they are released.

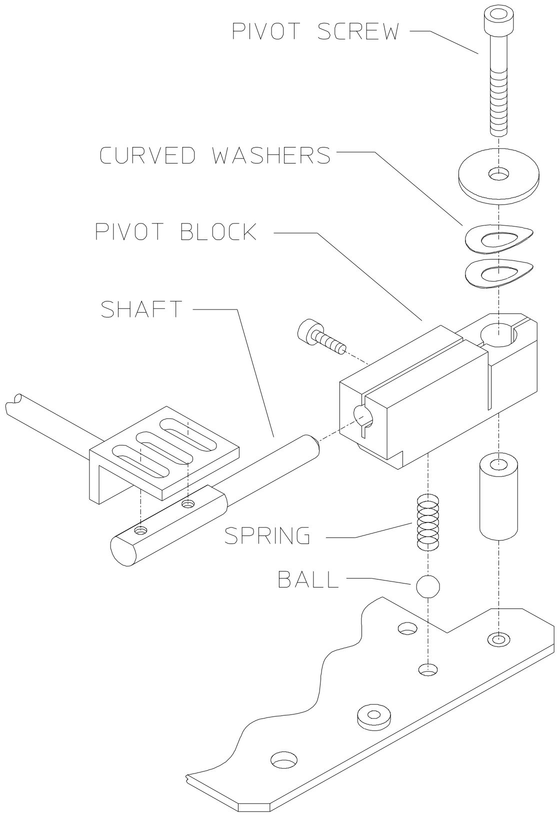

FIGURE 3.13. Pivot Block Removal

Replacement Notes:

- Be sure that the steel ball and compression spring are in place before securing the pivot block.
- Make sure that the curved washers are positioned on the pivot screw with the correct side against the flat washer (FIGURE 3.13).
- Before reinstalling the trial lens holder assembly in the patient support assembly, check for proper operation of the edge detector flag when the trial lens holder is raised and lowered. Ensure that the compression spring that holds tension against the flag is not over-compressed and preventing proper movement of the flag.
- Before reinstalling the front cover, lift and lower the trial lens holder several times to check that it operates properly and that the wires to the trial lens holder are not catching or rubbing against the cover.
- Refer to Section 4.9.6 for Trial Lens Holder alignment.

Follow-up Checks/Adjustments:

See Table 3-1.

3.38 Top Fan Removal

1) Remove front and rear covers (3.2, 3.3).

2) Unplug the fan cable.

3) Remove the two M3 screws attaching the fan bracket to the chassis.

Replacement Notes:

- Make sure that the fan wires are positioned in the narrow slot in the edge of the plastic fan housing, and that they are not pinched when the fan mounting screws are tightened.

Follow-up Checks/Adjustments:

See Table 3-1.

3.39 Bowl IR LED Assembly Removal

1) Remove the front and rear covers (3.2, 3.3).

2) Remove the tape holding the IR LED assembly wires to the outside of the bowl, and unplug the connector.

3) For the right-hand bowl IR LED, slide the connector and wires out towards the front, between the bowl and the baffle and the bottom of the bowl.

Replacement Notes:

- Tighten the left/right IR LED mounting screws only finger tight until after adjustment has been performed.

Follow-up Checks/Adjustments:

See Table 3-1.

3.40 Blue-Yellow Module / Bowl Plug Removal

This procedure is for removing the Blue-Yellow module in units equipped with the Blue-Yellow feature, or the Blue-Yellow bowl plug in units not equipped with the Blue-Yellow feature.

1) Remove the front and rear covers (3.2, 3.3).

2) Remove the two M4 screws and washers securing the Blue-Yellow module or unsnap the Blue-Yellow bowl plug from the bowl.

3) Lift out the Blue-Yellow module or bowl plug from the top of the bowl.

Replacement Notes:

- Make sure that no light is entering the bowl after reinstalling assembly.

Follow-up Checks/Adjustments:

See Table 3-1.

3.41 Bowl Removal

***CAUTION** — Be careful not to damage or dirty the bowl.*

1) Remove the front and rear cover assemblies (3.2, 3.3).

2) Remove the projection assembly (3.17).

3) Remove the blue-yellow module (if so equipped) or blue-yellow bowl plug (3.40).

4) Remove the four M4 screws securing the front of the bowl to the chassis.

5) Disconnect:
   - The ribbon cable on the Fixation Interconnect PCB.
   - Camera cable from the lower-left corner of the Motor Driver PCB. (This is the cable from the camera PCB.)
   - The power Connector on the backside of the Motor Driver PCB.

6) Remove the screw that secures the chassis end of the ground wire that comes from the right-hand bowl lamp assembly.

7) Remove two M4 screws securing the left end of the air baffle located below the bowl.

⚠ ***CAUTION —*** *In the next step, watch closely to prevent the camera from catching on cables behind the bowl and the IR LEDs from catching on the lower front baffles.*

---

8) Flex the baffle outward. While holding out on the baffle, lift the bowl until it clears the chassis on the left side, then move the top of the bowl outward and lift it out of the instrument.

9) If a new bowl is going to be installed, note how the wires are routed and taped on the old bowl before you begin stripping it.

Replacement Notes:

- A replacement bowl comes completely stripped. (See procedure 3.44 for installation of the IR bowl plugs on Models 720-*i*.)
- On a replacement bowl, secure the wires to the backside of the bowl as they were on the original bowl.
- Make sure the foam gaskets are properly seated between the bowl and the fan housing of the top fan.
- When reinstalling the bowl, carefully guide the end of the camera past the DC power harness in the instrument chassis.

Replacement Notes:

- None

Follow-up Checks/Adjustments:

See Table 3-1.

3.42 Reflex Gaze LED Removal

The Reflex Gaze LED is part of the Fixation Interconnect PCB.
(See Fixation Interconnect PCB removal, Section 3.15)

Note *— The reflex gaze LED is used in the Model 720-i for additional eye illumination to help differentiate the iris and pupil in the video insert for patients with a dark iris. In the Models 740-i and 750-i, the reflex gaze LED is used to monitor gaze tracking.*

3.43 Bowl Lamp Assembly Removal

1) Remove the front cover assembly (3.2).

2) Remove the rear cover assembly (3.3).

3) Loosen the four bowl mounting screws to relax the bowl.

4) Unplug the right/left bowl lamp connector from the Fixation Interconnect PCB.

5) Remove the tape securing the bowl lamp cable to the bowl.

6) Remove the hex head screw securing the ground cable to the frame.

7) Remove the two hex head screws (inside the bowl) securing the lamp assembly to the bowl.

8) **For Right Bowl Lamp:** Remove the complete lamp assembly by lifting up and maneuvering it out from the front of the instrument, between the bowl and frame.

   For Left Bowl Lamp: Remove the complete lamp assembly by lifting up and maneuvering it out from the back of the instrument, between the bowl and frame.

Replacement Notes:

- The bowl lamps must be replaced in pairs only.
- The bowl lamp baffles snap into place.

Follow-up Checks/Adjustments:

See Table 3-1.

3.44 IR Bowl Plug Removal / Installation

1) Remove the two M4 screws holding the IR Illumination Plug Bracket to the bowl.

2) When installing the IR Bowl Plug, you must rotate the plug until it's contoured tip is flush with the inner surface of the bowl before tightening the screw that holds it to the bracket.

Replacement Notes:

- None

Follow-up Checks/Adjustments:

See Table 3-1.

3.45 Quarter-Turn Fastener Replacement

The 1/4-turn fastener consists of a 1/4-turn stud and an anchor. The stud is commonly captured in place by a small plastic washer. The anchor is held in place by an internal, spring-loaded tab at the upper (outer) end of the anchor.

If it becomes necessary to replace the anchor, proceed as follows.

To remove the anchor:

1) Insert a 1/4"-wide screwdriver blade into the two small slots in the spring-loaded tab at the upper end of the anchor.

2) Push in on the tab with the screwdriver and turn it 1/8 turn **counterclockwise**, to latch the tab in its install/remove position. Remove the screwdriver and push the anchor out towards the front.

To install the anchor:

3) Make sure that the spring-loaded tab inside the anchor is latched in its install/remove position (1/8 turn counterclockwise), then insert the anchor into its hole in the assembly.

4) Insert a 1/4"-wide screwdriver blade into the two small slots in the spring-loaded tab.

5) Push in on the tab with the screwdriver and turn it 1/8 turn clockwise to its anchored position. Remove the screwdriver and check that the anchor is properly secured in place.

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3.46 System Fuse Replacement

Two fuses are located in the rear of the unit.

CAUTION: Carefully follow these instructions to safely replace the system fuses. Always power down the system and unplug the power cord before proceeding. At all times, use the minimum force necessary to accomplish each step so as to prevent damage or injury.

1. Power down the system. Unplug the power cord at both ends, for safety and easy access.

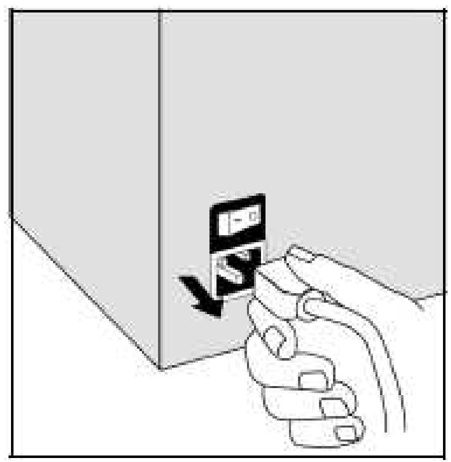


Figure 3.14.

2. Using a narrow-bladed screwdriver, gently pry open the power entry module fuse holder to expose and remove the fuse holder assembly.

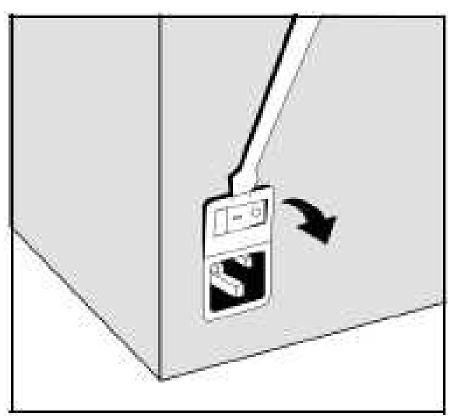


Figure 3.15.

3. Slide out each fuse holder (marked with an arrow) and check the filament for breakage.

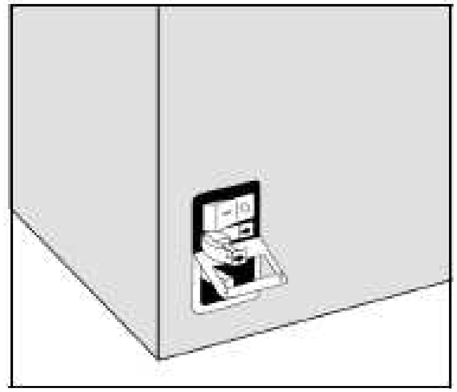


Figure 3.16

Fuse type and rating for both system fuses:

- T4A, 250V; (100 – 240V ~)

WARNING: Always replace fuses with the same type and rating. Failure to do so may create a risk of fire.

4. Insert the new fuse(s) in the holder(s). Slide the holders back into the housing with white arrows pointing to the right. Push the cover up and in until it snaps closed.

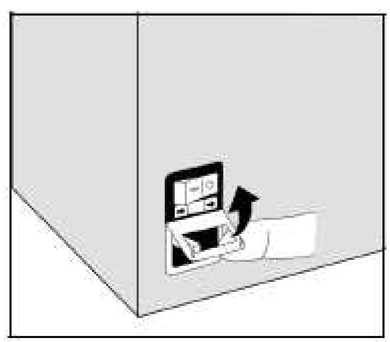


Figure 3.17.

5. Plug in the power cord at both ends.

6. Your system is now ready to be powered on.

3.47 Power Table Fuse Replacement

Note: HFA 120 & HFA 230 Power Table only.

Two fuses are located just below the table power cord inlet, near the floor.

⚠ **CAUTION:** Carefully follow these instructions to safely replace the table fuses. Always power down the table and unplug the power cord before proceeding. At all times, use the minimum force necessary to accomplish each step so as to prevent damage or injury.

1. Power down the table. Unplug the table power cord at both ends, for safety and easy access.

Figure 3.18. Table power entry module / fuse holder assembly

Figure 3.19. Removing the fuse holder assembly

2. The fuse holder can be removed out of the housing by grasping it while pressing down on the center tab of the fuse holder and firmly pulling out.

3. Check both fuse filaments for breakage.

Fuse type and rating for both system fuses:

- T8A, 125V; (HFA 120)
- T6.3A, 250V; (HFA 230)

WARNING: Always replace fuses with the same type and rating. Failure to do so may create a risk of fire.

4. Insert the new fuse in the holder. Slide the holder back into the housing until it snaps closed.

5. Plug in the power cord at both ends.

6. Your table is now ready to be powered on.

3.48 Stimulus Projection Lamp Replacement

This lamp is responsible for projecting the standard light stimulus. With the aid of color filters, it is also used to create red and blue stimuli for color testing. If needed, you may order a new lamp by calling the Carl Zeiss Meditec Parts Department and asking for:

P/N 266002-1106-082 (Projection Lamp).

1. Turn off the HFA II-*i* and lower the table.

2. To remove the top access panel, rotate it counterclockwise until you align the lamp symbol on the cover with the raised dot that is molded into the top of the case.

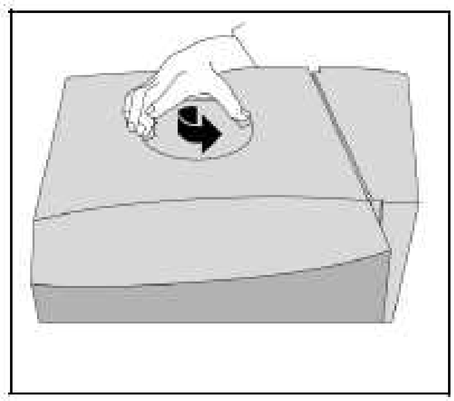


Figure 3.20.

3. Standing in front of the bowl opening, you will find that the projection lamp is located inside the open case top, at the 12 o'clock position.

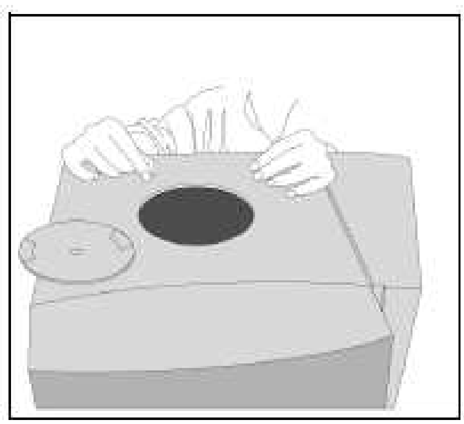


Figure 3.21.

CAUTION: Allow the lamp to cool completely (approximately five minutes) before handling it.

CAUTION: Do NOT touch the two disk-shaped filters.

4. Remove the connector cable by pulling its connector straight upward. Then use a screwdriver to loosen the screw.

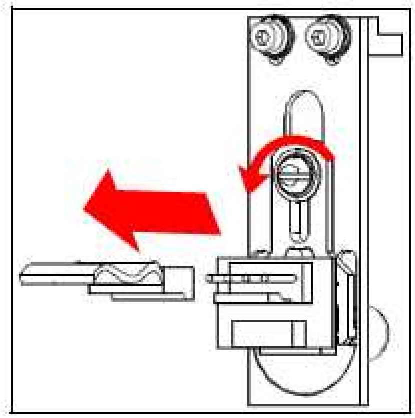


Figure 3.22. Connector Removal

5. Now, slide the wishbone-shaped plate that holds the lamp assembly in place away from you.

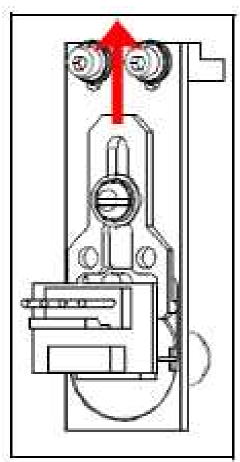


Figure 3.23.

6. Remove the old expended lamp assembly. Insert the replacement lamp into the housing. Note the notch in the base of the lamp housing lines up with the pin to the right of the assembly.

Note: Do NOT touch the glass part of the lamp with your fingers, as this will shorten the life expectancy of the lamp. If your finger touches the glass portion of the lamp, wipe the lamp clean with a soft cloth.

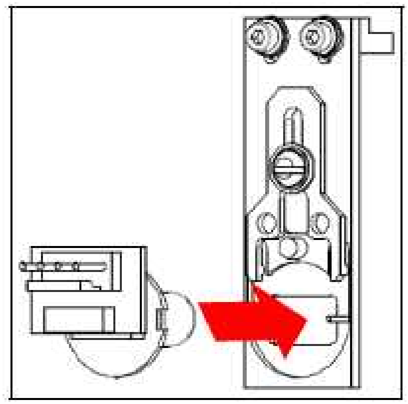


Figure 3.24.

7. Slide plate back into position, tighten screw and replace connector cable.

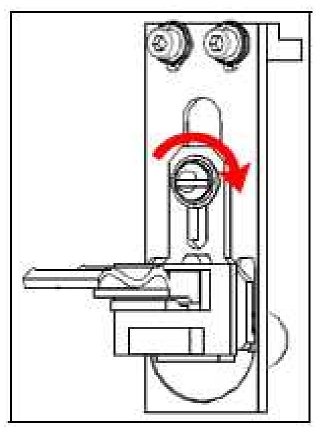


Figure 3.25.

8. To replace the top access panel, insert the panel into the opening. As you do so, align the lamp image on the lid with the raised dot on the underlying case. Rotate the panel clockwise until the lamp symbol aligns with the open-circle symbol.

3.49 Air Intake Filter Replacement

Note: To ensure proper cooling of the instrument, the air filter must be cleaned or replaced every three months (P/N 266010-0029-381).

1. Locate the air filter cover underneath the overhang on the back of the instrument. Press firmly with your finger or thumb on the middle of the top surface of the cover, and push down and pull out to unlatch it. Tilt the air filter cover open on its hinges and remove the air filter from its two locating pins.

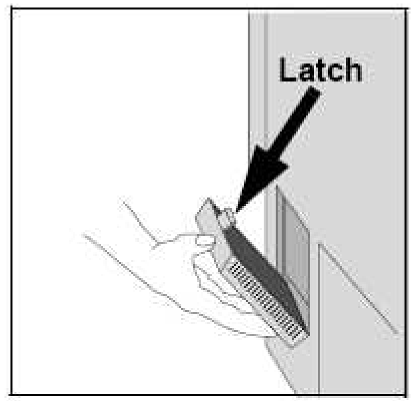


Figure 3.26.

2. Clean or replace the air filter. For cleaning, you should shake the air filter a few times and flick it with a fingertip to dislodge trapped dust. The filter may be rinsed with water, but make sure the filter is completely dry before Step 3. If you wish to replace the air filter, call the Carl Zeiss Meditec Parts Department and order a “Fan Filter” (P/N 266010-0029-381).

3. Return the clean and dry air filter to the locating pins in the air filter cover. Close and latch the air filter cover.

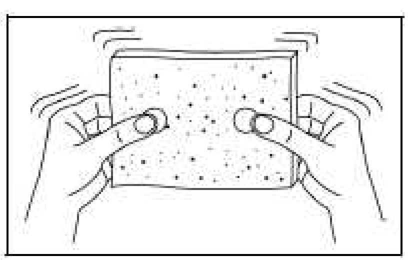


Figure 3.27.

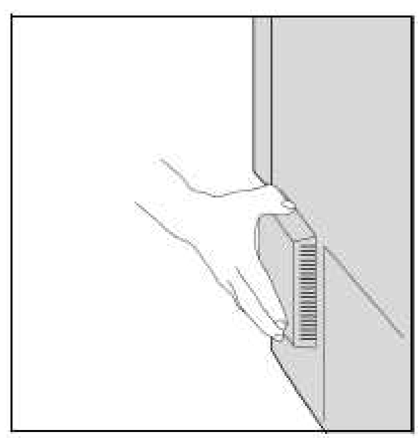


Figure 3.28.

Section 4 – Adjustment / Calibration

Notes:

4.1 Introduction

This section contains the procedures for adjustment and calibration of the HFA II-*i*. It is important that you use Table 3-1 in Section 3 to determine when adjustments/calibrations are required following removal/replacement of various parts and assemblies of the HFA II-*i*.

The information contained here reflects the latest revision level of software as of the time of this writing. Always check your Service Bulletins for possible subsequent changes to these procedures.

Calibration and Adjustment Flow Chart

The flowchart shown on the following page provides an overview of all required instrument calibrations and adjustments. Additionally, each block contains the section number in this manual where detailed procedures can be found for that specific calibration or adjustment.

Calibration/Diagnostics Access, Diagnostics Menu, and Calibration Menu selections are all software options. That is, each of these blocks is available via a menu screen. Whereas, the other blocks are all mechanically related adjustments and are not available via software.

> ***Note:*** *The Other blocks, labeled Trial Lens Holder, Camera Focus, and Bowl IR LEDS/Mirror, are mechanical adjustments that must be checked/performed prior to performing the related software calibrations of Position and Intensity.*

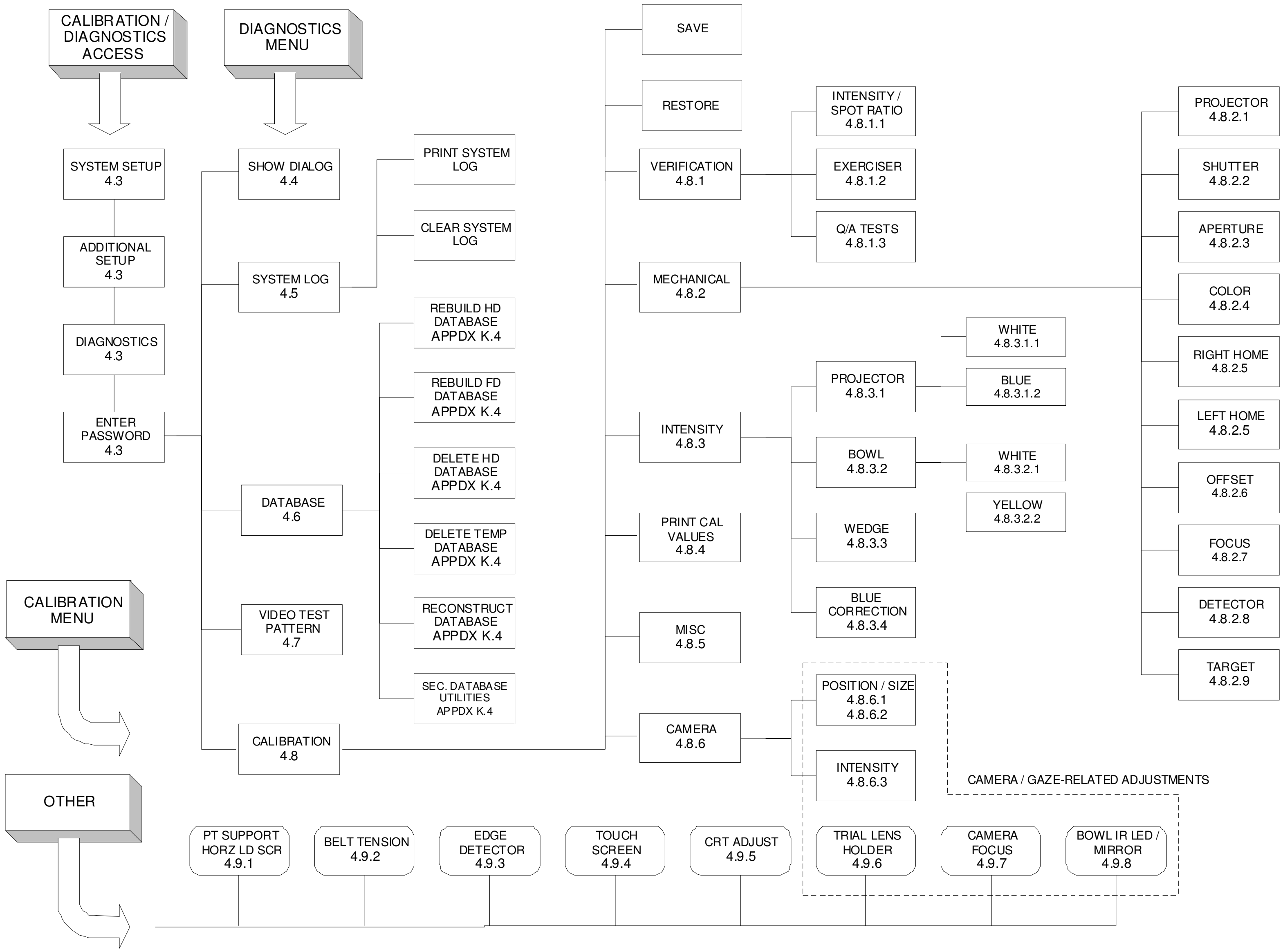


FIGURE 4.1. Calibration / Adjustment Flow Chart

4.2 Related Procedures

4.2.1 HFA II-*i* Calibration and Service Guidelines

Notes:

1. *Various procedures within the Adjustment / Calibration section make reference to HFA II-i White Light Verification Data Printouts. How these printouts and other required service paperwork are utilized on an HFA service call is described in Section 1. Section 1.3.2 (Three Steps to Completing an HFA II-i Service Call) and Section 1.3.3 (HFA II-i Field Service Paperwork Requirements) provide a basic approach to servicing the HFA II-i and the required paperwork needed to complete the call.*
2. *Following any calibration procedure that has calibration values stored on the hard drive, storage of the new values must be verified by cycling the power off-on before you perform final system checkout. If values obtained during calibration are not within the expected range, those values are held only in temporary storage and not written to the hard drive. When power is turned off, these values are erased and calibration reverts to its old status.*

There are several calibration procedures that require the tool stand to be placed on the chin rest (see FIGURE 4.2). Once the tool stand has been installed, ensure that the metal standoffs touch the forehead rest when performing the indicated calibration.

NOTE: Push the Tool Stand with your finger as shown or use the Fore Head Rest Clip Tool as shown in the Appendix.

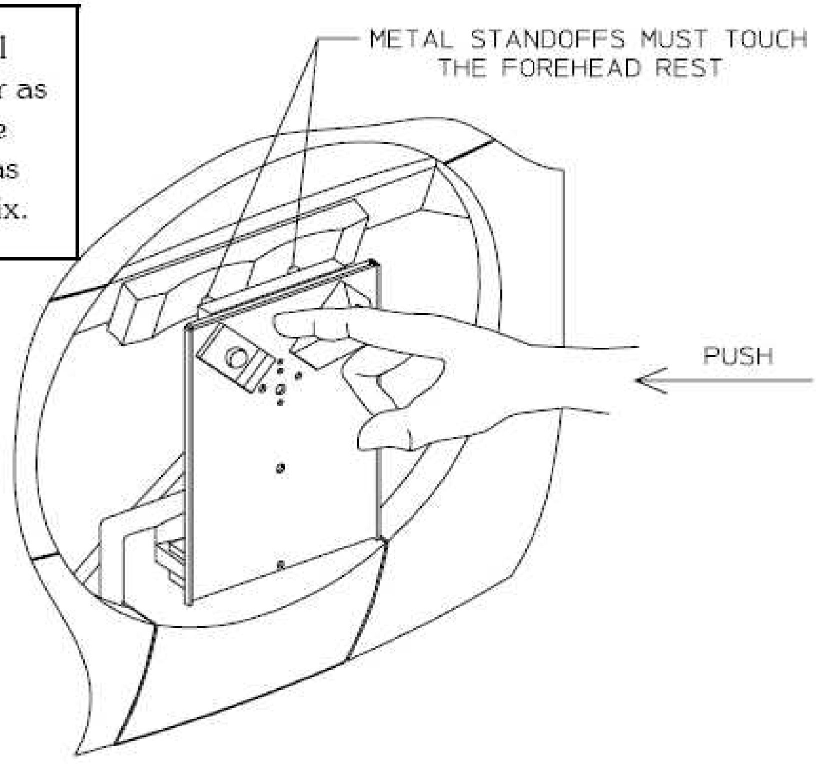


FIGURE 4.2. Proper Tool Stand Positioning

4.3 Calibration / Diagnostics Access

Access to the HFA II-*i* calibration and diagnostics menus is password protected. The password is proprietary and should be carefully protected.

To initiate access to the calibration and diagnostics functions, perform the following:

- From the instrument's Main Menu, select System Setup.
- Select Additional Setup.
- Select Diagnostics.
- When the ten-key pad appears, type in the password. Then select [Enter].

4.4 Show Dialog

Pressing the Show Dialog button will display a ten-key pad. This selection is left over from Development. Pressing [Enter] will return to the previous menu.

4.5 System Log

The System Log option enables the Field Support Engineer to either print/save or clear the System Log. Refer to Appendix J for a detailed description of the System Log and its uses.

4.6 Database

The database selection provides a number of utilities that can be used by the Field Support Engineer when problems such as data loss or corruption have occurred to the patient database. The database utilities are accessed via the Calibration and Diagnostics menu, however, they have nothing to do with actual instrument calibration and adjustment. As a convenience, Appendix K has been developed to describe each utility and their use in correcting database related problems. Please refer to Appendix K for additional information.

4.7 Video Test Pattern

This option allows the Field Support Engineer to display a test pattern on the CRT. The test pattern may be used when performing CRT alignment and symmetry adjustments. There are options to display the pattern for two minutes or one hour. Cycling power is OK.

4.8 Calibration

The Calibration main menu is the principle, or main menu for performing instrument verification and calibration. The menu consists of the following selections:

Verification .... Used to verify the Before and After light intensity calibration.

Mechanical .... Used to calibrate the projection and turret assemblies.

Intensity.................. Used to calibrate the spot and bowl intensities.

Print Cal Values....... Used to print out the EEPROM settings and wedge values.

Miscellaneous .... Used only by Manufacturing.

Camera .... Used to calibrate the CCD camera and gaze illuminators.

Save .... Used to save the calibration data to the floppy calibration diskette.

Restore .... Used to restore the calibration data from the floppy calibration diskette to the hard drive.

4.8.1 Verification (Obtaining Before and After Light Intensity Calibration Values)

4.8.1.1 Intensity / Spot Ratio Using the Minolta Light Meter Kit

Note: *Soligor users go to 4.8.1.2.*

Purpose

The purpose of this procedure is to determine the current state of the instrument light intensity calibration, both before and after servicing the instrument. The before and after information is compared to determine if the instrument has had any significant light intensity calibration shift during service.

Special Tools / Equipment Required

- ***"Minolta" Light Meter Kit***
- Digital Multimeter, Fluke 8060A or equivalent
- Bowl Shroud
- Small Flashlight

Prerequisites

All white intensity related calibrations must be performed with dim room light. The dimmer the instrument light, the darker the room must be. Because of the very low blue light levels, blue-yellow calibration requires total darkness. (Use a small flashlight occasionally to read meters, etc.)

Procedure

Notes:

- *You will print out all values obtained during this procedure. All values are automatically recorded on the HFA II-i Light Intensity Verification Data printouts (Before service or After service, as appropriate).*
- *If the service call requires both Before and After verification of the light intensities, a Calibration Shift Worksheet must be completed to determine the difference or 'shift' in light intensity. Refer to Appendix I, Service Forms.*

Preparation

Depending on the instrument model, perform the preparation steps for Models 720-*i* / 740-*i* / 745-*i* / or 750-*i*. (The Model 720-*i* does not offer the foveal threshold test; to acquire values surrounding the foveal area a 10-2 SITA test must be run.) These two tests provide a quick reference for determining an instrument's light intensity quality.

For Models 740-*i* / 745-*i* / 750-*i*

- Select a threshold patient test and turn on foveal threshold. Start the test, obtain your foveal threshold value, pause the test, and then select the Print icon. Your foveal value will be printed out. Label this printout either Before or After (as required).

For Model 720-*i* (This test will take approximately three minutes to run.)

Note: *You can print partial after Primary prints.*

1) Select the 10-2 test from the main menu (or go into Show Test Library, select Threshold, then 10-2).

2) In the Patient Data screen, enter your birth date, then select Proceed.

3) When the 10-2 test comes up, select Change Parameters, set Test Strategy to Sita-Fast, and then press Selection Complete.

4) Start the test. With patient response button in hand, position yourself on the chin rest. With both eyes open and fixating on the yellow target, complete the test.

5) The test will take about 2 to 3 minutes to complete. When finished, you will hear two beeps and the test results will be displayed.

6) Select the Print Icon and print the results, but do not save them to disk.

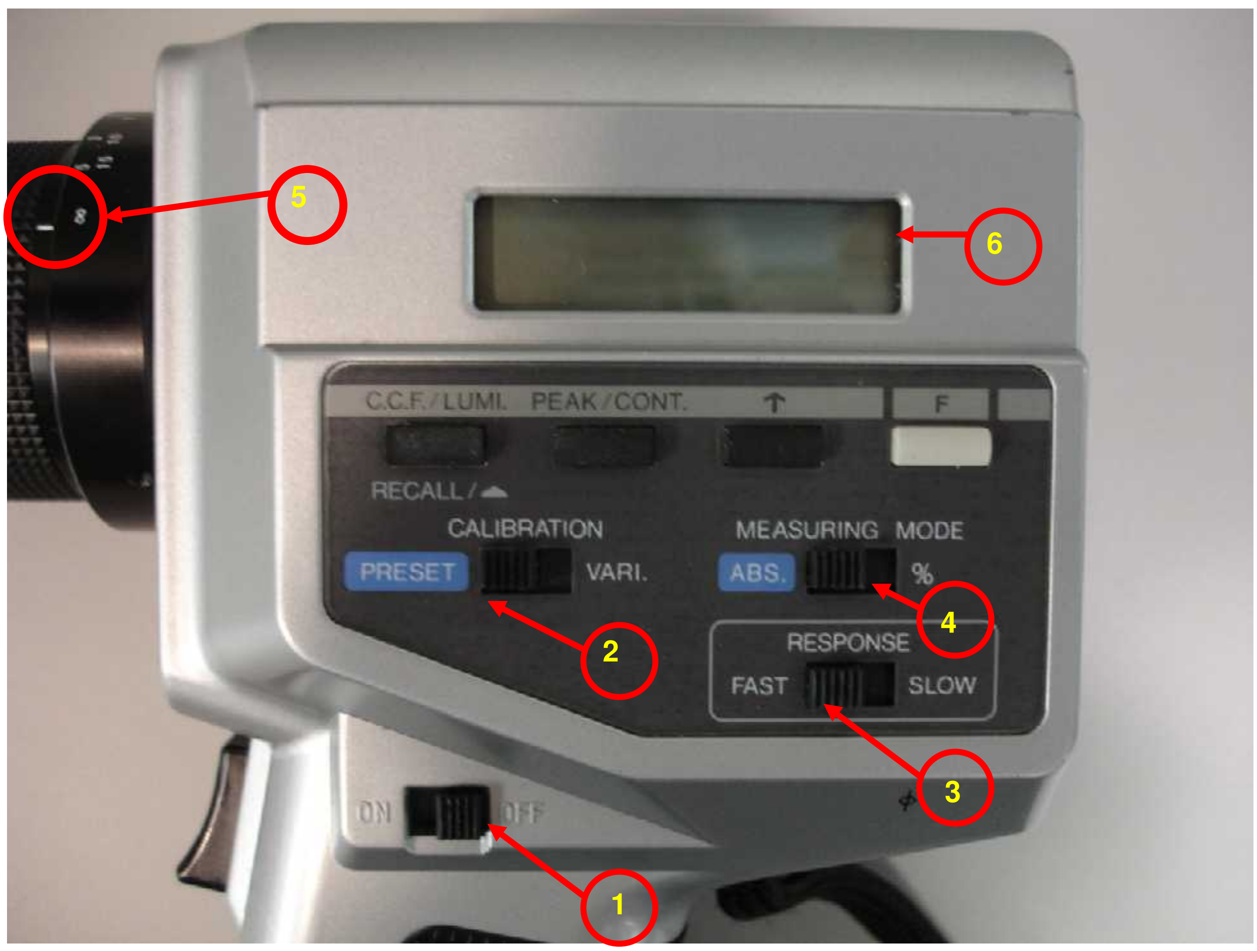
7) The four dB numbers nearest fixation (center of field) should be the highest values. Compare these numbers as you would with the Foveal Threshold values you receive on Models 740-*i* / 745-*i*, 750-*i*. Label this printout either Before or After (as required).

4.8.1.1.1 Minolta Meter Set Up and Preparation for Testing

Note – *Allow three minutes for the meter to warm up prior to measurement.*

1) Set the Power switch to ***On***.
2) Set the Calibration switch to the ***Preset*** position.
3) Set the Response switch to ***Fast.***
4) Set the Measuring Mode to ***ABS.***
5) Set the Focus to ***Infinity***.
6) Set the Meter Display to display in ***Foot-Lamberts***.
7) In a dark area and with the lens cap on, hold in the trigger until a reading appears on the meter display.

Note – *Verify that the intensity does not exceed 0.01 Foot/Lamberts. If the intensity exceeds this specification after ensuring that the lens cap is seated fully and all switches are set correctly, contact the CZMI Calibration Department for instructions.*



Minolta Meter Set Up

4.8.1.1.2 Loading the P Factors into the HFA Calibration Menu

Refer to Appendix E.

4.8.1.1.3 White Spot Intensity Verification

1) On the HFA **Main** menu, select ***Setup*** menu.
2) Select ***Additional*** menu.
3) Select the ***Diagnostics*** menu.
4) Enter the password to enter the ***Diagnostics*** menu.
5) Select ***Calibration***.
6) Select ***Verification***.
7) Select ***Intensity/Spot Ratio***.
8) Select ***Before*** or ***After*** as appropriate.
9) Select ***White***, then ***31/0dB***.
10) Roughly center the meter aiming circle within the projected spot. Hold the trigger in while you position the light meter to maximize the reading on the meter display by positioning the chinrest via the chinrest control switch. (First left/right, then up/down, then refine with left/right again. If you subsequently move the light meter accidentally, repeat this step in order to maximize the meter reading again.)
11) Enter the reading from the meter display directly into the ten-key pad and select ***Enter***. The calculated foot-lamberts will be displayed next to #31/0dB. Also displayed is the tolerance for each reading. If an asterisk (*) appears, this indicates a reading that is out of tolerance.

    Note – *Although the Minolta meter reads in foot-lamberts, some corrections are made at each intensity level using the P factors. The foot-lamberts reading calculated on the screen will most likely be slightly different than the reading displayed on the meter.*

12) Select ***#32/4dB***. Pull the meter trigger and enter the meter display reading via the ten-key pad. Press ***Enter***.
13) Select ***#33/9dB***. Pull the meter trigger and enter the meter display reading via the ten-key pad. Press ***Enter***.
14) Select ***#34/14dB.*** Pull the meter trigger and enter the meter display reading via the ten-key pad. Press ***Enter***.
15) Select ***#35/19dB.*** Pull the meter trigger and enter the meter display reading via the ten-key pad. Press ***Enter***.
16) Select ***#36/24dB***. Pull the meter trigger and enter the meter display reading via the ten-key pad. Press ***Enter***.

Confidential and Proprietary

17) Select ***#37/29dB***. Pull the meter trigger and enter the meter display reading via the ten-key pad. Press ***Enter***.

18) Select ***#38/34dB***. Pull the meter trigger and enter the meter display reading via the ten-key pad. Press ***Enter***.

4.8.1.1.4 White Bowl Intensity Verification

1) Select ***#61/Bowl***. The bowl lamp warm-up period will begin. (You may cancel from the warm up period when the voltage stabilizes at >20%.)

2) After the warm-up period ends or when the voltage reading has stabilized:
Pull the meter trigger and enter the meter reading via the ten-key pad.

3) Press ***Done***.

   - If the HFA II-*i* is equipped with the Blue-Yellow option, proceed to the Blue Spot Intensity Verification below.
   - If the HFA II-*i* is **NOT** equipped with Blue-Yellow option, select ***Print*** to print out the HFA II-*i* White Light Verification Data printout. Then proceed to Cal/Wedge printout as outlined in the service manual.

4.8.1.1.5 Blue Spot Intensity Verification

1) Select ***Blue*** / ***Yellow***.

2) Allow three minutes for the lamp to warm-up.

3) Select ***#62/0dB***.

4) Roughly center the meter aiming circle within the projected spot. Now hold the trigger in while you position the light meter to maximize the reading on the meter display by positioning the chinrest via the chinrest control switch. (First left/right, then up/down, then refine with left/right again. If you subsequently move the light meter accidentally, repeat this step in order to maximize the meter reading again.)

5) Enter the ***#62/0dB*** meter reading via the ten-key pad on the screen and select ***Enter***. The calculated foot-lamberts will be displayed. Also displayed is the tolerance for each reading. If an asterisk (*) appears, this indicates a reading that is out of tolerance.

6) Enter the ***#63/0dB*** meter reading via the ten-key pad on the screen and select ***Enter***.

7) Enter the ***#64/0dB*** meter reading via the ten-key pad on the screen and select ***Enter***.

8) Enter the ***#65/0dB*** meter reading via the ten-key pad on the screen and select ***Enter***.

4.8.1.1.6 Yellow Bowl Intensity Verification

1) Select ***Blue/Yellow*** and then select ***Bowl***.

2) Allow 3 minutes for the lamp to warm-up.

3) Roughly center the meter aiming circle two inches above the central fixation target. Now hold the trigger in while you position the light meter to maximize the reading on the meter display by positioning the chinrest via the chinrest control switch. (First left/right, then up/down, then refine with left/right again. If you subsequently move the light meter accidentally, repeat this step in order to maximize the meter reading again.)
4) Enter the "Yellow Bowl" meter reading via the ten-key pad on the screen.
5) Select ***Done*** and then ***Print Both*** to print out both the HFA II-*i* White Light and Blue-Yellow Light Verification Data printouts.

4.8.1.1.7 Cal/Wedge Printout

1) From the Main Calibration menu, select PRINT CAL VALUES.
2) On a Printrex printer, the printout will always be done on a single sheet. To get the printout on a single sheet with an HP printer, take the printer off-line and press Form Feed.
3) Proceed to Evaluating Results and evaluate the HFA II-*i* Light Verification Data printouts and Cal/Wedge printout results as indicated below.

4.8.1.1.8 Evaluating Results

Note: *An "Asterick" flags reading out of calibration.*

4.8.1.1.9 Evaluating White Light Verification Data Printout Results

- Projector Voltage must be less than 10 volts.
- Spot Positions and Background (Bowl):
  - All must fall within the confines of the table.
  - The dB Spread can be no more than 1.0 dB.

4.8.1.1.10 Evaluating Blue-Yellow Verification Data Printout Results

- Spot Positions and Background (Bowl):
  - All must fall within the confines of the table.
  - The dB Spread can be no more than 1.5 dB.

4.8.1.1.11 Evaluating Cal/Wedge Printout

The values on the cal/wedge printout must fall within the ranges indicated in Appendix Table H-1.

4.8.1.2 Intensity / Spot Ratio Using the Soligor Light Meter Kit

Note: *Minolta users go to 4.8.1.1.*

Purpose

The purpose of this procedure is to determine the current state of the instrument light intensity calibration, both before and after servicing the instrument. The before and after information is compared to determine if the instrument has had any significant light intensity calibration shift during service.

Special Tools/Equipment Required

- ***"Soligor" Light Meter Kit***
- Digital Multimeter, Fluke 8060A or equivalent
- Bowl Shroud
- Small Flashlight

Prerequisites

All white intensity related calibrations must be performed with dim room light. The dimmer the instrument light, the darker the room must be. Because of the very low blue light levels, blue-yellow calibration requires total darkness. (Use a small flashlight occasionally to read meters, etc.)

Procedure

Notes:

- *You will print out all values obtained during this procedure. All values are automatically recorded on the HFA II-i Light Intensity Verification Data printouts (Before service or After service, as appropriate).*
- *If the service call requires both Before and After verification of the light intensities, a Calibration Shift Worksheet must be completed to determine the difference or 'shift' in light intensity. Refer to Appendix I, Service Forms.*

Preparation

Depending on the instrument model, perform the preparation steps for Models 720-*i* / 740-*i* / 745-*i* or 750-*i*. (The Model 720-*i* does not offer the foveal threshold test; to acquire values surrounding the foveal area a 10-2 SITA test must be run.) These two tests provide a quick reference for determining an instrument's light intensity quality.

For Models 740-*i* / 745-*i* / 750-*i*

➢ Select a threshold patient test and turn on foveal threshold. Start the test, obtain your foveal threshold value, pause the test, and then select the Print icon. Your foveal value will be printed out. Label this printout either Before or After (as required).

For Model 720-*i* (This test will take approximately three minutes to run.)

Note: *You can print partial after Primary prints.*

1) Select the 10-2 test from the main menu (or go into Show Test Library, select Threshold, then 10-2).
2) In the Patient Data screen, enter your birth date, then select Proceed.
3) When the 10-2 test comes up, select Change Parameters, set Test Strategy to Sita-Fast, and then press Selection Complete.
4) Start the test. With patient response button in hand, position yourself on the chin rest. With both eyes open and fixating on the yellow target, complete the test.
5) The test will take about 2 to 3 minutes to complete. When finished, you will hear two beeps and the test results will be displayed.
6) Select the Print Icon and print the results, but do not save them to disk.
7) The four dB numbers nearest fixation (center of field) should be the highest values. Compare these numbers as you would with the Foveal Threshold values you receive on Models 740-*i* / 745-*i*, 750-*i*. Label this printout either Before or After (as required).

4.8.1.2.1 Soligor Meter Set Up and Preparation for Testing

1) Set up the Soligor light meter on the HFA II-*i* and zero out the meter (Appendix E). (For the Before Service readings, leave all covers on and cover instrument with the bowl shroud.)
2) Set the light meter to position 1.

4.8.1.2.2 Loading the P Factors into the HFA Calibration Menu

Refer to Appendix E.

4.8.1.2.3 White Spot Intensity Verification

1) From the Main Calibration menu, select VERIFICATION, then INTENSITY / SPOT RATIO.
2) Select either BEFORE or AFTER, as appropriate.

   Note: *The Mfg and QA selections are for manufacturing use only. Selecting either of these two buttons will set tolerance values which are much tighter than those required for field service evaluation.*

3) Set up the instrument as follows to calculate the foot-lamberts for you:

   a) Select P1, P2 and P3, and enter the P1, P2 and P3 factors from your Soligor Meter. Select P3B, P3Y and P3F if your light meter has these factors, otherwise enter the BYP3 factor on your meter for P3B and enter the P3 factor for P3Y and P3F.

   b) Select METER and enter your light meter serial number.

   Note: *The Auto Verify and Spot Ratio selections are only used in manufacturing. The Read P Factors use is described in Appendix E.*

4) Select WHITE, then #31/0 dB. A ten-key pad appears on the screen.

   Note: *Allow the projection lamp to remain lit for at least 3 minutes before proceeding to the next step.*

5) Position the light meter roughly on the projected spot, then maximize the reading by positioning the chinrest via the chinrest control switch. (First left/right, then up/down, then refine with left/right again. If you subsequently move the light meter accidently, repeat this step in order to re-maximize the meter reading.)

6) Enter the voltage reading via the ten-key pad and select [Enter]. The calculated foot-lamberts will be displayed next to #31/0 dB. Also displayed is the tolerance for each reading. If an asterisk (*) appears, this indicates a reading that is out of tolerance.

7) Select #32/4 dB and enter the voltage reading via the ten-key pad. Repeat the same procedure for selection #33/9 dB.

8) Switch to meter position 2 on the light meter and repeat the procedure for selection #34/14 dB and then #35/19 dB.

9) Switch to meter position 3 on the light meter and repeat the procedure for selections #36/24 dB, #37/29 dB, and #38/34 dB. (#39 is not used at this time.)

4.8.1.2.4 White Bowl Intensity Verification

1) Select #61/BOWL. The bowl lamp warm-up period will begin. (You may cancel from the warm up period when the voltage stabilizes at >20%.)

   After the warm up period ends or when the voltage reading has stabilized:

2) Enter the voltage reading via the ten-key pad.

3) If the HFA II-*i* is equipped with the Blue-Yellow option, proceed to the Blue Spot Intensity Verification below.

   If the HFA II-*i* is NOT equipped with Blue-Yellow option, select PRINT to print out the HFA II-*i* White Light Verification Data printout. Then proceed to Cal/Wedge printout below.

4.8.1.2.5 Blue Spot Intensity Verification

1) Select BLUE/YELLOW, and then #62/0 dB.
2) Ensure that the light meter is set to position 3.
3) Position the light meter on the projected spot, then maximize the reading by positioning the chinrest via the chinrest control switch. (First left/right, then up/down, then refine with left/right again. If you subsequently move the light meter accidently, repeat this step in order to re-maximize the meter reading.)
4) Enter the #62/0 dB voltage reading via the ten-key pad on the screen and select [Enter]. The calculated foot-lamberts will be displayed. Also displayed is the tolerance for each reading. If an asterisk (*) appears, this indicates a reading that is out of tolerance.
5) Repeat the procedure for each of the selections #63/3 dB thru #65/13 dB. (#66 and #67 are not used at this time.)

4.8.1.2.6 Yellow Bowl Intensity Verification

1) Select BLUE/YELLOW and select BOWL.
2) Allow 3 minutes for lamp warm-up and ensure that the light meter is set to position 3.
3) Enter the BOWL voltage reading via the ten-key pad on the screen.
4) Select DONE and then PRINT BOTH to print out both the HFA II-*i* White Light and Blue-Yellow Light Verification Data printouts. Then proceed to Cal/Wedge Printout below.

4.8.1.2.7 Cal/Wedge Printout

1) From the Main Calibration menu, select PRINT CAL VALUES.
2) On a Printrex printer, the printout will always be done on a single sheet. To get the printout on a single sheet with an HP printer, take the printer off-line and press Form Feed.
3) Proceed to Evaluating Results and evaluate the HFA II-*i* Light Verification Data printouts and Cal/Wedge printout results as indicated below.

4.8.1.2.8 Evaluating Results

Note: *An "Asterick" flags reading out of calibration.*

4.8.1.2.9 Evaluating White Light Verification Data Printout Results

- Projector Voltage must be less than 10 volts.
- Spot Positions and Background (Bowl):
  - All must fall within the confines of the table.
  - The dB Spread can be no more than 1.0 dB.

4.8.1.2.10 Evaluating Blue-Yellow Verification Data Printout Results

- Spot Positions and Background (Bowl):
  - All must fall within the confines of the table.
  - The dB Spread can be no more than 1.5 dB.

4.8.1.2.11 Evaluating Cal/Wedge Printout

The values on the cal/wedge printout must fall within the ranges indicated in Appendix Table H-1.

4.8.1.3 Exerciser

The Exerciser enables the Field Support Engineer to move the instrument's motors individually or in conjunction with one another. For additional details, refer to Section 5, Troubleshooting.

4.8.1.4 QA Tests

The QA Tests option enables the Field Support Engineer to manually select various aperture sizes and intensities to be presented in the bowl. Each test number is unique as to its size, intensity and location in the bowl. For additional details, refer to Section 5, Troubleshooting

4.8.2 Mechanical

4.8.2.1 Projector

Purpose

This procedure is designed to position the filament of the projection lamp so that the projected light becomes as uniform as possible across its area of illumination. The so-called Y-position of the filament is adjusted in this procedure; the X- and Z-positions are pre-adjusted at the factory and are not field adjustable.

Special Tools/Equipment Required

- +3.0 Diopter to +3.5 Diopter Trial Lens

Procedure

1) From the Mechanical Calibration menu, select PROJECTOR.

2) Hold a +3.0D to+3.5D trial lens in front of the turret lower lens so that the projected light passes through the lens and into the bowl.

3) Adjust the projection lamp adjustment screw (FIGURE 4.3) with a 2 mm Allen as needed to center the projected filament image.

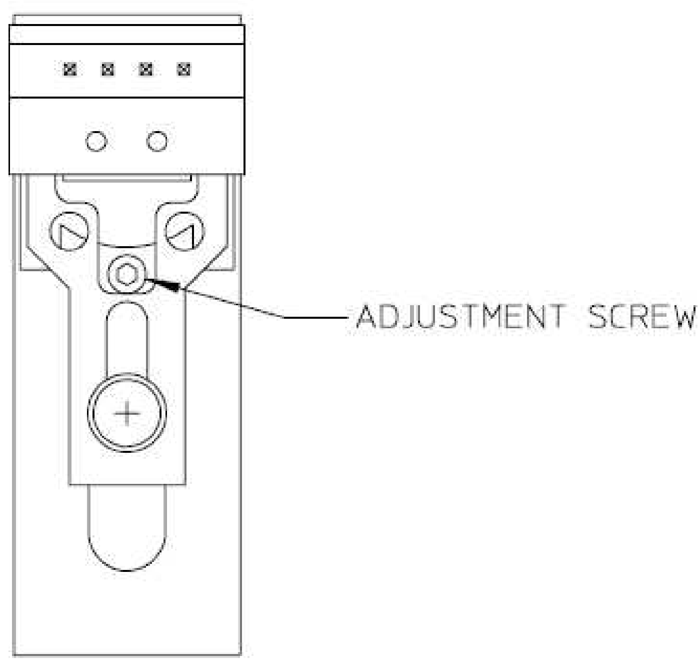


FIGURE 4.3. Lamp Filament Position Adjustment

4.8.2.2 Shutter

Purpose

This procedure ensures that the shutter is positioned correctly in the open and closed positions, and that it operates silently. (To avoid damage to the shutter, it should be calibrated as early in the calibration process as possible.)

Procedure

1) Make sure that the initial shutter adjustment is correct (the shaft is engaged through the shutter, and the shutter is approximately centered between the hub and the casting).

2) From the Mechanical Calibration menu, select SHUTTER > ALIGN SHUTTER.

3) Using the UP and DOWN icons, position the shutter so that it is either flush with the boss edge or one step past the boss edge (see FIGURE 4.4). DO NOT position the shutter below the boss edge.

   Note: *When positioning the shutter, ALWAYS select FLASH after any movement command. For example if UP 1 Step is selected, then select FLASH and observe the shutter reaction. DO NOT make multiple movement selections without selecting FLASH after each selection, as this will create shutter calibration errors.*

   When the shutter has been correctly positioned, and is then flashed, it should be completely silent; no tapping or ticking sounds should be heard.

4) When the shutter is positioned correctly, select STORE.

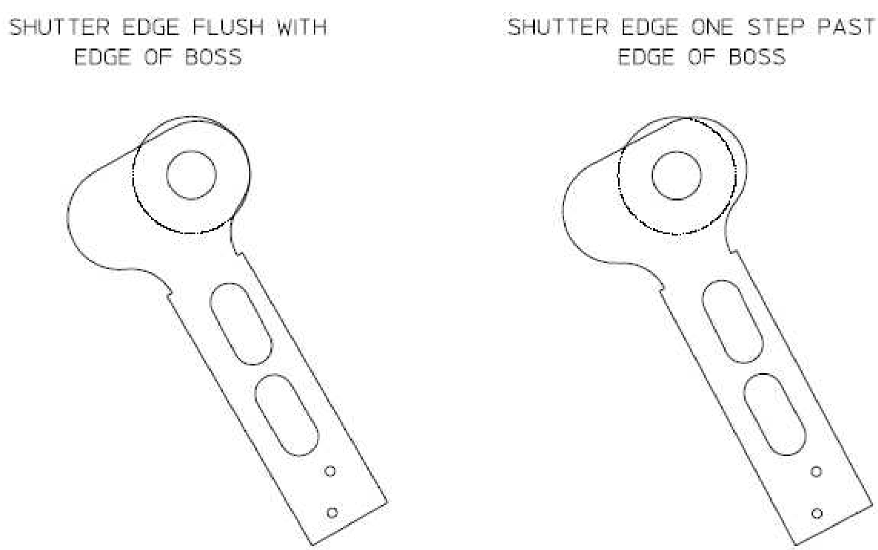


FIGURE 4.4. Shutter Positioning in Calibration

5) Verify that the printer is on-line, then print the CAL values. Verify that the shutter value is between 120 and 220.

   If the stored shutter value is out of range, loosen the shutter setscrew and reposition the shutter on the motor shaft as follows: (Removal of the film ND wedge may be required. If removed, make certain the setscrews are retightened when reinstalled.)

   a) If the Cal value is greater than 220, mount the shutter slightly higher (further clockwise) than previously positioned. Retighten the setscrew.

   b) If the Cal value is less than 120, mount the shutter slightly lower (further counter-clockwise) than previously positioned. Retighten the setscrew.

   c) Repeat steps 3, 4 and 5a or 5b, until the shutter value is within the specified range.

6) **Verification:** Proceed to the Motor Exerciser menu and exercise the film ND wedge for100 iterations. Then exercise the shutter (with the lamp OFF) for 100 iterations. The shutter should operate silently.

4.8.2.3 Aperture

4.8.2.3.1 Aperture Wheel Hole Centering Verification

Purpose

This procedure is designed to ensure that all five holes in the aperture wheel are properly centered relative to the light path.

Special Tools/Equipment Required

- Pencil
- Small Piece of Self-Stick Note Paper

Procedure

1) Dim the room lighting to enable a better view of the stimulus.

2) From the Mechanical Calibration menu, select APERTURE > LENS BASED.

   Note: *Currently, the GRID BASED selection is used only in manufacturing and requires a special tool.*

3) On the patient side of the aperture wheel (FIGURE 4.5), locate the reflected image of the III stimulus.

4) Using the STEP icons, rotate the aperture wheel until the reflected image and the III hole match (the light passes directly through the size three hole).

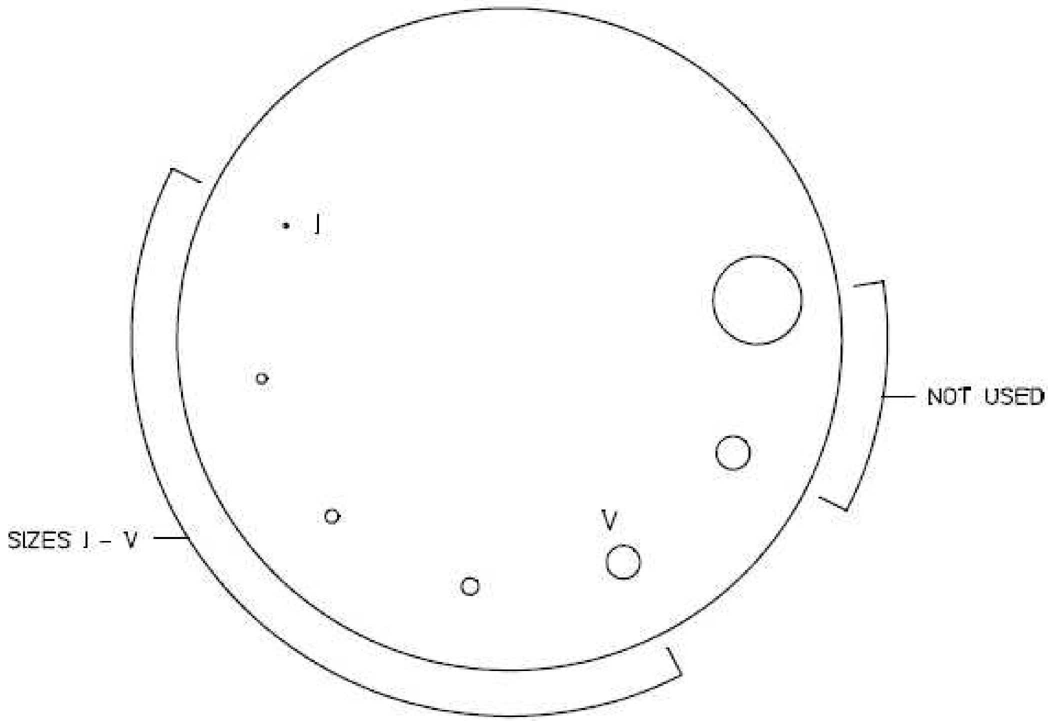


FIGURE 4.5. Aperture Wheel

5) Make a penciled cross on a small piece of self-adhesive note paper and stick it into the bowl such that the penciled cross is in the center of the III spot.

6) Select aperture I; position the spot on the penciled cross using the STEP icons (UP = left, DOWN = right).

7) Repeat step 6 with all the other apertures. (II, IV, V)

4.8.2.3.2 Aperture Spot Ratio Test

Purpose

The spot ratio test measures the spot intensity ratio between spot sizes V and III. The spot ratio is determined and compared with a theoretical value of 16. If the spot ratio is not within the specifications (two dB or 58% of the expected value), a Startup State Error 19 error, "*Aperture may be misaligned*" results. Pressing Proceed will not allow testing. Failure of the spot ratio test will require the aperture calibration, followed by measuring and saving a spot ratio value that is within specification.

Failure of the spot ratio test any time after a calibration has been completed will require the aperture calibration, followed by measuring and saving a spot ratio value that is within specification.

4.8.2.3.3 Measuring and Saving the Aperture Spot Ratio

In the aperture calibration menu, additional information to view and measure the aperture spot ratio is provided. The screen contains the following information:

V/III Spot Ratio
Stored
XX.XX (14.1 – 17.9)

Measured

- **XX.XX** represents the stored value of the V/III spot ratio.
- (14.1 – 17.9) represents the allowable range of the spot ratio.

1) After calibrating the spot sizes, press the "Measured" button.
2) A *"Please Wait"* dialogue will temporarily appear.
3) A new stored value entry then appears below the "Measured" button in the format, **XX.XX**.
4) Check the new stored value. If the new stored value is within specified range (14.1 – 17.9), press the "Store" button to save the new spot ratio.
5) Press the *"Done"* button to leave the aperture calibration.

Note - *Left Home, Right Home and Offset calibrations will be required after aperture calibration.*

4.8.2.4 Color

Purpose

This procedure is designed to ensure that all holes in the color wheel are properly centered relative to the light path.

Procedure

1) If the rear cover is on the instrument, remove the projection lamp access cover.

2) From the Mechanical Calibration menu, select COLOR, and note that the Clear 1 color wheel filter is initially selected.

3) Observe the position of the hole in the color wheel in relation to the spot of light striking the wheel.

4) Using the pads on the screen, adjust the color wheel position UP or DOWN until the hole in the color wheel is centered within the spot of light; then press STORE.

5) Repeat steps 3 and 4 for each of the other color wheel filter selections (Clear 2, Blue, Red, Yellow).

4.8.2.5 Right / Left Home

Purpose

This procedure is designed to establish the initial X-Y positioning (home position) of the projected spot. The HFA II-*i* perimeter requires two separate home positions: one for the right eye, one for the left eye.

Procedure

1) From the Mechanical Calibration menu, select RIGHT HOME.

2) Center the stimulus spot on the central fixation hole by using the Y (Up or Down) icons or X (Left or Right) icons; then select STORE. Select DONE.

3) Repeat step 2 in the LEFT HOME mode, then return to the Mechanical Calibration menu.

4.8.2.6 Offset

Purpose

This procedure is designed to ensure that the stimulus is in the exact center of the offset fixation LEDs (diamond.)

Procedure

1) From the Mechanical Calibration menu, select OFFSET. This causes the offset fixation LEDs to illuminate, and the size III stimulus to be projected in the center.

2) Using the Y (Up or Down) or X (Left or Right) icons, position the spot at the center of the fixation target LEDs, then select STORE.

4.8.2.7 Focus

Purpose

This procedure is designed to ensure a sharp focus at the center of the bowl.

Procedure

1) From the Mechanical Calibration menu, select FOCUS.

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2) Using the BACK/FORWARD icons, bring the spot into sharp focus, then select STORE.

Note: If you first rotate the glass wedge to partially dim the projected spot, you may find it easier to discern the point of sharpest focus.

3) Use the UPPER CALIBRATION/LOWER CALIBRATION to verify focus in other than central positions. (Use this opportunity to check for "halo" around the spot — a sure sign of dirty optics.)

4.8.2.8 Detector

Purpose

Normally, detector position check/adjustment is required any time you have removed or replaced the Detector PCB assembly, the detector housing, or the turret lower lens assembly.

Detector position is adjusted to assure that the maximum amount of light will be sensed by the detector. The alignment of the detector is critical. The HFA II-*i* uses only one detector to determine both spot and bowl intensity.

Special Tools/Equipment Required

- Brightness Detector Alignment Target

***Note** – Variations to Figure 4.6 may be seen on instruments in the field. This figure depicts the ideal configuration. Refer to service bulletins for variation.*

Procedure

1) Remove the Brightness Detector PCB (3.29).

2) While holding a clean lens tissue below the opening in the detector housing, tip the housing upward and tap it lightly so that the filter, glass window, and wavy washer drop out of the detector housing onto the tissue (FIGURE 4.6).

3) Insert the brightness detector alignment target into the detector housing. Ensure that it is properly seated.

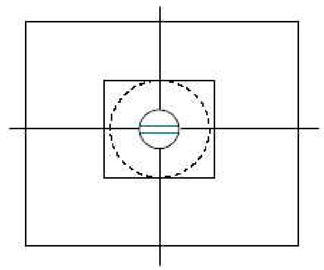
4) From the Mechanical Calibration menu, select DETECTOR.

Work carefully during the next steps to avoid accidently moving the turret. If the turret is accidently moved, select RESET to reinitialize the detector position.

5) With the room lights on, look into the alignment target and verify that the image of the projected spot falls within the inner box on the target (ideally, at the cross hairs).

6) If required, slightly loosen the screws that hold the detector housing to the turret assembly, and adjust as necessary.

Note: *Ideally, the image of the spot should always be centered on the smaller, inner target box, an acceptable setting is to ensure that the spot is within the dotted circle (see image below). This will assure that the maximum amount of light will be sensed by the detector.*



Acceptable Spot Image

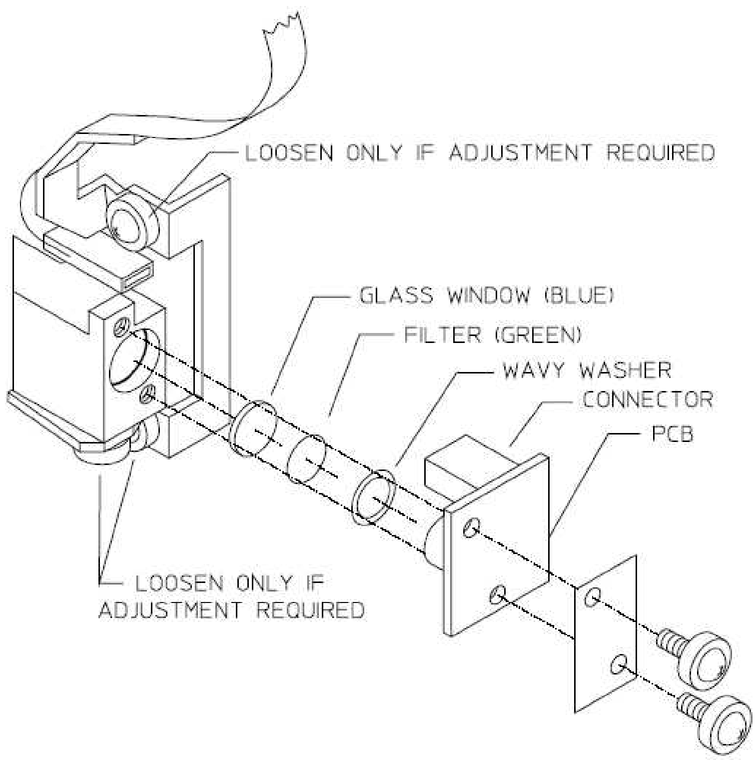


FIGURE 4.6. Brightness Detector Removal

4.8.2.9 Target

Purpose

This procedure is used to verify that the size III spot falls within the required tolerance zone in various areas of the bowl. This is a verification only; if the instrument does not meet the required tolerance, check Right Home and Left Home calibration. If the instrument still fails to meet the specified tolerance, troubleshooting and appropriate repair are required.

Special Tools/Equipment Required

- Spot Positioning Cross Fixture ("cross tool")
- Drafting Tape

Setup

1) Remove the front cover assembly (Section 3.2). Refer to FIGURE 4.7.

2) Insert the center pin of the cross tool into the central fixation hole in the bowl and hold it in place; then attach the horizontal band of the cross tool as follows:

   a) Fit the locating hole at each end of the horizontal band of the tool over the corresponding pin or tab on the outer edge of the bowl.

   b) While pressing the horizontal band against the bowl, apply a short piece of drafting tape halfway out on each horizontal leg of the cross tool to hold it flat against the bowl surface.

3) Position and tape the vertical band of the cross tool, using the small hole in the center bottom edge of the bowl as reference (not present on newer bowls).

Procedure

1) From the Mechanical Calibration menu, select TARGET.

2) Verify that for each of the 6 selections on the Target Verification menu, the size III stimulus falls within the corresponding dotted circle on the cross tool.

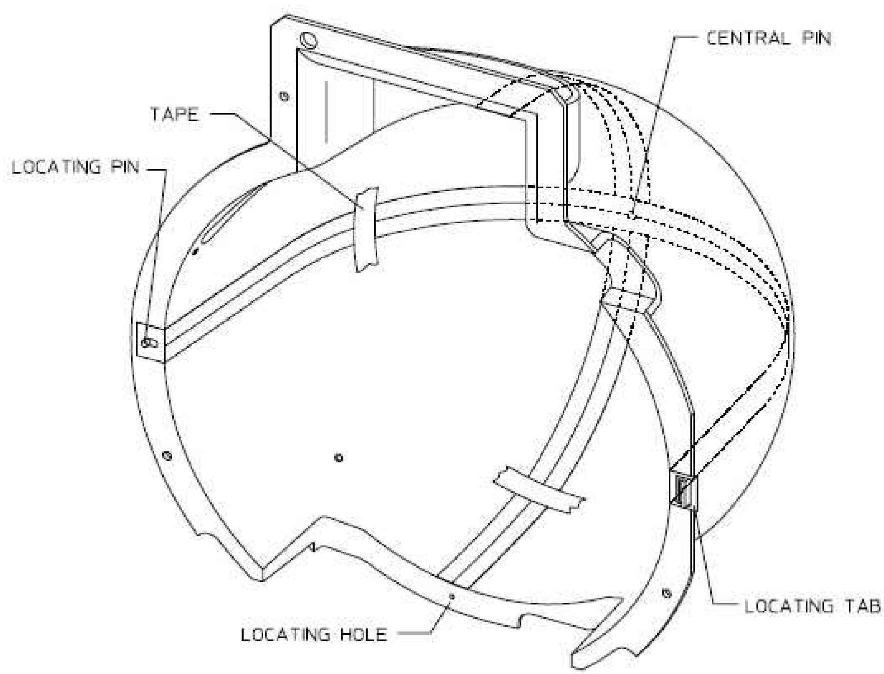


FIGURE 4.7. Spot Positioning Cross Fixture

4.8.3 Intensity

4.8.3.1 Projector Intensity Using the Minolta Light Meter Kit

Note: *Soligor users go to 4.8.3.2.*

4.8.3.1.1 White Projector Intensity

Purpose

This procedure ensures that the maximum brightness of the projected number V spot in the bowl is close to the optimum 929 Ft-L while the voltage across the projection lamp is less than 10 volts using the Minolta light meter.

Special Tools/Equipment Required

- Minolta Light Meter Kit
- Bowl Shroud
- Small Flashlight

Prerequisites

Before performing white projector intensity calibration, verify the following:

- Projection lamp filament voltage with lamp on as taken from the white light verification drop found on the calibration printout. If voltage is over 10 volts, replace lamp.
- Projector Adjustment (HFA2i Service Manual, Section 4.8.2.1)
- Shutter Calibration (HFA2i Service Manual, Section 4.8.2.2)
- Aperture Calibration (HFA2i Service Manual, Section 4.8.2.3)
- Color Wheel Calibration (HFA2i Service Manual, Section 4.8.2.4)
- Focus Calibration (HFA2i Service Manual, Section 4.8.2.7)

Note – *The Wedge Calibration (HFA2i Service Manual, Section 4.8.3.5) MUST be performed following any changes to the White Projector Intensity Calibration.*

Procedure

1) Set up the Minolta light meter on the HFA II-*i* as described in Section 4.8.1.1.1, if not already done.
2) From the Main Calibration menu, select ***Intensity***.
3) Set up the P factors as described in Section 4.8.1.1.2, if not already done.
4) Select ***Projector***, then ***White***. Allow the projector lamp to warm-up for 3 minutes before proceeding.
5) Position the light meter roughly on the projected spot, and then maximize the reading by positioning the chinrest via the chinrest control switch. (First left/right, then up/down, then refine with left/right again.)

6) Select ***Calculator***, and enter the meter reading displayed on your Minolta light meter via the ten-key pad and select ***Enter***. The meter reading and the calculated foot-lamberts will be displayed next to **White**. Also displayed on the CRT screen is the tolerance for the White Projector intensity calibration. If an asterisk (*) appears, this indicates that the value is out of tolerance.
7) While holding in the trigger of the Minolta light meter, use the pads on the screen to increase or decrease white spot intensity until your light meter reads the closest to the result of the displayed on-screen calculated value. Try to set the spot intensity as close to 929 Ft-L as you can. (It must be between 888 – 973 Ft-L, otherwise the after projector lamp intensity evaluation will not be within tolerance.)
8) Select ***Store***. (It may take up to 2 minutes to process and store the new calibration data. The instrument will 'beep' when the process is complete.)
9) Select ***Done***, unless the instrument is a Blue / Yellow unit.
10) Proceed to Blue Projector Intensity, if a Blue / Yellow unit.

4.8.3.1.2 Blue Projector Intensity

Purpose

This procedure ensures that the maximum brightness of the projected size V (5) in the bowl is close to the optimum 3.01 Ft-L.

