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1. Instruction

Thank you for purchasing the ACP-1500 auto chart projector.


(To get the best use this instrument, please carefully read these instructions and keep this instruction manual in a convenient location for future reference.)


ACP-1500 auto chart projector is used to test eyesight. This instrument makes use of the principle of optical imaging, project the charts on the screen and change the shape and the size of the charts by operating the remote controller. In this way, we can test eyesight, spherical power, cylinder power and accommodation balance. It also can be used to inspect the quality of the glasses.

ACP-1500 auto chart projector has lots of advantages. Novel appearance, convenient operation, nice measure, credible quality and so on. It is widely used in the hospitals and glass-shops.

2. Display for safe use

In order to insure the safe of this product and prevent any danger to the operator and others or damage to properties, important warning signs are placed on the product and inserted in the instruction manual. We suggest that everyone understand the meaning of the following displays and icons before reading the “safety cautions” and text. Picture 1 shows the position of the displays.

 **Warning:** potential dangerous instance. Ignoring or disregarding this display may lead to death or serious injury.

 **Caution:** potential dangerous instance. Ignoring or disregarding this display may lead to personal injury or physical damage.



1: Inside of the cover, refer to page 9.

2: Refer to page 12

Picture 1. Position of the warning displays

3. Reference

1. Refraction distance	1.5m---6m
2. Projection distance	1.5m---6m
3. Projection magnifications	30×(at 5m refraction)
4. Numbers of the charts	30
5. Chart changeover	1 frame/0.03sec.
6. Numbers of masks	Open 1, Horizontal line 5, Vertical line 8 Single isolation 21, R and G 1
7. Mask changeover	1 frame/0.1sec.
8. Program step	Max. Of 30 steps are available×2 Type
9. Projection lamp	12V 50W (Halogen lamp)
10. Electricity	AC 220V 50Hz
11. Power consumption	80W
12. Weight	6.0Kg
13. Dimensions	300mm×230mm×240mm

4. Names of the parts

4.1 Main body

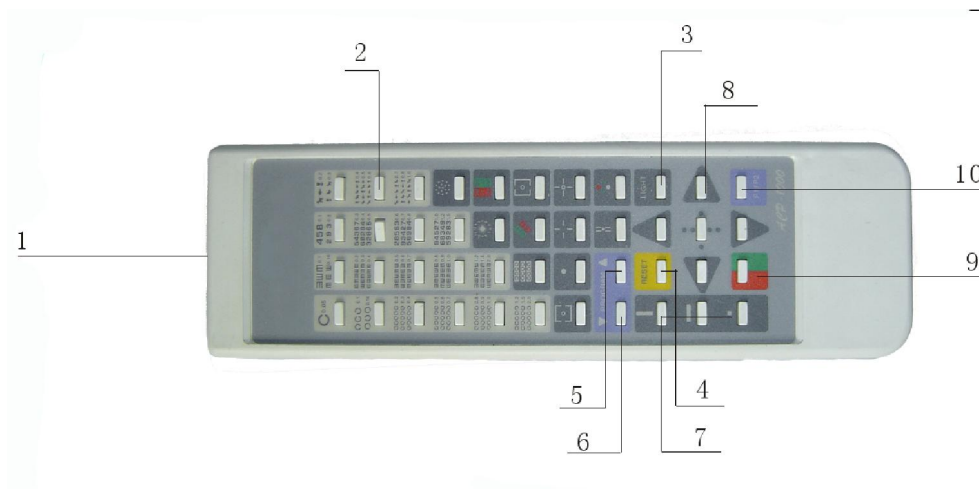


Picture 2. The figure of the instrument

The names of the parts are shown as follows.

- | | |
|--------------------|-------------------|
| (1) Top cover | (7) Bottom cover |
| (2) Front panel | (8) Lamp cover |
| (3) Sensor | (9) Interface |
| (4) Project window | (10) Power switch |
| (5) Base | (11) Power socket |
| (6) Focus knob | |

4.2 Remote controller





Picture 3. The figure of the remote controller


The names of the parts are shown as follows.

