

Smart System® Standard

Visual Acuity Systems

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M&S® Technologies

Sales: 1-877-225-6101 / 847-763-0500

Fax: 1-847-763-9170

Technical Support: 1-847-763-0500

mstech-eyes.com

Smart System® Standard
Visual Acuity Systems
User & Operation Guide



 **M&S Technologies**
5715 W. Howard Street
Niles, IL 60714
USA

T +1.877.225.6101

F +1.847.763.9170

Technical Support:

+1.847.763.0500

www.mstech-eyes.com

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Certification Company BV

Wisselweg 33
1314 CB Almere-Stad
The Netherlands

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Smart System® Standard User and Operation Guide

Introduction

Purpose of Manual

This manual provides the essential information necessary for installation, operation, and routine care of Smart System® Standard. The instructions within this manual should be carefully followed for safe and effective equipment use. It contains important operation and maintenance information for personnel trained to use this device.

It is important that all personnel who will operate Smart System® Standard:

- Read and understand this manual before device operation.
- Follow all warnings and precautions outlined in the sections **Operational Precautions and Limitations** and **Hazards** for their own safety and the safety of those around them.

In this manual, the following definitions apply for all WARNING and CAUTION statements:



WARNING: A warning statement covers any operation, procedure, practice, etc., which if not strictly observed, might result in serious injury or long-term health hazards to personnel or patients.



CAUTION: A caution statement covers any operation, procedure, practice, etc., which if not strictly observed, might result in mild or moderate injury or damage or destruction of equipment or loss of performance.










Abbreviations

The abbreviations used in this manual are listed and defined in the following table.

cm	Centimeter (1 cm = .01 m)
CPU	Central processing unit
EHR workstation	Electronic Health Record workstation
IFU	Instructions For Use
IR	Infrared
USB	Universal Serial Bus
VGA	Video Graphics Array
°C	Degrees (Celsius)
°F	Degrees (Fahrenheit)

Label Graphics Explanations

The following table provides an explanation of the label graphics found on the Smart System® Standard.

	Warning / Caution
	Reference Number
	Manufacturer
	Prescription Medical Device
	Medical Device
	Temperature Limits
	Consult Instructions for Use
	Keep Dry
	Electric Shock Hazard

System Description

Intended Use

Smart System® Standard is intended for use in displaying computerized images on a screen for vision testing.

Safety

Smart System® Standard is safe when used as described in this manual.

Contraindications

There are no known contraindications when used as directed.

Medical Device Classification

Class I	FDA listed device
Class I	EU MDD 93/42/EEC
Class I	Health Canada

Physical Description

Smart System® Standard is comprised of an All-in-One Unit (CPU and display screen); an IBM-compatible 101-key keyboard; computer mouse; USB 2.0 IR Detector; remote control; power strip; brackets and mounting software (optional); Glare Testing System (optional).

*For end users who prefer to supply their own computer equipment (CPU and LCD computer monitor required), Smart System® Standard may be supplied as software only. See Device Specifications and Assembly Instructions for configuration details.

All-in-One Unit

The All-In-One Unit consists of a CPU with a widescreen flat display panel. The Unit is intended to be installed in a permanent location within the exam room. See Assembly Instructions for directions on positioning the All-in-One Unit.

Keyboard and Mouse

A standard IBM-Compatible 101-key keyboard, computer mouse, and USB keyboard / mouse adaptor are supplied for use with the All-In-One Unit.

USB Infrared Detector

The USB Infrared (IR) Detector, when connected to the All-in-One Unit via USB 2.0 port, receives data input from the Remote Control.

Remote Control

The Remote Control is used to control the operation of the Smart System® Standard.

Foot Pedal (optional)

The Foot Pedal is an optional input controller of Smart System standard.

Smart System Android Tablet Controller (optional)

The Smart System Tablet is an optional input controller of Smart System Standard and may also be used for limited Near Vision testing applications. See the Smart System Tablet Instructions For Use for more information.

Power Strip (optional)

An optional power strip is provided for ease of set-up for the User.

Brackets and Mounting Hardware (optional)

Brackets and mounting hardware are provided for ease of set-up by the User.

Glare Testing System (optional)

The M&S Glare Testing System is an optional accessory which may be used in conjunction with Smart System® Standard. It consists of four Glare Lights, a Glare Control Module, and 15V AC Adapter.



WARNING: All M&S Glare Testing System users must be familiar with the Instructions for Use (IFU) prior to installation or use. The Glare Testing System has unique warnings and precautions which are specific to its use.

Specifications, Precautions, Limitations

Device Specifications

Intended Use	Smart System® Standard is intended for use in displaying computerized images on a screen for vision testing.
Indications for Use	Smart System® Standard is indicated for use in vision testing as part of a standard ophthalmic exam.
Operating System	Windows® 10 Home Premium (32-bit) (minimum)
Processor	Intel® Celeron™ N3010 2.2GHz/2MB
Dimensions	23.8" W x 18.2" H x 3.5" D (60.5 cm x 46.2 cm x 8.9 cm)
Weight	15.6 lbs. (7.1 Kg)
Memory	4GB DDR3L SODIMM
Video	Intel® HD Graphics
Display	22" Widescreen Flat Panel Display (16:10), 1680 x 1050
Storage	64 GB mSATA, DVD/CD-RW combo drive
Network Interface	Realtek RTL8111E PCIe GbE Controller
Audio	Realtek ALC662, integrated 2 x speakers
I/O Ports	4 USB 2.0 ports 1 Audio port 1 VGA 1 RJ45
Input Voltage Range	12V 5A
System Included AC Adapter	100 ~ 230V AC, 1.8A
UL Listed	110V North America, 1.8A, 50/60 Hz
Storage Conditions	10°C - 35°C (50°F - 95°F); 35% - 80% humidity
Operating Conditions	10°C - 35°C (50°F - 95°F); 35% - 80% humidity

Operational Precautions and Limitations

The following information will affect the operator's success in using Smart System® Standard.


Should Be Used Only by Trained Professionals – Federal law restricts the sale of this device to physicians and medical professionals only. Use of the device in procedures other than those described in this manual may result in injury.


Connect the System to an External Power Supply According to Labeling – Smart System® Standard uses externally supplied electricity to operate. Check the voltage and amperage ratings of the external supplies and make sure they match the labeled ratings for electricity inputs shown on the rear of Smart System® Standard.


Shut System Down on a Daily Basis – Smart System® Standard should be shut down on a daily basis. See “System Shut Down” section for the shut-down procedure.

Conduct of Examinations and Interpretation of Results – M&S Technologies does not suggest or endorse any specific method of conducting any examination, nor do we suggest any interpretation of results obtained by conducting such an examination. As a medical professional, it is your responsibility to determine the appropriate method for conducting an examination as well as the interpretation of the results.

Hazards

 **WARNING:** A small percentage of users may experience epileptic seizures when exposed to certain light patterns or backgrounds on a computer screen or while using the hardware. Certain conditions may induce previously undetected epileptic symptoms even in users who have no history of prior seizures or epilepsy. If patient or anyone in the patient's family has an epileptic condition, consult a physician prior to using the hardware. Immediately discontinue use of the hardware and consult a physician if patient experiences any of the following symptoms while using the hardware: dizziness, altered vision or muscle twitches, loss of awareness, disorientation, any involuntary movement, convulsions, or any unusual behavior or condition.

 **WARNING:** To prevent or reduce the risk of electrical shock or fire, do not expose the unit to rain or moisture.

 **CAUTION:** There are no user serviceable parts inside this unit. Attempting repairs will void the manufacturer's warranty. If unit requires service, please contact M&S Technologies Technical Support helpline.

Assembly Instructions

The following are step-by-step instructions for the Smart System® Standard wireless system. Carefully follow each step to ensure proper operation.

