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Document Applicability
This document applies to the Humphrey Matrix instrument Model 800, System Software Version 8.0 or higher, unless superseded.
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(1) Introduction

Chapter Overview
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• External Device Equipment, page 1-10
• Instrument Installation, page 1-11
• Tips to Avoid Damage, page 1-11
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Instrument Overview
Thank you for purchasing the Humphrey Matrix® Visual Field Instrument, featuring Frequency Doubling Technology.

The Humphrey Matrix Visual Field Instrument is an innovative, efficient, and compact automated visual field testing instrument. Years of research and clinical trials of the patented Frequency Doubling Technology have resulted in an instrument that provides rapid, clinically validated and user-friendly visual field testing.

Frequency Doubling Technology (FDT)
Frequency Doubling Technology (FDT) isolates a subset of low redundancy, retinal ganglion cell mechanisms in the magnocellular (M-cell) pathway. These M-cells have large diameter fibers and comprise only 3% to 5% of all retinal ganglion cells. Damage to these cells, for example in the glaucoma disease process, is detected by Frequency Doubling Technology.

Key features of the Humphrey Matrix:
• World-class clinical validation by leading researchers in the field
• Statistically significant correlation to the Humphrey Field Analyzer
• Extensive age-normative reference database
• Accurate & reliable supra-threshold screening tests in less than 1 minute per eye
• Full-threshold test results in five minutes per eye
• 24-2, 30-2, 10-2, N-30 and Macula FDT full-threshold tests
• FDT N-30 threshold and screening tests
• Video eye monitoring for patient alignment and fixation monitoring
• Easy to use; no special operator training or certification is needed
Introduction

• No corrective (trial) lens needed up to +/- 3 diopters; patients can usually wear their own correction or none at all (see Patient Correction on page 5-11).
• No eye patch is needed for the untested eye—it is automatically occluded
• Not affected by normal ambient lighting, so using normal room lighting is possible
• Native generic PCL®, PCL 5, and PostScript printer support for local USB printers
• Native generic PCL 3, PCL 5, and PostScript printer support for shared and networked printers
• Optical drive for data transfer
• Ethernet connector for data transfer
• (Optional) DICOM Gateway for Modality Worklists and image transfer to a DICOM System
• USB port for data transfer to USB hard drive, USB flash drive, or USB floppy drive
• Storage for more than 1 million patient tests and associated data
• Software upgrade capability for future enhancements

Intended Use

Humphrey Matrix is an AC-powered device intended to determine the extent of the peripheral visual field of a patient. The device is intended to determine the amount of visual field loss in a patient, which can then be used to diagnose/track the progression of glaucoma and other eye diseases.

Indications for Use

Humphrey Matrix is an AC-powered device intended to determine the extent of the peripheral visual field of a patient. The device is intended to determine the amount of visual field loss in a patient, which can then be used to diagnose/track the progression of glaucoma and other eye diseases.

Note: These perimetry results are an aid to interpretation, not a diagnosis. The doctor’s judgment is still the most important element in determining the clinical significance of the results, including considering the limitations of the statistical package.

Patient Population

The Humphrey Matrix may be used on all adults in need of diagnostic evaluation of the eye. This includes (but is not limited to) patients with the following disabilities or challenges:
• Wheelchair user
• Very low or not measurable visual acuity
• Fixation problems
• Deafness
• Large body, but not those above 99th percentile based on anthropomorphic data
There is a general requirement that the patient be able to sit upright and be able to place their face in the forehead rest of the instrument (with or without supplemental human or mechanical support).

**Part of the Body**
The Humphrey Matrix physically interacts with the patient’s forehead and chin. The patient’s hand and fingers (or similar ability) are also required to press the Patient Response button.

**Application**
The Humphrey Matrix is designed for continuous use, although it is expected that most sites operate the instrument for 10 hours or less per day, indoors, within a medical office or hospital setting. This setting shall have clean air free of soot, vapors from adhesives, grease, or volatile organic chemicals. Other Operating Environment specifications are given in Chapter (11), Specifications. Application related warnings are given in this chapter and elsewhere.

**User Profile**
We assume that users are clinicians with professional training or experience in the use of ophthalmic equipment, and in diagnostic interpretation of the tests. Specific assumptions regarding the profiles of individuals performing instrument operation or data interpretation are given below. This manual contains information that will aid in the proper instrument operation and interpretation of the resultant data.

**Instrument Operation**

**Demographic**
The user should be adult, and at least one of the following:

- Ophthalmologist
- Nurse
- Certified Medical Technician
- Ophthalmic Photographer
- Non-certified Assistant

**Occupational Skills**
The user should be able to perform all of the following tasks:

- Power on the instrument
- Enter, find, and modify patient identifying data
- Clean surfaces that contact patient
- Instruct the patient
- Align the patient with the instrument
- Select and initiate a test
- Review and save a test or try again
- Generate an analysis report
Introduction

- Review the analysis report for completeness
- Save, print, or export the analysis report
- Archive data
- Power off the instrument

Data Interpretation

Demographic

The user should be one of the following:
- Ophthalmologist or other Medical Doctor
- Optometrist or equivalent

Job Requirements

The user should have training and certification in the analysis and treatment of ophthalmic diseases or other eye-related medical issues as required by governing bodies.

Humphrey Matrix User Manual

Carl Zeiss Meditec designed this User Manual to serve as a detailed usage and reference guide for the Matrix instrument. The Matrix User Manual instructs you in the procedures for testing the patient, creating and managing patient records, and reviewing and printing tests. We assume that users are clinicians or technicians with professional training or experience in the use of ophthalmic imaging equipment, and in diagnostic interpretation of the images generated.

Note: This manual provides instructions for System Software Version 8.0 on Model 800.

Note: For the purpose of this manual, a DICOM system, Patient Management System (PMS), and Electronic Medical Records (EMR) system are considered the same.

Organization of the Manual

Below are explanations of three symbols used throughout the manual that require special attention:

⚠️ WARNING. Failure to follow instructions may result in a hazard that can lead to serious injury. Instructions may also describe potential serious adverse reactions and safety hazards.

⚠️ CAUTION. Failure to follow instructions may result in a hazard that may lead to moderate injury or damage to the equipment or other property.

⚠️ Note. Important information which should be given special attention.

This introductory chapter (1) provides a system overview and safety information. Chapter (2) covers setup information. General operation and a screens overview are discussed in chapter (3). Chapter (4) covers test results and reliability measures. Visual field test procedures are outlined in chapter (5). Chapter (6) discusses viewing and printings tests. Database Management is discussed in chapter (7). Chapter (8) discusses network configuration. See (9) for printer information.
Other chapters and appendices include: (10) Maintenance, (11) Specifications, (12) Legal Notices, (A) DICOM Gateway, (B) OfficeMate PMS Instructions, and (C) Data Transfer Using a CD.

Text Conventions

- “Click” means “left-click”.
- Chains of menu or button items are indicated with the use of the “>” symbol between items. For example, “File > Exit” directs you to select Exit in the File menu.

Selecting buttons

Select buttons and text fields by using the Track Pad on the keyboard. The Track Pad controls the cursor like a mouse. The left button is used to select items or buttons. Double tapping the track pad is the same as clicking the left button. The right button is not active for the Humphrey Matrix software.

The OK button accepts the current screen and any data entered and moves to the next screen, if applicable. The Cancel button will cancel current activity on the current screen and return the display to the previous screen, if applicable. Pressing the Esc Key returns the user to the previous screen. Selecting the Enter Key selects the default button on a screen.

Electronic User Manual Access

The Matrix User Manual is provided electronically in Adobe® Portable Document Format (PDF) on the Humphrey Matrix User Documentation CD included in the instrument accessory kit. You can view the User Manual PDF using any computer. If you do not have Adobe Reader® installed, go to www.adobe.com to download and install the free Adobe Reader.

This User Manual is designed to help you understand the capabilities and operation of the Humphrey Matrix Visual Field Instrument with Frequency Doubling Technology. This instrument is designed for use by anyone familiar with the operation as described in this manual; no special training or qualifications are required. To achieve satisfactory results, read the User Manual thoroughly before using the instrument. Only appropriately trained eye care professionals should perform interpretation of the results.

Additional References


System Hardware

With the exception of the keyboard, patient response button, chinrest module, and printer, the Matrix System integrates all hardware components in a unit, which includes the system computer and LCD screen display. The illustrations in Figure 1-1 label hardware elements on the Model 800. System specifications are in Chapter (11), Specifications.
Introduction

Instrument Components

The instrument has a sliding Patient Visor that aids in isolating the eye for testing and automatically occludes the opposite (untested) eye. A ¾-size keyboard with an integrated track pad controls the operation of the instrument. A plain paper 8.5” x 11” USB inkjet printer and a USB printer cable are included with the instrument. The detachable Patient Response button with holder, two Power Cords (one for the instrument and one for the printer), two Ethernet cables (one for a printer (in addition to the USB printer cable) and one for networking), Calibration Cap, and dust cover are also provided.
Underside Connectors

On the underside of the base of the Matrix are the computer ports described below.

**Network Connector**

The network connector is a standard RJ-45 (10/100 Base T) Ethernet port for connecting to local area networks (LANs).

**Universal Serial Bus (USB) Connectors**

The Universal Serial Bus (USB) is a standard connector for peripheral devices. USB flash drives, USB disk drives, USB floppy drives, USB keyboards, USB mice, and USB printers can be connected to these ports (USB 2.0 specification, USB 1.1 compatible). There are two USB ports on the underside of the base of the Matrix. The USB keyboard and integrated trackpad should be connected to one of the USB ports on the underside of the base of the instrument. It is recommended to use the other USB port on the underside of the base of
Introduction

the instrument for connecting a USB printer. The front USB port should be dedicated to removable USB storage devices.

⚠️ CAUTION: Connect ONLY the USB keyboard and integrated track pad supplied with the instrument or an approved replacement to a USB port on the bottom of the instrument.

**RS-232 Connector**

The RS-232 connector (Serial Port) is used by additional software products.

⚠️ CAUTION: Connect ONLY RS-232 serial compatible computer ports to the computer interface connector on the bottom of the instrument. Connection of any other computer port or device to the computer interface connector may damage the instrument.

**Patient Response Button Connector**

On the underside of the base of the Matrix is the Patient Response button connector shown below.

⚠️ CAUTION: Connect ONLY the Patient Response button supplied with the instrument or an approved replacement to the connector on the bottom of the instrument. Connection of any other device to the patient response button connector may damage the instrument or create an unsafe condition and will void the warranty.

**Chinrest Module**

The Model 800 includes a chinrest module to place the instrument on. The chinrest module includes a keyboard tray and height-adjustable chinrest. The chinrest has color
markers indicating chin placement for each eye—white marker for left eye and blue marker for right eye. The knobs on either side adjust the height of the chinrest.

![Figure 1-4 Matrix Model 800 with Chinrest Module](image)

1. Chinrest Height-adjustment knob
2. Keyboard tray. Observe tray extension limit marks on both sides of tray (see not below).
3. Blue (right eye) marker
4. White (left eye) marker

Note: The keyboard tray may extend beyond the table top just up to the extension limit marks on either side of the tray (Figure 1-4).
Introduction

Matrix Instrument Software
Carl Zeiss Meditec pre-installs all software necessary to operate the Matrix System instrument. Software updates with installation instructions may be provided on CD or on the Matrix section of our website (www.meditec.zeiss.com/matrix).

Data Storage
We recommend archiving data to a network file server. For non-networked environments, an external USB hard drive can be used.

CAUTION: We do not recommend that you use optical disks for long-term data storage or backup. Use should be limited to data transfer between systems. Take care to protect these media from damage. We recommend you use hard plastic cases when transporting and shipping these media. Optical disks are very susceptible to scratches that could render them unreadable.

External Device Equipment

WARNING: To maintain patient safety, if the instrument is externally connected to non-medical peripheral devices (i.e. printer, storage devices, etc.), the complete system must continue to meet the applicable medical requirements of IEC 60601-1 safety standard. This standard requires the usage of an Isolation Transformer to power the non-medical peripheral device 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 Matrix 800, a separation device must be used or there shall be no metal to metal connection between the non-medical peripheral device and the Matrix 800.

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.

Failure to observe this warning could result in electrical shock to the patient and/or examiner.

WARNING: Accessory equipment connected to the analog and digital interfaces must be certified according to the respective IEC standards (e.g., IEC 60950 for data processing equipment and IEC 60601-1 for medical equipment).

Printers
See Chapter (9), Printer Configuration for more information.
**Isolation Transformer**

The Matrix instrument is designed with an integrated Isolation Transformer intended to power an external printer through the power outlet on the Matrix. Any additional isolation transformer used to power other peripheral devices must be approved for medical use and must have a minimum rating that is sufficient for the device(s) being powered. CZM highly recommends contacting your CZM representative for an isolation transformer qualified for the Matrix.

Note: Technical support is not provided for accessory devices that have not been qualified by CZM.

**Instrument Installation**

**Care in Handling**

Use extreme care when handling and transporting the Matrix shipping boxes.

The instrument contains fragile components.

**Installation Requirements**

- The Matrix should operate on a dedicated power outlet. Based on your specification, we configure your Matrix at the factory to use either 100V, 115V, or 230V line voltage.
- An isolation transformer is required when connecting peripheral devices (i.e., printer, USB storage device, etc.) to the USB ports that are plugged into electrical outlets.

**Tips to Avoid Damage**

CAUTION: Users are not authorized to dismantle or modify the Matrix hardware.

- Only Carl Zeiss Meditec authorized technicians should disassemble or service this instrument.
- In case of emergency related to the instrument, unplug the power cord from the wall outlet and call for service immediately. For Carl Zeiss Meditec customer service: In the U.S., call 800-341-6968. Outside the U.S., contact your local CZM distributor.
- This instrument operates according to specifications under standard indoor office (fluorescent) lighting conditions, without exposure to any direct sunlight.
- Always select a location for your Matrix that allows easy access for both patient and technician.
- Always operate the Matrix from a power source as specified. This source should be a dedicated line. Use of a power source other than indicated on the unit will shorten the life of the unit and may cause damage in addition to improper operation.
- Always route electrical cables with safety as the first concern.
- Always unplug the Matrix before cleaning the plastic body panels or LCD screen. If the LCD or other body panels require more than a dusting, apply a mild cleaner to a soft cloth to clean them.
- Use a UPS (Uninterrupted Power Supply) to protect data from power failures.
- Never lift the Matrix by the patient visor.
Introduction

- Never position the Matrix in direct sunlight or near a direct source of heat.
- Never position the Matrix in a dusty location.
- Never attempt to change any of the batteries in the system. Attempting to change a battery can cause damage and loss of data.

Product Compliance

Complies with 93/42/EEC Medical Device Directive.

Complies with US and Canadian medical electrical system safety requirements.

User Changes to Software or Hardware

The Matrix 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.

WARNING: Unauthorized modification of Matrix 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.

CAUTION: It is possible that Matrix functionality may be adversely affected by the presence, installation, or use of third party software on the same computer. The user, and not Carl Zeiss Meditec, assumes all risks associated with third party software.

Protection of Patient Health Information

Note: Health care providers have responsibility for the protection of patient health information (PHI), both hardcopy and electronic. To protect patient confidentiality of your exported electronic data, the use of encryption is recommended and is the responsibility of the user.

Note: To protect patient confidentiality of your electronic Matrix data, the Matrix software is equipped with a built-in, non-configurable screen saver (blank screen) which activates after 15 minutes of idle use. When a key is depressed or the trackpad is touched, the screen saver is deactivated and the main menu appears.
Safety

Product Safety

This instrument is classified as follows:

- **Class I Equipment** — Protection against electrical shock.
- **Type BF** — Degree of protection against electric shock of applied part (forehead rest and Patient Response button).
- **Ordinary Equipment (IPX0)** — Degree of protection against ingress of liquids (none).
- **Continuous Operation** — Mode of operation.

**WARNING:** This device contains visual stimuli, including flickering light and flashing patterns, between 5 and 65 Hz. Medical professionals need to determine whether this device should be used for patients who may be photosensitive, including those with epilepsy.

**WARNING:** To prevent electric shock, the instrument must be plugged into an earthed ground outlet. Do not remove or disable the ground pin.

**CAUTION:** Do not use the printer or the instrument with an extension cord or a power strip (multiple portable socket outlet).

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

**CAUTION:** If a table is available, 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.

**CAUTION:** 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.

**CAUTION:** Avoid tipping. Do not use the instrument on an uneven or sloped surface. Also, do not roll the instrument 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:** (United States) Federal law restricts this device to sale by or on the order of a licensed healthcare practitioner.
Introduction

WARNING: SERVICE or REPAIR to be performed by QUALIFIED, AUTHORIZED PERSONNEL ONLY. There are NO USER SERVICEABLE PARTS INSIDE the Humphrey Matrix instrument. Disassembly of the instrument presents a possible ELECTRICAL SHOCK hazard and will VOID the warranty. If the unit fails, contact CZM for instructions.

WARNING: REPLACEMENT PARTS and ACCESSORIES – Use only approved replacement parts and accessories.

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.

Electromagnetic Compatibility (EMC)

Note: Essential Performance: To provide accurate visual field measurements.

Note: The Matrix needs to be installed and put into service according to the EMC information provided herein.

Note: Portable and mobile RF communications equipment can affect medical electrical equipment.

CAUTION: The use of accessories, transducers and cables other than those specified may result in increased emissions or decreased immunity of the equipment.

CAUTION: The Matrix should not be used adjacent to or stacked with other equipment.

CAUTION: DO NOT USE the instrument near other equipment that produces strong magnetic fields (such as MRI). The video monitor performance may be adversely affected.

Guidance and manufacturer’s declaration – electromagnetic emissions

The Matrix is intended for use in the electromagnetic environment specified below. The customer or user of the Matrix should assure that it is used in such an environment.

<table>
<thead>
<tr>
<th>Emissions Test</th>
<th>Compliance</th>
<th>Electromagnetic environment - guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF emissions</td>
<td>Group 1</td>
<td>The Matrix uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.</td>
</tr>
<tr>
<td>CISPR 11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RF emissions</td>
<td>Class B</td>
<td>The Matrix is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.</td>
</tr>
<tr>
<td>CISPR 11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harmonic emissions</td>
<td>Class A</td>
<td></td>
</tr>
<tr>
<td>IEC 61000-3-2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voltage fluctuations/</td>
<td>Complies</td>
<td></td>
</tr>
<tr>
<td>flicker emissions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IEC 61000-3-3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Guidance and manufacturer’s declaration – electromagnetic immunity

The Matrix is intended for use in the electromagnetic environment specified below. The customer or user of the Matrix should assure that it is used in such an environment.

<table>
<thead>
<tr>
<th>Immunity Test</th>
<th>IEC 60601 test level</th>
<th>Compliance level</th>
<th>Electromagnetic environment - guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrostatic Discharge (ESD)</td>
<td>± 6 kV contact ± 8 kV air</td>
<td>± 6 kV contact ± 8 kV air</td>
<td>Floors should be wood, concrete, or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.</td>
</tr>
<tr>
<td>IEC 61000-4-2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical fast transient/burst</td>
<td>± 2 kV for power supply lines ± 1 kV for input/output lines</td>
<td>± 2 kV for power supply lines ± 1 kV for input/output lines</td>
<td>Mains power quality should be that of a typical commercial or hospital environment.</td>
</tr>
<tr>
<td>IEC 61000-4-4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surge IEC 61000-4-5</td>
<td>± 1 kV differential mode ± 2 kV common mode</td>
<td>± 1 kV differential mode ± 2 kV common mode</td>
<td>Mains power quality should be that of a typical commercial or hospital environment.</td>
</tr>
<tr>
<td>IEC 61000-4-5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voltage dips, short interruptions, and voltage variations on power supply input lines. IEC 61000-4-11</td>
<td>&lt;5% $U_T$ (&gt;95% dip in $U_T$) for 0.5 cycle 40% $U_T$ (60% dip in $U_T$) for 5 cycles 70% $U_T$ (30% dip in $U_T$) for 25 cycles &lt;5% $U_T$ (95% dip in $U_T$) for 5 sec</td>
<td>&lt;5% $U_T$ (&gt;95% dip in $U_T$) for 0.5 cycle 40% $U_T$ (60% dip in $U_T$) for 5 cycles 70% $U_T$ (30% dip in $U_T$) for 25 cycles &lt;5% $U_T$ (95% dip in $U_T$) for 5 sec</td>
<td>Mains power quality should be that of a typical commercial or hospital environment. If the user of the Matrix requires continued operation during power mains interruptions, it is recommended that the Matrix be powered from an uninterruptible source.</td>
</tr>
<tr>
<td>IEC 61000-4-11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Frequency (50/60 Hz) magnetic field IEC 61000-4-8</td>
<td>3 A/m</td>
<td>3 A/m</td>
<td>Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.</td>
</tr>
</tbody>
</table>

Note: $U_T$ is the a.c. mains voltage prior to application of the test level.
The Matrix is intended for use in the electromagnetic environment specified below. The customer or user of the Matrix should assure that it is used in such an environment.