- (1) Light emitter
- (2) Chart key
- (3) Light key
- (4) Reset key
- (5) Forward key
- (6) Back key
- (7) Mask selector
- (8) Mask transfer key
- (9) R/G key
- (10) Program key (this key is used when activating the 'program' mode)

5. Operating procedures

 **Caution:** Do not tilt the device or place it in an unstable place. Otherwise, the device may topple over, drop or cause injury.

 **Warning:** connect the power plug to a three-prong properly grounded AC socket with an earth. If it connected to a socket that is not grounded, it can cause a fire and electric shock due to leakage.

 **Caution:** handling the power plug with wet hands can cause electric shock.

5.1 Preparation

- (1) Place the instrument at the same level as the person to be measured.
- (2) Turn the power switch off.
- (3) Insert the connector of the power cord into the power socket on the body and insert in power supply plug into the outlet.
- (4) Turn the power switch on.



Picture 4. Insert the connector

- (5) Remove the battery cover from the back of the remote controller.
- (6) Insert the dry batteries into the remote controller as illustrated and replace the battery.



Picture 5. Insert the dry batteries

(7) Adjust the position of the body so that the projector light is centered on the screen. First, direct the screw to the screen board and securely fix it with the hexagonal wrench to lock the main body.

(8) Loosen the barrel screw about a half of a turn with the attached hexagonal wrench. Screw the Focus knob clockwise or anticlockwise so that the projection on the screen is sharp and clear. For proper calibration, the projection of the chart which has 0.1 (or 20/ 200) visual acuity should contact the inner side of one of the scales on the calibration card that corresponds to the desired refracting distance.



Picture 6. Adjust the projection

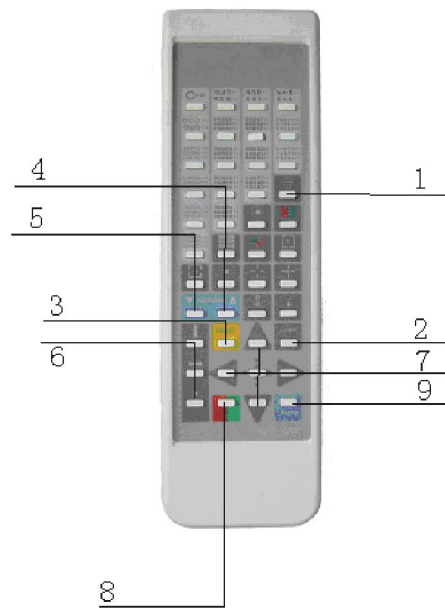
(9) If the size does not match the respective refracting distance scale, move the instrument either toward or away from the screen and then repeat items 8 above.

(10) Fix the barrel screw to complete preparation.

5.2 Operation of the remote controller

(1) Turn the power switch on. The chart will be reset to the start position and the lamp will light up.

(2) Direct the light emitter on the remote controller to the sensor on the projector body and press each key before using. The functions of the keys are shown as follows.



Picture 7. The functions of the keys

- ①Chart key projects the chart as indicated on the key
- ②Light key turns the lamp on /off .
- ③Reset key returns to the step 1 chart in the program.
- ④Forward key automatically advances the step in the program.
- ⑤Back key automatically backs the step in the program.
- ⑥Mask selector allows selection of a mask that is appropriate for the chart.
(Horizontal mask, vertical mask, one character mask).
- ⑦Mask transfer key..... moves the mask in the direction as indicated on the key. When the mask moves to the maximum (minimum) indication of a chart being projected, the next (previous)

chart in the sequence will automatically appear. Charts can be alternated within the same type of charts.

⑧R&G filter switch R&G filter can be applied only for the chart that allows R&G filtering.

⑨Program key see the chart for using the program function.

Attention

When the lamp is turned off, the lamp will light up by pressing either the ① or ③-⑨ keys.

