



National Health and Nutrition Examination Survey (NHANES)

Balance Manual



January 2020

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1. Introduction

1.1 Background

The ability to maintain balance is essential to nearly all activities associated with daily living. The balance system enables us to sense where we are in space and to maintain our posture and equilibrium while we are still or moving. We often do not consider balance as a “sense” in the same way that we think of seeing, hearing, tasting, smelling, and so on, because balance is usually an automatic, unconscious process. However, impairment of the balance system can be a major disabling condition for those who are affected.

The control of balance requires the integration of information from multiple sensory and motor systems by the central nervous system (CNS). Balance receptors in the inner ear (the vestibular system) provide information to the CNS about head and body movements. The eyes (visual system) provide input regarding the body’s orientation within the environment and about motion within the environment. The position and motion sensors of the muscles and joints, and the touch receptors of the extremities (proprioceptive system), send signals regarding bodily position, particularly in relation to the support surface. The CNS integrates all this information, determines the body’s spatial orientation, and sends appropriate neural messages to the motor system to activate movements that will maintain equilibrium and keep our vision clear when we are moving.

Because the balance system is so complex, it can be impaired by a large number of disease processes affecting any of the multiple sensory inputs, neural processing centers, or motor outputs. These include (but are not limited to) infections of the inner ear, head injury, drug or environmental toxicity, cerebrovascular insults, degenerative changes due to aging or illness, and autoimmune reactions. Balance disorders can result in a wide variety of symptoms, ranging from a generalized feeling of disorientation and disequilibrium to acute vertigo (i.e., the false sensation of motion, particularly spinning of the body or the environment). Because balance is normally an unconscious process, patients often have difficulty finding the words to explain their symptoms, and physicians can have difficulty determining the exact cause of the problem.

Impairments of balance are common and can be debilitating conditions. People with chronic balance disorders can be significantly disabled in many day-to-day functions, particularly those that

require stabilizing the body during weight-shifting, bending, or rapid head motion. Examples of such tasks include getting in and out of bed, taking a bath or shower, climbing stairs, and reaching for objects in high or low cabinets. Changes in body posture that require shifting one's weight or moving the head are particularly problematic and can induce vertigo. In addition, those who have balance impairments have more difficulty than normal individuals doing tasks that involve spatial perception and movement and often report bumping into walls, walking off a sidewalk, or veering into another lane while driving (Cohen, 1992; Cohen et al., 1995). Balance disorders restrict an individual's normal motor activities and can limit one's sense of independence, adversely affecting the quality of life.

The prevalence of balance disorders in the US is high and increases with age. Data from NHANES 2000-2004 indicate that 35.4 percent (69 million) US adults aged 40 or older have some balance dysfunction; prevalence jumps to 69 percent among those aged 70-79 years and 85 percent among those aged 80+ years (Agrawal et al., 2009). The higher risk of balance impairments among the elderly is due to functional changes associated with aging. The control of balance becomes increasingly dependent on visual and proprioceptive cues as we age, making the elderly more vulnerable to falls when those orientation cues are degraded (Peterka and Black, 1990).

Individuals with balance trouble have a six-fold increase in the risk of falling; fall risk increases even further among individuals who report symptoms of dizziness (Agrawal et al., 2009). Falls are the leading cause of both fatal and nonfatal injuries among older adults (aged 65+ years). In 2014, approximately 3 million older adults sought treatment in emergency rooms for fall-related injuries; 800,000 of these patients required hospitalization and 27,000 patients died (Bergen et al., 2016). Direct medical costs of falls in the US in 2000 were more than \$19 billion (Stevens et al., 2006). Many people who fall develop a fear of falling, even if they are not injured. This fear may cause them to limit their activities, leading to reduced mobility and loss of physical fitness; this in turn increases their actual risk of falling (Vellas et al., 1997).

In addition to the elderly, several other groups are at increased risk for balance disorders. People of color, those with lower educational status, and those with diabetes or hearing loss have a higher risk of balance dysfunction (Agrawal et al., 2009). In addition, individuals who have sustained head injuries are likely to suffer from problems with balance and dizziness (NIDCD, 1995).

NHANES will conduct a Modified Romberg Test (MRT) of standing balance; two vision measures: a visual Contrast Sensitivity Test (CST) and a Dynamic Visual Acuity (DVA) test; and a lensmeter measurement of eyeglass lenses worn by the survey participant. Participants aged 40+ years are eligible for these exams, assuming that they are not excluded for safety reasons (described elsewhere in this manual).

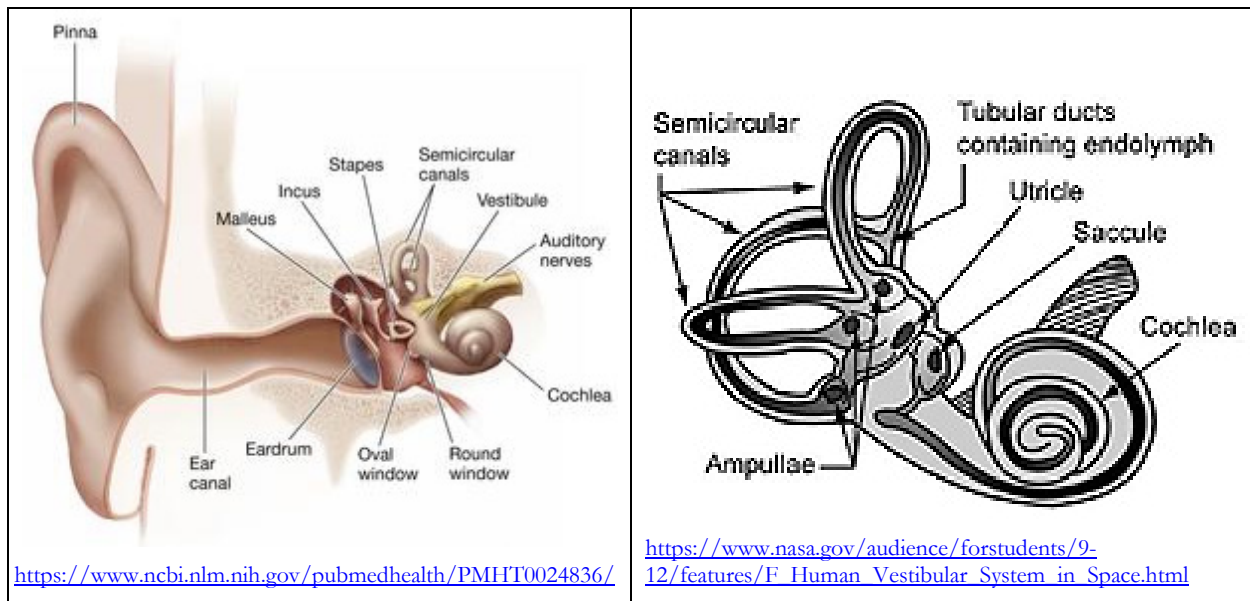
Researchers will be able to (1) determine the prevalence of balance deficits among adults aged 40+ years; (2) examine changes in the prevalence of balance disorders in this population since 1999-2004; (3) evaluate the proportion of balance disorders that may be specifically due to dysfunctions of the vestibular system; and (4) identify risk factors that predispose individuals to balance disorders. Incorporating these measures in NHANES will provide researchers with a national comparison and allow comparison of balance function across various population sub-groups.

1.2 Basic Anatomy of the Balance System

The body's ability to maintain balance depends on (1) inputs from three body systems (the vestibular, visual, and proprioceptive [touch] systems), (2) integration of these inputs by the CNS, and (3) appropriate responses to the integrated signal by the body's musculoskeletal system.

The primary organs of balance, the vestibular sensors, are located within the inner ear. Attached to the cochlea (the snail-shaped organ that converts sound into neural signals) are three semicircular canals. The canals are aligned to form a coordinate system, so that one canal lies in each plane (see Exhibit 1-1 below). The semicircular canals are encased in the temporal bone of the skull and are filled with fluid. At the base of each canal is an enlarged area called the ampulla, which contains a receptor organ, the cupulla, containing tiny hair cells that project into the gelatinous composition of the cupulla. At the base of these hair cells are fibers from the vestibular branch of the eighth cranial nerve (CNVIII), which carries their sensory input to the CNS.

Exhibit 1-1. Cochlea and semicircular canals (right and left)



The fluid in the semicircular canals moves in response to angular, pivoting movements of the head, such as turning, tilting, or bending. The movement of the fluid causes the hair cells in the ampullae to bend, changing the neural signals that are sent to the brain. The fluid in each ear moves in opposite directions, so that hair cells in the ampullae are also bent in opposite directions. For example, if you turn your head to the right, the fluid in your right horizontal semicircular canal moves in a direction that causes the vestibular sensor on that side to send additional neural impulses to the brain. At the same time, the hair cells of corresponding vestibular sensor on the left are bent in the other direction, causing fewer impulses to be sent. The brain interprets this difference in neural signals as head movement.

Between the cochlea and the semicircular canals is a space in the temporal bone called the vestibule. In this space, which is also fluid-filled, lie two organs, the utricle and saccule, which respond to linear (to-and-fro and up-and-down) motion of the head and to the force, or pull, of gravity. The utricle and saccule contain hair cells imbedded in a gelatinous covering (membrane) that contains tiny crystals, called otoconia. The otoconia press against the hair cells with a pressure proportionate to the head motion and to the pull of gravity. This information is sent to the brain to enable us to maintain our spatial orientation and balance.

Information from the visual and proprioceptive systems is sent to the brain and interpreted in conjunction with the signals from the vestibular system. The brain then sends out appropriate neural impulses that stimulate reflexive actions in the musculoskeletal and ocular systems to cause the body to react as necessary to maintain balance and keep our vision clear when moving.

Sometimes the brain must decide between conflicting inputs. For example, when you suddenly stop spinning, the fluid in your semi-circular canals continues to flow for a few seconds, which tells the brain that you are still moving. However, the input from your visual system and the proprioceptive receptors tells the brain that you are not. On the other hand, when you are waiting at a stop light and the car next to you pulls slightly forward, your visual system senses that you are rolling backward. However, your vestibular system indicates that you are still at rest. When the central nervous system does not respond to each of the three inputs, it causes a sensory conflict that can result in confusion, spatial disorientation, and motion sickness and, in extreme cases, falling and injury.

1.3 Disorders of Balance

Because of the complexity of the balance system and the number of sensory and motor mechanisms that contribute toward it, there are many disorders that can disrupt normal balance function.

Disorders can be due to physical injury, illness, malformation, malnutrition, or dehydration of any part or combination of parts of the body. Disorders or damage to the semicircular canals and/or otolith organs are considered peripheral vestibular disorders, and disorders or damage to other parts of the balance system are considered central disorders. This section discusses a few of the most common causes of balance dysfunction, but should not be viewed as all-inclusive or an exhaustive list.

Peripheral vestibular disorders are caused by damage to the inner ear balance receptors and/or the nerve (CNVIII) that connects to the receptor organs. Damage can result from infection, head injury, toxicity, or other causes and can be unilateral (one-sided) or bilateral (two-sided). Unilateral disorders are more common and often result in a primary symptom of vertigo (a sensation of movement, usually spinning, which results from an imbalance in the neural signals being sent to the brain). Examples of peripheral vestibular disorders include benign paroxysmal positional vertigo,

Meniere’s disease (an idiopathic fluctuation in ear symptoms), perilymphatic fistula (a leak of the fluid-filled inner ear), and neuritis or labyrinthitis (an inner ear infection).

Central vestibular disorders are caused by damage to the CNS areas that integrate balance information. This type of damage can result from space-occupying lesions, such as tumors or aneurysms in the brain stem, or from degenerative brain disorders, such as multiple sclerosis, or blood-flow issues, such as atherosclerosis, migraine, or stroke. Central disorders can result in vertigo or more generalized symptoms such as lightheadedness, dizziness, unsteadiness, or ataxia (loss of muscle coordination).

Damage to the visual and/or musculoskeletal system can also result in balance impairment. Systemic disorders such as metabolic abnormalities, peripheral neuropathies, autoimmune disease, and psychogenic disturbances (e.g., anxiety disorders) are other potential etiologies of disordered balance. Moreover, it is common to find comorbidities with balance disorders, or multiple areas of disorder, damage, or weakness, that all contribute to an individual’s balance dysfunction (van Leewen, et al., 2017; Balaban et al., 2011).

Depending on the etiology of the balance disorder, medical or therapeutic approaches are available to potentially eliminate or minimize the balance disorder. While few disorders are improved through medications such as diazepam (Valium) or meclizine, other disorders may be treated by dietary changes, repositioning maneuvers, or surgery. However, even if a disorder cannot be treated medically or surgically, rehabilitation therapy can often be effective in training the other contributory systems to compensate for the impaired system, and therefore reduce the intensity and duration of symptoms.

1.4 References

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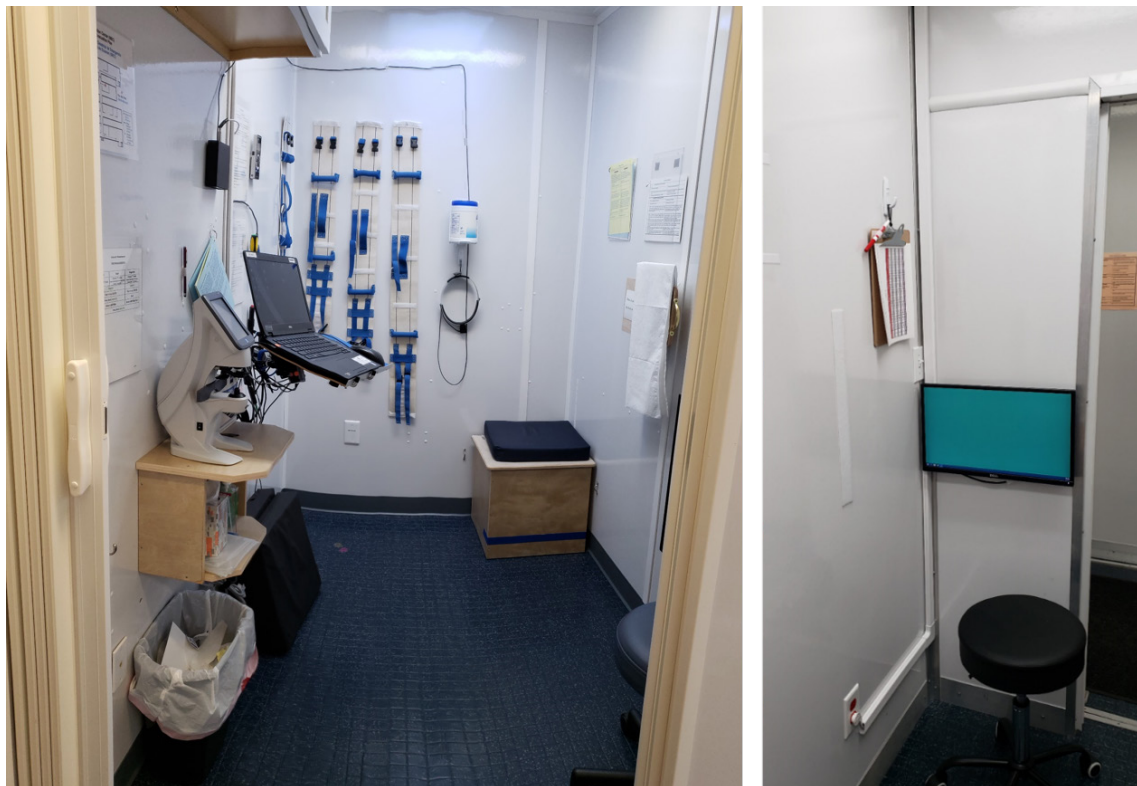
2. Equipment

2.1 Description of Exam Room in the MEC

The balance examination will be conducted in the balance room located in Trailer #3 of the Mobile Examination Center (MEC). The room has been specially outfitted to ensure the accuracy of the exam results and the safety of examinees throughout the balance test. The room has limited visual and auditory distractions, except for the equipment used for testing, and the visual target located on the wall for fixation during eyes-open testing (see Exhibit 2-1).

The work area for the health technologist consists of a small built-in table and laptop on a swing arm. There are cabinets located above the desk and laptop swing arm, in which equipment specific to the balance exam can be stored.

Exhibit 2-1. Exam room with set-up complete



2.2 Description of Equipment and Supplies

The following equipment has been supplied for the balance component of NHANES:

- **Sammons Preston Velcro gait belt.** The Sammons Preston Two-Handled Gait Belt is constructed of durable, heavy cotton with plastic handles on each side and a rear cotton handle that will enable the technician to steady the examinee. The Gait Belt is machine washable and 5” in width. The belt comes in four sizes (S, M, L, XL) based on waist measurement.
- **SafetySure transfer belt.** The SafetySure Transfer Belt has multiple handgrips that allow the technician to steady the examinee. The belt comes in three sizes based on waist measurement. Only the largest size is used on NHANES.
- **Sunmate medium density foam pad and waterproof slipcover.** The foam pad (16” x 18” x 3”) provides the compliant support surface for Conditions 3, 4, and 5 of the MRT portion of the balance protocol. The cover is a 4-way stretch weft-knit fabric with a polyurethane transfer coating treated against microfungi and bacteria. The slipcover is removable and can be washed with soap and water. Stretch-4 has four-way stretch that allows it to compress with the cushion, and not detract from the cushion’s support properties.
- **Digital quartz metronome.** The SQ200 from Seiko is a digital quartz metronome that features intuitive buttons and a rotary dial. The SQ200 Digital Quartz Metronome features a wide tempo range and 10 different beat settings. It is built with a monitor speaker, and 60 notes (C2 to B6). In addition, a 3-channel memory setting, a volume control, and several rhythm patterns are included.
- **Accelerometer.** The X16-1D accelerometer stores precisely timed acceleration data on a microSD flash card. The X16-1D operates from a replaceable AA type alkaline battery. The X16-1D accelerometer collects data regarding accelerations in the three planes (X, Y, and Z, respective to the accelerometer) at a rate of 100 Hz. The accelerometer’s on/off switch has been custom-altered, to improve ease of use. During the MRT exam, the accelerometer will be affixed to the low back of the SP via Velcro on the gait belt. Two accelerometers on each MEC provide backup units in the event one malfunctions during a stand.
- **Light meter.** The light meter for contrast sensitivity testing is used to ensure the proper lighting for the contrast sensitivity test. The light meter measures the light illuminating the test charts, NOT the light reflected by the test chart. (In other words, the meter is pointed at the source of light [illumination], not the test chart, for maximum accuracy.) The light meter uses a 9-volt battery and includes a low battery indicator. When not in use, it will be stored in the zippered case provided.

- **Micromedical VORTEQ.** The Dynamic Visual Acuity Test (DVAT) portion of the Micromedical VORTEQ laptop and accessories will be used to measure Vestibular-Ocular reflex (VOR) gain and symmetry. Through measuring Dynamic Visual Acuity in both the horizontal and vertical planes, and comparing it to binocular static visual acuity, appropriate VOR gain can be measured, and therefore provide insight into vestibular function.
- **Low Contrast Sensitivity Chart.** The Mars Perceptrix numbers contrast eye chart indicates the lowest contrast a person can perceive. With the Mars test, it is the contrast, and not the number size, which diminishes from the beginning to the end of the chart. The numbers are large, ensuring that most patients, even those with low vision, can see them.
- **Lensmeter.** The Nidek LM-7P Automated Lensmeter will be used to measure the SP's prescription of single-vision lenses, bifocal lenses, trifocal lenses, and progressive power lenses (PPL).

An inventory of the balance equipment and supplies will be conducted at the beginning and the end of each stand. Supplies will be sent to a MEC prior to its next stand opening. Malfunctioning or missing equipment should be reported to the MEC manager and health technologist assigned to Balance.

2.3 Start of Stand Procedures

2.3.1 Room Setup

Follow the procedures below to set up the Nidek LM-7P Automated Lensmeter (Exhibit 2-2).

Exhibit 2-2. Nidek lensmeter



1. Unpack the lensmeter and set it on the table.
2. Confirm that the power switch is turned off (O).
3. Gently lay the device on its side.
4. Connect the power cord to the power inlet, which is located under the bottom of the machine (see Exhibit 2-3).
5. Connect the ISIS computer cable to the back of the lensmeter (see Exhibit 2-4). Make sure the other end of the ISIS computer cable is still fully inserted into the port on the left side of the laptop.

Exhibit 2-3. Power cord connection to lensmeter



Exhibit 2-4. ISIS computer cable connection to lensmeter



6. Stand the device upright and pull the power cord through the indentation on the rear of the device to keep the cord free.
7. Set the lensmeter on top of the Velcro on the table.
8. Wrap the strap attached to the table around the bottom of the lensmeter as shown in Exhibit 2-5 and tighten the strap to secure the lensmeter to the table. Ask the facilities and equipment specialist (FES) for help if you have difficulty.

Exhibit 2-5. Securing the lensmeter to the table

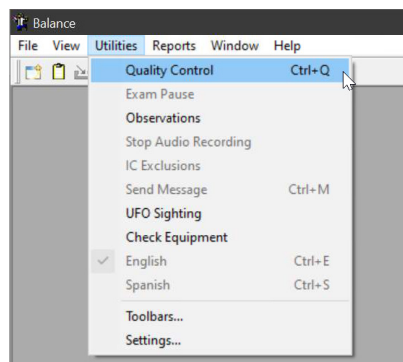


9. Turn on the power switch (I/O) and wait for the Measurement screen to be displayed.
10. Check the printer paper.
 - a. The printer paper door and the printer door release button are located on the right side of the lensmeter.
 - b. Push the printer door release button to open the printer door to check the printer paper.
 - c. If the paper is low or empty, replace the paper. Instructions for replacing the paper is in Section 2.6.1.

Next check the Micromedical VORTEQ laptop and accessories.

1. Make sure the laptop on the swing arm is stable and the power cord is fully inserted into the port.
2. If the laptop is not already on, turn it on and log in. Open the Balance application. Click on “Utilities” in the toolbar and select “Quality Control” (Exhibit 2-6).

Exhibit 2-6. Opening the QC Utility



3. Locate the USB hub and make sure the cords are fully inserted into the ports of the USB hub. If any cords have come out of the hub during transit, reinsert them.
4. Check the cable running from the TV monitor on the wall to the laptop area to make sure it is fully inserted and has not gotten loose during transit.
5. Hang the V-Link box on the wall and hang the cord between the V-Link box and the motion detector on the hooks around the wall.
6. The white cord that attaches the V-Link box to the computer was taped to the wall for transit. Remove the cord and plug it into the V-Link box.
7. Place the motion detector onto the headband as shown in Exhibit 2-7. From the top, insert the U-shaped side of the attachment into the matching u-shaped slot on the headband.

Exhibit 2-7. Attach the motion detector to the headband



8. Hang the headband on the wall in the designated area.

Hang the gait belts

1. Remove the five gait belts (five sizes) from storage.

2. Check the Velcro on each belt to make sure it has not torn or become detached. If the Velcro needs to be replaced or repaired, notify the home office component lead to arrange it.
3. After first checking the Velcro on the wall for firm attachment (press it on), hang the four smaller sized gait belts on the wall, from smallest to largest. Place the largest gait belt in the sitting bench.
 - a. If the Velcro is not attached firmly to the wall, work with the FES to remove the old Velcro and replace it with new Velcro.
 - i. If the Velcro needs to be replaced, remove the old Velcro from the wall, clean the wall with an alcohol wipe and wait for it to dry.
 - ii. Next, apply new Velcro and wait until the next day to hang the gait belt from the newly applied Velcro.

Inspect the foam pads

1. Inspect the foam pad covers for dirt and tears.
 - a. The foam pad covers can be wiped with a Purell wipe if necessary to clean them.
 - b. If there are tears in the foam pad cover, request a new one on the inventory form. A small supply of paper pillowcases are kept on the MEC and can be used until a replacement arrives.
 - c. If you need to use a paper pillowcase, use scissors to cut two corners of the disposable pillowcase to prevent the case from ballooning out when an SP steps on the pad. Never cut the disposable pillowcase while it is on the foam pad. Fold the extra length of the pillowcase over one side of the foam pad and tape it down. Replace the paper pillowcase daily or whenever it shows larger tears.

Prepare the monitor

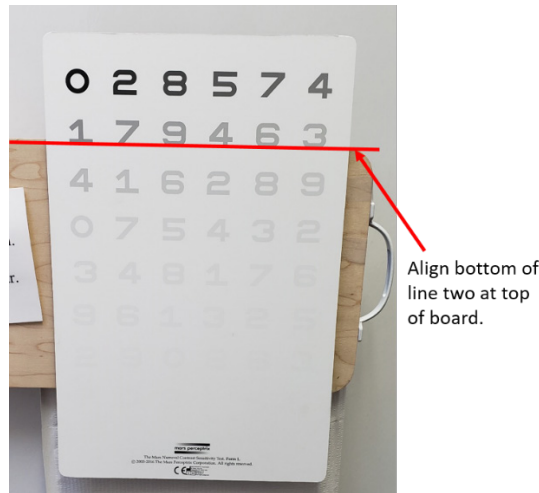
1. Before opening the Spectrum software, plug the HDMI cable from monitor into the HDMI extension cord from the back of the laptop.
2. Turn on the monitor using the ON/OFF button at the bottom right of the monitor.

Hang the CST chart

1. Locate the CST card schedule, CST charts, and CST score cards.
2. **Wash your hands** and select the CST chart indicated on the green CST Card Schedule.
3. The CST chart attaches to the swing arm with Velcro. Mount the CST chart on the swing arm so that the bottom of the second line of the chart is aligned with the top of

the swing arm (Exhibit 2-8). Try to minimize, as much as possible, how much you touch the front of the card.

Exhibit 2-8. Aligning the CST chart on the swing arm



4. Put the corresponding CST score card on the clipboard with a dry erase marker.

Hang the wand, USB button, stopwatch, and clipboard in the designated spots. Remove all other daily supplies from cabinet and place them on the table top. Store extra supplies in the cabinet.

2.3.2 Room Lighting Check

At SOS, the lighting in the Balance room is checked to make sure the lighting is appropriate for the CST exam. To check the lighting in room, follow the steps below.

1. Locate the light meter.
2. Press the orange ON/OFF button to turn it on.
3. While sitting on the SP bench, hold the photo detector portion of the light meter in front of the middle section of the white area of the CST chart with the white circle of the photo detector facing you. (Make sure your hand is not casting a shadow on the photo detector.)
4. Press the button labeled “HOLD” located on the top, right corner of the photo detector to freeze the lumens or lux measurement on the LED display.
5. The appropriate range of the measurement should be 189 to 377 lux, and optimally 267 lux. If the measurement does not fall in the range, notify the FES to help solve the lighting issue and then conduct the test again.

6. When the test is complete, cover the CST chart and push the swing arm flush to the wall for storage between tests.
7. Record the lux measurement on the SOS QC 2 tab (Exhibit 2-9).

Exhibit 2-9. Start of Stand Equipment Check screen

2.3.3 Metronome Check

1. In the cabinet you should find the metronome. At the start of every stand, put a new battery in the metronome.
2. Turn the metronome on and check the settings on the display (see Exhibit 2-10). The settings on the display should be:

- Channel: METRO-1
- Tempo: 60bpm
- Rhythm: 
- Beat: 0

NOTE: To change the tempo, rhythm, or beat, press the button for the setting that you need to change and turn the center dial.

Exhibit 2-10. Metronome settings



3. Press the start button to check the volume level and adjust it as necessary.
4. Check the Velcro on the back of the metronome to make sure it is well adhered and press the metronome onto the Velcro on the wall.
5. Turn the metronome off. Record that you completed this task on the start of stand QC 2 tab.