Special Tools/Equipment Required

- Minolta Light Meter Kit
- Bowl Shroud
- Small Flashlight

Prerequisites

Before performing blue projector intensity calibration, verify the following:

- Projection lamp filament voltage taken from the cal printout. If voltage is over 10 volts, replace the lamp.
- Projector Adjustment (HFA2i Service Manual, Section 4.8.2.1)
- Shutter Calibration (HFA2i Service Manual, Section 4.8.2.2)
- Aperture Calibration (HFA2i Service Manual, Section 4.8.2.3)
- Color Wheel Calibration (HFA2i Service Manual, Section 4.8.2.4)
- Focus Calibration (HFA2i Service Manual, Section 4.8.2.7)
- White Projector Intensity Calibration (HFA2i Service Manual, Section 4.8.3.1.1) (Required only if the Projector Lamp position was adjusted.)

Note – *Blue Correction Calibration (HFA2i Service Manual, Section 4.8.3.6) MUST be performed following any changes to the Wedge Calibration or the Blue Projector Intensity Calibration.*

Procedure

1) Prepare and set up the Minolta light meter on the HFA II-*i* as described in Section 4.8.1.1.1, if not already done.
2) From the **Calibration** main menu, select ***Intensity***.
3) Set up the meter serial number and P factors as described in Section 4.8.1.1.2, if not already done.
4) Select ***Projection***, then ***Blue***. Allow the projector lamp to warm-up for 3 minutes before proceeding.
5) Position the light meter roughly on the projected spot, and then maximize the reading by positioning the chinrest via the chinrest control switch. (First left/right, then up/down, then refine with left/right again.)
6) Select ***Calculator***, and enter the reading displayed on your Minolta light meter via the ten-key pad and select ***Enter***. The light meter reading and calculated foot-lamberts will be displayed next to **Blue**. Also displayed is the tolerance for the Blue projector intensity calibration. If an asterisk (*) appears, this indicates that the value is out of tolerance.
7) Using the pads on the screen, increase or decrease the blue spot intensity until your light meter reads closest to the result of the on screen calculated value. Try to set the spot intensity as close to 3.01 Ft-L as you can. (It must be between 2.88 – 3.15 Ft-L., otherwise the after blue projector intensity evaluation will not be within tolerance.)
8) Select ***Store***, then ***Done***. (It may take up to 2 minutes to process and store the new calibration data. The instrument will 'beep' when the process is complete.)

4.8.3.2 Projector Intensity Using the Soligor Light Meter Kit

Note: *Minolta users go to 4.8.3.1.*

4.8.3.2.1 White Projector Intensity

Purpose

This procedure ensures that the maximum brightness of the projected number V spot in the bowl is close to the optimum 929 Ft-L while the voltage across the projection lamp is less than 10 volts.

Special Tools/Equipment Required

- Soligor Light Meter Kit
- Digital Multimeter, Fluke 8060A or equivalent
- Bowl Shroud
- Small Flashlight

Prerequisites

Before performing white projector intensity calibration, verify the following:

- Projection lamp filament voltage with lamp on. If voltage is over 10 volts, replace lamp.
- Projector Adjustment (HFA2i Service Manual, Section 4.8.2.1)
- Shutter Calibration (HFA2i Service Manual, Section 4.8.2.2)
- Aperture Calibration (HFA2i Service Manual, Section 4.8.2.3)
- Color Wheel Calibration (HFA2i Service Manual, Section 4.8.2.4)
- Focus Calibration (HFA2i Service Manual, Section 4.8.2.7)

Note: *The Wedge Calibration (Section 4.8.3.5) MUST be performed following any changes to the White Projector Intensity Calibration.*

Procedure

1) Set up the light meter on the HFA II-i and zero out the meter as described in Section 4.8.1.2.1, if not already done.

2) Set the light meter to position 1.

3) From the Main Calibration menu, select INTENSITY.

4) Set up the instrument as follows to calculate the foot-lamberts:

   a) From the Intensity Menu, select P Factors (See Section 4.8.1.2.2) or select P1, P2 and P3 and enter the P1, P2 and P3 factors from your Light Meter. Select P3B, P3Y and P3F if your light meter has these factors, otherwise enter the BYP3 factor on your meter for P3B and enter the P3 factor for P3Y and P3F.

   b) Select METER and enter your light meter serial number.

   Note: *The Read P Factors use is described in Appendix E.*

5) Select PROJECTOR > WHITE. Allow the projector lamp to warm up for 3 minutes before proceeding.

6) Position the light meter roughly on the projected spot, then maximize the reading by positioning the chinrest via the chinrest control switch. (First left/right, then up/down, then refine with left/right again.)

7) Divide 929 by the P1 meter factor on your light meter.

8) Using the pads on the screen, increase or decrease spot intensity until your DMM reads the closest to the result of the calculation done above. Try to set the spot intensity as close to 929 Ft-L as you can. (It must be between 888 – 973 Ft-L, otherwise the after projector lamp intensity evaluation will not be within tolerance.)

9) Select CALCULATOR, and enter the voltage reading displayed on your DMM via the ten-key pad and select [Enter]. The voltage reading and the calculated foot-lamberts will be displayed next to WHITE. Also displayed on the CRT screen is the tolerance for the bowl intensity calibration. If an asterisk (*) appears, this indicates that the value is out of tolerance.

10) STORE the result. (It may take up to 2 minutes to process and store the new calibration data. The instrument will 'beep' when the process is complete.)

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11) Press DONE.

4.8.3.2.2 Blue Projector Intensity

Purpose

This procedure ensures that the maximum brightness of the projected number V blue spot in the bowl is close to the optimum 3.01 Ft-L.

Special Tools/Equipment Required

- Soligor Light Meter Kit
- Digital Multimeter, Fluke 8060A or equivalent
- Bowl Shroud
- Small Flashlight

Prerequisites

Before performing blue projector intensity calibration, verify the following:

- Projection lamp filament voltage with lamp on. If voltage is over 10 volts, replace lamp.
- Projector Adjustment (HFA2i Service Manual, Section 4.8.2.1)
- Shutter Calibration (HFA2i Service Manual, Section 4.8.2.2)
- Aperture Calibration (HFA2i Service Manual, Section 4.8.2.3)
- Color Wheel Calibration (HFA2i Service Manual, Section 4.8.2.4)
- Focus Calibration (HFA2i Service Manual, Section 4.8.2.7)
- White Projector Intensity Calibration (HFA2i Service Manual, Section 4.8.3.2.1) (Required only if the Projector Lamp position was adjusted.)

Note: *Blue Correction Calibration (Section 4.8.3.6) MUST be performed following any changes to the Wedge Calibration or the Blue Projector Intensity Calibration.*

Procedure

1) Set up the light meter on the HFA II-*i* and zero out the meter as described in Section 4.8.1.2.1, if not already done.

2) Set the light meter to position 3.

3) From the Calibration main menu, select INTENSITY.

4) Set up the instrument as follows to calculate the foot-lamberts:

   a) From the Intensity Menu, select P Factors (See Section 4.8.1.2.2) or select P1, P2 and P3 and enter the P1, P2 and P3 factors from your Light Meter. Select P3B, P3Y and P3F if your light meter has these factors, otherwise enter the BYP3 factor on your meter for P3B and enter the P3 factor for P3Y and P3F.

   b) Select METER and enter your light meter serial number.

   Note: *The Read P Factors use is described in Appendix E.*

5) Select PROJECTOR > BLUE. Allow the projector lamp to warm up for 3 minutes before proceeding.

6) Position the light meter roughly on the projected spot, then maximize the reading by positioning the chinrest via the chinrest control switch. (First left/right, then up/down, then refine with left/right again.)

7) Divide 3.01 by the P3B meter factor on your light meter (or use BYP3 if your light meter does not have a P3B factor).

8) Using the pads on the screen, increase or decrease spot intensity until your DMM reads closest to the result of the above calculation. Try to set the spot intensity as close to 3.01 Ft-L as you can. (It must be between 2.87 – 3.15 Ft-L, otherwise the after blue projector intensity evaluation will not be within tolerance.)

9) Select CALCULATOR, and enter the voltage reading displayed on your DMM via the ten-key pad and select [Enter]. The voltage reading and the calculated foot-lamberts will be displayed next to BLUE. Also displayed is the tolerance for the bowl intensity calibration. If an asterisk (*) appears, this indicates that the value is out of tolerance.

10) Select STORE > DONE. (It may take up to 2 minutes to process and store the new calibration data. The instrument will 'beep' when the process is complete.)

4.8.3.3 Bowl Intensity Using the Minolta Light Meter Kit

Note: *Soligor users go to 4.8.3.4.*

4.8.3.3.1 White Bowl Intensity

Purpose

This procedure ensures that the brightness of the background illumination is close to the optimum 2.92 Ft-L.

Special Tools/Equipment Required

- Minolta Light Meter Kit
- Bowl Shroud
- Small Flashlight

Procedure

1) Set up the Minolta light meter on the HFA II-*i* as described in Section 4.8.1.1.1, if not already done.

2) Position the light meter at a point approximately 2 inches up from the center fixation hole in the bowl.

3) From the **Calibration** main menu, select ***Intensity***.

4) From the **Intensity** Menu, select ***Read P Factors***. Set up the serial number and P Factors as described in Section 4.8.1.1.2, if not already done.

5) Select ***Bowl***, then ***White***. Allow the bowl lamps to warm-up for at least 3 minutes before proceeding.

6) Select ***Calculator,*** and enter the voltage reading displayed on your Minolta light meter via the ten-key pad and select ***Enter***. The light meter reading and calculated foot-lamberts will be displayed next to **White**. Also displayed on the CRT screen is the tolerance for the bowl intensity calibration. If an asterisk (*) appears, this indicates that the value is out of tolerance.

7) Using the pads on the screen menu, increase or decrease the background intensity until your light meter reads closest to the result of the calculation done above. Try to set the background intensity as close to 2.92 Ft-L as you can. (It must be between 2.72 – 3.13 Ft-L, otherwise the after evaluation of the bowl light intensity will not be within tolerance.)

8) Select ***Store***, then ***Done***, unless calibrating a Blue / Yellow unit.

4.8.3.3.2 Yellow Bowl Intensity

Purpose

This procedure ensures that the brightness of the yellow background is close to the optimum 29.87 Ft-L.

Special Tools/Equipment Required

- Minolta Light Meter Kit
- Bowl Shroud
- Small Flashlight

Procedure

1) Set up the Minolta light meter on the HFA II-*i* as described in Section 4.8.1.1.1, if not already done.

2) Position the light meter at a point approximately 2 inches up from the center fixation hole in the bowl.

3) From the **Calibration** main menu, select ***Intensity***.

4) From the **Intensity** menu, select ***Read P Factors***. Set up the serial number and P Factors as described in Section 4.8.1.1.2, if not already done.

5) Select ***Bowl***, then ***Yellow***. Allow the yellow lamp to warm-up for 3 minutes before proceeding. Observe the Minolta light meter voltage reading for 15 seconds to see if the light output from the yellow lamp has stabilized.

6) Select ***Calculator***, and enter the voltage reading displayed on your light meter via the ten-key pad and select ***Enter***. The light meter reading and the calculated foot-lamberts will be displayed next to **Yellow**. Also displayed is the tolerance for the bowl intensity calibration. If an asterisk (*) appears, this indicates that the value is out of tolerance.

7) Using the pads on the screen menu, increase or decrease background intensity until your light meter reads closest to the result of the calculation done above. Try to set the background intensity as close to 29.87 Ft-L as you can. (It must be between 28.53 – 31.28 Ft-L., otherwise the after evaluation of the yellow bowl lamp intensity will not be within tolerance.)

8) Select ***Store***, then ***Done***.

4.8.3.4 Bowl Intensity Using the Soligor Light Meter Kit

Note: *Minolta users go to 4.8.3.3.*

4.8.3.4.1 White Bowl Intensity

Purpose

This procedure ensures that the brightness of the background illumination is close to the optimum 2.92 Ft-L.

Special Tools/Equipment Required

- Soligor Light Meter Kit
- Digital Multimeter, Fluke 8060A or equivalent
- Bowl Shroud
- Small Flashlight

Procedure

1) Set up the light meter on the HFA II-*i* and zero out the meter as described in Section 4.8.1.2.1, if not already done.

2) Set the light meter to position 3.

3) Position the light meter at a point approximately 2 inches up from the center fixation hole in the bowl.

4) From the Calibration main menu, select INTENSITY.

5) Set up the instrument as follows to calculate the foot-lamberts:

   a) From the Intensity Menu, select P Factors (See Section 4.8.1.2.2) or select P1, P2 and P3 and enter the P1, P2 and P3 factors from your Light Meter. Select P3B, P3Y and P3F if your light meter has these factors, otherwise enter the BYP3 factor on your meter for P3B and enter the P3 factor for P3Y and P3F.

   b) Select METER and enter your light meter serial number.

   Note: *The Read P Factors use is described in Appendix E.*

6) Select BOWL > WHITE. Allow the bowl lamps to warm up for at least 3 minutes before proceeding. Observe the DMM voltage reading for 15 seconds to see if the light output from the bowl lamps has stabilized.

7) Divide 2.92 by the P3F factor on your light meter (or use P3 if your light meter does not have a P3F factor).

8) Using the pads on the screen menu, increase or decrease background intensity until your DMM reads closest to the result of the calculation done above. Try to set the background intensity as close to 2.92 Ft-L as you can. (It must be between 2.72 – 3.13 Ft-L, otherwise the after evaluation of the bowl light intensity will not be within tolerance.)

9) Select CALCULATOR, and enter the voltage reading displayed on your DMM via the ten-key pad and select [Enter]. The voltage reading and the calculated foot-lamberts will be displayed next to WHITE. Also displayed on the CRT screen is the tolerance for the bowl intensity calibration. If an asterisk (*) appears, this indicates that the value is out of tolerance.

10) Select STORE > DONE.

4.8.3.4.2 Yellow Bowl Intensity

Purpose

This procedure ensures that the brightness of the yellow background is close to the optimum 29.87 Ft-L.

Special Tools/Equipment Required

- Soligor Light Meter Kit
- Digital Multimeter, Fluke 8060A or equivalent
- Bowl Shroud
- Small Flashlight

Procedure

1) Set up the light meter on the HFA II-*i* and zero out the meter as described in Section 4.8.1.2.1, if not already done.

2) Set the light meter to position 3.

3) Position the light meter at a point approximately 2 inches up from the center fixation hole in the bowl.

4) From the Calibration main menu, select INTENSITY.

5) Set up the instrument as follows to calculate the foot-lamberts:

   a) From the Intensity Menu, select P Factors (See Section 4.8.1.2.2) or select P1, P2 and P3 and enter the P1, P2 and P3 factors from your Light Meter. Select P3B, P3Y and P3F if your light meter has these factors, otherwise enter the BYP3 factor on your meter for P3B and enter the P3 factor for P3Y and P3F.

   b) Select METER and enter your light meter serial number.

   Note: *The Read P Factors use is described in Appendix E.*

6) Select BOWL > YELLOW. Allow the yellow lamp to warm up for 3 minutes before proceeding. Observe the DMM voltage reading for 15 seconds to see if the light output from the yellow lamp has stabilized.

7) Divide 29.87 by the P3Y factor on your light meter (or use P3 if your light meter does not have a P3Y factor).

8) Using the pads on the screen menu, increase or decrease background intensity until your DMM reads closest to the result of the calculation done above. Try to set the background intensity as close to 29.87 Ft-L as you can. (It must be between 28.53 – 31.28 Ft-L, otherwise the after evaluation of the yellow bowl lamp intensity will not be within tolerance.)

9) Select CALCULATOR, and enter the voltage reading displayed on your DMM via the ten-key pad and select [Enter]. The voltage reading and the calculated foot-lamberts will be displayed next to YELLOW. Also displayed is the tolerance for the bowl intensity calibration. If an asterisk (*) appears, this indicates that the value is out of tolerance.

10) Select STORE > DONE.

4.8.3.5 Wedge

Purpose

This procedure ensures that both wedges are properly calibrated for attenuation of the white stimulus light. Wedge calibration must be performed whenever white projector intensity calibration has been performed.

During the Wedge Calibration procedure, the clear opening on the color wheel is rotated into the light path such that a white stimulus is projected into the bowl. Each step position on the glass wedge and the film wedge is measured by the spot detector, and a resulting white stimulus table is stored on the hard drive and calibration media.

Note: *If the Wedge calibration is performed and the instrument is also equipped with the Blue-Yellow option, the Blue Correction calibration MUST be performed after performing the Wedge Calibration.*

Special Tools/Equipment Required

- Bowl Shroud
- Small Flashlight

Procedure

1) Setup: Room lights darkened; bowl shroud on.

2) From the Calibration main menu, select INTENSITY > WEDGE > CALIBRATE.

3) After 7 – 10 minutes the unit beeps to indicate the calibration is completed. Select STORE > DONE.
   - If the instrument is equipped with the Blue-Yellow option, proceed to Section 4.8.3.6, Blue Correction.
   - If the instrument is NOT equipped the Blue-Yellow option, go to Section 4.8.1 and verify the after intensity values.

4.8.3.6 Blue Correction

Purpose

This procedure ensures that the wedges are properly calibrated for attenuation of the blue stimulus light. Blue Correction calibration must be performed whenever blue projector intensity calibration has been performed or the Wedge calibration has been performed.

During the Blue Correction calibration procedure, the blue filter on the color wheel is rotated into the light path such that a blue stimulus is reflected into thee detector via the mirror instead of being projected into the bowl. Each step position on the glass wedge and the film wedge is measured by the spot detector, compared to the white light calibration table and a resulting blue stimulus correction table is stored on the hard drive and calibration floppy diskette.

Special Tools/Equipment Required

- Tool Stand
- Mirror Tool
- Hand-Held Mirror
- Bowl Shroud

Prerequisites

Before performing Blue Correction, verify the following:

- Projection lamp filament voltage with lamp on. If voltage is over 10 volts, replace lamp.
- Projector Adjustment (HFA2i Service Manual, Section 4.8.2.1)
- Shutter Calibration (HFA2i Service Manual, Section 4.8.2.2)
- Aperture Calibration (HFA2i Service Manual, Section 4.8.2.3)
- Color Wheel Calibration (HFA2i Service Manual, Section 4.8.2.4)
- Focus Calibration (HFA2i Service Manual, Section 4.8.2.7)
- White Projector Intensity Calibration (HFA2i Service Manual, Section 4.8.3.1.1 or 4.8.3.2.1) (Required only if the Projector Lamp position was adjusted.)
- Blue Projector Intensity Calibration (HFA2i Service Manual, Section 4.8.3.1.2 or 4.8.3.2.2)

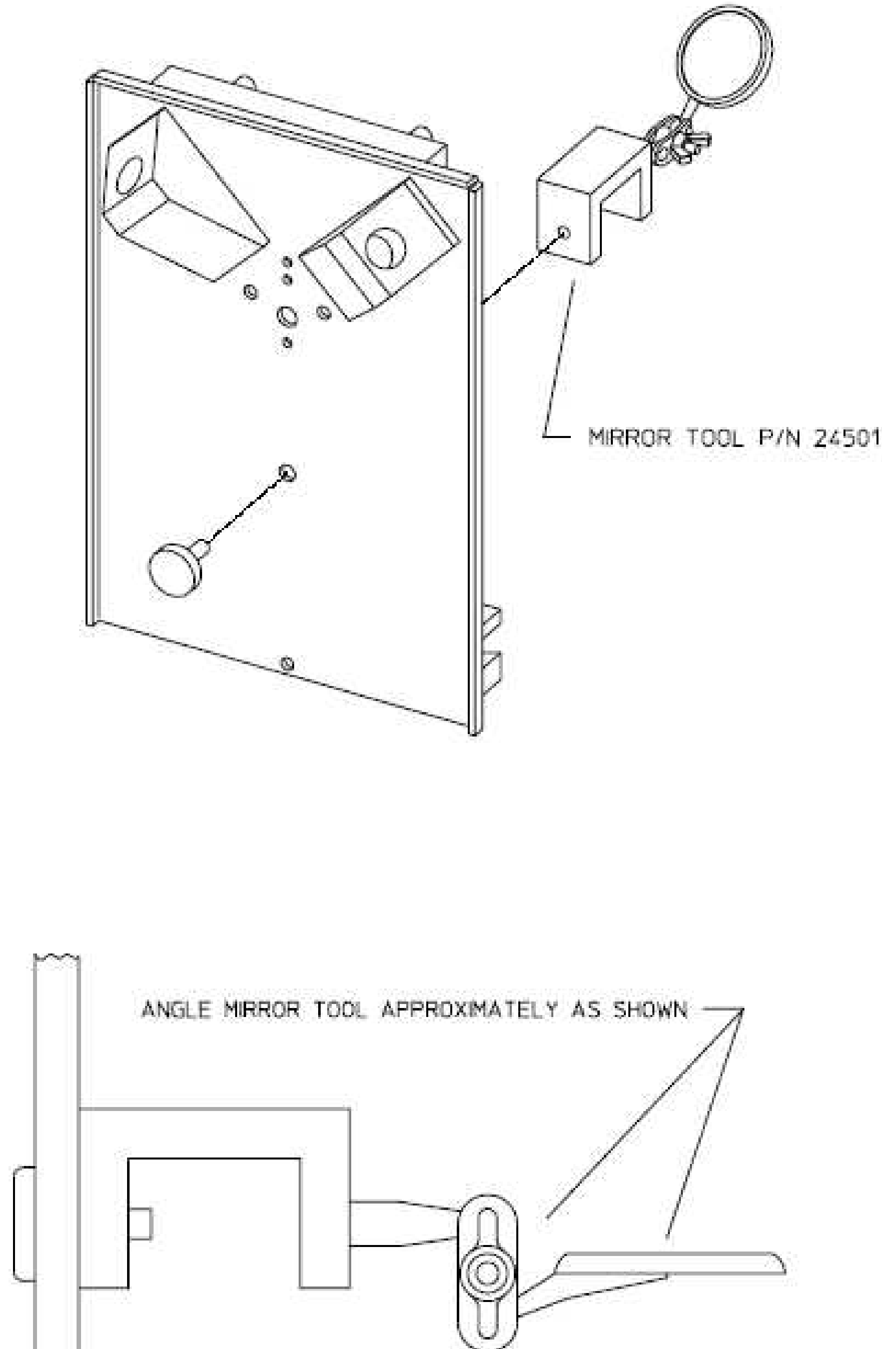

FIGURE 4.8. Tool Stand with Mirror Tool Attached

Procedure

1) Set up the tool stand with the mirror tool attached as shown in FIGURE 4.8. Manually adjust the mirror so that the mirror surface faces up (towards the top of the bowl) and extends outward as shown.

2) Raise the chin rest to its upper limit. The chin rest motor will stop (and make a buzzing sound) when it reaches its upper limit.

3) From the Calibration main menu, select INTENSITY > BLUE CORRECTION.

4) Select MIRROR CENTERING. The turret and detector will be positioned so that they point downward. A message, "Please Center Calibration Mirror", will be displayed on screen. (You will perform the mirror centering in step 6 of this procedure.)

5) Use a second small mirror (held in your left hand) to locate the image of the lower turret and detector housing, as shown in FIGURE 4.9.

6) Adjust the mirror tool (mounted on the chin rest) with your right hand, so that the reflected beam of blue light can be seen on the surface of the detector housing as observed with the hand held mirror. When the mirror tool is correctly centered (positioned), the blue light spot will be seen at some point on the detector housing, as shown in FIGURE 4.9.

   Note: *If you cannot locate the beam of blue light, place your hand between the lower turret and the mirror tool. You should be able to see the blue light on your hand. Once you have located the blue light, remove your hand and continue to adjust the mirror tool until the blue light can be seen on the detector housing.*

7) Once the mirror tool is correctly centered, place the bowl shroud over the HFA II-*i* and turn out the room lights. Ensure that the room is as dark as possible and that no stray light enters into the bowl. Select OK.

8) A message, "Please wait, adjusting stimulus position..." will be seen. The HFA II-*i* is adjusting the position of the turret so that the maximum amount of blue light can be sensed by the spot detector. This process takes about 20 seconds to complete. When complete, you will hear the shutter "tap" on the metal surface beneath the shutter and the instrument will return to the Blue-Yellow Initialization menu.

9) Select BLUE INITIALIZATION. A message, "Warming up lamp" will be displayed as well as a percent complete gauge. The process takes about 4-5 minutes, and when complete, the instrument will automatically proceed to the Blue-Yellow Initialization process.

   Note: *During the lamp warm up (or the Blue-Yellow Initialization process described below), if the room is not dark enough an error message and a beeping sound will prompt you to try again.*

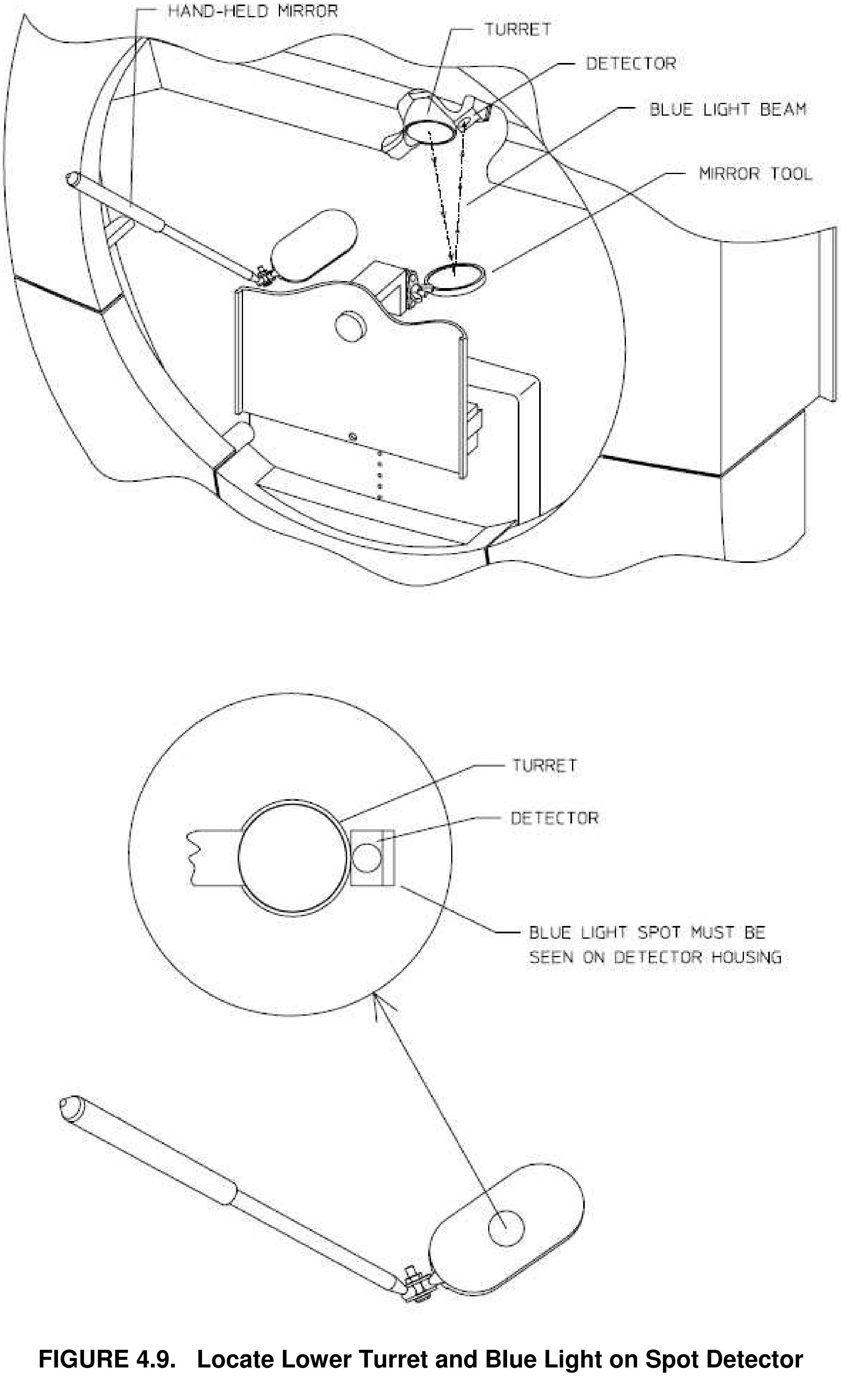

FIGURE 4.9. Locate Lower Turret and Blue Light on Spot Detector

10) During the Blue-Yellow Initialization process a percent complete gauge will be displayed on screen. The process takes about 4-5 minutes, and when complete, the message "Blue-Yellow Initialization Successful" will be displayed. When the message is displayed, select OK.

11) Select DONE.

4.8.4 Print Cal Values

Selecting Print Cal Values will print out the current settings stored on the hard drive. (NVM data), and also the film and glass wedge values. Refer to Appendix H for printout examples and interpretation instructions.

4.8.5 Miscellaneous

Miscellaneous is intended for use only by Manufacturing. Selection will display a ten-key pad. To return to the previous menu, select Cancel.

4.8.6 Camera

4.8.6.1 Camera Position / Size

Purpose

This procedure ensures that the video insert on the CRT is the correct size, and at the correct position.

Camera Position/Size (for all HFA II-*i* Models)

Special Tools/Equipment Required

- Tool Stand
- Fake Eye
- Strip of Masking Tape

Prerequisites

1) Remove the front and rear covers (Sections 3.2 and 3.3); then reinstall the front cover.

2) Verify the trial lens holder alignment (Section 4.9.6).

3) Remove the height adaptor from the tool stand and attach the fake eye to the tool stand.

4) Mount the tool stand on the chinrest.

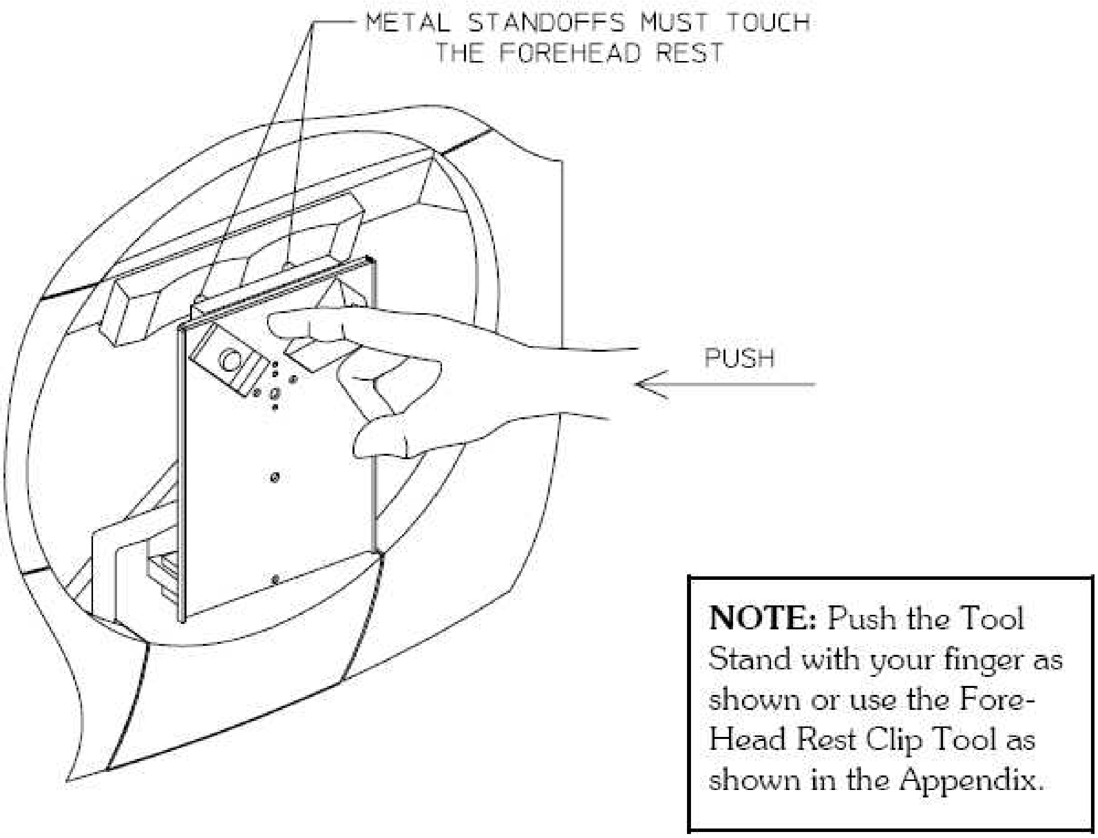

FIGURE 4.10. Proper Tool Stand Positioning

Pre-Setup (for all HFA II-*i* Models)

1) Push the tool stand forward slightly on the chinrest so that the metal tips on the Tool Stand Alignment Adaptor make contact with the headrest (FIGURE 4.10). Then raise the trial lens holder and pull it forward. This is the position that the tool stand should be in when performing the procedure.

2) The right-angle extension on the fake eye assembly will press against the trial lens holder and position it correctly (FIGURE 4.11). (Set the chinrest height so that the right-angle extension touches the trial lens holder at about the 0 - 0 level on the trial lens holder scale.)

   Note: *Once you have the trial lens holder set, do not move it.*

3) From the Calibration main menu, select Camera, then Position, and then Camera Monitor.

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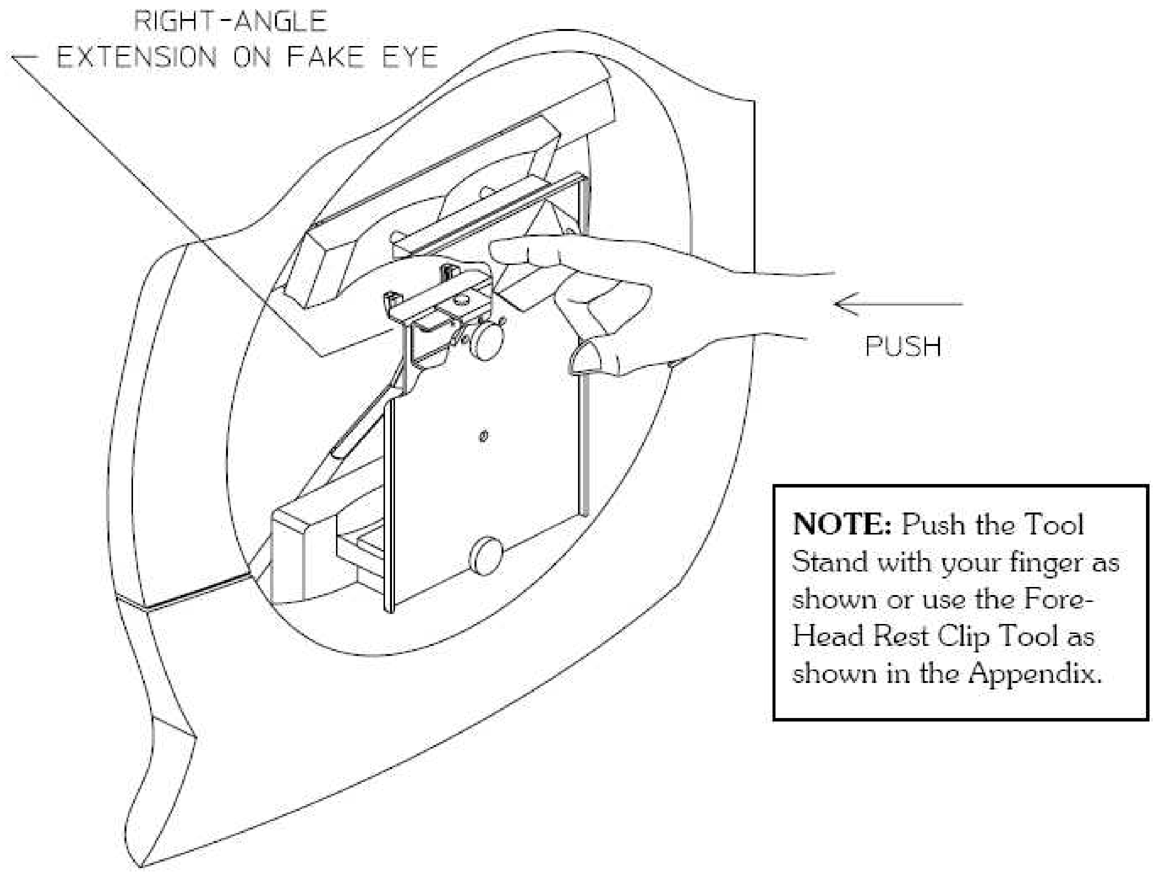

FIGURE 4.11. Trial Lens Holder Position

4) Select SIZE, and press the X-5 button until you get the smallest horizontal video picture and the system beeps twice. Press the X+5 button 11 times and STORE it. This step sets the horizontal width.

5) Press the Y+5 button until you get the smallest vertical video picture and the system beeps twice. Press the Y-5 button 9 times and STORE it. This step sets the vertical height.

6) Affix a piece of masking tape across the trial lens holder, with the top edge of the tape aligned on the 0 - 0 level of the scale on the trial lens holder (FIGURE 4.12). You can place a pencil mark on the top edge of the tape directly above the 90 degree reference point for an aid in setting the camera position as required in the following step. Reposition the trial lens holder against the right-angle extension on the fake eye assembly.

7) Select (camera) POSITION. Using the menus, move the trial lens holder image up or down, and left or right until the cross is just slightly below the centerline (top edge of the masking tape) of the trial lens holder and centered between the trial lens holder sides. Then select STORE.

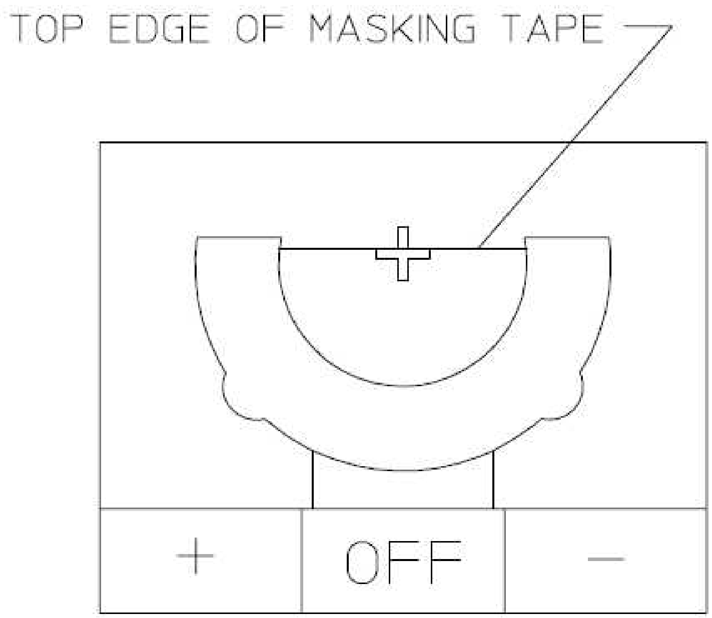

FIGURE 4.12 Camera Position / Size Calibration

8) To verify the picture size, you will need to view the camera image in a patient test. To do this: select DONE three times, press the Main Menu icon, select the CENTRAL 24-2 test, select right eye and then select PROCEED.

9) Verify that the picture insert does not extend into the circular test area. The picture size should be about 50 mm x 30 mm (2.0" x 1-3/16").

4.8.6.2 Gaze Position / Size

Purpose

This procedure (Models 740-*i*, 745-*i*, and 750-*i* only) ensures that the gaze-tracking box of the video insert is the right size and is symmetrical around the center cross.

Note: *The 720-i will display the gaze tracking box if the calibration menu is entered. It will appear in test modes also, but will not appear after the 720-i has been restarted.*

Special Tools/Equipment Required

- Tool Stand
- Fake Eye

Prerequisites

1) Remove the front and rear covers (Section 3.2, 3.3); then reinstall the front cover.

2) Verify trial lens alignment (Section 4.9.6).

3) Verify camera position/size (Section 4.8.6.1).

Procedure

1) Install the fake eye on the tool stand and slide the tool stand onto the instrument chinrest. Push the tool stand forward slightly on the chinrest so that the metal tips on the Tool Stand Alignment Adaptor make contact with the headrest (FIGURE 4.2). This is the position the tool stand should be in when performing the procedure.

2) From the Calibration main menu, select CAMERA > POSITION > GAZE MONITOR.

3) Using the chinrest control switch, center the fake eye on the center cross in the video insert.

4) Using the pads on the menu, adjust the size and then the position of the gaze tracking box until it matches the upper left box scribe marks on the tool. Alternate between size and position until the adjustment is correct. Adjust the size of the Gaze Tracking box until it matches the remaining box scribe marks.

5) Select STORE > DONE.

4.8.6.3 Camera Intensity (for all HFA II-*i* Models)

Purpose

This procedure ensures that the patient eye appears clearly illuminated in the camera video insert, and the trial lens IR LEDs are emitting proper output.

For Models 720-*i*, this procedure sets the reflex gaze LED, providing additional illumination to help differentiate the iris from pupil.

For Models 740-*i*, 745-*i*, and 750-*i*, this procedure sets the brightness of the reflex gaze LED to properly monitor gaze tracking, and sets the brightness and balance of the trial lens LEDs.

Special Tools/Equipment Required

- Tool Stand
- Fake Eye

Prerequisites

Before performing IR LED intensity, check/adjust the following:

1) Trial Lens Holder Alignment (4.9.6)

2) Camera Focus (4.9.7)

3) Bowl IR LED/Mirror (4.9.8)

4) Perform the Camera Position/Size Calibration.

Procedure

Models 720-*i*

1) From the Calibration main menu, select CAMERA INTENSITY.

2) Set GAIN WITH LENS HOLDER to 35, and STORE it.

3) Set GAIN WITHOUT LENS HOLDER to 35, STORE it, and select DONE.

Models 740-*i*, 745-*i*, and 750-*i*

1) Dim the room lights and turn down the brightness on the CRT. (This greatly improves your ability to distinguish small differences in illumination in the CRT image.)

2) From the Calibration main menu, select, CAMERA > INTENSITY.

3) Install the fake eye on the tool stand, and slide the tool stand onto the instrument chinrest. Push the tool stand forward slightly on the chinrest so that the metal tips on the Tool Stand Alignment Adaptor make contact with the headrest (FIGURE 4.10). This is the position the tool stand should be in when performing the procedure.

4) Raise and position the trial lens holder against the right angle bracket of the fake eye. The right-angle extension on the fake eye assembly will press against the trial lens holder and position it correctly (FIGURE 4.11). (Set the chinrest height so that the right-angle extension touches the trial lens holder at about the 0 - 0 level on the trial lens holder scale.) Verify that there is a central reflex indicating that the reflex LED in on.

   Note: *Once you have the trial lens holder set, do not move it.*

5) Center the fake eye to the cross in the video insert.

6) Select the REFLEX LED button on the right side of the screen.

7) Set the reflex count located to the right of the REFLEX LED button to 40.

8) Examine the reflex intensity value in the Intensity Reading column on the left side of the screen. If the reflex intensity is below 31 and the reflex count is at 40, use the UP STEP buttons to increase the reflex intensity until it just reaches 31 if possible. Do not allow the reflex count to exceed 100. A reflex intensity between 24 – 31 is acceptable. The higher values within the range are preferred.

9) Select STORE when the above conditions are set.

   Note: *The <35 count and information are not used in field calibration. They are for engineering use only.*

10) Examine the count for the >35 row of the Intensity Reading column for LEFT and RIGHT trial lens LEDs. The intensity readings for both should be between 100 – 200 and should be as close to each other as is possible.

11) If the readings are not in the acceptable range or are not close to each other, select LEFT LED and/or RIGHT LED and adjust using the UP STEP or DOWN STEP buttons. Repeat the checks until the trial lens LEDs are equally bright and intensity readings are between 100 – 200. The reflex intensity should remain between 24 – 31. If the reflex intensity has changed, repeat steps 6 and 7 above.

    Note: *When you adjust the brightness of one LED, the readings from the other LED also will be affected. Therefore, when you adjust one of the LEDs brighter, you may have to adjust the other one dimmer in order to get the readings of both within the desired range of 100 – 200.*

    When the desired result is obtained, select STORE.

4.9 Adjustments

4.9.1 Patient Support Horizontal Leadscrew Adjustment

Whenever possible, avoid loosening any of the screws that secure alignment of the forehead rest leadscrew and leadscrew nut. The leadscrew and leadscrew nut must remain accurately aligned to avoid binding at any point in the range of travel of the nut on the leadscrew. The preferred means of adjusting tension of the long belt on the patient support assembly is to adjust the position of the patient support X-motor.

4.9.2 Belt Tension

Belt tension is adjusted by feel.

4.9.3 Edge Detector

Adjust the edge detector and/or flag to center the flag in the edge detector slot.

4.9.4 Touch Screen

Purpose

This procedure is designed to calibrate the touch screen well enough to enable error-free use of the Patient data entry menu. The calibration process entails iterations of verify-calibrate, verify-calibrate — until the touch screen response occurs within 1/8" of the point of contact at the four corners and center of the screen.

Special Tools/Equipment Required

- Pencil Eraser

Verification

Check/verify touch screen calibration in the following manner.

1) Go to any screen and, using the pencil eraser tip, touch the screen in the four corners and in the center. Observe how far away the screen response appears from the point of contact.

2)
   - If the screen response is more than 1/8" away from the point of contact:

     Proceed to the Calibration Procedure below and recalibrate the touch screen by "following the error". (For example: If the response of the touch screen at the left side of the CRT was leftward from the point of contact, then at the next touch screen calibration, you should touch the upper left corner further to the left than you did during the last touch screen calibration, i.e., "follow the error" — this is why it may take more than one cycle of verify-calibrate to achieve acceptable calibration.)

   - If the screen response is within 1/8" of the touch screen contact point, make a final check as follows:

     From the main menu, select PATIENT icon, then PATIENT NAME, and type in your name. Verify that the screen displays exactly what you typed (if so, touch screen calibration is adequate).

Primary Touch Screen Calibration Procedure

Note: Use the pencil eraser tip, or similar soft-ended implement, during this procedure.

1) From the additional setup menu, select Touch Screen Calibration. If you are unable to access the additional setup menu, you can power-up the instrument while depressing the patient button until the touch screen calibration menu comes up. This will take approximately 2½ minutes.

2) Follow the instructions displayed on the screen.

   When you are instructed to press the rectangle in the Top Left Corner, note exactly where it is within the rectangle that you touch the screen. This will enable you to "follow the error," (as described above) if another attempt at calibration is necessary.

   Note: Press the rectangle only once; then wait for the screen to display the instruction to press the rectangle in the Bottom Left Corner.

   When you touch the rectangle, again note exactly where you touch the screen.

Secondary Touch Screen Calibration Procedure

Note: Use this procedure if the primary calibration procedure does not work due to the calibration being significantly out of adjustment.

1) Turn off the instrument power.
2) Hold the patient button in your hand and depress the switch all the way down.
3) Turn the power back on and continue to hold the button down.
4) Look at the screen and wait (still holding the button down) for a message on the screen that says, “If you want to calibrate the touchscreen, release the button now.” Release the button as soon as you see this message.
5) If the button was released in time, you should see a small square in the upper left of the screen. (Not the square in the extreme upper left with the letter “I” in it – just below that.)
6) Using a pencil with an eraser on it, quickly tap the square. Do Not touch any other part of the screen.
7) You should now see a small square in the lower right. Perform the same process as you did with the upper left square.
8) The instrument will begin the power on cycle.
9) Once it comes up to the Main Menu, re-check the calibration.

4.9.5 CRT Adjustments

Special Tools / Equipment Required

- Plastic Slot-Tip Alignment Tool
- Operator Panel Extension/Support Tool
- Extension Cables
- CRT Overlay Template (refer to Service Bulletin HFA2-029)

WARNING: *During these adjustments you will be working closely around the back of the CRT with power applied. Work carefully to avoid the areas where the CRT high voltage is present.*

Procedures

Note: *Because some of the CRT adjustments interact, they should be performed in the order presented here.*

All of the CRT adjustment control pots are located on the CRT Driver PCB (FIGURE 4.13). The name of each pot is labeled on the PCB.

Preparation

- Switch ON the instrument and allow it to warm up to normal operating temperature (about 15 minutes).
- A transparency CRT overlay template is included in Service Bulletin HFA2-029x. Cut the transparency with a scissor along the dark outer line. It will then just fit inside of the CRT bezel.

CRT Driver Board Adjustments

V SIZE (Vertical Size)

1) With CRT overlay template: Adjust the V SIZE pot so that the display image top and bottom edges match the top and bottom outline image on the overlay.

WIDTH (Horizontal Size)

2) With CRT overlay template: Adjust the WIDTH coil so that the display image's left and right edges match the left and right outline image on the overlay.

FOCUS

3) With the main menu still displayed, adjust the FOCUS pot for equal focus at the outer corners and center of the display.

BRIGHT (Brightness Control)

4) Set the EXTERNAL BRIGHTNESS pot to the maximum of its range.

5) Adjust the BRIGHT pot from minimum brightness towards the maximum brightness. The BRIGHT pot adjustment is correct when the white retrace lines are just visible.

6) Adjust the EXTERNAL BRIGHTNESS pot towards the minimum position until desired brightness is obtained.

CONT (Contrast)

7) Turn the CONT pot to minimum brightness (full counterclockwise) and then to maximum brightness (full clockwise), to determine the range of the pot. Adjust the CONT pot to its minimum, then turn the CONT pot clockwise about 1/3 of the total range. After adjusting contrast, it may be necessary to slightly readjust the BRIGHT pot.

V LIN (Vertical Linearity)

8) From a patient test, adjust the V LIN pot so that the circle encompassing the test points is circular and not egg shaped.

9) Remove the CRT overlay template and proceed to the Calibration and Diagnostics menu. Select the Video Test Pattern (Section 4.7) and perform any final adjustments using this on-screen display.

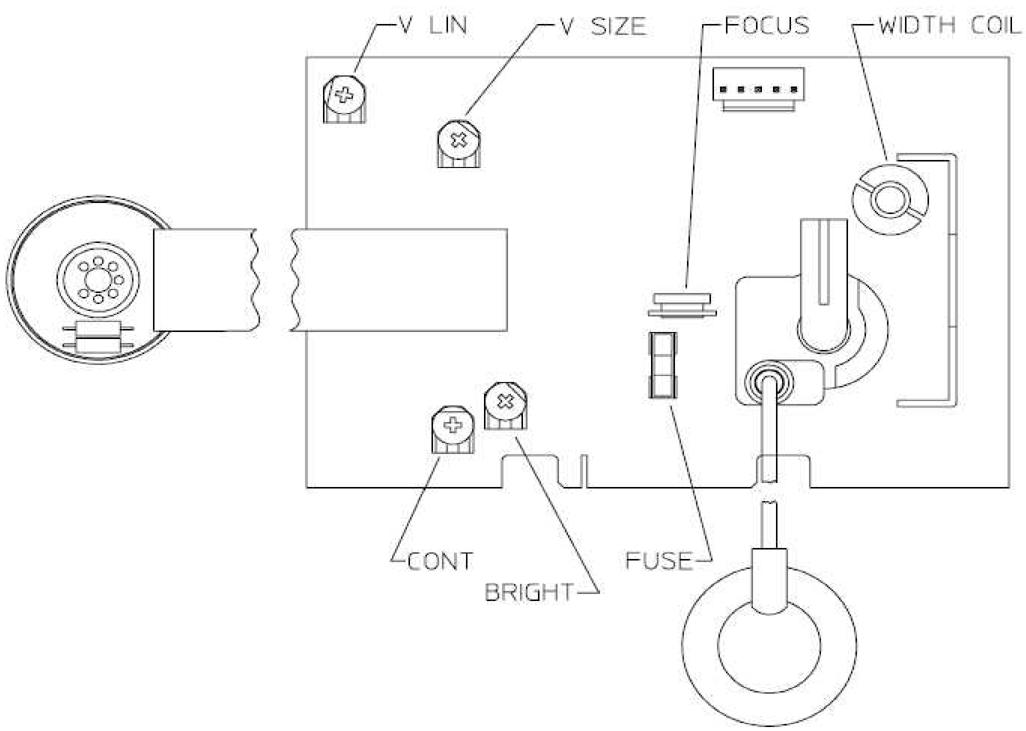

FIGURE 4.13. Z-Axis CRT Driver Board Adjustments

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CRT Yoke Adjustments

WARNING: *During these adjustments you will be working closely around the back of the CRT with power applied. Work carefully to avoid the areas where the CRT high voltage is present.*

Note: *Use the operator panel extension/support tool and extender cables as required to gain access to the yoke and magnet adjustments.*

Yoke Rings

Adjustment of the yoke rings (FIGURE 4.14) should seldom, if ever, be necessary. Adjustment should be done only if needed to obtain small additional horizontal or vertical display movement after all other CRT adjustments have been made. Yoke ring adjustment does not affect size of the display image.

CRT Yoke

CRT yoke adjustment rotates the display image on the CRT screen.

1) Slightly loosen the clamp screw that secures the yoke to the neck of the CRT (FIGURE 4.14).

2) Gently rotate the yoke to square the display image within the bezel opening. The display image should not be rotated more than 1/16". Use the rows and columns of dots on the touch screen as a reference.

3) Tighten the clamp screw just enough to keep the yoke from moving. (DON'T OVER-TIGHTEN!)

CRT Yoke Magnets

Note: *Adjustment of the yoke magnets should be avoided if at all possible and should be attempted only after all other possible remedies have been tried!*

Each of these magnets (FIGURE 4.14) has a subtle effect on size and shape of the display image. Adjustment of the magnets is a process of trial and error, and becomes a difficult, time-consuming task. If the display is distorted, consider all other possible causes before attempting to adjust the yoke magnets.

CAUTION *— Use caution when handling or working around the CRT yoke to avoid moving any of the yoke magnets.*

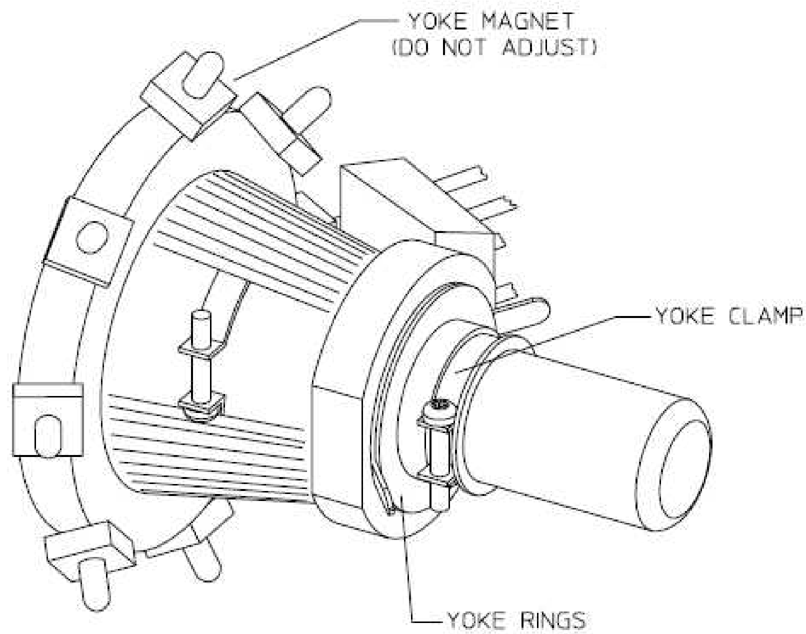

FIGURE 4.14. Z-Axis CRT Yoke Assembly

4.9.6 Trial Lens Holder

This procedure is used to align the trial lens holder. This must be done prior to aligning the camera or the gaze tracking system.

Special Tools / Equipment Required

- Tool Stand
- Trial Lens Holder Height Adaptor
- Zero Degree Trial Lens Alignment Adaptor (Black)
- C-clamp

Setup

1) Install the trial lens holder height adaptor and the chinrest mount on the bottom of the tool stand.

2) Remove the fake eye and install the trial lens alignment adaptor on the tool stand.

Procedure

1) Remove the front cover assembly (Section 3.2) and, using the C-clamp, clamp it securely in the upright position to a convenient work surface.

2) Mount the tool stand on the chinrest. Raise the chinrest (by manipulating the short belt inside the front cover) high enough to allow clearance of the height adaptor; then slide the chinrest mount over the chinrest. Push the mount onto the chinrest as far as it will go.

3) Center the chinrest by moving it left or right (manipulate the long belt). Use the edges of the chinrest and the molded lines on the front cover as visual reference (FIGURE 4.15).

4) Lower the chinrest until the height adaptor touches the front cover.

5) Manually lift the chinrest and tool stand slightly, and raise the trial lens holder into position below the tip of the trial lens alignment adaptor (FIGURE 4.16). Now lower the tool stand so that it again rests on the height adaptor.

   If properly aligned, the trial lens holder should encircle the tip of the alignment adaptor, with slight clearance all around (FIGURE 4.16).

6) Ensure that you have pushed the tool stand forward slightly on the chinrest so that the metal tips on the Tool Stand Alignment Adaptor make contact with the headrest (FIGURE 4.2). This is the position the tool stand should be in when performing the procedure.

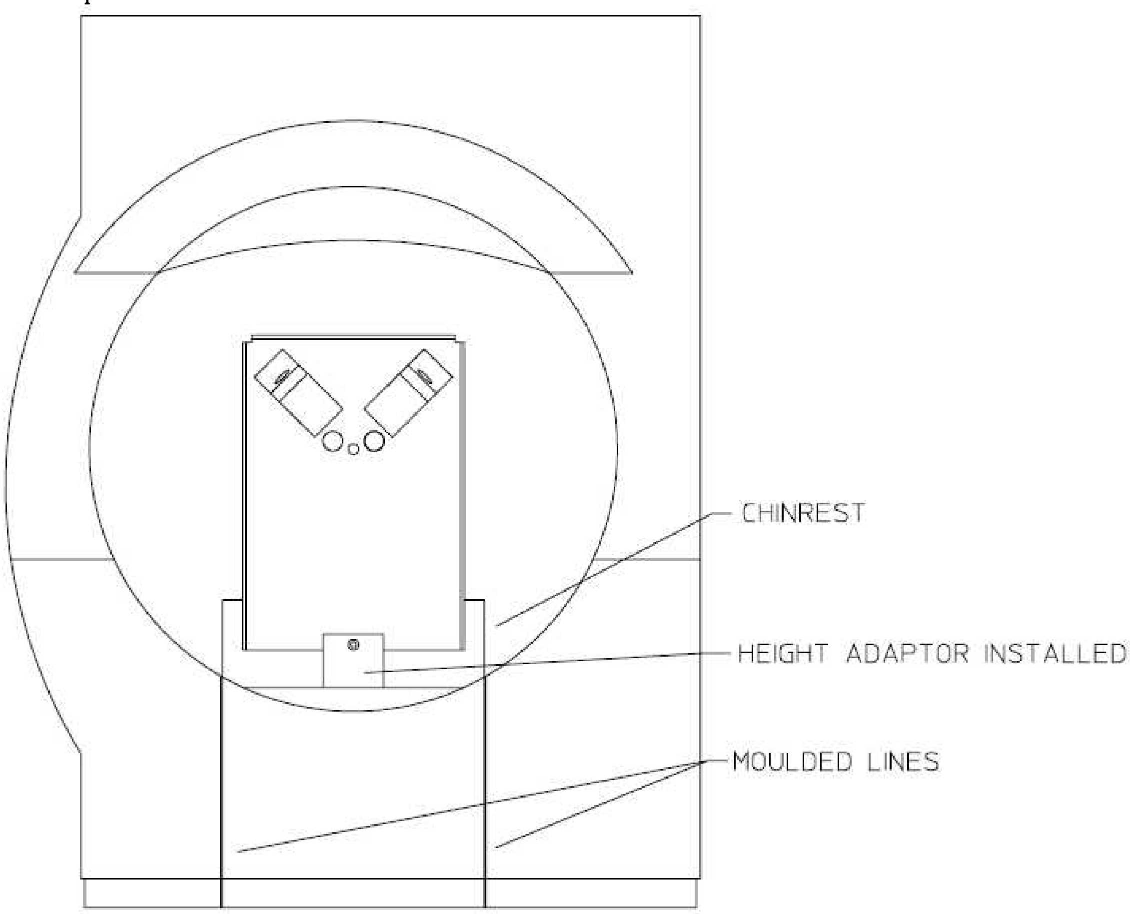

FIGURE 4.15. Chinrest Centered Relative to Front Cover

7) If the alignment is not correct, adjust the trial lens holder as follows:

   a) Check that the trial lens holder shaft rotates properly in the pivot block at the base of the shaft. If the stop screw at the base of the shaft (FIGURE 4.17) is screwed in too far, it will contact the top surface of the pivot block and impede rotation of the shaft.

   b) Loosen the two screws on the bottom of the shaft (FIGURE 4.17). This will allow up/down and left/right movement as necessary to obtain proper adjustment.

   c) With the trial lens holder positioned around the adaptor, retighten the screws. The trial lens holder should not put pressure against the alignment adaptor (FIGURE 4.16).

8) Check that the arm of the trial lens holder moves up and down smoothly in the slot of the trial lens trap. If necessary, the trial lens trap can be repositioned slightly by loosening the screw at each end of the trap.

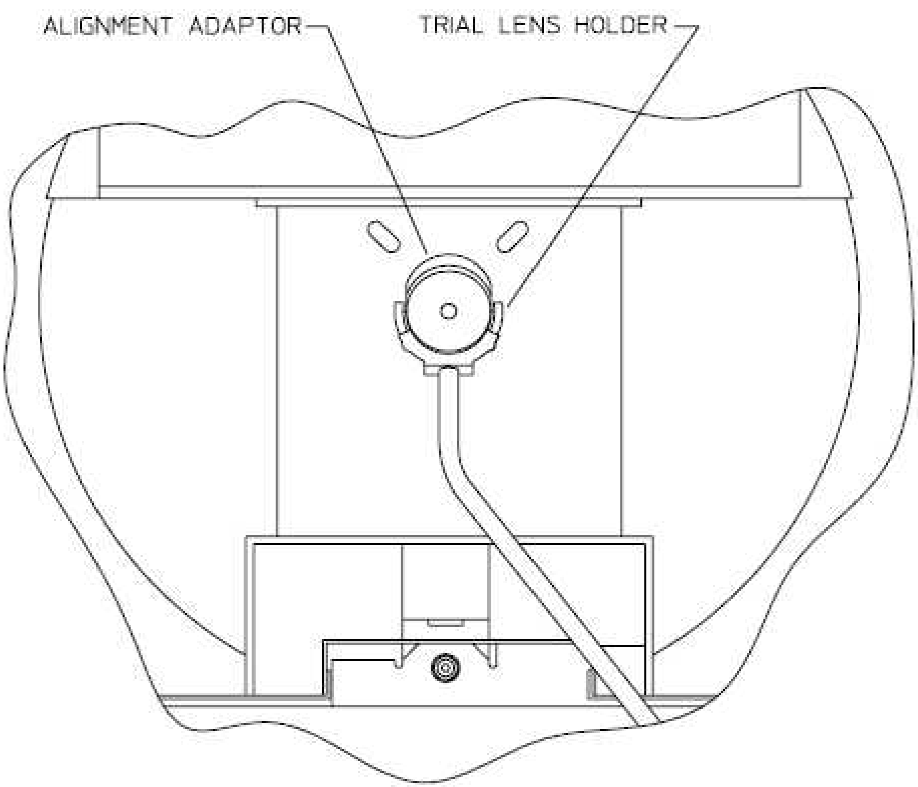

FIGURE 4.16. Trial Lens Holder Adjusted Relative to Alignment Adaptor

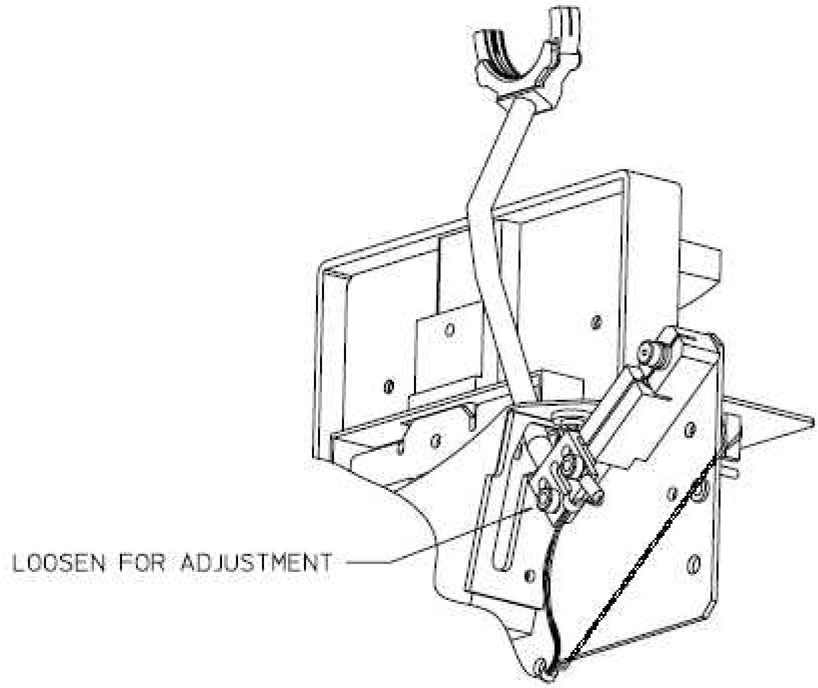

FIGURE 4.17. Trial Lens Holder Adjustment

4.9.7 Camera Focus

Purpose

This procedure adjusts the camera lens for optimum focus. It is not normally necessary to refocus the camera unless you have done replacements that affect the camera lens position (i.e., bowl replacement, fixation LED replacement, camera replacement).

Special Tools/Equipment Required

- Tool Stand
- Fake Eye with Camera Focus Target attached
- RTV

Prerequisites

Before starting Camera Focus, the following must be done:

1) Check/adjust the Trial Lens Holder (Section 4.9.6)

2) Check/adjust the Camera Position/Size (Sections 4.8.6.1 and 4.8.6.2).

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Procedure

1) Install the tool stand on the instrument, with fake eye attached and height adaptor removed. Push the tool stand forward slightly on the chinrest so that the metal tips on the Tool Stand Alignment Adaptor make contact with the headrest (FIGURE 4.2). This is the position the tool stand should be in when performing the procedure.

2) From the Calibration main menu, select CAMERA > POSITION.

3) Using the chinrest control switch, align the camera focus target in the video insert.

4) Gently rotate the camera lens manually and observe the focus target for best resolution obtainable. (You may need to use two fingers on opposite sides of the lens in order to rotate the lens without binding.)

5) Apply RTV at the point indicated in FIGURE 4.18 to secure the lens in position.

   Note: *Squeeze the RTV onto a piece of waste paper and allow it to thicken slightly and become tacky before you apply it to the lens.*

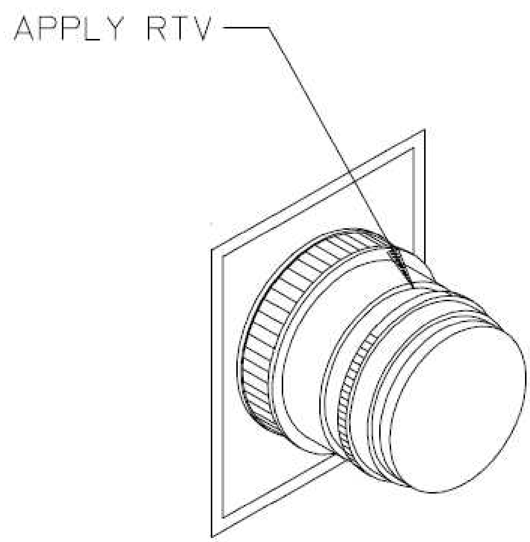

FIGURE 4.18. Applying RTV to Camera Lens

4.9.8 IR LED Alignments

Purpose

This procedure is used to align the Reflex LED and the Bowl IR LEDs.

Special Tools/Equipment Required

- Tool Stand
- Fake Eye

Prerequisites

Before starting IR LED Alignments, verify the following:

1) Check/adjust the trial lens holder (Section 4.9.6).

2) Check/adjust camera focus (Section 4.9.7).

3) Check/adjust camera size/position (Sections 4.8.6.1 and 4.8.6.2).

Reflex LED Alignment

Note: *The Reflex LED Alignment must be performed whenever the Fixation PCB is removed or the camera mount is loosened from the bowl assembly.*

1) Dim the room lights and turn down the brightness on the CRT (this greatly improves your ability to distinguish small differences in illumination in the CRT image).

2) From the Calibration Main Menu, select Camera > Position.

3) Install the Tool Stand with Fake Eye in the same manner as for camera intensity Cal.

4) Center the Fake Eye to the cross in the video insert.

5) Slightly loosen the two lower screws on the camera mount; you still want some pressure against the Reflex LED holder.

6) Move the Reflex LED using the Reflex LED holder until you center the circular LED pattern on the Fake Eye.

7) Tighten the screws of the camera mount and recheck to see if the adjustment was successful.

Bowl IR LED Assembly Alignment

Note: *After replacement or adjustment of the IR LED assembly, camera intensity calibration must be performed.*

1) Dim the room lights and turn down the brightness on the CRT (this greatly improves your ability to distinguish small differences in illumination in the CRT image).

2) From the Calibration Main Menu, select Camera > Position.

3) Install the Tool Stand with Fake Eye in the same manner as for camera intensity Cal.

4) Center the Fake Eye to the cross in the video insert.

5) Slightly loosen the screws holding the IR LED clamps.

6) Cover the cold mirror on the opposite side of the bowl with a small sticky note. Be careful that you do not touch the surface of the cold mirror.

7) Using the knurled portion of the IR LED assembly, adjust IR LED until you have the brightest image on the camera display. You will see four shadow spots in a diamond pattern from the IR LED assembly. You may not see all four spots on the display at onetime. If possible, make sure that none of the spots are in the gaze box.

8) Tighten the IR LED clamps and recheck the camera image.

9) Repeat the procedure for the IR LED assembly on the opposite side of the bowl (as required).

Section 5 – Troubleshooting

Notes:

5.1 Introduction

The troubleshooting aids in this section provide the Field Support Engineer several aids for problem diagnostics of the HFA II-*i*. As Field and Repair Center experience identifies recurrent problems and appropriate diagnostic processes, the section will be expanded to include additional troubleshooting aids.

5.2 General Guidelines for Assembly Level Troubleshooting

On-site assembly level troubleshooting poses unique and complex challenges to the Field Support Engineer. In addition to identifying and replacing the faulty assembly, the Field Support Engineer must often travel great distances to the customer location, resolve operator errors, and identify power and environmental causes of problems while satisfying the customer's perception of quality service.

A structured approach to resolving field problems can greatly increase customer satisfaction and the Field Support Engineer's effectiveness. There are seven major tasks in resolving field equipment problems:

Prior to Going On-Site

1. Obtain a Service History for the Instrument
2. Query the Operator of the Instrument
3. Check for Field Service Bulletins that Address the Problem

While On-Site

4. Have the Operator Demonstrate the Problem
5. Resolve the Obvious
6. Substitute the Failing Assembly
7. Confirm the Repair

Each of these tasks is explained below.

Prior to Going On-Site:

1) ***Obtain a Service History for the Instrument.***

Knowledge of previous problems will assist your troubleshooting efforts. Find out when the last Preventive Maintenance (PM) service call was performed (if applicable). If a PM is due, or will be due shortly, be prepared to perform this task in addition to the repair.

2) ***Query the Operator of the Instrument.***

Get a description of the problem and inform the operator that you will need him/her to demonstrate the problem to you when you arrive. A description of the problem should include the symptoms displayed and also the type of problem. Determining the type of problem helps you establish your approach to solving the problem and confirming the repair. All problems can be broadly categorized into one of three types:

- **Solid Failure -** the problem presents itself continuously.
- **Intermittent Duplicable -** the problem is intermittent in nature. Usually a specific sequence of events reproduces the intermittent symptom, although occasionally these problems may be random in nature. By performing the proper sequence of events, the problem can usually be reproduced. If a sequence of events readily reproduces the problem, examination of this sequence of events may help identify the faulty assembly.
- **Intermittent Non-Duplicable -** the problem is intermittent, and all reasonable attempts at recreating the symptoms fail. These are the most difficult problems to resolve.

3) ***Check for Field Service Bulletins that Address the Problem.***

If a service bulletin addresses a resolution, be sure to take the necessary equipment to perform the changes.

While On-Site:

4) ***Have the Operator Demonstrate the Problem.***

This is very important. Before doing anything, always have the operator attempt to demonstrate the problem to you. By having the operator demonstrate the problem, you may solve the problem immediately, or avoid some incorrect assumptions. Having the operator demonstrate the problem will *ALWAYS* result in one of the following:

- **Reveal Operator Error** - You may immediately see that the cause of the problem is operator error. You then have the opportunity to train the customer in the proper use of the instrument, instead of spending time troubleshooting a nonexistent instrument problem.
- **Demonstrate specific problem sequence** - The operator will show you the specific sequence of events needed to reproduce the problem, reducing your diagnostic time.
- **Help Form Ideas** - The operator may not be able to duplicate the problem. However, the sequence of steps used to demonstrate the problem will give you ideas on how to pursue the problem in other ways. In this case you have the opportunity to explain to the customer the difficulty in resolving a non-duplicable problem.

5) ***Resolve the Obvious.***

Obvious mechanical or physical defects should be resolved when discovered. Often, resolving the obvious will lead you to the real problem.

6) ***Substitute the Failing Assembly.***

Once you have deduced which assembly is at fault, or is suspected to be at fault, it should be substituted with a known good assembly.

7) ***Confirm the Repair.***

After an assembly is replaced, confirmation should be made by reinstalling the failing assembly to witness the original symptom. You are then assured of the effectiveness of the repair, and of the need to utilize your spare assembly. Also, the number of *No Problem Found* PCBs returned to the Repair Center is greatly reduced.

Confirming the repair to the customer often helps to bolster confidence in your abilities. To avoid repeat service calls it is especially important to confirm intermittent problems. Time spent confirming a repair is time well spent.

Note - *If the problem still exists, reinstall the original assembly that you removed, then continue troubleshooting.*

Solving Solid Failures:

It is usually straightforward deductive logic or electrical checks that will lead you to replace the faulty assembly. After replacement of the assembly in question resolves the symptom, it is imperative that you *CONFIRM THE REPAIR* by reinstalling the original assembly and witnessing the original symptoms again. For many assemblies this is the only means of positively verifying that the replacement circuitry has resolved the problem.

