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§1 INTRODUCTION

This service manual provides information for after-sales service of the NIDEK Automatic Chart Projector Model CP-690.

For proper after-sales service, it is necessary to understand this manual thoroughly before servicing.

Refer to “CP-690 Operator’s manual”.

Specifications are subject to change without notice for improvement. As for important changes, refer to Technical Bulletins.

In case the instrument cannot be repaired by procedures described in this manual, please tell us the serial number of the instrument and details of the symptom or symptoms.
§2 CAUTIONS

<Before service>
• Only service personnel, who are used to handling tools and are familiar with this instrument, can perform the servicing.

• Perform all servicing according to the procedures described in this manual. Failure to do so may cause unexpected accident or malfunction.

• Be sure to turn the power off during servicing unless there is an instruction to turn it on.

• Do not perform servicing with wet hands. Doing so could cause electric shock or malfunction.

<During service>
• If malfunction occurs, check the symptom and turn the power off.

• Once the lamp goes on, its surroundings become hot. Do not touch parts near the lamp while it is lit or just after the light goes off.

• When handling circuit boards, be sure to touch only parts indicated in this manual. If not, an electric shock or a failure may be caused.

• If the CP-690 produces smoke or strange odors, immediately turn off the system and disconnect the electrical plug from the outlet. Usage of the system under such abnormal conditions may cause fire or electric shock.

• Do not lose or drop the screws, parts, etc. inside the instrument. As for the parts which are easy to lose, prepare a case beforehand and store the parts in it.

• Apply a threadlocking adhesive to the screws which have been loosened and tightened again.

• The following words are used in §4 SUB TROUBLESHOOTING.
  – Power voltage check –
    1) Plug the power cord and turn the power switch ON.
    2) Measure the voltage of the confirmed points with a tester (selecting voltage).
  – Continuity check –
    1) Turn the power switch OFF and unplug the power cord.
    2) Measure the resistance of the confirmed points with the tester (selecting resistance).
  – Cable check (Check of poor contact) –
    1) Turn the power switch OFF and unplug the power cord.
    2) Check that the connectors are inserted correctly. (Refer to §7 WIRING DIAGRAM.)
    3) Reconnect the connectors and then check that there are no poor contacts in the connectors.
    4) Measure the resistance of the confirmed points in a broken cable with the tester (selecting resistance).
§3 TROUBLESHOOTING

Turn the power switch ON.

Does the LED next to the power switch go on? N Go to 4.11.
Y

Does the initialization*1 start? (Do the motors rotate?) Y Go to 4.1.
N Go to 4.2.

Does the initialization finish? (Do the motors stop?) Y Go to 4.3.
N

Does the projection lamp go on? Y Go to 4.4.
N

After initialization, is the first projected chart image blocked by a mask? Y Go to 4.5.
N

Is the chart brightness suitable? Y Go to 4.6.
N

Is the chart brightness even? Y Go to 4.7.
N
The initialization performs the following operations.
1) The chart ASSY rotates and then stops by the sensor.
2) The chart ASSY moves little by little to correct its position.
3) The mask ASSY rotates and then stops by the sensor.
4) The mask ASSY moves little by little to correct its position.
5) The projection lamp goes on. The first chart is presented.

* Is the chart image clear?
  Y: Go to 4.8.
  N: 

* Does the chart image change as operated by the remote control?
  Y: Go to 4.9.
  N: 

* Are there any charts blocked by the mask?
  Y: Make fine adjustments of the chart and mask ASSYS. (See 6.5.)
  N: 

* Does the chart tilt against the mask?
  Y: 
  N: Go to 4.10.

* When looking at the polarized chart with polarizing glasses, does the chart image disappear?
  Y: 
  N: Go to 4.10.

* Is the volume of the beep sound (response sound) appropriate?
  Y: Adjust the volume of the beep sound (response sound). (See 6.6.4.)
  N: 

End
## 4.1 The Initialization does not Start.

<table>
<thead>
<tr>
<th>Question</th>
<th>Y</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are the fuses blown?</td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Is the working voltage ±10% of the rating voltage?</td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Is the setting of the voltage selector correct?</td>
<td></td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Does the power cord have continuity?</td>
<td></td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Does the power switch have continuity? (Before checking the continuity,</td>
<td></td>
<td>N</td>
</tr>
<tr>
<td>unplug the power cord from the wall outlet and turn the power switch ON</td>
<td></td>
<td></td>
</tr>
<tr>
<td>and OFF.) (See 7.1.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Is the voltage between the 1st and 3rd pins of the P1 connector AC 15.6</td>
<td></td>
<td>N</td>
</tr>
<tr>
<td>V ±5%? (Before measuring the voltage, disconnect the P1 connector from</td>
<td></td>
<td></td>
</tr>
<tr>
<td>the circuit board.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Replace the BA01 board.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(See 5.2.1.)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.2 The Motor does not Work.

When interchanging the connector positions of the chart and mask motors, does the working motor change?

Y
Replace the BA01 board. (See 5.2.1.)

N
Replace the motor that does not work.
As for the chart motor, see 5.4.
As for the mask motor, see 5.6.
### 4.3 The Motors do not Stop.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Each voltage between TP1 and TP3 (chart sensor) and between TP2 and TP3 (mask sensor) on the BA01 board as follows?</td>
<td>Adjust the voltage of each sensor. (See 6.2.)</td>
</tr>
<tr>
<td></td>
<td>Is the problem corrected?</td>
</tr>
<tr>
<td>When the shading plate blocks the light, +4.5 to 5 V</td>
<td>Y</td>
</tr>
<tr>
<td>When the shading plate does not block the light, under +0.5 V</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Replace the sensor whose motor does not stop. As for the chart sensor, see 5.3.1. As for the mask sensor, see 5.3.2. Is the problem corrected?</td>
</tr>
<tr>
<td></td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>End</td>
</tr>
<tr>
<td></td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>End</td>
</tr>
<tr>
<td>Replace the BA01 board. (See 5.2.1.)</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>End</td>
</tr>
<tr>
<td></td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>End</td>
</tr>
<tr>
<td>Reconnect the connectors.</td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>End</td>
</tr>
<tr>
<td></td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>End</td>
</tr>
<tr>
<td></td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>End</td>
</tr>
<tr>
<td></td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>End</td>
</tr>
<tr>
<td></td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>End</td>
</tr>
<tr>
<td></td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>End</td>
</tr>
<tr>
<td></td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>End</td>
</tr>
</tbody>
</table>

- Y: Yes
- N: No
4.4 The Projection Lamp does not Go On.

