

> > > VISION SCREENER



Titmus V4 / Titmus V2

User Instruction Manual



Preface

This Instruction Manual was prepared by Sperian Protection Optical, Inc. for both first-time and experienced users of the Titmus V4 / Titmus V2 models of the vision screener. To ensure the safe operation of the Titmus V4/ Titmus V2 Vision Screener, the user should read the entire instruction manual before operation of the unit. Keep this manual for future reference.

Patent Nos.
US 7,390,091
US 6,505,937

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Warranty, Standards & Technical Data

Warranty

Sperian Protection Optical, Inc. warrants the Titmus VSeries against defects in materials and workmanship for a period of two (2) years from the date of purchase. Warranty includes the light module. Sperian will, as its option, repair or replace the instrument during the warranty period within a reasonable time after receipt of written notice from the buyer. To receive consideration for warranty repair or replacement procedures, product must be returned in its original packaging. If original packaging is not available, this can be obtained from Sperian at a nominal cost. It is necessary to obtain Return Authorization Number from Sperian prior to shipment. This warranty does not cover accessories or damages sustained in transit, or as a result of the buyer's misuse, neglect or carelessness, or by events beyond the control of Sperian. All correspondence must include the instrument serial number. Failure to return the completed registration card will void the warranty. Warranty valid only when purchase or repair is made from Sperian or an authorized Sperian Distributor.

Standards

The TITMUS™ Vision Screener conforms to the following UL, CSA and CE Standards.

USA:	AAMI ES 60601-1
Canada:	CSA-C22.2, No. 601.1-M90, Category 245 <i>Device Type per the Canadian Medical Device Regulations</i> Class I Device
CB Scheme:	IEC 60601-1
Europe:	EN 60601-1, IEC 60601-1, Third edition Emissions: Group 1, Class A <i>Applicable Directive</i> Annex VII, Medical Device Directive 93/42/EEC <i>Classification</i> Class I, Annex IX of MDD 93/42/EEC Non-sterile, Non-measuring device



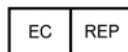
The CE mark on this device indicates it has been tested to and conforms to the provisions noted within the 93/42/EEC Medical Device Directive

Technical Data

Power Supply:	110-240 VAC, 0.4A-0.2A, 50/60 Hz
Fuse Rating:	2 A, 250 V, Type – T (time delay)
Cords:	1. Power cord, length 3 meters Note: Customer must contact TITMUS to obtain replacement cords or alternate voltage cords (240V). 2. <u>Titmus V4 only</u> : Control panel cord, IEEE 1394 FireWire connector, length 1.00 meter
Illumination:	As per ISO 8596 and ANSI Z80.21 Standards
Dimensions:	W X L X H units 11.00 X 17.00 X 7.75 inches (closed condition) 28 X 43 X 19 cm (closed condition)
Weight:	13 lbs / 6 kg
Temperature:	+50°F to +104°F (+10°C to +40°C)
Humidity:	30% to 75% (non-condensing)
Pressure:	80-106 kPa
Altitude:	1000 ft below sea level to 6000 ft above sea level



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Introduction

The Importance of Vision Screening

The eyes are a person's windows to the world. Without good vision, one can experience a sense of helplessness and may even suffer in other skills necessary for a full and functional lifestyle. Utilizing the Titmus VSeries vision screeners, you will quickly be capable of assessing whether a person's vision is within the normal parameters. Visual abnormalities will be revealed, often motivating action for a referral for further visual examination and possibly a much-needed visual correction. Consequently, that person's quality of life can be enhanced. The vision screener is capable of testing functions not determined by the typical "wall" or "eye" chart. Binocularity, muscle balance, color perception, acuity at near and far, color deficiency, depth perception, and a myriad of other visual functions can be screened. The wall chart screens for acuity only, leaving many visual abnormalities unidentified.

About the "TITMUS"

Sperian is the new name of Titmus. Titmus Optical set the standard for vision screening instruments in 1959 with the introduction of the OV7 model vision screener. Often referred to as the "TITMUS," the older OV7 model as well as the later-generation TITMUS Model 2, are still in use in many industrial locations, optical practices, as well as schools nationwide. The screeners are known for their durability.

As the market leader, TITMUS has developed the new Titmus VSeries of vision screeners. Designed to meet the unique needs of the 21st century, the Titmus VSeries will be a welcome tool because of its convenience, accuracy, and versatility.

Titmus VSeries Model Comparison

Titmus VSeries

The Titmus VSeries vision screeners are ergonomically-designed, precision-built stereoscopic instruments providing precise and prompt measurement of visual performance. The screeners are engineered for accuracy, validity, and reliability of the test results, with emphasis on convenience and ease of administration.

The Titmus VSeries consists of a variety of models. This manual covers the following models – **Titmus V4, Titmus V2.**

Model	Titmus V4	Titmus V3	Titmus V2
Control Panel	•	•	
Built-In Membrane Switches			•
Electronic Pointing System		•	
Ergonomics (Height Adjustment)	•	•	•
New Fluorescent Light Source	•	•	•
Portability	•	•	•
Soft Foam Headrest	•	•	•
Head Positioning Sensor	•	•	
Peripheral Vision Testing	•		•
Test Slide Advance/Reverse	Control Panel	Control Panel	Manual
Night Vision Testing	•		
Carrying Case	Optional	Standard	Optional
Standard Accessories	•	•	•

Standard & Optional Accessories

Standard Accessories

The following accessories are supplied with your Titmus VSeries vision screener:

- Power cord
- Control Panel cord (only with Titmus V4)
- Vision Screener User Instruction Manual
- Slide Information Brochure (based on slide set purchased by you)
- Record Forms – 1 pad of 100 forms to record test results
- Eight (8) Test Slides (mounted on a drum inside the vision screener)
- Accessory Case with –
 - 10 Lens Cleaning Wipes
 - 3 Fog Eliminator Cloths
 - 1 Dust Cover for instrument storage
- Other standard accessories based on Slide Set:
 - Occupational Job Standards Book
 - Aeromedical 32" Lens, 2 Prism Lenses
 - Professional +1.75 Lens, Training Cards
 - Pediatric +1.75 Lens, Training Cards
 - School +1.75 Lens, Training Cards
 - Preschool +1.75 Lens, Training Cards

Optional Accessories

- Carrying Case – soft-sided with wheels, for easy transport of vision screener
- Intermediate Lens to test vision at following distances: 19, 22, 26, 32 and 40 inches (50, 57, 67, 80 and 100 cm)
- Plus Lens for testing children's vision: +1.00, +1.50, +1.75 and +2.25

Unpacking the Instrument

Your Titmus™ vision screener may be supplied in a cardboard box or with an optional soft-sided carrying case. If supplied in a box, remove top foam and lift instrument out of the box by holding the sides. If supplied in a carrying case, unzip the case to remove the instrument.

Step 1



Step 2



Step 3: Titmus V4 accessories (includes control panel).



Step 3: Titmus V2 accessories (NO control panel).



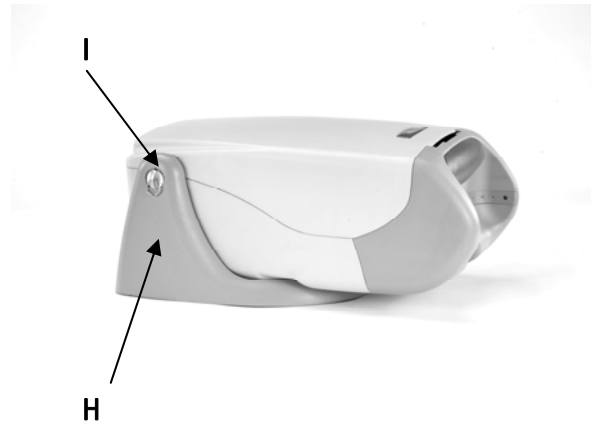
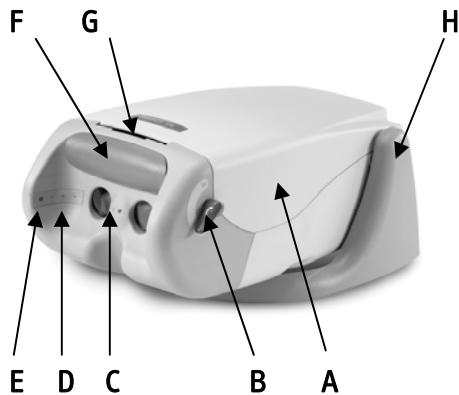
Step 4



Step 5



Titmus V4 External Features



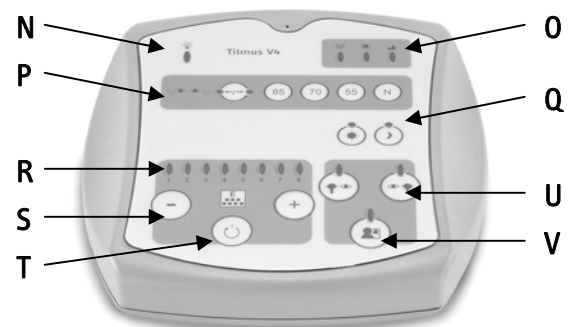
Front / Side/ Rear View

- A Removable cover for access to slides and light source
- B Lever for far/near lenses
- C Vision screening at far (20') and near (14")
- D Peripheral vision test lights
- E Head sensor to detect correct positioning
- F Comfortable foam headrest
- G Slots for intermediate/plus lens
- H Base of instrument
- I Base unlock clip to move unit into open position
- J Plug-in for power cord
- K On/off switch
- L Fuse holder
- M Plug-in for control panel cord

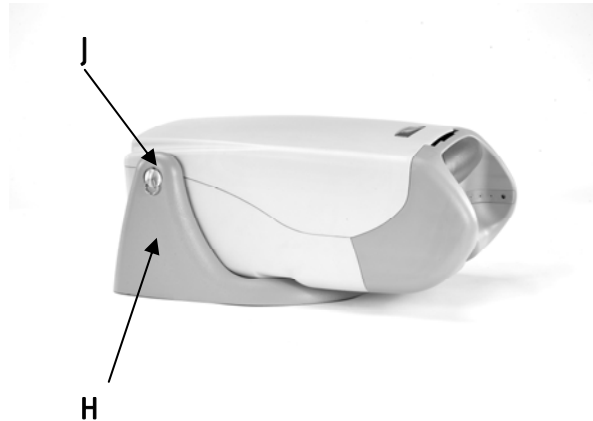
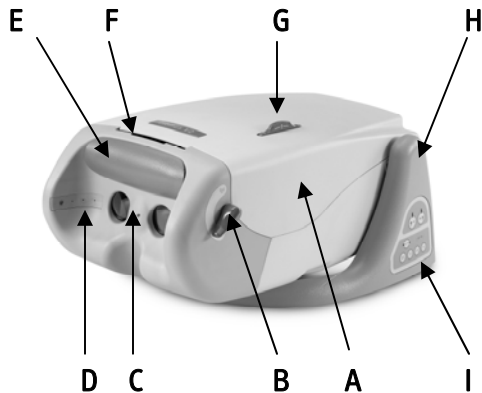


Control Panel

- N Light source condition
- O Test distance - near, intermediate or far
- P Peripheral vision screening
- Q Day or night illumination condition
- R Test Slide position
- S Test Slide advance/reverse
- T Reset control panel
- U Occlude each eye, light ON indicates eye being tested
- V Head position indicator/sensor deactivate