Solving Intermittent Duplicable Failures:

These failures are resolved in the same manner as solid failures but always require more time to resolve and confirm. The frequency of the problem helps you determine how long it will take to verify a repair. A good rule of thumb when troubleshooting intermittent problems is: 2 times the frequency of the symptom gives an 80% confidence level of the repair.

EXAMPLE:

Problem:

The problem appears only about once an hour. The sequence of events needed to reproduce the problem leads you to believe a circuit board is the likely cause.

Solution:

The suspected circuit board is replaced. To provide an 80% confidence level that the circuit board resolved the problem, the instrument will need to be tested for 2 hours without failing.

Solving Intermittent Non-Duplicable Failures:

These failures present the greatest difficulty to the Field Support Engineer. The most effective means for resolving these types of problems requires careful thought and the utilization of all available resources that the Field Support Engineer possesses.

It is important that before replacing an assembly, good solid rationale for its replacement be developed and a backup plan devised in case replacement of the assembly does not affect the symptom. It is best NOT to replace any hardware until solid rationale for replacement is clearly evident.

Once an assembly is replaced by a Field Support Engineer, the customer's expectations are set for a hardware resolution to the problem. This can prove to be a handicap. A good sequence to follow for resolving intermittent non-duplicable problems is:

1) Analyze the service history in detail. Look for trends or the possibility of a previous repair inducing the problem.

2) Query the operator(s) at length for any other clues such as:
   - Times of failures;
   - More failures with certain operators.

3) Watch the operator set up and use the instrument.

4) Check all Field Service Bulletins.

5) Contact other Field Support Engineers involved in previous repairs.

6) Look at the operating environment - static, power, grounding, temperature or rate of temperature change, humidity, etc.

7) Contact your Technical Support Specialists.

8) Keep a record of everything you've done to solve the problem.

9) Document the customer service report. Record what you feel should happen if the problem returns. This will help a different Field Support Engineer in the resolution of the problem.

10) Give the customer a thorough update on the situation.

11) Educate the customer on logging pertinent information that may benefit a Field Support Engineer should the problem return. Often, engaging the customer in the pursuit of a solution emphasizes the difficulty of the situation. In some instances, the customer may welcome the feeling of being involved in resolution of the problem.

5.3 A Guide to HFA II-*i* Service Diagnostic Aids

The HFA II-*i* is equipped with several types of service diagnostic aids. These diagnostic aids are summarized below and detailed elsewhere within this manual.

▪ Printouts and Identifiers

System Log - The System Log is a function in the software that keeps track of events that happen within the HFA II-*i* system. It may also prove invaluable to diagnosing intermittent problems, or symptoms that seem to worsen over time. Refer to Appendix J for more information on the System log.

Cal / Wedge Printout - The Cal / Wedge printout displays the state of calibration that the HFA II-*i* is in. More information on the Cal / Wedge printout can be found in Appendix H.

Software Module Identifiers - Provides a list of three letter abbreviations that can appear on-screen or in the instrument system log. Use the list to help identify the error source and its possible solution. (Section 5.4).

▪ Manual and Power-on Tests

Motor Exerciser and QA Test Points - Describes the various exerciser and QA tests that can be executed. (Section 5.5).

Printer Self Test - Provides descriptions of the Printrex error conditions, and how to perform a printer self test. (Section 5.6).

Power-On Self Tests - Describes the sequence of events that the Motor Driver board initiates during the instrument power on phase. (Section 5.7).

▪ Error Messages

Startup State Errors - Provides a list of possible Startup State Errors that may appear on-screen or in the system log. The Motor Driver board generates these errors during the instrument power on phase. Use the list to help identify the error source and its possible solution. (Section 5.8).

Hexadecimal Error Codes - Provides a table of hexadecimal errors that may appear on-screen or in the system log. Used properly, they can be valuable tools for fault isolation. The HFA II-*i* can generate thousands of error codes. To better manage this overwhelming amount of information, you will find only the error code number ranges detailed in Section 5.9.

Common Errors - Provides a table of the most common error messages and their solutions. (Section 5.10).

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5.4 Software Module Identifiers

Often, a Module ID will be displayed in association with a displayed error message. The Module ID identifies a particular block, or module, of software code. The three-letter Module ID will generally appear in a character string with several other characters.

Following is a glossary of the software module identifiers.

ERR	ERROR-EXCEPTION utility
TIM	TIMER
RAP	ROOT task
SEC	SW security utility
MBC	Calibration menu
KBD	Keyboard
TCH	Touch screen
PSW	Patient switch
UTL	System Utilities
BSD	Boot prom Service Duct
BPI	Boot Prom Interface
PRC	Print Charts
UT2	Unit test task #2
UT3	Unit test task #3
IPC	Inter-process comm. utility
PDM	Patient DB menu
PMM	Patient DB maintenance menu
PDB	Patient DB utility
MBI	Motor Board Interface
MBP	Motor Board physical driver
UT4	Unit test task #4
UT5	Unit test task #5
UT6	Unit test task #6
UT7	Unit test task #7
UT8	Unit test task #8
UT9	Unit test task #9
I I I	Interrupt handlers from 0xe0 to 0xfe
TST	Test utilities
DRA	(Device) RAM disk
RIN	Root task for Install application
ADM	Administration menu
GWI	Gateway input
DSE	Serial port driver
BKP	Backup/restore menu
FSY	File System
PRS	Print Spooler task
DEE	EEprom driver
STP	StatPac Module
DIO	Standard c I/O ev(stdin,stdout,stderr)
GUI	Graphics User Interface
GAP	Gui/App no-man's land
BGX	Boot Graphics
FLA	Flash
ATC	AutoTouch - record/playback
ATS	AutoTouch Service
HDX	HFA-I disk transfer utility task
MMG	Memory Manager - Smart Heap
UT0	Unit test task #0
UT1	Unit test task #1
GUI	Graphics User Interface
GWO	Gateway output
GHI	Host-to-Graphics Interface
KER	Kernel interface
APP	Application menu Setup
DEV	General Device support
INT	Interrupt dispatch and support
	HD initialization utility
UID	User Interface daemon
DFC	FD driver
PRM	Print menu
PRT	Printer Task
DPA	Parallel port driver
CPM	Custom test pattern menu
STC	Static Test Control module
STM	Static Test Module
KTM	Kinetic Test Module
LOG	Log utility
MAM	Main Monikers
TDM	Test and diagnostics menu
MFM	Manufacturing menu

Note:
DB = Database
FD = Floppy Disk
HD = Hard Disk

5.5 HFA II-*i* Motor Exerciser and QA Test Points

The HFA II-*i* offers the ability to exercise or move motors individually or in combination. In addition, QA test points may be selected in either a manual or automatic sequence.

Motor Exerciser and QA Test Points

1) From the Calibration main menu, select VERIFICATION.

2) Select either EXERCISER or Q/A TESTS. (SPOT SIZE is not performed in the field. It is used in-house to verify the ratio between the hole sizes in the aperture wheel in relation to the amount of light from the bowl surface.)

3) From the menu presented, select the desired test parameters

Motor Exerciser Menu:

- Test Count - Used to select the number of motor iterations.
- Motor Rate - Used to select the motor speed.
- Projector On - Used to turn the projection lamp ON.
- Projector Off - Used to turn the projection lamp OFF.
- X,Y,F,I,J,S - Used to select individual motors.

  X = Horizontal
  Y = Vertical
  F = Focus or Carriage
  I = Film Wedge
  J = Glass Wedge
  S = Shutter

- 30 Degree Tests - Used to move all motors within the central 0 - 30 degree range.
- 60 Degree Tests - Used to move all motors within the peripheral 30 - 60 degree range.
- Mixed 30/60 Tests - Used to move all motors within the 0 - 60 degree range.
- Stop Test - Used to stop the exerciser mode currently chosen.
- Done - Used to exit the motor exerciser.
- Iteration Count (looks like "Errors Encountered in Iteration") - Keeps track of the number of iterations. Updated when the test is complete, error occurs, or Stop Test is selected.
- Errors Current - Keeps track of the current number of errors.
- Errors Total - Keeps track of the total number of errors encountered.
- The last three items above are error status indications. These are displayed in 6 columns, each column representing one of the sequence: **X Y F I J S**

Q/A Test Points Menu:

- Current Point - Not a selection, but a status window. Provides information as to the parameters of the currently selected test point.
- Auto Sequence - The HFA II-*i* will automatically advance through all test points. (To interrupt and terminate, press the patient response button and then select *Done*.)
- Manual Sequencing - Each time the patient button is pressed, the test point will advance.
- Open Shutter - Opens the shutter.
- Close Shutter - Closes the shutter.
- Flash Shutter - Opens then closes the shutter.
- Initial Point - Presents a ten-key selection pop-up window. Allows a specific test point to be entered.
- Next Point - Advances the test point.
- Previous Point - Moves to the previous test point.
- Done - Returns to the Verification Menu.

5.6 Printrex Printer Self Test and Error Handling

5.6.1 Printer Self Test

5.6.1.1 Printer Self Test - Printrex Model 40038

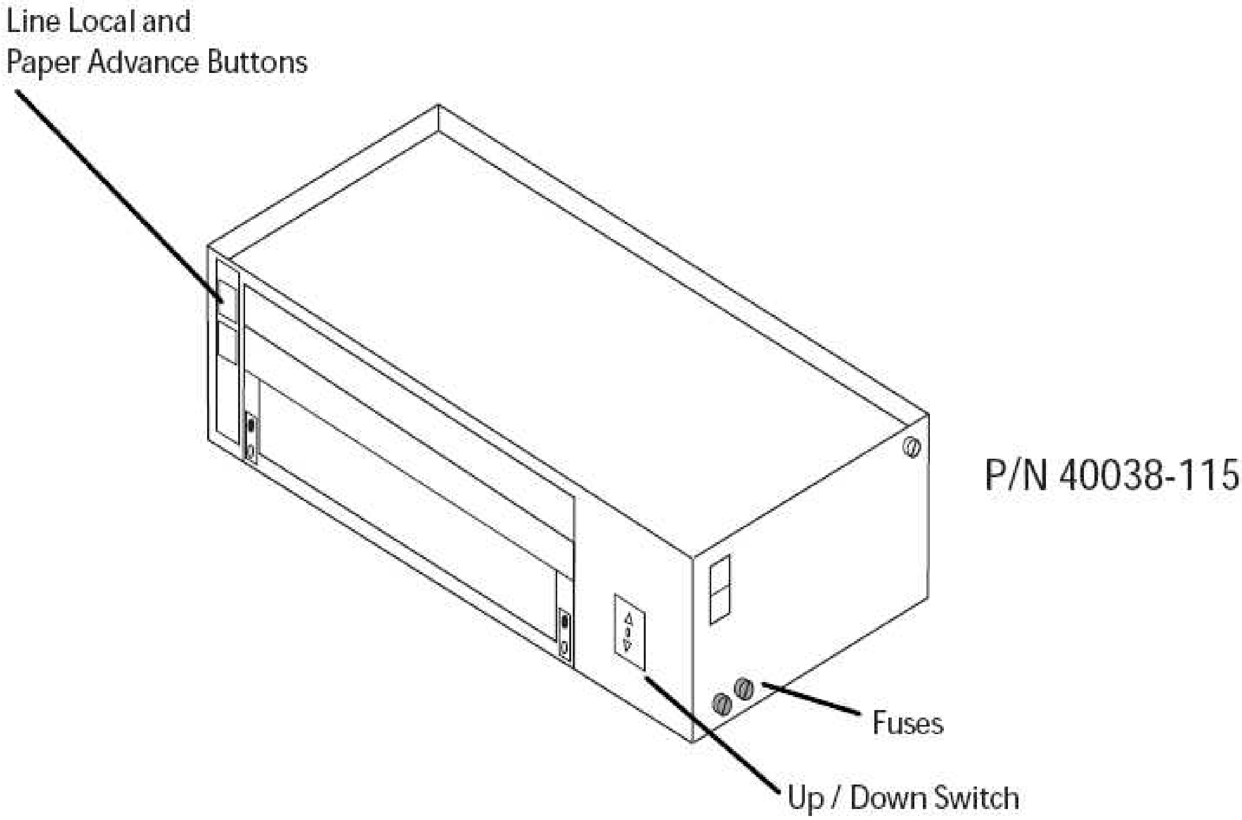


FIGURE 5.1. Printrex Printer Model 40038-115 (0000001211614)

To do the self test, place the printer in the local mode by pressing the Line/Local button. Then press and hold the Paper Advance button while pressing the Line/Local button to initiate the test. The buttons may be released once the test is started. In self test, the ERROR indicator turns ON and the printout shown in FIGURE 5.2 is generated.

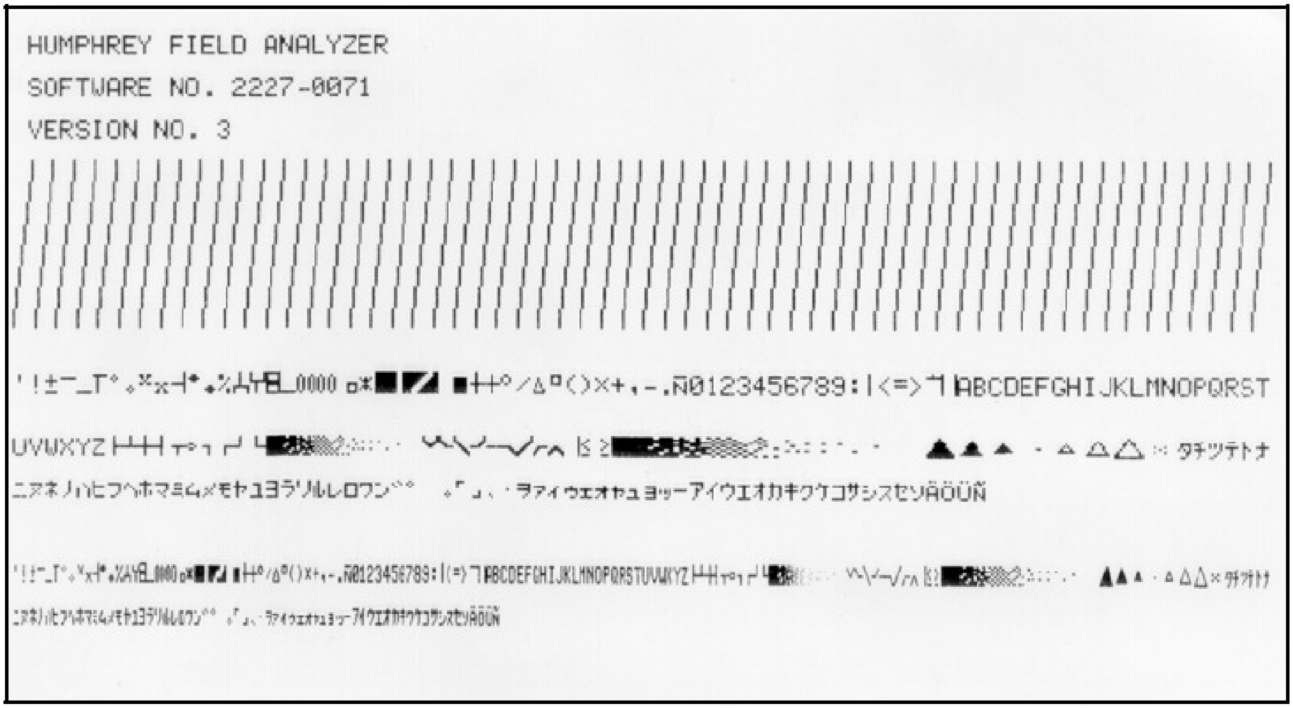


FIGURE 5.2. Self Test Printout for Printrex Model 40038

The self test printout continues until it is terminated by momentarily pressing the Paper Advance button again. After the self test, the printer remains in local mode until the Line/Local button is again pressed.

5.6.1.2 Printer Self Test - Printrex Model 54306

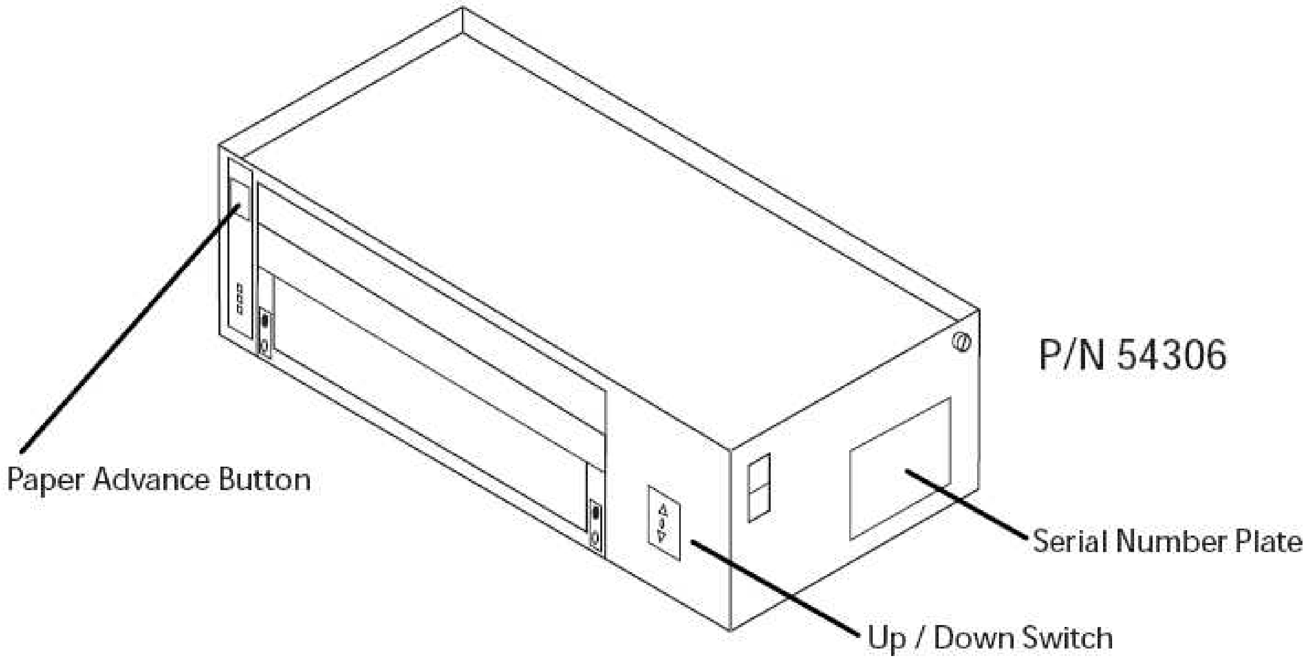
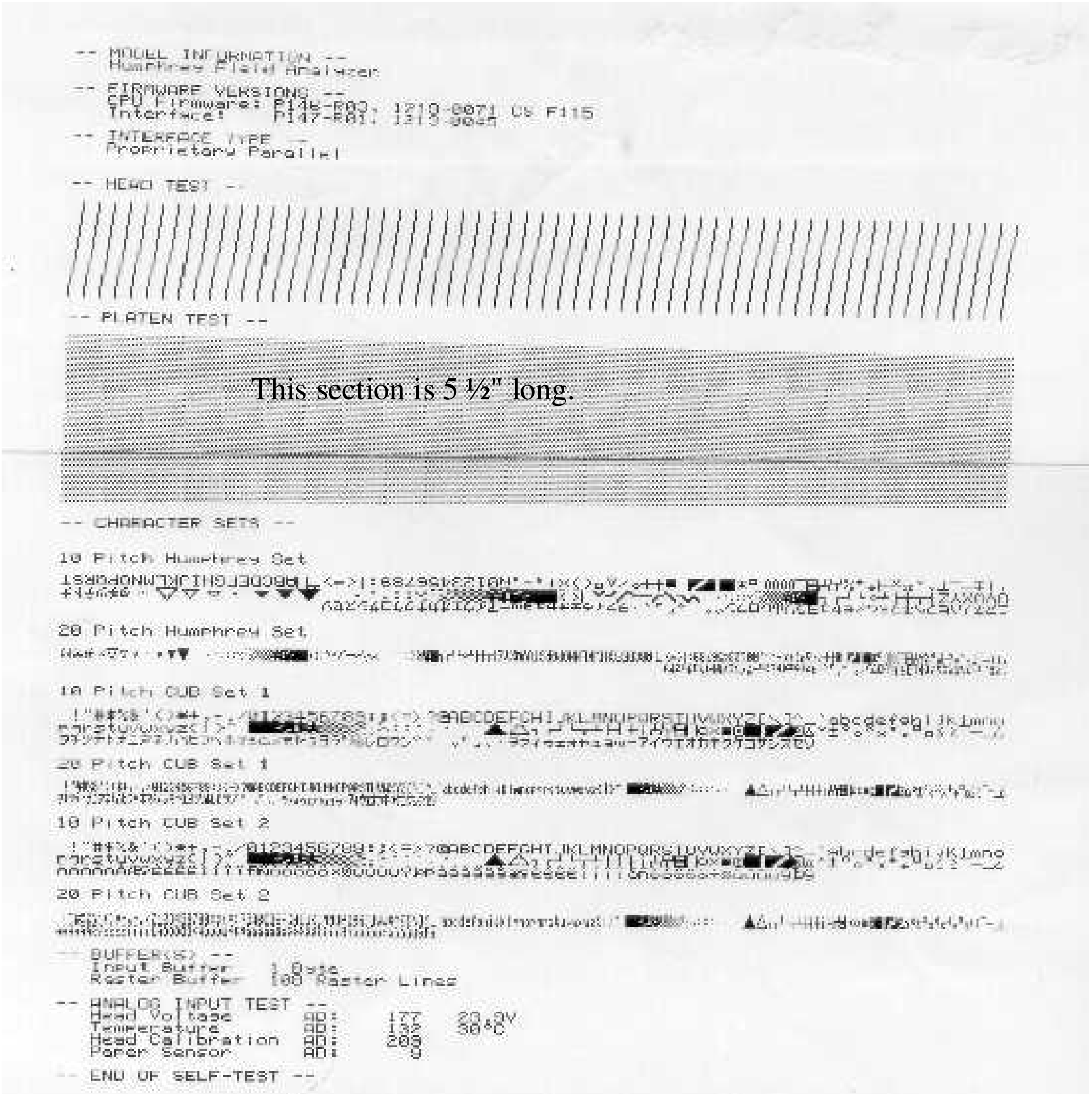


FIGURE 5.3. Printrex Printer Model 54306 (0000001255075)

To do the self test, power off the printer. Press and hold the Paper Advance button and power on the printer. Release the Paper Advance button when the self-test starts printing. Power off the printer to terminate the self-test. In self test, the ERROR indicator turns ON and the printout shown in FIGURE 5.4 is generated.



-- MODEL INFORMATION --
Humphrey Field Analyzer

-- FIRMWARE VERSIONS --
CPU Firmware: P146-R03, 1313-0071 CS F115
Interface: P147-R01, 1313-0045

-- INTERFACE TYPE --
Proprietary Parallel

-- HEAD TEST --

-- PLATEN TEST --

This section is 5 ½" long.

-- CHARACTER SETS --

10 Pitch Humphrey Set

20 Pitch Humphrey Set

10 Pitch CUB Set 1

20 Pitch CUB Set 1

10 Pitch CUB Set 2

20 Pitch CUB Set 2

-- BUFFER(S) --
Input Buffer 1 Byte
Raster Buffer 100 Raster Lines

-- ANALOG INPUT TEST --
Head Voltage AD: 177 23.9V
Temperature AD: 132 30°C
Head Calibration AD: 209
Paper Sensor AD: 9

-- END OF SELF-TEST --

FIGURE 5.4. Self Test Printout for Printrex Model 54306 & 26600211124420

5.6.1.3 Printer Self Test – Printrex Model 2660021124420

FIGURE 5.5. Printrex Printer Inside the Table Shelf

FIGURE 5.6. Printrex Printer Back View

To do the self test, power off the printer. Press and hold the Paper Advance button and power on the printer. Release the Paper Advance button when the self-test starts printing. Power off the printer to terminate the self-test. In self test, the ERROR indicator turns ON and the printout shown in FIGURE 5.4 is generated.

5.6.2 Printrex Printer Errors and Error Handling

The following conditions cause the front-panel ERROR indicator to light and fault signals to be sent to the host.

Paper Empty:

When the printer detects a paper-empty condition, it stops printing, goes off line, sets the Paper Empty line high, sets the Busy line high, sets the Fault line low and lights the ERROR indicator. Normal operation resumes when a new paper roll is installed.

Door Open:

When the door is opened (either latch unlocked), the printer stops printing, goes off line, sets the Fault Line low, sets the Busy line high, and flashes the ERROR indicator.

Overvoltage Error:

If the +24 Vdc input is too high (+27 volts or greater), the printer stops printing, sets the Fault line low, sets the Busy line high, flashes the ERROR indicator, and waits for the voltage to drop to operating levels.

Under Voltage:

If the +24 Vdc input is too low (+21 volts or less) for a period of 625 ms or more, the printer stops printing, sets the Fault line low, sets the Busy line high, flashes the ERROR indicator, and waits for the voltage to return to +22 volts or higher before resuming normal operation.

Over Temperature:

If the printhead temperature increases above a preset level, the printer runs slower than specified to allow it to cool, and returns to normal speed when the temperature reaches an acceptable level. If the printhead temperature exceeds operating levels, the printer stops printing, sets the Fault line low, sets the Busy line high, flashes the ERROR indicator, and waits for the temperature to drop to operating levels before resuming normal operation.

Brownout:

A brownout condition is defined as the +5 volt supply dropping below +4.5 volts. The printer goes into reset and all data in its buffers is lost if a brownout occurs.

5.7 Power-On Self Tests

5.7.1 Motor Driver Board Startup

The startup of the Motor Driver Board involves eighteen distinct operations, each of which must succeed before the Motor Driver Board is deemed to be operating successfully and capable of supporting clinical testing activity.

The Motor Driver Board startup sequence is outlined in the steps below. Recommended repair actions are described in Section 5.8.

Step 1 - Resets Motor Driver Board

Sends NMI signal to Motor Driver Board, then waits until CTS is true. Bowl intensity is at maximum value.

Step 2 - Gets ROM revision level

Checks the revision level to see whether loader or motor controller code is running, and to ascertain that it is at an appropriate level with the desired functional support.

Step 3 - Gets ROM status

Reads the status of the Motor Driver Board ROM startup, to ascertain if the self-check succeeded.

Step 4 - Resets motors

Brings all six motors to their respective flag crossings.

Step 5 - Sets internal variables for operation.

Sets internal variables using a white stimulus against a white bowl.

Step 6 - Initializes calibration constants

Data is read from NVM, and internal variables are populated. This includes offsets for the X, Y, F, and S motors, bowl and projector intensities, aperture wheel calibration values, gaze window location, eye monitor parameters, eye illumination parameters, and the gaze calibration parameters.

Note - *All parameters have reasonable default values in case of initial power-up or uncalibrated system.*

Step 7 - Turns on the projection lamp to allow for lamp warmup.

Step 8 - Sets bowl illumination to calibration value

Turns the bowl "on" to the specified calibration value (previously at full intensity).

Step 9 - Initializes the DVM

Sets the DVM to internal bipolar mode, then initiates the hardware auto-cal sequence. Sets DVM to bipolar internal mode, then reads for zero value. Iterates until reasonable zero is attained.

Step 10 - Zeros the DVM

Sets the DVM to external unipolar, then initiates the hardware auto-cal sequence. Sets DVM to (unipolar) detector mode, then reads for zero value. Iterates until reasonable zero is attained.

Step 11 - Turns on the projection lamp as a secondary output check.

Step 12 - Positions motors to bowl origin

Sets the X, Y, and F motors to point to the center of the bowl.

Step 13 - Sets aperture wheels to clear, w/Goldmann V

Simultaneously moves both wheels to their maximum apertures.

Step 14 - Turns projector on

The projector is turned on with the output voltage associated with its calibrated 10,000 asb level.

Step 15 - Sets voltage level

The projector turret is positioned 35 degrees above center. The shutter is opened, with no attenuation, and intensity is read. The intensity is compared with the value established at calibration time. If there is a notable difference, the output voltage is adjusted until the intensity read is within a specified limit of the calibration value. The voltage drop across the projection lamp is then measured and used as a reference for future voltage adjustments. The shutter is then closed.

Step 16 - Sets flash duration

The shutter is set to flash for a 200-millisecond duration.

Step 17 - Verifies wedges

At 10 points on each wheel, the intensity is measured and compared against the value stored in memory. If any value is greater than 1 dB from the measured value, the test fails. If the RMS value for these readings is greater than 0.5 dB, the test fails.

Step 18 - Turns off projector

The projector is turned off, but the background bowl lamps are left at their established values.

5.8 Startup State Errors

During the power-on sequence, the Motor Driver Board goes through 18 discrete operations, as indicated in **5.7.1 Motor Driver Board Startup** in the Service Manual. If an error occurs, the following message(s) will be displayed:

"**System startup state ##**" where ## indicates the startup state number.

The startup state numbers are as follows:

0[1]	Motor board - reset failed
1[1]	Get ROM ID - mismatch of revision levels
2[1]	Get status - ROM self check failed
3[1]	Resets motors - all motors failed to detect their flags
4[1]	Set motor flag params - motor or edge detector failed
5[1]	Set motor rates - motor did not respond properly
6[1]	Set white - internal variable for operation of white stimulus failed
7[1]	Projector on 1 - lamp warm up cycle failed
8[1]	Bowl on - bowl illumination failed to reach calibrated limit
9[3]	Initialize DVM
10[3]	Zero detector
11[2]	Projector on 2 - Projector lamp burned out or disconnected
12[1]	Position stimulus
13[1]	Set both wheels
14[3]	Set projector voltage - projector voltage exceeded 10 V, light path may be blocked
15[3]	Set flash duration
16[3]	Verify wedges
17[2]	Projector off
18	Shutter may be misaligned
19	Aperture may be misaligned

There will also be a suggested error recovery action to be taken by the operator. They are as follows:

All codes marked with [1] above will have the following message - "Please cycle power to restart"

All codes marked with [2] above will have the following message - "Please replace projection lamp and restart"

All codes marked with [3] above will have the following message - "Please dim room lights and press Retry"

Please note that an error code can be caused by a number of different things. For example, if there is a problem during the verification of the wedges, code 16, this could be caused by excessive room illumination, dirt on one of the wedges, dirt on the light detector, a broken glass wedge or defective electronics. All of the causes are indistinguishable from a software standpoint and the error message "Please dim the room lights and press Retry" is based on the expected cause of the error.

Note - *Additional errors may occur at the same time as the startup state errors, and are logged in the System log. Print out the System Log to check for additional errors.*

If the EEPROM should fail, there will be a message displayed as follows:

"HFA II may need service [code XXXXXX: 1>0x%AAAA 2>0x%BBBB]

Where AAAA will be replaced with a status code and BBBB is replaced with the index code.

Status Codes and their meanings are as follows:

190000	Bad Motor Value
190002	Bad Camera Value
190004	Bad Intensity Value
190006	Bad Read
190007	Bad Write

Index codes associated with Motor or Light values are:

0	Right Mode
1	Left Mode
2	Offset
3	Focus
4	Shutter
5	Aperture
6	Bowl
7	Projector
8	Yellow
9	Blue
10	Color

Index codes associated with Camera values are:

0	Illumination
1	Video Window
2	Gaze window
3	Gaze Parameters
4	Max Camera

Error messages will also appear in a small window in the upper right corner on the display. Status numbers, index numbers and an explanation of the error will be shown. These windows may be stacked on top of each other as the error develops. By touching the window, the error message on top will disappear, revealing the message under it (only from the Main Menu). To better see the error and to get a better idea of what may be causing it, print out the System Log.

Startup State Errors:

Note - *After any replacement/repair, refer to Section 3, Table 3-1 for follow-up actions.*

System startup state 0 - Indicates Motor Board Reset failed

Recommended Action:

- Cycle power to restart.
- Replace motor driver PCB.

System startup state 1 - Get ROM ID - there has been a mismatch of revision levels.

Recommended Action:

- Cycle power to restart.
- Install the most current revision of software.
- Replace motor driver PCB.

System startup state 2 - Get Status - the ROM self-check failed

Recommended Action:

- Cycle power to restart.
- Install the most current revision of software.
- Replace motor driver PCB.

System startup state 3 - Resets motors - All motors have failed to detect their flags

Recommended Action:

- Cycle power to restart.
- Check System Log (Appendix J.3) for repetitive motor failures.
- Visually inspect Motors, Flags, and Edge Detectors for misalignment. The Motor exerciser function can also be used to diagnose motor failures. Adjust as necessary.
- If failure cannot be traced to a particular Motor, flag, or detector check/replace motor driver PCB or connections.

System startup state 4 - Set motor flag parameters - a motor or edge detector has failed.

Recommended Action:

- Cycle power to restart.
- Check System Log (Appendix J.3) for repetitive motor failures.
- Visually inspect Motors, Flags, and Edge Detectors for misalignment. The Motor exerciser function can also be used to diagnose motor failures. Adjust as necessary.
- Refer to Common Error Messages (Section 5.10).
- If failure cannot be traced to a particular Motor, flag, or detector check/replace motor driver PCB or connections.

System startup state 5 - Set motor rates - A motor did not respond properly.

Recommended Action:

- Cycle power to restart.
- Check System Log (Appendix J.3) for repetitive motor failures.
- Visually inspect Motors, Flags, and Edge Detectors for misalignment. The Motor exerciser function can also be used to diagnose motor failures. Adjust as necessary.
- If failure cannot be traced to a particular Motor, flag, or detector check/replace motor driver PCB or connections.

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System startup state 6 - Set white - The internal variable for the operation of the white stimulus on the white bowl have failed.

Recommended Action:

- Cycle power to restart.
- Check/replace spot detector/cable.
- Check/replace motor driver PCB.

System startup state 7 - Projector on 1 - The projector lamp warm up cycle has failed.

Recommended Action:

- Cycle System Power.
- Replace Projection Bulb.
- Check projection path mechanical alignment.
- Check/replace projector lamp cable.
- Check/replace motor driver PCB.

System startup state 8 - Bowl on - The bowl failed to reach its calibrated value.

Recommended Action:

- Cycle Power to restart.
- Perform Bowl Intensity Calibration.
- Check/replace spot detector/cable.
- Check EEPROM.
- Check/replace bowl lamps (bowl lamps must be replaced in pairs only).
- Check/replace motor driver PCB.

System startup state 9 - Initialize DVM - The built in Digital Voltmeter (Motor Board) failed to initialize.

Recommended Action:

- Dim Room lights and Retry.
- Check/replace spot detector/cable.
- Refer to Common Error Messages (Section 5.10).
- Check/replace motor driver PCB.

System startup state 10 - Zero detector - The built in Digital Voltmeter (Motor Board) failed to find a reasonable zero value.

Recommended Action:

- Dim room lights and retry.
- Refer to Common Error Messages (Section 5.10).
- Check/replace spot detector/cable.
- Check projection path.
- Check/replace motor driver PCB.

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System startup state 11 - Projector on 2 - The projector lamp is either burned out or disconnected.

Recommended Actions:

- Ensure the Lamp is plugged in correctly.
- Replace the projection lamp and restart.
- Check/replace projector lamp cable.
- Check projection path mechanical alignment.

System startup state 12 - Position Stimulus - Centering stimulus failed.

Recommended Action:

- Cycle Power to restart.
- Perform Mechanical Calibrations.
- Refer to Common Error Messages (Section 5.10).

System start up state 13 - Set both wheels - Wheels failed to move to their maximum aperture.

Recommended Action:

- Cycle power to restart.
- Perform Wedge Calibration.
- Check Film and Glass ND wheels.
- Refer to Common Error Messages (Section 5.10).

System startup state 14 - Sets projector voltage - The projector voltage has exceeded 10V (Maximum limit)

Recommended Action:

- Dim room lights and retry.
- Replace projection lamp.
- Check projection path mechanical alignment.
- Refer to Common Error Messages (Section 5.10).

System startup state 15 - Set flash duration - The shutter failed to provide the 200 ms flash duration.

Recommended Action:

- Dim room lights and retry.
- Perform shutter and wedge calibration. Check for mechanical interference.
- Check/replace shutter motor.

System startup state 16 - Verify Wedges failed

Recommended Action:

- Dim room lights and retry.
- Perform shutter and wedge calibration.
- Check for broken, cracked, or very dirty green and/or blue filters in the detector assy. Replace as necessary.
- Check/replace ND Wheel.

System startup state 17 - Projector off failed

Recommended Action:

- Replace projection lamp and restart.
- Check/replace projection lamp cable.
- Check projection path alignment.
- Check/replace spot detector/cable.

System startup state 18 – Shutter may be misaligned

Recommended Action:

- Cycle power to restart.
- Check System Log (Appendix J) for repetitive motor failures.
- Visually inspect shutter operation for misalignment. Adjust as necessary.

System startup state 19 – Aperture may be misaligned

Recommended Action:

- Cycle power to restart.
- Check System Log (Appendix J) for repetitive motor failures.
- Perform the Aperture Spot Ratio procedure.

5.9 Hexadecimal Error Codes

Errors preceded by a '%' symbol, are generated by the Motor Board. These errors fall within two ranges: errors can indicate a fault with code received from the CPU, or a device that is controlled by the Motor Board or the Motor Board itself.

%1 thru %14 = Motor, Flag or Illumination Errors
%81 thru %93 = Flash Memory Loader Errors

Note - *Error codes are listed in Hexadecimal format. If an error code begins with an 0xNNNNNN, disregard the 0x and look up only the NNNNNN in the table.*

Hex. Error Codes Ranges	Error Module
000000-thru-000103	Operating System Error
002001-thru-002FOE	Patient Database Error
010001-thru018007	HFA2 Error Exception Utility Error
020000	Software Timer
030000-thru-030006	Root Task Error / Application Start-up
040000-thru-040005	Software Security Module
070000-thru-070020	Floppy Disk Driver (software)
080000-thru-080020	SCSI Device Error
0A0000-thru-0A0032	Printer Task Error
0B0000-thru-0B000C	Parallel Port Driver Error
0C0000-thru-0C0007	Inter-process Communication Utility Err.
0F0002-thru-0F2100	Patient Database Utility Error
110000-thru-11000A	Motorboard Physical Drive Error
120000-thru-120049	Motorboard Library Error
130000-thru-130009	Calibration Menu Error
140000-thru-140008	Keyboard Error
160000-thru-160005	Patient Switch Error
190000-thru-190034	Static Test Engine Error
1B0000-thru-1B0012	Service / Error Log Utility Error
200000-thru-200004	Gateway Input Error
210000-thru-210007	Serial Port Driver Error

Hex. Error Codes Ranges	Error Module
220000-thru-22001A	Backup / Restore Menu Error
230000-thru-20000B	File System Error
240000-thru-24000A	System Utility Function Error
250000-thru-25012D	Graphical User Interface Error
270000-thru-270014	CPU to Video Processor Error
290000-thru-290060	Application Software Error
2A0000-thru-2A0001 Error	General Device
2C0000-thru-2C0009 2D0000 2E0000	Boot Prom Error
300000-thru-310002	Test Utility Error
310000-thru-310002	Ram Disk Error
320000-thru-32000F	Installation Error
330000-thru-330007	Print Spooler Error
340000-thru-340004	EEPROM Device Driver Error
350002-thru-350307	StatPac Error
370000-thru-370002	GUI/APP No-Man's land Error
380000-thru-380002	Data Compression / Decompression Error
390000-thru-390004	Boot Graphics Error
3A0000-thru-3A0005	Flash Prom Interface Error
3D0000-thru-3D0009	HFA-i Hard Disk Transfer Utility Error
3E0000	Memory Manager Error
3F0000-thru-3F0004	Keyboard Controller Interface Error
40000-and-400001	Processor Interrupt Error
410000-thru-41000b	Run-Time Loadable Module Error
880000-thru-890008	DST Service Tool Error

5.10 Common Error Messages / Solutions

The table below provides the most common error messages, a description of the problem, and some possible solutions. Check each solution in the order given. After any replacement / repair procedure, ensure that you check Section 3, Table 3-1 for required follow-up actions.

ERROR MESSAGE	PROBLEM	SOLUTION
130009	A value stored within the EEPROM is out of tolerance.	1) Print out the Cal/Wedge printout. Look for the phrase "INVALID DATA" beneath NVM Data. Recalibrate as required. 2) If equipped with Blue-Yellow, recalibrate the Wedge calibration first, and then recalibrate the Blue Correction second.
Motor Board Uncalibrated (MBC Motor Board Controller)	A primary system error was reported during the power up sequence. A message, "Pressing Proceed Will Not Allow Testing" was displayed. The operator pressed proceed and then attempted to run a patient test.	Print out the System Log. Look at the log for Startup State "XX" Errors, where "XX" indicates a number. Refer to Sections 5.7 and 5.8 in this manual for description of each number.
Check Stepper Motor	The system software has detected a problem that does not fit into any system error message string. The software will default to the Check Stepper Motor message. It does not necessarily mean that there is a motor related problem.	Print out the System Log. There probably will not be any other errors, however, you should check to be sure. Often, this error is associated with the detector cable, the detector, its internal filters, or the light detection circuitry.

ERROR MESSAGE	PROBLEM	SOLUTION
Failure to Initialize DVM	The signal to initialize the DVM chip on the motor board did not occur. This message is usually accompanied with either a Start Up State 9 or 16 error message.	Print out the System Log. Verify that these errors are not occurring during system start up. If they are, ensure the room lights are dim during the start up period. This error will always occur if the front cover is off or if the black patch on the front cover has fallen off. Check the detector cable, detector, its internal filters, and the light detection circuitry.
Illegal Attenuation	The film wedge and the glass wedge do not provide enough light attenuation.	Print out the Cal\Wedge printout. Check the Wedge Attenuation value. It must be greater than 500. Try recalibrating the Wedges. If equipped with Blue-Yellow, recalibrate the Blue Correction after the Wedge calibration (see Error 130009). Check both the film wedge and glass wedge. Replace and recalibrate as required.
Unexpected Event	An event occurred which the system software and hardware could not properly process.	This is a very low level error involving the CPU. Normally, rebooting the instrument will restore functionality. It is not likely that an error will show in the System Log, however, it should be checked.
Check Stepper Motors, Shutter and Lamps	The projection lamp, yellow bowl lamp, or bowl lamps have degraded and have become unstable.	Printout the Cal\Wedge printout. Look at the Projection Lamp Voltage. If nearing 10 volts or below 7.8, replace the projection lamp. The yellow bowl lamp cannot be tested, and if suspect, should be replaced. The white bowl lamps should only be replaced in pairs.

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ERROR MESSAGE	PROBLEM	SOLUTION
Any floppy or hard drive error message	May be a problem with the diskette, the drive, the cable, etc.	Refer to Appendix K.5 and K.6 for drive-related troubleshooting dialogues.
System Startup State 4, 12, 13, or 14.	The “I” (film wedge) and “J” (glass wedge) motors or associated assemblies are not operating properly.	Print out the system log. Normally, numerous other error messages indicating either the “I” or “J” wedge will be seen. Determine which wedge is causing the Startup State error. Check for any mechanical rotation problems. Verify that the wedge passes freely through the edge detector. Ensure that the film wedge is not slipping off the brass hub that it is mounted on. Check for any scoring marks on the wedge’s opposing brass hub. If scoring marks are present, the pin on either wedge, aperture, or color wheel hub may be too long, causing them to be incorrectly positioned. Check the ease of rotation on the opposing wedge hub. Remove the aperture or color wheel as required to clean the shaft and bushing. Verify the functionality of the appropriate edge detector and motor. Check for proper alignment along the entire projection path.

ERROR MESSAGE	PROBLEM	SOLUTION
Printer is offline or is disconnected.	The HFA II was not able to communicate with the printer.	Ensure that the Printrex printer “green” power light is on. Check the printer power connection and the data cable. Reseat the both cables. Check for the proper printer selection in the System Set Up menu. Remove the paper carrier. Blow any paper debris from the IR LED hole in the lower right corner of the Printrex printer door opening. Reseat the paper carrier and paper as far to the right as possible. Perform the Printrex self test described in section 5.6 of this manual. As a final repair action, try another printer, then CPU PCB.

5.11 Instrument / BIOS Configuration

5.11.1 Instrument Configuration

This section provides a listing of configuration settings that are critical to the operation of the HFA II-*i* instrument.

Bootup Sequence:

In the Advanced CMOS SETUP, the first boot device is the (hard drive). The instrument will not boot up a system disk from other media drives (if configured with the default settings). Special instructions have been programmed in the instrument to recognize the installation software and the Diagnostic Support Tool. If an application software or the DST tool are installed during instrument power up, the system will recognize them and allow the system to boot. If you attempt to load any other diagnostic software utilities, you will need to first set the first boot device to the appropriate source.

Note: *If you set the first boot device in the Advanced CMOS Setup to an appropriate boot source for diagnostic purposes, it is necessary to reset the boot sequence back to the original device after using the utility. Failure to do so will create a "Non-system disk or disk error. Replace and strike any key" any time the appropriate boot source was left in during the bootup sequence.*

Changing the BIOS Advanced CMOS Setup First Boot Device:

1) Set the HFA II-*i* system power switch to ***ON.***
2) Press and hold the ***Delete*** key.
3) A ***Enter current Password*** dialogue will appear.
4) Enter the password (***xxxxx***).
5) The AMIBIOS HIFLEX SETUP UTILITY screen will appear.
6) Use the down arrow key to select ***Advanced CMOS Setup***.
7) Press ***Enter***.
8) The AMIOBIOS Setup - Advanced CMOS Setup screen is displayed.
9) Use the down arrow to select ***1st Boot Device***.
10) Use the ***PgUp*** (page up) or ***Pg Dn*** (page down) keys to select the first boot device. Set the first boot device to floppy if you plan on using the diagnostic utilities. Set the first boot device to IDE-0 if you plan on resetting the instrument for normal operation.
11) Press ***ESC*** (escape) to exit the Advanced CMOS Setup screen.
12) Press the ***F10*** function key to save and exit the AMIBIOS HIFLEX SETUP UTILITY.
13) Press ***Enter*** to answer yes to the *Save current settings and exit* prompt.

5.11.2 BIOS Configuration Version ≥5.1

MAIN

AMIBIOS

Version 08.00.15
Build Date 07/02/10
ID HF935T10

System Time........ "Current Time"*
System Date .... "Current Date"* (Note 3)

ADVANCED

CPU Configuration

No user definable settings

IDE Configuration

Sata#1 Configuration........ Enhanced
Sata#2 Configuration........ Enhanced

Primary IDE Master .... Hard Disk

- Type........ Auto
- LBA/Large Mode .... Auto
- Block (Multi-Sector Transfer) .... Auto
- PIO Mode........ Auto
- DMA Mode........ Auto
- S.M.A.R.T........ Auto
- 32 Bit Data Transfer .... Enabled

Primary IDE Slave .... Hard Disk *

- Type........ Auto
- LBA/Large Mode .... Auto
- Block (Multi-Sector Transfer) .... Auto
- PIO Mode........ Auto
- DMA Mode........ Auto
- S.M.A.R.T........ Auto
- 32 Bit Data Transfer .... Enabled

Secondary IDE Master .... Not Detected

Type .... Auto
LBA/Large Mode .... Auto
Block (Multi-Sector Transfer) .... Auto
PIO Mode .... Auto
DMA Mode .... Auto
S.M.A.R.T. .... Auto
32 Bit Data Transfer .... Enabled

Secondary IDE Slave .... Not Detected

Type .... Auto
LBA/Large Mode .... Auto
Block (Multi-Sector Transfer) .... Auto
PIO Mode .... Auto
S.M.A.R.T. .... Auto
32 Bit Data Transfer .... Enabled

Third IDE Master .... Not Detected (Note 2)

Type .... Auto
LBA/Large Mode .... Auto
Block (Multi-Sector Transfer) .... Auto
PIO Mode .... Auto
S.M.A.R.T. .... Auto
32 Bit Data Transfer .... Enabled

Fourth IDE Master .... ARMD (Note 2)

PIO Mode .... Auto
32 Bit Data Transfer .... Enabled
ARMD Emulation Type .... Auto

Floppy Configuration

Floppy A .... 1.44 MB 3½”

Super I/O Configuration

On Board Floppy Controller .... Enabled
Serial Port 1 Address .... 3F8 / IRQ4
Serial Port 2 Address .... 2F8 / IRQ3
Parallel Port Address 3BC
Parallel Port Mode .... Normal
Parallel Port IRQ IRQ7

Hardware Health Configuration

Fan1 PWM Control .... [080]

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Remote Access Configuration

Remote Access .... Disabled

Trusted Computing

TCG/TPM SUPPORT .... No

USB Configuration

Legacy USB Support .... Enabled
USB Functions .... 5 USB Ports
USB 2.0 Controller .... Enabled
USB 2.0 Controller Mode .... Hi Speed

AHCI Configuration

AHCI BIOS Support .... Enabled
AHCI Port 0 Support .... Not Detected
AHCI Port 1 Support .... Not Detected
AHCI Port 2 Support .... Not Detected
AHCI Port 3 Support .... Not Detected
AHCI Port 4 Support .... Not Detected
AHCI Port 5 Support .... Not Detected

PCI PnP

IRQ3.. Reserved
IRQ4.. Reserved
IRQ5.. Reserved
IRQ7.. Reserved
IRQ9.. Available
IRQ10.. Available
IRQ11.. Available
IRQ14.. Available
IRQ15.. Available

DMA Channel 0 .... Available
DMA Channel 1 .... Available
DMA Channel 3 .... Available
DMA Channel 5 .... Available
DMA Channel 6 .... Available
DMA Channel 7 .... Available

Enable ISA PnP configuration .... Enabled

BOOT

Boot Settings Configuration

Quick Boot .... Disabled
Quiet Boot... Enabled
Bootup Num-Lock.. Off

Boot Device Priority

1st Boot Device .... SATA:PM-"Hard Drive*"
2nd Boot Device .... 1st FLOPPY DRIVE (Note 2)

Hard Disk Drive

1st Drive .... SATA:PM-"Hard Drive*"

Removable Drives

1st Drive .... 1st FLOPPY DRIVE *(Note 2)
2nd Drive .... Disabled (Note 5)

SECURITY

Change Supervisor Password
User Access Level .... Full Access
Change User Password
Password Check .... Setup

CHIPSET

South Bridge Configuration

GbE LAN Boot.. Disabled
GbE Wake Up From S5... Disabled
HDA Controller .... Disabled

ACPI Aware O/S.. Yes
Resume on PME# .... Disabled
Restore on AC Power Loss .... Power On
Power Button Mode .... On/Off

Note 2: These configuration sections may or may not be visible depending on the instrument configuration.
Note 3: Upon battery failure the settings should remain as indicated above and the date should revert to 1-1-2002.
Note 5: This will only be displayed if the MO drive is connected.

* Variable field. Not the same for each system
" " Replace with indicated text. Drive information is automatically detected

5.11.3 BIOS Configuration Version 4.1, 4.2.2, 5.0

Standard CMOS Setup

Floppy Drive A	1.44 MB 3 1/2		
Floppy Drive B	Not installed		
Pri Master	Auto	32 Bit Mode	On
Pri Slave	Auto	32 Bit Mode	On
Sec Master	Not Installed		
Sec Slave	Not Installed		
Boot Sector Virus Protection	Disabled		

Advanced CMOS Setup

Quick Boot	Enabled
1st Boot Device	IDE-0
2nd Boot Device	Floppy
3rd Boot Device	IDE-1
4th Boot Device	Disabled
Try Other Boot Devices	Yes
Initial Display Mode	Silent
Display Mode at Add-On-ROM Init	Keep Current
S.M.A.R.T. for Hard Disks	Enabled
BootUp Num-Lok	Off
Floppy Drive Swap	Enabled
PS/2 Mouse Support	Enabled
System Keyboard	Absent
Primary Display	VGA/EGA
Password Check	Setup
Boot to OS/2 > 64MB	No
CPU Serial Number	Disabled
L1 Cache	Writeback
L2 Cache	Writeback
System BIOS Cacheable	Enabled
C000, 64K Shadow	Cached
D000,64K Shadow	Disabled

Advanced ChipSet Setup

USB Function	Enabled
USB Keyboard Legacy Support	Enabled
DRAM Page Closing Policy	Closed
DRAM Tras/Trc Cycle time	5/7
Address Setup Time (SCLKs)	1
CAS# latency (SCLKs)	3
SDRAM RAS# to CAS# delay	2
SDRAM RAS# Precharge	2
Graphics Mode Select	UMA - 1MB
Display Cache Window Size	64MB
ICH Delayed Transaction	Enabled
C1kGen Spread Spectrum	Disabled
Local Memory Frequency	100 MHz

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**** Display Cache Function ****	
Initialize Display Cache Memory	Disabled
Paging Mode Control	Open
RAS-to-CAS	Default
CAS Latency	Slow
RAS Timing	Slow
RAS Precharge Timing	Slow
Watch Dog Timer Control	Disabled
Watch Dog Timer Setting	8 sec.
CMOS RAM CLEAR FUNCTION	Enabled

Power Management Set-up

ACPI Aware O/S	No
ACPI Standby State	S1/POS
Power Management /APM	Disabled
Video Power Down Mode	Disabled
Hard Disk Power Down Mode	Disabled
Standby Time Out (Minute)	N/A
Suspend Time Out (Minute)	N/A
Throttle Slow Clock Ratio	50.0%
Keyboard & PS/2 Mouse Access	Monitor
FDC/LPT/COM Ports Access	Monitor
Primary Master IDE Access	Monitor
Primary Slave IDE Access	Ignore
Secondary Master IDE Access	Ignore
Secondary Slave IDE Access	Ignore
PIRQ [A] IRQ Active	Ignore
PIRQ [B] IRQ Active	Ignore
PIRQ [C] IRQ Active	Ignore
PIRQ [D] IRQ Active	Ignore
Power Button Function	On/Off
Resume On Ring	Disabled
Resume On PME	Disabled
Resume On RTC Alarm	Disabled
RTC Alarm Date	15
RTC Alarm Hour	12
RTC Alarm Minute	30
RTC Alarm Second	30

Plug and Play Setup

Plug and Play Aware O/S	No
Clear NVRAM	No
PCI Latency Timer (PCI Clocks)	64
Primary Graphics Adapter	Add-on VGA
PCI VGA Palette Snoop	Disabled
PCI IDE BusMaster	Disabled
PCI Slot1 IRQ Priority	Auto
PCI Slot2 IRQ Priority	Auto

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PCI Slot3 IRQ Priority	Auto
PCI Slot4 IRQ Priority	Auto
DMA Channel 0	PnP
DMA Channel 1	PnP
DMA Channel 3	PnP
DMA Channel 5	PnP
DMA Channel 6	PnP
DMA Channel 7	PnP
IRQ 3	PCI/PnP
IRQ 4	PCI/PnP
IRQ 5	ISA/ESIA
IRQ 7	PCI/PnP
IRQ 9	PCI/PnP
IRQ 10	PCI/PnP
IRQ 11	ISA/ESIA
IRQ 14	PCI/PnP
IRQ 15	PCI/PnP

Peripheral Setup

OnBoard FDC	Enabled
OnBoard Serial Port A	3F8/COM1
OnBoard Serial Port B	2F8/COM2
OnBoard Parallel Port	3BC
Parallel Port Mode	Normal
EPP Version	N/A
Parallel Port IRQ	7
Parallel Port DMA Channel	N/A
Keyboard PowerOn Function	Disabled
Specific Key for PowerOn	N/A
Mouse PowerOn Function	Disabled
OnBoard IDE	Primary

5.11.4 BIOS Configuration Version <4.1

Standard CMOS Setup

Floppy Drive A	1.44 MB 3 1/2
Floppy Drive B	Not installed
Pri Master	Auto
Pri Slave	Auto
Sec Master	Not Installed
Sec Slave	Not Installed
Boot Sector Virus Protection	Disabled

Advanced CMOS Setup

Quick Boot	Enabled
1st Boot Device	IDE-0
2nd Boot Device	Floppy
3rd Boot Device	IDE-1
4th Boot Device	Disabled
Try Other Boot Devices	Yes
Initial Display Mode	Silent
Display Mode at Add-On-ROM Init	Keep Current
S.M.A.R.T. for Hard Disks	Enabled
BootUp Num-Lok	Off
Floppy Drive Swap	Enabled
PS/2 Mouse Support	Enabled
System Keyboard	Absent
Primary Display	VGA/EGA
Password Check	Setup
Boot to OS/2 > 64MB	No
CPU Serial Number	Disabled
L1 Cache	Writeback
L2 Cache	Writeback
System BIOS Cacheable	Enabled
C000, 64K Shadow	Cached
D000,64K Shadow	Disabled

Advanced ChipSet Setup

USB Function	Enabled
USB Keyboard Legacy Support	Enabled
DRAM Page Closing Policy	Closed
DRAM Tras/Trc Cycle time	5/7
Address Setup Time (SCLKs)	1
CAS# latency (SCLKs)	3
SDRAM RAS# to CAS# delay	2
SDRAM RAS# Precharge	2
Graphics Mode Select	UMA - 1MB
Display Cache Window Size	64MB
ICH Delayed Transaction	Enabled
C1kGen Spread Spectrum	Disabled
Local Memory Frequency	100 MHz

**** Display Cache Function ****

Initialize Display Cache Memory	Enabled
Paging Mode Control	Open
RAS-to-CAS	Default
CAS Latency	Slow
RAS Timing	Slow
RAS Precharge Timing	Slow
Watch Dog Timer Control	Disabled
Watch Dog Timer Setting	8 sec.
CMOS RAM CLEAR FUNCTION	Enabled

Power Management Set-up

ACPI Aware O/S	No
ACPI Standby State	S1/POS
Power Management /APM	Disabled
Video Power Down Mode	Disabled
Hard Disk Power Down Mode	Disabled
Standby Time Out (Minute)	Disabled
Suspend Time Out (Minute)	Disabled
Throttle Slow Clock Ratio	50.0%
Keyboard & PS/2 Mouse Access	Monitor
FDC/LPT/COM Ports Access	Monitor
Primary Master IDE Access	Monitor
Primary Slave IDE Access	Ignore
Secondary Master IDE Access	Ignore
Secondary Slave IDE Access	Ignore
PIRQ [A] IRQ Active	Ignore
PIRQ [B] IRQ Active	Ignore
PIRQ [C] IRQ Active	Ignore
PIRQ [D] IRQ Active	Ignore
Power Button Function	On/Off
Resume On Ring	Disabled
PME Function Support	Disabled
Resume On RTC Alarm	Disabled
RTC Alarm Date	15
RTC Alarm Hour	12
RTC Alarm Minute	30
RTC Alarm Second	30

Plug and Play Setup

Plug and Play Aware O/S	No
Clear NVRAM	No
PCI Latency Timer (PCI Clocks)	64
Primary Graphics Adapter	Add-on VGA
PCI VGA Palette Snoop	Disabled
PCI IDE BusMaster	Disabled
PCI Slot1 IRQ Priority	Auto
PCI Slot2 IRQ Priority	Auto
PCI Slot3 IRQ Priority	Auto
PCI Slot4 IRQ Priority	Auto
DMA Channel 0	PnP
DMA Channel 1	PnP
DMA Channel 3	PnP
DMA Channel 5	PnP
DMA Channel 6	PnP
DMA Channel 7	PnP
IRQ 3	PCI/PnP
IRQ 4	PCI/PnP
IRQ 5	ISA/ESIA
IRQ 7	PCI/PnP

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IRQ 9	PCI/PnP
IRQ 10	PCI/PnP
IRQ 11	ISA/ESIA
IRQ 12	ISA/ESIA
IRQ 14	PCI/PnP
IRQ 15	PCI/PnP

Peripheral Setup

OnBoard IDE	Primary
OnBoard FDC	Enabled
OnBoard Serial Port A	3F8/COM1
OnBoard Serial Port B	2F8/COM2
OnBoard Parallel Port	3BC
Parallel Port Mode	Normal
EPP Version	N/A
Parallel Port IRQ	7
Parallel Port DMA Channel	N/A
Mouse PowerOn Function	Disabled
Keyboard PowerOn Function	Disabled
Specific Key for PowerOn	N/A

Section 6 – Diagrams

Notes:

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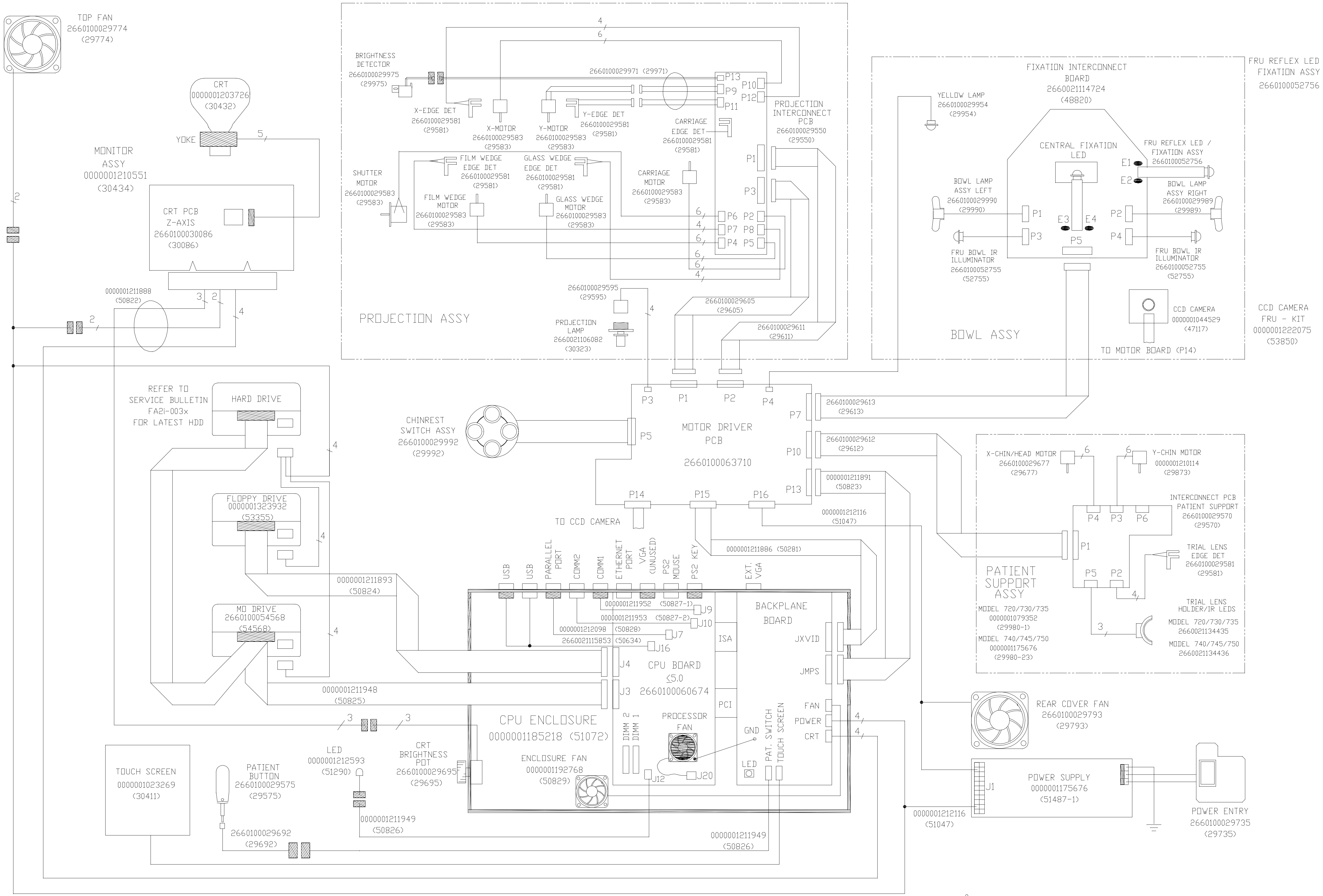


FIGURE 6.1.
HFA II-i System Interconnect Diagram
Software / Hardware Version ≤5.0

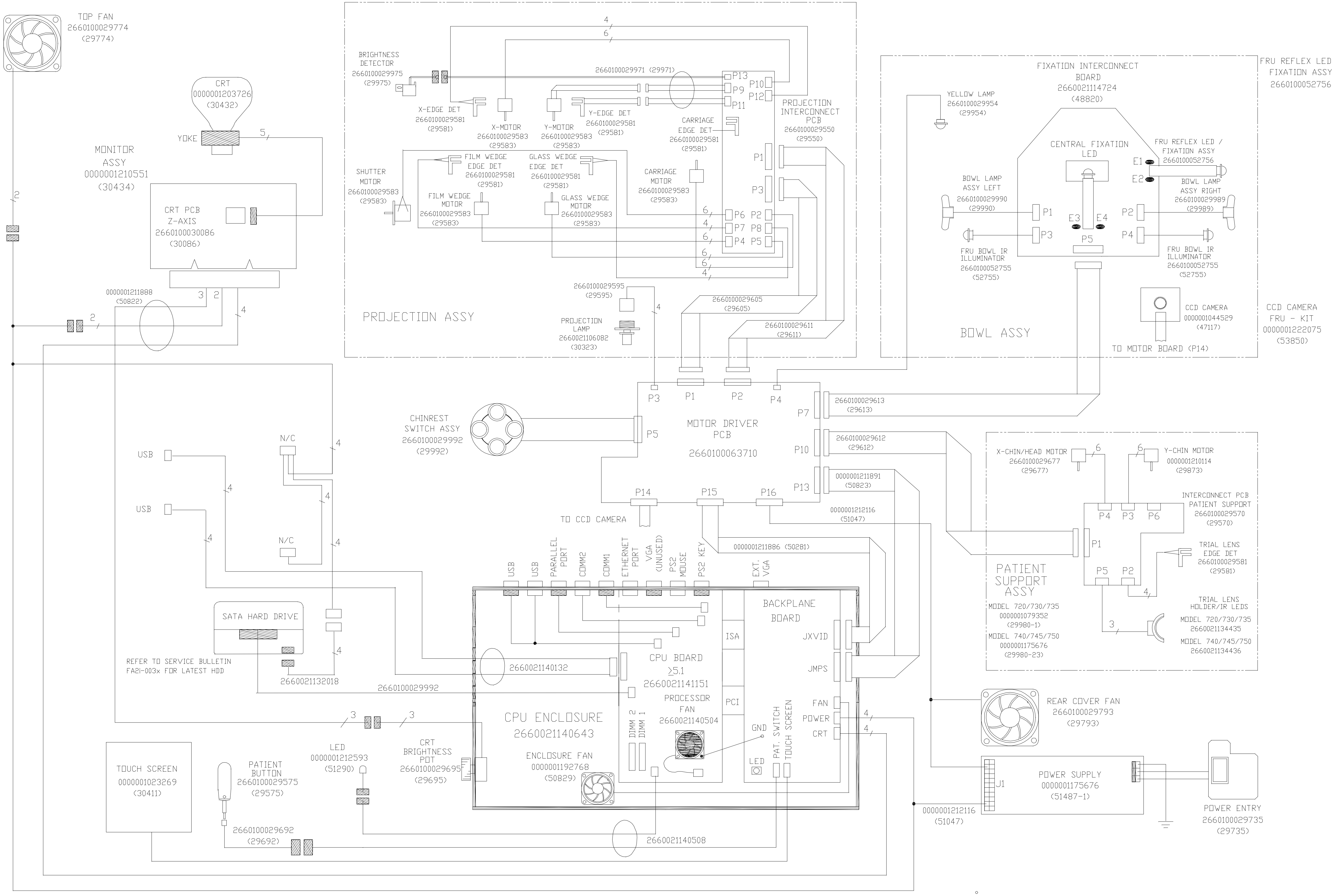


FIGURE 6.2.
HFA II-i System Interconnect Diagram
Software / Hardware Version ≥5.1