<table>
<thead>
<tr>
<th>Immunity Test</th>
<th>IEC 60601 test level</th>
<th>Compliance level</th>
<th>Electromagnetic environment – guidance</th>
</tr>
</thead>
</table>
| Conducted RF IEC 61000-4-6 | 3 Vrms  
150 kHz to 80 MHz | 3 V | Portable and mobile RF communications equipment should be used no closer to any part of the Matrix, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. |
| | | | Recommended separation distance  
\[ d = 1.17 \sqrt{P} \]  
\[ d = 1.17 \sqrt{P} \]  
80 MHz to 800 MHz  
\[ d = 2.33 \sqrt{P} \]  
800 MHz to 2,5 GHz  
where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in metres (m). |
| Radiated RF IEC 61000-4-3 | 3 V/m  
80 MHz to 2,5 GHz | 3 V/m | Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey, should be less than the compliance level in each frequency range. Interference may occur in the vicinity of equipment marked with the following symbol: |

Note 1: At 80 MHz and 800 MHz, the higher frequency applies.  
Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.  
\(^a\) Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM broadcast, cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the Matrix is used exceeds the applicable RF compliance level above, the Matrix should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the Matrix.  
\(^b\) Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.
### Recommended separation distances between portable and mobile RF communications equipment and the Matrix

The Matrix is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the Matrix can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the Matrix as recommended below, according to the maximum output power of the communications equipment.

<table>
<thead>
<tr>
<th>Rated maximum output power of transmitter (W)</th>
<th>Separation distance according to frequency of transmitter (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>150 kHz to 80 MHz</td>
</tr>
<tr>
<td>0.01</td>
<td>( d = 1.17 \sqrt[3]{P} )</td>
</tr>
<tr>
<td>0.1</td>
<td>0.370</td>
</tr>
<tr>
<td>1</td>
<td>1.170</td>
</tr>
<tr>
<td>10</td>
<td>3.700</td>
</tr>
<tr>
<td>100</td>
<td>11.700</td>
</tr>
</tbody>
</table>

For transmitters rated at a maximum output power not listed above, the recommended separation distance \( d \) in metres (m) can be estimated using the equation applicable to the frequency of the transmitter, where \( P \) is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

Note 1: At 80 MHz and 800 MHz, the higher frequency applies.

Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

### Symbols and Labels

- **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.
- **CAUTION**: Type BF applied parts: The Patient Forehead Rest and Patient Response button.
- **Alternating Current**: Off On
- **Manufacturer**
- **Authorized European Community Representative**
- **Serial number**
- **Catalog number / part number**
- **Model number**
**European Conformity**

Disposal of the Product within the EU. Do not dispose via domestic waste disposal system or communal waste disposal facility.

**Protective Packing Symbols**

The protective packing symbols specify the handling requirements and the transport and storage conditions.

**Handling Requirements**

- Fragile, Handle with Care
- Keep Dry
- This end up

**Transport and Storage Conditions**

- Relative Humidity (0% to 90%, non-condensing)
- Temperature (-20 to +60 deg. C)
- Atmospheric Pressure Limits (700 hPa to 1060 hPa)

**Product Labels and Serial Number Location**

On the lower left side of the instrument as facing the operator is the product label. On the underside of the base of the instrument is the serial number label.
**Instrument Disposition**

When it comes time to upgrade the Matrix, please contact Carl Zeiss Meditec to inquire about trade-in or upgrade values we may offer. Should you not wish to trade in the instrument, please dispose of it in accordance with local and national electrical and electronic equipment recycling requirements.

**Disposal**

This product contains electronic components. At the end of its lifetime, the product should be disposed of in accordance with the relevant national regulations.

**Disposal of the Product within the EU**

In accordance with applicable EU guidelines at the time at which the product was brought into the market, the product specified on the consignment note is not to be disposed of via the domestic waste disposal system or communal waste disposal facilities.

For further information on disposal of this product, please contact your local dealer or the manufacturer or its legal successor company. Please read the latest internet information provided by the manufacturer. Where the product or its components are resold, the seller must inform the buyer that the product must be disposed of in accordance with the currently applicable national regulations.
(2) Setting Up the Instrument

Chapter Overview

Because of its light weight and small size, you can set up your Matrix instrument virtually anywhere in your office.

• Refer to (9) Printer Configuration and to the information provided in the printer box for printer setup, use, maintenance and service information.
• Refer to the information provided in the chinrest module box for chinrest module setup.
• Refer to (8) Networking Configuration for networking information and setup.
• Refer to (A) DICOM Gateway if you want to use the DICOM Gateway software.

Topics covered in this chapter:
• Unpacking Equipment, page 2-1
• Preparation For Use, page 2-2
• Set Instrument Date and Time, page 2-2
• System Settings, page 2-3
  • System Settings – General, page 2-4
  • System Settings – Testing, page 2-5
  • System Settings – Export, page 2-7
  • System Settings – Backup, page 2-9
• USB Storage Devices, page 2-10

Unpacking Equipment

Two equipment boxes are shipped stapped together: the smaller box contains the chinrest and keyboard tray. Unpack the smaller box first.

1. Open the shipping box by carefully cutting the packing tape securing the top flaps of the box.
2. Lift out the top foam insert. There is an instruction sheet on top that shows how to set up the chinrest assembly and how to attach the keyboard tray.
3. Pull out the chinrest assembly and place it on the table or surface area where you are going to put the Matrix instrument. Following the enclosed instructions, attach the keyboard tray.

Next, unpack the larger box, which contains the Matrix instrument, keyboard and other items.

1. Open the shipping box by carefully cutting the packing tape securing the top flaps of the box.
2. Lift out the top foam insert. Note the packing list, instructions, CDs, button and button holder in the top foam cutouts.
3. Remove the keyboard from the bottom foam insert.
4. Lift the instrument out of the bottom foam insert by grasping the instrument at the two cutouts provided.
5. Remove the Matrix Visual Field Instrument from the plastic bag.
Setting Up the Instrument

6. Set the instrument on the chinrest assembly, as shown on the assembly instruction sheet.
7. Check the equipment received with the packing list to ensure all parts are included.

Aligning the instrument with your patient is important for good test results. It is recommended to use the chinrest module with the instrument. A height-adjustable table and a height-adjustable patient chair are recommended when performing testing. See instrument specifications — dimensions and weight — in Chapter 11 when considering tables.

Note: Retain the shipping materials (box and packaging) in the event you ever need to return the instrument to an authorized service or distribution location.

Preparation For Use

Once you have chosen a location, carefully lay the instrument on its side to prepare the instrument for use by connecting all of the components.

Patient Response Button Connection

Plug the Patient Response button connector into the small round connector jack towards the patient end, underneath the base of the unit (at the center) and near the patient response button symbol. See Patient Response Button Connector on page 1-8.

USB Keyboard/Track Pad Connection

While the unit is still on its side, plug the USB keyboard and integrated track pad into one of the USB ports on the underside of the base of the instrument. See on page 1-7.

Chinrest Module

The Matrix Model 800 includes a chinrest module to place the Matrix instrument on (Figure 1-5). See the installation instruction sheet for more information.

Set Instrument Date and Time

To set the date and time, double-click on the date and time in the lower left corner of the screen. This will open a window with a calendar and a clock. The arrows next to the year box and time boxes are used to adjust these values, or type the values directly into the boxes. Adjust the month by using the arrows to the right of the month or it can be changed using the month pull down menu. Select the date from the calendar. Select Set Time Zone to set your time zone. Once the appropriate changes are made select OK to save the changes. If no changes were made, or to disregard any changes made, select Cancel.
System Settings

System Settings are provided to allow you to customize the operation of the Humphrey Matrix instrument to meet your preferences and practice needs (see Figure 2-1). The SYSTEM SETTINGS Screen is comprised of eight screens: GENERAL, TESTING, EXPORT, BACKUP, NETWORKING, DICOM GATEWAY, SHARING and PRINTING. Click on a tab button to see the screen. TESTING and GENERAL factory default system settings are indicated by an asterisk (*). Select Reset Settings to return the first four tab settings — GENERAL, TESTING, EXPORT and BACKUP — to the factory default system settings. All user settings on the SYSTEM SETTINGS Screens are backed up with a database backup. To restore only user settings, see Restore User Settings on page 7-5.

Note: Selecting Reset Settings does not affect NETWORKING, DICOM GATEWAY, SHARING or PRINTER settings.

The GENERAL, TESTING, EXPORT, and BACKUP SYSTEM SETTINGS Screens are described below. The NETWORKING and SHARING SYSTEM SETTINGS screens are described in Configure Network Settings on the Matrix on page 8-13. The DICOM GATEWAY SYSTEM SETTINGS Screen is described in (A) DICOM Gateway. The PRINTING SYSTEM SETTINGS Screen is described in (9) Printer Configuration.
Setting Up the Instrument

**System Settings – General**

**Date Format:** Select the date format preferred from the drop down list. The date format selected is used everywhere the date is displayed or printed.

**Time Format:** Select either **12-Hour** or **24-Hour** (military) time formats. The time format selected is used everywhere the time is displayed or printed.

**Tool / Button Tips:** Turns popup text descriptions of buttons On or Off.

**Language:** Select the language used on the instrument. It is necessary to restart the instrument for the language to take effect.

**Contact Information:** Enter contact information for printing on the visual field printouts in the lower right corner. Typical use is to enter information for the practice or doctor. Select **Update** to accept a change to the Contact Information.

**Issuer of Patient ID:** Issuer of Patient ID is a DICOM data field to specify the assigning authority of the Patient ID. The Issuer of ID should be a practice-wide identifier which is the same for all instruments and patient information systems. By default, the Issuer of Patient ID is "Matrix - SN", where SN is the serial number of the Matrix. You can enter text in this field and then select **Update** to accept the change to the Issuer of Patient ID. Note that this change will only affect new patients—the current Issuer of Patient ID will not be changed for patients currently in the local database. To change the Issuer of Patient ID for existing patients, select **VIEW PATIENTS** (F2), select a patient, and then select the **Revise Info** button to edit the Issuer of Patient ID field.

**Note:** If DICOM Gateway is enabled, editing patient information (or merged into an existing patient) received from DICOM systems is disabled. Patient edits must be done at the DICOM system or disable DICOM Gateway to edit patient information on the instrument.

**Patient Source:** Select the default source of patients on the **VIEW PATIENTS** (F2) Screen. See **Patient Selection** on page 5-1 for more information.
System Settings – Testing

Default Test: Select the test that is run when Enter is pressed in the MAIN MENU (F1) Screen, or when Run Test is selected from the VIEW PATIENTS (F2) Screen. You can also choose the test to perform from the TESTING Screen. Select 1% or 5% to pick the default screening level for each of the screening tests.

Note: For more information regarding percentiles, see Screening Tests on page 4-2.

Use Patient’s Previous Settings: Select to use patient’s previous settings.

Default Working Folder: Select the default folder in which each test is saved. Folders are provided to allow some user defined sorting of the tests in the database. Use of folders is optional. You can select, edit, or create alternative folders in the TESTING Screen. Select Edit Folders... in the drop down list to add, rename, merge or delete folders if desired. This folder is used by the Database Backup and Database Restore functions. The default folder is Main and should not be changed by most users.

Default Test Speed: Provides ability to slow down the test speed (increase the time between stimulus presentations) in case a patient finds the normal pace of the testing too fast. Select Normal or Slow to set the test speed.
Setting Up the Instrument

**Default First Eye to Test:** Select the first eye for testing when a test is run. You can also choose the eye for testing from the Testing Screen.

**Catch Trials:** Select individual catch trials to turn either On or Off. Refer to the Reliability Measures on page 4-6 for more information on catch trials.

**Eye Monitoring:** Select to turn the Eye Display On or Off in the Testing Screen.

**Patient Response:** Select to enable/disable an audible beep when the user button is pressed during testing.

**Automatic End of Test Actions:** Select to choose your automatic actions of the test results when the test is completed. Select Print to automatically print to the default printer (see (9) Printer Configuration). Select Back Up Test to automatically back up to the default backup location (see System Settings – Backup on page 2-9). Select Export to automatically export to the default export location (see USB Storage Devices on page 2-10). Any or all of these actions can be selected.

**Default Fixation Target:** Select the normal Central fixation target or the Alternative target for patients with severe central vision loss. The alternative fixation target is a cross approximately one degree wide passing through the center of the screen, extending vertically and horizontally across the entire screen for all but the 10-2 and Macula tests. The Alternative fixation for the 10-2 and Macula tests consist of the central fixation targets and four additional approximately 2 degree diameter targets located approximately 10 degrees diagonally from the central target. You can also change the Fixation Target from the Testing Screen.

![Central Fixation](image1)

![Alternative Fixation](image2)

![Alternative Fixation (10-2 and Macula)](image3)
System Settings – Export

Default Export Location: The default export location sets the location when Export is selected as an Automatic End of Test Action on the Testing Screen (System Settings (F5) > Testing) (see System Settings – Testing on page 2-5). To set the default export location, select the CD-R/W, DICOM (if DICOM Gateway is enabled), Network Share, or USB radio button. For Network Share and USB, select a location from the corresponding drop-down menu. For Network Share, you must have previously added network shared folders to select them here (see Add Network Shared Folders on page 8-14). For information on USB storage devices see USB Storage Devices on page 2-10. For Network Share and USB, you can also select a folder on the Network Share or USB device by selecting the browse button ( ) (see Selecting a Folder on a USB Storage Device on page 2-11) and Selecting a Subfolder in a Network Share on page 8-17).

Note: The USB drop down menu has only one location. You don't need to select it. Several locations can be in the list only if a USB hub is used.

You can select PDF, JPEG, or XML as the data export format (see Printing/Saving Test Results on page 6-3 for a description of each format). If you selected DICOM Archive,
Setting Up the Instrument

PDF is the only data export format available. Select **Save Image files in Patient Folders** to save all data export images in one folder for each patient. The folder name is created from:

- patient name
- date of birth
- Patient ID

For example, Smith_Charlie_1932-03-02_80808080

If **Save Image files in Patient Folders** is not selected, no patient folders will be created, and all images will go into the root (top level) folder of the default export save location.

Note: The default export location and format is remembered after instrument shutdown. The selected Network Share or USB storage device (including folder) is also remembered after instrument shutdown, until you change it. However, if you remove the selected USB device and insert a new USB device, the new USB device will be selected as the default export location (with no folder).

Note: If you remove a shared folder that is currently selected as a Network Share, the first shared folder in the **SAVED SHARES** list will be selected as the Network Share. If there are no other shared folders in the list, the Network Share will be disabled. However, it is still selected as the default location.

Note: PDF images open in Adobe Reader. The program on your PC used to view the JPG images will vary depending on your computer configuration.

Note: On a PC, it may be possible to view and analyze Matrix data using third party software. Beyond the instructions here, Carl Zeiss Meditec does not support the import of Matrix data to a PC; neither do we specify third party software you can use on a PC to view and analyze Matrix data, nor support its use.

Note: When a subfolder is selected using the **browse** button ( ), after selecting **Network Share** in the **Export** screen, the subfolder text appears below the box. This text remains when a new primary folder is selected. To remove the old subfolder, click on the browse button and select a new one. Also, when you delete a share folder from the Share screen, the old deleted version is still shown in the **Export** screen **Network Share** box until you click on the drop down menu or **browse** button again and select a new folder.
**System Settings – Backup**

![Figure 2-4 System Settings – Backup Screen](image)

**Default Backup Location:** Select the default location for database backups when **Perform Backup** is selected from the **MAIN MENU (F1)** Screen (full database backup), and for automatic test backup at end of test. To set the default backup location, select the **CD-R/W**, **Network Share**, or **USB** radio button. For Network Share and USB, select a location from the corresponding drop-down menu. For Network Share, you must have previously added network shared folders to select them here (see **Add Network Shared Folders** on page 8-14). For information on USB storage devices see **USB Storage Devices** on page 2-10.

- **Note:** The USB drop down menu has only one location. You don't need to select it. Several locations can be in the list only if a USB hub is used.

- **Note:** The default backup location is remembered after instrument shutdown. The selected Network Share or USB storage device is also remembered after instrument shutdown, until you change it. However, if you remove the USB device and insert a new USB device, the new USB device will be selected as the default backup location.
Note: If you remove a shared folder that is currently selected as a Network Share, the first shared folder in the SAVED SHARES list will be selected as the Network Share. If there are no other shared folders in the list, the Network Share will be disabled.

Backup Reminder: Select the number of days after the last database backup until prompted to backup again. Select Update to accept a change.

USB Storage Devices

There is one USB port on the front of the Humphrey Matrix Model 800, and two USB ports on the underside of the base of the instrument. The USB ports can be used for connecting USB storage devices (USB flash drives, USB hard drives, and USB floppy drives) and USB input devices (keyboard, mouse, etc.). Storage devices may be connected to the front instrument USB port. (Connect printers to the bottom USB port.)

When you insert a USB storage device, the device is automatically connected (after a few seconds) and can be selected in the USB drop-down menus of the BACKUP and EXPORT screens, and the SAVE AS dialog. The USB device is displayed automatically. The device name and storage size can also be displayed on the USB STORAGE DEVICES Screen (Figure 2-7) by double-clicking the USB Ports icon (ın the lower right of all screens.

Note: The selected USB storage device is remembered after instrument shutdown, until you change it. However, if you remove the selected USB device and insert a new USB device, the new USB device will be selected as the location.

Note: The Matrix is only compatible with USB storage devices formatted in FAT, FAT16, FAT32, or NTFS. exFAT (sometimes called FAT64) cannot be used and will report a media error.

Note: Some USB hard drives may require connection to two USB ports or their own external power supply to work correctly.
Selecting a Folder on a USB Storage Device

To select a folder on the USB storage device, select the browse button (⋯) for the selected device and then select the folder you want as the default USB location (Figure 2-5). If desired, use the Create New Folder button (mkdir) to create and name a new folder for selection.

![Choose Directory Dialog](Figure 2-5 Choose Directory Dialog)

After selecting a folder, click the Choose Selected Directory button and the selected folder appears under the selected USB storage device (Figure 2-6).

![USB Folder Selected](Figure 2-6 USB Folder Selected)

Note: The selected USB folder is remembered after instrument shutdown. However, if you remove the selected USB device and insert a new USB device, the new USB device will be selected as the default export location (with no folder).

Note: It is recommended to use one USB storage device for the default export location, and a different USB storage device used for the default backup location.

Note: When using a USB floppy drive, it is recommended to save to the root (top level) directory of the default USB location.
Setting Up the Instrument

Safely Remove a USB Storage Device

Double-click the USB Ports icon in the lower right of all screens to see the USB STORAGE DEVICES Screen (Figure 2-7). To safely remove a USB storage device, click the Eject button to the right of the device before you remove a USB storage device from the Matrix. You can only safely remove the USB storage device if it is not currently being accessed. The message, “The USB storage device may now be safely removed” will be displayed if you can safely remove it.

Note: If a USB storage device has a light that indicates “in use”, this light is NOT extinguished by the Matrix after the user selects the Eject button.