Is the voltage between the 1st and 2nd pins of J2 connector on the BA01 board within DC3.69 to 6.01 V? (when the setting of SW2 is channel “2”.)

- **Y**: Replace the BA01 board.  
  (See 5.2.1)

- **N**: Is the voltage between the 1st and 2nd pins of the J12 connector on the BA14 board within DC3.69 to 6.01 V? (when the setting of SW2 is channel 2 and LED cable is not connected.)

- **Y**: Replace the BA01 board.  
  (See 5.2.1)

- **N**: Replace the BA14 board.  
  (See 5.2.3.)
4.5 The Chart Image is Partly Blocked.

Is the blocked part on the right side of the visual acuity indication or chart?

- Y: Move the VA mask toward the inside of the instrument (mask motor side).
  (See 6.6.2.)

  Are the motors, chart ASSY and mask ASSY fixed securely?

  - N: Adjust the chart and mask positions.
    (See 6.5.)

    Y: Adjust the initialized position.
    (See 6.1.)

  Does the mask (disk) block the chart?

  - N: Adjust the sensor voltage.
    (See 6.2.)

    Y: Does the fixed mask block the chart?

    - N: Adjust the chart and mask positions.
      (See 6.5.)

      Y: Adjust the position of the fixed mask.
      (See 6.4.)

    - Y: Adjust the initialized position.
      (See 6.1.)

      Adjust the sensor voltage.
      (See 6.2.)
4.6 The Chart Brightness is Unsuitable.

Is the setting of the light control switch (SW2 on the BA01 board) appropriate? [This switch has five channels; from 1 (most bright) to 5 (darkest).]
* The setting at shipment is “2”.

- Y
  - Is the setting of the voltage selector appropriate?
    - N
      - Set the light control switch to the appropriate channel.
        (See 6.6.3.)
    - Y
      - Is the working voltage ±10 % of the rating voltage?
        - N
          - Reset the voltage selector.
            (See 6.6.1.)
        - Y
          - Is there any dust on the condenser lens?
            - Y
              - Clean the condenser lens.
                (See 5.13.2)
            - N
              - Is there any dust on the chart AS?
                - Y
                  - Clean the chart AS.
                    (See 5.13.1.)
                - N
                  - Is there any dust inside the lens barrel?
                    - Y
                      - Clean the projection lens inside the lens barrel.
                        (See 5.13.3.)
                    - N
                      - N

- N
  - N
  - Y
  - N
  - N
Is the polarized chart dark?

- N

Is the polarized filter burnt? (is it brown?)

- Y

Replace the chart ASSY.
(See 5.5.)

- N

N

Replace the transformer.
(See 5.9.)

- Y

Replace the screen.
4.7 The Chart Brightness is Uneven.

Does the unevenness show up in the same area of the chart?

Y

Is the C lens ASSY dirty, burnt or scratched?

Y

Is the holder ASSY dirty, burnt or scratched?

Y

Adjust the position of the lamp (LED). Is the chart brightness still uneven? (See 6.3.)

N

End

Y

Replace the screen.

N

Clean the chart ASSY. (See 5.13.1.)

Clean the C lens ASSY. (See 5.13.2.)
If the dirt or burnt area can not be cleaned, or the ASSY is scratched, replace it. (See 5.10.)

Clean the holder ASSY. (See 5.13.3.)
If the dirt or burnt area can not be cleaned, or the ASSY is scratched, replace it. (See 5.11.)
4.8 The Chart Image is not Clear.

Adjust the focus of the chart. Is the image still not clear?  
(As for the adjustment method, See the operator’s manual.)

Y  

Clean the chart ASSY. Is the image still not clear?  
(See 5.13.1.)

Y  

Clean the holder ASSY. Is the image still not clear?  
(See 5.13.3.)

Replace the screen.
4.9 The Chart Image does not Change as Operated by the Remote Control.

Are the batteries in the remote control drained?

Y → Replace the batteries with new ones.
N →

Does the chart image change normally by cutting the interference light off?

Y → Install the instrument apart from windows or spot lights.
N →

The settings of the remote control and main body (channel of the remote control) are correct?

Y → Make the settings for using several CP-690 units. (See 6.6.5.)
N →

Is the voltage between the 1st pin of the J7 connector and TP3 DC 5 V ±5 %?

Y →
N → Replace the BA01 board. (See 5.2.1.)

Do the points below have continuity?

<table>
<thead>
<tr>
<th>BA01 board</th>
<th>BA02 board</th>
</tr>
</thead>
<tbody>
<tr>
<td>J7</td>
<td>P7</td>
</tr>
<tr>
<td>1st pin</td>
<td>1st pin</td>
</tr>
<tr>
<td>2nd pin</td>
<td>2nd pin</td>
</tr>
<tr>
<td>3rd pin</td>
<td>3rd pin</td>
</tr>
</tbody>
</table>

Y → Replace the BA02 board. (See 5.2.2.)
N → Replace the remote control.
4.10 The Polarized Chart does not Disappear.

Is the main body tilted?  
- Y: Install the main body on a stable and level surface.  
- N: Check further.

Is the projected chart tilted?  
- Y: Adjust the initialized position.  
- N: Check further.

Is the refractor used to polarize the chart?  
- Y: Replace the chart ASSY.  
- N: Check further.

Is the trial lens used to polarize the chart?  
- Y: Does the polarized chart image disappear by moving the lens?  
  - Y: End  
  - N: Does the view change by reversing the right and left of the glasses?  
    - Y: Replace the polarizing glasses.  
    - N: Check further.