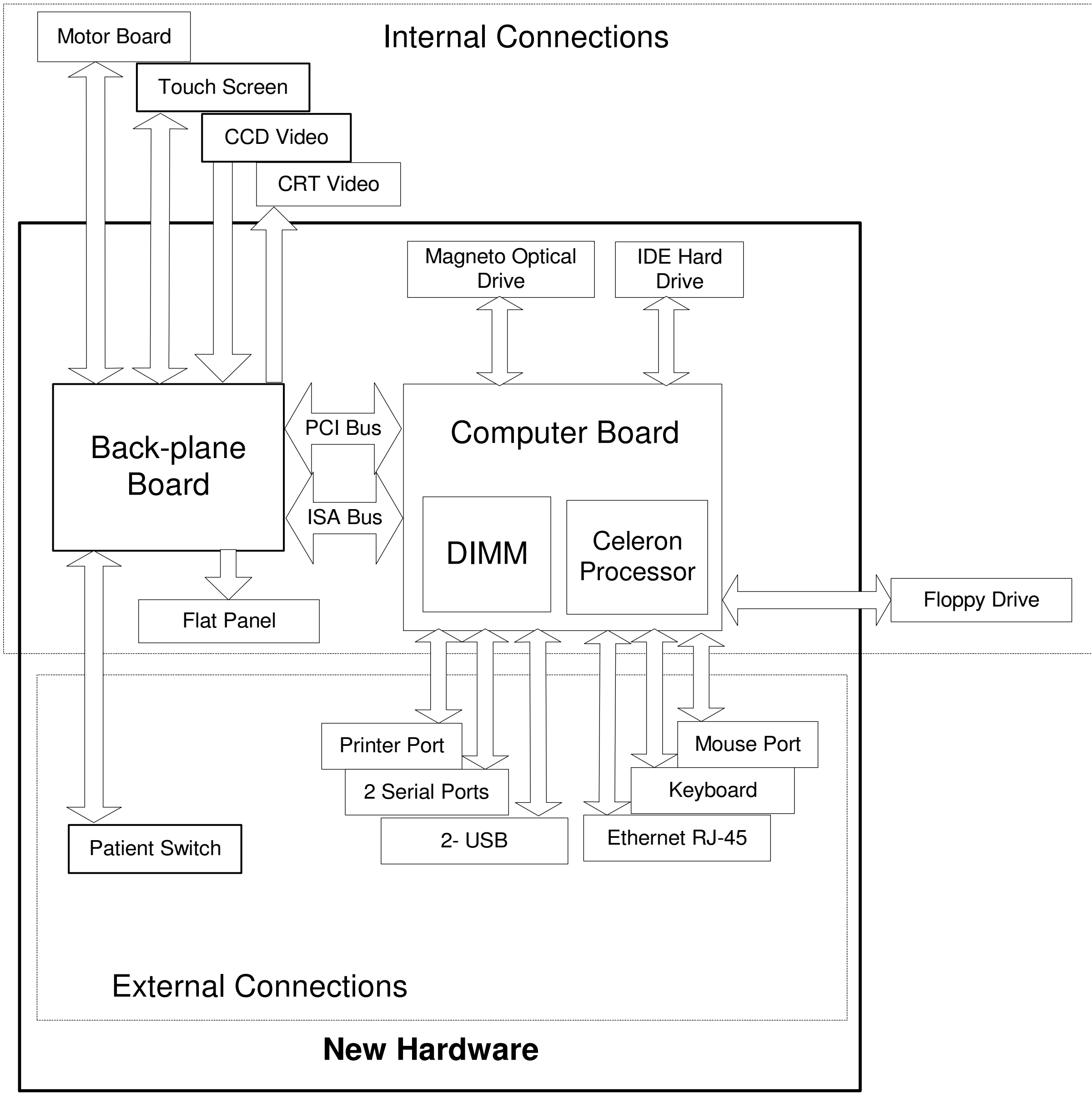


FIGURE 6.3. Version ≤5.0 System Block Diagram

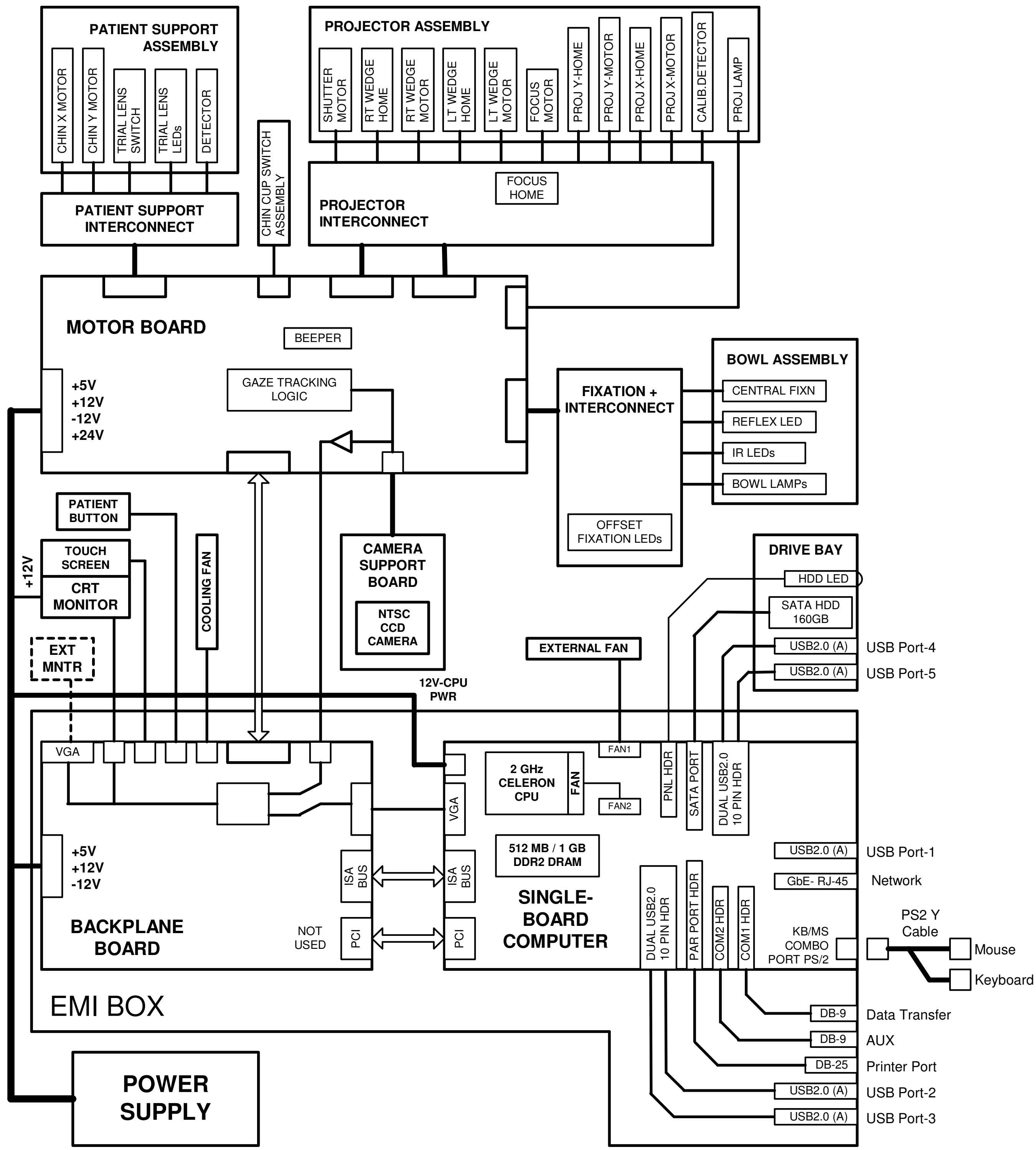


FIGURE 6.4. Version ≥5.1 System Block Diagram

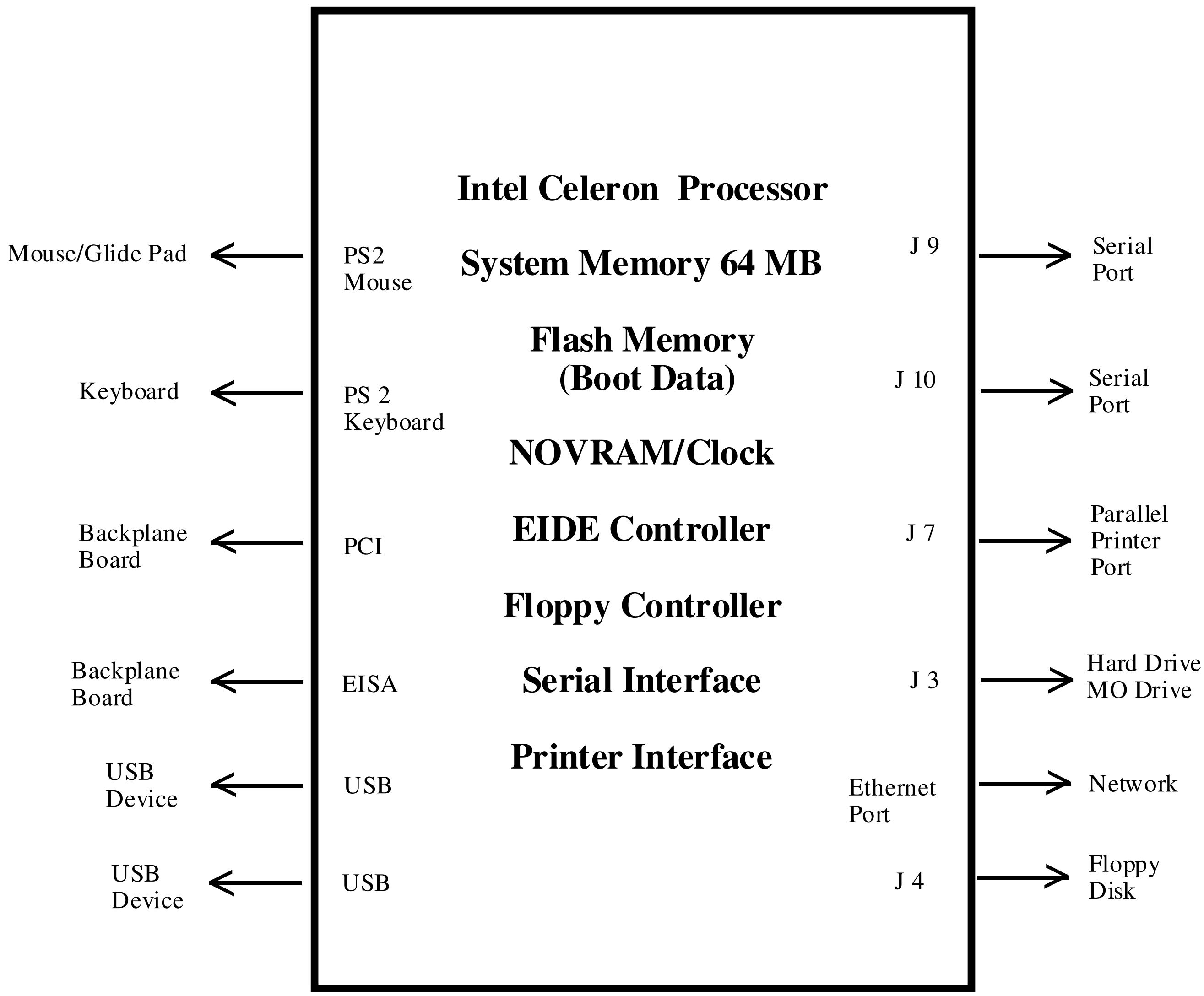


FIGURE 6.5. Version ≤5.0 CPU PCB Functions and Connections

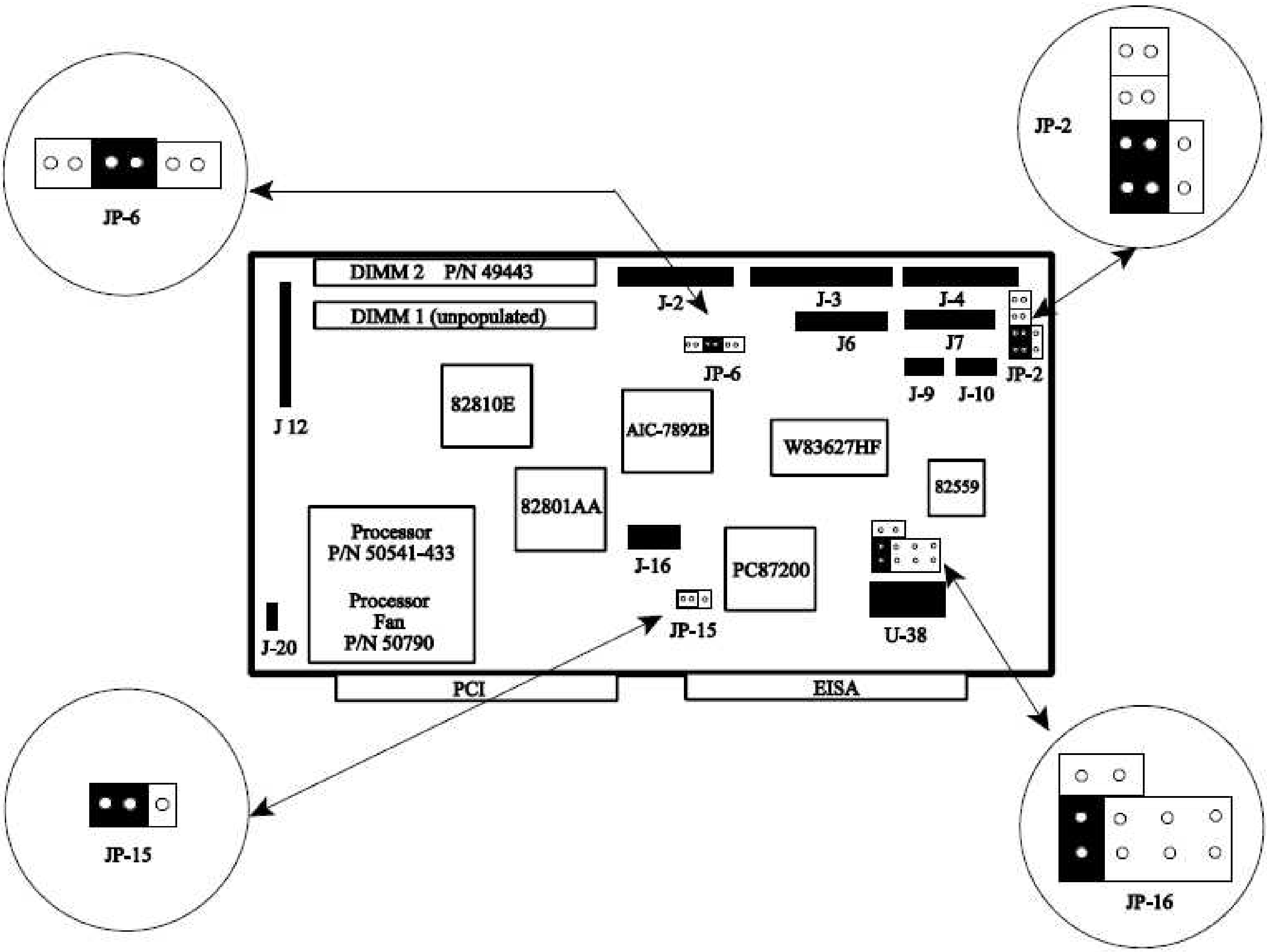
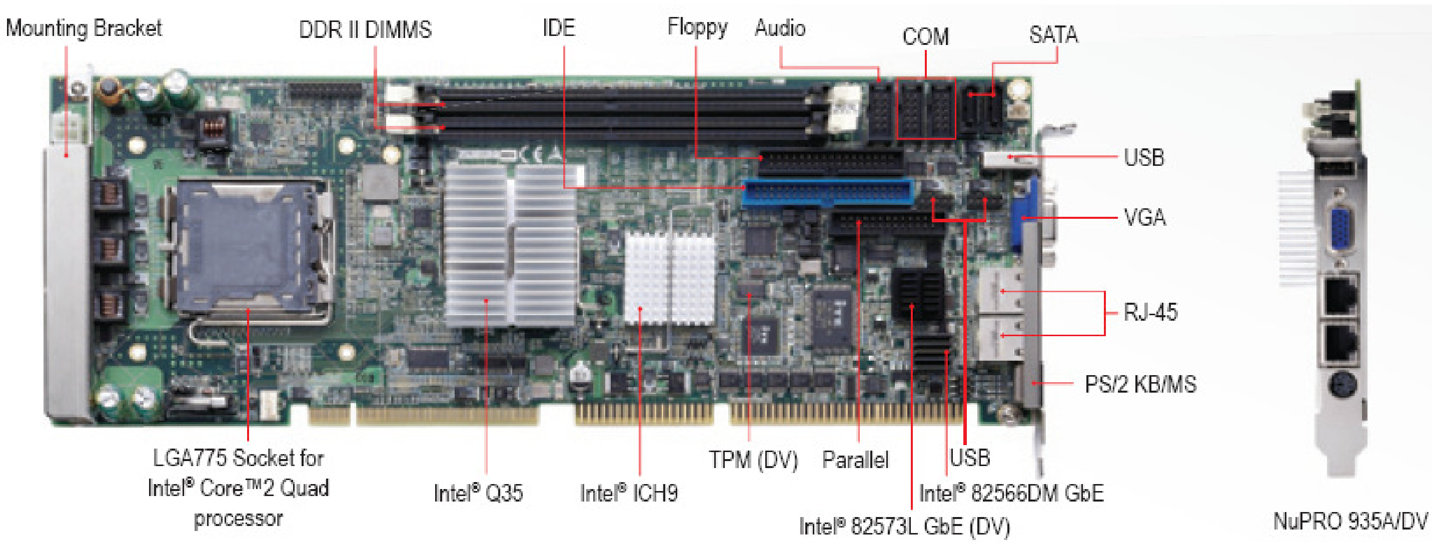
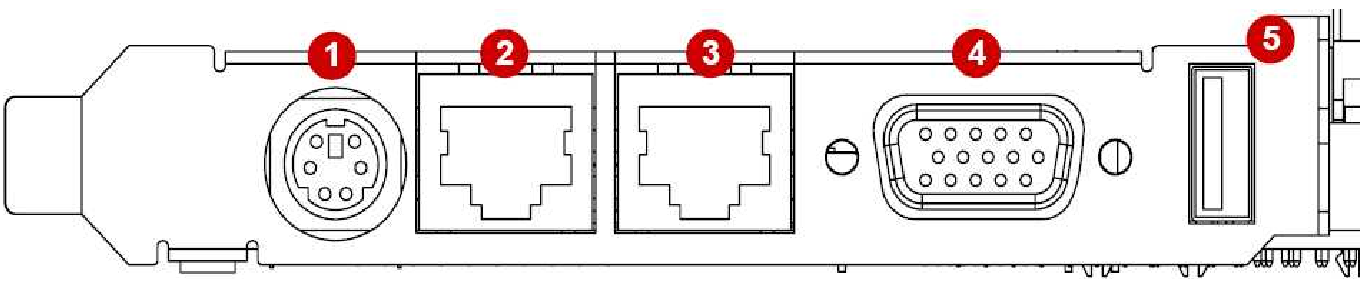


FIGURE 6.6. Version ≤5.0 CPU PCB Component and Jumper Locations



NuPRO-935A CPU PCB I/O Ports

The I/O panel is shown in the picture below copied from the NuPRO-935A data sheet.

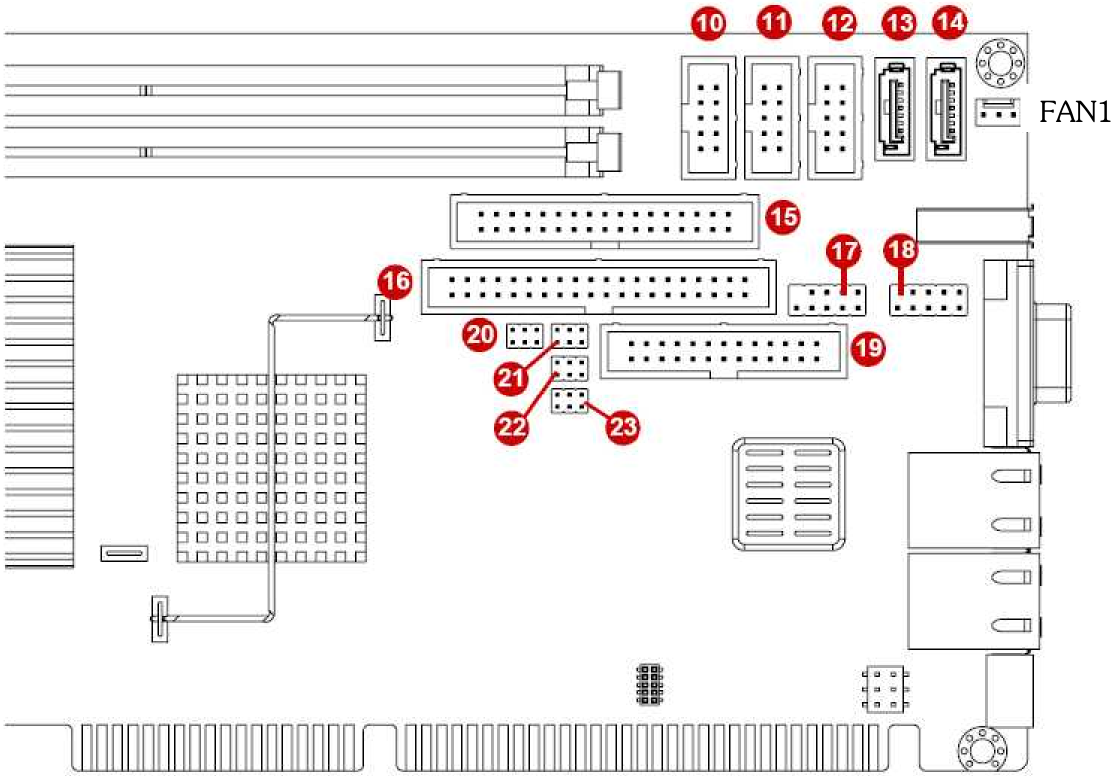


Connector # 1:	Combination Keyboard/Mouse PS/2 Connector.
Connector # 2:	Gigabit Ethernet Port – Unused
Connector # 3:	Gigabit Ethernet Port – Network Port
Connector # 4:	VGA output – Connected to the Backplane board.
Connector # 5:	USB 2.0 Port – USB Port-1

FIGURE 6.7. Version ≥5.1 CPU PCB and I/O Port Locations

Internal CPU PCB Connector Locations (part 1 of 2)

The connectors on the Version ≥5.1 CPU PCB Computer Board are shown in Figures 6.6 & 6.7, which were copied from the NuPRO-935A data sheet.

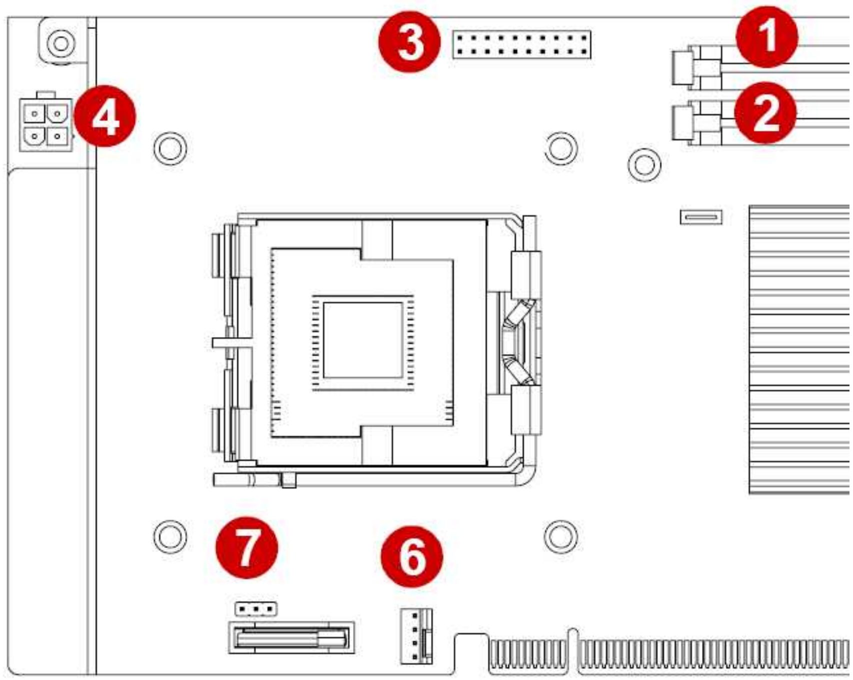


Connector Locations on the Computer Board

Connector # 10:	Unused.
Connector # 11:	COM1 – Auxiliary Serial Port
Connector # 12:	COM2 – Data Transfer Port
Connector # 13:	Unused SATA port.
Connector # 14:	SATA Port – Connected to Hard Drive
Connector # 15:	Unused Floppy Drive Connector
Connector # 16:	Unused IDE Connector
Connector # 17:	USB Ports 4 & 5 terminated on the Drive Bay Panel
Connector # 18:	USB Ports 2 & 3 terminated on the EMI Box side panel
Connector # 19:	Parallel Port – Printer Port
Connector "FAN1":	For External Fan on the rear side of the EMI Box
Jumper # 20:	COM1 Mode jumper
Jumper # 21:	COM1 Mode jumper
Jumper # 22:	COM1 Mode jumper
Jumper # 23:	COM1 Mode jumper

FIGURE 6.8. Version ≥5.1 CPU PCB Connector Locations (part 1 of 2)

Internal CPU PCB Connector Locations (part 2 of 2)

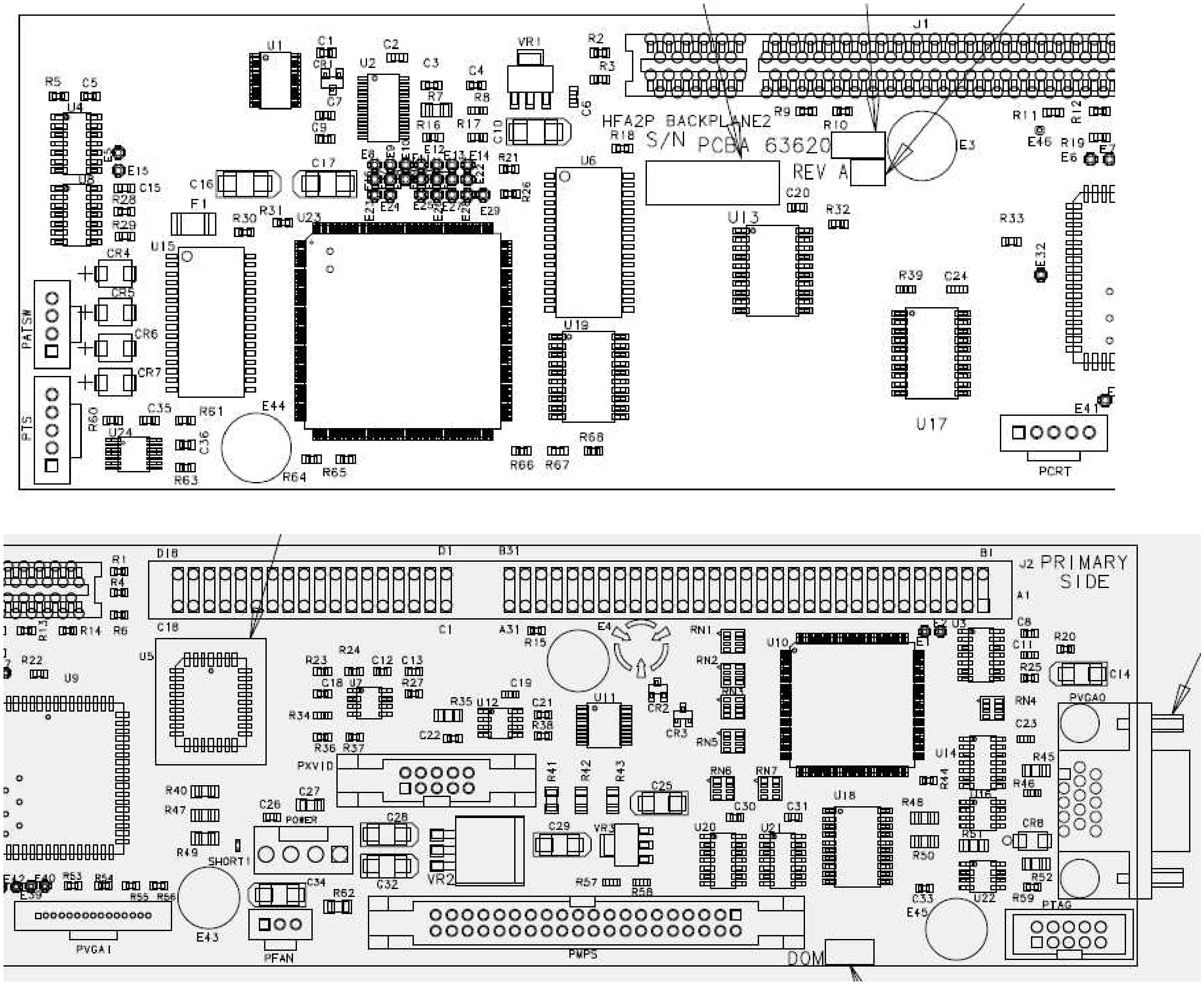


Connector Locations on the Computer Board

Connector # 1:	240 pin DDR DIMM Slot
Connector # 2:	240 pin DDR DIMM Slot
Connector # 3:	System Panel Connector – Pins 17-18 for HDD LED.
Connector # 4:	Processor Power 12V
Connector # 6:	CPU Fan Connector
Jumper # 7:	Jumper to Clear CMOS.

FIGURE 6.9. Version ≥5.1 CPU PCB Connector Locations (part 2 of 2)

Internal Backplane Board Connector Locations



Connector Locations on the Backplane Board

Connector “PTS”:	Cable to Touch Screen
Connector “PATSW”:	Cable to Patient Button
Connector “PCRT”:	Cable to CRT Monitor
Connector “PVGAI”:	VGA input from the computer board
Connector “POWER”:	Power from the Power Supply (+5V, +12V, –12V)
Connector “PFAN”:	The cooling fan on the topside
Connector “PMPS”:	Cable to Motor Board
Connector “PVGAO”:	VGA output to external monitor
Connector “PTAG”:	JTAG port for CPLD programming

FIGURE 6.10. Backplane Board Connector Locations

Backplane Board

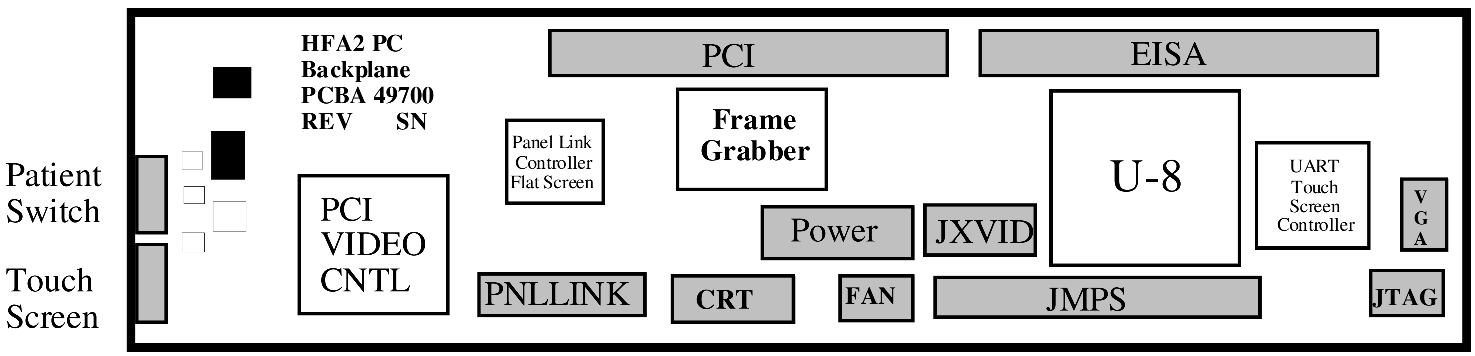


FIGURE 6.11. Backplane Board Component Locations

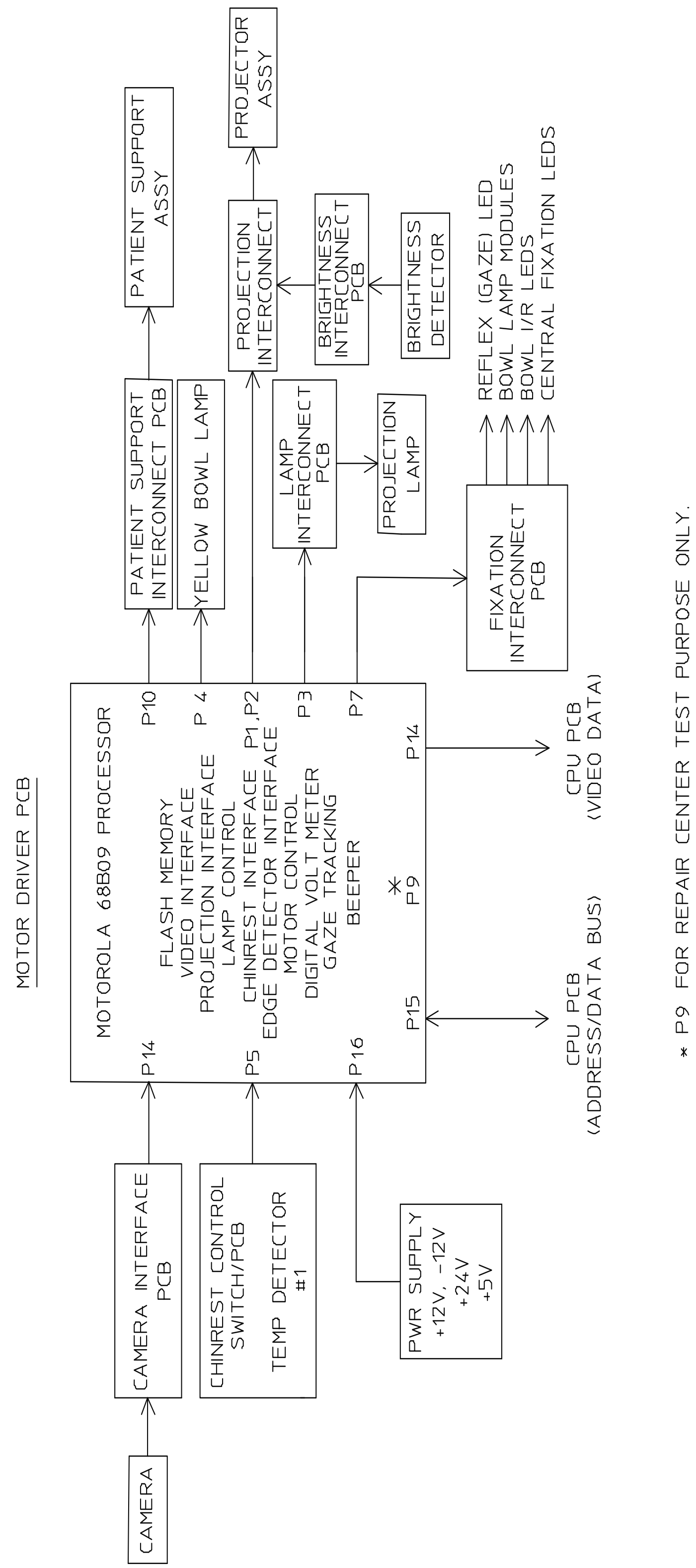


FIGURE 6.12. Motor Driver Board

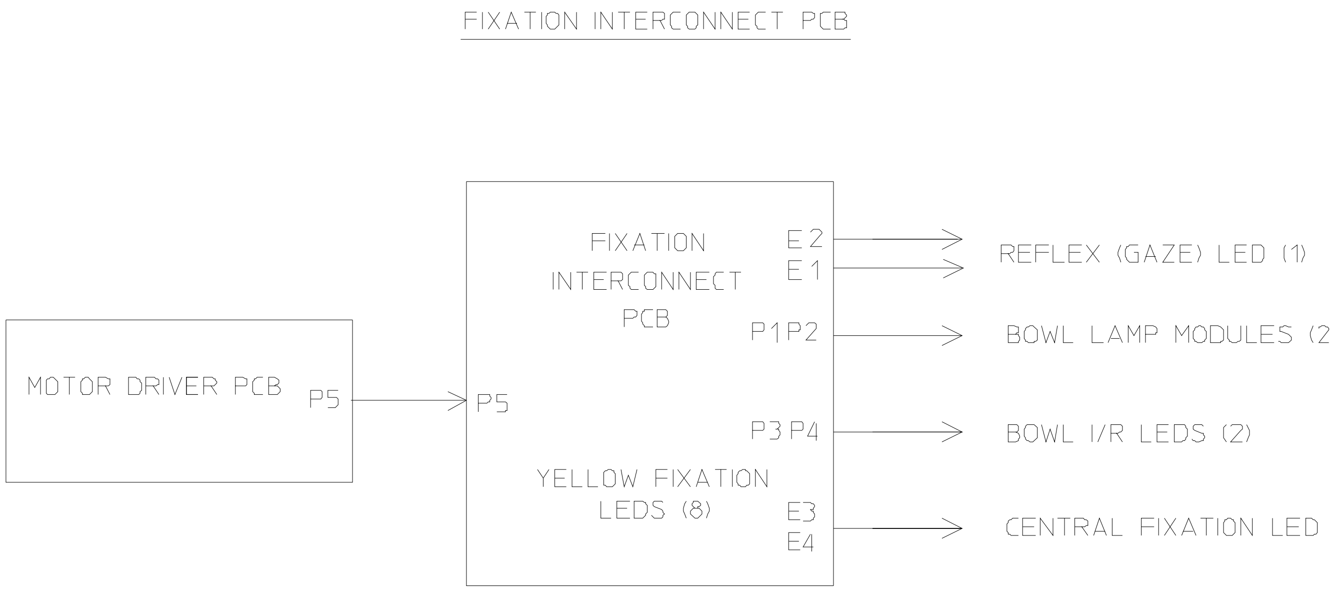


FIGURE 6.13. Fixation Interconnect PCB

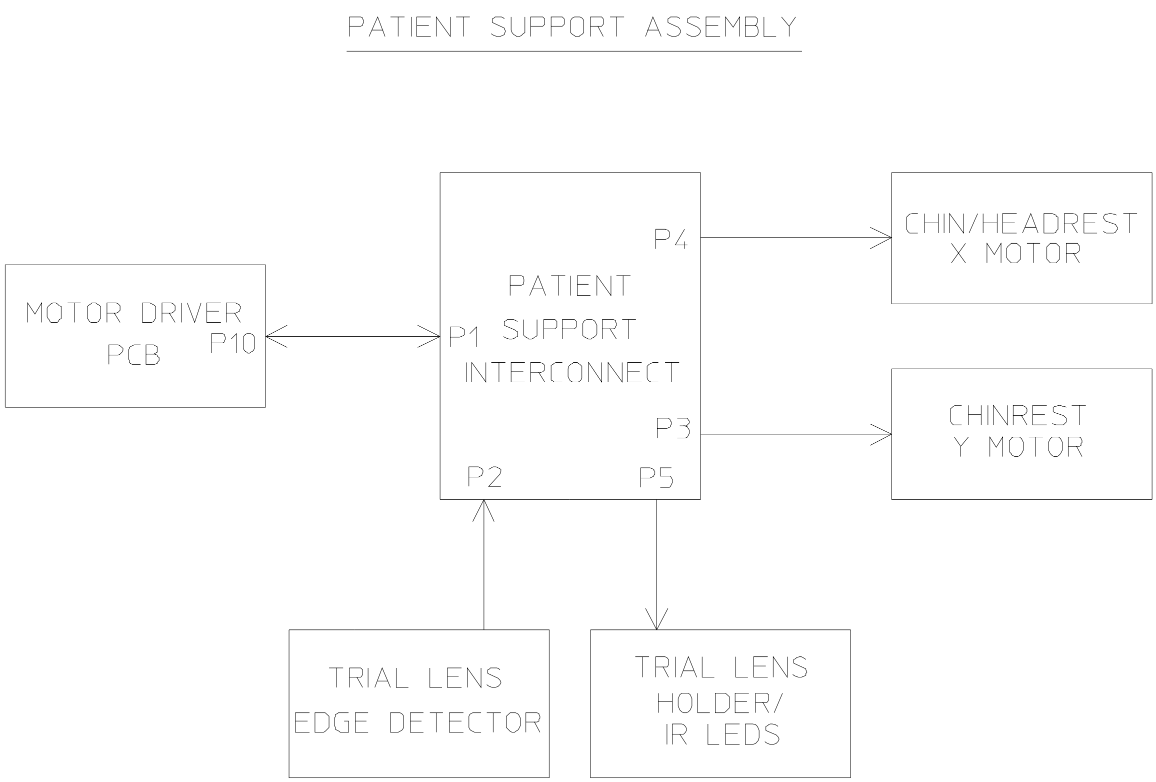
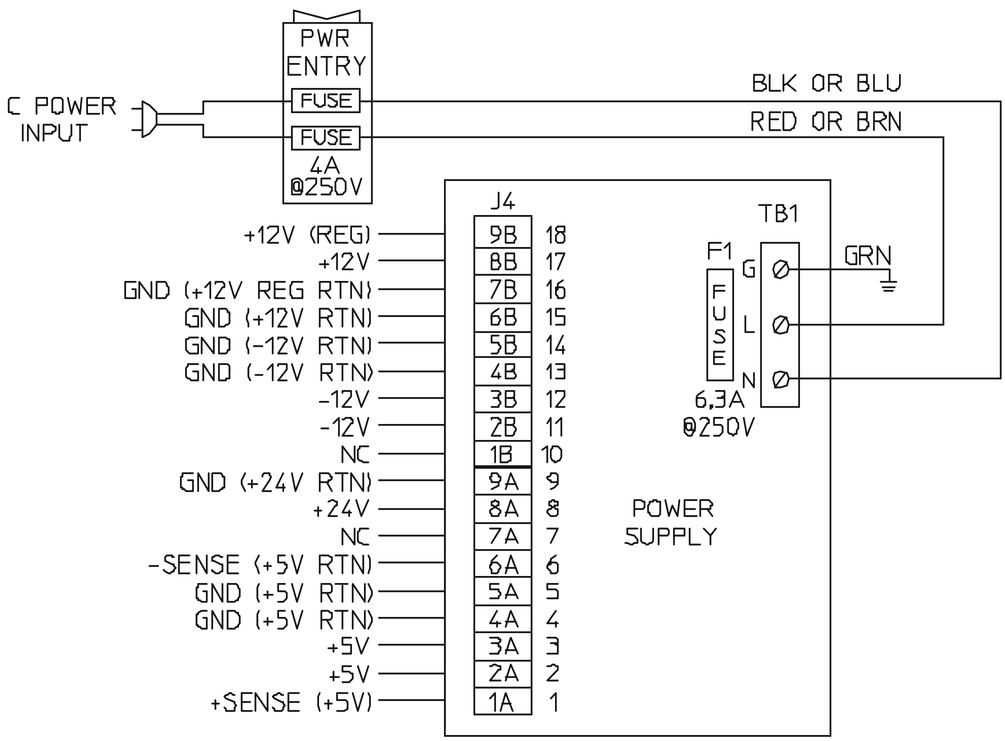


FIGURE 6.14. Patient Support Assembly

POWER ENTRY AND POWER SUPPLY

Note - *The switching power supply accepts AC power input voltages of 90 to 132/180 to 264V AC. The fuse requirements are the same for all input voltages.*



Notes: 1. *Layout is shown as viewed from left side of the instrument.*
2. *The HFA II Power Supply cannot be used in the HFA II-i.*

DC VOLTAGE MEASUREMENTS

Voltage	Tolerances
+5 V	4.75 – 5.25
±12 V	±11.4 – 12.6
+24 V	22.8 – 25.2

FIGURE 6.15. Power Entry and Power Supply

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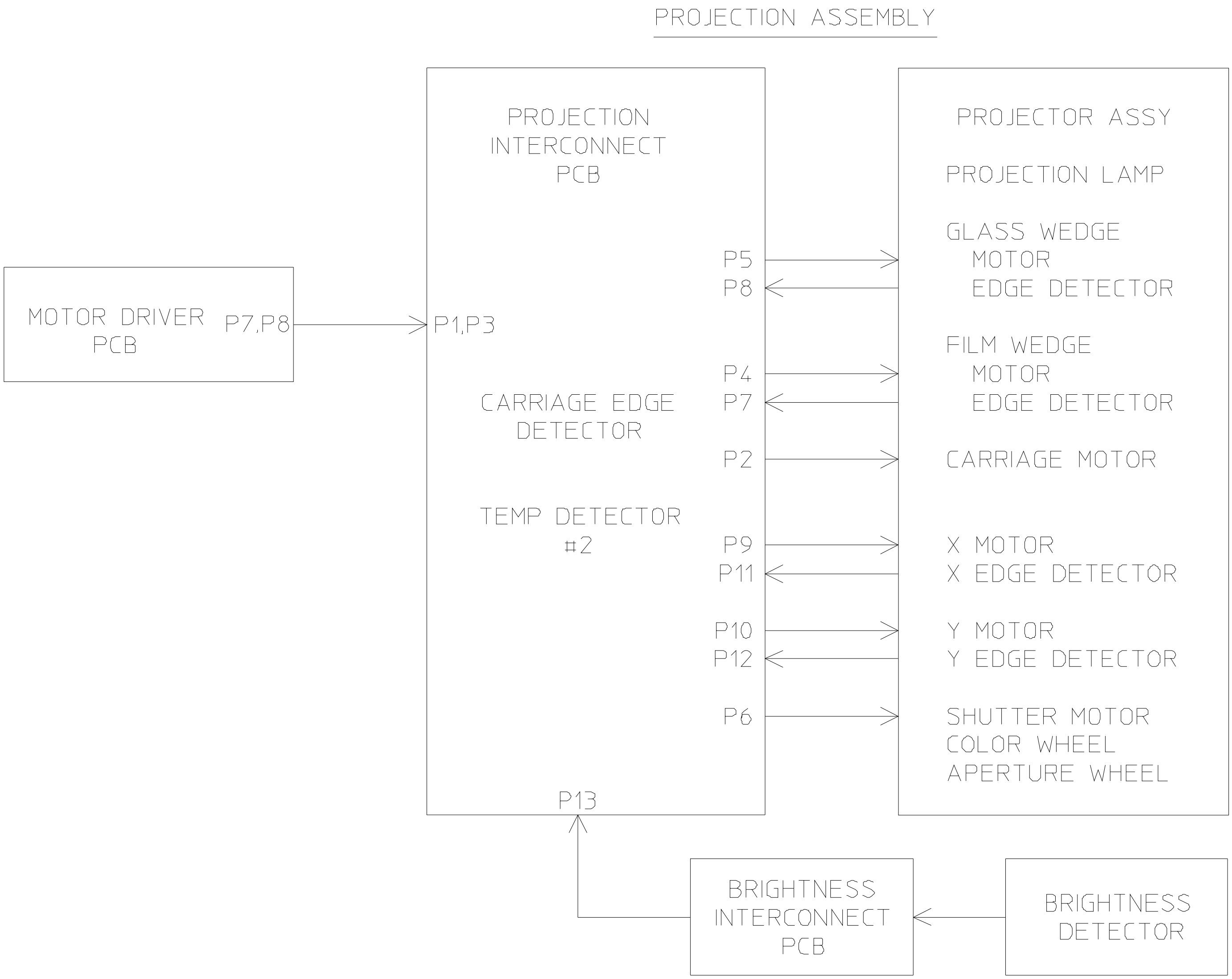

FIGURE 6.16. Projection Assembly

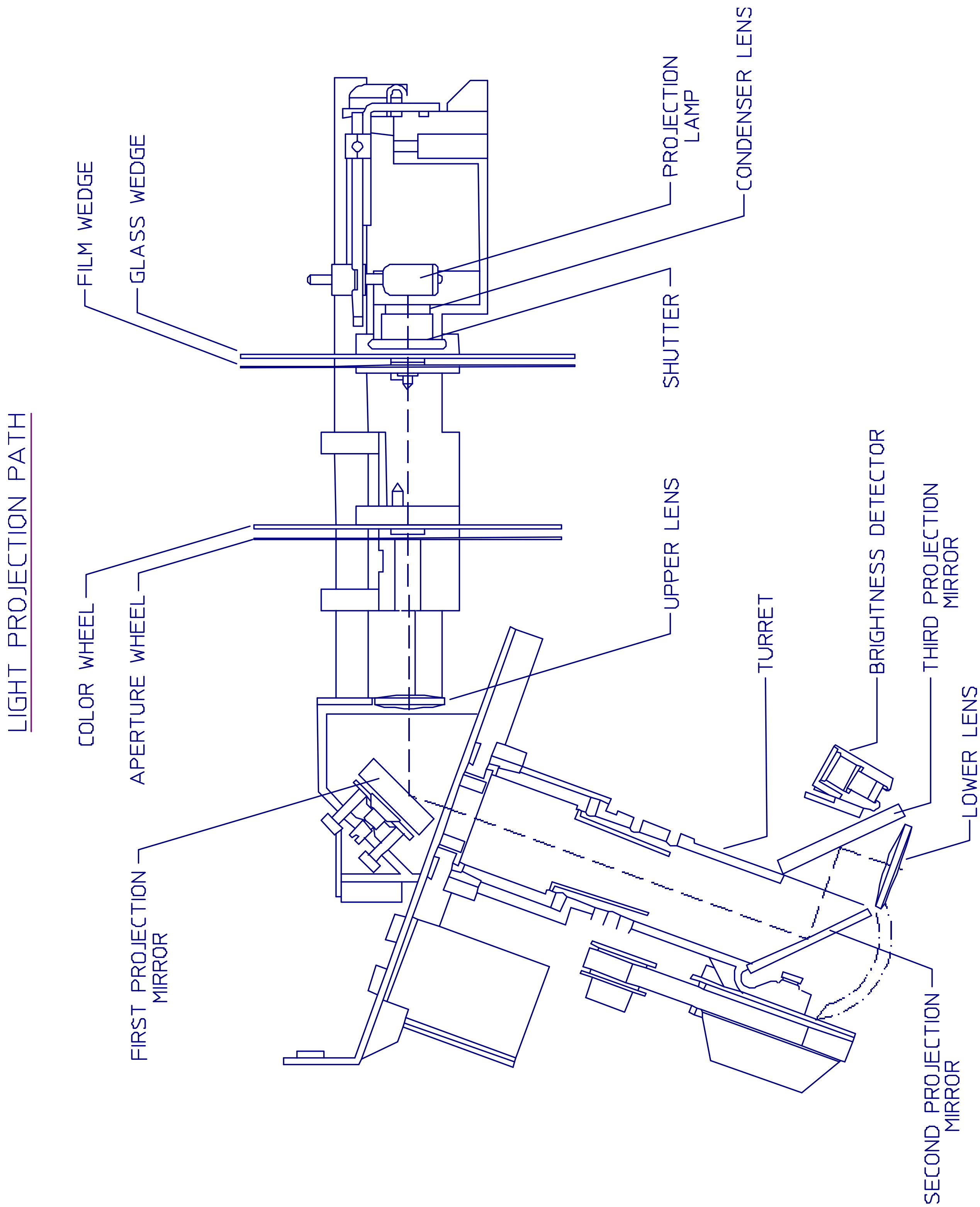

FIGURE 6.17. Projection Path

Section 7 – Parts

Notes:

7.1 Introduction

This section contains parts lists and associated information for the Humphrey Field Analyzer II-*i* system. It also contains instructions for ordering parts and returning defective parts.

> ***Note - International Operations:*** *The procedure for returning defective parts from International operations differs somewhat from that for U.S. domestic operations. These differences are noted in the instructions. Please follow the instructions carefully.*

7.2 Parts Orders – U.S. Domestic Service Operations

Spare parts may be ordered as needed following established parts ordering procedures. Parts needed overnight may be ordered by phone from the Parts Department. The cost of shipping parts for next day delivery is very high and should be used only in emergencies.

The Parts Department phone number is:

- 1-800-341-6968 (domestic toll-free)
- 1-925-557-4843 (domestic local)
- 1-925-557-4652 (domestic fax)

7.3 Parts Orders – International Service Operations

Customers are billed for shipping charges, including any customs fees required.

For International Service Operations, please use the ordering procedures that have been established for your area of operations, and which meet the requirements of the Carl Zeiss Meditec International Parts Department.

7.4 Returning Defective Parts / Subassemblies

When equipment needs to be returned to Carl Zeiss Meditec for repair, it is important that it is properly packed for shipment, and that authorization for return is obtained before the equipment is shipped.

> ***Note:*** *Costs to repair equipment damage caused by improper packing for shipment to Carl Zeiss Meditec become the responsibility of the sender.*

7.4.1 Equipment Return Authorization

Authorization must be obtained from Carl Zeiss Meditec before equipment is returned for repair. A *Return Material Authorization* (RMA) number is required on each return shipment to Carl Zeiss Meditec. The procedure for obtaining an RMA number varies, depending on your area of operation. Use the procedure that has been established by Carl Zeiss Meditec for your area of operations.

7.4.2 Packing for Shipment

Defective instrument subassemblies/parts should be packed in the shipping container received with the replacement subassembly or part. If necessary, contact the Carl Zeiss Meditec Parts Department for a replacement shipping container. Shipping containers are not available for assemblies that are supplied by a separate vendor (i.e., monitors, printer, keyboard, computer), so it is important to preserve those shipping containers when the instrument is first received by the customer.

7.4.3 Returning Defective Parts

The return of defective subassemblies is a very important part of our operation:

1. Evaluation of returned subassemblies assists in root cause analysis.
2. Subassemblies are rebuilt and returned to service stock, and are available as needed by our Service Engineers. Our inventory is kept low to keep operating costs down.

U.S. Domestic Field Support Engineers - when you return parts or assemblies to the Repair Center, attach a Service Inventory Transfer (SIT) tag or RMA tag to each assembly. On the tag, list the following information:

- the serial number of the instrument from which the part was removed
- the date of removal
- the problem (if you could not find the problem, describe what the customer reported, and add "CND" - Can Not Duplicate)
- the part number of the part/assembly being returned
- your territory number (U.S. Domestic Engineers)

This information will enable the Repair Center to make repairs as efficiently as possible.

Note - International Operations: *Additional procedures are necessary for return of defective parts from international service operations. Instructions have been provided to each area of operation by Carl Zeiss Meditec International Parts Department. If you are unfamiliar with the required procedure for your area, or have any questions regarding the procedure, please contact the Carl Zeiss Meditec International Parts Department.*

When you receive spare parts from the Parts Department, save the packaging material for returning the defective part for repair. Many of the parts are delicate and expensive; extra attention to packaging will pay off in less damage to parts during shipment.

7.5 Recommended Spares

Note — *Parts that are recommended as spares for supporting field repairs are generally kept in stock and are available for shipment in quantities equal to your normal service usage. Larger, restocking quantities or parts that are not recommended spares may be subject to order processing and shipment lead times of two weeks or longer.*

Parts that are recommended as spares for supporting field repairs on the Humphrey Field Analyzer II-*i* system are not indicated in this manual. Instead, please refer to the Humphrey Field Analyzer II-*i* system Service Bulletin titled *Recommended Spare Parts.*

Note – *The Recommended Spare Parts list* **does not** *include service tools. For tools, refer to Appendix A of the Humphrey Field Analyzer II-i system Service Manual.*

7.6 Parts Lists

Note - *For part numbers of tools, test equipment and service supplies please refer to Appendix A.*

7.6.1 Accessories / Supplies / Consumables

7.6.1.1 Accessories / Supplies / Consumables - Version ≤5.0

P/N	Description
266002-1125-235	Accessory kit (All Models)
266010-0033-905	Magnetic Optical Diskette 230 MB Formatted
266010-0029-623	Padding, Chinrest (300 Pieces)
266010-0014-176	Antistatic Wipes
266010-0024-433	Paper, Thermal Printer
266010-0008-025	Eye Patch, Black, with elastic strap
266002-1106-082	Projection Lamp Assy
266010-0029-954	B/Y Lamp, (for blue/yellow feature), Halogen, w/Reflector, 12V, 20W
266010-0021-453	Fuse, T4A, 250V
266010-0029-575	Patient Button Assy
266010-0022-511	Pwr Cord, Hospital Grade, (100–120V)
266010-0022-581	Pwr Cord, Euro, CEE 7/7, 10A (220–240V)
266002-1121-801	Power Cord, China
266002-1142-421	Power Cord, Brazil
266002-1140-306	HFA 4.2.2 User Docs, U.S. CD
266010-0030-151	Carrier, Paper, Thermal Printer

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7.6.1.2 Accessories / Supplies / Consumables - Version ≥5.1

P/N	Description
266002-1125-235	Accessory kit (All Models)
266010-0021-453	Fuse, T4A, 250V
266010-0014-176	Wipe Anti-Static
266010-0029-623	Padding Chinrest Cub
266010-0008-025	Eye Patch with Elastic Strap B
266002-1106-082	PCBA Cub Proj Lamp Assy Wb
266002-1123-232	Disk HFA2p Rct 1.0
266010-0029-381	Air Intake Filter
266002-1141-148	HFA 5.1 User Docs, U.S. CD
266002-1141-149	HFA 5.1 User Docs, OUS CD (International)
266002-1140-088	HFA 5.1 User Manual Hong Kong (English OUS paper copy)

7.6.1.3 Hardware / Peripherals / FRUs - Version ≥5.1

Sub components from the CPU Box Assembly are not available at this time. If a sub-component fails it must be replaced with the FRU assembly.

Parts listed below are unique to the 5.1 and 5.1.1 generation instruments, and are not backwards compatible with older instruments. Parts not listed are interchangeable and should be ordered using the existing Service Manual and associated bulletins as reference.

Hardware

HFA 5.1.1 Part Number	Part Description	Notes
2660021143937	Preloaded Hard Drive FRU	Complete with OS Loader pre-installed as application software cannot be installed on a raw drive
2660021141151	CPU Assembly FRU	New CPU/Backplane Box Assy.
2660021141101	CPU Assembly FRU (Refurb)	Refurbished CPU Assembly
2660021140132	External USB Interface Cable	USB Cable assy CPU Box to Front Panel
2660021132018	CBL SATA PWR ADAPTER	Adapter SATA Hard Drive Power to Existing IDE Molex
2660021140152	CBL SATA F/F LOCKING ST/ST 1.0M	SATA Data Cable for Hard Drive
2660021140508	ASSY CBL HFA2P 5.1.1 BKPLN3- PAT-SW/LED	Internal Patient Response Button / Hard Drive Activity Indicator Cable
2660021138610	LBL MATRIX 815 USB PORTS	Black Sticker for Front USB Panel Bracket

Peripherals

HFA 5.1.1 Part Number	Part Description	Notes
2660021141024	FLASH DRIVE 4GB USB	Blank “Zeiss” USB drive shipped with new instruments for data storage
2660021140133	PS2 Splitter (Cable)	New CPU assembly only has one PS2 port (Keyboard), this allows connectivity to a second device (KB/Mouse)
2660021140162	DRIVE USB FLOPPY DS HD	Optional USB Floppy Drive to import old exams.
2660021140423	HOLDER HFA2P USB FLASH DRIVE	Insert to hold calibration / software USB drives on instrument.

Software Service Tools

HFA 5.1.1 Part Number	Part Description	Notes
2660021142844	SOFTWARE 5.1.1 Installation USB	Instrument software (ships with instrument)
2660021140934	Service DST Tool	New DST tool for HFA 5.1 Generation Hardware
2660021140928	Flash Drive USB Kinetic 5.1.1	Enables the Kinetic feature, replaces P/N 53425
2660021140931	Flash Drive USB German Test	Enable German testing features replaces 52862
2660021140640	Flash Drive USB GPA Sample Data	GPA Sample database in USB format.

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7.6.2 Shipping Materials and Repack Instructions

Item	P/N	Description
		Packaging Assy, (includes items 3-10)
3	---	Foam Insert Top Left
4	---	Foam Insert Top Right
5	---	Foam Base
6	---	Cardboard Top
7	---	Cardboard Tube
8	---	Plywood Bottom
9	---	Pallet
10	---	Cardboard Bottom
--		Buckles, Strapping, 1/2" wide (2 required)
--		Bag, Plastic 6" x 8"
--		Turret Restraint Assy (rubber band w/pull ribbon)
*--		Instruction Sheet, Repack, HFA II-*i*

Power Table Shipping Materials (New Style)

---		Box, Power Table without printer
---		Box, Power Table with printer
---		Box, Ship, 400 Power Table, Stand-up
---		Box, Ship, 400 Power Table

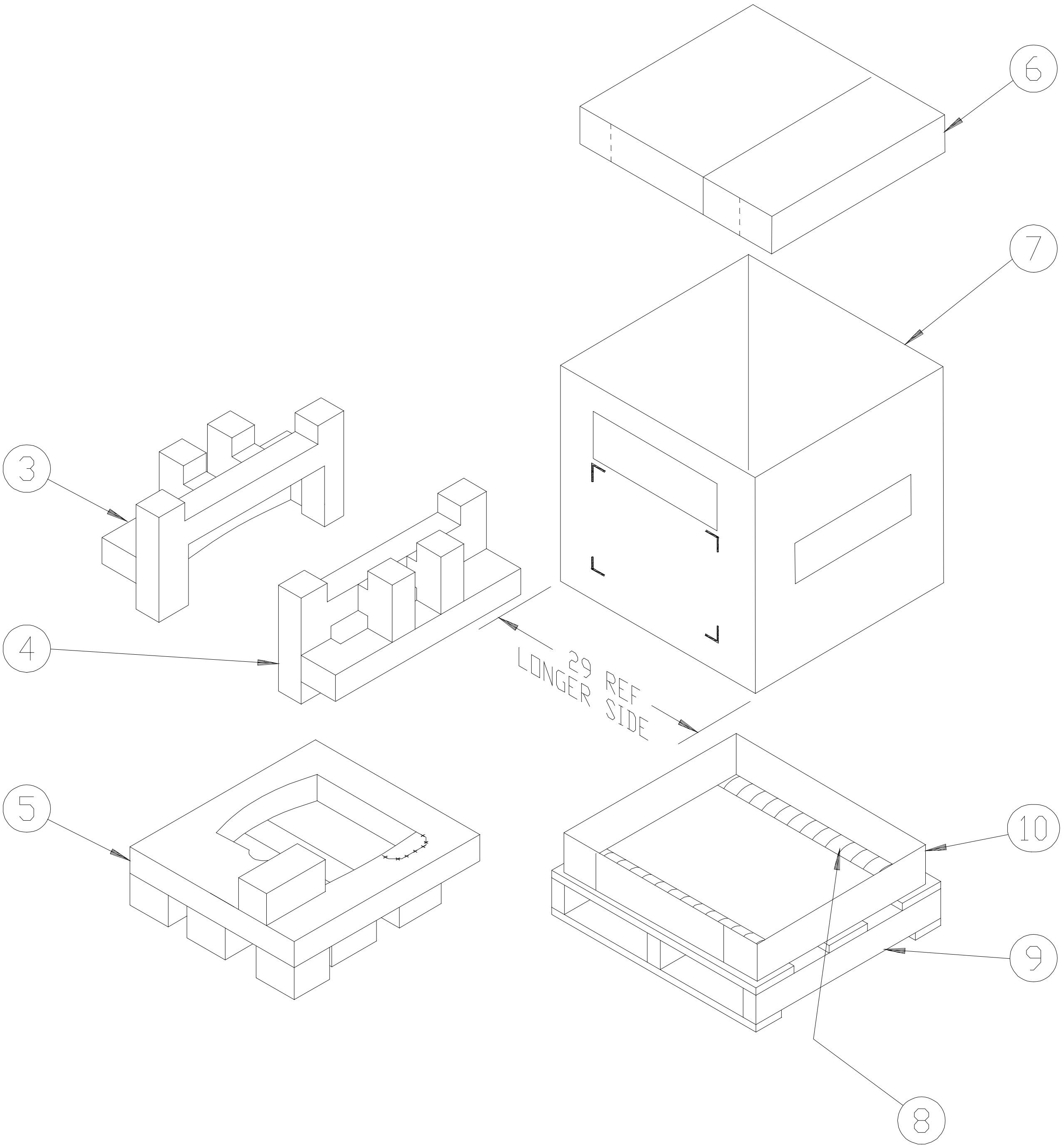

FIGURE 7.1. HFA II-*i* Packing Materials

HFA II-*i* Repacking Instructions

***CAUTION —** The bowl is easily damaged if abused. **DO NOT** store anything inside the bowl. If the instrument is received with objects stored inside the bowl, your account will be charged for ensuing repairs.*

1) Disconnect the power cords and all peripherals from the HFA II-*i*.

2) Lock down the drive heads on the floppy and Optical drive using spare diskettes.

3) Pack the patient button, power cord, and all other accessories in the accessory box, if appropriate.

4) Put the trial lens holder in the down position.

5) Rotate the HFA II-*i* turret completely clockwise. To hold the turret in place:
   - loop one end of the rubber-band turret restraint around the end of the small turret pulley;
   - pass the rubber band behind the turret and loop the other end around the left-hand bowl lamp baffle inside the bowl.

6) Remove the perforated cutout from the right side of the base foam insert.

7) Place the base foam insert inside the cardboard bottom on the pallet.

8) Place the HFA II-*i* in the base as indicated on the drawing.

9) Remove the perforated cutout from the right side of the right top foam insert.

10) Orient the top right and top left foam inserts to conform with the surface of the field analyzer contours.

11) If you are shipping the keyboard back with the unit, place the keyboard in the slot on the rear top of the foam inserts.

12) Place the accessory kit on top of the left and right foam inserts.

13) Slide cardboard tube over the left and right foam inserts until bottom edges touch the bottom of the cardboard bottom.

14) Place the cardboard top on the cardboard tube.

15) Secure entire shipping container with repackaging straps and buckles. See the detail of how to use the buckles.

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7.7 Illustrated Parts Breakdown

The drawings on the following pages provide illustrated parts breakdowns of the instrument. The parts drawings are keyed by item numbers to their associated parts lists.

7.7.1 Abbreviation Definitions

Table 7-1 lists definitions for the abbreviations that appear in the following parts lists.

Table 7-1. Abbreviation Definitions

Abbreviation	Definition	Abbreviation	Definition
ADH	Adhesive	MTG	Mounting
ASSY	Assembly	MTR	Motor
BRKT	Bracket	NYL	Nylon
BSHG	Bushing	PCBA	Printed Circuit Board Assembly
BTN	Button	PLT	Plate
CBL	Cable	PWR	Power
CVR	Cover	RET	Retaining
DET	Detector	SCR	Screw
DIA	Diameter	SHLDR	Shoulder
ELEC	Electronics	SOC	Socket
EMI	Electro Magnetic Interference	SQ	Square
FL	Flat	STD	Standard
GSKT	Gasket	STDOF	Standoff
HD	Head	TERM	Terminal
MNT	Mount	THD	Thread
MPS	Motorized Patient Support	WSHR	Washer

***Note -** The drawings on the following pages provide illustrated parts breakdowns of the instrument. The parts drawings are keyed by item numbers to their associated parts lists.*

For part numbers of individual cables, first refer to the System Interconnect diagrams in Section 6. Cables that do not have a part number listed are supplied only as part of an associated assembly.

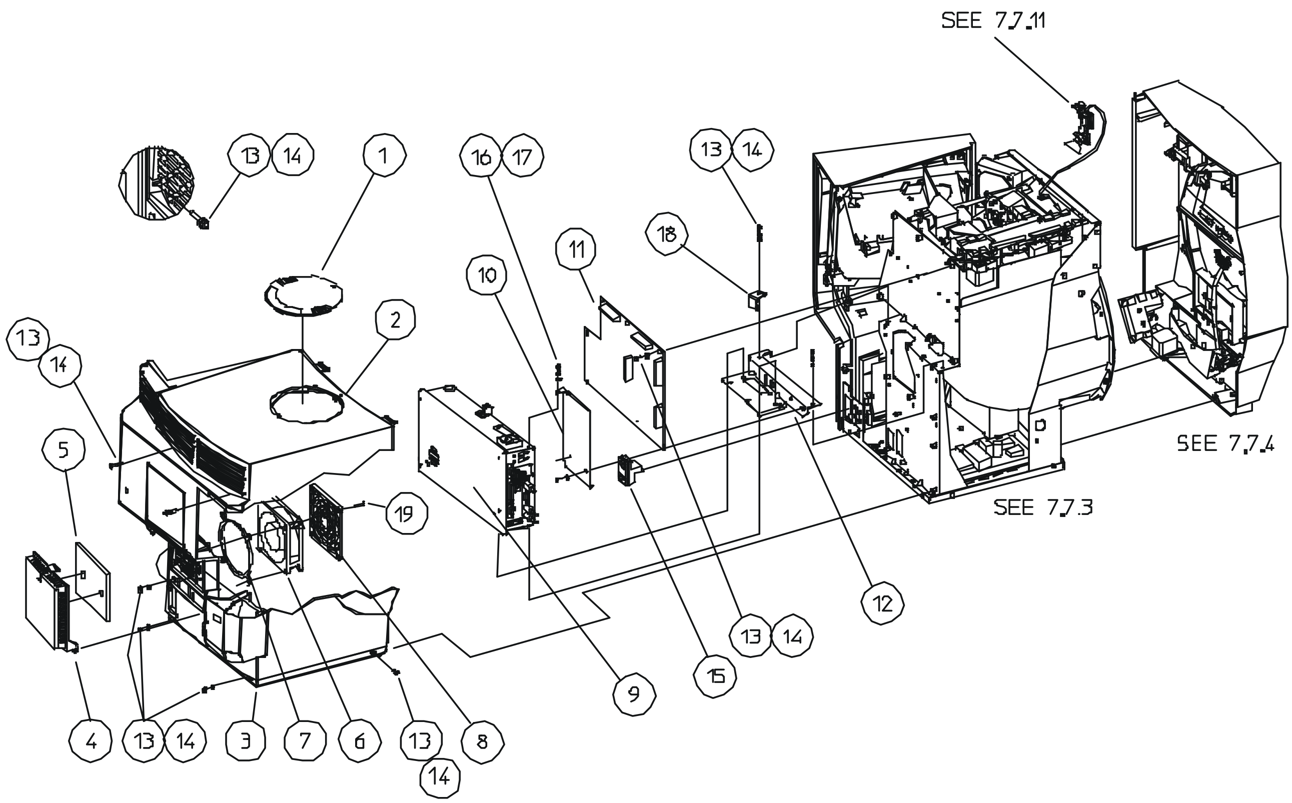
***Note -** Part numbers are not provided to parts that are NOT identified as a "Spare Part".*

7.7.2 HFA II-*i* Miscellaneous – 1

Item	P/N	Description
1	266010-0029-991	Assy, Door, Lamp Access, w/label
		Label, Caution, Lamp Door
2		Cover, Rear
3		Cable Access Door
4	266010-0029-380	Door, Fan Filter
5	266010-0029-381	Filter, Bottom Fan, 114mm/138mm/6.35mm
6	266010-0029-793	Assy, Bottom Fan
7		Gasket, Fan
8		Guard, Fan
9	266010-0060-674	CPU/Backplane Enclosure (Version ≤5.0) (FRU)
9	266002-1141-151	CPU/Backplane Enclosure (Version ≥5.1) (FRU)
10		Bracket, Right, Side
11	266010-0063-710	Motor Driver Board (all HFA II-*i* models)
12		Bracket, Bottom
13		Screw, M4 x 12, Soc HD, Cap
14	266010-0014-445	Washer, Square Cone, .168/.370/.050, ST/Z
15	266010-0029-735	Assy, Power Entry Module (with cables)
16		Screw, M3 x 8, Soc HD, Cap
17	266010-0014-446	Washer, Square Cone, .142/.307/.039
18		Bracket, IDE and Floppy Cable
19		Screw, M4 x 8, PH HD, Black STL

Sparing of small hardware is left to the discretion of the Field Support Engineer.

