

# Instruction Manual

PUBLICATION NO. 6011

## Vision Screening with the VS-V Vision Screener

Model # 1155



  
**Keystone View**  
Excellence in Vision Testing  
[www.keystoneview.com](http://www.keystoneview.com)

**DIVISION OF MAST CONCEPTS, INC.**

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**IMPORTANT NOTICE:** The instrument is held closed by a magnetic latch. To free the latch, place thumbs on top edge of base and press up on bottom of chassis (see illustration).

**DO NOT** lift up on black eyeshield assembly.

# INTRODUCTION

## THE IMPORTANCE OF VISION SCREENING

Vision gives us control over our environment. A significant amount of the information we learn comes through our eyes. For children, adequate vision is essential for normal development and learning. For adults, adequate vision is essential for safety, job performance, entertainment and everyday life activities.

An estimated 40% of people in the United States have some kind of vision dysfunction. Fortunately, it is also believed that up to 95% of these individuals can attain adequate vision through corrective or therapeutic measures.

Vision testing and therapy facilitates this task, quickly indicating if a person's vision falls within the acceptable standards of "good vision" - and if the individual would benefit from a comprehensive exam and or vision therapy.

## WHO USES VISION TESTING?

**Schools and child development specialists:** Educators and child development specialists have long recognized the role of vision testing in detecting learning disabilities – or vision problems misdiagnosed as learning disabilities. Child examinations also can detect – before it's too late – visual abnormalities that can hinder development of reading, art, athletic and technical abilities. Additionally, vision testing plays an important role in vocational and educational guidance.

**Clinics:** Vision testing is an important part of a standard health examination; qualifying subjective complaints like headaches and eye strain and revealing pertinent data in insurance and sports-related physicals.

**Occupational health/workplace testing:** In industry, a comprehensive vision testing program not only

helps a business define the risks and parameters of a job - and place the appropriate employees in these positions. Screening can provide a historical record of an employee's visual health from hire to termination - essential in today's increasingly litigious workers compensation climate.

## THE VS-V: FEATURES AND CAPABILITIES

The VS-V blends technological convenience with more than 80 years of vision testing research, expertise and excellence.

Like its predecessors, the VS-V features several unique competitive advantages such as testing in reflected light rather than with backlit targets to mirror everyday visual function.

The test procedure is simple: The subject sits or stands before the testing instrument with the head in the headrest to view target slides and lamps. The examiner controls the entire procedure through the hand control. The examiner explains the targets, prompted by easy-to-follow instructions, and the subject reports what they see. Responses are recorded onto the included record form.

Though the test series normally takes only 3-5 minutes, it incorporates 20 tests that screen 10 vision functions:

- **Binocular testing.** In order to replicate everyday visual function, all tests are given with both eyes open, even those checking acuity in each eye separately.
- **Suppression.** The VS-V is able to disclose whether a subject has blocked vision in either eye – something which a standard wall chart test cannot diagnose.
- **Far-point acuity.** For testing vision at far point, the VS-V replicates an actual distance of 20 feet (6 meters) by using a unique

lens system. Space is therefore conserved with this compact, versatile instrument.

- **Near-point acuity.** Similar technology is used to test vision at "reading distance" – the equivalent of 16 inches (40 cm).
- **Intermediate-point acuity.** Two mid-distance tests offered at both 26 inches (66 cm) and 39 inches (100 cm) use a supplemental lens system easily operated through the hand control. The 26 inch test provides valuable information relative to vision fatigue in heavy computer users while the 39 inch test is useful for persons who use control panels and operate machinery.
- **Phoria.** Special stereoscopic test targets and prism diopters are used to gauge whether a subject's eyes are balanced to work together with comfort and efficiency.
- **Stereopsis.** The VS-V incorporates a 3-D target to measure depth perception.
- **Fusion.** Simple images test a subject's ability to merge two images into one clear, coherent joined image.
- **Color perception.** The VS-V tests for both severe (red/green) and mild (blue/violet) deficiencies in color perception.
- **Horizontal peripheral visual field.** This test quickly identifies "tunnel vision" – restrictions of the peripheral vision field. VS-V incorporates miniature (LED) lamp targets located between the lenses and at the side, temple areas of the viewing head to show how far to the side a subject's visual field extends when the subject looks straight ahead.
- **Low light/night vision.** The Keystone View VS-V can be adapted to recreate the low lighting conditions experienced in night driving. Results have the same high level of accuracy as VS-V tests that replicate daytime light conditions.

# THE TEST INSTRUMENT

The VS-V is designed for both standardized and completely confidential testing. Targets are enclosed in the unit, so subjects cannot see or study them in advance. Internal target illumination ensures consistency of operating conditions, and the unit pivots

through a 55-degree arc to adjust to the eye level of any subject.

Only 10 inches wide, 15 inches long and 7 inches high, the VS-V is compact and completely self-contained, easily sharing desk or table space with

a desktop personal computer. When not in use, a magnetic catch holds the unit closed. The total weight is less than 10 pounds. The VS-V operates from a standard 100-240 volt a.c. power outlet.



1. **Control unit:** The VS-V places test operations under push-button command with the Elliptech Soft-Touch hand control (control panel described in detail on next page).
2. **Unique lens system:** The automated lens system allows the examiner to easily change between far, near, and intermediate distances with simple pushes of the button on the Elliptech Soft-Touch hand control.
3. **Periometer test:** Horizontal peripheral vision fields are measured using light-emitting diode target lamps, positioned between the lenses and recessed in the temple areas of the viewing head so eyeglass frames will not interfere with testing.
4. **Headrest:** Accommodates a wide variety of eyeglass frames. During testing, the subject's forehead should rest lightly against this specially-designed strip.

5. Accessible from the rear panel of the unit is the power "on/off" switch, a fuse holder for a 3/4 amp fuse, the main power receptacle and a convenient storage area, which stores the instruction manual and record forms.
6. **Transformer:** To eliminate electrical and heat hazards, power for the VS-V is converted to 12 volts DC. To ensure safe operation of the equipment, the VS-V must only be used with the transformer supplied by the manufacturer. Use of any other transformer that has not been approved by the manufacturer could result in safety problems.

Part No. 818-470

INPUT: 100-240 volt a.c. 50/60 Hz

OUTPUT: 12V DC-.83 A



Type B Device



In accordance with Directive 93/42/EEC

The Class II symbol on the transformer label indicates that the transformer does not only rely on basic insulation to protect against electric shock, but has double insulation as an additional safety precaution, there being no provision for protective earthing or reliance upon installation conditions.

## Environment

Operating temperature 32~104°F

Storage temperature -32~104°C

**Positive occlusion**

The VS-V incorporates a unique system for occluding (blocking out) the stereoscopic test target image seen by either eye. Each side of the test target is illuminated by a separate lamp. Occlusion of the desired eye is accomplished quickly and effectively by turning off the appropriate lamp, using the Visionary Software interface or control panel.

A major function of occlusion is to determine the existence of *visual suppression*: the mental blocking out of the image seen by one eye so that the *only* image registering in the brain is the one seen by the other eye. Normally, the images seen by the two eyes are fused into a single, integrated image.

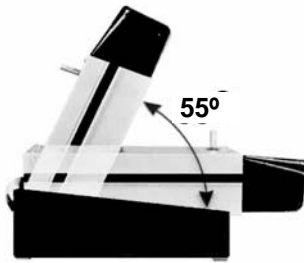
Because the VS-V requires the eyes to work together, any suppression will become evident during the first two tests if the subject reports that the image which *should* be visible to one eye does not appear.

In such cases, occlude the vision of the *opposite* eye: This usually causes the “non-seeing” eye to work hard enough so the “missing” image becomes visible. If it does *not*, it may be concluded the test subject is blind in that eye.