CAUTION: Always use the Eject button to remove a USB storage device, and only when it is reported safe to do so. Otherwise, you may damage or corrupt data on your USB storage device.
(3) General Operation

Chapter Overview

Topics covered in this chapter include:

- Powering Up the Instrument, page 3-1
- Powering Down the Instrument, page 3-1
- Keyboard and Track Pad Operations, page 3-1
- Screens Overview, page 3-2
- F1: Main Menu, page 3-2
- F2: View Patients, page 3-4
- F3: Recall Tests, page 3-5
- F4: File Functions, page 3-6
- F5: System Settings, page 3-7
- F6: Help, page 3-8

Powering Up the Instrument

Before plugging the instrument into an appropriate power outlet, make sure that the Power Switch (O/I) is in the OFF (0) position. The Power Switch is located on the left side of the instrument when facing the operator side (see Figure 1-2). To turn the instrument ON, connect the instrument’s power cord to an appropriate power outlet, then switch the Power Switch (O/I) to the ON (I) position. The system will begin to load the operating software. A status bar will indicate progress of the instrument initialization. After approximately 2 to 10 minutes (depending on if a file check, done every fifth power up, is performed), the MAIN MENU (F1) will appear on the Operator LCD Display.

Powering Down the Instrument

First, press the Printer Power button to turn the Printer OFF. Refer to the Printer User’s Guide for more information. Then, select Shut Down (lower right corner of the screen; see Figure 3-1) to turn OFF the Matrix instrument from any screen. Wait until the message “Safe to power off in 5 seconds...” appears (~ 1 minute). After this message appears, wait 5 seconds before turning OFF the main power switch (0 position).

Note: Turning the main power switch OFF without selecting Shut Down will make it take longer to power up next time and could potentially corrupt the Humphrey Matrix software and require service to restore normal operation.
General Operation

Keyboard and Track Pad Operations

The keyboard functions in a similar manner to normal computer keyboards. Pressing ALT and the underlined letter or number on the button selects the button (English language only). The Track Pad controls the cursor like a mouse. The left button is used to select items or buttons. Double tapping the track pad is the same as clicking the left button. The right button is not active for the Humphrey Matrix software.

Screens Overview

The functions of the Humphrey Matrix instrument are organized into various screens. The screen name is displayed at the top of every screen. The bottom of the screen contains the date and time. The Shut Down button is also located at the bottom of the screen. Only shut down the instrument using the Shut Down button, and wait until the message “Safe to power off in 5 seconds...” appears (~ 1 minute). The MAIN TOOLBAR is located vertically along the right side of the display and is always visible. This toolbar is used to navigate the available functions of the instrument. Select the Toolbar buttons using the mouse or with the hot keys shown in the button icons (F1–F6 and Esc). Pressing the Esc Key returns the user to the previous screen. Selecting the Enter Key selects the default button on a screen.

F1: Main Menu

![Figure 3-1 Main Menu Screen](image)
The **Main Menu** (F1) Screen appears automatically after instrument initialization is completed when the instrument is initially powered on. The **Main Menu** provides buttons for selecting all the visual field tests available on the instrument. You may also initiate testing by selecting the **Select Patient** button, which also will select the most recent test/settings for patients already in the instrument database – if Use Patient’s Previous Settings option is selected in the System Settings Testing screen. If this option is not selected, default testing will be initiated.

Because backing up patient test data is important, the **Main Menu** also has a **Perform Backup** button, along with an indicator telling you the date of your last backup. **Perform Backup** does a Full Backup of your database in the Database Backup Format (.fdt2), as well as a backup of system settings and user settings. The location of the backup is set in **System Settings > Backup** (see **System Settings – Backup** on page 2-9). You should back up your database regularly. Select a backup schedule that fits your practice. Many practices perform weekly backups to protect their patient visual field data. The default backup reminder is 1 week, but you can change the default in **System Settings > Backup**.

All Humphrey Matrix data stored on the hard disk, a CD, a network file server or computer, a USB drive, and/or any other storage device are your records, and it is your responsibility to preserve the integrity of these data files. Carl Zeiss Meditec is not responsible for loss of patient data.

It is your responsibility to maintain the confidentiality of Humphrey Matrix protected patient health information. Carl Zeiss Meditec is not responsible for protected patient health information.
F2: View Patients

The VIEW PATIENTS (F2) Screen is where new patients are added or existing patient entries in the database are searched, recalled, and revised. If you have DICOM Gateway enabled and are connected to a Modality Worklist provider, you can import patient demographic and scheduled exam information from a Modality Worklist. The VIEW PATIENTS Screen is also accessed from the MAIN MENU by selecting the Select Patient button, or any of the ThresholdTest buttons. Once a patient is selected, you may run a test, recall previous test(s), analyze test results, revise patient information, or delete the patient from the local database. To delete a patient from the local database, it is necessary to delete all of his or her field tests in the RECALL TESTS (F3) Screen first.

Note: Spaces are significant in the name field. With Local Database selected as the source, type the patient’s last name. The patient’s name and information is displayed. However, if you add any leading or trailing spaces around the name, or if there was a space in the field before you began typing, the patient is not displayed. If when entering a patient name, you do not see the expected patient(s) displayed, press the Reset button to clear the field of text and spaces, then type in the name. Do not use spaces in the name field.
F3: Recall Tests

The RECALL TESTS (F3) Screen is where individual tests in the database are searched by patient or test information. Once the desired individual tests are selected, you can then recall, delete, print, or save the test results. In addition, you can move tests to another folder, or reassign tests to another patient. Note that deleting a test from the database is permanent. The deleted test is only recovered if it is available on a previous database backup.

Note: The Reset button clears all search fields and resets the From and To date fields to default values.

Note: The Issuer of Patient ID (IPID) may be truncated under the following two conditions:

<table>
<thead>
<tr>
<th>From the RECALL TESTS screen:</th>
<th>From the RECALL TESTS screen:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Select patient</td>
<td>• Select patient</td>
</tr>
<tr>
<td>• press Recall Tests</td>
<td>• Press Edit Test...</td>
</tr>
<tr>
<td>• press More&gt;&gt; for additional test details</td>
<td>• Select Reassign Test</td>
</tr>
<tr>
<td></td>
<td>In the Select Patient dialog, the IPID may be truncated.</td>
</tr>
</tbody>
</table>

When truncation is necessary, it is done at the beginning of the string instead of the end because the end of the string is more likely to be unique than the beginning of the string.
F4: File Functions

The FILE FUNCTIONS (F4) Screen is where the patient test database is backed up or imported, merged, or restored. User settings can also be restored from a database backup. The FILE FUNCTIONS Screen is where available software upgrades of the Humphrey Matrix system software can be performed. Upgrades may also be accessed via the Help (F6) button.
F5: System Settings

The SYSTEM SETTINGS (F5) Screen provides the operator with the ability to customize the configuration of the Humphrey Matrix Visual Field Instrument by changing default system settings to meet your preferences and practice needs. The SYSTEM SETTINGS Screen is comprised of eight screens: GENERAL, TESTING, EXPORT, BACKUP, NETWORKING, DICOM GATEWAY, SHARING, and PRINTING. Details can be found in System Settings on page 2-3, (8) Networking Configuration, and (9) Printer Configuration.

Note: The Reset Settings button restores the default settings under the GENERAL, TESTING, EXPORT and BACKUP tabs. The settings under the NETWORKING, DICOM GATEWAY, SHARING and PRINTING tabs are not affected.

Note: In the Contact Information field, unlimited text is allowed. However, when information is printed on the exam report, only five lines print with approximately 19 characters allowed per line. Also, if there is no naturally break in the text, the text will wrap to the next line, sometimes inserting a hyphen in an unconventional location.
F6: Help

The HELP (F6) Screen is where the user may view the instrument’s system information including system software version (SBC Software Version). When needed, the Install Software, Calibration, Diagnostics, and Logging, functions are also accessed from the Help Screen.

The Advanced button provides additional system information, resources, and views of NVRAM, User Settings, and System Settings.
(4) Test Results and Reliability Measures

Chapter Overview

This chapter discusses test results and reliability measures. Topics covered in this chapter include:

- Visual Field Tests Summary, page 4-1
- Screening Tests, page 4-2
- Threshold Tests, page 4-2
- Reliability Measures, page 4-6

Visual Field Tests Summary

Table 4-1 below summarizes the various FDT visual field tests available on the Humphrey Matrix Visual Field Instrument. Sample printouts for all the tests listed are included in Sample Tests on page 6-8 for your reference.

The screening tests provide qualitative results regarding the patient’s visual function. Screening tests are typically used for patients where no eye disease has been detected as part of a routine eye examination. Threshold testing is used to obtain quantitative visual field results to confirm the presence of eye disease and monitor visual function over time.

<table>
<thead>
<tr>
<th>FDT Test</th>
<th>Visual Field Locations</th>
<th>Probability Level Classifications</th>
<th>Fixation Catch Trials</th>
<th>False Positive Trials</th>
<th>False Negative Trials</th>
<th>Test Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-30-5, N-30-1 Screening</td>
<td>19</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>Supra-Threshold</td>
</tr>
<tr>
<td>24-2-5, 24-2-1 Screening</td>
<td>55</td>
<td>2</td>
<td>10</td>
<td>10</td>
<td>0</td>
<td>Supra-Threshold</td>
</tr>
<tr>
<td>N-30-F Threshold</td>
<td>19</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>3</td>
<td>MOBS</td>
</tr>
<tr>
<td>24-2 Threshold</td>
<td>55</td>
<td>4</td>
<td>10</td>
<td>10</td>
<td>6</td>
<td>ZEST</td>
</tr>
<tr>
<td>30-2 Threshold</td>
<td>69</td>
<td>4</td>
<td>10</td>
<td>10</td>
<td>6</td>
<td>ZEST</td>
</tr>
<tr>
<td>10-2 Threshold</td>
<td>44</td>
<td>4</td>
<td>10</td>
<td>10</td>
<td>6</td>
<td>ZEST</td>
</tr>
<tr>
<td>Macula Threshold</td>
<td>16</td>
<td>4</td>
<td>6</td>
<td>3</td>
<td>0</td>
<td>ZEST</td>
</tr>
</tbody>
</table>
Screening Tests

All of the Humphrey Matrix visual field FDT screening tests are supra-threshold tests meaning that they test at specific age-corrected contrast values determined by the normative database probability levels. Select the probability levels to use for screening for general clinical use to maximize sensitivity (-5 uses the 5% probability level) or for population based screening to maximize specificity (-1 uses the 1% probability level). The screening test results consist of probability plots of the tested locations for each eye and overall reliability measures along with patient and test information. The test locations indicate the different probability levels with different patterns, increasing in darkness with decreasing probability level. See Sample Tests on page 6-8.

The N-30-5 (or N-30-1) FDT screening test is essentially the same 19-point rapid screening test performed on the FDT Visual Field Instrument, except that moving the fixation target is not required with the Humphrey Matrix. The same normative database is used for the N-30 tests in the FDT and Humphrey Matrix Visual Field Instruments so the tests are comparable between the two instruments. Each test location is assigned one of four probability levels, depending on the test selected. Each visual field location is tested until the patient responds, or until all three probability levels are tested. The initial probability level is tested twice if needed, followed by once at each of the other levels to complete the N-30 screening. As a result, the screening test time will increase for patients with eye disease.

The 24-2-5 (or 24-2-1) FDT screening test is a screening version of the 24-2 full threshold test. Each test location is assigned one of two probability levels, depending on the test selected. Each visual field location is tested at a single probability level (pass/fail). Each visual field location is tested until the patient responds or the location is tested twice at the initial probability level to complete the 24-2 screening.

Threshold Tests

All the Humphrey Matrix visual field threshold tests are full threshold tests meaning that they provide quantitative measures of the visual function at each location tested. The threshold test results consist of a raw threshold plot (dB values), a gray scale plot (pattern shading), total and pattern deviation plots (dB values), total and pattern deviation probability plots (pattern shading), MD and PSD global indices (numeric with probability values), overall reliability measures, along with patient and test information for each eye tested. The probability plots indicate one of five possible probability levels with different patterns, increasing in darkness with decreasing probability level. See Figure 4-1 and Sample Tests on page 6-8.

The N-30-F FDT full threshold test is essentially the same 19-point full threshold test performed on the FDT Visual Field Instrument, except that moving the fixation target is not required and the threshold algorithm has been optimized to reduce test time with the Humphrey Matrix. The same normative database is used for the N-30 tests in the FDT and Humphrey Matrix Visual Field Instruments so the tests are comparable between the two instruments.
Test Results and Reliability Measures

Figure 4-1 Full Threshold Test Example
For the **N-30-F FDT full threshold test**, the instrument utilizes a staircase threshold strategy known as a **Modified Binary Search (MOBS)**. The Humphrey Matrix utilizes a four-reversals rule (N-30-F) for determining the threshold level. The range of possible threshold level values for the raw data (patient threshold scores) is between 0 dB Maximum Contrast (lowest patient sensitivity) and 56 dB Minimum Contrast (highest patient sensitivity). The formula used to calculate the dB values is 

$$10 \times \log_{10} \left( \frac{2048}{c} \right) \times 10 \times H$$

where $c$ ranges from 1 (minimum contrast) to 2048 (maximum contrast) and $H$ is approximately 2. Note that XX is displayed if the threshold is not determined due to inconsistent patient responses which do not meet the MOBS threshold criteria. The magnitude of the threshold level values is directly correlated to the Field Analyzer values.

The **24-2, 30-2, 10-2 and Macula FDT full threshold tests** are modeled after the Humphrey Field Analyzer (HFA™) tests to provide visual field test results that are familiar. The **FDT test results for the threshold tests correlate with the HFA results, but they are not directly comparable**. The FDT tests use a large (~270 subjects for each eye) age normative FDT database. The FDT full threshold tests use a maximum likelihood threshold strategy known as ZEST (Zippy Estimate of Sequential Testing) to provide accurate threshold results as quickly as possible. ZEST is similar to SITA used on the HFA, but differs in the specific algorithm details.

The **24-2 (55-point) and 30-2 (69-point) FDT full threshold tests** are central 30 degree visual field tests for use in general visual field testing and glaucoma management. These tests also provide a Glaucoma Hemifield Test that provides a plain language interpretation of the visual field results based on an asymmetry analysis between test locations in the upper vs. lower hemifield to detect glaucoma. The Glaucoma Hemifield Test (GHT) messages include **Within normal limits, Outside normal limits, Borderline, Borderline - General reduction of sensitivity, General reduction of sensitivity, and Abnormally high sensitivity**.

The **10-2 (44-point) FDT full threshold test** is a central 10 degree visual field test for use with retinal disease (AMD, Diabetic Retinopathy) and end-stage glaucoma. The **Macula (16-point) FDT full threshold test** is a central 5 degree visual field test subset of the 10-2 test.

On the left in the lower half of the full threshold test printout is a pair of plots, one above the other, labeled Total Deviation. The numeric values in the upper portion of these plots represent the difference in decibels (dB) between the patient’s test results and the age-corrected normal values at each tested point in the visual field.

The lower total deviation plot, called a probability plot, translates the values from the upper plot into shaded symbols which indicate the statistical significance of each decibel deviation. These are explained in **Table 4-2, “Probability Level Classifications”**. The darker the symbol, the less likely it is that the field is normal in that location (although the likelihood of abnormality also depends upon the actual prevalence of disease in the patient population). For instance, a totally black square indicates that the deviation from normal found at that point location occurs in fewer than 0.5% of normal subjects. Notice that this probability statement is made on a point-by-point basis, allowing you to read the results like an isopter plot or graytone.
Test Results and Reliability Measures

To the right of the total deviation plots are two additional plots, labeled Pattern Deviation. These are similar to the total deviation plots, except that here the test results have been adjusted for any changes in the height of the measured hill of vision caused, for example, by cataracts or small pupils. Similarly, the software corrects for any patients who are “supernormal”, adjusting the expected hill of vision upward by the appropriate amount and thereby making the analysis more sensitive to localized scotomas.

Thus, the numeric Pattern Deviation plot shows the deviation in decibels from the age corrected normal values, adjusted for any shift in overall sensitivity. The pattern deviation probability plot indicates the statistical significance of the result at each point. Again, the darker the symbol the more significant the deviation from the normal threshold value.

Table 4-2 Probability Level Classifications

<table>
<thead>
<tr>
<th>Shaded Symbols</th>
<th>Statistical Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Shaded Symbol 1]</td>
<td>The patient achieved a threshold level in the range that 95% ($P \geq 5%$) of normal subjects of the same age achieved for the test locations with this shading.</td>
</tr>
<tr>
<td>![Shaded Symbol 2]</td>
<td>The probability is less than 5% ($P &lt; 5%$) that a normal subject of the same age would perform at the threshold level that this patient achieved for the test locations with this shading.</td>
</tr>
<tr>
<td>![Shaded Symbol 3]</td>
<td>The probability is less than 2% ($P &lt; 2%$) that a normal subject of the same age would perform at the threshold level that this patient achieved for the test locations with this shading.</td>
</tr>
<tr>
<td>![Shaded Symbol 4]</td>
<td>The probability is less than 1% ($P &lt; 1%$) that a normal subject of the same age would perform at the threshold level that this patient achieved for the test locations with this shading.</td>
</tr>
<tr>
<td>![Shaded Symbol 5]</td>
<td>The probability is less than 0.5% ($P &lt; 0.5%$) that a normal subject of the same age would perform at the threshold level that this patient achieved for the test locations with this shading. This shading will also occur if the patient failed to respond at the maximum contrast level of the instrument (0 dB is indicated).</td>
</tr>
</tbody>
</table>

Mean Deviation and Pattern Standard Deviation (MD & PSD) are global statistical indices calculated from points over the entire visual field for the threshold tests. These indices reduce the individual threshold scores to a single number to provide overall information about the entire visual field. The magnitude of the MD & PSD values are directly correlated to the Humphrey Field Analyzer indices.

Mean Deviation (MD) is the average elevation or depression of the patient’s overall field compared to the normal reference field. If the deviation is significantly outside the population norms, a “$p$” value is given. For example, if $p < 2\%$, this means that fewer than 2% of the normal population shows an MD larger than that found in this test. A significant MD may indicate that the patient has an overall depression, or that
there is significant loss in one part of the field and not in others. MD is best interpreted in relation to the Total and Pattern Deviation plots.

**Pattern Standard Deviation (PSD)** is a measurement of the degree to which the shape of the patient’s measured field departs from the normal, age-corrected reference field. A low PSD indicates a smooth hill of vision. A high PSD indicates an irregular hill and may be due either to variability in patient response or to actual field irregularities.

### Reliability Measures

When reviewing the results of the visual field test, give careful consideration to the reliability indicators (catch trials). They are an important measure of patient reliability in taking the test (and of the reliability of the results). They are indicated as a ratio of the number responded to the number presented (as well as a percentage of the total). For example, 1/10 (10%) indicates that the patient responded to 1 of the 10 catch trials presented. If errors occur in greater than one third of the catch trials, the test results may be unreliable.

#### Fixation Errors

The ratio of the number of times the patient responded to a target placed in the blind spot versus the total number of times fixation was tested (i.e., total number of targets placed in the blind spot). Fixation errors indicate the patient is not maintaining good fixation during the test, is misaligned, or does not understand the test.

#### False Positive Errors

The ratio of the number of times the patient responded to a “pause” in the testing sequence (i.e., no target presented) versus the total number of “pauses” in the testing sequence. False positive errors indicate the patient is pressing the button even if the patient does not see any patterns (trigger happy) or does not understand the test.

#### False Negative Errors

The ratio of the number of times the patient did not respond to a test pattern at the maximum possible contrast level of the instrument versus the total number of times that maximum possible contrast level patterns were tested. When possible, false negative catch trials are only presented at locations where the patient has previously responded. False negative catch trials are not used with screening tests. False negative errors indicate the patient is likely not paying attention, does not understand the test, or has a severe loss at the location of the false negative catch trial(s).
(5) Patient Testing

Chapter Overview

To prepare to perform a visual field test, follow the simple procedure sections outlined below:

- Test Set-Up, page 5-1
- Patient Selection, page 5-1
- Administering the Test, page 5-10
- Patient Correction, page 5-11
- Patient Seating and Position, page 5-12
- Explaining the Test Procedure to the Patient, page 5-12
- Testing, page 5-13

Test Set-Up

1. When you are ready to conduct the first test of the day, remove the Calibration Cap from the Patient Eyepiece. Replace the calibration cap on the Patient Eyepiece when the instrument is not in use to minimize the accumulation of dust and debris on the Patient Eyepiece.