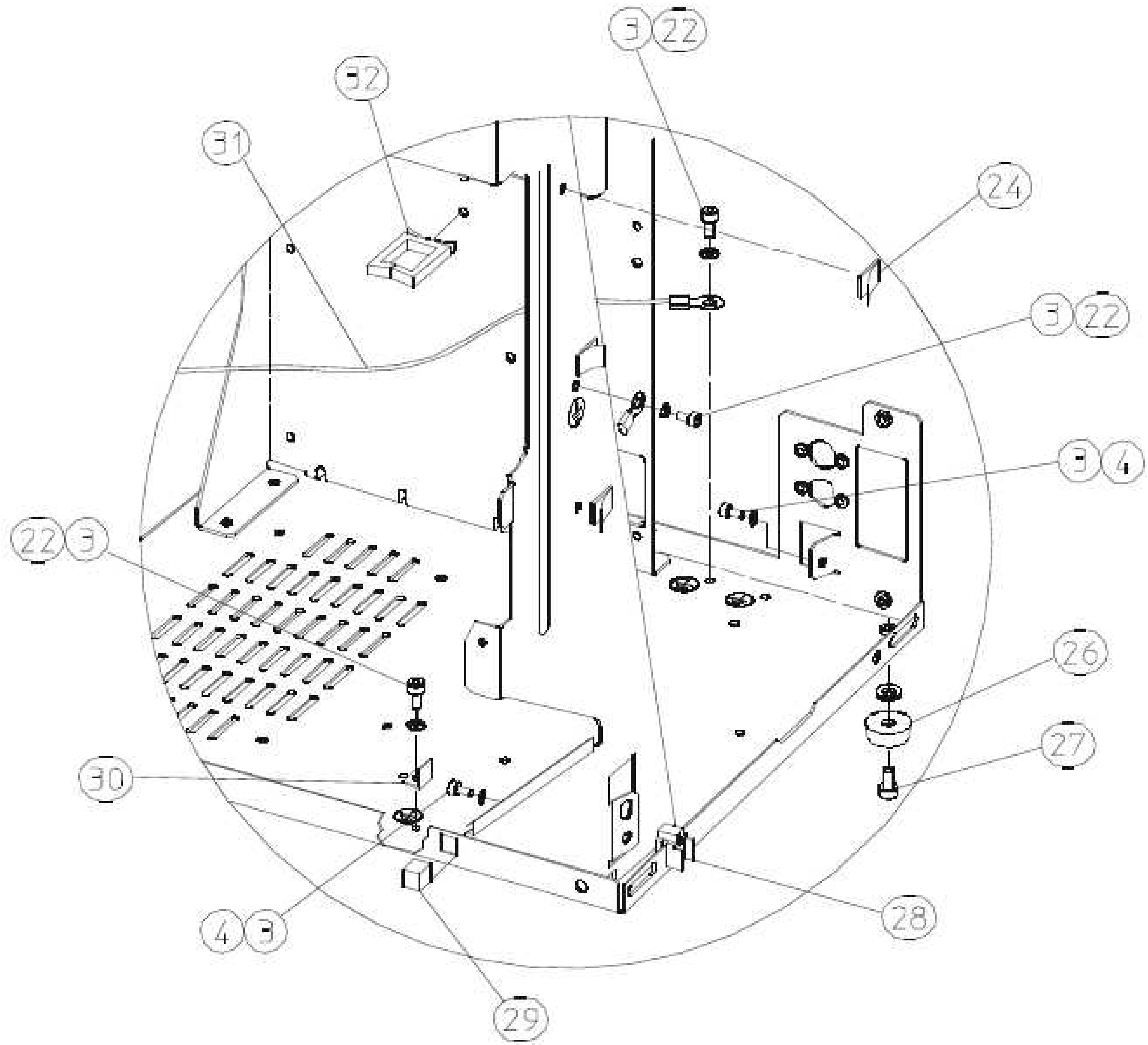
(7.7.2 HFA II-*i* Miscellaneous – 1)



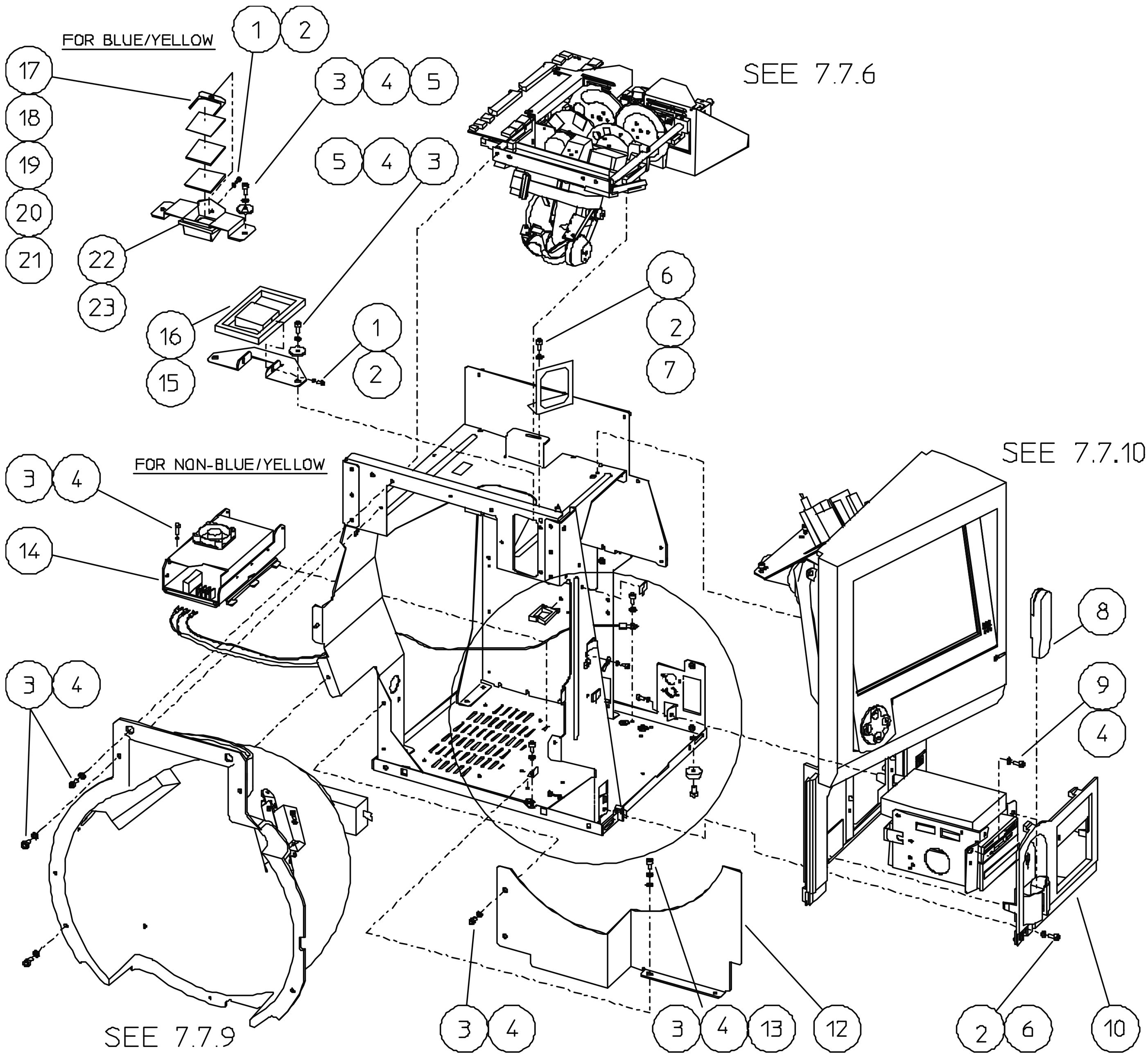
7.7.3 HFA II-*i* Miscellaneous – 2

Item	P/N	Description
1		Screw, M3 x 12, Soc HD Cap S/BZ
2	266010-0014-446	Washer, Square Cone, .142/.307/.039 ST/Z
3		Screw, M4 x 8, Soc HD Cap S/BZ
4	266010-0014-445	Washer, Square Cone, .168/.370/.050 ST/Z
5		Washer, Flat .187/.750/.060
6		Screw M3 x 6 Soc HD Cap
7		Bracket, Fan
8	266010-0029-575	Assy, Patient Button
9		Screw, M4 x 12, Soc HD, Cap
10		Panel, Disk Drives (Version ≤5.0) [720-*i*, 740-*i*, 745-*i*]
10		Panel, Disk Drives (Version ≤5.0) [750-*i* only]
10		Panel, Disk Drives (Version ≥5.1)
11	----------	Item number not used
12		Baffle, Patient Support
13		Washer, Flat, .188/.505/.030
14	000000-1346-828	Assy, Power Supply w/added bracket and fan
		Power Supply Fan
15		Plug, Cut Out, Bowl
16	266002-1100-085	Tape, Foam, 375 Gray
17	266010-0024-489	Retainer, Filter (Blue/Yellow)
18	266010-0029-956	Filter, Heat (Blue/Yellow)
19	266010-0029-958	Diffuser (Blue/Yellow)
20	266010-0029-957	Filter, Yellow (Blue/Yellow)
21	266010-0029-950	Bracket, Mount, Filters (Blue/Yellow)
22	266002-1100-085	Tape, Foam, 375 Gray
23		Washer, Lock, Int M4/8.0/0.5
24		Clamp, Cable, C-Clip
25		Assy, Cable, CPU to Ext Keyboard
26	266010-0014-823	Bumper, #8 Screw .93 x .62 Grey
27		Screw M4 x 12 Soc HD Cap
28	266010-0029-692	Assy, Connector, Mdlr, RJ-11
29	266010-0029-461	Receptacle, 1/4-turn Fastener
30		Term, Tab, 25M #8
31	266002-1105-761	Assy, Cable, Gnd, Frame to P/S
32		Wire, Saddle, -4 Tall
		Nut, M3 Lock Poly Amid Insert (not shown)
		Washer, Flat #8 (not shown)
	266010-0029-874	Gromet, Ribbed .155/.379/.230/.05 (not shown)
	266010-0029-774	Assy, Fan, 12V Upper (not shown)
		Guard, Fan, 80mm (not shown)
		Screw, M3 x tab, Soc Hd Cap (not shown)
		Filter, Foam, Fan 80mm (not shown)
	266002-1106-254	Retainer, Filter, Fan 80mm (not shown)

(7.7.3 HFA II-*i* Miscellaneous – 2)



(7.7.3 HFA II-*i* Miscellaneous – 2)



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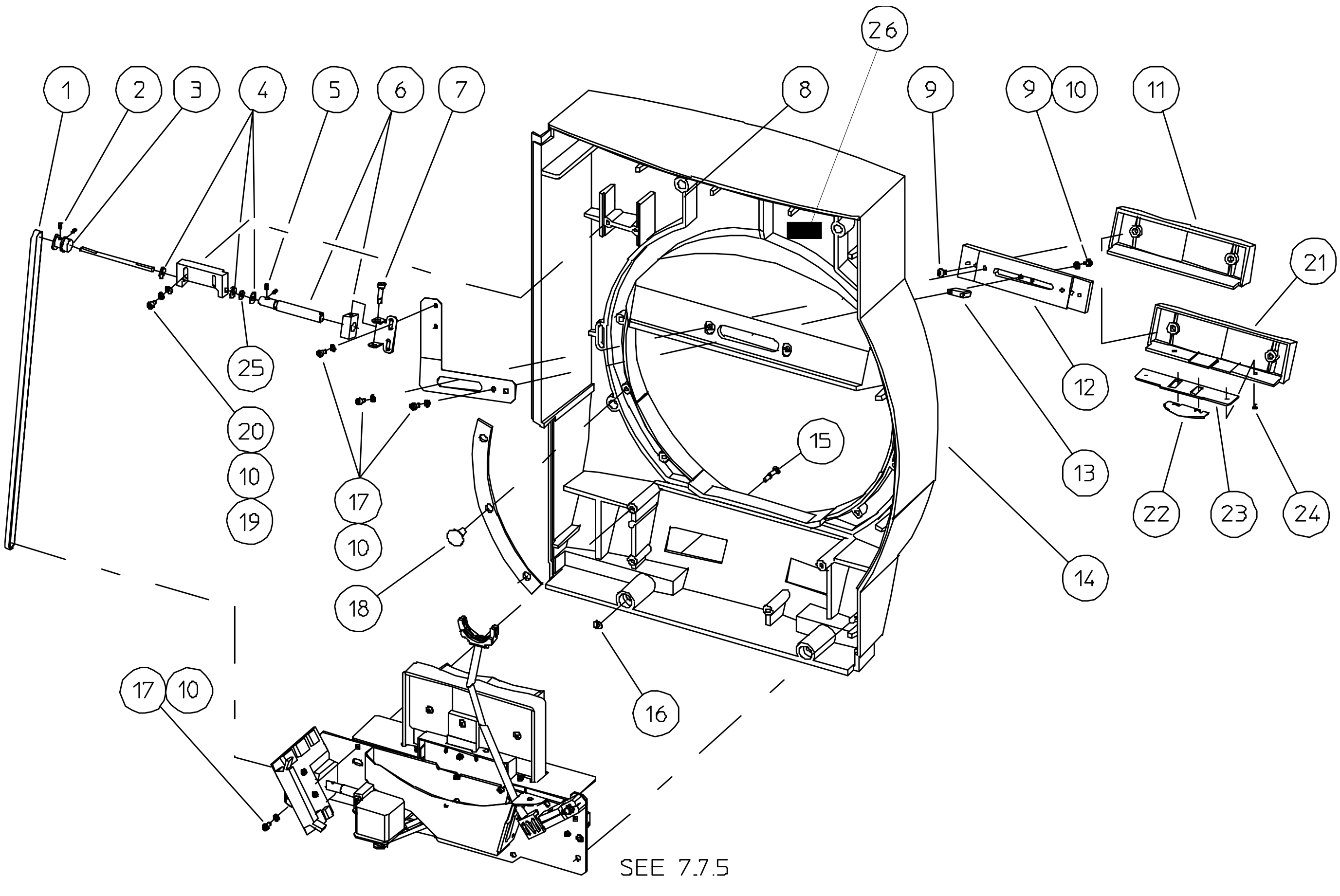
7.7.4 Patient Support Assembly

Item	P/N	Description
		Assy, Front Cover 720
		Assy, Front Cover 740
		Assy, Front Cover 745/750
1	266010-0029-551	Belt, 370/2.03/6.0
2		Setscrew, M4 x 6, Set Soc Cup
3		Pulley, 18/2.03/5
4		Washer, Flat, Nylon, .200/.437/.020
5		Setscrew, M3 x 4, Soc Cup
6		Leadscrew and Nut, Horizontal
7		Screw, Shoulder, 5.0/4 M4 Soc HD
8	266002-1100-085	Tape Foam, 3.75 Gray, Front cover
9	266002-1106-835	Screw, M4 x 6, Soc Btn HD Cap
10	266010-0014-445	Washer, Square Cone .168/.370/.050
11		Headrest, Molded (Non-Blue/Yellow)
12	266010-0029-408	Slide, Chinrest, Horizontal
13		Spacer, Forehead Rest
14	266010-0029-300	Cover, Front
15	266010-0029-460	Stud Fastener, ¼ turn, 4mm x 24mm
16	266010-0029-462	Retainer, Stud Fastener, ¼ Turn, 4mm
17		Screw, M4 x 8, Soc HD Cap
18		Rivet, Push, Nylon
19		Screw, M4 x 20, Soc HD Cap
20		Washer, Flat, .198/.437/.062
21	266010-0030-076	Headrest, Molded (Blue/Yellow)
22	266010-0030-069	Baffle, Blue/Yellow
23	266010-0030-068	Holder, Baffle, Blue/Yellow
24		Screw, 2-56 x .188
25	266010-0006-711	Washer, Wavy, .25/.345/.008
26		Black Out Velvet Patch

(7.7.4 Patient Support Assembly)



7.7.5 Chinrest / Trial Lens Holder Assembly

Item	P/N	Description
	266002-1125-081	Patient Support Assembly (720-*i*)
	266002-1125-082	Patient Support Assembly (740-*i*/745-*i*/750-*i*)
1		Belt (102/2.03/6)
2	266010-0028-375	Setscrew, M4 x 4, Soc Cup
3		Pulley (18/2.03/5)
4		Washer, Flat (.200/.437/.031)
5		Support, Chinrest
6		Bearing, Ball (5.0 x 16.0 x 5.0)
7		Leadscrew and Nut, Vertical
8	266010-0029-677	Assy, X Motor, Chin/Headrest
9		Setscrew, M3 x 4, Soc Cup
10		Pin, Roll, .094 Dia x .50
11		Leadscrew & Nut, Horizontal
12		Screw, M3 x 8, Soc HD Cap
13	266010-0014-446	Washer, Square Cone (.142/.307/.039)
14		Bracket, Stiffner, Chinrest
15	266010-0029-499	Chinrest, Molded
16	266010-0029-409	Slide, Chinrest, Vertical
17		Screw, Shoulder, 5.0/4 M4 Soc HD
18		Screw, M4 x 8, Soc HD Cap
19	266010-0014-445	Washer, Square Cone (.168/.370/.050)
20	266010-0029-678	Assy, Y Motor, Chin
21		Bearing, Snap-in, (.187 x .234 x .140)
22		Washer, Flat, (.188/.437/.062)
23	266010-0029-408	Slide, Chinrest, Horizontal
24	266010-0008-112	Retaining Ring, .125 shaft
25	266010-0029-520	Spring, Compression, (.210 x .500)
26	266010-0029-476	Flag, Edge Detector
27		Nut, M3 Kep
28		Bracket, Edge Detector
29	266010-0029-581	Assy, Edge Detector
30		Washer, Split (M3/5.6/1.0)
31	266010-0029-524	Ball
32		Screw, M3 x 12, Soc HD Cap
33		Shaft, Trial Len
34		Screw, M4 x 30, Soc HD Cap
35		Washer, (.187/.750/.060)
36		Washer, Curved (.395/.735/.011)
37	266010-0029-737	Bearing Shaft, Trial Lens Holder
38		Block, Trial Lens
39		Screw, M4 x 8, PH HD Black
40	266002-1134-435	Assy, Trial Lens Holder (720-*i*)
	266002-1134-436	Assy, Trial Lens Holder (740-*i*/745-*i*/750-*i*)
41	266010-0029-674	Brush, Trial Lens Tube
42	266002-1106-836	Screw, M4 x 8, Soc, Btn HD, Cap
43		Support

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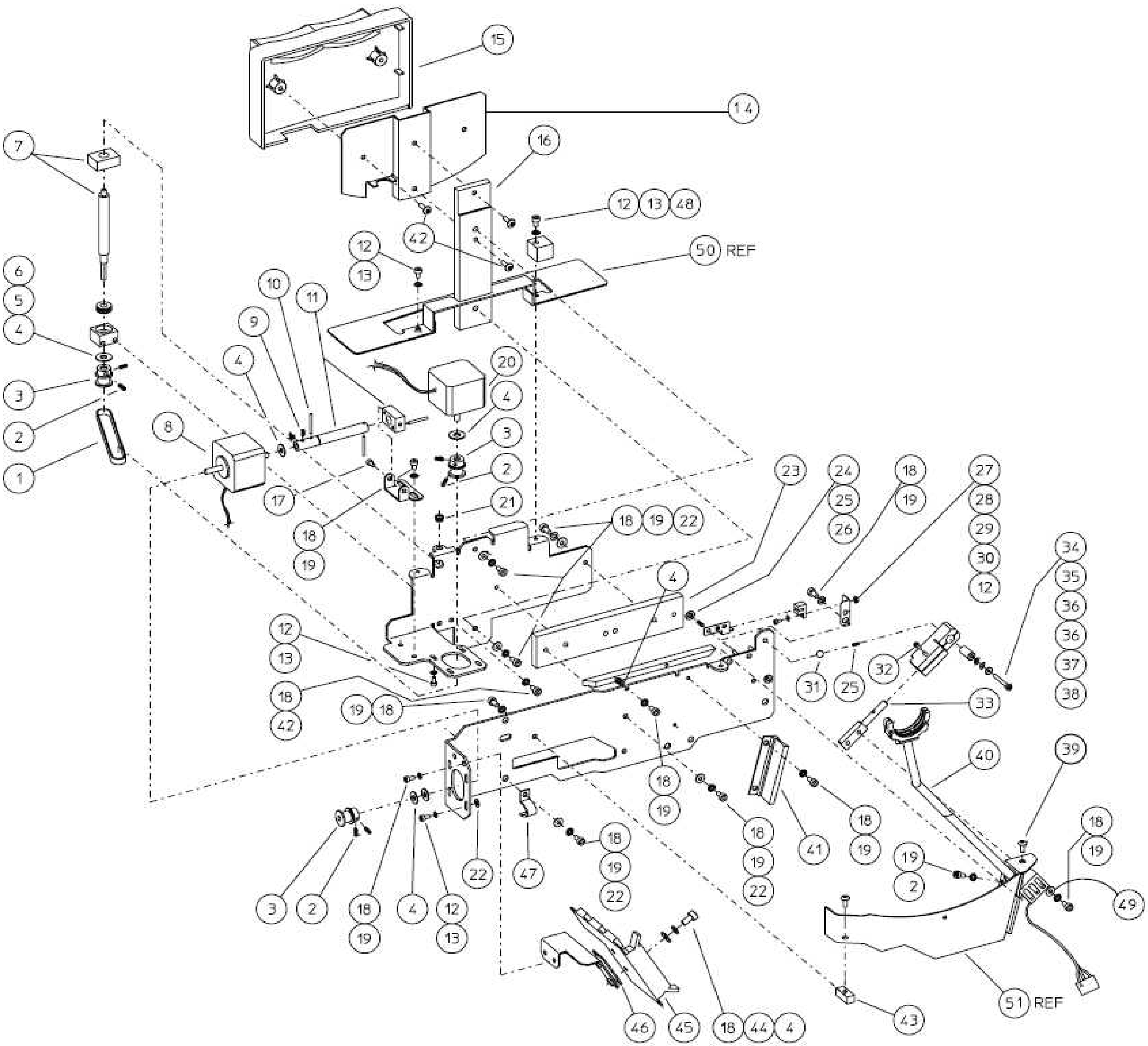
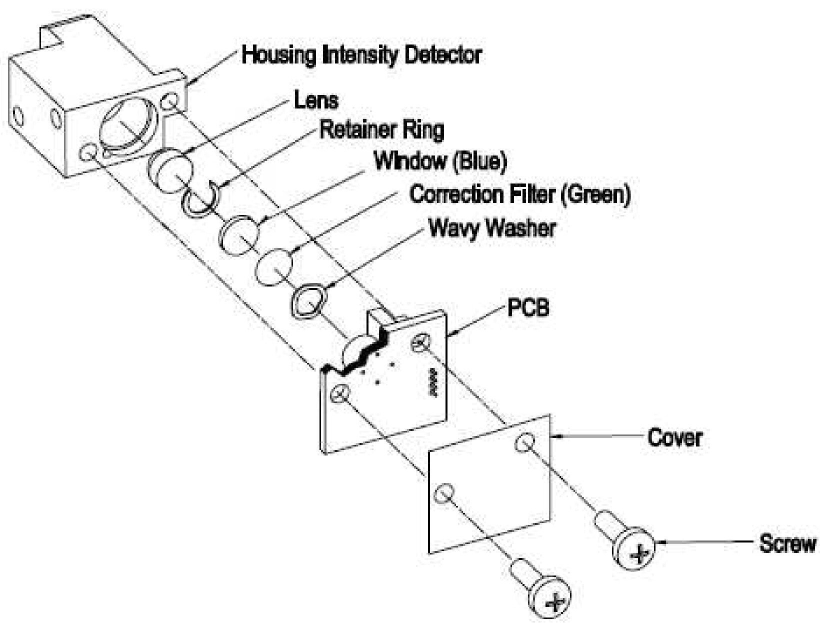
(7.7.5 Chinrest / Trial Lens Holder Assembly)

Item	P/N	Description
44		Washer, Split (M4/7.0/1.2)
45	266010-0029-570	PCB, Interconnect, Patient Support Assy
46		Insulator, PCB
47		Clamp, Wire
48		Block, Patient Support
49		Assy, Cable, Gnd, Trial Lens

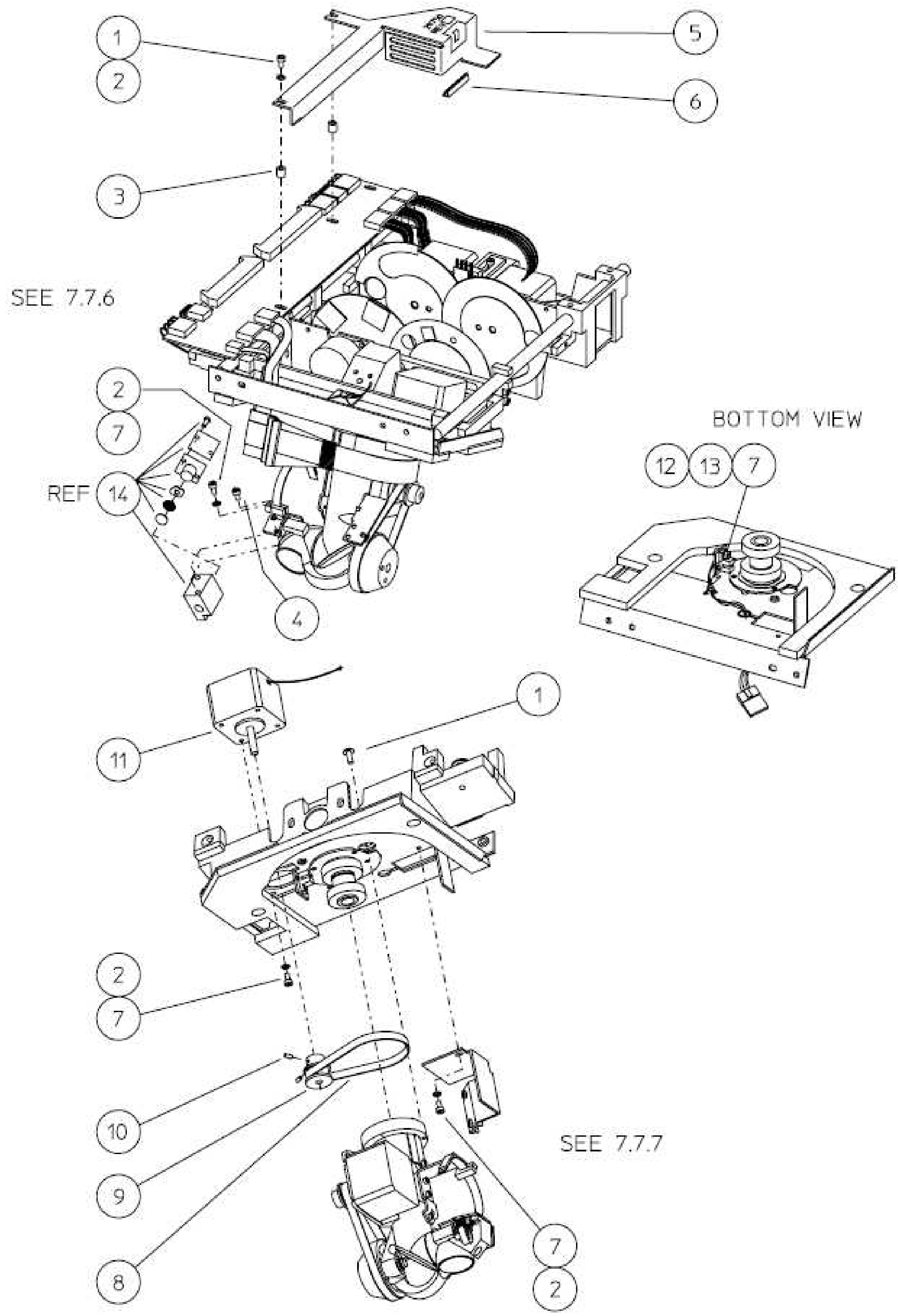


7.7.6 Projection Assembly

Item	P/N	Description
	266002-1125-074	Complete Projection Assembly 720-*i*
	266002-1125-075	Complete Projection Assembly 740-*i*
	266002-1125-076	Complete Projection Assembly 745-*i*/750-*i*
1		Screw, M3 x 16, Soc HD Button
		(Do not interchange with slotted head)
2	266010-0014-446	Washer, Square Cone, .142/.307/.039
3		Spacer, .115/.25/.25, Nylon
4		Screw, M3 x 6, Soc HD, Btn
5		Bracket, Finger Guard, Shaft
6		Grommet, cont, .037 to .071
7		Screw, M3 x 8, Soc HD, Cap
8		Belt, 100/2.03/6
9		Pulley, 24 2.03/5
10		Setscrew, M4 x 6, Soc, Cup
11	266010-0029-583	Assy, Motor
12		Nut, M3 Kep
13	266010-0029-581	Assy, Edge Detector
14		Assy, Brightness Detector (see diagram below)
	266010-0029-975	Assy, Intensity Detector Housing
	266010-0030-258	Housing Intensity Detector
		Lens, 12.7 FL 6.3 Dia Detector
		Ring, Ret, 6.5 Int
	266010-0008-105	Window, Spot Intensity (blue)
	266010-0008-098	Filter, CIE Correction (green)
	266010-0006-711	Washer, Wavy, .255/.345/.008
	266002-1115-839	PCB Brightness Detector
	266002-1105-450	Cover Brightness Detector
		Screw, M3 x 8, PH, HD, White



(7.7.6 Projection Assembly)



7.7.7 Projector Assembly

Item	P/N	Description
1		Pulley, 32/2.03/5
2		Setscrew, M4 x 6, Soc Cup
3		Screw, M3 x 8, Soc HD Cap
4	266010-0014-446	Washer, Square Cone, .142/.307/.039
5	266010-0029-583	Assy, Motor
6	266010-0030-106	Assy, Shutter (new style)
7	266002-1104-334	Setscrew, M3 x 6, Soc Cup
8		Assy, Edge Detector
9		Washer, Flat, .140/.205/.040, Nylon
10	266010-0029-550	PCB, Interconnect, Projection System
11	266010-0029-584	Assy, Shutter Motor
12		Washer, Split, M3/5.6/1.0
13		Washer, Flat, .146/.315/.031, Nylon
14	266002-1106-082	PCB, Projection Lamp Assy
15		Screw, M4 x 20, Slotted HD Cap B/Z
		Locknut, M4, (not shown
		— screws onto bottom end of item 15)
16	266010-0014-445	Washer, Square Cone, .168/.370/.050
17		Washer, Spring, Curvy, .174/.322/.008
18	266010-0029-981	Assy, ND Film Wedge
19	266010-0029-969	Assy, ND Glass Wedge
20		Assy, Color Wheel (740)
		Assy, Color Wheel (745/750)
21	266010-0029-978	Assy, Aperture Wheel
22	266010-0021-517	Washer, Flat, .200/.359/.048
23		Bushing, .188/.312/.50, Flange, Plastic
24	266010-0007-063	Washer, Flat, .223/.366/.031, Nylon
25	266010-0030-031	Washer, Spring, Curvy, .200/.370/.006
26	266010-0006-085	Ring, Retaining, .145 E EXT
27		Washer, Flat, .200/.437/.020, Nylon
28		Belt, 195/2.03/6
29		Pulley, 18/2.03/8
30		Bushing, 5/8/12, Delrin AF
31		Screw, Shoulder, 5.0/14 M4, Soc HD

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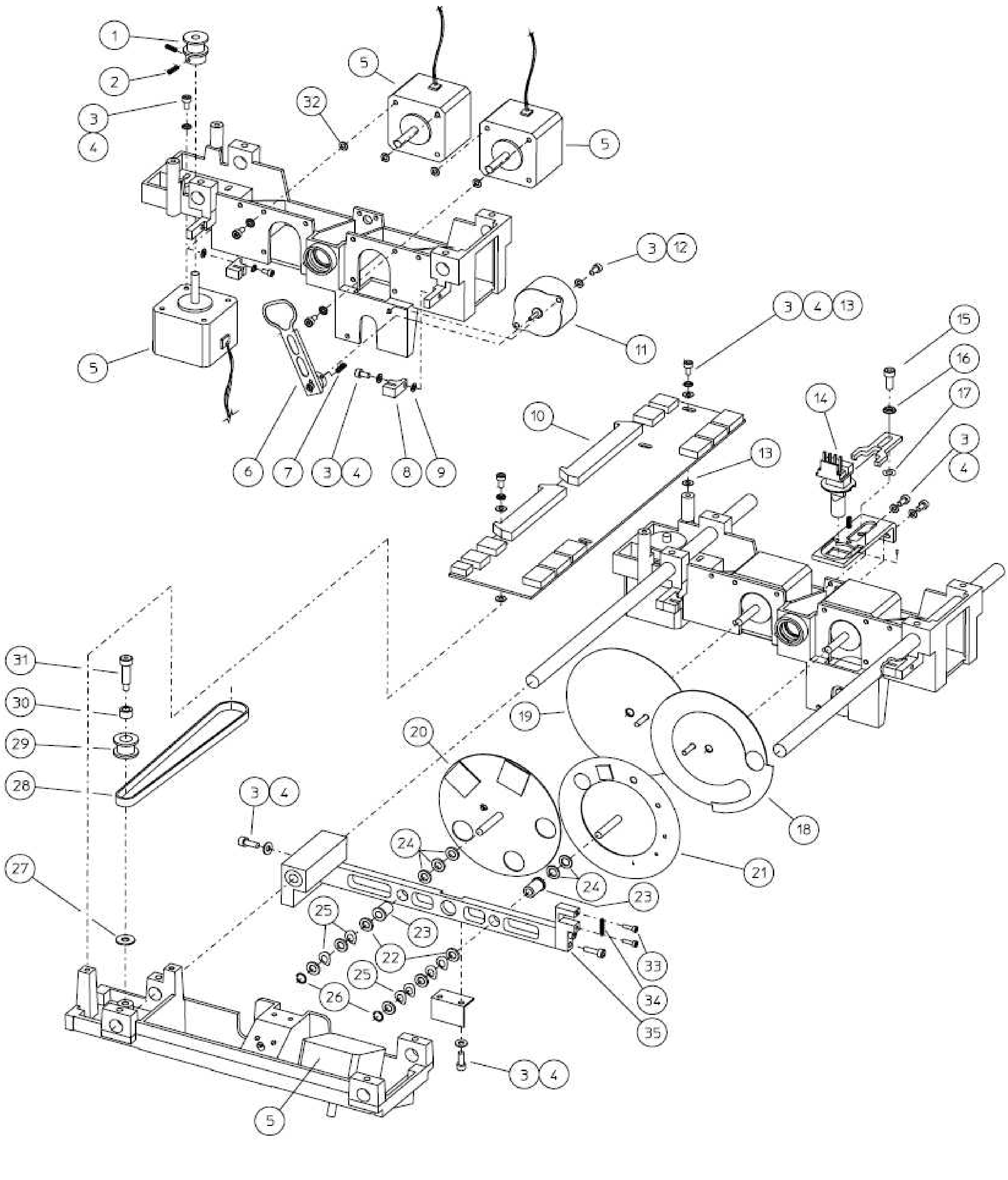
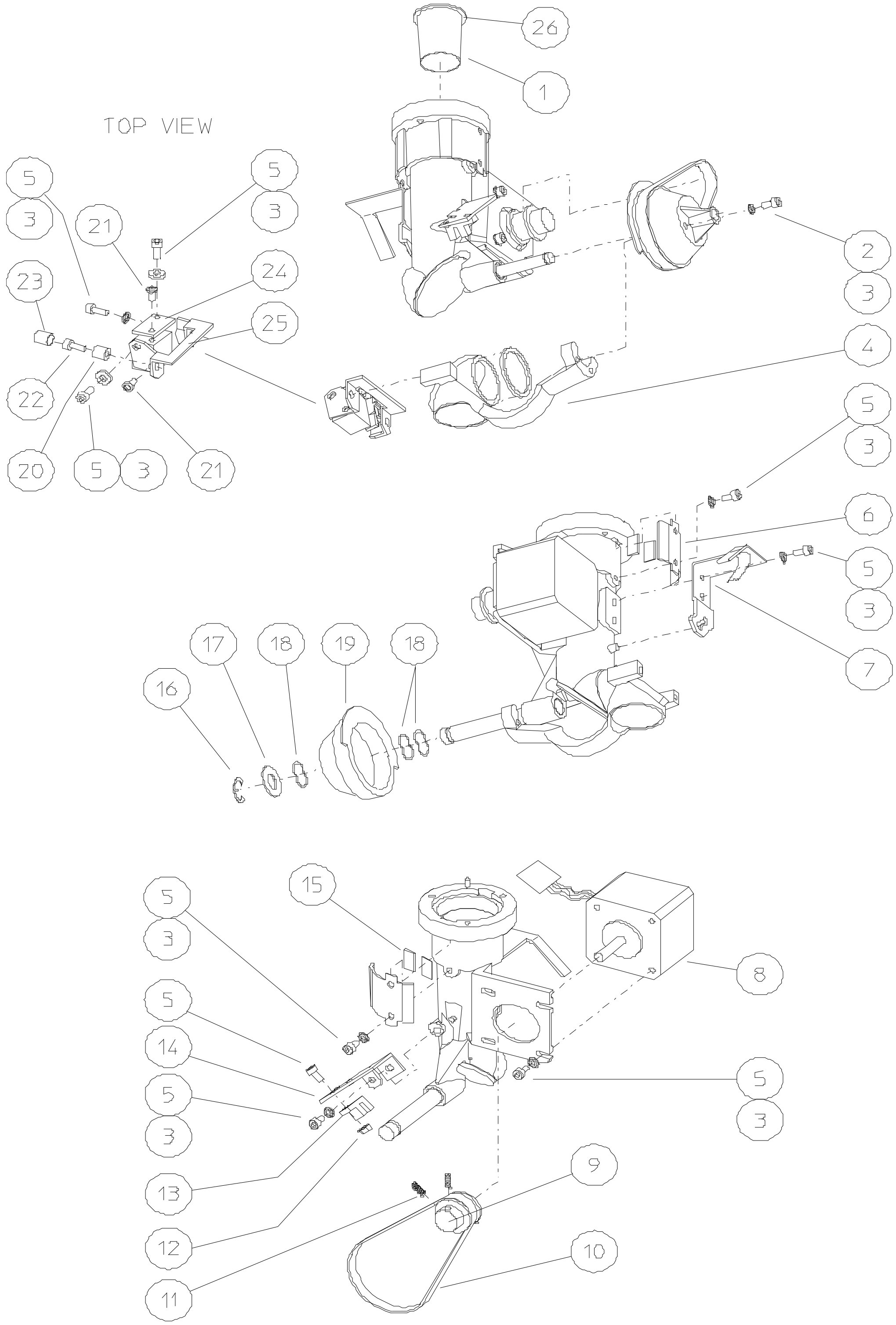
(7.7.7 Projector Assembly)



7.7.8 Projection Turret Assembly

Item	P/N	Description
1		Baffle, Oil
2		Screw, M3 x 10, Soc HD, Cap
3	266010-0014-446	Washer, Square Cone, .142/.307/.039
4		Assy, Y Mount
5		Screw, M3 x 8, Soc HD, Cap
6		Retainer, X, Flex Cable 1
7	266010-0029-971	Assy, Turret Flex Cable (includes 3 cables, w/mounting brackets - must be replaced as a set)
8	266010-0029-582	Assy, Motor, Y Axis
9		Pulley, 24/2.03/5
10		Belt, Y Motor, 112/2.03/6
11		Setscrew, M4 x 6, Cup Point
12		Nut, M3, Kep
13		Assy, Edge Detector, Y Axis
14		Bracket, Y, Big Detector
15	266002-1105-950	Foam, Poron w/PSA
16	266010-0000-557	Ring, Retaining, .250 E Ext
17		Washer, Flat, .255/.375/.031, Delron
18	266010-0006-711	Washer, Wavy, .255/.345/.008
19		Pulley, Y, Molded
20		Spacer
21		Screw, M3 x 6, Soc HD, Btn
22		Screw, M3 x 12, Soc HD, Cap
23		Heat Shrink, Black, ¼
24	266010-0029-975	Assy, Brightness Detector
25		Bracket, Brightness Detector
26		Adhesive, Black Max Loctite 380

(7.7.8 Projection Turret Assembly)



7.7.9. Bowl Assembly

Item	P/N	Description
1		Plug, HFA2, Blue/Yellow
2		Baffle, HFA2, Background, Left
3		Mirror, HFA2, Cold (740-*i*,745-*i*,750-*i*)
4		Holder, HFA2, Mirror, Cold, Left (740-*i*,745-*i*,750-*i*)
5		Holder, HFA2, LED IR (740-*i*,745-*i*,750-*i*)
6	266010-0029-652	LED IR, High Power, T05 (740-*i*,745-*i*,750-*i*)
7		Clamp, HFA2, LED IR (740-*i*,745-*i*,750-*i*)
8		Screw, M4 x 8, Soc HD, Cap
9	266010-0014-445	Washer, Square, Cone (.168/.370/.050)
10		Bracket, HFA2, Plug, IR Illumination
11		Plug, HFA2, IR Illumination
12		Clamp, HFA2, Holder, LED, IR
13		Holder, HFA2, Mirror, Cold, Right (740-*i*,745-*i*,750-*i*)
14		Baffle, HFA2, Background, Right
	266010-0052-755	Assembly, IR LED (Consists of items 5, 6 & 7) (740-*i*,745-*i*,750-*i*) (not shown)
	266010-0029-990	Assembly, Bowl Lamp, Left (not shown)
	266010-0029-989	Assembly, Bowl Lamp, Right (not shown)

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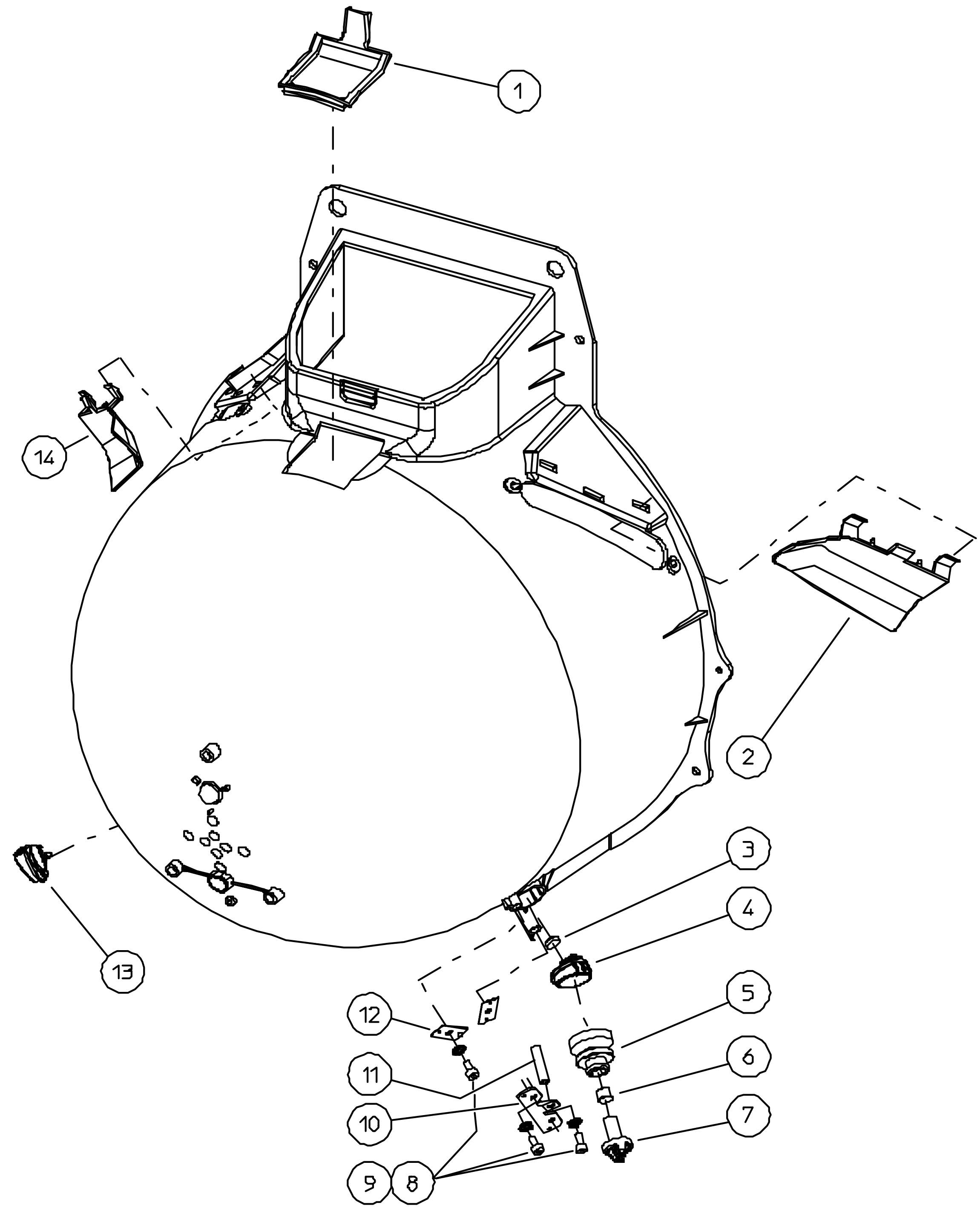
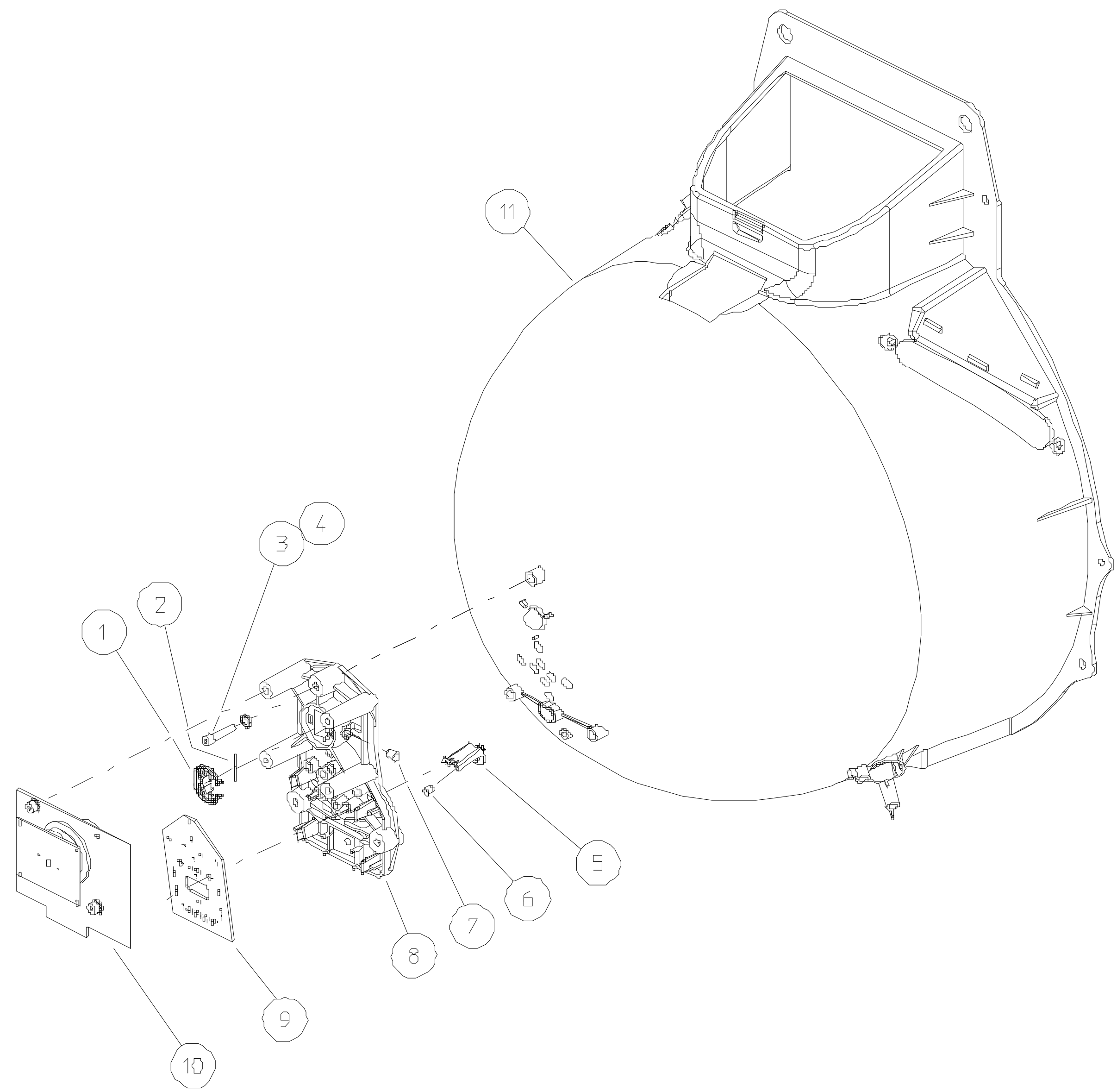
(7.7.9 Bowl Assembly)



(7.7.9 Bowl Assembly)

Item	P/N	Description
1		Clip, HFA2, Beamsplitter, Central
2	266010-0029-577	Filter, Beamsplitter, CCD (740-*i*,750-*i*)
		Beamsplitter, HFA2, Fixation (720-*i*)
3		Screw, M4 x 20, Soc HD, Cap
4	266010-0014-445	Washer, Square Cone (.168/.370/.050)
5		Holder, HFA2, LED Reflex
6		Assy, Cable, HFA2, Gaze LED
7		LED, Central Fixation (part of 48820)
8		Mount, HFA2, Camera
9	266002-1114-724	PCB, Fixation
10		Kit, FRU, CCD Camera
	266002-1117-337	CCD Camera
	266010-0053-001	Cable
	266002-1112-361	Support PCBA
		HFA2, CCD Camera (Ref. Only)
11		Bowl, HFA2, 175mm RAD
	266010-0052-756	Fixation Assembly (Contains items 5, 6 & 9) (Not Shown)

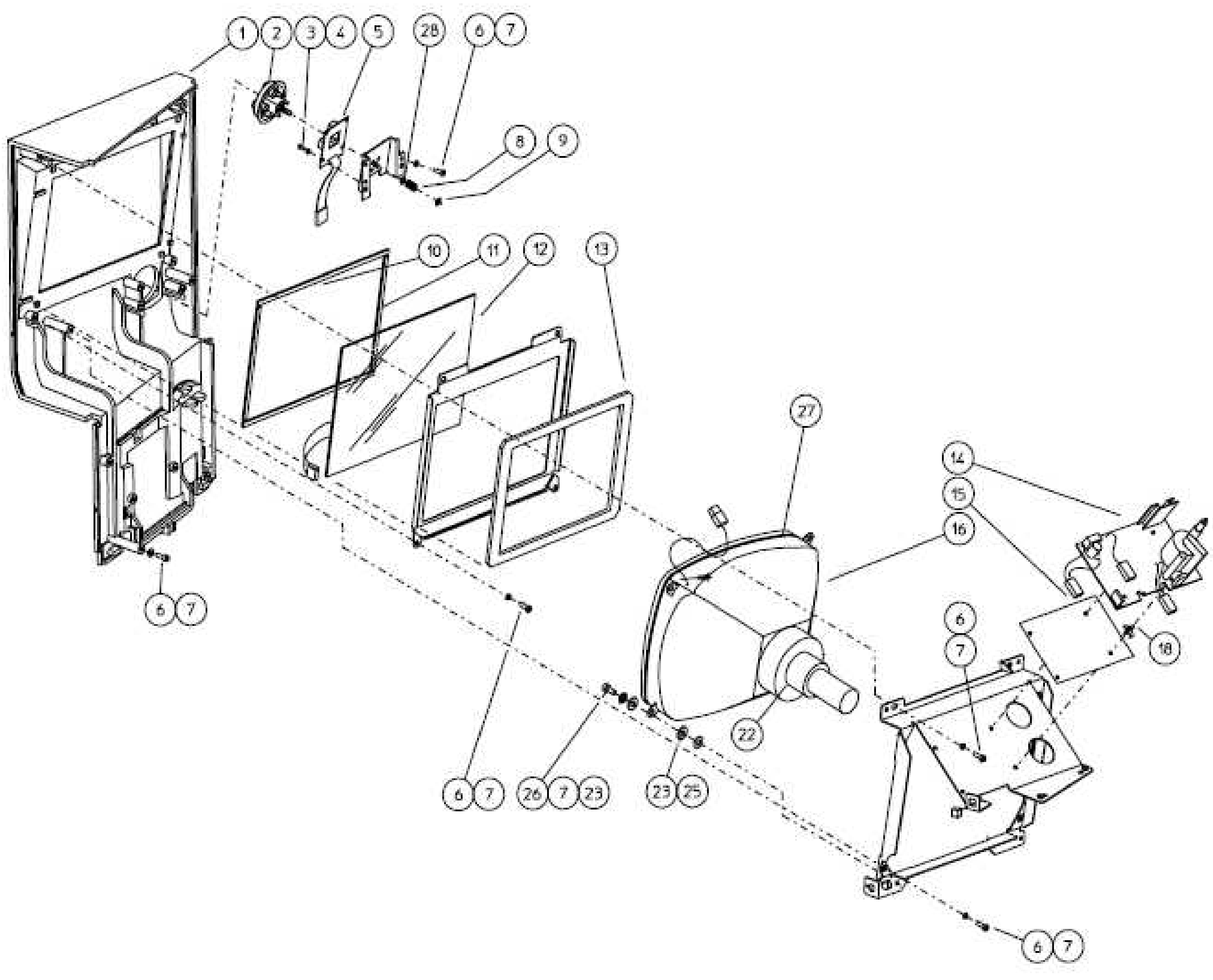
(7.7.9 Bowl Assembly)



7.7.10 Operator Panel Assembly

Item	P/N	Description
1	266010-0029-302	Panel, Operator
--	266010-0029-992	Chinrest Switch Assy
2	266010-0029-390	Button, Chinrest Switch
3		Screw, M3 x 8, Soc HD Cap
4	266010-0014-446	Washer, Square Cone (.142/.307/.039)
5	266010-0029-610	PCB, Chinrest Switch Assy
6		Screw, M4 x 8, Soc HD Cap
7	266010-0014-445	Washer, Square Cone (.168/.370/.050)
8	266010-0029-765	Spring, Compression (.312/.750/.017)
9	266010-0032-439	Retaining Ring
10	266010-0029-698	Gasket, Touchscreen, Long
11	266010-0029-699	Gasket, Touchscreen, Short
12		Touchscreen, 12", CRT
13	266010-0030-198	Gasket, Foam, CRT
14	266010-0030-086	PCB, CRT, Z-Axis
15	266010-0029-841	Shield, CRT PCB
16		CRT, 12" P-4 90 Degrees 50" Radius
		Monitor, 12" P-4 35KHZ ANL Z-Axis
	000000-1210-551	Monitor Assy (pcb, yoke, tube & bracket)
17		Item number not used
18		Spacer, PCB Snap, .187, Nylon
19		Item number not used
20		Item number not used
21		Item number not used
22	266010-0030-087	Yoke assy, Z-Axis
23		Washer, Flat, .188/.505/.030
24		Item number not used
25		Washer, Flat, .198/.437/.062
26		Screw, M4 x 20, Soc. HD, Cap
27	266002-1100-085	Tape, Foam, 2.0 Feet (goes around each end of the CRT tube)
28		Washer, Flat, .250/.375/.031

(7.7.10 Operator Panel Assembly)



7.7.11 B/Y Lamp Assembly

Item	P/N	Description
--	266010-0030-071	Yellow Lamp Assy (includes all items listed below)
1		Cable Assy, Motor Driver PCB to B/Y Lamp (two wires with connector at one end)
2	266010-0029-954	Lamp, Halogen, w/Reflector
3	266010-0024-495	Spring, B/Y Lamp
4		Screw, M9 x 8, Soc HD Cap
5	266010-0014-446	Washer, Square Cone, .142/.307/.039
6		Bracket, B/Y Lamp, Stationary
7		Bracket, B/Y Lamp, Removable
8		Socket, B/Y Lamp (with two wires attached)
9	266010-0000-673	Cable Tie
10		Sleeve, Expandable, Polyester .12 Black
11	266010-0030-312	Shield, Lamp

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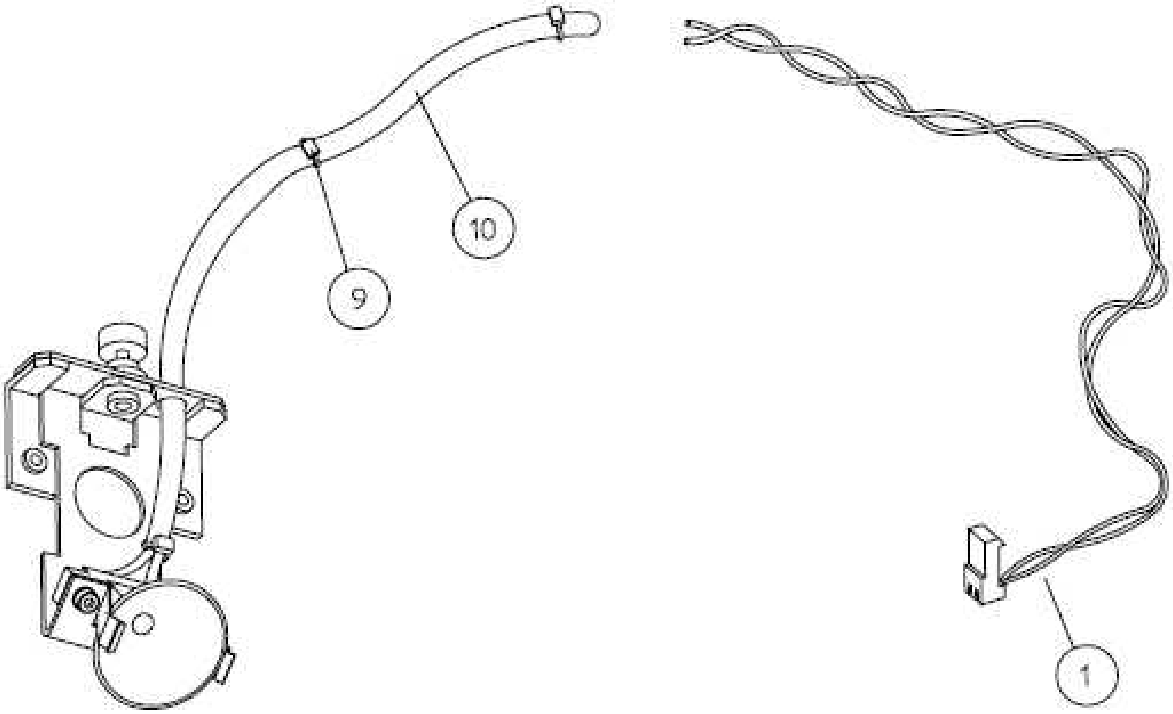
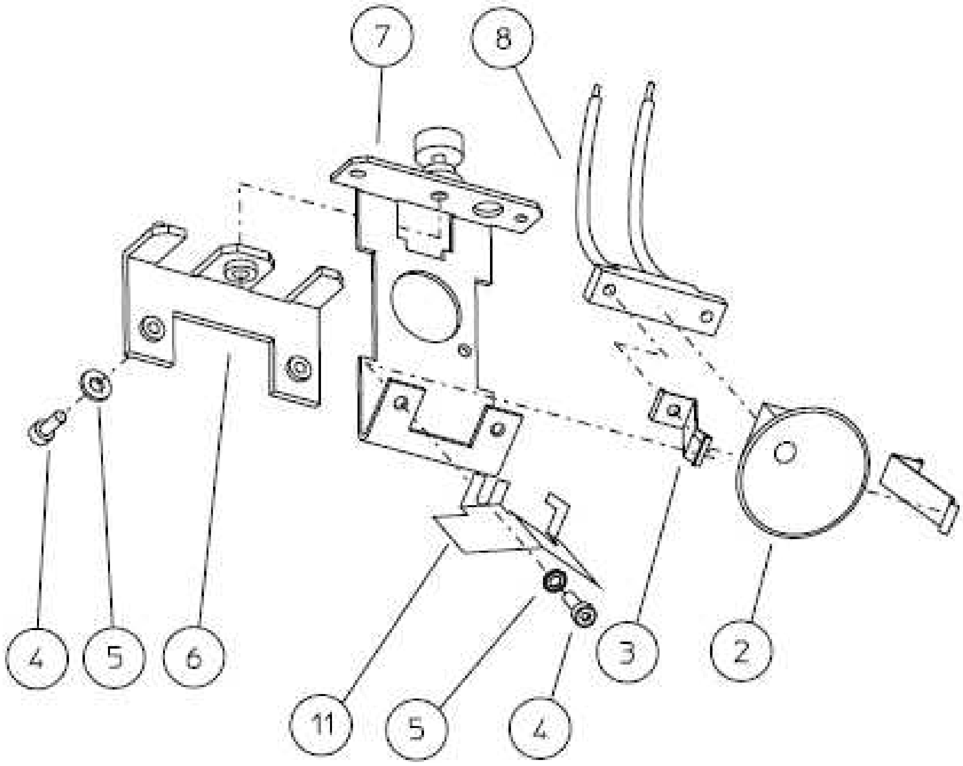
(7.7.11 B/Y Lamp Assembly)



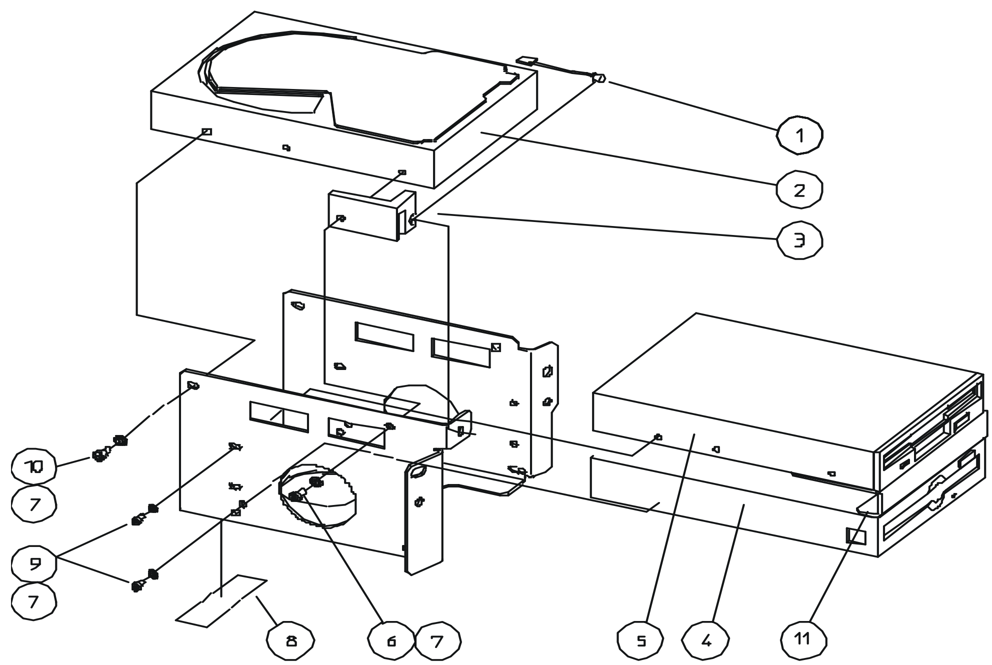


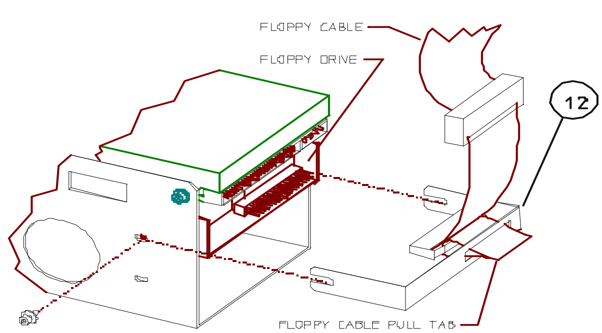
7.7.12 Drive Mounting Assembly Version ≤5.0

Item	P/N	Description
1		Assy, LED, HFA II-*i* Hard Drive, IBM (720-*i*, 740-*i*,745-*i*,750-*i*)
		Cable Clamp, Assy LED (Not Shown)
2	SB FA2i-003x	Drive, hard, w/software, (720-*i*, 740-*i*, 745-*i*, 750-*i*)
3		Holder, LED, Hard Drive
4	266010-0054-568	Drive, Magnetic Optical, 3 ½", ATAPI (MCM) (750-*i*)
5	266010-0029-244	Drive, Floppy, Sony or Teac, 3½", High Density
		Drive, Floppy, Sony, 3 ½”, High Density
6		Screw, 6-32 x .375, Soc HD Cap
7	266010-0014-446	Washer, Square Cone, .142/.307/.039
8		Label, Drive Date Code
9		Screw, M3 x 8, Soc HD Cap
10		Screw, 6-32 x .250, Soc HD Cap
11		Panel Drive, Blanking, HFA II-*i* (750-i only) (attached using items 7 & 9)
12		Floppy Drive Cable Retaining Bracket

Note - *Refer to Service Bulletin FA2i-003x for additional hard & tape drive information.*

(7.7.12 Drive Mounting Assembly Version ≤5.0)

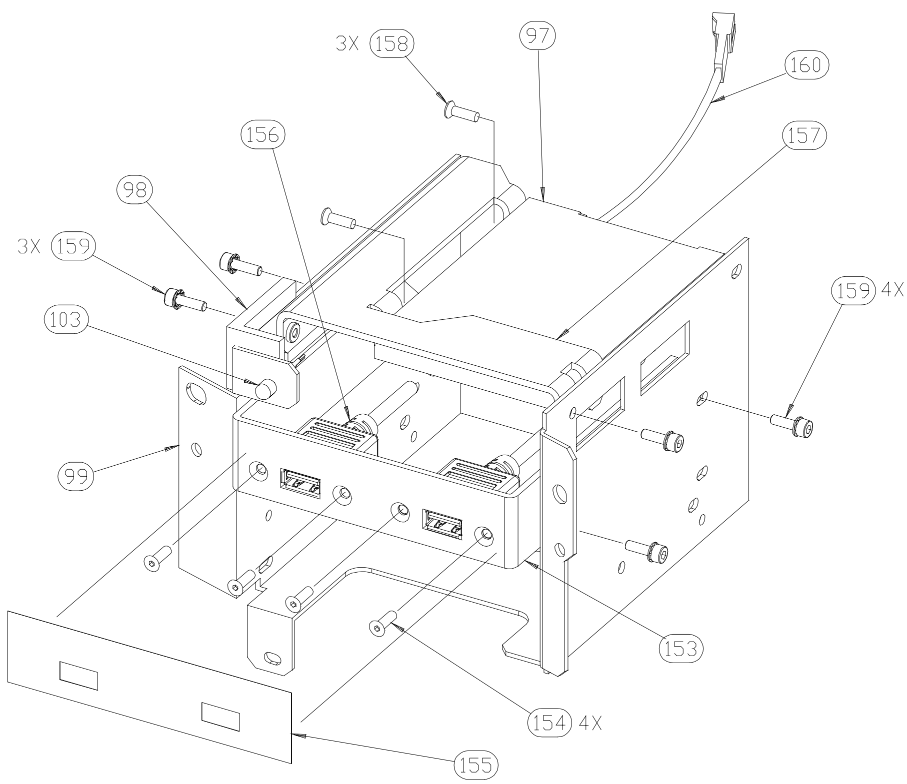


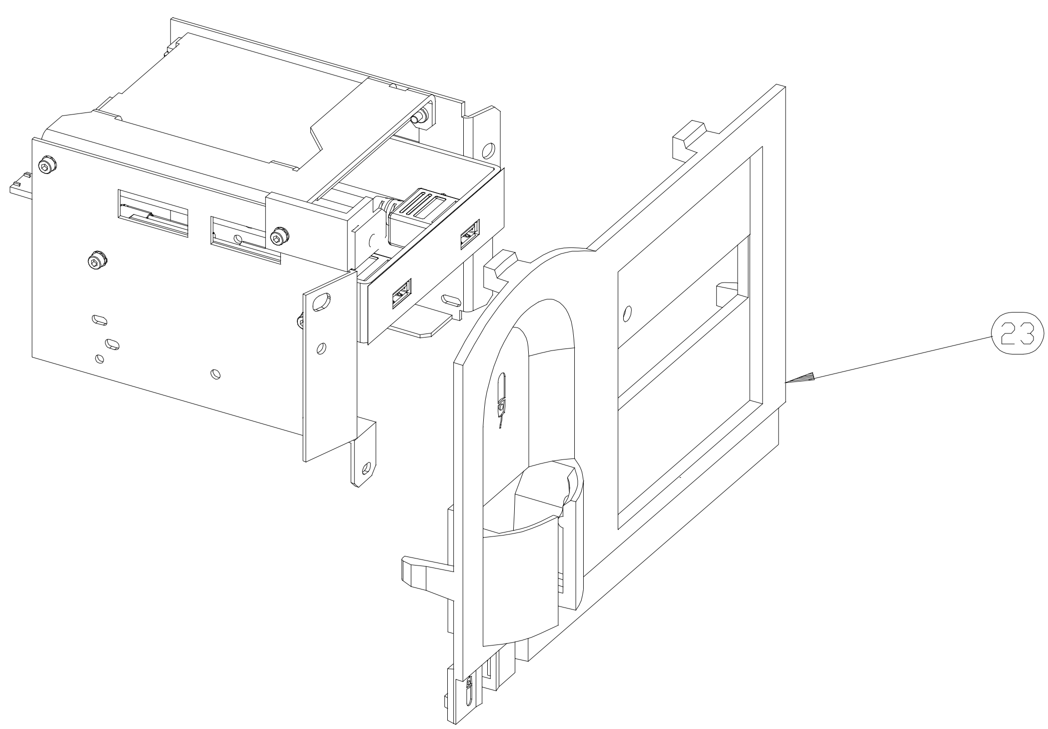


7.7.13 Drive Mounting Assembly Version ≥5.1

Item	P/N	Description
23		Panel Disk Drives 720, 740, 745
97	SB FA2i-003x	Drive, Hard Sata 2.5”
98		Holder LED Hard Drive
99		Bracket Disk Drives
103		Assy Cable HFA LED Hard Drive
153		Bracket HFA USB Ports
154		Screw M3 x 12 SOC Flat Hd S/BZ
155		Label USB Ports
156		Assy Cable HFA Dual USB External
157		Tray HFA Hard Drive
158		Screw M3 x 6 SOC Flat Hd S/BZ
159		Screw M3 x 0.5 x 10 SOC Hd Cap Sem
160	266002-1132-018	Cable Sata Power Adapter

(7.7.13 Drive Mounting Assembly Version ≥5.1)

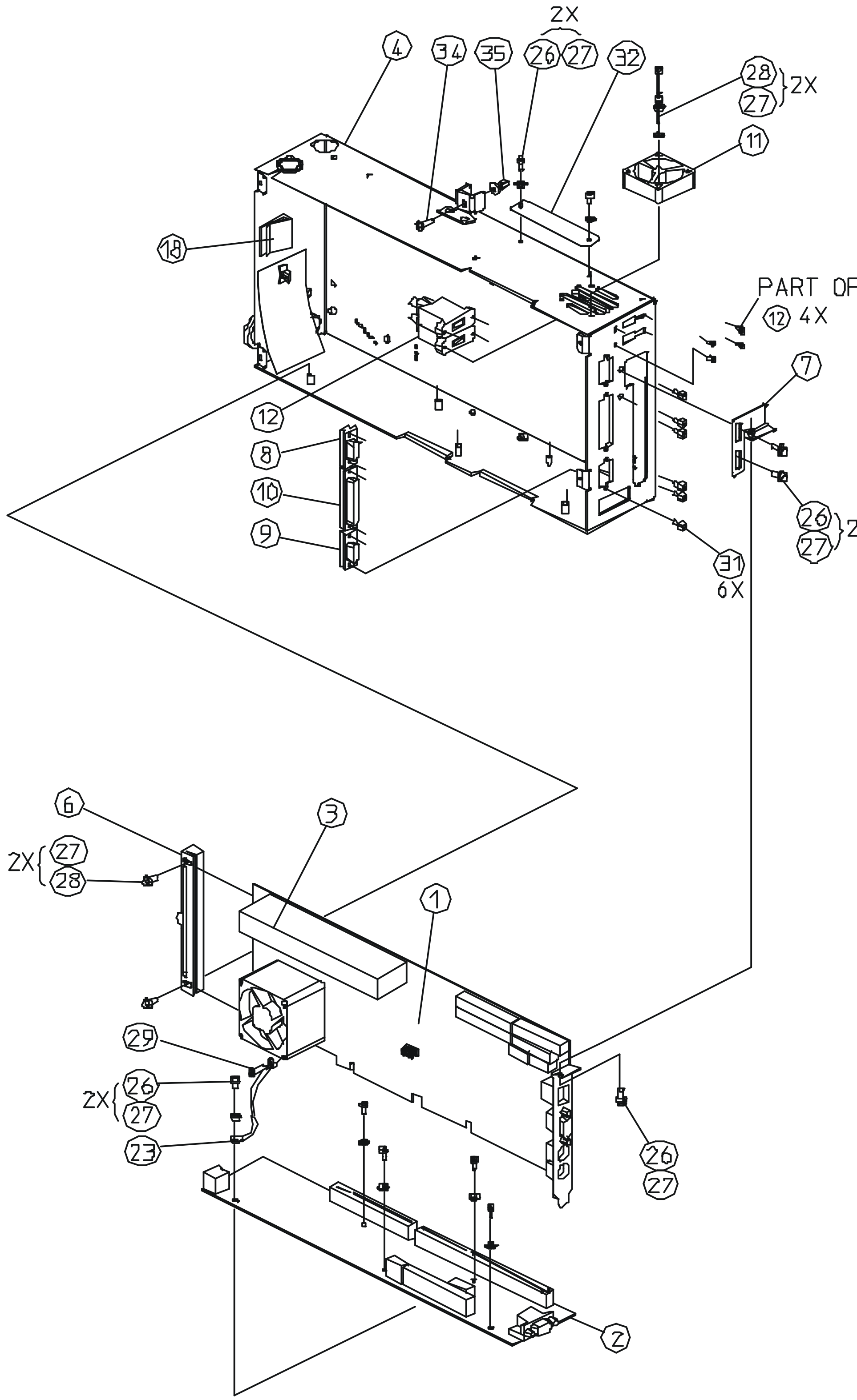




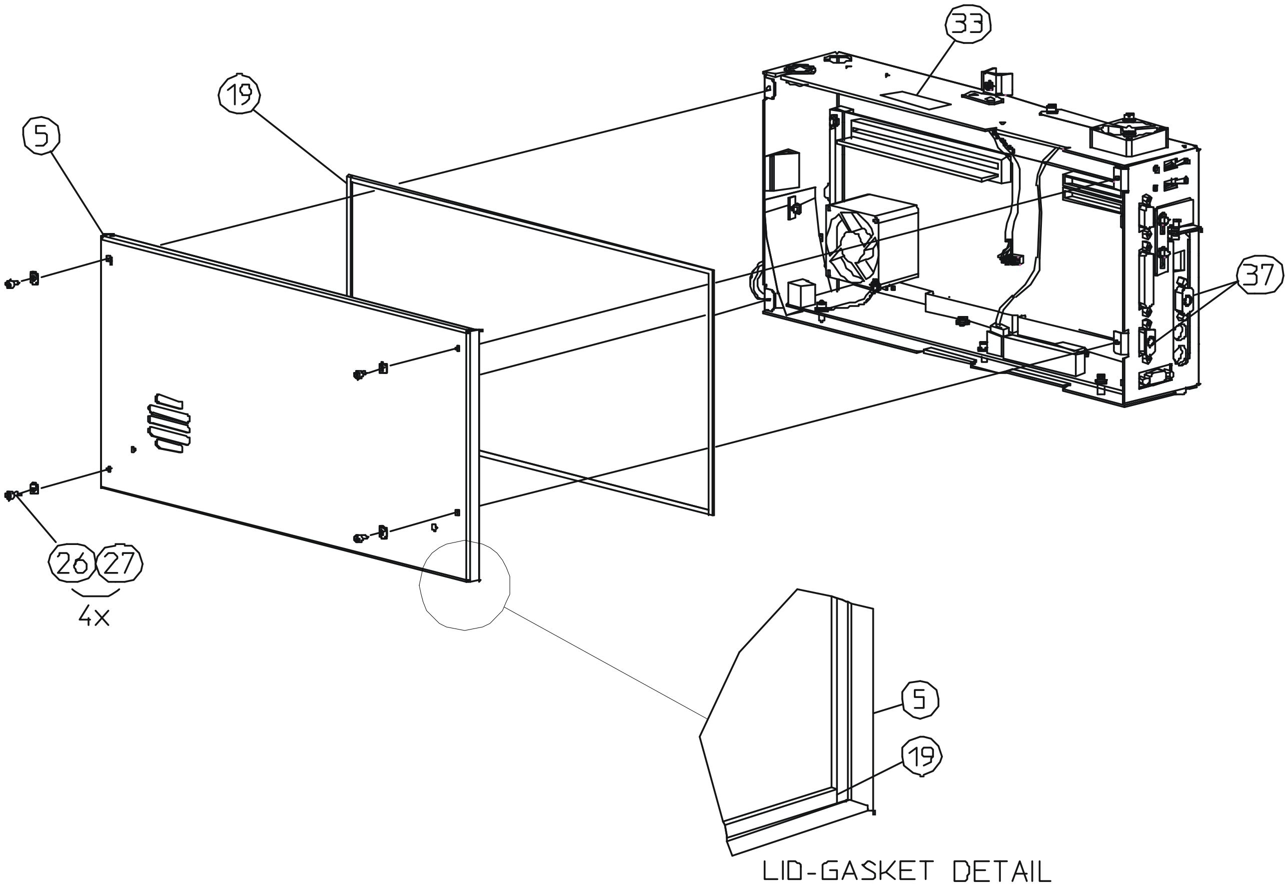
7.7.14 CPU / Backplane Enclosure Version ≤5.0

Item	P/N	Description
	266010-0060-674	CPU/Backplane Enclosure (Version ≤5.0) (FRU)
1		CPU PCB, HFA II-*i*, 433MHz
2		Backplane PCB, HFA II-*i*
3		DIMM, 64MB, PC100, Non ECC
4		Box, HFA II-*i*, EMI Shield
5		Assembly Lid w/Gasket (item 19) HFA II-*i*, Box EMI
6		Clamp, HFA II-*i*, CPU PCB
7		Bracket, External, CPU PCB Clamp
8		Cable, HFA II-*i* Serial No. 1
9		Cable, HFA II-*i* Serial No. 2
10		Cable, HFA II-*i* Parallel Port
11		Fan with Cable, HFA II-*i*, 5 volt
12		Cable USB
13	266010-0029-695	Brightness Pot, Assembly
14	266002-1117-635	Knob, Brightness Pot
15		Snap Bushing 0.625" dia
16		Push Spacer
17		Snap Bushing 0.750" dia
18		Cable Clamp, C-Clip
19		Gasket, EMI foam 1/8" X 1/4"
20		Wire Saddle – 4
21		Wire Saddle – 1
22		Flat Tie Holder
23		Braided Ground Cable HFA II-*i*
24	266010-0000-673	Tie Wrap, Black
25		Screw, M4 X 6 set Socket Head, Cup
26		Screw, M3 X 8, Socket Head, Cap
27	266010-0014-446	Washer, Square Cone, .142/.307/.039
28		Screw, M3 X 20, Socket Head, Cap
29		Screw, #6 X 0.625" Self Tap, A-AB Phil
30		Shield Brightness Pot Insulator, HFA II-*i*
31		Screw, 4-40 X .25 Jack Socket
32		Clamp, IDE/Floppy Cable HFA II-*i*
33		Label, SN, HFA II-*i* CPU
34	266010-0029-460	Stud Fastener, 1/4 Turn 4 X 24 MM
35	266010-0029-462	Retainer Stud Fastener, 1/4 Turn
36		Item number not used
37		Caplug SVGA
		Ferrite (Not Shown)
	266002-1116-577	Bracket, Ferrite (Not Shown)
		SCR M2 X 4 Phil Hd (2 Ea) (Not Shown)
	266002-1123-173	Battery, CMOS, CR-2032

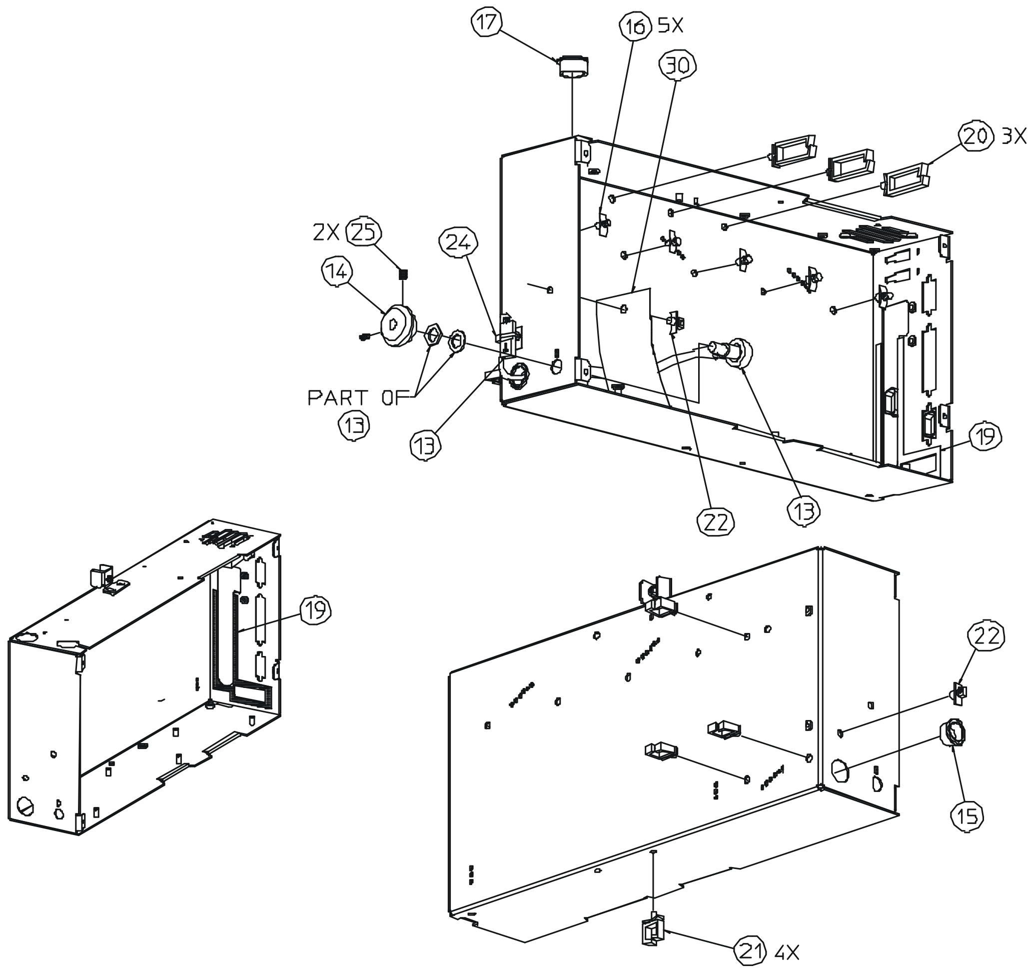
(7.7.14 CPU / Backplane Enclosure Version ≤5.0)