Titmus V2 External Features



Front / Side/ Rear View

- A Removable cover for access to slides and light source
- B Lever for far/near lenses
- C Vision screening at far (20') and near (14")
- D Peripheral vision test lights
- E Comfortable foam headrest
- F Slots for intermediate/plus lens
- G Wheel to advance/reverse test slides
- H Base of instrument
- I Membrane switches
- J Base unlock clip to move unit into open position
- K Plug-in for power cord
- L On/off switch
- M Fuse holder

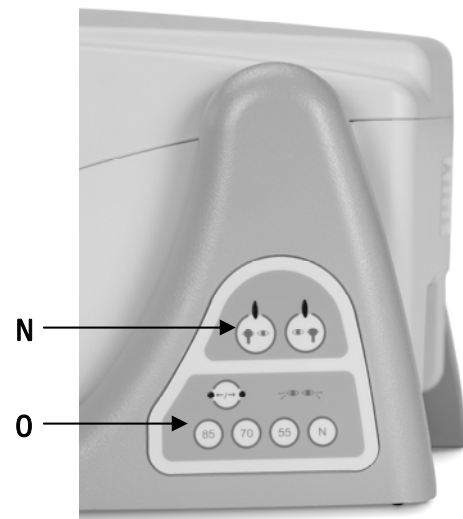


Membrane Switches

- N Occlude each eye, light ON indicates eye being tested
- O Peripheral vision screening



NOTE: THE TITMUS V2 DOES **NOT** HAVE A CONTROL PANEL.



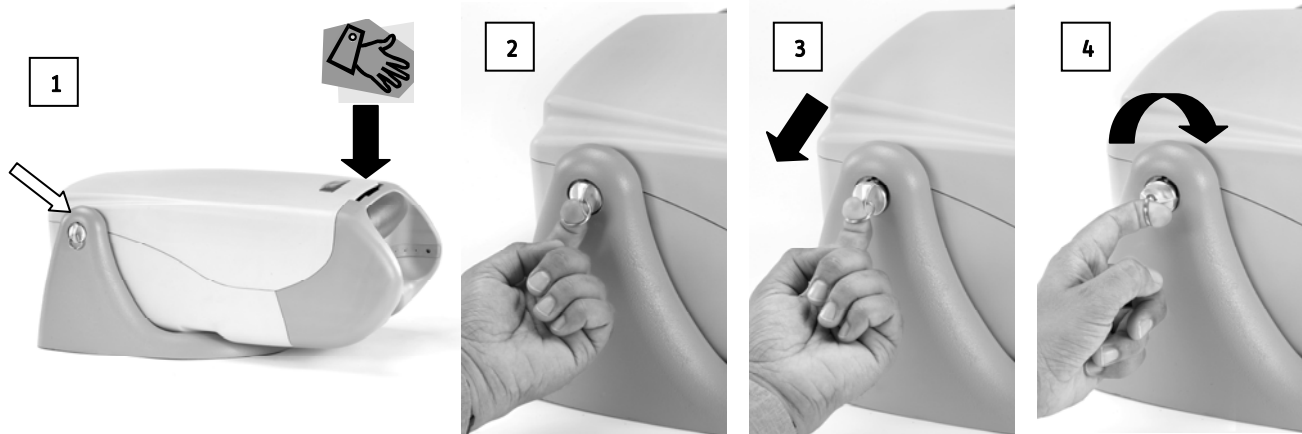
Operation of the Vision Screener

Unlock/Lock the instrument for height adjustment

Locate the lock at the side of the instrument. Follow the steps as shown in the images.

Steps 1-4:

- Push down on the FRONT of the unit with one hand as shown by the arrow.
- Using the other hand, pull and twist the latch to unlock, as shown in the images.



LOCK:

- ENSURE UNIT IS IN CLOSED POSITION AS ABOVE.
- Turn the lock until it clicks into place. A clicking sound can be heard when locked.
- After locking, turn the lock slightly to ensure that it does not rotate.
- The instrument now CANNOT be raised for height adjustment and will remain in a closed position for transport.



ALWAYS CHECK THE LOCK BEFORE LIFTING INSTRUMENT FOR TRANSPORT.

Height Adjustment

The height adjustment is designed for patient comfort. The Titmus VSeries can be adjusted to fit children and adults of varying heights in a standing or seated position. This is essential for accurate testing. The instrument height can be adjusted by the operator or the patient. To adjust the height, refer to the image.



Operation of the Vision Screener (continued)

Operating the Far/Near Lever

1. Operator is seated on the right side of the instrument.
2. To move the lever from FAR to NEAR and back, move the lever as shown.

FAR VISION TESTING (20 feet)



NEAR VISION TESTING (14")



For Near Vision Testing:

This applies especially for patients who wear bifocals, multifocals or progressive lenses.

1. Ask the patient to place hands on the instrument as shown.
2. Ask patient to use thumbs to raise glasses until he/she is viewing the slide through the proper part of his/her lens for reading.
3. Ensure that the patient is comfortable.



Intermediate Vision Testing & Using Plus Lens

- Ensure lever is in FAR position. Place lens in the holder.
- The lens must be inserted in the slot with the label facing the front of the instrument.
- Perform test.
- REMOVE lens upon completion of test.



CAUTION: Do not turn the FAR/NEAR lever while the lens is in the instrument. This may damage the instrument.

Using Plus Lens:

The plus lens must be inserted in the slot with the label facing the front of the instrument.