2. Check that the Patient Visor is in the correct position to test the corresponding eye. For testing the RIGHT eye (factory default setting), position the Patient Visor so that it extends past the housings on your RIGHT side when viewing from the Operator LCD side of the instrument. This positions the Patient Eyepiece on the RIGHT side facing the Patient Visor. If the Patient Visor is not correctly positioned, a popup message will appear on the screen when the Start Test button is pressed.

3. Make sure the Patient Response button is properly connected. The patient test will not begin if the Patient Response button is not connected.

Patient Selection

From the MAIN MENU Screen (F1), select the button for the test that you want to perform or the Select Patient button. Pressing the Select Patient button will use the most recent test/settings for patients already in the instrument database, if the Use Patient’s Previous Settings box on the Systems Settings – Testing was checked. Otherwise, a default test will be performed. Either selection proceeds to the VIEW PATIENTS Screen (Figure 5-1). Alternatively, you may select the VIEW PATIENTS (F2) Screen directly from the Task bar or by pressing the F2 key on the keyboard.

On the VIEW PATIENTS Screen you can select patients from the following sources on the Source drop-down menu:

- Local Database: Patients saved on the local Matrix instrument database, or new patients you add to the local database. See Local Database (Search Local Database or Add New Patient) on page 5-7.
• **MWL - Today’s Patients**: From a Modality Worklist if you have DICOM Gateway enabled and are connected to a Modality Worklist provider, see [DICOM Gateway Configuration](#) on page A-2. See MWL - Today’s Patients (Worklist Patients Scheduled for Today) on page 5-2.

• **MWL - Custom Query**: From a Modality Worklist if you have DICOM Gateway enabled and are connected to a Modality Worklist provider, see [DICOM Gateway Configuration](#) on page A-3. See MWL - Custom Query (Search the Worklist) on page 5-5.

• **OMLocal**: Only available if using OfficeMate® Practice Management Software with the Matrix. See [OMLocal (OfficeMate Practice Management Software)](#) on page 5-9.

Note: The default source of patients is set on the System Settings – General Screen (see Patient Source in System Settings – General on page 2-4).

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**MWL - Today’s Patients (Worklist Patients Scheduled for Today)**

![View Patients Screen – MWL - Today’s Patients](image)

Using **MWL - Today’s Patients** allows you to quickly display all patients exams scheduled today for this instrument. Input of patient data is not required if scheduling via Modality Worklist. If you have DICOM Gateway enabled and are connected to a Modality Worklist.
provider (see DICOM Gateway Configuration on page A-3), select MWL - Today's Patients from the Source drop-down menu. The Modality Worklist is automatically searched for patients scheduled for an exam for this Matrix (AE Title) on today’s date. A Matrix is identified by its Local AE Title entered on the DICOM Gateway Screen (see Local Application Entity Settings on page A-4).

To sort on any column in ascending or descending order, click on its column title. You can also resize the width of any column by clicking between columns to activate the resizing tool ( ), holding down the left track pad button, and dragging to resize.

Select the Refresh button to refresh or search the Modality Worklist again.

Note: In order to be able to see the correct list of patients, you must ensure that the scheduled patient date on the server matches the local system date on the Matrix.

Select the desired patient by clicking on its row to highlight it, and then select the Run Test button to start testing. Alternatively, you may double-click anywhere in the patient’s row to start testing. Using either method of initiating a test, the patient’s information is automatically saved in the local database. Scheduled test information (Accession number, etc.) is not saved.

Exam Selection Screen

If the selected patient has only one scheduled exam for today, the Testing Screen (Figure 5-8) appears. If the selected patient has more than one scheduled exam for today, an Exam Selection Screen appears (Figure 5-2). You can sort on any column in ascending or descending order by clicking on its column title. You can also resize the width of any column by clicking between columns to activate the resizing tool ( ), holding down the left track pad button, and dragging to resize.

Select the desired exam by clicking on its row to highlight it. Select the Details button to see patient and scheduled exam details (Figure 5-3). Alternatively, you may double-click
Patient Testing

anywhere in the exam’s row to see patient and scheduled exam details. Select the OK button on the EXAM SELECTION Screen to open the TESTING Screen (Figure 5-8).

Note: If DICOM Gateway is enabled, editing patient information imported (or merged into an existing patient) from a DICOM system is disabled.

Note: Patient scheduled information is not removed from the Modality Worklist until the ePDF of the exam is received by the DICOM system (see Automatic End of Test Export to a DICOM System on page A-7).

Worklist Patient Conflicts

If no patients in the local database have a matching Patient ID and Issuer of Patient ID as an imported patient, but a patient in the local database that does not have a Patient ID and Issuer of Patient ID, has the same First Name, Last Name, and Date of Birth as an imported patient, a dialog appears for you to decide if the imported patient should be merged with the existing local patient, a new patient created from the imported patient, or the import aborted.

If a single patient in the local database has the same Patient ID and Issuer of Patient ID pair as an imported patient, a dialog appears – only if DOB, first name, last name are not the same – for you to decide if the imported patient should be merged with the existing local patient, or the import aborted.
**MWL - Custom Query (Search the Worklist)**

Using **MWL - Custom Query** allows you to provide specific query parameters before displaying scheduled patients exams for this instrument. Input of patient data is not required if scheduling via Modality Worklist. If you have DICOM Gateway enabled and are connected to a Modality Worklist provider (see **DICOM Gateway Configuration** on page **A-3**), select **MWL - Custom Query** in the **Source** drop-down menu to perform a custom search of the Modality Worklist by patient information, date, exam information, AE Title, and other fields. **Broad Query** and **Patient-Based Query** are enabled by default. If **Broad Query** is enabled, select **Search for All Dates** to search for exams for all dates. Deselect **Broad Query** to search for exams for all dates, AE Titles, and Modalities. Deselect **Patient-Based Query** to search for all patients.

**Note:** AE Title is the **Local AE Title** of a Matrix entered on the **DICOM Gateway** Screen (see **Local Application Entity Settings** on page **A-4**).

See **Table 5-1** for a list of Modality Code descriptions. A custom modality can be entered in the Modality field (uppercase characters only).
Table 5-1 DICOM Standard Modality Code Descriptions

<table>
<thead>
<tr>
<th>Modality Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(blank)</td>
<td>All modalities</td>
</tr>
<tr>
<td>OPV</td>
<td>Ophthalmic Visual Field</td>
</tr>
<tr>
<td>OP</td>
<td>Ophthalmic Photography</td>
</tr>
<tr>
<td>OPM</td>
<td>Ophthalmic Mapping</td>
</tr>
<tr>
<td>OPT</td>
<td>Ophthalmic Tomography</td>
</tr>
<tr>
<td>OT</td>
<td>Other</td>
</tr>
</tbody>
</table>

If needed, you can select the Default button to reset all the query fields to their default values. Once you have entered your desired criteria, select the Search button to initiate the query.

When the search is complete, the exam list will be updated. You can sort on any column in ascending or descending order by clicking on its column title. You can also resize the width of any column by clicking between columns to activate the resizing tool, holding down the left track pad button, and dragging to resize. Move the mouse cursor over a column title to see a more detailed description. For example, Requested Procedure ID is the Scheduled Procedure Step Start Date.

Select the desired exam by clicking on its row to highlight it, and then select the Run Test button to open the Testing Screen (Figure 5-8). Alternatively, you may double-click anywhere in the patient’s row to start testing. Using either method of initiating a test, the patient’s information is automatically saved in the local database. Scheduled test information (Accession number, etc.) is not saved.

You may also select the Save button to save the patient’s information in the local database, and select the Details button to see patient and scheduled exam details (Figure 5-3).

Note: If DICOM Gateway is enabled, editing patient information imported (or merged into an existing patient) from a DICOM system is disabled.

Note: Patient scheduled information is not removed from the Modality Worklist until the ePDF of the exam is received by the DICOM system (see Automatic End of Test Export to a DICOM System on page A-7).
Local Database (Search Local Database or Add New Patient)

You can recall or add a new patient from the local database on the instrument. If Local Database is selected in the Source drop-down menu, you can search for an existing patient already in the local database by typing the patient’s last name, first name, DOB (date of birth), Patient ID, or Issuer of Patient ID to initiate a search of the local database. The patient list is automatically refined by the entered search criteria. You can sort on any column in ascending or descending order by clicking on its column title. You can also resize the width of any column by clicking between columns to activate the resizing tool ( ), holding down the left track pad button, and dragging to resize.

If needed, you can select the Reset button to clear your entered search criteria.

Once a patient is selected, you may run a test (Run Test), recall previous test(s) (Recall Tests), analyze test results (Analysis), revise patient information (Revise Info), or delete the patient from the local database (Delete Patient). To delete a patient from the local database, it is necessary to delete all of his or her field tests in the Recall Tests (F3) Screen first.

Note: If DICOM Gateway is enabled, editing patient information imported (or merged into an existing patient) from a DICOM system is disabled. Patient edits must be done at
the DICOM system to edit patient information on the instrument. If you are using a
DICOM system, you should only change the Patient ID, Patient Name, or Date of Birth on
the DICOM system, and not on the Matrix, to avoid patient conflicts.

Select the desired patient by clicking on its row to highlight it, and then select the Run Test
button to open the Testing Screen (Figure 5-8). Alternatively, you may double-click
anywhere in the patient’s row to start testing.

Add New Patient

By selecting Local Database from the Source drop-down menu, a new patient can be
added to the local database using the Add Patient button. When selecting Add Patient, the
Enter New Patient Screen appears (Figure 5-6). Input the required patient data. Note
however, the instrument requires the following minimum set of data:

• DOB and First Name and Last Name
or
• DOB and Patient ID

Enter the Date of Birth (DOB) in the format specified in System Settings (F5). MM-DD-YYYY
is the system default format for date (i.e., 12-25-1919 for December 25, 1919).
Note: If DICOM Gateway is used, it is recommended to enter data in all fields (Last Name, First name, Date of Birth, Patient ID, and Issuer of Patient ID) to minimize the possibility of patient conflicts in the DICOM System.

Once the required patient information is entered, select the Add Patient button. A patient information dialog appears. Select OK to confirm. The patient’s demographic information is then saved in the local database and the Testing Screen opens (Figure 5-8).

**OMLocal (OfficeMate Practice Management Software)**

Using OMLocal allows you to quickly display all patients exams scheduled from OfficeMate Practice Management Software (PMS). Input of patient data is not required if using OfficeMate (see (B) OfficeMate PMS Instructions for instructions in configuring and connecting to OfficeMate running on a PC). For assistance in using OfficeMate, contact OfficeMate Customer Support.

To connect to OfficeMate, select OMLocal from the Source drop-down menu. You can search for a patient by typing the patient’s last name, first name, DOB (date of birth), or Patient ID to initiate a search of the OfficeMate software. The patient list is automatically refined by the entered search criteria. You can sort on any column in ascending or descending order by clicking on its column title. You can also resize the width of any
Patient Testing

column by clicking between columns to activate the resizing tool ( ), holding down the left track pad button, and dragging to resize.

If needed, you can select the Reset button to clear your entered search criteria.

Once you have entered your desired criteria, select the Search button to initiate the query. When the search is complete, the patient list will be updated.

Select the desired patient by clicking on its row to highlight it, and then select the Run Test to open the Testing Screen (Figure 5-8) and start testing. Alternatively, you may double-click anywhere in the patient’s row to start testing. Using either method of initiating a test, the patient’s information is automatically saved in the local database.

You may also recall previous test(s) (Recall Tests) or analyze test results (Analysis) for the selected patient if previous exams exist in the local database.

A new patient can be added to the local instrument database using the Add Patient button. When selecting Add Patient, the ENTER NEW PATIENT Screen appears (Figure 5-6). See Add New Patient on page 5-8 for more information.

Administering the Test

Figure 5-8 Testing Screen
The Testing Screen (Figure 5-8) allows you to prepare the patient for the test and to confirm or modify the testing configuration selections, if needed, prior to performing the visual field test.

The status box under the chart on the right side of the screen shows that the Pre-test Demo is running. Until the test is started, stimulus presentations for the selected test are automatically displayed to demonstrate the test to the patient.

1. Confirm that the patient’s name, ID and date of birth are correct. Return to View Patients (F2) if changes are needed (only in local database).
2. Confirm the desired Test Type is selected in the upper right of the screen.
3. Also, confirm proper selection of the Folder, Test Speed, and Fixation Target. Refer to the System Settings – Testing on page 2-5 for more information. You can change each of these by using the pull down menu (click on the arrow to change if necessary).

You can alter the first eye tested in this screen by selecting the OD (RIGHT) or OS (LEFT) buttons above the chart.

In the Testing Screen, the video eye monitoring will display a live image of the patient’s eye to aid in proper alignment of the patient and to ensure fixation during testing. Selecting the Freeze button will freeze the live image of the eye. This provides the capability to measure the pupil size using the increments on the cross hair in the frozen video image. The markings on the cross hair are in 1mm increments. Press the Unfreeze button to return to live video.

**Patient Correction**

For accurate visual field test results, correct the patient to within the refractive error cited in the table below. Use the patient’s habitual correction or a trial frame if needed. It is OK to use bifocal or progressive lenses.

<table>
<thead>
<tr>
<th>Tests</th>
<th>Patient Corrected within:</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-30-5 (-1) FDT Screening</td>
<td>+/- 6 Diopters</td>
</tr>
<tr>
<td>N-30-F FDT Threshold</td>
<td></td>
</tr>
<tr>
<td>24-2-5 (-1) FDT Screening</td>
<td>+/- 3 Diopters</td>
</tr>
<tr>
<td>24-2 FDT Threshold</td>
<td></td>
</tr>
<tr>
<td>30-2 FDT Threshold</td>
<td></td>
</tr>
<tr>
<td>Macula FDT Threshold</td>
<td>+/- 2 Diopters</td>
</tr>
<tr>
<td>10-2 FDT Threshold</td>
<td></td>
</tr>
</tbody>
</table>

Use a trial frame instead of the patient’s habitual correction if:

- Corrective lenses are tinted or photo-chromatic
- Small or thick eye glass frames obscure part of the testing field
Patient Seating and Position

1. Confirm the Patient Visor is in the correct position so that the Patient Eyepiece is aligned with the eye to be tested.

2. Hand the Patient Response button to the patient and check that the patient is relaxed.

3. Adjust the position of the patient or the instrument to obtain proper, comfortable patient alignment. Proper alignment requires the patient to see all four self-alignment points at the same time while fixating on the black square target in the center. These are illustrated on pages 11-4, 11-5, and 11-6. It is OK if the fixation target appears fuzzy to the patient.

4. If you are using the Chinrest Module, you can use the Chinrest height-adjustment knobs. Inform the patient to put his/her chin in the blue-marked chinrest for the right eye, or the white-marked chinrest for the left eye. See Chinrest Module on page 1-8.

5. Align the patient’s head against the forehead rest by adjusting the table or seat height for proper, comfortable head position relative to the instrument. Move the patient toward the instrument if needed.

6. When Eye Monitoring is turned on, an image of the patient’s eye is displayed on the Testing screen. Keep the patient’s pupil inside the circle on the video image throughout the test. Keeping the pupil perfectly centered for proper alignment is not necessary, but it should stay within the circle.

A very important factor affecting test reliability is the steadiness of the patient fixation. Unless the tested eye accurately fixates on the target while responding to stimuli, there is a possibility of unreliable results.

A comfortable patient position with good fixation is more important than obtaining or keeping exactly centered alignment.

Explaining the Test Procedure to the Patient

Explain the test procedure to the patient as follows:

“The instrument is going to show you some patterns that flicker, or shimmer, or are striped. Each time you see one of these patterns, press (and release) the button you have in your hand. Please place and keep your forehead on the instrument forehead rest.”

“Can you see the black spot in the center of the screen? You must keep looking at the black spot in the center at all times during the test.”

“While looking at the black spot in the center, can you see all four triangles at the edge of the screen?”

“Are you comfortable?”

“A sample of the test is now running. Please press the button whenever you see a pattern that flickers, or shimmers, or is striped. You may pause the test by holding down the button. Releasing the button resumes the test. You may blink your eyes whenever you want. A good time to blink is whenever you press the button.”

During testing, the stimulus may be more difficult to see than as shown in the pre-test demo.
There is a brief flash just before the actual test begins. Select the **Start Test** button. The test is beginning now. Please remember to keep looking at the black spot in the center of the screen at all times during the test.

It is a good idea to encourage the patient throughout the testing to help ensure proper patient alignment, fixation, and attention. Remind the patient to occasionally blink.

### Testing

Once the test preparations are complete and the patient is ready to begin:

1. Select the **Start Test** button located on the lower left of the **Testing** Screen to begin the test.
2. If the **Patient Visor** is not in the correct position for the test selected, the **Patient Response button** is not connected properly, there is too much ambient light, or calibration is needed, an error message will appear when the Start Test button is selected.

Once the test starts there is a test progress bar indicating “Testing…” below the chart display on the right side of the screen. The tested visual field location is indicated on the chart display throughout the test. There are also two buttons on the lower left of the screen to control the test:

- **Pause**: Selecting this button pauses the test. When paused the progress bar will say, “Paused…” and the Pause button changes to Resume Test. Pressing the Resume Test button will resume the test.
- **Cancel**: Selecting this button will bring up a prompt asking “Are you sure you want to cancel the test?” Clicking on the **No** button will resume the test, while clicking on the **Yes** button will delete the data collected during that test and bring up four options:
  - **Re-Test Right (Left)**: Select this button to repeat the test on the same eye.
  - **Test Left (Right) Eye**: Select this button to test the opposite eye.
  - **New Test**: Select this button to bring up the original **Testing** Screen for the same patient for additional testing.
  - **Done Testing**: Selecting this button returns to the **Main Menu**.

At any time during the test the patient may press and hold the Response button to pause the test. The test will resume automatically when the Response button is released.

Once the test for the first eye is complete the instrument will momentarily beep. Choose one of the three options relative to testing the second eye:

- **Start Left (Right) Eye**: Select this button to perform the same test type on the other eye.
- **New Test**: Select this button to bring up the original **Testing** Screen for the same patient for additional testing.
- **Done Testing**: Selecting this button returns to the **Main Menu**.
Patient Testing

You may enter “Notes” or Patient “Information” at any time before, during or after the test by selecting the appropriate tab. You may want to note how well the patient maintained fixation during the test, for example.

At the completion of each eye test, the results are displayed on the Operator LCD. When the testing for both eyes is completed, the results are automatically saved to the instrument’s hard drive, backed up to a CD (if enabled), and sent to the default printer (if enabled). Model 800 tests can also be automatically backed up and exported to a default USB drive or network location. If DICOM Gateway is enabled, an ePDF can be automatically exported to a DICOM System (see System Settings – Testing on page 2-5).

We recommend that you also back up your testing database every week from the MAIN MENU (F1) or the FILE FUNCTIONS (F4) Screen.
(6) Viewing and Printing Tests

Chapter Overview

This chapter discusses viewing and printing tests. Sample tests are shown at the end of the chapter. Topics covered in this chapter include:

- Viewing Test Results, page 6-1
- Printing/Saving Test Results, page 6-3
- Moving/Reassigning Tests, page 6-5
- Sample Tests, page 6-8

Viewing Test Results

You may view and print previous visual field test results for a particular patient by selecting a patient from the View Patients (F2) Screen and then selecting the Recall Tests button. You may also select individual tests from multiple patients from the Recall Tests (F3) Screen by using the track pad. Use the track pad and select one test at a time, a section at a time by holding down SHIFT, or select multiple separate entries by holding down CONTROL and selecting each desired test with the track pad (see Figure 6-1).

![Figure 6-1 Recall Tests]
Viewing and Printing Tests

If you selected multiple entries, choose the pull-down menu at the top of the Test Details Screen (see Figure 6-2) to select a specific test from all selected, or use the Previous or Next buttons at the bottom of the Test Details Screen to cycle through the selected tests. You may view the raw Threshold (dB) levels of the threshold test results, or use the pull-down menu above each chart to select various graphical representations of the test including:

- Gray Scale
- Total Deviation (dB) Probability Plot
- Pattern Deviation (dB) Probability Plot

Note: Only the Total Deviation Probability Plot is available for screening tests.