(7.7.14 CPU / Backplane Enclosure Version ≤5.0)



(7.7.14 CPU / Backplane Enclosure Version ≤5.0)



7.7.15 CPU / Backplane Enclosure Version ≥5.1

Item	P/N	Description
	266002-1141-151	CPU/Backplane Enclosure (Version ≥5.1) (FRU)
1		Assy Computer Picmg HFA2-*i* Q35
2		PCBA HFA2p Backplane2
3		Assy Cable HFA2p Dual USB External
4		Box HFA2p Emi Shield Adlink
5		Lid HFA2p Emi Shield Adlink
6		Clamp HFA2p PCBA Picmg
7		Bracket HFA2p PCBA Picmg
8		Assy Cable HFA2p 5.1 Picmg Interface-2
9		Clamp HFA2 Mon Cable Ground
10		PCBA HFA2p Backplane2 VGA
11		Assy Cable HFA2p Fan 5v
12		Assy Cable HFA2p Dual USB Internal
13	266010-0029-695	Assy Cable Cub Pot Brightness
14	266002-1117-635	Knob Pot HFA2p
15		Bushing Snap .625 Dia Mntg Hole
16		Push Spacer
17		Bsng Snap .750"Dia Mntg Hole
18		Assy Cable HFA2p Fan 80x80x15 Emi Box
19		Gasket Emi Invo Foam Nkl/Cop
20		Wire Saddle-4
21		Wire Saddle-1
22		Flat Tie Holder
23		Screw M3x12 Soc Hd Cap S/Bz
24	266010-0000-673	Tie Wrap 4" Black
25		Screw M4x6 Set Soc Cup S/Bz
26		Screw M3x8 Soc Hd Cap S/Bz
27	266010-0014-446	Washer Sq Cone .142/.307/.039 St
28		Screw M3 X 20 Soc Hd Cap S/Bz
29		Adh Threadlock 6hr Loctite 242
30		Shield HFA2p Insulator
31		Screw 4-40 X .25 Jack Socket
32		Assy Cable HFA2p Backplane VGA In
33		Label S/N HFA2p CPU Backplane2
34	266010-0029-460	Stud Fastener 1/4 Turn 4x24mm
35	266010-0029-462	Retainer Stud Fastener 1/4turn
36		Bag Antistatic 28 X 4223
37		Caplug SVGA
38		Label Warning Esd Blu/Wht
45		Screw 4-40 X .500 Soc Hd Cap St
46		Washer Split .120/.209/.025 Sst
47		Saddle Wire Large
48		Shield HFA2p Backplane VGA
49		Clamp Flat Cable Snap In 15mm
50		Clamp Flat Cable Snap In 30mm
51		Plate HFA2p Emi Box Ethernet

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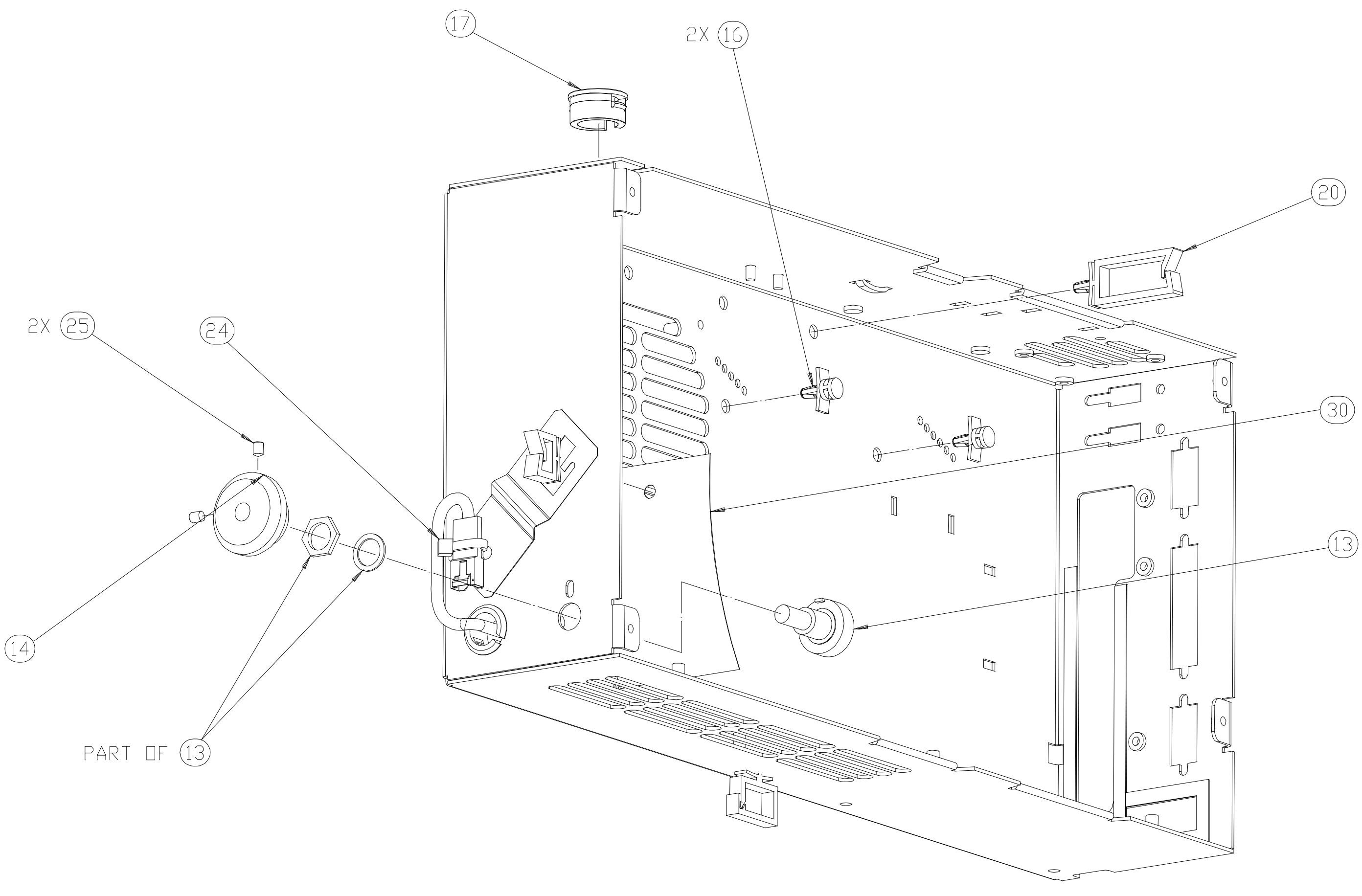
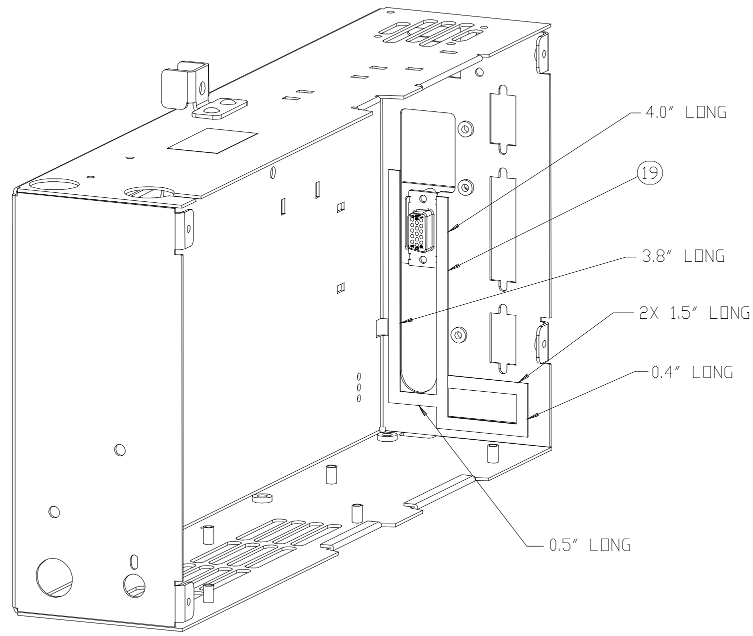
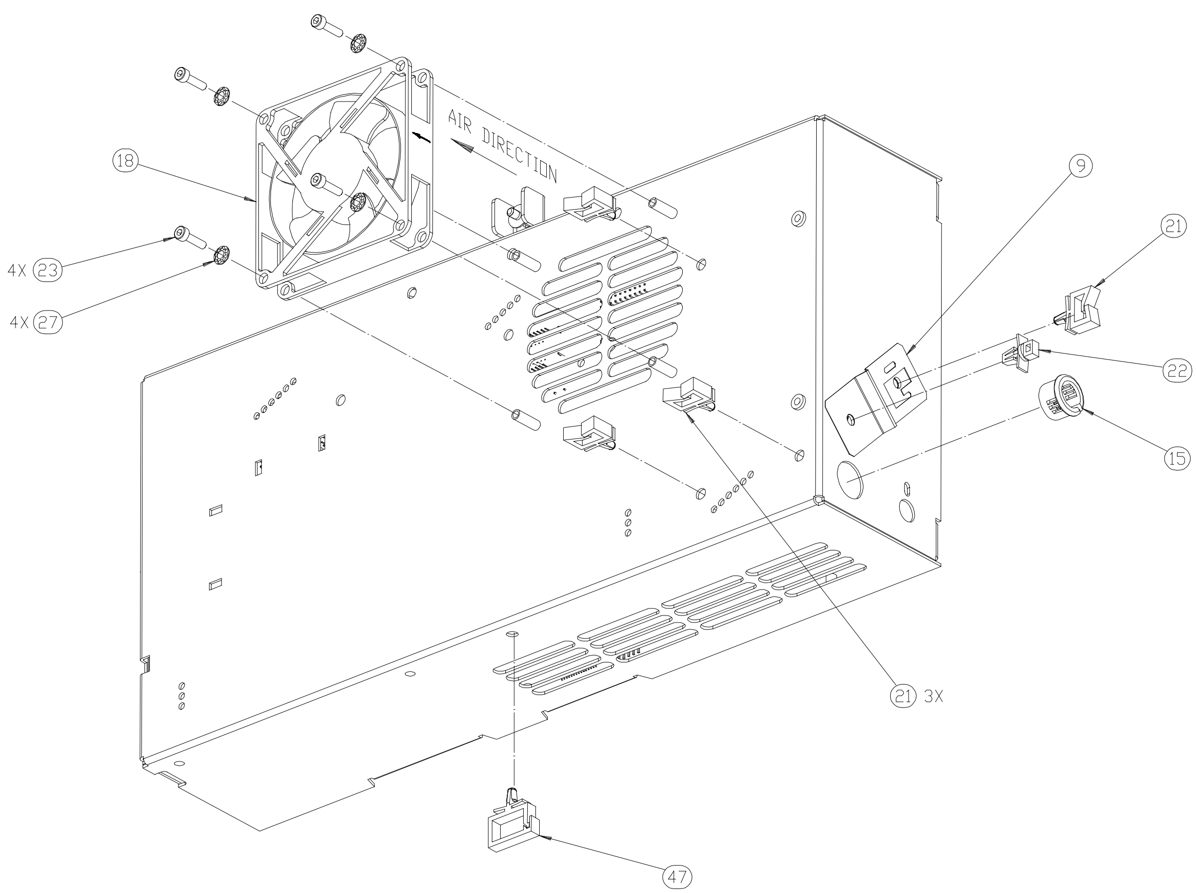
(7.7.15 CPU / Backplane Enclosure Version ≥5.1)

Item	SAP P/N	Description
52		Clamp Cable C-Clip
53		Label .5 X 1.75 Blank Write Or Print
54		Screw M3x16 Soc Hd Cap S/Bz
55		Washer .120 X .220 X .020 Nyl
		Memory Module 1-GB DDR2 800
		Fan CPU with Heatsink

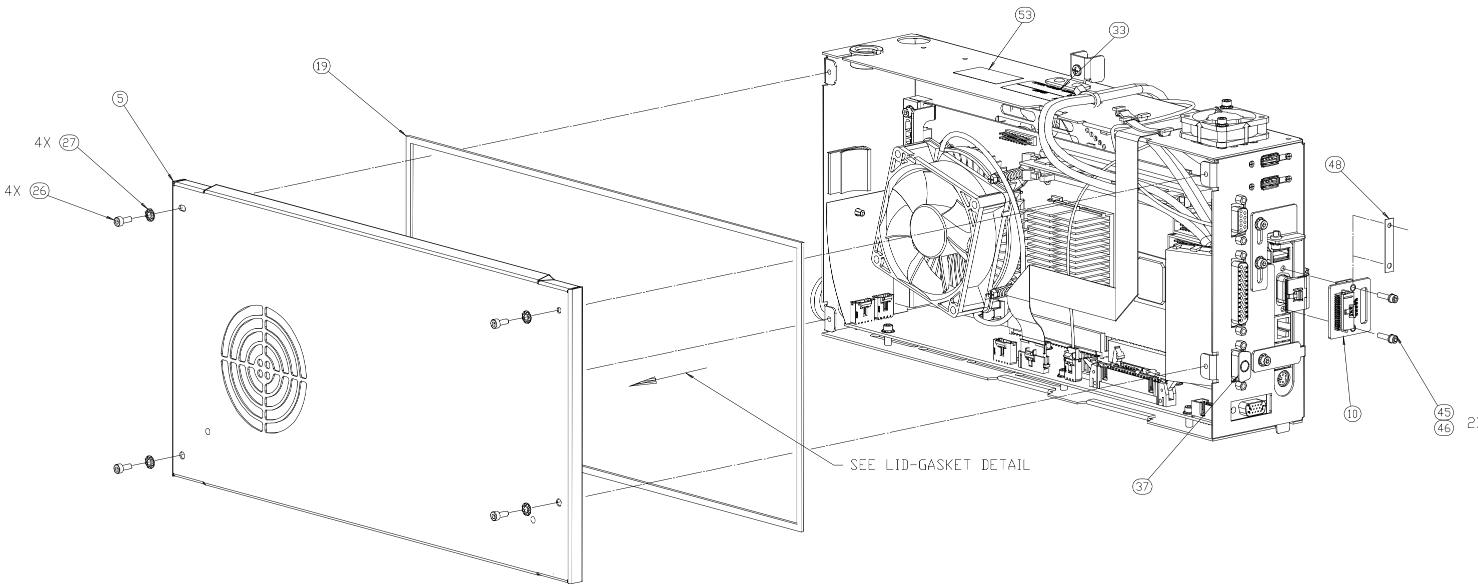


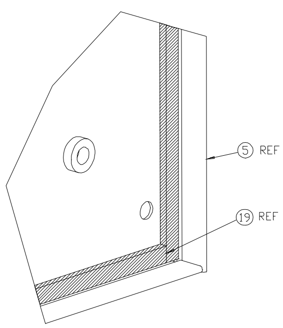
(7.7.15 CPU / Backplane Enclosure Version ≥5.1)



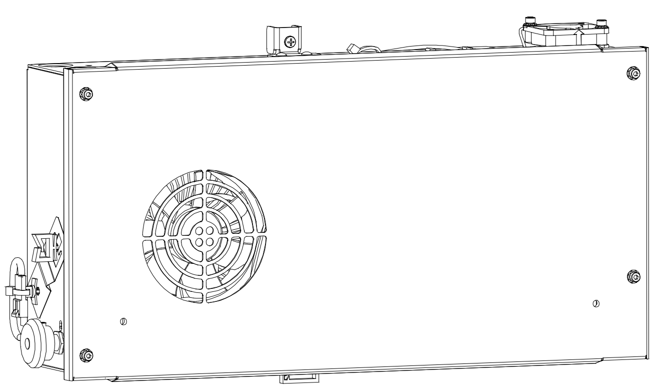


(7.7.15 CPU / Backplane Enclosure Version ≥5.1)

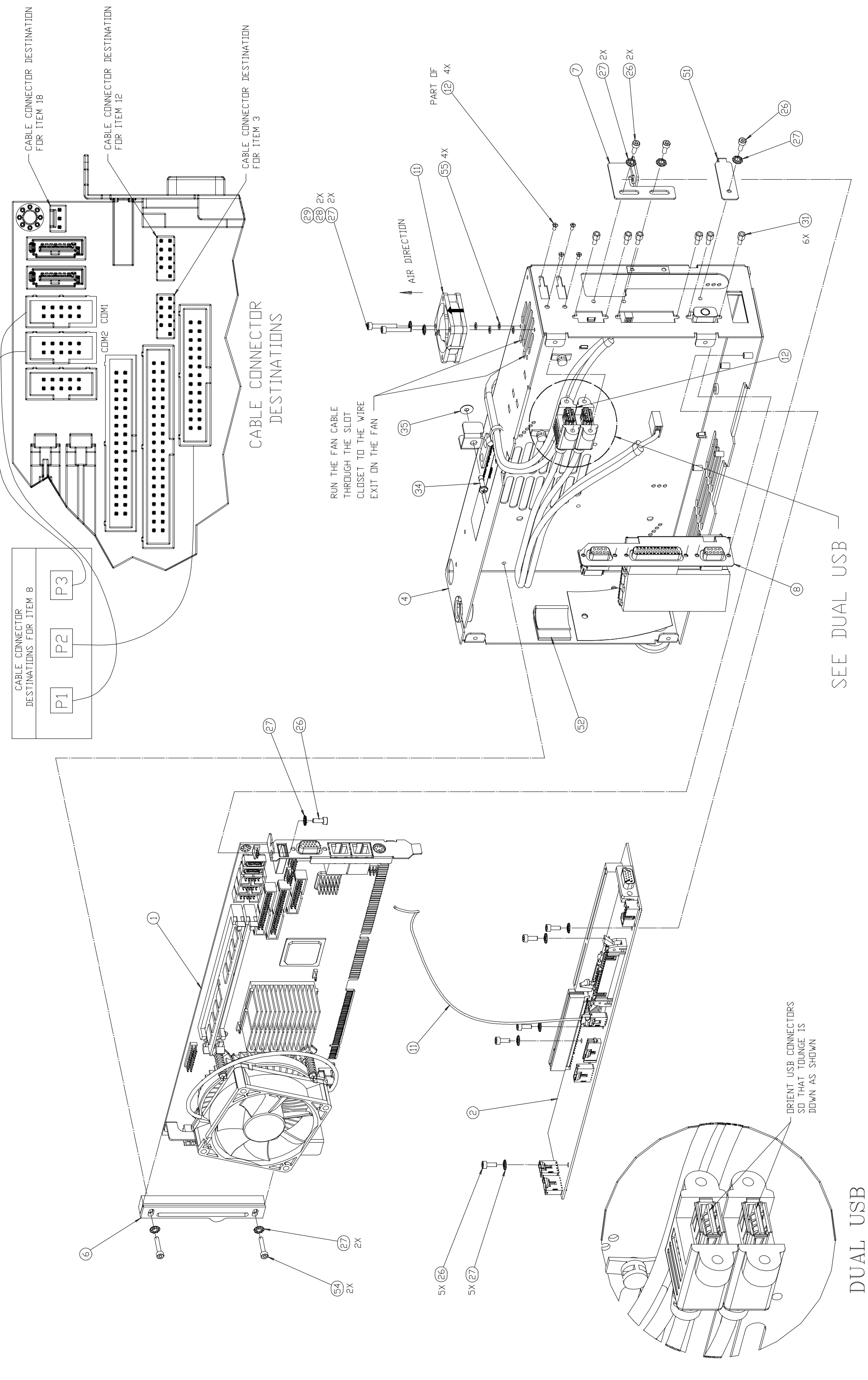




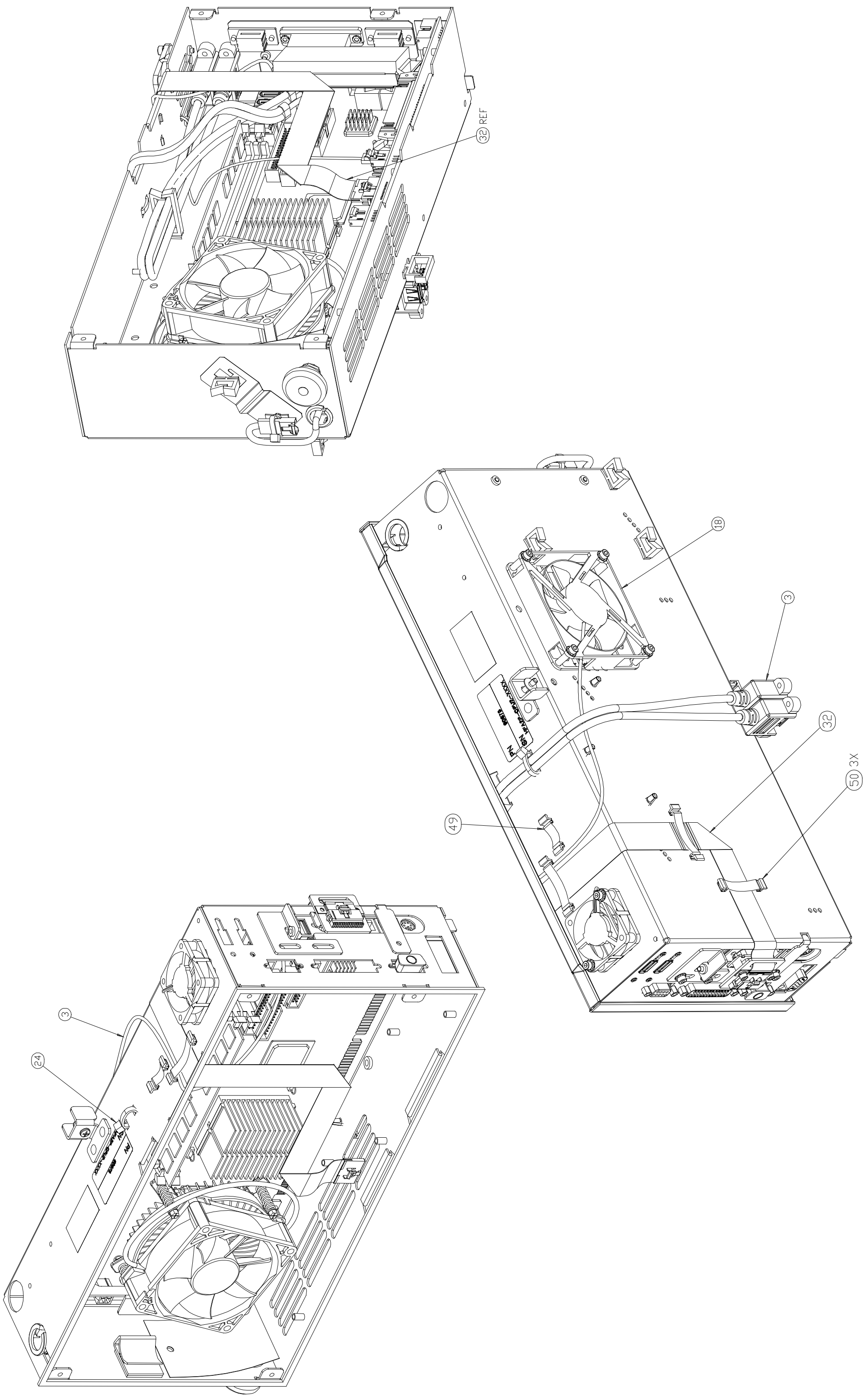
LID-GASKET
SCALE: NONE



(7.7.15 CPU / Backplane Enclosure Version ≥5.1)



(7.7.15 CPU / Backplane Enclosure Version ≥5.1)



7.7.16 Power Table / Printer Assemblies

Item	P/N	Description
		120v HFA Power Table - w/Printer (Assembled)
		120v HFA Power Table - No Printer (Assembled)
		230v HFA Power Table - No Printer (Unassembled)
		120v HFA Int'l Pwr Table - No Ptr (Unassembled) [Japan]
	266002-1124-192	Caster with Lock
	266002-1124-655	Rocker Switch
		Power Entry Module, 5 x 20mm
	000000-1211-638	Fuse, 8 amp, SB, Metric, 125 volts, 100 - 120 volt units
	000000-1211-851	Fuse, 6.3 amp, SB, Metric, 250 volts, 220 - 240 volt units
		Screw M5x16 SOC BTN HD CAP SST
7		Screw M5x25 SOC HD CAP S/BZ
8	266002-1111-338	Washer M5 Spring Steel
9	266002-1113-664	Washer M5 Flat
	266002-1104-255	Screw M4x40 SOC HD CAP S/BZ
	266010-0014-445	Washer M4 Square Cone
	266010-0022-511	Cord Power Hosp Grd 18GA Gray
	266010-0022-581	Cord Power EUROCEE 7/7 10A
		Cord Power 90 Deg LH IEC 320 6A 250V
	266002-1124-420	Printer, Thermal Line (Printrex)

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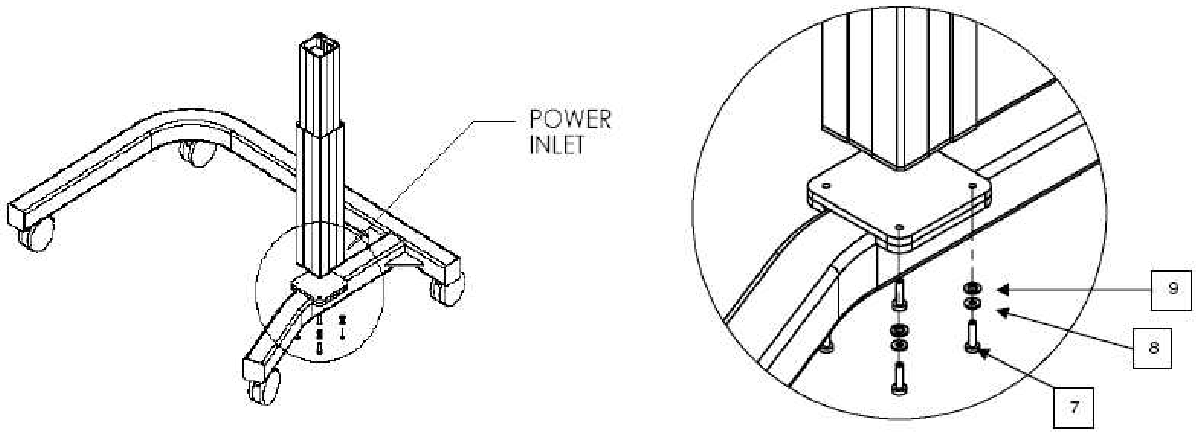
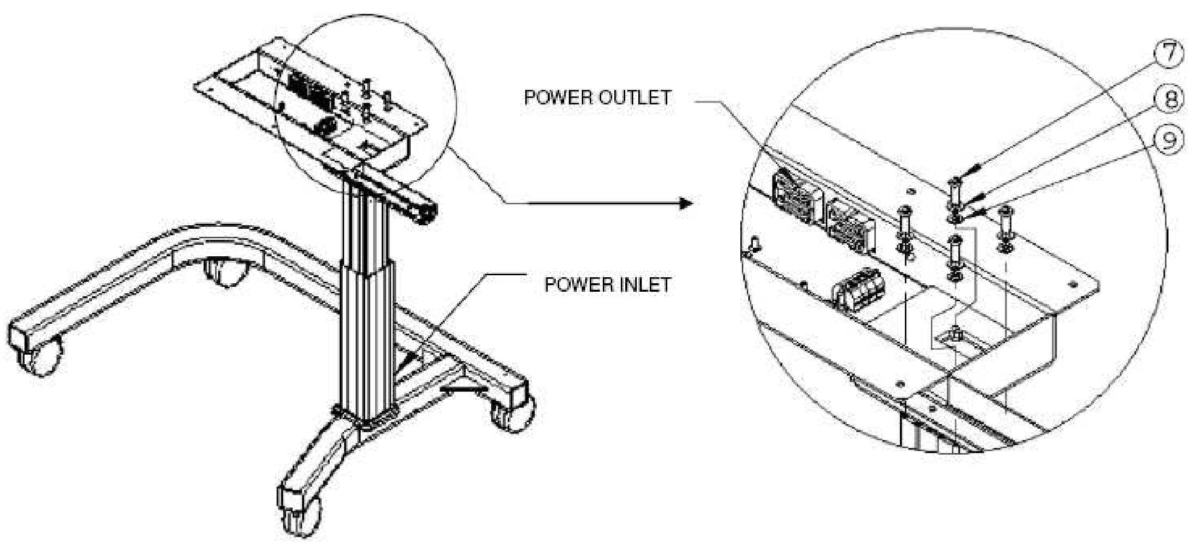
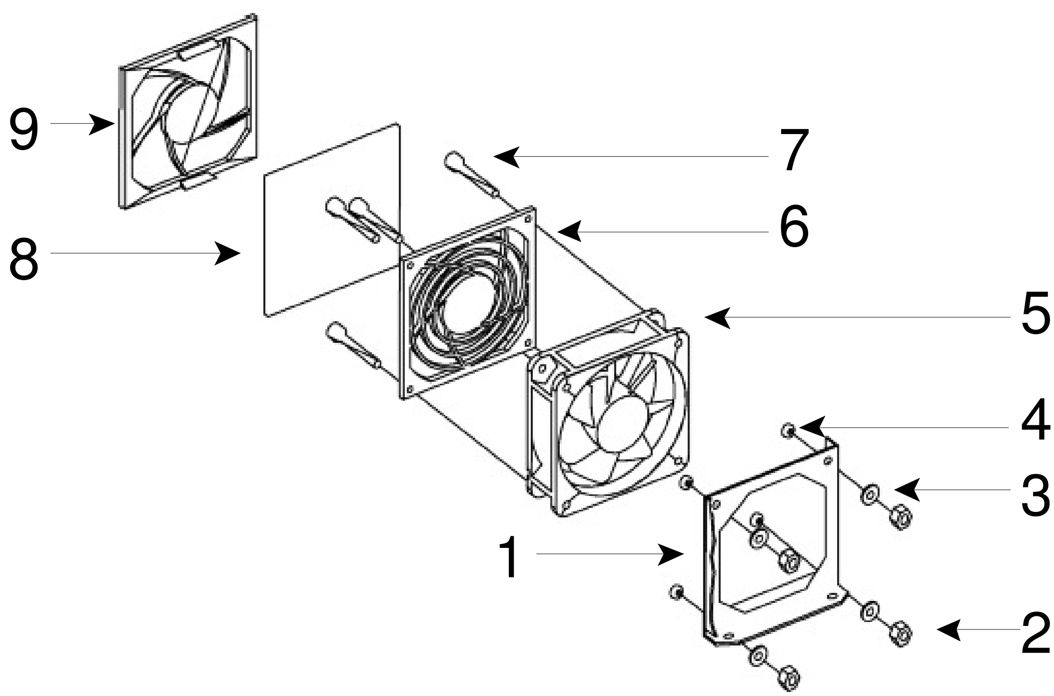
(7.7.16 Power Table / Printer Assemblies)





7.7.17 Upper Fan Assembly

Item	P/N	Description
1		Bracket, Fan
2		Nut, M3 Lock Polyamid Insert
3		Washer, Flat #8
4	266010-0029-874	Grommet, Ribbed, .155/.370/.230/.05
5	266010-0029-774	Assy, Fan, 12V Upper
6		Guard, Fan, 80mm
7		Screw, M3 x tab Soc Hd Cap
8		Filter, Foam, Fan, 80mm
9	266002-1106-254	Retainer, Filter, Fan, 80mm



Appendices

Notes:

Appendix A. Tools, Test Equipment, and Service Supplies

A.1 List of Tools, Test Equipment, and Service Supplies

The tools and test equipment required for servicing the HFA II-*i* Perimeter are listed below. Additional detail regarding the special tools and test equipment is provided in Section A.2.

Description	Legacy P/N	SAP P/N
Digital Multimeter, Fluke 8060A or equivalent	21566	2660100021566
Soligor Light Meter Kit	14905	2660100014905
Soligor Mount Adaptor (HFA I/II) (set of 2)	30248	2660100030248
Minolta Light Meter Kit		2660021130148
Bowl Shroud	54710	2660100054710
Tool Stand Assembly:	30251	2660100030251
Trial Lens Alignment Adaptor	49647	0000001115324
Fake Eye	30079	2660100030079
Tool Stand	30137	2660100030137
Chinrest Mount	30135	2660100030135
Trial Lens Holder Height Adaptor	30183	2660100030183
Tool Stand Alignment Adaptor	30253	2660100030253
Mirror Tool	24501	2660100024501
Fore Head Rest Hook	49834	0000001145837
Extender Cables:		
Kit, Extender Cables	30172	2660100030172
Touchscreen extender cable	29616	2660100029616
Patient Support extender cable	30161	2660100030161
CPU-to-Floppy extender cable	30160	2660100030160
CPU JMPS-to-Motor Driver P11 extender cable	30163	2660100030163
CRT PCB/Brightness Control extender cable	29592	2660100029592
CRT Overlay	48952	2660021114805
Spot Positioning Cross Fixture	29868	2660100029868
Brightness Detector Alignment Target	30257	2660100030257
Projection Mount	30247	2660100030247
Operator Panel Extension/Support	49784	0000001145833
LED Assembly, Hard Drive	30126	2660100030126
* Diagnostic Support Tool, 3.4.5 (Disks) ≤5.0	56108	0000001299264
* Diagnostic Support Tool, Version ≥5.1		2660021140934
* Software Tool HFA II-*i* BIOS	56280	0000001285690

* Refer to Software Timeline Service Bulletin (FA2i-005x) for most current part numbers.

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Description	Legacy P/N	SAP P/N
Loopback Tool	28497	2660100028497
Flash Drive USB German Test (Germany Only)		2660021140931
Static Protection Kit	20928	2660100020928
Metric Socket Set		(acquire locally)
Metric Ballpoint Hex (Allen) Key Set		(acquire locally)
Metric Ballpoint Drivers, 2mm, 2.5mm, and 3mm		(acquire locally)
Miscellaneous Hand Tools		(acquire locally)
Drafting Tape		(acquire locally)
Self-stick notes (small)		(acquire locally)
Calculator (with log function)		(acquire locally)
Pen Light (AAA battery size)		(acquire locally)
C-clamp, 3"		(acquire locally)
Mirror (hand-held)		(acquire locally)
Foil Tape, 1" width (specify length)	04525	2660021100512
Foam, adhesive-backed (specify length)	30213	2660021105950
RTV	00752	2660100000752
Loctite No. 222	01456	2660100001456
Clock oil	02534	2660100002534
Grease, Rheolube 362, 2 oz jar	08780	2660100008780

A.2 The Special Tools - What They Are / What They Do

A.2.1 Soligor Light Meter Kit

The Soligor Light Meter Kit is used for all HFA II-*i* intensity measurements. The light meter is modified for use with our product and is not an off-the-shelf purchasable item. Refer to Appendix E.

A.2.2 Minolta Light Meter Kit

The Minolta Light Meter Kit is used for all HFA II-*i* intensity measurements. The light meter is modified for use with our product and is not an off-the-shelf purchasable item. Refer to Appendix E.

A.2.3 Bowl Shroud

A black shroud that drapes over the HFA and prevents ambient light from entering the bowl when performing light intensity measurements.

A.2.4 Trial Lens Alignment Adaptor

A cylindrical nose piece that attaches to the tool stand (FIGURE A.1). It is used in conjunction with the Trial Lens Holder Height Adaptor when verifying/adjusting the position of the trial lens holder. The white-colored Alignment Adaptor is used on trial lens holders with a black tube, and the black-colored Alignment Adaptor is used on trial lens holders with a grey tube.

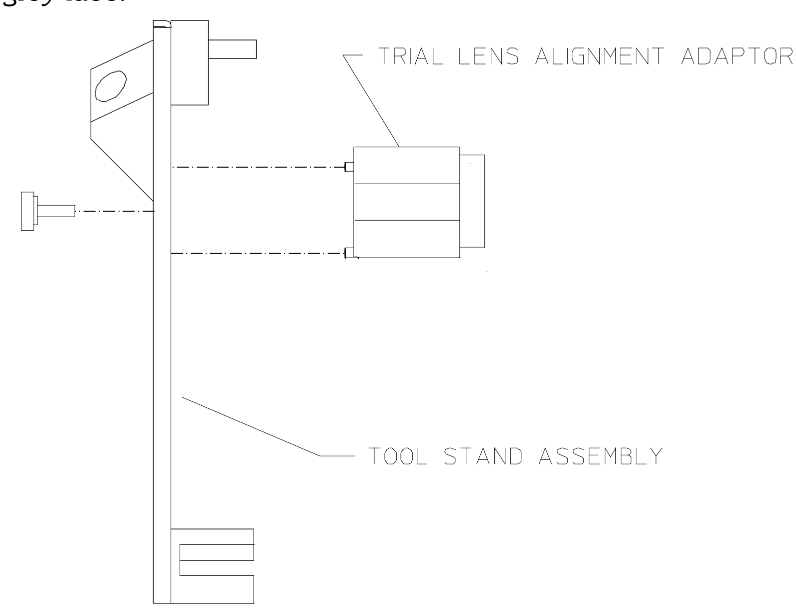

FIGURE A.1. Trial Lens Alignment Adaptor

A.2.5 Fake Eye

A fixture with an imitation eye, gaze tracking alignment box, focus target, and trial lens holder Z-positioning stop (see FIGURE A.2). It is used in conjunction with the Tool Stand to perform the following:

- verify and set camera window position and size in relation to trial lens holder;
- verify and set gaze tracking;
- adjust camera focus;
- set the Z-position of the trial lens holder.

A.2.6 Tool Stand Assembly

Refer to FIGURE A.2.

Tool Stand and Chinrest Mount — A stand that attaches to the HFA II-*i* by means of the chinrest mount. The Tool Stand serves as a mounting base for a variety of calibration and adjustment tools.

Trial Lens Holder Height Adaptor — A block that attaches to the bottom of the Tool Stand to set the height of the Tool Stand when performing the Trial Lens Holder adjustment. The block is removed for all other adjustments requiring the Tool Stand.

Cold Mirror Alignment Adaptors — These two adaptors attach to the Tool Stand and are used in conjunction with a pen light to set the position of the Cold Mirrors.

Tool Stand Alignment Adaptor — A block with two extended pins that contact the forehead rest to set the correct Z (front-back) alignment of the Tool Stand when mounted on the chinrest.
Forehead Rest Hook — A hook that allows the Tool Stand to be held to the forehead rest.

A.2.7 Mirror Tool

The Mirror Tool is a small mirror that attaches to the center of the Tool Stand. The mirror is used only when setting the correction values for the blue stimulus.

A.2.8 CRT Overlay

A clear plastic template that is placed over the touch screen and is used as an aid to verify/adjust CRT symmetry.

A.2.9 Spot Positioning Cross Fixture

This is a horizontal and vertical target that mounts to the inside surface of the bowl. It is used to check the positional tolerances of the projected light spot within the bowl.

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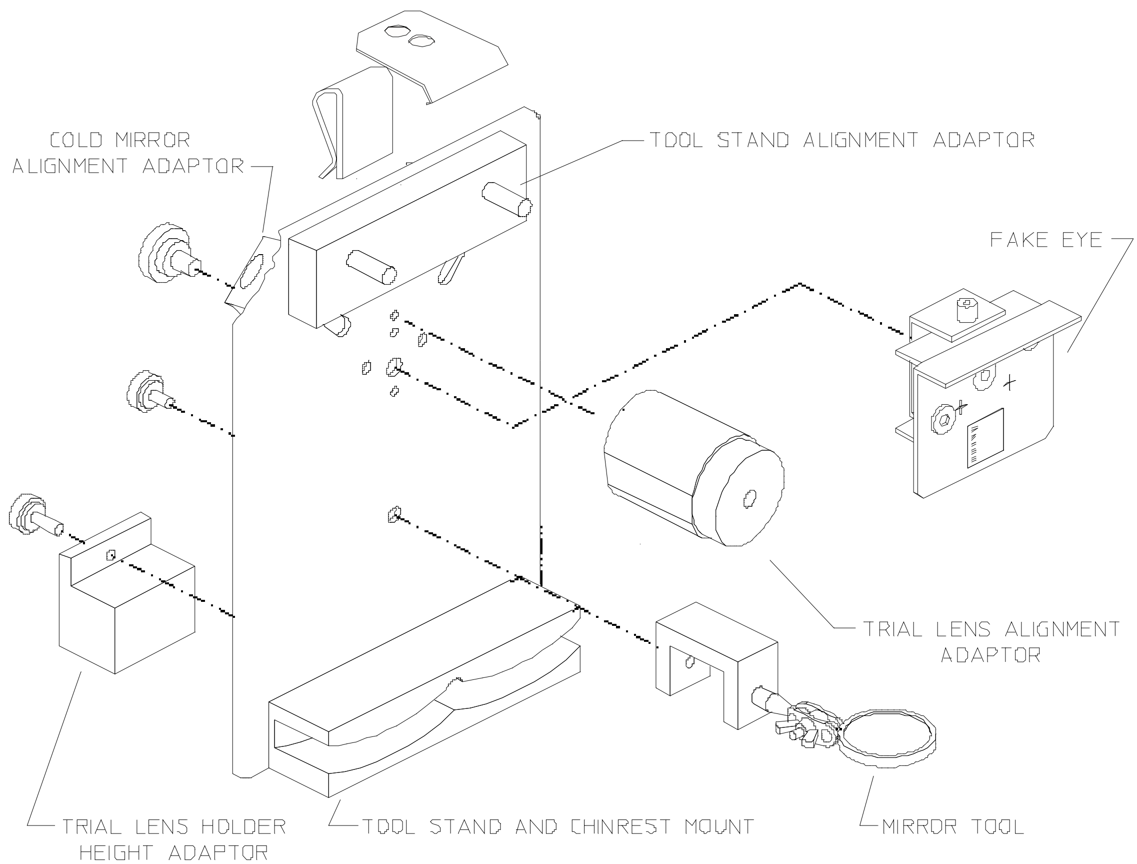

FIGURE A.2. Tool Stand Assembly

A.2.10 Brightness Detector Alignment Target

A small, cylindrical target that is placed into the detector housing when aligning the detector housing to a projected spot of light

A.2.11 Projection Mount

A mounting stand that supports the projection assembly when removed from the HFA II. Holes are provided in the mount to accommodate both 1/4" and 3/8" carriage rails.

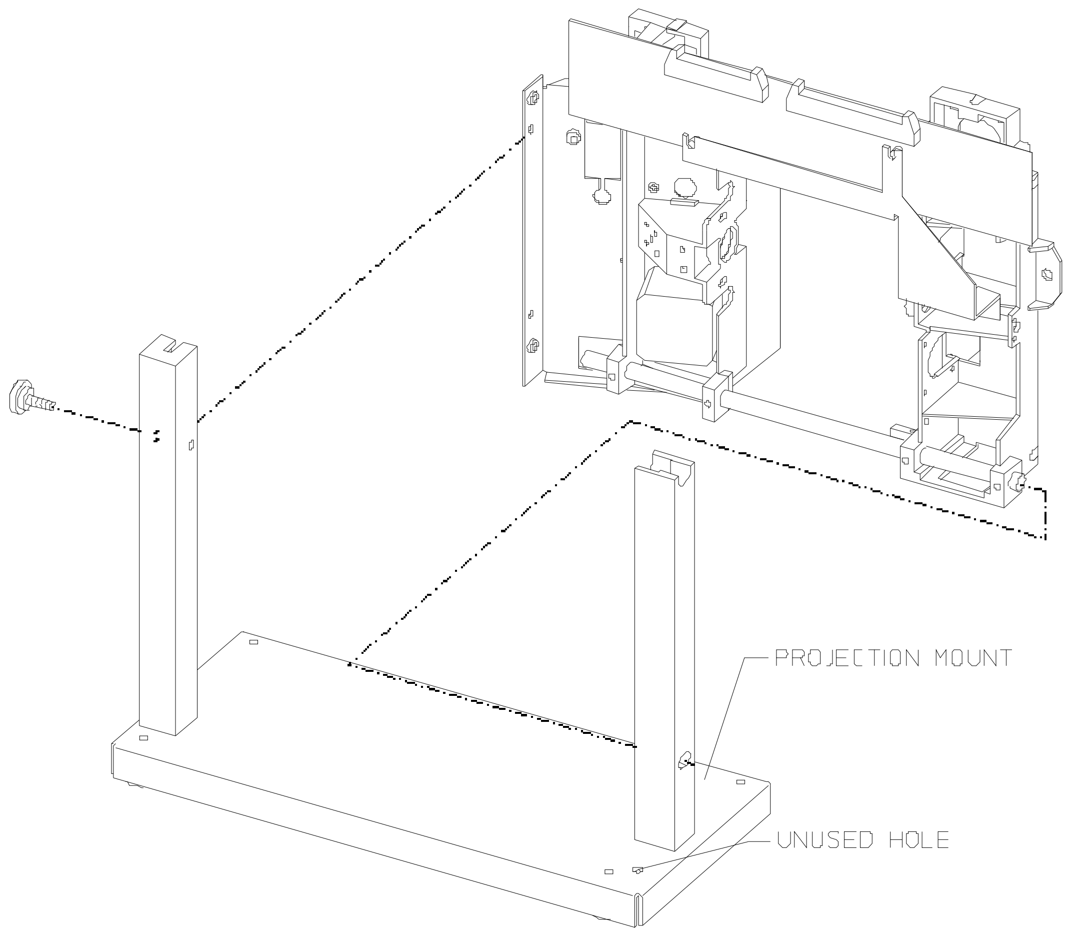

FIGURE A.3. Projection Mount Assembly

A.2.12 Operator Panel Extension / Support

A tool that extends and holds the operator panel, allowing access for CRT adjustments with power applied. The latest revision of this tool is adjustable to compensate for tables equipped with a slider.

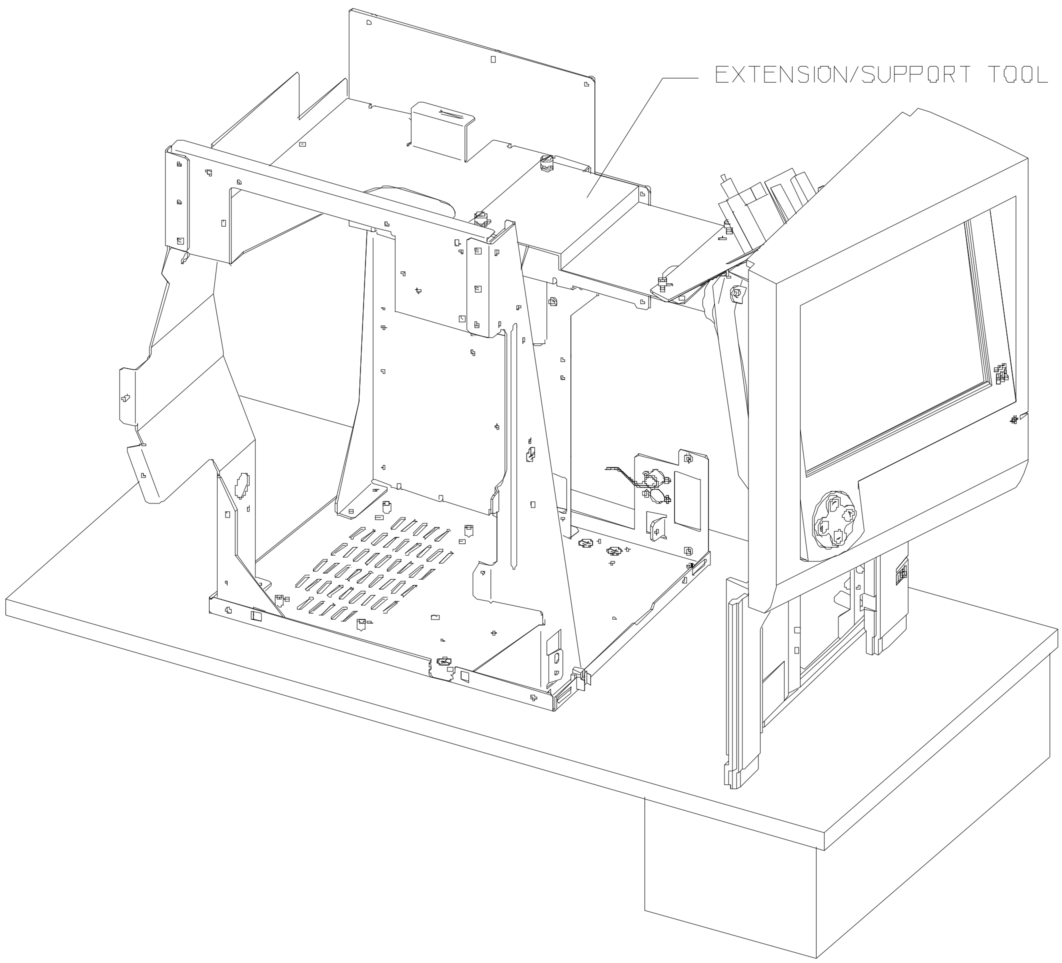

FIGURE A.4. Operator Panel Extension/Support

Note – *Early revisions of this tool are not adjustable. To compensate for the added height of the slider, a support spacer should be placed between the bottom of the operator panel and the table top.*

A.2.13 Hard Drive LED Assembly

An LED with cable and connector used as a hard drive go/no-go indicator.

A.2.14 Service Key

The Service Key is an electronic key, with memory, that can be plugged into the parallel port on the HFA II-*i*. The Service Key allows the Field Support Engineer to perform service tasks such as setting the identity of the CPU (see Appendix G).

Note – *The Service Key is no longer needed with the newer versions of the DST (see A.2.15).*

Note – *The service key is a proprietary element of Humphrey HFA II-i software security. As such, the key should be safeguarded and handled appropriately.*

A.2.15 Diagnostic Support Tool

The Diagnostic Support Tool (DST) is a set of three 3½" floppy disks that enables the Field Support Engineer to perform system configuration, and numerous troubleshooting routines. The DST is designed as an open framework of menus and test functions.

DST Startup Procedure:

1. With the instrument power turned OFF, insert the DST disk #1 into the floppy drive.
2. Switch the instrument power ON.
3. After approximately 2 minutes, the following message will appear:

   "Please insert diskette #2"

   Remove disk #1 and insert disk #2. Press ***continue***.
4. The next message displayed is:

   "Copying file - /XXX/YYY"

   The XXX and YYY represent different segments of the DST code.
5. After approximately 2 minutes, the following message will appear:

   "Please insert diskette #3"

   Remove disk #2 and insert disk #3. Press ***continue***.
6. The next message displayed is:

   "Copying file - /XXX/YYY"

   The XXX and YYY represent different segments of the DST code.
7. After approximately 2 minutes, the on-screen header will display:

   "Diagnostic Support Tool"
8. A keyboard will appear instructing you to:

   "Enter Password "
9. Type in the password **"CUB2HFA"** [case sensitive] and press ***Enter***.

   The **Diagnostic Tool Main Menu** will now appear.

Make sure the patient button is plugged in.

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Note – *DST Tool for Version ≥5.1:*

All service personnel should carry a new HFA 5.1 DST Tool, P/N 2660021140934. This new tool replaces the old floppy disk based DST in function and must be used in conjunction with 5.1 generation instruments. Older DST software will not work.

- *Passwords will remain the same*
- *The 5.1 DST Tool MUST have 5.1 software present on the hard drive to function. It will not operate with a blank hard drive.*
- *If any Hardware or Software options are changed in the DST, application software MUST be reloaded once finished with DST to retain settings.*

A.2.16 Loopback Tool

The Loopback Tool performs external loopback testing of the Data Transfer and Auxiliary serial ports located on the side of the CPU/Backplane enclosure box behind the rear cover door. The connector loops the transmit line back to the receive line, and the RTS line back to the CTS line.

A.2.17 Static Protection Kit

The Static Protection Kit is essential for protection of the HFA II-*i* Perimeter against electrostatic discharge whenever you are disassembling or handling HFA II-*i* Perimeter circuitry. The kit contains the following items:

- a bench mat with permanently attached alligator clip ground lead;
- a banana plug lead with snap connector;
- an adjustable wrist cuff.

The static protection kit's bench mat must be properly grounded, and you must be wearing the wrist cuff whenever working on the HFA II-*i* Perimeter with the cover removed.

To use the static protection kit:

1) Connect the bench mat alligator clip to a known good electrical ground point. Any unpainted screw or chassis surface on the HFA II-*i* Perimeter is an acceptable ground point, ***provided that the HFA II-i Perimeter has its power cord connected and is plugged into a grounded power receptacle.***

   In situations where work is to be performed on the HFA II-*i* and it is undesirable to have the unit plugged into a power receptacle, an alternate grounding point is necessary. Usually, an acceptable ground point can be found at the cover screw for the AC power outlet. It is useless to use the bench mat without it being properly grounded.

2) After properly grounding the bench mat, connect the banana plug lead into the bench mat connector.

3) Connect the wrist cuff to the snap clip on the banana plug lead.

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4) Adjust the wrist cuff to fit snugly around your wrist. The wrist cuff should always be worn when working on the HFA II-*i* Perimeter with the cover removed.

A.2.18 Communications Terminals / Laptop

Communication Terminal/Laptop usage with the HFA II-*i* is not possible.

Appendix B. The Interface Ports

Note: *The interface ports on the Humphrey HFA II-i Perimeter* ***ARE NOT*** *intended for interfacing the instrument with any other equipment, except as described below.*

B.1 General Information

The Humphrey HFA II-*i* Perimeter provides several interface connectors, most of which are located on the main connector panel (see FIGURE B.1). The patient switch connector is located elsewhere on the instrument, as noted below. The following list briefly explains the intended use of each connector.

Note: *The notation shown in parentheses indicates the corresponding connector designation that appears on the CPU /Backplane Enclosure.*

- VGA (EXT VGA) - This 15-pin interface port is used to connect an external VGA color monitor.
- Network (NETWORK) – Floppy-based HFA II-i's: Ethernet 10BASET used to connect to a network. USB-based HFA II-i's: Gigabit Ethernet port.
- PRINTER (PRINTER) - This interface port is used to connect an external printer. It is a 25-pin, Centronics-compatible, parallel port.
- SERIAL PORT (DATA TRANSFER) - This port is used to transfer data from HFA I, HFA II, and HFA II-*i's*. This port is not intended for, and does not support, connections to or from communications terminal for service and error message retrieval or medical records programs.
- SERIAL PORT (AUX) - This port is not used by customer, service, or manufacturing. It is to be covered with a cap.
- Interface hardware and pin assignments for the RS-232 serial ports are identified in Section B.2.
- USB PORTS (USB) – Non-operational on all floppy-based HFA II-i's.
- VGA (UNUSED) - This port is not used by customer, service, manufacturing or software engineering. It will not function and is to be covered with a cap.
- Keyboard (KEYBOARD) - This interface port is used to connect a keyboard with a PS2 connector.
- Mouse (MOUSE) - This port is used to connect a serial pointing device such as a glide pad, mouse or trackball.

Located elsewhere on the instrument:

- (JPATSW) - This interface port is used to connect the patient response switch.

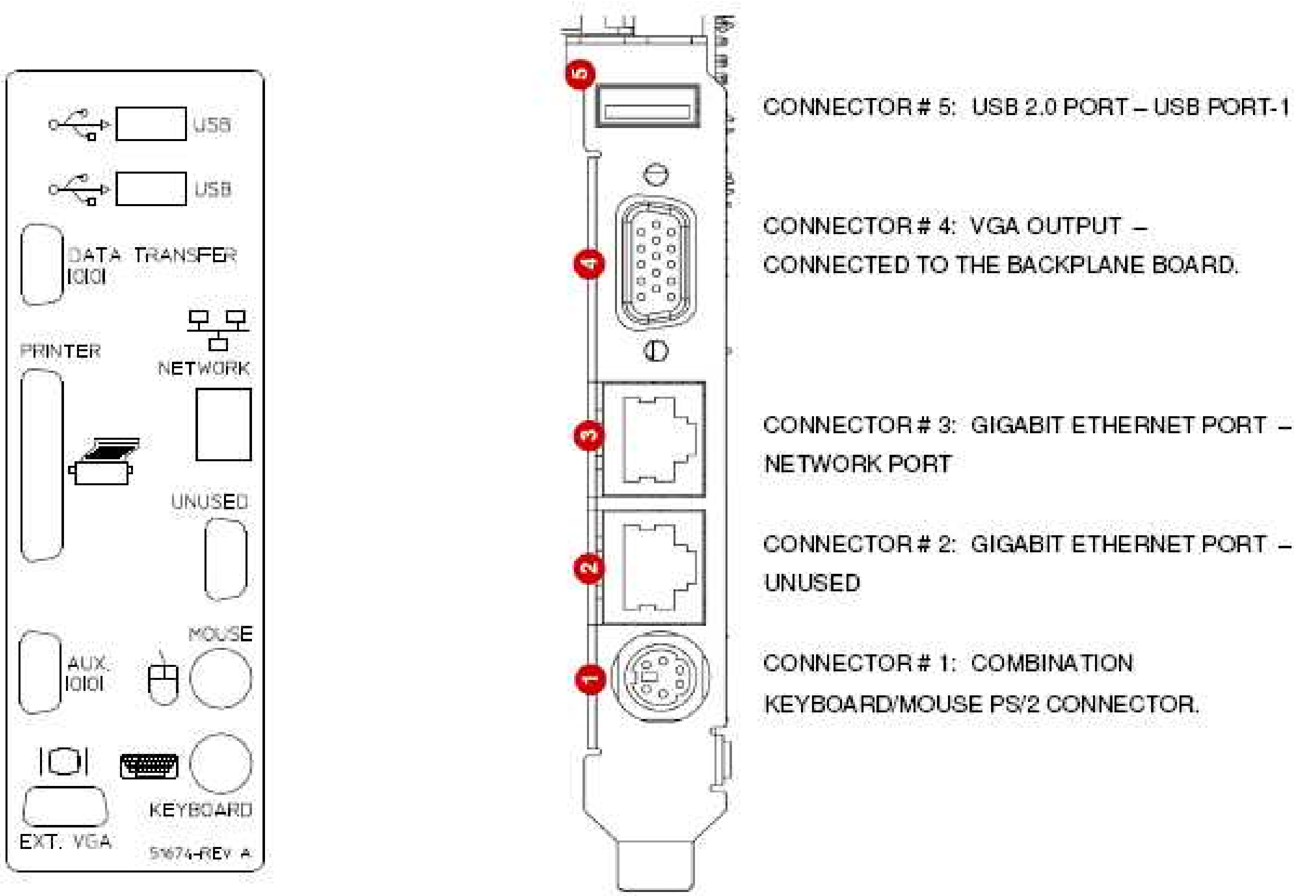

FIGURE B.1 HFA II-i Version ≤5.0 & Version ≥5.1 Interconnects

B.2 RS-232 Interface Hardware and Pin Assignments

Note: *Carl Zeiss Meditec, Inc. provides this information as a courtesy to our customers, and for the use of authorized Service personnel. Carl Zeiss Meditec does not assume any responsibility for interfacing or providing software to the customer for use of the RS-232 interface with non-Carl Zeiss Meditec external devices.*

The RS-232 interface connectors on the HFA II-*i* are DB-9F 9-pin sockets. This requires a Cannon DB-9P, or equivalent, mating connector on the interface cable. For reliable data transfer, the interface cable length should be kept as short as possible. Maximum length allowed is 50 feet.

The pin assignments at the HFA II-*i* RS-232 output port are detailed below.

Pin 1 - Data Carrier Detect
(Input) No Connection.

Pin 2 - Received Data (RX)
(Input) Used to receive data from the external system.

Pin 3 - Transmitted Data (TX)
(Output) Used to transmit information asynchronously using ASCII code. The data format, comprising data bits, parity, and stop bit(s), is determined by user-defined selections. The output goes from -12 volts to +12 volts, in the form of pulses, depending on the data being transmitted.

Pin 4 - Data Terminal Ready (DTR)
(Output) Is connected internally with pin 7 (RTS). Both signals are TRUE whenever the instrument is powered up and ready for operation.

Pin 5 - Signal Ground (GND)
Ground reference for the electronic circuits.

Pin 6 - Data Set Ready (DSR)
(Input) (no connection)

Pin 7 - Request To Send (RTS)
(Output) Is connected internally with pin 4 (DTR). Both signals are TRUE whenever the instrument is powered up and ready for operation.

Pin 8 - Clear To Send (CTS)
(Input) This signal must be TRUE to enable output transmission from the HFA II-*i*. This signal is usually set to TRUE permanently, or in response to "Request To Send" when the external data system's receive circuit is ready.

Pin 9 - Ring Indicator (RI)
(Input) (no connection)

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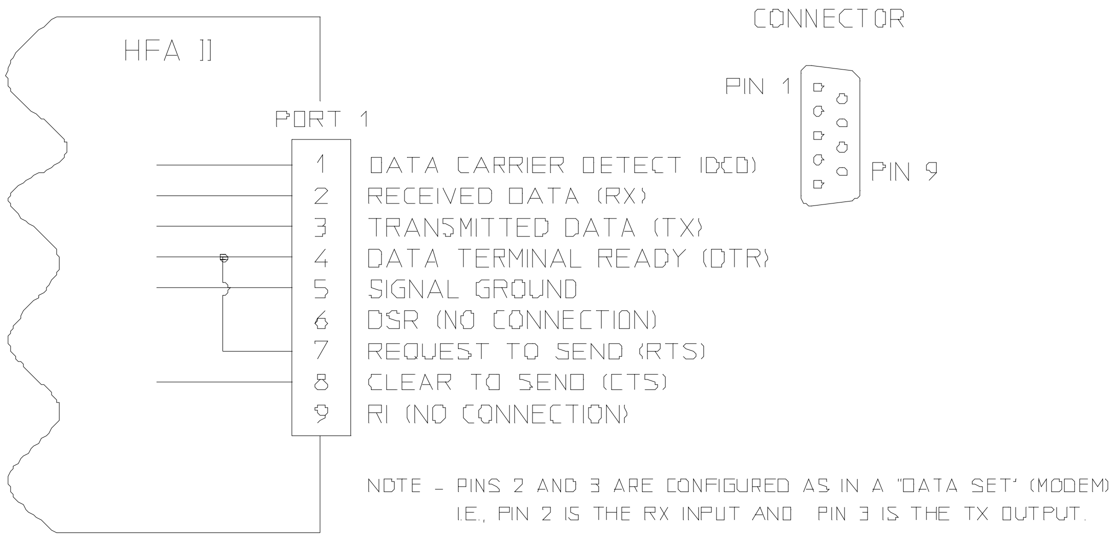


FIGURE B.2. Serial Port Connector Pin-out

Appendix C. Data Transfers

There may be a need to transfer patient data between an HFA I (600 Series) instrument and an HFA II-*i* (700 Series) instrument. Transfer of data between an HFA I and HFA II-*i* can only be accomplished via a serial data transfer. See transfer modes below for details.

C.1 Serial Transfer Modes

The HFA II-*i* is capable of serial data transfer in two transfer modes:

1) Serial I transfer mode will not transfer gaze data or SITA test data. It is primarily designed to transfer only HFA I exam data.

2) Serial II transfer mode will transfer SITA test and gaze data. It is designed to transfer both HFA I, HFA II, or HFA II-*i* data.

To set the transfer made:

Main Menu > System Set Up > Save/Transmit > Data Format

Transfer Type	HFAII-i Mode
HFA I to HFAII-i	*Either Mode*
HFA II-i to HFA II	*Serial I Mode*
HFA II to HFA II-i	*Either Mode*
HFA II-i to HFA II-i	*Either Mode*

TABLE C-1. Transfer Modes

TESTS THAT CAN BE TRANSFERRED USING EITHER SERIAL I OR II TRANSFER MODE:

1. Macula
2. Central 10-2 Threshold
3. Central 24-2 Threshold
4. Central 30-2 Threshold
5. Peripheral 60-4 Threshold
6. Nasal Step Threshold
7. Armaly Central Screening
8. Armaly Full Field Screening
9. Nasal Step Screening
10. Central 40 Screening
11. Central 76 Screening
12. Central 80 Screening
13. Peripheral 68 Screening
14. Full Field 81 Screening
15. Full Field 120 Screening
16. Full Field 246 Screening
17. Blindengeldgutachten (German visual disability test)
18. Fuehrerscheingutachten (German driver's license test)
19. Esterman Monocular
20. Esterman Binocular
21. Kinetic Tests (Serial II mode only)

TESTS THAT WILL NOT BE TRANSFERRED USING EITHER SERIAL I OR II TRANSFER MODE:

- Fast Threshold tests or Master files.
- Compared, Averaged, or Merged exams.
- Tests without birthdates, or with invalid birthdates.
- Tests with invalid test dates.
- Tests without **LEFT** or **RIGHT** denoted in eye field.
- Tests that have invalid (x,y) coordinates for test points.

C.2 HFA I to HFA II-*i* Serial Data Transfer

1) For HFA Models 605 - 611 "Plus" and 620 - 630, allow up to 10 minutes per floppy disk to transfer files from the HFA I to the HFA II-*i*.

2) For HFA Models 635 and 640, approximately 1700 patient files can be transferred from the hard disk per hour.

File Transfer Preparation:

In order to transfer data files from the HFA I to the HFA II-*i*, the following procedure *MUST* be followed. (Refer to the HFA II-*i* User's Guide for the data transfer setup instructions.)

1) Perform a rebuild on the HFA I hard disk drive. This will properly sort the directory and correct or remove corrupted files. To perform the rebuild function:

   a) Select ***Configuration Menu*** from the main menu.

   b) Select ***Rebuild Hard Disk Directory and Recover Files.***

   c) Select ***Yes***. This procedure will take about 60 minutes per 1,000 files to complete.

2) Check all patient records for the following:

   a) Each patient record on the diskette or hard disk *MUST* have the patient name and birthdate entered. If the patient name or birthdate is missing, the transfer process will ignore the file and the file will not be transferred.

   b) All patient names *MUST* be entered exactly as they were. If not, the patient record is treated as a completely different patient. This means that records for a particular patient could be scattered all over the directory.

3) Once the rebuild function has been completed and the patient records have been checked, perform a hard disk-to-tape backup. To perform this function:

   a) Select ***Disk Functions*** from the main menu.

   b) Select ***Tape Functions***.

   c) Select ***Back Up Entire Hard Disk To Tape***.

   d) Select ***Yes***. The backup will take about 35 minutes for 12,000 files.

4) Once the hard disk-to-tape backup has been completed, immediately perform a compare tape-to-hard disk. To perform the compare function:

   a) Select ***Disk*** Functions from the main menu.

   b) Select ***Tape Functions***.

   c) Select ***Compare Tape To Hard Disk***.

   d) Select ***Yes***. The compare takes the same amount of time as the backup.

5) The data transfer can now be performed.

Data Transfer Procedure:

By using the special transfer software chip(s), the *ENTIRE* contents of the HFA I hard disk or floppy disk can be transferred to the HFA II-*i* at one time.

Without the special transfer software chip(s), a manual file selection will need to be done to transmit files to the HFA II-*i*. For a unit with a hard disk, a maximum of 250 files can be selected and transmitted at a time. All 250 files must be manually highlighted prior to transmission. For a unit with a floppy disk, a maximum of 100 files can be selected and transmitted at a time. All 100 files must be manually highlighted prior to transmission.
There is one serial port designated for data transfer (DATA TRANSFER) behind the rear cover door of the HFA II-*i*. Use the DATA TRANSFER port for file transmission.

On the HFA II-*i*:

1) From the main menu, select ***File Functions.***

2) Select ***Transfer.***

3) Select ***HFA Serial Cable*** as the Source.

4) Choose ***Hard or Floppy*** as the Destination, then ***Proceed***.

On the HFA I:

5) From the main menu, select ***Configuration***.

6) Make sure the baud rate is set to ***9600*** and the parity is set to ***EVEN*** on the configuration screen, then select ***Enter*** (to the main menu).

7) Select ***Disk Functions***.

8) Select ***Transmit Files***.

9) Choose ***Hard or Floppy*** as the file source drive.

10) For a restrictive file search, enter a patient's name on the keyboard, then Enter. To retrieve the entire directory, select Enter without entering a name.

11) If you want to transmit selected files, highlight the file(s) you want to transmit. If you intend to transmit all files shown on the directory, do not highlight any files. ***STOP HERE!*** Do Not choose Selection Complete.

On the HFA II-*i*:

12) After reading the on-screen message, select ***Selection Complete*** on the HFA I.

13) ***Select*** Cancel when all files have been transmitted. If you leave the system idle for ten minutes after the transfer of the data, the instrument will automatically terminate the transfer process.

C.3 HFA II to HFA II-*i* Serial Data Transfer

Transfer of serial data from the HFA II to HFA II-*i* is possible in both Serial I transfer mode and Serial II transfer mode. However, you must have the HFA II-*i* and the HFA II set to the Serial II transfer mode to ensure that all of the test information (SITA and gaze data) is passed to the HFA II-*i*.

Transmitting HFA II Tests to HFA II-*i*:

1) Ensure that the Serial II Transfer is enabled on the HFA II. Check the destination window of the Transfer Files selection on the File Functions Menu. If not, load the Serial II Transfer Disk as described in Appendix C.2.

   Note – *To perform the data transfer, the HFA II will need to be equipped with version 14.2 software.*

2) Ensure that the data transfer cable is connected between the HFA II-*i* DATA TRANSFER port and the HFA II SERIAL PORT 1.

On the HFA II:

3) From the Main Menu, select ***System Setup***.

4) Select the ***Save/Transmit*** option.

5) Select ***RS-232 Options***.

6) On the RS-232 Options screen, select the following settings:
   A) Set Baud Rate to ***19200***
   B) Parity to ***Even***
   C) Data Bits to ***7***
   D) Stop Bits to ***1***

7) Press ***Proceed***. The Transmit/Save screen will then appear.

8) Press the ***Main Menu*** icon in the upper right corner of the screen.

9) From the Main Menu, select ***File Functions***.

10) Select ***Transfer Tests***. A dialog box titled "Disk Options" will appear on screen.

11) Select ***Hard Drive*** as the Source.

12) Select ***HFA II Serial Cable*** as the Destination.

13) Select the Directory Order (either Name or Date), then press ***Proceed***.

    ▪ If you chose Name:

    To select all files on the drive, press Enter, and Select All. All files on the disk will be marked with a "✓" to indicate that they have been selected.

    ▪ If you search files by patient name:

    Enter the name - or just the first few characters - of the patient's last name whose test(s) you wish to transfer. Select the test(s) you wish to transfer. All files selected will be marked with a "✓" to indicate that they have been selected.

    • If you chose Date:

    The file directory will be displayed in reverse chronological order. Enter a specific date (mm-dd-yyyy), then choose Enter. The file directory will display tests taken on the date you selected. Select the test(s) you wish to transfer. All files selected will be marked with a "✓" to indicate that they have been selected.

14) Press Proceed. A pop up dialog box will appear advising you of the number of tests selected to be transferred. ***STOP HERE!*** Do Not choose Yes to start the transfer process.

On the HFA II-*i*:

15) From the Main Menu, select ***System Setup***.

16) Select the ***Save/Transmit*** option.

17) Select Serial Receive option.

18) On the RS Receive Setup options screen, select the following settings:
    A) Set Baud Rate to ***19200***
    B) Parity to ***Even***
    C) Data Bits to ***7***
    D) Stop Bits to ***1***

19) Press ***Proceed***. The Transmit/Save screen will then appear. Press ***Proceed***.

20) The System Setup menu will appear.

21) From the System Setup, select ***File Functions***.

22) Select ***Transfer Tests***.

23) Select ***HFA Serial Cable*** as the Source.

24) Choose ***Hard or Floppy*** as the Destination, then ***Proceed***.

On the HFA II:

25) To proceed, select ***YES***.

26) After all tests are transmitted, a pop up dialog box will appear advising you of the number of tests that were successfully transferred.

27) Press the ***Main Menu*** icon to exit this function.

C.4 HFA II-*i* to HFA II-*i* Serial Data Transfer

Transfer of serial data from the HFA II-*i* to HFA II-*i* is possible in both the Serial I transfer mode and Serial II transfer mode. You must have both of the HFA II-*i* units in the Serial II transfer mode to ensure that all of the test information is passed to the HFA II-*i*.

Transmitting HFA II-*i* Tests to HFA II-*i*:

1) Ensure that the Serial II Transfer Disk is enabled on the HFA II-*i* transmitting instrument. Check the destination window of the Transfer Files selection on the File Functions Menu.

2) Ensure that the data transfer cable is connected between the transmitting HFA II-*i* DATA XFER port and the receiving HFA II-*i* DATA XFER port.

   Note: *When the HFA II-i is receiving data, it can distinguish between serial modes automatically.*

On the Transmitting HFA II-*i*:

3) From the Main Menu, select ***System Setup***.