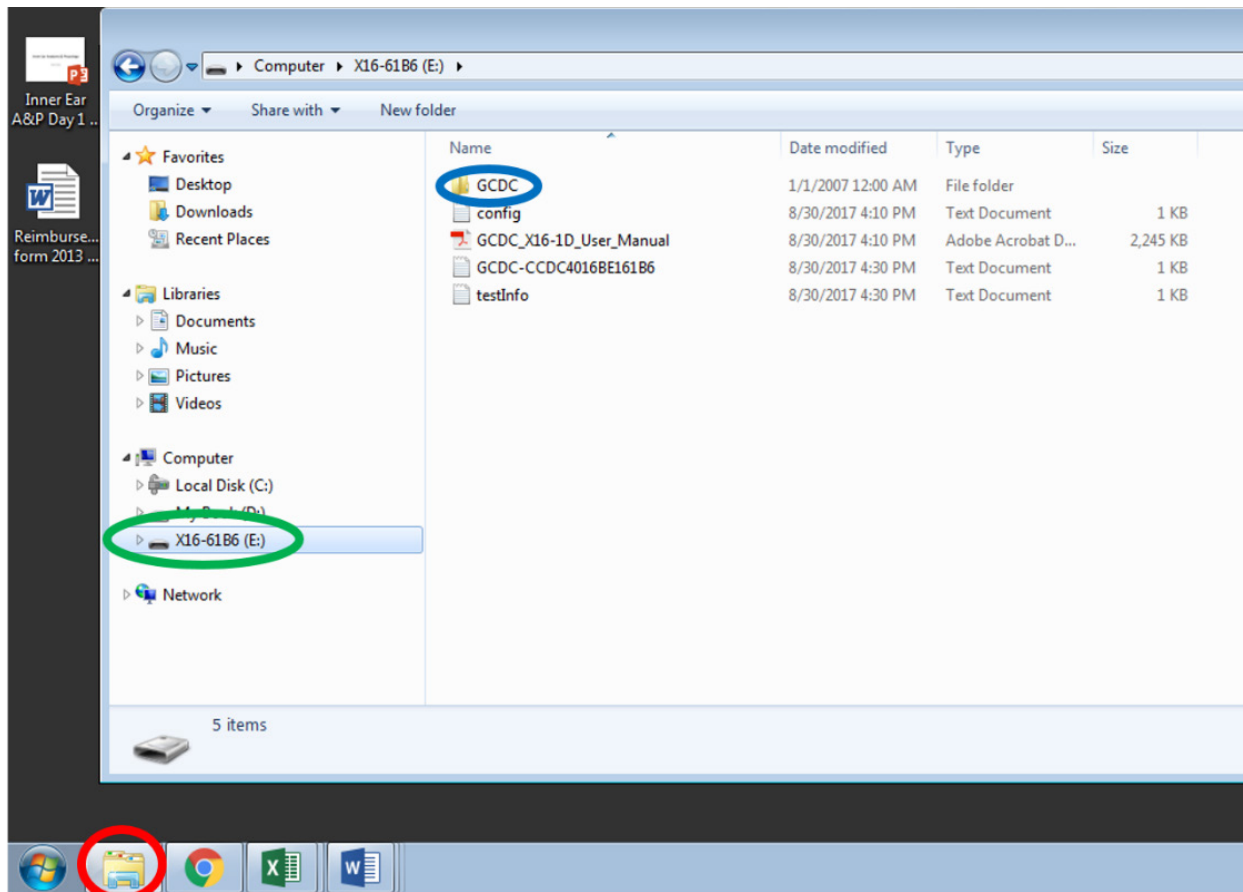
2.3.4 Accelerometer Checks

Each MEC has three accelerometers. At SOS, check all three accelerometers. For each accelerometer:

1. Put a battery in any accelerometer that does not already have one.
2. Press the “ON” button to check the battery. The blue light should start blinking. If the blue light does not start blinking, change the battery before proceeding.
3. Set the accelerometers on the counter for 10 seconds.
4. Plug in each accelerometer one at a time into the USB port on the laptop.
5. Open the folder “GCDC” (see Exhibit 2-11).
 - a. Click on the “folder” icon in the bottom left of the screen (circled red)

- b. Click on the file named “X16-...” (circled green)
- c. Click on the folder named GCDC (circled blue)

Exhibit 2-11. Opening the accelerometer folders



6. During the 10 seconds that the accelerometer was on, it should have created a file. Make sure there is a file present.
7. If files are present, highlight and delete the files so there are no files on the accelerometer when you start data collection. The accelerometer is now ready for data collection.
 - a. If no files are present, it is an indication that the battery may be dead. Change out the battery on the accelerometer and repeat the process.
8. **Turn the accelerometers off by pressing and holding the “on/off” button until the accelerometer has a repeated, quick flash, indicating it has turned off.**
9. Record that you completed this task on the start of stand QC 2 tab.

10. Check the “Accelerometers Used” sheet to determine which two accelerometers were used at the last two stands. Put the two accelerometers used at the last two stands in the cabinet with the battery in them where they can be easily accessed if necessary. The accelerometer you keep out will be used for the current stand.
11. Finally, locate the USB cable for the accelerometer (taped to the wall for transit) and plug the cable into the accelerometer that will be used for the stand and attach the accelerometer to the wall.

2.3.5 Lensmeter Calibration Check

Calibration checks are performed at the start of each stand to confirm that the lensmeter is working properly. A record of these checks is kept as part of the Quality Control (QC) procedures. Follow the procedures outlined below to check the calibration of the lensmeter. Refer to the Lensmeter Operator’s Manual for more detailed descriptions of the screen and buttons.

First, lift the nose piece on the lensmeter and inspect the sensor with the penlight for lint and debris (see Exhibit 2-12).

Exhibit 2-12. Lensmeter nose piece lifted for sensor inspection



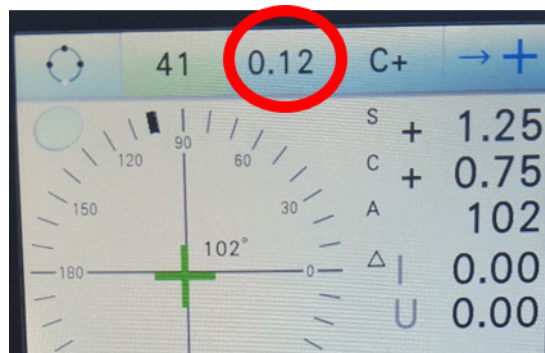
If any debris is detected, use a puff of air from the blower brush to clean the lens. If necessary, dampen a Q-tip with an alcohol wipe and gently wipe the lint away from the sensor. Replace the nosepiece and proceed with calibrations. Record that you completed this task on the start of stand QC 2 tab.

2.3.5.1 Measuring Prescription of Eyeglasses

There are four pair of calibration eyeglasses of known prescription (8 total prescriptions) on each MEC. Each pair is marked with numbers 1, 2, 3, or 4. To complete the lensmeter calibration procedures, you will need the four pairs of calibration glasses and the box of pre-moistened, individually wrapped lens wipes. Follow the procedures outlined below for measuring the prescription of each pair of calibration glasses and transferring the results to ISIS.

1. Before measuring the calibration glasses, check the lensmeter settings. The settings are listed in Appendix B.
2. Press the increment button in the top, middle portion of the screen (see Exhibit 2-13) to change the setting from 0.12 to 0.25.
3. Clean the lenses with a lens wipe. Do not use paper towels, tissues, or other cloths to dry the glasses since these items are not lint free.
4. Be sure the lensmeter is turned on before you place the glasses on the nosepiece; otherwise, you will receive a “Please remove the lens from nosepiece” message. If this occurs touch the arrow to re-start the instrument once the glasses are removed.
5. Select the QC 1 tab on the Start of Stand tab.

Exhibit 2-13. Lensmeter screen setting



Measuring the right lens:

1. Using the Normal Measurement screen, press the button on the lensmeter to select the right eye. (The background of the “R” will be flashing green.)
2. Start with the glasses labeled “Pair 1” and place the bottom of the right frame on the nosepiece with the front surface facing up.

3. Pull the lens table lever forward until the lens table comes into contact with the bottoms of the frames. Note: Make sure the bottoms of both frames are in contact with the lens table. If the frames are off the lens table, an error may occur in the axis value.
4. Initially, you may see a circle on the screen. Move the lens up and down, right and left until a green cross appears in the center of the screen. Make sure that the bottoms of the frames are in contact with the lens table. NOTE: The prism value should be at 0 or .25.
5. Lift up on the lens clamp (located in the center front of the instrument) to unlock it and gently lower the lens clamp to secure the lens.
6. Make minor adjustments until the cross in the center of the screen turns blue. This is optical center (see Exhibit 2-14).

Exhibit 2-14. Finding optical center with the lensmeter



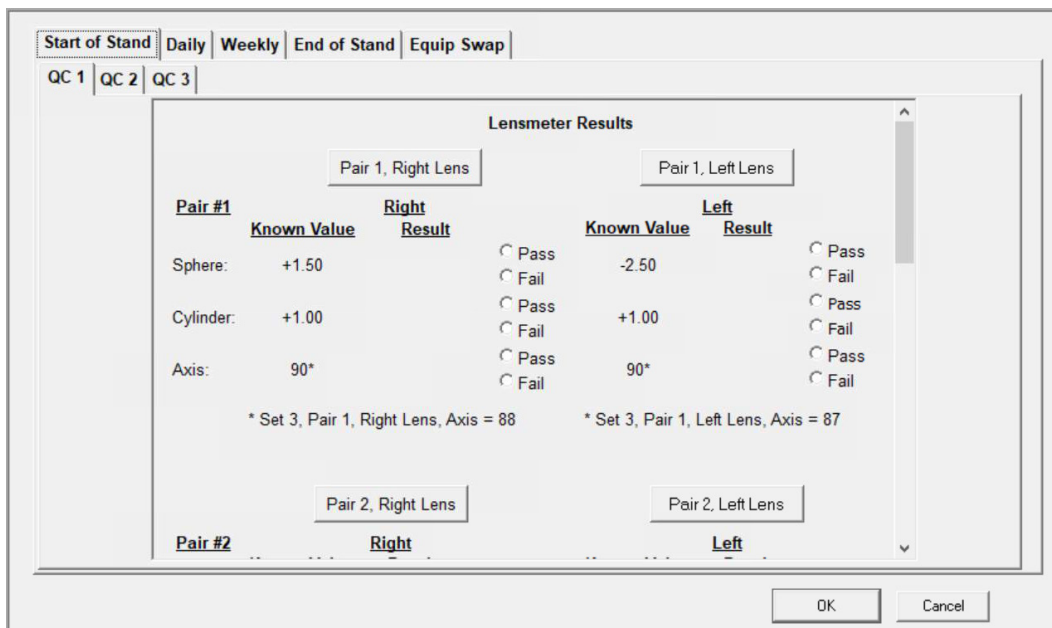
7. Press the read button (located near your thumb). The “R” button will be highlighted in blue indicating that the measurement has been stored (see Exhibit 2-15).

Exhibit 2-15. Read button on lensmeter



8. On the Start of Stand QC 1 tab on the ISIS screen, click the appropriate pair/lens button (e.g. “Pair 1, Right Lens”) button (Exhibit 2-16) and touch the transfer icon on the lensmeter screen to transfer the data.

Exhibit 2-16. Start of Stand Lensmeter Results screen



Measuring the left lens:

1. Lift the lens clamp and remove the eyeglasses from the lensmeter. Press the “L” to select the left eye. The “L” is now highlighted on the screen and the data values have shifted to the left side of the screen.
2. Do not move the lever or the lens table. Place the bottom of the left frame on the nosepiece with the front surface facing up.
3. Again, move the lens up and down, right and left until a cross appears in the center of the screen. Make sure that the bottoms of the frames are in contact with the lens table.
4. Lift up on the lens clamp to unlock it and gently lower the lens clamp to secure the lens.
5. Press the read button. Both the “R” and “L” buttons will be highlighted in blue indicating that the measurements have been stored.
6. Click the appropriate pair/lens button (e.g. “Pair 1, Left Lens”) button on the ISIS screen and touch the transfer icon on the lensmeter screen to transfer the data.

Final steps:

After each measurement is taken, compare the results to the known value displayed on the screen. The known values and tolerance ranges can also be found in Section 2.3.5.2. If the results are within the tolerance range, select “pass” on the ISIS screen and move on to the next measurement. If the lensmeter is out of tolerance, first repeat the measurement yourself. If it is still out of tolerance, have another technologist attempt the measurement. If the problem still exists, notify the health tech in charge of the component. The health tech in charge of the component will notify the home office component specialist. MARCO, the manufacturer, will be contacted to determine whether the equipment will need to be sent back. If so, Westat will send a backup piece of equipment. **Finally, change the lensmeter increment from 0.25 to 0.12 (Exhibit 2-13).**

2.3.5.2 Table of Standardized Eyeglasses Prescriptions

An eyeglass prescription is expressed in sphere, cylinder, and axis of the cylinder power. The sphere and cylinder powers may be a plus or minus number. The axis describes the placement of the cylinder power, and is represented by 001 through 180 degrees, similar to a protractor.

See Table 2-1 for the prescriptions of the standardized eyeglasses and the tolerance range for the sphere, cylinder, and axis.

Table 2-1. Tolerance table

Pair	Right lens			Left lens		
	Sphere	Cylinder	Axis	Sphere	Cylinder	Axis
Pair #1	+1.50	+1.00	90	-2.50	+1.00	90
Pair #2	+1.50	+3.50	45	-5.00	+3.50	45
Pair #3	+3.00	+1.00	180	-4.00	+1.00	180
Pair #4	+3.00	+3.50	125	-6.50	+3.50	125

The tolerance range for Sphere and Cylinder is + or - 0.25 D. The tolerance range for Axis is + or - 3 degrees. (Example: The acceptable calibration range for a known axis value of 180 is 177 – 003.)

Note: The axis for some of the calibration lenses is slightly different from the standard in the table above. The lenses with known differences and the corresponding axis measurements are below.

Set 1, Pair 3, Left Lens, Axis = 003

Set 1, Pair 4, Right Lens, Axis = 123

Set 3, Pair 1, Right Lens, Axis = 88

Set 3, Pair 1, Left Lens, Axis = 87

2.3.6 DVA Checks

A check of the DVA equipment should be performed at the beginning of each stand to ensure the equipment is working properly. A record of these checks is kept as part of the Quality Control (QC) procedures. Follow the procedures outlined below to perform a check of the DVA equipment.

1. Ensure the TV monitor is turned to “ON.”
2. On the laptop, click “Spectrum” to open the software.
3. Click “SELECT PATIENT.”

4. Create a fake SP, using the following:
 - a. NAME: TEST
 - b. ID: DDMMYYYY (For example, for a calibration performed on the 3rd of February 2019, the ID would be 02032019.)
 - c. AGE: 40
5. Check the connection between the laptop and screen:
 - a. Follow the procedures you would use to start to perform the static visual acuity test, using the right and left arrow keys to ensure that the optotype (“C”) is changing direction and the up and down arrow keys to ensure the optotype is changing size.
 - b. Click “SET ACUITY” to advance.
6. Check the connection between the motion sensor and the equipment:
 - a. The word “HORIZONTAL” on the accelerometer attached to the headband should be visible from the top, as shown in Exhibit 2-17. (See Chapter 3, Section 3.6.4.3, for further information regarding set up of Horizontal DVA test.)

Exhibit 2-17. Headband with accelerometer positioned for horizontal testing



- b. Press “Record” to start the test.
- c. Holding the headband and sensor in your hand, move the headset in a horizontal movement in rhythm to the tones from the computer.
- d. The optotype (“C”) should flash as you move.
- e. Switch the motion sensor to “Vertical.” Note that the wire should be on the top, and not pointing downward. The word VERTICAL should also be visible from the top.

- f. Holding the headband and sensor in your hands, move the headset in a vertical movement in rhythm to the tones from the computer.
 - g. The optotype (“C”) should flash as you move.
7. Close out Spectrum; do NOT export the file.
 8. Record that you completed the horizontal and vertical tests on the start of stand QC 2 tab.

2.3.7 Recording Serial Numbers

The serial number for the lensmeter and accelerometer, as well as, the CST chart number used at each stand is recorded on the Start of Stand QC 3 tab (Exhibit 2-18) in ISIS.

Exhibit 2-18. Start of Stand Serial Number screen

Items/Equipment	Done	Serial Number	Comments
Lensmeter:	<input type="checkbox"/>	<input type="text"/>	<input type="text"/>
Accelerometer:	<input type="checkbox"/>	<input type="text"/>	<input type="text"/>
CST Chart Number:	<input type="checkbox"/>	<input type="text"/>	<input type="text"/>

The serial number for the accelerometer being used is recorded in two places – on the “Accelerometers Used” sheet and on the Start of Stand QC 3 tab. Only record the last four digits of accelerometer’s the serial number in both places. Make sure you record the serial number in the “Serial Number” data entry field in ISIS and not the “Comments” field. It is not necessary to enter something in the “Comments” field. The “Comments” field is used as necessary.

For the CST chart number, only enter the number of the chart. For example, enter “3” not “Chart 3” for the accelerometer being used.

Click the “done” box next to each piece of equipment as you enter each number. NOTE: Enter the serial number in the “serial number” field and NOT the “comment” field.

After completing all of the Start of Stand tabs, complete the Daily and Weekly tabs as well. You will have already completed the tasks listed on those tabs as part of the SOS QC so you don't need to do them again. Simply click the check boxes and you're done.

2.4 Daily and Weekly Checks

At the beginning of each day, perform the checks below to make sure the room and equipment are ready for exams. Immediately report any concerns with the equipment or room to the health tech in charge of the component for the stand.

1. Do a visual check of the lights in the room. If any bulbs have burned out, notify the FES.
2. Log in to the laptop and turn on all equipment.
3. Check the metronome to make sure it is audible and that the display is bright. If the display is dim, the batteries need to be changed.
4. Plug the HDMI monitor cable into the HDMI extender cable in the back of the laptop.
5. Check the floor of the room, especially in the corner designated for MRT, to ensure it is free of debris.
6. Check the foam pads for snags or holes.
7. Ensure all cords are intact and attached to their respective equipment, but please, do not tug on the cords.
8. Check the SP bench for CST and DVA to make sure it is against the wall on both sides.
9. Inspect the lensmeter with the penlight. Follow the procedures in Section 2.6.1 to remove any debris detected.
10. Check the accelerometer as indicated in Section 2.3.4.
11. Complete the Daily QC tab in the QC utility (Exhibit 2-19).

Exhibit 2-19. Daily Equipment Check screen

Start of Stand | **Daily** | Weekly | End of Stand | Equip Swap

Equipment Checks

Lensmeter Sensor Inspection: Complete

Accelerometer file creation check: Complete

At the beginning of the work week, change the battery in the accelerometer being used and complete the Weekly QC tab in the QC utility (Exhibit 2-20). You will know that it's time to complete the weekly QC if you click on the "Weekly" tab and it needs to be filled out. If you forget to complete the "Weekly" tab, when you close the QC utility, you will receive an alert from ISIS that not all QCs are complete. If all of the items in the "Daily" tab are filled out, it's probably time to complete the weekly QC. Check the "Weekly" tab to see if that is the case.

Exhibit 2-20. Weekly QC screen

Start of Stand | Daily | **Weekly** | End of Stand | Equip Swap

Changed accelerometer battery: Yes
 No

Comments:

It is not necessary to enter anything in the "Comments" field. The "Comments" field is used as necessary. An example of when you would need to use the comments field is if you recently swapped the accelerometer and it's too soon to change the battery. You would select "Yes" for "Changed accelerometer battery" and in the comments field, you would type something similar to "Accelerometer swapped MM/DD. New battery not necessary today."

2.5 Procedures at the End of an Exam Day

At the end of each exam day, turn off the DVA monitor on the wall, metronome, and lensmeter. Cover the lensmeter with the vinyl dust protector and make sure the CST chart is covered with the disposable pillowcase to protect it. Unplug the HDMI monitor cable from the HDMI extension cable in the back of the laptop. Reboot/Restart the laptop. (Do not shut down the laptop at the end of the exam day. Selecting “shut down” turns the laptop off. Updates cannot be deployed if the laptop is off.)

2.6 Equipment Care and Maintenance Procedures

As with all medical equipment, the balance equipment must be handled with care to ensure that it stays in good working order.

2.6.1 Lensmeter Care

The following procedures should be followed when cleaning the Lensmeter sensor.

1. Lift up the nosepiece and remove it.
2. Inspect the sensor with a penlight for lint and debris.
3. If any debris is detected, use a puff of air from the blower brush to clean the lens.
4. If necessary, dampen a Q-tip with an alcohol wipe and gently wipe the lint away from the sensor.
5. Replace the nosepiece.
6. If the exterior of the instrument becomes dirty, wipe it with an alcohol wipe.

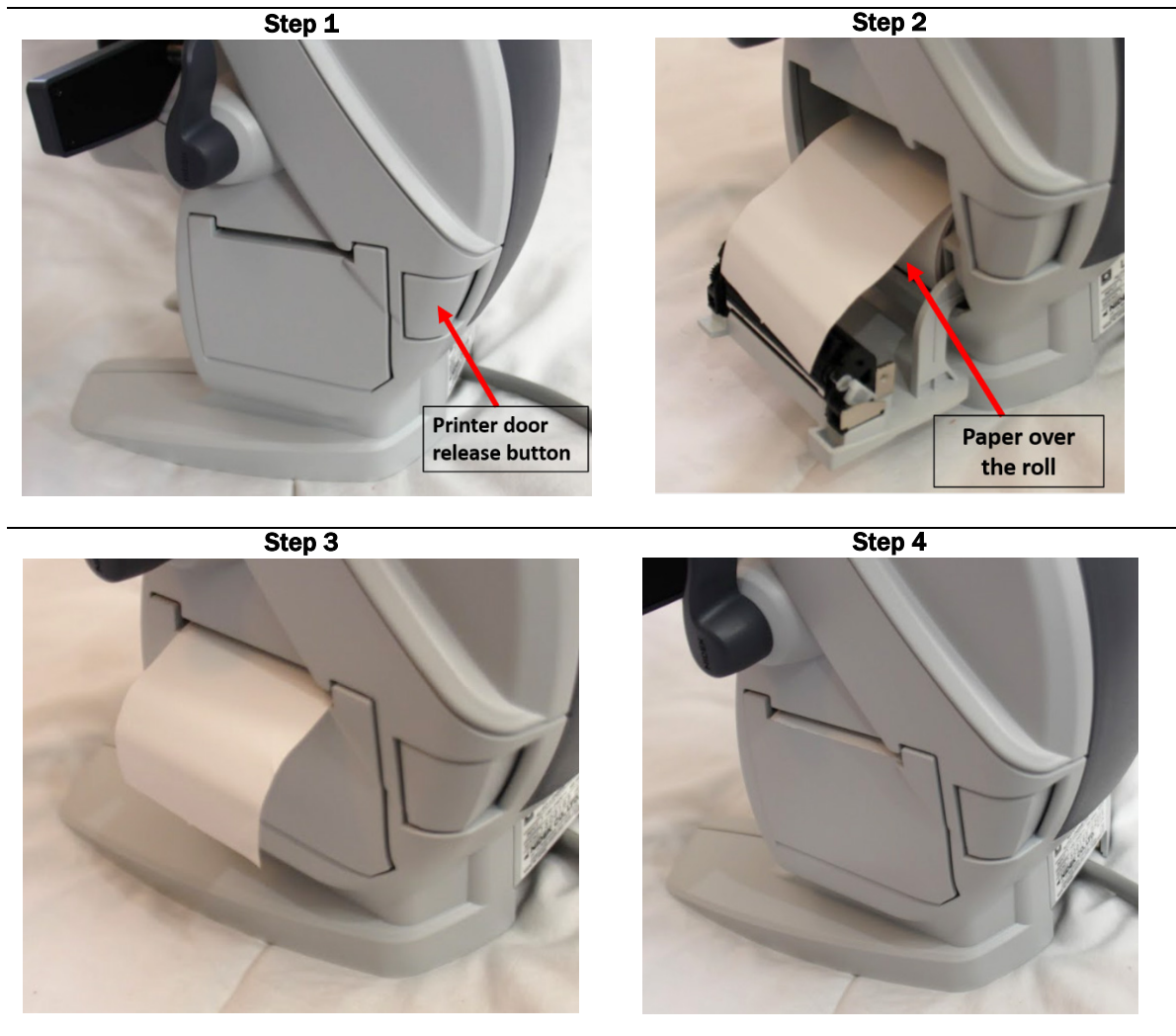
At the end of each day, turn the lensmeter off and cover it with the dust cover.

To change the lensmeter paper, follow the steps below and see Exhibit 2-21.

- a. To replace the printer paper, lift out the empty cardboard roll out of the slot and insert a new roll with the paper going over the roll.
- b. Pull out extra paper so that when the door is closed, a few inches of paper hangs outside the door.

- c. Push the door closed and pull off the extra paper by pulling down and across.

Exhibit 2-21. Changing the lensmeter paper



2.6.2 Micromedical VORTEQ

Wipe the DVA headset with the Purell sanitizing wipe after each SP.

2.7 End of Stand Procedures

Calibration checks are only performed on the lensmeter at the end of the stand. Follow the procedures indicated in Section 2.3.5. Lensmeter results will be saved under the End of Stand QC tab in the QC utility (Exhibit 2-22). If the lensmeter fails the calibration check, notify the health

technologist in charge of the component for the stand and the home office so that arrangements can be made for repair of the equipment prior to the next stand.

Exhibit 2-22. End of Stand Lensmeter Results screen

The screenshot shows the 'End of Stand' tab in a software application. The main area is titled 'Lensmeter Results' and is divided into two columns: 'Right' and 'Left'. Each column has a sub-header for 'Pair #1' and 'Pair #2'. For Pair #1, the 'Right' column shows: Sphere: +1.50, Cylinder: +1.00, Axis: 90*. The 'Left' column shows: Sphere: -2.50, Cylinder: +1.00, Axis: 90*. Below these are radio buttons for 'Pass' and 'Fail'. A note at the bottom of the results area reads: '* Set 3, Pair 1, Right Lens, Axis = 88' and '* Set 3, Pair 1, Left Lens, Axis = 87'. The 'OK' and 'Cancel' buttons are located at the bottom right of the window.

Put the “Accelerometers Used” QC sheet in the front pocket of the procedures manual for the next team to reference. Put the procedures manual in the cabinet for transit.

Shutdown the laptop after confirming that it is okay to do so.

Pack the Nidek LM-7P Automated Lensmeter.

1. Turn the machine off.
2. Loosen the strap around the bottom of the lensmeter but do not completely detach it from the table. Ask the FES for help with the strap if you have difficulty.
3. Slowly remove the lensmeter from the Velcro holding it to the table.
4. Gently lay the device on its side.
5. Disconnect the ISIS computer cable from the back of the lensmeter and secure the cord to the table.

6. Disconnect the power cord from the bottom of the lensmeter and the wall.
7. Pack the lensmeter in the lensmeter box (pictures available in Appendix D).
 - a. Slide the square Styrofoam block under the ink cartridges.
 - b. Put the desiccant pack over the nosepiece and tape it down.
 - c. Place bubble wrap over the lensmeter screen and down the front of the lensmeter and tape it into place.
 - d. Place the thin, clear plastic cover over the lensmeter.
 - e. Place the lensmeter on its side in the bottom Styrofoam cutout in the box.
 - f. Put the top Styrofoam cutout on top of the lensmeter and the cardboard insert on top of the Styrofoam.
 - g. Put the lensmeter dust cover in the cardboard insert and tape the box closed.
 - h. Do not store the lensmeter in the belly.
 - i. Tape the two lensmeter cords to the lensmeter table.

Pack the Micromedical VORTEQ accessories

1. Remove the motion detector from the headband and lift the cord out of the hooks that run it around the room.
2. Unplug the white cord from the V-Link box and tape the white cord to the wall.
3. Remove the V-Link box from the wall.
4. Put the headband, motion detector, V-Link box and cords in bubble wrap and store them in the laptop box.
5. Secure the laptop and laptop arm for transit.

Remove the gait belts

1. Remove the gait belts from the wall.
2. Check the Velcro on each belt to make sure they are still in good condition. If the Velcro needs to be fixed or replaced, notify the home office component person to arrange for repair before the start of the next stand.

3. Visually check the Velcro on the wall to make sure that it is firmly attached to the wall. Work with the FES to replace the Velcro if necessary.
4. Neatly store the gait belts in the SP sitting bench for transit.

Pack the CST chart

1. First, **clean your hands**.
2. Gently, remove the CST card from the swing arm and pack it in the original sleeve and box along with the corresponding score card.
3. Store the CST charts in the SP sitting bench for transit. NOTE: The charts cannot be stored in the belly or any other moist areas.