1) General Installation

- a) Unpacking: *Applies only to systems provided with hardware* - Carefully unpack each of the components. The following is a list of components:
 - 1) Computer & LCD Computer Monitor OR All-in-One Unit
 - 2) IBM Compatible 101 Key Keyboard
 - 3) Mouse
 - 4) USB IR Detector
 - 5) Remote Control
 - 6) Power Strip
 - 7) Brackets and Mounting Hardware (optional)
- b) If system is software-only, insert CD and follow prompts (separate detailed instructions provided) to install software.
- c) Locate the Monitor and Computer at a permanent location within the exam room.
 - 1) In a direct-view situation, the center of the monitor should be approximately 66" off the ground and represent a direct line of sight from the average adult patient in the exam chair to the center of the monitor.
 - 2) In a mirrored environment, the center of the mounting bracket or monitor should be roughly 78" off the ground.
 - 3) With a mirror, the monitor should be moved over 18" from the center of the chair to the opposite side of the stand so as not to interfere with the phoroptor or near-rod.
 - 4) **Note** that the computer and monitor can be mounted in different locations if long audio and video cables are run between the two units.
 - 5) If using customer-provided computer (e.g., EHR workstation):
 - (A) A second graphics card must be provided and installed with VGA output for Smart System®
 - (B) Windows® must be configured in advance for dual-video
 - (C) M&S recommends working with an IT professional to specify and install card and set up video output
- d) Plug Keyboard into any open USB port (including the front-side).
- e) Plug Mouse into any open USB port (including the front-side).
- f) Plug USB Infrared Detector into Computer.
- g) Plug Computer Power Cord into the back of Computer at location.
- h) Plug Monitor Cable into the back of Computer at Monitor Input location Color Coded Blue (if not using All-in-One unit).
- i) Plug in Monitor Power Cable into the back of the Monitor (if not using All-in-One unit).
- j) Plug Monitor and Computer Power Cables into Outlet or optional Power Strip.

Initialize and Calibrate Equipment

Complete Calibration

1. Upon completing all of the connections, turn on the computer and monitor. System will initialize and the startup process begins. If using a user-supplied computer, the software will need to be installed and registered at this point using the separate installation instructions provided. Upon completion of the start-up process on first-use, the monitor will display System Calibration set-up.
2. Smart System® will launch – if calibration does not automatically appear on first use, press “z” or “Home” key to make the set-up screen appear.

The screenshot shows the 'M&S Main Configuration Screen' with the following sections:

- Display Settings:** Includes 'Distance From the Screen to the Bridge of the Patient's Nose' with 'Feet' selected and 'Meters' unselected. 'Dist 1' is 15 FT and 4 IN. 'Dist 2' is 13 FT and 1 IN. 'Screen Position - Direct or Using a Mirror' is set to 'Direct' for both distances.
- System Functionality:** Includes buttons for 'Letter', 'Media', 'Device', and 'Advanced'.
- Timer Settings:** Includes 'Blank Screen Timer (minutes)' set to 20, 'Letter Cycle Timer (Seconds)' set to 4, and 'Silent Fixation Timer (MilliSeconds)' set to 400.
- Worth 4 Dot Controls Section:** Includes 'Worth4Dot ColorAdjuster' and 'Choose Green or Blue' with 'Blue Worth 4 Dot' selected.
- Buttons:** 'Display', 'DONE', 'Import Config Files', and 'Export Config Files'.

3. Move the cursor to the FT field for **DIST1**.
4. Enter the new Focal Distance in FT and IN (e.g., 10 feet and 2 inches).
5. Select **Direct** or **Mirrored**.
6. If a Second Distance is desired, for instance with Wheelchairs or Clinical Trials, move the cursor to the FT field for **DIST2**.
7. Enter the new Focal Distance in FT and IN (e.g., 10 feet and 2 inches).
8. Select **Direct** or **Mirrored**.
9. Press **Display** button.

Initialize and Calibrate Equipment (Cont'd)



10. Measure the 10cm x 10cm square and use the adjusting arrows to size the black box correctly. **Note: This is crucial for correct optotype sizing!** This is a change from previous software that was based on 4" x 4".
11. Click **Done**.
12. Click **Done**.
13. Smart System® is now calibrated and ready for use.

Re-Calibration of Focal Distance Only

Note that the focal distance is measured from the bridge of the nose of the average patient to the monitor (direct) or from the bridge of the nose to the mirror and then from the mirror to the monitor (mirrored).

1. Press “z” or “Home” key to make the set-up screen appear.

The screenshot shows the 'M&S Main Configuration Screen' with the following sections:

- Display Settings:**
 - Distance From the Screen to the Bridge of the Patient's Nose: FT (15), IN (4), Direct (selected)
 - Dist 2: FT (13), IN (1), Direct (selected)
 - Units: Feet (selected), Meters (unselected)
 - Show Opto Size in Bottom Left: checked
 - Show Opto Sizes for each Chart Line: unchecked
 - List of Monitors Available to Display Smart System: 1920x1080\\.DISPLAY1
 - Click Here to Adjust your Screen Pixel Size for Proper Display: Display button
 - Worth 4 Dot Controls Section: Worth4Dot ColorAdjuster, Choose Green or Blue (Blue Worth 4 Dot selected), This Checkbox Will Revert to Old Standard (unchecked)
- System Functionality:**
 - Edit Letter Charts and Lines, Defaults, Random, ...: Letter button
 - Edit Movie Ordering and add Image/Movies to Lists: Media button
 - Program your Wireless Remote, Wired Keypad, and Footpedal: Device button
 - For more settings press the Advanced Settings Button: Advanced button
- Timer Settings:**
 - Blank Screen Timer (minutes): 20
 - Letter Cycle Timer (Seconds): 4
 - Silent Fixation Timer (MilliSeconds): 400
- Buttons:** DONE, Import Config Files, Export Config Files

2. Move the cursor to the FT field for **DIST1**.
3. Enter the new Focal Distance in FT and IN (e.g., 10 feet and 2 inches).
4. Select **Direct** or **Mirrored**.
5. If a second distance, for instance with wheelchairs or clinical trials, is desired, move the cursor to the FT field for **DIST2**.
6. Enter the new Focal Distance in FT and IN (e.g., 10 feet and 2 inches).
7. Select **Direct** or **Mirrored**.
 - **Note:** toggling between Feet and Meters allows the distance to be entered in the appropriate format.
8. Click **Done**.

Remote Control & Designations

The Wireless Remote is used to control the operation of the Smart System® Standard.

The remote control is laid out in logical sections: Tests, Patient Education, Isolation, Additional Tests, and Sizing.



Primary Remote Assignments & Functions

10, 15, ...	Directly select a given acuity level (e.g., 30 = 20/30; pressing a 2 nd time will randomize)
SGL	Displays a single optotype, (i.e., Letters, Numbers, Allen Pictures)
LINE	Displays a single line of any optotype
LINES	3 lines of the same size
VLine	A vertical line of optotypes
B	Blank Screen
LTR	Sloan & Snellen Letters
PIX	Allen Pictures
CONT	Contrast Sensitivity
#'s	Displays Numbers
Arrow	Displays an arrow beneath the first optotype in a single line – vertical or horizontal
HOTV	HOTV
E	Tumbling E's
CYC	Adolescent/Older Child Fixation, single optotype (Letters, Allen, and Numbers) or single line on screen will randomize at regular timing intervals. User can program the timing of the intervals.
R/G	Red/Green
W4D	Worth 4 Dot
FNC	"Shift" Key provides access to less commonly used features
+	Scroll up in size on any optotype or scroll up through movies/images
-	Scroll down in size on any optotype or scroll down through movies/images
Round 1	Plays the selected image or movie
Round 2	Glare Medium (Optional)
Round 3	Directory Images
Round 4	Directory Movies

Function-Level Remote Control

Assignments and Functions

Press **FNC**, release, and then press the desired key.

Key-press	Function	Description
FNC + WFD	On Screen Size	Toggles the Large On-Screen Size Display that shows the sizing of the optotypes
FNC + LTR	ETDRS	Toggles between Snellen and the ETDRS Chart
FNC + PIX	Allen Pictures	Allen Pictures for children
FNC + LINE	Black/White Toggle	Toggles black optotypes on white screen and white optotypes on black screen. Useful for low vision.
FNC + B	Exit	Exits the software to Windows®
FNC + 10	Additional Tests	Fixation disparity and Maddox rod – use + and – to step through tests
FNC + 20	Astigmatic Dial	Displays the Astigmatic dial: use + and – to step the pointer-ball around the dial
FNC + 50	Random Dot Stereo	Random Dot Stereo – See Appendix
FNC + 80	Contour Stereo	Contour Stereo - Landolt Rings – See Appendix
FNC + 400	Retinoscopy E	A red-green screen with a 20/400 E used by some doctors for fixation during retinoscopy