4) Select the ***Save/Transmit*** option.

5) Select ***RS-232 Options***.

6) On the RS-232 Options screen, select the following settings:
   A) Set Baud Rate to ***19200***
   B) Parity to ***Even***
   C) Data Bits to ***7***
   D) Stop Bits to ***1***

7) Press ***Proceed***. The Transmit/Save screen will then appear.

8) Press the ***Main Menu*** icon in the upper right corner of the screen.

9) From the Main Menu, select ***File Functions***.

10) Select ***Transfer Tests***. A dialog box titled "Disk Options" will appear on screen.

11) Select ***Hard Drive*** as the Source.

12) Select ***HFA II Serial Cable*** as the Destination.

13) Select the Directory Order (either Name or Date), then press ***Proceed***.

   - If you chose Name:

   To select all files on the drive, press Enter, and Select All. All files on the disk will be marked with a "✓" to indicate that they have been selected.

   - If you search files by patient name:

   Enter the name - or just the first few characters - of the patient's last name whose test(s) you wish to transfer. Select the test(s) you wish to transfer. All files selected will be marked with a "✓" to indicate that they have been selected.

   - If you chose Date:

   The file directory will be displayed in reverse chronological order. Enter a specific date (mm-dd-yyyy), then choose Enter. The file directory will display tests taken on the date you selected. Select the test(s) you wish to transfer. All files selected will be marked with a "✓" to indicate that they have been selected.

14) Press Proceed. A pop up dialog box will appear advising you of the number of tests selected to be transferred. ***STOP HERE!*** Do Not choose Yes to start the transfer process.

On the Receiving HFA II-*i*:

15) From the Main Menu, select ***System Setup***.

16) Select the ***Save/Transmit*** option.

17) Select ***RS-232 Options***.

18) On the RS-232 Options screen, select the following settings:
    A) Set Baud Rate to ***19200***
    B) Parity to ***Even***
    C) Data Bits to ***7***
    D) Stop Bits to ***1***

19) Press ***Proceed***. The Transmit/Save screen will then appear.

20) Press the ***Main Menu*** icon in the upper right corner of the screen.

21) From the main menu, select ***File Functions.***

22) Select ***Transfer***.

23) Select HFA II Serial Cable as the Source.

24) Choose ***Hard or Floppy*** as the Destination, then ***Proceed***.

On the Transmitting HFA II-*i*:

25) To proceed, select ***YES***. After all tests are transmitted, a pop up dialog box will appear advising you of the number of tests that were successfully transferred.

26) Press the Main Menu icon to exit this function.

C.5 HFA II-*i* to Third Party Programs Serial Data Transfer

Transfer of serial data from the HFA II-*i* to a third party program is possible only in the Serial II transfer mode.

Transmitting HFA II-*i* Tests to Third Party Programs:

Ensure that the Serial II Transfer Disk is set in Save/Transmit > Data Format.

1) From the HFA II-*i* Main Menu, select ***System Setup***.

2) Select the ***Save/Transmit*** option.

3) Select ***RS-232 Options***.

4) On the RS-232 Options screen, select the following settings:
    A) Set Baud Rate to ***19200***
    B) Parity to ***Even***
    C) Data Bits to ***7***
    D) Stop Bits to ***1***

5) Press ***Proceed***. The Transmit/Save screen will then appear.

6) Press the ***Main Menu*** icon in the upper right corner of the screen.

7) From the Main Menu, select ***File Functions***.

8) Select ***Transfer Tests***. A dialog box titled "Disk Options" will appear on screen.

9) Select ***Hard Drive*** as the Source.

10) Select ***HFA I Serial Cable*** as the Destination.

11) Select the Directory Order (either Name or Date), then press ***Proceed***.

- If you chose Name:

To select all files on the drive, press Enter, and Select All. All files on the disk will be marked with a "✓" to indicate that they have been selected.

- If you search files by patient name:

Enter the name - or just the first few characters - of the patient's last name whose test(s) you wish to transfer. Select the test(s) you wish to transfer. All files selected will be marked with a "✓" to indicate that they have been selected.

- If you chose Date:

The file directory will be displayed in reverse chronological order. Enter a specific date (mm-dd-yyyy), then choose Enter. The file directory will display tests taken on the date you selected. Select the test(s) you wish to transfer. All files selected will be marked with a "✓" to indicate that they have been selected.

12) Press ***Proceed***.

A pop up dialog box will appear advising you of the number of tests selected to be transferred.

13) If you wish to proceed, select ***YES***.

After all tests are transmitted, a pop up dialog box will appear advising you of the number of tests that were successfully transferred.

14) Press the ***Main Menu*** icon to exit this function.

Appendix D. Peripherals

D.1 Printers

► **Local Printers:** The HFA local printer must meet the following criteria:

- Equipped with a parallel port.
- PCL 3 or PCL 5 (emulation not supported).

► **Network Printers:**

- Printers must be PCL 3 or PCL 5 (emulation not supported).
- Configuring an HFA for network printing requires the HFA to first be connected over the network to a Windows computer that shares access to a supported printer.

The following are the approved Printers that have been validated for use with the HFA II-*i* instrument:

Note – *If the printer is to be used as a network printer, the network cable used* ***MUST BE UNSHIELDED****.*

Note – *The HFA II-i must have software version 4.2 or greater to support Deskjet only printers.*

[1] – Current Approved Printer

[2] – Previous Approved Printer

- Brother HL-5370DW [1] *
- Lexmark E260dn [1] *
- HP 6000 (connected to a NAS drive via USB port) [1] *
- *Brother HL- 2700CN [2]*
- *Brother HL- 5240 [2] (International: Use Regional Version)*
- *Samsung ML-3470D (230 V) [2]*
- *HP LaserJet 1100 SE [2]*
- *HP LaserJet 1160 * [2]*
- *HP LaserJet 1200 [2]*
- *HP LaserJet 1300 [2]*
- *HP LaserJet 1320 – 220 volt version [2]*
- *HP LaserJet 3200 [2]*
- *Lexmark E 312L [2]*
- *Lexmark E 320 [2]*
- *Lexmark E 321 * [2]*
- *Lexmark E 232 * [2]*
- *Brother HL- 5040 [2]*
- *Brother HL- 5050 [2]*
- *Brother HL- 5140 * [2]*
- *OKI B4250 * [2]*

* *Printers are not qualified for 220 volt operation.*

For up-to-date approved printers, refer to the "Current Product Approved Printer Matrix" posted in Lotus Notes under the **Service Bulletins** folder.

D.2 USB HUB

WARNING – *The device must have CE and FCC approvals. Do not use an external power supply to power the hub. Failure to observe these warnings could result in electrical shock to the patient and/or examiner. The only devices you may connect to the USB hub are the printer and USB key storage devices. Use of non-approved USB devices may compromise the performance of other USB devices and may affect instrument safety.*

D.3 USB (Key Type) Storage Device

This device is also known as a USB thumb drive, USB pen drive, USB flash drive, USB jump drive, USB key drive, USB storage key, USB memory key and a USB key. It simply plugs into the USB port. To use this device, plug it into an available USB port on the USB hub.

WARNING – *The device must have CE and FCC approvals. The storage device must be powered from a USB port on the USB hub only.*

WARNING – *User Changes to Software or Hardware – The HFA II-i is a medical device. The software and hardware have been designed in accordance with U.S., European and other international medical device standards designed to protect clinicians, users and patients from potential harm caused by mechanical, diagnostic or therapeutic failures. Unauthorized modification of HFA II-i software or hardware (including peripherals) can jeopardize the safety of operators and patients, the performance of the instrument, and the integrity of patient data; it also voids the instrument warranty.*

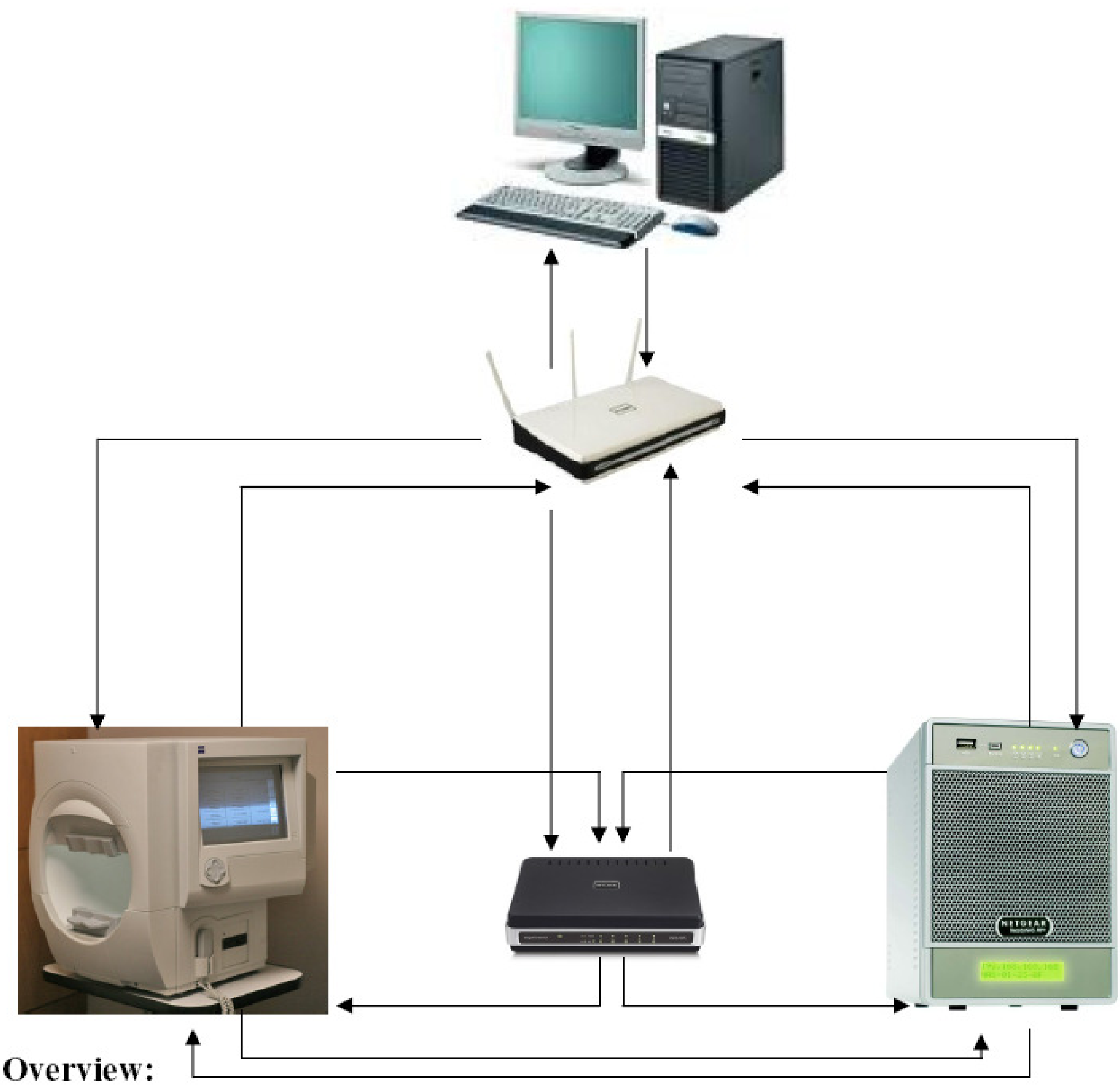
Note – *Carl Zeiss Meditec does not provide technical support for the use of approved third party hardware or software.*

D.4 NAS Drives

A NAS drive can be connected to the HFA for backup/archive only. The HFA must be equipped with minimum software Version 4.2.2 and a NetPro license. The NET Gear NAS device can be connected:

- Directly to the HFA II-i instrument using a network cable (crossover) to the Ethernet port.
- Using a Network switch connected to the HFA and the NAS device, optional connection to LAN from Network switch.
- Via an office network (local area network / LAN).

D.4.1 NAS Drives Installation



Overview:

2660021124580 - includes Netgear Box and 2 - Hard Drives [1TB min.]

The Net Gear NAS device comes preconfigured for use:

- User name “admin”
- Password “November171846” case sensitive
- Default workgroup “ CZM ” not case sensitive
- Host name “ ZNAS4 “ not case sensitive
- Device name “ ZeissNAS4 “ not case sensitive
- Two Hard Drives preconfigured in RAID 1 (mirror)
- Authentication is disabled in factory settings
- Factory settings allows for automatic IP addressing

Note: *The current IP address is shown in the bottom window of the NAS device. Press the power switch momentarily to activate the window*

Note: *Do not turn on the HFA II-i instrument until the initialization has completed on The NAS device. Initialization will be complete when the small screen displays The IP address and the amount of storage on the device.*

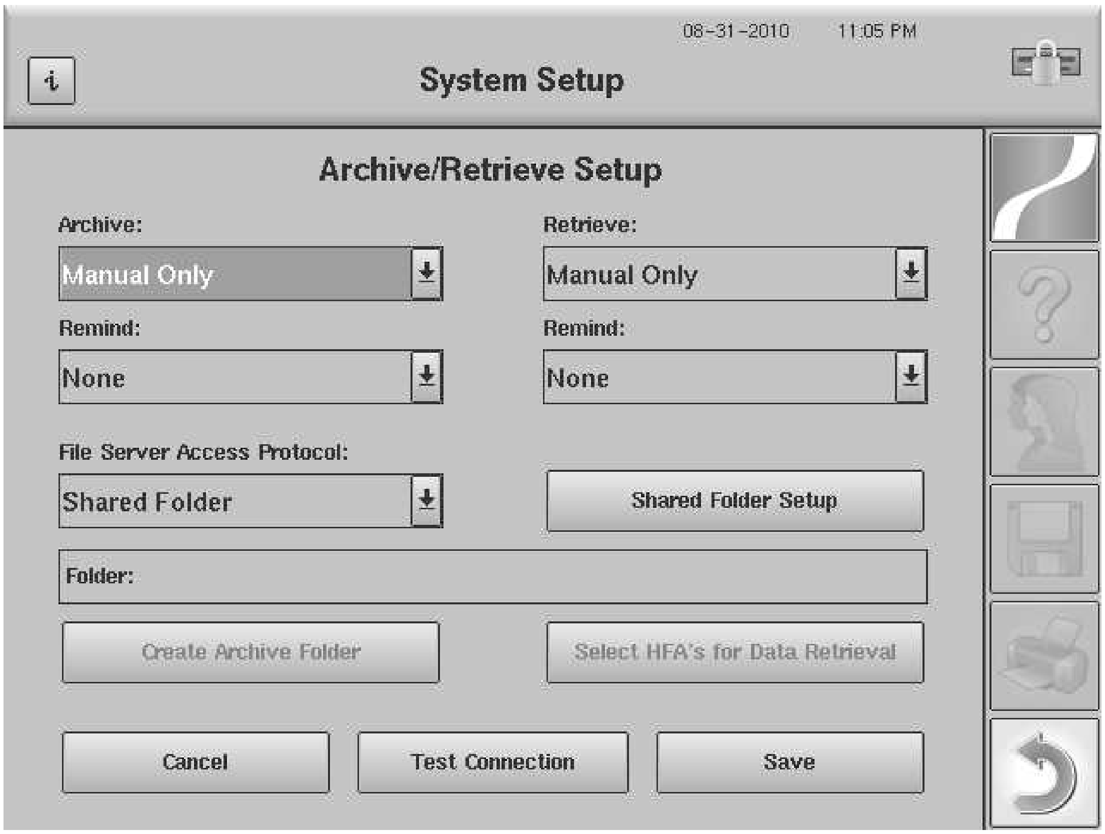
Configuring the HFA Network for the NAS Device (Stand Alone)

- From Main Menu, select SYSTEM SETUP > COMMUNICATIONS SETUP> HFA NETWORK SETUP.
- Select DHCP from the OPTAIN HFA IP CONFIGURATION drop down list.
- Once the HFA gets an IP Address from the NAS device, the IP Address and Subnet mask will be displayed. The default gateway may not be displayed.
- Press the Workgroup/Domain button and enter “CZM”.
- Press the HFA NAME and enter a HOST NAME for the HFA.
- Press – SAVE. You will need to recycle power for the changes to completed.

Set Up a Shared Folder on the NAS Device

Follow the steps below to set up a shared folder on the NAS device:

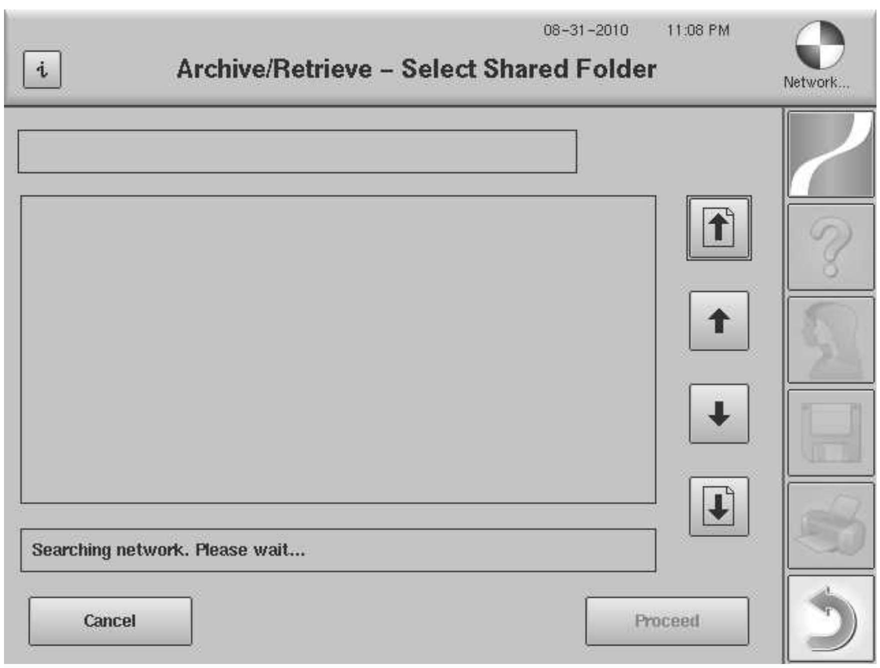
- From the Main Menu, select SYSTEM SETUP >COMMUNICATIONS SETUP>ARCHIVE/RETREIVE SETUP to display the Archive/Retrieve Setup screen.



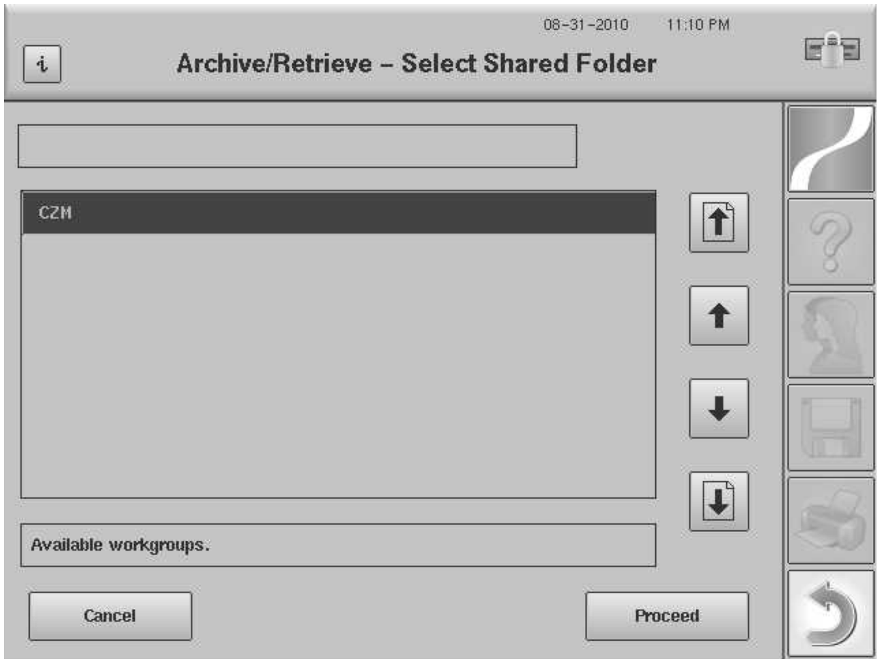
- In the File Server Access Protocol drop-down box, select SHARED FOLDER, if not already selected.

- Press the SHARED FOLDER SETUP button to display the Shared Folder Setup screen.

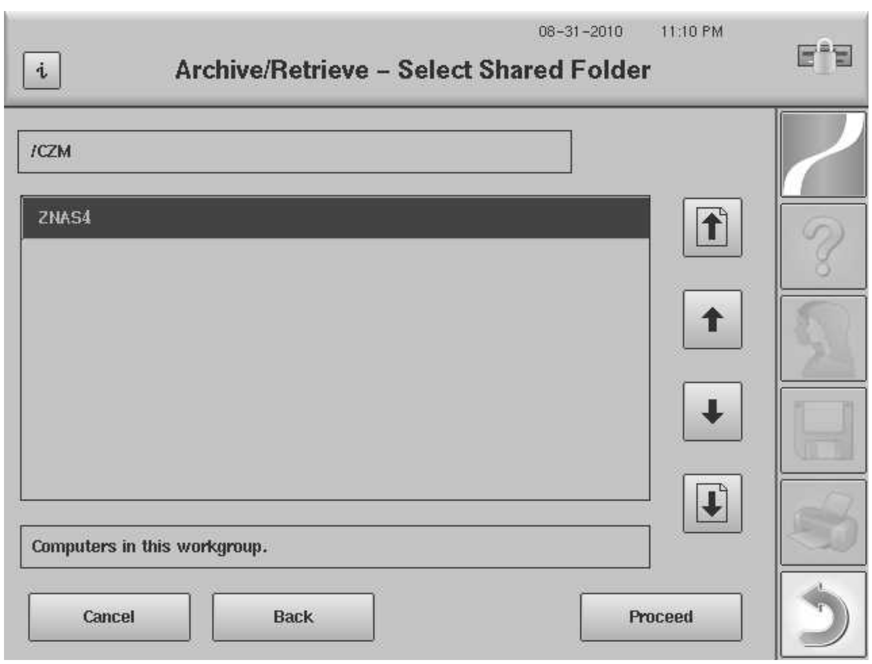
- Press the USER NAME button. Press CLEAR. Press ENTER.
- Leave the PASSWORD for the file server blank.
- Press BROWSE FOR SHARED FOLDER to search for the CZM Workgroup.



Note: *The search process can take several minutes. Please be patient while allowing the HFA II-i to complete its investigation of the NAS device.*



- Select CZM (the NAS device Workgroup) when it is displayed. Press PROCEED.
- Select ZNAS4 (the NAS device name) when it is displayed. Press PROCEED.

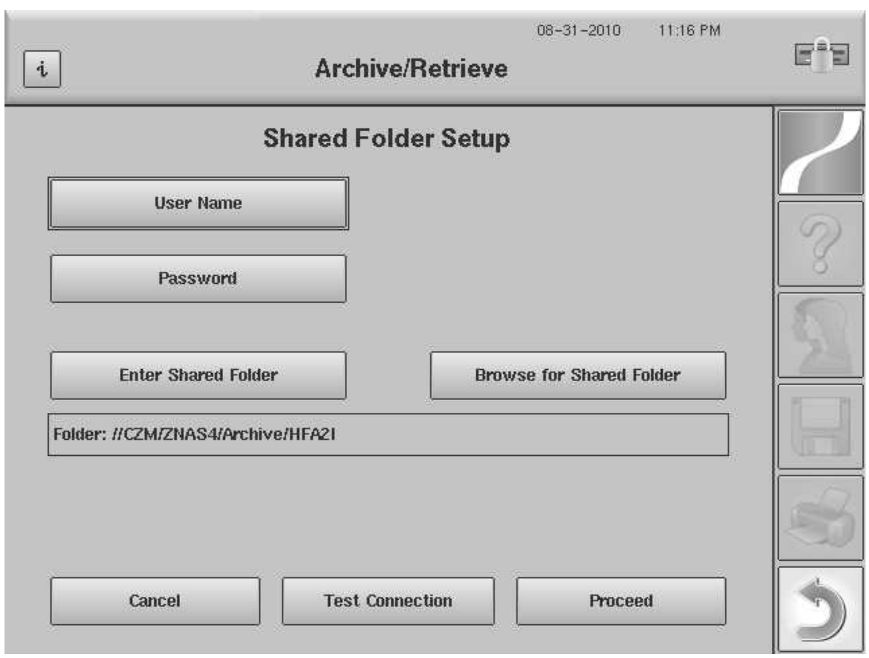


- Select Archive (the NAS device shared folder name). Press SELECT FOLDER.

- Press BROWSE FOR SHARED FOLDER again to create a new HFA-specific shared folder inside the Archive folder.

- If the "HFA2I" folder is not displayed, press CREATE FOLDER. Press CLEAR. Enter HFA2I. Press ENTER.
- Select HFA2I (the HFA shared folder name).

- Press Select Folder.
- The name and location of the HFA shared folder will appear in the outlined box.



- Press PROCEED.
- A connection test will be performed. The connection test screen will disappear if the test is successful.
- The Archive/Retrieve Setup screen appears. Press SAVE.

(Optional) Set Up a Shared Printer

Type A USB connector

Type B connector

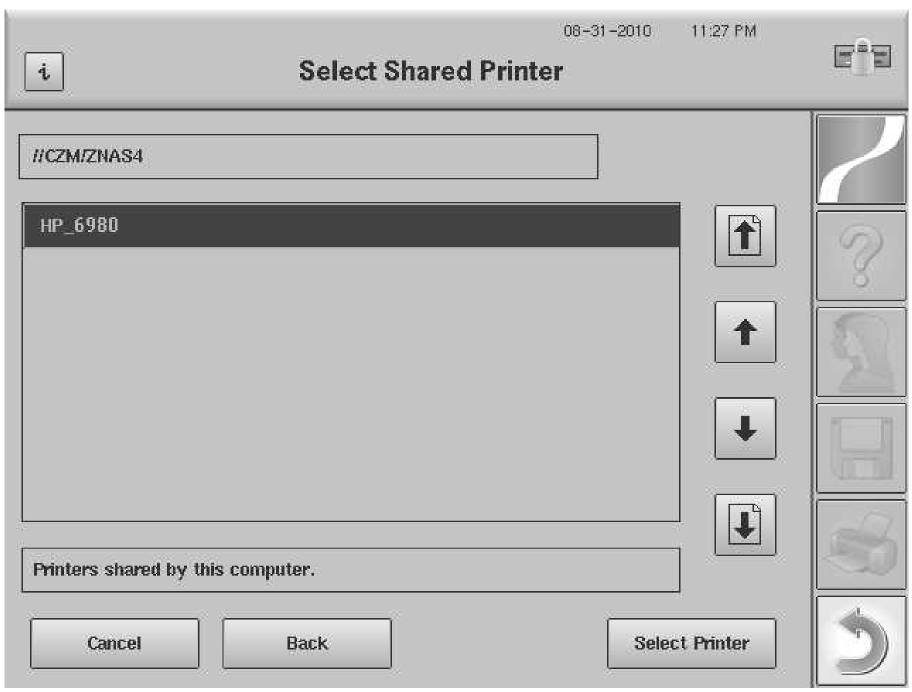
Follow the steps below to set up a shared printer that is connected to the NAS device:

- Connect the printer and the NAS drive with a USB cable (the Type B connector connects to the printer, the Type A connector connects to the NAS drive).
- Turn on the printer.
- From the Main Menu, select SYSTEM SETUP >PRINT SETUP>CUSTOM PRINTER SETUP to display the Network Printer Setup screen.
- Select your Printer Type (PCL-3 or PCL-5) from the Printer Type drop-down box.

- Press the SHARED PRINTER SETUP button to display the Shared Printer Setup screen.
- Press the USER NAME button. Press CLEAR. Press ENTER.
- Leave the PASSWORD for the file server blank.
- Press BROWSE FOR SHARED PRINTER to search for the CZM Workgroup.

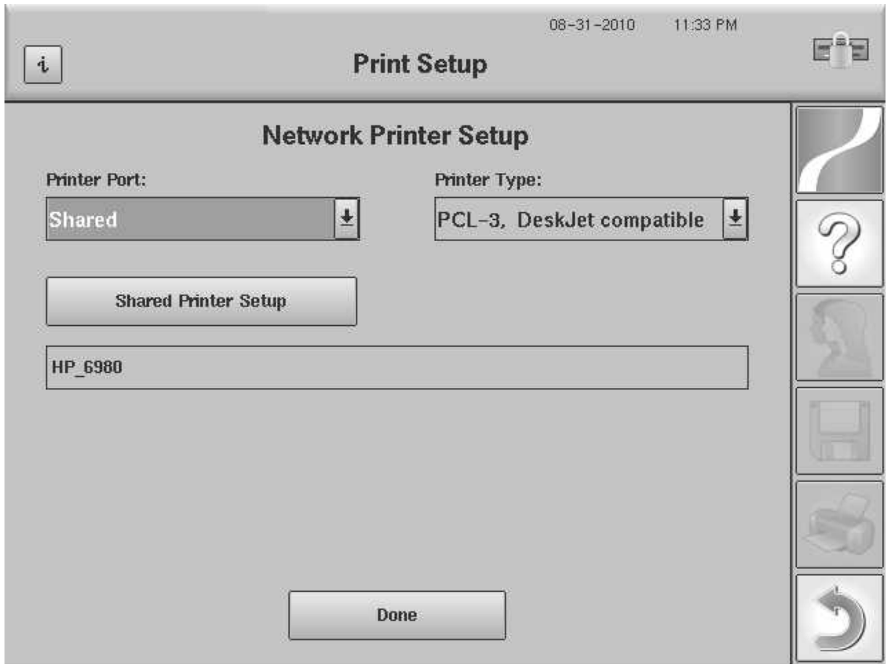
Note: *The search process can take several minutes. Please be patient while allowing the HFA II-i to complete its investigation of the NAS device*

- Select CZM (the NAS device Workgroup) when it is displayed. Press PROCEED.
- Select ZNAS4 (the NAS device name) when it is displayed. Press PROCEED.
- Select your printer when it is displayed. Press SELECT PRINTER.

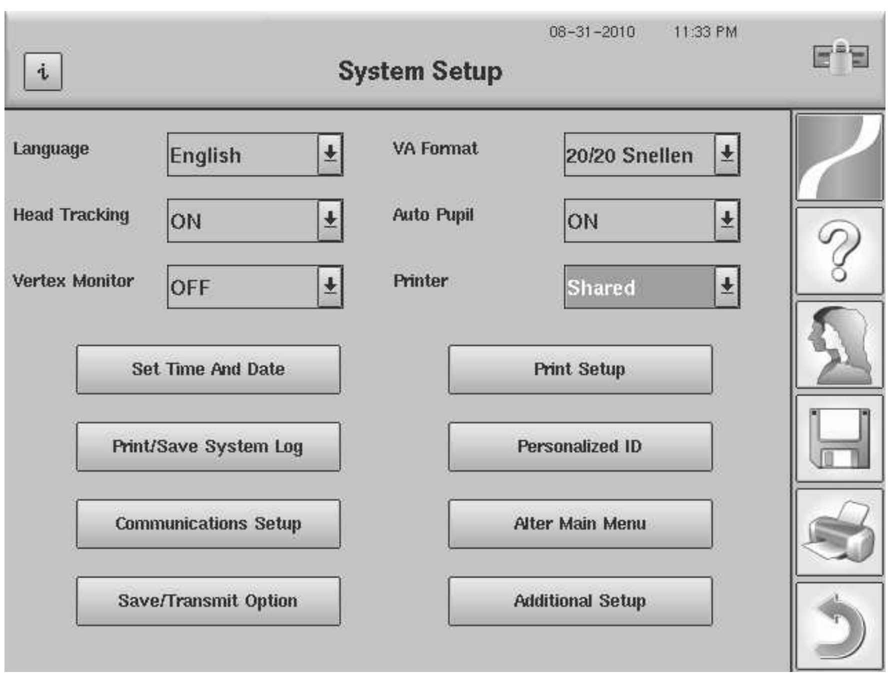


Note: *The model name of the printer may not be displayed, but only one printer will be available for selection.*

- Press PROCEED.
- A connection test will be performed. It may take several minutes. The connection test screen will disappear if the test is successful.
- Press DONE.



- On the System Setup screen select SHARED in the Printer drop-down box to enable the shared printer.



D.5 Mouse

Carl Zeiss Meditec provides a keyboard with glide pad for use with the HFA II-*i*. If your customers choose to use another type pointing device for use with the HFA II-*i*, choose a PS2, Microsoft-compatible serial mouse, trackball, or keyboard with integrated trackball or glide pad. The mouse or glide pad must be connected to the mouse connector (see Appendix B, Figure B-1 for port location). The mouse may be used in place of, or in conjunction with, the touch screen and keyboard.

D.6 Keyboard

Carl Zeiss Meditec provides a keyboard as standard equipment on the HFA II-*i*. Should you decide not to purchase the keyboard from Carl Zeiss Meditec, use the following specifications:

- IBM 101 with standard PS2 connector

The keyboard is used in conjunction with the touch screen.

D.7 Monitor

Carl Zeiss Meditec does not sell external monitors for the HFA II-*i*. However, when selecting an external monitor, choose any standard PC monitor that has the following specifications:

- Muilti-sync SVGA (or VGA)
- Capable of Minimum 70 Hz capability
- Minimum 640 x 480 pixels
- An interface cable of appropriate length

Please note that a color monitor may be purchased and used; however, it will only display in black and white.

D.8 Uninterruptible Power Supply (UPS)

Carl Zeiss Meditec does not sell a UPS (provides battery backup during power loss). However, when selecting a UPS for use with the HFA II-*i*, note the following specifications and recommendations:

- The UPS must have a minimum 450 VA rating.
- It must be dedicated to the HFA II-*i*. Do not connect the power table or other devices into the UPS.

Power backup during power loss will depend on the type of UPS selected. Consult a local supplier for details.

Confidential and Proprietary

Appendix E. Light Meter General Information / Setup

E.1 Minolta Light Meter

► General Information

The Minolta Light Meter Kit, P/N 2660021130148, can be used for all HFA II-i intensity measurements.

FIGURE E.1. Minolta Light Meter Kit, P/N 2660021130148

TABLE 1. Minolta Light Meter Kit Part Numbers

Kit Component Part Number	Component Name
P/N 2660021130149	Assembly, Minolta Meter Case & Foam
P/N 2660021124118	Minolta Meter Model LS-100
P/N 2660021125234	40.5mm +3 Close-up Lens
P/N 2660021129899	Mount, Minolta Meter LS-100
P/N 2660021130152	Disk, HFA P Factors

► Meter Components

The Minolta meter comes with a lens cap and a close-up lens.

FIGURE E.2. Minolta Light Meter Components

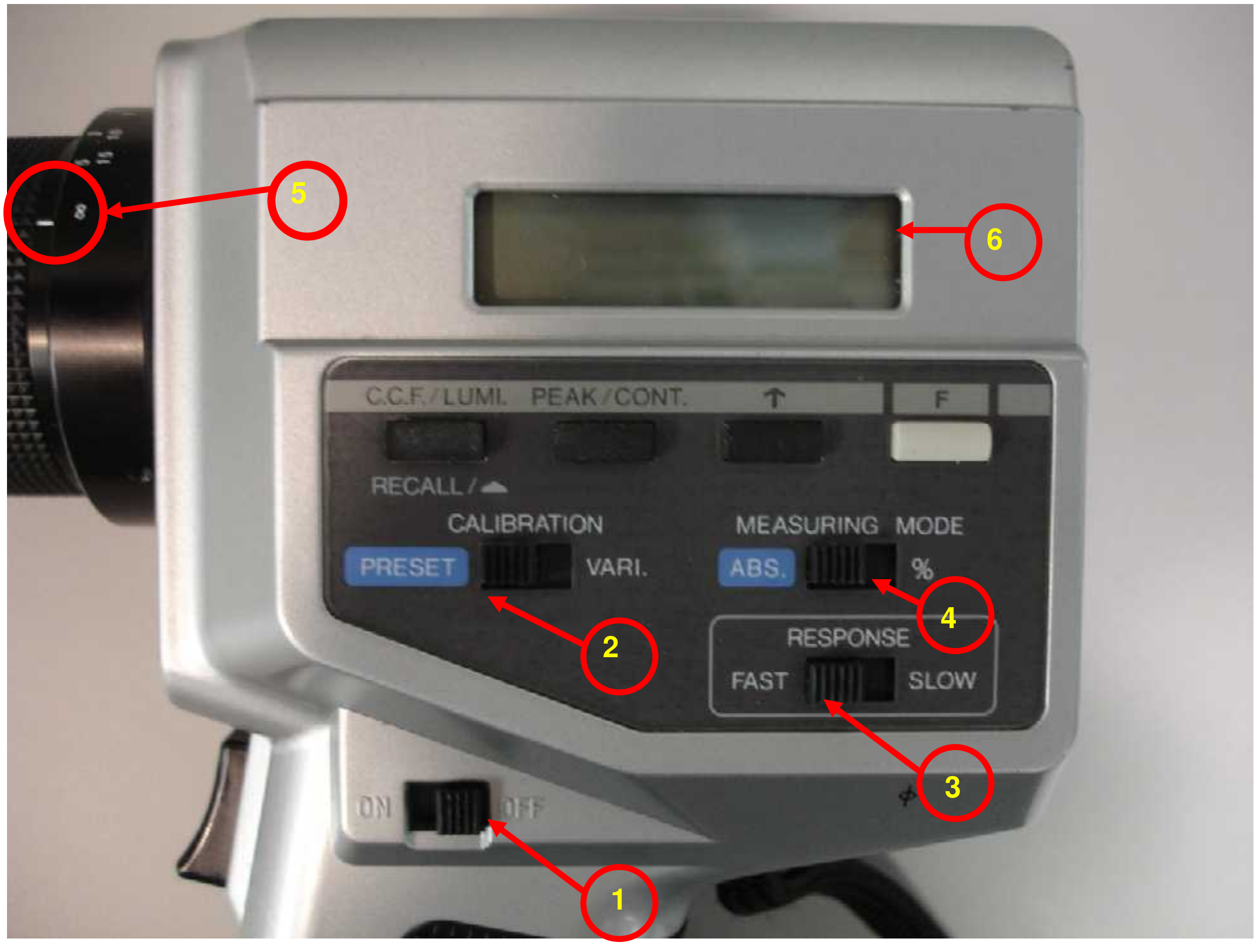


FIGURE E.3. Minolta Meter Set Up

► Minolta Meter Set Up and Preparation for Testing

Note – *Allow three minutes for the meter to warm up prior to measurement.*

1) Set the Power switch to ***On***.
2) Set the Calibration switch to the ***Preset*** position.
3) Set the Response switch to ***Fast.***
4) Set the Measuring Mode to ***ABS.***
5) Set the Focus to ***Infinity***.
6) Set the Meter Display to display in ***Foot-Lamberts***.
7) In a dark area and with the lens cap on, hold in the trigger until a reading appears on the meter display.

Note – *Verify that the intensity does not exceed 0.01 Foot/Lamberts. If the intensity exceeds this specification after ensuring that the lens cap is seated fully and all switches are set correctly, contact the CZMI Calibration Department for instructions.*

► Securing the Minolta Meter to the Mount

1) Loosen the captive thumb screw at the bottom of the mount until the captive screw threads are below the surface of the mount.
2) Angle the Minolta meter with the switches facing up into the mount such that the top mount bar wraps around the top of the meter (Figure E.4).
3) Pivot the handle of the meter into the mount such that the threads in the bottom of the handle come into alignment with the captive thumb screw (Figure E.4). This should require very little force.
4) Secure the thumbscrew finger tight to retain the meter in the mount (Figure E.5).

FIGURE E.4. Pivoting the Minolta Meter into the Mount

► Securing the Minolta Meter & Mount to the HFA Instrument Chinrest

1) Raise the HFA chinrest assembly to the top-center position.
2) Align the meter and mount's lower cutout with the chinrest cups of the HFA.
3) Gently push the meter and mount up on the chinrest cups.
4) The chinrest cup front edge will pass through the mount assembly when the mount is fully engaged (Figure E.6).

5) For some chinrest designs, you will hear an audible click as the retaining tang snaps into place over the back edge of the chinrest. Not all chinrests will allow the tang to snap into place. For those instruments, use extreme care not to knock the meter and mount off of the chinrest assembly.
6) Note that in Figure E.7 the chinrest retaining tang did not latch into place.
7) Remove the lens cap cover and place it in the lens cap holder built into the mount.

FIGURE E.5. Minolta Meter Secured in the Meter Mount

FIGURE E.6. Securing Meter and Mount to the HFA Instrument

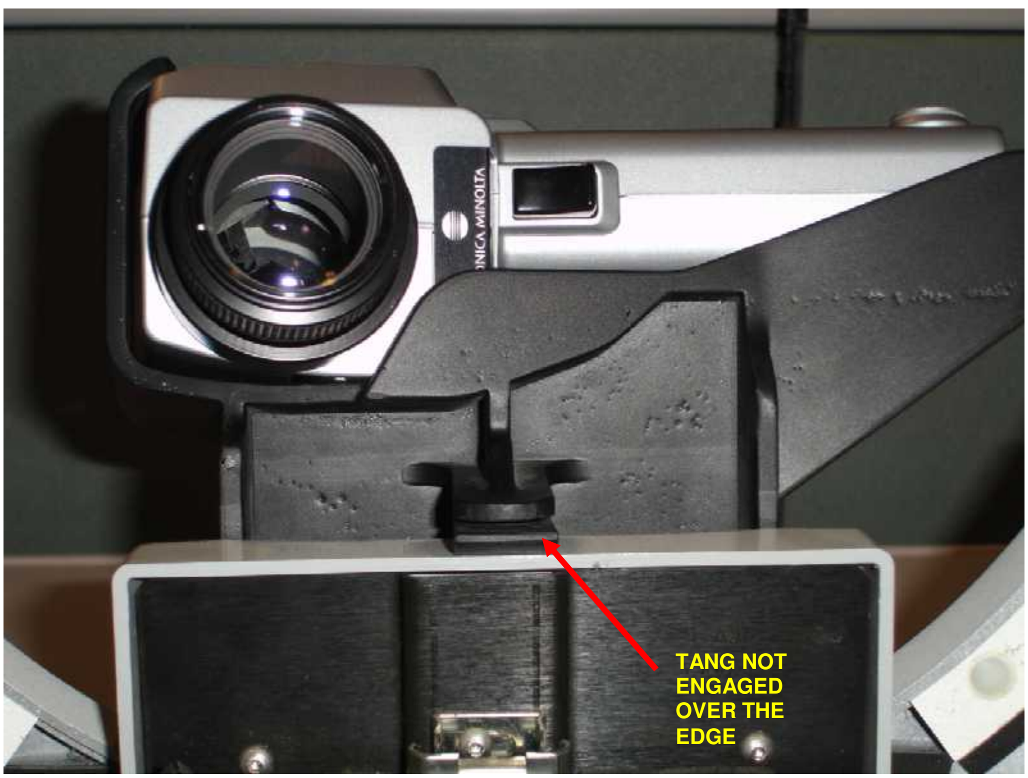


FIGURE E.7. Latching Tang not Fully Engage

► Loading the P Factors into the HFA Calibration Menu

1) Remove the P Factors disk from the Minolta Light Meter Kit (Figure E.8).
2) Ensure that the serial number found on the P Factors disk or USB stick matches the serial number of the Minolta meter that you are using. The serial number of the meter is engraved on the right side of the meter handle.
3) Ensure the P factors disk is in calibration (1 year from the Calibration Date).
4) On the HFA instrument **Main** menu, select ***Setup*** menu.
5) Select ***Additional*** menu.
6) Select the ***Diagnostics*** menu.
7) Enter the password to enter the **Diagnostics** menu.
8) Select ***Calibration***.
9) Select ***Verification***.
10) Select ***Intensity/Spot Ratio***.
11) Insert the P Factors floppy disk into the floppy disk drive.
12) Select ***Read P Factors***.
13) The drive activity light will be illuminated for a few seconds and then the readings for the various P factors will change to non-zero numbers.

FIGURE E.8. P Factors Disk with Serial Number and Calibration Date

► Storage of the Light Meter and Mount

1) Turn the Minolta light meter power switch to ***OFF***.
2) Remove the lens cap from the holder on the mount and place it on the lens of the meter.
3) Remove mount by reaching into the bowl and lifting up the mount tang slightly and sliding the mount away from the bowl.
4) Loosen the thumbscrew located on the bottom of the mount that secures the handle of the light meter to the mount.
5) Pivot the handle of the light meter up and remove the meter from the mount.
6) Place the light meter in the cutout of the case with the button side down.
7) To place the mount in the case, first orient the mount with the chinrest holder up and the handle end of the mount toward the back of the box. In this orientation the tang will be to the left and near the top.
8) Angle the thumbscrew toward the bottom of the back end of the cut out and pivot the rest of the mount into the cutout.

► Changing the Battery of the Minolta Light Meter LS-100

1) The battery is located in a compartment on the top of the head of the meter.
2) To open the compartment, put your thumb on the cover next to the arrow head and push toward the back of the meter.
3) The cover will slide back about 7 or 8 mm.
4) Lift the cover up from the meter.
5) Remove the battery from the compartment by pushing the back of the battery from the rear toward the front of the meter.
6) Tilt the battery back out of the compartment and remove it.
7) Replace the battery with a standard nine volt battery.
8) Slide the battery in the compartment with the (+) end to the right.
9) Compress the spring by pushing the battery forward until the rear edge of the battery clears the battery compartment.
10) Press the battery down into the compartment.
11) Slide the lid of the compartment in place.
12) It is recommended that you now check the operation of the meter with the new battery. Turn the light meter power to ***On***.
13) Test the battery by placing the meter in a dark area. Place lens cap on the meter and pull the trigger. If the display indicates 0.01 foot/Lamberts or less, the meter and battery are functioning properly. If not, contact the CZMI Calibration Department for instructions.

E.2 Soligor Light Meter

► Soligor Light Meter Setup

FIGURE E.9 shows the proper setup of the Soligor light meter kit for use with the HFA II-*i*.

Note: *When used on the HFA II-i, the rectangular cutout on the flat portion of the Soligor mounting bracket points into the bowl. When the Soligor is used on the HFA I, the Soligor handle fits into the rectangular cutout, and it points away from the bowl.*

1) Mount the light meter to the chinrest.
2) Connect the DMM (20V DC scale) and the power supply to the light meter.
3) Set the meter to the required position.
4) Line up the light meter with the trial lens holder raised, then lower the trial lens holder.
5) Aim the light meter to about 10 degrees above the Central Fixation hole.
6) If the light meter was off, let it warm up for 5 minutes.
7) Zero the light meter:
   a) Turn off the room lights.
   b) Set the light meter to position 3.
   c) Check and adjust the light meter (if needed) so that the DMM reads zero when the lens is completely blocked off. (Use the lens cap provided with the meter.)

      The tolerance is ± 2 mV. (To adjust the light meter, turn the small screw in the handle of the meter.)

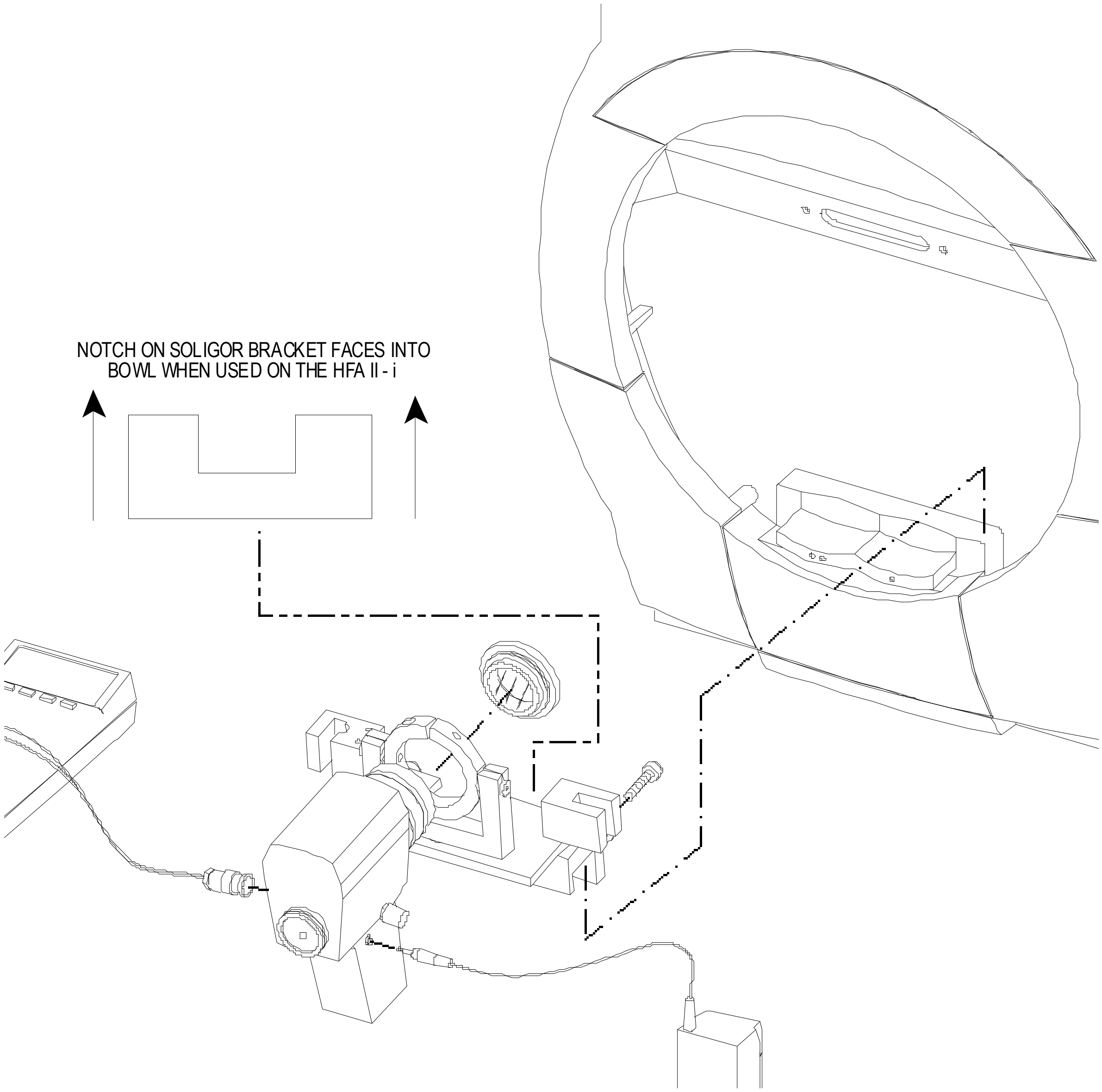


FIGURE E.9. Soligor Light Meter Setup

► How to Set Up the P-Factor Disk / USB Stick

Note: *You must update your P Factors disk / USB stick whenever your light meter is recalibrated or replaced. Label and Date the P Factors disk / stick.*

► Soligor Light Meter

A "*Read P Factors*" button has been added to the Light Intensity menu. Selecting the "*Read P Factors*" button from the Light Intensity menu causes the Soligor meter calibration P factor values to be read from a disk (located in the HFA II-*i* floppy drive) and entered into the menu. The Field Support Engineer must create the Soligor meter calibration P factors disk. The P Factors disk is created by copying a file with the name "pfactors.cfg" on a DSHD floppy disk. The file will contain the Soligor meter P calibration factors for the Engineer's meter. A sample file is shown below. Save the file as an ASCII text file. Lines beginning with '#' are comments and are ignored by the program. You must use all capital letters and the delimiter between the meter and the serial number, all of the factors, and all of the factor values must be a TAB. As an example for the meter, you would need to type *METER(TAB)1935*, where *(TAB)* represents pressing the TAB key.

```
#################################
# pfactors.cfg
# Configuration file for MBC module to help enter lightmeter
# P Factors and Meter serial number
METER 1935
P1 393.32
P2 36.282
P3 8.187
P3B 6.849
P3Y 8.218
P3F 7.812
```

► P Factor Disk for Version ≥5.1

You can convert your disk to work with the new 5.1 configuration by transferring its data to a USB stick. It's recommended that you carry one of the 4-GB blank sticks listed in the parts section to store P-factors as well as temporary database calibration and configuration backups during service events.

To convert your P-factors floppy disk to a USB, you will need a PC with a USB port and floppy drive. Simply copy the file from the root of the floppy and place it in the hfa/cal folder on the USB stick, (this directory doesn't exist by default and must be created).

Appendix F. Operating System

The operating system is a real-time system based on the Vx Works kernel. In addition to Vx Works, the file system DOS Fs and Vx Works run-time libraries are utilized.

The operating system is structured to be run as a preemptive, real-time, multitasking environment, using message passing as the principal method of inter-process communication. The system assumes the existence of both a hard disk as well as a floppy disk / USB system. The floppy disk file system is designed to be compatible with that used by IBM PC-DOS compatible machines. The Vx Works operating system supports an IDE / SATA hard drive and a Magneto Optical drive through the file system.

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Appendix G. ► Initializing the Cal / Config Data
► Setting the Serial Number
► Setting the Model / Hardware Options
► Hard Disk Format & Restore (Table)
► Setting the Software Options

The five operations described in Appendix G can be performed by using the Diagnostic Support Tool (DST).

Note: *Refer to FIGURE G.1 for a graphical representation of the descriptions given below.*

- **Initializing the Cal / Config Data** — is required whenever a new Hard Drive is installed, or the existing Hard Drive is initialized or becomes corrupted.

  Initializing the Cal/Config Data erases the stored systems information in the **CALCFG.INI** and **NVRAM.DAT** files that are located on the hard drive. Calibration constants, model and serial number, instrument defaults, hardware options and software options are all erased during the Cal/Config Data initialization process. All of these parameters must be reentered after Cal/Config Data initialization.

- **Setting the Serial Number** — is required any time the Hard Drive is replaced, or the Cal/Config Data has been initialized or corrupted.

  Setting the Serial Number writes and stores the instrument model number and serial number in both the **CALCFG.INI** and **NVRAM.DAT** files on the Hard Drive.

- **Setting the Model/Hardware Options** — is required whenever a new hard drive is installed or the existing Cal/Config Data has been initialized or corrupted.

  Setting the Hardware Options writes and stores the hardware options HEX number in the **CALCFG.INI** file. The hard option HEX number, also called the "hard opt", is used by the instrument operating system to determine which features of the instrument are to be enabled (accessible to the user). The hard opt number can be viewed on the HFA II-*i* unit information screen.

- **Setting the Software Options** — is required whenever the model/hardware option number has been changed or entered into the Cal/Config Data (for the first time).

  Each time software is loaded onto the hard disk, a software option number is automatically written into the Cal/Config Data. The software option number generated is based on the model or hardware option number. If the software option number is missing or does not agree with the hardware option number, instrument features (for a particular model HFA II-*i*) will not be enabled (accessible to the user). The software option number can be viewed on the HFA II-*i* information screen.

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Equipment Required:

- Service Key (see Appendix A)
- Diagnostic Support Tool (DST) software diskettes (see Appendix A.2)

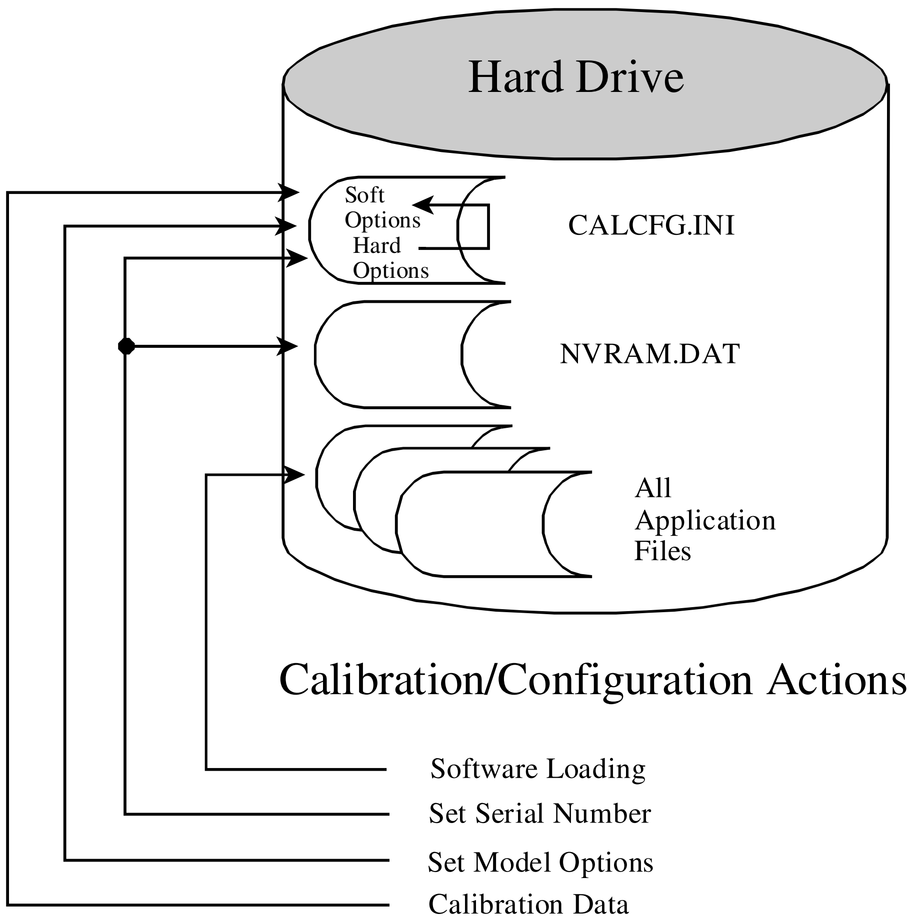

FIGURE G.1. Actions Performed in Appendix G

G.1 Initializing the Cal / Config Data

This procedure is required whenever a new hard drive has been installed, before calibration is performed.

1) Set up the DST for use as described in Appendix A.2, under Diagnostic Support Tool.

2) From the DST Main Menu, select Configuration. The Configuration Menu appears.

3) Select Initialize the Configuration. A warning message appears informing you that all configuration and calibration data will be destroyed.

4) Select OK. A test log screen appears confirming whether or not you want to continue. Select Initialize to erase all contents of the Cal/Config Data. (Select Quit to return to the Configuration Menu.)

5) An “Initialization successful” message will appear.

   Note: *If you initialize the CAL/Config Data, you must also perform the procedures for* ***Setting Serial Number****,* ***Setting the Model/Hardware Options****, and* ***Setting the Software Options*** *described below. Then recalibrate the instrument (see Table 3-1).*

G.2 Setting the Serial Number

This procedure is required any time the hard drive is replaced or the Cal/Config Data is initialized. During this procedure you will be instructed to type in the serial number of the instrument. The serial number can always be found on the label located on the rear cover assembly.

> ***Note:*** *The instrument’s serial number NEVER changes throughout the life of the instrument. Instrument serial numbers are critical for tracking instrument reliability, performance, and customer satisfaction.*

1) Set up the DST for use as described in Appendix A.2, under Diagnostic Support Tool.

2) From the DST Main Menu select Configuration. The Configuration Menu appears.

3) Select Set Serial Number, then select Edit. A ten-key pad appears. Type in the four-digit model of the instrument. For example, 0750, then select [Enter].

4) A ten-key pad appears. Type in the six-digit serial number of the instrument. For example, 001000, then select [Enter].

5) Select Save to store the serial number and return to the Configuration Menu. (Selecting Quit will not store the serial number and will return to the Configuration Menu.)

6) Switch OFF the instrument and remove the Service Key (if used).

7) Switch ON the instrument and verify that the correct serial number appears on the screen during the boot-up process.

G.3 Setting the Model / Hardware Options

Note: *The hardware options codes listed in this section are for C1.1 system software. Changes in future revisions of software may result in changes to the hardware options.*

This procedure is designed to set up the basic hardware configuration by setting the model number of the instrument. This is required whenever the CAL/Config Data has just been initialized.

For Model 720-*i*:

1) Set up the DST for use as described in Appendix A.2, under Diagnostic Support Tool.

2) From the DST Main Menu select Set Model/Hardware Options. The Model/Hardware Options Menu appears.

3) Select Set Model 720-*i* Defaults, a test log menu appears and displays the model 720-*i* default settings.

4) Select Continue. The Model 720-*i* hardware Options are set and the Model/Hardware Options Menu is displayed.

5) Switch OFF the instrument and remove the Service Key (if used).

6) Switch ON the instrument. Select the “i” screen and verify that the correct model number appears on the boot-up screen.

7) Proceed to “Setting the Software Options.”

For Model 740-*i*

1) Set up the DST for use as described in Appendix A.2, under Diagnostic Support Tool.

2) From the DST Main Menu select `Set Model/Hardware Options`. The Model/Hardware Options Menu appears.

3) Select Set Model 740-*i* Defaults, a test log menu appears and displays the Model 740-*i* default settings.

4) Select Continue. The Model 740-*i* hardware Options are set and the Model/Hardware Options Menu is displayed.

5) Switch OFF the instrument and remove the Service Key (if used).

6) Switch ON the instrument. Select the "i" screen and verify that the correct model number appears on the boot-up screen.

7) Proceed to "Setting the Software Options."

For Model 745-*i*/ 750-*i*

1) Set up the DST for use as described in Appendix A.2, under Diagnostic Support Tool.

2) From the DST Main Menu select Set Model/Hardware Options. The Model/Hardware Options Menu appears.

3) Select Set Model 750-*i* Defaults, a test log menu appears and displays the Model 750-*i* default settings.

4) Select Continue. The Model 750-*i* hardware Options are set and the Model/Hardware Options Menu is displayed.

5) Switch OFF the instrument and remove the Service Key (if used).

6) Switch ON the instrument. Select the "i" screen and verify that the correct model number appears on the boot-up screen.

7) Proceed to "Setting the Software Options."

TABLE 1

Hard Drive Format & Restore	
Format Hard Drive	Initializes Hard Drive
Load System Software	Make the Hard Drive Bootable
Restore the Calibration Constants from the Floppy	Only if the instrument is **NOT** being re-calibrated
Restore the Customer Configuration Floppy	If available
Restore the Customer's Data	Verify the Customer's Database (operates normally)

G.4 Setting the Software Options

Note: *Setting the software options is required whenever the hardware option number has been changed or the Cal/Config Data has just been initialized. Please note that the DST cannot be used to set the software option number unless the instrument is being repaired at the Carl Zeiss Meditec factory. All other repair situations must follow the procedure described below.*

The software option number is automatically created during the installation of application software. The software option number is based on the hardware option number already written into the Cal/Config Data. Ensure that the correct hardware option number has been written to the Cal/Config Data prior to creating the software option number.

1) Ensure that you have the latest revision of application software.

2) Follow the procedures in Appendix M for loading the application software.

3) At the HFA II-*i* Main Menu, select the **"i"** button at the top of the screen. When the HFA II-*i* Unit Configuration screen is displayed, verify that the correct Model Number, Hardware Option Number and Software Option Number have been set, based on instrument model (see Table G-1).

   Note: *The Hardware and Software Option Numbers are based on revision C3 software residing on the hard disk.*

Table G-1

Model Number	Hardware Option Number	Software Option Number
720-*i*	000134	0011590C
740-*i*	230134	00157918
745-*i*	330134	0015f918
750-*i*	b30334	0017F9F8

Appendix H. Calibration Printouts

Contents:

- Cal / Wedge Printout
- Automated Light Intensity Verification Printouts
  - White Light Verification Data
  - Blue-Yellow Verification Data

H.1 Cal / Wedge Printout

The numbered definitions below (1, 2, 3, etc.) are keyed to the numbered elements of the sample calibration printout shown in FIGURE H.1.

1 = Date/time of calibration printout, instrument serial number, and hardware option number

2 = NVM Data

The numbers that appear in the printout represent the current calibration values stored in Cal/Config Data for each item listed, for this particular instrument. A brief definition of each item is given below, followed by a table that lists the acceptable tolerance range for each item.

Proj ....represents voltage* (left column) and intensity* (right column) of the projection lamp when a white stimulus is projected.
Bowl................represents voltage* and intensity* for the white bowl lamps.
Blue ....represents voltage* and intensity* of the projection lamp when a blue stimulus is projected.
Yellow ....represents voltage* and intensity* for the yellow bowl lamp
Right Mode .....microsteps of positioning
Left Mode ....microsteps of positioning
Offset Fix.........microsteps of positioning
Focus ....microsteps of positioning
Shutter ....microsteps of positioning
Aperture..........microsteps of positioning for each of the 5 positions of the aperture wheel
Color..............microsteps of positioning for each of the 5 positions of the color wheel

* *Voltage and intensity are expressed here as relative numbers, not actual units of voltage or intensity (such as volts or foot-lamberts). Typically, any high round number (e.g., 30000) that appears here in the printout is the default value for a parameter that has not been calibrated. It is possible but highly unlikely that a calibrated value would fall precisely at a high round number.*

3 = Voltage drop across projector lamp when white stimulus is projected, and when blue stimulus is projected

> ***Note:*** *The Blue projector voltage drop will display a value greater than zero* **only** *when the printout is obtained immediately* after *performing the light intensity calibration/verification.*

4 = Camera/Gaze Data

Illumination:

Reflex LED...................... intensity of the reflex LED
Left LED .... intensity of the left trial lens LED
Right LED .... intensity of the right trial lens LED
Gain No Trial Lens.......... camera gain with trial lens holder down
Gain Trial Lens .... camera gain with trial lens holder up
Scale .... (not currently used)

Video Window:

Source X......................... where the video image will be positioned on the CRT (inside the video insert)
Source Y......................... where the video image will be positioned on the CRT (inside the video insert)
Dest X .... where the video insert will be positioned on the CRT screen
Dest Y .... where the video insert will be positioned on the CRT screen
Width .... represents the width of the video insert
Height .... represents the height of the video insert

Gaze Window:

X.................................... represents the distance from the left edge of the video insert to the left edge of the gaze box
Y.................................... represents the distance from the top edge of the video insert to the top edge of the gaze box
Width .... represents the width of the gaze box
Height .... represents the height of the gaze box

Gaze Size:

Height .... conversion factor for converting pixels to millimeters
Width .... conversion factor for converting pixels to millimeters
Aspect Ratio .... normalizing factor to produce a true circle from the data received from the camera

5 = Blue Correction Table

The Blue Correction Table contains twelve correction values for both the *Film wedge* and the *Glass wedge*. The Blue Correction table for the *Film wedge* should start at zero and typically increase to around the mid to high 20's, and sometimes into the 30's The Blue Correction table for the *Glass wedge* should also start at zero, and display negative numbers going to –20 or –30 (in the middle of the table).

The values given above are to be used as a general guideline. The final evaluation for Blue Calibration depends on the light intensity worksheet results.

6 = Wedge Attenuation

To help quantify the attenuation of the film and glass wedges, additional data has been added to the calibration printout. *This information is intended for manufacturing and engineering use and is not required for field service evaluation*. The *Working Film Wedge Steps* displayed on the calibration printout indicates the total attenuation of the film wedge. The *Working Glass Wedge Steps* indicates the total attenuation of the glass wedge. Both are expressed in centibels (10 centibels equals 1 decibel). The *Total Working Wedge Attenuation* displayed on the calibration printout is the combined attenuation of the *Working Film Wedge Steps* and *Working Glass Wedge Steps*, also expressed in centibels. The *Total Working Wedge Attenuation* must be greater than 500 centibels. *Bins Film* and *Bins Glass* displayed on the calibration printout are used to evaluate the linearity of the NVM ND Table 0 film wedge and NVM ND Table 1 glass wedge. Ideally, the amount of attenuation between any two adjacent glass or film wedge motor steps should increase between 1, 2, or 3 centibels. However this may not always be the case and is not a requirement for service evaluation.

7 = NVM ND Table 0

This is the *film* wedge calibration table stored in Cal/Config Data. The values in the table were obtained during the latest wedge calibration. During wedge calibration, brightness of the projected spot is sensed for 175 different positions of the wedge.

With a properly calibrated film wedge, the values printed should run from approximately 0 – 370 in a linear progression, with no large jumps in value between adjacent positions. If a large jump in value is noted, check the wedge for fingerprints, scratches, debris, or flaking emulsion.

8 = NVM ND Table 1

This is the *glass* wedge calibration table stored in Cal/Config Data. The values in the table are obtained during the wedge calibration process. During wedge calibration, brightness of the projected spot is sensed for 175 different positions of the wedge.

With a properly calibrated glass wedge, the values printed should run from approximately 0 - 270 in a linear progression, with no large jumps in value between adjacent positions. If a large jump in value is noted, check the wedge for fingerprints, scratches, debris, or flaking emulsion.

1

2003-04-02 06:36

MACHINE ID: 0750-009340 . 00000000-00B30334

NVM DATA

			ABSOLUTE	PREFERRED
PROJ	84	38047	<30000 - 65534>	<31500 - 62250>
BOWL	35	2630	< 1000 - 10000>	< 1050 - 9500>
BLUE	85	9772	< 6000 - 65534>	< 6300 - 62250>
YELLOW	102	24745	<10000 - 65534>	<10500 - 62250>

2

RIGHT MODE	-16	416			
LEFT MODE	-32	416			
OFFSET FIX	0	0			
FOCUS	560				
SHUTTER	192				
APERTURE	-192	-176	-160	-160	-176
COLOR	64	64	48	64	48

3

WHITE PROJECTOR VOLTAGE DROP: 7.977790
BLUE PROJECTOR VOLTAGE DROP: 8.177691

CAMERA/GAZE DATA
ILLUMINATION:
REFLEX LED 40
LEFT LED 25
RIGHT LED 25
GAIN NO TRIAL LENS 0
GAIN TRIAL LENS 0
SCALE 0
VIDEO WINDOW:
SOURCE X 169
SOURCE Y 145
DEST X 0
DEST Y 0
WIDTH 140
HEIGHT 113

4

GAZE WINDOW:
X 125
Y 96
WIDTH 96
HEIGHT 96
GAZE SIZE:
HEIGHT 16
WIDTH 24
ASPECT RATIO 0.660

BLUE CORRECTION TABLE:

FILM	0	2	3	3	4	4	5	6	7	8	7	7
GLASS	0	0	-12	-18	-21	-23	-21	-18	-13	-9	-11	-11

5

TOTAL WORKING WEDGE ATTENUATION : 556
WORKING FILM WEDGE STEP SLOPE <1 - 316 MB>: 170
WORKING GLASS WEDGE STEP SLOPE <1 - 240 MB>: 146

6

BINS:	<-4	-4	-3	-2	-1	0	1	2	3	4	>4
FILM:	0	0	0	0	0	17	35	76	39	3	0

BINS:	<-4	-4	-3	-2	-1	0	1	2	3	4	>4
GLASS:	0	0	0	0	0	0	57	84	5	0	0

7

NVM ND TABLE 0 -- FILM

0	0	0	0	0	1	3	5	6	6
7	7	7	7	7	7	7	7	7	7
8	8	8	8	9	9	9	10	11	11
12	13	14	15	17	18	19	21	22	24
26	27	29	31	33	34	36	38	40	42
44	46	48	50	52	54	56	58	60	62
65	67	70	73	75	78	81	83	86	88
91	93	95	98	100	103	105	108	111	113
116	119	121	124	127	129	132	134	136	138
140	141	142	143	145	146	148	150	152	155
157	160	163	166	170	173	177	180	183	187
190	193	196	199	202	205	208	210	213	216
219	222	225	227	230	232	234	236	238	239
241	243	245	247	250	252	254	255	257	259
261	263	265	267	269	271	272	273	274	275
276	278	279	281	282	283	285	287	288	290
292	294	296	297	300	302	304	306	307	308
311	311	313	314	316					

8

NVM ND TABLE 1 -- GLASS

0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	1
2	4	6	9	12	14	17	19	21	23
23	26	27	28	29	30	31	32	33	34
36	37	39	41	43	45	47	49	52	53
56	57	59	61	63	65	67	68	70	72
74	75	77	79	81	82	84	86	88	89
91	93	95	96	98	100	102	103	105	106
108	109	111	113	114	116	117	119	120	122
123	125	126	128	129	131	132	134	135	137
139	140	142	143	145	146	148	149	151	152
154	156	157	159	160	162	163	165	166	168
170	171	173	174	176	177	179	181	182	184
185	187	188	190	192	193	195	196	198	200
201	203	205	206	208	209	211	212	214	216
218	219	221	222	224	225	227	229	231	232
234	235	237	239	240					

FIGURE H.1. Sample Cal / Wedge Printout

TABLE H - 1. CALIBRATION TOLERANCE RANGES

NVM DATA	**Min**	**Max**	**Min**	**Max**
	Voltage		Intensity	
Proj	40	127	30000	65534
Bowl	10	127	1000	10000
Blue	40	127	60000	65534
Yellow	10	127	10000	65534
	Microsteps (X)		Microsteps (Y)	
Right Mode	–1000	1000	–1000	1000
Left Mode	–1000	1000	–1000	1000
Offset Fix	–1000	1000	–1000	1000
	Microsteps			
Focus	–1000	1000		
Shutter	120	220		
Aperture	–1000	1000		
Color	–1000	1000		
CAMERA/GAZE DATA	Relative Numbers			
Illumination:				
Reflex LED	1	127		
Left LED	1	127		
Right LED	1	127		
Gain No Trial Lens	0	127		
Gain Trial Lens	0	127		
Scale	(not used)			

(continued)

(Table H - 1. — continued)

	Min	Max	Min	Max
Video Window:				
Source X	1	120		
Source Y	1	600		
Dest X	0	120		
Dest Y	0	500		
Width	64	256		
Height	64	256		
Gaze Window:				
X	8	255		
Y	8	255		
Width	8	127		
Height	8	127		
Gaze Size:				
Height	1	64		
Width	1	64		
Aspect Ratio	0.10	2.00		

H.2 Automated Light Intensity Printouts

Automated Light Intensity Printouts provide a numerical and graphical representation of the instrument's current light intensity calibration. The printouts can only be obtained by selecting the Verification button on the Calibration Main Menu.