Remove the metronome and accelerometer from the wall and remove and dispose of the battery in each. After removing the and disposing of the battery in the metronome and accelerometer, store them in one of the bins in the cabinet. Remove the stopwatch and clipboard from the wall and store them in one of the bins in the cabinet. Secure the wand, USB button, and mouse by taping them to the lensmeter desk or another stable surface. Tape the USB cord used for the accelerometer to the wall. Do not unplug any cords from the laptop. Store the foam pads and seat cushion in a dry area without anything on top of them. Store the light meter and all other equipment and supplies in the cabinet or sitting bench. Secure the cabinet doors so they do not open during transit.

Turn the DVA monitor off and secure it with a bungee cord for transit.

Teardown pictures of each MEC are available for a visual reference.

2.8 Malfunctions and Troubleshooting

2.8.1 Accelerometer

If the accelerometer is not connecting to the computer, or there are no files, change the battery, or swap out with the back-up accelerometer if you are with an SP and do not have time to change the battery.

To change the battery:

1. Use the screwdriver to remove the screw from the top of the accelerometer. Hold the accelerometer over a tray, or cup the accelerometer so you can catch the nut on the underside of the screw when it disconnects.
2. Open the accelerometer using a hinge-like motion (it does not come straight off).
3. Remove the old battery.
4. Insert a new battery, noting the positive (“+”) and negative (“-”) placement, also marked on the circuit board.
5. Close the casing and replace the nut and screw previously removed in the first step.
6. Conduct the accelerometer check as instructed in Section 2.3.4.

If, after battery replacement the accelerometer continues to malfunction, use the back-up accelerometer and notify the home office of the malfunctioning unit to receive further instruction. Record the last four digits of the serial number for the replacement accelerometer in two places – on the “Accelerometers Used” sheet and on the Equipment Swap tab of the QC utility (Exhibit 2-23).

Exhibit 2-23. Equipment Swap Serial Number screen

Items/Equipment	Done	Serial Number	Comments
Lensmeter:	<input type="checkbox"/>	<input type="text"/>	<input type="text"/>
Accelerometer:	<input type="checkbox"/>	<input type="text"/>	<input type="text"/>
CST Chart Number:	<input type="checkbox"/>	<input type="text"/>	<input type="text"/>


2.8.2 Lensmeter

Because there is no routine maintenance for the lensmeter, any malfunction will need to be investigated by the health tech. If troubleshooting tests cannot diagnose the malfunction, notify the home office. The appropriate Marco representative will be contacted. Refer to the Lensmeter operator’s manual for a more complete list of error messages and remedies. If the lensmeter is swapped, record the serial number of the replacement lensmeter on the Equipment Swap tab of the QC utility.

2.8.3 Micromedical VORTEQ

Because there is no routine maintenance for the VORTEQ, any malfunction will need to be investigated by the health tech. If troubleshooting tests cannot diagnose the malfunction, notify the home office. Either the Balance consultant or the appropriate MicroMedical representative will be contacted. The following are solutions to common problems that may occur with the equipment.

1. **Problem:** Optotype is displaying on the tester screen, but not the monitor for the SP.
Potential issue: Spectrum software opened before monitor was powered on.
Solution: Re-connect in proper order
 - a. Turn off SP monitor
 - b. Close Spectrum software
 - c. Turn on SP monitor
 - d. Re-open Spectrum software

2. **Problem:** Metronome for DVA is not audible to you and/or SP.
Potential issue: Volume is turned down and/or SP's hearing ability is diminished.
Solution: Adjust the volume
 - a. Check volume of laptop (speaker icon  in bottom right of screen)
 - i. Click on the icon
 - ii. Use the mouse to raise the volume bar to a higher level. The laptop should make a sound to confirm the level selected.
 - iii. If the confirmation sound is not audible to you, check the headphone jack to make sure it is not being used.
 - iv. If the headphone jack is being used, remove the cord from the headphone jack. The sound should now be audible to you.

If the sound is audible to you but not the SP, perhaps the SP's hearing ability is too diminished to hear the "ding" without causing alarm for other components on the MEC. Consider tapping your foot or gently tapping the SP's shoulder to provide the proper rhythm. If these options are not suitable, discontinue DVA testing and record as "Could not test."

3. **Problem:** Optotype is visible during static acuity, but is not flashing during DVA.
Potential issue: Motion detector cord has become disconnected.
Solution: Check entirety of the cord. Make sure the ends are snugly connected.

4. **Potential issue:** Motion detector on the headband is not oriented in the proper plane.
Solution: Check the orientation of the motion detector. Review the images in Section 2.3.1, Exhibit 2-7 for proper orientation and correct it as necessary.

5. **Potential issue:** SP is not moving head correctly.
Solution: Watch the SP for proper movement. If the SP is moving his/her head too slow, encourage them to move faster. If the SP is moving his/her head too fast, encourage them to move slower. If the SP is moving his/her head in the wrong direction, stop the test and re-instruct with visual cues while the SP is watching you.

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3. Examination Protocol

3.1 Eligibility Criteria

All examinees ages 40 years and older are eligible to participate in the balance component. There are multiple exclusionary criteria that preclude an examinee from participating in various tests of the balance component. Exclusions from one test in the balance component will not automatically affect participation in the other tests. If an SP cannot see well enough to find the exam room unassisted, he/she will be excluded from the entire balance component.

Participants will be excluded from the Modified Romberg Test (MRT) if they:

1. Have vision so poor that they need assistance to find their way to the test room (Test protocol exclusion);
2. Are pregnant (either by self-report or lab testing in the MEC [Safety exclusion]);
3. Have an amputation of the leg or feet (other than toes) (Test protocol exclusion);
4. Weigh more than 315 pounds, since the foam used to stand on during the test may become too compressed to provide a suitable surface (Test protocol exclusion);
5. Are unable to stand on their own (Safety exclusion);
6. Have a prosthetic device below the waist (Test protocol exclusion);
7. State that they are unable to do the MRT because of a recent injury or surgery to their legs, ankles, or feet (Safety exclusion);
8. Are experiencing **BOTH** current symptoms of dizziness, lightheadedness or feeling faint **AND** have fallen in the past 12 months because of problems with dizziness or balance (Safety exclusion);
9. Are wearing shoes with heels 3 inches or more (Test protocol exclusion);
10. Have a body size either too small or too large (determined when the safety belt is put on) to accommodate proper fitting of the safety belt (Safety exclusion); or
11. Say that they are not okay to begin the balance test and either wish to speak to a physician (physician referral) or do not wish to speak to a physician (Safety exclusion).

Participants will be excluded only from Condition 5 of the Modified Romberg Test if they:

1. Currently have neck pain, have ever had neck surgery, or have ever had a neck problem that lasted more than 6 weeks (Safety exclusion); or
2. Cannot move their head and neck comfortably in the range of motion required for the condition (Safety exclusion).

SPs will be excluded from the second part of the Dynamic Visual Acuity test (i.e., involving head rotation) if they:

1. Are pregnant (either by self-report or lab testing in the MEC (Safety exclusion));
2. Report that they currently have neck pain, have ever had neck surgery, or have ever had a neck problem that lasted more than six weeks (Safety exclusion);
3. Cannot move their head and neck comfortably in the range of motion required for this condition (Safety exclusion);
4. Have contrast sensitivity less than 30 percent (Test protocol exclusion);
5. Have a measured binocular static visual acuity (using corrected lenses as appropriate) worse than 20/125. This situation creates a ceiling effect for the exam findings when measuring the difference between static and dynamic visual acuity (Test protocol exclusion); or
6. Have a cochlear implant (Safety exclusion).

If an SP provides an unsolicited comment, prior to this exam, that he/she is currently dizzy or lightheaded, the SP must be evaluated by the MEC physician before proceeding with the balance component. If an SP becomes dizzy during one of the balance tests, stop the test. Instruct the SP to sit in a chair (without wheels) until he/she is no longer dizzy or lightheaded. If the SP feels he/she needs to be seen by the MEC physician, have the SP immediately evaluated by the physician; otherwise, close the balance exam and allow the SP to proceed with their other MEC exams. Whenever an exam is terminated because of dizziness or lightheadedness, select “other, specify” on the section status screen and type “SP became dizzy” or “SP became lightheaded.”

3.2 Pre-Examination Procedures

3.2.1 Preliminary Activities

A few preliminary procedures should be accomplished before beginning the balance exam. When the coordinator assigns an SP to the balance component, introduce yourself and ask the SP to have a seat. Click on the logon SP button. Log on using your ID and password.

Each participant wears an identification bracelet with the participant's identification number bar-coded on it. Enter the participant's identification number into the ISIS system by "reading" the barcode with the wand. ISIS will automatically pull up the identification screen for that examinee. Verify that the SP information is correct. Click "OK" to proceed with the examination.

Introduce the component using the scripts in Appendix A. For the first part of the exam, it is preferable that SPs take their shoes off. If an SP has on shoes, ask if he/she is able to take them off. If they are not, and the heel of their shoe is 3 inches or more, you will be able to indicate this on the ISIS screen during the exam and ISIS will skip the SP to the next appropriate question.

Have the examinee remove their hat or anything on their head that may interfere with your ability to place the headband on the SP's head during the Dynamic Visual Acuity (DVA) test. These items may be placed on the table during the test.

3.2.2 Shared and Safety Exclusion Questionnaire

Prior to beginning the balance examination procedures, the study participant is asked a series of shared and safety exclusion questions to identify conditions that may exclude the SP from part(s) of the exam, affect how the test will be conducted, or how the results will be interpreted. ISIS will prompt you to ask the appropriate questions, and responses are entered directly into the computer (see Exhibit 3-1). In most cases, responses are entered from drop-down menus. To help reduce data entry errors, a pop up message will appear when a responses is entered on any screen that will exclude the SP from a portion of the exam. The message will indicate exactly what part(s) of the exam the SP will be excluded from and allow you to review and/or change your data entry, or continue to the next screen.

Be certain to ask the questions **exactly** as they appear on the screen. Do not omit or add anything. If the SP is unsure how to answer, use the explanations below each question to help the SP determine the answer. Some questions have help text on the screen that can be read to the SP if necessary. Listen carefully to the SP's responses, and make certain he/she is providing the information the question is seeking. If you think the SP has misunderstood the question, probe to clarify by repeating the question with a preface such as "Just to make sure I have this correct..."

To complete this section, select or enter the appropriate response for each question below. The questions on pregnancy, amputations, and weight are questions that are shared with other MEC component exams. Therefore, if a person has provided this information in another component exam, ISIS will show the answer in the response space for the question in this component. If a response appears from another component, do not ask the question again.

Exhibit 3-1. Balance Shared and Safety Exclusion screen

The screenshot shows a form with four questions and their corresponding response options:

- Question: "CAN SP SEE WELL ENOUGH TO FIND THE EXAM ROOM UNASSISTED?" with a dropdown menu showing "Yes".
- Question: "Are you currently pregnant?" with a dropdown menu showing a blue bar.
- Question: "Do you have any amputations of your legs and feet other than toes?" with a dropdown menu.
- Question: "How much do you weigh without clothes or shoes?" with a text input field and two checkboxes: "Don't Know" and "SP Refused".

1. CAN SP SEE WELL ENOUGH TO FIND THE EXAM ROOM UNASSISTED?

- YES
- NO

If an SP cannot see well enough to find the exam room unassisted, he/she will not be able to complete any portions of the balance exam. Answering "no" will end the exam.

2. Are you currently pregnant?

- YES
- NO
- DON'T KNOW

Female SPs over the age of 60 do not receive this question. SPs under the age of 60 are not assigned to the component until the result of the pregnancy test is back. If the lab pregnancy test has been

performed and is positive, the question will prefill with “yes” and be disabled. If the lab pregnancy test either has not been performed because of the SP’s age or it has, but the value is not positive, the question will prefill with the response coded in other MEC components and disable it. Women who are pregnant are excluded from the MRT and the dynamic portion of the DVA exam.

3. Do you have any amputations of your legs and feet, other than toes?

YES	REFUSED
NO	DON’T KNOW

SPs with amputations of the legs and feet, other than toes, or answer, “REFUSED” or “DON’T KNOW” are excluded from the MRT exam.

4. How much do you weigh without shoes or clothes?

A space is provided for you to enter the weight in pounds or to choose “REFUSED” or “DON’T KNOW.” If the response is over 315 pounds, the SP is excluded from the MRT exam due to limitations of the foam pad density that will be used.

5. Do you weigh less than 300 pounds?

YES	REFUSED
NO	DON’T KNOW

SPs who refused to estimate or could not estimate how much they weigh in the previous question are asked this follow-up question. If the response is “no,” the SP is excluded from the MRT exam due to limitations of the foam pad density that will be used. If the SP’s weight from body measures is more than 315 pounds, the findings will be managed at the back end when the final dataset is created.

6. Can you stand on your own?

HELP: “On your own” means without assistance from another person; without use of a device, such as a cane, walker, or leg brace; and without relying on support from a wall, furniture, etc.

YES	REFUSED
NO	DON’T KNOW

Participants who cannot stand unassisted will be excluded from the MRT. A person with a cane or assistive device can take the test if they think that they can stand without it (see Exhibit 3-2).

Exhibit 3-2. Balance Shared and Safety Exclusion (2) screen

Do you weigh less than 300 pounds?

Can you stand on your own?

HELP: 'On your own' means without assistance from another person; without use of a device, such as a cane, walker, or leg brace; and without relying on support from a wall, furniture, etc.

Do you have a leg brace?

HELP: This question includes any orthotic device below the waist; it does not include extra-depth or orthopedic shoes or orthopedic inserts in shoes. It does not include a brace worn for sports.

Do you have an injury or surgery to your foot, leg, or hip that would hinder you from doing a balance test while standing?

Have you had a problem during the last 24 hours with dizziness, lightheadedness, feeling as if you are going to pass out or faint?

Have you fallen during the past 12 months due to a problem with dizziness or balance?

7. Do you have a leg brace?

HELP: This question includes any orthotic device below the waist; it does not include extra-depth or orthopedic shoes or orthotic inserts in shoes. It does not include a brace worn for sports.

YES REFUSED
NO DON'T KNOW

SPs who have a leg brace are excluded from the MRT exam.

8. Do you have an injury or surgery to your foot, leg, or hip that would hinder you from doing a balance test while standing?

YES REFUSED
NO DON'T KNOW

SPs who respond “yes,” “REFUSED” or “DON’T KNOW” to this question are excluded from the MRT.

9. Have you had a problem **during the last 24 hours** with dizziness, lightheadedness, feeling as if you are going to pass out or faint?

YES REFUSED
NO DON'T KNOW

10. Have you fallen **during the past 12 months** due to a problem with dizziness or balance?

HELP: By falls or falling, we mean unexpectedly dropping to the floor or ground from a standing, walking, or bending position.

YES REFUSED
NO DON'T KNOW

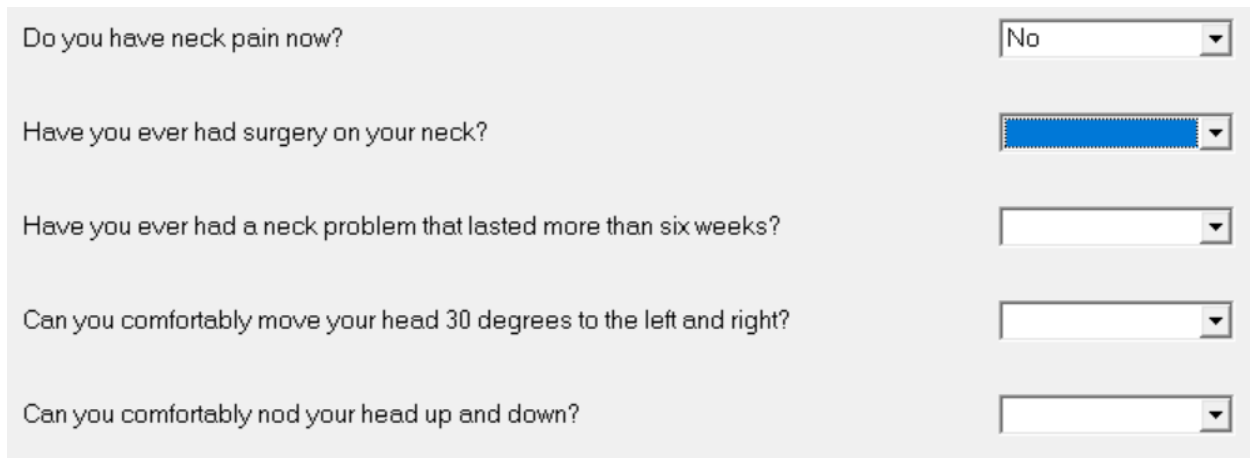
SPs responding “yes” to BOTH questions 9 AND 10 will be excluded from the MRT.

11. Do you have neck pain now?

YES REFUSED
NO DON'T KNOW

SPs responding “YES,” “REFUSED,” or “DON’T KNOW” are excluded from Condition 5 of the MRT and the dynamic portion of the DVA exam (see Exhibit 3-3).

Exhibit 3-3. Balance Shared and Safety Exclusion (3) screen



The screenshot shows a survey interface with five questions, each followed by a dropdown menu. The questions are: 'Do you have neck pain now?' (dropdown shows 'No'), 'Have you ever had surgery on your neck?' (dropdown is blue), 'Have you ever had a neck problem that lasted more than six weeks?' (dropdown is empty), 'Can you comfortably move your head 30 degrees to the left and right?' (dropdown is empty), and 'Can you comfortably nod your head up and down?' (dropdown is empty).

12. Have you ever had surgery on your neck?

YES REFUSED
NO DON'T KNOW

SPs responding “yes” are excluded from Condition 5 of the MRT and the dynamic portion of the DVA exam.

13. Have you ever had a neck problem that lasted more than six weeks?

YES REFUSED
NO DON'T KNOW

SPs responding “yes” are excluded from Condition 5 of the MRT and the dynamic portion of the DVA exam.

14. Can you comfortably move your head 30 degrees to the left and right?

YES REFUSED
NO DON'T KNOW

SPs responding “no” are excluded from Condition 5 of the MRT and the dynamic portion of the DVA exam. If the SP is unsure, demonstrate the range of motion and allow the SP time to try it if needed.

15. Can you comfortably nod your head up and down?

YES REFUSED
NO DON'T KNOW

SPs responding “no” are excluded from Condition 5 of the MRT and the dynamic portion of the DVA exam. If the SP is unsure, demonstrate the range of motion and allow the SP time to try it if needed.

When responses to all the questions have been entered, click the forward arrow on the navigation bar to advance to the MRT Pretest screen.

3.3 Modified Romberg Test (MRT)

3.3.1 Description of MRT

The Modified Romberg Test of Standing Balance on Firm and Compliant Support Surfaces examines the ability of the examinee to stand unassisted under five conditions, ordered in increasing level of difficulty. In Condition 1, the subject stands on the bare floor with eyes open, which allows the subject to make use of all the sensory inputs that contribute to balance—vestibular, visual, and proprioceptive. Condition 2 tests balance when only vestibular and proprioceptive information is available; the subject closes his eyes to eliminate the visual input. In Condition 3, the subject must

maintain balance on a foam surface with eyes open, which reduces the proprioceptive input and leaves only visual and vestibular cues. In Condition 4, the visual input is again removed and the subject’s ability to maintain balance using only his vestibular system is tested. In Condition 5, the subject must maintain balance on a foam surface with eyes closed while slowly shaking his head side-to-side, as if saying “no.” In Condition 5, visual and proprioceptive cues are eliminated, and the vestibular system is challenged with a slow “no” movement, to better tease out any partial vestibular issues.

Table 3-1. Condition Summary table

Condition	Description
Condition 1	firm surface, eyes open
Condition 2	firm surface, eyes closed
Condition 3	foam surface, eyes open
Condition 4	foam surface, eyes closed
Condition 5	foam surface, eyes closed, head shaking left to right, slowly

Each subject is eligible for an initial test (trial 1) and one re-test (trial 2) to pass a specific test condition. Within each test condition, the protocol for retesting is the same as for the initial test.

Because each successive test condition from 1 to 5 is progressively more difficult than the condition preceding it, the balance testing component is ended whenever a subject fails to pass a condition or the participant refuses to proceed. During the test, be careful not to use the words “pass” and “fail” to the SP. Suggested words might be, “OK, we’re done with this part of the test.” OR “Now we can move on to the next part of the test.” If an SP presses and says, “Did I pass?” suggested responses include, “We are just gathering information today, not interpreting the results,” or, “You gave us great data—thanks!” The tech can remind the participant to expect the balance test results in their final report of findings, which will be mailed to them in the coming weeks with other results from the day’s visit.

3.3.2 MRT Pre-Test Questions

Before starting the MRT, the tech will complete the following pre-test questions to further determine eligibility for MRT (see Exhibit 3-4). Two of the questions (the barefoot and safety belt questions) are yes-no questions that are not asked of the SP. These two questions will prompt you to check the SP for certain things to make sure they are eligible for the test.

Exhibit 3-4. Balance Pre-Test Question screen

The screenshot shows a software interface for a pre-test questionnaire. It contains four questions, each followed by a dropdown menu. The first question, 'Are you okay to begin this balance test?', has a blue dropdown menu. The second question, 'Are you having a problem that you would like to discuss with the doctor?', has a white dropdown menu. The third question, 'IS SP BAREFOOT OR WEARING SHOES WITH HEELS LESS THAN 3 INCHES?', also has a white dropdown menu. Below the third question is a note: '(ASK SP TO REMOVE SHOES. IF SP WILL NOT REMOVE SHOES WITH HEELS MORE THAN 3 INCHES, MRT CANNOT BE COMPLETED.)'. The fourth question, 'ABLE TO FIT SP WITH BELT?', has a white dropdown menu.

1. Are you okay to begin this balance test?

YES REFUSED
NO DON'T KNOW

SPs responding “yes” continue to the MRT. SPs responding “no” receive a follow-up question.

2. Are you having a problem that you would like to discuss with the doctor?

YES REFUSED
NO DON'T KNOW

SPs responding “no” to the previous question are asked this follow-up question. SPs who indicate that they need to speak to the physician are exited from the exam to speak with the physician. SPs who do not want to speak to the physician can continue with other parts of the balance test but CANNOT do the MRT unless the participant changes his/her mind. If the SP changes his/her mind, the coordinator can reassign them to the component.

3. IS SP BAREFOOT OR WEARING SHOES WITH HEELS LESS THAN 3 INCHES?

(ASK SP TO REMOVE SHOES. IF SP WILL NOT REMOVE SHOES WITH HEELS MORE THAN 3 INCHES, MRT CANNOT BE COMPLETED.)

It is preferable for the SP to complete the MRT without shoes. If the SP arrives to the balance component with shoes on, ask the SP to remove his/her shoes. If the SP is unable to remove his/her shoes, the balance exam can still be conducted as long as the heels on the shoes are less than 3 inches. If the heels on the shoes are 3 inches or more and the SP cannot/will not remove them, the SP cannot complete the MRT portion of the exam.

4. ABLE TO FIT SP WITH BELT

The safety belt is available in five different sizes. If you are unsure what size will fit the SP best, start with the larger size and switch to a smaller size, if necessary. If a proper fit cannot be obtained, the SP cannot complete the MRT portion of the exam.

3.3.3 Preparation of the Examinee

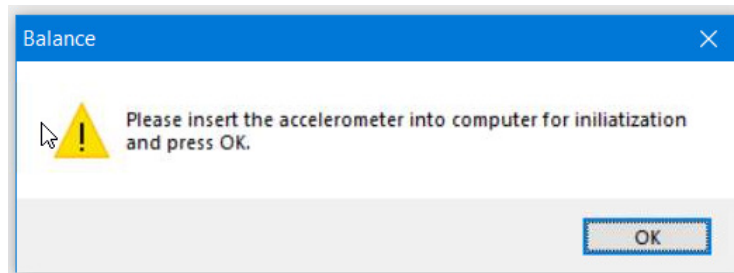
Using the script in Appendix A, explain the purpose of the balance examination and what you will be doing during the test. Demonstrate the stance for the test by standing with your feet together and arms crossed on the chest. (It is also acceptable for the SPs to stand with their arms folded across the waist, holding the elbows with the hands.) This stance will be used for all conditions.

You will place a gait belt around the SP's waist. Determine the appropriate size gait belt based on the subject's waist size. It is not necessary to measure the waist; a judgment call will generally be adequate. If you are unsure what size will fit the SP best, start with the larger size and switch to a smaller size if necessary. After wrapping the belt around the participant's waist, have the SP turn toward the wall so you can position the Velcro that will later hold the accelerometer in the center of the lower back. Once the Velcro is in the correct position, secure the belt snugly (but not tightly) with the Velcro closure and buckles. If the subject's waist is either too large or too small for any belt to fit securely, the subject should be excluded from the exam.

When advancing the ISIS screen from the last pre-test question slide to the first exam slide, the ISIS screen will prompt you to plug in the accelerometer for initialization (see Exhibit 3-5). Plug the accelerometer into the USB port on the wall if it is not already plugged in. When the accelerometer

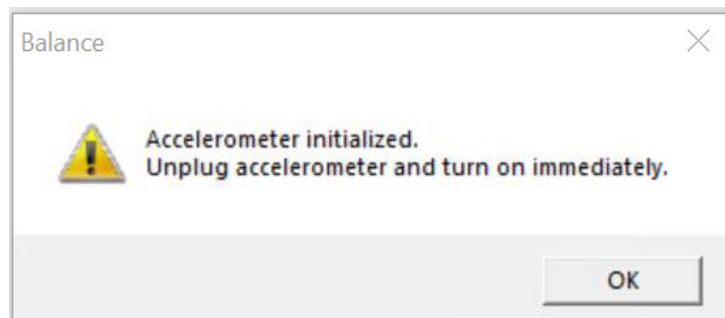
is plugged in, you will notice that the blue light on the accelerometer is flashing. Press “OK” on the pop-up box on the ISIS screen.

Exhibit 3-5. Pop-up window prompting examiner to plug in the accelerometer



Another pop up will appear confirming the initialization of the accelerometer and instructing you to unplug the accelerometer and immediately turn it on (see Exhibit 3-6). Click “OK” and unplug the accelerometer.

Exhibit 3-6. Pop-up window confirming initialization and prompting examiner to unplug and turn on the accelerometer



When you unplug the accelerometer, the blue light will turn off. Press the black button on the bottom of the accelerometer to turn it back on immediately. The blue light will start flashing again. Attach the accelerometer to the Velcro located in the middle of the SP’s lower back on the gait belt with the USB port pointed toward the SP’s head. The accelerometer will measure sway; higher scores indicate increased sway (which signifies greater difficulty maintaining balance), however, test results will not be based on the accelerometer measures. Always make sure the blue light is flashing before attaching the accelerometer to the belt on the SP.

NOTE: It is acceptable to initialize and put the accelerometer on the belt before putting the belt on the SP, but remember to turn the accelerometer on.

Point out that the walls serve as support that will be available to the subject if he or she feels unsteady; and emphasize that you will be within reach at all times to prevent him/her from falling.

3.3.4 Positioning the SP

For each trial, the SPs will be asked to stand with their feet together and arms crossed on the chest. (It is also acceptable for the SPs to stand with their arms folded across the waist, holding the elbows with the hands.) Whether the SP is standing on the floor or on the foam, proper positioning of the foot is for the SP to place his/her feet together with both heels and big toes touching. In rare instances, if necessary, slight deviations in the spread of feet are acceptable for SPs, who for *physical* reasons (such as obesity or leg deformity), are unable to put their feet completely together. In these rare situations, the feet should be placed as close together as possible, preferably no more than two finger-widths apart. An exception *should not* be made to make the exam easier for SPs who cannot place their feet together due to balance trouble.

When positioning the SP for the test, ensure that the SP is not so close to the wall that they don't have space to recover if they start to sway, and that he/she is not so far away from the wall that they have a long way to fall before hitting the wall if they cannot recover. The distance that the SP will stand from the wall will vary based on body size. Adjust where the SP stands as necessary so that the SP has between approximately 6"-8" of clearance from the wall on all sides, both at the hips and at the shoulders. The participants can use the wall to steady themselves when they are getting into position, but they cannot touch the wall once the testing begins.