When the mask is not open, it will automatically be open by pressing the ① chart key.

When the instrument is not used for 5/10minutes, the lamp will be automatically turned off. The instrument is ready to wake up by pressing any key.

(By alternating the DIP settings, you can designate the automatic-turnoff-time; setting at delivery is 5 minutes)

5.3 Using the program function

1. How to program the measuring procedure

① Starting program

(1) Turn on the instrument or press the “RESET” to reset the instrument.

(2) Press the “RESET” key to get into the phase of “Ready to programming”, at the same time the buzzer will sound two times.

(3) Press the “R & G” key to get into the phase of “Programming affirms”, at the same time the buzzer will sound two times.

(4) Press the “RESET” key again and the buzzer will sound two times; you can program a measuring procedure.

(5) Select either program 1 or 2 by pressing “P1/P2” key. (Buzzer once: P1; buzzer twice: P2).

(6) Press the ‘▲’ key to affirm , at the same time buzzer sounds three times.

Notice:

Step 2~4 is used to avoid the misoperation.

During theses steps, if any other key is pressed, the instrument will return into the normal procedure.

② Programming the charts

(1) Press the chart key or the mask key according to the measuring procedure to project , then press the ‘▲’ key to affirm. At the same time, buzzer will sound four times means one step has been saved.

(2) Repeat the step 1 according to the measuring procedure. Programming is available for up to 30 steps.

③ Completing the programming

(1) Press the reset key to complete the programming. The buzzer will sound only once.

(2) Turn off the instrument to save all the programming.

④ Carrying out the programming

(1) Turn on the instrument.

(2) Press “P1/P2” key to chose program 1 or program 2.

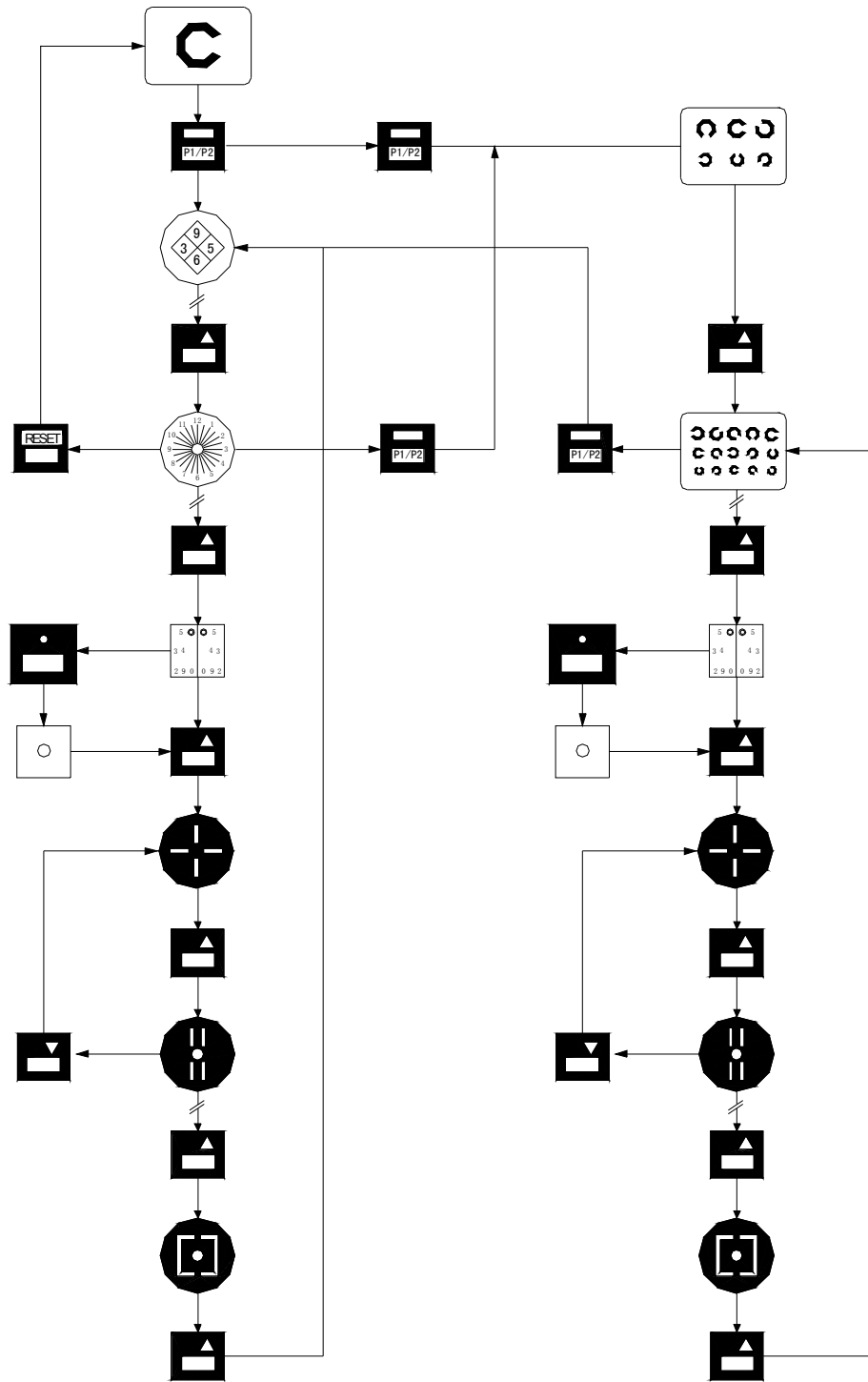
When the program 1 is selected the buzzer will sound once.