- The Plus Lens, +1.75, is used with the Acuity Test for children. Other plus lenses are also available as optional accessories.
- Standard testing procedure requires that acuity test is administered first. If child demonstrates poor visual acuity (20/40), it is unnecessary to administer the Plus Lens Test. If the child demonstrates 20/30 or 20/20, administer the Plus Lens Test.
- Children with normal vision will be unable to read the 20/20 line through the Plus Lens. If a child can read the 20/20 line through the Plus Lens, then result is FAIL. Blurred vision through Plus Lens is normal, clear distance vision is abnormal and can indicate excessive farsightedness. This test is very important for school age children.



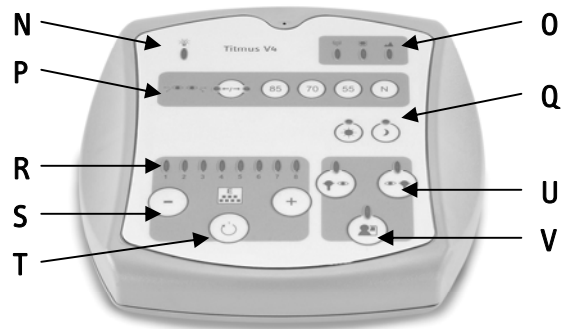
Operation of the Vision Screener (continued)

Operating the Titmus V4 using the Control Panel

Connect the panel to the vision screener using the cord shown.

Control Panel Operating switches

- N** *Light source condition*
Normally in a steady state.
Note: On start-up, this indicator flashes for approximately 1 minute then becomes steady – this indicates that minimum illumination level is reached in order to start testing.
If this indicator keeps flashing continuously, light module needs to be replaced.
- O** *Test distance - near, intermediate or far*
Indicates the test distance,
Book: NEAR at 14”
Computer: Intermediate (based on the lens used, between 19”-40”)
Mountain: FAR at 20 feet
- P** *Peripheral vision screening (horizontal only)*
Use the button with arrows to select left or right eye to be tested.
Use the buttons with numbers - 85, 70, 55 and N to operate the lights at 85°, 70°, 55° and Nasal (45°) for peripheral vision testing.
- Q** *Day or night illumination condition*
Press button with the image of the sun for daylight vision testing. This is the default illumination level.
Press button with the image of the moon for night vision testing.
- R** *Test Slide position*
Number indicates the Test Number. Refer to your Slide Information Brochure for tests at each position.
- S** *Test Slide advance/reverse*
Select “+” to advance to next test, “-” to go back to previous test.
- T** *Reset control panel*
This will reset the instrument and all buttons on the control panel to the initial start-up condition of the instrument. Test Slide drum will reset to Test No. 1.
- U** *Occlude each eye, light ON indicates eye being tested*
These buttons activate Occlude Shutters that occlude each eye (clicking sound).
Indicator light ON indicates that the eye is being tested.
If indicator light is OFF, eye is occluded.
Left button is for Left Eye, Right button is for the Right Eye.
- V** *Head position indicator/sensor deactivate*
Indicates if the head of patient is correctly positioned. If no indication, head is not correctly positioned.
Note: To override the head sensor, press the button, light on indicator will start flashing. This indicates that the head sensor has been deactivated. Use ONLY if patient tends to move head causing the test slide illumination to go ON/OFF. Override may be used with younger children who tend to squirm when testing.



Operation of the Vision Screener (continued)

Operating the Titmus V2

- G *Wheel to advance/reverse test slides*
Indicates test slide position



Correct Position of wheel

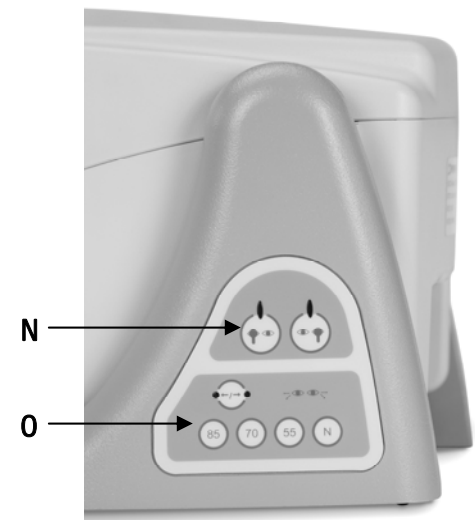


Incorrect Position of wheel



I *Membrane switches*

- N *Occlude each eye, light ON indicates eye being tested*
These buttons activate Occlude Shutters that occlude each eye (clicking sound).
Indicator light ON indicates that the eye is being tested.
If indicator light is OFF, eye is occluded.
Left button is for Left Eye, Right button is for the Right Eye.
- O *Peripheral vision screening (horizontal only)*
Use the button with arrows to select left or right eye to be tested.
Use the buttons with numbers - 85, 70, 55 and N to operate the lights at 85°, 70°, 55° and Nasal (45°) for peripheral vision testing.



Testing using the Vision Screener

Preparation for Testing

1. Place the instrument on a table of conventional height with sufficient top area to permit test administrator to manipulate controls and record results.
2. Unlock height adjustment lock. **See section Unlock/Lock the instrument for height adjustment.**
3. Titmus V4: Connect panel to instrument using panel cord. *No connection needed for the Titmus V2.*
4. Connect power cord to instrument and turn switch ON.
5. Test all control switches to ensure proper operation.
6. Check lenses to ensure they are clean. Use cleaning towlettes or fog cloths (if lens are fogging).
7. Place record forms and other accessories near the instrument, ready for use.
8. Avoid positioning the instrument where strong glaring light will shine directly into the instrument or into the subject's face.
9. Clean the headrest foam and the front of the instrument.



CAUTION: Ensure that the headrest foam and instrument front is cleaned prior to testing another patient. This is to prevent the spread of diseases or infections.