Remote Control Use & Operation

Most Common Tasks Accomplished with the Remote Control

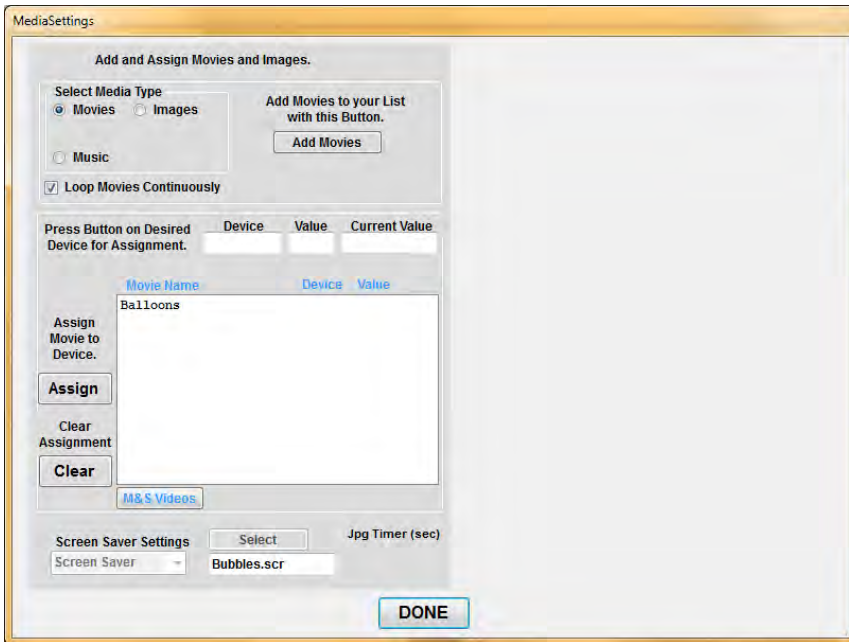
1. **Switching between Tests** – To switch between tests, for instance moving from Snellen letters to Allen pictures, press the appropriate test mode button. In this example, pressing **PIX** will switch to Allen pictures.
2. **Isolating a Line** – To isolate a single line of optotypes, press the **Line** key. To isolate a vertical line of descending optotypes, press **VLine**.
3. **Isolating a Letter** – To isolate a single optotype, press the **SGL** button.
4. **Randomizing** – There are several ways to randomize the display:
 - a. Press the test mode button again. For example, if you desire to randomize the Snellen letters, simply press **LTR** a second time.
 - b. Press the optotype size button again. For example, if the top line of the chart is 20/40 and you wish to randomize the chart, simply press **40**.
 - c. If working with a single optotype or single line, press the **SGL** or **Line** button a second time.
5. **Access to a Particular Size** – To access a particular size of optotype or a particular line of the chart, press the numbered button corresponding to it. For example, to bring up 20/100, press **100**.
6. **Increasing and Decreasing Size** – To increase or decrease the optotype size, simply press + (Plus) or – (Minus) on the keypad.
7. **Blanking the Screen** – To blank the screen, press the **B** key.
8. **The Optotype Pointer** – When working in a Line or Vertical Line of optotypes, press the **Arrow** key to bring up the optotype pointer. Next, use the left side Up/Down (+/-) buttons to move the arrow left or right. Using the right side Up/Down (+/-) buttons will change the optotype size. Subsequently pressing **Arrow** will toggle off the arrow.
9. **Cycling a Line or Single Optotype** – To randomize a single optotype or line of optotypes at a predetermined rate, press the **Cyc** key. Every several seconds the row will refresh. This works well for adult fixation.

Fixation and Patient Education Movies

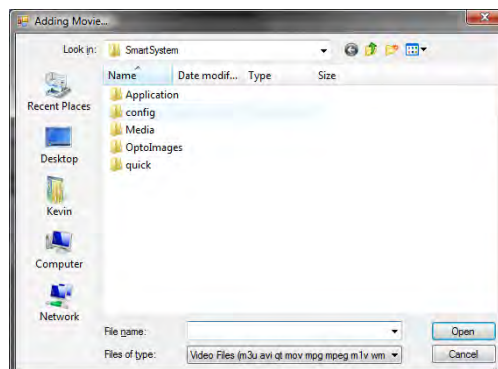
Copying a Movie, Image or Presentation from CD-ROM or USB Drive/Stick

If you purchase or own additional Patient Education or Fixation Movies (MPGs), Images or Presentations, to copy the file, please follow the instructions below:

1. Plug in the Keyboard and Mouse.
2. Insert the CD into the CD-ROM drive in the Smart System® unit.
3. Press “**z**” or “**Home**” key to enter the configuration.



4. Press the “**Media**” button.
5. In the **Select Media Type**, click the appropriate choice: Movies, Images or Music.
6. Click **Add [Movie/Image/Music]** button just to the right.
7. Using the dialog box, navigate to the location of the movie, image or presentation (Note that presentations will be the folder name, rather than a file).



Fixation and Patient Education Movies (Cont'd)

8. Click **Open**.
9. The file(s) will copy to the proper Smart System® folder automatically and be ready for use.

To “Play” the movies

1. Press “4” on the Round Button to display list.
2. Scroll through the movies using the + and – keys.
3. “Play” the selected movie by pressing “1” on the Round Button.

To “Display” an image

1. Press “3” on the Round Button to display list.
2. Scroll through the movies using the + and – keys.
3. “Display” the selected image by pressing “1” on the Round Button.

System Shut Down

The System should be Shut Down on a Daily Basis. The procedure is as follows:

1. Press **FNC + B** key. The system will exit out of Smart System® software and return to the Windows® operating system.
2. Press ON\Off button on the Computer and the CPU will shut down.
3. If using the optional keypad, turn it off using the switch on the top of the keypad.
4. **The monitor should remain on** but will automatically go to power-saver mode. This is indicated when the monitor's power light turns from green to amber.

Appendix

Snellen Distance Equivalents

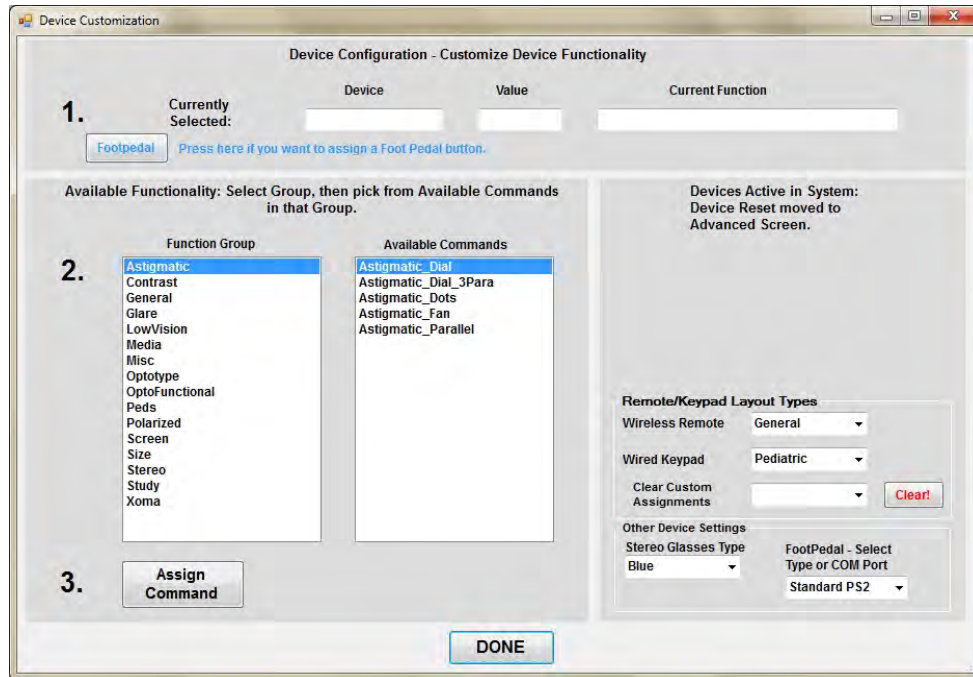
This Chart shows the Conversion between Common Optotype Size Measuring Units. If you work in 6-meter based metric or decimal units, use this table to convert from the displayed size based on 20-feet to the metric or decimal equivalent. To switch to a different format shown on-screen, please see Adjusting the Letters & Symbols.

Size	20 foot	Metric	Decimal
10	20/10	6/3	2.00
12.5	20/12.5	6/3.8	1.60
16	20/16	6/4.8	1.25
20	20/20	6/6	1.00
25	20/25	6/7.5	.80
32	20/32	6/9.5	.63
40	20/40	6/12	.50
50	20/50	6/15	.40
63	20/63	6/19	.32
80	20/80	6/24	.25
100	20/100	6/30	.20
125	20/125	6/38	.16
160	20/160	6/48	.12
200	20/200	6/60	.10
250	20/250	6/75	.080
320	20/320	6/95	.063
400	20/400	6/120	.050

Customizing the Keypad, Remote Control and Footpedal

To customize the layout of the Keypad, Remote Control, or Footpedal, please follow these instructions:

- Plug in a keyboard and mouse.
- Press “z” or “Home” on the keyboard to enter the configuration.
- At the main configuration screen, click the **Device** button to reach the Device Customization screen.



Note: DO NOT change the Layout Type for any of the controllers without instruction from M&S Technical Support (877-225-6101).