Are the polarizing glasses used to polarize the chart?  
- Y: Replace the polarizing glasses.  
- N: Check further.
4.11 The LED does not Go On.

Is the voltage between the 1st and 2nd pins of J9 on the BA01 board +4.5 to 5 V?  
(Before measuring the voltage, remove the P9 connector from the board.)

- **N** Replace the BA01 board.  
  (See 5.2.1.)

- **Y** Replace the bottom cover ASSY (including the power LED).  
  (See 5.7.)
5.1 How to Remove the Covers

[NOTE] Before removing the covers, unless “Turn the power switch ON” is written, be sure to turn the power switch OFF and unplug the power cord.

[NOTE] Once the lamp goes on, its surroundings become hot. Do not touch parts near the lamp until they cool down.

[How to remove the top cover ASSY]

Rotate the fastener a half-turn with a coin. Remove the top cover ASSY by lifting the rear side of it up.

[How to remove the front cover ASSY]

1. Remove the top cover ASSY.

2. Unscrew PT3 × 10 (n=2) and remove the front cover ASSY together with the plate (M074).
   * When remounting this part, be careful of the orientation of the plate (M074). (See the right figure.)

[How to remove the bottom cover ASSY]

1. Remove the top cover ASSY.

2. Disconnect the connector from J9 on the BA01 board.

3. Unscrew BS3 × 6ZnC (n=2) to remove the hook (M055).

4. Unscrew BS3 × 6ZnC (n=2) and PC3 × 10Cr (n=2) to remove the bottom cover.
   * When the lens barrel obstructs the removal, shorten it to the minimum.
[How to remove the disk cover]

1. Remove the top cover ASSY.

2. Unscrew AS3 × 6ZnC (n=4) to remove the disk cover (M030).
   * When remounting the disk cover, direct the side affixed with the CAUTION label to the lamp side (the rear side of the instrument).
5.2 Replacement of the Circuit Boards

5.2.1 Replacement of the BA01 board

Replacement part: BA01 board (33155-BA01)
* Circuit board, bridge diode, regulator IC, insulating sheet (Each 1 pc.)

1. Remove the top cover ASSY. (See 5.1.)

2. Remove all connectors from the BA01 board.

3. Pull out 1 chip CPU from the BA01 board and install it into the new board.
   [NOTE] Be careful of the orientation of the CPU.

4. Unscrew BS3 × 10znc (n=2) fixing the bridge diode (D1) and regulator IC (IC2).

5. Remove the BA01 board while holding the tip of the four spacers with long nose pliers and then mount the new circuit board.
   * Push the new board into the spacers securely.

6. Fix the new bridge diode (D1) and regulator IC (IC2) into the radiator plate (M032) with the screws and then solder each terminal onto the BA01 board.
   * When tightening the screws, catch the insulating sheet (80399-01006) between the regulator IC and radiator plate.
   * Do not catch the insulating sheet between the bridge diode and radiator plate. However, apply heat sink grease to the side contacting the cooling heat.
   * After soldering, cut the terminals protruding from the circuit board to a position of 2 to 4 mm from the board.
   * As the same with the last circuit board, adjust the position of VR1 (beep sound volume) and VR2 [light amount (voltage)] and set SW1 (DIP switch) and SW2 (light amount selecting switch) of the new board.

7. Assemble the removed parts in reverse order.
5.2.2 Replacement of the BA02 board

Replacement part: 33155-BA02

1. Remove the top and front cover ASSYs. (See 5.1.)

2. Disconnect the connector from J7 on the BA01 board.

3. Unscrew BS3 × 6znC (n=2) to replace the BA02 board with a new one.

4. Assemble the removed parts in reverse order.

5.2.3 Replacement of the BA14 board

Replacement part: 33155-BA14

[NOTE] Once the lamp goes on, the device on the BA14 board becomes hot. Do not conduct work until the device cool down.

1. Remove the top and front cover ASSYs. (See 5.1.)

2. Disconnect J2 connector and EA14 cable connector on the BA01 board.

3. Remove the BA14 board while holding the tops of the two spacers with long-nose pliers and replace with new one.
   * Push the new board into the spacers properly.

4. Assemble the removed parts in reverse order.
5.3 Replacement of the Sensors

5.3.1 Replacement of the chart sensor

Replacement part: Chart sensor (33155-EA05)

1. Remove the top cover ASSY. (See 5.1.)

2. Disconnect the connector from J6 on the BA01 board.
   * Cut the tie wrap (T18R) which ties the cables of the chart sensor.

3. Remove the disk cover (M030). (See 5.1.)

4. Unscrew BS3 × 6\(_{ZnC}\) (n=2) to remove the chart sensor and sensor fitting plate (M009).

5. Unscrew PC3 × 6 (n=2) from the sensor fitting plate (M009) and replace the chart sensor (EA05) with a new one.
   * Check that the shading plate of the mask disk does not interfere with the mask sensor.

6. Assemble the removed parts (except for the top cover) in reverse order.
   * Write the connector number “P6” on the connector of the replaced chart sensor with an oil-based ink (black).
   * Tie the wiring with the tie wrap (T18R) in its original position. (See “7.2 How to carry out the wiring”.)

7. After performing “6.2 Adjustment of the sensor voltage”, remount the top cover.
5.3.2 Replacement of the mask sensor

Replacement part: Mask sensor (33155-EA05)

1. Remove the top cover ASSY. (See 5.1.)

2. Disconnect the connector from J4 on the BA01 board.
   * Cut the tie wrap (T18R) which ties the cables of the mask sensor.

3. Remove the disk cover (M030). (See 5.1.)

4. Unscrew BS3 × 6\textsubscript{ZnC} (n=2) to remove the mask sensor and sensor fitting plate (M009).

5. Unscrew PC3 × 6 (n=2) from the sensor fitting plate (M009) and replace the mask sensor (EA05) with a new one.
   * Check that the shading plate of the mask disk does not interfere with the mask sensor.