3.3.5 The Five Test Conditions

This section outlines the specific procedures for each test condition, however, there are certain procedures that all test conditions have in common.

Starting the test:

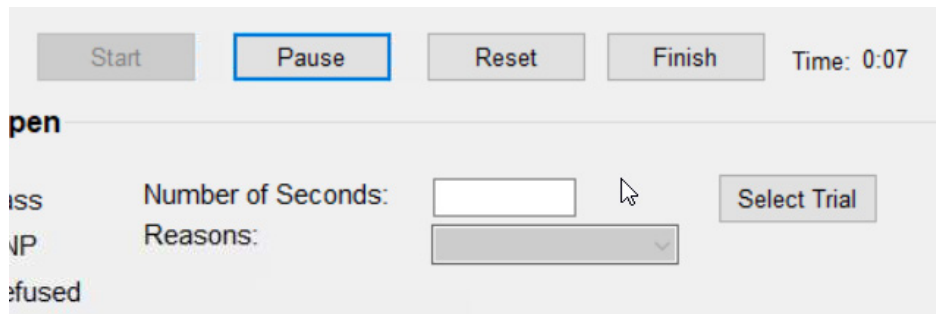
1. Direct the examinee to stand facing the visual target, and position the examinee as indicated in Section 3.3.4.
2. As indicated in the Safety Protocol section (Section 3.3.7), always assume that the SP will lose his/her balance and position yourself to assist the subject should they lose their balance.

3. Stand within arm's length of the SP with a clear view of him or her.
4. Keep one hand free to assist the subject and the USB button in your other hand.
5. Double-check the computer to make sure everything is ready before asking the SP to stand in the test position. When the examinee has assumed the correct position, say "Begin" and then quickly press the USB button. The timer on the screen will start to run.
6. Once the trial begins, there should be no talking by anyone in the room and you should not touch the SP in any way. If you touch the SP, then the trial is finished.

During the test:

1. Do not look at the timer on the computer during the test. The timer will ding when it reaches the maximum number of seconds for each condition.
2. For safety and scoring purposes, keep your eyes on the SP at all times, observing him/her closely throughout the trial. Exact times to failure can be read from the computer after the test is finished. As you scan the SP, remember to check to see if the SP opened their eyes during the exam for Conditions 2, 4, and 5, which counts as a fail.
3. Stop the test when the computer indicates that time is up or whenever the subject does something that constitutes a failure (see Scoring Protocol Section 3.3.6). If you need to end the test before time expires, press the USB button. If you press the USB button before time expires, you will have the following options available on the screen (see Exhibit 3-7):
 - a. Reset – Click this button to start the trial over. This will be a rare occurrence. An example of when you would need to start a trial over is if the SP started talking after you had started the timer. Do not reset for a "fail" or for any other reason.
 - b. Finish – Click this button to save the time on the timer and move on to the next trial or condition. **Note:** If the SP attempts the first trial for any condition, but cannot stabilize themselves enough for you to start the test, type "1" in the "Number of Seconds" data entry field to indicate that they attempted the trial. If the SP is not able or willing to make a second attempt at the trial, code "Refused" for trial 2.

Exhibit 3-7. Features of the MRT Examination screen



Retrial procedures:

ISIS will determine if a retrial is necessary based on the number of seconds saved for trial 1 of the condition. For Conditions 1 and 2, if the SP cannot stand for 15 seconds in trial 1, ISIS will prompt you to complete a retrial. For Conditions 3 – 5, if the SP cannot stand for 20 seconds in trial 1, ISIS will prompt you to complete a retrial. Conditions 1 and 2 will only last for 15 seconds each. Conditions 3 – 5 will last for 30 seconds each, however, if an SP is able to complete at least 20 seconds for each of these conditions, they will be able to proceed to the next condition. (For example, if the SP completes 22 seconds on the first attempt of Condition 3, but only completes 15 seconds on the second attempt of Condition 3, that person will be prompted to attempt Condition 4).

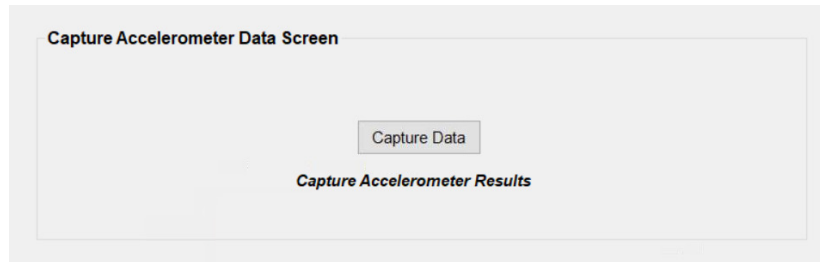
If a retrial is indicated, offer to conduct a retrial of the condition by asking, “When you are ready, could we try that again?” This encourages the SP to do the retrial without sounding optional or forcing the SP to do a retrial. If necessary, you may allow the subject up to 1 minute to reorient himself/herself between trials. If the examinee agrees to try again, click “Select Trial” for trial 2 on the screen and repeat the condition exactly as before. If the examinee does not want to try again, select “refused” on the ISIS screen for the remaining trials and end this portion of the balance examination.

Capturing data from the accelerometer:

If the examinee was unable to pass the first or second trial in any condition, this portion of the balance examination is over. ISIS will prompt you to plug in the accelerometer and the SP will move on to the Lensmeter test.

1. Remove the accelerometer from the gait belt and insert the accelerometer in the USB port on the side of the laptop.
2. Click capture on the ISIS screen to capture the accelerometer data (see Exhibit 3-8).

Exhibit 3-8. Accelerometer Data Capture screen



3. Capturing the data may take a few seconds. A message will display to confirm that the file was successfully captured when it is complete.

3.3.5.1 Test Condition 1

For Condition 1, SPs will stand on the bare floor with their eyes open. Follow the steps in Exhibit 3-9 to start the test.

Exhibit 3-9. SP Positioned for Condition 1



On the ISIS screen click “Select Trial” for Condition 1, Trial 1 (see Exhibit 3-10).

Exhibit 3-10. MRT Exam screen for Conditions 1 and 2

The screenshot shows the MRT Exam interface. At the top, there are buttons for Start, Pause, Reset, and Finish, and a Time field. Below this, there are two main sections: Condition 1 - Firm Surface, Eyes Open and Condition 2 - Firm Surface, Eyes Closed. Each condition section contains two trials. For each trial, there are radio buttons for Pass, DNP, and Refused, and input fields for Number of Seconds and Reasons. A Select Trial button is located to the right of each trial's input fields.

The “Time,” located directly above the “Select Trial” button, will now have “0:00” beside it indicating that it is ready (see Exhibit 3-11).

Exhibit 3-11. Screen ready to begin Condition 1, Trial 1

The screenshot shows the MRT Exam interface with Condition 1, Trial 1 selected. The Start button is highlighted with a blue border. The Time field now shows 0:00. The interface is ready to begin the trial.

Instruct the examinee using the script in Appendix A for Condition 1. Follow the procedures previously outlined for starting the test. When the trial is over, tell the examinee, “This part of the test is over. You can relax.”

If the SP successfully completed all 15 seconds, ISIS will automatically save the number of seconds in the data entry field, code the exam as “pass,” and prompt you to proceed to Condition 2 (see Exhibit 3-12).

Exhibit 3-12. Screen with Condition 1, Trial 1 complete

Condition: 1 Trial: 1 Start Pause Reset Finish Time: 0:15

Condition 1 - Firm Surface, Eyes Open

Feet together eyes open: Pass Number of Seconds: 15 Select Trial
 DNP Reasons: [Dropdown]
 Refused

Feet together eyes open: Pass Number of Seconds: [Empty] Select Trial
 DNP Reasons: [Dropdown]
 Refused

If the test was stopped before reaching 15 seconds, click “Finish” on the ISIS screen. ISIS will automatically save the number of seconds that had passed when the failure occurred in the data entry field and code the exam as DNP (did not pass). The tech must select the reason for the failure from the drop-down list (see Exhibit 3-13). ISIS will indicate that a retri al is necessary if the SP was not able to stand for 15 seconds. If a retri al is necessary, follow the retri al procedures previously outlined.

Exhibit 3-13. Selecting reason for failure from drop-down list

Condition: 1 Trial: 1 Start Pause Reset Finish Time: 0:07

Condition 1 - Firm Surface, Eyes Open

Feet together eyes open: Pass Number of Seconds: 7 Select Trial
 DNP Reasons: [Dropdown]
 Refused

Feet together eyes open: Pass Number of Seconds: [Empty] Select Trial
 DNP Reasons: [Dropdown]
 Refused

Reasons dropdown menu options:
Feet Moved
Arms Moved Off Waist
Tech Intervention
Grab/Touch Wall

If the examinee was unable to pass the first or second trial in Condition 1, this portion of the balance examination is over. The SP will move on to the next section of the exam and ISIS will prompt you to plug in the accelerometer. Follow the steps previously outlined for capturing data from the accelerometer.

3.3.5.2 Test Condition 2

If the SP passes Condition 1, Condition 2 will become available for data entry (see Exhibit 3-14). For Condition 2, SPs will stand on the bare floor with their eyes closed.

Exhibit 3-14. SP Positioned for Condition 2



On the ISIS screen click “Select Trial” for Condition 2, Trial 1 (see Exhibit 3-15). Instruct the examinee using the script in Appendix A for Condition 2. Follow the procedures previously outlined for starting the test.

When the trial is over, tell the examinee, “This part of the test is over. You can open your eyes and relax.” If the SP successfully completed all 15 seconds, ISIS will automatically save the number of seconds in the data entry field, code the exam as “pass,” and prompt you to proceed to Condition 3.

Exhibit 3-15. Screen with Condition 2, Trial 1 complete

The screenshot displays the ISIS interface for a balance examination. At the top, it shows 'Condition: 2' and 'Trial: 1'. Below this are buttons for 'Start', 'Pause', 'Reset', and 'Finish', along with a 'Time: 0:15' indicator. The interface is divided into two main sections: 'Condition 1 - Firm Surface, Eyes Open' and 'Condition 2 - Firm Surface, Eyes Closed'. Each section contains two trials. For each trial, there are radio buttons for 'Pass', 'DNP', and 'Refused'. To the right of these are input fields for 'Number of Seconds' (set to 15) and a 'Reasons' dropdown menu. A 'Select Trial' button is located to the right of each trial's input fields. The 'Select Trial' button for the first trial in Condition 2 is highlighted with a blue border, indicating it is the active or selected trial.

If the test was stopped before reaching 15 seconds, click “Finish” on the ISIS screen. ISIS will automatically save the number of seconds that had passed when the failure occurred in the data entry field and code the exam as DNP. The tech must select the reason for the failure from the drop-down list. ISIS will indicate that a retrial is necessary if the SP was not able to stand for 15 seconds. If a retrial is necessary, follow the retrial procedures previously outlined.

If the examinee was unable to pass the first or second trial in Condition 2, this portion of the balance examination is over. The SP will move on to the next section of the exam and ISIS will prompt you to plug in the accelerometer. Follow the steps previously outlined for capturing data from the accelerometer.

3.3.5.3 Test Condition 3

If the SP passes Condition 2, Condition 3 will become available for data entry. In Condition 3, SPs will stand on the foam pad with their eyes open (see Exhibit 3-16).

Exhibit 3-16. SP Positioned for Condition 3



On the ISIS screen click “Select Trial” for Condition 3, Trial 1.

Place the foam pad on the floor where the examinee will stand for the test. Instruct the examinee using the suggested script in Appendix A for Condition 3. If necessary, demonstrate the proper stance but without standing on the foam yourself. Follow the procedures previously outlined for starting the test.

Additional notes for Condition 3:

1. Remember to make sure everything is ready before asking the SP to stand on the foam. Never instruct an SP while they are standing on the foam. This compresses the foam, and may cause unwanted fatigue to the participant.
2. Direct the SP to step onto the center of the foam pad, facing the visual target. NOTE: Some SPs may be unstable as they get on and off of the foam pad. Always be ready to grab the handle on the gait belt as they get on and off the pad until they can stabilize themselves. It may also be helpful for the SP to hold onto the wall as they get on and off of the foam pad.
3. Do not begin until the SP is stable.

When the trial is over, tell the examinee, “This part of the test is over. You can step off the foam and relax.” Have the SP step off the foam pad as soon as the trial is over. Switch out the foam pad (this is necessary whether the SP moves to Condition 4 or repeats Condition 3).

If the SP successfully completed all 30 seconds, ISIS will automatically save the number of seconds in the data entry field, code the exam as “pass,” and prompt you to proceed to Condition 4 (see Exhibit 3-17).

Exhibit 3-17. Screen with Condition 3, Trial 1 complete

The screenshot displays the ISIS interface for a trial. At the top, it shows 'Condition: 3' and 'Trial: 1'. There are buttons for 'Start', 'Pause', 'Reset', and 'Finish', along with a 'Time: 0:30' indicator. The interface is divided into two main sections: 'Condition 3 - Foam Pad, Eyes Open' and 'Condition 4 - Foam Pad, Eyes Closed'. Each section contains two rows of settings. For Condition 3, the first row has 'Feet together eyes open' with radio buttons for 'Pass' (selected), 'DNP', and 'Refused'. The 'Number of Seconds' is set to 30, and there is a 'Select Trial' button. The second row is identical but with 'Pass' unselected. For Condition 4, the first row has 'Feet together eyes closed' with radio buttons for 'Pass', 'DNP', and 'Refused'. The 'Number of Seconds' field is empty, and the 'Select Trial' button is highlighted with a blue border. The second row is identical but with 'Pass' unselected.

If the test was stopped before reaching 30 seconds, click “Finish” on the ISIS screen. ISIS will automatically save the number of seconds that had passed when the failure occurred in the data entry field and code the exam as DNP. The tech must select the reason for the failure from the drop-down list. ISIS will indicate that a retrial is necessary if the SP was not able to stand for 20 seconds. If a retrial is necessary, switch the foam pad and follow the retrial procedures previously outlined.

If the examinee was unable to pass the first or second trial in Condition 3, this portion of the balance examination is over. ISIS will prompt you to plug in the accelerometer and the SP will move on to the next section of the exam. Follow the steps previously outlined for capturing data from the accelerometer.

3.3.5.4 Test Condition 4

If the SP passes Condition 3, Condition 4 will become available for data entry. In Condition 4, SPs will stand on the foam pad with their eyes closed (see Exhibit 3-18).

Exhibit 3-18. SP positioned for Condition 4



On the ISIS screen click “Select Trial” for Condition 4, Trial 1.

If not already done, switch the foam pad and instruct the examinee using the script in Appendix A for Condition 4. Follow the procedures previously outlined for starting the test.

Additional notes for Condition 4:

1. Remember to make sure everything is ready before asking the SP to stand on the foam. Never instruct an SP while they are standing on the foam.

2. Direct the SP to step onto the center of the foam pad, facing the visual target. Again, be ready to help stabilize the SP if needed.
3. Do not begin until the SP is stable.

When the trial is over, tell the examinee “This part of the test is finished. You can open your eyes and step off the foam.” Have the SP step off the foam pad as soon as the trial is over.

If the SP successfully completed all 30 seconds, ISIS will automatically save the number of seconds in the data entry field, code the exam as “pass,” and prompt you to proceed to Condition 5 (see Exhibit 3-19).

Exhibit 3-19. Screen with Condition 4, Trial 1 complete

The screenshot displays the ISIS software interface. At the top, it shows 'Condition: 4' and 'Trial: 1'. There are four buttons: 'Start', 'Pause', 'Reset', and 'Finish', along with a timer showing 'Time: 0:30'. Below this, there are two main sections for recording trial data.

The first section is titled 'Condition 3 - Foam Pad, Eyes Open'. It contains two rows of data entry fields. Each row has a label 'Feet together eyes open:', three radio buttons for 'Pass', 'DNP', and 'Refused', a 'Number of Seconds:' field with a text input containing '30', a 'Reasons:' dropdown menu, and a 'Select Trial' button.

The second section is titled 'Condition 4 - Foam Pad, Eyes Closed'. It also contains two rows of data entry fields. The first row in this section has the 'Pass' radio button selected. The 'Number of Seconds:' field contains '30', and the 'Select Trial' button is highlighted with a blue border. The second row in this section is currently empty.

If the test was stopped before reaching 30 seconds, click “Finish” on the ISIS screen. ISIS will automatically save the number of seconds that had passed when the failure occurred in the data entry field and code the exam as DNP. The tech must select the reason for the failure from the drop-down list. ISIS will indicate that a retrieval is necessary if the SP was not able to stand for 20 seconds. If a retrieval is necessary, switch the foam pad and follow the retrieval procedures previously outlined.

If the examinee was unable to pass the first or second trial in Condition 4, this portion of the balance examination is over. ISIS will prompt you to plug in the accelerometer and the SP will move on to the next section of the exam. Follow the steps previously outlined for capturing data from the accelerometer.

3.3.5.5 Test Condition 5

If the SP passes Condition 4, Condition 5 will become available for data entry. In Condition 5, SPs will stand on the foam pad with their eyes closed and slowly shake their head left to right as if saying “no” (see Exhibit 3-20).

Exhibit 3-20. SP Positioned for Condition 5



On the ISIS screen click “Select Trial” for Condition 5, Trial 1.

If not already done, switch the foam pad and instruct the examinee using the script in Appendix A for Condition 5. Turn on the metronome, explain to the participant that they should turn their head (right to left) to the tempo of the metronome, and follow the procedures previously outlined for starting the test.

Additional notes for Condition 5:

1. Remember to make sure everything is ready before asking the SP to stand on the foam. Never instruct an SP while they are standing on the foam.
2. Direct the SP to step onto the center of the foam pad, facing the visual target. Be ready to help stabilize the SP if necessary.
3. Do not begin until the SP is stable.
4. If the SP stops turning his/her head and does not resume, prompt the SP by saying “keep turning.” If they do not resume turning their head after prompting, stop the trial and code it as “tech intervention.”

When the trial is over, tell the examinee “This part of the test is finished. You can open your eyes and step off the foam.” Have the SP step off the foam pad as soon as the trial is over.

If the SP successfully completed all 30 seconds, ISIS will automatically save the number of seconds in the data entry field and code the exam as “pass” (see Exhibit 3-21). Stop the metronome and advance the ISIS screen.

Exhibit 3-21. Screen with Condition 5, Trial 1 complete

Condition: 5 Trial: 1 Start Pause Reset Finish Time: 0:30

Condition 5 - Foam Pad, Eyes Closed, Head Moving

Eyes closed head moving: Pass DNP Refused Number of Seconds: 30 Select Trial
Reasons: [Dropdown]

Eyes closed head moving: Pass DNP Refused Number of Seconds: [Text Box] Select Trial
Reasons: [Dropdown]

If the test was stopped before reaching 30 seconds, ISIS will automatically save the number of seconds that had passed when the failure occurred in the data entry field, and code the exam as DNP. The tech must select the reason for the failure from the drop-down list. ISIS will indicate that a retrial is necessary if the SP was not able to stand for 20 seconds. If a retrial is necessary, switch the foam pad and follow the retrial procedures previously outlined.

After completing Condition 5, ISIS will prompt you to plug in the accelerometer. Follow the steps previously outlined to capture the data on the accelerometer, remove the safety belt from the participant, ask the person to have a seat on the bench, and then move on to the next section of the exam.

3.3.6 Scoring Protocol

Each trial and each condition will be scored by ISIS as either PASS or DNP based on the number of seconds the SP was able to complete for each trial. DNP is defined as any occurrence of any of the following before 15 seconds for Conditions 1 and 2, or 20 seconds for Conditions 3 – 5 is complete:

- Movement of the subject’s feet from the initial test position (falling, side stepping, hopping, pivoting, etc.);
- Movement of the subject’s arms off of the chest (or waist);
- Eyes open during an eyes-closed condition (i.e., Conditions 2 , 4, and 5);
- Touching the wall; or
- Any intervention by the examiner to stop the subject from falling.

Increased sway without movement of the feet does not constitute a DNP. Heels lifting off of the floor is too hard to judge, especially when the SP is standing on the foam, therefore, we will only count clear feet movement like side stepping, hopping, and pivoting as a DNP. Talking within the time interval for a condition such that the examiner has to respond to the subject is cause to stop the trial and repeat it, but is not defined as a DNP. If a trial was stopped because of talking, you do not need to code anything on the ISIS screen. Reinstruct the SP about talking, click “reset” on the ISIS screen and repeat the trial.

Scan the SP from head to toe during the test. In many situations, an SP’s reactions with the feet, arms, and eyes are nearly simultaneous. In these cases, the examiner’s best judgment must be made with respect to scoring the reason for DNP based on vigilant monitoring of the SP. Be as accurate as possible with coding.

All trials per condition will be stored in the ISIS database. The time to failure (rounded to the nearest second) will also be recorded.

3.3.7 Safety Protocol

The MRT protocol is very simple and straightforward. However, a few precautionary measures are necessary to ensure the safety of examinees who may have trouble with the procedure due to their balance difficulties.

- Assist the examinee in assuming the test position and in making the transition from one test condition to another, especially when stepping on and off the foam surface.
- Always stand within arm's length of the subject, with a clear view of the subject, and your hands near (but not touching) the grab loop on the safety belt.
- Always keep one hand free to assist the SP.
- Ensure that the subject stands close enough to the back wall of the test room that the wall may serve to break a fall if the examinee becomes unstable.
- Err on the conservative side; even if you are unsure that an examinee is destabilizing or if you are not sure that he or she has recovered balance, tap the SP's arm or shoulder, and/or tell him or her "open your eyes" and/or "relax."
- Maintain the mindset that the subject could fall at any moment during the test.

While the mentality that an examinee could fall at any time is critical to being ready to prevent a fall, note that the following times during the test pose the greatest risk of destabilization and your hands should be up and ready:

- While the examinee is stepping onto the foam and placing his or her feet together;
- While the examinee is stepping off of the foam;
- During the first 3 seconds of a new test condition; and
- During Test Conditions 3, 4, and 5 (with greater risk during Conditions 4 and 5).

Report any falls immediately to the physician and MEC Manager, who will notify the Westat Component Lead at the home office within 24 hours. The Westat Component Lead will inform the NCHS Project Officer.

3.4 Lensmeter Test

3.4.1 Description of the Lensmeter Test

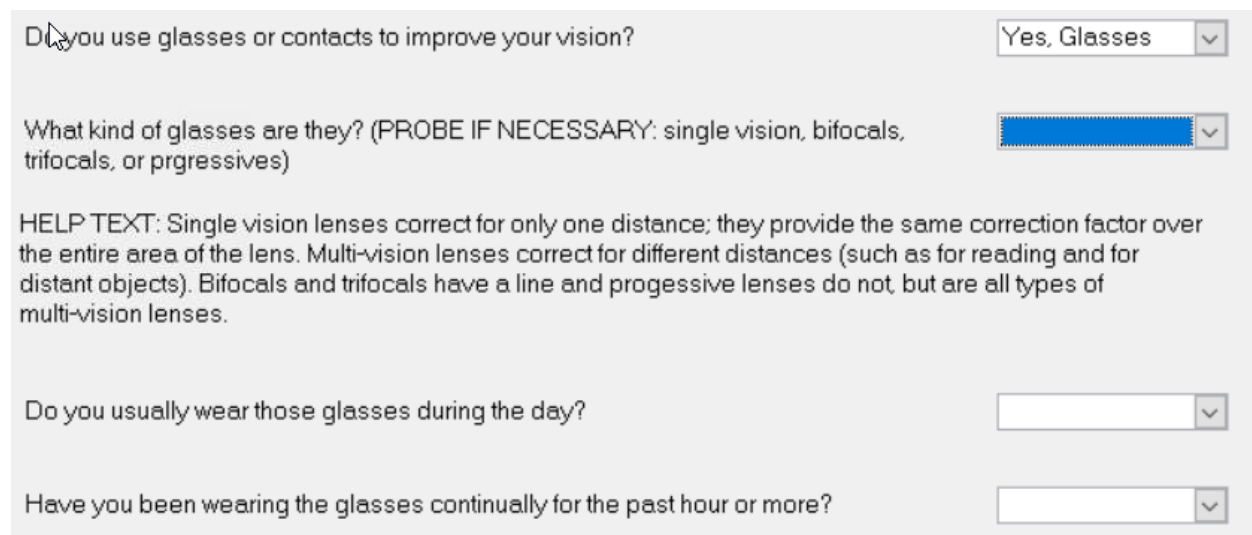
The lensmeter allows you to measure the SP's prescription of single vision lenses, bifocal (trifocal) lenses, and progressive power lenses (PPL). SPs who will be excluded from the dynamic portion of the DVA test based on responses to questions asked during the MRT section, will be asked the lensmeter pretest questions only.

3.4.2 Lensmeter Pre-Test Questions

Before the eyeglasses prescription is measured, the SP will be asked a set of questions about the type of corrective vision they use (see Exhibit 3-22). Remember to ask the questions **exactly** as they appear on the screen. Do not omit or add anything. If the SP is unsure how to answer, use the explanations below each question to help the SP determine the answer. Some questions have help text on the screen that can be read to the SP if necessary. Listen carefully to the SP's responses, and make certain he/she is providing the information the question is seeking. If you think the SP has misunderstood the question, probe to clarify by repeating the question with a preface such as "Just to make sure I have this correct..."

To complete this section, select the appropriate response or follow the instructions below.

Exhibit 3-22. Lensmeter Pretest Question screen



The screenshot displays a software interface for asking pretest questions. It features four questions, each with a corresponding dropdown menu. The first question is "Do you use glasses or contacts to improve your vision?" with a dropdown menu showing "Yes, Glasses". The second question is "What kind of glasses are they? (PROBE IF NECESSARY: single vision, bifocals, trifocals, or prgressives)" with a dropdown menu that is currently blank. Below this question is a block of help text: "HELP TEXT: Single vision lenses correct for only one distance; they provide the same correction factor over the entire area of the lens. Multi-vision lenses correct for different distances (such as for reading and for distant objects). Bifocals and trifocals have a line and prgressive lenses do not, but are all types of multi-vision lenses." The third question is "Do you usually wear those glasses during the day?" with a blank dropdown menu. The fourth question is "Have you been wearing the glasses continually for the past hour or more?" with a blank dropdown menu.

Do you use glasses or contacts to improve your vision? Yes, Glasses

What kind of glasses are they? (PROBE IF NECESSARY: single vision, bifocals, trifocals, or prgressives)

HELP TEXT: Single vision lenses correct for only one distance; they provide the same correction factor over the entire area of the lens. Multi-vision lenses correct for different distances (such as for reading and for distant objects). Bifocals and trifocals have a line and prgressive lenses do not, but are all types of multi-vision lenses.

Do you usually wear those glasses during the day?

Have you been wearing the glasses continually for the past hour or more?

1. Do you use glasses or contacts to improve your vision?

YES, GLASSES	REFUSED
YES, CONTACTS	DON'T KNOW
YES, BOTH	
NO	

SPs who only wear contacts or who refuse or respond “don’t know” will skip the questions and will go to the questions about contacts. SPs who do not wear corrective vision will skip to the contrast sensitivity test. (Note: Reading glasses are included as corrective vision.)

2. What kind of glasses are they? (PROBE IF NECESSARY: single vision, bifocals, trifocals, or progressives)

CODE NO-LINE BIFOCALS AS PROGRESSIVES.

HELP: Single-vision lenses correct for only one distance; they provide the same correction factor over the entire area of the lens. Multi-vision lenses correct for different distances (such as for reading and for distant objects). Bi-focals and tri-focals have a line and progressive lenses do not, but are all types of multi-vision lenses.

SINGLE VISION	REFUSED
BIFOCAL	DON'T KNOW
TRIFOCAL	
PROGRESSIVES	

3. Do you usually wear those glasses during the day?

YES	REFUSED
NO	DON'T KNOW

If the SP responds with “sometimes,” probe by asking “Do you wear them most of the time?” Code the SP’s response even if it is “don’t know.”

4. Have you been wearing the glasses continually for the past hour or more?

YES	REFUSED
NO	DON'T KNOW

SPs who have been wearing their glasses continually for the past hour or more will wear their glasses during the CST and DVA tests. SPs who respond “no” will skip this section where lenses are measured. If SPs only removed their glasses for exams on the MEC but then put them back on,

mark “yes.” SPs wearing readers may have had them on a lot in the past hour but it does not count as “continually.” The questions continue as shown in Exhibit 3-23.