1. Press the button on the device you wish to customize (Keypad, Remote, Footpedal, Marco or Topcon) – this can include **FNC** or SHIFT with a button (e.g. **FNC** + 50 or SHIFT + 200).
2. **Note** – For the Footpedal, press the Footpedal button and the button will switch to *Waiting ...*. Press the Footpedal switch desired and the value shown above it will reflect 1, 2 or 3. Continue as shown below.
3. Choose the Function Group of the feature you'd like to set and then from the Available Commands. For a complete list of functions, see the “Appendix Entry for *Function Groups and Associated Functions*”.
4. Click **Assign Command**.
5. Click **Done** to exit Device Customization.
6. Click **Done** to exit Main Configuration.

Adjusting the Letters and Symbols

It is possible to Remove Letters or Symbols from Smart System[®] as well as Adjusting the Number of Lines shown and Letters/Symbols across:

1. Plug in the Keyboard and Mouse.
2. Press “z” or “Home” to enter the M&S Main Configuration Screen.
3. Press the “Letter” button and the M&S Letter Configuration Screen displays.

Note: “The Reset Button” will reset all letters to the default lines and should be used with caution.

To change the “**Size Display Indicator**” to local notation 20 feet, Logmar Int, Logmar Decimal, 6 meter or Decimal follow the procedure below:



1. In the “**Size Display Type**” (shown in bottom left corner) **Click** the down-arrow.
2. **Select** 20 feet, 6 meter, Logmar Int, Logmar Decimal or Decimal.
3. Click **Done**.
4. Click **Done**.

Adjusting the Letters and Symbols (Cont'd)

To change to “**Always Random**” or “**Never Random**” Charts:



1. In the “**Random/Default**” box, check the box **Always Random** or **Never Random**.
2. Click **Done**.
3. Click **Done**.

Removing Letters/Symbols



1. In the “Images Listed in this Box will be Used During Runtime” box, remove any unwanted letters or symbols, maintaining a space between each choice.
2. The list of valid letters/symbols is shown for reference below.
3. Press **Enter** key on keyboard when done editing the list.
4. If the **Reset** Button is pressed, the symbol will be removed and replaced on all lines.
5. Click **Done**.
6. Click **Done**.

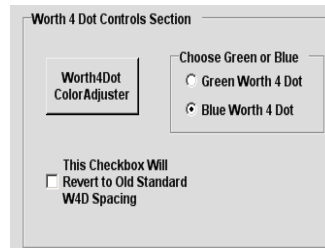
Adjusting Chart Defaults: Number of Characters, Lines Displayed, and Default Characters

1. In the “Set Letter Chart Settings Here” section, select the Opto Letter Type set by clicking the down-arrow and selecting the set to be modified.
2. Each size row can now be individually edited.
3. Select Opto Size for Editing by clicking the down-arrow and choosing the size.
4. To alter the number of lines shown, in the “Number Additional Lines below Default in Chart”, increase or decrease the default number shown. Note that the total number of lines shown is 1 greater than the number selected as the choice made for the number of lines shown below the current line. (To have a total of 3 lines shown, set the number to 2).
5. To alter the number of letters/symbols displayed on the line, in the “Number of Characters Displayed on Line” section, increase or decrease the number shown. Letters will be added or removed automatically to match the number shown up to 8 across.
6. To alter the Default 1 and Default 2 characters shown, in the Random/Default Box, adjust the letters in the Default 1 and Default 2. Note that Default 2 allows a second set of defaults so that a semi-random chart can be presented to patients.
7. Repeat steps 4-7 for each Line of the Chart.
8. Click **Done**.
9. Click **Done**.

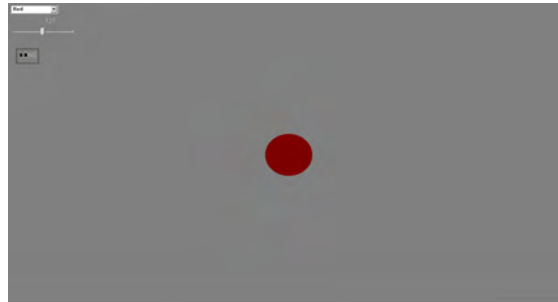
Worth 4 Dot Adjustment

To adjust the brightness of the Red, Green or Blue Worth 4 Dots and Distance Stereo, follow these instructions:

1. Plug in a Keyboard and Mouse.
2. Press “**z**” or “**Home**” on the keyboard to enter the configuration.
3. In the Worth 4 dot section of the Main Configuration, select Blue or Green for the Worth 4 dot type.



4. To adjust the color of the dot to perfectly occlude with the glasses found in the exam room, press **Worth 4 Dot Color Adjuster**.
5. The following screen will display.
6. In the Upper Left, select the color of dot you wish to adjust – the choices are Red, Blue, or Green.

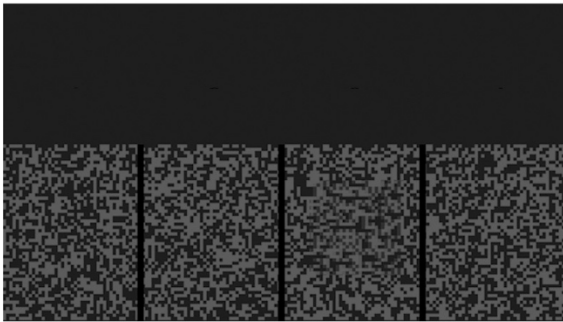


7. Using your red-blue or red-green glasses, slide the slider left or right to decrease or increase the brightness until the filtering is correct for your glasses.
 - **Note** that you should view the dot through the opposite-colored lens (e.g., view the red dot with the blue or green lens).
8. Once correct, select the next color for your glasses and repeat Step 16.
9. When finished, click **Done**.
10. At the Main Configuration screen, click **Done**.

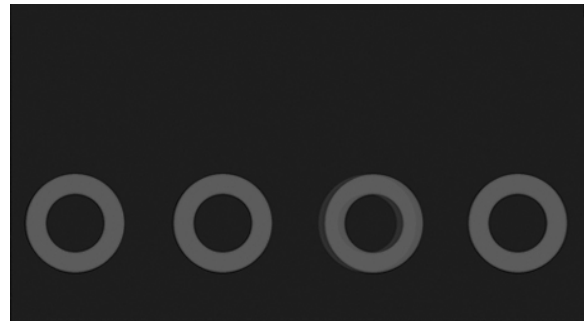
Distance Stereo

Smart System® provides three methods for measuring distance stereo: Random Dot or Contour Stereo using Rings.

1. It is critical that the Worth 4 Dot settings be adjusted to completely occlude the colors as detailed in the **Worth 4 Dot** appendix section if using Red/Blue stereo. The color levels are used to accurately present the stereo separation.



Random Dot Stereo



Contour Stereo Rings

Distance Stereo (Cont'd)

Press the Assigned Key to Enable Stereo Testing

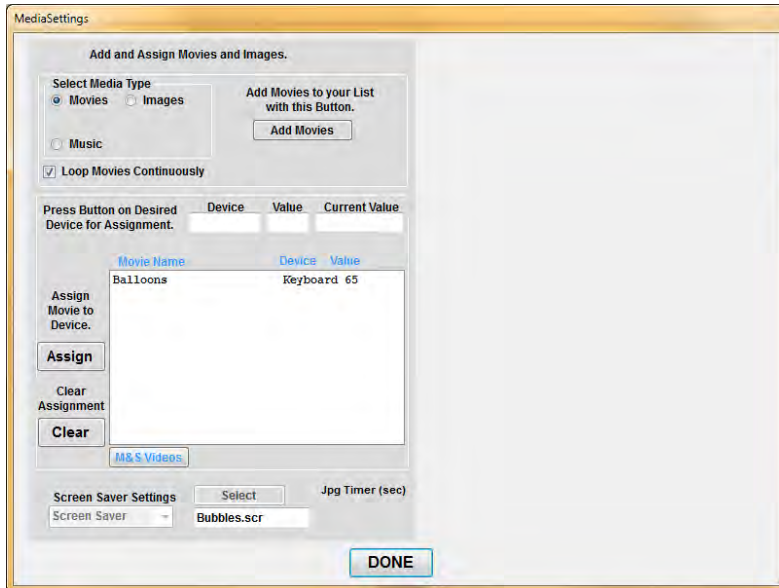
- **FNC** + 50 Random Dot Stereo
- **FNC** + 80 Contour Stereo Rings

- If using the remote control, the screen will show the position in the upper right corner (if Red-Blue the quadrant 1 indicating upper left, 2 upper right, 3 lower left and 4 lower right or if LC Shutter glasses, the position 1-4 left to right) followed by the arc-seconds of separation.
- The “Minus” key reduces the separation and the “Plus” key increases the separation.