When the program 2 is selected the buzzer will sound twice..

(3) Press the “▼” key to carry out the program step by step. Press the “▲” key to return to the former step.

Notice: During the programming procedure, if the former program is exit it will be erased to start a new program.

2. Carrying out program-base examinations



Picture 8. The program-base examinations

5.4 Using charts for measuring binocular functions

		Polarize R and G test	Binocular balance test	Worth four dot test
Chart				
Filter		Polarizing filters	Polarizing filters	Red filter for the right eye and green filter for the left eye
Purpose		Test of binocular refraction and accommodation balance.	Test of the final binocular refraction balance.	Test of the function of binocular fusion.
How the charts are viewed.	Right eye			
	Left eye			
	How the charts are seen binocularly	<p>Myopia</p> <p>Right eye is over corrected and the left eye is under corrected.</p> <p>Left eye is over corrected and the right eye is under corrected.</p>	<p>Presbyopia</p> <p>Left eye is over corrected and the right eye is under corrected.</p> <p>Adjust the spherical power to provide binocular balance.</p>	<p>There is a variance of degree between the right eye and the left eye.</p> <p>Adjust the spherical power to provide binocular balance.</p>
How the charts are seen binocularly		<p>The binocular refraction and accommodation balance are achieved when the two reds of two greens are seeing at the same intensity.</p>		<p>In the case where 4 dots are seen, there will be normal fusion.</p> <p>If only two targets are seen, the left eye is suppressed.</p> <p>If only three green targets are seen, the right eye is suppressed.</p> <p>If five targets are seen, it indicates that the patient has diplopia.</p>