The occlusion system is also used with certain tests to provide official medico-legal data.



Target drum and illumination lamps are readily accessible by removing the top cover of the case. The drum accommodates eight permanently-mounted stereoscopic tests that may be removed if required under special circumstances. (Instructions for re-installation are presented on page 4).



*The VS-V adjusts effortlessly to the eye level of any test subject. It pivots through a 55° arc with free floating action fully controlled by the subject. When not in use, a magnetic catch holds the unit closed.*

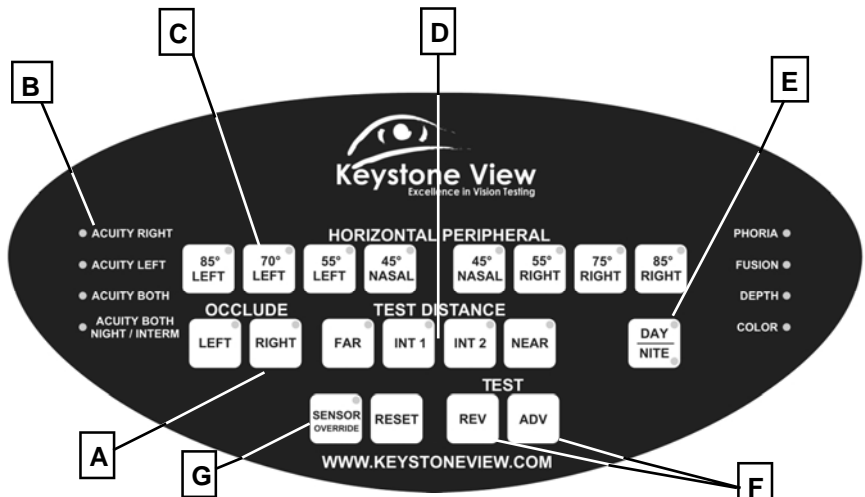
A convenient storage area, accessible from the rear, is built into the base of the instrument. The instruction manual and extra record forms may be stored here when the VS-V not in use.

Accessible on the rear panel of the VS-V are:

- The main power switch “on/off”.
- Fuse holder for 3/4 amp fuse.
- Main power receptacle.

**Elliptech Control Unit**

The VS-V Elliptech Soft-Touch hand control unit makes for easy operations of the vision screener. By pressing the appropriate buttons on this compact panel, the stereo tests can be advanced or reversed. Near, far, or intermediate test distances selected, either of the subject’s eyes occluded, and the peripheral vision test lamps selectively lit. The comfortable design makes it suitable for either hand-held or desk-top operation.



- A) Occlusion is controlled by pushing separate buttons for each eye.
- B) Stereo tests are listed on the control key card. A lamp next to each test description signals when that target is being presented.
- C) Peripheral vision target lamps are lit by pressing these buttons. A signal lamp indicates which eye is being tested.
- D) The test distance buttons will switch the lens to the corresponding distance.
- E) The day/night switch allows the examiner to toggle between simulated bright “real-life” daytime illumination and dim light nighttime illumination.
- F) Touch these buttons and the stereo target drum either advances or reverses to the next test. Keep button depressed and drum will continue to rotate.
- G) Head Sensor override button allows operation of the machine without an examinee’s head properly placed inside the headrest.

# VS-V MAINTENANCE

Under normal use conditions, the VS-V instrument requires minimum attention if protected by the dust cover when not in use. Virtually no repair or adjustment is needed, since all operating components are protected and solid-state circuitry assures exceptionally high reliability.

## Cleaning

Periodically, some cleaning will be necessary. The main instrument housing and control unit should be dusted from time to time with a soft cloth or brush, and the lenses washed with soap and water dampened cloth and dried with a soft cloth or tissue.

If the instrument has become very soiled, it may be cleaned with a mild soap-and-water dampened or general purpose cleaner dampened cloth. (Other solvents are not recommended).

*Be sure to disconnect the unit from its power supply before cleaning.*

When the VS-V is used in a heavy industrial environment, such as that of a foundry, it is possible some dust may accumulate on the stereo targets.

In this case, remove the top cover of the instrument and carefully dust the target with a soft camel's hair brush. *The drum should not be removed.* Instead, rotate it using the test advance button on the control panel.

## Lamp Replacement

Two long-life daylight LED lamps provide illumination of the stereo targets. Though they are rated for a long duration of continuous use, replacement may eventually be required. For new lamps, order part # 818-062 from your local distributor.

## Fuse Replacement

A standard 3/4 ampere automotive-type fuse is incorporated in the circuitry of the VS-V to protect the unit against possible electrical malfunction.

Should replacement ever be required, order a 3 AG 3/4 amp. Fuse (1.25 inches long) from your distributor (Part No. 297-800).

## Installation And Synchronization Of The Stereo Test Target Drum

The VS-V Screen is shipped ready for operation, with the target drum installed and synchronized with the control panel. It is recommended that instrument owners **do not** remove the drum except for replacement or in an emergency situation.

*Drum removal:* If removal is required, (Wear light cotton gloves or use a facial tissue to protect the stereo target areas from finger prints. Try to handle the drum near the end cap gears) push the spring clips, "A" and "B", outward from the ends of the drum. Slide the drum towards the rear of the instrument - away from gears "C" and "D" - and lift it out.

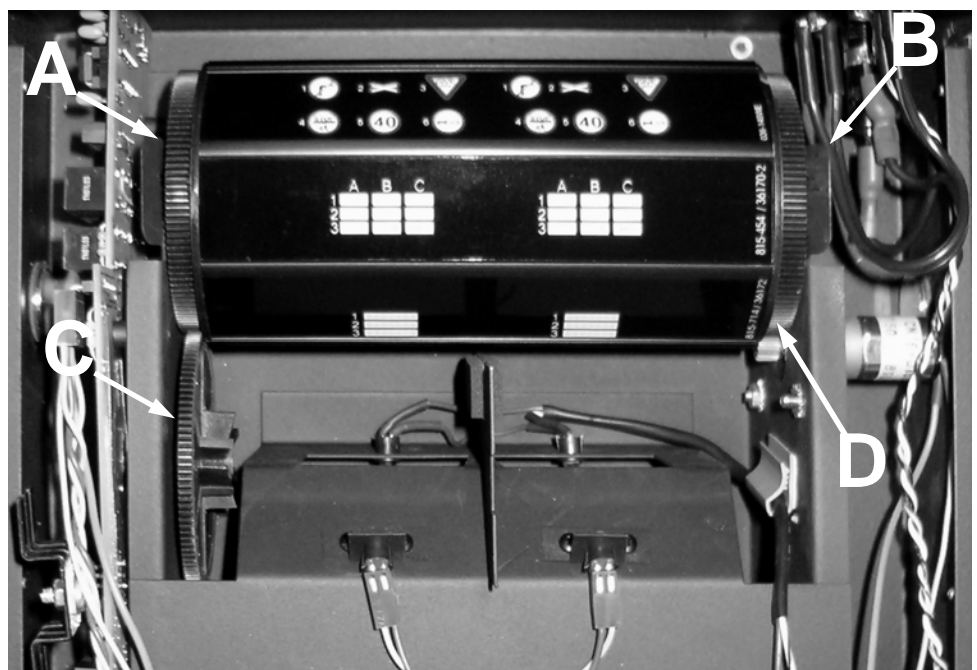
*Drum replacement and synchronization:*

1. Turn power switch on. Slowly rotate gear "C" until gear "D" stops moving. Observe which signal light on the control panel is lit: This shows how the drum is to be installed.
2. To synchronize the target drum with the control, the drum must be inserted with the corresponding target facing the lens opening at the front. Insert the drum downward between the spring clips ("A" and "B"); slide it forward toward the lenses until the clips snap in toward the drum. The drum gear cogs should now

be engaged with gears "C" and "D".