To obtain the Automated Light Intensity Printout, perform the following:

1) Complete the light intensity Before or After verification as described in Section 4.

   Note: *The Mfg and QA selections are for manufacturing use only. Selecting either of these two buttons will set tolerance values which are much tighter than those required for field service evaluation.*

2) Select Print. A single-page printout will be obtained on all non-blue-yellow models. On blue-yellow models, a two-page printout will be obtained. The first page represents the White Light Verification Data and the second page represents the Blue-Yellow Verification Data.

Interpreting the Printouts -

HFA II-*i* White Light Verification Data Printout:

(Refer to the sample printout on the following page)

(1) Indicates whether the verification data was obtained either BEFORE or AFTER servicing the HFA II-*i*.
(2) Serial number of the HFA II-*i*.
(3) Serial number of the lightmeter being used to perform the verification.
(4) Revision level of the software currently installed in the instrument.
(5) The multiplier values (P1, P2, P3, P3F) written on the calibration label and affixed to the lightmeter being used to perform the verification.
(6) The current white projector voltage required to obtain a 0 dB light intensity value.
(7) The dB spread or amount of dB difference between the highest and lowest light intensity data points appearing on the graph (including the BOWL). For the White Light Verification Data Printout, this value must be 1.0 dB or less.
(8) A numerical and graphical representation of each measured spot value (0 dB - 34 dB) and the BOWL value. The tolerances (MIN and MAX), as well as the actual measured value (READING), for each data point are indicated in Ft-L.
(9) The asterisk indicates a value that is out of tolerance.

   (***Note:*** *The data point at 39 dB is not used during field service evaluation.*)

(10) Light intensity data points. Nine data points (including the BOWL) are plotted to indicate the attenuation produced by the glass and film wedges.
(11) Spot Ratio - for manufacturing use only.
(12) Location to be signed by the Field Support Engineer performing the verification.

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HFA II - i White Light Verification Data

HFA II WHITE LIGHT VERIFICATION DATA : BEFORE

1

2

HFA II SERIAL NUMBER: 750 7501723

SOLIGAR METER NUMBER: 1100

3

SYSTEM SOFTWARE REV: REV C1.1

DATE & TIME: 06-29-2001 10:40 PM

4

P1: 471.07 P2: 42.537 P3: 10.300 P3F: 0.905

5

WHITE PROJECTOR VOLTAGE AT : 8.604 V (10 V MAX)

6

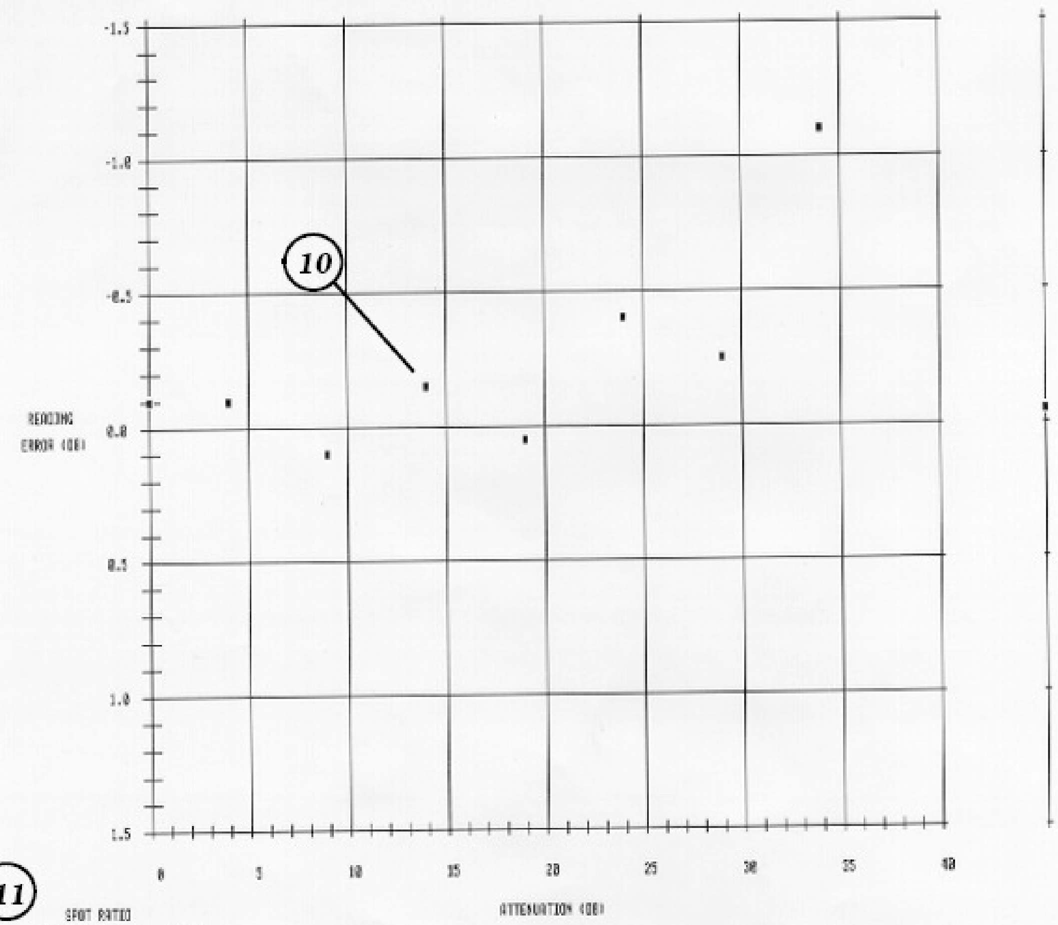
8

DB SPREAD: 1.2 DB *

7

9

	0DB	4DB	9DB	14DB	19DB	24DB	29DB	34DB *	BOWL
MAX	1067.0	465.0	147.00	46.60	14.70	4.600	1.470	0.466	3.51
READING	942.1	376.9	113.06	38.20	11.49	4.000	1.237	0.474	2.82
MIN	820.0	234.0	92.90	29.40	9.23	2.940	0.330	0.294	2.43



11

SPOT RATIO

III/I: 15.6 (12.0 - 20.00)

III/II: 4.0 (3.2 - 5.00)

DONE BY ______________________

12

HFA II-*i* Blue-Yellow Verification Data Printout:

(Refer to the sample printout on the following page)

(13) Indicates whether the verification data was obtained either BEFORE or AFTER servicing the HFA II-*i*.

(14) Serial number of the HFA II-*i*.

(15) Serial number of the lightmeter being used to perform the verification.

(16) Revision level of the system software currently installed in the instrument.

(17) The multiplier values (P3B and P3Y) written on the calibration label and affixed to the lightmeter being used to perform the verification.

Note: *BYP3 and P3 are the older multiplier values used to calibrate Blue-Yellow intensities. The newer values are P3B and P3Y.*

(18) The current blue projector voltage required to obtain a 0 dB light intensity value displayed in Ft-L.

(19) The dB spread or amount of dB difference between the highest and lowest light intensity data points appearing on the graph (including the BOWL). For the Blue Light Verification Data Printout, this value must be 1.5 dB or less.

(20) A numerical and graphical representation of each measured spot value (0 dB – 23 dB) and the BOWL value. The tolerances (MIN and MAX) as well as the actual measured value (READING) for each data point are indicated in Ft-L.

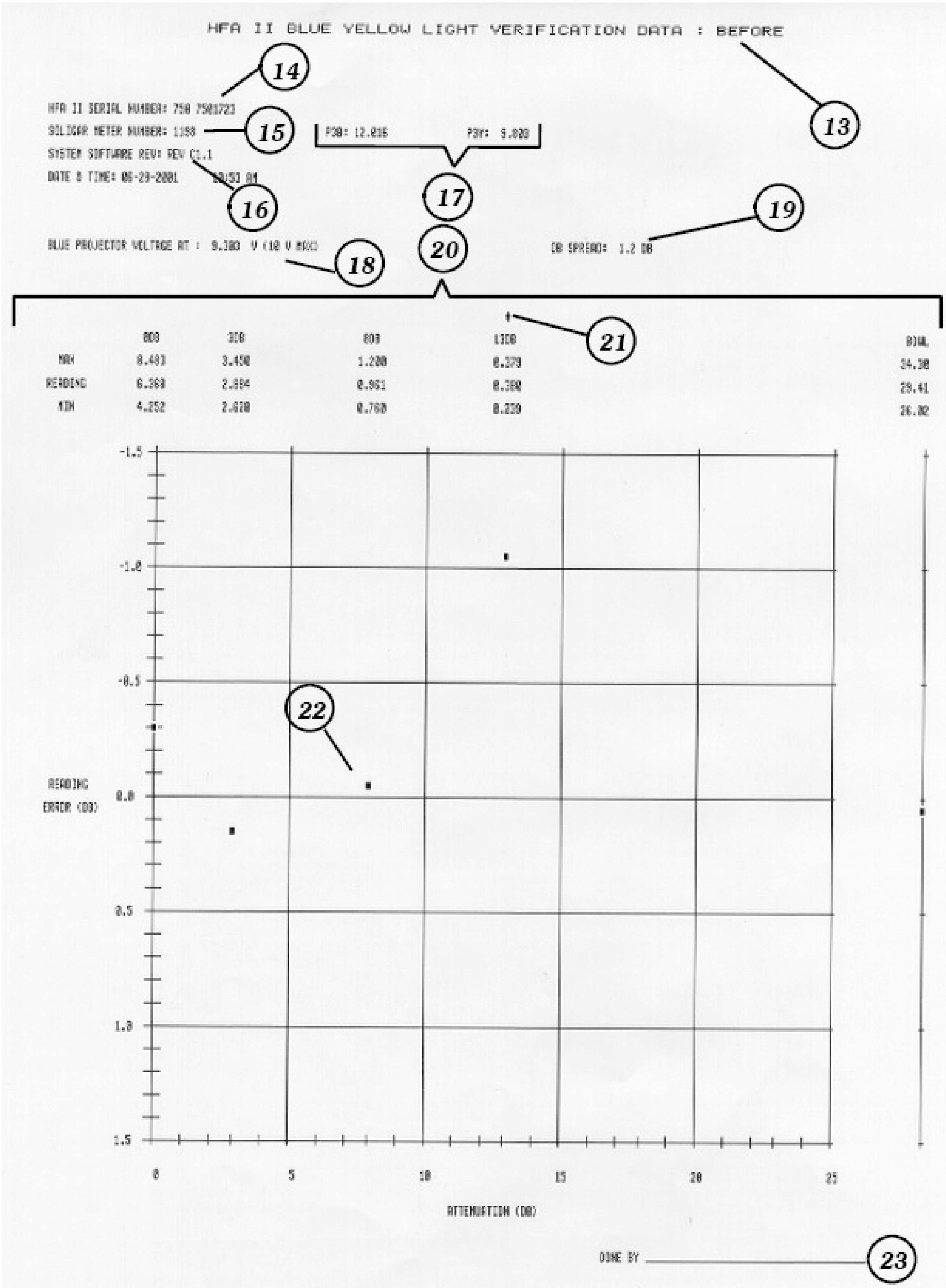
(21) The asterisk indicates a value which is out of tolerance.

Note: *The data points at 18 dB and 23 dB are not used during field service evaluation.*

(22) Light intensity data points. Five data points (including the BOWL) are plotted indicating the attenuation produced by the glass and film wedges.

(23) Location to be signed by the Field Support Engineer performing the verification.

HFA II - i Blue-Yellow Light Verification Data



Appendix I. Service Forms / Documents

The following are the documents / Service forms / paperwork used for the HFA instrument:

- **E-HFA II-*i* Service Manual:**

  Lotus Notes > Service Manuals \ HFA2 i

- **E- HFA II-*i* Service Bulletins:**

  Lotus Notes > Service Bulletins \ HFA II i

- **E- HFA II-*i* Checklist Form:**

  Lotus Notes > Service Bulletins \ System Field Service Checklist \ HFA II/HFA II-i System Field Service Checklist

- **E-General Disclaimer Form:**

  Lotus Notes > Service Bulletins \ Service Disclaimers/Customer Letters/Misc Documents \ Zeiss General Disclaimer Form

- **E-misc documents:**

  Lotus Notes > Service Bulletins \ Service Disclaimers/Customer Letters/Misc Documents\

  - HFA Measurement Change Customer Letter
  - HFA Calibration Shift Worksheet – After Service
  - HFA Database Analysis Diagnostic Field Service Scrip

- **Current Product Approved Printer Matrix:**

  Lotus Notes > Service Bulletins \ Current Product Approved Printer Matrix

- **Current Product Software Revision Level Matrix:**

  Lotus Notes > Service Bulletins \ Current Product Software Revision Level Matrix

For a complete list of Service Forms & Documents, refer to the OS Field Service Paperwork Guide:

Lotus Notes > Field Service Reference Library > Policies Procedures and Informational Document Library > Policies and Procedures > CCD-006x

Appendix J. System Screens and Logs

Contents:

- Unit Configuration Screen
- System Log

The HFA II-*i* system software contains several screens and logs which can be used to determine system configuration, or may be used as troubleshooting aids. The descriptions given below assume that the system is fully operational. In certain instances, some or all of the screens or logs may not be obtainable due to instrument malfunction.

> ***Note:***
> 1. *Example screens and logs will vary based on the HFA II-i model and currently installed software, or the software being installed.*
> 2. *Further discussion of some of the items mentioned in this Appendix can be found elsewhere in this manual. In particular, software revision level information can always be found in the service bulletins.*

J.1 Boot Screen

Unlike the boot screen on the HFA II, unit configuration related information is not available on the boot screen of the HFA II-*i*. The information found on the HFA II boot screen will be found on the unit configuration screen commonly called the "**i**" screen of the HFA II-*i*. Also different from the HFA II is the fact that the HFA II-*i* does not report system errors with a set of audio beeping patterns. Refer to the Troubleshooting section in this manual for additional information.

J.2 Unit Configuration Screen

The HFA II-*i* Unit Configuration Screen provides system configuration data and system software information. This screen can always be accessed from the main menu of the instrument, and from some, but not all, other menus. Once accessed, it can also be printed. The screen provides such data as instrument serial number, software revision levels, and what hardware or software options have been enabled or disabled on the instrument.

To access the Unit Configuration Screen, perform the following:

- From the instrument's Main Menu, select the **"i"** button at the top left.
- After a short delay, a screen similar to the one shown below will be displayed on the CRT.
- If desired, the screen may be printed / saved by selecting Print/Save.

(1) Instrument model number.

(2) Instrument serial number.

(3) Revision level of the operating system currently installed on the hard disk.

(4) Revision level of the language software currently installed on the hard disk.

Note: *The language software revision level may be different from the operating or system software. This allows the language software to be updated independently of the system software.*

(5) Revision level of the Backplane.

(6) Revision level of the Motor Board.

(7) Available Memory on the system CPU PCB.

(8) Instrument hardware option number (refer to Appendix G).

(9) Instrument hardware options that have been enabled or disabled.

(10) Instrument software option number (refer to Appendix G).

(11) Instrument software options that have been enabled or disabled.

(12) Personalized identification for the doctor, instrument location, etc.

HFA II-*i* series Configuration

Model	750i
Serial Number	750-1723
Operating System	5.1.1 (0080)
Language	A6
CPU / Backplane	2000 / B2 A1:A1:A1:A1
Motor board Version	A3:a1:a1:a1:a1:a1
Available Memory	502 MB (DP, 146.64 GB)

Hardware Options - 00000000 00b30334

Red Filter	Enabled
Blue Filter	Enabled
Yellow Background Light	Enabled
Gaze Hardware Installed	Enabled

Software Options - 0597f9f8

Gaze Track	Enabled
Auto Pupil	Enabled
Head Track	Enabled
Vertex Monitoring	Enabled
Blindengeldgutachten	Disabled
Fuehrerscheingutachten	Disabled
Esterman	Enabled
Blue-Yellow	Enabled
Kinetic	Enabled
Custom Test	Enabled
GPA	Disabled
Data Export	Enabled
SITA-SWAP	Disabled
HFA-NET Pro	Enabled
DICOM Gateway 2.0	Enabled

Personalized ID

HFA 5.1 PERIMETRY

J.3 System Log

The principle role of the System Log is to attempt to keep track of all the 'events' that occur within the instrument. For example, an event can be a system restart (switching the instrument power to ON), recording an error code, showing the results of an attempt to rebuild the hard disk database, or the installation of a new revision of software, just to name a few. The date and time when each event occurred appears prior to each logged event. Note that there will be instances when an event cannot be logged because of an instrument malfunction. The log also contains the serial number of the instrument and the hardware option number (see Appendix G).

The log, which is stored on the hard disk, is a circular disk file containing up to 1000 entries (about 18, 8½ x 11" pages). The 1001st entry will write over the first entry in the log file (FIFO). The most recent event will be recorded as the last entry in the log unless there are currently 1000 entries.

The instrument operator can print or save the log. The Field Support Engineer can print, save and clear (erase) the log. As part of a service call, after printing/saving and retaining the log, the current log entries may be cleared as described below. Obviously, if there is a malfunction with the hard drive, the log cannot be printed, saved or cleared.

When possible, the System Log should always be printed out when troubleshooting an instrument problem. It can often provide valuable 'clues' when attempting to solve an instrument malfunction.

To print / save the log, perform the following:

1) From the Main Menu, select System Setup.
2) Select Print / Save System Log, then select Print or Save.
3) The log cannot be displayed on the CRT.

To print out or clear the log, perform the following:

1) From the Main Menu, select System Setup.
2) Select Additional Setup.
3) Select Diagnostics.
4) When the ten-key pad appears, enter the calibration password.
5) Select System Log.
6) Select Print / Save System Log and, if necessary, Clear System Log.

Appendix K. Data Loss Recovery

Contents:

- Data Loss Prevention Tips
- Database Structure
- The Five "R's" of Database Recovery
- Database Utilities
- Floppy Diskette - Troubleshooting Dialogue
- Hard Disk - Troubleshooting Dialogue
- Magnetic Optical Drive
- "Repair Backup" (repairs files on hard disk, enabling backup to be performed.)

K.1 Data Loss Prevention Tips

There may be situations, due either to operator misunderstanding or instrument malfunction, when the patient database or backup becomes corrupted or is reported as inaccessible. Prior to completing any data loss related service call, always take the time to discuss the following data loss prevention tips with your customer.

- Ensure that your customer understands the importance of routinely backing up their patient data files. At minimum, this should include a copy of each floppy diskette and at least one magnetic optical disk. In fact, it is recommended that two magnetic optical disks are used and rotated every other backup. Consult the Owner's Manual for recommendations on the frequency of backup.

- Stress the importance of proper handling and storage of floppy diskettes and magnetic optical disks. Make certain that tapes are stored at least five feet away from any magnetic field. This includes not storing the diskettes on the top surface of the HFA II.

- Verify that only high-quality, double-sided, high-density floppy ***preformatted*** diskettes are used. Only DOS preformatted floppy diskettes will operate in the HFA II. A preformatted diskette can be reformatted on the HFA II.

- Make certain that the customer understands that they should not remove a floppy diskette or magnetic optical disk from the drive during a read or write operation. Point out the floppy drive icon in the upper right of the CRT display. Ensure that they observe this icon and only remove the diskette at the appropriate time.

- If frequent data loss occurs, verify the power source that the HFA II is connected to meets instrument operational requirements. A fluctuating line voltage can cause database related problems. Use of an uninterruptible power supply or UPS may help prevent data loss. Operational and UPS requirements are discussed in Section 1.

- Explain the difference between a file that has been copied and one that was backed up using the Backup/Restore function in the disk menu. A copied file is one that was stored to the floppy drive after completion of a test, one which was copied or duplicated using the Copy or Duplicate Test functions in the File Functions Menu. The copied file can be placed onto the floppy drive and recalled for viewing on the CRT. A file that was backed up using the Backup/Restore function cannot be accessed and viewed on the CRT. This concept is often a source of confusion.

K.2 Database Structure

Two identical patient databases coexist on the hard disk drive. The Primary or principle database, and the Secondary database which is a duplicate of the Primary.

The Primary database is the principle database. That is, when a test is saved to the hard disk drive, it is first saved to the Primary database and then saved to the Secondary database. When a test is recalled from the hard disk drive, it is only recalled from the Primary database. The Secondary database functions are transparent to the customer.

K.3 The Five "R's" of Database Recovery

There are five basic steps to consider when attempting to correct a database problem:

Reboot............Recover............Reconstruct............Rebuild............Restore

1. Reboot

If the patient database cannot be accessed, Rebooting or turning the power off-on may correct the problem. This is often the simplest step to try. The instrument will attempt a recovery if either (but not both) of the databases fails to verify or if recovery was deferred (floppy only) prior to shut down. Rebooting or cycling power will also cause the instrument to present the operator with the on-screen message to recover or make the instrument a floppy-only system.

2. Recover

The Recover option is very much like performing a restore from magnetic optical disk. This option is selectable only when a problem with the Primary database has been detected. If a problem occurs within the Primary database, the operator will receive an on-screen message to either attempt to recover the database (Fix Now) or temporarily make the instrument a floppy-only system. If recovery is selected, the software will attempt to copy the Secondary database over the corrupted Primary database. If successful, the database has been recovered. If unsuccessful, then the hard disk database is disabled and the instrument can only be operated with a floppy disk database until it is repaired. The doctor can also defer recovery until the end of the day or automatically on boot the next day. This will allow the doctor to continue using the instrument so that he/she can test the patients in the waiting room.

The floppy-only option will allow the instrument to save only to the floppy disk drive. This enables the operator to continue to save patient exams until a Field Support Engineer can repair the hard disk drive problem. The floppy-only option would normally be selected if the Recover option has failed, the user has just completed a test and immediately needs to save it to disk, or does not currently have the time to wait for the Recover option to complete.

3. Reconstruct (or "Cleanup" on Additional Setup)

The hard disk Reconstruct option is described in Appendix K.4, Database Utilities.

4. Rebuild

The hard disk Rebuild option is described in Appendix K. 4, Database Utilities.

5. Restore

The restore option is often the last step taken in database recovery. Either the magnetic optical disk or the floppy backup is restored to the hard disk.

K.4 Database Utilities

In the event of a patient database problem, there are a number of software features designed to protect the integrity of the patient database. These utilities, described below, can be accessed and activated via the calibration portion of the software. Refer to Section 4 for access details.

The Database option provides six primary utilities which can be used to either rebuild, reconstruct or delete the patient database. Refer to Section 9 (Database Management) in the Humphrey Field Analyzer II User Guide.

K.4.1 Rebuild Hard Disk Database

This utility attempts to rebuild the corrupted index files and reconstruct the checksums that may exist on the hard disk. Selection opens a pop-up window warning the user that rebuilding may take a very long time. The options to continue (OK) or Cancel are provided. This can be a lengthy process depending on the number of files on the hard disk drive. This option is also available to the user via the System Setup, and Additional System Setup menu selections. The rebuild function will first attempt a simple recovery if it detects a database failure. If recovery succeeds, rebuild is done. Otherwise, it starts rebuild. If rebuild fails but the primary database can be opened then a reconstruct is automatically attempted.

> ***Note:*** *When rebuild of the primary database succeeds either the first attempt or after subsequent reconstruction the primary database is copied to the secondary database. The customer will see "Ensuring Database Integrity....." along with a progress bar.*

K.4.2 Rebuild Floppy Database

This utility attempts to rebuild any corrupt files that may exist on the floppy diskette. Selection opens a pop-up window asking the user if they wish to continue. The options to continue (OK) or Cancel are provided. This option is also available to the user via the System Setup, and Additional System Setup menu selections.

K.4.3 Delete Hard Disk Database

This utility will delete the entire patient database. All other files on the hard disk will not be affected. Selection opens a pop-up window informing the user that the entire database will be deleted. The options to continue (OK) or Cancel are provided.

K.4.4 Delete Temporary Database

This utility deletes any temporary database copies that reside on the hard disk. Selection will begin the deletion process. There is no option to cancel.

K.4.5 Reconstruct Database

The reconstruct utility is very similar to copying the hard disk database to floppy disks, deleting the hard disk database and then copying the floppy disks back to the hard drive. (The copy process differs from the restore process in that the copies only contain the patient data and not the hard disk File Allocation Table, which is more susceptible to corruption.) When reconstruct is selected, the Primary database is copied into a temporary location on the hard disk drive rather than the floppy disks. The Primary database at the original location is then deleted, and the Primary database at the temporary location is renamed (moved) back to the original Primary location. The "Cleanup Hard Disk Database" utility will remove any patients that have no tests. These options are also available to the user via the *System Setup, and Additional System Setup* menu selections.

K.4.6 Secondary Database Utilities

Selecting this option provides nine more database utilities. Each utility is described below.

- **Compare Database Sizes**

This function does a file by file byte level comparison of both the Primary and Secondary databases to verify that they are of the same size. This is a quick test that performs a count of the number of files in each database. Under normal system conditions, the two databases should always be equal. If they are not, the recovery option should be performed.

- **Verify Primary Database/Verify Secondary Database**

Checks to see that the database can be opened. Each database is verified independently.

Copy Primary to Secondary/Copy Secondary to Primary

Once it has been determined that either the Primary or Secondary database has a problem, this utility allows the service technician to copy the good database over the problem database.

> ***Note:*** *This is what happens during recovery. It is better to first select Rebuild if you know there is a failure. Rebuild will try to recover if there is a problem. These copy commands are low level equivalents to what happens automatically.*

- **Primary Read Test/Secondary Read Test**

Sometimes a database will open (verify) but will fail a read test. This utility checks each record in the database. Depending on the number of files on the hard disk, this may be a very time consuming test. Each database is read independently.

- **Delete Primary Database/Delete Secondary Database**

Once it has been determined that either the Primary or the Secondary database has a problem, this utility allows the service technician to delete the problem database.

K.5 Floppy Diskette - Troubleshooting Dialogue

If the floppy diskette database is corrupted or inaccessible, the customer will usually report the following on-screen error message: *"Floppy Disk Database is Not Accessible - Retry, Rebuild, or Cancel"* or similar error message.

Check/Perform the Following:

- Is the diskette IBM formatted?
- Does the customer have a backup copy?
- Is this the only diskette that has a problem or are there others? If all diskettes have problems, there may be a problem within the floppy subsystem (floppy drive, floppy cabling, and/or floppy disk controller on the CPU PCB). Refer to Section 5 for diagnostic troubleshooting procedures.
- Ensure that the file(s) on the diskette is a copied file and not one that was created as part of a backup using the Backup/Restore function.
- Check the diskette; is it damaged in any way? Is the diskette label applied properly, or does it cover a portion of the read access door?
- Check the System Log for database-related errors. The floppy database will be indicated as device 3.0. In general, errors like 7000c, 230001, f00de or similar errors are associated with the floppy drive patient database.
- Attempt a rebuild. From the Main Menu, select System Setup, Additional Setup, and then Rebuild Floppy Disk Database. This process will attempt to repair the damage. A rebuild can also be executed within Calibration. Refer to Section 4 for details.

- If the rebuild fails, try viewing the diskette on a PC. Proceed to the "A" drive and attempt to look at the directory. You cannot view individual patient files, but should be able to see the directory. The directory will consist of files like PATS.DAT, PATS.IDX, PDB.DAT, RXS.DAT, etc. If the diskette is part of a backup that was made using the Backup/Restore function you will only see BACKUP.PDB
- If the directory cannot be seen or looks damaged, try executing scan disk on the PC. It has been reported that this may partially repair a corrupted floppy.
- If all of the above has failed and there is not a duplicate of the diskette, contact Technical Support for additional assistance. Also, advise your customer to format and begin using a new diskette.

K.6 Hard Disk Drive - Troubleshooting Dialogue

The following dialogue is intended to assist you in solving database related problems. This is only one approach; each situation is unique. Ultimately, it is the service technician's choice to determine which utilities should be used and which approach should be taken. The dialogue utilizes the "5 Rs" of database recovery (Appendix K.3).

If the hard disk drive database is corrupted or inaccessible, the customer will usually report the following on-screen error message: *"Hard Disk Database is Not Accessible - Would You Like to Recover?"* or *"A hard drive database failure has occurred. You can only use a floppy disk until the hard disk drive database is repaired."*

Check/Perform the following:

- Does the customer have a backup? This can either be copies, a backup made using the Backup/Restore function, or a magnetic optical disk.
- Check the System Log for database-related errors. The hard drive database will be indicated as device 4.2. In general, errors like "hard drive error" or similar errors are associated with the hard drive patient database and/or the hard drive subsystem (hard disk drive, hard drive cabling, and/or the controller on the CPU PCB). Refer to Section 5 for hardware/diagnostic troubleshooting procedures.
- If a floppy diskette is inserted in the floppy drive, remove it and turn the instrument power Off/On (Reboot). Then make a second attempt to view the hard disk database. Sometimes a problem with the floppy diskette may be indicated as a problem with the hard disk drive or database.
- Was the option to Recover attempted? If not, attempt to recover the database. The recover option will normally be displayed either after the reboot or if you attempt to access the database. Select the "Fix Now" button in the Fix Now/Floppy Only alert.
- If the recover option fails, proceed to the Diagnostics/Calibration Menu and select the Reconstruct database option. The Reconstruct utility can only be attempted if the database can be opened. If it cannot then use Rebuild to perform rebuild/reconstruct.
- If reconstruct fails, attempt a hard disk Rebuild if the database can be opened.
- If the rebuild fails, and the customer *DOES NOT* have a backup of their database available, replace the hard disk drive with a new drive. Contact the Technical Support Department and arrange to have the old drive returned. There may be a possibility that the data can be recovered

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- If the customer *DOES* have a backup available, choose the Restore utility. This will delete only the database from the hard disk. Once deleted, the Restore utility will continue to automatically restore the database, and check to see that all files have been restored and can be accessed (viewed and printed). Run at least one simulation test to ensure that the hard disk drive can also be written to as well.
- If the restore of the database does not correct the problem, attempt to initialize the hard disk drive (refer to Appendix L). Once initialization is complete, restore the database (and other customer set-ups — printer type, personalized ID, etc.) from a configuration backup floppy.
- If the initialization fails, it is likely to be a problem with the hard drive subsystem (hard disk drive, hard drive cabling, and/or the controller on the CPU PCB). Refer to Section 5 for hardware/diagnostic troubleshooting procedures.
- Once restore is complete, check to see that all test/patient files have been restored and can be accessed (viewed and printed). Run at least one simulation test to ensure that the hard disk drive can be written to.

K.7 Magnetic Optical Disks

If the magnetic optical disk cannot be restored, the customer will usually report the following on-screen error message: "Backup Fails," "Disk is Write Protected," "Insert a Disk with a capacity of at least nnnn," "Your Database is Too Large to Fit on the Current Disk," "Format Fails," "Failure in Verification Phase I," and "Failure in Verification Phase II."

Check/Perform the Following:

WARNING: *Performing a Restore will write over any files that currently reside on the hard disk drive. Ensure that you have copied (use the Copy function) any files currently on the hard disk on to a floppy diskette prior to performing the restore operation. If the "Replace" option vs the "Merge" option has been selected, option dialogue does not appear if a database failure has been detected.*

- Does the customer have more than one backup magnetic optical disk? If so, try backing up to the other magnetic optical disk or to a new magnetic optical disk.
- If the magnetic optical disk is new, try initializing it via the File Functions Menu.
- Contact the Technical Support Department and arrange to have the magnetic optical disk returned. There may be a possibility that the data can be recovered.
- Check the System Log for the above mentioned error types. There may be a problem with the magnetic optical disk subsystem (magnetic optical disk drive, magnetic optical disk cabling, or the controller on the CPU PCB). Refer to Section 5 for diagnostic troubleshooting procedures.

Appendix L. Initializing the Hard Disk

Note: *The procedures outlined below only apply to IDE hard drives. SATA drives (5.1 and greater HFAs) cannot be low level formatted in the field.*

Hard disk drives are pre-initialized when ordered as a spare part. In the event hard disk initialization is required, it can be done at the repair site.

There are two types of initialization: low level and high level. The low level initialization prepares the hard drive for the high level initialization. Data may not be stored on the hard drive if only the low level format has been done. High level initialization is required to save data on the drive.

All drives should come from the factory low level formatted. Current requirements for the HFA II-*i* require that the low level initialization uses FAT 16 format and has only one partition. That partition will make use of up to 2.1 gigabytes of disk space.

High level initialization can be done many times on a drive and is used to remove all data from a drive. The high level initialization is performed using the HFA II-*i* application system software.

The items listed below are stored as files on the hard disk drive. Initializing the drive will erase these files. Therefore, depending on the situation, attempt to acquire this information prior to initializing the hard disk. All of the items will need to be restored after the drive has been initialized and or replaced.

- Application system software - Ensure that you have the latest revision to load on the hard disk.
- Setup Configuration - Items such as Alter Main Menu, printer type, personalized ID, head tracking On/Off, etc. are all stored on the hard disk drive. The configuration should either be written down or backed up onto a floppy diskette prior to initializing the hard disk.
  To back up the Setup configuration, proceed as follows:
  1) From the Main Menu, select System Setup, and Additional Setup.
  2) Select Backup Configuration and follow the on-screen instructions.
- Patient Database - Reload the patient database for all models that can save patient files on the hard drive. If the instrument is so equipped, this can be done using the Magnetic Optical Diskette and/or floppy diskettes.
- Calibration Configuration - All of the calibration values as well as the model, serial number and option codes are stored on the hard drive. These values are stored on the HFA II-*i* Series Calibration Backup disk.
  To back up the Calibration configuration, proceed as follows:
  1) From the Main Menu, select System Setup, and Additional Setup.
  2) Select Diagnostics.
  3) When the ten-key pad appears type in the password.
  4) Select Save. Place a disk in the floppy drive and follow the on-screen prompts.

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High Level Initialization of the Hard Drive.

Note - *Change BIOS (Advanced CMOS Setup) 1st Boot Device from IDE-0 to Floppy. Change 2nd Boot Device from Floppy to IDE-0. Remember to save the changes when you exit the BIOS setup. Once Initialization has been completed, change the BIOS to its original setup. Remember to save the changes when you exit the BIOS setup. Load the appropriate system software.*

1. Switch OFF power to the instrument.
2. Insert the 3.5" floppy disk #1 containing the application system software into the floppy drive.
3. Switch ON power to the instrument.
4. For a brief moment you will see the message “Your Humphrey Field Analyzer is powering up: please wait” displayed on the monitor as the operating system is loaded from the disk to the CPU memory. Upon completion of loading you will see the following display:

   HFA II-i Series Installation 3.2 (0409)

5. Press “Utilities”. Message will come up as follows:

   Formatting the hard drive will erase all data including the Patient Database!
   Are you sure?

   NO **YES**

   Note: *Formatting will be completed in a few seconds.*

   SEE WARNING below

6. Upon completion of the formatting you will be returned to the following display:

   HFA II-i Series Installation 3.2 (0409)

   Press “Install” to install the HFA II-i series system software.

WARNING:

ALL DATA ON THE HARD DRIVE WILL BE LOST DURING THIS PROCESS.

This function permits the Field Support Engineer to format and initialize the hard disk drive. Performing this test destroys all data on the hard disk drive (operating system, patient data, printer type, setup data, calibration data and alter main menu data). This function performs a high-level format of the hard disk drive.

Low Level Formatting of the Hard Drive

If for some reason you receive a hard drive for the HFA II-*i* that is not formatted or requires formatting, it is possible to perform a low level format with a Windows 95-98 system disk that contains FDISK.exe and FORMAT.com.

1. Power off the HFA II-*i*. Wait 5 to 10 seconds. Power the HFA II-*i* back on and immediately press and hold down the DEL key.

   Enter CURRENT Password: - will be displayed.

2. Enter password

   The BIOS main menu screen will be displayed.

3. Press the down arrow once to highlight Advanced CMOS Setup and Press Enter.

4. Press the down arrow key once to highlight 1st Boot Device.

5. Change 1st Boot Device to Floppy by pressing the Page down key until the arrow is next to Floppy.

6. Press ESC. Press F10 function key to save and exit.

7. Press Enter.

8. Insert a Windows 95 or 98 system diskette with the FDISK and FORMAT files installed.

9. Power on the HFA II-*i*. Will boot to an A:/> prompt.

10. Type FDISK and press enter.

    Do you wish to enable large disk support (Y/N)? [Y] - default.

    You have two options to choose from, either Y to enable FAT32 when creating partitions or N do not enable FAT32 and instead use FAT16.

11. Type N and press enter.

    Verifying drive integrity.

    Current fixed disk drive: [1] - default

    Choose one of the following:

    1. Create DOS partition or Logical DOS Drive
    2. Set active partition
    3. Delete partition or Logical DOS Drive
    4. Display partition information

    Enter choice: [1] - default

12. Press Enter to select 1 as the default.

    Current fixed disk drive: [1] - default

    Choose one of the following:

    1. Create Primary DOS Partition
    2. Create Extended DOS Partition
    3. Create Logical DOS Drive(s) in the Extended DOS Partition

    Enter Choice: [1] - default

13. Press Enter to select 1 as the default.

    Do you wish to use the maximum available size for a primary DOS partition and make the partition active. [Y] - default.

14. Type N and press enter.

    Verifying Drive Integrity.

    Enter partition size in Mbytes or percent of disk (%) to create a Primary DOS Partition . . . . [2047].

15. Press Enter to accept the default of 2047 (2.047 Gb).

Partition	Status	Type	Volume Label	Mbytes	System	Usage
C:	**1**	**Pri**	**DOS**	**2047**	**UNKNOWN**	**10%**

__Note:__ FAT16 will not appear under System until the drive has been formatted. Usage (%) will vary with total drive size.

Volume Label is to remain blank.

16. Press ESC to go back to the first four options.

    1. Create DOS partition or Logical DOS Drive
    2. Set active partition
    3. Delete partition or Logical DOS Drive
    4. Display partition information

17. Select 2 and Press Enter.

    Enter the number of the Partition you want to make active . . . . [ ].

18. Type 1 and Press Enter.

    An A will appear under Status.

19. Press ESC 3 times to Exit FDISK.

20. Power off the HFA II-*i*. Wait 5 to 10 seconds. Power the HFA II-*i* back on.

21. At the A:\> prompt Type FORMAT C: and Press Enter.

    A warning message will be displayed.
    Proceed with Format (Y/N)?

22. Type Y and Press Enter.

    Formatting 2,047.31M

    Volume label (11 characters, Enter for None)?

23. Press Enter.

24. Remove the Windows diskette from the floppy drive.

25. Power off the HFA II-*i*. Wait 5 to 10 seconds. Power the HFA II-*i* back on and immediately press and hold down the DEL key.

    Enter CURRENT Password: - will be displayed.

26. Enter password.

    The BIOS main menu screen will be displayed.

27. Press the down arrow key once to highlight Advanced CMOS Setup.

28. Press Enter.

29. Press the down arrow key once to highlight 1st Boot Device.

30. Change 1st Boot Device to IDE-0 by pressing the Page up key until the arrow is next to IDE-0.

31. Press ESC. Press F10 function key to save and exit.

32. Press Enter.

    Invalid System Disk
    Replace the disk and press any key.

33. Insert the 1st HFA II-*i* system software diskette.

34. Press Enter.

    VxLd 1.2 . . . . will be displayed.

    The floppy will be accessed and the display screen will go blank.

    The floppy drive light will go out for up to 15 seconds and the floppy drive will be accessed again. After a few seconds the screen will display the INSTALL and UTILITIES buttons.

35. Press UTILITIES to format the drive. (This only takes a few seconds)

    Formatting the hard drive will erase all data including the Patient Database!
    Are you sure?

    NO **YES**

36. Press YES to format the hard drive.

    Formatting complete.

    CONTINUE

37. Press Continue.

38. Press the INSTALL button and follow the prompts.

    Once all of the HFA II-*i* software diskettes have been loaded the following message will be displayed.

    Completed Copying files.

    Remove Floppy and Cycle power to complete installation.

39. Power off the HFA II-*i* and remove the diskette from the floppy drive.

40. Power the HFA II-*i* back on.

    Complete Install button will be displayed.

41. Press the Complete Install button to complete the installation.

    Installation in Progress.

    Displays percentage bar and beeps once in awhile until completed

    Installation Successful

42. Power off the HFA II-*i*. Wait 5 to 10 seconds. Power the HFA II-*i* back on.

Cycle power to begin using the installed software.

The HFA II-*i* should now boot to the Main Menu screen.

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Appendix M. Loading Application Software

Customer-installable software updates are supplied to the customer on floppy disks / USB drive. The diskettes / USB drive are referred to as the application system software, or simply the system software.

The system software consists of several other different software revisions, all of which (except the installation software) get loaded into the instrument during the software installation process. The system software consists of the following:

- Installation software
- Operating system software — loads onto the hard disk drive
- Language software — loads onto the hard disk drive
- CPU (boot) software — loads onto the hard disk drive
- Motor Driver software — loads into the flash IC on the Motor Driver PCB

To view the revision levels of each software, refer to Appendix J, System Screens and Logs.

In service situations where the hard disk is being replaced, or the Field Support Engineer suspects possible corruption of the system software on the hard disk, the system software can be reloaded onto the hard disk.

Loading System Software from Floppy Disk:

1. Switch the instrument power to OFF.

2. Insert the 3.5" HFA II-*i* Series System Software floppy diskette labeled #1 into the floppy disk drive. The current software requires four diskettes. Future software versions may require more.

3. Switch the instrument power ON and you will soon see a *VX Ld 1.2 ....* display on the monitor as the operating system is loaded from the disk to the CPU memory. When complete, you will see the following display:

   HFA II-i series installation 3.2 (0409)

   Install Utilities

4. Select Install. A *Copying Files* prompt will be seen on the screen.

5. When the disk files are loaded you will see a Please Insert Disk # 2 and press any key dialogue displayed.

6. Remove disk # 1 and insert disk # 2. Press any key on the keyboard.

7. A Verifying Copy Disk and then Copying Files prompt will again be seen on the screen.

8. When the disk files are loaded you will see a **Please Insert Disk # 3 and press any key** message displayed.

9. Remove disk # 2 and insert disk # 3. Press any key on the keyboard.

10. A ***Verifying Copy Disk*** and then ***Copying Files*** prompt will again be seen on the screen.

11. When the disk files are loaded you will see a ***Please Insert Disk # 4 and press any key*** message displayed.

12. Remove disk # 3 and insert disk # 4. Press any key on the keyboard.

13. A ***Verifying Copy Disk*** and then ***Copying Files*** prompt will again be seen on the screen.

14. When the fourth disk files have been loaded you will see ***Completed copying files, remove floppy and cycle power to complete installation*** on the display.

15. Remove disk # 4 and turn the unit power to OFF.

16. Wait fifteen seconds and turn the unit power to ON.

17. Soon a ***Completing the installation of HFA II-i 54798.3.2 52557.A2 Existing installed product HFA II-i XXXXX.revNN XXXXX.NN A2:a1:a1:a1:a1:a1 Install date MM-DD-YYYY*** display will be seen. This indicates the application code revision and the motor driver board code revision respectively of the newly installed software as well as the application code revision and the motor driver board code revision of the previously loaded software. The XXXXX is the part number of the software, NN is the revision number, and MM-DD-YYYY is month, day and year that the previous software was loaded.

Complete Install

18. Press Complete Install - A progress meter will be displayed and will climb to the 100%. You will hear three beeps during the load process indicating that the software is loading correctly.

19. When the load is completed an ***Installation successful, cycle power to begin using the installed software*** dialogue will replace the progress meter.

20. Turn the instrument power to OFF. Wait fifteen seconds and then turn the instrument power to ON.

21. When the instrument powers up to the main menu, select the "**i**" button from the top of the main menu. Verify that the correct revision of software has been loaded. The software revision level can be viewed opposite the "Operating System" listing.

The installation is now completed.

Notes:

1) If the system software was loaded on a newly initialized drive, you will encounter a number of system errors and messages before the main menu is displayed. One of the messages will indicate that a new patient database will be created.

2) If the software was loaded on a newly initialized drive you will need to restore the calibration configuration, unit configuration, patient database and any software options that were on the unit prior to the initialization. See Section 4.8 for instructions on restoring the calibration configuration.

Loading System Software from USB:

1. Switch the instrument power to OFF.

2. Insert the application software USB thumb drive into a USB port.

3. Turn the instrument power to ON.

4. Press the install software button when it appears on screen.

5. Follow the on-screen prompts to complete the software install.

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Appendix N. Special Software Options

Designed into the software are options that can only be enabled using a particular password. One such feature is the Ocular Hypertension Treatment Study or OHTS software. The password for OHTS can be obtained from the Technical Support Department. Once the password has been obtained, perform the following steps to enable OHTS:

1. From the Main Menu, select *System Setup*.
2. Select *Additional Setup* and then select *Diagnostics*.
3. When the ten-key pad appears, type in the specified password and select [Enter].
4. Select *OHTS* Option to ON.
5. The instrument is now enabled for the OHTS feature.

Currently, OHTS is the only software feature that may need to be enabled at a customer site. As other specialized options become available, they will be announced in a service bulletin.

Appendix O. Hardware Upgrades

At this time the following upgrades are authorized for the HFA II-*i*:

Magneto Optical Drive Upgrade – The Magneto Optical Upgrade was created to provide an efficient backup method for the 720-*i*, 740-*i* and 745-*i* HFA II-*i* models. Details as to the required parts, installation, and calibration procedures for this upgrade are provided Service Bulletin FA2i-007x.

Kinetic Software Upgrade – The Enhanced Kinetic software program is now available for customers with HFA II-*i* Models 740-*i* and 745-*i*. The upgrade will include the enhanced kinetic program, custom kinetic and the SSA disability test. This upgrade is customer installable.

Blue – Yellow Upgrade – Offers the addition of hardware / software to enable blue – yellow (SWAP) testing. Details as to the required parts, installation, and calibration procedures for this upgrade are provided in Service Bulletin FA2i-012x.

> ***Note:*** *All field upgrades (both domestic and international) MUST be reported to Carl Zeiss Meditec Customer Care department. If an upgrade is performed without the knowledge of Carl Zeiss Meditec, a future release of software (when loaded on the upgraded HFA II-i) will disable the unauthorized upgrade.*

Appendix P. HFA Data Transfer Cable Diagrams

The Data Transfer cables are frequently used with the HFA II-*i*. Shown below are the cable diagrams for troubleshooting or fabrication purposes. The cables can also be ordered directly from the Carl Zeiss Meditec Parts Department.

Data Transfer Cables

HFA I to HFA II-*i* Serial Cable [0000001171872 (P/N 52416)] - The HFA I to HFA II-*i* null modem serial cable is used when transferring patient data files from an HFA I to an HFA II-*i*. Refer to Appendix C for details on cable hookup and use. The cable is available in a ten-foot length.

HFA I End (25-Pin Male)	HFA II-*i* End (9-Pin Male)
2	2
3	3
4	8
5	7
6	4
7	5
20	6

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HFA II to HFA II-*i* Serial Cable [P/N 0000001171873 (52417)] - The HFA II to HFA II-*i* serial null modem cable is used when transferring patient data files from an HFA II to an HFA II-*i*. Refer to Appendix C for details on cable hookup and use. The cable is available in a ten-foot length.

HFA II End (9-Pin Male)		HFA II-*i* End (9-Pin Male)
2	⟷	3
3	⟷	2
4	⟷	6
5	⟷	5
6	⟷	4
7	⟷	8
8	⟷	7

Appendix Q Care and Cleaning of Optics

Proper care and cleaning of optical components will assure optimum performance and maximum lifetime. Contaminants on an optical surface increase scatter off the surface and absorb light energy, creating hot spots that eventually lead to coating failure.

The cleaning of any precision optic risks damaging the surface so optics should only be cleaned when necessary. The need for cleaning can be minimized by returning optics to their case or covering the optic and mount with a protective bag when not in use.

Cleaning Do's and Don't's

Do:
– Use real cotton Q-tips (lens tissue can also be used)
– Always wet the Q-tip or lens tissue in the cleaning agent before cleaning
– Use reagent grade acetone whenever possible (isopropyl alcohol may also be used).

Don't:
– *Do Not* use acetone or alcohol to clean the film wedge. Use only compressed air or a camel hair negative brush.

> ***Note:*** *Care should be taken when using compressed air as it may occasionally deposit moisture on the targeted surface.*

Assemblies that may be Cleaned

Assemblies that may be cleaned are listed below. Those marked with an asterisk (*) will require some recalibration after cleaning. Refer to Table 3-1 in Section 3 for guidelines. Assume that a newly cleaned assembly is the same as one that has just been replaced.

(Refer to the projection path diagram in Section 6 for assembly identification.)

Condenser lens
* Glass wedge
* Film wedge (see above note on cleaning)
* Color wheel
Upper lens
First projection mirror
Second projection mirror
Third projection mirror
Lower lens
* Brightness detector
Blue filter (glass)

WARNING: *Damage will occur to the Green Filter if cleaned with acetone.*

When cleaning is required, we recommend one of the following procedures.

Q.1 Cleaning Supplies

- **Latex Finger Cots and Gloves:** Solvents are harsh to the skin, wear protection.
- **Optics Cleaning Tissue:** Soft, absorbent, lint-free lens tissue is best.
- **Swabs:** Cotton swabs with wooden handles or polyester swabs with polypropylene handles are best.
- **Blower:** Filtered dry nitrogen blown through an antistatic nozzle is best. Canned dusters also work. Bulb-type blowers and brushes must be kept clean to prevent recontamination.
- **Mild Soap:** Neutral soap, 1% in water. Avoid perfumed, alkali, or colored soaps. Several drops of green soap (available at a pharmacy) per 100 cc of distilled water is acceptable.
- **Isopropyl Alcohol:** Spectroscopic grade evaporates more slowly than acetone.
- **Acetone:** Spectroscopic grade.
- **Hemostats:** For holding lens tissue.
- **Tweezers:** For holding small optics.
- **Bright Light:** For inspection.

Q.2 General Cleaning Procedures

Dust Cleaning

Dust on optics can be very tightly bound by static electricity. Blowing removes some dirt; the remainder can be collected by the surface tension of a wet alcohol swab. Acetone helps promote rapid drying of the optic to eliminate streaks.

Blow off dust. If any dust remains, twist lens tissue around a swab, soak in alcohol, and wipe the optic in one direction with a gentle figure-eight motion. Repeat as necessary. Next, repeat using acetone.

Cleaning Heavy Contamination

Fingerprints, oil, or water spots should be cleaned immediately. Skin acids attack coatings and glass and can leave permanent stains. Cleaning with solvents alone tends to redistribute grime. These contaminants must be lifted from an optical surface with soap or other wetting agent. The optic is then rinsed in water and the water removed with alcohol. Acetone helps speed drying and helps eliminate streaks from forming.

Blow off dust. Using a soap saturated lens tissue around a swab, wipe the optic gently in a figure-eight motion. Repeat as necessary. Repeat this procedure with distilled water. Repeat again with alcohol. Repeat once more with acetone.

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Drop and Drag Cleaning Method

This method is often used for light cleaning of flat optical surfaces, such as mirrors. For cleaning grease, oil, water spots, or other heavy contamination, begin first with the cleaning procedure previously mentioned.

Place the optic on a clean work surface. Blow off dust. Hold a piece of unfolded lens tissue above the optic and place a few drops of acetone on the tissue. Lower the lens tissue onto the optic and pull it across the optic. Repeat this procedure until the optic is clean. Be sure to use a new piece of lens tissue with each pass. This will avoid scratching the optical surface by dragging loose contaminants.

Brush Cleaning Method

This technique is ideal for cleaning smaller optics, including lenses, and involves holding a folded lens tissue with a hemostat to brush the surface clean.

Fold a lens tissue so as not to touch the part of the tissue that will make contact with the optic. The fold should be about as wide as the optic. Hold the tissue with hemostats parallel to and near the fold. While holding the optic, using tweezers if necessary, blow off any dust. Soak the tissue with acetone. Brush the fold in the tissue across the surface of the optic using light pressure. Repeat as necessary until the optic is clean, making sure new lens tissue is exposed with each wipe.

For mounted optics with hard to reach edge corners, wrap lens tissue around a swab, soak it in acetone, brush around the edge and then across the middle using a continuous figure-eight stroke. Repeat if necessary.

Wipe Cleaning Method

For heavier cleaning of lenses and mirrors, this method involves wiping an optic with a lens tissue by hand.

Blow off dust. Fold a lens tissue as with the brush method. Apply acetone to the tissue. Holding the lens tissue in your hand with the fold near the tip of your fingers, apply uniform pressure while gently wiping across the surface of the optic. Repeat as necessary until the optic is clean, making sure new lens tissue is exposed with each wipe.

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Appendix R. Optional Software Installation

Prior to loading the optional software, you should print the current software options in the "i" screen. After loading the software options you should verify that the options are enabled in the "i" screen. Additionally, you should verify that the options appear in the menus and are functional.

Licensing the Software Options:

Refer to Service Bulletin FA2i-025x for the Optional Features Licensing Procedure.

Licensed Options Include:

Kinetic - The upgrade, for Models 740-i and 745-i, includes the enhanced kinetic program, custom kinetic and the SSA disability test. This upgrade is customer installable.

SitaSWAP - If an HFA II-i is equipped with SWAP hardware, the instrument can then be licensed for SitaSWAP. SitaSWAP is only applicable to the Threshold 24-2 test. This upgrade is customer installable

GPA - Enables the enhanced Glaucoma Progression Analysis. This feature is customer installable.

HFANet - Enables the available networking features. The instrument must be equipped with a minimum 4.2.2 software version. This upgrade is customer installable.

DICOM - Enables the instrument to be DICOM compliant. The instrument must be equipped with a minimum 5.0 software version. This upgrade is customer installable.

Data XML Export - Enables the instrument to export test data in XML format. This upgrade is available for clinical research sites. Approval for license use must be obtained from Product Management. Once approved this feature is customer installable.

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Appendix S. Network Connectivity Goals & Requirements

The goals described here provide an overview of the required software/licenses for the HFA™ and server based upon the end connection goal. There are three end goals.

Goal 1

View the PDF or TIFF of the HFA report in the patient record of a DICOM compliant EMR or Viewer/Archive application (Example: VistA, FORUM; Export a DICOM compliant image file and raw data to the server and attach the image file to an EMR or Viewer/Archive application).

HFA Software	HFA License	Server Software
Version 5.0	DICOM Gateware 2.0	DICOM Gateware 2.0
Version 5.1	DICOM Gateware 2.0	DICOM Gateware 2.0

Goal 2

View an HFA report in the patient record of an EMR. Requires export of the HFA PDF or TIFF image file to a shared network folder that an EMR can import from.

(This EMR integration method using HFA-NET Pro requires an HFA-specific interface. EMRs that have created an HFA-specific interface are OfficeMate/ExamWRITER®, Compulink, Versasuite and Medflow. Only these EMRs will be supported for connectivity with HFA-NET Pro. Connectivity to other EMRs is available through FORUM.)

HFA Software	HFA License	Server Software
Version 4.2.2	NetPro	N/A
Version 5.0	NetPro	N/A
Version 5.1	NetPro	N/A

Goal 3

View an HFA report on a PC. Requires exporting a PDF or TIFF image file of the report to a network folder, and browsing to that folder to view the file.

HFA Software	HFA License	Server Software
Version 4.2.2	NetPro	* Adobe® Acrobat (for PDF) * Windows® Picture and Fax Viewer (for TIFF)
Version 5.0	NetPro	* Adobe® Acrobat (for PDF) * Windows® Picture and Fax Viewer (for TIFF)
Version 5.1	NetPro	* Adobe® Acrobat (for PDF) * Windows® Picture and Fax Viewer (for TIFF)

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Requirements

Server	* Pentium® 1.8GHz / 1GB RAM / 40GB minimum free Hard Disk space. * HFA file size (per exam) – average PDF: 30Kb.
Operating Systems	* Windows® XP and Vista. Also Windows® 2003 and 2008 server. * Common Internet File System (CIFS) and/or File Transfer Protocol (FTP) are required.
Switches	* HFAs equipped with software version 5.0 or less, must use a 10/100 Mbps Ethernet connection, forced through to the server. 1000 Mbps (Gigabit Ethernet) connections are not supported. * HFAs equipped with software version 5.1 or greater will support 1000 Mbps Ethernet. If two or more HFAs are on the network, and one is 5.0, the network must be configured to run at 10/100 Mbps as described above.
Humphrey Field Analyzer (HFA)	* HFA must be an "i" series. Non-i series HFAs do not have an Ethernet port and therefore cannot be configured to run on a local area network. * Minimum HFA application software and software licenses are required. Depending on the vintage of the HFA, it must be equipped with application software version 4.2.2 or 5.0, and/or version 5.1 or greater software for newer HFAs (see What is the Customer's End Goal? Appendix S). * Depending on your final connectivity goal, and the vintage of your HFA, you may need to purchase an HFA-NET Pro or DICOM Gateway license to connect to the server (see What is Your Connectivity End Goal? Appendix S). * The HFA can transmit exam reports in two file formats (PDF or TIFF) to a Windows shared folder using CIFS or FTP. In addition, the HFA can transmit exam data (in a protected format) to a Windows shared folder, for backup and restore purposes. (If more than one HFA is on the network – see below.) * Two or more HFAs connected to a network can share data through a central database solution (such as FORUM®).[1] * The HFA can be connected to many Electronic Medical Record (EMR) applications through FORUM.
Network Printers	* Printers must support either PCL 3 or 5 natively. Printers that emulate PCL 3 or 5 are not supported. * Configuring an HFA for network printing requires the HFA to first be connected over the network to a Windows® computer that shares access to a supported printer.

Note: *To network an HFA 5.1 instrument with other HFAs, all other HFAs must be running system software version 5.0 or greater. A DICOM compliant EMR that supports Modality Worklist and EPDF IOD is required.*

[1] Prior to the availability of FORUM, sharing data between HFAs used the Archive/Retrieve process using HFA-NET Pro. This method is no longer recommended for sharing data between instruments, due to limitations in implementing some types of changes across instruments. Now with the availability of FORUM, HFA Archive/Retrieve should only be used as a secondary method to backup/restore HFA databases over local area networks.

Appendix T. HFA Data Compatibility

Sharing Data – Mixed HFA Environment – To share data between HFAs that are *Not Networked*, follow guidelines in the charts below. Doing so enables you to copy or convert tests so that they can be copied, viewed or printed on HFA II or HFA II-i instruments.

Note: *If your HFA is equipped with version 5.1 or greater software, a USB floppy drive will be needed to move data to HFAs equipped with only a floppy drive.*

Copy Tests Function – HFA tests can be copied from one HFA II or HFA II-i instrument to another HFA II or HFA II-i instrument as long as the receiving instrument is running the same or newer version of software. However, the COPY TESTS function (FILE FUNCTIONS>COPY TESTS) does not allow data to be saved from an instrument running newer software to another instrument running an older version of system software. The following table describes the COPY TESTS behavior regarding data compatibility.

		Copy To				
		HFA II-*i*			HFA II	
		V5.x	V4.x	≤ V3.x	V15.0	VA6 – V14.2
Copy From	V5.x	✔	–	–	–	–
	V4.x	✔	✔	–	✔	–
	≤ V3.x	✔	✔	✔	✔	✔
	V15.x	✔	✔	–	✔	–
	VA6 – V14.2	✔	✔	✔	✔	✔

CONVERT TESTS FUNCTION – Starting with HFA version 5.0 system software, an additional option for sharing exams between instruments is available. The new CONVERT TESTS feature (FILE FUNCTIONS>CONVERT TESTS) allows HFA data from an instrument running version 5.x system software to be saved in a generic HFA format that can be read by previous versions of HFA software.

		Converted File Compatibility		
		HFA II-*i*		HFA II
		V5.x	< V5.x	VA6 – V15.0
Convert From	V5.x	NA	✔	✔

The CONVERT TESTS feature is designed to work only with an empty floppy disk and is intended to allow sharing HFA tests between practices. This feature is not designed for routinely sharing tests between HFAs in the same practice because not all the data items in the database are saved during the CONVERT TESTS function. HFAs in the same practice can share data most effectively if they are all running the same version of system software.

***WARNING:** HFA V5.x creates a different database structure not fully compatible with previous versions of software.*

Appendix U. Description of New Behavior for Patient Data w/version 5.0 & Greater

Background:

Patient identity is defined by four data fields. The first three can be edited / entered from the patient data 1 screen. The fourth is a system setting / preference:

1. Patient's Name
2. Patient's Date of Birth
3. Patient's ID
4. Issuer of Patient's ID

Prior to 5.0, a user could, from the Patient Data 1 screen, recall a patient then edit the first three patient data fields – name, DOB, ID. If they edited the name or DOB, they would not actually correct the patient's identity but create a new patient – very misleading.

Change in Behavior:

1. The option to edit the ID is accessed in the Patient Edit dialog:

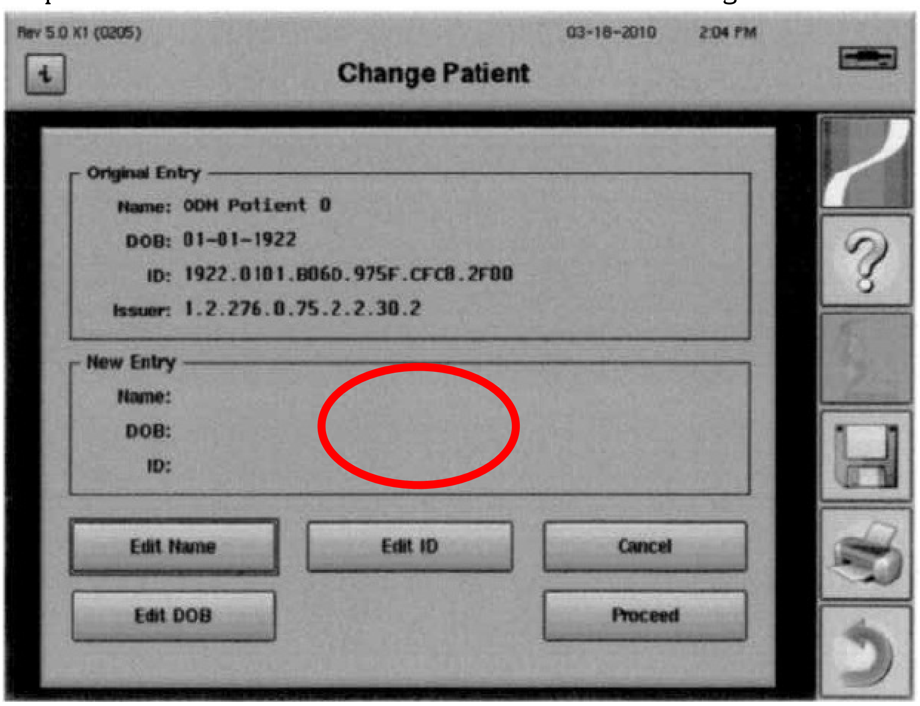

FIGURE U.1. Patient Edit Dialog with New Edit ID Button

When the user edits an ID and it happens to match an existing patient, a warning will be presented and they will have to choose a different ID.

When the user edits an ID and it happens to match an existing patient, a warning will be presented and they will have to choose a different ID.

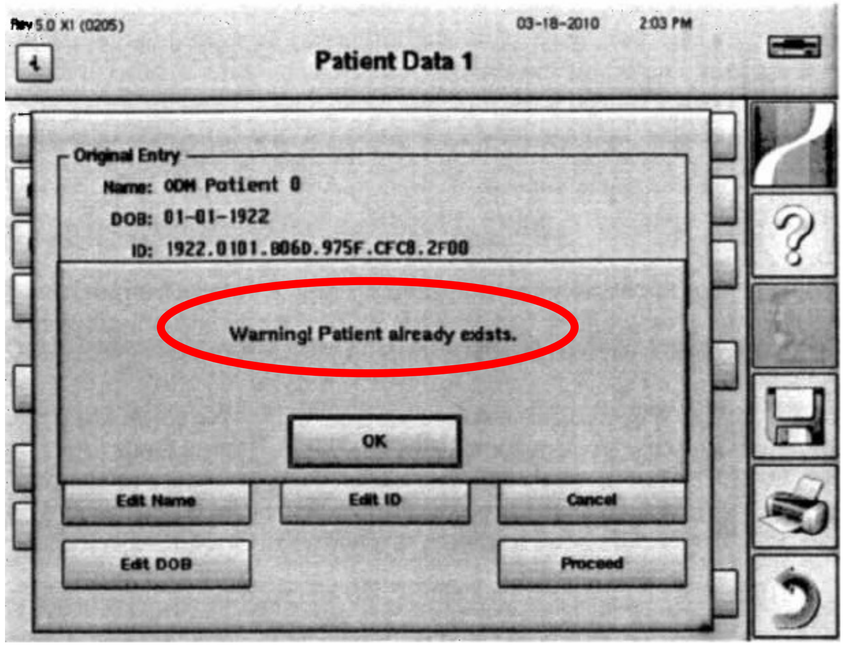

FIGURE U.2. Patient Edit – ID Already Exists Warning

For now, we are not providing the option from the Patient Edit dialog, to merge patients. This can still be done from the patient browser. If the user changes the ID, then the Issuer of ID will change to what is stored in the system preferences.

2. If the patient was recalled from the floppy, MWL, or DICOM Archive, the behavior is unchanged – the user will not be able to edit the patient's identity.

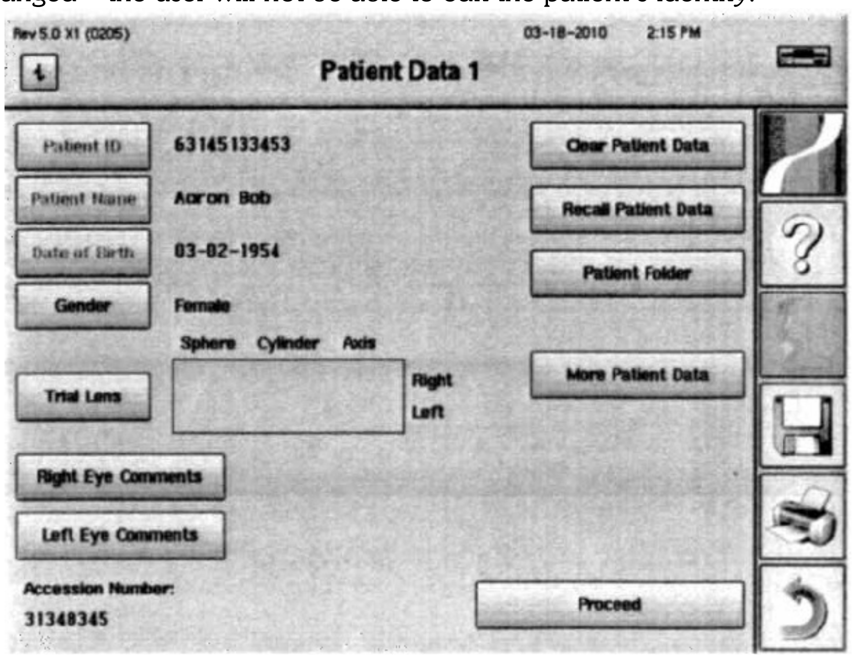

FIGURE U.3. Patient Data 1 Screen – Recall from other than HD w/Identity Buttons Disabled

3. If a patient has been recalled from the Hard Drive from the Patient Data 1 screen, the Name, DOB, and ID buttons will still be active.

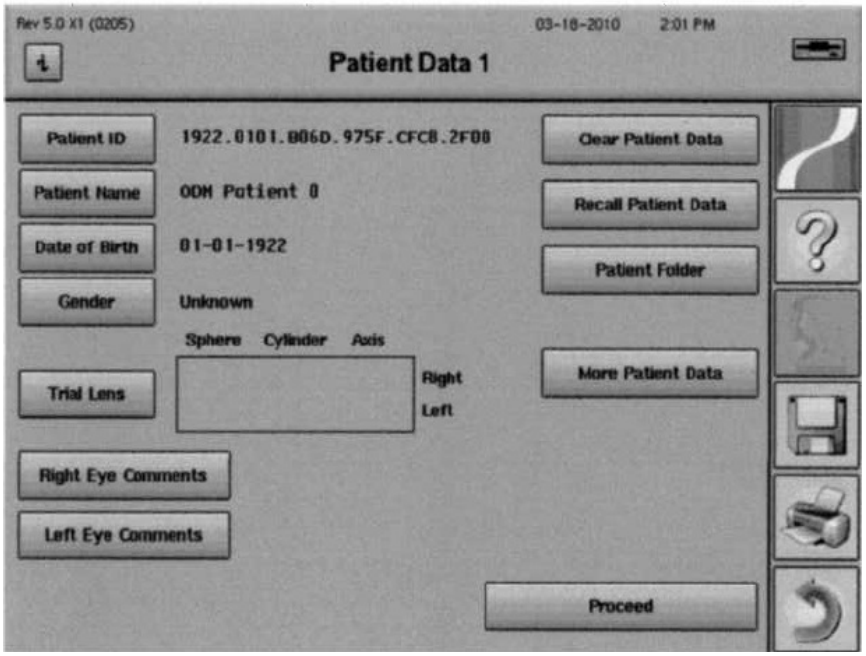

FIGURE U.4. Patient Data 1 Screen – Recall from HD w/Identity Buttons Enabled

However, selecting Name, DOB, or ID will not directly edit the fields but launch the Patient Edit dialog and the keypad for the field selected (for example, if the user selects to edit the name, the software will take the user to the Patient Edit dialog AND bring up the alpha-numeric keypad for entering / editing the patient name.

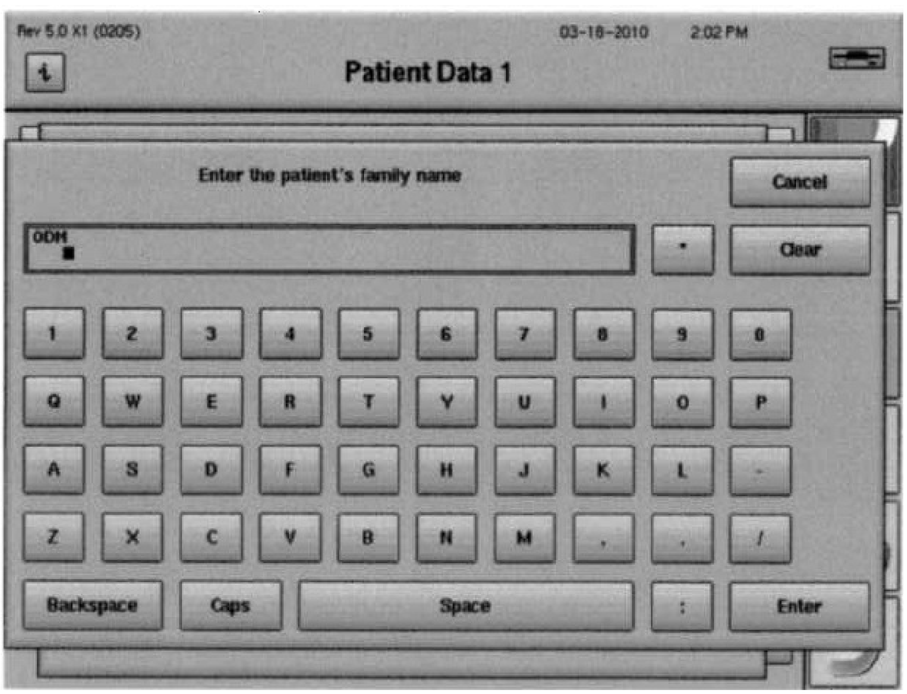

FIGURE U.5. Name Selected – Patient Edit invoked

By invoking the Patient Edit dialog, the patient is actually edited, not changed into a new patient. Once the user completes the entry of the field they selected, the keypad will close and the Patient Edit dialog will still be present.

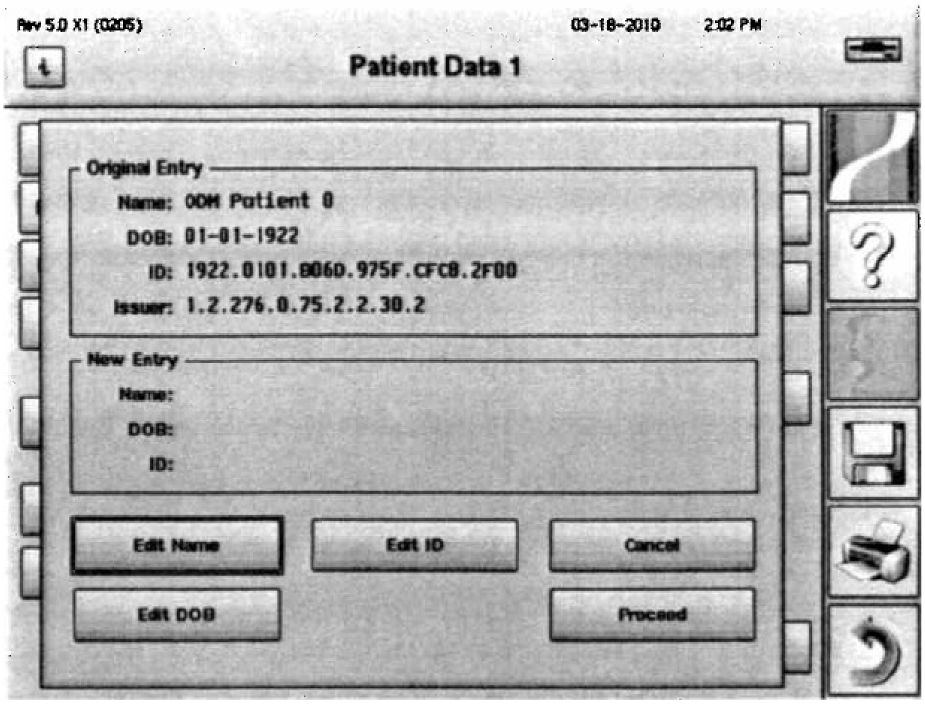

FIGURE U.6. Patient Edit – Patient Data 1 Screen in Background

They can then edit the other two identity fields as they wish. Pressing PROCEED will save the edits and the Patient Data 1 screen will be updated as well. Pressing CANCEL will discard the changes and return the user to the Patient Data 1 screen.

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Humphrey Field Analyzer Service Manual
II-*i* series
Specifications subject to change without notice