Exhibit 3-23. Lensmeter Pretest Question (2) screen

Are you currently wearing contact lenses?

Are the contacts you are wearing single vision or multi-vision?

HELP TEXT: Single vision contacts correct for only one distance. Multi-vision contacts correct for different distances (such as for reading and for distant objects). Multi-vision contacts may be bifocal or progressive in each lens, or may consist of a left contact corrects for one distance and a right contact that corrects for a different distance.

Do you usually wear contacts during the day?

Have you been wearing the contacts continually for the past hour or more?

5. Are you currently wearing contact lenses?

- YES REFUSED
- NO DON'T KNOW

6. Are the contacts you are wearing single vision or multi-vision?

HELP TEXT: Single vision contacts correct for only one distance. Multi-vision contacts correct for different distances (such as for reading and for distant objects). Multi-vision contacts may be bi-focal or progressive in each lens, or may consist of a left contact that corrects for one distance and a right contact that corrects for a different distance.

- SINGLE VISION REFUSED
- MULTI-VISION DON'T KNOW

7. Do you usually wear contacts during the day?

- YES REFUSED
- NO DON'T KNOW

8. Have you been wearing the contacts continually for the past hour or more?

YES	REFUSED
NO	DON'T KNOW

SPs who have been wearing their contacts continually for the past hour or more will wear their contacts during the CST and DVA tests.

3.4.3 Measuring the Eyeglasses Prescription

If the SP indicated that they have worn glasses continually for the past hour or more and they are eligible for the dynamic portion of the DVA test, obtain measurements of the lenses as indicated below.

Explain the test to the SP using the scripts in Appendix A. Lens wipes are available to clean the eyeglasses. Do not use paper towels, tissues, or other cloths to wipe the glasses.

If the SP's glasses appear to be fragile, or have obvious signs of being altered by the SP (i.e., tape holding the pieces together, a safety pin in place of screws, etc.) *do not* measure the SP's glasses. Code "CNO."

3.4.3.1 Measuring Single Vision, Lined Bifocal, and Lined Trifocal Lenses

Single vision lenses are measured on the auto measurement screen. Bifocal lenses have a distance and a near portion. Trifocal lenses have a distance, intermediate, and a near portion. Bifocal and trifocal lenses have a line denoting each portion of the lens that can easily be seen. Bifocal and trifocal lenses are measured on the normal measurement screen.

SPs are not always accurate about the type of glasses they have, therefore, the auto measurement screen will be used to verify the type of glasses if the glasses do not have lines. If the type of glasses are different than what SP indicated during the pretest questions, before measuring the lenses, back up to the previous screen and correct the coding for the type of glasses.

Determining the type of lens:

1. Put the machine in auto detection mode. (A question mark will appear beside the lens icon on the display screen, in the top left corner.)
2. Place the lower nasal portion of the lens over the nose piece and wait about 2 seconds.
 - a. If the lens is a progressive, the machine will automatically change to the progressive measurement screen. Follow the procedures in Section 3.4.3.2 for progressive measurement procedures. (Note: If the SP did not report progressives, go back and change the response to that question.)
 - b. If the machine does not change, the lens is single vision, stay on the current screen and measure the lens as indicated below (see Exhibit 3-24).

Exhibit 3-24. Lensmeter Single Vision and Lined Lenses Measurement screen

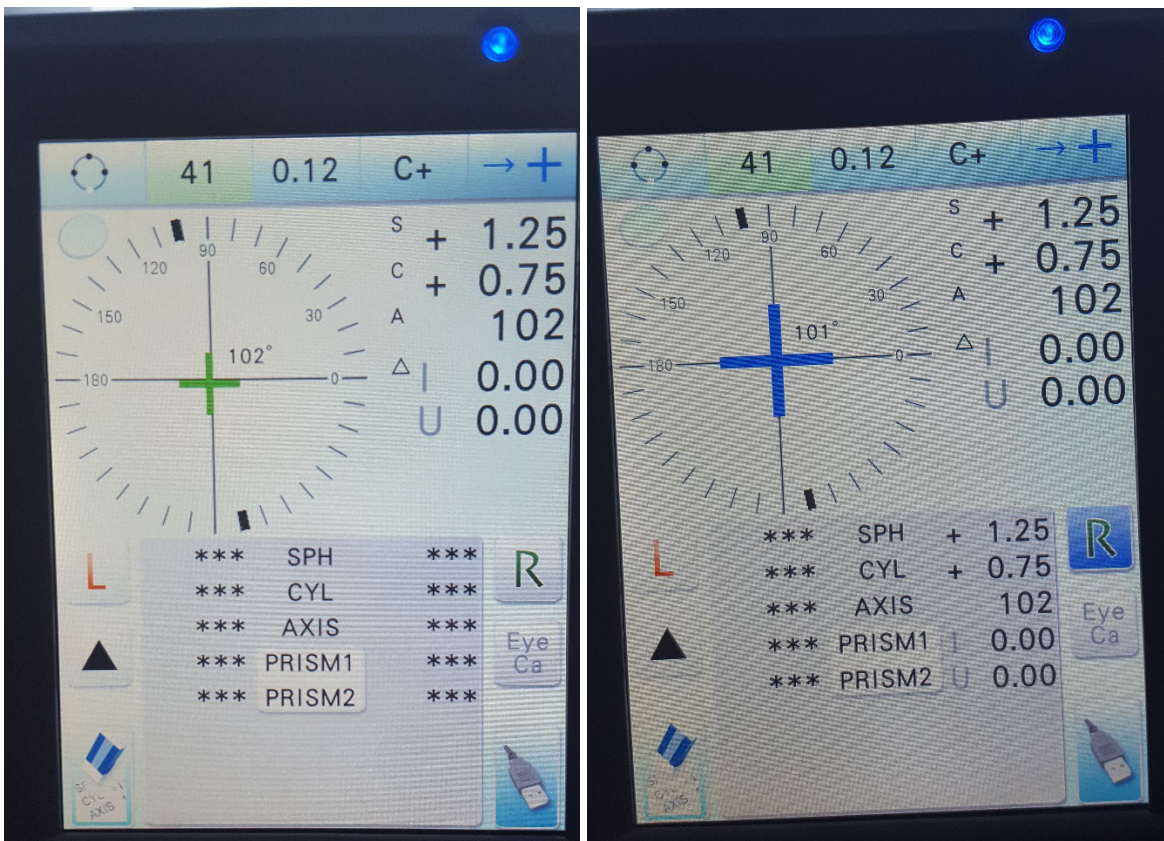
The screenshot displays the measurement interface for a lensmeter. At the top, there are two buttons: "Clear Data" and "Retry Connection". In the center, a lens icon is shown with a question mark and the number "2" above it, and the number "1" below it. Below the lens icon, the screen is divided into two main sections: "RIGHT" and "LEFT". Each section contains two measurement boxes, "Measurement 1" and "Measurement 2". Each measurement box has a "Select Measure" button and a list of parameters: SPH, CYL, AXIS, PRISM 1, PRISM 2, and ADD. The values for all parameters are currently 0. At the bottom of each measurement box are two radio button options: "Could not obtain" and "SP Refused".

The lensmeter should already be on. Follow the steps below to measure the single vision lenses:

Measuring the right lens:

1. The right lens is always measured first. On the ISIS screen, click the first “select measure” button.
2. On the lensmeter, set the lensmeter to “right” by pressing the measurement select button on the right of the gray area on the screen. The button will change from blank to “R.”
3. The glasses should be oriented as if you were going to put them on yourself, then tilt the glasses so that the bottom edge of the frame/lens is facing away from you and the top edge is closer to you. Place the bottom of the right lens on the nosepiece with the front surface of the lens facing up.
4. Pull the lens table lever forward until the lens table comes into contact with the bottoms of the frames (lens, if frameless). Note: Make sure the bottoms of both frames are in contact with the lens table. If the frames are off the lens table, an error may occur in the axis value.
5. Move the lens up and down, right and left until a green or blue cross appears in the center of the screen (see Exhibit 3-25). Make sure that the bottoms of the frames are still in contact with the lens table. NOTE: The prism value should be at 0 or .25.

Exhibit 3-25. Finding optical center with the lensmeter



6. Lift up on the lens clamp (located in the center front of the instrument) to unlock it and gently lower the lens clamp to secure the lens (see Exhibit 3-26).

Exhibit 3-26. Lens clamp holding glasses in place

Lens Clamp

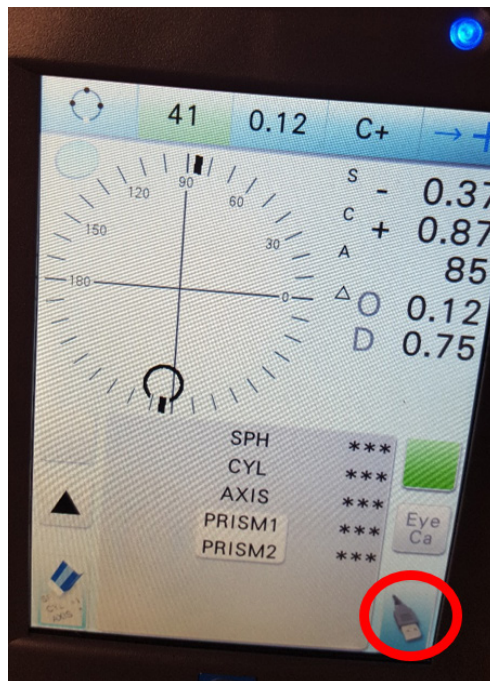


7. Adjust the glasses slightly, if necessary, to get the green cross to turn blue. The blue cross indicates that you have found the optical center. (The goal is to get the blue cross and you will be able to get it for the majority of glasses, however, in **rare** instances, you may be unable to get the blue cross. When this happens, get the cross as close to the center as possible and press the Read button.)
8. Press the Read button (located near your thumb, circled in Exhibit 3-27). The “R” button will be highlighted in blue indicating that the measurement has been stored. Note: Sometimes you may hear the lensmeter beep indicating that it has automatically stored the measurement. Always press the Read button anyway to ensure that the glasses are in the correct position when the measurement is taken. Press the USB icon in the bottom right corner of the lensmeter screen to send the data, and “R” to reset the measuring side to the right side (see Exhibit 3-28).

Exhibit 3-27. Read button on lensmeter

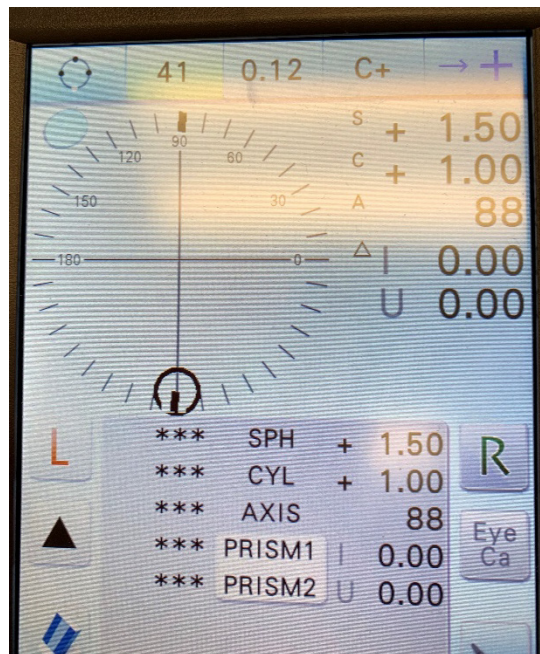


Exhibit 3-28. USB icon on screen used for sending data to ISIS



9. The lensmeter reading will appear on the ISIS screen on the line you previously selected. Click “select measure” on the next line of the ISIS screen.
10. Put the lens clamp up and move the glasses straight down (toward the bottom of the lens) so that the nosepiece is as close to the bottom of the lens as possible.
11. Lower the lens clamp.
12. Adjust the glasses so that the center of the circle on the lensmeter screen is in the middle of the grid and then press the Read button (see Exhibit 3-29).

Exhibit 3-29. Aligning lens for the second measurement



13. Press the USB button to send the data to ISIS.
14. Lift the lens clamp and remove the glasses from the machine.
15. Advance the ISIS screen and click the first “select measure” button.

Measuring the left lens:

1. Lift the lens clamp. Press the “L” button to indicate you are testing the left lens.
 - a. The “L” is now highlighted on the screen and the data values have shifted to the left side of the screen.
2. Place the bottom of the left frame on the nosepiece with the front surface facing up.

3. Again, move the lens up and down, right and left until a green or blue cross appears in the center of the screen. Make sure that the bottoms of the frames are in contact with the lens table. NOTE: The prism value should be at 0 or .25.
4. Lift up on the lens clamp (located in the center front of the instrument) to unlock it and gently lower the lens clamp to secure the lens.
5. Adjust the glasses slightly, if necessary, to get the green cross to turn blue. The blue cross indicates that you have found the optical center.
6. Press the Read button (located near your thumb). The “L” button will be highlighted in blue indicating that the measurement has been stored.
7. Press the USB icon to send the data and “L” to reset the measuring side to the left side.
8. Click “select measure” on the next line of the ISIS screen.
9. Put the lens clamp up and move the glasses straight down (toward the bottom of the lens) so that the nosepiece is as close to the bottom of the lens as possible.
10. Lower the lens clamp.
11. Adjust the glasses so that the center of the circle on the lensmeter screen is in the middle of the grid and then press the Read button.
12. Press the USB button to send the data to ISIS.
13. Lift the lens clamp and remove the glasses from the machine.

3.4.3.2 Measuring Progressives (Including No-Line Bifocal and No-Line Trifocal Lenses)

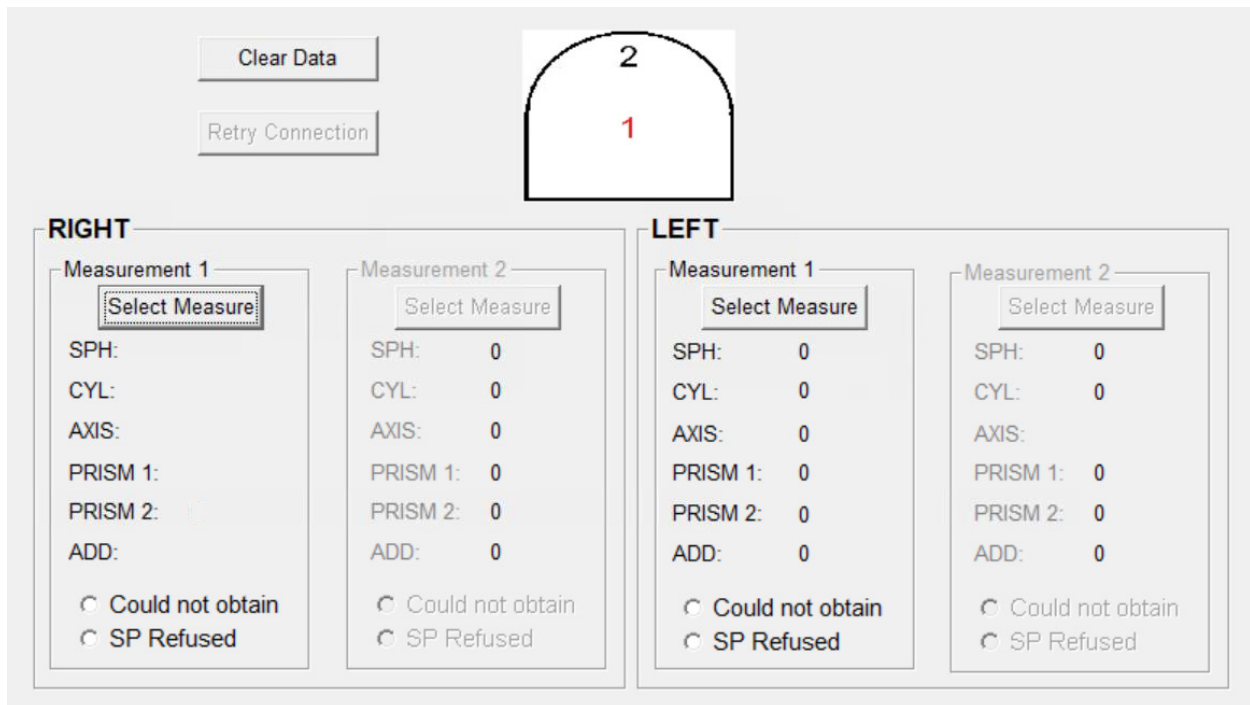
Progressive lenses (also known as “no-line bifocals” or “no-line trifocals”) have a distance and a near portion or a distance, intermediate, and a near portion. Progressive lenses do not have a line denoting each portion of the lens. Progressive lenses will be measured on the auto measurement screen (see Exhibit 3-30).

If the SP’s glasses do not have lines, check the type of glasses as indicated in Section 3.4.3.1. If the glasses are determined to be progressives, follow the steps below to measure the lenses.

Measuring the right progressive lens:

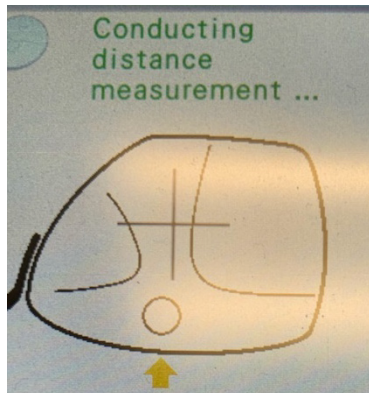
1. On the ISIS screen, click the first “select measure” button.

Exhibit 3-30. Lensmeter Progressive Measurement screen



2. Set the lensmeter to “right” by pressing the Select Measure button on the right of the gray area on the screen. The button will change from blank to “R.”
3. Place the right lens on the nosepiece.
4. The words “Conducting distance measurement . . .” will appear on the screen with a yellow arrow on the bottom of the screen pointing up (see Exhibit 3-31). This indicates that you must move the lens up so that the upper portion of the lens is over the nose piece.

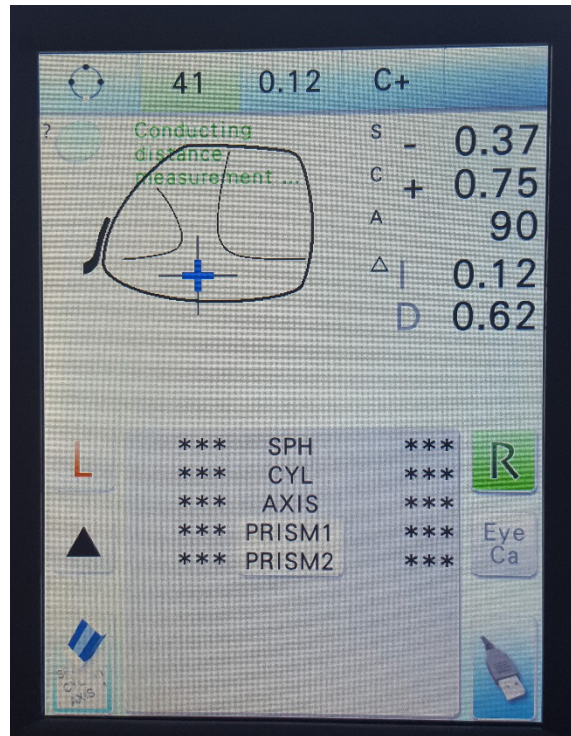
Exhibit 3-31. Lensmeter Measurement screen



5. Place the frames so that the right and left sides are securely against the lens table.

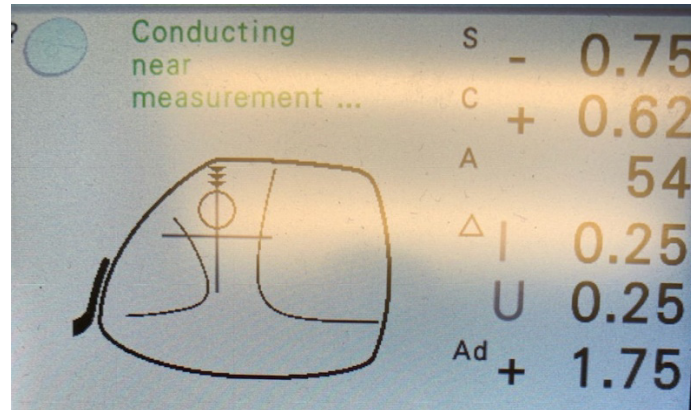
6. Follow the guides on the screen (see Exhibit 3-32). You may need to move the lens right and left or up and down. When you are at the distance portion, a small blue cross is displayed.

Exhibit 3-32. Lensmeter showing optical center on progressive lens



7. Lower the lens clamp onto the lens.
 - a. The machine may capture the measurement automatically before you lower the clamp onto the lens. When you hear a beep and see that the “R” is highlighted, you know that the lens measurement is stored.
8. Even if the measurement has already been automatically stored, still lower the clamp and press the Read button to double-check and save the measurement. This double-check is necessary in case the lens was tilted when the automatic reading was saved.
9. “Distance measurement complete” will appear on the screen after the measurement is stored.
10. Raise the lens clamp and move the lens so that the lower portion is over the nosepiece. The words “conducting near measurement” will appear on the screen.
11. Three little black arrows on the screen to guide you to the highest value add portion of the lens (see Exhibit 3-33).
 - a. The value add is located to the right of the lens graphic on the screen under sphere, cylinder, and axis values.

Exhibit 3-33. Lensmeter guiding graphic to highest value add portion of lens



12. Lower the lens clamp and press the Read button to store the add measurement. The “R” on the screen will be highlighted in blue and “near measurement complete” will appear on the screen.
13. Press the USB button to send the file to ISIS.
14. Lift the lens clamp and remove the glasses from the machine.
15. Advance the ISIS screen.

Measuring the left progressive lens:

1. Click “select measure” on the next line of the ISIS screen.
2. Press the L button on the lensmeter to indicate that the left lens will be measured.
3. Put the left lens on the nosepiece.
4. Make sure that the bottoms of both sides of the frames are in contact with the lens table and follow the guides on the screen.
5. When you are at the distance portion, a blue cross will be displayed.
6. Press the Read button to store the distance measurement.
7. Raise the lens clamp and reposition the lens so that the lower portion (as close to the bottom as possible) is over the nosepiece. Again, use the little black arrows to guide you to the highest value add portion of the lens.
8. Press the USB button to send the file to ISIS.
9. Lift the lens clamp and remove the glasses from the machine.

Troubleshooting

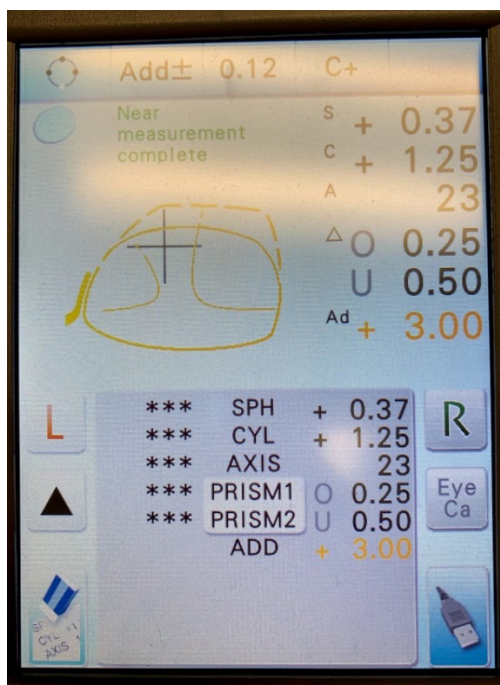
If the progressive lens has a prescribed prism or has minimal sphere power, the blue cross may not appear for distance and near measurements or it may appear far at the top or bottom of the lens. If this occurs, obtain the distance measurement by doing the following:

1. Place the upper middle portion of the lens over the nosepiece, lower the lens clamp and then press the Read button.
 - a. You are measuring the point on the lens that the SP looks through.

If you are not able to obtain the near add graphic, it may be because the maximum add has been cut off for the lens to fit into the small frame. If this happens:

2. With the bottom of the lens over the nosepiece, use the little black arrows to guide you to the highest value add power of the lens that you can get without running off the bottom of the frame.
3. Lower the lens clamp and press the Read button.
 - a. A graphic of a small lens will appear on the screen in orange and the near add power is automatically captured once the lens is no longer covering all of the sensors. This occurs when the lens is halfway off of the nosepiece (see Exhibit 3-34).

Exhibit 3-34. Lensmeter indicating the lens is halfway off nosepiece



- b. If this happens or if you are unable to place the lens clamp at the highest add power, move the lens slightly up so that the clamp can be placed and then press the Read button.

3.5 Contrast Sensitivity Test (CST)

3.5.1 Description of Contrast Sensitivity Test

The CST has been measured for decades and often for routine exams of persons with vision problems. It is easy to measure, record, and detect changes in the transfer of visual information when the change only affects visual acuity at low contrast levels. CST measures the ability to see details at low contrast levels (that is, light versus darker images). This information is useful for interpreting the DVA results that may be due to vision limitation and not limitations in vision/inner ear function. Contrast sensitivity is also important for mobility, where we need to see such low contrast forms such as a curb, faint shadows, and stairs when walking down. If a person can see details at very low contrast, his or her contrast sensitivity is high and vice versa.

NOTE: Do not touch the CST card unnecessarily. Touching the card could cause it to become dirty, which could affect the contrast on the card. If you must touch the card, clean your hands first.

3.5.2 Preparation of the Examinee

With the SP sitting on the bench with his/her back against the wall, pull the CST arm out so that the card is in front of the SP and locked in position. (The arm must be locked in position to ensure that SP is approximately 20 inches from the chart.)

3.5.3 Conducting the CST

Explain the purpose of the test by using the script in Appendix A. All CST charts are labeled with a number. Before beginning the test, choose the chart that will be used from the drop-down box on the ISIS screen. Next, position the CST card in front of the SP and uncover it. Using the suggested scripts, explain what you will be doing. When giving instructions, be careful not to touch the card, and instruct the SP that it is important that he or she does not touch the card. Before starting the

test, make sure the SP is sitting with his/her back against the wall (see Exhibit 3-35). Their back should remain against the wall for the duration of the test.

Exhibit 3-35. SP positioned for CST



As the SP reads each number on the chart, follow along on the CST card. If the SP misses a number, mark it with an X on the score card using a dry erase marker. It is important to encourage the SP to guess when they say they can't see any more numbers. SPs tend to stop when they start to get unsure but often get a few more correct after they are encouraged to guess. If the SP gets more correct after you've encouraged them to guess, encourage them to keep trying. When the SP misses two consecutive numbers, the test will end. (Note: Missing the last number of one line and the first number of the next line counts as two consecutive numbers.) When the test is over, cover the CST chart and move it back against the wall.

On the ISIS screen, you will need to enter three things. First, select the chart that was used from the drop-down list. Next, enter the numeric value of the last correct number that the SP said. Finally, enter the number of errors prior to the final correct number (see Exhibit 3-36).

Exhibit 3-36. CST Exam screen

CHART USED:

ENTER VALUE OF FINAL CORRECT NUMBER:

ENTER NUMBER OF ERRORS PRIOR TO FINAL CORRECT NUMBER:

CNO

SP Refused

In the example in Exhibit 3-37, the numeric value of the last correct number that the SP said was “1.32” and the number of errors prior to the final correct number was “1.”

Exhibit 3-37. Scoring the CST

Row	FORM 1	Left Eye <input type="checkbox"/>	Right Eye <input type="checkbox"/>	Binocular <input type="checkbox"/>
1	0 <input type="checkbox"/> 0.04	2 <input type="checkbox"/> 0.08	8 <input type="checkbox"/> 0.12	5 <input type="checkbox"/> 0.16
2	1 <input type="checkbox"/> 0.28	7 <input type="checkbox"/> 0.32	9 <input type="checkbox"/> 0.36	4 <input type="checkbox"/> 0.40
3	4 <input type="checkbox"/> 0.52	1 <input type="checkbox"/> 0.56	6 <input type="checkbox"/> 0.60	2 <input type="checkbox"/> 0.64
4	0 <input type="checkbox"/> 0.76	7 <input type="checkbox"/> 0.80	5 <input type="checkbox"/> 0.84	4 <input type="checkbox"/> 0.88
5	3 <input type="checkbox"/> 1.00	4 <input type="checkbox"/> 1.04	8 <input type="checkbox"/> 1.08	1 <input type="checkbox"/> 1.12
6	9 <input type="checkbox"/> 1.24	6 <input type="checkbox"/> 1.28	1 <input type="checkbox"/> 1.32	3 <input checked="" type="checkbox"/> 1.36
7	2 <input type="checkbox"/> 1.48	9 <input type="checkbox"/> 1.52	0 <input type="checkbox"/> 1.56	8 <input type="checkbox"/> 1.60
8	7 <input type="checkbox"/> 1.72	0 <input type="checkbox"/> 1.76	9 <input type="checkbox"/> 1.80	1 <input type="checkbox"/> 1.84

Numeric value of last correct number

Two consecutive wrong numbers marked

Error prior to final correct number

If the SP successfully completes at least four lines, ISIS will proceed to the DVA test unless the SP has been otherwise excluded.