You may also select the OD (RIGHT) or OS (LEFT) eye radio button above both eye charts for the threshold tests to show two different graphical representations of the same eye (see Figure 6-2).

Test data displayed includes Test Duration, Catch Trials, Mean Deviation (MD), and Pattern Standard Deviation (PSD) global indices with statistical significance, and GHT (for the 24-2 and 30-2 tests only). You may also recall and modify any Notes or test information (Info) you previously entered for the selected test by selecting the appropriate tab below each chart. Select the More >> button at the upper right of the screen to view additional test information generated by the instrument.
**Printing/Saving Test Results**

When viewing a test, you may select **Print** to obtain printed test results, select **Delete** to permanently delete the selected test from the instrument’s database or select **Save As...** (see Figure 6-3) to save the test.

![Figure 6-3 Save As Dialog (One Test Selected)](image)

**Saving Tests**

You can save a test to a CD-R/W, floppy disk, USB storage device, or network share location in any of these formats:

- **PDF**, saves the test results of the printout in PDF format (Portable Document Format from Adobe)
- **JPEG**, saves the test results as a photo image of the printout in JPEG (Joint Photographic Experts Group) format
- **Database Backup format (.fdt2)**, saves the test in Humphrey Matrix database 8.0 format, which can only be read by a Humphrey Matrix instrument running system software 8.x
- **XML** (Extensible Markup Language), used to access the test results in a text form used for clinical research

If you are using eyefinity OfficeMate Practice Management Software with the Matrix, you can also save to the **Remote Connection** location. The Remote Connection only saves in **Combined PDF and Data** format.

If you are using DICOM Gateway (see (A) DICOM Gateway) and have it enabled, you can save the test to a DICOM System in PDF format.
Viewing and Printing Tests

To set the location, select the **CD-RW, DICOM** (if DICOM Gateway is enabled), **Network Share**, or **USB** radio button. For Network Share and USB, select a location from the corresponding drop-down menu. For Network Share, you must have previously added network shared folders to select them here (see Add Network Shared Folders on page 8-14). For information on USB storage devices see USB Storage Devices on page 2-10. For Network Share and USB, you can also select a folder on the Network Share or USB device by selecting the **browse** button ( ) (see Selecting a Folder on a USB Storage Device on page 2-11) and Selecting a Subfolder in a Network Share on page 8-17).

If you selected DICOM, PDF is the only data export format available.

For all locations except DICOM and Remote Connection, the File Name is automatically generated, but you can change it (two File Names appear for OU Threshold tests).

Note: If saving in Database Backup Format, do not rename the file extension (.fdt2) for a successful import.

Select OK to save the test(s). If you selected more than one test, a **File Name** is automatically generated for each.

Note: The selected location and format for the **Save As** dialog is remembered after instrument shutdown. The selected Network Share or USB storage device (including folder) is also remembered after instrument shutdown, until you change it. However, if you remove the selected USB device and insert a new USB device, the new USB device will be selected as the default export location (with no folder).

Note: If you remove a shared folder that is currently selected as a Network Share, the first shared folder in the SAVED SHARES list will be selected as the Network Share. If there are no other shared folders in the list, then the Network Share will be disabled.

Note: PDF images open in Adobe Reader. The program on your PC used to view the JPG images will vary depending on your computer configuration.

**Printing Tests**

You may also print all selected tests from the RECALL TESTS (F3) Screen without viewing them by selecting the **Print** button. The test(s) will print to the default printer (see Printer Configuration). When printing, a **Printer icon** ( ) appears to the left of the USB Ports icon ( ) on the lower right of the screen. If you select multiple tests for printing, please consider the implications of printing time. For other questions regarding the operation of the printer, please refer to the Printer information supplied with the printer.
Moving/Reassigning Tests

To move tests to a different working folder (see System Settings – Testing on page 2-5 for information on the default working folder), or to reassign tests to a different patient, select the test(s) you want and then select Edit Test... (see Figure 6-4).

![Figure 6-4 Edit Test Dialog](image)

**Move to Folder**

Select Move to Folder... on the Edit Test dialog to move the test(s) to a different working folder (see Figure 6-5).

![Figure 6-5 Move Tests to Folder Dialog](image)

Select the working folder you want from the drop-down menu and then select OK.
Reassign Tests

Select **Reassign Test** on the **Edit Test** dialog to reassign the test(s) to a different patient.
Select **OK** to confirm and the **Select Patient** dialog appears (**Figure 6-6**).

![Figure 6-6 Reassign Test – Select Patient Dialog](image)

Search for the patient you want by entering patient information in the fields provided—the patient list is updated automatically. You can sort on any column in ascending or descending order by clicking on its column title. You can also resize the width of any column by clicking between columns to activate the resizing tool (=resizing tool), holding down the left track pad button, and dragging to resize.

Select the patient you want to reassign tests to by clicking on its row to highlight it and selecting **OK**.
Analysis

The Analysis button in the VIEW PATIENTS (F2) Screen only provides an Overview Plot. Select Overview to generate an Overview Plot (see Figure 6-7).

To generate an Overview Plot for the selected patient, select a test type from Test Selection and an eye from Select Eye. Select Print to print the Overview Plot to the default printer, or Save As... to save it to a location (see Printing/Saving Test Results on page 6-3). Count is the number of available tests for each test type shown in Test Selection. A sample Overview printout is included at the end of the Sample Tests in this chapter (see Figure 6-17 on page 6-17).

Note: Multi-page Overview Plots (five or more tests) are split into separate documents when sent to a DICOM Archive.
Sample Tests

NAME: Lastname, Firstname
ID: Sample01
DOB: 06-08-1979 [23]

N-30-5 FDT Screening
DATE: 10-25-2002 3:07 PM
TEST SPEED: NORMAL

LEFT EYE

PUPIL DIAMETER:
VISUAL ACUITY:
RX:

RIGHT EYE

PUPIL DIAMETER:
VISUAL ACUITY:
RX:

TOTAL DEVIATION

30  30  30

TEST DURATION: 0:35
FIXATION TARGET: Central
FALSE POS ERRS: 0/3 (0 %)

P >=5%
P <5%
P <2%
P <1%

NOTES:

RIGHT EYE

PUPIL DIAMETER:
VISUAL ACUITY:
RX:

TOTAL DEVIATION

30  30  30

TEST DURATION: 0:33
FIXATION TARGET: Central
FALSE POS ERRS: 0/3 (0 %)

NOTES:

Figure 6-8 N-30-5 FDT Screening
Figure 6-9 N-30-1 FDT Screening
24-2-5 FDT Screening

DATE: 10-28-2002 9:24 AM

TEST SPEED: NORMAL

LEFT EYE

PUPIL DIAMETER: 

VISUAL ACUITY: RX:

TOTAL DEVIATION

RIGHT EYE

PUPIL DIAMETER: 

VISUAL ACUITY: RX:

TEST DURATION: 1:35

FIXATION TARGET: Central

FALSE POS ERRS: 0/10 (0 %)

NOTES:

P>5%
P<5%

TEST DURATION: 1:32

FIXATION TARGET: Central

FALSE POS ERRS: 0/10 (0 %)

NOTES:

Figure 6-10 24-2-5 FDT Screening
Figure 6-11 24-2-1 FDT Screening
Figure 6-12 N-30-F FDT Threshold
Figure 6-13 24-2 FDT Threshold

NOTES:
Figure 6-14 30-2 FDT Threshold
Figure 6-15 10-2 FDT Threshold
Figure 6-16 Macula FDT Threshold
Figure 6-17 24-2 FDT Threshold Overview
(7) Database Management

Chapter Overview

The FILE FUNCTIONS (F4) Screen provides database management capabilities. A single testing database is used on the Humphrey Matrix so all your visual field test results are available in the working database.

Topics covered in this chapter include:

- Database Backup, page 7-1
- Database Import / Merge, page 7-3
- Database Restore, page 7-4
- Restore User Settings, page 7-5

Database Backup

You can back up the instrument’s testing database to a CD-R, USB drive, network location, or floppy disk in Database Backup Format (.fdt2). Back up your database regularly. Select a backup schedule that accommodates your business.

Note: A database backup creates a folder on the destination media named from the instrument serial number (e.g., SN51111122222). The name of the backup file is created from the instrument serial number and the date and time of the backup (e.g., SN51111122222_FullBackup_05-11-2010_06.48.44_1.fdt2). Along with backup of test data, a database backup also backs up the current user settings and system settings.

Note: Matrix System Software Version 8.0 creates a different database structure than previous versions that is not fully compatible with previous software releases. When data is imported from 07.02.01 or lower Matrix software versions to version 8.0 software systems, the Matrix 8.0 software will convert the data to the proper format. Matrix 8.0 data cannot be imported into a Matrix running a lower version of software.

CAUTION: We do not recommend that you use optical disks (CDs) for long-term data storage or backup. Use should be limited to data transfer between systems. Take care to protect these media from damage. We recommend you use hard plastic cases when transporting and shipping these media. Optical disks are very susceptible to scratches that could render them unreadable.
To make a backup copy of the testing (default) database:

1. Select **File Functions (F4)** to display the **FILE FUNCTIONS Screen** (*Figure 7-1*).

![Figure 7-1 File Functions Screen](image)

2. In the **Database Backup** section, select the **browse** button ( ) to select a backup location. The **Save Location** dialog appears (*Figure 7-2*).

![Figure 7-2 Save Location Dialog (Database Backup)](image)

3. To set the backup location, select the **CD-R/W**, **Network Share**, or **USB** radio button. For Network Share and USB, select a location from the corresponding drop-down menu.
Note: For Network Share, you must have previously added network shared folders to select them here (see Add Network Shared Folders on page 8-14). For information on USB storage devices see USB Storage Devices on page 2-10.

Note: The backup location is remembered until instrument shutdown.
4. Select OK to set the location.
5. Select Back Up to start the backup.
6. A message will be displayed when the backup has completed successfully.

**Database Import / Merge**

The user can merge Humphrey Matrix databases (full or partial) from multiple Humphrey Matrix instruments into one instrument if desired. If more than one instrument is in use at the same location or practice, it is a good idea to merge the databases.

1. Using the backup procedure described above (Database Backup on page 7-1), back up the database from each Humphrey Matrix instrument to a different destination.
2. In the Database Import / Merge section, select the browse button ( ) to select a database location. The Location dialog appears (Figure 7-3).

![Figure 7-3 Save Location Dialog (Database Import / Merge)](image)

3. To set the database location, select the CD-R/W, Network Share, or USB radio button. For Network Share and USB, select a location from the corresponding drop-down menu. For Network Share, you must have previously added network shared folders to select them here (see Add Network Shared Folders on page 8-14). For information on USB storage devices see USB Storage Devices on page 2-10.
4. Select the browse button ( ) and select a database file (.fdt2) by clicking on it.
5. Select Open.
6. Select OK.
7. Auto is selected as the default Conflict Resolution. Select Manual, if desired (see Conflict Resolution on page 7-4).
8. Select Import to start the import/merge
9. A message will be displayed when the import/merge has completed successfully.
10. Repeat steps 2 through 4 until all units are synchronized.
Conflict Resolution

In the **File Functions** menu under Database Import / Merge and Restore Database, you have the option of setting the **Conflict Resolution** to **Auto** or **Manual**.

If **Conflict Resolution** is set to **Manual** and there are two of the same tests for a patient, or two of the same patients, one in the database and one on the restore media, the operator will receive a prompt to decide which results are placed in the database. If **Conflict Resolution** is set to **Auto**, and the Matrix software detects duplicate tests or patients, the software will try to resolve the duplicates by automatically choosing one of them without prompting the operator for confirmation. Occasionally, the operator will be asked to examine the two tests or patients and make the decision because the software cannot reliably choose the right course of action. Auto mode is considerably faster than Manual mode, which always asks the operator to make the decision when a duplicate test or patient is detected.

Note: When importing a database, if a patient conflict resolution dialog is presented and the user asks for more test details, the Issuer of Patient ID (IPID) may be truncated. When truncation is necessary, it is done at the beginning of the string instead of the end because the end of the string is more likely to be unique than the beginning of the string.

Database Restore

**Database Restore** restores the latest Full Backup (performed by **Database Backup** or **Perform Backup**) and all partial backups (**Save As**, and **Automatic Backup at End of Test**, if they were saved in the same location as the Full Backup).

To restore a database backup of the testing database:

1. Select **File Functions (F4)** to display the **FILE FUNCTIONS** Screen (**Figure 7-1**).
2. In the **Database Restore** section, select the **browse** button ( ) to select a database location. The **Location** dialog appears (**Figure 7-4**).

![Figure 7-4 Save Location Dialog (Database Restore)](image)

3. To set the location that contains the full database backup file (.fdt2), select the **CD-R/W, Network Share**, or **USB** radio button. For Network Share and USB, select a location from the corresponding drop-down menu. For Network Share, you must have
previously added network shared folders to select them here (see Add Network Shared Folders on page 8-14). For information on USB storage devices see USB Storage Devices on page 2-10.

Note: Use Database Import if it is coming from another instrument.

Note: The restore location is remembered until instrument shutdown.

4. Select OK.
5. Auto is selected as the default Conflict Resolution. Select Manual, if desired (see Conflict Resolution on page 7-4).
6. Select Restore to start the restore.
7. A message will be displayed when the database restore has completed successfully.

**Restore User Settings**

Note: Settings on a version 8.0 instrument cannot be restored to an instrument running version 7.02

All user settings on the SYSTEM SETTINGS Screens are backed up with a database backup (see System Settings on page 2-3). To restore only the user settings from a database backup:

1. Select File Functions (F4) to display the FILE FUNCTIONS Screen (Figure 7-1).
2. In the Restore User Settings section, select the browse button ( ) to select a location. The Location dialog appears (Figure 7-5).

   ![Figure 7-5 Save Location Dialog (Restore User Settings)](image)

3. To set the location, select the CD-RW, Network Share, or USB radio button. For Network Share and USB, select a location from the corresponding drop-down menu. For Network Share, you must have previously added network shared folders to select them here (see Add Network Shared Folders on page 8-14). For information on USB storage devices see USB Storage Devices on page 2-10.
4. Select the browse button ( ) and select a user_settings.txt file by clicking on it.
5. Select Open.
6. Select OK.

Note: The restore location is remembered until instrument shutdown.
7. Select Restore.
8. A message will be displayed when the restore has completed successfully.

Note: Printer settings are not backed up and therefore not restored.

Note: Information on the Upgrade System function is found under Upgrade System on page 10-5.
(8) Networking Configuration

Chapter Overview

This chapter provides connectivity options for Matrix Model 715 and 800, and configuration instructions to enable transfer of Matrix data from a Humphrey Matrix Model 800 instrument to a network file server via network connection.

Topics covered in this chapter include:

- Network Capabilities, page 8-1
- Risks of Internet Connectivity, page 8-2
- Approved Third Party Hardware and Software, page 8-2
- Using the Shared Network Folders, page 8-2
- Network File Server System Requirements, page 8-3
- Configuration to a Pre-existing Office Network, page 8-4

Note: Users are responsible for network setup and maintenance, including installation and configuration of all necessary hardware and software. Carl Zeiss Customer Support is limited to testing network connectivity of the Matrix instrument. Customer Support cannot troubleshoot or repair problems with network connectivity.

Note: See your IT, System, or DICOM network administrator for help in entering correct configuration information.

Network Capabilities

The Matrix Model 800 has the network connectivity options shown in Table 8-1 and described below.

With an Ethernet port, the Matrix 800 instrument is capable of connecting to local area networks for data storage and printing. With DICOM Gateway software enabled, the Matrix 800 can connect to a DICOM system, such as Carl Zeiss Meditec’s FORUM™ (see (A) DICOM Gateway). The Matrix 800 supports the following:

- Access of shared folders offered by a CIFS (e.g., Windows) file server.
- Database backup/restore to/from a shared folder.
- Export exam to a shared folder or DICOM system.
- Import patient scheduling and demographic information from a DICOM Modality Worklist.
- Print to shared printers and IP printers.

Table 8-1 Matrix 800 Network Connectivity Options

<table>
<thead>
<tr>
<th>Connection</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet Port</td>
<td>Network Shared Folder (see Add Network Shared Folders on page 8-14</td>
</tr>
<tr>
<td>Serial Port</td>
<td>DICOM-compliant system (see (A) DICOM Gateway)</td>
</tr>
<tr>
<td>OfficeMate ExamWRITER (see (B) OfficeMate PMS Instructions</td>
<td></td>
</tr>
</tbody>
</table>
Networking Configuration

Risks of Internet Connectivity

⚠️ CAUTION: When connected to the Internet, the Matrix may be vulnerable to serious security risks, including viruses and worms that could disable your system or adversely affect its performance.

⚠️ WARNING: When networking the Matrix, use only network cables with an unshielded RJ-45 connector. Use of a shielded network connector in the Matrix could result in electrical shock to the patient and/or examiner.

Approved Third Party Hardware and Software

If you wish to use a third party device, seek technical support from the device manufacturer. Repairs necessitated by the attempt to use a non-approved device are not covered under warranty.

⚠️ Note: Carl Zeiss Meditec does not provide technical support for the use of unapproved third party hardware or software.

Using the Shared Network Folders

Using shared network folders is recommended in offices that have a local area network, especially if you have multiple Matrix instruments. Once you have set up the instrument(s) on the network, you can use the shared network folder for database backup and test export.

Set Up Shared Network Folder

⚠️ Note: Configuring the PC and the instrument for data transfer to a shared network folder should be attempted only by a network administrator or system administrator.

⚠️ Note: If you attempt a data transfer function when the network is down or the server is down, the function will fail and the instrument will notify you that a connection could not be established.
Network File Server System Requirements

Operating System
- Windows® XP Professional, 32-bit, Service Pack 3
- Windows 2000 Professional, Service Pack 4
- Windows Vista®, 32-bit, Service Pack 1
- Windows Server 2008, 32-bit
- Windows 7, 32-bit

System Requirements
If you plan to use a network file server it must meet the following minimum requirements:
- Processor: 800MHz processor or faster
- Memory: 256 MB RAM
- Network interface card 10 or 100 Mbps
- Network switch, 10/100
- External Hard Drive or Tape backup unit for offsite data storage

Note: It is the user’s responsibility to protect their exam data from loss by frequent backup of the network server. Backup media should be of archival quality, and the media should be stored in a secure, remote location.

CAUTION: Failure to backup the network file server may result in the loss of medical exam data.

Network File Server Recommendations
In addition to the minimum requirements listed above, we recommend the following for the network file server:
- A mirrored RAID array for data storage—strongly recommended.
- An uninterruptible power supply (UPS)—strongly recommended.
- The file server must be started prior to use by the Matrix.

Note: It is strongly recommended that the file server not be used for interactive programs, such as web browsing or word processing.
8-4

Networking Configuration

Configuration to a Pre-existing Office Network

This section explains how to configure the Matrix 800 to communicate via your pre-existing office network (a local area network or LAN). To do this, the Matrix must be connected to the office network by a standard network patch cable. It is the user’s responsibility to install the necessary cables. Configuration topics, in order, are:

• Install the Network Cable, page 8-4
• Create a Shared Folder on Network File Server, page 8-4
• Configure Network Settings on the Matrix, page 8-13
• Add Network Shared Folders, page 8-14
• Selecting a Subfolder in a Network Share, page 8-17

Install the Network Cable

Plug one end of a standard network patch cable into the Matrix Ethernet port (see on page 1-7). Plug the other end of the cable into the 10/100 network switch. This switch controls the bandwidth in and out of Matrix. Connect another standard network patch cable between the switch and the office network outlet.

Create a Shared Folder on Network File Server

To save your Matrix data, a shared folder needs to be created on the network file server, or on a computer on the local network. For a Windows XP computer, see Create a shared folder on a Windows XP computer below. For a Windows Vista or Windows 7 computer, see Create a shared folder on a Windows Vista or Windows 7 computer on page 8-9.

Create a shared folder on a Windows XP computer

1. Create a local folder on the computer for exported data. The new folder can be created in any available path on the hard disk drive. In the example below, the new folder was created by right-clicking on the Windows desktop, and then selecting New > Folder (Figure 8-1).