3. Press the *test advance* button on the control to move the drum to the next target. Look through the lenses to determine if the target is centered vertically in the lens openings.
4. If a centering adjustment is required, move only spring clip "A" away from the drum and move the left end of the drum backward and away from gear "C". Gear "C" *must* be disengaged from the drum cogs. Rotate drum backward or forward to accomplish adjustment. Snap drum back into position, re-engaging gear "C". Recheck target alignment by looking through lenses.
5. Repeat step 4 if required.

For other maintenance data, contact your equipment distributor or Keystone View.



# THE TEST

Eight stereoscopic test targets, eight miniature lamps and a supplemental lens system provide eighteen tests of ten visual functions. Most of the stereo tests are given at both far point (optically equivalent to 20 feet) and near point (equal to 16 inches). Normally, all testing—monocular as well as binocular

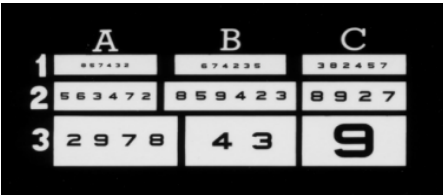
- is done with both eyes open and seeing. This insures the rapid detection of such problems as suppression (the mental blocking out of the image perceived by one of the eyes). Problems of this type would escape conventional wall chart techniques. However, the VS-V does incorporate a means of oc-

cluding either eye, should this be desired.

All test are scientifically correct and psychologically sound. The complete series can be administered in only three to five minutes.

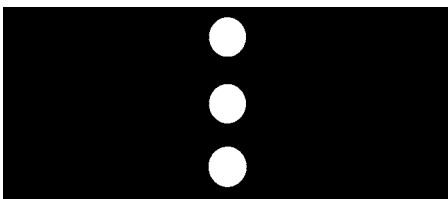
## Stereoscopic Test Targets

Each of these permanently-mounted test targets presents somewhat differing images to the two eyes. The eyes must work together to fuse—or merge—both images into a single image.



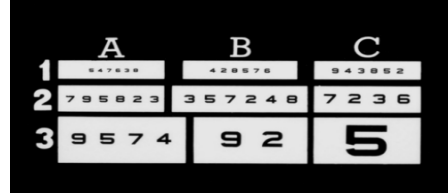
### Acuity: Binocular - At far and near

This acuity test presents the same number groups to both eyes simultaneously. Provides nine ratings ranging from 20/200 to 20/20. All three acuity targets employ modern Sloan-type numerals without serifs (finishing strokes).



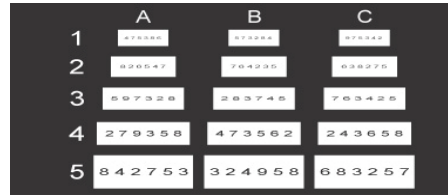
### Fusion - Tests at far and near points

Here's a check of one of the basics of visual efficiency: Whether the images seen by the two eyes merge into a single, integrated image. Two balls are presented to each eye. They should fuse into a column of three balls.

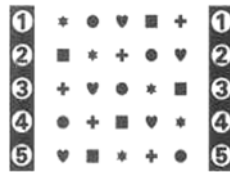


### Acuity: Right Eye - Tests at far and near points

The acuity (fineness of visual discrimination) of the right eye is checked while the left eye is open and seeing. Results are calibrated at values from 20/200 to 20/20.

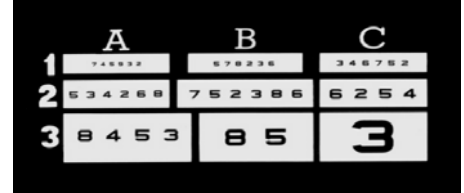


**Acuity: Binocular for Night 39 inches (100 cm) and 26 inches (66 cm)** - This acuity test presents the same number groups to both eyes simultaneously. Provides five ratings ranging from 20/70 to 20/20.



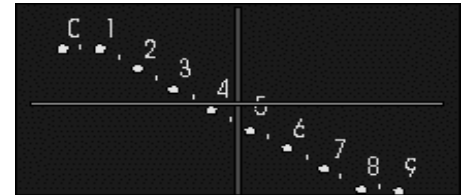
### Stereopsis - At far and near

This 3-D target measures stereopsis, depth perception, due solely to the coordinated use of the eyes. The subject must name the symbol on each line that stands out from the others. A correct answer on row four shows 75% stereopsis.



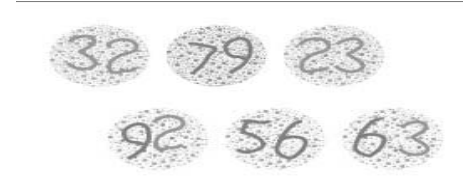
### Acuity: Left Eye, Tests at far and near points

Similar to the preceding test this target measures the visual acuity of the left eye while the right eye is open and seeing. Snellen values of from 20/200 to 20/20 are provided.



### Phoria (eye co-ordination) - Test at far and near points

Are the eyes balanced to work together with comfort and efficiency? This target measures vertical and lateral phorias (the tendency of an eye to turn in, out, up, or down) in prism diopters.



### Color Perception - One target at far

This target presents numbers in pseudo-isochromatic symbols. They indicate if a severe (red/green) or mild (blue/violet) discrimination deficiency exists, but do not further clarify the disorder.

## Horizontal Peripheral Visual Fields Test

Miniature lamp (LED) targets between the lenses and recessed in the temple (side) areas of the viewing head show how far to the side a subject's visual field extends when (s)he looks straight

ahead. Persons with "tunnel vision", a grossly-restricted peripheral field, are quickly identified. The targets are selectively lit by individual buttons on the control panel to show a 45° nasal field

and to check temporal fields at angles of 85°, 70°, and 55°. (A total field of from 45° to 130° can be measured for each eye). The eyes may be tested separately or together.

# THE RECORD FORM

The VS-V Record Form — illustrated at the right—makes record keeping easy: The examiner needs only to check the test subject's responses to provide a detailed record of his/her visual abilities.

(Complete instructions for filling out the record chart will be found in the section, "Test Administration".)

The area for noting subject responses to the stereographic tests is divided into clear and shaded columns: Any checks in the shaded columns indicate potential unsatisfactory performance. See page 13 for scoring guidelines. (For the phoria tests, horizontal shaded bars indicate a probable vision handicap.)

Tests are identified by a sequence number and by description to match call outs on the hand control.

It is often desirable to provide a second copy of the record form, either for the test subject or for a vision specialist to whom he/she may be referred. A carbon copy of the chart can be easily prepared using pencil carbon paper between two forms and writing with a ballpoint pen or hard lead pencil.

The record form is supplied in pads of 100 sheets each (3 pad minimum re-order).