3.6 Dynamic Visual Acuity (DVA)

3.6.1 Description of DVA

DVA is a test of the vestibulo-ocular reflex (VOR). The VOR is used to stabilize images on the retina during movement. Input from the vestibular system results in a signal to the oculo-motor system to move the eyes in the opposite direction of the head to maintain image focus (i.e., if the head turns to the right, the VOR causes the eyes to move left to remain on target). DVA measures the difference in visual acuity when the head is still (and the VOR therefore is not utilized for accurate vision) and when the head is moving (requiring good VOR function to maintain acuity). This test will compare static visual acuity to dynamic visual acuity to determine if differences exist. DVA is therefore a proxy for normal vestibular function, at least in the plane in which the head is moved. For this test, only best-corrected binocular DVA will be assessed. DVA is a well-established clinical test that provides a quick screening for vestibular loss (Rine et al., 2013).

Although Condition 4 of the MRT, as implemented in NHANES 1999-2004, was designed to test the vestibular system by removing visual and proprioceptive inputs to balance, static tests such as the MRT may not be sufficiently sensitive for evaluating compensated vestibular loss. In addition, DVA allows evaluation of vestibular function in participants who are excluded from the MRT or who are unable to make it to Condition 4 or Condition 5 of that test.

During the DVA test, participants first take a brief binocular visual acuity test with their head still by identifying “optotypes” (i.e., tumbling Cs, which can also be described as a block letter C, in different orientations) presented on a computer screen at varying sizes (static visual acuity). Then they repeat the test while moving their head from side-to-side and up-and-down to evaluate vestibulo-ocular reflex function (dynamic visual acuity).

As with the contrast sensitivity test, you should encourage the SP to guess. SPs tend to speak softer when they become unsure. Do not hesitate to ask the SP to speak louder and/or clearly if you cannot hear them. Also be aware of where you are standing during the test. The floor is marked as a reminder so that you do not stand in the SP’s field of vision.

3.6.2 DVA Pre-Test Questionnaire

Some SPs will be excluded from DVA based on their responses to the neck safety exclusion questions asked earlier. Unless an SP cannot see well enough to find the exam room unassisted, all SPs will complete the static portion of the DVA test (see Exhibit 3-38). The questions previously asked about corrective lenses will assure that the correct protocol is used. ISIS will prompt you to ask one question and the response is entered directly into the computer.

Exhibit 3-38. DVA Pre-Test screen

A screenshot of a computer interface for a questionnaire. The text "DOES SP HAVE A COCHLEAR IMPLANT?" is displayed on the left. To the right of the text is a blue rectangular dropdown menu with a small downward-pointing arrow on its right side.

1. DOES SP HAVE A COCHLEAR IMPLANT?

HELP: A cochlear implant is a surgically implanted device, typically used for people whose hearing is so bad that they cannot benefit from hearing aids.

If a cochlear implant (see Exhibit 3-39) is not visible, you will need to ask the SP to make sure you code this question correctly. If you are unsure that what you see is a cochlear implant, ask the SP. SPs with cochlear implants will be excluded from the dynamic part of the DVA test.

Exhibit 3-39. Cochlear implant

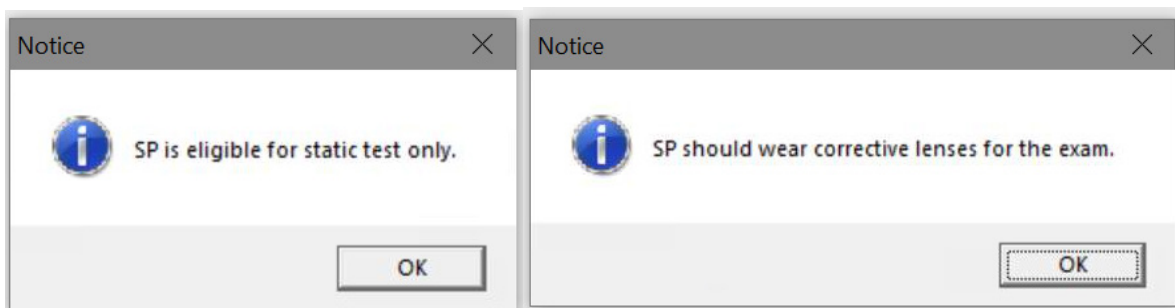


3.6.3 Preparation of the Examinee

When you advance the ISIS screen, you may receive reminders about what part of the test the SP is eligible for and whether the SP should wear their corrective lenses for the exam (see Exhibit 3-40).

It is important to pay attention to these pop ups because the DVA exam is conducted in a separate software that ISIS does not control. The pop ups will tell you how to prepare the SP for the exam and which protocol to choose.

Exhibit 3-40. DVA pop-up reminders



The SP will remain sitting on the bench that was used for the CST exam (see Exhibit 3-41). The SP should sit with his/her back against the wall during the test.

Exhibit 3-41. SP positioned for DVA test



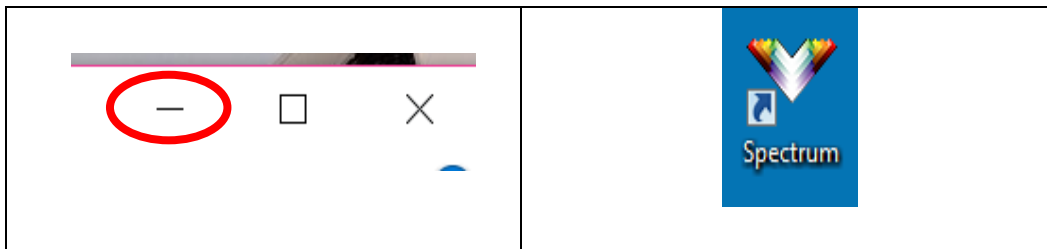
3.6.4 Procedure for DVA Testing

3.6.4.1 Opening the DVA Software

The DVA test is conducted using special software installed on the laptop. The instructions for opening and using the software for the DVA test are below.

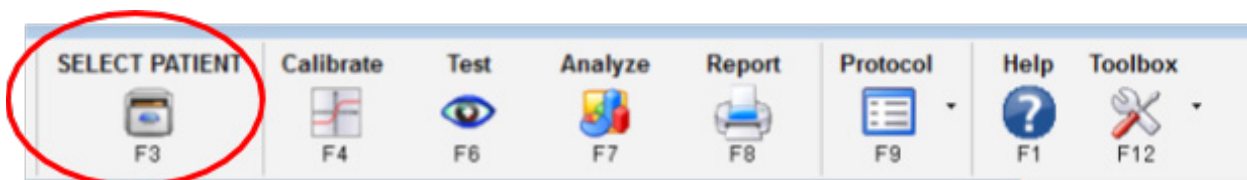
1. If ISIS does not automatically launch the Spectrum software, minimize the Balance application by using the “-” button in the top right corner of the screen and double-click the Spectrum icon to open the software (see Exhibit 3-42). NOTE: The ISIS screen will be inactive once the Spectrum application launches.

Exhibit 3-42. Minimize screen button and Spectrum icon



2. Next you will need to set up a profile. To do this, click on “Select Patient” from the toolbar (see Exhibit 3-43).

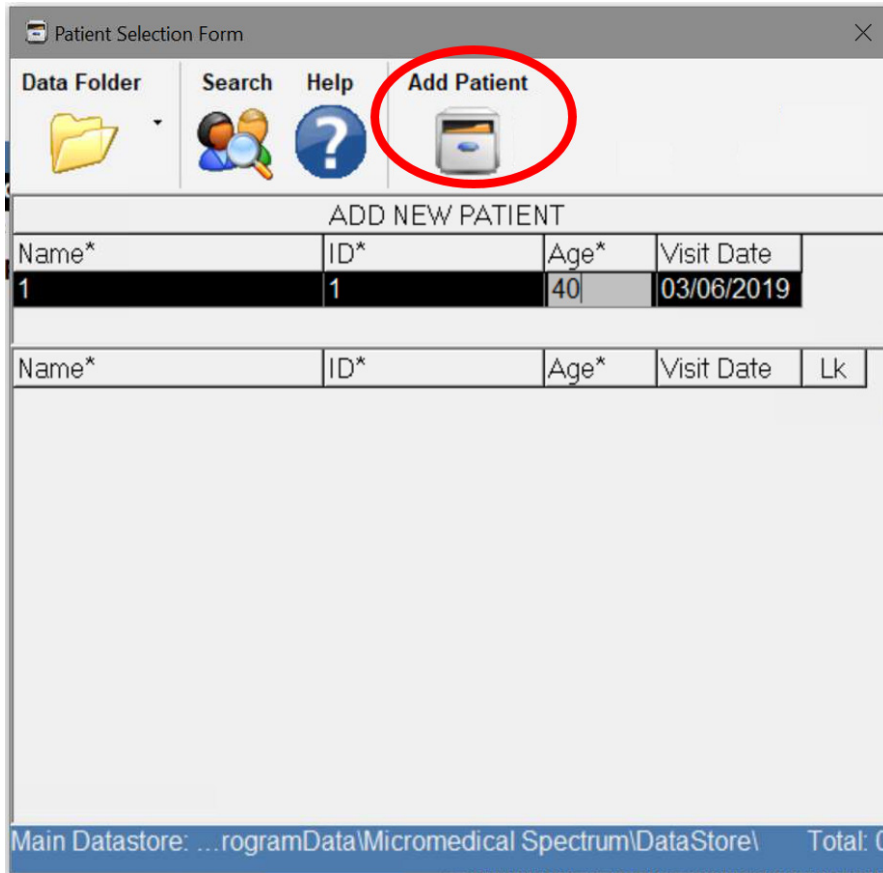
Exhibit 3-43. Spectrum toolbar – select patient icon



For each SP, you will need to enter a name, ID, and age in Spectrum to create a profile. For simplicity, the name, ID, and age for the previous profile for all SPs will all be “1, 1, 40.”

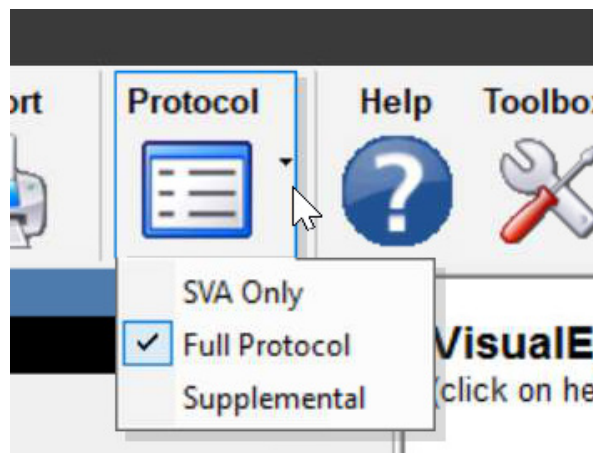
3. After entering the information for the SP’s profile, click “Add Patient” in the toolbar (see Exhibit 3-44).

Exhibit 3-44. Patient selection form toolbar



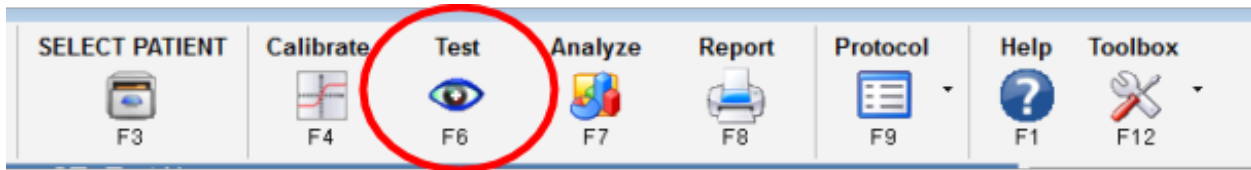
- Next, select the appropriate protocol for the SP. Click “Protocol” in the toolbar (see Exhibit 3-45) If ISIS told you that the SP was eligible for the static test only, choose the protocol that says “SVA Only.” If you did not get that message, choose “Full Protocol.

Exhibit 3-45. Spectrum toolbar – Protocol icon



- Click on the “TEST” icon in the top middle of the screen (see Exhibit 3-46).

Exhibit 3-46. Spectrum toolbar – test icon

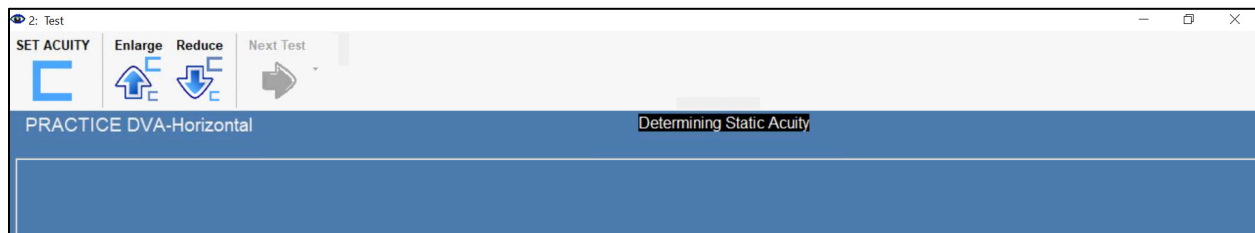


6. Describe the test using the suggested scripts in Appendix A.
 - a. Use the up or down arrow to increase or decrease the size of the optotype and the left or right arrows to change the orientation of the optotype.
 - b. It is helpful to use the optotype on the screen when describing the test to the SP.

3.6.4.2 Conducting the Static DVA Test

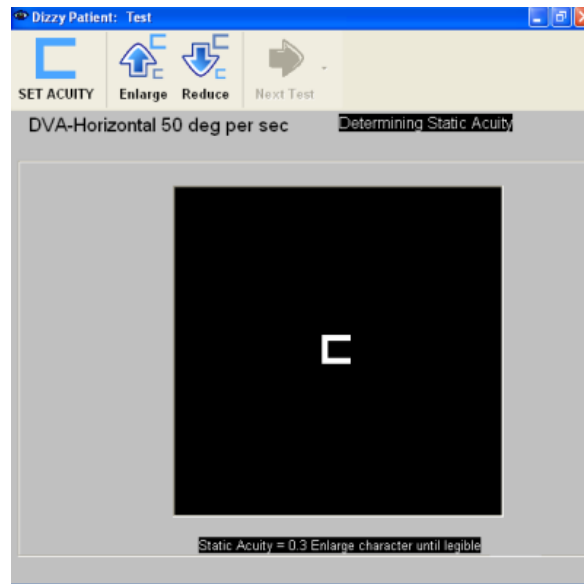
The ISIS screen will tell you if the SP should wear corrective lenses for the test and/or if the SP is only eligible for the static portion of the test. You will be conducting the static visual acuity test first (see Exhibit 3-47). Notice that the top, center portion of the blue screen reads “Determining Static Acuity.”

Exhibit 3-47. Static DVA Test screen toolbar



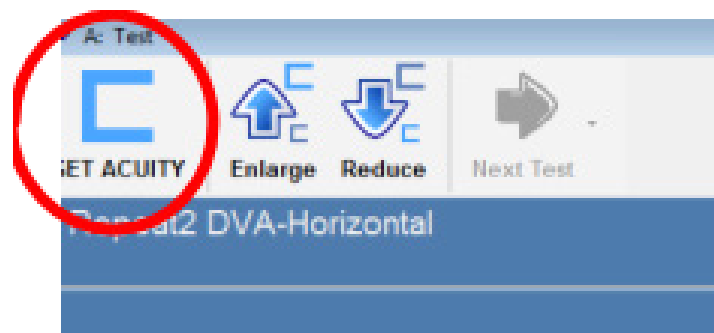
1. Use the up arrow to make the optotype as large as possible, then ask the SP to indicate the direction of the optotype (see Exhibit 3-48). (When using an interpreter, ask the interpreter to avoid looking at the screen as they interpret the SP’s responses.)

Exhibit 3-48. Static DVA Test screen



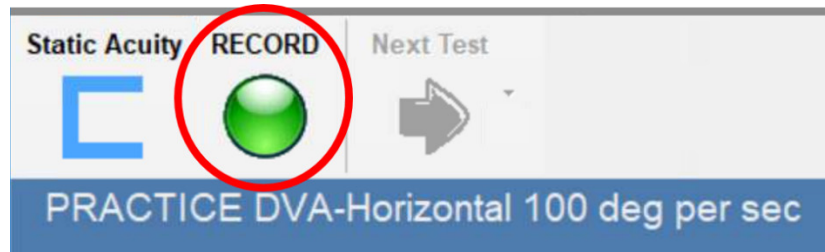
2. Establishing threshold
 - a. To establish threshold, each time the SP guesses the direction of an optotype, change the orientation.
 - i. If the SP gets 2 out of 3 optotype orientations correct, decrease the size and repeat until the SP misses 2 out of 3.
 - b. If the SP misses 2 out of 3, use the up arrow to increase it to the size the SP last got correct and click SET ACUITY in the top left corner (see Exhibit 3-49).
 - c. If the SP is unable to identify the direction of the optotype at its largest, click SET ACUITY at the largest size and end the test.
 - d. Click SET ACUITY at the smallest size that the SP is able to identify the direction of the optotype (may vary by SP), and move on to dynamic visual acuity.

Exhibit 3-49. Static DVA Test screen toolbar – set acuity icon



If the SP was only eligible for the static test, click the “record” icon to advance the Spectrum screen (see Exhibit 3-50). The computer will start beeping. After a few beeps, press Enter on the keyboard and follow the steps in Section 3.6.4.5 to save, export and capture the results.

Exhibit 3-50. Spectrum screen toolbar – record icon



3.6.4.3 Conducting the Horizontal Dynamic DVA Test

For the second part of this test, the examiner will place the headband with the motion sensor on the participant’s head. The motion sensor will measure head movement during the test, to ensure the participant is going in the proper direction at the proper speed. Explain the test by using the suggested scripts in Appendix A. For this portion, the participant will be asked to move his/her head from side-to-side while reading tumbling C’s on a computer monitor (see Exhibit 3-51). The optotype will only appear when the SP’s head is moving fast enough and in the right direction.

Exhibit 3-51. SP performing horizontal DVA test



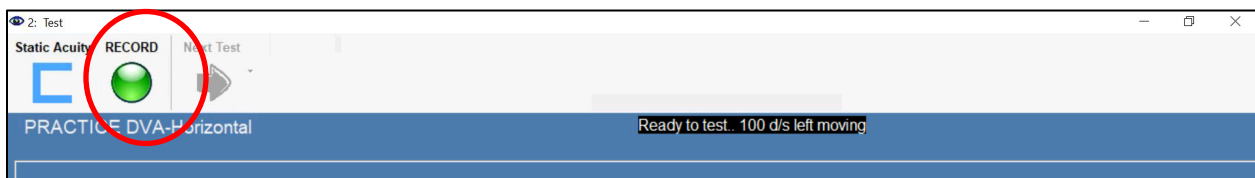
1. Place the accelerometer headband securely on the SP's head with the accelerometer on FRONT, with the word "HORIZONTAL" flat and visible (see Exhibit 3-52). If the SP is wearing something on his/her head that prevents you from securely placing the headband on his/her head, ask the SP to remove it unless it is something the SP wears for religious or cultural reasons.

Exhibit 3-52. Headband with accelerometer positioned for horizontal testing



2. Turn the dial on the back of the headband to secure it firmly onto the SP's head. The dial will click with each turn. Wiggle the headband gently to make sure it doesn't slip or wiggle around.
3. With the SP still sitting, instruct the SP according to the suggested script. If the SP has been wearing their glasses or contacts for more than 1 hour, have them keep their glasses or contacts on for the test. If not, have them remove their glasses or contacts, as instructed by the ISIS software.
4. The SP will practice first. The top left corner of the blue screen will read "PRACTICE DVA-Horizontal" and the top middle of the blue screen will read "Ready to test." The SP will shake his/her head from left to right as if saying "NO." The head should move to the beat of the metronome/sound presented from the DVA laptop.
 - a. Click the green "RECORD" button to begin the horizontal practice (Exhibit 3-53).

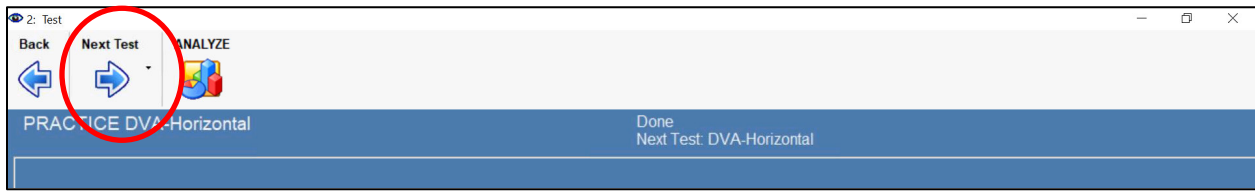
Exhibit 3-53. Record button on Spectrum toolbar



- b. Quickly increase the size of the optotype by 6 or 8 and then tell the SP to start moving their head left to right.

- c. After the SP has the hang of it by getting 2-3 in a row correct, PRESS <ENTER> to stop the practice. NOTE: You do not need to decrease the size of the optotype during the practice.
- d. Notice the top middle of the blue screen reads “Done. Next Test DVA-Horizontal.”
- e. Click the “Next Text” button to advance to the DVA-Horizontal test screen (see Exhibit 3-54).

Exhibit 3-54. Next test button on Spectrum toolbar



5. Click the green “RECORD” button to begin testing the left side horizontal, quickly increase the size of the optotype by 4, then tell the SP to begin moving their head from left to right.
 - a. Repeat the method for establishing threshold as previously indicated.
 - b. Once threshold is determined, PRESS <ENTER> to set DVA. The test is now paused.
 - c. Tell the SP, “We are going to do that same thing, again. Are you ready?”
 - d. Press “ENTER” to begin testing of the right side horizontal, quickly increase the size of the optotype by 4, then tell the SP to begin moving their head from left to right.
 - e. Repeat the method for establishing threshold.
 - f. Once threshold is determined, press <ENTER> to set DVA.

3.6.4.4 Conducting the Vertical Dynamic DVA Test

1. Explain the next portion of the exam using the suggested scripts in Appendix A. Gently twist the accelerometer so that the word “VERTICAL” is now facing up (see Exhibit 3-55).

Exhibit 3-55. Headband with accelerometer positioned for vertical testing



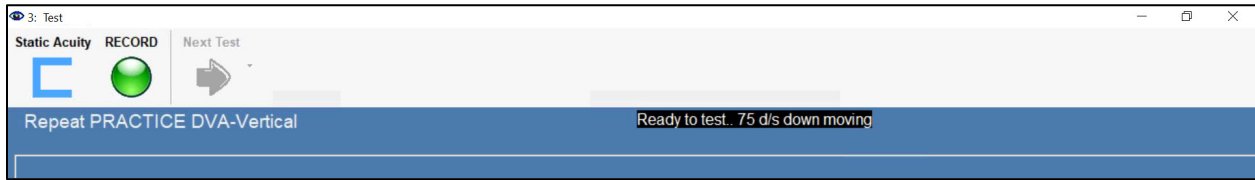
2. Click on the “NEXT TEST” arrow. NOTE: Static acuity has already been set. Do not repeat it.
3. The SP will practice first. The top left corner of the blue screen will read “PRACTICE DVA-Vertical” and the top middle of the blue screen will read “Ready to test.” The SP will shake his/her head up and down as if saying “YES.” (See Exhibit 3-56). The head should move to the beat of the metronome/sound presented from the DVA laptop.

Exhibit 3-56. SP performing vertical DVA test



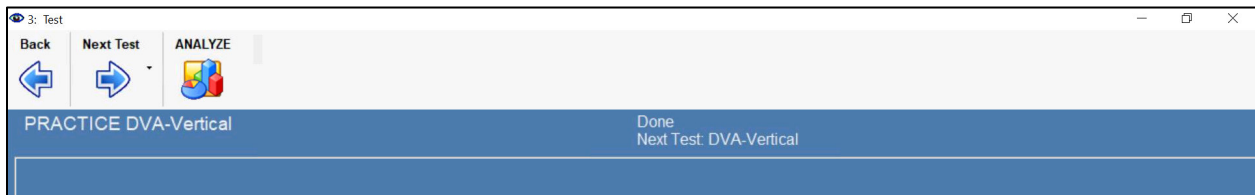
- a. Click the green “RECORD” button to begin the vertical practice (see Exhibit 3-57).

Exhibit 3-57. Spectrum screen showing vertical DVA practice is the current test



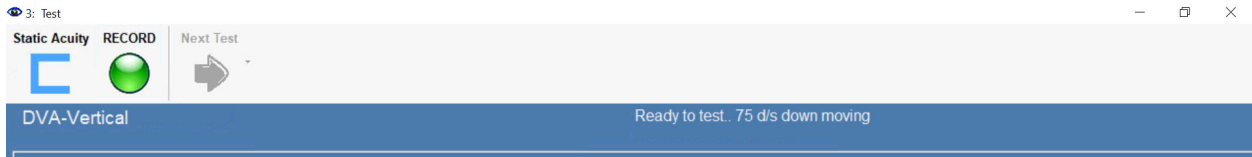
- b. Quickly increase the size of the optotype by 6 or 8 and then tell the SP to start moving their head up and down.
- c. After the SP has the hang of it by getting 2-3 in a row correct, press <ENTER> to stop the practice. NOTE: You do not need to decrease the size of the optotype during the practice.
- d. Notice the top middle of the blue screen reads “Done. Next Test DVA-Vertical.”
- e. Click the “Next Text” button to advance to the DVA-Vertical test screen (see Exhibit 3-58).

Exhibit 3-58. Spectrum screen showing vertical DVA test is the next test



4. Click “RECORD” to begin testing of upward Vertical DVA (see Exhibit 3-59). Quickly increase the size of the optotype by 4, then tell the SP to begin moving their head up and down.
 - a. Repeat the method for establishing threshold.
 - b. Once threshold is determined, press <ENTER> to set DVA. The test is now paused.
 - c. Press “ENTER” to begin testing of downward Vertical DVA, quickly increase the size of the optotype by 4, then tell the SP to begin moving their head up and down.
 - d. Repeat the method for establishing threshold.
 - e. Once threshold is determined, press <ENTER> to set DVA.
 - f. Tell the SP that he/she can relax while you save the results.