6. Assemble the removed parts (except for the top cover) in reverse order.
   * Write down the connector number “P4” on the connector of the replaced mask sensor with an oil-based ink (black).
   * Tie the wiring with the tie wrap (T18R) in its original position. (See “7.2 How to carry out the wiring”)

7. After performing “6.2 Adjustment of the sensor voltage”, remount the top cover.
5.4 Replacement of the Chart Motor

Replacement part: Chart motor (33155-E003)

1. Remove the top and bottom cover ASSYs. (See 5.1.)

2. Disconnect all connectors (except for J7) from the BA01 board.
   * Cut the tie wrap (T18R) which ties the cables of the chart motor.

3. Unscrew BS3 × 6ZnC (n=2) to remove the P.C. board ASSY (1500).

4. Loosen HH3 × 5 (n=2) and unscrew SB3 × 6, SW3 and 3PW3 to remove the holder ASSY (1300).

5. Unscrew SB3 × 6 (n=4) to remove the base plate (M001).

6. Unscrew AS3 × 6ZnC (n=4) to remove the disk cover (M030).

7. Loosen HH4 × 6 (n=4) of the chart disk retainer.

8. Unscrew SB4 × 10 (n=4), SW4 (n=4) and PW4 (n=4) and remove the chart motor to replace it with a new one.
   * During this replacement, leave the chart ASSY in the disk housing.
   * Mount the chart motor being careful of the wiring side.
9. Make a clearance of 0.5 mm between the mask and chart disks by displacing the chart ASSY. Tighten HH4 × 6 (n=4) of the chart disk retainer.

* Tighten the four screws (HH4 × 6(n=4)) while checking that the two tips contact the notch of the motor shaft (flat side) vertically.
* Check that the mask and chart disks do not contact each other by rotating them by hand. (As for the bottom of the disk housing, check the disks by shining light in there with a penlight.)

10. Assemble the removed parts (except for the bottom and top cover ASSYs) in reverse order.
* Check that the shading plate of the chart disk does not interfere with the chart sensor.
* Write down the connector number “P5” on the connector of the replaced mask motor with an oil-based ink (black).
* Tie the wiring with the tie wrap (T18R) in its original position. (See “7.2 How to carry out the wiring”.)

11. After performing “6.1 Adjustment of the initialized position”, “6.2 Adjustment of the sensor voltage” and “6.4 Adjustment the fixed mask position” and “6.5 Adjustment of the chart and mask positions”, remount the bottom and top cover ASSYs.
5.5 Replacement of the Chart ASSY


1. Remove the top and bottom cover ASSYs. (See 5.1.)

2. Disconnect the connector from J3 on the BA01 board.
   * Cut the tie wrap (T18R) which ties the cables of the mask motor.

3. Remove the disk cover (M030). (See 5.1.)

4. Unscrew BS3 × 6ZnC to remove the VA mask (M029).

5. Unscrew SB3 × 6 (n=2) to remove the illumination ASSY (1200).

6. Unscrew BS3 × 6ZnC (n=2) to remove the mask sensor and sensor fitting plate (M009).

7. Unscrew SB4 × 10 (n=4), SW4 (n=4) and mask sensor and sensor fitting plate M009).PW4 (n=4) to remove the mask ASSY.
   * In order to remove the mask ASSY, slide it to the rear side slightly and pull it out upward.

8. Loosen HH4 × 6 (n=4) of the chart disk retainer, pull out the chart ASSY from the shaft of the chart motor by sliding the chart ASSY and then insert the new chart ASSY. (Do not tighten HH4 × 6.)
   * Before mounting the new chart ASSY, check that it has no dirt such as dust.
9. Make a clearance of 0.5 mm between the mask and chart disks by displacing the chart ASSY. Tighten HH4 × 6 (n=4) of the chart disk retainer.
   * Tighten the four screws (HH4 × 6 (n=4)) while checking that the two tips contact the notch of the motor shaft (flat side) vertically.
   * Check that the mask and chart disks do not contact each other by rotating them by hand. (As for the bottom of the disk housing, check the disks by shining light in there with a penlight.)

10. Assemble the removed parts (except for the bottom and top cover ASSYs) in reverse order.
    * Check that the shading plate of the mask disk does not interfere with the mask sensor after remounting the mask sensor.
    * Tie the wiring with the tie wrap (T18R) in its original position. (See “7.2 How to carry out the wiring”.)
    * Remount the VA mask (M029) toward the inside of the instrument (mask motor side). (See “6.6.2. To display or not display the visual acuity”.)

11. After performing “6.1 Adjustment of the initialized position”, “6.2 Adjustment of the sensor voltage” and “6.4 Adjustment the fixed mask position” and “6.5 Adjustment of the chart and mask positions”, remount the bottom and top cover ASSYs.
5.6 Replacement of the Mask Motor and Mask ASSY


1. Remove the top and bottom cover ASSYs. (See 5.1.)

2. Disconnect the connector from J3 on the BA01 board. Cut the tie wrap (T18R) tying the cables of the mask motor.

3. Remove the disk cover (M030). (See 5.1.)

4. Unscrew BS3 × 6ZnC (n=2) to remove the mask sensor and sensor fitting plate (M009),

5. Unscrew SB4 × 10 (n=4), SW4 (n=4) and PW4 (n=4) to remove the mask ASSY.
   * Remove the mask ASSY by sliding it to the rear side slightly and then pull it out upward.

6. Loosen HH4 × 6 (n=4) of the mask disk retainer to replace the mask motor (E003) or mask ASSY with a new one.
   * The two tips among HH4 × 6 (n=4) shall contact the notch of the motor shaft (flat side) vertically.
   * Fix the exposed part of the motor shaft to about 1 to 2 mm with HH4 × 6 (n=4) temporarily.
7. **Fix the mask ASSY in the disk housing.**
   * Mount the disk motor being careful of the wiring side. (See the figure on page 5-11.)