## Keystone VS-V Record Form (Standard Targets)

For use with Model 1155 VS-V Screeners

Name \_\_\_\_\_ Date \_\_\_\_\_  
 Occupation \_\_\_\_\_ Age \_\_\_\_\_  
 Does the examinee wear Glasses  or Contacts  (If yes, how often?) Always  Sometimes   
 What kind of Vision Correction? Distance Only  Reading  Multifocals   
 1. Have you ever been examined by a vision specialist? No  Yes  How long since last exam? \_\_\_\_\_  
 2. Do you have any difficulty with your eyes? No  Yes  What kind of difficulties? \_\_\_\_\_

### FAR VISION TESTS --- Switch to FAR on Elliptech Hand Control

TEST DESCRIPTION AND KEY (Corresponds to Remote Control Key)		UNACCEPTABLE	RETEST	ACCEPTABLE See Standards Guide (1)
F-1	<b>RIGHT EYE: ACUITY</b> A B C 1. 20 = 547638 25 = 428576 30 = 943852 2. 40 = 795823 50 = 357248 60 = 7236 3. 70 = 9574 100 = 92 200 = 5	20/200 = 5 20/100 = 92	20/70 = 9574 20/60 = 7236 20/50 = 357248	(One Miss) Allowed Per Line 20/30 = 943852 20/25 = 428576 20/20 = 547638
	<b>LEFT EYE: ACUITY</b> A B C 1. 20 = 745932 25 = 578236 30 = 346752 2. 40 = 534268 50 = 752386 60 = 6254 3. 70 = 8453 100 = 85 200 = 3	20/200 = 3 20/100 = 85	20/70 = 8453 20/60 = 6254 20/50 = 752386	(One Miss) Allowed Per Line 20/30 = 346752 20/25 = 578236 20/20 = 745932
	<b>BOTH EYES: ACUITY</b> A B C 1. 20 = 857432 25 = 674235 30 = 382457 2. 40 = 563472 50 = 859423 60 = 8927 3. 70 = 2978 100 = 43 200 = 9	20/200 = 9 20/100 = 43	20/70 = 2978 20/60 = 8927 20/50 = 859423	(One Miss) Allowed Per Line 20/30 = 382457 20/25 = 674235 20/20 = 857432

### NIGHT VISION TESTS --- Switch to NITE on control (Read Column A)

BOTH EYES: ACUITY		UNACCEPTABLE	RETEST	ACCEPTABLE See Standards Guide (1)
F-4	1. 20 = 475386 2. 25 = 826547 3. 30 = 597328 4. 40 = 279358 5. 50 = 842753	20/50 = 842753	20/40 = 279358	(One Miss) Allowed Per Line 20/30 = 597328 20/25 = 826547 20/20 = 475386

### INTERMEDIATE DISTANCE TEST 1 (39") --- Switch to INT 1 on control (Read Column B)

BOTH EYES: ACUITY		UNACCEPTABLE	RETEST	ACCEPTABLE See Standards Guide (1)
I-1	1. 20 = 573284 2. 25 = 764235 3. 30 = 283745 4. 40 = 473562 5. 50 = 324958	20/50 = 324958	20/40 = 473562	(One Miss) Allowed Per Line 20/30 = 283745 20/25 = 764235 20/20 = 573284

### INTERMEDIATE DISTANCE TEST 2 (26") --- Switch to INT 2 on control (Read Column C)

BOTH EYES: ACUITY		UNACCEPTABLE	RETEST	ACCEPTABLE See Standards Guide (1)
I-2	1. 20 = 975342 2. 25 = 638275 3. 30 = 763425 4. 40 = 243658 5. 50 = 683257	20/50 = 683257	20/40 = 243658	(One Miss) Allowed Per Line 20/30 = 763425 20/25 = 638275 20/20 = 975342

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Form Re-order #5661

Continued on Reverse Side  
737-265

## INTERPRETATION OF TEST SCORE

REFER for full eye-examination any subject who scores one or more test in the "unacceptable" area of the record form, or whose side field of vision is less than 70 degrees on one or both sides.

Scores in the lightly shaded area indicate a somewhat doubtful performance; and subjects whose occupation requires good vision (e.g. Display Screen operators) and who score thus, should be referred.

**NOTE:** Those failing only the stereopsis (depth perception) and/or color vision tests need not be referred, but should be made aware of their deficiency.

(SEE ALSO PAGE 13 IN THIS MANUAL)



# PREPARATION FOR TESTING

Place the VS-V on a table, desk, or counter which provides sufficient space for the instrument, control unit, and record forms. A desk/table height of 26-30 inches is recommended.

Position the instrument near the edge of the desk or counter. If subjects are tested while seated, be sure sufficient knee room is provided. Chairs for both the examiner and test subject should be straight-backed.

## Equipment readiness

Before testing, check the VS-V to ensure it is in proper working condition.

The unit should be connected to a standard 100-240 volt a.c. outlet and both target illumination lamps should light when the power switch is turned on. (Please note the optical sensor device included with your VS-V can be turned on and off via the hand control. If turned on, the lamps will light only when an individual's head is within the viewing area or when the sensor light beam is interrupted by placing a hand in its path.)

Next check to determine if the drum holding the test targets is properly synchronized with the control. Compare the tests actually presented through the lenses with the indicator lamps on the panel: They should correspond.

(If they do not, or if portions of two test targets are presented simultaneously, follow the procedures outlined on page 4 of this manual to align the drum. Once properly positioned, no realignment should be necessary unless the drum is removed.)

Also make sure that:

1. The horizontal field target lamps illuminate, as the appropriate buttons on the control panel are depressed.
2. The corresponding target illumination lamp goes out when each of the "Occlude" buttons is pressed.

The viewing lenses are calibrated with the Elliptech Soft-Touch hand control. Lens operation can be checked by pushing the far, near, intermediate 1 and intermediate 2 buttons lens distances buttons.

The night vision button reduces the illumination on both targets.

It may also be advisable to dust the VS-V and clean the lenses with soap and water and a soft cloth before use.

## General test condition

Whenever possible, VS-V screening tests should be given in a reasonably quiet room. Testing can be performed in virtually any area where traffic, noise, or interruptions do not disconcert either the test subject or examiner or interfere with the accuracy or speed of the tests.

Extremely bright room lighting or glare may adversely affect the operation of VS-V units equipped with head-position optical sensor switches. For the best possible conditions, subdued room lighting is recommended but not required.

If a number of persons are to be tested, they should be admitted to the test area one at a time. This will prevent those waiting to take the tests from obtaining erroneous or advance information concerning responses that could affect test validity. Though only the subject can see the test targets, oral remarks may be overheard by others.

The examiner may be positioned anywhere in the immediate vicinity of the test subject where space is available for the control unit and record forms.

## Corrective lenses

If the subject wears corrective lenses (regular eyeglasses or contact lenses)

the tests should be conducted with the lenses worn as usual.

If lenses are worn only for reading or distance vision, they should be removed when testing that type of vision for which the lenses were not prescribed.

Exercise caution when testing a person who has recently been fitted with new glasses. Many vision specialists do not fit a patient with full-correction lenses, but rely on the patient to help him/herself as time progresses. Therefore, poor scores on the screening tests shortly after such a fitting may not be truly significant. A retest after two months is recommended.

## Test subject's posture

Good body posture is important to good vision. It is vital that proper posture be maintained during testing. An uncomfortable position will cause strain and distract the test subject.

Whether he/she is seated or standing, the subject's back and head should be erect and the shoulders level. His/her forehead should rest comfortably against the instrument's headrest and this position should be maintained throughout testing.

Adjustment of the height and angle of the VS-V is under the direct control of the test subject. He/she may wish to grasp the side of the unit with one or both hands and the elbows resting on the desk or counter.

Do not allow the subject to pull back or away from the instrument between individual tests. Caution him/her against tilting the head to the side at anytime.

Your VS-V is equipped with the facility to test vision under conditions of low lighting, such as would be experienced when driving at night.

To test "low light or night vision", press the button on the control panel marked Day/Nite, the corresponding LED will be lit when the night vision is selected. Carry out testing on any desired visual

function in the usual way. Test results should not be significantly different from those obtained under normal light conditions.

# TEST ADMINISTRATION

When vision screening is conducted with the VS-V, it is important that an organized procedure be followed and standardized questions be used. Only in this way can consistent results be assured. The sequence of the tests and the instructions given the subject can both affect his/her performance.

The test questions embedded in the Visionary Software and listed on the following pages have been found to evoke quick responses from the average test subject. However, as the individual examiner becomes experienced in administering the tests, (s)he may wish to adapt the specific wording of each question to his or her own style.

Responses should be prompt. After each target is presented and the question asked, allow five to ten seconds for the subject to become oriented to the target scene and report what is seen. An obvious hesitation indicates an effort to guess. Since there is no "penalty" for an "incorrect" answer, encourage the subject to be as frank as possible in telling what (s)he sees.