![Figure 8-1 Right-click on Desktop, Select New > Folder](image)
Continuing the example, the new folder created on the Windows desktop was named **Netshare** (Figure 8-2).

2. Right click on the new folder, and then select **Sharing and Security**... as shown in Figure 8-2.

3. If you have Simple File Sharing enabled, the following **Netshare Properties** dialog opens to the Sharing tab (Figure 8-3).
If you have Simple File Sharing disabled, the following Netshare Properties dialog opens to the Sharing tab (Figure 8-4).

4. If you see the Netshare Properties dialog from Figure 8-3, select **Share this folder on the network** and **Allow network users to change my files**.

---

**Figure 8-4 Netshare Properties (Simple File Sharing OFF)**
5. If you see the **Netshare Properties** dialog from Figure 8-4, select the **Permissions** button. The **Permissions for Netshare** dialog opens (Figure 8-5).

![Figure 8-5 Permissions for Netshare Dialog](image)

Select the **Allow** checkbox for **Full Control** as shown in Figure 8-5 so that all checkboxes for **Allow** are checked. Click **OK** to save changes and close the **Permissions for Netshare** dialog.

Note: You can change the **Share Name** if desired. The default share name is the same as the folder name. We recommend you use the default share name.

6. Click **OK** to save changes and close the **Netshare Properties** dialog.

7. The Netshare folder now displays a shared folder icon.
Networking Configuration

Note: In order to ensure secure domains on your share folder, set up a shared user group of known and trusted users. Name the group Authenticated Users. To create an Authenticated Users group, see the applicable Windows XP website or follow the steps below.

1. Open Computer Management
   - Click Start, and then click Control Panel. Click Administrative Tools, and then double-click Computer Management.
2. In the console tree, click Groups.
   - Computer Management > System Tools > Local Users and Groups > Groups
3. Click Action, and then click New Group.
4. In Group name, type the name for the new group: Authenticated Users.
5. In Description, type a description of the new group.
   - To add one or more users to the group, click Add.
6. Click Create, and then click Close.

To add a member to the Authenticated Users group:

1. Open Computer Management
   - Click Start, and then click Control Panel. Click Performance and Maintenance, click Administrative Tools, and then double-click Computer Management.
2. In the console tree, click Groups.
   - Computer Management > System Tools > Local Users and Groups > Groups
3. Right-click the group in which you want to add a member, point to All Tasks, click Add to Group, and then click Add.
4. Click Look in to display a list of domains from which users and groups can be added to the group.
5. In Location, click the domain containing the users and computers you want to add, and then click OK.
6. In Name, type the name of the user or group you want to add to the group, and then click OK.
   - If you want to validate the user or group names that you are adding, click Check Names.
Create a shared folder on a Windows Vista or Windows 7 computer

1. Create a local folder on the computer for exported data. The new folder can be created in any available path on the hard disk drive. In the example below, the new folder was created by right-clicking on the Windows desktop, and then selecting New > Folder (Figure 8-6).

Continuing the example, the new folder created on the Windows desktop was named Netshare (Figure 8-7).
2. Right click on the new folder, and then select **Properties** as in Figure 8-7. Select the **Sharing** tab on the Netshare Properties dialog (Figure 8-8).

### Figure 8-8 Netshare Properties – Sharing Tab

3. Select the **Advanced Sharing...** button. If you have User Account Control enabled you will see a **User Account Control – Windows needs your permission to continue** dialog. Click **Continue** to proceed. The Advanced Sharing dialog opens (Figure 8-9).

### Figure 8-9 Advanced Sharing Dialog

Note: You can change the **Share Name** if desired. The default share name is the same as the folder name. We recommended you use the default share name.
4. Select **Share this folder** if not already selected.
5. Select the **Permissions** button. The **Permissions for Netshare** dialog opens (Figure 8-10).

![Permissions for Netshare Dialog](image)

6. Select the **Allow** checkbox for **Full Control** as shown in Figure 8-10 so that all checkboxes for **Allow** are checked.
7. Click **OK** to save changes and close the **Permissions for Netshare** dialog.
8. Click **OK** to close the **Advanced Sharing** dialog.
9. Click **OK** to close the **Netshare Properties** dialog.

Note: Before a shared folder on a Windows 7 PC is added to Matrix via the Guest account (Guest check box selected), disable the password protection on the Windows 7 PC. To turn off the password protected sharing, on the PC:

1. Click **Start**.
2. Enter **Network and Sharing Center** in the **Start** search box.
3. Click on **Change advanced sharing settings** in the left pane.
4. Ensure the **Password protected sharing** is turned off, and save changes.
Note: In order to ensure secure domains on your share folder, set up a shared user group of known and trusted users. Name the group **Authenticated Users**. To create an **Authenticated Users** group, see the applicable Windows 7 or Windows Vista website or follow the steps below.

1. Open Microsoft Management Console by clicking the Start button, typing `mmc` into the search box, and then pressing Enter. If you’re prompted for an administrator password or confirmation, type the password or provide confirmation to the User Access Control message prompt.
2. In the left pane, click **Local Users and Groups**.
3. If you don’t see **Local Users and Groups**, double-click the **Groups** folder.
4. Click **Action**, and then click **New Group**.
5. Type the group name Authenticated Users and a description.
6. Click **Add**, and then type the name of the user account.
7. Click **Check Names**, and then click **OK**.
8. Click **Create**.

To add a member to the **Authenticated Users** group:

1. Open Microsoft Management Console by clicking the Start button, typing `mmc` into the search box, and then pressing Enter. If you’re prompted for an administrator password or confirmation, type the password or provide confirmation.
2. In the left pane, click **Local Users and Groups**.
3. If you don’t see **Local Users and Groups**, double-click the **Groups** folder.
4. Right-click the group you want to add the user account to, and then click **Add to Group**.
5. Click **Add**, and then type the name of the user account.
6. Click **Check Names**, click **OK**, and then click **OK** again.
Configure Network Settings on the Matrix

1. Select System Settings (F5) > Networking to display the Networking Screen (Figure 8-11).

2. Select DHCP to use a DHCP (Dynamic Host Configuration Protocol) server to automatically assign an IP address to the Matrix instrument.

3. If your network uses static IP addresses, contact your network administrator to have the Matrix added, or select Manual and fill in the IP Address, Subnet Mask, and Default Gateway fields. Matrix Name is a user configurable setting. The default value is Matrix-serial_number. Reboot the instrument and DICOM server if you change the value.

4. If you selected the Manual IP Configuration, click the Save button when all the necessary fields are completed.

When switching from Manual IP to DHCP, or DHCP to Manual, the displayed IP addresses are not updated until after you click the SAVE button.

If you change the Matrix Name and end the name with a period, a tool tip message is displayed: A hostname label may not be empty. This means that the Matrix expects to see additional text following that period. You may use a period in the host name but not at the end of the name.
Networking Configuration

Add Network Shared Folders

You need to add at least one network shared folder for the Matrix to use for the default Backup and Export locations (System Settings – Backup on page 2-9 and USB Storage Devices on page 2-10), the Save As location (Printing/Saving Test Results on page 6-3), and all data management functions (7 Database Management).

1. Select System Settings (F5) > Sharing to display the SHARING Screen (Figure 8-12).
Networking Configuration

Add a Network Computer

You need to add at least one computer or file server on your network for the Matrix to back up or export to. A network computer is also needed for setting up shared printers.

1. Select Add to add a networked computer. The Add a Networked Computer dialog appears (Figure 8-13).

![Add a Networked Computer Dialog](image)

Figure 8-13 Add a Networked Computer Dialog

2. Enter the Computer Name or IP address of the computer. If the computer requires a secure login, enter the User name and Password for the computer. Select Anonymous login if you can log in as a guest—guest is automatically entered for the User name and the password is blank.

- Note: You may use a simple name for the Computer Name or IP, or you may need to use a fully-qualified computer name, such as mycomputer.mycompany.com, depending upon your network configuration.
- Note: In a Domain environment, the User name should specify Domain name\user name. For example: env\joesmith, where env is the domain name and joesmith is the user name.
- Note: See your IT, System, or DICOM network administrator for help in entering correct configuration information.

3. Select OK to add the computer to the Available Shares list. You can add/remove computers to the list as needed. Select Remove to remove a computer from the list.
Networking Configuration

Add a Shared Folder (Share)
You need to add at least one network shared folder for the Matrix to use for the Backup, Export, and Save As locations.

1. To see a computer’s shared folders, click the expand/collapse icon (■) in the Available Shares column. To add a shared folder to the list of saved shares, select the shared folder you want by clicking on it, and then click the Arrow button ( ▶️ ) between the list of available shares and saved shares (see 2.).
2. A dialog appears where you can rename the shared folder, if desired (see Figure 8-14).

![Figure 8-14 Save Shared Location Dialog](image)

3. Click OK to add the shared folder to the list of saved shares.
4. You can now select the shared folder in the Network Share drop-down menu of the Backup, Export, and Save As screens (System Settings – Backup on page 2-9, USB Storage Devices on page 2-10, and Printing/Saving Test Results on page 6-3, and all data management functions (7) Database Management).
5. If you want to remove a shared folder from SAVED SHARES list, select it and then select the Remove button.

Note: If you remove a shared folder that is currently selected as a Network Share, the first shared folder in the SAVED SHARES list will be selected as the Network Share. If there are no other shared folders in the list, the Network Share will be disabled.
6. To see the properties of a selected shared folder, or to rename it, select it and then select the Properties button.

Note: Always perform a Database Backup after adding shared folders or connecting for FORUM. This ensures that the user settings .txt file is stored and setup information is available if connectivity is lost and has to be restored. Shared and network printer setup information, however, does not get stored in the .txt file. Restoring the .txt file only sets the default local printer.
Selecting a Subfolder in a Network Share

To select a subfolder in a selected Network Share folder, select the browse button ( ) for the selected Network Share folder and then select the subfolder you want (Figure 8-15). If desired, use the Create New Folder button ( ) to create and name a new folder for selection.

![Choose Directory Dialog (Network Share)](image)

After selecting a subfolder, click the Choose Selected Directory button and the selected subfolder appears under the selected Network Share (Figure 8-16).

![Network Share Subfolder Selected](image)

- Note: The selected Network Share subfolder is remembered after instrument shutdown, unless the subfolder or its shared folder is changed or removed.

- Note: Depending on your network permissions, you may not be able to create a new subfolder inside a network shared directory. See your IT administrator for help.
(9) Printer Configuration

Chapter Overview

This chapter instructs you how to configure a printer for use with the Humphrey Matrix.

Topics covered in this chapter include:

• Introduction, page 9-1
• Approved Printers, page 9-1
• Printer Safety, page 9-2
• Installation Overview, page 9-2
• Printer Configuration, page 9-3
• Optional USB Printer Installation, page 9-2
• Print Settings, page 9-5

Introduction

These instructions provide requirements and recommendations for the printer, but are
generic with respect to brand, although one may be supplied with the instrument. Specific
configuration instructions vary by printer, and users are advised to closely follow the
instructions supplied. The Humphrey Matrix Model 800 provides native generic PCL 3, PCL
5, and PostScript printer support for local, shared, and networked printers. The printer does
not require external drivers to support these printer languages.

Note: Only native PCL-3, PCL-5 or postscript printers will work with the Matrix. Printers that
depend on a windows print engine do not work with the Matrix.

Approved Printers

Many printers are available that are compatible with the Matrix. Please note if you use an
unqualified printer with the Matrix, CZM cannot guarantee technical support. Repairs
necessitated by the attempt to use a non-qualified device are not covered under warranty.
Any printer considered must meet the following criteria:

• Native generic PCL3, PCL5, and Postscript printer driver support
• Network port or USB port (the network port must be 100, or 10/100 Base T. If a USB
  port is used, an isolation transformer is required).
• Ability to print on 8.5 x 11 paper in the U.S. or appropriate paper size outside the U.S.

CAUTION: We strongly recommend you use printers supplied or approved by Carl
Zeiss Meditec, when available, because they will have been tested to work with the
instrument and meet medical electrical and safety requirements.
Printer Configuration

Printer Safety

**WARNING:** To maintain patient safety, an isolation transformer is required when connecting externally powered peripheral devices (i.e., printer, USB drive, etc.) within 1.5 meters (4.9 feet) from the patient. In addition, a separation device is required for all externally powered peripheral devices outside this distance unless these devices have no metal to metal connection to the Matrix via I/O connectors. Failure to observe this warning could result in electrical shock to the patient and/or examiner.

**WARNING:** To directly connect a network printer to the Matrix only use a UTP network cable. Use of a shielded network cable will ground the printer through the Matrix, which could result in electrical shock to the patient and/or examiner. It could also invalidate the system safety approval.

**CAUTION:** Do not use the printer or the instrument with an extension cord or a power strip (multiple portable socket outlet).

Installation Overview

The following three general steps are common to all configurations. These steps are explained further in the specific sections.

1. **Printer hardware setup and configuration:** Refer to the instructions provided with the printer to unpack and set up the printer hardware. Printer configuration is typically not required.

2. **Connect hardware to enable communication between instrument and printer.** The hardware used depends on the type of configuration you select either a printer on a network or a local printer.

3. **Configure the instrument software to communicate with the printer.** See Print Settings on page 9-5 to connect the Matrix to a local, shared, or network printer.
**Printer Configuration**

A printer can be connected locally to the Matrix through the USB port; or, configured for network connection.

**Connection Overview**

The printer is connected and configured based upon connection type. Instructions in this chapter discuss the three connection types:

1. Optional USB Printer
2. Network Printer
3. Shared Printers

Note: For network printers, consult your network administrator or information technology (IT) professional to make sure you configure the printer correctly. Specific characteristics of individual network configurations can vary greatly.

**Optional USB Printer Installation**

1. Open the printer shipping box by carefully cutting the packing tape securing the top flaps of the box.
2. Remove the printer, USB cable, power cord, printer information, and printer software CD (for reference only) from the printer box.
3. To protect the printer during shipping some components were secured with tape and packing material. Make sure all tape and packing material is removed before operating the printer.
4. To achieve satisfactory results, read the printer information thoroughly before using the printer. Refer to the printer information to install the print cartridges to complete the printer set-up.
5. Once the printer set-up is completed, connect the printer USB cable to the USB port on the printer and to a USB port located underneath the base of the Matrix, and then connect the printer power cord to the printer.

**Local Printer Power Connections**

![Figure 9-1 Accessory Power OUTPUT (Left) and Power Cord INPUT (Right)](image-url)
Printer Configuration

Underneath the base of the unit there are two power cord receptacles, one for a printer and the other to power the instrument.

1. If your Matrix is connected to an isolation transformer (see Printer Safety on page 9-2), plug the printer power cord supplied with the printer into the accessory power OUTPUT receptacle on the unit (Figure 9-1, left). If your Matrix is not connected to an isolation transformer, you must plug the printer power cord into a different power outlet than the Matrix. Note: You may need a different power cable with a smaller plug to connect your printer to the power outlet on the Matrix.
2. Plug the approved hospital grade power cord provided with the instrument into the appropriate Power Cord INPUT receptacle (Figure 9-1, right).
3. Verify ALL connections are fully seated.
4. Once all the cables are connected, turn the Matrix Visual Field Instrument upright.
5. Verify that the instrument feet are not on top of any cables.

⚠️ CAUTION: Use only the printer and printer cables provided (or approved alternate) with this device to meet medical safety requirements.
Print Settings

The Humphrey Matrix Model 800 provides native generic PCL 3, PCL 5, and PostScript printer support for local, shared, and networked printers. Select System Settings (F5) > Printing to display the PRINTING Screen (Figure 9-2).

Click on a printer to highlight and select it.

Add Printer: Select this button to add a new network or shared printer. The Add New Printer dialog box appears (Figure 9-3). A local USB printer is automatically set up when it is connected to the Matrix (see Local Printer Setup on page 9-6 for Local Printer Setup instructions).
Select **Network Printer** or **Shared Printer**, and then select **Next**. See:

- **Network Printer Setup** on page 9-7 for Network Printer Setup instructions
- **Shared Printer Setup** on page 9-7 for Shared Printer Setup instructions

**Remove Printer**: Select this button to remove the selected printer from your list of printers. A dialog will ask to confirm your deletion. Select **Delete Printer** to delete the printer.

**Make Default**: Select this button to make the currently selected printer the default printer when **Print** is selected for Automatic End of Test Options, Recall Tests, Overview Analysis, Logging, Export Sys Info, and Diagnostics. A green checkmark appears on the printer icon to the left of the printer name when **Make Default** is checked, and the printer is moved to the top of the printer list. **To print, you must have one printer selected as the default printer.**

**Cancel All Jobs**: Select this button to clear all printers of all pending print jobs.

**Refresh**: Select this button to update the list for local connected printers.

**Local Printer Setup**

1. Connect a local printer to a USB port on the Matrix and turn it on. Wait a few seconds, and the printer is automatically added to the list of printers available for selection on the **PRINTING** Screen (Figure 9-2). You cannot change the local printer name.
2. If desired, select the printer and then select **Make Default** to make the printer the default printer.
Network Printer Setup

1. Select Network Printer from the Add Printer dialog (Figure 9-3). The Network Printer Setup dialog box appears (Figure 9-4).

![Figure 9-4 Network Printer Setup Dialog](image)

Note: The yellow triangle (⚠️) indicates an incorrect value has been entered in the field.

2. Enter a name for this printer in the Name field (e.g., FrontOffice, etc.). Blank spaces are not allowed.

3. Enter the IP Address of the network printer in the IP Address field.

4. Select the type of printer from the Type drop-down menu: PCL 3, PCL 5, or PostScript.

5. Select Print Test Page to print a sample page on this printer. If a test page does not print, make sure you have entered the correct IP Address and selected the correct printer Type. Also verify the printer is turned on and properly connected. If needed, see your Network Administrator for help.

6. Select Finish to complete the Network Printer Setup. The printer is added to the list of printers available for selection on the PRINTING Screen (Figure 9-2).

7. If desired, select the printer and then select Make Default to make the printer the default printer.

8. When printing, a Printer icon (🪞) appears to the left of the USB Ports icon (🌐) on the lower right of the screen.

Shared Printer Setup

1. Select Shared Printer from the Add New Printer dialog (Figure 9-3). The Shared Printer Setup dialog box appears (Figure 9-5).

![Figure 9-5 Shared Printer Setup Dialog](image)

Note: The yellow triangle (⚠️) indicates an incorrect value has been entered in the field.

2. Enter a name for this printer in the Name field (e.g., Ella’s Printer, etc.). Blank spaces are not allowed.
3. Select **Browse** to select the Path to the Shared Printer. The **Select a Printer** dialog appears. A network computer must already be added in the list of available shares on the **SHARED Screen** (see **Add a Network Computer** on page 8-15). Select the network computer where the shared printer is connected to. Expand the computer by clicking on the expand/collapse icon ( (){), and select the shared printer you want (Figure 9-6).

![Figure 9-6 Select a Network Shared Printer Dialog](image)

4. Select **OK**.
5. Select the type of printer from the **Type** drop-down menu: **PCL 3**, **PCL 5**, or **PostScript**.
6. Select **Print Test Page** to print a sample page on this printer. If a test page does not print, make sure you selected the correct Shared Printer and printer Type. If needed, see your Network Administrator for help.
7. Select **Finish** to complete the Shared Printer Setup. The printer is added to the list of printers available for selection on the **PRINTING Screen** (Figure 9-2).
8. If desired, select the printer and then select **Make Default** to make the printer the default printer.
9. When printing, a **Printer icon** (_printer) appears to the left of the **USB Ports icon** (_usb) on the lower right of the screen.
10 Maintenance

Chapter Overview

Topics covered in this chapter include:

- Service Information, page 10-1
- Technical Assistance Information, page 10-1
- Troubleshooting Guide, page 10-3
- Upgrade System, page 10-5
- Install Software, page 10-5
- Help (Including Calibration and Diagnostics), page 10-7
- Cleaning, Disinfection, and Sterilization, page 10-14

Service Information

WARNING: SERVICE or REPAIR is to be performed by QUALIFIED, AUTHORIZED PERSONNEL ONLY. There are NO USER SERVICEABLE PARTS INSIDE the Humphrey Matrix instrument. Disassembly of the instrument presents a possible ELECTRICAL SHOCK hazard and will VOID the warranty.