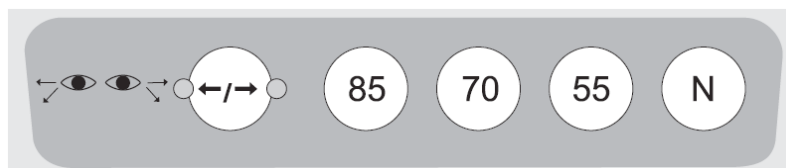
10. The patient should be seated comfortably. **See section Patient Positioning.**
11. Raise the instrument for comfortable viewing, based on patient height. Move instrument up/down. **See section Height Adjustment.**
12. Ensure lever is in FAR position.
13. Follow the Slide Information Brochure and Record Form provided with specific models for test sequencing and recording.

Patient Positioning

- Patient must be comfortably seated or standing.
- Ensure forehead is placed on headrest.
- Ensure that back is straight and neck is not tilted backwards.
- Do not let patient continue looking at slide after test is finished.
- Proceed to next test.

Peripheral Vision Testing

Refer to the sections Titmus V4 Control Panel and the Titmus V2 Membrane Switches, for location of peripheral vision testing control switches.



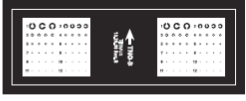
1. When the instrument is switched ON, the LEFT EYE light will come on first. On the button with arrows, light next to LEFT arrow will be lit.
2. The LEFT EYE can now be tested for Horizontal Peripheral Vision.
3. Press 85, 70, 55 to operate the lights at 850, 700, 550 in the Temporal field.
4. Press N to operate the light at 450 in the Nasal field.
5. Press the button with arrows to test RIGHT EYE for Horizontal Peripheral Vision test. The light next to RIGHT arrow will be lit, light next to LEFT arrow will go off.
6. Repeat the process with the 85, 70, 55 and N for the RIGHT EYE.

Testing & Interpretation of the Test results

Please refer to the “**Slide Information Brochure**” supplied with your instrument for the various tests.

The Slide Information Brochure has information about how to perform each test, recording the test results and interpretation of the test results. See samples below.

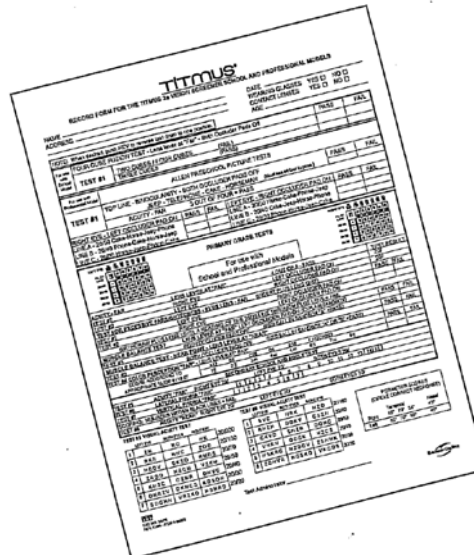
TITMUS Vision Screener TNO Occupational SLIDE INFORMATION BROCHURE				
Basic Testing Information: Each model contains 8 test slides. Tests are administered at Far, Near and Intermediate distances. For ease in administration, follow test sequence under each category. If you wish to skip a test, continue with the next test in the sequence.				
Slide & Testing Function	FAV Level at Far	NEAR Level at Near	INTERMEDIATE Level at 16/20/10 Feet	PERIPHERAL
SLIDE 1 SP-3 BUCKLE COGNITION	•	•	•	•
SLIDE 2 TNO ACUITY TEST	•	•	•	•
SLIDE 3 TNO ACUITY TEST	•	•	•	•
SLIDE 4 TNO ACUITY TEST	•	•	•	•
SLIDE 5 TNO ACUITY TEST	•	•	•	•
SLIDE 6 SP-3 COLOR TEST	•	•	•	•
SLIDE 7 SP-3 PERIPHERAL TEST	•	•	•	•
SLIDE 8 SP-3 PERIPHERAL TEST	•	•	•	•

Slide 2 - TNO-B ACUITY, BOTH EYES	
	
TESTING FUNCTION	Tests acuity for Both Eyes. This test checks for sharpness of the eye. Right and Left Eye images are the same, normally they fuse into a single image.
DESCRIPTION	Landolt Rings, Layout based on ISO Standard 9596:1994 - defines acuity levels, how many objects for each level, spacing between objects and lines. Ease of instruction - subject identifies location of opening for each ring. Greatly reduced chance of guessing.
AGE TESTED	All ages
TIPS	Use largest target as a demonstrator, explain the direction of the openings of the Landolt Rings. When subject understands test, ask subject which of the smallest targets can be seen clearly. Subject may miss one ring and read the next one correctly. The subject fails a line, only if ANY 2 or more rings are missed.
PATIENT QUESTION	Starting with the smallest target you can see, which line can you read? What is the direction of the opening of the ring? Top, Bottom, Left or Right?
PATIENT ANSWER	Table listing line number, visual acuity and position of opening of ring (Top, Bottom, Left or Right).
PASS/FAIL CRITERIA	FAIL, if subject misses ANY 2 rings on a line. For Line 1 only - no mistakes allowed.
HOW TO RECORD	Record the last acuity level seen correctly by the subject.

Recording the Test results

Please refer to the Slide Information Brochure & Record Forms supplied with your instrument. Sample forms are shown below.

- ☐ Top section Fill with appropriate information about the patient
- ☐ Pass/Fail tests Insert a check in the appropriate columns
- ☐ Acuity tests Insert a check in the appropriate box OR
Circle the appropriate acuity level OR
Write in the appropriate box as “20/20”
- ☐ Other tests (depth perception, color, muscle balance etc.) Draw a diagonal line through the final response OR circle the final response

Instrument Transport

Disconnect the power cord.
For Titmus V4: Disconnect control panel.
Refer to the Section 'Unlock/Lock the instrument for height adjustment'.