Acknowledge each response, but be careful not to indicate approval or disapproval, praise or disappointment. Do not "lead" the subject into giving any kind of response. Keep the amount of conversation to a minimum during testing to help preserve the objectivity of the tests and save examination time.

## Recording the findings

Speed of recording will depend entirely on the examiner's familiarity with the test targets and the recording form on the screen. The form has been designed to show both expected and abnormal responses so scoring can be done by simply checking the appropriate space.

If undesirable visual characteristics are noted, responses are likely to be slower than usual, and the examiner should allow additional time. Even in such cases, the complete screening examination should take no more than five minutes.

## Help the test subject to do well

Anyone's visual skills rating can be significantly altered by the attitude of the examiner. It should be the examiner's purpose to evoke the best performance the subject can give.

It is assumed that in normal living, people make the best possible use of their visual skills and do not function under the handicap of their worst moments. Thus, if four balls are seen in the fusion tests rather than the expected three, give the test subject an opportunity for the two white balls to soon merge into one.

If a younger child is being tested, be sure (s)he can recognize and identify the numerals from 1 through 9. Most of the screening tests employ numerals as stimuli.

The information on whether the individ-

ual wears corrective lenses is obtained at the time of testing. As mentioned, lenses should be worn during the test as they are normally worn. If worn at all times, both near and far point tests are given with the prescription. If lenses are worn only for reading or distance vision, they should be used only for the appropriate section of the test series.

## Medico-legal records

Many medico-legal records require distance acuity to be measured without corrective lenses and with occlusion of the eye not being tested. If the VS-V is used to provide such information, these special tests should be conducted after the standard test sequence has been completed.

This test is usually required only at distance but varying state compensation laws may indicate that the same type of test should be repeated at near point.

The procedure is the same except the right occluder button is depressed during left eye testing and the left occluder button is depressed during right eye testing. Be sure that corrective lenses are removed.

## Test Procedure: Stereoscopic Tests

The test subject should sit or stand in front of the VS-V instrument, observing the rules of posture on page 7. Administer the tests with glasses worn by the

subject as usual.

### FAR POINT TESTS

Set the test distance to far by selecting

the corresponding button on the control panel. Be sure multi-focal wearers are looking through the upper segments of their lenses.

### Test F-1: Far Point Acuity (right eye)

*Question:* "Here are nine blocks with numbers in them. Please read me the numbers in the first block in (Box 1-A).

*Response:* If five of the six numerals are correctly identified the subject is considered as having 20/20 (6/6) acuity in the right eye and need not read further. If the first block is not correctly read, have the subject continue across



each row consecutively from left to right until the numbers in a block are

called correctly.

**Recording:** Place a check mark beside the line on the record form showing the first box correctly read. (Please note that Box 3C 2/200 is listed *first* on the form and box 1A 20/20 is listed last).

**Remarks:** The subject may report that no boxes or numerals are seen. This indicates the existence of a visual *suppression* in the right eye. Should this

occur, *occlude* the left eye and proceed with test.

When the occluder is used, responses on the record form should be *circled* rather than checked.

The existence of suppression is important because it reliably indicates some *other* binocular vision problem.

When a certain stress level is reached

in the lack of binocular co-ordination, one eye simply lets the other work alone and with comfort. Cases of suppression deserve immediate referral to a vision specialist.

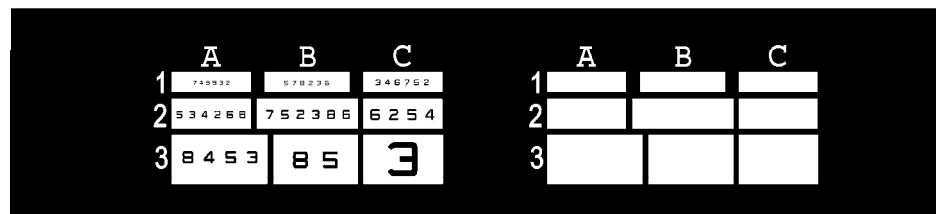
Depending on the severity of the suppression problem, further screening for binocularity - as with Tests 4, 5, and 6 - may be futile.

**Test F-2: Far Point Acuity (left eye)**

**Question:** "Now let's repeat this kind of test. The only thing that has changed are the numbers in the different blocks. Can you tell me the numbers in block 1-A?"

**Recording:** Follow the same procedure as Test 1.

**Remarks:** The subject may not realize

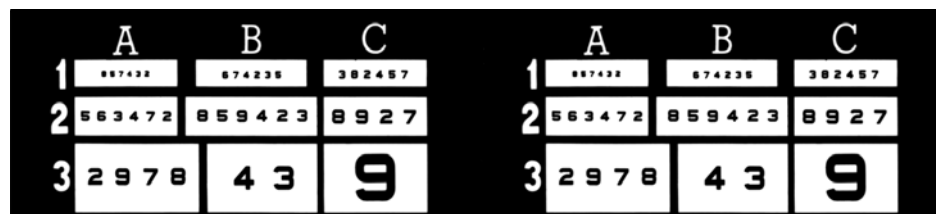


that the first two test each measure the acuity of only one eye. To maintain test

accuracy, exercise caution that (s)he does not learn this.

**Test F-3: Far Point Acuity (binocular)**

**Procedure:** Follow the same procedure as Test 2.



**Test F-4, I-1, and I-2 — Night & Intermediate Test Target for Binocular Acuity**

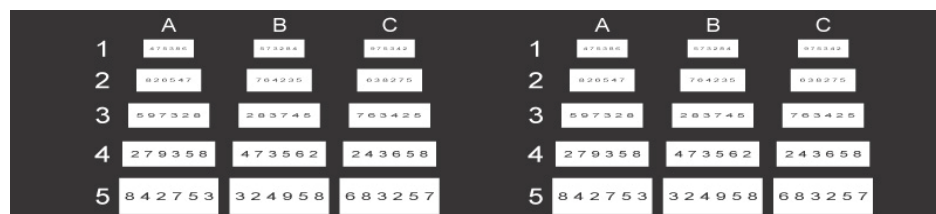
This special three-in-one target is used to test night (low-light) vision as well as intermediate vision at two distances. The intermediate vision tests are provided at 39 and 24 inch distances. (Three different tests can be performed using this one target).

Night Vision

For this test, set the vision screener illumination to night position by pressing the day/night button on your hand control.

**Question:** "Here you see three columns. Please read me the numbers in column A from the left starting at the top row (Box 1-A)?"

**Response:** If the numbers in the top row are correctly identified the examinee is considered as having 20/20 binocular acuity during the night and you can move on to the Intermediate Distance Test (next column on the same target). If the subject cannot identify the numbers in the top row (row 1) correctly,



have them read the numbers in row 2. Repeat this process until the examinee correctly identifies a full row.

**Recording:** Place a check mark beside the line on the record form showing the first box correctly read.

**Do not advance to the next target as the following test will use column 2 of this same target.**

Intermediate Distance 1 (39 inches)

Make sure to turn off the night vision feature by pressing the day/night button on your hand control. Now activate the Intermediate 1 lens, pushing the corresponding button on your hand control.

Conduct this test in the same manner as the night vision test, having the

examinee start at the top row of column B (Box 2-B). If the examinee successfully identifies the numbers in row 1 they have 20/20 vision at Intermediate distance 1. If not, repeat this process until the examinee correctly identifies a full row.

Intermediate Distance 2 (26 inches)

Switch to the Intermediate Distance 2 lens by pressing the corresponding button on the hand control. This test makes use of the third and final column on this target.

Use the same format during this exam, starting at the top row and working down until the examinee identifies a full row correctly.