Assigning Buttons to Display Movies, Images, and Music

Any of the Smart System® controllers can be programmed to directly play a particular Movie, Image, or Music with a Keyboard and Mouse:

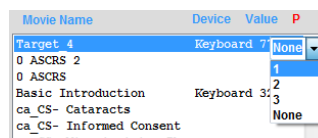
1. Press “z” or **Home** on the keyboard to enter the configuration.
2. Press the **Media** button.
3. Select the **Media Type**: *Movies, Images, or Music*



4. Press the desired button or FNC/Shift Combination (e.g., **FNC** 100).
Note: For the Footpedal, press the **Footpedal** button you wish to program and continue.
5. Select the Movie, Image or Presentation from the **Movie Name** list.
6. Click **Assign**.
7. Continue steps 3 - 6 to program additionally or Click **Done**.
8. Click **Done**.

In some settings, primarily Pediatric Smart System® PC-Plus Systems, 3 assigned movies have been the norm and work via SHIFT + 10, SHIFT + 15, and SHIFT + 20, the three foot-pedal switches, and the Up, Left and Right buttons on the remote. To change this, either use the traditional methods described earlier in this manual or perform the following steps:

1. Click on a *Movie* in the **Movie Name** list.
2. To the right in the column under the red-letter **P**, right click the mouse.
3. A drop-down appears.
4. Choose 1, 2, or 3 which is Remote: Up, Left or Right / Keypad:
Shift + 10 Shift + 15 and Shift + 20 or Footpedal: Left Center Right
5. The number will appear in the column.
6. Repeat for steps 2 and 3 or Click **Done**.
7. Click **Done**.



Function Groups and Associated Functions

The table below is used for assigning functionality to any of the controls as described in the section above **Customizing the Keypad, Remote Control and Footpedal**. First, choose the appropriate Function Group and then the Function you wish to assign.

Function Group	Function
Astigmatic	Dial
	Dots
	Fan
	Parallel
	3 Parallel
Contrast	Contrast_Contrast_Sensitivity
Glare	Low
	Medium
	High
General	MINUS
	MINUS_Control_2
	PLUS
	PLUS_Control_2
Media	Assign_Image
	Assign_Video
	Directory_Movies
	Directory_Images
	Presentation_Play
	Image_General_Group
	Image_Ishihara_Plates
	Image_Patient_Ed
	Image_SineGrating
	Play_Selected
	Pause_Movie
	Start_Over
	Language_Select
	Skip_Forward_30_Seconds
	Misc
Exit_to_Windows®	
Change User	

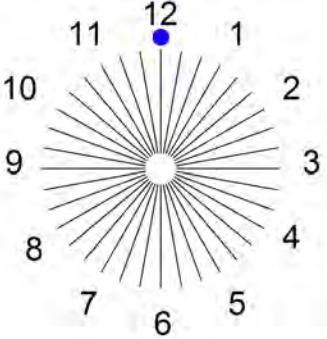
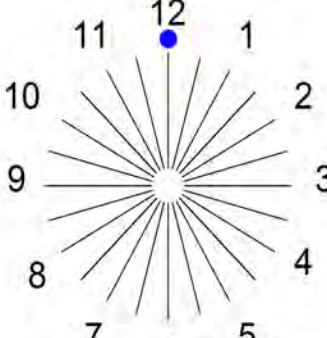
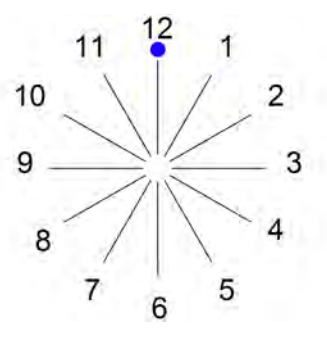
	No_Function
	Quick_Custom_Letter
	Toggle_Full_Screen
	Print
	Open_Config_Screen
	RedGreen_E_20_400
	Version_Info
OptoFunctional	Arrow_Display
	Chart_MultiLine
	Cycle_Interval
	One_Dot
	One_Line
	Randomize
	Red-Green
	Single_Char
	Snellen_Logmar
	Three_Lines
	Vertical_Line
	Vertical_Line_SameSize
	White_Black_Reverse
	Worth_4_Dot
	Verhoeff_Circles
Optotype	Allen_Pictures
	Numbers
	ETDRS_Chart
	Hebrew
	HOTV
	Landoldt_Rings
	Sloan_Letters
	Snellen_Letters
	Tumbling_E
	Extra_Numbers
Screen	Screen_Monitor_2nd_Distance
	Screen_On_Screen_Size

Size	8
	10
	15
	20
	25
	30
	40
	50
	60
	70
	80
	100
	125
	150
	200
	250
	300
	400
	500
	600
	800
	1000
	1250
	1600
Stereo	Contour
	Random_Dot

Astigmatic Dial

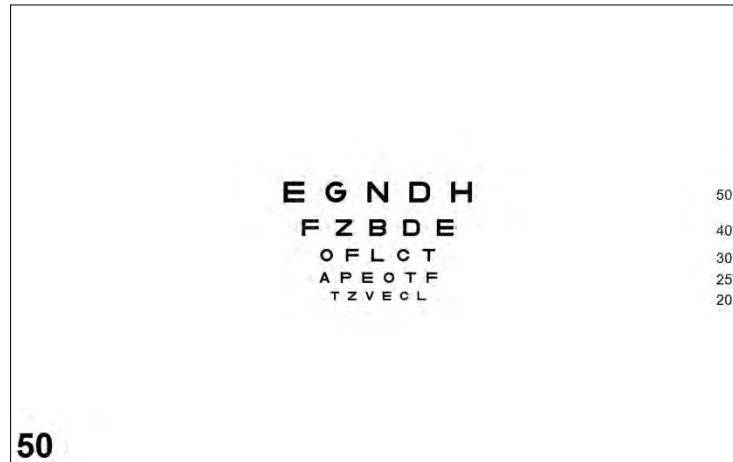
Smart System® Standard has an astigmatic dial that can be utilized with the blue-ball pointer. To get the Astigmatic Dial, press **FNC** + 20 on the remote control. Then, use Up/Down on the remote to move the pointer. The number of lines can be configured by Pressing “**z**” to enter the configuration and clicking **Advanced**. Click the drop-down next to Astigmatic Dial – Num Arms per Clock Section and choose 1 (Hourly), 2 (Every 30 Minutes), or 3 (Every 20 Minutes). Click **Done** and click **Done** again.

The table below shows the result for each:

	<p>Every 20 minutes</p> <p>Astigmatic Dial - Num Arms per Clock Section. <input type="text" value="3"/></p>
	<p>Every 30 minutes</p> <p>Astigmatic Dial - Num Arms per Clock Section. <input type="text" value="2"/></p>
	<p>Every hour</p> <p>Astigmatic Dial - Num Arms per Clock Section. <input type="text" value="1"/></p>

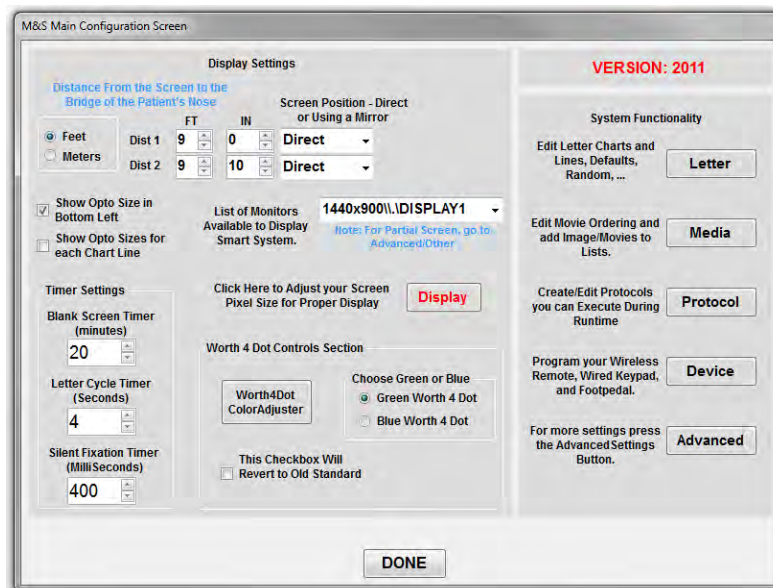
Showing Sizing for each Line

Smart System® has the ability to show the size for each line of a chart on the right side of the screen.



To enable this feature:

1. Press “z” or “Home” to enter the configuration.



2. On the Main Configuration Screen, check the box marked “**Show Opto Sizes for Each Chart Line**”.
3. Click **Done**.
4. The line sizing will now appear on the right edge of the chart for easy reference.