Chart		Polarized crosshair test	Reticle test with a fixation target	Coincidence test	Coincidence test	Stereo test
Filter		Polarizing Filters	Polarizing Filters	Polarizing Filters	Polarizing Filters	Polarizing Filters
Purpose		Test of the binocular balance and hetero-phobia.	Binocular test for fixation disparity.	Test of aniseikonia and vertical hetero phobia which can not be polarized crosshair test	Test of aniseikonia and vertical hetero phobia which can not be polarized crosshair test	Test of presence of stereoscopy.
How the charts are viewed	Right Eye					
	Left Eye					
How the charts are seen binocularly		<p>Esophria</p> <p>Exophoria</p> <p>Left eye hyperphoria</p> <p>Left eye hypophoria</p> <p>If either line is seen thinner, the eye in question is suppressed.</p>	<p>The right eye has an infixation display.</p> <p>Indicates that the right eye has an infrafixation disparity.</p> <p>Indicates that the right eye has a vertical disparity.</p> <p>Left eye hypophoria.</p> <p>If either is clearly visible, there is suppression with the periphery of the retina in question.</p>	<p>Aniseikonia of about 7%.</p> <p>Equivalent to two lines. A single line indicates about 3.5%.</p> <p>Vertical heterophoria</p> <p>If either line is seen thinner The eye in question is suppressed.</p>	<p>Aniseikonia of about 7%.</p> <p>Equivalent to two lines. A single line indicates about 3.5%.</p> <p>Vertical heterophoria</p> <p>If either line is seen thinner The eye in question is suppressed.</p>	<p>Two lines are seen in fusion to form a single line image and floated or sunk against the central circle. If the images are slowly fused, there is still correctable heterophoria.</p>

5.5 Care and check

1. Daily maintenance

① This instrument is very sensitive to dust. Protect the instrument with the dust cover when it is not in use.


② Turn the power switch off when the instrument is not used.


③ Wipe the cover and the operating panel with a dry cloth when they get dirty.

When the cover is very dirty, reduce a neutral detergent for dish washing with hot water, dampen a cloth with the mixture wring the water out, and wipe off the dirt.

④ When the lens is dirty, wipe it lightly with a dry soft cloth.

2. Replacing the projection lamp

 **Caution:** To avoid electric shock, unplug the power cable when replacing the projection lamp.

 **Caution:** Do not replace the projection lamp immediately after turning off the light. Otherwise you might get burn because of the hot temperature of the lamp.

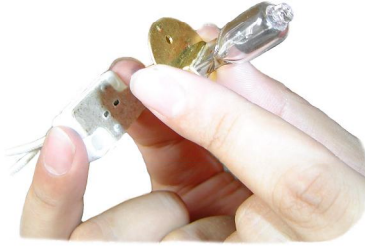
① Turn power switch off

② Remove the lamp cover screw and remove the cover.



Picture 9. Remove the cover

- ③ Remove the lamp attaching screws, hold the socket and remove the lamp.
- ④ Hold the socket and the lamp flange and remove the lamp from the socket.



Picture 10. Remove the lamp from the socket

- ⑤ Install the spare lamp securely as shown in the diagram. Make sure that you install it in the correct direction. (See diagram)

Do not touch the glass tube of the lamp directly with your finger. In case you touch the glass tube by accident, you must wipe the fingerprints off with alcohol.



Picture 11. The correct direction


- ⑥ Match the protruded part of the lamp attaching area with the lamp flange notch and tighten then with the lamp attaching screw to secure the lamp.
- ⑦ Place the lamp cover on.
- ⑧ Turn the power switch on.
- ⑨ Make a trial projection to check that there is no illumination irregularity. If there is any irregularity, turn the power off again and check that the lamp is installed properly.

3. Replacing the fuse



Warning: unplug the power cable before removing the fuse cover to replace the fuse.

Remove the fuse cover with the power cable plugged in can cause electric shock.. do not install

 **Warning:** use only attaching fuses (250 v, 1 A). Using other fuses may cause a fire in the event that the instrument fails.

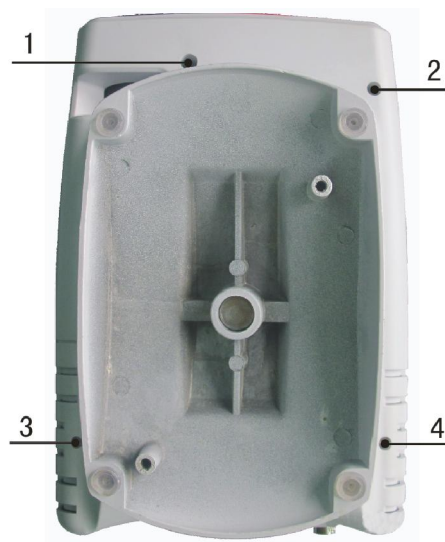
- ① Turn the power switch off and disconnect the power supply plug.
- ② Simultaneously squeeze both sides of the fuse holder and then remove the fuse holder. The fuses will be removed together with the holder.
- ③ Remove the blown fuses and insert the spare fuses on the cap of the fuse holder and install it as before.