**Test F-5: Far Point Phoria**

(The red line measures *lateral phoria*. The green line measure *vertical phoria*).

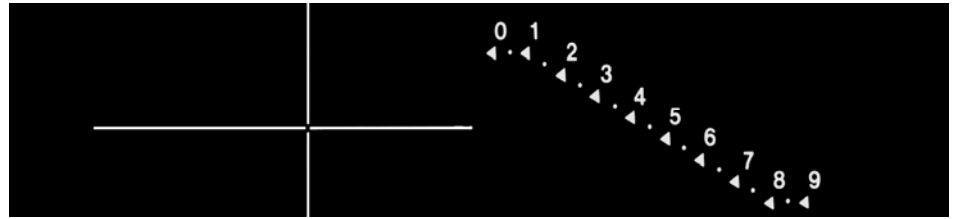
If you have administered the Intermediate test, make sure to set the lens back to far on the Elliptech Hand Control.

**Question:** "Do you see a scale of numbers and dots with two crossed lines running through it?"

"At what number, or between what numbers, does the green line pass through the scale?" (*Record response*)

"At what number, or between what numbers, does the red line pass?"

**Response:** The expected answer for both lines is "between 4 and 5." Response may be delayed by the apparent movement of the red line. To assist in speeding a response, ask for a number within the range of movement. When this has been obtained, determine how far each way the movement continues.



**Recording:** Check the appropriate spaces on the Record Form to show exactly what the test subject reports. If the red line continues to *fluctuate*, draw a line between the numbers between which it moves. If it *keeps moving in one direction*, wait until it stops before checking the record form.

**Remarks:** If a subject with binocular vision sees *only* the crossed lines, (s)he is either suppressing or suffers from amblyopia ("lazy eye"), strabismus, or a similar deviated eye condition. Discontinue testing.

Some test subjects may report one or both of the lines seems to break before and after passing through the scale. This

is not important. However, a decided *head tilt* is important and can significantly affect the finding. Be sure proper posture is maintained.

Should a subject *wearing glasses* report the *green* line passes through the scale at some point other than between 4 and 5, test him/her a second time without glasses. If, on the retest, the line passes correctly between 4 and 5, the probable cause of the discrepancy is *bent eye-glass frames*. Recommend to the subject that (s)he have an optician check the glasses soon.

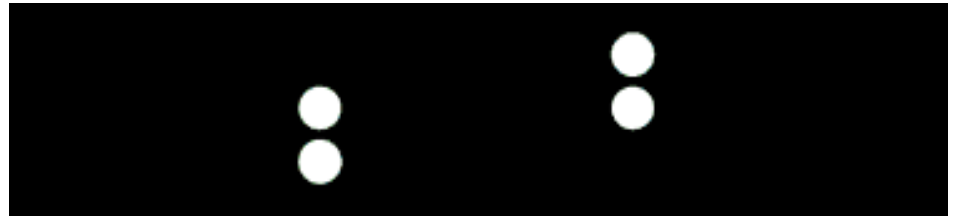
**Test F-6: Far-point Fusion**

**Question:** "How many balls do you see?"

**Response:** The expected answer is three balls. A satisfactory answer is four balls becoming three.

**Recording:** Check the appropriate space on the record form.

**Remarks:** If only two balls are seen (which is highly unlikely), determine by



their color whether they are seen by the right or left eye. The blue ball is presented to the left eye only. If four balls are seen—either initially or after a

few seconds—determine if the blue ball is to the left or right of the red one.

**Test F-7: Far-point Stereopsis**

**Question:** "Here you see five rows of symbols (shapes) with numbers on each side. Each line across has five different symbols. At the top of the first line is a star, a ball, a heart, a box, and a cross. Does one of the symbols in this line seem to float out in the air...closer to you than the others? Which one? In the second line, which one floats out closer than the others?" Etc.



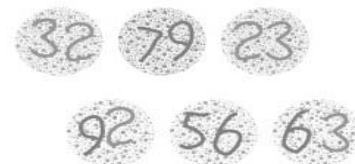
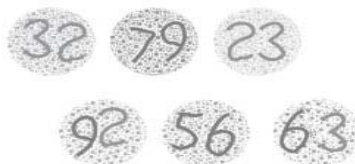
**Response:** The normal response is to correctly report all five lines. If the subject does not report the box as "floating out" toward him/her in the first row, it may be necessary to rephrase

the question for better understanding.

**Recording:** Place a check mark on the last symbols correctly read.

**Test F-8: Color Vision (red/green) and (blue/violet)**

This target presents a test for severe color blindness (red/green) on the top row and mild color blindness (blue/violet) on the bottom row.



*Question:* Here you have two rows each containing three circles. Each circle contains a number that the examinee needs to identify. "What number do you see in the circle on the top left? In the circle to the right?" Etc....

*Response:* Correctly naming two out of three numerals in each row is the mini-

mum acceptable answer. Even this could indicate some possible color blindness.

*Recording:* Check the number of circles on which all three numerals are correctly identified.

*Remarks:* Failure to name two out three

numbers correctly on the top (red/green) row indicates possible severe color blindness.

Failure to name two out three numbers correctly on the bottom (blue/violet) row indicates possible mild color blindness.

**NEAR POINT TESTS**

While the tests subject is still looking at the color vision target, switch to Near distance on the control panel. (The "Near" indicator lamp will light.)

Explain to the subject that you will now

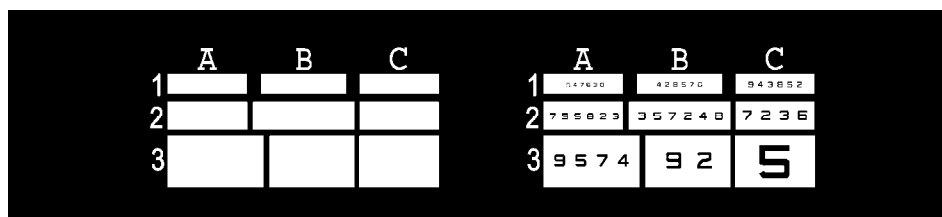
check his/her visual skills at the optical equivalent of normal reading distance and that he/she must look through a slightly different set of lenses.

Have the subject put on or remove corrective lenses as indicated. Multi-focal wearers should now be viewing the tar-

get through the lower segments of their lenses. Let the subject adjust his/her head position in the instrument and become acclimated to the near distance. Advance to Test N-1.

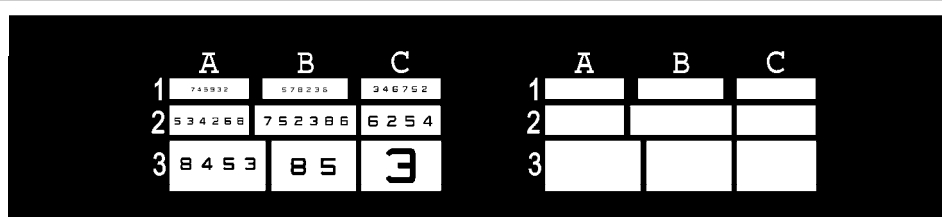
**Test N-1: Near-point Acuity (right eye)**

*Procedure:* Follow the same procedures as for (far-point) Test F-1. Employ the occluders as required.



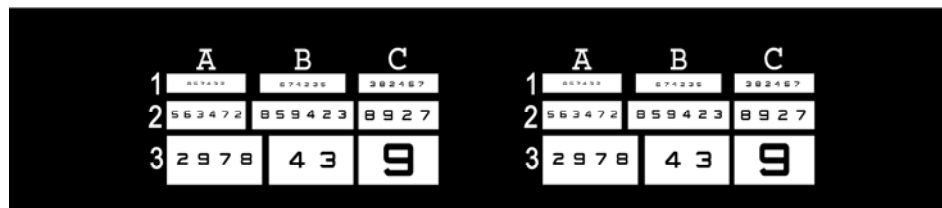
**Test N-2: Near-point Acuity (left eye)**

*Procedure:* Testing and recording follows the same procedure as the previous acuity tests.