M&S Smart System® Standard – Contrast Functions

Operation of the Smart System® Standard Contrast Testing

Contrast Control

When the Smart System® is in contrast test mode, the left “+/-“keys control the contrast level and the right “+/-” keys control the optotype size.

Contrast Display

When the Smart System® is in contrast mode, the on-screen display shows the contrast level in the lower right corner and the optotype size, as usual, in the lower left corner. The contrast levels are 63, 50, 32, 25, 20, 16, 12, 10, 9, 8, 7, 6, 5, 4, 3, 2, and 1 percent.

Contrast Testing with the M&S Smart System® 20/20 Letter Contrast Test

The M&S Smart System® 20/20 Letter Contrast Test uses Sloan Letters. Optotype contrast uses a "pixel density" approach that sets the gray value to the percent of contrast between the Black and White values of the monitor.

Monitor Calibration

If using a monitor from M&S Technologies, it has been calibrated as closely as possible to a luminance of approximately 85 cd/m² and a color temperature of 3300K as the standards specify. This will be a warmer or almost yellower appearance than standard monitors that can have values more than 165 cd/m² and 7800K, which result in a brighter bluer image.

M&S Technologies does not suggest or endorse any specific method of conducting any examination, including contrast testing, nor do we suggest any interpretation of results obtained by conducting such an examination. As a medical professional, it is your responsibility to determine the appropriate method for conducting an examination as well as the interpretation of the results.

Monitor Benchmark Settings

The monitors provided by M&S are pre-set to the values found below for optimal use in testing contrast. If you feel that your monitor has been modified, please consult the table below or contact Technical Support for assistance.

NEC AccuSync 72V LCD Monitor Brightness: 86% Contrast: 40% User Color Settings: R=93, G=67, B=0	NEC Mutisync 225WXM 22” Brightness: 54.0% Contrast: 50% User Color Settings: R=92.9 G=73.7 B=25.5
NEC Multisync 1770NXM & 1990NXM Brightness: 67.9% Contrast: 50% User Color Settings: R=92.9 G=73.7 17” B=43.5 / 19” B = 34.5	NEC Accusync 224 22” Brightness: 54.0% Contrast: 50% User Color Settings: R=92.9 G=73.7 B=25.5
NEC Mutisync 205WXM 20” Brightness: 54.0% Contrast: 50% User Color Settings: R=92.9 G=73.7 B=25.5	NEC Accusync 221 Brightness: 54.0% Contrast: 50% User Color Settings: R=92.9 G=73.7 B=25.5

Suggested Contrast Test Procedure (Example 1)

Determine visual acuity threshold at 100% contrast, black letters. This test assumes Corrected or Uncorrected VA of 20/20. **The room lights should be off for contrast testing.**

1. Press CONT and then SGL to get a single Sloan Letter.
2. Use “-” to reduce the contrast until the patient no longer correctly answers.
3. Record the previous value (last correct).
4. Press “+” three times, check to see if the patient is correct. If not, press “+” until a correct answer.
5. Use “-” to reduce the contrast percentage once again until the patient answers incorrectly again.
6. Record the last correct value.
7. With the two results, compare and record the higher percentage. Perform for each of the following:

Begin testing at the following lines and percentages:

- 20/25 @ 25%
- 20/50 @ 8%
- 20/100 @ 4%
- 20/200 @ 3%

Suggested Contrast Sensitivity Form (Example 1)

Patient Name:	Chart:
Date: / /	Time: : AM PM
VA OD:	VA OS:
Pupil Size OD:	Pupil Size OS:

Exam should be conducted in dark exam room

	OD		OS	
Beginning Contrast %	Acuity	Contrast %	Acuity	Contrast %
100		100		100
25	20/25		20/25	
8	20/50		20/50	
4	20/100		20/100	
3	20/200		20/200	

Record Contrast % as the last correct value. Compare and record the higher percentage using the two results.

Suggested Contrast Test Procedure (Example 2)

Determine visual acuity threshold at 100% contrast, black letters. This test assumes Corrected or Uncorrected VA of 20/20. **The room lights should be off for contrast testing.**

1. Press **CONT** to enter contrast – it will automatically switch to a single line at 63% contrast.
2. Press **Size** button to switch to 20/30, 20/50 or 20/70 as directed below.
3. Use “-” to reduce the contrast until the patient answers 3 out of 5 letters incorrectly. Record the previous value (last line with 3 out of 5 correct).
4. Press “-” to reach 0.8%.
5. Use “+” to increase the contrast percentage until the patient answers 3 out of 5 letters correctly. Record the last line where the patient reported 3/5 correct.
6. Compare and record the higher percentage using the two results. Perform for each of the following.

Begin testing at the following lines and percentages:

- 20/30 @ 25%
- 20/50 @ 25%
- 20/70 @ 25%

Suggested Contrast Sensitivity Form (Example 2)

Patient Name:	Chart:
Date: / /	Time: : AM PM
VA OD:	VA OS:
Pupil Size OD:	Pupil Size OS:

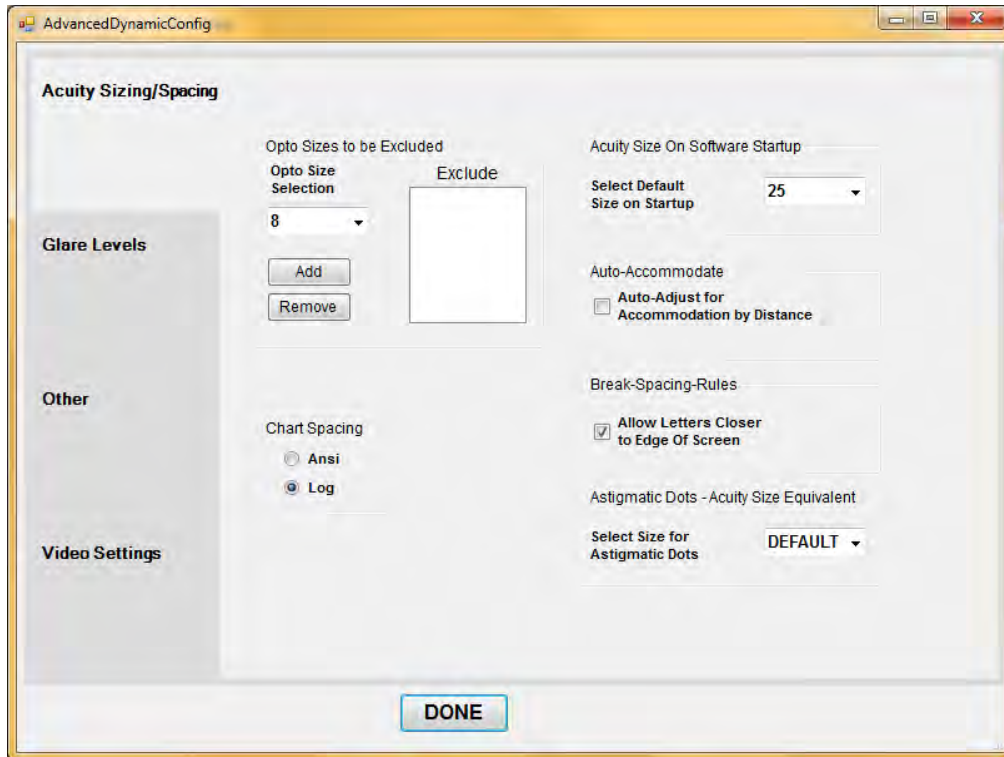
Exam should be conducted in dark exam room

Size	OD	OS	Norm
Acuity			20/20
20/70			4%
20/50			5%
20/30			10%

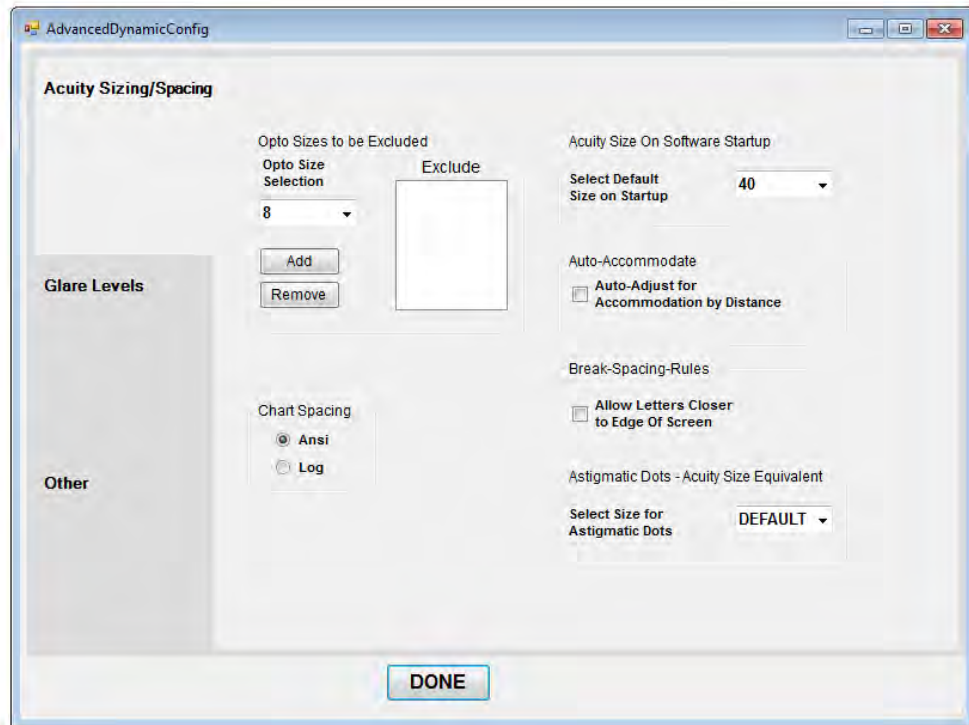
Advanced Configuration

There are many aspects of the Smart System® Standard that can be set using the Advanced Configuration.