CAUTION: Ensure the height adjustment lock is engaged prior to lifting the instrument. This will prevent the instrument from swinging open when carrying.



Instrument can be carried using the back pocket as shown.



Instrument can be put into the carrying case for transport.



Cleaning / Storing the Instrument

- See accessory case provided with the instrument.
- Lens cleaning towlettes are supplied for cleaning the viewing lenses. Fog cloths are supplied to prevent the viewing lenses from fogging.



CAUTION: DO NOT PUT FINGERS IN EYES OR MOUTH AFTER USING THE CLEANING TOWLETTE OR FOG CLOTH.

Eye Contact: wash eyes with cold water, get fresh air

Skin Contact: wash with water

Ingestion: Gastric irritation and vomiting. Do not induce vomiting, give plenty of water and consult a physician. Prevent aspiration of vomited material induced by ingestion of product.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Refer to MSDS sheets for both products for detail information. MSDS sheets are available upon request.

- Soft foam headrest may be repeatedly cleaned using a disinfectant solution. This practice is recommended between the testing of each subject.
- The exterior of the instrument may be easily cleaned with a soft cloth dampened in a mild solution of soap and water.
- Test Slides are in a completely enclosed module, hence cleaning is rarely required. If required, slides may be cleaned utilizing a household-type glass cleaner. Remove slides before cleaning. Do not use abrasives as they will damage the slide.
- Do not immerse slide in cleaning solution. Dampen soft cloth with solution and gently wipe clean. Dry the slides with a soft cloth or tissue.



Dust Cover: Use dust cover to protect the instrument and prevent dust accumulation when not in use.

Maintenance of the Vision Screener

Recommended Service Schedule

- | | |
|--|---|
| • Clean/disinfect the headrest foam: | AFTER EACH PATIENT OR AS REQUIRED |
| • Clean the front surface of the unit: | AFTER EACH PATIENT OR AS REQUIRED |
| • Inspect Instrument: | DAILY |
| • Clean front test lens: | DAILY |
| • Clean outside of instrument: | WEEKLY |
| • Clean test slides: | MONTHLY |
| • Replace Light Module: | AS INDICATED BY THE CONTROL PANEL OR IF TESTS SEEM VERY DIMLY LIT |

Replacing Light Module

Please contact a Service Center for replacing the light module. To find out your nearest Service Center, please call 1-800-446-1802 or +1-804-452-5200.

Maintenance of the Vision Screener (continued)

Changing Slides

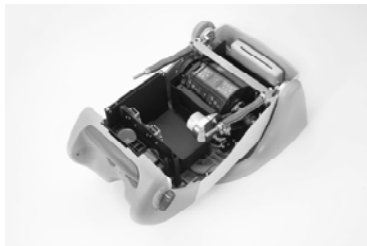


CAUTION: FIRST UNPLUG THE INSTRUMENT.

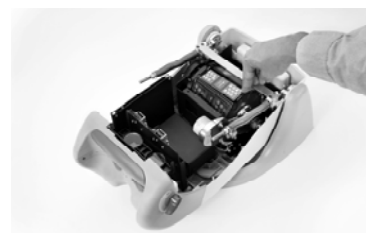
1. Remove top cover by unlatching tabs at the back. To do this, reach into the back pocket and press on the tabs inside. The top cover will pop open towards the back as shown in the image. Remove the top cover.



2. The slide drum will now be visible.
3. Roll the rubber ring at the center of the drum to the side.
4. Pull on the tab towards the gear side of the drum. This will cause the slide to pop up from one side.



5. Remove and replace with new slide.
6. Insert new slide with the arrow pointing in the direction of the other slides in the drum. Securely place into slide frame, slide will snap into place.
7. Ensure that the rubber ring is at the center of the drum.
8. Put top cover in place ensuring that the tabs at the front of the unit are correctly positioned.



9. Snap top cover in place by pressing on the top. Ensure that the back of the top cover is correctly closed.



Replacing the Fuse

Tool required: Flat head screwdriver.



CAUTION: FIRST UNPLUG THE INSTRUMENT.

A safety feature on the fuse holder will disconnect the power if instrument is inadvertently left plugged in. Follow the steps in reverse to assemble.

Steps:

1. Use screwdriver to snap open the tab on the power module.



2. Use screwdriver to remove the fuse assembly by pulling it outwards.



3. Replace both fuses.



4. Follow steps in reverse to reassemble.

Electromagnetic Environment - Guidance

This section applies to the following models – Titmus V4, Titmus V2.

Medical Electrical Equipment needs special precautions regarding Electromagnetic Emissions and Immunity and needs to be installed and put into service according to the Electromagnetic Emissions and Immunity information provided in this document.

Portable and mobile RF communications equipment can affect Medical Electrical Equipment.

Equipment should not be used adjacent to or stacked with other equipment and, if adjacent or stacked use is necessary, the Equipment should be observed to verify normal operation in the configuration in which it will be used.

Guidance and Manufacturer's Declaration - Electromagnetic Emissions

The Titmus V4/V2 is intended for the use in the electromagnetic environment specified below. The customer or the user of the Titmus V4/V2 should ensure that it is used in such an environment.

Use of cables, other than those specified in this manual, may result in increased Emissions or decreased Immunity of the Titmus V4/V2.

Emissions Test	Compliance	Electromagnetic environment -guidance
RF emissions CISPR 11	Group 1	The Titmus V4/V2 uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class A	The Titmus V4/V2 is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic Emissions IEC 61000-3-2	Class A	
Voltage fluctuations / flicker emissions IEC 61000-3-3	Complies	

Guidance & Manufacturer's Declaration - Electromagnetic Immunity

The Titmus V4/V2 is intended for the use in the electromagnetic environment specified below. The customer/user of the Titmus V4/V2 should ensure that it is used in such an environment.