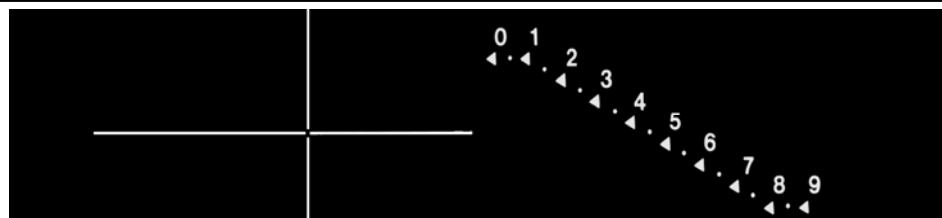
**Test N-3: Near-point Acuity (binocular)**

*Procedure:* Follow the same procedures as for previous acuity tests.



**Test N-4: Near-point Phoria**

*Procedure:* Follow the same procedures as for the far-point phoria tests (F-4). Remember that the apparent movement of the red (vertical) line may delay response. Ask for a number within the range of movement and then that determine how far each way the motion continues.



*Remarks:* A test subject wearing multi-focals may show a vertical phoria (measured by the green line) at the near distance even though none was

noted at far point. Persons who do not wear corrective lenses normally give the same responses at both distances.

### Test N-5: Near-point Fusion

*Procedure:* Follow the same procedures as for far-point Test F-5.

*Remarks:* This test is particularly important for persons who must use their eyes for extended periods doing close work: Maintaining single, binocular vision at near point requires greater visual coordination than at far point.



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### Test N-6: Near-point Stereopsis

This test is optional, since the demonstration of good stereopsis at distance almost assures good performance at Near Point. Further, this skill is not vital to the great majority of Near-Point visual tasks.



## Test Procedures: Peripheral Visual Fields

This test shows a subject's range of vision to each side when he/she looks straight ahead. Have the subject direct his/her attention to a far-point stereo target and light the peripheral target lamps at random. The stereo target used should be a simple binocular target.

Thus, an excellent time to introduce the peripheral vision test into the total VS-V series is after the far-point color vision tests have been completed and before the near-point stereoscopic test

are begun.

Tell the subject to continue looking at the numbered circles of the color vision target. Explain that at any time a light may flash to the left or right side of the target. When it does, the subject is to indicate "left side", "right side", or "both sides."

The "N" buttons on the control panel test nasal fields are at an angle of 45° across the nose. Testing the right eye nasal field should produce a "left side" response, and vice versa.

All peripheral target lamps should be lit, but the order of appearance is left to the examiner. Check the appropriate box on the form for each target identified.

If an individual is blind in one eye a total range for the other eye should be obtained. This is done by depressing both the "N" and "70°" buttons simultaneously. A response of "both sides" is expected.

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### Notes about sensors

The head position sensor incorporated in some Keystone Vision Screeners may occasionally malfunction when the instrument is used in areas of very bright ambient lights. If this occurs, the target illumination lamps inside the instrument may not light or light erratically.

The sensor function may be overridden using the Elliptech Soft-Touch hand control..

# INTERPRETING TEST RESULTS

In general, the results of the VS-V screening tests should not be considered separately, but as a *whole*. Taken in their entirety, they will almost always provide reliable indication of the test subject's visual efficiency.

It must be remembered the test series is designed to identify persons who may benefit from professional vision care. It is not intended to provide diagnostic or clinical data.

## Suggested Visual standards

If all of an individual's test scores are recorded in the clear area of the "Acceptable" columns on the record form, it may be assumed that (s)he has the adequate visual skills for living.

If some scores are marked in the lightly shaded area of the "Acceptable" columns, the subject can be considered to have "doubtful performance".

Some authorities will accept 20/40 acuity as a passing minimum and many driver licensing agencies accept 20/40 as a minimum standard. If a subject's occupation demands good vision at the reading distance but not at far point, consider 20/30 as a minimum score for near point and 20/40 as the minimum score at far point. The opposite would apply if visual skills are critical at far but not at near, as in the case of a crane operator.

Consider scores in the clear area as good general standards for visual abilities, but allow scores in the lightly shaded areas if those visual tasks are not in demand.

Scores falling in the darkly shaded "Unacceptable" areas of the record form indicate the subject will benefit from a professional vision examination. Be sure to test subjects with eye glasses on if they have been prescribed.

Do not refer for professional consultation

for "Unacceptable" performance on the color test. No remedy has yet been perfected for defective color vision. However, for reasons of safety, persons who are color blind should be made aware of their deficiency.

Stereopsis is a highly developed visual skill subject to maturation factors. Younger persons may do less well than those over 25. However, adults whose occupations involve moving machinery or materials should for safety reasons, score in at least the lightly shaded "Acceptable" area. This level indicates 75% stereopsis in the Shepherd-Fry Scales.

Phoria readings are important and "failure" can indicate reasons for headaches and fatigue. The record form gives the following passing ranges:

### Distance (F-5)

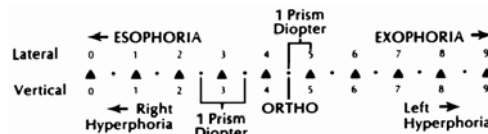
Phoria, Lateral: Not more than 6 prism diopters esophoria or 4 prism diopters exophoria

### Near (N-4)

Phoria, Vertical: Not more than 4 prism diopters esophoria or 6 prism diopters exophoria

Not more than 1 prism diopter right or left hyperphoria

### TEST KEY



### NORMAL COLOR VISION

Test (F-8) Severe, Red/Green—Identify numerals 32, 79, and 23 Mild, Blue/Violet—Identify numerals 92, 56, and 63.

### NORMAL DEPTH PERCEPTION (STEREOPSIS)

Test (F-8 and N-6) Identification of the stand-out symbol in line 4

### TEST KEY

Important: Refer for professional consul-

Line	1	2	3	4	5
Symbol	Box	Heart	Cross	Star	Cross
Shepherd-Fry Scale	10%	30%	60%	75%	85%

tation if suppression is indicated on the following binocular tests:

Phoria: If only the yellow numbered line is seen or only the crossed red and green lines are seen.

### Additional aids to test interpretation

Some children may not be able to read at the expected level before age seven because the maturation of their binocular visual skills has not kept pace with their chronological age. Therefore, younger children who fail the *lateral phoria* and *fusion* tests may be visually *immature* rather than visually deficient.

With individuals of any age, definite *vertical phoria* not due to bent eyeglass frames will provoke a tendency for diplopia (seeing double). At far point, this presents a definite safety hazard; at near, it can adversely affect work or study performance.

### Periodic retesting

An individual's vision is not static. It changes with time and can be affected by such factors as age, general health, emotional disturbances, fatigue and working conditions. It is thus desirable that visual skills be periodically *re-screened*, preferably once a year.

## Horizontal Peripheral Vision Test

This test is particularly significant in the case of vehicle operators. A person with normal lateral vision will be able to see a moving object when it is 90° (or at right angle) to his eye on the temporal (outside) side.

No exact standards have been developed that show the point where diminu-

tion of lateral fields has an effect on accidents. Yet authorities state that a field more restricted than 60° would be a serious danger to a vehicle or a cyclist.

A temporal reading of 70° should be considered the minimum standard for safety. (The U.S. Interstate Commerce Commission requires a lateral field of at

least 70° for each eye).

It is suggested when anyone who holds a motor vehicle operator's license demonstrates a severely restricted field, even though his/her other visual skills are normal, (s)he be referred to a vision specialist for examination and professional opinion.