8. **Loosen HH4 × 6 (n=4) of the mask disk retainer to make a clearance of 0.5 mm between the mask and chart disks.** Retighten HH4 × 6 (n=4).
   * Tighten the four screws (HH4 × 6 (n=4)) while checking that the two tips contact the notch of the motor shaft (flat side) vertically.
   * Check that the mask and chart disks do not contact each other by rotating them by hand. (As for the bottom of the disk housing, check the disks by shining light in there with a penlight.)

9. **Assemble the removed parts (except for the bottom and top cover ASSYs) in reverse order.**
   * Check that the shading plate of the mask disk does not interfere with the mask sensor.
   * Write down the connector number “P3” on the connector of the replaced mask motor with an oil-based ink (black).
   * Tie the wiring with the tie wrap (T18R) in its original position. (See “7.2 How to carry out the wiring”.)

10. **After performing “6.1 Adjustment of the initialized position”, “6.2 Adjustment of the sensor voltage” and “6.5 Adjustment of the chart and mask positions”, remount the bottom and top cover ASSYs.**
5.7 Replacement of the Bottom Cover ASSY (Power LED)

Replacement part: Bottom cover ASSY (33156-1015)

1. After removing the top and front cover ASSYs according to “5.1 How to remove the covers”, replace the bottom cover ASSY with a new one. (See 5.1.)
   * Peel off the fuse label (100 V system: 33102-M103, 200 V system: 33138-M086), serial number label, and serial number plate from the bottom ASSY and stick them to the new bottom cover ASSY in the same positions.
   * The A type and instrument for Marco does not have the serial number label.

2. Assemble the removed parts in reverse order.

5.8 Replacement of the Power Switch

Replacement part: Seesaw switch (80460-00103)

1. Remove the top and bottom cover ASSYs.
   (See 5.1.)

2. Unscrew BS3 × 6ZnC (n=2) to remove the base (M033).

3. Remove the hook part of the seesaw switch from the base (M033).

4. Disconnect the black and white wires (each: 2) from the removed seesaw switch and then connect these wires to the new seesaw switch.

<table>
<thead>
<tr>
<th>2</th>
<th>1</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>A</td>
<td>L</td>
</tr>
</tbody>
</table>

   - Black wire of the inlet terminal A → Terminal 1 of the switch part
   - White wire of the inlet terminal B → Terminal 2 of the switch part
   - Black wire of the inlet terminal L → Terminal 1a of the switch part
   - White wire of the inlet terminal N → Terminal 2a of the switch part

5. Assemble the removed parts in reverse order.
   * Be careful of the positioning of the seesaw switch.
5.9 Replacement of the Power Transformer

Replacement part: Power transformer (100 V system: 33155-E001, 200 V system: 33155-E002)

1. Remove the top and bottom cover ASSYs.  
   (See 5.1.)

2. Disconnect the connector from J1 on the BA01 board.

3. Disconnect the wires from the terminals (1, 2 and 5) of the inlet.  
   * Cut the tie wrap (T18R) which ties the wires.

4. Unscrew BS3 \times 6_{ZnC} (n=2) to displace the board ASSY (1500) until the screws fixing the transformer appear.

5. Unscrew SB4 \times 8 (n=4), SW4 (n=4) and 3PW4 (n=4) to replace the transformer with a new one.

6. Draw the wires (black, brown and red) of the new transformer through the clearance between the base plate (M001) and chart motor. Connect the wires to the following terminals of the inlet.

   * Retie the wiring in the original position with the tie wrap (T18R).

7. Assemble the removed parts in reverse order.
5.10 Replacement of the LED ASSY/C lens ASSY

Replacement part: LED ASSY (33156-1205)
C lens ASSY (U, M, F, T, P, I, and M types: 33156-1235, UK and A types: 33161-1225)

[NOTE] Once the lamp goes on, its surroundings become hot. Do not touch parts near the lamp until they cool down.

1. Remove the top and bottom cover ASSYs. (See 5.1.)

[Replacement of the LED ASSY]
1) Remove the cable of the LED ASSY from the BA14 board.
2) Loosen TH3 × 4 (n=3) in order to remove the LED ASSY.
3) Attach the new LED ASSY.
* Assemble the LED ASSY under the condition that the cable of the LED ASSY is upside.
[Replacement of the C lens ASSY]

1) Unscrew SB3 × 6 (n=2) to remove the illumination part ASSY.

2) Loosen TH3 × 4 (n=3) to remove the C lens ASSY.

3) Attach the new C lens ASSY.
   * Assemble the C lens ASSY under the condition that the two fix screws, which are on the side of the C lens ASSY, are upside.

2. Assemble the top and bottom cover ASSYs after “6.4 Adjustment of the fixed mask position” and “6.3 adjustment of the lamp filament position” are performed.
5.11 Replacement of the Holder ASSY


1. Remove the top and bottom cover ASSYs. (See 5.1.)

2. Loosen HH3 × 5 (n=2) to remove SB3 × 6, SW3 and 3PW3 and replace the holder ASSY with a new one.

3. Assemble the removed parts in reverse order. Adjust the installed position of the main body and the focus according to the operator’s manual.
5.12 Replacement of the Fuses

Replacement part: Two fuses [100 V system: 80402-02039 (1 A, 250 V), 200 V system: 80402-02037 (0.5 A, 250 V)]

Replace the fuses according to the CP-690 operator’s manual.
5.13 Cleaning

5.13.1 Cleaning of the chart and mask

1. Remove the top cover ASSY and disk cover (M030). (See 5.1.)

2. Blow off the dust on the disks with a blower.

   * For stubborn dirt on the disks, wipe it with a swab whose tip is wrapped in lens cleaning paper and is dampened with the liquid mixture.

   * When cleaning the opposite sides of the chart and mask disks, rotate both disks by hand and wipe the chart disk through the open mask. [If it is impossible, remove the chart or mask ASSY (See 5.5, 5.6) to wipe the disks.]

   * Wipe the disks so as not to leave wipe marks.

   * When wiping the mask disk, pay attention not to leave lint on the disk.

   * When cleaning the filter bond with the chart, wipe only its surface lightly. Do not touch the adhesive.