An authorized service location must perform or approve all repairs on products under warranty. Unauthorized repairs will void the warranty. An authorized service location or other qualified electronics personnel should repair products out of warranty.

Technical Assistance Information

If you have an instrument problem that you cannot resolve using the following troubleshooting guide, contact Carl Zeiss Meditec:

In the U.S.: 1-800-341-6968.
Outside the U.S.: Contact your local Carl Zeiss Meditec distributor.

Troubleshooting Guide
## Replacement Parts and Accessories

<table>
<thead>
<tr>
<th>Description</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Patient Response button</td>
<td>0000001045678</td>
</tr>
<tr>
<td>Patient Response button Holder</td>
<td>0000001054028</td>
</tr>
<tr>
<td>Keyboard</td>
<td>2660021142427</td>
</tr>
<tr>
<td>Calibration Lens Cap</td>
<td>0000001299290</td>
</tr>
<tr>
<td>Table Top Tray</td>
<td>0000001356019</td>
</tr>
<tr>
<td>Dust Cover</td>
<td>0000001096628</td>
</tr>
<tr>
<td>Power Cord - USA, Canada, Japan</td>
<td>2660100022511</td>
</tr>
<tr>
<td>Power Cord - Europe</td>
<td>0000001145999</td>
</tr>
<tr>
<td>Power Cord - UK</td>
<td>2660021133168</td>
</tr>
<tr>
<td>Power Cord - Australia</td>
<td>2660021131890</td>
</tr>
</tbody>
</table>
## Troubleshooting Guide

Here is a summary of some common problems you may experience. If you are unable to resolve the problem using this guide, contact technical service.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Area to Check</th>
<th>Possible Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humphrey Matrix will not power up.</td>
<td>Check the Humphrey Matrix power cable connections. Ensure that the power cord is inserted firmly in the Humphrey Matrix power input receptacle. The receptacle is located underneath the base of the instrument. Make sure that the outlet being used is on. Plug in a known good device into the outlet and turn that unit on. If the unit comes on then you know the outlet is good.</td>
<td>Replace power cord if defective. Connect instrument power cord to a working outlet.</td>
</tr>
<tr>
<td>The Humphrey Matrix will turn on but will not boot up to the MAIN MENU Screen.</td>
<td>Turn the Humphrey Matrix OFF and let sit for 10 seconds. Turn unit back on and try again.</td>
<td></td>
</tr>
<tr>
<td>The Humphrey Matrix will boot up to the MAIN MENU Screen but will not perform a test.</td>
<td>Turn the Humphrey Matrix OFF and let sit for 10 seconds. Turn unit back on and try again. Perform a Calibration from the HELP (F6) Screen.</td>
<td></td>
</tr>
<tr>
<td>Printer will not power on.</td>
<td>Refer to the Printer Information for troubleshooting help. Check the power cord connection at the back of the printer and at the Humphrey Matrix. Unplug and reseat the power cord at both ends. Press the printer power button again. The printer will not power on automatically.</td>
<td>Refer to the Printer Information for troubleshooting help. Replace the printer power cord if defective. Replace the printer if defective.</td>
</tr>
</tbody>
</table>
## Maintenance

<table>
<thead>
<tr>
<th>Printer issue</th>
<th>Troubleshooting steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Printer not printing</td>
<td>Refer to the Printer information for troubleshooting help.</td>
</tr>
<tr>
<td></td>
<td>Printer not turned on. Press printer power button.</td>
</tr>
<tr>
<td></td>
<td>Check the printer USB cable connection at the back of the printer and at the Humphrey Matrix. Unplug and reseat the USB cable at both ends. Cycle the printer power off / on and try again.</td>
</tr>
<tr>
<td></td>
<td>Check the USB cable on a known working USB peripheral if available.</td>
</tr>
<tr>
<td></td>
<td>No paper in the printer.</td>
</tr>
<tr>
<td></td>
<td>Missing or empty ink cartridges.</td>
</tr>
<tr>
<td></td>
<td>Shut Down the Humphrey Matrix and cycle power off / on to reboot, then try printing.</td>
</tr>
<tr>
<td></td>
<td>Check <strong>Printer Connectivity</strong> status in the HELP (F6) DIAGNOSTICS Screen that should indicate <strong>Connected and Idle</strong> or <strong>Connected and Printing</strong>.</td>
</tr>
<tr>
<td></td>
<td>Replace the printer USB cable if defective.</td>
</tr>
<tr>
<td></td>
<td>Replace the printer if defective.</td>
</tr>
</tbody>
</table>
Upgrade System

The Matrix 800 instrument is designed with the ability to upgrade the operating software using the CD-R/W drive, or from a folder in a USB drive or network location. The total time for the software upgrade is about 10 to 20 minutes, depending on the source. To upgrade the Matrix 800 system software:

1. Select File Functions (F4) to display the File Functions Screen (Figure 7-1).
2. In the Upgrade System section, select the browse button ( ) to select an upgrade location. The Save Location dialog appears (Figure 10-1).

![Figure 10-1 Save Location Dialog (Database Restore)](image)

3. To set the upgrade location, select the CD-R/W, Network Share, or USB radio button. For Network Share and USB, select a location from the corresponding drop-down menu. For Network Share, you must have previously added network shared folders to select them here (see Add Network Shared Folders on page 8-14). For information on USB storage devices see USB Storage Devices on page 2-10.

Note: The upgrade location is remembered after instrument shutdown. The selected Network Share or USB storage device is also remembered after instrument shutdown, until you change it. However, if you remove the USB device and insert a new USB device, the new USB device will be selected as the upgrade location.

4. Select OK to set the location.
5. Select Upgrade to start the upgrade.
6. Select OK.
7. A message will be displayed when the upgrade has completed successfully. If you upgraded with a CD or USB device, you can now remove it.
8. Select OK to restart the instrument.

The HELP (F6) Screen will identify which version of the Humphrey Matrix system software is installed (Figure 10-3).

Install Software

The Install Software function on the HELP Screen integrates the system software upgrade procedure with pre- and post-backup functions to help ensure a safe and complete upgrade process.
Note: It is recommended to use the Install Software function for system software upgrades to ensure recent backups are performed before and after the upgrade process.

1. Select Help (F6) to display the Help Screen (Figure 3-6).
2. Select Install Software > Upgrade Software to display the Upgrade Software Screen (Figure 10-2).

3. In the STEP 1 section: Back up the instrument’s database prior to upgrading the software. Select the browse button ( ) to select a backup location and then click the Back Up button. For more information, see Database Backup on page 7-1.
4. In the STEP 2 section: Upgrade the system software. Select the browse button ( ) to select an upgrade location and then click the Upgrade button. For more information, see Upgrade System on page 10-5.
5. In the STEP 3 section: Back up the instrument’s database after upgrading the software. Select the browse button ( ) to select a backup location and then click the Back Up button. For more information, see Database Backup on page 7-1.
Help (Including Calibration and Diagnostics)

The HELP (F6) Screen (Figure 10-3) provides basic system information regarding the Humphrey Matrix instrument and buttons to access reference user information, instrument diagnostics, calibration, logging, and software installation. System information provided includes instrument model and serial numbers, software version numbers, calibration information, last database backup date and error log status.

![Figure 10-3 Help (F6) Screen – Basic](image)

The Install Software function integrates the software upgrade procedure with pre- and post-backup functions to help ensure a safe and complete upgrade process. See Install Software on page 10-5 for more information.

The Advanced >> button displays more system information that may be useful for Technical Service. The button toggles between Advanced >> and Basic <<.

You may select the Export Sys Info button to send the system information to the printer or to an image file (see Export System Information on page 10-8). The buttons along the bottom of the screen allow you to perform Calibration (see Calibration on page 10-9), instrument Diagnostics (see Diagnostics on page 10-10), and to review system Logging information (see Logging on page 10-12). These functions are not commonly needed and are typically only used by Technical Service.
Export System Information

To export Matrix system information, select Help (F6) > Export Sys Info. Select Print to print the file on the default printer, or select Export to export the system information as an image file.

A Save Location dialog appears when selecting Export (Figure 10-4).

![Figure 10-4 Save Location Dialog](image)

To set the location, select the CD-R/W, Network Share, or USB radio button. For Network Share and USB, select a location from the corresponding drop-down menu. Select OK to save the file to the selected location. For Network Share, you must have previously added network shared folders to select them here (see Add Network Shared Folders on page 8-14). For information on USB storage devices see USB Storage Devices on page 2-10. For Network Share and USB, you can also select a folder on the Network Share or USB device by selecting the browse button (…) (see Selecting a Folder on a USB Storage Device on page 2-11) and Selecting a Subfolder in a Network Share on page 8-17).

Note: If you remove a shared folder that is currently selected as a Network Share, the first shared folder in the SAVED SHARES list will be selected as the Network Share. If there are no other shared folders in the list, the Network Share will be disabled.
**Calibration**

The Humphrey Matrix Visual Field Instrument does not require scheduled calibration. The instrument calibration is automatically checked each time the instrument is powered ON and at the start of each test to be sure the unit is properly calibrated. If the instrument detects the need for calibration, the Operator LCD Display will display a needs calibration warning. Perform calibration at any time, not only when requested by the instrument. Calibration will take approximately 15 minutes to complete.

To calibrate the instrument, select **Help (F6) > Calibration (Figure 10-5)**.

Before selecting the **Calibrate** button in the **CALIBRATION Screen**, make sure the Patient Eyepiece is covered with the Calibration Cap. Once the Patient Eyepiece is covered, select **Calibrate**. There is a prompt to ensure the Patient Eyepiece is covered. If the Calibration Cap is not available, substitute something that will temporarily block light from entering the Patient Eyepiece (black cloth over Patient Visor, etc.) or perform the calibration in a completely darkened room. The Operator LCD Display will indicate if there is too much ambient light to complete the calibration. A **Calibration Progress** indicator is provided.

The **Advanced >>** button displays Factory Calibration information reserved for Technical Service use. The button toggles between **Advanced >>** and **Basic <<**.
Diagnostics

The **Diagnostics** Screen ([Figure 10-6](#)) provides basic information regarding the operational status of the Humphrey Matrix instrument. This screen is useful if you are experiencing problems with your Humphrey Matrix Instrument. Problem areas are indicated by different color text.

![Figure 10-6 Diagnostics Screen – Basic](image)

The Patient **View Port Status** is provided to confirm the internal view port position sensors are operating correctly. The Patient Response button (PRB) **Status** is provided to confirm the PRB is properly connected and operating correctly. **Print Sample Test, Keyboard Test, and Mouse Test** buttons are provided to test the operation of these devices.

The **Advanced >>** button displays **Advanced Diagnostics** capabilities that are typically used for technical service. The button toggles between **Advanced >>** and **Basic <<**. The **Advanced Diagnostics** capabilities ([Figure 10-7](#)) include:

- **Database**: Check Database, Repair Database
- **File I/O**: HDD test (Hard Drive); Network Test, Share Test and USB Test, Show LCD Pattern test
- **CRT tests**: View Pattern, Ambient Light Level, Calibration Status, Monitor Brightness, Monitor Alignment
- **Play Scale** and **MCU Beep** sound tests
• Camera: Camera Display, Camera Alignment

Note: The **Network Test** reports those devices connected to your network. The **Share Test** reports those shared folders you are allowed to read and write to in **System Settings → Sharing → Saved Shares**. If you are not connected to a network or have no Saved Shares, these tests are not available.
Logging

The internal computer provides a variety of logging functions during the operation of the Humphrey Matrix instrument that are reserved for Technical Service use in troubleshooting any problems.

Select Help (F6) > Logging to display the LOGGING Screen (Figure 10-8).

You can export the logs individually (select a log from the Log Type drop-down menu, and then select Export), or all at once (select Export All). To print an individual log, select Print Log. Printing these logs is generally not recommended due to formatting issues and extended printing time for large logs.
A Save Location dialog appears when selecting Export or Export All (Figure 10-9).

![Save Location Dialog](image)

To set the log location, select the **CD-R/W**, **Network Share**, or **USB** radio button. For Network Share and USB, select a location from the corresponding drop-down menu. Select **OK** to save the log file to the selected location. For Network Share, you must have previously added network shared folders to select them here (see **Add Network Shared Folders** on page 8-14). For information on USB storage devices see **USB Storage Devices** on page 2-10. For Network Share and USB, you can also select a folder on the Network Share or USB device by selecting the browse button (…) (see **Selecting a Folder on a USB Storage Device** on page 2-11) and **Selecting a Subfolder in a Network Share** on page 8-17).

Note: If you remove a shared folder that is currently selected as a Network Share, the first shared folder in the SAVED SHARES list will be selected as the Network Share. If there are no other shared folders in the list, the Network Share will be disabled.
Cleaning, Disinfection, and Sterilization

Cleaning
Clean the instrument as necessary by wiping the housing surfaces with a soft dry cloth or a soft cloth that is lightly dampened with soapy water or 70% Isopropyl alcohol. Clean the Patient Eyepiece window and Operator LCD Display window with a soft, lint free cloth lightly dampened with commercially available window cleaners (do not use soap) or 70% Isopropyl alcohol.

Disinfection
Disinfect the patient contact surfaces (the Forehead Rest, Chinrest and Patient Response button) as necessary by wiping the surfaces with a soft cloth that has been lightly dampened with 70% Isopropyl alcohol. Allow the surface to dry thoroughly before patient contact. Contact surfaces should always be cleaned between patients.

Caution: Do not allow cleaning or disinfection solutions or other liquids to seep into the seams in the housings or along the LCD display. Do not spray cleaning or disinfection solutions or other liquids directly onto the instrument. Damage to internal components may occur and are not covered by the instrument warranty.

Sterilization
Do not sterilize the instrument or any of its components.
(11) Specifications

Instrument Specifications

Dimensions:
30 cm [12"] wide x 56 cm [22"] deep x 43 cm [17"] high
(nominal dimensions of the instrument without keyboard)

Weight:
14 kg [30 lbs.] nominal

Patient display size:
60° diameter nominal field-of-view

Power requirements:
100-240 V~, 50/60 Hz, 200 VA maximum

Auxiliary Power Output:
115 V~ 50/60 Hz, 50 Watts maximum for printer

Power Connection:
IEC-320 standard power inlet connector for worldwide use

Power Cord:
Approved hospital grade detachable power cord

Printer:
External USB color inkjet printer

Computer Interface:
RS-232 Serial, 9-pin D male connector, null-modem cable
3 USB Ports, Type A, USB 2.0 specification
Ethernet Port, RJ-45, 10/100 Base T

Chinrest Module Specifications

Dimensions:
31 cm [12.2"] wide x 85 cm [33.5"] deep x 28 cm [11"] high
(nominal dimensions)

Weight:
3.4 kg [7.5 lbs.] nominal
Specifications

Environmental Specifications

Operating Conditions
Operating Temperature: +15° C to +35° C [+59° F to +95° F]
Operating Humidity: 30% to 75% non-condensing
Operating Altitude: 700 hPa to 1060 hPa

Storage and Shipping Conditions
Storage Temperature: -20° C to +60° C [-4° F to +140° F]
Storage Humidity: 0% to 90% non-condensing (limited to 90% @ 40° C, 50% @ 50° C)
Storage Altitude: 700 hPa to 1060 hPa

Visual Field Test Specifications

<table>
<thead>
<tr>
<th>FDT Test</th>
<th>Visual Field Locations</th>
<th>Probability Level Classifications</th>
<th>Fixation Catch Trials</th>
<th>False Positive Trials</th>
<th>False Negative Trials</th>
<th>Test Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-30-5 (-1) Screening</td>
<td>19</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>Supra-Threshold</td>
</tr>
<tr>
<td>24-2-5 (-1) Screening</td>
<td>55</td>
<td>2</td>
<td>10</td>
<td>10</td>
<td>0</td>
<td>Supra-Threshold</td>
</tr>
<tr>
<td>N-30-F Threshold</td>
<td>19</td>
<td>4</td>
<td>6</td>
<td>6</td>
<td>3</td>
<td>MOBS</td>
</tr>
<tr>
<td>24-2 Threshold</td>
<td>55</td>
<td>4</td>
<td>10</td>
<td>10</td>
<td>6</td>
<td>ZEST</td>
</tr>
<tr>
<td>30-2 Threshold</td>
<td>69</td>
<td>4</td>
<td>10</td>
<td>10</td>
<td>6</td>
<td>ZEST</td>
</tr>
<tr>
<td>10-2 Threshold</td>
<td>44</td>
<td>4</td>
<td>10</td>
<td>10</td>
<td>6</td>
<td>ZEST</td>
</tr>
<tr>
<td>Macula Threshold</td>
<td>16</td>
<td>4</td>
<td>6</td>
<td>3</td>
<td>0</td>
<td>ZEST</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FDT Test</th>
<th>Field of view tested (degrees)</th>
<th>Approximate Target size (degrees)</th>
<th>Spatial frequency (cycles / degree)</th>
<th>Temporal frequency (Hz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-30-5 (-1) Screening</td>
<td>Central 30</td>
<td>10 x 10</td>
<td>0.25</td>
<td>25</td>
</tr>
<tr>
<td>24-2-5 (-1) Screening</td>
<td>Central 30</td>
<td>5 x 5</td>
<td>0.50</td>
<td>18</td>
</tr>
<tr>
<td>N-30-F Threshold</td>
<td>Central 30</td>
<td>10 x 10</td>
<td>0.25</td>
<td>25</td>
</tr>
<tr>
<td>24-2 Threshold</td>
<td>Central 30</td>
<td>5 x 5</td>
<td>0.50</td>
<td>18</td>
</tr>
<tr>
<td>30-2 Threshold</td>
<td>Central 30</td>
<td>5 x 5</td>
<td>0.50</td>
<td>18</td>
</tr>
<tr>
<td>10-2 Threshold</td>
<td>Central 10</td>
<td>2 x 2</td>
<td>0.50</td>
<td>12</td>
</tr>
<tr>
<td>Macula Threshold</td>
<td>Central 5</td>
<td>2 x 2</td>
<td>0.50</td>
<td>12</td>
</tr>
</tbody>
</table>
Threshold Test Results
  • Threshold (dB) Plot
  • Gray Scale Plot
  • Total and Pattern Deviation (dB) Plots
  • Total and Pattern Deviation Probability Plots with 5 probability level classifications
    \((P \geq 5\%, \ P < 5\%, \ P < 2\%, \ P < 1\%, \ P < 0.5\%)\) based on age-related normative references
  • MD (Mean Deviation) and PSD (Pattern Standard Deviation) statistical Global Indices values with 5 probability level classifications \((P \geq 5\%, \ P < 5\%, \ P < 2\%, \ P < 1\%, \ P < 0.5\%\) based on age-related normative references
  • Reliability Indices: Fixation, False Positive, and False Negative Catch Trials ratios
  • Glaucoma Hemifield Test (GHT) for 24-2 & 30-2 threshold tests

Screening Test Results
  • Total Deviation Plot with 4 loss classifications for N-30-5 (-1) screening test, 2 loss classifications for 24-2-5 (-1) screening test
  • Reliability Indices: Fixation and False Positive

Reliability Measures
  • Fixation Monitoring: Heijl-Krakau method
    • Catch trial contrast: 25%
    • Presentation Order: Pseudo-Random
    • Pattern: approximately one degree diameter circular FDT stimulus
  • False Positive Catch Trials:
    • Catch trials contrast: 0%
    • Presentation Order: Pseudo-Random
    • Pattern: one of the FDT stimuli in test pattern presented in a random location
  • False Negative Catch Trials:
    • Catch trial contrast: 100%
    • Presentation Order: Pseudo-Random
    • Pattern: one of the FDT stimuli in test pattern presented in a random location where the patient has previously responded (when possible)

Stimulus
  • Presentation Order: Random
  • Duration: 300 ms nominal
  • Cosinusoidal counter-phase flicker modulation
  • Color: black and white
  • Mean Background Illumination: 100 cd/m² nominal
  • Contrast range N-30 tests: 56 dB (~ 0%) to 0 dB (~ 100%), (~40 dB is the maximum human visual field sensitivity)
  • Contrast range 24-2, 30-2, 10-2 & Macula tests: 38 dB (~ 0%) to 0 dB (~ 100%)
  • Optical system: Badal type
Specifications

Right Eye

Humphrey Matrix N - 30 FDT Tests
8-9x9-10 degree FDT patterns (25 Hz, 0.25 cycles/degree)
Horizontal axis offset +/- 1 degree
Vertical axis offset +/- 3 degrees
(≈1 degree square stationary central fixation target)
Humphrey Matrix N 24-2 (55 pts.) and 30-2 (69 pts) FDT Tests
5x5 degree FDT patterns (18 Hz, 0.5 cycles/degree)
Horizontal axis offset +/- 1 degree
Vertical axis offset +/- 3 degrees
(~1 degree square stationary central fixation target)
Specifiedations

Right Eye

Humphrey Matrix Macula (16 pts.) FDT Test and
Humphrey Matrix 10-2 (44 pts.) FDT Test
2x2 degree FDT patterns (12 Hz, 0.5 cycles/degree)
No horizontal or vertical axis offset in central 4 degrees,
+/- 1 degree axis offsets outside central 4 degrees
(~1 degree square stationary central fixation target)
(12) Legal Notices

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This Warranty gives you specific legal rights, and you may have other rights, which vary from state to state. For one year from the date of delivery (the “Warranty Period”) to the original purchaser (“You,” “Your,” “Purchaser”), Carl Zeiss Meditec, Inc. (“ZEISS,” “Seller,” “We,” “Our,” “Us”) warrants its Matrix instrument, excluding components and software as stated below (the “Matrix”) to be free from defects in material or workmanship. In the event of failure, Seller’s obligation is limited to repairing or replacing on an exchange basis the parts that have been promptly reported as defective by Purchaser during the Warranty Period and are confirmed as defective by Seller upon inspection. This Warranty covers all parts, labor, travel and expenses for the Warranty Period, except as otherwise stated herein. This Warranty only applies to the original Purchaser and shall not, in any way, be transferable or assignable.