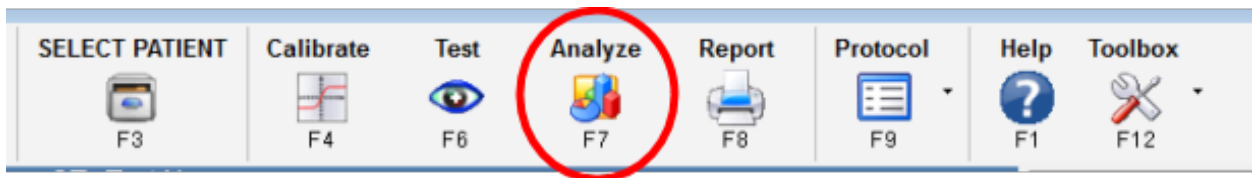
Exhibit 3-59. Spectrum screen showing vertical DVA test is the current test



3.6.4.5 Exporting DVA results

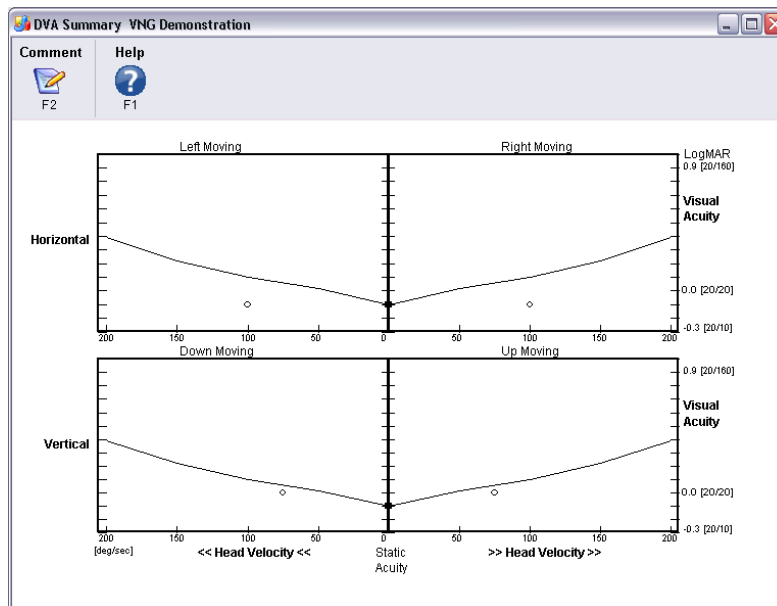
1. To export results, click on the “ANALYZE” icon in the top middle of the screen (see Exhibit 3-60).

Exhibit 3-60. Spectrum toolbar – analyze icon



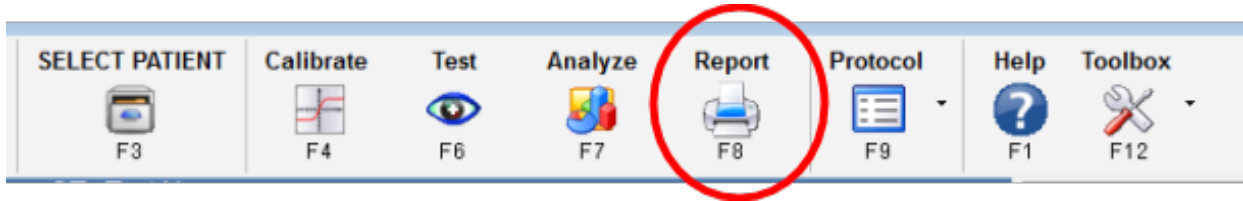
2. You should see a figure that looks similar to the one in Exhibit 3-61. Click on the X box in the top right corner to exit the analysis screen.

Exhibit 3-61. DVA summary graph



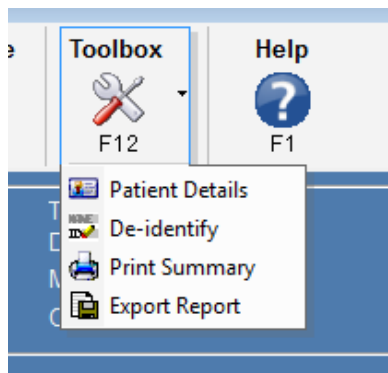
3. Click on the “REPORT” icon in the top middle of the screen (see Exhibit 3-62).

Exhibit 3-62. Spectrum toolbar – report icon



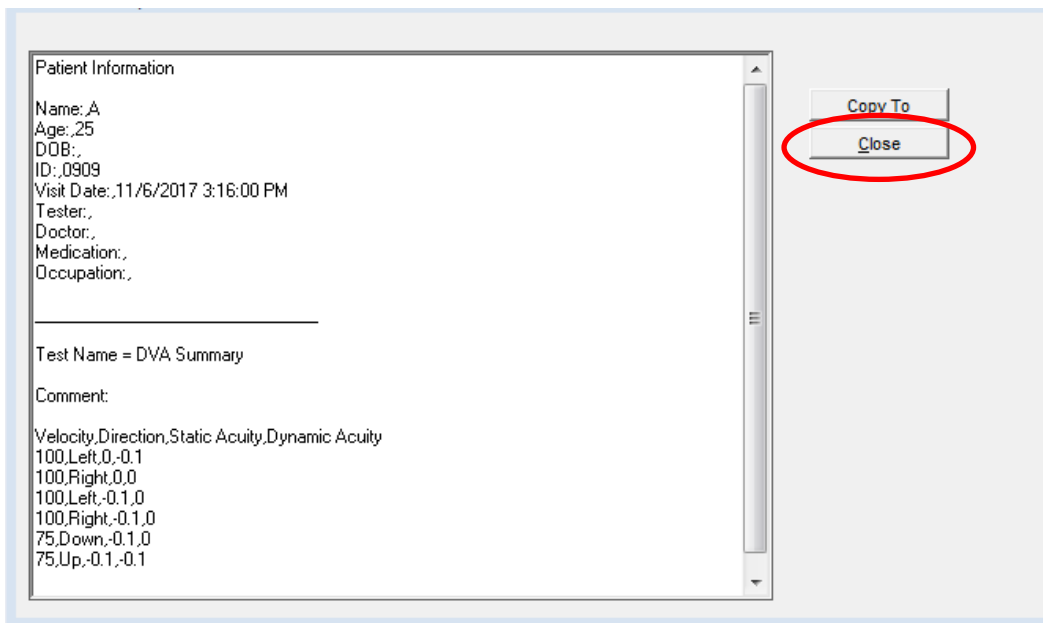
4. Click on the small arrow adjacent to the “TOOLBOX” icon in the top middle of the screen and select “EXPORT REPORT” (see Exhibit 3-63).

Exhibit 3-63. Spectrum toolbar – toolbox icon



5. You should see the box shown in Exhibit 3-64. Click on the “CLOSE” option on the right of the screen.

Exhibit 3-64. Exam report pop-up



6. Click on the X box in the top right corner to exit the Test Report screen.
7. Click on the X in the top right corner of the main Spectrum screen to exit Spectrum. You must close out of Spectrum completely for ISIS to capture the DVA results.
8. Remove the headband and wipe it with a Purell wipe. (Do not wipe the accelerometer attached to the headband.)
9. Return to the ISIS screen and click “capture” to capture the DVA results (see Exhibit 3-65).

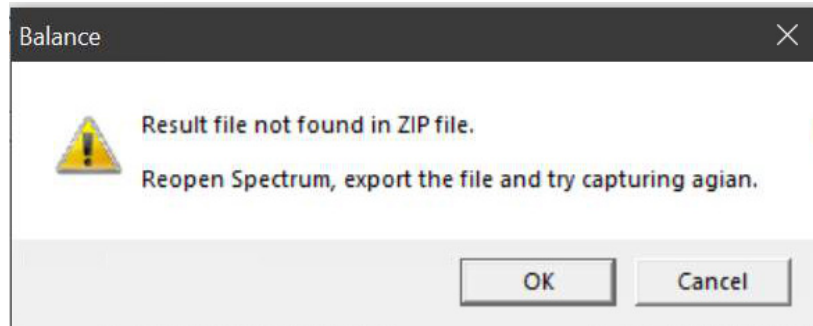
Exhibit 3-65. DVA Exam screen

The screenshot shows the 'DVA Test' interface. At the top, there is a 'DVA Test' title and a 'Capture' button. Below the title, there is a 'Static Visual Acuity' section with a value of '20' and a 'Capture DVA Results' button. The bottom portion of the screen is divided into three columns, each with a title and four radio button options: 'Complete', 'Partial', 'Could not obtain', and 'SP Refused'. The columns are: 'Static Visual Acuity', 'DVA (Part 1: Up and Down)', and 'DVA (Part 2: Side to Side)'.

The bottom portion of the ISIS screen includes a status for all three parts of the DVA exam. The tech is responsible for coding the status of each part on this screen.

The export process at the end of the DVA exam in Spectrum creates a ZIP file with all of the DVA exam data in it. When you finish the DVA exam and click the “Capture” button on the ISIS screen, ISIS will now check to see if a ZIP file was created. If the ZIP file was not created, ISIS will display a pop up message (see Exhibit 3-66).

Exhibit 3-66. ZIP file not found error message

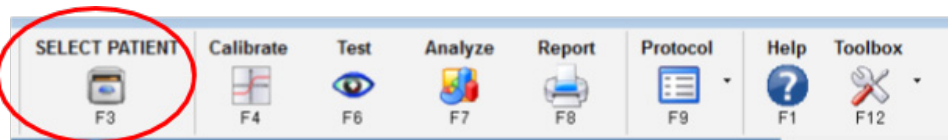


Click "OK" to exit the message and repeat the export process.

To repeat the export process:

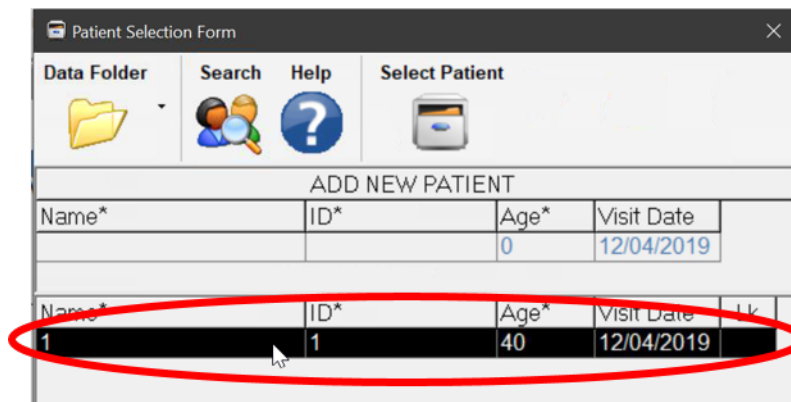
1. Minimize ISIS by using the "-" button in the top right corner of the screen and re-open Spectrum by clicking on the Spectrum icon on the computer's desktop (Exhibit 3-42).
2. When Spectrum opens, click the "Select Patient" icon at the top of the screen (Exhibit 3-67).

Exhibit 3-67. Spectrum toolbar – select patient icon



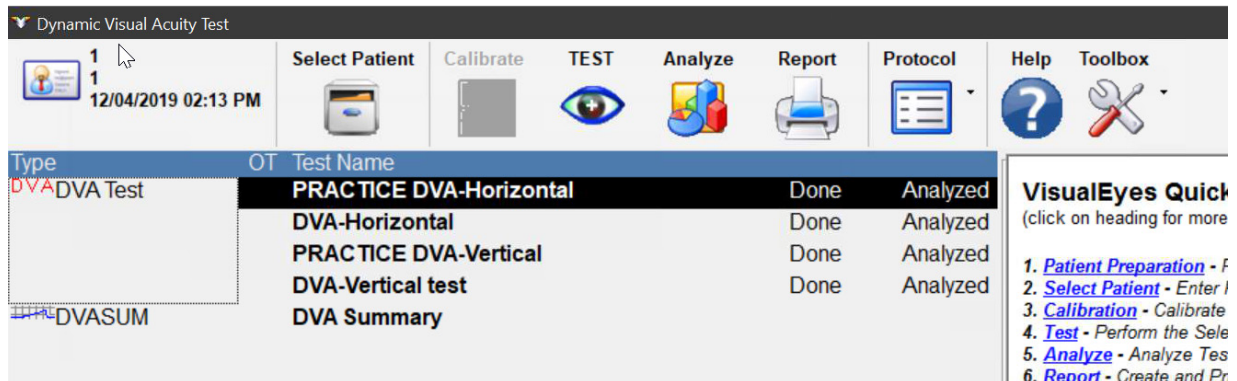
3. When the Patient Selection Form opens, the 1-1-40 case will be listed at the bottom (Exhibit 3-68). Click the case and click "Select Patient" to reopen the case. (If there is no previous case listed, return to the ISIS screen, move forward without capturing the data file, and send a UFO.)

Exhibit 3-68. Previous exam list



- You will see the summary of the exam you just completed (Exhibit 3-69).

Exhibit 3-69. Spectrum exam summary



- Follow the steps in Section 3.6.4.5 to repeat the export process.
- Click “Capture” on the ISIS screen again.

3.6.4.6 Other DVA Scenarios

Case 1-1-40 already exists:

- Scan the SPID barcode for the name and ID categories on the screen and continue with the exam.
- Send a UFO.

Start part of the exam again:

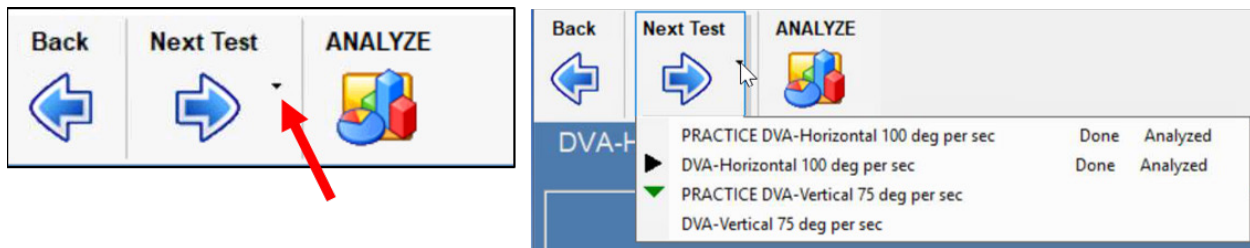
Examples of when you would need to do this include:

- Accidentally starting a portion, and needing to go back.
- The SP’s responses were slow, and you did not obtain threshold, and you need to restart.

There are two ways to start part of the exam again:

- Option 1: Click the little drop-down arrow beside the Next Test button and select the test you want to start again (see Exhibit 3-70).

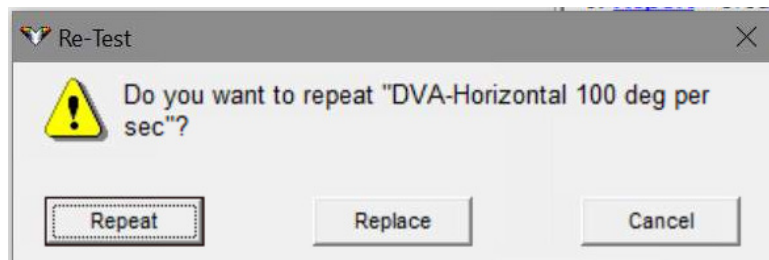
Exhibit 3-70. Spectrum toolbar – next test icon



OR

- Option 2: Close the screen by clicking the “X” in the upper-right corner and double-click the test that you want to start again.
- After selecting the test you want to start again, you will be provided the options of “Repeat,” “Replace,” and “Cancel” (see Exhibit 3-71).

Exhibit 3-71. Spectrum pop-up box



- If you do not want to keep the previous information, select “Replace.” In most cases, you will not want to keep the previous information.
- In the rare instance that you do want to keep the previous information, select “Repeat.” If you selected repeat to keep the previous information, send a UFO at the end of the exam.

How to get back into a case and pick up where you left off (e.g., Accidentally closed screen).

- If, at any time in the DVA exam, you close Spectrum before you finish the exam or before you were able to export, you will need to reopen Spectrum and enter back into the exam.
- To do this, minimize the ISIS Balance screen.
- Re-open Spectrum by clicking on the Spectrum icon on the computer’s desktop.

- Re-open your SP's file, similar to the start of DVA by first clicking on the "Select Patient" folder.
- Instead of adding a new patient, double-click on your SP's file.
- When the Home screen opens, double-click the test where you left off to resume the test.

SP time expired before getting to smallest - how to repeat it.

With the DVA, there is a finite number of presentations of the optotype ("C"). During each part of the test (i.e., part 1 of Horizontal, part 2 of Horizontal DVA, etc.) there are a maximum of 50 presentations. Therefore, it is important that you only arrow "up" two or three times once starting the DVA testing. If, for whatever reason, the software stops before you are able to establish threshold, use option 1 or option 2 above to repeat that test. When provided the options of "Repeat," "Replace," and "Cancel," choose "Replace" and start the test again.

3.7 Directions to Examinee

When the entire test has been completed and the SP has been closed out of the component, return any items that the examinee may have removed at the beginning of the exam (e.g., eyeglasses, hair ornaments, etc.). Wait a few moments for a message from the coordinator indicating which station the SP should be directed to next. Thank the examinee and direct him or her to the next station. If the examinee inquires about the results of any of the balance examination procedures, explain to him or her that you simply conduct the tests and that the results will be given to him or her with some explanatory materials at the end of the exam.

NEVER interpret the results of the exam for the SP or give any indication of the test results.

3.8 Final Procedures

At the end of the exam, reset the test room for the next SP.

Appendix A
English and Spanish Scripts

Appendix A

English and Spanish Scripts

English Scripts	Spanish Scripts
<p>Introduction to Component</p> <p>In this room, we are going to check the things that keep you balanced when standing. Before we begin, I need to ask a few questions to determine if this test is appropriate for you.</p>	<p>Introduction to Component</p> <p>En esta sala, vamos a hacer una prueba sobre qué tan bien puede usted mantener el equilibrio estando de pie. Antes de comenzar, necesito hacerle algunas preguntas para determinar si esta prueba es adecuada para usted.</p>
<p>Part 1 - MRT</p> <p>SP excluded from entire MRT: Given your responses, it seems that this part of the test is not suitable for you. Let's move on to the next part.</p> <p>SP NOT excluded from entire MRT: SP seated For the first test, I'm going to see how well you can keep your balance while standing. Please just watch me for now. I am going to ask you to stand straight with your arms crossed on your chest and your feet together, like this (DEMONSTRATE CORRECT STANCE).</p> <p>You will stand like this for up to about 30 seconds at a time. You may do this several times in different ways . . . for example, with your eyes open or your eyes closed. Please do not talk during the test.</p> <p>I will be standing right here next to you the whole time just in case you lose your balance during the test. I am going to put this safety belt around your waist (SHOW THE BELT) to help me steady you if you get off balance. I'm going to put this device on the belt (POINT TO ACCELEROMETER) to measure your movement.</p> <p>The whole test will take several minutes. Do you have any questions?</p>	<p>Part 1 - MRT</p> <p>SP excluded from entire MRT: De acuerdo con sus respuestas, parece que esta parte de la prueba no es adecuada para usted. Pasemos a la siguiente parte.</p> <p>SP NOT excluded from entire MRT: SP seated En la primera prueba, voy a ver qué tan bien puede usted mantener el equilibrio estando de pie. Por el momento, obsérveme. Le voy a pedir que se pare derecho con los brazos cruzados sobre el pecho y los pies juntos, así (DEMONSTRATE CORRECT STANCE).</p> <p>Mantendrá esta posición hasta por 30 segundos cada vez. Es posible que tenga que hacer esto varias veces de distintas maneras . . . por ejemplo, con los ojos abiertos o con los ojos cerrados. Por favor, no hable durante la prueba.</p> <p>Voy a permanecer de pie junto a usted todo el tiempo en caso de que pierda el equilibrio durante la prueba. Le voy a poner estas correas de seguridad en la cintura (SHOW THE BELT) para mantenerlo firme en caso de que pierda el equilibrio. Voy a poner este aparato en la correa (POINT TO ACCELEROMETER) para medir su movimiento.</p> <p>La prueba tomará varios minutos. ¿Tiene alguna pregunta?</p>

<p>Start Condition 1</p> <p>When I tell you to start, please stand as I showed you with your arms crossed on your chest and your feet together while looking at the mark on the wall. Stay like this for as long as you can or until I tell you to stop. (Do not let SP stand in any condition while you explain the condition- let them relax.)</p> <p>Once we start the test, do not speak, until the test is over.</p> <p>Do you have any questions before we begin? Get into position.</p> <p>Begin. (Quickly press the USB button.)</p>	<p>Start Condition 1:</p> <p>Cuando le diga que comience, manténgase de pie como se lo mostré, con los brazos cruzados sobre el pecho y los pies juntos y mire a la marca en la pared. Mantenga esta posición el mayor tiempo posible o hasta que yo le diga que pare. (Do not let SP stand in any condition while you explain the condition- let them relax.)</p> <p>Cuando empecemos la prueba no hable sino hasta que hayamos terminado.</p> <p>¿Desea hacer alguna pregunta antes de que empecemos? Por favor, póngase en la posición.</p> <p>Comience. (Quickly press the USB button.)</p>
<p>Trial Over:</p> <p>Stop. You can relax.</p>	<p>Trial Over:</p> <p>Descanse. Puede descansar.</p>
<p>Repeat Condition 1:</p> <p>When you are ready, could we try that again?</p>	<p>Repeat Condition 1:</p> <p>Cuando esté listo, ¿podemos intentarlo otra vez?</p>

<p>Start Condition 2:</p> <p>This time we will do the same thing, but you're going to close your eyes during the test.</p> <p>Are you ready? Cross your arms on your chest and put your feet together.</p> <p>Close your eyes. Begin. (Quickly press the USB button.)</p>	<p>Start Condition 2:</p> <p>Esta vez volveremos a hacer los mismo, pero deberá mantener los ojos cerrados durante la prueba.</p> <p>¿Está listo? Ponga los brazos cruzados sobre el pecho y mantenga los pies juntos.</p> <p>Cierre los ojos. Comience. (Quickly press the USB button.)</p>
<p>Trial Over:</p> <p>Open your eyes and relax.</p>	<p>Trial Over:</p> <p>Abra los ojos y descanse.</p>
<p>Repeat Condition 2:</p> <p>When you are ready, could we try that again?</p>	<p>Repeat Condition 2:</p> <p>Cuando esté listo, ¿podemos intentarlo otra vez?</p>

<p>Start of Condition 3</p> <p>This time you'll be standing with your arms crossed, feet together, eyes open looking at the mark on the wall, but standing on this foam.</p> <p>Are you ready? Step up on the foam. Cross your arms. Put your feet together.</p> <p>Begin. (Quickly press the USB button)</p>	<p>Start of Condition 3</p> <p>Esta vez permanecerá de pie con los brazos cruzados sobre el pecho, los pies juntos y mirando a la marca en la pared, pero deberá pararse en esta espuma.</p> <p>¿Está listo? Párese en la espuma. Ponga los brazos cruzados sobre el pecho. Ponga los pies juntos.</p> <p>Comience. (Quickly press the USB button.)</p>
<p>Trial Over:</p> <p>Relax and step off the foam.</p>	<p>Trial Over:</p> <p>Puede bajarse de la espuma y descansar.</p>
<p>Repeat Condition 3:</p> <p>When you are ready, could we try that again?</p>	<p>Repeat Condition 3:</p> <p>Cuando esté listo, ¿podemos intentarlo otra vez?</p>

<p>Start Condition 4</p> <p>For the next part of the test, you will stand in the same position as before on the foam pad, but this time you will have your eyes closed.</p> <p>Are you ready? Step up on the foam. Cross your arms. Put your feet together.</p> <p>Close your eyes and begin. (Quickly press the USB button.)</p>	<p>Start Condition 4</p> <p>Para la siguiente parte de la prueba, deberá pararse en la espuma en la misma posición que antes, pero deberá mantener los ojos cerrados.</p> <p>¿Está listo? Párese en la espuma. Ponga los brazos cruzados sobre el pecho. Ponga los pies juntos.</p> <p>Cierre los ojos y comencemos. (Quickly press the USB button.)</p>
<p>Trial Over:</p> <p>Open your eyes and relax. Step off the foam.</p>	<p>Trial Over:</p> <p>Abra los ojos y descanse. Puede bajarse de la espuma.</p>
<p>Repeat Condition 4</p> <p>When you are ready, could we try that again?</p>	<p>Repeat Condition 4</p> <p>Cuando esté listo, ¿podemos intentarlo otra vez?</p>

<p>Start Condition 5</p> <p>For this last balance test, you will stand on the foam with your eyes closed, your arms crossed, and your feet together, but this time please move your head from side to side, as when you shake your head to say “No”. Turn your head to the beat of the metronome. [DEMONSTRATE] See, it’s not fast.</p> <p>Are you ready?</p> <p>Step up on the foam. Cross your arms. Put your feet together.</p> <p>Close your eyes and begin turning your head. (Quickly press the USB button.)</p>	<p>Start Condition 5</p> <p>Para esta última prueba de equilibrio, deberá pararse en la espuma con los ojos cerrados, los brazos cruzados sobre el pecho y los pies juntos, pero esta vez debe girar la cabeza de lado a lado, como cuando uno niega algo con la cabeza. Mueva la cabeza al ritmo del metrónomo. [DEMONSTRATE] No es rápido.</p> <p>¿Está listo?</p> <p>Párese en la espuma. Ponga los brazos cruzados sobre el pecho. Ponga los pies juntos.</p> <p>Cierre los ojos y comience a girar la cabeza. (Quickly press the USB button.)</p>
<p>Trial Over:</p> <p>Stop. Open your eyes and step off the foam.</p>	<p>Trial Over:</p> <p>Descanse. Puede abrir los ojos y bajarse de la espuma.</p>
<p>Repeat Condition 5:</p> <p>When you are ready, could we try that again?</p>	<p>Repeat Condition 5:</p> <p>Cuando esté listo, ¿podemos intentarlo otra vez?</p>
<p>MRT Test Complete:</p> <p>We are finished with this part. After I remove the belt, please have a seat while I finish recording these results.</p>	<p>MRT Test Complete:</p> <p>Hemos terminado esta parte. Después de que le quite la correa, puede sentarse mientras termino de registrar los resultados.</p>

<p>PART 2 - Lensmeter</p> <p>Ask questions first</p> <p>IF SP WEARS GLASSES: Next, I would like to take a measurement of the lenses in your eyeglasses using this machine. The machine will not harm your lenses in any way. May I have your glasses to take the measurements?</p> <p>IF NECESSARY: Is it okay if I clean your glasses first?</p>	<p>PART 2 - Lensmeter</p> <p>Ask questions first</p> <p>IF SP WEARS GLASSES: Ahora, quisiera medir los lentes de sus anteojos usando esta máquina. La máquina no dañará sus lentes. ¿Podría darme sus anteojos para tomar las mediciones?</p> <p>IF NECESSARY: ¿Está bien si primero limpio los anteojos?</p>
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<p>PART 3 - Contrast Sensitivity Test</p> <p>Vision is an important part of a person's ability to keep their balance. I am going to test your vision as it relates to balance.</p>	<p>PART 3 - Contrast Sensitivity Test</p> <p>La visión es una parte importante de la capacidad de una persona de mantener el equilibrio. Voy a hacerle una prueba de la visión relacionada con el equilibrio.</p>
<p>For this test, please read the numbers from the card in front of you from left to right. Keep your head still for this test. The numbers will get lighter and lighter until you may not be able to see them anymore. Don't be afraid to guess if you're unsure about a number.</p> <p>Start reading the numbers slowly from left to right.</p>	<p>Para esta prueba, por favor lea los números en la tarjeta de izquierda a derecha. Mantenga la cabeza quieta para esta prueba. Los números se harán cada vez más tenues o más claros hasta que casi no pueda verlos. Si no está seguro, puede dar respuestas aproximadas.</p> <p>Comience a leer los números despacio de izquierda a derecha.</p>
<p>We are done with this test.</p>	<p>Hemos terminado esta prueba.</p>