3. Assemble the removed parts in reverse order.
5.13.2 Cleaning of the condenser lens

[NOTE] Once the lamp goes on, its surroundings become hot. Do not touch parts near the lamp until they cool down.

1. Remove the top cover ASSY. (See 5.1.)

2. Remove the condenser lens. (See 5.10.)

3. [Cleaning of the condenser lens]
   Blow the dust off with a blower.
   For stubborn dirt, wipe it with a swab whose tip is wrapped in lens cleaning paper and is dampened with the liquid mixture.
   
   * Wipe them so as not to leave wipe marks.

4. Assemble the bottom and top cover ASSYs after “6.3 Adjustment of the Lamp (LED) Position” is performed.
5.13.3 Cleaning of the holder ASSY

1. Remove the top and front cover ASSYs. (See 5.1.)

[30 × model, 25 × model]
1) Rotate the objective holder counterclockwise to remove it from the lens barrel.

2) Clean the surface of the lens of the objective holder.

* Blow the dust off with a blower. For stubborn dirt, wipe it with a swab whose tip is wrapped in lens cleaning paper and is dampened with the liquid mixture.
* Wipe them so as not to leave wipe marks.

[Variable power model]
1) Loosen the knurled screw and draw the forepart of the lens barrel.

2) Clean the surface of the lenses indicated by arrows in the diagram below.

2. After assembling the removed parts in reverse order, perform the adjustment of the installed position of the main body and the focus according to the operator’s manual.
6.1 Adjustment of the Initialized Position

The sensors and shading plates detect the initialized position.
The sensor voltage (position) must be adjusted when the motor, sensors and disks are misaligned by replacing or adjusting the parts.

1. Remove the top cover ASSY. (See 5.1.)
2. Turn No. 8 of the DIP switch on the BA01 board to the ON position and turn the power switch ON.
   * Install the main body on a stable and level surface.
   * When turning the DIP switch to the ON or OFF position, slide the switch without loading the circuit board. If not, a failure may occur.

3. Project the chart on the screen and roughly adjust the focus.

4. Operate the remote control as follows so that the first projected chart and open mask become horizontal.
   VA UP button ······················Move the chart up
   VA DOWN button ······················Move the chart down
   START button ·························Move the mask up
   NEXT button ···························Move the mask down

5. After checking that the chart is not blocked, press the R/G button. (The initialized position is memorized.)

6. Turn No. 8 of the DIP switch to the OFF position, remount the top cover ASSY and then turn the power switch OFF and ON.
6.2 Adjustment of the Sensor Voltage

1. Remove the top cover ASSY. (See 5.1.)

2. Turn No. 8 of the DIP switch on the BA01 board to the ON position and turn the power switch ON.
   * When turning the DIP switch to the ON or OFF position, slide the switch without loading the circuit board. If not, a failure may occur.

3. Adjust the voltage of the chart and mask sensors as follows.

[Voltage adjustment of the chart sensor]
   1) Measure the voltage between TP1 and TP3 on the BA01 board. Check that this voltage is within the applicable range as follows. If it is not, make the voltage within the applicable range by displacing the chart sensor.
      [Applicable range: 4.5 V to 5.0 V]
   2) Press the VA DOWN button on the remote control twice and the VA UP button once.
   3) Measure the voltage between TP1 and TP3 on the BA01 board. Check that this voltage is within the applicable range as follows. If it is not, make the voltage within the applicable range by displacing the chart sensor.
      [Applicable range: 0.5 V or less]
   4) Press the VA UP button on the remote control once. Check that the voltage between TP1 and TP3 is 4.5 V to 5.0 V.

[Voltage adjustment of the mask sensor]
   1) Measure the voltage between TP2 and TP3 on the BA01 board. Check that this voltage is within the applicable range as follows. If it is not, make the voltage within the applicable range by displacing the mask sensor.
      [Applicable range: 4.5 V to 5.0 V]
   2) Press the START button on the remote control twice and the NEXT button once.
   3) Measure the voltage between TP2 and TP3 on the BA01 board. Check that this voltage is within the applicable range as follows. If it is not, make the voltage within the applicable range by displacing the chart sensor.
      [Applicable range: 0.5 V or less]
   4) Press the NEXT button on the remote control once. Check that the voltage between TP2 and TP3 is 4.5 V to 5.0 V.

Guide: When the voltage is higher than the applicable range, bring the sensor close to the shading plate. When it is lower, locate the shading plate away from the sensor.

4. Turn No. 8 of the DIP switch to the OFF position, remount the top cover ASSY and then turn the power switch OFF and ON.
6.3 Adjustment of the Lamp (LED) Position

[NOTE] For variable power lens barrel, set the lens position as below before adjustment. Lens position does not matter for 30 × and 25 × lens barrel model.

1. Remove the top and bottom cover ASSYs (See 5.1) and turn the power switch ON. Place a piece of white paper at a position of 0 to 10 mm from the lower side of the front cover.
   * The LED image appear on the paper as follows.

2. Loosen TH screw (n=3) fixing LED ASSY. Adjust the focus of the LED image by pushing and pulling the LED ASSY. Fix TH screw where the reflection image is focused.

3. Loosen PC screw (n=4) fixing LED ASSY. Move the LED ASSY in order that LED image becomes center of circle. Fix the screw where the reflection image of LED becomes center.

   * The position of LED image is not center.

4. Project the chart onto the screen to check that the chart brightness is even.

5. Remount the top and bottom cover ASSYs.
6.4 Adjustment of the Fixed Mask Position

[NOTE] The parts around the lamp become hot. Do not touch the parts directly by hand.

1. Turn the power switch ON, project the chart on the screen and adjust the focus.

2. Turn the power switch OFF, remove the top cover ASSY and disk cover (M030). (See 5.1.)

3. Disconnect the connectors from J3 and J5 on the BA01 board.

4. Unscrew BS3 × 6ZnC to remove the VA mask (M029).

5. Turn the power switch ON again, rotate the chart and mask disks by hand to check the position (tilt) of the fixed mask.
   * The fixed mask resembles the open mask of the mask disk in shape.
   * When checking the position, adjust the focus to the chart. (The fixed mask appears such as a fuzzy image.)