Picture 12. Replace the fuse

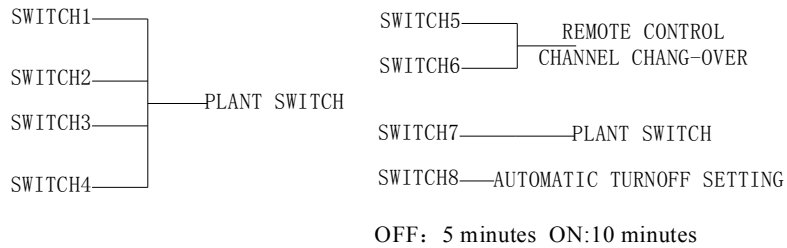
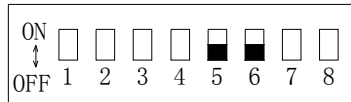
4. Changing the channel setting of the remove controller

- ① Turn the power switch off and unplug the power cable.
- ② Remove the lamp cover screws and the screw on the lower cover (four in total) and lift the top cover to remove it.



Picture 13. The position of the screws

③ Change the DIP switch 5 and 6 according to the diagram on picture 15.




Channel	Remote control	Body	
		5	6
1	S=VDD	ON	OFF
2	S=VSS	OFF	ON

Picture 14. Change the channel

④ Remove the battery cover from the back of the remote controller and change the channel switch S.

⑤ Replace the top cover after completing the DIP switch setting, tighten the screws on the lower cover and then tighten the lamp cover with attaching screw.

5.6 Operating procedures for troubleshooting

 **Warning:** do not break down, modify or repair the equipment. Doing so can cause electric shock. Request a repair from your dealer.

Check the item in the following checklist when you experience a problem. When the situation is not recovered by the indicated action or the problem does not comply with the description in the “situation” column in the checklist, contact your dealer or the address on the back cover of this manual.

Situation	Example	Action
The projection lamp does not light with the power switch on.	Is the power supply plug connected to the incoming line source?	Plug it securely in the outlet.
	Is the power cord connected?	Plug it securely in the power on the main body.
	Is the fuse blown?	Replace the fuse.
	Is the lamp burnt out?	Replace the lamp.
The instrument does not function when the remote controller switch is pressed.	Are the batteries fresh?	Replace the batteries.
	Is there anything interrupting the light emitter on the remote controller and the sensor on the body?	Remove the interrupting object.
	Is the remote controller set at the proper channel setting with the body?	Adjust the channel.

6. Charts

ACP-1500A

- | | |
|-----------------------------------|---------------------------------------|
| (1) "E" chart 0.1, 0.16, | (16) Children's chart 0.2, 0.3 |
| (2) "E" chart 0.2, 0.3, 0.4, | (17) Children's chart 0.4, 0.5, 0.6 |
| (3) "E" chart 0.5, 0.6, 0.7, | (18) Children's chart 0.7, 0.8, 1.0 |
| (4) "E" chart 0.8, 0.9, 1.0, | (19) Balance chart 0.5, 0.6, 0.8, 1.0 |
| (5) "E" chart 1.2, 1.5, 2.0 | (20) Astigmatic chart |
| (6) "C" chart 0.05, | (21) Polarized R and G chart |
| (7) "C" chart 0.1, 0.16, | (22) Worth four dot test |
| (8) "C" chart 0.2, 0.3, 0.4, | (23) Stereo test |
| (9) "C" chart 0.5, 0.6, 0.7, | (24) Coincidence test |
| (10) "C" chart 0.8, 0.9, 1.0, | (25) Coincidence test |
| (11) "C" chart 1.2, 1.5, 2.0 | (26) Fixed chart |
| (12) Numbers chart 0.1, 0.2, | (27) Polarized crosshair chart |
| (13) Numbers chart 0.3, 0.4, 0.5 | (28) Polarized crosshair chart |
| (14) Numbers chart 0.6, 0.7, 0.8, | (29) R and G chart |
| (15) Numbers chart 1.0, 1.2, 1.5 | (30) Astigmatic chart |