<p>PART 4 - DVA Test</p> <p>DVA Introduction</p> <p>SP eligible for STATIC ONLY: Now, we will be doing one more test of your vision. Please look at the computer screen in front of you.</p> <p>SP eligible for ALL PARTS: For this last test, we are going to measure how well you see while moving. Please look at the computer screen in front of you and keep your head still.</p>	<p>PART 4 - DVA Test</p> <p>DVA Introduction</p> <p>SP eligible for STATIC ONLY: Ahora vamos a hacer una prueba más de la vista. Por favor, mire la pantalla de la computadora en frente de usted.</p> <p>SP eligible for ALL PARTS: En esta última prueba, vamos a medir qué tan bien ve cuando se mueve. Por favor, mire la pantalla de la computadora en frente suyo y mantenga la cabeza quieta.</p>
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<p>DVA Part 1 – Head Still (Static)</p> <p>You will see the letter “C” facing different directions – right, left, up, and down. When the direction changes, please tell me the direction the opening of the “C” is facing. (DEMONSTRATE) The “Cs” will gradually become smaller and smaller until you cannot see them clearly anymore. Please make your best guess as to which way the “C” is facing until I stop the test. Do you have any questions?</p>	<p>DVA Part 1 – Head Still (Static)</p> <p>Verá la letra “C” mirando hacia distintos lados - hacia la derecha, hacia la izquierda, hacia arriba y hacia abajo. Cuando la posición cambie, dígame hacia qué lado está mirando la “C”. (DEMONSTRATE) La letra se irá haciendo cada vez más pequeña hasta que no pueda verla con claridad. Déme respuestas aproximadas sobre la dirección en que mira la letra “C” hasta que le pida que se detenga. ¿Tiene alguna pregunta?</p>
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<p>DVA Part 2 – Head Moving Side-to-Side</p> <p>Now I will ask you to tell me again which way the “Cs” are facing, but this time you will be moving your head from side-to-side, similar to shaking your head when you say “no.” I’m going to place this headband (SHOW HEADBAND) on your head. It will tell the computer if your head is moving at the right speed. The “Cs” will not appear if you are moving your head too slow.</p> <p>First, we will practice to make sure you understand what I need you to do. If you have any discomfort during the practice, please tell me. [PRACTICE – DON’T MAKE “C” SMALLER]</p> <p>Now, we will start the test. This time, the “C” shapes will get smaller. As the Cs get smaller, please continue to make your best guess. Wait for me to tell you to start.</p> <p>Begin.</p>	<p>DVA Part 2 – Head Moving Side-to-Side</p> <p>Ahora, le volveré a pedir que me diga hacia qué lado mira la “C”, pero esta vez deberá girar la cabeza de lado a lado, como cuando uno niega algo con la cabeza. Le pondré esta cinta (SHOW HEADBAND) en la cabeza. La cinta le informa a la computadora si usted está moviendo la cabeza a la velocidad correcta. Las letras “C” no aparecerán si mueve la cabeza demasiado despacio.</p> <p>Primero, haremos una práctica para ver si mis instrucciones fueron claras. Avíseme si durante la práctica algo le molesta. [PRACTICE – DON’T MAKE “C” SMALLER]</p> <p>Comencemos la prueba. Esta vez, las letras “C” se irán haciendo cada vez más pequeñas. A medida que las “C” se hagan más pequeñas, continúe dándome respuestas aproximadas. Espere a que le diga que comience.</p> <p>Comience.</p>
<p>We’re going to do that one more time. Wait for me to tell you to start. Begin.</p>	<p>Vamos a hacer la prueba una vez más. Espere a que le diga que comience. Comience.</p>
<p>Stop and relax.</p>	<p>Descanse.</p>

<p>DVA Part 3 – Head Moving Up-and-Down</p> <p>For the last part of the test, you’re going to do the same thing as before but this time you will be moving your head up-and-down, similar to shaking your head when you say “yes.” (SET HEADBAND TO VERTICAL)</p> <p>As before, if you are moving your head too slow, the “Cs” will not appear.</p> <p>Let’s practice first. If you have any discomfort during the practice, please tell me. [PRACTICE – DON’T MAKE “C” SMALLER]</p> <p>Let’s start the test. This time, the “C” shapes will get smaller, until you can no longer tell where the “C” is pointing. Please continue to make your best guess. Wait for me to tell you to start.</p> <p>Begin.</p>	<p>DVA Part 3 – Head Moving Up-and-Down</p> <p>Para esta última parte de la prueba, tendrá que hacer lo mismo que antes, pero esta vez deberá mover la cabeza hacia arriba y hacia abajo, como cuando uno afirma algo con la cabeza. (SET HEADBAND TO VERTICAL)</p> <p>Al igual que antes, si mueve la cabeza demasiado despacio, las “Cs” no aparecerán en la pantalla.</p> <p>Hagamos una práctica. Avíseme si durante la práctica algo le molesta. [PRACTICE – DON’T MAKE “C” SMALLER]</p> <p>Comencemos la prueba. Esta vez, las “Cs” se irán haciendo cada vez más pequeñas hasta que ya no pueda ver hacia qué lado mira la “C”. Le recuerdo que puede dar respuestas aproximadas si no está seguro. Espere a que le diga que comience.</p> <p>Comience.</p>
<p>We’re going to do that one more time. Wait for me to tell you to start. Begin.</p>	<p>Vamos a hacer la prueba una vez más. Espere a que le diga que comience. Comience.</p>
<p>DVA Test Complete</p> <p>We’re all done. Thank you for your hard work!</p>	<p>DVA Test Complete</p> <p>Hemos terminado. Gracias por participar.</p>

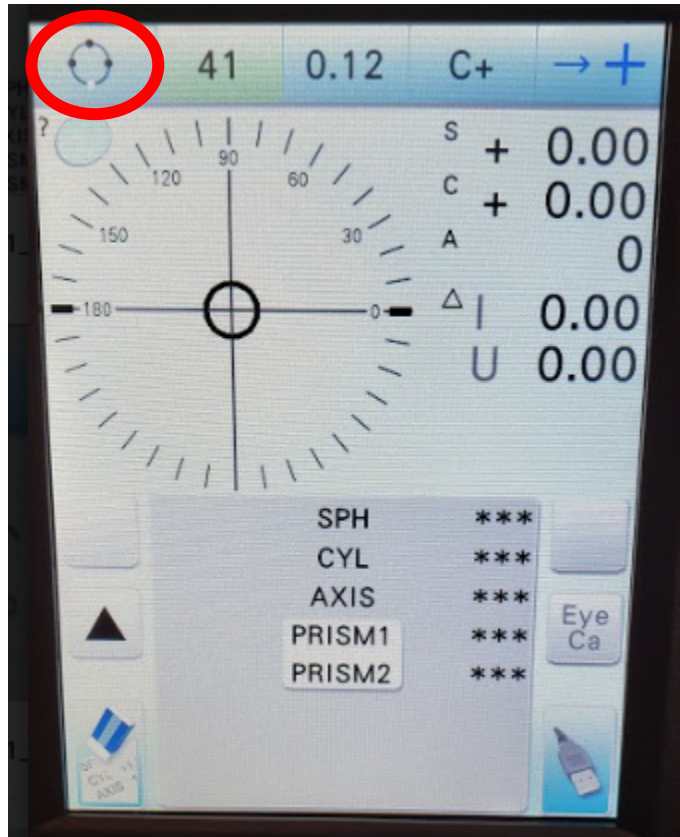
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Appendix B
Lensmeter Settings

Appendix B Lensmeter Settings

To access the parameter settings on the lensmeter, tap the top left icon on the screen



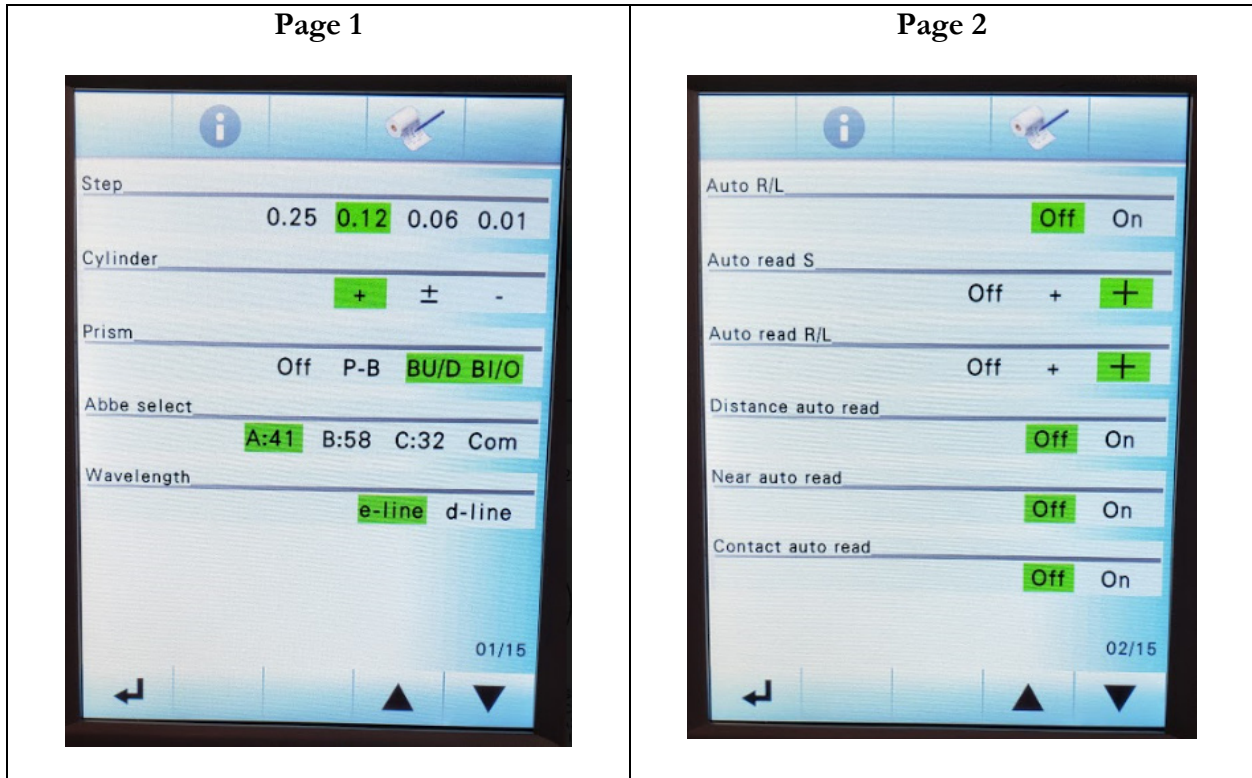
The lensmeter has 15 pages of settings. To move from one screen to the next, use the arrows on the bottom right corner of the screen.



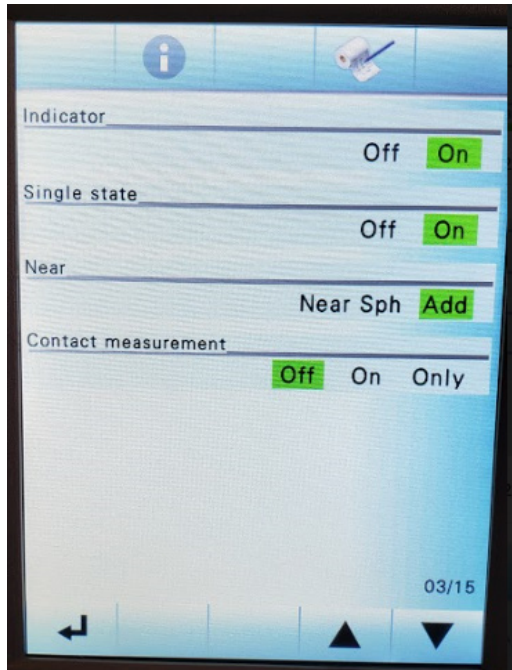
To return to the measuring screen, press the arrow in the bottom left corner of the screen.



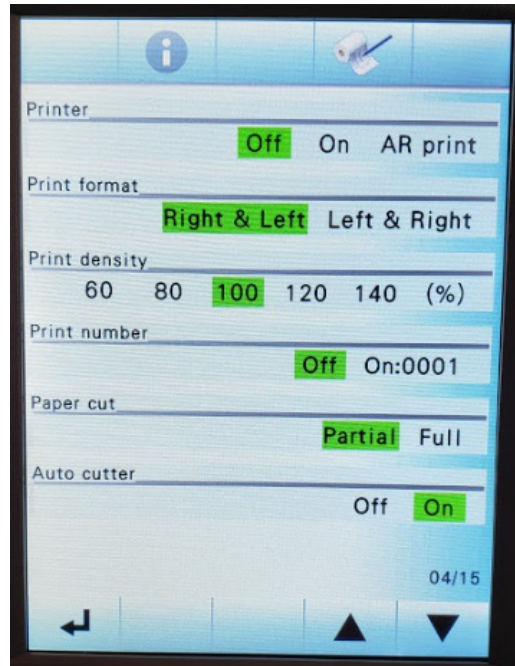
The correct settings for NHANES are as follows:



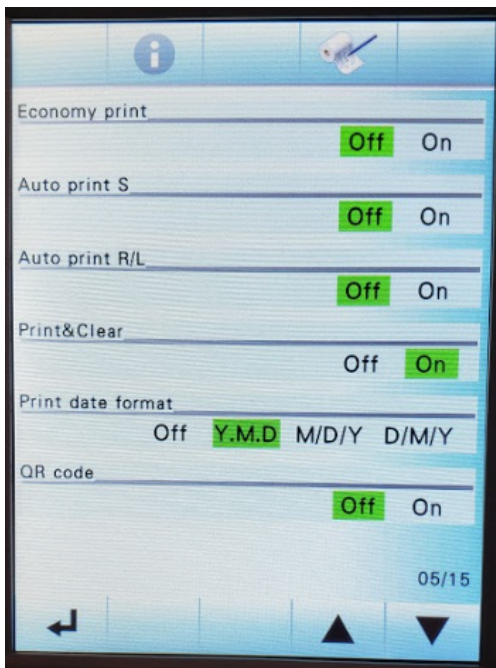
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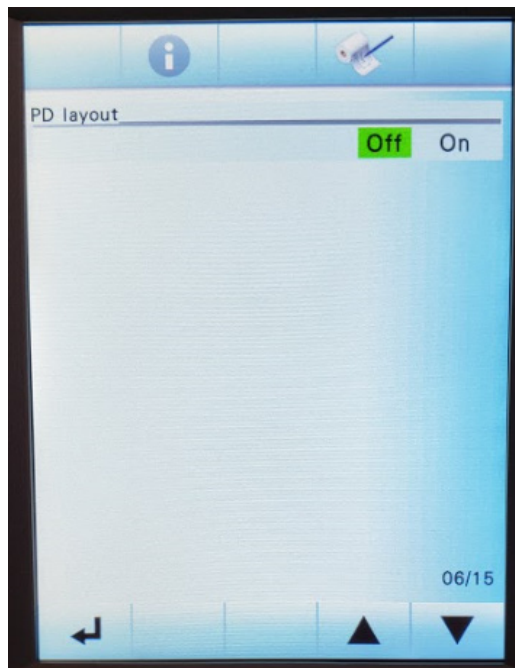
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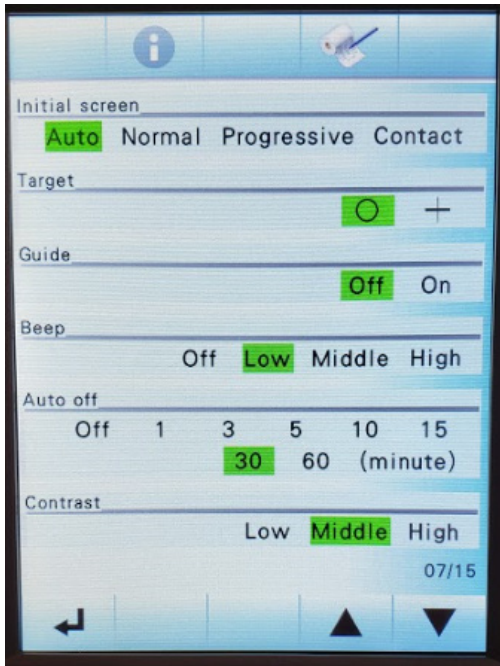
Page 5



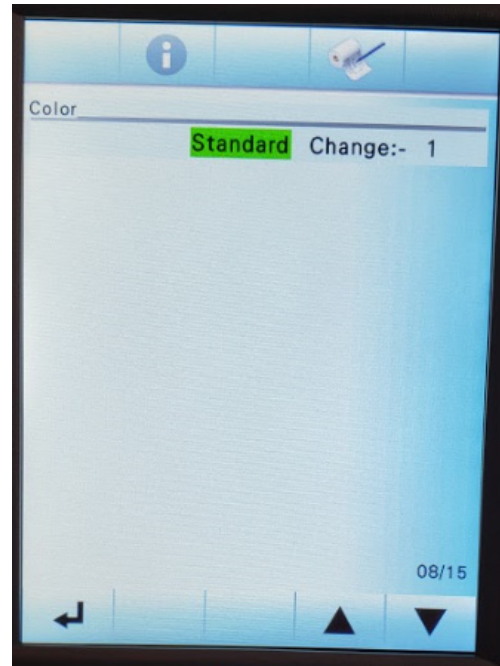
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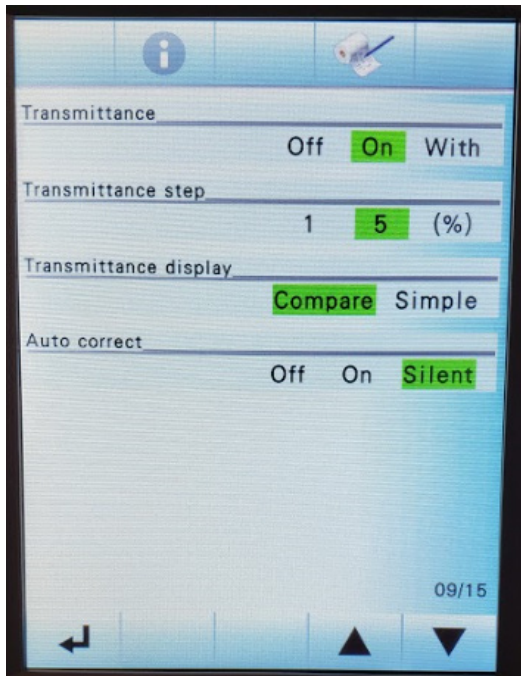
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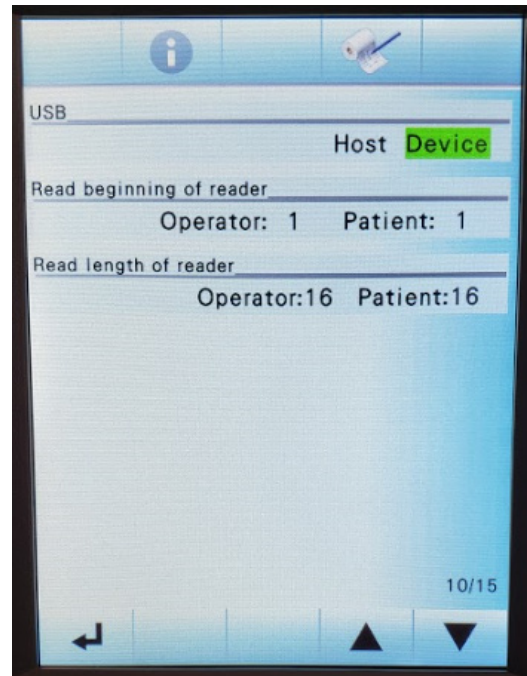
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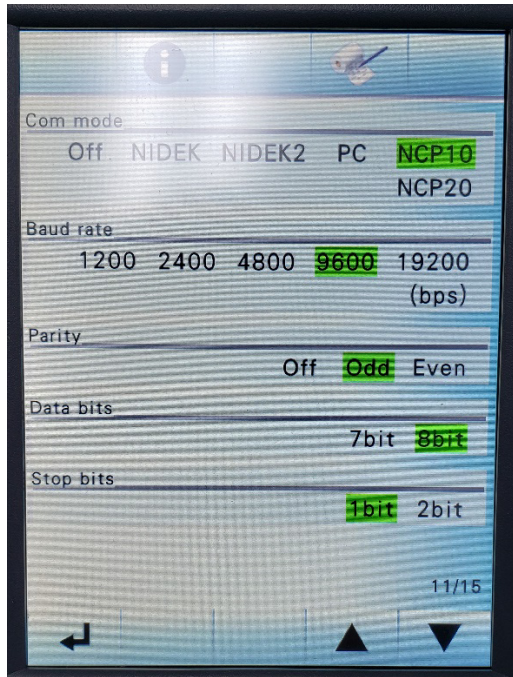
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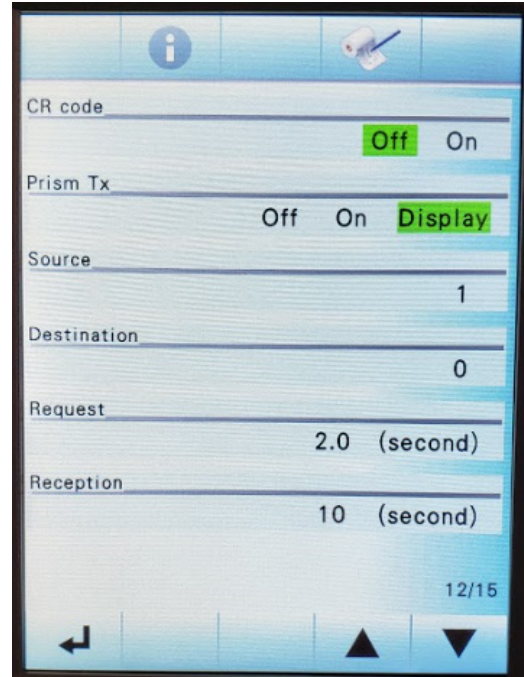
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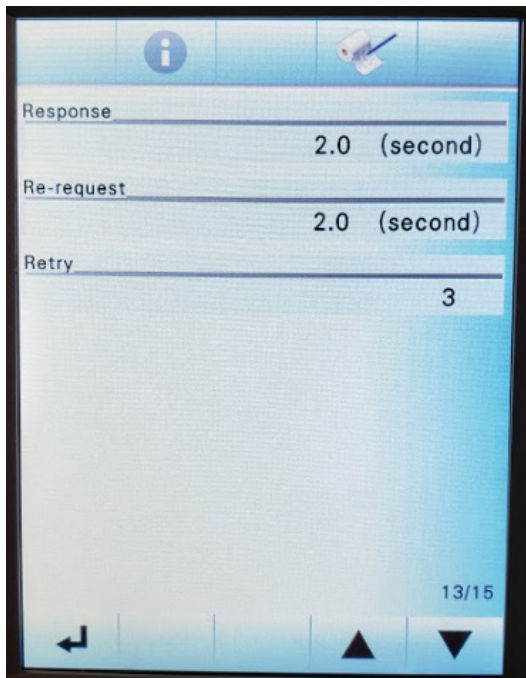
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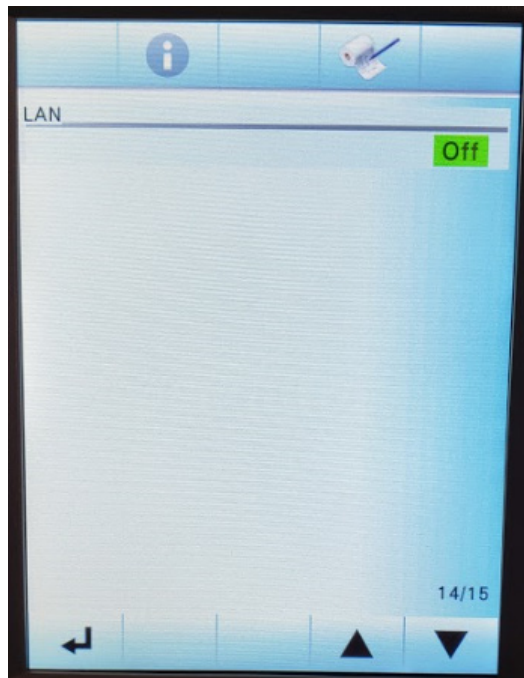
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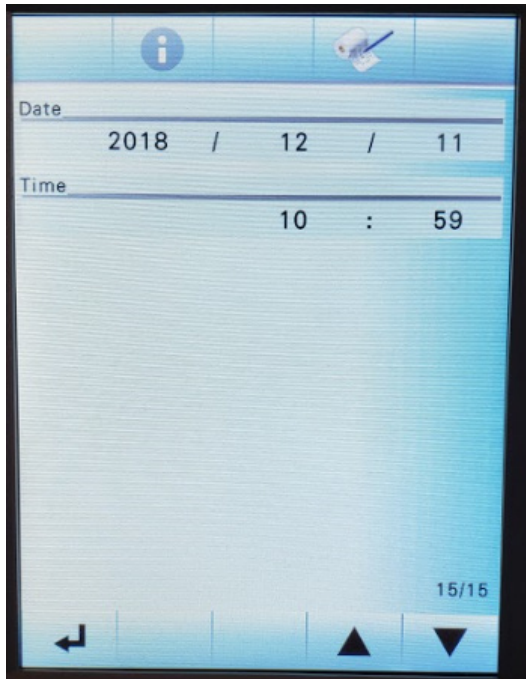


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* Leave time zone on Eastern Standard Time

Appendix C
Examples of Report of Findings

Appendix C

Examples of Report of Findings

A preliminary and final Report of Findings will be provided to participants after the MEC exam.

Examples of the Preliminary Report of Findings

If Wearing Eyeglasses or Contacts for the Static Visual Acuity Test

We have done a quick check of your vision in both eyes together. This does not take the place of a full eye exam done by an eye doctor such as an ophthalmologist or optometrist. These results may differ from a vision exam you may have by an eye doctor. With eyeglasses or contacts your combined right eye and left eye distance vision is 20/____.

[For SPs with vision 20/25 or better in both eyes with their current correction (either no correction, distance eyeglasses and/or contact lenses), this additional text will be included in the report:]

This is a good level of vision. We have not done a full eye examination, so you should continue your usual schedule of regular examinations by your eye doctor.

[For SPs with vision worse than 20/25 in both eyes with their current correction (either no correction, distance eyeglasses and/or contact lenses), this additional text will be included in the report:]

This level of vision is not as good as most people's vision. If you were not already aware of this, you should see an eye doctor to see if he/she can improve your vision. Your eye doctor can also provide you with a full eye examination.

If not Wearing Eyeglasses or Contacts for the Static Visual Acuity Test

We have done a quick check of your vision in both eyes together. This does not take the place of a full eye exam done by an eye doctor such as an ophthalmologist or optometrist. These results may

differ from a vision exam you may have by an eye doctor. Without eyeglasses or contacts your combined right eye and left eye distance vision is 20/ ____.

[For SPs with vision 20/25 or better in both eyes with their current correction (either no correction, distance eyeglasses and/or contact lenses), this additional text will be included in the report:]

This is a good level of vision. We have not done a full eye examination, so you should continue your usual schedule of regular examinations by your eye doctor.

[For SPs with vision worse than 20/25 in both eyes with their current correction (either no correction, distance eyeglasses and/or contact lenses), this additional text will be included in the report:]

This level of vision is not as good as most people's vision. If you were not already aware of this, you should see an eye doctor to see if he/she can improve your vision. Your eye doctor can also provide you with a full eye examination.

Examples of the Final Report of Findings

Balance

You performed a Modified Romberg test for balance during your examination. This screening test is listed by the Centers for Medicare and Medicaid (CMS) Physician Quality Reporting System for fall risk assessment.

[For SPs who passed conditions 1 – 5 of the MRT, this additional text will be included in the report:]

Based on the Modified Romberg screening test, you are not at risk for falling.

[For SPs who passed conditions 1 – 4 of the MRT but not condition 5, this additional text will be included in the report:]

Based on the Modified Romberg screening test, you passed. When testing your inner ear function with balance, you may be at risk for falling.

For SPs who did not pass conditions 1 – 4 of the MRT, this additional text will be included in the report:]

Based on this screening test, you may be at risk for falling. We highly recommend that you discuss this result with your doctor.

Contrast Sensitivity

During your examination, your visual contrast sensitivity was tested using the Mars Contrast Sensitivity Test charts. Contrast sensitivity measures the ability to see details at low contrast levels (that is, light versus darker images). Contrast sensitivity is also important for mobility, where we need to see such low contrast forms as the curb, faint shadows, and stairs when walking down. The result of your screening test is: {PASS/FAIL}

For SPs who did not pass, this additional text will be included in the report:]

We recommend that you follow up with your doctor or eye care professional to discuss these results.

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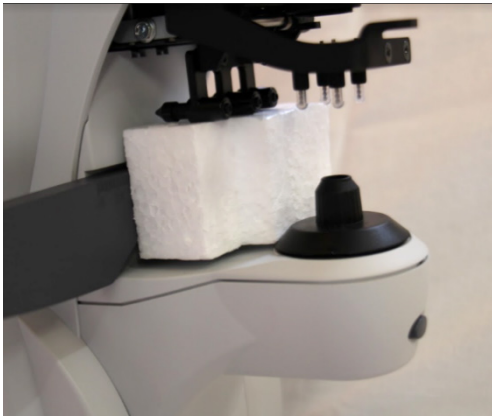
Appendix D
Packing the Lensmeter

Appendix D

Packing the Lensmeter

Pack the lensmeter for transit using the steps below.

Step 1



Step 2



Step 3



Step 4



Step 5



Step 6



Step 7