6. Loosen HH3 × 4 (n=2) to rotate the fixed mask by hand. Adjust it to satisfy the following conditions.
   * The fixed mask shall be horizontal against the chart.
   * When overlapping the chart with the fixed mask horizontally, the fixed mask shall not hide part of the chart. (Perform the same check on the astigmatism clock dial and dots charts.)

7. Tighten the loosened screws while pushing the fixed mask into the lamp side.
   * After tightening the screws, check the position of the fixed mask again.

8. Assemble the removed parts in reverse order.
   * Remount the VA mask (M029) toward the inside of the instrument (mask motor side).
6.5 Adjustment of the Chart and Mask Positions

1. Remove the top and bottom cover ASSYs and disk cover (M030). (See 5.1.)

2. Turn the power switch ON, project the chart onto the screen and adjust the focus.

3. Loosen SB4 × 10 (n=4), SW4 (n=4) and PW4 (n=4) fixing the mask motor. Make fine adjustments of the mask motor position to satisfy the following conditions.
   * If the adjustment can not be completed by moving the mask motor, move the chart position by making fine adjustments of the chart sensor position. However, when the chart sensor is moved, perform “6.4 Adjustment of the fixed mask position”.

   • Single letter mask position
     When applying the single letter mask to the following charts [the parenthesized numbers are visual acuity], the alphabetical letter shall be in about the center of the mask.
     U type: Alphabet (70), M type: Alphabet (100), F type: Alphabet (0.3), T type: Alphabet (0.2), P type: Alphabet (0.2), I type: Number (0.25), UK type: Alphabet (24), A type: Hiragana (0.3)

   • R/G filter position
     The boundary between the red and green filters shall be in the middle of the chart horizontally.
     As a guide, the boundary is within about 3 mm from the center at the refractive distance of 5 m.

   • Blocking of the astigmatism clock dial chart
     The projected astigmatism clock dial chart shall be not blocked.

   • Positions of the horizontal and vertical line masks
     When applying the horizontal or vertical line mask to the following charts [the parenthesized numbers are visual acuity], the mask shall not incline and the next chart shall not be seen (for checking the light leakage).
     U type: Alphabet (70 to 50), M type: Alphabet (100 to 20), F type: Alphabet (0.3 to 0.5), T type: Alphabet (0.2 to 0.4), P type: Alphabet (0.2 to 0.32), I type: Number (0.25 to 0.4), UK type: Alphabet (24 to 15), A type: Hiragana (0.2 to 0.4)

4. Tighten the loosened screws and check to satisfy the above conditions.

5. Perform “6.1 Adjustment of the initialized position” and “6.2 Adjustment of the sensor voltage”.
6.6 Setting

6.6.1 Setting of the voltage selector

* Check that the number indicated in the voltage indication window, which is next to the power socket on the bottom side of the instrument, matches the supplied power voltage. If not, change it as follows.

1. Turn the power switch OFF and disconnect the power cord from the main body.

2. Pull the fuse holder out while pushing both sides of the fuse holder with thin flatblade screwdrivers to release the fixing lips.

3. Remove the voltage selector together with the fuses, change the orientation of the voltage selector so that the applicable voltage is indicated and reinsert it.

4. Fit the fuse holder into the original position.
6.6.2 To display or not display the visual acuity

1. Remove the top cover ASSY. (See 5.1.)

2. **Loosen** BS3 × 6ZnC fixing the VA mask.

3. Switch between the display and non-display of the visual acuity by moving the VA mask.

   **[In order not to display the visual acuity]**
   Move the VA mask (M029) toward the outside of the instrument (right side). Tighten the loosened BS3 × 6ZnC temporally.

   **[In order to display the visual acuity]**
   Move the VA mask (M029) toward the inside of the instrument (left side: mask motor side). Tighten the loosened BS3 × 6ZnC temporally.

4. Turn the power switch ON and project the chart onto the screen to check that the all visual acuities are displayed (or not displayed). (Check also the light leakage and chart blockage.)
   * When light leakage or chart blockage is found, make fine adjustments of the VA mask position.

5. **Tighten BS3 × 6 ZnC securely and remount the top cover ASSY.**
6.6.3 Selecting the amount of chart light

1. Remove the top cover ASSY. (See 5.1.)

2. Turn the power switch on and set the rotary switch (SW2) on the BA01 board with a flatblade screwdriver.
   * The light amount has 5 levels. (See the right figure.)
   * Channel 6 is the same brightness as Channel 1.
   * The setting at shipment is Channel 2.

<table>
<thead>
<tr>
<th>Channel</th>
<th>Chart brightness</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>250 cd/m²</td>
</tr>
<tr>
<td>2</td>
<td>230 cd/m²</td>
</tr>
<tr>
<td>3</td>
<td>200 cd/m²</td>
</tr>
<tr>
<td>4</td>
<td>160 cd/m²</td>
</tr>
<tr>
<td>5</td>
<td>140 cd/m²</td>
</tr>
</tbody>
</table>

3. Turn the power switch ON and project the chart on the screen to check that the chart brightness is suitable.
   * Use the screen attached to the CP-690 main body.

4. Remount the top cover ASSY.

6.6.4 Setting of the beep sound volume (Response sound)

1. Remove the top cover ASSY. (See 5.1.)

2. Rotate the volume (VR1) on the BA01 board with a flatblade screwdriver.
   * Rotating the volume clockwise makes the beep sound louder.
   * In order to check the beep sound volume, press the program next button on the remote control.

3. Remount the top cover ASSY.
6.6.5 Setting of the DIP switch

1. Remove the top cover ASSY. (See 5.1.)

2. Change the setting of the DIP switch (SW1) on the BA01 board.
   * When turning the DIP switch to the ON or OFF position, slide the switch without loading the circuit board. If not, the board may fail.
   * See the table below as for each function of the DIP switch.