Immunity Test	IEC 60601 test level	Compliance level	Electromagnetic environment - guidance
Electrostatic discharge (ESD) IEC 61000-4-2	± 6 kV contact ± 8 kV air	± 6 kV contact ± 8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	± 2 kV for power supply lines ± 1 kV for input/output lines	± 2 kV for power supply lines ± 1 kV for input/output lines	Main power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	± 1 kV line(s) to line(s) ± 2 kV line(s) to earth	± 1 kV line(s) to line(s) ± 2 kV line(s) to earth	Main power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5% U_T (>95% dip in U_T) for 0,5 cycle 40% U_T (60% dip in U_T) for 5 cycles	<5% U_T (>95% dip in U_T) for 0,5 cycle 40% U_T (60% dip in U_T) for 5 cycles	Main power quality should be that of a typical commercial or hospital environment. If the user of the Titmus V4/V2 requires continued operation during power main interruptions, it is recommended that the Titmus V4/V2 be powered from an uninterruptible power supply or a battery.

Immunity Test	IEC 60601 test level	Compliance level	Electromagnetic environment - guidance
	70% U_T (30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5 sec	70% U_T (30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5 sec	
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a commercial or hospital environment.

Note: U_T is the a.c. mains voltage prior to application of the test level.

Guidance & Manufacturer's Declaration - Electromagnetic Immunity

The Titmus V4/V2 is intended for the use in the electromagnetic environment specified below. The customer/user of the Titmus V4/V2 should ensure that it is used in such an environment.

Immunity Test	IEC 60601 test level	Compliance level	Electromagnetic environment - guidance
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	3 V	Portable and mobile RF communications equipment should be used no closer to any part of the Titmus V4/V2, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance $d = 1,17 * P^{1/2}$
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2,5 GHz	3V/m	$d = 1,17 * P^{1/2}$, 80 MHz to 800 MHz $d = 2,33 * P^{1/2}$, 800 MHz to 2,5 GHz Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and 'd' is the separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey ^a , should be less than the compliance level in each frequency range ^b . Interference may occur in the vicinity of equipment marked with the following symbol: 

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

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

^a Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the Titmus V4/V2 is used exceeds the applicable RF compliance level above, the Titmus V4/V2 should be observed to verify normal operation. If abnormal performance is observed, traditional measures may be necessary such as reorienting or relocating the Titmus V4/V2.

^b Over the frequency range 150kHz to 80MHz, field strengths should be less than 3V/m.

Recommended Separation Distance Between Portable & Mobile RF Communications Equipment and the Titmus V4/V2

The Titmus V4/V2 is intended for use in the electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the Titmus V4/V2 can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communication equipment (transmitters) and the Titmus V4/V2 as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter W	Separation distance according to frequency of transmitter M		
	150 kHz to 80 MHz $d = 1,17 * P^{1/2}$	80 MHz to 800 MHz $d = 1,17 * P^{1/2}$	800 MHz to 2,5 GHz $d = 2,33 * P^{1/2}$
0,01	0,12	0,12	0,23
0,1	0,37	0,37	0,74
1	1,17	1,17	2,33
10	3,70	3,70	7,37
100	11,70	11,70	23,30

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

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

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

Glossary of Eye Care Terms

A

Accommodation – eye's ability to automatically change focus from seeing at one distance to seeing at another.

Achromatic – being colorless or without color.

Amblyopia – the loss of vision without any apparent cause. Also known as “lazy eye.”

Astigmatism – condition in which the cornea's curvature is asymmetrical (the eye is shaped like a football or egg instead of a baseball). Light rays are focused at two points on the retina rather than one, resulting in blurred vision. Additional symptoms include distorted vision, eyestrain, shadows on letters, squinting and double vision.

B

Bifocals – two powers in one lens, usually for near and distance correction.

Binocular vision – coordinated use of the two eyes.

C

Cataract – cloudiness or opacity of the crystalline lens, preventing clear vision, often caused by aging.

Color deficiency – inability to recognize certain colors, specifically shades of red and green. Often referred to as “color blindness” and is usually hereditary.

Convergence – eyes' ability to turn inward. People with convergence insufficiency have trouble (eyestrain, blurred vision, etc.) with near tasks such as reading.

Cornea – the clear part of the eye covering the iris and pupil; it lets light into the eye, permitting sight.

Crossed eyes – see **Esotropia**.

D

Dark adaptation – increase in the sensitivity of the eye to detect light in the darkness or dim light.

Depth perception – the ability to distinguish the relative distance of objects in visual space.

Diopter – often written as “D.” The unit of measure of lens power. A lens having one diopter of refractive power will bring parallel rays of light to focus at a distance of one meter.

Diplopia – also known as double vision; the perception of two images yet being only one object.

Distance vision – the ability to see objects clearly at 20 ft. to infinity.

Divergence – the slight turning out to adjust the eyes to a distant object.

E

Emmetropia – the normal refractive condition of the eye in which there is clear focus of light on the retina.

Esophoria – a muscle condition in which both eyes are open and each eye looks directly at a target, but, when covering one eye, the covered eye turns inwards.

Esotropia – “crossed eyes,” a tendency of the eye to turn inward toward the nose, when both eyes are open.

Exophoria – a muscle condition in which both eyes are open and each eye looks directly at a target, but, when covering one eye, the

covered eye turns outwards.

Exotropia – “wall eyes,” this is a tendency of the eye to turn outward, away from the nose, when both eyes are open.

F

Far Vision – distance vision.