# Detailed Explanation of Stereo Vision

## Two Eyes = Two Separate Views!

The eyes of a human being are positioned side-by-side. Each eye takes a view of the same area from a slightly different angle. The two eye views have plenty in common, but each eye picks up visual information the other doesn't.

## Two Eyes = Three Dimensions (3D)!

Each eye captures its own view and the two separate images are sent on to the brain for processing. When the two images arrive simultaneously in the back of the brain they are united into one picture. The mind combines the two images by matching up the similarities and adding in the small differences. The small differences between the two images add up to a big difference in the final picture! The combined image is more than the sum of its parts. It is a three-dimensional *stereo* picture.

The word "stereo" comes from the Greek word "stereos" which means firm or solid. With stereo vision you see an object as solid in three spatial dimensions--width, height and depth--or x, y and z. It is the added perception of the depth dimension that make stereo vision so rich and special.

## Stereo Vision Has Many Advantages

Stereo vision--or stereoscopic vision --likely evolved as a means of survival. With stereo vision, we can see **where** objects are in relation to our own bodies with much greater precision--especially when objects are moving toward or away from us in the depth dimension. We can see some around solid objects without moving our heads and can even perceive and measure "empty" space with our eyes and brains.

## If You've Got Stereo Vision, Count Your Blessings!

According to the web site of the American Academy of Ophthalmology, September, 1996: "many occupations are not open to people who have good vision in one eye only [*people without stereo vision*]"

Here are a few examples of occupations that depend heavily on stereo vision:

- Baseball player
- Waitress
- Driver
- Architect
- Surgeon
- Dentist

Here are just a few examples of general actions that depend heavily on stereo vision:

- Throwing, catching or hitting a ball
- Driving and parking a car
- Planning and building a three-dimensional object
- Threading a needle and sewing
- Reaching out to shake someone's hand
- Pouring into a container
- Stepping off a curb or step

## Make sure your examinees have Stereo Vision

Persons who do not have stereo vision often do not know what they're missing, because they've never had it. Vision testing with the Keystone View vision screener will allow you to identify if examinees have stereo vision problems. If defects are found refer the examinee to an optometrist or ophthalmologist for a full eye exam. Vision therapies are available to aid persons who have problems with stereo vision.



# VISION TERMS GLOSSARY

**Accommodation:** The power to adjust the focus of the eyes for seeing objects distinctly at different distances.

**Acuity, visual:** Sharpness of vision. Ability to distinguish detail.

**Amblyopia:** Sometimes referred to as "lazy eye", amblyopia is decreased vision in one or both eyes not caused by anatomical damage. Vision therapy often is used to treat amblyopia, since the condition is usually uncorrectable by optical means (e.g. eyeglasses).

**Astigmatism:** a common condition, often occurring with near-sightedness or far-sightedness, where all of the rays of light entering the eye do not focus on the same plane, resulting in out of focus vision. The cause is unknown. A minor degree of astigmatism is considered normal and does not need correction.

**Binocular:** Using two eyes simultaneously.

**Binocular Vision:** The ability to use the two eyes simultaneously to focus on the same object and to fuse the two images into a single image.

**Color blindness:** an inherited condition most commonly seen in men and with the colors red and green. It is caused by a deficiency of certain "cones", or color detectors, in the eye. Although there is no cure, this condition does not significantly impact most day to day vision functions.

**Convergence:** the inward movement of eyes toward each other.

**Depth perception:** or stereopsis - is how a person judges how far away an object is from him/her, combining such factors as the apparent size of the object, its apparent rate of motion, the object's height in the field of vision, the image's clarity and various shadows.

**Diplopia:** commonly known as "double vision," when a person sees two images of an object instead of one. Binocular diplopia - double vision in both eyes - is caused by a misalignment of the eyes and is often treated with vision therapy. Monocular diplopia - double vision in only one eye - can be caused by factors including astigmatism, dry eye and retinal problems.

**Esophoria** - commonly referred to as "being cross-eyed" or under convergence

- occurs when the two eyes do not aim simultaneously at the same object and instead point in different directions - in this case inward. Esophoria impacts binocular vision - the ability of both eyes to work together - and depth perception.

**Exophoria** - commonly referred to as "being wall-eyed" or Over convergence - occurs when the two eyes do not aim simultaneously at the same object and instead point in different directions - in this case outward. Esophoria impacts binocular vision - the ability of both eyes to work together - and depth perception.

**Far Point:** 20 feet (6 meters ) to infinity.

**Fusion:** the term that defines how well both eyes work together to combine the images each see into one clear, coherent joined image.

**Heterophoria:** a squint due to weak eye muscles.

**Hyperopia** - or **farsightedness:** occurs when light rays focus behind a person's retina, as opposed to directly on it. A farsighted person can see distant objects clearly but has difficulty seeing objects close by.

**Ishihara test:** A test that screens individuals for color blindness.

**Monocular:** Pertaining to one eye.

**Muscle Balance:** The tendency of either eye to remain in the position of fixation, when fusion of images is prevented; orthophoria.

**Muscle Imbalance:** The tendency of either eye to turn away from the position of fixation, when fusion of images is prevented; esophoria or exophoria.

**Myopia** - or **nearsightedness:** occurs when light rays focus in front of a person's retina, as opposed to directly on it. A nearsighted person can see objects close to them clearly but has difficulty seeing objects that are far away.

**Near Point:** The average reading distance, 14 to 16 inches.

**Occluders:** any device used by a vision health professional to temporarily obscure vision in one or both eyes while testing eye functions.

**Orthophoria:** Expected position of eyes in

relation to each other.

**Peripheral vision:** refers to the areas at the edges of the vision field - what a person sees "out of the corner of their eyes." Loss of peripheral vision - often called "tunnel vision" - can be caused by stroke, glaucoma, migraine headaches or retinal damage.

**Phoria, Lateral:** Descriptive of the relative horizontal position assumed by the eyes when dissociated (no fusion). When the tendency is to turn outward from a given position, the condition is known as exophoria. When the tendency is inward, the condition is known as esophoria. Phoria are indices of the accommodative-convergence relationship and indicate a lack of coordination between the eyes.

**Phoria, Vertical:** Description of the relative, vertical position assumed by the eye when dissociated. When the tendency is for the right eye to turn upward, the condition is known as right hyperphoria. When the left eye tends to turn up, the condition is left hyperphoria.

**Snellen Chart:** Printed letters of a special design, arranged in groups of different sizes on a test card and used to determine visual acuity.

**Strabismus:** or "crossed eyes" - is a condition where a person cannot correctly align both of his/her eyes - one or both eyes turn up, down, in or out. To correct for the double vision that results from this, people with strabismus often "suppress" the visual input from one of the eyes, causing the non-suppressed eye being stronger than the suppressed one.

**Stereopsis:** See Depth Perception

**Stereotarget:** A pair of photographs or reproductions mounted in an instrument designed to present each eye with a separate image.

**Suppression:** The voluntary or involuntary non-use of vision, usually by one eye.

**Vision Screening:** A test for many facets of functional vision, designed to identify subjects who can benefit from an examination by a vision specialist.

**Vision Specialist:** Ophthalmologist or Optometrist.

**SNELLEN EQUIVALENTS**

20/20 = 6/6  
20/25 = 6/7.5  
20/30 = 6/9  
20/40 = 6/12  
20/50 = 6/15  
20/60 = 6/18  
20/70 = 6/21  
20/100 = 6/30  
20/200 = 6/60

**NEAR VISION EQUIVALENTS**

20/20 = N.4 / J.1  
20/25 = N.5 / J.2  
20/30 = N.6 / J.4  
20/40 = N.8 / J.6  
20/50 = N.10 / J.8  
20/60 = N.12 / J.10  
20/70 = N.14 / J.12  
20/100 = N.18 / J.14



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