ACP-1500B

- | | | | |
|---------------------|----------------------|--------------------------------|-------------------------|
| (1) "E" chart | 20/400 | (16) Numbers chart | 20/30, 20/25, 20/20 |
| (2) "E" chart | 20/300 | (17) Children's chart | 20/200 |
| (3) "E" chart | 20/200, 20/100 | (18) Children's chart | 20/100, 20/80 |
| (4) "E" chart | 20/80, 20/70, 20/60 | (19) Children's chart | 20/60, 20/40, 20/30 |
| (5) "E" chart | 20/50, 20/40, 20/30 | (20) Astigmatic chart | |
| (6) "E" chart | 20/25, 20/20, 20/15 | (21) R and G chart | 20/50, 20/40, 20/30 |
| (7) "Letter" chart | 20/200, 20/150 | (22) R and G chart | 20/25, 20/20, 20/15 |
| (8) "Letter" chart | 20/100, 20/80 | (23) R and G chart | |
| (9) "Letter" chart | 20/70, 20/60, 20/50 | (24) Stereo test | |
| (10) "Letter" chart | 20/40, 20/30, 20/25, | (25) Coincidence test | |
| (11) "Letter" chart | 20/20, 20/20, 20/20 | (26) Balance chart | 20/80,20/60,20/50,20/40 |
| (12) "Letter" chart | 20/20, 20/15, 20/10 | (27) Balance chart | 20/30,20/25,20/20,20/15 |
| (13) Numbers chart | 20/200, 20/150 | (28) Polarized crosshair chart | |
| (14) Numbers chart | 20/100, 20/80, 20/70 | (29) Worth four dot test | |
| (15) Numbers chart | 20/60, 20/50, 20/40 | (30) Astigmatic chart | |

ACP-1500C

- | | | | |
|-----------------------|----------------|--------------------------------|--------------------|
| (1) "E" chart | 0.1, 0.2, | (17) Children's chart | 0.4, 0.5, 0.6 |
| (2) "E" chart | 0.3, 0.4, 0.5, | (18) Children's chart | 0.7, 0.8, 1.0 |
| (3) "E" chart | 0.6, 0.7, 0.8, | (19) Balance chart | 0.5, 0.6, 0.8, 1.0 |
| (4) "E" chart | 1.0, 1.2, 1.5, | (20) Astigmatic chart | |
| (5) "Letter" chart | 0.05 | (21) Polarized R and G chart | |
| (6) "Letter" chart | 0.1, 0.16 | (22) Worth four dot test | |
| (7) "Letter" chart | 0.2, 0.3, 0.4 | (23) Stereo test | |
| (8) "Letter" chart | 0.5, 0.6, 0.7 | (24) Coincidence test | |
| (9) "Letter" chart | 0.8, 0.9, 1.0 | (25) Coincidence test | |
| (10) "Letter" chart | 1.2, 1.5, 2.0 | (26) Fixed chart | |
| (11) "Letter" chart | 0.1, 0.2 | (27) Polarized crosshair chart | |
| (12) "Letter" chart | 0.3, 0.4, 0.5 | (28) Polarized crosshair chart | |
| (13) Numbers chart | 0.6, 0.7, 0.8 | (29) R and G chart | |
| (14) Numbers chart | 1.0, 1.2, 1.5 | (30) Astigmatic chart | |
| (15) Children's chart | 0.1 | | |
| (16) Children's chart | 0.2, 0.3 | | |