1. Using the Keyboard & Mouse, press the “**Home**” key (near page up and page down) to open the Main configuration.
2. Click the **Advanced** button.

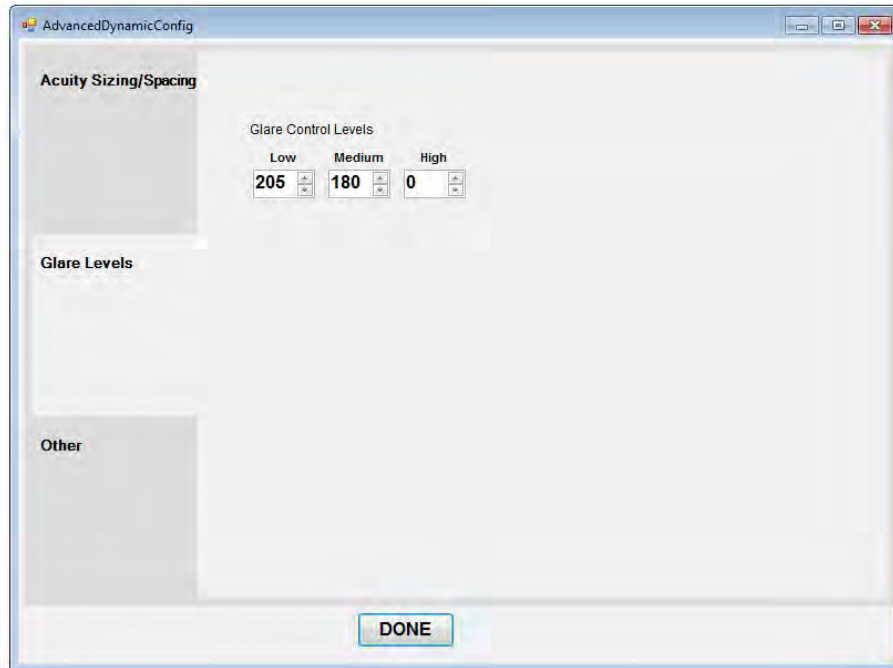


3. The **Acuity Sizing/Spacing** allows several chart changes.

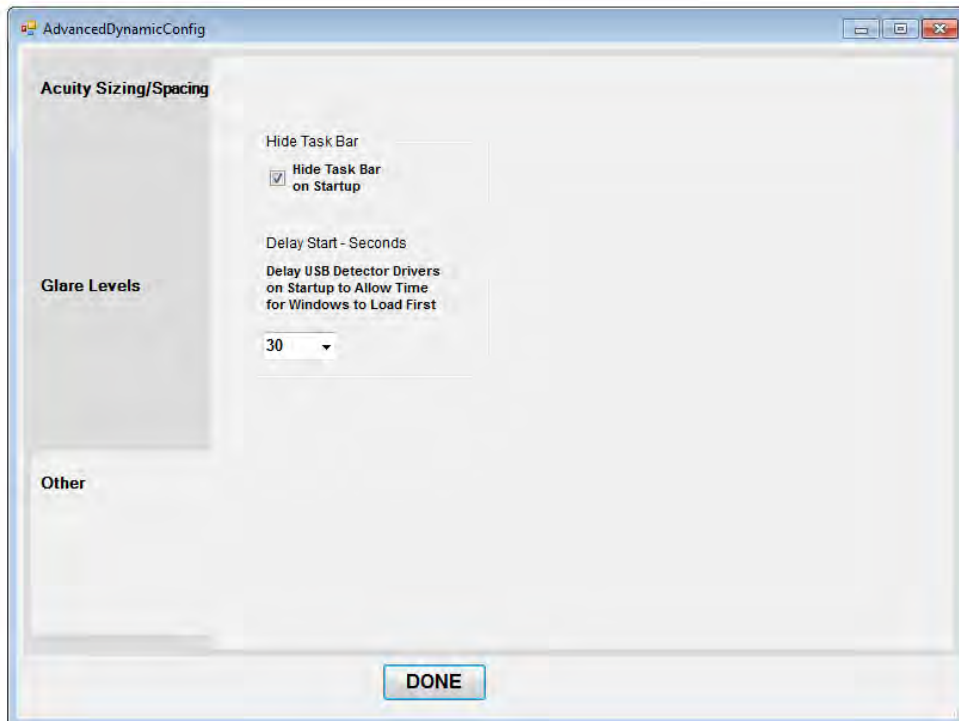


1. Particular line sizes can be excluded.
2. Chart Spacing can be Ansi (space between lines equal to height of larger) or Log (space between lines equal to height of smaller).
3. The Default Startup size can be selected.
4. Auto-accommodate should only be used with the direction of M&S Technical Support.
5. Allow Letters Closer to edge of screen permits letters to approach the edge of the screen – by default, an optotype width of separation is kept.
6. The Jackson Cylinder/Dots default sizing can be adjusted.

4. The **Glare Levels** screen should only be used with M&S Technical Support.



5. The **Other** screen controls the behavior of the Windows® Task bar and should only be used with assistance from Technical Support. The Delay of the software to allow Windows® to load can be adjusted from 0 to 60 seconds. The other items are for M&S Technical Support.



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Contractor: M&S Technologies, 5715 W. Howard Street, Niles, IL 60714.

Entire Agreement. This agreement constitutes the entire agreement between Licensee and MST and supersedes any other prior agreements or communications regarding the WBS. If any provision of this agreement is held invalid, the remainder of this agreement shall continue in effect.

M&S® Technologies, division of The Hilsinger Company Parent LLC ("MST")

End User Limited Hardware Warranty

Computer hardware products and related accessories purchased new from M&S Technologies, or on behalf of M&S through its Authorized Distributors ("AD"), come with a 1-year limited hardware warranty. Refurbished computer hardware products and related accessories purchased from M&S Technologies, or on behalf of M&S through its Authorized Distributors, come with a 30-day limited hardware warranty.

This limited hardware warranty covers defects in M&S Technologies, materials and workmanship relating to purchased hardware and accessory product purchases by M&S end-users customers.

This limited hardware warranty does not cover:

- Software, including the operating system and software added to the M&S-purchased hardware products. (See the M&S Software License Agreement and related Limited Lifetime Warranty for any M&S-developed software.)
- Hardware products and accessories not purchased through M&S Technologies, or its Authorized Distributors
- Problems that result from:
 - External causes such as accident, abuse, misuse, or problems with electrical power
 - Servicing not authorized by M&S Technologies
 - Usage that is not in accordance with product instructions
 - Failure to follow the product instructions or failure to perform preventive maintenance
 - Problems caused by using accessories, parts, or components not supplied by M&S
- Products with missing or altered serial numbers
- Products for which M&S has not received payment
- Expendable and/or consumable parts
- Normal wear and tear

This warranty gives M&S Purchaser of Record (POR) specific legal rights, and POR may also have other rights which vary from state to state (or jurisdiction to jurisdiction). M&S' responsibility for malfunctions and defects in hardware is limited to troubleshooting with the end user, repair and/or replacement as set forth in this warranty statement. All express and implied warranties for the product, including but not limited to any implied warranties and conditions of merchantability and fitness for a particular purpose, are limited in time to the term of the 1-year limited warranty period or the 30-day limited warranty period. No warranties, whether express or implied, will apply after the limited warranty period has expired.