Farsightedness – see **Hyperopia**.

Field of vision – the entire area which can be seen at one time without shifting the head or the eyes.

Fixation – directing the eye so the image centers on the fovea.

Fovea – area of clearest vision on the retina.

Fusion – coordination of the images seen by each eye into one picture.

G

Glare – bright light which causes discomfort and loss of vision.

Glaucoma – condition caused by increased intraocular pressure which damages the optic nerve.

H

Heterophoria – a squint due to a weak muscle.

Hyperopia – also called farsightedness. Condition in which the length of the eye is too short, causing light rays to focus behind the retina rather than on it, resulting in blurred near vision. Additional symptoms include eyestrain and squinting.

Hyperphoria – a tendency for one eye to deviate upward.

Hypophoria – one eye in the line of sight depressed relative to the other eye.

I

Intermediate vision – the area of vision between 20 and 40 inches.

Iris – the pigmented area behind the cornea that gives color to the eye (e.g., blue eyes). The cornea controls the amount of light entering the eye by changing the size of the pupil.

L

Lateral Phoria – a Muscle Balance Test to define a value for the balance of the eyes, in the horizontal direction, that identifies Esophoria, Exophoria, and Orthophoria.

Lazy eye – see **Amblyopia**.

Legal blindness – the best-corrected visual acuity of 20/200 or less.

Lens – 1. The nearly spherical body in the eye, located behind the cornea that focuses light rays onto the retina.
2. A device used to focus light into the eye in order to magnify or minimizes images, or otherwise correct visual problems. Eyeglass lenses, contact lenses, and intraocular lenses are some examples.

M

Macula – part of the eye near the middle of the retina; the macula allows us to see objects with great detail.

Malingering – the intentional production of false symptoms to achieve financial or other gains; for example pretending to have loss of vision to avoid military duty.

Monocular – vision with only one eye.

Muscle balance – the coordination of muscles allowing the two eyes to work together.

Myopia – also called nearsightedness. Condition in which the length of the eye is too long, causing light rays to focus in front of the retina rather than on it, resulting in blurred distance vision. Additional symptoms include eyestrain, poor night vision or squinting.

N

Near Vision – vision at 14 to 16 inches.

Nearsightedness – see **Myopia**.

O

Occlusion – obstruction or “shutting” of vision from one or both eyes.

Ophthalmologist – a Medical Doctor (M.D.) who specializes in the eye. Ophthalmologists perform eye exams, treat disease, prescribe medication, and perform surgery. They may also write prescriptions for eyeglasses and contact lenses.

Optician – opticians are not doctors, but in some states they must complete training and be licensed. And in some states they can become certified, after special training, to fit contact lenses. Most opticians sell and fit eyeglasses, sunglasses, and specialty eyewear that are made to an optometrist’s or ophthalmologist’s prescription. Many also have equipment on the premises so they can grind lenses and put them in frames without ordering from a lab.

Optometrist – doctors of optometry (O.D.s) examine eyes for both vision and health problems, prescribe glasses, and fit contact lenses. They can prescribe many ophthalmic medications and may participate in your pre- and postoperative care if you have eye surgery. O.D.s must complete four years of post-graduate optometry school for their doctorate.

Orthophoria – ideal condition of muscle balance (balanced eyes).

P

Perimetry – charting the eye’s field of vision, often using light flashed at various locations from the outside peripheral plane to the nasal area.

Peripheral vision – ability to perceive objects outside of the direct line of vision.

Presbyopia – loss of accommodation due to aging (usually after age 40), causing difficulty focusing on near

objects. This is caused by the loss of elasticity of the crystalline lens.

Prism – a wedge-shaped piece of glass that can bend rays of light toward its base.

Progressive lens – an eyeglass lens that incorporates both the distance and near vision correction into one lens without a line.

Pupil – the opening in the center of the iris that changes size to regulate the amount of light that enters the eye.

R

Refraction – the bending of the rays of light. Sometimes used to refer to an eye examination that determines the best corrective lenses for good vision.

Retina – the multi-layered sensory tissue, lining the back of the eye, that captures and converts light rays into electrical impulses and sends them to the brain where they are converted into images.

S

Snellen chart – a chart, often hung on a wall at a distance of 20 ft. from the subject, used for evaluating visual acuity. Symbols or letters and numbers should be legible if eyes are normal.

Strabismus – a manifestation of a muscle imbalance. Eyes that turn inward or outward.

Stereopsis – depth perception; ability to see binocularly (two-eyed).

Suppression – the blocking of vision of one eye without apparent structural or physical cause.

T

Trifocal – corrective lens that incorporates three different lens powers, usually for near, intermediate, and distance vision correction.

20/20 – many eye care practitioners consider this the average visual acuity for human beings, but humans can see 20/15 or even 20/10. People with 20/40 vision can see clearly at 20 feet what people with 20/20 vision can see clearly at 40 feet. In the United States, 20/40 is the lowest uncorrected acuity required to obtain a driver’s license.

V

Vertical Phoria – a Muscle Balance Test to define a value for the balance of the eyes in the vertical direction. This identifies a tendency of Hyperphoria (one eye in the line of sight elevated relative to the other eye)

Vision – the ability to see and to interpret what is seen.

Visual acuity – the sharpness of vision of an eye.

Visual field – the full scope of the area that the eye can see while looking straight ahead.

Many terms in this glossary are used with permission by www.allaboutvision.com.

Visit website for additional eye care terms. For additional eye care terms see the following glossaries and web sites:

- Dictionary of Eye Terminology by Triad Publishing Company, P.O. Box 13355, Gainesville, Florida 32604, www.triadpublishing.com
- <http://www.children-special-needs.org/>
- <http://www.strabismus.org/miscellaneous.html>

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