The procedure for warranty claims shall be as follows: when You believe the Matrix is defective, promptly report the defect to ZEISS. Whenever possible, We will provide “in the customer’s office” service to repair Your Matrix. However, at Our discretion, repairs may be made in Our repair department. In this case, We will pay all shipping costs unless Your Matrix is found upon inspection not to be eligible for repair under this Warranty, in which case You will be responsible for one-half the shipping costs. If Your Matrix is ineligible for repair under Warranty, We will notify You, and any repairs You authorize will be performed at Our normal rates. All replaced parts will become the property of ZEISS.

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[A] DICOM Gateway

Chapter Overview

This chapter describes the configuration of the DICOM Gateway feature available only on the Humphrey Matrix Model 800.

Note: DICOM Gateway configuration is intended for an IT or DICOM network administrator. Your DICOM network administrator will understand the DICOM terms and can provide you with correct configuration information. For assistance in the U.S., call CZM at 800-341-6968. Outside the U.S., contact your local CZM distributor.

Topics covered in this chapter:
- Overview, page A-1
- Configuration Overview, page A-2
- DICOM Gateway Configuration, page A-3
- Automatic End of Test Export to a DICOM System, page A-7

Overview

The Matrix DICOM Gateway is a software feature that allows you to connect one or more Matrix Model 800 instruments to a DICOM-compatible EMR/PMS system, or DICOM archive, such as Carl Zeiss Meditec’s FORUM™ software. The DICOM Gateway enables your Matrix 800 to connect to your DICOM Storage Provider and Modality Worklist Servers. A DICOM Storage Provider is an image management system that supports archiving patient data, such as Picture Archiving and Communication System (PACS). A DICOM Modality Worklist Provider can be part of an image management system that supports scheduling patients, such as FORUM.

When the DICOM Gateway is configured, the Matrix can display a list of patients who are scheduled for visual field exams ("DICOM Modality Worklist"). When a patient is selected from this list, all demographic data (e.g., name, patient ID, birthdate, etc.) is entered automatically into the Matrix local exam database. Once the visual field exam is performed, any report that would normally be printed can be automatically added to the patient’s electronic medical record for easy viewing and analysis. This workflow eliminates the need to manually enter patient demographic information into the Matrix and eliminates the need to print or scan diagnostic reports.

Note: For the purpose of this manual, a DICOM system, Practice Management System (PMS), and Electronic Medical Records (EMR) system are interchangeable.

Note: You should check the Matrix DICOM Conformance Statement with your EMR/PMS vendor to determine the compatibility of their system with the Matrix 800 DICOM Gateway.

Note: Ensure there is network connectivity between your EMR/PMS and the Matrix 800 before proceeding with the configuration steps that follow.
Configuration Overview

The process for your complete DICOM Gateway solution includes the following steps that you will need to perform:

1. **DICOM Server Setup**: Set up your DICOM storage server to recognize the AE Titles of your Matrix instruments that will be connecting through the DICOM Gateway. This is a potentially complex and time-consuming process whose details depend on your EMR and which should only be attempted by someone who has expert knowledge of your EMR system (e.g., an IT or DICOM network administrator).

2. **Network the Matrix**: Configure your Matrix instrument to connect to your network with an Ethernet cable. See your IT, EMR/PMS, or PACS administrator and Networking Configuration for more information.

3. **Configure DICOM Gateway**: Configure the DICOM Gateway to communicate with the designated Storage and Modality Worklist servers and perform a connection test. See DICOM Gateway Configuration on page A-3 for more information.

4. **Set Automatic Export of PDF at End of Test**: See Automatic End of Test Export to a DICOM System on page A-3 for more information.

5. **Use DICOM Gateway**: Query your Modality Worklist server for requested exams, perform these exams and export them to your DICOM System in ePDF format, either automatically, as described in Step 4 above, or manually, by saving them to your DICOM System, as described in Printing/Saving Test Results on page 6-3.
DICOM Gateway Configuration

To configure DICOM Gateway on the Matrix, select System Settings (F5) > DICOM Gateway to display the DICOM Gateway Screen (Figure A-2).

Note: The yellow triangle (⚠️) indicates an incorrect value has been entered in the field.

Enable DICOM

The Enable DICOM checkbox is unchecked by default to disable the DICOM Gateway software on the Matrix. To enable the DICOM Gateway Software, check Enable DICOM. When disabled, MWL - Today’s Patients and MWL - Custom Query will not appear in the Source drop-down menu on the View Patients (F2) Screen, the DICOM radio button will not appear on the Export Screen and Save As... dialog, and you can edit patient information that was received from the DICOM system. If enabled, patient records cannot be modified in the Matrix instrument. Please edit all patient records using the EMR/PMS system.
Local Application Entity Settings

**Institution Name:** Typically represents the name of the hospital or clinic. Enter a total of up to 64 characters and spaces. **Station Name:** Typically a unique name for the exam lane or instrument. Enter a total of up to 16 characters and spaces.

**Local AE Title:** Enter a unique AE Title for the Matrix instrument. This AE Title needs to be registered with your DICOM system. Input a total of up to 16 characters (text is case-sensitive). **MWL - Today’s Patients** automatically searches for patients scheduled for an exam for this Local AE Title on today’s date (see **MWL - Today’s Patients (Worklist Patients Scheduled for Today)** on page 5-2).

Note: Each Matrix instrument must have its own unique AE Title which needs to be registered with your DICOM system.

**DICOM Port:** Enter the Local Port Number for DICOM Gateway that your DICOM system (e.g., FORUM) connects to.

Remote Application Entities

**MWL and Storage Provider AE Title:** Enter your DICOM System’s MWL and Storage Provider Application Entity Title. Input a total of up to 16 characters (text is case-sensitive).

**MWL and Storage Provider Host Name:** Enter your DICOM System’s MWL and Storage Provider Host Name or IP Address.

**MWL and Storage Provider Port:** Enter your DICOM System’s MWL and Storage Provider Port number.

Note: The other Remote Application Providers (Storage Commitment Provider, etc.) are disabled in this software release.

Once you have all the fields completed, click the **Test** button. A green status indicator light (🟢) will appear to the left of MWL and Storage Provider and the Connection Test Details will report "Passed" for a successfully configuration (see **Figure A-3** below). A yellow status indicator light (🟡) may be visible during the connection test if it takes time to complete the connection test. If a red status indicator light (🔴) appears, it means the configuration failed the connection test—see the text in Connection Test Details for more information.

Note: When you change a field, the status indicators turn gray until you run another test.
The status indicator light for the test connection to the MWL and Storage Provider is required to be green. If the status indicator light is red and the Connection Test Details reports “Failed”, verify that the AE Title, Host Name, and Port are correct, and then select the Test button again. If you are still unsuccessful, take the following actions:

- Check with your network administrator to verify that your instrument is connected to the network.
- Retry.
- Make sure the DICOM Modality Worklist and storage servers are running.
- The DICOM storage provider hard drive(s) may be full. Add more hard drives or make more space available.
- Refer to the DICOM system manual for a possible resolution of the problem.
- Call Customer Service.

Note: The status indicators only check for correct MWL and Storage Provider entries. If you are unable to retrieve a Modality Worklist, check that the Local AE Title and DICOM Port entries are correct.
Specific DICOM error messages and their possible resolution are shown in Chapter 10, Maintenance. Users in the U.S. who are unable to resolve their problem should contact Carl Zeiss Meditec Customer Service for assistance, at 1-800-341-6968. Outside the U.S., contact your local Carl Zeiss Meditec distributor.

**Advanced DICOM Settings**

We recommend that you use the default values shown in the Advanced DICOM Settings dialog (Figure A-4). Experienced DICOM administrators may adjust these settings to optimize performance or allow for slow network connections.

![Advanced DICOM Settings](image)

*Figure A-4 Advanced DICOM Settings*
**Automatic End of Test Export to a DICOM System**

To automatically export exam reports in ePDF format (a DICOM formatted PDF file transmitted via DICOM protocols) to a DICOM System, (1) select DICOM as the default export location, and (2) select Export as an Automatic End of Test Action, as described in the sections below.

Note: When the ePDF is received by the DICOM system, the corresponding scheduled exam for the patient on the Modality Worklist is automatically removed.

**Select DICOM as the Default Export Location**

To set a DICOM System as the default export location, select System Settings (F5) > Export to display the EXPORT Screen. In the Default Export Location section, select the DICOM radio button. PDF is automatically selected as the format (Figure A-5).

![Figure A-5 Select DICOM as the Default Export Location](image)
Select Export as an Automatic End of Test Action

To select Export as an Automatic End of Test Action, select System Settings (F5) > Testing to display the Testing Screen. Select Export in the Automatic End of Test Actions section (Figure A-6).

![System Settings Screen]

Figure A-6 Export Selected as an Automatic End of Test Action
Instructions for Using OfficeMate Practice Management Software (PMS) with the Matrix Model 800 (serial port connectivity)

Note: OfficeMate configuration is intended for an IT network administrator. Your network administrator can provide you with correct configuration information. For assistance in the U.S., call CZM at 800-341-6968. Outside the U.S., contact your local CZM distributor. For OfficeMate assistance, contact OfficeMate Customer Support.

Serial Connectivity Kit
The Matrix Serial Connectivity Kit includes a special serial cable with a 90 degree angle for use in connecting OfficeMate to the Matrix serial port. For more information, see the Humphrey Matrix Serial Connectivity Kit User Instructions.

OfficeMate PC Requirements
- Windows XP
- ExamWriter version 7.3 or later
- 9 pin RS-232 port

Note: RS-232 to USB converters are not supported.
- Connection must be COM 1 only
- OM Matrix Gateway must be running on the PC. This is a free download from OfficeMate. Install and reboot your computer to run the OM Matrix Gateway. Go to http://www.officemate.net/omkb/article.aspx?ID=19629. If the link has expired, search the internet for OM Matrix Gateway.
- The PC platform should have a 32-bit OS. If your PC has a 64-bit OS, configure a virtual 32-bit environment to allow the OM Matrix Gateway to function correctly.

Note: Always start up and open OfficeMate/ExamWriter® prior to starting the Matrix.
(C) Data Transfer Using a CD

Chapter Overview
You can transfer data between Matrix instruments using the built-in CD drive. This appendix explains the features and limitations of Matrix data transfer using CDs, and provides instructions for data transfer.

Compatible Media Formats
The Matrix instrument can use the following types of CDs to transfer data:

- CD-R – writable CD
- CD-R/W – rewriteable CD

Note: DVDs cannot be used. They will report an error.

Note: The CDs do not need be formatted—blank disks will be formatted upon first use.

Note: The CDs can be used multiple times until the disk is full—each additional export data is written to the disk and is available for import.

Note: CD-R/W disks cannot be erased on the Matrix instrument. Use a PC computer to erase all data on a CD-R/W disk.

Compatible Data Transfer Functions
Optical disks can be used for all export and import functions.

Export and Import

Note: Most CD-R disks are limited to about 48 separate writes. It is also a good idea to alternate between two CD-R media with each export in case a problem develops with one of the media.

You can copy the Matrix database to a CD for transfer to another Matrix instrument. Install the CD into the Matrix CD drive.

Note: On a PC, it may be possible to view and analyze Matrix data using third party software. Beyond the instructions here, Carl Zeiss Meditec does not support the import of Matrix data to a PC; neither do we specify third party software you can use on a PC to view and analyze Matrix data, nor support its use.

CAUTION: We do not recommend that you use optical disks (CDs) for long-term data storage or backup. Use should be limited to data transfer between systems. Take care to protect these media from damage. We recommend you use hard plastic cases when transporting and shipping these media. Optical disks are very susceptible to scratches that could render them unreadable.
Data Transfer Instructions

The actual data transfer functions—export, import, save as—are done using the Matrix software in the usual way, except that you select the optical drive (CD-R/W) as the location or source drive for data transfer, and you insert a compatible disk in the optical drive. See (7) Database Management, System Settings – Backup on page 2-9, USB Storage Devices on page 2-10, and Printing/Saving Test Results on page 6-3.

Upon completion of the data transfer, press the CD/DVD eject button.
## Error Codes

Error codes that require additional user information have been included in this table. Those that are self-explanatory have not.

<table>
<thead>
<tr>
<th>Code Number</th>
<th>Message (SBC V06.00.0X)</th>
<th>Possible Cause</th>
<th>Recommended Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>115</td>
<td>Not enough data for Overview found. Select a patient with enough data.</td>
<td>A minimum of 2 visual fields of the same test type are required for an overview plot.</td>
<td>A minimum of two visual fields of the same test type are required for an overview plot</td>
</tr>
<tr>
<td>123</td>
<td>Please limit input to CHARACTER_LIMIT characters.</td>
<td>Merging any folder with the Main (default) folder causes this message.</td>
<td>Select Continue.</td>
</tr>
<tr>
<td>148</td>
<td>The default folder DEFAULT_FOLDER_NAME contents will be merged but the default folder cannot be deleted. Continue?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>151</td>
<td>Invalid folder name entered. Please enter a valid folder name.</td>
<td>Empty folder name field.</td>
<td>Enter folder name.</td>
</tr>
<tr>
<td>160</td>
<td>Invalid file name entered. Please enter a valid file name.</td>
<td>Empty file name field when saving Overview analysis plot as JPEG.</td>
<td>Enter valid file name.</td>
</tr>
<tr>
<td>167</td>
<td>WARNING! Are you sure you want to permanently delete the selected test from the database?</td>
<td>User confirmation needed.</td>
<td>Deleting tests from the database is permanent. Unrecoverable if not available from a prior backup.</td>
</tr>
<tr>
<td>168</td>
<td>WARNING! Selected test will be permanently deleted from the database. Continue?</td>
<td>User confirmation needed.</td>
<td>Deleting tests from the database is permanent. Unrecoverable if not available from a prior backup.</td>
</tr>
<tr>
<td>175</td>
<td>Patient not found in database. Add New Patient?</td>
<td>User confirmation needed.</td>
<td>The automatic search feature did not find a patient with the name entered in the database — either new patient or a data entry error.</td>
</tr>
<tr>
<td>176</td>
<td>Unable to run test during calibration. Wait until calibration is completed.</td>
<td>All testing operations are disabled during calibration.</td>
<td>Check Calibration status in Help (F6) Calibration screen. Calibration takes approximately 15 minutes to complete. SW error if message doesn’t go away when calibration is completed. (restart).</td>
</tr>
<tr>
<td>192</td>
<td>Sample test is not present on the system. Function unavailable.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>196</td>
<td>What would you like to do with these tests?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Error Code</td>
<td>Description</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>197</td>
<td>Are you sure you want to reassign these NUMBER_OF_TESTS tests?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>202</td>
<td>The character AN_INVALID_CHARACTER cannot be used as a text delimiter. While in the Save As Dialog box, the user attempts to assign a delimiter which is invalid. Invalid characters include: (the double quote, “)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>238</td>
<td>This operation is not available. Because the network host was not available the file write test could not be attempted.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>239</td>
<td>Please enter a name for the printer.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>240</td>
<td>Please enter a valid hostname or IP address Ask the operator to enter a shared network computer host name or ip address (computer1.cznet.org, 128.115.68.2). This message is no longer used.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>241</td>
<td>Please select a path for the printer. Asks the operator to specify the location of the network shared printer. This message is no longer used. The printer is now selected graphically.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>262</td>
<td>The device is busy and cannot safely be removed. The storage device is currently being used for read or write operation. Wait for the operation to complete before trying to remove the storage device. If this situation persists, try rebooting the Matrix. The period of time required to wait will depend on the operation performed. Backup or export of a large number of patients and tests will take a long time.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>513</td>
<td>Overview Software Error! Function not available. Software implementation error. An error has occurred during SW processing. Report event to Service. New software may be required.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>515</td>
<td>Overview plot Software Error! Function not available. Software implementation error. An error has occurred during SW processing. Report event to Service. New software may be required.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>540</td>
<td>Test parameter SW Error! Test cancelled. Function not available. SW implementation error. This error indicates a defect in the SW processing has occurred. Contact Service.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 552        | Database backup not found on media. The database backup could not be found. Make sure the media is connected to the device and database files are on the selected storage media. For a restore, the files are placed in a directory named SN<serial number of the Matrix>.
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Details</th>
<th>Resolution</th>
</tr>
</thead>
</table>
| 576  | Printer Error! Unable to print System Information! | Numerous printer errors:  
- Not connected  
- No paper in tray  
- Non-approved printer  
- No ink | Verify the printer attached to the system is an approved printer.  
Perform the print sample test from the Diagnostics screen.  
If problem persists, cycle the printer power or Shut Down and reboot the Matrix instrument.  
If problem still persists, try a different approved printer. |
| 584  | Unable to retrieve login credentials for ________________ | | Try again. Check network. |
| 593  | Failure to export exam to DICOM archive | | Check DICOM archive. Check DICOM configuration in System Settings. |
| 619.2| Critical Error! Factory calibration needed. Select 'Shut Down' and then cycle power to restart your instrument and restore normal operation. If problem persists, contact Customer Service. See Help F6. | User attempted to perform the pattern test 'Set Pattern' from the Advanced Diagnostics screen. This operation could not complete because their system needs to be factory calibrated. | SW detected a problem that requires Shut Down and restart to clear.  
Service will be needed if this issue is chronic and prevents normal operation of the system. |
| 619.3| Critical Error! Factory calibration needed. Select 'Shut Down' and then cycle power to restart your instrument and restore normal operation. If problem persists, contact Customer Service. See Help F6. | User attempted to perform an 'Ambient Light Level' check from the Advanced Diagnostics screen. This operation could not complete because their system needs to be factory calibrated. | SW detected a problem that requires Shut Down and restart to clear.  
Service will be needed if this issue is chronic and prevents normal operation of the system. |
| 619.4| Critical Error! Factory calibration needed. Select 'Shut Down' and then cycle power to restart your instrument and restore normal operation. If problem persists, contact Customer Service. See Help F6. | User attempted to perform a 'Monitor Brightness' check from the Advanced Diagnostics screen. This operation could not complete because their system needs to be factory calibrated. | SW detected a problem that requires Shut Down and restart to clear.  
Service will be needed if this issue is chronic and prevents normal operation of the system. |
| 702  | Unable to connect to DICOM server. | | Check DICOM archive. Check DICOM configuration in System Settings. |
| 704  | One or more patients could not be imported. | Some of the patients could not be imported from the serial EMR application. | Check the EMR connection and setup. |