M&S does not accept liability beyond the remedies provided for in this limited hardware warranty or for consequential or incidental damages, including, without limitation, any liability for third-party claims against POR for damages, for products not being available for use, or for lost data or lost software. M&S liability will be no more than the amount POR paid for the product that is the subject of a claim. This is the maximum amount for which M&S is responsible.

A small percentage of users may experience epileptic seizures when exposed to certain light patterns or backgrounds on a computer screen or while using the hardware. Certain conditions may induce previously undetected epileptic symptoms even in users who have no history of prior seizures or epilepsy. If POR, or anyone in POR's family, have an epileptic condition, consult a physician prior to using the hardware. Immediately discontinue use of the hardware and consult a physician if POR experiences any of the following symptoms while using the hardware: dizziness, altered vision or muscle twitches, loss of awareness, disorientation, any involuntary movement, convulsions, or any unusual behavior or condition.

The limited hardware warranty on all M&S-purchased hardware products begins on the earliest date of the packing slip, invoice, or receipt. The warranty period is not extended if M&S repairs or replaces a warranted product or any parts. M&S may change the availability of limited hardware warranties, at its discretion, but any changes will not be retroactive.

M&S warrants that the Products that POR purchased from M&S, or on behalf of M&S through our Authorized Distributors, are free from defects in materials or workmanship under normal use during the Limited Warranty Period. POR's are entitled to warranty service according to the terms and conditions of this document if a repair to POR's Product is required within the Limited Warranty period. This Limited Warranty extends to the original end user purchaser and is not transferable. Warranty service availability and response times may vary.

Before the warranty expires, please contact M&S Technical Support at 847-763-0500 or our Authorized Distributors. Please also have your hardware serial number or invoice number available.

During the 30 days of the 30-day limited refurbished hardware warranty and the first year of all other limited hardware warranties, M&S or its Authorized Distributor will provide telephone support, repair or replace any M&S-purchased hardware products that prove to be defective in materials or workmanship. If M&S or its Authorized Distributor is not able to troubleshoot the problem with the end user or repair the product, M&S will replace it with a comparable product that is new or refurbished. M&S may also provide loaner hardware in circumstances whereby a repair or replacement is required. It is at the full discretion of M&S, as to the best approach for providing warranty service.

As part of warranty repairs or replacement, M&S or its Authorized Distributor may require the system software/firmware be brought up-to-date.

During the Limited Warranty Period, M&S will troubleshoot and correct the issue with the end user, repair or replace any defective component. This is POR's exclusive remedy for defective products. M&S reserves the right to elect, at its sole discretion, to give POR a refund of POR's purchase price instead of a replacement.

All warranty service calls handled directly by M&S will be assigned a Technical Support tracking number.

When POR's warranty service requires POR to return hardware to the M&S Technologies, Illinois warehouse, M&S will provide a loaner and a return label to ship POR M&S-purchased product for repair. POR must return the defective products to M&S in their original or equivalent packaging, or accept the risk if the product is lost or damaged in shipment. M&S will return the repaired or replacement products to POR. M&S will pay to ship the repaired or replaced products to POR if you use an address in the United States (excluding Puerto Rico and U.S. possessions and territories). Otherwise, M&S will ship the product to POR freight collect. If the failed M&S-purchased hardware is not received by M&S within twenty-one (21) business days from the date that the loaner was dispatched to customer, or the unit is not returned in the specific packaging, the Customer will be invoiced at list price for the replacement unit. Upon receipt of the repaired or replaced hardware, POR must ship any loaned hardware to the M&S Technologies, Illinois warehouse using the prepaid freight provided.

If M&S determines that the problem is not covered under this warranty, M&S will notify POR and inform POR of service alternatives that are available to POR on a fee basis. Products returned will not be accepted if there is damage due to external causes, including accident, abuse, misuse, natural and unnatural disasters, acts of God, problems with electrical power, servicing not authorized by the M&S, usage not in accordance with product instructions, failure to perform required preventative maintenance, problems caused by use of parts and components not supplied by M&S, and damage incurred during shipment of defective parts to M&S for repair. If damage is evident from these causes, the CUSTOMER will be invoiced at list price for the replacement parts. Servicing fees may also be applied at the sole discretion of M&S. Although M&S is not under any obligation to provide warranty service for Product damaged in any of the ways mentioned herein, M&S may, at its sole discretion, agree to provide additional service for such Products if, after inspection by M&S, we determine that the Product is still in acceptable operating condition.

If warranty service is provided by an M&S Authorized Distributor, depending on circumstances, POR may be required to return M&S-purchased hardware to the Authorized Distributor via prepaid freight.

NOTE: Before POR ships the product(s) to us, make sure to back up the data on the hard drive(s) and any other storage device(s) in the product(s). Remove any confidential, proprietary, or personal information and removable media such as floppy disks, CDs, or PC Cards. M&S is not responsible for any of POR's confidential, proprietary, or personal information; lost or corrupted data; or damaged or lost removable media.

M&S is not responsible for the preservation of any data or the protection of any confidential, proprietary or personal data contained in any product, nor is M&S responsible for the restoration or reinstallation of any programs or data other than software written and installed by M&S or its Authorized Distributor when the product was provided to the end user by M&S or on behalf of M&S by its Authorized Distributor.

Upon the expiration of the limited hardware warranty, POR will be offered an option to purchase an extended service contract. Hardware service will be provided to POR under the terms of the service agreement. Please refer to that contract for details on how to obtain service.

M&S uses new and refurbished parts made by various manufacturers in performing warranty repairs and in building replacement parts and systems. Refurbished parts and systems are parts or systems that have been returned to M&S, some of which were never used by a customer. All systems are inspected and tested for quality.

Replacement parts and systems are covered for the remaining period of the limited hardware warranty for the product POR bought. M&S owns all parts removed from repaired products.

This limited hardware warranty coverage terminates if POR sell or otherwise transfer this product to another party.

This Limited Warranty is made as of the date of shipment of the Products to the Customer (the "Effective Date") by and between M&S Technologies, its subsidiaries and affiliates, with offices at 5715 W. Howard Street, Niles, Illinois 60714 ("collectively "the Company"), and the Customer (as defined below).

1. Definitions.

In addition to the terms defined elsewhere in this Agreement, the following terms whenever used in this Agreement shall have the following meanings:

"Customer" means the end user of the Products.

"Hardware" means the hardware purchased from M&S, along with any end user manuals supplied by M&S. This includes M&S Products purchased through M&S Authorized Distributors.

"Maintenance Releases" means any update, upgrade, revision, patch, bug fix or an improved, upgraded or enhanced version of the Products released by M&S to which Customer is rightfully entitled by way of a valid maintenance agreement, warranty, or other M&S offering. Third Party Products are excluded and subject to their own terms and conditions.

"Object Code" means computer programs assembled, compiled, or converted to magnetic or electronic binary form on software or hardware media, which are readable and usable by computer equipment, but not generally readable by humans without reverse assembly, reverse compiling, reverse conversion, reverse engineering and/or any other disassembly or decompilation.

"Product(s)" means, collectively, the Hardware and Software which may be supplied to Customer.

"Software" means all components of M&S vision testing industry software and related documentation made generally available by M&S from time to time, which is accompanied by its own license agreement. The term "Software" shall include any and all software, scripts, firmware, and microcode running on Hardware or any computer system, including all Maintenance Releases supplied in accordance with this Agreement. The Software shall be provided in Object Code form only. No source code will be provided.

"Third Party Products" means any hardware or software licensed or distributed by M&S to Customer that is not owned by M&S.

Except as expressly set forth in this limited warranty, M&S makes no other warranties or conditions, expressed or implied, including any implied warranties of merchantability and fitness for a particular purpose, title and non-infringement. M&S expressly disclaims all warranties and conditions not stated in this limited warranty. Any implied warranties that may be imposed by law are limited in duration to the limited warranty period. Some states or countries do not allow a limitation on how long an implied warranty lasts or the exclusion or limitation of incidental or consequential damages for consumer products. In such states or countries, some exclusions or limitations of this limited warranty may not apply to POR.

This Limited Warranty applies only to Products sold by M&S or on behalf of M&S by their Authorized Distributors.

These terms and conditions constitute the complete and exclusive warranty agreement between POR and M&S regarding the purchased hardware and accessories from M&S Technologies, POR have purchased. These terms and conditions supersede any prior agreements or representations, including representations made in M&S sales literature or advice given to POR by M&S or an agent or employee of the M&S that may have been made in conjunction with your purchase of the Product. No change to the conditions of this Limited Warranty is valid unless it is made in writing and signed by an Authorized Distributor of the M&S.

M&S® Technologies

5715 W. Howard Street
Niles, IL 60714

Sales: 1/847-763-0500
1/877-225-6101

Fax: 1/847-763-9170

Technical Support: 1/847-763-0500

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