3. Remount the top cover ASSY.

[DIP switch functions of the BA01 board of the CP-690]

<table>
<thead>
<tr>
<th>Switch No.</th>
<th>Function</th>
<th>OFF</th>
<th>ON</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Setting of the channels of the remote control (For using several units)</td>
<td>According to the combination of the switch codes (See the table on the next page.)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>None</td>
<td>The setting is definitely OFF.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Changing of the automatic shutoff time of the lamp</td>
<td>15 minutes</td>
<td>5 minutes</td>
</tr>
<tr>
<td></td>
<td>(When connecting the CP-690 to the RT-2100, the setting of the RT-2100 is put on a higher priority.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Focused writing of program A</td>
<td>Not wiring</td>
<td>Wiring</td>
</tr>
<tr>
<td>8</td>
<td>Adjustment mode</td>
<td>The setting is definitely OFF.</td>
<td></td>
</tr>
</tbody>
</table>

* All settings at shipment are OFF.
[Setting when using several units (Switch code setting)]

When several CP-690 units are used in the same room, set the switches of the main body and remote control according to the table below in order to prevent electrical interference of the remote control.

(When using the CP-690 with the RT-1200, set also the control box (CB) of the RT-1200.)

<table>
<thead>
<tr>
<th>Switch setting</th>
<th>On the BA01 board of the CP-690 main body</th>
<th>In the battery box of the remote control as shown below</th>
<th>Rear side of the RT-1200CB</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SW1</td>
<td>SW2</td>
<td>SW3</td>
</tr>
<tr>
<td>1st unit</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>2nd unit</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>3rd unit</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>4th unit</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>5th unit</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>6th unit</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
</tr>
<tr>
<td>7th unit</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>8th unit</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
</tr>
</tbody>
</table>

* The setting at shipment is the same as the 1st unit.
* The usage environment such as setting of the DIP switch of the RT-1200 and software is the same as the CP-670.
* When using the CP-690 with the RT-2100, the setting of the switch code is not necessary.
  (It can control the CP-690 with the RT-2100 regardless of the setting from SW1 to SW3 of the main body.)
  However, the switch codes of the main body and remote control need to be set in order to use the remote control.
* Select “CP-690 Type**” when selecting the visual chart of the RT-2100 control box.
* Once the jumper wire of the remote control is cut, it cannot be reconnected. Only when using five units or more, cut the wire.
7.1 Wiring Diagram

[Total wiring Diagram]
**[EA05]**

* Describe the connector No. when assembling.
  - Mask side: P4
  - Chart side: P6

**[EA06]**

**[EA13]**

**[EA14]**

* WIRE: UL3265 AWG26

* WIRE: UL3265 AWG25
7.2 How to Carry Out the Wiring

Carry out the wiring as follows and tie the wiring with a tie wrap (T18R) in the position " "

Band the mask motor with the cable of mask sensor.
Draw a tie wrap through a hole of disk house.
## LIST OF REPLACEABLE PARTS

### [U type]

<table>
<thead>
<tr>
<th>Type</th>
<th>Parts name</th>
<th>Parts No.</th>
<th>Number</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Board</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BA01 board (main board)</td>
<td>33155-BA01</td>
<td>1</td>
<td>IC board, bridge diode, regulator IC, insulating sheet (each: 1 pc.)</td>
</tr>
<tr>
<td></td>
<td>BA02 board (IR board)</td>
<td>33155-BA02</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BA14 board (RESISTOR board)</td>
<td>33155-BA14</td>
<td>1</td>
<td></td>
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<table>
<thead>
<tr>
<th>Type</th>
<th>Parts name</th>
<th>Parts No.</th>
<th>Number</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Board</td>
<td>BA01 board (main board)</td>
<td>33155-BA01</td>
<td>1</td>
<td>IC board, bridge diode, regulator IC, insulating sheet (each: 1 pc.)</td>
</tr>
<tr>
<td></td>
<td>BA02 board (IR board)</td>
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<td>BA14 board (RESISTOR board)</td>
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<td>Parts</td>
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<td>Motor (for chart/mask)</td>
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<td>1 chip CPU (for UK type)</td>
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<tr>
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<td>Fuse, slow-blow type (200 V system: 0.5 A 250 V)</td>
<td>80402-02037</td>
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<tr>
<td></td>
<td>Seesaw switch</td>
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<td>Parts in EA01</td>
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<tr>
<td></td>
<td>Screen</td>
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<td>Unit</td>
<td>Sensor (for chart/mask)</td>
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<td></td>
<td>Bottom cover ASSY</td>
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</tr>
<tr>
<td></td>
<td>Mask ASSY</td>
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<td></td>
<td>C lens ASSY</td>
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<td></td>
<td>LED ASSY</td>
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<td></td>
<td>Holder ASSY (25×)</td>
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<td>Chart ASSY</td>
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<td></td>
<td>Remote control ASSY (NIDEK brand)</td>
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### [A type]

<table>
<thead>
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<th>Type</th>
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<th>Remarks</th>
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<tbody>
<tr>
<td>Board</td>
<td>BA01 board (main board)</td>
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<td>IC board, bridge diode, regulator IC, insulating sheet (each: 1 pc.)</td>
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<td>Screen</td>
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<td>Unit</td>
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<td>C lens ASSY</td>
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</tbody>
</table>
[Tools and measuring devices]

Phillips screwdriver set
Flatblade screwdriver set
Precision screwdriver set
Hexagonal-head wrench set
Nipper (For cutting tie wraps)
Long-nose pliers
Tweezers
Tester
Soldering iron
Penlight

[Others]

Threadlocking adhesive (Three Bond 1401B)
Liquid mixture (methanol 50 % + ether 50 %)
KIMWIPES (CRECIA WIPER S-200)
Blower
Solder
Heat sink grease (MIZUTANI ELECTRIC CO., LTD.)
Insulating tape (NITOFRON tape: NITTO No. 973UL Width: 19 mm)
Tie wrap (T18R)
Swabs
Lens cleaning paper